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Chapter XI

# Emerging Enterprise Storage Systems: Storage or System Area Networks (SANs)[1]

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In today's distributed and highly sophisticated enterprise computing infrastructures, processing and storage capabilities are usually located across an expansive network with multiple platforms and protocols. These often lock out many users from accessing certain vital data, let alone knowing that the required data even exists!

A storage or system area network (SAN) is a supra-high-speed micro- or pico-area (geographically speaking) network that is dedicated to moving data between storage devices and users. With their increased speed and Internet-based components, SANs offer a better storage solution to meet data storage needs across the enterprise. SAN systems deliver significant enhancements to system connectivity. This new connectivity architecture is based on mostly Fibre Channel (FC) fabrics. The fabric support is built on high-speed optical- and digital-switching technologies. The protocols used are either open or based on industry standards. The most advanced SANs use Fibre channel standards, and can transfer data at rates up to 100 Mbps over up to 10 kilometers (km).

Fibre channel fabric technology will evolve rapidly over the next five years. The release of FC-based solutions using this technology will mirror the practices used today for qualifying new servers, clustering technologies, operating systems, drivers, and host bus adapters (HBAs). Application of this new connectivity architecture to disk storage solutions requires an understanding of new technology, vocabulary and acronyms, and system design concepts.

This chapter appears in the book, Enterprise Networking: Multilayer Switching and Applications by Vasilis Theoharakis and Dimitrios Serpanos.

This chapter along with the additional resources given in the references will support the usage of SAN technologies in enterprises. The first half of this chapter develops the new framework needed. The second half of this chapter details the capabilities of fabric topology. To lay the groundwork for a networked storage system, it is important to understand these concepts in order to best plan the first steps of building a new secure and open enterprise storage infrastructure.



## BACKGROUND AND INTRODUCTION

Enterprise storage systems are used not only for storing live data, but also for data warehousing and data mining purposes. Data warehouse refers to a copy of transaction data specifically structured for query and analysis. It is a complex system, which requires a distinct architecture to successfully support the assembly of complex business decisions. It can also be referred to as an integrated, multi-subject repository containing extremely detailed chronological data, that can accept and process queries for a set of end users. Emerging leading-edge organizations need to implement data warehousing for any one or more of the following reasons (Kimball, 1996).:

*To perform server/disk bound tasks associated with querying and reporting on those servers/disks that are not used by the transaction processing systems*. Most enterprises want to set up transaction processing systems so that there is a high probability that the transactions will be completed within an acceptable amount of time. If the reports and queries—which use a much greater amount of server/disk resources than transaction processing—run on the servers/disks used by transaction processing systems, the transaction completion rate can be reduced. Running queries and reports, with variable resource requirements, on the servers/disks used by transaction processing systems can also make it quite complex to manage the servers/disks. To keep the transaction processing response time within acceptable limit, an adequate solution could be a data warehousing architecture that uses separate servers/disks for some querying and reporting.

*To use data models and/or server technologies that speed up querying and reporting, and that are not appropriate for transaction processing.* There are many data models that usually speed up querying and reporting, e.g., a star schema. These may not be appropriate for transaction processing because the modeling technique will slow down and complicate transaction processing. There are server technologies that may speed up query and reporting processing, but may slow down transaction processing (e.g., bit-mapped indexing). Some server technologies may accelerate transaction processing, but will slow down query and report processing, e.g., technology for transaction recovery.

*To provide an environment where a little or no technical knowledge of database technology is required to build and maintain queries and reports.* A data warehouse is sometimes established to simplify query processing and report writing by less technically savvy personnel. They may only need occasional help from the information technology (IT) personnel.