HP StorageWorks Mezzanine Backup-Restore Solution technical blueprint

Executive summary

This paper presents an HP technical blueprint for building mezzanine backup-restore solutions, which include HP StorageWorks raid arrays, tape libraries, and software.

The HP StorageWorks Modular Smart Array 1500 (MSA1500) controller shelf is a 2-Gb Fibre Channel storage system for the entry-level to midrange storage area network (SAN). It reduces the complexity, expense, and risk of SAN deployments in heterogeneous server environments.

This system provides a low-cost and scalable storage system. The modular design of the MSA1500 enables customers to easily add storage capacity up to 24 TB on an as-needed basis.

While the MSA1500 can be deployed as primary storage with SCSI disk drives, it can also be used as a mezzanine solution for staged backup and restore with Serial ATA (SATA) disk drives, otherwise known as disk-to-disk backup. This added feature utilizes the MSA1500 controller shelf with SATA drives and enclosures as a middle-tier backup and recovery device supported with industry-standard backup and recovery software. It is now possible to have tape and disk coexist within a solution to enhance life cycle data management. In the future, most comprehensive solutions will involve some combination of disk and tape. Tape continues to provide the foundation for data protection solutions to protect data in the event of natural disaster, viruses, hackers, and so on.

This blueprint includes the components, the design rules, 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 mezzanine backup-restore solution. Additional technical blueprints cover a wide range of solutions. For a list of these blueprints, refer to http://www.hp.com/go/MSA1500cs for more information.

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 providing 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.

Figure 1. Mezzanine backup-restore solution: logical view
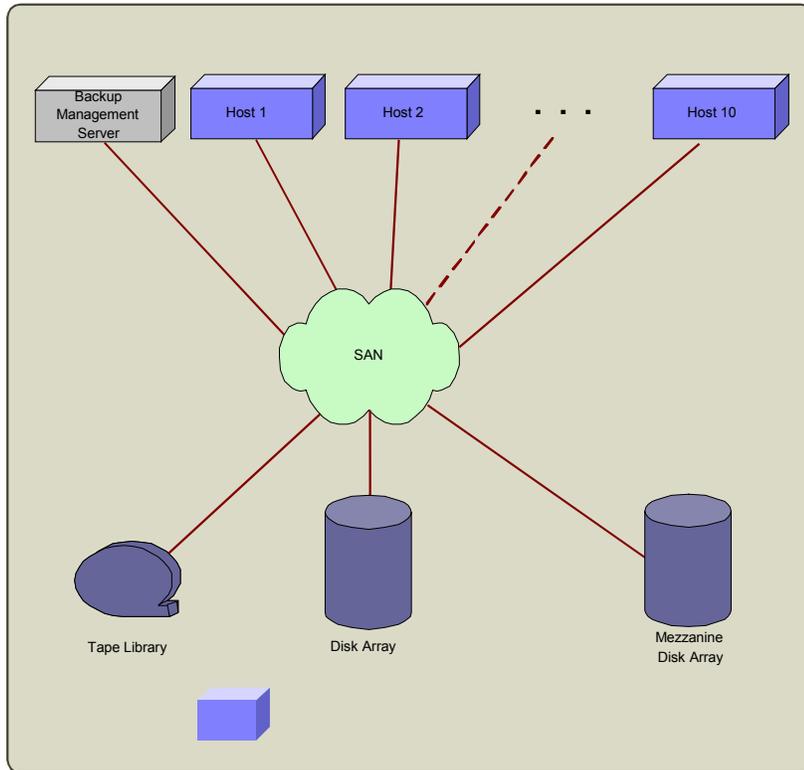
Business needs

Businesses today want fast, reliable storage solutions, which are easy to manage, along with comprehensive technologies for data recovery. When disasters hit, the true test of your abilities is the speed by which you get data back online.

What problem is this solution meant to solve: Two Stage Backup utilizing the MSA1500 and tape storage is being released to address customers' shrinking backup windows. Using SATA disk technology allows for higher capacity at a lower price and offline backup and restore. This solution increases overall system performance by adding high-speed targets to the backup environment.

