



HP Simply Consolidation solution guide

Your guide to shared storage for business efficiency

Spring 2008

Simply StorageWorks

For many businesses, the accumulation of data is increasing by more than 100 per cent a year – and new regulatory requirements are only adding to the problem. The challenge is to manage data storage efficiently while controlling costs. HP Simply Consolidation can help you implement simple, affordable and reliable shared data storage for your application servers.

How can this guide help?

This guide is designed to help you understand the benefits of consolidating your storage by sharing storage from multiple application servers. In addition, it discusses what a storage area network (SAN) does and suggests practical ways to choose the solution that is right for your business. The focus of this guide is on entry-level network storage solutions for small and mid-sized businesses (SMBs). In particular, it features the HP StorageWorks Modular Smart Array (MSA) and the HP StorageWorks All-in-One (AiO) Storage System.

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Can we help you further?

This guide is part of the Simply StorageWorks framework, which provides comprehensive guidance and information about the complete HP storage solutions for small and mid-sized businesses. If you are looking for ways to optimise your file-serving infrastructure, consult our **Simply File Services solution guide**. For ways to protect your critical information, refer to the **Simply Business Protection solution guide**.

Part 1: The importance of consolidating your storage



Challenges of rapid on-line data growth

In the past, there seemed to be only one way for small and mid-sized businesses to handle the exponential growth of data: add more servers to store it. Yet as data accumulation increases – spurred by mounting stacks of e-mail and new legal requirements for business documentation – simply adding servers is not enough to solve most storage problems. Worse, adding extra drives or servers with **direct-attached storage** (DAS) can mean adding extra headaches. Such a solution does not scale up well. It creates an environment that is difficult to manage, often with devices scattered throughout several locations. It adds to the risk of losing your most important data. It is not responsive to business change, sometimes becoming a serious impediment to profitability and growth. In short, simply adding servers is an ineffective way to handle the problems of data storage, resulting in a higher total cost of ownership (TCO).

The solution: network storage

As a solution to rapid data growth and server proliferation, network storage provides many advantages over the limitations of DAS. A dedicated, optimised network storage solution can vastly simplify management, permit better resource utilisation and protect critical data. Further, network storage is accessible to any computer that can have access to the network, making it easier to scale centrally and protect.

Network-attached storage (NAS) vs. storage area network (SAN)

The network storage solution you should consider will depend on whether you are experiencing growth of unstructured **file data**, such as productivity documents, or experiencing growth of structured application data, such as e-mail or database information, often referred to as **block data**.

Files reside on a file system, and access to them is gained using a file-serving protocol. Some applications can bypass this file system and improve performance by gaining access to disk storage directly with lower-level block access protocols.

Network-attached storage (NAS) refers to dedicated, turnkey file server solutions that are quick to install and easy to manage. In contrast, a **storage area network (SAN)** is a way for an application to use capacity on a centralised storage array by employing low-level block access commands. In other words, NAS can be described as file-based data sharing and SAN as block-based data sharing.

Unified storage, or all-in-one storage, is another network storage term that describes technologies that allow storage devices to perform both NAS and SAN functions with the same system.

Understanding these terms – files, blocks, NAS, SAN and unified storage – can be invaluable in assessing which storage solution is best for your business. For example, adding capacity for unstructured file data (such as rich media content or productivity files) can be addressed with a file-serving, or NAS, solution. A storage array, or SAN, solution is a good fit for an e-mail or database application that is running out of space.

This Simply Consolidation solution guide focuses on HP's SAN solutions. If you think a NAS or optimised file server better meets your needs, refer to our Simply File Services solution guide.

Benefits of storage consolidation

Consolidating your storage with a SAN can help reduce cost and complexity while improving your ability to manage data storage. Further, a properly designed SAN can reduce your TCO and improve your return on investment (ROI) as demonstrated by the following dimensions:

Lower costs

- **Better asset utilisation**
- **Higher IT staff productivity** with reduced repetitive management tasks
- **A diminishing “price per server”**, achieved with consolidated storage

Mitigate risk

- **Better growth management** with technology that lends itself to exponential expansion
- **Higher data availability and security** with software and hardware tools designed to protect single consolidated storage
- **Faster data back-up and restore** with higher-speed data paths that improve the speed of data protection

Accelerate business growth

- **Faster capacity deployment** by adding capacity without disrupting user access
- **Better data protection** through more comprehensive methods to secure and replicate your assets
- **More flexibility** with a range of storage strategies that give you choices to meet both immediate and future goals

Storage consolidation enabler: the storage area network (SAN)

What is a storage area network?

The simplest way of understanding a storage area network (SAN) is to compare it to an already popular type of IT infrastructure solution: the local area network (LAN), which enables multiple PCs to share key IT resources such as applications, servers, shared files and printers.

In much the same way, a SAN enables you to share storage among many servers. However, storage and servers require a much faster way to communicate than printers. Therefore, there are various choices that can help you to create the best data path between storage and servers.

The components of a storage area network (SAN)

In the simplest form, a SAN requires:

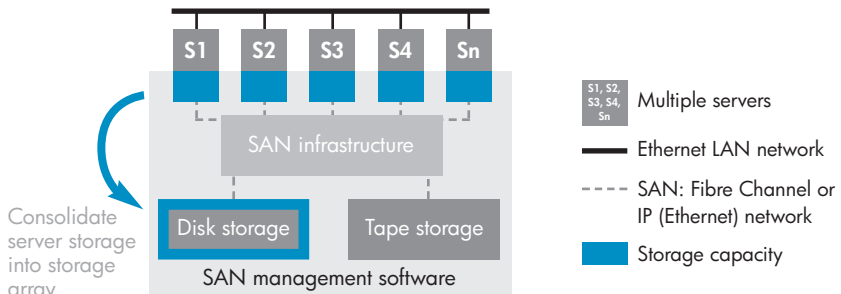
- Storage that is capable of sharing itself (typically a disk array)
- A network or data path that lets servers and storage “talk” to each other
- Servers, often referred to as “hosts”
- Software that configures the shared environment (typically included with the storage device)

Optional components can enhance a SAN:

- Secondary storage (typically a tape library for back-up and restore)
- Management software and monitoring tools

A SAN is just as likely to use tape back-up and restore as it is to use disk. This means that instead of sharing disk storage, a SAN can be implemented around high-speed tape back-up and restore.¹

¹ See the Simply Business Protection solution guide for additional details.



