HP StorageWorks Data Center Enterprise Backup Solution

Executive summary

This paper presents an HP StorageWorks Enterprise Backup Solution (EBS) technical blueprint for building heterogeneous Storage Area Network (SAN) backup solutions. Using this blueprint, customers can consolidate their distributed backup devices into a shared, centrally managed data protection solution that provides more efficient use of their tape resources across heterogeneous platforms. Management of your data protection resources can be done system wide from a single console. In addition, consolidation allows easier and more efficient tape backup procedures. As a result, customers realize reduced IT administration expense and higher system availability.

This blueprint includes the EBS design rules and presents an example EBS with a logical view, a physical view, and a bill of materials. Specifications are supplied for the EBS components. A discussion of scaling the Data Center EBS is also provided.

Blueprints are enablers to build HP SAN solutions. These solutions provide storage that is easy to manage and grow while reducing a customer's total cost of ownership. Figure 1 presents a logical view of the Data Center EBS. An additional technical blueprint is available to build a HP tested and supported Entry-Level EBS. Visit www.hp.com/go/ebs for a list of all blueprints.

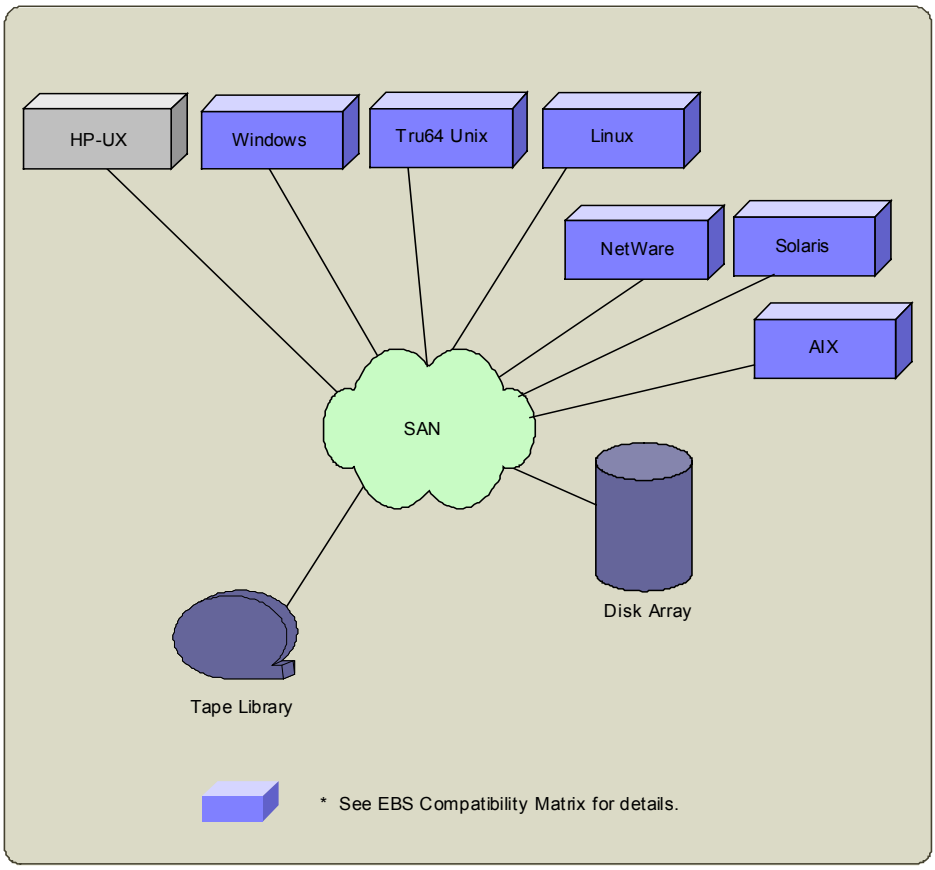


Figure 1. Data Center EBS logical view

Business needs

Businesses with heterogeneous servers in distributed environments often have dedicated backup systems supporting homogeneous islands, making it difficult to manage in a cost-effective way. These islands prohibit being able to reassign drives to respond to unpredictable storage demands to avoid business disruption. IT resources are challenged to manage the storage requirements of the separate islands that can have different backup applications as well. Providing additional storage resources often requires taking servers offline, decreasing the availability of business applications and data to the end users. An EBS can help customers solve their data protection problems in distributed, heterogeneous environments in an efficient and cost-effective way.

