hp storage

january 2003

technical blueprint

hp StorageWorks entry consolidation solution

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executive summary

This paper presents an HP technical blueprint for building an entry-level storage consolidation solution. Technical blueprints are the second tier of HP solutions blueprints, the business blueprints being the first tier. For access to the consolidation business blueprint, visit www.hp.com/go/hpstorage_blueprints. Using this blueprint, customers can consolidate their storage into a shared and centrally managed pool to efficiently use their storage and simplify storage management. Storage management can be done from anywhere on the intranet. In addition, backup tools allow easier and more efficient tape backup procedures. As a result, customers realize reduced IT administration expense, higher system availability, and better support for their Service Level Agreements (SLAs).

Offering storage solution blueprints is how HP defines a configuration for a specific storage problem and provides all the information necessary to implement it. A blueprint represents a fully tested and supported configuration, orderable as a set of individual components from the HP standard price list. Recognizing that one size does not fit all, guidance on flexibility and scalability is given—ranging from minor changes listed in the blueprint itself, to design and consultancy services for total flexibility. Standard product support is provided for each component in a blueprint configuration, and optional design, build, integration, and enhanced-support services are also available from HP. Overall, the customer's experience is a quicker time to solution, without the limits of a fixed-product bundle.

This blueprint includes the components, the design rules, and an example with a logical view, a physical view, and a bill of materials. Specifications are supplied for the components. Figure 1 presents a logical view of the HP StorageWorks Entry Consolidation Solution. Additional technical blueprints cover a wide range of solutions. See the "for more information" section at the end of this document for a list of these blueprints.
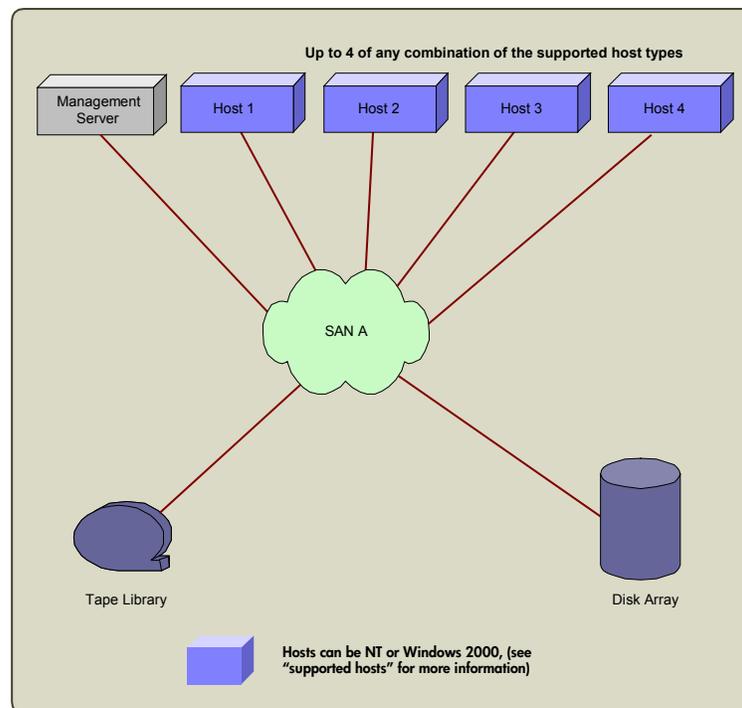

figure 1. entry consolidation solution: logical view

business needs

Businesses today must capture and manage a rapidly expanding amount of digital information. In some cases, information is the business, and its access and availability are critical to business success. Add to this the fact that most organizations face decreasing IT budgets, so they need a more efficient approach to storage deployment and management. Straightforward direct attached storage (DAS) where servers and disk arrays are strewn throughout the organization no longer suffices. IT managers need networked storage to centrally monitor, manage, and scale their resources.

This StorageWorks Entry Consolidation blueprint provides customers with a way to deal with storage challenges:

- Beats the DAS management challenge by pooling storage capacity and managing it centrally on this SAN.
- Improves utilization of storage resources, minimizing the need to maintain surplus storage to meet unexpected demand and lowering the overall cost of storage.
- Beats the shrinking backup window by networking tape backup on this simple SAN configuration.

