enterprise Exchange solution

executive summary

Messaging and collaboration tools are changing the way companies do business today. The ability to communicate with co-workers, customers, and suppliers through messaging applications is critical. With mission-critical data being sent and received, the issues of availability and storage in your messaging system are of utmost importance to the success of your business.

Exchange 2000 from Microsoft is a leading messaging application for large and small businesses today. Given the increasing importance of this messaging application to our customers, HP provides technical blueprints to build tested and supported Exchange solutions. These solutions are designed to meet your messaging needs today and to grow with your requirements over time. This flexibility and scalability ensure your solution provides you the lowest total cost of ownership possible.

This document presents an Exchange 2000 solution supporting up to 10,000 users. This solution provides:

- A storage solution built around an HP StorageWorks Disk Array XP1024 and Disk Array XP128, providing exceptional Exchange performance and availability with ease of management.
- A highly available solution based on clustered HP servers with multiple paths managed by HP Auto Path XP software and Fibre Channel-connected Storage Area Networks (SAN).
- A scalable solution that can grow with your requirements.

Diagrams, design rules, scalability options, and a bill of materials (BOM) are included for the example configuration. In addition, information is provided on HP Services that can help you design, install, and maintain your Exchange 2000 messaging application. See the "for more information" section at the end of this document for additional information on HP Exchange solution blueprints.

today's challenges in messaging applications

Exchange 2000 from Microsoft is one of the leading business-critical messaging applications available today. As more and more business activities rely on its operation, the cost of its failure can pose a significant threat to a company's success. The three major concerns customers have for their Exchange 2000 environment are:

- Availability – eliminate downtime and minimize the recovery window in case of downtime
- Scalability – scale up capacity and performance as an organization grows without affecting availability
- Manageability – establish effective management to achieve availability and scalability requirements
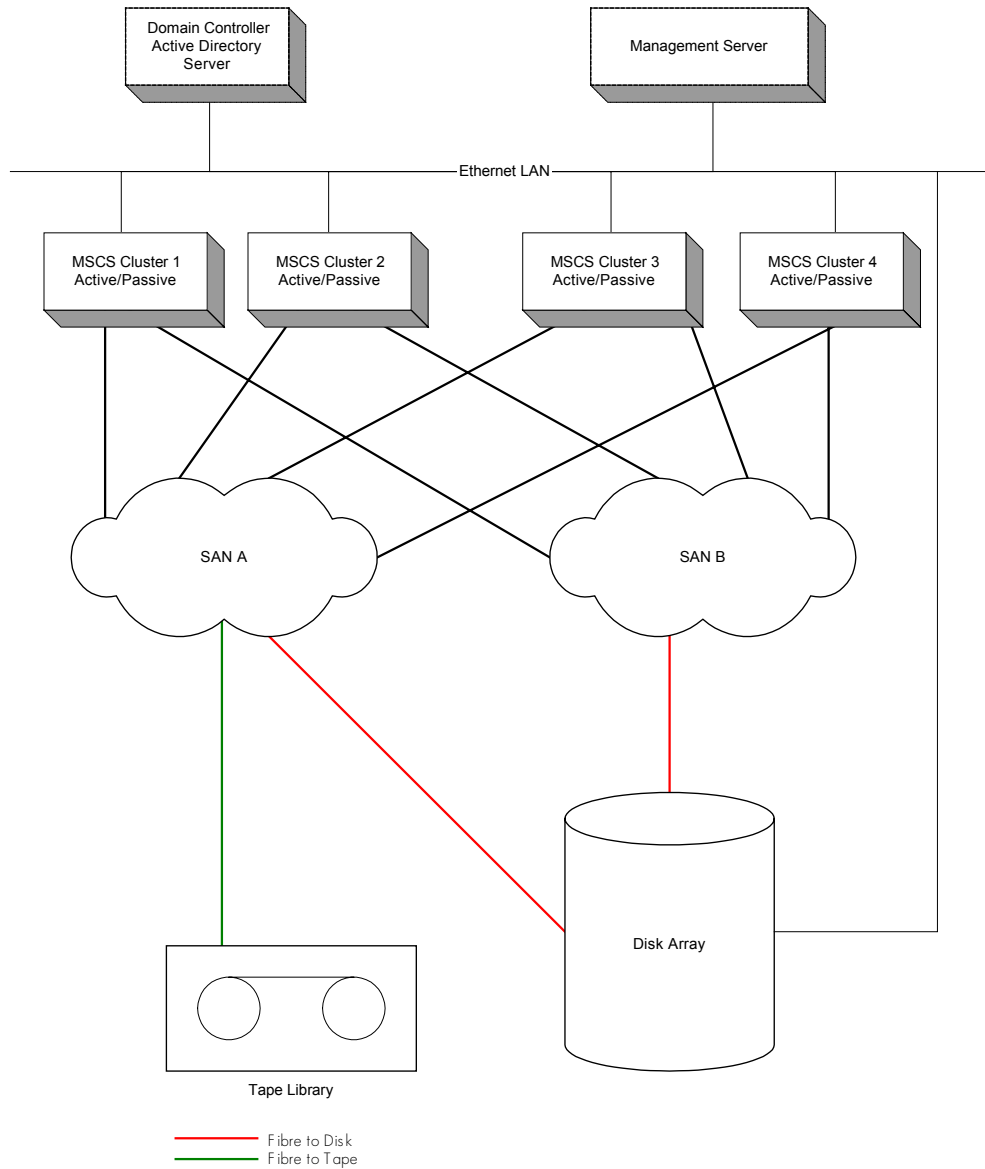
why an hp Exchange solution?

