



TECHNICAL REPORT: **Booting IBM BladeCenter™ from Network Appliance™ FCP SAN Attached Storage**

Version 1.0

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Abstract

This document demonstrates to the storage administrator audience how to prepare, configure, and boot IBM BladeCenter blade servers using Network Appliance FCP SAN attached storage systems. This document describes how to configure the BladeCenter Fibre Channel expansion adapter, provides a brief overview of the BladeCenter I/O module subsystem, and provides detailed steps for configuring FCP SAN boot using Network Appliance storage system.

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Many Thanks!

Change Notification

Change Revision	Description	Date
1.0	Initial release	February 2007

Important Notice

This document does not make any testing statements about supported configurations. You should always refer to the *Compatibility and Configuration Guide for NetApp FCP and iSCSI Products*, available at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/. In addition, you should review the IBM ServerProven Program at <http://www-03.ibm.com/servers/eserver/serverproven/compat/us/>.

Overview

FCP SAN boot, remote boot, and “root boot” are the terms used when referring to a server configuration where the server’s operating system is installed on a logical drive (LUN) that is not resident locally to the server chassis. So why SAN boot? Why is that any better than booting the host OS from local storage? The primary benefits are:

- The ability to create a Snapshot™ copy of the host OS. Create a Snapshot copy of the OS before installing a hot fix, service pack, or other risky change to the OS. If it goes bad, just restore it from the copy. Further details about Snapshot technology can be found at: <http://www.netapp.com/products/snapshot.html>.
- Performance. The host is likely to boot significantly faster in a SAN boot configuration because you can put several spindles under the boot volume.
- Fault tolerance. Multiple disks under the volume in a RAID 4 or RAID-DP™ configuration.
- BladeCenter implementations often benefit from SAN/iSAN boot because all of the hosts are composed of identical hardware. The administrator can build a single OS LUN and clone it to the other hosts.
- LUN cloning can also be a compelling argument with environments that rarely change the host OS image. Each clone has many blocks in common with the “master” and therefore does not consume as much disk space. See Appendix B for details on how to configure LUN cloning in a Microsoft® Windows™ environment.

This document describes in detail the process that you must go through to set up an FCP SAN boot for IBM BladeCenter servers using a LUN from an FCP SAN attached Network Appliance storage system. This process is intended for a configuration of a Blade Center directly connected to the Network Appliance storage system using Fibre Channel (FC) cables, as shown in Figure 1. If the blade server is connected to the NetApp storage system via Inter-Switch Links (ISLs) to external FC switches, reference the IBM Interoperability Matrixes and switch user guides for instructions to correctly integrate the BladeCenter into a SAN.

When designing a BladeCenter FCP SAN solution, ISL oversubscription and locality should be carefully considered. A common SAN design has an ISL oversubscription ratio of 7:1, which is suitable for many user environments. This means at least 2 ISLs per BladeCenter switch into the existing SAN, because there are up to 14 blade servers in the BladeCenter chassis. High-performance SANs or conservative designs are recommended to have an ISL oversubscription ratio of 3:1. This means having 1 ISL for every 3 blade servers. In addition, you need to consider maximizing SAN locality. (Locality refers to localizing traffic between blade server and NetApp storage systems on a single switch or in one area of a SAN with as few hops as possible.) The guiding principle of locality is that as much as possible of the storage traffic between the blade server and the storage system should flow through as few hops as possible. Obviously this requirement is automatically met in simple SANs with few switches. Things get more complicated, and potentially a lot less efficient, when the SAN has a fabric with several switches.

In addition to performance considerations, nonlocality can become expensive in a multiswitch fabric because each ISL between switches takes at least two ports (one on each switch), and ports are usually the critical resource in a SAN fabric. Because each device on one switch that communicates with a device on the other takes an ISL, a traffic pattern that has four devices communicating across switches takes four ISLs. If locality is not considered in laying out the traffic patterns, much of each switch capacity can be eaten up quickly by ISLs. Locality considerations become more important as the complexity of the SAN grows. Finding the best arrangement of servers and storage is fairly easy in a two-switch fabric, but it becomes more difficult as the fabric grows. A core-edge topology can ease the problem by

providing central switches or directors at the core of the fabric that switch between devices connected to switches between the edge of the fabric.

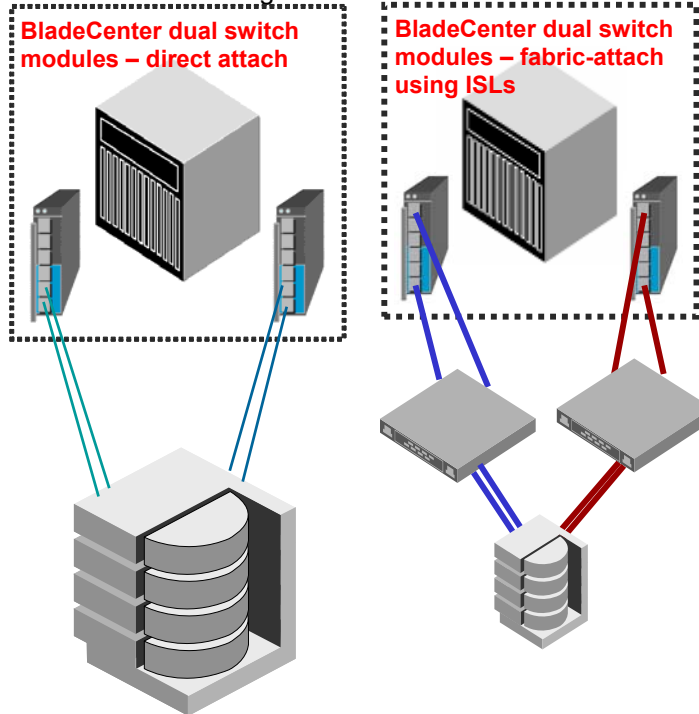


Figure 1) BladeCenter direct attached and using ISLs.

About the BladeCenter I/O Subsystem

Currently there are three different types of BladeCenter chassis: Telco, Enterprise, and H. The H and Enterprise chassis are capable of containing up to 14 blade servers, and 8 for the Telco chassis. The chassis also has two management modules and a total of four I/O modules. Based on the current blade design, only Ethernet, Copper Pass-Thru (CPM) or Optical Pass-Thru (OPM) I/O modules can be inserted into bays 1 and 2. Any type of defined switch module, for example the Ethernet and Fibre switch modules, and Copper or Optical Pass-Thru, can be inserted into bays 3 and 4. A two-port Fibre Channel expansion card option can be installed in the blade server where port 1 is always connected to the module in bay 3 and port 2 is always connected to the module in bay 4.



Figure 2) BladeCenter Enterprise and Telco chassis.

In addition, the BladeCenter H chassis is capable of containing bridge modules in bays 3, 4, 5, and 6, as well as high-speed switch modules in bays 7 through 10. However, for the purpose of this document, the I/O module will be a Fibre Channel switch module installed in bays 3 and 4. The BladeCenter H chassis is shown in Figure 3.

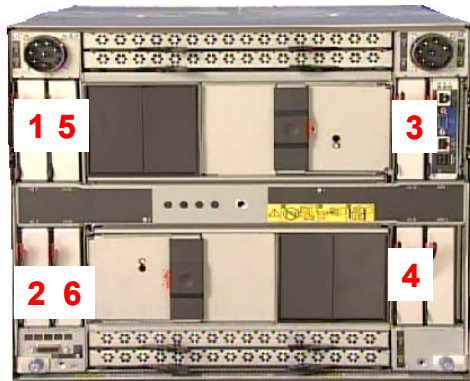


Figure 3) BladeCenter H chassis.

Preparation Checklist

As a preparation procedure, ensure that you either have access to or have researched the following areas before proceeding to configuration. Additionally, review Appendix A, “Design and Implementation Considerations.”

Network Appliance storage system

- Review the *Compatibility and Configuration Guide for NetApp FCP and iSCSI Products*, available at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/.
- Ensure that the NetApp storage system is cabled in accordance with the user guide that comes with the storage system.
- Obtain the IP addresses of the NetApp storage system
- Obtain all the necessary licenses for the storage system; for example, FCP, MPIO, SnapDrive®, etc. These can be obtained at <https://now.netapp.com/eservice/agree.do>.

IBM BladeCenter Fibre Channel expansion adapter

- Review the *Compatibility and Configuration Guide for NetApp FCP and iSCSI Products*, available at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/
- Review the *IBM BladeCenter Fibre Channel Adapter Installation and User’s Guide*, available at <http://www-03.ibm.com/servers/eserver/support/bladecenter/index.html>.
- IBM BladeCenter blade server updates can be found at <http://www-03.ibm.com/servers/eserver/support/bladecenter/index.html>.

IBM BladeCenter Fibre Channel switch module

- Review the appropriate *Switch Module Installation and User’s Guide*, available at <http://www-03.ibm.com/servers/eserver/support/bladecenter/index.html>.
- Record the IP addresses of the BladeCenter Fibre Channel switch modules.
- Back up the switch fabric configuration to a file. These steps are documented in the user guides for the switch modules.

Management workstation

- Configure a workstation that can be used to access the IBM BladeCenter Management Module, switches, and NetApp storage system via an IP address.

Installation Flow (Quick Steps)

Experienced users can use this section as a quick guide.

Configure single FC path

- Set up a single-path environment. This can be done by disabling the FC port that is connected to the HBA on the FC switch in bay 4; or remove the switch in bay 4. It can also be done by mapping the LUN to only one port of the HBA and limit to one path to the first HBA using zoning.

Gather WWN of FC adapter

- Log in to the FC switch module and locate the World Wide Name (WWN) of the HBA from the name server. Note that the HBA must have loaded the driver in order to log in to the switch.

Zone the FC switch

- Zone the FC switch; include the HBA and storage system in the zone.
- Add the zone to the zone configuration.
- Activate the configuration on the switch.

Create and map LUN to host

- Create one boot LUN and map the LUN to the HBA.

Configure boot sequence for booting on CD-ROM

- Use the Management Module to configure the boot sequence.

OS installation

- Insert the CD-ROM of the OS that you want to install.
- Power on the blade server and continue to install the OS on the blade server.

Configure boot sequence

- Set up the FC expansion card (HBA) BIOS to boot on SAN LUN.

Configure for redundancy

- Enable the second path by inserting the FC switch in bay 4; or enable the port for the HBA.
- Install the NetApp host attach kit.

Preparing the FC Expansion Card (HBA)

This section describes the steps for preparing the IBM JS21 blade servers with an FC expansion card. This is done in preparation for FCP SAN boot from fabric-attached storage (FAS). The FC expansion card is an option card that is installed inside the blade server. The expansion card interfaces with the two midplanes and provides connectivity to I/O modules 3 and 4 in the rear of the chassis.

Figure 4 shows the placement of the FC expansion card inside the blade server. The figure on the left illustrates a small-form-factor expansion card and the figure on the right illustrates a standard-form-factor expansion card. For a detailed overview of the FC expansion cards, refer to the installation and user's guides that comes with the adapter.

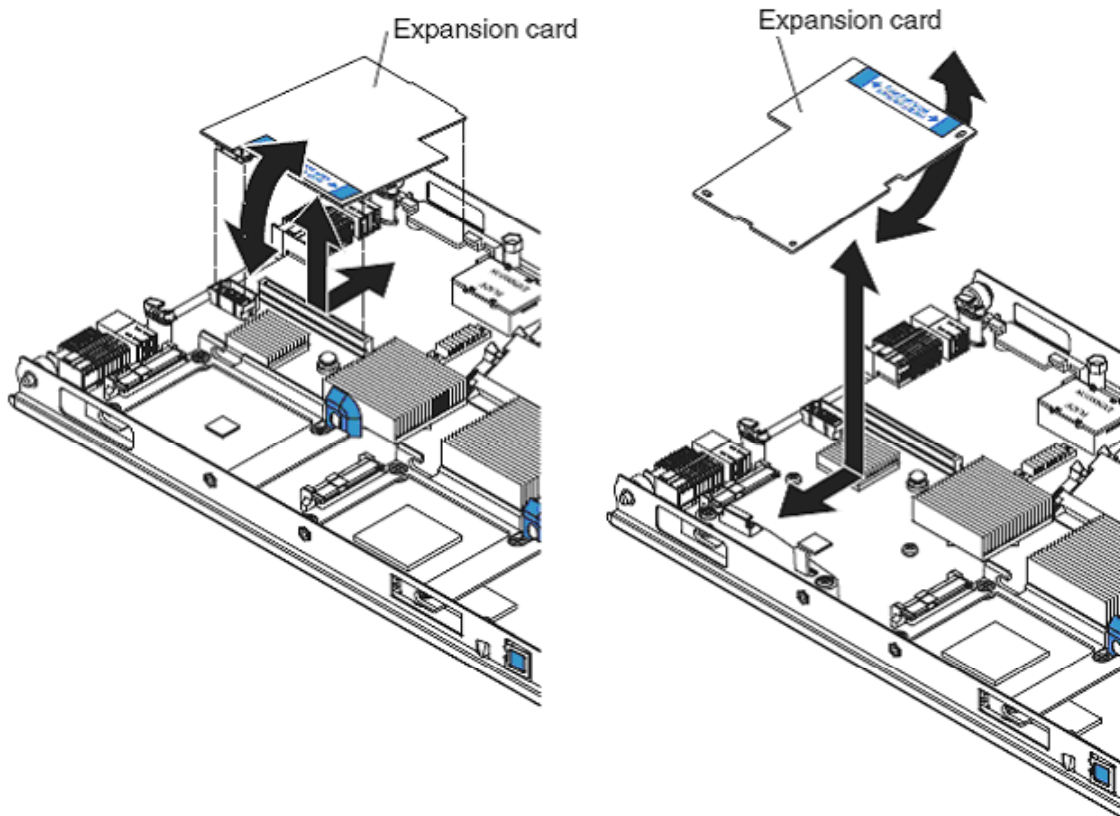


Figure 4) Blade server FC expansion card installation.

Directions: Installing the FC Expansion Card

NOTE: The QLogic 4Gb SFF Fibre Channel Expansion Card for IBM BladeCenter, option part number (p/n) 26R0890, is currently the only adapter that has been tested for FCP SAN boot with JS21.

1. Ensure that the blade server is powered off.
2. Remove the blade server from the chassis (if it is installed in the chassis).
3. Remove the cover of the blade server.

4. Remove the FC Expansion Card from the static-protective package.
5. Slide the narrow end of the FC Expansion Card into the raised hook on the tray.
6. Align the FC Expansion Card connectors with the network-interface option connector and the PCI-X expansion slot.
7. Gently press the card into the connectors.
8. Lower the cover so that the slots at the rear slide down onto the pins at the rear of the blade server.
Important: The blade server cannot be inserted into the BladeCenter unit until the cover is installed and closed. Do not attempt to override this protection. Figure 4 shows how to install the FC expansion card in the blade server.
9. Install the blade server into the BladeCenter chassis.

Gather WWN of the FC Expansion Card

The next two sections guide you through how to gather the WWN from the FC expansion card (HBA) inside the blade server. Use “Directions: Recording the WWN of FC Expansion Card on JS21 Blade Server” if you are configuring a JS21 blade server, and use “Directions: Recording the WWN of FC Expansion Card on LSxx/HSxx Blade Server” if you are using an LSxx/HSxx blade server.

