Auspex Support for Cisco Fast EtherChannel™

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Auspex Systems, Inc.

2300 Central Expressway

Santa Clara, California 95050-2516 USA

Phone: 408/566-2000 • Fax: 408/566-2020

Email: Info@Auspex.com

http://www.auspex.com

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Introduction

The explosive growth in campus-wide and enterprise network traffic has rendered many network backbones incapable of handling current traffic volume requirements effectively. Standard Ethernet technology is no longer adequate for client applications that demand increasingly large data throughput.

The next generation of network technology, Gigabit Ethernet, will be capable of transmission speeds of up to 1,000Mbps. Auspex believes that Gigabit Ethernet provides simplicity of implementation that is superior to both ATM and FDDI; and that Gigabit Ethernet will be deployed first in server-to-server communications, and then in delivering Gigabit speeds to the desktop. Auspex NetServers will offer full Gigabit Ethernet connectivity for enterprise, workgroup, and departmental applications as that technology matures.

However, a Gigabit Ethernet standard is not expected until March 1998. Standardized network interface cards (NICs) will become available in mid-to-late 1998. Although pre-standard Gigabit Ethernet products are available, there is a significant risk that expansion of such implementations will require costly upgrades.

To satisfy the needs of customers who want high transmission speeds today, Auspex has created a partnership with Cisco Systems to deliver Cisco Fast EtherChannel, an excellent interim solution that uses existing Ethernet wiring with Cisco Systems routers, switches and related hardware. When implemented on Auspex NetServers, Fast EtherChannel delivers high performance network throughput up to 800 Mbps.

This document discusses the implications of upgrading from Standard Ethernet to Cisco Fast EtherChannel, and demonstrates why this implementation is a sensible, cost-effective way to improve network performance now while taking the first step along the migration path to Gigabit Ethernet.

1   Challenges for the Enterprise Network

Insufficient network throughput and steadily increasing traffic volumes have caused serious performance problems in many campus-wide and enterprise network environments. Demand for bandwidth is steadily increasing in the network core, especially between switches and routers, by such demanding end-user applications as Web browsing, video conferencing, and project-wide groupware.

As these and other applications that require high data throughput become more heavily used in the workplace, network bandwidth and performance become more crucial than ever to the success of the enterprise. The problem of increased network traffic has become so acute in some fast-paced environments that a dramatic and immediate improvement in network bandwidth and switching capacity has become a top priority.

Specific Technical Factors

Network protocols such as FDDI and ATM have made increasing traffic possible. Further, the 80/20 rule (80% of network traffic is local and 20% is off the backbone) is being reversed: 80% of network traffic will now move to the backbone.

To make matters worse, large amounts of processing power frequently remain unused. The latest generation of microprocessors can handle more than 12 MB/second, but since network traffic is uneven across ports, processors remain idle during data transmission operations. Network bottlenecks continue to cause problems that cascade throughout the enterprise, from the data center to the wiring closet to the client desktop. They are choking today's networks and preventing them from reaching their full performance potential.

Furthermore, ports on switches and Network Interface Cards (NICs) are vulnerable to failures, with predictable consequences for network performance and reliability.

Changing Customer Needs

Because Auspex NetServer file servers are typically used in network environments with a very large number of clients, server performance is no longer being optimized using standard Ethernet technology.

Moreover, the needs of Auspex customers are evolving toward a transition to flat subnets, and toward network data that are consolidated in the same way as storage data. Increased network throughput, which Gigabit Ethernet promises to satisfy in the future, is urgently needed now.

Auspex offers full support now for Cisco Fast EtherChannel in its NetServer family of high-performance network file servers.

2   What Is Cisco Fast EtherChannel?

Fast EtherChannel is a trademark of Cisco Systems for its proprietary technology that builds on the IEEE 802.3u Fast Ethernet standard and on Kalpana EtherChannel technology. The Fast Ethernet standard was ratified in 1995, and EtherChannel technology has been available for over five years.

Both Fast Ethernet and EtherChannel technologies have been extensively proven in the field. Because Cisco Fast EtherChannel is based on these resilient and extremely reliable technologies, the risk associated with migration to Cisco Fast EtherChannel is minimal.

Auspex NetServer file servers provide full support for Cisco Fast EtherChannel through Auspex Network Processor modules and through software.

"Fat Pipes"

Cisco Fast EtherChannel technology embraces the concept of combining several full-duplex point-to-point links (pipes) logically into one large "fat pipe" (or channel). Each pipe can be a 10BaseT or a 100BaseT port.

Cisco Fast EtherChannel functionality is fully integrated between the Cisco Catalyst 5000-series switch and the 7500-series router. This integration allows the router to be recognized logically by the switch as a fat pipe.

A fat pipe can be connected directly to an Auspex NetServer to provide a seamless data link. Each Auspex Network Processor supports up to 3 fat pipes, and each Auspex NetServer supports up to 15 fat pipes.