EBS provides customers with:

- Improved utilization of tape drives in tape automation, minimizing the need to maintain surplus tape drives to meet unexpected demand, thereby lowering the overall cost of storage.
- Capacity that can be expanded quickly and easily, providing additional capacity where and when it is needed, without disrupting business activity.
- A central pool of tape storage for heterogeneous environments that can be managed from a single console, reducing the demand for IT resources.
- Increased data access as multiple hosts can access and share tape libraries.

Solution design and design rules

The example EBS illustrated in this blueprint can be modified to meet specific customer needs. To provide flexibility, the following assumptions and design rules can be revised as necessary. This information is intended as a guide in configuring a specific SAN backup solution to meet customer data protection requirements.

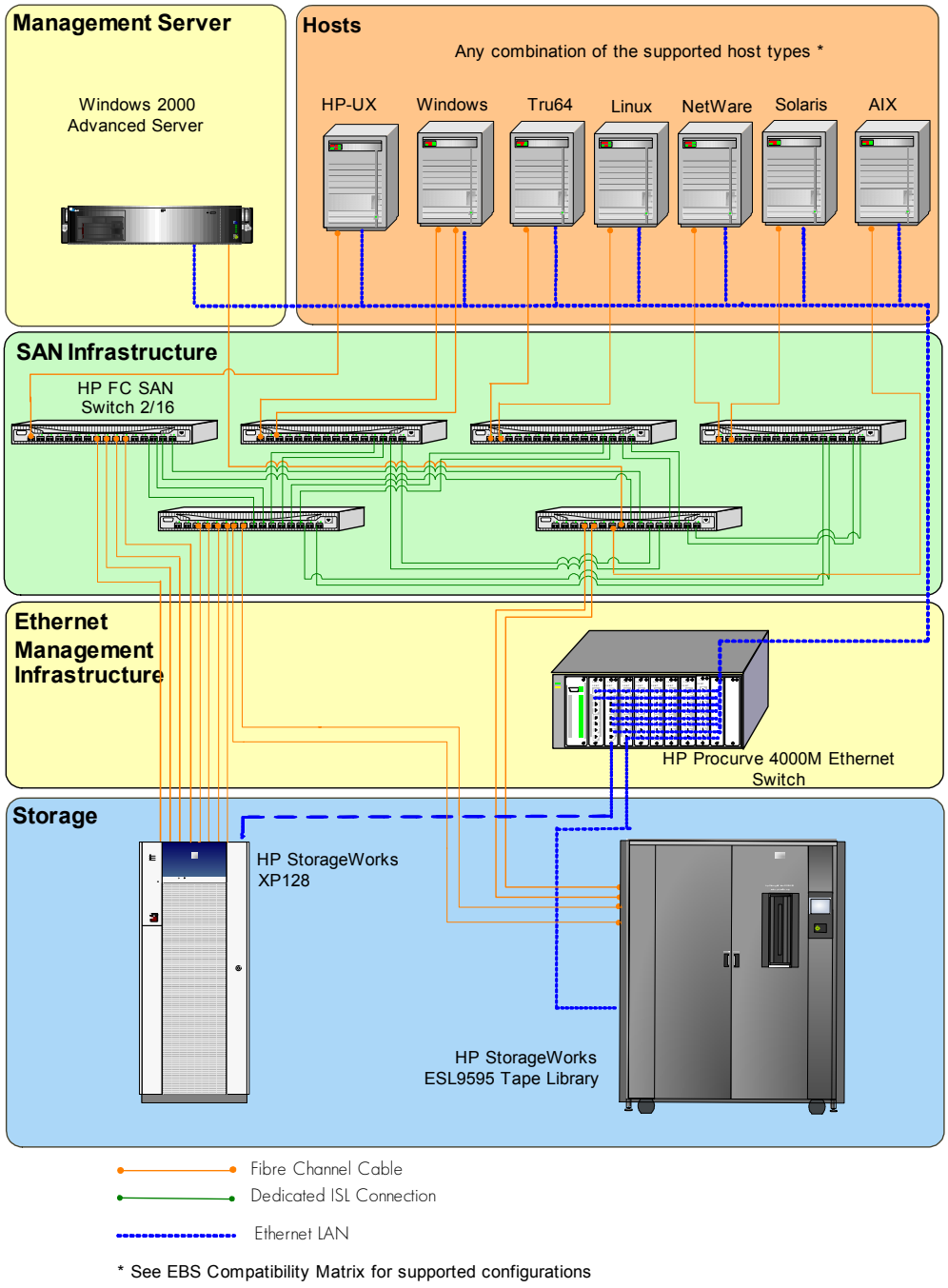


Figure 2. Data Center EBS physical view

Assumptions

The following section details underlying assumptions and design rules that can be modified to address specific customer requirements. This information is provided as a guide in configuring this specific Data Center EBS.

Disk Array

- HP StorageWorks XP disk array is loaded with 124 drives.
- Disk capacities are calculated for the XP disk array with average utilization of 60% based on mixture of RAID 1 and RAID 5.

Tape

- Tape library contains only HP StorageWorks Ultrium 460 drives.
- Incremental backups occur six days a week.
- Full backups occur on the seventh day. A full backup of the entire SAN takes no more than 8 hours.
- Access to library is not redundant. There is a single physical path to the library.
- HP StorageWorks ESL9595 Tape Library with 13 drives backs up no more than 11 TB in one backup session.