Directions: Recording the WWN of FC Expansion Card on JS21 Blade Server

The WWN of the FC expansion card (HBA) can be gathered from the switches. Note that the FC driver must be loaded before the HBA can log in to the FC switch. Follow the directions below to initiate the HBA to log in to the switch without an OS installed on the blade server.

NOTE: The WWN cannot be gathered from within the JS21 blade server itself.

1. Power on the blade server.
2. Open a command prompt and telnet to the Management Module.
3. Change the session console timeout value in the Management Module to infinity; type **<telnetcfg -T system:mm[1] -t 0>**.
NOTE: This configuration command needs to be entered only once and is saved in MM NVRAM.
4. Open a SOL connection to the blade; type **console -T blade[bladeno]**.
5. During the boot of the blade server and when the POST menu and indicators are displayed, press the 1 key after the word *Keyboard* is displayed and before the word *Speaker* is displayed to enter the SMS menu. The SMS menu is displayed:

```
PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Main Menu
```

Network Appliance Inc.

```

1.   Select Language
2.   Setup Remote IPL (Initial Program Load)
3.   Change SCSI Settings
4.   Select Console
5.   Select Boot Options
6.   Firmware Boot Side Options
7.   Progress Indicator History
-----
Navigation Keys:
                                     X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:5

```

6. Select option 5 and then option 1:

```

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Multiboot
1.   Select Install/Boot Device
2.   Configure Boot Device Order
3.   Multiboot Startup <OFF>
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:1

```

7. Select option 7, as shown below. This forces the JS21 blade server to scan for bootable devices, such as login to the fabric, and to look for bootable LUNs on both ports of the HBA. (4Gb FC expansion cards are capable of booting on both ports.) In order to find a bootable LUN, an OS must be installed.

```

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Select Device Type
1.   Diskette
2.   Tape
3.   CD/DVD
4.   IDE
5.   Hard Drive
6.   Network
7.   List all Devices
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:3

```

When the HBA has logged in to the switch, you can gather the WWN of the HBA from the name server of the switch. Follow the instructions below to accomplish this. Note that in order

to get the WWN of both adapters, you need to perform these steps on both of the switches (bays 3 and 4).

BladeCenter Brocade Switch Module Commands	BladeCenter QLogic / McData Switch Module Commands
<ol style="list-style-type: none"> 1. Start a telnet session and log in to the switch, open a command prompt, and type telnet <i>ipaddressofswitch</i>. 2. BSSM: >nsShow 3. BSSM: > logout 	<ol style="list-style-type: none"> 1. Start a telnet session and log in to the switch, open a command prompt, and type telnet <i>ipaddressofswitch</i>. 2. FCSM: USERID> admin start 3. FCSM (admin): USERID> ns show 4. FCSM (admin): USERID> admin end 5. FCSM (admin): USERID> logout

WWN of HBA 1	
WWN of HBA 2	

Directions: Recording the WWN of FC Expansion Card on LSxx/HSxx Blade Server Using QLogic HBA

1. Power on the blade server. While the system is going through POST, test your HBA hardware setup by pressing Alt-Q or Ctrl-Q when you see HBA BIOS on the screen.
2. When the QLogic BIOS starts, select the first HBA in the list.
3. Select Configuration Settings and then select Host Adapter Settings.
4. Record the WWN of the adapter below. Perform the previous steps for the second HBA/port.

WWN of HBA 1	
WWN of HBA 2	

IBM BladeCenter FC Switch Modules

This section describes the I/O modules that support the FC expansion card inside the blade server. I/O modules must be installed in slot 3 or 4 to provide an external FC connection to the blade server. The I/O modules for FCP are provided in two flavors: Fibre Channel switch modules and Optical Pass-Thru modules that can be used as interconnects to attach the BladeCenter into an external SAN environment. The Optical Pass-Thru module is supported only with 2Gb adapters.

The Fibre Channel switch module is designed to reduce the amount of cabling that is used to interface to the external SAN environment. The Fibre Channel switch module also has the resident functionality of a traditional Fibre Channel switch.

The Optical Pass-Thru module is designed to allow I/O expansion card break-out capabilities to an external SAN environment. Because the optical break-out provides a one-to-one (FC expansion-to-external device) port correlation, it may become more feasible to utilize an intermediate switch device. This intermediate switch device allows cable extensibility and aggregates the flow of traffic to a target device with minimal port count.

NOTE: The instructions in this document assume that the FC modules have been installed and configured with an IP address. You should consult the documentation that comes with the FC module for additional guidance.

Zoning and Interoperability should be considered when deploying BladeCenter in an FCP SAN boot environment while using Fibre Channel switch modules. Also, this section does not assume that you are using a particular type of Fibre Channel switch module, only that the switch module inside the BladeCenter is a functional IBM BladeCenter Fibre Channel switch module.

Follow the zoning examples below to guide you through the zoning setup for your configuration. When zoning, ensure that the zone contains only the WWN of the HBA (FC expansion card) and the back-end storage system.

NOTE: Allow only *one* FC path during OS installation.

FC Switch Interoperability

For SAN environments that operate on the premise of Open Fabrics, interoperability may be inherent. Open Fabrics are SAN where vendor-neutral device integration is permissible. Interoperability means connecting two or more switch fabric devices of different vendor types.

When attaching the IBM BladeCenter into any SAN environment, it is important to understand the SAN vendor of the devices that you are attaching to. Once this is determined, you should gather storage system appropriate documentation to guide you in designing this interoperable SAN.

For best practices, before proceeding to integrate the BladeCenter into an existing fabric, you should back up your switch configuration. This procedure is documented in the user's guide of the switch module, available at <http://www-03.ibm.com/servers/eserver/support/bladecenter/index.html>.

Additionally, for BladeCenter interoperability guidelines, see the *IBM BladeCenter Fibre Channel Interoperability Guide*, available at <http://www-03.ibm.com/servers/eserver/support/bladecenter/index.html> and the *Compatibility and Configuration Guide for NetApp FCP Products*, available at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/.

By default, when installing the IBM BladeCenter switch modules, external ports are disabled from within the IBM BladeCenter Management Module. It is not possible to enable the external switch ports within the switch module until the external ports have been enabled within the Management Module. To enable the external ports, log in to the IBM BladeCenter Management Module, select IO Module Task > Admin/Power/Restart, and then select the I/O module and enable external ports, as shown in Figure 6.

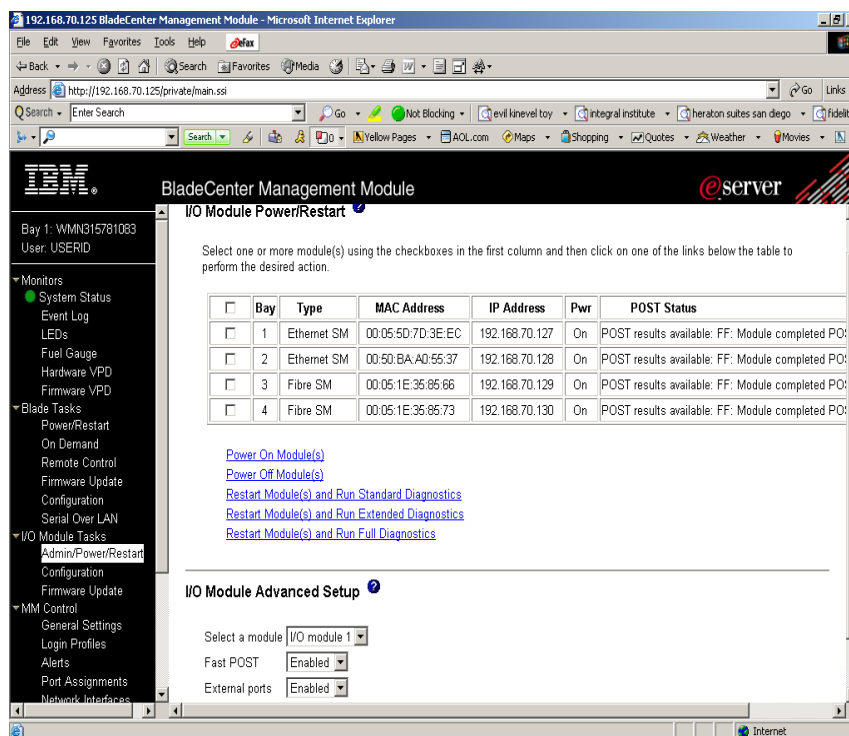


Figure 6) IBM BladeCenter Management Module.

Note that if you disable the E-port link between the IBM eServer BladeCenter Fibre Channel switch module and an upstream device and then reenables the link, the connection may not come back on line. The fix is to configure external ports as G ports if ISL is not established. See the IBM Web site at <http://www-1.ibm.com/support/docview.wss?uid=psg1MIGR-54431> for more information.

Zoning

Zoning is used to prevent propagation of state-change traffic to other blade servers in the fabric. Each blade server that has an I/O expansion card resident should be included in a separate zone. This is to prevent extraneous state-change traffic to other blade servers that may be in operation. Although in most cases this traffic is nondisruptive, it can have a slight performance impact on adjacent blade servers in the fabric.

To reduce the challenges related to operating system interoperability, zones can be created that fence off different operating systems. If a shared target such as a tape drive is needed, overlapping zones can be used while still protecting the different operating systems from each other. A similar reference can be made in regard to HBAs based on manufacturer. In these situations, some HBAs register as initiators, while some models allow configuration as both initiator and target. To minimize unwanted interactions between devices and to help with troubleshooting, limit the number of initiator HBAs within a zone to one. This is called *single initiator zone*, and prevents initiators from talking to each other, called *initiator cross-talk*.

There is one possible exception to this statement: when you are dealing with clustering applications and cluster nodes need to communicate with each other through their SAN connections. In general, it is recommended to zone devices with similar operating systems

together, such as a zone for Windows 2003, another for AIX, SLES9, RHEL4, etc. Also, use numerous small zone sets in a configuration instead of fewer large zone sets.

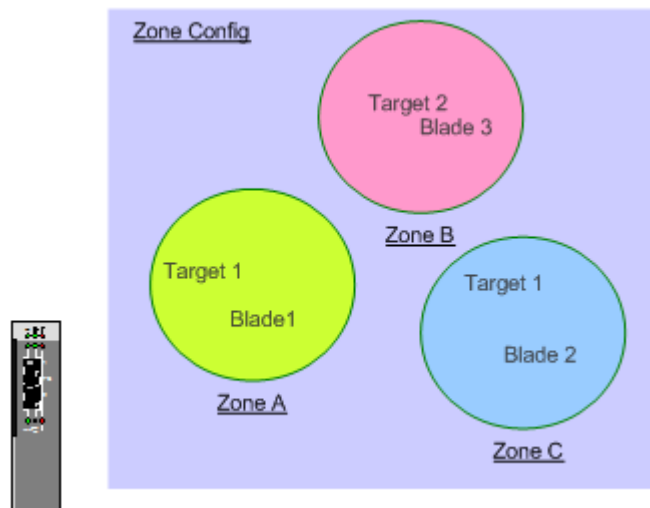


Figure 7) Zoning concept.

Why Implement zoning?

Zoning allows a SAN administrator to group storage resources to specific user groups based on a logical and/or functional basis. In a large enterprise with centralized storage, groups of users, such as departments, would have access only to storage resources that are not necessarily shared with other groups. This concept is very similar to VLANs in a LAN environment. Some operating systems attempt to “own” any disk that they find and write their signature to the disk. With zoning, this type of behavior can be restricted significantly. With a good zoning implementation, the SAN administrator limits what storage can be accessed by a given host node. In addition, zoning can enhance performance.

What Can Happen without Zoning?

Data corruption, or even loss of data, can occur if an initiator probes the fabric for targets and then proceeds to initialize, or perform I/O operations on, a given target that is already being utilized by a different initiator. Zoning provides the functionality of a virtual SCSI bus that limits an initiator to a given set of targets.

When a change occurs within the SAN, the fabric generates a State Change Notification (SCN). Without zoning, an SCN is sent to all ports within the fabric. When the ports go into recovery mode, certain fabric services can become flooded. Even though these situations should last for only a short period of time, fabric traffic throughput can be reduced significantly.

Some SAN devices have limited system resources for mapping and maintaining their connections. In a large SAN without zoning, this limitation could result in the initiator finding and mapping resources that it does not need to communicate with.

All of these aspects of a SAN are connected to each other, and zoning in particular. Zoning can play a critical role in limiting which paths between an initiator and a target are available for multipathing and redundant fabrics. Zoning can restrict the logical connection to a target, but LUN masking within the target further restricts which of its LUNs to make available to a

given initiator. In large SANs with a mixture of tape and disk resources, zoning can play a significant role for optimum throughput of data. Gateway mapping can be assisted by controlling which host nodes, based on their operating system, can access the gateway.

Directions: Configuring the Fibre Channel Switch Module

The following table shows the zone configuration steps:

IBM BladeCenter Brocade SAN Switch Module (Using CLI)	IBM BladeCenter QLogic and McData SAN Switch Module (Using CLI)
1. <code>brocadesm:USERID> zonecreate "Blade1", "WWWPn"</code>	1. Start a zone editing session: <code>cli \$> admin start</code> <code>cli (admin) #> zoning edit</code>
2. <code>brocadesm:USERID> cfgcreate "SANboot", "Blade1"</code>	2. Create a zoneset: <code>cli (admin-zoning) #> zoneset create SANboot</code>
3. <code>brocadesm:USERID> cfgenable "SANboot"</code>	3. Create a zone: <code>cli (admin-zoning) #> zone create Blade1</code>
4. <code>brocadesm:USERID> cfgsave</code>	4. <code>cli (admin-zoning) #> zone add Blade1 WWWPn</code>
	5. Make the zone a member of the zoneset: <code>cli (admin-zoning) #> zoneset add SANboot Blade1</code>
	6. Save the zoning session: <code>cli (admin-zoning) #> zoning save</code>
	7. Activate the zoneset: <code>cli (admin) #> zoneset activate SANboot</code>
	8. Exit from admin mode: <code>cli (admin) #> admin end</code>

NOTE: These zoning steps must be repeated for each Fibre Channel switch module.

Directions: Configuring Single Path

During the installation of the operating system, there should only be one path active to each blade server. The reason for this is that no multipathing software is available during the installation of the operating system. The second or alternate path can be activated after the installation of the operating system is complete. Follow the steps below to disable the second path on your embedded BladeCenter switch.

NOTE: In this example, the blade server is installed in blade slot 1, which is connected to port 1 on the switch module. Follow the directions in "Configuring for Redundancy," later in this document, to enable the second port (fcs1). Alternatively, you can choose to map the LUN to only one HBA port during the installation of the operating system and add the second HBA port after the operating system installation is complete.

As a precaution, this example disables the second HBA port, maps the LUN only to the first HBA port, and adds the second port after the installation of the operating system is complete.

