

DELL PowerEdge Systems


Configuring Dell PowerEdge 11G Servers Running Windows Server 2008 for iSCSI SAN Boot

- ✓ For Windows® Server 2008 SP2 and Windows® Server 2008 R2
- ✓ Use embedded Broadcom® NetXtreme II 5709c 1GbE or integrated Intel® AT 10GbE Server Adapters
- ✓ Boot from Dell™ EqualLogic™ PS Series or Dell™ PowerVault™ MD3000i based targets

Storage Interoperability Engineering

Dell Product Group
January 2010



 NOTE: A NOTE indicates additional important information.

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This information in this document was developed and verified by the Dell Product Group, Storage Interoperability Engineering Lab team, in January 2010.

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Configuring Boot from SAN using iSCSI based Dell Storage Arrays

1 Introduction

This document provides instructions for configuring Dell™ PowerEdge™ 11G family of servers to boot the Microsoft® Windows Server® 2008 SP2 or 2008 R2 from iSCSI SAN based boot images.

The evolution of server and storage virtualization as well as the adoption of Storage Area Networks (SANs) by SMB, Departmental, and Enterprise markets has created the demand to boot servers directly from SAN based volumes (LUNs). Beyond the obvious flexibility and power efficiency benefits of not needing DAS Boot Disks in servers, Boot from SAN allows for quick reconfiguration and deployment of multiple OS and Application specific images.

Dell's iSCSI solution offerings provide an extremely flexible and scalable platform to meet many demanding customer environments. Dell iSCSI Array products ranging from NAS Appliances, MD3000i, EqualLogic, and the full EMC iSCSI portfolio can all be configured to support Boot from iSCSI.

1.1 Scope

The process for configuration boot from iSCSI can vary considerably based on which server based network interface controllers are being used, which operating systems you are booting, what type of iSCSI SAN arrays you are using for storing the boot volumes, and how your SAN architecture is designed to support varying levels of I/O throughput performance and high availability by adding redundant systems and multi-path I/O.

In this document we limit our focus to the steps required to configure the iSCSI SAN boot paths as shown in Table 1 below.

Table 1: Boot paths covered by this document

Operating Systems	Windows Server 2008 SP2 Windows Server 2008 R2
Server	Dell PowerEdge 11G Family <ul style="list-style-type: none">• Process validated on PowerEdge R710, system BIOS 1.3.6
Network Interface Controllers	Broadcom NetXtreme II 5709c Gigabit Ethernet NIC <ul style="list-style-type: none">• Process validated using Broadcom NetExtreme II Ethernet Boot Agent v5.0.5 and iSCSI Configuration Utility v4.1.1 Intel 10 GbE AT Server Adapter¹ <ul style="list-style-type: none">• Process validated using Intel Boot Agent Utility (IBAUtil) v4.17.00.00 and flash firmware iSCSI Boot v2.4.06
Storage Array	Dell EqualLogic PS Series <ul style="list-style-type: none">• Process validated using array controller firmware v4.1.4 Dell PowerVault MD3000i <ul style="list-style-type: none">• Process validated using array controller firmware v07.35.31.60

¹ The procedure in this document should work with other 1GbE and 10GbE Intel NICs provided by Dell that use the same Intel option ROM.

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1.2 Process Overview

The process for booting from SAN over iSCSI described in this document involves completion of the following key configuration processes:

- Configure storage arrays to host the operating system boot volumes
- Configure the network interface(s) on the server to support boot from iSCSI targets
- Install the operating system onto the target iSCSI SAN based volume
- Configure redundant boot paths (multi-path I/O) to the boot volumes (optional)

The overall process is illustrated in Figure 1 below. We do not create a local installation image then deploy that image to an iSCSI LUN as was possible with Windows Server 2003. For Windows Server 2008 you must prepare an image for iSCSI boot by first performing a direct operating system installation on a machine that has the iSCSI network driver and is connected to an available iSCSI based LUN.² After you verify that the system boots properly from the iSCSI LUN you can then collect the boot image for deployment to other systems.

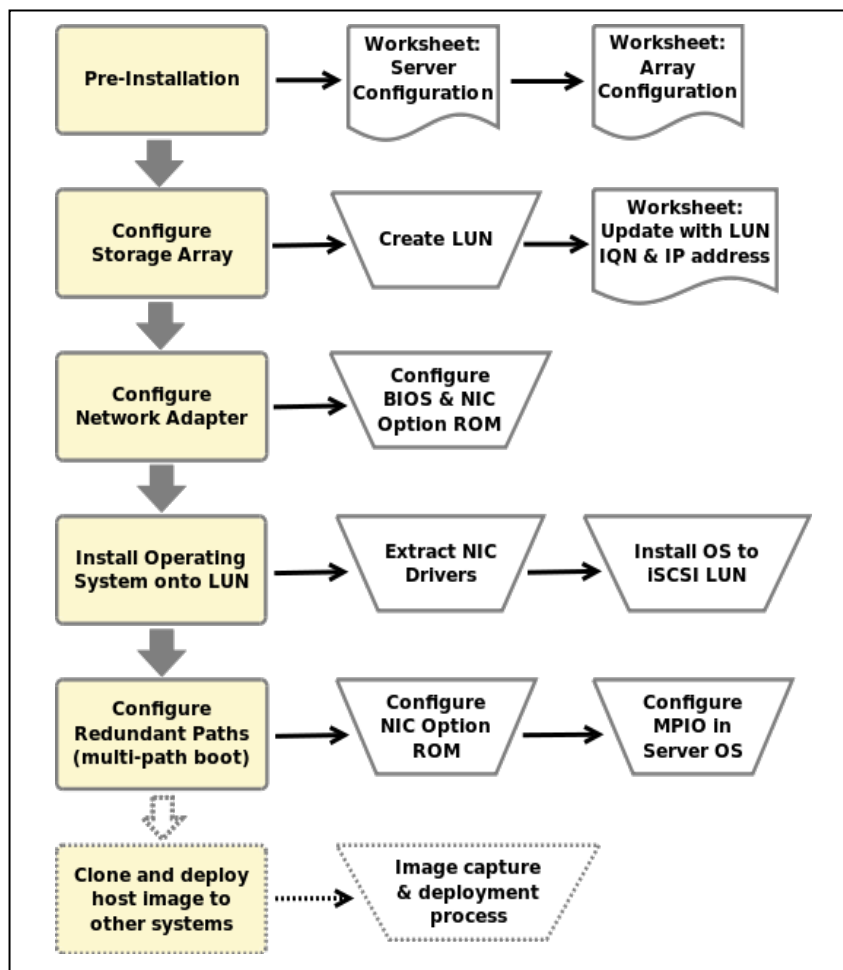


Figure 1: Process for Direct Install for Windows 2008 Boot from iSCSI SAN

² See Microsoft Support document KB2002298, <http://support.microsoft.com/kb/2002298>

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Note: in Figure 1 that we include a major step at the end for cloning and deploying copies of the OS image after it has been configured for iSCSI SAN boot to other systems. The details in completing that process are left for the reader. The actual process for completing that task will be based on your environment and your familiarity with the various tools and methods that can be used to complete image cloning and deployment.

1.3 Additional Considerations

The iSCSI boot scenario we describe in this document corresponds to Scenario #2, “Server network adapter creates iBFT for connection to iSCSI target without requiring external devices”, as described in the Microsoft TechNet article “*About iSCSI Boot*”, available at <http://technet.microsoft.com/en-us/library/ee619722%28WS.10%29.aspx>. We recommend that you review the sections titled “Requirements for iSCSI Boot deployment” and “Differences in Windows functionality when using iSCSI Boot” in that document before continuing with this process. Please consider the following additional considerations:

- It is not recommended to configure a gateway for an iSCSI boot adapter if the iSCSI target is in the same subnet as the initiator. For more details, see the Microsoft Knowledge Base article KB960104 on support.microsoft.com.
- Network Interface Card (NIC) teaming is not supported for iSCSI boot
- iSCSI boot is not supported with IPV6 networks and Broadcom 5722/5708 NetXtreme or the Dell supported Intel family of adapters.
- If you are using two NICs, one as primary and the other as the secondary boot NIC, ensure that they are configured to use separate subnets. (This applies only to the PowerVault MD3000i boot from iSCSI scenario.)
- For a server with Hyper-V enabled, you can boot the parent partition from SAN. Hyper-V does not support boot from SAN for virtual machines

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2 Before you Begin

Before you start the configuration process, you should do the following:

1. Use a configuration tracking worksheet similar to the example provided in section 8 on page 35.
2. Refer to the following documents:
 - a. Intel PRO Family of Adapters User's Guide located on the Intel NIC media or on the Dell Support website at support.dell.com
 - b. Broadcom NetXtreme Family of Adapters User's Guide located on the Broadcom NIC media or on the Dell Support website at support.dell.com
3. Update your Dell Storage Array to the latest drivers and firmware versions referring to the following matrices or support sites:
 - a. Dell PowerVault MD3000i Support Matrix located on the Dell Support website at support.dell.com
 - b. Dell EqualLogic Support Downloads located on the Dell EqualLogic website at www.equallogic.com/support
4. Download the latest Current Intel PRO or Broadcom NetXtreme drivers and firmware from the Drivers and Downloads section on the Dell Support website at support.dell.com.

3 Configuring the Storage Array


The following sections describe the process of configuring the storage arrays with the LUNs necessary to host the iSCSI Boot. In this document we limit our boot path configuration examples to two target array types: Dell EqualLogic PS Series or Dell PowerVault MD3000i.

- Section 3.1, "Configuring the Dell EqualLogic Storage System"
- Section 3.2, "Configuring the PowerVault MD3000i Storage Array"

3.1 Configuring the Dell EqualLogic Storage System

Perform the following steps to make a target volume available:

1. Log in to Dell EqualLogic PS Series Group Manager.
2. Under Activities, select Create Volume. Name the volume and enter a description. Select a storage pool and click next.
3. Create either of the following volume sizes for the boot volume according to your requirement:
 - Thin Provision
 - Snapshot reserved (defaults to 100% of the volume)

 NOTE: Microsoft® recommends a minimum system partition size of 40 GB for Windows Server 2008 installations, depending on system RAM, possible power states and other considerations. For more information, see the Microsoft® website at microsoft.com/windowsserver2008.
4. Select the iSCSI access mode for the Server you are going to present the Array Disk to:
 - Authenticate using CHAP user name
 - Limit access by IP Address
 - Limit access to iSCSI Initiator Name

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- ☒ NOTE: If you limit access based on iSCSI initiator name, then the name entered here must match the name on the host server that will be booting from this volume.
 - ☒ NOTE: Do not enable shared storage. Clustering on boot from iSCSI is not a supported configuration.
5. Summary screen is displayed. Verify the settings on the Summary Screen.
 6. Click on the volume option, and then right click on the volume you just created and view the iSCSI settings. In the iSCSI Target box is the IQN name. This is the Target Name that will be used for the Initiator Target Device.