Implementing a SAN, particularly when it is an organization's first SAN deployment, can be a time-consuming, complex, and risky project. HP StorageWorks blueprints remove these problems by documenting a fully tested and supportable configuration and providing information on actually how to implement a solution.

solution design and design rules

The Fibre Channel network infrastructure allows storage devices (disks and tape) to be shared across hosts. A management server provides a single console to schedule and manage backups. You can load additional management tools to manage data availability and access. An existing Windows 2000 server can be added to the Fibre Channel network to serve as the management server.
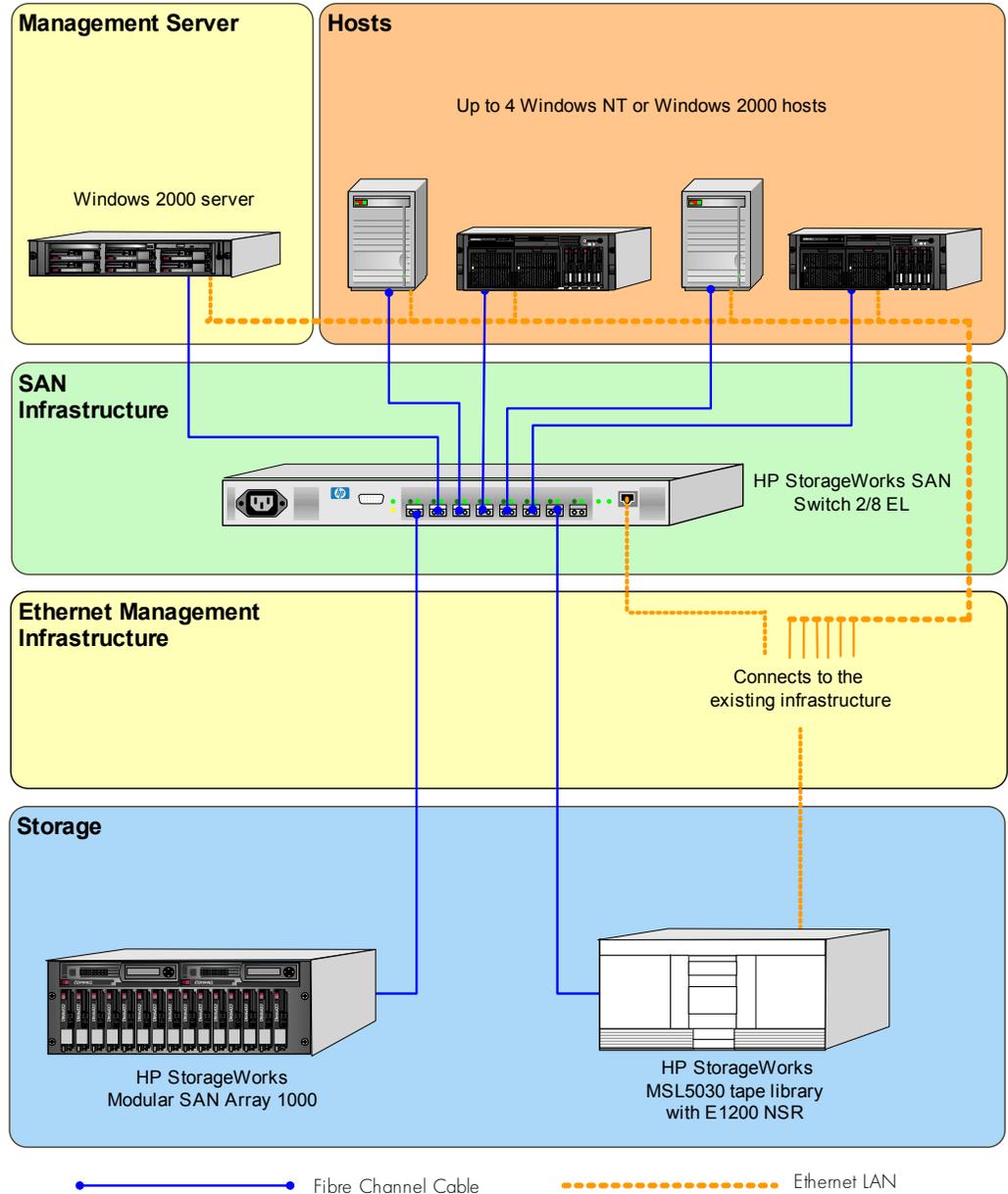
figure 2. example entry consolidation solution physical view

Using an existing Ethernet network provides LAN connectivity for out-of-band SAN component management. There is no Ethernet connectivity to the disk array; it is managed in-band or through a serial link for low-level functions. See the "bill of materials" section for specific component information.

