

application notes

# hp StorageWorks Booting Windows Systems from a Storage Area Network

Fourth Edition (April 2003)

**Part Number:** AA-RS2UD-TE

This document describes how to boot Microsoft Windows NT and Windows 2000 from StorageWorks Enterprise Virtual Arrays and Enterprise Modular Arrays.

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>.



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Booting Windows Systems from a Storage Area Network Application Notes  
Fourth Edition (April 2003)  
Part Number: AA-RS2UD-TE

# 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 NT 4.0 and Windows 2000
- HBAs

## 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.

## 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

## Restrictions

### Operating System Restrictions

Microsoft Windows NT and Windows 2000 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.

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**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>.

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### Clustered Server Restrictions

- Microsoft requires that clustered servers keep boot disks on data paths that are separate from shared-storage paths. This requires a dedicated HBA for booting and another HBA for shared disks.
- Single path multiple bus configurations are not supported.

### Standalone Server Restrictions

In a standalone server environment, an HBA 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.

## Required Hardware And Software

### RAID Arrays

- Enterprise Virtual Array
- Enterprise Modular Array (RA8000, MA6000, MA8000, EMA12000, EMA16000, ESA 12000 Fibre Channel)

### 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

### Fibre Channel Switches

- StorageWorks 1 GB FC Switches–8 Port and 16 Port
- StorageWorks 1 GB SAN Switches–8 Port and 16 Port
- StorageWorks 1 GB SAN Switches–8-EL and 16-EL
- StorageWorks 2 GB SAN Switches–16 Port
- StorageWorks 2 GB SAN Switches–8-EL and 16-EL
- StorageWorks 2 GB SAN Switches–32 Port
- StorageWorks 2 GB SAN Switches–64 Port
- StorageWorks MSA 2 GB SAN Switch–8 Port
- StorageWorks Edge Switch 2/16
- StorageWorks Edge Switch 2/24
- StorageWorks Edge Switch 2/32
- StorageWorks Director Switch 2/64
- StorageWorks Edge Switch 2/140

### Servers

Only HP ProLiant Servers are supported.

### Supported External Boot Devices

StorageWorks Enterprise Virtual Arrays

StorageWorks Enterprise Modular Arrays with ACS (Array Controller Software) Version 8.5, 8.6, or 8.7.

Refer to the Software Solution kit documentation for supported disks.

## Operating Systems

- Microsoft x86 Windows NT 4.0 Server
- Microsoft x86 Windows NT 4.0 Enterprise Server
- Microsoft x86 Windows 2000 Server
- Microsoft x86 Windows 2000 Advanced Server

## Boot Setup Procedures for Specific Software Solutions

The following sections describe boot set up procedures for specific software solutions and the following host bus adapter (HBA) firmware, and boot BIOS versions:

- 3.82A1 firmware
- Boot BIOS:
  - 1.60A4
  - 1.60A5
  - 1.61A2

The procedures include:

- Enterprise Modular Arrays
  - [Windows Boot Setup Procedure for Transparent Failover Mode](#)
  - [Windows Boot Setup Procedure for Multiple Bus Failover Mode](#)
- Enterprise Virtual Arrays
  - [Windows Boot Setup Procedures for Enterprise Virtual Array](#)

## 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 or Windows 2000

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

- RA8000/ESA12000 and 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.

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**Note:** Reference to the HSG80 are intended to cover all of the RA8000 RAID Array products.

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- 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.
  - 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.
  - When creating a partition for the operating system load, make sure that all the partition sizes are identical for all the disks that carry the same disk description as determined by Windows (for example, Disk 00 Id 01 XXXXX). If you do not make the partitions identical, especially in SCSI-3 mode, the installer formats the partition, reboots, and restarts the selection process.

## Considerations For Booting Clusters

Microsoft 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 double the number of HBAs 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)
- 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

## Considerations For Secure Path

Secure Path provides high availability computing through a redundant data path to the RAID Array. 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 (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.

## Windows Boot Setup Procedure for 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 host bus adapters (HBAs).

Before you begin, make sure you have reviewed the information and tasks in the sections [Required Hardware And Software](#), [Restrictions](#), and [Prerequisites](#).

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**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.

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### 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](#), for those without this utility, refer to the section [Setup for Servers without RBSU](#). 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. 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**.
7. Reboot the server.

