



Chelsio T5/T4 Unified Boot for Linux & Windows

Configuration and User's Guide



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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

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IV. APPENDIX

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Chelsio End-User License Agreement (EULA)

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I. Unified Boot Option ROM

1. Introduction

Thank you for choosing Chelsio T5/T4 Unified Wire adapters. These high speed, single chip, single firmware cards provide enterprises and data centers with high performance solutions for various Network and Storage related requirements.

The Terminator 5 (T5) is Chelsio's next generation of highly integrated, hyper-virtualized 40/10GbE controllers. The T5 is built around a programmable protocol-processing engine, with full offload of a complete Unified Wire solution comprising NIC, TOE, iWARP RDMA, iSCSI, FCoE and NAT support. It scales true 40Gb line rate operation from a single TCP connection to thousands of connections, and allows simultaneous low latency and high bandwidth operation thanks to multiple physical channels through the ASIC.

The T4 adapters can fully offload TCP, UDP, iSCSI, iWARP and FCoE over a single Unified Wire. The adapters also fully support SR-IOV, EVB/VNTag, DCB, Traffic Management and Filtering.

Ideal for all data, storage and high performance clustering applications, the T5/T4 Adapters enable a unified fabric over a single wire by simultaneously running all unmodified IP sockets, Fibre Channel and InfiniBand applications over Ethernet at line rate.

Designed for deployment in virtualized data centers, cloud service installations and high performance computing environments, Chelsio T5/T4 adapters bring a new level of performance metrics and functional capabilities to the computer networking industry.

PXE is short for Preboot eXecution Environment and is used for booting computers over an Ethernet network using a Network Interface Card (NIC). FCoE SAN boot process involves installation of an operating system to an FC/FCoE disk and then booting from it. iSCSI SAN boot process involves installation of an operating system to an iSCSI disk and then booting from it.

This section of the guide explains how to configure and use Chelsio Unified Boot Option ROM which flashes PXE, iSCSI and FCoE Option ROM onto Chelsio's converged network adapters (CNAs). It adds functionalities like PXE, FCoE and iSCSI SAN boot.

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:

- T520-BT
- T502-BT
- T580-CR

- T520-LL-CR
- T520-SO-CR*
- T520-CR
- T522-CR
- T540-CR
- T580-LP-CR
- T580-SO-CR*
- T420-CR[#]
- T440-CR[#]
- T422-CR[#]
- T404-BT[#]
- T420-BCH*
- T420-SO-CR*
- T440-LP-CR[#]
- T420-LL-CR[#]
- T420-BT[#]

* Only PXE

[#] Only PXE,iSCSI

1.1.2. Supported Hardware

The following hardware platforms are supported by Chelsio Unified Boot Option ROM software:

- DELL PowerEdge T710
- DELL PowerEdge 2950
- DELL PowerEdge T110
- Dell T5600
- IBM X3650 M2
- IBM X3650 M4*
- HP ProLiant DL385G2
- Supermicro X7DWE
- Supermicro X8DTE-F
- Supermicro X8STE
- Supermicro X8DT6
- Supermicro X9SRL-F
- Supermicro X9SRE-3F
- ASUS P5KPL
- ASUS P8Z68

* If system BIOS version is lower than 1.5 and both Legacy and uEFI are enabled, system will hang during POST. Please upgrade the BIOS version to 1.5 or higher to avoid this issue.

1.1.3. Supported Switches

The following switches are supported by Chelsio Unified Boot Option ROM software:

- Cisco Nexus 5010 with 5.1(3) N1 (1a) firmware.
- Arista DCS-7124S-F
- Mellanox SX_PPC_M460EX

Other platforms/switches have not been tested and are not guaranteed to work.

1.2. Software Requirements

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

1.3. Package Contents

Chelsio Unified Boot Option ROM package contains the following:

- **OptionROM:** This directory contains Unified Boot Option ROM image (*cubt4.bin*), uEFI driver (*ChelsioUD.efi*), default boot configuration file (*bootcfg*) and a flash utility (*cfut4.exe*), which can be used to flash the option ROM onto Chelsio's T5 and T4 based Converged Network Adapters (CNAs). It also contains Firmware (*t5fw-x.xx.xx.x.bin* for T5; *t4fw-x.xx.xx.x.bin* for T4) files.
- **LinuxDUD:** This directory contains files required to update drivers for Linux distributions.
- **WindowsDrivers:** This directory contains network driver packages to be added to WDS server and boot images.
- **EULA:** Chelsio's End User License Agreement.
- **docs:** The docs directory contains support documents - README, Release Notes and User's Guide (this document) for the software package.

2. Hardware Installation

- i. Shutdown/power off your system.
- ii. Power off all remaining peripherals attached to your system.
- iii. Unpack the Chelsio adapter and place it on an anti-static surface.
- iv. Remove the system case cover according to the system manufacturer's instructions.
- v. Remove the PCI filler plate from the slot where you will install the Ethernet adapter.
- vi. For maximum performance, it is highly recommended to install the adapter into a PCIE x8/x16 slot.
- vii. 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.
- viii. Secure the Chelsio adapter with a screw, or other securing mechanism, as described by the system manufacturer's instructions. Replace the case cover.
- ix. 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.
- x. 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.
- xi. Power on your system.
- xii. On Linux systems, run *update-pciids* command to download the current version of PCI ID list

```
[root@host~]# update-pciids
%   Total   %   Received   %   Xferd   Average Speed   Time   Time   Time Current
                        Dload   Upload   Total   Spent   Left   Speed
100 198k   100   198k       0    0       491k    0 --:--:-- --:--:-- --:--:-- 626k
Done.
```

- xiii. 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
07:00.0 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
07:00.1 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
07:00.2 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
07:00.3 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
07:00.4 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
```

```
07:00.5 SCSI storage controller: Chelsio Communications Inc T520-LL-CR
Unified Wire Storage Controller
07:00.6 Fibre Channel: Chelsio Communications Inc T520-LL-CR Unified Wire
Storage Controller
```

- 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 T5/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
- xiv. Based on the operating system, install the appropriate network driver. Install and load *cxgb4* for Linux systems and *VBD* and *NDIS* for Windows systems.
- xv. Finally, verify if the card is discovered:
- For Linux systems, examine the output of *dmesg* and you should see a similar output:

```
eth2: Chelsio T520-LL rev 0 10GBASE-SFP RNIC PCIe 8 GT/s x8 MSI-X, Offload
capable
0000:07:00.4: S/N: RE12130097, P/N: 11011675004
```

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 T5 40G and T420-BT adapters, 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 Firmware and Option ROM

Depending on the boot mode selected, Chelsio Unified Boot provides two methods to flash firmware and option ROM onto Chelsio adapters: Flash utility *cfut4* for Legacy mode and *HII* for uEFI mode. Both methods also provide the functionality to update/erase (T5/T4) Boot configuration, Hardware configuration and Phy Firmware files.

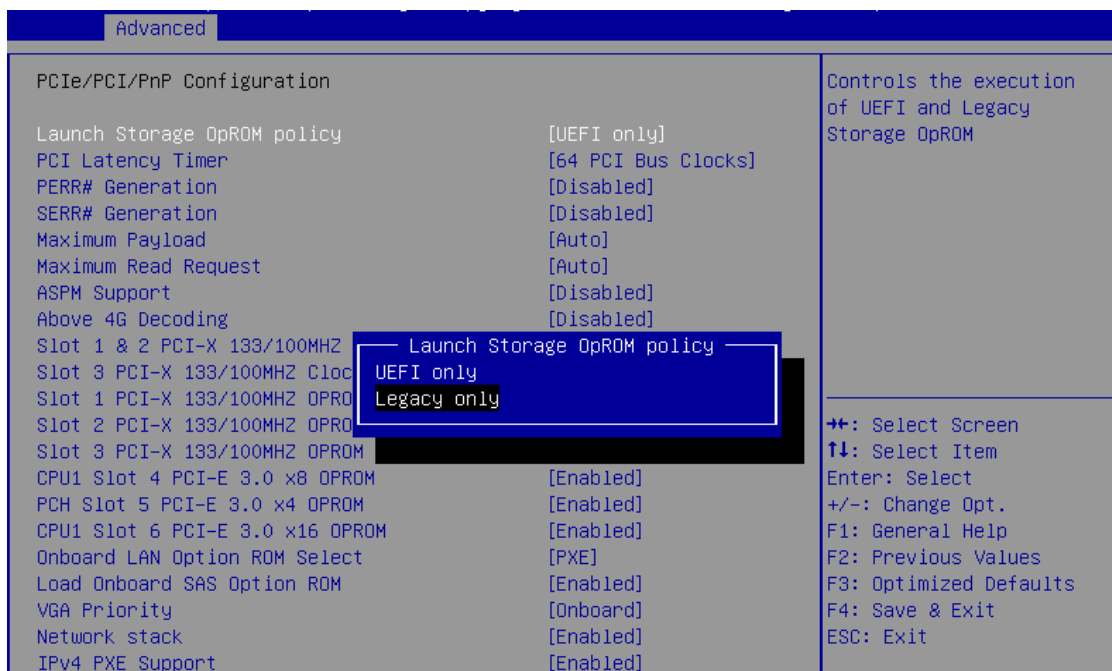
3.1. Preparing USB flash drive

This document assumes that you are using a USB flash drive as a storage media for the necessary files. Follow the steps below to prepare the drive:

- i. Create a DOS bootable USB flash drive. ([Click here](#) for instructions)
- ii. Create a directory *CHELSIO* 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 change your working directory to *OptionROM* directory.
- v. Copy all the files and place them in the *CHELSIO* directory created on the USB flash drive.
- vi. Plug-in the USB flash drive in the system on which the Chelsio CNA is installed.
- vii. Reboot the system and go into the BIOS setup.
- viii. Make the USB flash drive as the primary boot device.
- ix. Save the changes.

3.2. Legacy

- i. In BIOS, configure the system having Chelsio CNA to boot in Legacy mode.



- ii. Once the system boots from the USB flash drive, change your working directory to *CHELSIO* directory:

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

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

- iii. Run the following command to list all Chelsio CNAs present on the system. The list displays a unique index for each CNA found.

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

```
C:\CHELSIO>cfut4 -l

Chelsio T4/T5 Flash Utility v1.5

Index  ChelsioAdaptertype  DevId
=====
[0]    T520-LL          5011
```

- iv. Delete any previous version of Option ROM flashed onto the CNA:

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

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

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

Chelsio T4/T5 Flash Utility v1.5

Erasing serial flash sector(s) ... Done
Reboot machine for changes to take effect
```

- v. Delete any previous firmware using the following command:

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

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

Chelsio T4/T5 Flash Utility v1.5

Erasing serial flash sector(s) ... Done
Erasing serial flash sector(s) ... Done
Reboot machine for changes to take effect
C:\CHELSIO>_
```

- vi. Delete any previous Option ROM settings:

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

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

Chelsio T4/T5 Flash Utility v1.5

Erasing serial flash sector(s) ... Done
Reboot machine for changes to take effect
```

- vii. Run the following command to flash the appropriate firmware (*t5fw-x.xx.xx.x.bin* for T5 adapters; *t4fw-x.xx.xx.x.bin* for T4 adapters).

```
C:\CHELSIO>cfut4 -d <idx> -uf <firmware_file>.bin
```

Here, `firmware_file` is the firmware image file present in the *CHELSIO* directory.

```
C:\CHELSIO>cfut4 -d 0 -uf T5FW-1~1.BIN

Chelsio T4/T5 Flash Utility v1.5

Erasing serial flash sector(s) ... Done
Writing Image at Base 00080000 ... Done
Writing Image at Base 00088000 ... Done
Writing Image at Base 00090000 ... Done
Writing Image at Base 00098000 ... Done
Writing Image at Base 000a0000 ... Done
Writing Image at Base 000a8000 ... Done
Writing Image at Base 000b0000 ... Done
Writing Image at Base 000b8000 ... Done
Writing Image at Base 000c0000 ... Done
Writing Image at Base 000c8000 ... Done
Writing Image at Base 000d0000 ... Done
Writing Image at Base 000d8000 ... Done
Writing Image at Base 000e0000 ... Done
Writing Image at Base 000e8000 ... Done
Writing Image at Base 000f0000 ... Done
Reboot machine for changes to take effect
```

- viii. Flash the unified option ROM onto the Chelsio CNA using the following command:

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

Here, `cubt4.bin` is the unified option ROM image file present in the *CHELSIO* directory.

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

Chelsio T4/T5 Flash Utility v1.5

Erasing serial flash sector(s) ... Done
Writing Image at Base 00000000 ... Done
Writing Image at Base 00008000 ... Done
Writing Image at Base 00010000 ... Done
Writing Image at Base 00018000 ... Done
Writing Image at Base 00020000 ... Done
Writing Image at Base 00028000 ... Done
Writing Image at Base 00030000 ... Done
Writing Image at Base 00038000 ... Done
Writing Image at Base 00040000 ... Done
Writing Image at Base 00048000 ... Done
Writing Image at Base 00050000 ... Done
Writing Image at Base 00058000 ... Done
Writing Image at Base 00060000 ... Done
Writing Image at Base 00068000 ... Done
Erasing serial flash sector(s) ... Done
Writing Image at Base 00070000 ... Done
Reboot machine for changes to take effect
```

- ix. Flash the default boot configuration file.

```
C:\CHELSIO>cfut4 -d <idx> -uc bootcfg
```

```
C:\CHELSIO>cfut4 -d 0 -uc bootcfg

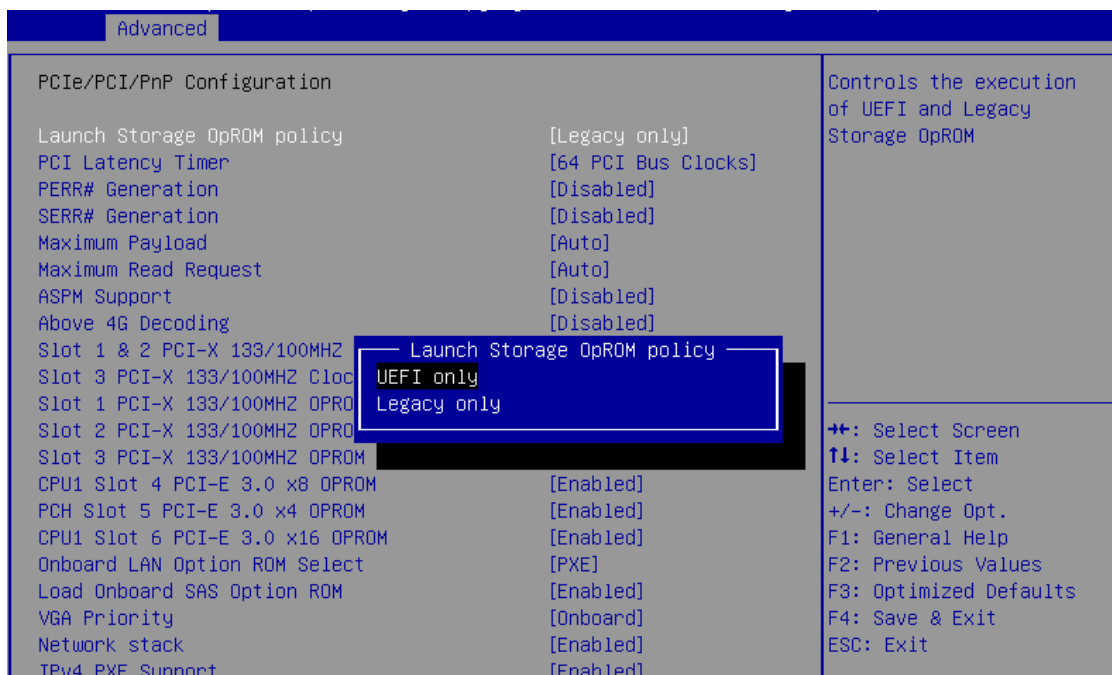
Chelsio T4/T5 Flash Utility v1.5

Erasing serial flash sector(s) ... Done
Updating the configuration in flash
Writing Image at Base 00070000 ... Done
Updating the configuration in flash succeeded
```

- x. Reboot the system for changes to take effect.

3.3. uEFI

- i. Configure the system having Chelsio CNA to boot in uEFI mode.



Note For Supermicro systems, enable **Network Stack** as well before proceeding.

- ii. Boot to EFI Shell.

```
EFI Shell version 2.31 [4.654]
Current running mode 1.1.2
Device mapping table
  fs0 :Removable HardDisk - Alias hd83b0f0b blk0
        PciRoot(0x0)/Pci(0x1d,0x0)/USB(0x1,0x0)/USB(0x5,0x0)/HD(1,MBR,0x0fdb738d,0x800,0x78b800)
  blk0 :Removable HardDisk - Alias hd83b0f0b fs0
        PciRoot(0x0)/Pci(0x1d,0x0)/USB(0x1,0x0)/USB(0x5,0x0)/HD(1,MBR,0x0fdb738d,0x800,0x78b800)
  blk1 :HardDisk - Alias (null)
        PciRoot(0x0)/Pci(0x1f,0x2)/Sata(0x0,0x0)/HD(1,MBR,0x00092b0c,0x3f,0x9c25fe)
  blk2 :HardDisk - Alias (null)
        PciRoot(0x0)/Pci(0x1f,0x2)/Sata(0x0,0x0)/HD(2,MBR,0x00092b0c,0x9c263d,0x88b8fdc)
  blk3 :HardDisk - Alias (null)
        PciRoot(0x0)/Pci(0x1f,0x2)/Sata(0x0,0x0)/HD(3,MBR,0x00000000,0x927be19,0x14019e7)
  blk4 :HardDisk - Alias (null)
        PciRoot(0x0)/Pci(0x1f,0x2)/Sata(0x0,0x0)/HD(4,MBR,0x00000000,0xa67d83f,0x13fe849)
  blk5 :BlockDevice - Alias (null)
        PciRoot(0x0)/Pci(0x1f,0x2)/Sata(0x0,0x0)
  blk6 :Removable BlockDevice - Alias (null)
        PciRoot(0x0)/Pci(0x1d,0x0)/USB(0x1,0x0)/USB(0x5,0x0)

Press ESC in 1 seconds to skip startup.nsh, any other key to continue.
Shell> _
```

- iii. Issue command `drivers` to determine if Chelsio uEFI driver is loaded. If the driver is loaded (as shown in the image below), continue to step (iv)

```

64 00000024 B - - 1 1 BIOS[INT10] Video Driver CsmVideo
65 00000010 ? - - - - <UNKNOWN> <UNKNOWN>
68 00000001 B - - 1 1 AMI AHCI BUS Driver AHCI
6C 00000010 B - - 3 3 <UNKNOWN> Terminal
6D 00000010 B - - 1 1 <UNKNOWN> Terminal
79 0000000A ? - - - - SCSI Bus Driver ScsiBus
7A 0000000A ? - - - - Scsi Disk Driver ScsiDisk
7F 05061000 B X X 2 2 Intel(R) PRO/1000 5.6.10 PCI-E IntelGigabitLanx64
80 0000000A D - - 2 - iSCSI Driver IScsiDxe
85 00000010 D - - 1 - <UNKNOWN> BIOSBLKIO
BD 0000008A D - - 2 - AMI USB Driver UHCD
BF 0000008A B - - 2 5 USB bus UHCD
C0 00000001 D - - 2 - USB Hid driver UHCD
C1 00000001 D - - 1 - USB Mass Storage driver UHCD
C2 00000001 ? - - - - AMI USB CCID driver UHCD
E3 00000010 D - - 7 - <UNKNOWN> CORE_DXE
E4 00000010 D - - 1 - <UNKNOWN> CORE_DXE
E5 00000010 B - - 6 6 <UNKNOWN> CORE_DXE
E7 00000010 B - - 2 5 <UNKNOWN> CORE_DXE
E8 00000010 D - - 1 - AMI PS/2 Driver CORE_DXE
E9 00000010 ? - - - - AMI Floppy Driver CORE_DXE
EA 00000001 ? - - - - AMI IDE BUS Driver CORE_DXE
F8 0100004B B X X 2 - Chelsio Unified Driver Offset(0x3034,0x1a)

Shell> drivers_

```

If the driver is not loaded, load the uEFI driver (*ChelsioUD.efi*) found in the CHELSIO directory, and try again.

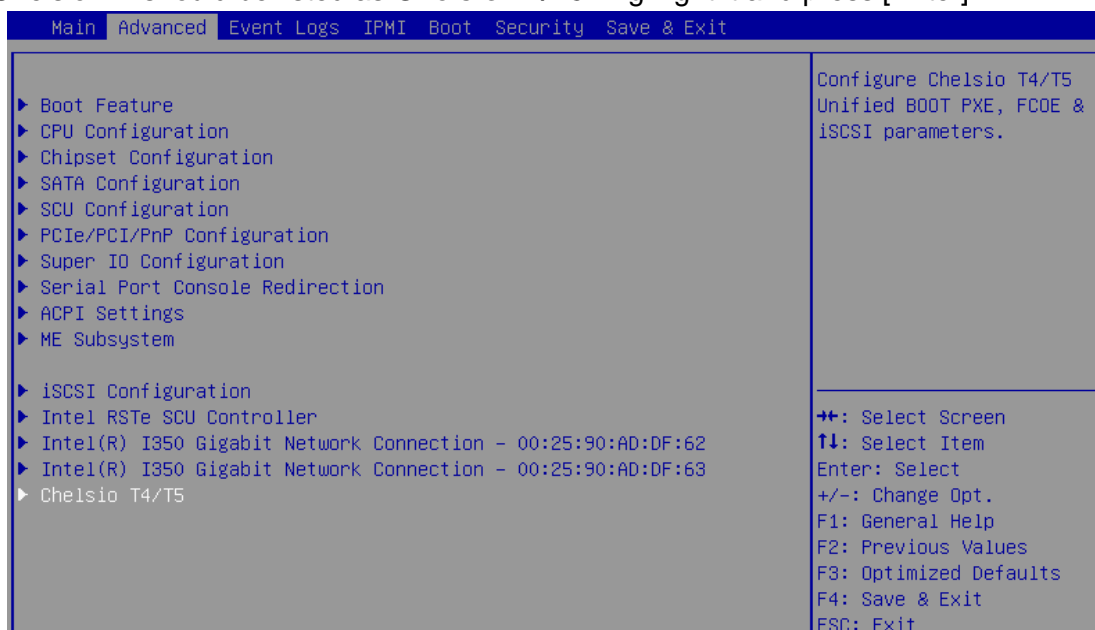
```

