

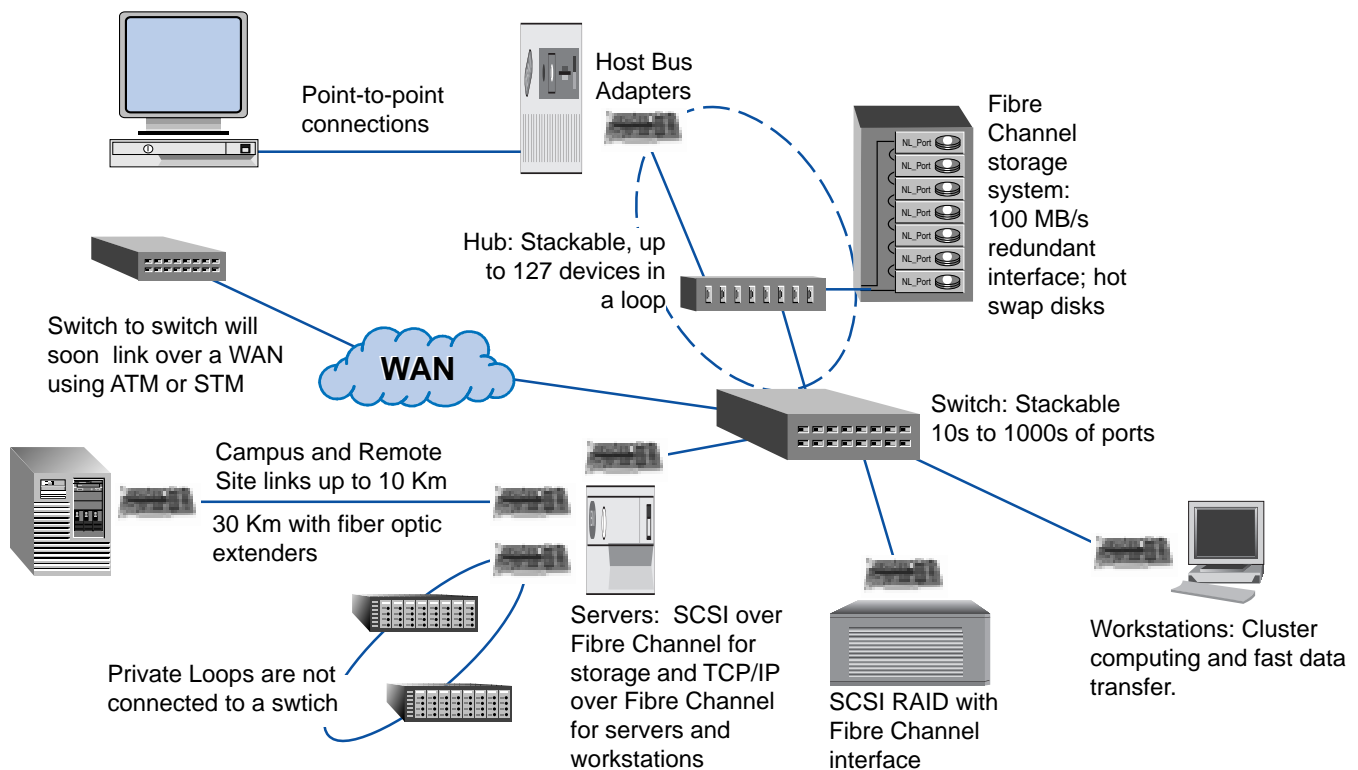
Fibre Channel Solutions

Fibre Channel Systems: Putting It Together

IT managers, system integrators, and VARs quickly discover that Fibre Channel is built upon the concepts and protocols they know well. Fibre Channel delivers the same type of functions, only faster, easier, more scalable, and much more reliable than SCSI and legacy networks.

Fibre Channel systems expand the flexibility of IT organizations with their inherent ability to run SCSI and IP protocols on the same network. These networks bring new levels of capability and performance. Take a look at what goes into a network. You will find it quite familiar and interesting.

