BUILDING A HIGHLY RELIABLE SAN

REPLICATION IMPROVES DATA PROTECTION

System reliability is a vital component in Storage Area Network (SAN) design that keeps your production environment operating and avoids data loss and downtime. But since SANs are built using both mechanical and electronic parts, component failures due to usage, environmental factors, or manufacturing defects are not uncommon. Even in completely redundant systems, controllers can quit, fans can stop operating, power supplies can burn out, and disk drives can degrade or fail.

To eliminate downtime, IT managers should focus on total system design and how components work together to deliver reliability. A common mistake is to evaluate individual component reliability alone—you can "miss the forest for the trees" and significantly increase expenses with no improvement in overall system reliability.

Focusing on the reliability of individual components can result in greater expense with no improvement in system reliability.

SYSTEM DESIGN TRUMPS COMPONENT RATINGS

While SAN component reliability ratings are of interest, system reliability is established as a result of mulitple components working together. For example, a server with one direct-attached disk is only as reliable as that disk; the server's electronics reliability rating may be very high, but if the disk fails, the system fails. However, if you configure two internal disks with RAID, reliability improves dramatically; a disk failure does not impact system operation because you have "designed" redundancy into your system.

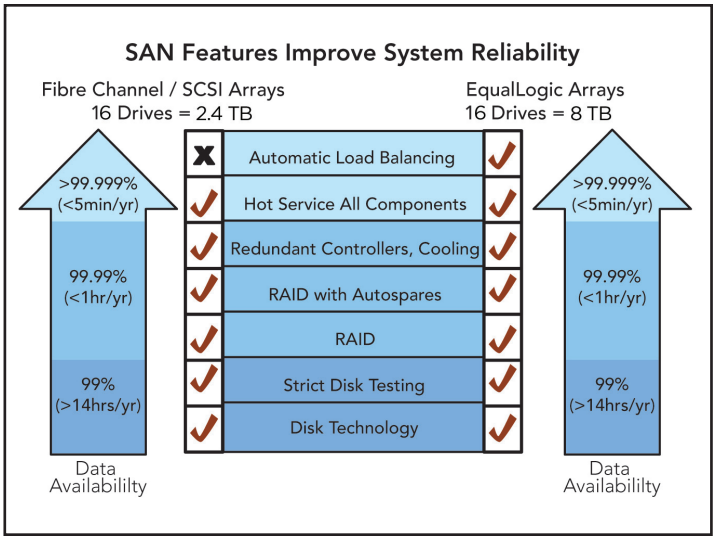
Some storage vendors want SAN buyers to focus on individual disk drive reliability ratings, but good system design and RAID implementations render these statistics essentially moot. A properly configured 16-drive system using RAID 50 has a "mean time to data loss" of at least 100,000 years; while that number may be even higher depending on drive type, administrators can count on system reliability and select drives based on other features such as price/performance and capacity. Fibre Channel (FC), SAS, and SATA drives all have benefits: individual FC and SAS drives have higher reliability rating than SATA drives, but SATA drives hold more capacity and therefore require fewer components. And fewer components means fewer potential failures.

The differences in reliability ratings between FC, SAS, and SATA drives can be immaterial to system reliability when comparing well designed storage systems.

BEST PRACTICE SYSTEM DESIGN

To ensure maximum uptime IT managers should properly configure the SAN environment, using storage arrays specifically designed for full redundancy, online servicing without disruption or compromise of data protection, and automated management that minimizes disk workloads. Best practices include:

- Interoperable Infrastructure—SAN technology should be easily deployed and interoperable. This minimizes disruptions caused by incompatible devices.
- Redundant System Architecture—All components should be fully redundant, online serviceable, and hot swappable—disk drives, fans, power supplies, controllers, and network interfaces.* RAID caches improve system performance and must be protected via mirroring between controllers.
- Serviceable System Design—Servicing a system should not compromise data protection such as RAID.
- Advanced Chassis Design—Chassis should be designed for advanced cooling and vibration dampening, essential factors for keeping vital system components working properly. Dampening eliminates vibration and provides maximum disk drive performance.
- Stringent Testing—All components should be well tested prior to delivery. Disk drive reliability can be improved by 20% or more with testing.
- Flexible RAID Configuration and Automatic Sparing—Not all RAID configurations deliver the same level of reliability. Highly reliable systems support RAID 10, RAID 50, and RAID 6, but equally important are automatic RAID configuration and short rebuild times. Storage arrays should include spare disks that are automatically configured and brought online when needed.
- Redundant Data Paths—All connections from servers to storage should be redundant.
- Automatic Load Balancing—Arrays that automatically load balance data across all available disks improve reliability by lowering the duty cycle on each disk, as well as improving total system performance and utilization.
- Continuous Self-monitoring and Self-correction—Storage arrays should provide continuous monitoring of all components including proactively testing disks in production.



DON'T MISS THE FOREST FOR THE TREES

While component-based reliability statistics can be informative, they don't tell the whole story. Architectural and automated management features minimize both planned and unplanned downtime. To achieve the highest levels of service, systems should be online serviceable without reducing data protection or causing brown-outs or outages. Effective SAN reliability depends on advanced system design, proper configuration and implementation, proactive management, and online serviceability.

* Note: Using network based RAID across multiple storage arrays to achieve a reliable system introduces a new element of risk, as network dependence lowers data availability and protection.