fs0:\CHELSIO> load ChelsioUD.efi
load: Image fs0:\CHELSIO\ChelsioUD.efi loaded at 7F2BA000 - Success

```

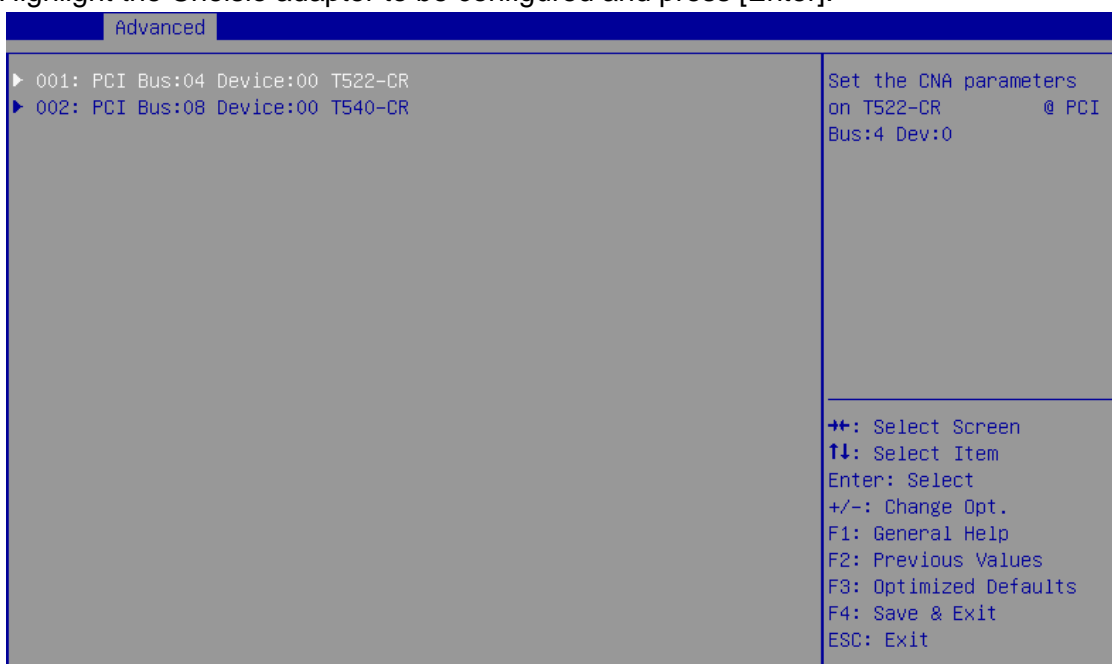
- iv. Reboot the system and go into BIOS setup.

- v. Chelsio HII should be listed as **Chelsio T4/T5**. Highlight it and press [Enter].

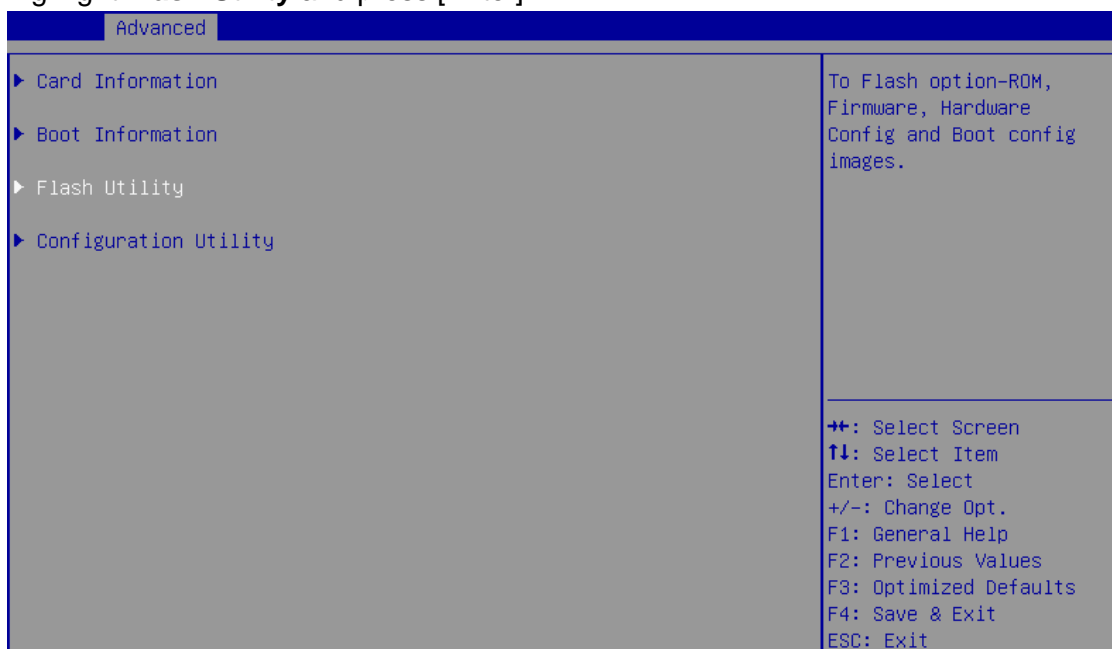


Note If Chelsio T4/T5 is not listed, please ensure that Chelsio uEFI driver is loaded correctly as mentioned [here](#) in the **Flashing Firmware and Option ROM** section.

- vi. Highlight the Chelsio adapter to be configured and press [Enter].

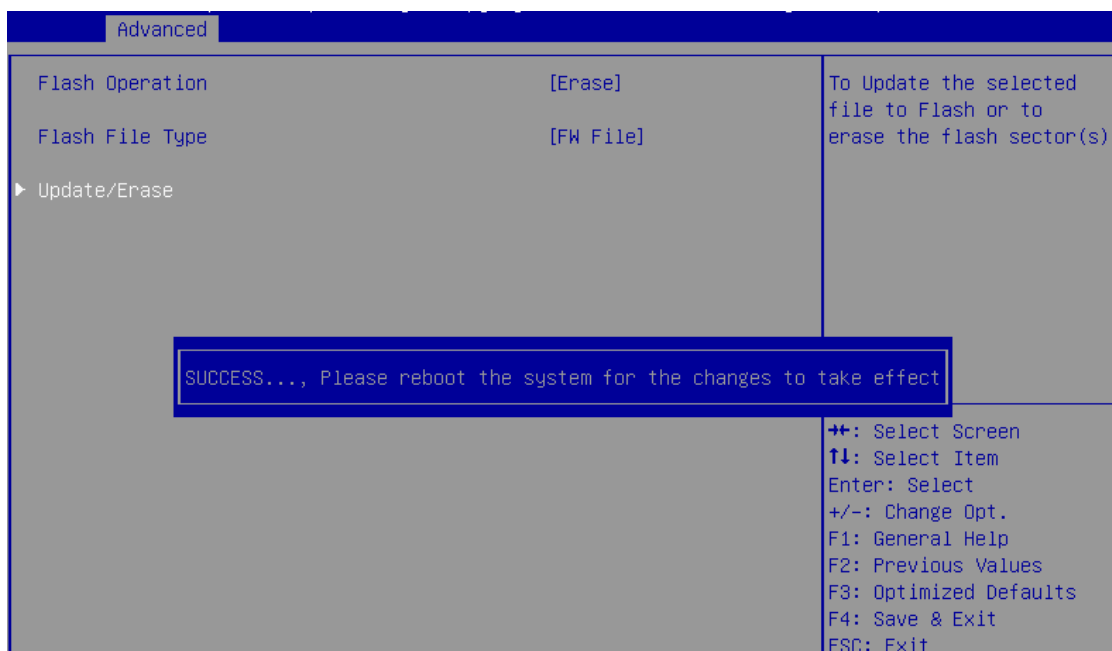


vii. Highlight **Flash Utility** and press [Enter].



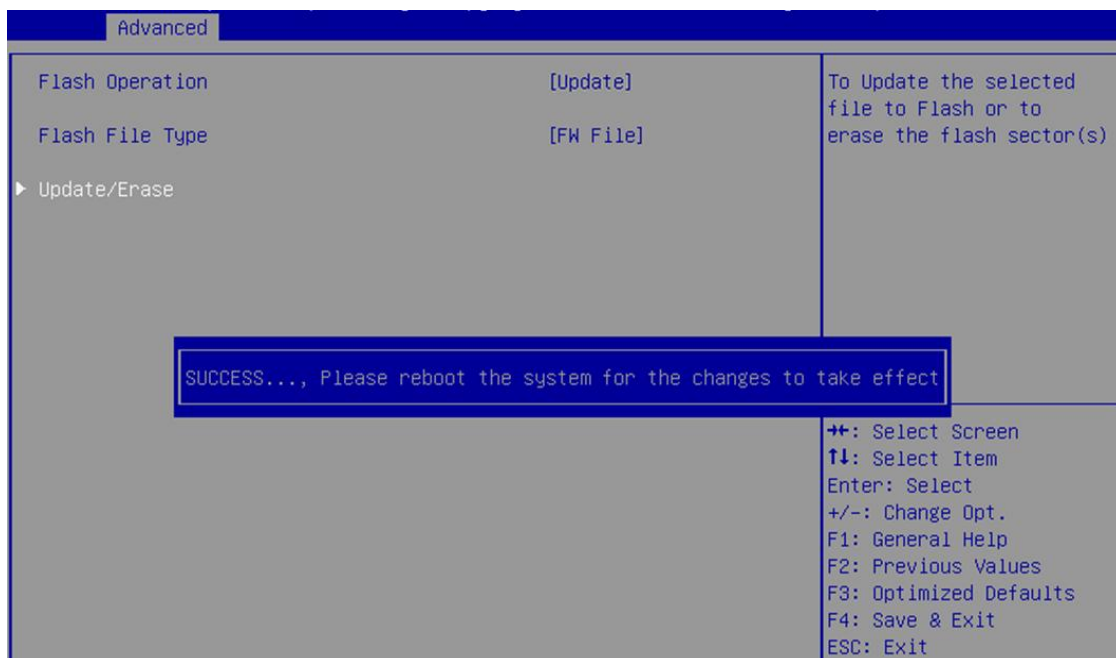
viii. Erase or update firmware using the methods explained below:

- **Erase existing firmware**
 - a. Select *[Erase]* as *Flash Operation*
 - b. Select *[FW File]* as *Flash File Type*
 - c. Select *Update/Erase*
 - d. Press [Y] to confirm.
 - e. Reboot system.



- **Update firmware**

- a. Select *[Update]* as *Flash Operation*
- b. Select *[FW File]* as *Flash File Type*
- c. Enter full path to the firmware file for *Enter File Name*. For e.g.: *CHELSIO\t5fw-1.13.32.0.bin*.
- d. Press [Enter]
- e. Select *Update/Erase*
- f. Press [Y] to confirm.
- g. Reboot system



Similarly, you can use the above method to update/erase Option ROM, (T5/T4) Boot Configuration, Hardware Configuration and Phy Firmware file.

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>



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

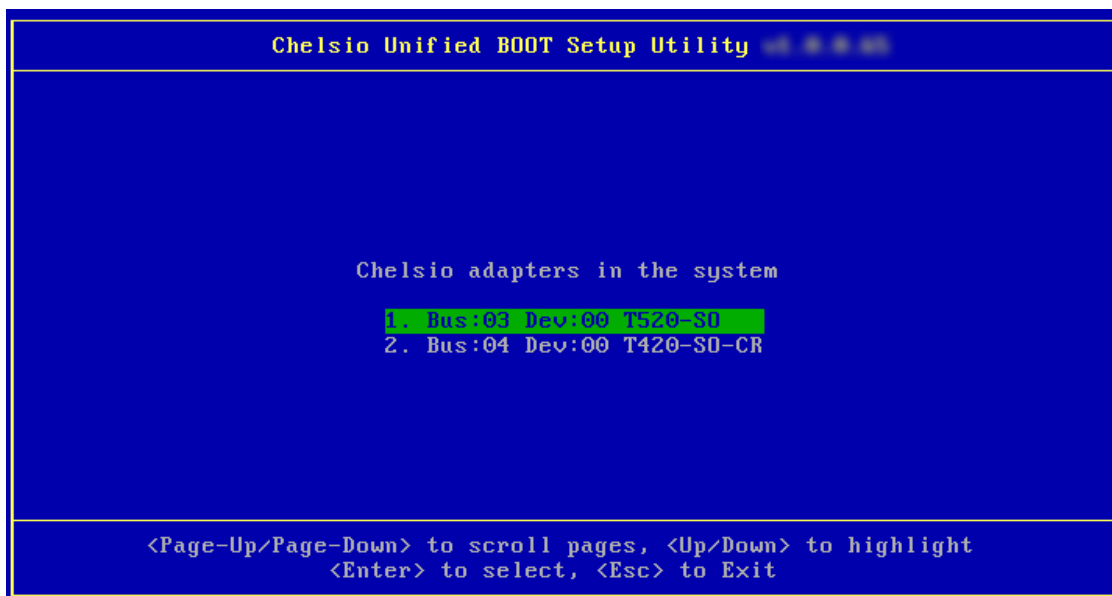
Before proceeding, please ensure that the Chelsio CNA has been flashed with the provided firmware and option ROM (See [Flashing Firmware and option ROM](#)).

5.1. 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 Unified Boot BIOS vX.X.X.XX, Copyright (C) 2003-2015 Chelsio Communications Press <Alt-C> to Configure T4/T5 Card(s). Press <Alt-S> to skip BIOS* appears on the screen to enter the configuration utility.

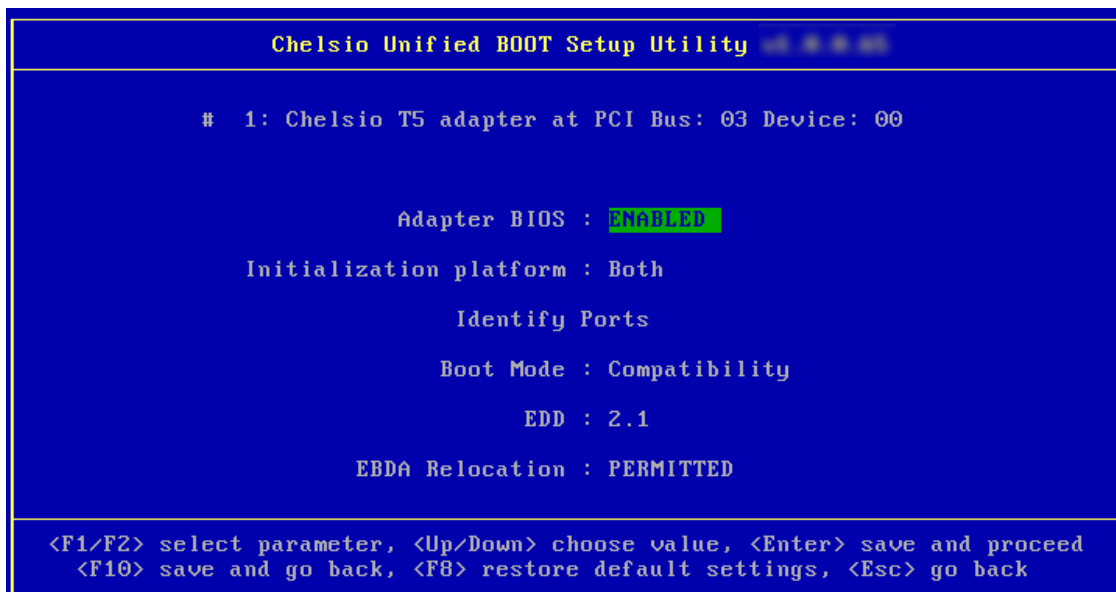
```
Chelsio Unified Boot BIOS v1.0.0.00
Copyright (C) 2003-2015 Chelsio Communications
Press <Alt-C> to Configure T4/T5 Card(s). Press <Alt-S> to skip BIOS.
```


- iii. The configuration utility will appear as below:



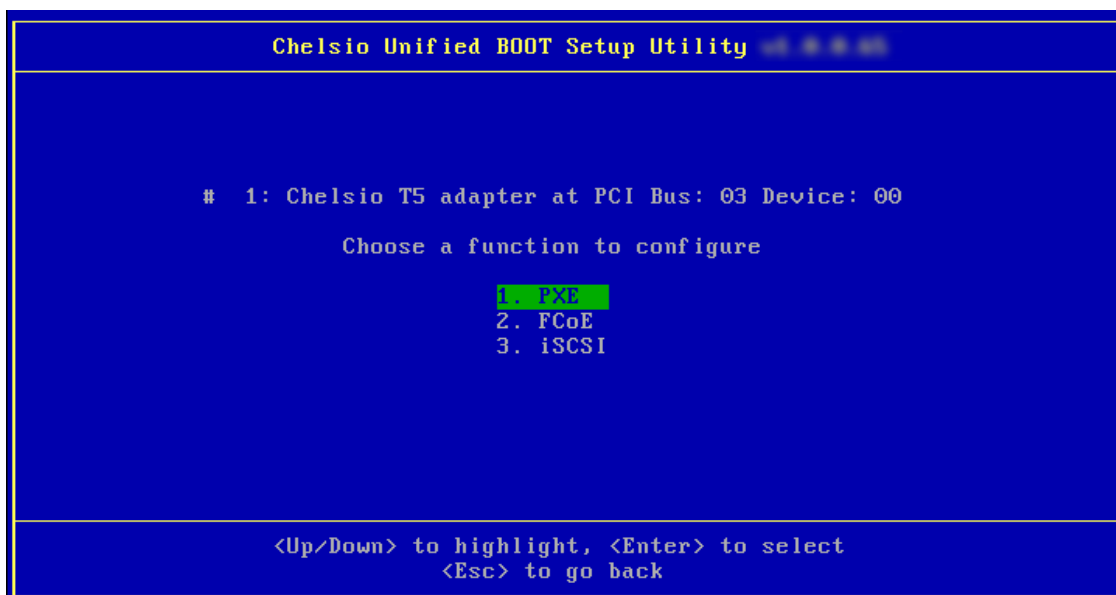
- iv. Choose the CNA on which you flashed the option ROM image. Hit [Enter].

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

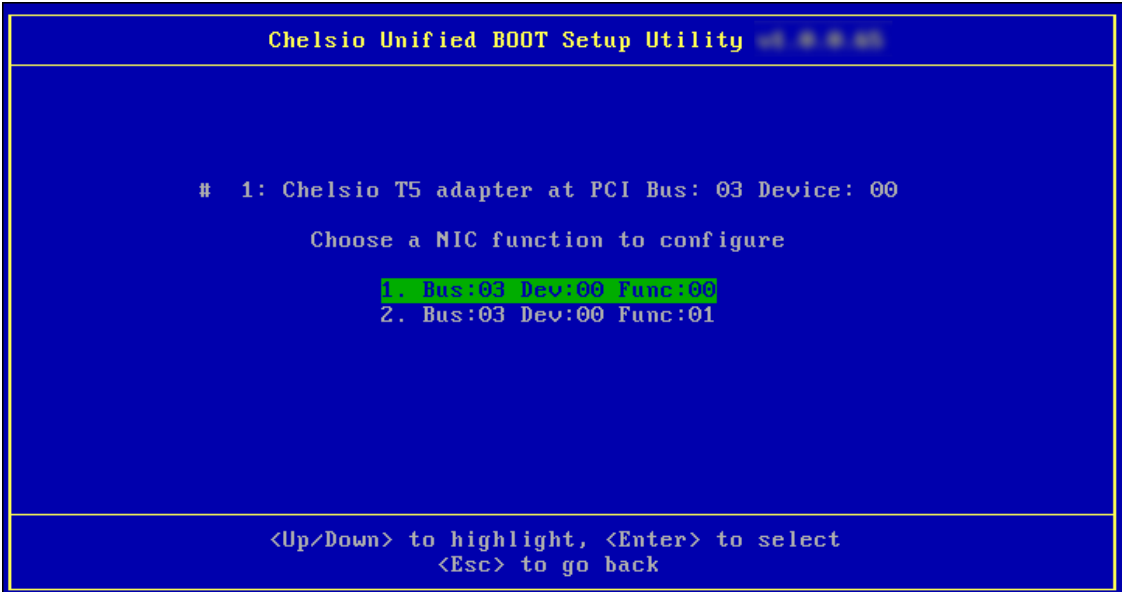


 **Note** Use the default values for Boot Mode, EDD and EBDA Relocation parameters, unless instructed otherwise.

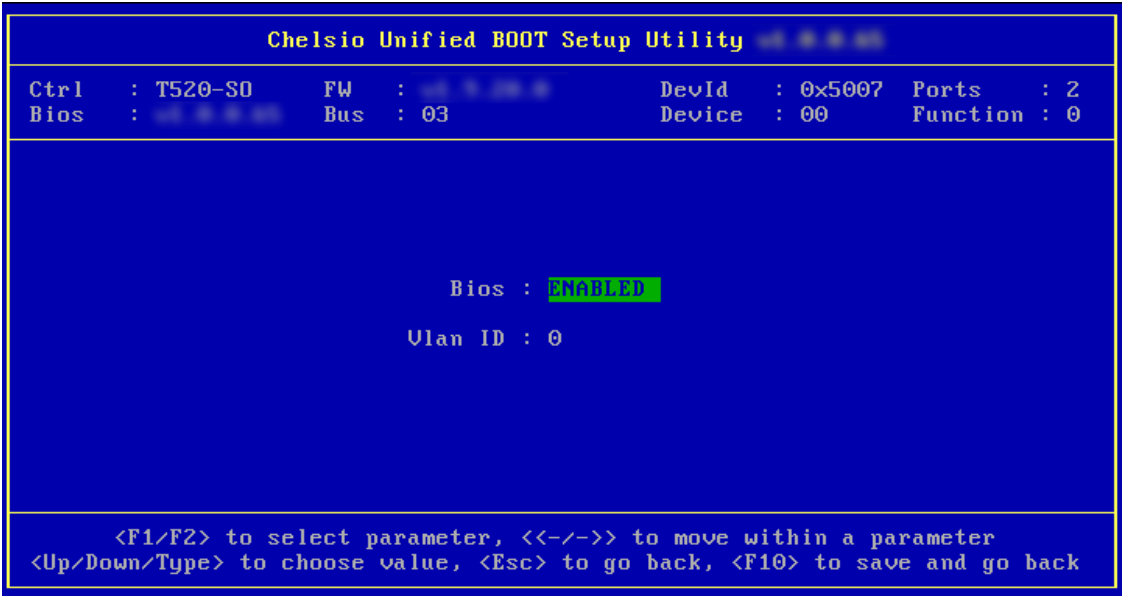
- vi. Choose PXE from the list to configure. Hit [Enter].



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



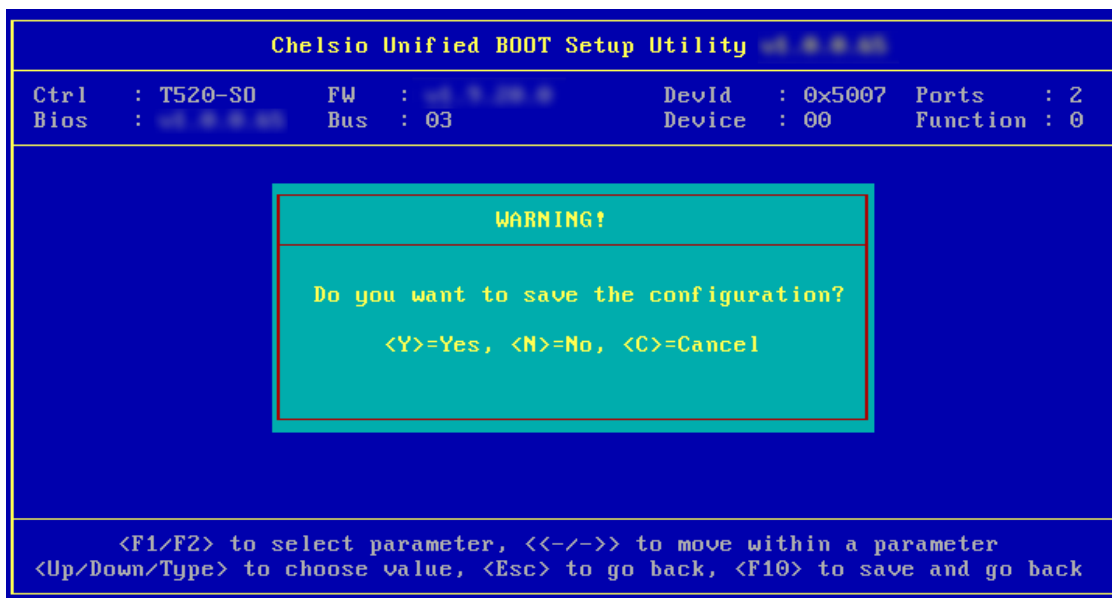
- viii. Enable NIC function bios if not already enabled.



- 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:

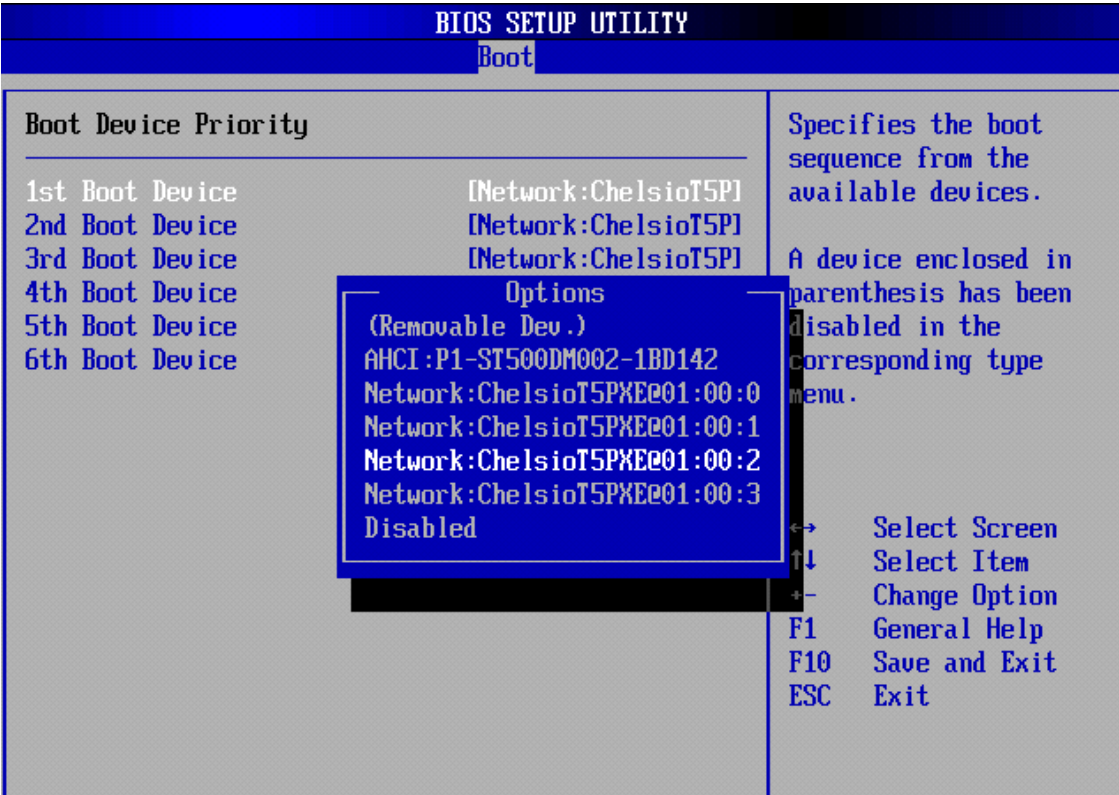
NIC Function enabled	Ports enabled
NIC Func00	00
NIC Func01	01
NIC Func02	02
NIC Func03	03

- x. Hit [F10] or [Esc] and then [Y] to save configuration changes.



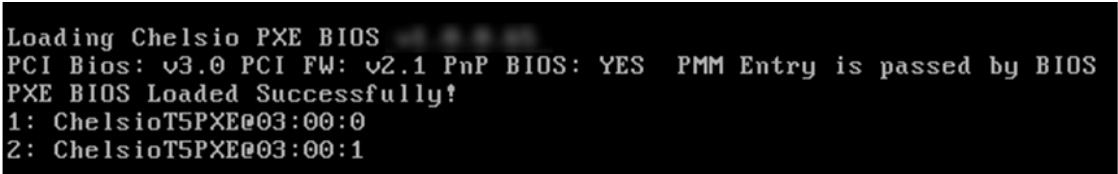
- xi. Reboot the system.
- xii. Hit [F2] or [DEL] or any other key as mentioned during system startup to enter the system BIOS.

xiii. Choose any one of the Chelsio PXE devices as the first boot device.



xiv. Reboot and hit [F12] key when prompted to start PXE boot.

xv. Chelsio option ROM will now initialize and setup PXE devices.



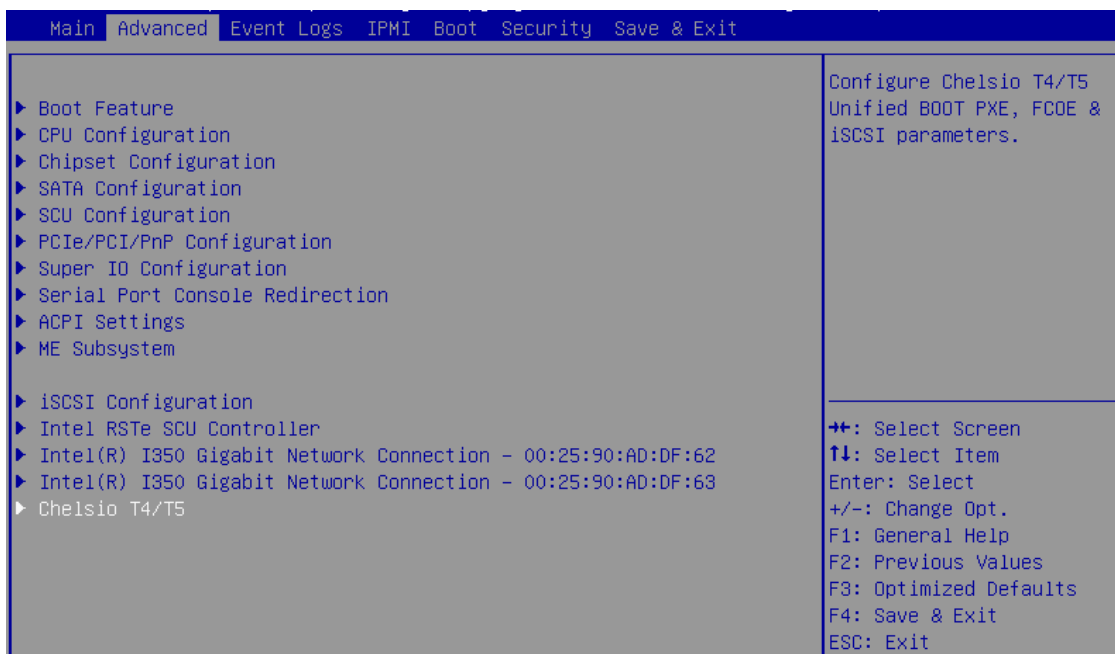
5.2. uEFI PXE Boot

Important

- Only uEFI v2.1 and v2.3.1 supported.
- Any other uEFI version is NOT SUPPORTED and may render your system unusable.

This section describes the method to configure and use Chelsio uEFI PXE interfaces.

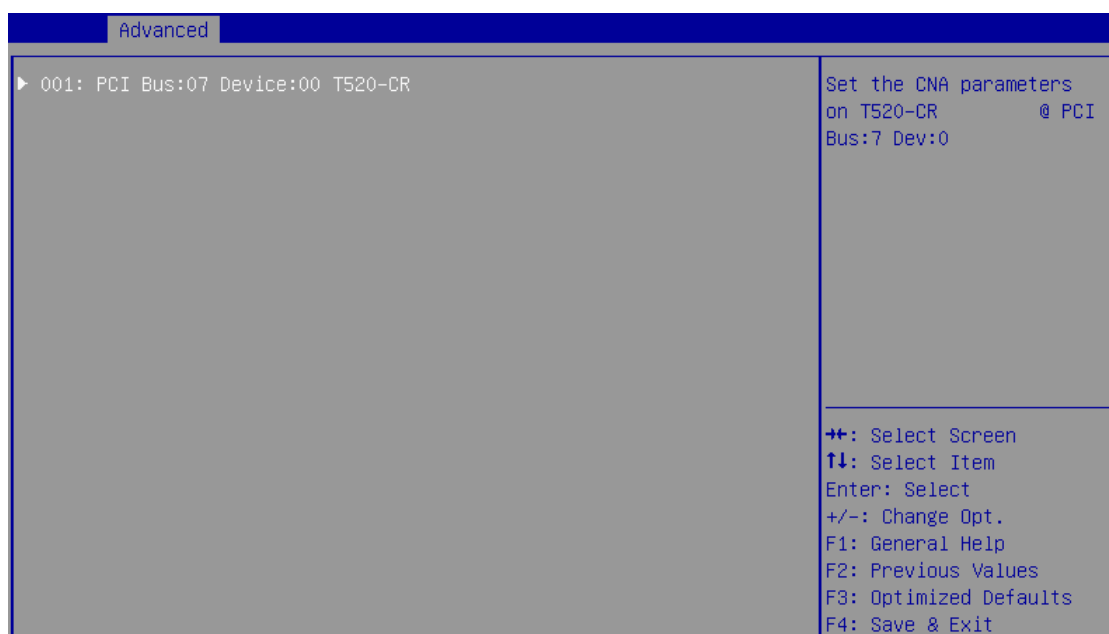
- Reboot the system and go into the BIOS setup.
- Chelsio HII should be listed as **Chelsio T4/T5**. Highlight it and press [Enter].



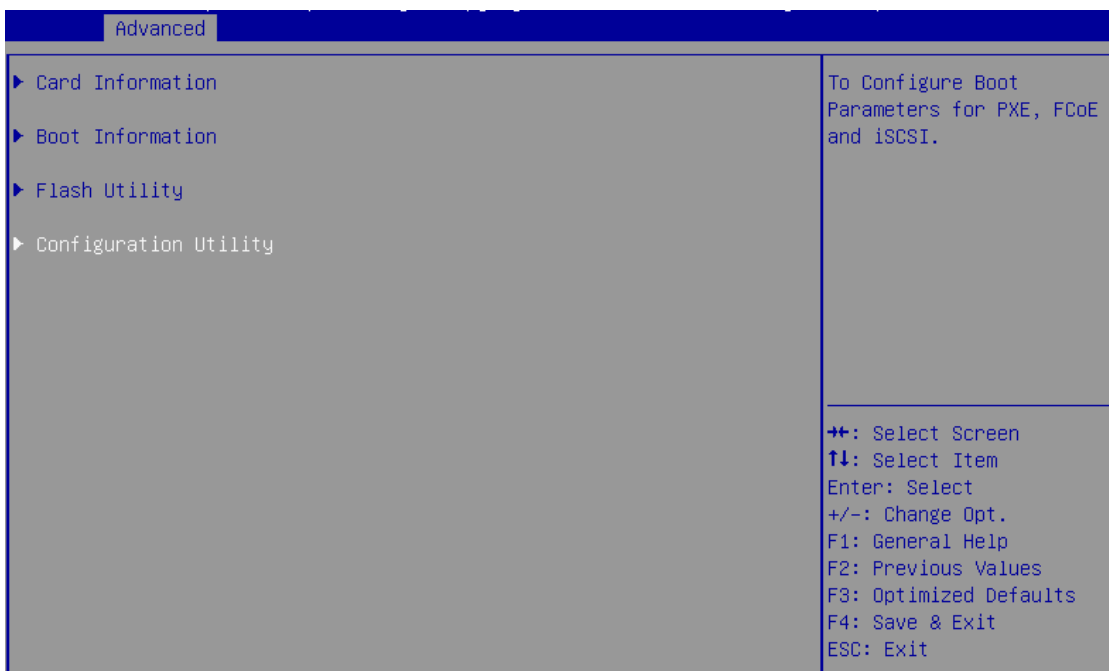
Note

If Chelsio T4/T5 is not listed, please ensure that Chelsio uEFI driver is loaded correctly as mentioned [here](#) in the **Flashing Firmware and Option ROM** section.

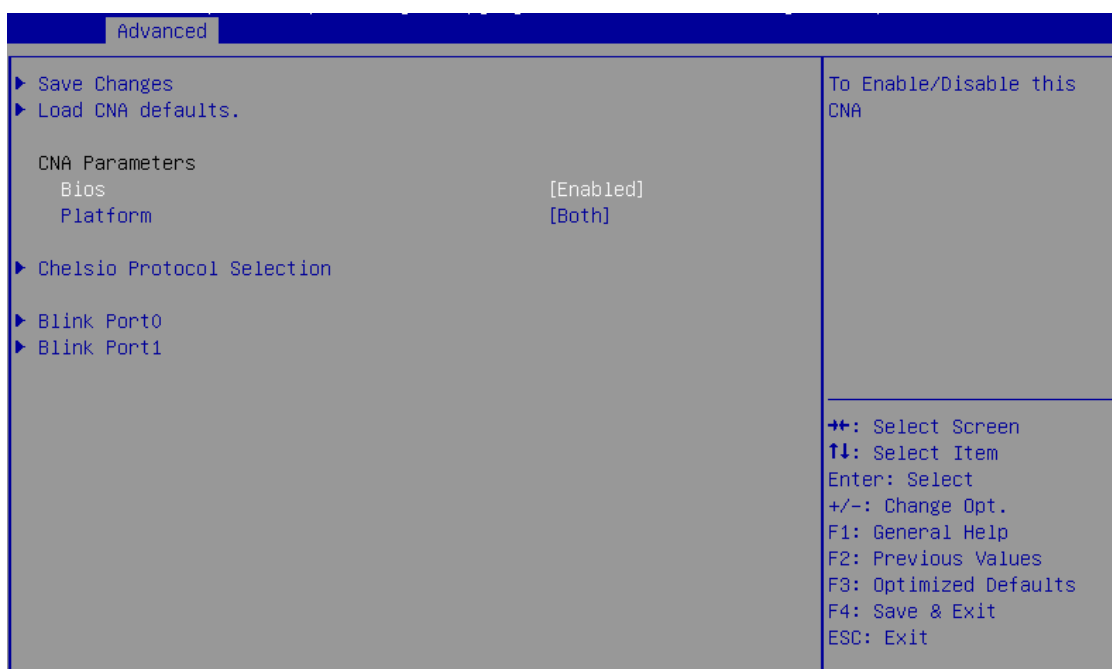
- iii. Select the Chelsio adapter to be configured and press [Enter].



- iv. Select **Configuration Utility** and press [Enter].

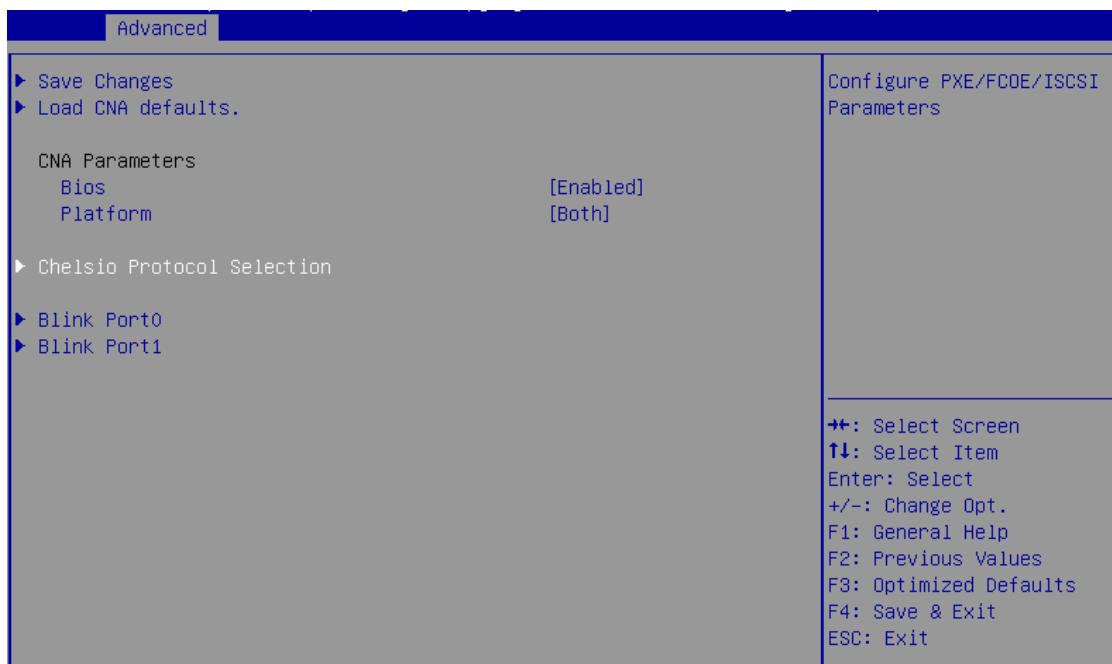


- v. Enable adapter BIOS if not already enabled.

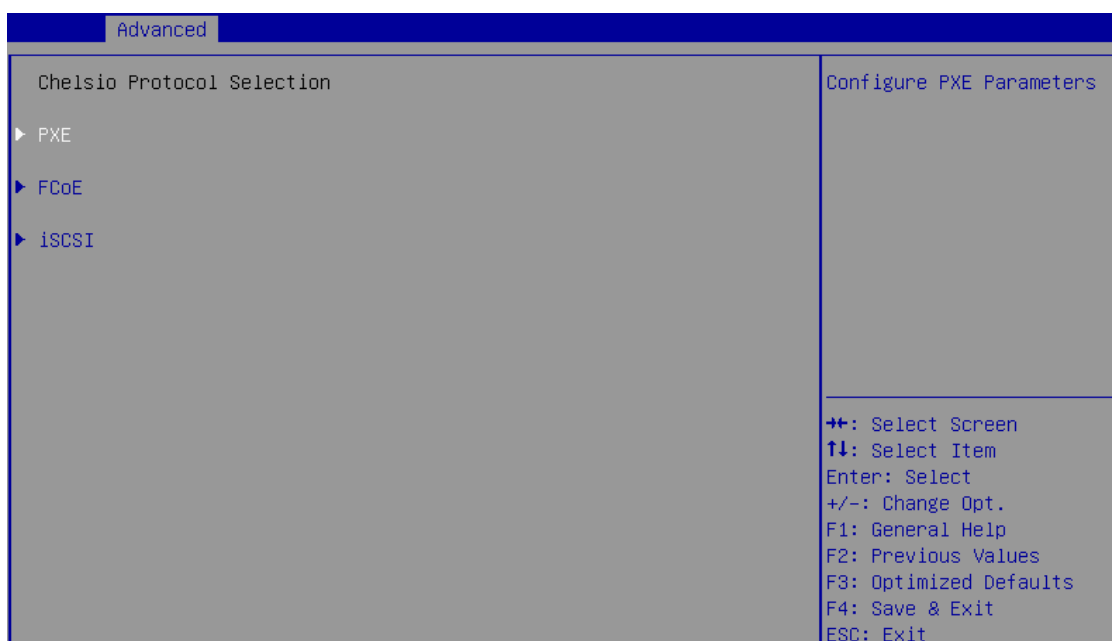


Note *It is highly recommended that you use the **Save Changes** option every time a parameter/option is changed.*

- vi. Select **Chelsio Protocol Selection** and press [Enter].

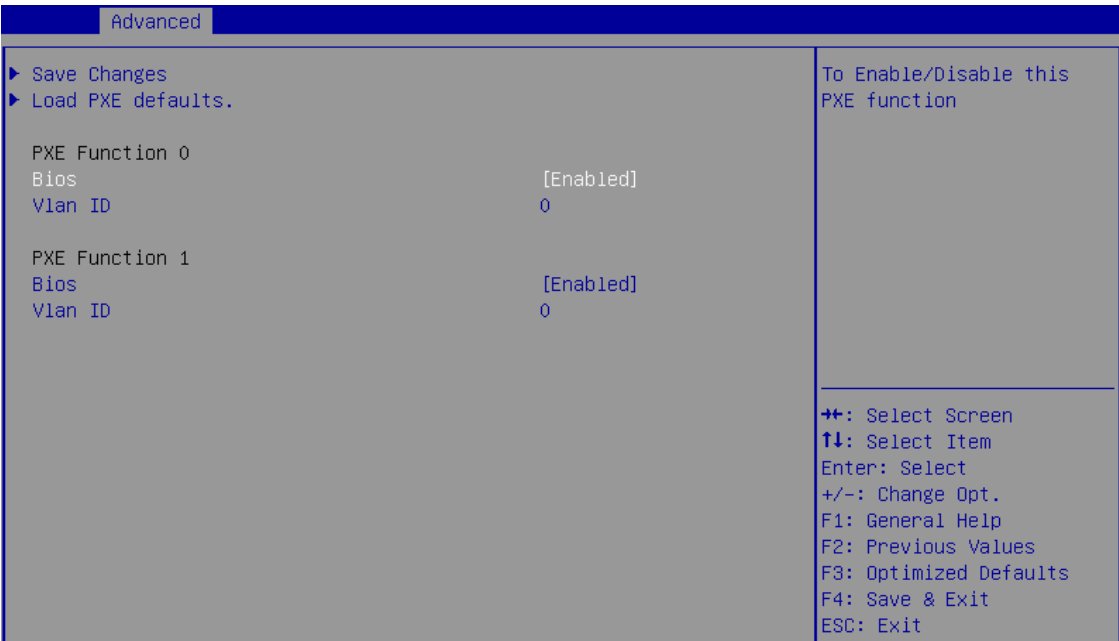


- vii. Select **PXE** and press [Enter].

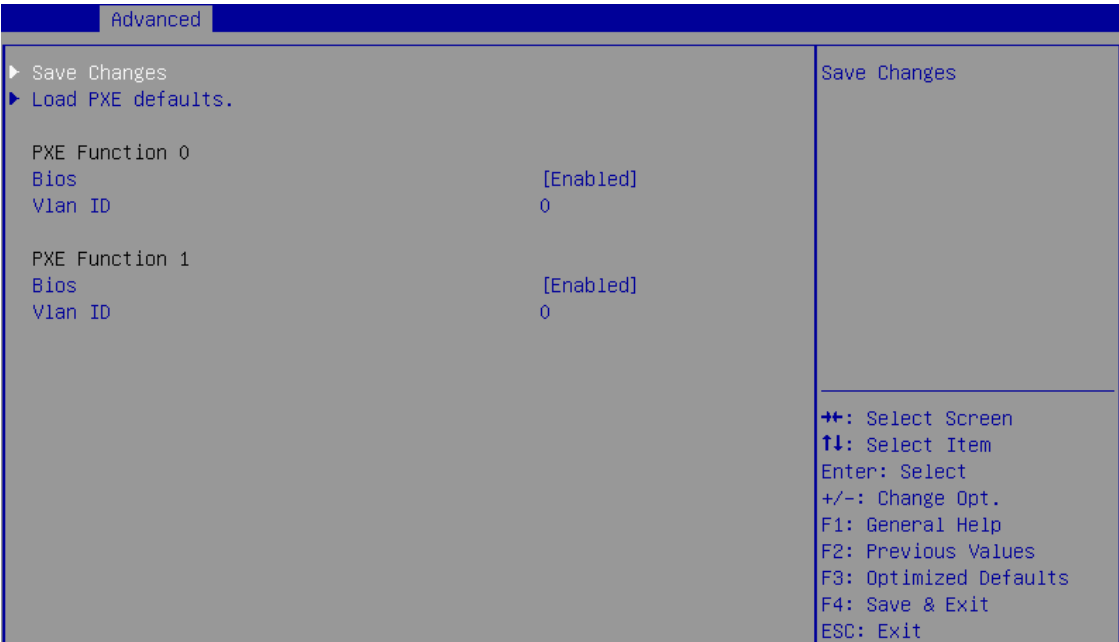


- viii. Choose the boot port to try PXE boot. It is recommended to enable only those functions and ports which are going to be used. Please note that enabling PXE Function 0 will enable port 0 for PXE, enabling PXE Function 1 will enable port 1 and so on, for NIC function. Please refer the table below:

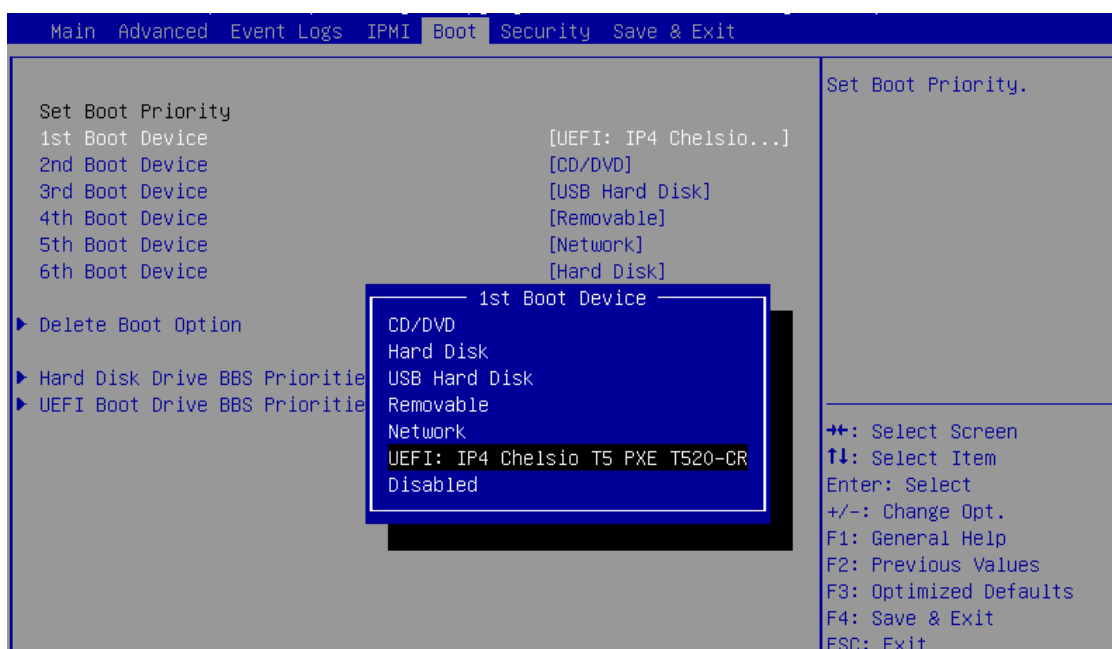
NIC Function enabled	Ports enabled
PXE Function 0	00
PXE Function 1	01
PXE Function 2	02
PXE Function 3	03



ix. Select **Save Changes** and press [Enter]



- x. Reboot the system and choose any of the available Chelsio PXE devices for PXE boot.



- xi. Reboot and hit [F12] key when prompted to start PXE boot.
 xii. Chelsio option ROM will now initialize and setup PXE devices.