Adding a mezzanine approach to conventional tape-only backup offers many advantages during the backup and restore processes, including:

- Improved reliability using low-cost disk storage with RAID-based data protection
- Improved data availability with faster single file restores
- Improved backup system scalability using up to 24 TB of near online storage capacity
- Improved backup and recovery system performance that can reduce the overall backup and restore window required

This mezzanine backup-restore solution blueprint provides customers:

- Faster single file recovery from inexpensive near online storage.
- Decreased backup window by distributing file backups to near online storage and tape. Disk files are then copied to tape for offline storage.
- Increased data reliability by first capturing file backups to RAID-protected near online storage, where failure does not mean data loss.

As required, offline or offsite backup files can be efficiently staged or copied to tape.

Solution design and design rules

An MSA1500 provides large-capacity, low-cost storage over a SAN. This storage is used by a data protection application [HP OpenView Data Protector (Data Protector), VERITAS NetBackup (NBU), VERITAS BackupExec (VBE), Legato NetWorker (LNW), or Computer Associates BrightStor ARCserve Backup (CABA)] for mezzanine (near online/tiered) storage. In the example solution presented here, an HP StorageWorks Enterprise Virtual Array (EVA) can back up data to tape resources through an HP StorageWorks Network Storage Router (NSR) or to the MSA1500. Using zoning and Selective Storage Presentation (SSP) in both the MSA1500 and the NSR, multiple hosts can be configured to use the MSA1500 and NSR storage devices. While multiple hosts can share a single tape device behind the NSR through the use of shared storage/SAN options in the application, each MSA1500 logical device [Logical Unit Number (LUN)] must be presented to one and only one host. A host may have more than one LUN from the MSA1500.

Using the data protection application, a "virtual jukebox" (Data Protector), a "disk storage unit" (NBU), a "backup folder" (VBE), a "File Device/Advanced File Device (LNW), or a "File System Device" (AB) is created, pointing to the newly created/presented MSA1500 LUN. This allows the MSA1500 to act as a backup target. Reading from the source disk array such as MSA1000, EVA, or XP, data is packaged and backed up to the MSA1500 LUN using the logical backup device created for the MSA1500 LUN within the application. Mezzanine storage provides faster single file recovery, a reduced backup window, and increased reliability.

Figure 2. Mezzanine backup-restore solution: physical view
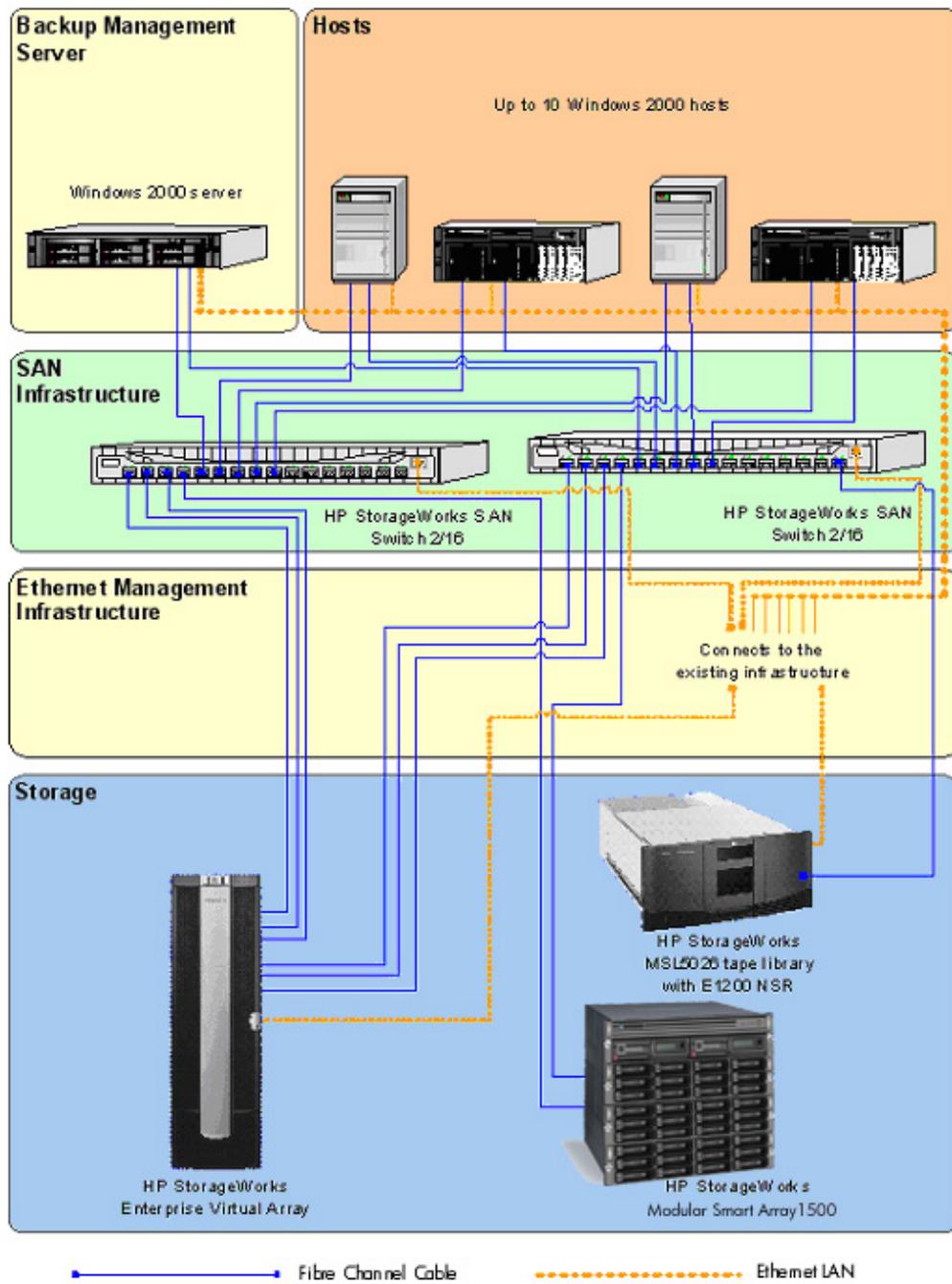
Ethernet connectivity provides out-of-band management for the solution components. The MSA1500 is a dedicated mezzanine storage device.

