Chelsio T4 Unified Boot for Linux & Windows

Configuration and User's Guide

Chelsio Communications (Headquarters)

370 San Aleso Ave.
Suite 100
Sunnyvale, CA 94085
U.S.A

www.chelsio.com

Tel: 408.962.3600
Fax: 408.962.3661

Chelsio (India) Private Limited

Subramanya Arcade, Floor 3, Tower B
No. 12, Bannerghatta Road,
Bangalore-560029
Karnataka,
India

Tel: +1-91-80-4039-6800

Chelsio KK (Japan)

SHIMA Akasaka Bldg.
Minato-ku, Tokyo
Japan 107-0052

Tel: 03-6234-4353

Sales
For all sales inquiries please send email to sales@chelsio.com

Support
For all support related questions please send email to support@chelsio.com

Document History

Version	Revision Date
1.0.0	05/18/2012
1.0.1	07/30/2012
1.0.2	10/05/2012
1.0.3	16/05/2012
1.0.4	07/31/2013
1.0.5	09/03/2013

TABLE OF CONTENTS

I. Unified Boot Option ROM

1. Introduction

PXE is short for Preboot eXecution Environment and is used for booting computers over an ethernet network using a Network Interface Card (NIC).

This section of the guide explains how to configure and use Chelsio T4 Unified Boot Option ROM which flashes PXE Option ROM onto Chelsio's converged network adapters (CNAs). It adds Network boot functionality.

> ⓘ Note *Currently only Legacy PXE supported.*

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio Adapters that are compatible with Chelsio Unified Boot Option ROM software:

- T420-CR
- T440-CR
- T422-CR
- T420-BCH
- T420-SO-CR
- T440-LP-CR
- T420-LL-CR
- T420-BT
- T404-BT

1.2. Software Requirements

Chelsio Unified Boot Option ROM software requires Disk Operating System to flash PXE ROM onto Chelsio T4 adapters.

1.3. Package Contents

Chelsio Unified Boot Option ROM contains the following:

- **OptionROM**: This directory contains Unified Boot Option ROM image (*cubt4.bin*) and a Legacy T4 Flash Utility (*cfut4.exe*), which can be used to flash Unified Boot Option ROM onto Chelsio's T4 based Converged Network Adapters (CNAs). It also contains Firmware (*t4fw-x.x.xx.x.bin*) and T4 configuration (*t4-config.txt)* files.

- **LinuxDUD:** This directory contains image (*.img*) files required to update drivers for Linux (RHEL and SLES) distributions.
- **WindowsDrivers:** This directory contains network driver packages to be added to WDS server and boot images.
- **docs:** The docs directory contains support documents - README, Release Notes and User's Guide (this document) for the software package.

2. Hardware Installation

1. Shutdown/power off your system.
2. Power off all remaining peripherals attached to your system.
3. Unpack the Chelsio adapter and place it on an anti-static surface.
4. Remove the system case cover according to the system manufacturer's instructions.
5. Remove the PCI filler plate from the slot where you will install the Ethernet adapter.
6. For maximum performance, it is highly recommended to install the adapter into a PCIE x8 slot.
7. Holding the Chelsio adapter by the edges, align the edge connector with the PCI connector on the motherboard. Apply even pressure on both edges until the card is firmly seated. It may be necessary to remove the SFP (transceiver) modules prior to inserting the adapter.
8. Secure the Chelsio adapter with a screw, or other securing mechanism, as described by the system manufacturer's instructions. Replace the case cover.
9. After securing the card, ensure that the card is still fully seated in the PCIE x8 slot as sometimes the process of securing the card causes the card to become unseated.
10. Connect a fiber cable, multi-mode for short range (SR) optics or single-mode for long range (LR) optics, to the 10Gb Ethernet adapter or regular Ethernet cable for the 1Gb Ethernet adapter.
11. Power on your system.
12. Verify if the adapter was installed successfully:
    - On Linux systems, run *lspci* command and you should see a similar output:

```
[root@host~]# lspci | grep –i Chelsio

03:00.0 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller

03:00.1 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller

03:00.2 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller

03:00.3 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller

03:00.4 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller

03:00.5 SCSI storage controller: Chelsio Communications Inc T420-CR Unified
Wire Storage Controller

03:00.6 Fibre Channel: Chelsio Communications Inc T420-CR Unified Wire
Storage Controller

03:00.7 Ethernet controller: Chelsio Communications Inc Device 0000
```

- On Windows systems, follow these steps:
    i. Open **Device Manager** in **Control Panel**.
    ii. Under **Other devices** section, Chelsio adapter should be listed as ***Ethernet Controller.*** If the adapter is not listed, right-click on the system name or click on the **Actions** menu and select ***Scan for hardware changes.***

For Chelsio T4 adapters, the physical functions are currently assigned as:

- Physical functions 0 - 3: for the SR-IOV functions of the adapter
- Physical function 4: for all NIC functions of the adapter
- Physical function 5: for iSCSI
- Physical function 6: for FCoE
- Physical function 7: Currently not assigned

13. Based on the operating system, install the appropriate network driver. Install and load *cxgb4* for Linux systems and *VBD* and *NDIS* for Windows systems.

14. Finally, verify if the card is discovered:
    - For Linux systems, examine the output of *dmesg* and you should see a similar output:

```
eth0: Chelsio T420-CR rev 2 10GBASE-SFP RNIC PCIe x8 MSI-X
0000:04:00.4: S/N: PT18111226, P/N: 110112140D0
```

The above outputs indicate the hardware configuration of the adapters as well as the Serial numbers. As observed by the *x8*, the card is properly installed in an x8 slot on the machine and using MSI-X interrupts.

- For Windows systems, open **Device Manager** again. Expand **Network adapters** section and now Chelsio adapter should be listed.

ⓘ Note   *Network device names for Chelsio's physical ports are assigned using the following convention: the port farthest from the motherboard will appear as the first ethernet network interface. However, for T420-BT adapter, the association of physical ethernet ports and their corresponding network device names is opposite. For this adapter, the port nearest to the motherboard will appear as the first network interface.*

3. Flashing configuration file, firmware & option ROM

Chelsio legacy T4 Flash utility (*cfut4.exe*) is used to program the PXE Option ROM image onto the Chelsio CNAs.

Example # 1: This example assumes you are using a USB flash drive as a storage media for the necessary files. Follow the steps below:

i.   Create a DOS bootable USB flash drive.

ii.   Create *CHELSIO* folder on the USB flash drive.

iii.   If you haven't done already, download Chelsio-Uboot-x.x.x.xx.zip from Chelsio Download
       Center, service.chelsio.com

iv.   Untar the downloaded package and navigate to *OptionROM* folder*.*

v.   Copy all the files and place them in the *CHELSIO* folder created on the USB flash drive.

vi.   Plug in the USB flash drive in the system on which you have the Chelsio T4 CNA.

vii.   Reboot the system and go into the BIOS setup.

viii. Make the USB flash drive as the primary boot device. Save the changes and exit.

ix.   Once the system boots from the USB flash drive, navigate to the *CHELSIO* directory:

```
C:\>cd CHELSIO
```

```
C:\>cd CHELSIO_
```

x.   Run the following command to list all Chelsio T4 CNA's present on the system. The list displays a unique index for each CNA found.

```
C:\CHELSIO>cfut4 -l
```

```
C:\CHELSIO>cfut4 -l

 Chelsio T4 Flash Utility v1.4

 Index  ChelsioAdaptertype    DevId
 =====  ==================    =====
  [0]   T440-CR               4003

C:\CHELSIO>
```

xi.   Delete any previous version of Option ROM flashed on the CNA:

```
C:\CHELSIO>cfut4 -d <idx> -xb -xc
```

Here, `idx` is the CNA index found in step ix (0 in this case)

```
C:\CHELSIO>cfut4 -d 0 -xb -xc

 Chelsio T4 Flash Utility v1.4
 Erasing serial flash ... done
 Erasing serial flash ... done
 Update success!
 Reboot machine for changes to take effect
```

xii. Delete any previous firmware and configuration file using the following command:

```
C:\CHELSIO>cfut4 -d <idx> -xh -xf
```

Here, `idx` is the CNA index found in step ix (0 in this case)

```
C:\CHELSIO>cfut4 -d 0 -xh -xf

 Chelsio T4 Flash Utility v1.4
 Erasing serial flash ... done
 Erasing serial flash ... done
 Update success!
 Reboot machine for changes to take effect
```

xiii. Run the following command to flash the configuration file (*t4-config.txt*).

```
C:\CHELSIO>cfut4 -d <idx> -uh <t4_configuration_file>
```

Here, `idx` is the CNA index found in step ix (0 in this case) and `t4_configuration_file` is the T4 configuration file present in the *CHELSIO* folder.

```
C:\CHELSIO>dir

 Volume in drive C is BOOT
 Volume Serial Number is 180A-BCA0
 Directory of C:\CHELSIO

 .              <DIR>         05-16-12   4:50p
 ..             <DIR>         05-16-12   4:50p
 T4-CON~1 TXT       20,302    05-10-12  12:40p
 T4FW-1~1 BIN      326,144    05-10-12  12:40p
 CFUT4    EXE       44,031    03-30-12   2:22p
 CUBT4    BIN      456,704    05-16-12  11:22a
          4 file(s)       847,181 bytes
          2 dir(s)   3,686,449,152 bytes free

C:\CHELSIO>cfut4 -d 0 -uh t4-con~1.txt

 Chelsio T4 Flash Utility v1.4
 Erasing serial flash ... done
 Flash update successful
```

xiv. Run the following command to flash the firmware (*t4fw-x.x.xx.x.bin*).

```
C:\CHELSIO>cfut4 -d <idx> -uf <t4_firmware>
```

Here, `idx` is the CNA index found in step ix (0 in this case) and `t4_firmware` is the T4 firmware present in the *CHELSIO* folder.

```
C:\CHELSIO>dir

 Volume in drive C is BOOT
 Volume Serial Number is 180A-BCA0
 Directory of C:\CHELSIO

 .              <DIR>         05-16-12  4:50p
 ..             <DIR>         05-16-12  4:50p
 T4-CON~1 TXT       20,302    05-10-12 12:40p
 T4FW-1~1 BIN      326,144    05-10-12 12:40p
 CFUT4    EXE       44,031    03-30-12  2:22p
 CUBT4    BIN      456,704    05-16-12 11:22a
         4 file(s)        847,181 bytes
         2 dir(s)   3,686,449,152 bytes free

C:\CHELSIO>cfut4 -d 0 -uf t4fw-1~1.bin

 Chelsio T4 Flash Utility v1.4
 Erasing serial flash ... done
 Flash update successful
 Update success!
 Reboot machine for changes to take effect
```

xv. Flash the unified option ROM onto the Chelsio CNA, using the following command:

```
C:\CHELSIO>cfut4 -d <idx> -ub cubt4.bin
```

Here, `idx` is the CNA index found in step ix (0 in this case) and `cubt4.bin` is the name of the unified option ROM image file.

```
C:\CHELSIO>dir

 Volume in drive C is BOOT
 Volume Serial Number is 180A-BCA0
 Directory of C:\CHELSIO

.                   <DIR>         05-16-12   4:50p
..                  <DIR>         05-16-12   4:50p
T4-CON~1 TXT           20,302     05-10-12 12:40p
T4FW-1~1 BIN          326,144     05-10-12 12:40p
CFUT4    EXE           44,031     03-30-12  2:22p
CUBT4    BIN          456,704     05-16-12 11:22a
         4 file(s)           847,181 bytes
         2 dir(s)    3,686,449,152 bytes free

C:\CHELSIO>cfut4 -d 0 -ub cubt4.bin

 Chelsio T4 Flash Utility v1.4
 Erasing serial flash ... done
 Flash update successful
 Update success!
 Reboot machine for changes to take effect
```

xvi. Reboot the system for changes to take effect.

