IBM eserver BladeCenter™

SAN Solutions Guide

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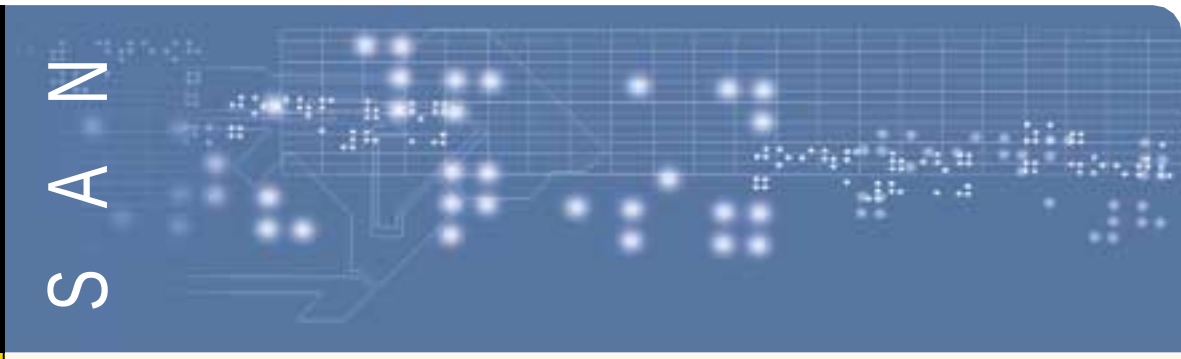
SAN



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IBM eserver BladeCenter™ SAN Solutions Guide

Version 1.0

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Table of Contents

Introduction

The *IBM eServer BladeCenter SAN Solutions Guide* provides you with solutions that incorporate the advanced features of the IBM eServer BladeCenter. These solutions address the most common objectives of today's information technology (IT) departments. Today, efficiency and managing the bottom line are paramount to success. You need your IT infrastructure to do more than ever before under tighter budgets. You need to do it in less time, with less space. You need to meet increasing user demands for greater availability and higher quality of services. And you need to get it all done with a smaller and less-skilled staff. IBM can help.

The *IBM eServer BladeCenter SAN Solutions Guide* offers many powerful SAN solutions with BladeCenter. If you are interested in deploying an IBM solution, please contact IBM customer service. Resources can be found at the following IBM Web sites:

IBM eServer BladeCenter

IBM eServer BladeCenter
http://www.ibm.com/servers/eserver/bladecenter/

IBM Technical Support
http://www.ibm.com/support/us/

IBM Proven Programs

IBM ServerProven™ Program
http://www.pc.ibm.com/ww/eserver/xseries/serverproven/

IBM TotalStorage Proven™ Program
http://www.developer.ibm.com/en/welcome/storage/proven.html

IBM Storage

FAStT Storage Family
http://www.storage.ibm.com/hardsoft/disk/fastt/index.html

IBM ESS Storage Family
http://www.storage.ibm.com/hardsoft/products/ess/index.html

IBM Tivoli Storage Manager
http://www.tivoli.com/products/index/storage-mgr-san/

The Storage Area Network

Traditionally, organizations have paired storage resources with specific servers on a local area network (LAN), primarily because of technical restrictions. This is known as direct-attached storage (DAS). As a result, free disk space on one server cannot be used by other storage-constrained servers. Another storage method is network-attached storage (NAS). With this method, NAS devices provide shared data and file serving to clients and other servers on a LAN.

A storage area network (SAN) is a separate network dedicated to storage, enabling disk and tape storage to be isolated from the LAN. A SAN is a high-speed network dedicated to information management. It is a combination of technologies, including hardware, software, and networking components, that provide any-to-any interconnection of server and storage elements. A SAN can help improve security, reliability, and management of a company's critical data. The benefits of a SAN can be achieved without impacting the company's primary communication network.

IBM eServer BladeCenter with Fibre Channel SANs offer a powerful solution for consolidating storage resources to boost storage management, flexibility, and cost effectiveness. SANs link multiple storage systems and servers over a secure, high-speed network that is data-centric rather than server-centric. Storage devices, such as tape libraries and disk arrays, can be shared. With IBM eServer BladeCenter with Fibre Channel SANs, storage capacity can grow independently of server usage, helping companies grow their storage environments much more quickly and without system disruption. SANs can improve data availability, reduce downtime costs, significantly decrease management and administrative costs, and improve asset utilization.

IBM eServer BladeCenter Application and SAN Solutions

The IBM eServer BladeCenter is designed to address the demanding requirements that collaboration software, web services, workgroup computing, or scientific computing can place on your IT infrastructure. The following matrix outlines they key applications that BladeCenter was designed around as well as the SAN solutions that you can benefit from in each of these environments. The identified solutions are then outlined in detail throughout guide.

IBM eServer BladeCenter Application Matrix

What is the main application for my BladeCenter environment?	What are the storage attachment possibilities (SAN, NAS, or DAS)?*	How critical is data backup to my application data?	How critical is continuous data availability?	How critical is consolidated storage?
Collaboration (e-mail, Lotus Notes, Microsoft Exchange)	SAN, NAS, DAS	High	High	High
Web Services (Websphere, Apache, Middleware)	SAN, NAS	Medium	High	Medium
Workgroup Computing (File and Print, Terminal Services, Terminal Serving, Citrix)	SAN, NAS, DAS	Medium	Medium-high	Low
Scientific Computing (High Performance Computing, General Parallel Filing System, Data Mining)	SAN, NAS	Medium	Medium	Medium

Table Note
*For the differences between SAN, NAS, and DAS, see “The Storage Area Network” on page 2.

As indicated in the matrix, IBM eServer BladeCenter applications use SAN solutions to solve your needs. The applications are listed below; reference the solution areas discussed in this guide accordingly.

