hp StorageWorks Booting Windows Systems from a Storage Area Network

This document describes how to boot Microsoft Windows systems from StorageWorks Enterprise Virtual Arrays and Enterprise Modular Arrays when configured on ProLiant servers.

For the latest version of these Application Notes and other storage documentation, access the HP storage website at http://www.hp.com/country/us/eng/prodserv/storage.html.

Application Notes Contents

These Application Notes describe boot set up procedures for specific software solutions, Fibre Channel Host Bus Adapter (HBA) firmware versions, and boot BIOS versions.

Intended Audience

This document is intended for customers who are familiar with:

- HSG80-based or Enterprise Virtual Array-based Fibre Channel RAID Array technology and the interconnections required to attach to an HBA in a Windows server. This information is in the StorageWorks RAID Array and StorageWorks Software Solution kit (Software Solution kit) documentation.

- Windows operating systems

- HBAs

- Switch zoning

Introduction

Traditionally, HP ProLiant servers boot operating systems from internal SCSI and IDE storage devices. With the support of external booting with StorageWorks fibre channel host bus adapters (HBA) and RAID Arrays, customers can optionally eliminate server-based internal boot devices. Booting from an external device provides decreased downtime through faster server replacement in the event of a server failure.

Why Boot to a SAN?

Booting to the SAN provides:

- Redundant storage paths

- Disaster Recovery

- Improved security

- Minimize server maintenance

- Reduce impact on production servers

- Reduce backup window

Additional Information

For detailed information about HBAs, switches, storage arrays, and storage software, access the following HP websites:

Topic	HP Website
HBAs and switches	http://h18006.www1.hp.com/storage/saninfrastructure.html
Storage array systems	http://h18006.www1.hp.com/storage/arraysystems.html
Secure Path	http://h18006.www1.hp.com/products/sanworks/secure-path/index.html
ProLiant servers	http://h18004.www1.hp.com/products/servers/platforms/storage.html

Supported Configurations

This document describes single server, cluster, and Secure Path-based configurations using:

■   Enterprise Modular Array—transparent or multiple bus failover modes

■   Enterprise Virtual Array—multiple bus failover mode or single path

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Note: For information about booting to a SAN on MSA1000 systems, go to the HP website at http://h18006.www1.hp.com/products/msa1000/documentation.html.

Restrictions

Operating System Restrictions

Microsoft Windows operating systems require a unique, dedicated disk for booting. Therefore, each server connected to a RAID Array must have its own disk, or LUN (Logical Unit Number), dedicated solely for booting and operating system files. Data can be allocated across both the boot disk and the remaining disks. Booting from array-based disk partitions is possible.

Note: The memory paging system requires fast access to the *pagefile.sys* file. In some cases, in SAN environments with heavy I/O loads, the access request for moving information to or from the paging file may be delayed. This can cause the operating system to halt, requiring a reboot to recover. Microsoft recommends that if paging errors occur, page files should be relocated to disks that are built into the server using its internal data paths. Microsoft has published a technical article with additional recommendations related to booting from a SAN at: http://support.microsoft.com/default.aspx?scid=kb;EN-US;q305547.

Clustered Server Restrictions

■ Microsoft requires that clustered servers (MSCS) keep boot disks on data paths that are separate from shared-storage paths. This requires a dedicated HBA port for booting and another HBA port for shared disks.

■ There is no MSCS failover clustering support for ProLiant BL20P servers (due to the 4 HBA requirement).

Standalone Server Restrictions

In a standalone server environment, an HBA port can share boot and data paths.

Server Replacement In The Event Of A Server Failure

You must retain the HBAs to ensure that the replacement server hardware components are identical in every way to the one you are replacing. Place each HBA into the PCI slots of the new server in the same order as they were placed in the old server.

If you are using an internal disk for your paging file system, you can move this disk to the replacement server. You can also use a new disk, but you must format it and manually reset the paging to that disk.

If you are using a BL20p, you must remap all the LUNS to the onboard Fibre Channel adapters.

Required Hardware And Software

RAID Arrays

- Enterprise Virtual Array (EVA5000 and EVA3000) V2.x and V3.x
- Enterprise Modular Array (MA6000, MA8000, EMA12000, EMA16000, ESA 12000 Fibre Channel)

Refer to the Solution Software kit documentation for detailed information.

Host Bus Adapters

- 64-bit PCI to Fibre Channel 1 GB Host Bus Adapter DS-KGPSA-CB, part number 176479-B21
- FCA2101 2 GB Host Bus Adapter, part number 245299-B21
- FCA2355DC 2 GB PCI-X Host Bus Adapter, part number 321835-B21
- FCA2214 2 GB PCI-X Host Bus Adapter, part number 254456-B21
- FCA2214DC 2 GB PCI-X Host Bus Adapter, part number 321835-B21
- FCA2404 2 GB PCI-X Host Bus Adapter, part number 3218535-B21

Note: Refer to each adapter's release notes for LUN limitations.

Fibre Channel Switches

Booting from the SAN is supported on B-Series and M-Series switch products. Refer to the *HP StorageWorks SAN Design Reference Guide* for the current list of supported switch models for these product lines. This guide is available at http://h18006.www1.hp.com/products/storageworks/san/documentation.html

Servers

All HP ProLiant Servers, including BL20p and BL40p, are supported. For detailed information, refer to
http://h18004.www1.hp.com/products/servers/platforms/storage.htmlf

Operating Systems

The following Microsoft Windows systems are supported:
- Windows NT 4.0 Enterprise Edition SP6a
- Windows NT 4.0 Server SP6a
- Windows 2000 Server SP2, SP3, SP4
- Windows 2000 Advanced Server SP2, SP3, SP4
- Windows Server 2003, Standard Edition
- Windows Server 2003, Enterprise Edition

Boot Setup Procedures for Specific Software Solutions

The following sections describe boot set up procedures for specific software solutions. Table 1 shows the supported host bus adapter (HBA) firmware, boot BIOS, and driver versions.

Table 1: Supported HBA Firmware, Boot BIOS, and Driver Versions

Host Bus Adapter	Firmware	BIOS	Minimum Driver
64-bit PCI to Fibre Channel 1 GB Host Bus Adapter DS-KGPSA-CB, part number 176479-B21	3.91a1	1.63a1	4.82a16
FCA2101 2 GB Host Bus Adapter, part number 245299-B21	3.91a1	1.63a1	4.82a16
FCA2355 2 GB PCI-X Host Bus Adapter, part number 321835-B21	3.91a1	1.63a1	4.82a16
FCA2404 2 GB PCI-X Host Bus Adapter, part number 3218535-B21	1.01a1	1.63a1	4.82a16
FCA2214 2GB PCI-X Host Bus Adapter, part number 281541-B21	N/A	1.33	8.0.2.72
FCA2214DC 2GB PCI-X Host Bus Adapter, part number 321835-B21	N/A	1.33	8.0.2.72
Dual Port Fibre Channel Mezzanine Card (2 Gb) for BL20Gp2 G2	N/A	1.33	8.0.2.72

Note: For FCA2214, FCA2214DC, and Mezzanine HBAs, firmware loads at driver load time.

The procedures include:

- ■ Configuring ProLiant Essentials Rapid Deployment Pack (RDP) – If you are using RDP to provide automated server deployment and redeployment, refer to Deploying Servers that Boot from a SAN with the Rapid Deployment Pack, page 18 before performing the Enterprise Modular Arrays or Enterprise Virtual Arrays procedures

- ■ Enterprise Modular Arrays

  — Windows Boot Setup Procedure for Modular Arrays Configured in Transparent Failover Mode, page 26

  — Windows Boot Setup Procedure for Modular Arrays Configured in Multiple Bus Failover Mode, page 31

- ■ Enterprise Virtual Arrays

  — Windows Boot Setup Procedures for Enterprise Virtual Array Configured in Multiple Bus Failover Mode, page 36

  — Windows Boot Setup Procedures for Enterprise Virtual Array Single Path, page 41

Prerequisites

To perform these procedures, you should be familiar with:

■ HSG80-based or Enterprise Virtual Array-based Fibre Channel RAID Array technology (depending on your system configuration) and the interconnections required to attach to an HBA in a Windows-based server. This information is in the RAID Array and Software Solution kit documentation.

■ Windows NT 4.0, Windows 2000, Windows Server 2003

The following procedures are not described in this document. However, they must be performed before performing this installation.

■ MA8000/EMA12000/EMA16000, or MA6000

— Set and/or verify the HSG80 controller port topology for your configuration.

— Set and/or verify the controller SCSI Version. In SCSI-3 mode, LUN 0 is assigned to the Command Console. Therefore, the unit you assign as your boot disk must be LUN 1 or higher. **SCSI-3 mode is recommended**.

— Verify that all existing storage units have the proper access.

— Delete any unused connections.

Note: Reference to the HSG80 are intended to cover all of the MA8000 RAID Array products.

■ Enterprise Virtual Array—Verify that all existing storage units (virtual disks) have the proper access settings.

■ Switch-based configurations and zoning—If zoning is enabled, check the switch to ensure there are no zoning conflicts.

Special Considerations For Boot Disk Partitions

■ Before attempting to create a boot disk, you must ensure that you are starting with a clean, unpartitioned virtual disk.

■ If you are planning to set up booting from a RAID Array that has other virtual disks attached to other servers, be aware of the following information note that when setting up booting for the new server, the installation program displays a list of partitions available for loading the operating system. The display contains a disk for every controller port accessible by the HBA. Although it appears that there are more than one virtual disk available for booting, there is really only one available virtual disk.

Windows Boot Process

On Intel-based computers, the system BIOS controls the initial operating system boot process. After the initial Power On Self Test (POST) when hardware components are initialized, the system BIOS identifies the boot device. Typically, this is a floppy disk or a hard disk. In the case of the hard disk, the BIOS reads the first physical sector on the disk, called the Master Boot Sector, and loads an image of it into memory. The BIOS then transfers execution to that image of the Master Boot Sector.

The Master Boot Record contains the partition table and a small amount of executable code. The executable code examines the partition table and identifies the active (or bootable) partition. The Master Boot Record then finds the active partition's starting location on the disk and loads an image of its first sector, called the Boot Sector, into memory. The Master Boot Record then transfers execution to that Boot Sector image.

Whereas the Master Boot Record is generally operating system independent, the Boot Sector of the active partition is dependent on both the operating system and the file system. In the case of Windows, the Boot Sector is responsible for locating the executable file, *NTLDR*, which continues the boot process. The only disk services available to the Boot Sector code at this stage of system boot up are provided by the BIOS INT 13 interface. The Boot Sector code must be able to find NTLDR and file system data structures such as the root directory, the File Allocation Table (FAT) in the case of an MS-DOS FAT volume or the Master File Table in the case of an NTFS volume. These must be present within the area of the disk addressable by the 24-bit side, cylinder, sector structure used by the BIOS INT 13 interface and the partition table. This limits the size of the system partition to 7.8 gigabytes regardless of which file system is used.

Deployment Considerations

The ProLiant Essentials Rapid Deployment Pack (RDP) provides automated server deployment and redeployment through a central console using imaging and scripting technologies for ProLiant servers. The deployment console provides simple drag-and-drop functionality for deployment events. This is newly added support for installing the Windows operating system to a ProLiant server attached to a SAN. Refer to Deploying Servers that Boot from a SAN with the Rapid Deployment Pack, page 18 for detailed information.

