



# PS SERIES BEST PRACTICES DEPLOYING MICROSOFT® EXCHANGE SERVER 2007 IN AN iSCSI SAN

## ABSTRACT

This Technical Report describes how to deploy Exchange Server 2007 in an iSCSI SAN using PS Series storage arrays. It provides configuration and management recommendations and best practices for Exchange 2007 and the PS Series SAN.



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January 2008

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PS Series Firmware Version 3.2 or later.

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## REVISION INFORMATION

Version	Date	Description
1.0	November, 2007	Initial Release

The following table shows the software and firmware versions used.

Vendor	Model	Software Revision
Microsoft®	Windows® Server™ 2003 64-bit All Editions	SP2
Microsoft	Exchange Server 2007 64-bit All Editions	Version 8 (Build 685.24)
Microsoft	iSCSI Software Initiator	Version 2.04
QLogic	SANsurfer Manager	4.03.18
QLogic	QLogic QLA405x iSCSI HBA	BIOS: 1.09 Firmware: 2.0.0.45
EqualLogic®	Host Integration Tools Kit for Microsoft Windows	Version 2.2.1 and above.
EqualLogic	PS Series Firmware	Version 3.2

The following table lists the documents referred to in this Technical Report. All EqualLogic Technical Reports are available on the Customer Support site at: <https://www.equallogic.com/support/>

Vendor	Document Title
EqualLogic	Deploying Windows Server 2007 in an iSCSI SAN Technical Report
EqualLogic	Microsoft Windows: Expanding Basic Disk Volumes Technical Report
EqualLogic	Storage Array Network Performance Guidelines Technical Report
EqualLogic	Booting Windows Server 2003 from an iSCSI SAN Technical Report
EqualLogic	Deploying Microsoft Multipath I/O in an iSCSI SAN Technical Report
EqualLogic	Microsoft Windows: Aligning Disk Sectors for Optimal Performance Technical Report
Microsoft	<a href="#">Troubleshooting Exchange Server 2007 Performance</a>
Microsoft	<a href="#">Microsoft Exchange Server 2007 – Deployment</a>
Microsoft	<a href="#">Exchange Server 2007 Operations</a>
Microsoft	<a href="#">Microsoft Exchange Analyzers</a>

## **INTRODUCTION TO EXCHANGE 2007 AND PS SERIES STORAGE**

Microsoft Exchange Server 2007 is a messaging and collaboration server with many new features that may impact your storage needs. Exchange 2007 includes support for Unified Messaging (UM). Unified Messaging combines multiple messaging infrastructures into a single messaging infrastructure. Therefore, Exchange 2007 users who are enabled for Unified Messaging can receive all voice mail, e-mail, and fax messages in their Exchange 2007 mailboxes. Exchange 2007 also includes many new messaging compliance features. You can use the policy and compliance features of Exchange 2007 to apply rules to messages that are sent and to enforce retention requirements for stored data. The new Messaging Records Management (MRM) feature in Exchange 2007 helps users and organizations retain the messages that they need for business or legal reasons. As the use of e-mail expands and combines with voice, fax and compliance requirements many Exchange installations face ever-growing demands for increased storage space, higher performance, and increased recoverability. To handle these demands, many corporations deploy complicated and inflexible solutions such as Direct Attached Storage (DAS), Network Attached Storage (NAS), and traditional (non-virtualized) SANs.

With any SAN, you can consolidate storage resources and provide a more scalable configuration than DAS or NAS, while also improving performance and simplifying management. In addition, a SAN can deliver high-end functionality like snapshots and data replication that not only improve data protection and recovery capabilities, but also enhance Exchange operations. However, much SAN technology consists of expensive and complex offerings that are difficult to implement and manage.

To provide storage consolidation for any enterprise, PS Series storage arrays from EqualLogic enable you to set up an IP-based (iSCSI) SAN that delivers performance, scalability, recoverability, and resilience beyond that delivered by other SANs. To work with a PS Series SAN, all a server needs is a standard iSCSI initiator. Once connected to a PS Series SAN, volumes on the SAN appear as regular disks, which can be formatted and managed as usual—it's that simple.

Integrated virtualization software makes a PS Series SAN easy to manage, providing automatic RAID configuration, disk sparing, data provisioning, replication, and load balancing. For reliability, PS Series storage arrays include redundant, hot-swappable hardware, including disks, control modules, fans, and power supplies. Increasing volume size, like most SAN management tasks, is a point-and-click operation.

To expand SAN capacity, you can group together multiple arrays—storage and performance scale linearly. With multiple arrays in the SAN you gain the ability to create a tiered storage solution along with pools, in effect SANs within the SAN. Storage has never been this easy to use.

By deploying Exchange Server with a PS Series SAN, businesses can combine the industry-leading messaging and collaboration application with reliable, scalable, and high-performance disk storage to meet the ever-expanding needs of e-mail users.

To get the maximum benefits from Exchange and PS Series storage, you should adhere to the best practices for Exchange Server, as outlined by Microsoft and industry experts. In addition, this Technical Report contains requirements and recommendations for deploying Exchange Server with PS Series storage, including best practices for performance, reliability, scalability, flexibility, and recoverability. The best practices described in this report are applicable to all versions of Microsoft Exchange. The examples in this Technical Report were created using Microsoft Exchange Server 2007 running on Microsoft Windows Server 2003 64-bit. Key issues addressed by this report are:

- Design considerations, including availability, performance, scalability, and management.
- How to set up a PS Series group and volumes.
- Benefits of booting servers from a SAN.
- How to set up an Exchange server, including optimizing the server and connecting to volumes.
- Configuring Exchange to use PS Series volumes.
- Expanding SAN capacity and file systems without affecting availability.

- Backing up Exchange data.

## **BENEFITS OF DEPLOYING EXCHANGE WITH PS SERIES STORAGE**

The benefits of deploying Exchange server with a PS Series SAN are as follows:

- **Rapid deployment and configuration of storage** – A PS Series SAN can quickly be operating and providing storage for Exchange. A simple setup utility lets you quickly configure an array on the network and create a PS Series group. Automation of complex operations such as RAID configuration, disk sparing, data provisioning, and load balancing means that even users new to SAN technologies can effectively manage the SAN.
- **Redundant hardware and hot serviceable configuration** – PS Series storage arrays are fully redundant with dual controllers, power supplies, and fans—all of which can be serviced online and without disrupting applications. The Auto-Stat Disk Monitoring System (ADMS) automatically scans drives in the background to ensure optimal data availability.
- **Data protection.** All data is protected with RAID and spare disks. Combined with “hot” service capabilities, online operation is assured. Volume snapshot, clone, and replication protection capabilities are available and included at no extra cost.
- **Simple and immediate storage expansion** – Using modular PS Series storage arrays as the Exchange Server storage solution, you can increase SAN storage capacity and performance online, without server or application disruption.
- **SAN boot capability** – Not only do iSCSI host bus adapters (HBAs) increase I/O performance, they also provide the ability to install and boot the Windows operating system from a PS Series volume (some NIC’s provide this also), increasing disaster tolerance. When server hardware fails, the unit can be quickly removed and replaced with a similarly-configured spare hardware platform. This new platform can be directed to the SAN boot volume and, in minutes, resume providing application services. Other benefits of SAN boot include centralized storage management and reliable and highly available storage resources that eliminate the need for mirrored boot volumes.
- **Network path protection and load balancing** – Using multiple NICs or iSCSI HBAs with the Microsoft iSCSI Initiator service, you can configure multipath I/O and increase the reliability and performance of Exchange Server. Also known as MPIO, multipath I/O enables the dynamic load balancing of iSCSI SAN traffic across redundant paths between the Exchange server and the PS Series SAN.
- **Excellent Performance** – PS Series arrays provide excellent performance and scaling automatically, as demonstrated by Exchange Solution Reviewed Program results. The Microsoft Exchange Solution Reviewed Program (ESRP) – Storage website (<http://technet.microsoft.com/enus/exchange/bb412164.aspx>.) contains detailed information on specific Exchange solutions operations.
- **Advanced Management features.** PS Series storage comes standard with a comprehensive set of features including:
  - Automatic load balancing
  - Virtual volume management
  - Thin Provisioning
  - Space-efficient snapshots for instant backup and restore
  - Volume cloning for rapid server provisioning

- Multipath I/O (MPIO) support
  - Cluster support
  - Auto-replication for a comprehensive disaster recovery solution
  - Storage pools creating a “SAN within a SAN”
  - Member-by-member RAID level control
  - Collections (consistency groups) tying volumes together across arrays and pools
- **VSS-based backups** – The EqualLogic Host Integration Tools kit includes a VSS provider, called Auto-Snapshot Manager for Windows, that interacts with the PS Series storage, the Windows Server 2003 VSS writer, and a VSS requestor backup application to dramatically improve backup operations by creating flexible, space-efficient, point-in-time-copies of data called snapshots or Smart Copies.
  - **Thin provisioning database and Log volumes** – With PS Series thin provisioning capability, administrators have the option to pre-allocate storage resources for Exchange Server. This type of storage allocation eliminates the pains of expanding available storage when the application requires it. Repeated data growth operations can be avoided and the result is improved utilization of physical storage resources.
  - **Remote site volume replication** – With the PS Series auto-replication capability, Exchange Server data can be automatically transferred to remote data centers, protecting the data from serious failures, ranging from the destruction of the volume to a complete site disaster—with no impact on data availability or performance.

## PLANNING AND DESIGN CONSIDERATIONS

When designing an Exchange Server environment, you should understand these challenges:

- Reliability, Availability, and Serviceability
- Performance
- Scalability
- Recoverability
- Ease of management
- Service level commitments

It is critical to focus on these challenges *before* you begin the initial Exchange installation. The EqualLogic Technical Report, [Deploying Microsoft Windows Server 2003 in an iSCSI](#), describes how to design a robust server and network environment that uses PS Series storage to overcome the challenges IT manager’s face today. The Microsoft Exchange Server Best Practices Analyzer Tool (ExBPA) version 2.7 and later includes an Exchange 2007 Readiness Check scan that can be used to assess an organization's readiness for Exchange 2007. [Microsoft Exchange Server 2007](#)

### Reliability, Availability, and Serviceability

The environment must be robust, resilient, and easily repaired by hot swapping components while the system remains available. In a SAN configuration, the server, network, and storage arrays should all have a robust level of fault tolerance to avoid costly downtime and allow scheduled maintenance to take place without service disruption. Special attention should be placed on fault isolation and overall operations while system components are being serviced.

You can easily build fault tolerance into your Exchange Server storage environment by using PS Series storage arrays, which provide high availability and scalability, in addition to hot-swappable hardware and MPIO support.

### **Performance**

The Exchange environment must provide optimal performance and response time. Access to Exchange data is crucial to the day-to-day operations of most companies, and under-performing storage can have a devastating effect on the overall performance of Exchange and on your company's productivity.

A SAN built with PS Series storage automatically optimizes its own performance and improves that performance as you add additional arrays to the SAN. If you are planning a large deployment, you may need to isolate the Exchange workload from other application workloads. You can do this by creating separate storage pools for Exchange-related volumes within the PS Series group. The ESRP results from EqualLogic demonstrate the leadership performance offered by PS Series arrays.

<http://technet.microsoft.com/enus/exchange/bb412164.aspx>

### **Scalability**

As your workload grows and storage capacity needs increase, the environment must accommodate changes without affecting users. Storage used in an Exchange Server environment must be highly scalable to accommodate not only growing numbers of users, but also the ever-growing amount of data each user needs to store in Exchange.

Modular PS Series storage arrays provide easy, online scalability.

### **Recoverability**

It must be possible to recover from situations that can cause data loss, ranging in scale from a corrupted or infected file to the loss of an entire data center due to hostile action or act of nature.

PS Series storage arrays deliver snapshots and auto-replication technology as standard features, enabling automatic backup and disaster recovery capabilities for your critical data. Designing your environment with separate volumes for Exchange databases and transaction logs can improve backup and recovery performance.

### **Ease of Management**

Setup and configuration, backup and recovery, and day-to-day administration should be handled easily and have minimal impact on operations and users.

PS Series storage automates complex tasks like RAID configuration and provides both graphical and command line user interfaces for easy and intuitive storage management.

### **Service Level Commitments**

Organizations often have varying service level requirements across applications. One application might be critical to business results, while another might require segregation of storage resources to meet application best practices or organizational needs.

PS Series storage allows for differing performance and availability levels through the choice of arrays and RAID levels, while the ability to store data on physically discrete pools allows a PS Series storage to meet data segregation commitments.