Assumptions

MSA1500

- Uses SSP.
- Stores data with RAID. When using RAID Advanced Data Guarding (ADG), data is protected if two disk drives should fail.

Tape library

An HP StorageWorks Enterprise Backup Solution (EBS)-supported HP StorageWorks MSL or HP StorageWorks ESL model tape library is used.

Backup process

All backups are LAN-free over the Fibre Channel fabric.

Recovery process

Depending on which ISV is used and how the application is configured, the primary backup may or may not be on disk. If staging is implemented, then after the policy parameters are satisfied, the backup can be migrated from disk to tape. When the disk copy expires, the copy on tape becomes the primary backup file.

Fibre Channel infrastructure

The SAN is operating correctly and is a known good environment before mezzanine storage is implemented.

Design rules

- When using multiple hosts on the MSA1500, use SSP to protect LUNs. LUNs may not be shared, as shared LUNs may result in data corruption.
- The MSA1500 can be configured with 32 LUNs. Best practices dictate no more than 20 servers accessing a single MSA1500.
- The NSR on the fabric should be zoned using host-centric based zoning.

Component review

HP StorageWorks SAN Switch 2/16 scalable, 2-GB technology		• Sixteen 1-Gb/s and 2-Gb/s universal auto-sensing ports • Universal, self-configuring ports (F, FL, E) • 1U rack-mountable enclosure
HP StorageWorks MSL5026S2 Tape Library increase storage efficiency without additional administrative burden		• Supports one or two SDLT tape drives for native transfer rates up to 115.2 GB/hr (maximum) • Stores up to 4.2 TB of data (native) • Offers a scalable modular design. Up to eight modules for a total capacity of up to 67.2 TB (2:1 compressed)
HP StorageWorks Modular Smart Array 1500 controller shelf lower cost and higher capacity		• Uses the latest industry-standard 2-Gb/s interconnects and Fibre Channel technology • Scales to 24.4 TB, using (96) 250-GB, SATA hard drives • Throughput up to 200 MB/s
HP StorageWorks Enterprise Virtual Array offers an enterprise class, high-performance, high-capacity, and high-availability Vraid storage solution		• Model 2C12D-B up to 22.8 TB (raw) • 2-Gb/s end-to-end Fibre Channel technology in 2-Gb/s Open Fibre Channel SAN networks • State-of-the-art controller software, with VersaStor-enabled virtualization technology • Available drive capacities: 36.4, 72.8, 146 GB

For more information on HP storage products, visit: www.hp.com/country/us/eng/prodserv/storage.html