```

Loading Chelsio PXE BIOS
PCI Bios: v3.0 PCI FW: v2.1 PnP BIOS: YES PMM Entry is passed by BIOS
PXE BIOS Loaded Successfully!
1: ChelsioT5PXE003:00:0
2: ChelsioT5PXE003:00:1
  
```

6. FCoE boot process

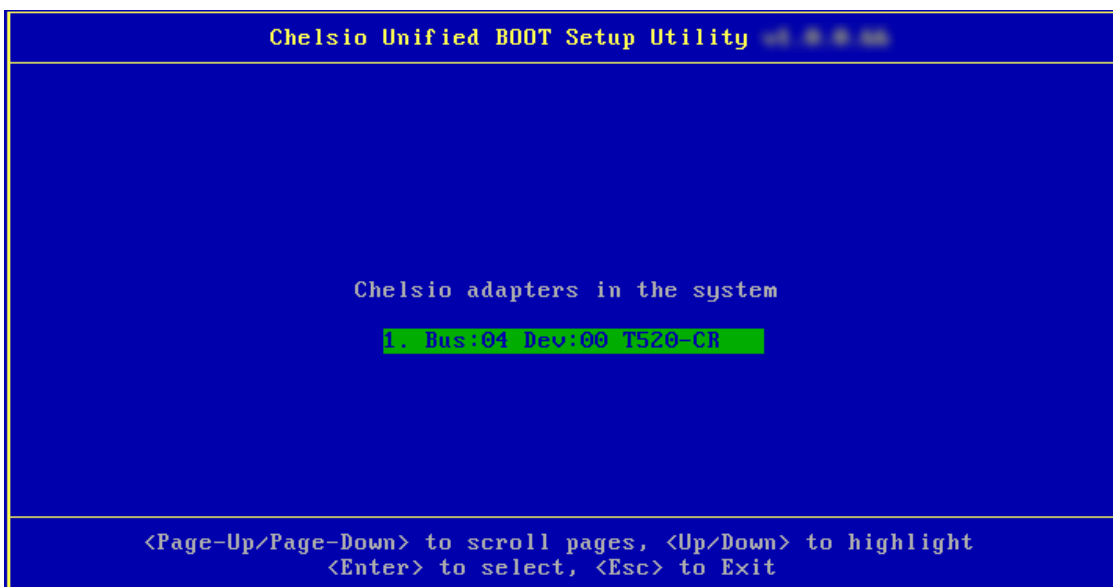
Before proceeding, please ensure that the Chelsio CNA has been flashed with the provided firmware and option ROM (See [Flashing firmware and option ROM](#)).

6.1. Legacy FCoE boot

- i. Reboot the system.
- ii. Press [Alt+C] when the message “*Chelsio Unified Boot BIOS vX.X.X.XX, Copyright (C) 2003-2015 Chelsio Communications Press <Alt-C> to Configure T4/T5 Card(s). Press <Alt-S> to skip BIOS*” appears on the screen to enter the configuration utility.

```
Chelsio Unified Boot BIOS v1.0.0.00
Copyright (C) 2003-2015 Chelsio Communications
Press <Alt-C> to Configure T4/T5 Card(s). Press <Alt-S> to skip BIOS.
```

- 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 if not already enabled. Hit [ENTER].

```
Chelsio Unified BOOT Setup Utility v0.9.0.0

# 1: Chelsio T5 adapter at PCI Bus: 04 Device: 00

Adapter BIOS : ENABLED
Initialization platform : Both
Identify Ports
Boot Mode : Compatibility
EDD : 2.1
EBDA Relocation : PERMITTED

<F1/F2> select parameter, <Up/Down> choose value, <Enter> save and proceed
<F10> save and go back, <F8> restore default settings, <Esc> go back
```

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

- vi. Choose FCoE from the list to configure and hit [Enter].

```
Chelsio Unified BOOT Setup Utility v0.9.0.0

# 1: Chelsio T5 adapter at PCI Bus: 04 Device: 00

Choose a function to configure

1. PXE
2. FCoE
3. iSCSI

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

- vii. Choose the first option, **Configure function parameters**, from the list of parameter type and hit [Enter].

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5601	Ports	: 2
Bios	: 1.0.0.0	Bus	: 04	Device	: 00	Function	: 6
<p>Choose the parameter type to configure</p> <p>1. Configure function parameters</p> <p>2. Configure boot parameters</p> <p>3. Show port WWPN</p>							
<p><Up/Down> to highlight, <Enter> to select <Esc> to go back</p>							

- viii. Enable FCoE BIOS if not already enabled.

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5601	Ports	: 2
Bios	: 1.0.0.0	Bus	: 04	Device	: 00	Function	: 6
<p>Bios : ENABLED</p> <p>Port order for boot retry : 00 NONE</p> <p>Discovery Timeout : 30</p>							
<p><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</p>							

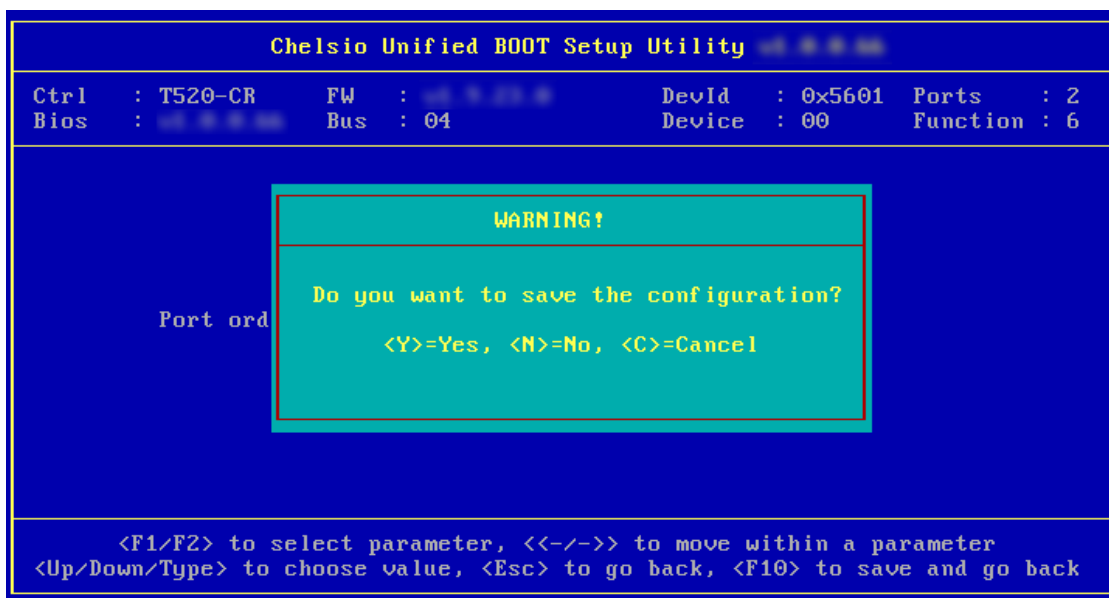
- ix. Choose the order of the ports to discover FCoE targets.

Chelsio Unified BOOT Setup Utility					
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5601
Bios	: 1.0.0.0	Bus	: 04	Device	: 00
Ports	: 2	Function	: 6		
<p>Bios : ENABLED</p> <p>Port order for boot retry : 00 01</p> <p>Discovery Timeout : 30</p>					
<p><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</p>					

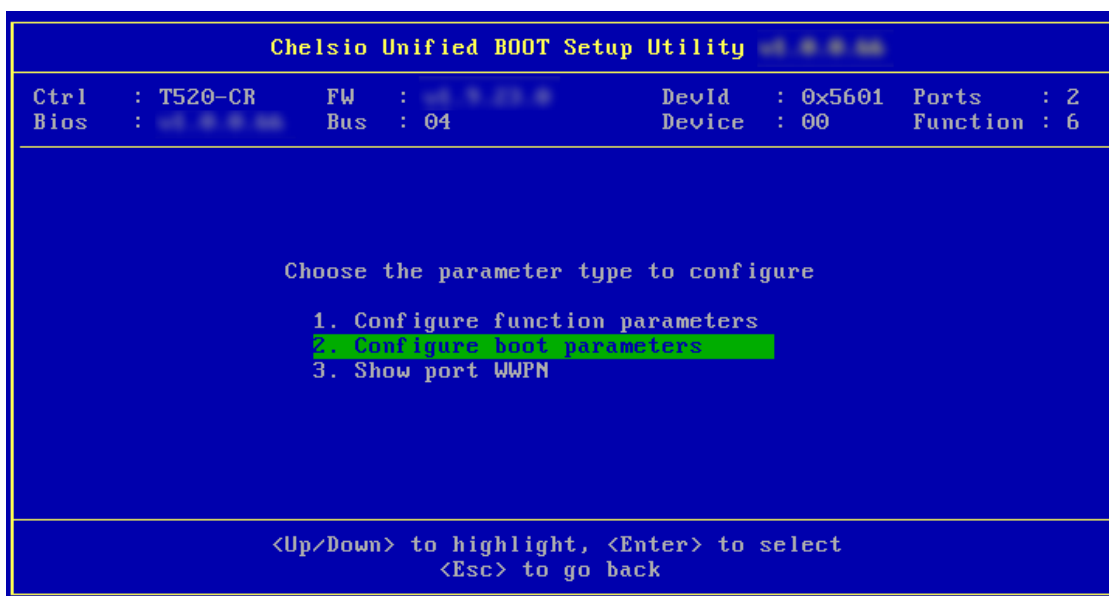
- x. Set discovery timeout to a suitable value. Recommended value is ≥ 30 .

Chelsio Unified BOOT Setup Utility					
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5601
Bios	: 1.0.0.0	Bus	: 04	Device	: 00
Ports	: 2	Function	: 6		
<p>Bios : ENABLED</p> <p>Port order for boot retry : 00 01</p> <p>Discovery Timeout : 30</p>					
<p><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</p>					

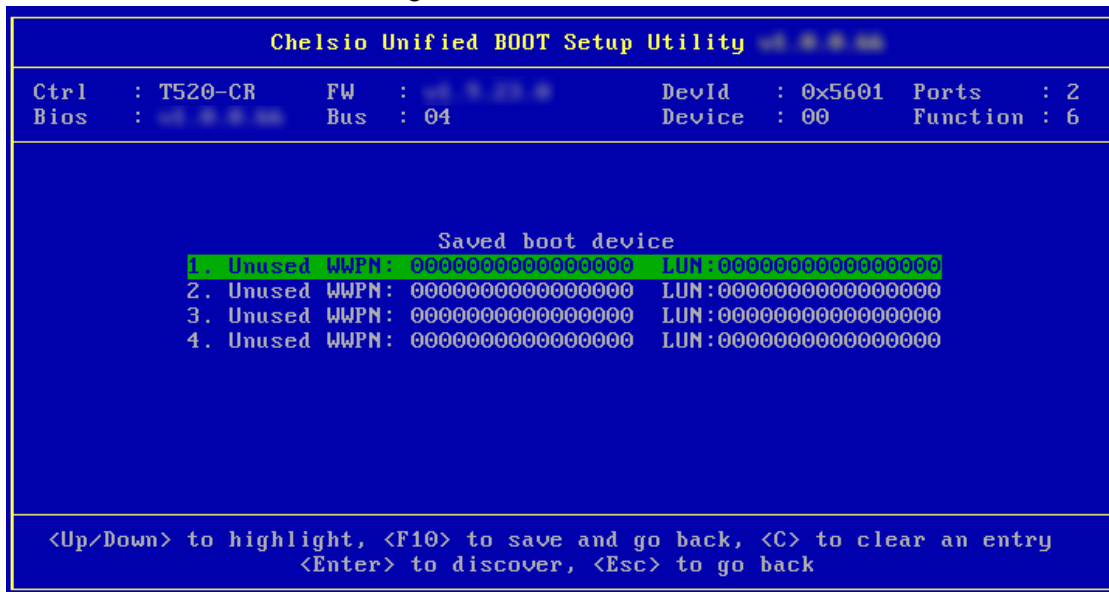
- xi. Hit [F10] or [Esc] and then [Y] to save the configuration.



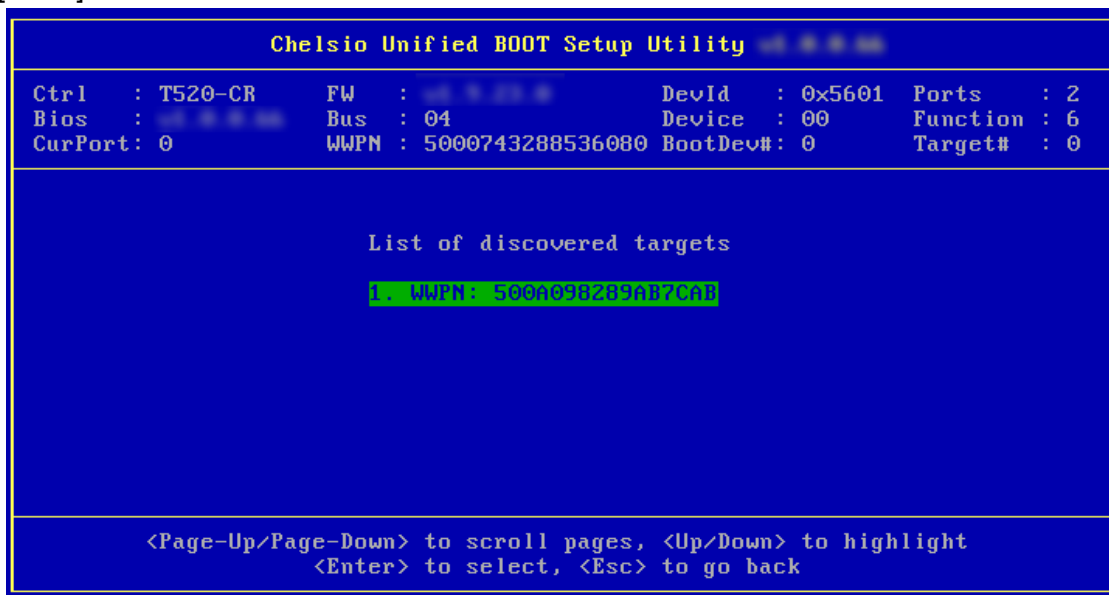
- xii. Choose **Configure boot parameters**.



- xiii. Select the first boot device and hit [Enter] to discover FC/FCoE targets connected to the switch. Wait till all reachable targets are discovered.



- xiv. List of discovered targets will be displayed. Highlight a target using the arrow keys and hit [Enter] to select.



- xv. From the list of LUNs displayed for the selected target, choose one on which operating system has to be installed. Hit [Enter].

Chelsio Unified BOOT Setup Utility				
Ctrl : T520-CR	FW : 5.0.0.0	DevId : 0x5601	Ports : 2	
Bios : 5.0.0.0	Bus : 04	Device : 00	Function : 6	
CurPort: 0	WWPN : 5000743288536080	BootDev#: 0	Target# : 0	
List of LUNs present on the target				
1. LUN: 0000000000000000	NETAPP	35.0003	GB	
2. LUN: 0002000000000000	NETAPP	1.0035	GB	
3. LUN: 0003000000000000	NETAPP	1.0035	GB	
4. LUN: 0004000000000000	NETAPP	1.0035	GB	
5. LUN: 0005000000000000	NETAPP	1.0035	GB	
6. LUN: 0006000000000000	NETAPP	1.0035	GB	
7. LUN: 0007000000000000	NETAPP	1.0035	GB	
8. LUN: 0008000000000000	NETAPP	1.0035	GB	
<Page-Up/Page-Down> to scroll the list, <Up/Down> to highlight <Enter> to select, <Esc> to go back				

Chelsio Unified BOOT Setup Utility				
Ctrl : T520-CR	FW : 5.0.0.0	DevId : 0x5601	Ports : 2	
Bios : 5.0.0.0	Bus : 04	Device : 00	Function : 6	
Saved boot device				
1. Used	WWPN: 5000090289AD7C0B	LUN: 0000000000000000		
2. Unused	WWPN: 0000000000000000	LUN: 0000000000000000		
3. Unused	WWPN: 0000000000000000	LUN: 0000000000000000		
4. Unused	WWPN: 0000000000000000	LUN: 0000000000000000		
<Up/Down> to highlight, <F10> to save and go back, <C> to clear an entry <Enter> to discover, <Esc> to go back				

xvi. Hit [F10] or [Esc] and then [Y] to save the configuration.

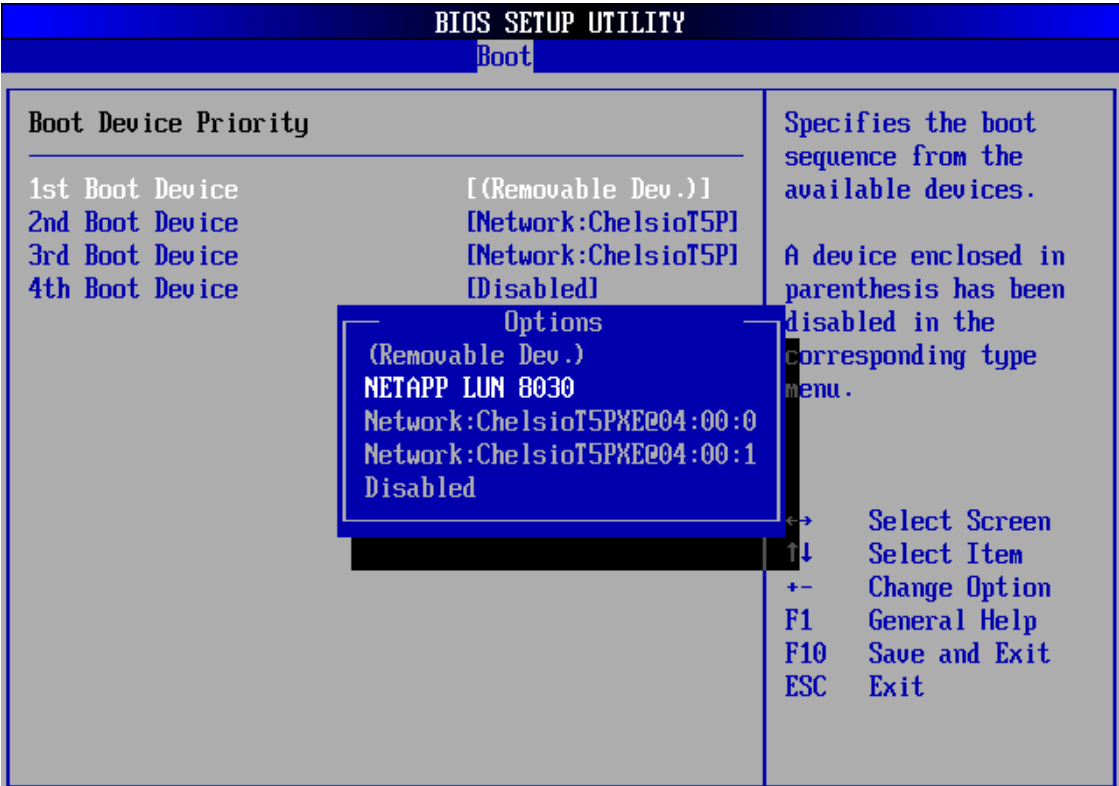


xvii. Reboot the machine.

xviii. During POST, Chelsio option ROM will discover FCoE targets.

```
Installing Chelsio T5 Storage FCoE BIOS
PCI BIOSv3.0 PCI FWv2.1 PnP BIOS: YES PMM Entry is passed by BIOS
Bringing up link on PCI:04:00:6 Port 0 ... Done
Discovering FCoE Target(s) on PCI:04:00:6 Port 0 ... Done
sd(1): T520-CR          PCI:04:00:6 P(0) WWPN:500A098289AB7CAB Lun(00)
      NETAPP LUN              8030 35.0003 GB
Storage FCoE BIOS Installed Successfully!
```

- xix. Enter BIOS setup and choose FCoE disk discovered via Chelsio adapter as the first boot device.



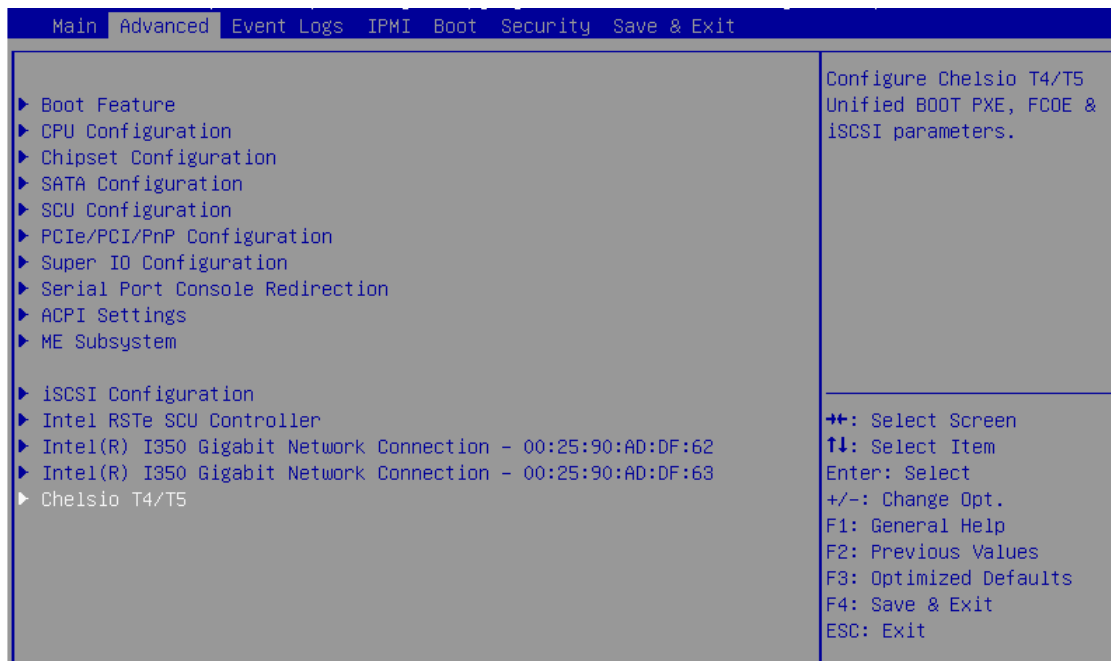
- xx. Reboot and boot from the FCoE disk or install the required OS using PXE.

6.2. uEFI FCoE Boot

Important

- Only uEFI v2.1 and v2.3.1 supported.
- Any other uEFI version is **NOT SUPPORTED** and may render your system unusable.

