Applications Note

iSCSI Boot Setup

iSCSI Boot Configuration Example Used in this Applications Note

iSCSI Initiator	iSCSI Target
Windows Server® 2003	Linux®

1
Release Overview

This applications note uses the products listed in Table 1-1.

Table 1-1. Products Affected

ASIC	NX3031
Product	QLE3044: low-profile card with 4-GbE ports QLE3142-LR/SR: dual port 10GbE with SFP+ optical interface QLE3142-CU: dual port 10GbE with copper twinax cabling
PCI Express® Interface	PCI Express 1.1 and PCI Express 2.0 x4 support on QLE3044 x8 support on QLE3142-LR/SR/CU
1GbE/10GbE Interface	Quad port 1GbE or dual port 10GbE
Software Release	QLogic version 4.0.229 and later
Product Support	www.qlogic.com

2
Prerequisites

The validated platforms in this document were used for iSCSI boot using a server running RHEL5.2 64-bit as the iSCSI boot target configured with iSCSI target and DHCP servers running on the same system.

The iSCSI boot initiator was configured on the Windows Server 2003 operating system (OS) with a 32-bit image that was installed and configured specifically for that system and will be used as the iSCSI boot initiator. Other Linux® distributions or OS versions might require different procedures that are not documented in this applications note.

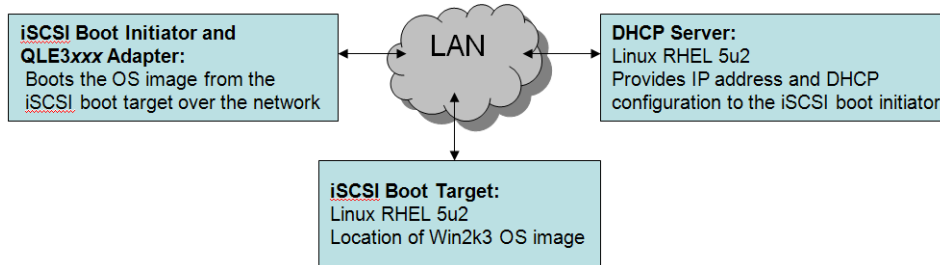An example configuration is illustrated in the following figure.

Table 2-1 lists other valid iSCSI boot configurations not shown in this applications note.

Table 2-1. Other Valid iSCSI Boot Configurations

iSCSI Initiator	iSCSI Target
Linux Server	Windows Server
Linux Server	Linux Server
Windows Server	Windows Server
Linux Server	Appliance
Windows Server	Appliance

2.1
iSCSI Boot Target Requirements

The iSCSI boot target requirements are listed in Table 2-2.

Table 2-2. iSCSI Boot Target Requirements

Services	Required/Optional
dhcp server	Required
iSCSI Enterprise target	Required
Red Hat® 5.2 x86_64 Install DVD	Optional

These services can be installed from the appropriate packages with the Linux Package Manager, or by searching for the appropriate packages for each Linux distro.

2.2
iSCSI Boot Initiator Requirements

The iSCSI boot initiator requirements are listed in Table 2-3.

Table 2-3. iSCSI Boot Initiator Requirements

Programs	Required/Optional
Windows Server 2003 32-bit Install CD	Required
Microsoft® iSCSI initiator	Required

Microsoft packages can be retrieved from Microsoft's Web site.

2.3
Validated Components

The components in Table 2-4 have been validated for the iSCSI boot procedure.

Table 2-4. Validated Components

QLogic Driver	Refer to the Release Notes for the latest version.
QLogic Firmware	Refer to the Release Notes for the latest version.
DHCP server	V3.0.5-Red Hat (inbox)
iSCSI Enterprise Target	Version 0.4.16
MSFT iSCSI Initiator	Version 2.0.6

2.4
Overview

An overview of the steps required to set up an iSCSI boot initiator and an iSCSI target server is described in this section.

The example in this applications note uses Windows Server 2003 for the iSCSI initiator and Linux RHEL5u2 configured with the iSCSI target.

See Appendix A for an example on how to set up the DCHP server.

Linux PXE on server and initiator systems. Most of these steps are explained in detail in the following sections.

1. Configure DHCP service to be enabled and to start when the system boots.

    If you need more information, see the QLogic document *Setting Up a Linux PXE Server* (part number FE0051401-00), specifically the *Configure the DHCP Service* section.

2. Install and configure the iSCSI enterprise target on the iSCSI boot target system.

3. Install and configure the iSCSI boot initiator system's QLogic driver and registry specifically for booting through iSCSI.

