

# Gigabit Ethernet and beyond



The preponderance of enterprise applications is forcing companies to consider adopting 10 Gigabit Ethernet networks. By Vinita Gupta



The accelerating growth of worldwide network traffic is forcing service providers, enterprise network managers and IT architects to look at higher-speed network technologies in order to solve the bandwidth crunch that exists. This has led to a lot of interest in 10 Gigabit Ethernet technologies.

According to the Dell'Oro Group's Five-Year Ethernet Forecast (July 2008): The number of 10 Gigabit Ethernet (10GbE) ports will rise from 651,000 in 2007 to 15.1 million in 2012 and that revenue from this category will grow from \$1.7 billion in 2007 to \$5.1 billion in 2012. Moreover, 10 GbE will represent almost a quarter of market revenue by 2012. Significant new product introductions should help to propel growth.

### Demand for 10GbE

10GbE is breaking new ground and becoming a mainstay for enterprise Metro Area Networks as well as service provider networks. Ethernet is the de facto standard for LAN. With the advent of 10GbE it is poised to become the de facto standard for any and all of a company's networking needs. The technology has become more affordable and 10GbE does not obsolete current investments in network infrastructure. All these factors are prompting Indian enterprises to opt for this technology.

"The fundamental network architecture requires a faster

### The major verticals adopting Gigabit & 10G are

Media	Animation and high end Graphics applications
Manufacturing	Especially CAD applications
BFSI and ITES	Specific applications

backbone than the user's access speed or distribution layer. Therefore, if the access network is 10/100 then the backbone should be Gigabit. As companies add more Gigabit ports in their access or distribution networks, they are feeling the need for a faster backbone. This was temporarily being met through trunks of Gigabit links but as 10G has become more mature and price competitive, the market has seen a natural shift to 10G," said Jayesh H Kotak, Vice President-Product Management, D-Link India.

Subashini Prabhakar, Chief Technology Manager, Dax Networks believed that this technology will be used to consolidate bigger networks. "The chances of any other technology replacing Ethernet are dim. There is a roadmap all the way from Gigabit to 10 Gbps to 100 Gbps. Today 1 Gbps is used for desktops and 10 Gbps in the trunks."

### Applications drive growth

The price-performance that the combination of Gigabit and 10G bring to customers is driving increasing adoption of 10G. In general as desktops become more powerful and applications more feature-rich, it generates a lot of data/content, which necessitates a more powerful transport infrastructure of which Gigabit and 10G networks are a prime example.

Some of the applications driving this technology are Web 2.0 applications typically with multimedia content. There are specific applications in banking and finance as well as CAD applications in the manufacturing sector. Media companies using animation and high-end graphics applications are the early adopters of 10G technology in the industry.

Chandra Koppurapu, Vice President for Asia Pacific at Foundry Networks, said, "10GbE enables the use of Ethernet for transporting data, voice and video traffic within an enterprise and a carrier's network. With 10G, companies will have the capability to provide GbE service to workstations and, eventually, to the desktop in order to support applications such as streaming video, medical imaging, centralized applications, and high-end graphics. New and upcoming bandwidth-hungry applications like streaming video, medical imaging, centralized

applications, and high-end graphics will drive 10GbE technology. Verticals like entertainment and animation have shown great interest in 10G."

Rama Subramaniam, Head-Systems Engineering, Juniper Networks, India revealed that though there is no application on the desktop that needs 10 GbE, it is used in the aggregation/connectivity between switches. He added, "Consumers are looking at LAN switches for applications beyond connectivity to do access control; connect PCs and servers with security, etc. Power over Ethernet (PoE) is

### Ethernet facts

- Ethernet refers to the original 10Base-T Ethernet technology
- Fast Ethernet refers to the 100Base-T Ethernet technology
- Gigabit Ethernet is a generic reference to 1000Base Ethernet
- 1000Base-SX is Gigabit Ethernet over shortwave laser fiber optic cable
- 1000Base-T is Gigabit Ethernet over unshielded twisted-pair (UTP) Category 5 (CAT 5) or CAT5E cable or better

also catching on as you can use the same LAN switch for data and voice. Many organizations are adopting IP telephony, which requires an Ethernet connection for the IP phone, so instead of having an additional power cabling why not use PoE."

IP telephony has increased the requirement for PoE. Today desktops and laptops have gigabit ports. In the future, companies will resort to using GbE at the desktop level. PoE switches consume more power hence Nortel provides power-efficient switches, revealed Sajan Paul, Head-Technology and Consulting, Enterprise Solutions, Nortel India.

Prabhakar mentioned, "When we drive GbE to the desk, the communication to the core must be in multiple of 1Gbps. By using a 10G uplink, you can ensure non-blocking communication between the edge switch and the core network. So 10G ensures non-blocking bandwidth in the network." The Ethernet uplink backbone is crucial in the data center network and the chain is as strong as its weakest link. ▶

### Advantages and disadvantages of 10GbE

#### Advantages

- 10 Gigabit Ethernet is the natural evolution of the well-established IEEE 802.3 standard in speed and distance. It extends Ethernet's proven value set and economics to metropolitan and wide area networks by providing:
- Potentially lowest total cost of ownership (infrastructure/operational/human capital)
  - Straightforward migration to higher performance levels
  - Proven multi-vendor and installed base interoperability (Plug and Play)
  - Familiar network management feature set
  - Supports all traffic types-data, voice and video over IP
  - 10 Gigabit Ethernet does not obsolete current investments in network infrastructure
  - Flexibility in network design
  - Ability to support jumbo or large frame sizes to reduce the network overhead

#### Disadvantages

- Cannot deliver specific bit rates or limit jitter to deliver effective QoS
- RSVP protocol is not well supported
- Not originally designed to support real-time voice or video traffic
- Not a WAN solution
- Uses 802.1p and 802.1q to try and achieve QoS and CoS. These technologies are still in development and have come a long way

► Deployment of 10G in the data center is inevitable because of the application demands.

