WHITE PAPER

BROCADE SAN SOLUTIONS: A MORE EFFECTIVE APPROACH TO INFORMATION STORAGE AND MANAGEMENT

An overview of the wide-ranging, measurable benefits of an intelligent core-to-edge SAN fabric infrastructure

BROCADE

The intelligent platform for networking storage

As organizations face the prospect of storing and managing an increasing amount of information, they are rapidly turning to Storage Area Networks (SANs) as a cost-effective way to implement a highly strategic technology infrastructure. SANs are designed to provide a flexible environment that decouples servers from their storage devices through the use of Fibre Channel switch technology (commonly referred to as the SAN fabric).

By combining flexibility and intelligence, SANs address today's most challenging business requirements: how to protect and access critical data, how to utilize computing resources more efficiently, and how to ensure the highest levels of business continuance. Driving the migration to SANs are solutions such as the Brocade® SilkWorm® family of fabric switches and software, which provides the reliable, high-performance data transfer so critical to efficient SAN operations. Today, organizations around the globe are rapidly deploying core-to-edge SAN fabrics built on intelligent Brocade hardware and software offerings—and enjoying the fast Return On Investment (ROI) provided by a wide variety of SAN applications.

The Growing Need for More Efficient Information Management

During the last decade, ever-increasing information access requirements have had a profound effect on most data centers. Storage capacity requirements have skyrocketed. The windows of time available for data backup and recovery have virtually disappeared. And IT staffs have faced greater pressure to keep pace with growth—while reducing costs. As a result, many organizations have been searching for more cost-effective ways to increase both data availability and manageability.

The goal of this search is a strategic storage infrastructure that efficiently manages and protects critical business information. This infrastructure must be able to scale quickly to handle continued data growth—a difficult problem for traditional Direct-Attached Storage (DAS) models. To address these requirements, many organizations are embracing a more strategic enterprise storage infrastructure based on intelligent SANs.

The Many Advantages of a SAN Infrastructure

Because they leverage a wide range of innovative technologies, SANs extend many new capabilities throughout the enterprise. In general, SANs are networked storage environments that provide scalable, reliable IT infrastructures to meet the most demanding requirements for high-availability, high-performance storage applications. In the SAN model, switches provide connectivity between servers and storage devices—enabling more flexible connectivity options and greater resource sharing (see Figure 1).

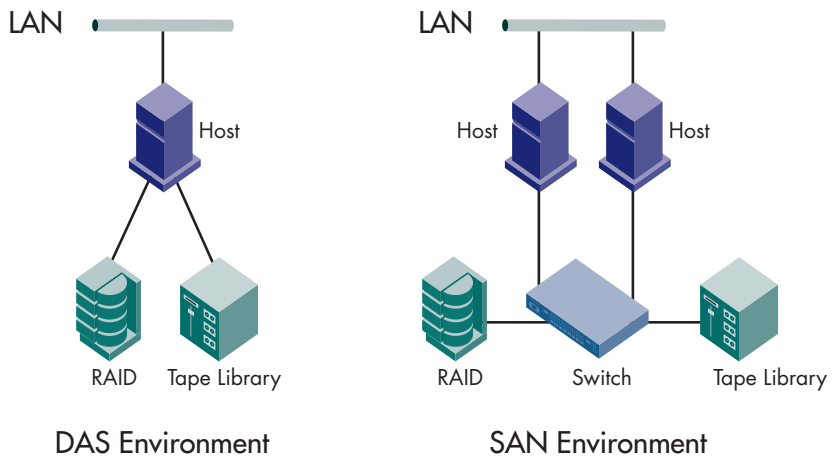


Figure 1.
Simplified resource sharing through a Brocade SAN

Today, the standard protocol for SANs is Fibre Channel technology, which supports high levels of scalability, performance, and manageability and helps overcome the distance limitations of other connectivity protocols such as SCSI. Fibre Channel technology also enables a flexible networked environment that is optimized for high-speed server-to-storage data communications and connectivity.