4. Configuring PXE Server

The following components are required to configure a server as PXE Server:

- DHCP Server
- TFTP Server

PXE server configuration steps for Linux can be found on following links:

- http://linux-sxs.org/internet_serving/pxeboot.html
- http://www.howtoforge.com/ubuntu_pxe_install_server

 PXE server configuration steps for Windows can be found on following links:

- http://technet.microsoft.com/en-us/library/cc771670%28WS.10%29.aspx
- http://tftpd32.jounin.net/ (Use port # 67, set PXE option and provide bootable file name in settings)
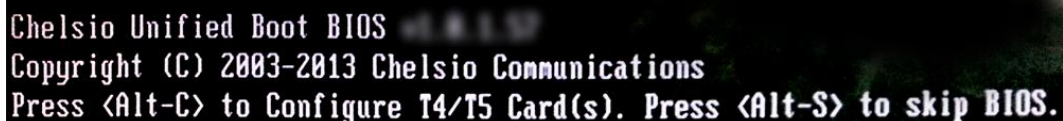- http://unattended.sourceforge.net/pxe-win2k.html

i Note   *Chelsio Communications does not take any responsibility regarding contents given in above mentioned links. These are given for example purposes only.*

5. PXE boot process

Before proceeding, please ensure that the Chelsio CNA has been flashed with the provided configuration file, firmware and option ROM (See Flashing configuration file, firmware & option ROM).

5.1. For Legacy PXE boot

i. After configuring the PXE server, make sure the PXE server works. Then reboot the client machine.

ii. Press [Alt+C] when the message *Chelsio T4 Unified Boot Bios, Copyright (C) 2003-2013 Chelsio Communications Press <Alt-C> to Configure T4 Card(s). Press <Alt-S> to skip B*IOS" appears on the screen to enter the configuration utility.
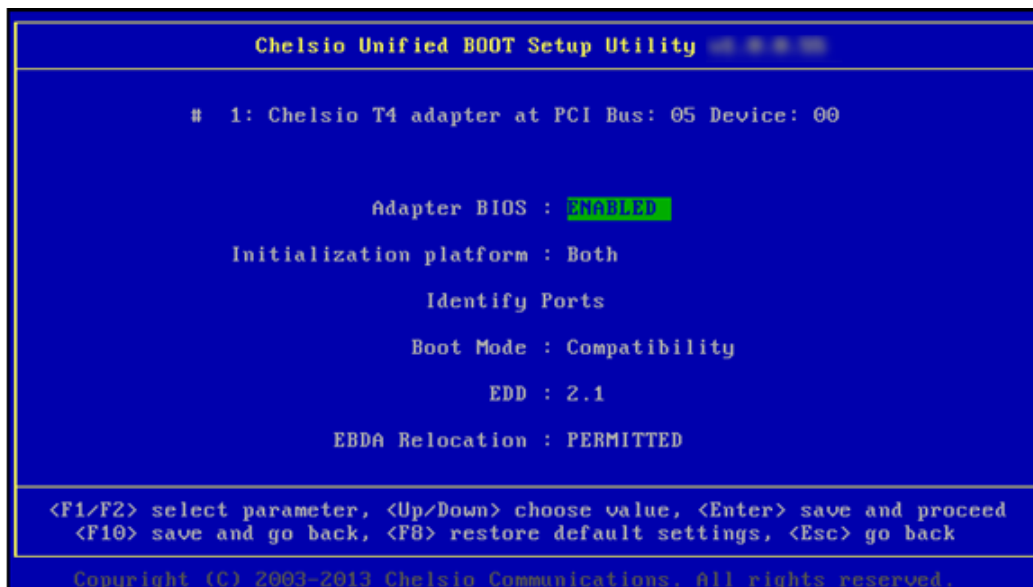

iii. The configuration utility will appear as below:
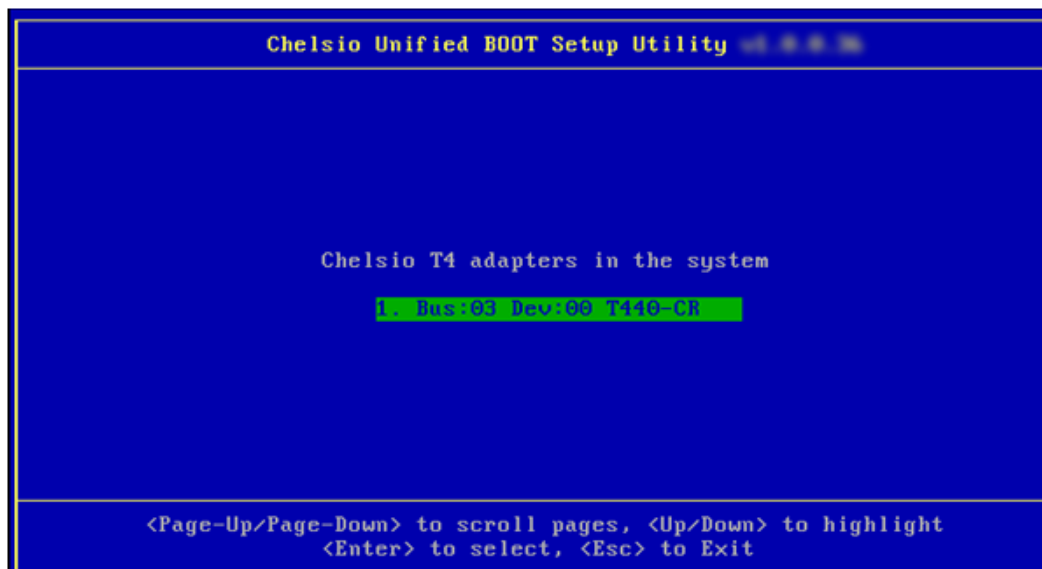
iv. Choose the CNA on which you flashed the option ROM image. Hit [Enter].

v. Enable the Adapter BIOS using arrow keys if not already enabled. Hit [ENTER].

> ⓘ Note *Use the default values for Boot Mode, EDD and EBDA Relocation parameters, unless instructed otherwise.*

vi. Choose *PXE* from the list to configure. Hit [Enter].

vii. Use the arrow keys to highlight the appropriate function among the 4 supported NIC functions and hit [Enter] to select.

```
          Chelsio Unified BOOT Setup Utility



   #1: Chelsio T4 adapter at PCI Bus: 03Device:  00

          Choose a NIC function to configure

              1.  Bus:03 Dev:00 Func:00
              2.  Bus:03 Dev:00 Func:01
              3.  Bus:03 Dev:00 Func:02
              4.  Bus:03 Dev:00 Func:03







          <Up/Down> to highlight, <Enter> to select
                    <Esc> to go back
```

viii. Enable NIC function bios if not already enabled.

```
          Chelsio Unified BOOT Setup Utility

 Ctrl   : T440-CR    FW   : v1.8.11.0        DevId   : 0x4003   Ports    : 4
 Bios   : v1.0.0.55  Bus  : 05               Device  : 00       Function : 0




                         Bios : ENABLED

                    Vlan ID : 0





       <F1/F2> to select parameter, <<-/->> to move within a parameter
 <Up/Down/Type> to choose value, <Esc> to go back, <F10> to save and go back

       Copyright (C) 2003-2013 Chelsio Communications. All rights reserved.
```

ix. Choose the boot port to try the PXE boot. It is recommended to only enable functions and ports which are going to be used. Please note that enabling NIC Func 00 will enable port 0 for PXE, enabling NIC Func 01 will enable port 1 and so on for NIC function. Please refer the table below:

| NIC Function enabled	Ports enabled
NIC Func00	00
NIC Func01	01
NIC Func02	02
NIC Func03	03

ⓘ Note   *VLAN id currently not supported in Legacy and UEFI environments.*

x.   Hit [Esc] and then [Y] to save configuration changes.

xi.   Reboot the system.

xii.   Hit [F2] or [DEL] or any other key as mentioned during system startup to enter the system setup.

xiii.   Allow the Chelsio T4 option ROM to initialize and setup PXE devices.

DO NOT PRESS ALT-S to skip Chelsio T4 option ROM.
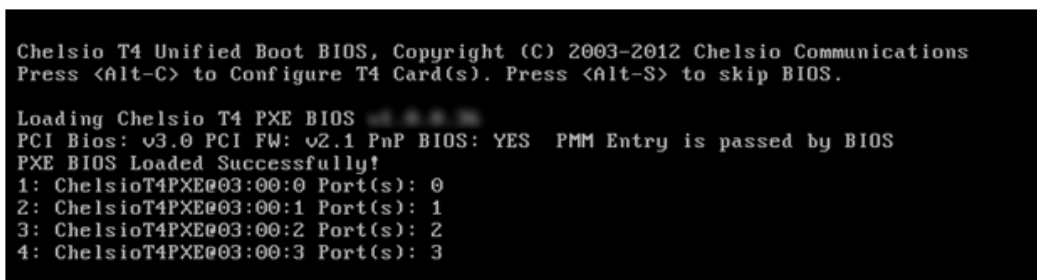
xiv.   In the system setup, choose any of the Chelsio T4 PXE devices as the first boot device.
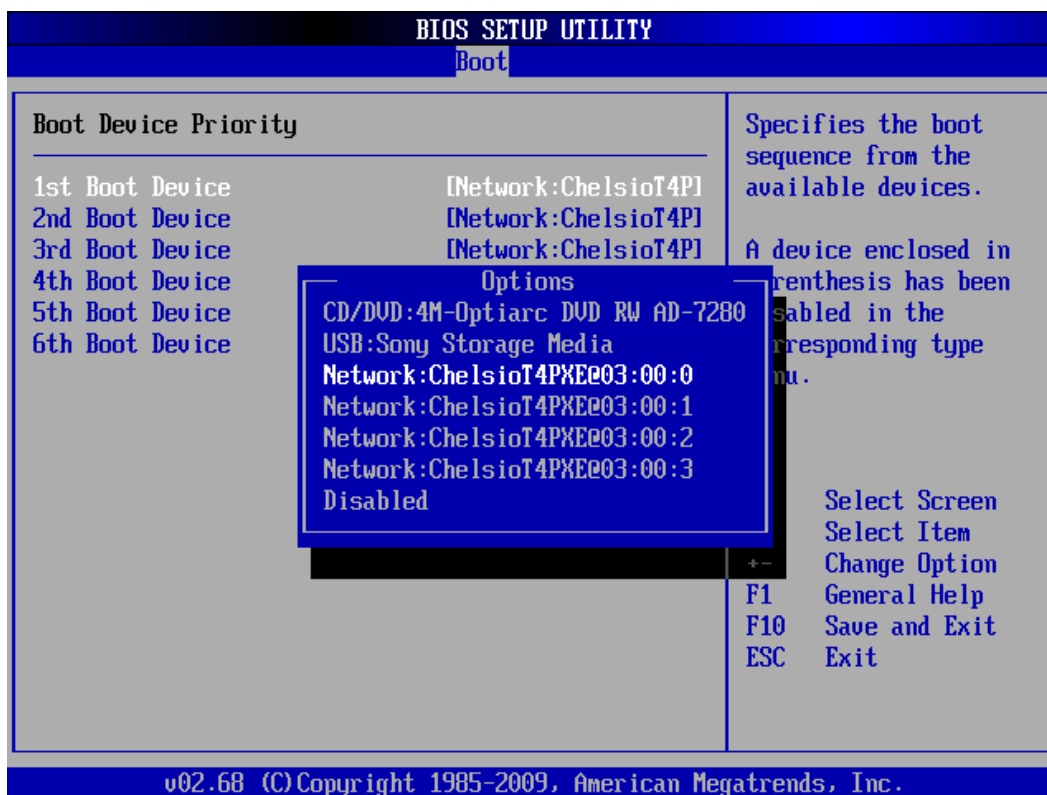
xv. Reboot. DO NOT PRESS ALT-S to skip Chelsio T4 option ROM, during POST.

xvi. Hit [F12] key when prompted to start PXE boot.