**Figures 1a & 1b show examples of Exchange high-availability environments.**

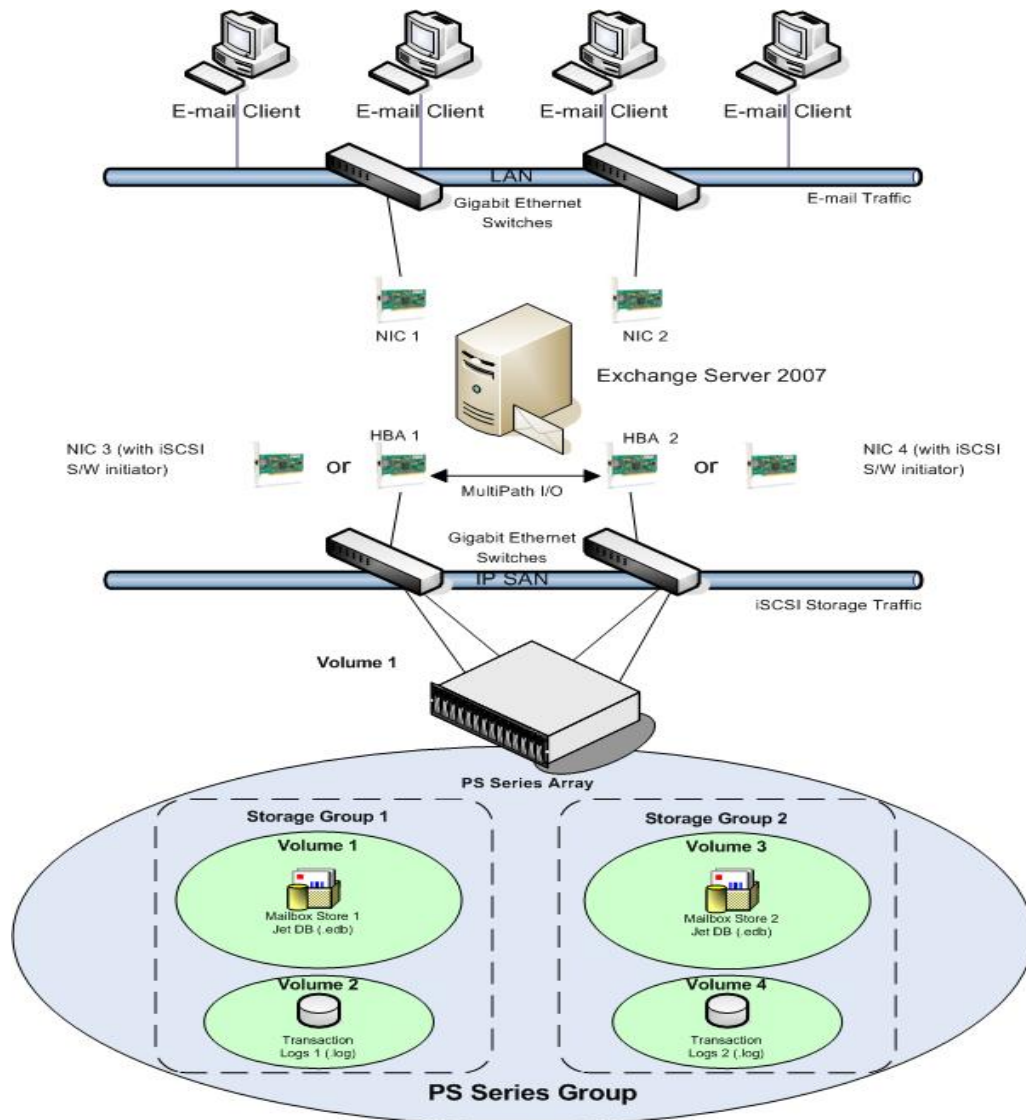


Figure 1a

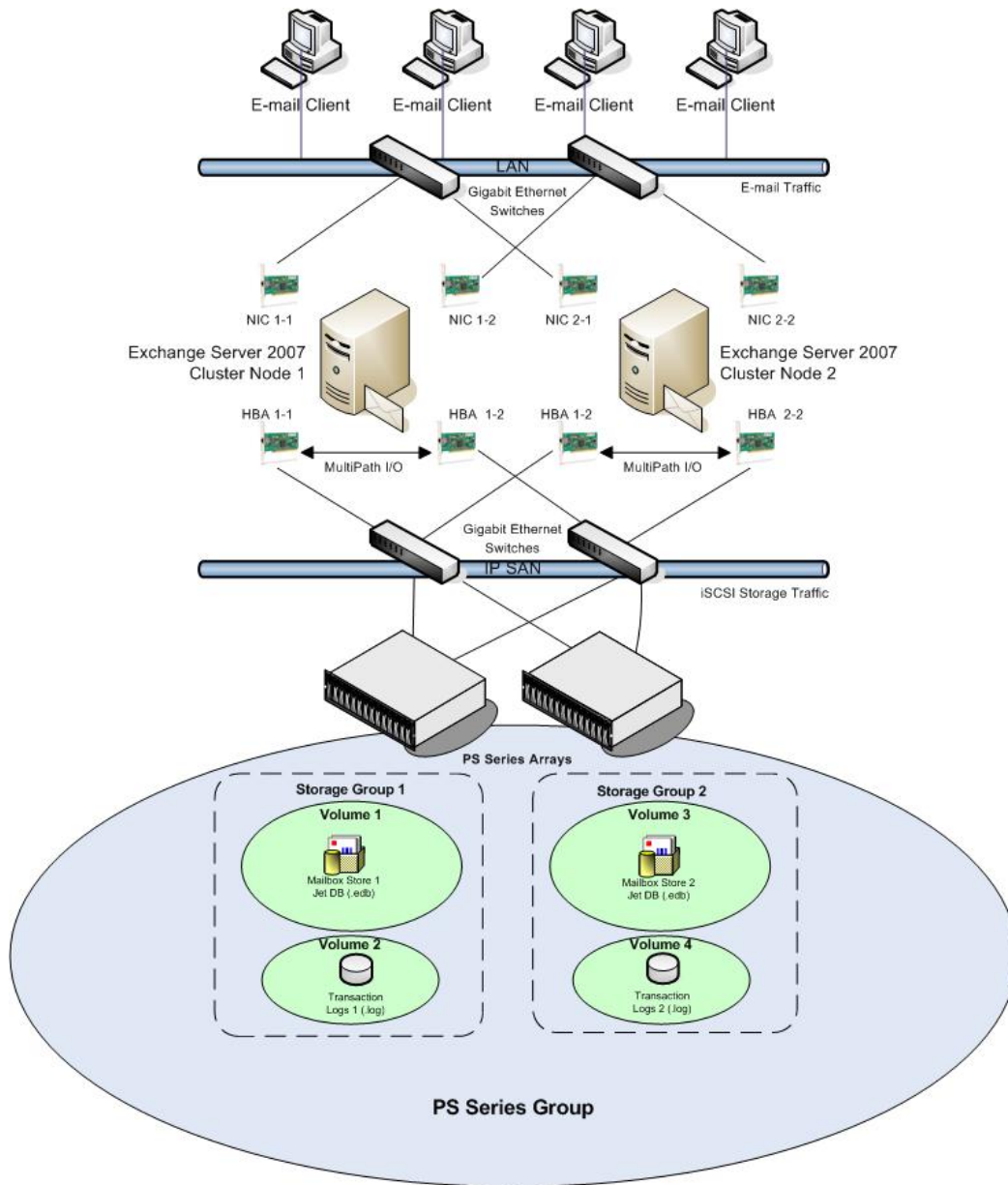


Figure 1b

## Exchange Server Memory Resources

Exchange Server 2007 works best with adequate memory resources. This version of Exchange as a result of moving to a 64-bit architecture enables much better memory utilization than previous versions of Exchange Server. For example, because of the virtual address space limitations of a 32-bit platform, Exchange Server 2003 is limited to using 4 gigabytes (GB) or less of physical memory. In contrast, Exchange 2007 can use 32 GB of memory and more.

Inadequate memory configuration can affect the storage I/O load and performance. An Exchange server configured with insufficient memory will generate heavier I/O loads to storage; alternately, configuring sufficient memory will make your Exchange installation more efficient in its use of storage resources. By making your server as tuned and efficient as possible, you can get the maximum benefit from using PS Series storage.