By implementing a strategic SAN, organizations can revitalize their IT infrastructure to address some of today's most challenging business requirements, including:

- How to centralize storage management and reduce administrative costs
- How to ensure that data is readily accessible across the enterprise
- How to optimize the utilization of technology and personnel resources
- How to maximize system and data availability to support the highest levels of business continuance

Improved ROI for Storage Environments

One of the greatest advantages of SANs is their ability to significantly reduce overall storage and operating costs. In fact, SANs often provide more than a 50 percent savings benefit over DAS environments. Much of this savings results from centralized storage and simplified management—typically the highest costs associated with a DAS environment. For instance, a recent ITcentrix study revealed that SANs can reduce management costs to just 15 percent of the total storage cost, compared to an average of 55 percent for DAS environments.

In addition, SANs can provide an extremely fast ROI, with many SAN implementations providing a payback in six months or less. For example, as measured by an ROI tool jointly developed by Brocade and KPMG, a leading financial software company recently achieved a two-month payback for its high-availability SAN implementation and a four-month payback for its storage consolidation implementation. Moreover, a leading telecommunications company in large part has been able to avoid as much as $5 million dollars per day in lost opportunity costs, based on the improved fault tolerance and greater flexibility provided by its Brocade SAN implementation.

To enable such impressive results, Brocade SANs provide a flexible, manageable storage infrastructure that supports virtually unlimited data growth through "pay-as-you-grow" scalability. This flexible framework enables organizations to easily scale up their server and storage infrastructures—without inhibiting performance or disrupting operations on the rest of the system.

SANs also improve storage resource management through centralization, even within distributed IT architectures. For example, intelligent SAN software tools enable organizations to allocate storage to various hosts, then replicate data, back it up, and monitor it on a continual basis. These capabilities are critical to facilitate storage growth while maintaining system uptime requirements and controlling administrative costs.

Today, the Brocade SilkWorm family of fabric switches and software is designed to support a wide range of key SAN solutions, including:

- Backup and recovery
- Storage consolidation
- Server consolidation
- High availability
- Business continuance

The following sections describe how organizations can benefit from deploying a Brocade SAN for these application areas. For more detailed information about these application areas, refer to the sidebar.

Brocade SOLUTIONware Guides

To simplify SAN deployment, Brocade and its partners have developed a library of technical SOLUTIONware guides representing nearly 60 SAN configurations that have been tested and documented in detail. Because SOLUTIONware configurations are pretested, they can provide a fast, reliable way to implement a variety of SAN applications. For more information about SOLUTIONware guides, visit www.brocade.com/san/solutionware.jhtml.

Greater Data Protection with Improved Backup and Recovery

As enterprise data becomes a much more valuable business asset, ensuring its stability and protection is more critical than ever. Unfortunately, many organizations have faced the challenge of having to back up more and more data even as backup windows have continued to shrink.

The main reason behind this trend is that traditional backup and recovery models have tended to complicate the overall process of backing up data. One model has typically featured dedicated disk and tape systems for each particular host server, with each host backing up its own data to its own locally attached tape drives or library. This design is a relatively poor utilization of resources because, even though one server's tape drive might be idle, another server cannot use it. In addition, each operating system platform tends to use unique backup and recovery software applications, which further complicates resource management.

Other traditional approaches involve a primary backup and recovery server that controls tape resources by using sophisticated applications such as VERITAS NetBackup, Legato NetWorker, Computer Associates BrightStor, Hewlett-Packard Omniback, and Tivoli Storage Manager. The backup server receives data from other servers across a LAN or WAN, then stores that data on centrally owned disk and tape resources. The major drawback to this approach is that using the LAN or WAN for storage traffic can potentially degrade performance for production workloads and further lengthen backup and recovery windows.

In contrast, SANs are designed to streamline the data backup and recovery process. The Fibre Channel protocol transports large blocks of data with greater efficiency and reliability than IP-based networks. To significantly improve performance, Brocade Fibre Channel SAN fabrics can provide 1 and 2 Gbit/sec full-duplex bandwidth capabilities—and even 8 Gbit/sec with Brocade Inter-Switch Link (ISL) Trunking. This performance and reliability combines for a highly effective backup and recovery solution for both "LAN-free" and "server-free" backup and recovery approaches.

LAN-Free Backup and Recovery

Removing the LAN from the backup and recovery process provides a variety of advantages. Organizations can implement SAN-attached tape drives and libraries such that each server sends its own backup data directly to the shared tape resources instead of through the network to the backup server. Sophisticated software applications still control the process, tracking the backup and recovery of data. However, because the SAN enables bulk data transfer from each server to shared SAN storage, the LAN is used only for communication (not data) traffic between the servers (see Figure 2). The result is a faster, more scalable, and more reliable backup and recovery solution—with more effective utilization of storage, server, and LAN resources.

