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

A Dell Technical White Paper

Dell | Product Group

Storage Interoperability Engineering Team

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March 2010

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Introduction

This document provides instructions for configuring Dell™ PowerEdge™ 11G family of servers to boot the Microsoft® Windows Server® 2008 SP2 or the Windows Server 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 (Logical Unit Numbers or LUNs). Beyond the obvious flexibility and power efficiency benefits of not needing Direct-Attached Storage (DAS) Boot Disks in servers, Boot from SAN allows for quick reconfiguration and deployment of multiple operating system- 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 Network-Attached Storage (NAS) Appliances, MD3000i, EqualLogic™, and the full EMC iSCSI portfolio can all be configured to support Boot from iSCSI.

Scope

The process for configuration boot from iSCSI can vary considerably based on which server-based NICs 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 (MPIO).

In this document, we limit our focus to the steps required to configure the iSCSI SAN boot paths as shown in the following table.

Boot Paths Covered By This Document

Operating Systems	**Windows Server 2008 SP2** **Windows Server 2008 R2**
Server	**Dell PowerEdge 11G Family** • Process validated on PowerEdge R710, system BIOS 1.3.6
Network Interface Controllers	**Broadcom NetXtreme II 5709c Gigabit Ethernet NIC** • Process validated using Broadcom NetExtreme II Ethernet Boot Agent 5.0.5 and iSCSI Configuration Utility 4.1.1 **Intel 10 GbE AT Server Adapter**[1] • Process validated using Intel Boot Agent Utility (IBAUtil) 4.17.00.00 and flash firmware iSCSI Boot 2.4.06

[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.

Storage Array	**Dell EqualLogic PS Series** • Process validated using array controller firmware 4.1.4 **Dell PowerVault MD3000i** • Process validated using array controller firmware 07.35.31.60

Process Overview

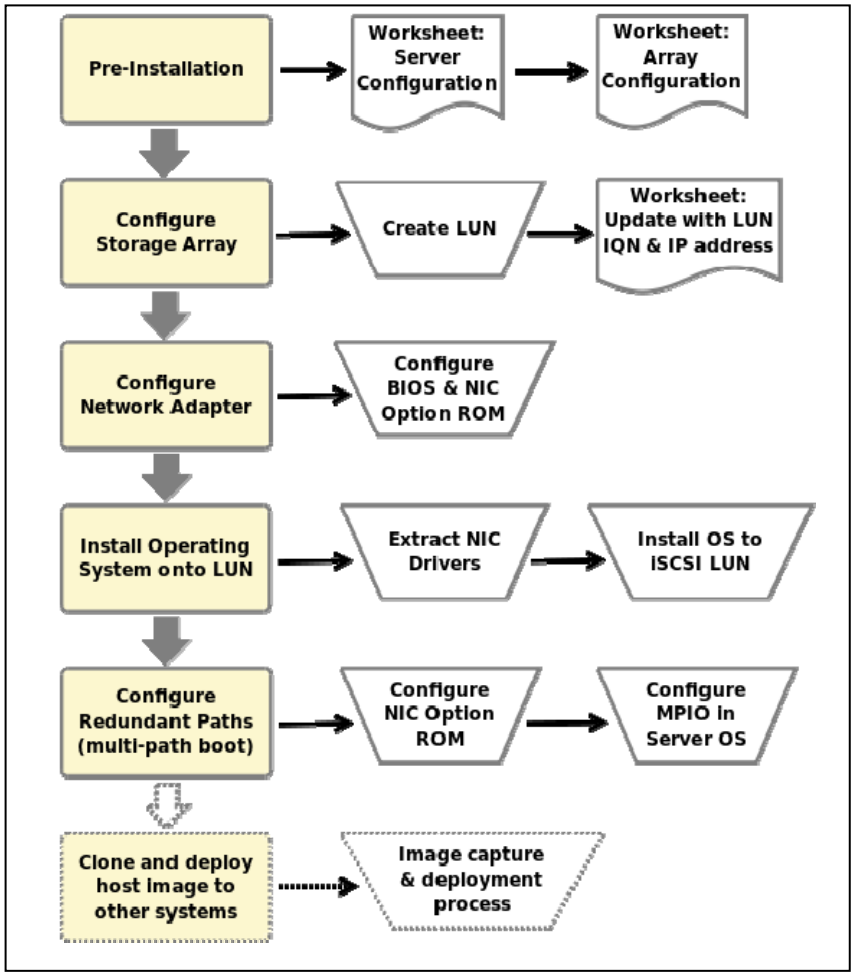
The process for booting from SAN over iSCSI described in this document involves completion of the following key configuration processes:

- 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 the following figure. We do not create a local installation image and 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 system 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.

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

Process for Direct Install for Windows 2008 Boot from iSCSI SAN



Note: In the preceding figure, we include a major step at the end for cloning and deploying copies of the operating system image after it has been configured for iSCSI SAN boot to other systems. The details for completing that process will be based on your environment and your familiarity with the various tools and methods for image cloning and deployment.

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 article 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.
- 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 the primary and the other as the secondary boot NIC, ensure that they are configured to use separate subnets. (This consideration applies only to the PowerVault MD3000i boot from iSCSI scenario.)
- For a server with Microsoft Hyper-V™ enabled, you can boot the parent partition from SAN. Hyper-V does not support boot from SAN for virtual machines.

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 "Configuration Worksheet" on page 35.
2. See the following documents:

   Intel PRO Family of Adapters User's Guide located on the Intel NIC media documentation website or under **Network** documentation on the Dell Support website at **support.dell.com/manuals**
   Broadcom NetXtreme Family of Adapters User's Guide located on the Broadcom NIC media website or under **Network** documentation on the Dell Support website at **support.dell.com/manuals**
3. Update your Dell Storage Array to the latest drivers and firmware versions referring to the following matrices or support sites:

   Dell PowerVault MD3000i Support Matrix located on the Dell Support website at **support.dell.com/manuals**
   Dell EqualLogic Support Downloads located on the Dell EqualLogic website at www.equallogic.com/support

4. Download the latest Intel PRO or Broadcom NetXtreme drivers and firmware from the **Drivers and Downloads** section on the Dell Support website at **support.dell.com**.

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.

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 the CHAP user name
   - Limit access by IP Address
   - Limit access to the iSCSI Initiator Name

     NOTE: If you limit access based on the 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.

   The **Summary** screen is displayed.
5. Verify the settings on the **Summary** screen.
6. Click the **Volume** option. Then, right-click the volume you just created and view the iSCSI settings. In the **iSCSI Target** box is the iSCSI Qualified Name (IQN), which is the Target Name that will be used for the Initiator Target Device.

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.

Manually Register a Host

1. Launch the Dell 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 host name in the **Enter host name** text box. The host name can be an informal name; it does not have to be 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 menu, and then click **Next**. Select **Windows Server 2003/Server 2008 Non-Clustered** since we are creating this LUN for dedicated boot image storage.

5. In the **Configure Host Access (Manual) - Specify iSCSI Initiators** screen, click **New...**. Enter the iSCSI initiator name and the 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 of the host server that will be booting from this array.

6. Enter the IQN of the host initiator in the **iSCSI initiator name** field. Record this information in the Configuration Worksheet provided on page 35.

   NOTE: Leave the iSCSI Initiator label setting at **Default**. The fully-qualified IQN format is:
   `<iqn><yyyy-mm>.com<company name>:<server name>`
   as shown in the following example.

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

7. Click **Add** and then click **Next**.

8. Accept the default, **No: This host will NOT share access to the same virtual disks with other hosts**, since we are configuring this target to contain an operating system boot image. Then, click **Next**. The **Confirm Host Definition** page appears. Your host definition should then appear as shown in the following example.

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

9. Click **Finish**, and then click **No** when asked if you want to define another host.

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 see 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**.

   The **Create Disk Groups and Virtual Disks** screen appears.

2. Click the **Virtual Disk: Create a new virtual disk using free capacity on an existing disk group** button.

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**.

   - Set the capacity for the virtual disk. The capacity setting should be large enough to host a full operating system 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.

   - 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.

   - Select File system in the Virtual Disk I/O characteristics field, and click Next.

4. Select **Map now:** and then select the host 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 your configuration worksheet.

6. Click **Finish**.

   The **Create Disk Groups and Virtual Disks - Complete** screen appears next.

   At this point we do not need to create any more virtual disks.

7. Select **No** to return to the main MDSM screen.

8. Record the preferred controller path assigned to the virtual disk:

   - Click the Modify tab, and select Change Virtual Disk Ownership/Preferred Path.

   - Expand the disk group containing the virtual disk you created, and select the virtual disk. Note the preferred path setting shown at the bottom of the screen. It will be the RAID Controller Module in either slot 0 or slot 1. Record this information in your configuration worksheet since you will need it to determine which IP address is used to access the target.

Record IQN and iSCSI Host IP Addresses
Using MDSM, complete the following steps:

1. Click the **iSCSI** tab, and then click **Change Target Identification**. Record the iSCSI target name, as shown in the following example, in your configuration worksheet.

```
iqn.1984-05.com.dell:powervault.6001422000fff137000000049751257
```

2. In the **iSCSI** tab, click **Configure iSCSI Ports**.

3. 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 IP address(es) assigned to the ports on this controller in your configuration worksheet. Your host system will be configured to boot from the iSCSI target at this address.

Configuring Network Adapters

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

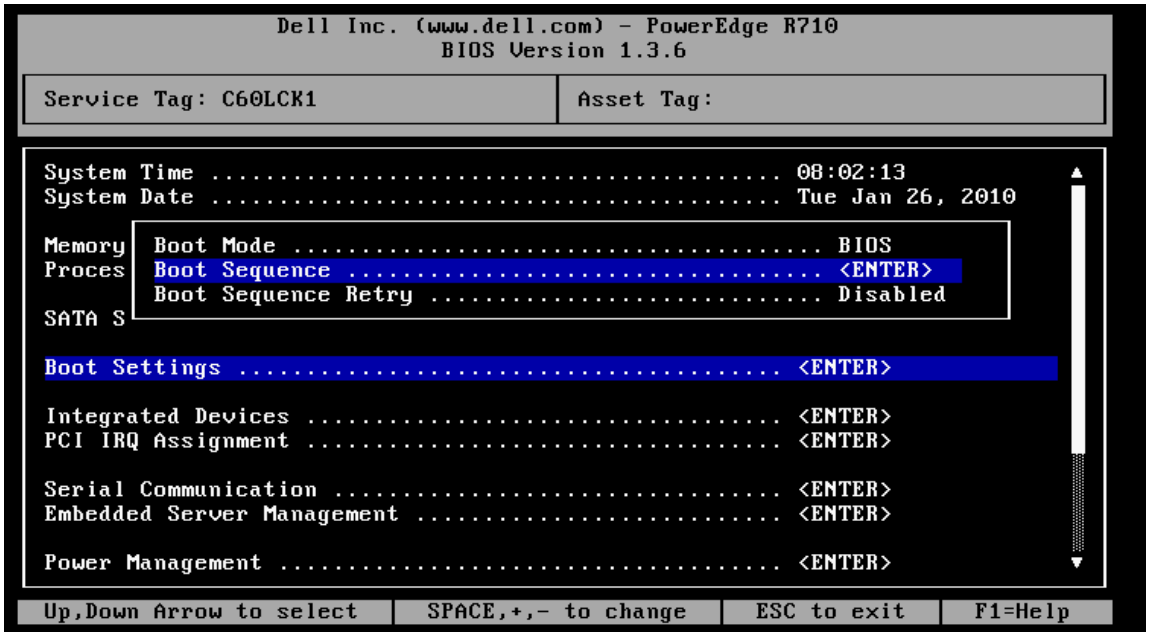
- For configuring the Broadcom network adapter, see the following section.
- For configuring the Intel network adapter, see page 17.

