- Having a separate Ethernet for the private metadata network, though not absolutely required, is highly recommended, and the separation of network traffic between the SAN and a public network could greatly enhance the performance of the SAN in high-bandwidth environments.
- There are a number of SAN technologies, and Xsan is just one implementation of that technology.
- You are able to describe the basic structure of an Xsan volume and the Xsan file system.
- There are a number of new features with Xsan 2. Among these are MultiSAN and Spotlight.

References

Administration Guides

Xsan 2 Setup Guide
(http://images.apple.com/xsan/docs/Xsan_2_Setup_Guide.pdf)

Xsan 2 Administrator's Guide
(http://images.apple.com/xsan/docs/Xsan_2_Admin_Guide.pdf)

Xsan 2 Technology Overview March 2008
(http://images.apple.com/xsan/docs/L363053A_Xsan2_TO.pdf)

Xsan 1.4 Reference Guide

Apple Knowledge Base Documents

"Xsan 2 or later: How to configure MultiSAN"
(http://support.apple.com/kb/HT3144)

Review Questions

Please replace questions 1 and 2 with the following:

1. What limitations of DAS and NAS storage architectures are resolved by implementing a SAN storage architecture?
2. What benefits do you gain from implementing a Storage Area Network?

3. The maximum cable run from a client to an Ethernet switch should be no greater than what?
4. When purchasing fiber optic connectors, why should you make sure that they are qualified for use in a Fibre Channel network?

[please replace *all the text* on this page with the following:]

3. How does a cluster file system take advantage of a SAN storage architecture?
4. Why is Fibre Channel used for Xsan?
5. Why is metadata so important when dealing with file systems?
6. What is the purpose of having a dedicated Ethernet network dedicated solely to SAN traffic?
7. What are the basic components of an Xsan volume?

Answers

1. By implementing a SAN storage architecture you avoid performance bottlenecks and single points of failure. You can also scale your storage as needed.
2. When you implement a Storage Area Network you gain high performance, concurrent file sharing, network-based storage management, a flexible SAN topology, and the elimination of single points of failure.
3. With a cluster file system LUN provisioning is reduced and data silos are eliminated. The volumes are shared, the storage is used more efficiently, and storage management is easier.
4. Fibre Channel is used for Xsan because of its high speed, proven reliability and guaranteed in-order delivery.
5. When dealing with file systems, the fundamental idea of metadata describes how the data on the volume is organized.
6. Non-SAN-related Ethernet traffic can interfere with the exchange of metadata among Xsan controllers and clients.
7. Xsan volumes are composed of LUNs, Storage Pools, and Volumes.

Files and folders are, by default, owned by the users who create them. After files and folders are created, those items keep their privileges (a combination of ownership and permissions) even when they are moved, unless the privileges are explicitly changed by their owners or by an administrator. New files and folders that you create as an administrator are not accessible by client users if they are created in folders for which the users don't have privileges.

When setting up Xsan volumes, make sure that the files and folders allow the appropriate access privileges for the users who need access to them. A useful method to ensure this is by using groups and group memberships.

In Mac OS X Client, every user is a member of a default group that is created at the same time as the user account and has the same name as the user name for that user account. This user is the only member of this group. For example, if you created a user, *ravi*, on a local machine, the operating system would create a group, also called *ravi*, in which to place that user. This situation can restrict access to files and folders on a shared Xsan volume because that group does not exist on the servers managing the Xsan.

[delete rest of paragraph.]

For Xsan volumes, by default, group ownership is assigned to a group called *wheel,* a system group made up of administrative users. It is common practice to change this default group ownership on an Xsan volume. Common replacements groups are called *Editors* or *Xsan Users*, and are managed centrally from a directory system, such as Open Directory, using Server Admin.

Managing Local Users

Xsan tracks file ownership based on *user IDs* and *group IDs*. In this respect, Xsan is similar to UFS, NFS, and Mac OS X Extended format. Each file and folder is marked with a numeric user ID and a numeric group ID. Ownership and group access are evaluated by comparing the UID of the file system object with the UID of the user. Permissions are applied depending on whether the user is identified as the owner, the group member, or neither.

The following table lists limits and capacities for Xsan volumes and should help guide your decision making when considering whether to build another SAN or modify your existing SAN.

Volume Limitations

Parameter	Maximum
Number of computers on a SAN (controllers and clients)	64
Number of volumes on a SAN	16
Number of storage pools in a volume	512
Number of LUNs in a storage pool	32
Number of LUNs in a volume	512
Number of files in a volume	4,294,967,296
LUN size	Limited only by the size of the RAID array
Volume size	2 petabytes
File size	Approximately 263 bytes
Volume name length	70 characters (A–Z, a–z, 0–9, and _)
File or folder name length	251 ASCII characters
SAN name length	255 Unicode characters
Storage pool name length	255 ASCII characters
Affinity name length	8 ASCII characters
LUN name (label or disk name)	242 ASCII characters