You can get detailed Exchange Server 2007 memory configuration guidelines from the Microsoft TechCenter article titled, [Memory Configuration Table for Exchange 2007](#)

**Note:** For a detailed article on determining if you need more memory in your Exchange server and how to diagnose memory utilization issues, see the Microsoft TechCenter article titled, [Troubleshooting Exchange Server 2007 Performance](#).

## Planning the Exchange Volume Configuration

In Exchange 2007, it is a best practice to place all databases in a storage group on the same volume. It is also a best practice to place no more than one database in each storage group.

The Exchange store has a number of different components with different functions that make up the storage installation.

Primary components of the Exchange store:

- Mailbox database also referred to as the Jet databases, (`Mailbox Database.edb`) contains the data, data definitions, indexes, checksums, flags, and other information that comprise mailboxes in Exchange 2007.
- Exchange transaction logs (`*.log`) is a robust recovery mechanism of the Extensible Storage Engine (ESE) that is designed to reliably restore an Exchange database to a consistent state after any sudden stop of the database. Before changes are made to an Exchange database file, Exchange writes the changes to a transaction log file. After a change has been safely logged, it can then be written to the database file.
- Exchange 2007 no longer uses public folders for services such as free and busy database, offline address books, and organizational forms. This means that, unless you have a content or application-based need for public folders, you do not have to deploy or maintain a public folder database. If you have an application-based need such as Outlook 2003 clients you may need a Public Folder database file (`Public Folder Database.edb`) that contain public folder information and should be setup in its own storage group.

An Exchange storage group is a logical container for Exchange databases and their associated system and transaction log files.

Storage groups are the basic unit for backing up and restoring data in Microsoft Exchange (although you can restore a single database and mailbox with supported backup applications). All databases in a storage group share a single set of transaction log files.

For an Exchange installation on a PS Series SAN, we recommend that you do the following:

- Create two volumes in the PS Series SAN for each Storage Group, one volume for the databases and one volume for the logs.
- If you are using multiple mail stores in a Storage Group, put the mail stores on the same volume.  
**Note:** Although you can put each mail store on its own volume, there is no real management advantage, because the log volume is common for all mail stores within an Exchange Storage Group, and backups of the database and the logs should occur at the same time, preferably using VSS or volume collections. When using a PS Series group, there is no performance advantage either to separating mail stores, since I/O is automatically load balanced across the volumes.
- If using SAN boot for the Exchange servers, you must also set up the volumes for this configuration.

[Booting from an iSCSI SAN](#)

### Exchange Volume Sizing

Microsoft recommends that the database should not be more than 100GB in size or no more than 200GB when continuous replication is in use. This is not a hard limit, but a recommendation based on the impact database size has on recovery times.

You can get detailed Exchange Server 2007 storage configuration guidelines from the Microsoft Exchange Server TechCenter article titled, [Mailbox Server Storage Design](#)

### Mailbox Quota

The first metric to understand is mailbox size. Knowing the amount of data that an end user is allowed to store in his or her mailbox allows you to determine how many users can be housed on the server.

### Database White Space

The database size on the physical disk is not just the number of users multiplied by the user quota. The database itself will always have free pages, or white space, spread throughout. During online maintenance, items marked for removal from the database are removed, which frees these pages. The percentage of white space is constantly changing with the highest percentage immediately after online maintenance and the lowest percentage immediately before online maintenance. The size of white space in the database can be approximated by the amount of mail sent and received by the users with mailboxes in the database. For example, if you have 100 mailboxes in a database where users send and receive an average of 20 MB of mail per day, the white space is approximately 2 GB (100 mailboxes × 20 MB per mailbox).

### Actual Mailbox Size

Over time, user mailboxes will reach the mailbox quota, so an amount of mail equivalent to the incoming mail may need to be deleted to remain under the mailbox quota. This means that the dumpster may increase to a maximum size equivalent to two weeks (14 days default retention) of incoming mail.

Projected actual mailbox size can be calculated with the following formula:

Mailbox Quota + White Space + (Weekly Incoming Mail × 2)

After you have determined the projected actual mailbox size, you can use that value to determine the maximum number of users per database. Take the maximum recommended database size, and divide it by the projected mailbox size. This will also help you determine how many databases you will need to handle the projected user count, assuming fully populated databases. Microsoft recommends a Data Overhead Factor using 20% to account for any extraneous growth that may occur.

**Determining volume size when a limited number of databases are available** (due to Exchange edition or amount of servers available).

To roughly determine the size of the Exchange store volume (for example, volume `dbvol` will hold the `.edb` file) and the log volume (for example, volume `logvol` will hold the `.log` file), use the following formulas:

$$\text{dbvol} = \text{total users} * \text{Projected actual mailbox size} * 1.20$$

To roughly determine the size of the transaction log volume  
$$\text{logvol} = \text{db\_vol} * .20$$

You may find it necessary to provide extra capacity to the log volume to accommodate user migrations and or backup failures. For more information, see Microsoft's TechNet article: [Mailbox Server Storage Design](#)

If you miscalculate your storage needs, it is quick and easy to increase the size of a PS Series volume. The ability to grow volumes dynamically as your business grows and mail usage increases is an important feature of a PS Series SAN. For more information, see the EqualLogic Technical Report [Microsoft Windows: Expanding Basic Disk Volumes. Or Deploying Thin Provisioning In A PS SERIES SAN](#)

### **Distribute Mailboxes Across Multiple Stores**

One of the major advances in Exchange 2007 is the ability to create multiple Exchange storage groups, up to fifty for each Exchange server, with the ability to have up to fifty mail stores total per Exchange server (Enterprise Edition). Standard Edition is limited to five Exchange storage groups/databases per server. This provides greater flexibility in how mailboxes are configured, in addition to easier backups and faster restore operations, because more stores means smaller individual stores.

Each store in an Exchange storage group has a dedicated database specific to that store. The Exchange transactions logs, however, are shared among all the mail stores in an Exchange storage group.

### **Distribute Data**

Exchange users usually fall into several categories that most administrators will immediately recognize:

- Average or typical user whose mailbox size and frequency of backup and restore operations fall in line with most Exchange system users.
- High-use individual who tends to need a lot of space in their mailbox, work with many large attachments, and never delete or archive anything.
- Executive-level individual whose usage can be either typical or high, but who needs an additional level of performance and availability.

In addition, Exchange 2007 performance and scalability guidelines provide typical user profiles (heavy, medium, light, and very light).

The load on the Jet database consists of random reads and random writes. The load on the log consists of sequential writes during normal operation and sequential reads during the restoration of a mail store. If the PS Series group contains arrays with different performance characteristics or RAID levels, over time the SAN will automatically move the volume data within a pool to balance the load across the SAN while optimizing performance.

As needed, you can distribute users among different stores, which can have different default mailbox sizes, Exchange System Policies, and performance characteristics.

