1. 9a. Explain how SAN can be applied to OLTP workload?

Multiple users performing a set of consistent transactions characterize online transaction processing workloads.

If we use our banking application as an example, the tellers perform most of their transactions using the deposit transaction. This transaction verifies a customer account and adds the deposit to a suspense balance. The suspense files would be used as input for later off-shift processing during a batch cycle to update permanent customer records and accounts.

The Data Organizational Model : The use of relational database technology (RDBMSs) defines the major I/O attributes for commercial applications. This provides OLTP workloads with a more defined set of processing metrics that enhances your ability to estimate I/O behavior and utilization.

OLTP workloads using an RDBMS can be supported through RAID arrays using level 5 configurations. This provides both redundancy and fault tolerance needs.

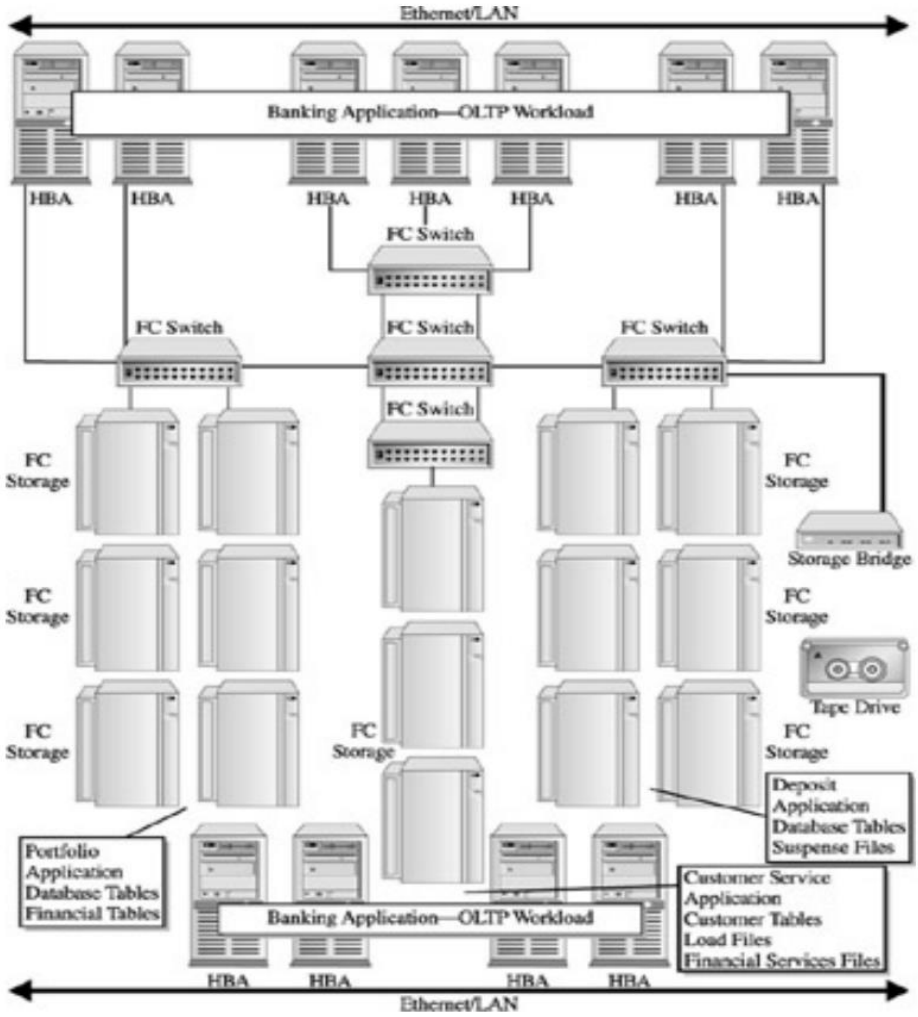
User Access :User traffic plays a significant role in defining the number of data paths necessary for the OLTP transactions to be processed within the service level.