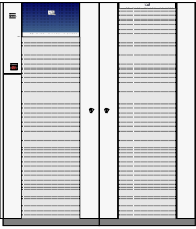**figure 1 - enterprise Exchange solution logical view**

HP provides a tested and supported Exchange solution built with world-class servers and storage, supported by a single point of contact—HP. HP servers and storage are Microsoft-certified platforms. In addition, as a result of the strong services alliance between HP and Microsoft that spans over 15 years and the ongoing collaboration around key Microsoft technologies, HP can provide you with the highest level of services and support for Microsoft technology available today. With a service and support organization of over 65,000 professionals in 160 countries and a broad portfolio of 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 servers consistently rank among the top performing platforms in Exchange testing, as reported by Microsoft (www.microsoft.com/exchange/techinfo/planning/2000/PerfScal.asp). This solution is designed around an HP ProLiant DL580 G2. HP servers provide a broad range of server-based solutions for a variety of needs. These servers feature the latest technology and can be configured to meet your specific requirements, including the number of processors, the amount of available RAM, or the number of network adapters. HP service and warranty offerings make HP servers the perfect platform for your Exchange solution.

HP StorageWorks tape libraries and HP OpenView Storage Data Protector software provide a secure and manageable solution for customer data protection. Storage Data Protector and Exchange integration provides flexible backup protection with minimal impact on system performance and application availability. Depending on the available hardware, Storage Data Protector can write backup streams to the same tape drive or to different ones. Backup streams can either go to devices locally attached to the Exchange server, go through the LAN to any system or systems, or make use of a SAN and move the data with maximum performance to Fibre Channel-connected devices. By using this flexible architecture Storage Data Protector allows you to distribute the backup load and achieve the lowest possible backup times. Storage Data Protector is scalable with a customer's infrastructure to provide highly reliable and cost-effective backup in systems of any size.

The HP Disk Array XP family features explosive performance, incredible scalability and reliability, and unmatched manageability in truly heterogeneous environments. Fault-tolerant, redundant architecture ensures there is no single point of failure. Online firmware upgrades virtually eliminate planned downtime. The Disk Array XP family can scale to 128 disk drives or 1024 disk drives without a moment of downtime. The HP integrated software portfolio uniquely solves your critical IT management issues by delivering powerful disaster recovery capabilities and zero-impact, zero-downtime backup and restore solutions.

