

**Dense computing and redundant storage consolidation**  
July 2004



# **IBM ^ BladeCenter** **Remote SAN Boot for HS20 and HS40**

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## 1.0 Overview

Remote boot or “root boot” is the name 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. This document will describe in details the process that you must go through to setup a remote boot for IBM eServer BladeCenter Servers using a logical drive from Fibre Channel Storage Array.

This process is intended for a configuration of a Blade Center directly connected to the Storage Array using Fibre Channel (FC) cables (Figure 1) If the Blade Server is connected to the Storage Array via FC switches (Figure 2), please reference the IBM eServer BladeCenter Interoperability guide first for instructions to correctly integrate the BladeCenter into an existing FC switched fabric. Upon following these preliminary tasks, you will be able to use the information in this document to set up remote boot.

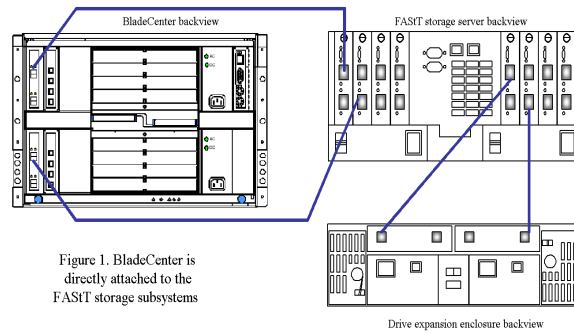
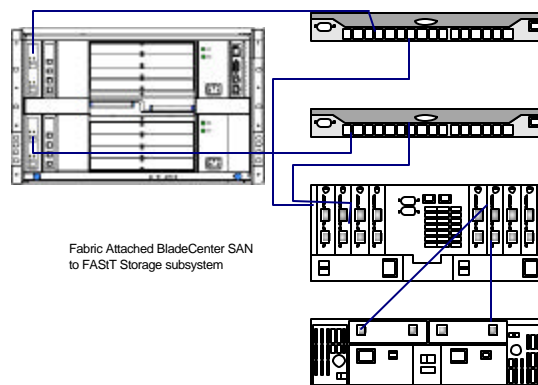


Figure 1. BladeCenter is directly attached to the FAST storage subsystems

**Figure 1.- BladeCenter in Direct-attach SAN environment**



Fabric Attached BladeCenter SAN to FAST Storage subsystem

**Figure 2.- BladeCenter in Fabric-attach SAN environment**

## 2.0 Change Notification

Change Revision	Description	Date
1.0	Initial Release.	12/2003
2.0	-Addition of Windows 2003 Standard Edition, Enterprise Edition, and Web Edition Operating System versions. -Removal of requirement to use I/O Stream-guard in remote boot. -Addition of HS40 and OPM support. -Addition of Brocade SAN Switch Module support.	07/2004

### **3.0 Using this document**

This document will demonstrate to the Storage Administrator audience how to prepare, configure, and boot the IBM eServer BladeCenter using IBM Fibre Channel based storage solutions. The initial view of this document describes how to configure the Blade Center Fibre Channel I/O expansion adapter, provides a brief overview of the BladeCenter I/O module subsystem, and detailed steps for configuring Remote boot. Additionally, this document describes 'how to' and best practices for configuring the Fibre Channel capable I/O Modules using FAStT and ESS Storage platforms. I would like to point out that this document was not intended for use in configuring Clustered Hosts for Remote boot.

## 4.0 Preparation Checklist

As a preparation procedure, ensure that you either have access or have researched the following areas before proceeding to configuration.

### **Fibre Channel I/O expansion adapter**

- ✓ Review the Blade Center Fibre Channel I/O Adapter Installation & User's guide.
- ✓ Refer to the Storage vendor's preferred setting for assigning the Boot LUN. In most cases, this will be LUN 0 (zero).
- ✓ Ensure that the Fibre Channel I/O Adapter has the latest supported BIOS. This is located at: [www.ibm.com/support](http://www.ibm.com/support)

### **Fibre Channel Switch Module**

- ✓ Review the appropriate Switch Module installation & User's guide.
- ✓ For the Optical Pass-thru module, ensure that the OPM (break-out) cable is using the correct mapping to identify the Blade that you intend to configure for remote booting.
- ✓ Review the Blade Center's Fibre Channel switch Interoperability Guide.
- ✓ Backup the switch fabric configuration to a file.
- ✓ Record the IP Addresses of the BladeCenter Fibre Channel Switch module.

### **Remote Management workstation for configuring remotely**

- ✓ Configure a Remote Management workstation which can be used to access the Fibre Channel switch module via an IP address. This is a system with the IBM FAStT Storage Manager installed also and can be used to manage the storage.
- ✓ Install the IBM SAN Utility switch management application on the Remote Management workstation to have a graphical interface for managing the Fibre Channel Switch module. This workstation should be running the latest Java Utility when configured with a Microsoft Windows Operating system.

### **FAStT Storage**

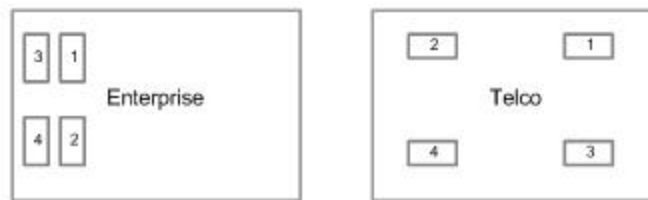
- ✓ Reference the most current FAStT Readme files, Installation and User's guides to ensure that you are comfortable with the configuration to follow. Otherwise, contact your local Blade Center support representative.
- ✓ Install the host management software on the Remote Management workstation.
- ✓ Obtain the IP Addresses of the FAStT Storage subsystem.
- ✓ Obtain the necessary Storage Partitioning Premium Feature if required.
- ✓ Ensure that the FAStT Storage server and drives are cabled in accordance with the FAStT cabling guide.

### **ESS Storage**

- ✓ Reference the most current ESS Readme, Installation and User's guides to ensure that you are comfortable with the configuration to follow.
- ✓ Reference the ESS Specialist Online Help for using ESS Specialist. Otherwise, contact your local Blade Center or Storage support representative.

## 5.0 About the BladeCenter I/O Subsystem

The IBM eServer BladeCenter is capable of containing up to fourteen processor blades for the Enterprise chassis and eight for the Telco chassis, two management modules, and four total I/O modules. Based on the current blade design, only Ethernet<sup>1</sup> (ENET) or Optical Pass-thru (OPM) I/O modules can be inserted into Bays 1 & 2. Any type of defined switch module, for example the Ethernet Switch Modules, Fibre Channel and Optical-Pass-Thru, can be inserted into Bays 3 & 4. However, for the purpose of this document, the I/O module will either be a Fibre Channel switch or Optical Pass-Thru module used in Slots 3 or 4. The corresponding blade server I/O expansion card must match with the I/O module protocol type. For example, the Fibre Channel daughter-card supports the Fibre protocol and only the OPM or Fibre Channel switch module is supported. On a BladeCenter chassis, the four switch bays are numbered from a rear view perspective as shown in below in Figure 3.



**Figure 3. Enterprise and Telco Blade Chassis Rear view (I/O subsystem)**

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<sup>1</sup>Ethernet will be abbreviated as ENET in the rest of this document.



## 6.0 Preparing the BladeCenter Server I/O Expansion card for Remote Boot

The HS20 and HS40 Server Blades have the capabilities of using the <sup>2</sup>Fibre Channel I/O Expansion card that is designed with dual-channels. When the Blades using I/O expansion cards are inserted into the BladeCenter's chassis they interface with a mid-plane which provides connectivity to I/O modules 3 and 4 in the rear of the chassis.

The diagram in Figure 4 depicts placement of the I/O expansion card on the Server blade. For a more detailed overview of the I/O expansion card, you should refer to the Installation and User's guides.