- About five full copies of data are maintained within library (275 cartridges).

Fibre Channel infrastructure

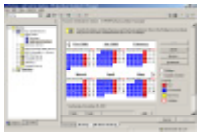
- The SAN configuration conforms to HP SAN guidelines.
- For Windows servers, separate Host Bus Adapters are required for the XP array and the tape library to provide best performance and robust error recovery capabilities.
- For more information, consult the *SAN Design Guide* referenced in "HP StorageWorks SAN components."

Design rules

Note: All of the following tape drive and cartridge numbers assume HP Ultrium 460 drives and Ultrium Generation 2 media; throughput and capacities quoted are native numbers (no compression).

- The EBS can accommodate any combination and number of the supported host types as specified in the EBS Compatibility Matrix (refer to the "Hosts" section).
- One Ultrium 460 drive can backup about 864 GB of usable capacity in an 8-hour period (about108 GB per hour).
- One Fibre Channel switch port is used per two tape drives.
- Eight Fibre Channel switch ports are used for the XP disk array.
- If using 36-GB drives in the HP StorageWorks Disk Array XP128 (4.464 TB), HP recommends a 4-drive ESL9322 Tape Library.
  - Usable capacity: about 2.678 TB
  - Required number of Ultrium cartridges for full backup: 14
- If using 73-GB drives in the Disk Array XP128 (9.052 TB), HP recommends a 7-drive ESL9322 Tape Library.
  - Usable capacity: about 5.431 TB
  - Required number of Ultrium cartridges for full backup: 28
- If using 146-GB drives in the Disk Array XP128 (18.104 TB), HP recommends a 13-drive ESL9595 Tape Library. This configuration is used in the example SAN solution.
  - Usable capacity: about 10.862 TB
  - Required number of Ultrium cartridges for full backup: 55