Each store has a distinct path to the databases (`.edb` files) that support the store. Databases can be placed on PS Series volumes in one-to-many configuration. For example, one large Exchange server can configure mail

stores on different PS Series volumes. These volumes can exist on the same or different PS Series groups. Alternately, multiple mail stores can be placed on a single PS Series volume under different directories. This enables you to group together databases with similar performance and maintenance needs.

For example, if the maintenance window for West Coast users is three hours later than for East Coast users, you can create stores for the two user groups on different PS Series volumes and back up the volumes at different times.

Using multiple stores and Exchange storage groups allows the administrator to put fewer users in each store. This translates into improved recoverability and fewer affected users if you must unmount a store or perform a full restore. With a small database, these tasks can be completed quickly.

How long deleted mail and mailboxes are kept on the system can also be based on the needs of the individual user groups. However, even if the configuration of the stores is different, the backup needs may be the same, so you may want to place the stores on the same PS Series volume.

If you are using Microsoft VSS for backup operations, separating databases from logs presents no obstacles, because multiple volumes can be backed up together. If you are using PS Series snapshot functionality to back up data without VSS, creating a volume collection containing the volumes with the databases and their associated logs allows you to create a snapshot of all the related data simultaneously. For more information on volume collections see the *PS Series Group Administration* guide.

### **Optimize Data Recovery with Recovery Storage Groups**

The Recovery Storage Group (RSG) feature has been changed / improved in Microsoft Exchange Server 2007, most notably, in the following areas:

- RSGs are created and managed by using the Exchange Management Shell, or by using the Exchange Server Disaster Recovery Analyzer Tool (ExDRA). Management of an RSG cannot be performed using the Exchange Management Console.
- RSGs are not visible in the Exchange Management Console, even after they have been created and populated with a database.
- ExDRA will prescriptively recommend and then assist in performing recoveries involving a recovery storage group.

Once the mail store is in the Recovery Storage Group, you can restore individual mailboxes instead of having to restore every mailbox.

### **Choosing Array RAID Levels for Exchange**

Before creating a PS Series group, you should determine which RAID level, RAID 10 or RAID 50, to configure for each individual group member (storage array). When choosing the RAID level for each array, you need to consider not only the performance characteristics of the various Exchange files, but also the availability each level provides.

A PS Series group's automatic load balancing algorithms take RAID levels into account. Over time, volumes can be automatically moved to arrays offering the best RAID level for that volume.

For more information on choosing RAID levels in a PS Series group, see the [Choosing a Member RAID Policy](#) Technical Report on the EqualLogic Customer Support website.

## DEPLOYING EXCHANGE WITH A PS SERIES SAN

The following sections describe Exchange Server requirements and recommendations and the basic tasks for deploying Exchange with a PS Series SAN.

### Background Information

Before you begin the deployment, we recommend that you review the following documents:

- Microsoft TechNet article: [Microsoft Exchange Server 2007 – Deployment](#)
- Technical Report [Deploying Microsoft Windows Server 2003 in an iSCSI SAN](#), located on the EqualLogic Customer Support website.

### Basic Steps

Follow these steps to deploy Exchange Server 2007 with a PS Series SAN:

1. **Set up a PS Series group and create the volumes required for the Exchange environment.** See *Planning the Exchange Volume Configuration* for volume layout and sizing guidelines. Be sure to create access control records for each volume to allow the appropriate servers access to the volume. Also, reserve snapshot space for each volume if you will be creating snapshots or using Auto-Snapshot Manager for VSS backups.

Optionally, you can create a volume for booting Exchange from the SAN, for a Microsoft Cluster Server quorum disk, or a VSS control volume if using Auto-Snapshot Manager.

See the PS Series *QuickStart* and *Group Administration* manuals and the EqualLogic Technical Report, [Deploying Microsoft Windows Server 2003 in an iSCSI SAN](#) for more information.

2. **Optimize the SAN network for performance.** See the EqualLogic Technical Report [Storage Array Network Performance Guidelines](#) for more information.
3. **Optionally, configure the environment so that Exchange servers can boot from the SAN.** For details, see the EqualLogic Technical Report [Booting Windows Server 2003 from an iSCSI SAN](#).
4. **Prepare and optimize the Exchange servers and connect them to volumes.** For details, see the EqualLogic Technical Report [Deploying Microsoft Windows Server 2003 in an iSCSI SAN](#).
5. **Install Exchange on the server and configure it to use the PS Series storage.** See *Planning the Exchange Volume Configuration* for information about specifying the iSCSI disks for the database and log files. Exchange Server 2007 installation and deployment requirements are well documented in [Microsoft Exchange Server 2007 – Deployment](#).

After deployment, you can expand iSCSI disks online, expand PS Series group capacity, and back up volumes, as described in the EqualLogic Technical Report [Deploying Microsoft Windows Server 2003 in an iSCSI SAN](#).

### Configuring Exchange to Use PS Series Storage

The following sections cover the procedures for using Exchange Server 2007 with PS Series storage.

The steps assume the group and volume have already been created, the server is persistently connected to the volumes, the new disks associated with the volumes have been initialized, the disk sectors have been aligned, the disks have been formatted, and the drive letters have been assigned.

The examples in the following sections assume that the Exchange server is connected to two volumes, one for the databases and one for the log. Drive letters are assigned as follows:

- H: – Jet database (dbvol)
- L: – Transaction logs (logvol)

## Server Requirements and Recommendations

Additional Exchange server requirements and recommendations for a configuration that uses a PS Series SAN are as follows:

- One or more industry-standard iSCSI initiators. This can be a NIC and Microsoft iSCSI Software Initiator combination or an iSCSI HBA. This Technical Report was prepared using QLogic HBAs. Consult the vendor's initiator documentation for installation instructions. Always check the Knowledge Base on the EqualLogic Customer Support website for the latest initiator information.

If you plan to use multipath I/O, do *one* of the following:

- Install two or more iSCSI HBAs and the latest Microsoft iSCSI Software Initiator. MPIO can be enabled and configured by using the iSCSI Software Initiator control panel to connect each initiator to each iSCSI target (PS Series volume). For more information on Multipath I/O DSM, See the EqualLogic Technical Report [Deploying Microsoft Multipath I/O in an iSCSI SAN](#)
- Install two or more Gigabit Ethernet NIC's and use the MPIO capability that is integrated in the Microsoft iSCSI Software Initiator.

Additionally EqualLogic has developed a Device Specific Module (DSM) for MPIO. The EqualLogic MPIO DSM will automatically make appropriate connections to volume based on available network resources configured for the SAN. For more information on the EqualLogic MPIO DSM see the Technical Report, *Deploying the EqualLogic Multipath Device Specific Module*.

- Optimize the server. See the [Deploying Windows Server 2003 in an iSCSI SAN](#) technical report for details.
- Persistently connect the server to the PS Series volumes created for the Exchange configuration.
- Initialize the connected PS Series volumes as basic disks.
- For the best performance, align disk sectors. See the EqualLogic Technical Report [Microsoft Windows: Aligning Disk Sectors for Optimal Performance](#) for more information.
- Format the disks.

