

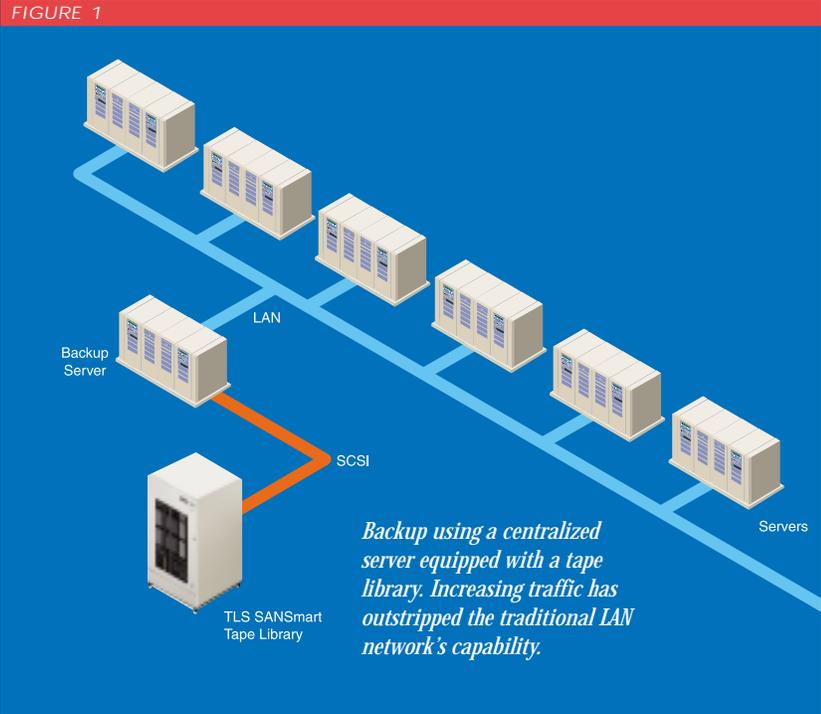
TECH-DOC

A TECHNICAL PRIMER

TAPE  
LIBRARY  
SYSTEMS  
FOR  
ENTERPRISE  
DATA  
STORAGE



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**SAN NOW**

Like many new technologies, SAN and Fibre Channel have been hyped to the skies. Overblown expectations aside, the technology delivers solid results when properly planned and implemented. Qualstar's SANSmart™ TLS-Series tape libraries support all SAN topologies and interoperate with most components and applications.

The Internet and e-everything applications have driven data storage requirements through the roof. Systems and network administrators are struggling to cope with huge increases in both the amount of data being created and the number of locations (servers, desktops, NASs) where it is being stored. Charged with protecting their companies' most valuable asset, administrators are faced with less time for backup as demand for expanded access to critical data is also rising.

**BACKUP OVER THE LAN**

Traditionally, backup was accomplished using tape drives connected directly to servers. As the number of servers proliferated, managing

the tapes became a significant challenge. Tapes had to be labeled, cataloged, loaded, unloaded and transported between their storage locations and the drives. The advent of faster networks made it feasible to move backup data across the LAN (Fig. 1) to a central server equipped with an automated tape library, thereby eliminating locally attached tape drives and manual media management and its attendant problems. Centralized backup using tape libraries has become the standard operating mode for most medium, and all large enterprises.

**SAN SOLVES LAN TRAFFIC JAM**

Increasing LAN traffic from user applications and rapidly growing data movement requirements have outstripped the network's capability. Storage Area Networks (SANs) are designed specifically to move data files between storage devices like RAIDs and tape libraries, and servers. A SAN combines the benefits of network connectivity with the high speed and long transmission distance that Fibre Channel technology yields. A SAN implementation will also substantially improve LAN performance for all users