Switch Based Zoning

You must be familiar with switch-based zoning. For specific information about zoning for your environment, refer to your switch's installation guide.

Cabling Scheme Options for Single Channel HBAs

SAN boot is supported in the zoned single channel HBA configurations as shown in Figure 2 through Figure 6.

Figure 1: Single server-two single channel HBAs, one switch straight-cable storage configuration

Figure 2: Single server-two single channel HBAs, one switch cross-cable storage configuration

Zone 1

Server

HBA1 HBA2

Zone 2

Switch 1

Switch 2

Pn Pn+1

Pn

Active

Active

Active

Active

Port 1 A Port 2

Port 1 B Port 2

Pn+1

Blue (port 1) = Boot path
Red (port 2) = Data path
SPOF is one HBA

SHR-2631A

Figure 3: Single server-two single channel HBAs, two switch straight-cable HA storage configuration

Path 1
Zone

Server

HBA1 HBA2

Path 2
Zone

Switch A

Switch B

Pn Pn+1

Pn Pn+1

Active

Active

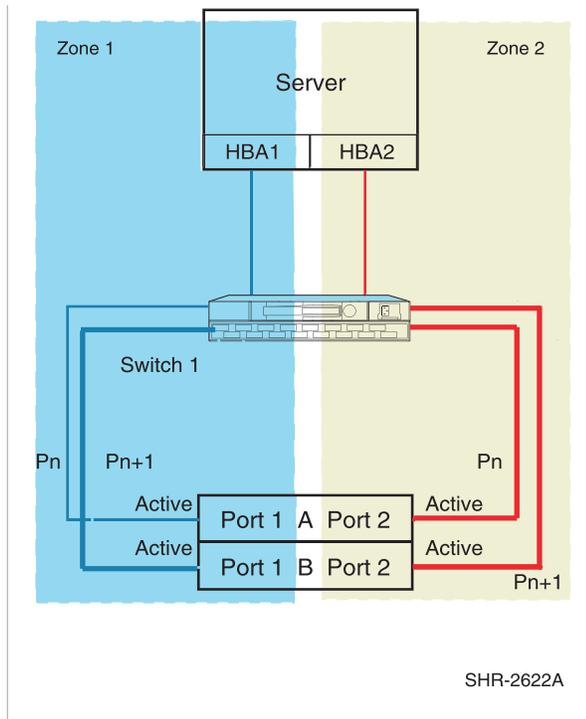Active

Active

Port 1 A Port 2

Port 1 B Port 2

SHR-2427D

Figure 4: Single server-two single channel HBAs, two switch cross-cable HA storage configuration

Figure 5: Clustered servers-four single channel HBAs, two switch straight-cable HA storage configuration

Switch 2

Zone 4

Zone 2

Server

HBA1 | HBA2

Server

HBA1 | HBA2

Switch 1

Zone 1

Zone 3

Active

Active

Port 1 A Port 2

Zone 2

Port 1 B Port 2

Zone 1

Active

Active

Blue (port 1) = Boot path
Red (port 2) = Data path

SHR-2630A
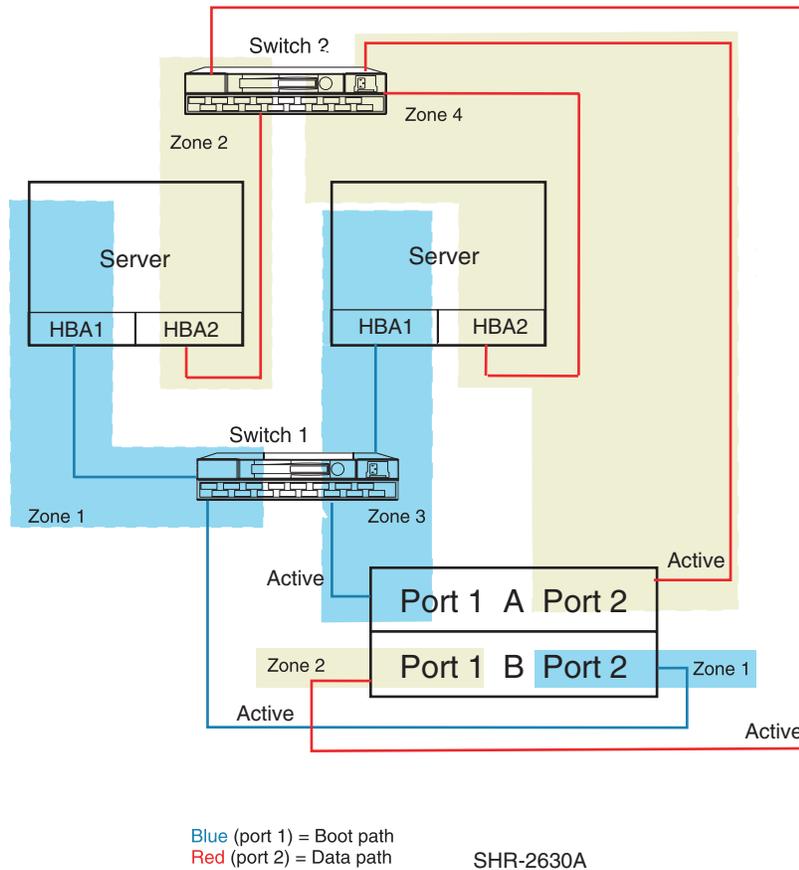
Figure 6: Clustered servers-four single channel HBAs, two switch cross-cable HA storage configuration

Cabling Scheme Options for Dual Channel HBAs

Dual channel HBAs are typically used in situations where the number of server PCI slots is limited. Figure 7 through Figure 12 show the cabling options for dual channel HBAs.

SHR-2624A
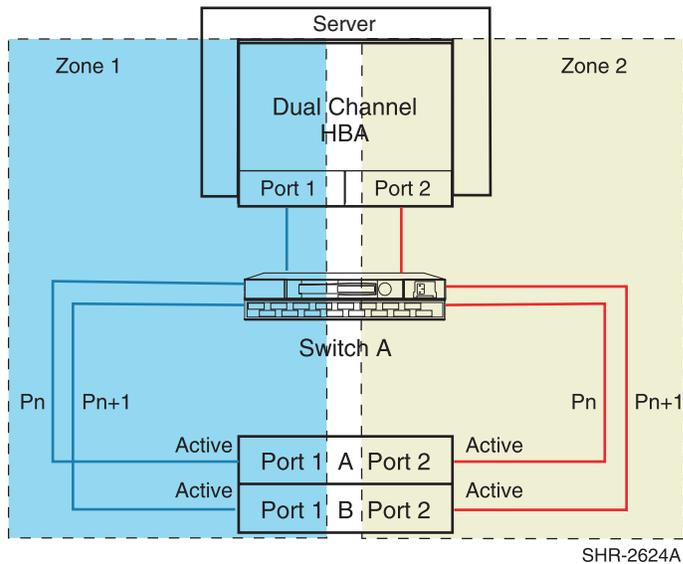
Figure 7: Single server-one dual channel HBA, one switch straight-cable storage configuration
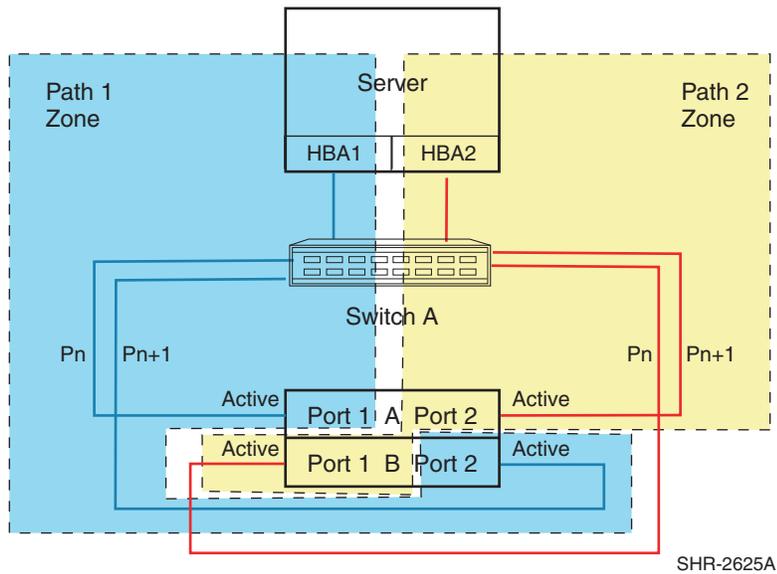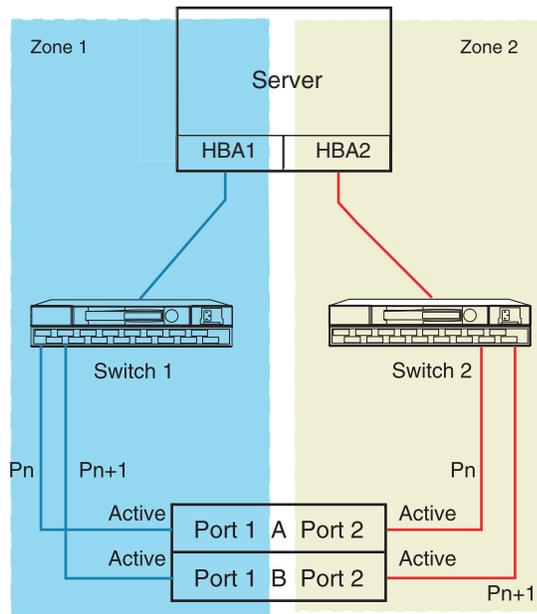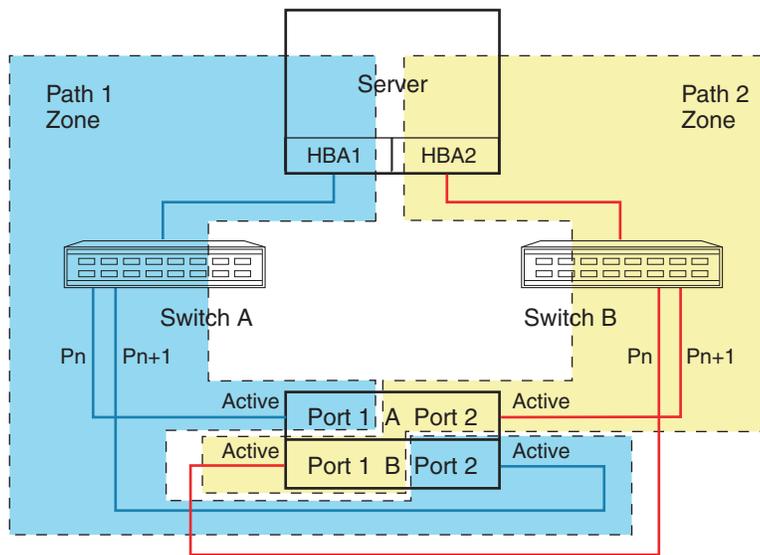
.

