HP StoreEasy 1000 Storage Administrator Guide

This document describes how to install, configure, and maintain all models of HP StoreEasy 1000 Storage and is intended for system administrators. For the latest version of this guide, go to http://www.hp.com/support/StoreEasy1000Manuals.

HP Part Number: B7D88-96379
Published: June 2015
Edition: 1

Acknowledgments

Warranty

WARRANTY STATEMENT: To obtain a copy of the warranty for this product, see the warranty information website:

http://www.hp.com/go/storagewarranty

Contents

1 HP StoreEasy 1000 Storage

The HP StoreEasy 1000 Storage system provides multi-protocol file sharing and application storage for a range of business environments. The 14x0 and 15x0 platforms are ideal for small businesses or workgroups or a remote office. The 16x0 and 18x0 can accommodate medium and large IT environments.

NOTE: The HP StoreEasy 1000 Administrator Guide provides information on all models within the StoreEasy 1000 Storage product family. The product name is listed generically where the same information is applicable to different models. For example, if the same information applies to 1450 and 1650, the model is listed as 1x50.

Features

The HP StoreEasy 1000 Storage provides the following advantages:

- Efficiently maximizing resources through file and data management without increasing costs.
- HP and Microsoft management integration, including Microsoft Server Manager and System Center and HP Systems Insight Manager and iLO (Integrated Lights Out).
- Each system ships from the factory with preintegrated hardware and preloaded software, to significantly reduce the time and complexity of installation.

For more information about HP StoreEasy 1000 Storage features, go to:

http://www.hp.com/go/StoreEasy1000

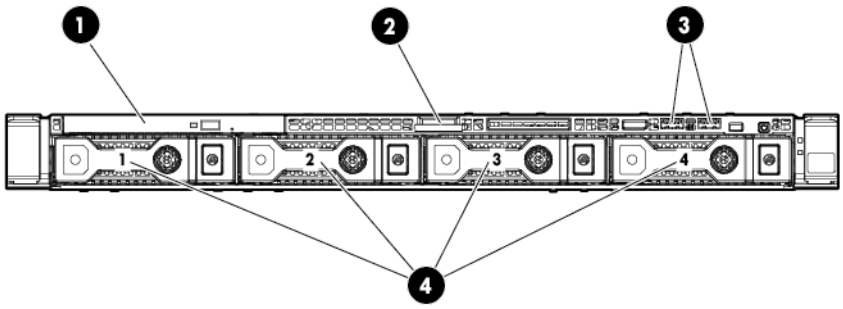
Hardware components

This section provides illustrations of the storage system hardware components.

HP StoreEasy 1450 Storage hardware components

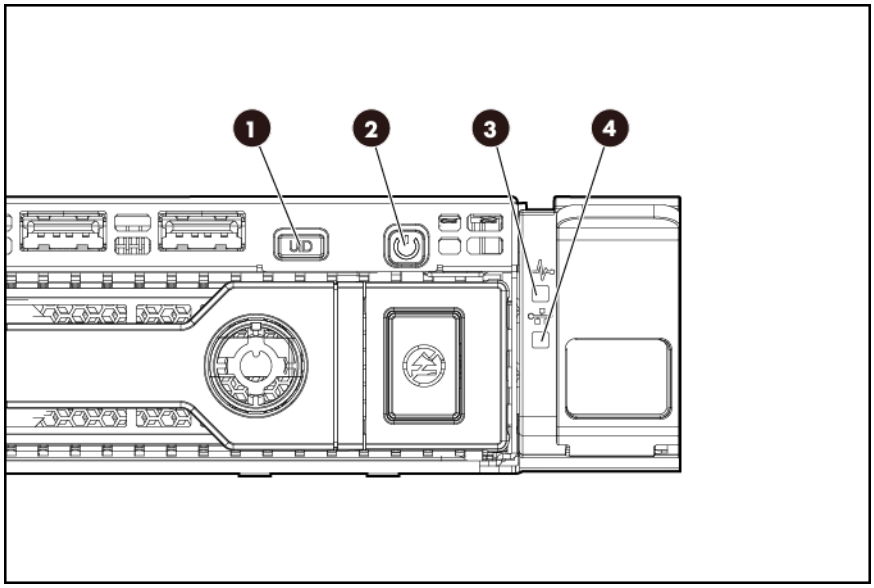
The following figures show components and LEDs located on the front and rear panels of the HP StoreEasy 1450 Storage.

Figure 1 HP StoreEasy 1450 Storage front panel components



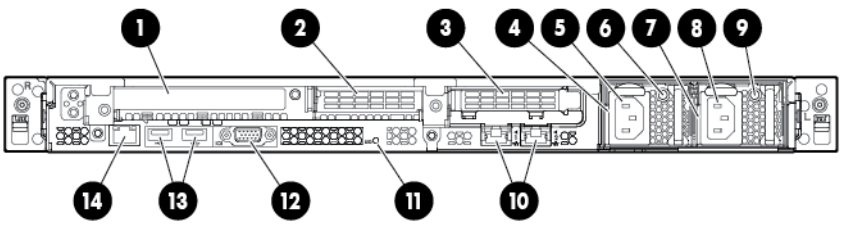
1. Optical drive
2. Serial label pull tab
3. USB connectors
4. LFF drives

Figure 2 HP StoreEasy 1450 Storage front panel LEDs and buttons



Item	Description	Status
1	UID LED/button	Blue = Identification is activated. Flashing blue = System is being managed remotely. Off = Identification is deactivated.
2	Power On/Standby button and system power LED	Green = System is on. Flashing green = Waiting for power. Amber = System is in standby, but power is still applied. Off = Power cord is not attached or power supply failed.
3	Health LED	Green = System is on and system health is normal. Flashing amber = System health is degraded. Flashing red = System health is critical. Off = System is off.
4	NIC status LED	Green = Linked to network Flashing green = Network activity Off = No network link

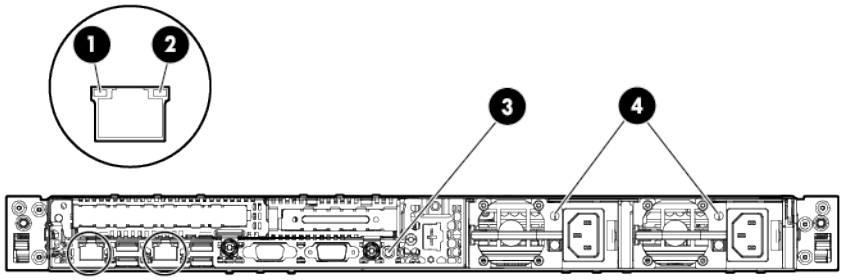
Figure 3 HP StoreEasy 1450 Storage rear panel components



1. PCIe3 slot 1 (primary, associated with processor 1)
2. PCIe3 slot 2 (primary, associated with processor 1)
3. PCIe3 slot 3 (secondary, associated with processor 2)
4. Power supply 1 bay
5. Power supply 1 power connector (optional)
6. Power supply 1 LED (optional)

7. Power supply 2 bay
8. Power supply 2 power connector
9. Power supply 2 LED
10. Embedded 2x1GbE network adapter
11. Unit ID LED
12. Video connector
13. USB3.0 connectors
14. Dedicated iLO connector (optional)

Figure 4 HP StoreEasy 1450 Storage rear panel LEDs and buttons

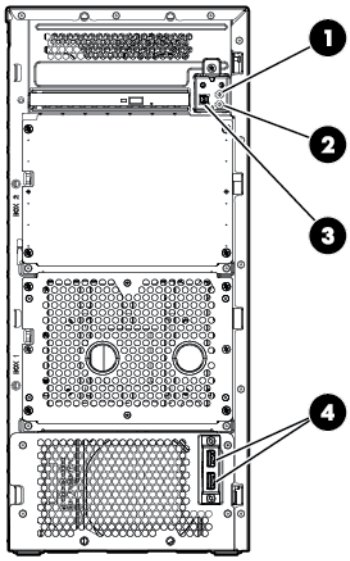


Item	Description	Status
1	NIC link LED	Green = Link exists Off = No link exists
2	NIC status LED	Green = Activity exists Flashing green = Activity exists Off = No activity exists
3	UID LED/button	Blue = Activated. Flashing blue = System is being managed remotely. Off = Deactivated.
4	Power supply LEDs	Green = Normal Off = One or more of the following conditions exist: • Power is unavailable • Power supply failed • Power supply is in standby mode • Power supply exceeded current limit

HP StoreEasy 1550 Storage hardware components

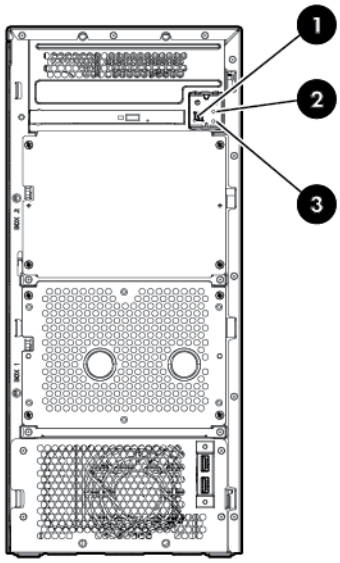
The following figures show components and LEDs located on the front and rear panels of the HP StoreEasy 1550 Storage.

Figure 5 HP StoreEasy 1550 Storage front panel components



1. Optical drive (optional)
2. Box 2
3. Box 1
4. USB 3.0 connectors

Figure 6 HP StoreEasy 1550 Storage front panel LEDs and buttons



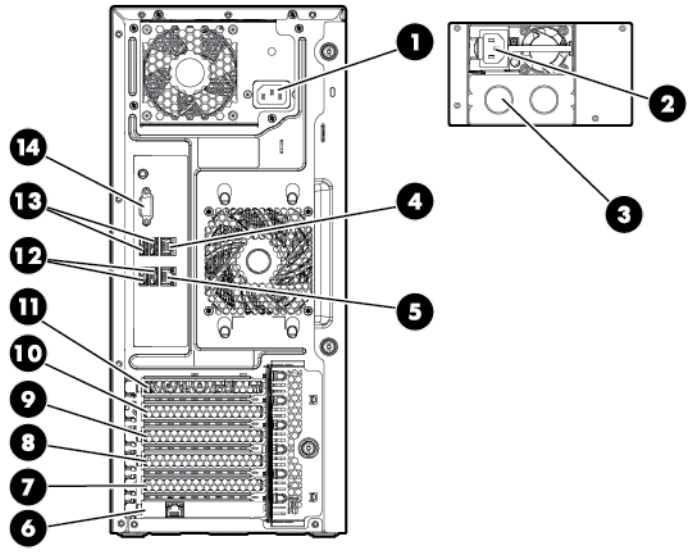
Item	Description	Status
1	Power On/Standby button and system power LED*[1]	Solid green = System on Flashing green (1 Hz/cycle per sec) = Performing power on sequence Solid amber = System in standby Off = No power present**[2]
2	Health LED*	Solid green = Normal Flashing green (1 Hz/cycle per sec) = iLO is rebooting. Flashing amber = System degraded† Flashing red (1 Hz/cycle per sec) = System critical[3]
3	NIC status LED*	Solid green = Link to network Flashing green (1 Hz/cycle per sec) = Network active Off = No network activity

[1] When all three LEDs described in this table and the UID button/LED on the rear panel flash simultaneously, a power fault has occurred.

[2] Facility power is not present, power cord is not attached, no power supplies are installed, power supply failure has occurred, or the power button cable is disconnected.

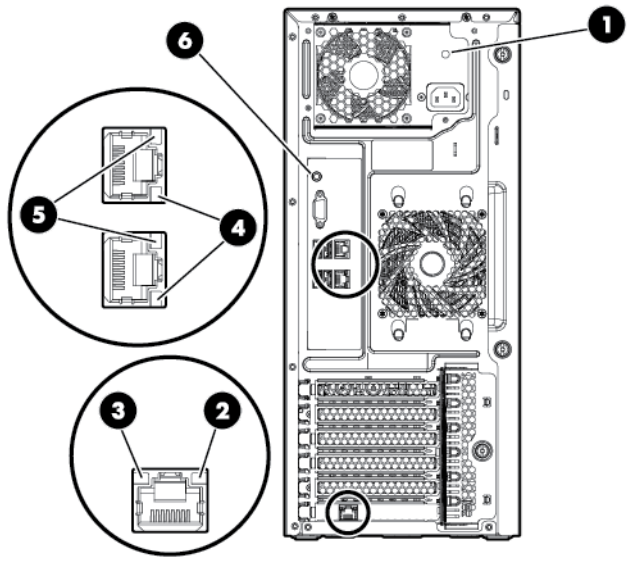
[3] If the health LED indicates a degraded or critical state, review the system IML or use iLO to review the system health status.

Figure 7 HP StoreEasy 1550 Storage rear panel components



1. Non-hot-plug power supply
2. Power supply bay 1 of the hot-plug power supply (optional)
3. Power supply bay 2 of the hot-plug power supply (optional)
4. NIC connector 1
5. NIC connector 2
6. Dedicated iLO port (optional)
7. Slot 5 PCIe3x8 (8, 4, 1)
8. Slot 4 PCIe3x4 (4, 1)
9. Slot 3 PCIe3x8 (8, 4, 1)
10. Slot 2 PCIe3x4 (4, 1)
11. Slot 1 PCIe3x16 (16, 8, 4, 1)
12. USB 2.0 connectors
13. USB 3.0 connectors
14. Video connector

Figure 8 HP StoreEasy 1550 Storage rear panel LEDs and buttons



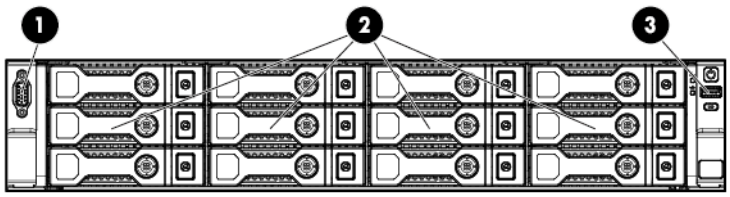
Item	Description	Status
1	Power supply LED	Solid green = Normal

Item	Description	Status
		Off = One or more of the following conditions exist: • AC power is unavailable • Power supply failed • Power supply is in standby mode • Power supply error
2	iLO link LED	Green = Linked to network Off = No network connection
3	iLO activity LED	Green or flashing green = Network activity Off = No network activity
4	NIC activity LED	Green or flashing green = Network activity Off = No network activity
5	NIC link LED	Green = Linked to network Off = No network connection
6	UID button/LED	Solid blue = Activated Flashing blue: • 1 Hz/cycle per sec = Remote management or firmware upgrade in progress • 4 Hz/cycle per sec = iLO manual reboot sequence initiated • 8 Hz/cycle per sec = iLO manual reboot sequence in progress Off = Deactivated

HP StoreEasy 1650 Storage hardware components

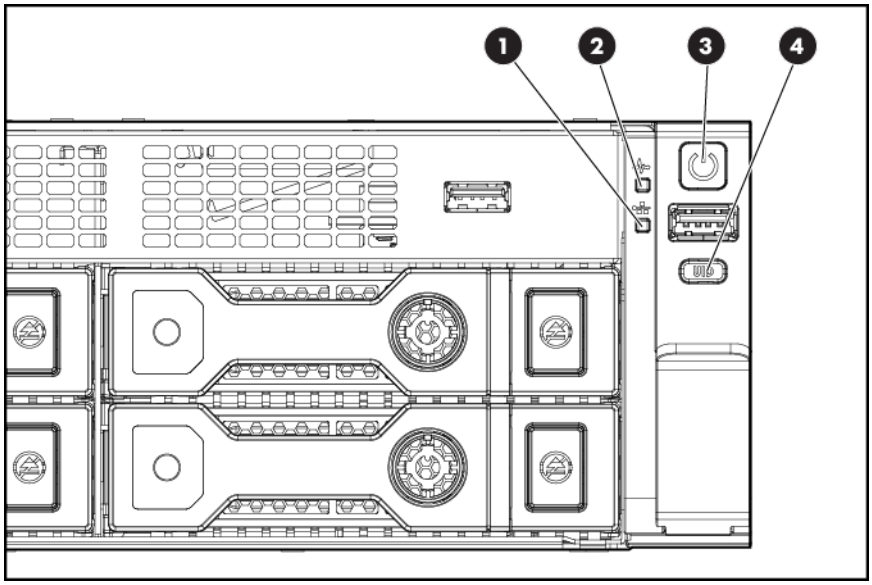
The following figures show components and LEDs located on the front and rear panels of the HP StoreEasy 1650 Storage.

Figure 9 HP StoreEasy 1650 Storage front panel components



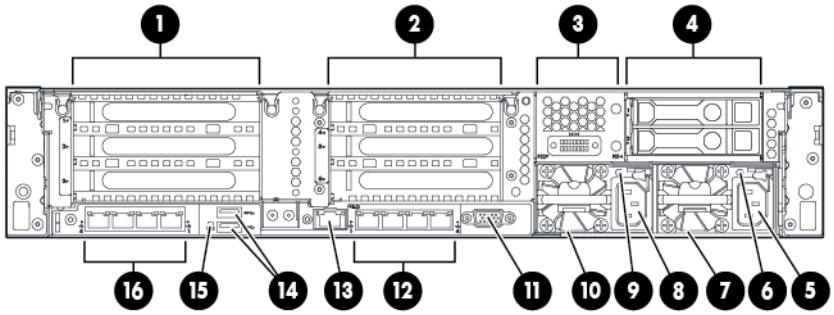
1. Video connector
2. LFF drives
3. USB connector

Figure 10 HP StoreEasy 1650 Storage front panel LEDs and buttons



Item	Description	Status
1	NIC status LED	Green = Linked to network Flashing green = Network activity Off = No network link
2	Health LED	Green = System is on and system health is normal. Flashing amber = System health is degraded. Flashing red = System health is critical. Off = System is off.
3	Power On/Standby button and system power LED	Green = System is on. Flashing green = Waiting for power. Amber = System is in standby, but power is still applied. Off = Power cord is not attached or power supply failed.
4	UID LED/button	Blue = Identification is activated. Flashing blue = System is being managed remotely. Off = Identification is deactivated.

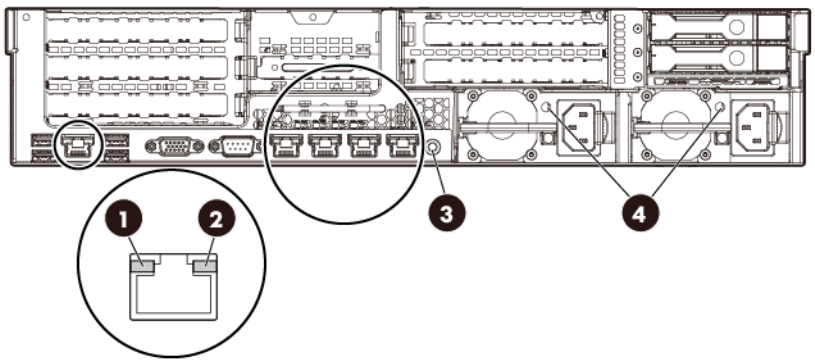
Figure 11 HP StoreEasy 1650 Storage rear panel components



1. PCI slots (Slots 1–3 top to bottom, riser shipped standard)	2. PCI Slots (Slots 4–6 top to bottom, requires second riser card, and second processor)
3. Optional serial port	4. Optional rear 2 SFF HDD (supported in 24 SFF or 12 LFF front end)[1]
5. HP Flexible slot power supply bay 1	6. Power supply power LED
7. Power supply power connection	8. HP Flexible slot power supply bay 2
9. Power supply power LED	10. Power supply power connection
11. VGA connector	12. Embedded 4 x 1GbE network adapter
13. Dedicated iLO connector	14. USB 3.0 connectors (2)
15. Unit ID LED	16. Optional FlexibleLOM ports (Shown: 4 x 1GbE)

[1] The rear panel can also have 3 LFF drives instead 2 SFF drives. In case of 3 LFF drives, you cannot add the second PCI riser to the system, but you can install the second processor.

Figure 12 HP StoreEasy 1650 Storage rear panel LEDs and buttons



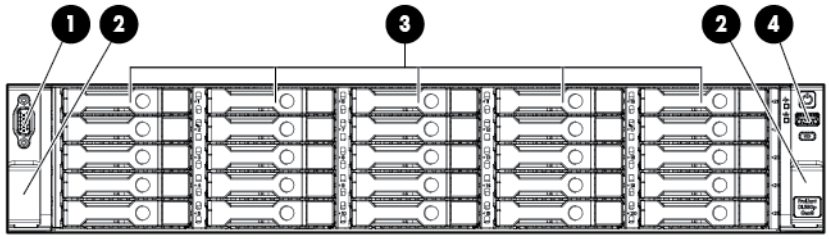
Item	Description	Status
1	NIC status LED	Green = Activity exists Flashing green = Activity exists Off = No activity exists
2	NIC link LED	Green = Link exists Off = No link exists
3	UID LED/button	Blue = Activated Flashing blue = System is being managed remotely. Off = Deactivated.
4	Power supply LEDs	Green = Normal

Item	Description	Status
		Off = One or more of the following conditions exist: • Power is unavailable • Power supply failed • Power supply is in standby mode • Power supply exceeded current limit

HP StoreEasy 1850 Storage hardware components

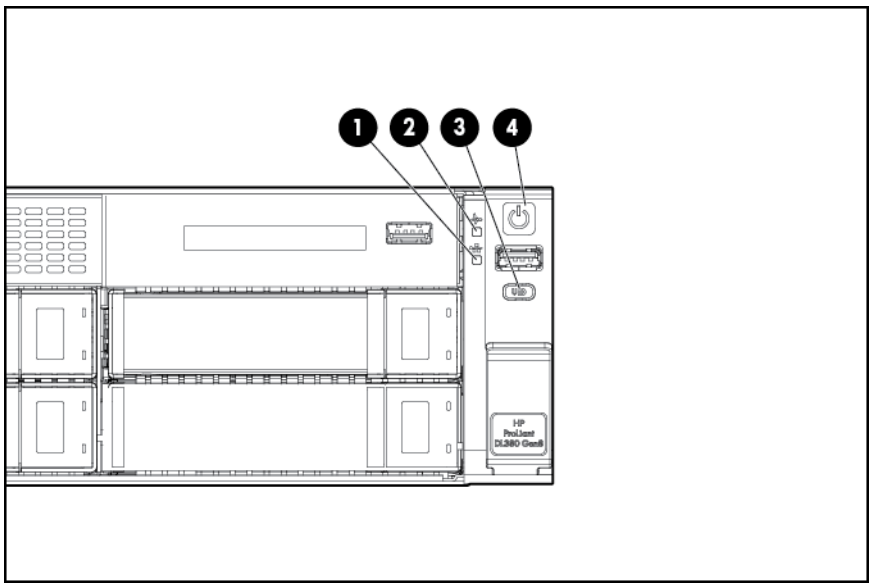
The following figures show components and LEDs located on the front and rear panels of the HP StoreEasy 18x0 Storage.

Figure 13 HP StoreEasy 1850 Storage front panel components



1. Video connector
2. Quick release levers (2)
3. Drive bays
4. USB connector

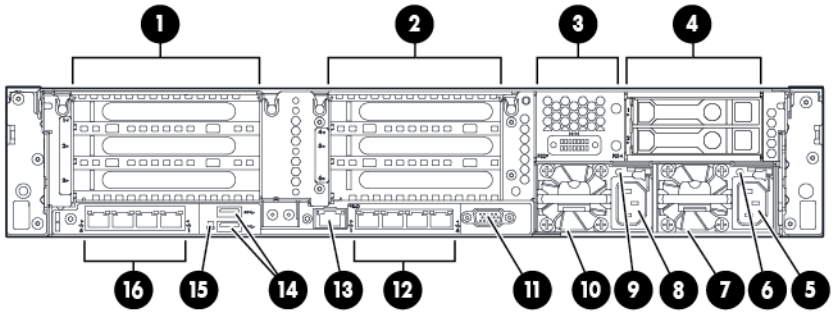
Figure 14 HP StoreEasy 1850 Storage front panel LEDs and buttons



Item	Description	Status
1	NIC status LED	Off = No network link Solid green = Link to network

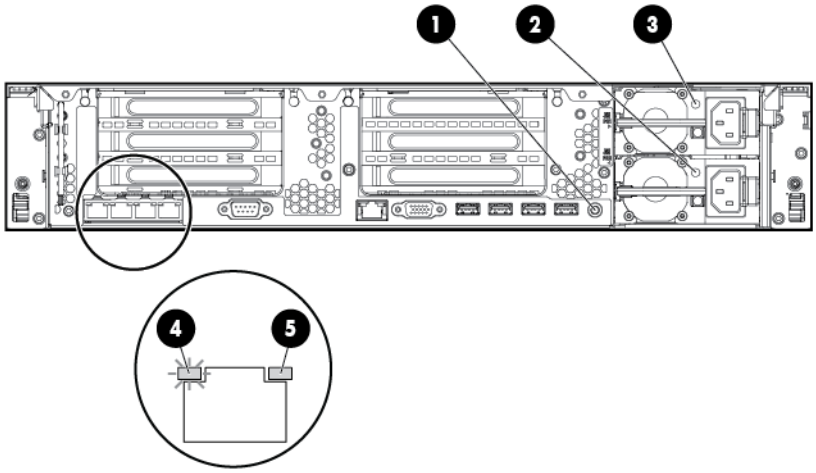
Item	Description	Status
		Flashing green = Network activity
2	System health LED	Green = Normal Flashing amber = System degraded Flashing red = System critical To identify components in degraded or critical state, see "Systems Insight Display LED combinations" (page 19)
3	UID LED and button	Solid blue = Activated Flashing blue = System being remotely managed Off = Deactivated
4	Power On/Standby button and system power LED	Off = Power cord not attached or power supply failure Solid Amber = System is in standby; Power On/Standby Button service is initialized. Flashing Green = Power On/Standby Button has been pressed; system is waiting to power on. Solid Green = System on

Figure 15 HP StoreEasy 1850 Storage rear panel components



1. PCI slots (Slots 1–3 top to bottom, riser shipped standard)
2. PCI slots (Slots 4–6 top to bottom, requires second riser card, and second processor)
3. Optional serial port
4. Optional rear 2 SFF HDD (supported in 24 SFF or 12 LFF front end)
5. HP Flexible slot power supply bay 1
6. Power supply power LED
7. Power supply power connection
8. HP Flexible slot power supply bay 2
9. Power supply power LED
10. Power supply power connection
11. VGA connector
12. Embedded 4 x 1GbE network adapter
13. Dedicated iLO connector
14. USB 3.0 connectors (2)
15. Unit ID LED
16. Optional FlexibleLOM ports (Shown: 4 x 1GbE)

Figure 16 HP StoreEasy 1850 Storage rear panel LEDs and buttons

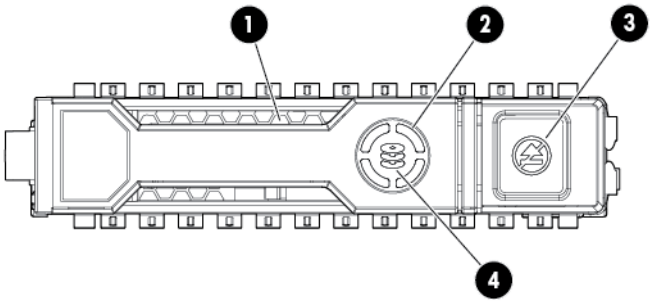


Item	Description	Status
1	UID LED/button	Blue = Activated. Flashing blue = System is being managed remotely. Off = Deactivated.
2	Power supply 2 LED	Off = System is off or power supply has failed. Solid green = Normal
3	Power supply 1LED	Off = System is off or power supply has failed. Solid green = Normal
4	NIC activity LED	Green = Activity exists Flashing green = Activity exists Off = No activity exists
5	NIC link LED	Green = Link exists Off = No link exists

Drive LED definitions

The following figure shows the drive LEDs. These LEDs are located on all HP ProLiant hot plug hard drives.

Figure 17 Drive LEDs



Item	LED	Status	Definition
1	Locate	Solid blue	The drive is being identified by a host application.
		Flashing blue	The drive carrier firmware is being updated or requires an update.
2	Activity ring	Rotating green	Drive activity
		Off	No drive activity
3	Do not remove	Solid white	Do not remove the drive. Removing the drive causes one or more of the logical drives to fail.
		Off	Removing the drive does not cause a logical drive to fail.
4	Drive status	Solid green	The drive is a member of one or more logical drives.
		Flashing green	The drive is rebuilding or performing a RAID migration, stripe size migration, capacity expansion, or logical drive extension, or is erasing.
		Flashing amber/green	The drive is a member of one or more logical drives and predicts the drive will fail.
		Flashing amber	The drive is not configured and predicts the drive will fail.
		Solid amber	The drive has failed.
		Off	The drive is not configured by a RAID controller.

Systems Insight Display LED combinations

When the health LED on the front panel illuminates either amber or red, the server is experiencing a health event. Combinations of illuminated Systems Insight Display LEDs, the system power LED, and the health LED indicate system status.

Table 1 Systems Insight Display LEDs and internal health LED combinations

Systems Insight Display LED and color	Health LED	System power LED	Status
Processor (amber)	Red	Amber	One or more of the following conditions might exist: • Processor in socket X has failed. • Processor X is not installed in the socket. • Processor X is unsupported. • ROM detects a failed processor during POST.
	Amber	Green	Processor in socket X is in a pre-failure condition.
DIMM (amber)	Red	Green	One or more DIMMs have failed.

Table 1 Systems Insight Display LEDs and internal health LED combinations *(continued)*

Systems Insight Display LED and color	Health LED	System power LED	Status
	Amber	Green	DIMM in slot X is in a pre-failure condition.
Over temp (amber)	Amber	Green	The Health Driver has detected a cautionary temperature level.
	Red	Amber	The server has detected a hardware critical temperature level.
PCI riser (amber)	Red	Green	The PCI riser cage is not seated properly.
Fan (amber)	Amber	Green	One fan has failed or is removed.
	Red	Green	Two or more fans have failed or are removed.
Power supply (amber)	Red	Amber	One or more of the following conditions may exist: • Only one power supply is installed and that power supply is in standby. • Power supply fault • System board fault
	Amber	Green	One or more of the following conditions may exist: • Redundant power supply is installed and only one power supply is functional. • AC power cord is not plugged into redundant power supply. • Redundant power supply fault • Power supply mismatch at POST or power supply mismatch through hot-plug addition
Power cap (off)	—	Amber	Standby
Power cap (green)	—	Flashing green	Waiting for power
	—	Green	Power is available.

NOTE: For more information on troubleshooting, refer to the hardware platform information. The following list identifies the ProLiant model for each HP StoreEasy 1000 Storage product:

- 1450—HP ProLiant DL160 Gen9 server
- 1550—HP ProLiant ML110 Gen9 server
- 1650—HP ProLiant DL380 Gen9 server
- 1850—HP ProLiant DL380 Gen9 server

The ProLiant documentation is available at:

http://www.hp.com/go/proliantgen9/docs

Software components

Windows Storage Server 2012 R2 Standard Edition comes preinstalled and activated on the HP StoreEasy 1x50 Storage. The storage system configuration also includes the HP Initial Configuration Tasks window, Windows Server Manager, and HP StoreEasy tools, which are used to set up and manage your storage system.

NOTE: Windows Storage Server 2012 R2 Standard Edition is installed in the **Server with a GUI** mode by default. You can switch to **Server Core Installation** mode. However, the **Server Core Installation** mode is only supported on an HP StoreEasy 1000 Storage system when the operating environment does not require user interaction (such as in a data center). Any activity that requires the use of a GUI must be done in the **Server with a GUI** mode. For more information about installation options, see the **Windows Server Installation Options** article on Microsoft TechNet at:

http://technet.microsoft.com/library/hh831786.aspx

To switch to Server Core mode, see "Using server core" (page 41) for more information.

The **Windows Server Manager→Tools→HP StoreEasy** menu provides a collection of HP and Microsoft utilities that are useful for managing the storage system. The **Initial Configuration Tasks** window assists during the initial out of box setup by configuring items, such as system settings, setting the network IP and domain of the HP StoreEasy 1000 Storage system, configuring email alerts, registering product, provisioning storage, and protecting your server. For more information on the ICT tasks, see "Configuring the storage system" (page 37). The HP StoreEasy Pool Manager is used to create storage pools and assign spare drives. For more information on Pool Manager, see "Using HP StoreEasy Pool Manager" (page 50). Using **Windows Server Manager→File and Storage Services**, you can also create virtual disks and place volumes on the virtual disks.

2 Installing the storage system

Setup overview

The HP StoreEasy 1000 Storage comes preinstalled with the Microsoft Windows Storage Server 2012 R2 Standard Edition operating system with Microsoft iSCSI Software Target included.

Default roles

This section includes the list of roles that come preinstalled with HP StoreEasy 1000 Storage system . Table 2 (page 23) describes the default roles:

Table 2 Default roles

Role	Role service

File and Storage Services	• *File and iSCSI Services*
	  ◦ File Server
	  ◦ Branch Cache for Network Files
	  ◦ Data Deduplication
	  ◦ DFS Replication
	  ◦ File Server Resource Manager
	  ◦ File Server VSS Agent Service
	  ◦ iSCSI Target Server
	  ◦ iSCSI Target Storage Provider (VDS and VSS hardware providers)
	  ◦ Server for NFS
	  ◦ Work Folders
	• *Storage Services*

Print and Document Services	• Print Server • Internet Printing • LPD Service

Web Server (IIS)	• *Web Server*
	  ◦ Common HTTP Features
	  – Default Document
	  – Directory Browsing
	  – HTTP Errors Static Content
	  – HTTP Redirection
	  ◦ *Health and Diagnostics*
	  – HTTP Logging
	  – Logging Tools
	  – Request Monitor
	  – Tracing
	  ◦ *Performance*
	  – Static Content Compression
	  ◦ *Security*
	  – Request Filtering
	  – Basic Authentication
	  – Windows Authentication
	  ◦ *Application Development*
	  – .NET Extensibility 4.5
	  – ASP
	  – ASP.NET 4.5

Table 2 Default roles *(continued)*

Role	Role service
	– ISAPI Extensions – ISAPI Filters • *Management Tools* ° IIS Management Console ° IIS 6 Management Compatibility – IIS 6 Metabase Compatibility

Verify the kit contents

Remove the contents, ensuring that you have all of the following components. If components are missing, contact HP technical support.

Hardware

- HP StoreEasy 1000 Storage system (with operating system preloaded)
- Power cords
- Rail kit

Media and documentation

- *HP StoreEasy 1000 Storage Quick Start Guide*
- Safety and Disposal Documentation CD
- HP System Recovery DVD
- End User License Agreement
- Certificate of Authenticity Card
- HP ProLiant Essentials Integrated Lights-Out Advanced Pack

Locate the serial number, Certificate of Authenticity, and End User License Agreement

For technical support purposes, locate the storage system's serial number, COA (Certificate of Authenticity), and EULA (End User License Agreement). Record the serial number and COA product key and make a print copy of the EULA as needed.

The storage system's serial number is located in several places:

- Top of the storage system or blade
- Back of the storage system
- Inside the storage system shipping box
- Outside of the storage system shipping box

The storage system's COA card is located inside the storage system shipping box. There is also a COA sticker with product key affixed to the top of the storage system or blade. The electronic copy of the EULA installed with the storage system is available at `%SystemDrive%\Windows\System32\license.rtf`.

Install the storage system hardware

If your storage system is fully racked and cabled, go to "Connect to the storage system" (page 35).

For the 1450, 1650, and 1850 systems, install the rail kit and insert and secure the storage system into the rack by following the *HP Rack Rail Kit Installation Instructions*.

If you ordered the HP Tower to Rack Conversion Tray Universal Kit for the purpose of installing the 1550 tower model in a rack, use the provided tower-to-rack conversion kit installation instructions to install the tower hardware into the rack.

Validate network information

Complete the tests in Table 3 (page 25) to verify network connectivity. Consult with your network administrator to confirm test results.