Configuring the Broadcom Network Adapter

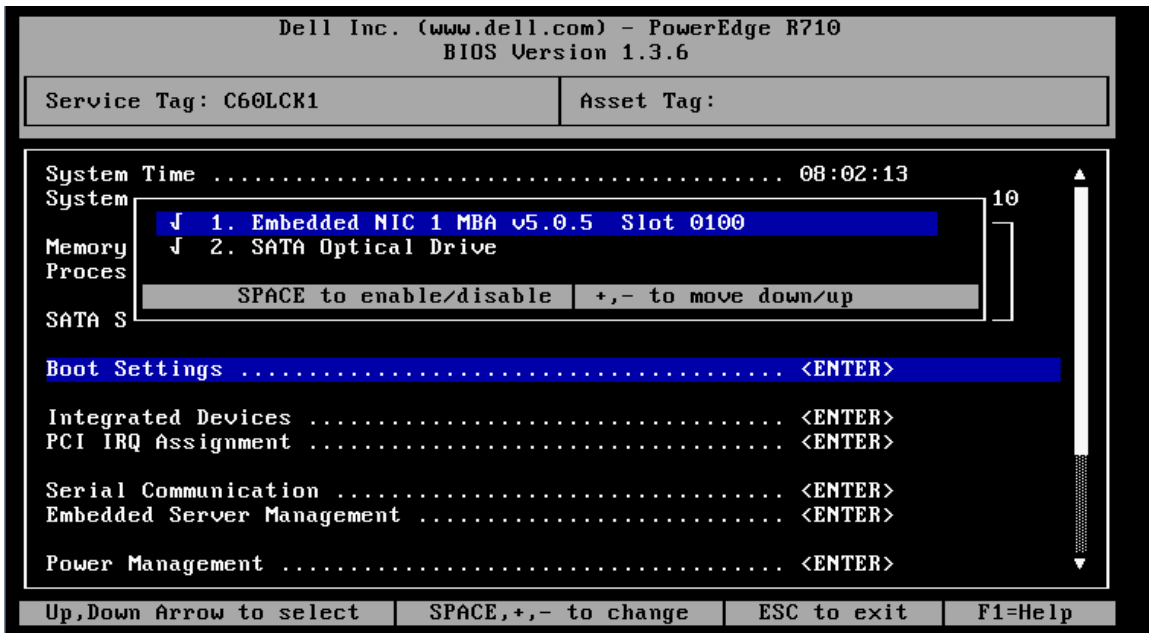
To prepare the system to boot from an iSCSI-based LUN, you must first modify the system BIOS and then configure the Broadcom NetExtreme II Ethernet Boot Agent.

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 select **Boot Sequence**. Press <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.



3. 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:

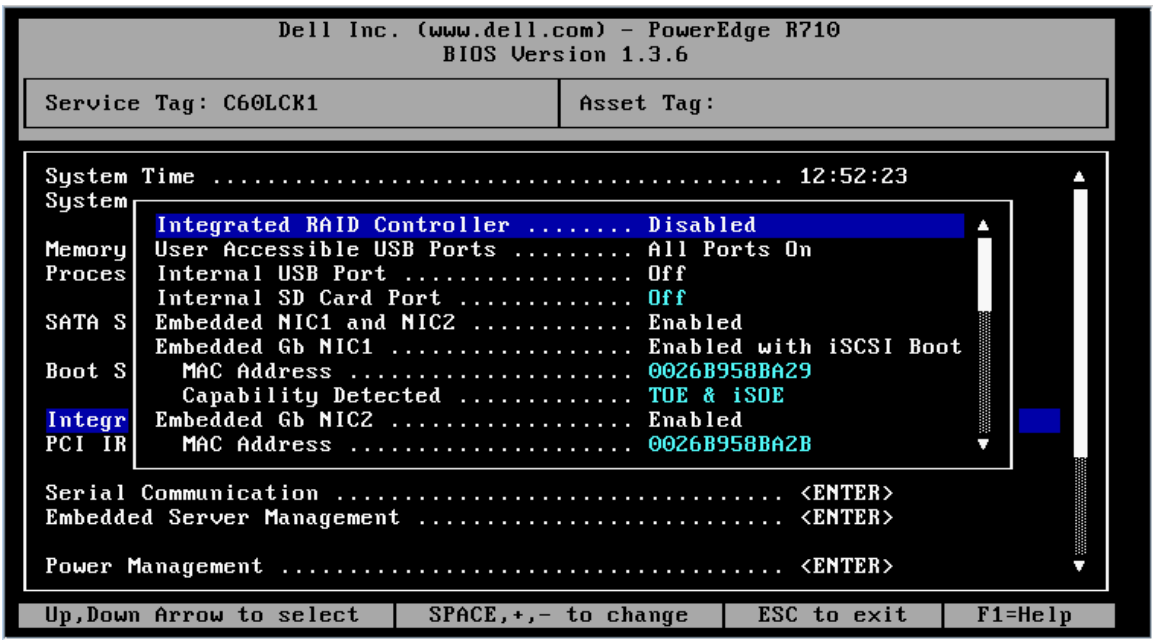
   Integrated RAID Controller Disabled (Disables access to any internal hard drives)

   Internal USB Port **Off** (Prevents a conflict during the Windows 2008 installation process)

Internal SD Card Port **Off** (Prevents a conflict during the Windows 2008 installation process)

Embedded NIC*x* **Enabled with iSCSI Boot**

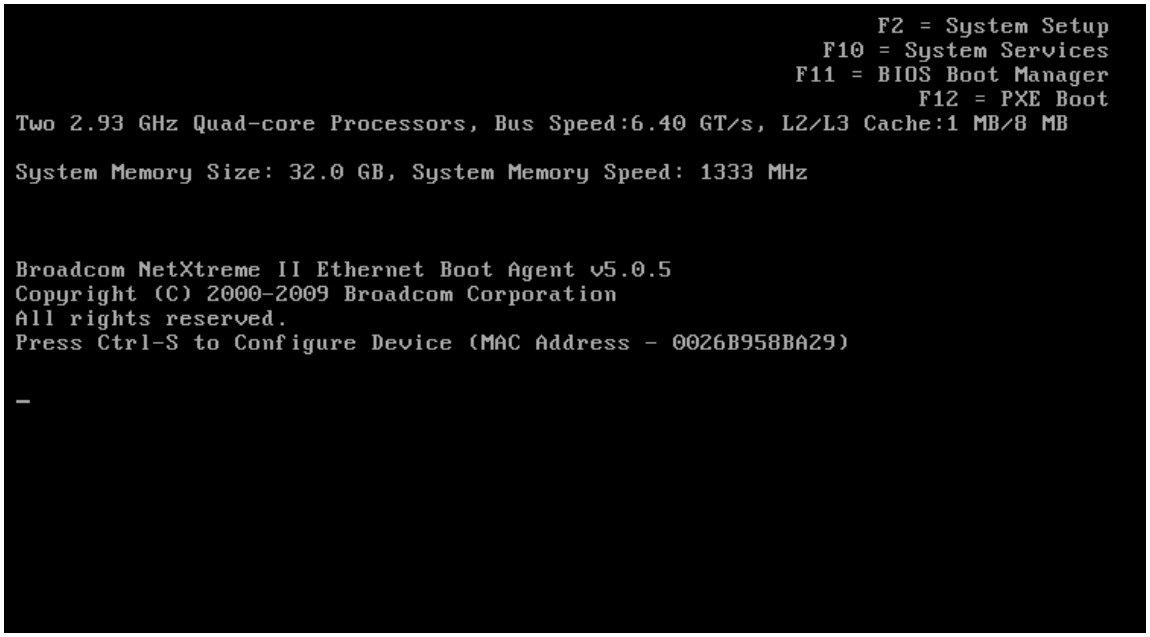
4. After making the changes, press <ESC> and save. The changes are shown in the following example. Continue immediately with the process in the next section.



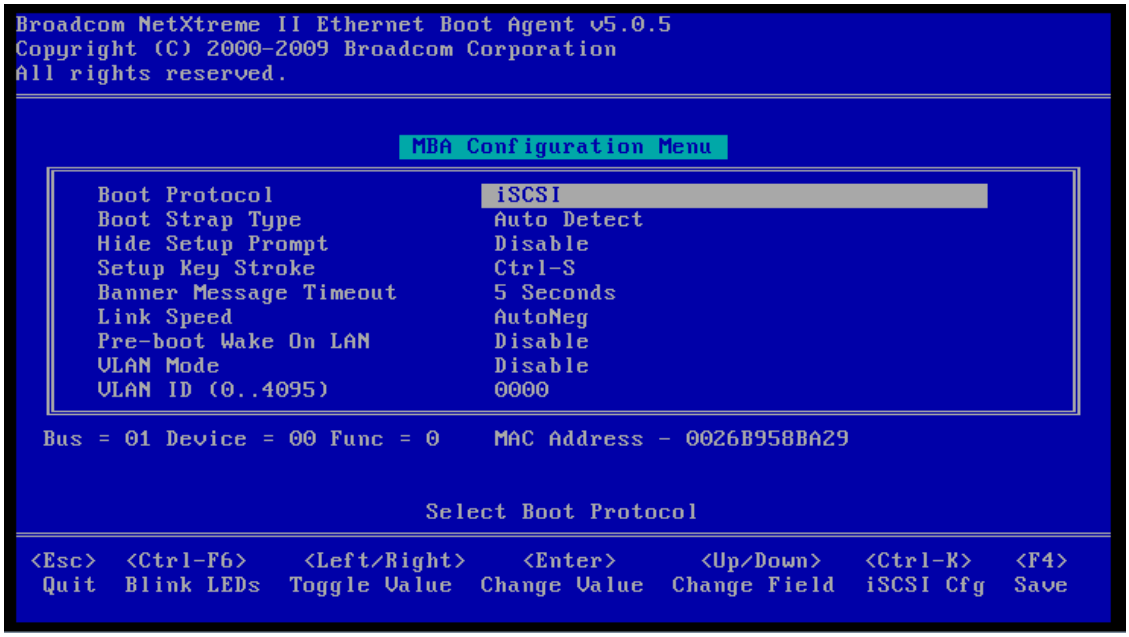
Preparing the Broadcom NetXtreme II Ethernet Boot Agent