II. Driver Update Disk For Linux

1. Introduction

This section of the document describes the use and configuration of Chelsio's DUD for OS installations via PXE server. This solution can be used for installing operating systems over an ethernet network using Chelsio's T4-based Converged Network Adapters (CNAs). The Chelsio T4 Unified Option ROM resides on the flash memory of the T4-based adapter from where it is loaded by an x86 system BIOS during power on initialization.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio Adapters that are compatible with Chelsio Driver Update Disk software:

- T420-CR
- T440-CR
- T422-CR
- T420-BCH
- T420-SO-CR
- T440-LP-CR
- T420-LL-CR
- T420-BT
- T404-BT

1.2. Software Requirements

1.2.1. Linux Requirements

The Chelsio Driver Update Disk driver has been developed to run on 64-bit Linux platforms. Following is the list of Drivers/Software and supported Linux distributions:

Linux Distribution	Driver/Software (DUDs)
RHEL6.4,2.6.32-358.el6	PXE
SLES11SP3,3.0.76-0.11	PXE

2. Creating Driver Update Disk (DUD)

2.1. Creating DUD for RedHat Enterprise Linux

i.   If you haven't done already, download Chelsio-Uboot-x.x.x.xx.zip from Chelsio Download Center, service.chelsio.com

ii. Unzip the package,

```
[root@host~]# unzip Chelsio-Uboot-x.x.x.xx.zip
```

iii. Change your current working directory to *LinuxDUD* directory,

```
[root@host~]# cd Chelsio-Uboot-x.x.x.xx/LinuxDUD
```

iv. Insert a blank, formatted USB flash drive.

v.   Depending on the distribution to be installed, copy the corresponding image file to the USB drive. For example, execute the following command for RHEL 6.4:

```
[root@host~]# cp Chelsio-DriverUpdateDisk-RHEL6.4-x86_64-x.x.x.x.img <path
to USB drive>
```

2.2. Creating DUD for Suse Enterprise Linux

i.   If you haven't done already, download Chelsio-Uboot-x.x.x.xx.zip from Chelsio Download Center, service.chelsio.com

ii. Unzip the package,

```
[root@host~]# unzip Chelsio-Uboot-x.x.x.xx.zip
```

iii. Insert a blank USB flash drive.

iv. Format the USB drive

```
[root@host~]# mkfs.vfat /dev/sda
```

v. Depending on the distribution to be installed, copy the corresponding image file to the USB
stick. For example, execute the following command for SLES11sp3.

```
[root@host~]# dd if=/root/Chelsio-Uboot-x.x.x.xx/LinuxDUD/Chelsio-
DriverUpdateDisk-SLES11sp3-x86_64-x.x.x.x.img of=/dev/sda
```

3. OS Installation

3.1. Installation using Chelsio NIC DUD (PXE only)

This is the recommended method for installing Linux OS using Chelsio T4 PXE boot. The Chelsio Driver Update Disk (DUD) has support for all the new adapters. Use Network Boot (PXE Boot) media to install the OS, and provide the Driver Update Disk as per the detailed instructions for each OS.

The DUD supports installation of RHEL and SLES distributions using Chelsio adapters over Network. There may be built-in Chelsio driver in these distributions. The driver may or may not work with Chelsio adapters, depending on the adapter in use, and the version of the driver that shipped in that particular distribution. Please flash the firmware provided in the package.

3.1.1. RHEL 6.X installation using Chelsio DUD

i.   PXE boot prompt

Please make sure that the USB drive with DUD image is inserted. Type `dd` at the boot prompt for the installation media. The `dd` option specifies that you will be providing a Driver Update Disk during the installation.
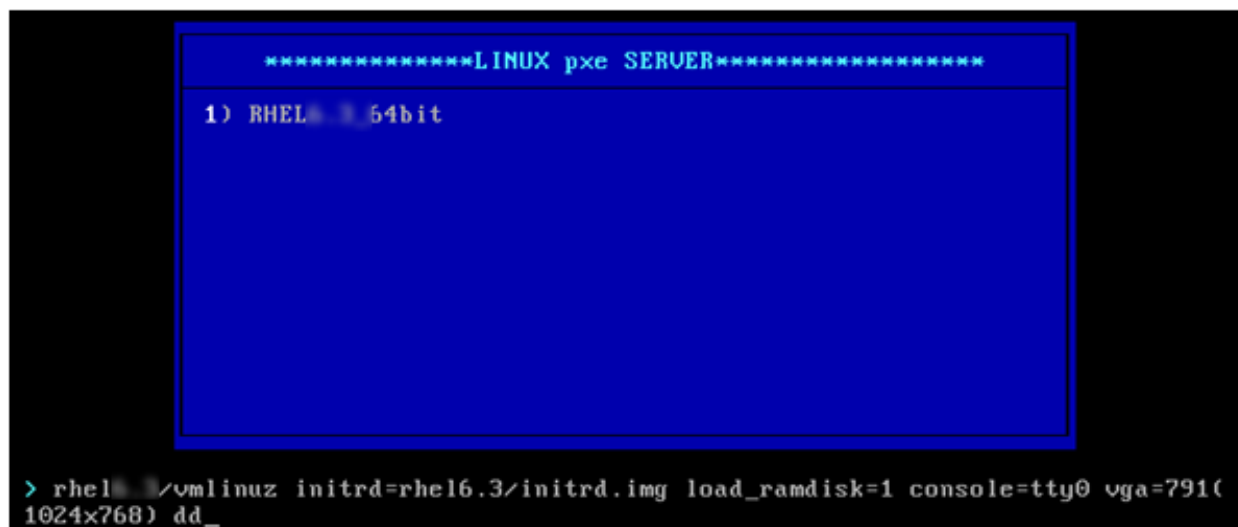
ii.   Driver disk prompt:

The installer will load and prompt you for the driver update disk. Select "Yes" and hit [Enter] to proceed.
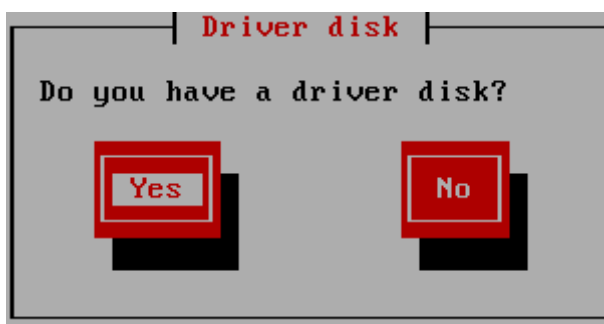
iii. Driver disk source prompt:

You will be asked to select the Driver Update Disk device from a list. USB drives usually show up as SCSI disks in Linux. So if there are no other SCSI disks connected to the system, the USB drive would assume the first drive letter "a". Hence the drive name would be "sda".

You can view the messages from the Linux kernel and drivers to determine the name of the USB drive, by pressing [Alt] + [F3] or [Alt] + [F4]. Press [Alt] + [F1] to get back to the list.

iv. Select the Driver Update File:

Select the Appropriate image file and Choose "OK". Now the installer will search for the appropriate drivers from the driver disk and load them. This step may take some time. Check on the [Alt] + [F3] or [Alt] + [F4] screens for log messages.
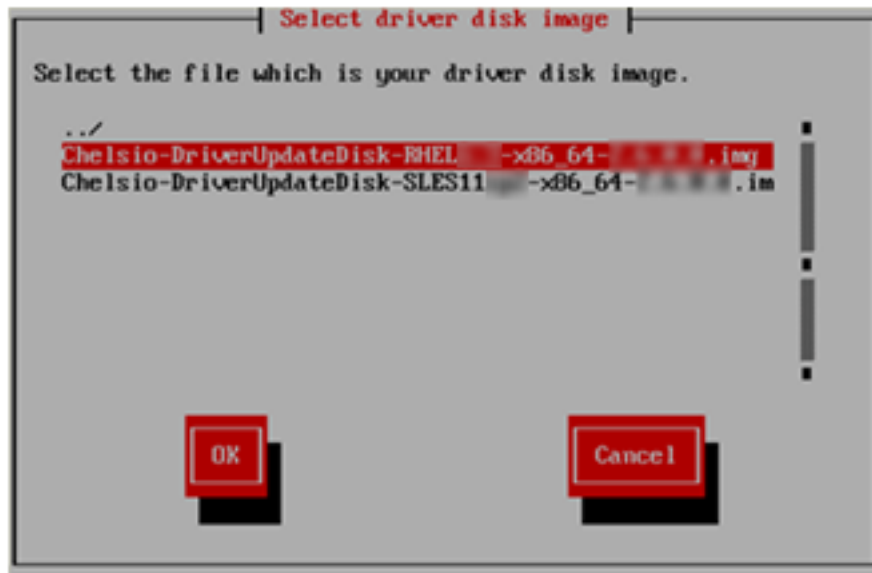
v. Load additional drivers prompt:

The installer will ask if you wish to load more drivers. Choose "Yes" to load if you have any other drivers to load. Otherwise choose "No".
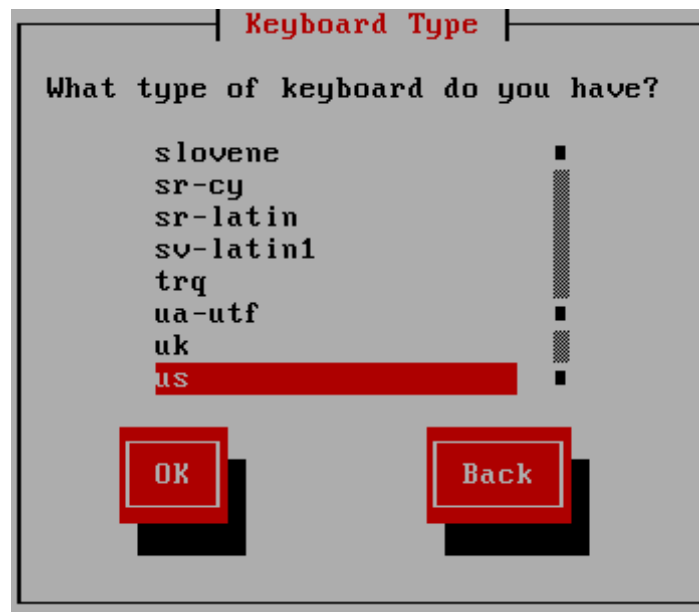

vi. Choose language and Keyboard type:

Select the required language from the list.

vii. Select Keyboard type

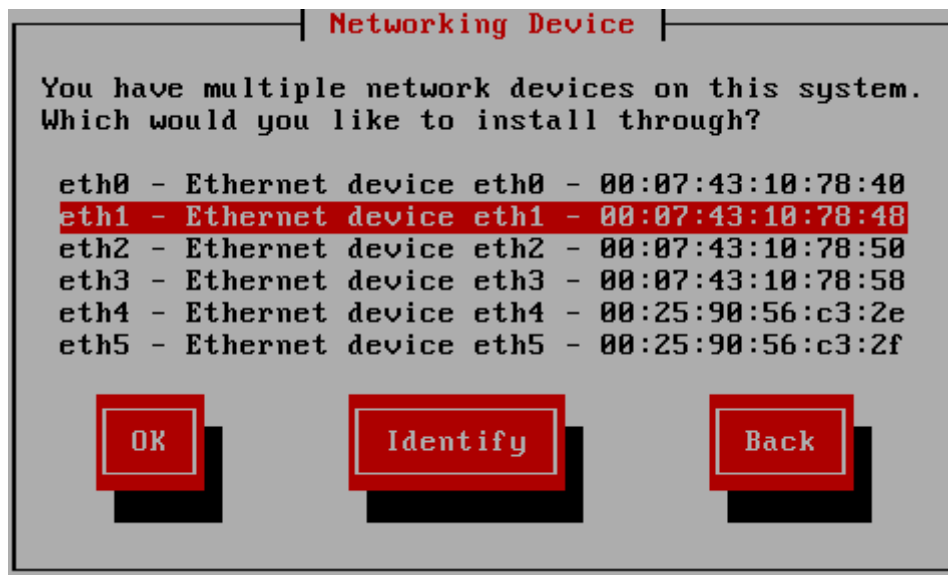Select the type of keyboard you have from the list.