Component review

HP OpenView Storage Data Protector Software 	Single, central management interface to monitor remote and local backup jobs and resources Tightly integrated with HP OpenView Management tools Highly scalable architecture and licensing
HP FC SAN Switch 2/16 	Provides 16 ports in a 1U rack-mountable enclosure Software enables multi-switch fabric tools for ease of configuration and monitoring 1Gb/sec–2Gb/sec per auto-sensing universal port
HP StorageWorks Disk Array XP128 	Provides up to 18 TB of capacity (over 16 TB usable) Supports heterogeneous connectivity, including HP-UX, Windows, Solaris, AIX, and Linux New 146-GB 10K rpm disk drive
HP StorageWorks Ultrium 460 Tape Drives 	HP is leading developer of Ultrium/LTO tape technology 108-GB/hour transfer rate* 200-GB per tape cartridge capacity *data compression can double transfer rates and capacities
HP StorageWorks ESL9000 Tape Libraries  	Hot-swappable, redundant components to ensure the most availability in their class Up to 16 drives and 595 tape cartridges

For more information on HP storage products, visit www.hp.com/go/storage

Hosts

Operating systems and HBAs

OS	HP-UX	Windows	Tru64 UNIX	Linux	NetWare	Solaris	AIX
Version	11.11 11.0	2003NT 2000 AS	5.1B 5.1A	Red Hat AS 2.1 (32 bit)	6.05.1	87	4.3.3
HBA	A6795A	FCA2101	FCA2354 (PCI)	FCA2214	FCA2210	JNI FCE-6460	IBM 6228

Interconnect

SAN Fibre Channel infrastructure

Features	HP StorageWorks FC Switch 16B	HP StorageWorks SAN Switch 2/32
Number of ports	16	32
Per port line speed	2.125 Gbps, Full Duplex	2.125 Gbps, Full Duplex
Note: Shaded areas represent hardware used in example technical blueprint configuration.		

Tape storage

StorageWorks tape libraries

Features	ESL9322	ESL9595
Drive type	Ultrium 460	Ultrium 460
Number of drives	8	16
Number of slots	322	595
Max native storage capacity	64.4 TB	119 TB
Max native data transfer rate (fully loaded)	240 MBps	480 MBps
Note: Shaded areas represent hardware used in example technical blueprint configuration.		

Disk storage

StorageWorks disk array systems

Features	XP128 36-GB drives	XP128 73-GB drives	XP128 146-GB drives
Number of drives	124	124	124
Usable capacity with RAID 1 and RAID 5	2.679 TB	5.431 TB	10.862
Raw capacity	4.464 TB	9.052 TB	18.104
Note: Shaded areas represent hardware used in example technical blueprint configuration.			

Backup software

Backup software components

Software name	Quantity	Required/optional	Description
HP OpenView Storage Data Protector 5.1 Cell Manager	1 x system	Required	Provides data protection through automated backups
Drive Extension LTU	Total number of tape drives in library	Required	License to use (LTU) tape drives in library
Library LTU	1 x 61-250 slots 1 x unlimited slots	Optional	Supports tape libraries with greater than 60 slots
Online Backup LTU	1 x system	Optional	Enables online backups with major databases and applications, including Oracle, SAP, Exchange, Informix, and more
Manager of Managers LTU	1 x system	Optional	Ideal for centralized management of remote offices. Enables library sharing between Data Protector cells
Windows Open File Backup LTU	1 x server or 1 x 10 servers or 1 x 5 workstations or 1 x enterprise server	Optional	Backs up Windows and NetWare files to ensure all files get backed up without downtime
Zero Downtime Backup LTU	1 x TB	Optional	Online backup utilizing array replication and backup server to isolate application server from backup process
Direct Backup LTU	1 x TB	Optional	Enables serverless backup from disk array to tape library
Instant Recovery LTU	1 x TB	Optional	Enables image to be recovered in seconds from disk
Note: Shaded areas represent software used in example technical blueprint configuration.			

Management

SAN Management Server

Vendor	Model	Memory	Operating system	Internal RAID	HBA
HP	ProLiant DL560	2GB	Windows 2000 Advanced Server	HP Smart Array 5i Plus	FCA2101

Out-of-Band SAN Management – Ethernet Switch

Features	HP ProCurve Switch 2524	HP ProCurve Switch 4000m
Number of ports	24	24
Speed	10/100 Mbps	10 / 100 Mbps
Management capable	•	•
Note: Shaded areas represent hardware used in example technical blueprint configuration.		