FIGURE 2

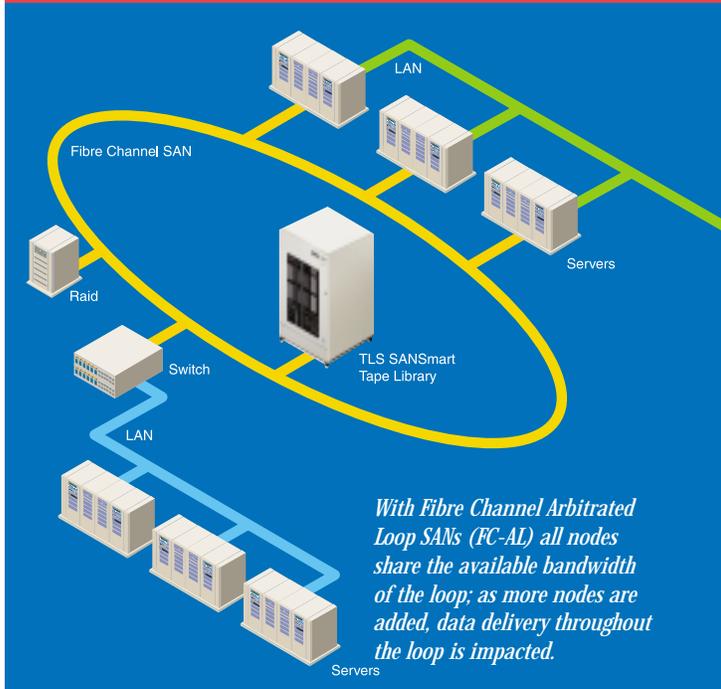
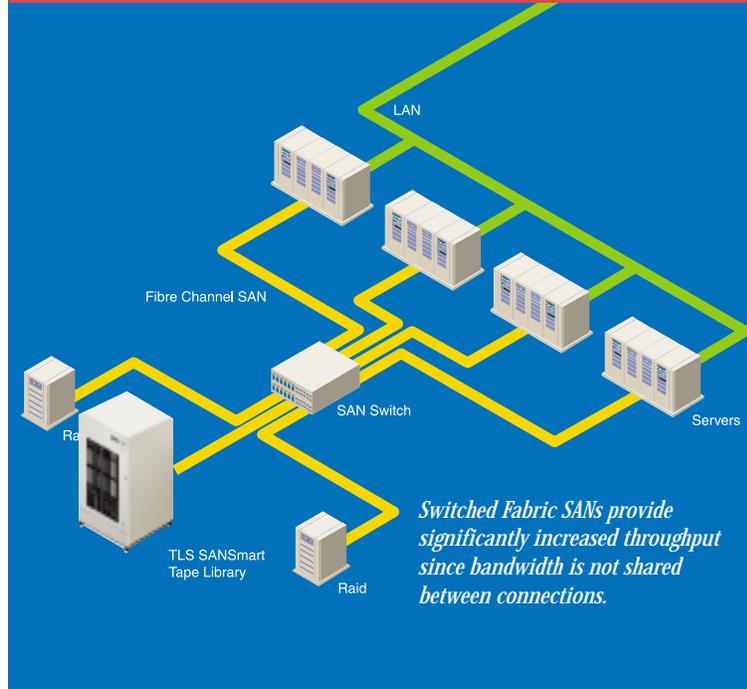


FIGURE 3



by moving file transfers off of the LAN onto a separate network that is optimized for such transfers.

#### FIBRE CHANNEL BASICS

Fibre Channel makes a SAN possible by allowing large numbers of devices to be connected across relatively long distances, while still delivering high data rates. For example, an RLS- or TLS-Series tape library which is dedicated to mirroring backup for disaster recovery can be located across town from the data center and still be able to transfer data as if it were locally connected to the backup server.

#### FC-AL SAN

SANs can be configured in either arbitrated loop (FC-AL) or switched fabric (FC-SW) topologies. (Fibre Channel can also be used in point-to-point applications between two devices.) FC-AL allows up to 126 nodes to be linked together. In this configuration, all nodes share the available bandwidth of the loop, thus adding nodes will impact the delivered data rate to a particular node.