In addition, consult the [Storage Array Network Performance Guidelines](#) Technical Report for information about improving network performance between PS Series storage arrays and Exchange servers.

## Specifying Exchange Log and Database Locations

When using a PS Series group for Exchange storage, the installation procedure is the same as usual. After the roles wizard has completed, confirm that the Finalize installation using the Exchange Management Console is checked and click Finish. After the Finalize installation wizard has completed the default log, system and database path for the First Storage Group is: "C:\Program Files\Microsoft\Exchange Server\Mailbox\First Storage Group". At this point you can easily move the log and system paths as well as the database path to the "L" and "H" volumes as outlined in *Migrating Exchange Information Stores to PS Series Storage*.

The example in this report uses the following data locations for the First Storage Group:

Transaction log location:	L:\First Storage Group
System path location:	L:\First Storage Group
Exchange database:	H:\First Storage Group

Figures 2 and 3 show how to specify the location of the log for an Exchange Storage Group and the location of databases for the Storage Group mailbox.

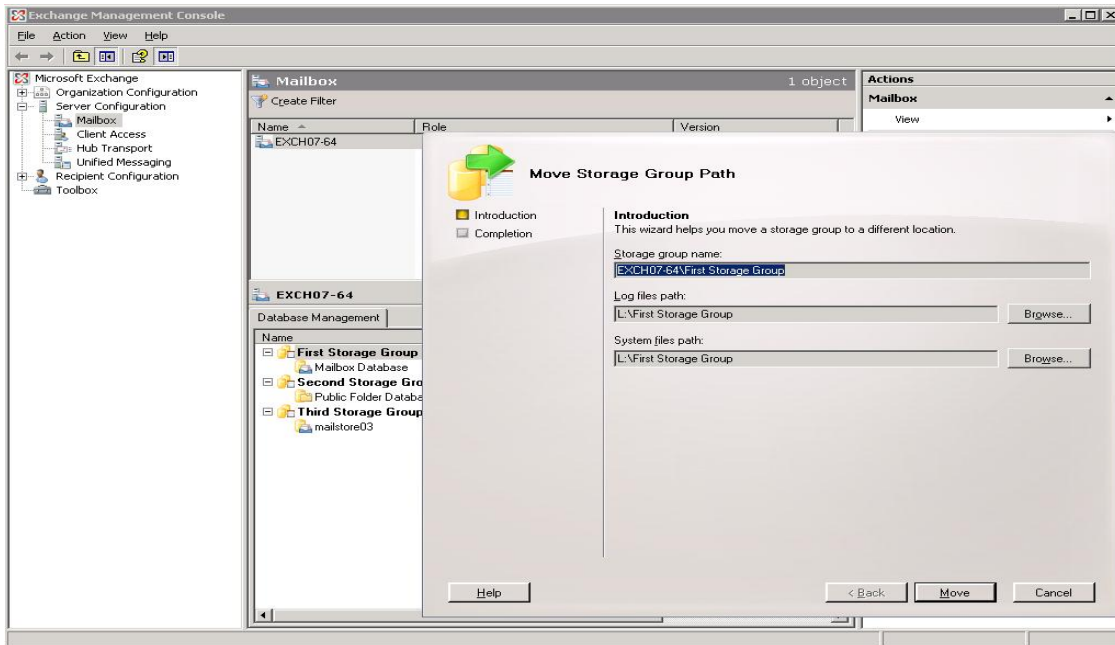


Figure 2: Storage Group Properties and Log Location.

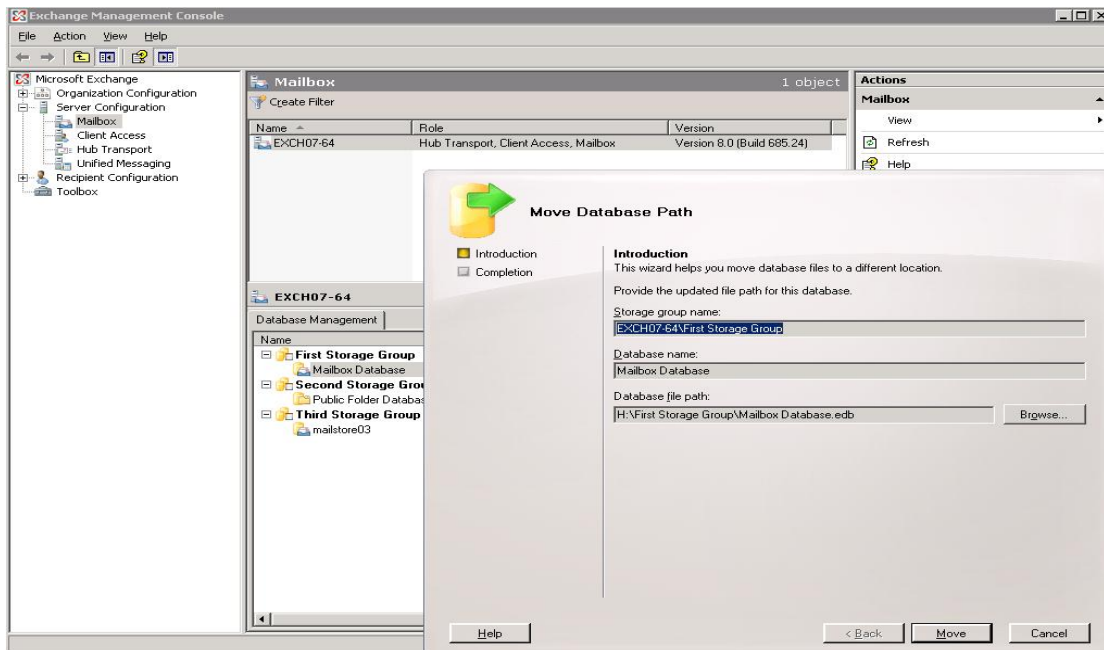


Figure 3: Mailbox Store Properties and Database Locations.

**Note:** If you're SAN employs tiered storage, the volumes containing the logs and databases automatically and transparently migrate to the members that provide the best overall performance. For more information, consult the EqualLogic Technical Report, [Deploying Pools and Tiered Storage in a PS Series SAN](#).

## Migrating Exchange Information Stores to PS Series Storage

If you are currently using direct attached storage (DAS) or a local system drive for storage in your Exchange implementation, you can easily migrate mail stores and logs to a PS Series group and gain the performance and scalability, high availability and data protection benefits of an iSCSI SAN. You will want to do this during a planned maintenance period, as the mailboxes must be offline and you must have exclusive access to the mail stores being moved during the migration.

**Note:** As with any critical application whose configuration you are modifying, it is strongly recommended that you perform a full backup of all information stores and logs before performing the migration.

In this example, an Exchange store and logs will move from a local drive (C :) to two PS Series volumes associated with the H: and L: drives.

Moving an Exchange information store requires moving three components:

- Transaction log and system path. (Storage Group)
- Exchange mailbox store that contains the mailboxes. (Database)
- If applicable, the Public Store.