SHR-2626A
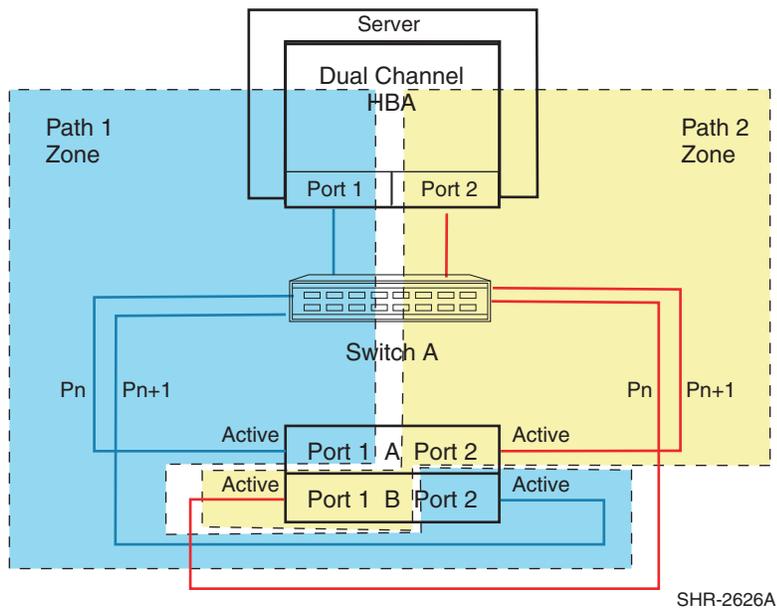
Figure 8: Single server-one dual channel HBA, one switch cross-cable storage configuration

Blue (port 1) = Boot path
Red (port 2) = Data path
SPOF is one HBA

SHR-2619B
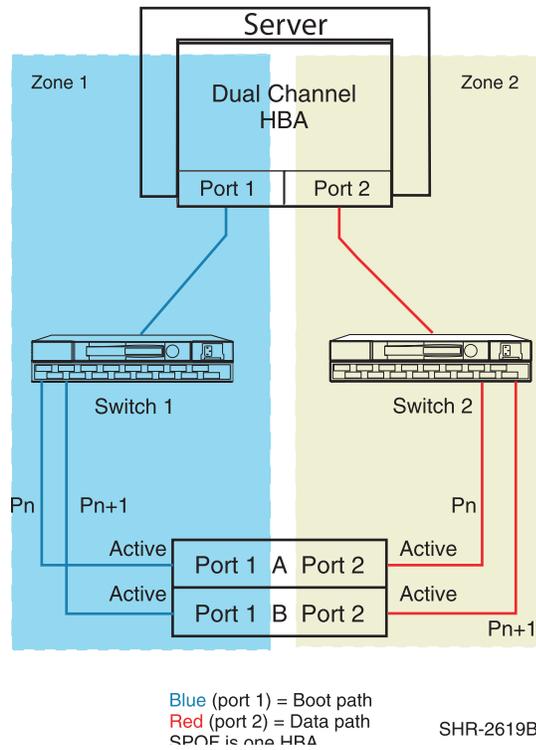
Figure 9: Single server-one dual channel HBA, two switch straight-cable HA storage configuration

SHR-2621A
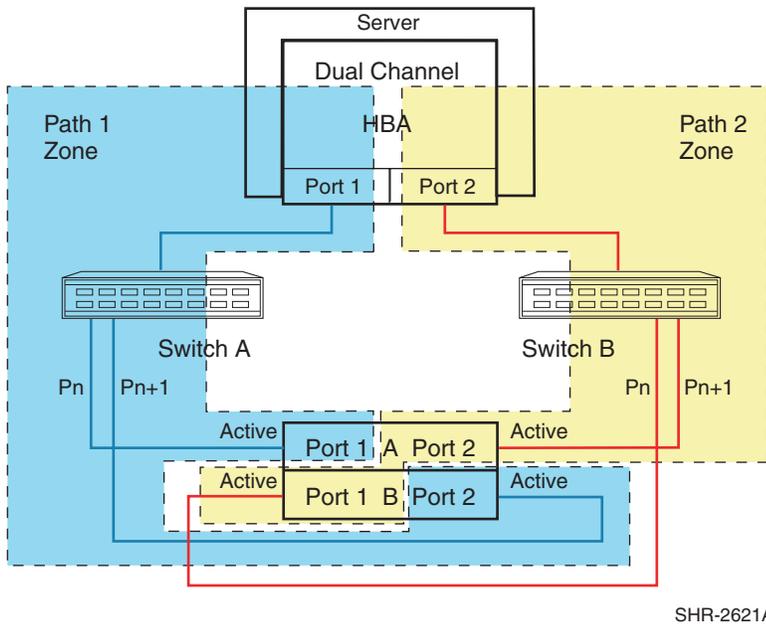
Figure 10: Single server-one dual channel HBA, two switch cross-cable HA storage configuration
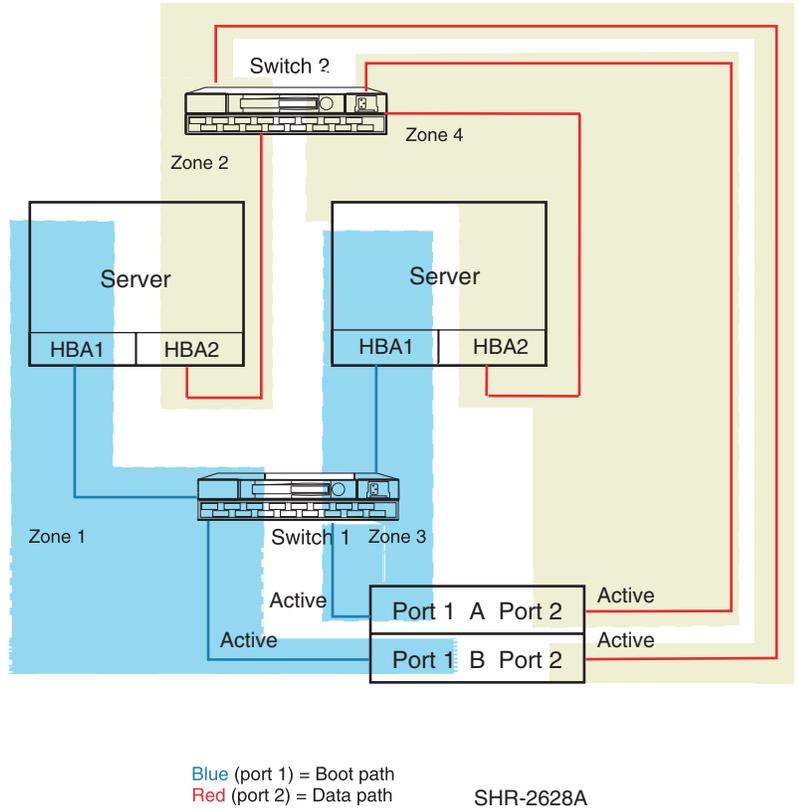
Switch 2

Zone 4

Zone 2

Server

Dual Channel
HBA

Port 1   Port 2

Server

Dual Channel
HBA

Port 1   Port 2

Zone 1   Switch 1   Zone 3

Active   Active
                Port 1 A Port 2
Active   Active
                Port 1 B Port 2

Blue (port 1) = Boot path
Red (port 2) = Data path   SHR-2627A
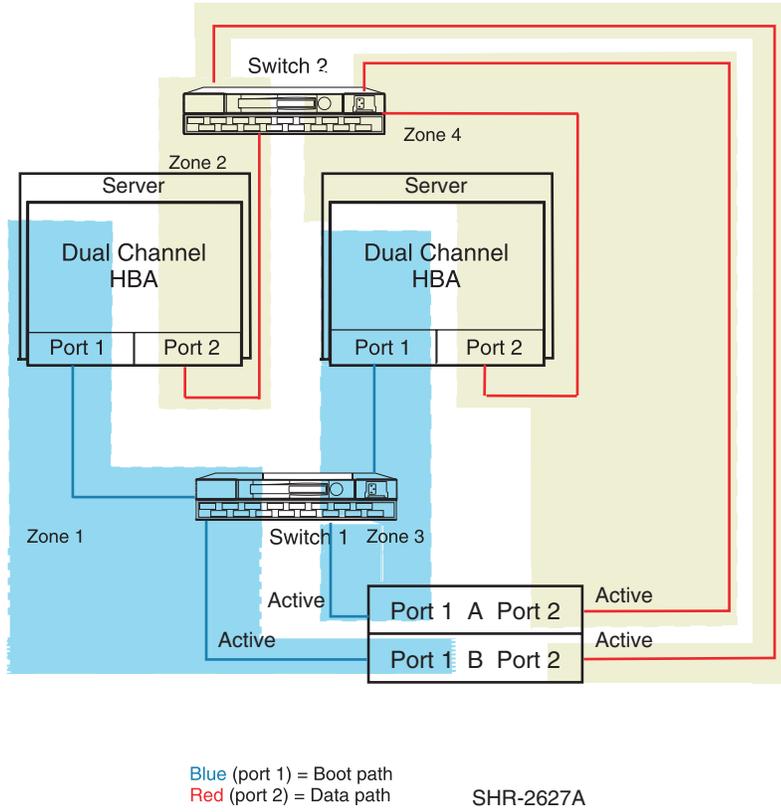
Figure 11: Clustered servers-two dual channel HBAs, two switch straight-cable HA configuration

Blue (port 1) = Boot path
Red (port 2) = Data path   SHR-2629A
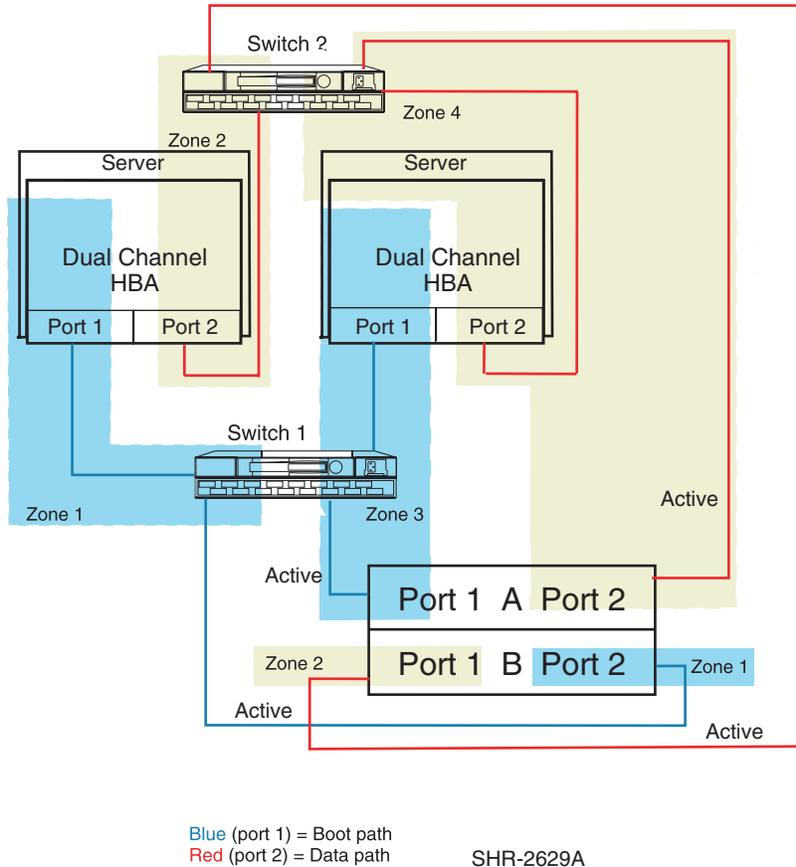
Figure 12: Clustered servers-two dual channel HBAs, two switch cross-cable HA configuration

Considerations For Booting Clusters

Windows operating systems require that an HBA used for booting is not the same HBA used for cluster shared storage. Because of this, you must use separate HBAs or HBA ports in each server when setting up for cluster booting. In general, the key steps for setting up booting include:

■   Installing all HBAs but not connecting them

■   Configuring each HBA that attaches to boot disks for booting (for cluster, a RAID Array needs two, separate boot disks)

■   Connecting and setting up each HBA for booting, one at a time

■   Setting up disk connectivity from each intended, unique boot disk to its server, using the command line interface (CLI) or GUI

■   Installing the Windows operating system on a unique and dedicated disk in the RAID Array, one at a time

■   Making sure the drive letters are the same for both servers' boot disks

■   Booting the servers

■   Installing cluster software

> **Note:** Packaged Cluster configurations are not supported (such as ProLiant DL38 Generation 2 Packaged Cluster).