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

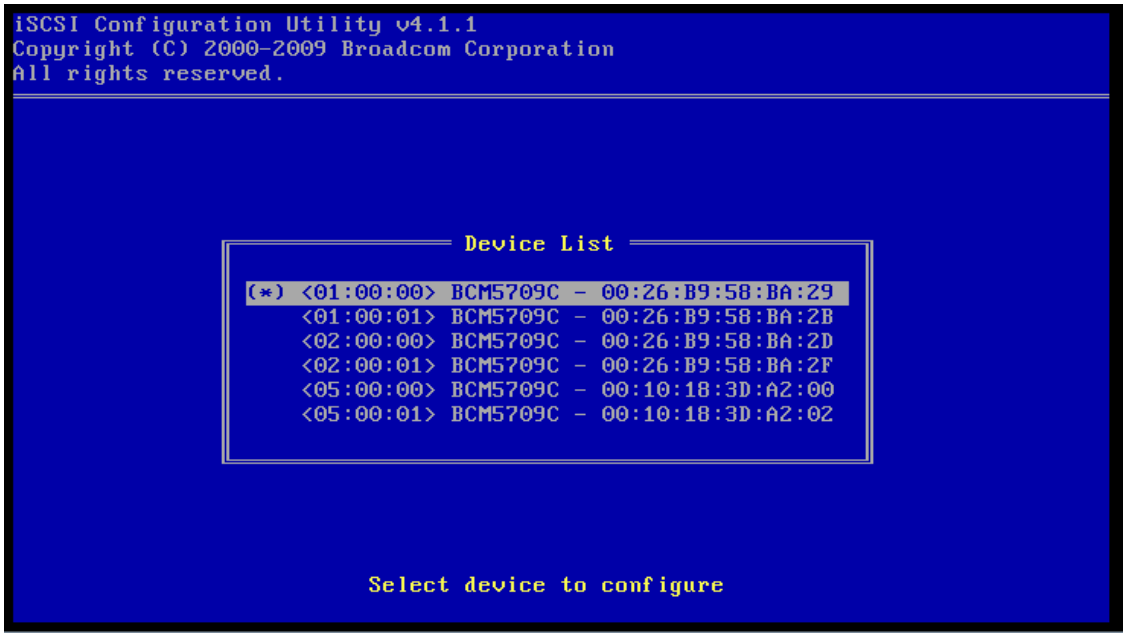
1. During Power-On Self-Test (POST), when you see the NetXtreme II Broadcom Ethernet Boot Agent version appear, press <Ctrl-S> to configure the device.



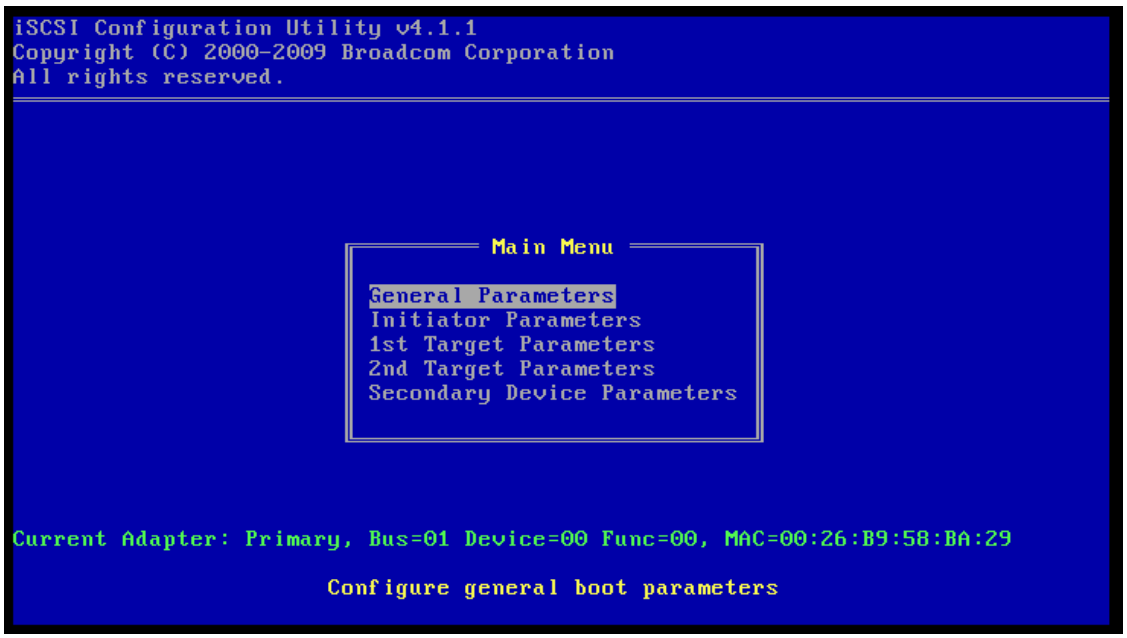
2. Make sure the Boot Protocol is set to **iSCSI**, and leave all other settings at their defaults. Then press <Ctrl-K> to enter the iSCSI Configuration Utility.



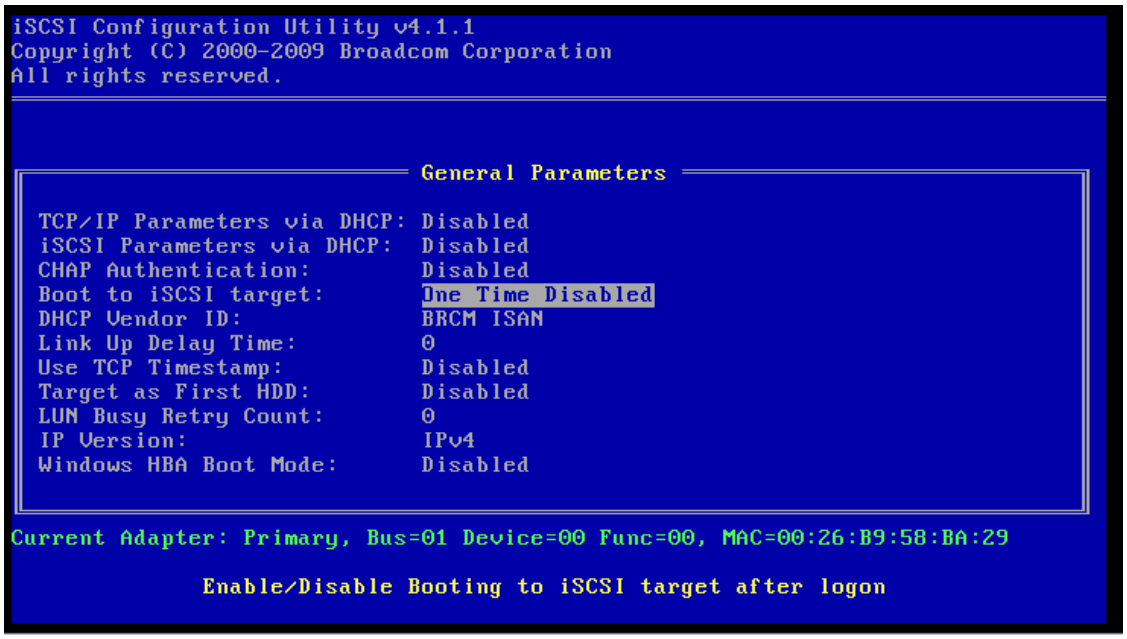
3. Select the interface whose MAC address matches the one selected during BIOS Setup, and press <Enter>.



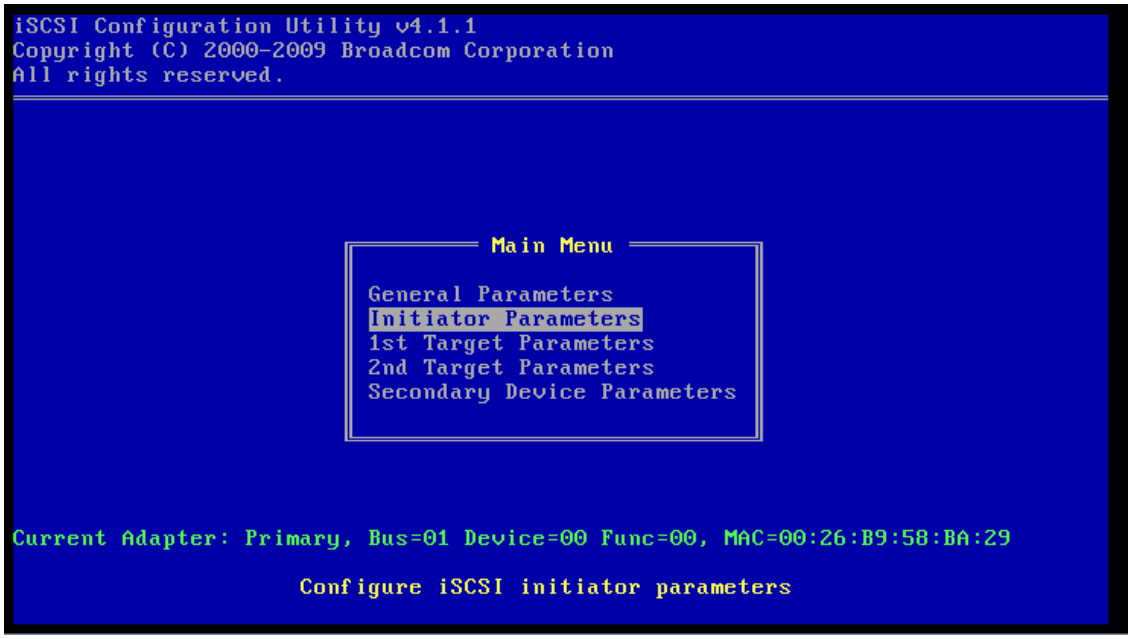
4. At the **Main Menu** for the iSCSI Configuration Utility, select **General Parameters** and press <Enter>.



