HP ProLiant Storage Server iSCSI Feature Pack for Microsoft® Exchange Server 2003, Microsoft Windows Storage Server 2003, and HP ProLiant Storage Server — white paper

About this document

This document introduces a new solution using the HP ProLiant Storage Server iSCSI Feature Pack. It details configurations for Microsoft® Exchange Server 2003 on an HP ProLiant Storage Server device running Microsoft Windows® Storage Server 2003 through the HP ProLiant Storage Server iSCSI Feature Pack. The iSCSI Feature Pack enables placement of Exchange files (typically database files and transaction log files, however other files can be placed on the iSCSI storage) on the Windows Storage Server network attached storage (NAS) device. The device offers modular expansion capabilities by adding Smart Array storage, as demonstrated in this document.

This paper also provides solution details, validated configurations, performance testing results, and best practices. As part of the configuration validation testing, backup and restore tests were performed to measure throughput rates for data backup to an iSCSI device. Backup tests were performed with HP OpenView Storage Data Protector 5.1 as well as CommVault Galaxy 5.0.

Demonstration (for a limited time) and consultation for this storage solution are available by asking your HP sales channel to contact microsoft_storage_solutions@hp.com.

A later document will address the more advanced topics and features of this solution including high availability (clustering) and Exchange disaster recovery.

Intended audience

The primary audience for this document is:

- System architects, consultants, and network engineers who plan the components and the deployment
- Storage administrators who perform the design, installation, and management of storage including Windows Storage Server NAS
- Exchange administrators who perform the design, installation, and management of Exchange servers and backup and restore of Exchange database files

Prerequisites

This document assumes that the reader:

- Is familiar with Exchange server administration concepts
- Has experience with Windows Storage Server 2003

A list of available resources for reading and satisfying these prerequisites is available in Table 1.

Introduction

iSCSI is a standard for using the Ethernet protocol and associated networking hardware as a storage topology (for block mode access, such as Exchange databases). Because of the huge investments in existing Ethernet technology and expertise, iSCSI will be easy for many companies to learn and deploy. It also offers some of the features and ease of use, such as expansion, previously found only in high-end Fibre Channel storage area networks (SAN).

With the new HP ProLiant Storage Server iSCSI Feature Pack, Windows Storage Server 2003 enables you to use NAS as storage for applications and Exchange server, in addition to file serving. The HP ProLiant Storage Server iSCSI Feature Pack for Windows Storage Server 2003 enables Exchange Server 2003 databases, transaction logs, and other Exchange files (for example, SMTP mailroot) to be stored on an HP ProLiant DL100 Storage Server or HP ProLiant DL380 G4 Storage Server running Windows Storage Server 2003. Note that the Microsoft Windows Storage Server (WSS) 2003

Feature Pack offering for NAS did not allow these other file types to be relocated to the NAS device (Microsoft announced support for Exchange 2003 databases and log files on Windows Storage Server 2003 in April 2004 using that feature pack).

The HP ProLiant Storage Server iSCSI Feature Pack is installed on the Windows Storage Server computer (NAS device) to provide iSCSI target functionality. An iSCSI initiator (such as the one from Microsoft used in the tests found here) is installed on the Exchange Server 2003 computers to add iSCSI functionality to each. The HP ProLiant Storage Server iSCSI Feature Pack includes a Web Administration console as shown in Figure 1.

Figure 1. iSCSI Configuration in Web Administration console
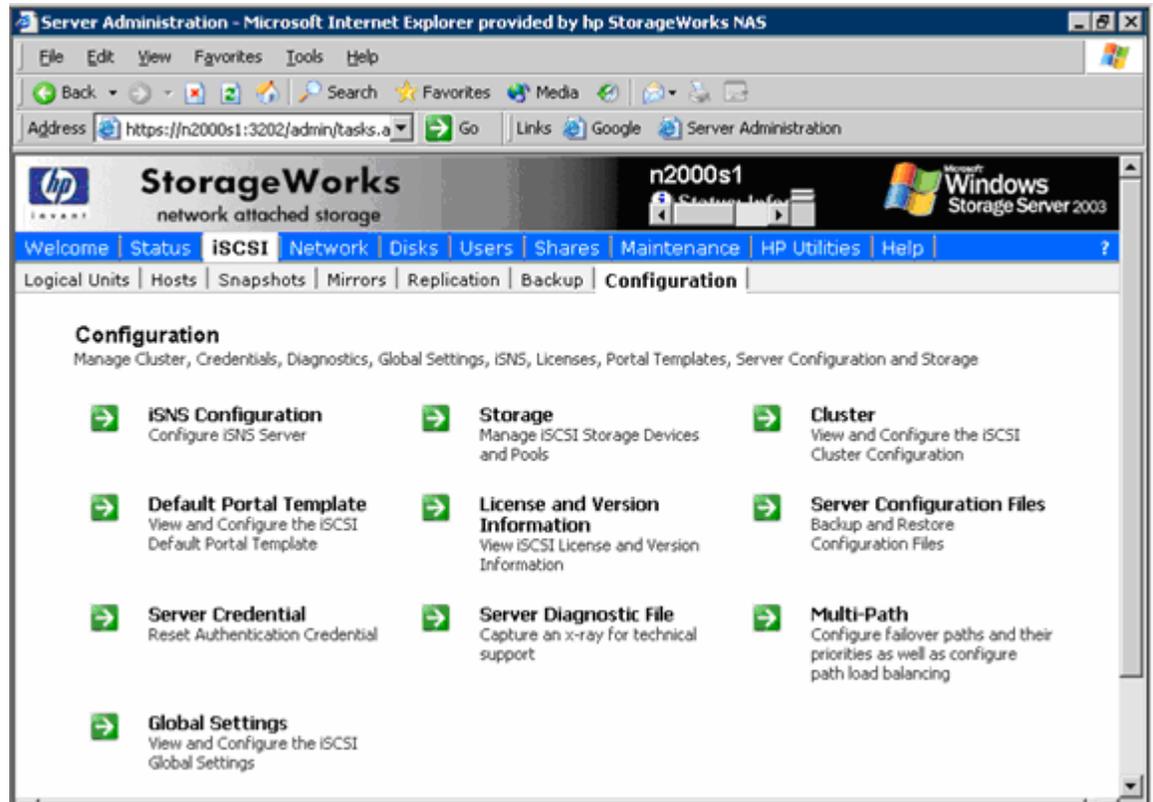
For this paper, both the HP DL380 G4 Storage Server[1] and the HP DL100 Storage Server were tested using LoadSim 2003. This document provides best practices, for example, to size systems for peak loads and to accommodate future growth, thus avoiding the penalty of downtime when a system is undersized and must be upgraded in the immediate future. In addition migration scenarios are taken into account to help you move your existing environment to the iSCSI solution. Exchange database tools and applications that are currently being used by an organization, for example, backup and anti-virus software, can still be used in conjunction with the Windows Storage Server 2003 NAS and the HP ProLiant Storage Server iSCSI Feature Pack.

Another whitepaper illustrates using the DL100 Storage Server or DL380 G4 Storage Server, with the Windows Storage Server Feature Pack: *Microsoft Exchange Server 2003, Windows Storage Server 2003, and HP Network Attached Storage* (available from

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[1] Actual testing was performed on an HP ProLiant DL380 G3 Storage Server, but results should be at least the same and most likely, much better.

http://h71019.www7.hp.com/ActiveAnswers/cache/76258-0-0-0-121.aspx). That paper defines the following scenarios:

- Low-capacity scenario (for up to 250 mailboxes)
- Medium-capacity scenario (for up to 750 mailboxes)
- High-capacity scenario (for up to 1,500 mailboxes)

In the testing to follow in this paper, the Windows Storage Server is used with the HP ProLiant Storage Server iSCSI Feature Pack to provide the low-capacity scenario (DL100 Storage Server) and the medium to high-capacity scenario (DL380 G4 Storage Server).

- Low-capacity scenario (for up to 500 mailboxes)
- Medium- to high-capacity scenario (for up to 5,000 mailboxes)

Overview

A Windows Storage Server NAS device running the HP ProLiant Storage Server iSCSI Feature Pack can host the databases and transaction logs for several Exchange servers and thousands of Exchange mailboxes, according to the results obtained in HP testing. Figure 2 helps to illustrate the basic configuration. Each element is discussed in detail later.

Figure 2. Basic network configuration of Exchange Server 2003 and Windows Storage Server 2003 via iSCSI
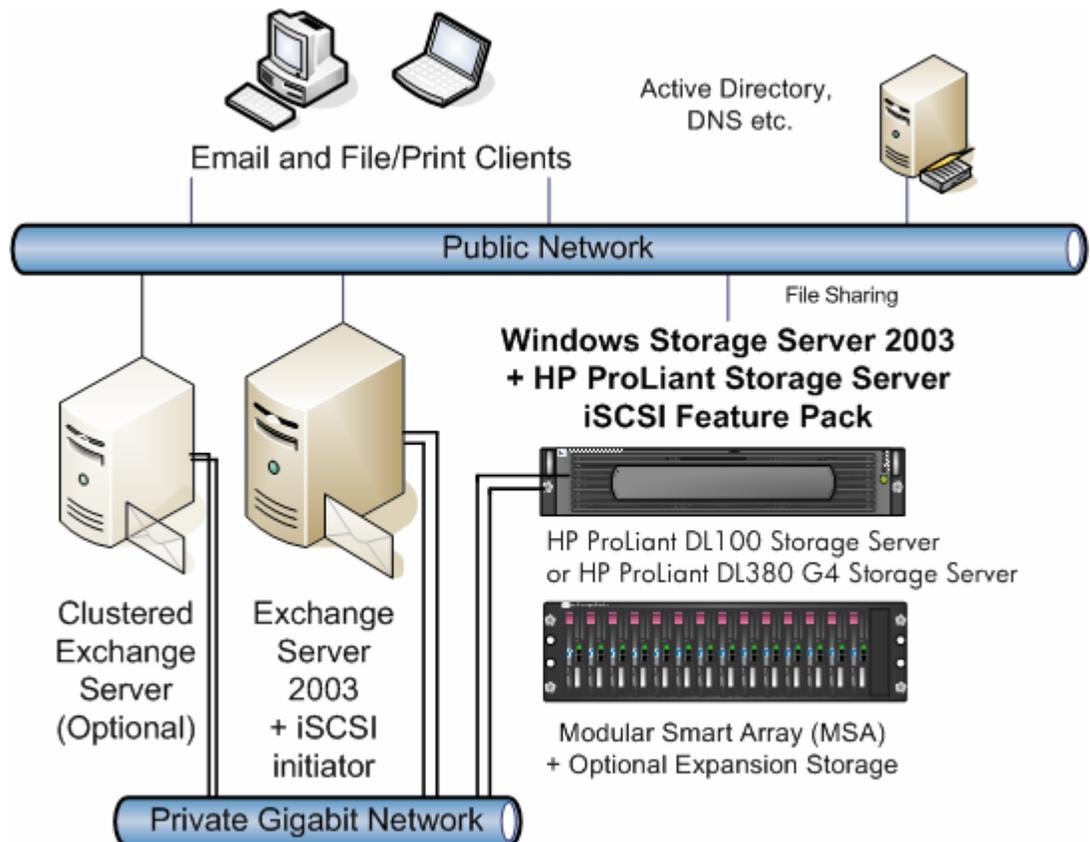
iSCSI terminology

Some iSCSI concepts are new and others may differ from your past understanding or usage of the terms. A more thorough coverage is available in the resources listed in Table 1.