Figure 3. Example mezzanine backup-restore solution rack
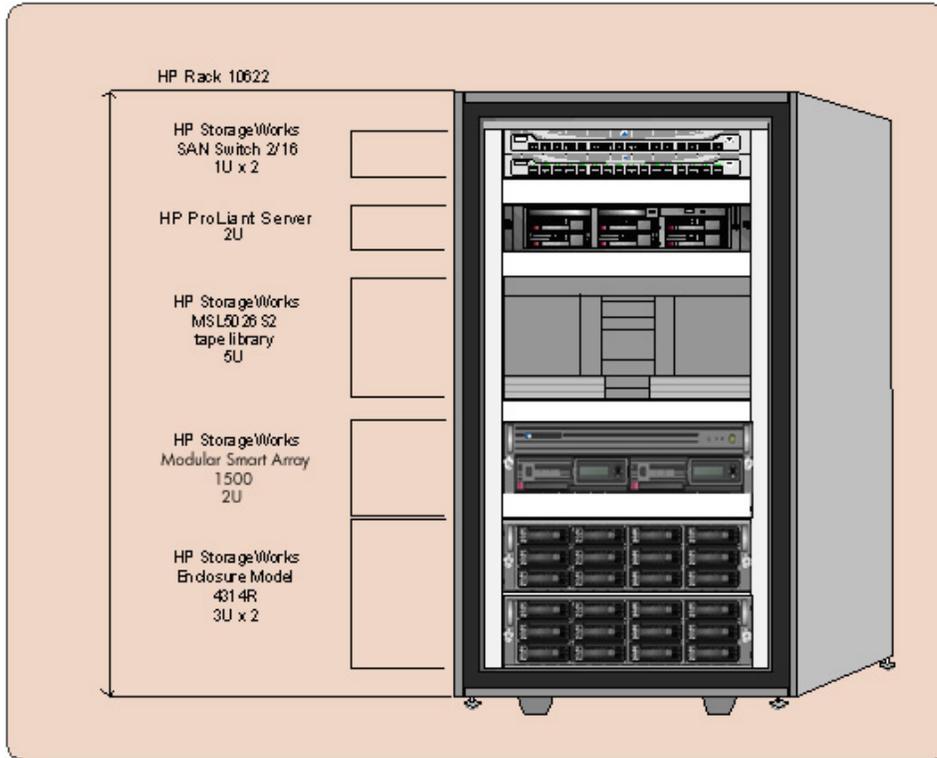
Customers with an existing SAN and a supported ESL or MSL tape library may only need to add the MSA1500 and the two MSA20 enclosures. If a backup management server is not already in place, one must be added to support the solution. This server must meet the configuration requirements of the data protection application being used.

Figure 3 shows the solution racked in HP Rack 10000 Series 22U rack. The 10000 Series also includes 36U, 42U, and 47U racks. The e1200 NSR is embedded in the tape library.

Supported hosts

Table 1. Supported hosts and Fibre Channel host bus adapters (HBAs)

Link speed	Any Microsoft® Windows® 2000 server	Any Windows 2000 advanced server
1 or 2 Gb/s	FCA-2101 (245299-B21)	FCA-2101 (245299-B21)

Interconnect

Table 2. SAN Fibre Channel infrastructure

Features	HP StorageWorks SAN Switch 2/8	HP StorageWorks SAN Switch 2/16
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 1: An external FC switch must be used. The MSA Fabric Switch 6 is not supported.		
Note 2: Shaded areas represent hardware used in example technical blueprint configuration.		

Storage

Table. 3. Disk storage

Features	MSA1500 w/160-GB drives plus two MSA20 Serial ATA disk enclosures	MSA1500 w/250-GB drives plus two MSA20 Serial ATA disk enclosures
Number of SATA disk drives	12	12
Maximum number of SATA disk drives	96	96
Total raw capacity	15.0 TB	23.4 TB
Note 1: Shaded areas represent hardware used in example technical blueprint configuration.		
Note 2: One MSA1500 can support a total of eight single-bus MSA20 Serial ATA disk enclosures or four MSA30 single-channel SCSI disk enclosures		

Table 4. 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	
Maximum native storage capacity	4.2 TB		3.6 TB	
Maximum 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: An EBS-supported MSL or ESL model tape library is used.				
Note 2: Shaded areas represent hardware used in the example technical blueprint configuration.				