4. Install and configure the Microsoft iSCSI initiator on the iSCSI boot initiator system.

5. Create and modify the iSCSI boot initiator's iSCSI boot image that contains Windows and grub partition, and then place it onto the iSCSI boot target system.

6. Modify the iSCSI boot target's DHCP setting to support the boot image through iSCSI.

3
Set Up the iSCSI Enterprise Target on the iSCSI Boot Target System

1. From a server running RHEL5u2 x86_64 OS, retrieve the `iscsitarget-0.4.16.tar.gz` package from http://sourceforge.net/project/showfiles.php?group_id=108475

2. Build and install the package by typing the following commands:

   a. **`# tar zxf iscsitarget-0.4.16.tar.gz`**

   b. **`# cd iscsitarget-0.4.16`**

   c. **`# make`**

   d. **`# make install`**

3. Reboot the system to unload any older versions of the iSCSI target, and then restart with the latest version built from the previous steps.

4. Modify the iSCSI configuration file. Use a text editor to modify the `/etc/ietd.conf` file as follows:

   a. Customize the "Target" name for the system. For example:

   ```
   Target iqn.2008-10.com.apps4167:storage.disk2
   ```

   b. Modify the line with the LUN information to have the path for the iSCSI boot image to be used by typing:

   ```
   Lun 0 Path=/var/ftp/pub/iscsi/test.img,Type=fileio
   ```

   c. Uncomment the following lines from the `/etc/ietd.conf` file.

   ```
   MaxConnections          1
   InitialR2T Yes
   ImmediateData           No
   MaxRecvDataSegmentLength 8192
   MaxXmitDataSegmentLength 8192
   MaxBurstLength          262144
   FirstBurstLength        65536
   DefaultTime2Wait        2
   DefaultTime2Retain      20
   MaxOutstandingR2T       8
   DataPDUInOrder          Yes
   DataSequenceInOrder     Yes
   ErrorRecoveryLevel      0
   HeaderDigest            CRC32C,None
   DataDigest              CRC32C,None
   various target parameters
   Wthreads                8
   ```

5. Type the following command so that the `iscsi-target` service will be turned on when the system reboots.

```
# chkconfig --level 345 iscsi-target on
```

6. Restart the `iscsi-target` service by typing:

```
# service iscsi-target restart
```

4
Install and Pre-configure Windows Server 2003 on the iSCSI Boot Initiator System

1. Install Windows Server 2003 (32-bit) onto the server that will be the iSCSI boot initiator. Be sure to properly allocate the size of the partition to be used for this Windows installation so that it can be *imaged* to a file and can be stored on the iSCSI boot target system's hard disk drive (HDD).

   Optional: if the hard drive for the iSCSI boot initiator will also contain a Linux partition to assist with extracting the bootable image, make sure that there is enough space to hold the base Linux install and the size of the Windows partition (which could be as small as 3GB), plus the `grub.conf` file (typically 100MB).

   If you are using a dual boot HDD, edit the `/etc/grub.conf` file to select the default boot image to be the Windows partition. This step makes it easier to boot directly to Windows Server.

2. Install the latest QLogic drivers. For more details, see the *QLE3xxx Series Intelligent Ethernet Adapters Users Guide* (part number NE0154601-00). Configure the interface with the appropriate IP address if a DHCP server is not being used.

5
Load and Configure the Microsoft iSCSI Boot Initiator on the Initiator System

1. Download the appropriate version of Microsoft iSCSI initiator with boot support for the initiator system from one of the following links:

   - Microsoft iSCSI initiator 2.06 for x86 checked debug version:
     http://download.microsoft.com/download/9/6/8/968031d1-6e4b-47f3-9faa-cb43825f93f0/Initiator-2.06-boot-build3497-x86chk.exe

   - Microsoft iSCSI initiator 2.06 for x86:
     http://download.microsoft.com/download/9/6/8/968031d1-6e4b-47f3-9faa-cb43825f93f0/Initiator-2.06-boot-build3497-x86fre.exe

   - Microsoft iSCSI initiator 2.06 for x64 checked debug version:
     http://download.microsoft.com/download/9/6/8/968031d1-6e4b-47f3-9faa-cb43825f93f0/Initiator-2.06-boot-build3497-x64chk.exe

   - Microsoft iSCSI initiator 2.06 for x64:
     http://download.microsoft.com/download/9/6/8/968031d1-6e4b-47f3-9faa-cb43825f93f0/Initiator-2.06-boot-build3497-x64fre.exe

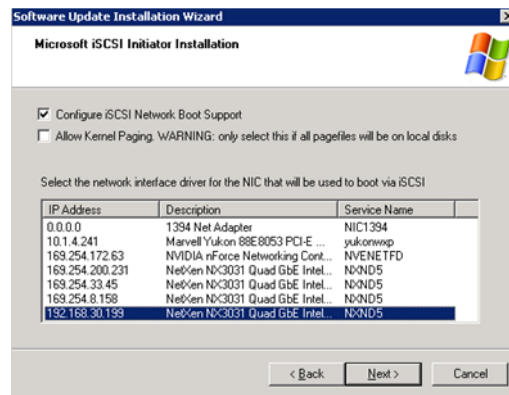2. Copy the downloaded installation executable to the system.