Table 3 Validation tests

Test	Command(s) to execute	Successful? (Y/N)
Ping the IP address of the StoreEasy system from another system on the same network.	`ping <system address>`	
Ping the IP address of some other system on the same network form the StoreEasy system.	`ping <system address>`	
Ping the name of the StoreEasy system from another system on the same network.	`ping <node 1 name>` `ping <node 1 fqdn>`	
Ping the name of some other system on the same network form the StoreEasy system.	`ping <node 1 name>` `ping <node 1 fqdn>`	
If you will be adding the StoreEasy system to an Active Directory domain, some additional tests include:		
Ping the domain controller from the StoreEasy system.	`ping <domain controller address>` `ping <domain controller name>`	

Verify the network path to the domain controller and DNS servers is correct.	`pathping <domain controller address>`
	`pathping <domain controller name>`
	`pathping <DNS server address>` (Repeat for each DNS server)
	`pathping <DNS server name>` (Repeat for each DNS server)	

Additionally, HP recommends that you also verify the iLO IP address and name resolution. However, this is not critical to support a file server.

Cabling the storage system

The StoreEasy systems support both single domain and dual domain cabling using D2000, D3000, and D6000 disk enclosures, depending on the SmartArray RAID controller that is installed in the system. See Table 4 (page 26) for details. In a single domain, external disk enclosures are connected, using a single data path, to the SmartArray RAID controller in the StoreEasy system. In a dual domain, external disk enclosures are connected, using two data paths, to a single SmartArray RAID controller in the StoreEasy system. For more detailed information about single and dual domains, see the technology brief entitled, "Redundancy in enterprise storage networks using dual-domain SAS configurations" located at: http://h20565.www2.hp.com/portal/site/hpsc/public/kb/docDisplay/?docId=c01451157.

NOTE: Microsoft Storage Spaces are not supported on HP StoreEasy 1000 Storage.

Table 4 Controller, disk enclosure, and single/dual domain support

Controller model	Supported in StoreEasy systems	Disk enclosure supported	Single domain support	Dual domain support
P441	1450, 1550, 1650, 1850	D2000	Y	Y
		D3000	Y	Y
		D6000	Y	N
P841	1450, 1550, 1650, 1850	D2000, D3000, D6000	Y	Y

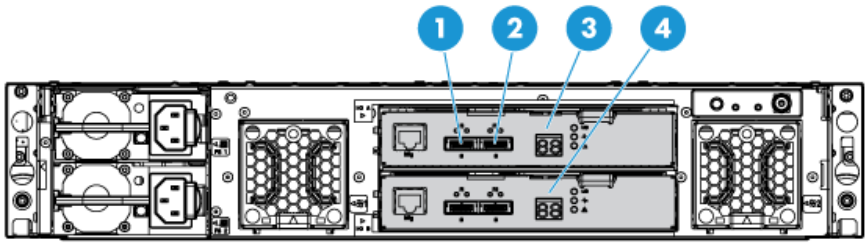
NOTE:

- The 1450 storage systems use a P440 controller, whereas 1650 and 1850 storage systems use P440ar controllers for internal disks that include OS disks.
- The P441 and P841 controllers are used for connecting external D2000, D3000, and D6000 disk enclosures.

I/O modules

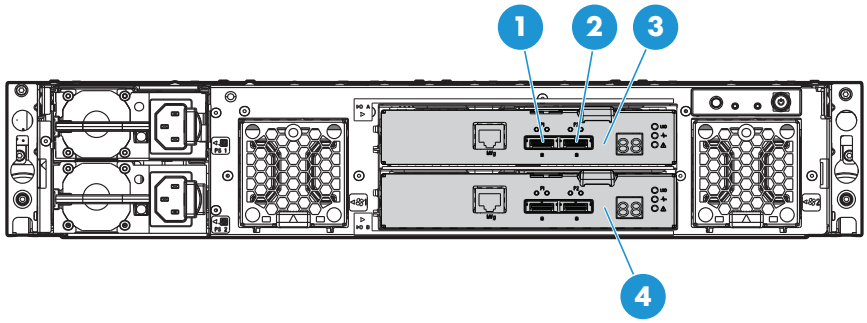
The StoreEasy systems connect to the I/O modules on the D6000 and D2000 disk enclosures. Figure 18 (page 26) shows the I/O module ports on the D2600 disk enclosure, Figure 19 (page 27) shows the I/O module ports on the D2700 disk enclosure, and Figure 20 (page 27) shows the I/O module ports on the D6000 disk enclosure.

Figure 18 HP D2600 Disk Enclosure I/O module ports



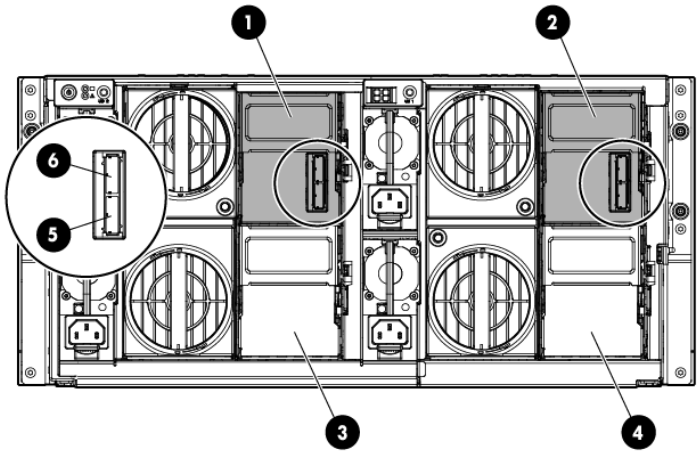
1. Port 1
2. Port 2
3. I/O module A
4. I/O module B

Figure 19 HP D2700 Disk Enclosure I/O module ports



1. Port 1
2. Port 2
3. I/O module A
4. I/O module B

Figure 20 D6000 I/O modules



1. Primary I/O module (Drawer 2)
2. Primary I/O module (Drawer 1)
3. Secondary I/O module or blank (Drawer 2)
4. Secondary I/O module or blank (Drawer 1)
5. SAS port 1 connector
6. SAS port 2 connector

Cabling guidelines

This section provides information on the types of cables to be used with D3000 and D2000/D6000 disk enclosures supported by the P441 controller and the cabling guidelines.

The following are the types of cables that you can use with the D3000 disk enclosures:

- HP External 0.5m (1ft) Mini SAS HD 4x to Mini SAS HD 4x Cable
- HP External 1.0m (3ft) Mini SAS HD 4x to Mini SAS HD 4x Cable
- HP External 2.0m (6ft) Mini SAS HD 4x to Mini SAS HD 4x Cable
- HP External 4.0m (13ft) Mini SAS HD 4x to Mini SAS HD 4x Cable

The following are the types of cables that you can use with the D2000/D6000 disk enclosures:

- HP 0.5m External Mini SAS High Density to Mini SAS Cable
- HP 1.0m External Mini SAS High Density to Mini SAS Cable
- HP 2.0m External Mini SAS High Density to Mini SAS Cable
- HP 4.0m External Mini SAS High Density to Mini SAS Cable
- HP 6.0m External Mini SAS High Density to Mini SAS Cable

When connecting disk enclosures to the StoreEasy system, consider the following guidelines:

- In a single domain configuration, the secondary I/O modules on the D6000 are not used, so they might or might not be installed. The cabling diagrams in this section show the secondary I/O modules are not installed.
- For single domain configurations, the maximum number of disk enclosures supported by the P441 or P841 controller are 1 D6000, 8 D2000s, or 8 D3000s (up to 200 drives total).
- For dual domain configurations, the maximum number of disk enclosures supported by the P441 controller are 8 D2000 or 8 D3000s (up to 200 drives total).
- For dual domain configurations, the maximum number of disk enclosures supported by the P841 controller are 1 D6000, 8 D2000s, or 8 D3000s (up to 200 drives total).

NOTE:

  - The maximums listed are based on the number of drives per controller. Any StoreEasy system could have additional or alternate controllers installed, which would affect the overall number of supported disk enclosures. The maximum number of enclosures that can be connected to a controller is eight.
  - The P441 or P841 controllers support:
    - Up to 200 physical drives.
    - D2000 and D3000 disk enclosures; up to eight daisy chained in either single or dual domain configuration.
    - D6000 disk enclosure. Only one D6000 enclosure can be connected. Daisy chaining is not supported.

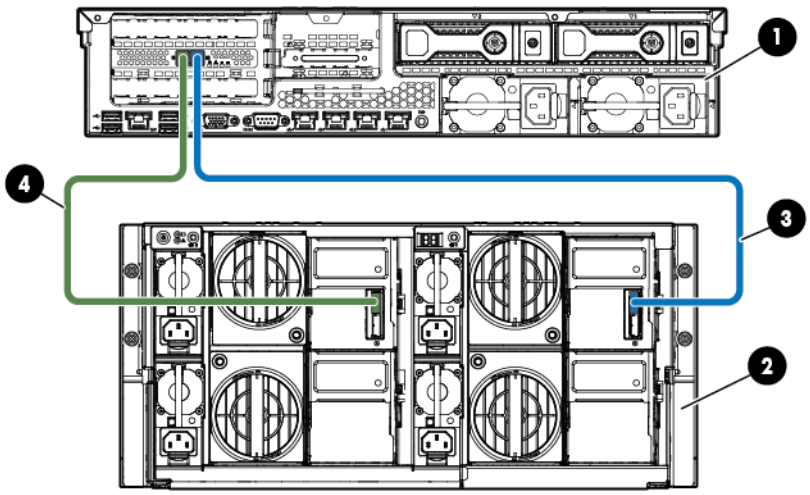
- In the cabling diagrams for the D2000/D3000 disk enclosure, the D2600 disk enclosure is used. Be aware that the cabling configuration is exactly the same for all D2000/D3000 disk enclosures.
- The D6000 disk enclosure does not support the use of SAS daisy chains; the D2000/D3000 disk enclosures supports SAS daisy chains. In a SAS daisy chain, the D2000/D3000 disk enclosures are connected to each other — I/O module A from each disk enclosure is connected together and I/O module B of each disk enclosure is connected together.
- Only supported, documented cabling configurations are shown. Only cabling configurations shown in this document or in related D2000/D3000 or D6000 documentation are supported configurations.

△ **CAUTION:** When cabling a dual domain configuration, ensure that you do not connect multiple controllers in the StoreEasy system to the same disk enclosure; this is an unsupported configuration and might result in data loss. If the StoreEasy system is configured incorrectly, and you attempt to use Pool Manager, Pool Manager will detect the configuration and display an error message. The controllers can be connected to different disk enclosures.

Single domain cabling diagrams with D6000 Disk Enclosures

The following diagram shows StoreEasy systems in single domain configurations with D6000 disk enclosures.

Figure 21 HP StoreEasy 1x50 with the P441 Controller

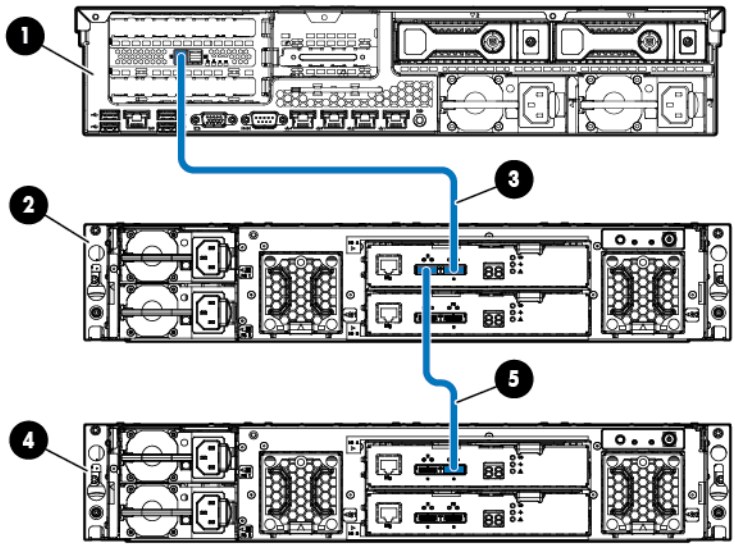


1. P441 controller
2. D6000 enclosure
3. Connection to SAS port 1 on the primary I/O module (left drawer) of D6000 enclosure
4. Connection to SAS port 1 on the primary I/O module (right drawer) of D6000 enclosure

Single domain cabling diagrams with D2000/D3000 Disk Enclosures

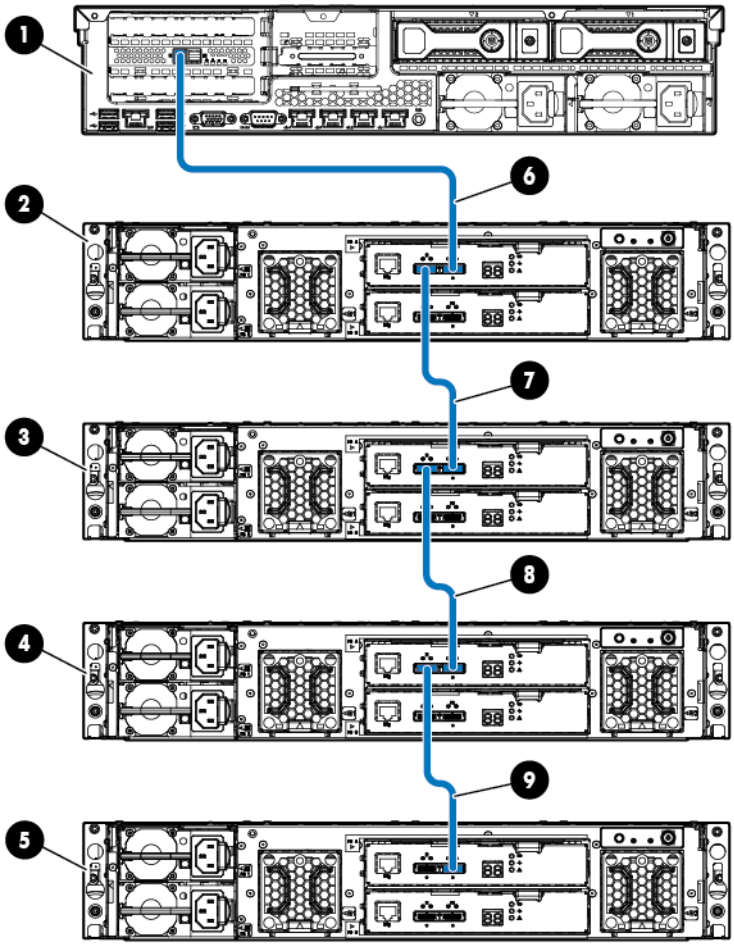
The following diagrams show different StoreEasy systems in single domain configurations with the D2000/D3000 disk enclosures. With these cabling diagrams, SAS daisy chains are used to connect the disk enclosures together.

Figure 22 HP StoreEasy 1x50 with the P441 controller



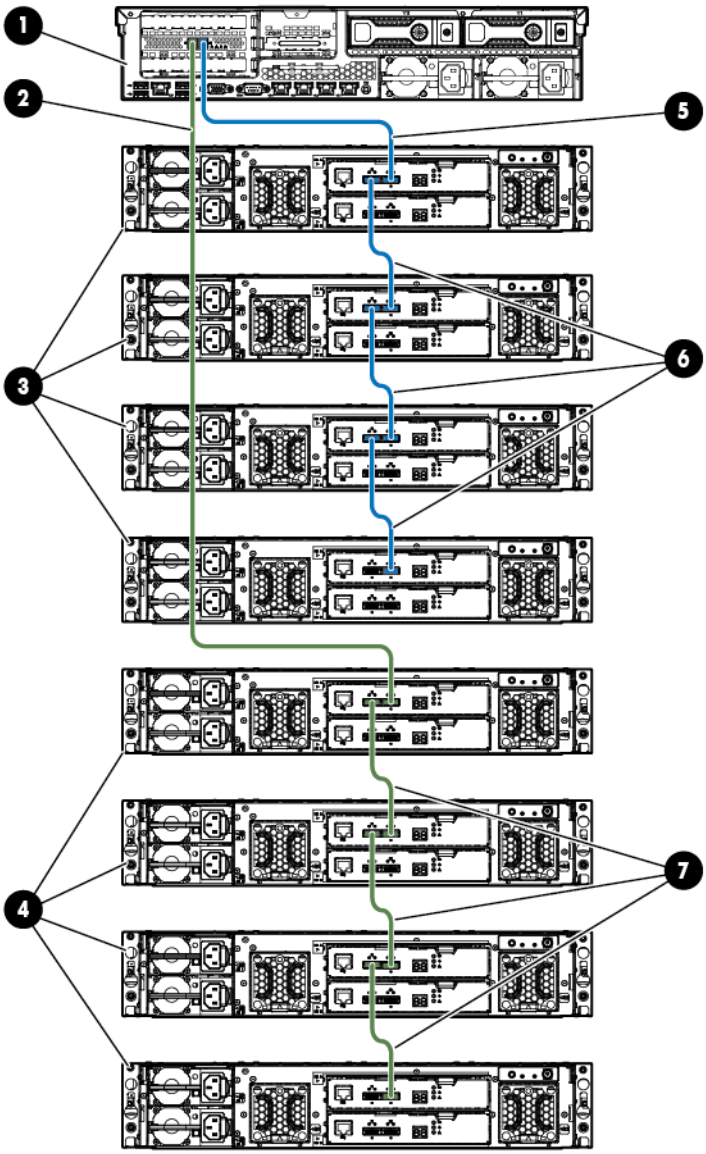
1. P441 controller
2. D2000/D3000 enclosure 1
3. Connection between P441 controller and port 2 on I/O module A of D2600 enclosure
4. D2000/D3000 enclosure 2
5. Connection between port 1 of I/O module A of D2600 enclosure 1 and port 2 on I/O module A of D2600 enclosure2

Figure 23 HP StoreEasy 1x50 with the P441 controller in a single domain configuration



1. P441 controller
2. D2000/D3000 enclosure 1
3. D2000/D3000 enclosure 2
4. D2000/D3000 enclosure 3
5. D2000/D3000 enclosure 4
6. Connection from P441 controller to port 2 of I/O module A on disk enclosure 1
7. Connection from port 1 of I/O module A on disk enclosure 1 to port 2 of I/O module A on disk enclosure 2
8. Connection from port 1 of I/O module A on disk enclosure 2 to port 2 of I/O module A on disk enclosure 3
9. Connection from port 1 of I/O module A on disk enclosure 3 to port 2 of I/O module A on disk enclosure 4

Figure 24 HP StoreEasy 1x50 with the P441 controller utilizing multiple ports



1. P441 controller
2. Connection from P441 controller to port 2 of I/O module A on top of the disk enclosures in Group 2
3. Group 1 of 4 D2000/D3000 enclosures
4. Group 2 of 4 D2000/D3000 enclosures
5. Connection from P441 controller to port 2 of I/O module A on top of the disk enclosures in Group 1
6. Connections between the disk enclosures in Group 1
7. Connections between the disk enclosures in Group 2

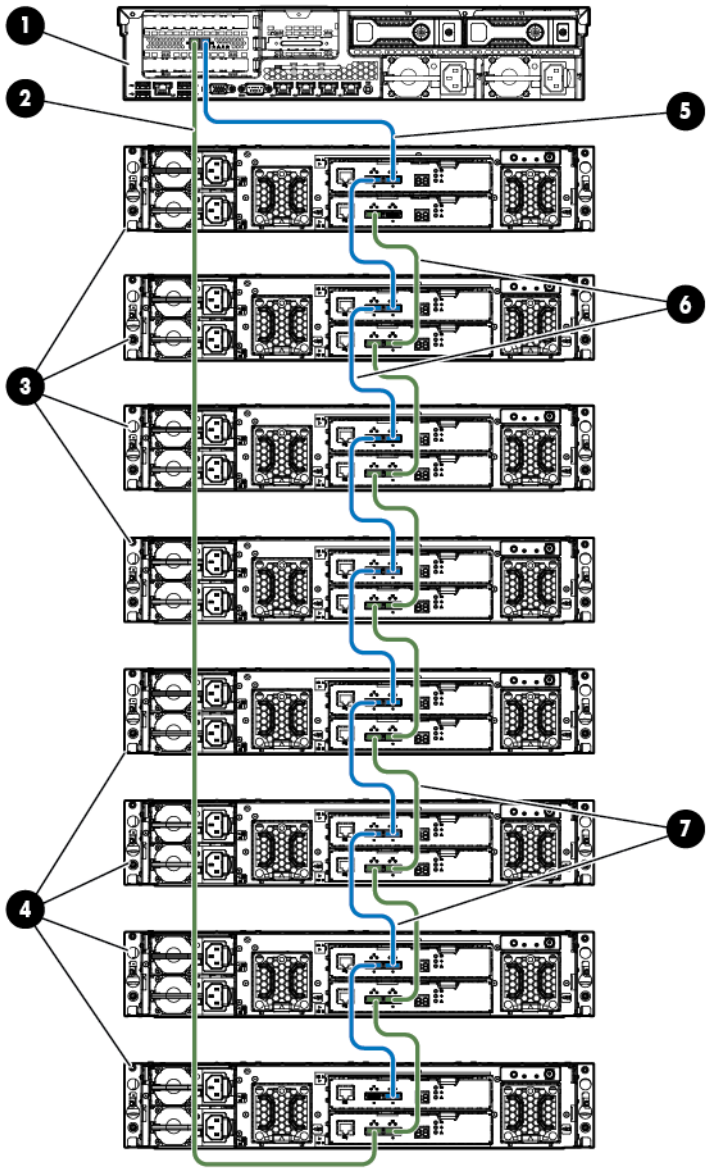
Dual domain cabling diagrams with D2000/D3000 Disk Enclosures

In dual domain configurations with the D2000/D3000 Disk Enclosures, you have the option of cabling for best fault tolerance or best performance.

Figure 25 (page 33) illustrates best fault tolerance, which provides the best data protection in the event of an I/O module failure. The disk enclosures are put into two groups of four disk enclosures each. There is always one path to the disk enclosure from the controller (from either the top disk enclosure in the group or the bottom disk enclosure in the group). The green path carries the data

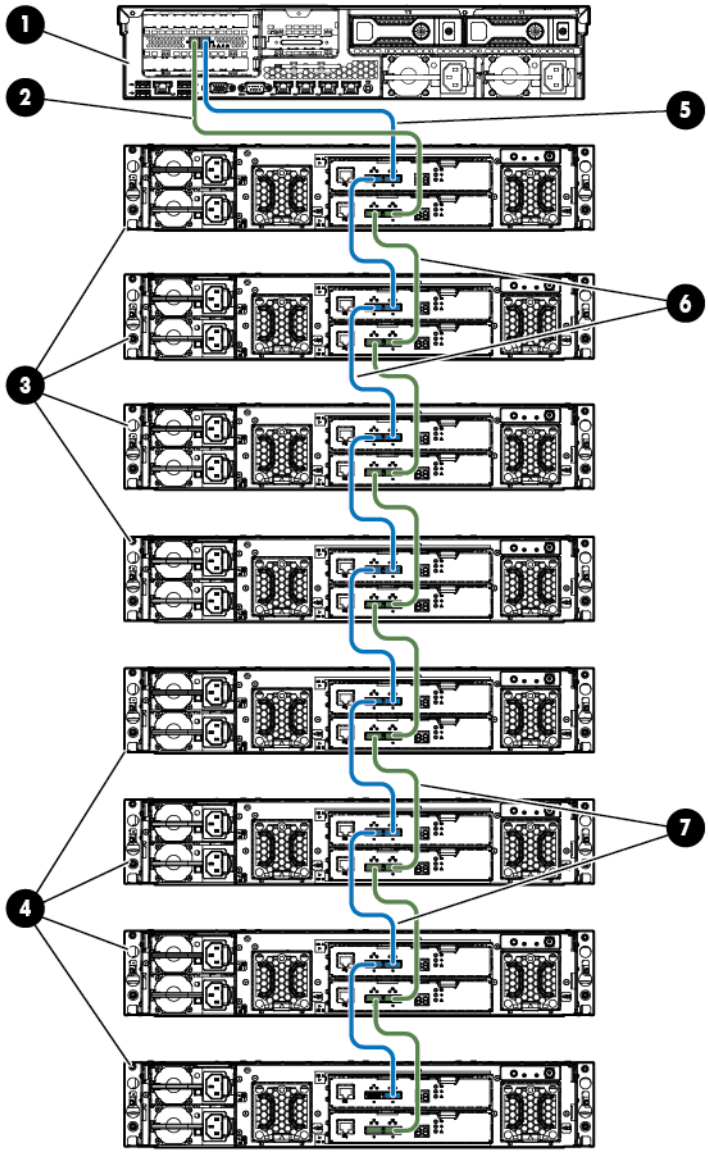
if the blue path is broken. Besides a controller failure, the worst case scenario is losing access to one I/O module if an I/O module fails. Figure 25 (page 33) also illustrates the SAS daisy chain between disk enclosures. Besides a controller failure, the worst case scenario is losing access to one I/O module in a disk enclosure if any I/O module fails.

Figure 25 HP StoreEasy 1x50 with the P441 controller in a dual domain configuration (best fault tolerance)



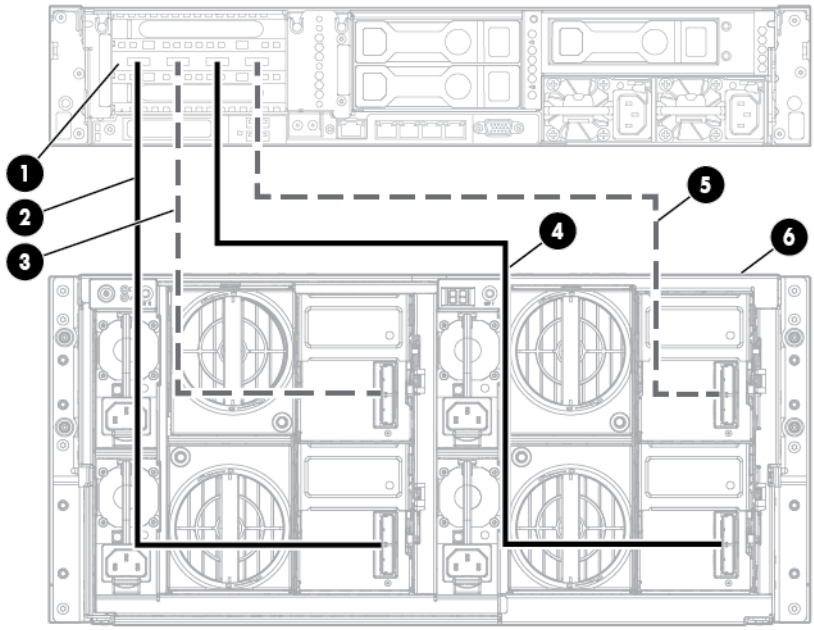
1. P441 controller
2. Connection from P441 controller to port 1 of I/O module B on bottom of the disk enclosures in Group 2
3. Group 1 of 4 D2000/D3000 enclosures
4. Group 2 of 4 D2000/D3000 enclosures
5. Connection from P441 controller to port 2 of I/O module A on top of the disk enclosures in Group 1
6. Connections between the disk enclosures in Group 1
7. Connections between the disk enclosures in Group 2

Figure 26 HP StoreEasy 1x50 with the P441 controller in a dual domain configuration (best performance)



1. P441 controller
2. Connection from P441 controller to port 2 of I/O module B on top of the disk enclosures in Group 1
3. Group 1 of 4 D2000/D3000 enclosures
4. Group 2 of 4 D2000/D3000 enclosures
5. Connection from P441 controller to port 2 of I/O module A on top of the disk enclosures in Group 1
6. Connections between the disk enclosures in Group 1
7. Connections between the disk enclosures in Group 2

Figure 27 HP StoreEasy 1x50 with the P841 controller in a dual domain configuration



1. P841 controller
2. Connection to SAS port 1 on primary I/O module path 1 (right drawer) of D6000 enclosure
3. Connection to SAS port 1 on primary I/O module path 2 (right drawer) of D6000 enclosure
4. Connection to SAS port 1 on primary I/O module path 1 (left drawer) of D6000 enclosure
5. Connection to SAS port 1 on primary I/O module path 2 (left drawer) of D6000 enclosure
6. D6000 enclosure

Connect to the storage system

Use either the direct attach or iLO method to connect to the storage system.

IMPORTANT: Only the direct attach and iLO access methods can be used to install the storage system. After the storage system installation process is complete and the server's IP addresses have been assigned, you can then additionally use the remote desktop method to access the storage system.

- **Direct attach**—This access method is mandatory if your network does not have a DHCP (Dynamic Host Configuration Protocol) server. Connect the following cables to the back panel of the storage system in this sequence: keyboard, mouse, network cables, monitor cable, and power cable.

  NOTE: The keyboard, mouse, and monitor are not provided with the storage system.

- **iLO**—Access the storage system using the iLO remote management method:
  1. Connect a network cable to the iLO port located on the back of the storage system.
  2. Connect a power cable to the storage system.
  3. Locate the iLO Network Settings tag attached to the storage system and record the default user name, password, and DNS name.
  4. From a remote computer, open a standard Web browser and enter the iLO management hostname of the storage system.

NOTE: By default, iLO obtains the management IP address and subnet mask from your network's DHCP server. The hostname found on the iLO tag is automatically registered with your network's DNS server. If the DHCP configuration is not possible or the system is not found in DNS, use the direct attach method to configure iLO with a static IP address.

5. Using the default user information provided on the iLO Network Settings tag, log on to iLO, and then launch a remote console to the storage system.

   For detailed instructions on using iLO remote management software, see the *HP iLO 4 User Guide*, which you can search for (by product name) at http://www.hp.com/support/manuals.

Power on the server and log on

1. Power on the system by pushing the power button on the front panel. If using iLO, click **Momentary Press** under the **Power Switch** menu of the remote console.

   The storage system starts and displays the Setup Windows wizard.
2. Select the desired language, country or region, language settings, keyboard layout, and click **Next**.
3. Accept the license agreement and click **I Accept**.
4. When prompted, enter a password of your choice and click **Finish**. The password that you enter must be the one you can remember.
5. When prompted, press `CTRL+ALT+DELETE` to log on to the system. If using iLO, click the **Ctrl-Alt-Del** menu item in the Keyboard menu of the remote console.
6. When prompted, enter the password that you set in Step 4.

   The installation process continues until complete, which takes approximately 10–15 minutes. When the installation completes, the server reboots.
7. Press `CTRL+ALT+DELETE` to log on to the system.

3 Configuring the storage system

The HP ICT (Initial Configuration Tasks) window launches automatically at logon for any user who is a member of the local administrators group. Use ICT to perform the following tasks:

- Update system settings, such as changing the local administrator password, time zone, save reseller information, and so on.
- Launch Network Configuration wizard to configure and validate the network configuration.
- Configure email alerts and register product.
- Create storage pools and virtual disks.
- Enable software updates and enhancements directly from Windows update.
- Register for a free trial of Autonomy LiveVault and get more information on Vision Solution Double-Take Availability Information products.

You can open only one instance of the ICT at a time. If you do not want to open the ICT window every time you logon, select the **Do not show this window at the next logon** check box in the window. You can also launch ICT by opening a command prompt and typing `C:\Windows\System32\OEMOOBE\OEMOOBE.EXE`. The following tasks are included in the ICT:

- System Settings
- Networking
- Notifications
- Storage Configuration
- Protect This Server

System Settings

This task group enables you to configure the system settings. The following tasks are included in this group:

- **Set local administrator password**—Enables you to change the administrator user password. The default password is the password that you entered during the initial setup of the server. To change the password, enter the new password in the **New password** and **Confirm password** fields and click **OK**.

IMPORTANT: HP cannot assist with lost passwords.

- **Set time zone**—Enables you to change the date and time settings. You can change the time zone, date and time, and synchronize the date and time with an Internet time server.
- **Enable Windows error reporting**—Enables you to send the description of problems on your server to Microsoft and look for steps you can take to resolve them. Select the desired setting and click **OK**.
- **Enable customer experience improvement program**—Enables you to participate in the customer experience program. Microsoft Corporation collects statistical information about your system configuration, performance of some components of Windows, and certain types of events. Windows periodically uploads a small file to Microsoft that contains a summary of the information collected. Select the desired setting and click **OK**.
- **Save reseller information**—Enables you to enter details of the reseller from whom you purchased the system and purchasing details for future reference. The asset serial number is added by

default and you cannot change it. Enter the details in the respective fields and click **OK** to save the information.

You can also access the **Reseller Information Tool** using the following methods:

- Open Server Manager and click **Tools**→**HP StoreEasy**→**Save Reseller information**.
- Double-click the **System Tools** folder on the desktop and select **Save Reseller Information**.

The reseller information is also available on the **Hardware** tab in the HP System Dashboard.

Networking

This task group enables you to set the network IP and domain of HP StoreEasy 1000 Storage. The following tasks are included in this group:

- **Configure networking**—Enables you to configure the network interfaces using the HP NCT (Network Configuration Tool) wizard. For detailed information on NCT, see "Using the Network Configuration Tool" (page 43).
- **Provide computer name and domain**—Enables you to specify the computer name and domain. Windows Storage Server 2012 R2 is installed with a randomly generated computer name. You may find the server easier to access remotely and easier to recognize in reports and logs if you assign it a name that is meaningful to you and that fits with the naming scheme for computers in your organization.

  Consider the following when assigning a computer name:

  - The recommended length for most languages is 15 characters or fewer. For languages that require more storage space per character, such as Chinese, Japanese, and Korean, the recommended length is 7 characters or fewer.
  - HP recommends that you use only Internet-standard characters in the computer name. Standard characters are the numbers from 0 through 9, uppercase and lowercase letters from A through Z, and the hyphen (-) character. Computer names cannot consist entirely of numbers.
  - If you are using DNS on the network, you can use a wider variety of characters. These include Unicode characters and other non-standard characters, such as the ampersand (&). Using nonstandard characters may affect the ability of non-Microsoft software to operate on the network.
  - The maximum length for a computer name is 63 bytes. If the name is longer than 15 bytes (15 characters in most languages, 7 characters in some), computers that are running Windows NT 4.0 and earlier will recognize this computer by the first 15 bytes of the name only. In addition, there are additional configuration steps for a name that is longer than 15 bytes.
  - If a computer is a member of a domain, you must choose a computer name that differs from any other computer in the domain. To avoid name conflicts, the computer name should be unique on the domain, workgroup, or network.

  In a Windows Active Directory Domain, passwords and permissions for computer objects and user accounts are easier to manage due to being stored in a centralized database that is replicated among the domain controllers.

  To name the computer and join it to a domain, click **Provide computer name and domain** in the HP Initial Configuration Tasks window and then click **Change** on the Computer Name tab.

Notifications

This task group enables you to configure e-mail alerts and register for proactive notifications. The following tasks are included in this group:

- **Configure email alerts**—Enables you to configure the email accounts that should receive alerts when significant events occur. Using the **Event Notifier Configuration** wizard, you can add SMTP server IP addresses and send a sample email to check if the email alerts have been configured properly. You can also access the **Event Notifier Configuration** wizard directly using the following methods:
  - Open Server Manager and select **Tools→HP StoreEasy→Configure e-mail alerts**.
  - Double-click the **System Tools** folder on the desktop and select **Configure Email Alerts**.
  - Click **Event Notifier Config** on the **Start** screen.
- **Register Product**—Opens a web browser to the HP product registration page. HP strongly recommends registering your system so that you can receive proactive notifications of system updates, critical issues, and announcements of feature updates. If your system is connected to a network that can access the Internet, you can perform the product registration from any other system. You can also access the Register Product link using the following methods:
  - Double-click the **Register Product** icon on the desktop.
  - Click **Register Product** on the **Start** screen.
  - Open Server Manager and select **Tools→HP StoreEasy→Register Product**.

Storage Configuration

This task group enables you to configure the system storage using the StoreEasy Pool Manager. The following storage provisioning tasks are included in this group:

- **Create storage pools**—Opens the **Pool Manager** window that enables you to create one or more storage pools on the internal drives of the StoreEasy system. Pool Manager is also used to create storage pools if any external storage enclosures are attached. The internal drives of StoreEasy models 1450 are already configured in a storage pool and contain the operating system. Only externally attached drives can be managed on these systems.
- **Create virtual disks**—Launches the **New Virtual Disk** wizard that enables you to create the virtual disk in an existing storage pool. The New Volume Wizard is started by default when you complete the new Virtual Disk Wizard. You can create a new volume in the virtual disk that you just created. For more information on creating virtual disks, see the *HP StoreEasy 1000 Storage Online Help*.

Protect This Server

This task group enables you to check that your server receives critical software updates and enhancements directly from the Microsoft website. The following tasks are included in this group:

- **Enable automatic updating**—Opens the **Windows Update** dialog box that you can use to select the way Windows updates are downloaded and installed. HP recommends that you do not select automatic updates to avoid unexpected system restarts after updates are applied. The Windows Update feature simplifies the task of updating the operating system, and saves

administrator's time. Features on the Windows Update dialog box are configurable by members of the administrators group on the local computer.