- **Collaboration.** If your main application for BladeCenter is e-mail services, Lotus Notes, or Microsoft Exchange services, it is highly recommended that you take advantage of a SAN environment. The following solutions will apply to your IT environment and are rated accordingly.
  - Backup and restore solutions importance is high (see page 9)
  - Business continuance and high-availability solutions importance is high (see page 21)
  - Storage consolidation solutions importance is high (see page 21)

- **Web services.** If your main application for BladeCenter is Websphere, Apache, or other Middleware, it is recommended that you take advantage of a SAN environment. The following solutions will apply to your IT environment and are rated accordingly.
  - Backup and restore solutions importance is medium (see page 9)
  - Business continuance and high-availability solutions importance is high (see page 21)
  - Storage consolidation solutions importance is medium (see page 21)

- **Workgroup computing.** If your main application for BladeCenter is file and print, terminal services, terminal serving, or Citrix, it is recommended that you take advantage of a SAN environment. The following solutions will apply to your IT environment and are rated accordingly.
  - Backup and restore solutions importance is medium (see page 9)
  - Business continuance and high-availability solutions importance is medium to high (see page 21)
  - Storage consolidation solutions importance is low (see page 21)

- **Scientific computing.** If your main application for BladeCenter is high-performance computing (HPC), a general parallel file system (GPFS), or data mining, it is recommended that you take advantage of a SAN environment. The following solutions will apply to your IT environment and are rated accordingly.
  - Backup and restore solutions importance is medium (see page 9)
  - Business continuance and high-availability solutions importance is medium (see page 21)
  - Storage consolidation solutions importance is medium (see page 21)

IBM eServer BladeCenter Features and Benefits

The IBM eServer BladeCenter offers the following features:

- Up to 14 blade servers in a 7U chassis
- Blade servers featuring 2-way Intel® Xeon™ processors for enterprise application serving
- Designed for business continuity with highly available shared resources
- Optional Ethernet (Gigabit) switch and optional integrated Fibre Channel switch modules
- Autonomic systems management features and new capabilities with IBM Director
- Blade servers can boot directly from the SAN

The IBM eServer BladeCenter architecture provides a highly manageable, modular infrastructure that is designed to help maximize productivity, minimize IT administration, and lower your total cost of management.

Here's how it works. The IBM eServer BladeCenter holds up to 14 two-way blade servers that connect to shared resources, such as power, cooling, switching and management, through two redundant midplanes. Six IBM eServer BladeCenters can fit into an industry-standard rack, allowing you to scale up to 84 two-way servers in a single rack. This doubles the density of most of today's 1U servers.

The benefits include:

- **Modular scalability.** This modular approach can help save space and consolidate resources while allowing you the pay-as-you-grow scalability needed in today's dynamic marketplace. You can simply add new blades into open bays as you need them, eliminating the need to physically install and cable individual servers.
- **Simplified management.** Through managing the IBM eServer BladeCenter using centralized management and technologies that enable IBM autonomic computing and grid computing, the IBM eServer BladeCenter can help deliver distributed computing while at the same time simplify management.
- **Performance density.** Dual Intel Xeon processors allow for high-density packaging with the same Intel Xeon processors found in today's 1U servers.
- **Fast installation and deployment.** Physically inserting new blades into a chassis is designed to be much easier and faster than mounting new servers, along with their slides or rails, IBM eServer BladeCenter solutions also allow for automated installation and refreshing of operating systems and applications within as little as a few minutes.

- **High availability and ease of serviceability.** High-availability features maximize up time, simplify failure diagnosis, and reduce servicing time. Critical components can be redundant and/or hot swappable, including the blades.
- **Boot directly from the SAN.** With Fibre Channel boot capability, IBM eServer BladeCenter blade servers can boot directly from the shared storage that resides on the SAN. Booting from the SAN simplifies storage management and allows storage to be consolidated, resulting in ease of backup and recovery.

  NOTE: For configurations that require SAN boot, please contact IBM technical support.

How to Use This Guide

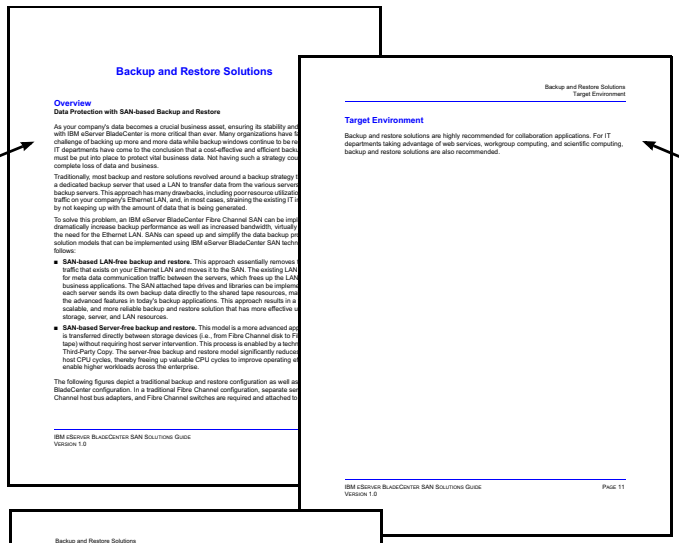
All chapters within the *IBM eServer BladeCenter SAN Solutions Guide* are organized the same way:

- **Solution Category.** Each solution category includes an overview of the featured technology and the category's target audience.
- **BladeCenter Solution.** Each solution category includes one or more IBM eServer BladeCenter solutions, which includes the solution description and configuration.

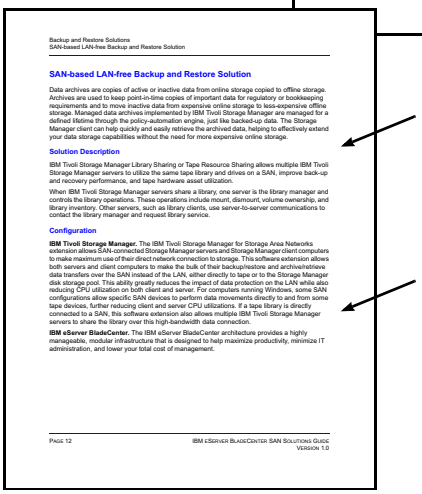
The following pages provide a visual representation of how the sections are organized.