We basically need three types of information from the end users or their representatives—the application systems analysts. This information consists of the number of transactions, the time period within which the transactions will be executed, and the expected service level.

Data Paths: Next, we need to understand the data highway required for this workload. This necessitates breaking down our first two categories into a logical infrastructure for the workload.

By comparing the data organizational model (that is, the database type and its characteristics, as well as the byte transfer requirements) with something called the concurrent factor, we can begin to formulate the number of data paths necessary to meet workload service levels.

2. 9b. Explain the Design and Configuration of OLTP based workload?



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This configuration is comprised of four FC switches, 15 disk arrays, intersystem-link ports, and an integrated FC-SCSI bridge into a tape library.

This supports our workload analysis estimate of ports using three servers with two HBAs, respectively.

It assumes a relational database that is capable of partitioning among the storage arrays and leveraging a RAID 5– level protection scheme within each array.

3. 9c. Illustrate the Application of SAN to Web based Transaction Workloads?

Based upon the processing architectures of web server software, which enable interactive web services, many of the workloads will be almost entirely transactional in nature. However, within this transactional model, another type of transaction type will emerge—the messaging transaction.

Though messaging transactions are processed in real time, they will have a different set of processing characteristics than typical OLTP transactions.

The Data Organizational Model:

WIT workloads simply use the OS file system as the data organizational method. This provides a straightforward view when determining byte transfer rates for WIT I/Os given the format of web file structures. However, this must be augmented when considering the amount and type of delayed I/Os generated from messaging transactions.

User Access:

Defining user traffic is the most challenging activity in estimating WIT workloads. In web-based processing environments, the classic time periods do not apply. This is especially true in retail-oriented web sites that rely on customer interaction for sales and which are open 24/7.

Data paths:

Data paths for the WITs in a complex web environment, comprised of both OLTP, messaging, and batch loads, will likely surpass the number for typical OLTP.

there may be a need to consider the following:

The ratio of channels per server (for example, the number of HBAs per server)

The need for SMP-enabled servers (meaning more concurrent processing)

Ensure workload balancing can be used in some form (for instance, in a workload balance software package, processing affinity options, or process prioritization)