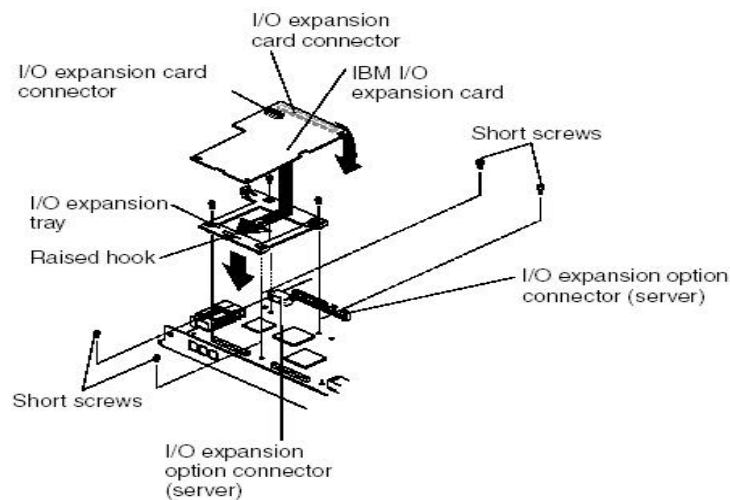
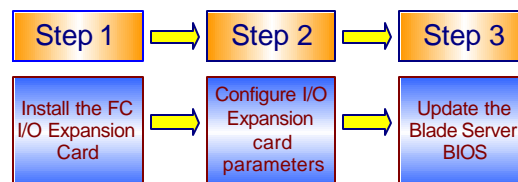


Figure 4. -HS20 Blade I/O Expansion card layout

This section is intended to provide a description and steps for preparing the HS20 and HS40 Blade Servers with an I/O expansion card in preparation to Remote Boot from Fibre Channel Storage.



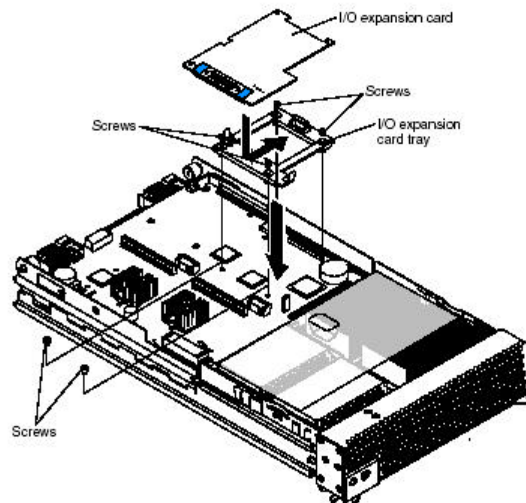
<sup>2</sup> Although the HS40 has dual I/O expansion card slots, only one is presently supported in the Remote boot scenario.

## 6.1 Install the FC I/O Expansion Card

1. Ensure that the HS20 or HS40 Blades are powered-off.
2. Remove the FC I/O Expansion Card from the static-protective package.
3. Slide the narrow end of the FC I/O Expansion Card into the raised hook on the tray.
4. Align the FC I/O Expansion Card connectors with the network-interface option connector and the PCI-X expansion slot. **(For HS40 Blades record whether you are using Slot 0 or Slot 1).**
5. Gently press the card into the connectors.
6. 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.

The following illustration (Figure 5) shows how to install an I/O expansion card on the blade server. The same procedure is used to install an expansion card in either I/O expansion card location; however, the illustration shows installing an expansion card only in I/O expansion card location 2.



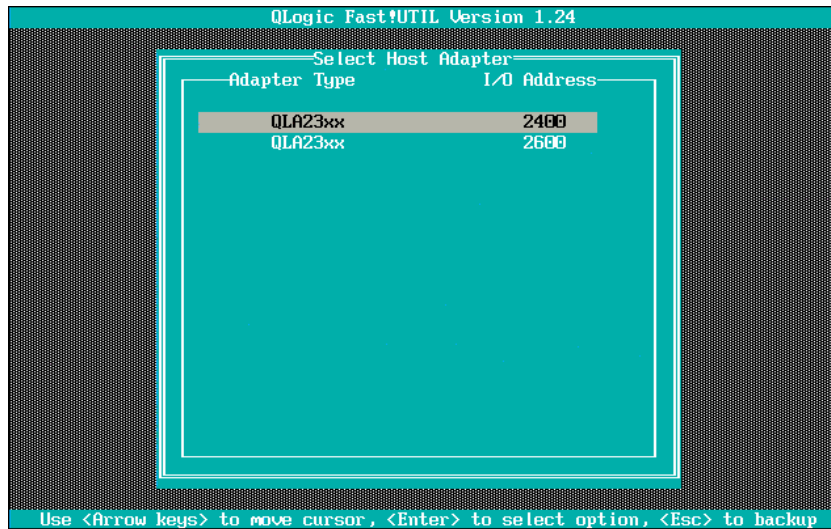
**Important:** If you are installing only one I/O expansion card in your blade server, it must be installed in I/O expansion card location 2.

Figure 5. -HS40 Blade FC I/O Expansion card layout

## 6.2 Record Host Adapter Port Name

1. Boot the HS20 or HS40 Blade Server.
2. Press **Ctrl+Q** to enter the BIOS configuration utility as depicted in the illustration below.

3. Select the 1st Host adapter port as shown in Figure 6 by pressing **Enter**.



**Figure 6. - Fibre Channel I/O Expansion card ports**

**Note:** The upper port correlates to the top Fibre Channel I/O Module (Slot 3) of the BladeCenter chassis.

4. Select **Configuration Settings** → **Host Adapter Settings**.
5. Record the Adapter Port Name (World-Wide Port Name) of this Host adapter channel. You will need this when configuring Storage Partitioning/provisioning and to zone the Fibre Channel expansion card port
6. Press the **Esc** key.
7. Select the menu item, **Select Host adapter**.
8. Select the 2nd Host Adapter port and press Enter.
9. Obtain the Adapter Port Name of the adapter and record it.
10. Press **Escape** to exit the Fast!Util program after you have recorded the Adapter Port Name for both adapters.
11. Power down the Blade server.

**Record the adapter World-Wide Name port information below:**

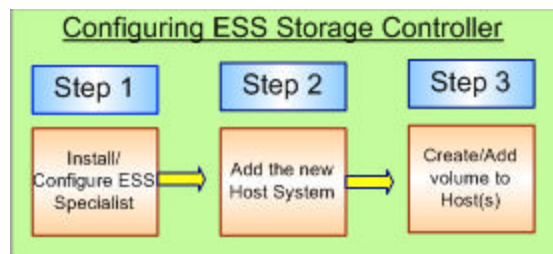
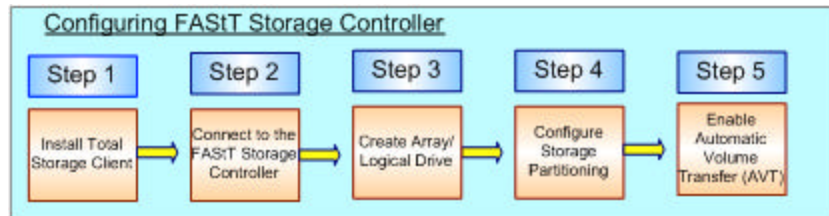
Slot	World-Wide Name:	I/O Address:
Slot 3		
Slot 4		

### **6.3 Update the Blade Server BIOS (if necessary)**

1. The Blade Server BIOS can be updated using the Update Xpress CD available from <http://www.ibm.com/support>. This will also mentioned again in Section 8.3.

## 7.0 Configuring Fibre Channel Storage arrays (Single-path only)

Up to this point, the Storage Administrator has configured the Blade Server and recorded the necessary information for configuring the FC I/O Expansion card. This section describes attaching the IBM eServer BladeCenter into a SAN and configuring a single path to Remote boot from FAStT or ESS storage array.



### 7.1 Configuring FAStT Storage for Remote boot

**Note:** The following steps will be performed from a Remote workstation that has the FAStT Total Storage Manager client installed. You should consult the FAStT documentation for additional guidance.

1. Install the IBM FAStT Storage Manager Client on the designated Remote workstation.
2. Launch the IBM FAStT Storage Manager Client using the *Start* → *Programs* → *IBM Storage Management Client* Windows menu.
3. Using the Storage Management application, connect to the Storage subsystem that you intend to manage and configure for Remote booting.
4. Once you have selected the applicable Storage subsystem, proceed to Creating logical drives and arrays.