Scalable

Cisco Fast EtherChannel provides scalable connections between LAN switches, routers, clients, and Auspex NetServer file servers. Additional Cisco Fast EtherChannel connections do not adversely affect network performance.

Further, as Gigabit Ethernet becomes a stable and mature technology that is ready for the enterprise, you can upgrade one link at a time, as needed.

Works with Existing Media

Cisco Fast EtherChannel supports mechanisms for full-duplex autosensing and autonegotiation, and is completely functional across existing media: UTP copper wire and fiber, both single-mode and multi-mode.

Cisco Fast EtherChannel provides a simple, reliable backbone that supports high-speed, fault-tolerant network data transmission.

Check Summing

Check summing improves the reliability of data. On Auspex NetServers, check summing is performed in non-CPU hardware, which frees the CPU to perform other tasks. Check summing in hardware is also much faster than check summing performed via software and the CPU.

Load Balancing

Load balancing in a Cisco Fast EtherChannel connection provides redundant paths for network traffic, clears bottlenecks from the network, and dramatically improves performance. Both Cisco and Auspex support load balancing.

Cisco Load Balancing of Data Links

All the ports in a Cisco Fast EtherChannel connection are load-balanced.

Cisco 5000-series Catalyst switches handle the load balancing of incoming traffic from multiple MAC addresses. Load balancing is fully integrated between Cisco Catalyst 5000-series switches and 7500-series routers, and is based entirely on MAC addresses.

In case of a port failure, the switch "fails over" to remaining ports on the Cisco Fast EtherChannel connection. All types of network traffic – multi-cast, broadcast, and unicast – are evenly distributed among available network ports.

Auspex Load Balancing on NetServer File Servers

Load balancing on the Auspex NetServer is handled entirely through software, and is normally based on IP addresses. However, the algorithm for load balancing can be changed from IP-based to MAC-based (or round-robin), depending on whether the network is switched or routed. Before sending a packet onto the network, the Auspex software driver supporting Cisco Fast EtherChannel determines the port to which the packet is sent.

Channels can be created across multiple Auspex Network Processors in a switched environment (but not in a routed environment).

Round-robin load balancing works well for back-to-back Auspex NetServers.

Load Balancing between Cisco and Auspex Components

A Cisco Catalyst switch performs load balancing on outbound traffic to an Auspex NetServer. The Auspex NetServer driver, in turn, performs load balancing on outbound traffic to the Cisco Catalyst Switch.

Ports can be added to a fat pipe dynamically through the Auspex software that supports Cisco Fast EtherChannel, and a fat pipe can be enabled and disabled dynamically.

Auspex software supports back-to-back channeling for running dedicated network traffic. Destination traffic can be maintained at a constant level to facilitate password "sniffing" (decoding).

All ports in a Cisco Fast EtherChannel connection have the same Internet Protocol (IP) or Media Access Control (MAC) address, which optimizes network throughput and simplifies network administration.

Failure Recovery Strategies

Cisco and Auspex provide reliable failure recovery mechanisms for Cisco Fast EtherChannel.

Cisco Failure Recovery for Data Links

Cisco data links are extremely fault-tolerant. If a link fails, traffic is seamlessly re-routed through available remaining links. No human intervention is required.

Re-routing is accomplished in less than one second with minimal interruption of network traffic, and without causing timeouts in applications and dropped client sessions.

Auspex Failure Recovery for NetServers

Proprietary DriveGuard technology from Auspex protects data in case of a disk drive failure. Auspex ServerGuard protects the network file system in case of a server failure or natural disaster.

Both DriveGuard and ServerGuard require minimal incremental network traffic. Both provide fast recovery from system failure or other catastrophe, and both protect the crucial data upon which business operations increasingly rely.

Compatible with Existing Networks

You don't need to upgrade existing file servers for Fast EtherChannel, because Auspex software and Network Processor modules support Cisco Fast EtherChannel. Cisco Fast EtherChannel functions reliably over Auspex FastEthernet Full Duplex (HME) adapters (both Single and Quad boards). And Auspex software for Cisco Fast EtherChannel is specifically designed to make configuration of Auspex NetServers for Cisco Fast EtherChannel fast and trouble-free.

Because existing Cisco Systems switches and routers accommodate Cisco Fast EtherChannel, you don't need to replace fully functional equipment with costly upgrades. And Cisco Fast EtherChannel works with existing media.

Because Cisco Fast EtherChannel builds on current Ethernet technology, you don't need to waste money and precious time building a new knowledge base. Working network administrators can use existing Cisco network configuration, analysis and troubleshooting tools with Cisco Fast EtherChannel.

Auspex Software for Support of Cisco Fast EtherChannel

Auspex software for Cisco Fast EtherChannel provides a simple command-line interface for Cisco Fast EtherChannel configuration and management, and is completely compatible with current Auspex Network Modules.

