GIGABIT GOES MAINSTREAM

Gigabit Ethernet routers and switches energize today’s data-rich applications while providing a foundation for future-proofing tomorrow’s networks.

To learn more about router and switch optimization, check out CDW’s white paper The Network Administrator’s Guide to Routers and Switches at CDW.com/routersswitches.
Future-proofing IT networks has never been easy. The natural desire to get the most value out of existing networking investments encourages IT managers to delay upgrades to new routers and switches as long as possible.

But enterprises must balance financial prudence with increased pressure on today’s networks to run faster and more reliably than ever before. That means handling larger volumes of information in central data centers and sharing information among far-flung remote facilities efficiently enough to keep end-users productive.

“Enterprises aren’t using networks just for email anymore — they’re also using them for telephony, video, digital imaging and other workloads that can saturate the network,” says Anthony Annexy, principal inside solution architect for healthcare at CDW.

The answer for these interrelated challenges is to increase bandwidth and reduce latency in a cost-effective way. For many IT pros, that means a network foundation built using Gigabit Ethernet. Widely deployed 1 gigabit per second (Gbps) Ethernet hardware offers a practical alternative to traditional 10/100 megabit per second (Mbps) or Fast Ethernet.

At the same time, Ethernet running at 10/40/100Gbps is starting to support data centers, campus backbones, wide area networks (WANs) and gracefully facilitate an array of bandwidth-hungry applications across the enterprise network. “Without gigabit routers and switches, it’s easy to experience latency issues and bottlenecks, which is why almost everybody is either using or planning to use Gigabit Ethernet,” Annexy says.

IT pros will soon have even more Gigabit Ethernet choices: A consortium of networking vendors emerged late in 2014 to define a new class of hardware that fills the intermediate bandwidth gap between 1 and 10Gbps without requiring enterprises to upgrade their existing cabling infrastructures.

With such a range of performance options, it’s no wonder that network administrators are committing to Gigabit Ethernet and taking advantage of attractive price points that make staged upgrades a prudent way to future-proof networks.

A Growing Hunger for Bandwidth

The array of speed choices for Gigabit Ethernet comes just in time to meet exploding demand for fast and closely managed data flows in modern data centers and WAN environments. Today’s networks are being called upon to handle new sources of traffic, including data from video surveillance systems, telephony solutions and video streams. Even standard business applications are generating higher traffic volumes.

“A program like Microsoft Office, that used to just run on desktops, is now being delivered via the cloud,” says Michael Dickman, vice president of global product line management at Hewlett-Packard. “In addition, every phone call at HP runs on Microsoft Lync, which means we have a ton of rich voice and video traffic moving across the network that didn’t exist even a few years ago.”

He adds that the traffic isn’t distinguished only by high volumes. It is also more complex to manage from a quality-of-service (QoS) standpoint. Data generated by ubiquitous mobile devices and applications is also saturating enterprise networks. “The average worker doesn’t have just one device anymore — he or she may use a notebook, a smartphone and a tablet at various times during the day, which puts new pressure on networks,” says Jason Rolleston, senior director of product management for routing at Cisco Systems.

Specialized data-intensive applications developed for certain vertical markets, such as oil and gas exploration, industrial design, software development and healthcare create additional networking demands. For example, today’s medical professionals routinely access and exchange electronic medical records and digital diagnostic images — all vital to patient care and all hungry for bandwidth.

“Doctors can’t be left waiting as they try to pull up an X-ray when they’re at the bedside of a patient,” Annexy says.

PERCENTAGE OF I.T. DECISION-MAKERS WHO IDENTIFIED INFRASTRUCTURE OR NETWORKING AS THE MOST IMPORTANT ELEMENTS WHEN IMPLEMENTING INTERNET OF THINGS SOLUTIONS IN THEIR ORGANIZATIONS

SOURCE: Forrester Consulting, Internet-Of-Things Solution Deployment Gains Momentum Among Firms Globally, October 2014
FEATURE | GIGABIT ETHERNET

“...In addition, doctors and nurses use iPads and notebooks to update charts at bedside and show patients the results of tests. Those traffic volumes saturate networks, so without gigabit switching, hospitals encounter latency and other performance issues possibly affecting patient care.”