Follow these steps:

1. Configure two volumes to hold the Exchange information store and logs, as described in *Specifying Exchange Log and Database Locations*.
2. To move/change Transaction log and system path. (Storage Group) : Open Exchange Management Console, expand **Server Configuration** in the leftmost panel and then click **Mailbox**, in the result pane select the server that contains the storage group you want. See Figure 4. In the work pane, select the storage group that you want to move. In the action pane, click **Move Storage Group Path**. The Move Storage Group Path wizard appears. On the **Introduction** page, click **Browse** next to one or both of the **Log files path** and **System files path** boxes, and then select the new locations for the files. See Figure 5. Click **OK**. A warning appears, alerting that you are about to move Exchange data files, which will cause the system to dismount, move, and mount the data files in a new location. Click **Yes**. After successful completion of the move, you will be notified. Click **OK** to confirm.

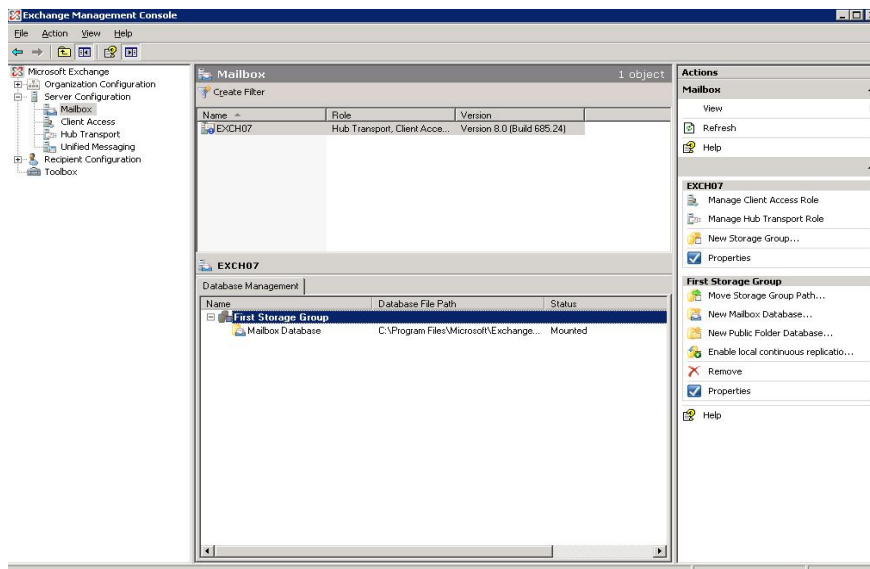
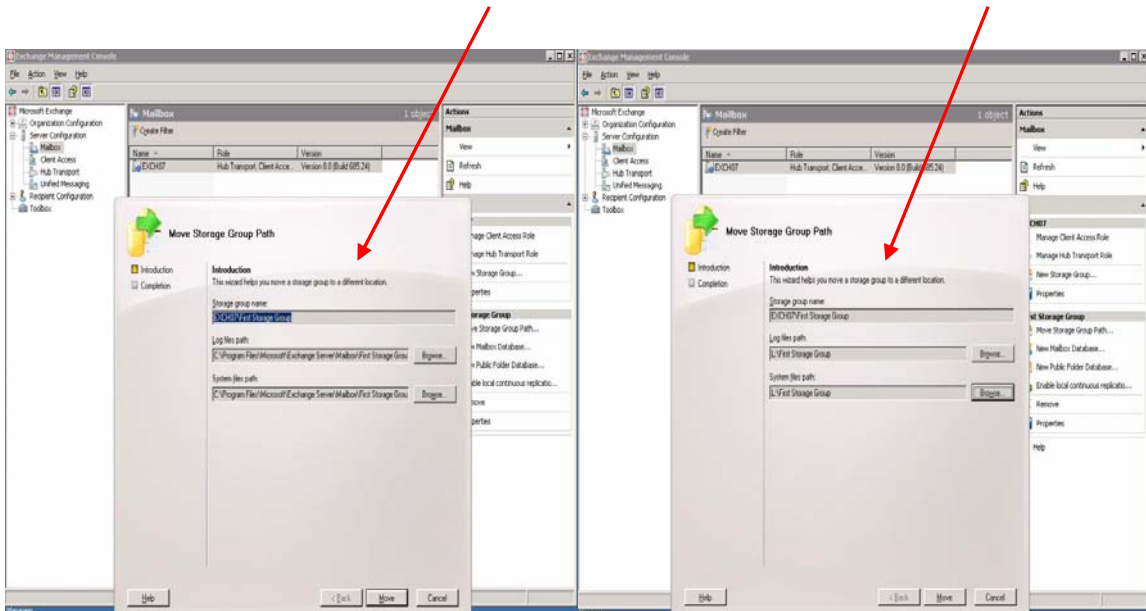


Figure 4: Working with Storage Group in Exchange Management Console.

Current log and system location

New log and system location



**Figure 5: Move Storage Group Path.**

3. To move/change Exchange mailbox store that contains the mailboxes. (Database): Open Exchange Management Console, expand **Server Configuration** in the leftmost panel and then click **Mailbox**, in the result pane select the server that contains the storage group with store you want. See Figure 4. In the work pane, select the Database that you want to move. In the action pane, click **Move Database Path**. The Move Database Path wizard appears. On the **Introduction** page, click **Browse** next to the **Database file path** box, and then select the new locations for the file. See Figure 6. Click **OK**. A warning appears, alerting that you are about to move Exchange data files, which will cause the system to dismount, move, and mount the data files in a new location. Click **Yes**. After successful completion of the move, you will be notified. Click **OK** to confirm.

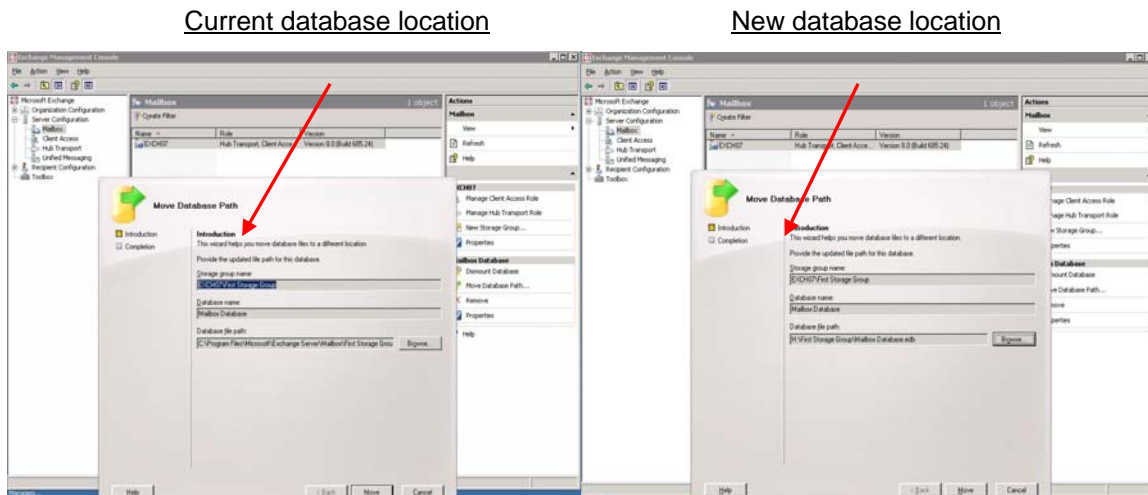


Figure 6: Move Mailbox Store Path.