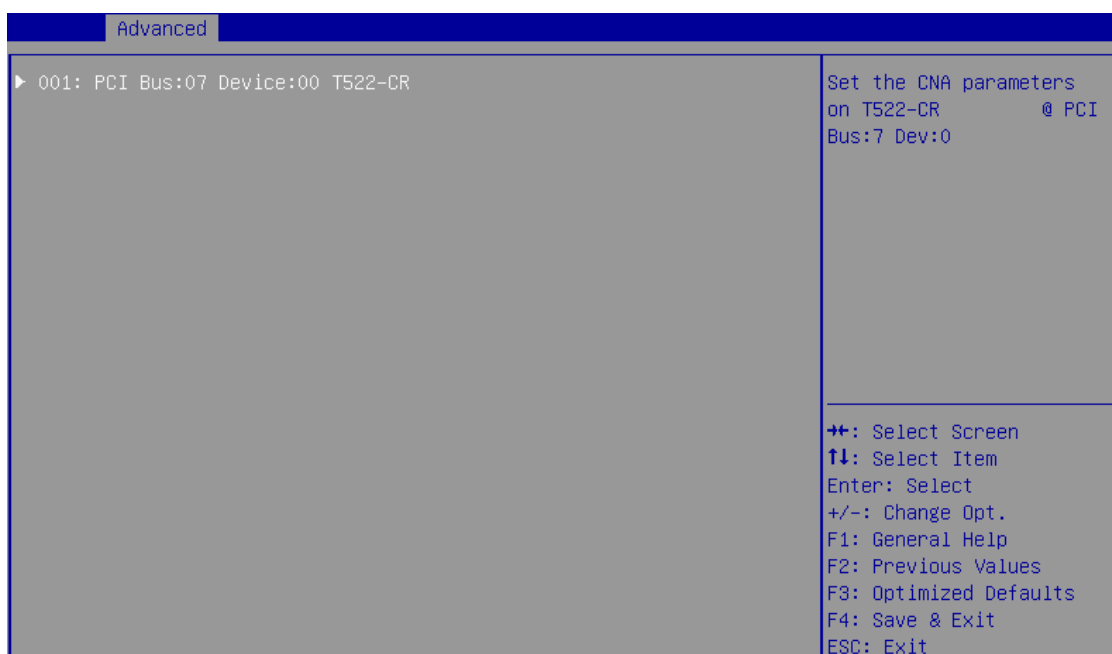
- Reboot the system and go into BIOS setup.
- Select **Chelsio T4/T5** and press [Enter]



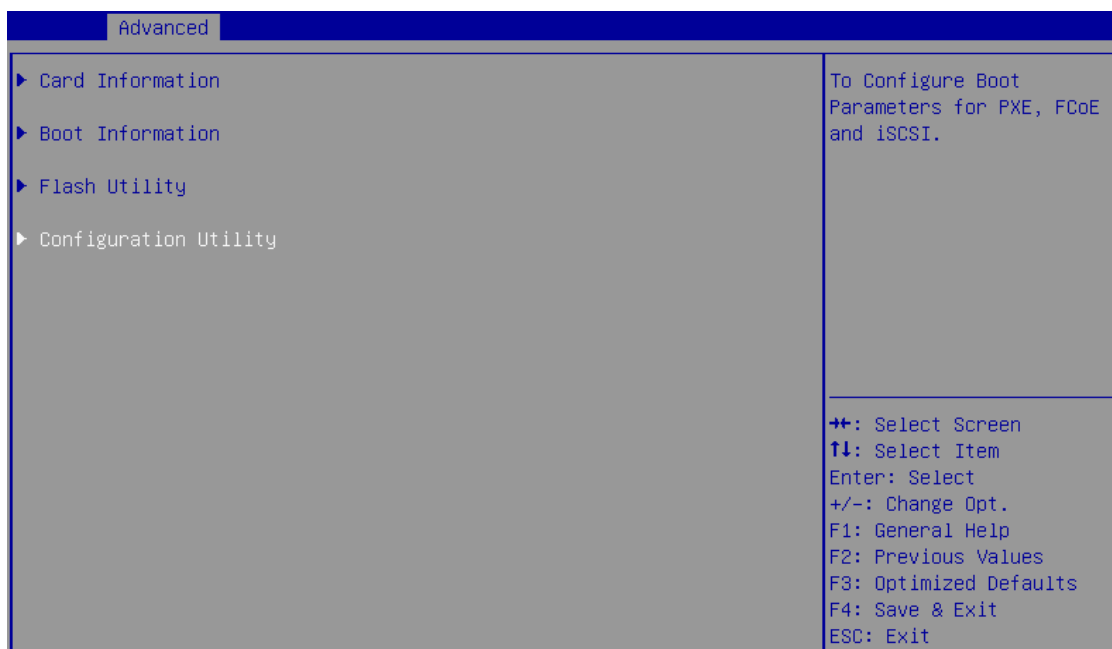
Note

If Chelsio T4/T5 is not listed, please ensure that Chelsio uEFI driver is loaded correctly as mentioned [here](#) in the **Flashing Firmware and Option ROM** section.

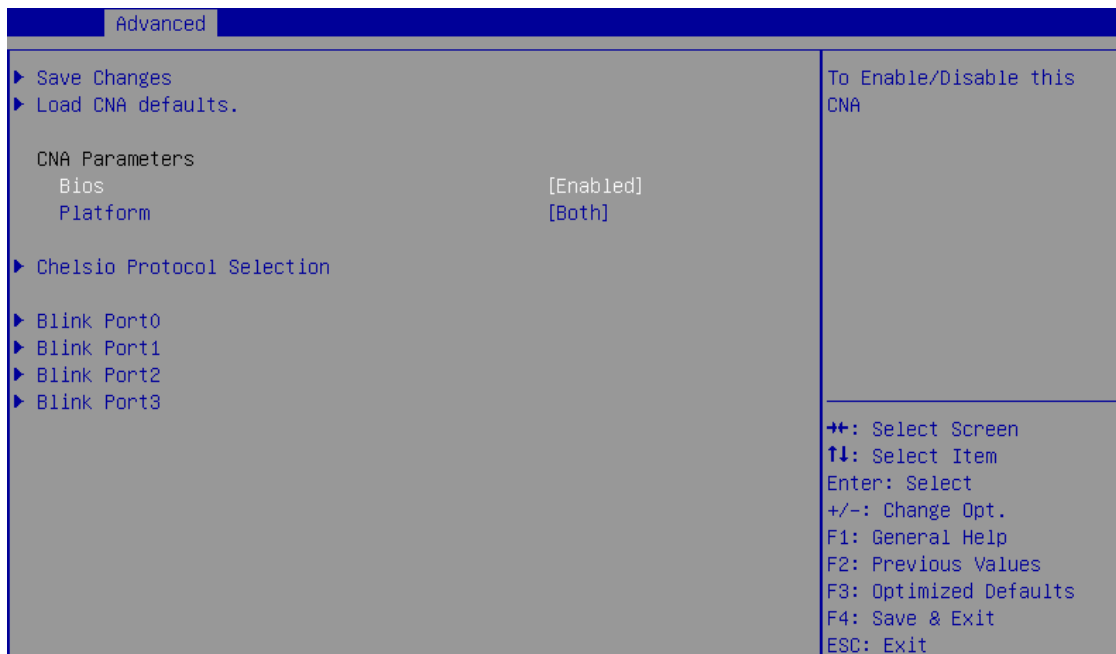
- iii. Select the Chelsio adapter to be configured and press [Enter].




- iv. Select **Configuration Utility** and press [Enter].

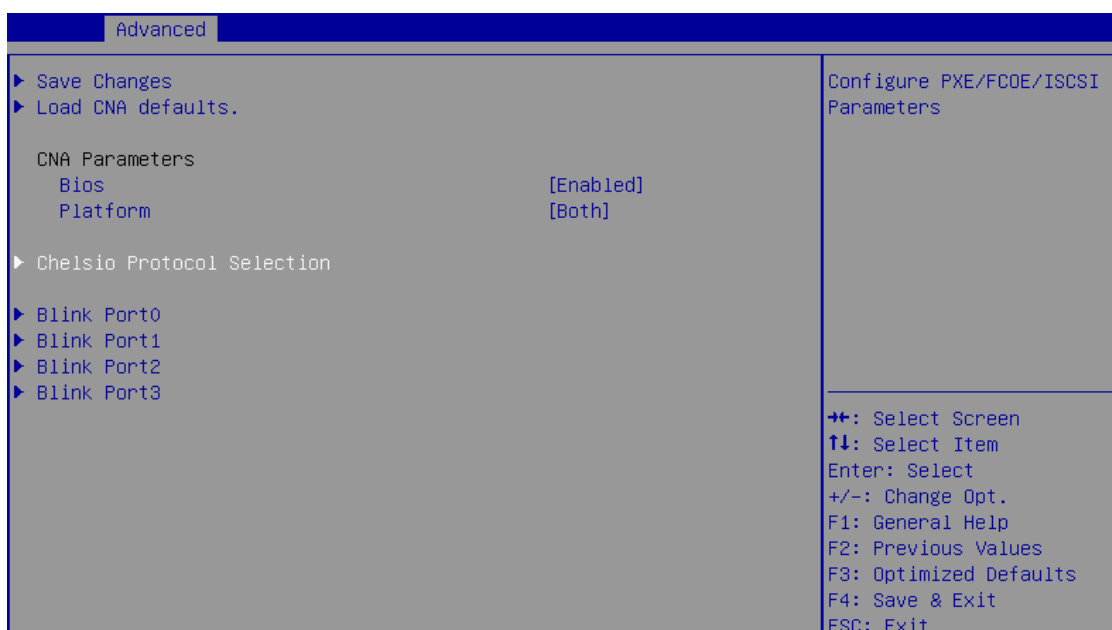


- v. Enable adapter BIOS if not already enabled.

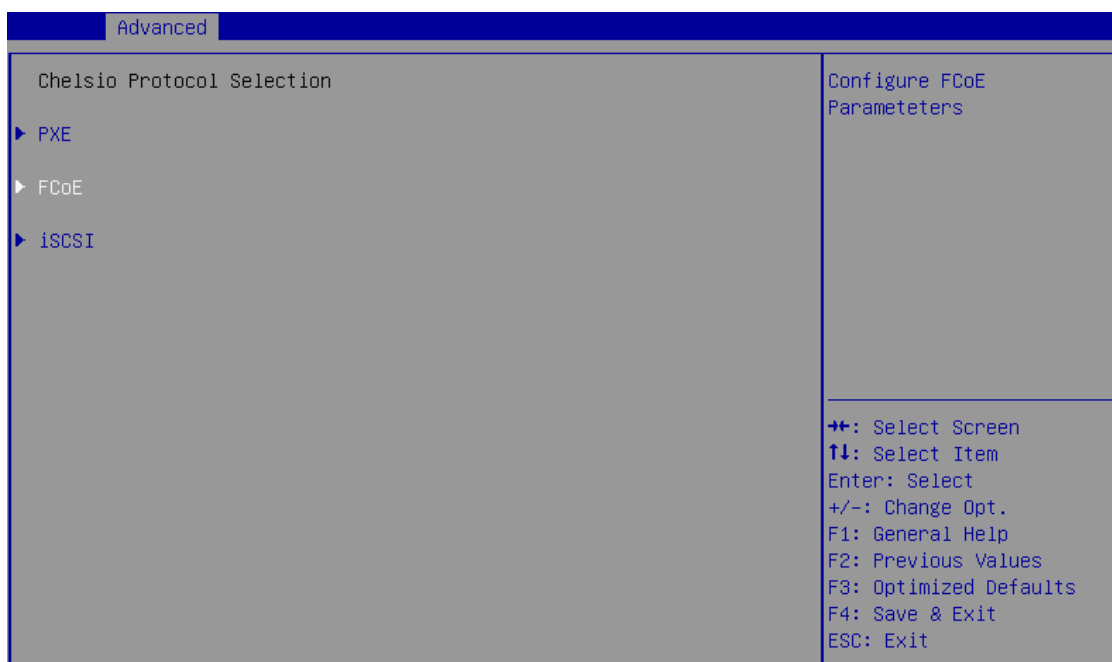


 **Note** *It is highly recommended that you use the **Save Changes** option every time a parameter/option is changed.*

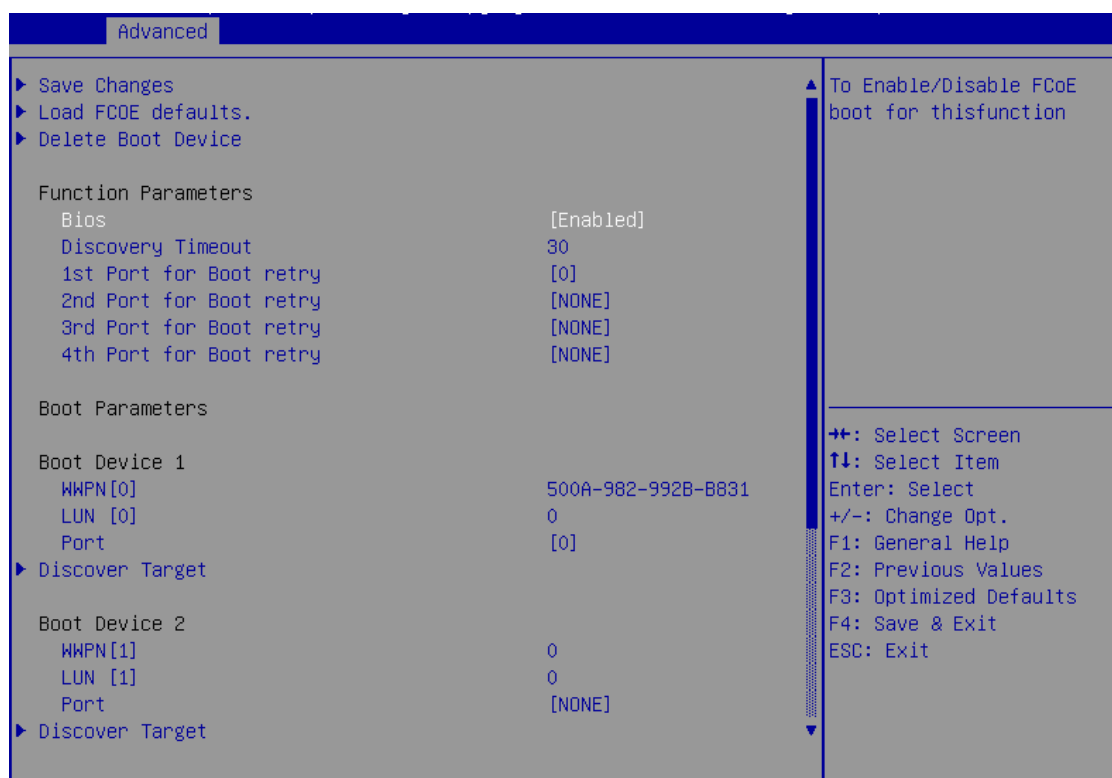
- vi. Select **Chelsio Protocol Selection** and press [Enter].



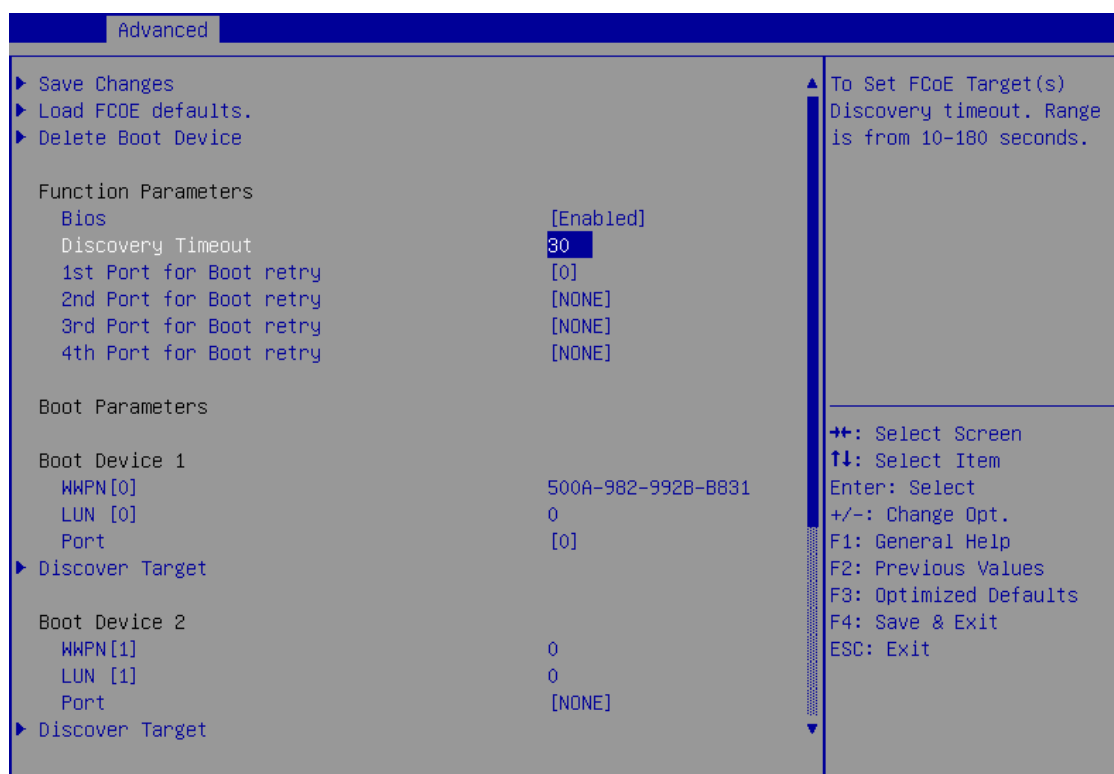
- vii. Select **FCoE** and press [Enter].



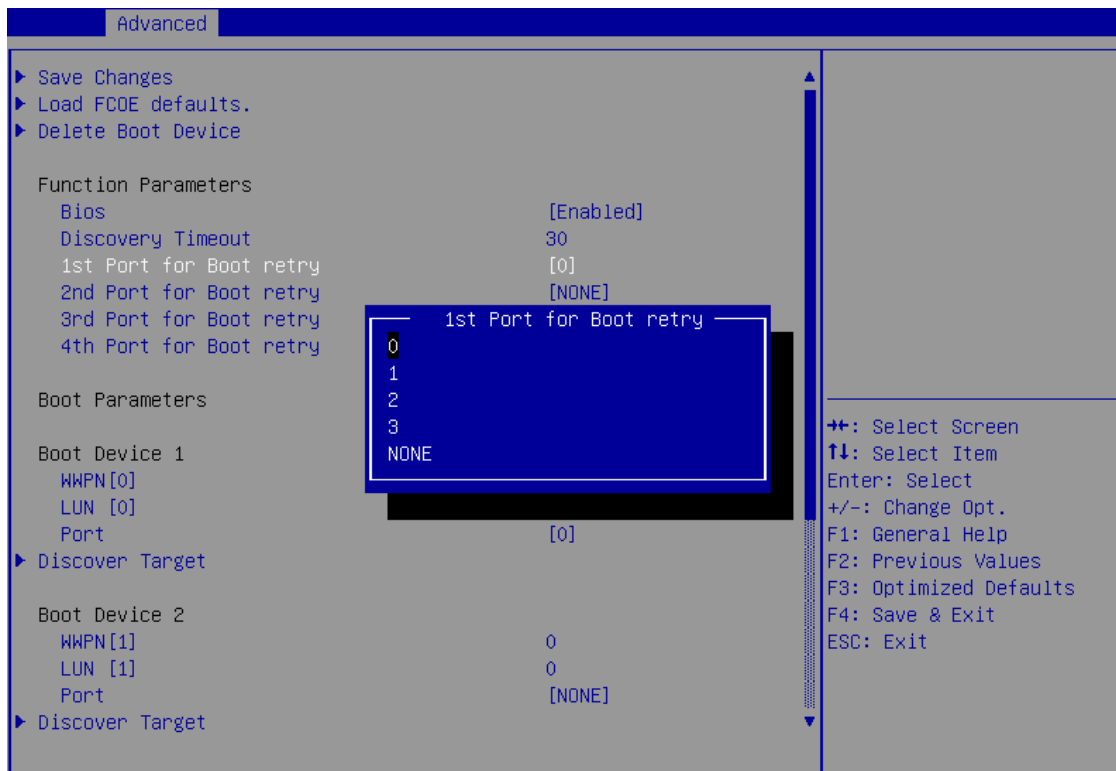
viii. Under **Function Parameters**, enable FCoE BIOS, if not already enabled.



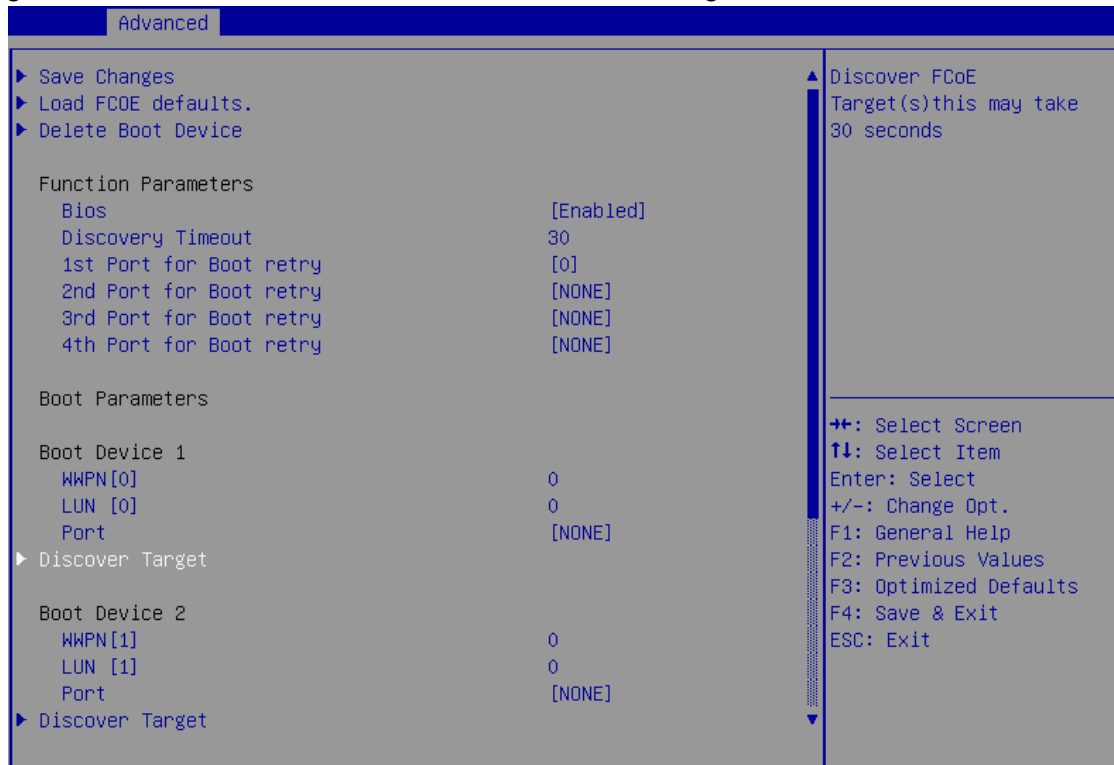
- ix. Set discovery timeout to a suitable value. Recommended value is ≥ 30



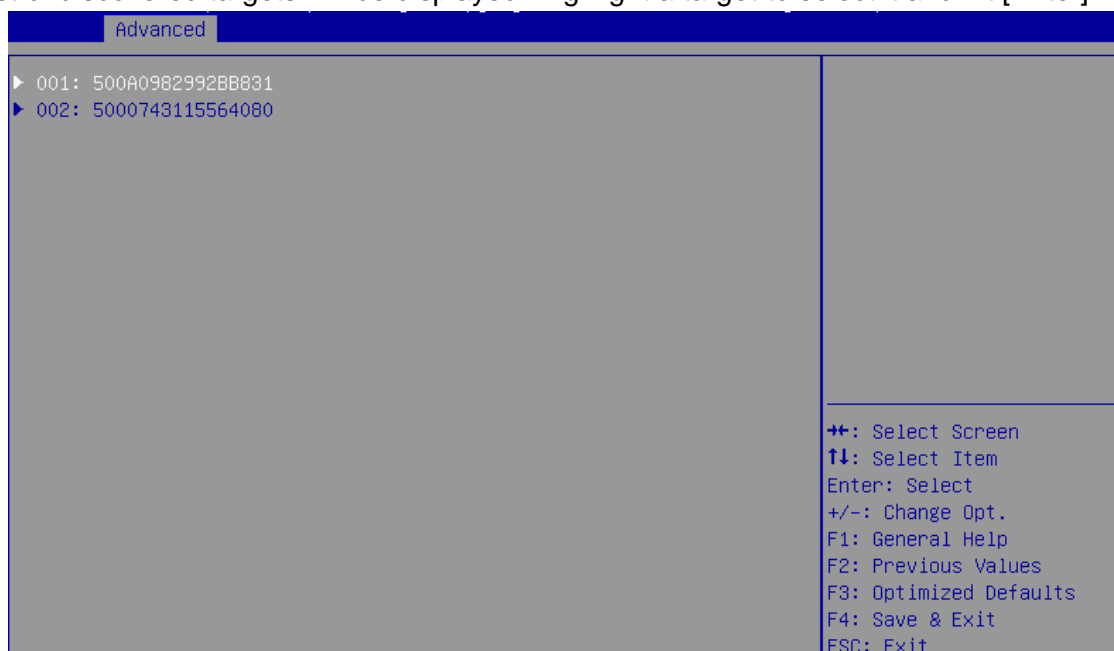
- x. Choose the order of the ports to discover FCoE targets.



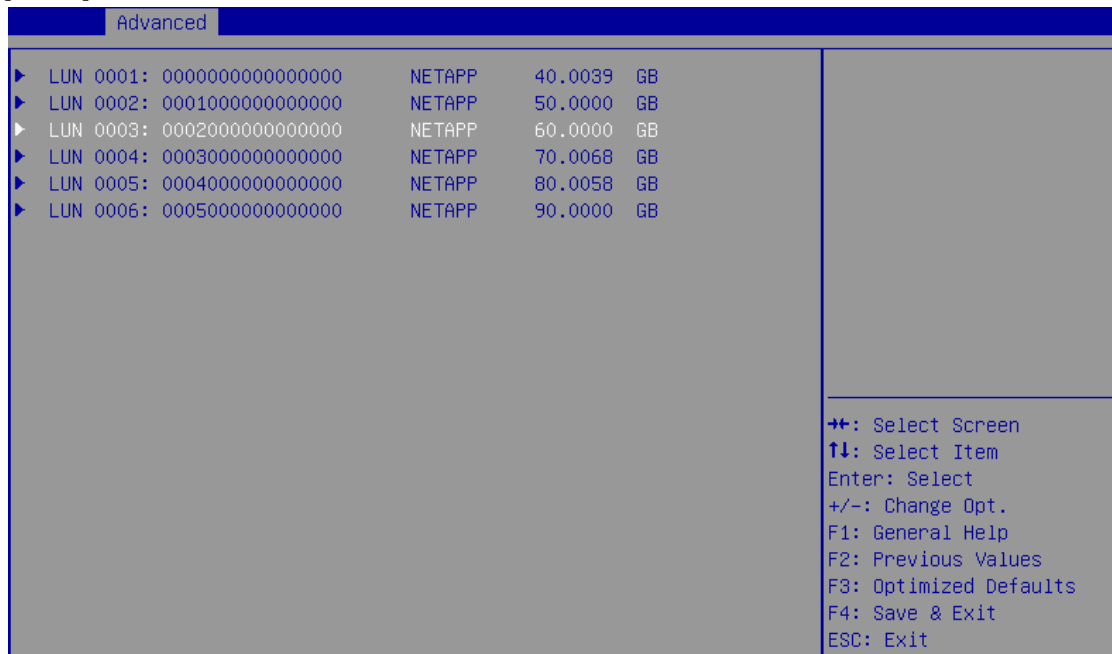
- xi. Under the first boot device, select **Discover Target** and press [Enter] to discover FC/FCoE targets connected to the switch. Wait till all reachable targets are discovered.



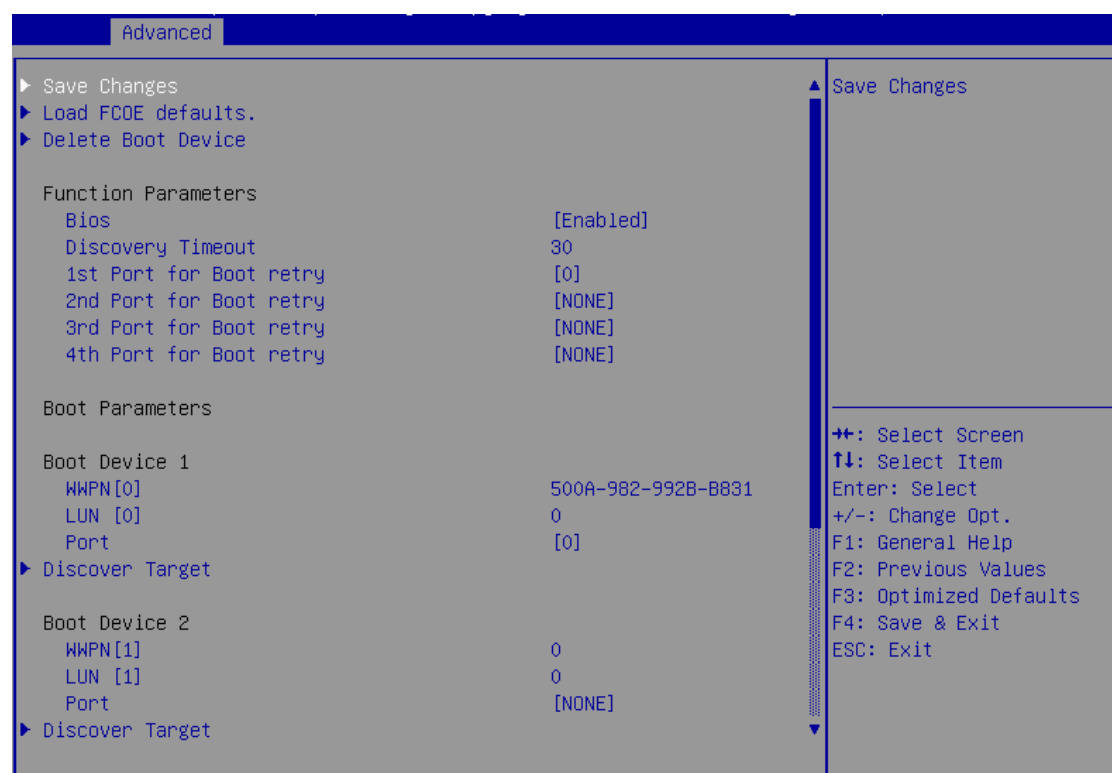
- xii. List of discovered targets will be displayed. Highlight a target to select it and hit [Enter].



- xiii. List of LUNs for the selected target will be displayed. Highlight a LUN to select it and hit [Enter].

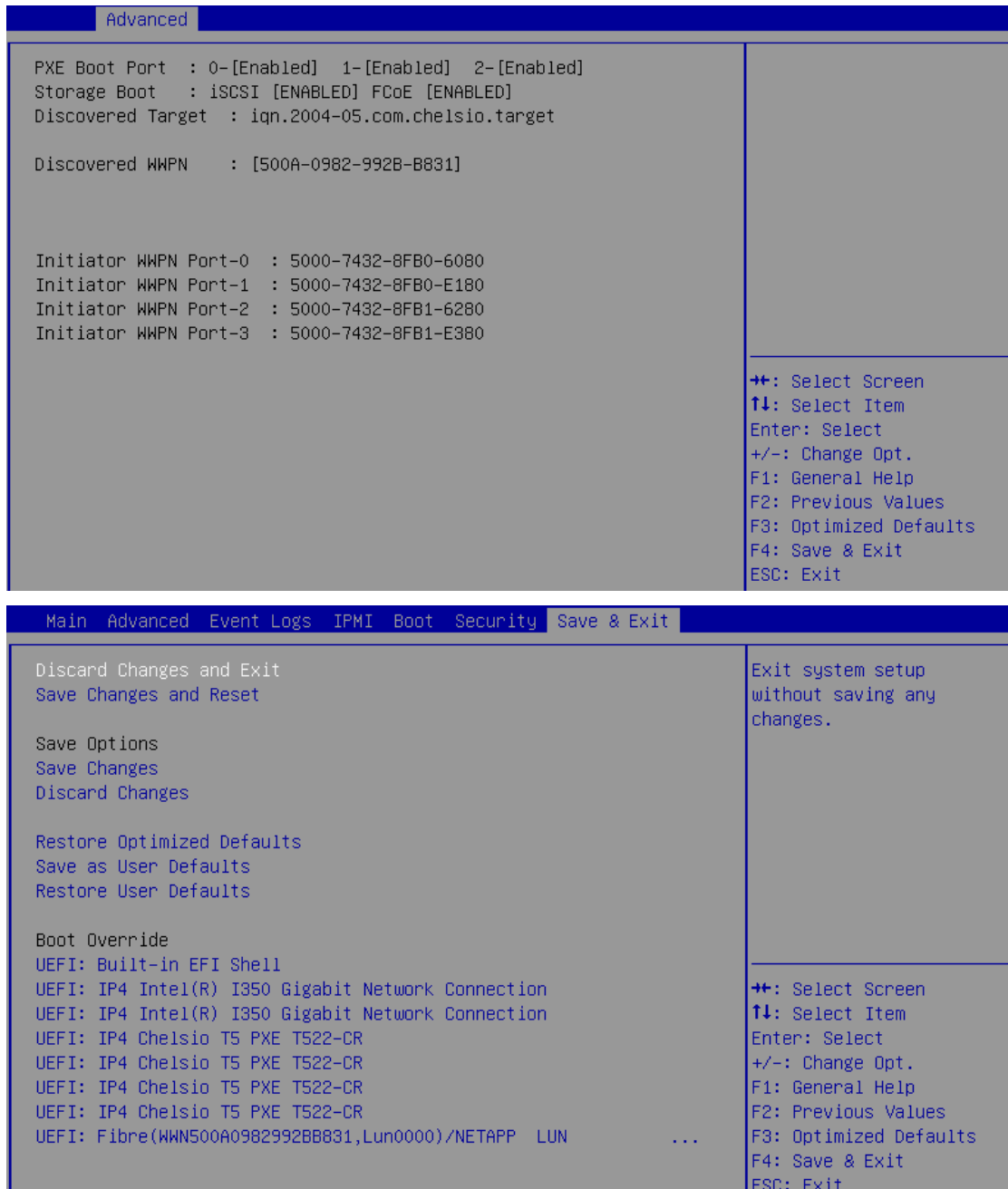


- xiv. Select **Save Changes** and press [Enter].