Brocade Switch Module Commands	Logic / McData Switch Module Commands
1. Start a telnet session to the switch.	1. Start a telnet session to the switch.
2. Log in using USERID.	2. FCSM: USERID> admin start
3. BSSM: > portDisable 1	3. FCSM (admin): USERID> config edit
4. BSSM: > logout	4. FCSM (admin-config): USERID> set config port 1
	5. set port 1 to offline
	6. FCSM (admin-config): USERID> config save
	7. FCSM (admin): USERID> config activate
	8. FCSM (admin): USERID> admin end
	9. FCSM (admin): USERID> logout

Configuring the NetApp Storage System

Up to this point, the storage administrator has configured the blade server and the switch modules. This section describes how to configure the Network Appliance storage system that is connected to the IBM BladeCenter. In this example, the storage system is running Data ONTAP 7.2.1 in single-image mode. In this mode, both nodes in the active-active storage system configuration share the same World Wide Node Name (WWNN). Single-image mode provides the following advantages:

- The host can access all LUNs through any target port on the storage system.
- Single-image mode is supported on all storage systems and by all supported FCP hosts beginning with Data ONTAP 7.1.
- There are no switch limitations. You can connect a storage system in single-image mode to any supported FCP switch.

At this time, Network Appliance recommends using single-image mode for the following platforms: FAS270C, F800, FAS900, FAS3000, and FAS6000 HA storage subsystems. See the *Network Appliance Fibre Channel Configuration Guide* for more information.

NOTE: The instructions in this section assume that the storage system has been installed and configured with an IP address. **You should consult the documentation that comes with the storage system for additional guidance.**

Follow the directions below to create and map LUNs to the blade server. Perform these steps for each of the blade servers that you are configuring for SAN boot.

Directions: Configuring NetApp Storage System Using CLI

The `lun setup` command prompts you through the process of creating a LUN, creating an igroup, and mapping the LUN to the igroup. The volume where the LUN will reside must be created (`vol create`) before running `lun setup`.

NOTE: You should consult the Network Appliance documentation for additional guidance.

___ 1. Telnet and log in to the NetApp storage system. Type `lun setup` and press Enter.

___ 2. Select `[y]` and press Enter:

```
lun setup
  This setup will take you through the steps needed to create LUNs
  and to make them accessible by initiators. You can type ^C (Control-C)
  at any time to abort the setup and no unconfirmed changes will be made
  to the system.
Do you want to create a LUN? [y]: y
```

___ 3. Select the type of operating system that you are installing on the blade server; in this example it is Windows:

```
Multiprotocol type of LUN (solaris/windows/hpux/aix/linux/netware/vmware)
[linux]: windows
```

___ 4. Type the path to the LUN that you want to create, as shown below. Note that the volume must be created first (`vol create`), and there must be sufficient space in the volume.

```
A LUN path must be absolute. A LUN can only reside in a volume or
qtree root. For example, to create a LUN with name "lun0" in the
qtree root /vol/vol1/q0, specify the path as "/vol/vol1/q0/lun0".
Enter LUN path: /vol/vol1/blade1bootlun
```

- ___ 5. Specify whether you want the LUN to be created with space reservations enabled or not. In this example, space reservations are enabled. **Caution:** Choosing space reservation disabled may cause write operations to the storage system to fail, which can cause data corruption. It is strongly recommended that you enable space reservations.

```
A LUN can be created with or without space reservations being enabled.
Space reservation guarantees that data writes to that LUN will never fail. Do you
want the LUN to be space reserved? [y]: y
```

- ___ 6. Specify the size of the boot LUN:

```
Size for a LUN is specified in bytes. You can use single-character multiplier
suffixes: b(sectors), k(KB), m(MB), g(GB) or t(TB).
Enter LUN size: 5g
```

- ___ 7. Create a comment or a brief description about the LUN:

```
You can add a comment string to describe the contents of the LUN. Please type a string (without quotes), or
hit ENTER if you don't want to supply a comment.
Enter comment string: blade1 boot LUN
```

- ___ 8. Create an igroup, as shown below.
NOTE: If you have already created one or more igroups, you can enter ? to list them. The last igroup you used appears as the default. If you press Enter, that igroup is used. If you have not created any igroups, enter a name of the igroup that you want to create now.

```
The LUN will be accessible to an initiator group. You can use an existing group
name, or supply a new name to create a new initiator group. Enter '?' to see
existing initiator group names. Name of initiator group[]: blade1
```

- ___ 9. Enter the FCP protocol, which will be used by the hosts in the igroup:

```
Type of initiator group win_host5_group2 (FCP/iSCSI)[FCP]:FCP
```

- ___ 10. Add the World Wide Port Names (WWPNs) of the first HBA port that will be in the igroup:

```
Enter comma separated portnames: ?
Initiators connected on adapter 4a
Portname                               Group
21:00:00:14:5E:24:61:52
Initiators connected on adapter 5a:
None connected.
Enter comma separated portnames: 21:00:00:14:5E:24:61:52
```

- ___ 11. Specify the operating system type that the initiators in the igroup use to access LUNs. In this example, it is Windows:

```
The initiator group has an associated OS type. The following are currently supported: solaris, windows, hpux, aix, linux, netware, and vmware. OS type of initiator group "win_host5_group2"[windows]: windows
```

- ___ 12. Specify the LUN ID that the host will map to the LUN, as shown below. It is highly recommended to use 0 as the LUN ID for boot LUNs.
NOTE: If you press Enter to accept the default, Data ONTAP issues the lowest valid unallocated LUN ID to map it to the initiator, starting with zero. Alternatively, you can enter any valid number. See the NetApp Host Attach Kit or Host Support Kit documentation, or the host operating system documentation, for information about valid LUN ID numbers.

```
The LUN will be accessible to all the initiators in the initiator group. Enter `?' to display LUNs already in use by one or more initiators in group "win_host5_group2". LUN ID at which initiator group "win_host5_group2" sees "/vol/finance/records" [0]: 0
```

- ___ 13. Review and accept the configuration:

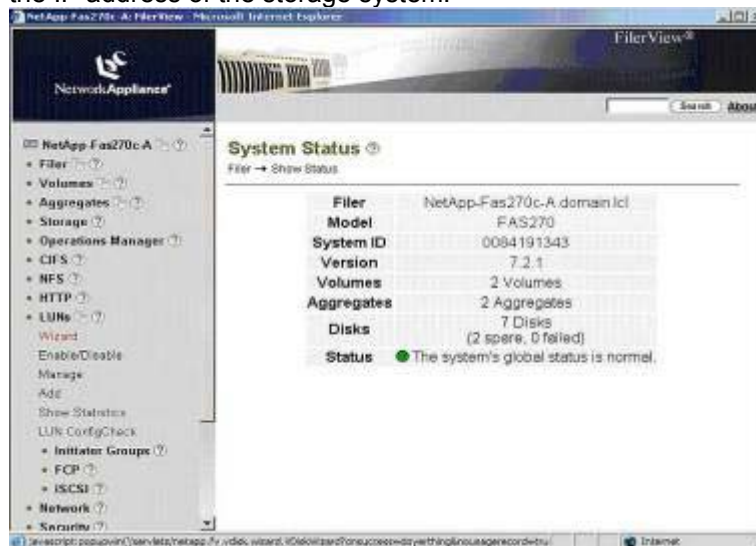
```
LUN Path           : /vol/finance/records
OS Type            : windows
Size               : 5g (5368709120)
Comment           : 5 GB Windows LUN for finance records
Initiator Group    : win_host5_group2
Initiator Group Type : iSCSI
Initiator Group Members : iqn.1991-05.com.microsoft:host5.domain.com
Mapped to LUN-ID   : 0
Do you want to accept this configuration? [y]: Y
Do you want to create another LUN? [n]: N
```

You have now created and mapped a LUN that will be used for the operating system. Repeat these steps for any blade server that you want to install.

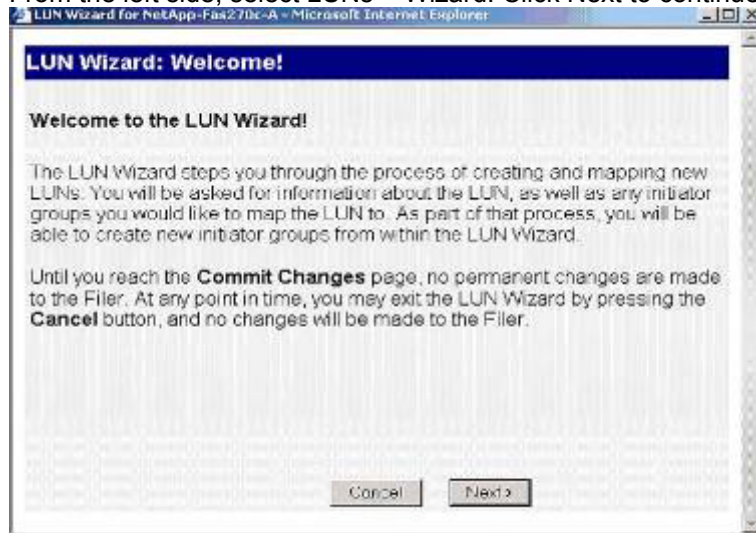
Optional Directions: Configuring NetApp Storage system Using Storage systemView®

As an alternative, you can use Storage systemView to create and map LUNs. Refer to the NetApp documentation for details on Storage systemView.

- ___1. Launch Storage systemView, open a Web browser, and point the browser to the IP address of the storage system.



- ___2. From the left side, select LUNs > Wizard. Click Next to continue.



- ___3. Use the information from the CLI section to complete the wizard to create and map the LUN to the blade server.

Configuring the Intel/AMD Blade Server: HS and LS Blade Server Family

Directions: Disabling the Local Hard Drive on the Blade Server

IBM recommends that you disable the local hard drives when SAN booting.

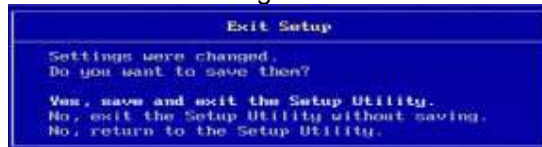
1. Power on the blade server and press F1 to enter the system BIOS of the blade server. The Configuration/Setup Utility appears. Select Devices and I/O Ports to continue



2. Depending on the type of blade, disable the onboard I/O controller. The most recent blade servers are shipped with on-board SAS controller. Earlier blades have SCSI or IDE on board. Disable the I/O controller:



3. When the I/O controllers has been disabled, press ESC twice and then click Yes to save the changes:



Directions: Configuring the HBA BIOS for SAN Boot

The blade servers ship with either Emulex or QLogic expansion cards (HBA). | This example uses a QLogic HBA.

1. Power on the blade server and when prompted press Ctrl-Q to enter the QLogic BIOS. All the blade servers are dual ported. Before the OS is installed and

multipathing is configured, it is highly recommended to configure only the first HBA port. HBA port 0 is always listed at the top. Select HBA port 0 and press Enter to continue:

Adapter Type	I/O Address
QLA2312	5000
QLA2312	5100

___ 2. Select Adapter Settings and press Enter:

Configuration Settings
Adapter Settings
Selectable Boot Settings
Restore Default Settings
Raw Nvram Data
Advanced Adapter Settings

___ 3. Enable the Host Adapter BIOS and then press ESC to continue:

Adapter Settings	
BIOS Address:	CB000
BIOS Revision:	1.43
Adapter Serial Number:	C83233
Interrupt Level:	4
Adapter Port Name:	210000145E246152
Host Adapter BIOS:	Enabled
Frame Size:	2048
Loop Reset Delay:	5
Adapter Hard Loop ID:	Enabled
Hard Loop ID:	125
Spinup Delay:	Disabled
Connection Options:	2
Fibre Channel Tape Support:	Enabled
Data Rate:	2

- ___ 4. Select Selectable Boot Settings and then press Enter:



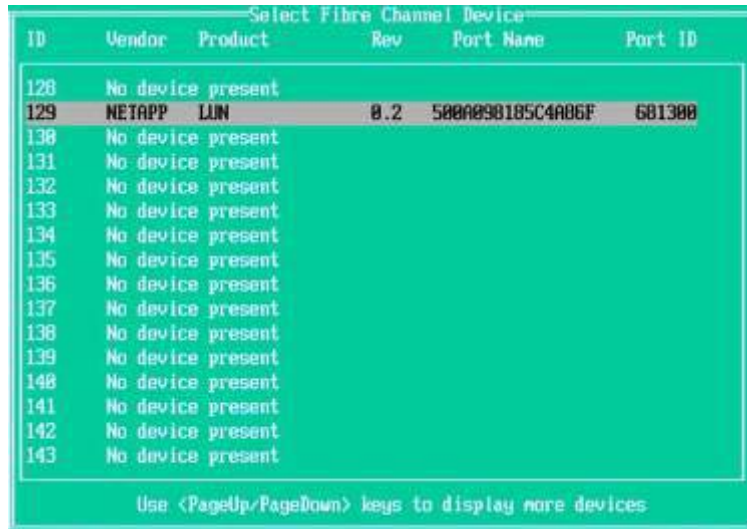
- ___ 5. Select the first boot LUN and then press Enter:



- ___ 6. Select the NetApp storage system from the list and then press Enter, as shown in the following figure.

NOTE: If the QLogic BIOS does not find the storage system, there are three possible scenarios to check:

- * QLogic BIOS version: During testing, we found that the storage system was not recognized with QLogic BIOS version 1.43 but worked fine with version 1.47.
- * Zoning: Incorrect zoning prevents the QLogic HBA from discovering the storage system.
- * SAN connectivity: Verify the connection between the storage system and the blade server.
- * If the storage system appears in the list below, but no boot LUN is found, you need to verify the igroups/LUN masking.



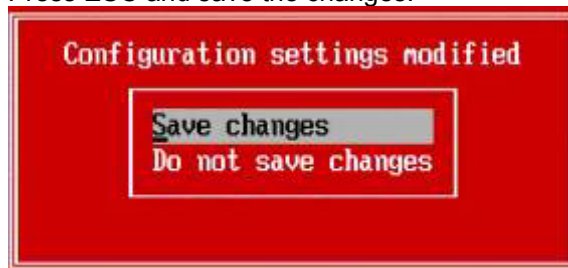
___7. When the boot LUN has been successfully added, press ESC.



___8. Verify that the following parameters are set in Configuration Settings > Advanced Adapter Settings **for both HBA ports**:

- * Port Down Retry Count = 75
- * Link Down Timeout = 30

___9. Press ESC and save the changes:

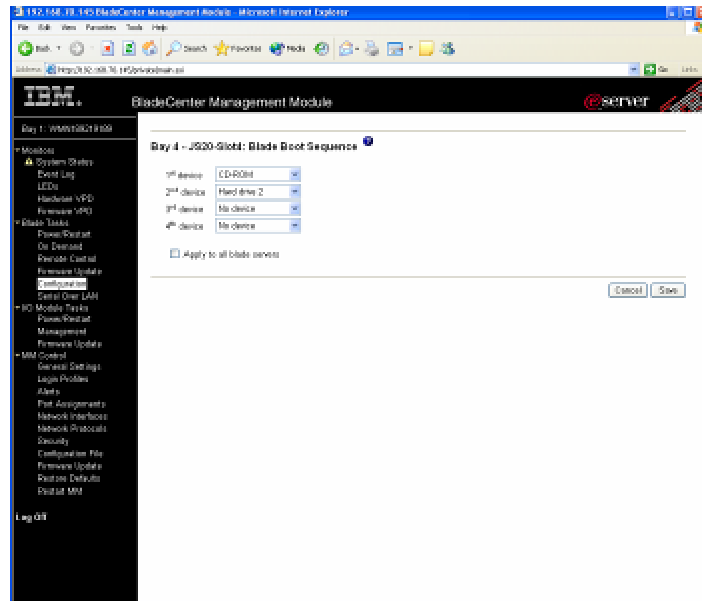


Configuring Boot Sequence for Installing from CD

The boot sequence can be configured using the BIOS setup utility on the HSxx/LSxx blade server or in the BladeCenter Management Module. This section shows the Management Module.