key components

HP ProLiant DL580 G2		- Four-way Xeon 1.6GHz - Four 36GB disk drives 4GB SDRAM - Hot-swappable, redundant power supplies and fans 4U rack-mountable enclosure
HP StorageWorks SAN Switch 2/16		- Sixteen 1Gb/2Gb universal auto sensing ports 1U rack-mountable enclosure
HP StorageWorks MSL5030 Tape Library 4 Modules		8 HP Ultrium 230 tape drives - Up to 12TB native storage capacity (3TB per module) 120 slots (30 slots per module)
HP StorageWorks Disk Array XP1024		- Up to 74TB - Versatile crossbar architecture - Fibre Channel, ESCON, FICON support - RAID 0/1, RAID 5 support - Available drive capacities: 36GB, 73GB

enterprise Exchange solution

enterprise Exchange solution

This solution supports up to 10,000 users, each with a 50MB mailbox.

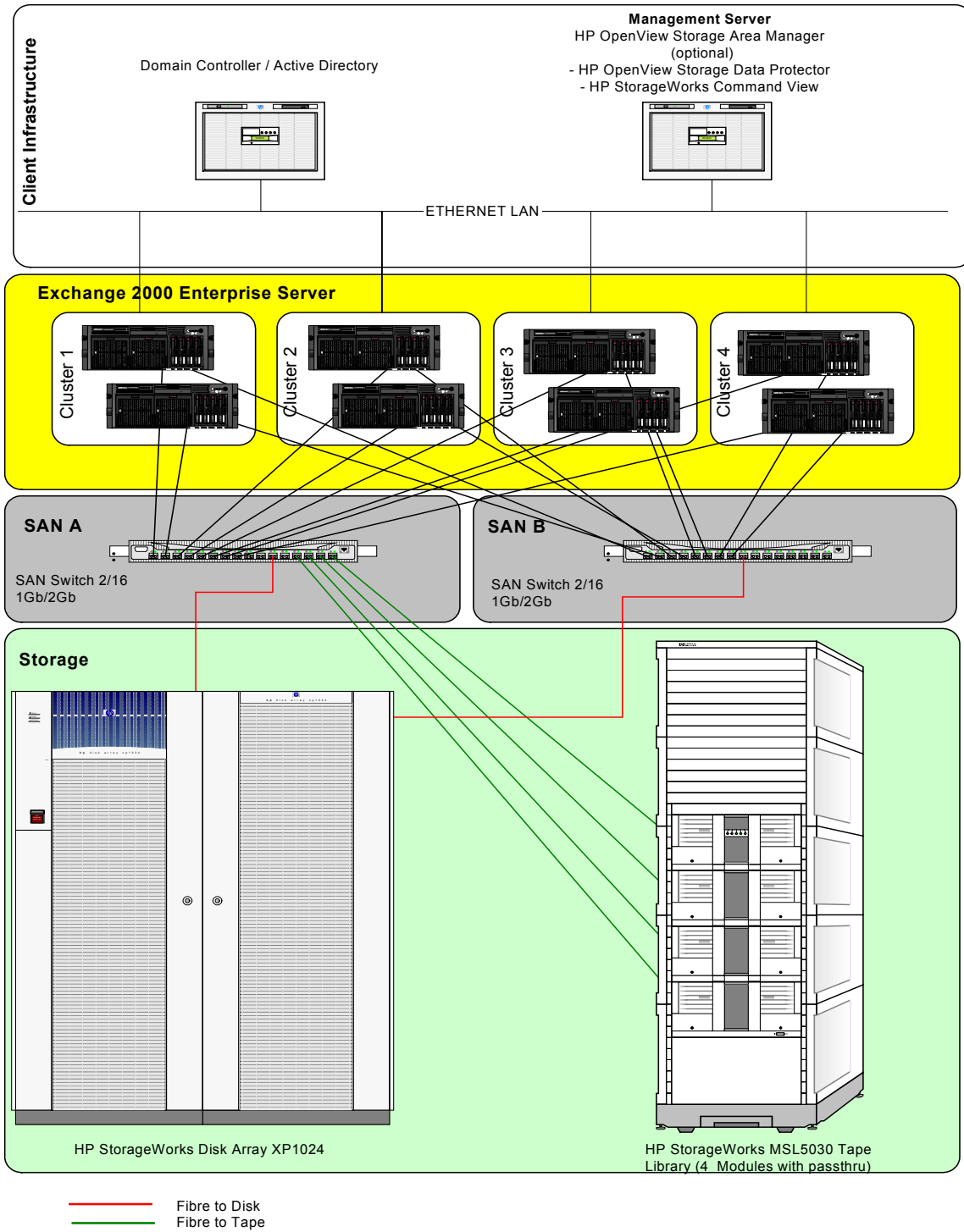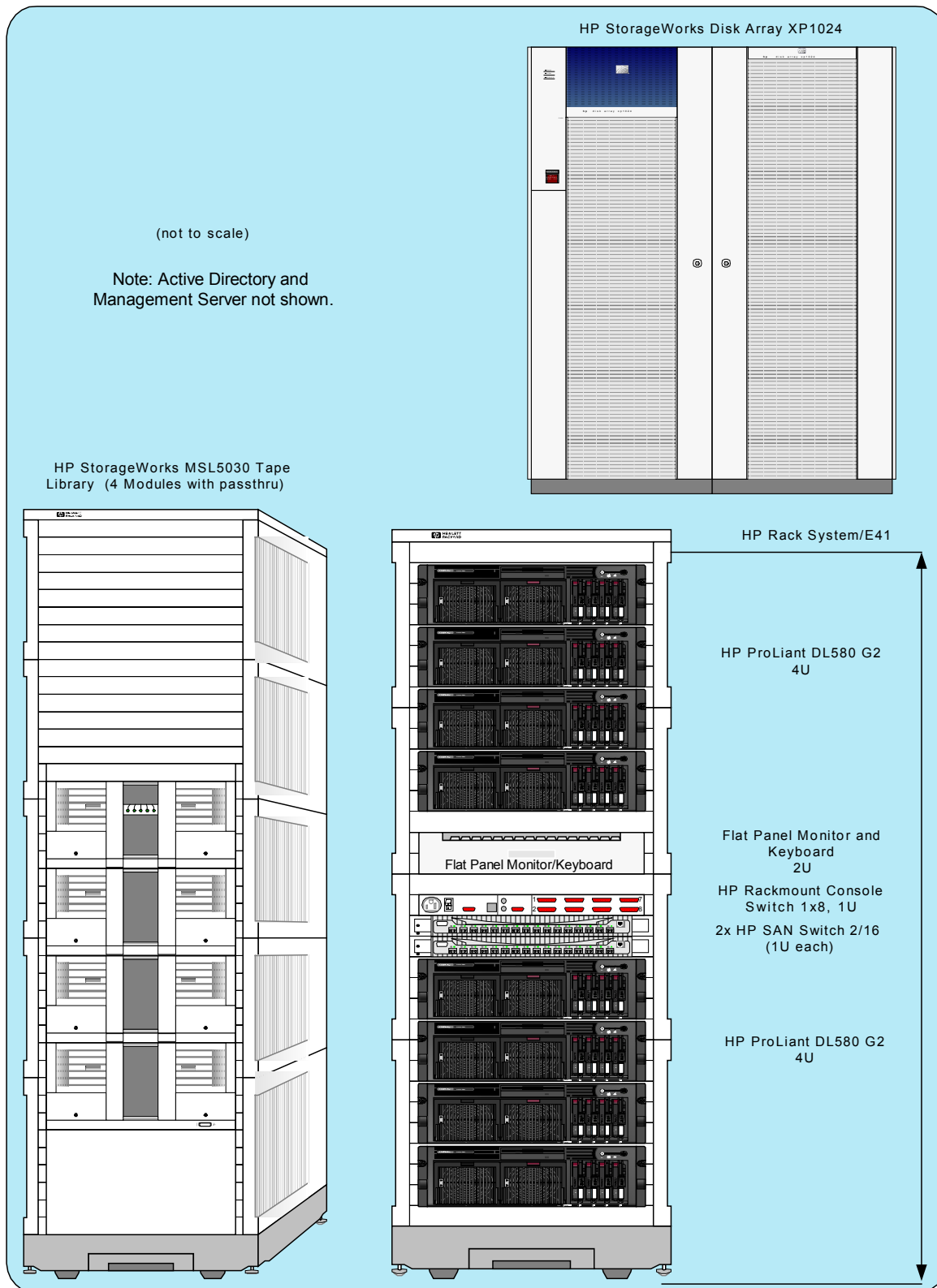**figure 2 - example enterprise Exchange solution physical view**