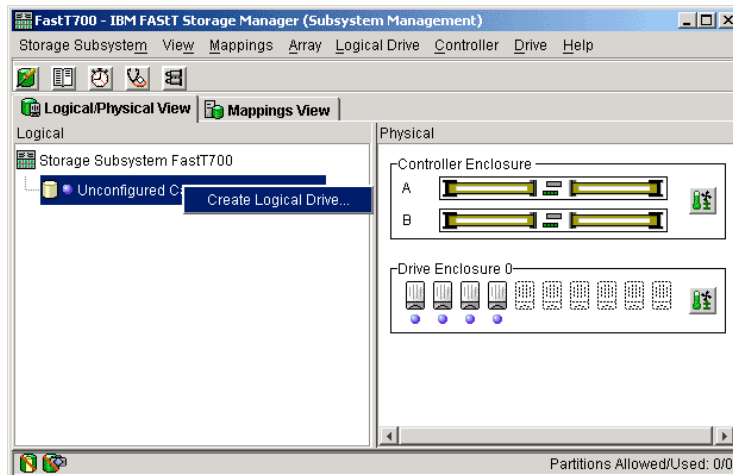


Figure 7. - Storage Manager client management screen.

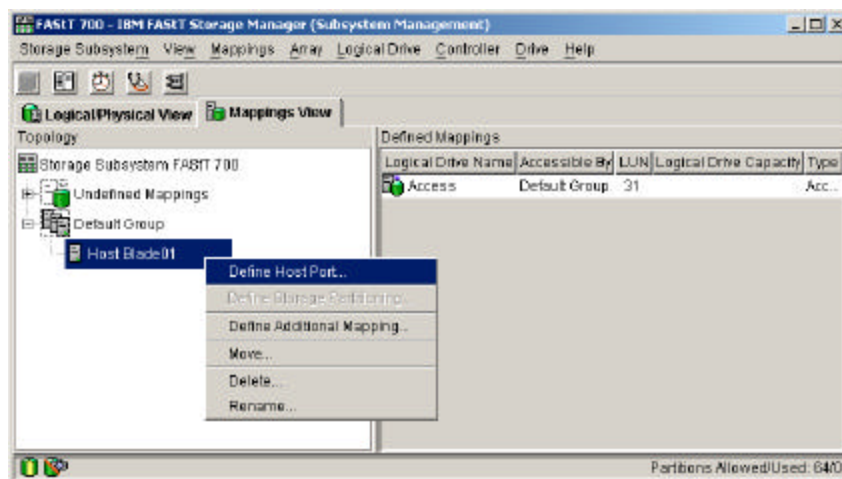
5. Proceed to configure Storage partitioning by performing the steps below.

**Note:** You should review your FAST publications will provide more in-depth illustrations on Storage Partitioning.

6. Under the *Mappings View* tab, you should create a host group, host, and assign host ports.

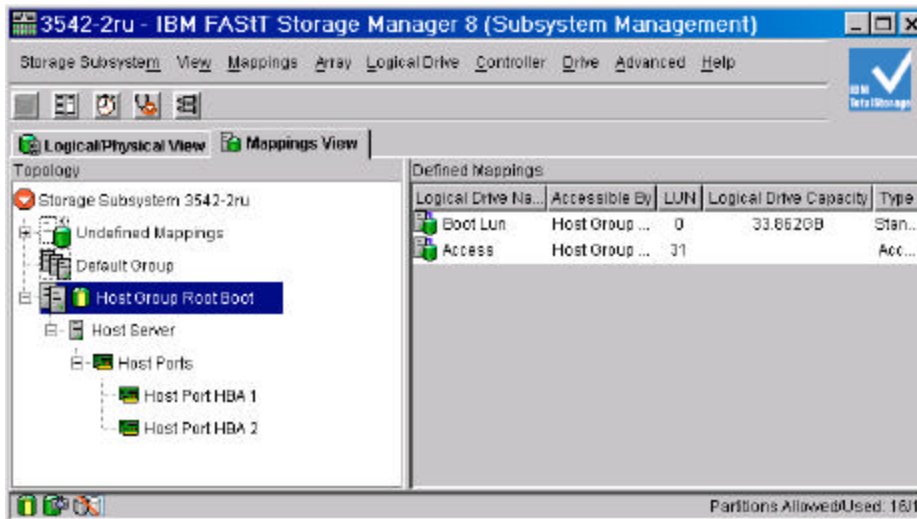
- a. Select *Mappings* → *Define Host Group*.
- b. Click on the Host group; select *Mappings* → *Define* → *Host*.
- c. Click on the Host that was created in the previous step; select *Mappings* → *Define* → *Host-ports*. Each Host should initially have a single host-port assigned. Otherwise, the host will have dual-path access assigned. The host port is the Adapter WWPN that you recorded while configuring the FC I/O Expansion card. The host type for each of these host-port types will be Windows® Non-clustered by default and should be changed to correspond to the Operating system type that you will be installing

**Note:** Automatic Volume Transfer (AVT) is used to perform Controller level LUN transitioning. For the Linux host-type, this is already enabled. However, as described later in this document, AVT should be enabled for Windows.



**Figure 8. -Configuring Host groups and defining Host ports**

7. Right click on the host created in Step 6b and assign the intended boot Logical Drive, as LUN 0, to the Host that was also created previously.
8. Remove the Access Logical Drive from the **Host group** created in Step 6a. (Note: This LUN is added automatically to the host group when the first LUN is mapped to it. Review the figure below to compare with your configuration.



**Figure 9. - FAStT Host-port mapping**

9. Enable AVT on the FAStT storage controller using the following script sample.

**Note:** AVT is intended to be used in situations that utilize redundant paths to the Storage controller. The script can be found in your FAStT CD-pack or on at <http://www.ibm.com/support>. This procedure is also mentioned in the *Configuring for Redundancy* section and can be performed at either point. Additional documentation can also be found in the Storage Management Client Online Help or Installation and User's guide. The Enable AVT script is typically provided in a \*.scr file and is only intended to be performed by a seasoned Storage Administrator.

```

Enabling AVT
Windows 2000 (Non-clustered)
// The following commands Enable AVT
// You must reboot the controllers for the NVSRAM settings to take affect
set controller [a] HostNVSRAMBYTE [2,0x24]=0x01;
set controller [b] HostNVSRAMBYTE [2,0x24]=0x01;
    
```

## 7.2 *Configuring ESS Storage for Remote boot*

1. Configure the ESS using the ESS Specialist.

- Storage Allocation
- Open Systems
- Modify Host Systems.

2. Enter the information in the text fields of the Modify Host System

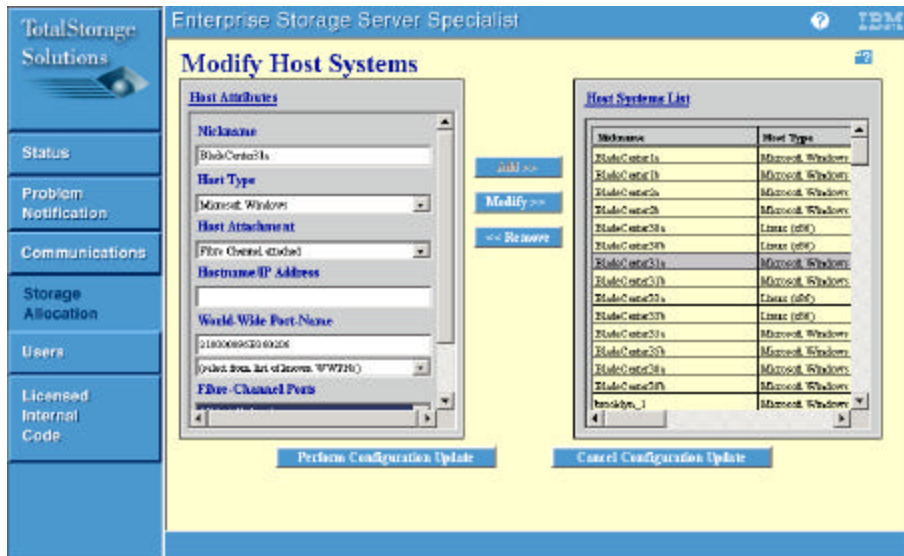


Figure 10. - ESS Host Port mapping using ESS Specialist

3. Add the Host Attributes to the Host Systems List and Perform Configuration Update.
4. After the Configuration Update you will be brought to the Open Systems Storage Window, Add Volumes to the Host. Select the **Add volumes**.