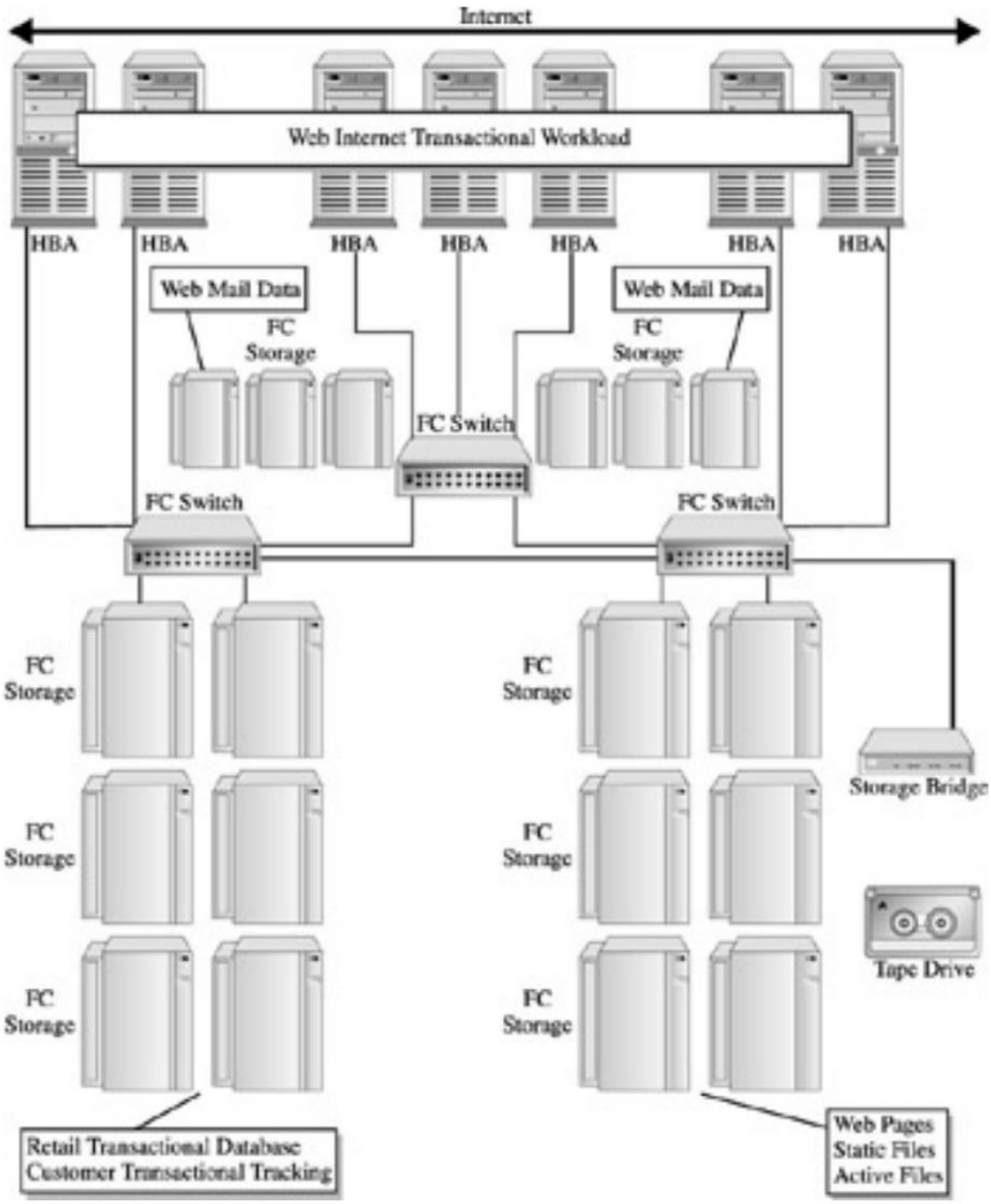
The Design and Configuration of Web-Based Workloads

This configuration is comprised of three FC switches, 18 disk arrays, intersystem-link ports, and an integrated FC-SCSI bridge into a tape library.

This supports our workload estimate using web-based consideration and using seven servers with two HBAs, respectively.

It assumes a combination of web-based e-mail files, a transactional relational database supporting customer retail transactions, and a complement of web pages.

This supports both transactional activity through the meshed configuration where numerous paths exist to the data while the messaging workload is supported by sufficient data paths with consideration for delayed I/O.



4. OR

10a. Apply Storage Area Network to Dataware house Workloads?

Data warehouses provide strategic and tactical business information used to direct business planning and forecasting analysis. Data warehouses are built from subsets of operational databases, typically OLTP workloads that form a historical database of various business activities.

Data Organizational Model:

The use of a relational database system as the data organizational model for the data warehouse is guaranteed.

This not only defines a set of metrics that allows for greater detail in determining the byte transfer rates, but also the physical placement of data within the storage devices.

Database size determines the number of storage devices necessary for pure capacity. Although important, physical placement becomes a critical factor.

User Access :

The one break you can expect from DW configurations is that the user community supported is generally limited.