In FC-AL implementations (Fig. 2), data passes around the loop, from node to node, until it reaches its target. Normally, the physical connection of devices to the Fibre Channel is accomplished through hubs. Hubs concentrate connections from several nodes into one Fibre Channel connection, saving money and allowing nodes to be connected or disconnected without interrupting the data flow on the loop.

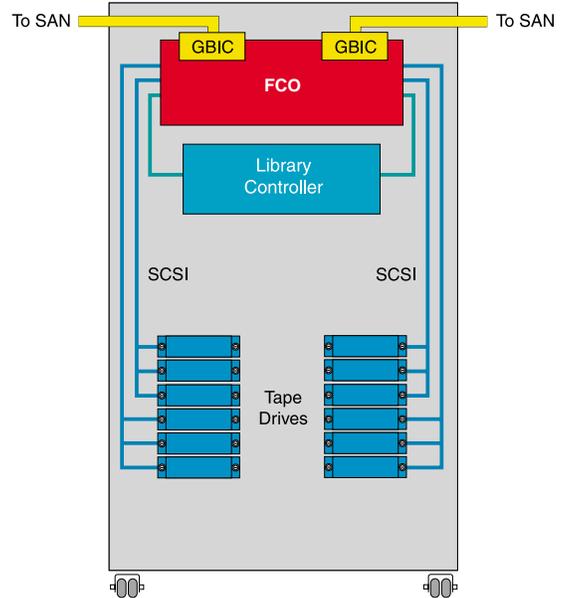
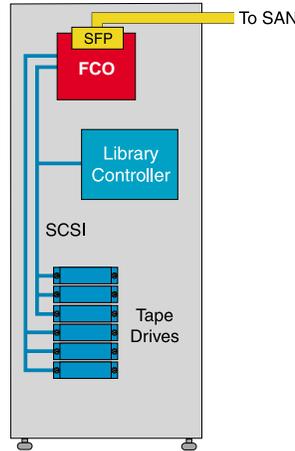
#### SWITCHED FABRIC SAN

An FC-SW SAN (Fig. 3) employs switches to provide a number of simultaneous connections between the devices involved in a specific data transfer. For example, a server can be transferring data to a library at 200 megabytes per second, while a RAID is transferring a file to another server at the same data rate. Since bandwidth is not shared, the overall throughput of the SAN increases significantly.

#### SCSI OVER FIBRE CHANNEL

Tape drives and libraries use SCSI commands to communicate with servers. All storage management applications expect to be

Qualstar's Fibre Channel Option (FCO), near right, and Dual-channel FCO, far right, connect TLS-SANSmart automated tape libraries to SANs.



communicating with tape devices using the SCSI protocol. A module called a bridge is required to translate SCSI and Fibre Channel commands. We have developed bridges, called Fibre Channel Options (FCO), for our TLS-Series SANSmart libraries that use Ultra160 SCSI busses to insure maximum performance. The dual-channel FCO for eight- and twelve-drive libraries contains two independent 2Gb fibre channel ports for high-availability requirements and fast data transfer.

As SCSI peripheral devices require bridges to communicate over Fibre Channel, servers also need appropriate SCSI-to-FC connections. Host Bus Adapters (HBAs) provide this interface, typically in PCI-format cards that are designed for specific systems.

Several manufacturers provide models that offer various physical interfaces, features and levels of performance.

**IMPLEMENTATION**

Implementing a SAN will soon become as straightforward as setting up SCSI busses. Each component has several suppliers vying to become the market leader in their specific niche. At the present time, however, the hub, switch, bridge and HBA manufacturers and the application developers are working hard to raise the level of interoperability between their products. All suppliers provide support lists that reflect the work already completed to guide component selection. Some diligence is required to be sure that interoperability problems do not complicate the SAN installation.

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