viii.   Select Installation method:

In this step, you can choose the source which contains the OS installation ISO image. In this case, select "NFS directory".

ix. Select Displayed Network Devices:

The Chelsio Network Devices will be displayed. Select the appropriate Chelsio NIC interface to proceed with installation.


x. Configure TCP/IP settings:

Here you can specify if you want to configure your network interfaces using DHCP or manually using IPv4. IPv6 is currently not supported. Hence disable IPv6 before proceeding.
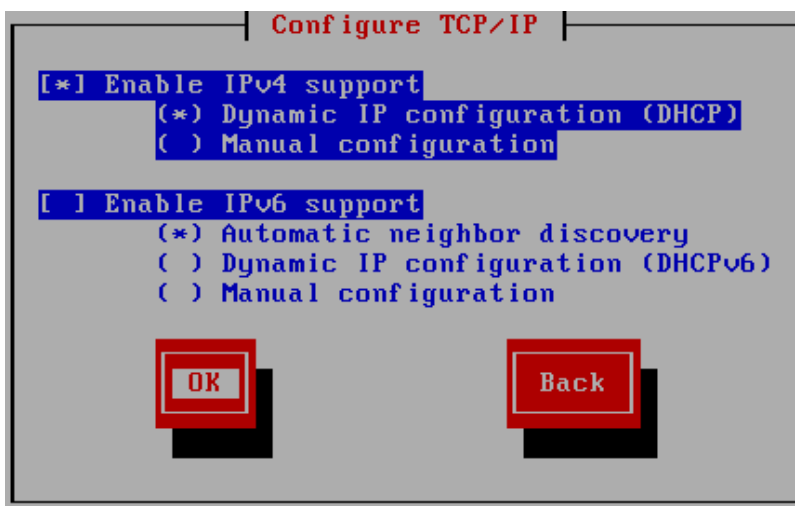
xi. Provide NFS/FTP/HTTP Server Name/IP and Path:

Proceeding with the installation will get NFS/FTP/HTTP setup page. Here, provide NFS server details to proceed with the installation. Then the graphical Installation screens for RHEL will appear. Proceed with the installation as usual.
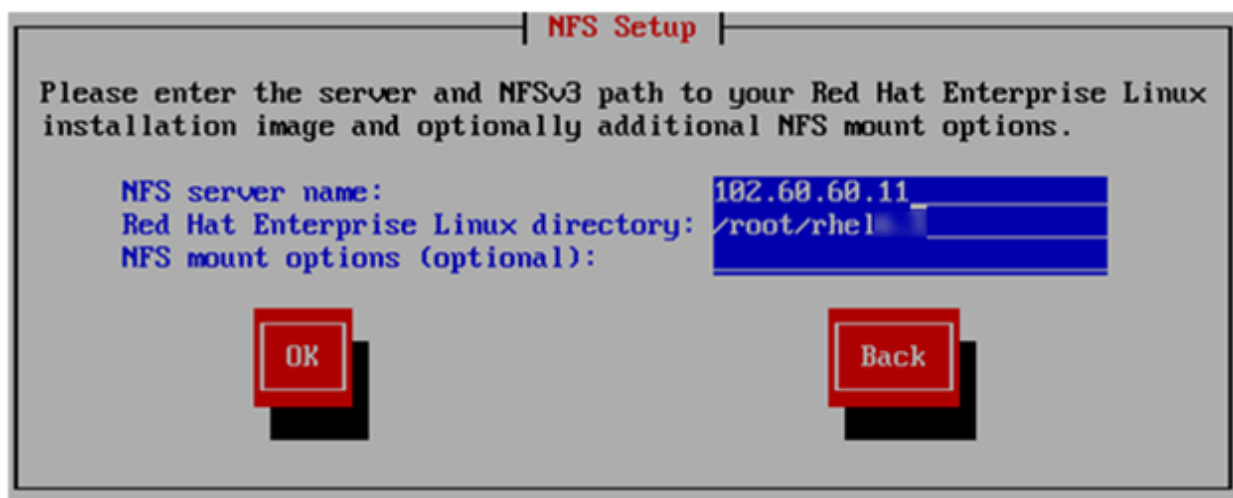
3.1.2. SLES installation using Chelsio DUD

i.   PXE boot prompt:

Please make sure that the USB drive with DUD image is inserted.

Type *dd* at the boot prompt for the installation media. The *dd* option specifies that you will be providing a Driver Update Disk during the installation. The DUD gets detected and the driver is automatically loaded by installer.
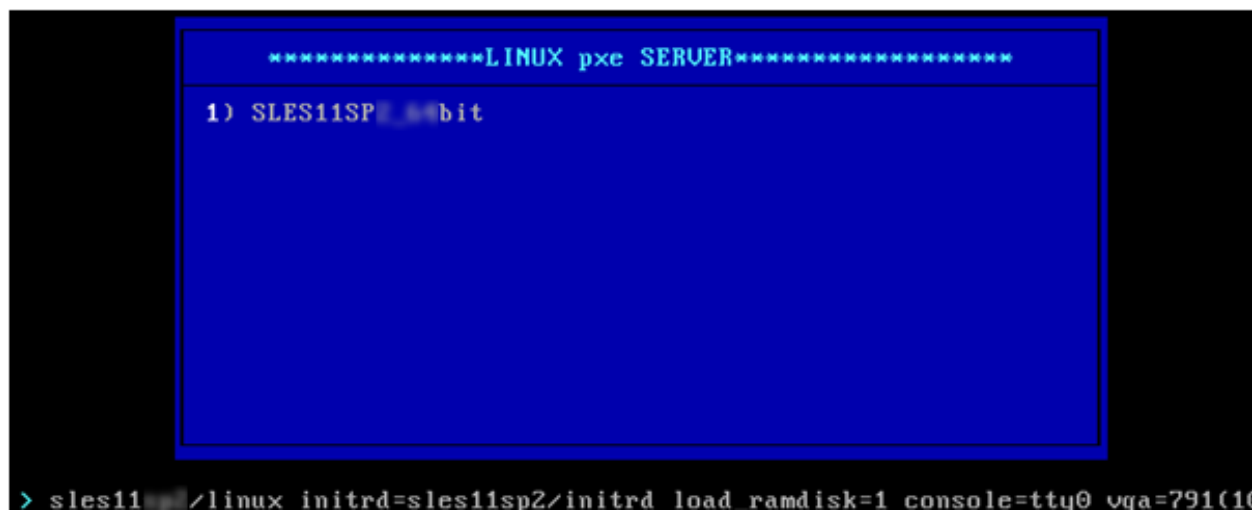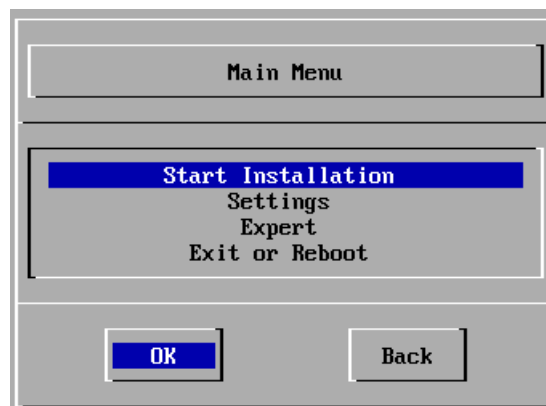
```
[    2.227429] hp_sw: device handler registered
[    2.252145] rdac: device handler registered

>>> SUSE Linux Enterprise Server 11 installation program v3.3.81 (c) 1996-2010 SUSE Linux Products GmbH <<<
Starting udev... ok
Loading basic drivers... ok
Starting hardware detection... ok
(If a driver is not working for you, try booting with brokenmodules=driver_name.)

Activating usb devices... ok
AMI Virtual CDROM
  drivers: usb_storage*
JetFlash Transcend 2GB
  drivers: usb_storage*
Logitech USB Multimedia Keyboard
  drivers: usbhid*
Chelsio Ethernet controller
  drivers: cxgb4*
Chelsio Ethernet controller
  drivers: cxgb4*
Chelsio Ethernet controller
  drivers: cxgb4*
Chelsio Ethernet controller
  drivers: cxgb4*
Chelsio Ethernet controller
  drivers: cxgb4*
Intel 82574L Gigabit Network Connection
  drivers: e1000e*
Intel 82574L Gigabit Network Connection
  drivers: e1000e*
Driver Update: Chelsio Network driver update Disk
Driver Update: Chelsio FCoE Initiator Driver Update Disk
Driver Updates added:
  Chelsio Network driver update Disk
  Chelsio FCoE Initiator Driver Update Disk
```
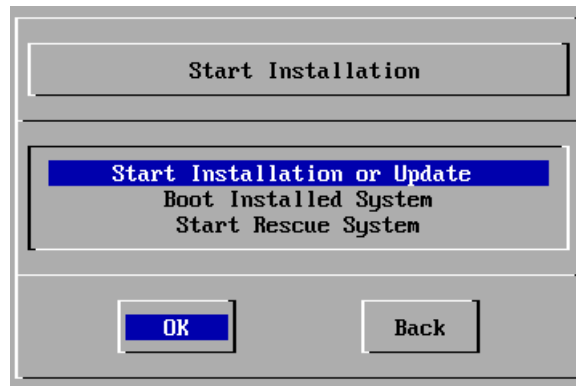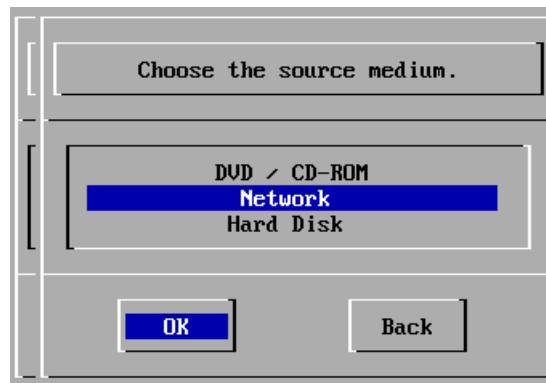
ii.   Start Installation

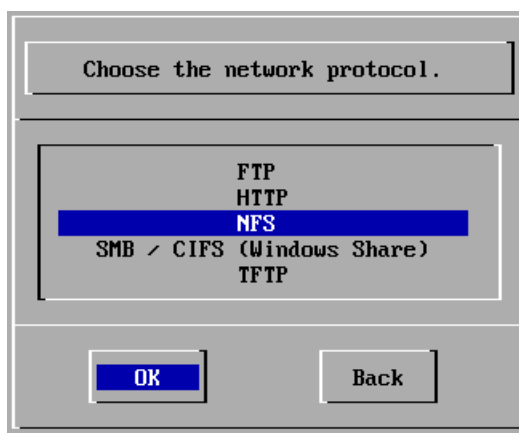Select "Start Installation" and then "Start Installation or Update".

```
              Main Menu

     Start Installation
           Settings
            Expert
        Exit or Reboot


      [   OK   ]      [   Back   ]
```

```
 ┌────────────────────────────────────────────┐
 │  ┌──────────────────────────────────────┐  │
 │  │          Start Installation          │  │
 │  └──────────────────────────────────────┘  │
 │  ┌──────────────────────────────────────┐  │
 │  │     Start Installation or Update     │  │
 │  │       Boot Installed System          │  │
 │  │        Start Rescue System           │  │
 │  └──────────────────────────────────────┘  │
 │     ┌────────┐           ┌────────┐         │
 │     │   OK   │           │  Back  │         │
 │     └────────┘           └────────┘         │
 └────────────────────────────────────────────┘
```

iii. Select method of install:

Select "Network" as the source of medium to install the SLES Operating System.

```
 ┌────────────────────────────────────────────┐
 │[ ┌──────────────────────────────────────┐  │
 │  │       Choose the source medium.      │  │
 │  └──────────────────────────────────────┘  │
 │[ ┌──────────────────────────────────────┐  │
 │  │            DVD / CD-ROM               │  │
 │  │              Network                 │  │
 │  │             Hard Disk                │  │
 │  └──────────────────────────────────────┘  │
 │     ┌────────┐           ┌────────┐         │
 │     │   OK   │           │  Back  │         │
 │     └────────┘           └────────┘         │
 └────────────────────────────────────────────┘
```

iv. Select the Network protocol:

Select the desired Network protocol from the list presented.

```
Choose the network protocol.

                  FTP
                  HTTP
                  NFS
         SMB / CIFS (Windows Share)
                  TFTP

         OK                    Back
```

v. Select appropriate Chelsio network Interface:

Select the appropriate Chelsio interface from the list to proceed with installation. You can view the messages from the Linux kernel and drivers to determine the name of NIC interface by pressing [Alt] + [F3] or [Alt] + [F4]. Press [Alt] + [F1] to get back to the list.

```
Choose the network device.

Chelsio Ethernet controller
Chelsio Ethernet controller
Chelsio Ethernet controller
Chelsio Ethernet controller
eth3 : Chelsio Ethernet controller
eth2 : Chelsio Ethernet controller
eth4 : Chelsio Ethernet controller
eth5 : Chelsio Ethernet controller
Chelsio Ethernet controller
eth0 : Intel 82574L Gigabit Network Connection
eth1 : Intel 82574L Gigabit Network Connection

         OK                    Back
```

vi. Configure DHCP IP

Select "Yes" to configure the network interface selected in the previous step using DHCP.
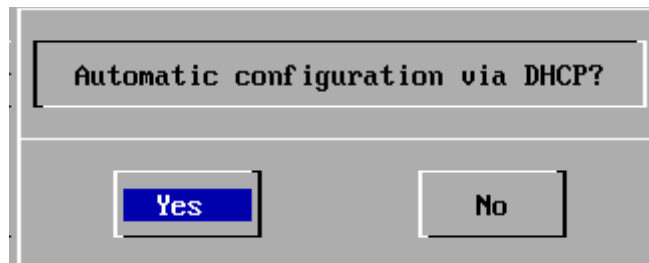
vii. Provide NFS/FTP/HTTP/TFTP Server Name/IP and Path:

Provide a valid NFS/FTP/HTTP/TFTP Server IP address to proceed.
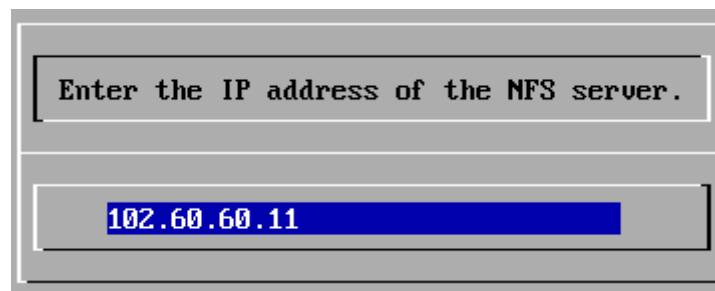
viii.   Provide operating system Directory Path:

Provide a valid directory path to the operating system to be installed. When the graphical Installation screen for SLES appears, proceed with the installation as usual.
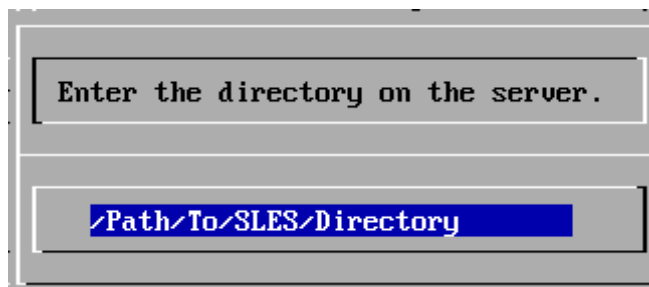
III. PXE-WDS Driver For Windows

1. Introduction

This section describes the use and configuration of Chelsio's PXE-WDS driver package for Chelsio's T4 10/1G adapters. The driver package consists of Network driver needed to install Windows operating system using WDS for Chelsio T4 CNAs.

Windows Deployment Services can be used to add driver packages to boot image on the server and configure them to be deployed to client computers along with the install image. This can be used to PXE boot to the supported operating systems.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio Adapters that are compatible with Chelsio PXE-WDS driver:

- T420-CR
- T440-CR
- T422-CR
- T420-SO-CR
- T420-BCH
- T420-BT
- T404-BT

1.2. Software Requirements

1.2.1. Windows Requirements

The Chelsio PXE-WDS driver package has been developed to run on Windows platform. Currently the driver is available for following version:

- Windows Server 2012

Other versions have not been tested and are not guaranteed to work.

i Note   *The boot image from above mentioned operating systems is supported. You can find the image (boot.wim) in \Sources folder in the operating system CD/DVD.*

2. PXE- WDS driver configuration

You can use Windows Deployment Services to add driver packages (such as network adapter drivers, mass storage drivers, and bus drivers) to Windows boot images. This means that you do not have to export the image, use the tools in the Windows Automated Installation Kit to add driver packages manually- and then add the updated boot image.

2.1. Windows Deployment Services

Please refer to Microsoft documentation to setup WDS server. Additional information is available at Windows Deployment Services Getting Started Guide.

2.2. Adding Driver Packages to WDS Server

This section contains information about adding driver packages to WDS server for 64-bit systems.

First add VBD driver and then followed by NDIS. For more information, see Managing and Deploying Driver Packages.

Before proceeding, download *Chelsio-Uboot-x.x.x.xx.zip* from Chelsio Download Center, service.chelsio.com and unzip the contents of the package to a desired location.