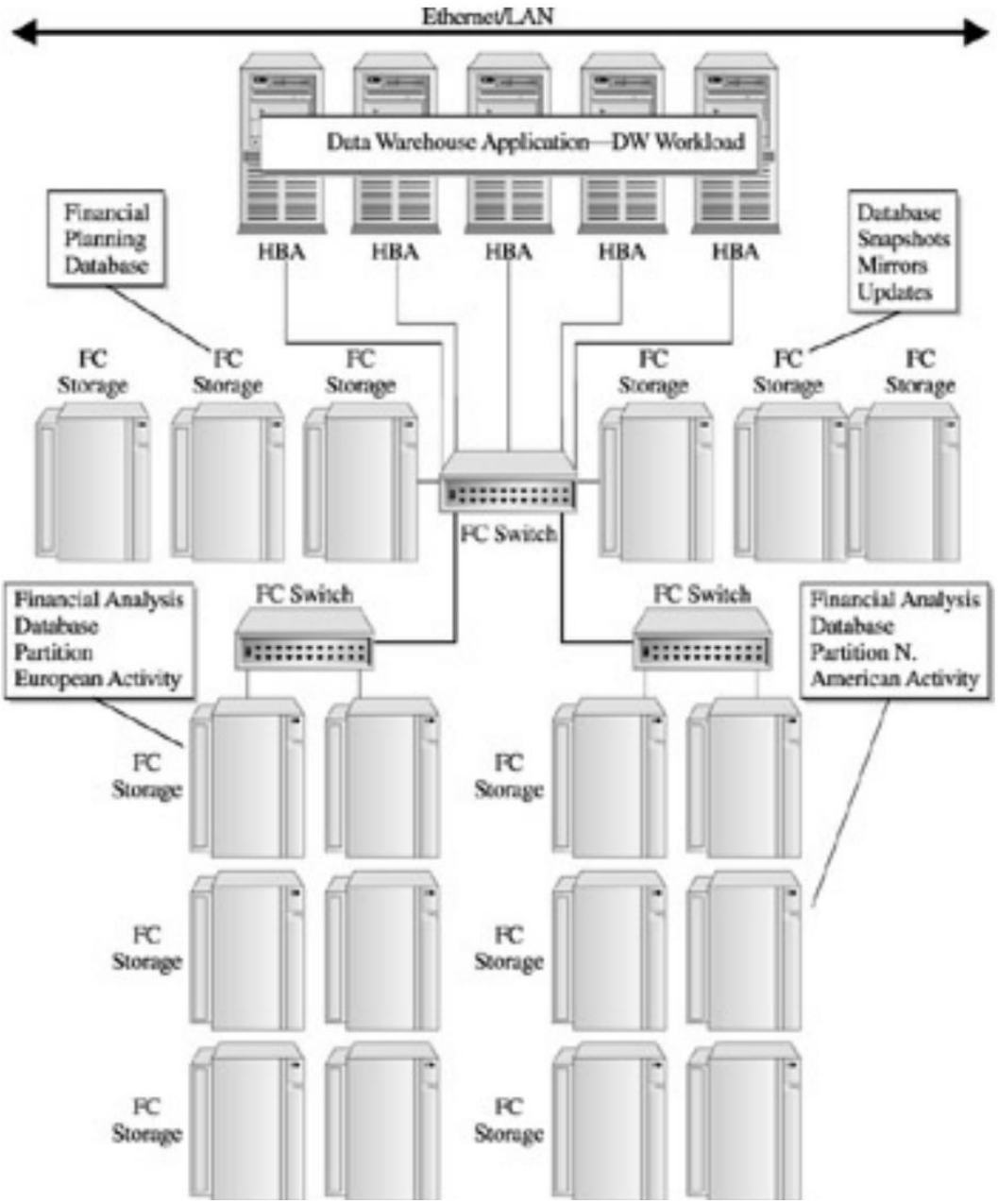
Although somewhat obvious, since there are only a limited amount of company personnel assigned to strategic planning, the user base is likely to grow significantly as the success of DW applications demonstrate their value.

Data Paths:

Processing transactions that have gigabyte requirements requires multiple data paths. In addition, the necessity to physically partition the database across storage arrays requires more data paths.

If we augment the requirement further with database updates that may need to be performed in isolation, the number of data paths becomes significant.