Figure 11. – ESS volume assignment using ESS Specialist

5. Click on your Host (Host Nickname), and select clusters (Green) from Cluster 1 and/or Cluster 2, then select **Next**.

**Note on Adding Volumes:** You will want to add (1) 5 GB LUN, for Operating Systems Purposes. Additional volumes can be added after the installation of the OS. Perform the Configuration Update.

Only one volume should be assigned to the Host until the installation of the Operating System is completed.

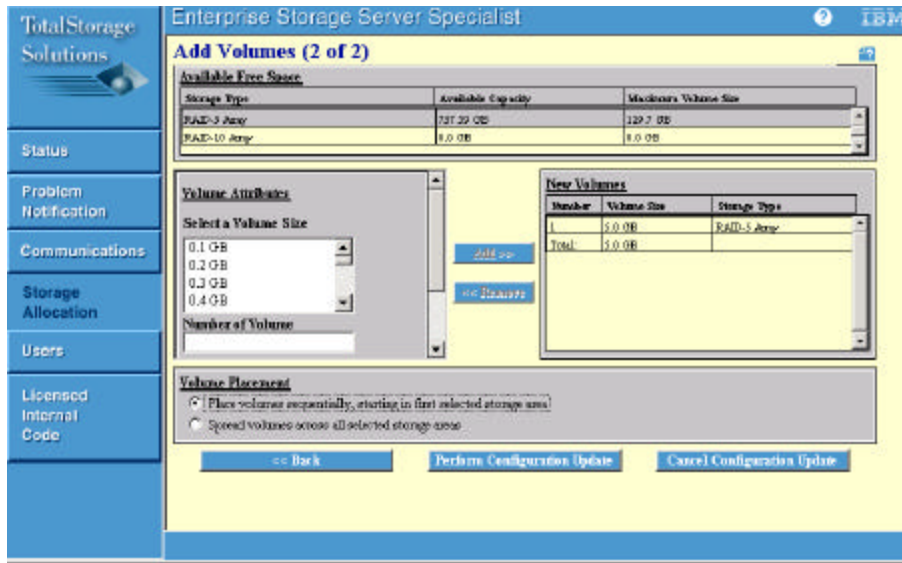


Figure 12. – ESS volume creation using ESS Specialist

6. You will then see the (1) 5GB LUN that was created and it is assigned to the WWPN of the FC I/O Expansion card.



## **8.0 Update the Server BIOS for HS20 and HS40**

1. Power on the HS20 or HS40 Blade server.
2. Enter the BIOS by pressing F1 and you will be directed to the Server's BIOS menu.
3. Confirm that the Blade server's BIOS and Diagnostics are at the latest level by reviewing the support website ([www.ibm.com/support](http://www.ibm.com/support)). Otherwise, update using the latest code levels found there.

### **8.1 Configure I/O Expansion card parameters**

1. Boot the HS20 or HS40 Blade Server.
2. Press **Ctrl+Q** to enter the BIOS configuration utility as depicted in the illustration below.
3. Select the first Fibre Channel adapter port.

**Note:** The upper port correlates to the top Fibre Channel I/O Module (Slot 3) of the BladeCenter chassis and is assumed to be the path configured first in this document.

4. Select **Configuration Settings → Host Adapter Settings**.
5. Enable the Host adapter's BIOS by selecting Enable from the Host adapter BIOS parameter.
6. Press the **Esc** key once.
7. Select **Selectable Boot Settings** and enable the Selectable Boot.
8. Select the **(Primary) Boot Port Name, LUN** and press **Enter**. This will bring you to the Select Fibre Channel Device screen.
9. Listed here you will find the Controller to which your HBA Adapter is connected on the FAStT Storage or ESS Storage device. Select it and press the **Enter** key.
10. Your Selectable Boot Settings should now show the Controller Port Name, as shown Figure 13.

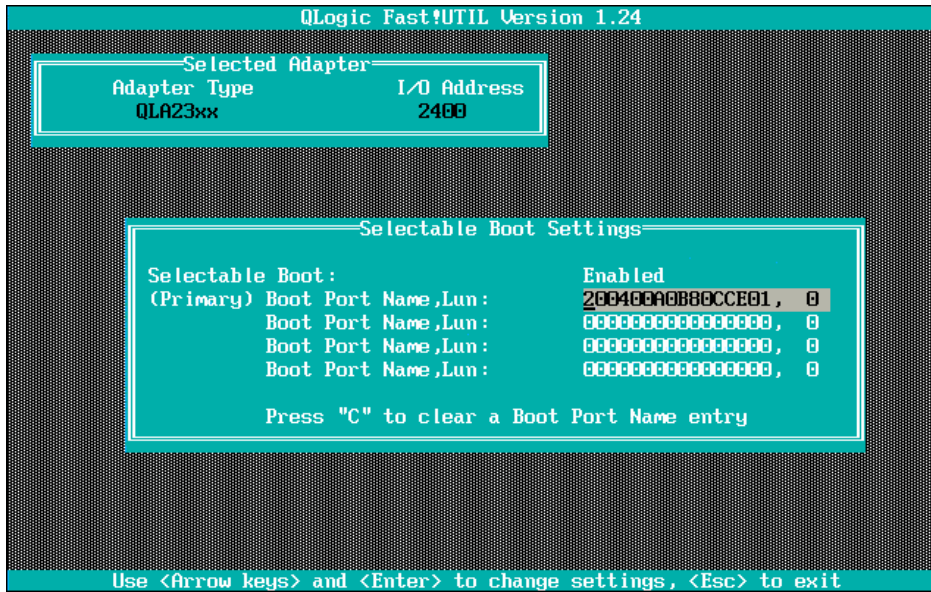


Figure 13 – HBA Boot device assignment mapping

## 8.2 Configuring the HS20 Blade Server BIOS

1. On Server boot, Select *F1* to enter the Server’s BIOS. If your HS20 has the optional SCSI attachment, change the Plannar SCSI to Disabled.

<b>Note:</b>	Ensure that the <i>Daughter Card</i> parameter is Enabled.
--------------	--

2. Select the IDE Configuration Menu.
3. Disable the Primary IDE connection and Secondary IDE connection.



**Figure 14. - System BIOS: IDE device Disable**

4. Ensure that these devices are listed in the following order as startup devices:

<b>Device</b>	<b>Startup Order</b>
CD-Rom	First Startup Device
Diskette Drive 0	Second Startup Device
Hard Disk 0	Third Startup Device
Network	Fourth Startup Device

5. Select Save Settings and then exit the BIOS configuration.

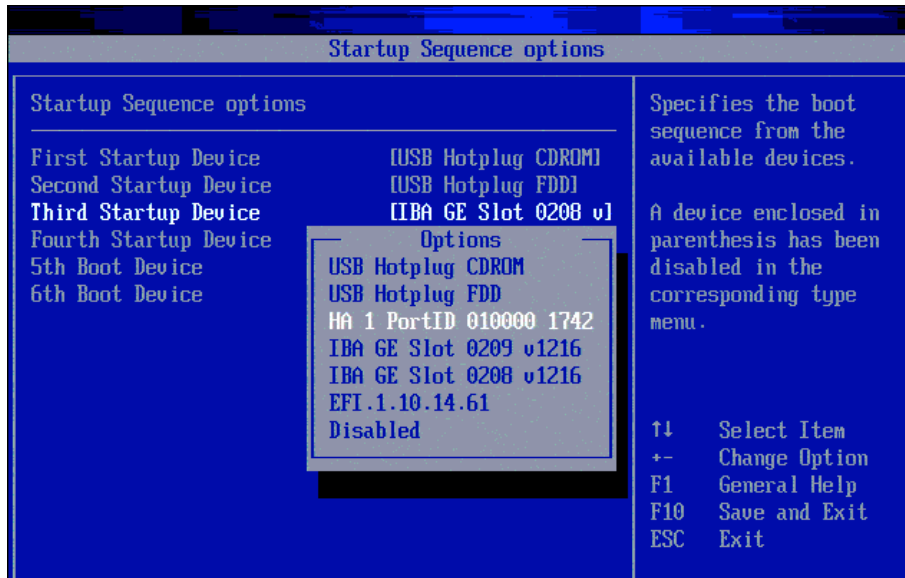
### **8.3 *Configuring the HS40 Blade Server BIOS.***

1. Ensure that the Media Tray and KVM Control is assigned to the HS40 that you are working with.
2. Ensure that these devices are listed in the following order as startup devices:

<b>Device</b>	<b>Startup Order</b>
USB Hotplug CDROM	First Boot Device
USB Hotplug FDD	Second Boot Device
HA 1 PortID 010000 1742 (Fibre Device)	Third Boot Device

3. Select the Third Startup Device and press `Enter`.
4. Select the Fibre Channel Daughter Card as the Third Startup Device. In the example shown in Figure 15, the Fibre Channel Daughter Card is HA 1 PortID 0100000 1742.