figure 3 - example enterprise Exchange solution rack

This Exchange solution can be racked in an HP Rack System/E41 rack. The example rack in Figure 3 includes an HP rackmount flat monitor and keyboard and a rackmount console switch (1x8). These optional components provide device management capability at the rack in a minimum amount of space.

enterprise Exchange configuration

The example Exchange solution in this blueprint can be modified to meet specific customer needs. Following are the assumptions, design rules, and scalability options. This information is intended as a guide in configuring a specific Exchange solution to meet a customer's requirements. The HP Exchange Solution Design Wizard may be used to build configurations using different assumptions and requirements. See your HP sales representative for more information.

assumptions

Exchange usage profile

Exchange parameter	value	Exchange parameter	value
Mailbox size	50MB	Internet users	10%
Maximum number of users	10,000	Bridgehead servers	No
Average message size	10KB	Front-end servers	No
MAPI users	90%		

Exchange architecture

- An existing Windows 2000 Active Directory Domain.
- Two Storage Groups with four mailbox stores each (about 315 users per store) per cluster.
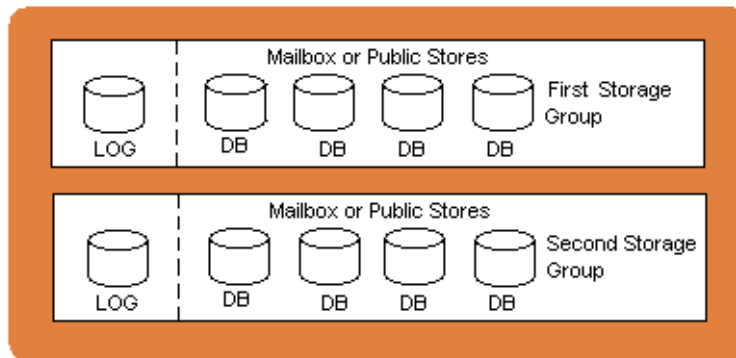- Four clusters needed to support 10,000 users.

figure 4 - storage groups for each cluster

- Total storage required for mailbox stores is 1000GB (each user has a 50MB mailbox). Per Microsoft recommendations, twice that amount of storage is provided to allow for restore and recovery operations. In addition, 10GB is provided for each Storage Group's log files and 10GB is provided for a quorum disk per cluster.
- Databases and transaction log files are on different LUNs on the disk array.
- Different RAID levels are used for log files and databases. Microsoft recommends RAID 1 for log files and RAID 5 for databases for performance optimization.

server

- Eight DL580 G2 servers with 4-way processors and redundant power supplies and fans. See "enterprise Exchange solution specifications" for specifics.
- Two HBAs per server with Auto Path XP software to manage multipath I/O.
- Two Network Interface Cards (NIC) per server. One connection is needed for the cluster heartbeat.
- Exchange 2000 Enterprise Server
- Storage Data Protector

array

- Disk Array XP1024 or Disk Array XP128 array with a 10GB cache (expandable in 2GB increments) and 1GB of shared memory (expandable in 512MB increments).
- Exchange transaction log files are the most important data stores of any Exchange system. Any loss of transaction files guarantees data loss. The log files are written to sequentially and random writes are done to the Information Store database. Microsoft recommends using a RAID 1 or 1+0 protection for log files.
- Exchange databases require high reliability. RAID 5 is used for fault tolerance with good performance for database files.
- Disk requirements are calculated using the most efficient design of the Disk Array XP for this environment.
    1. Mailbox stores use RAID 5. Five array groups are needed to provide 1000GB of storage:
        20 x 73GB disks using Open E Emulation and RAID 5 = 1017.6GB (useable)
    2. Log files and quorum disks use RAID 1. Two array groups are needed to provide 120GB of storage:
        8 x 36GB disks using Open E Emulation and RAID 1 = 116.6GB (useable)
- Sixteen LUNs are created for use by Exchange (eight for Storage Group log files, eight for Storage Group databases).