3.2 Configuring the PowerVault MD3000i Storage Array

Perform the following steps to register a host and create a virtual disk to be used as the boot volume.

3.2.1 Manually register a host

1. Launch the PowerVault Modular Disk Storage Manager (MDSM), and connect to the PowerVault MD3000i storage array to be used by the host for booting.
2. Click Configure, and select Configure Host Access (Manual).
3. Type a name of your choice in the Enter host name text box. This can be an informal name, not necessarily a name used to identify the host to the network. The Select host type drop-down menu appears.
4. Select the operating system of your host in the Select host type drop-down box and then click next. Selected "Windows Server 2003/Server 2008 Non-Clustered" since we are creating this LUN for dedicated boot image storage.
5. In the next screen titled "Configure Host Access (Manual) - Specify iSCSI Initiators", Click New... at the bottom right corner, enter the iSCSI initiator name and iSCSI initiator label in the "Enter new iSCSI initiator dialog box", and then click Add.
 - ☒ NOTE: The initiator name entered here must match the name on the host server that will be booting from this array.
6. Enter the iSCSI Qualified Name (IQN) of the host initiator in the iSCSI initiator name field. Record this information in your configuration worksheet.
 - ☒ NOTE: Let the iSCSI Initiator label be set to Default. The fully qualified IQN format is: <iqn><yyyy-mm>.com<company name>:<server name> . The following figure provides an example.

Lab example: `iqn.1984-04.com.dell:daedalus`

7. Click Add and then "Next" in the lower left portion of the screen.
8. Since we are configuring this target to contain an OS boot image we accept the default "No: This host will NOT share access to the same virtual disks with other hosts." Then click next. The Confirm Host Definition page appears. Your host definition should then appear in the following screen. The following figure shows an example.

```
Host name:                BFITEST1
Host type:                Windows Server 2003/Server 2008 Non-Clustered
iSCSI initiator label/name: BFITEST10/iqn.1984-04.com.dell:daedalus
```


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9. Click Finish. Then click "No" when asked if you want to define another host.

3.2.2 Create a virtual disk and assign it to the host

A fully configured Disk Group is required for the following section. If a Disk Group has not been configured, please refer to the "Creating Virtual Disks and Disk Groups" section of the PowerVault MDSM Online Help manual (accessible using the "Help" link in MDSM) for detailed instructions.

1. In MDSM, click the Configure tab and then click "Create Disk Groups and Virtual Disks".
2. The "Create Disk Groups and Virtual Disks" screen appears. The "Virtual Disk: Create a new virtual disk using free capacity on an existing disk group" button should be selected.
3. Expand the disk group you will be using to host the new virtual disk and select a free capacity node within that group. Click Next.
 - a. Set capacity for the virtual disk. The capacity setting should be large enough to host a full OS installation and any other applications that will be installed into that image. Microsoft recommends a minimum system partition size of 40 GB for Windows Server 2008 installations, depending on system RAM, possible power states and other considerations. For more information, see the Windows Server 2008 website at microsoft.com.
 - b. Set a Virtual Disk Name
 - NOTE: It is recommended that you use the service tag of the PowerEdge system and the term boot-LUN in the description field.
 - c. Select File system in the Virtual Disk I/O characteristics field, and click next.
4. Select "Map now:" and then select the host which you created in the previous step.
5. Select "0" as the logical unit number. **IMPORTANT:** Most operating systems will need to have their boot partition on LUN 0.
 - NOTE: Record the LUN Number in "Configuration Worksheet" on page 65.
6. Click "Finish". The "Create Disk Groups and Virtual Disks - Complete" screen will appear next. At this point we do not need to create any more virtual disks. Select "No" to return to the main MDSM screen.
7. Record the preferred controller path assigned to the virtual disk:
 - a. Click on the "Modify" tab. Select "Change Virtual Disk Ownership/Preferred Path".
 - b. Expand the disk group containing the virtual disk you created, and select the virtual disk. Note the preferred path setting at the bottom of the screen. It will be the RAID Controller Module in either slot 0 or slot 1. You will need this information to determine which IP address is used to access the target.

3.2.3 Record IQN and iSCSI host IP addresses

Using MDSM, complete the following steps:

1. Click the iSCSI tab, then click "'Change Target Identification'". Record the iSCSI target name shown here in your configuration worksheet. The following figure shows an example:

```
iqn.1984-05.com.dell:powervault.6001422000fff1370000000049751257
```

2. In the iSCSI tab, click "'Configure iSCSI Ports'". At the "iSCSI host port:" drop down menu, select the same RAID controller module that was assigned as the preferred path controller for the virtual disk. Record the

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IP address(s) assigned to the ports on this controller. Your host system will be configured to boot from the iSCSI target at this address.

4 Configuring Network Adapters

The following sections describe the process for configuring the server BIOS and NICs to support boot from iSCSI targets.

- For configuring the Broadcom network adapter see Section 4.1.
- For configuring the Intel network adapter, see Section 4.2.

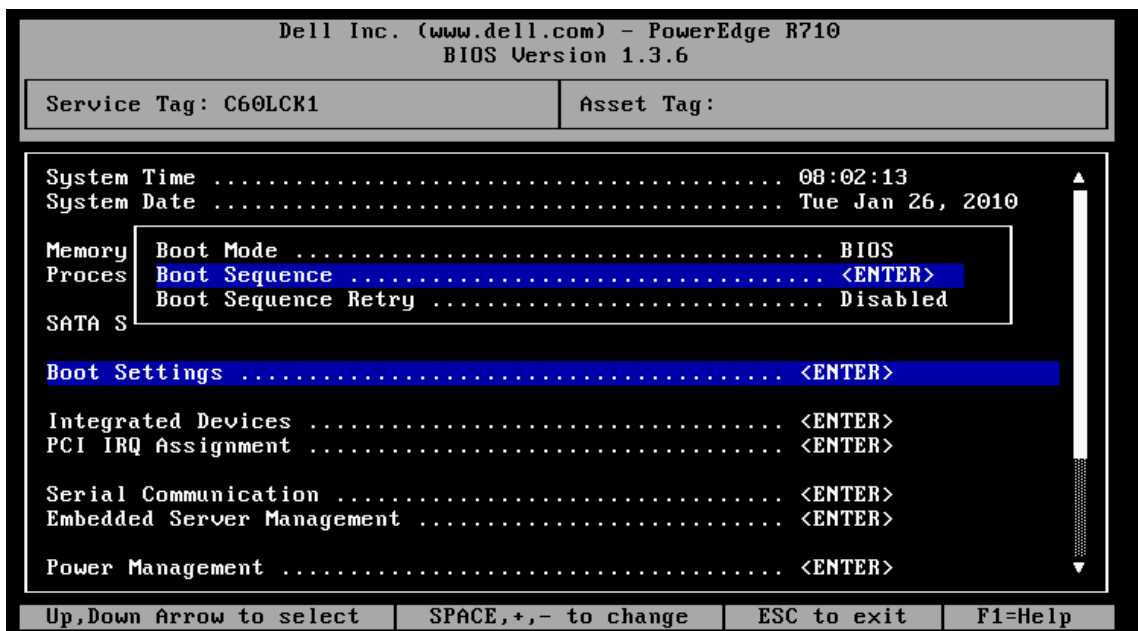
4.1 Configuring the Broadcom Network Adapter

To prepare the system to boot from an iSCSI based LUN, you must first modify the system BIOS and then configure the Broadcom NetExtreme II Ethernet Boot Agent.

4.1.1 Preparing the server to use the Broadcom NIC for iSCSI boot

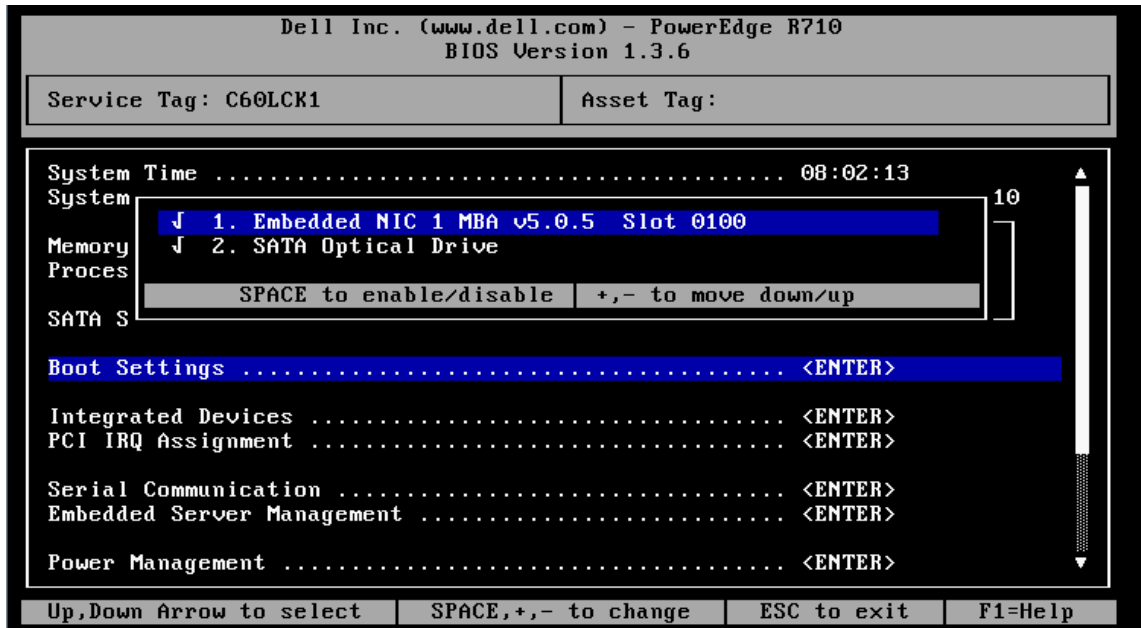
First we must change the boot sequence settings.

1. Press <F2> to enter Setup, select 'Boot Settings', and then 'Boot Sequence' and hit enter.



2. Adjust the boot sequence order so that the onboard Broadcom NIC is first in the list, followed by the DVD/CD-ROM device.

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3. Then select "Integrated Devices". Multiple NIC choices will appear in the list. Select the correct NIC to be used for boot from iSCSI. You should also record the MAC address for this NIC for use later in this procedure. Make the following changes:

Integrated RAID Controller: **Disabled** (This disables access to any internal hard drives.)