**Note:** The HS40 requires that you have the HBA port BIOS enabled before seeing Fibre Channel Daughter card as a Startup sequence option.



**Figure 15. – HS40 Device Startup sequence**

5. Select Save and exit the BIOS configuration.

## 9.0 Configuring IBM eServer BladeCenter Fibre Channel capable I/O Modules

This section describes I/O modules that support the Fibre Channel capable I/O expansion card. Therefore, I/O modules must reside in slots 3 or 4. The I/O modules are provided in two flavors; Fibre Channel Switches and Optical Pass-thru modules that can be used as interconnects to attach the Blade Center into an external SAN environment.

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 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 I/O 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 the Target device.

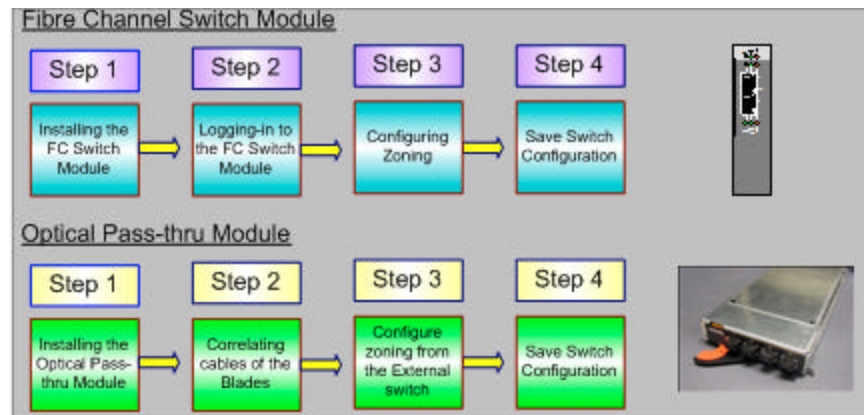


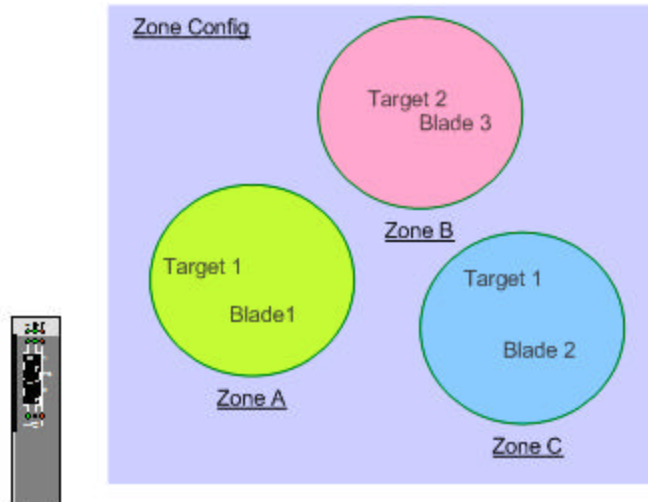
Figure 16. - Configuring Fibre I/O Modules

### 9.1 Configuring Fibre Channel Switch module for a Remote Boot environment

This configuration section does not assume that you are using a particular type of Fibre Channel switch module only that the switch module is a functional IBM eServer BladeCenter Fibre Channel capable switch module. This section describes two important concepts; Zoning and Interoperability. These should be considered when deploying BladeCenter in a Remote boot SAN environment while using Fibre Channel Switch Modules.

#### A. Zoning

Zoning is used to prevent propagation of state-change traffic to other Blades in the Fabric. It is recommended that each Blade that has I/O expansion cards resident be included in a separate zone. This is to prevent extraneous State-change traffic to other Blades that may be in operation. Although in most cases, this traffic is non-disruptive, it can have a slight performance impact on adjacent Blades in the fabric. Follow the zoning example provided in **Figure 18** to guide you through zoning setup for your configuration.



**Figure 17. - Zoning Concept**

IBM eServer Brocade SAN Switch Module (Using Command-Line Interface)	IBM eServer Fibre Channel 2-Port FC Switch Module (Using Command-Line Interface)
<ol style="list-style-type: none"> <li>1. brocadessm:USERID&gt; zonecreate "Blade1", "Domain,Port"</li> <li>2. brocadessm:USERID&gt; zonecreate "Blade1", "WWPn"</li> <li>3. brocadessm:USERID&gt; cfgcreate "RemoteBoot", "Blade1"</li> <li>4. brocadessm:USERID&gt; cfgenable "RemoteBoot"</li> <li>5. brocadessm:USERID&gt; cfgsave</li> </ol>	<ol style="list-style-type: none"> <li>1. Start a zone editing session: cli \$-&gt; admin start cli (admin) #&gt; zoning edit</li> <li>2. Create a zoneset cli (admin-zoning) #&gt; zoneset create RemoteBoot</li> <li>3. Create a zone: cli (admin-zoning) #&gt; zone create TestBlade1  cli (admin-zoning) #&gt; zone add TestBlade1 Domain1, Port1 cli (admin-zoning) #&gt; zone add TestBlade1 WWPn</li> <li>4. Make the zone a member of the zoneset: cli (admin-zoning) #&gt; zoneset add RemoteBoot TestBlade1</li> <li>5. Save the zoning session: cli (admin-zoning) #&gt; zoning save</li> <li>6. Activate the zoneset: cli (admin) #&gt; zoneset activate RemoteBoot</li> <li>7. Leave admin mode: cli (admin) #&gt; admin end</li> </ol>

**Figure 18. - Zone Configuration steps using the Brocade SAN switch Module and 2-port FC switch Module**

**Note:** These zoning steps must be repeated for each Fibre Channel Switch Module.

### **B. Interoperability**

For SAN environments that operate on the premise of Open Fabrics, interoperability may be inherent. Open Fabrics are SANs where vendor neutral device integration is permissible. Interoperability is described as interconnecting two or more Switch Fabric devices of different vendor types.

When attaching the 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 proceed to gathering appropriate documentation that will guide you in designing this interoperable SAN. For the purpose of

Remote booting, you should consult the Storage vendor to ensure that Interoperable Fabrics are supported. For best practices, before proceeding to integrate the BladeCenter into an existing Fabric, you should backup your switch configuration. Additionally, for BladeCenter Interoperability guidelines see the IBM eServer BladeCenter Fibre Channel Interoperability Guide, available at <http://www.pc.ibm.com/support>.