HP recommends the following for updates:

- Under Important updates, select one of the following options:
  - Download updates but let me choose whether to install them (default option)
  - Check for updates but let me choose whether to download and install them
- Under Recommended updates, select **Give me recommended updates the same way I receive important updates**.
- Run **Download and Install Updates** immediately after system installation.
- Subscribe to HP customer advisories using Subscriber's choice for business. For more information, see Subscription service. Ensure to check if firmware and related device drivers are up-to-date based upon information for your system at the *HP Support & Drivers* website.
- Apply regular HP StoreEasy 1000 Storage Service Releases.

- **Free Autonomy LiveVault 30–day trial**—Begins the registration process for a free 30-day trial of the Autonomy LiveVault cloud based backup system. If your system is not connected to the Internet, you can signup by visiting LiveVault. You can also access the Free Autonomy LiveVault 30–day trial link using the following methods:
  - Double-click the **Free LiveVault 30-day Trial** icon on the desktop.
  - Click **Free LiveVault 30-day Trial** on the **Start** screen.
- **Vision Solution Double-Take Availability Information**—Opens an HTML page that displays details about installing the trail version of the Double-Take Availability software. The trial version provides you an opportunity to evaluate the software in your environment. You can also access the HTML page directly by double-clicking the **Vision Solution Double-Take Availability Information** icon on the desktop.

Complete system configuration

After the storage system is physically set up and you have completed all of the required tasks in the Initial Configuration Tasks window, you may want to complete additional setup tasks. Depending on the deployment scenario of the storage system, these steps can vary. These additional steps can include:

- Running Microsoft Windows Update—HP highly recommends that you run Microsoft Windows updates to identify, review, and install the latest, applicable, critical security updates on the storage system.
- Creating and managing users and groups—User and group information and permissions determine whether a user can access files. If the storage system is deployed into a workgroup environment, this user and group information is stored locally on the device. By contrast, if the storage system is deployed into a domain environment, user and group information is stored on the domain.
- Adjusting logging for system, application, and security events.
- Installing third-party software applications—For example, these might include an antivirus application that you install.
- Registering the server—To register the server, see the HP registration website (http://register.hp.com).

Using server core

The Server Core interface is a command prompt with PowerShell support. In Windows Server 2012 R2, you can transition between Server with a GUI mode and Server Core mode without reinstalling the operating system.

Transition to Server Core mode

1. Open PowerShell and execute the following command:

   ```
   PS C:\Users\Administrator> Remove-WindowsFeature Server-Gui-Shell,
   Server-Gui-Mgmt-Infra
   ```

2. When prompted, restart the server by executing the following command:

   ```
   PS C:\Users\Administrator> shutdown –r –t 0
   ```

   After the server restart, only the command prompt will be available, indicating the server is now in Server Core mode.

NOTE: If you close all command prompts, there will be no way to manage the server in Server Core mode. To resolve this issue, complete the following steps:

1. Press **CTRL+ALT+DELETE**.
2. Select **Start Task Manager**.
3. Select **File→Start New Task**, which opens a command prompt.
4. Enter `cmd.exe`.

Alternatively, you can log off and log back again. For more information, see the Microsoft TechNet article "Configure a Server Core Server" at:

http://technet.microsoft.com/en-us/library/jj592692.aspx

Transition to Server with a GUI mode

1. Open PowerShell and execute the following command:

   ```
   PS C:\Users\Administrator> Add-WindowsFeature Server-Gui-Shell,
   Server-Gui-Mgmt-Infra
   ```

2. Reboot the server manually by entering one of the following commands:

   ```
   PS C:\Users\Administrator> shutdown –r –t 0
   ```

   or

   ```
   PS C:\Users\Administrator> Install-WindowsFeature
   Server-Gui-Mgmt-Infra,Server-Gui-Shell –Restart
   ```

NOTE: Transitioning to Server Core mode disables the OEM-Appliance-OOBE feature. After transitioning back to Server with a GUI mode, you must manually enable this feature by executing the following command:

```
PS C:\Users\Administrator>dism /online /enable-feature
/featurename:OEM-Appliance-OOBE
```

Then, install HP ICT from `C:\hpnas\Components\ManagementTools`.

Additional access methods

After the storage system installation process is complete and the system's IP address has been assigned, you can additionally use the Remote Desktop and Telnet methods to access the storage system.

Using the Remote Desktop method

Remote Desktop provides the ability for you to log on to and remotely administer your server, giving you a method of managing it from any client. Installed for remote administration, Remote Desktop allows only two concurrent sessions. Leaving a session running takes up one license and can affect other users. If two sessions are running, additional users will be denied access.

To connect the storage system to a network using the Remote Desktop method:

1. On the PC client, select **Start→Windows PowerShell**. Type `mstsc` and press **Enter**.
2. Enter the IP address of the storage system in the **Computer** box and click **Connect**.
3. Log on to the storage system with the administrator user name and password.

Using the Telnet method

Telnet is a utility that enables you to connect to machines, log on, and obtain a command prompt remotely. By default, Telnet server is not installed.

4 Managing the storage system

After you have completed the initial setup of the system using the ICT window, use Windows Server Manager to manage the system. The Server Manager is automatically launched when you close ICT. You can also launch Server Manager from the storage system desktop clicking the shortcut icon on the task bar. The local HP StoreEasy Storage system as well as other Windows servers may be managed, as described in the Manage Multiple, Remote Servers with Server Manager article on Microsoft TechNet.

Windows Server Manager can also be used for remote management of the storage system by installing it on a Windows 8 client as part of Remote Server Administration tools. To download the tools, go to Microsoft Download Center.

NOTE: The **Tools** menu of Windows Server Manager is not applicable to a remote system under management. It applies only to the local system.

Many storage related tasks are accomplished with the **File and Storage Services** option in Server Manager. The **Tools** menu contains the common utilities familiar to Windows administrators. The **Tools→HP StoreEasy** menu group contains HP-specific management tools as well as some of the commonly used Windows tools related to managing a StoreEasy system. The **Tools→HP StoreEasy** menu contains the following options:

- **Collect System Reports**—Launches the data collection and diagnostic tool. Collect System Reports is a data collection and diagnostic tool. This tool collects extensive data about the state of the storage system that is used by HP Support to diagnose any problems. Data collection progress is shown, and when complete, Windows Explorer opens to the folder containing a time-stamped .cab archive with the collected information. The folder is `C:\Windows\HPSReports\Enhanced\Report\cab`. HP Support will provide an FTP site to which the `.cab` file may be uploaded.
- Configure Email Alerts—Launches the **Event Notifier Configuration Wizard** that enables you to configure the email recipients that should be notified of hardware events.
- Configure Networking—Launches the Network Configuration Tool.
- **Documentation**—Launches the online help.
- **Evaluate Deduplication Savings**—Launches the Windows `ddpeval.exe` tool which can be used to evaluate the storage space that would be saved by enabling deduplication on a particular volume.
- **File Share Snapshots**—Launches the Windows tool for scheduling and configuring storage for snapshots of a file share.
- HP System Dashboard—Launches the HP System Dashboard.
- **iLO Settings**—Launches the **HP Lights-Out Online Configuration Utility**.
- Manage Storage Pools—Launches the HP StoreEasy Pool Manager.
- Register Product—Launches http://register.hp.com to register the product.
- Save reseller information—Launches the **Reseller Information Tool** that enables you to enter the reseller and purchasing information.
- **View Logs**—Opens the StoreEasy log directory.

Using the Network Configuration Tool

The HP NCT (Network Configuration Tool) wizard enables you to configure the network interfaces on HP StoreEasy 1000 Storage. NCT analyzes all available network interfaces of the StoreEasy system and allows you to choose different network configurations to reduce the chances of any incorrect configuration. It also validates the configuration to help troubleshoot errors in the

networking environment. HP strongly recommends that you use this tool to configure network interfaces. You can also import the network configuration using the network configuration file. For more information on the network configuration file, see "Managing the network configuration file" (page 47) and "Importing network configuration" (page 49).

Use NCT to perform the following tasks:

- Change the network interface settings.
- Configure network teams.
- Configure VLAN assignments and assign VLAN IDs.
- Configure the IP address for the selected interface.
- Confirm network settings and diagnose environmental network issues using the network validation system.

You can launch the NCT directly using the following methods:

- Open a command prompt or PowerShell and type `NCT`.
- Open Server Manager and select **Tools→HP StoreEasy→Configure Networking**.
- Double-click the **System Tools** folder on the desktop and click **Configure Networking**.
- Click **Configure Networking** on the **Start** screen.

The NCT is divided into two panes. When you launch NCT to configure network interfaces or validate the network configuration, the network configuration discovery is initiated. When the system discovery completes, the left pane or interface pane lists the discovered interfaces and their operational state. The right pane displays the current configuration step. Hovering over a network interface in the interface pane displays the device name, interface name, and status. For example, the interface might be disabled, disconnected, or enabled.

IMPORTANT: While using NCT, if you change the network configuration of the system using any other tool, the changes are reflected in NCT only when you close and relaunch it.

The NCT wizard includes the following sections:

- Network Interfaces
- Network Team Configuration
- Network VLAN Configuration
- Network Interface IP Configuration
- Network Configuration Summary
- Network Validation

Network Interfaces

Network Interfaces enables you to configure the physical network interfaces to suit your environment.

To configure an interface:

1. Select the **Configure** check box for the interface that you want to configure. If you clear the check box, the interface is excluded from all configurations and is not modified.
2. Enter the new interface name. The new name that you enter must not contain special characters, such as \ / * ? < > | and ".
3. Click **Next** to proceed to the Network Team Configuration step.

The physical network interfaces that are part of a team or used for RDP cannot be configured. For such interfaces, the **Configure** check box is disabled.

Network Team Configuration

NOTE:

- It is optional to configure a network team. If you do not want to create network teams, click **Next** to proceed to the Network VLAN configuration step. The **Do not configure network teams now** option is selected by default.
- The **Network Team Configuration (optional)** window is displayed only if there are no pre-existing teams.

Network Team Configuration enables you to configure new teams. Teaming is used to increase available bandwidth, load balancing, and improving fault tolerance. The maximum number of teams that you can create is equal to the number of physical network interfaces on the system. On clustered systems, the number of teams created on the local node is same as the number of teams created on the remote node. Team creation on the remote node is automatic.

To create network teams if there are no existing teams:

1. Select **Configure network teams now** and enter the number of teams you want to create in **Number of teams**
2. Click **Next** to proceed to the Network VLAN configuration step.

To create network teams in the case of existing teams:

1. Select the physical network interfaces on the **Network Interfaces** window and click **Next**.
2. Select the **Create** check box and do the following:
   1. Enter the team name.
   2. Select the team type from **Type**. The default selection is **Switch Independent/Dynamic**.

   NOTE: The number of teams displayed for configuration or deletion depends on the number of physical network interfaces that you select. For example, if you select two interfaces for configuration, two rows will appear for team creation.

3. Click **Next**.

   The network interfaces that are not included in any team are displayed.
4. Select the network interfaces that you want to include in the new team.
5. Click **Next** to proceed to the Network VLAN configuration step.

The **Network Team Configuration** window also enables you to delete an existing team by selecting the **Delete** check box. When you delete an existing team, the physical network interface included in that team can be used for new teams.

NOTE: When a team is created, a default virtual network interface is also created. To remove the default virtual interface, assign one or more VLAN IDs on the **Network VLAN Configuration** window and select the **remove the default virtual network interface** check box.

While creating network teams, the interfaces claimed by one team cannot be added to any other team. The team that these interfaces belong to is displayed next to the interface name. If all adapters are already claimed by one or more teams, a warning message is displayed. You can either go back and remove some interfaces from the previously created teams or skip the creation of a team.

- If some of the physical network interfaces included in the team are disconnected while other interfaces are connected, the team status is displayed as `degraded`.
- If all physical network interfaces included in the team are disconnected, the team status is displayed as `disconnected`.

The network teams are displayed in the interface pane when you proceed to the IP Address Configuration step.

Network VLAN Configuration

NOTE: It is optional to configure VLAN assignments. If you choose not to configure VLAN assignments, only the default team interface is created. Click **Next** to skip this step and go to the IP Address Configuration step.

Network VLAN Configuration enables you to configure VLAN assignments. The default VLAN ID is 0, but the VLAN IDs can have a value from 0 to 4094. Each VLAN ID assigned to a physical network interface or network team creates a virtual network interface. Both physical and virtual interfaces created for network teams can have VLAN IDs assigned to them. If a physical interface is assigned a VLAN ID, a team is created with a single physical interface. A virtual interface with the VLAN ID is then created in the team.

To assign VLAN IDs:

1. Select the **Configure VLAN IDs now** and click **Next**.
2. Select one of the following options and enter the VLAN ID in the respective fields:
   - **Add a single VLAN ID**—Select to add a single VLAN ID.
   - **Add discrete VLAN IDs**—Select to add the VLAN IDs as comma separated values.
   - **Add a range of VLAN IDs**—Select to specify the VLAN IDs using a start and end value with an increment. For example, a start value of 2 and an end value of 20 with an increment of 5 would assign VLAN IDs 2, 7, 12, and 17.
3. Select the **Remove the default virtual network interface** check box to remove the default virtual interface from a team. This step is optional.

   NOTE: If a default virtual interface is deleted, the system will not receive any packets on the team or physical NIC unless you assign one or more VLAN IDs.

4. Click **Next** to proceed to the Network Interface IP Configuration step.

The VLAN assignments are displayed in the interface pane when you proceed to the Network Interface IP Configuration step.

NOTE: If you select **Do not configure network interface VLAN identifiers now** after you assign VLAN IDs to teams and adapters, the assigned IDs are not removed. You must go through each VLAN page and select the **Do not add a VLAN ID to this team** implicitly for all teams and adapters.

Network Interface IP Configuration

Network Interface enables you to begin the IP address configuration by selecting the interface on which you want to make changes using the interface pane. Each interface that can be configured is enabled on the system, even if no changes are made to the interface. The IP addresses that you assign can be static or dynamically assigned using DHCP.

To configure the IP information for an interface:

1. Select **Use DHCP to assign IP address and gateway** to dynamically assign an IP address using DHCP or select **Assign a static IP address and gateway** to assign a static IP address.

   IMPORTANT: If you select **Assign a static IP address and gateway**, the DNS server address must also be static and you must also assign a network mask. Assigning a default gateway address is optional.

2. Select **Use DHCP to assign DNS server addresses** or **Assign a static IP address and gateway**. If you selected the **Assign a static IP address and gateway** option in the above step, the **Assign a static IP addresses for DNS option** is selected by default and you cannot change it.

3. Click **Next** to proceed to the Network Configuration Summary step.

IMPORTANT: HP recommends that you check each interface before clicking **Next** on this window.

The network defined by the IP address and subnet mask is used to validate the gateway, if one is specified. If an interface is assigned a static address, its configuration is validated against other interface settings when a different interface is selected or when you click **Next**.

Network Configuration Summary

Network Configuration Summary enables you to view a summary of all configuration changes that will take place on the system. Before proceeding, confirm that the changes are appropriate. If some configurations are not required or not valid, click **Previous** or use the navigation links at the bottom of the page to correct the errors. To apply the configuration changes, click **Apply**. When you click **Apply**, the details of each task configured is displayed on the interface pane. If some errors are encountered when the changes are applied, the same are displayed on the **Errors** tab. When you click **Apply**, the system automatically creates and saves the network configuration file (`NCTConfig.xml`) at `C:\Program Files\HP\HP StoreEasy NetworkConfiguration Wizard`. For more information on the network configuration file, see "Managing the network configuration file" (page 47) and "Importing network configuration" (page 49).

Network Validation

Network Validation enables you to validate and configure the network settings. Network validation requires that all network interfaces that you want to test be connected.

NOTE:

- It is optional to validate the network settings. However, HP recommends using the network validation system to confirm that your network settings are valid and to help diagnose environmental network issues.
- You can launch only the Network Validation section of NCT by executing the `NCT -validate` command in a command prompt or PowerShell.

To begin network validation:

1. Select **Validate the network configuration now**.
2. Enter the name of the domain controller for the domain that your system will be a part of and IP address of the domain controller in the respective fields. If you do not want to join the system to a domain, you can leave these fields blank.
3. Click **Validate**.

When the validation begins, the user interface may seem unresponsive. Each interface is tested in order and validation success or failure is noted in the output window. Validation results are also saved at `c:\hpnas\logs\NetworkConfigTool`. Each validation result is saved in a file named with the time and date the validation was performed.

Managing the network configuration file

The `NCTConfig.xml` file is created when you apply the network configuration changes by clicking **Apply** on the **Network Configuration Summary** window. This file includes the network configuration details. Only a user who is a member of the local administrator group can modify the contents of this file. The system creates the `NCTConfig.xml` file depending on the sequence in which the NCT wizard completes the network configuration tasks successfully. For example, if the physical network interface configuration is successful, but the creation of teams or VLANs fails, then the `NCTConfig.xml` file is created with only the physical network interfaces listed in the file. The VLANs and teams are not listed. This is because in this case, the NCT wizard successfully completed the network interface task, even though the other tasks were unsuccessful. However, if the physical

network interface task fails, then the `NCTConfig.xml` file is not created at all because the validation failed at the first task. When the file is created successfully, you can use it to import the configuration from one server to another. Important considerations while working with the `NCTConfig.xml` file are:

- Do not rename the XML tags in the file. Renaming the tags might lead to errors while applying the configuration.
- Do not rename the `NCTConfig.xml` file.
- Do not edit the contents of the `PciKey` tag. Editing this tag causes errors.
- If the `NCTConfig.xml` file is corrupt or the tags are invalid, a message is displayed on the screen indicating the same. You cannot reuse the same file. In such cases, NCT uses the system discovery state for further configurations.

Sample network configuration file

```
<?xml version="1.0" encoding="utf-8"?>
<!--This XML file has been generated by the Network Configuration Tool after successful application of user
settings-->
<!--Created - 10 Wed Dec 2014 04:50-->
<NetworkConfigurationTool>
<SystemSerialNumber-2M23330589>
 <Interfaces>
  <Interface ifIndex="16">
   <Name>Ethernet 41</Name>
   <Description>HP Ethernet 1Gb 4-port 331FLR Adapter #4</Description>
   <IsMediaConnected>false</IsMediaConnected>
   <IsNetEnabled>false</IsNetEnabled>
   <AdapterHWInformation>
    <BindingOrder>0</BindingOrder>
    <Bus>3</Bus>
    <Device>0</Device>
    <Function>3</Function>
    <InstanceID>{DABD5F10-C2A9-40ED-9701-F4EEE1FE6B60}</InstanceID>
    <PciKey>3:0:3</PciKey>
   </AdapterHWInformation>
   <AdapterIPConfiguration>
    <DefaultGateway>16.78.88.1</DefaultGateway>
    <DHCPEnabled>false</DHCPEnabled>
    <IPAddress>16.78.88.20</IPAddress>
    <PrimaryDNS></PrimaryDNS>
    <SecondaryDNS></SecondaryDNS>
    <TertiaryDNS></TertiaryDNS>
    <StaticEnabled>true</StaticEnabled>
    <SubnetMask>255.255.248.0</SubnetMask>
    <IsDHCPDNS>false</IsDHCPDNS>
    <IsDHCPIP>false</IsDHCPIP>
    <IsStaticDNS>true</IsStaticDNS>
    <IsStaticIP>true</IsStaticIP>
   </AdapterIPConfiguration>
   <DNSDomainName></DNSDomainName>
   <IsAvailableforTeam>true</IsAvailableforTeam>
   <IsMemberofTeam>false</IsMemberofTeam>
   <IsLocal>true</IsLocal
   <IsVirtualLAN>false</IsVirtualLAN>
  </Interface>
  <Teams>
   <Team>
   <Name>Team1</Name>
   <TeamingMode>SwitchIndependent</TeamingMode>
   <LoadBalancingAlgorithm>Dynamic</LoadBalancingAlgorithm>
   <TeamStatus>Down</TeamStatus>
   <IsLocal>false</IsLocal>
   <VLANforTeam>
    <DefaultVLAN></DefaultVLAN>
    <DiscreteVLAN/>
    <SingleVLAN>45</SingleVLAN>
    <StepVLANRange></StepVLANRange>
    <IsProperStep>true</IsProperStep>
    <RangeVLAN/>
    <UpperRangeLimit></UpperRangeLimit>
    <LowerRangeLimit></LowerRangeLimit>
    <VLANType>SingleVLAN</VLANType>
    <VLANIDs>
     <VLANID>45</VLANID>
    </VLANIDs>
    <CanMoveForward>true</CanMoveForward>
   </VLANforTeam>
   <TeamMembers>
    <TeamMember>Ethernet 3</TeamMember>
   </TeamMembers>
  </Team>
 </Teams>
```

```
</SystemSerialNumber-2M23330589>
</NetworkConfigurationTool>
```

In the `NCTConfig.xml` file, you can edit only the following tags:

- `<Name>`—Contains the physical network interface name.
- `<AdapterHWInformation>`—Contains the hardware information of the physical network interface. You can edit all subtags within this tag, such as `<BindingOrder>`, `<Bus>`, `<Device>`, and so on. However, you cannot edit the `<PciKey>` tag.
- `<AdapterIPConfiguration>`—Contains the IP configuration of the network interface. You can edit all subtags within this tag, such as `<DefaultGateway>`, `<DHCPEnabled>`, `<IPAddress>`, and so on.

The following table describes the sample values for these tags:

Tag	Sample value
`<Name>`	**`Ethernet 3`**, **`1 GbE Public 1`**, and so on.
`<DHCPEnabled>`	**`true`** or **`false`**.
`<IsDHCPIP>` and `<IsDHCPDNS>`	• If `DHCPEnabled` is set to **`true`**, the value in this tag must be set to **`true`**. • If `DHCPEnabled` is set to **`false`**, the value in this tag must be set to **`false`**.
`<StaticEnabled>`	**`true`** or **`false`**.
`<IsStaticIP>` and `<IsStaticDNS>`	• If `StaticEnabled` is set to **`true`**, the value in this tag must be set to **`true`**. • If `StaticEnabled` is set to **`false`**, the value in this tag must be set to **`false`**.
`<IPAddress>`	**`16.78.90.32`**, **`10.1.2.21`**, **`128.90.34.123`**, and so on.
`<SubnetMask>`	**`255.255.248.0`**,**`255.255.0.0`**, and so on.
`<DefaultGateway>`	**`16.78.88.1`**, **`128.90.34.21`**, and so on.
`<PrimaryDNS>`	**`16.78.22.12`**, **`128.89.23.12`**, and so on.
`<SecondaryDNS>`	**`16.78.22.12`**, **`128.89.23.12`**, and so on.
`<TertiaryDNS>`	**`16.78.22.12`**, **`128.89.23.12`**, and so on.

IMPORTANT:

- If the `DHCPEnabled` or `StaticEnabled` tags are modified, the values in the `IsDHCPIP`, `IsDHCPDNS`, `IsStaticIP`, and `IsStaticDNS` tags must be changed accordingly.
- If the `StaticEnabled`, `IsStaticIP`, and `IsStaticDNS` tags are set to **`True`** and no values are specified for `IPAddress`, `SubnetMask`, and `PrimaryDNS`, the setting of the IP configuration fails.
- The `StaticEnabled` and `DHCPEnabled` tags cannot be set to **`true`** at the same time.

Importing network configuration

The `NCTConfig.xml` file enables you to directly import the network configuration settings from one server to another and apply the network configuration settings for all adapters at one instance. After successfully importing the settings, when you relaunch NCT, a confirmation message is displayed indicating if you want to use the last used network configuration settings. If you click **Yes**, the NCT wizard loads the network configuration details from the `NCTConfig.xml` file and

displays the existing interface details along with the team details. You can reconfigure the desired network interface from the available interfaces and create new teams or delete existing teams.

IMPORTANT: While changing the interface name, you must change only the prefix associated with the default VLAN. For example, if the complete interface name is `Ethernet 2 Team –VLAN Default`, then you must change only the prefix, that is, `Ethernet 2 Team`. The default VLAN name, which is `VLAN Default` in this example, must not be changed.

To import the network configuration settings from the `NCTConfig.xml` file:

1. Open the `NCTConfig.xml` file and edit the IP configuration of the adapter in the `<AdapterIPConfiguration>` tag.
2. Edit the interface name, if required.
3. Save the file and copy it to `C:\Program Files\HP\HP StoreEasy NetworkConfiguration Wizard` on the server on which you want to import the configuration.
4. Launch NCT and when prompted, click **Yes** to use the last saved configuration.

   The NCT wizard loads and displays the configuration details from the `NCTConfig.xml` file.
5. Click **Next** when the discovery completes.
6. Make required network configuration changes on the respective windows.
7. Click **Apply** on the **Network Configuration Summary** window to apply the changes.
8. Click **Validate** on the **Network Configuration Validation** window to validate the changes.

If the XML file import is unsuccessful, it could be due to one of the following reasons:

- The file is corrupt.
- The number of adapters in the XML file and the number of adapters on the system on which you want to import the file do not match.
- The file name is different from `NCTConfig.xml`.
- The file is copied to a different location or folder.
- The XML tags other than the ones you can edit are edited.

Using HP StoreEasy Pool Manager

HP StoreEasy Pool Manager is used to create, edit, grow, and delete storage pools. A storage pool is a set of physical disks that are grouped together. A storage pool contains one or more virtual disks and defines the RAID Level that will be used for the virtual disks. Any local or domain user may use Pool Manager to view the storage layout, but to make any modifications such as creating, deleting, or editing pools, you must be a member of the local administrators group on the StoreEasy system. In most cases, whether using Pool Manager locally on the StoreEasy system or from a browser on a remote machine, the credentials of the logged in Windows user are used and the browser does not prompt for credentials. If prompted for credentials, enter the username and password of a domain user that is a member of the local administrators group on the StoreEasy system. If the StoreEasy system is not in an Active Directory domain, provide the username and password of the local administrator account.

You can access HP StoreEasy Pool Manager using the following ways:

- In Windows Server Manager, select **Tools→HP StoreEasy→Manage Storage Pools**.
- In the **Storage Configuration** task group in the ICT window, click **Create storage pools**.

NOTE: When you launch Pool Manager from ICT, the only operation available is creating a storage pool.

Accessing Pool Manager remotely

Pool Manager is hosted on an IIS website on the StoreEasy system. The website is named *HP StoreEasy Web Management* and uses TCP port 49258 by default. The TCP port 49258 is not open in the Windows Firewall, so Pool Manager cannot be accessed remotely.

NOTE: If changes are made to the storage configuration using a tool other than Windows Server Manager, StoreEasy Pool Manager, or PowerShell Cmdlet, it is necessary to update the storage cache. Update the storage cache using the following method:

- Open PowerShell and run `Update-StorageProviderCache`.

NOTE: You might see a message when using the Provision Storage wizard indicating RAID6 is not supported. The Smart Array controller that is used to control the operating system drives is not licensed for RAID6. A RAID6 license is included with the system that is shipped from the factory and the license key is delivered in printed form in the system packaging. If for some reason the SmartArray controller is replaced, you must re-enter the license key. For instructions, see *Installing the license key with ACU* in the *Configuring Arrays on HP Smart Array Controllers Reference Guide* at http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00729544/c00729544.pdf.

For replacement instructions, see the *HP Smart Array Controllers for HP ProLiant Servers User Guide* at http://bizsupport1.austin.hp.com/bc/docs/support/SupportManual/c01608507/c01608507.pdf.

The following pool sets are available while creating storage pools:

Table 5 Pool sets

Pool Set	No. of pools	Drives per pool	Logical drive RAID options							Spare needed	Spare bay used	Max drive size	Drive types (Must be of same type per system)				
			RAID 1	RAID 5	RAID 6	RAID 10	RAID 50 (2)	RAID 60 (2)	RAID 60 (3)				SATA	SATA SSD	MDL SAS	SAS SSD	ENT SAS
StoreEasy 1450 LFF-Maximum 4 Data Drives																	
1	1	4	—	—	✓	—	—	—	—	—	—	8 TB	✓	—	—	—	—
2	1	4	—	—	✓	✓	—	—	—	—	—	8 TB	—	—	✓	—	—
3	1	4	—	✓	✓	✓	—	—	—	—	—	3 TB	—	—	✓	—	—
4	2	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	—	—
5	1	4	—	✓	—	✓	—	—	—	—	—	2 TB	—	✓	—	—	—
6	2	2	✓	—	—	—	—	—	—	—	—	2 TB	—	—	—	✓	—
7	1	4	—	✓	—	✓	—	—	—	—	—	2 TB	—	—	—	✓	—
StoreEasy 1550 LFF-Maximum 4 Data Drives																	
1	1	4	—	—	✓	—	—	—	—	—	—	8 TB	—	✓	—	—	—
2	1	4	—	—	✓	✓	—	—	—	—	—	8 TB	—	—	✓	—	—
3	1	4	—	✓	✓	✓	—	—	—	—	—	—	—	—	—	—	—
4	2	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	—	—
5	1	4	—	✓	—	✓	—	—	—	—	—	2 TB	—	✓	—	—	—
StoreEasy 1650–Maximum 12 Data Drives																	
1	1	12	—	—	✓	✓	✓	✓	—	1	12	2 TB	—	—	✓	—	—
2	1	11	—	—	✓	—	—	—	—	1	12	4 TB	✓	—	✓	—	—

Table 5 Pool sets *(continued)*

Pool Set	No. of pools	Drives per pool	Logical drive RAID options							Spare needed	Spare bay used	Max drive size	Drive types (Must be of same type per system)				
			RAID 1	RAID 5	RAID 6	RAID 10	RAID 50 (2)	RAID 60 (2)	RAID 60 (3)				SATA	SATA SSD	MDL SAS	SAS SSD	ENT SAS
3	1	10	—	—	✓	✓	✓	✓	—	1	11, 12	2 TB	✓	—	✓	—	—
4	2	5	—	—	✓	—	—	—	—	1	12	8 TB	✓	—	✓	—	—
		6				✓											
5	2	6	—	—	✓	✓	—	—	—	—	—	8 TB	✓	—	✓	—	—
6	2	4	—	✓	✓	✓	—	—	—	—	—	8 TB	✓	—	✓	—	—
		7		—	✓	—	—	—	—	1	12						
7	3	4	—	✓	✓	✓	—	—	—	—	—	8 TB	✓	—	—	—	—
8	6	2	—	—	✓	—	✓	✓	—	—	—	4 TB	—	—	✓	—	—
9	2	8	—	—	✓	✓	✓	✓	—	—	—	8 TB	—	—	✓	—	—
		4			✓	✓	—	—	—								
10	6	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	—	—
11	3	4	—	✓	—	✓	—	—	—	—	—	2 TB	—	✓	—	—	—
12	2	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	—	—	—
13	1	12	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	—	—	—
14	2	8	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	—	—	—
		4							—								
StoreEasy 1850– Maximum 24 Data Drives																	
1	2	11	—	—	✓	—	—	—	—	1	23, 24	2 TB	—	—	✓	—	✓
2	3	8	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	✓	✓	—
3	3	7	—	✓	✓	✓	—	—	—	1	22, 23, 24	2 TB	—	—	✓	—	✓
4	1	22	—	—	—	—	—	✓	—	1	23, 24	2 TB	—	—	✓	—	—
5	3	8	—	✓	✓	✓	—	—	—	1	23, 24	2 TB	—	—	✓	—	—
		8								1							
		6								—							
6	2	13	—	✓	—	—	—	—	—	1	24	2 TB	—	—	✓	—	—
		10															
7	6	4	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	✓	✓	✓
8	3	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	—	✓	—	✓
		7		✓	✓	—				1	24						
		9		—	✓	—				1							

Table 5 Pool sets *(continued)*

Pool Set	No. of pools	Drives per pool	Logical drive RAID options							Spare needed	Spare bay used	Max drive size	Drive types (Must be of same type per system)				
			RAID 1	RAID 5	RAID 6	RAID 10	RAID 50 (2)	RAID 60 (2)	RAID 60 (3)				SATA	SATA SSD	MDL SAS	SAS SSD	ENT SAS
9	1	22	—	—	—	✓	✓	✓	—	1	23, 24	2 TB	—	—	—	—	✓
10	4	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	—	—	—	✓
11	3	8	—	—	✓	✓	—	—	—	—	—	—	—	—	—	—	✓
12	1	24	—	—	—	—	—	✓	—	—	—	—	—	—	—	—	✓
13	3	6	—	✓	✓	✓	—	—	—	1	24	2 TB	—	—	—	—	✓
		8															
		8															
14	4	6	—	✓	✓	✓	—	—	—	1	24	2 TB	—	—	—	—	✓
		6															
		6															
		4															
15	2	16	—	—	✓	✓	✓	✓	—	1	24	2 TB	—	—	—	—	✓
		7		✓	✓	—	—	—	—								
16	2	13	—	—	✓	—	—	—	—	1	24	2 TB	—	—	—	—	✓
		10		✓	✓	✓	—	—	—								
17	2	11	—	—	✓	✓	—	—	—	1	23, 24	2 TB	—	✓	—	✓	—
18	1	22	—	✓	✓	✓	✓	—	—	—	—	2 TB	—	✓	—	✓	—
19	4	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
		2	✓	—	—					—	—						
		9	—	✓	✓					1	23, 24						
		9	—	✓	✓					1							
20	2	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
		20	—	—	✓	✓				1	23, 24						
21	3	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
		10	—	✓	✓	✓				1	23, 24						
		10	—	✓	✓	✓				1	23, 24		—				
22	12	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
D2600 LFF-Maximum 12 Data Drives																	
1	1	11	—	—	✓	—	—	—	—	1	12	4 TB	✓	—	✓	—	—
2	1	10	—	—	✓	✓	✓	✓	—	1	11, 12	8 TB	✓	—	✓	—	—

Table 5 Pool sets *(continued)*

Pool Set	No. of pools	Drives per pool	Logical drive RAID options							Spare needed	Spare bay used	Max drive size	Drive types (Must be of same type per system)				
			RAID 1	RAID 5	RAID 6	RAID 10	RAID 50 (2)	RAID 60 (2)	RAID 60 (3)				SATA	SATA SSD	MDL SAS	SAS SSD	ENT SAS
3	2	5	—	—	✓	—	—	—	—	1	12	8 TB	✓	—	✓	—	—
		6			✓	✓											
4	2	6	—	—	✓	✓	—	—	—	—	—	8 TB	✓	—	✓	—	—
5	2	4	—	✓	✓	✓	—	—	—	—	—	8 TB	✓	—	✓	—	—
		7		—	✓	—				1	12						
6	3	4	—	✓	✓	✓	—	—	—	—	—	8 TB	✓	—	—	—	—
7	1	12	—	—	✓	—	✓	✓	—	—	—	2 TB	—	—	✓	—	—
8	2	8	—	—	✓	✓	✓	✓	—	—	—	8 TB	—	—	✓	—	—
		4			✓	✓	—	—									
9	6	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	✓	—	—
10	3	4	—	✓	—	✓	—	—	—	—	—	2 TB	—	✓	✓	—	—
11	2	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	✓	—	—
12	1	12	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	✓	—	—
13	2	4	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	✓	—	—
		8							—								
D2700 SFF-Maximum 24 Data Drives																	
1	1	11	—	—	✓	—	—	—	—	1	23, 24	2 TB	—	—	✓	—	—
2	3	8	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	✓	✓	✓
3	3	7	—	✓	✓	✓	—	—	—	1	22, 23, 24	2 TB	—	—	✓	—	✓
4	1	22	—	—	—	—	—	✓	—	1	23, 24	2 TB	—	—	✓	—	—
5	3	8	—	✓	✓	✓	—	—	—	1	23, 24	2 TB	—	—	✓	—	—
		8							—	1							
		6							—	—	—						
6	2	13	—	—	✓	—	—	—	—	1	24	2 TB	—	—	✓	—	—
		10							—								
7	6	4	—	✓	✓	✓	—	—	—	—	—	2 TB	—	—	✓	✓	✓
8	3	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	—	✓	—	—
		7		✓	✓	—			—	1	24						
		9		—	✓	—			—	1							
9	2	11	—	—	✓	—	—	—	—	1	23, 24	2 TB	—	—	—	—	✓