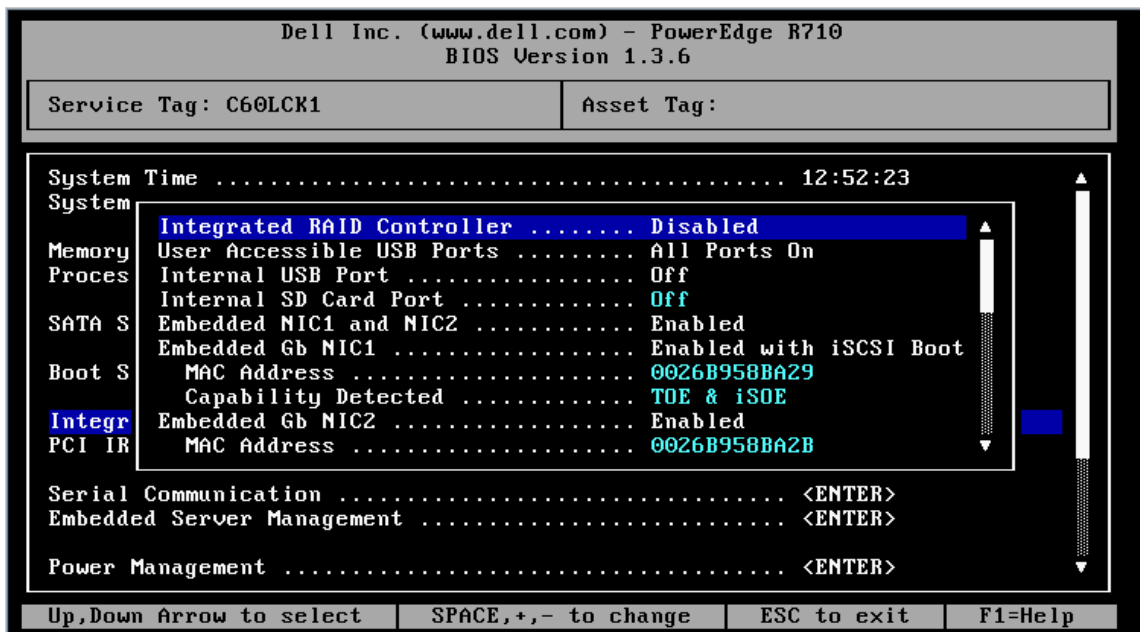
Internal USB Port: **Off** (To prevent a conflict during Windows 2008 install process.)

Internal SD Card Port: **Off** (To prevent a conflict during Windows 2008 install process.)

Embedded NICx: **Enabled with iSCSI Boot**

4. These changes are shown in the following figure. After changing, escape out and save. Immediately continue with the process in the next section.

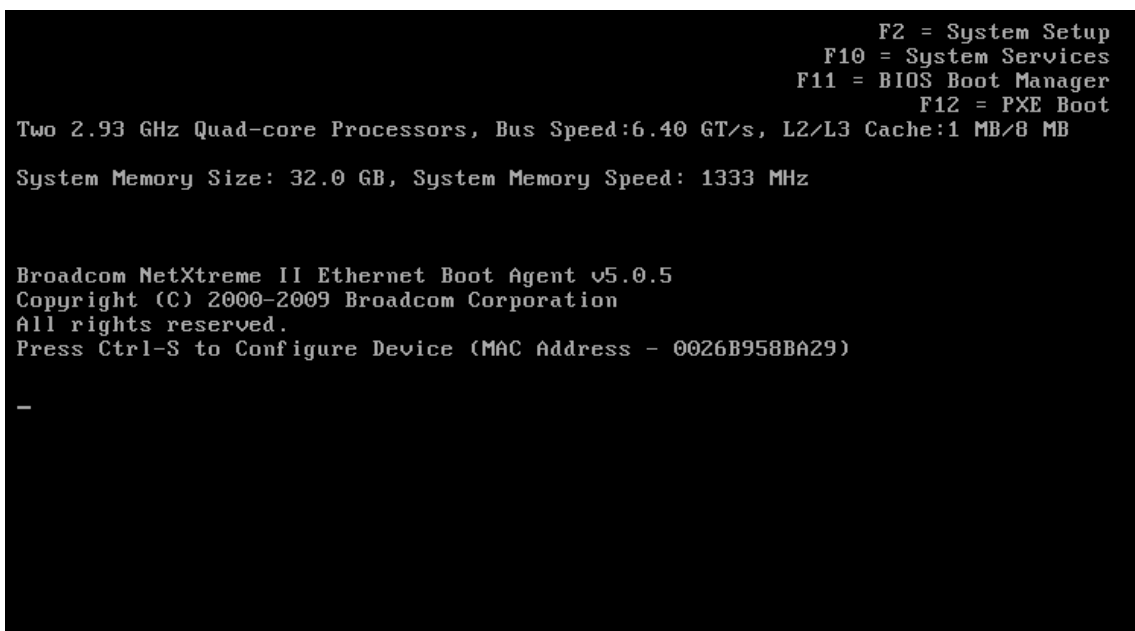
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4.1.2 Preparing the Broadcom NetXtreme II Ethernet Boot Agent

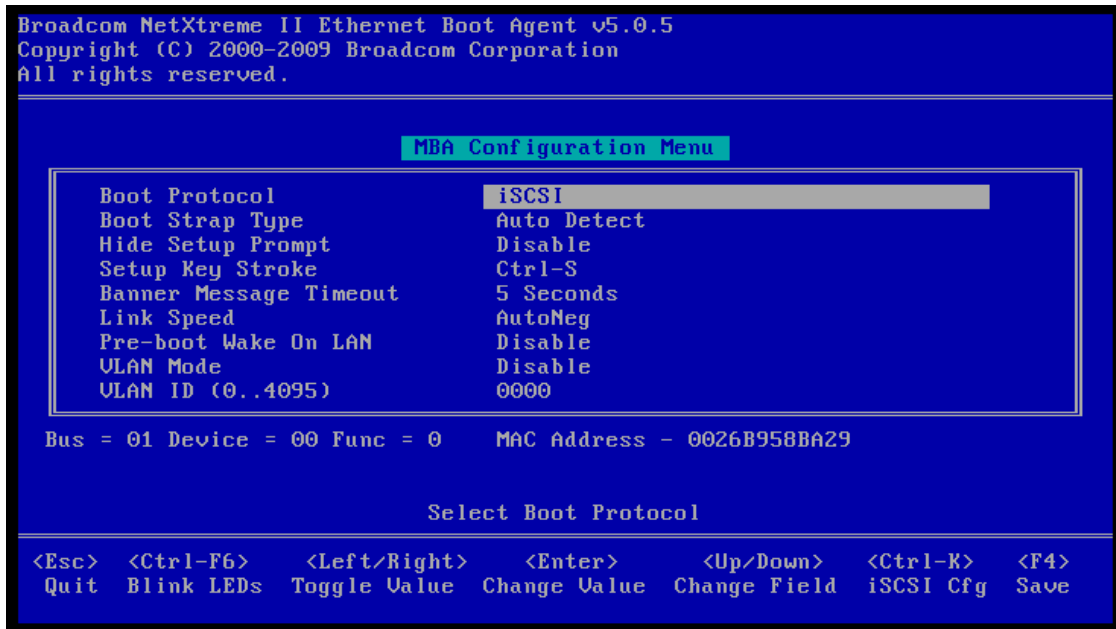
You must use the Broadcom NetXtreme II Ethernet Boot Agent to configure the NIC for boot from iSCSI.

1. During POST, when you see the Broadcom Ethernet Boot Agent version appear, press CTRL+S to configure the device.

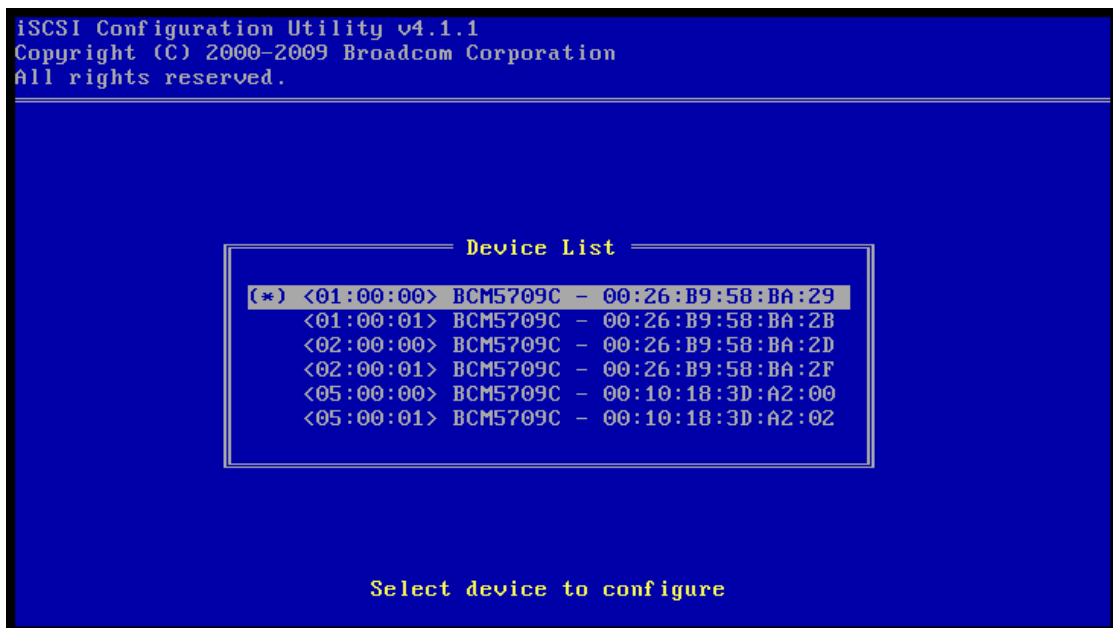


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2. Make sure the Boot Protocol is set to iSCSI, and leave all other settings at their defaults. Then press CTRL-K to enter the iSCSI Configuration Utility.