The example solution illustrated in this blueprint can meet specific customer needs by modifying the plan. To provide guidance on this flexibility, the underlying assumptions and design rules are detailed in the following section. This information is intended as a guide in configuring a specific consolidation solution to meet a customer's requirements.

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assumptions:

array
- Modular SAN Array (MSA)1000 is fully loaded (that is, 14 disk drives).
- Disk capacities are calculated with the MSA1000 using RAID ADG. One drive is used as a hot spare.

tape
- Incremental backups occur four days a week for each server.
- Full backups for each server are staggered throughout the week. They occur every fifth day in the backup cycle. A daily backup cycle takes no more than 8 hours.
- One full backup is retained for each server.

Fibre Channel infrastructure
- The HP StorageWorks SAN Switch 2/8 EL provides a more flexible expansion capability as requirements grow. The internal MSA Fabric Switch 6 may be used, but future expansion is limited to adding a second MSA Fabric Switch 6 to the MSA1000. The Switch 6 cannot be cascaded to an external fabric.

design rules:
- The Entry Consolidation Solution can accommodate 1 to 4 Windows NT or Windows 2000 hosts, from any hardware manufacturer. Note that 1 to 4 NetWare 5.1 and 6.0 hosts could be supported using this configuration. NetWare support requires use of a specific version of controller firmware in the MSA1000. This solution can also accommodate 1 to 4 Linux hosts (Red Hat Linux 7.2 Personal or Professional Edition; SuSE Linux Enterprise Server 7). See your HP representative for more details.
- Four switch ports are used or reserved by the solution: three Fibre Channel switch ports are used for the management server, the MSA1000, and the e1200 bridge in the tape library. An additional port is reserved for future expansion.
- All backup data flows are over the SAN, not the network. This achieves greater speed and reduces network traffic.
- If using 18.2-GB drives in the MSA1000, HP recommends a single HP StorageWorks Ultrium 230 tape drive.
  - Usable capacity: about 200 GB
  - Required number of cartridges: 8
- If using 36.4-GB drives in the MSA1000, HP recommends a single Ultrium 230 tape drive.
  - Usable capacity: about 400 GB
  - Required number of cartridges: 8
- If using 72-GB drives in the MSA1000, HP recommends two Ultrium 230 tape drives.
This is the configuration used in the example SAN solution.
  - Usable capacity: about 800 GB
  - Required number of cartridges: 14

component review

HP StorageWorks SAN Switch 2/8 EL install cost-effective small SANs		• Eight 1-Gb/s and 2-Gb/s universal auto-sensing ports • Universal, self-configuring ports (F, FL, E) • Four-switch SAN Fabric support with an upgrade option to full 20-switch support • 1U rack-mountable enclosure
HP StorageWorks MSL5030 Tape Library increase storage efficiency without additional administrative burden		• Supports one or two LTO Ultrium tape drives for native transfer rates up to 108 GB/hr (maximum) • Stores up to 3 TB of data (native) • Offers a scalable modular design that can be configured with up to 8 modules for a total storage capacity of up to 48 TB (2:1 compressed)
HP StorageWorks Modular SAN Array 1000 low cost and high performance		• Uses the latest industry-standard 2-Gb/s interconnects and Fibre Channel technology • Scales to 1.0 TB, using (14) 72-GB, 1-inch Universal hard drives • Adding additional HP StorageWorks 4200/4300 enclosures (two enclosures max), scales to 3.0 TB, using (42) 72-GB, 1-inch Universal hard drives