Table 5 Pool sets *(continued)*

Pool Set	No. of pools	Drives per pool	Logical drive RAID options							Spare needed	Spare bay used	Max drive size	Drive types (Must be of same type per system)				
			RAID 1	RAID 5	RAID 6	RAID 10	RAID 50 (2)	RAID 60 (2)	RAID 60 (3)				SATA	SATA SSD	MDL SAS	SAS SSD	ENT SAS
10	1	22	—	—	—	✓	✓	✓	—	1	23, 24	2 TB	—	—	—	—	✓
11	4	6	—	—	✓	✓	✓	—	—	—	—	2 TB	—	—	—	—	✓
12	3	8	—	✓	✓	—	—	—	—	—	—	2 TB	—	—	—	—	✓
13	1	24	—	—	—	—	—	✓	—	—	—	2 TB	—	—	—	—	✓
14	3	6	—	✓	✓	✓	—	—	—	✓	24	2 TB	—	—	—	—	✓
		8							—								
		8							—								
15	4	6	—	✓	✓	✓	—	—	—	✓	24	2 TB	—	—	—	—	✓
		6							—								
		6							—								
		4							—								
16	2	16	—	—	✓	✓	✓	✓	—	✓	24	2 TB	—	—	—	—	✓
		7		✓		—	—	—	—								
17	2	13	—	—	✓	—	—	—	—	✓	24	2 TB	—	—	—	—	✓
		10		✓		✓			—								
18	3	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	—	—	—	✓
		7		✓	✓	—			—	✓	24						
		9		✓	✓	—			—								
19	2	11	—	—	✓	✓	—	—	—	✓	23, 24	2 TB	—	✓	—	✓	—
20	1	22	—	—	✓	✓	✓	✓	—	✓	23, 24	2 TB	—	✓	—	✓	—
21	4	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
		2	✓	—	—				—	—	—						
		9	—	✓	✓				—	✓	23, 24						
		9	—	✓	✓				—	—							
22	2	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
		20	—		✓	✓			—	✓	23, 24						
23	3	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
		10	—	✓	✓	✓			—	✓	23, 24						
		10							—	✓							
24	12	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
D3600 LF-Maximum 12 Data Drives																	

Table 5 Pool sets *(continued)*

Pool Set	No. of pools	Drives per pool	Logical drive RAID options							Spare needed	Spare bay used	Max drive size	Drive types (Must be of same type per system)				
			RAID 1	RAID 5	RAID 6	RAID 10	RAID 50 (2)	RAID 60 (2)	RAID 60 (3)				SATA	SATA SSD	MDL SAS	SAS SSD	ENT SAS
1	1	11	—	—	✓	—	—	—	—	✓	12	4 TB	✓	—	✓	—	—
2	1	10	—	—	✓	✓	✓	✓	—	✓	11, 12	8 TB	✓	—	✓	—	—
3	2	5	—	—	✓	—	—	—	—	✓	12	8 TB	✓	—	✓	—	—
		6				✓			—								
4	2	6	—	—	✓	✓	—	—	—	—	—	8 TB	✓	—	✓	—	—
5	2	4	—	✓	✓	✓	—	—	—	—	12	8 TB	✓	—	✓	—	—
		7		—	✓	—			—	✓							
6	3	4	—	✓	✓	✓	—	—	—	—	—	8 TB	✓	—	—	—	—
7	1	12	—	—	✓	—	✓	✓	—	—	—	8 TB	—	—	✓	—	—
8	2	8	—	—	✓	✓	✓	✓	—	—	—	8 TB	—	—	✓	—	—
		4			✓	✓	—	—	—							—	—
9	6	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
10	3	4	—	✓	—	✓	—	—	—	—	—	2 TB	—	✓	—	✓	—
11	2	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	—	✓	—
12	1	12	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	—	✓	—
13	2	4	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	—	✓	—
		8							—								
D3700 SFF-Maximum 24 Data Drives																	
1	2	11	—	—	✓	—	—	—	—	✓	23, 24	2 TB	—	—	—	—	✓
2	1	22	—	—	—	✓	✓	✓	—	✓	23, 24	2 TB	—	—	—	—	✓
3	6	4	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	—	✓	✓
4	4	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	—	—	—	✓
5	3	8	—	—	✓	✓	—	—	—	—	—	2 TB	—	—	—	—	✓
6	3	7	—	✓	✓	✓	—	—	—	✓	22, 23, 24	2 TB	—	—	—	—	✓
7	1	24	—	—	—	—	—	✓	—	—	—	2 TB	—	—	—	—	✓
8	3	6	—	✓	✓	✓	—	—	—	✓	24	2 TB	—	—	—	—	✓
		8							—								
		8							—								
9	4	4	—	✓	✓	✓	—	—	—	✓	24	2 TB	—	—	—	—	✓
		6							—								

Table 5 Pool sets *(continued)*

Pool Set	No. of pools	Drives per pool	Logical drive RAID options							Spare needed	Spare bay used	Max drive size	Drive types (Must be of same type per system)				
			RAID 1	RAID 5	RAID 6	RAID 10	RAID 50 (2)	RAID 60 (2)	RAID 60 (3)				SATA	SATA SSD	MDL SAS	SAS SSD	ENT SAS
		6							—								
		6							—								
10	2	16	—	—	✓	✓	✓	✓	—	✓	24	2 TB	—	—	—	—	✓
		7		✓	✓	—	—	—	—								
11	2	13	—	—	✓	—	—	—	—	✓	24	2 TB	—	—	—	—	✓
		10		✓	✓	✓			—								
12	3	6	—	✓	✓	✓	—	—	—	—	—	2 TB	—	—	—	—	✓
		7		✓	✓	—			—	✓	24						
		9		✓	✓	—			—								
13	2	11	—	—	✓	✓	—	—	—	✓	23, 24	2 TB	—	✓	—	✓	—
14	3	8	—	✓	✓	✓	—	—	—	—	—	2 TB	—	✓	—	✓	—
15	1	22	—	—	✓	✓	✓	✓	—	✓	23, 24	2 TB	—	✓	—	✓	—
16	4	2	✓	—	✓	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
		2	✓	—	—				—	—	—						
		9	—	✓	✓				—	✓	23, 24						
		9	—	✓	✓				—	✓							
17	2	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
		20	—	—	✓	✓			—	✓	23, 24						
18	3	2	✓	—	—	—	—	—	—	—	23, 24	2 TB	—	✓	—	✓	—
		10	—	✓	✓	✓			—	✓							
		10	—	✓	✓	✓			—								
19	12	2	✓	—	—	—	—	—	—	—	—	2 TB	—	✓	—	✓	—
D6000 LFF-Maximum 5 Data Drives																	
1	3	11	—	—	✓	—	—	—	—	✓	34, 35	3 TB	—	—	✓	—	—
2	3	10	—	—	✓	—	—	—	—	✓	31, 32, 33, 34, 35	5 TB	—	—	✓	—	—
3	4	8	—	—	✓	—	—	—	—	✓	33, 34, 35	5 TB	—	—	✓	—	—
4	5	6	—	—	✓	—	—	—	—	✓	31, 32,	8 TB	—	—	✓	—	—

Table 5 Pool sets *(continued)*

Pool Set	No. of pools	Drives per pool	Logical drive RAID options							Spare needed	Spare bay used	Max drive size	Drive types (Must be of same type per system)				
			RAID 1	RAID 5	RAID 6	RAID 10	RAID 50 (2)	RAID 60 (2)	RAID 60 (3)				SATA	SATA SSD	MDL SAS	SAS SSD	ENT SAS
											33, 34, 35						
5	1	30	—	—	—	—	—	—	✓	—	31, 32, 33, 34, 35	5 TB	—	—	✓	—	—
6	1	33	—	—	—	—	—	—	✓	—	34, 35	3 TB	—	—	✓	—	—

The Pool Manager wizard contains the following sections:

- **Overview**—Displays storage information, such as number of controllers, enclosures (internal and external), storage pools, and virtual disks. The system hardware and software configuration information is also displayed. You can also view additional details on the system configuration by clicking **System Management Homepage**

  NOTE:

  - The number and status of disks in an enclosure displayed on the **Create Pool** tab can be affected by removing or inserting new disks. If a physical disk is not currently assigned to a storage pool or it is removed and a new disk is inserted into an empty slot, the physical disk is not included in the list of disks that is displayed unless you refresh the storage. You can refresh the storage system by either opening a Windows PowerShell prompt and executing the `Update-StorageProviderCache` command or by clicking **Rediscover Storage** in Pool Manager.
  - If an assigned physical disk is removed and re-inserted into a different slot, the pool status might be displayed as `Healthy` or `Degraded`. This depends on whether a physical drive from the global spare can be assigned to the virtual disks in the pool.
  - Before opening HP Smart Storage Administrator, ensure that the Pool Manager is closed. HP Smart Storage Administrator closes without warning when you perform any pool operations from Pool Manager.

- **Create Pools**—Enables you to create a new storage pool. Before selecting a pool option, evaluate the available options:
  - Click on each valid pool option (blue buttons) to view details about the option.
  - Click on each invalid pool option (grey buttons) to view details about why this option is not available.
  - Click on **Help me decide** for assistance is making your selection.
- **Edit Pools**—Enables you to change the pool configuration or delete the pool. When you select a pool, additional pool information, such as drives, virtual disks, and spares in also displayed on the screen.

- **View Jobs**—Displays the storage jobs running on the system. You can view the information, such as name, description, state, and so on.
- **View Logs**—Displays the Pool Manager components and most recent log entries for each component. Use the **Select Component** list to select the components for which you want to view the logs. The available components are Pool Manager Provider, Management Web Service, and Storage Management Provider.

For detailed information on these tasks, click the respective help icon on the screen.

Calculating pool size

When creating a storage pool, the capacity and free space is calculated based on a number of factors, including where the storage pool is created. Consider the following when creating pools:

- If a storage pool is created for a specific RAID level, the capacity is based on the specified RAID level. The free space is calculated based on the free space on the smallest of the physical disks in the pool to support the specified RAID level.
- If a storage pool contains a LUN which is greater than 20 MB and has the Logical Drive label as **Reserved**, the RAID level of the pool is set to the RAID level of the LUN. Any subsequent volume in the pool is created at the same RAID level. However, this might fail if a similar LUN already exists in the pool which is of an incompatible RAID level.
- A virtual disk in a storage pool is always striped across all physical disks in the pool.
- If the storage pool is created with a tool other than HP StoreEasy Pool Manager, the free space calculation is based on the recommended RAID level or it is derived from the reserved LUN in the pool. If the reserved LUN does not exist, it is automatically created (if there is space available in the pool) and based on the assumed RAID level. If the reserved LUN is deleted using a tool other than Windows Server Manager, the RAID level specified in Pool Manager is used. The chosen RAID level will be whichever offers the highest fault tolerance using the available set of physical disks in the pool.

As an example, a RAID 6 storage pool is created using HP StoreEasy Pool Manager that contains five 3 TB drives. The available space is 9 TB (3 x 3 TB, excluding the two parity drives). If the pool already contains a 2 TB RAID 1 LUN (virtual disk) using two of the five drives, the available space is 6 TB (3 x 2 TB, excluding the two parity drives and considering that the available space in the smallest drive is 2 TB (3-1)).

Pool Manager best practices

The HP StoreEasy pool best practices provide:

- Preset configuration options (pool sets) calculated on a per enclosure basis. An enclosure may refer to the StoreEasy system and its internal drives or an attached external disk enclosure, such as D2600/D2700, D3600/D3700, and D6000.
- Guidance to prevent pools from being too large (based on disk type and RAID level) or too small. Pools that are too large run the risk of data loss if there are multiple disk failures within the pool. Pools that are too small increase the chance of inefficient capacity utilization.

To achieve optimal pool performance:

- Pools cannot span enclosures.
- Where applicable, the use of a hot spare is enforced.
- When using midline SAS and SATA drives, the only RAID levels allowed are RAID6 or RAID60.
- The available pool sets vary depending on the type of enclosure. A pool set defines how the available physical drives may be used to form pools. For example, if an enclosure contains 23 available drives, one pool set may offer a single 22-drive pool with one drive designated as a spare. Another pool set may offer two 11-drive pools with drive designated as a spare, which is available to either pool.

Typically, using larger LUNs, which require larger pools simplifies storage management and namespace management, especially when using storage for file shares. However, the following factors can affect the use of larger LUNs:

- Backup strategy
  - Larger LUNs require longer backup windows.
  - Multiple, smaller LUNs may be more efficient for backup and recovery scenarios.
- Performance requirements
  - If there are performance requirements for specific clients, segmenting groups of clients onto different LUNs might be useful.
- Drive availability
  - Starting with a full disk enclosure provides the most options for creating pools. A disk enclosure with a smaller number of drives has a smaller number of pooling options.
  - RAID migration is not allowed. For example, you start with a pool containing 13 drives that are configured with RAID 5 and then create a LUN (virtual disk) that fills the pool. Later, you decide to grow that LUN. Although a 22-drive pool set may be listed, you cannot grow a 13-drive pool into a 22-drive pool because the 22-drive pool requires RAID 50 or RAID 60. Migrating from RAID 5 to RAID 50 or RAID 60 is not supported.

There following table describes the three basic types of pools, their properties, and usage:

Pool type	Properties	Good for
Capacity	• Created with high capacity midline SAS drives (7.2K RPM). • Always contain RAID6 or RAID 60 LUNs.	• Archival storage (high capacity) • General purpose file shares • Sequential workloads
Performance	• Created with enterprise SAS drives (10K or 15K RPM). • Contain an even number of disk drives to support RAID10 LUNs.	• Applications • Clients with high performance needs • Random I/O workloads • Low capacity data sets
Balanced	• Created with enterprise SAS drives (10K or 15K RPM). • Contain RAID5/6 or RAID50/60 LUNs. **NOTE:** This storage will generally be of higher performance than Capacity pools and have better capacity utilization than Performance pools.	• General purpose file shares • Sequential workloads

Using the HP System Dashboard

The HP System Dashboard is a management software that enables you to view information about the HP StoreEasy 1000 Storage system, such as resource utilization, system details, storage configuration, and network configuration.

Use one of the following methods to launch the HP System Dashboard:

- Double-click the **HP System Dashboard** icon on the desktop.
- Open Server Manager and click **Tools→HP StoreEasy→HP System Dashboard**.

- Click **HP System Dashboard** on the **Start** screen.
- Click the **HP System Dashboard** shortcut icon on the system toolbar.

The HP System Dashboard contains the following tabs that allow you to view the current system state and utilization:

- Overview—Displays system health, system utilization summary, and system properties.
- Events—Displays system event logs that include critical, warning, and informational messages.
- Storage—Displays storage overview, drives, volumes, and shares.
- Network—Displays network overview, interfaces, teams, and VLANs.
- System—Displays system overview, hardware, and software details.

The HP System Dashboard menu bar contains the following buttons:

- **Systems**—Click to select the system for which you want to view the data.
- **Refresh**—Click  to refresh the dashboard data.
- **Help**—Click  to launch the online help.

You can also customize the menu bar display options and view information of the StoreEasy systems. To change the display options, click the drop-down arrow in the menu bar, and select the required option under **Display Options**.

IMPORTANT:

- If you refresh the web browser by pressing **F5** or by clicking the refresh button in the address bar, by default, the data on the dashboard is refreshed and reloaded for the current node, irrespective of previous selection. However, if you refresh the dashboard data by clicking the dashboard refresh button, that is,  on the menu bar, the data is refreshed only for the selected nodes.
- The data on the **Overview** screen is refreshed every three minutes. However, you can manually refresh the data by clicking the dashboard refresh button on the menu bar.

The data displayed on the dashboard is as per the sampling interval specified in the dashboard configuration file. If the data for a resource is displayed on more than one screen, the values differ based on the sampling interval. For example, the default sampling interval for network overview is one minute, whereas for other network screens, the interval is 15 minutes. Any change in the interface name or property is reflected under network overview after one minute and on other network screens, the change is reflected after 15 minutes.

NOTE: Depending on the number of disks attached to the system, the initial discovery after the dashboard services are installed might take several minutes.

Viewing the dashboard overview

Click **Overview** on the dashboard to view the CPU, memory, and storage utilization summary. You can also view a graphical representation of the free space, used space, and unallocated space in the Storage Utilization pie chart. The **Overview** screen is the default screen that appears when you access the HP System Dashboard.

The following table describes the fields that are available on this screen:

Field	Description
Action	Warning or failure message related to the system health. This box is not displayed if the system health is normal. • If the system health degrades, an appropriate warning message is displayed. For example, `The CPU`

Field	Description

	`utilization has crossed its warning threshold level.`
	• If the system health degrades due to multiple causes, the following message is displayed:
	`System health is degraded due to multiple causes.`
	• If the system health fails, an appropriate failure message is displayed. For example, `System failure as all enclosures are in failed state.`
	• If the system health fails due to multiple reasons, the following message is displayed:
	`System health is failed due to multiple causes.`

CPU	Average value of the CPU utilization over a period of time. The value displayed is the average of the number of samples collected at the time interval specified in configuration file.
Memory	Average value of the physical memory utilization over a period of time. The value displayed is the average of the number of samples collected at the time interval specified in configuration file.
Network	Average value of the network bandwidth utilization over a period of time. The value displayed is the average of the number of samples collected at the time interval specified in configuration file.
Users	Total number of users connected to SMB shares.
Free space	Free space available on the volume. The free space is the difference between the total presented virtual disk and total used space on each volume.
Used space	Sum of used space on each volume.
Unallocated space	Difference between the total size of all attached disks and the total presented storage pools.
Deduplication ratio	Average deduplication ratio of all volumes that have deduplication enabled. Deduplication ratio is the percentage amount of data savings with respect to the total size of the volume. If none of the volumes have deduplication enabled, **Disabled** is displayed in the box.
Product	Product name with activation status of the system on which you are accessing the HP System Dashboard.
P/N	StoreEasy product number of the system on which you are accessing the HP System Dashboard.
S/N	Serial number of the system on which you are accessing the HP System Dashboard.
Versions	StoreEasy software version of the system on which you are accessing the HP System Dashboard.

NOTE:

- CPU, memory, network utilization, and number of users on the dashboard are the average values of samples collected over a period of time. Therefore, the values might not always match with the other applications where the data displayed is at different points in time.

For information on common issues and workarounds related to HP System Dashboard, see Table 7 (page 115).

Viewing event details

Click **Events** on the dashboard to view the event logs. A maximum of 60 events are displayed for the system. The **Events** tab contains three additional tabs:

- Critical
- Warning
- Information

The HP System Dashboard uses the following icons to represent the events:

- —Indicates critical
- —Indicates warning
- —Indicates information

Critical

Click **Critical** to view critical events that are logged in the system. The **Critical** tab is divided into two panes. The left pane provides information on all critical events and the right pane provides detailed information of the event selected in the left pane. The following table describes the fields that are available on this screen:

Field	Description
State	Icon that represents the event.
Severity	Severity level of the event.
Date & Time	Date and time when the event was logged.
Source	Source of the log. For example, VSS, MSIInstaller, or Perflib.
ID	Event log ID.
System	Local name of the system.
User	Username from which the event is triggered.
Message	Detailed description of the message.

Warning

Click **Warning** to view warning events logged in the system. The **Warning** tab is divided into two panes. The left pane provides information on all warning events and the right pane provides detailed information of the event selected in the left pane. The following table describes the fields that are available on this screen:

Field	Description
State	Icon that represents the event.
Severity	Severity level of the event log.

Field	Description
Date & Time	Date and time when the event was logged.
Source	Source of the log. For example, VSS, MSIInstaller, or Perflib.
ID	Event log ID.
System	Local name of the system.
User	Username from which the event is triggered.
Message	Detailed description of the message.

Information

Click **Information** to view informational events logged in the system. The **Information** tab is divided into two panes. The left pane displays all informational events and the right pane provides detailed information of the event selected in the left pane. The following table describes the fields that are available on this screen:

Field	Description
State	Icon that represents the event.
Severity	Severity level of the message.
Date & Time	Date and time when the event was logged.
Source	Source of the log. For example, VSS, MSIInstaller, or Perflib.
ID	Event log ID.
System	Local name of the system.
User	Username from which the event is triggered.
Message	Detailed description of the message.

Viewing storage details

Click **Storage** on the dashboard to view storage details, such as the drives, volumes, and shares available in the system. The **Storage** tab contains four additional tabs:

- Overview
- Drives
- Volumes
- Shares

The HP System Dashboard uses the following icons to display the state of an individual drive, volume, and share:

- —Indicates normal
- —Indicates information
- —Indicates warning
- —Indicates minor or degraded
- —Indicates major error
- —Indicates critical error
- —Indicates unknown state

Overview

Click **Overview** to view a graphical representation of the space utilization for each volume available in the system. To view the utilization details, select the bar that represents the volume in the graph. The lower left pane displays the overall storage utilization of the system. The lower right pane displays the utilization of the selected volume bar graph.

NOTE:

- MV indicates Mounted Volume in the Storage Overview graph. A mounted volume is a volume that does not have a drive letter, but is mounted to another volume.

Drives

Click **Drives** to view details of the drives available in the system and the connected enclosures and arrays.

The **Drives** tab is divided into two panes. The left pane displays a list of all drives and the right pane provides a summary of the drive selected in the left pane. The following table describes the fields that are available on this screen:

Field	Description
State	Icons that represent the state of the individual drive.
Name	Name of the disk.
Drive location	Location of the drive. • For 3PAR arrays, the location is in the `arrayname:cage:magazine:disk` format. • For modular smart arrays, the location is in the `arrayname:enclosure index:slot` format. • For all other drives, the location is in the `location:bay` format.
Size	Size of the drive.
Type	Type of drive.
System	Local name of the system.
Alerts	Alert message about the drive. If no alert is applicable, an appropriate message is displayed.
Utilization	Usage of the drive.
Utilization (%)	Capacity utilization graph.
Properties	Displays the following drive properties: • Serial number • Model • Firmware • Speed • Controller information • Number of volumes associated with the selected drive. • Number of shares associated with the selected drive. **NOTE:** If the speed is displayed as zero for a specific disk, the disk drive firmware might need an update.

Volumes

Click **Volumes** to view details of the volumes created on the connected enclosures and arrays. All volumes available in the system, including operating system volumes are displayed.

The **Volumes** tab is divided into two panes. The left pane displays a list of all volumes and the right pane provides a summary of the volume selected in the left pane. The following table describes the fields that are available on this screen:

Field	Description
State	Icons that represent the state of the individual volume.
Name	Name of the volume.
Label	Label assigned to a specific volume.
Capacity	Total capacity of the volume.
Provisioning	Type of provisioning. For example, Thin or Fixed.
Resiliency	Raid level configuration of volume.
System	Local name of the system.
Alert	Alert message about the volume. If no alert is applicable, an appropriate message is displayed.
Utilization	Horizontal graph representing free, allocated, and total space. If deduplication is enabled, a bar graph for deduplication is also displayed.
Properties	Displays the following volume properties: • Access path to the volume • Encrypted (Yes or No) • Clustered (true or false) • Deduplication (Enabled or Disabled) • Number of drives associated with the selected volume • Number of shares associated with selected volume

Shares

Click **Shares** to view details of all shares available in the system.

The **Shares** tab is divided into two panes. The left pane displays a list of all shares and the right pane displays a summary of the share selected in the left pane. To view additional details, click **Summary** and then click **Details**. The following table describes the fields that are available on this screen:

Field	Description
State	Icons that represent the state of a share.
Name	Name assigned to the share.
Protocol	Protocol used for the share.
Size	Size of the share.
System	Local name of the system.
Alert	Alert message about the share. If no alert is applicable, an appropriate message is displayed.
Utilization	Horizontal graph representing used space.

Field	Description
Properties	Displays the following share properties: • Owning node name if clustered is **true**. • Local path of the share if clustered is **true**. • Clustered (true or false) • Drives • Volumes If you select **Details**, the access path is also displayed under **Properties**.
Reports	Provides the FSRM (File Server Resource Manager) reports. If the report is unavailable, **Not available** is displayed.

Viewing network details

Click **Network** on the dashboard to view the network interfaces, teams, and VLANs available in the system. The **Network** tab contains four additional tabs:

- Overview
- Interfaces
- Teams
- VLANs

The HP System Dashboard uses the following icons to display the state of an individual interface, team, and VLAN:

- —Indicates connected
- —Indicates disconnected
- —Indicates degraded
- —Indicates disabled

Overview

Click **Overview** to view a graphical representation of the network bandwidth utilization in percentage for each interface available in the system. A bar graph representing the utilization for all interfaces is displayed. To view the network bandwidth utilization, select the bar that represents the interface in the graph. The lower left pane displays the overall utilization of the system. The lower right pane displays the utilization of the selected interface.

Interfaces

Click **Interfaces** to view a list of network interfaces available in the system. The interface details of the selected nodes are displayed.

The **Interfaces** tab is divided into two panes. The left pane displays a list of all network interfaces and the right pane displays a summary of the interface selected in the left pane. To view the IPV4 settings, click **Summary** and then click **IPV4**. The following table describes the fields that are available on this screen:

Field	Description
State	Icons that represent the state of an individual interface.
Name	Name assigned to the interface.

Field	Description
Status	Operational state of the network interface: • Disconnected • UP • Degraded • Disabled
Primary IP	Primary IP address of the network interface. If the interface is in a team, **Teamed** is displayed.
System	Local name of the system.
Alerts	Alert message about the network interface. If no alert is applicable, an appropriate message is displayed.
Utilization	Horizontal graph for the network bandwidth utilization percentage.
Properties	Displays the following network interface properties: • Interface description • Network category • Speed • Connectivity • Connection DNS name • Team • VLAN If you select **IPV4**, the following properties are displayed: • Primary IP • Network mask • Gateway • Primary DNS • Secondary DNS • Tertiary DNS • Alternate IP address

Teams

Click **Teams** to view a list of teams available in the system. The team details of the selected nodes are displayed.

The **Teams** tab is divided into two panes. The left pane displays a list of all teams and the right pane displays a summary of the team selected in the left pane. The following table describes the fields that are available on this screen:

Field	Description
State	Icons that represent the status of an individual team.
Name	Name assigned to the team.
Number of interfaces	Number of interfaces.
System	Local name of the system.
Alerts	Alert message about the network adapters included in the team. If no alert is applicable, an appropriate message is displayed.

Field	Description
Utilization	Horizontal graph indicating the bandwidth utilization of the network adapters.
Properties	Displays the following team properties: • Teaming mode • Load balancing mode • Default interface name • List of all team members • Number of VLANs in a team • Team NICs

VLANs

Click **VLANs** to view a list of VLANs available in the system. The VLAN details of the selected nodes are displayed.

The **VLANs** tab is divided into two panes. The left pane displays a list of all VLANs and the right pane displays detailed information about the VLAN selected in the left pane. The following table describes the fields that are available on this screen:

Field	Description
State	Icons that represent the status of an individual VLAN.
Name	Name assigned to the VLAN.
VLAN ID	Unique identifier assigned to the VLAN.
System	Local name of the system.
Alerts	Alert summary about the selected VLAN. If no alert is applicable, an appropriate message is displayed.
Utilization	Horizontal graph indicating the bandwidth utilization of the VLAN.
Properties	Displays the following VLAN properties: • Name of the interface that hosts the VLAN. • Name of the team that hosts the interface hosting the VLAN.

Viewing system details

Click **System** on the dashboard to view the system details of the selected nodes.

The **System** tab contains three additional tabs:

- Overview
- Hardware
- Software

Overview

Click **Overview** to view the system information and properties of the selected nodes. The **Overview** tab is divided into two panes. The left pane displays the node information and the right pane

provides a summary of the system properties. To view additional details, click **Summary** and then click **Details**. The HP System Dashboard uses the following icons to display the system state:

- —Indicates health OK
- —Indicates health warning
- —Indicates health degraded

The following table describes the fields that are available on this screen:

Field	Description
State	Icons that represent the status of the system.
Version	StoreEasy software version.
S/N	Product serial number of the system.
SR version	Version of the SR (Service Release). If no SR is installed, **None** is displayed.
Memory	Average value of the physical memory utilization percentage over a period of time. You can configure the period using the dashboard configuration file.
System	Local name of the system.
Up time	Time since the system was last restarted.
Properties	Displays the following reseller details: • Asset details, such as asset name and asset serial number. • Contact details, such as contact name and contact phone. • Other details, such as PO number, purchase date, installation date, and support ID. The reseller details are extracted from the Reseller Information Tool. If you select **Details**, the following properties are displayed: • SR date and version. • IP address of the iLO.

Hardware

Click **Hardware** to view the hardware components in the system. The hardware details of the selected nodes are displayed.

The **Hardware** tab is divided into two panes. The left pane displays all hardware components and the right pane displays detailed information about the component that you select in the left pane. The following table describes the fields that are available on this screen:

Field	Description
State	Icons that represent the status of a component.
Name	Name of the hardware component.
Type	Type of component.
Model	Model number of the component.
Firmware version	Firmware version installed on the hardware component.
System	Local name of the system.

Field	Description
Alerts	Alert summary of the selected component. If no alert is applicable, an appropriate message is displayed.
Properties	Hardware properties, such as device name, manufacturer, and firmware version.

Software

Click **Software** to view a list of software installed on the system. The software details of the selected nodes are displayed. The following table describes the fields that are available on this screen:

Field	Description
Name	Name of the installed software.
Publisher	Publisher of the software.
Installed on	Date when the software was installed.
Size	Size of the software.
Version	Version number of the installed software.
System	Local name of the system.

Managing the dashboard configuration file

The dashboard configuration file named `configuration.xml` is located at `%PROGRAMFILES%\HP\HP StoreEasy Data Service\UserConfigurationFiles\`. This file is used to define and control the behavior of various user interface elements of the dashboard. Using the dashboard configuration file, you can set the warning and alert threshold parameters, data sampling parameters, and other properties. When you modify the dashboard configuration file and save the changes, the dashboard services update the data depending on the updated time interval that you specify in the file.

NOTE: Only a user who is a member of the local Administrator group can modify the contents and save the dashboard configuration file. A local or domain user cannot make any changes to the dashboard configuration file.

When the first `configuration.xml` file is created, the `LastKnownGood.xml` file is created simultaneously. This file is created every time the file is parsed successfully. The `LastKnownGood.xml` file is saved in the same location as the current file. If the `configuration.xml` file is corrupt or invalid, the `LastKnownGood.xml` is used by the dashboard services. If the `LastKnownGood.xml` file is also corrupt or invalid, the `FactoryConfig.xml` file is used by the dashboard services. You cannot edit the contents of the `FactoryConfig.xml` file.

The top-level element in the `configuration.xml` file is `<Dashboard>` that contains the following sub-elements:

- `<Overview>`
- `<Storage>`
- `<SystemTabs>`
- `<EventLogs>`
- `<Network>`

Overview

The <Overview> sub-element defines the properties for the **Overview** tab. It contains the <Thresholds>, <Sampling>, and <StorageUtilizationGraph> elements.

Thresholds

Use thresholds to set the warning and alert limits for the system utilization and performance. Thresholds affect the display color of various fields that are displayed on the dashboard. By default,

- Green indicates normal.
- Yellow indicates degraded.
- Red indicates failed.

Overrides

Use the overrides to specify the sampling period and samples per average for a given property. The overrides are specified within the <Thresholds> sub-element.

- SamplePeriodOverride specifies the period in minutes that is different from the default period.
- SampleCountOverride specifies the number of samples that are different from the default period.

NOTE: You can override or edit the dashboard configuration file.

Sampling

Use the <Sampling> sub-element to define the sampling rate and samples per average. The sampling rate and samples per average are used by the dashboard to display various properties, such as CPU, memory, and network that are calculated as an average over a period of time.

- Period specifies the sample rate in minutes. Valid sampling period values are from 1 to 1440 minutes .
- SamplesPerAverage specifies the number of samples to calculate the average. Valid sampling count values are from 1 to 100.

Storage Utilization Graph

Use the <StorageUtilizationGraph> sub-element to define the threshold value for the labels in the storage utilization graph on the **Overview** tab. The value is entered in percentage.

- <NoDataLabelThreshold percentage> specifies the value in percentage that indicates if the labels are displayed in the graph. For example, if the threshold value is 5% but the free space available in the system is 3%, then 3% is not displayed because it is less than the threshold value. The default value is 5% but you can change it to any value between 1% to 100%.

Storage

The <Storage> sub-element defines the properties for the drives, volumes, and shares on the Storage tab.

- <UpdateCache> specifies the time for the storage provider cache update. The storage provider cache is updated with the latest storage configuration. By default, the cache is updated every 360 minutes. The minimum time that you can specify for cache update is 360 minutes.
- <Discovery> specifies the discovery time based on which the storage data is discovered and updated. By default, the storage data is discovered every 15 minutes. The minimum time that you can specify for storage data discovery is 15 minutes.

System Tabs

The <SystemTabs> sub-element updates the data on the Hardware and Software tabs.

- <Discovery> specifies the discovery time based on which the hardware health status is updated. The default value is 24 hours. The minimum value must be 30 minutes.

Event Logs

The <EventLogs> sub-element updates the data on the Critical, Warning, and Informational tabs.

- <Discovery> specifies the discovery time based on which the data is updated on the Critical, Warning, and Information tabs. The default value and minimum value is 5 minutes.

Network

The <Network> sub-element defines the properties of the network interfaces, teams, and VLANs.

- <NetworkTabOverview> specifies the discovery time based on which the bandwidth of the interfaces is discovered and updated. By default, the bandwidth of the interfaces is discovered every minute. The minimum time that you can specify for the bandwidth of the interfaces is one minute.
- <NetworkInterfaceTeamVLAN> specifies the discovery time based on which the interface, team, and VLAN details are discovered and updated. By default, the interface, team, and VLAN details are discovered every 15 minutes. The minimum time that you can specify for this discovery is 15 minutes.

IMPORTANT: If you enter a value that is lower than the minimum required value in the dashboard configuration file, the HP System Dashboard discards the new value and considers the default value to update and display the data.

The <UserDetails> sub-element defines Windows user details for node to node communication.

- <UserName> specifies the Windows user name that is created on all cluster nodes for node to node communication.
- <Password> specifies the password for the Windows user created by the dashboard for node to node communication.

IMPORTANT: If you enter a value that is lower than the minimum required value in the dashboard configuration file, the HP System Dashboard discards the new value and considers the default value to update and display the data.

HP Notification System

The HP Notification System feature enables you to set email alerts for various system parameters, such as free space, unallocated space, and used space. The email alerts are sent at a scheduled time based on the rules and notification parameters that you specify. For example, if you set the value of the Used Space parameter as 100 MB, an email alert is sent when the used space in the system reaches 100 MB.

You can access the HP Notification System dialog box using the following methods:

- Double-click the **HP Notification System** icon on the desktop.
- Open **Server Manager**, click **Tools→HP StoreEasy** and select **HP Notification System** from the menu.
- Click **HP Notification System** on the **Start** screen.

To set an email alert:

1. In the **Contact Information** group, enter the full name, email address to and from which the alert must be sent, and SMTP server name.

2. Click **Test** for the SMTP server validation. This step is optional.

   NOTE: If the validation is successful, an email is sent to the specified email address and a confirmation message is displayed on the screen. If the validation fails, a message is displayed indicating that you must verify the SMTP server details.

3. In the **Notification Parameters** group, select a parameter and comparison, and then enter a value that should be compared against the parameter value.
4. Click **OK**.

   The `Rule saved successfully` message is displayed.

To delete an existing rule, click **Delete**.

5 Administration tools

HP StoreEasy 1000 Storage systems include several administration tools to simplify storage system management tasks.

Microsoft Windows Storage Server 2012 R2 administration tools

Microsoft Windows Storage Server 2012 R2 operating systems provide a user interface for initial server configuration, unified storage system management, simplified setup and management of storage and shared folders, and iSCSI targets. It is specially tuned to provide optimal performance for network-attached storage. Windows Storage Server 2012 R2 provides significant enhancements in share and storage management scenarios, as well as integration of storage system management components and functionality.

Remote Administration

The following tools are available for remote management of the system:

- Remote Desktop
- Server Manager on a Windows 8 client via RSAT tools
- Remote PowerShell

File and Storage Services

File and Storage Services includes technologies that help you set up and manage one or more file servers, which are servers that provide central locations on your network where you can store files and share them with users. If users need access to the same files and applications, or if centralized backup and file management are important to your organization, you should set up one or more servers as a file server by installing the File and Storage Services role and the appropriate role services.