## 9.2 *Configuring a Single Path to the Storage Server*

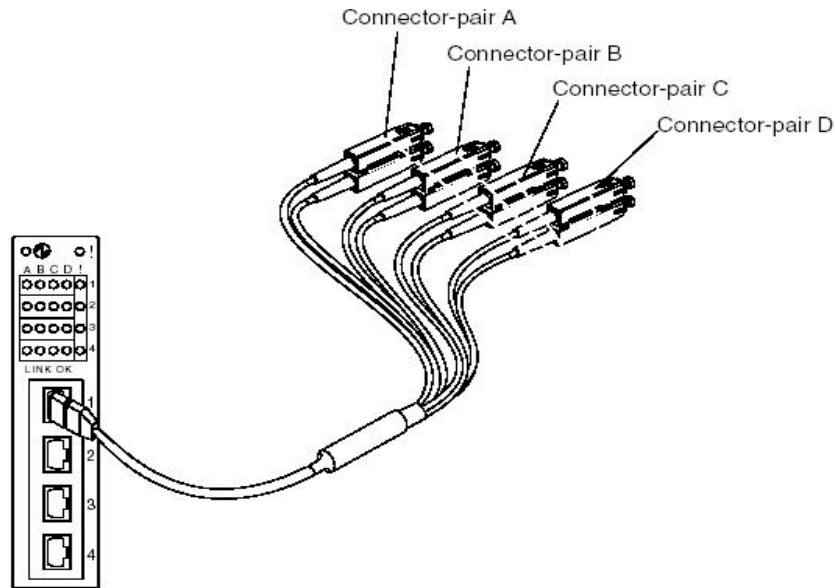
**Note:** Disable **Port 0** on one of the Switch Modules (Module 4). This step assumes that a path to your storage controller is attached to this port.

**Disabling this Switch port only allows a single path to the storage controller.**

<b>Brocade Switch Module Commands</b>	<b>Qlogic Switch Module Commands</b>
<ol style="list-style-type: none"> <li>1. Start a telnet session to the switch</li> <li>2. Login using 'USERID'</li> <li>3. BSSM: &gt; portDisable 0</li> <li>4. BSSM: &gt; logout</li> </ol>	<ol style="list-style-type: none"> <li>1. Start a telnet session to the switch</li> <li>2. FCSM: USERID&gt; admin start</li> <li>3. FCSM (admin): USERID&gt; config edit</li> <li>4. FCSM (admin-config): USERID&gt; set config port 0</li> <li>5. set port 0 to offline</li> <li>6. FCSM (admin-config): USERID&gt; config save</li> <li>7. FCSM (admin): USERID&gt; config activate</li> <li>8. FCSM (admin): USERID&gt; admin end</li> <li>9. FCSM (admin): USERID&gt; logout</li> </ol>

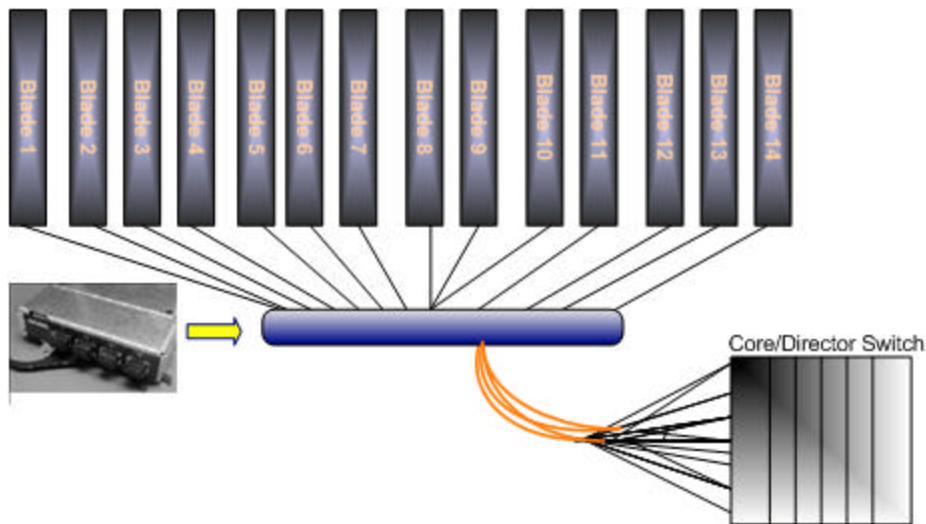
## 9.3 *Configuring Optical Pass-thru module for a Remote Boot environment*

The Optical Pass-thru module (OPM) provides 4-pair of fiber optic cable break-outs per single Optical transceiver. The OPM has 4 Optical transceivers numbered 1 thru 4 on the face of the OPM that allows communication to the device. Each cable correlates to a particular Blade slot. For example, break-out Cable extension 1 thru 4 of Optical transceiver port 1 correlates with the Blades in slot 1 thru 4. The break-out cable extension 1 thru 4 of Optical transceiver port 2 correlates with Blades in slot 5 thru 8 and so on. Depending on whether the OPM is in slot 3 or 4 will determine whether you have connectivity to the upper or lower port of the I/O Expansion card.



**Figure 19. - Optical Pass-Thru Module and Break-out (SC-type) cable**

Because the OPM serves as a physical extension of the FC I/O expansion card ports, there is not a concern for Interoperability or zoning on the OPM per se. The SAN Administrator should be mindful of cable management and port-count when designing a SAN using OPM.



**Figure 20. - SAN diagram using OPM**

As depicted in the drawing above, the OPM is directly attached to the external switch. The external switch can be zoned as described in the zoning section of “Configuring Fibre Channel Switch module for Remote boot environment” section of this document. It is also recommended to consult the switch vendor’s documentation to find out more about Zoning.



## 10.0 Installing the Windows Operating System

Now that you have configured the System BIOS, FC I/O Expansion card BIOS and Storage array you are ready to begin the installation of the Operating System. The following Operating Systems have been validated and are subjects of this document:

Operating System	Platform
Windows 2000	Server Enterprise Advanced Server
Windows 2003	Standard Server Web Edition Enterprise Edition

To install the Operating system, you will require a 3<sup>rd</sup> party device driver for the FC I/O Expansion card. This device driver can be downloaded from the following website: [www.pc.ibm.com/support](http://www.pc.ibm.com/support) . This device driver package should be extracted to the root of the a:\ drive. Once this is done, you are ready to perform the installation using the steps below.

1. Begin the installation using the supported Windows CD-ROM.
2. During the installation process, when prompted, Press **F6** to install a 3<sup>rd</sup> party device driver
3. When prompted insert the Fibre Channel Daughter Card device driver diskette.
4. If Windows prompts you to use the driver included with Windows or the driver that you have specified, be certain to use the driver from the diskette, not the driver included with Windows.
5. Continue the Windows 2000/Windows 2003 installation until finished.
6. Install the recommended service packs and reboot.
7. **(For FASTT only)** Install the relevant FASTT host management software packages (You should refer to the FASTT website for additional Installation and User's guide instructions):
  - a. Total Storage Manager client
  - b. Agent
  - c. Utilities

**Note:** RDAC is not to be installed until the secondary path to the Storage has been configured and installed. Otherwise, you could experience a Blue-screen.

8. **(For ESS only)** Install SDD using the appropriate Windows installation package. However, you should reference the SDD User's guide for planning purposes.
9. Power down the Blade server and proceed to enable the second path as described in the Configuring for Redundancy section (Section 11) if you desire to have dual-paths to the Storage Controller.

## 10.1 Installing the Linux Operating System

Once you have configured the System BIOS, FC I/O Expansion card BIOS and Storage array you are ready to install Linux. The following Operating System<sup>3</sup> versions are subjects of this document.

Operating System	Platform
Redhat Linux	Advanced Server 2.1 Enterprise Linux 3.0

The Linux distribution typically has the FC I/O Expansion card source files. Therefore, you should proceed with installation and the KudZu application should detect the appropriate device driver for the boot device. To install Linux, proceed to the following steps:

1. Insert the Installation CD-ROM.
2. Proceed to the installation using the FC I/O Expansion card device driver that was detected.
3. Install the latest Errata and reboot.
4. **(For FASTT only)** Install the relevant FASTT host management software packages (You should refer to the FASTT website for additional Installation and User's guide instructions):
  - a. Total Storage Manager client
  - b. Agent
  - c. Utilities
  - d. FASTT MSJ

**Note:** These steps do not support configuring using the Linux RDAC. FASTT MSJ is to be used to configure the Primary and Alternate paths to the Storage device.

5. **(For ESS only)** Install the SDD multi-path device driver to ensure fail-over and load-balancing. However, you should refer to the SDD User's guide for planning purposes.
6. Use FASTT MSJ to configure the primary path to your Fibre Channel Disk device. This is not applicable for ESS.
7. Power down the Blade server and configure the second path.

## 11.0 Configuring for Redundancy

Up to this point of configuring Remote boot, these steps have assumed that you were using a single port of the FC I/O expansion card to perform the OS installation (configured through Port Disable on the switch).