5. Under **General Parameters**, ensure that all settings match the following screenshot.

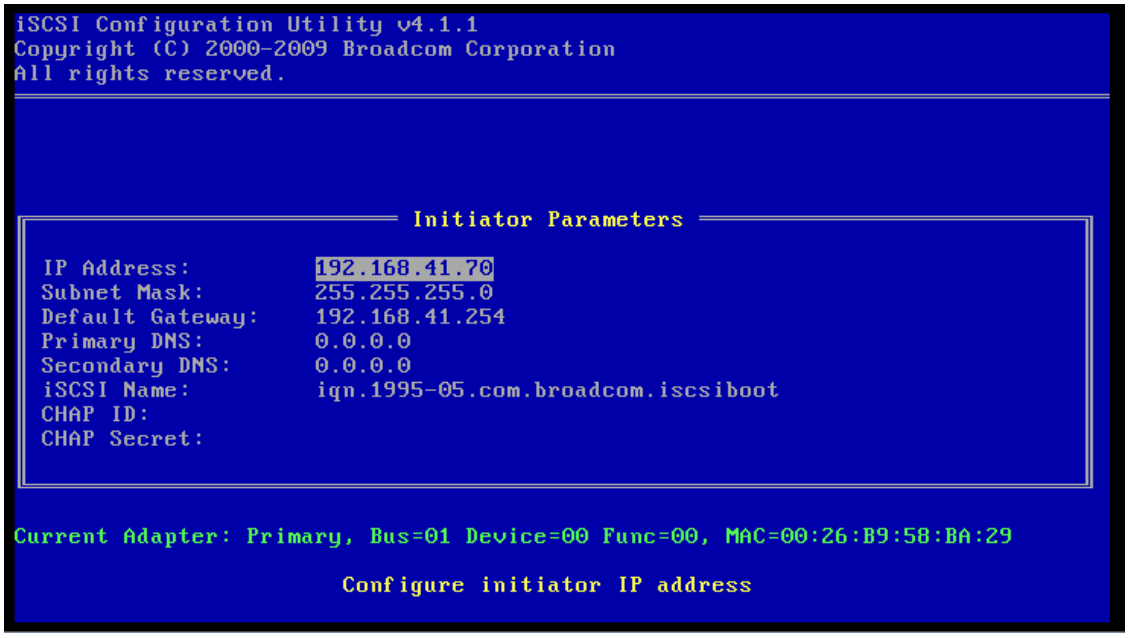


6. Press <ESC> once to return to the **Main Menu**, select **Initiator Parameters**, and press <Enter>.

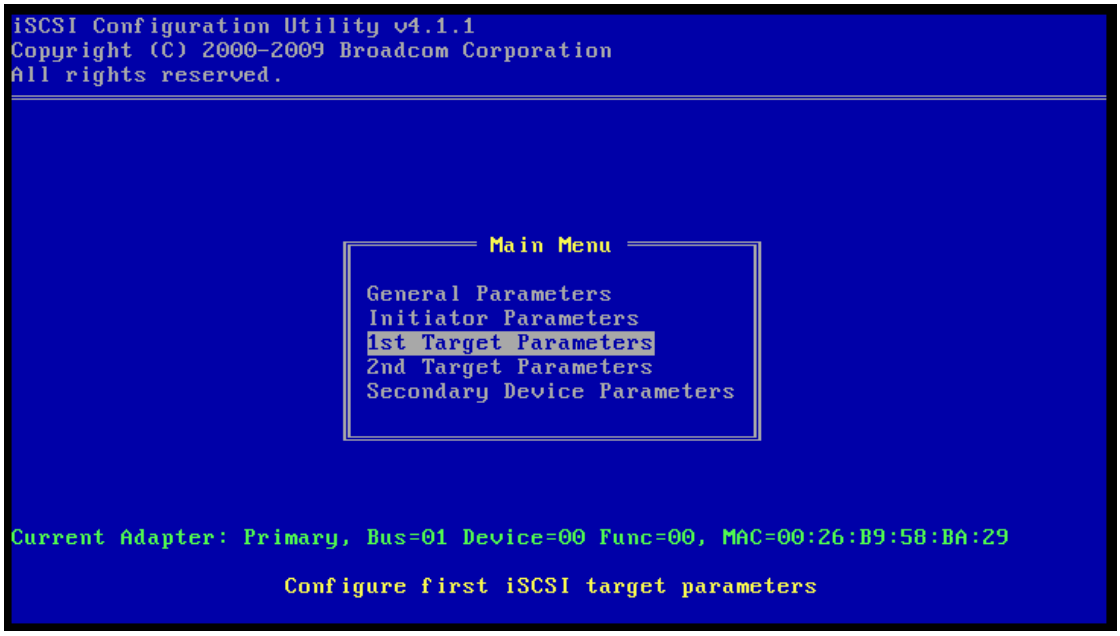


7. Under **Initiator Parameters**, enter the following information:

IP Address:	<host IP Address>
Subnet Mask:	<host netmask>
Default Gateway:	Not required, if the 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 an IQN name, then this name must be changed to match the IQN configured on the target (see "Configuring the Dell EqualLogic Storage System" on page 6 or "Configuring the PowerVault MD3000i Storage Array" on page 7).
CHAP ID:	(optional)
CHAP Secret:	(optional)

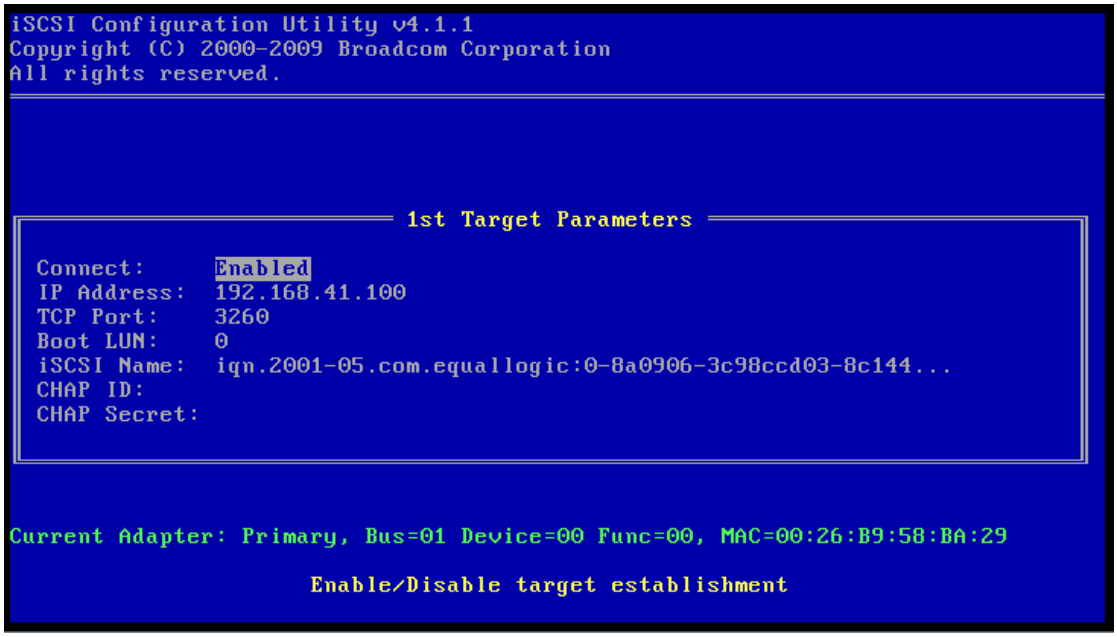


8. Press <ESC> once to return to the **Main Menu**; then select **1st Target Parameters** and press <Enter>.



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

Connect:	This option should be enabled.
IP Address:	This parameter should be set to the iSCSI target IP address. For an EqualLogic-based target, this IP address will be the Group IP address. For an MD3000i-based target, this IP address will be one of the IP addresses assigned to the ports on the preferred path RAID controller module.
TCP Port:	Default is 3260. This value can be changed to match specific target information.
Boot LUN:	Default is 0. This value usually will not need to be changed.
iSCSI Name:	Manually entered IQN name of the iSCSI target.
CHAP ID:	(optional)
CHAP Secret:	(optional)



10. Press <ESC> once to return to the **Main Menu**. Ensure that there is no information entered for either **2nd Target Parameters** or **Secondary Device Parameters**.

11. Press <ESC> once more to leave the iSCSI Configuration Utility. IMPORTANT: Be sure to save the configuration.

12. Press <ESC> 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 the Windows® installation.

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.

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 flash drive.

2. Extract both the Intel Boot Agent Utility (**ProBoot.exe**) and the Intel iSCSI Remote Boot Utility (**ISBoot.exe**) to the bootable USB flash drive in separate directories.

3. With the Intel NIC installed, boot the server using the DOS-bootable USB flash drive.

4. Change to the directory containing the Boot Agent, and run **IBAUtil.exe -fe** to 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>_
```

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

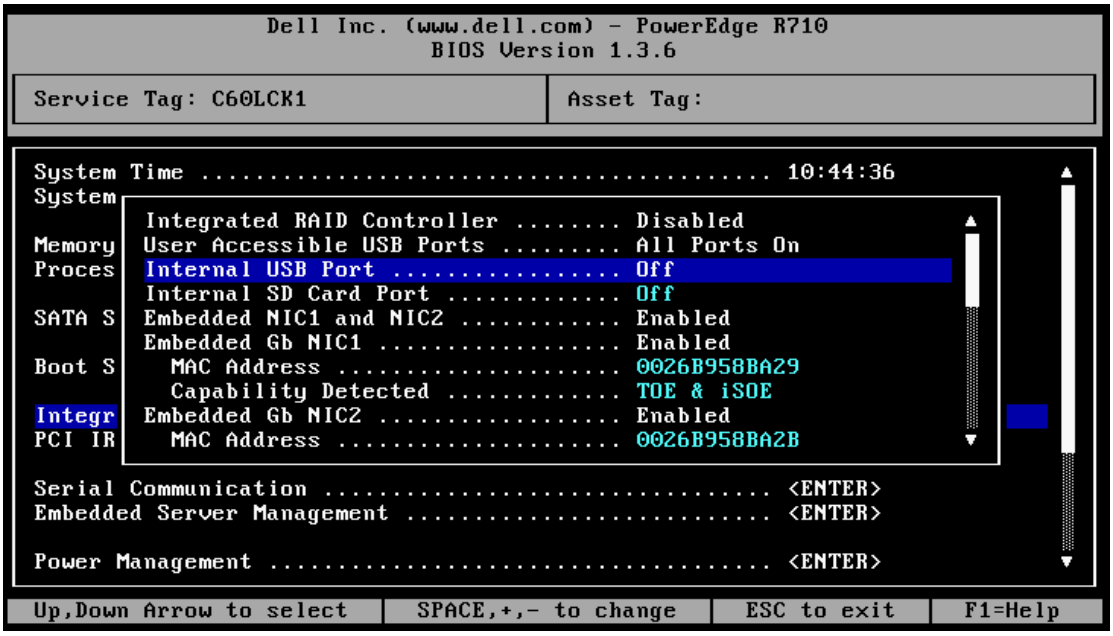
```
C:\>cd \iscsi\iscsiutl\dos