- Initiator—The source of iSCSI commands, which are sent over the network. The initiator can be in the form of a specialized hardware adapter or software, which is used with a standard Ethernet network adapter. In this test environment the Microsoft iSCSI Software Initiator software was used.

- Target—The storage device, in this case an HP ProLiant Storage Sever running the HP ProLiant Storage Server iSCSI Feature Pack software. iSCSI targets in this case provide security of what initiators are given read and/or write access to the devices.

- iSNS Server—Internet Storage Name Service—a software service used for discovery of devices in iSCSI networks. The HP ProLiant Storage Server iSCSI Feature Pack software provides this capability and an iSNS Server is available from Microsoft. Either one can be used on the Windows Storage Server.

- Storage Pool—A set of devices that have been grouped together and allocated for use by the iSCSI target.

- Logical Unit—The disk presented for host access, which is created from either type of device, discussed below. A logical unit can either be imported from an existing disk or created from a new, raw device.

- Devices—Within the HP ProLiant Storage Server iSCSI Feature Pack there are two types of devices that can be created. The first is a native, iSCSI disk, and the second is an imported disk. Either one is then presented with host access as a logical unit. The iSCSI software stores metadata about the disk configuration, either in the first few megabytes of the raw disk or on a file device associated with an imported disk. Figure 3 below shows an iSCSI storage device properties and the metadata segment.

Figure 3. iSCSI storage device properties showing the metadata segment

Related documentation

Many of the resources and documents available to assist you in your deployment are compiled in Table 1.

Table 1. Additional documentation and resources

Resource	Link	Description
Microsoft iSCSI	http://www.microsoft.com/ windowsserversystem/storage/ technologies/iscsi/default.mspx	Main Microsoft Storage Technologies—iSCSI page
Microsoft Support for iSCSI	http://www.microsoft.com/ windowsserversystem/storage/ technologies/iscsi/msfiSCSI.mspx	Whitepaper from Microsoft Enterprise Storage Division
Windows Server 2003 iSCSI Cluster	http://www.microsoft.com/ windowsserversystem/storage/ technologies/iscsi/iscsicluster.mspx	Cluster Support FAQ
Microsoft knowledge base article	http://support.microsoft.com/ default.aspx?scid=kb;en-us;839686	Support for iSCSI technology components in Exchange Server
HP ProLiant Storage Server	http://h18006.www1.hp.com/ storage/networkattached.html	Information on ordering HP ProLiant Storage Server configurations
HP ProLiant Storage Server iSCSI Feature Pack	Information to help you deploy the Windows Storage Server 2003 HP ProLiant Storage Server iSCSI Feature Pack on an HP DL100 Storage Server or DL380 G4 Storage Server	T3662A
Release notes	Information about late-breaking bugs or workarounds for known issues	Included in default installation
Online help system	Help information for the web based administration console	Included in default installation

Recommended design principles

This section outlines the HP recommended design principles for most any size deployment. The next sections detail the sized and tested configurations.

Network design

Part of the appeal that iSCSI brings to the storage market is low cost, standardized network adapters and topology hardware in addition to years of expertise developed in deploying these networks. However, it should be stressed that existing networks be evaluated for suitability regarding their capacity to support iSCSI storage. In any deployment, HP recommends using a **dedicated** Gigabit Ethernet network between the Exchange server and the Windows Storage Server NAS. This ensures adequate performance as well as helps to provide data security against network sniffing of Exchange data. An alternative would be to use IPSec to secure the connection if it is not possible to use private, secured network—but there will be a performance impact.

It is possible to use direct network cable between the NAS and the Exchange server. However, adding an additional Gigabit network card and multiple Gigabit switches provides fault tolerance when used with the HP network teaming feature. In the test environment, the HP network teaming feature (see Figure 4) was enabled, providing a 2-Gbps link in addition to the benefit of fault tolerance in case of network interface, link, or switch failure. The Gigabit Ethernet cables were connected to a private HP ProCurve switch.

If you plan to locate your Exchange server any distance away from the Windows Storage Server NAS, check with your networking hardware vendors on the specifics regarding the maximum supported distance. The maximum distance will vary according to the cable type and specifications.

Figure 4. HP network teaming combines Gigabit adapters for fault tolerance and throughput
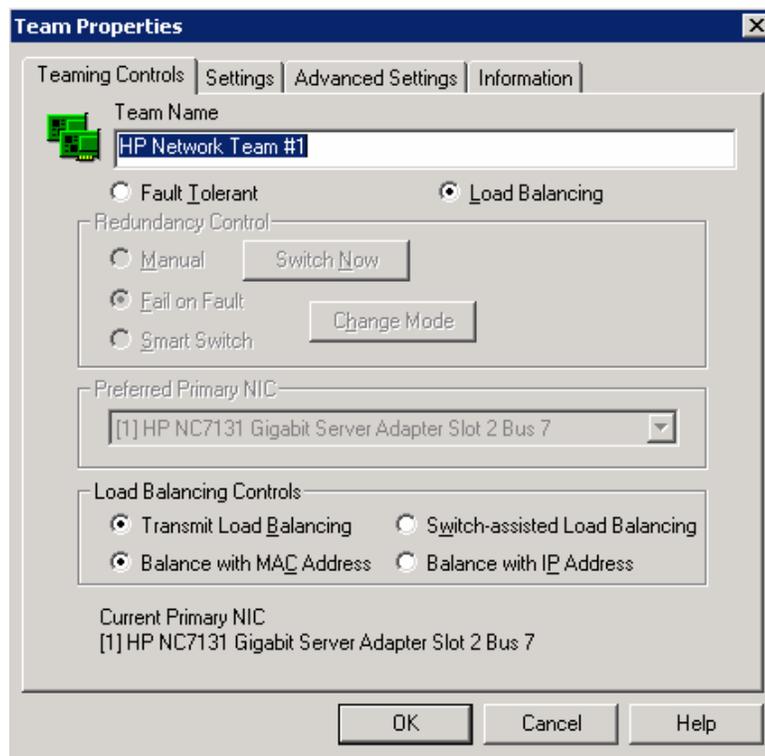
Hardware selection

Check the Windows Server Catalog at http://www.microsoft.com/windows/catalog/server/default.aspx?subID=22&xslt=about&pgn=moreinfo to be sure that the iSCSI hardware components that you select have been qualified under the Designed for Windows Logo program. If the iSCSI hardware devices have passed the Designed for Windows Logo Program, the hardware is also supported by Exchange Server 2003 and by Exchange 2000 Server with no additional qualification.

Exchange storage design

This section discusses the most important criteria for design and selection of Exchange storage:

- Isolation of Exchange transaction logs from databases
- Selection of best RAID protection for performance and fault tolerance

• Hardware RAID controller with sufficient write-back caching for performance

Exchange transaction logs and databases must be stored on separate disk volumes to provide both data protection and efficiency (separation of sequential writes and random read/write access, respectively). The HP ProLiant Storage Server iSCSI Feature Pack and NAS can be configured to place the Exchange transaction logs on the Exchange server and the databases on the Windows Storage Server NAS. Little performance difference was measured between placing the transaction logs local to the Exchange server compared with placing them on an iSCSI disk. However, you must consider how to recover the transaction logs if the Exchange server fails and is replaced with new hardware; in that case, the log drives would need to be moved to the new server.

Transaction logs should be placed on a RAID 1 (mirror pair) array (volume), or for additional disk space, four or more disks in a RAID 1+0 (striped mirror). The number of spindles in the array determines storage space, but not performance. Performance on the transaction log volume is enhanced by decreasing the response time, which is accomplished by write-back caching. On HP Smart Array controllers with battery-backed write cache, such as the Smart Array 5i Plus and later, the write cache percentage should be set at 100%. (Dedicated read cache memory is built into the controller.) This setting will also benefit performance on the database arrays (volumes).

For database arrays (volumes), the choice of RAID protection on the disk arrays is often a trade-off between maximum storage and performance. While RAID 5 can provide data protection, it does so at the cost of performance. RAID 1+0 was shown in the testing to provide the absolute best performance given the same number of disk spindles. For example, the descriptions of the tests explain how six spindles in a RAID 5 array cannot provide sufficient I/O rate to support the same number of Exchange mailboxes as the same number of disks in a RAID 1+0 array. RAID 1+0 is preferable for the database volume—even when using 36-GB drives in an array, if the number of disks required to support the I/O is used, this provides ample storage for 100-MB mailboxes. Exercise caution when sizing if you are using the newest disk drives (for example, 146 GB or larger), as a few spindles can support the required database storage capacity but will **not** be able to support the required I/O performance.

As the testing results described later in this document indicate, it is most important to place the Exchange logs and database files on a RAID 1+0 array on a hardware RAID controller with sufficient write-back caching. Even if the logs need to be accessed over the Gigabit network (on the NAS), there should be adequate network performance, and the RAID controller performance is paramount.

Sizing for supported load

One of the questions that must be answered in storage sizing, is how much performance does the (average) e-mail user require? This average load is then multiplied by the total number of users to determine what size of system is needed. Or, conversely, the capabilities of the system are examined and the maximum number of users that can be supported is determined. If a production Exchange environment is in place, the 'perfmon' object for Disk Transfers per second on the database disk can be divided by the number of Active Connections to measure the current I/O per user. However, sizing for averages can lead to poor performance during peak periods, so additional overhead is needed for these peak, stressful periods.

In any test environment measuring user load, the evaluation should closely match what will be deployed in production. For the tests in this paper, LoadSim 2003 was used to simulate the user load against the Exchange server. To most accurately represent an organization that relies on e-mail, the user profile selected within LoadSim was a mix of medium and heavy users, at a ratio of 2:1, respectively. These profiles represent quite active e-mail users and are used to simulate Enterprise environments. For the smaller organizations, where e-mail may not be so heavily used, these profiles may overstate the server impact, but they do provide assurance that the following configurations are properly sized to meet the most stressful peak-period demands. The maximum recommended user load

may actually be less than this number depending on the user profile (heavier usage) and additional services running on the Exchange server (connectors, anti-virus scanning, content indexing, etc.).

In addition to the level of activity by the e-mail users, another sizing consideration is the size of the mailboxes. The medium profile creates on average a 60-MB mailbox, and the heavy profile creates on average a 100-MB mailbox. Larger mailboxes do affect not only your storage sizing but also performance criteria, as Exchange performance is affected by managing the larger mailboxes.

The final measure of LoadSim results is the 95th-percentile response time (a measure of client-side latency), which should be well below the desired goal of 1 second (1,000 milliseconds).

Tested configurations

The following sections define the hardware configurations that were tested using the simulation tools LoadSim and Jetstress.

