



The Right Technology. Right Away.[™]
CDW.com • 800.800.4239



Widening the pipes

Businesses need new solutions to meet the bandwidth demands of new applications that are stressing I.T. infrastructures.

- Executive summary 2
- Relieving network congestion 2
- 10GbE in support of storage consolidation 2
- New applications drive bandwidth demands 3
- Why 10GbE? Why now? 4
- Prices on the decline 4
- Meeting the demands of consolidation 5
- Reducing the total cost of ownership 5
- New considerations: Power over Ethernet (PoE) 6
- New considerations: Quality of Service (QoS) 6
- Glossary 7
- Product spotlight 8

According to IDC, 10GbE should surpass GbE product sales by 2007.

Source: IDC (2005)

Executive summary

With the increase over the last five years in rich content, file sizes and distributed architectures, business computing has grown increasingly bandwidth-hungry.

High-capacity storage networks, virtualized data centers and server clusters that support processing-intensive applications are just three examples that demand high throughput for massive amounts of data. And businesses, in general, are looking to increase I.T. agility in order to "future-proof" their operations for long-term growth and competitiveness.

Today, network hardware is transitioning to 10 Gigabit Ethernet (10GbE) to meet these increased needs. 10GbE isn't just for massive enterprises anymore — HP and IBM are offering the technology in midrange server blades and as add-on network interface cards (NICs) for existing servers. And high-density, low-latency switches that incorporate 10GbE ports are now starting to appear.

Relieving network congestion

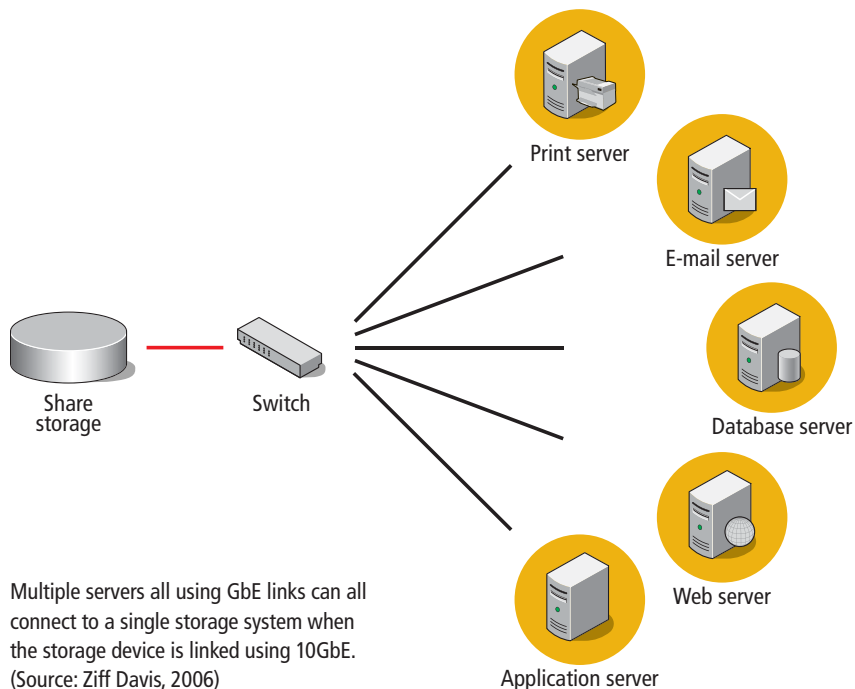
I.T. departments are under pressure trying to meet increased workload demands within tight budgets. At the same time, new applications and new cost-saving measures such as server consolidation are causing I.T. departments to look at new technologies to address their changing requirements.

When examining the alternatives, many companies are realizing switches that support a mix of technologies — including 10GbE, quality-of-service (QoS) features, bandwidth allocation and throttling, and Power over Ethernet (PoE) — will play an important role in upgrading today's I.T. infrastructure to meet growing networks.