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>
```

Configure Integrated Devices in Server BIOS

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

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

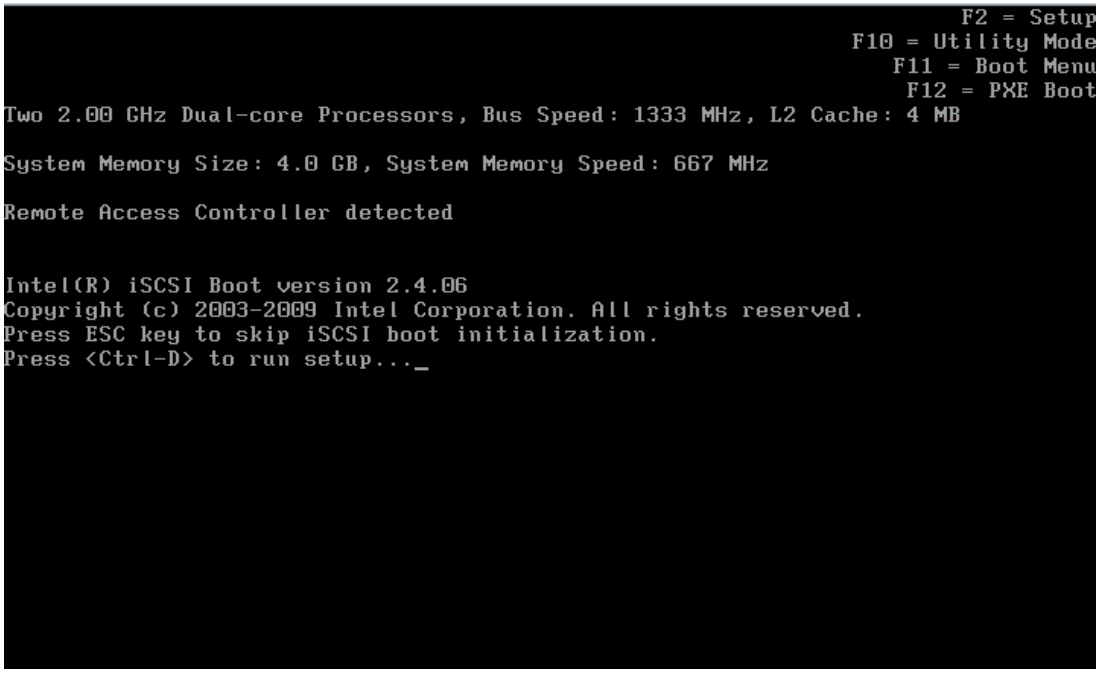
Integrated RAID Controller	**Disabled** (Disables access to any internal hard drives)
Internal USB Port	**Off** (Prevents a conflict during the Windows 2008 installation process)
Internal SD Card Port	**Off** (Prevents a conflict during the Windows 2008 installation process)
Embedded NIC*x*	**Enabled** (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 set to Enabled and not to Enabled with iSCSI Boot or Enabled with PXE Boot.*



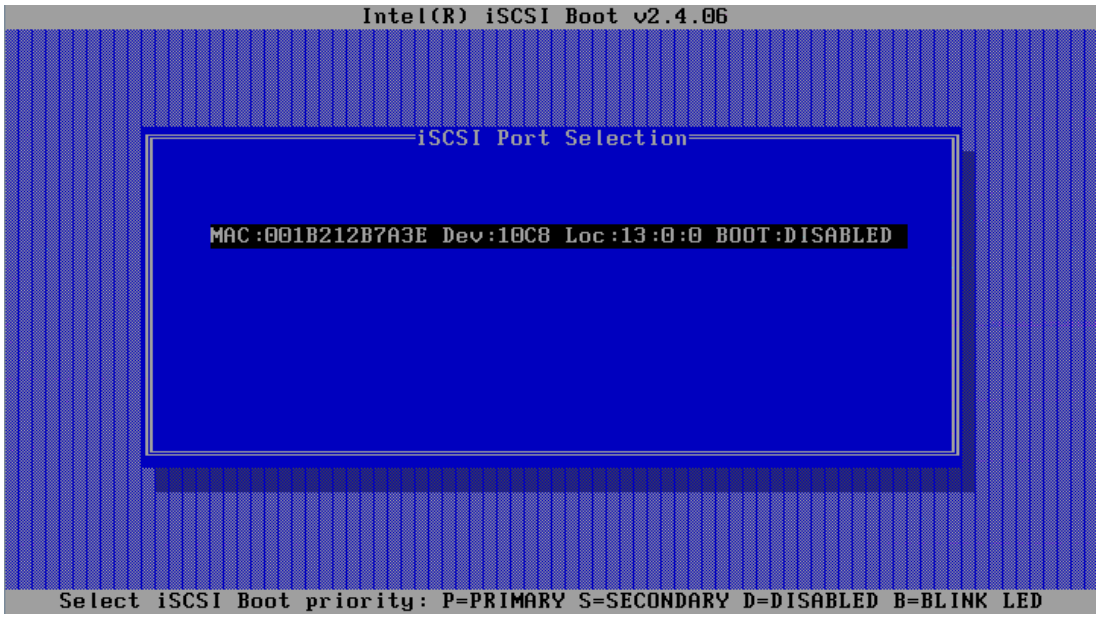
Set iSCSI Boot Configuration on the NIC

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

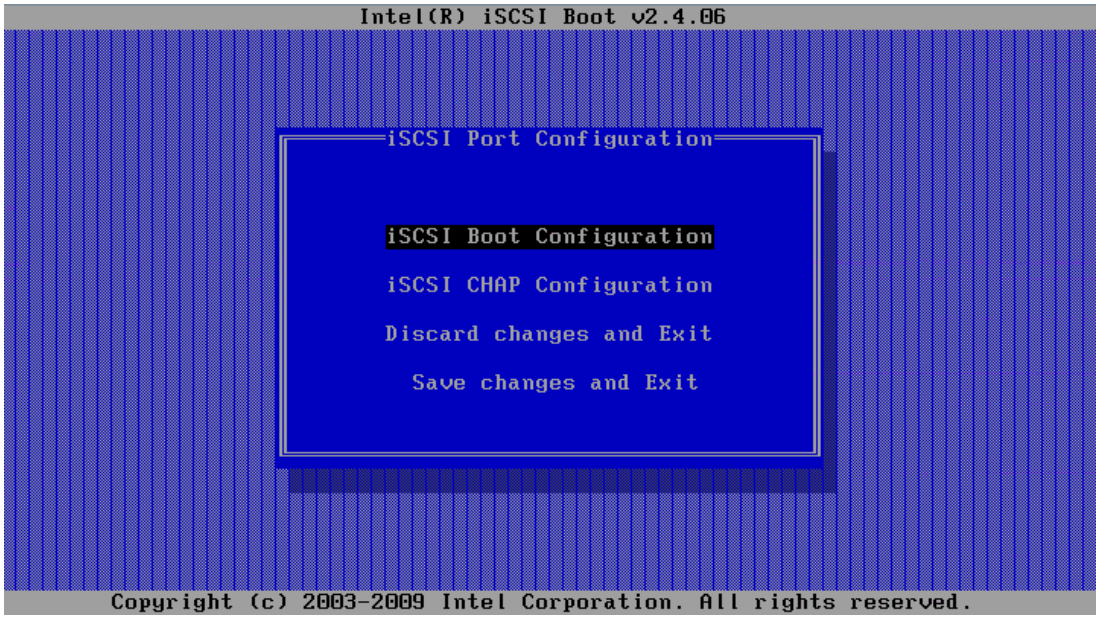
1. On server restart, press <Ctrl-D> when prompted for the iSCSI Remote Boot setup:



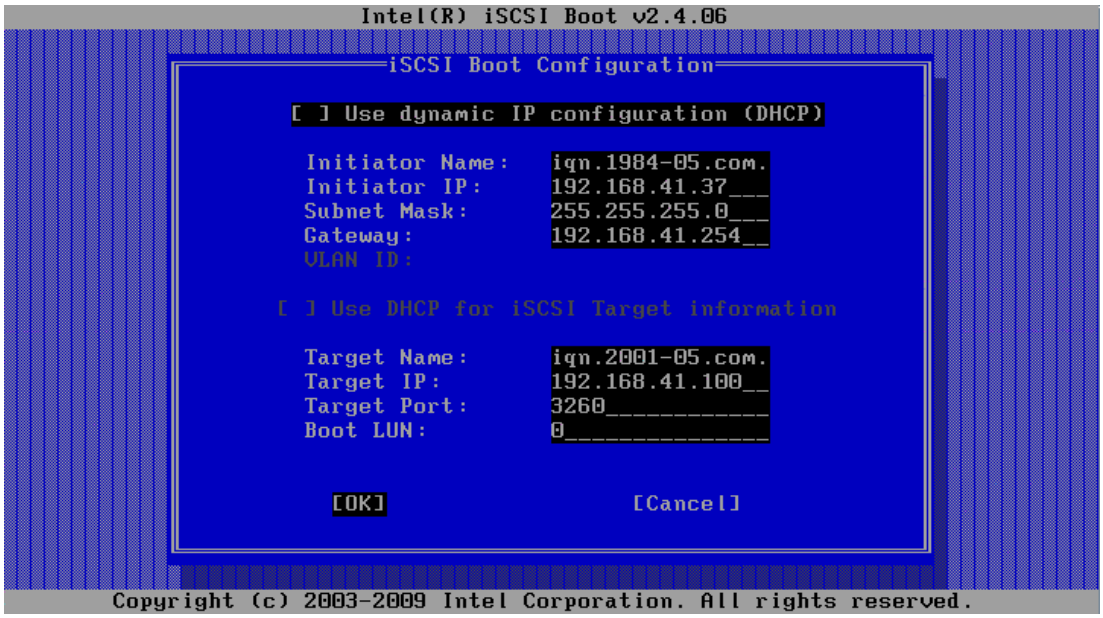
2. Select the MAC address of the NIC on which you want to perform iSCSI Remote boot:



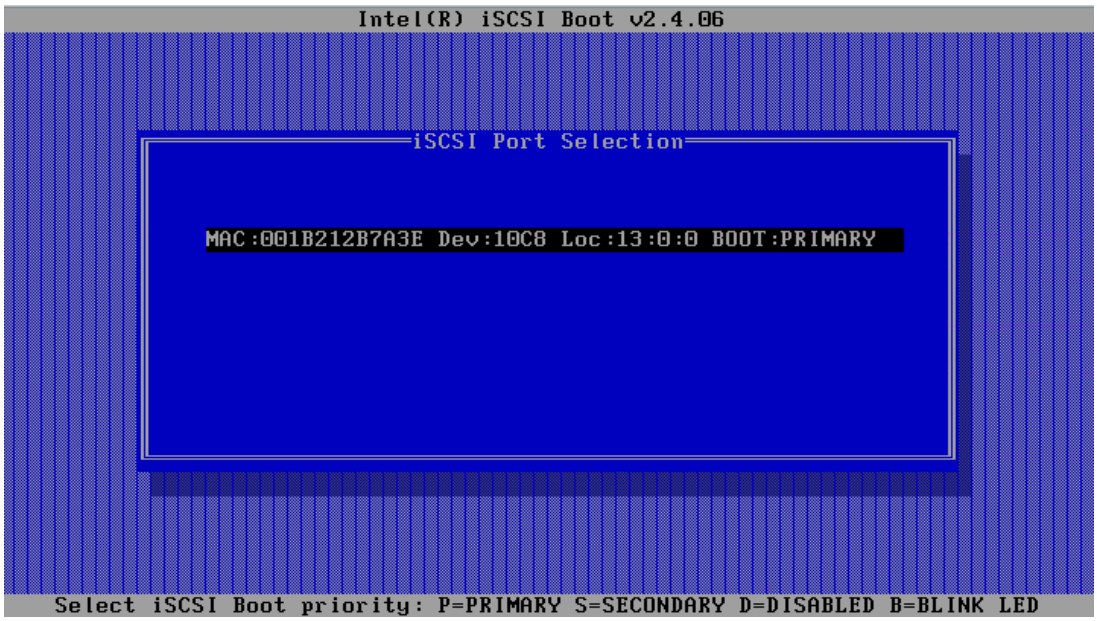
3. Select **iSCSI Boot Configuration**:



4. Enter the **Initiator Name**, the **Target Name**, and the IP information. Then select **OK**:



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 <ESC> to exit the Intel iSCSI Remote Boot setup. The NIC should try to connect immediately to the specified target. Ensure that you receive a LUN header from the target showing successful login.

7. Continue with the Windows installation.

Installing Windows Server 2008 or 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.

Extract NIC Drivers for Later Use If Necessary

You will first need to extract the Broadcom NetXtreme Virtual Bus Driver (VBD) and the Network Driver Interface Specification (NDIS) drivers or the 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.

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 restart the server.
2. Insert the Windows Server 2008 or 2008 R2 DVD in the DVD drive.
3. Press any key when prompted to boot from the DVD.

   The **Install Windows** dialog box appears.
4. Select the appropriate **Language**, **Time**, and **Keyboard** options.
5. Click **Next**, and then click **Install Now** to continue the installation.

   The **Operating System Selection** page appears.
6. Select **Full Installation** and click **Next** to continue.

   The **License Agreement** screen appears.
7. Read the license agreement and select **I accept the license terms** to continue with the installation. Click **Next**.

   The **Installation Type** page appears.
8. Select **Custom**.

9. Determine if the target LUN is available in the list of drives. If the target LUN is available, proceed to step 15.

10. Insert the removable media containing the drivers for the NIC (Intel PRO Network device or Broadcom NetXtreme adapter).