Management software components

Software name	Management server	SAN hosts	Description
HP OpenView Storage Area Manager 3.0	•	Host agent installed	Provides comprehensive, centralized SAN management
HP StorageWorks Command View SDM	•		Provides device configuration and management for the HP Virtual Array family of products
HP SAN Switch Web Tools	•		Provides device configuration and management for the HP SAN Switch Fibre Channel switches
HP Tape and Library Tools	•		Provides device configuration and management for the HP tape library family of products

Solution value

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 over 30,000 professionals in 120 countries around the world, 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 tape libraries and HP OpenView Storage Data Protector software provide a secure and manageable solution enabling optimal customer data protection. Storage Data Protector provides backup protection for data in heterogeneous environments with minimal impact on system performance and application availability. Storage Data Protector is based on a modular design, so it is scalable with a customer's infrastructure to provide highly reliable and cost-effective backup in systems of any size. For customers who have standardized on a third-party backup application, HP has certified ISV backup applications providing investment protection for customers.

The ESL9000 Tape Libraries utilize the HP StorageWorks E2400-160 FC Interface Controller to attach to the SAN. These Interface Controllers are an integral component of the HP Extended Tape Library Architecture and are responsible for managing concurrent attempts to access the elements of the tape library, adding a layer of intelligence between the tape drives and the SAN. The Interface Controllers are an evolutionary step beyond previous FC routers and bridges, adding functionality, reliability, and flexibility to the SAN connectivity for the tape libraries.

HP SAN Solutions are managed using the industry-leading HP OpenView SAN management software, allowing a SAN to be managed and monitored from a single management station. An easy-to-learn, easy-to-use interface allows IT staff to be more efficient in managing the storage.

Scaling-growth-flexibility

The EBS example provided in this technical blueprint also can scale over time to meet customer requirements. By adding an additional or larger HP Fibre Channel switch, the example EBS can be grown to support additional hosts, storage arrays, and tape libraries. For specific guidelines on selecting the appropriate components, refer to the *EBS Design Guide* referenced in "HP StorageWorks EBS components."

If there is a need for higher storage capacity, multiple Disk Arrays XP128 can be added. This would likely require an additional Fibre Channel switch, or a switch with a higher port count, such as the HP StorageWorks SAN Switch 2/32.

With additional storage, a larger backup capacity may be needed. See "Design rules" for more information or consult the *EBS Design Guide* referenced in "HP StorageWorks EBS components."

How can I enhance my support options?

Consulting and Integration Services

- Architectural blueprint services
  - Business continuity
- Storage solution services
  - Data replication solution service
  - SAN solution service
  - Backup and recovery solution service

For details, contact your HP sales representative or visit www.hp.com/hps/storage. For descriptions of additional HP support offerings, refer to the "HP services" section.

Solution configuration

The following table lists a bill of materials (BOM) representing the major hardware and software used in the example solution in this blueprint. Required cables and other necessary items have not been included. For assistance, contact your HP sales representative.