---

<sup>3</sup> The Linux OS installation steps only apply to Red Hat versions of Linux presently.

This purpose of this was to prevent LUN contention during the OS installation. The next steps will discuss configuring the 2<sup>nd</sup> port of the FC I/O Expansion card to become useable in the event of a failure on the 1<sup>st</sup> port. This section will describe how to configure the second I/O expansion module and install multi-path software etc. This process is used for connecting the secondary path using Storage Partitioning for FAStT or provisioning for ESS platforms.

## 11.1 FAStT

1. Configure Host-port mapping using FAStT Storage Manager Client as previously done in Section 7.1.
2. Under the *Mappings View* tab, you should create a host group, host, and assign host ports.
  - a. Select *Mappings* → *Define Host Group*.
  - b. Click on the Host group; select *Mappings* → *Define* → *Host*.
  - c. Click on the Host that was created in the previous step; select *Mappings* → *Define* → *Host-ports*. Each Host should initially have a single host-port assigned. Otherwise, the host will have dual-path access assigned. The host port is the Adapter WWPN that you recorded while configuring the FC I/O Expansion card. The host type for each of these host-port types will be Windows<sup>®</sup> Non-clustered by default and should be changed to correspond to the Operating system type that you will be installing.
3. Enable AVT for the FAStT Storage Controller using the following script sample. **Note: This should have been done while preparing the controller.**

**Enabling AVT**

```
Windows 2000 (Non-clustered)
// The following commands Enable AVT
// You must reboot the controllers for the NVSRAM settings to take affect
set controller [a] HostNVSRAMBYTE [2,0x24]=0x01;
set controller [b] HostNVSRAMBYTE [2,0x24]=0x01;
```

4. To enable the second path to the Storage controller:

**Note:** Enable **Port 0** on the Switch Modules that was previously Disabled to allow only a single path. This provides you with dual-paths to the storage controller.

Brocade Switch Module Commands	Qlogic Switch Module Commands
<ol style="list-style-type: none"> <li>1. Start a telnet session to the switch</li> <li>2. Login using 'USERID'</li> <li>3. BSSM: &gt;portEnable 0</li> <li>4. BSSM: &gt; logout</li> </ol>	<ol style="list-style-type: none"> <li>1. Start a telnet session to the switch</li> <li>2. FCSM: USERID&gt; admin start</li> <li>3. FCSM (admin): USERID&gt; config edit</li> <li>4. FCSM (admin-config): USERID&gt; set config port 0</li> <li>5. set port 0 to online</li> <li>6. FCSM (admin-config): USERID&gt; config save</li> <li>7. FCSM (admin): USERID&gt; config activate</li> <li>8. FCSM (admin): USERID&gt; admin end</li> <li>9. FCSM (admin): USERID&gt; logout</li> </ol>

**Note:** Steps 5 and 6 are not applicable for Linux.

5. Verify paths to the Target Storage device using the **SMdevices** command. If a primary and alternate path is not available, do not proceed to install RDAC. (**Not applicable for Linux Operating Systems**)
6. Install RDAC for failover capability and reboot the server as directed. **Note:** The RDAC application should be compatible with the Firmware that is being used on the Storage controller. You can confirm this by referring to the FAStT RDAC and Firmware Readme files. (**Not applicable for Linux Operating Systems**)
7. Proceed to Configure the BIOS of the 2<sup>nd</sup> port for the Fibre Channel Daughter-card.
  - a. Boot the HS20 or HS40 Blade Server.
  - b. Press **Ctrl+Q** to enter the BIOS configuration utility as depicted in the illustration below.
  - c. Select the first Fibre Channel adapter port.

**Note:** The upper port correlates to the top Fibre Channel I/O Module (Slot 3) of the BladeCenter chassis and has already been configured during the Single-path configuration.

- d. Select **Configuration Settings** → **Host Adapter Settings**.
- e. Enable the Host adapter's BIOS by selecting Enable from the Host adapter BIOS parameter.
- f. Press the **Esc** key once.
- g. Select **Selectable Boot Settings** and enable the Selectable Boot.
- h. Select the "**(Primary) Boot Port Name, LUN**" parameter and press **Enter**. This will bring you to the Select Fibre Channel Device screen.
- i. Listed here you will find the Controller to which your HBA Adapter is connected on the FAStT Storage Server. Select it and press the **Enter** key.
- j. Your Selectable Boot Settings should now show the Controller Port Name, as shown Figure 21 below.
- k. Save your settings and Exit the FC Daughter-card BIOS.

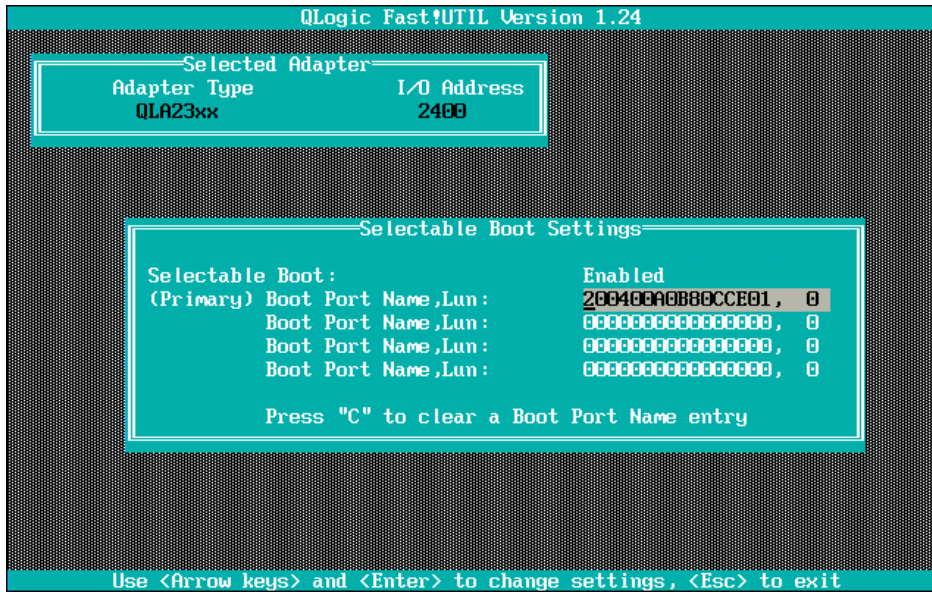


Figure 21 – HBA Boot device assignment mapping

8. Reboot your system to the Operating System.
9. Run the **SMdevices** command from the command line to verify paths to the Target Storage device. If RDAC is properly installed, you will notice that the 2<sup>nd</sup> path to the LUN has been masked. (**Not applicable for Linux Operating Systems**)

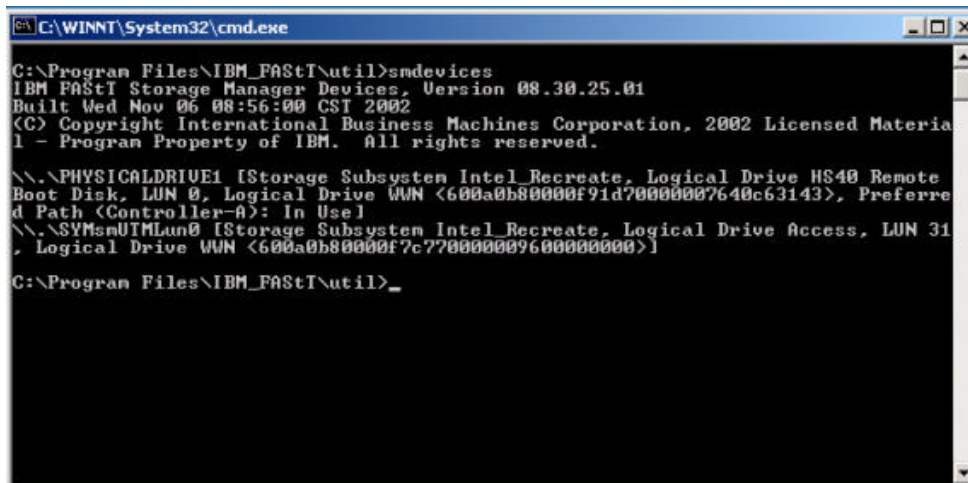


Figure 22 Sample SMDevices Output

## 11.2 ESS

1. Using ESS Specialist, modify the Host System to include the 2<sup>nd</sup> HBA and Boot LUN.
2. Enter the information in the text fields for the 2<sup>nd</sup> port of the FC Host adapter and Boot LUN.