Logical Step in Migration to Gigabit Ethernet

Cisco Fast EtherChannel is a key intermediate step in the migration path from standard Ethernet to Gigabit Ethernet that is designed for customers who need higher bandwidth now.

Cisco Fast EtherChannel technology can be easily upgraded to Gigabit Ethernet technology, which will provide network throughput up to 8000Mbps between switches. Cisco Fast EtherChannel will provide scalability and full compatibility with Gigabit Ethernet when that technology becomes standardized and when fully supported equipment becomes available.

Easy Configuration

As mentioned previously, Auspex NetServer software for Fast EtherChannel provides fast and simple configuration through a command-line interface.

The Cisco switch requires some manual configuration for Fast EtherChannel through the Cisco Internetwork Operating System (IOS) command-line interface. To configure the port, simply use the IOS "set port channel" command. For example, the command "set port channel 3/1-3/4" sets ports 1 through 4 on the EtherBlade module under a single channel 3 (where 3 is the number of the EtherBlade module on the switch).

The supervisory module on the switch must be running IOS version 2.3 or greater.

Performance

Performance improvement with Fast EtherChannel is dramatic: at least a four-fold improvement over Standard Ethernet.

Up to 800Mbps between switches. Up to 40Mbps sustained bandwidth per channel. Faster, multiple links provide an immediate improvement in performance that solves the problem of inadequate network throughput until Gigabit Ethernet technology is ready for the enterprise.

The high performance that customers have come to expect from Auspex NetServers and from Cisco Systems routers and switches work together to provide much faster overall network performance.

Low Cost

Cisco Systems offers a value-added feature that bundles either two or four Fast Ethernet ports on a single Cisco 7500-series router; this provides an aggregate bandwidth of either 400Mbps (2 ports per channel) or 800Mbps (4 ports per channel). Upgrading the router requires a Cisco Fast EtherChannel module called the EtherBlade module, which is available at a very low cost: under $1500.

3   The Cisco Fast EtherChannel Solution

Cisco Fast EtherChannel is the logical step in migration path to Gigabit Ethernet and beyond. However, because Gigabit Ethernet has not yet become effectively supported on both copper and fiber media, and because its standard will not be fully ratified until March 1998, Gigabit Ethernet cannot yet be regarded as a stable, mature technology.

A Sensible Solution, Now

A complete Cisco Fast EtherChannel solution is available now.

You don't need to upgrade existing file servers for Cisco Fast EtherChannel, because Auspex software and Network Processor modules support Cisco Fast EtherChannel.

You don't need to upgrade switches and routers, because existing Cisco Systems Catalyst 5000-series switches and 7500-series routers accommodate Cisco Fast EtherChannel.

You don't need to replace cabling. Cisco Fast EtherChannel is functional across existing fiber and UTP copper media. Cabling requirements along the migration path from Ethernet to Cisco Fast EtherChannel to Gigabit Ethernet are well known and will not change.

You don't need to modify current network applications when upgrading from standard Ethernet to Cisco Fast EtherChannel. In fact, migration is completely transparent to client applications.

You don't need to worry about data loss, because fault-tolerant Auspex NetServers and reliable Cisco links provide a seamless, extremely reliable solution for mission-critical data and applications.

Product Availability

Auspex and Cisco have teamed up to provide a sensible, cost-effective solution to today's network traffic problems.

Auspex Fast EtherChannel software is enabled with the NetServer 7000 with NetServer System Software release 1.9.2. Cisco Fast EtherChannel hardware has been installed in hundreds of customer sites worldwide and has proven reliability.

Moreover, Cisco and Auspex offer an upgrade policy that makes migration to Cisco Fast EtherChannel a sensible, cost-effective solution to performance degradation on today's overloaded networks.

Appendix A — Cisco Fast EtherChannel Highlights

- Auspex and Cisco Systems provide a fully integrated, seamless interface between servers and the backbone.

- At least a four-fold improvement in performance, up to 800Mbps.

- Proven and reliable technology.

- Use existing file servers, switches, routers, cabling, and other network hardware.

- No need to build a new knowledge base - utilize existing network administrator expertise.

- Transparent solution with no disruption of client applications.

- Each Auspex Network Processor can support up to 3 channels, and each Auspex NetServer up to 15 channels.

- Sensible migration path to Gigabit Ethernet.

- Excellent fault tolerance with both Auspex file servers and Cisco data links.

- Support for 10BaseT and 100BaseT ports.

- Scalability with minimal impact on network performance.

- Supported on both UTP copper wire and fiber, both single-mode and multi-mode.

- Load balancing optimizes available resources.

- Extremely fast check summing in Auspex NetServer hardware.

- Dynamic configuration of Auspex NetServer ports through a simple command-line interface.

- Available now.

- Low cost and generous upgrade policies from Auspex and Cisco.