Low capacity: HP ProLiant DL100 Storage Server

The HP ProLiant DL100 Storage Server (640 GB Model) with Intel® Pentium® 4 2.8 GHz was selected for testing. The DL100 Storage Server was tested up to 500 mailboxes (using the 2:1 Medium to Heavy LoadSim profile mix) on one Exchange 2003 server. The maximum recommended user load may actually be less than this number depending on the user profile (heavier usage) and additional services running on the Exchange server (connectors, anti-virus scanning, content indexing, etc.). The primary storage difference between the HP ProLiant Storage Server models is that the HP ProLiant DL380 G4 Storage Server offers a Smart Array RAID controller with hot-swappable SCSI drives instead of ATA drives. For more information, see http://h18006.www1.hp.com/ storage/networkattached.html or go to http://www.hp.com/storage and click network attached storage.

A list of some of the DL100 Storage Server product features includes:

- 1U form factor
- Intel Celeron® 2.8GHz (320 GB Model) or Intel Pentium 4 2.8 GHz (640 GB Model) or Intel Pentium 4 3.2 GHz (1 TB Model)
- 512 MB of memory standard, expandable to 4 GB (320 GB Model) or 1 GB of memory standard, expandable to 4GB (640 GB and 1 TB Models)
- Four (4) hot-plug 1" 7200 RPM SATA hard drives standard
  - 4 x 80 GB (320 GB model)
  - 4 x 160 GB (640 GB model)
  - 4 x 250 GB (1 TB model)
- Hardware RAID controller
- Two auto-sensing Gigabit NICs (embedded) 10/100/1000
- SCSI controller (embedded) with external connector for backup device
- Factory configured dual OS partition for data protection (automatic fail over to secondary partition in the event of a failure on the primary partition)
- Factory configured RAID 5 data volume
- Microsoft Windows Storage Server 2003 (WSS 2003) operating system

Figure 5 illustrates the sample configuration for a low-capacity scenario (tested up to 500 mailboxes). Note that an HP ProLiant DL380 server is chosen as the Exchange Server because it can be configured with up to six internal drives and fault-tolerant options for redundant fans and power supplies. However, another HP ProLiant server could easily support the 500 Exchange users. The main sizing concerns are sufficient RAM (1 GB) and enough disks for the Exchange database volume—

especially if using RAID 5 (or Advanced Data Guarding [ADG]). As discussed earlier, RAID 1+0 is preferable for the database volume. Note also that the transaction logs can be placed in the Exchange server, which takes advantage of the additional storage capacity of the HP ProLiant DL380 server, but the Smart Array 5i RAID controller option kit is highly recommended as it allows the cache to be set at 100% write cache, which is important for performance, as discussed in this document.

Figure 5 Sample configuration for Exchange and iSCSI low capacity scenario.
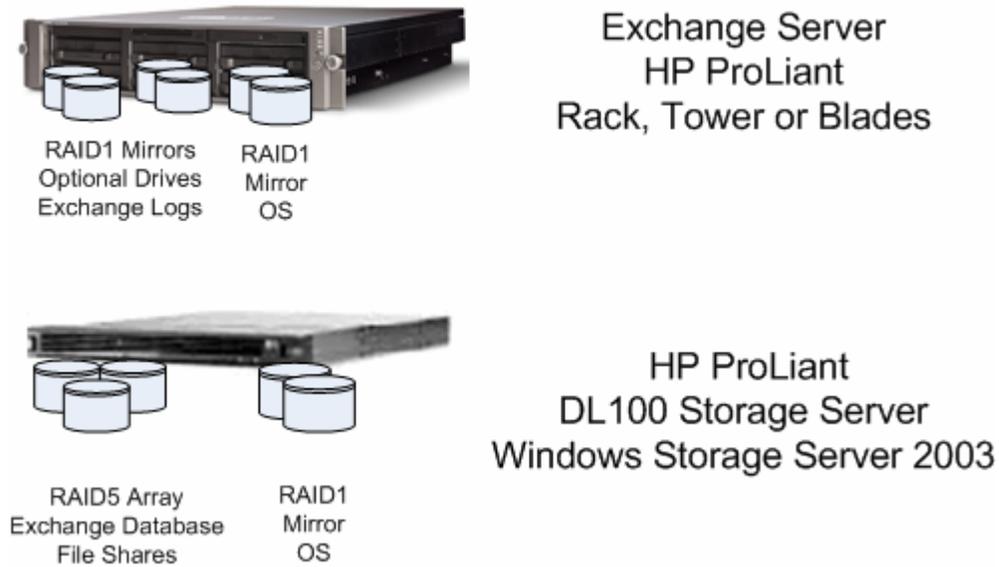
A later section in this document details the process for configuring new or existing storage as iSCSI storage for Exchange Server. For this test environment, the default configuration of the DL100 Storage Server included a 671-GB F data drive. This drive partition was deleted (in the Disk Management console) and then a new logical unit was created in the iSCSI web console. The entire storage capacity does not have to be used by Exchange, however, with the limited number of internal disks, performance will be impacted by the file sharing load.

A sample bill of materials for the low-capacity configuration shown in Figure 5 appears in Table 2. You can use it as a starting point for defining your own deployment.

Table 2. Configuration (bill of materials) for low-capacity scenario

Configuration component	Description	HP part number [1] (NA) = North America
Exchange server	**HP ProLiant DL380 G4 server**	
1. RAID controller	1. Ultra3-based Smart Array 6i with optional 128-MB Battery Backed Write Cache (BBWC)	
2. Network adapter	2. Two-Port NC7782 10/100/1000 embedded NIC	
3. Memory	3. 1-GB base memory (2 x 512 MB)	311144-xx1
4. Processor options	4. Intel® Xeon™ 3.6-1MB cache /800-MHz FSB	
	Or other model such as	370596-xx1
	Xeon 3.2 GHz 1-MB cache/533-MHz FSB, 1-GB RAM	

Configuration component	Description	HP part number [1] (NA) = North America
• Disks—See configuration for exact number and placement	Up to 14 Ultra320 hot-pluggable SCSI drives • 300 GB 10,000 rpm U320 Universal Hard Drive, 1 in. • 146.8 GB 10,000 rpm, U320 Universal Hard Drive, 1 in. • 72.8 GB 10,000 rpm, U320 Universal Hard Drive, 1 in. • 72.8 GB 15,000 rpm, U320 Universal Hard Drive, 1 in. • 36. 4GB 15,000 rpm, U320 Universal Hard Drive, 1 in.	 • 350964-B22 • 286716-B22 • 286714-B22 • 286778-B22 • 286776-B22
• Optional redundant power supply	Hot Plug AC Redundant Power Supply Module (NEMA and IEC cords) (NA and Japan) Hot Plug AC Redundant Power Supply Module (IEC cord) (WW)	355892-001 355892-B21
• Uninterruptible power systems	See http://h18002.www1.hp.com/products/quickspecs/11473_div/11473_div.HTML	
• Storage server	**HP ProLiant DL100 Storage Server** Intel Celeron 2.8 Hz (320 GB Model) 512 MB of memory standard, expandable to 4 GB Intel Pentium 4 2.8 GHz (640 GB Model) Intel Pentium 4 3.2 GHz (1 TB Model) 1 GB of memory standard, expandable to 4 GB Hardware RAID and Four (4) hot plug 1" 7200 RPM SATA hard drives standard • 4 x 80 GB (320 GB model) • 4 x 160 GB (640 GB model) • 4 x 250 GB (1 TB model) Two auto sensing Gigabit NICs (embedded) 10/100/1000 SCSI controller (embedded) with external connector for backup device	 367987-B21 367988-B21 367989-B21
• iSCSI Target Software	HP ProLiant Storage Server iSCSI Feature Pack	T3662A
Network switch	Recommended: dedicated Gigabit switch Tested: HP Gigabit switch: ProCurve 2708	 MFG #J4898A #ABA
Backup device	Options include • Tape drives (S/DLT, LTO, and so on) • Disk array (for example, on Modular Smart Array Enclosure expansion)	
Tested software: 1. Operating system 2. Messaging application 3. Management and monitoring 4. Backup 5. Antivirus 6. Load testing	1. Windows Server 2003 Standard Edition 2. Exchange Server 2003 Standard Edition 3. HP Systems Insight Manager 4. HP OpenView Storage Data Protector 5.1 5. Sybari Antigen 7.5 6. LoadSim 2003 and Jetstress (free downloads)	See third-party vendor for ordering information

Test results summary

Testing was performed using a LoadSim 2003 user profile mix of medium and heavy users, at a ratio of 2:1, respectively.

The DL100 Storage Server was tested up to 500 mailboxes (using the 2:1 Medium to Heavy LoadSim profile mix) on one Exchange 2003 server. The maximum recommended user load may actually be less than this number depending on the user profile (heavier usage) and additional services running on the Exchange server (connectors, anti-virus scanning, content indexing, etc.). While the LoadSim score is acceptable, the database volume ran an extremely high disk queue length (averaging 38 during the sample period), which indicates that the disk is a bottleneck. If the load was sustained at this rate, the Exchange performance could deteriorate. The Gigabit Ethernet link was ample for the load and ran at only 1 MB/s.

Table 3. Exchange load simulation results for DL100 Storage Server iSCSI storage unit

Exchange Server description	DL100 Storage Server Tested number of users[1]	LoadSim 95th Percentile Score (milliseconds)	% CPU
HP ProLiant DL380 G2 2x 1.26GHz PIII CPU, 2.8 GB RAM	500 1 SG, 1 Mailbox Store + Public Folder Store	843	15%

Notes:

See the section on user profile definition and sizing. Testing used a LoadSim 2003 user profile mix of medium and heavy users, at a ratio of 2:1, respectively.

Medium to high capacity: HP ProLiant DL380 G4 Storage Server

The DL380 G4 Storage Server was tested to over 5,000 mailboxes spread over four Exchange 2003 servers. Figure 6 illustrates the sample configuration that was tested.

A list of some of the DL380 G4 Storage Server product features includes:

- 2U form factor
- Integrated Lights-Out (iLO) Management standard on system board, Advanced License Pack included
- Intel Xeon 3.06 GHz with 512K L2 cache and 1 MB L3 cache
- 1 GB standard (expandable to 4 GB) of 2-way interleaved capable PC2100 DDR SDRAM running at 200MHz
- Three available 64-bit PCI-X slots, including two hot pluggable 100MHz slots and one non-hot plug 133MHz slot
- Expandable with the HP StorageWorks Modular Smart Array 30 enclosures and Smart Array RAID controllers for several terabytes of additional capacity
- Two NC7781 PCI-X Gigabit NICs (embedded) 10/100/1000 WOL (Wake on LAN)
- 2 x 400-Watt Hot Plug Power Supplies and 8 Fans

Note that an HP ProLiant DL380 server was chosen as the Exchange Server because it can be configured with up to six internal drives and fault-tolerant options for redundant fans and power supplies. However, other HP ProLiant servers could easily support the 900 to 2,000 Exchange users. The main sizing concerns are sufficient RAM (1 GB) and enough disks for the Exchange database volume—especially if using RAID 5 (or Advanced Data Guarding [ADG]). As discussed earlier, RAID 1+0 is preferable for the database volume. Note also that the transaction logs can be placed in the Exchange server, which takes advantage of the additional storage capacity of the HP ProLiant DL380 server, but the Smart Array 5i RAID controller option kit is highly recommended as it allows the cache to be set at 100% write-back, which is important for performance, as discussed in this document.