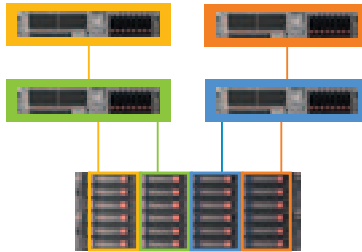
SAN component no. 1: the disk array

SAN disk arrays are centralised storage pools for servers. Compared with internal disk drives or external enclosures that can be attached directly behind a server, SAN disk arrays provide additional benefits associated with their ability to enable data consolidation, including increased availability, capacity utilisation and simplified management.

In a consolidated environment, a disk array is shared among several servers. As a result, problems with the disk storage or with the data path between the servers and storage can disrupt the applications running on those servers. Therefore, it is important to design an environment that delivers the level of redundancy and availability that your business requires.

Key product criteria

- **Redundant components:** Hot-swappable fans, power supplies, hard drives, redundant arrays of independent disks (RAID) and multiple data paths help ensure that servers can gain access to their data.
- **Scalability:** With a modular design, the disk storage allows you to increase capacity by adding drives, drive shelves, or controllers.
- **Performance:** Disk arrays with high-speed disk drives and a larger quantity of disks are critical.
- **Data security:** Implement RAID functionality to protect against drive failure.



Benefit of a SAN: provides increased availability and capacity utilisation – plus simplified management – by consolidating data in a disk array.

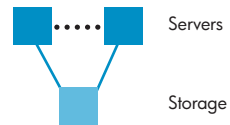
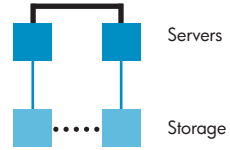
SAN component no. 2: the network, or data path

The SAN infrastructure allows servers to “talk” to the storage. There are different options based on cost, speed and distance between the servers and storage.

Distance: The first benefit is its speed over relatively long distances. Servers can reside right next to each other, in different rooms, on different floors of a building, or in different buildings throughout a campus. The servers and storage act as though they are connected locally, providing very fast performance.

Fault tolerance: SAN technology lends itself to multiple cable connections between a server and the storage array, protecting against a cable, controller, or switch failure.

High availability: A SAN is the recommended architecture for server clustering, with two or more servers in the cluster sharing the same storage capacity. Adding data replication makes it possible to build fail-over sites and disaster recovery – protecting data at a second location should disaster occur at the first.



Benefit of a SAN: creates a high-performance, resilient infrastructure that can be modified easily as your needs change.

SAN component no. 3: the SAN configuration software

Configuration software is perhaps the most important part of any SAN. Typically, the disk array has two sets of configuration software: one to protect the disks via RAID and another to share your disk array with one or more servers.

RAID set-up: The disk array typically allows you to create a RAID group for the number of disk drives in the array. RAID technology protects your disks in the SAN from physical drive failures. RAID can also continue to serve your business until repairs can be performed on one or more failed disk drives.

SAN sharing software (logical unit number [LUN] assignment): This software enables storage devices to be shared with servers. Once RAID groups have been created, you can assign portions of them to one or more servers. Each server typically draws on the benefit of the RAID-protected set of disks. The software “carves” portions of the disk capacity and “gives” the capacity to the

corresponding server. For example, you may have 2.5 TB of storage protected in a RAID 5 configuration, with five servers attached to the SAN. Your finance server may require 500 GB of capacity, your engineering group 1 TB, marketing 500 GB, shipping 250 GB and the legal group 250 GB. The appropriate capacities are selected and assigned to each server. That server “believes” it owns unique storage. In reality, however, the SAN is a single disk entity that is used by every server.

HP All-in-One (AiO) Storage Systems use HP All-in-One Storage Manager (ASM) software to take a different approach to SAN configuration. ASM reduces complexity by presenting storage in an “application-centric” framework and integrates well with applications such as Microsoft® Exchange and SQL Server. ASM automates both the RAID set-up and LUN assignment for hosts connected to the AiO Storage System via iSCSI.

Benefit of a SAN: enhances efficiency by managing your consolidated storage from one logical location and allows value-added capabilities, building on the infrastructure.

SAN component no. 4: the servers

Multiple servers can be connected to a SAN. Servers require a way to connect to and communicate with the storage. There are various methods to make this connection – either a dedicated data path using high-speed Fibre Channel components or a data path using iSCSI, which can be dedicated or shared. To participate in the SAN, a Fibre Channel or iSCSI card is inserted into the server, and then appropriate cables are used to connect the servers to the storage device.

Optional component no. 1: secondary storage

Running back-up over a LAN usually results in the tape drives running at slower LAN speeds. Therefore, one of the key benefits of building a high-speed SAN infrastructure

(with Fibre Channel, for example) is its ability to run and push data at the tape drive's maximum speed. Faster back-up and restore provides better protection and recovery of data.

Optional component no. 2: the management software

Monitoring: Management software can give you a graphic picture of your SAN and the status of all of your components – even if your servers or storage are in different locations.

Assessment: Performance bottlenecks in the SAN can be identified and resolutions tested to find the optimum functionality.

Benefit of a SAN: allows server and storage resources to evolve at their own pace without jeopardising the IT investment. Various types of servers and servers with different operating systems can share the storage pool.

Planning for storage consolidation and SAN deployment

To help with your SAN deployment and achieve your business and IT objectives, some general guidelines are listed below.

The guidelines provide a storage-centric view to help in determining which technology will best satisfy your needs.