Administrators can use the File and Storage Services role to setup and manage multiple file servers and their storage by using Server Manager or Windows PowerShell. Some of the specific applications include the following:

- Use Data deduplication to reduce the disk space requirements of your files, saving money on storage.
- Use iSCSI Target Server to create centralized, software-based, and hardware-independent iSCSI disk subsystems in storage area networks (SANs).
- Use Server Manager to remotely manage multiple file servers from a single window.
- Use Windows PowerShell to automate the management of the majority of administration tasks for file servers.

For more information, see the Windows Storage Server 2012 R2 Help.

Data Deduplication

Data deduplication involves finding and removing duplication within data without compromising its fidelity or integrity. The goal is to store more data in less space by segmenting files into small variable-sized chunks (32–128 KB), identifying duplicate chunks, and maintaining a single copy of each chunk. Redundant copies of the chunk are replaced by a reference to the single copy. The chunks are compressed and then organized into special container files in the System Volume Information folder.

After a volume is enabled for deduplication and the data is optimized, the volume contains the following:

- **Unoptimized files**—For example, unoptimized files could include files that do not meet the selected file-age policy setting, system state files, alternate data streams, encrypted files, files with extended attributes, files smaller than 32 KB, other reparse point files, or files in use by other applications.
- **Optimized files**—Files that are stored as reparse points that contain pointers to a map of the respective chunks in the chunk store that are needed to restore the file when it is requested.
- **Chunk store**—Location for the optimized file data.
- **Additional free space**—The optimized files and chunk store occupy much less space than they did prior to optimization.

To enable data deduplication on a volume:

1. Open Windows Server Manager.
2. Select **File and Storage Services** and then select **Volumes**.
3. Right-click a data volume and select **Configure Data Deduplication**.

   The Deduplication Settings window is displayed.
4. Do the following:
   a. Select the workload for the volume.
   b. Enter the number of days that should pass between file creation and when files are deduplicated.
   c. Identify any file type extensions that should not be deduplicated.
   d. Click **Add** to browse to any folders containing files that should not be deduplicated.
5. Click **Apply** to apply these settings or click **Set Deduplication Schedule** to configure a deduplication schedule.

For more information, see the Windows Storage Server 2012 R2 Help.

Print Management

Use Print Management to view and manage printers and print servers in your organization. You can use Print Management from any computer running Windows Storage Server 2012 R2and you can manage all network printers on print servers running Windows 2000 Server, Windows Server 2003, Windows Storage Server 2003, Windows Storage Server 2003 R2, Windows Storage Server 2008, Windows Storage Server 2008 R2, Windows Storage Server 2012, or Windows Storage Server 2012 R2.

Print Management provides details such as the queue status, printer name, driver name, and server name. You can also set custom views by using the Print Management filtering capability. For example, you can create a view that displays only printers in a particular error state. You can also configure Print Management to send e-mail notifications or run scripts when a printer or print server needs attention. The filtering capability also allows you to bulk edit print jobs, such as canceling all print jobs at once. You can also delete multiple printers at the same time.

Administrators can install printers remotely by using the automatic detection feature, which finds and installs printers on the local subnet to the local print server. Administrators can log on remotely to a server at a branch location, and then install printers remotely.

For more information, see the Windows Storage Server 2012 R2 Help.

Network File System User Mapping

NFS (Network File System) is a network file sharing protocol that allows remote access to files over a network and is typically used in networks with computers running UNIX, Linux, or Mac OS operating systems. NFS is supported on all HP StoreEasy 1000 Storage systems.

The following types of NFS account mapping are supported:

- Active Directory® Domain Services (AD DS) mapped user access
- Unmapped anonymous user access
- Unmapped UNIX user access

For more information about NFS, see the following Microsoft website:

The Storage Team at Microsoft – File Cabinet Blog

6 Storage management overview

This chapter provides an overview of some of the components that make up the storage structure of the storage system.

Storage management elements

Storage is divided into four major divisions:

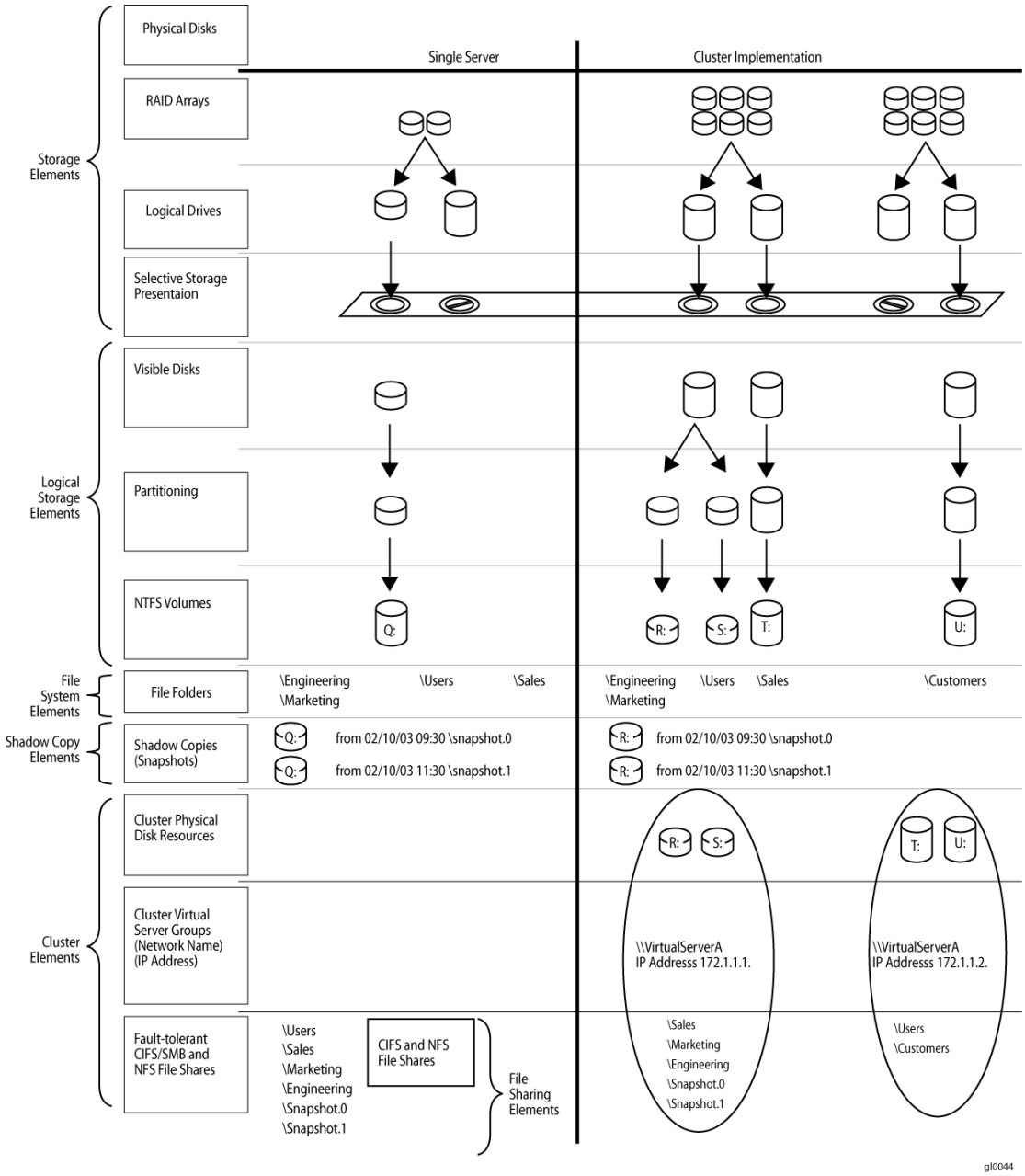
- Physical storage elements
- Logical storage elements
- File system elements
- File sharing elements

Each of these element is composed of the previous level's elements.

Storage management example

Figure 28 (page 79) depicts many of the storage elements that one would find on a storage device. The following sections provide an overview of the storage elements.

Figure 28 Storage management process example



Physical storage elements

The lowest level of storage management occurs at the physical drive level. Minimally, choosing the best disk carving strategy includes the following policies:

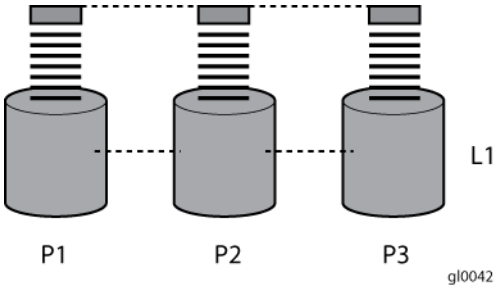
- Analyze current corporate and departmental structure.
- Analyze the current file server structure and environment.
- Plan properly to ensure the best configuration and use of storage.
  - Determine the desired priority of fault tolerance, performance, and storage capacity.
  - Use the determined priority of system characteristics to determine the optimal striping policy and RAID level.
- Include the appropriate number of physical drives in the arrays to create logical storage elements of desired sizes.

Arrays

See Figure 29 (page 80). With an array controller installed in the system, the capacity of several physical drives (P1–P3) can be logically combined into one or more logical units (L1) called arrays. When this is done, the read/write heads of all the constituent physical drives are active simultaneously, dramatically reducing the overall time required for data transfer.

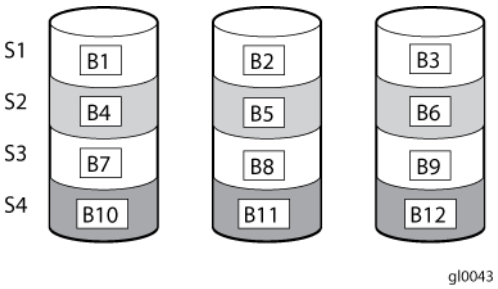
NOTE: Depending on the storage system model, array configuration may not be possible or necessary.

Figure 29 Configuring arrays from physical drives



Because the read/write heads are simultaneously active, the same amount of data is written to each drive during any given time interval. Each unit of data is termed a block. The blocks form a set of data stripes over all the hard drives in an array, as shown in Figure 30 (page 80).

Figure 30 RAID 0 (data striping) (S1-S4) of data blocks (B1-B12)



For data in the array to be readable, the data block sequence within each stripe must be the same. This sequencing process is performed by the array controller, which sends the data blocks to the drive write heads in the correct order.

A natural consequence of the striping process is that each hard drive in a given array contains the same number of data blocks.

NOTE: If one hard drive has a larger capacity than other hard drives in the same array, the extra capacity is wasted because it cannot be used by the array.

Fault tolerance

Drive failure, although rare, is potentially catastrophic. For example, using simple striping as shown in Figure 30 (page 80), failure of any hard drive leads to failure of all logical drives in the same array, and hence to data loss.

To protect against data loss from hard drive failure, storage systems should be configured with fault tolerance. HP recommends adhering to RAID 5 configurations.

The table below summarizes the important features of the different kinds of RAID supported by the Smart Array controllers. The decision chart in the following table can help determine which option is best for different situations.

Table 6 Summary of RAID methods

	RAID 0 Striping (no fault tolerance)	RAID 1+0 Mirroring	RAID 5 Distributed Data Guarding	RAID 6 (ADG)	RAID 50	RAID 60
Maximum number of hard drives	N/A	N/A	14	Storage system dependent	14	Storage system dependent
Tolerant of single hard drive failure?	No	Yes	Yes	Yes	Yes	Yes
Tolerant of multiple simultaneous hard drive failures?	No	If the failed drives are not mirrored to each other	No	Yes (two drives can fail)	No	Two drives can fail

Online spares

Further protection against data loss can be achieved by assigning an online spare (or hot spare) to any configuration except RAID 0. This hard drive contains no data and is contained within the same storage subsystem as the other drives in the array. When a hard drive in the array fails, the controller can then automatically rebuild information that was originally on the failed drive onto the online spare. This quickly restores the system to full RAID level fault tolerance protection. However, unless RAID Advanced Data Guarding (ADG) is being used, which can support two drive failures in an array, in the unlikely event that a third drive in the array should fail while data is being rewritten to the spare, the logical drive still fails.

Logical storage elements

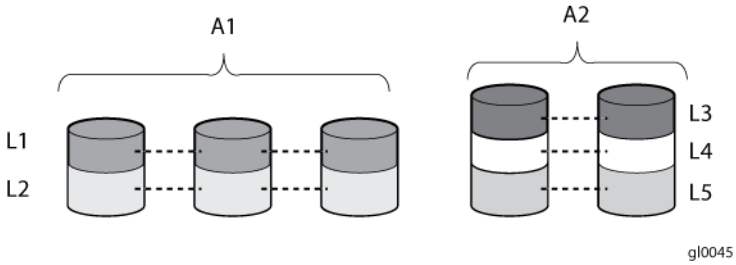
Logical storage elements consist of those components that translate the physical storage elements to file system elements. The storage system uses the Window Disk Management utility to manage the various types of disks presented to the file system. There are two types of LUN presentation: basic disk and dynamic disk. Each of these types of disk has special features that enable different types of management. The HP Pool Manager is used to create, edit, grow, shrink and delete storage pools.

Logical drives (LUNs)

While an array is a physical grouping of hard drives, a logical drive consists of components that translate physical storage elements into file system elements. A LUN may also be referred to as a virtual disk.

It is important to note that a LUN may span all physical drives within a storage controller subsystem, but cannot span multiple storage controller subsystems.

Figure 31 Two arrays (A1, A2) and five logical drives (L1 through L5) spread over five physical drives



NOTE: This type of configuration may not apply to all storage systems and serves only as an example.

Through the use of basic disks, you can create primary partitions or extended partitions. Partitions can only encompass one LUN. Through the use of dynamic disks, you can create volumes that span multiple LUNs. You can use the Windows Disk Management utility to convert disks to dynamic and back to basic and to manage the volumes residing on dynamic disks. Other options include the ability to delete, extend, mirror, and repair these elements.

Partitions

Partitions exist as either primary partitions or extended partitions. The master boot record (MBR) disk partitioning style supports volumes up to 2 terabytes in size and up to 4 primary partitions per disk (or three primary partitions, one extended partition, and unlimited logical drives). Extended partitions allow the user to create multiple logical drives. These partitions or logical disks can be assigned drive letters or be used as mount points on existing disks. If mount points are used, it should be noted that Services for UNIX (SFU) does not support mount points at this time. The use of mount points in conjunction with NFS shares is not supported.

The GUID partition table (GPT) disk partitioning style supports volumes up to 18 exabytes in size and up to 128 partitions per disk. Unlike MBR partitioned disks, data critical to platform operation is located in partitions instead of unpartitioned or hidden sectors. In addition, GPT partitioned disks have redundant primary and backup partition tables for improved partition data structure integrity.

On the **Volumes** tab in the disk properties dialog box in Disk Management, disks with the GPT partitioning style are displayed as GUID Partition Table (GPT) disks, and disks with the MBR partitioning style are displayed as Master Boot Record (MBR) disks.

Volumes

When planning dynamic disks and volumes, there is a limit to the amount of growth a single volume can undergo. Volumes are limited in size and can have no more than 32 separate LUNs, with each LUN not exceeding 2 terabytes (TB), and volumes totaling no more than 64 TB of disk space.

The RAID level of the LUNs included in a volume must be considered. All of the units that make up a volume should have the same high-availability characteristics. In other words, the units should all be of the same RAID level. For example, it would not be a good practice to include both a RAID 1+0 and a RAID 5 array in the same volume set. By keeping all the units the same, the entire volume retains the same performance and high-availability characteristics, making managing and maintaining the volume much easier. If a dynamic disk goes offline, the entire volume dependent on the one or more dynamic disks is unavailable. There could be a potential for data loss depending on the nature of the failed LUN.

Volumes are created out of the dynamic disks, and can be expanded on the fly to extend over multiple dynamic disks if they are spanned volumes. However, after a type of volume is selected, it cannot be altered. For example, a spanning volume cannot be altered to a mirrored volume without deleting and recreating the volume, unless it is a simple volume. Simple volumes can be mirrored or converted to spanned volumes. Fault-tolerant disks cannot be extended. Therefore, selection of the volume type is important. The same performance characteristics on numbers of reads and writes apply when using fault-tolerant configurations, as is the case with controller-based RAID. These volumes can also be assigned drive letters or be mounted as mount points off existing drive letters.

The administrator should carefully consider how the volumes will be carved up and what groups or applications will be using them. For example, putting several storage-intensive applications or groups into the same dynamic disk set would not be efficient. These applications or groups would be better served by being divided up into separate dynamic disks, which could then grow as their space requirements increased, within the allowable growth limits.

File system elements

File system elements are composed of the folders and subfolders that are created under each logical storage element (partitions, logical disks, and volumes). Folders are used to further subdivide the

available file system, providing another level of granularity for management of the information space. Each of these folders can contain separate permissions and share names that can be used for network access. Folders can be created for individual users, groups, projects, and so on.

File sharing elements

The storage system supports several file sharing protocols, including Distributed File System (DFS), Network File System (NFS), File Transfer Protocol (FTP), Hypertext Transfer Protocol (HTTP), and Microsoft Server Message Block (SMB). On each folder or logical storage element, different file sharing protocols can be enabled using specific network names for access across a network to a variety of clients. Permissions can then be granted to those shares based on users or groups of users in each of the file sharing protocols.

Volume Shadow Copy Service overview

The Volume Shadow Copy Service (VSS) provides an infrastructure for creating point-in-time snapshots (shadow copies) of volumes. VSS supports 64 shadow copies per volume.

Shadow Copies of Shared Folders resides within this infrastructure, and helps alleviate data loss by creating shadow copies of files or folders that are stored on network file shares at pre-determined time intervals. In essence, a shadow copy is a previous version of the file or folder at a specific point in time.

By using shadow copies, a storage system can maintain a set of previous versions of all files on the selected volumes. End users access the file or folder by using a separate client add-on program, which enables them to view the file in Windows Explorer.

Shadow copies should not replace the current backup, archive, or business recovery system, but they can help to simplify restore procedures. For example, shadow copies cannot protect against data loss due to media failures; however, recovering data from shadow copies can reduce the number of times needed to restore data from tape.

Using storage elements

The last step in creating the element is determining its drive letter or mount point and formatting the element. Each element created can exist as a drive letter, assuming one is available, and/or as mount points on an existing folder or drive letter. Either method is supported. However, mount points cannot be used for shares that will be shared using Microsoft Services for Unix. They can be set up with both but the use of the mount point in conjunction with NFS shares causes instability with the NFS shares.

Formats consist of NTFS, FAT32, and FAT. All three types can be used on the storage system. However, VSS can only use volumes that are NTFS formatted. Also, quota management is possible only on NTFS.

Network adapter teaming

Network adapter teaming is software-based technology used to increase a server's network availability and performance. Teaming enables the logical grouping of physical adapters in the same server (regardless of whether they are embedded devices or Peripheral Component Interconnect (PCI) adapters) into a virtual adapter. This virtual adapter is seen by the network and server-resident network-aware applications as a single network connection. For more information on Microsoft's implementation of Network Teaming, go to https://technet.microsoft.com/en-us/library/hh831648.aspx.

Management tools

HP Systems Insight Manager

HP SIM is a web-based application that allows system administrators to accomplish normal administrative tasks from any remote location, using a web browser. HP SIM provides device management capabilities that consolidate and integrate management data from HP and third-party devices.

IMPORTANT: You must install and use HP SIM to benefit from the Pre-Failure Warranty for processors, SAS and SCSI hard drives, and memory modules.

For additional information, refer to the Management CD in the HP ProLiant Essentials Foundation Pack or the HP SIM website (http://www.hp.com/go/hpsim). For the latest version of HP SIM, refer to HP SPOCK.

Management Agents

Management Agents provide the information to enable fault, performance, and configuration management. The agents allow easy manageability of the server through HP SIM software, and thirdparty SNMP management platforms. Management Agents are installed with every SmartStart assisted installation or can be installed through the HP PSP. The Systems Management homepage provides status and direct access to in-depth subsystem information by accessing data reported through the Management Agents. For additional information, refer to the Management CD in the HP ProLiant Essentials Foundation Pack or the HP website (http://www.hp.com/servers/manage).

7 File server management

This chapter describes the tasks and utilities that play a role in file server management.

File services management

Information about the storage system in a SAN environment is provided in the SAN Design Reference Guide, located on the HP web site at www.hp.com/go/SDGManuals.

Storage management utilities

The storage management utilities preinstalled on the storage system include the HP SSA (Smart Storage Administrator) . Initially, you can use the Provision Storage tasks to configure storage. For more information, see "Storage Configuration" (page 39)

Array management utilities

Storage devices for RAID arrays and LUNs are created and managed using the array management utilities mentioned previously. For HP Smart Arrays, use HP SSA.

NOTE: The HP SSA is used to configure and manage array-based storage. Software RAID-based storage systems use Microsoft Disk Manager to manage storage. You need administrator or root privileges to run the HP SSA.

Smart Storage Administrator

The HP SSA supports the Smart Array controllers and hard drives installed on the storage system.

To open HP SSA from the storage system desktop:

NOTE: If this is the first time you are running HP SSA, you will be prompted to select the Execution Mode for SSA. Selecting **Local Application Mode** allows you to run the HP SSA from a Remote Desktop, remote console, or storage system web access mode. Remote service mode allows you to access the HP SSA from a remote browser.

1. Click **Start** and then click ↓. Select **HP System Tools→HP Smart Storage Administrator**.
2. If the Execution Mode for HP SSA is set to **Remote Service Mode**, log on to the HP System Management Homepage. The default user name is **`Administrator`** and the password is the Windows Storage Server 2012 R2 administrator password that is set by the storage system administrator. The password is case-sensitive.

To open the HP SSA in browser mode:

NOTE: Confirm that the HP SSA Execution Mode is set to Remote Service Mode.

1. Open a browser and enter the server name or IP address of the destination server. For example, `http://servername:2301` or `http://192.0.0.1:2301`.
2. Log on to the HP System Management Homepage.
3. Click **Smart Storage Administrator** on the left side of the window. The HP SSA opens and identifies the controllers that are connected to the system.

Some SSA guidelines to consider:

- Do not modify the single logical drive of the storage system; it is configured for the storage system operating system.
- Spanning more than 14 disks with a RAID 5 volume is not recommended.
- Designate spares for RAID sets to provide greater protection against failures.
- RAID sets cannot span controllers.

- A single array can contain multiple logical drives of varying RAID settings.
- Extending and expanding arrays and logical drives is supported.

The *HP Smart Storage Administrator User Guide* is available for download at http://www.hp.com/support/manuals.

Disk Management utility

The Disk Management tool is a system utility for managing hard disks and the volumes, or partitions, that they contain. Disk Management is used to initialize disks, create volumes, format volumes with the FAT, FAT32, or NTFS file systems, and create fault-tolerant disk systems. Most disk-related tasks can be performed in Disk Management without restarting the system or interrupting users. Most configuration changes take effect immediately. A complete online help facility is provided with the Disk Management utility for assistance in using the product.

NOTE:

- When the Disk Management utility is accessed through a Remote Desktop connection, this connection can only be used to manage disks and volumes on the server. Using the Remote Desktop connection for other operations during an open session closes the session.
- When closing Disk Management through a Remote Desktop connection, it may take a few moments for the remote session to log off.

Guidelines for managing disks and volumes

- The single logical drive is configured for the storage system operating system and should not be altered in any manner. If this logical drive is altered, the system recovery process may not function properly when using the System Recovery DVD. Do not tamper with the local `C:` volume. This is a reserved volume and must be maintained as it exists.
- HP does not recommend spanning array controllers with dynamic volumes. The use of software RAID-based dynamic volumes is not recommended. Use the array controller instead; it is more efficient.
- Use meaningful volume labels with the intended drive letter embedded in the volume label, if possible. (For example, volume e: might be named “Disk E:.”) Volume labels often serve as the only means of identification.
- Record all volume labels and drive letters in case the system needs to be restored.
- When managing basic disks, only the last partition on the disk can be extended unless the disk is changed to dynamic.
- Basic disks can be converted to dynamic, but cannot be converted back to basic without deleting all data on the disk.
- Basic disks can contain up to four primary partitions (or three primary partitions and one extended partition).
- Format drives with a 16 K allocation size for best support of shadow copies, performance, and defragmentation.
- NTFS formatted drives are recommended because they provide the greatest level of support for shadow copies, encryption, and compression.
- Only basic disks can be formatted as FAT or FAT32.
- Read the online Disk Management help found in the utility.

Scheduling defragmentation

Defragmentation is the process of analyzing local volumes and consolidating fragmented files and folders so that each occupies a single, contiguous space on the volume. This improves file system

performance. Because defragmentation consolidates files and folders, it also consolidates the free space on a volume. This reduces the likelihood that new files will be fragmented.

Defragmentation for a volume can be scheduled to occur automatically at convenient times. Defragmentation can also be done once, or on a recurring basis.

NOTE: Scheduling defragmentation to run no later than a specific time prevents the defragmentation process from running later than that time. If the defragmentation process is running when the time is reached, the process is stopped. This setting is useful to ensure that the defragmentation process ends before the demand for server access is likely to increase.

If defragmenting volumes on which shadow copies are enabled, use a cluster (or allocation unit) size of 16 KB or larger during the format. Otherwise defragmentation registers as a change by the Shadow Copy process. This increase in the number of changes forces Shadow Copy to delete snapshots as the limit for the cache file is reached.

CAUTION: Allocation unit size cannot be altered without reformatting the drive. Data on a reformatted drive cannot be recovered.

For more information about disk defragmentation, read the online help.

Disk quotas

Disk quotas track and control disk space use in volumes.

NOTE: To limit the size of a folder or share, see "Quota management" (page 108).

Configure the volumes on the server to perform the following tasks:

- Prevent further disk space use and log an event when a user exceeds a specified disk space limit.
- Log an event when a user exceeds a specified disk space warning level.

When enabling disk quotas, it is possible to set both the disk quota limit and the disk quota warning level. The disk quota limit specifies the amount of disk space a user is allowed to use. The warning level specifies the point at which a user is nearing his or her quota limit. For example, a user's disk quota limit can be set to 50 megabytes (MB), and the disk quota warning level to 45 MB. In this case, the user can store no more than 50 MB on the volume. If the user stores more than 45 MB on the volume, the disk quota system logs a system event.

In addition, it is possible to specify that users can exceed their quota limit. Enabling quotas and not limiting disk space use is useful to still allow users access to a volume, but track disk space use on a per-user basis. It is also possible to specify whether or not to log an event when users exceed either their quota warning level or their quota limit.

When enabling disk quotas for a volume, volume usage is automatically tracked from that point forward, but existing volume users have no disk quotas applied to them. Apply disk quotas to existing volume users by adding new quota entries on the Quota Entries page.

NOTE: When enabling disk quotas on a volume, any users with write access to the volume who have not exceeded their quota limit can store data on the volume. The first time a user writes data to a quota-enabled volume, default values for disk space limit and warning level are automatically assigned by the quota system.

For more information about disk quotas, read the online help.

Adding storage

Expansion is the process of adding physical disks to an array that has already been configured. Extension is the process of adding new storage space to an existing logical drive on the same array, usually after the array has been expanded.

Storage growth may occur in three forms:

- Extend unallocated space from the original logical disks or LUNs.
- Alter LUNs to contain additional storage.
- Add new LUNs to the system.

The additional space is then extended through a variety of means, depending on which type of disk structure is in use.

Expanding storage

Expansion is the process of adding physical disks to an array that has already been configured. The logical drives (or volumes) that exist in the array before the expansion takes place are unchanged, because only the amount of free space in the array changes. The expansion process is entirely independent of the operating system.

NOTE: See your storage array hardware user documentation for further details about expanding storage on the array.

Extending storage using Windows Storage Utilities

Volume extension grows the storage space of a logical drive. During this process, the administrator adds new storage space to an existing logical drive on the same array, usually after the array has been expanded. An administrator may have gained this new storage space by either expansion or by deleting another logical drive on the same array. Unlike drive expansion, the operating system must be aware of changes to the logical drive size.

You extend a volume to:

- Increase raw data storage
- Improve performance by increasing the number of spindles in a logical drive volume
- Change fault-tolerance (RAID) configurations

For more information about RAID levels, see the *Smart Array Controller User Guide*, or the document titled *Assessing RAID ADG vs. RAID 5 vs. RAID 1+0*. Both are available at the Smart Array controller web page or at http://h18000.www1.hp.com/products/servers/proliantstorage/arraycontrollers/documentation.html.

Extend volumes using Disk Management

The Disk Management snap-in provides management of hard disks, volumes or partitions. It can be used to extend a dynamic volume only.

NOTE: Disk Management cannot be used to extend basic disk partitions.

Guidelines for extending a dynamic volume:

- Use the Disk Management utility.
- You can extend a volume only if it does not have a file system or if it is formatted NTFS.
- You cannot extend volumes formatted using FAT or FAT32.
- You cannot extend striped volumes, mirrored volumes, or RAID 5 volumes.

For more information, see the Disk Management online help.

Volume shadow copies

NOTE: Select storage systems can be deployed in a clustered as well as a non-clustered configuration. This chapter discusses using shadow copies in a non-clustered environment.

The Volume Shadow Copy Service provides an infrastructure for creating point-in-time snapshots (shadow copies) of volumes. Shadow Copy supports 64 shadow copies per volume.

A shadow copy contains previous versions of the files or folders contained on a volume at a specific point in time. While the shadow copy mechanism is managed at the server, previous versions of files and folders are only available over the network from clients, and are seen on a per folder or file level, and not as an entire volume.

The shadow copy feature uses data blocks. As changes are made to the file system, the Shadow Copy Service copies the original blocks to a special cache file to maintain a consistent view of the file at a particular point in time. Because the snapshot only contains a subset of the original blocks, the cache file is typically smaller than the original volume. In the snapshot's original form, it takes up no space because blocks are not moved until an update to the disk occurs.

By using shadow copies, a storage system can maintain a set of previous versions of all files on the selected volumes. End users access the file or folder by using a separate client add-on program, which enables them to view the file in Windows Explorer. Accessing previous versions of files, or shadow copies, enables users to:

- Recover files that were accidentally deleted. Previous versions can be opened and copied to a safe location.
- Recover from accidentally overwriting a file. A previous version of that file can be accessed.
- Compare several versions of a file while working. Use previous versions to compare changes between two versions of a file.

Shadow copies cannot replace the current backup, archive, or business recovery system, but they can help to simplify restore procedures. Because a snapshot only contains a portion of the original data blocks, shadow copies cannot protect against data loss due to media failures. However, the strength of snapshots is the ability to instantly recover data from shadow copies, reducing the number of times needed to restore data from tape.

Shadow copy planning

Before setup is initiated on the server and the client interface is made available to end users, consider the following:

- From what volume will shadow copies be taken?
- How much disk space should be allocated for shadow copies?
- Will separate disks be used to store shadow copies?
- How frequently will shadow copies be made?

Identifying the volume

Shadow copies are taken for a complete volume, but not for a specific directory. Shadow copies work best when the server stores user files, such as documents, spreadsheets, presentations, graphics, or database files.

NOTE: Shadow copies should not be used to provide access to previous versions of application or e-mail databases.

Shadow copies are designed for volumes that store user data such as home directories and My Documents folders that are redirected by using Group Policy or other shared folders in which users store data.

Shadow copies work with compressed or encrypted files and retain whatever permissions were set on the files when the shadow copies were taken. For example, if a user is denied permission to read a file, that user would not be able to restore a previous version of the file, or be able to read the file after it has been restored.

Although shadow copies are taken for an entire volume, users must use shared folders to access shadow copies. Administrators on the local server must also specify the `\\servername\sharename` path to access shadow copies. If administrators or end users want to access a previous version of a file that does not reside in a shared folder, the administrator must first share the folder.

NOTE: Shadow copies are available only on NTFS, not FAT or FAT32 volumes.

Files or folders that are recorded by using Shadow Copy appear static, even though the original data is changing.

Allocating disk space

When determining the amount of space to allocate for storing shadow copies, consider both the number and size of files that are being copied, as well as the frequency of changes between copies. For example, 100 files that only change monthly require less storage space than 10 files that change daily. If the frequency of changes to each file is greater than the amount of space allocated to storing shadow copies, no shadow copy is created.

Administrators should also consider user expectations of how many versions they will want to have available. End users might expect only a single shadow copy to be available, or they might expect three days or three weeks worth of shadow copies. The more shadow copies users expect, the more storage space administrators must allocate for storing them.

Setting the limit too low also affects backup programs that use shadow copy technology because these programs are also limited to using the amount of disk space specified by administrators.

NOTE: Regardless of the volume space that is allocated for shadow copies, there is a maximum of 64 shadow copies for any volume. When the 65th shadow copy is taken, the oldest shadow copy is purged.

The minimum amount of storage space that can be specified is 350 megabytes (MB). The default storage size is 10 percent of the source volume (the volume being copied). If the shadow copies are stored on a separate volume, change the default to reflect the space available on the *storage* volume instead of the *source* volume. Remember that when the storage limit is reached, older versions of the shadow copies are deleted and cannot be restored.

△ **CAUTION:** To change the storage volume, shadow copies must be deleted. The existing file change history that is kept on the original storage volume is lost. To avoid this problem, verify that the storage volume that is initially selected is large enough.

Identifying the storage area

To store the shadow copies of another volume on the same file server, a volume can be dedicated on separate disks. For example, if user files are stored on `H:\`, another volume such as `S:\`can be used to store the shadow copies. Using a separate volume on separate disks provides better performance and is recommended for heavily used storage systems.

If a separate volume will be used for the storage area (where shadow copies are stored), the maximum size should be changed to **No Limit** to reflect the space available on the storage area volume instead of the source volume (where the user files are stored).

Disk space for shadow copies can be allocated on either the same volume as the source files or a different volume. There is a trade-off between ease of use and maintenance versus performance and reliability that the system administrator must consider.

By keeping the shadow copy on the same volume, there is a potential gain in ease of setup and maintenance; however, there may be a reduction in performance and reliability.

△ **CAUTION:** If shadow copies are stored on the same volume as the user files, note that a burst of disk input/output (I/O) can cause all shadow copies to be deleted. If the sudden deletion of shadow copies is unacceptable to administrators or end users, it is best to use a separate volume on separate disks to store shadow copies.

Determining creation frequency

The more frequently shadow copies are created, the more likely that end users will get the version that they want. However, with a maximum of 64 shadow copies per volume, there is a trade-off between the frequency of making shadow copies and the amount of time that the earlier files will be available.

By default, the storage system creates shadow copies at 0700 and 1200, Monday through Friday. However, these settings are easily modified by the administrator so that the shadow copy schedule can better accommodate end user needs.

Shadow copies and drive defragmentation

When running Disk Defragmenter on a volume with shadow copies activated, all or some of the shadow copies may be lost, starting with the oldest shadow copies.

If defragmenting volumes on which shadow copies are enabled, use a cluster (or allocation unit) size of 16 KB or larger. Using this allocation unit size reduces the number of copy outs occurring on the snapshot. Otherwise, the number of changes caused by the defragmentation process can cause shadow copies to be deleted faster than expected. Note, however, that NTFS compression is supported only if the cluster size is 4 KB or smaller.

NOTE: To check the cluster size of a volume, use the `fsutil fsinfo ntfsinfo` command. To change the cluster size on a volume that contains data, back up the data on the volume, reformat it using the new cluster size, and then restore the data.

Mounted drives

A mounted drive is a local volume attached to an empty folder (called a mount point) on an NTFS volume. When enabling shadow copies on a volume that contains mounted drives, the mounted drives are not included when shadow copies are taken. In addition, if a mounted drive is shared and shadow copies are enabled on it, users cannot access the shadow copies if they traverse from the host volume (where the mount point is stored) to the mounted drive.

For example, assume there is a folder `F:\data\users`, and the `Users` folder is a mount point for `G:\`. If shadow copies are enabled on both `F:\` and `G:\`, `F:\data` is shared as `\\server1\data`, and `G:\data\users` is shared as `\\server1\users`. In this example, users can access previous versions of `\\server1\data` and `\\server1\users` but not `\\server1\data\users`.

Managing shadow copies

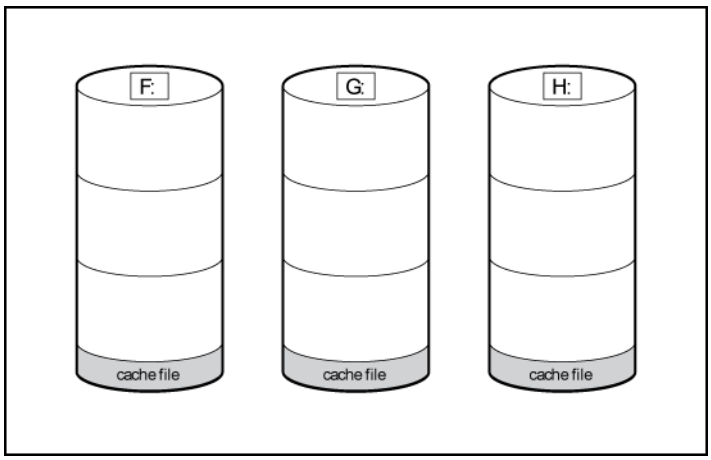
The `vssadmin` tool provides a command line capability to create, list, resize, and delete volume shadow copies. The system administrator can make shadow copies available to end users through a feature called "Shadow Copies for Shared Folders." The administrator uses the **Properties** menu (see Figure 32 (page 92)) to turn on the Shadow Copies feature, select the volumes to be copied, and determine the frequency with which shadow copies are made.

Figure 32 System administrator view of Shadow Copies for Shared Folders

The shadow copy cache file

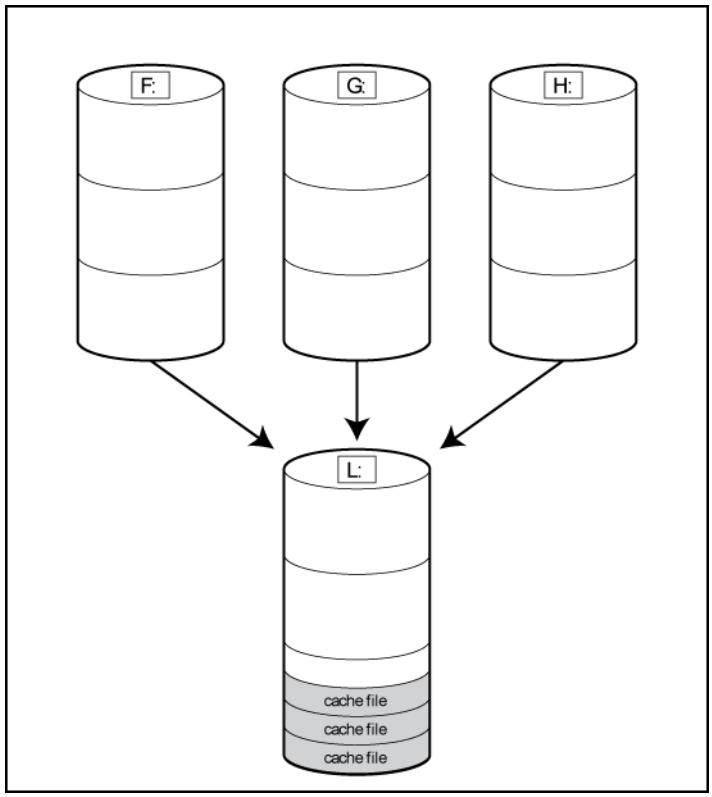
The default shadow copy settings allocate 10 percent of the source volume being copied (with a minimum of 350 MB), and store the shadow copies on the same volume as the original volume. (See Figure 33 (page 92)). The cache file is located in a hidden protected directory titled "System Volume Information" off of the root of each volume for which shadow copy is enabled.

Figure 33 Shadow copies stored on a source volume



The cache file location can be altered to reside on a dedicated volume separate from the volumes containing files shares. (See Figure 34 (page 93)).

Figure 34 Shadow copies stored on a separate volume



The main advantage to storing shadow copies on a separate volume is ease of management and performance. Shadow copies on a source volume must be continually monitored and can consume space designated for file sharing. Setting the limit too high takes up valuable storage space. Setting the limit too low can cause shadow copies to be purged too soon, or not created at all. By storing shadow copies on a separate volume space, limits can generally be set higher, or set to No Limit. See the online help for instructions on altering the cache file location.

△ **CAUTION:** If the data on the separate volume L: is lost, the shadow copies cannot be recovered.

Enabling and creating shadow copies

Enabling shadow copies on a volume automatically results in several actions:

- Creates a shadow copy of the selected volume.
- Sets the maximum storage space for the shadow copies.
- Schedules shadow copies to be made at 7 a.m. and 12 noon on weekdays.

NOTE:

- Creating a shadow copy only makes one copy of the volume; it does not create a schedule.
- After the first shadow copy is created, it cannot be relocated. Relocate the cache file by altering the cache file location under Properties prior to enabling shadow copy. See Viewing shadow copy properties (page 94).

Viewing a list of shadow copies

To view a list of shadow copies on a volume:

1. Access Disk Management.
2. Select the volume or logical drive, then right-click on it.
3. Select **Properties**.

4. Select **Shadow Copies** tab.

All shadow copies are listed, sorted by the date and time they were created.

NOTE: It is also possible to create new shadow copies or delete shadow copies from this page.

Set schedules

Shadow copy schedules control how frequently shadow copies of a volume are made. There are a number of factors that can help determine the most effective shadow copy schedule for an organization. These include the work habits and locations of the users. For example, if users do not all live in the same time zone, or they work on different schedules, it is possible to adjust the daily shadow copy schedule to allow for these differences.

Do not schedule shadow copies more frequently than once per hour.

NOTE: When deleting a shadow copy schedule, that action has no effect on existing shadow copies.

Viewing shadow copy properties

The Shadow Copy Properties page lists the number of copies, the date and time the most recent shadow copy was made, and the maximum size setting.

CAUTION: Use caution when reducing the size limit for all shadow copies. When the size is set to less than the total size currently used for all shadow copies, enough shadow copies are deleted to reduce the total size to the new limit. A shadow copy cannot be recovered after it has been deleted.

NOTE: For volumes where shadow copies do not exist currently, it is possible to change the location of the cache file. Managing the cache files on a separate disk is recommended.

Redirecting shadow copies to an alternate volume

IMPORTANT: Shadow copies must be initially disabled on the volume before redirecting to an alternate volume. If shadow copies are enabled and you disable them, a message appears informing you that all existing shadow copies on the volume will be permanently deleted.

To redirect shadow copies to an alternate volume:

1. Access Disk Management.
2. Select the volume or logical drive, then right-click on it.
3. Select **Properties**.
4. Select the **Shadow Copies** tab.
5. Select the volume that you want to redirect shadow copies from and ensure that shadow copies are disabled on that volume; if enabled, click **Disable**.
6. Click **Settings**.
7. In the **Located on this volume** field, select an available alternate volume from the list.

   NOTE: To change the default shadow copy schedule settings, click **Schedule**.

8. Click **OK**.
9. On the **Shadow Copies** tab, ensure that the volume is selected, and then click **Enable**.

Shadow copies are now scheduled to be made on the alternate volume.

Disabling shadow copies

When shadow copies are disabled on a volume, all existing shadow copies on the volume are deleted as well as the schedule for making new shadow copies.

△ **CAUTION:** When the Shadow Copies Service is disabled, all shadow copies on the selected volumes are deleted. Once deleted, shadow copies cannot be restored.

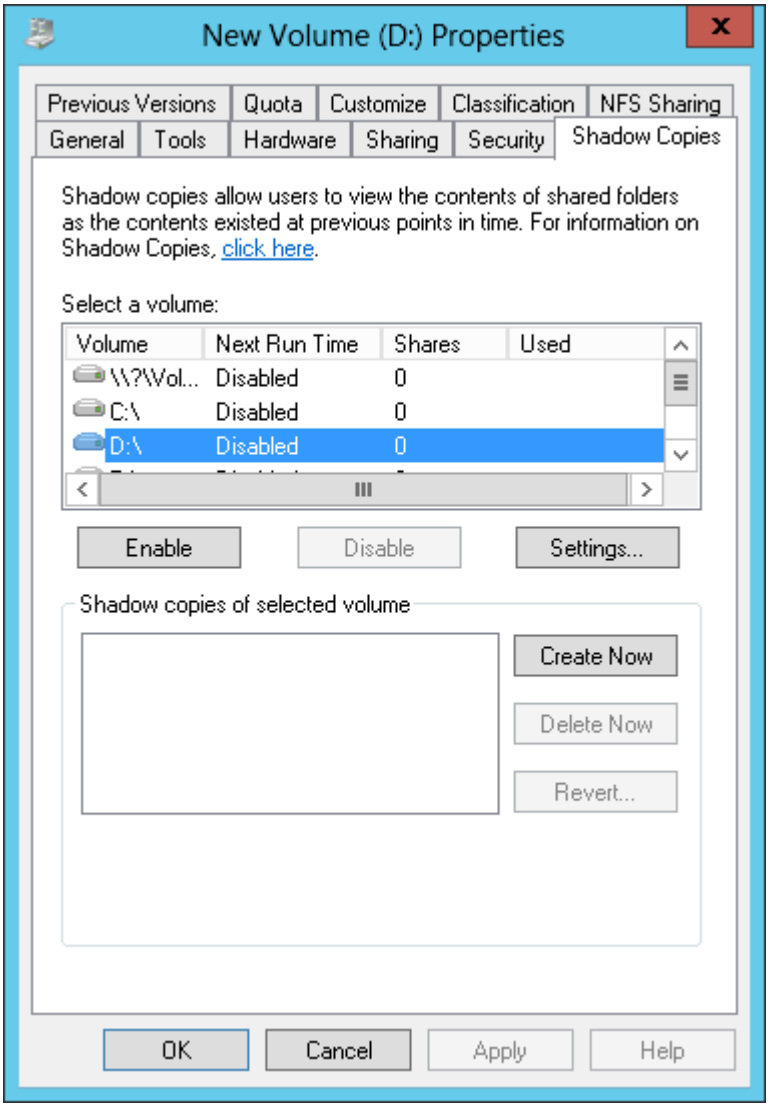
Managing shadow copies from the storage system desktop

To access shadow copies from the storage system desktop:

The storage system desktop can be accessed by using Remote Desktop to manage shadow copies.

1. Select **Start→Computer**.
2. Right-click the volume name, and select **Properties**.
3. Click the **Shadow Copies** tab. See Figure 35 (page 95).

Figure 35 Accessing shadow copies from My Computer



Shadow Copies for Shared Folders

Shadow copies are accessed over the network by supported clients and protocols. There are two sets of supported protocols, SMB and NFS. All other protocols are not supported, including HTTP, FTP, AppleTalk, and NetWare Shares. For SMB support, a client-side application denoted as

Shadow Copies for Shared Folders is required. The client-side application is available for Windows XP, Windows 2000 SP3+, and later operating system versions.

No additional software is required to enable UNIX users to independently retrieve previous versions of files stored on NFS shares.

NOTE: Shadow Copies for Shared Folders supports retrieval only of shadow copies of network shares. It does not support retrieval of shadow copies of local folders.

NOTE: Shadow Copies for Shared Folders clients are not available for HTTP, FTP, AppleTalk, or NetWare shares. Consequently, users of these protocols cannot use Shadow Copies for Shared Folders to independently retrieve previous versions of their files. However, administrators can take advantage of Shadow Copies for Shared Folders to restore files for these users.

SMB shadow copies

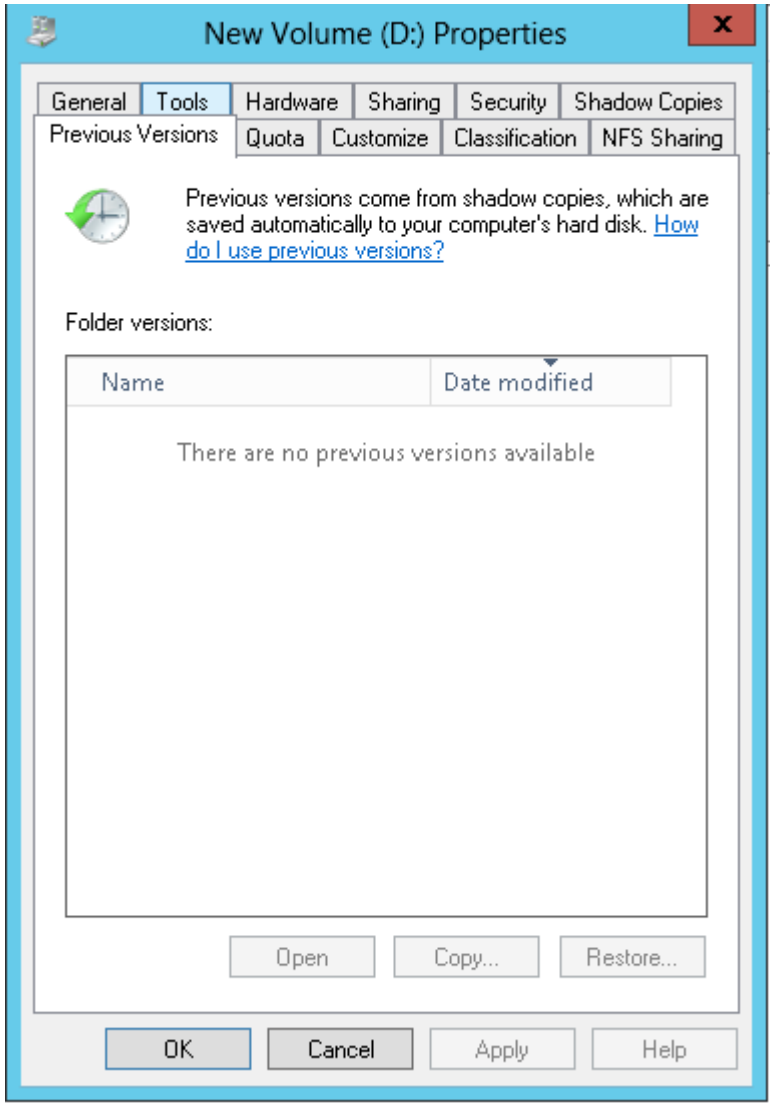
Windows users can independently access previous versions of files stored on SMB shares by using the Shadow Copies for Shared Folders client. After the Shadow Copies for Shared Folders client is installed on the user's computer, the user can access shadow copies for a share by right-clicking on the share to open its Properties window, clicking the **Previous Versions** tab, and then selecting the desired shadow copy. Users can view, copy, and restore all available shadow copies.

Shadow Copies for Shared Folders preserves the permissions set in the access control list (ACL) of the original folders and files. Consequently, users can only access shadow copies for shares to which they have access. In other words, if a user does not have access to a share, he also does not have access to the share's shadow copies.

The Shadow Copies for Shared Folders client pack installs a **Previous Versions** tab in the **Properties** window of files and folders on network shares.

Users access shadow copies with Windows Explorer by selecting **Open**, **Copy**, or **Restore** from the **Previous Versions** tab. (See Figure 36 (page 97)). Both individual files and folders can be restored.

Figure 36 Client GUI



When users view a network folder hosted on the storage system for which shadow copies are enabled, old versions (prior to the snapshot) of a file or directory are available. Viewing the properties of the file or folder presents users with the folder or file history—a list of read-only, point-in-time copies of the file or folder contents that users can then open and explore like any other file or folder. Users can view files in the folder history, copy files from the folder history, and so on.

NFS shadow copies

UNIX users can independently access previous versions of files stored on NFS shares via the NFS client; no additional software is required. Server for NFS exposes each of a share's available shadow copies as a pseudo-subdirectory of the share. Each of these pseudo-subdirectories is displayed in exactly the same way as a regular subdirectory is displayed.

The name of each pseudo-subdirectory reflects the creation time of the shadow copy, using the format `.@GMT-YYYY.MM.DD-HH:MM:SS`. To prevent common tools from needlessly enumerating the pseudo-subdirectories, the name of each pseudo-subdirectory begins with the dot character, thus rendering it hidden.

The following example shows an NFS share named “NFSShare” with three shadow copies, taken on April 27, 28, and 29 of 2003 at 4 a.m.

NFSShare

.@GMT-2003.04.27-04:00:00

.@GMT-2003.04.28-04:00:00

.@GMT-2003.04.29-04:00:00

Access to NFS shadow copy pseudo-subdirectories is governed by normal access-control mechanisms using the permissions stored in the file system. Users can access only those shadow copies to which they have read access at the time the shadow copy is taken. To prevent users from modifying shadow copies, all pseudo-subdirectories are marked read-only, regardless of the user's ownership or access rights, or the permissions set on the original files.

Server for NFS periodically polls the system for the arrival or removal of shadow copies and updates the root directory view accordingly. Clients then capture the updated view the next time they issue a directory read on the root of the share.

Recovery of files or folders

There are three common situations that may require recovery of files or folders:

- Accidental file deletion, the most common situation
- Accidental file replacement, which may occur if a user selects Save instead of Save As
- File corruption

It is possible to recover from all of these scenarios by accessing shadow copies. There are separate steps for accessing a file compared to accessing a folder.

Recovering a deleted file or folder

To recover a deleted file or folder within a folder:

1. Access to the folder where the deleted file was stored.
2. Position the cursor over a blank space in the folder. If the cursor hovers over a file, that file is selected.
3. Right-click, select **Properties** from the bottom of the menu, and then click the **Previous Versions** tab.
4. Select the version of the folder that contains the file before it was deleted, and then click **Open**.
5. View the folder and select the file or folder to recover. The view may be navigated multiple folders deep.
6. Click **Restore** to restore the file or folder to its original location. Click **Copy** to allow the placement of the file or folder to a new location.

Recovering an overwritten or corrupted file

Recovering an overwritten or corrupted file is easier than recovering a deleted file because the file itself can be right-clicked instead of the folder. To recover an overwritten or corrupted file:

1. Right-click the overwritten or corrupted file, and then click **Properties**.
2. Click **Previous Versions**.
3. To view the old version, click **Open**. To copy the old version to another location, click **Copy** to replace the current version with the older version, click **Restore**.

Recovering a folder

To recover a folder:

1. Position the cursor so that it is over a blank space in the folder to be recovered. If the cursor hovers over a file, that file is selected.
2. Right-click, select **Properties** from the bottom of the menu, and then click the **Previous Versions** tab.

3. Click either **Copy** or **Restore**.

   Clicking **Restore** enables the user to recover everything in that folder as well as all subfolders. Clicking **Restore** does not delete any files.

Backup and shadow copies

Shadow copies are only available on the network via the client application, and only at a file or folder level as opposed to the entire volume. Hence, the standard backup associated with a volume backup will not work to back up the previous versions of the file system. To answer this particular issue, shadow copies are available for backup in two situations. If the backup software in question supports the use of shadow copies and can communicate with underlying block device, it is supported, and the previous version of the file system will be listed in the backup application as a complete file system snapshot. If the built-in backup application NTbackup is used, the backup software forces a snapshot, and then uses the snapshot as the means for backup. The user is unaware of this activity and it is not self-evident although it does address the issue of open files.

Shadow Copy Transport

Shadow Copy Transport provides the ability to transport data on a Storage Area Network (SAN). With a storage array and a VSS-aware hardware provider, it is possible to create a shadow copy on one server and import it on another server. This process, essentially "virtual" transport, is accomplished in a matter of minutes, regardless of the size of the data.

A shadow copy transport can be used for a number of purposes, including:

- Tape backups

  An alternative to traditional backup to tape processes is transport of shadow copies from the production server onto a backup server, where they can then be backed up to tape. Like the other two alternatives, this option removes backup traffic from the production server. While some backup applications might be designed with the hardware provider software that enables transport, others are not. The administrator should determine whether or not this functionality is included in the backup application.

- Data mining

  The data in use by a particular production server is often useful to different groups or departments within an organization. Rather than add additional traffic to the production server, a shadow copy of the data can be made available through transport to another server. The shadow copy can then be processed for different purposes, without any performance impact on the original server.

The transport process is accomplished through a series of DISKRAID command steps:

1. Create a shadow copy of the source data on the source server (read-only).
2. Mask off (hide) the shadow copy from the source server.
3. Unmask the shadow copy to a target server.
4. Optionally, clear the read-only flags on the shadow copy.

The data is now ready to use.

Folder and share management

The storage system supports several file-sharing protocols, including DFS, NFS, FTP, HTTP, and Microsoft SMB. This section discusses overview information as well as procedures for the setup and management of the file shares for the supported protocols. Security at the file level and at the share level is also discussed.

NOTE: Select servers can be deployed in a clustered or non-clustered configuration. This section discusses share setup for a non-clustered deployment.

Folder management

Volumes and folders on any system are used to organize data. Regardless of system size, systematic structuring and naming conventions of volumes and folders eases the administrative burden. Moving from volumes to folders to shares increases the level of granularity of the types of data stored in the unit and the level of security access allowed.

Folders can be managed using Server Manager. Tasks include:

- Accessing a specific volume or folder
- Creating a new folder
- Deleting a folder
- Modifying folder properties
- Creating a new share for a volume or folder
- Managing shares for a volume or folder

Managing file-level permissions

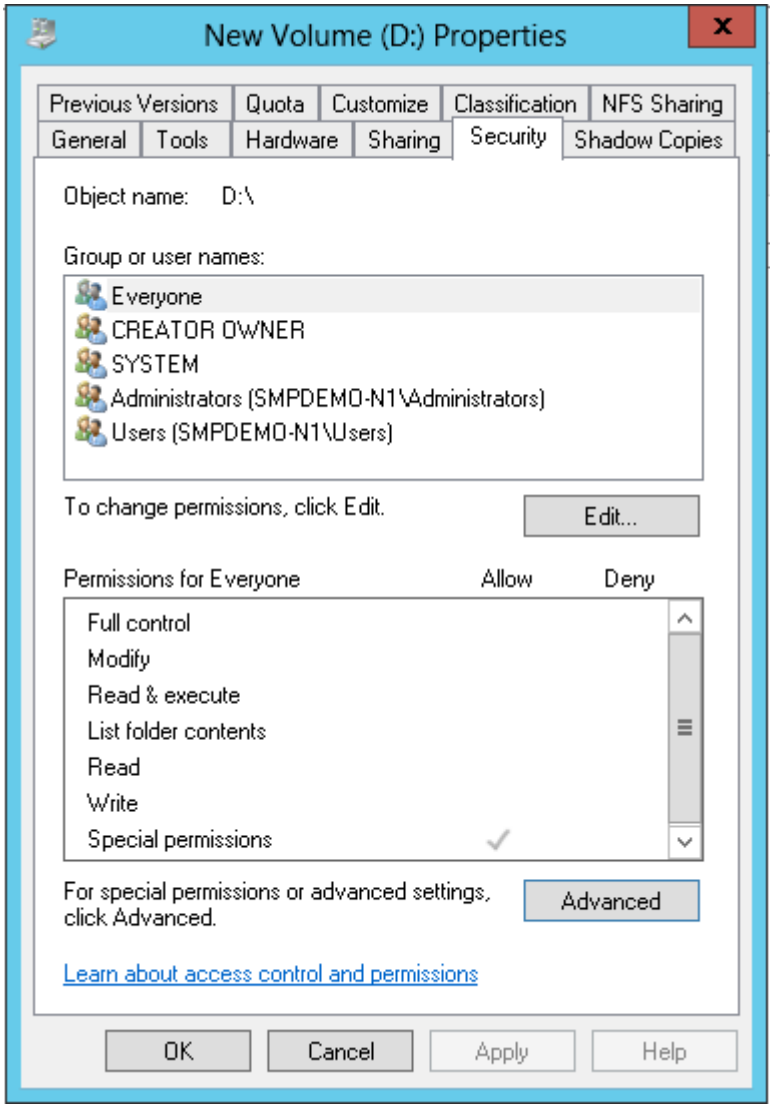
Security at the file level is managed using Windows Explorer.

File level security includes settings for permissions, ownership, and auditing for individual files.

To enter file permissions:

1. Using Windows Explorer, access the folder or file that needs to be changed, and then right-click the folder.
2. Click **Properties**, and then click the **Security** tab.

Figure 37 Properties screen, Security tab



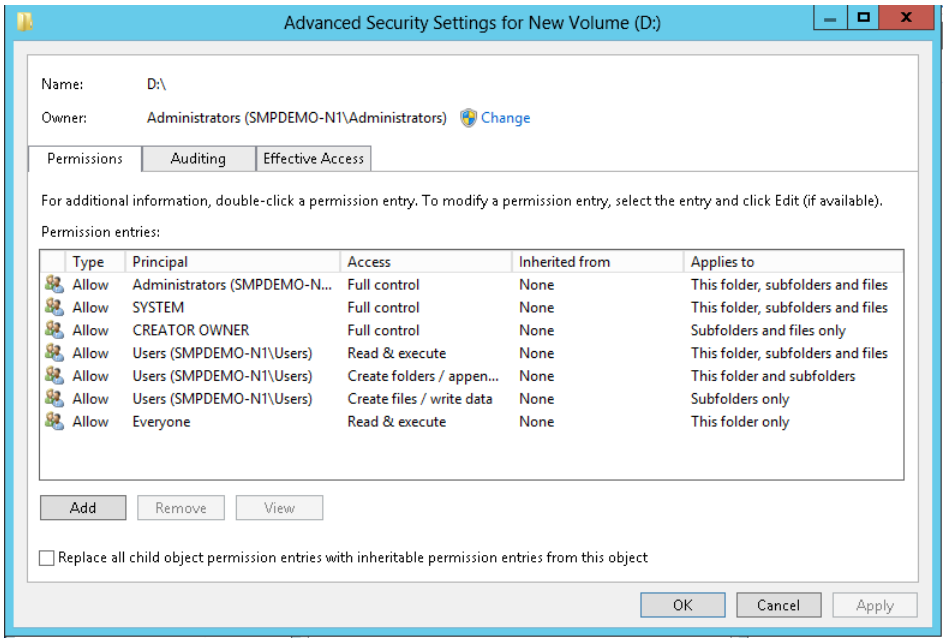
Several options are available on the **Security** tab:

- To add users and groups to the permissions list, click **Add**. Follow the dialog box instructions.
- To remove users and groups from the permissions list, highlight the desired user or group, and then click **Remove**.
- The center section of the **Security** tab lists permission levels. When new users or groups are added to the permissions list, select the appropriate boxes to configure the common file-access levels.

3. To modify ownership of files, or to modify individual file access level permissions, click **Advanced**.

   Figure 38 (page 102) illustrates the properties available on the **Advanced Security Settings** screen.

Figure 38 Advanced Security settings screen, Permissions tab

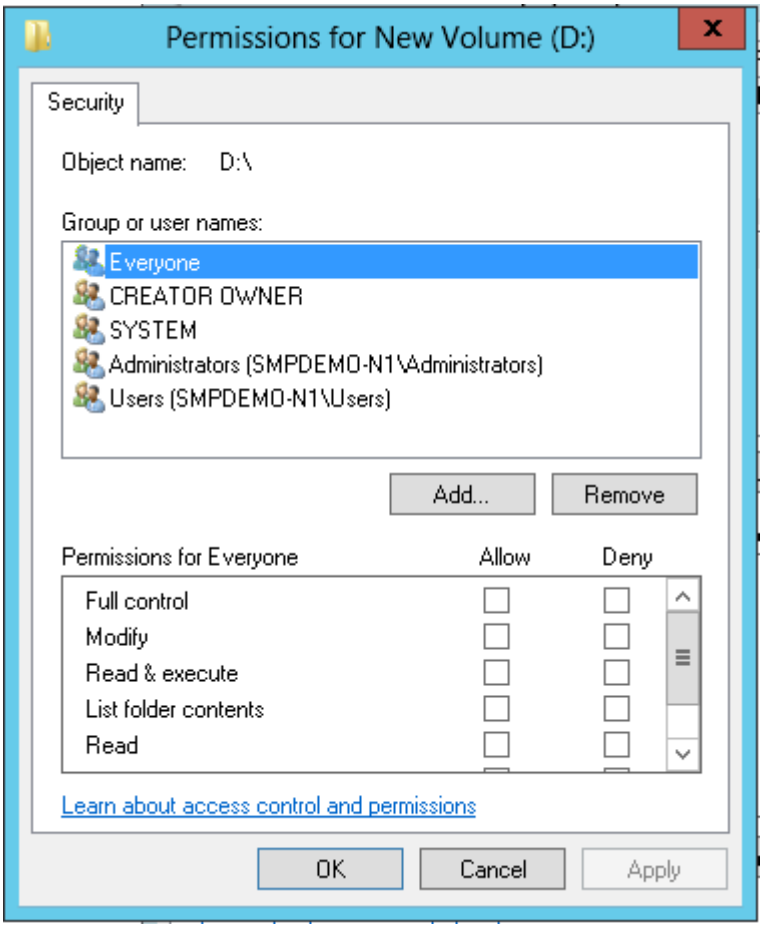


Other functionality available in the **Advanced Security Settings** screen is illustrated in Figure 38 (page 102) and includes:

- **Add a new user or group**—Click **Add**, and then follow the dialog box instructions.
- **Remove a user or group**—Click **Remove**.
- **Replace permission entries on all child objects with entries shown here that apply to child objects**—This allows all child folders and files to inherit the current folder permissions by default.
- **Modify specific permissions assigned to a particular user or group**—Select the desired user or group, and then click **Edit**.

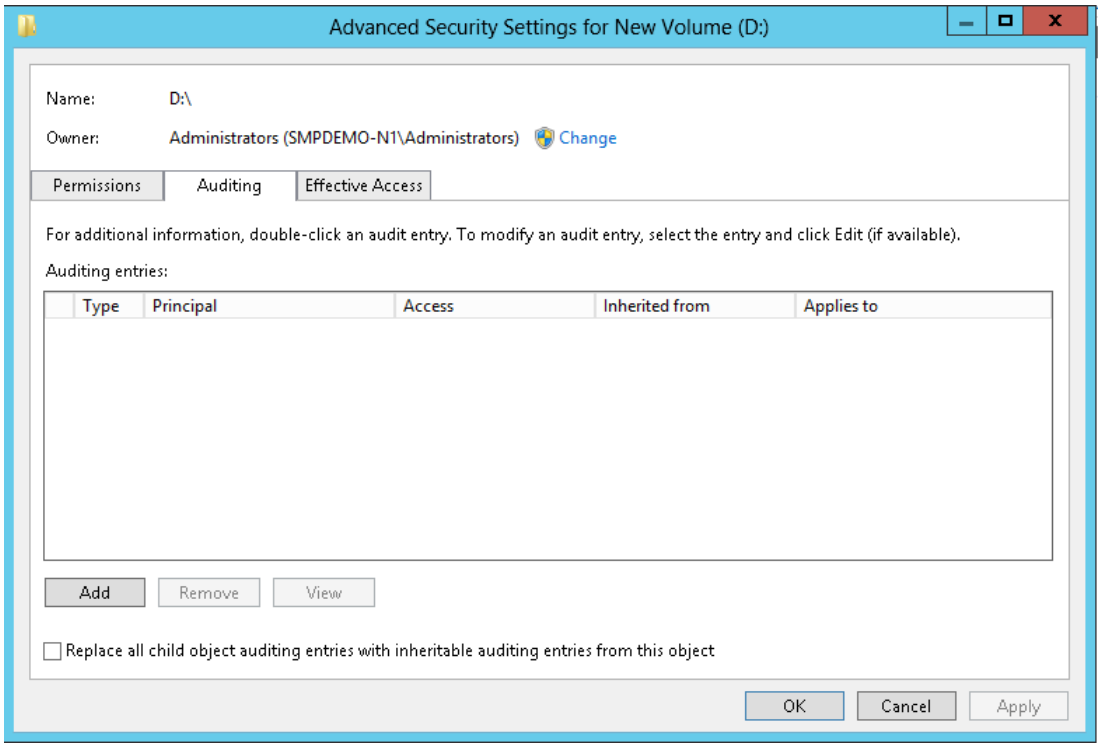
4. Enable or disable permissions by selecting the **Allow** box to enable permission or the **Deny** box to disable permission. If neither box is selected, permission is automatically disabled. Figure 39 (page 103) illustrates the **Edit** screen and some of the permissions.

Figure 39 User or group Permission Entry screen



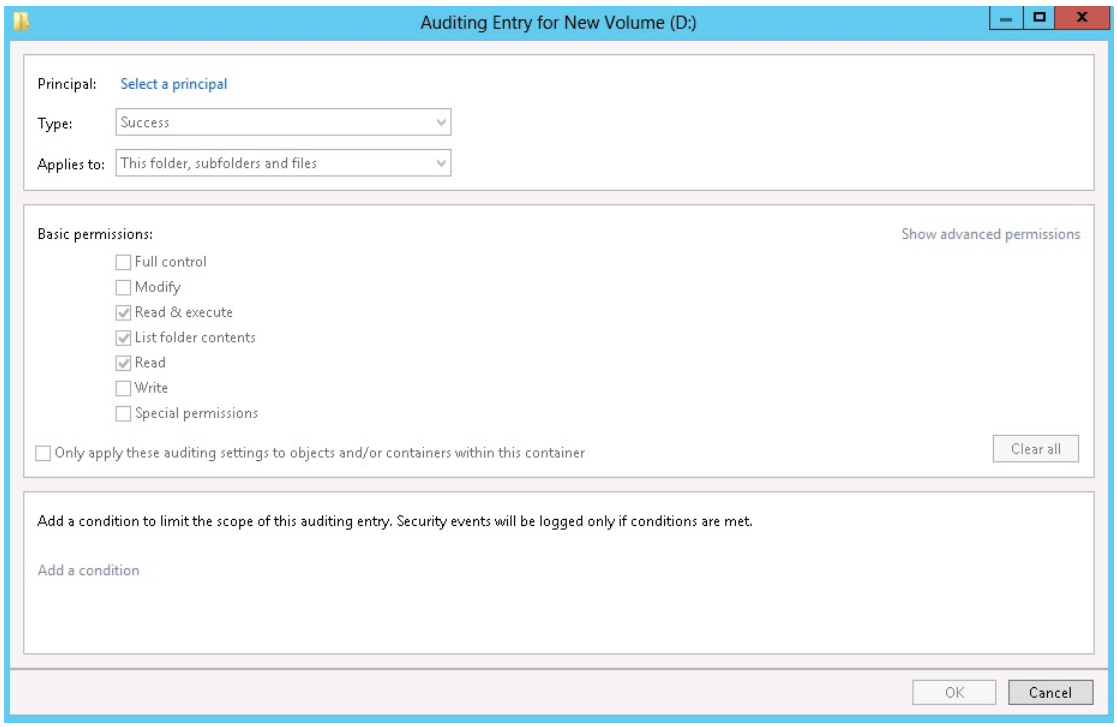
Another area of the **Advanced Security Settings** is the **Auditing** tab. Auditing allows you to set rules for the auditing of access, or attempted access, to files or folders. Users or groups can be added, deleted, viewed, or modified through the **Advanced Security Settings Auditing** tab.

Figure 40 Advanced Security Settings screen, Auditing tab



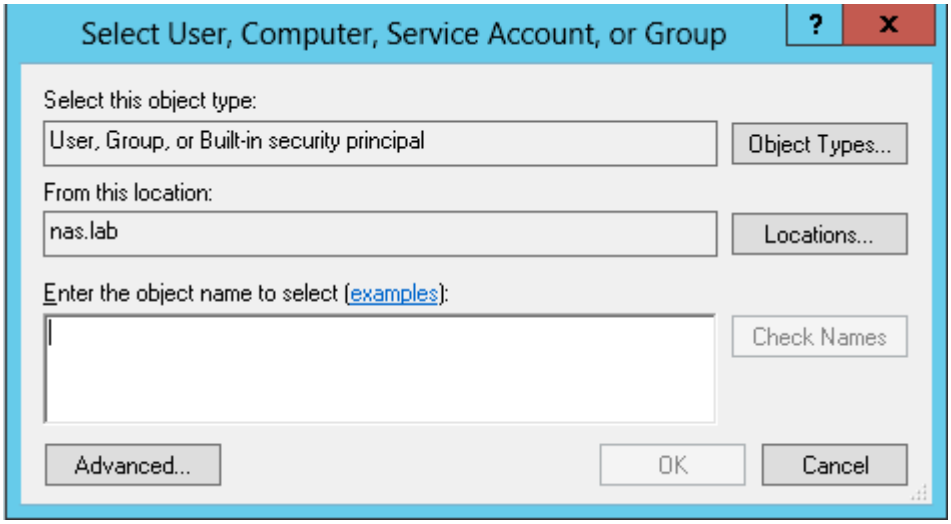
5. Click **Add** to display the **Auditing Entry** screen.

Figure 41 Auditing Entry for New Volume screen



6. Click **Select a principal** to display the Select User or Group screen.

Figure 42 Select User or Group screen



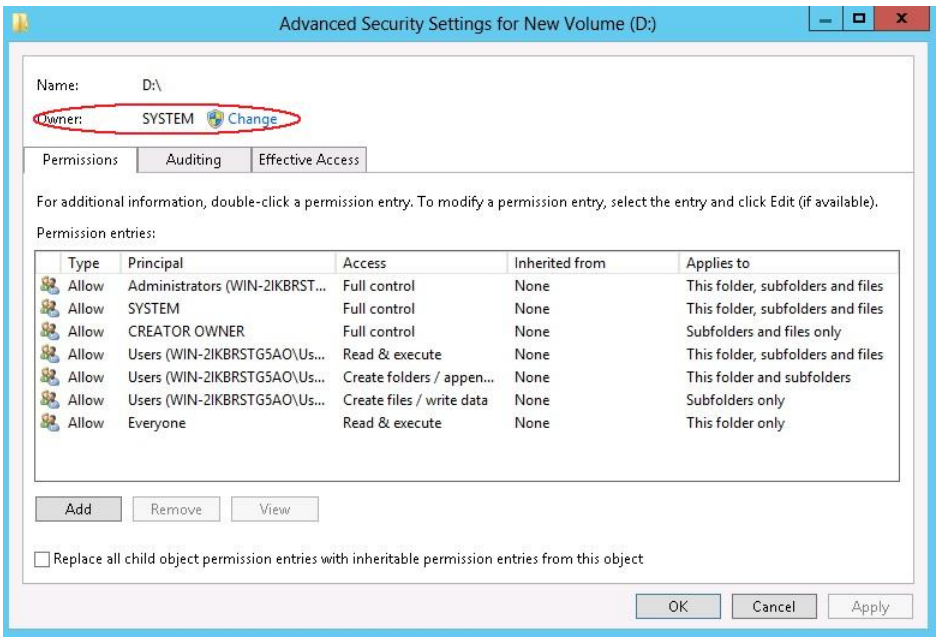
NOTE: Click Advanced to search for users or groups.

7. Select the user or group.
8. Click **OK**.
9. Select the desired **Successful** and **Failed** audits for the user or group.
10. Click **OK**.

NOTE: Auditing must be enabled to configure this information. Use the local Computer Policy Editor to configure the audit policy on the storage system.

The **Owner** tab allows taking ownership of files. Typically, administrators use this area to take ownership of files when the file ACL is incomplete or corrupt. By taking ownership, you gain access to the files, and then manually apply the appropriate security configurations.

Figure 43 Advanced Security Settings screen



The current owner of the file or folder is listed at the top of the screen. To take ownership:

1. Click the appropriate user or group in the **Change owner to** list.

2. If it is also necessary to take ownership of subfolders and files, enable the **Replace owner on subcontainers and objects** box.
3. Click **OK**.

Share management

There are several ways to set up and manage shares. Methods include using Windows Explorer, a command line interface, or Server Manger.

NOTE: Select servers can be deployed in a clustered as well as a non-clustered configuration. This chapter discusses share setup for a non-clustered deployment.

As previously mentioned, the file-sharing security model of the storage system is based on the NTFS file-level security model. Share security seamlessly integrates with file security. In addition to discussing share management, this section discusses share security.

Share considerations

Planning the content, size, and distribution of shares on the storage system can improve performance, manageability, and ease of use.

The content of shares should be carefully chosen to avoid two common pitfalls: either having too many shares of a very specific nature, or of having very few shares of a generic nature. For example, shares for general use are easier to set up in the beginning, but can cause problems later. Frequently, a better approach is to create separate shares with a specific purpose or group of users in mind. However, creating too many shares also has its drawbacks. For example, if it is sufficient to create a single share for user home directories, create a “homes” share rather than creating separate shares for each user.

By keeping the number of shares and other resources low, the performance of the storage system is optimized. For example, instead of sharing out each individual user's home directory as its own share, share out the top-level directory and let the users map personal drives to their own subdirectory.

Defining Access Control Lists

The Access Control List (ACL) contains the information that dictates which users and groups have access to a share, as well as the type of access that is permitted. Each share on an NTFS file system has one ACL with multiple associated user permissions. For example, an ACL can define that User1 has read and write access to a share, User2 has read only access, and User3 has no access to the share. The ACL also includes group access information that applies to every user in a configured group. ACLs are also referred to as permissions.

Integrating local file system security into Windows domain environments

ACLs include properties specific to users and groups from a particular workgroup server or domain environment. In a multidomain environment, user and group permissions from several domains can apply to files stored on the same device. Users and groups local to the storage system can be given access permissions to shares managed by the device. The domain name of the storage system supplies the context in which the user or group is understood. Permission configuration depends on the network and domain infrastructure where the server resides.

File-sharing protocols (except NFS) supply a user and group context for all connections over the network. (NFS supplies a machine-based context.) When new files are created by those users or machines, the appropriate ACLs are applied.

Configuration tools provide the ability to share permissions out to clients. These shared permissions are propagated into a file system ACL, and when new files are created over the network, the user creating the file becomes the file owner. In cases where a specific subdirectory of a share has different permissions from the share itself, the NTFS permissions on the subdirectory apply instead.

This method results in a hierarchical security model where the network protocol permissions and the file permissions work together to provide appropriate security for shares on the device.

NOTE: Share permissions and file-level permissions are implemented separately. It is possible for files on a file system to have different permissions from those applied to a share. When this situation occurs, the file-level permissions override the share permissions.

Comparing administrative (hidden) and standard shares

SMB supports both administrative shares and standard shares.

- Administrative shares are shares with a last character of $. Administrative shares are not included in the list of shares when a client browses for available shares on a SMB server.
- Standard shares are shares that do not end in a $ character. Standard shares are listed whenever a SMB client browses for available shares on a SMB server.

The storage system supports both administrative and standard SMB shares. To create an administrative share, end the share name with the $ character when setting up the share. Do not type a $ character at the end of the share name when creating a standard share.

Managing shares

Shares can be managed using Server Manager. Tasks include:

- Creating a new share
- Deleting a share
- Modifying share properties
- Publishing in DFS

CAUTION: Before deleting a share, warn all users to exit that share and confirm that no one is using that share.

NOTE: These functions can operate in a cluster on select servers, but should only be used for non-cluster-aware shares. Use Cluster Administrator to manage shares for a cluster. The page will display cluster share resources.

File Server Resource Manager

File Server Resource Manager (FSRM) is a suite of tools that allows administrators to understand, control, and manage the quantity and type of data stored on their servers. Some of the tasks you can perform are:

- Quota management
- File screening management
- Storage reports

Server Manager provides access to FSRM tasks.

For procedures and methods beyond what are described below, see the online help.

Quota management

On the Quota Management node of the File Server Resource Manager snap-in, you can perform the following tasks:

- Create quotas to limit the space allowed for a volume or folder and generate notifications when the quota limits are approached or exceeded.
- Generate auto quotas that apply to all existing folders in a volume or folder, as well as to any new subfolders created in the future.
- Define quota templates that can be easily applied to new volumes or folders and that can be used across an organization.

File screening management

On the File Screening Management node of the File Server Resource Manager snap-in, you can perform the following tasks:

- Create file screens to control the types of files that users can save and to send notifications when users attempt to save blocked files.
- Define file screening templates that can be easily applied to new volumes or folders and that can be used across an organization.
- Create file screening exceptions that extend the flexibility of the file screening rules.

Storage reports

On the Storage Reports node of the File Server Resource Manager snap-in, you can perform the following tasks:

- Schedule periodic storage reports that allow you to identify trends in disk usage.
- Monitor attempts to save unauthorized files for all users or a selected group of users.
- Generate storage reports instantly.

8 Troubleshooting, servicing, and maintenance

The storage system provides several monitoring and troubleshooting options. You can access the following troubleshooting alerts and solutions to maintain the system health:

- Notification alerts
- System Management Homepage (SMH)
- Hardware component LEDs
- HP and Microsoft support websites
- HP Insight Remote Support software
- Microsoft Systems Center Operations Manager (SCOM) and Microsoft websites
- HP SIM 6.3 or later, which is required for proper storage system/HP SIM integration.

NOTE: Integration with HP SIM is only supported using the WBEM/WMI interfaces. Do not attempt to configure HP SIM to use the ProLiant SNMP agents, because the configuration is untested and unsupported. The ProLiant SNMP agents are enabled on the storage system by default and should not be disabled as they are used for internal management functions. If they are enabled for external client consumption, HP SIM must be configured so it does not attempt to communicate with these agents.

Maintaining your storage system

HP recommends the following maintenance guidelines for upgrading your system components (operating system, software, firmware, and drivers), depending on your environment:

- If your storage system is working properly, you are not required to install any updates.
- If security updates are important for your operating environment, you can:
  - Use Microsoft Windows Update to download updates.
  - Use Windows Update Server to update the server blades in the storage system.
  - Download and install specific security updates as needed from the Microsoft Security TechCenter website:

    http://technet.microsoft.com/security/default.aspx
- If your maintenance policy is to only update servers to the most current and tested versions of the system components, you can install the latest HP service release. To find the latest service release, go to http://www.hp.com/go/support and search for your specific product. You can also register your product on the HP support and drivers page to receive notification of new service releases for your product.
- If your maintenance policy allows you to update servers to the most current versions of the system components for which HP StoreEasy has not completed testing and bundled as a service release, then apply the latest HP Service Pack for Proliant (SPP) from http://www.hp.com/go/spp. The latest firmware and driver updates can be retrieved for your specific product or the underlying server platform from http://www.hp.com/go/support by selecting **Drivers & Downloads** and then searching for the server platform (for example, ProLiant DL380 Gen9 server) to find specific updates.
- HP recommends updating the operating system, software, firmware, and NIC drivers simultaneously (in the same update window) to ensure proper operation of the storage system.

Determining the current storage system software version

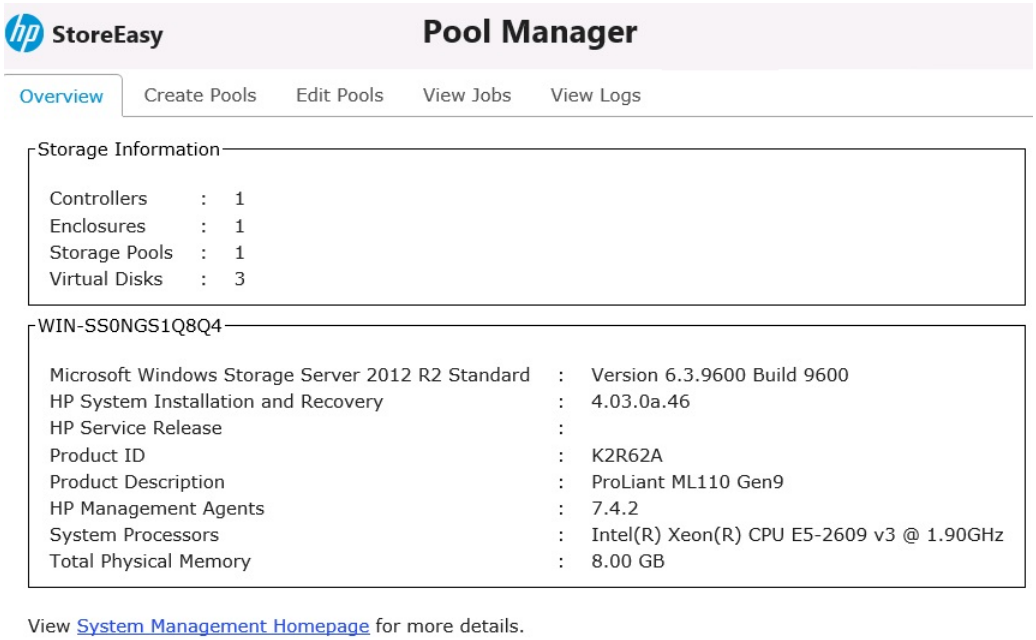
You can find the current version using the HP StoreEasy tools or the registry.

From the HP StoreEasy tools:

1. Open the HP StoreEasy tools from the **Tools** menu in Windows Server Manager.
2. Select **Manage Storage Pools**.
3. On the **Overview** tab, locate the version listed in the HP System Installation and Recovery.

NOTE: The versions shown in Figure 44 (page 110) may differ from the version you are currently running.

Figure 44 Pool Manager Overview



From the registry:

1. Log in to the server blade.
2. Open a command window.
3. Enter the `reg query` command as shown in the following example:

   ```
   C:\> reg query HKLM\Software\Wow6432Node\Hewlett-Packard\StorageWorks /s
   ```

   The following information appears:

   ```
   HKEY_LOCAL_MACHINE\Software\Wow6432Node\Hewlett-Packard\StorageWorks\QuickRestore
       BASE    REG_SZ    3.00.0.11
       QRVersion    REG_SZ    V4.03.0a.84
   ```

   The QRVersion field lists the version.

HP System Management Homepage

The HP System Management Homepage (SMH) is a web-based interface that consolidates and simplifies single system management for HP servers. The SMH is the primary tool for identifying and troubleshooting hardware issues in the storage system. You may choose this option to diagnose a suspected hardware problem. Go to the**SMH main page** and open the **Overall System Health Status** and the **Component Status Summary** sections to review the status of the storage system hardware.

By aggregating the data from HP web-based agents and management utilities, the SMH provides a common, easy-to-use interface for displaying the following information:

- Hardware fault and status monitoring
- System thresholds
- Diagnostics
- Software and firmware version control for an individual server

The SMH Help menu provides documentation for using, maintaining, and troubleshooting the application. For more information about the SMH software, go to www.hp.com/support/manuals and enter **System Management Homepage** in the Search box. A list of documents and advisories is displayed. To view SMH user guides, select **User Guide**.

Starting the System Management Homepage application

To start the application, double-click the **HP System Management Homepage** desktop shortcut or enter `https://hostname:2381/` in Internet Explorer. The *hostname* can be `localhost` or the IP address of the server you want to monitor. To log into SMH, enter the same username and password you use to log in to the server. Users who have administrative privileges on the server have the same privileges in the SMH application.

To view the SMH of one server from another server, you must modify the Windows firewall settings as follows:

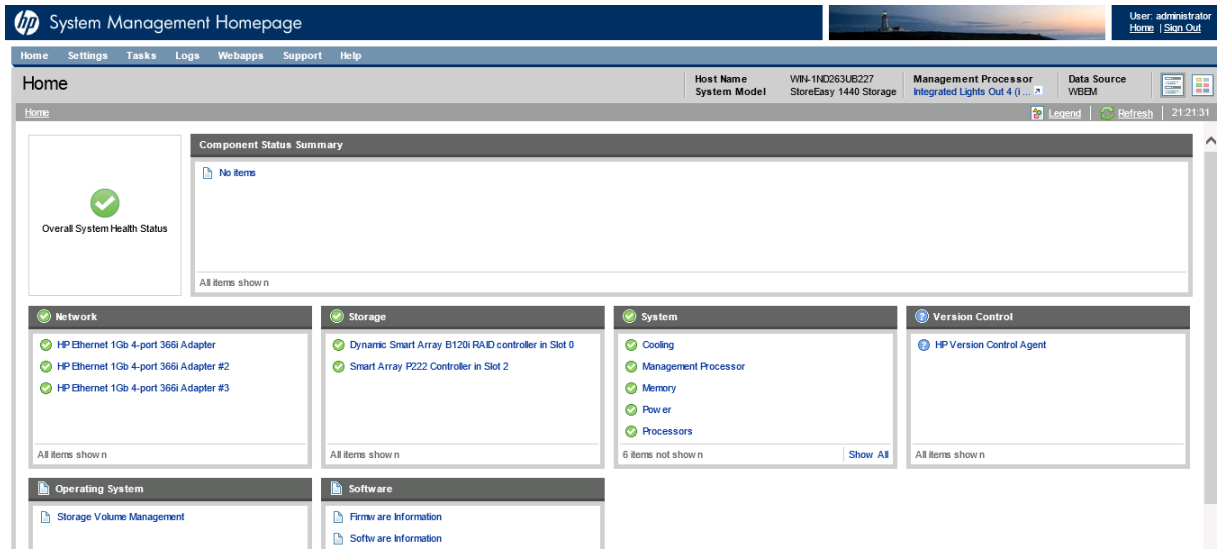
1. Open the Control Panel and select **System Security→Windows Firewall→Allowed Programs**.
2. Select **Allow another program** and click **Browse** in the Add a Program dialog box.
3. Navigate to `C:\hp\hpsmh\bin` and select **hpsmhd**. Click **Open** and then click **Add**. HP System Management Homepage displays in the Allowed Programs and Features window.
4. Select **Home/work (Private)** and **Public** and click **OK**.
5. To access the SMH on another server, enter the following URL: `https://<server IP address>:2381`.

NOTE: Port 2381 may need to be opened in the system's firewall, if applicable.

System Management Homepage main page

Figure 45 (page 111) shows the SMH main page.

Figure 45 System Management Homepage main page



The page provides system, subsystem, and status views of the server and displays groupings of systems and their status.

NOTE:

- NICs will display with a failed status (red icon) if they are unplugged. To remove unused NICs from the system status, you can disable them by selecting **Control Panel→Hardware→Device Manager**, right-click on the specific NIC, and then select **Disable**.
- When you remove a disk or disconnect a cable, the SMH interface might not display alerts when you click the **Refresh** button. You can force a hard refresh by clicking the **Home** button or by navigating to the problem area. The default refresh interval is two minutes. To change the interval in the **Settings** menu, select **Autorefresh**, and then **Configure Page refresh settings**. The minimum interval is five seconds and the maximum is 30 minutes.

Overall System Health Status

A webapp sets the value of the **Overall System Health Status** icon by using a predefined heuristic. If no webapp can determine the status, the worst possible status is displayed in the **Component Status Summary** section.

Component Status summary

The **Component Status Summary** section displays links to all subsystems that have a critical, major, minor, or warning status. If there are no critical, major, minor or warning items, the **Component Status Summary** section displays no items.

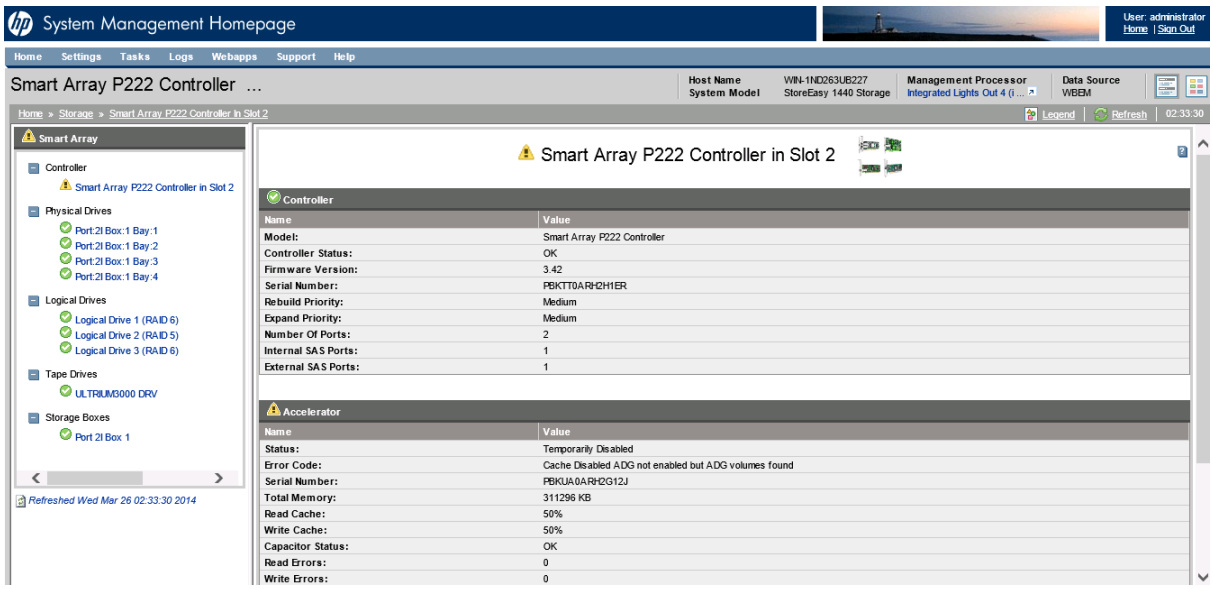
Network

This section shows the status of the network connections.

Storage

This section displays information about the Smart Array and storage controllers within the storage system. The **Storage System** page is organized as a left panel and a main page:

Figure 46 Storage system



The left panel provides links to information about the following items:

- **Controller**

  Select a storage controller to view its type, status, firmware version, and serial number.

- **Physical Drives**

  This section provides an overview of all disk drives attached to the controller. Drives are identified and grouped as assigned, unassigned, and spare drives. Each physical drive is listed as a separate entry in the Storage System submenu. Select any of the physical drives to display more information about the drive.

  NOTE: Spare drives are only used when a disk drive fails. Until a spare drive is used, it remains offline and its LEDs will remain off.

- **Logical Drives**

  A list of logical drives associated with the controller appears in the left panel tree view. Select one of the logical volume entries to display the status of the volume, fault tolerance (RAID level), and capacity (volume size). A link to the logical volume storage pool is also displayed.

- **Tape Drives**

  This section provides information about tape drives, if they are included.

- **Storage Boxes**

  This section provides an overview of the disk drives that are listed individually in the Physical Drives section.

System

This section displays status for various system components.

Version Control

This section provides information about the Version Control Agent.

Operating system

This section provides information about the operating system storage volumes.

Software

This section provides information about system firmware and software.

Certificate of Authenticity

The Certificate of Authenticity (COA) label is used to:

- Replace the main board/motherboard.
- Upgrade the factory-installed operating system using the Microsoft Upgrade program for license validation.
- Reinstall the operating system because of a failure that has permanently disabled it.

The COA label location varies by server model. On rack-mounted server models, the COA label is located either on the front section of the right panel or on the right front corner of the top panel. On tower models, the COA label is located toward the rear of the top panel of the server. On blade models, the COA label is located on top of the server or storage blade.

HP System Dashboard

This section provides troubleshooting steps for the HP System Dashboard.

HP System Dashboard does not launch or display data

To resolve this issue, perform the following steps:

1. Go to **Control Panel→Programs→Programs and Features→Uninstall a program** and verify that HP StoreEasy Data Service, HP Management Web Services, and HP StoreEasy Dashboard are installed on the system.
2. Do one of the following:
   - If the above mentioned software are not installed with version mentioned in the Release Notes, then install the service release for HP System Dashboard.
   - If the above mentioned software are installed, enter `services.msc` in the **Run** dialog box and verify that the following services are running:
     - HP Network Discovery Service
     - HP Storage Discovery Service
     - HP System Health Discovery Service
     - HP Storage Management Service

     If a service is not running, select the service, and then click **Start** or **Restart**.

HP System Dashboard services are not installed

If any of the dashboard services are not installed on the server, then install the service with the same version mentioned in the Release Notes. Check if the **HP StoreEasy Dashboard Services** component is installed. If it is not installed, then install this component.

Management web services are not installed

Check if the **HP Management Web Services** component is installed. If it is not installed, then install this component with the same version as mentioned in the Release Notes.

HP System Dashboard user interface is not installed

Check if the **HP StoreEasy Dashboard** component is installed. If it is not installed, install this component with the same version as mentioned in the Release notes.

HP System Dashboard service is paused or stopped

If a dashboard service is paused or stopped, restart the service to discover the data. Verify if the following services are running:

- HP Storage Discovery Service
- HP System Health Discovery Service
- HP Network Discovery Service
- HP Storage Management Service

To start or restart a service:

1. Enter `services.msc` in the **Run** dialog box.
2. Select the service that is not running and click **Start** or **Restart**.

CPU utilization is high continuously

If the CPU utilization is high, increase the value in the `<Discover>` tag under `<Eventlogs>` and `<Storage>` sub elements in the dashboard configuration file. For more information on the configuration file, see "Managing the dashboard configuration file" (page 71).

Known issues

Table 7 (page 115) identifies known issues with the storage system and provides workarounds to mitigate them.

Table 7 Known issues

Issue	Resolution
On some storage systems, a momentary press of the power button results in an operating system shutdown.	Confirm that the power settings for the storage system ignore the power button or disable the power button in the system BIOS.
There may be errors from DFS and NFS logged in the Event Viewer after the storage system is configured.	These errors can be ignored.
Mounted data volumes are not remounted after performing a system recovery. These data volumes are not damaged or destroyed but they are not visible after a system recovery operation.	To restore the mount points to their original locations, you must record them prior to running system recovery. 1. Using Windows Disk Manager, record the mount points of the volumes within the root directory of each volume. 2. After running system recovery, scan the system to find data volumes that are not assigned drive letters. 3. Temporarily mount the volumes that are not assigned drive letters. 4. Locate the recorded list of mount points and remount the temporarily mounted volumes to the correct locations according to the record.
Network interfaces that are configured to use DHCP might not retrieve a DHCP address immediately if the configuration and network validation fails for these interfaces in the Network Configuration Tool.	Perform the following steps to restart the network interface: 1. Open a command prompt and enter `ncpa.cpl` to open the network control panel. 2. Right-click on the interface that is configured for DHCP and does not have an address, and then select **Disable**. 3. Right-click on the interface that is configured for DHCP and does not have an address, and then select **Enable**.
When starting the System Management Homepage, you may see a message that there is an error with the security certificate.	You can safely continue and log in. Once logged in, see the Local Server Certificate topic in the System Management Homepage online help to set up a trusted certificate.
The New Volume option is not enabled after extending a virtual disk.	After extending a virtual disk, the New Volume option (visible when you right-click the virtual disk) is disabled in Windows Server Manager. This can occur if the space on the virtual disk was fully utilized (the Capacity and Allocated Space columns display the same value) before extending the virtual disk. To enable the New Volume option, do one of the following: • In Disk Management, select **Rescan Disks**. • From the HP StoreEasy folder on the desktop, select **Rediscover Storage**. • Open a Windows PowerShell command prompt and execute the `Update-StorageProviderCache` command.
Status column on Storage Pools window in Windows Server Manager is blank.	When viewing details about storage pools on the Storage Pools window in the Windows Server Manager, the Status column is always blank. However, you can view the health status and operational status. Health status is indicated by the icon to the left of the Name column. Operational status is a separate column. You can hide the Status column by right-clicking the column name and selecting **Status**, which removes Status from the list of column headings that display.
Windows Server Manager indicates there are zero (0) storage pools but does not display any kind of error message about it.	This issue can be caused by one of the following actions: • The cache is out of date. • The discovery operation times out. • An operation fails because it requires a service restart or cache update. • The HP Storage Management Service has stopped running.

Table 7 Known issues *(continued)*

Issue	Resolution
	To resolve the issue, restart the HP Storage Management Service using one of the following methods: • From the desktop, navigate to the Services window (services.msc) and locate **HP Storage Management Service**. Right-click the service and select **Start**. • Open a Windows PowerShell prompt and enter the following cmdlet: `net start hpstormsvc`
Windows Server Manager may display the free space for storage pools that contain a RAID 6 virtual disk as zero (0).	This issue may be due to the RAID 6 license either not being installed or expired. The license key is included as a hard-copy document when you first received your storage system. You can also locate the license key in the quick restore log file (`qrlog.txt`), which is located in `C:\Windows\logs`. You should keep the license key in a safe place and make a copy of the `qrlog.txt` file so the license key is easily available when needed. To install the license key, see "Installing a license key with ACU" in the *Configuring Arrays on HP Smart Array Controllers Reference Guide* which can be downloaded from the following website: http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00729544/c00729544.pdf To obtain a new license key, go to the Smart Array Advanced Pack (SAAP) product page: http://www.hp.com/go/SAAP
When creating a storage pool on a StoreEasy 1000 system, the following warning message may appear: `The storage pool was created, but spare drives could not be added. Edit the pool to add spare drives.`	This can occur if the pool being created is not the last pool being managed by the controller. For example, you have Pool A, Pool B, and Pool C. You delete Pool B and then create a new storage pool. The new storage pool is considered "out of order" and its creation requires all storage pools to be re-ordered. The new pool is created successfully, but without a spare drive. You can add a spare drive using the Grow option on the Edit Pools tab of Pool Manager.
The Storage Management Provider displays the following error message: `0x26005054 The service failed to subscribe for events.`	1. Open Add/Remove Programs and verify that HP Insight Management Agents is installed. 2. If it is installed, open the **Run** dialog box and enter `WBEMTEST` and click **Connect**. 3. Enter `root\hpq` as the namespace. Wait to see if the namespace connects. If it does not connect, the WBEM installation is corrupt. 4. Navigate to the `C:\hpnas\components\PSP` directory, which contains the WBEM installer. 5. Open the batch script file and search for "HP Insight Management Agents for Windows Server x64 Editions" and identify its executable name. 6. Run the executable to re-install the agents.
On an HP StoreEasy 1000 system, if you are logged in as a local administrator and the system has been joined to a domain, the Initial Configuration Tasks (ICT) window displays "None" for Available Disks, Storage Pools, and Volumes.	To resolve this issue, you must log in as a domain user.
Storage topology is not displayed properly in other tools after making changes using the HP Smart Storage Administrator.	When using HP Smart Storage Administrator to make storage configuration changes, the changes might not be displayed in Windows Server Manager, StoreEasy Pool Manager, or the Windows Server Manager API. To resolve this issue, perform the following steps before using one of these tools after making changes from the HP Smart Storage Administrator:

Table 7 Known issues *(continued)*

Issue	Resolution
	1. Close the HP Smart Storage Administrator after making the changes. 2. Update the storage cache using the following method: • Open PowerShell and run `Update-StorageProviderCache`. The changes made using the HP Smart Storage Administrator will now be displayed.
The `Actual Drive ID does not match what is expected` message is displayed during system installation and recovery.	When the logical drive configuration of the system does not match with the system recovery configuration file, this message is displayed on the screen. This usually occurs when you delete the logical drive on which the operating system is installed. • If a recent backup exists, the system can be restored after removing all logical drives in logical array A using HP Smart Storage Administrator. Start Intelligent Provisioning during system boot and remove all logical drives from array A and then boot from the System Recovery media. Restore the backup when the system recovery process completes and appropriate storage is configured. • If a recent backup does not exist, use the System Recovery media to access and capture the data from the remaining logical drives in array A by copying the files to a network share. When the data is copied, use the System Recovery media to restore the system after removing the logical drives in array A using Intelligent Provisioning. **IMPORTANT:** This issue only affects logical drives in array A. Do not delete logical drives in any other logical array. For information on using the System Recovery DVD, see "Using the System Recovery DVD to save system data" (page 128).
In a dual domain configuration, the loss of a redundant path intermittently displays the controller as `Loading` in Pool Manager.	To resolve this issue, open a Windows PowerShell command prompt and execute the `Update-StorageProviderCache` command.
Windows Server Manager does not display correct capacity details of the logical drive that is extended using SSA.	To resolve this issue: • Open a Windows PowerShell command prompt and execute the `Update-StorageProviderCache` command. • Click **Storage Pools** or any other section in the left pane of Windows Server Manager, and then click **Disks**.
If all drive letters are consumed, the New Volume Wizard fails while assigning the access path.	To resolve this issue: 1. Open Server Manager and click **File and Storage Services→Volumes**. 2. Right-click on the volume and select **Manage Drive Letter and Access Paths**. 3. Select a drive letter from the list and click **OK**.

Verifying services are running

If an issue occurs and other troubleshooting efforts do not resolve it, verify that the following services are always running:

- HP Insight Event Notifier
- HP Insight Foundation Agents
- HP Insight NIC Agents
- HP Insight Server Agents
- HP Insight Storage Agents
- HP ProLiant Agentless Management Service
- HP ProLiant Health Monitor Service
- HP ProLiant System Shutdown Service

- HP Smart Array SAS/SATA Event Notification Service
- HP Storage Management Service
- HP System Management Homepage
- HP Version Control Agent
- HP Storage Management Service
- HP WMI Storage Providers

Additionally, verify that the user interfaces for REST and Pool Manager are installed and running:

1. Open IIS using one of the following methods:
   - In Windows Server Manager, select **IIS** in the left navigation pane. In the list of servers that display in the main content pane, right-click the applicable server and select **Internet Information Services (IIS) Manager**.
   - Select **Internet Information Services (IIS) Manager** from the Tools menu in Windows Server Manager.
   - Press **Windows** + **R** to open the Run window. Enter `inetmgr` and click **OK**.
2. Verify that the HP StoreEasy Management website contains the following entries:
   - aspnet_client
   - help
   - rest
   - webui
3. Right-click the **HP StoreEasy Management** website and select **Manage Website**. If it is running, the Start option will be disabled.

If these steps do not resolve the issue, contact HP Technical Support.

Error codes

This section contains the error codes that may occur.

Storage Management Provider error codes

The Storage Management Provider error codes are listed in Table 8 (page 118).

Table 8 Storage Management Provider errors

Error code	Error message	Recommended action
0x24005001	Error during discovery.	Restart HP Storage Management Service.
0x24005003	Error while parsing CLI output.	Restart HP Storage Management Service.
0x20005003	Error while parsing CLI output.	
0x25005008	The controller specified was not found.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x20005009	The specified RAID level is invalid.	
0x25005009	The specified RAID level is invalid.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2300500B	The operation is not supported because the storage pool is unhealthy.	Retry the operation.
0x2300500C	The operation is not supported because the storage pool is transforming.	Retry the operation.

Table 8 Storage Management Provider errors *(continued)*

Error code	Error message	Recommended action
0x2300500D	The physical drive specified is already in use.	Retry the operation.
0x2300500E	Less than the minimum number of physical drives was specified.	Retry the operation.
0x2300500F	The specified physical drives are unsupported for this operation. They may either be in use or are a mismatch.	Retry the operation.
0x24005011	The physical disk was not found in the provider cache.	Restart HP Storage Management Service.
0x25005011	The physical disk was not found in the provider cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005012	No physical disks were found in the logical drive.	Restart HP Storage Management Service.
0x25005013	Failed to update pool in cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005014	Failed to get the pool from the controller.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005015	Failed to delete the pool from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005016	Failed to get the pool IDs for the subsystem from the controller.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005017	Failed to get the associated pool for the LUN from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005018	Failed to update disk in cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005019	Failed to get the disk from the controller.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500501A	Failed to get associated disks for the LUN from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500501B	Failed to get associated disks for the pool from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2000501C	Unknown type of storage object.	
0x2500501C	Unknown type of storage object.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2400501D	Failed to get the associated subsystem for the storage object from cache.	Restart HP Storage Management Service.
0x2500501D	Failed to get the associated subsystem for the storage object from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.

Table 8 Storage Management Provider errors *(continued)*

Error code	Error message	Recommended action
0x2500501E	Failed to get the storage object from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500501F	Failed to update the storage object in cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005020	Failed to get the storage object from the controller.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005021	Failed to copy storage objects.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x20005022	Error creating Pool.	
0x20005023	Error deleting LUN.	
0x20005024	The storage pool contains virtual disks.	
0x20005025	Failed to delete the reserved LUN.	
0x25005026	Failed to get the logical drive from the controller.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005027	Failed to convert from WCS to MBS.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005028	Failed to get proxy.	Restart HP Storage Management Service.
0x2500502A	Failed to update the logical drive in cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500502B	Failed to get volumes for the pool.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500502C	Failed to get the pool for the physical drive.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500502F	Failed to acquire the lock.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005030	Failed to add physical disk(s) to one of the LUNs in the pool.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005031	Failed to add physical disk(s) as data drive(s) to the pool.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005032	Failed to add physical disk(s) as spare drive(s) to the pool.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005033	The usage parameter is invalid.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x20005037	Access denied.	

Table 8 Storage Management Provider errors *(continued)*

Error code	Error message	Recommended action
0x25005037	Access denied.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005038	The cache is out of date.	Restart HP Storage Management Service.
0x25005038	The cache is out of date.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005039	The logical drive was not found in cache.	Restart HP Storage Management Service.
0x25005039	The logical drive was not found in cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2400503A	The storage pool was not found in cache.	Restart HP Storage Management Service.
0x2500503A	The storage pool was not found in cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2400503B	The subsystem was not found in cache.	Restart HP Storage Management Service.
0x2500503B	The subsystem was not found in cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2300503D	Incompatible `ResiliencySetting` for this operation.	Retry the operation.
0x23005040	Some of the parameter values supplied were invalid.	Retry the operation.
0x20005040	Some of the parameter values supplied were invalid.	
0x25005040	Some of the parameter values supplied were invalid.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005041	Failed to get the logical drives in the pool.	Restart HP Storage Management Service.
0x25005041	Failed to get the logical drives in the pool.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005043	Failed to get physical disk in the pool.	Restart HP Storage Management Service.
0x25005045	Failed to get physical disk in the subsystem.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005046	Failed to get the pool for the physical drive.	Restart HP Storage Management Service.
0x24005047	Failed to get the physical disks in the enclosure.	Restart HP Storage Management Service.
0x20005048	Physical disks not supported as arguments to the method.	
0x25005049	The operation was successful, but it has resulted in the storage pools being renamed.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500504A	Failed to get all pools from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.

Table 8 Storage Management Provider errors *(continued)*

Error code	Error message	Recommended action
0x2500504B	Failed to get the controller for the pool from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500504C	Failed to get the disk(s) for the pool from the controller.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500504D	Failed to add an association to cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500504E	The physical disk is in use. It cannot be deleted from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500504F	Invalid relation type.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x21005051	Failed to find the MI Main module.	Re-install HP Storage Management Provider.
0x21005052	Failed to initialize the MI Application.	Re-install HP Storage Management Provider.
0x21005053	The Storage Management Service is not able to host the SMP.	Re-install HP Storage Management Provider.
0x26005054	The service failed to subscribe for events.	Refer to the troubleshooting guide.
0x24005055	Failed to get the proxy object.	Restart HP Storage Management Service.
0x21005056	Failed to load the SMProvider DLL. Either it is not registered or is unable to load its dependencies.	Re-install HP Storage Management Provider.
0x25005059	Failed to get all LUNs for the disk from the controller.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500505A	Failed to remove association from the provider cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500505B	The operation was successful, but it has resulted in the storage pools being renamed.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500505C	The operation was successful, but it has resulted in the storage pools being renamed.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2000505D	The operation was successful, but it has resulted in the storage pools being renamed.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500505E	Failed to get all logical drives from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2500505F	Failed to get the controller for the logical drive from cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005060	The disk(s) cannot be added to this pool because it contains at least one LUN requiring RAID level migration.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.

Table 8 Storage Management Provider errors *(continued)*

Error code	Error message	Recommended action
0x21005061	Failed to remove partition data from the logical drive. You must manually clear the disk or delete the partition. Otherwise, subsequent volume creation requests might fail.	Re-install HP Storage Management Provider.
0x20005062	The format of the specified RAID level is invalid. Valid RAID levels are RAID 0, RAID 1, RAID 10, RAID 5, RAID 6, RAID 50, RAID 60, RAID 10 (ADM), RAID 50 (2), RAID 50 (3), RAID 50 (4), RAID 50 (5), RAID 1 (ADM), RAID 60 (2), RAID 60 (3), RAID 60 (4), RAID 60 (5).	
0x20005063	The format of the specified RAID level is invalid. Valid RAID levels are RAID 0, RAID 1, RAID 10, RAID 5, RAID 6.	
0x23005064	The length of the virtual disk friendly name exceeds the maximum supported length.	Retry the operation.
0x24005065	Failed to get the pool from the logical drive.	Restart HP Storage Management Service.
0x25005068	The virtual disk could not complete the operation because its health or operational status does not permit it.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005069	Enclosure not found in cache.	Restart HP Storage Management Service.
0x2500506A	Failed to update enclosure in cache.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2400506B	Failed to get the enclosure for the physical disk.	Restart HP Storage Management Service.
0x2400506C	Failed to get WMI class names to subscribe.	Restart HP Storage Management Service.
0x2100506D	SMP assembly file not found.	Re-install HP Storage Management Provider.
0x2700506E	The registry key `HKLM\HARDWARE\Description\System\BIOS` was not found.	The system is in an invalid state. Contact HP Support.
0x2700506F	The registry key `HKLM\HARDWARE\Description\System\BIOS\SystemProductName` was not found.	The system is in an invalid state. Contact HP Support.
0x21005070	`SmartArray.dll` file not found.	Re-install HP Storage Management Provider.
0x21005071	`Raptor.dll` file not found.	Re-install HP Storage Management Provider.
0x21005072	Failed to get the library name to load.	Re-install HP Storage Management Provider.
0x25005073	Failed to release the lock.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x24005074	Failed to create the mutex.	Restart HP Storage Management Service.
0x24005075	Failed to get the proxy to the controller library.	Restart HP Storage Management Service.
0x25005076	The resiliency setting does not match the pool's resiliency setting.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x25005077	The operation was successful but the storage provider cache is out of date. You must update the storage provider cache before proceeding further.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.

Table 8 Storage Management Provider errors *(continued)*

Error code	Error message	Recommended action
0x25005078	The specified friendly name already exists.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x20005079	The Storage Pool could not complete the operation because its health or operational status does not permit it.	
0x2500507A	One of the physical disks specified is assigned to other storage pool.	Update the storage management provider cache by invoking Windows PowerShell command `Update-StorageProviderCache`.
0x2300507B	This operation is supported only for spare drives.	Retry the operation.
0x2000507C	The physical drive could not complete the operation because its health or operational status does not permit it.	
0x2000507D	One of the physical disks specified can not be configured by the subsystem.	
0x2300507E	The specified pool does not contain witness lun and hence cannot be shrunk.	Retry the operation.
0x2300507F	This operation is not supported on primordial storage pools.	Retry the operation.

Pool Manager Provider error codes

The Pool Manager Provider error codes are listed in Table 9 (page 124).

Table 9 Pool Manager Provider errors

Error code	Error message
0x20006001	Pool Manager Provider has been unloaded from memory.
0x20006002	The Pool Manager Rule XML file is invalid.
0x20006003	Pool configuration is not supported for this enclosure.
0x20006004	Failed to initialize logger.
0x20006005	Could not find ROM Check Library (`pssver.dll`), which is required to find pool template for any enclosure.
0x20006006	Failed to use WMI to call the SMP Provider.
0x20006007	Failed to connect to the SMP Provider.
0x20006008	General WMI error in the Pool Manager Provider.
0x20006009	The first healthy disk size within the virtual enclosure exceeded the maximum drive capacity allowed for a pool by the virtual enclosure.
0x2000600A	The proposed spare disk slot is empty.
0x2000600B	The first healthy disk type within the virtual enclosure does not match the disk type supported by the virtual enclosure.
0x2000600C	An empty disk slot was found.
0x2000600D	The OS pool was not found in the expected location.
0x2000600E	The proposed spare disk is unhealthy.
0x2000600F	The proposed spare disk in already in use.

Table 9 Pool Manager Provider errors *(continued)*

Error code	Error message
0x20006010	The existing pool type does not match the virtual enclosure type.
0x20006011	The proposed pool cannot be created or grown because one of the concrete pools within the pool set cannot be grown.
0x20006012	The existing pool contains disks of different sizes or types.
0x20006013	The existing pool has a RAID level that is not supported for the proposed pool.
0x20006014	The global spare used by this existing pool is not in the current virtual enclosure.
0x20006015	Some of the disks within the proposed pool are already part of another pool, which spans the current virtual enclosure.
0x20006016	Some of the disks within the proposed pool are unhealthy.
0x20006017	Some of the disks within the proposed pool are offline.
0x20006018	Some of the disks in the proposed pool are marked by the storage subsystem as cannot pool.
0x20006019	The number of existing pools exceeds the count specified in the rule file.
0x2000601A	The pool is unhealthy.
0x2000601B	Some of the disks in the proposed pool are a different type than the first disk of the virtual enclosure.
0x2000601C	Some of the disks in the proposed pool are a different size than the first disk of the virtual enclosure.
0x2000601D	Some of the disks in the proposed pool are a different spindle speed than the first disk of the virtual enclosure.
0x2000601E	Information on some of the disks in the proposed pool could not be read.
0x2000601F	The proposed spare disk is a different type than the first disk of the virtual enclosure.
0x20006020	The proposed spare disk is a different size than the first disk of the virtual enclosure.
0x20006021	The proposed spare disk is a different spindle speed than the first disk of the virtual enclosure.
0x20006022	Pool will be grown by adding spare disks only. No data disks will be added.
0x20006023	Some of the disks in the proposed pool are already used as spare(s).

Management Web Service error codes

The Management Web Service error codes are listed in Table 10 (page 125).

Table 10 Management Web Service errors

Error code	Error message	Recommended action
0x2000A001	You are not authorized to access the resource.	
0x2000A002	Received invalid input.	
0x2000A003	Failed to access WMI.	
0x2000A004	File not found.	
0x2000A005	Registry value not found.	

Table 10 Management Web Service errors *(continued)*

Error code	Error message	Recommended action
0x2000A006	The web service encountered an exception while performing the request. Check the web service log for more detail.	
0x2000A007	The storage pool was created, but spare drives could not be added. Edit the pool to add spare drives.	
0x2000A008	The operation on the storage pool failed because the storage provider cache was out of date. Please retry the operation.	
0x2000A009	The operation cannot be performed because a storage provider discovery is in progress. Please try the operation later.	
0x2000A00A	Failed to get the discovery status of the storage provider.	
0x2300A00B	The storage subsystem has indicated that one or more of the physical disks cannot be used in a storage pool.	Check the health and operational status of the physical drives. Please retry the operation.
0x2300A00C	One or more of the physical disks provided in the request was not found or cannot be used in a storage pool.	Check the health and operational status of the physical drives. Please retry the operation.

HP Support websites

Use the "Support and troubleshooting" task at the HP Support & Drivers website (http://www.hp.com/go/support) to troubleshoot problems with the storage system. After entering the storage system name and designation (for example, HP StoreEasy 1000 Storage) or component information (for example, SAS I/O module), use the following links for troubleshooting information:

- Download drivers and software—Provides drivers and software for your operating system.
- Troubleshoot a problem—Provides a listing of customer notices, advisories, and bulletins applicable for the product or component.
- Manuals—Provides the latest user documentation applicable to the product or component. User guides can be a useful source for troubleshooting information. For most storage system hardware platforms, the following ProLiant server manuals may be useful for troubleshooting assistance:
  - **HP ProLiant Server User Guide** or **HP ProLiant Server Maintenance and Service Guide**

    These guides contain specific troubleshooting information for the server.
  - **HP ProLiant Servers Troubleshooting Guide**

IMPORTANT: Some troubleshooting procedures found in ProLiant server guides may not apply to the storage system. If necessary, check with your HP Support representative for further assistance.

For HP StoreEasy 1000 Storage guides, go to http://www.hp.com/support/StoreEasy1000Manuals.

For specific ProLiant model documentation, go to:

http://www.hp.com/go/proliantgen9/docs

For software-related components and issues, online help or user guide documentation may offer troubleshooting assistance. Known issues, workarounds and service releases are addressed in this guide or the release notes.

- Customer notices—Address informational topics about the HP StoreEasy 1000 Storage.
- Customer advisories—Address know issues and solutions or workarounds.

NOTE: You must register for Subscriber's Choice to receive customer advisories and notices. See "Subscription service" (page 135) for more information.

Autonomy LiveVault

To use Autonmony LiveVault, which enables data protection in the cloud, see the following website:

http://www.autonomy.com/storeeasy

Microsoft Systems Center Operations Manager

Microsoft Systems Center Operations Manager (SCOM) provides comprehensive monitoring, performance management, and analysis tools to maintain Windows OS and application platforms. This solution allows you to monitor Microsoft Windows environments and HP storage products through a common OpsMgr console. To download HP management packs for Microsoft System Center Operations Manager, including installation, configuration, and usage documentation, visit the **HP Management Packs for Microsoft Systems Center** site at:

www.hp.com/go/storageworks/scom2007

Removing and replacing hardware components

For information on removing and replacing a hardware component, follow the component removal and replacement instructions in the appropriate ProLiant user guide.

The following list identifies the ProLiant model for each HP StoreEasy 1000 Storage product:

- 1450—HP ProLiant DL160 Gen9 server
- 1550—HP ProLiant ML110 Gen9 server
- 1650—HP ProLiant DL380 Gen9 server
- 1850—HP ProLiant DL380 Gen9 server

The ProLiant documentation is available at http://www.hp.com/go/proliantgen9/docs.

NOTE: After replacing the system board, you must ensure that the correct product name is installed on the replacement part. The correct product name is important for applications such as System Insight Manager and Insight Remote Support. To install the correct product name, browse to the `C:\hpnas\components\support\naming` folder. Locate and run the Smart Component that applies to your system. After running the Smart Component, you must shut down and then restart your system for the changes to take effect. If you run the incorrect Smart Component, the product name will be set incorrectly, but it will not affect your system in any other way.

9 Storage system recovery

This chapter describes how to perform a system recovery. To restore the HP StoreEasy 1000 Storage system to the factory defaults, see "Restoring the factory image with a DVD or USB flash device" (page 129).

System Recovery DVD

The System Recovery DVD enables you to install an image or recover from a catastrophic failure.

At any time, you may boot from the DVD and restore the server to the factory condition. This enables you to recover the system if all other means to boot the server fail.

While the recovery process makes every attempt to preserve the existing data volumes, you should have a backup of your data before recovering the system.

IMPORTANT: All data on the original OS logical drive is erased during the recovery process.

During system recovery, you can replace the existing drives with drives of the same size or larger. HP recommends that the replacement drives be the same type as the original drives, but it is not required. However, drives in the same RAID group must all be the same type (you cannot mix drive types in a RAID group).

If you replace any disk drives and then perform a system recovery, you must ensure that the replacement drives do not contain a logical drive. Use the Option ROM Configuration for Arrays (ORCA) utility to delete logical drives. For more information about ORCA, see the *Configuring Arrays on HP Smart Array Controllers Reference Guide*, which is available at:

http://www.hp.com/support/manuals

Using the System Recovery DVD to save system data

Boot the System Recovery DVD and when prompted, select **Windows Recovery Environment**. Perform the following steps:

1. Select the keyboard layout.
2. Select **Troubleshoot→Advanced Options→Command Prompt**.
3. Enter `WPEINIT` and wait for approximately ten seconds before proceeding.
4. Enter `IPCONFIG` at the command prompt to confirm that the network interface has an IP address.

NOTE:

- If your network is not using DHCP, manually assign the IP address and DNS information. The following are some examples of the commands for manually assigning an IP address:
  - `netsh interface ip set address "connection name" static 192.168.0.101 255.255.255.0 192.168.0.1`
  - `netsh interface ip add dns "connection name" 208.67.222.222`
  - `netsh interface ip add dns "connection name" 208.67.220.220 index=2`

  For more information on using the `netsh` command, go to https://technet.microsoft.com/en-us/library/bb490943.aspx.
- Starting the network might take some time. Continue to the next step only after a valid IP address is assigned to the network interface.

5. Enter `NET USE Z: \\servername\sharename` at the command prompt, where `\\servername\sharename` is the UNC path to a network share where the data will be copied.
6. If prompted, enter the username and password for the share that you are accessing.

When the share is mapped to the `Z:` drive, you can use Robocopy to copy files from the system to the network share. For more information on Robocopy, see https://technet.microsoft.com/library/cc733145.aspx.

Drive letters are not assigned after a restore

When a system that has existing data volumes (non-operating system volumes) is restored using the System Recovery DVD, the data volumes will not have drive letters assigned to them. This is by design. The volume labels are retained and can be used to identify the data volumes.

You can assign drive letters to volumes using `diskpart.exe` or Disk Management.

To use Disk Management:

1. Click **Start→Windows PowerShell**.

   The Windows PowerShell window opens.
2. Enter `diskmgmt.msc` and press **Enter**.

   The Disk Management window opens.
3. Right-click the disk and partition the one for which you want to assign a drive letter and select **Change Drive Letter and Paths**.

Restoring the factory image with a DVD or USB flash device

1. Do one of the following:
   a. For direct access, insert the System Recovery DVD or a bootable USB flash device (prepared with a System Recovery image).
   b. For remote management access, connect to the server using iLO from a client PC. Insert the System Recovery DVD in the client PC or attach a bootable USB flash device that is prepared with a System Recovery image.
2. Reboot the server blade to either the USB flash device or USB DVD drive.

   The system BIOS attempts to boot to the USB device first by default. Watch the monitor output during the boot as you may need to press a key to boot to the USB media.

   NOTE: If directly connected, you may have to change the BIOS settings to ensure proper boot sequence. If connected remotely, you may have to change some iLO settings to ensure proper boot sequence.
3. Click **Restore Factory Image**.

   The recovery process completes with minimal user intervention required. The server automatically reboots more than once.

   IMPORTANT: Do not interrupt the recovery process.

   When the upgrade process is complete, the system automatically logs in as the Administrator using “HPinvent!” as the password, and then prompts you to change the Administrator password.
4. Remove the directly connected DVD or flash device (or remotely connected iLO virtual DVD or flash device) from the server.

Using a USB flash drive for storage system recovery

If you create a backup copy of the System Recovery DVD using a USB flash drive, you can also use it to restore the system.

To create a system recovery USB flash drive:

1. Obtain a blank 8 GB or larger USB flash drive.
2. Insert the USB flash device into your workstation or laptop.
3. Open an elevated command prompt with Administrator privileges.
4. At the command prompt, enter `diskpart`.
5. At the diskpart prompt, enter `list disk`.
6. Identify the disk number that corresponds to the flash drive. This is typically the last disk listed.
7. Enter `sel disk <USB drive number>` (for example, `sel disk 4`).
8. Enter `clean`. This deletes everything from the USB flash device, so ensure that you have the proper disk selected.
9. Enter `create par primary`.
10. Enter `sel par 1`.
11. Enter `format fs=fat32 quick`.

    NOTE: If your USB flash drive does not support the FAT32 file system, format the drive as NTFS instead. Omitting the `quick` parameter lengthens the format time considerably.

12. Enter `active` to mark the partition as active.
13. Enter `assign letter=<drive letter>` to assign a drive letter to the USB drive (for example, `assign letter=U`).
14. Enter `exit` to quit diskpart context commands.
15. Insert the System Recovery DVD into the computer.
16. Using Windows Explorer or a comparable utility, open the DVD so that all contents are visible, including hidden and system files.
17. Select all of the files (including bootmgr) on the DVD.
18. Copy all of the selected files to the root of the USB flash drive.

Backing up and restoring the system with Windows Recovery Environment

To use Windows Recovery Environment, you must have created a system backup with the Windows Server Backup utility. You can either perform a single back up or schedule a regular back up.

Perform the following steps to create a one-time system backup using Server Manager:

1. Open Server Manager and click **Tools→Windows Server Backup**.
2. In the **Local Backup** window, create one-time backup of the data by performing one of the following steps:
   - From the **Action** menu, select **Backup Once**.
   - In the left pane, right-click on **Local Backup** and select **Backup Once**.

   The **Backup Once Wizard** is launched.
3. During one-time backup, the **Different options** option is selected by default. The **Schedule backup options** is unavailable. Click **Next** to continue.
4. Select **Full Server (recommended)** to backup all server data, applications, and system state and click **Next** to continue.
5. Select **Remote shared folder** as the destination type and click **Next** to continue.
6. Enter the path to the remote folder in **Location** and select the desired option in the **Access control** group. Click **Next** to continue.

7. Review the items selected for the backup and click **Backup**.

   A backup of the items is created and saved at the specified destination. The backup activity is also displayed on the **Local Backup** window.

Perform the following steps to restore the system with Windows Recovery Environment:

1. Do one of the following:
   - For direct access, connect the cable and insert the System Recovery DVD in the StoreEasy system or attach a bootable USB flash drive that is prepared with a System Recovery image.
   - For remote management access, connect to the server using iLO from the client PC. Insert the System Recovery DVD in the StoreEasy system or attach a bootable USB flash device that is prepared with a System Recovery image.
2. Reboot the server to either the USB flash device or USB DVD drive.

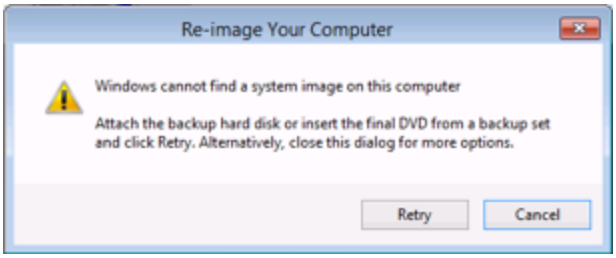
   The system BIOS attempts to boot to the USB device by default. Watch the monitor output during the boot as you may need to press a key to boot to the USB media.

   NOTE: If directly connected, you might have to change the BIOS settings to ensure proper boot sequence. If connected remotely, you might have to change some iLO settings to ensure proper boot sequence.

3. In **Windows Boot Manager**, select **Windows Recovery Environment**.

   The recovery environment is loaded and the **System Recovery Options** wizard opens.
4. Select the keyboard layout.
5. Select **Troubleshoot** to access the repair tools that allow you to recover or troubleshoot Windows.
6. Select **Advanced options** to access the advanced repair options.
7. Select **System Image Recovery** to restore the system using a previously created system recovery image.
8. Select the target operating system to be restored.

   The **Re-image your computer** wizard is launched, which scans the computer for a system image. If it is unable to locate a system image, the following message is displayed:



9. Attach an external drive or insert a DVD that contains the backup files and click **Retry**. If you want to recover from the network, click **Cancel**.
10. Select one of the following options and click **Next**:
    - **Use the latest available image**—Select to use the backup image that was recently created. If you are restoring from the network, this option is unavailable.
    - **Select a system image**—Select to restore from the network.
11. If you are restoring from the network, click **Advanced**, and then select **Search for a system image on the network**.
12. Click **Yes** on the confirmation message to proceed with the network connectivity.
13. Enter the share path where the backup image is stored and click **OK**.

14. Enter the network login credentials for authentication and click **OK**.
15. Select the system image from the list and click **Next**.
16. Select the date and time of the system image that you want to restore and click **Next**.
17. Select **Format and repartition** disks to delete existing partitions and reformat all disks during the restore process and click **Next**. If you do not want to restore certain disks, click **Exclude Disks**.

    NOTE: If the **Format and repartition disks** option is unavailable, click **Install Drivers** to install the drivers for the disks that you want to restore.

18. Verify the system image details and click **Finish** to start the recovery process.
19. Click **Yes** on the confirmation message to proceed with Windows recovery.

IMPORTANT: Do not interrupt the recovery process.

When the system recovery completes, the system reboots.

10 HP Product Feedback

The HP Product Feedback feature enables you to send your suggestions, ideas on product improvement, or feedback on HP StoreEasy 1000 Storage or any other HP product to storeeasyproductfeedback@hp.com. You can access the HP Product Feedback dialog box using the following methods:

- Double-click the **Product Feedback** icon on the desktop.
- Click **Product Feedback** on the **Start** screen.

11 Iternity iCAS

iCAS on HP StoreEasy Storage enables compliant and cost efficient archiving of enterprise application data. The flexibility of this solution enables you to grow seamlessly from a few terabyte up to hundred terabyte using the same platform. Migration of archive data, which is necessary at the long term can be done easily in the background. A shortcut to the iCAS URL is provided on the desktop and Start screen.

12 Support and other resources

Contacting HP

HP technical support

For worldwide technical support information, see the HP support website:

http://www.hp.com/support

Before contacting HP, collect the following information:

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

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

http://www.hp.com/go/e-updates

After registering, you receive email notification of product enhancements, new driver versions, firmware updates, and other product resources.

Related information

You can access the technical documents and whitepapers for HP StoreEasy 1000 Storage at http://www.hp.com/go/StoreEasy1000.

For technical documents, click **Technical Support/Manuals** under **Supporting documentation**.

For technical whitepapers, click **Data Sheets/Documents** under **Supporting documentation**. You can also access the technical whitepapers by clicking the desktop icon.

HP websites

For additional HP information, see the following HP websites:

- http://www.hp.com
- http://www.hp.com/go/storage
- http://www.hp.com/go/hpsim
- http://www.hp.com/service_locator
- http://www.hp.com/support/manuals
- http://www.hp.com/support/downloads
- http://www.hp.com/storage/whitepapers

Rack stability

Rack stability protects personnel and equipment.

WARNING! To reduce the risk of personal injury or damage to equipment:

- Extend leveling jacks to the floor.
- Ensure that the full weight of the rack rests on the leveling jacks.
- Install stabilizing feet on the rack.
- In multiple-rack installations, fasten racks together securely.
- Extend only one rack component at a time. Racks can become unstable if more than one component is extended.

Customer self repair

HP customer self repair (CSR) programs allow you to repair your storage product. If a CSR part needs replacing, HP ships the part directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your HP-authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider, or see the CSR website:

http://www.hp.com/go/selfrepair

13 Documentation feedback

HP is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback (docsfeedback@hp.com). Include the document title and part number, version number, or the URL when submitting your feedback.

A Operating system logical drives

The logical disks reside on physical drives as shown in Storage system RAID configurations (page 138).

IMPORTANT: The first two logical drives are configured for the storage system operating system.

The Operating System volume default factory settings can be customized after the operating system is up and running. The following settings can be changed:

- OS logical drive size can be changed to 60 GB or higher

If the Operating System volume is customized and the System Recovery DVD is run at a later time, the System Recovery process will maintain the custom settings as long as the above criteria are met (OS logical drive size of 60 GB or higher) and the OS volume is labeled **System**. If the storage system arrays are deleted and the System Recovery DVD is run, the System Recovery process will configure the storage system using the factory default settings listed in the table below.

HP StoreEasy 1000 Storage systems do not include preconfigured data volumes. The administrator must configure data storage for the storage system.

The system reserved partition contains the operating system boot loader and allows you to enable BitLocker Drive Encryption for the Operating System volume.

Table 11 Storage system RAID configurations

Server model	Logical Disk 1
• HP StoreEasy 14x0 Storage (base model) • HP StoreEasy 14x0 4TB SAS Storage • HP StoreEasy 14x0 8TB SATA Storage • HP StoreEasy 14x0 16TB SATA Storage	• Operating System Volume (100 GB) • RAID 6 • Physical Drives 1–4
• HP StoreEasy 15x0 Storage (base model) • HP StoreEasy 15x0 4TB SATA Storage • HP StoreEasy 15x0 8TB SATA Storage • HP StoreEasy 15x0 16TB SATA Storage	• Operating System Volume (120 GB) • RAID 6 • Physical Drives 1–4
• HP StoreEasy 16x0 Storage (base model) • HP StoreEasy 16x0 16TB SAS Storage • HP StoreEasy 16x0 32TB SAS Storage • HP StoreEasy 16x0 48TB SAS Storage	• Operating System Volume (100 GB) • RAID 1 • Physical Drives 25–26
• HP StoreEasy 18x0 Storage (base model) • HP StoreEasy 18x0 9.6TB SAS Storage • HP StoreEasy 18x0 14.4TB SAS Storage	• Operating System Volume (450 GB) • RAID 1 • Physical Drives 25–26

NOTE: In the HP Smart Storage Administrator, mapping of logical disks begins at 1. In Microsoft Disk Manager, mapping begins at 0.

If the operating system has a failure that might result from corrupt system files, a corrupt registry, or the system hangs during boot, see "Storage system recovery" (page 128).

B Network ports

The following table provides information on the local and remote network ports that are used by various HP StoreEasy 1000 Storage applications.

Table 12 Local and remote ports

Application	Local port number	Remote port number	Enable
NetBIOS TCP Port 49258	49258	Any	Yes
Network Storage System-HTTPS-3202	3202	Any	Yes
Network Storage System-HTTP-3201	3201	Any	Yes
Microsoft iSCSI Software Target Service-UDP-138	138	Any	Yes
Microsoft iSCSI Software Target Service-TCP-135	135	Any	Yes
Microsoft iSCSI Software Target Service-TCP-3260	3260	Any	Yes
OEM OOBE Discovery Service (WSD-IN)	3702	Any	Yes
OEM OOBE Discovery Service (WSD-OUT)	Any	3702	Yes
LPD Service	515	Any	Yes
Windows Standards-Based Storage Management CIM-XML indications inbound	5990	Any	Yes
Windows Standards-Based Storage Management SLP outbound	427	Any	Yes
Failover Clusters (DCOM-RPC-EPMAP-In)	135	Any	Yes
Failover Clusters — Named Pipes (NP-In)	445	Any	Yes
Failover Clusters (UDP-Out & In)	3343	3343	Yes
Failover Clusters (TCP-In)	3343	Any	Yes
SNMP Service (UDP Out)	Any	161	Yes
SNMP Service (UDP In)	161	Any	Yes
DFS Management (SMB-In)	445	Any	Yes
DFS Management (DCOM-In)	135	Any	Yes
File Server Remote Management (SMB-In)	445	Any	Yes
File Server Remote Management (DCOM-In)	135	Any	Yes
Server for NFS (NFS-UDP-In)	2049	Any	Yes

Table 12 Local and remote ports *(continued)*

Application	Local port number	Remote port number	Enable
Portmap for UNIX-based Software (TCP-In)	111	Any	Yes
Windows Sync Share (HTTPS-In)	443	Any	Yes
Windows Sync Share (HTTP-In)	80	Any	Yes
World Wide Web Services (HTTPS Traffic-In)	443	Any	Yes
World Wide Web Services (HTTP Traffic-In)	80	Any	Yes
Messaging System-HTTP-3202	3202	Any	Yes
Messaging System-HTTP-3201	3201	Any	Yes
Remote Desktop - User Mode (TCP-In)	3389	Any	Yes
Remote Desktop - User Mode ((UDP-In)	3389	Any	Yes
Core Networking - Dynamic Host Configuration Protocol for IPv6(DHCPV6-Out)	546	547	Yes
Core Networking - Dynamic Host Configuration Protocol for IPv6(DHCPV6-In)	546	547	Yes
Core Networking - Dynamic Host Configuration Protocol (DHCP-Out)	68	67	Yes
Core Networking - Dynamic Host Configuration Protocol (DHCP-In)	68	67	Yes
Remote Desktop - User Mode (UDP-In)	3389	Any	Yes
Remote Desktop - User Mode (TCP-In)	3389	Any	Yes
File and Printer Sharing (LLMNR-UDP-Out)	Any		Yes
File and Printer Sharing (LLMNR-UDP-In)	5355	Any	Yes
Windows Remote Management (HTTP-In)	5985	Any	Yes
File and Printer Sharing (NB-Session-In)	139	Any	Yes
File and Printer Sharing (NB-Session-Out)	Any	139	Yes
File and Printer Sharing (SMB-In)	445	Any	Yes

Table 12 Local and remote ports *(continued)*

Application	Local port number	Remote port number	Enable
File and Printer Sharing (SMB-Out)	Any	445	Yes
File and Printer Sharing (NB-Name-In)	137	Any	Yes
File and Printer Sharing (NB-Name-Out)	Any	137	Yes
File and Printer Sharing (NB-Datagram-In)	138	Any	Yes
File and Printer Sharing (NB-Datagram-Out)	Any	138	Yes

C Regulatory information

For important safety, environmental, and regulatory information, see *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at http://www.hp.com/support/Safety-Compliance-EnterpriseProducts.

Belarus Kazakhstan Russia marking

EAC

Manufacturer and Local Representative Information

Manufacturer's information:

- Hewlett-Packard Company, 3000 Hanover Street, Palo Alto, California 94304, U.S.

Local Representative information Russian:

- **HP Russia**: ЗАО "Хьюлетт-Паккард А.О.", 125171, Россия, г. Москва, Ленинградское шоссе, 16А, стр.3, тел/факс: +7 (495) 797 35 00, +7 (495) 287 89 05
- **HP Belarus**: ИООО «Хьюлетт-Паккард Бел», 220030, Беларусь, г. Минск, ул. Интернациональная, 36-1, офис 722-723, тел.: +375 (17) 392 28 18, факс: +375 (17) 392 28 21
- **HP Kazakhstan**: ТОО «Хьюлетт-Паккард (К), 050040, Казахстан, г. Алматы, Бостандыкский район, ул. Тимирязева, 28В, 1 этаж, тел./факс: +7 (727) 355 35 50, +7 (727) 355 35 51

Local Representative information Kazakh:

- **HP Kazakhstan**: ЖШС «Хьюлетт-Паккард (К)», Қазақстан, Алматы қ., Бостандық ауданы, Тимирязев к-сі, 28В, тел./факс: +7 (727) 355 35 50, +7 (727) 355 35 51

Manufacturing date:

The manufacturing date is defined by the serial number.

CCSYWWZZZZ (HP serial number format for this product)

Valid date formats include:

- YWW, where Y indicates the year counting from within each new decade, with 2000 as the starting point; for example, 238: 2 for 2002 and 38 for the week of September 9. In addition, 2010 is indicated by 0, 2011 by 1, 2012 by 2, 2013 by 3, and so forth.
- YYWW, where YY indicates the year, using a base year of 2000; for example, 0238: 02 for 2002 and 38 for the week of September 9.

Turkey RoHS material content declaration

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Ukraine RoHS material content declaration

Обладнання відповідає вимогам Технічного регламенту щодо обмеження використання деяких небезпечних речовин в електричному та електронному обладнанні, затвердженого постановою Кабінету Міністрів України від 3 грудня 2008 № 1057

Warranty information

HP ProLiant and X86 Servers and Options

http://www.hp.com/support/ProLiantServers-Warranties

HP Enterprise Servers

http://www.hp.com/support/EnterpriseServers-Warranties

HP Storage Products

http://www.hp.com/support/Storage-Warranties

HP Networking Products

http://www.hp.com/support/Networking-Warranties

Glossary

The following glossary terms and definitions are provided as a reference for storage products.

Glossary terms

ACL Access control list.

ADS Active Directory Service.

array A synonym of storage array, storage system, and virtual array. A group of disks in one or more disk enclosures combined with controller software that presents disk storage capacity as one or more virtual disks.

backups A read-only copy of data copied to media, such as hard drives or magnetic tape, for data protection.

A full backup copies all the data selected to be backed up. An incremental backup copies only data selected to be backed up that has changed since the last full backup.

Backups provide data protection in the event of system or hard drive failure, because the data is stored on media separate from the system hard drives.

CIFS Common Internet File System. The protocol used in Windows environments for shared folders.

CLI Command-line interface. An interface comprised of various commands which are used to control operating system responses.

cluster A group of logically integrated servers that enables high availability, increases capacity, or distributes processing.

CSR Customer self repair.

data protection A method of protecting data from being corrupted or lost as a result of hard drive failure. Methods used to provide data protection include RAID and backups.

DHCP Dynamic Host Configuration Protocol.

DNS Domain Name System.

fault tolerance The capacity to cope with internal hardware problems without interrupting the system's data availability, often by using backup systems brought online when a failure is detected. Many systems provide fault tolerance by using RAID architecture to give protection against loss of data when a single disk drive fails. Using RAID 1, 3, 5, 6, 10, or 50 techniques, the RAID controller can reconstruct data from a failed disk drive and write it to a spare or replacement disk drive.

FTP File Transfer Protocol.

HBA Host bus adapter.

HDD Hard disk drive.

ICT Initial Configuration Tasks

iLO Integrated Lights-Out.

iSCSI Internet small computer system interface. Like an ordinary SCSI interface, iSCSI is standards-based and efficiently transmits block-level data between a host computer (such as a server that hosts Exchange or SQL Server) and a target device (such as the HP All-in-One Storage System). By carrying SCSI commands over IP networks, iSCSI is used to facilitate data transfers over intranets and to manage storage over long distances.

LAN Local area network. A communications infrastructure designed to use dedicated wiring over a limited distance (typically a diameter of less than five kilometers) to connect to a large number of intercommunicating nodes. Ethernet and token ring are the two most popular LAN technologies. (SNIA)

logical disk A logical disk contains one or more volumes and spans multiple hard drives in an array. RAID configuration of storage is performed at the logical disk level. Also known as a *LUN*.

LUN	Logical unit number. A LUN results from mapping a logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN.
mount point	A host's file system path or directory name where a host volume (device) is accessed.
NAS	Network attached storage.
NCT	Network Configuration Tool
NFS	Network file system. The protocol used in most UNIX environments to share folders or mounts.
NIC	Network interface card. A device that handles communication between a device and other devices on a network.
SAN	Storage area network. A network of storage devices available to one or more servers.
SAS	Serial Attached SCSI.
SATA	Serial Advanced Technology Attachment.
SNMP	Simple Network Management Protocol. A widely used network monitoring and control protocol. Data is passed from SNMP agents, which are hardware and/or software processes reporting activity in each network device (hub, router, bridge, and so on) to the workstation console used to oversee the network. The agents return information contained in a MIB (Management Information Base), which is a data structure that defines what is obtainable from the device and what can be controlled (turned off, on, and so on).
volume	Volume on disk. An accessible storage area on disk, either physical or virtual.
volume mapping	The process by which volume permissions (read only, read/write, or none) and LUNs are assigned to a host port.

Index