To provide the additional disks, a Smart Array 6402 and a Smart Array 6404 controller were placed in the DL380 G4 Storage Server. Four rack-mountable HP StorageWorks Modular Smart Array 30 (MSA30) disk enclosures (featuring redundant power supplies and up to 14 drives each) were added, for a total of 56 disks. An array of 10 disks on each enclosure was created using RAID 1+0 and presented to a host for the database volume.

Initially, the log drives were placed on the iSCSI storage array (DL380 G4 Storage Server). The log drives were later moved to the local (internal drives of the server) and JetsressUI was used to compare the configurations. Little performance difference was measured between placing the transaction logs local to the Exchange server compared with placing them on an iSCSI disk. The best practice recommendation is to place the transaction log disks on the RAID controller with the most write cache (protected by battery backup). This can be either in the Exchange server (for example if the 5i plus has the option kit installed) or on the iSCSI storage array (especially if a Smart Array has been added for capacity expansion).

The test results are summarized later in this document in Table 5. Additional scalability testing with this expanded configuration will be presented in a later ActiveAnswers white paper.

Figure 6. Sample configuration for Exchange and iSCSI medium- to high-capacity scenario.
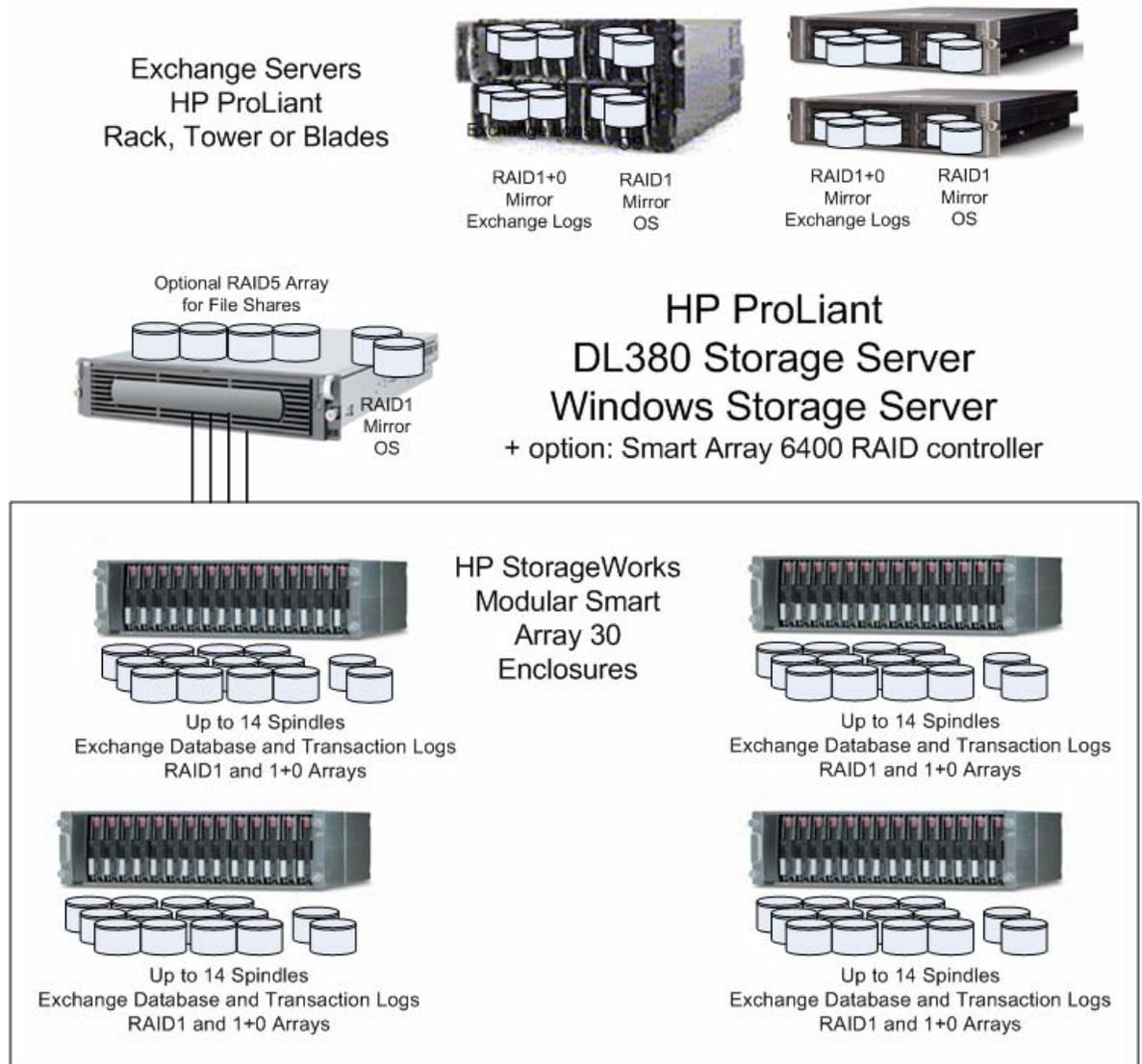
A sample bill of materials for this configuration appears in Table 4. You may use it as a starting point for defining your own deployment.

Table 4. Configuration (bill of materials) for medium- to high-capacity scenario

Configuration component	Description	HP part number[1] (NA) = North America
Exchange servers 1. RAID controller 2. Network adapter 3. Memory 4. Processor options	**HP ProLiant DL380 G4 server** 1. Ultra3-based Smart Array 6i with optional 128-MB Battery Backed Write Cache (BBWC) 2. Two-port NC7781 10/100/1000 embedded NIC 3. 1-GB base memory (2 x 512 MB) 4. Intel® Xeon™ 3.6-1MB cache /800-MHz FSB Or other model such as Xeon 3.2 GHz 1-MB cache/533 MHz FSB, 1-GB RAM	311144-xx1 370596-xx1
• Memory (RAM) for above server	HP ProLiant 2GB PC2-3200 2x1GB FIO BASE	343056-L21
• Second processor option kit	Intel X3.2-GHz/800-1MB 380G4 FIO BASE Intel X3.4-GHz/800-1MB 380G4 FIO BASE Intel X3.6-GHz/800-1MB 380G4 FIO BASE	374492-L21 311583-L22 311584-L22
• Battery-backed write cache for RAID controller	Enabler option kit	346914-L21
• Optional redundant power supply	Hot Plug AC Redundant Power Supply Module (NEMA and IEC cords) (NA and Japan) Hot Plug AC Redundant Power Supply Module (IEC cord) (WW)	355892-001 355892-B21
Exchange servers: Blade Systems 1. Processor 2. Memory 3. Network adapter 4. RAID controller 5. Options	HP ProLiant BL40p P3.0-4MB, 1GB (2P) • (2) Xeon MP 3.0-GHz standard (up to 4 supported) • Cache Memory 4-MB Level 3 Cache (per processor) • Memory 1024 MB (Standard) of two-way interleaved PC2100 ECC DDR (2 X 512 MB) • Network Controller Five NC7781 PCI-X Gigabit NICs (embedded) with WOL and PXE • One additional 10/100T NIC dedicated to iLO Management Storage Controller Smart Array 5i Plus Controller (integrated on system board) with BBWC	344286-B21
• Memory (RAM) for above server	4096 MB of PC2100 ECC DDR DIMM Memory Kit (2x2048 MB)	300682-B21
• Second processor option kit	Intel Xeon 2.80 GHz-512 KB/400 MHz Intel Xeon X3.2-2 MB/533 MHz	257915-B21 352568-B21
• Processor option kit	Xeon MP 3.0 GHz 4-MB Processor Option Kit	344287-B21

Configuration component	Description	HP part number[1] (NA) = North America
• Battery-backed write cache for RAID controller	Enabler option kit	255514-B21
• Disks—See configuration for exact number and placement	Ultra320 hot-pluggable SCSI drives • 300 GB 10,000 rpm U320 Universal Hard Drive, 1" • 146.8GB 10,000 rpm, U320 Universal Hard Drive, 1" • 72.8GB 10,000 rpm, U320 Universal Hard Drive, 1" • 72.8GB 15,000 rpm, U320 Universal Hard Drive, 1" • 36.4GB 15,000 rpm, U320 Universal Hard Drive, 1"	• 350964-B22 • 286716-B22 • 286714-B22 • 286778-B22 • 286776-B22
• Uninterruptible power systems	http://h18002.www1.hp.com/products/quickspecs/11473_div/11473_div.HTML	
Storage server	HP ProLiant DL380 G4 Storage Server • 3.2GHz Intel® XeonTM processor with EM64T, 800 MHz FSB • Dual Port NC7782 PCI-X Gigabit NICs (embedded) 10/100/1000 Wake on LAN (WOL) • Hot Plug Fans with optional full redundancy (Included in High performance models) • Hot Plug Power Supply with optional redundancy (Included in High performance models)	370596-xx1
• iSCSI Target Software	HP ProLiant Storage Server iSCSI Feature Pack	T3662A
• RAID controller	• Smart Array 6402/128 controller • Smart Array 6404/256 controller	273915-B21 (128 MB) 273914-B21 (256 MB)
• Drives for optional RAID 5 array	• Add Ultra320 15K SCSI drives	(See below)
External storage	MSA30—Rack-mountable 14-drive enclosure with redundant power supplies Attached to the Smart Array 6402 controller • Single bus • Dual bus	302969-B21 302970-B21
• Added disks	Ultra320 hot-pluggable SCSI drives • 300 GB 10,000 rpm U320 Universal Hard Drive, 1 in. • 146.8 GB 10,000 rpm, U320 Universal Hard Drive, 1 in. • 72.8 GB 10,000 rpm, U320 Universal Hard Drive, 1 in. • 72.8 GB 15,000 rpm, U320 Universal Hard Drive, 1 in. • 36.4 GB 15,000 rpm, U320 Universal Hard Drive, 1 in.	• 350964-B22 • 286716-B22 • 286714-B22 • 286778-B22 • 286776-B22

Configuration component	Description	HP part number[1] (NA) = North America
Network switch	Recommended: dedicated Gigabit switch Tested: HP Gigabit switch: ProCurve 2708	MFG #J4898A#ABA
Backup device	Options include • Tape drives (S/DLT, LTO, etc.) • Disk array (for example, additional MSA30 shelves or DL100 Storage Server)	
Tested software 1. Operating system 2. Messaging application 3. Management and monitoring 4. Backup 5. Antivirus 6. Load testing	1. Windows Server 2003 Enterprise Edition (to support clustering) 2. Exchange Server 2003 Enterprise Edition (to support clustering and multiple storage groups) 3. HP Systems Insight Manager 4. HP OpenView Storage Data Protector 5.1 5. Sybari Antigen 7.5 6. LoadSim 2003 and Jetstress (free downloads)	See third-party vendor for ordering information

Notes:

[1]Part numbers were obtained from
http://h18002.www1.hp.com/products/quickspecs/productbulletin.html.