## Set Up the Host Bus Adapter

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. 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.
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. Choose the first HBA.
  - c. Choose **Option 1, Configure Boot Devices**.
  - d. Choose **1** as the primary boot path.
  - e. Return to the main menu by pressing **Page Up** twice.
5. 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
```
6. Note to which LUN the controller is online.
7. Verify that the HBA is online by entering the following command:  

```
HSG> show connections
```
8. Optionally rename the connection.
9. Allow the HBA to access the LUN as follows:  

```
HSG> set d1 enable_access_path=!newcon01
```

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**Note:** If your RA8000/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.

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- On the server, at the **Select the Desired Boot Device** prompt, choose the line number that contains the WWPNN of the controller port to which the LUN is online. The following example shows which line number to choose.

	Port 1	Port 2	
<input checked="" type="checkbox"/>	<input type="text"/> WWPN: 5000 1fe1 0006 4c33	<input type="text"/> WWPN: 5000 1fe1 0006 4c34	Top Controller This Controller
<input type="checkbox"/>	<input type="text"/> WWPN: 5000 1fe1 0006 4c31	<input type="text"/> WWPN: 5000 1fe1 0006 4c32	Bottom Controller Other Controller

**Note:** Each controller port has an WWPNN. The WWPNN 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 WWPNN from this controller for booting.

- Repeat the last 4 steps for the second item in the List of Saved Boot Devices.
- Reboot the server.

## Install the Operating System

- Insert the Windows operating system CD-ROM.
- Reboot the server.
- For Windows 2000, press **F6** when prompted. For Windows NT, press **F6** as soon as the text setup starts.
- When the setup program prompts you to specify an additional device, choose **S=Specify Additional Device**.
- Insert the driver diskette for the HBA. It contains the HBA driver required for booting. Press **Enter**.
- A list of devices displays. Select the device as follows:
  - For Windows 2000, choose **KGPSA-xx, PCI-Fibre Channel, HBA**.
  - For Windows NT, choose **Emulex LP6000/LP7000/LP8000/LP9000/LP850/LP950, PCI-Fibre Channel Adapter**.

**Note:** If this adapter does not display in the list, recheck the setup procedures for the HSG80 RA8000, hubs, switch, HBA, or server.

- Complete the installation.

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**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.

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8. For Windows NT, if you are using the 4.81a9 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.

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

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10. Run the Fibre Channel Software setup from the Software Solution kit.
11. Using the Smart Start CD-ROM, update the system drivers.
12. 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](#)
- [Set Up the Host Bus Adapter](#)
- [Install the Operating System](#)

## 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 Procedure for 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 host bus adapters (HBAs).

Before you begin, make sure you have reviewed the information and tasks in the sections [Required Hardware And Software](#), [Restrictions](#), and [Prerequisites](#).

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**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.

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### 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](#), for those without this utility, refer to the section [Setup for Servers without RBSU](#). 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. 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**.
7. Reboot the server.

## Set Up the Host Bus Adapter

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. 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.
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. Choose the first HBA.
  - c. Choose **Option 1, Configure Boot Devices**.
  - d. Choose **1** as the primary boot path.
  - e. Return to the main menu by pressing **Page Up** twice.
5. 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
```
6. Note to which LUN the controller is online.
7. Verify that the HBA is online by entering the following command:

```
HSG> show connections
```
8. Optionally rename the connection.
9. Allow the HBA to access the LUN as follows:

```
HSG> set d1 enable_access_path=!newcon01
```

---

**Note:** If your RA8000/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.

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- On the server, at the **Select the Desired Boot Device** prompt, choose the line number that contains the WWPN of the controller port to which the LUN is online. The following example shows which line number to choose.

	Port 1	Port 2	
<input checked="" type="checkbox"/>	<input type="text"/> WWPN: 5000 1fe1 0006 4c33	<input type="text"/> WWPN: 5000 1fe1 0006 4c34	Top Controller This Controller
<input type="checkbox"/>	<input type="text"/> WWPN: 5000 1fe1 0006 4c31	<input type="text"/> WWPN: 5000 1fe1 0006 4c32	Bottom Controller Other Controller

**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.

- Repeat the last 4 steps for the second item in the List of Saved Boot Devices.
- Reboot the server.

## Install the Operating System

- Insert the Windows operating system CD-ROM.
- Reboot the server.
- For Windows 2000, press **F6** when prompted. For Windows NT, press **F6** as soon as the text setup starts.
- When the setup program prompts you to specify an additional device, choose **S=Specify Additional Device**.
- Insert the driver diskette for the HBA. It contains the HBA driver required for booting. Press **Enter**.
- A list of devices displays. Select the device as follows:
  - For Windows 2000, choose **KGPSA-xx, PCI-Fibre Channel, HBA**.
  - For Windows NT, choose **Emulex LP6000/LP7000/LP8000/LP9000/LP850/LP950, PCI-Fibre Channel Adapter**.
- 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 RA8000, hubs, switch, HBA, or server.