Fibre Channel systems are built without restrictions. Virtually any topology that an IT organization requires is possible. The basic building blocks are point-to-point dedicated bandwidth, loop shared bandwidth, and switched scaled bandwidth. Switches and hubs are stackable.



Fibre Channel Network and Storage

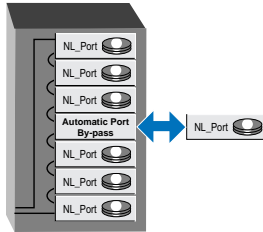
Fibre Channel networks and storage are built from products that are very familiar to IT professionals. These products and a short description are listed below in alphabetical order.

Copper Cables



Four kinds of copper cables are defined in the Fibre Channel standard. The most popular implementations are twin-ax using DB-9 or HSSD connectors.

Disk Enclosures



Fibre Channel disk enclosures utilize a backplane with a built-in Fibre Channel loop. At each disk location in the backplane loop is a port bypass circuit which permits hot swapping of disks. If a disk is not present, the circuit automatically closes the loop. When a disk is inserted, the loop is opened to accommodate the disk.

Drivers



If software drivers for the host bus adapter vendor are not resident in your server or workstation, they are installed into the operating system using standard procedures for the OS. Fibre Channel drivers support multiple protocols, typically SCSI and IP. Most popular operating systems are supported including Windows NT, AIX, Solaris, IRIX, and HP-UX.

Extenders



Extenders are used to provide longer cable distances. Most optical interfaces are multimode cable. Extenders convert the multimode interface to single mode and boost the power on the laser. Typically, an extender will provide a single mode cable distance of 30 Km or 18 miles.

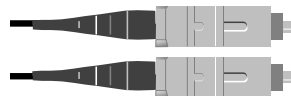
Fibre Channel Disks



Fibre Channel disks have the highest capacity and transfer capability available. Typically, these disks have a capacity of 9 GB and support redundant Fibre Channel loop interfaces.

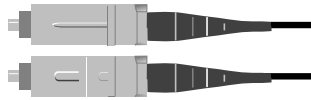
Fibre Optic Cable

Connector: The SC connector is the standard connector for Fibre Channel fiber optic cables. It is a push-pull connector and is favored over the ST connector. If the cable is pulled, the tip of the cable in the connector does not move out, resulting in loss of signal quality.



Multimode Connectors

Multimode Cable: Multimode cable is dominant for short distances of 2 Km or less. Multimode has an inner diameter of 62.5 or 50 microns, allowing light to enter the cable in multiple modes, including straight and at different angles. The many light beams tend to lose shape as they move down the cable. This loss of shape is called dispersion and limits the distance for multimode cable. Cable quality is measured by the product of bandwidth and distance. Existing 62.5 micron FDDI cable is usually rated at 100 or 200 MHz /Km, providing gigabit communications up to 100 or 200 meters.



Single Mode Connectors

Single Mode Cable: Single mode cable is used for long distance cable runs. Its distance is limited by the power of the laser at the transmitter and by the sensitivity of the receiver. Single mode cable has an inner diameter of 7 or 9 microns and only allows a single ray of light to enter the cable. Therefore, with single mode cables there is no dispersion.



Galaxy combines transmit and receive cables into a single, compact connector.

Galaxy Connector: Fibre Channel has recently adopted a new connector called the Galaxy. It reduces the size of the connector by 50%, doubling the connector density for hubs and switches. The Galaxy will start appearing in 1998.

Gigabit Interface Converters



Media Interface Converter

Distances in a data center are supported with twin-ax copper circuits and, therefore, hubs, disks, and many host bus adapters come standard with a copper interface. Gigabit Interface Converters (GBIC) and media interface converters plug into the copper interface and convert it to an optical interface. GBICs use an HSSD connector for the copper interface and media interface converters use the DB-9 copper interface. The benefit is a low cost copper link and optics for longer distance when required.