Bill of materials

Bill of materials

Management server and management hardware components		
QTY	**DESCRIPTION**	**COMMENTS**
1	HP ProLiant DL560 in the following configuration:	Order Windows 2000 Advanced Server
	2 Processors (1.5 GHz or better) 2 GB or more of Advanced ECC PC2100 SDRAM DIMM Memory Redundant power supplies	
2	HP 72.8 GB 15K Ultra320 Wide SCSI-3 HD	Order a minimum of 1, a maximum of 2
1	FCA2101 Fibre Channel HBA (Microsoft OS)	245299-B21
1	ProCurve Switch 4000m	
Management software		
QTY	**DESCRIPTION**	**COMMENTS**
1	HP OpenView SAM v3.0 Media 5App+2 TB LTU	
Backup software		
QTY	**DESCRIPTION**	**COMMENTS**
1	HP OpenView Storage Data Protector Cell Manager UNIX	B6951AA
15	Drive Extension LTU	B6953AA
1	Library Extension LTU – unlimited slots	B6958BA
Tape libraries and media		
QTY	**DESCRIPTION**	**COMMENTS**
1	HP StorageWorks ESL9595 Tape Library	330833-B21 (400 slots, 0 drives)
1	HP StorageWorks ESL9000 400 to 595 Slot Upgrade	330842-B23
16	HP StorageWorks ESL9000 Ultrium 460 Drive Upgrade Kit	330834-B21
1	HP StorageWorks ESL9000 ePCI Card Cage	330838-B21
4	HP StorageWorks E2400-160 FC Interface Controller	330839-B21
4	15m FC cable, LC/LC	221692-B23
595	HP StorageWorks Ultrium-2 Data Cartridge, 400 GB	C7972A
5	HP StorageWorks Ultrium Generation 2 Barcode Labels, 100 pack	Q2002A (100 data cartridge labels, 10 cleaning cartridge labels per pack)
5	HP StorageWorks Ultrium Universal Cleaning Cartridge	C7978A

Host hardware components		
QTY	**DESCRIPTION**	**COMMENTS**
1	PCI 2x Fibre Channel Adapter (HP-UX11.0 and above)	A6795A (1 / N-, L-, or V-class host in SAN)
2	FCA2101 Fibre Channel Host Adapter (Microsoft OS)	245299-B21 (2/host in SAN)
1	FCA2354 Fibre Channel Adapter (Tru64 Unix)	261329-B21 (1/host in SAN)
1	FCA2214 Fibre Channel Host Adapter (Linux OS)	281541-B21 (1/host in SAN)
1	FCA2210 Fibre Channel Host Adapter (NetWare OS)	281540-B21 (1/host in SAN)
1	FCA2257P Fibre Channel Host Adapter PCI (Solaris OS)	254456-B21 (1/host in SAN)
1	Fibre Channel Host Adapter PCI (AIX OS)	197819-B21 (1/host in SAN)
SAN infrastructure components		
QTY	**DESCRIPTION**	**COMMENTS**
6	HP StorageWorks FC SAN Switch 2/16	322118-B21
Variable	2-Gb Small Form Pluggables (SFPs) Short-Wave Transceiver Kit	221470-B21
Storage arrays		
QTY	**DESCRIPTION**	**COMMENTS**
1	HP StorageWorks XP128 Disk Control Frame	A7876A
31	HP StorageWorks XP128 146GB 10K rpm, FC Array Group – 4 disks	A7900A
1	HP StorageWorks XP128 Standard Performance ACP Pair	A7900SU

For more information

To get answers to 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.

Storage solutions

To learn more about HP Storage solutions, contact your local HP sales representative or visit our Web site at http://www.hp.com/go/storagesolutions.

For additional HP Storage technical blueprints, visit www.hp.com/go/hpstorage_blueprints.

HP StorageWorks SAN components

For further information on the individual components in an HP SAN, visit www.hp.com/go/SAN, and select "SAN Design Guide" from the "SAN Solutions" section.

SAN Design Guide:

http://h18006.www1.hp.com/products/storageworks/san/documentation.html

HP StorageWorks EBS components

For further information on the individual components in an HP Enterprise Backup Solution, visit www.hp.com/go/ebs, and select "EBS Design Guide" from the "technical documentation" section.

HP services

HP offers a full range of storage services, including design, integration, data migration, and support services, and services to help you evolve your SAN as your needs change. For details, contact your HP sales representative or visit www.hp.com/hps/storage.

Data migration services

HP offers end-to-end management of the entire data migration process, allowing 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.

Operate and evolve services

HP operate and evolve services range from reactive hardware and software support (8 x 5 next-business-day response to 24 x 7 same-day response with six-hour call-to-restoration commitments) to comprehensive, proactive mission-sensitive and mission-critical environment support. To help you evolve your storage environment, HP will analyze your storage environment and provide detailed recommendations on how to tune performance and optimize capacity.

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