- Complete the installation.

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**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.

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9. For Windows NT, if you are using the 4.81a9 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.

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

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11. Run the Fibre Channel Software setup from the Software Solution kit.
12. Install the Secure Path for Windows software.
13. Using the Smart Start CD-ROM, update the system drivers.
14. Install the operating system's latest service pack.

#### Using Secure Path to Complete the HBA Setup

Use the following steps to complete the HBA setup from the Software Solution CD-ROM.

1. Reboot the server.
2. Install Secure Path for Windows and set up the Secure Path agent and client. Refer to the Secure Path for Windows documentation for complete instructions.
3. Reboot the server.
4. Open Secure Path, create and save a profile, and log in.
5. After logging in to Secure Path, use CLI to add the second connection from the HBA to the boot LUN as follows:

```
HSG> set enable_access_path=<connection names>
```

<connection names> are the names of connections that are associated with same controller to which the LUN is online. There should be two connections at this time.

6. Right-click **My Computer**.
7. Choose **Manage > Disk Management > Actions > Rescan Disks**.
8. Return to Secure Path and refresh the display. The display includes the new connections (paths) for the LUN.
9. Right-click the LUN and move to the other controller.
10. Reboot the server.
11. Configure the secondary boot path:
  - 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 adapter.
  - c. Choose **Option 1, Configure Boot Devices**.
  - d. Choose **2** as the Secondary boot path.

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**Note:** If your RA8000/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.

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- e. On the server, at the **Select the Desired Boot Device** prompt, choose the line number that contains the WWPN of the controller port to which the LUN is online.
  - f. At the **Select the Desired Boot Device** prompt, choose the entry next to **LUN:xx**. This establishes the HBA's starting LUN number, and is used to look for a bootable disk. Your actual boot LUN is this one or higher.
  - g. On the next screen, choose the line number that contains the LUN from which you want to boot.
  - h. Choose **1, Boot this device via WWPN**.
  - i. Return to the main menu by pressing **Page Up** three times.
12. Repeat [step 11](#) for the second adapter.
  13. Press **X** to exit the utility.
  14. Reboot the server and open Secure Path. The display now contains four connections to the LUN.

### 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 the top switch and the other HBA to the bottom switch.
2. 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:

- [Before you begin, make sure you have reviewed the information and tasks in the sections Required Hardware And Software, Restrictions, and Prerequisites.](#)
- [Set Up the Host Bus Adapter](#)
- [Install the Operating System](#)

### 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

### Set up the Enterprise Virtual Array

1. Create A Virtual Disk (LUN):
  - For Windows NT—Create a Virtual Disk (LUN) no greater than 4GB.
  - For Windows 2000—Create a Virtual Disk (LUN) no greater than 8GB.
2. Record the WWPN (Worldwide Port Number) of each controller. 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](#), for those without this utility, refer to the section [Setup for Servers without RBSU](#).

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**.
  - e. 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**. Set the secondary HBA to **Position 3**. The Smart Array should be in **Position 4** or higher.
7. Reboot the server.

### Set Up the Host Bus Adapter

1. Record the IEEE number for all HBAs.
2. You may install all adapters at this time. Install either a DS-KGPSA-CB adapter or FC2101 adapter and record the PCI slot it occupies.

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.

## Install the Operating System

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 diskette that came with the HBA. It contains the HBA driver required for booting. Press **Enter**.
6. A list of devices displays. Select the device as follows:
  - For Windows 2000, choose **KGPSA-xx, PCI-Fibre Channel, HBA**.
  - For Windows NT, choose **Emulex LP6000/LP7000/LP8000/LP9000/LP850/LP950, PCI-Fibre Channel Adapter**.
7. Continue with 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.

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**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.

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9. For Windows NT, if you are using the 4.81a9 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.

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

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11. Run the Fibre Channel Software setup from the Software Solution kit.
12. Install the Secure Path for Windows software.
13. Using the Smart Start CD-ROM update the system drivers.
14. Install the latest operating system service pack.

### Set up the Remaining Adapters

1. Configure the secondary path of the primary adapter to use the other WWPN of the desired Enterprise Virtual Array.
2. Follow the procedure described in the section [Set Up the Host Bus Adapter](#) to set up the secondary boot adapter.
3. Connect the two remaining HBAs that you did not use for booting to the switches (No BIOS changes are necessary. Connect one HBA to the top switch and the other HBA to the bottom switch.

### 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.