Considerations For Secure Path

Secure Path provides high availability computing through a redundant data path to the RAID Array. Especially in a cluster situation, because of Microsoft's requirement that the boot HBA is different from the shared data HBA, each server needs four HBAs (with a minimum of two for boot and two for data, bringing the total number to eight HBAs. This provides data path redundancy for boot and data. Secure Path is an application that loads after the operating system has booted and should be treated the same as any other application installation.

It is strongly suggested to use more than one HBA port for boot and more than one for data. This provides data path redundancy for boot and data. Secure Path is an application that loads after the operating system has booted and should be treated the same as any other application installation. See the Secure Path web site for specific version information at http://h18006.www1.hp.com/products/sanworks/secure-path/index.html.

Deploying Servers that Boot from a SAN with the Rapid Deployment Pack

This section provides instructions for modifying the Windows-scripted install jobs provided with the Rapid Deployment Pack (RDP) to deploy servers that boot from SAN.

For information about supported servers or for RDP documentation, go to http://www.hp.com/servers/rdp.

> **Note:** HP strongly suggests that you make a backup copy of each file or deployment job before making any changes.

1. Install the Fibre Channel Driver Boot Support for Rapid Deployment Pack 1.40 software:

   a. Obtain the Fibre Channel Driver Boot Support for Rapid Deployment Pack 1.40 software from http://www.hp.com/servers/rdp and install the files on your Deployment Server.

> **Note:** This software contains the Emulex 4.82a16 and the QLogic 8.2.0.72 drivers. If newer drivers are available, deploy them after the initial SAN Boot installation.

   b. Extract the files in the SoftPaq to a new folder on your deployment server.

   c. From the Command Prompt, move to the folder containing the extracted files.

   d. Enter the command `cscript install.wsf` to install the files to the appropriate location on the deployment server.

2. Copy a scripted install job provided with the Rapid Deployment Pack to use for your Boot from SAN deployment job:

   a. Right click on the title bar of the Jobs pane, and choose **create a new folder**.

   b. Enter the desired name for your Boot from SAN jobs folder.

c. Select the either Microsoft Windows 2000 or Microsoft Windows 2003 Scripted Install Job for your target system hardware (BL or ML/DL). Right-click the job and choose **Copy.**

d. Right-click the Boot from SAN folder, and choose **Paste** to copy the job into the folder.

e. To rename the job, right-click the job and choose **Rename**.

f. Enter a descriptive name for the job. Figure 13 on page 19 shows a completed Deployment Server Console Jobs pane.
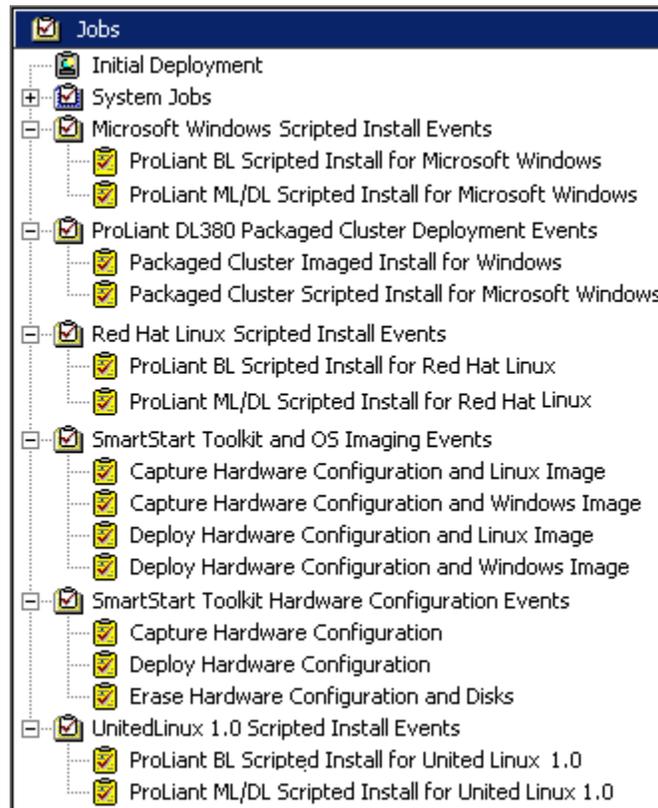
Figure 13: Deployment Server Console Jobs pane

Figure 14 shows the Job Properties dialog box entry for installing the job with the RDP.
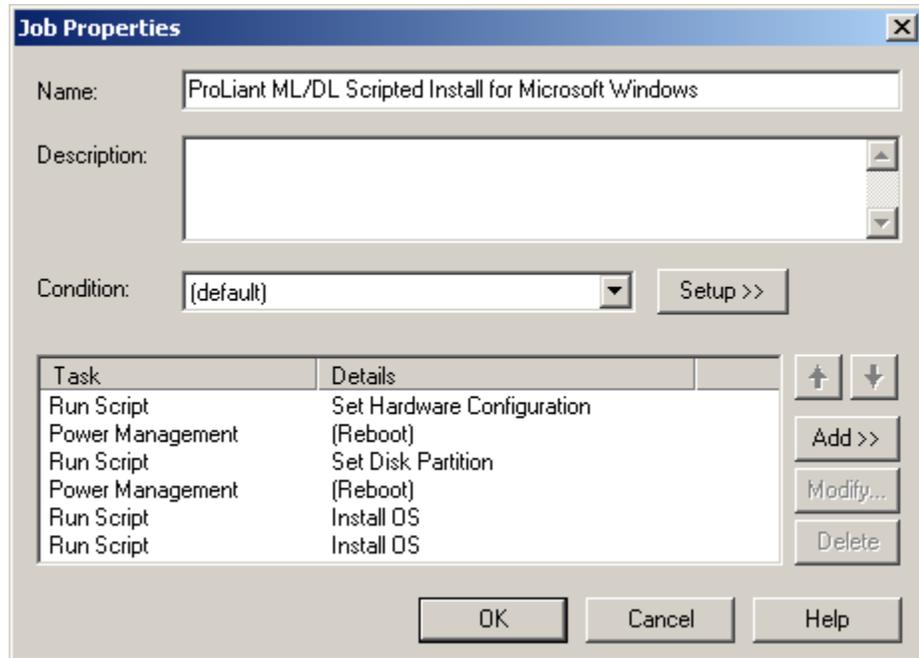
Figure 14:   Windows scripted install job as provided with Rapid Deployment Pack

3. Edit the copied job to enable Boot from SAN deployment:

    a. Select the newly created job.

    b. Highlight the first task, **Run Script - Set Hardware Configuration** and click **Modify**.

    c. Add **REM** to the beginning of the **set aryfile=** line

    d. Click **Finish.**

    Figure 15 shows the Run Script dialog box with the modified script information.
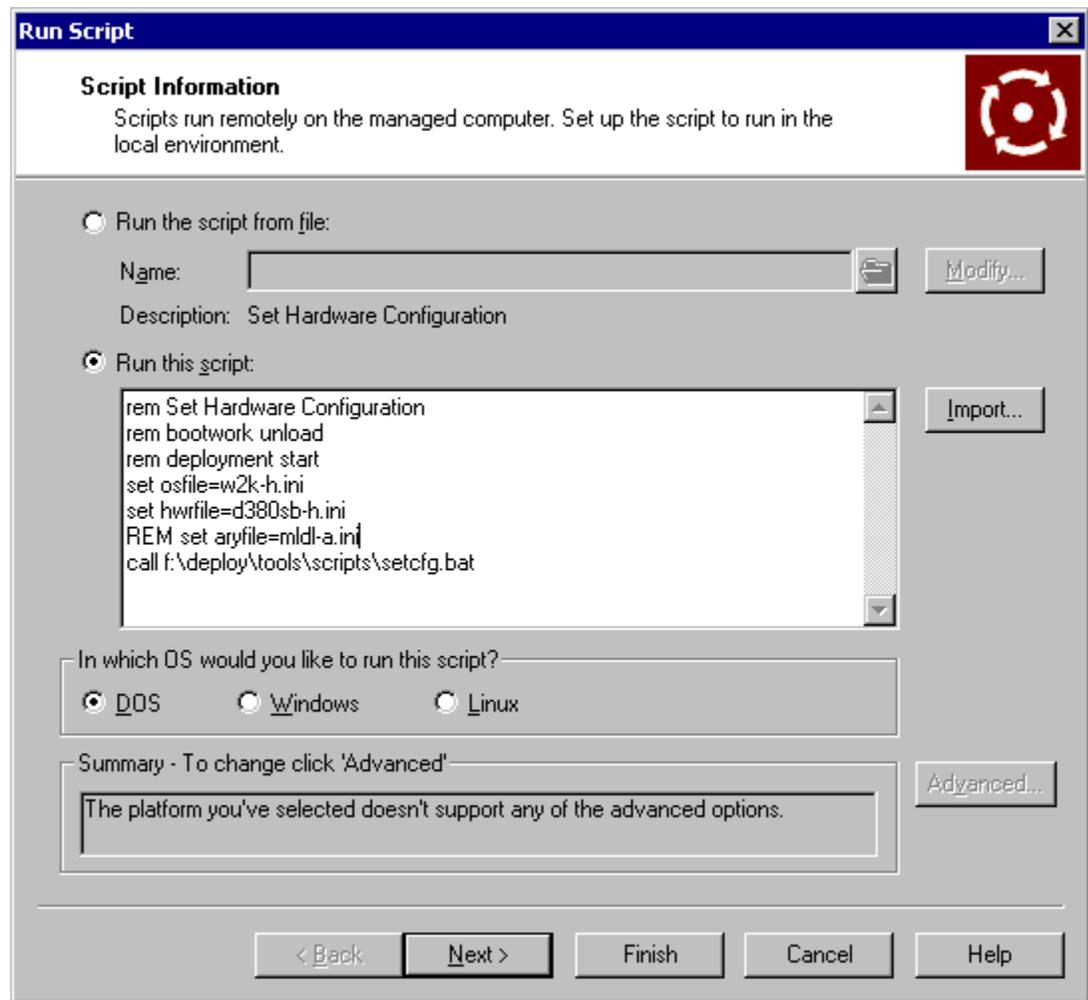
Figure 15: Run Script - Set Hardware Configuration task modified for boot from SAN Deployment

4. Delete the **Run Script – Set Disk Partition** or the first **Run Script – (embedded)** task.

5. In place of the deleted **Run Script – Set Disk Partition** or the first **Run Script – (embedded)** task, add a Distribute Disk Image task.

   a. Choose the **DOS_ONLY.IMG** from the Images folder.