	Fibre Channel implementation	iSCSI implementation	Direct-attached storage (DAS) implementation
High uptime/reliability	Best	Better	Good
Shared storage	Better	Best	Limited
High-speed back-up/restores	Best	Better	Good
Future expansion	Best	Better	Good
Price per GB	Good	Better	Best

Looking at your business from a server- and application-centric view, the table below can be used to calculate roughly how much storage capacity you need now and in the near future – in addition to the level of protection you need per server and application. Using capacities and growth rates, you can determine approximately what your disk requirements will be. Your service requirement and data value will help you to calculate the type of storage network or data path you may wish to investigate.

Storage capacity: Calculate your storage capacity per server, your expected future capacity needs and your company’s projected annual growth

Service requirements: In case of failure, how much downtime can you tolerate? Are your application servers already clustered?

Data value: In case of data loss, how much would it cost you to re-create your data from scratch?

	Storage capacity			Service requirement		Data value
	Current	Future	Growth rate	Maintenance level	Cluster (Y/N)	
Server/application 1						
Server/application 2						
Server/application N						
Total	GB	GB	%	Highest level		\$

Part 2:

Assessing your options

Choosing the appropriate technology for your environment



Disk drive technologies: Serial ATA vs. SCSI, SAS and Fibre Channel disks

Various disk drive technologies can be deployed in a SAN with different complementing benefits.

Fibre Channel, Serial Attached SCSI (SAS) and Small Computer System Interface (SCSI)

disk technology is the right choice for networked storage. SCSI/SAS or Fibre Channel disks remain a better choice for reliable, high-performance storage. If performance is not a primary consideration and your business requires high-capacity,

cost-effective storage for file serving, archival data, or reference information, then SATA is a perfect choice.

Serial ATA (SATA) disks provide a much lower cost per gigabyte than SCSI, SAS, or Fibre Channel disks. However, SATA disks are not designed for the same level of performance and reliability as SCSI, SAS, or Fibre Channel disk drives.

If your business has requirements for multiple drive technologies, look for disk arrays that can support both: HP All-in-One (AiO) Storage and Modular Smart Array (MSA) systems.

	Serial ATA (SATA)	SCSI	Serial Attached SCSI (SAS)	Fibre Channel
Capacity	Highest	Moderate	Moderate	Moderate
Reliability	Moderate	High	High	High
Performance	Low	High	High	High
Scalability	Moderate	Low	Moderate	High
Data access type	Moderate	Frequent	Frequent	Frequent
Price per GB	Low	Moderate	Moderate	High
Best use	File storage, archival/back-up, secondary applications	Business transactions and primary applications	Business transactions and primary applications	Business transactions and primary applications

“HP has been a partner who has invested the time to understand our business goals and needs. They provide the best solutions that make the most sense for us. We know that we can trust their word and their solutions.”

Peter Gilbert,
Director of the
Information
Technology
Services Group,
London Health
Sciences Centre

SAN infrastructure

A storage network needs to be fast and accurate to deliver data. Typically, a dedicated infrastructure is needed to meet the requirement for speed and error-free delivery. Historically, SANs have used Fibre Channel protocol on a dedicated fibre-optic network. Because its performance was raised to a sufficient level (via Gigabit Ethernet), the development of the new iSCSI protocol has made it possible to use an existing Ethernet infrastructure.

Fibre Channel SANs: for larger, more demanding environments

Because the low-latency Fibre Channel protocol is designed specifically for storage networks, it provides a high level of performance and reliability between servers and storage devices. Over the coming years, Fibre Channel SANs are expected to remain the choice when fully integrated SAN back-up is required and in environments where high performance and availability are critical (e.g., in data centres).

IP (iSCSI) SANs: the technology for smaller businesses

For smaller IT environments, Internet Protocol (IP) SANs are ideal. An existing 1 GB/s Ethernet network will provide sufficient bandwidth to connect several servers to a SAN storage device. This can be done using either standard network interface cards (NICs) or optional TCP/IP Offload Engine (TOE) cards that offload network tasks from servers with high CPU loads. Performance can be improved by teaming network ports and enabling TCP/IP functions such as Jumbo Frames through the Ethernet network layer.

When considering a storage infrastructure, an analogy of ordinary roads can be helpful: Fibre Channel is similar to an eight-lane motorway (high speed with room for a high volume of traffic). The IP SAN is like a two-lane road (capable of high speed but with fewer cars). Just as it is more costly to construct an eight-lane motorway than a two-lane road, choosing the right SAN infrastructure is a matter of balancing your needs for performance, scalability and cost.

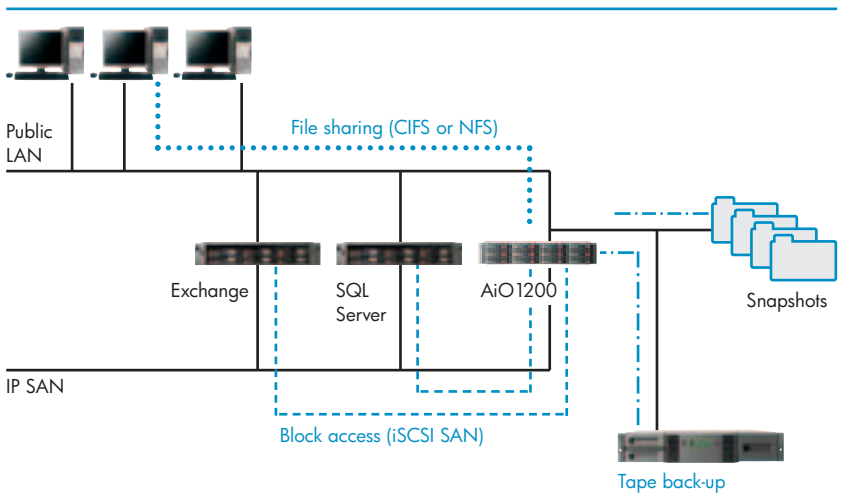
HP's approach and unique benefits

Simple, affordable reliable solutions

To match the IT intensity of your business, the size of your environment and your other business needs, HP gives small and mid-sized companies the choice between an integrated "turnkey" solution or a customised network solution that groups several types of products.