Test results summary

Testing was performed using a LoadSim 2003 user profile mix of medium and heavy users, at a ratio of 2:1, respectively.

The DL380 G4 Storage Server was tested up to 5,000 mailboxes (using the 2:1 Medium to Heavy LoadSim profile mix) spread over four Exchange servers. The purpose of this test was to simulate a mix of servers attached to a central DL380 G4 Storage Server (expanded with Smart Array 6400 controllers). The detail on each of the four different Exchange servers and the iSCSI storage unit is shown in Table 5. Again, the maximum recommended user load may actually be less than this number depending on the user profile (heavier usage) and additional services running on the Exchange servers (connectors, antivirus scanning, content indexing, and so on).

Table 5. Four tested Exchange servers connected to one HP ProLiant DL380 G3 Storage Server iSCSI storage unit

Server description	Tested number of users[1]	LoadSim 95th Percentile Score (milliseconds)	% CPU
HP ProLiant DL380 G2 2x 1.26GHz PIII CPU, 2.8 GB RAM	2,000 1 SG, 4 Mailbox Stores + Public Folder Store	535	77%
Clustered HP ProLiant Blade Server BL20p G2 , 2x 3.66 GHz Xeon CPU, 2 GB RAM	900 1 SG, 2 Mailbox Stores	499	15%
Clustered HP ProLiant DL380 G2 2x 1.26GHz PIII CPU, 2.8 GB RAM	900 1 SG, 4 Mailbox Stores	588	33%
HP ProLiant DL380 G2 2x 1.133 GHz PIII CPU, 4 GB RAM	1,200 1 SG, 4 Mailbox Stores	420	44%
Total	5,000		

Notes:

[1]See the section on user profile definition and sizing. Testing used a LoadSim 2003 user profile mix of medium and heavy users, at a ratio of 2:1, respectively.

Each Exchange Server was presented with two logical drives from the iSCSI storage, one for the databases and one for the transaction logs. The database volume was twelve spindles in a RAID 1+0 array, and the transaction logs were a RAID 1 mirrored pair of spindles. All disks used were 15,000 rpm.

Gigabit network performance

Figure 7 shows the network utilization of the teamed Gigabit network link on the DL380 G3 Storage Server during stress testing, averaging about 7%. This number is calculated from the total 2 Gb/s of the teamed link, so it is effectively 14% of a single 1 Gb/s link. The measured throughput on this network interface was 71 Mb/s which equates to 9 MB/s.

Figure 7. Network utilization of DL380 G3 Storage Server teamed Gigabit network link during stress testing
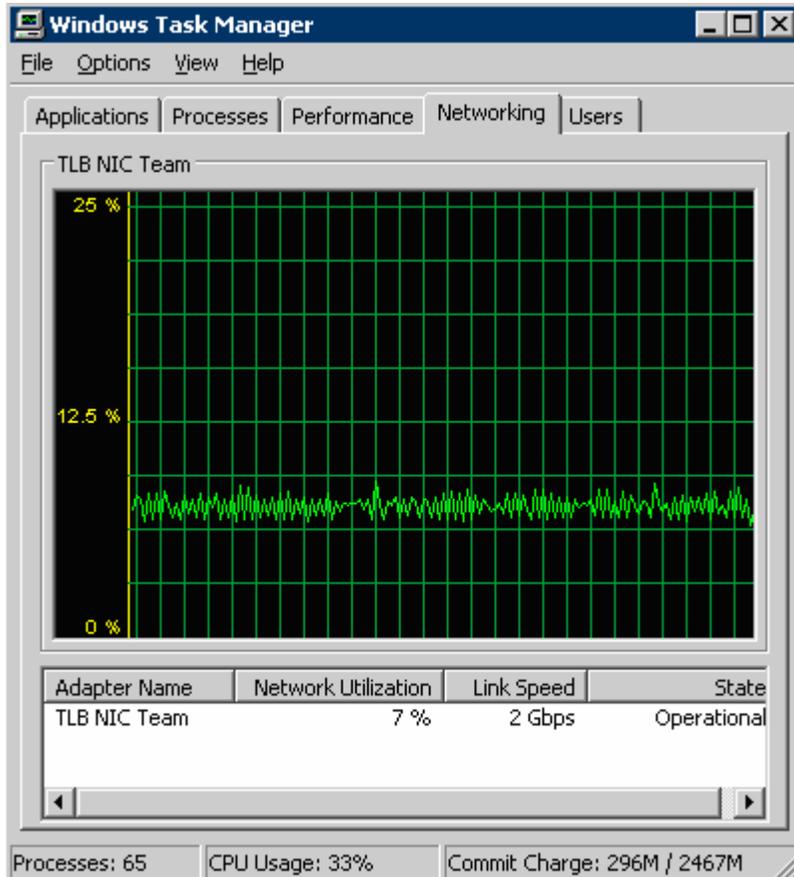
Installing and configuring the HP ProLiant Storage Server iSCSI Feature Pack

The following sections detail the procedures for configuring new Exchange storage or migrating existing Exchange data to the new iSCSI storage.

Configuration process for new Exchange storage

This section details the instructions for setting up new storage. Both the HP ProLiant DL100 Storage Server and HP ProLiant DL380 G4 Storage Server are covered, with information on the differences between each.

1. Log into the Windows Storage Server and create the disk arrays and logical drives using the HP Array Controller Utility. Set the Smart Array controller to 100% write caching if not done so already. For the DL100 Storage Server, the write cache cannot be enabled, as shown in Figure 8.

Figure 8. Array Controller Properties for the DL100 Storage Server
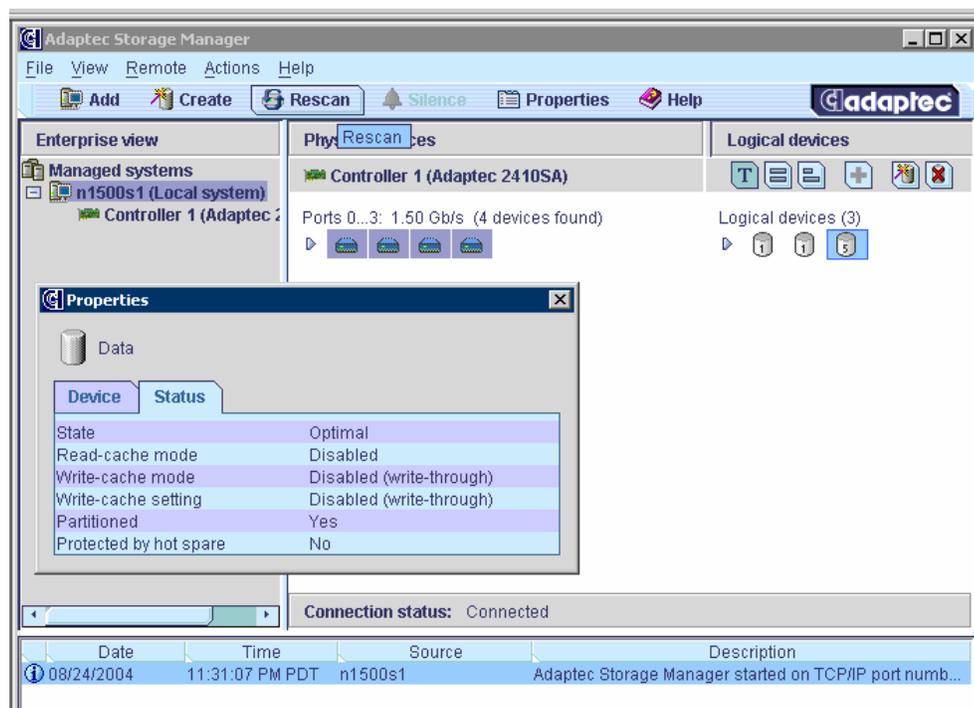
2. Configure each network interface on the Exchange Server and Windows Storage Server with a static IP address and set up HP Network Teaming as discussed earlier in this document.
3. On the Exchange Server, install the Microsoft iSCSI Software Initiator by launching the MSI file. The instructions here are based on the version installed and tested: 1.04a (build 244) Microsoft ISCSI driver 5.2.3790.243. The most recent software can be downloaded from http://www.microsoft.com/downloads/ details.aspx?FamilyID=12cb3c1a-15d6-4585-b385-befd1319f825&displaylang=en. Be sure to select the option to install for Everyone (which is not the default) if you wish other administrators logging into the server to be able to launch and configure the Microsoft iSCSI Software Initiator software. If you do not select this option, the other users can still access the Microsoft iSCSI Software Initiator software from the Control Panel and create a desktop shortcut from there.

4. On the Windows Storage Server, install the HP ProLiant Storage Server iSCSI Feature Pack server software and reboot the server.
5. Log in to the Windows Storage Server, and launch the Web Administration console – this may already be the Home Page for the Internet Explorer browser, unless another administrator has already changed it. Select Start, Programs, Administrative Tools, and Web Interface for Remote Administration or set the address in the browser to https://localhost:3202. You will be prompted to enter administrative credentials.

   Best Practice: Before making major changes in the steps below, select Server Configuration Files to backup the iSCSI Server configuration files.
6. You must enter the key code for the HP ProLiant Storage Server iSCSI Feature Pack before using it. Select the iSCSI tab and the Configuration menu choice. Add the Key Codes for iSCSI Storage Server via the Configuration License Screen.
7. Select iSNS Configuration to configure either a remote computer or the local system as an iSNS Server (for device discovery in iSCSI networks).
8. Select Default Portal Template to verify the portal (combination of IP address, port number, and group number) for this server. By default, the iSCSI Server assigns the host one portal for each network interface card (NIC) IP address. If you have network teaming enabled, the address of that single, virtual team interface should be detected.

Note

If network teaming is added after the iSCSI targets have been presented to hosts (or some other change results in a change to the IP address of the iSCSI storage server), then the iSCSI Default Portal Template will need to be modified to add the new address. The iSCSI initiator software will also need to be updated with the new Portal address. If the hosts have existing connections, you will also need to log off and log on again.

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9. Select Logical Units and select the New task. Enter a name and the amount of storage to use or all available storage. (You do not need to consume all of the disk space and can later expand the logical unit if there is disk space available. A later section in this document covers expanding an array using a Smart Array RAID controller). Leave the host access at defaults for now and finish creating the logical unit. Host access will be given to the Exchange Server in the next steps.

Note
The default configuration of DL100 Storage Server includes a 671 GB F data drive. You must delete this drive partition (in the Disk Management console) and then create a logical unit in the iSCSI web console. If the web console is already open, click the option to force a rescan of the devices.