3. Double-click the installation executable. The Software Update Installation Wizard dialog box displays.
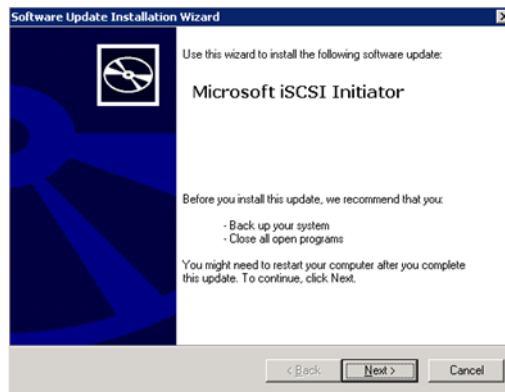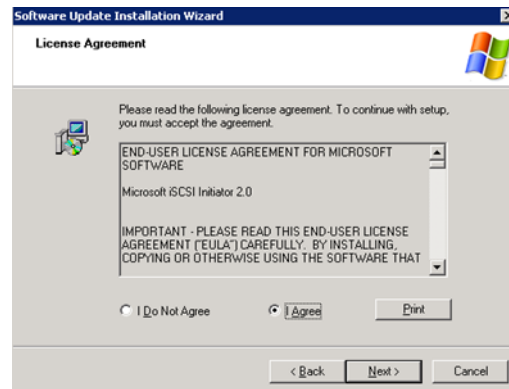

4. Click **Next**. The following dialog box opens.
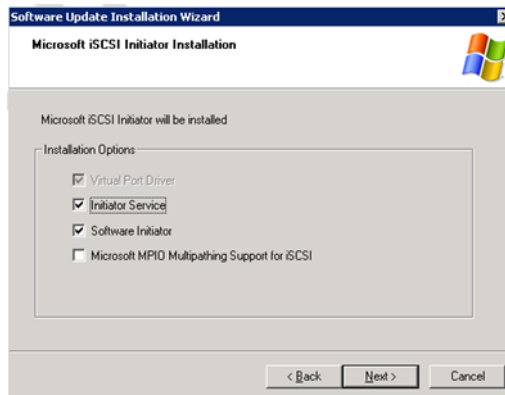
5. Click **Next**. The following dialog box opens.

6. Select **Configure iSCSI Network Boot Support**, and then click the IP address on the port of the network card from which to boot iSCSI. Finally, click **Next**. The following dialog box opens:
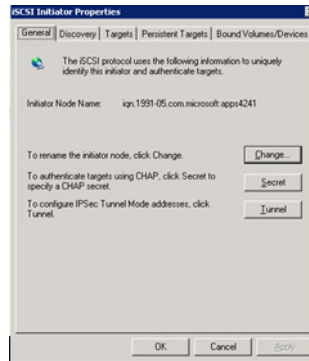
7. Read the information. Select **I Agree**, and then click **Next** to complete the installation. After installation completes, the following dialog box opens.
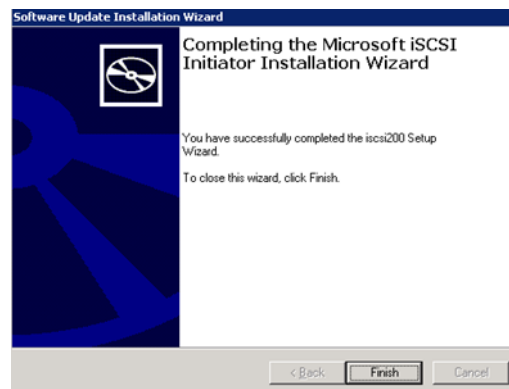
8. Click **Finish**.