The **HP StorageWorks All-in-One (AiO) Storage System** family of unified storage devices provides shared iSCSI storage while also supplying optimised NAS file-and-print serving and data protection capabilities – all under a radically simple management umbrella.

These fully integrated systems are designed to be deployed and managed by IT generalists with no storage expertise. The AiO Storage Systems support mixed SATA and SAS hard disk drive (HDD) environments, and are expandable using MSA50, MSA60 and MSA70 storage enclosures.





Core features of the All-in-One Storage System

- Includes the Microsoft iSCSI Software Target, which permits consolidated block-based SAN storage for applications running on Windows®, Linux, VMware and more.
- Runs Microsoft Windows Storage Server 2003 R2 operating system, which allows 20 per cent faster file-serving performance and 35 per cent more efficient file storage with integrated de-duplication features.
- Provides data protection with an integrated copy of HP Data Protector Express software. Supports replication between systems using HP StorageWorks Storage Mirroring software.
- Delivers on the promise of simplicity with the All-in-One Storage Manager (ASM) interface, which is designed for IT generalists.

For more information on HP All-in-One Storage, visit: www.hp.com/go/aiostorage

“With our recent move to a virtual server configuration, we needed a storage device that has a rich feature set and that allows for greater throughput, which our virtual server environment requires. The MSA2000 provides us with these capabilities and at a price we can easily afford.”

Mark Ross, Associate Director/Operations Manager/Storage Administrator, IU Kelley School of Business

The **HP StorageWorks Modular Smart Array (MSA)** family of products enables the construction of a complete storage consolidation solution using several modular components that integrate seamlessly. An MSA solution thus requires a little more planning but provides maximum flexibility, availability and performance.

These robust solutions provide outstanding price/performance features for small clusters, as well as entry-level and mid-range SAN environments. Designed to

maximise transfer rates, reduce management costs and drive a rapid return on investment, each solution supports flexible platforms and advanced data protection features. The MSA family provides reliable, cost-effective storage to address your most demanding needs.

For more information about HP Modular Smart Array (MSA) systems, visit: www.hp.com/go/msa2000

Part 3: Choosing the right solution



Cost-effective IP SAN and file serving in a single solution: All-in-One Storage Systems

Solutions for a small company outgrowing its server capacity

“Winsure” is an insurance company with 100 employees, two offices and only one IT person. Their main office has five servers, but the older file server needed to be replaced and some application servers were running low on space. With a limited budget, they needed a solution that could solve multiple storage problems and be easy to deploy.

The solution

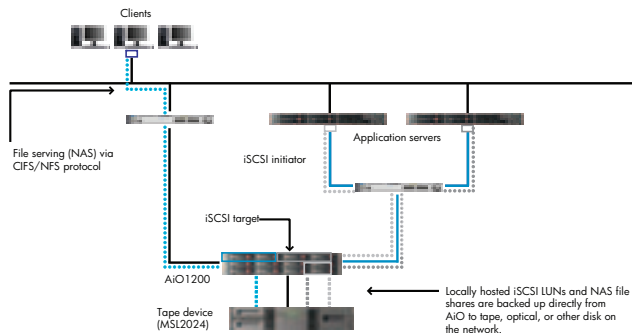
The HP 1200 All-in-One Storage System (AiO1200) replaced their older file server, extended their application server storage capacity with iSCSI and acted as a consolidation target for their back-up data.

By having a single pool of storage for application data, file serving and even data protection, they reduced their management costs and increased their ability to respond to growth.

The benefits

HP All-in-One Storage Systems combined the benefits of an iSCSI SAN and an optimised NAS file server, making it perfect for cost-conscious offices or departments. It can also be used as a disk-based back-up target and consolidation point for data protection, including replication between systems using HP StorageWorks Storage Mirroring.

All-in-One Storage System



Scalable and redundant IP solution with MSA2000i

Unexpected data growth presents a major business challenge

Winsure managed their business effectively. The company grew and became established in the market. One of the biggest challenges for Winsure, however, was the unexpected data growth in their headquarters.

The company needed a flexible and affordable storage solution that would allow all of the different groups within Winsure to have easy access to storage and manage their data storage needs flexibly.

After an urgent meeting with the head of finance and the technology manager, it became clear that Winsure did not want to invest in an expensive solution because they were satisfied with current user performance. The need for more disk space was the main challenge.

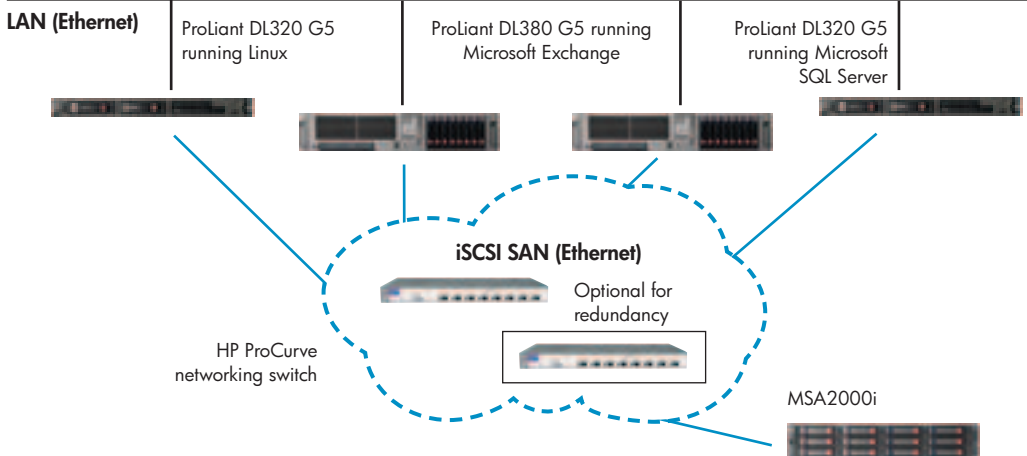
The solution

Winsure decided to implement an IP SAN solution with an MSA2000i as a central storage array, enabling the company to expand the disk space flexibly and affordably.