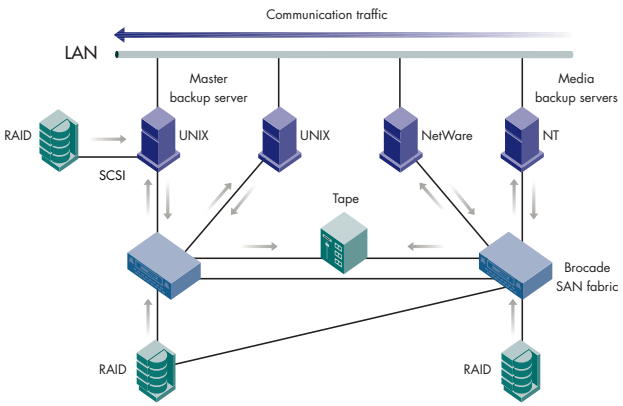


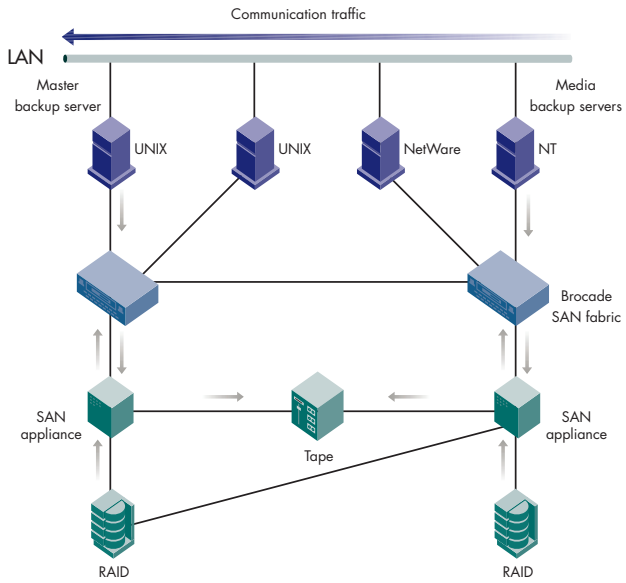
Figure 2.
A SAN-based LAN-free backup and recovery model

The advantages of a LAN-free backup and recovery environment can be dramatic. For instance, after it deployed a LAN-free backup solution for its Windows NT Exchange server environment, a large hospital was able to reduce its backup window from 18 hours to just 6 hours. In addition, a large telecommunications company reduced its weekend backups from 60 to 30 hours, lowered its IP network traffic by 90 percent, and was able to perform recoveries in half the previous time. Other impressive results include companies that have reduced their backup windows from 26 to 3 hours, 48 to 4 hours, and 26 to 8 hours.

Server-Free Backup and Recovery

Another evolving SAN implementation is known as server-free backup and recovery. In this model, data is transferred directly between storage devices (for example, from disk to tape) without using host servers. This process is enabled by a technology called third-party copy, which can be implemented in SAN appliances (such as Crossroads or Pathlight bridges), host systems (such as Legato Celestra), or even storage devices and switches themselves (in the future). The greatest benefit of server-free backup and recovery is that it frees up valuable host CPU cycles to improve operating efficiency and enable higher workloads across the enterprise (see Figure 3).

Figure 3.
A SAN-based server-free backup and recovery model



More Efficient Utilization of IT Resources through Consolidation

Traditionally, organizations have paired specific storage resources with servers, primarily due to technical restrictions. However, this DAS model typically results in relatively poor utilization of storage resources, because the storage is dedicated to each server—not shared among servers. In fact, recent studies have shown that many DAS implementations utilize less than 50 percent of available storage resources, whereas SAN implementations typically reach utilization levels of 80 percent or higher.

The DAS model has proven to be especially inflexible during periods of expansion because simply adding more servers and storage resources generally results in a complex environment to manage, with poor resource utilization. In contrast, centralized SAN-based storage is far easier and much less expensive to manage as the enterprise grows.