3. Select the interface whose MAC address matches the one selected during BIOS setup, and press Enter.



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- At the Main Menu for the iSCSI Configuration Utility, select General Parameters and hit Enter.

```
iSCSI Configuration Utility v4.1.1
Copyright (C) 2000-2009 Broadcom Corporation
All rights reserved.

----- Main Menu -----
General Parameters
Initiator Parameters
1st Target Parameters
2nd Target Parameters
Secondary Device Parameters

Current Adapter: Primary, Bus=01 Device=00 Func=00, MAC=00:26:B9:58:BA:29

Configure general boot parameters
```

- Under General Parameters, ensure that all settings match the screenshot below.

```
iSCSI Configuration Utility v4.1.1
Copyright (C) 2000-2009 Broadcom Corporation
All rights reserved.

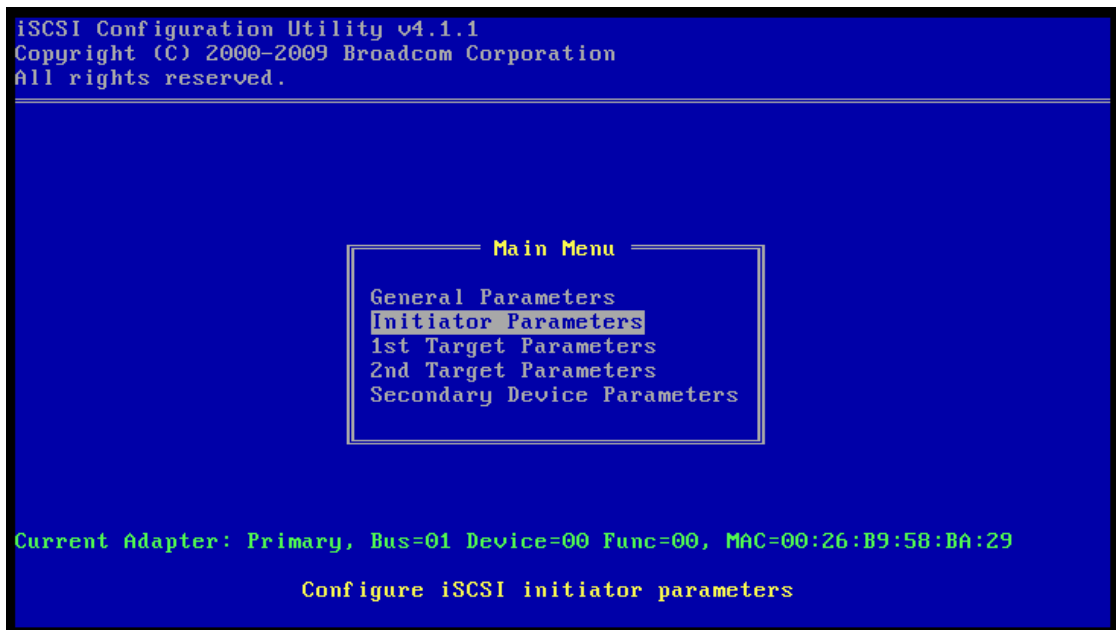
----- General Parameters -----
TCP/IP Parameters via DHCP: Disabled
iSCSI Parameters via DHCP: Disabled
CHAP Authentication: Disabled
Boot to iSCSI target: One Time Disabled
DHCP Vendor ID: BRCM ISAN
Link Up Delay Time: 0
Use TCP Timestamp: Disabled
Target as First HDD: Disabled
LUN Busy Retry Count: 0
IP Version: IPv4
Windows HBA Boot Mode: Disabled

Current Adapter: Primary, Bus=01 Device=00 Func=00, MAC=00:26:B9:58:BA:29

Enable/Disable Booting to iSCSI target after logon
```

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6. Escape once back the Main Menu, select Initiator Parameters, and hit Enter.



7. Under Initiator Parameters, enter the following information:

IP Address: <host IP Address>
Subnet Mask: <host netmask>
Default Gateway: Not required, if iSCSI initiator (this host) and the iSCSI target reside on the same subnet
Primary DNS: Usually not required
Secondary DNS: Usually not required
iSCSI Name: The server will auto-generate an IQN name for this host. If the target is set to control access based on IQN name, then this must be changed to match the IQN configured on the target (see section 3.1 for Equallogic or section 3.2.3 for MD3000i).
CHAP ID: (optional)
CHAP Secret: (optional)

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```
iSCSI Configuration Utility v4.1.1
Copyright (C) 2000-2009 Broadcom Corporation
All rights reserved.

----- Initiator Parameters -----
IP Address:          192.168.41.70
Subnet Mask:         255.255.255.0
Default Gateway:    192.168.41.254
Primary DNS:         0.0.0.0
Secondary DNS:      0.0.0.0
iSCSI Name:         iqn.1995-05.com.broadcom.iscsiboot
CHAP ID:
CHAP Secret:

Current Adapter: Primary, Bus=01 Device=00 Func=00, MAC=00:26:B9:58:BA:29

Configure initiator IP address
```

8. Hit Escape once to return the Main Menu, and select '1st Target Parameters' and hit Enter.

```
iSCSI Configuration Utility v4.1.1
Copyright (C) 2000-2009 Broadcom Corporation
All rights reserved.

----- Main Menu -----
General Parameters
Initiator Parameters
1st Target Parameters
2nd Target Parameters
Secondary Device Parameters

Current Adapter: Primary, Bus=01 Device=00 Func=00, MAC=00:26:B9:58:BA:29

Configure first iSCSI target parameters
```

9. Under 1st Target Parameters, enter the following information:

Connect: This option should be enabled

IP Address: This should be set to the iSCSI target IP address. For an EqualLogic based target this will be the Group IP address. For an MD3000i based target, this will be one of the IP addresses assigned to the ports on the preferred path RAID controller module.

TCP Port: Default is 3260. This can be changed to match specific target information

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Boot LUN: Default is 0. This usually will not need to be changed
iSCSI Name: Manually entered IQN name of the iSCSI target
CHAP ID: (optional)
CHAP Secret: (optional)

```
iSCSI Configuration Utility v4.1.1
Copyright (C) 2000-2009 Broadcom Corporation
All rights reserved.

----- 1st Target Parameters -----
Connect:      Enabled
IP Address:   192.168.41.100
TCP Port:    3260
Boot LUN:    0
iSCSI Name:  iqn.2001-05.com.equallogic:0-8a0906-3c98ccd03-8c144...
CHAP ID:
CHAP Secret:

Current Adapter: Primary, Bus=01 Device=00 Func=00, MAC=00:26:B9:58:BA:29

Enable/Disable target establishment
```

10. Escape once to the Main Menu. Ensure that there is no information entered for either '2nd Target Parameters' or 'Secondary Device Parameters'
11. Escape once more to leave the iSCSI Configuration Utility. Be sure to save the configuration!
12. Escape one more time to the MBA Configuration menu, and press <F4> to save your changes and exit.
✍ NOTE: Ensure that the Windows 2008 installation DVD is in the drive.
13. Upon exiting the Broadcom utility, the server should immediately try to connect to the iSCSI target. Continue with Windows installation.

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4.2 Configuring the Intel Network Adapter

To prepare the system to boot from an iSCSI based LUN, you must enable the iSCSI remote boot feature in the NIC option ROM, modify the Integrated Devices setting in the server BIOS, then setup the iSCSI boot configuration on the NIC.

4.2.1 Enable iSCSI remote boot in the NIC boot ROM

The Intel NICs are not shipped with Boot ROMs enabled for iSCSI. You must perform the following steps to enable iSCSI remote boot in the Boot ROM on the NIC.

1. Create a DOS bootable USB Key
2. Extract both the Intel Boot Agent (ProBoot.exe) and Intel iSCSI Remote Boot Setup Utility (ISBoot.exe) to the bootable USB key in separate directories.
3. With the Intel NIC installed, boot the server using the DOS bootable key.
4. Change to the directory containing the Boot Agent, and run 'IBAUtil.exe -fe'. This will enable the flash.

```
C:\>cd intel

C:\INTEL>ibautil -fe
Intel(R) Boot Agent Utility
IBAUtil version 4.17.00.00
Copyright (C) 2002-2009 Intel Corporation

Enabling Boot ROM on NIC 1..done
Reboot the system to enable the FLASH on NIC 1.

NIC Network Address Series  WOL Boot ROM Type          Version
===  =====
1   001B212B7A3E  10GbE  N/A  PXE                          2.0.12

C:\INTEL>_
```

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5. Change to the directory with the iSCSI Remote Boot Utility, and run 'iscsiutl.exe -up -all'. This will replace the PXE boot flash with the iSCSI boot flash on the installed Intel NIC.

```
C:\>cd \iscsi\iscsiutl\dos
C:\ISCSI\ISCSIUTL\DOS>iscsiutl -up -all

Intel(R) iSCSI Remote Boot Utility
iSCSIUtl version 2.4.06.0
Copyright (C) 2003-2009 Intel Corporation

Press 'q' in a prompt to exit the command operation

Programming flash on port 1 with flash firmware image
Create restore image before proceeding? (Y)es or (N)o: n
Continue update without restore image? (Y)es or (N)o: y
Updating iSCSI removes PXE functionality
Would you like to continue? (Y)es or (N)o: y
Flash update successful

Port Network Address Series WOL Flash Firmware Version
==== =====
1 001B212B7A3E 10GbE N/A iSCSI Enabled 2.4.06

C:\ISCSI\ISCSIUTL\DOS>
```

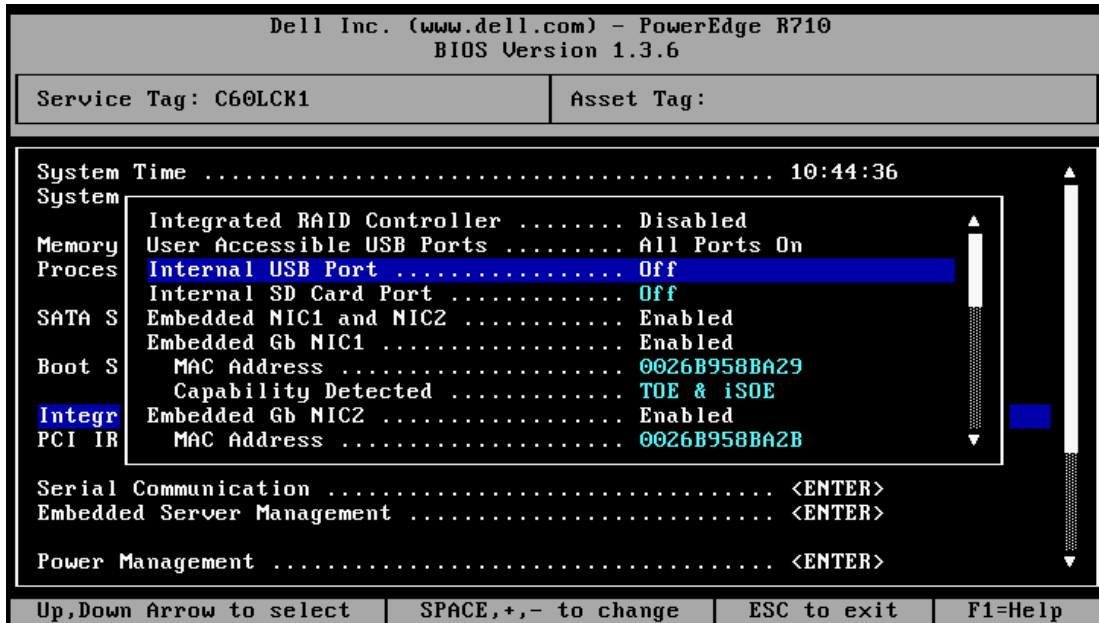
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4.2.2 Configure Integrated Devices in server BIOS

Make the following change to ensure there are no embedded NICs on the server enabled for iSCSI boot.

On server reboot, press <F2> to enter Setup then select 'Integrated Devices'. Make the following changes:

- Integrated RAID Controller** Disabled (This disables access to any internally installed hard drives.)
- Internal USB Port** Off (to prevent a conflict during Windows 2008 install process)
- Internal SD Card Port** Off (to prevent a conflict during Windows 2008 install process)
- Embedded NICx** Enabled (all) Multiple NIC choices will appear in the list. Since we will be using the Intel NIC for the iSCSI boot path, *you must make sure that all of the embedded NIC choices in this screen are all set to "Enabled", not "Enabled with iSCSI Boot" or "Enabled with PXE Boot".*



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4.2.3 Set iSCSI boot configuration on the NIC

The following process will complete the NIC configuration for iSCSI boot.

1. On server reboot, press <CTRL-D> when prompted for the iSCSI Remote Boot setup:

```

F2 = Setup
F10 = Utility Mode
F11 = Boot Menu
F12 = PXE Boot

Two 2.00 GHz Dual-core Processors, Bus Speed: 1333 MHz, L2 Cache: 4 MB

System Memory Size: 4.0 GB, System Memory Speed: 667 MHz

Remote Access Controller detected

Intel(R) iSCSI Boot version 2.4.06
Copyright (c) 2003-2009 Intel Corporation. All rights reserved.
Press ESC key to skip iSCSI boot initialization.
Press <Ctrl-D> to run setup..._
```

2. Select the MAC address of the NIC you want to perform iSCSI Remote boot:

```

Intel(R) iSCSI Boot v2.4.06

iSCSI Port Selection

MAC:001B212B7A3E Dev:10C8 Loc:13:0:0 BOOT:DISABLED

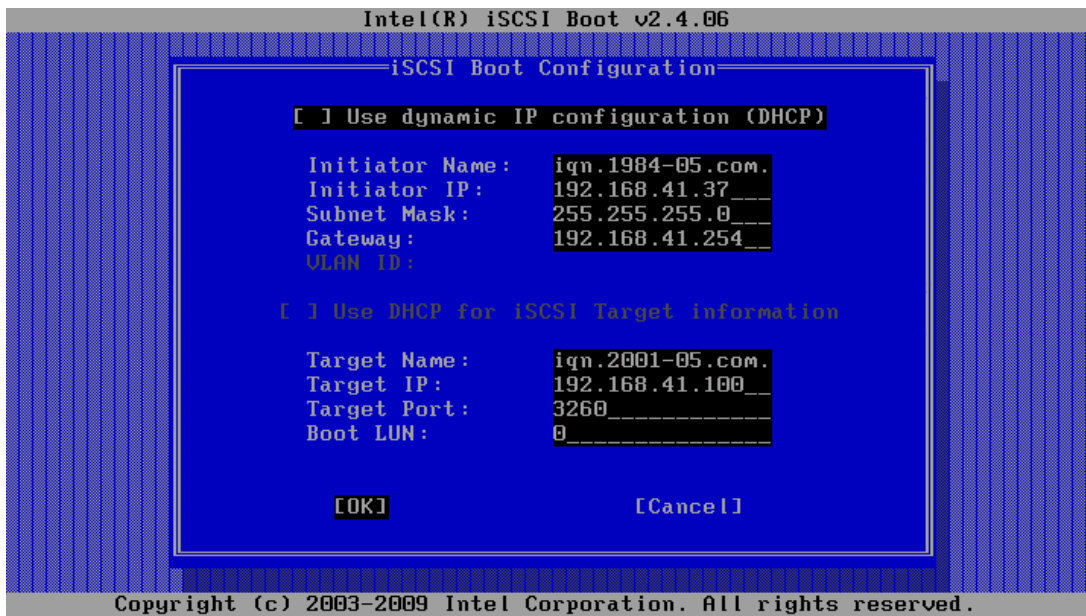
Select iSCSI Boot priority: P=PRIMARY S=SECONDARY D=DISABLED B=BLINK LED
```

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

3. Select "iSCSI Boot Configuration":

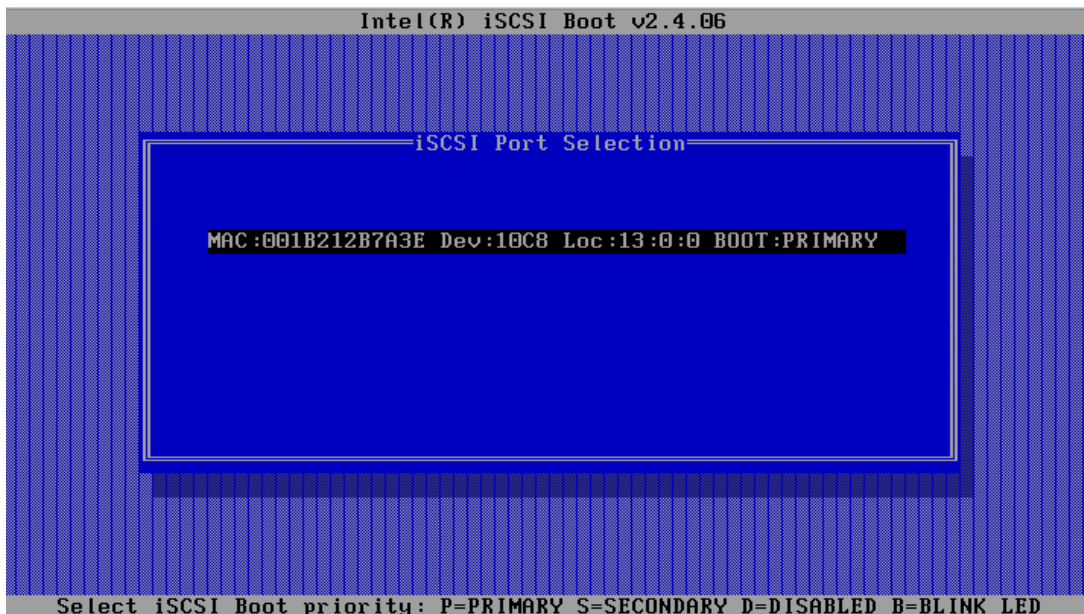


4. Enter Initiator and Target names and IP information, then select OK:

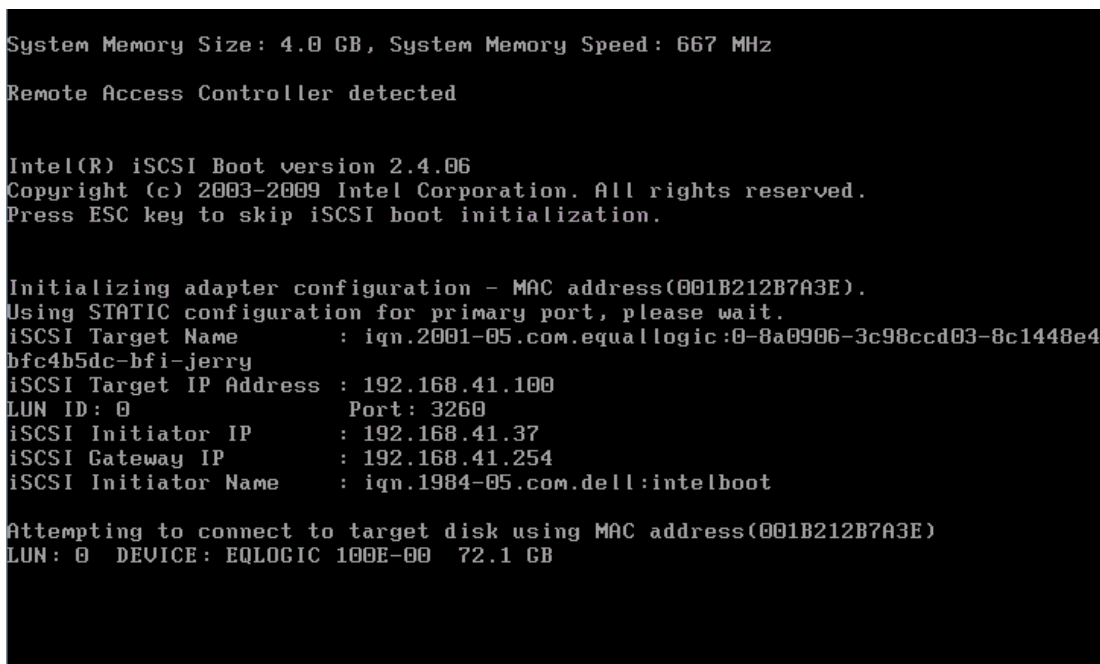


Configuring Boot from SAN using iSCSI based Dell Storage Arrays

5. Select 'Save changes and Exit' to return to the main MAC list, and then press 'P' to select the NIC as the Primary boot path for iSCSI:



6. Press Escape to exit the Intel iSCSI Remote Boot setup, and the NIC should immediately try to connect to the specified target. Ensure that you receive a LUN header from the target showing successful login.



7. Continue with Windows installation.


Configuring Boot from SAN using iSCSI based Dell Storage Arrays

5 Installing Windows Server 2008 / 2008 R2

In this section we provide steps to complete a basic installation of Windows® Server 2008 onto a bootable iSCSI SAN based target LUN.

5.1 Extract NIC drivers for later use if necessary

You will first need to extract the Broadcom NetXtreme VBD and NDIS drivers or Intel PRO plug and play drivers in case you need them later in this process.

1. Use the setup.exe /a command for Broadcom or the setup.exe -a command for Intel on a workstation to extract the drivers from the setup executable file, specifying a target directory for the extracted files.
 **NOTE:** Make note of the directory structure to which the files are extracted. For example, the Broadcom drivers for Windows Server 2008 x64 are extracted to the following locations:



For VBD: /Program Files 64/Broadcom/BDrv5706/VBD

For NDIS: /Program Files 64/Broadcom/BDrv5706/W2k8

2. Copy the driver files to removable media suitable for use during operating system installation, preferably a USB Flash Drive.

5.2 Install the Operating System directly onto the iSCSI LUN

Perform the following steps to install the operating system on iSCSI LUN:

1. Turn on or reboot the server.
2. Insert the Windows Server 2008/ 2008 R2 DVD in the DVD drive.
3. Press any key when prompted to boot from the DVD.
4. The Install Windows dialog box appears. Select the appropriate Language, Time, and Keyboard options. Click Next and then, Install Now to continue the installation.
5. The Operating System Selection page appears. Select Full Installation and click next to continue.
6. The License Agreement screen appears. Read the license agreement and select I accept the license terms to continue with the installation. Click Next.
7. The Installation Type page appears. Select Custom.
8. Determine if the target LUN is available in the list of drives. If the target LUN is available, proceed to step 15 below.
9. Insert the removable media containing the drivers for the NIC (Intel PRO Network device or Broadcom NetXtreme adapter)
10. Click Load Driver. The Load Driver dialog box appears.
11. Click Browse. The Browse for Folder dialog box appears.
12. Navigate to the location containing the driver for the Network device and click OK.
 **NOTE:** For example, you will need to install both the VBD (Virtual Bus Driver) & NDIS (Network Driver Interface Specification) driver for the Broadcom NetXtreme adapter. If you will be enabling HBA offload mode then you will need to install the VBD & OIS driver.
13. Click Next to load the driver. The available drives list containing the targeted LUN appears.
 **NOTE:** If the list of available drives containing the targeted LUN does not appear, click Refresh. You may have to wait for up to a minute or click Refresh a few times before seeing the drives.

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