NOTE: Updated versions of this guide can be downloaded from the following IBM Web site: http://www.ibm.com/servers/eserver/bladecenter/.

Solution Category



BladeCenter Solution



Backup and Restore Solutions

Overview

Data Protection with SAN-based Backup and Restore

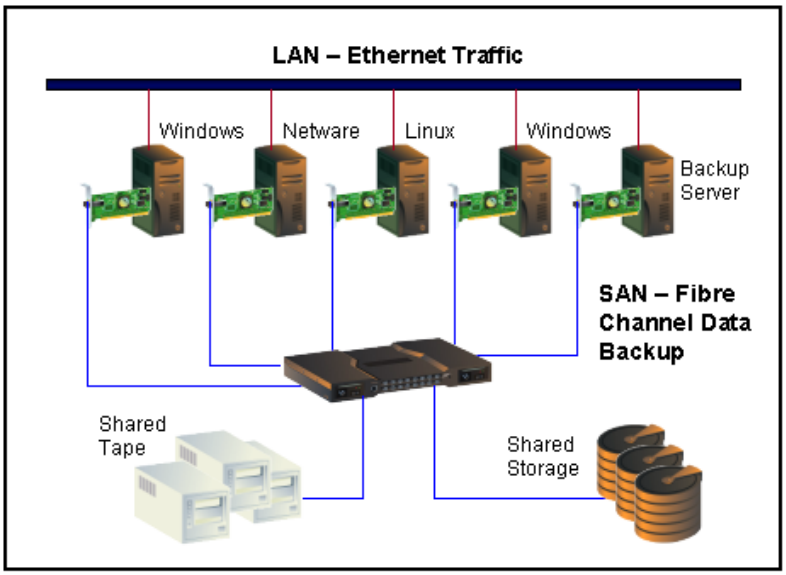
As your company's data becomes a crucial business asset, ensuring its stability and protection with IBM eServer BladeCenter is more critical than ever. Many organizations have faced the challenge of backing up more and more data while backup windows continue to be reduced. Most IT departments have come to the conclusion that a cost-effective and efficient backup strategy must be put into place to protect vital business data. Not having such a strategy could result in complete loss of data and business.

Traditionally, most backup and restore solutions revolved around a backup strategy that included a dedicated backup server that used a LAN to transfer data from the various servers to the tape backup servers. This approach has many drawbacks, including poor resource utilization, increased traffic on your company's Ethernet LAN, and, in most cases, straining the existing IT infrastructure by not keeping up with the amount of data that is being generated.

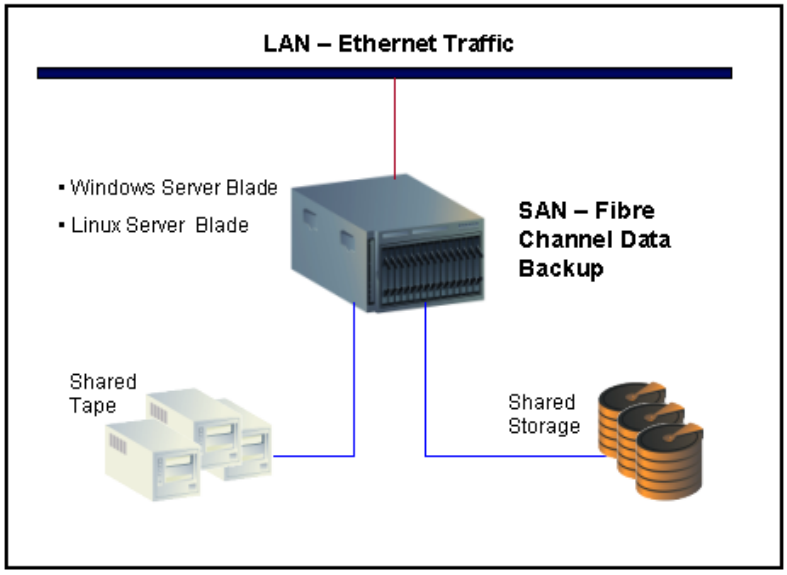
To solve this problem, an IBM eServer BladeCenter Fibre Channel SAN can be implemented to dramatically increase backup performance as well as increased bandwidth, virtually eliminating the need for the Ethernet LAN. SANs can speed up and simplify the data backup process. Two solution models that can be implemented using IBM eServer BladeCenter with Fibre Channel SAN technology are as follows:

- **SAN-based LAN-free backup and restore.** This approach essentially removes the backup traffic that exists on your Ethernet LAN and moves it to the SAN. The existing LAN is used only for meta data communication traffic between the servers, which frees up the LAN for other business applications. The SAN attached tape drives and libraries can be implemented so that each server sends its own backup data directly to the shared tape resources, making use of the advanced features in today's backup applications. This approach results in a faster, more scalable, and more reliable backup and restore solution that has more effective utilization of storage, server, and LAN resources.
- **SAN-based Server-free backup and restore.** This model is a more advanced approach. Data is transferred directly between storage devices (i.e., from Fibre Channel disk to Fibre Channel tape) without requiring host server intervention. This process is enabled by a technology called Third-Party Copy. The server-free backup and restore model significantly reduces application host CPU cycles, thereby freeing up valuable CPU cycles to improve operating efficiency and enable higher workloads across the enterprise.

The following figures depict a traditional backup and restore configuration as well as an IBM eServer BladeCenter configuration. In a traditional Fibre Channel configuration, separate servers, Fibre Channel host bus adapters, and Fibre Channel switches are required and attached to shared tape libraries and storage. IBM integrates Fibre Channel Switch Modules, eliminating the need for external SAN connectivity components and reducing complexity, setup time, and cost.



Traditional Fibre Channel Backup and Restore Configuration



IBM eServer BladeCenter Backup and Restore Configuration

For additional information about backup and restore solutions, visit the following Web site: http://www.tivoli.com/products/index/storage-mgr-san/.

Target Environment

Backup and restore solutions are highly recommended for collaboration applications. For IT departments taking advantage of web services, workgroup computing, and scientific computing, backup and restore solutions are also recommended.

SAN-based LAN-free Backup and Restore Solution

Data archives are copies of active or inactive data from online storage copied to offline storage. Archives are used to keep point-in-time copies of important data for regulatory or bookkeeping requirements and to move inactive data from expensive online storage to less-expensive offline storage. Managed data archives implemented by IBM Tivoli Storage Manager are managed for a defined lifetime through the policy-automation engine, just like backed-up data. The Storage Manager client can help quickly and easily retrieve the archived data, helping to effectively extend your data storage capabilities without the need for more expensive online storage.

Solution Description

IBM Tivoli Storage Manager Library Sharing or Tape Resource Sharing allows multiple IBM Tivoli Storage Manager servers to utilize the same tape library and drives on a SAN, improve back-up and recovery performance, and tape hardware asset utilization.

When IBM Tivoli Storage Manager servers share a library, one server is the library manager and controls the library operations. These operations include mount, dismount, volume ownership, and library inventory. Other servers, such as library clients, use server-to-server communications to contact the library manager and request library service.

Configuration

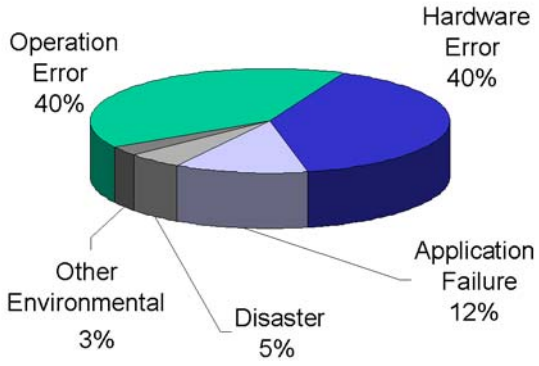
The IBM Tivoli Storage Manager for Storage Area Networks extension allows SAN-connected Storage Manager servers and Storage Manager client computers to make maximum use of their direct network connection to storage. This software extension allows both servers and client computers to make the bulk of their backup/restore and archive/retrieve data transfers over the SAN instead of the LAN, either directly to tape or to the Storage Manager disk storage pool. This ability greatly reduces the impact of data protection on the LAN while also reducing CPU utilization on both client and server. For computers running Windows, some SAN configurations allow specific SAN devices to perform data movements directly to and from some tape devices, further reducing client and server CPU utilizations. If a tape library is directly connected to a SAN, this software extension also allows multiple IBM Tivoli Storage Manager servers to share the library over this high-bandwidth data connection.

Business Continuance and High-Availability Solutions

Overview

Business Continuance Requirements for High-Availability SAN Environments

Until recently, disaster planning for businesses focused on recovering centralized data centers following a catastrophe. While these measures remain important to disaster planning, the protection they provide is far from adequate for today's distributed computing environments. The goal for companies today is to achieve a state of business continuity, where critical systems and networks are always available. To attain and sustain business continuity, companies must engineer availability, security, and reliability into every process from the outset. System downtime can be caused by a number of factors, including hardware errors, operation error, application failure, or disaster (see the figure below).



System Downtime Factors

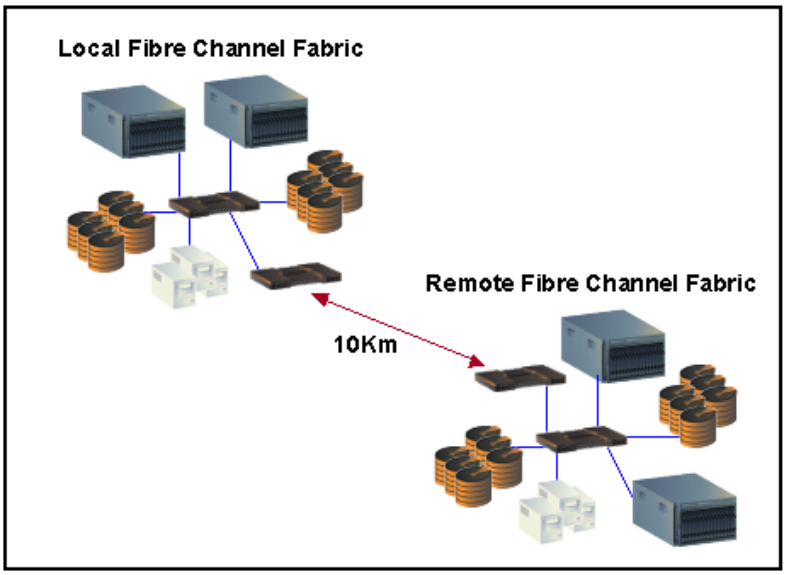
As organizations search for ways to improve the availability of critical enterprise data, they are turning to IBM eServer BladeCenter with Fibre Channel SANs. Many organizations have already realized the significant advantages IBM eServer BladeCenter with Fibre Channel SANs can provide as a vital component of a strategic business continuance solution—SANs can integrate innovative devices and applications, provide high-availability options, and with the distributed network approach, can recover data and quickly bring systems online following a disaster.

A sensible disaster recovery plan incorporates a distance solution in the event of a disaster. Data access over long distances is necessary for any business continuance solution. Fibre Channel technology can provide distance connectivity of up to 120 km, enabling enterprise customers to maintain geographically separate disaster recovery facilities or mirroring operations. IBM eServer BladeCenter with Fibre Channel SANs can utilize wide area networks (WANs) or metropolitan area networks (MANs) to cover even longer distances.

A viable IBM eServer BladeCenter SAN solution addresses business continuance requirements, including:

- Eliminating single points of failure
- Utilizing multi-pathing failover software
- Streamlining data backup and recovery processes
- Enabling high-performance remote backup, electronic vaulting, and mirroring at or between data centers separated by long distances

See the figure below for a sample configuration of a viable IBM eServer BladeCenter SAN solution that addresses business continuance.



A MAN with Native Fibre Channel Connectors Over Longer Distances

Target Environment

Business continuance and high-availability solutions are highly recommended for collaboration and web services applications. For IT departments taking advantage of workgroup computing and scientific computing, business continuance and high-availability solutions are also recommended.

Remote Mirroring Solution

Remote mirroring is an automated method of making your storage entirely redundant in a remote location. Mirroring key data center infrastructure at a disaster recovery site helps protect against complete data center outage in the event of a disaster—business can be re-routed to the replicated secondary site in the event of a primary site outage.

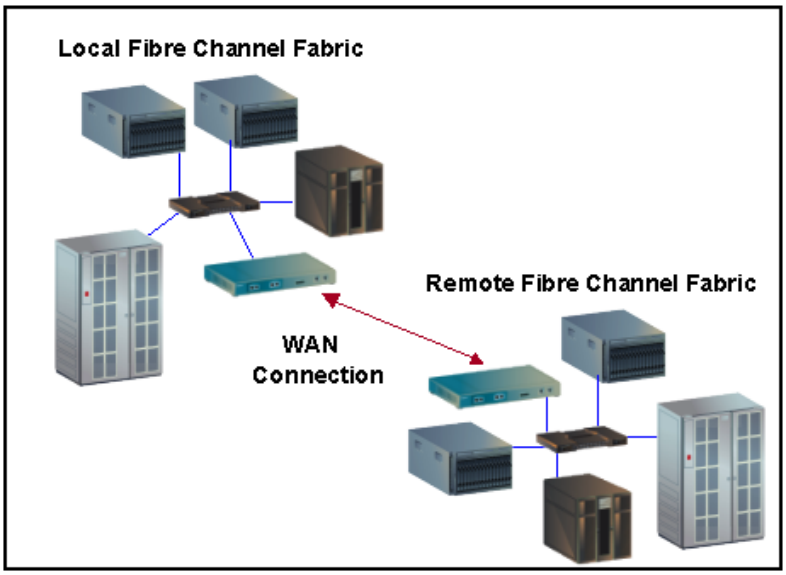
In data mirroring, data is written to two separate physical devices (such as disks) within a RAID array simultaneously. This mirroring technology helps protect an organization's data against disk subsystem loss or, in worst case, complete site failure. Remote mirroring also allows data failover from the primary site to the remote site and to fail back to the primary site once it has been restored. For example, if one of the mirrored drives fails, the data is available via the remaining disk. A hot-spare drive, a physical drive defined for automatic use when similar drive fails) can then be used to reestablish the mirror relationship and the redundancy that results while the failing drive is being replaced.

Solution Description

Disaster Recovery

Disaster recovery has never been more important than it is today. In the wake of recent global events, companies are scrambling to implement viable, cost-effective solutions to ensure data integrity and reduce or eliminate vulnerabilities.

Many features deemed necessary for disaster recovery configurations are native to IBM eServer BladeCenter SAN solutions—IBM-supported configurations, simplified implementation, seamless integration, and a wide range of application and end-to-end management support. Disaster recovery configurations can be integrated into existing data center infrastructure, increasing return on investment (ROI) and reducing total cost of ownership (TCO). See the following figure for a sample configuration that illustrates remote mirroring using a WAN connection.

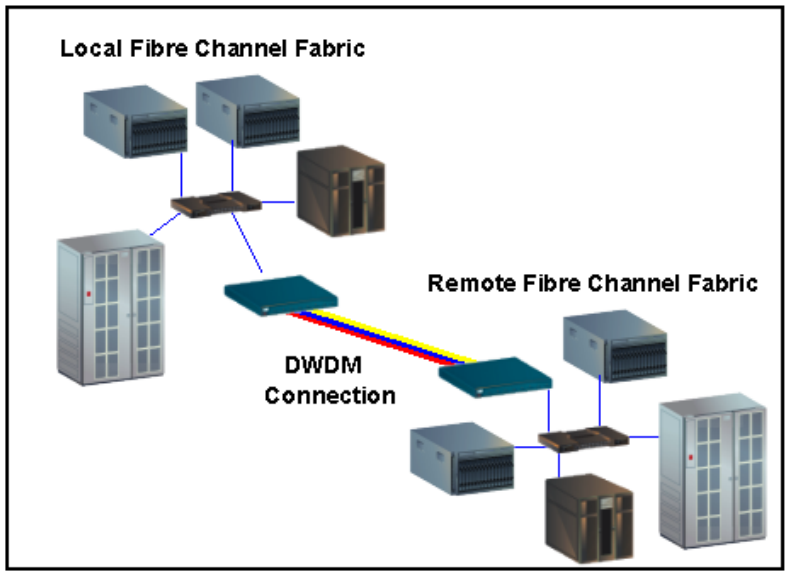


A SAN with Remote Mirroring Using a WAN Connection

MAN Using DWDM

Companies are expanding their infrastructure even in the current economic downturn. Data growth continues to expand at an unprecedented pace. Companies are diversifying their localities and looking for ways to mitigate geographical distances while controlling infrastructure costs.

Dense wave division multiplexing (DWDM) is the solution to these issues. Wave division multiplexing (WDM) is an optical technology that combines many wavelengths of light onto the same strand of fiber, increasing the total bandwidth of the fiber to the sum of the bit rates associated with individual wavelengths. DWDM might allow for more than 40 wavelengths to be coupled on to the same fiber. Using DWDM header equipment, data can traverse distances of up to 100 km with little or no impact on performance. The following figure illustrates a SAN solution using DWDM.



A SAN with Remote Mirroring Using a DWDM Connection

Utilizing dark fibre available in most metropolitan areas, greater geographic distances can be achieved, and at lower cost, than similar solutions. DWDM technology allows multiple SAN links to be multiplexed into a single fiber strand, lowering communications infrastructure cost. Multiple sites can be connected through DWDM, allowing flexibility in scalability and better utilization of resources. Resources once geographically separated can now be easily shared across the SAN. management and application software ensure seamless and cost-effective management and application support.

High-Availability Clustering Solution

A cluster is two or more interconnected servers (sometimes called nodes) that create a solution to provide higher availability, higher scalability, or both. The advantage of clustering servers for high availability is seen if one server fails, another server in the cluster can assume the workload of the failed server and users see no interruption of access. The advantages of clustering servers for scalability include increased application performance and a greater number of users that can be supported. You can think of a cluster of servers as if they were a single, unified computing resource. With the total redundancy of multiple servers, the cluster can help achieve greater system uptime.

Clustering can be implemented at different levels of the system, including hardware, operating systems, middleware, systems management, and applications. The more layers that incorporate clustering technology, the more reliable, scalable and manageable the cluster. The layers are:

- **"Cluster-aware" applications** can offer failover/failback capability. Some also offer workload balancing and parallel support features.
- **Systems management** helps maximize cluster uptime by monitoring and managing applications, operating system and hardware. All the servers in a cluster are managed from a single point of control.
- **Middleware** for clusters provides improved data protection, data recovery and failover transparency to end users.
- **Operating system** cluster implementations usually offer improved management of cluster operations and greater uptime.
- **Servers, interconnect hardware, and storage hardware** in a clustered configuration can provide data mirroring, component redundancy, component self-monitoring and alerting, and resource sharing to virtually eliminate any single point of hardware failure.

The solution below focuses on the storage hardware.

Solution Description

In today's competitive environment, information is the lifeblood of any corporation. Data must be kept available, reliable, and safe at all times—24/7/365. To reduce ongoing maintenance costs, data management must be integrated and centralized data networks must be fault-tolerant and self-healing. No IT solution can deliver on these stringent requirements better than a SAN.

No matter how reliable the system, redundancy is a must when it comes to the protection of data. Native SAN solutions support multiple switch elements within the SAN, as well as redundant connections from hosts and storage to switch. However, these redundant elements do not sit idle waiting for a failure to occur. Using multi-pathing software, IBM eServer BladeCenter can take advantage of redundant data paths; in the event of a failure, traffic is transparently rerouted to the next available open path. In addition, a SAN is tolerant of component failures and self-healing in case of a switch or HBA failure, provided the SAN was designed with redundancy.

For example, with a high-availability SAN, all components have redundant elements. There are multiple servers, storage subsystems, HBAs, and switches. The SAN is able to tolerate a failure of any one of these components.

Storage Consolidation and Data Sharing

Overview

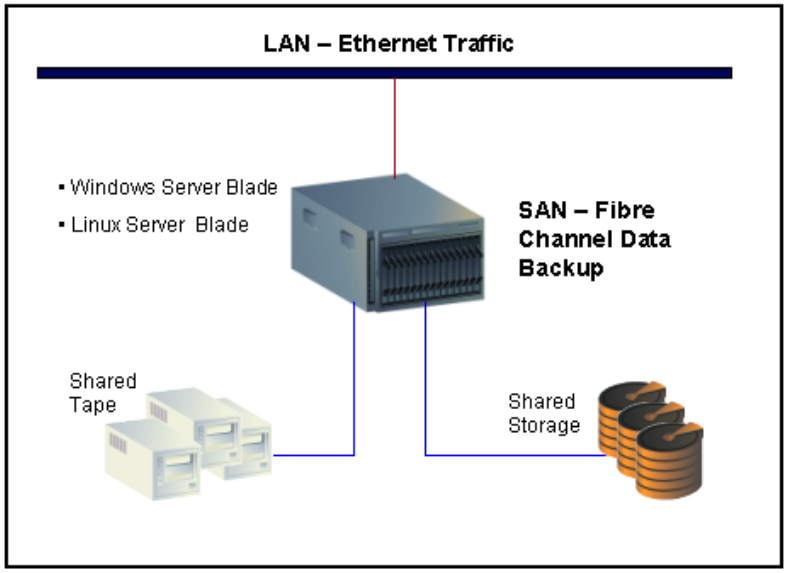
Storage and Data Consolidation in SAN Environments

Traditionally, organizations have paired storage resources with specific servers, primarily because of technical restrictions. As a result, free disk space on one server cannot be used by other storage-constrained servers.

IBM eServer BladeCenter with Fibre Channel SANs offer a powerful solution for consolidating storage resources to boost storage management, flexibility, and cost effectiveness. SANs link multiple storage systems and servers over a secure, high-speed network that is data-centric rather than server-centric. Storage devices, such as tape libraries and disk arrays, can be shared. With IBM eServer BladeCenter with Fibre Channel SANs, storage capacity can grow independently of server usage, helping companies grow their storage environments much more quickly and without system disruption. SANs can improve data availability, reduce downtime costs, significantly decrease management and administrative costs, and improve asset utilization. More specifically, benefits of IBM eServer BladeCenter with Fibre Channel SAN storage solutions and data consolidation include:

- Improved productivity, by reducing retrieval time to data content
- Reduced infrastructure and storage costs through more efficient data management
- Online storage configuration and administration
- Logical views of storage for easy monitoring of disk configurations
- Increased server availability and eliminated associated server downtime
- Zero downtime for storage growth and administration
  - Grow volumes dynamically with no downtime
  - Reduces storage costs by combining the unused space on multiple arrays
  - Protects investment and lowers total cost of ownership

See below for a sample diagram of an IBM eServer BladeCenter with Fibre Channel SAN that has heterogeneous server and storage resources.