Prabhakar stated that most motherboards come with a default Gigabit Ethernet port. However, the price gap remains on switches. Today a Gigabit switch can cost somewhere between four to five times what a fast Ethernet switch costs. Until this price gap remains, select verticals only will adopt GbE. Today Fast Ethernet technology is widely deployed in small enterprises as it goes down well with their IT departments. If you take the price factor out of the equation, they will readily adopt GbE as well.

*Today, Fast Ethernet installations outnumber the Gigabit variety as it offers sufficient performance in many cases*

### Indian adoption

Indian organizations are late adopters of 10GbE compared to the US, Japanese, and European markets. Having said this, most Indian organizations are adopting the latest technologies within 10GbE. So in that sense, although late in one way, Indian organizations are adopting the latest and most advanced features of 10GbE and will be well prepared for future traffic demands and growth.

The technology has many value-additions for customers. Looking at the way in which people are relying on technology for their businesses, social activities, etc., 10GbE is definitely going to be an integral part of cutting-edge networks in India. In addition, in order to achieve Gigabit Ethernet, all component and cables



**Chandra Koppurapu**

VICE PRESIDENT-ASIA PACIFIC,  
FOUNDRY NETWORKS

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**Rama Subramaniam**

HEAD-SYSTEMS ENGINEERING,  
JUNIPER NETWORKS INDIA

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between the devices the user is connecting obviously have to support the Gigabit standard.

According to Tata Rao, Senior Vice President, System Engineering, Cisco India and SAARC, networks of today are evolving to address four new developments:

- Increase in desktop computing power
- Introduction of bandwidth-intensive applications
- Expansion of highly sensitive data on the network
- Presence of multiple device types, such as IP phones, WLAN access points, and IP video cameras

"These new demands are contending for resources with many existing mission-critical applications. As a result, IT professionals must view the edge of the network as critical to manage the delivery of information and applications effectively. As companies increasingly rely on networks as the strategic business infrastructure, it is more important than ever to ensure their high availability, security, scalability, and control. Switches should support intelligent services that consistently address these requirements from the desktop to the core and through the WAN," said Rao.

Switches have continued to maintain the edge they had in speed while gaining in features. Both managed and unmanaged switches are in demand.

Kotak pointed that data centers are deploying Gigabit Ethernet to increase operational efficiency. "We can expect to see more deployments on it for future proofing thanks to the reduction in the price difference between Fast and Gigabit Ethernet equipment. GbE retains the simplicity and manageability of Ethernet and Fast Ethernet. It is easy to

### Some GbE offerings:

- Gigabit Ethernet Network cards
- Gigabit Unmanaged switches
- Gigabit Managed L2 switches
- Gigabit L3 switches with 10G uplink
- L3 Modular chassis switches with Gigabit and 10G modules

integrate with existing LAN equipment with minimal support staff. Consequently, we are seeing newer cabling deployments capable of Gigabit to the desktop and newer business laptops coming built in with Gigabit Ethernet ports."

### Fast Ethernet vs. 10GbE

Fast Ethernet is ten times faster than standard Ethernet and runs at 100 Mbps. Gigabit Ethernet is a hundred times faster than standard Ethernet and runs at 1,000 Mbps. Gigabit Ethernet is generally used for high-speed backbone architectures that are required to handle a large number of devices on the network.

Today, Fast Ethernet installations outnumber the Gigabit variety as it offers sufficient performance in many cases. A large number of network adapters now support all three Ethernet speeds and are commonly referred to as 10/100/1000 adapters.

India is emerging as the fastest growing market for Ethernet products, due to the increasing use of bandwidth and Internet Protocols (IP) for voice, data and video by enterprises across verticals. Betting on high reliability and performance, the cost of ownership of Ethernet products is more economical. ■

### About Gigabit Ethernet and 10GbE

<b>Gigabit Ethernet</b>	<ul style="list-style-type: none"> <li>■ This is a transmission technology based on the Ethernet frame format and protocol used in local area networks (LANs)</li> <li>■ It is defined in the IEEE 802.3 standard and is currently being used as the backbone in many enterprise networks</li> <li>■ Gigabit Ethernet is carried primarily on optical fiber (with very short distances possible on copper media)</li> <li>■ Existing Ethernet LANs with 10 Mbps and 100 Mbps cards can feed into a Gigabit Ethernet Backbone</li> </ul>
<b>10 Gigabit Ethernet</b>	<ul style="list-style-type: none"> <li>■ Standardized in IEEE 802.3a, this telecommunication technology offers data speeds up to 10 billion bits per second. Built on the Ethernet technology used in most of today's local area networks (LANs), using optical fiber, 10 Gigabit Ethernet switches improves the data rate from 2.5 Gbps to 10 Gbps</li> <li>■ 10 Gigabit Ethernet uses the familiar IEEE 802.3 Ethernet media access control (MAC) protocol and its frame format and size</li> <li>■ On multimode fiber, 10 Gigabit Ethernet will support distances up to 300 meters; on single mode fiber, it will support distances up to 40 kilometers</li> <li>■ Smaller Gigabit Ethernet networks can feed into a 10 Gigabit Ethernet network</li> </ul>