The need for networking speed is poised to grow in the years ahead, particularly as applications that use the Internet of Everything or IoE – a combination of people, processes, data analytics and devices – become more widespread.

“We’re seeing IoE expanding network needs in a number of ways,” Rolleston says. “One is from the sheer number of devices on factory floors, in delivery trucks and at offshore oil-exploration facilities that must communicate with data centers. The second is from the complex analytics required to help people understand all this data. To manage this information, IT administrators need networks that meet bandwidth demands and provide new management to handle new types of requirements.”

Gigabit Benefits

The demands of modern networks help explain why Gigabit Ethernet has become the standard for data center, campus and WAN environments. Falling prices for Gigabit Ethernet make it an easy choice compared to older 100Mbps technology.

For example, a standard 24-port, 10/100Mbps switch costs approximately $800, only about 30 percent less than a copper-cable gigabit device with the same number of ports and many years of useful life ahead of it. “It’s important to consider your network roadmap,” says Annexy. “Paying some extra cost now will provide future-proofing that will help avoid a forklift upgrade later.”

Another reason why multi-gigabit Ethernet routers and switches are a networking no-brainer is that IT administrators need networks that meet bandwidth demands and provide new management to handle new types of requirements.”

802.11ac: A Networking Game Changer?

One of the most compelling reasons for moving to a multi-gigabit router and switch is the new 802.11ac wireless standard. Commercial networking products already on the market support the standard’s first iteration, known as Wave 1, which supports theoretical data speeds of more than 1Gbps. When Wave 2 of 802.11ac hardware arrives later this year, speeds could jump to nearly 7Gbps. Other performance enhancements come from 802.11ac’s reliance on the 5GHz radio frequency, which avoids interference with the crowded 2.4GHz channel.

But to attain speeds like these, some IT administrators must upgrade their legacy equipment on wired networks. “If I only have 100Mbps Ethernet hardware, moving to 802.11ac access points would be like buying a Ferrari and never leaving the driveway,” says Anthony Annexy, principal inside solution architect for healthcare at CDW. “If you plan to move to ac, you’ll want gigabit switching so that you can utilize the full speed of the wireless equipment.”

To take advantage of Wave 2 wireless devices, enterprises would need a 10Gbps foundation in their core networks. But this presents a challenge — an upgrade to fiber cabling is required to support this performance level, which may be too costly and time-consuming for many enterprises. The networking industry is working on an alternative option. The NBase-T Alliance is a diverse collection of leading networking vendors that is creating a standard for 2.5 and 5Gbps Ethernet running over existing Category 5e and Category 6 copper cabling.
departments won’t typically require an upgrade of the copper cabling infrastructure. “Gig-E is supported by the Category 5 and Category 6 cabling infrastructure,” says Hasan Siraj, Cisco senior director of product management for the campus switching portfolio. “This helps alleviate many concerns about what it will take to move to Gig E.”

Gigabit Ethernet technology also offers flexibility for linking remote sites. For example, network administrators can create fractional connections with branch offices by contracting with third-party providers for full 1Gbps pipelines, but subscribing for only 100Mbps service if that’s all they need for now. As requirements grow, the additional capacity is available without requiring the provider to lay new cable or swap out equipment. “Having connectivity in place enables organizations to quickly expand branch communications,” says Rolleston.

One caveat is that organizations must go all-in when moving from 10/100 Mbps to Gigabit Ethernet. “Enterprises have to upgrade all their network routers and switches to take advantage of the better performance on a port-by-port basis,” says Anil Desai, an independent IT consultant.