tape

- Four HP StorageWorks MSL5030 Tape Libraries providing a total of eight HP StorageWorks Ultrium tape drives.

design rules

- Log files and mailbox stores are stored on separate LUNs.
- Active/Passive cluster configuration is highly recommended.
- Multiple mailbox stores inside a Storage Group minimize the impact of restoring a single mailbox store.
- Multiple paths for each server provide additional availability.
- For best backup and restore performance, one tape drive per Storage Group is recommended.

backup strategy

- Storage Data Protector software is used to manage online backups.
- Circular logging is turned off. Log files are not overwritten after they are applied to a database. This allows the log files to be used with the last full database backup to recover a database. If you enable circular logging, you can restore data only up to the last backup. You may not be able to restore data from the last backup to the point of the failure because the required log files may not be available.
- A separate management server runs the HP OpenView Storage Data Protector Cell Manager Starter Packs application.
- Eight tape drives, one for each Exchange Storage Group, allow for parallel backups from the clusters.
- Full Exchange database backups occur seven days a week. Full daily backups delete log files that contain transactions already committed to the database, minimizing the amount of storage space needed for log files. They also minimize the number of tapes needed for recovery.
- Backups should be scheduled during periods of low system load. A system load of up to 30 percent has minimal impact on backup time.
- Several incremental backups should be run during the day.
- The Exchange application and the Active Directory are backed up regularly as part of the customer's normal backup procedure.
- Full Exchange database (all clusters) can be backed up in approximately 1 hour using MSL5030 Tape Libraries with Ultrium tape drives.

- Best case (no system load) backup and restore speeds for Ultrium tape drives are listed in the following table by the number of simultaneously backed-up Storage Groups. Each Storage Group has its own tape drive (a 1:1 correspondence).

number of Storage Groups simultaneously backed up	backup speeds		restore speeds	
	total MB/s	total GB/hr	total MB/s	total GB/hr
1	**34**	**124**	**41**	**148**
2	**66**	**240**	**68**	**246**
3	**87**	**315**	**86**	**308**
4	**106**	**380**	**84**	**302**

table 1- Ultrium tape drive backup and restore speeds when simultaneously backing up multiple storage groups

- Recovery time is determined by the restore time plus the time needed to replay the log files. The number of log files varies depending on the time interval between incremental backups and the arrival rate of new email messages.
- Full Exchange server restore of all databases can be done in less than one hour using the MSL5030 Tape Library with Ultrium tape drives. Additional time may be necessary to replay log files for complete recovery.

availability

- The Exchange Server database is available during online backups.
- In the event that a single database recovery is required, only the individual Exchange database that is being restored is not available during the recovery. All other databases are available.
- The Active/Passive server cluster ensures availability should an Exchange server fail.
- Using Auto Path XP with redundant paths through two Fibre Channel switches increases the system's availability should an HBA, Fibre Channel cable, switch, or controller fail.
- Response time is less than 500ms.

scaling options for the enterprise Exchange solution

adding additional messaging users

- Expand this configuration to 12,500 users by installing an additional cluster and disk storage.

scaling for 7,500 users

- Eliminate one server cluster from the configuration in Figure 2.
- To maintain high availability, the second switch in Figure 2 must remain.
- Three MSL5030 Tape Libraries can be used in place of the four tape libraries shown.
- The storage needed would be reduced by approximately 25 percent.
- Further reductions are possible. Scale down the hardware components appropriately.

online storage

- Disk Array XP1024 capacity may be expanded online by adding additional disks and disk enclosures (DKUs).