11. Click **Load Driver**. The **Load Driver** dialog box appears.

12. Click **Browse**. The **Browse for Folder** dialog box appears.

13. 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 and the NDIS driver for the Broadcom NetXtreme adapter. If you will be enabling HBA offload mode, then you will need to install the VBD and the Offload iSCSI (OIS) driver.

14. 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 list of drives.

    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. When the installation is complete, installing MDSM will filter out this LUN from Disk Manager.

15. Select the drive and click **Next** to start the Windows installation.

    The Windows installer copies and expands files and installs features and updates.

    When the installation is complete, the server restarts.

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 restarts:

    a. Press <Ctrl-K> to access the iSCSI Configuration Utility.
    b. Select the **General Parameters** option and make sure that **Boot to iSCSI Target** is enabled.
    c. Press <ESC> to exit the Broadcom menus and save the configuration when prompted.

    The system then boots from the iSCSI LUN and completes the Windows setup.

17. Restart the system and log in to the operating system.

18. 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**.

19. If the system will require configuration of redundant iSCSI paths to the boot image LUN, or if you will be configuring multi-path I/O, 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, install the Host Integration Toolkit.[3]
    - If you are using a PowerVault MD3000i storage array, install the Dell PowerVault MDSM software[4].

20. If you enabled the Hyper-V role, then the primary BFi LAN On Motherboard (LOM) or NIC will be restricted automatically 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 avoid the selection of that adapter manually when creating virtual networks.

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.

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 see your iSCSI target array user documentation for supported redundant path configurations.

1. Turn on or restart the server.

   NOTE: If you are *not* configuring a LOM, skip to step 8.

2. Press <F2> to enter BIOS Setup during POST.

3. Select **Integrated Devices** and press <Enter>.

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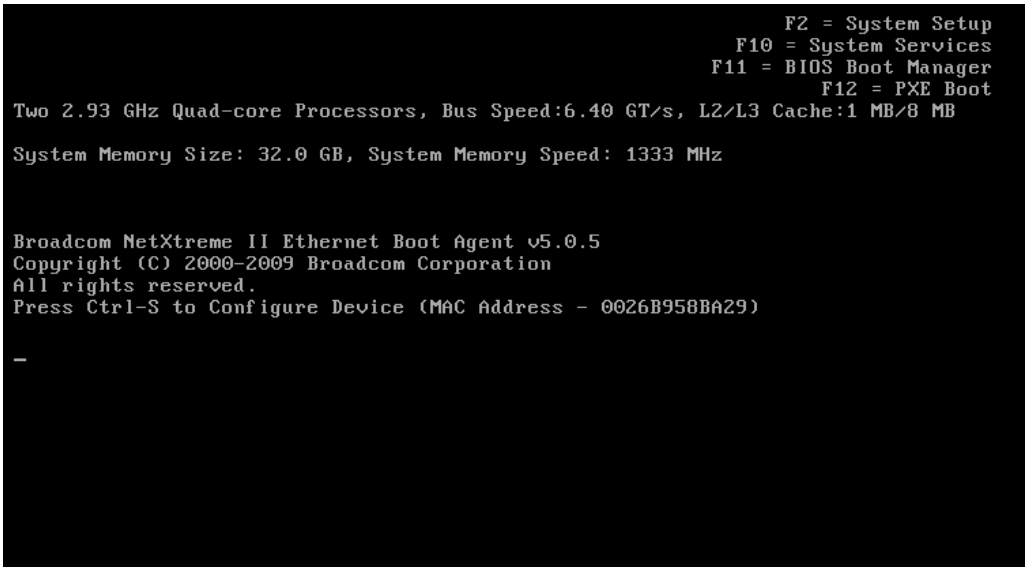
[3] http://www.equallogic.com/resourcecenter/assetview.aspx?id=8933
[4] http://support.dell.com/support/edocs/systems/md3000i/en/index.htm

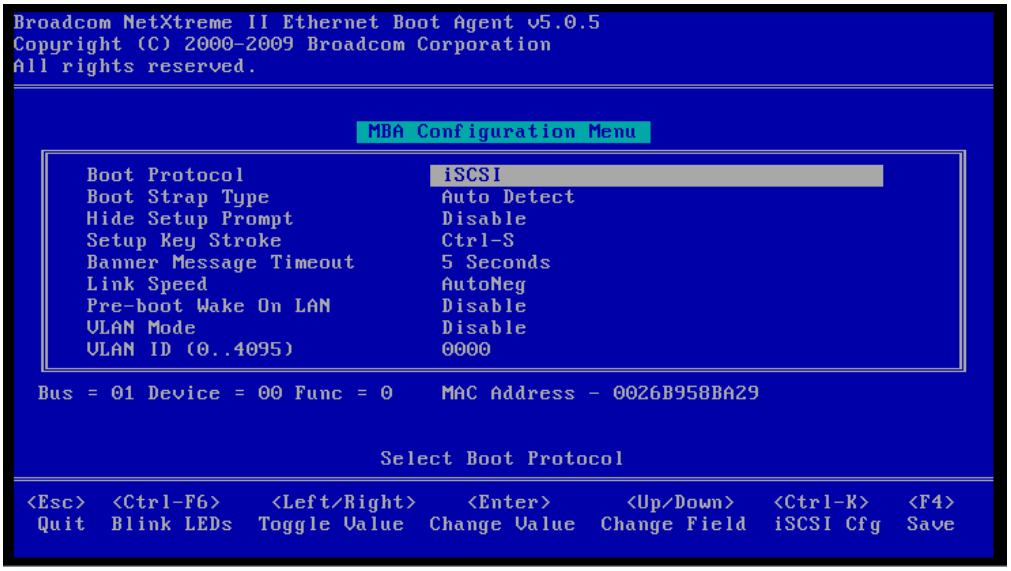
4. In the **Integrated Devices** menu, ensure that the desired additional NIC is set to use the **Enabled with iSCSI Boot** setting.
5. Press <ESC> to exit the **Integrated Devices** menu.
