Gigabit Ethernet Technical Brief

Achieving End-to-End Performance

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Achieving End-to-End Performance

Intranet Web servers, centralized file and compute servers, data warehousing, groupware, medical imaging, CAD/CAM applications, 3-D modeling, animation, video, pre-press applications, server farms, seismic processing...

The list goes on and on. The demand for high-speed network connections is proliferating at a pace almost as rapid as the speed requirements of the applications themselves. Evidence is everywhere: the rapid acceptance of 10/100 Mbps connections on today's desktop computers, Ethernet switching at the department level, and the deployment of Fast Ethernet switches in corporate backbones are a few examples of the need for faster and faster networks.

And still, bottlenecks remain. Server network connections have been limited to 100 Mbps since FDDI was shipping in volume in the late 1980's. Fast Ethernet made it easier to build internetworking products, but did not provide a faster server interface. Today, centralized servers are often configured with multiple 100 Mbps network connections to meet bandwidth requirements.

Enter Gigabit Ethernet.

Gigabit Ethernet is a new technology that will provide seamless interoperability with Ethernet and Fast Ethernet. Gigabit Ethernet transfers data at a blazingly fast speed: one gigabit per second, or 100 times the rate of standard Ethernet. Gigabit Ethernet is designed to deliver the same benefits as Fast Ethernet: seamless integration with installed Ethernets, dramatically higher performance than the previous standard, and a familiar management environment.

It couldn't happen at a better time. Multimedia over IP is just starting to take off with the proposed IETF standards, real-time transfer protocol (RTP) and resource reservation protocol (RSVP). These protocols, combined with gigabit networks, high-performance desktops, and Internet technology, will quickly change the way corporations access information.

Ethernet. Fast Ethernet. Gigabit Ethernet. Networking made simple!

Goals of Gigabit Ethernet

Under development in the IEEE by the 802.3z Task Force, Gigabit Ethernet has the following primary goals:

- Complete interoperability with Ethernet and Fast Ethernet

    – Retain the installed base of NICs

    – Leverage the investment in hubs, switches, and routers

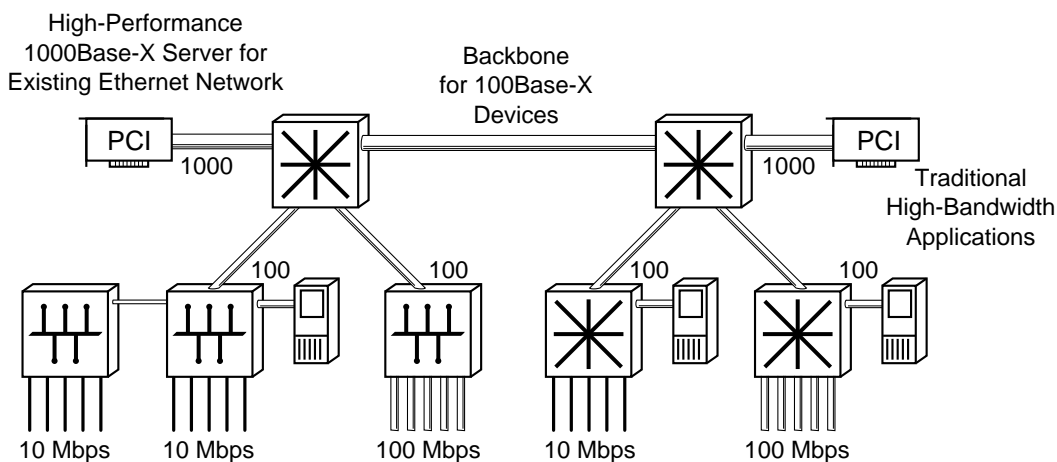   – Leverage the network management environment

- Conform to the Ethernet standard

  – Frame format

  – Minimum and maximum frame sizes

  – CSMA/CD access method

  – 802.2 LLC specifications

- Provide a simple forwarding mechanism between 10, 100, and 1000 Mbps

  – No fragmentation of frames

  – No encapsulation of frames

  – No translation of frames

- Provide 10 times the performance of Fast Ethernet

Uses of Gigabit Ethernet

Initially, Gigabit Ethernet will be deployed in three key areas:

- Aggregating traffic between Ethernet clients and centralized file or compute servers

- Connecting multiple 100Base-T Fast Ethernet switches through 100/1000 Mbps switches

- Connecting both workstations and servers with Gigabit Ethernet to run high-bandwidth applications, such as CAD/CAM, medical imaging, and pre-press

Figure 1 illustrates the projected initial uses of Gigabit Ethernet.

High-Performance
1000Base-X Server for
Existing Ethernet Network

Backbone
for 100Base-X
Devices

PCI
1000

PCI
1000

Traditional
High-Bandwidth
Applications

100   100   100   100

10 Mbps   10 Mbps   100 Mbps   10 Mbps   100 Mbps

Figure 1.   Initial deployment of Gigabit Ethernet

In the future, the uses of Gigabit Ethernet will be extended to incorporate switches based entirely on Gigabit Ethernet on the campus backbone, centralized server farms connected to these all-gigabit switches, and specialized high-performance client workstations. Figure 2 illustrates some future Gigabit Ethernet possibilities.

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