Gigabit Link Modules



Copper GLM



Fiber Optic GLM

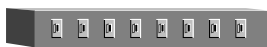
Gigabit Link Modules or GLMs are pluggable modules providing either a copper or fiber optic interface. GLMs include the serializer/deserializer (SERDES) and have a media independent parallel interface to the host bus adapter. Users can easily change the media interface from copper to fiber optics.

Host Bus Adapters



Host Bus Adapters (HBAs) are similar to SCSI host bus adapters and Network Interface Cards or NICs. Most HBAs either use Gigabit Link Modules or GBICs. A typical HBA uses the PCI bus, is half length, and utilizes a highly integrated Fibre Channel ASIC for processing the Fibre Channel protocol and managing the I/O with the host. Adapters are also available for SBus, PCI, MCA, EISA, GIO, HIO, PMC, and Compact PCI.

Hubs



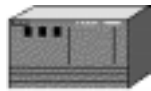
Fibre Channel hubs are used to connect nodes in a loop. Logically, the hub is similar to a Token Ring hub with “ring in” and “ring out.” Each port on a hub contains a port bypass circuit (PBC) to automatically open and close the loop. Hubs support hot insertion and removal from the loop. If an attached node is not operational, a hub will detect this and bypass the node. Typically, a hub has seven to ten ports and can be stacked to the maximum loop size of 127 ports.

Link Analyzer



Fibre Channel Link Analyzers capture cause and effect of data errors. Specific frame headers can be monitored and captured for analysis.

Routers / LAN Switch



Routers / LAN switches interface Fibre Channel with legacy LANs. These are layer 2 and /or 3 devices that use Fibre Channel for a reliable, gigabit backbone.

SCSI Bridge



Fibre Channel provides the ability to link existing SCSI based storage and peripherals using a SCSI bridge. SCSI-based peripherals appear to the server or workstation as if they were connected directly on Fibre Channel.

SNA Gateway



SNA gateways interface Fibre Channel to SNA. Fibre Channel host bus adapters are integrated into standard products like the Novell SAA and Microsoft SNA gateways.

Static Switches

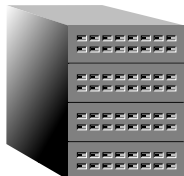


Static switches, also called Link Switches, provide point-to-point connections and are externally controlled. They offer a low-cost option for applications not requiring the fast, dynamic switching capability inherent in the Fibre Channel protocol.

Switches



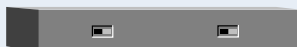
Single switch



Stacked switches

Fibre Channel switches are among the highest performing switches available for high-bandwidth and low-latency communications. The secret is in the Fibre Channel protocol, designed specifically by the computer industry to remove the barriers of performance with legacy channels and networks. Today, a Fibre Channel switch provides connection and connectionless service (Classes 1, 2, and 3) or only connectionless service (Class 2 and 3). Typical connection set up or frame switching time is less than 1 microsecond. Switches are stackable to meet the most demanding application. The number of addresses available is 2²⁴ or over 16 million. Switch options provide high-availability features.

Switch WAN Extender



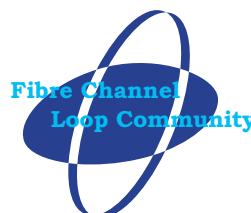
Future Enhancement

Fibre Channel switches can be connected over wide area networks using an Interworking Unit (IWU). Expansion ports on switches are linked using either ATM or STM services. Since Fibre Channel may be faster than a single ATM or STM interface, multiple WAN channels can be used for full Fibre Channel bandwidth.

For more information contact the Fibre Channel Association or the Fibre Channel Loop Community.



Fibre Channel Association
950 Westbank Dr. #207
Austin, TX 78746
800-272-4618
fca@fibrechannel.com
<http://www.fibrechannel.com>



Fibre Channel Loop Community
PO Box 2161
Saratoga, CA 95070
408-867-1385
<http://www.fclloop.org>