3. Save the configuration and proceed to enabling the path through the Switch Module.
4. To enable the Switch Module secondary path to the Storage controller:

**Note:** Enable **Port 0** on the Switch Modules that was previously Disabled to allow only a single path. This provides you with dual-paths to the storage controller.

Brocade Switch Module Commands	Qlogic Switch Module Commands
<ol style="list-style-type: none"> <li>5. Start a telnet session to the switch</li> <li>6. Login using 'USERID'</li> <li>7. BSSM: &gt;portEnable 0</li> <li>8. BSSM: &gt; logout</li> </ol>	<ol style="list-style-type: none"> <li>10. Start a telnet session to the switch</li> <li>11. FCSM: USERID&gt; admin start</li> <li>12. FCSM (admin): USERID&gt; config edit</li> <li>13. FCSM (admin-config): USERID&gt; set config port 0</li> <li>14. set port 0 to online</li> <li>15. FCSM (admin-config): USERID&gt; config save</li> <li>16. FCSM (admin): USERID&gt; config activate</li> <li>17. FCSM (admin): USERID&gt; admin end</li> <li>18. FCSM (admin): USERID&gt; logout</li> </ol>

5. Install the SDD multi-path device driver using the Linux RPM or Windows installation package.

**Note:** You should reference the SDD User's to properly plan your installation.

6. Use the data path query device command to confirm that both daughter-card paths are able to see the Boot LUN and storage.

```

C:\Program Files\IBM\Subsystem Device Driver>datapath query device

Total Devices : 5

DEU#: 0  DEVICE NAME: Disk6 Part0  TYPE: 2105F20  POLICY: OPTIMIZED
SERIAL: 628FCA47
=====
Path#      Adapter/Hard Disk      State  Mode      Select      Errors
  0        Scsi Port2 Bus0/Disk6 Part0    OPEN  NORMAL    2533397     3
  1        Scsi Port3 Bus0/Disk6 Part0    OPEN  NORMAL    2549148     0

DEU#: 1  DEVICE NAME: Disk7 Part0  TYPE: 2105F20  POLICY: OPTIMIZED
SERIAL: 629FCA47
=====
Path#      Adapter/Hard Disk      State  Mode      Select      Errors
  0        Scsi Port2 Bus0/Disk7 Part0    OPEN  NORMAL    2492024     3
  1        Scsi Port3 Bus0/Disk7 Part0    OPEN  NORMAL    2506264     0

DEU#: 2  DEVICE NAME: Disk8 Part0  TYPE: 2105F20  POLICY: OPTIMIZED
SERIAL: 62AFCA47
=====
Path#      Adapter/Hard Disk      State  Mode      Select      Errors
  0        Scsi Port2 Bus0/Disk8 Part0    OPEN  NORMAL    2577910     3
  1        Scsi Port3 Bus0/Disk8 Part0    OPEN  NORMAL    2588413     0

DEU#: 3  DEVICE NAME: Disk9 Part0  TYPE: 2105F20  POLICY: OPTIMIZED
SERIAL: 62BFCA47
=====
Path#      Adapter/Hard Disk      State  Mode      Select      Errors
  0        Scsi Port2 Bus0/Disk9 Part0    OPEN  NORMAL    2513811     3
  1        Scsi Port3 Bus0/Disk9 Part0    OPEN  NORMAL    2539580     0

DEU#: 4  DEVICE NAME: Disk10 Part0  TYPE: 2105F20  POLICY: OPTIMIZED
SERIAL: 62CFCA47
=====
Path#      Adapter/Hard Disk      State  Mode      Select      Errors
  0        Scsi Port2 Bus0/Disk10 Part0    OPEN  NORMAL    2518656     3
  1        Scsi Port3 Bus0/Disk10 Part0    OPEN  NORMAL    2526513     0

C:\Program Files\IBM\Subsystem Device Driver>

```

Figure 23 –Output of SDD’s *datapath query device* command

- Once SDD is loaded and both paths to Storage are configured, you should verify paths using the *datapath query device* command. **Note:** See the SDD User Guide for more information.

```

C:\Program Files\IBM\Subsystem Device Driver>datapath query adapter

Active Adapters :2

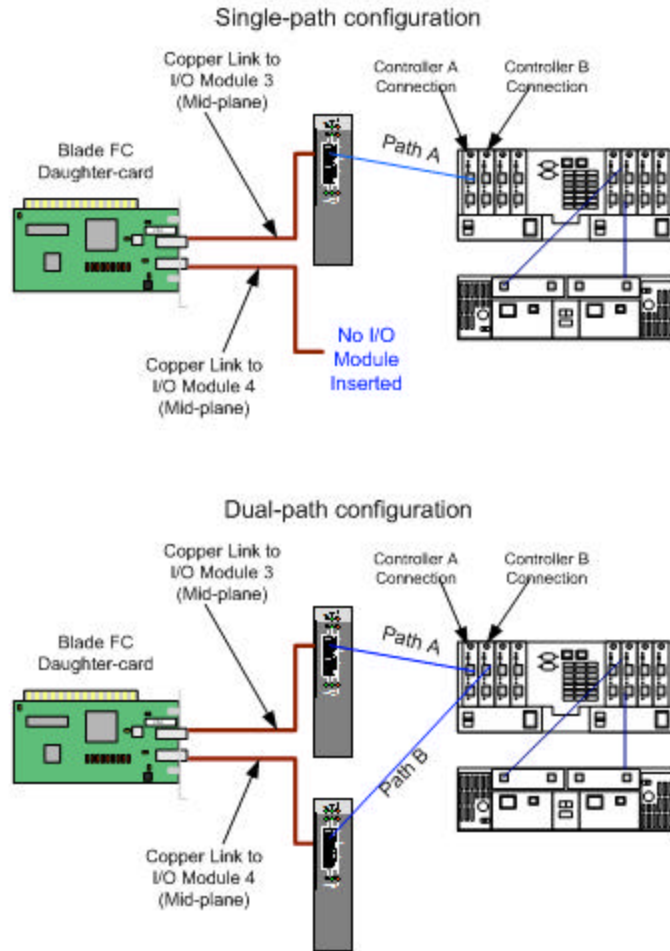
Adpt#      Adapter Name      State  Mode      Select      Errors  Paths  Active
  0        Scsi Port2 Bus0    NORMAL  ACTIVE    12635798    15     5     5
  1        Scsi Port3 Bus0    NORMAL  ACTIVE    12709918     0     5     5

C:\Program Files\IBM\Subsystem Device Driver>_

```

Figure 24- Output of SDD’s *datapath query adapter* command

## Appendix A: Single/Dual-path Concept Diagrams<sup>4</sup>



<sup>4</sup> **Note:** Other configurations can be used in combination with zoning. However, hardware and software level zoning and provisioning should be carefully planned.



## ***Summary***

This paper provides an overview for configuring the IBM BladeCenter to remote boot in the Linux and Windows operating environments. These steps are typically performed by seasoned Storage Administrators with requisite knowledge of the FAStT and ESS Storage products. However, this document has sought to provide guidance for the novice SAN Administrator to follow and successfully accomplish this task. One should keep in mind that this provides a general guideline for configuring remote boot and any effort to create a remote boot environment should be well planned.

## ***Additional Information***

For more information about blade server technology and benefits in general and BladeCenter specifically, read *Why Blade Servers?* and *Slashing the costs of your IT Infrastructure*, at [http://www.ibm.com/pc/us/eserver/xseries/bladecenter/more\\_about.html](http://www.ibm.com/pc/us/eserver/xseries/bladecenter/more_about.html). Visit <http://www.ibm.com/servers/eserver/blades> (or call 1-888-SHOPIBM) for information about IBM eServer BladeCenter products and services, including part numbers and prices for servers, racks, storage units and other options.

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