Specifically, businesses are realizing they need an improved infrastructure to provide the application response times their users and customers demand. New applications such as Voice over Internet Protocol (VoIP) and audio and video streaming are competing for bandwidth with traditional applications like databases, customer service programs and e-mail (which now is routinely used to send large attachments).

To ensure all of these applications have the response times users are accustomed to, companies are looking for networking technologies that essentially widen the pipes. Such a move has been undertaken in the past when companies went from Ethernet, which supports 10Mb/sec data-transfer rates, to Fast Ethernet backbones, which offered 100Mb/sec of bandwidth. Over time, companies made a similar transition from Fast Ethernet to Gigabit Ethernet. And now, many companies see a move to 10GbE as the next logical step.

10GbE in support of storage consolidation



New applications drive bandwidth demands

I.T. infrastructures are becoming more stressed as new applications vie for bandwidth on company backbones. And increasingly, 10GbE backbones are being eyed as the solution to alleviate network congestion.

In fact, there are several application areas where 10GbE is a natural fit today. These areas include server consolidation, application virtualization, storage consolidation and Fibre Channel alternative.

Server consolidation

Many companies are physically consolidating multiple application servers onto a single high-performance server to reduce the operating costs of maintaining so many individual servers. Such a consolidated server must support many more simultaneous requests and many more users. 10GbE could widen the pipe into that server providing the necessary bandwidth to accommodate the additional users.

Application virtualization

Some companies are using virtualization software to run multiple applications on a single server. Similar to the reasons companies are consolidating servers, virtualization cuts operating costs and makes it easier to deploy new applications. Here, again, a single server running multiple virtual applications will need to support many simultaneous users and data requests. And thus, 10GbE could provide a high-performance link to that server so user response times are not degraded.

Storage consolidation

Along the same lines of thinking, many companies are consolidating data held in widely dispersed storage devices onto a single, high-performance storage system. The drivers for this consolidation are reduced operating cost and centralization of all data to ensure data is managed properly and backed up appropriately. A 10GbE link to the storage system will theoretically allow 10 gigabit-connected servers to access the data stored on the device.

Fibre Channel alternative

Many applications require a tight integration between application servers and application data. Typically, companies that had applications that required fast data access times would use high-performance storage area networks (SANs) based on Fibre Channel technology, which requires special skills to manage. 10GbE offers a high-speed alternative to Fibre Channel, and what makes 10GbE attractive in this application is that virtually all companies have experience with Ethernet networks.

While all of these applications are different, the common theme is the need for fat pipes to connect the various servers and storage systems.

For instance, in server consolidation environments, simply providing the processing power to run the applications is not enough. If 10 departmental e-mail servers are collapsed onto a single high-performance blade server, that server will need to handle the input/output (I/O) requests of a significantly larger number of simultaneous users. That is where 10GbE can play an important role.

Similarly, in a storage consolidation scenario, the 10GbE link between a storage system and multiple servers can support the data transactions of the users accessing the applications running on the discrete servers. The alternative would be to have independent storage systems for each server, which would be more complex to manage and would be harder to back up.

“The economic benefits of server virtualization, which is enabling wide scale server consolidation, are driving the need for a reliable, high-speed network core infrastructure that 10GbE enables.”

*– Bob Gill, managing director,
TheInfoPro (2006)*

In June 2006, the IEEE ratified the 10GbE standard IEEE 802.3an, known as 10GBASE-T, that enables the use of low-cost copper cabling for the transmission of 10GbE.

Source: IEEE (2006)

Why 10GbE? Why now?

Many companies have not considered using 10GbE until just recently. Some simply did not see the need for the additional bandwidth since their applications did not require it. However, even companies that have less demanding application needs are now discovering that today's storage requirements can overwhelm a network.

For instance, collaborative applications, where people share large files such as PowerPoint® presentations or Word documents with embedded multimedia files, can put a strain on a network.