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10. On the Exchange Server, launch the Microsoft iSCSI Software Initiator software either through the Control Panel or the icon on the desktop (if the desktop icon does not appear, re-run the MSI file and select the option to repair the installation). Select the Target Portals tab and click the Add button. Enter the IP address or name of the Windows Storage Server and click OK. If you get an error saying "the requested name is correct but no data of the requested type was found" this means that the server you entered is not running the HP iSCSI software (and may not even be the NAS unit you intend to use).
11. Return to the Windows Storage Server Web Administration console and select Hosts to add the Exchange Server(s). Enter the server name and keep the option to resolve by server address (as opposed to fully qualified DNS name). Keep the Authentication Type as Anonymous if you prefer no authentication (see the product documentation for more details on security). Select CHAP if you

have configured a server secret which the Initiator (Exchange Server) must know or Mutual CHAP if you have configured a secret on both the Initiator and Windows Storage Server.

12. Next, select the Initiator Name/Address pairs from the drop down list (just off the screen in the following Figure) to add to the host and click OK. If there is not a known iSCSI initiator available in the drop-down list, return to the Exchange Server and run the Microsoft iSCSI Software Initiator software to make sure that you have entered the target portal properly.

Figure 9. Known iSCSI Initiator the drop-down list
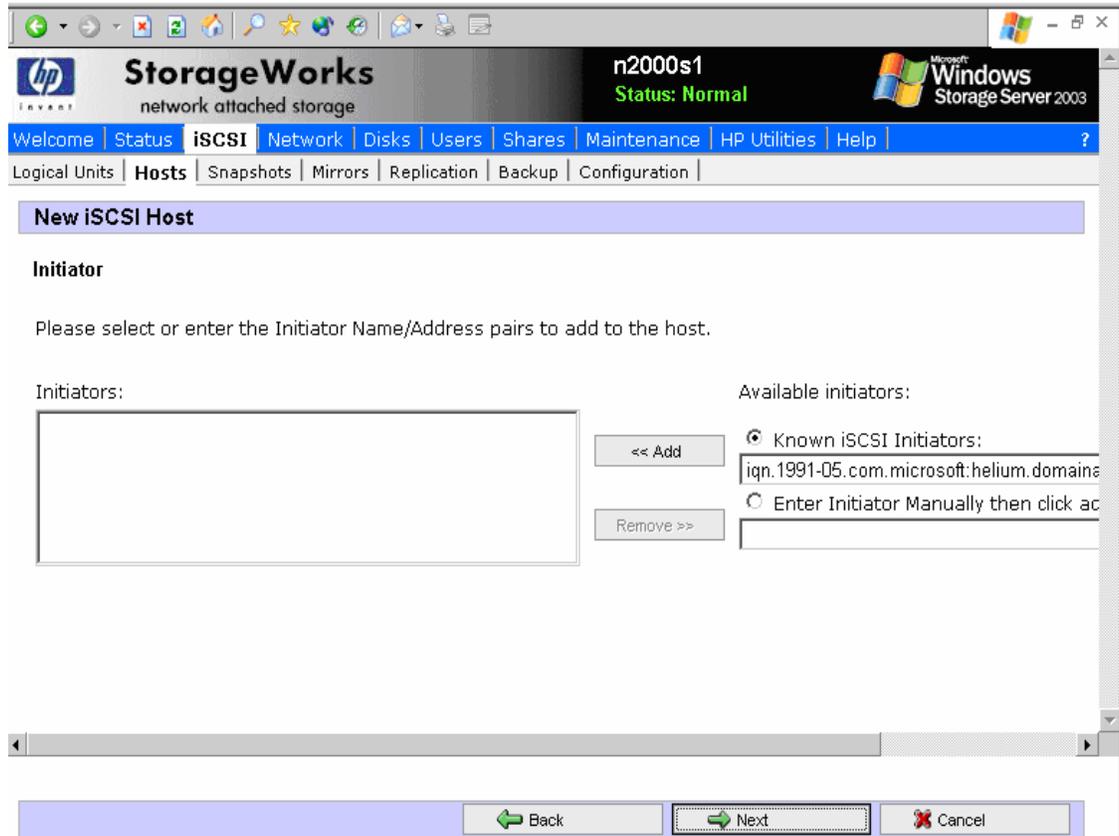
13. If you have already configured Logical Units (through the previous procedures), set the access right for the Exchange Server to Read/Write Exclusive. If not, proceed to the next step. Select Logical Units to create a Logical Unit and set the access right for the Exchange Server to Read/Write Exclusive.

14. On the Exchange Server, run the Microsoft iSCSI Initiator software (shortcut on desktop or use Control Panel). Click on the Available Targets tab and the Refresh button, and you should see the iSCSI storage listed (if it is not, return to the Windows Storage Server console and select the Host, select the Initiators task and select Add to select the known iSCSI initiator from the drop-down). Select the target and click Log On… In the dialog box (shown in Figure 10 below) select *Automatically restore this connection when the system boots* and click OK. The status should show Connected. Do not select the *Enable multi-path* checkbox (this is a different feature than the HP ProLiant NIC teaming discussed earlier in this document).

Figure 10. Initiating a connection to the iSCSI target
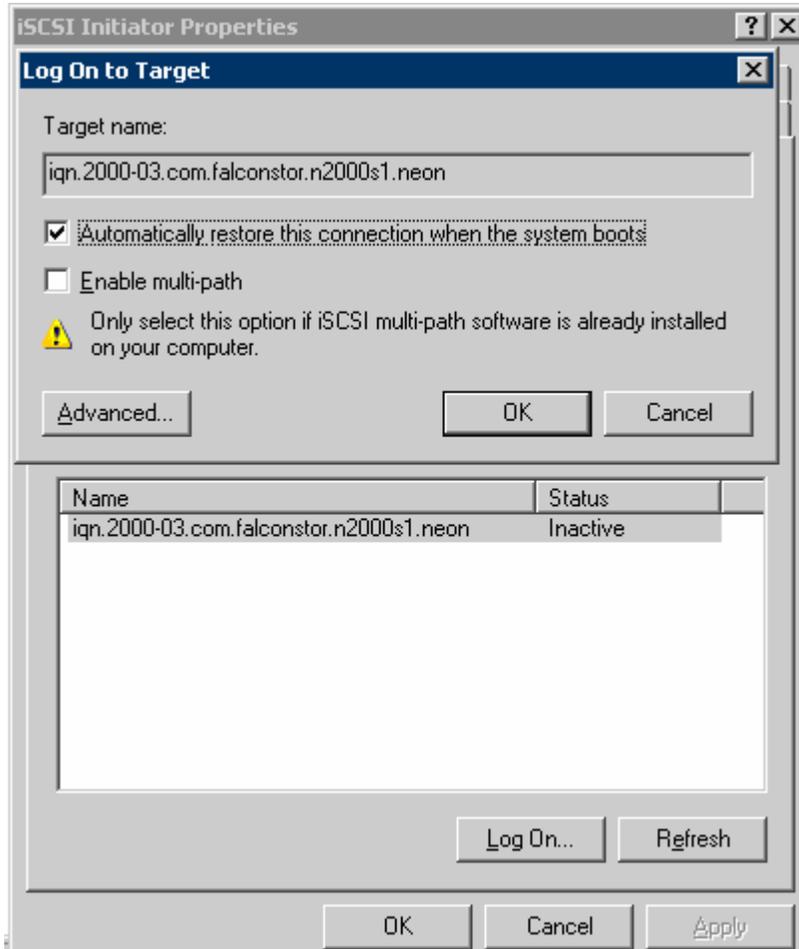
15. Launch the Disk Management console (diskmgmt.msc), which can also be found in the Computer Management console. If the new disk does not appear, select Rescan disks. You may see the Initialize and Convert Disk Wizard. Keep the defaults to initialize but not convert the new disk. If the wizard does not run automatically, right-click on one of the new disks and choose Initialize Disk.
16. Run diskpar.exe from a command prompt to create a new partition (see the following note). Be certain that you select the correct disk (first, run diskpar -i # for the disk number that you want to set partition information and verify that there is not an existing partition). Create the partitions using diskpar (an offset of 64 or greater is preferred).

Note
Diskpar can be obtained from the Windows 2000 Resource Kit. Diskpar is a utility to set the starting sector for new disks. If diskpar is not used (and the disk management console is used instead) to create new partitions, then the starting sector may be misaligned with the track boundaries. Since Exchange Server database writes are mostly 4K in length, it is important that the starting offset is a multiple of four and greater than 63 (the length of the hidden sectors reserved for the master boot record).
For more information about diskpar, see http://go.microsoft.com/fwlink/?linkid=26101.

17. In the Disk Management console, right-click on the new partition and select Change Drive Letter and Paths… Click the Add button and assign a drive letter. If you do not assign a drive letter to the new volumes first, the format will fail. Next, quick-format the drives using the Disk Management MMC, keeping the default file system of NTFS and entering a meaningful volume label such as "Server Logs."

Moving existing Exchange data to iSCSI

The following procedures detail the process of migrating existing Exchange Data to the new iSCSI storage. The migration is straightforward and it is possible to keep data intact if done correctly.

HP Smart Array Controllers

Exchange databases created on drives attached to an HP Smart Array Controller may be moved to the Windows Storage Server NAS and mounted via iSCSI. To do so, follow these procedures:

1. Like any data migration or movement, this procedure introduces risk to the Exchange databases, so ensure that you have a valid backup copy (e.g. on tape or disk media). Make a note of the Exchange configuration – which databases are located on which drives.
2. Shut down the Microsoft Exchange Information Store – which will impact e-mail users and should be scheduled during off-hours.
3. Move the physical drives and verify that the array is recognized in the Windows Storage Server. The disk (volumes) must not be mounted (do not assign a drive letter) and must not contain any iSCSI file devices. Remove any drive letters by using the Disk Management console (diskmgmt.msc) and reboot the Windows Storage Server if necessary.

Figure 11. Disk Management console showing the Exchange Data drive without drive letter
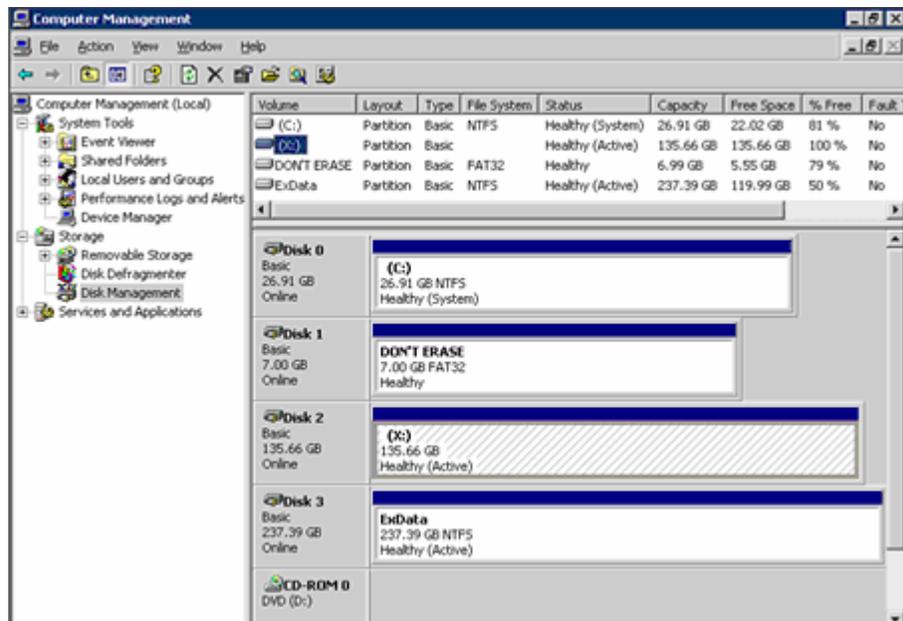
4. In the Web Administration console for iSCSI Server, select Configuration and Storage to create a File Device to hold the pointers to the disk array to be imported. The absolute minimum size is 8MB (but this will most likely fail to import the disk), so a recommended size should be at least 20MB or in relation to the disk array to be imported.