The easy implementation over an IP LAN network and the flexibility of the iSCSI connection enabled Winsure to plan their disk space growth in a controlled and centralised way.

The benefits

With the scalable MSA2000i solution, Winsure achieved a solution that is easy to manage and enables the company to grow in a planned and structured way. The redundant hardware components allow Winsure to increase their storage availability.



Shared storage for an application cluster with MSA500 G2

Moving from DAS to shared storage as the business grows

Winsure's second office also has several servers, two of which are used as application servers for an application critical to Winsure's business. Therefore, they were looking to gain higher availability by moving from DAS to shared storage.

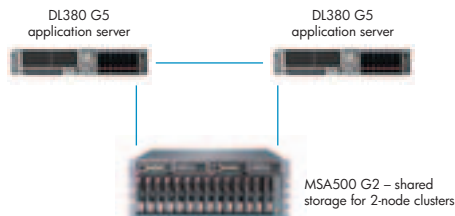
The solution

The best way to accomplish this transition was to implement a simple two-node cluster. Two servers participating in a cluster share an MSA500 G2. In the event of a server or application failure, the secondary server "takes over" the function of the first server and the business continues to run. Because Winsure use ProLiant servers, the existing hard drives were moved into the MSA500 G2, saving time, lowering cost and reducing complexity.

The benefits

The MSA500 G2 has a very simple design and uses familiar SCSI cabling to connect servers to the array. HP provides bundled part numbers that include two DL servers and an MSA500 G2 for a complete hardware solution. You can simply add your choice of hard drives or migrate existing ProLiant universal drives into the MSA500 G2. Optional services are available so that you can install the appropriate operating system and drives to customise your solution. Whether you prefer to deploy the cluster at your main site or want to deploy a consistent configuration at multiple remote sites, you can receive a two-node cluster that is functioning and ready to implement right out of the box.

Shared storage with MSA500 G2



More business transactions mean a need for higher performance and availability

Winsure continued to be successful and to grow, with more transactions, more records and more employees. As a result, newer strategies were required. Not only did the company need to improve availability, but data protection was also becoming critical. In addition, different groups within Winsure had their own servers based on performance needs. They needed to simplify storage management.

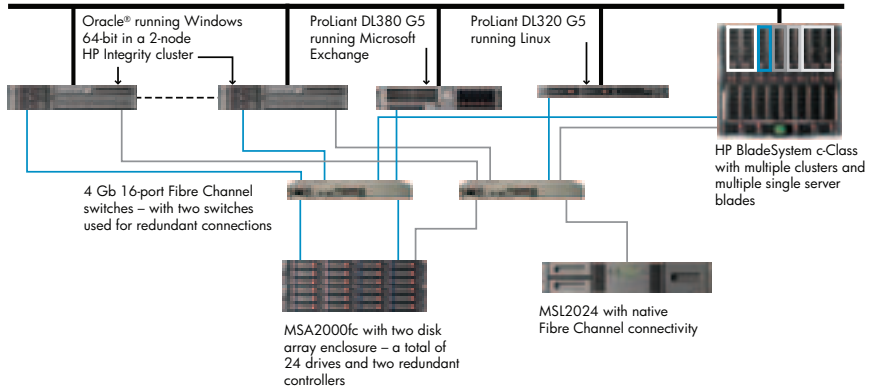
The solution

The Winsure IT department, which has now grown to four staff members, decided to implement a Fibre Channel SAN. This allowed them to add servers easily as needed, implement additional server clusters for their different applications, add redundancy for their critical servers and take advantage of the Fibre Channel SAN for high-speed back-up and restore.

The benefits

When consolidating storage from multiple servers (clustered or non-clustered), a SAN solution based on the MSA2000fc provides outstanding efficiency, flexibility and scalability. Multiple clusters are also possible.

The association of server blades with the SAN makes the perfect IT building block, permitting maximum efficiencies on both the computing and storage side. Enhancements in the MSA2000fc, such as dual controller capability, make this type of deployment possible with significant improvements in performance.



Cost-effective, disaster-tolerant storage

When lost data could mean lost business for Winsure

Because they made cost-effective decisions for shared storage and SANs early in their IT growth, Winsure continued to grow, becoming number one in their industry. SANs gave Winsure a storage strategy that could expand as their business grew. The stakes became even higher. Data became extremely critical to the existence of the company. Even losing a few transactions during the day could have had a negative impact on their customers.

The solution

For up-to-the-second protection against many problems, Winsure deployed Storage Mirroring, host-based software for Windows and Linux environments that helped replicate data to another server in real time. They chose to locate this replication server in one of their buildings across town so that in the event of a local problem at the production facility, they would be able to gain access to the replication server automatically, ensuring more uptime than ever before.

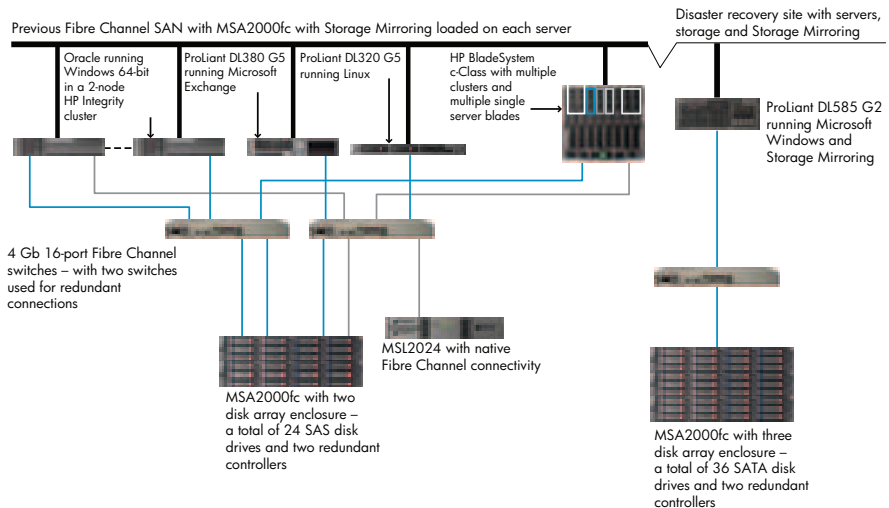
The benefits

Storage Mirroring can recover files replicated hours, minutes, or seconds earlier. This replication can complement tape back-up and restore as well as snapshot technologies to add another “layer” of enhanced data protection.