- NOTE: If you are using a PowerVault MD3000i storage array, a LUN of size 20 MB and with LUN ID of 31 appears in the list of available iSCSI LUNs. **Do not select this LUN.** This LUN appears because the MD3000i MPIO driver is not loaded during installation. Once the installation is complete, installing Modular Disk Storage Manager will filter out this LUN from Disk Manager.
14. Select the drive and click Next to start Windows installation.
 15. The Windows installer copies and expands files and installs features and updates. Once the installation is complete, the server reboots.
 16. If you are using a Broadcom NetXtreme adapter, then we recommend you verify that the Boot to iSCSI Target setting has switched from “One Time Disabled” to “Enabled”. After the server reboots:
 - a. Press <Ctrl><k> to access the iSCSI configuration utility.
 - b. Select the General Parameters option and make sure Boot to iSCSI Target is enabled.
 - c. Press <Esc> to exit the Broadcom menus and save the configuration when prompted.
 17. The system then boots from the iSCSI LUN and completes Windows setup.
 18. Reboot the system and log in to the operating system.
 19. Disable the page file. Since the PowerEdge system will not have a local hard drive configured on the host you will need to disable the page file:
 - a. Right-click My Computer and select Properties.
 - b. In the System Properties screen, click the advanced tab.
 - c. In the Performance section, click Settings.
 - d. In the Performance Options screen, click the advanced tab.
 - e. In the Virtual Memory section, click Change.
 - f. In the Virtual Memory screen, select No paging file.
 20. If the system will require configuration of redundant iSCSI paths to the boot image LUN, or if you be configuring multi-path I/O (MPIO), then you will need to install additional software in the host image for your array type. If you are using a Dell | Equallogic storage array:
 - a. If you are using a Dell | Equallogic storage array install the Host Integration Toolkit.³
 - b. If you are using a PowerVault MD3000i storage array install the Dell PowerVault Modular Disk Storage Manager (MDSM) software⁴.
 21. If you enabled the Hyper-V role, then the primary BFi LOM or NIC will automatically be restricted in Hyper-V Virtual Networks. A virtual network cannot be created on this adapter. If a secondary BFi LOM or NIC will be configured, then you must manually avoid selection of that adapter when creating virtual networks.

³ <http://www.equallogic.com/resourcecenter/assetview.aspx?id=8933>

⁴ <http://support.dell.com/support/edocs/systems/md3000i/en/index.htm>

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

6 Creating Redundant Paths to the Boot Target (Multi-Path I/O)

After installing the operating system to the iSCSI LUN, it is recommended that you configure redundant paths to the target from all hosts that are configured with boot from iSCSI. Misconfigured networks or networks under heavy load may interfere with critical communication between the host and the associated boot LUN on the target, causing the system to hang or display a blue screen.

To work-around this potential problem, you can configure multiple (redundant) paths between the host and target. As a best practice, you should configure redundant iSCSI network paths and monitor the network performance. If you are using an MD3000i array, your redundant network paths should be on different subnets.

- NOTE: If the Hyper-V Role is configured on this system, make sure that there are no virtual networks that are bound to the physical NICs or LOMs that will be utilized for the secondary BFi adapter.

6.1 Configuring Multi-Path I/O for the Broadcom NetXtreme adapter

For multi-path boot you will need two network ports on the server dedicated to iSCSI SAN boot and two iSCSI SAN IP address assignments. You should also refer to your iSCSI target array user documentation for supported redundant path configurations.

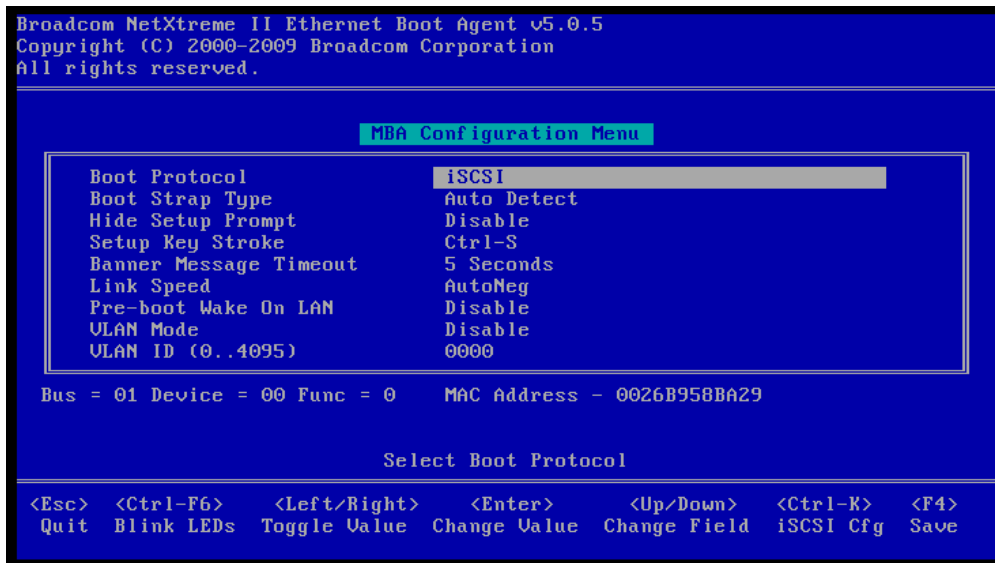
- Turn on or reboot the server.
 - NOTE: If you are not configuring a LOM ("LAN On Motherboard"), skip to step #8 below.
- Press <F2> to enter BIOS setup during Power On Self Test (POST).
- Select Integrated Devices and press <Enter>.
- In the Integrated Devices menu, ensure that the desired additional NIC is set to use the **Enabled with iSCSI Boot** setting.
- Press<Esc> to exit the Integrated Devices Menu.
- Press <Esc> to exit BIOS Setup. The BIOS exit menu appears.
- Select Save Changes and Exit to exit BIOS Setup
 - NOTE: Ensure all USB keys/drives are removed from the system before proceeding.
- In the Broadcom Boot banner, press <Ctrl><s> to enter the LOM/NIC option ROM:

```
F2 = System Setup
F10 = System Services
F11 = BIOS Boot Manager
F12 = PXE Boot
Two 2.93 GHz Quad-core Processors, Bus Speed:6.40 GT/s, L2/L3 Cache:1 MB/8 MB
System Memory Size: 32.0 GB, System Memory Speed: 1333 MHz

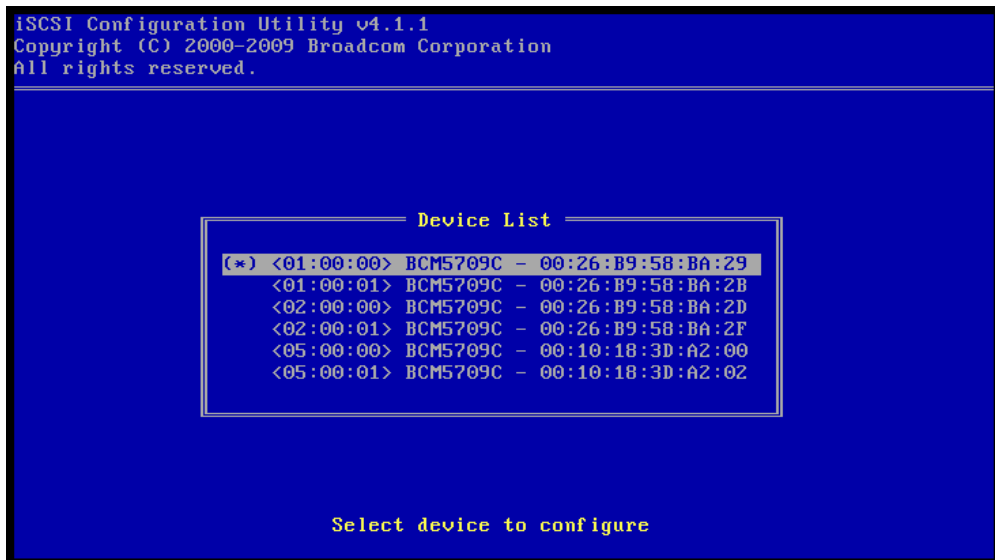
Broadcom NetXtreme II Ethernet Boot Agent v5.0.5
Copyright (C) 2000-2009 Broadcom Corporation
All rights reserved.
Press Ctrl-S to Configure Device (MAC Address - 0026B958BA29)
-
```

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

9. In the MBA Configuration Menu, press <Ctrl><k>:

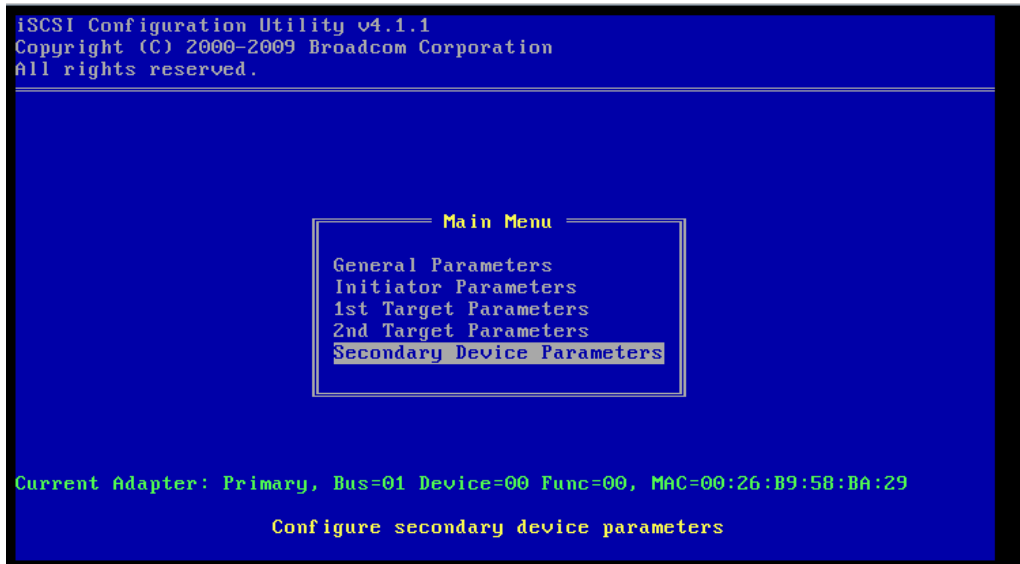


10. Select the current primary adapter and press <Enter>:

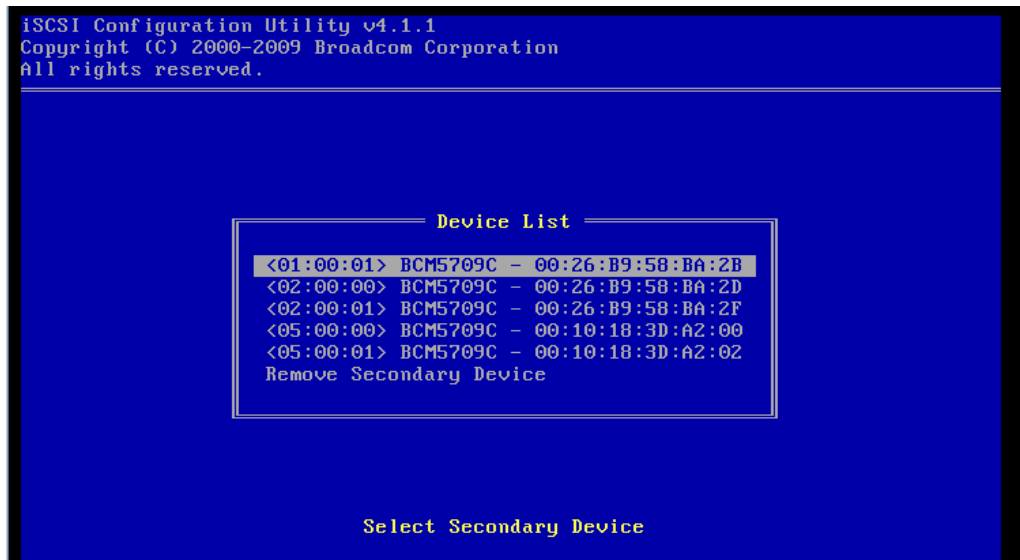


Configuring Boot from SAN using iSCSI based Dell Storage Arrays

11. In the Main Menu, select Secondary Device Parameters.

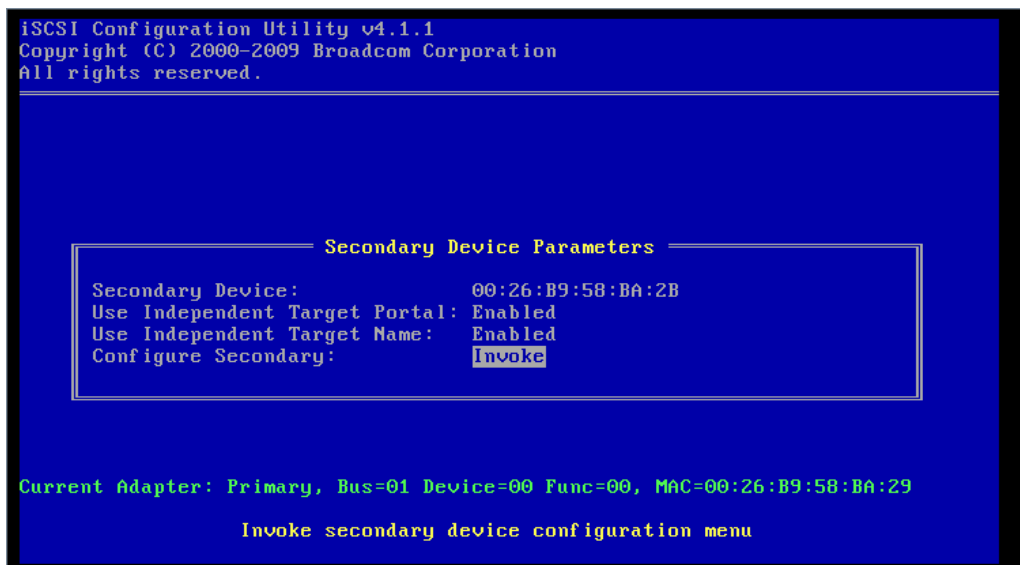


12. Press Enter to bring up a list of available secondary adapters and then select the MAC address of the adapter chosen.



Configuring Boot from SAN using iSCSI based Dell Storage Arrays

13. In the Secondary Device Parameters screen, set **Use target independent portal mode** as Enabled, **Use target independent name** as Enabled and select Invoke to configure the secondary adapter.



14. In the Main Menu, select General Parameters and set the following parameters:

TCP/IP parameters via DHCP	Disabled
iSCSI parameters via DHCP	Disabled
CHAP Authentication	Disabled
Boot to iSCSI target	Disabled (when installing image), Enabled (after cloning or installing image to boot from iSCSI target)
DHCP Vendor ID	BRCM ISAN
Link Up Delay Time	0
Use TCP Timestamp	Disabled
Target as First HDD	Disabled (if using Imaging with Local Disk), Enabled (if using Direct or Remote Install)
LUN Busy Retry Count	0
IP Version	IPV4 or IPV6
Windows HBA Boot Mode	Disabled (not applicable for Linux)

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

```
iSCSI Configuration Utility v4.1.1
Copyright (C) 2000-2009 Broadcom Corporation
All rights reserved.

----- General Parameters -----
TCP/IP Parameters via DHCP: Disabled
iSCSI Parameters via DHCP: Disabled
CHAP Authentication: Disabled
Boot to iSCSI target: Enabled
DHCP Vendor ID: BRCM ISAN
Link Up Delay Time: 0
Use TCP Timestamp: Disabled
Target as First HDD: Enabled
LUN Busy Retry Count: 0
IP Version: IPv4
Windows HBA Boot Mode: Disabled

Current Adapter: Secondary, Bus=01 Device=00 Func=01, MAC=00:26:B9:58:BA:2B

Acquire TCP/IP configuration via DHCP
```

- ❏ NOTE: Take care to make sure that all network settings are properly configured. For example, if you enable CHAP in the target but you do not enable it in the Primary or Secondary path (or vice versa) a blue screen will result.
- ❏ NOTE: If you wish to use Offload iSCSI (OIS) to boot, set Windows HBA Mode to Enabled. You will need a license key to enable offload features. For additional information, see the Broadcom NetXtreme Family of Adapters User's Guide.
- ❏ NOTE: To use DHCP for dynamically assigned settings, set the TCP/IP parameters through DHCP and iSCSI parameters through DHCP to Enabled. For additional information, see the Broadcom NetXtreme Family of Adapters User's Guide.
- ❏ NOTE: Do not enable CHAP at this time. It is recommended that you configure advanced features after the connection between host and target is established.

15. Press <Esc> to return to the main menu.

16. Configure values for Initiator Parameters:

- IP Address
- Subnet Mask
- Default Gateway
- Primary DNS (optional)
- Secondary DNS (optional)
- iSCSI Name (the iSCSI initiator name to be used by the client system)

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

```
iSCSI Configuration Utility v4.1.1
Copyright (C) 2000-2009 Broadcom Corporation
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----- Initiator Parameters -----
IP Address:      192.168.41.78
Subnet Mask:     255.255.255.0
Default Gateway: 192.168.41.254
Primary DNS:     192.168.110.1
Secondary DNS:   0.0.0.0
iSCSI Name:      iqn.1984-04.com.dell:bluefish.secondary
CHAP ID:
CHAP Secret:

Current Adapter: Secondary, Bus=01 Device=00 Func=01, MAC=00:26:B9:58:BA:2B

Configure initiator IP address
```

17. Press <Esc> to return to the Main Menu.
 18. In the Main Menu, select 1st Target Parameters and change the following:
 - Connect to Enabled
 - IP Address (Target IP)
 - iSCSI Name (IQN name of Target)
 - Boot LUN & TCP Port (if different from default settings)
- NOTE: Do not configure anything under 2nd Target Parameters

```
iSCSI Configuration Utility v4.1.1
Copyright (C) 2000-2009 Broadcom Corporation
All rights reserved.

----- 1st Target Parameters -----
Connect:        Enabled
IP Address:     192.168.41.100
TCP Port:       3260
Boot LUN:       0
iSCSI Name:     iqn.2001-05.com.equallogic:0-8a0906-2b78ccd03-5fd44...
CHAP ID:
CHAP Secret:

Current Adapter: Secondary, Bus=01 Device=00 Func=01, MAC=00:26:B9:58:BA:2B



Enable/Disable target establishment
```

19. Press <Esc> to return to the Main Menu. Select Exit and Save Configuration to exit the NIC/LOM Ctrl-s menu.
20. Press <F4> to save your MBA configuration.
21. Complete Windows configuration steps in Section 0.

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

6.2 Configuring Multi-Path I/O for the Intel adapter

For multi-path boot you will need two network ports on the server dedicated to iSCSI SAN boot and two iSCSI SAN IP address assignments. You should also refer to your iSCSI target array user documentation for supported redundant path configurations.

1. Turn on or reboot the server.
 NOTE: If you are not configuring a LOM, skip to step #8 below.
2. Press <F2> to enter BIOS setup during Power On Self Test (POST).
3. Select Integrated Devices and press <Enter>.
4. In the Integrated Devices menu, ensure that the desired additional NIC is set to use the Enabled with iSCSI Boot setting.
5. Press<Esc> to exit the Integrated Devices Menu.
6. Press <Esc> to exit BIOS Setup. The BIOS exit menu appears.
7. Select Save Changes and Exit to exit BIOS Setup
 NOTE: Ensure all USB keys/drives are removed from the system before proceeding.
8. In the Intel Boot banner, press <Ctrl><D> to enter the NIC option ROM:

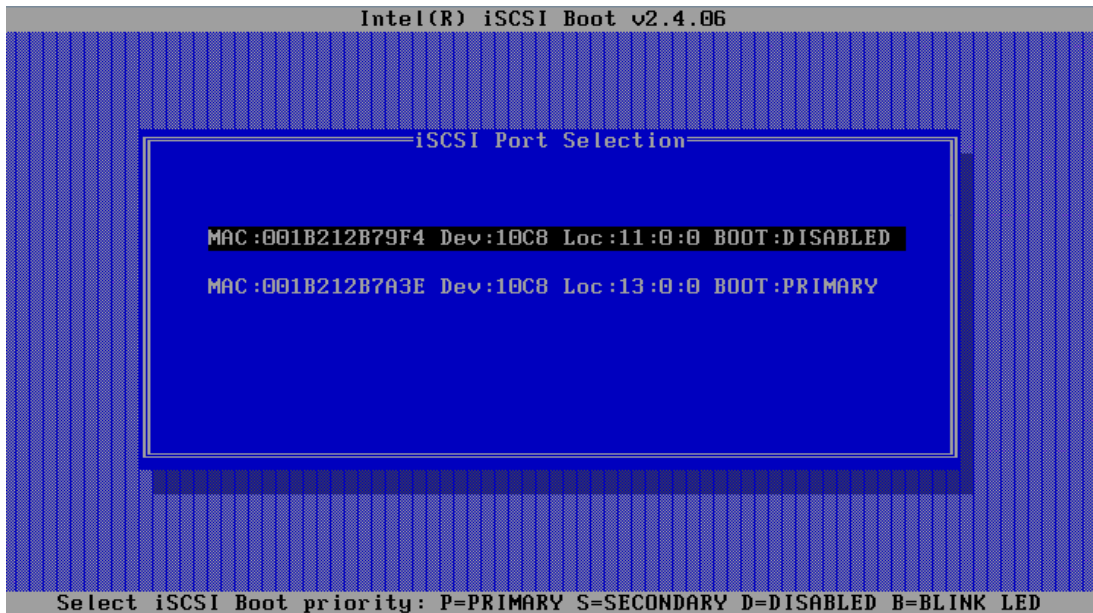
```

                                                    F2 = Setup
                                                    F10 = Utility Mode
                                                    F11 = Boot Menu
                                                    F12 = PXE Boot
Two 2.00 GHz Dual-core Processors, Bus Speed: 1333 MHz, L2 Cache: 4 MB
System Memory Size: 4.0 GB, System Memory Speed: 667 MHz
Remote Access Controller detected

Intel(R) iSCSI Boot version 2.4.06
Copyright (c) 2003-2009 Intel Corporation. All rights reserved.
Press ESC key to skip iSCSI boot initialization.
Press <Ctrl-D> to run setup..._
```


Configuring Boot from SAN using iSCSI based Dell Storage Arrays

9. Select the disabled adapter and press <Enter>:

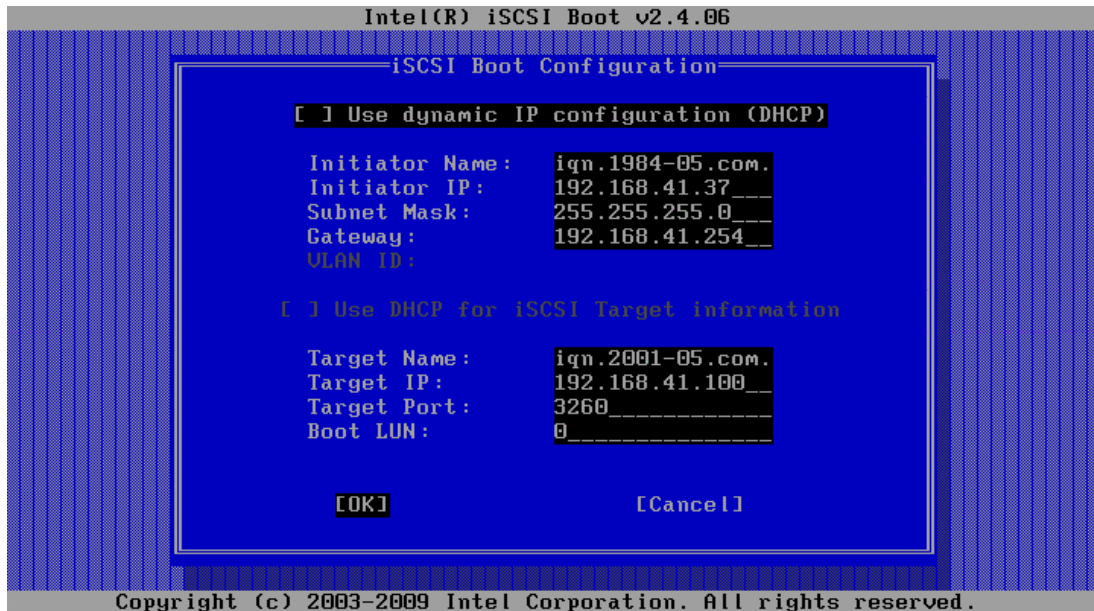


10. In the iSCSI Port Configuration Menu, select iSCSI Boot Configuration:

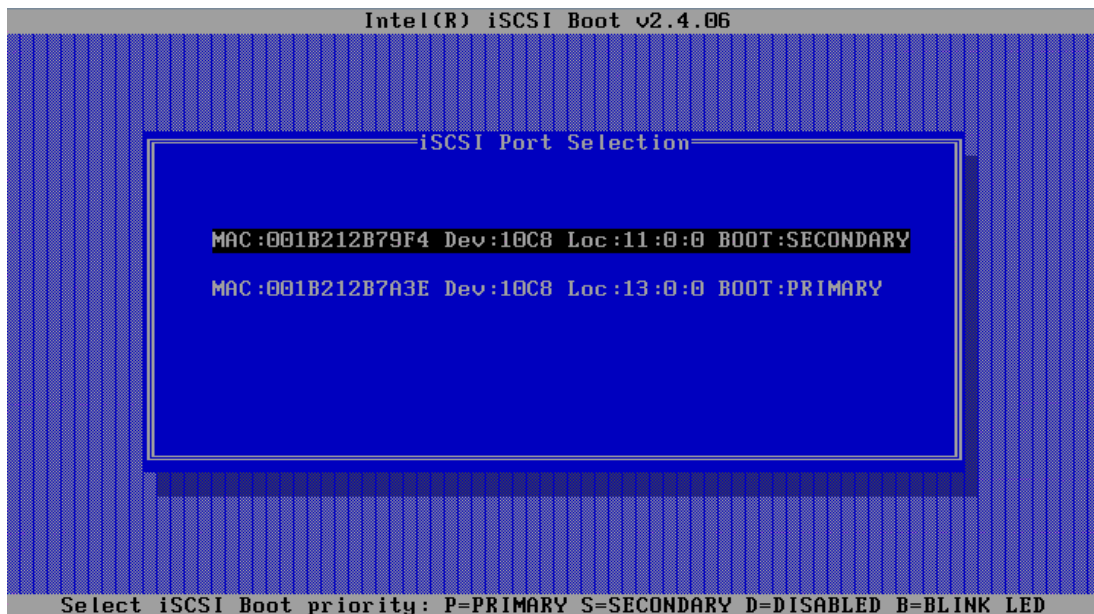


Configuring Boot from SAN using iSCSI based Dell Storage Arrays

11. Enter Secondary Initiator and Target name and IP information, then select OK:



- NOTE: Take care to make sure that all network settings are properly configured. Failing to do so could result in boot failure.
 - NOTE: Do not enable CHAP at this time. It is recommended that you configure advanced features after the connection between host and target is established.
12. Select 'Save changes and Exit' to return to the main MAC list, and then press 'S' to select the Alternate NIC as the Secondary path for iSCSI:



13. Press <Esc> to exit the adapter setup.

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

6.3 Windows Configuration

Once the redundant boot-paths are created using the above process, the server will boot as long as one of the paths is available at boot time. To ensure path redundancy once the OS is running, MPIO software will need to be enabled or installed on the server.

- Open the iSCSI Initiator in the Windows Control Panel. If this is the first time you have run the Initiator, you will receive a message that the iSCSI Service is not running, and would you like to start it. Answer yes to this, as well as the follow-on question to add an exception to the Windows Firewall.
- In Windows 2008/2008 R2, the MPIO software is considered an optional component. Using Server Manager, add the Multipath I/O Feature. This will require a reboot to complete, at which time the EqualLogic Host Integration Kit can be installed.

For more information on running MPIO in Windows Server, see the following:

- *Windows Server High Availability with Microsoft MPIO*, available at: <http://www.microsoft.com/WindowsServer2003/technologies/storage/mpio/default.mspx>
- Multipath I/O Overview (for Windows Server 2008 R2), available at: <http://technet.microsoft.com/en-us/library/cc725907.aspx>

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

7 Troubleshooting

If iSCSI Boot BIOS fails to detect the iSCSI target, perform the following troubleshooting steps and try to boot the system from iSCSI:

1. Try disabling the spanning tree protocol (if enabled) on the switch ports on which the iSCSI boot NIC is configured. For information about disabling the spanning tree, see the documentation that shipped with the switch.
2. Check for data entry errors in the iSCSI boot settings in Network adapter's configuration menu. The configuration options must match the instructions provided. For more troubleshooting procedures, see the iSCSI boot section in Intel® PRO or Broadcom NetXtreme Family of Adapters User's Guide and the Dell Support website at support.dell.com.
3. To eliminate switch problems, try connecting the initiator to the target directly using a standard Ethernet cable. Do not use a cross-over cable.
4. During the operating system installation to the iSCSI LUN, if you receive the error message: `Failed to create a new partition on the selected unused space. [Error: 0x80042453]`, then this indicates that the initiator connection has been made to a controller that does not own the LUN.

Configuring Boot from SAN using iSCSI based Dell Storage Arrays

8 Configuration Worksheet

You can use the following worksheet to capture boot from iSCSI configuration information.

Dell PowerEdge Server (Host/Initiator) NOTE: use fully-qualified IQN format: <iqn><yyyy-mm>.com.<company name>:<server name>. Example: iqn.1984-04.com.dell:server-name. For more information, see RFC3720 and RFC3721 at http://rfc.net/ .	
IQN:	
Primary Boot NIC	Secondary Boot NIC (optional)
IP Address:	IP Address:
Subnet Mask:	Subnet Mask:
Gateway:	Gateway:
Slot Location:	Slot Location:
Dell Storage Array (Target)	
IQN:	
iSCSI Port:	
LUN Number:	
Primary iSCSI port:	Secondary iSCSI port: (optional)
IP Address:	IP Address:

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