How can IT managers determine which of today’s routers and switches are the best fit for their communications needs? Networking experts say organizations must understand the unique role of each type of device and what today’s leading models offer.

Find the Right Routers

Routers perform important gateway roles as the terminal points for WAN services or for connecting headquarters operations with other enterprise campus buildings and remote facilities. By contrast, network switches handle LAN traffic. The exception is routing or Layer 3 switches, a class of specialized devices that help manage certain internal traffic within enterprises. For example, if a network administrator wants to segment multiple virtual LANs among different departments in a building, he or she can use a routing switch for that task, Annexy says.

When evaluating new Gigabit Ethernet routers, IT managers should start with an overall networking plan. “Before I think about what’s the right router to buy, I’ve got to have a wide area network strategy,” says Dickman. The most cost-effective routers may serve only current networking needs, but an accurate roadmap will lay out a plan for the future and include factors such as the wider adoption of cloud computing.

Extra performance headroom purchased today will delay the need for future upgrades. “Moving forward, because of clouds and other trends, traffic on wide area networks will grow significantly, maybe even at a faster pace than for local area networks,” Dickman says.

Choosing routers for branch offices requires a similarly long-term view. “Consider what types of workloads are prevalent in the branch today, such as activities associated with retail operations or virtual desktops. This will influence connectivity requirements going forward,” says Siraj.

The strategic planning will also help network administrators consider whether to develop a hybrid plan. “Increasingly, organizations are complementing MPLS [Multiprotocol Label Switching] or some other commodity Internet broadband link with a Gigabit Ethernet line to take advantage of a combined approach,” he adds.

IT managers also should consider features and manageability capabilities such as support for network teaming, which provides the ability to bond individual channels so they run as one unit. “Thanks to teaming, IT managers can combine two 1Gbps Ethernet routers to create a 2Gbps connection,” Desai explains. “Having 10, 1Gbps ports can be cheaper than
buying a 10Gbps port model, with the additional advantages of high availability. If one segment goes down, traffic can switch to another port without clients even noticing a problem.”

Routers should also offer a handful of basic but important features, such as the ability to create firewalls, establish QoS policies and perform network address translations (NAT) connections enabling Dynamic Host Configuration Protocol (DHCP) server. Some of these advanced features may strain the processors embedded in routers, so product evaluations must determine which devices will be powerful enough to handle an organization’s projected demands.

Published price–performance comparisons will be a guide, but tech specs alone may not provide an accurate picture. “A vendor may give a router a performance rating of X, but in the real world, enterprises may only get 20 percent of X because of their particular combinations of features and traffic types,” Dickman says.

Buying routers with the faster CPUs — and higher price tags — isn’t the only option. IT managers should use performance considerations to determine exactly which advanced features are must-haves and which ones add only marginal value. “Instead of buying a router that offers a super–complex, hierarchical QoS capability, you might decide you’re fine with more modest QoS tools,” Dickman explains. “Without that added complexity within the router, you’ll be able to achieve optimum performance much more easily.”

Switches for Long–term Use

To find the right switches for their enterprises, IT managers should consider a handful of important criteria, the most basic of which being how many ports should be available on each device. Decisions often center on whether to go with 24– or 48–port devices.

Applications such as storage virtualization, backup and recovery, and disaster recovery necessitate having multiple network ports for failover and redundancy. “IT managers can use the ports to connect servers to separate switches and entirely separate networks to segregate traffic,” Desai says.

A backup, internal power supply within switches further ensures uptime and keeps devices that run mission-critical applications available if a main power unit falters.

Trunking, another switch feature to consider, enables administrators to connect two multiport Gig–E switches to each other via a 10Gbps fiber connection to eliminate communications chokepoints, Desai adds.

Enterprises should also determine whether to choose Power over Ethernet (PoE), a capability that lets network devices draw power from switches instead of from standard electrical outlets. For example, an organization may decide to mount wireless access points on ceilings where AC outlets aren’t likely to be nearby. “If you’re deploying 80 access points throughout a facility, you won’t want to pay an electrician to install dozens of new AC receptacles,” Annexy says. “But if you choose a PoE switch, you’ll be able to power the access points via the copper port on the switch.”