Directions: Configuring MM to Boot Blade Server on CD

1. Log in to the BladeCenter Management Module using the Web interface.
2. In the left navigation pane, click Blade Tasks and then select Configuration.
3. Scroll down to the Boot Sequence page.
4. Select CD-ROM as the first boot device and then click Save:



You have now configured the boot sequence on the blade server to boot on CD-ROM.

Installing the Operating System

Now that you have configured the Fibre Channel expansion card, switches, and storage system, you are ready to install the operating system.

To install an operating system on the HSxx/LSxx blade server, use one of the following two methods;

- Remote Deployment Manager (RDM): See the RDM documentation.
- CD-ROM: Follow the instructions in this section, which describe how to manually install an operating system on a blade server using a CD-ROM.

Directions: Installing Windows 2003

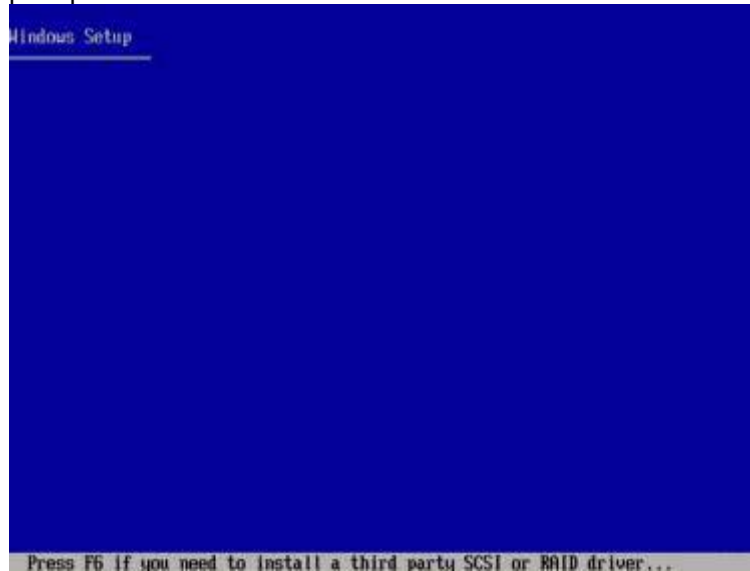
Before proceeding to install Windows 2003, review the supported HBA drivers from the *Compatibility and Configuration Guide for NetApp FCP and iSCSI Products*, available at

http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/. Note the driver version and then download the driver for the HBA from IBM, available at <http://www-304.ibm.com/jct01004c/systems/support/supportsite.wss/brandmain?brandind=5000020>.

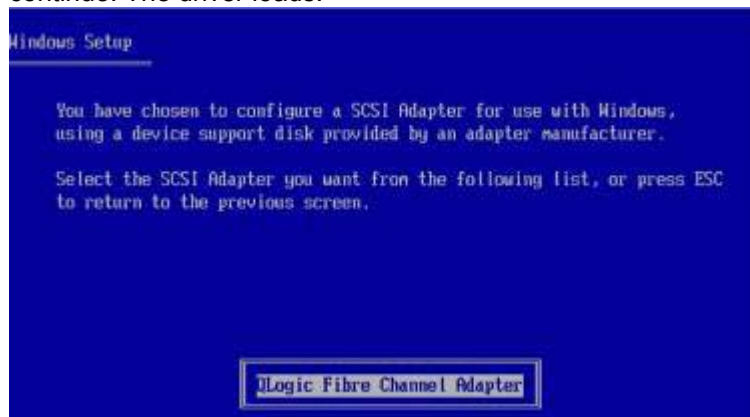
When the driver disk has been created, follow the instructions below to install the Windows operating system.

NOTE: During testing, we found odd behaviors with QLogic BIOS version 1.43, but it worked fine with version 1.47.

1. Boot the blade server on the Windows installation CD and press F6 when prompted:



2. Press S when prompted, insert the HBA driver diskette, and press Enter to continue. The driver loads:



___3. Select S to use the driver on the floppy disk:



___4. Press Enter to continue with the Windows installation as you normally would do. The rest of the Windows installation is the same as a normal installation.



You have successfully installed Windows 2003 on your blade server.

Configuring for Redundancy

Up to this point in configuring FCP SAN boot, the steps have assumed that you are using a single port of the FC expansion card to perform the OS installation (configured through port disable on the switch). The purpose of this was to prevent LUN contention during the OS installation. The next steps discuss configuring the second port of the FC expansion card (HBA) to become usable in the event of a failure on the first port. This section also describes how to configure the second I/O expansion module and install multipath software. This process is used for connecting the secondary path using igroup, (LUN masking, or sometimes called storage partitioning).

Directions: Enabling Second Switch Path

Enable the second switch path to the storage controller, using the following steps. **Note:** In this example, the blade server is installed in blade slot 1, which is connected to port 1 on the switch module.

Brocade Switch Module Commands	QLogic/McData Switch Module Commands
<ol style="list-style-type: none">1. Start a telnet session to the switch.2. Log in using USERID.3. BSSM: >portEnable 14. BSSM: > logout	<ol style="list-style-type: none">1. Start a telnet session to the switch.2. FCSM: USERID> admin start3. FCSM (admin): USERID> config edit4. FCSM (admin-config): USERID> set config port 15. FCSM (admin-config): USERID> set port 1 to online6. FCSM (admin-config): USERID> config save7. FCSM (admin): USERID> config activate8. FCSM (admin): USERID> admin end9. FCSM (admin): USERID> logout

NOTE: Enable port 1 on the BladeCenter switch modules. This port was previously disabled to allow only a single path during the installation of the OS. This provides dual paths to the storage controller.

Installing and Configuring Data ONTAP DSM 3.0 for Windows

Directions: Installing Windows Hot Fixes

Check the user guides for Data ONTAP Device Specific Module (DSM) 3.0 and the release notes to find out what Windows hot fixes are required, and then install them on the blade server. The hot fixes required at this time are shown in Figure 8. The hot fixes need to be downloaded from Microsoft.

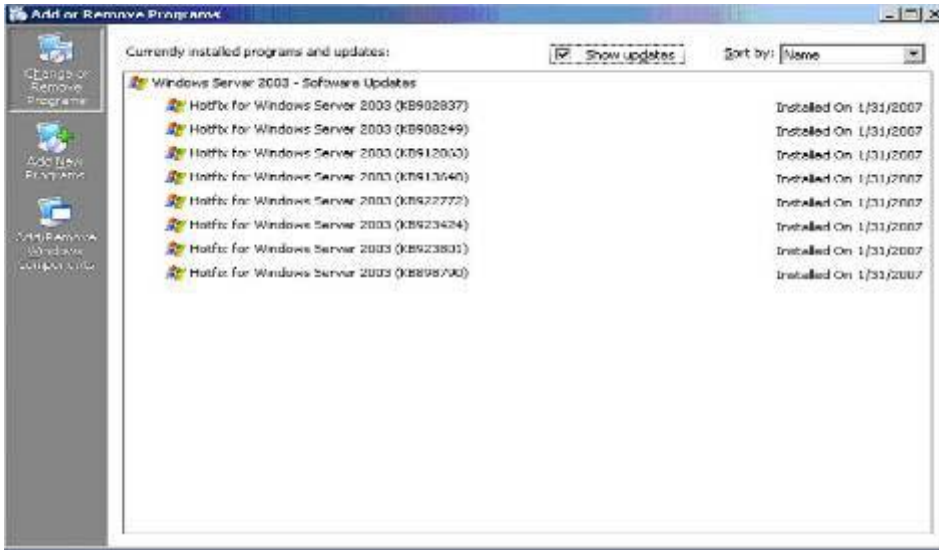
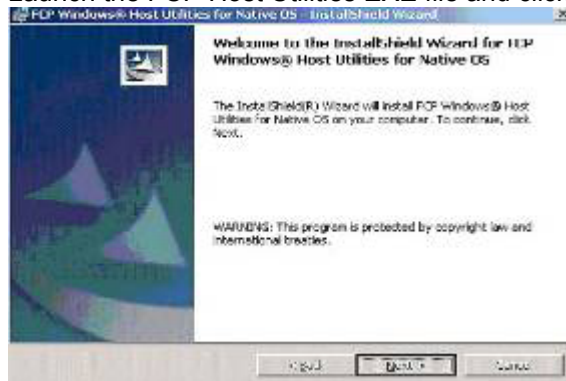


Figure 8) Required hot fixes.

Directions: Installing the FCP Host Utilities

Download the FCP Host Utilities from <http://now.netapp.com/NOW/cgi-bin/software>.

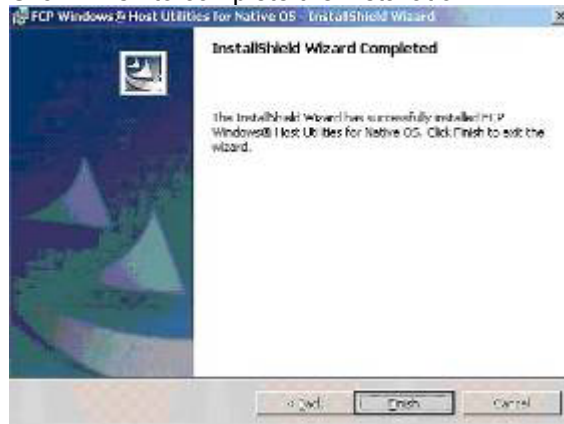
1. Launch the FCP Host Utilities EXE file and click Next to continue:



2. Accept the license agreement and click Next to continue:



___6. Click Finish to complete the installation:



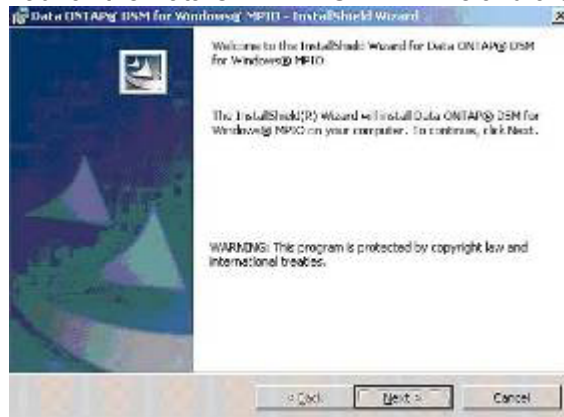
___7. Click Yes to reboot the blade server:



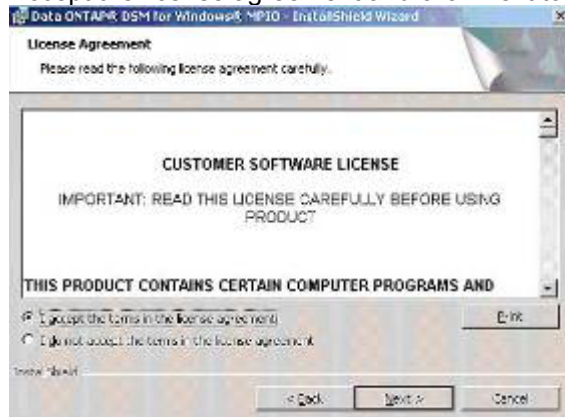
Directions: Running the DSM Installer Program

Download the Data ONTAP DSM for Windows from <http://now.netapp.com/NOW/cgi-bin/software>.

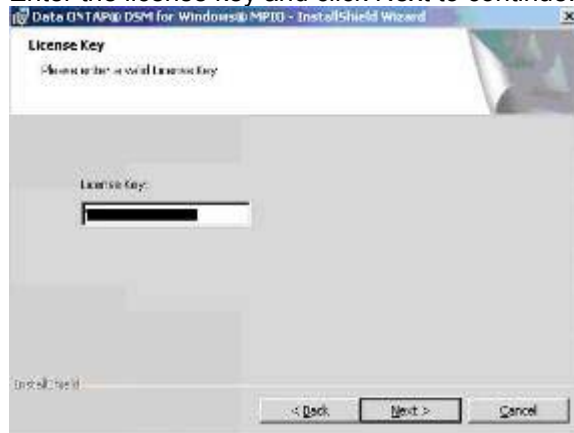
___1. Launch the Data ONTAP DSM EXE file and click Next to continue:



___2. Accept the license agreement and click Next to continue:



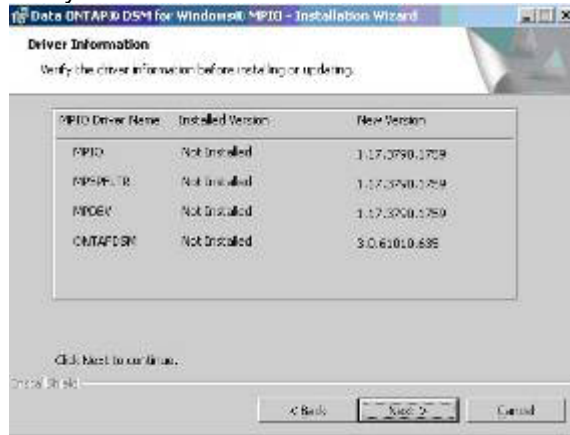
___3. Enter the license key and click Next to continue:



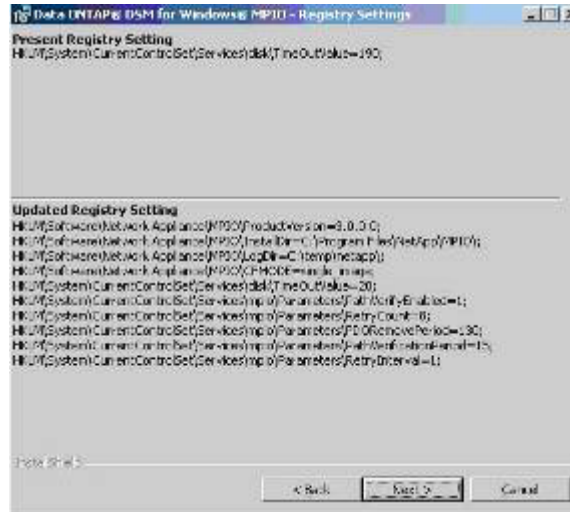
___4. Select the Cluster Failover Mode that you are using. This example uses Single Image. Click Next to continue:



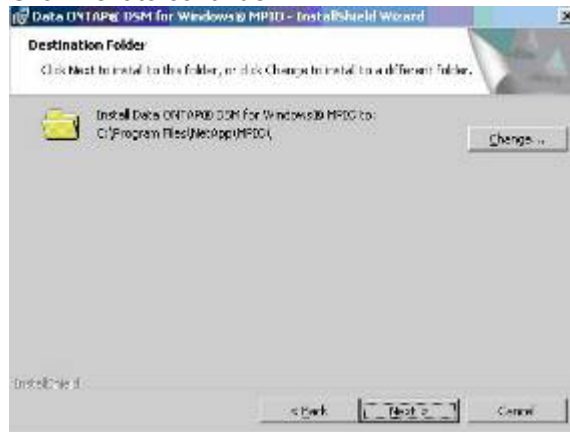
5. Verify the driver levels and then click Next to continue:



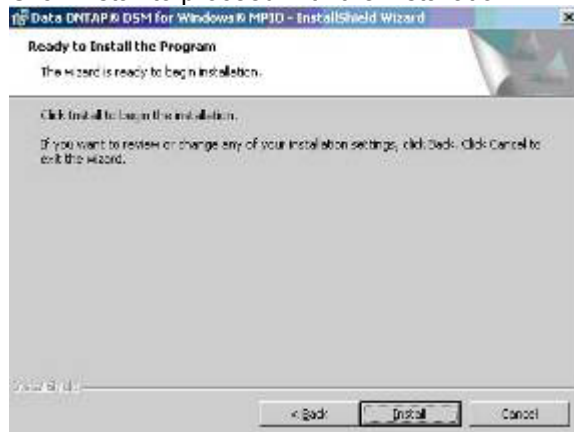
6. Click Next to continue:



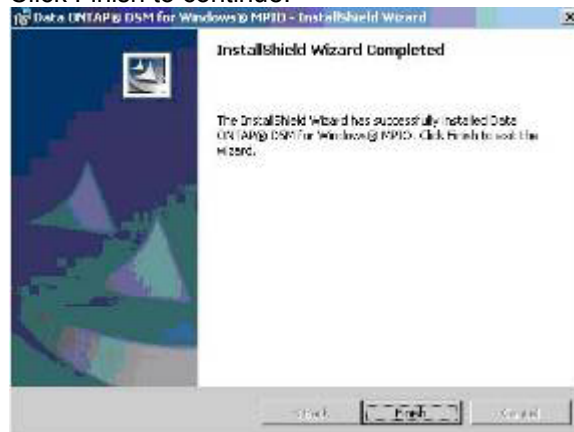
7. Click Next to continue:



8. Click Install to proceed with the installation:



9. Click Finish to continue:



10. Click Yes to reboot the blade server:



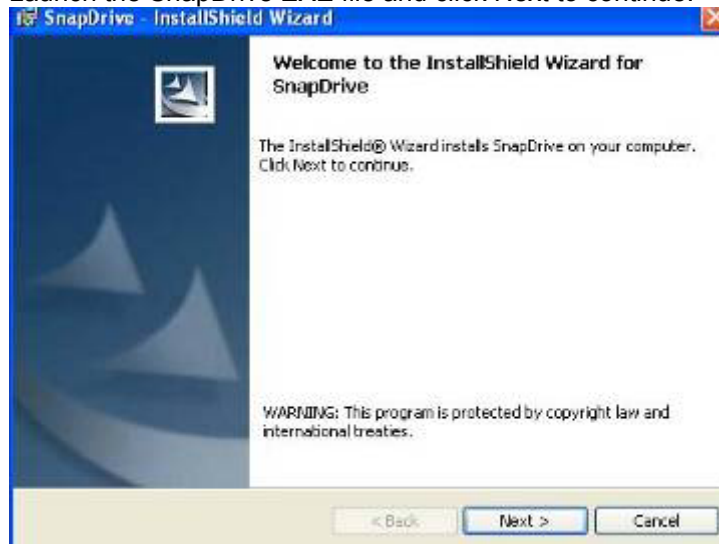
Optional Directions: Installing SnapDrive for Windows 4.2

SnapDrive for Windows is an enterprise-class storage and data management solution for Microsoft Windows environments. It simplifies management and increases availability and reliability of the application data. Key SnapDrive functionality includes error-free application-storage provisioning, consistent data Snapshot copies, rapid application recovery, and the ability to easily manage data. SnapDrive runs on Windows hosts, complements the native NTFS file system, and integrates seamlessly with Microsoft Cluster Server (MSCS).

With SnapDrive for Windows, server and storage administrators can quickly and easily use a wizard-based approach to map, manage, and migrate data between new and existing NetApp storage resources from a host-consistent perspective. SnapDrive for Windows eliminates the need to maintain the manual scripts that are normally used to back up and restore data to

specific drives or mount points being used by various downstream applications and databases, without extensive downtime. It can also be used to easily add storage as needed, eliminating the need to preallocate large amounts of storage resources based only on forecasted demand.

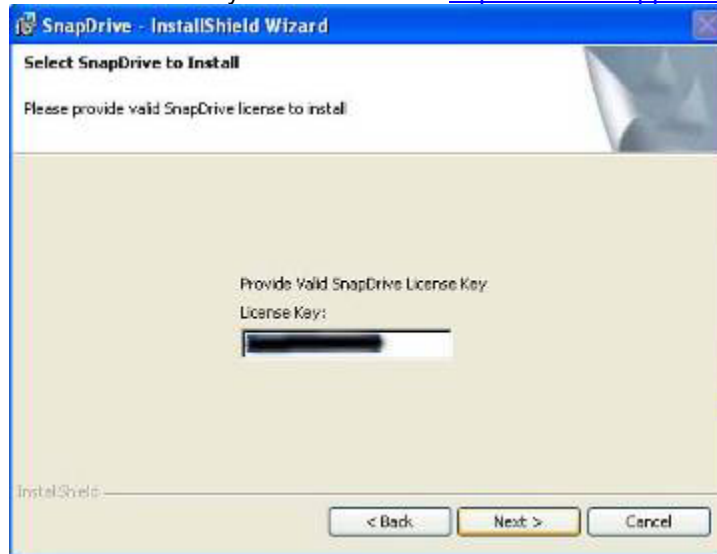
- ___ 1. Launch the SnapDrive EXE file and click Next to continue:



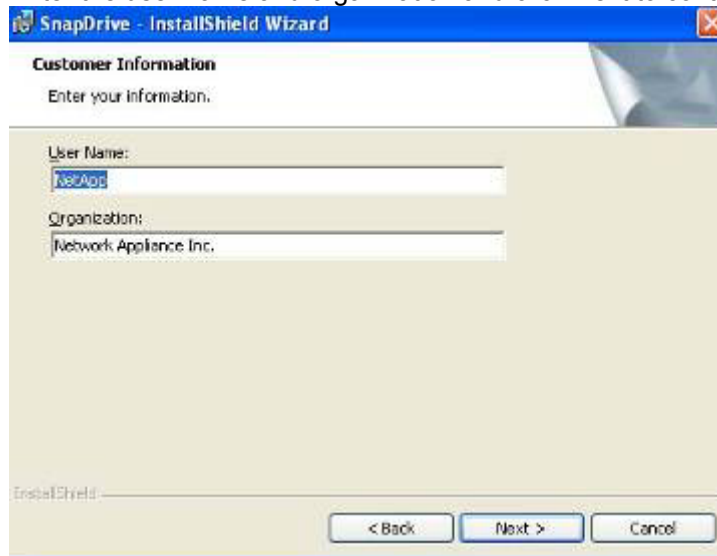
- ___ 2. Accept the license agreement and click Next to continue:



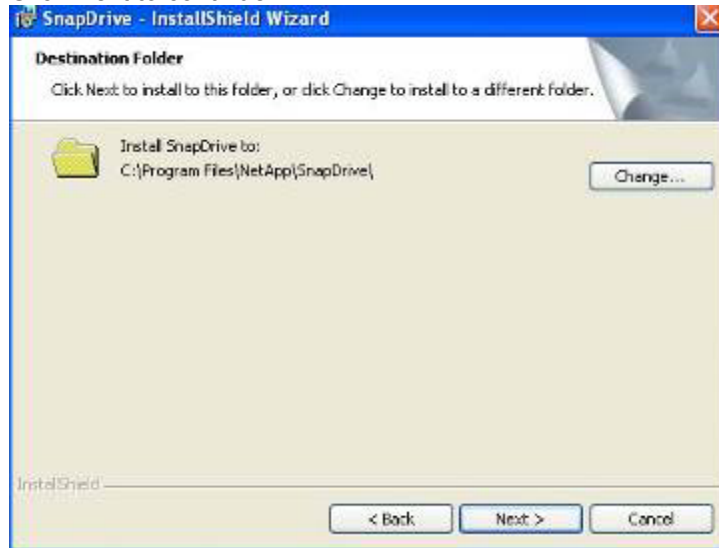
- ___ 3. Enter the license key for SnapDrive and click Next to continue.
NOTE: License keys are available at <https://now.netapp.com/eservice/agree.do>.



- ___ 4. Enter the user name and organization and click Next to continue:



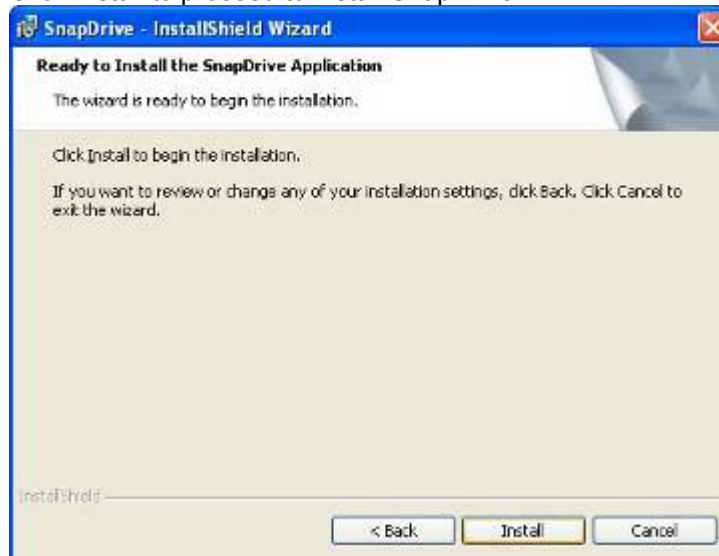
___ 5. Click Next to continue:



___ 6. Select a user account with local administrative rights and then click Next to continue.



___7. Click Install to proceed to install SnapDrive:



___8. Click Finish and reboot the blade server.

Directions: Mapping LUN to the Second Port of the HBA

The WWN from the second HBA port can be mapped to the boot LUN using the CLI or Storage systemView. This document demonstrates using Storage systemView. . The CLI command for adding WWN to existing igroup is `igroup add`.

___1. Launch Storage systemView, open a Web browser, and point the browser to the IP address of the storage system. From the left side, select LUNs > Initiator Groups > Manage. Select the initiator group to which you want add a WWN:



- ___2. Enter the WWN of the second port of the HBA and then click Apply to continue:

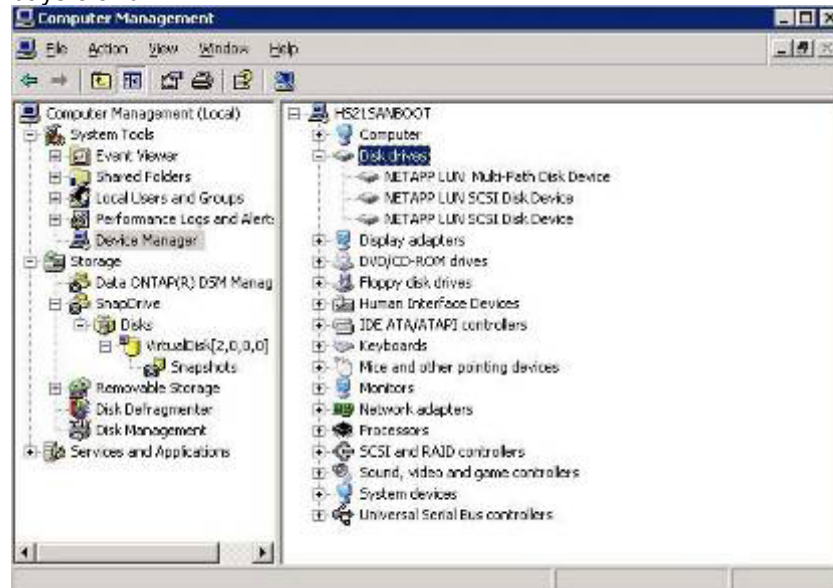


Directions: Verifying SnapDrive and MPIO

- ___1. Upon removal of the blade server, it is highly recommended to verify that SnapDrive and the MPIO configuration have been successfully installed. To verify that SnapDrive is installed correctly, right-click My Computer on the desktop and select Manage to open Computer Management. From the left side, select Storage > SnapDrive > Disks, as shown in the following figure. Notice the little "S" beside the disk icon for the C: drive. This LUN has been flagged by SnapDrive as a SAN boot LUN. A SAN boot LUN has the following features disabled under SnapDrive: Disconnect, Delete, Expand, and Restore. Create Snapshot is enabled, but a warning dialog box appears indicating that the consistency of the Snapshot copy cannot be guaranteed.
- NOTE:** If any part of the Windows Page File is placed on a LUN, SnapDrive flags that LUN as a SAN boot and the previously mentioned limitations apply.

- ___2. To verify that the MPIO installation was successful, select Device Manager from the left side in Computer Management, as shown in the following figure. Expand Disk Drives and ensure that one instance of the NETAPP LUN Multi-Path Disk Device is listed. In addition, ensure that one instance of NETAPP LUN SCSI Device is listed for each path of each LUN. The following example has one boot LUN with two paths mapped to the blade server, through the FC switches in

bays 3 and 4.

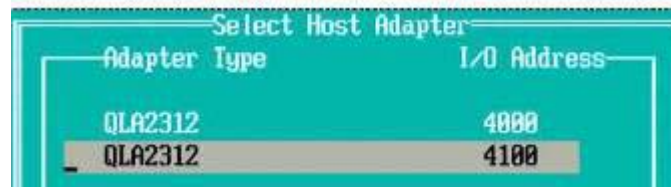


Directions: Configuring the Blade Server Boot on Second Path

In the event of a failure of the first fabric, you will need to configure the second HBA port to boot. Use the instructions in “Directions: Configuring the HBA BIOS for SAN Boot,” earlier in the document, to configure the second HBA port for SAN boot.

- ___1. Power on the blade server. While the system is going through POST, test your HBA hardware setup by pressing Alt-Q or Ctrl-Q when you see HBA BIOS on the screen.

- ___2. When the QLogic BIOS starts, select the second HBA port in the list:



___3. Select Configuration Settings:



___4. Select Adapter Settings:



___5. Enable the Host Adapter BIOS:



___6. Press ESC and then select Selectable Boot Settings:



___7. Set Selectable Boot to Enabled, select the Boot Port Name, LUN, and then press Enter:



___8. Select the bootable NETAPP LUN from the list:



___9. Ensure that the boot LUN appears in the list:



___10. Press ESC twice. Save and reboot when prompted.

You have successfully configured the blade server. For additional information, see Appendix B, "LUN Cloning of Windows Boot LUNs."

Configuring the PowerPC Blade Server, JS21 Family

Configuring Serial Over LAN (SOL)

The Management Module in the BladeCenter unit contains a video connector for attaching a monitor. However, the JS21 blade server does not contain a video controller. You need to configure and establish a SOL connection to the JS21 blade server for console output. For additional information about SOL requirements, see the white paper “*Enabling and Configuring SOL (Serial Over LAN) on an 8842 Blade Server*”: <http://www-3.ibm.com/pc/support/site.wss/document.do?Indocid=MIGR-55018>.