decreasing the recovery window

- Employing the HP Zero-Downtime Backup (ZDB) approach and Instant Recovery can significantly reduce the Exchange database recovery window, from hours to minutes. ZDB automates the creation and splitting of a business copy. Instant Recovery automates the recovery from that business copy.
- The recovery window also can be reduced from hours to minutes using the HP StorageWorks Fast Recovery Solutions for Exchange. The Fast Recovery Solutions automates the recovery of an Exchange database from a recovery-ready copy.

enterprise Exchange solution specifications

Use the latest released software, firmware, and driver revisions for each component. Your HP sales representative or channel partner can assist you.

server

Exchange 2000 Server Configuration

Operating System	Server	Host Bus Adapter	Processors	ECC SDRAM	Disk Drives	Network Interface Card
Windows 2000 Advanced Server, SP 3	DL580 G2	(2) 64-bit/66 MHz Fibre Channel HBA	(4) 1.6GHz Xeon MP	4GB	(4) 36GB Wide Ultra3	(2) NC7770 PCI-X Gigabit Server Adapters

interconnect

SAN Fibre Channel Infrastructure

Features	HP StorageWorks SAN Switch 2/8 EL	HP StorageWorks SAN Switch 2/16
Number of Ports	8	16
Per Port Line Speed	1.0625 / 2.125Gbps, Full Duplex	1.0625 / 2.125Gbps, Full Duplex
Note: Shaded areas represent hardware used in example technical blueprint configuration.		

storage

Disk Storage

Disk Array XP1024 Features		
Number of DKUs	1	
Drive Size and RAID Level (Open E Emulation)	36GB Drives (RAID 1)	73GB Drives (RAID 5)
Number of Array Groups	2	5
Total Usable Capacity	116.6GB	1017.6GB
Note 1: Shaded areas represent hardware used in example technical blueprint configuration.		
Note 2: An Array Group is 4 disks.		

Tape Storage

	MSL5030 Tape Library		
Features	3 Modules	4 Modules	5 Modules
Drive Type	Ultrium 230	Ultrium 230	Ultrium 230
Number of Drives	6	8	10
Number of Slots	90	120	150
Max Native Storage Capacity	9TB	12TB	15TB
Max Native Data Transfer Rate (Fully loaded)	90MBps	120MBps	150MBps
Note 1: Shaded areas represent hardware used in example technical blueprint configuration.			

software components

Exchange Server Software

Software Name	Description
Microsoft Exchange 2000 Enterprise Server	Supports messaging application for multiple Storage Groups.
HP OpenView Storage Data Protector	Allows data protection through automated backups.
HP Auto Path XP	Provides a graphical user interface to manage I/O multipath failover for single or clustered server configurations, automatically recognizing and configuring HP disk arrays and supported host bus adapters.
HP OpenView Storage Area Manager — host agent component (optional)	Allows Exchange server to be managed as part of a SAN. Host agent was loaded on Exchange server during solution testing.
HP Tape and Library Tools (optional)	Provides device configuration and management for the HP tape library family of products.

Management Server Software

Software Name	Description
HP OpenView Storage Data Protector	Provides data protection through automated backups.
HP StorageWorks Command View	Provides device configuration and management for the HP Disk Array XP family of products.
HP StorageWorks Secure Manager XP	Provides LUN-by-LUN array-based data security for maximum protection.
HP OpenView Storage Area Manager (optional)	Provides comprehensive, centralized SAN management.
HP StorageWorks Performance Advisor (optional)	Provides a web-based application with real-time collecting and monitoring of your Disk Array XP.

services

HP Services

Exchange consulting services	HP can help you assess your current and future messaging and collaboration solution requirements and then design a solution that leverages the full power of Microsoft Exchange to meet those needs enterprise-wide.
Microsoft education services	HP has fully certified and integrated education solutions that get your IT professional and end users up-to-speed quickly on your Exchange server system.
Microsoft software licensing services	HP can help you manage Microsoft licensing on a worldwide basis, optimizing software procurement and deployment for your entire organization.
Global deployment services	HP's onsite installation services are fully coordinated with our integration services to get your Microsoft Exchange solution up and running quickly and reliably.
Support services	After HP has helped you build the messaging and collaboration solution, we keep it running strong with industry-leading software and hardware and network support services. These comprehensive services provide a single point-of-contact for both HP and multivendor products.

enterprise Exchange bill of materials

The following is a BOM representing the hardware and software used in the example Exchange solution configuration in Figure 2 of this blueprint.

Bill of Materials		
Exchange Server		
QTY	**DESCRIPTION**	**COMMENTS**

8	HP ProLiant DL580 G2 servers in the following configuration:
	  4 Processors (1.6GHz)
	  4 GB or more of 200 MHz ECC SDRAM
	  Redundant power supplies
	  Monitor, keyboard, and mouse
		Windows 2000 Advanced Server (SP2 or better)

8	HP NC7770 PCI-X Gigabit Server Adapters	Each server uses one NIC for the cluster heartbeat
16	HP 36GB 10K Ultra3 Wide SCSI-3 Universal Drives	Min 2 , Max 4 for each server. 73GB drives available
16	HP 64-bit, 66 MHz Fibre Channel HBA	
SAN Hardware Components		
QTY	**DESCRIPTION**	**COMMENTS**
2	HP StorageWorks SAN Switch 2/16	
22	Optical SFPs	
HP Tape Libraries		
QTY	**DESCRIPTION**	**COMMENTS**
4	HP StorageWorks MSL5030 Tape Library, 2 Drive, Rack Mount	
1	MSL5000 Universal Passthru Mechanism	Provides for interconnect between first two libraries
1	MSL5000 Passthru Extender	Provides for interconnect between additional libraries
8	HP StorageWorks Ultrium 230 Tape Drive (LVDS)	Included in tape library
Tape Media		
QTY	**DESCRIPTION**	**COMMENTS**
80	HP Ultrium Data Cartridge, 200GB	
1	Ultrium Cleaning Cartridge	Minimum
Disk Array		
QTY	**DESCRIPTION**	**COMMENTS**
1	HP StorageWorks Disk Array XP1024, 10GB cache, 1GB shared memory	
9	36GB disk drives	2 Array Groups + 1 hot spare
21	73GB disk drives	5 Array Groups + 1 hot spare
Application Software		
QTY	**DESCRIPTION**	**COMMENTS**
1	MS Exchange 2000 Enterprise	SP2 or better
1	HP OpenView Storage Data Protector	For management server
1	HP StorageWorks Command View	
1	HP Auto Path XP + media kit	Purchase 10-host license
1	HP StorageWorks Secure Manager XP + media kit	Purchase one 5 TB license or two 1 TB licenses
1	HP StorageWorks LUN Configuration Manager XP + media kit	Purchase one 5 TB license or two 1 TB licenses
1	HP StorageWorks Performance Advisor	Recommended

figure 5 - example enterprise Exchange solution BOM

for more information

Exchange solutions

Additional HP Exchange solution technical blueprints are available at
www.hp.com/products1/storage/application/email/info_library.html

      Entry-Level Exchange Solution
      Mid-Market Exchange Solution

For more business-level information, take a look at our business blueprint available at
www.hp.com/products1/storage/application/email/info_library.html

To get answers on additional Exchange implementation questions, contact your HP sales representative who can consult our Solution Design Wizard to tailor a solution that meets your requirements.

hp Exchange solution components

To get further information on the individual components, go to www.hp.com

hp services

A full range of Exchange services are available including planning, implementing, and evolving your Exchange solution as your needs change. For full details see www.hp.com/go/mstechservices. Available services include:

Exchange consulting services

HP consultants can help you build an always-on messaging infrastructure that your organization can depend on. Available consulting services include:

- readiness assessment
- planning and design
- migration planning
- implementation

HP can help you address your requirements for availability, manageability, server consolidation, storage and capacity planning, backup and restoration, co-existence with other messaging systems, global deployment, definition of service level objectives, and implementation of management policies.

support services

These comprehensive and flexible services provide single point-of-contact for both HP and multivendor products. Specific support services from HP include:

- software support
- multivendor hardware support
- multivendor network support