For more information on HP storage products, visit:
www.hp.com/country/us/eng/prodserv/storage.html
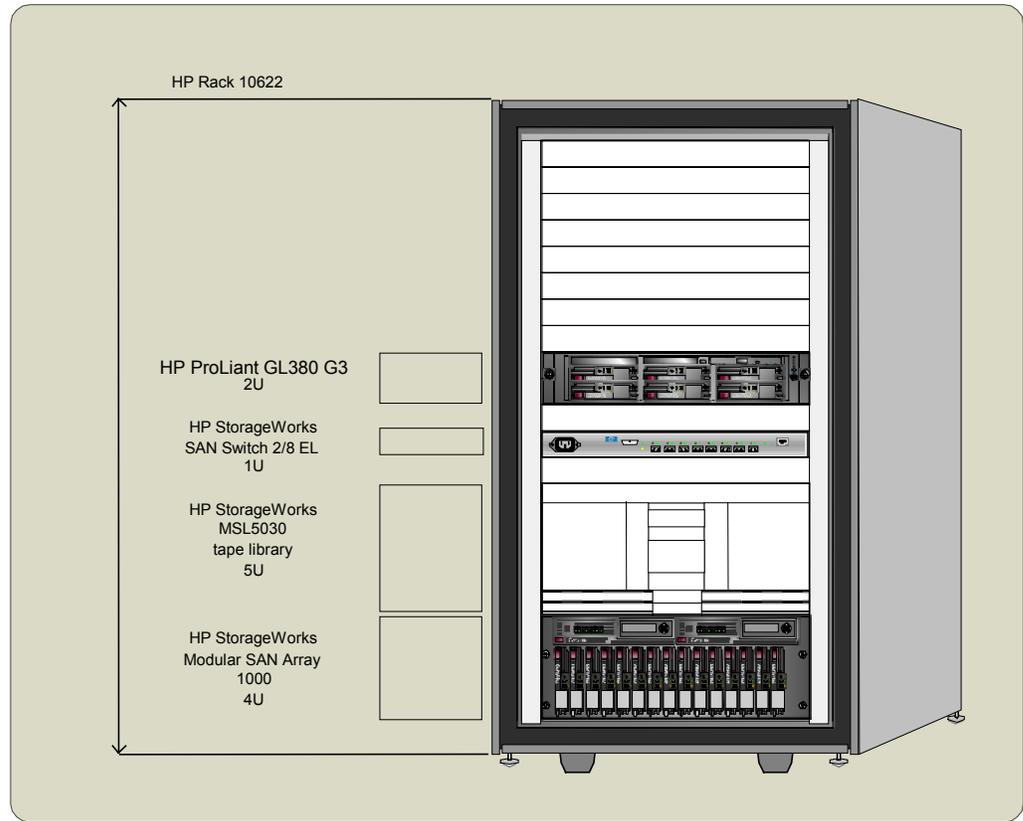
figure 3. example entry consolidation solution rack

To minimize space at a customer's site, place this SAN solution in a rack. Pictured in Figure 3 is an HP Rack 10000 Series 22U rack. For example, if additional rack space for servers is needed, an HP 10000 Series 36U, 42U, or 47U rack may be used. If multiple servers are placed in a rack together, an HP Console Switch can be added to provide a shared display, keyboard, and mouse for managing the servers.

To ensure that the latest supported software, firmware, and driver revisions are being used, check with your HP sales representative or channel partner.

supported hosts

supported hosts and Fibre Channel host bus adapters (HBAs)*		
link speed	any Windows NT server	any Windows 2000 server any Windows 2000 advanced server
1 Gb/s or 2 Gb/s	FCA-2101 (245299-B21)	FCA-2101 (245299-B21)

*A NetWare 5.1 or 6.0 configuration can be supported if the proper controller firmware is used in the MSA1000. The HBA must be the FCA-2210 (281540-B21). Also, a Red Hat Linux 7.2 Personal or Professional Edition or SuSE Linux Enterprise Server 7 configuration can be supported if the proper controller firmware is used in the MSA1000. The HBA must be the FCA-2214 (281541-B21). See your HP representative for the supported ISV backup software package for use with Linux.

interconnect

SAN Fibre Channel infrastructure

features	HP StorageWorks SAN Switch 2/8 EL	HP StorageWorks SAN Switch 2/16 EL
number of ports	8	16
per port line speed	1.0625/2.125 Gb/s, Full Duplex	1.0625/2.125 Gb/s, Full Duplex

Note: Shaded areas represent hardware used in example technical blueprint configuration.

storage

disk storage

features	MSA1000 w/72-GB drives	MSA1000 w/72-GB drives plus one 4200/4300 disk enclosure	MSA1000 w/72-GB drives plus two 4200/4300 disk enclosures
number of MSA1000 drives	14	14	14
number of 4200/4300 drives	0	14	28
total usable capacity with RAID ADG and 1 hot spare	800 GB	1.6 TB	2.4 TB
total raw capacity	1.1 TB	2.2 TB	3.33 TB

Note 1: Shaded areas represent hardware used in example technical blueprint configuration.