9. Reboot the system to enable the iSCSI initiator.

10. Launch the Microsoft iSCSI initiator by double-clicking the shortcut from the desktop. The iSCSI Initiator Properties dialog box opens.
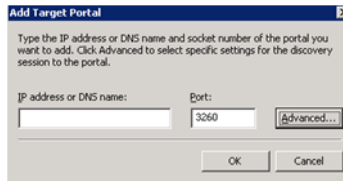

11. Click the **Discovery** tab. The iSCSI target should be listed under **Target Portals**.
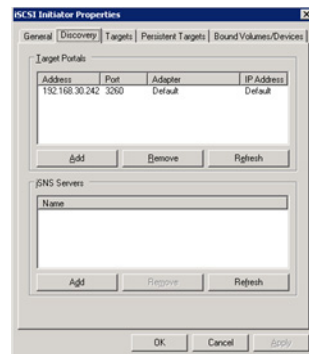
If the target is not present, then try one of these options:

■ Click **Refresh** under the **Target Portals** section.

■ Click **Add** under the **Target Portals** section to manually configure the iSCSI target. The Add Target Portal dialog box opens.

❑ Click **Advanced**. The Advanced Settings dialog box opens.
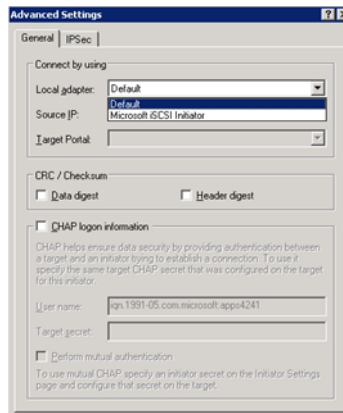
❑ Select **Microsoft iSCSI Initiator** from the **Local adapter** list.

❑ Select the IP address for the QLogic Intelligent Ethernet adapter from the **Source IP** list.

❑ Click **OK**.

❑ From the Add Target Portal dialog box, enter the IP address for the system running the iSCSI target.
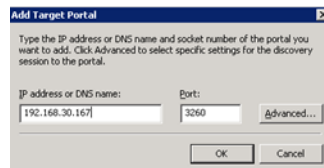

■ If the target still does not appear, refer back to "Set Up the iSCSI Enterprise Target on the iSCSI Boot Target System" on page 4 to determine if the iSCSI target is running correctly.

12. Click the **Targets** tab on the iSCSI Initiator Properties dialog box to find the iSCSI target that will store the boot image. If the status is **Inactive**, then click **Log On**.


The Log On to Target dialog box opens.
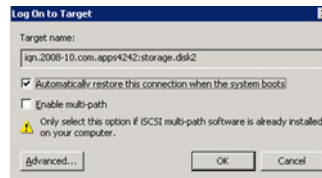
13. Select **Automatically restore this connection when the system boots**, and then click **OK** to complete the log on process.

The target's status should change from **Inactive** to **Connected**.

14. Verify that the iSCSI target can be seen from the system that has been configured with the iSCSI initiator. From the desktop, right-click **My Computer**, and then click **Manage**.

The Computer Management window opens.
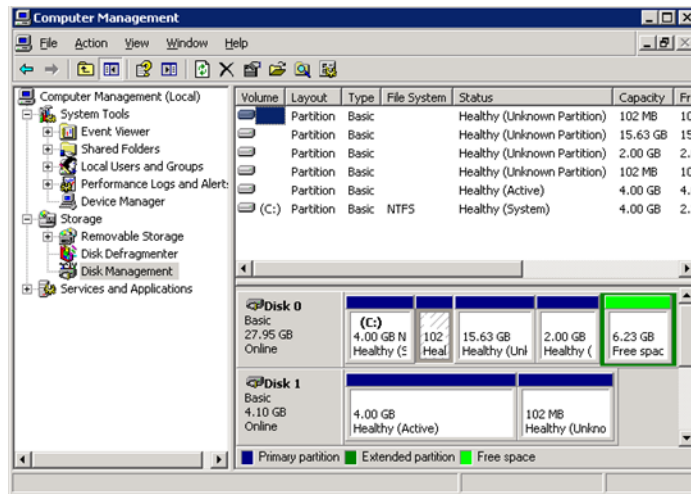
a. Click **Storage** from the left pane, and then click **Disk Management**. Look for a disk other than Disk0. This disk will be 4GB in size; it may also show the 102MB size for the Linux GRUB if the image on the HDD that this iSCSI boot target had contained a dual boot image for Windows Server 2003 and Linux.

6
Create the iSCSI Boot Image from the HDD

1. Shut down the Windows Server 2003 system running the iSCSI boot initiator. Remove the HDD that has the partition containing the Windows Server 2003 OS created from Section 4 and Section 5.

   a. Install the HDD as a secondary drive onto a system capable of running RHEL5u2.

   b. Boot up the RHEL5u2 system and follow the next steps to create an image of the Windows Server 2003 OS to use for iSCSI boot.