5. 10b. Illustrate with diagram DataWare house Workload using a Cascading SAN Configuration.? [3] [2] [3] [6]



This configuration is comprised of three FC switches, 18 disk arrays, interswitch-link ports, and an integrated FC-SCSI bridge into a tape library.

This supports our workload estimate using data warehouse metrics and considerations, and supports the five servers attached to the end user LAN.

It assumes three relational database systems supporting two warehouses, the Financial Analysis System and the Financial Planning System.

Note that the Financial Analysis data is large enough that it is partitioned into North American activity and European activity.

The outstanding issue in this configuration is the update process that occurs with operational databases that are not part of this SAN.

6. 9c. Write a short note on Import Auto Industry case study?

This case study discusses the activities surrounding the analysis, justification, and implementation of a storage area network (SAN) to support a major restructuring of key application systems within a major international auto distributor in the United States.

The Situation Analysis:

The current application model consists of all critical application systems being run on the mainframes.

These are generally OLTP type applications that provide support to all business functions within the headquarters and distribution centers.

The applications targeted for redesign and redeployment are some of the few that are operated from the UNIX open systems area.

These are the current data warehouses for sales, warranty, service, and parts.

The Search and Evaluation:

The storage team concluded that any solution had to scale to the multi-terabyte level.

This was deduced by a quick but careful analysis of current utilization, historical trending of growth, and current estimates.

The storage team had to validate key pieces of information before embarking on its search for solutions.

- First, it was asked, was the validity of current estimates it received from the application designers for aggregate user data, or did it include overhead estimates for database overhead from the DBAs?
- Second, were these estimates for day-one installation or have some growth factors been built in?
- The answers turned out to be good news and bad news, and some new news, which called for even new challenges.
- The good news was that the estimates included the overhead as estimated by the DBAs. Consequently, the aggregate data sizing could be used as is.

Available Alternatives:

Considering all the available estimates, and validating the capacities, processing requirements, and services levels, the new data warehouse infrastructure would need to support a 3-terabyte capacity.

Storage Evaluation Results:

The UNIX mainframe was a high-end SMP machine that was capable of being partitioned into 2 to 16 logical processing partitions.

The SAN configuration was analyzed as 4, 64-port director class switches, with 12 HBAs installed across the existing data warehouse UNIX servers-for example, 4 HBAs each.

The storage arrays were configured with 3 terabytes of capacity with specific configurations for each solution-for example, one set for the SCSI-based UNIX mainframe and a different set of arrays for the Fibre Channel-based SAN.

Solution Acquisition and Implementation :

The storage admin team recommended the SAN solution with subsequent approval from IT executives and reluctant concurrence from the application design team.

Because this would be the first installation of the storage networking technology for the data center and because of the visibility of the applications, the design team's reluctance was understandable.

SAN Operational Issues :

- **Facilities and Location**: This was handled by accommodating more space within the existing server and storage areas.
- **Management Processes**: Perhaps the most troublesome issue was the operational integration into the data center.
- **Integration into Data Center** :One of the most difficult activities surrounding the installation and subsequent expansion of the SAN is the integration of wiring complexities and integration into the existing complexities of server and network wiring and switching structures.

New SAN Software Tools

Once prototype testing was in place, it became apparent that new tools were necessary for managing the storage across the SAN.