While bandwidth demands have gone up, it wasn't until recently that the price of 10GbE switches and NICs had been deemed too high for many companies to make the change. This limited their use to niche applications such as academic or government research labs that required the higher performance that 10GbE delivered. However, the price of 10GbE products has now come to a point where use of the technology has moved beyond the niche market.

As companies install more 10GbE switches, they are selectively using the increased bandwidth for different applications. For example, a 2006 *Optimize* magazine article noted that some companies use 10GbE on core business servers to address unpredictable peaks in online ordering.

The article noted that this approach was deemed a less complex alternative to load balancing the same chore between multiple servers. That means operations are easier to manage, thus reducing the time I.T. staff members would spend tending to this operation.

Prices on the decline

The average selling price (ASP) of 10GbE switches decreased by 19 percent in 2005, and the switches will be in hot demand through 2010, according to the market research firm In-Stat. In-Stat bases this decline on a number of factors including the price per port of 10GbE switches and the configurations of the switches sold during the previous year.

Furthermore, though 10GbE will be driving the market, the entire Ethernet switch market will continue to grow over the next several years with total sales rising from \$14.9 billion in 2005 to \$17.7 billion in 2009.

Meeting the demands of consolidation

Companies are increasingly turning to server and storage consolidation to reduce capital costs such as hardware acquisition and operational costs over the long term. However, to reap the benefits of consolidated servers and storage systems, companies also need a network infrastructure that provides the bandwidth to support application traffic and user I/O requests on a particular server.

One way to meet the demands in a consolidated environment is to connect such a server using 10GbE. From a practical standpoint, that would mean using a backbone switch that had 10GbE ports and a server with a 10GbE NIC.

One issue that has emerged in such a network setting is the possible drain on a server's CPU to handle the I/O and data management requirements at 10GbE speeds. Specifically, the CPU needs to handle the error correction and data management tasks of standard Transmission Control Protocol (TCP) communications.

In some cases, the drain can be significant. For example, a June 2006 *eWEEK* article noted that in certain situations, 40–60 percent or more of the server CPU can be tied up in this effort. That would mean only about half of the server's CPU would be available for its main duties of running its applications.

As a result, some companies are adopting what are called TCP Offload Engines (TOE), which are dedicated processors that handle the data management tasks. 10GbE NICs incorporate TOEs so that the server's performance is not impacted.

According to recent research from VeriTest, TOEs can nearly double throughput on six-port Gigabit Ethernet connections and decrease CPU utilization by two-thirds.

Reducing total cost of ownership

One of the highly desirable points about using 10GbE is that it offers a high-speed alternative to technologies such as Fibre Channel.

Specifically, 10GbE provides a way for companies to use a single network technology for all their connectivity needs. So rather than using Fibre Channel, 10GbE enables companies to move to a single-fabric network that can provide unified data, storage and cluster connectivity. This can reduce an organization's total cost of ownership (TCO) substantially. Moreover, the ongoing cost of maintaining and upgrading the network declines as the infrastructure becomes less complex and easier to manage.

The reduced complexity in network management helps keep ongoing administration tasks to a minimum and thus saves labor and personnel costs.

And because 10GbE is a standards-based Ethernet protocol, it integrates easily into existing networks and works with current management tools. So in many cases, 10GbE does not require any specialized skill sets. In contrast, Fibre Channel technology often requires additional staff training and more expensive diagnostic and troubleshooting equipment. Additionally, because fewer vendors offer products (compared to those who sell Ethernet), companies do not get the pricing benefits when numerous vendors offer competing products.

"10GbE is the next logical step for high-performance data centers."

*– Joel Conover, research director,
Current Analysis (2006)*

“With growing demand for streaming video, voice over IP, high-end multimedia, and other bandwidth-intensive applications, Ethernet continues to evolve to remain the standard networking technology.”