- xv. Reboot the system for changes to take effect.

- xvi. The discovered LUN should appear in the **Boot Configuration** section and system BIOS section.



- xvii. Select the LUN as the first boot device and exit from BIOS.

- xviii. Either boot from the LUN or install the required OS.

7. iSCSI boot process

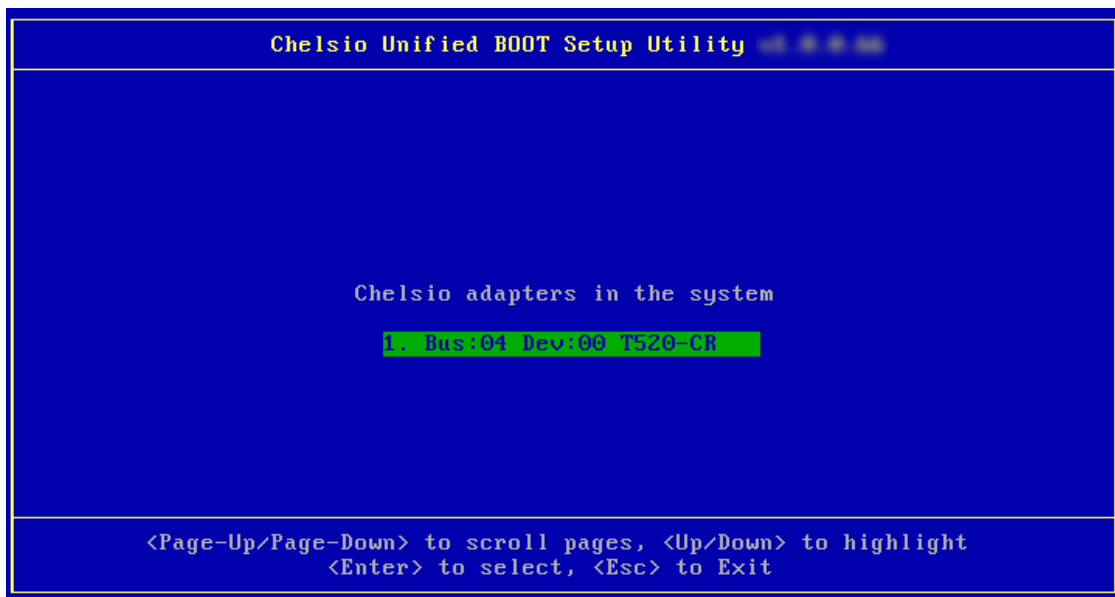
Before proceeding, please ensure that the Chelsio CNA has been flashed with the provided firmware and option ROM (See [Flashing Firmware and option ROM](#)).

7.1. Legacy iSCSI boot

- i. Reboot the system.
- ii. Press [Alt+C] when the message “*Chelsio Unified Boot BIOS vX.X.X.XX, Copyright (C) 2003-2015 Chelsio Communications Press <Alt-C> to Configure T4/T5 Card(s). Press <Alt-S> to skip BIOS*” appears on the screen to enter the configuration utility.

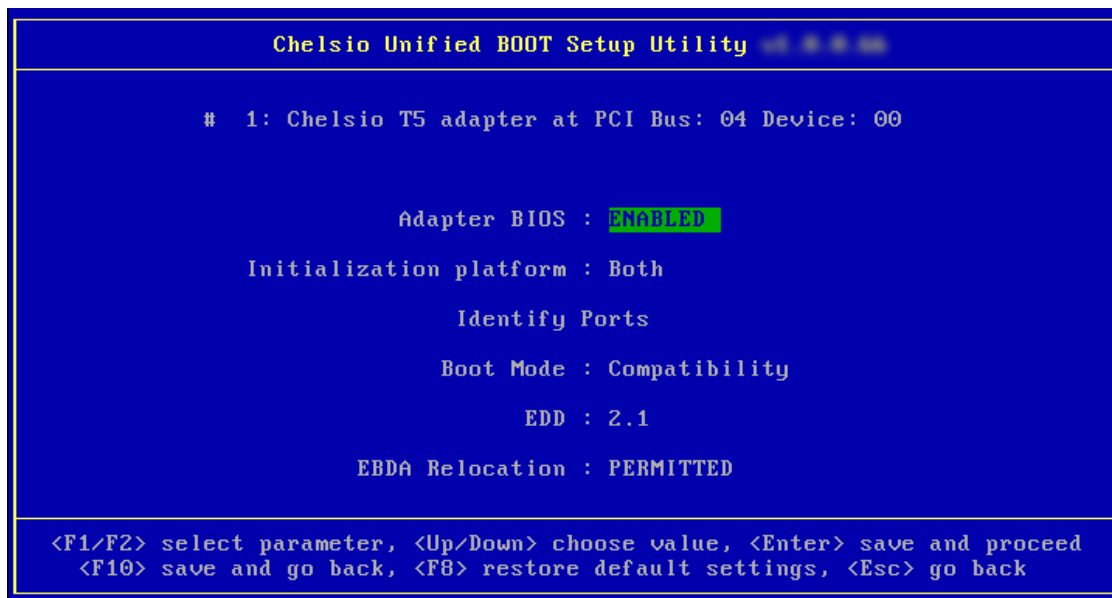
```
Chelsio Unified Boot BIOS v1.0.0.00
Copyright (C) 2003-2015 Chelsio Communications
Press <Alt-C> to Configure T4/T5 Card(s). Press <Alt-S> to skip BIOS.
```

- 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 if not already enabled. Hit [Enter].



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

- vi. Choose *iSCSI* from the list to configure and hit [Enter].



- vii. Choose the first option, **Configure Function Parameters**, from the list of parameter type and hit [Enter].

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 04.00.00.00	DevId	: 0x5501	Ports	: 2
Bios	: 04.00.00.00	Bus	: 04	Device	: 00	Function	: 5
<p>Choose the parameter type to configure</p> <ol style="list-style-type: none"> 1. Configure Function Parameters 2. Configure Initiator Parameters 3. Configure CHAP Parameters 4. Configure Network Parameters 5. Configure Target Parameters 6. Discover iSCSI Target(s) 							
<p><Up/Down> to highlight, <Enter> to select <Esc> to go back</p>							

- viii. Enable iSCSI BIOS if not already enabled. iBFT (iSCSI Boot Firmware Table) will be selected by default. You can also configure the number of iSCSI login attempts (retries) in case the network is unreachable or slow.

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 04.00.00.00	DevId	: 0x5501	Ports	: 2
Bios	: 04.00.00.00	Bus	: 04	Device	: 00	Function	: 5
<p>Bios : ENABLED</p> <p>Port order for boot retry : 00 NONE</p> <p>Discovery Timeout : 30</p> <p>iSCSI OS Initiator : iBFT</p> <p>iSCSI Login Retry (Slow MW) : 0</p>							
<p><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</p>							

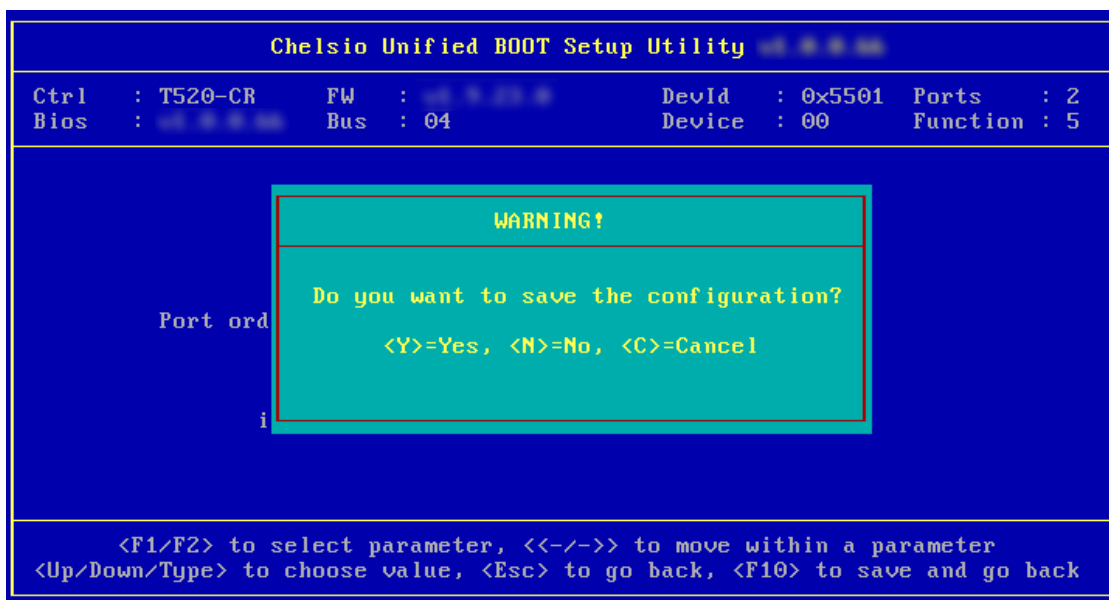
- ix. Choose the order of the ports to discover iSCSI targets.

Chelsio Unified BOOT Setup Utility					
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5501
Bios	: 1.0.0.0	Bus	: 04	Device	: 00
Ports	: 2	Function	: 5		
<p>Bios : ENABLED</p> <p>Port order for boot retry : 00 01</p> <p>Discovery Timeout : 30</p> <p>iSCSI OS Initiator : iBFT</p>					
<p><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</p>					

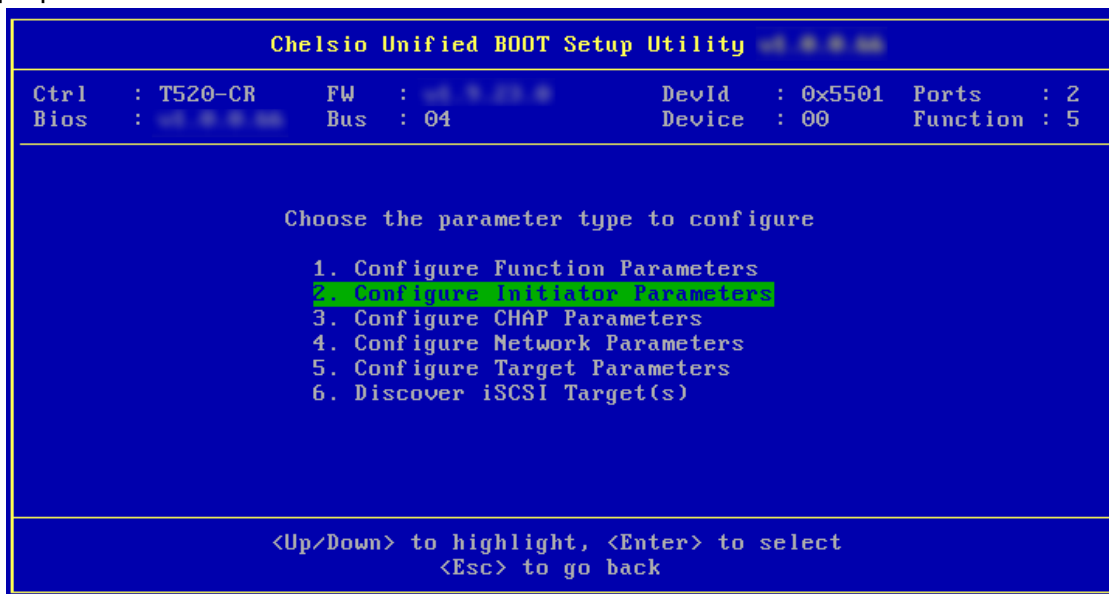
- x. Set discovery timeout to a suitable value. Recommended value is ≥ 30 .

Chelsio Unified BOOT Setup Utility					
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5501
Bios	: 1.0.0.0	Bus	: 04	Device	: 00
Ports	: 2	Function	: 5		
<p>Bios : ENABLED</p> <p>Port order for boot retry : 00 01</p> <p>Discovery Timeout : 30</p> <p>iSCSI OS Initiator : iBFT</p>					
<p><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</p>					

- xi. Hit [Esc] and then [Y] to save the configuration.



- xii. Go back and choose **Configure Initiator Parameters** to configure initiator related properties.



- xiii. Initiator properties like IQN, Header Digest, Data Digest, etc will be displayed. Change the values appropriately or continue with the default values. Hit [F10] to save.

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5501	Ports	: 2
Bios	: 1.0.0.0	Bus	: 04	Device	: 00	Function	: 5
Initiator IQN : <u>.com.Chelsio:boot:000743280530</u> Header Digest : None Data Digest : None InitialR2T : No ImmediateData : Yes MaxOutstandingR2T : 1 DefaultTime2Wait : 20 DefaultTime2Retain : 20 FirstBurstLength in KB : 64 MaxBurstLength in KB : 256							
<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							

- xiv. CHAP authentication is disabled by default. To enable and configure, go back and choose **Configure CHAP Parameters**

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5501	Ports	: 2
Bios	: 1.0.0.0	Bus	: 04	Device	: 00	Function	: 5
Choose the parameter type to configure <ol style="list-style-type: none"> 1. Configure Function Parameters 2. Configure Initiator Parameters 3. <u>Configure CHAP Parameters</u> 4. Configure Network Parameters 5. Configure Target Parameters 6. Discover iSCSI Target(s) 							
<Up/Down> to highlight, <Enter> to select <Esc> to go back							

- xv. Enable CHAP authentication by selecting *ENABLED* in the **CHAP Policy** field. Next, choose either *one-way* or *mutual* as the authentication method. Finally, provide Initiator and Target CHAP credentials according to the authentication method selected. Hit [F10] to save.

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 00.00.00.00	DevId	: 0x5501	Ports	: 2
Bios	: 00.00.00.00	Bus	: 02	Device	: 00	Function	: 5
<p>CHAP Policy : MUTUAL</p> <p>CHAP Method : None,CHAP</p> <p>Initiator CHAP Username : init12x</p> <p>Initiator CHAP Password : chelinit65</p> <p>Target CHAP Username : tar12x</p> <p>Target CHAP Password : cheltar65</p>							
<p><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</p>							

- xvi. Go back and choose **Configure Network Parameters** to configure iSCSI Network related properties.

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 00.00.00.00	DevId	: 0x5501	Ports	: 2
Bios	: 00.00.00.00	Bus	: 04	Device	: 00	Function	: 5
<p>Choose the parameter type to configure</p> <ol style="list-style-type: none"> 1. Configure Function Parameters 2. Configure Initiator Parameters 3. Configure CHAP Parameters 4. Configure Network Parameters 5. Configure Target Parameters 6. Discover iSCSI Target(s) 							
<p><Up/Down> to highlight, <Enter> to select <Esc> to go back</p>							

xvii. Select the port using which you want to connect to the target. Hit [Enter].

Chelsio Unified BOOT Setup Utility					
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5501
Bios	: 1.0.0.0	Bus	: 04	Device	: 00
Ports	: 2	Function	: 5		
Choose a port to configure					
1. Port 0					
2. Port 1					
<Up/Down> to highlight, <Enter> to select					
<Esc> to go back					

xviii. Select Yes in the **Enable DHCP** field to configure port using DHCP or No to manually configure the port. Hit [F10] to save.

Chelsio Unified BOOT Setup Utility					
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5501
Bios	: 1.0.0.0	Bus	: 04	Device	: 00
Ports	: 2	Function	: 5		
Port 0 network parameter configuration					
ULAN ID : 0					
IP Version : IPV4					
Enable DHCP : No					
IP address : 192.168.0.200					
Subnet mask : 255.255.255.0					
Gateway : 0.0.0.0					
Ping IP address 0.0.0.0					
Ping IP					
<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					

- xix. Go back and choose **Configure Target Parameters** to configure iSCSI target related properties.

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 00.00.00.00	DevId	: 0x5501	Ports	: 2
Bios	: 00.00.00.00	Bus	: 04	Device	: 00	Function	: 5
<p>Choose the parameter type to configure</p> <ol style="list-style-type: none"> 1. Configure Function Parameters 2. Configure Initiator Parameters 3. Configure CHAP Parameters 4. Configure Network Parameters 5. Configure Target Parameters 6. Discover iSCSI Target(s) 							
<p><Up/Down> to highlight, <Enter> to select <Esc> to go back</p>							

- xx. If you want to discover target using DHCP, select Yes in the **Discover Boot Target via DHCP** field. To discover target via static IP, select No and provide the target IP and Hit [F10] to save. The default TCP port selected is 3260.

Chelsio Unified BOOT Setup Utility							
Ctrl	: T520-CR	FW	: 00.00.00.00	DevId	: 0x5501	Ports	: 2
Bios	: 00.00.00.00	Bus	: 04	Device	: 00	Function	: 5
<p>Discover Boot Target via DHCP : No</p> <p>Target IP Version : IPV4</p> <p>Target IP address : 102.88.88.228</p> <p>Target TCP port : 3260</p>							
<p><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</p>							

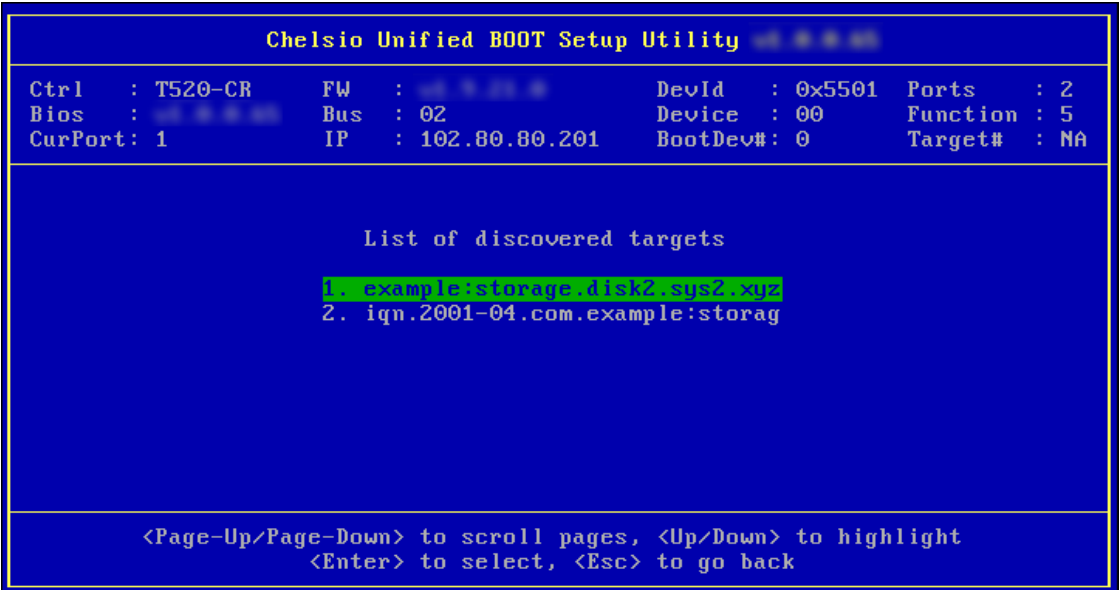
xxi. Go back and choose **Discover iSCSI Target (s)** to connect to a target.

Chelsio Unified BOOT Setup Utility					
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5501
Bios	: 1.0.0.0	Bus	: 04	Device	: 00
Ports	: 2	Function	: 5		
<p>Choose the parameter type to configure</p> <ol style="list-style-type: none"> 1. Configure Function Parameters 2. Configure Initiator Parameters 3. Configure CHAP Parameters 4. Configure Network Parameters 5. Configure Target Parameters 6. Discover iSCSI Target(s) 					
<p><Up/Down> to highlight, <Enter> to select <Esc> to go back</p>					

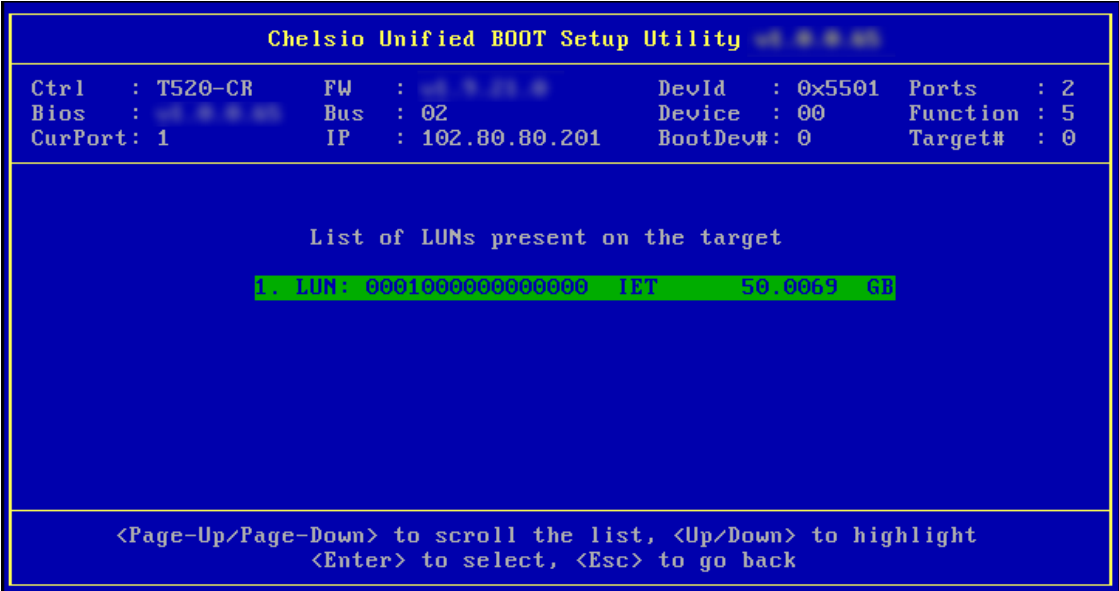
xxii. Select the portal group on which iSCSI service is provided by the target.

Chelsio Unified BOOT Setup Utility											
Ctrl	: T520-CR	FW	: 1.0.0.0	DevId	: 0x5501						
Bios	: 1.0.0.0	Bus	: 04	Device	: 00						
Ports	: 2	Function	: 5								
<p>Saved boot device</p> <table> <thead> <tr> <th>Portal</th> <th>LUN</th> </tr> <tr> <th>-----</th> <th>---</th> </tr> </thead> <tbody> <tr> <td>102.80.00.228:3260</td> <td>0</td> </tr> </tbody> </table>						Portal	LUN	-----	---	102.80.00.228:3260	0
Portal	LUN										
-----	---										
102.80.00.228:3260	0										
<p><Up/Down> to highlight, <F10> to save and go back. <Enter> to discover, <Esc> to go back</p>											

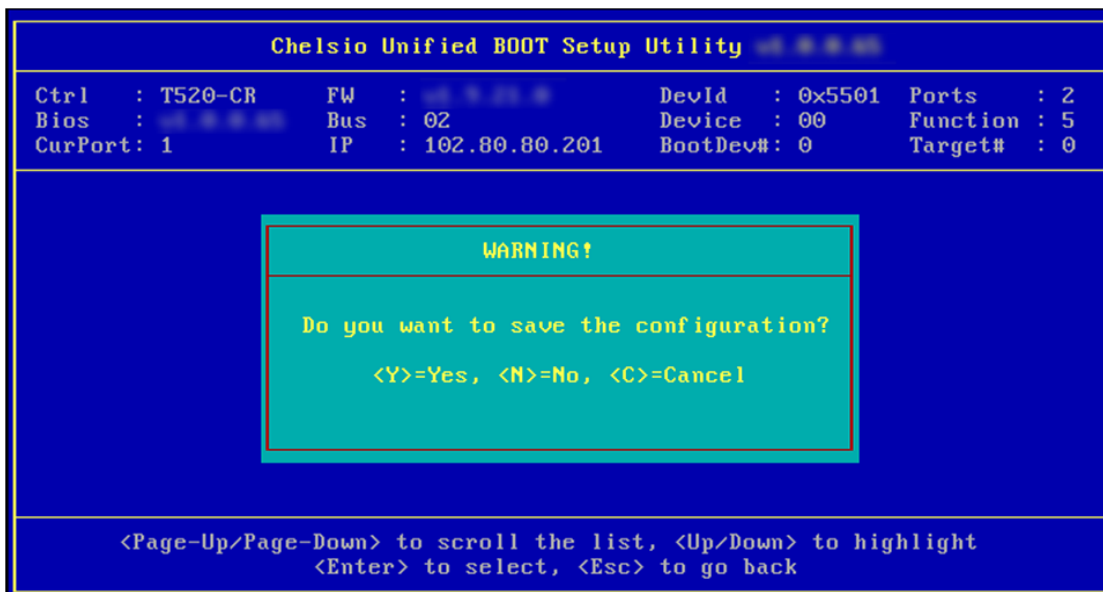
xxiii. A list of available targets will be displayed. Select the target you wish to connect to and hit [Enter].



xxiv. A list of LUNs configured on the selected target will be displayed. Select the LUN you wish to connect to and hit [Enter].



xxv. Hit [Esc] and then [Y] to save the configuration.



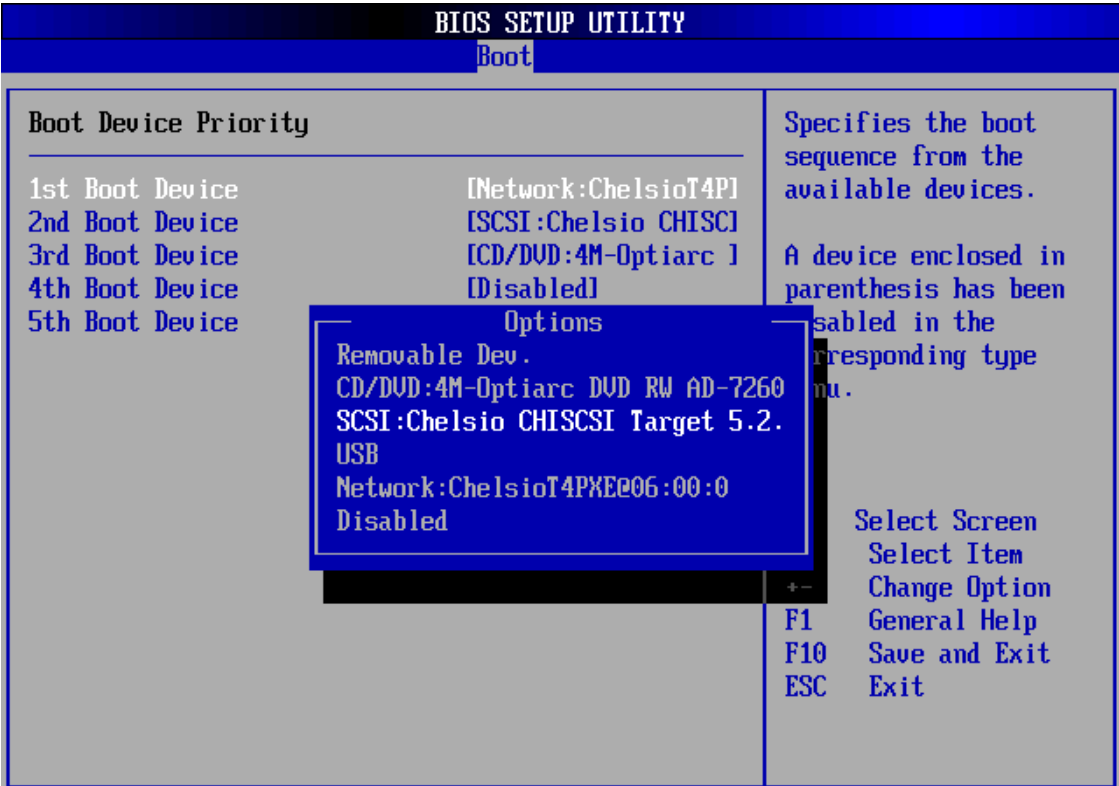
xxvi. Reboot the machine.

xxvii. During POST, Chelsio option ROM will discover iSCSI targets.

```
Chelsio Storage FCoE BIOS is Disabled or Boot Ports are all set to NONE.
Please run Chelsio Unified Configuration Utility.

Installing Chelsio T5 Storage iSCSI BIOSv
PCI BIOSv3.0 PCI FWv2.1 PnP BIOS: YES PMM Entry is passed by BIOS
Bringing up link on PCI:02:00:5 Port 0 ... Done
Waiting for LLDP negotiation ... Done
Discovering iSCSI Target(s) on PCI:02:00:5 Port 0 ... Done
sd(1): T520-CR PCI:02:00:5 P(1) MAC:00:07:43:28:CD:DB Host:102.80.80.200
    ign.2003-13.com.Chelsio:boot: Target:102.80.80.53:3260 ign.2001-04.com.example:
storage.disk2.sys2.xyz Lun(01) IET VIRTUAL-DISK 0 50.0069 GB
Storage iSCSI BIOS Installed Successfully!
```


- xxviii. Enter BIOS setup and choose iSCSI target LUN discovered via Chelsio adapter as the first boot device.



- xxix. Reboot and boot from the iSCSI Target LUN or install the required OS using PXE.

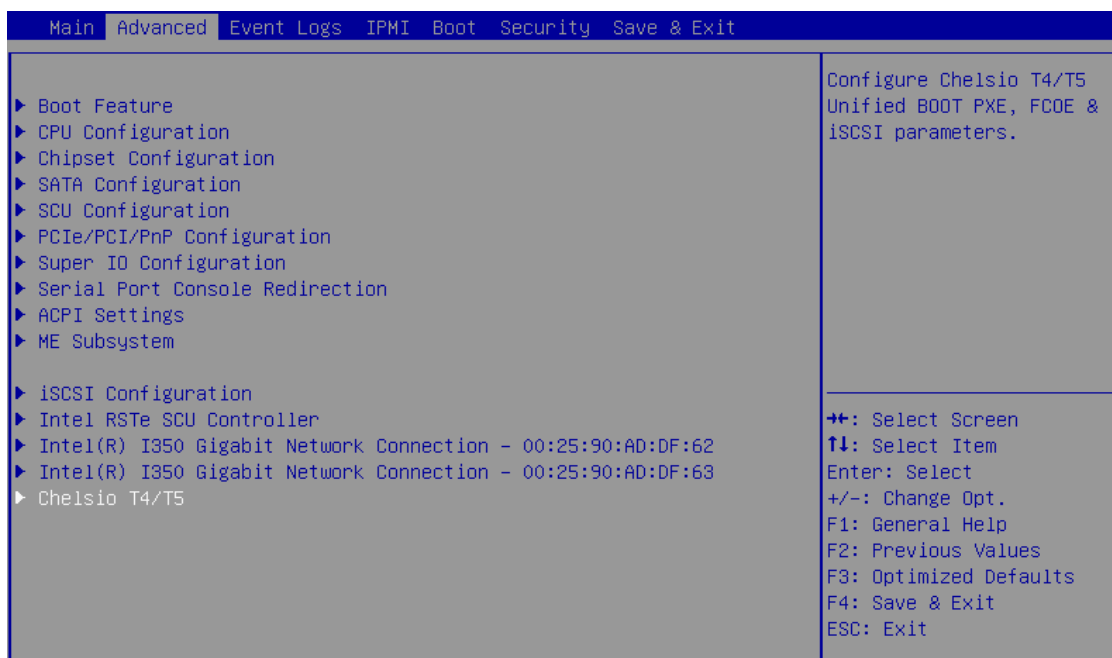
7.2. uEFI iSCSI Boot

Important

- Only uEFI v2.1 and v2.3.1 supported.
- Any other uEFI version is **NOT SUPPORTED** and may render your system unusable.

This section describes the method to perform iSCSI boot on uEFI platforms.

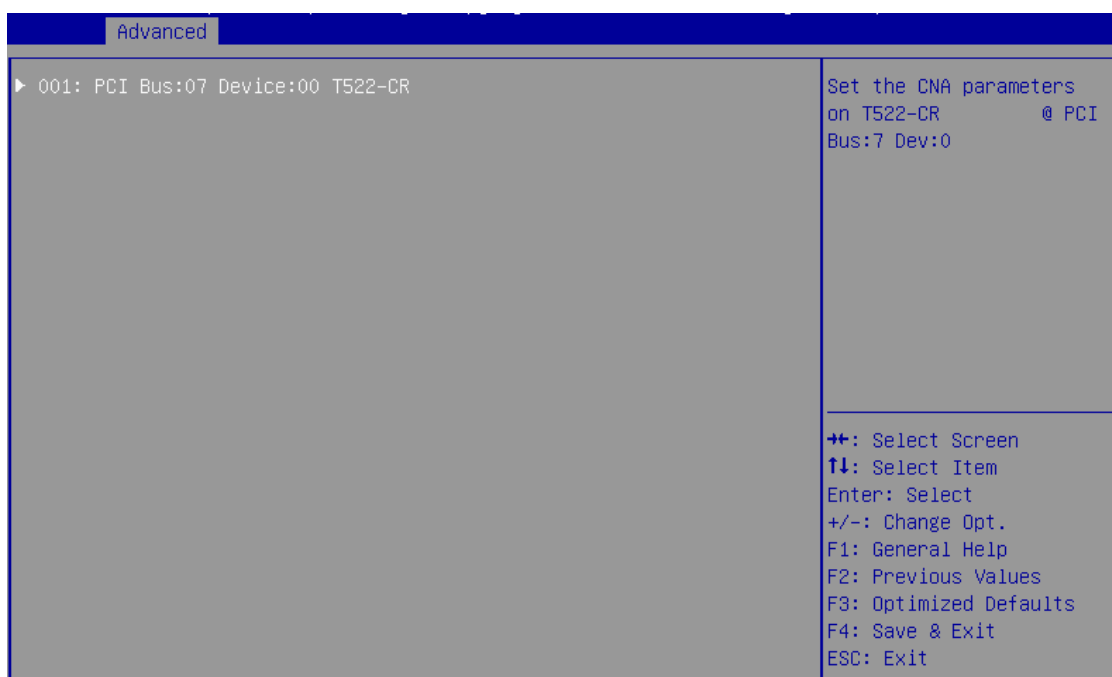
- Reboot the system and go into BIOS setup.
- Select **Chelsio T4/T5** and press [Enter]



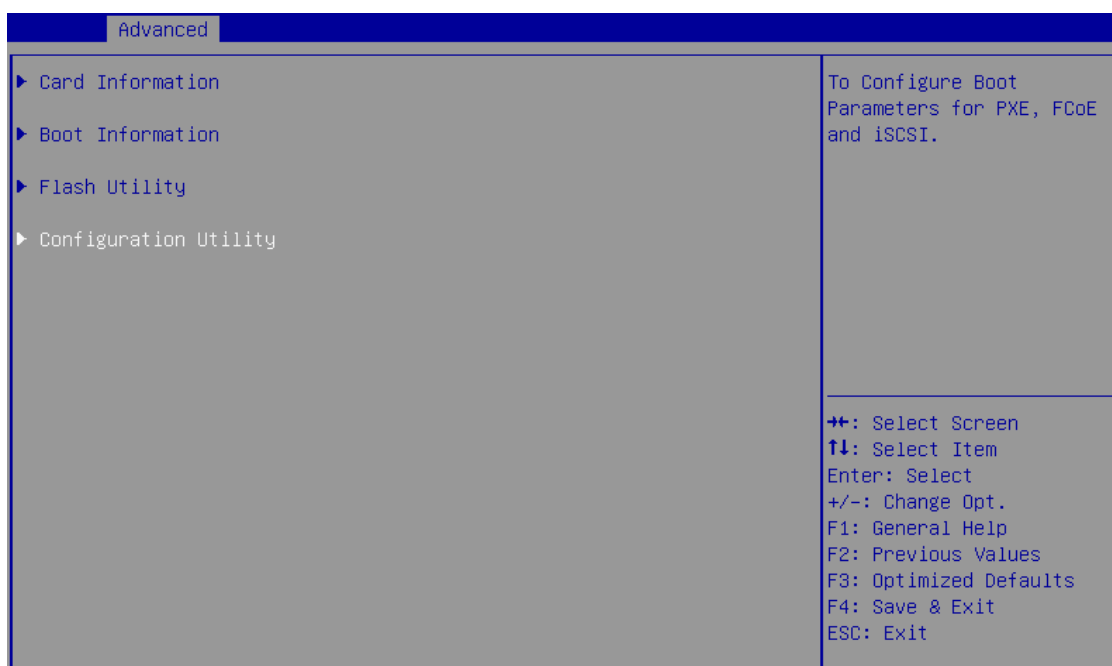
Note

If Chelsio T4/T5 is not listed, please ensure that Chelsio uEFI driver is loaded correctly as mentioned [here](#) in the **Flashing Firmware and Option ROM** section.

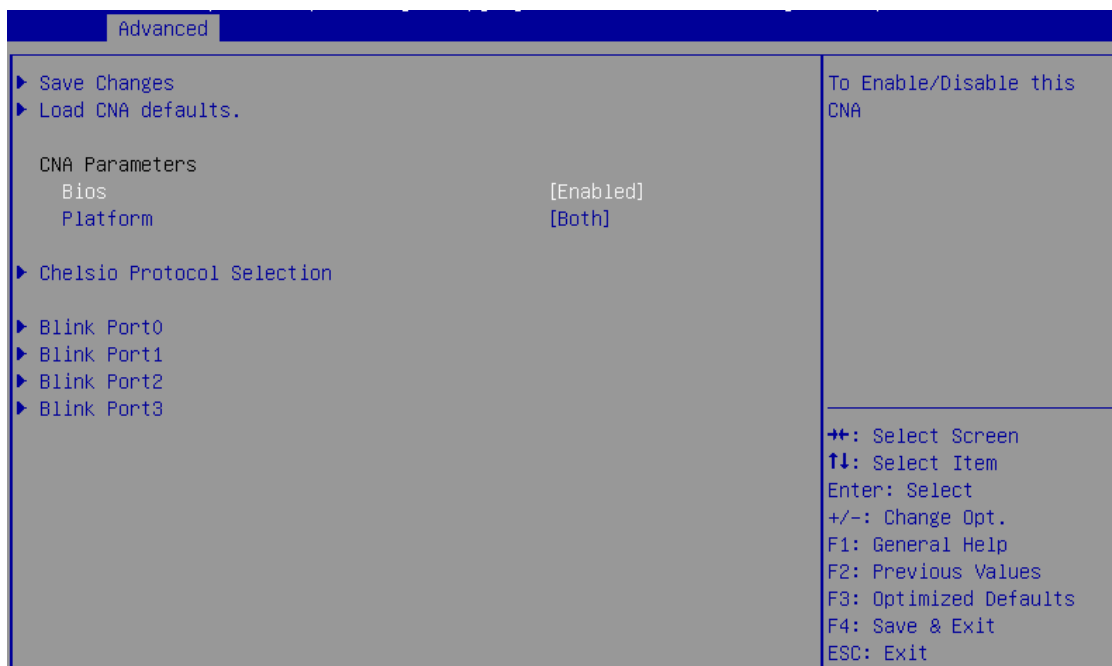
- iii. Select the Chelsio adapter to be configured and press [Enter].




- iv. Select **Configuration Utility** and press [Enter].

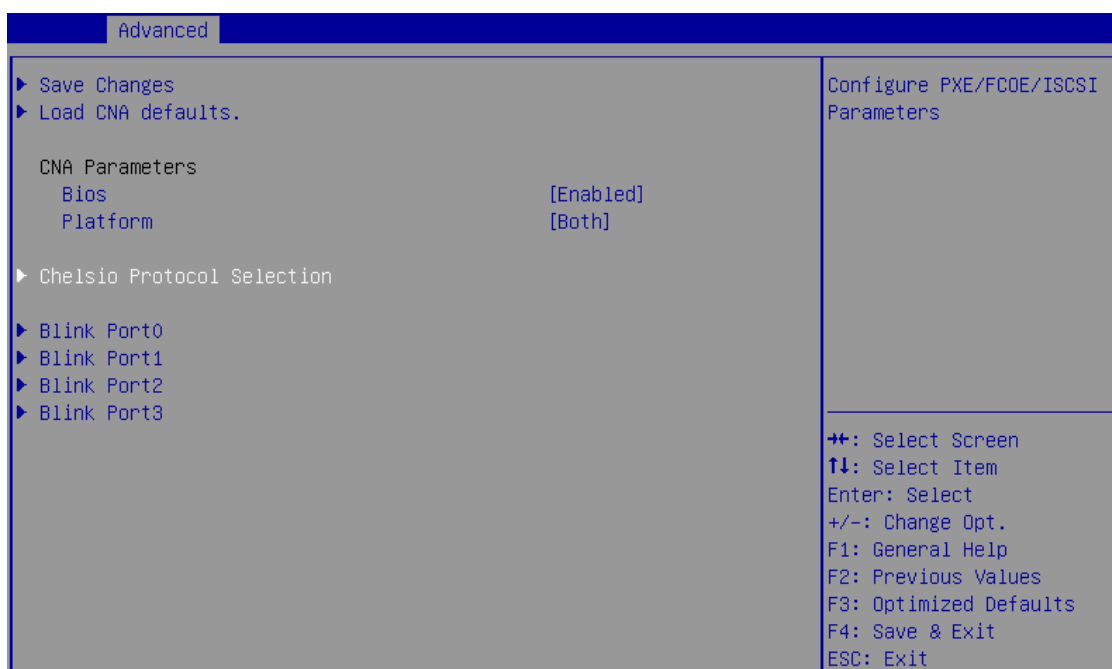


- v. Enable adapter BIOS if not already enabled.

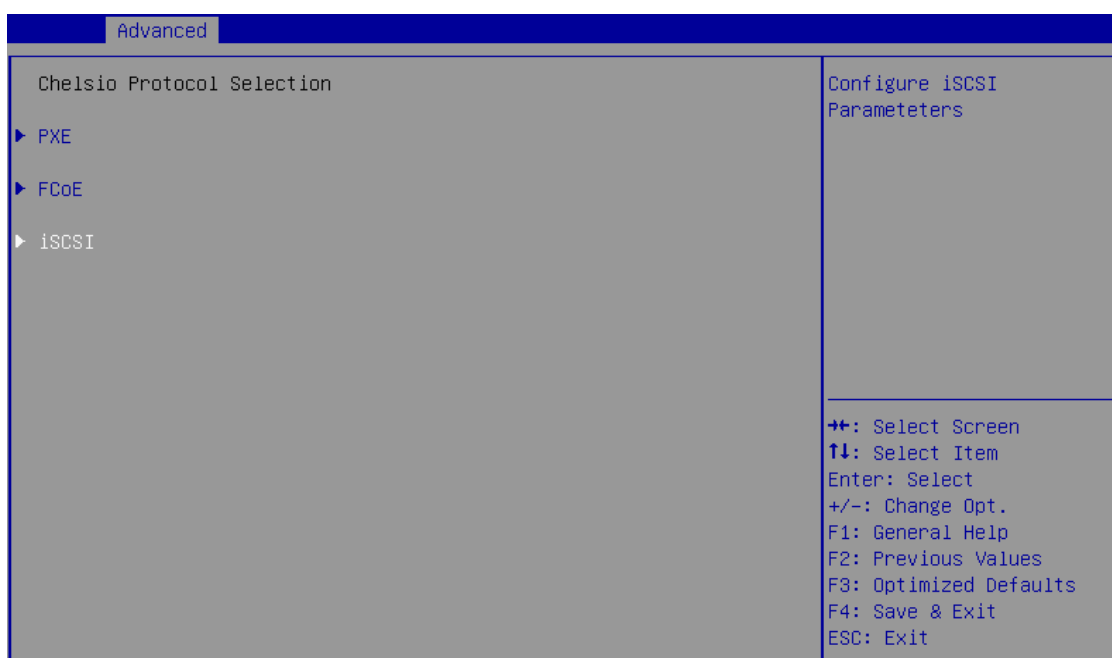


 **Note** *It is highly recommended that you use the **Save Changes** option every time a parameter/option is changed.*

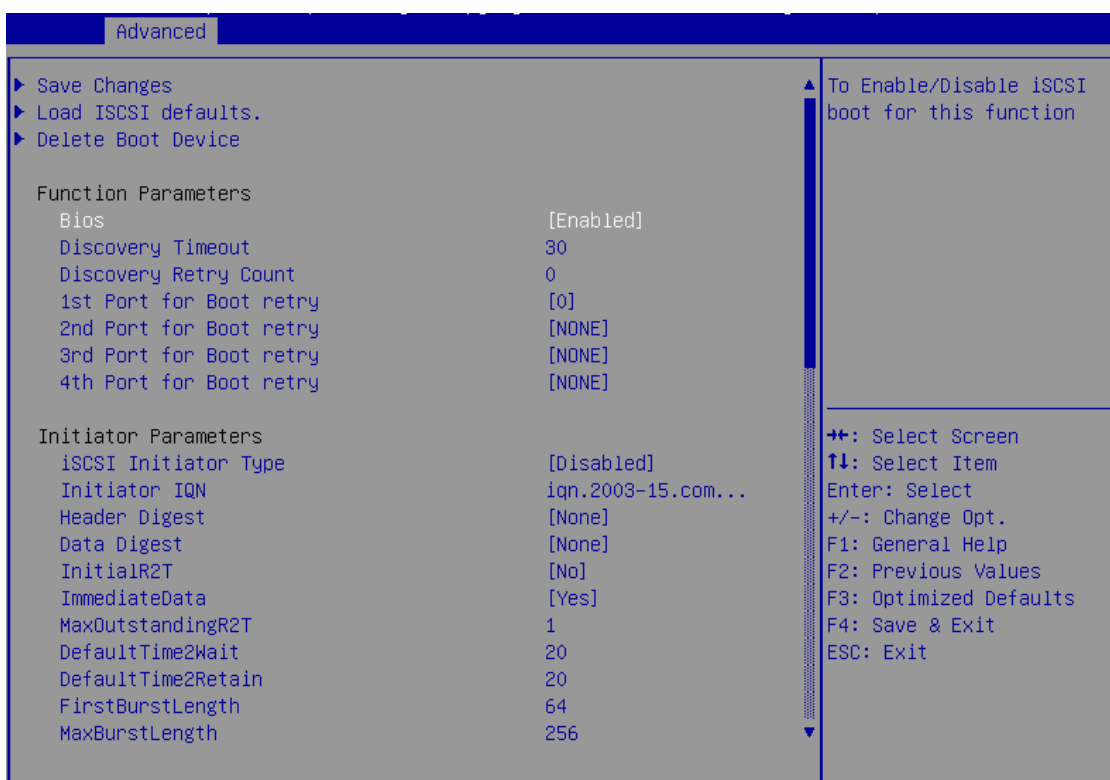
- vi. Select **Chelsio Protocol Selection** and press [Enter].



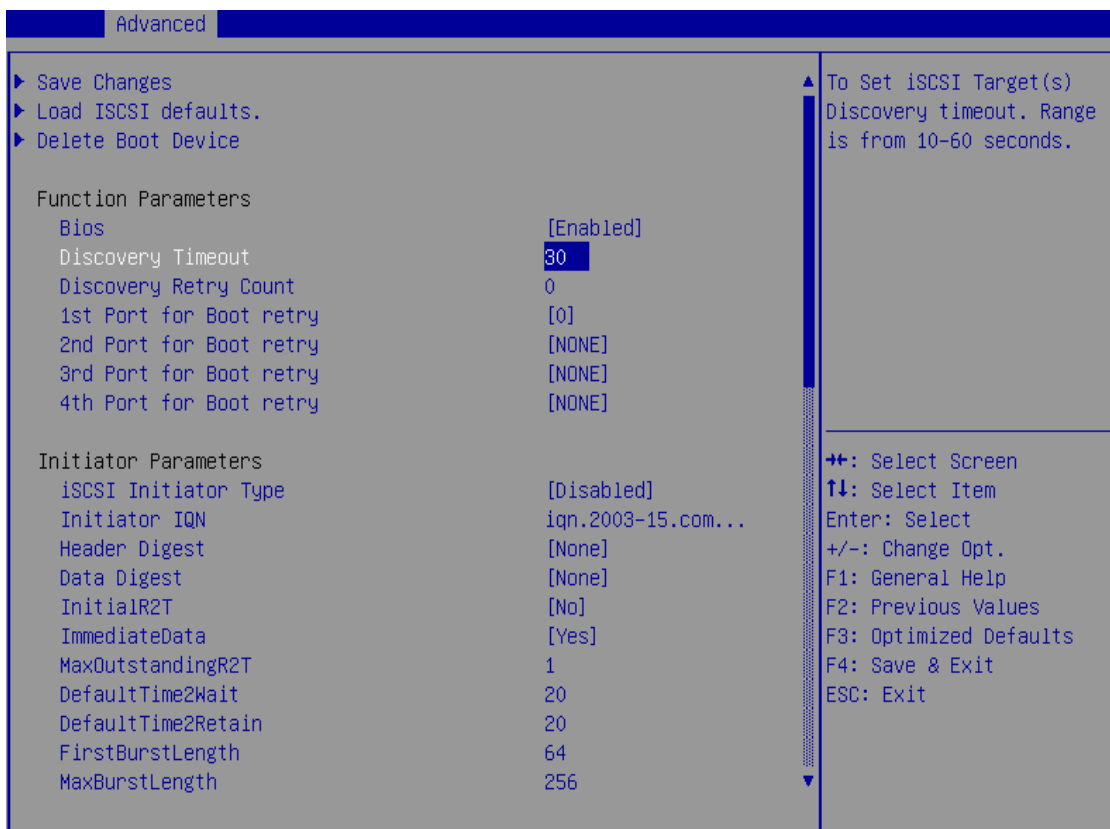
- vii. Select **iSCSI** and press [Enter]



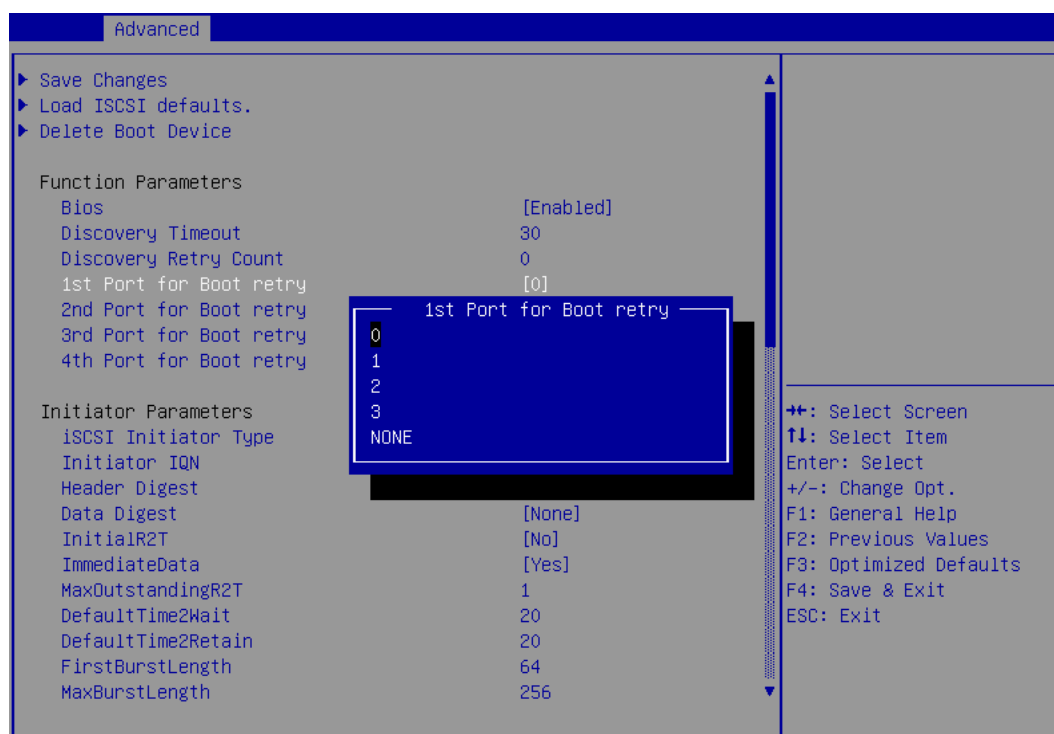
- viii. Under **Function Parameters**, enable iSCSI BIOS, if not already enabled.



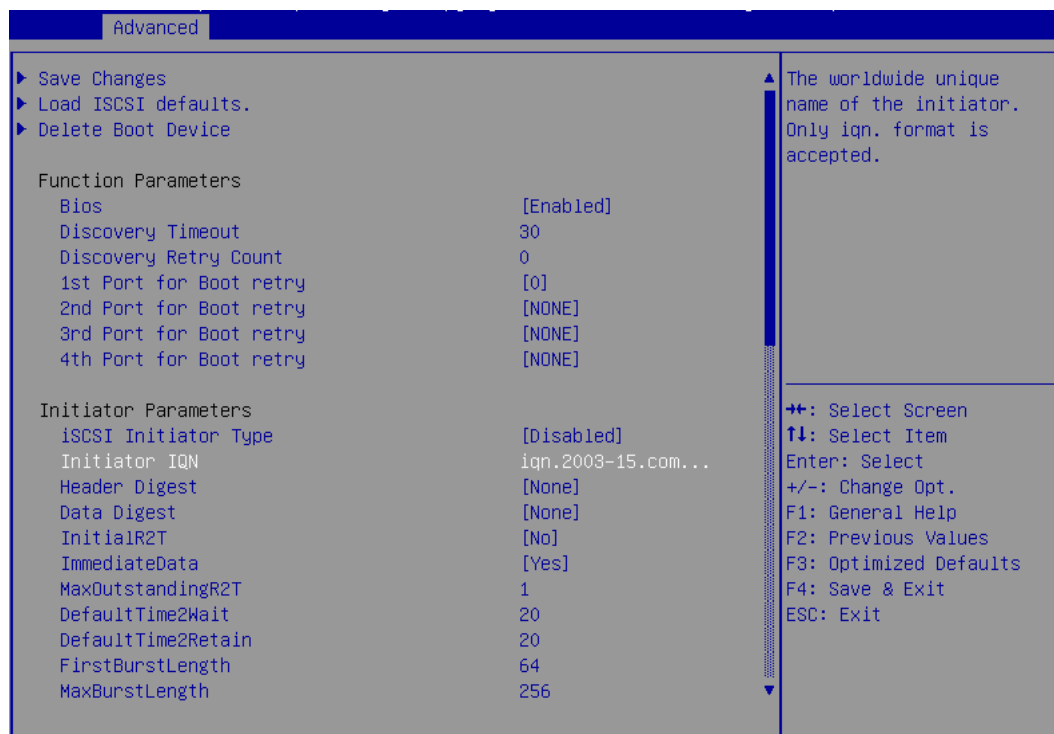
- ix. Set discovery timeout to a suitable value. Recommended value is ≥ 30



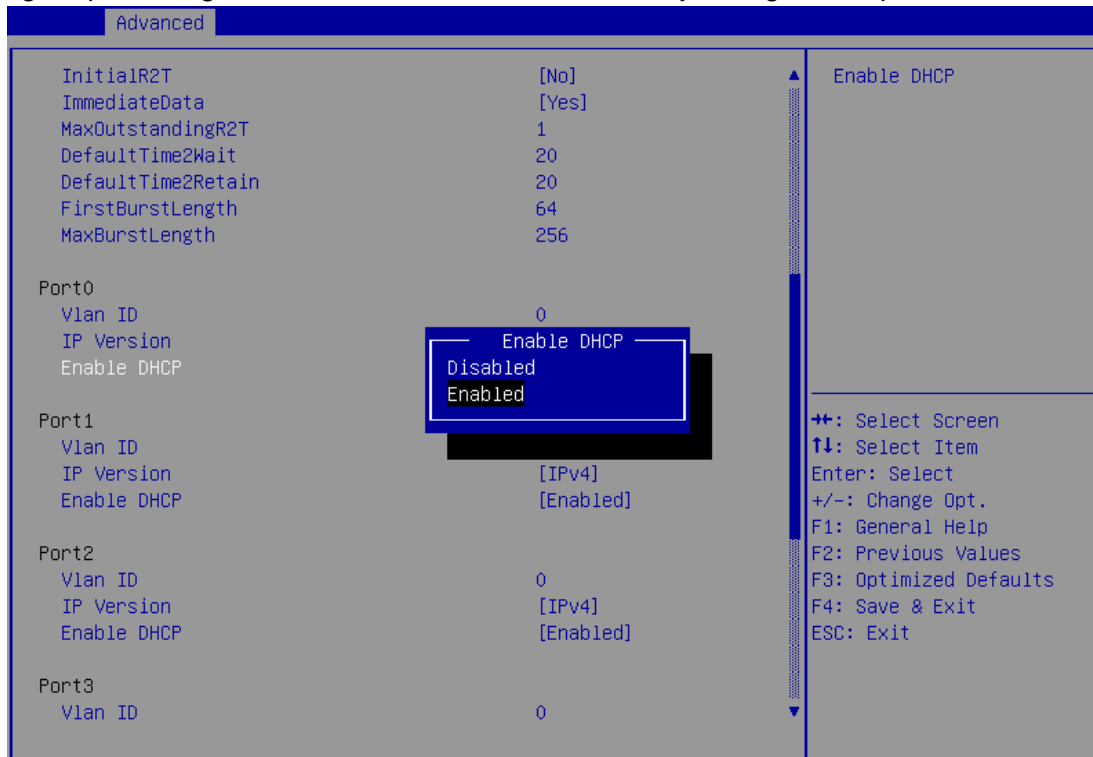
- x. Choose the order of the ports to discover iSCSI targets.



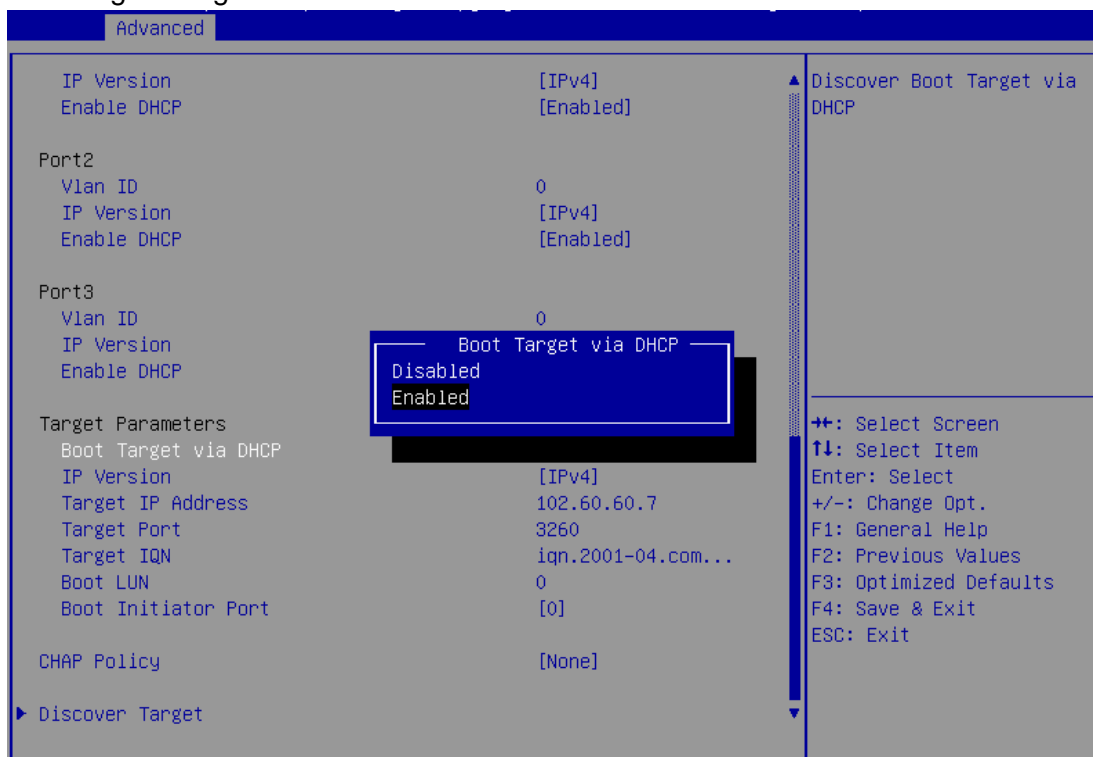
- xi. Under **Initiator Parameters**, iSCSI Initiator properties like IQN, Header Digest, Data Digest, etc will be displayed. Change the values appropriately or continue with the default values.



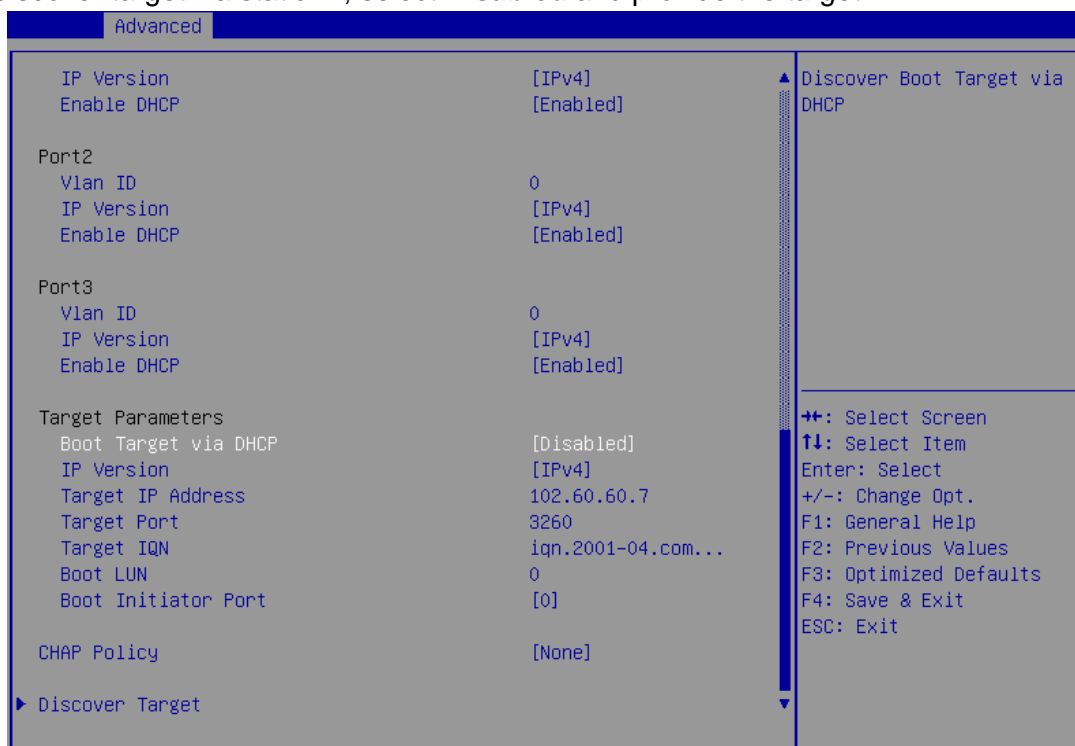
- xii. Under the first port, select **Enable DHCP** field, hit [Enter] and select **Enabled**. This will configure port using DHCP. Select **Disabled** to manually configure the port.