Note 2: One MSA1000 can support a total of two single-bus 4200/4300 disk enclosures.

Note 3: All enclosures use RAID ADG and include one hot spare.

tape storage

features	HP StorageWorks MSL5026s2 tape library		HP StorageWorks MSL5030 tape library	
drive type	SDLT		LTO Ultrium	
number of drives	1	2	1	2
number of slots	26		30	
max native storage capacity	4.2 TB		3.6 TB	
max native data transfer rate	16 MB/s 57.6 GB/hr	32 MB/s 115.2 GB/hr	15 MB/s 54 GB/hr	30 MB/s 108 GB/hr

Note 1: Shaded areas represent hardware used in the example technical blueprint configuration.

management

management server

model	memory	operating system	internal RAID	HBA
ProLiant DL380 G3	512 MB	Windows 2000 server, SP2	Smart Array 5i Controller (built-in)	FCA2101 (245299-B21)

management software components

software	management server	SAN hosts	description/notes
Array Configuration Utility XE	√	host agent installed	Provides a graphical view of drive array configurations. Web-based ACU-XE supports online, remote Web-based, and offline configuration.
Insight Manager XE	√	host agent installed	Serves as a powerful storage, server, and server option management tool. Browser-based Insight Manager XE provides full access from anywhere on the intranet, eliminating the need for a dedicated Insight Manager management console.
VERITAS Software Backup Exec SAN Edition	√	√	Integrates data protection and archival strategies with disk storage subsystems across multiple platforms and operating systems located on the same Storage Area Network (SAN).

synergy of components

Easily affordable and scaleable, this high-performance storage system is suited for entry-level to mid-range SANs. Built on DAS to SAN (DtS) architecture for maximum investment protection, the MSA1000 is the ideal storage device for customers taking their first steps into consolidation.

- High-performance controllers built on DtS architecture for maximum investment protection.
- 2-Gb/s Fibre Channel host connections. Support for 1-Gb and 2-Gb Fibre Channel fabrics.
- Original support for Microsoft Windows NT and Windows 2000 operating systems, with optional HP StorageWorks Secure Path.
- Ultra3 SCSI connections to drives. Support for Ultra2 and Ultra3 Universal 1-inch drives.

The HP StorageWorks MSL5030 Tape Library leverages leading storage hardware and software to provide flexible, cost-effective tape backup solutions for a range of environments and supports growing data center backup and restore requirements without additional administrative burden.

- Hot-plug drives for online repair and capacity expansion, without interrupting library operations for minimum downtime.
- Thirty data slots for a native capacity of 3.0 TB, giving the highest density in a 5U form factor in the mainstream segment (including one mail slot for quick load/unload). Removable magazine to ease offsite storage.
- Two cPCI slots for added functionality through add-on cards in future.
- Multi-unit modular scalability, up to eight units, for future growth and investment protection.

HP DtS technology makes the move to a SAN environment fast and easy. Data stored on one-inch universal disk drives (Ultra2 and Ultra3) using newer Smart Array controllers and data stored on RA4100 storage systems can be migrated to the MSA1000. Existing data and configurations remain intact. You can use a single MSA1000 to migrate up to 42 drives and 32 volumes.

The HP StorageWorks Network Storage Router e1200 provides embedded Fibre Channel connectivity for the MSL and ESL tape libraries. The e1200 is installed in one of the cPCI expansion slots of the tape library to provide a Fibre Channel connection without consuming extra rack space.

This configuration supports many ISV tape backup packages, including Atempo Time Navigator, BackBone NetVault, CA BrightStor ARCserve, CommVault Galaxy, Legato NetWorker, Syncsort Backup Express, Tivoli Storage Manager, and VERITAS Backup Exec. Visit http://h18000.www1.hp.com/products/storageworks/ebs/index.html for specific information on supported ISV packages. Solution requirements and capabilities vary by ISV package used.

scaling-growth-flexibility

The example SAN can evolve to support additional hosts, storage arrays, and tape libraries if required. Answers to frequently asked questions are detailed in the following sections.

For specific guidelines on selecting the appropriate components, contact your HP sales representative or channel partner.

What happens if I run out of disk space?