6. Press <ESC> to exit BIOS Setup. The **BIOS exit** menu appears.
7. Select **Save Changes** and **Exit** to exit BIOS Setup.

   NOTE: Ensure that all USB flash drives are removed from the system before proceeding.

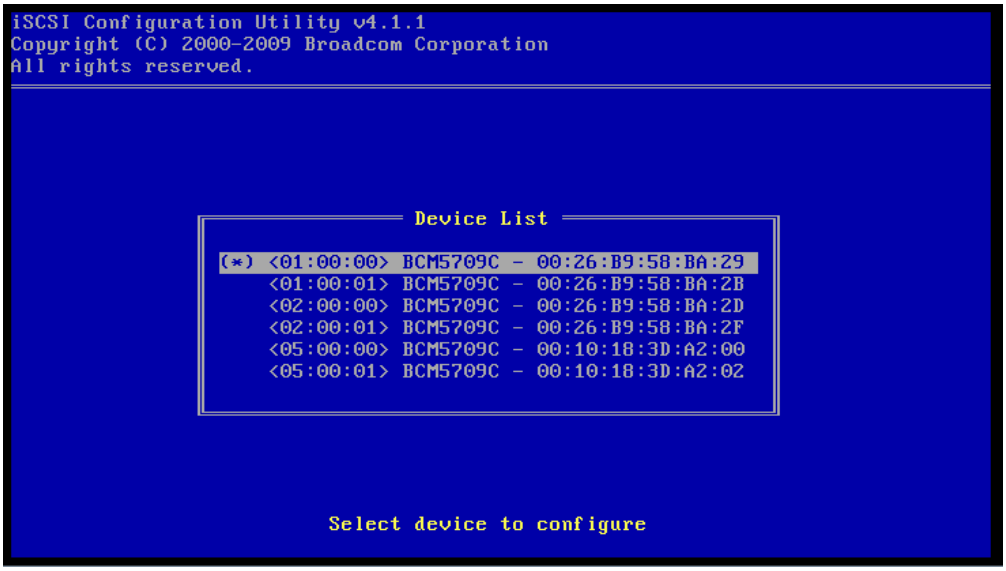
8. In the Broadcom Boot banner, press <Ctrl-S> to enter the LOM/NIC option ROM:



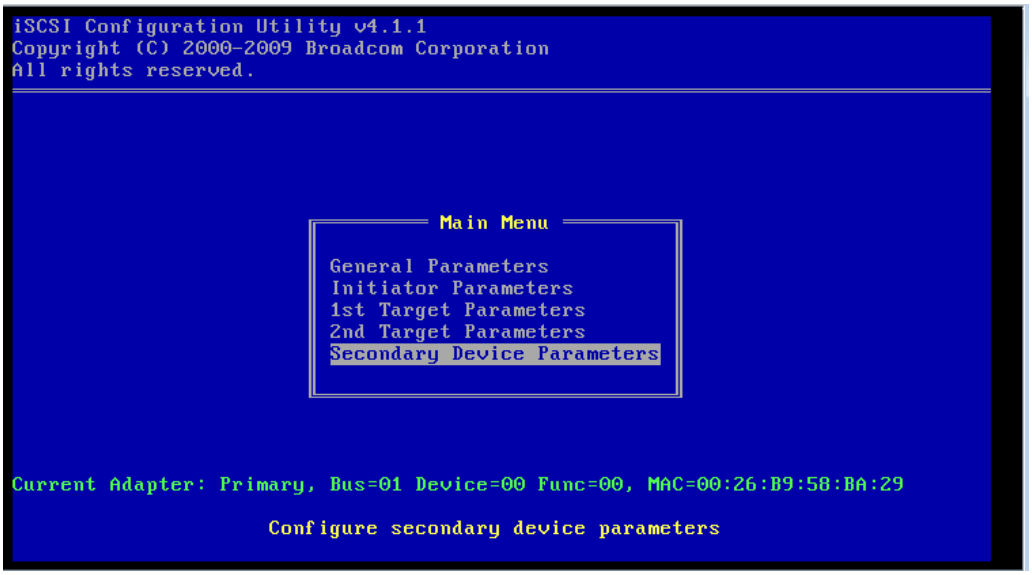
9. In the **MBA Configuration** menu, press <Ctrl-K>:



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

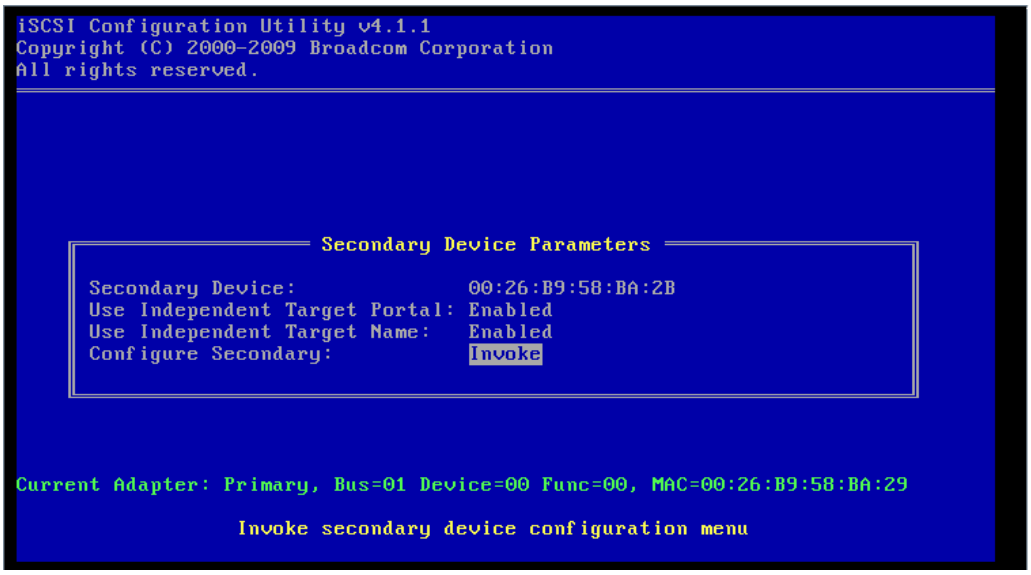


11. In the **Main Menu**, select **Secondary Device Parameters**.



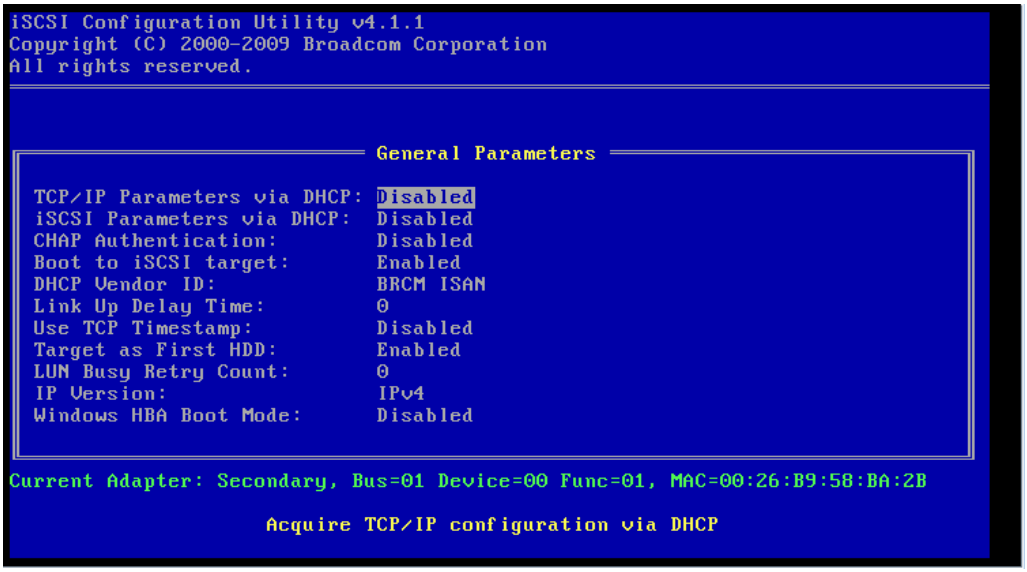
12. Press <Enter> to display a list of available secondary adapters, and then select the MAC address of the adapter chosen.

13. In the **Secondary Device Parameters** screen, set **Use Independent Target Portal** mode as **Enabled** and set **Use Independent Target Name** as **Enabled**. Then, select **Invoke** to configure the secondary adapter.



14. In the **Main Menu**, select **General Parameters** and then 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)



NOTE: You must ensure 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 OIS to boot, set **Windows HBA Boot 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*.

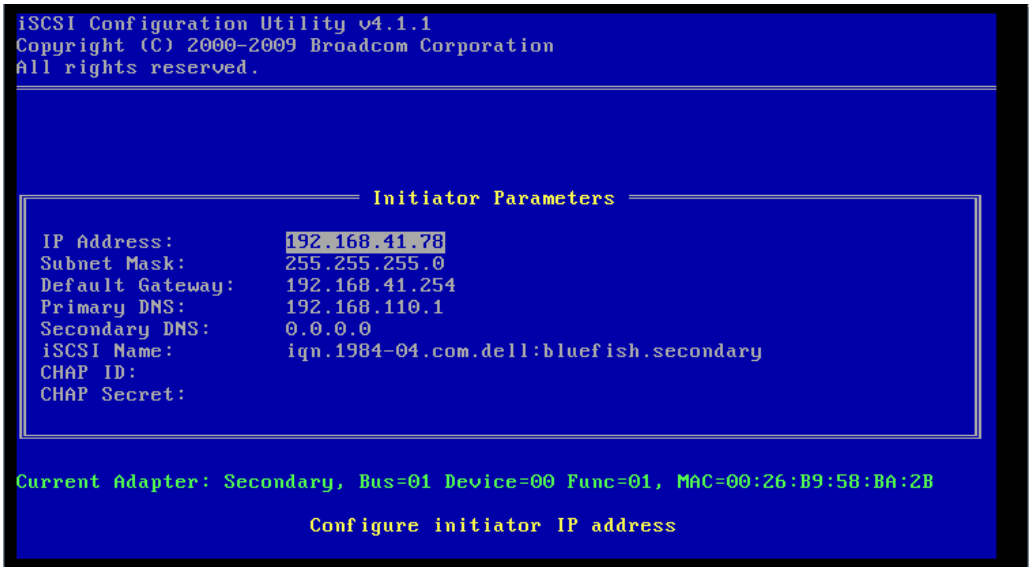
NOTE: To use DHCP for dynamically-assigned settings, set the TCP/IP and the iSCSI parameters through DHCP to **Enabled**. For additional information, see the *Broadcom NetXtreme Family of Adapters User's Guide*.

NOTE: Do not enable CHAP at this time. It is recommended that you configure advanced features after the connection between the host and target is established.

15. Press <ESC> to return to the **Main Menu**.

16. Configure the following values for Initiator Parameters:

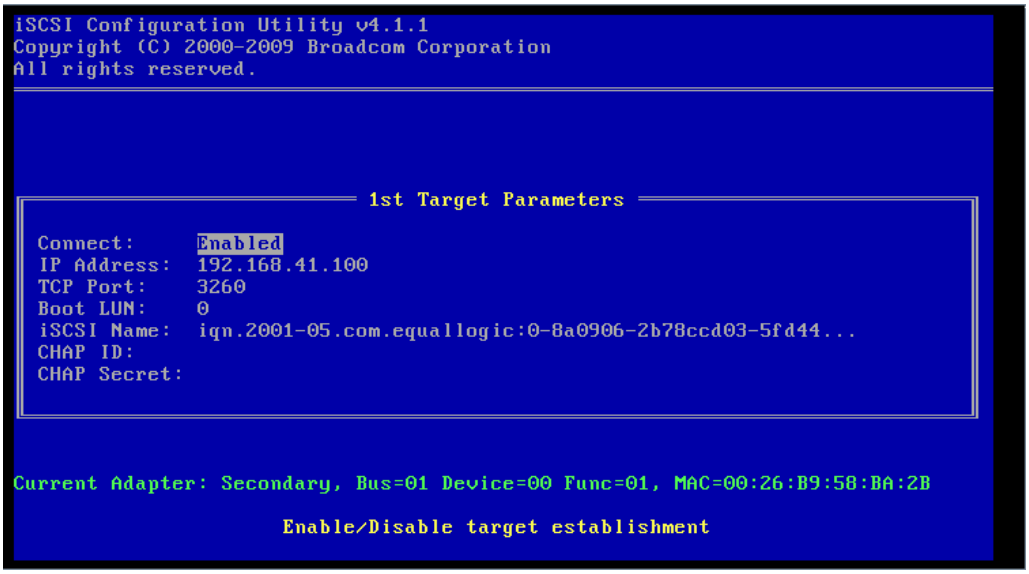
- IP Address
- Subnet Mask
- Default Gateway
- Primary DNS (optional)
- Secondary DNS (optional)
- iSCSI Name (the iSCSI initiator name to be used by the client system)



17. Press <ESC> to return to the **Main Menu**.
18. In the **Main Menu**, select **1st Target Parameters** and change as follows:

- Connect to **Enabled**
- IP Address to **Target IP Address**
- TCP Port and Boot LUN (if different from default settings)
- iSCSI Name to **IQN name of Target**

  NOTE: Do not configure anything under **2nd Target Parameters**.



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 the Windows configuration steps in ”Windows Configuration” on page 34.

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. Also, see your iSCSI target array user documentation for supported redundant path configurations.

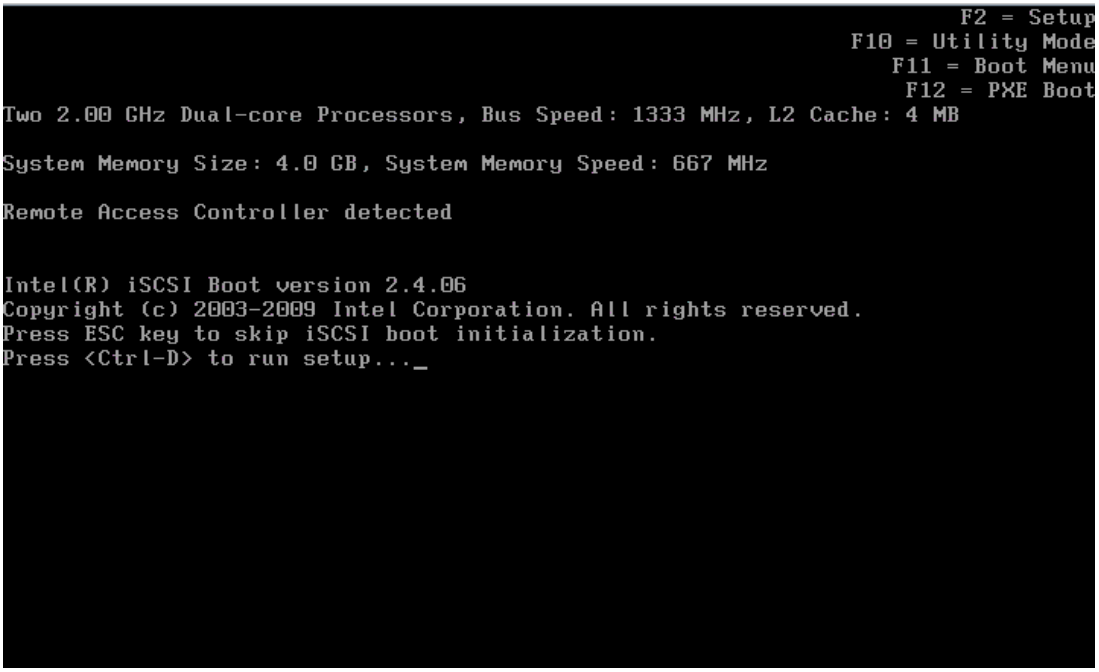
1. Turn on or restart the server.

   NOTE: If you are *not* configuring a LOM, skip to step 8.

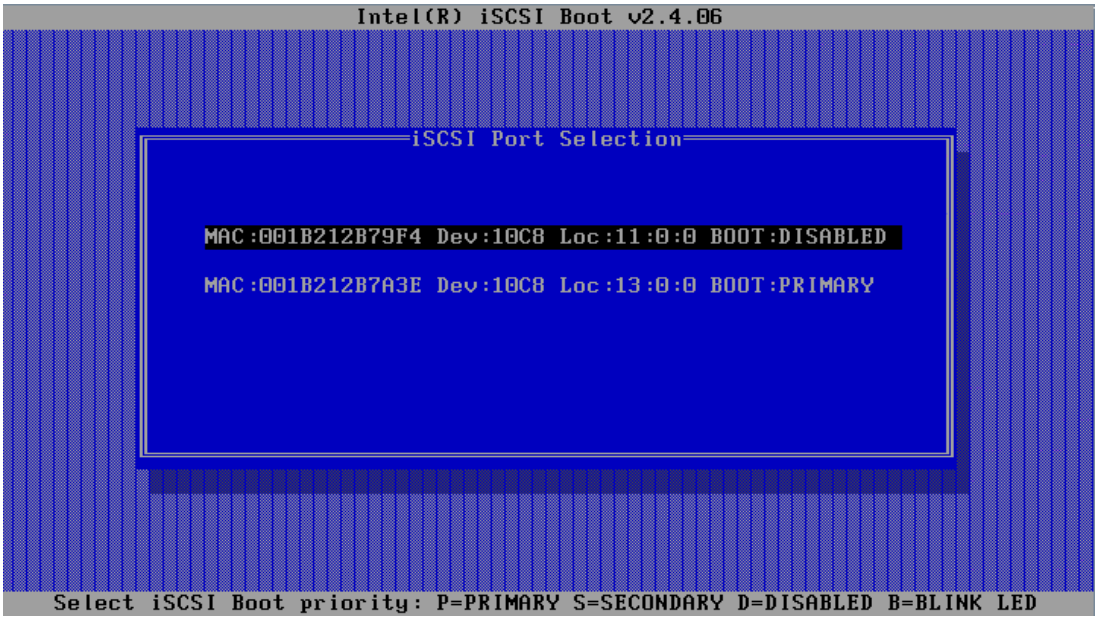
2. Press <F2> to enter BIOS Setup during POST.