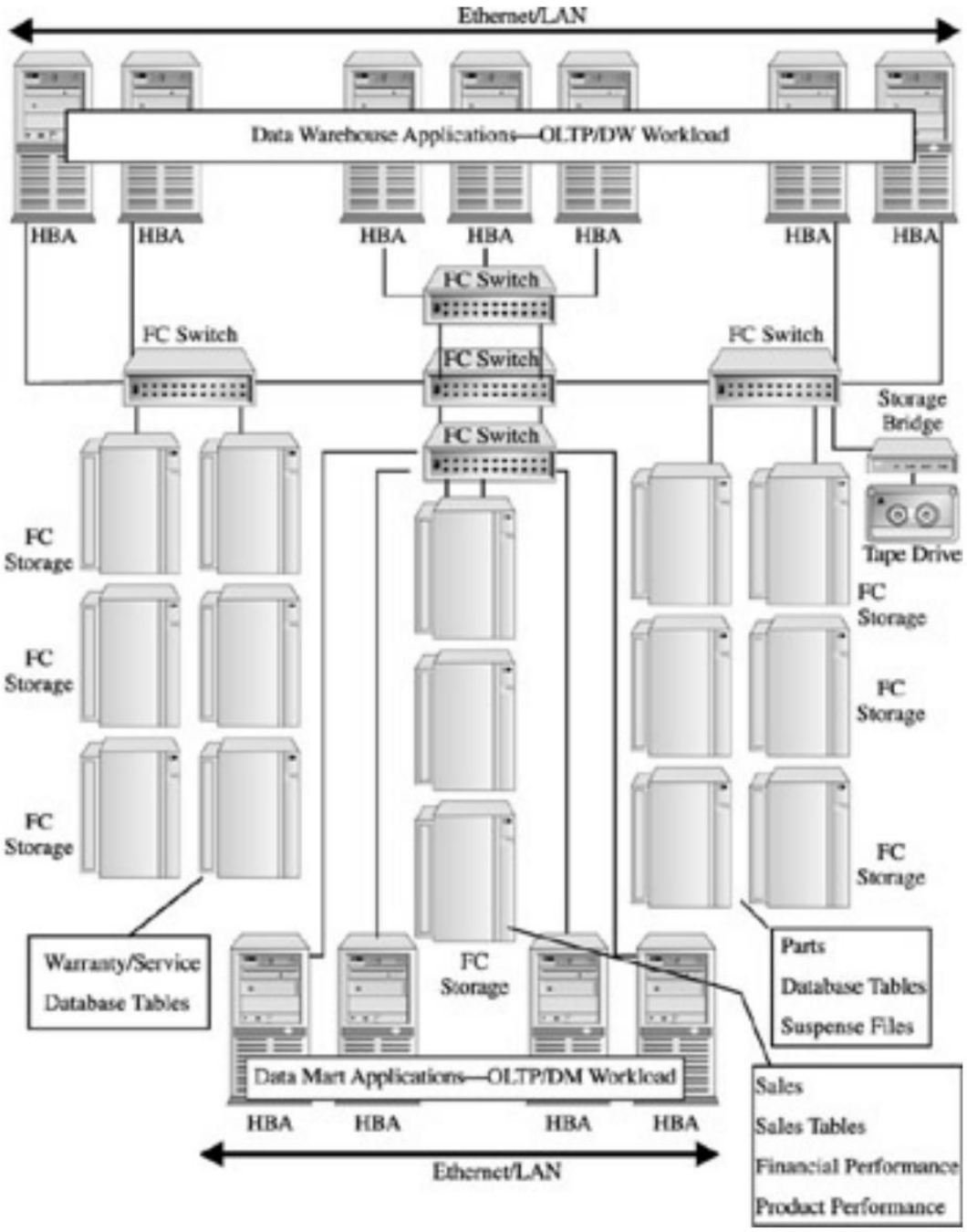
The requirements specifically came from the need to manage the storage centrally across the supported servers.

IT Organizational Integration

The responsibility to evaluate and justify the SAN initially was given to the storage administration team.

The installation and support of the SAN beta testing was accomplished through a team approach, using the expertise of systems admins, application designers, and DBAs, with leadership from the storage admin team.

The SAN Solution:



The SAN solution provided the infrastructure for these applications.

The ability to move and access data at the increased levels of Fibre Channel SAN configurations has provided this company with a significant competitive edge.

This case study illustrates the success that storage networking can have with an adequate and reasonable application and I/O workload planning set of activities.