In the figure that follows, the data is “copied” from the “live” environment on the left and sent over the network to the “replication” environment on the right.

The Storage Mirroring software is designed to take only byte-level changes and send them to the second server or site. This byte-level replication uses the least amount of network bandwidth, giving you an excellent data protection solution – without the need to purchase new communication infrastructures.

Cost-effective, disaster-tolerant storage



EVA – combine simple management with performance and availability

If you need increased performance and greater flexibility for demanding mission-critical applications, consider the HP StorageWorks Enterprise Virtual Array (EVA) family.

Ultimate management efficiency

The HP StorageWorks Enterprise Virtual Array (EVA) family gives you the ultimate in management efficiency, thanks to built-in virtualisation. The EVA aggregates and automates your SAN storage. It presents your storage capacity as a “virtual” pool, eliminating the physical boundaries between storage and server. This simplifies management and increases your flexibility in building storage pools for applications.

With virtualisation in the EVA, you can save money by not over-investing or over-provisioning disk capacity because the EVA supports dynamic capacity or LUN expansions without taking the array off line. The EVA family provides connectivity through the use of industry-standard or multi-pathing software, such as Multi-path I/O (MPIO), and massive scalability that is limited only by the size of today’s disk drives.

The new HP StorageWorks 4400 Enterprise Virtual Array (EVA4400) provides EVA enterprise-class functionality at an affordable price. In addition, you can install the EVA4400 in just a few hours.

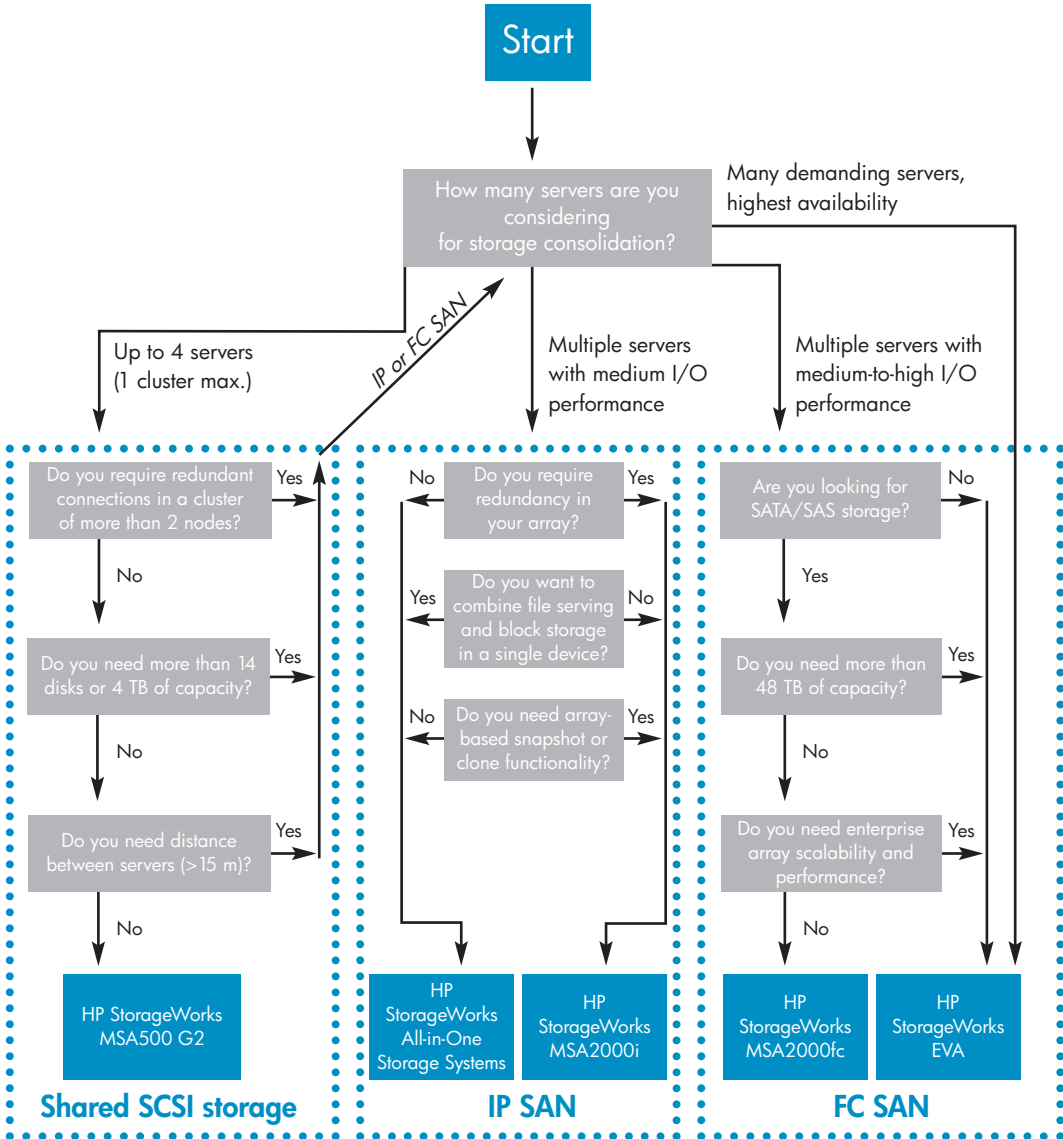
By adding software such as HP StorageWorks Dynamic Capacity Management, Business Copy, or Continuous Access, your EVA4400 can assist your workload distribution and data mining.