   b. Deselect the **Automatically perform configuration task after completing this imaging task** check box.

   c. Choose **Finish**.
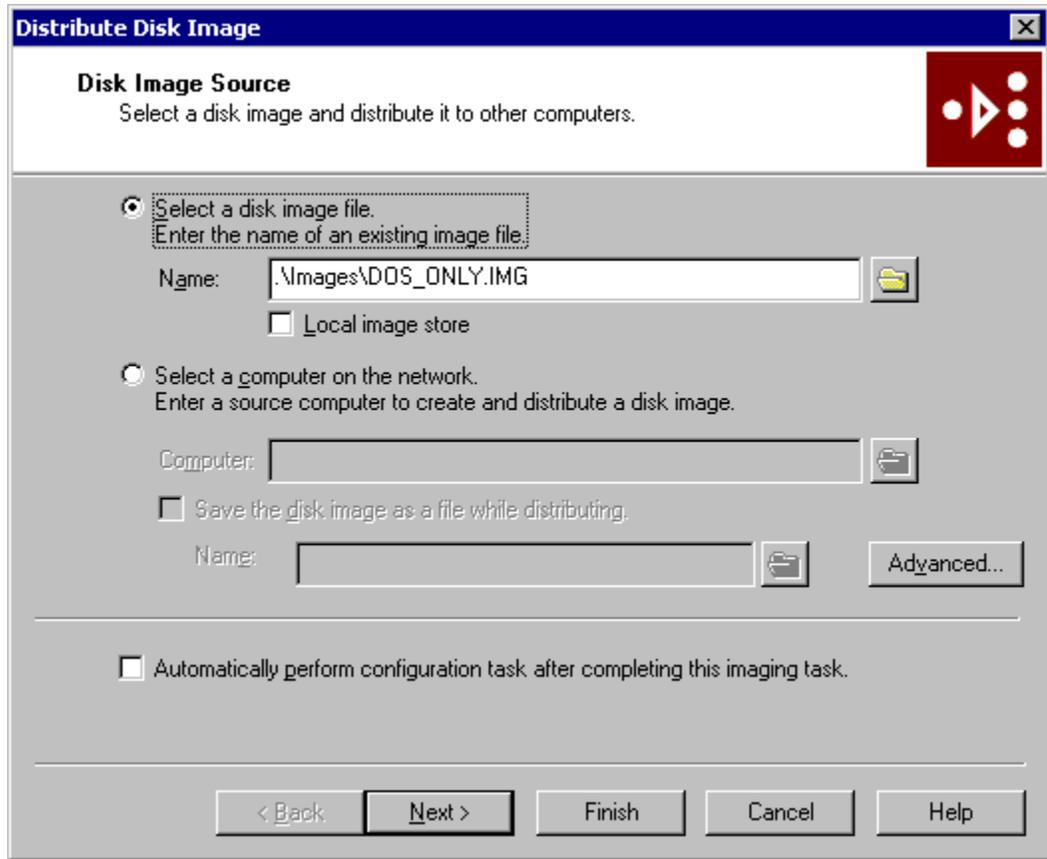
Figure 16: Deploy Image task created for boot from SAN deployment

d. Select the **Deploy Image - .\Images\DOS_ONLY.IMG** task and press the UP arrow three times to place it between the two **Power Management – (Reboot) tasks**. This places the Deploy Image task in the location of the deleted **Run Script – Set Disk Partition** task as shown in Figure 16.

6. Edit the first **Run Script - Install OS** task.

7. Add the following text as a new line before the call to *w2k.bat* (for Microsoft Windows 2000 jobs) or *wnet.bat* (for Microsoft Windows 2003 jobs):

```
set skipformat=yes
```

Figure 17 on page 23 shows a completed **Run Script – Install OS** task.
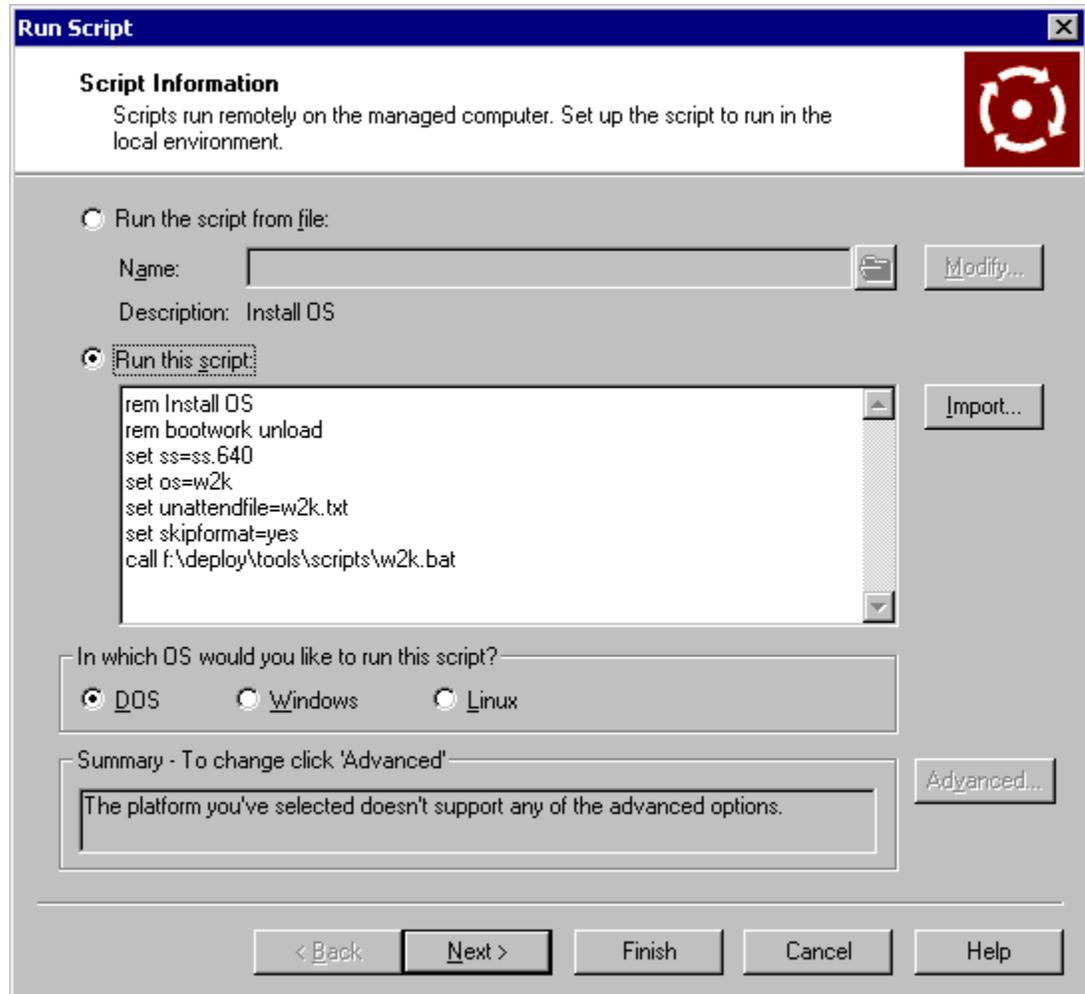
Figure 17: Run Script – Install OS task modified for boot form SAN deployment

8. Choose **Finish** to save the changes to the **Run Script – Install OS** task.

9. Click the modified job, as shown in Figure 13 on page 19 for task verification.

   Figure 18 on page 24 shows the Job Properties dialog box for the modified job.
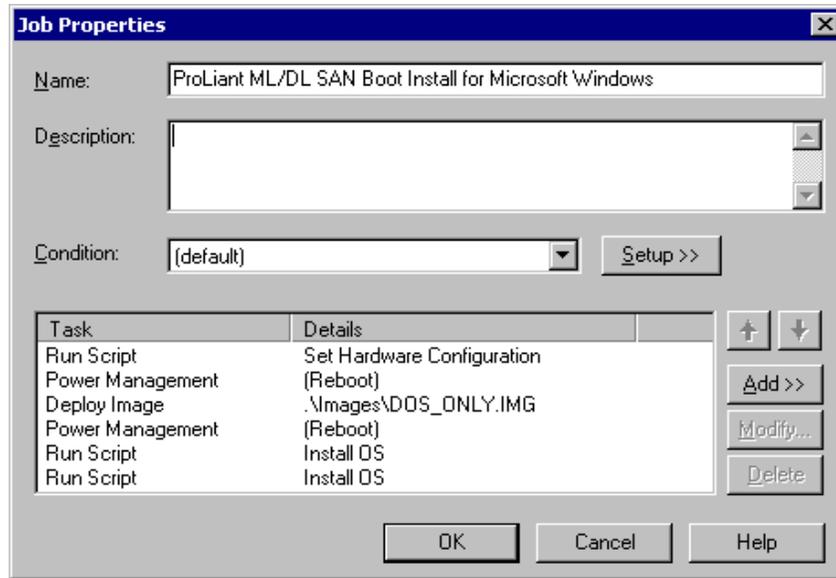
Figure 18: Windows scripted install job, modified for Boot from SAN deployment

10. Edit the Microsoft Windows unattended install file(s) as follows:

For Microsoft Windows 2000:

a. From the extracted files folder, open the \w2k*unattend.txt* file (source file).

b. Open the eXpress\deploy\configs*w2k.txt* file (target file).

c. Copy the driver descriptions from the [MassStorageDrivers] section from the source to the target file.

d. Copy the driver names from the [OEMBootFiles] section of the source to the target file.

For Microsoft Windows 2003:

a. From the extracted files folder, open the \wnet*unattend.txt* file (source file).

b. Open the eXpress\deploy\configs*wnet.txt* file (target file).

c. Copy the driver descriptions from the [MassStorageDrivers] section from the source to the target file.

d. Copy the driver names from the [OEMBootFiles] section of the source to the target file.

11. Manually configure a reference server of the type you plan to deploy:

a. Disable the Integrated SmartArray Controller (if present). Use the ROM Based System Configuration Utility's PCI settings to do so.

b. Set the Controller Boot Order to place the desired HBA as the first controller to boot.

12. Capture the Hardware Configuration of the reference server:

    a.   Boot the reference server from the PXE or Bootworks diskette so it is available in the Rapid Deployment Pack console.

    b.   Drag the **Capture Hardware Configuration** job from the **SmartStart Hardware Configuration Events** folder to the reference server.

    c.   When the job completes, it creates the file *CPQCAP-H.INI* in the \eXpress\deploy\configs\ directory.

    d.   Rename the *CPQCAP-H.INI* file to the name specified on the **set hwrfile=** line in the **Run Script – Set Hardware Configuration** in This automatically sets your hardware configuration on each server deployed with your Boot from SAN job.

The customized job is now ready to deploy servers that boot from SAN.

Windows Boot Setup Procedure for Modular Arrays Configured in Transparent Failover Mode

This section describes boot setup for transparent failover mode configurations for Enterprise Modular Arrays. The example shows the for BIOS menus for the HBAs.

Note: This configuration does not support Windows Server 2003.

Before you begin, make sure you have reviewed the information and tasks in the sections Restrictions on page 5, Required Hardware And Software on page 6, and Prerequisites on page 8.

Note: Start with only one HBA in the server. If you require additional HBAs for data, add the additional HBA after you have set up booting.