NOTE: The values in this section are examples. Your settings may be different. Also, SOL uses the Ethernet switch in switch bay 1. It is therefore highly recommended to not configure the first Ethernet (eth0) device on each JS21 blade server. In order to properly configure a JS21 blade server, you therefore require two Ethernet switches, one that is capable of SOL in switch bay 1 and a one in switch bay 2. See the IBM Web site for tested combinations.

NOTE: If you are using the Cisco switch module in bay 1, it is highly recommended to upgrade the switch firmware to IOS 12.1(22)EA6 or later. because it supports the use of VLAN 4095 for Serial Over LAN. If you are using this firmware level, no configuration is needed on the Cisco switch module for Serial Over LAN.

Directions: Configuring SOL

- ___1. Connect and log in to the Management Module using your Web browser.
- ___2. Make sure that the Management Module and the Ethernet switches are at the most recent firmware levels. You can check this from the Management Module.

NOTE: To update the firmware, see the documentation that comes with the blade server and the read me file that comes with the firmware update package.

- ___3. To enable SOL, on the Management Module, in the left navigation pane, select Blade Tasks and then select Serial Over LAN.

The default Management Module SOL settings provide the best overall SOL performance. You can modify these settings to meet requirements that are specific to your BladeCenter unit or network configuration. The default SOL values are:

- Serial Over LAN: Enabled
Use this field to enable or disable SOL globally for the BladeCenter unit. Enabling or disabling SOL globally does not affect the SOL session status for each blade server.
- SOL VLAN ID: 4095
This value should not be modified.
- BSMP IP Address Range: x.x.x.x
- Accumulate timeout: 5
- Send threshold: 250

- Retry count: 3
- Retry interval: 250

4. When finished, click Save.
5. Enable SOL for each blade server. (For each blade server, scroll down to the Serial Over LAN Configuration section, and in the Serial over LAN field, select Enabled.)
6. Make sure that the status of the SOL session is Ready and that SOL is enabled. Serial Over LAN has now been configured.

Configuring Boot Sequence for Installing from CD

The boot sequence can be configured using the SMS menu on the JS21 blade server or the Management Module. This section shows both scenarios. The first section guides you through the steps on how to configure using the SMS and the second section uses the Management Module. The boot sequence is synchronized between the Management Module and SMS within the JS21 blade server.

Directions: Configuring SMS to Boot JS21 on CD

1. Press the Media Select button on the front of the blade server to ensure that the media tray is assigned to the blade server.
2. Turn the blade server on.
3. Open a command prompt and telnet to the Management Module.
4. Open a SOL connection to the blade; type **console -T blade[bladen0]**.
5. During the boot of the blade and when the POST menu and indicators are displayed, press the 1 key after the word *Keyboard* is displayed and before the word *Speaker* is displayed. The SMS menu is displayed:

```
PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Main Menu
1.  Select Language
2.  Setup Remote IPL (Initial Program Load)
3.  Change SCSI Settings
4.  Select Console
5.  Select Boot Options
6.  Firmware Boot Side Options
7.  Progress Indicator History
-----

Navigation Keys:
X = eXit System Management Services
-----
Type menu item number and press Enter or select Navigation key:5
```

6. Select option 5 and then select option 1:


```

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Multiboot
1.  Select Install/Boot Device
2.  Configure Boot Device Order
3.  Multiboot Startup <OFF>
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:1

```

7. Select option 7:

```

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Select Device Type
1.  Diskette
2.  Tape
3.  CD/DVD
4.  IDE
5.  Hard Drive
6.  Network
7.  List all Devices
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:3

```

8. Select option 3, USB-CDROM:

```

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Select Device
Device Current Device
Number Position Name
1.      -      Ethernet
          ( loc=U788D.001.23A0285-P1-T7 )
2.      -      Ethernet
          ( loc=U788D.001.23A0285-P1-T8 )
3.      1      USB CD-ROM
          ( loc=U788D.001.23A0285-P1-T1-L1-L2-L3 )
4.      2      SCSI 36401 MB Harddisk, part=2 (AIX 5.3.0)
          ( loc=U788D.001.23A0285-P1-T10-L1-L0 )
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services

```

```
-----  
Type menu item number and press Enter or select Navigation key:3
```

___ 9. Select option 2, Normal Mode Boot:

```
Version MB240_470_012  
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.  
-----  
Select Task  
  
USB CD-ROM  
  ( loc=U788D.001.23A0285-P1-T1-L1-L2-L3 )  
  
  1.  Information  
  2.  Normal Mode Boot  
  3.  Service Mode Boot  
-----  
Navigation keys:  
M = return to Main Menu  
ESC key = return to previous screen      X = eXit System Management  
Services  
-----  
Type menu item number and press Enter or select Navigation key: 2
```

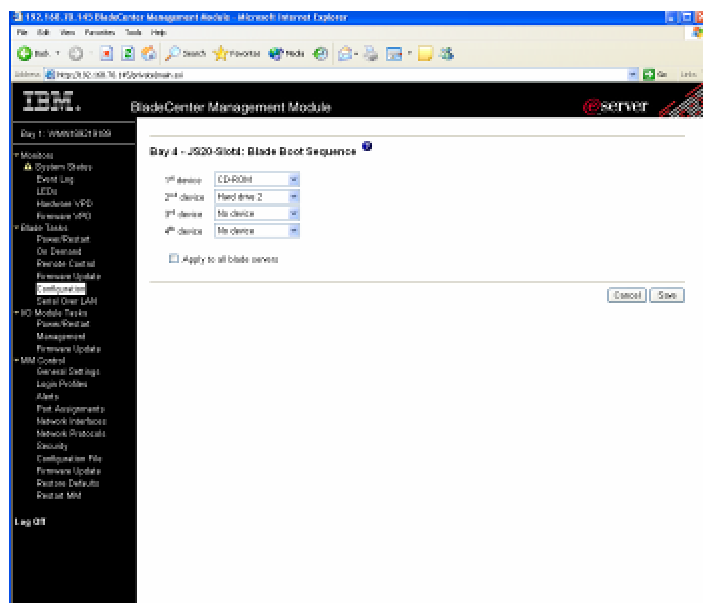
___ 10. Select option 1 for YES. The blade server now starts the installation of the operating system from the CD-ROM.

```
Version MB240_470_012  
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.  
-----  
Select Task  
  
USB CD-ROM  
  ( loc=U788D.001.23A0285-P1-T1-L1-L2-L3 )  
  
  1.  Information  
  2.  Normal Mode Boot  
  3.  Service Mode Boot  
-----  
Navigation keys:  
M = return to Main Menu  
ESC key = return to previous screen      X = eXit System Management  
Services  
-----  
Type menu item number and press Enter or select Navigation key: 2
```

___ 11. Continue to section 12.0 if you are installing AIX or section 13.0 if you are installing Linux®.

Directions: Configuring MM to Boot JS21 on CD

- ___ 1. Log in to the BladeCenter Management Module using the Web interface.
- ___ 2. In the left navigation pane, click Blade Tasks and then select Configuration.
- ___ 3. Scroll down to the Boot Sequence page.
- ___ 4. Select CD-ROM as the first boot device and then click Save:



You have now configured the boot sequence on the JS21 blade server to boot on CD-ROM.

Installing the AIX Operating System

Now that you have configured the Fibre Channel expansion card, switches, and storage system, you are ready to install the AIX operating system. To install AIX on JS21, use one of the following two methods;

- Network installation using Network Installation Manager (NIM): See the AIX documentation. This requires the blade server to boot on the network instead of CD-ROM.
- Installation using CD-ROM: Follow the instructions below.

Directions: Installing AIX

The installation of AIX 5.2 and 5.3 is identical. This section guides you through the steps to install AIX 5.3 using CD-ROM.

1. Insert the AIX 5.3 CD1 in to the CD-ROM drive.
2. Ensure that the media tray is still assigned to the JS21 blade server.
NOTE: Make sure that local switching of the media tray is not disabled for the JS21 blade server in the Management Module Web interface. For more information, see the *IBM BladeCenter Management Module User's Guide*.
3. Turn on the JS21 blade server.
4. Telnet to the Management Module and start a SOL session, as shown in the following example. In this example the JS21 blade server is located in slot 4 in the BladeCenter chassis.

```
1. >telnet 192.168.70.125
```

2. username: **USERID**
3. password: *********
4. system> **console -T blade[4]**

___5. At the System Console screen, type 1 and then press Enter: shown in example below.

```
***** Please define the System Console. *****
Type a 1 and press Enter to use this terminal as the
system console.
Pour definir ce terminal comme console systeme, appuyez
sur 1 puis sur Entree.
Taste 1 und anschliessend die Eingabetaste druecken, um
diese Datenstation als Systemkonsole zu verwenden.
Premere il tasto 1 ed Invio per usare questo terminal
come console.
Escriba 1 y pulse Intro para utilizar esta terminal como
consola del sistema.
Escriuiu 1 i i premeu Intro per utilitzar aquest
terminal com a consola del sistema.
Digite um 1 e pressione Enter para utilizar este terminal
como console do sistema.
>>> Choice [1]: 1
```

___6. At the Language screen, select your language and then press Enter. In the following example, type 1 and then press Enter to install in English.

```
HARDWARE SYSTEM MICROCODE
Licensed Internal Code - Property of IBM
(C) Copyright IBM Corp. 1990, 1994.
All rights reserved.

US Government Users Restricted Rights -|
>>> 1 Type 1 and press Enter to have English during install.
     2 Entreu 2 i premeu Intro per veure la instal·lació en cataló.
     3 Entrez 3 pour effectuer l'installation en français.
     4 F³r Installation in deutscher Sprache 4 eingeben
       und die Eingabetaste dr³cken.
     5 Immettere 5 e premere Invio per l'installazione in Italiano.
     6 Digite 6 e pressione Enter para usar Português na instalação.
     7 Escriba 7 y pulse Intro para la instalación en español.
     88 Help ?

>>> Choice [1]: 1
```

___7. At the Installation and <Maintenance screen, select 2 and then press Enter:

```
Welcome to Base Operating System
                Installation and Maintenance
Type the number of your choice and press Enter. Choice is indicated by
>>>.
>>> 1 Start Install Now with Default Settings
     2 Change/Show Installation Settings and Install
     3 Start Maintenance Mode for System Recovery
     88 Help ?
     99 Previous Menu
>>> Choice [1]: 2
```

___8. At the Installation and Settings screen, select 3 and then press Enter for more options:

```

Installation and Settings

Either type 0 and press Enter to install with current settings, or type the
number of the setting you want to change and press Enter.
  1 System Settings:
    Method of Installation.....New and Complete Overwrite
    Disk Where You Want to Install.....hdisk0
  2 Primary Language Environment Settings (AFTER Install):
    Cultural Convention.....English (United States)
    Language .....English (United States)
    Keyboard .....English (United States)
    Keyboard Type.....Default
  3 More Options (Desktop, Security, Kernel, Software, ...)
>>> 0 Install with the current settings listed above.
-----+-----
88 Help ?          | WARNING: Base Operating System Installation
will
99 Previous Menu  | destroy or impair recovery of ALL data on the
| destination disk hdisk0.
>>> Choice [0]: 3

```

___ 9. At the Install Options screen, select 3 and then press Enter to enable the 64-bit kernel:

```

Install Options
 1. Enable Trusted Computing Base..... No
 2. Enable CAPP and EAL4+ Technology..... No
    (English only, 64-bit kernel enablement, JFS2 file systems)
 3. Enable 64-bit Kernel..... No
 4. Create JFS2 File Systems..... No

 5. Graphics Software..... Yes
 6. Documentation Services Software..... No
 7. Enable System Backups to install any system..... Yes
    (Installs all devices and kernels)
>>> 8. Install More Software
 0 Install with the current settings listed above.
 88 Help ?
 99 Previous Menu
>>> Choice [8]: 3

```

___ 10. At the Install Options screen, select 4 and then press Enter to select Create JFS2 File Systems:

```

Install Options
 1. Enable Trusted Computing Base..... No
 2. Enable CAPP and EAL4+ Technology..... No
    (English only, 64-bit kernel enablement, JFS2 file systems)
 3. Enable 64-bit Kernel..... Yes
 4. Create JFS2 File Systems..... No
 5. Graphics Software..... Yes
 6. Documentation Services Software..... No
 7. Enable System Backups to install any system..... Yes
    (Installs all devices and kernels)
>>> 8. Install More Software
 0 Install with the current settings listed above.
 88 Help ?
 99 Previous Menu
>>> Choice [8]: 4

```

- ___11. At the Install Options screen, select 0 and then press Enter to continue with selected settings:

```
Install Options
1. Enable Trusted Computing Base..... No
2. Enable CAPP and EAL4+ Technology..... No
   (English only, 64-bit kernel enablement, JFS2 file systems)
3. Enable 64-bit Kernel..... Yes
4. Create JFS2 File Systems..... Yes
5. Graphics Software..... Yes
6. Documentation Services Software..... No
7. Enable System Backups to install any system..... Yes
   (Installs all devices and kernels)
>>> 8. Install More Software
      0 Install with the current settings listed above.
      88 Help ?
      99 Previous Menu
>>> Choice [8]: 0
```

- ___12. At the Overwrite Installation Summary screen, select 1 to continue with new installation:

```
Overwrite Installation Summary
Disks: hdisk0
Cultural Convention: en_US
Language: en_US
Keyboard: en_US
64 Bit Kernel Enabled: Yes
JFS2 File Systems Created: Yes
Graphics Software: Yes
Documentation Services Software: No
Enable System Backups to install any system: Yes
Optional Software being installed:
>>> 1 Continue with Install
-----
      88 Help ?          |   WARNING: Base Operating System Installation
will                    |
      99 Previous Menu  |   destroy or impair recovery of ALL data on the
                        |   destination disk hdisk0.
>>> Choice [1]: 1
```

- ___13. Installation now starts to copy files to the hard drive (be patient). When prompted for CD2, insert the AIX CD2 and press Enter to continue:

```
Filesets processed: 2 of 56
System Installation Time: 1 hr 9 mins   Tasks Complete: 20%
installp: APPLYING software for:
        Java14.sdk 1.4.1.6
installp: Please insert volume 2 into device /dev/cd0 and press Enter
to continue or enter "q" to quit.
```

- ___14. When prompted for terminal type, select vt100 and then press Enter to continue:

```
Set Terminal Type
The terminal is not properly initialized. Please enter a terminal type
and press Enter. Some terminal types are not supported in
non-English languages.
      ibm3101          tvi912          vt330
      ibm3151          tvi920          vt340
```

```

ibm3161      tvi925      wyse30
ibm3162      tvi950      wyse50
ibm3163      vs100       wyse60
ibm3164      vt100       wyse100
ibmpc        vt320       wyse350
lft          sun

+-----Messages-----
| If the next screen is unreadable, press Break
(Ctrl-c)
  88 Help ?   | to return to this screen.
              |
>>> Choice []: vt100

```

___ 15. Select Accept and then press Enter:

```

Software License Agreements
Move cursor to desired item and press Enter.
  Show Installed License Agreements
  Accept License Agreements
F1=Help      F2=Refresh  .      F3=Cancel      Esc+8=Image
Esc+9=Shell  Esc+0=Exit  Enter=Do

```

___ 16. Use the Tab key to select yes and then press Enter to continue:

```

Accept License Agreements
Type or select values in entry fields.
Press Enter AFTER making all desired changes.
                                     [Entry Fields]
ACCEPT Installed License Agreements      yes

```

___ 17. Configure your system as desired and then press ESC+0 to exit.
NOTE: It is highly recommended that you at least set your root password before exiting.

```

Installation Assistant
Move cursor to desired item and press Enter.
  Set Date and Time
  Set root Password
  Configure Network Communications
  Install Software Applications
  Using SMIT (information only)
  Tasks Completed - Exit to Login
F1=Help      F2=Refresh  .      F3=Cancel      Esc+8=Image
Esc+9=Shell  Esc+0=Exit  Enter=Do

```

You have now successfully installed AIX onto your JS21 blade server.