3. Select **Integrated Devices** and press <Enter>.
4. In the Integrated Devices menu, ensure that the desired additional NIC is set to use the **Enabled with iSCSI Boot** setting.
5. Press<ESC> to exit the **Integrated Devices** menu.
6. Press <ESC> to exit BIOS Setup. The **BIOS exit** menu appears.
7. Select **Save Changes** and **Exit** to exit BIOS Setup.

   NOTE: Ensure that all USB flash drives are removed from the system before proceeding.

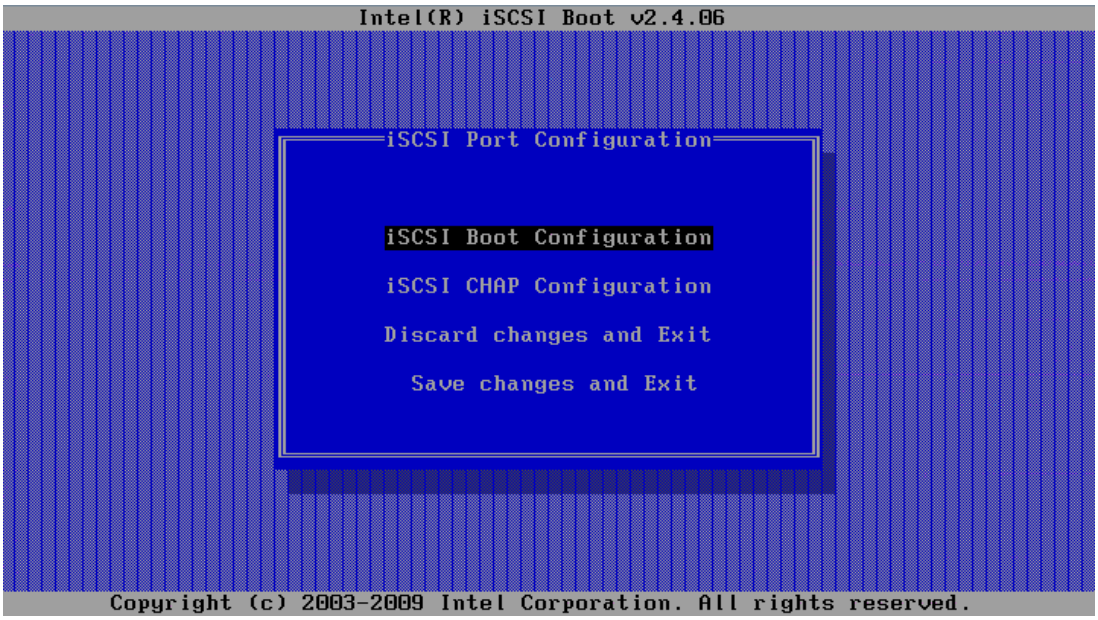
8. In the Intel Boot banner, press <Ctrl-D> to enter the NIC option ROM:



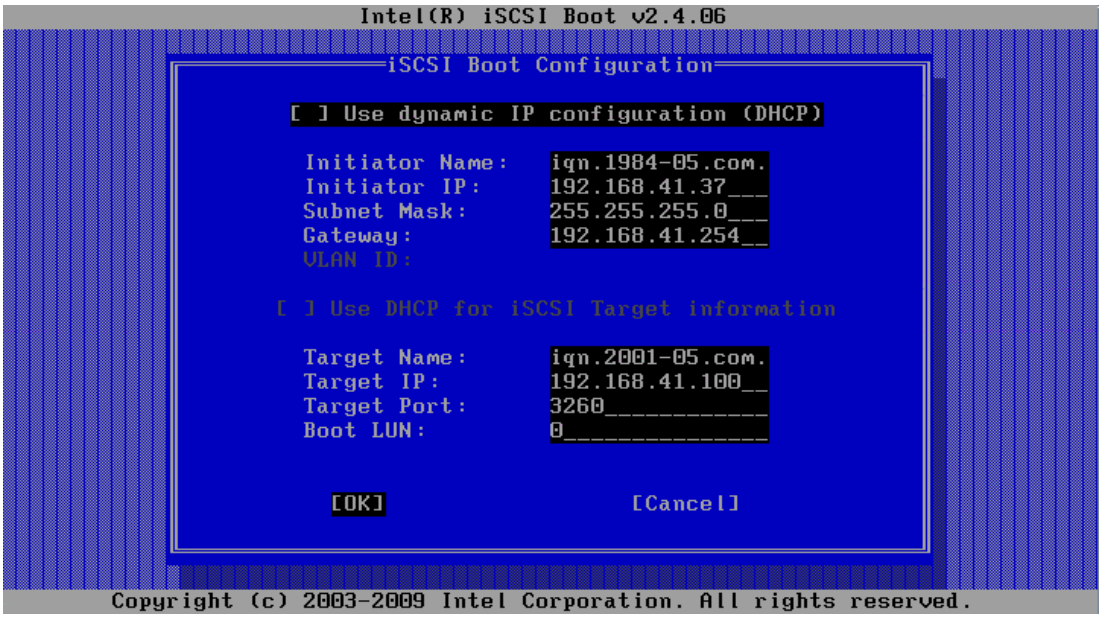
9. Select the disabled adapter and press <Enter>:



10. In the **iSCSI Port Configuration** menu, select **iSCSI Boot Configuration**:



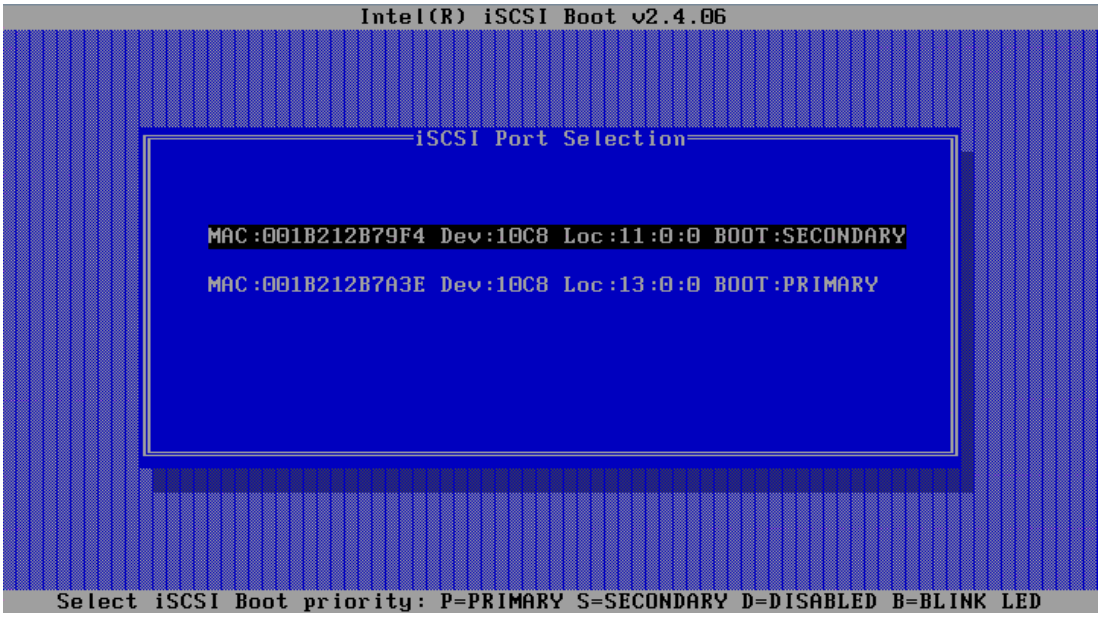
11. Enter the Secondary Initiator name, the Target name, and the Target IP information, then select **OK**:



NOTE: Ensure 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.

Windows Configuration

When the redundant boot paths are created using the preceding process, the server will boot as long as one of the paths is available at boot time. To ensure path redundancy after the operating system 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 you are prompted to start it. Answer **Yes** to the prompt, as well as to the follow-on question to add an exception to the Windows Firewall.

- In Windows 2008 and 2008 R2, the MPIO software is considered an optional component. Using Server Manager, add the Multi-path I/O feature. This addition will require a system restart 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

Troubleshooting

If the 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 the *Intel PRO Family of Adapters User's Guide* or in the *Broadcom NetXtreme Family of Adapters User's Guide* and under **Network** on the Dell Support website at **support.dell.com/manuals**.

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 the indication is that the initiator connection has been made to a controller that does not own the LUN.

Configuration Worksheet

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

<table>
<tr><td colspan="2">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/.</td></tr>
<tr><td colspan="2">IQN:</td></tr>
<tr><td>Primary Boot NIC</td><td>Secondary Boot NIC (optional)</td></tr>
<tr><td>IP Address:</td><td>IP Address:</td></tr>
<tr><td>Subnet Mask:</td><td>Subnet Mask:</td></tr>
<tr><td>Gateway:</td><td>Gateway:</td></tr>
<tr><td>Slot Location:</td><td>Slot Location:</td></tr>
<tr><td colspan="2">Dell Storage Array (Target)</td></tr>
<tr><td colspan="2">IQN:</td></tr>
<tr><td colspan="2">iSCSI Port:</td></tr>
<tr><td colspan="2">LUN Number:</td></tr>
<tr><td>Primary iSCSI port:</td><td>Secondary iSCSI port: (optional)</td></tr>
<tr><td>IP Address:</td><td>IP Address:</td></tr>
</table>