Set Up the Server

ProLiant servers are available in two configurations. Newer models use ROM Based Setup Utility (RBSU), while older models do not. For servers with RBSU, refer to the section Setup for RBSU Servers on page 26. For those without this utility, refer to the section Setup for Servers without RBSU on page 31. Select one of the following procedures based on your ProLiant server configuration.

Setup for RBSU Servers

1. Boot the server from the ProLiant Smart Start CD-ROM version 5.3 or higher. You can alternatively download the latest ROM BIOS from the HP website http://www.hp.com.

2. Install the latest ROM from the Smart Start CD-ROM or the downloaded version.

3. Set the boot order:
   a. While the system is booting, Press **F9** to start the ROM Setup Utility.
   b. Choose **Boot Controller Order**.
   c. Select the primary HBA and move it to **Controller Order 1**.

4. Disable the Smart Array.

5. Exit the utility.

Setup for Servers without RBSU

If your server does not have RBSU, perform the following steps:

1. Download and install the latest system ROM from the HP website http://www.hp.com.

2. Download SOFTPAQ SP18002.

3. Run the SOFTPAQ program to create an upgrade diskette.

4. Boot from the ProLiant Smart Start CD-ROM and run the program to clear the configuration.

5. Reboot from the new upgrade diskette. The ORD.EXE program should start automatically.

---

6. Set the Primary HBA to **Position 1**. If any additional HBAs are required, set the additional HBAs now.

Note: The SmartArray should be in a higher numbered position than the HBAs.

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7. Reboot the server.

Set Up the Host Bus Adapter

Emulex HBAs

1. Record the IEEE number for all HBAs.

2. You can install all adapters at this time. Install each adapter and record the PCI slot it occupies.

3. Perform the steps in Initial Zoning Setup on page 29.

4. Configure the adapter:

   a. While the server is booting, press **Alt E** when the following message displays:

   ```
   Press <Alt E> To Go To Emulex BIOS Utility.
   ```

   b. At the **Enter a Selection** prompt, choose the first adapter.

   c. Choose **Option 2**, **Configure This Adapter's Parameters**.

   d. Choose **Option 1**, **Enable or Disable BIOS**. Press **1** to enable BIOS. (These steps are repeated for the other adapters after the Windows operating system has been installed).

   e. Choose **Option 4**, **Topology Selection, <Advanced Option>**.

   f. Choose **Point to Point**. Press **Page Up**.

   g. Choose **Option 8**, **Enable Start Unit Command**, **<Advanced Option>**. Press **1** to enable.

   h. Press **X** to exit and reboot the server.

5. Configure the boot devices:

   a. While the server is booting, press **Alt E** when the following message displays:

   ```
   Press <Alt E> To Go To Emulex BIOS Utility.
   ```

   b. Choose the first HBA.

   c. Choose **Option 1**, **Configure Boot Devices**.

   d. In the list of Saved Boot Devices, choose **1** as the primary boot path or **2** as the secondary boot path.

   e. Choose the WWPN for the desired storage system.

6. Use a terminal emulator or a terminal connected to the storage subsystem to enter the following CLI commands:

   a. Configure a device with no access allowed, as follows:

   ```
   HSG> initialize disk10000
   HSG> add unit d1 disk10000 disable_access_path=all
   HSG> show d1
   ```

7. Note to which LUN the controller is online.

---

8. Verify that the HBA is online by entering the following command:

   ```
   HSG> show connections
   ```

9. Optionally rename the connection.

10. Allow the HBA to access the LUN as follows:

    ```
    HSG> set dl enable_access_path=!newcon01
    ```

Note: If your MA8000/ESA12000 is configured to operate in SCSI-3 mode, the Command Console displays as LUN 0. If the system is configured to operate in SCSI-2 mode, the connection you just created displays.

---

11. On the server, at the **Select Two Digit Number of the Desired Boot Device** prompt, enter the LUN number that you created.

Note: Each controller port has an WWPN. The WWPN should be identical for all ports except for the last number. Use the last number to determine the controller port from which you are booting. The Top Controller is considered to be "this controller" because of its serial line connection. If the LUN is online to "this controller," then you must choose the line with the WWPN from this controller for booting.

---

12. Reboot the server.

QLogic HBAs

1. Install all adapters.

2. Perform the steps in Initial Zoning Setup on page 29.

3. Configure the adapter:

   a. While the server is booting, press **Ctrl Q** to enter *Fast!*UTIL.

   b. Perform the steps in the Initial Zoning Setup section on page 29 then go to step c.

   c. In the Select Host Adapter Menu, choose the adapter you want to boot, then press **Enter**.

   d. In the *Fast!*UTIL Options Menu, choose **Configuration Settings**, then press **Enter**.

   e. In the Configuration Settings menu, choose **Host Adapter Settings**, then press **Enter**.

   f. In the Host Adapter Settings menu, change the **Host Adapter BIOS** to **Enabled** by pressing **Enter**.

   g. Press **ESC** to go back to the Configuration Settings menu, Choose **Selectable Boot Settings**, then press **Enter**.

   h. In the Selectable Boot Settings menu, enable the **Selectable Boot** option, then move the cursor to the **Primary Boot Port Name, Lun:**, then press **Enter**.

   i. In the Select Fibre Channel Device menu, Choose the device to boot from, then press **Enter**.

   j. Use a terminal emulator or a terminal connected to the storage subsystem to enter the CLI commands to identify the connections.

      ```
      HSG> show connections
      ```

4. After locating the connection, optionally rename the connection and make note of the name.

5. Create the LUN and assign one connection.

6. Go back to the HBA BIOS.

7. In the Select LUN menu, choose the supported LUN.

8. Save the changes by pressing **ESC** twice.

Setting Up Switch Zoning

You must set up switch zoning as part of your configuration. Refer to the figures in Cabling Scheme Options for Single Channel HBAs on page 10 and Cabling Scheme Options for Dual Channel HBAs on page 14.

Initial Zoning Setup

1. Create a zone that includes the boot HBA port and the one controller port using the WWN or switch port number.

2. Enable the zone.

3. Configure your adapter as follows:
   - For Emulex HBAs, go to step 4 on page 27.
   - For QLogic HBAs, go to step 3 on page 28.

Finalize Zoning

1. Modify the initial zone to include the second controller port

2. Create a zone in the second fabric to include the secondary boot HBA port and the two remaining controller ports.

Install the Operating System

Installing from the Rapid Deployment Pack

If you are using ProLiant Essentials Rapid Deployment Pack (RDP), use the deployment jobs modified for Boot from SAN Deployment to install the operating system as described in the Rapid Deployment Pack User's Guide available at http://www.hp.com/servers/rdp.

Installing from the CD-ROM

To install the operating system on all other servers:

1. Insert the Windows operating system CD-ROM.

2. Reboot the server.

3. For Windows 2000 press **F6** when prompted. For Windows NT, press **F6** as soon as the text setup starts.

4. When the setup program prompts you to specify an additional device, choose **S=Specify Additional Device**.

5. Insert the driver diskette for the HBA. It contains the HBA driver required for booting. Press **Enter**.

Note: For Emulex HBAs, *lputiInt.exe* (LightPulse Utility) is not installed. The drivers need to be reinstalled as described in step 10 on page 30.

---

6. A list of devices displays. Select the appropriate HBA from the list.

Note: If this adapter does not display in the list, recheck the setup procedures for the HSG80 MA8000, hubs, switch, HBA, or server.

---

7. Complete the installation.

Note: For Windows NT, do not install networking until after the operating system installation finishes. You must install networking after the operating system installation completes. Windows 2000 does not have this setup restriction; networking can be installed during setup.

---

8. For Windows NT**,** if you are using the 4.82a16 driver, you must install the Adjunct driver (for persistent binding) after the operating system has finished its installation.

9. After the operating system installation completes, reboot.

10. Update the driver:

   a. For Windows 2000, the Found New Hardware Wizard displays **Emulex Utility IFC Dev. SCSI ASCIT8 device** after the first reboot. Choose **Cancel** at this point and for any other prompts for new hardware.This device is automatically installed with the Software Solution kit.

   b. For Windows NT, run the driver update utility from the Software Solution kit to install the Adjunct driver.

11. Run the Fibre Channel Software setup from the Software Solution kit.

12. Using the Smart Start CD-ROM, update the system drivers.

13. Install the operating system's latest service pack.

Set Up the Other Servers

Repeat all of the setup steps described in the previous sections for the other servers before you begin the Cluster installation, including:

- Set Up the Server, page 26
- Set Up the Host Bus Adapter, page 27
- Install the Operating System, page 29

Note: In HA/F500 configurations, MSCS failover clusters on Windows 2000 and Windows Server 2003 systems are no longer supported in transparent mode failover (single path) configurations.

Windows Boot Setup Procedure for Modular Arrays Configured in Multiple Bus Failover Mode

This section describes boot setup for multiple bus failover mode configurations for Enterprise Modular Arrays. The example shows the for BIOS menus for the HBAs.

Before you begin, make sure you have reviewed the information and tasks in the sections Restrictions on page 5, Required Hardware And Software on page 6, and Prerequisites on page 8.

Set Up the Server

ProLiant servers are available in two configurations. Newer models use ROM Based Setup Utility (RBSU), while older models do not. For servers with RBSU, refer to the section Setup for RBSU Servers on page 26. For those without this utility, refer to the section Setup for Servers without RBSU on page 31. Select one of the following procedures based on your ProLiant server configuration.

Setup for RBSU Servers

1. Boot the server from the ProLiant Smart Start CD-ROM version 5.3 or higher. You can alternatively download the latest ROM BIOS from http://www.hp.com.

2. Install the latest ROM from the Smart Start CD-ROM or the downloaded version.

3. Set the boot order:

   a. While the system is booting, Press **F9** to start the ROM Setup Utility.

   b. Choose **Boot Controller Order**.

   c. Select the primary HBA and move it to **Controller Order 1**.

4. Disable the Smart Array Controller.

5. Exit the utility.

Setup for Servers without RBSU

If your server does not have RUBSU, perform the following steps:

1. Download and install the latest system ROM from the HP website: http://www.hp.com.

2. Download SOFTPAQ SP18002.

3. Run the SOFTPAQ program to create an upgrade diskette.

4. Boot from the ProLiant Smart Start CD-ROM and run the program to clear the configuration.

5. Reboot from the new upgrade diskette. The ORD.EXE program should start automatically.

6. Set the Primary HBA to **Position 1**. If any additional HBAs are required, set the additional HBAs now.

Note: The SmartArray should be in a higher numbered position than the HBAs.

---

7. Reboot the server.

Set Up the Host Bus Adapter

Emulex HBAs

1. Record the IEEE number for all HBAs.

2. You can install all adapters at this time. Install each adapter and record the PCI slot it occupies.

3. Perform the steps in

4. Configure the adapter:

    a. While the server is booting, press **Alt E** when the following message displays:

       ```
       Press <Alt E> To Go To Emulex BIOS Utility.
       ```

    b. At the **Enter a Selection** prompt, choose the first adapter.

    c. Choose **Option 2**, **Configure This Adapter's Parameters**.

    d. Choose **Option 1**, **Enable or Disable BIOS**. Press **1** to enable BIOS. (These steps are repeated for the other adapters after the Windows operating system has been installed).

    e. Choose **Option 4**, **Topology Selection, <Advanced Option>**.

    f. Choose **Point to Point**. Press **Page Up**.

    g. Choose **Option 8**, **Enable Start Unit Command**, **<Advanced Option>**. Press **1** to enable.

    h. Press **X** to exit and reboot the server.