Software

Table. 5

Data protection software	Backup management server	Host	Description
HP OpenView Storage Data Protector 5.1	Cell Manager	Media Agent Disk Agent	Data Protector is the only tool that integrates disk-based and tape-based recovery in a single product across multiple applications, operating systems, and storage architectures.
VERITAS NetBackup Data Center 5.0	Master Server	Media Server Client	Intuitive graphical user interfaces enable organizations to manage all aspects of backup and recovery and allow consistent backup policies to be set across the enterprise.
VERITAS BackupExec 9.1 for Windows	Media Server	Media Server Client	Simplifies the management and creation of tape duplicates for offsite vaulting.
Legato NetWorker 7.1.1	Server	Storage Node	Easily configurable with drag-and-drop options, with a configurable graphical interface providing menus, toolbars, and server/client lists.
Computer Associates BrightStor ARCserve Backup for Windows 11.0 SP1	Primary Server	Distributed Server	Provides an easy-to-use interface for backup, restore, and device management. Delivers reliable recovery and backup for distributed environments.

Management

Table 6. Backup management server

Must meet the minimum requirements for the data protection application.

Table 7. MSA1500 management software

Management software	A SAN host	Description/notes
Array Configuration Utility XE	√	Provides a graphical view of drive array configurations. Web-based ACU-XE supports online, remote Web-based, and offline configuration.
Insight Manager XE	√	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.

Synergy of components

This solution uses proven, customer-accepted, fault-tolerant technology with the option to add additional system and data reliability. There is no new technology to learn; it has the look and feel of primary storage.

Implementing a mezzanine backup-restore solution adds flexibility and performance to an existing data protection system. Using this solution in concert with existing backup tools, high-priority data can be backed up and later restored without having to wait on tape mounts. In addition, the new backup resources made available allow existing backup resources to support greater demands for storage and speed.

Tape libraries continue to play a vital role by providing data archiving and retention capabilities. These capabilities are critical to meet the growing requirements businesses face for retaining business information. They also play an essential role in disaster recovery and in making systems disaster tolerant.

Table 1 describes three scenarios to better meet data protection requirements when using mezzanine storage.

Table 8. Scenarios for the mezzanine backup-restore solution

Scenario description	Backup window impact	Restore time impact	Best used for	Notes
Full and incremental backups to MSA1500; offline backup to tape	Backup window reduced as additional backup resources are available Improved reliability from RAID-protected storage	Instant access for single file restores	Operations with a fixed backup window requiring all applications to be backed up at one time Business-critical data with zero tolerance for tape error handling	More efficient use of backup window Tape resources can be used more hours per day
Weekly full backup to tape, daily incremental backups to MSA1500	Backup window reduced as additional backup resources are available More frequent backup for frequently changing data, without changing media	Instant access for single file restores Improved reliability from RAID-protected storage	Large sets of data requiring frequent file restores	Less administration required for frequent incremental backups Large backup window needed for weekly full backups to tape
Full and incremental backups to MSA1500 (not recommended for a full data protection solution)	Multi-stream host backups to disk reduce the backup window	Instant access for full or file restores Improved reliability from RAID-protected storage	Business requires high data reliability and instant data recovery over short periods of time	Requirement of additional processes for disaster recovery and any required data archiving or retention

Scaling-growth-flexibility

What happens if I already own a tape library?

This mezzanine backup-restore solution supports any MSL or ESL tape library that is supported by the EBS. See the [EBS Hardware/Software Compatibility Matrix](#) for a list of EBS supported tape libraries.

What if I want to back up more servers?

Performance is heavily dependent on the size and types of applications being backed up. Consult your HP representative for recommendations to meet your specific needs.

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

Each data protection application provides tools to automate the backup process and the reporting of status, including error notification. These capabilities depend on the application components licensed for use. For more information, contact your HP sales representative.

How can I enhance my support options?

Refer to the HP services website http://www.hp.com/hps/storage/ for a description of available support offerings from HP.