Configuring Boot Sequence for FCP SAN Boot

This section guides you through the steps to set up the boot sequence of the blade server and enable boot on the Fibre Channel expansion card.

Directions: Configuring SMS to Boot on the First Path (fcs0)

- ___ 1. Turn the blade server on.
- ___ 2. Open a command prompt and telnet to the Management Module.

- ___3. Open a SOL connection to the blade; type **console -T blade[bladeno]**.
- ___4. During the boot of the blade and when the POST menu and indicators are displayed, press the 1 key after the word *Keyboard* is displayed and before the word *Speaker* is displayed. The SMS menu is displayed:

```

          1 = SMS Menu                5 = Default Boot
          8 = Open Firmware Prompt    6 = Stored Boot List

Memory      Keyboard   Network   SCSI     Speaker

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Main Menu
1.  Select Language
2.  Setup Remote IPL (Initial Program Load)
3.  Change SCSI Settings
4.  Select Console
5.  Select Boot Options
6.  Firmware Boot Side Options
7.  Progress Indicator History
-----
Navigation Keys:
                                           X = eXit System Management

Services
-----
Type menu item number and press Enter or select Navigation key:5

```

- ___5. Select option 5, Select Boot Options, then select option 2, Configure Boot Device Order:

```

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Multiboot
1.  Select Install/Boot Device
2.  Configure Boot Device Order
3.  Multiboot Startup <OFF>
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management

Services
-----
Type menu item number and press Enter or select Navigation key:2

```

- ___6. Select option 1, Select 1st Boot Device:

```

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Configure Boot Device Order
1.  Select 1st Boot Device
2.  Select 2nd Boot Device

```



```

3.  Select 3rd Boot Device
4.  Select 4th Boot Device
5.  Select 5th Boot Device
6.  Display Current Setting
7.  Restore Default Setting
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:1

```

7. **Select option 8, List All Devices.**

```

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Select Device Type
1.  Diskette
2.  Tape
3.  CD/DVD
4.  IDE
5.  Hard Drive
6.  Network
7.  None
8.  List All Devices
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:8

```

8. **Select option 4 for FC Harddisk:**

```

-----
Select Device
Device Current Device
Number Position Name
1.      -      Ethernet
          ( loc=U788D.001.23A0292-P1-T7 )
2.      -      Ethernet
          ( loc=U788D.001.23A0292-P1-T8 )
3.      1      USB CD-ROM
          ( loc=U788D.001.23A0292-P1-T1-L1-L3 )
4.      -      SCSI 5368 MB FC Harddisk, part=1 ( )
          ( loc=U788D.001.23A0292-P1-C5-T1-W200400a0b8139d63 )
5.      None
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management Services
-----
Type menu item number and press Enter or select Navigation key:4

```

9. **Select option 2, Set Boot Sequence:**

```

SCSI 5368 MB FC Harddisk, part=1 ( )
  ( loc=U788D.001.23A0292-P1-C5-T1-W200400a0b8139d63-L0000000000000000 )

1. Information
2. Set Boot Sequence: Configure as 1st Boot Device

-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen          X = eXit System Management Services
-----
Type menu item number and press Enter or select Navigation key:2

```

____ 10. The boot sequence for the JS21 blade server has now been configured. Select option M to return to the main menu or X to exit the System Management Services:

```

-----
Current Boot Sequence
1. SCSI 5368 MB FC Harddisk, part=1 ( )
  ( loc=U788D.001.23A0292-P1-C5-T1-W200400a0b8139d63-L0000000000000000 )
2. None
3. None
4. None
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen          X = eXit System Management Services
-----
Type menu item number and press Enter or select Navigation key: M

```

Configuring for Redundancy

Up to this point in configuring FCP SAN boot, the steps have assumed that you are using a single port of the FC expansion card to perform the OS installation (configured through port disable on the switch). This was to prevent LUN contention during the OS installation. The next steps discuss configuring the second port of the FC expansion card (HBA) to become usable in the event of a failure on the first port. This section also describes how to configure the second I/O expansion module and install multipath software. This process is used to connect the secondary path using igroup (LUN masking, or sometimes called storage partitioning).

Directions: Installing and configuring FCP IBM® AIX® Host Utilities 4.0

The FCP IBM AIX Host Utilities enable you to configure an IBM AIX host to access LUNs on a NetApp storage system. You can use either direct-attached or fabric-attached configuration. For multipathing, you can use either the AIX native MPIO or Veritas™ Dynamic Multipathing (DMP). This section steps you through how to use the native MPIO that comes with AIX.

NOTE: You cannot use both MPIO and Veritas DMP. You must use one or the other.

The Host Utilities consist of the following:

- A host settings package. You must download and install either the MPIO host settings package or the Veritas DMP host settings package, depending on what you use on your host to manage multipathing.
- The SAN Toolkit package. This package works with either host settings package. You must download and install it.

The host settings packages provide the information to enable your host to use the NetApp storage systems in a multipathing environment, and the SAN Toolkit package provides diagnostic tools. The SAN Toolkit contains the following diagnostic scripts for AIX configurations:

- `storage_system_info` script. Run this script to gather information about storage system configuration.
- `aix_info` script. Run this script to gather information about host configuration.
- `switch_info` script. Run the appropriate script (`brocade_info`, `mcddata_info`, or `cisco_info`) to gather configuration information from the switches.
- `sanlun`. Use this NetApp tool to display information about how LUNs on the storage system map to host devices.

See http://now.netapp.com/NOW/download/software/sanhost_aix/AIX/ for more information and to find out where to download the packages. Ensure that you download the FCP IBM AIX Attach Kit and the Dot Hill SANpath Software. In addition, you need the SANpath Activation Key.

____1. To install the AIX Host Utilities, log in as root; change to the directory that contains the FCP IBM AIX Attach Kit software; and type **install**, as shown in the following figure. When you run the installation command, it performs the following tasks:

- * Displays the operating system version, HBA model, and firmware of your host.
- * Installs the toolkit package.
- * Depending on the installation option you select, changes the host HBA ODM values to operate with NetApp storage systems.
- * Runs the `bosboot` command to update the boot image.
- * Logs all `install` command output to a file named `netapp_install_log_yymmddhhMMSS`, where `yymmddhhMMSS` represents the date and time that you started the installation. By default, this log file is placed in `/tmp` and `/opt/NetApp`.

NOTE: The FCP IBM AIX installation script does not prevent you from installing unsupported components. To ensure that your configuration meets requirements, check the *Compatibility and Configuration Guide for NetApp FCP and iSCSI Products* at

http://now.netapp.com/NOW/knowledge/docs/san/fcp_icsi_config/.

Disregard the warning that SANpath will not be installed. The `install` command does not automatically install any multipathing software. If you have SANpath software, you must install it separately.

```
./install
NetApp Attach Kit for AIX install
This host is running AIX 5.3 ML2.
There are 2 HBAs detected on this host.
fcs0 is an FC6239. The firmware (microcode) level is 1.90X2.
fcs1 is an FC6239. The firmware (microcode) level is 1.90X2.
Please check the NetApp SAN Support Matrix for OS and HBA Compatibility.
OS and HBA check complete.
WARNING: SANpath will not be installed. Please consult your manual to
understand how this impacts the availability of your NetApp storage system to
this host.
```

____2. Specify the location of the software package:

```
Please enter the location of the NetApp packages:
(if you are installing from CD, you may enter the device name, e.g. /dev/cd0)
[default: /tmp/1.3/ntap_aix_fcp_1.3] /tmp/1.3/ntap_aix_fcp_1.3
```

- ___3. The installation command asks how you want to handle updating the Object Data Manager (ODM) settings for each HBA in your system. Unless you have specific requirements for tuning your system, it is recommended that you choose option 3, which updates the settings and saves the old HBA settings to the file `/opt/NetApp/fcp_attach_kit/saved_hba_settings`. Option 3 enables you to update the settings for each HBA connected to the storage system rather than updating the settings for all host HBAs.

```
The NetApp AIX FCP Attach Kit 1.3 requires changes to device attributes for the
Fibre Channel adapter fcs0. This script can update the ODM settings, which
will take effect at the next reboot.
You can either:
1) Update the ODM settings for all HBAs;
2) Skip update for all HBAs.
3) Update the ODM settings for this HBA;
4) Do not update anything for this HBA, skip to the next one;
What would you like to do? If you are not certain, NetApp recommends
selecting the default [1]:
> 3
The NetApp AIX FCP Attach Kit 1.3 requires changes to device attributes for the
Fibre Channel adapter fcs1. This script can update the ODM settings, which
will take effect at the next reboot.
You can either:
1) Update the ODM settings for all HBAs;
2) Skip update for all HBAs.
3) Update the ODM settings for this HBA;
4) Do not update anything for this HBA, skip to the next one;
What would you like to do? If you are not certain, NetApp recommends
selecting the default [1]:
> 3
HBA settings update successful.
Running bosboot to update the boot image...
Installation of the NetApp AIX Attach Kit was successful.
You MUST reboot the system before accessing your NetApp storage system(s).
Installation log saved in both /tmp/netapp_install_log_060516104006
and /opt/NetApp/install_log
```

- ___4. Reboot the system (`shutdown -F -r now`). The changes to the ODM settings do not take effect until you reboot the system.
- ___5. It is always a good practice to verify the value of the HBA initiator queue depth. To check the queue depth, type `lsattr -El fcs0` and `lsattr -El fcs1`. It is recommended to use a value of 48 for the HBA queue depth.

Directions: Enabling the Second Switch Path

Enable the second switch path to the storage controller, using the following steps.

NOTE: In this example, the blade server is installed in blade slot 1, which is connected to port 1 on the switch module.

Brocade Switch Module Commands	QLogic / McData Switch Module Commands
1. Start a telnet session to the switch.	1. Start a telnet session to the switch.
2. Log in using USERID.	2. FCSM: USERID> admin start
3. BSSM: >portEnable 1	3. FCSM (admin): USERID> config edit
4. BSSM: > logout	

Network Appliance Inc.

4. FSCM (admin-config): USERID> set config port 1
5. FSCM (admin-config): USERID> set port 1 to online
6. FSCM (admin-config): USERID> config save
7. FSCM (admin): USERID> config activate
8. FSCM (admin): USERID> admin end
9. FSCM (admin): USERID> logout

NOTE: Enable port 1 on the BladeCenter switch modules. (Port 1 was previously disabled to allow only a single path during the installation of the OS.) Enabling port 1 provides dual paths to the storage controller.

Directions: Mapping LUN to the Second Port of the HBA

The WWN from the second HBA port can be mapped to the boot LUN using CLI or Storage systemView. This document steps you through Storage systemView to do this. The CLI command for adding WWN to an existing igroup is `igroup add`.

1. Launch Storage systemView, open a Web browser, and point the browser to the IP address of the storage system.
2. From the left side, select LUNs > Initiator Groups > Manage:



___3. Select the initiator group to which you want add a WWN:



___4. Enter the WWN of the second port of the HBA and then click Apply to continue:



Directions: Configuring SMS to Boot on Second Path (fcs1)

NOTE: In current IBM tests, only one boot path can be selected at a time on a JS21 blade server. The selection of the second path must be done manually if the first path fails; that is, there is currently no automatic failover if the primary path fails and you reboot the blade

server. To manually change the boot sequence to boot on the second path, perform the following steps:

- ___ 1. Log in to the Storage Management software and make sure that the LUN has actually failed over to the second path.
- ___ 2. Turn the blade server on.
- ___ 3. Open a command prompt and telnet to the Management Module.
- ___ 4. Open a SOL connection to the blade; type **console -T blade[bladeno]**.
- ___ 5. During the boot of the blade and when the POST menu and indicators are displayed, press the 1 key after the word *Keyboard* is displayed and before the word *Speaker* is displayed. The SMS menu is displayed:

```
1 = SMS Menu          5 = Default Boot
8 = Open Firmware Prompt 6 = Stored Boot List

Memory      Keyboard   Network   SCSI     Speaker

PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Main Menu
1.  Select Language
2.  Setup Remote IPL (Initial Program Load)
3.  Change SCSI Settings
4.  Select Console
5.  Select Boot Options
6.  Firmware Boot Side Options
7.  Progress Indicator History
-----
Navigation Keys:
                                     X = eXit System Management

Services
-----
Type menu item number and press Enter or select Navigation key:5
```

- ___ 6. Select option 5, Select Boot Options, and then select option 2, Configure Boot Device Order:

```
PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Multiboot
1.  Select Install/Boot Device
2.  Configure Boot Device Order
3.  Multiboot Startup <OFF>
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:2
```

___7. Select option 1, Select 1st Boot Device:

```
PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Configure Boot Device Order
1. Select 1st Boot Device
2. Select 2nd Boot Device
3. Select 3rd Boot Device
4. Select 4th Boot Device
5. Select 5th Boot Device
6. Display Current Setting
7. Restore Default Setting
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:1
```

___8. Select option 8, List All Devices: .

```
PowerPC Firmware
Version MB240_470_012
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Select Device Type
1. Diskette
2. Tape
3. CD/DVD
4. IDE
5. Hard Drive
6. Network
7. None
8. List All Devices
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management
Services
-----
Type menu item number and press Enter or select Navigation key:8
```

___9. Select option 4 for FC Harddisk:

```
-----
Select Device
Device Current Device
Number Position Name
1. - Ethernet
( loc=U788D.001.23A0292-P1-T7 )
2. - Ethernet
( loc=U788D.001.23A0292-P1-T8 )
3. 1 USB CD-ROM
( loc=U788D.001.23A0292-P1-T1-L1-L3 )
4. - SCSI 5368 MB FC Harddisk, part=1 ()
( loc=U788D.001.23A0292-P1-C5-T1-W200400a0b8139d63 )
5. None
```

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```
-----  
Navigation keys:  
M = return to Main Menu  
ESC key = return to previous screen          X = eXit System Management Services  
-----  
Type menu item number and press Enter or select Navigation key: 4
```

10. Select option 2, Set Boot Sequence:

```
SCSI 5368 MB FC Harddisk, part=1 (  
  ( loc=U788D.001.23A0292-P1-C5-T1-W200400a0b8139d63-L0000000000000000 )  
  
1. Information  
2. Set Boot Sequence: Configure as 1st Boot Device  
  
-----  
Navigation keys:  
M = return to Main Menu  
ESC key = return to previous screen          X = eXit System Management Services  
-----  
Type menu item number and press Enter or select Navigation key: 2
```

11. The boot sequence for the JS21 blade server has now been configured. Select option M to return to the main menu or X to exit the System Management Services:

```
-----  
Current Boot Sequence  
1. SCSI 5368 MB FC Harddisk, part=1 (  
  ( loc=U788D.001.23A0292-P1-C5-T1-W200400a0b8139d63-L0000000000000000 )  
2. None  
3. None  
4. None  
  
-----  
Navigation keys:  
M = return to Main Menu  
ESC key = return to previous screen          X = eXit System Management Services  
-----  
Type menu item number and press Enter or select Navigation key: M
```

You have successfully configured the JS21 blade server. For additional information, see Appendix D: JS2x Standalone Diagnostics.

Summary and Additional Information

This paper provides an overview of configuring the IBM BladeCenter to FCP SAN boot using Network Appliance storage. These steps are typically performed by seasoned storage administrators with the requisite knowledge of Network Appliance and IBM BladeCenter. However, this document seeks to provide guidance for the novice SAN administrator to follow and successfully accomplish this task. Keep in mind that these are general guidelines for configuring FCP SAN boot, and any effort to create a FCP SAN boot environment should be well planned. For further information, see the Appendix below.

For more information about Network Appliance products, see <http://www.netapp.com/products/>.

For more information about IBM BladeCenter products, see <http://www-03.ibm.com/systems/bladecenter/>.

Appendix A: Design and Implementation Considerations

Consider these points when designing or implementing an FCP SAN boot environment using JS21 blade servers:

- Check IBM ServerProven for supported configurations: <http://www-03.ibm.com/servers/eserver/serverproven/compat/us/index.html>.
- Review supported configurations from the Network Appliance website: http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/
- Review the *IBM Switch Interoperability Guide for IBM BladeCenter* for supported switch configurations: <http://www-307.ibm.com/pc/support/site.wss/document.do?sitestyle=ibm&Indocid=MIGR-58206>.
- The 2Gb expansion card has not been tested for FCP SAN boot on a JS21 blade server. The 2Gb expansion card is not able to boot on the second port on the JS2x blade server.
- The Optical Pass-Thru Module is not supported with the 4Gb expansion card in a SAN boot environment.
- During installation of the operating system, there should be only a single path to the storage system. This is to ensure that the first port on the Fibre Channel expansion card (fcs0) gets configured and also to prevent the same LUN from showing up twice. Additional paths and failover can be configured after the operating system is installed.
- Manual reconfiguration of the expansion card using SMS on JS21 blade server is required if the primary path fails to fcs0.

Appendix B: LUN Cloning of Windows Boot LUNs

One of the advantages of SAN booting is the ability to use LUN cloning on boot LUNs. The administrator can build a single OS LUN and clone it to the other hosts. LUN cloning can also be a compelling argument in environments that rarely change the host OS image. Each clone has many blocks in common with the "master" and therefore does not consume as much disk space.

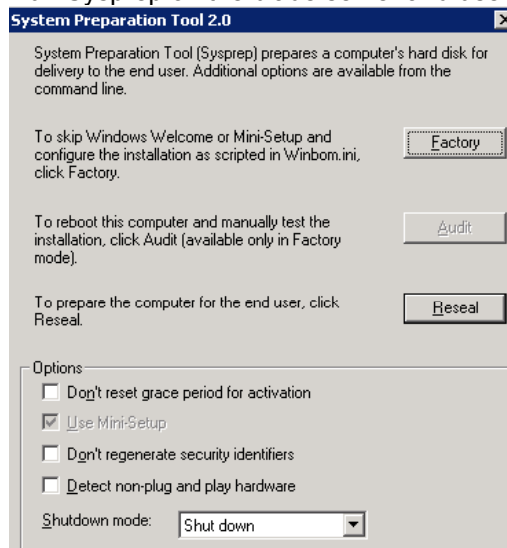
A LUN clone is a point-in-time, writable copy of a LUN in a Snapshot copy. Changes made to the parent LUN are not reflected by the clone. A LUN clone shares space in the volume of the LUN and the backing Snapshot copy until the LUN is split from its backing Snapshot copy. The cloned LUN does not require additional disk space until changes or additions are made to it. Only the changed blocks consume additional disk space. You cannot delete the backing Snapshot copy until you split all the clones associated with that copy. When you split the clone from the backing Snapshot copy, you copy the data from the Snapshot copy to the new split clone in that volume, so the space will be needed in the volume.

After the splitting operation, both the backing Snapshot copy and the clone occupy their own disk space. For mass deployment, Microsoft has a System Preparation Tool (Sysprep) that enables administrators to prepare Windows Server system images as part of an automated deployment. For more information on Sysprep, see <http://support.microsoft.com/kb/892778>.

This appendix guides you through the steps to run Sysprep on a blade server and use LUN cloning for mass deployment.

Directions: Downloading and Running the Microsoft System Preparation Tool

1. Download the Sysprep tool from Microsoft: <http://support.microsoft.com/kb/892778>. Copy the Sysprep tool to the blade server.
2. Run Sysprep on the blade server and use the Reseal option to remove the SID:



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Directions: Cloning a LUN

A LUN clone is a copy of a writable Snapshot copy of a LUN. To clone a LUN, you must create a writable Snapshot copy of the LUN that you want to clone.

- ___1. List the LUNs using the command `lun show`:

```
storage system> lun show
/vol/volx/cloned.lun 125.5m (131604480) (r/w, online)
/vol/volx/lun1 30.0g (32218421760) (r/w, online)
/vol/volx/bootlun.lun 125.5m (131604480) (r/w, online, mapped)
```
- ___2. Create a Snapshot copy of the LUN you want to clone using the command `snap create <volume_name> <snapshot_name>`:

```
storage system> snap create volx snap2
```
- ___3. Create a writable (snapshot-backed) LUN using the command `lun create -b <snapshot_lunpathname> <lun_clone_path>`, as shown below. Basically, this mounts the LUN from the Snapshot copy as a LUN, making that Snapshot copy busy and undeletable.

```
storage system> lun create -b /vol/volx/.snapshot/snap2/cloned.lun
/vol/volx/cloned2.lun
storage system> snap list
Volume volx
working...
%/used    %/total    date           name
-----    -
0% ( 0%)  0% ( 0%)  Dec 13 12:36   snap2 (busy, LUNs) <== notice it's busy
0% ( 0%)  0% ( 0%)  Dec 13 12:12   snap1
1% ( 0%)  0% ( 0%)  Dec 07 16:00   hourly.0
```
- ___4. Clone the LUN using the `clone` command:
For Data ONTAP 6.5.x: `lun clone start <lun_clone_path>`
For Data ONTAP 7.0.x: `lun clone split start <lun_clone_path>`

```
storage system> lun clone start /vol/volx/cloned2.lun
```
- ___5. To display the progress of the clone operation, use the command `lun clone show <lun_clone_path>`:

```
storage system> lun clone show
/vol/volx/cloned2.lun (77% complete)
```
- ___6. A message is posted when the clone operation is complete: `storage system>`

```
Mon Dec 13 12:46:01 PST [storage system: lun.clone.completed:notice]:
Cloning completed on lun /vol/volx/cloned2.lun.
storage system> lun show
/vol/volx/cloned.lun 125.5m (131604480) (r/w, online)
/vol/volx/cloned2.lun 125.5m (131604480) (r/w, online)
/vol/volx/lun1 30.0g (32218421760) (r/w, online)
/vol/volx/bootlun.lun 125.5m (131604480) (r/w, online, mapped)
storage system> snap list
Volume volx
working...
%/used    %/total    date           name
-----    -
0% ( 0%)  0% ( 0%)  Dec 13 12:36   snap2 <== no longer busy
0% ( 0%)  0% ( 0%)  Dec 13 12:12   snap1
0% ( 0%)  0% ( 0%)  Dec 07 16:00   hourly.0
```

____7. The Snapshot copy used for LUN cloning can now be deleted using the command `snap delete <volume_name> <snapshot_name>`. Currently, `lun clone` creates clones in the same source volume. In other words, the `lun clone` command cannot be used to copy and move or clone a LUN from one volume to another. To move or copy a LUN to another volume, use `ndmpcopy`. See the Data ONTAP documentation for details. Example of `ndmpcopy`:

```
storage system> ndmpcopy /vol/volx/lun1 /vol/volx/
```

This example creates `/vol/volx/lun1`. You can use the `lun move` command to rename the LUN or to move the LUN to a new path in the same volume.

NOTES:

- The copied LUN is mapped to the same igroup and LUN ID as the source LUN.
- To move Exchange or MS SQL database LUNs to new volume, use SnapManager® for Exchange (SME) or SnapManager for SQL Server (SMSQL):
 - Stop services.
 - Create a new LUN of the required size on the other volume.
 - Use SME or SMSQL to migrate data to the new LUN.
- To copy a volume containing a LUN to the same or different storage system, use `vol copy`. See the Data ONTAP documentation for details.

Appendix C: Data Collection Tool for SnapDrive for Windows (SnapDrvDc.exe)

The Data Collection Tool for SnapDrive for Windows (SnapDrvDc.exe) creates a report of the SnapManager registry values and hosting storage system values. It runs on all SnapManager products that work with SnapDrive for Windows (VLD, FCP, iSCSI). You may be asked to send the output of this tool to Network Appliance Global Services when troubleshooting SnapDrive for Windows or SnapManager application configurations.

Directions: Installing and Running SnapDrvDC

1. Download SnapDrvDC from http://now.netapp.com/NOW/download/tools/snapmanager_e2k_dct/. This link includes instructions for downloading and executing the data collection program.

Verify and enable RSH access from the blade server to the storage system.

2. Open a telnet session to the storage system and open a different command window on the Windows server. Place the windows side by side.
3. At the command prompt, type **rsh <storage systemname> version** (replace <storage systemname> with the host name or IP address of your storage system) and press Enter. An error message similar to this appears:

```
C:\>rsh x.x.x.x version
EPGBLONSTORAGE SYSTEM1: Permission denied.
rsh: can't establish connection
```
4. On the telnet session to the storage system, you see the failed RSH attempt. Note the information in bold (userID and IP address):

```
storage system> Thu Feb 7 16:18:58 EST [rshd_0:warning]:
Permission denied to rsh request from user at host
xp.netapp.com IP address x.x.x.x
Thu Feb 7 16:18:58 EST [rshd_0:error]: rsh error:
Permission denied.
```
5. Using Wordpad (*not* Notepad), open the C\$ share on the storage system, then drill down and open the /etc/hosts.equiv file. Add the userID and IP address from the telnet session (cut and paste -- it is case-sensitive) to the end of the /etc/hosts.equiv file, making sure that there is a blank line at the end of the file. Save this new /etc/hosts.equiv file.
6. Retest rsh access; type

```
C:\>rsh ip_addr_of_storage_system version
NetApp Release 7.2.1: Wed Feb 7 17:00:29 PDT 2007
```
7. When RSH is working, you can run the SnapDC utility and upload the resulting CAB file.

Upload SnapDrvDC to NetApp via FTP or HTTP.

SnapDrvDC creates a CAB file that can be quite large. In that case, you must use FTP to upload the file to NetApp. To do so, first rename the CAB file to case#_snapdrvdc.cab and then upload it via FTP:

- ___8. ftp <ftp.netapp.com>
- ___9. Login: anonymous
- ___10. Password: [valid-email-address]
- ___11. cd to ntap
- ___12. bi to transfer file in binary mode
- ___13. hash to display hash marks while file downloads
- ___14. put case#_snapdrvdc.cab to transfer file

Alternatively, you can go to <http://upload.netapp.com> and upload the file via HTTP or HTTPS if outgoing FTP access is restricted from your location.

Appendix D: JS2x Standalone Diagnostics

The IBM Standalone Diagnostics CD-ROM provides hardware diagnostics and service-related utilities for POWER, PowerPC, and eServer i5 systems with common pSeries I/O, and for RS/6000-based systems. The preferred method for diagnosing and servicing these systems is to use the concurrent diagnostics and service-related utilities that are installed with the operating system on the system or partition. However, the standalone diagnostics CD-ROM can be used in the following situations when it makes sense to test the hardware independently of the operating system:

- No operating system is installed on a system or partition
- The operating system does not have support for the service-related function that you want to perform
- There may be a problem with the boot device
- The service documentation specifically recommends running standalone diagnostics

Updates are released periodically to support new systems and devices. You can find the latest release of the Standalone Diagnostic CD-ROM at <http://www14.software.ibm.com/webapp/set2/sas/ff/diags/download/home.html>.

Diagnostics can also be run from within AIX, using the `diag` command. The menu options and functionality are the same as the standalone version. See Appendix E, “JS2x Linux Service Aids,” for upgrading the firmware in the Linux operating system. Follow the instructions below to update the JS21 blade server using the standalone diagnostics.

Directions: Updating JS21 Using Standalone Diagnostics

- ___ 1. Boot the JS21 blade server on the Standalone Diagnostics CD-ROM; or if you are running AIX, type **diag** to start the standalone diagnostics.
- ___ 2. From the Function Selection menu, select Task Selection.
- ___ 3. From the Tasks Selection List, select Update and Manage System Flash.
- ___ 4. Select Validate and Update System Firmware.
- ___ 5. At the “Flash update image file” prompt, insert the CD-ROM containing the Open Firmware, select `/dev/cd0` as source, and then commit PF7.
- ___ 6. Follow the instructions displayed on the screen. For example, click Yes to proceed with the flash operation.
- ___ 7. When the system reboots successfully and you are satisfied with the functionality of the new image, commit the update using the Standalone Diagnostics CD-ROM.
- ___ 8. From the Function Selection menu, select Task Selection.
- ___ 9. From the Tasks Selection List, select Update and Manage System Flash.

____10. Click Commit the Temporary Image.

____11. Click Yes to commit the image.

NOTE: This selection copies the permanent system firmware image to the temporary image when booted from the temporary image. Booting of temporary or permanent can be configured using the SMS within the JS21 blade server.

____12. Press ESC and then press F10 to exit diagnostics.

Appendix E : JS2x Linux Service Aids

After installing the Linux operating system, you must download and install the Service Aids for Hardware Diagnostics. This toolkit provides the tools required to service and update JS21 blade systems running IBM-supported versions of the Linux operating system. In the rare instance when a system error occurs, the toolkit provides first failure data capture, error log analysis, and other information needed for accurate problem determination and correction.

Directions: Updating JS21 Using Linux Service Aids

- ___ 1. Download and install the Service Aids for Linux. These utilities and instructions can be found at <https://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html>
- ___ 2. Obtain the latest JS21 Open Firmware level from the IBM support site.
- ___ 3. Telnet and log in as root to the JS21 blade server.
- ___ 4. Copy the latest version of the Open Firmware that you obtained from the IBM support site to the JS21 blade server.
- ___ 5. Type the **update_flash -f /path/to/filename** command to upgrade the Open Firmware of the JS21 blade.
NOTE: The update_flash utility immediately reboots the server when the temporary image is flashed.
- ___ 6. After the JS21 blade has successfully rebooted, log in as root and promote the flash to the permanent side by using the **update_flash -c** command. Options available with the update_flash command are:

Update_flash usage

```
Usage: update_flash [-q] { -r | -c | [-v] -f <filename> }
-r                Reject temporary image
-c                Commit temporary image
-v                Validate ONLY with specified image file working
-f <filename>    Update firmware with specified image file
```

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