Abstract

This implementation guide provides the information needed to configure the HP 3PAR StoreServ Storage with Microsoft®
Windows® Server 2008 or Windows Server 2012. Unless otherwise noted, information in the guide applies to servers running
the Windows Server 2012 operating system, to servers running the Windows Server 2012 R2 operating system, to servers
running the Windows Server 2008 operating system with Service Pack 1 (SP1) and Service Pack 2 (SP2) on both x86 (32-bit)
and x64 (64-bit) architectures, and to servers running Windows Server 2008 R2 on x64 (64-bit) architecture only.
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1 Introduction

This implementation guide provides the information needed to configure the HP 3PAR StoreServ Storage with Microsoft® Windows® Server 2012 or Microsoft® Windows® 2008. Unless otherwise noted, information in this guide applies to servers running the following operating systems:

- Windows Server 2008 with Service Pack 1 (SP1) and Service Pack 2 (SP2), on both x86 (32-bit) and x64 (64-bit) architectures
- Windows Server 2008 and Windows Server 2012 on x64 (64-bit) architecture only

This guide also applies to the HP X3000 G2 Storage System.

NOTE: This guide covers HP 3PAR StoreServ Storage systems running HP 3PAR Operating System (HP 3PAR OS) 3.1.x, OS 2.3.x, and OS 2.2.x. Information covers all of these HP 3PAR OS versions unless otherwise specified.

Although this implementation guide covers HP 3PAR OS 3.1.x, 2.3.x, and 2.2.x, Windows Server 2012 and 2012 R2 are supported only with HP 3PAR OS 3.1.x.

For information about the supported HP 3PAR OS version required to support Windows Server 2012 and 2012 R2, see the HP Single Point of Connectivity Knowledge (SPOCK) website:

HP SPOCK

Supported Configurations

The following types of host connections are supported between the HP 3PAR StoreServ Storage and hosts running a Windows Server 2012 or Windows Server 2008 OS:

- Fibre Channel (FC)
- Software iSCSI initiator
- Hardware iSCSI initiator (Windows Server 2008 R2 SP1, Windows Server 2012 and 2012 R2 only)
- Fibre Channel over Ethernet (FCoE) initiator ports to Fibre Channel HP 3PAR OS target ports (Windows Server 2008 and Windows Server 2012)
- Fibre Channel over Ethernet (FCoE) initiator ports to FCoE HP 3PAR OS target ports (Introduced with 3PAR OS 313, FCoE HP 3PAR OS targets are supported only with Windows Server 2012 and 2012 R2)
- Microsoft Hyper-V

Fibre Channel connections are supported between the HP 3PAR StoreServ Storage and the Windows Server 2012/2008 host in both a fabric-attached and direct-connect topology.

A configuration with a Windows Server 2012/2008 host requires the following software on the host, depending on the host configuration and unless otherwise specified:

- Multipathing: native Microsoft MPIO
- iSCSI only:
  - Microsoft iSCSI initiator
  - Booting from the HP 3PAR StoreServ Storage: the Double-Take Flex software iSCSI storage (supported only on Windows Server 2008)).

For information about supported hardware and software platforms, see the HP Single Point of Connectivity Knowledge (HP SPOCK) website:

HP SPOCK
NOTE: For a Software iSCSI-connected configuration, consult the Microsoft iSCSI Software Initiator Version 2.8 Users Guide, downloadable from the Microsoft website.

In addition, HP 3PAR Host Explorer software is recommended for Windows Server 2008 servers connected to an HP 3PAR StoreServ Storage running HP 3PAR OS 3.1.x or OS 2.3.x.

HP 3PAR Host Explorer software is not supported in the Windows Server 2012 or Windows Server 2012 R2 OS.

To obtain the HP 3PAR Host Explorer software, contact your HP account manager or HP Customer Support.

For more information about HP 3PAR storage products, follow the links in “HP 3PAR Storage Products” (page 7).

Table 1 HP 3PAR Storage Products

<table>
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<td>HP 3PAR StoreServ Software—Replication</td>
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HP X3000 and X3000 G2 Storage Systems

An HP 3PAR StoreServ Storage connection to an HP X3000 or HP X3000 G2 Network Storage System is supported via Fibre Channel with the HP X3000 operating system booted locally from the host internal disk. Follow the relevant sections of this implementation guide to connect the HP 3PAR StoreServ Storage to the HP X3000 or HP X3000 G2.

The following sections of this document are relevant to X3000 configurations and must be followed:

- “Introduction” (page 6)
- “Performing Preliminary HP 3PAR StoreServ Storage and Host Configuration” (page 11)
- “Setting Up a Windows Server 2008 or 2012/HP 3PAR StoreServ Storage Configuration for Fibre Channel” (page 27)
- “Booting from the HP 3PAR StoreServ Storage” (page 68)
- “Using Failover Clustering with Microsoft MPIO” (page 71)

HP 3PAR OS Upgrade Considerations

For information about planning an online HP 3PAR Operating System (HP 3PAR OS) upgrade, see the HP 3PAR Operating System Upgrade Pre-Planning Guide, which is available on the HP Support Center (SC) website:

HP Support Center

For complete details about supported host configurations and interoperability, consult the HP SPOCK website:
**WARNING!** Failing to comply with the procedures outlined in “Upgrading to HP 3PAR OS 3.1.1 or 3.1.2” (page 8) or “Upgrading to HP 3PAR OS 3.1.3” (page 9) may result in the following issue:

On the first Windows Server 2008, 2008 R2, 2012, or 2012 R2 reboot following an HP 3PAR StoreServ Storage array firmware upgrade (whether a major upgrade or an MU update within the same release family) the Windows server will mark the HP 3PAR LUNs as offline, but the data remains intact.

This behavior is seen only in the following cases:

- HP 3PAR LUNs are seen by non-clustered Windows servers.
- HP 3PAR LUNs are used in Microsoft Failover Clustering, but are not configured as shared storage in the Failover Cluster.

The behavior of LUNs being marked offline is not seen if HP 3PAR LUNs are configured as shared storage in a Microsoft Failover Cluster.

**Note:** When the HP 3PAR LUNs are marked offline, the Windows server administrator must follow these steps so that the applications can access the HP 3PAR LUNs:

1. Click **Computer Management** → **Disk Management**.
2. Right-click each of the HP 3PAR LUNs.
3. Set the LUNs as **online**.

### Upgrading to HP 3PAR OS 3.1.1 or 3.1.2

Before upgrading to HP 3PAR OS 3.1.1 or 3.1.2, HP recommends the execution of Microsoft KB2849097 on every Windows Server 2008/2012 host connected to an HP 3PAR array prior to performing an initial array firmware upgrade. Subsequently, the script contained in KB2849097 will have to be rerun on a host each time new HP 3PAR LUNs are exported to that host.

KB2849097 is a Microsoft PowerShell script designed to modify the Partmgr Attributes registry value that is located at HKLM\System\CurrentControlSet\Enum\SCSI\<device>\<instance>\Device Parameters\Partmgr. The value is responsible for the state of HP 3PAR LUNs following an array firmware upgrade. The script sets the value to "0" essentially changing its policy to "online."

**NOTE:** The following procedure will ensure proper execution of KB2849097, which will prevent the HP 3PAR LUNs from being marked offline when the Windows server is rebooted following an array firmware upgrade.

1. Windows Server 2008/2012 requires the PowerShell execution policy to be changed to RemoteSigned to allow execution of external scripts. This must be done before the script is executed. To change the PowerShell execution policy, open the PowerShell console and issue the following command:

   ```bash
   Set-ExecutionPolicy RemoteSigned
   ``

   You might be prompted to confirm this action by pressing **y**.

2. The next step is to save the script as a .ps1 file to a convenient location and execute it by issuing the following command in a PowerShell console window:

   ```bash
   C:\ps_script.ps1
   ```

   The above command assumes that the script has been saved to **C:** under the name **ps_script.ps1**.
3. The Administrator will then be prompted to provide a Vendor String, which is used to distinguish between different vendor types. The script will only modify those devices whose Vendor String matches the one that has been entered into the prompt.

Enter 3PAR in the prompt to allow the script to be executed on all HP 3PAR LUNs currently presented to the host as shown in the output below:

Enter Vendor String: 3PAR

4. The script will then iterate through all HP 3PAR LUNs currently present on the host and set the Attributes registry value to 0. In order to verify that the Attributes value for all HP 3PAR LUNs were properly modified, issue the following command:

```
Get-ItemProperty -path "HKLM:\SYSTEM\CurrentControlSet\Enum\SCSI\Disk\Ven_3PARdata\*\Device Parameters\Partmgr" -Name Attributes
```

The Attributes value should be set to 0 as shown in the example below:

```
PSPath : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\SCSI\Disk\Ven_3PARdata\Prod_VV\5&381f35e2&0&00014f\Device Parameters\Partmgr
PSParentPath : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\SCSI\Disk\Ven_3PARdata\Prod_VV\5&381f35e2&0&00014f\Device Parameters
PSChildName : Partmgr
PSDrive : HKLM
PSPProvider : Microsoft.PowerShell.Core\Registry
Attributes : 0
```

### Upgrading to HP 3PAR OS 3.1.3

After upgrading to HP 3PAR OS 3.1.3, HP requires host persona 15 to be used for Windows Server 2008, 2008 R2, 2012, or 2012 R2 to prevent this issue from occurring. Changing to host persona 15 is an online procedure. Use the HP 3PAR CLI sethost command to change the persona and verify using the showhost command following the upgrade.

```
# sethost -persona 15 windowshost
# showhost
Id Name         Persona           -WWN/iSCSI_Name- Port
 0 windowshost WindowsServer 10000000C9606724 0:5:1
                 10000000C9606724 1:5:1
```

### Peer Motion

The HP 3PAR StoreServ Storage supports data migration from one HP 3PAR StoreServ Storage to another HP 3PAR StoreServ Storage as well as EVA to HP 3PAR StoreServ Storage using Peer Motion and Online Import. See the HP 3PAR-to-3PAR Storage Peer Motion Guide for configuration and migration Details.

### Audience

This implementation guide is intended for system and storage administrators who monitor and direct system configurations and resource allocation for the HP 3PAR StoreServ Storage.

The tasks described in this guide assume that the administrator is familiar with Windows Server 2012, Windows Server 2012 R2, and Windows Server 2008 servers and with the HP 3PAR OS.
NOTE: This implementation guide is not intended to reproduce or replace any third-party product documentation. For details about devices such as hosts, HBAs, fabric switches, and non-HP 3PAR software management tools, consult the appropriate third-party documentation.
2 Performing Preliminary HP 3PAR StoreServ Storage and Host Configuration

Required

If you are setting up a fabric along with your installation of the HP 3PAR StoreServ Storage, see “Setting Up and Zoning the Fabric” (page 19) before configuring or connecting the HP 3PAR StoreServ Storage and host.

Configuring the HP 3PAR StoreServ Storage Host Persona and Ports (HP 3PAR OS 3.1.x or OS 2.3.x)

For an HP 3PAR StoreServ Storage running HP 3PAR OS 3.1.x or OS 2.3.x, each HP 3PAR StoreServ Storage port connecting to a host HBA port through a fabric or direct connection must be set to the correct host persona.

**NOTE:** When deploying HP Virtual Connect Direct-attach FC Storage for HP 3PAR StoreServ Storage, where the HP 3PAR StoreServ Storage ports are cabled directly to the uplink ports on the HP Virtual Connect FlexFabric 10 Gb/24-port Module for c-Class BladeSystem, follow the steps for configuring the HP 3PAR StoreServ Storage ports for a fabric connection.

For more information about HP Virtual Connect, HP Virtual Connect interconnect modules, and the HP Virtual Connect direct-attach feature, see HP Virtual Connect documentation. To obtain this documentation, search the HP SC website:

http://h20565.www2.hp.com/portal/site/hpsc

See also the **HP SAN Design Reference Guide**, available on the following website:

**HP SAN Design Reference Guide**

Configuring Ports on the HP 3PAR StoreServ Storage for a Direct Connection

To configure HP 3PAR StoreServ Storage ports for a direct connection to the Windows Server 2012/2008 host on HP 3PAR OS 3.1.x or OS 2.3.x, complete the following steps:

1. To set up the HP 3PAR StoreServ Storage ports for a direct connection, issue the following set of commands with the appropriate parameters for each direct connect port:
   a. `controlport offline <node:slot:port>`
   b. `controlport config host -ct loop <node:slot:port>`
      where `-ct loop` specifies a direct connection.
   c. `controlport rst <node:slot:port>`

Example:

```
# controlport offline 1:5:1
# controlport config host -ct loop 1:5:1
# controlport rst 1:5:1
```

2. After all ports have been configured, verify that the ports are configured for a host in a direct connection by issuing the `showport -par` command on the HP 3PAR StoreServ Storage.

Configuring Ports on the HP 3PAR StoreServ Storage for a Fabric Connection

To configure ports for fabric using HP 3PAR OS 3.1.x or OS 2.3.x, follow these steps:
1. To determine whether a port has already been configured for a host port in fabric mode, issue `showport -par` on the HP 3PAR StoreServ Storage.

2. If the port has not been configured, take the port offline before configuring it for connection to a host. To take the port offline, issue the HP 3PAR OS CLI command `controlport offline <node:slot:port>`.

   ```
   # controlport offline 0:4:1
   ```

3. To configure the port to the host, issue `controlport config host -ct point <node:slot:port>`, where `-ct point` indicates that the connection type specified is a fabric connection. For example:

   ```
   # controlport config host -ct point 0:4:1
   ```

4. To bring the port online, issue `controlport rst <node:slot:port>; for example:

   ```
   # controlport rst 0:4:1
   ```

5. Connect each host HBA port to the fabric. Each host HBA port’s worldwide name (WWN) should be associated with the HP 3PAR StoreServ Storage port it is connected to.

6. Complete the zoning; see “Setting Up and Zoning the Fabric” (page 19).

7. Issue `showhost` to verify that the host has connected to the HP 3PAR StoreServ Storage.

Creating the Host Definition

Before connecting the host to the HP 3PAR StoreServ Storage using HP 3PAR OS 3.1.x, create a host definition for the Windows Server 2012/2008 host.
NOTE: With HP 3PAR OS 3.1.1, HP requires host persona 1 for Windows Server 2008 R2 (only) and host persona 2 for Windows Server 2008, 2012, or 2012 R2 hosts. However, host persona 6 is automatically assigned following an online HP 3PAR OS upgrade from OS version 2.2.x. After such an upgrade, you must change host persona 6 to host persona 2.

With HP 3PAR OS 3.1.2, HP requires host persona 2 for Windows Server 2008, 2008 R2, 2012, or 2012 R2 hosts. Following an online upgrade from HP 3PAR OS 3.1.1 for Windows Server 2008 R2 hosts, you must change from host persona 1 to host persona 2.

From HP 3PAR OS 3.1.3, HP requires host persona 15 for Windows Server 2008, 2008 R2, 2012, or 2012 R2 hosts. However, host persona 2 is automatically assigned following an online HP 3PAR OS upgrade from OS version 3.1.2. After such an upgrade, you must change host persona 2 to host persona 15.

Before changing host personas, refer to the HP 3PAR Operating System Upgrade Pre-Planning Guide for instructions to prevent loss of LUN mapping.

To obtain a copy of this documentation, go to the following page on the HP SC website:

HP Support Center

Host persona 2 enables three functional features:
- HP 3PAR Host Explorer, which requires the SESLun element of host persona 2
- The UARepLun, which notifies the host of newly exported VLUNs and should trigger a LUN discovery request on the host, making the VLUN automatically available on format
- The RTPG feature, which automatically enables active/active multipathing on Windows Server 2008, 2008 R2, 2012, or 2012 R2 hosts

Host persona 15, available from HP 3PAR OS 3.1.3, includes all the functionality of Persona 2 as well as a fix for an issue where a Windows server will mark the HP 3PAR LUNs "offline" following an HP 3PAR OS upgrade.

1. To create host definitions, issue the `createhost [options] <hostname> [WWN]...` command. For example:

```
# createhost -persona 15 windowshost 10000000C9606724
```

2. To verify that the host has been created, issue the `showhost` command.

```
% showhost
Id Name           Persona        -WWN/iSCSI_Name- Port
0 windowshost    WindowsServer        10000000C9606724 ---
```

NOTE: See the HP 3PAR Command Line Interface Reference or the HP 3PAR Management Console User’s Guide for complete details on using the `controlport`, `createhost`, `sethost`, and `showhost` commands.

These documents are available on the following page of the HP SC website:

HP Support Center

Changing from Host Persona 2 to Host Persona 15

The change to host persona 15 is an online procedure:
The change to host persona 15 is an online procedure. Use the HP 3PAR CLI `sethost` command to change the persona and verify using the `showhost` command.

```
# sethost -persona 15 windowshost
# showhost
Id Name         Persona           -WWN/iSCSI_Name- Port
0  windowshost  WindowsServer    10000000C9606724  0:5:1
     10000000C9606724  1:5:1
```

Changing from Host Persona 6 or Persona 1 to Host Persona 2 (Generic-ALUA)

The change to host persona 2 is an offline procedure:

1. Stop all host I/O on the Windows Server 2008 or 2008 R2 host.
2. Shut down the host and make sure that there are no active paths shown on the HP 3PAR CLI `showhost` command.
3. Use the HP 3PAR CLI `sethost` command to change the persona and verify using the `showhost` command.

```
# sethost -persona 2 windowshost
# showhost
Id Name Persona -WWN/iSCSI_Name- Port
0 windowshost Generic-ALUA 10000000C9606724 ---
```

4. Turn on the Windows Server. The host will enable ALUA on all the LUN paths at bootup.

Configuring the HP 3PAR StoreServ Storage Port Personas and Ports (HP 3PAR OS 2.2.x)

**Required**

Windows Server 2012 and 2012 R2 are supported only on HP 3PAR OS 3.1.1 MU2 and later. This section explains these procedures for an HP 3PAR StoreServ Storage running HP 3PAR OS 2.2.x, in separate subsections:

- Configuring HP 3PAR StoreServ Storage ports for direct topology
- Configuring HP 3PAR StoreServ Storage ports for fabric topology
- Creating the host definition

Configuring HP 3PAR StoreServ Storage Ports for Direct Topology (HP 3PAR OS 2.2.x)

Follow these steps:

1. To set the port persona for each HP 3PAR StoreServ Storage port that will connect to an HBA on the host, issue `controlport persona 1 <node:slot:port>.

**NOTE:** The required port persona value for direct connect is 1.
2. To verify that each port has the correct persona and connection type, issue `showport -par`. For example:

```
# showport -par
0:4:1 loop auto disable disable (1) g_ven, g_hba, g_os, 0, DC enabled
```

3. Connect each Host HBA port to its associated HP 3PAR StoreServ Storage port. Each host HBA port’s worldwide name (WWN) should be associated with the HP 3PAR StoreServ Storage port it is connected to.

4. Issue `showhost` to verify that the host has connected to the HP 3PAR StoreServ Storage.

## Configuring HP 3PAR StoreServ Storage Ports for Fabric Topology (HP 3PAR OS 2.2.x)

To set up HP 3PAR StoreServ Storage ports for fabric connect, complete the following steps for each fabric connect port.

**CAUTION:** Do not take ports for fabric connection offline until you verify that the port has not been previously defined. A previously defined fabric port might already be connected to hosts. Taking a port offline in this scenario would interrupt the host connection. In cases where the HP 3PAR StoreServ Storage ports are already configured for fabric, the port will not have to be taken offline.

Follow these steps:

1. To determine whether a port has already been configured for a host port in fabric mode, issue `showport -par` on the HP 3PAR StoreServ Storage.

   In the output below, `loop` denotes direct connect and `point` denotes fabric.

```
# showport -par
N:S:P Connmode ConnType CfgRate MaxRate Class2   UniqNodeWwn VCN      IntCoal
0:0:1 disk  loop  auto  2Gbps  disabled  disabled  disabled enabled
0:0:2 disk  loop  auto  2Gbps  disabled  disabled  disabled enabled
0:4:1 host  point  auto  4Gbps  disabled  disabled  disabled enabled
0:4:2 host  point  auto  4Gbps  disabled  disabled  disabled enabled
0:5:1 host  point  auto  2Gbps  disabled  disabled  disabled enabled
0:5:2 host  loop  auto  2Gbps  disabled  disabled  disabled enabled
1:0:1 disk  loop  auto  2Gbps  disabled  disabled  disabled enabled
1:0:2 disk  loop  auto  2Gbps  disabled  disabled  disabled enabled
1:2:1 host  point  auto  2Gbps  disabled  disabled  disabled enabled
1:2:2 host  loop  auto  2Gbps  disabled  disabled  disabled enabled
1:4:1 host  point  auto  2Gbps  disabled  disabled  disabled enabled
1:4:2 host  point  auto  2Gbps  disabled  disabled  disabled enabled
1:5:1 host  loop  auto  4Gbps  disabled  disabled  disabled enabled
1:5:2 host  loop  auto  4Gbps  disabled  disabled  disabled enabled
1:5:3 host  loop  auto  4Gbps  disabled  disabled  disabled enabled
1:5:4 host  loop  auto  4Gbps  disabled  disabled  disabled enabled
```

2. If the port has not been configured, take the port offline before configuring it to a host, issue `controlport offline <node:slot:port>`. For example:

```
# controlport offline 1:5:1
```
3. To configure the port to the host, issue the following command:

```
# controlport persona 7 <node:slot:port>
controlport vcn disable <node:slot:port>
```

For example:

```
# controlport persona 7 1:5:1
# controlport vcn disable 1:5:1
```

**NOTE:** The required port persona value for fabric is 7. For this port persona value, VCN must be disabled.

4. To bring the port online, issue `controlport rst <node:slot:port>`; for example:

```
# controlport rst 1:5:1
```

5. Connect each host HBA port to the fabric. Each host HBA port's worldwide name (WWN) should be associated with the HP 3PAR StoreServ Storage port it is connected to.

6. Complete zoning; see “Setting Up and Zoning the Fabric” (page 19).

**Creating the Host Definition (HP 3PAR OS 2.2.x)**

Before connecting the host to the HP 3PAR StoreServ Storage, create a host definition for the Windows 2008 host:

1. Issue `createhost [options] <hostname> [WWN...]`.
   
   For example:

   ```
   # createhost windowshost 10000000C9606724
   ```

2. To verify that the host is created, issue the `showhost` command; for example:

   ```
   % showhost
   Id Name           WWN/iSCSI_Name------------- Port
   0 windowshost     10000000C9606724            ---
   ```

**Installing the HP 3PAR Host Explorer Software**

The HP 3PAR Host Explorer software is recommended for a configuration with a Windows Server 2008 OS host that is connected to the HP 3PAR OS.

**NOTE:** HP 3PAR Host Explorer software is not supported in the Windows Server 2012 OS.

To install the HP 3PAR Host Explorer program, contact your HP account manager or HP Customer Support for the CD, and follow instructions in the Host Explorer documentation.

**Setting Up Multipathing**

For high-availability storage with load balancing of I/O and improved system and application performance, Windows Server 2012/2008 requires the native Microsoft MPIO and the StorPort miniport driver. Also, a Windows Server 2008 server connected to an HP 3PAR StoreServ Storage
running HP 3PAR OS 2.2.x requires the Round Robin MPIO policy (the Veritas DMP I/O policy setting is “Round Robin”).

This section explains:
- Installing and configuring the native Microsoft MPIO for HP 3PAR StoreServ Storage
- Setting the MPIO policy to round robin for HP 3PAR OS 2.2.x

### Configuring Microsoft MPIO for HP 3PAR Storage

#### Required

For the required prerequisite Microsoft hotfixes, see HP SPOCK at [HP SPOCK](#).

For more information about the hotfixes listed on HP SPOCK, see the Microsoft website:

Microsoft

**NOTE:** The procedure in this subsection requires rebooting.

Follow these steps:

1. If you have not already done so, check HBA vendor documentation for any required support drivers, and install them.
2. If necessary, install the StorPort miniport driver.
3. If the MPIO feature is not enabled, open the Server Manager and install the MPIO feature. This will require a reboot.
4. After rebooting, open the Windows **Administrative Tools** and click **MPIO**.
5. In the **MPIO-ed Devices** tab, click the **Add** button; the **Add MPIO Support** popup appears.
6. In the **Device Hardware ID**: text box, enter `3PARdataVV`, and click **OK**. See “Adding MPIO Support for HP 3PAR Devices” (page 18).
7. Reboot as directed.

**NOTE:** You can also use MPIO-cli to add 3PARdataVV. The command is:

```
"mpclaim -r -I -d "3PARdataVV"
```

**Configuring MPIO for Round Robin**

A Windows Server 2008 server connected to an HP 3PAR StoreServ Storage running HP 3PAR OS 2.2.x or later requires that the multipath policy be set to Round Robin.

Windows Server 2012, Windows Server 2012 R2, or Windows Server 2008 R2 servers do not need to change the multipath policy, as it defaults to Round Robin.

If the server is running any supported Windows Server 2008 version prior to Windows Server 2008 R2, and if the Windows Server 2008 server is connected to an HP 3PAR StoreServ Storage array that is running HP 3PAR OS 2.2.x, the multipath policy will default to failover and must be changed to Round Robin. However, if the OS version on the HP 3PAR StoreServ Storage array is HP 3PAR OS 2.3.x or later, then you must use HP 3PAR OS host persona 1 for Windows Server 2008 R2 or host personal 2 for Windows Server 2008 non-R2 so that the multipath policy defaults to Round Robin. For recommended host persona, see “Configuring the HP 3PAR StoreServ Storage Port Personas and Ports (HP 3PAR OS 2.2.x)” (page 14).

To verify the default MPIO policy, follow these steps:

1. In the **Server Manager**, click **Diagnostics**; select **Device Manager**. Expand the **Disk drives** list.
2. Right-click an HP 3PAR drive to display its **Properties** window and select the **MPIO** tab. Select **Round Robin** from the drop-down menu. See “Specifying MPIO Policy ” (page 19).
3. Click **OK**.

### Setting Up and Zoning the Fabric

**NOTE:** This section does not apply when deploying HP Virtual Connect direct-attach FC storage for HP 3PAR StoreServ Storage systems, where the HP 3PAR StoreServ Storage ports are cabled directly to the uplink ports on the HP Virtual Connect FlexFabric 10 Gb/24-port Module for c-Class BladeSystem. Zoning is automatically configured based on the Virtual Connect SAN Fabric and server profile definitions.

For more information about HP Virtual Connect, HP Virtual Connect interconnect modules, and the HP Virtual Connect direct-attach feature, see HP Virtual Connect documentation. To obtain this documentation, search the HP SC website:

http://h20565.www2.hp.com/portal/site/hpsc

See also the **HP SAN Design Reference Guide**, available on the following website:

**HP SAN Design Reference Guide**

Fabric zoning controls which Fibre Channel end-devices have access to each other on the fabric. Zoning also isolates the host and HP 3PAR StoreServ Storage ports from Registered State Change Notifications (RSCNs) that are irrelevant to these ports.

You can set up fabric zoning by associating the device World Wide Names (WWNs) or the switch ports with specified zones in the fabric. Although you can use either the WWN method or the port
zoning method with the HP 3PAR StoreServ Storage, the WWN zoning method is recommended because the zone survives the changes of switch ports when cables are moved around on a fabric.

**Required**

Employ fabric zoning, using the methods provided by the switch vendor, to create relationships between host HBA ports and storage server ports before connecting the host HBA ports or HP 3PAR StoreServ Storage ports to the fabric(s).

Fibre Channel switch vendors support the zoning of the fabric end-devices in different zoning configurations. There are advantages and disadvantages with each zoning configuration. Choose a zoning configuration based on your needs.

The HP 3PAR StoreServ Storage arrays support the following zoning configurations:

- One initiator to one target per zone
- One initiator to multiple targets per zone (zoning by HBA). This zoning configuration is recommended for the HP 3PAR StoreServ Storage. Zoning by HBA is required for coexistence with other HP Storage arrays.

**NOTE:** For high availability/clustered environments that require multiple initiators to access the same set of target ports, HP recommends that separate zones be created for each initiator with the same set of target ports.

**NOTE:** The storage targets in the zone can be from the same HP 3PAR StoreServ Storage, multiple HP 3PAR StoreServ Storages, or a mixture of HP 3PAR and other HP storage systems.

For more information about using one initiator to multiple targets per zone, see Zoning by HBA in the Best Practices chapter of the *HP SAN Design Reference Guide*, available on the following website:

**HP SAN Design Reference Guide**

If you use an unsupported zoning configuration and an issue occurs, HP may require that you implement one of the supported zoning configurations as part of the troubleshooting or corrective action.

After configuring zoning and connecting each host HBA port and HP 3PAR StoreServ Storage port to the fabric(s), verify the switch and zone configurations using the HP 3PAR OS CLI `showhost` command, to ensure that each initiator is zoned with the correct target(s).

**HP 3PAR Coexistence**

The HP 3PAR StoreServ Storage array can coexist with other HP array families.

For supported HP array combinations and rules, see the *HP SAN Design Reference Guide*, available on the following website:

**HP SAN Design Reference Guide**

**Configuration Guidelines for Fabric Vendors**

Use the following fabric vendor guidelines before configuring ports on fabric(s) to which the HP 3PAR StoreServ Storage connects.

- Brocade switch ports that connect to a host HBA port or to an HP 3PAR StoreServ Storage port should be set to their default mode. On Brocade 3xxx switches running Brocade firmware 3.0.2 or later, verify that each switch port is in the correct mode using the Brocade telnet interface and the `portcfgshow` command, as follows:

```
brocade2_1:admin> portcfgshow
Ports  0  1  2  3  4  5  6  7
-----------------------------------------------
```
The following fill-word modes are supported on a Brocade 8 G/s switch running FOS firmware 6.3.1a and later:

```
admin>portcfgfillword
Usage: portCfgFillWord PortNumber  Mode  [Passive]
Mode: 0/-idle-idle   - IDLE in Link Init, IDLE as fill word (default)
       1/-arbff-arbff - ARBFF in Link Init, ARBFF as fill word
       2/-idle-arbff  - IDLE  in Link Init, ARBFF as fill word (SW)
       3/-aa-then-ia  - If ARBFF/ARBFF failed, then do IDLE/ARBFF
```

HP recommends that you set the fill word to mode 3 (aa-then-ia), which is the preferred mode using the `portcfgfillword` command. If the fill word is not correctly set, er_bad_os counters (invalid ordered set) will increase when you use the `portstatsshow` command while connected to 8 G HBA ports, as they need the ARBFF-ARBFF fill word. Mode 3 will also work correctly for lower-speed HBAs, such as 4 Gb/2 Gb HBAs. For more information, see the Fabric OS command Reference Manual supporting FOS 6.3.1a and the FOS release notes:

**Brocade**

In addition, some HP switches, such as the HP SN8000B 8-slot SAN backbone director switch, the HP SN8000B 4-slot SAN director switch, the HP SN6000B 16 Gb FC switch, or the HP SN3000B 16 Gb FC switch automatically select the proper fill-word mode 3 as the default setting.

- McDATA switch or director ports should be in their default modes as G or GX-port (depending on the switch model), with their speed setting permitting them to autonegotiate.
- Cisco switch ports that connect to HP 3PAR StoreServ Storage ports or host HBA ports should be set to `AdminMode = FX` and `AdminSpeed = auto port`, with the speed set to `auto negotiate`.
- QLogic switch ports should be set to port type `GL-port` and port speed `auto-detect`. QLogic switch ports that connect to the HP 3PAR StoreServ Storage should be set to I/O Stream Guard `disable` or `auto`, but never `enable`.

**Target Port Limits and Specifications**

To avoid overwhelming a target port and ensure continuous I/O operations, observe the following limitations on a target port:

- For information on the maximum number of supported host ports per HP 3PAR StoreServ Storage port, consult the "HP 3PAR Support Matrix" on HP SPOCK:
  - **HP SPOCK**

- I/O queue depth on each HP 3PAR StoreServ Storage HBA model, as follows:
  - QLogic 2G: 497
  - LSI 2G: 510
  - Emulex 4G: 959
- HP 3PAR HBA 4G: 1638
- HP 3PAR HBA 8G: 3276 (HP 3PAR StoreServ 10000 and HP 3PAR StoreServ 7000 systems only)

- The I/O queues are shared among the connected host HBA ports on a first-come, first-served basis.
- When all queues are in use and a host HBA port tries to initiate I/O, it receives a target queue full response from the HP 3PAR StoreServ Storage port. This condition can result in erratic I/O performance on each host. If this condition occurs, each host should be throttled so that it cannot overrun the HP 3PAR StoreServ Storage port's queues when all hosts are delivering their maximum number of I/O requests.

**NOTE:** When host ports can access multiple targets on fabric zones, the assigned target number assigned by the host driver for each discovered target can change when the host is booted and some targets are not present in the zone. This situation may change the device node access point for devices during a host reboot. This issue can occur with any fabric-connected storage, and is not specific to the HP 3PAR StoreServ Storage.

### HP 3PAR Priority Optimization

The HP 3PAR Priority Optimization feature introduced in HP 3PAR OS version 3.1.2. MU2 is a more efficient and dynamic solution for managing server workloads and can be utilized as an alternative to setting host I/O throttles. Using this feature, a storage administrator is able to share storage resources more effectively by enforcing quality of service limits on the array. No special settings are needed on the host side to obtain the benefit of Priority Optimization although certain per target or per adapter throttle settings may need to be adjusted in rare cases. For complete details of how to use Priority Optimization (Quality of Service) on HP 3PAR arrays, please read the HP 3PAR Priority Optimization technical white paper available at the following website:

**HP 3PAR Priority Optimization**

### HP 3PAR OS Persistent Ports

The HP 3PAR OS Persistent Ports (or virtual ports) feature minimizes I/O disruption during an HP 3PAR StoreServ Storage online upgrade or node-down event (online upgrade, node reboot, or cable pull test). Port shutdown or reset events do not trigger this feature.

Each FC target storage array port has a partner array port automatically assigned by the system. Partner ports are assigned across array node pairs.

HP 3PAR OS Persistent Ports allows an HP 3PAR StoreServ Storage FC port to assume the identity (port IP address) of a failed port while retaining its own identity. Where a given physical port assumes the identity of its partner port, the assumed port is designated as a persistent port. Array port failover and failback with HP 3PAR OS Persistent Ports is transparent to most host-based multipathing software, which can keep all of its I/O paths active.

**NOTE:** Use of HP 3PAR OS Persistent Ports technology does not negate the need for properly installed, configured, and maintained host multi-pathing software.

For a more complete description of the HP 3PAR OS Persistent Ports feature, its operation, and a complete list of required setup and connectivity guidelines, see:

- the HP Technical white paper *HP 3PAR StoreServ Persistent Ports* (HP document #F4AA4-4545ENW)
  
  This document is available on the following HP SC website:
HP Support Center

• the HP 3PAR Command Line Interface Administrator’s Manual, “Using Persistent Ports for Nondisruptive Online Software Upgrades”

This document is available on the following HP SC website:

HP Support Center

Fibre Channel

HP 3PAR OS Persistent Ports Setup and Connectivity Guidelines for FC

Starting with HP 3PAR OS 3.1.2, the HP 3PAR OS Persistent Ports feature is supported for FC target ports.

Starting with HP 3PAR OS 3.1.3, the Persistent Port feature has additional functionality to minimize I/O disruption during an array port “loss_sync” event triggered by a loss of array port connectivity to fabric.

HP 3PAR OS Persistent Ports Setup and Connectivity Guidelines for FC

Specific cabling setup and connectivity guidelines need to be followed for HP 3PAR OS Persistent Ports to function properly:

• HP 3PAR StoreServ Storage FC partner ports must be connected to the same FC Fabric and switch.

• The FC fabric being used must support NPIV, and NPIV must be enabled.

• The host-facing HBAs must be configured for point-to-point fabric connection (there is no support for direct-connect “loops”).
FCoE target support has been added in HP 3PAR OS 3.1.3. Connect the Windows host FCoE initiator ports and the HP 3PAR StoreServ Storage FCoE target ports to the FCoE switches.

**NOTE:** FCoE switch VLANs and routing setup and configuration is beyond the scope of this document. Consult your switch manufacturer’s documentation for instructions of how to set up VLANs and routing.

1. CNA ports on HP 3PAR StoreServ 10000 and HP 3PAR StoreServ 7000 arrays require a one-time configuration using the `controlport` command.

   For Example on a new FCoE config:

   ```
   # showport
   N:S:P Mode State ----Node_WWN---- -Port_WWN/HW_Addr- Type Protocol
   0:3:1 suspended config_wait - - cna -
   0:3:2 suspended config_wait - - cna -
   # showport
   N:S:P Brand Model Rev Firmware Serial HWType
   0:3:1 QLOGIC QLE8242 58 0.0.0.0 PCGLT0ARC1K3U4 CNA
   0:3:2 QLOGIC QLE8242 58 0.0.0.0 PCGLT0ARC1K3U4 CNA
   ```

2. If State=config_wait or Firmware=0.0.0.0, use the `controlport config fcoe <n:s:p>` command to configure. Use the `showport` and `showport -i` commands to verify the configuration setting.

   For example:

   ```
   # controlport config fcoe 0:3:1
   # controlport config fcoe 0:3:2
   # showport 0:3:1 0:3:2
   N:S:P Mode State ----Node_WWN---- -Port_WWN/HW_Addr- Type Protocol Label
   Partner FailoverState
   0:3:1 target ready 2FF70002AC000121 20310002AC000121 host FCoE -
   -
   0:3:2 target ready 2FF70002AC000121 20320002AC000121 free FCoE -
   -
   # showport -i 0:3:1 0:3:2
   N:S:P Brand Model Rev Firmware Serial HWType
   0:3:1 QLOGIC QLE8242 58 4.11.122 PCGLT0ARC1K3U4 CNA
   0:3:2 QLOGIC QLE8242 58 4.11.122 PCGLT0ARC1K3U4 CNA
   ```
3. Check the current settings of the FCoE ports by issuing `showport -fcoe`. For example:

```
# showport -fcoe
N:S:P ENode_MAC_Address PFC_Mask
0:3:1 00-02-AC-07-01-21 0x08
0:3:2 00-02-AC-06-01-21 0x00
```

**NOTE:** If changing the config from iSCSI to FCoE, follow the steps below.

1. Issue the `showport` command.

```
# showport
0:3:1 target ready - 000E1E05BEE6 iscsi iSCSI - - -
0:3:2 target ready - 000E1E05BEE2 iscsi iSCSI - - -
```

2. Offline the iSCSI ports by issuing the command `controlport offline [node:slot:port]`:

```
# controlport offline 0:3:1
# controlport offline 0:3:2
showport
0:3:1 target offline - 000E1E05BEE2 iscsi iSCSI 0:3:2 target offline - 000E1E05BEE2 iscsi iSCSI
```

3. Change the topology to FCoE by issuing the commands `controlport config fcoe [node:slot:port]` and `controlport rst [node:slot:port]`:

```
# controlport offline 0:3:1
# controlport offline 0:3:2
controlport rst 0:3:1
controlport rst 0:3:2
0:3:1 target offline - 000E1E05BEE2 iscsi iSCSI 0:3:2 target offline - 000E1E05BEE2 iscsi iSCSI
showport
0:3:1 target ready 2FF70002AC000121 20310002AC000121 host FCoE - - -
0:3:2 target ready 2FF70002AC000121 20320002AC000121 free FCoE - - -
```

4. Check the current settings of the FCoE ports by issuing `showport -fcoe`. For example:

```
# showport -fcoe
N:S:P ENode_MAC_Address PFC_Mask
0:3:1 00-02-AC-07-01-21 0x08
0:3:2 00-02-AC-06-01-21 0x0
```
Creating the Host Definition

The same steps for FC and FCoE hosts are followed when creating a Host Definition. For more information, see “Creating the Host Definition” (page 12).

HP 3PAR OS Persistent Ports

The HP 3PAR OS Persistent Ports (or virtual ports) feature minimizes I/O disruption during an HP 3PAR StoreServ Storage online upgrade or node-down event (online upgrade, node reboot, or cable pull test). Port shutdown or reset events do not trigger this feature.

Each FCoE target storage array port has a partner array port automatically assigned by the system. Partner ports are assigned across array node pairs.

HP 3PAR OS Persistent Ports allows an HP 3PAR StoreServ Storage FCoE port to assume the identity (port IP address) of a failed port while retaining its own identity. Where a given physical port assumes the identity of its partner port, the assumed port is designated as a persistent port. Array port failover and failback with HP 3PAR OS Persistent Ports is transparent to most host-based multipathing software, which can keep all of its I/O paths active.

NOTE: Use of HP 3PAR OS Persistent Ports technology does not negate the need for properly installed, configured, and maintained host multi-pathing software.

For a more complete description of the HP 3PAR OS Persistent Ports feature, its operation, and a complete list of required setup and connectivity guidelines, see:

• the HP Technical white paper HP 3PAR StoreServ Persistent Ports (HP document #F4AA4-4545ENW)
  This document is available on the following HP SC website:
  HP Support Center

• the HP 3PAR Command Line Interface Administrator’s Manual, “Using Persistent Ports for Nondisruptive Online Software Upgrades”
  This document is available on the following HP SC website:
  HP Support Center

Fibre Channel over Ethernet

NOTE: For information regarding the Persistent Ports feature for an FCoE initiator to FC target configuration (FCoE to FC switched), see .

HP 3PAR OS Persistent Ports Setup and Connectivity Guidelines for FCoE

Starting with HP 3PAR OS 3.1.3, the HP 3PAR OS Persistent Ports feature is supported for FCoE target ports (FCoE end-to-end configurations).

Starting with HP 3PAR OS 3.1.3 software and above, the HP 3PAR OS Persistent Ports feature is enabled by default for HP 3PAR StoreServ Storage FCoE ports during node-down events.

HP 3PAR OS Persistent Ports Setup and Connectivity Guidelines for FCoE

Specific cabling setup and connectivity guidelines need to be followed for HP 3PAR OS Persistent Ports to function properly. Key elements for the HP 3PAR OS Persistent Ports feature setup and connectivity are:

• HP 3PAR StoreServ Storage FCoE partner ports must be connected to the same FCoE network.
• The FCoE network being used must support NPIV, and NPIV must be enabled.
Checking the Host for Required Drivers

Check the Microsoft website for required packages and hotfixes, including updated drivers. Also consult HP SPOCK for support drivers, and follow HBA vendor instructions:

**HP SPOCK**
You can also use the Emulex One Command or QLogic QConvergeConsole software to verify support for HBA driver versions.

Installing and Configuring an Emulex Fibre Channel HBA

For HBA installation instructions, driver support and usage guidelines, refer to the Emulex installation and usage guide for each product type. If your configuration includes MPIO, check also for information about any required MPIO support driver.

**NOTE:** For booting from the HP 3PAR StoreServ Storage, configuring the BIOS is required. For further information, see “Configuring for an HP 3PAR StoreServ Storage Boot: Emulex HBA” (page 68).

Configuring the Emulex Support Driver

After installing the driver, set HBA driver parameters; consult the HBA driver documentation for details.

To avoid overwhelming a target port and to ensure continuous I/O operations, observe the limitations on a target port; see “Target Port Limits and Specifications” (page 21).

**NOTE:** When host ports can access multiple targets on fabric zones, the assigned target number (which is assigned by the host driver) for each discovered target can change when the host is booted and some targets are not present in the zone. This situation might change the device node access point for devices during a host reboot. This issue can occur with any fabric-connected storage, and is not specific to the HP 3PAR StoreServ Storage.

**NOTE:** If you run HP 3PAR OS Rolling Upgrade, consult the *HP 3PAR Operating System Upgrade Pre-Planning Guide*.

To obtain a copy of this documentation, go to the following page of the HP SC website:

**HP Support Center**

Checking Emulex HBA Parameters and Connection Status

Use the Emulex One Command utility to check connection status.

Installing and Configuring a QLogic Fibre Channel HBA

For HBA installation instructions, driver support and usage guidelines, refer to the QLogic installation and usage guide for each product type. If your configuration includes MPIO, check also for information about any required MPIO support driver.

**NOTE:** For booting from the HP 3PAR StoreServ Storage, configuring the BIOS is required. For further information, see “Configuring for an HP 3PAR StoreServ Storage Boot: QLogic HBA” (page 69).
Configuring the QLogic Support Driver

After installing the driver, set HBA driver parameters, such as maximum number of LUNs per target and the Port Down Retry Count; consult the HBA driver documentation for details.

To avoid overwhelming a target port and to ensure continuous I/O operations, observe the limitations on a target port; see “Target Port Limits and Specifications” (page 21).

**NOTE:** When host ports can access multiple targets on fabric zones, the target number assigned by the host driver for each discovered target can change when the host is booted and some targets are not present in the zone. This may change the device node access point for devices during a host reboot. This issue can occur with any fabric-connected storage, and is not specific to the HP 3PAR StoreServ Storage.

**NOTE:** If you perform an HP 3PAR OS Rolling Upgrade, consult the HP 3PAR Operating System Upgrade Pre-Planning Guide, which is available on the following page of the HP SC website: HP Support Center

Checking QLogic HBA Parameters and Connection Status

Use the QLogic QConvergeConsole software to check connection status.

Installing and Configuring an Brocade Fibre Channel HBA

For HBA installation instructions, driver support and usage guidelines refer to the Brocade installation and usage guide for each product type. If your configuration includes MPIO, also check for information about any required MPIO support driver.

Configuring the Brocade Support Driver

After installing the driver, set HBA driver parameters; consult the HBA driver documentation for details. To avoid overwhelming a target port and to ensure continuous I/O operations, observe the limitations on a target port; see “Target Port Limits and Specifications” (page 21).

**NOTE:** When host ports can access multiple targets on fabric zones, the target number assigned (which is assigned by the host driver) for each discovered target can change when the host is booted and some targets are not present in the zone. This situation might change the device node access point for devices during a host reboot. This issue can occur with any fabric-connected storage, and is not specific to the HP 3PAR StoreServ Storage.

**NOTE:** If you run HP 3PAR OS Rolling Upgrade, consult the HP 3PAR Operating System Upgrade Pre-Planning Guide. To obtain a copy of this documentation, go to the following page of the HP SC website: HP Support Center.

Checking Brocade HBA Parameters and Connection Status

Use the Brocade Host Connectivity Manager utility to check connection status.

To reduce the time taken to complete an MPIO path failover in the event of an issue, it is recommended that the Path TOV is set to 14 seconds.

Follow these steps to modify the Path TOV value (As shown in Figure 3 (page 29)):

1. Open the Brocade Host Connectivity Manager utility.
2. For each FC port that needs to be modified, right click on the FC port and select `vHBA Configuration` from the drop down menu.
3. Modify the `Path TOV (Seconds)` value.
4. Repeat these steps for each FC port.
5. Reboot the host to make this new setting active.
Installing Veritas DMP Multipathing on the Windows Server 2008 Host

**NOTE:** Check with Veritas for supported compatibility:

Symantec

Otherwise, when Veritas tries to validate server components, you might see the following error message:

Error message as (NOT a supported OS)

In addition, the installation will fail.

If the configuration includes Veritas Storage Foundation software, configure it for use with the HP 3PAR StoreServ Storage. Follow these steps:

1. Install the latest DDI packet from the Veritas website.
2. Select only **3PARDATA (V3PARAA)** as your DMP device: see “Setting Up Veritas Storage for the HP 3PAR StoreServ Storage” (page 30).

**Figure 4 Setting Up Veritas Storage for the HP 3PAR StoreServ Storage**

For details about this software, refer to the *Veritas Storage Foundation for Windows Administration Guide* and the *Veritas Storage Foundation & High Availability Solutions Installation & Upgrade Guide*.

**Disabling the Write Cache Option for HP 3PAR LUNs**

HP 3PAR virtual volumes/LUNs are write cache-enabled and, by design, cannot be turned off. The **Veritas Enterprise Administrator** dialog box, shown in **Figure 5 (page 31)** appears when Veritas Enterprise Administrator is invoked, with the left tree on the graphical user interface (GUI) expanded.
The HP 3PAR StoreServ Storage supports Windows Server 2012 and Windows Server 2008 software iSCSI initiators, which are described in this chapter.

In addition, as of HP 3PAR OS 3.1.2.x, the HP 3PAR StoreServ 7000 Storage and HP 3PAR StoreServ 10000 Storage introduce support for hardware iSCSI with supported Converged Network Adapters (CNAs). For more information about supported configurations, see the HP SPOCK website: HP SPOCK

To configure supported CNAs, see vendor-specific documentation.

NOTE: HP recommends that you read the Microsoft iSCSI Software Initiator Users Guide for Windows-specific concepts and procedures discussed in this chapter.

Setting Up the iSCSI Initiator and iSCSI Target Ports

Connect the host iSCSI initiator port(s) and the HP 3PAR StoreServ Storage iSCSI target ports to the switches.

If you are using VLANs, make sure that the switch ports which connect to the HP 3PAR StoreServ Storage iSCSI target ports and iSCSI Initiator ports reside in the same VLANs and/or that you can route the iSCSI traffic between the iSCSI Initiator ports and the HP 3PAR StoreServ Storage iSCSI target ports. Once the iSCSI Initiator and HP 3PAR StoreServ Storage iSCSI target ports are configured and connected to the switch, you can use the ping command on the iSCSI Initiator host to make sure that it sees the HP 3PAR StoreServ Storage iSCSI target ports.

WARNING! On Windows Server 2008/2012 servers connected to HP 3PAR F200/F400 or T400/T800 1Gb iSCSI targets, to reduce MPIO failover times, HP requires that MPIO Path Verify is enabled.

Follow these steps to enable Path Verify for Microsoft MPIO:

1. In a command shell or PowerShell window, run the regedit command.
2. In the registry editor window, navigate to the following registry key:
   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mpio\Parameters
3. Set the values of UseCustomPathRecoveryInterval to 1 and PathVerifyEnabled to 1.
4. Reboot the host for the setting to take effect.

NOTE: Switch VLAN configuration and routing setup and configuration are beyond the scope of this document. Consult your switch manufacturer’s guide for instructions about setting up VLANs and routing.

Configuring the HP 3PAR StoreServ Storage for iSCSI

Follow these steps to set up the HP 3PAR StoreServ Storage for iSCSI storage:

1. (This step applies to the HP 3PAR StoreServ 10000 Storage and the HP 3PAR StoreServ 7000 Storage.) If the HP 3PAR StoreServ Storage iSCSI ports have not been configured for iSCSI, first use this command:

   # controlport config iscsi -f N:S:P
2. Check the current iSCSI port settings: issue `showport -iscsi`. The following example shows ports offline and unconfigured.

```
<table>
<thead>
<tr>
<th># showport -iscsi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix</td>
</tr>
<tr>
<td>0:01:01</td>
</tr>
<tr>
<td>0:01:02</td>
</tr>
<tr>
<td>1:01:01</td>
</tr>
<tr>
<td>1:01:02</td>
</tr>
</tbody>
</table>
```

3. Issue `controliscsiport addr` to set the IP addresses and netmask addresses of the iSCSI target ports; for example:

```
# controliscsiport addr 10.101.1.31 255.255.0.0 -f 0:3:1
# controliscsiport addr 10.101.1.131 255.255.0.0 -f 1:3:1
```

4. Verify the configuration; the following example shows two ports ready:

```
<table>
<thead>
<tr>
<th># showport -iscsi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix</td>
</tr>
<tr>
<td>0:01:01</td>
</tr>
<tr>
<td>0:01:02</td>
</tr>
<tr>
<td>1:01:01</td>
</tr>
<tr>
<td>1:01:02</td>
</tr>
</tbody>
</table>
```

5. Issue `createhost -iscsi [options] <hostname> [<iscsi_name>...]`. Here is an example of a Windows 2008 R2 `createhost` command:
NOTE: For HP 3PAR OS 3.1.3 and later, HP requires host persona 15 for the following hosts:

- Windows Server 2008
- Windows Server 2008 R2
- Windows Server 2012
- Windows Server 2012 R2

With HP 3PAR OS 3.1.2, HP requires host persona 2 for the following hosts:

- Windows Server 2008
- Windows Server 2008 R2
- Windows Server 2012
- Windows Server 2012 R2

With HP 3PAR OS 3.1.1, HP requires the following host persona:

- host persona 2 for Windows Server 2008
- host persona 1 for Windows Server 2008 R2
- host persona 2 for Windows Server 2012
- host persona 2 for Windows Server 2012 R2

For more information on host personas and how to change persona following an HP 3PAR OS Upgrade, see “Creating the Host Definition” (page 12).

```
# createhost -iscsi -persona 15 sqa-dl380g5-08
iqn.1991-05.com.microsoft:sqa-dl380g5-08
```

6. Check the newly set up host with the `showhost` command. For example:

```
# showhost
Id  Name           Persona -------------WWN/iSCSI_Name--------------      Port
1   sqa-dl380g5-08 WindowsServer iqn.1991-05.com.microsoft:sqa-dl380g5-08 ---
```

Configuring Host iSCSI “no traffic” reattach

Follow these steps to automatically reattach dropped multipath connections that are currently carrying no traffic.

1. Change the `EnableNOPOut` parameter for the iSCSI Initiator in the Windows registry (iSCSI Ping):

   [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Class\{4D36E97B-E325-11CE-BFC1-08002BE10318}\0005<parameters>]

   **NOTE:** The \0005\ part of the registry path may be a different decimal number, such as \0003\.

2. Change the `<parameters>` value from 00000000 to 00000001:

   "EnableNOPOut"=dword:00000000

3. Reboot the server(s) for the change to take effect.
Using the Microsoft iSNS Server to Discover Registrations

Use the Microsoft iSNS server to discover the iSCSI initiator and iSCSI targets on the dedicated network. When the iSCSI Initiator and iSCSI targets have registered with the iSNS server, they automatically start discovery of the registered devices by querying the iSNS client/server via TCP/IP. A database of these registrations is also maintained.

Installing and using the iSNS server consists of these procedures, explained in separate subsections:

- Installing the iSNS server
- Using the iSNS server to discover registrations

Configuring the iSCSI Initiator and Target for iSNS Server Usage

Follow these steps:

1. Issue `showport -iscsi` to verify whether the iSCSI target ports are configured for the iSNS server; for example:

```
$ showport -iscsi
```

2. Set up the IP addresses for iSNS; for example:

```
# controliscsiport isns 10.0.0.60 0:1:1
# controliscsiport isns 10.0.0.60 1:1:1
```

3. Verify the configuration setting for iSNS; for example:

```
# showport -iscsi
```

4. Use the Windows Server 2012/2008 Add Features wizard to add the Internet Storage Name Server feature.

5. Once the iSNS server is installed on another Windows Server 2012/2008 server, open the iSCSI Initiator, click the Discovery tab. In the Discovery window, click the Add Server... button in the iSNS servers area.

6. Enter the IP address or DNS name, and then click OK.

Using the iSNS Server to Create a Discovery Domain

Follow these steps:

1. Click Start → Administrative Tools → iSNS Server → Discovery Domains tab.
2. In the window that appears, click the Create button. In the Create Discovery Domain popup, enter the discovery domain or select the default; click OK.
3. To add iSNS to the iSCSI initiator, follow these steps:
   1. Click Start→Administrative Tools→iSCSI Initiator.
   2. From the iSCSI Initiator Properties, select the Discovery tab, click the Add Server in iSNS Servers section, and enter iSNS-Server or iSNS-IP in the popup window’s Add iSNS Server setting.

Establishing a Connection with the iSCSI Initiator Software

This section explains procedures for configuring Microsoft iSCSI Initiator software to establish a connection. All of the steps after step 1 are the same for both Windows Server 2012 and Windows Server 2008. Follow these steps:

1. To start iSCSI Initiator in Windows Server 2012, click Start→Programs→Administrative Tools→iSCSI Initiator, as shown in “Starting the Windows Server 2012 iSCSI Initiator” (page 36).

Figure 6 Starting the Windows Server 2012 iSCSI Initiator

To start iSCSI Initiator in Windows Server 2008, click Start→Programs→Administrative Tools→iSCSI Initiator, as shown in “Starting the Windows Server 2008 iSCSI Initiator” (page 37).
2. From **iSCSI Initiator Properties** select **Discovery** tab.
3. From the **Discovery** tab, **Target portals** area, click the **Discover Portal...** button, and in the **Add Target Portal** dialog box, enter the IP address of the portal you want to add, as shown in “Specifying a Target Portal IP Address” (page 39).
4. Establish the connection: click Advanced; the Advanced Settings dialog box appears, as shown in “Configuring a Target Portal Connection” (page 40).
In the **Connect using** section of this dialog box, do the following:

- In the **Local Adapter** text field, select **Microsoft iSCSI Initiator**.
- In the **Initiator IP:** text field, select the IP address of the NIC adapter or CNA that you want to use to connect to the iSCSI target.

The **CRC/Checksum** is not required.

For more information about setting the CHAP login, see “Configuring Host and Target CHAP” (page 44).

5. Click **OK** in the **Advanced Settings** dialog box and again in the **Discover Target Portal** dialog box. The **Discovery** tab in the **iSCSI Initiator Properties** window displays the port information, as shown in “Target Portal Discovery” (page 41).
6. Repeat these steps to connect additional target ports. Check the connections in the **Discovery** tab in the **iSCSI Initiator Properties** window.

**Establishing an iSCSI Session and Enabling Multipathing**

To establish an iSCSI logon session with an HP 3PAR StoreServ Storage iSCSI target port, follow these steps:

1. Click the **Targets** tab. Its window displays the names and status of the ports you have configured.

2. Click the **Connect** button to establish an iSCSI connection session with the HP 3PAR StoreServ Storage iSCSI target port. The **Connect to Target** popup appears, as shown in “Connecting to a Target” (page 42).

3. Select the **Favorite Targets** and **Enable multi-path** check boxes.
4. Do not click OK; instead click the Advanced... button. The Advanced Settings window appears, as shown in “Specifying Connection Parameters” (page 43).
5. In this window, select the following settings in the **Connect using** section:

**NOTE:** If you leave the default settings for these options, the Microsoft iSCSI Initiator will not work correctly, especially if you have multiple local adapters, source IP addresses, and target ports.

- **Local adapter** drop-down menu: Microsoft iSCSI Initiator
- **Initiator IP** drop-down menu: IP address of the NIC adapter or CNA in your system that will connect to the iSCSI target port
- **Target Portal IP** drop-down menu: IP address of the target portal (iSCSI target port)

6. Click **OK** in the **Advanced Settings** window and again in the **Targets** window. The iSCSI initiator will establish an iSCSI session with the target port.

7. If desired, verify the connection: In the **Targets** section of the **iSCSI Initiator Properties** window, the **Status** column for the target will show the status as **Connected**. See “Verifying Connected Status for Both Targets” (page 44)
8. Perform Step 4 through Step 7 to add the connection to the second target portal. The iSCSI Initiator Properties window shows the status of both; see “Verifying Connected Status for Both Targets” (page 44).

Figure 14 Verifying Connected Status for Both Targets

Configuring Host and Target CHAP

This section contains procedures for configuring the Challenge-Handshake Authentication Protocol (CHAP) and removing it, in separate subsections:

- “Setting Host CHAP” (page 44)
- “Setting Target CHAP” (page 46)
- “Setting Mutual (Bidirectional) CHAP” (page 48)
- “Removing CHAP” (page 48)

Setting Host CHAP

To set a host CHAP secret, configure it on both the HP 3PAR StoreServ Storage server and the Windows Server 2012/2008 host. Follow these steps:

1. Make sure that an iSCSI host definition has been created on the HP 3PAR StoreServ Storage.
2. Use `showhost -chap` to show that no CHAP secret is already set up. In the output, host CHAP appears as `Initiator_CHAP_Name`.

```
# showhost -chap
Id Name           -Initiator_CHAP_Name- -Target_CHAP_Name
```

3. Issue `sethost initchap <chap_name> <host_name>` to set `initchap`. For example:

```
root@xnodee86a:~# sethost initchap MyChapSecret sqa-d1360g6-02-iscsi
Calling "sethost initchap" for host sqa-d1360g6-02-iscsi. Continue?
select q=quit y=yes n=no: y
```

4. Issue `showhost -chap` to verify that `initchap` has been created.

```
root@xnodee86a:~# showhost -chap
Id Name           -Initiator_CHAP_Name- -Target_CHAP_Name-
25 sqa-d1360g6-02-iscsi sqa-d1360g6-02-iscsi
```
5. In the iSCSI Initiator Properties window, click the Targets tab. In the Targets tab, choose the targets where the CHAP applies. Click Connect from Connect to Target, then check the Enable multi-path and click the Advanced... button. From the Advanced Settings windows, follow these steps, as shown in “Setting Up the Target CHAP Secret for HP 3PAR StoreServ Storage initchap” (page 46):
   a. Set Microsoft iSCSI Initiator for Local adapter
   b. Select Initiator IP
   c. Select Target Portal IP
   d. Check Enable CHAP log on box
   e. Enter CHAP secret for Target secret

   **NOTE:** Enter MyChapSecret (from the example in Step 3) at the Target secret field. See “Setting Up the Target CHAP Secret for HP 3PAR StoreServ Storage initchap” (page 46).

   **Figure 15 Setting Up the Target CHAP Secret for HP 3PAR StoreServ Storage initchap**

   Setting Target CHAP

   To set a target CHAP secret, configure it on both the HP 3PAR StoreServ Storage and the Windows Server 2012/2008 host by following these steps:
1. Issue `showhost -chap` to show that no CHAP secret is already set up.

```
# showhost -chap
Id Name           -Initiator_CHAP_Name- -Target_CHAP_Name-
```

2. To set a CHAP secret for a target, issue `sethost targetchap -chapname <chapname>` where `<chapname>` is the secret. For example:

```
# sethost targetchap -f target_secret0 sqa-dl380g5-08
```

3. To check results, issue `showhost -chap`; for example:

```
# showhost -chap
Id Name           -Initiator_CHAP_Name- -Target_CHAP_Name-
 0 sqa-dl380g5-08                       s055
```

4. In the iSCSI Initiator Properties window, click the Configuration tab. Click CHAP and enter the Initiator CHAP secret, then click OK, as shown in “Setting Up Host CHAP for HP 3PAR StoreServ Storage targetchap” (page 47).

**NOTE:** Enter `target_secret0`, from the example in step 2, at the Initiator CHAP secret field. See “Setting Up Host CHAP for HP 3PAR StoreServ Storage targetchap” (page 47).

![Figure 16 Setting Up Host CHAP for HP 3PAR StoreServ Storage targetchap](image)
Setting Mutual (Bidirectional) CHAP

To set mutual (bidirectional) CHAP, follow these steps:
1. Set the host CHAP secret following instructions in “Setting Host CHAP” (page 44).
2. Set the target CHAP secret following instructions in “Setting Target CHAP” (page 46).
3. Issue `showhost -chap`. The output shows both secrets set:

```
# showhost -chap
Id Name           -Initiator_CHAP_Name- -Target_CHAP_Name
0 sqa-dl380g5-08 sqa-dl380g5-08        s055
```

Removing CHAP

To remove CHAP from the HP 3PAR StoreServ Storage, follow these steps:
1. Issue `sethost removechap`; this command removes all CHAP information for all specified hosts. For example:

```
# sethost removechap sqa-dl380g5-0
Calling "sethost removechap" for host sqa-dl380g5-08. Continue?
select q=quit y=yes n=no: y
```

2. To check status, issue `showhost -chap`; for example:

```
# showhost -chap
Id Name           -Initiator_CHAP_Name- -Target_CHAP_Name-
0 sqa-dl380g5-08 --
```
3. In the **iSCSI Initiator Properties** window, click the **Targets** tab where the CHAP applies; click the **Connect** button from the **Connect to Target** window and check the **Enable multi-path** option. Then click the **Advanced...** button and in the **Advanced Settings** window, follow these steps, as shown in “Removing CHAP” (page 49):

a. Set Microsoft iSCSI Initiator for Local adapter.

b. Select **Initiator IP**

c. Select **Target portal IP**

d. Clear the **Enable CHAP log on** check box.

**Figure 17 Removing CHAP**

---

**Establishing a Connection with a Hardware iSCSI Initiator**

As of HP 3PAR OS 3.1.2.x, the HP 3PAR StoreServ 7000 Storage and HP 3PAR StoreServ 10000 Storage introduces support for hardware iSCSI on Windows Server 2012, Windows Server 2012 R2, and Windows Server 2008 R2 SP1 with supported converged network adapters (CNAs). For more information about supported configurations, see the HP SPOCK website:

[HP SPOCK](#)

This section describes the basic hardware iSCSI configuration using a CN1100E. For further configuration information or a different CNA type, see vendor specific documentation.
NOTE: For the Hardware iSCSI with Emulex CNAs, the UCNA driver has an extended timeout value that is set to 90 seconds. This parameter determines the amount of time the UCNA driver waits for the target to become available after it has lost connection to the target during an I/O operation.

If the iSCSI initiator loses a path to the target, this default value will delay any MPIO operations until this timeout has been reached, causing a significant delay in I/O operations.

The following registry entry can be modified to reduce the delay in I/O operations. For example, reducing this value to 30 seconds can result in the delay in I/O operations being reduced to less than 40 seconds.

To update the timeout value, follow these steps:
1. In a command shell or PowerShell window, run the `regedit` command
2. In the registry editor window, navigate to the following registry key:
   HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\be2iscsi\Parameters\Device
3. Change the `DriversParamaters` string value, modifying it to `eto=30` or adding `eto=30` as required.
4. Reboot the host for the setting to take effect.

The CNA can be configured using either dependent iSCSI (the IP address of the system is obtained from the host NIC connections) or Independent iSCSI (the IP address is entered into the CNA card). The CN1100E can be configured to boot from SAN; SCSI targets are entered into the card. For general information about the CN1100E, consult the HP website.

Requirements for the software iSCSI listed above regarding port setup, network connectivity, and VLAN configuration also apply for hardware iSCSI.

To set a static IP address, follow these steps:
1. After installing the CN1100E, boot the system. The following text appears in the BIOS:

   ```
   Emulex 10Gb iSCSI Initiator BIOS..
   Press <Ctrl> <S> for iSCSISelect(TM) Utility
   ```
2. Press Ctrl+S to enter the utility.

**Figure 18 iSCSI Utility**
3. Select a controller and press Enter.
4. From the Controller Configuration screen, select Network Configuration and press Enter.
5. In the Network Configuration screen, select Configure Static IP Address and press Enter. The screen for setting a static IP address displays.

**Figure 19 Setting a Static IP Address**

6. After entering the IP address, subnet mask, and default gateway, click Save to return to the Controller Configuration menu.

If the configuration being set up will be booted from SAN rather than from the host, follow these steps.
1. After entering the iSCSI Initiator Configuration screen, which will be the first screen displayed, obtain the IQN for the card and create a host definition on the HP 3PAR StoreServ Storage. For example:

   ```
   # createhost -iscsi -persona 2 ws2012host1 iqn.1990-07.com.emulex:a0-b3-cc-1c-94-e1
   ```

2. Assign a VLUN to this host definition to be used as the SAN boot LUN.
3. From the Controller Configuration menu, select Controller Properties.
4. In the properties screen, verify that boot support is enabled. If it is not, scroll to Boot Support and enable it, then save and exit this screen.
5. From the Controller Configuration menu, select iSCSI Target Configuration.
6. In the iSCSI Target Configuration menu, select Add New iSCSI Target and press Enter.
7. Fill in the information for the first iSCSI target. Make sure Boot Target is set to Yes.
8. After the information is filled in, click **Ping** to verify connectivity.
9. After a successful ping, click **Save/Login**.
10. After both controllers have been configured, issue the `showiscsisession` command to display the iSCSI sessions on the HP 3PAR StoreServ Storage and the host. If everything is configured correctly, the displays should appear as follows:

```
root@jnodec103140:S99814# showiscsisession
0:2:1   10.101.0.100   21   15     1 iqn.1990-07.com.emulex:a0-b3-cc-1c-94-e1
2012-09-24 09:57:58 PDT
1:2:1   10.101.1.100  121   15     1 iqn.1990-07.com.emulex:a0-b3-cc-1c-94-e1
2012-09-24 09:57:58 PDT
```

```
root@jnodec103140:S99814# showhost -d ws2012host1
1 ws2012host1 Generic-ALUA iqn.1990-07.com.emulex:a0-b3-cc-1c-94-e1 0:2:1 10.101.0.100
1 ws2012host1 Generic-ALUA iqn.1990-07.com.emulex:a0-b3-cc-1c-94-e1 1:2:1 10.101.1.100
```

11. If you do not want to use CHAP as an authentication method, exit the CN1100E setup screens and reboot now.

   If you would like to use CHAP as an authentication method, return to the **Add/Ping iSCSI Target** screen as shown in “Adding an iSCSI Target” (page 52), select **Authentication Method**, and then choose one of the following options:
   - Select **One-Way CHAP** (see “One-Way CHAP” (page 53)).
The CHAP Configuration screen appears (see “CHAP Configuration for One-Way CHAP” (page 53)).

Fill in the **Target CHAP Name** (the initiator IQN name) and **Target Secret**, then click **OK**.

- In the **Authentication Method** setting on the **Add-Ping iSCSI Target** screen (“One-Way CHAP” (page 53)), select **Mutual CHAP**. The CHAP Configuration screen appears (see “CHAP Configuration for Mutual CHAP” (page 54)).
Fill in the **Target CHAP Name** (the initiator IQN name), the **Target Secret**, the **Initiator CHAP Name** (which is the DNS name of the storage), and an **Initiator Secret**, and then click **OK**.

- If you want to remove CHAP authentication later on, in the **Authentication Method** setting on the **Add-Ping iSCSI Target** screen (“One-Way CHAP” (page 53)), select **None**.

12. If you have set up CHAP authentication, then before rebooting the host system, make sure to set the matching CHAP parameters for the host in the HP 3PAR StoreServ Storage.

**NOTE:** If you do not want to configure CHAP using BIOS, you can alter the iSCSI initiator properties after the system is booted.

- If one-way CHAP has been selected, enter the matching CHAP secret as follows:

```bash
root@jnodec103140:S99814# sethost initchap -f aaaaaabbbbbb ws2012host1
root@jnodec103140:S99814# showhost -chap
Id Name       -Initiator_CHAP_Name- -Target_CHAP_Name-
1 ws2012host1 ws2012host1           --
```

- If mutual CHAP has been selected, enter the mutual CHAP secret as follows:

```bash
root@jnodec103140:S99814# sethost targetchap -f bbbbbbcccccc ws2012host1
root@jnodec103140:S99814# showhost -chap
Id Name       -Initiator_CHAP_Name- -Target_CHAP_Name-
1 ws2012host1 ws2012host1              S814
root@jnodec103140:S99814#
root@jnodec103140:S99814# showhost -chap
Id Name       -Initiator_CHAP_Name- -Target_CHAP_Name-
1 ws2012host1 ws2012host1              S814
```

After entering the CHAP secret, exit the BIOS and reboot the host.
Target Port Limits and Specifications

To avoid overwhelming a target port and ensure continuous I/O operations, observe the following limitations on a target port:

- For information on the maximum number of supported host ports per HP 3PAR StoreServ Storage port, consult the *HP 3PAR Support Matrix* on the HP SPOCK website:
  HP SPOCK
- I/O queue depth on each HP 3PAR StoreServ Storage HBA model, as follows:
  - QLogic 1G: 512
  - QLogic 10G: 2048 (HP 3PAR StoreServ 10000 and HP 3PAR StoreServ 7000 systems only)
- The I/O queues are shared among the connected host HBA ports on a first-come, first-served basis.
- When all queues are in use and a host HBA port tries to initiate I/O, it receives a target queue full response from the HP 3PAR StoreServ Storage port. This condition can result in erratic I/O performance on each host. If this condition occurs, each host should be throttled so that it cannot overrun the HP 3PAR StoreServ Storage port’s queues when all hosts are delivering their maximum number of I/O requests.

HP 3PAR OS Persistent Ports

The HP 3PAR OS Persistent Ports (or virtual ports) feature minimizes I/O disruption during an HP 3PAR StoreServ Storage online upgrade or node-down event (online upgrade, node reboot, or cable pull test). Port shutdown or reset events do not trigger this feature.

Each iSCSI target storage array port has a partner array port automatically assigned by the system. Partner ports are assigned across array node pairs.

HP 3PAR OS Persistent Ports allows an HP 3PAR StoreServ Storage iSCSI port to assume the identity (port IP address) of a failed port while retaining its own identity. Where a given physical port assumes the identity of its partner port, the assumed port is designated as a persistent port. Array port failover and failback with HP 3PAR OS Persistent Ports is transparent to most host-based multipathing software, which can keep all of its I/O paths active.

**NOTE:** Use of HP 3PAR OS Persistent Ports technology does not negate the need for properly installed, configured, and maintained host multi-pathing software.

For a more complete description of the HP 3PAR OS Persistent Ports feature, its operation, and a complete list of required setup and connectivity guidelines, see:

- the HP Technical white paper *HP 3PAR StoreServ Persistent Ports* (HP document #F4AA4-4545ENW)
  This document is available on the following HP SC website:
  HP Support Center
- the *HP 3PAR Command Line Interface Administrator’s Manual*, “Using Persistent Ports for Nondisruptive Online Software Upgrades”
  This document is available on the following HP SC website:
  HP Support Center
HP 3PAR OS Persistent Ports Setup and Connectivity Guidelines for iSCSI

Starting with HP 3PAR OS 3.1.3, the HP 3PAR OS Persistent Ports feature is supported for iSCSI. The HP 3PAR OS Persistent Ports feature is enabled by default for HP 3PAR StoreServ Storage iSCSI ports during node-down events.

Specific cabling setup and connectivity guidelines need to be followed for HP 3PAR OS Persistent Ports to function properly.

A key element for iSCSI connectivity is that partner ports must share the same IP network.
This chapter pertains to a Windows server with an x64-based processor running an x64 version of Windows Server 2008, 2008 R2, 2012 and 2012 R2.

For details on Hyper-V operation, consult its documentation on the Microsoft website.

**Required**

A hotfix, available from Microsoft, is required to support live storage migrations with Windows Server 2012 and 2012 R2 using Cluster Shared Volumes on HP 3PAR OS 3.1.2 and later. The hotfix must be applied before updating the HP 3PAR StoreServ Storage. For more information about the required hotfix, see the Windows Server 2012 SPOCK configuration on the HP SPOCK website:

**HP SPOCK**

**Installing the Hyper-V Software**

Hyper-V software is installed by installing the Hyper-V Role from the Server Manager.

For system requirements and known issues, consult the *Microsoft Hyper-V Server 2008 Getting Started Guide* from the Microsoft Hyper-V website. Follow steps explained there to install the Hyper-V management tool, create and set up a virtual machine, install the operating system and integration services, and configure virtual networks.

**Configuring the Hyper-V Software**

To configure the Hyper-V software, follow instructions in the *Microsoft Hyper-V Server 2008 Setup and Configuration Tool Guide*.

**NOTE:** No particular parameters need to be set in the Hyper-V software to work with the HP 3PAR StoreServ Storage; no additional steps are necessary on the HP 3PAR StoreServ Storage to work with a Windows Hyper-V server.
7 Configuring the Windows Server 2012/2008 Host as an FCoE Initiator

This chapter describes the procedures for setting up a Windows Fibre Channel over Ethernet (FCoE) configuration with an HP 3PAR StoreServ Storage. These instructions cover both end-to-end FCoE and FCoE initiator to FC target.

Windows Host Requirements

The Windows host needs to meet the following software requirements:

- Obtain the supported level of CNA BIOS and firmware from: [HP](#)
- Obtain the supported level of CNA drivers from: [HP Support](#)
- Install the Emulex OneCommand Manager, the Qlogic QConvergeConsole Manager or Broadcom Advanced Control Suite (BACS) from: [HP Support](#)

For specific details of supported configurations, consult the HP SPOCK website: [HP SPOCK](#)

Configuring the FCoE Switch

Connect the Windows (FCoE Initiator) host ports and HP 3PAR StoreServ Storage server (FCoE target) ports to an FCoE-enabled switch.

**NOTE:** FCoE switch VLANs and routing setup and configuration is beyond the scope of this document. Consult your switch manufacturer’s documentation for instructions of how to set up VLANs and routing.
Procedure 1 Using system BIOS to configure FCoE

1. Enter the setup menu. The combination of keys to press to enter setup may be different depending on the host being configured. The example below is for an HP ProLiant:

   Figure 24 Setup menu for Configuring FCoE

   ![Setup menu for Configuring FCoE](image)

   2. In the System Options pane, select **NIC Personality Options**.

   Figure 25 NIC Personality Options

   ![NIC Personality Options](image)

   3. In the **PCI Slot 2** Pane, select **FCoE** for both Port 1 and Port 2.
4. PCI Slot 2 Port 1 and Port 2 now display FCoE.

5. Save the changes and exit the BIOS.

Configuring an HP 3PAR StoreServ Storage Port for a FCoE Host Connection

When setting up FCoE initiator to FC target, there is nothing unique that needs to be configured on the HP 3PAR StoreServ Storage. The initiator coming from the host adapters through the FCoE Forwarder switch is treated as just another Fibre Channel device connecting to the HP 3PAR StoreServ Storage ports. The same guidelines described in “Configuring Ports on the HP 3PAR StoreServ Storage for a Fabric Connection” (page 11) and “Setting Up a Windows Server 2008 or 2012/HP 3PAR StoreServ Storage Configuration for Fibre Channel” (page 27) must be followed when a server with a host CNA card configured with FCoE is connected to HP 3PAR StoreServ Storage ports.

When setting up FCoE initiator to FCoE target, the StoreServ ports must be configured for FCoE. For notes on how to configure FCoE ports on the StoreServ, see “Configuring the HP 3PAR StoreServ Storage for FCoE” (page 24).
NOTE: For specific configurations that support FCoE CNAs and forwarder switches, refer to the appropriate HP 3PAR OS release version on the HP SPOCK website:

HP SPOCK

Configuring Initiator FCoE to FC Target

If an FCoE to FC configuration is being set up, the following figure summarizes the general steps you should follow to configure a CNA and FCoE Forwarder Switch.

Figure 28 Initiator FCoE to FC Target

NOTE: For complete and detailed instructions for configuring a server with a given Converged Network Adapter, refer to the CNA manufacturer documentation.

The FCoE switch or FCoE forwarder must be able to convert FCoE traffic to FC and also be able to trunk this traffic to the fabric that the HP 3PAR StoreServ Storage target ports are connected to.

1. Install the CNA card in the server just like any other PCIe card - refer to the server vendor documentation.
2. Install the CNA card driver following the CNA card installation instructions (it assumes the server is already running a supported operating system).
3. Physically connect the server CNA card ports to the FCoE Forwarder switch and configure the FCoE Forwarder switch ports - refer to the switch vendor documentation.
4. Configure the HP 3PAR StoreServ Storage ports in accordance with the guidelines in “Performing Preliminary HP 3PAR StoreServ Storage and Host Configuration” (page 11) and connect the HP 3PAR StoreServ Storage port either to the FCoE Forwarder FC switch ports or the Fibre Channel fabric connected to the FCoE Forwarder.
5. Create FC zones for the host initiator’s ports and the HP 3PAR StoreServ Storage target port. Once the initiators have logged in to the HP 3PAR StoreServ Storage target ports, create a host definition and provision storage to the host.

NOTE: It is not possible to connect a server with a CNA directly to the HP 3PAR StoreServ Storage. An FCoE Forwarder switch must be used.
Configuring Initiator FCoE to Target FCoE

StoreServ ports must be configured for FCoE. For notes on how to configure FCoE ports on the StoreServ, see “Configuring the HP 3PAR StoreServ Storage for FCoE” (page 24).

Figure 29 Initiator FCoE to Target FCoE

1. Install the CNA card in the server just like any other PCIe card - refer to the server vendor documentation.
2. Install the CNA card driver following the CNA card installation instructions (it assumes the server is already running a supported operating system).
3. Physically connect the server CNA card ports to the FCoE fabric.
4. Configure the HP 3PAR StoreServ Storage ports in accordance with the guidelines in “Performing Preliminary HP 3PAR StoreServ Storage and Host Configuration” (page 11) and connect the HP 3PAR StoreServ Storage ports to the FCoE fabric.
5. Create VLANs for the host initiator’s ports and the HP 3PAR StoreServ Storage target port. Once the initiators have logged in to the HP 3PAR StoreServ Storage target ports, create a host definition and provision storage to the host.

**NOTE:** FCoE switch VLANs and routing setup and configuration are beyond the scope of this document. Consult your switch manufacturer’s documentation for instructions of how to set up VLANs and routing.
WARNING! When using HP 3PAR OS 3.1.1 MU2 (and only MU2) with Windows Server 2012 and 2012 R2, for both NTFS and ReFS filesystem types, run the following command from a PowerShell or CMD window before you run a **Perform a quick format** action on a TPVV in the Disk Management utility.

**NOTE:** These steps are not required with later versions of HP 3PAR OS with Windows Server 2012.

Run the following command:

1. 
   ```
   # fsutil behavior set disabledeletenotify 1
   ```
   This will disable the “delete notifications for all volumes” behavior. Failure to run the command will significantly increase the time it takes to complete the format operation, and the Disk Management utility may become unresponsive if you attempt to interrupt any pending format operations.

2. After all outstanding format operations have successfully completed, run the following command to re-enable the “delete notifications for all volumes” behavior:
   ```
   # fsutil behavior set disabledeletenotify 0
   ```

Creating Storage on the HP 3PAR StoreServ Storage

This section describes the basic method for creating storage.

For additional information, see the *HP 3PAR Command Line Interface Administrator’s Manual*. For a comprehensive description of HP 3PAR OS commands, see the *HP 3PAR Command Line Interface Reference*. To obtain a copy of this documentation, go to the HP SC website:

**HP Support Center**

Creating Virtual Volumes

Virtual volumes are the only data layer visible to hosts. After devising a plan for allocating space for hosts on the HP 3PAR StoreServ Storage, create the VVs for eventual export as LUNs to the Windows Server 2012/2008 host.

You can create volumes that are provisioned from one or more common provisioning groups (CPGs). Volumes can be fully provisioned from a CPG or can be thinly provisioned. You can optionally specify a CPG for snapshot space for fully-provisioned volumes.

**Using the HP 3PAR Management Console:**

1. From the menu bar, select:
   - **Actions** → **Provisioning** → **Virtual Volume** → **Create Virtual Volume**

2. Use the **Create Virtual Volume** wizard to create a base volume.

3. Select one of the following options from the **Allocation** list:
   - **Fully Provisioned**
   - **Thinly Provisioned**
Using the HP 3PAR OS CLI:

To create a fully-provisioned or thinly-provisioned virtual volume, follow these steps:

1. Issue the following HP 3PAR OS CLI command:

   ```
createvv [options] <usr_CPG> <VV_name> [.<index>] <size>[g|G|t|T]
   ```

   Here is an example:

   ```
   # createvv -cnt 10 demo 5g
   ```

2. Issue `showvv` to check the volumes created:

   ```
   # showvv
   ```

<table>
<thead>
<tr>
<th>Id</th>
<th>Name</th>
<th>Prov Type</th>
<th>CopyOf</th>
<th>BsId</th>
<th>Rd</th>
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<th>Adm</th>
<th>Snp</th>
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<td>0</td>
<td>RW</td>
<td>normal</td>
<td>0</td>
<td></td>
<td>0</td>
<td>5120</td>
</tr>
</tbody>
</table>

   **NOTE:** To create thinly-provisioned virtual volumes, an HP 3PAR Thin Provisioning license is required.

   Consult the *HP 3PAR Management Console User’s Guide* and the *HP 3PAR Command Line Interface Reference* for complete details on creating volumes for the HP 3PAR OS version that is being used on the HP 3PAR StoreServ Storage.

   These documents are available on the following page of the HP SC website:

   **NOTE:** The commands and options available for creating a virtual volume may vary for earlier versions of the HP 3PAR OS.

Exporting VLUNs to the Windows Server 2012/2008 Host

Follow the instructions for creating virtual volumes (VV)s and virtual LUNs (VLUNs) in the *HP 3PAR Command Line Interface Administrator’s Manual*.

Note the following guidelines:

- Sparse LUNs are supported (you can skip LUNs).
- You can export LUNs in nonascending order (e.g. 0, 5, 7, 3).
- The Windows Server 2012/2008 system registers only LUNs 0 to 254.
• The maximum number of usable LUNs per host port is 255. Although the HP 3PAR StoreServ Storage can export LUNs 0 to 65535, only LUNs 0 to 254 should be used for Windows configurations.

• For an HP 3PAR OS earlier than version 2.3.1, the maximum LUN size that can be presented to a Windows Server is 2 TB; for version 2.3.1 or later, the maximum LUN size that can be presented to a Windows Server is 16 TB.

Discovering LUNs

Use the Server Manager utility to display information about the disks: click Storage, and click Disk Management. “Listing Disk Devices” (page 65) shows an example.

Figure 30 Listing Disk Devices

You can also use the Emulex One Command Manager or QLogic QConvergeConsole to discover devices.

Scanning for New Devices on an Windows Server 2012/2008 Host

Disk devices on Windows servers can be used as basic disks or dynamic disks. The HP 3PAR StoreServ Storage already provides most of the extra capabilities of dynamic disks. HP strongly recommends that HP 3PAR StoreServ Storage volumes be used only as basic disks unless any of the additional features of dynamic disks are a requirement.
NOTE: If dynamic disks are used, data corruption can occur if duplicate copies of the same volume are ever concurrently exposed to a server. If you need duplicate copies, use the HP 3PAR StoreServ Storage Virtual Copy feature, or break a Windows mirrored set of disks created on two discrete HP 3PAR StoreServ Storage volumes.

For information about dynamic disks with a Windows Server 2012/2008 server, see the following website:

**Working with Basic and Dynamic Disks**

When VLUNs are exported to the Windows Server 2012/2008 server, they might not appear in the Windows Disk Manager automatically. After a new VLUN is exported from an HP 3PAR StoreServ Storage iSCSI port, issue a rescan from Windows Disk Manager or Windows Device Manager.

**NOTE:** Be sure that Windows Disk Manager is closed while you are exporting LUNs, and then wait until the Windows Device Manager shows all of the new LUN exports before you open the Windows Disk Manager. Once all LUNs have been shown as available in the Windows Device Manager, it is safe to proceed to the Windows Disk Manager to initialize and create disk partitions.

To scan for new devices on the Windows Server 2012/2008 host, follow these steps:

1. In the Windows **Server Manager** window, click **Device Manager**.
2. Right-click **Disk drives**; in the popup that appears, select **Scan for hardware changes**, as shown in “Scanning for New Devices” (page 66).

**Figure 31** Scanning for New Devices
Removing a Storage Volume from the Host

To remove a volume from the Windows Server 2012/2008 host, follow standard Microsoft administrative procedures for removing a volume, and follow the HP 3PAR StoreServ Storage standard procedure to remove a volume.

**NOTE:** Removing a disk from a Windows Server 2012/2008 host does *not* erase the data on the disk. If there is concern about the data on the disk, you might want to use a third party utility that erases the data on the disk before you remove it from the Windows Server 2012/2008 host.

SCSI UNMAP Primitive Support for Windows Server 2012

HP 3PAR OS 3.1.1 introduced support for the UNMAP storage primitive (operation code 42h) which is supported by Windows Server 2012 and 2012 R2 with the NTFS filesystem. UNMAP causes the HP 3PAR StoreServ Storage to reclaim storage space on a thinly-provisioned virtual volume (TPVV) when data or files are deleted on a supported filesystem type. This feature is useful in maintaining the volume as a thin volume with no storage disk space allocated for files that are deleted.

**NOTE:** Currently, the Windows Server 2012 and 2012 R2 Resilient File System (ReFS) does not take advantage of space reclaimed from files deleted by using the UNMAP primitive on thinly-provisioned LUNs.

Offloaded Data Transfer (ODX) Support for Windows Server 2012

HP 3PAR OS 3.1.2 introduces support for offloaded data transfer (ODX), which is supported by Windows Server 2012 and 2012 R2 with the NTFS filesystem.

In a traditional file transfer/copy operation between two LUNs on the same storage array, buffered-read and buffered-write operations would be used on the host to complete the request. With arrays that support ODX, Windows Server 2012 and 2012 R2 can complete the request by offloading the file transfer to the storage array. By doing so, ODX minimizes latencies, maximizes array throughput, and reduces resource usage such as CPU and network consumption on the host computer. Windows Server 2012 offloads file transfers transparently and automatically when you move or copy files, regardless of whether you drag-and-drop files through File Explorer or use the command-line file copy commands. For more information about ODX, see the following website:

[Microsoft](https://docs.microsoft.com/en-us/windows-server/storage/storage-optimizations/offloaded-data-transfer-odx)
9 Booting from the HP 3PAR StoreServ Storage

For details about connecting the HP 3PAR StoreServ Storage to the host, see “Performing Preliminary HP 3PAR StoreServ Storage and Host Configuration” (page 11).

Configuring for iSCSI SAN Boot

Hardware iSCSI SAN Boot is support on Windows Server 2012, Windows Server 2012 R2, and Windows Server 2008 R2 SP1 with HP 3PAR StoreServ 7000 Storage and HP 3PAR StoreServ 10000 Storage.

For more information about supported configurations, see the HP SPOCK website:

HP SPOCK

NOTE: For SAN boot with hardware iSCSI using Emulex CNAs, do not use a LUN ID higher than 4 as the boot LUN. This is a requirement of the Emulex BIOS. Failing to do this may result in the host issues when attempting to SAN boot.

For more information, refer to vendor specific documentation.

For configurations that have iSCSI connections on Windows Server 2008, the Double-Take Flex software is required.

NOTE: iSCSI SAN Boot using Double-Take Flex software is not supported on Windows Server 2012 or Windows Server 2012 R2.

See the latest version of the Double-Take Flex User’s Guide for full instructions.

NOTE: The rest of this chapter consists of instructions for configuring for an HP 3PAR StoreServ Storage boot with Fibre Channel storage.

Configuring the BIOS for Fibre Channel SAN Boot

This section explains specific host HBA settings required for booting from an HP 3PAR StoreServ Storage in a fabric configuration. Use the Boot BIOS version listed on the HP SPOCK website:

HP SPOCK

To obtain a copy of this documentation, go to the following page of the HP SC website:

HP 3PAR Support Center

NOTE: With the introduction of the Microsoft Storport driver, booting from a Storage Area Network (SAN) has become less problematic.

See the following website:

Microsoft

Configuring for an HP 3PAR StoreServ Storage Boot: Emulex HBA

To configure the Emulex HBA, follow these steps:

2. Press Alt+E. For each Emulex adapter, set the following parameters:
   - Select **Configure the Adapter’s Parameters**.
   - Select **Enable or Disable the BIOS**; for SAN boot, ensure that the BIOS is enabled.
   - Press Esc to return to the previous menu.
• Select **Auto Scan Setting**; set the parameter to First LUN 0 Device; press **Esc** to return to the previous menu.

• Select **Topology**.
  ◦ Select **Fabric Point to Point** for fabric configurations.
  ◦ Select **FC-AL** for direct connect configurations.

3. Press **Esc** to return to the previous menu if you need to set up other adapters. When you are finished, press **x** to exit and reboot.

**Configuring for an HP 3PAR StoreServ Storage Boot: QLogic HBA**

Use the QLogic HBA Fast!UTIL utility to configure the HBA. Follow these steps:

1. Boot the Windows Server 2012/2008 server; as the server is booting, press the **Alt+Q** or **Ctrl+Q** keys when the HBA BIOS prompts appear.

2. In the Fast!UTIL utility, click **Select Host Adapter** and then select the appropriate adapter.

3. Click **Configuration Settings → Adapter Settings**.

4. In the **Adapter Settings** window, set the following:
   - **Host Adapter BIOS**: Enabled
   - **Spinup Delay**: Disabled
   - **Connection Option**:
     ◦ 0 for direct connect
     ◦ 1 for fabric

   **NOTE:** Record the Adapter Port Name WWWPN for creating the host definition as explained later in this chapter.

5. Press **Esc** to exit this window.

6. Click **Selectable Boot Settings**. In the **Selectable Boot Settings** window, set **Selectable Boot Device** to **Disabled**.

7. Press **Esc** twice to exit; when you are asked whether to save NVRAM settings, click **Yes**.

8. Exit Fast!UTIL.

**Creating the Host Definition for an HP 3PAR StoreServ Storage Boot: FC**

To create the host definition for booting from the HP 3PAR StoreServ Storage, issue `createhost -persona 15 <hostname> [<WWN>...]`.

For example:

```
# createhost -persona 15 windowshost 10000000C9606724
```

To verify that the host is created, issue the `showhost` command.

```
% showhost
Id Name           Persona -------------WWN/iSCSI_Name------------- Port
0  windowshost    Generic-ALUA         10000000C9606724             ---
```
Connecting the HP 3PAR StoreServ Storage to the Host: Fibre Channel

For Fibre Channel HBAs in a Windows Server 2012/2008 host, you do not need to set any parameters for SAN boot other than those set in “Installing and Configuring an Emulex Fibre Channel HBA” (page 27) and “Installing and Configuring a QLogic Fibre Channel HBA” (page 27).

Assigning a LUN as the Boot Volume

The Windows Server 2012/2008 server must use a LUN as the boot volume for a Fibre Channel SAN boot. To assign a LUN as the boot volume, follow these steps:

1. On the HP 3PAR StoreServ Storage, create a VV of appropriate size.
2. Export it to the Windows Server 2012/2008 host. For details, see “Exporting VLUNs to the Windows Server 2012/2008 Host” (page 64). The Boot LUN should be the lowest-ordered LUN number that exports to the host.
3. Restrict the host to a single path connection to the HP 3PAR StoreServ Storage. Only a single path should be available on the HP 3PAR StoreServ Storage and a single path on the host to the VLUN that will be the boot volume.

Installing the Host OS onto the Fibre Channel Boot Volume

The HP 3PAR StoreServ Storage supports Windows Server 2012/2008 host boot. You can install the Windows Server 2012/2008 OS to boot from the HP 3PAR StoreServ Storage. Follow all recommended settings and guides.

To install the Windows Server 2012/2008 OS on HP 3PAR StoreServ Storage volumes, follow these steps:

1. It is recommended that the connection between the HP 3PAR StoreServ Storage and the Windows Server 2012/2008 host system be a single-path connection.
2. Follow standard procedures in the Microsoft documentation for installing the OS on a bootable device.
3. Reboot the Windows Server 2012/2008 system. The HP 3PAR StoreServ Storage volume is configured with the Windows Server 2012/2008 OS.

Connecting Multiple Paths for Fibre Channel SAN Boot

After the Windows Server 2012/2008 host completely boots up and is online, connect additional paths to the fabric or the HP 3PAR disk storage system directly by completing the following tasks.

1. On the HP 3PAR StoreServ Storage, issue createhost -add <hostname> <WWN> to add the additional paths to the defined HP 3PAR StoreServ Storage host definition.
The HP 3PAR StoreServ Storage supports failover clustering. Set up the cluster according to Microsoft recommendations.
Using Failover Clustering in a Virtualized Environment

The HP 3PAR StoreServ Storage supports failover clustering on some VMware ESX/ESXi virtualized environments as guest OS clustering. For the purposes of setup and configuration, such an environment is to be considered a VMware ESX configuration.

Setup of the host ESX/ESXi servers should be in accordance with the *HP 3PAR VMware ESX Implementation Guide*.

For additional information on the configuration of a Windows Server 2012/2008 failover cluster within a set of virtual machines on VMware ESX, see VMware KB-000269-02 (for ESX/ESXi 4.0) or VMware KB-000271-00 (for ESX/ESXi 4.1).
12 Using the Veritas Cluster Server

Symantec Storage Foundation

Symantec Storage Foundation (SF) 5.1 SP1, SP2 and SF 6.0.x have a space-reclamation feature to reclaim space from a thinly-provisioned virtual volume (TPVV). When working with a failover cluster and VxDMP, this feature is not supported, as a failover cluster requires basic disks, and the space reclamation feature is available only on dynamic disks (the Veritas DMP I/O policy setting is "Round Robin").

Installing the Veritas Cluster Server

The HP 3PAR StoreServ Storage supports use with Veritas Cluster Server and there are no special setup considerations for the HP 3PAR StoreServ Storage server. Refer to the Veritas Cluster Server Installation Guide and the Veritas Cluster Server User’s Guide for installation and setup instructions.

Setting SCSI-3 Persistent Reservation Support for the HP 3PAR StoreServ Storage

NOTE: This section applies only to systems using Windows Server 2008 non-R2 OSs with Veritas 5.1 GA.

For Veritas Cluster Server (VCS) V5.1 and later, you can enable or disable the SCSI 3 support. Follow these steps:

1. Download latest DDI (DDI-2.1) from the following website:
   Symantec Support

2. Save the DDI to a folder (Figure 32 (page 73)):

   ![Figure 32 Saving the DDI to a Folder](image)

3. Extract DDI files.
4. Verify the HP 3PAR enable/disable script:

   DisableSupportSCSI3V3paraa & EnableSupportSCSI3V3paraa
5. By default, the 3PAR Support for SCSI 3 appears as 0x00000000 (0) in the Data column. To confirm, click Start → Run → regedit → Computer → HKEY_LOCAL_MACHINE → SYSTEM → CurrentControlSet → Services → v3paraa → Parameters. See Figure 33 (page 74)

Figure 33 V3PARAA Parameters

6. To enable HP 3PAR SCSI-3 support, click the EnableSupportSCSI3V3paraa script (Figure 34 (page 74)), then reboot the server after the script runs.

Figure 34 Enabling Script Support

7. After the script runs, the HP 3PAR Support SCSI-3 appears as 0x00000000 (1) in Data column.
8. Open the Veritas Enterprise Administrator (VEA) to verify the new settings (Figure 35 (page 75)).

![Figure 35 Veritas Enterprise Administrator](image-url)
The HP 3PAR StoreServ Storage supports Microsoft failover clustering with Veritas DMP on Windows Server 2008, but not on Windows Server 2012 or Windows Server 2012 R2. Follow Microsoft recommendations when setting up the cluster, as well as Symantec recommendations when setting up DMP to support Microsoft clustering (the Veritas DMP I/O policy setting is "Round Robin").

See the following website:

Symantec Support
Installing the Veritas DMP

When installing Veritas DMP, be sure that 3PARDATA (VA3PARAA) is checked. See “Setting Up Veritas Storage for the HP 3PAR Storage Server” (page 78).

⚠️ **WARNING!** Veritas Storage Foundation 5.1 and Veritas Storage Foundation HA 5.1 require the use of 8-byte long WWNs on every virtual volume exported from an HP 3PAR StoreServ Storage array to the Windows Server host. Using 16-byte-long WWNs instead with the above Veritas Storage Foundation version may prevent the Veritas Storage Foundation software from recognizing 3PAR disks properly.

To verify the length of the WWN currently assigned to a virtual volume, issue the following command:

```
# showvv -d
```

The below example illustrates how both types of WWNs appear in the above command’s output. Please note that testvv1 has a 16-byte WWN assigned against it whereas testvv2 has an 8-byte long WWN.

```
# showvv -d
Id Name Rd Mstr Prnt Roch Rwch PPrnt PBlkRemain ------------ VV_WWN-------------
-----CreationTime------
1 .srdata RW 1/0/- --- --- --- ---   --        60002AC00000000000000000185E4
2012-08-17 09:44:48 PDT
0 admin   RW 1/0/- --- --- --- ---   --        60002AC000000000000000000185E4
2012-08-17 09:41:04 PDT
998 testvv1 RW 1/0/- --- --- --- ---   --        60002AC000000000000000038200185E4
2013-06-03 01:23:13 PDT
999 testvv2 RW 1/0/- --- --- --- ---   --        50002AC0038200185E4
2013-06-03 01:22:20 PDT
```

The WWN of a virtual volume cannot be changed while it’s actively exported to hence the change must be performed before the virtual volume is exported or after all its associated VLUNs were removed. To change the WWN of a virtual volume, issue the following command:

```
# setvv -wwn <new wwn> <vv name>
```

For example:

```
# setvv -wwn 50002AC003D885E4 testvv1
```

The above command assumes that 50002AC003D885E4 is the newly assigned WWN and testvv is the name of the virtual volume for which the WWN is being changed.

To verify that the WWN change has taken place, issue `showvv -d` and examine the output.
Figure 36 Setting Up Veritas Storage for the HP 3PAR Storage Server
14 Support and Other Resources

Contacting HP

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

Specify the type of support you are requesting:

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<th>Support request</th>
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<td><a href="http://www.hp.com/go/3par">http://www.hp.com/go/3par</a></td>
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<td>Backing up VMware databases and using backups for disaster recovery</td>
<td>HP 3PAR Management Plug-in and Recovery Manager Software for VMware vSphere User’s Guide</td>
</tr>
<tr>
<td>Installing and using the HP 3PAR VSS (Volume Shadow Copy Service) Provider software</td>
<td>HP 3PAR VSS Provider Software for Microsoft Windows User’s Guide</td>
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<td>for Microsoft Windows</td>
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<tr>
<td>Best practices for setting up the Storage Replication Adapter for VMware vCenter</td>
<td>HP 3PAR Storage Replication Adapter for VMware vCenter Site Recovery Manager Implementation Guide</td>
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<tr>
<td>Troubleshooting the Storage Replication Adapter for VMware vCenter Site Recovery</td>
<td>HP 3PAR Storage Replication Adapter for VMware vCenter Site Recovery Manager Troubleshooting Guide</td>
</tr>
<tr>
<td>Installing and using vSphere Storage APIs for Array Integration (VAAl) plug-in</td>
<td>HP 3PAR VAAI Plug-in Software for VMware vSphere User’s Guide</td>
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<td>software for VMware vSphere</td>
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</tbody>
</table>
### Typographic conventions

#### Table 2 Document conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Element</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bold text</strong></td>
<td>• Keys that you press</td>
</tr>
<tr>
<td></td>
<td>• Text you typed into a GUI element, such as a text box</td>
</tr>
<tr>
<td></td>
<td>• GUI elements that you click or select, such as menu items, buttons,</td>
</tr>
<tr>
<td></td>
<td>and so on</td>
</tr>
<tr>
<td><strong>Monospace text</strong></td>
<td>• File and directory names</td>
</tr>
<tr>
<td></td>
<td>• System output</td>
</tr>
<tr>
<td></td>
<td>• Code</td>
</tr>
<tr>
<td></td>
<td>• Commands, their arguments, and argument values</td>
</tr>
<tr>
<td><code>&lt;Monospace text in angle brackets&gt;</code></td>
<td>• Code variables</td>
</tr>
<tr>
<td></td>
<td>• Command variables</td>
</tr>
<tr>
<td><strong>Bold monospace text</strong></td>
<td>• Commands you enter into a command line interface</td>
</tr>
<tr>
<td></td>
<td>• System output emphasized for scannability</td>
</tr>
</tbody>
</table>

⚠️ **WARNING!** Indicates that failure to follow directions could result in bodily harm or death, or in irreversible damage to data or to the operating system.

⚠️ **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.

**NOTE:** Provides additional information.

### Required

Indicates that a procedure must be followed as directed in order to achieve a functional and supported implementation based on testing at HP.

### HP 3PAR branding information

- The server previously referred to as the "InServ" is now referred to as the "HP 3PAR StoreServ Storage system."
- The operating system previously referred to as the "InForm OS" is now referred to as the "HP 3PAR OS."
- The user interface previously referred to as the "InForm Management Console (IMC)" is now referred to as the "HP 3PAR Management Console."
- All products previously referred to as "3PAR" products are now referred to as "HP 3PAR" products.
15 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.