## EXCHANGE DATA MANAGEMENT

Backing up your data as well as monitoring for disk space usage are two important disk management tasks. You should monitor your Exchange volumes so they do not fill up unexpectedly. When a volume starts to get full, you may want to consider increasing the volume size, as described below.

### Defragmenting Exchange Databases

Under typical conditions, performing an offline defragmentation will not permanently recover significant disk space. The file will usually grow again to its previous un-defragmented size. Special circumstances, such as moving many mailboxes out of the database, may make it worthwhile to defragment the database offline. By default, during typical operation, the database is logically defragmented nightly. This does not reduce the size of the file on disk, but does make the database perform efficiently.

### File-level Defragment Exchange database drives

If the volume that holds your Exchange database has a high level of fragmentation, you should defragment the volume using the standard Disk Defragmenter tool (under Start, All Programs, Accessories, System Tools). Be sure not to run a disk-defragment program on a production Exchange server during working hours or while a database is mounted (in which case Windows cannot defragment the file).

**Important:** Before running defrag on any Exchange volume it is recommended that you make a full backup.

### Expanding SAN Storage Online

As the storage requirements grow for each application, PS Series storage can be easily expanded, online and with no disruption to users.

For example, you can increase the size of a PS Series volume using the Group Manager GUI or the command line interface (CLI). You must then enable the operating system to recognize the size increase. The additional space will be immediately available for use. This procedure is described in the EqualLogic Technical Report *Microsoft Windows: Expanding Basic Disk Volumes*.

If the PS Series group does not have sufficient free space to increase a volume size or add new volumes, you will need to expand the group. To do this, simply add another array (member) to the group. See the PS Series *QuickStart* or the *Group Administration* manual for more information.

### **Backing Up Data Using VSS**

You can back up Exchange data residing on a PS Series storage array using any backup application that supports backing up Exchange. However, to leverage the capabilities of Volume Shadow Copy Service (VSS) available in Windows Server 2003, Exchange Server 2007, and EqualLogic Auto-Snapshot Manager for Windows, you must choose a backup application that supports VSS, in addition to the backup features you desire. Note that backup and restore products are at various stages of VSS requestor implementation.

Backup applications that support VSS and can be used as a VSS requestor include the following:

- Symantec™ Backup Exec™
- CommVault® Galaxy™ Backup & Recovery
- CA BrightStor® ARCserve® Backup
- Bakbone® NetVault
- Legato® NetWorker

See the backup application documentation for information about using the application as a VSS requestor. See the Auto-Snapshot Manager for Windows Installation and Administration manual for information about using that VSS provider.

For more detailed backup and recovery procedures for specific backup and recovery vendors, see the Technical Reports on the EqualLogic Customer Support website.

### **SUMMARY**

An iSCSI SAN comprised of EqualLogic PS Series storage provides an ideal storage infrastructure for an Exchange 2007 installation. A PS Series SAN brings all the reliability and performance needed for a successful deployment, enabling scalability as the Exchange installation grows, while maintaining availability.

An important part of a successful Exchange installation is to follow Microsoft's recommendations for system and server configurations. In addition, you should follow the configuration best practices described in this Technical Report, regarding PS Series group setup, server setup, and deployment, to ensure a robust installation that will meet your needs now and in the future. The best practices described here apply to any version of Microsoft Exchange working with any PS Series SAN. The specific examples use Microsoft Exchange Server 2007 running on Microsoft Windows Server 2003.

## EQUALLOGIC DOCUMENTATION AND CUSTOMER SUPPORT

Visit the EqualLogic Customer Service website, where you can download the latest documentation and firmware. You can also view FAQs, the Knowledge Base, and Technical Reports and submit a service request.

EqualLogic PS Series storage array documentation includes the following:

- *Release Notes*. Provides the latest information about PS Series storage arrays and groups.
- *QuickStart*. Describes how to set up the hardware and start using a PS Series storage array.
- *Group Administration*. Describes how to use the Group Manager GUI to manage a PS Series group. This manual provides comprehensive information about product concepts and procedures.
- *CLI Reference*. Describes how to use the Group Manager command line interface to manage a group and individual arrays.
- *Hardware Maintenance*. Provides information on maintaining the PS Series storage array hardware.

To report a problem or to get access to the resources available on the Customer Support website, go to <https://www.equallogic.com/support/> and click LOGIN. If you do not already have an account, you can request one here. Once you are logged in, click Log a Case to report a problem.

To report an urgent issue, please call us at 1-877-887-7337 and speak with a member of the Customer Support team.

If you have any comments or suggestions related to this technical report, please send them to [techreports@equallogic.com](mailto:techreports@equallogic.com)

## ADDITIONAL REFERENCES

The following Exchange references were used in the preparation of this report.

EqualLogic recommends that you review the documents in the Exchange Server 2007 Technical Documentation Library that are specific to your Exchange environment:

<https://technet.microsoft.com/en-us/library/bb124558.aspx>

Specifically, when deploying PS Series arrays, we recommend referencing the following documents:

- Microsoft Exchange Solution Reviewed Program (ESRP) – Storage  
<http://technet.microsoft.com/enus/exchange/bb412164.aspx>
- Using Exchange Server 2007 Recovery Storage Groups  
<https://technet.microsoft.com/en-us/library/aa997260.aspx>
- Exchange Server 2007 Performance Issues  
<https://technet.microsoft.com/en-us/library/bb397229.aspx>
- Exchange Server 2007 High Availability Strategies  
<https://technet.microsoft.com/en-us/library/bb123523.aspx>
- Exchange Server 2007 Clustering  
<https://technet.microsoft.com/en-us/library/bb201729.aspx>
- Exchange Server 2007 Disaster Recovery  
<https://technet.microsoft.com/en-us/library/aa998848.aspx>
- Exchange Server 2007 Deployment Guide  
<https://technet.microsoft.com/en-us/library/bb123895.aspx>
- Troubleshooting Exchange Server Performance.  
<http://technet.microsoft.com/en-us/library/bb397229.aspx>
- Planning Your Server and Storage Architecture  
<https://technet.microsoft.com/en-us/library/bb738142.aspx>
- Microsoft White Paper on MPIO:  
<http://download.microsoft.com/download/3/0/4/304083f1-11e7-44d9-92b9-2f3cdbf01048/mpio.doc>
- Microsoft iSCSI Software Initiator Version 2.0.5 (build 3392)  
<http://www.microsoft.com/downloads/details.aspx?FamilyID=12CB3C1A-15D6-4585-B385-BEFD1319F825&displaylang=en>