To help avoid disruption and reduce costs during periods of expansion, SANs provide unprecedented flexibility that changes the way storage resources can be purchased and managed. By enabling any-to-any server and storage connectivity via switches, SANs decouple specific devices and thereby improve storage resource sharing. This cost-effective open systems approach enables the consolidation of resources and the selection of best-of-breed heterogeneous server and storage equipment (see Figure 4). Today, consolidation can involve both storage and server environments.

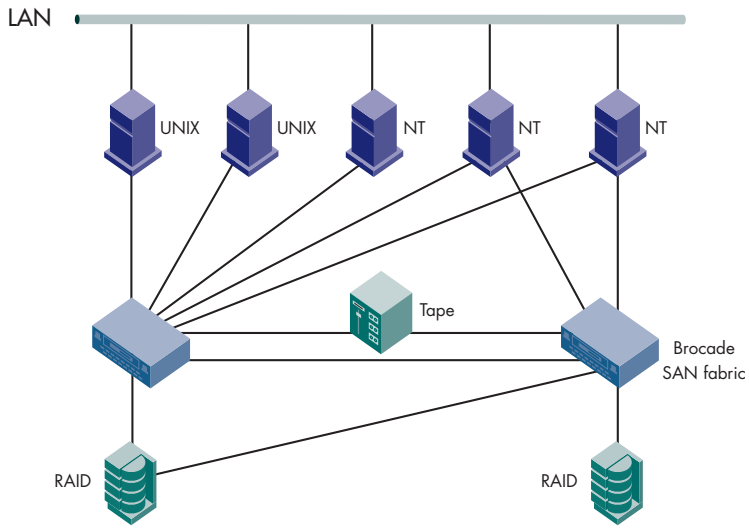


Figure 4.
A simplified best-of-breed SAN infrastructure with heterogeneous server and storage resources

Storage Consolidation

SANs can help organizations grow their IT infrastructures much faster, since storage capacity can grow independent of server usage. In fact, storage provisioning times can be as much as 90 percent lower. Moreover, the same number of administrators can typically manage much larger amounts of SAN-based storage—often three to four times that of DAS environments. These capabilities provide a high degree of efficiency in optimizing resources and enabling non-disruptive growth.

The benefits of storage consolidation can be impressive, as shown by the following real-world examples:

- A large telecommunications company that recently implemented a SAN was able to slice its previous storage requirements in half.
- A financial services provider scaled its storage infrastructure from 2 to 10 terabytes in just four months (without having to add personnel to manage the additional workload).
- An Internet infrastructure provider reduced the time required to add or move storage from multiple days to just a few hours, while eliminating the need to recable systems during configuration changes.

Server Consolidation

By consolidating servers in a SAN environment, organizations can greatly reduce the number of devices and disparate systems they must manage—potentially saving a significant amount of money on server maintenance and personnel resources.

For instance, after deploying a server consolidation SAN, a large hospital reduced its number of primary Windows NT servers from 50 to 7—with significantly improved automation and administration to lower operating costs. In addition, a telecommunications company reduced its server allocation by one-third through consolidation. Both organizations can now operate much more efficiently and cost-effectively than before.

High Availability for Improved Data Access

Due to service level agreements, industry regulations, or other business needs, today's organizations require the highest possible data and system availability. In fact, incidents that were previously viewed as minor unplanned outages can now severely impact business operations. To address this requirement, SANs are designed to facilitate a high-availability environment that can help prevent (and better tolerate) system outages to reduce the risk of downtime.

To maximize data and system availability, SANs incorporate a wide range of capabilities, including:

- Highly reliable components with built-in redundancy and hot-plugging characteristics
- No single points of failure
- Intelligent traffic routing and rerouting
- Dynamic failover protection
- Non-disruptive maintenance and upgrades
- Resilient dual-fabric network designs

One of the most common ways SANs support high-availability operations is by enhancing server clustering implementations, which are typically used to ensure that applications continue to run in the event of a host server failure. Traditional non-SAN clustered environments usually include two servers sharing disk storage. However, this represents an inflexible model that is often limited to two servers sharing storage—with the failover server remaining idle until pressed into duty.

With clustering in SAN environments, many more servers can share SAN-attached storage. In some implementations, any server can handle the additional workload when one server is unavailable—helping to prevent idle server resources and vastly improving resource utilization (see Figure 5). In addition, longer Fibre Channel connectivity distances between devices facilitate a more effective disaster recovery plan.

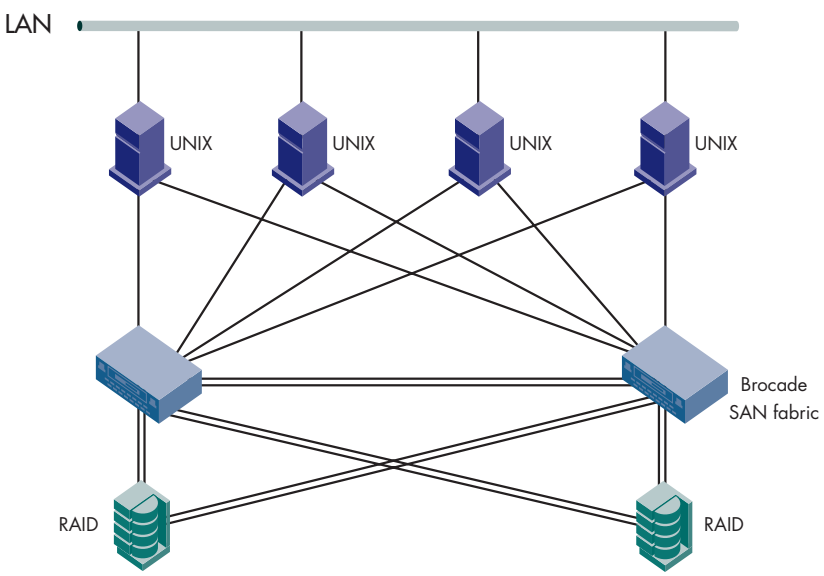


Figure 5.
A high-availability clustering model with switch failover capabilities

The value of a SAN clustering implementation is apparent in the example of the telecommunications company that deployed a VERITAS Cluster Server and SilkWorm switches to create a highly available SAN environment. Before the SAN was deployed, the implementation included three clusters, each with two servers. Resources were being wasted, because there were three idle failover servers and neither the application load nor data was shared between clusters. After the SAN implementation, only three servers (instead of six) and half the storage resources were required. Today, the company can efficiently manage its SAN by dynamically allocating storage and applications, and by performing non-disruptive server and storage maintenance.

Advanced Features for the Highest Levels of Business Continuance

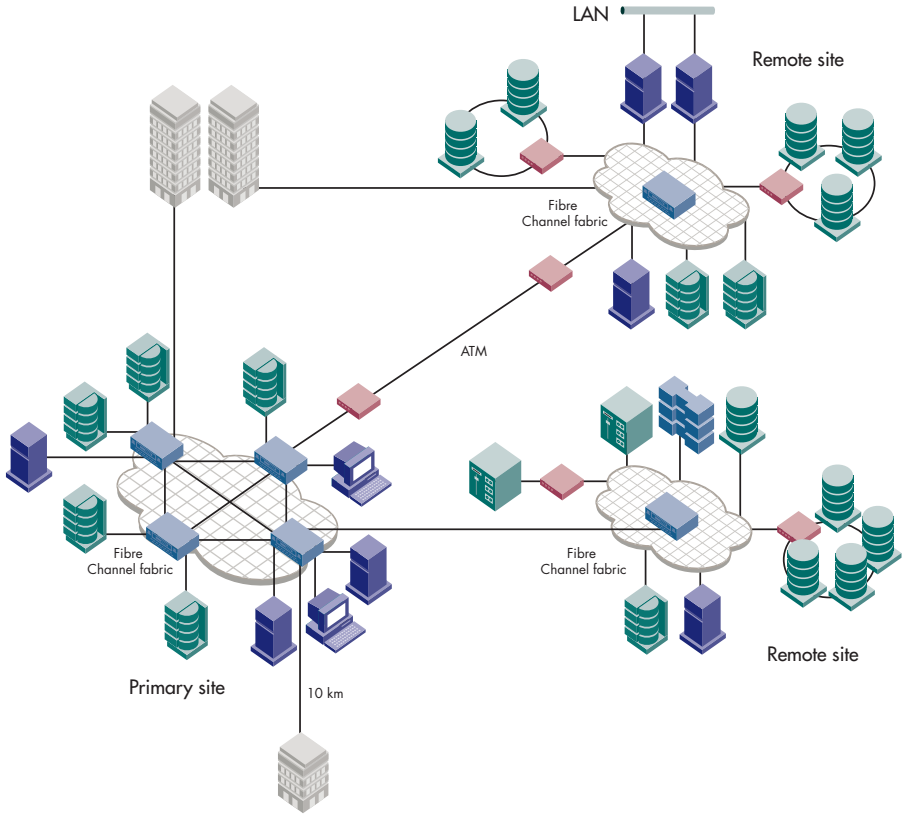
With their ability to integrate reliable, innovative devices and applications, SANs provide many options for organizations that need to support business continuance activities in a cost-effective manner. A redundant network design and reliable components provide a high degree of fault tolerance to help prevent system outages. And if a failure does occur, the distributed networked approach of SANs supports the fast recovery of data and restoration of operations.