5. Configure the boot devices:

    a. While the server is booting, press **Alt E** when the following message displays:

       ```
       Press <Alt E> To Go To Emulex BIOS Utility.
       ```

    b. Choose the first HBA.

    c. Choose **Option 1**, **Configure Boot Devices**.

    d. In the list of Saved Boot Devices, choose **1** as the primary boot path or **2** as the secondary boot path.

    e. Choose the WWPN for the desired storage system.

6. Use a terminal emulator or a terminal connected to the storage subsystem to enter the following CLI commands:

    a. Configure a device with no access allowed, as follows:

       ```
       HSG> initialize disk10000
       HSG> add unit d1 disk10000 disable_access_path=all
       HSG> show dl
       ```

7. Note to which LUN the controller is online.

8. Verify that the HBA is online by entering the following command:

    ```
    HSG> show connections
    ```

9. Optionally rename the connection.

10. Allow the HBA to access the LUN as follows:

    ```
    HSG> set dl enable_access_path=!newcon01
    ```

> **Note:** If your MA8000/ESA12000 is configured to operate in SCSI-3 mode, the Command Console displays as LUN 0. If the system is configured to operate in SCSI-2 mode, the connection you just created displays.

11. On the server, at the **Select Two Digit Number of the Desired Boot Device** prompt, enter the LUN number that you created.

> **Note:** Each controller port has an WWPN. The WWPN should be identical for all ports except for the last number. Use the last number to determine the controller port from which you are booting. The Top Controller is considered to be "this controller" because of its serial line connection. If the LUN is online to "this controller," then you must choose the line with the WWPN from this controller for booting.

12. Reboot the server.

QLogic HBAs

1. Install all adapters.

2. Perform the steps in Initial Zoning Setup on page 29.

3. Configure the adapter:

    a. While the server is booting, press **Ctrl Q** to enter *Fast!*UTIL.

    b. Perform the steps in the Initial Zoning Setup section on page 29, then go to step c.

    c. In the Select Host Adapter Menu, choose the adapter you want to boot, then press **Enter**.

    d. In the *Fast!*UTIL Options Menu, choose **Configuration Settings**, then press **Enter**.

    e. In the Configuration Settings menu, choose **Host Adapter Settings**, then press **Enter**.

    f. In the Host Adapter Settings menu, change the **Host Adapter BIOS** to **Enabled** by pressing **Enter**.

    g. Press **ESC** to go back to the Configuration Settings menu, Choose **Selectable Boot Settings**, then press **Enter**.

    h. In the Selectable Boot Settings menu, enable the **Selectable Boot** option, then move the cursor to the **Primary Boot Port Name, Lun:**, then press **Enter**.

    i. In the Select Fibre Channel Device menu, Choose the device to boot from, then press **Enter**.

    j. Use a terminal emulator or a terminal connected to the storage subsystem to enter the CLI commands to identify the connections

       ```
       HSG> show connections
       ```

4. After locating the connection, optionally rename the connection and make note of the name.

5. Create the LUN and assign one connection.

6. Go back to the HBA BIOS.

7. In the Select LUN menu, choose the supported LUN.

8. Save the changes by pressing **ESC** twice.

Set Up the Remaining Adapters

1. Connect the two remaining HBAs that you did not use for booting to the switches (No BIOS changes are necessary). Connect one HBA to one fabric and the other HBA to the other fabric.

2. Finalize the zoning as described in Finalize Zoning on page 29.

3. Using CLI, rename the new connections and create LUNs to use with these connections.

Install the Operating System

Installing from the Rapid Deployment Pack

If you are using ProLiant Essentials Rapid Deployment Pack (RDP), use the deployment jobs modified for Boot from SAN Deployment to install the operating system as described in the Rapid Deployment Pack User's Guide available at http://www.hp.com/servers/rdp.

Installing from the CD-ROM

1. Insert the Windows operating system CD-ROM.

2. Reboot the server.

3. For Windows 2000 and Windows Server 2003, press **F6** when prompted. For Windows NT, press **F6** as soon as the text setup starts.

4. When the setup program prompts you to specify an additional device, choose **S=Specify Additional Device**.

5. Insert the driver diskette for the HBA. It contains the HBA driver required for booting. Press **Enter**.

Note: For Emulex HBAs, *lputilnt.exe* (LightPulse Utility) is not installed. The drivers need to be reinstalled as described in step 11.

---

6. A list of devices displays. Select the appropriate HBA.

7. Press **Enter** to continue the installation. The **Specify Additional Device** screen displays.

Note: If this adapter does not display in the list, recheck the setup procedures for the HSG80 MA6000 and MA8000/ESA12000, hubs, switch, HBA, or server.

---

8. Complete the installation.

Note: For Windows NT, do not install networking until after the operating system installation finishes. You must install networking after the operating system installation completes. Windows 2000 does not have this setup restriction; networking can be installed during setup.

---

9. For Windows NT**,** if you are using the 4.82a16 driver, you must install the Adjunct driver (for persistent binding) after the operating system has finished its installation.

10. After the operating system installation completes, reboot.

11. Update the driver:

    a. For Emulex HBAs on Windows 2000 and Windows Server 2003, the Found New Hardware Wizard displays Emulex Utility IFC Dev. SCSI ASCIT8 device after the first reboot. Choose Cancel at this point and for any other prompts for new hardware.This device is automatically installed with the Software Solution kit.

    b. For Windows NT, run the driver update utility from the Software Solution kit to install the Adjunct driver.

12. Run the Fibre Channel Software setup from the Software Solution kit.

13. Install the Secure Path for Windows software.

14. Using the Smart Start CD-ROM, update the system drivers.

15. Install the operating system's latest service pack.

Set Up the Remaining Adapters

1. Connect the two remaining HBAs that you did not use for booting to the switches (No BIOS changes are necessary). Connect one HBA to one fabric and the other HBA to the other fabric.

2. Finalize the zoning as described in Finalize Zoning on page 29.

3. Using CLI, rename the new connections and create LUNs to use with these connections.

Set Up the Other Servers

Repeat all of the setup steps described in the previous sections for the other servers before you begin the Cluster installation, including:

■ Set Up the Server, page 26

■ Set Up the Host Bus Adapter, page 27

■ Install the Operating System, page 29

Set Up the Cluster

1. Create a new LUN to be used with the cluster service. There should be eight connections four from each server. Use CLI, as shown in the following example:

    ```
    HSG> initialize disk30100
    HSG> add unit D5 disk30100 disable_access_path=all
    HSG> show connections
    HSG> set D5 enable_access_path=<all non-booting connection names>
    ```

    `<all non-booting connection names>` are the names of all connections you do not use for booting.

2. Reboot the server.

3. Install the cluster service. Refer to Microsoft cluster installation documentation for complete instructions.

Windows Boot Setup Procedures for Enterprise Virtual Array Configured in Multiple Bus Failover Mode

Set Up the Enterprise Virtual Array

1. Create A Virtual Disk (LUN).
2. Record the WWPN of each controller port. There should be four.

Set Up the Server

ProLiant servers are available in two configurations. Newer models use ROM Based Setup Utility (RBSU), while older models do not. For servers with RBSU, refer to the section Setup for RBSU Servers on page 36. For those without this utility, refer to the section Setup for Servers without RBSU on page 36.

Select one of the following procedures based on your ProLiant server configuration.

Setup for RBSU Servers

1. Boot the server from the ProLiant Smart Start CD-ROM version 5.3 or higher. You can alternatively download the latest ROM BIOS from http://www.hp.com.
2. Install the latest ROM from the Smart Start CD-ROM or the downloaded version.
3. Set the boot order:
   a. While the system is booting, Press **F9** to start the ROM Setup Utility.
   b. Choose **Boot Controller Order**.
   c. Select the primary HBA and move it to **Controller Order 1**.
   d. Move the secondary adapter to **Controller Order 3**.
4. Disable the Smart Array Controller.
5. Exit the utility.

Setup for Servers without RBSU

If your server does not have RBSU, perform the following steps:

1. Download and install the latest system ROM from the HP website: http://www.hp.com.
2. Download SOFTPAQ SP18002.
3. Run the SOFTPAQ program to create an upgrade diskette.
4. Boot from the ProLiant Smart Start CD-ROM and run the program to clear the configuration.
5. Reboot from the new upgrade diskette. The ORD.EXE program should start automatically.
6. Set the Primary HBA to **Position 1**. If any additional HBAs are required, set the additional HBAs now.

Note: The SmartArray should be in a higher numbered position than the HBAs.

---

7. Reboot the server.

Set Up the Host Bus Adapter

Emulex HBAs

1. Record the IEEE number for all HBAs.

2. You may install all adapters at this time. Record the PCI slot each adapter occupies.

3. Perform the steps in Initial Zoning Setup on page 29.

4. Configure the adapter:

   a. While the server is booting, press **Alt E** when the following message displays:

      ```
      Press <Alt E> To Go To Emulex BIOS Utility.
      ```

   b. At the **Enter a Selection** prompt, choose the first adapter.

   c. Choose **Option 2**, **Configure This Adapter's Parameters**.

   d. Choose **Option 1**, **Enable or Disable BIOS**. Press **1** to enable BIOS (Steps a through c are repeated for other adapters after the Windows operating system has been installed).

   e. Choose **Option 4**, **Topology Selection,** then choose the **Advanced Option**.

   f. Choose **Point to Point**. Press **Page Up**.

   g. Choose **Option 8**, **Enable Start Unit Command**, then choose the **Advanced Option**. Press **1** to enable.

   h. Press **X** to exit and reboot the server.

5. Configure the boot devices:

   a. While the server is booting, press **Alt E** when the following message displays:

      ```
      Press <Alt E> To Go To Emulex BIOS Utility.
      ```

   b. At the **Enter a Selection** prompt, choose the first adapter.

   c. Choose **Option 1**, **Configure Boot Devices**.

   d. In the list of Saved Boot Devices, choose **1** as the primary boot path or **2** as the secondary boot path.

   e. Choose the WWPN for the desired storage system.

6. Use a terminal emulator or a terminal connected to the storage subsystem to enter the following CLI commands:

   a. Configure a device with no access allowed, as follows:

   ```
   HSG> initialize disk10000
   HSG> add unit d1 disk10000 disable_access_path=all
   HSG> show dl
   ```

7. Note to which LUN the controller is online.

8. Verify that the HBA is online by entering the following command:

   ```
   HSG> show connections
   ```

9. Optionally rename the connection.

10. Allow the HBA to access the LUN as follows:

    ```
    HSG> set dl enable_access_path=!newcon01
    ```

Note: If your MA8000/ESA12000 is configured to operate in SCSI-3 mode, the Command Console displays as LUN 0. If the system is configured to operate in SCSI-2 mode, the connection you just created displays.

---

11. On the server, at the **Select Two Digit Number of the Desired Boot Device** prompt, enter the LUN number that you created.

Note: Each controller port has an WWPN. The WWPN should be identical for all ports except for the last number. Use the last number to determine the controller port from which you are booting. The Top Controller is considered to be "this controller" because of its serial line connection. If the LUN is online to "this controller," then you must choose the line with the WWPN from this controller for booting.