A Simplified SAN with Heterogeneous Server and Storage Resources

This section discusses IBM eServer BladeCenter storage consolidation and data sharing. It also discusses booting IBM eServer BladeCenter blade servers from a SAN.

Storage consolidation. Storage consolidation can be viewed as two consecutive tasks:

1. **Physical consolidation.** Data from disparate storage subsystems can be combined on to large, enterprise class shared disk arrays, which can be located some distance from the servers. The capacity of these disk arrays can be shared by multiple servers, and users may also benefit from the advanced functions typically offered with such subsystems. This may include RAID capabilities, remote mirroring, and instantaneous data replication functions, which might not be available with smaller, integrated disks. The array capacity may be partitioned, so that each server has an appropriate portion of the available storage. Available capacity can be dynamically allocated to any server requiring additional space. Capacity not required by a server application can be re-allocated to other servers. This avoids the inefficiency associated with free disk capacity attached to one server not being usable by other servers. Extra capacity can be added in a non-disruptive manner.
2. **Logical consolidation.** It is possible to achieve shared resource benefits from the SAN without moving existing equipment. A SAN relationship can be established between a client and a group of storage devices that are not physically co-located (excluding devices that are internally attached to servers). A logical view of the combined disk resources can allow available capacity to be allocated and reallocated between different applications running on distributed servers, to achieve better utilization.

Storage consolidation is not a simple task. Each platform, along with its operating system, treats data differently at various levels in the system architecture. Considerations include:

- Different attachment protocols, such as SCSI, ESCON, and FICON
- Different data formats, such as Extended Count Key Data (ECKD), blocks, clusters, and sectors
- Different file systems, such as Virtual Storage Access Method (VSAM)
- Journal File System (JFS), Andrew File System (AFS), and Windows NT File System (NTFS).
- OS/400, with the concept of single-level storage
- Different file system structures, such as catalogs and directories
- Different file naming conventions, such as AAA.BBB.CCC and DIR/Xxx/Yyy
- Different data encoding techniques, such as EBCDIC, ASCII, floating point, and little or big endian

Data sharing. Storage consolidation is the starting point of the data sharing approach. When consolidating storage for homogeneous servers, data could really be shared. There are three categories of data sharing:

- **Storage sharing** splits the storage into physical partitions that are each owned by an individual attached platform. Participants in storage sharing may be aware of the presence of the other participants, but need not be.

  With storage sharing, two or more homogeneous or heterogeneous servers share a single storage subsystem whose capacity has been physically partitioned so that each attached server can access only the units allocated to it. Multiple servers can own the same partition, but this is only possible with homogeneous servers.

- **Data-copy sharing** involves replicating the data through some type of copy process so another platform can access it. Data-copy sharing allows different platforms to access the same data by sending a copy of the data from one platform to the other. There are two approaches to data-copy sharing between platforms: flat file transfer and piping.

- **True data sharing** refers to data in a continuous storage space that can be concurrently accessed by different platforms without any replication. This implies concurrent access to files with potentially a mixture of readers and writers.

  In true data sharing, only one copy of the data is accessed by multiple platforms, whether homogeneous or heterogeneous. Every platform attached has read and write access to the single copy of data. Participants have to be aware of the presence of other sharers to ensure data integrity. This is usually implemented by some type of locking mechanism.

Booting IBM eServer BladeCenter blade servers from SANs. IBM eServer BladeCenter supports booting from SANs. With Fibre Channel boot capability, IBM eServer BladeCenter blade servers can boot directly from the shared storage that resides on the SAN. A single storage array can be configured to provide boot drives or logical units (LUNs) to each IBM eServer BladeCenter blade server, eliminating the need for each server to have a dedicated direct-attached disk drive. The host operating system can reside on a LUN that is mapped to a specific blade server. (LUN mapping is the ability to grant a host exclusive access to a disk, array, or LUN partition.) Booting from the SAN results in simplified storage management and allows the storage to be consolidated, resulting in ease of backup and recovery.

NOTE: Note the following about booting directly from a SAN:

- Each IBM eServer BladeCenter blade server host must have exclusive access to the disk from which it is booting. No other host on the SAN should be able to detect or have access to the same logical disk. This can be accomplished by using a type of LUN management, such as LUN masking, zoning, or a combination of these methods.
- For configurations that require SAN boot, please contact IBM technical support.

For additional information about storage consolidation and data sharing, see the following IBM Web sites:

FAStT Storage Family
http://www.storage.ibm.com/hardsoft/disk/fastt/index.html

IBM ESS Storage Family
http://www.storage.ibm.com/hardsoft/products/ess/index.html

IBM Tivoli Storage Manager
http://www.tivoli.com/products/index/storage-mgr-san/

Target Environment

Storage consolidation and data sharing solutions are highly recommended for collaboration applications. For IT departments taking advantage of web services, workgroup computing, and scientific computing, storage consolidation and data sharing solutions are also recommended.

Data Sharing and Volume Management Solution

True data sharing across heterogeneous environments at SAN speeds allows data to be accessed and updated by multiple users and different operating systems. The ability to store, catalogue, search, and retrieve digitized images and large files is significantly enhanced with the speed and open connectivity of a SAN. The solution is composed of content management software for the cataloguing, searching, and management of information, and SAN-connected disk and tape devices for the storing and high speed delivery of information.

IBM storage technology products are designed to support the large and growing data-storage requirements of business-critical applications with IBM eServer BladeCenter. These solutions paired with Tivoli Storage software help meet enterprise storage requirements today and set the foundation for a SAN tomorrow. IBM storage solutions range from basic high-speed configurations designed to offer continuous data access and protection to long distance, high-availability, and fully redundant configurations for critical disaster-recovery capabilities.