2.2.1. Adding VBD

i. Open the **Windows Deployment Services** MMC snap-in. Expand the **Servers** node and the node for your Windows Deployment Services server. Right-click the **Drivers** node and select **Add Driver Package**.
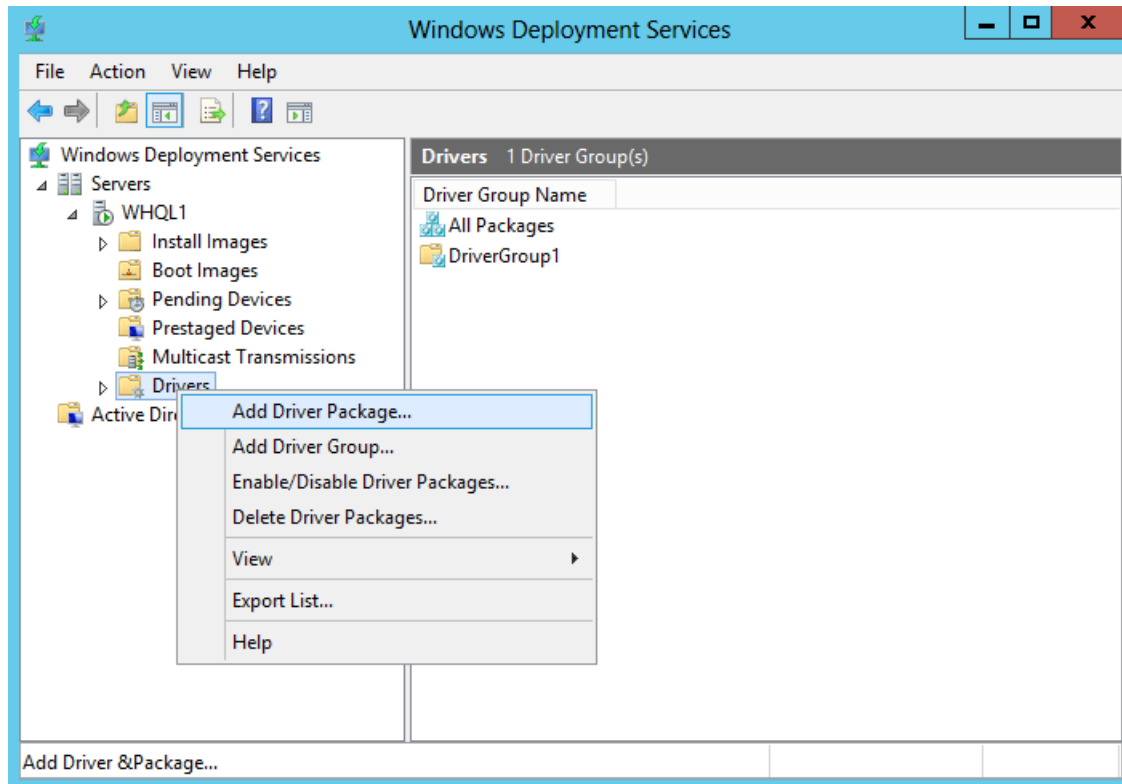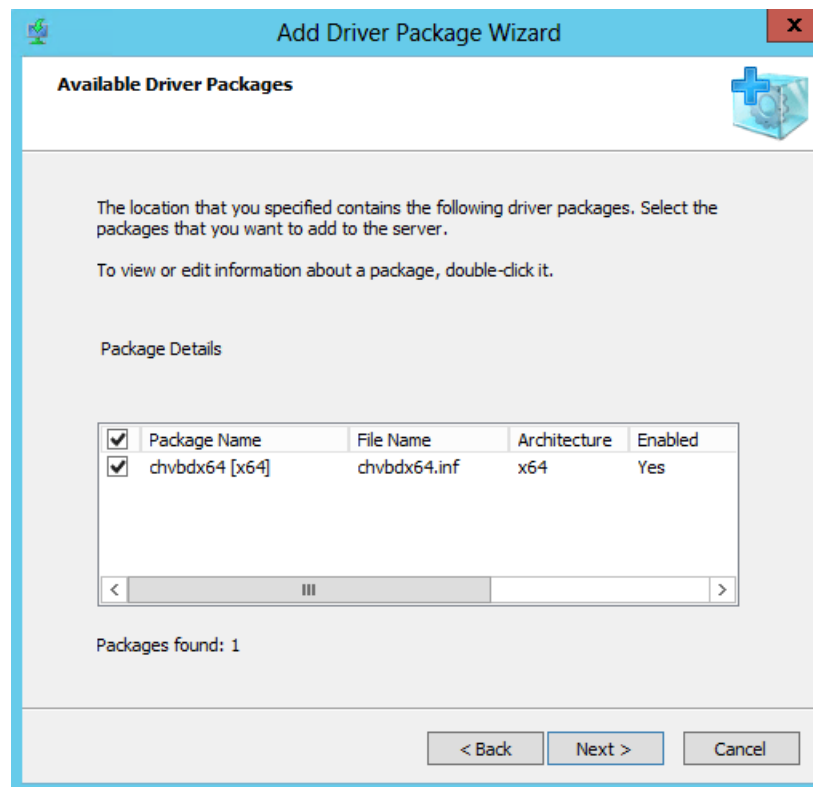
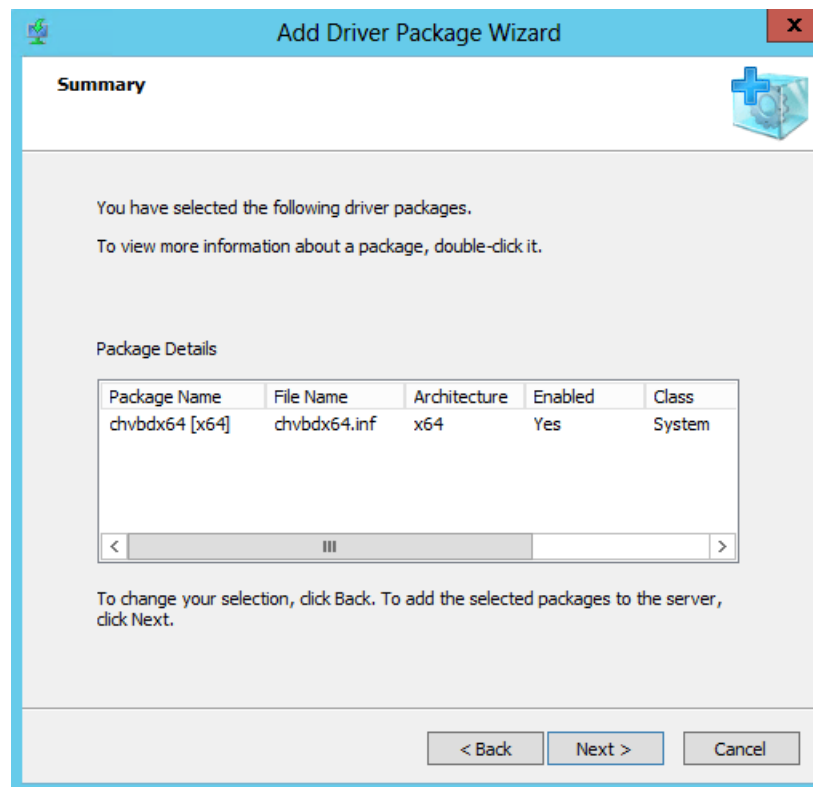ii. Select the *Select driver package from an .inf file* option and click **Browse**.
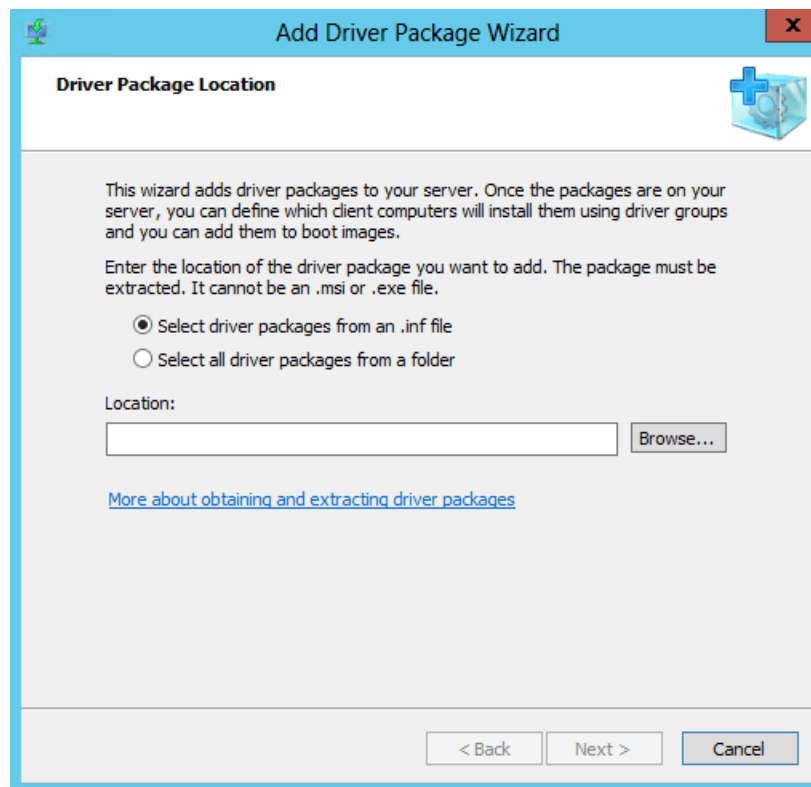
iii. Locate the VBD driver (*chvbdx64.inf)* in
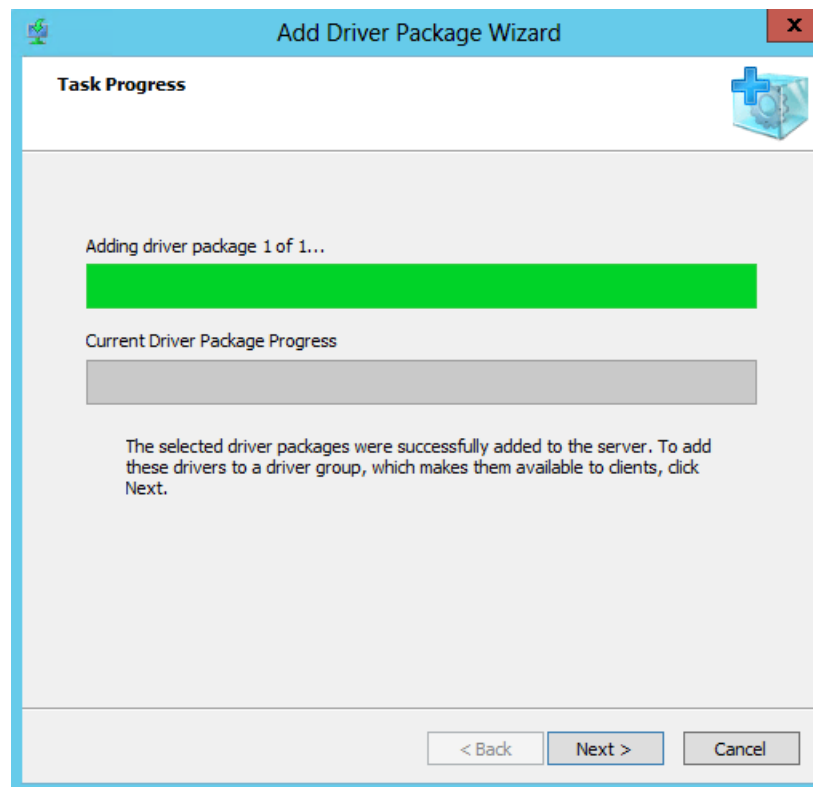*Chelsio-Uboot-x.x.x.xx/WindowsDrivers/NetworkDriver* and click **Open**.
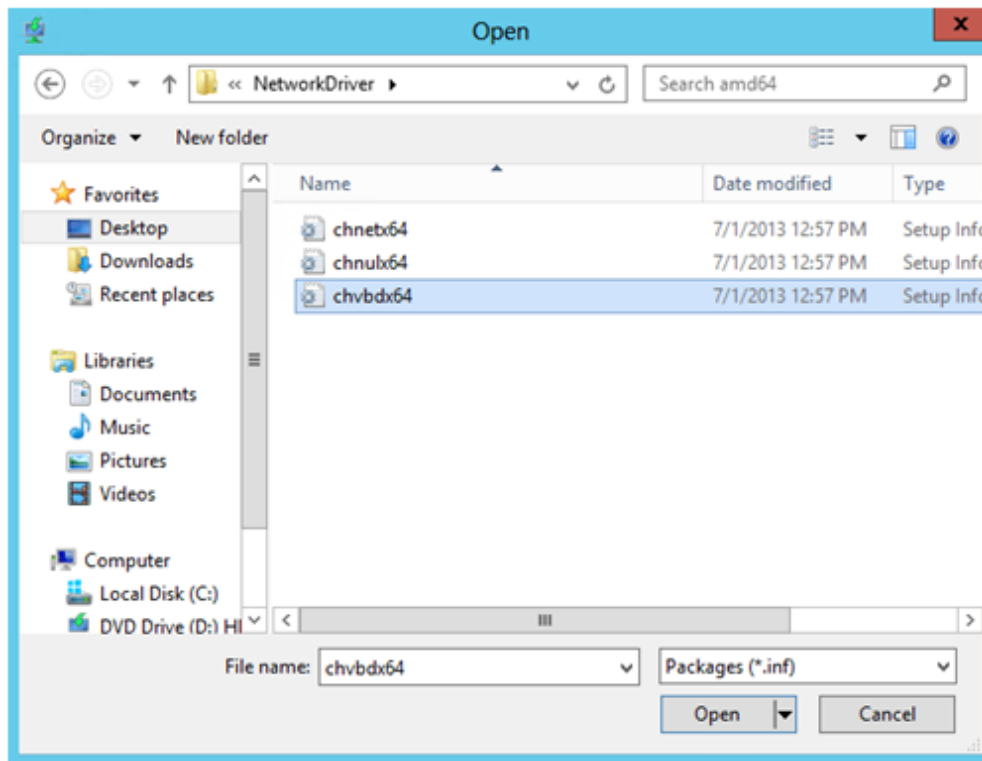
iv. Please ensure that the checkbox for *chvbdx64[x64]* is selected and click **Next**.

v. To add the selected VBD driver, click **Next** or to change click **Back**.

vi. The selected driver will now be added to the server. After the task is complete, click **Next**.

vii. When asked which driver group to add the packages to, select *Select an existing driver group*, and ensure that *DriverGroup1* is selected. This driver group (by default) is configured as follows:

a) It has no filters so all clients will have access to the packages in this group, and

b) Only packages that match the client's hardware will be installed.
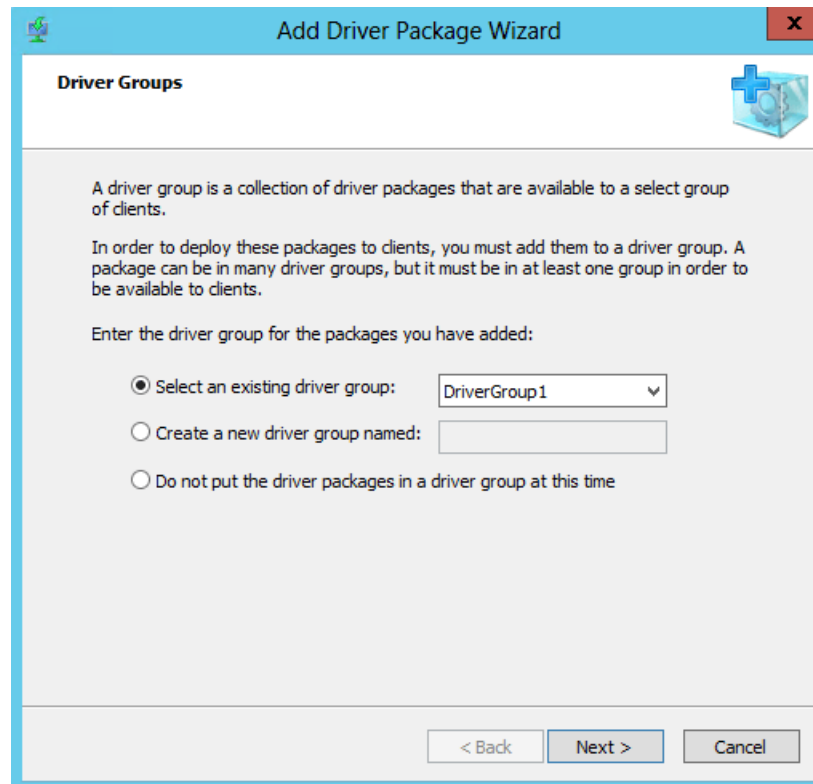
viii. On the last page of the wizard, make sure that the check box for *Modify the filters for the group now* is unselected, and click **Finish**.
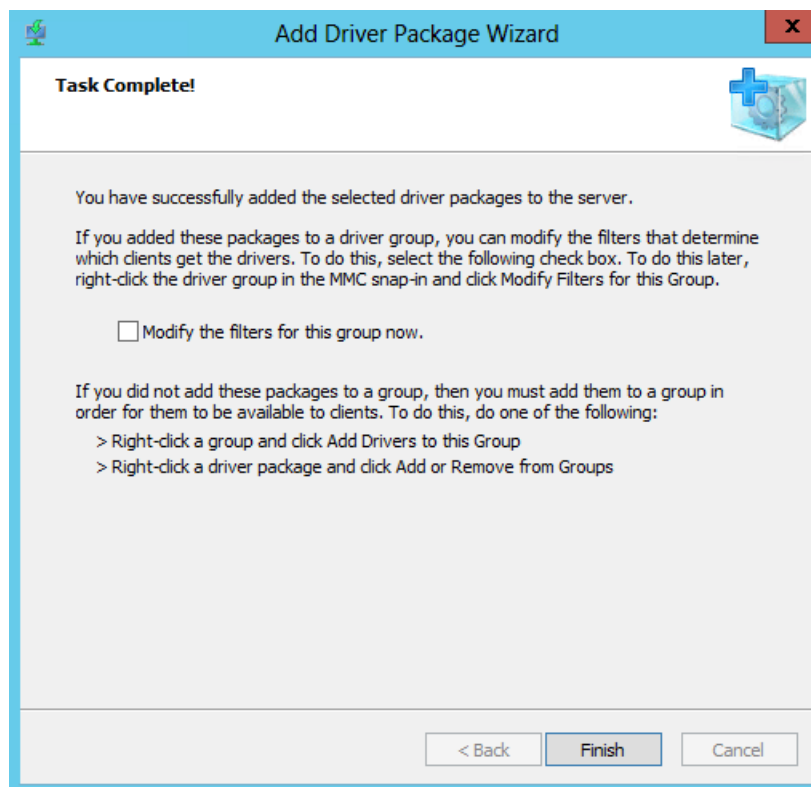
2.2.2. Adding NDIS (cht4ndis.inf)

The procedure for adding NDIS driver to the WDS server is similar to VBD as explained in the previous section. In step (iii), locate and use the file *chnetx64.inf* and in step (iv), ensure that only *chnetx64[x64]* is selected.