In particular, Brocade SANs provide a key component of the disaster recovery solution by protecting data over longer distances in replicated or mirrored configurations and by enabling remote electronic tape vaulting, clustering, and disk access solutions. Basic Fibre Channel technology provides the 10-kilometer connectivity distances required to maintain geographically separate disaster recovery facilities or mirroring operations. For large fabric configurations, Brocade SANs can utilize Wide Area Networks (WANs) or Metropolitan Area Networks (MANs) to support even longer distances.

For instance, remote switches can provide virtually unlimited distance connections through ATM or IP protocols over existing WANs. Brocade has partnered with CNT Corporation and other vendors to enable Fibre Channel to flow over ATM or IP infrastructures. This type of SAN-over-WAN infrastructure would typically be used to support asynchronous mirroring or replication solutions, or electronic tape vaulting—depending on bandwidth requirements.

To meet the high-bandwidth requirements of real-time, mission-critical applications, Brocade Extended Fabrics software supports near-native Fibre Channel performance over distances up to 120 kilometers. Brocade enables this type of MAN configuration by leveraging extended wavelength Gigabit Interface Converters (GBICs), Small Form-Factor Pluggable (SFP) interfaces, or Dense-Wave Division Multiplexing (DWDM) technology from providers such as ONI Systems Corp., Nortel, Cisco, Adva, and others to support data traffic over Fibre Channel. These Fibre Channel networks not only provide long-distance connectivity, but also help speed up the recovery process to reduce the amount of lost productivity and revenue following a disaster (see Figure 6).

Figure 6.
A MAN with native Fibre Channel connections over longer distances



By enabling the automatic transfer of data to a remote facility for applications such as wide area data replication, high-speed remote centralized backup, and system mirroring, Brocade SANs provide a key role in business continuance. For example, a global brokerage firm recently implemented dual-fabric SANs interconnected over DWDM devices with server clusters running business-critical applications to enable complete failover to a redundant site in less than two minutes. A financial services provider achieved similar results with its SAN implementation, enabling failover to a disaster recovery site in less than five minutes to avoid disrupting its business operations.

A Strategic Technology for the Future

By providing the innovative SAN infrastructure solutions for the majority of current SAN implementations, Brocade is redefining how organizations view their storage environments. To help ensure a smooth integration with other IT solutions, Brocade performs rigorous interoperability testing of its products with those from leading OEMs, strategic partners, and systems integrators.

Supporting heterogeneous interoperability across the storage and server IT infrastructure, the Brocade SilkWorm family of switches and software helps enable a truly best-of-breed SAN environment. As a result, Brocade SANs can help organizations leverage their existing technology investments while transforming their storage environments into strategic infrastructures that can greatly enhance information access, management, and protection for years to come.

For more information about how to get started with a SAN implementation, visit **www.brocade.com.**

Corporate Headquarters
1745 Technology Drive
San Jose, CA 95110
T: (408) 487-8000
F: (408) 487-8101
info@brocade.com

European Headquarters
29, route de l'Aéroport
Case Postale 105
Geneva 15, Switzerland 1215
T: +41 22 799 56 40
F: +41 22 799 56 41
europe-info@brocade.com

Asia Pacific Headquarters
The Imperial Tower 15th Fl.
1-1-1 Uchisaiwaicho,
Chiyoda-ku, Tokyo 100-0011
Japan
T: +81 33507 5802
F: +81 33507 5900