Solution Description

Depending on your environment, IBM eServer BladeCenter can be deployed into the small to medium business, adding additional blade servers, as they are needed. Depending on your data requirements, BladeCenter can be deployed with storage capacity that fits your needs.

IBM Content Manager is a highly scalable, reliable repository for imaging and media asset management across multiple interchangeable platforms. It provides powerful cataloguing and searching with version control and life cycle management. Content Manager's hierarchical storage management, combined with the disk, tape, and optical auxiliary options provided by Tivoli Storage Manager, make cost-efficient use of storage. Disk and tape hardware configurations can be implemented by combining one or more of the SAN solutions for consolidation, data protection, or disaster tolerance.

Storage Consolidation Solution

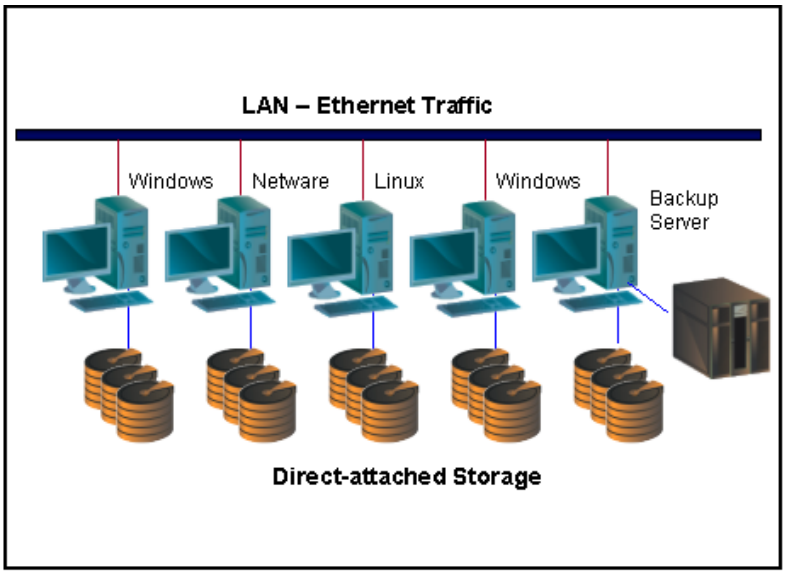
Storage consolidation is the practice of transforming direct-attached host storage to networked SAN storage. In essence, the storage is de-coupled from the server to which it was traditionally attached. The benefits of this are numerous and immediate—simplified and cost-effective management, seamless scalability, increased reliability, added redundancy, and enhanced performance. These benefits translate into quantifiable return on investment (ROI) and reduced total cost of ownership (TCO).

Solution Description

Utilizing IBM eServer BladeCenter components, storage consolidation can be implemented with little or no disruption to existing configurations, and the tangible benefits are immediate. Relying on emerging open standards like Common Information Model (CIM), Web Based Enterprise Management (WEBM), and Bluefin, Tivoli software ensures that customers are not locked into proprietary vendor-specific management solutions.

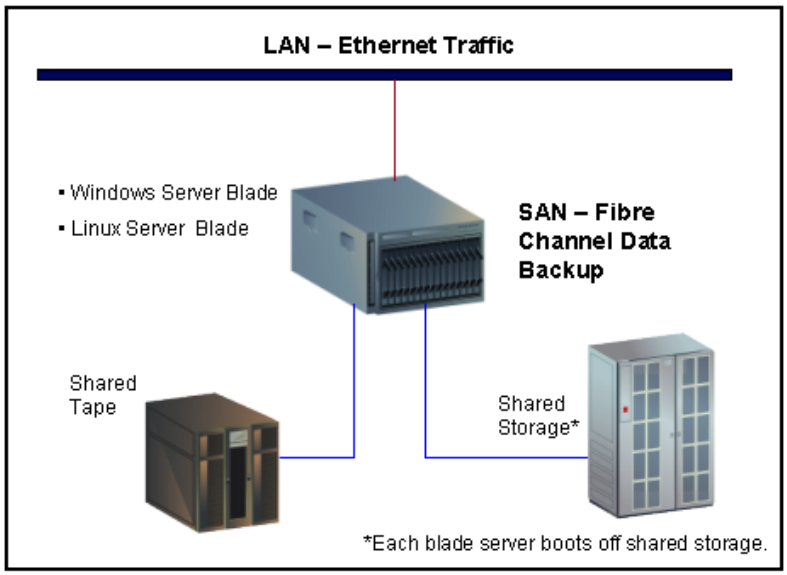
Configuration

Direct-attached storage spread across multiple hosts poses several problems. Management is difficult and valuable resources are not as easily shared. In addition, sharing data over a congested Ethernet LAN can cause resource bottlenecks. Unused “white space” on storage volumes leaves valuable resources unutilized. The following example shows a site with storage directly attached to the servers. Data is then accessed through the LAN.



Direct-attached Storage Across Multiple Hosts

With storage moved to an IBM eServer BladeCenter with Fibre Channel SAN, the problems of direct attachment are eliminated. All storage is shared in a SAN, making resources more readily available. Scalability is unlimited; and it is possible to have centralized management, which further reduces a customer’s TCO. Speed is greatly increased, while traffic on an Ethernet LAN is greatly decreased. This results in greater end-user satisfaction with the corporation’s IT department. In the following example, storage has been moved to a shared SAN. See the figure below for a sample configuration of a SAN with pooled storage.



A SAN with Pooled Storage

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Barron's 500
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Business 2.0 100 Fastest Growing Tech Companies
BusinessWeek Global 1000
BusinessWeek Hot Growth Company
Forbes Best 200 Small Companies
Fortune's 100 Fastest Growing Companies
Network Computing
- Editor's Choice
- "Well Connected" Data Management and Storage Technology Product of the Year

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