Figure 12. Example iSCSI File Device
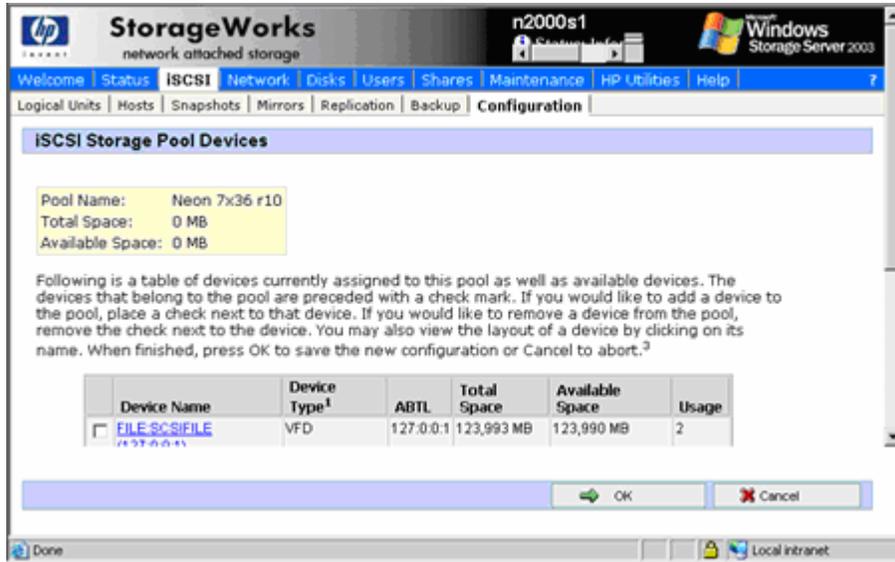
5. Select Logical Units and the Import task. You will then give it a descriptive name, select the disk to import from the drop-down and select the file device to use. If there are no disks to import in the drop-down, verify that the disk to import is not mounted (assigned a drive letter). Once the disk is imported, it should **not** be mounted (given a drive letter or mount point) by the local operating system.

Figure 13. iSCSI Logical Unit (from imported disk array)
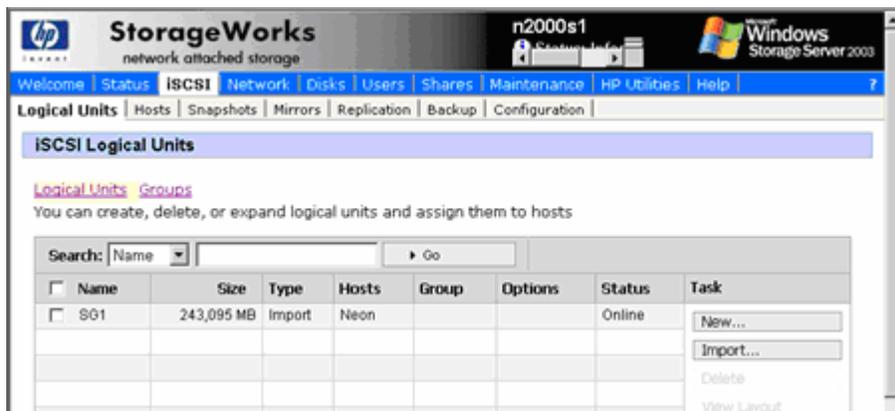
6. Next, in the iSCSI Web Administration console, select the Logical Units and the Hosts task to set the access right for the Exchange Server to Read/Write Exclusive (RWE).
7. On the Exchange Server, run the Microsoft iSCSI Initiator software (shortcut on desktop or use Control Panel) and select the Target Portals tab. Enter the IP address or name of the Windows Storage Server and keep the default for socket unless you have changed it on the Windows Storage Server.

8. On the Available Targets tab you should see the iSCSI storage listed. Select the target and click Log On… Select *Automatically restore this connection when the system boots* and click OK. The status should show Connected.

9. Launch the Disk Management console (diskmgmt.msc), which can also be found in the Computer Management console. Assign the same drive letter to the new disk as noted in step 1, to keep the exact same drive configuration.

10. Start the Microsoft Exchange Information Store service and verify that the databases mount.

Migrating from NAS

The procedure for moving databases from NAS to iSCSI server is similar to the above, with the exception that no physical drives may need to be moved (if merely changing the Windows Storage Server to an iSCSI Server). Instead the drive letter is removed on the Exchange database drive on the Windows Storage Server and imported as in the previous procedures. There is no need to copy or move large amounts of Exchange data using this procedure, so it can be done in a manner of minutes (especially after you have practiced the procedure in your test environment).

Like any data migration or movement, this procedure introduces risk to the Exchange databases, so ensure that you have a valid backup copy (e.g. on tape or disk media).

Follow all of the procedures above. After the drive is imported on the iSCSI server, recognized as an iSCSI target and given a drive letter on the Exchange Server, use the Remote Storage Wizard to change the **configuration information** to point the new database location to the iSCSI-attached drive. Note that the Microsoft Exchange Information Store service must be running to complete the Remote Storage Wizard configuration update as shown in Figure 14 below. However, it is normal for the Stores to fail to mount – as the old network drive location is no longer available.

Note

When running the Remote Storage Wizard, if you do not see the new drive listed in the File Location Selection dialog box, manually type in the drive letter and it will then show up as available for use.

Figure 14. Remote Storage Wizard used to change the configuration information
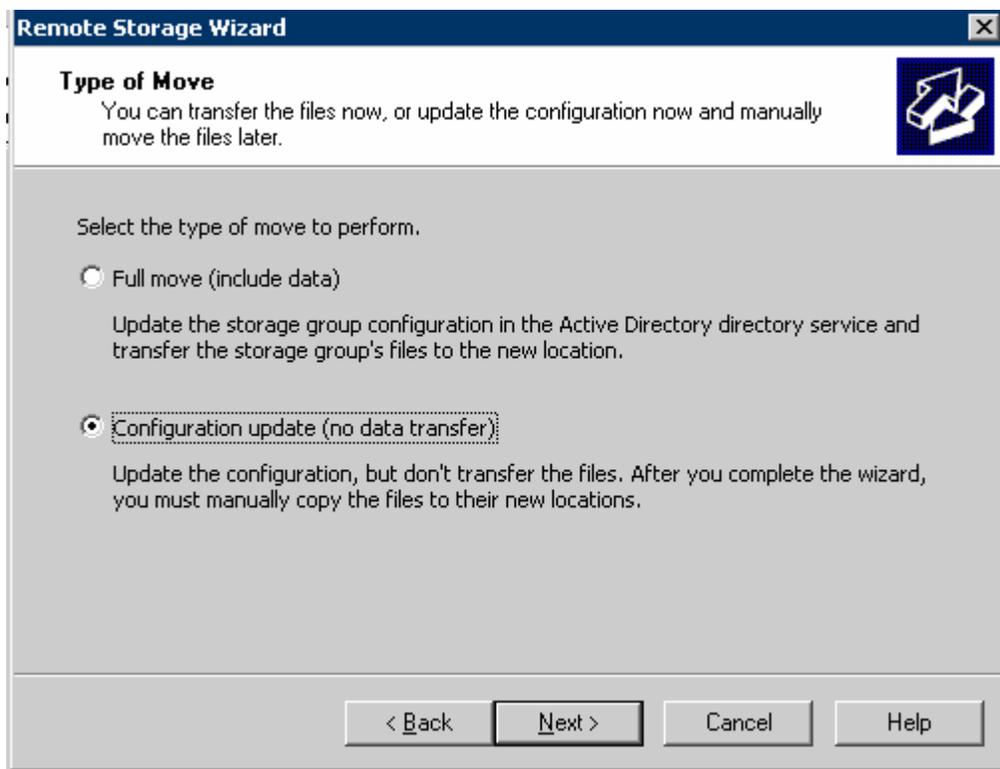
Changing imported units

It is possible and quite easy to change an imported logical unit – for example, if you wish to change to a raw disk or change the size of a file device used to mount the imported disk (the iSCSI Server software allows expansion of a file device, but to make it smaller you must follow these procedures).

1. On the Exchange Server, shut down the Microsoft Exchange Information Store service and make sure there is no other access to the database volume.
2. Run the Microsoft iSCSI Initiator software (shortcut on desktop or use Control Panel) and select the Available Targets tab – you should see the iSCSI storage listed.
3. Select the Active Sessions tab and click the Log Off button. The drive is now dismounted from the Exchange server.
4. On the Windows Storage Server, use the iSCSI Server Web Administration console to delete the logical unit. You will see a warning on the page "If deleted logical units have active connections from hosts, data will be lost." However, this operation is non-destructive, as you will merely re-associate the logical unit with a new file device.
5. Create the new file device (in the Configuration, Storage section) or raw disk and assign the logical unit to it (in the Logical Unit section).

Managing Exchange 2003 and the HP ProLiant Storage Server iSCSI Feature Pack

This section highlights some of the differences from traditional storage management for Exchange Server and NAS with iSCSI.

Monitoring and management

The Windows Storage Servers from HP support HP Systems Insight Manager and HP OpenView for management and troubleshooting, integrating well into existing HP ProLiant server management infrastructure.

Unlike traditional NAS, where file shares are used, the iSCSI solution provides disks that appear as local to the Exchange server. Physical disks do not report counters on the Windows Storage Server and must be monitored on the server where the iSCSI connection is made (Exchange Server).

Restarting servers

Because the storage array is a server computer, it must be considered when restarting any of the devices. Before restarting the Exchange server, it is recommended that you shut down the Exchange Information Store service on the Exchange server, and then shut down the server. This procedure helps to ensure that all transaction logs are committed to the database and the checkpoint is advanced.

To restart both servers, restart the Windows Storage Server computer first, and then power off and restart the Exchange server. This ensures that all storage provided by the Windows Storage Server computer is available when Exchange starts. If a server operator or administrator is not available to power the Exchange server back on (for example, in a remote-server scenario), then a best practice is to set the startup delay in the boot.ini on the Exchange server substantially longer than the startup delay in the boot.ini of the Windows Storage Server.