---

12. Reboot the server.

QLogic HBAs

1. Install all adapters.

2. Perform the steps in Initial Zoning Setup on page 29.

3. Configure the adapter:

   a. While the server is booting, press **Ctrl Q** to enter *Fast!*UTIL.

   b. Perform the steps in the Initial Zoning Setup section on page 29 then go to step c.

   c. In the Select Host Adapter Menu, choose the adapter you want to boot, then press **Enter**.

   d. In the *Fast!*UTIL Options Menu, choose **Configuration Settings**, then press **Enter**.

   e. In the Configuration Settings menu, choose **Host Adapter Settings**, then press **Enter**.

   f. In the Host Adapter Settings menu, change the **Host Adapter BIOS** to **Enabled** by pressing **Enter**.

   g. Press **ESC** to go back to the Configuration Settings menu, Choose **Selectable Boot Settings**, then press **Enter**.

   h. In the Selectable Boot Settings menu, enable the **Selectable Boot** option, then move the cursor to the **Primary Boot Port Name, Lun:**, then press **Enter**.

   i. In the Select Fibre Channel Device menu, Choose the device to boot from, then press **Enter**.

4. After locating the connection, optionally rename the connection and make note of the name.

5. Create the LUN and assign a host:

   a. Access the HSV Element Manager through a web browser.

   b. Use the HSV Element Manager to create the LUN and assign a host. You must create a host if one does not exist.

6. Go back to the HBA BIOS.

7. In the Select LUN menu, choose the supported LUN.

8. Save the changes by pressing **ESC** twice.

Install the Operating System

Installing from the Rapid Deployment Pack

If you are using ProLiant Essentials Rapid Deployment Pack (RDP), use the deployment jobs modified for Boot from SAN Deployment to install the operating system as described in the Rapid Deployment Pack User's Guide available at http://www.hp.com/servers/rdp.

Installing from the CD-ROM

1. Insert the Windows operating system CD-ROM.

2. Reboot the server.

3. For Windows 2000 and Windows Server 2003, press **F6** when prompted. For Windows NT, press **F6** as soon as the text setup starts.

4. When the setup program prompts you to specify an additional device, choose **S=Specify Additional Device**.

5. Insert the diskette that came with the HBA. It contains the HBA driver required for booting. Press **Enter**.

Note: For Emulex HBAs, *lputilnt.exe* (LightPulse Utility) is not installed. The drivers need to be reinstalled as described in step 11 on page 39.

---

6. A list of devices displays. Select the appropriate HBA.

7. Continue the operating system installation. While in text mode stage, two instances of the boot device are presented. Choose the **second instance** of the boot device.

8. Complete the installation.

Note: For Windows NT, do not install networking until after the operating system installation finishes. You must install networking after the operating system installation completes. Windows 2000 and Windows Server 2003 do not have this setup restriction; networking can be installed during setup.

---

9. For Windows NT**,** if you are using the 4.82a16 driver, you must install the Adjunct driver (for persistent binding) after the operating system has finished its installation.

10. After the operating system installation completes, reboot.

11. Update the driver:

    a. For Emulex HBAs on Windows 2000 and Windows Server 2003, the Found New Hardware Wizard displays Emulex Utility IFC Dev. SCSI ASCIT8 device after the first reboot. Choose Cancel at this point and for any other prompts for new hardware.This device is automatically installed with the Software Solution kit.

    b. For Windows NT, run the driver update utility from the Software Solution kit to install the Adjunct driver, or run the latest driver update (available on the web).

12. Run the Fibre Channel Software setup from the Software Solution kit.

13. Install the Secure Path for Windows software.

14. Using the Smart Start CD-ROM update the system drivers.

15. Install the latest operating system service pack.

Set Up the Remaining HBA Ports

1. Connect the two remaining HBAs that you did not use for booting to the switches (No BIOS changes are necessary). Connect one HBA to one fabric and the other HBA to the other fabric.

2. Finalize the zoning as described in Finalize Zoning on page 29.

3. Using CLI, rename the new connections and create LUNs to use with these connections.

Set Up the Other Server

Repeat all of the setup steps described in the previous sections for the other server before you begin the Cluster installation.

Set Up the Cluster

1. Reboot the server.

2. Install the clustering service. Refer to Microsoft cluster installation documentation for complete instructions.

Windows Boot Setup Procedures for Enterprise Virtual Array Single Path

Set Up the Enterprise Virtual Array

1. Create A Virtual Disk (LUN),
2. Record the WWPN of each controller port.

Set Up the Server

ProLiant servers are available in two configurations. Newer models use ROM Based Setup Utility (RBSU), while older models do not. For servers with RBSU, refer to the section Setup for RBSU Servers on page 36. For those without this utility, refer to the section Setup for Servers without RBSU on page 36.

Select one of the following procedures based on your ProLiant server configuration.

Setup for RBSU Servers

1. Boot the server from the ProLiant Smart Start CD-ROM version 5.3 or higher. You can alternatively download the latest ROM BIOS from http://www.hp.com.
2. Install the latest ROM from the Smart Start CD-ROM or the downloaded version.
3. Set the boot order:
   a. While the system is booting, Press **F9** to start the ROM Setup Utility.
   b. Choose **Boot Controller Order**.
   c. Select the primary HBA and move it to **Controller Order 1**.
   d. Move the secondary adapter to **Controller Order 3**.
4. Disable the Smart Array Controller.
5. Exit the utility.

Setup for Servers without RBSU

If your server does not have RBSU, perform the following steps:

1. Download and install the latest system ROM from the HP website: http://www.hp.com.
2. Download SOFTPAQ SP18002.
3. Run the SOFTPAQ program to create an upgrade diskette.
4. Boot from the ProLiant Smart Start CD-ROM and run the program to clear the configuration.
5. Reboot from the new upgrade diskette. The ORD.EXE program should start automatically.
6. Set the Primary HBA to **Position 1**. If any additional HBAs are required, set the additional HBAs now.

Note: The SmartArray should be in a higher numbered position than the HBAs.

7. Reboot the server.

Set Up the Host Bus Adapter

Emulex HBAs

1. Record the IEEE number for all HBAs.

2. Configure Switch zoning by adding a new zone to include the HBA and the EVA port through which you want to boot. You can use either WWPN or Switch port number. Follow all zoning rules described in the *HP StorageWorks SAN Design Reference Guide*, available at

   http://h18006.www1.hp.com/products/storageworks/san/documentation.html.

3. Configure the adapter:

   a. While the server is booting, press **Alt E** when the following message displays:

      ```
      Press <Alt E> To Go To Emulex BIOS Utility.
      ```

   b. At the **Enter a Selection** prompt, choose the first adapter.

   c. Choose **Option 2**, **Configure This Adapter's Parameters**.

   d. Choose **Option 1**, **Enable or Disable BIOS**. Press **1** to enable BIOS (Steps a through c are repeated for other adapters after the Windows operating system has been installed).

   e. Choose **Option 4**, **Topology Selection,** then choose the **Advanced Option**.

   f. Choose **Point to Point**. Press **Page Up**.

   g. Choose **Option 8**, **Enable Start Unit Command**, then choose the **Advanced Option**. Press **1** to enable.

   h. Press **X** to exit and reboot the server.

4. Configure the boot devices:

   a. While the server is booting, press **Alt E** when the following message displays:

      ```
      Press <Alt E> To Go To Emulex BIOS Utility.
      ```

   b. At the **Enter a Selection** prompt, choose the first adapter.

   c. Choose **Option 1**, **Configure Boot Devices**.

   d. Using a web browser, access the HSV Element Manager to present the virtual disk to the host.

   e. Choose **1** as the primary boot path.

   f. Enter the number of the first desired port of the HSV device in the list.

   g. At the prompt, enter the two digits of starting LUN (Hex). Use the LUN number you created earlier on the Enterprise Virtual Array.

   h. Choose **1**, **Boot this device via WWPN**.

   i. Press **X** to exit and reboot the server.

QLogic HBAs

1. Install all adapters.

2. Perform the steps in Initial Zoning Setup on page 29.

3. Configure the Adapter:

    a. While the server is booting, press **Ctrl Q** to enter *Fast!*UTIL.

    b. Perform the steps in the Initial Zoning Setup section on page 29 then go to step c.

    c. In the Select Host Adapter Menu, choose the adapter you want to boot, then press **Enter**.

    d. In the *Fast!*UTIL Options Menu, choose **Configuration Settings**, then press **Enter**.

    e. In the Configuration Settings menu, choose **Host Adapter Settings**, then press **Enter**.

    f. In the Host Adapter Settings menu, change the **Host Adapter BIOS** to **Enabled** by pressing **Enter**.

    g. Press **ESC** to go back to the Configuration Settings menu, Choose **Selectable Boot Settings**, then press **Enter**.

    h. In the Selectable Boot Settings menu, enable the **Selectable Boot** option, then move the cursor to the **Primary Boot Port Name, Lun:**, then press **Enter**.

    i. In the Select Fibre Channel Device menu, Choose the device to boot from, then press **Enter**.

    j. Use a terminal emulator or a terminal connected to the storage subsystem to enter the CLI commands to identify the connections

        ```
        > show connections
        ```

4. After locating the connection, optionally rename the connection and make note of the name.

5. Create the LUN and assign one connection.

6. Go back to the HBA BIOS.

7. In the Select LUN menu, choose the supported LUN.

8. Save the changes by pressing **ESC** twice.

Install the Operating System

Installing from the Rapid Deployment Pack

If you are using ProLiant Essentials Rapid Deployment Pack (RDP), use the deployment jobs modified for Boot from SAN Deployment to install the operating system as described in the Rapid Deployment Pack User's Guide available at http://www.hp.com/servers/rdp.

Installing from the CD-ROM

1. Insert the Windows operating system CD-ROM.

2. Reboot the server.

3. For Windows 2000 and Windows Server 2003, press **F6** when prompted. For Windows NT, press **F6** as soon as the text setup starts.

4. When the setup program prompts you to specify an additional device, choose **S=Specify Additional Device**.

5. Insert the diskette that came with the HBA. It contains the HBA driver required for booting. Press **Enter**.

6. A list of devices displays. Select the appropriate HBA.

7. Continue the operating system installation. While in text mode stage, two instances of the boot device are presented. Choose the **second instance** of the boot device.

8. Complete the installation.

Note: For Windows NT, do not install networking until after the operating system installation finishes. You must install networking after the operating system installation completes. Windows 2000 and Windows Server 2003 do not have this setup restriction; networking can be installed during setup.

---

9. For Windows NT**,** if you are using the 4.82a16 driver, you must install the Adjunct driver (for persistent binding) after the operating system has finished its installation.

10. After the operating system installation completes, reboot.

11. Update the driver:

   a. For Emulex HBAs on Windows 2000 and Windows Server 2003, the Found New Hardware Wizard displays Emulex Utility IFC Dev. SCSI ASCIT8 device after the first reboot. Choose Cancel at this point and for any other prompts for new hardware. This device is automatically installed with the Software Solution kit or Softpaq.

   b. For Windows NT, run the driver update utility from the Software Solution kit to install the Adjunct driver.

12. Run the Fibre Channel Software setup from the Software Solution kit.

13. Install the Secure Path for Windows software.

14. Using the Smart Start CD-ROM update the system drivers.

15. Install the latest operating system service pack.

Note: In HA/F500 configurations, MSCS failover clusters on Windows 2000 and Windows Server 2003 systems are no longer supported in EVA single path configurations.