2. After the Linux OS boots up, check the HDD to determine the size of the Windows Server 2003 OS partition to extract.

   a. To determine the appropriate area on the HDD, type the following command:

   `# fdisk –l`

   Example output:

   ```
   Disk /dev/sda: 36.4 GB, 36401479680 bytes
   255 heads, 63 sectors/track, 4425 cylinders
   Units = cylinders of 16065 * 512 = 8225280 bytes


      Device Boot      Start         End      Blocks   Id  System
   /dev/sda1   *           1         487     3911796    7  HPFS/NTFS
   ```

   b. Type the following command, using the information from `fdisk`, to extract an image to use for booting:

   `# dd if=/dev/sda of=<Hostname>_iSCSI_boot_<OS_ver>.img bs=8225280 count=487`

3. Copy the iSCSI boot image to the iSCSI boot target system. The file location should be based on the setup of the `tftp` server. In this example, the file is in `/var/ftp/pub/iscsi/test.img`.

4. Restart the `iscsi-target` service by typing:

```
# service iscsi-target restart
```

This step is required when changing `test.img` from one image to another, since the prior image may be cached.

5. Modify the DHCP server configuration file to support the iSCSI target. The required changes in the following steps are in ***bold, italic*** text.

a. Edit the `/etc/dhcpd.conf` file as follows:

```
ddns-update-style interim;
subnet 192.168.30.0 netmask 255.255.255.0 {
        range 192.168.30.150 192.168.30.199;
        default-lease-time 3600;
        max-lease-time 4800;
        option routers 192.168.0.1;
        option domain-name-servers 192.168.0.1;
        option subnet-mask 255.255.255.0;
        option domain-name "apps.net";
        option time-offset -8;
        next-server 192.168.30.242;
        filename "";
        option root-path
"iscsi:192.168.30.242::::iqn.2008-10.com.apps4242:storage.disk2";
}
host apps {
        hardware ethernet 00:0E:1E:01:09:FA;
        fixed-address 192.168.30.202;
        filename "pxelinux.0";
}
```

b. Restart the DHCP service.

```
# service dhcpd restart
```

7
Configure the iSCSI Boot Initiator System

1. Power up the iSCSI boot initiator system and open the BIOS configuration window.

2. Open the boot setup/options, and then select the QLogic Intelligent Ethernet adapter as the first boot device. The QLogic Intelligent Ethernet adapter should be listed as a gPXE device.

3. Optionally, remove the power connector to the existing HDD so that the boot sequence will not access the HDD.

8
Finish—Boot the iSCSI Boot Initiator System

After the iSCSI boot initiator system starts up and communicates to the iSCSI boot target system, the Windows Server boot-up and login screens should open.

The iSCSI boot initiator system contains all the information up to the point when the OS was extracted and copied onto the iSCSI boot target system.

Subsequent information and changes will now be stored onto the image file located on the iSCSI boot target system.

A
Configure the DHCP Service

A sample of an `/etc/dhcpd.conf` file can be found at `/usr/share/doc/dhcp-3.0.5/dhcpd.conf.sample`. This file can be copied to `/etc/dhcpd.conf`.

Here is an example of a working `/etc/dhcpd.conf` file. Items in **bold** have been customized for this setup.

```
ddns-update-style interim;
subnet 192.168.30.0 netmask 255.255.255.0 {
range 192.168.30.200 192.168.30.254;
default-lease-time 3600;
max-lease-time 4800;
option routers 192.168.0.1;
option domain-name-servers 192.168.0.1;
option subnet-mask 255.255.255.0;
option domain-name "apps.net";
option time-offset -8;
next-server  192.168.30.2;
filename          "pxelinux.0";
}


host apps {
hardware ethernet 00:0e:1e:00:7c:c8;
fixed-address 192.168.30.202;
filename "pxelinux.0";
}
```

1. Ensure that the DHCP service is running on the QLogic's Intelligent Ethernet adapter interface. If there are multiple NICs in the DHCP server system; for example, if there are two onboard NIC ports and the QLogic Intelligent Ethernet adapter, then expect the third interface to be the QLogic interface (`eth2`).

   QLogic recommends editing or creating a file named `dhcpd` under the `/etc/sysconfig` directory that contains the following entry and the interface `[n]` that will be the port to operate the DHCP service.

   ```
   DHCPDARGS=eth[n]
   ```

2. Setup DHCP service to start on each boot, and then run the following command from the Linux prompt:

   ```
   $ chkconfig --level 345 dhcpd on
   ```

Document Revision History
Rev A, June 17 2009
Changes
Initial release