2.3. Adding Driver Packages to Boot Images

This section contains information about adding driver packages to Windows boot images for 64-bit systems.

Please ensure that the VBD and NDIS drivers are added to the WDS server before proceeding (See Adding Driver Packages to WDS Server). Also, add VBD driver first and then followed by NDIS to the boot image. For more information, see Managing and Deploying Driver Packages.

2.3.1. Adding VBD driver

Follow the steps below to add VBD driver package to Windows boot image using the Windows interface (MMC snap-in) for 64-bit systems.

i. Open the **Windows Deployment Services** MMC snap-in. Expand the **Servers** node and then **Boot Images** node.

ii. Right-click on the boot image that you want to add the driver to, and select **Add Driver Packages to Image**.
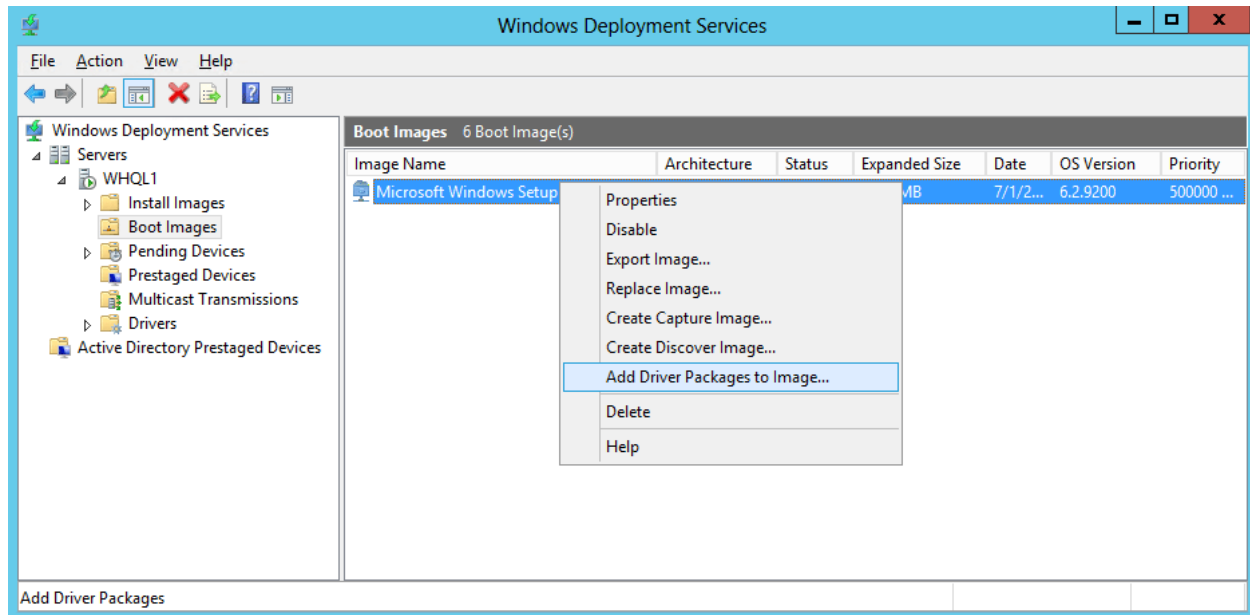
iii. If required, back up the boot image by following the instruction on the screen or click **Next** to continue.
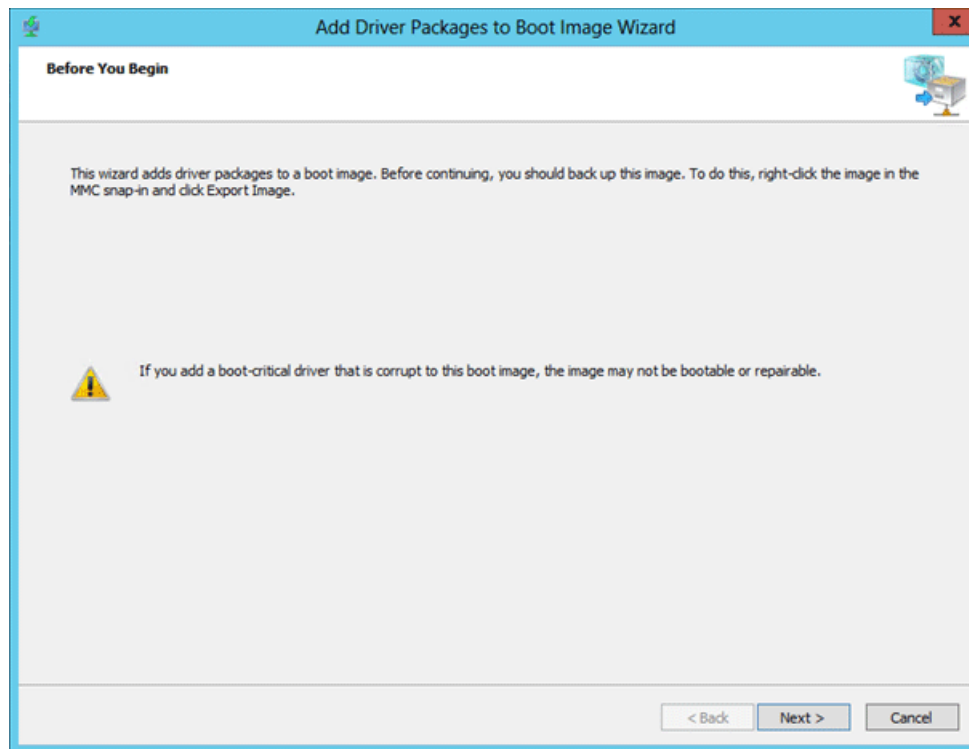
iv. Click **Search for Packages**. Then in the **Search results** section, select the checkbox for
chvbdx64[x64] only and click **Next**.

v. To add the selected VBD driver, click **Next** or to change click **Back**.
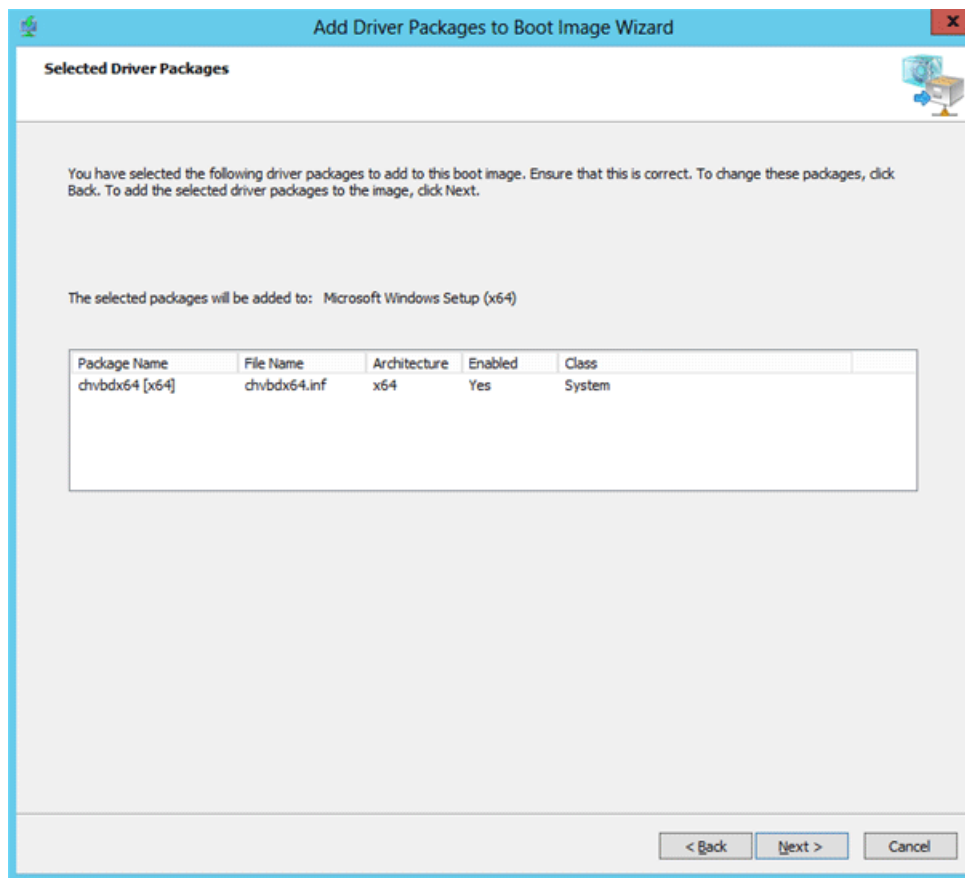
vi. The VBD driver will now be added to the boot image.
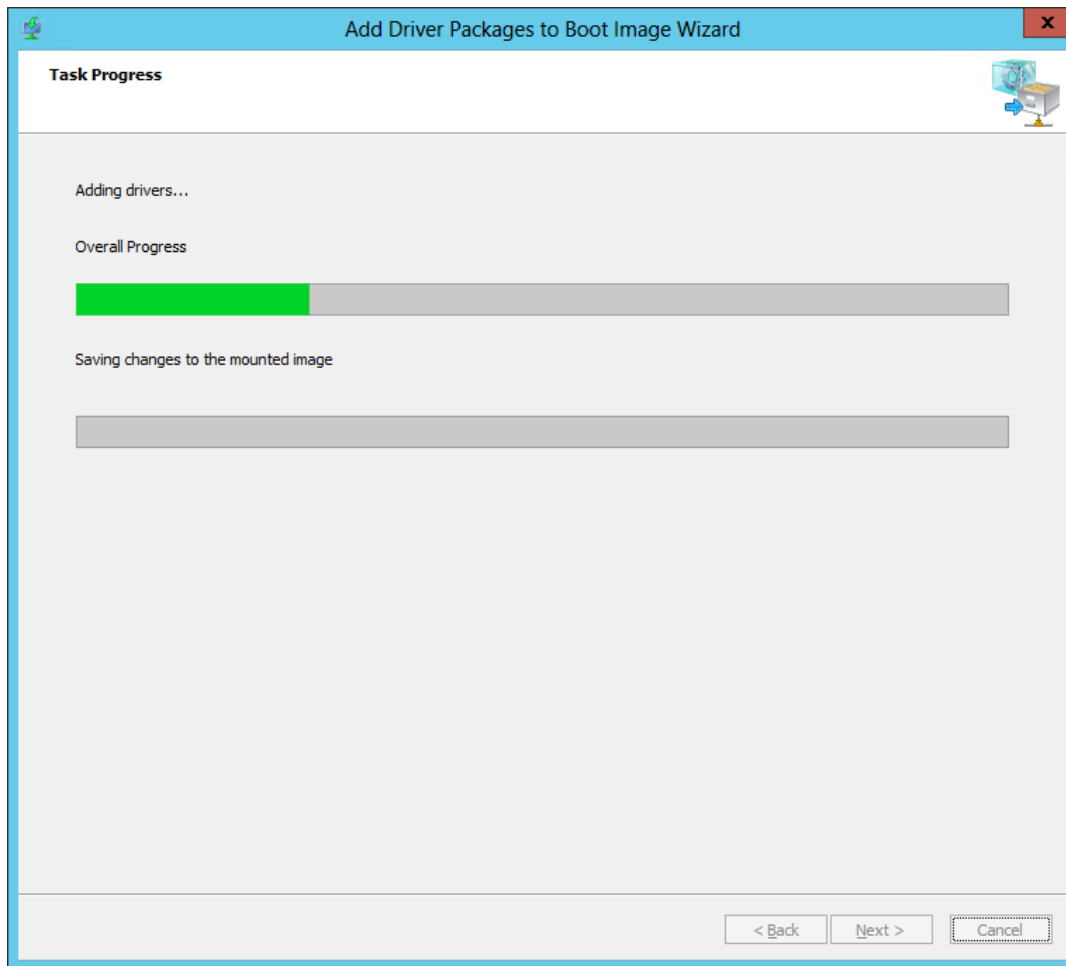
vii. Once the task is completed, click **Finish** to close the wizard.
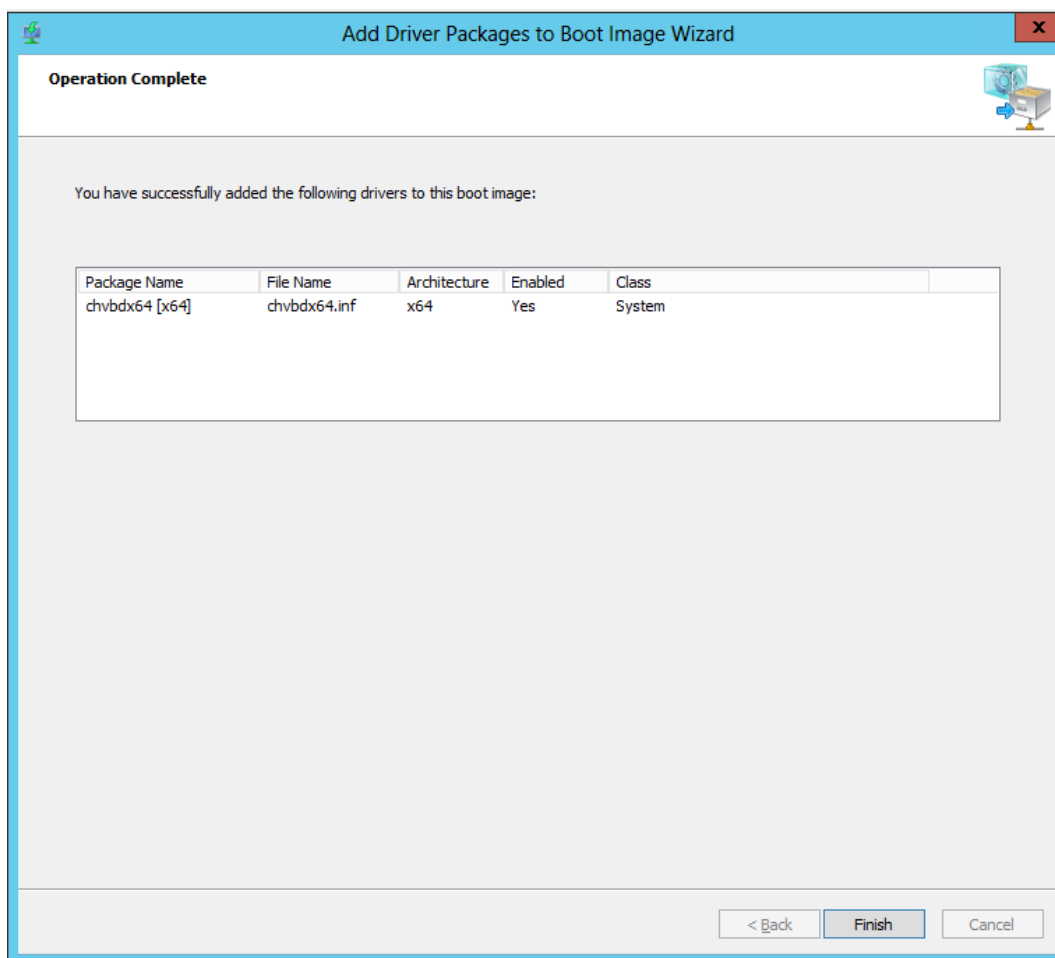
2.3.2. Adding NDIS driver (cht4ndis) to Windows boot image