For more about the HP EVA, contact your HP sales representative or visit: www.hp.com/go/eva

Choosing the right solution

Which storage area network (SAN) is right for you?

Here is a quick way of choosing the best solution for your specific storage needs.



See the QuickSpecs at: www.hp.com/go/msa for latest product details

HP's family of products

	HP StorageWorks Modular Smart Arrays	HP StorageWorks All-in-One Storage Systems		
	Entry-level consolidation	Entry-level consolidation and unified storage		
	MSA500 G2	AiO400r/ AiO400t	AiO600	AiO1200
	Affordable shared storage solution	Entry-level unified IP SAN and NAS solution	Expandable unified IP SAN and NAS solution	Higher-performance SAN and NAS solution
Disk technology	SCSI	SATA or SAS	SATA or SAS	SATA or SAS
Scalability	Scale up to 4 TB	Pre-configured 2 TB system with 4 disk slots	Pre-configured up to 3 TB; scalable to over 50 TB with MSA enclosures	Pre-configured up to 9 TB; scalable to over 50 TB with MSA enclosures
Consolidation	Consolidate storage up to 4 servers or one 2-node cluster	Consolidate multiple servers in an IP SAN including shared storage behind a cluster		
Redundancy	Full redundancy with up to 2 array controllers	Hardware RAID controller; MPIO enables multiple paths between servers and storage		
Operating system support	Microsoft Windows, Linux	Windows, Linux, VMware ESX, QLogic		
Other features	Data replication and server fail-over over LAN or WAN in Windows and Linux environments ¹	Includes All-in-One Storage Manager for simple management and migration; provides file serving, replication ¹ , snapshots and direct back-up		

¹ Using HP StorageWorks Storage Mirroring

HP's family of products

HP StorageWorks Modular Smart Arrays

HP StorageWorks Enterprise Virtual Array family (For more advanced, enterprise-level needs)

Entry-level consolidation	Mid-range consolidation	High-end consolidation
MSA2000i	MSA2000fc	EVA4400, EVA6100 and EVA8100
Flexible	Flexible, scalable	High-performance and high-availability virtualised array solution
IP SAN solution	Fibre Channel SAN solution	Fibre Channel SAN solution
SATA and/or SAS	SATA and/or SAS	Fibre Channel and/or SATA
Scale up to 36 TB (SATA) or 14.4 TB (SAS)	Scale up to 36 TB (SATA) or 14.4 TB (SAS)	Scale up to 240 TB (EVA8100) using 1 TB SATA drives
Consolidate multiple servers in an IP SAN	Enhanced storage consolidation in a Fibre Channel SAN with multi-server clustering	Easy manageability and virtualisation allows consolidation of multiple storage devices
Redundant controllers, cooling and power supplies	Redundant controllers, cooling and power supplies	Redundant architecture and broad choice of software, including local and remote replication
Windows Linux VMware	Windows Linux VMware	Windows Linux HP-UX Tru64 UNIX, OpenVMS Solaris, AIX, Novell, NetWare VMware Macintosh
Data replication and server fail-over over LAN or WAN in Windows and Linux environments ¹	Data replication and server fail-over over LAN or WAN in Windows and Linux environments ¹	Virtual Snapshots (Vsnapshots) Virtually instantaneous snap clones for back-up and restore; remote replication; HP Pay per use for storage capacity and software
Snapshots Clones	Snapshots Clones	

¹ Using HP StorageWorks Storage Mirroring

Part 4:

Complete your knowledge



How HP Services can complement your solutions

Regardless of the size of your business – small, medium, or large – one aspect is the same: Over time, business needs change. HP Services recognises the dynamic, fluid nature of business and provides a total care approach geared towards every aspect of your IT environment and at every point of the IT life-cycle – design, integration, data migration and support.

HP Care Pack Services

HP Care Pack Services create a simpler, more affordable services solution scaled to the needs of small and mid-sized businesses. The services can supplement existing technical resources so that smaller businesses can spend less time focusing on technology – and more time focusing on business.

HP provides support for your SAN solution with a full range of HP Care Pack services that can:

- Save you time by speeding up the installation process of your solution
- Extend your standard warranty for longer investment protection
- Enhance your service level
- Provide phone assistance and licence updates on your software components
- Reduce costly downtime and improve employee productivity

Mission-Critical Services

The following services combine reactive technical assistance with proactive account services for selected distributions of Windows and Linux, storage and/or SAN systems:

- HP Proactive Essentials (PE) Service is an entry-level, mission-critical package that increases system performance, expedites problem resolution and decreases downtime caused by software defects.
- HP Proactive 24 Service and HP Critical Service are high-end, mission-critical packages for demanding support requirements where data loss or downtime would put your business at risk.



Advanced services

HP Services also provides a range of advanced services that can assist you in the design, integration and maintenance of your storage environment and SAN infrastructure.

- SAN Solution Service encompasses all the activities required for fast, efficient and successful implementation of your SAN infrastructure devices – with minimal disruption to your operations. We help you get maximum peace of mind and a rapid return on your SAN investment – together with assistance in critical areas such as SAN management, data protection and recovery.

HP Assessment Service for SANs

If you are new to SANs or are experiencing extensive growth and need to better manage your SAN environment, you should consider the HP Assessment Service for SANs. Without requiring SAN downtime, this service provides a snapshot of your SAN environment as well as recommendations for improving the availability levels and ongoing management of your storage devices and SAN environment.

For more information about HP Services and support, contact your HP sales representative or HP Authorised Channel Partner, or visit:

www.hp.com/go/storageservices

Your questions answered

What happens if I need to add more storage capacity after I deploy my SAN?