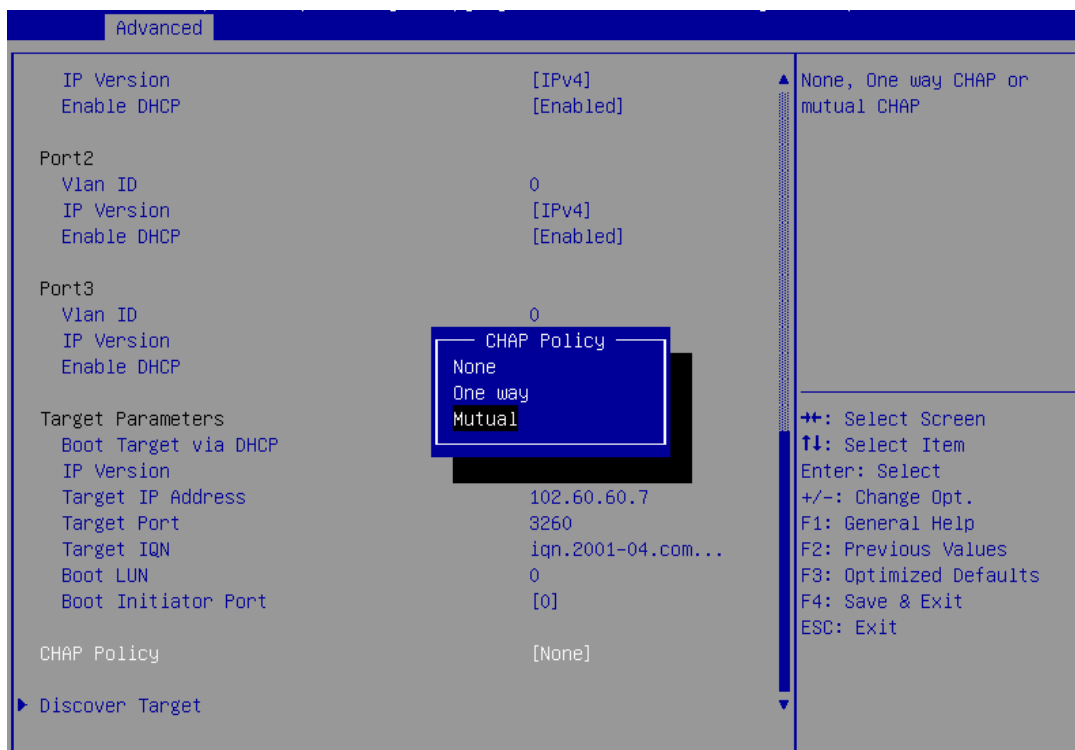
- xiii. Under **Target Parameters**, select **Enabled** for the **Boot Target via DHCP** parameter to discover target using DHCP.



To discover target via static IP, select **Disabled** and provide the target IP.



- xiv. CHAP authentication is disabled by default. To enable and configure, highlight **CHAP Policy** and hit [Enter]. Select the policy type from the corresponding pop-up and hit [Enter] again.



- xv. Provide Initiator and Target CHAP credentials according to the CHAP policy selected.

Advanced	
Vlan ID	0
IP Version	[IPv4]
Enable DHCP	[Enabled]
Port3	
Vlan ID	0
IP Version	[IPv4]
Enable DHCP	[Enabled]
Target Parameters	
Boot Target via DHCP	[Disabled]
IP Version	[IPv4]
Target IP Address	
Target Port	
Target IQN	
Boot LUN	0
Boot Initiator Port	[0]
CHAP Policy	[Mutual]
CHAP Method	[None]
Initiator CHAP Username	
Initiator CHAP Password	
Target CHAP Username	
Target CHAP Password	chelsiotar987_

▲ The minimum length is 12 Characters and the maximum length is 16 Characters.

++: Select Screen
 ↑↓: Select Item
 Enter: Select
 +/-: Change Opt.
 F1: General Help
 F2: Previous Values
 F3: Optimized Defaults
 F4: Save & Exit
 ESC: Exit

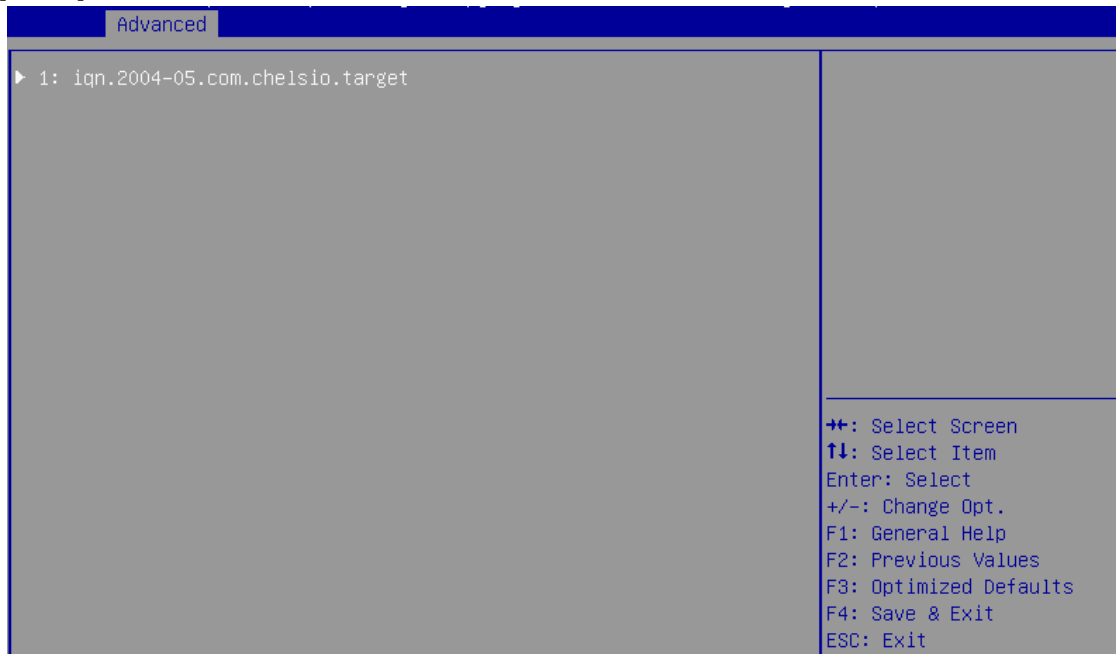
- xvi. Select **Discover Target** and press [Enter] to discover iSCSI targets connected to the switch. Wait till all reachable targets are discovered.

Advanced	
Vlan ID	0
IP Version	[IPv4]
Enable DHCP	[Enabled]
Port3	
Vlan ID	0
IP Version	[IPv4]
Enable DHCP	[Enabled]
Target Parameters	
Boot Target via DHCP	[Disabled]
IP Version	[IPv4]
Target IP Address	102.60.60.7
Target Port	3260
Target IQN	iqn.2001-04.com...
Boot LUN	0
Boot Initiator Port	[0]
CHAP Policy	[None]
▶ Discover Target	

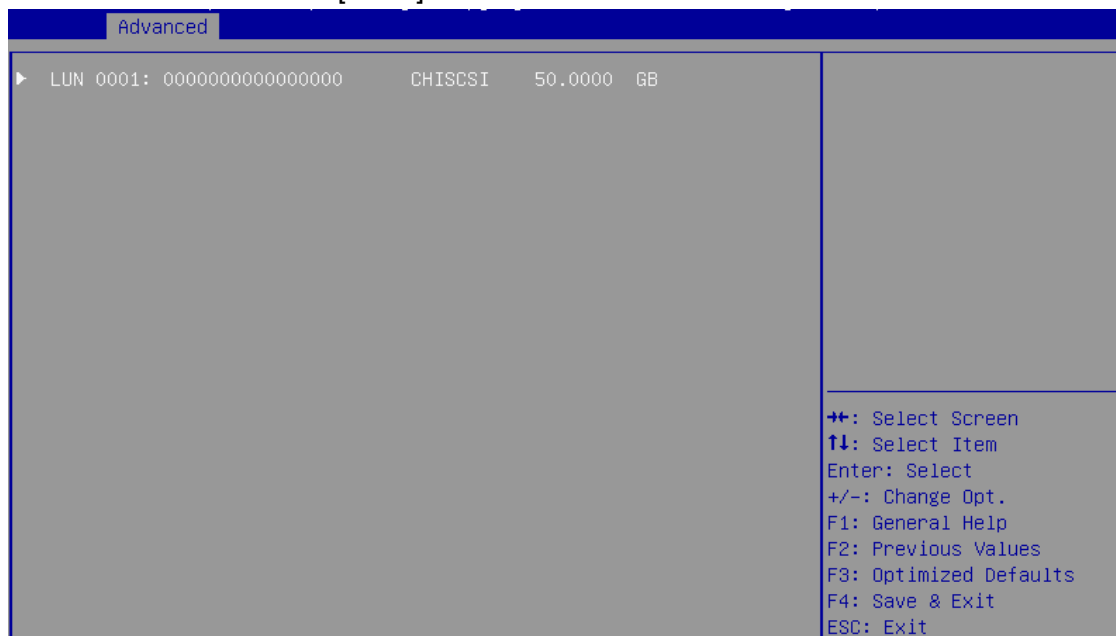
▲ Discover iSCSI Target(s) this may take 30 seconds

++: Select Screen
 ↑↓: Select Item
 Enter: Select
 +/-: Change Opt.
 F1: General Help
 F2: Previous Values
 F3: Optimized Defaults
 F4: Save & Exit
 ESC: Exit

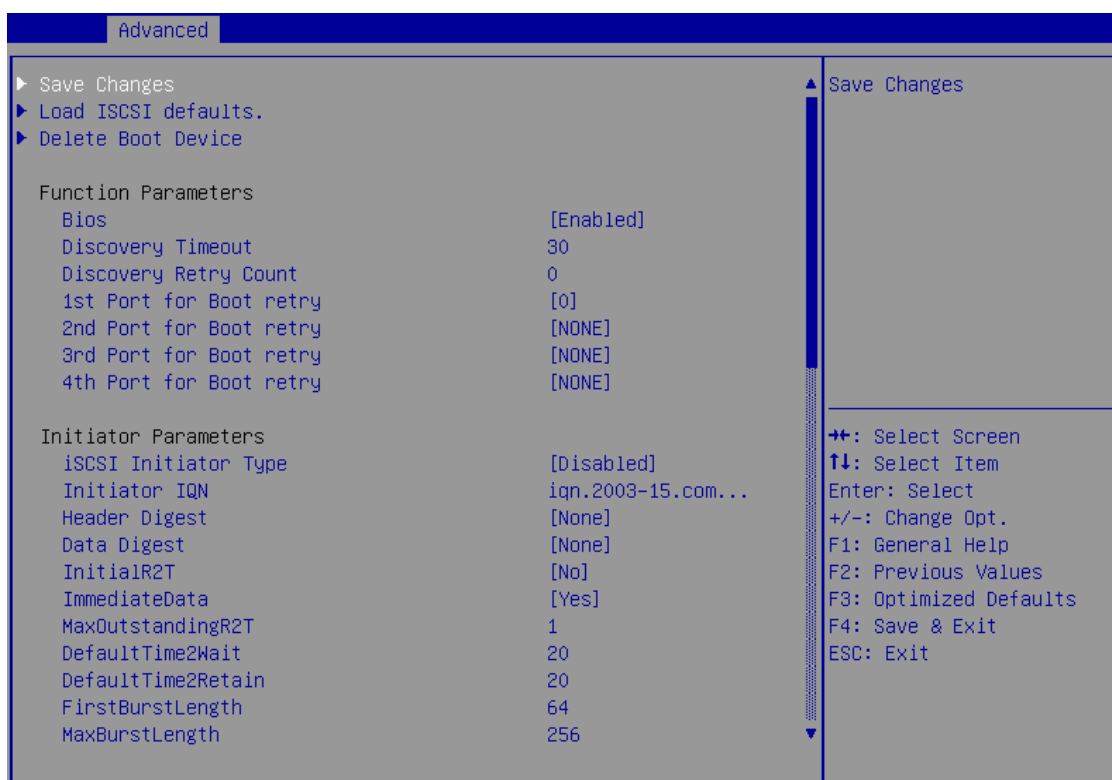
- xvii. A list of available targets will be displayed. Select the target you wish to connect to and hit [Enter].



- xviii. A list of LUNs configured on the selected target will be displayed. Select the LUN you wish to connect to and hit [Enter].

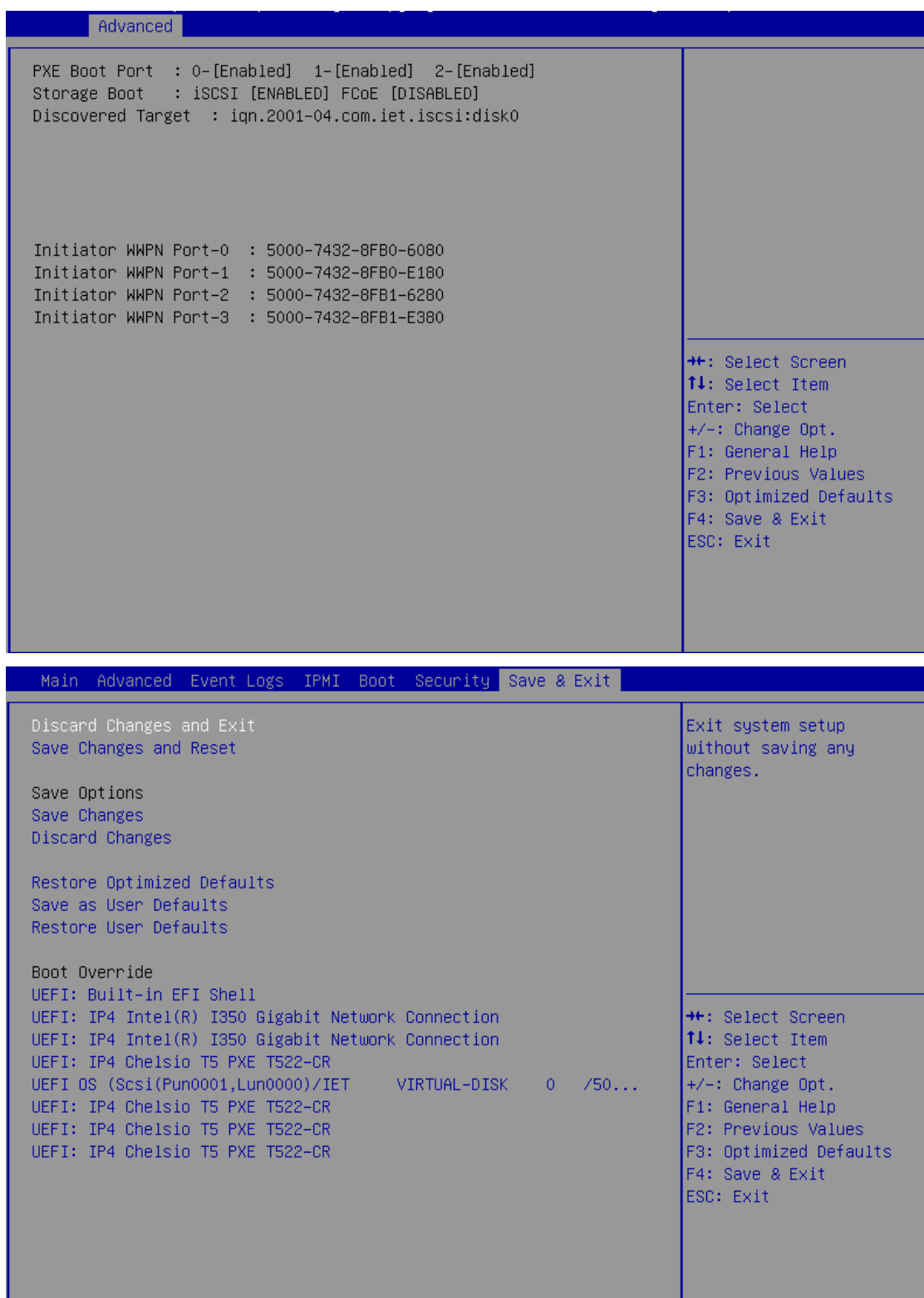


xix. Select **Save Changes** and press [Enter]



xx. Reboot the system for changes to take effect.

xxi. The discovered LUN should appear in the **Boot Configuration** section and system BIOS.



xxii. Select the LUN as the first boot device and exit from BIOS.

xxiii. Either boot from the LUN or install the required OS.

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 on FC/FCoE LUN and iSCSI LUN. This solution can be used for installing operating systems over an Ethernet network/SAN using Chelsio's T5 and T4 based Converged Network Adapters (CNAs).

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:

- T520-BT
- T502-BT
- T580-CR
- T520-LL-CR
- T520-SO-CR*
- T520-CR
- T522-CR
- T540-CR
- T580-LP-CR
- T580-SO-CR*
- T420-CR[#]
- T440-CR[#]
- T422-CR[#]
- T420-BCH*
- T420-SO-CR*
- T440-LP-CR[#]
- T420-LL-CR[#]
- T420-BT[#]
- T404-BT[#]

* Only PXE

[#] Only PXE,iSCSI

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)
RHEL7.1, 3.10.0-229.el7	PXE, FCoE, iSCSI
RHEL 7.0, 3.10.0-123.el7	PXE, FCoE, iSCSI
RHEL6.6, 2.6.32-504.el6	PXE, FCoE, iSCSI
SLES12, 3.12.28-4-default*	PXE, FCoE, iSCSI
SLES11SP3, 3.0.76-0.11	PXE, FCoE, iSCSI

*DUD required only for FCoE installation; for PXE and iSCSI, inbox drivers can be used.

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

2. Creating Driver Update Disk (DUD)

The following section describes the procedure to create Driver Update Disks for RHEL and SLES distributions for T5 adapters. In case of T4 adapters, you can skip this step and use inbox drivers to install the operating system.

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 6.6:

```
[root@host~]# cp Chelsio-DriverUpdateDisk-RHEL6.6-x86_64-x.xx.x.x.img <path  
to USB drive>
```

 **Note** For RHEL 7.X, use *Chelsio-DriverUpdateDisk-RHEL7.X-x86_64-x.xx.x.x.iso*

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/sda1
```

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/sda1
```

3. OS Installation

3.1. Installation using Chelsio DUD (PXE boot)

This is the recommended method for installing Linux OS using Chelsio 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 Linux 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 7.X installation

- i. Please make sure that the USB drive with DUD image is inserted. Type `e` and then `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. You will be asked to select the Driver Update Disk device from a list. USB drives usually show up as SCSI disks in Linux. Enter the index number of the device to be used and hit [Enter].

```
Page 1 of 1
Driver disk device selection
      DEVICE      TYPE      LABEL      UUID
  1)  sda1        vfat      7_8GB      C6A6-09F1
# to select, 'r'-refresh, 'n'-next page, 'p'-previous page or 'c'-continue: 1
```

- iii. The installer will search and display DUD image files found in the selected device. Enter the index number of the file to be used and hit [Enter].

```
Page 1 of 1
Choose driver disk ISO file
  1)  LinuxDUD/Chelsio-DriverUpdateDisk-2017.04-08.09.01.01.iso
# to select, 'n'-next page, 'p'-previous page or 'c'-continue: 1_
```

- iv. Drivers provided in the DUD will be listed. Enter 1 to select FCoE driver (*csistor*), or 2 to select Network driver (*cxgb4*). Hit [Enter]

```
Page 1 of 1
Select drivers to install
 1) [ ] /media/DD//rpms/x86_64/kmod-csistor-...rpm
 2) [ ] /media/DD//rpms/x86_64/kmod-cxgb4-...rpm
# to toggle selection, 'n'-next page, 'p'-previous page or 'c'-continue: 1
```

- v. To select the next driver, enter the driver index or enter “C” to start the loading process. Hit [Enter]. The selected driver(s) will now be loaded.

```
Page 1 of 1
Select drivers to install
 1) [x] /media/DD//rpms/x86_64/kmod-csistor-...rpm
 2) [ ] /media/DD//rpms/x86_64/kmod-cxgb4-...rpm
# to toggle selection, 'n'-next page, 'p'-previous page or 'c'-continue: 2
```

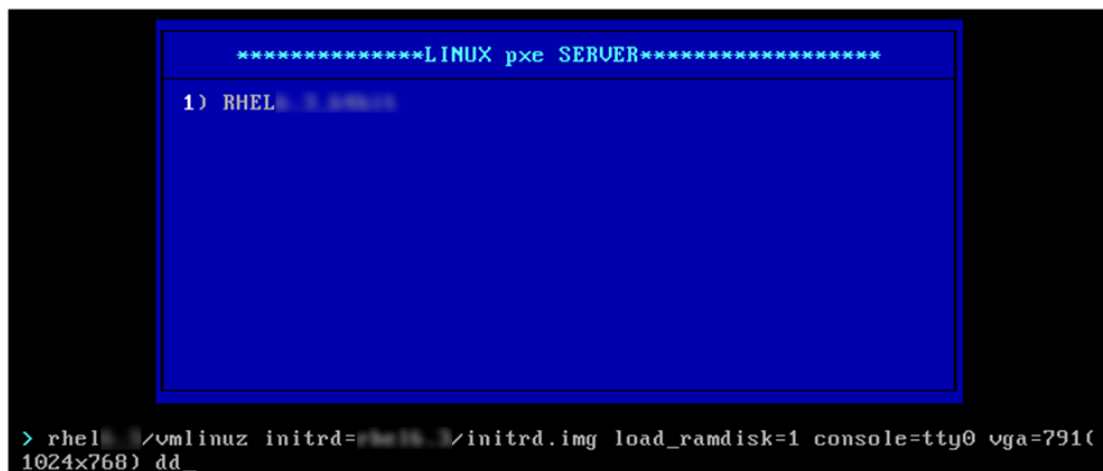


Note To deselect a driver, enter the index of the selected driver and hit [Enter]

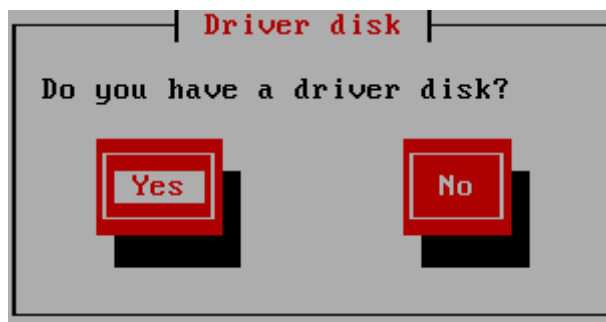
- vi. The **Driver disk prompt** will be displayed again. Follow the same procedure mentioned above to select any other drivers you wish to load or press “C” to skip and start the loading process.
- vii. After the drivers are successfully loaded, OS installation will commence. Proceed as usual.

3.1.2. RHEL 6.X installation

- i. Please make sure that the USB drive with DUD image is inserted. Press *Tab* and then 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.

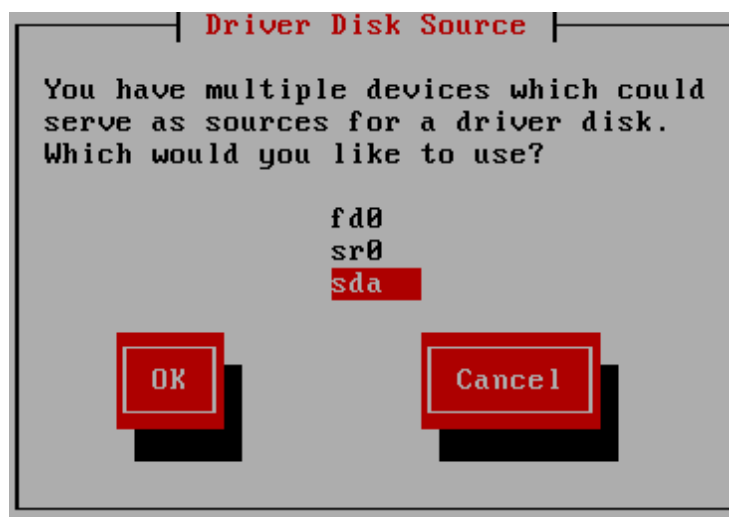


- ii. The installer will load and prompt you for the driver update disk. Select "Yes" and hit [Enter] to proceed.

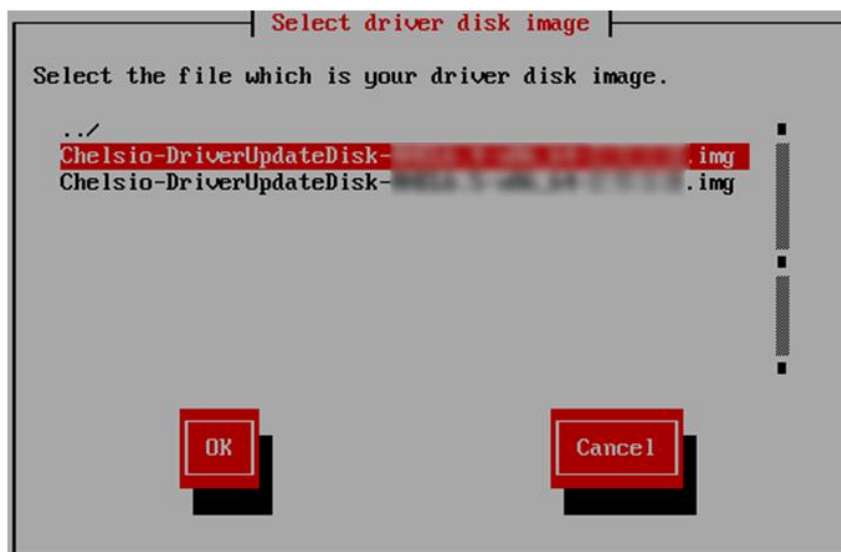


- iii. You will be asked to select the Driver Update Disk device from a list. USB drives usually show up as SCSI disks in Linux. So if there are no other SCSI disks connected to the system, the USB drive would assume the first drive letter “a”. Hence the drive name would be “sda”.

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 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.



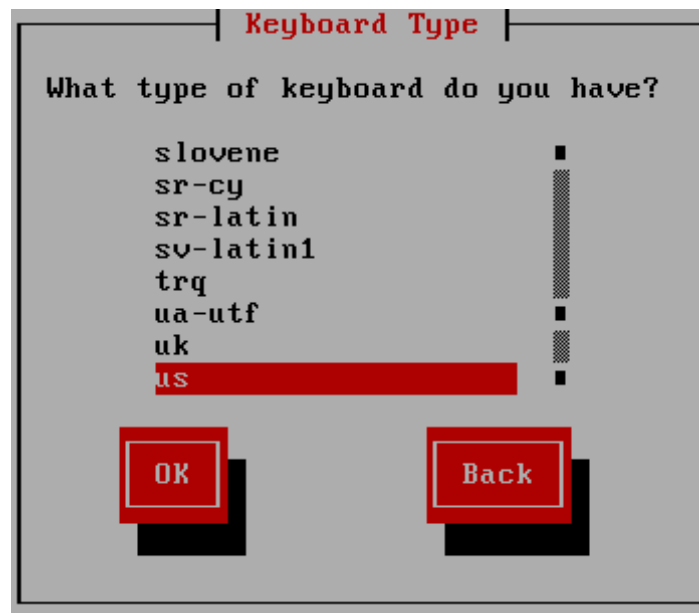
- v. The installer will ask if you wish to load more drivers. Choose “Yes” to load if you have any other drivers to load. Otherwise choose “No”.



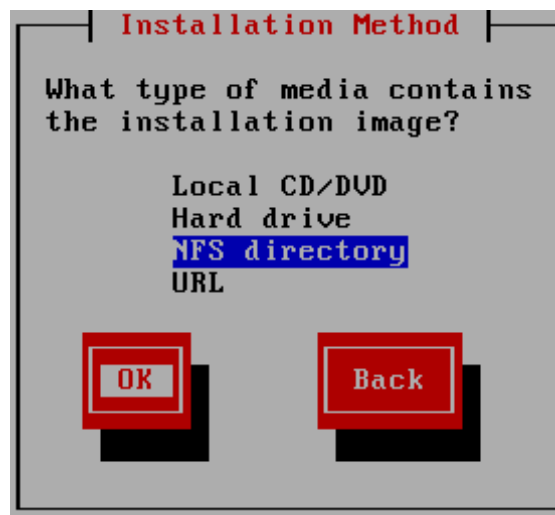
- vi. Select the required language from the list.



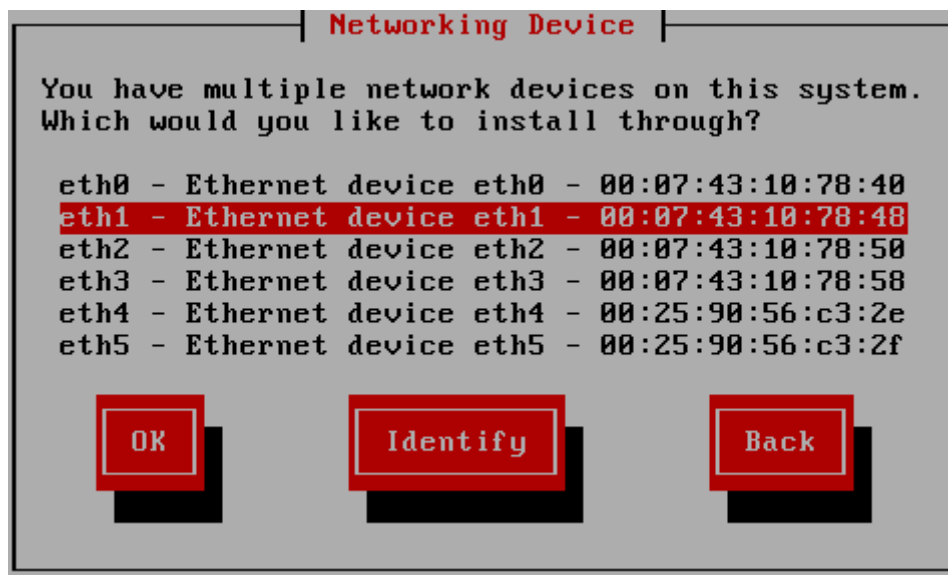
vii. Select the type of keyboard you have from the list.



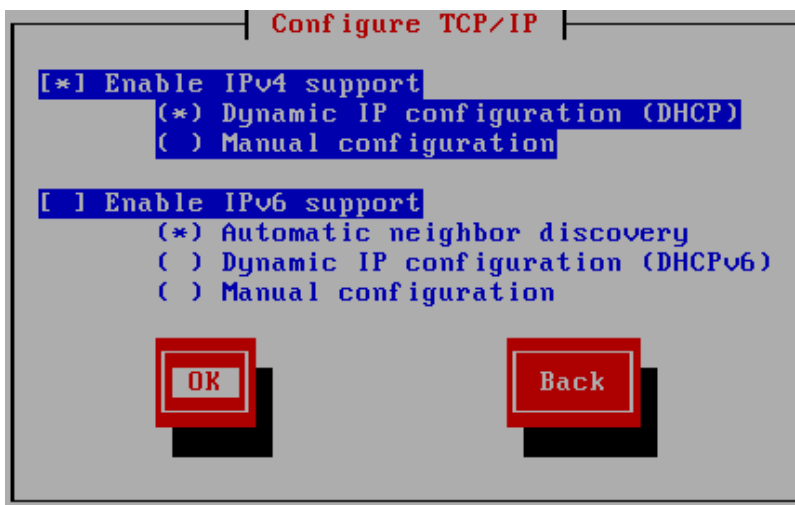
viii. In this step, you can choose the source which contains the OS installation ISO image. In this case, select "NFS directory".