Antivirus software

Note that administrators who are more familiar with deploying NAS for file and print servers must understand how to deploy both file-based and e-mail antivirus scanning. File-based scanning products are often used on PC desktops. The antivirus products used in the test environment are not file-based scanning, as is most often deployed on file servers. Instead, these antivirus products run with Exchange server and scan e-mail attachments. A list of products can be found at http://www.microsoft.com/exchange/partners/antivirus.asp.

If file-based scanning is deployed, the administrator must be careful to exclude the Exchange files from scanning, to prevent inadvertent false positives (that is, matching a viral signature against the binary data stored in Exchange databases, logs, or other files, which can result in a server crash if the file is quarantined by the antivirus software). This list of file exclusions should include all Exchange databases, logs, SMTP mailroot, and other files such as message-tracking logs. For more details, see Microsoft knowledge base article 823166, "Overview of Exchange Server 2003 and antivirus software" at http://support.microsoft.com/default.aspx?scid=kb;EN-US;823166#3.

Full-text indexing

Full-text indexing (FTI) enables the Microsoft Outlook and Microsoft Outlook Web Access e-mail clients to perform full-text searches against both messages and attachments. The index of Exchange server content makes it possible to locate words in attachments (including the document properties) that might otherwise be missed using the basic search capability of Microsoft Outlook. Without FTI enabled, the Exchange server will perform ordinary, character-based searches. FTI is a beneficial function of Microsoft Exchange, but proper configuration and tuning of the deployment is crucial to avoid risks that may outweigh the benefits. The FTI feature places an additional burden on the performance of the disk subsystem. Also, note that if you are deploying Microsoft Outlook 2003 in cached mode, it does not benefit from FTI.

For full details, see the HP white paper "Optimizing Full-Text Indexing on Microsoft Exchange Server 2000 and 2003" at http://h71028.www7.hp.com/ActiveAnswers/Render/1,1027,6637-6-100-225-1,00,00.htm.

Extending drive arrays

As part of the HP iSCSI Feature Pack test suite, a drive array was extended by adding physical drives to the cabinet and using the ability of the Smart Array controller to extend the existing RAID set without impacting the safety of the data. The procedures for doing so in an iSCSI environment follow. A disk was created with ten (10) drives and two drives were added later to the MSA 30 storage cabinet to demonstrate the ease of online expansion. The additional two drives were added to the existing logical drive and the new capacity added to the volume using diskpart in Windows Server 2003; however the process was found to be slightly different due to the introduction of iSCSI to the storage environment.

Note

In case of operator error it is strongly advised that a backup be made and validated before proceeding with any change to an array holding Exchange or other valuable data.

To extend a drive array:
1. After a backup has been made and validated, add the physical drives to the cabinet. Modify the existing array by adding the drives, as shown below in Figure 15.

Figure 15. Extending the size of an existing array using the HP Array Configuration Utility

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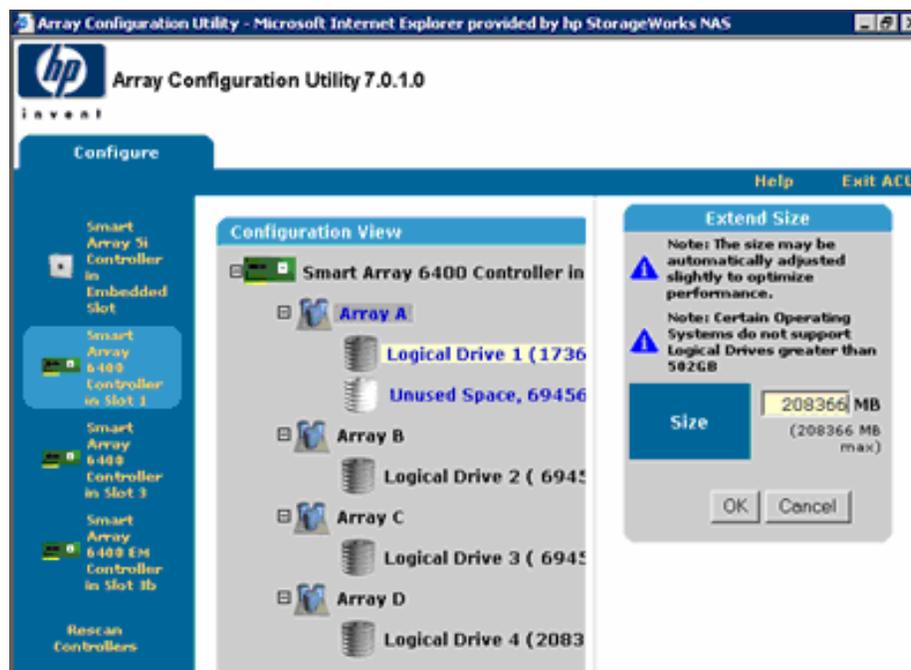
2. Wait for the new drive capacity to show up when the array rebuild is complete. This can take several hours, especially if the Expand priority is set to Low. You may increase the Expand priority if there is little concern of impacting production performance.
3. Next, rescan the disks in the Disk Management Console on the Windows Storage Server NAS. When the new partition size shows up, shut down disk access on the Exchange Server (e.g. if a cluster, take the disk resource offline, otherwise, shut down the Microsoft Exchange Information Store Service or take all Stores on that disk offline).

4. On the Windows Storage Server Administrator Console, remove all host access and grant RWE access to the Windows Storage Server NAS only. Select the Logical Unit and the Expand task in the Windows Storage Server Administrator Console. Select the desired amount of disk space or all available space, and click OK.

5. Return to the Exchange Server and at a command prompt run diskpart (a utility included with the operating system). Note that the disk resource must be brought back online if it is a cluster disk. Enter "list vol" and "select vol #" where # is the volume to be extended. Enter "extend" and the volume will be extended.

6. You may now restart the Microsoft Exchange Information Store Service and bring all Stores on that disk online).

Disaster recovery

For a more comprehensive overview, see the HP white paper "Microsoft Exchange Server 2000 and 2003 Backup and Restore using HP Technology" at http://h71028.www7.hp.com/activeanswers/cache/70576-0-0-225-121.aspx.

More information on advanced disaster recovery features of the iSCSI storage solution will be made available in a later ActiveAnswers white paper.

Backup and restore testing

As part of the configuration validation testing, backup and restore tests were performed to measure throughput rates for data backup. Backup tests were performed with HP OpenView Storage Data Protector 5.1 as well as CommVault Galaxy 5.0. Table 6 shows the measured backup rates for a 65-GB Exchange Store with a SDLT tape device compared to an iSCSI storage device.

Table 6. Backup of 65-GB Exchange Store via SDLT tape

	SDLT throughput GB/hr	% Network Utilization
SDLT tape	66	N/A
iSCSI storage device	50	1 Gb/s @ 19%
iSCSI storage device	64	2 Gb/s @ 15%

The backup to iSCSI storage device used a twelve disk RAID 1+0 array which performed at 10MB/sec of sequential write throughput. Network utilization on a 1 Gb/s link ran at about 19% and CPU was at about 70%. Teaming the network link (transmit load balancing) resulted in 28% higher throughput with an effective network utilization of 15%.

In additional tests, the SDLT tape device was connected to different locations; directly to the Exchange server, on a separate backup server or on the NAS device. For this test suite, all servers were attached to a dedicated Gigabit switch and all servers used the HP network teaming driver (in Transmit Load Balancing mode to create a 2-Gb/s link). The conclusion from the tests is that the tape device can be attached directly to the Windows Storage Server or a dedicated backup server and achieve nearly the same performance as if attached to the Exchange server. This can save costs in a multiple server environment by allowing a single dedicated tape device to back up many servers over the network.

Recovery storage group

The Recovery storage group (RSG) is a new feature in Exchange Server 2003. For more detail, see the HP white paper "Exchange Server 2003 Recovery Storage Group and HP ProLiant Server Technologies" at http://activeanswers.compaq.com/aa_downloads/6/100/225/1/64974.pdf.

Working with RSG in the HP ProLiant Storage Server iSCSI Feature Pack environment has certain advantages. You may use storage on the current iSCSI server or merely add another NAS device as an iSCSI target, and performance between the storage subsystems can be made comparable if the hardware platforms are kept similar.

Clustering

Note
All references to clustering and the HP ProLiant Storage Server iSCSI Feature Pack in this document refer to clustering of the Exchange servers, as opposed to clustering of the NAS servers (often referred to as NAS heads)—the HP ProLiant Storage Server iSCSI Feature Pack does not support clustering the Windows Storage Servers. The HP ProLiant Storage Server iSCSI Feature Pack enables Exchange server clusters with a Windows Storage Server 2003 device to provide shared storage for the cluster nodes.

The HP ProLiant Storage Server iSCSI Feature Pack can be used to create disks that provide the shared storage necessary to cluster two or more Exchange Servers. In this test environment, Windows Server 2003 is used to cluster two Exchange Servers, and the test results will follow later in another ActiveAnswers whitepaper. The official launch of clustering and HP ProLiant products will shortly follow the initial launch of the HP ProLiant Storage Server iSCSI Feature Pack, but clustering is complex enough that it is advised to begin gathering information as soon as possible. Clustering assists in removing or eliminating certain sources of downtime (such as scheduled maintenance, operating system crashes or server hardware faults), but it does require special tools and knowledge, for example in the area of disaster recovery.

The procedure for setting up a cluster is different in Windows Server 2003 than in the 2000 version. It is strongly advised that you use the whitepaper *"HP Best Practices for Microsoft Exchange Server 2000 and 2003 Cluster Deployments"* available at http://h71019.www7.hp.com/ActiveAnswers/ cache/70595-0-0-0-121.aspx#311.

Conclusion

The HP ProLiant Storage Server iSCSI Feature Pack is a new solution that enables placement of Exchange Server 2003 files on an HP ProLiant Storage Server running Microsoft Windows Storage Server 2003. Typically the Exchange database files and transaction log files are placed on the iSCSI storage. The performance of this configuration is shown in this whitepaper to be comparable to direct-attached or Fibre Channel arrays. The iSCSI storage also offers great flexibility for use as a backup target with RAID protected disk (for example, the ATA-based HP ProLiant DL100 Storage Server on the low end or the SCSI-based HP ProLiant DL380 G4 Storage Server on the high end). Part of the appeal of iSCSI is the use of existing Gigabit Ethernet adapters and network topology without having to add higher cost Fibre Channel adapters and create a switched Fibre Channel topology.

This paper also details the procedures for setting up new storage or migrating existing Exchange data arrays to the HP ProLiant Storage Server iSCSI Feature Pack with little service interruption. The iSCSI solution can be used for Exchange clusters and offers advanced data protection features which will be covered in a later ActiveAnswers whitepaper.

For more information

HP storage website

The HP website has the latest information on this product, as well as the latest drivers. Access storage at http://www.hp.com/country/us/eng/prodserv/storage.html. From this website, select the appropriate product or solution.

HP authorized reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the HP website for locations and telephone numbers: http://www.hp.com/.

HP technical support

Telephone numbers for worldwide technical support are listed on the following HP website: http://www.hp.com/support/. From this website, select the country of origin.

Note: For continuous quality improvement, calls may be recorded or monitored.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions