

hp StorageWorks rapid restore for Exchange 2000

Using hp StorageWorks Enterprise Volume Manager V2.0 and hp StorageWorks Enterprise Modular Array

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executive summary

The HP StorageWorks Rapid Restore for Exchange 2000 solution is a quick and complete method of recovering Microsoft Exchange 2000 databases with minimal disruption to Exchange services. The solution uses **clones** as a source for recovery and automated offline backups. A clone is a physical point-in-time copy of a data volume that can be used to perform an **extremely rapid restoration** of Exchange Information Stores.

Using the HP StorageWorks Enterprise Volume Manager (EVM) V2.0 and the HP StorageWorks Enterprise Modular Array (EMA), customers can create clones of their Exchange Server databases and resume full operation of their Exchange Server environments in minutes.

By using the information in this solution, customers can perform the following tasks:

- Create clones of Exchange 2000 databases
- Restore data from clones
- Create scripts to implement automated tape backups from clones

Administrators face lengthy delays when restoring an Exchange environment from tape. This solution, which is based on creating clones with EVM in a SAN-based configuration, reduces the restore time from hours to minutes and reduces disruption to Exchange users. These time-savings can be dramatic, as illustrated in the following diagram:

Elapsed application downtime while restoring an Exchange 2000 storage group

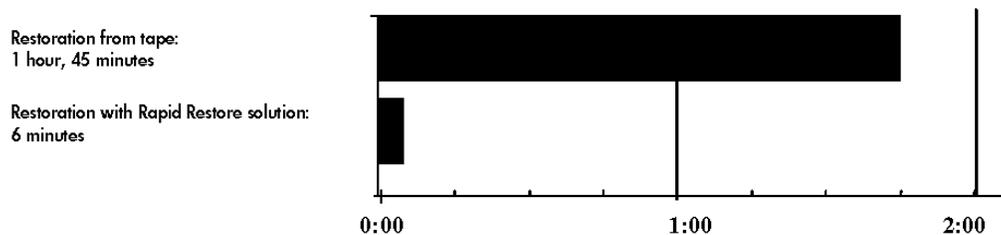


figure 1. comparative restoration times—Rapid Restore for Exchange 2000 solution as it compares to tape based restoration (single Exchange 2000 storage group with two databases, 3000 user load, logs not applied).

By using this solution to augment your tape-based recovery plan, you can recover your Exchange Information Stores rapidly, decreasing the amount of application downtime. Because a clone provides a copy of your production data, you can offload operations, such as tape backups, testing, and maintenance, from the production server to a backup server. The entire solution is engineered within Microsoft support guidelines.

“By partnering with companies like Hewlett-Packard, the worldwide prime integrator for Exchange 2000, we are able to deliver highly beneficial storage solutions to our customers. The **Rapid Restore for Exchange 2000** and Virtualized Storage Management for Exchange 2000 solutions take advantage of highly scalable and easy-to-manage storage systems and management software, and the company’s expertise in designing, deploying, and managing Exchange 2000 infrastructures. These HP StorageWorks solutions provide a great way for customers to maximize the availability of their Exchange 2000 environment.”

Kevin McCuiston
Microsoft Corporation Group Product Manager
Exchange

business needs

Businesses need reliable and continuously available Exchange data to serve customers and maintain productivity. Downtime that results from lengthy backup and restore processes promote lost revenue, poor customer satisfaction, and missed competitive opportunities. In addition, backing up Exchange databases can degrade Exchange performance for an extended period of time. A restore from the last-known good tape backup of the database can also result in an unacceptable period of downtime.

By making snapclones part of your backup and restore strategy, you can achieve the following results:

- Restore databases in minutes, as opposed to the hours usually required when restoring from backup tapes.
- Back up to tape directly or across the SAN. Since the backups are performed offline, users do not experience Exchange performance degradation.

The following additional solution details are documented in the Rapid Restore for Exchange 2000 implementation blueprint, which is available from your HP sales representative.

- Procedures for restoring an Exchange environment from clones
- Information regarding performance, sizing, and characterization
- Best practices specific to Exchange environments
- Scripts for automating the clone creation and backup process
- Procedures for integrating with backup applications, such as VERITAS Backup Exec and CommVault Galaxy

features and benefits

This solution provides the following benefits to the Exchange administrator:

- Dramatically improves restoration times for Exchange 2000 databases
- Includes best practices for maximizing Exchange 2000 availability during database recovery
- Simplifies implementation and management, includes automation examples
- Engineered within Microsoft guidelines to maintain data integrity
- Protects investment by leveraging existing HP hardware and software, supporting multiple configurations, and providing interoperability with future products
- Integrates with the leading tape backup applications for Exchange—specifically tested with VERITAS Backup Exec V8.6 and CommVault Galaxy V3.7.1

about clones and snapshots

With the Enterprise Modular Array, you can create traditional snapshots and clones. Clones are the powerful recovery technology used in this Rapid Restore for Exchange 2000 solution.

Snapshots

Snapshots require that you reserve and set aside space equal to the size of the original active volume. Data is not written into this reserved space until necessary. As data changes in the original volume, the original data is written to the snapshot. Snapshots can be created quickly and are immediately available for use. Since snapshot volumes share data with the original production volume (those blocks that have not changed), they can only be used to recover from data loss or corruption as a result of writes to the original database.

Clones

A clone is a complete physical copy of the original data. Clones require the allocation of storage capacity that is at least equal to the size of the production volume. Clone creation is not immediate, as the original data must be copied to the clone volume. You can improve the clone creation time by creating a triple mirror set (RAIDset with an additional mirror copy) up front so as to eliminate the time required to create the original clone volume. However, resynchronizing the RAIDset with the clone volume requires time for updating with the production volume.

table 1. comparison of clones and snapshots

	Clones	Snapshots
Array (controller) support	EMA (HSG80)	EMA (HSG80)
Storage capacity allocation	Equal to the production volume	Equal to the production volume
RAID level	RAID 0, 1, 5	RAID 1, 5
Data recovery	Physical copy of the production volume, available for point-in-time recovery. Requires re-synchronization.	Virtual copy of the production volume, available immediately for point-in-time recovery. Not available to restore in cases where production volume is lost.

solution overview

The Rapid Restore for Exchange 2000 solution, a validated and fully integrated configuration, provides a SAN-based backup and restore infrastructure for end-to-end data protection. This solution leverages the capabilities of EVA V2.0, EVM V2.0, and the HP StorageWorks Enterprise Backup Solution (EBS) as illustrated in Figure 2.

Application + Disk Array + Replication Software + Backup Infrastructure = Solution

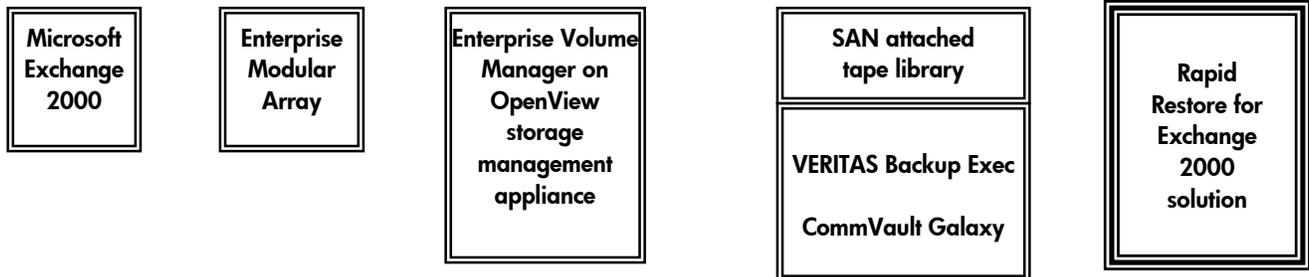


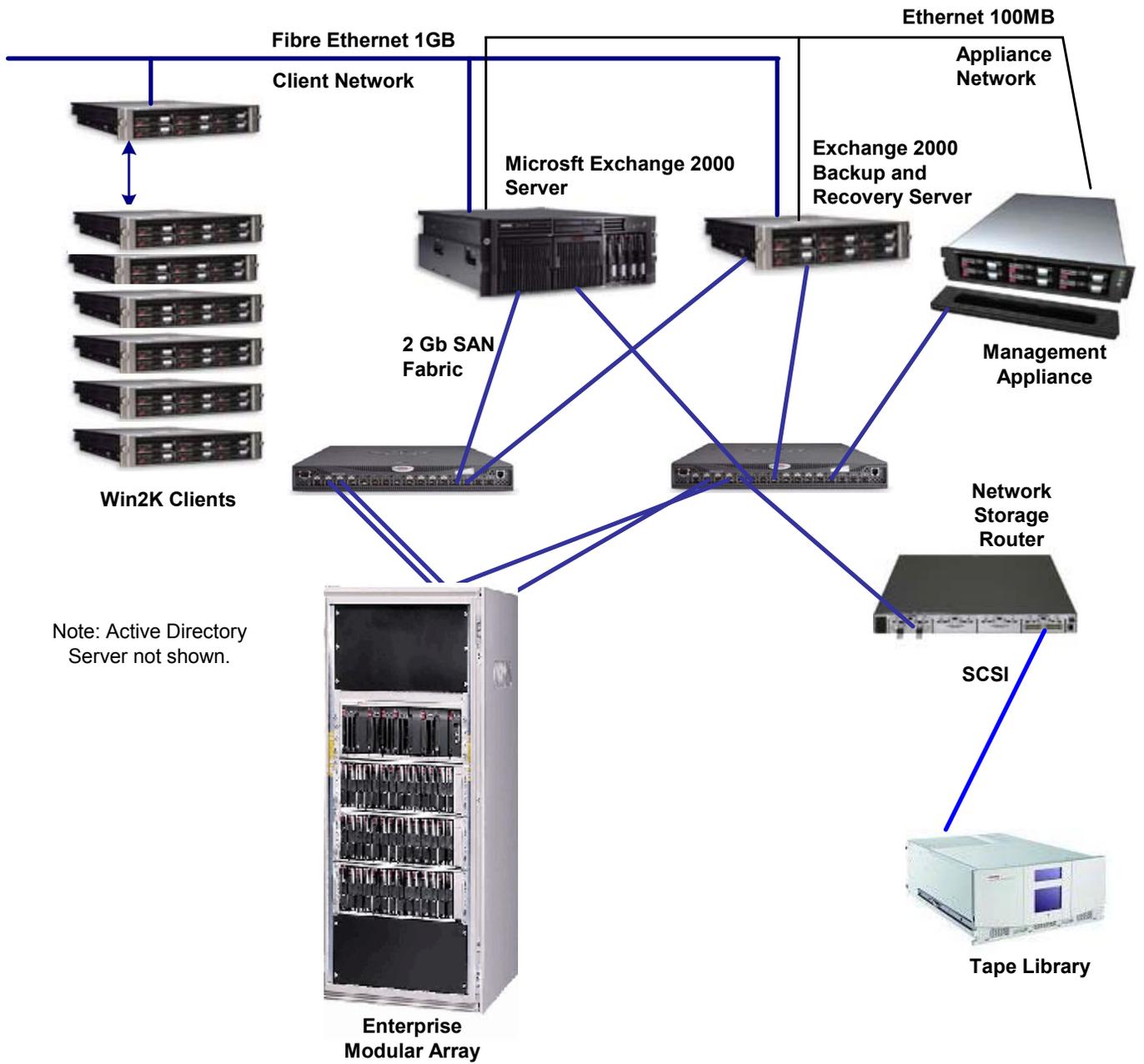
figure 2. Rapid Restore for Exchange 2000 solution building blocks

solution components

Rapid Restore for Exchange 2000 consists of the following core components:

- **Microsoft Exchange 2000**
You can configure the Exchange 2000 application on any Windows 2000 server.
- **Enterprise Modular Array (EMA)**
The Enterprise Modular Array contains the Exchange 2000 database and log volumes. Clones are created on the array using array controller software (ACS), which operates the storage subsystem. Based on the HSG80 controller, EMA is a high-performance, high-capacity, and high-availability RAID storage solution.
- **Enterprise Volume Manager (EVM)**
Enterprise Volume Manager is a browser-based storage management software that facilitates controller-based clone operations to make block-to-block copies of storage volumes. With EVM, you can create, run, and manage automated storage replication jobs, as well as link them with external jobs. You must have an EVM host agent on each database server to utilize controller-based database cloning. The HP OpenView Storage Management Appliance is the operating platform for EVM, which offloads the processing from the host systems.
- **SAN-Based Backup Infrastructure**
Enterprise Backup Solution with VERITAS Backup Exec 8.6 or CommVault Galaxy 3.7.1 backup software provides SAN-based backup-and-restore operations for clone-based tape backups. You must use a SAN-attached backup configuration when using this solution for clone-based offline tape backups. You must use a separate backup host with the backup application loaded and viewable to the storage subsystem to act as the dedicated backup server. For granular backups and restores, a copy of the Exchange 2000 application must exist on the backup server.

figure 3. Rapid Restore for Exchange 2000 solution configuration



hardware and software components

Figure 4 and table 2 provide lists of suggested components for the solution.

figure 4. Rapid Restore for Exchange 2000 solution recommended components

<p>Exchange 2000 Server hp ProLiant DL580 G2</p>		<p>4-Way Xeon 2.0 GHz, 4 GB ECC SDRAM (4) 36 GB, universal disk drives Integrated Gigabit Ethernet NIC NC6136 StorageWorks FCA2101 2 Gb FC HBA</p> <p>Windows 2000 Advanced Server SP2 Exchange 2000 Enterprise Edition SP3 Enterprise Volume Manager 2.0D Client StorageWorks secure path v4.0</p>
<p>Backup Server hp ProLiant DL380 G3</p>		<p>(2) 2.4 GHz processor, 4 GB SDRAM (6) 36 GB, universal disk drives Integrated Gigabit Ethernet NIC NC6136 HP NC3164 Gigabit Ethernet NIC StorageWorks FCA2101 2 Gb FC HBA</p> <p>Windows 2000 Advanced Server SP2 Exchange 2000 Server* Enterprise Volume Manager 2.0D Client StorageWorks secure path 4.0</p> <p>Backup Application Software and associated agents (choose one): hp storage data protector v5.0 VERITAS Backup Exec v8.6 VERITAS NetBackup v3.4,v4.5 CommVault Galaxy 3.7.1</p> <p>* Allows for individual mailbox restores and / or offline integrity checks.</p>
<p>SAN Management Appliance hp OpenView storage management appliance</p>		<p>OpenView storage management appliance OpenView storage management appliance software StorageWorks Enterprise Volume Manager 2.0C</p>
<p>Fibre Channel Switch hp StorageWorks SAN switch 2/16</p>		<p>(16) 1 Gb / 2 Gb universal auto-sensing ports</p>
<p>Enterprise Storage hp StorageWorks modular SAN array</p>		<p>StorageWorks Enterprise Modular Array HSG80 dual controllers, 512MB mirrored cache ACS V8.6-4 Firmware StorageWorks Windows 2000 V8.6 platform kit (42) 36GB Ultra3 SCSI 10K Disk Drives</p>
<p>Tape Library hp StorageWorks MSL5026</p>		<p>StorageWorks MSL5026SL library (2) StorageWorks SDLT 220 tape drives StorageWorks network storage router n1200</p>

table 2. recommended hardware and software components

	Quantity	Part Number
Exchange Server		
HP ProLiant DL580 G2 server—Intel Xeon 2.0 GHz	1	201203-001
RAM upgrade, 2-GB ECC SDRAM	1 ea	202171-B21
HP NC6136 Gigabit Server NIC	1 ea	203539-B21
36.4-GB Wide Ultra3 SCSI 15,000-rpm Universal Disk Drives	4 ea	232916-B22
FCA 2101 2-Gb FC HBA	2 ea	245299-B21
Windows 2000 Advanced Server with SP2	1 per server	Microsoft
Microsoft Cluster Server (MSCS)	1 per server	Microsoft
Microsoft Exchange 2000 Server 2000 Enterprise Edition with SP3	1 per server	Microsoft
HP StorageWorks EVM 2.0D Client	1 per server	included in EVM 5 host license pack
HP StorageWorks Secure Path 4.0 (5-License Pack)	1 per server	231292-B22
Backup/Recovery Server		
HP ProLiant DL380 G3 server—Intel Xeon 2.4 GHz	1	257917-001
RAM Memory Upgrade, 512-MB ECC SDRAM	1	300678-B21
HP NC6136 Gigabit Server NIC	1	203539-B21
36.4-GB Wide Ultra3 SCSI 15,000-rpm Universal Disk Drives	2	232916-B22
FCA 2101 2-Gb FC HBA	2	245299-B21
Windows 2000 Advanced Server with SP2	1	Microsoft
Microsoft Exchange 2000 Server SP3	1	Microsoft
HP StorageWorks EVM V2.0D Client	1	included in EVM 5 host license pack
HP StorageWorks Secure Path 4.0	1	included in Secure Path - 5 license pack
Management Appliance		
Storage Management Appliance II	1	189715-002
HP OpenView Storage Management Appliance Software V2.0		requires Web download
HP StorageWorks EVM V2.0D (Starter kit, 5 host licenses)	1	263670-B22
Storage - Enterprise Modular Array		
Enterprise Modular Array—EMA 12000 (60 Hz) 41U Modular Storage Cabinet (Blue) with 1 Controller Enclosure and 3 Dual Bus 14-bay drive enclosures	1	175993-B21
HSG80 Array Controller with 256-MB cache (2 are required for redundancy)	2	176622-B21
256-MB Cache Module (for 512 total cache)	2	380674-B21
External Cache Battery	2	135823-B21
18GB, 10K rpm, Ultra3 SCSI, 1 inch disk drive	14	142673-B22
36GB, 10K rpm, Ultra3 SCSI, 1 inch disk drive	28	176496-B22
HSG80 Solution Software for Windows NT/2000	1	279811-B21
ACS v8.7S Controller FC-SW and Snapshot Software	1	222364-B23

table 2. hardware and software components (cont.)

SAN		
2Gb 16-Port SAN Switch	2	287055-B21
2Gb SFF-SW Transceiver kit	32	221470-B21
Fibre Channel Cables	As required	234457-B2x
Backup		
MSL5026SL RM SDLT MiniLibrary (2 drives)	1	302512-B22
MSL5000 Embedded Fibre option e1200	1	262672-B21
CommVault Galaxy 3.7.1 with associated agents	optional	CommVault
VERITAS Backup Exec 8.6 with associated agents	optional	VERITAS

test environment

This section describes the baseline configuration used in the testing of this solution.

Note: Some of the “as tested” components may differ from those models shown in the suggested components list – figure 4 and table 2.

network configurations

A gigabit Ethernet network segment was configured for client access to the application servers. A second 10/100 Mbps network segment was set up for the Management Appliance and its applications.

The SAN was configured with two redundant 1-Gb 16-port SAN switches and managed by the HP OpenView Storage Management Appliance. Two Fibre Channel paths are required for each server for a fully redundant configuration.

Exchange backup/recovery server

A dedicated ProLiant 8500 server (8-way, Pentium III, 700 MHz), loaded with Microsoft Windows 2000 Advance Server SP2, was used for SAN-based tape backups. Exchange 2000 Server SP3 was installed on the backup/recovery server. This method provided individual Exchange 2000 mailbox restores, offline integrity checks, and the ability to test new versions of software.

By mounting the clones on the backup/recovery server, the database and logs can be backed up to a tape library without impacting the production Exchange 2000 server. VERITAS Backup Exec 8.6 and CommVault Galaxy 3.7.1 were separately installed and used as the backup applications. The databases and logs were backed up to an HP SSL2020 AIT tape library with two AIT 50/100 drives.

Exchange servers

The Exchange 2000 servers used Microsoft Windows 2000 Advanced Server SP2. Two ProLiant 8500 servers (8-way, Pentium III, 700 MHz) were attached to the SAN using two KGPSA (1-Gb HBA) adapters. Each server used HP StorageWorks Secure Path V4.0 to manage a high-availability multiple path Fibre Channel connection to the SAN.

clients

Seven clients were connected to the Gigabit Ethernet network. All clients had identical configurations. Microsoft LoadSim was used to generate an MMB2 load. The load was balanced across six clients with 450 users each, and the seventh client acted as a control unit with 300 users.

Exchange configuration

The following example Exchange 2000 configuration was tested during solution development. This information is intended as a guide for configuring a comparable Exchange 2000 Rapid Restore solution to meet your specific needs and may be modified as required. The assumptions, design rules, and scalability options are provided for further reference.

Two Exchange storage groups, SG1 and SG2, were created. The first storage group contained two databases and a public folder store. The second storage group contained two databases. Each storage group contained 1500 mailboxes (750 mailboxes in each database).

Circular logging was disabled in both storage groups so that the transaction logs could be rolled forward during restoration.

enterprise modular array configuration

All 3000 Exchange users, each with 50-MB mailboxes, were equally distributed within each database. Each storage group contained 1500 mailboxes (750 mailboxes per database). The .EDB and .STM files were separated from the transaction logs by placing them on separate volumes within the EMA. Two volumes were created for each storage group's database files and two volumes were created for each storage group's log files.

Storage Group 1

Database (EDB, STM) files: (6) 36 GB disks (RAID1+0)

Log files: (4) 18 GB disks (RAID1+0)

Storage Group 2

Database (EDB, STM) files: (6) 36 GB disks (RAID1+0)

Log files: (4) 18 GB disks (RAID1+0)

Each storage group database volume used approximately 41GB of storage capacity (includes two database files and public folder store).



figure 6. Disk Layout—Enterprise Modular Array

performance results

The following best practices were used when configuring the Exchange environment:

- Traditional Microsoft Exchange 2000 configuration rules apply when planning storage configurations. Use RAID1 for EDB, STM, and log files. Always keep log files on volumes that have been configured using RAID1 because of heavy write activity.
- When configuring data and log files, it is an HP best practice and Microsoft recommendation to use different disk groups for log files and data files. Using this strategy, the log files will always be located on different volumes than the data files.

A baseline configuration was developed to determine the impact of clones on the Exchange Server 2000 database. All performance tests were compared against this baseline configuration.

Test 1. Baseline with EVM

EVM V2.0C was installed into the SAN environment and a baseline test was performed to determine the impact of EVM on the Exchange 2000 Server and SAN performance. Two sets of baseline performance data were collected, one with the SAN appliance turned off and another where the SAN appliance was active with EVM installed but not running.

Results: Introducing EVM into the Exchange 2000 Server/SAN environment did not have an impact on the application or network performance. The baseline performance numbers remained acceptable.

Test 2. Creating clones with EVM

Two separate tests were conducted. One test created a clone of the databases and a clone of the transaction logs, and the second test created a clone of the databases only. In the second case, the transaction logs were copied to a disk folder after the database clone was split off.

A "quick" clone volume of one Exchange storage group consisting of 2 databases and a public folder store was created with EVM. With quick cloning, three members of each mirrorset are already present at the start of the EVM job. EVM splits the third member off to form an independent LUN.

In order to remain within Microsoft support guidelines, Exchange suspends services to the storage group whose database is being cloned while the associated clone is being created. Note that all other storage groups remain active.

Results: The storage group was down for approximately 5 minutes when splitting off the clone of the databases and transaction logs. The storage group was down for approximately 2.5 minutes when splitting off a clone of just the databases. Exchange mailboxes within the affected storage groups are not accessible during this period.

Test 3. Clone-based backup

A clone of one storage group was created, split off, mounted on a remote backup server, and backed up to tape. Third-party backup applications were used to backup the clone from the backup server to a tape library. A separate zone was created on the SAN switch so that only the backup server had access to the tape library.

Results: Clone-based backups are completed in slightly less time than Exchange online backups. See table 3. During the backup process, the clone-based backup is not associated with the Exchange application server, eliminating any influence of backup on the Exchange performance.

Test 4. Clone-based restore

The time it takes to restore one storage group when creating a clone of the database and logs was compared to an online restoration from tape. Third-party backup applications were installed on the Exchange server and used to restore one storage group while the other storage group continued to operate under load. Data was transferred from the tape library to the Exchange server over the SAN.

Results: Restoring a storage group using clones is significantly faster than restoring from tape. See table 3. Note that additional time should be included when using the Exchange utilities such as ESEFILE and ESEUTIL, which may be used to check database integrity after restoring from tape. Since a clone is a copy of the entire volume, the restore time of a clone remains constant even as the size of the datastores is increased, while the tape restore times will increase proportionally.

table 3. backup and restore performance using clones (EMA/HSG80)

Backup Performance Results	Time
online backup to tape (SAN) using third-party backup applications	2 hours, 52 min
clone backup to tape	2 hours, 49 min
Restore Performance Results	
restore from clone	6 min
restore from tape	1 hour, 45 min

Note: Backup times in Table 3 reflects use of AIT 50/100-GB drives (6 MB/s native).

why HP?

- HP provides tested and supported Exchange Solutions built with world-class servers and storage, supported by a single point of contact—HP.
- HP is the only Prime Integrator of Exchange 2000 as designated by Microsoft and has over 2.7 million Exchange 2000 seats under contract
- HP servers and storage arrays are Microsoft-certified platforms
- HP storage is being used to support Microsoft's corporate Exchange infrastructure as well as a development platform for Exchange

"...HP is as knowledgeable on Exchange as it gets. In fact, HP has more people dedicated to working on Exchange than Microsoft has developing the product. When it comes to deployment what works and what doesn't for real customers in the real world they are the clear experts."

Eric Lockard
Former General Manager
Exchange Business Unit
Microsoft Corporation

for more information

A companion implementation blueprint is also available for this solution that provides detailed and in-depth information. See your HP sales representative or authorized reseller for more information.

For additional information on the Rapid Restore for Exchange 2000 solution:

<http://h18000.www1.hp.com/products/storageworks/solutions/rrex2k/index.html>

HP Services for Microsoft Exchange:

<http://h18005.www1.hp.com/services/messaging/>

Microsoft Exchange 2000 information:

<http://www.microsoft.com/exchange/default.asp>

HP StorageWorks Enterprise Modular Array information and documentation:

<http://h18006.www1.hp.com/products/storageworks/ma8kema12k/index.html>

HP OpenView Storage Management Appliance information and documentation:

<http://h18006.www1.hp.com/products/sanworks/managementappliance/index.html>

HP StorageWorks Enterprise Volume Manager documentation:

<http://h18006.www1.hp.com/products/sanworks/evm/index.html>

HP StorageWorks Business Continuity Solutions:

<http://h18006.www1.hp.com/storage/solutions/bcontinuity.html#dpr>

HP StorageWorks Tape Storage Systems:

<http://h18006.www1.hp.com/storage/tapestorage.html>

HP OpenView Storage Data Protector information and documentation:

www.openview.hp.com/products/dataprotector/index.asp

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