*– Pamela Tufegdzic,
In-Stat analyst (2006)*

New considerations: PoE

As companies deploy more wireless local-area networks (WLAN) and VoIP services within their buildings, there is a need for a new type of network infrastructure element: PoE.

Traditionally, wireless access points (WAPs) and VoIP desk units would all use individual power supplies and would need an electrical outlet in the vicinity of each device. In many cases, buildings are not designed to accommodate these extra devices and hence need to be rewired at great cost.

The alternative to installing new electrical outlets is to use switches that deliver power to the devices over the Ethernet cables that connect them to the corporate network. Last year, 70 percent of 230 North American I.T. managers were using PoE and an additional 13 percent said they would add PoE this year, according to a 2005 report by the consultancy NetLink Research.

The reason for the great interest in PoE is that it reduces the need to rewire a building to provide additional electrical outlets for WAPs and IP phones. This can save a company money outright. Additionally, PoE devices can all be supported using one uninterruptible power supply (UPS) system rather than many, thus saving more money while providing for high availability. An additional benefit of PoE is enhanced manageability. Specifically, the IEEE 802.3af standard provides a means to centrally monitor electrical consumption of each PoE device. Managers can also selectively turn off and restore power to a device.

Demand for PoE is only likely to grow. For example, a 2005 In-Stat/MDR report noted that the market for WLANs will explode, growing to about 242,500 units shipping in 2009 (that is up from the 35,800 units the report said actually shipped in 2004). And U.S. IP telephony sales are on the rise — sales jumped 31 percent from the first to second quarter this year, according to the Synergy Research Group.

For these reasons, many new switches that offer 10GbE ports also include support for PoE.

New considerations: QoS

10GbE can be used to build a high-speed networking infrastructure to support today's corporate applications.

While 10GbE provides a wider pipe, switch vendors are also incorporating bandwidth management technologies that help I.T. departments make more efficient use of their network.

Specifically, many switch vendors now routinely include QoS features that allow managers to prioritize traffic and give some traffic a higher priority than others.

Another feature that is often incorporated is a bandwidth allocation tool. This allows a manager to dedicate a certain percent of the available bandwidth to particular applications ensuring those applications always have enough bandwidth to run properly.

This feature comes in handy when, for example, many employees run peer-to-peer (P2P) applications that consume a lot of bandwidth and starve critical corporate applications.

Today, there is increased emphasis on controlling P2P traffic not just for bandwidth purposes, but also due to the security risks such traffic can cause. Specifically, in the first quarter of 2006, malicious software attacks via instant messaging and P2P increased by more than 700 percent over the same quarter in 2005, according to the security company FaceTime Communications.

More recently, switch vendors Cisco and HP have been adding traffic-throttling features. In some cases, the feature works by spotting unusual activity such as a single desktop or server sputtering a large number of packets onto the network.

Such a situation can occur if a NIC goes bad. In this situation, the switch could automatically detect the high rise in packets and essentially squeeze off the bandwidth to the device. This prevents the bad NIC from flooding the network and depriving other applications of needed bandwidth.

Another use for this feature is to blunt the impact of denial-of-service attacks. In this case, a server or desktop that has been previously infected might be commanded by a hacker to start flooding the network with traffic to overwhelm other servers. The throttling feature would allow a manager to reduce the bandwidth to the bad systems, thus reducing the damage they might be capable of carrying out.

All told, the combination of 10GbE, PoE, QoS and other features in today's newest switches offers businesses a platform to run their operations. These features enable new applications to get the bandwidth they need and provide managers with a way to administer the bandwidth so important applications get priority. Additionally, support for these features gives companies a capacity to roll out real-time applications like streaming video and VoIP.

Glossary

10 Gigabit Ethernet (10GbE): An IEEE Ethernet standard that supports data transmission rates of 10Gb/sec (also known as 10GBASE-T).