The procedure for adding NDIS driver to Windows boot image is similar to VBD as explained in the previous section. In step (iv), select the checkbox for *chnetx64[x64] o*nly and click **Next**.
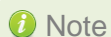
> ⓘ Note   *If the image that you are updating is currently being downloaded to a client when you perform this procedure, Windows Deployment Services will ensure that the client receives a consistent copy of the file.*

IV. Appendix

Chelsio End-User License Agreement (EULA)

Installation and use of the driver/software implies acceptance of the terms in the Chelsio End-User License Agreement (EULA).

IMPORTANT: PLEASE READ THIS SOFTWARE LICENSE CAREFULLY BEFORE DOWNLOADING OR OTHERWISE USING THE SOFTWARE OR ANY ASSOCIATED DOCUMENTATION OR OTHER MATERIALS (COLLECTIVELY, THE "SOFTWARE"). BY CLICKING ON THE "OK" OR "ACCEPT" BUTTON YOU AGREE TO BE BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, CLICK THE "DO NOT ACCEPT" BUTTON TO TERMINATE THE INSTALLATION PROCESS.

1. License. Chelsio Communications, Inc. ("Chelsio") hereby grants you, the Licensee, and you hereby accept, a limited,   non-exclusive,   nontransferable   license   to:

(i) install and use the Software on a single computer system or   on   multiple workstations,   systems   and   servers   that incorporate a Chelsio network adapter and may be accessed by multiple users from multiple locations; and (ii) make one copy of the Software in machine readable form solely for back-up purposes, provided you reproduce   Chelsio's   copyright notice and any proprietary legends, as required by Chelsio.

2. Restrictions. This license granted hereunder does not constitute a sale of the Software or any copy thereof. Except as expressly permitted under this Agreement, you may not:

(i) reproduce, modify, adapt, translate, rent, lease, loan, resell for profit, distribute, or create derivative works of or based upon, the Software or any part thereof; or

(ii) make available the Software, or any portion thereof, in any form, on the Internet. The Software contains trade secrets and, in order to protect them, you may not decompile, reverse engineer, disassemble, or otherwise reduce   the Software to a human-perceivable form.   You assume full responsibility for the use of the Software and agree to use the Software legally and responsibly.

3. Ownership of Software. As Licensee, you own only the media upon which the Software is recorded or fixed, but Chelsio retains all right, title and interest in and to the Software recorded on the original media and all subsequent copies of the Software, regardless of the form or media in or on which the Software may be embedded.

4. Confidentiality. You agree to maintain the Software in confidence and not to disclose the Software, or any information or materials related thereto, to any third party without the express written consent of Chelsio. You further agree to take all reasonable precautions to limit access of the Software only to those of your employees who reasonably require such access to perform their employment obligations and who are bound by confidentiality agreements with you.

5. Term. This license is effective in perpetuity, unless terminated earlier. You may terminate the license at any time by destroying the Software (including the related documentation), together with all copies or modifications in any form. Chelsio may terminate this license, and this license shall be deemed to have automatically terminated, if you fail to comply with any term or condition of this Agreement. Upon any termination, including termination by you, you must destroy the Software

(including the related documentation), together with all copies or modifications in any form.

6. Limited Warranty. Chelsio warrants only that the media upon which the Software is furnished will be free from defects in material or workmanship under normal use and service for a period of thirty (30) days from the date of delivery to you. CHELSIO DOES NOT AND CANNOT WARRANT THE PERFORMANCE OR RESULTS YOU MAY OBTAIN BY USING THE SOFTWARE OR ANY PART THEREOF. EXCEPT FOR THE FOREGOING LIMITED WARRANTY, CHELSIO MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, AND HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, BUT NOT LIMITED, TO NON-INFRINGEMENT OF THIRD PARTY RIGHTS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow the exclusion of implied warranties or limitations on how long an implied warranty may last, so the above limitations may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

7. Remedy for Breach of Warranty. The sole and exclusive liability of Chelsio and its distributors, and your sole and exclusive remedy, for a breach of the above warranty, shall be the replacement of any media not meeting the above limited warranty which is returned to Chelsio. If Chelsio or its distributor is unable to deliver replacement media which is free from defects in materials or workmanship, you may terminate this Agreement by returning the Software.

8. Limitation of Liability. IN NO EVENT SHALL CHELSIO HAVE ANY LIABILITY TO YOU OR ANY THIRD PARTY FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, HOWEVER CAUSED, AND ON ANY THEORY OF LIABILITY, ARISING OUT OF OR RELATED TO THE LICENSE OR USE OF THE SOFTWARE, INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR LOSS OF ANTICIPATED PROFITS, EVEN IF CHELSIO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL CHELSIO'S LIABILITY ARISING OUT OF OR RELATED TO THE LICENSE OR USE OF THE SOFTWARE EXCEED THE AMOUNTS PAID BY YOU FOR THE LICENSE GRANTED HEREUNDER. THESE LIMITATIONS SHALL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY.

9. High Risk Activities. The Software is not fault-tolerant and is not designed, manufactured or intended for use or resale as online equipment control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of the Software could lead directly to death, personal injury, or severe physical or environmental damage. Chelsio specifically disclaims any express or implied warranty of fitness for any high risk uses listed above.

10. Export. You acknowledge that the Software is of U.S. origin and subject to U.S. export jurisdiction. You acknowledge that the laws and regulations of the United States and other countries may restrict the export and re-export of the Software. You agree that you will not export or re-export the Software or documentation in any form in violation of applicable United States and foreign law. You agree to comply with all applicable international and national laws that apply to the Software, including the U.S. Export Administration Regulations, as well as end-user, end-use, and destination restrictions issued by U.S. and other governments.

11. Government Restricted Rights. The Software is subject to restricted rights as follows. If the Software is acquired under the terms of a GSA contract: use, reproduction or disclosure is subject to the restrictions set forth in the applicable ADP Schedule contract. If the Software is acquired under the terms of a DoD or civilian agency contract, use, duplication or disclosure by the Government is subject to the restrictions of this Agreement in accordance with 48 C.F.R. 12.212 of the

Federal Acquisition Regulations and its successors and 49 C.F.R. 227.7202-1 of the DoD FAR Supplement and its successors.

12. General. You acknowledge that you have read this Agreement, understand it, and that by using the Software you agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between Chelsio and you, and supersedes any proposal or prior agreement, oral or written, and any other communication between Chelsio and you relating to the subject matter of this Agreement. No additional or any different terms will be enforceable against Chelsio unless Chelsio gives its express consent, including an express waiver of the terms of this Agreement, in writing signed by an officer of Chelsio. This Agreement shall be governed by California law, except as to copyright matters, which are covered by Federal law. You hereby irrevocably submit to the personal jurisdiction of, and irrevocably waive objection to the laying of venue (including a waiver of any argument of forum non conveniens or other principles of like effect) in, the state and federal courts located in Santa Clara County, California, for the purposes of any litigation undertaken in connection with this Agreement. Should any provision of this Agreement be declared unenforceable in any jurisdiction, then such provision shall be deemed severable from this Agreement and shall not affect the remainder hereof. All rights in the Software not specifically granted in this Agreement are reserved by Chelsio.

Chelsio reserves the right to modify this license agreement at any time without notice, and any modified version of this agreement shall supercede any earlier versions.

Should you have any questions concerning this Agreement, you may contact Chelsio by writing to:

Chelsio Communications, Inc.
370 San Aleso Ave.
Sunnyvale, CA 94085