- Use 4200/4300 enclosures to add storage capacity. Up to two additional single-bus enclosures can be added to the MSA1000. Maximum storage space using an MSA1000 with two enclosures is 3 TB (42 disk drives x 72.8 GB each). With online capacity expansion, you can add storage to an operational MSA1000, reducing expensive server downtime. Online Volume Extension allows for the capacity growth of existing logical volumes.
- Adding additional MSL5030 modules expands tape backup capacity. Multi-unit modular scalability allows growth to up to eight units. Adding modules may help reduce the required backup window.

What if I want to add more servers?

- To expand to a second switch, making additional ports available for use, use the reserved port on the FC switch. Adding additional servers also may require adding an additional Fibre Channel I/O module to the MSA1000 to meet performance requirements. FC pass-through modules for the MSA1000 are active/passive (when two are installed in the same MSA). If a second module is added, the MSA1000 must have a second controller and Secure Path.

How can I increase storage resilience or availability?

- Using HP OpenView Storage Virtual Replicator improves data availability. Through virtualization, online volume growth, snapshot and management features, this software complements the standard capabilities within the operating system.
- High-availability configurations using the MSA1000 and HP ProLiant Cluster HA/F100 and HA/F200 products provide device and data path failover to keep business-critical applications running.
- If configuring new ProLiant servers with Windows 2000 Advanced Server or Windows NT on a new MSA1000, you can configure them to boot from the SAN. Booting from an external device provides decreased downtime through faster server replacement in the event of a server failure.
- Build a high-availability configuration from the example SAN by adding an additional HBA to each server; a second Fibre Channel switch; and an additional Fibre Channel I/O module to the MSA1000 (Figure 4). Secure Path software allows path failover if a connection fails, keeping your system available. Redundant hardware, advanced RAID technology, and the Secure Path automated failover capability are used to enhance fault tolerance and availability. Secure Path effectively eliminates controllers, disk drives, interconnect hardware, and HBAs as single points of failure in the storage subsystem.
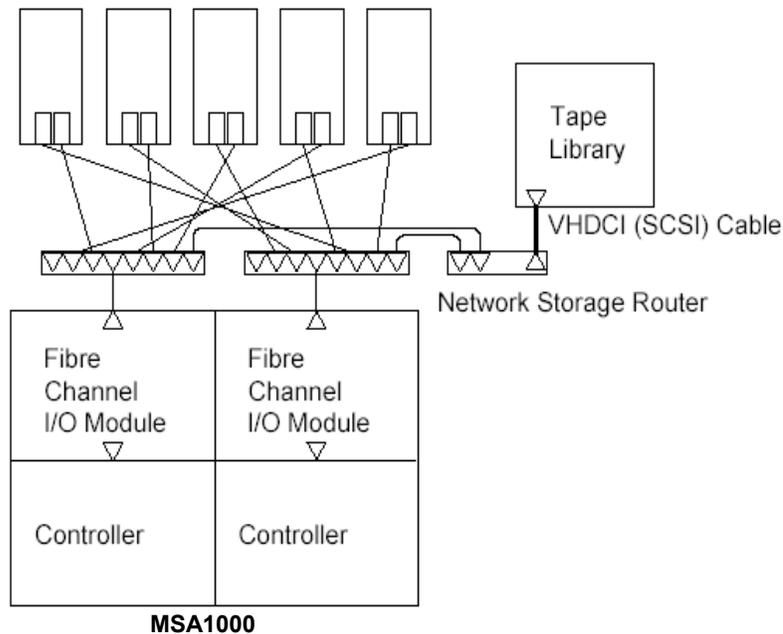
figure 4. entry consolidation solution configured for high availability

How can I increase the intelligence of my storage system to automate tasks and increase visibility and control?

- Array Configuration Utility XE (ACU XE) and Insight Manager XE expand your visibility and control beyond a single management station. Web-based ACU XE supports online, remote Web-based, and offline configuration. Browser-based Insight Manager XE provides full access from anywhere on the intranet.

How can I enhance my support options?

- See the "hp services" section for a description of available support offerings from HP.

high availability— disaster recovery/disaster tolerance

High-data availability is designed into the MSA1000. It supports hot-plug expansion and replacement of hard drives, controllers, and fabric switches for simple, fast installation and maintenance. Fans, power supplies, and I/O modules are also hot-plug replaceable. Online Volume Extension allows for the capacity growth of existing logical volumes on an operating MSA1000.

High-availability configurations using the MSA1000 and HP ProLiant Cluster HA/F100 and HA/F200 products support business-critical applications. These industry-standard, Fibre Channel-clustered solutions provide device and data path failover to keep applications running.