Denial-of-service attack: A technique used by hackers to flood a network with traffic directed to servers, thus overwhelming the systems so they cannot perform as they normally would.

Fast Ethernet: An IEEE standard for data networks that provides data transmission rates of 100Mb/sec (also known as 100Base-T).

Fibre Channel: A high-speed, fiber optic-based, networking technology used in SANs.

Power over Ethernet (PoE): An IEEE standard for using wire in a copper Ethernet cable to deliver electricity to network-attached devices such as WAPs and VoIP telephone sets.

Quality of service (QoS): A common feature in Ethernet switches that lets managers prioritize traffic, giving critical application traffic a higher priority as it moves through a corporate backbone.

Server consolidation: A trend to physically consolidate distinct, smaller servers into a single, high-performance server to reduce acquisition, management and maintenance costs.

Storage area networks (SANs): High-performance storage systems for applications that require very fast data access times.

Product spotlight: HP ProCurve's Intelligent Edge switches

To meet the evolving needs of security, mobility and converged applications, HP ProCurve's Intelligent Edge switches — the ProCurve Switch 3500 stackable and the ProCurve Switch 5400 chassis family — set a new standard. These next-generation switches offer wire-speed performance and integrated gigabit PoE, with scalability from 24 to 288 ports per switch across the family to provide your network with the flexibility for future growth — supporting other PoE systems (such as VoIP) and 10GbE.

Why ProCurve Networking by HP?

- Lifetime warranty
- ProCurve phone and Web support
- Next business day advance replacement
- No-cost software updates
- Open industry standards and more



ProCurve Switch 3500yl series

- High-performance, stackable form factor
- Planned future IPv6 host and routing
- Available in 24 or 48 10/100/1000BASE-T models, with four 10GbE ports
- Lifetime warranty for as long as you own the product, on all parts

ProCurve Switch 3500yl-24G-PWR (J8692A) 24-port model
CDW 953149

ProCurve Switch 3500yl-48G-PWR (J8693A) 48-port model
CDW 935403



CDW 953149

ProCurve Switch 5400zl series

- Chassis form factor
- Planned future IPv6 host and routing
- Port density up to 288 10/100/1000BASE-T ports and 48 10GbE ports
- Lifetime warranty for as long as you own the product, on all parts

ProCurve Switch 5406zl (J8699A) 48-port model
CDW 935401

ProCurve Switch 5412zl-96G (J8700A) 96-port model
CDW 998992



CDW 935401

Features and benefits:

Performance

- 3500yl/5400zl architecture — 115 to 692Gb/sec crossbar switching fabric provides intra- and inter-module switching with 36 to 428 million pps throughput on purpose-built ProVision ASIC

Connectivity

- 802.3af PoE support — provides up to 15.4W per port to power compliant PoE devices such as IP phones, wireless access points and security cameras

Resiliency and high availability

- 802.1s Multiple Spanning Tree Protocol — provides high link availability in multiple virtual LAN (VLAN) environments by allowing multiple spanning trees
- 802.3ad Link Aggregation Control Protocol and ProCurve Trunking — support up to 36 trunks, each with up to eight links per trunk
- Hot-swappable modules (5400zl series) — permit modules, mini-GBICs and power supplies in a redundant power supply configuration to be added or swapped without interrupting the network

Layer 2 switching

- ProCurve switch meshing — dynamically load balances across multiple active redundant links to increase available aggregate bandwidth
- VLAN support and tagging — support complete 802.1Q standard and 2048 VLANs simultaneously

Layer 3 routing

- Static IP routing — provides basic routing

Security

- Switch CPU protection — provides automatic protection against malicious network traffic trying to shut down the switch
- Virus throttling — detects traffic patterns typical of WORM-type viruses and either throttles or entirely prevents the ability of the virus to spread across the router VLANs, without requiring external appliances

Contact your CDW account manager, visit CDW.com or call 800.800.4239 to learn more about customized solutions for your business.