HP StorageWorks Modular Smart Arrays, All-in-One Storage Systems and EVA4400 are modular, so that you can add capacity – internally or externally – with additional disk enclosures as your needs grow:

- Scale up to 4 TB on the MSA500 G2 without external expansion
- Scale up to 36 TB SATA or 14.4 TB SAS with three MSA2000 storage array enclosures
- Scale up to 45 TB SATA or 18 TB SAS on the AiO1200 with a Smart Array P800 controller and four MSA60 enclosures
- Scale up to 72 TB SATA or 28.8 TB SAS on the AiO600 with eight MSA60 systems
- Scale up to 96 TB of Fibre Channel storage on the EVA4400

If you need even more capacity, simply add more MSA or EVA4400 systems to your SAN.

How many servers can I add?

The MSA2000fc disk array is tested to support up to 64 servers. For connections to more than 20 hosts, we recommend that you deploy an additional disk array and split the workload across the two arrays.

The MSA2000i also supports up to 16 servers, but, due to the limited network performance of the IP SAN, the I/O requirements of the servers will determine if you can achieve satisfactory performance.

The HP StorageWorks All-in-One Storage System can provide connectivity that is similar to the MSA2000i, depending on the model chosen and the I/O requirements of your application. Smaller All-in-One models are designed for smaller or fewer server connections with typical deployments of two to four hosts.

The EVA4400 storage array can support up to 256 hosts connected in a multi-path configuration and up to 512 hosts connected in a single-path configuration.

How do I adjust my back-up strategy to match my storage consolidation solution?

HP StorageWorks tape libraries are modular, just as are our storage arrays. This means that you can increase performance and capacity simply by adding additional drives or tape libraries.

HP Data Protector and Data Protector Express software also follow this modular concept. This means that you pay only for the licences you currently require but still have the flexibility to scale up when needed.

How can I expand the Fibre Channel connections in my SAN?

If the number of servers exceeds the number of Fibre Channel ports, you can simply add another Fibre Channel switch to your infrastructure – a process called cascading (see specifications on how your switch supports cascading). For extensive configurations, we recommend that you work with your preferred HP storage partner.

www.hp.com/go/san

How does HP StorageWorks Storage Mirroring software increase the availability of data?

HP StorageWorks Storage Mirroring is a cost-effective software solution that replicates data at a file and byte level and monitors data continuously to replicate only the file changes that occur.

It gives you:

- An effective disaster-recovery strategy – replicating data from multiple servers off site
- Centralised back-up – eliminating dependence on a back-up window and the need to work with live production data
- Automatic or manual fail-over capabilities – helping to ensure business continuity and data availability in the event of a disaster
- A means of integrating dissimilar servers and storage arrays

Jargon buster

Simple definitions of key technology terms used in this guide.

Cascading

The ability to connect switches to one another to create a larger SAN fabric.

Direct-attached storage (DAS)

A deployment of dedicated storage devices for each server, usually using SCSI connections.

Fibre Channel

A protocol designed for high-speed storage networks requiring high availability. SANs use fibre-optic cabling to connect different devices.

Host bus adaptor (HBA)

A PCI adaptor that connects a server to the SAN fabric. Each HBA installed is referred to as a host interface.

IP and iSCSI protocol

iSCSI is a storage networking protocol that uses standard Ethernet-based Internet Protocol (IP) networks. iSCSI is especially attractive for small environments that do not have the performance and scalability requirements of Fibre Channel.

Logical unit number (LUN)

A LUN is a logical unit number, which is really a logical volume. The operating systems and the software on them operate against a logical volume and view it as a linear address space of fixed-size blocks. A physical disk can be set up to be one large LUN or carved up into multiple LUNs.

Network-attached storage (NAS)

Dedicated turnkey file-serving solutions that are fast to install and easy to manage. They are typically optimised for file-serving performance because they are tuned for a single function. The HP ProLiant Storage Server and All-in-One Storage Systems are example products with NAS capabilities.

Network interface card (NIC)

Network cards used in servers, usually to connect them to an Ethernet network. They perform the same function as an HBA for Fibre Channel connections.

Redundant array of independent disks (RAID)

A method of writing data simultaneously over multiple disk drives used in disk arrays for greater data protection and/or increased performance.

Replication

Mirroring data between two arrays – usually located in separate data centres – to achieve the highest availability in case of failure of one data centre. This can be achieved via host/IP-based replication or – for enterprise arrays such as EVA or XP – via SAN-based replication directly between two arrays.

SAN fabric

The hardware that connects workstations and servers to storage devices in a SAN. The SAN infrastructure allows any-server-to-any-storage-device connectivity through Fibre Channel switching.

Serial Attached SCSI (SAS) interface

A next-generation SCSI interface that uses serial technology.

Serial Advanced Technology Attachment (SATA)

Interface technology for disk drives, providing the lowest cost per megabyte. It is ideal for storing file data, secondary application data, or low-usage reference information (an increasing regulatory requirement). SATA provides basic reliability and performance compared with SCSI (and Fibre Channel) HDDs.

Small Computer System Interface (SCSI)

A protocol used to communicate with SCSI devices. It is also used by Fibre Channel technology to communicate with disk drives.

Storage area network (SAN)

High-speed, special-purpose network connecting different data storage devices to servers. SANs may extend to multiple or remote locations for back-up and archival storage.

TCP/IP Offload Engine (TOE) card

Network cards that offload network protocol tasks from the standard server CPUs.

Unified storage

A set of technologies that allows storage devices to perform two roles – both NAS file serving and SAN with the same storage appliance.

Virtualisation

Technologies that help remove physical storage boundaries by treating all available storage, regardless of its location, as one “virtual” pool.

Simply StorageWorks

Storage is easy when you choose HP.

For information on Simply StorageWorks solutions, visit:

www.hp.com/eur/simply (Europe, the Middle East and Africa)

www.hp.com/apac/simply (Asia, Australia and New Zealand)

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