You can build a redundant SAN with tape backup from this example SAN. The MSA1000 and servers connect with redundant paths to two external Fibre Channel fabric switches using the optional redundant controller and MSA Fibre Channel I/O module and redundant Fibre Channel HBAs (Figure 4).

solution-specific configuration

The following graphic lists a bill of materials (BOM) representing the major hardware and software used in the example consolidation solution in this blueprint. Required cables, HBAs, and other necessary items have not been included. For assistance, contact your HP sales representative. If you would like to explore other tape backup configurations, see the EBS Sizer application at www.hp.com.

bill of materials

bill of materials			
management server			
quantity	part number	description	comments
1	257917-001	HP ProLiant DL380 G3	order Windows 2000; install SP2
2	286713-B22	36.4-GB, 10,000-rpm U320 Universal 1-inch hard drive	
1	245299-B21	FCA2101	
infrastructure			
quantity	part number	description	comments
1	280823-B21	E1200 Network Data Router (1FC X 2 LVD)	Install in the cPCI expansion slot of the tape library
1	176219-B21	HP StorageWorks SAN Switch 2/8 EL	
HP tape library			
quantity	part number	description	comments
1	301897-B23	MSL5030L1, 2 LTO drives, rackmount	
tape media			
quantity	part number	description	comments
14	C7971A	HP Ultrium data cartridges	
1	C7978A	HP LTO Ultrium universal cleaning cartridge	
MSA1000			
quantity	part number	description	comments
1	201723-B22	MSA1000	
14	232432-B22	72.8-GB Universal 1-inch hard drives	
1	254786-B21	256-MB battery-backed cache module	
1	190211-001	StorageWorks Enclosure Model 4354R, rack-mountable	
software components			
quantity	part number	description	comments
1	281584-B21	SAN Ed VERITAS Backup Exec	
1	283914-B21	PHAN KIT, VERITAS Backup Exec	

figure 5. example entry consolidation solution BOM

why hp

HP provides a tested and supported end-to-end solution built with world-class components, supported by a single point of contact—HP. With a service and support organization of 5,000 storage service professionals in 160 countries, expert and responsive support is readily available. With a broad portfolio of storage-specific services, HP offers customers the peace of mind that comes from knowing that their solution works right now and can expand into their future with them.

HP Entry Consolidation Solutions offer the most scalable configurations—low/mid-range to enterprise-class storage—on the market. The solution can scale up and out to grow with customer needs, providing return on IT investment today and tomorrow. By offering the broadest range of operating system and HBA support, your solution works in your heterogeneous IT environment.

for more information

consolidation solutions

For additional HP Consolidation Solution technical blueprints, visit:
www.hp.com/go/hpstorage_blueprints
> Mid-range SAN (EMA/EVA)
> Mid-range SAN (VA)
> Enterprise SAN (XP)

For more business-level information on the benefits that consolidation can bring your company, take a look at our Consolidation Solution business blueprints:
> Storage Efficiency Consolidation

To get answers on further solution implementation questions, contact your HP sales representative who will consult our regularly updated interoperability matrices and provide guidance on additional operating system, fabric topology, and third-party/legacy device interoperability.

| **hp SAN components** | To get further information on the individual components in an HP SAN, visit: |
| | |

www.hp.com/go/SAN

hp services

A full range of storage services are available including design, integration, data migration, support, and services to help you evolve your SAN as needs change. For full details, contact your HP sales representative or visit:

www.hp.com/hps/storage

The following services are available.

design and integration services

We provide our expertise and experience to assist you in creating your SAN architecture and design. HP also offers storage/SAN integration services, which provide a trouble-free and quick on-site installation of your SAN solution. We also provide additional services in critical areas such as SAN management, data protection, and recovery.

data migration services

We offer a stress-free data migration from mission-critical HP-UX, Windows NT/Windows 2000, SUN legacy, and EMC storage systems to the HP StorageWorks SAN platform based on an end-to-end management of the entire data migration process.

operate and evolve services

Services range from reactive hardware and software support (8 x 5 3-day response to 24 x 7, same-day response with 6-hour Call-to-Restoration commitments) to comprehensive, proactive mission-sensitive and mission-critical environment support. To help you evolve your storage environment, HP analyzes the performance and capacity usage of your storage environment including all major system components. A detailed performance and capacity report with recommendations on how to tune your performance and optimize your capacity usage is provided.