Other devices that take advantage of PoE switches include Voice over IP phones and surveillance cameras.

Modern Gig–E switches may also offer some valuable security capabilities. For example, HP’s Network Protector software enables the company’s switches to identify and quarantine infected devices to aid defense–in–depth security strategies.

Rising volumes of network traffic create new management challenges for IT administrators, so finding sophisticated monitoring tools is an important part of the switch evaluation process. A high–end class of fully managed switches provides sophisticated capabilities for setting QoS rules that prioritize video and audio traffic and shield communications from disruptive latency.

In the wake of numerous high–profile data breaches, security takes on even greater importance. Fully managed switches often provide valuable security capabilities, such as authentication based on the IEEE 802.1X standard.

Management software such as Cisco’s Prime Infrastructure enables IT managers to create a device configuration for one switch and then roll it out from a central console to any other switches in the network. Another management plus is support for multivendor environments. HP’s Intelligent Management Center lets administrators control switches from different vendors using the same software.

Switch evaluators should also account for the rise of software–defined networking (SDN), which is poised to become more widely deployed in...
enterprise environments in the years ahead. Already, a number of innovative SDN products have become available. HP’s Network Optimizer application takes an SDN approach to using switches to help manage network infrastructures.

It can automatically determine if two users within an enterprise have established a video conferencing session, for example, and apply QoS policies appropriate for real-time communications. When the session ends, the software removes the QoS rules to free up network resources for other traffic.

“A switch that’s deployed today may be in operation for the next five to 10 years, so a very important consideration is whether the device can offer what will be needed for the next decade of innovation in software-defined networking,” Dickman says.

What makes a switch SDN-ready? One criterion, according to Dickman, is whether the device supports the Open Networking Foundation’s OpenFlow Switch Specification 1.3, an industry standard for router and switch communications in SDN implementations.

Another option for switch management is choosing low-cost, “smart managed” switches. These units offer fewer features than fully managed alternatives, but their “set it and forget it” simplicity can be useful in small organizations or branch offices without a staff of dedicated networking technicians available to configure and manage the gear.

The Modern Standard

Whether for routers or switches, in core data centers or distributed WANs, gigabit speeds are fueling sophisticated business applications. “Enterprise managers should be actively planning for Gigabit Ethernet if they haven’t already implemented it in their organizations,” Annexy says. “Gigabit Ethernet is today’s standard for modern networks.”

With 1Gbps Ethernet becoming the standard for campus networks and wide area networks (WANs), many IT managers are evaluating when the time may be right for the next major jump in speed — to 10/40/100Gbps Ethernet. For some, the time is now.

Many IT managers are likely to find that 10Gbps Ethernet can be a valuable tool not only for network backbones and WANs but also for specialized initiatives within data centers to keep enterprises running more efficiently, reduce costs and protect data.

Server virtualization, and the data center consolidation it enables, has long been in IT playbooks to promote efficiency and cost savings. But when multiple virtual machines run on the same physical hardware, the resulting workloads can create network bottlenecks. “Updating the bandwidth in the pipe from 1 to 10 Gigabit Ethernet will help alleviate those problems,” says Anil Desai, an independent IT consultant.

Faster Ethernet technology can help in other problem areas. For example, the faster Ethernet option can provide relief if 1Gbps links connecting a database server to a high-performance storage–area network become overwhelmed with traffic. To do that, IT managers might implement multiple 1Gbps connections coming into a network switch and use a single 10Gbps Ethernet link for communicating with the storage server. “Traffic could simultaneously flow over all the individual 1 gigabit segments, while the dedicated 10 Gig connection addresses the likelihood that multiple clients would be accessing the server throughout the day,” Desai says.