High availability—disaster recovery/disaster tolerance

HP offers solutions that simplify and streamline your infrastructure. Other available solutions provide business continuity and tape-based disaster recovery. For more information, refer to the following URLs:

- Consolidation Solutions: http://h18006.www1.hp.com/storage/solutions/itconsolidation.html
- Business Continuity Solutions: http://h18006.www1.hp.com/storage/continuity
- Tape-based Disaster Recovery Solutions: http://h18000.www1.hp.com/products/storageworks/drtape/

Solution-specific configuration

The following table lists a bill of materials (BOM) representing the major hardware and software used in the example mezzanine backup-restore solution in this blueprint. Not all required cables, HBAs, and other necessary items have been included. For assistance, contact your HP sales representative.

Bill of materials

Table 9. Example mezzanine backup-restore solution BOM

Management server			
Quantity	**Part number**	**Description**	**Comments**
1	N/A	Windows 2000 server	Must meet minimum requirements of data protection software
Infrastructure			
Quantity	**Part number**	**Description**	**Comments**
2	287055-B21	HP StorageWorks SAN Switch 2/16	
TBD	221470-B21 1005-0979	Optical Transceivers (SFPs) Short Wave Long Wave	Dependent on the number of hosts (minimum is 13, maximum is 32)
Tape library			
Quantity	**Part number**	**Description**	**Comments**
1	293472-B25	MSL5026S2, 2 DRV, SDLT 160/320, RM Library with embedded FC router option	
Tape media			
Quantity	**Part number**	**Description**	**Comments**
TBD	C7980A	HP Super DLT tape 220-320GB data cartridge	Dependent on size of backup data
1	C7982A	HP Super DLT tape cleaning cartridge	
MSA1500			
Quantity	**Part number**	**Description**	**Comments**
1	AA986A	MSA1500	
1	218231-B22	MSA1000 Controller, with 256MB cache	Second controller for MSA1500
1	AA987A	MSA Fibre Channel I/O Module	Redundant Fibre Channel I/O module
2	190209-001	HP StorageWorks Enclosure Model 4314R	
42	286778-B22	72.8 GB Pluggable Ultra320 Universal 1-inch hard drive, 15,000 rpm	
SATA configurations			
1	335921-B21	MSA20 SATA disk enclosure	Holds up to 12 SATA disk drives for a raw capacity of 3 TB per enclosure
1	AA988A	MSA Dual Channel SCSI I/O module	One dual channel I/O comes with the MSA1500 base configuration, up to three more can be installed for a total of eight ports

Disk storage: EVA 2C12D-B			
Quantity	**Part number**	**Description**	**Comments**
1	283199-B21	EVA 2C12D-B 60Hz (41U Graphite with backend Fibre Channel loop switches)	
	250203-B24	VCS PKG DUAL HSV2.0A	
TBD		Pluggable Ultra320 Universal hard drives	Per customer requirements (48 minimum, 168 maximum)
1	231292-B22	HP StorageWorks Secure Path V4.0 for Windows (five licenses)	Obtain sufficient licenses to match the configuration
Software components			
Quantity	**Part number**	**Description**	**Comments**
1	B6961AA	Data Protector 5.0 Starter Pack (LTU, media, and manuals)	
1	B6963AA	Drive extensions	One for each jukebox
1	B6958BA	Unlimited slots per library	One for each jukebox
1	VEI805XA	NetBackup, DataCenter, Windows NT®/Windows 2000, SAN Media Server License, v4.5, Standard License	Select appropriate tier level
1	VEI582XA	NetBackup, DataCenter, Vault Option, Base (includes four drives), v4.5, Standard License	
1	VEI561XA	NetBackup, DataCenter, Shared Storage Option, v4.5, Standard License	
1	VEI806XA	NetBackup, DataCenter, Library-Based Tape Drive Support, v4.5, Standard License	
1	CAP100AR	BrightStor ARCserve Backup v9 for Windows	
1	CAP103AR	BrightStor ARCserve Backup v9 SAN Option for Windows (includes TLO)	

Why HP

With the mezzanine backup-restore solution, customers can reduce their backup and restore window while enhancing their existing backup infrastructure through scalability, reliability, and availability, where you want it and when you need it. 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 mezzanine backup-restore 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.

HP services

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

www.hp.com/hps/storage

The following services are available.

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.

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.

For more information

For more information on two-stage backup and restore with the MSA1500, visit:

http://h18006.www1.hp.com/products/storageworks/MSA1500/index.html

For additional HP solution technical blueprints, visit:

www.hp.com/go/hpstorage_blueprints

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.

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

www.hp.com/go/storage