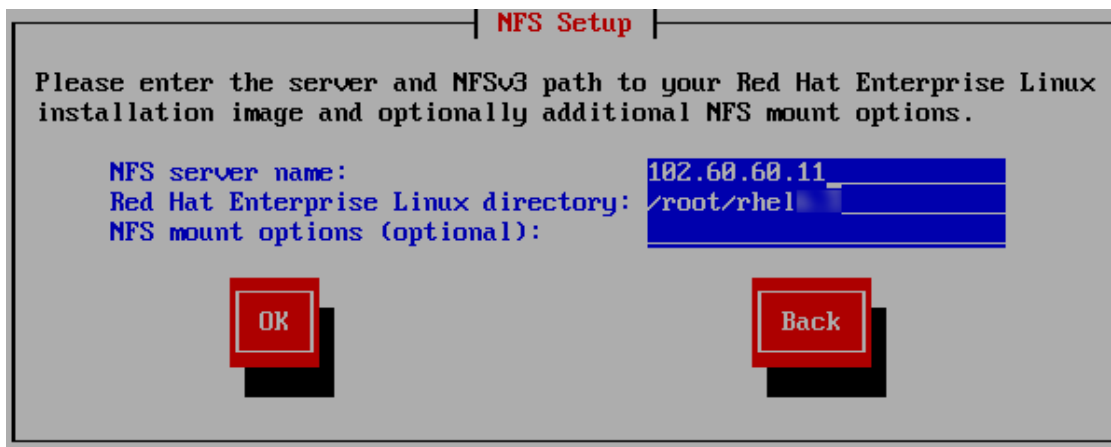
- ix. The Chelsio network devices will be displayed. Select the appropriate Chelsio NIC interface to proceed with installation.



- x. 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. 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.

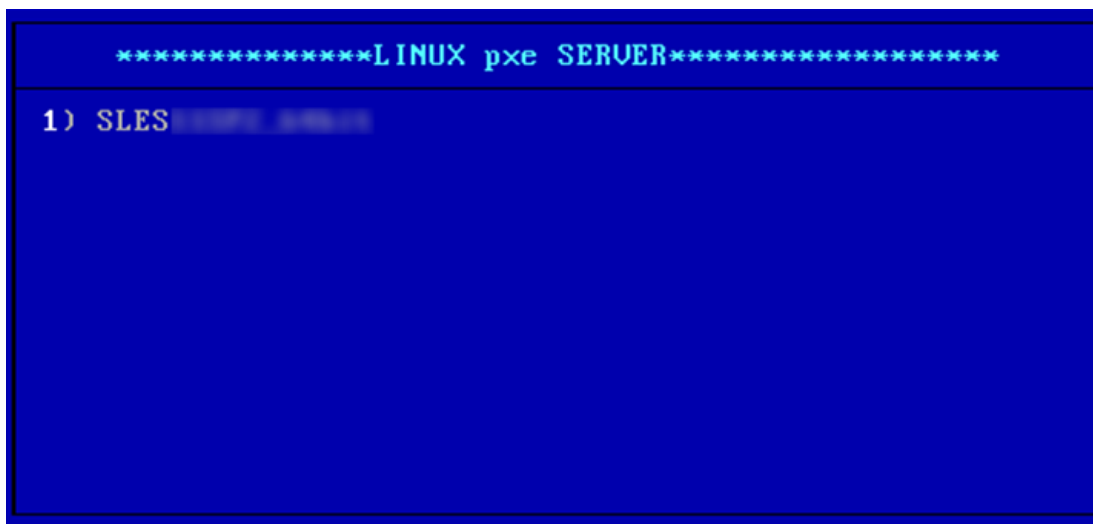


3.1.3. SLES11 SPx/SLES12 installation

- i. In case of SLES11 SPx PXE, FCoE and iSCSI, and SLES12 FCoE, please make sure that the USB drive with DUD image is inserted.

Note No DUD required for SLES12 PXE and iSCSI, as inbox drivers can be used.

- ii. Select the appropriate entry from the PXE menu and press [Enter].

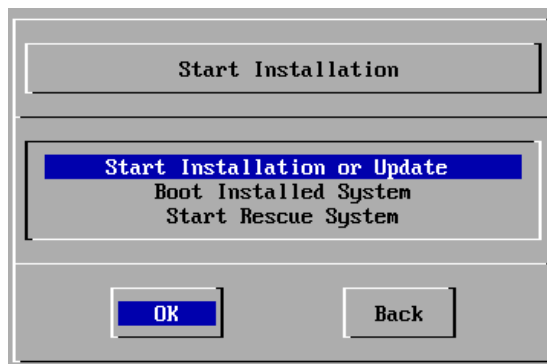
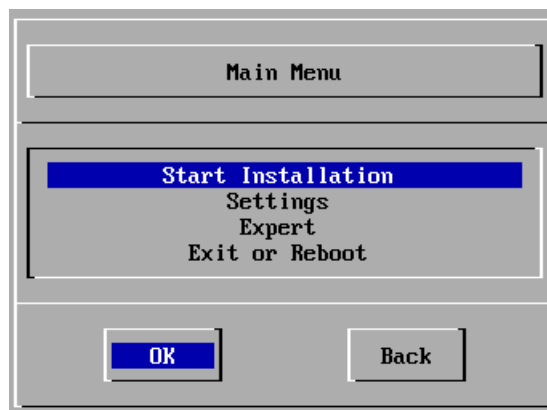


```
[ 2.227429] hp_sw: device handler registered
[ 2.252145] rdac: device handler registered

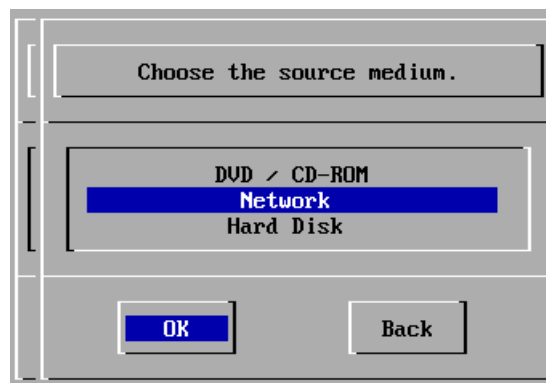
>>> SUSE Linux Enterprise Server 11 installation program v3.3.81 (c) 1996-2010 SUSE Linux Products GmbH <<<
Starting udev... ok
Loading basic drivers... ok
Starting hardware detection... ok
(If a driver is not working for you, try booting with brokenmodules=driver_name.)

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
```

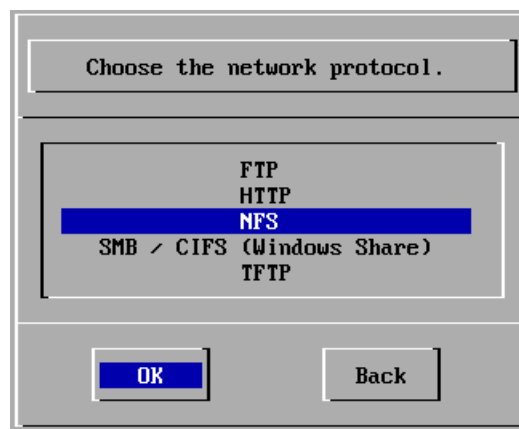
- iii. Select “Start Installation” and then “Start Installation or Update”.



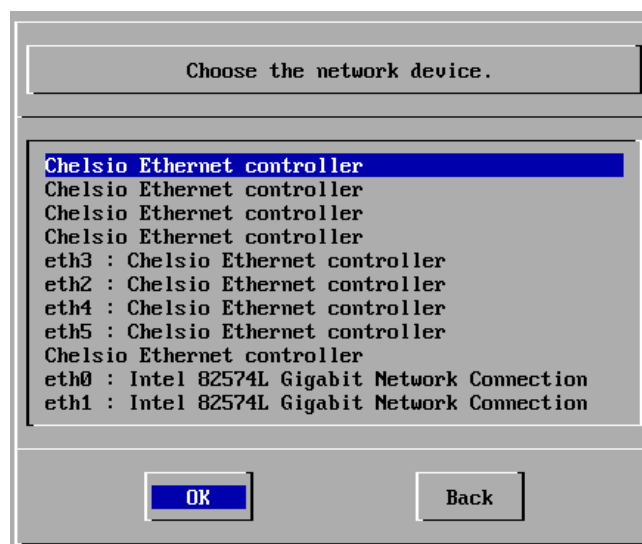
- iv. Select “Network” as the source of medium to install the SLES Operating System.



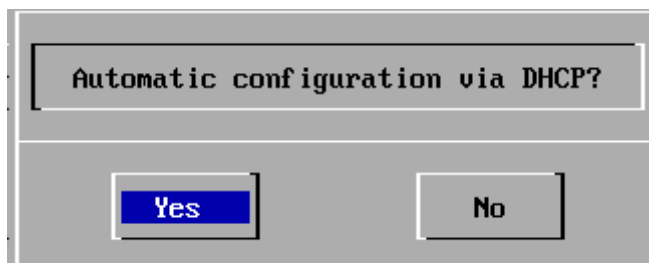
- v. Select the desired Network protocol from the list presented.



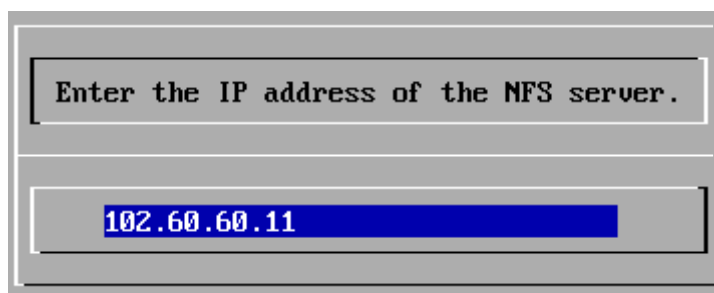
- vi. Select the appropriate Chelsio interface from the list to proceed with installation. You can view the messages from the Linux kernel and drivers to determine the name of NIC interface by pressing [Alt] + [F3] or [Alt] + [F4]. Press [Alt] + [F1] to get back to the list.



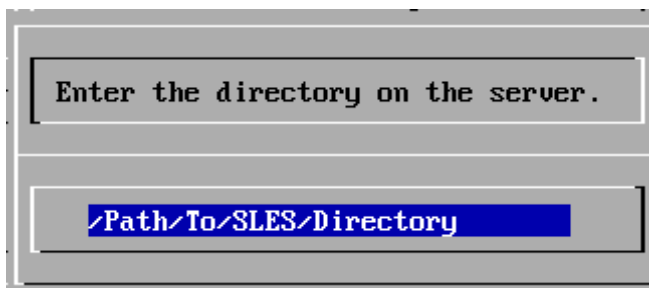
- vii. Select “Yes” to configure the network interface selected in the previous step using DHCP.



- viii. Provide a valid NFS/FTP/HTTP/TFTP Server IP address to proceed.



- ix. Provide a valid directory path to the operating system to be installed.



- x. Proceed with the installation as usual.

3.2. Installation on FCoE LUN

- If you are installing using CD/DVD, please make sure that the USB drive with DUD image is inserted. Also, change the boot priority to boot from CD/DVD in the BIOS setup.
 - i. Insert the OS installation disc into your CD/DVD ROM.
 - ii. On the Grub menu, choose *Install or upgrade an existing system* option if not already selected.
 - iii. Type *e* and then *dd* at the boot prompt for RHEL 7. For RHEL 6 and SLES distributions, press *Tab* and then *dd*.

- iv. Load Chelsio Driver Update Disk depending on the Linux distribution ([Click here](#) for RHEL 7.x; [Click here](#) for RHEL6.x; [Click here](#) for SLES11 SPx/SLES12).
- If you are installing from a PXE server, please refer **3.1. Installation using Chelsio DUD (PXE boot)** ([Click here](#) for RHEL 7.x; [Click here](#) for RHEL6.x; [Click here](#) for SLES11 SPx/ SLES12) section to load Chelsio Driver Update Disk.

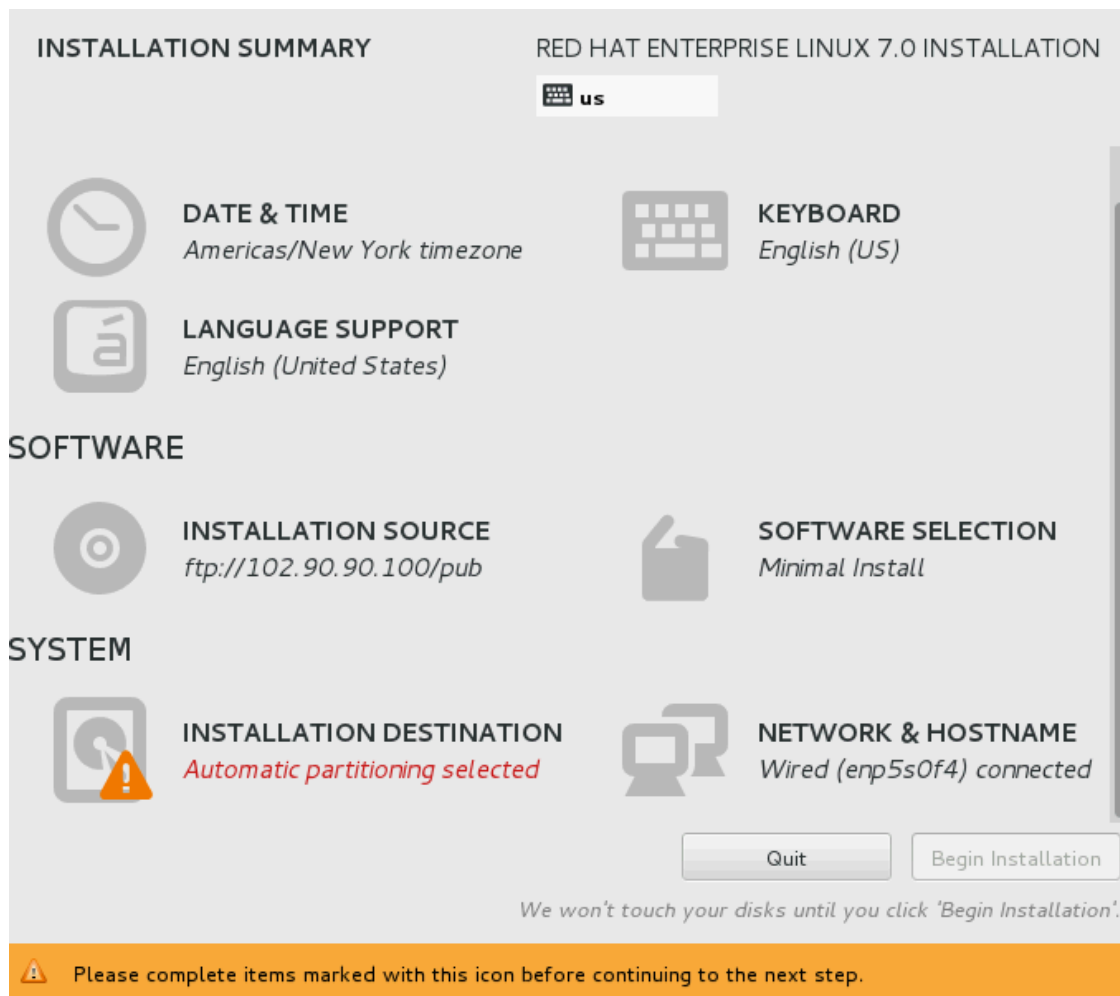
After successfully loading Chelsio DUD, follow the procedure mentioned below to continue installation, based on the distribution.

3.2.1. RHEL 7.x

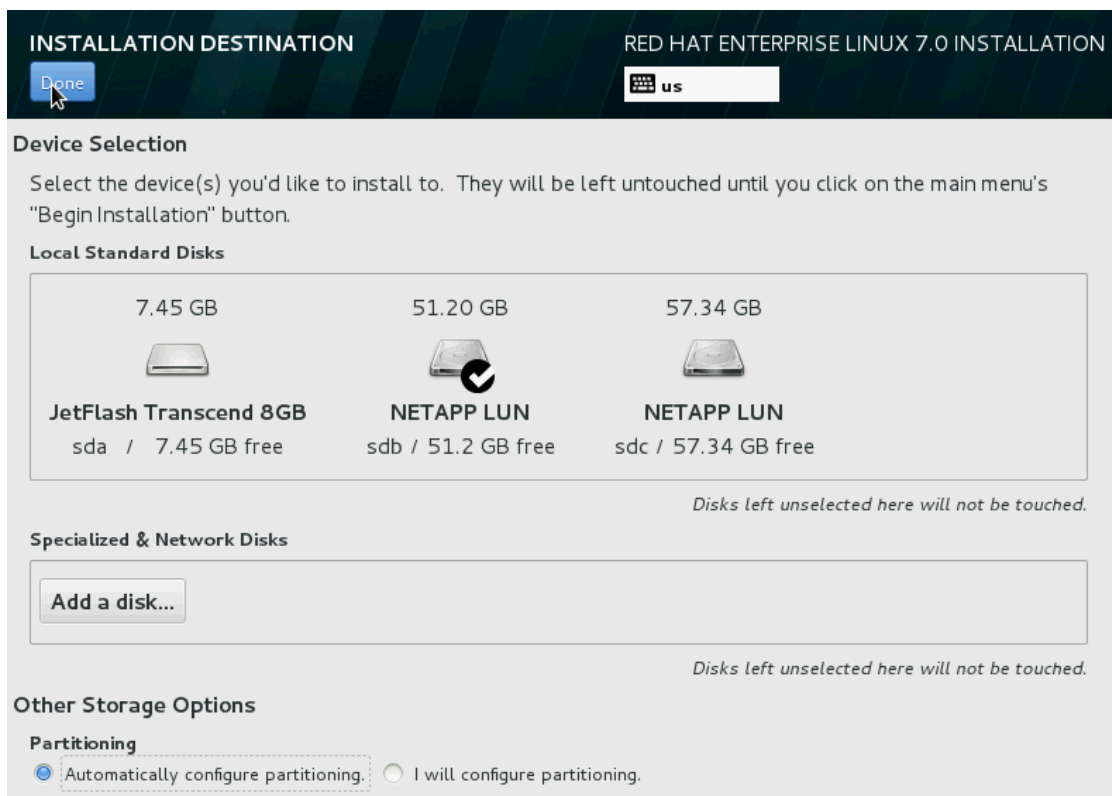
- i. Choose your installation language and click **Continue**



- ii. Click **INSTALLATION DESTINATION** under **SYSTEM**.

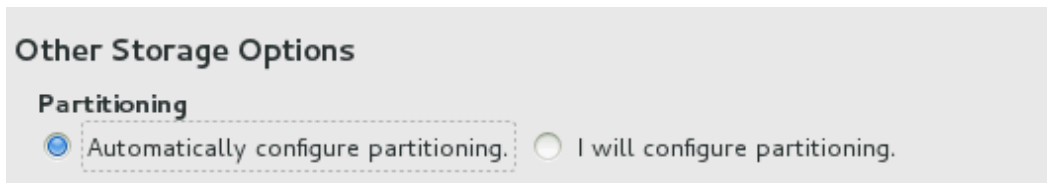


- iii. The discovered FC/FCoE LUNs will appear as local storage in the **Local Standard Disks** section. Select the LUN which was saved as boot device in system BIOS.



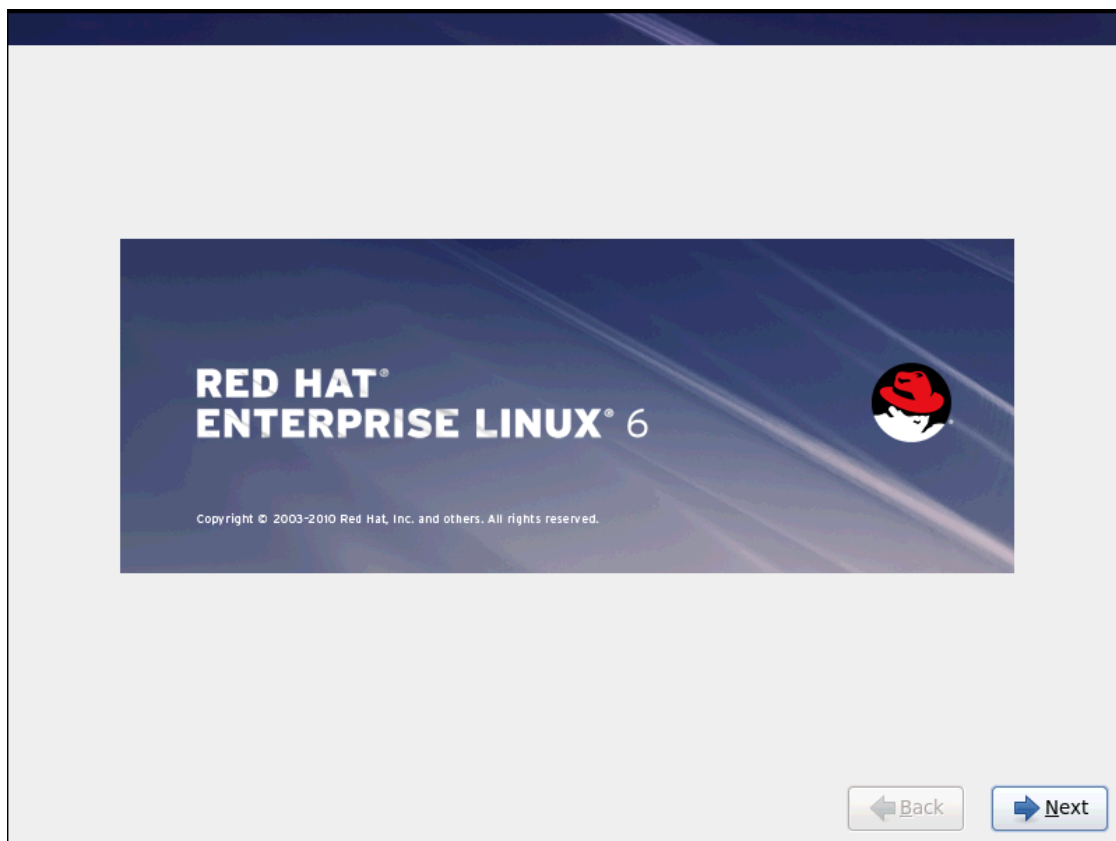
Note Make sure the same LUN discovered at the Option ROM stage is selected for OS installation.

- iv. Under **Other Storage Options**, you can either chose to configure partition automatically or manually. Select the appropriate option and click **Done**. Then proceed with the installation as usual.




3.2.2. RHEL 6.x Installation

- i. Click **Next** when the graphical installer screen appears.



- ii. Select **Specialized Storage Devices** radio button and click **Next**.



What type of devices will your installation involve?

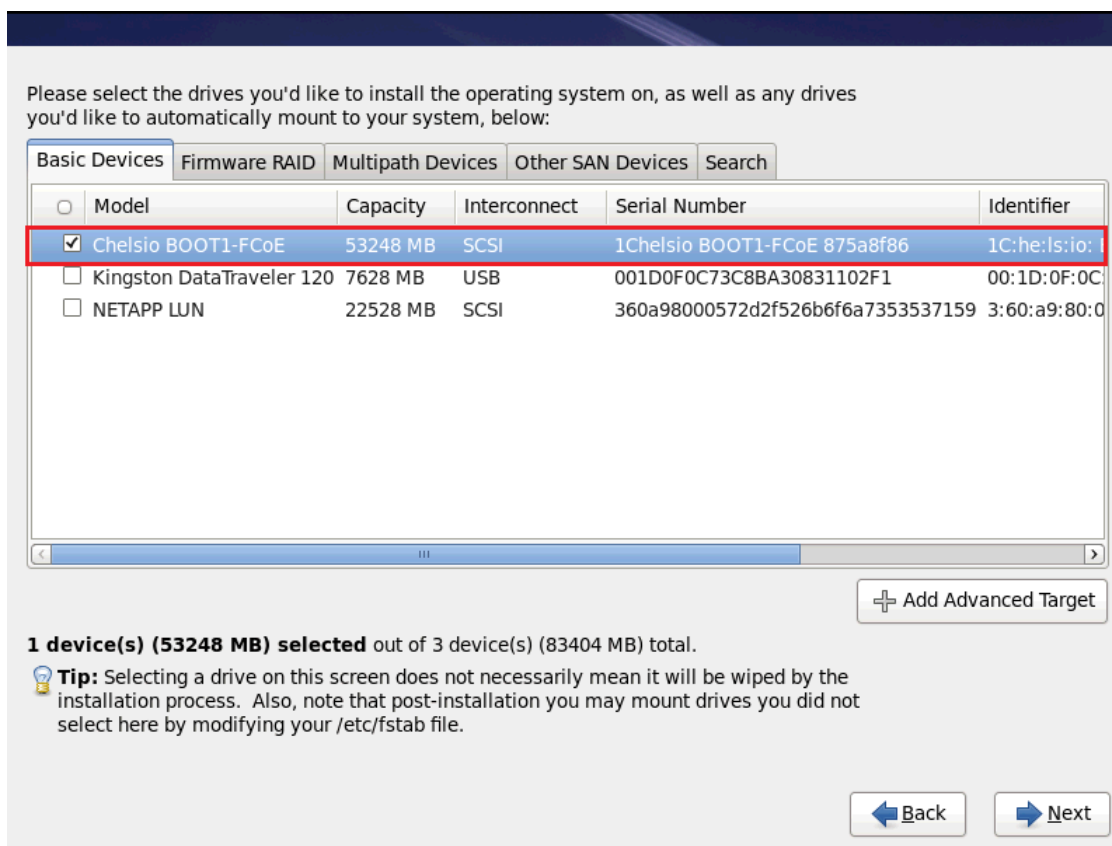
Basic Storage Devices

☐ Installs or upgrades to typical types of storage devices. If you're not sure which option is right for you, this is probably it.

Specialized Storage Devices

☒ Installs or upgrades to enterprise devices such as Storage Area Networks (SANs). This option will allow you to add FCoE / iSCSI / zFCP disks and to filter out devices the installer should ignore.

- iii. Select the FC/FCoE LUN which was saved as boot device in system BIOS and click **Next**. Then proceed with the installation as usual.



Please select the drives you'd like to install the operating system on, as well as any drives you'd like to automatically mount to your system, below:

Basic Devices Firmware RAID Multipath Devices Other SAN Devices Search

<input type="checkbox"/>	Model	Capacity	Interconnect	Serial Number	Identifier
<input checked="" type="checkbox"/>	Chelsio BOOT1-FCoE	53248 MB	SCSI	1Chelsio BOOT1-FCoE 875a8f86	1C:he:ls:io:
<input type="checkbox"/>	Kingston DataTraveler 120	7628 MB	USB	001D0F0C73C8BA30831102F1	00:1D:0F:0C:
<input type="checkbox"/>	NETAPP LUN	22528 MB	SCSI	360a98000572d2f526b6f6a7353537159	3:60:a9:80:0

1 device(s) (53248 MB) selected out of 3 device(s) (83404 MB) total.

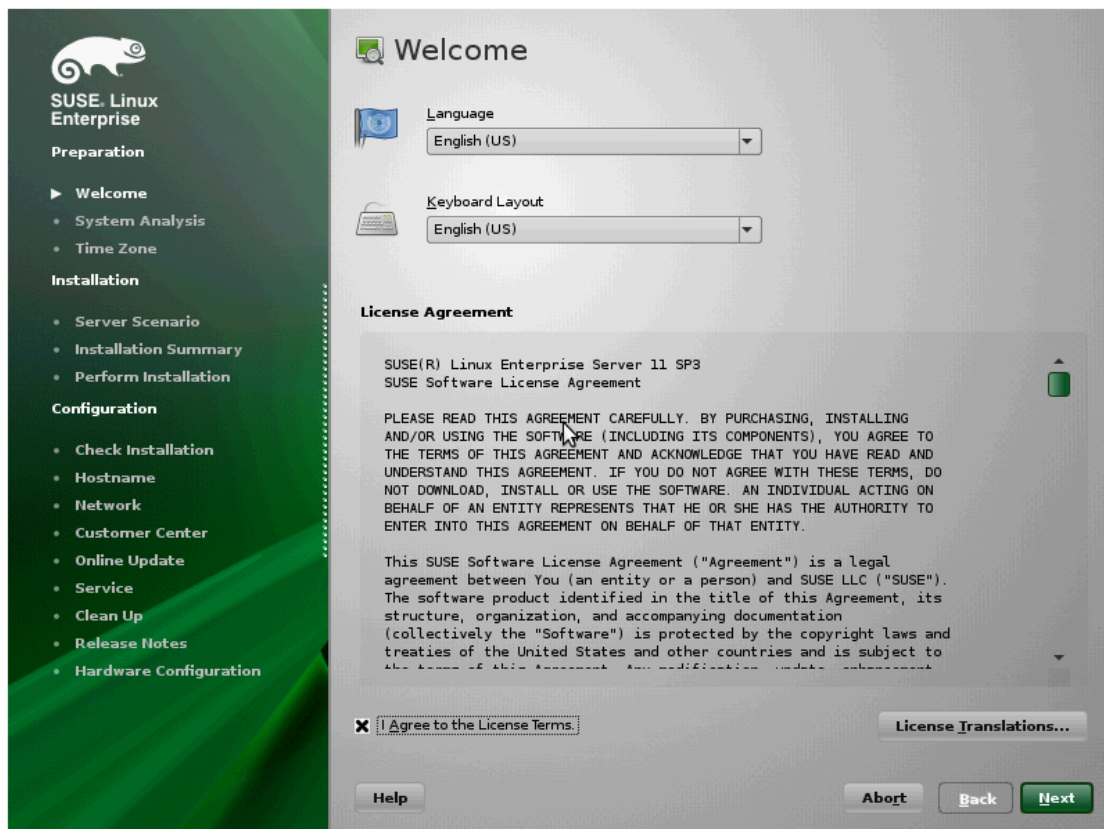
Tip: Selecting a drive on this screen does not necessarily mean it will be wiped by the installation process. Also, note that post-installation you may mount drives you did not select here by modifying your /etc/fstab file.

Back Next

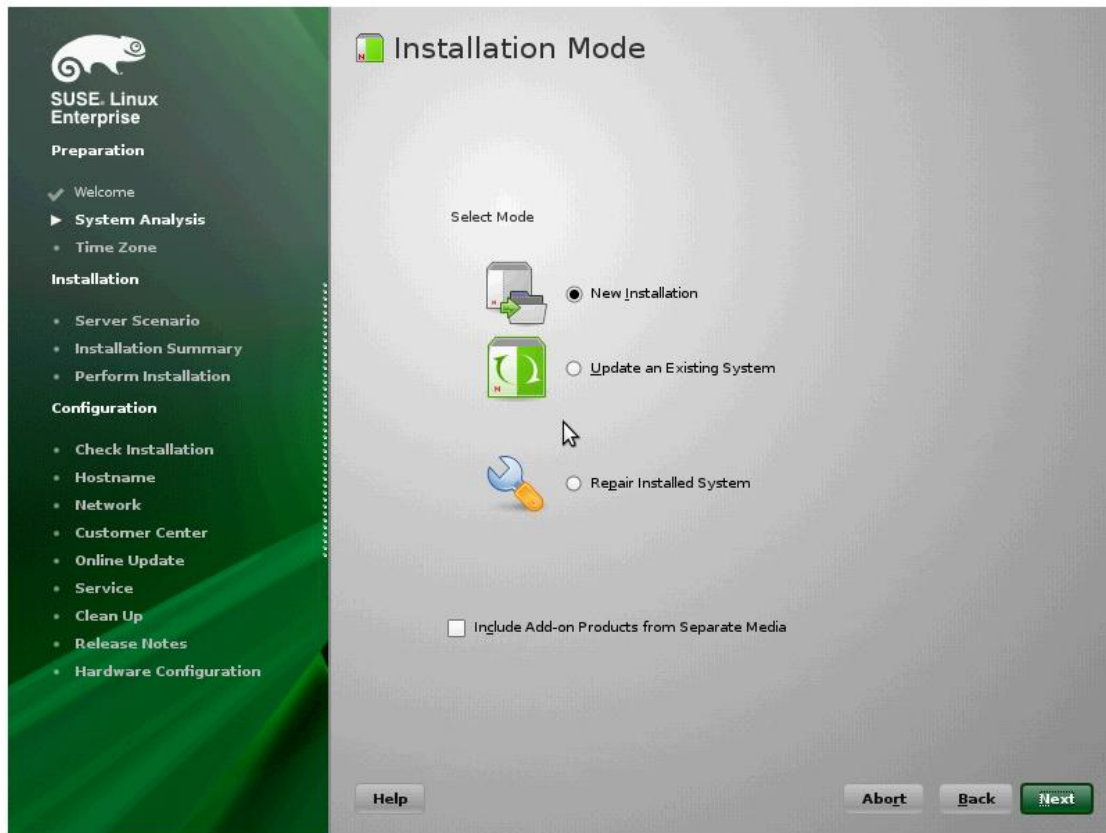
Note Make sure the same LUN discovered at the Option ROM stage is selected for OS installation.

3.2.3. SLES11 SPx Installation

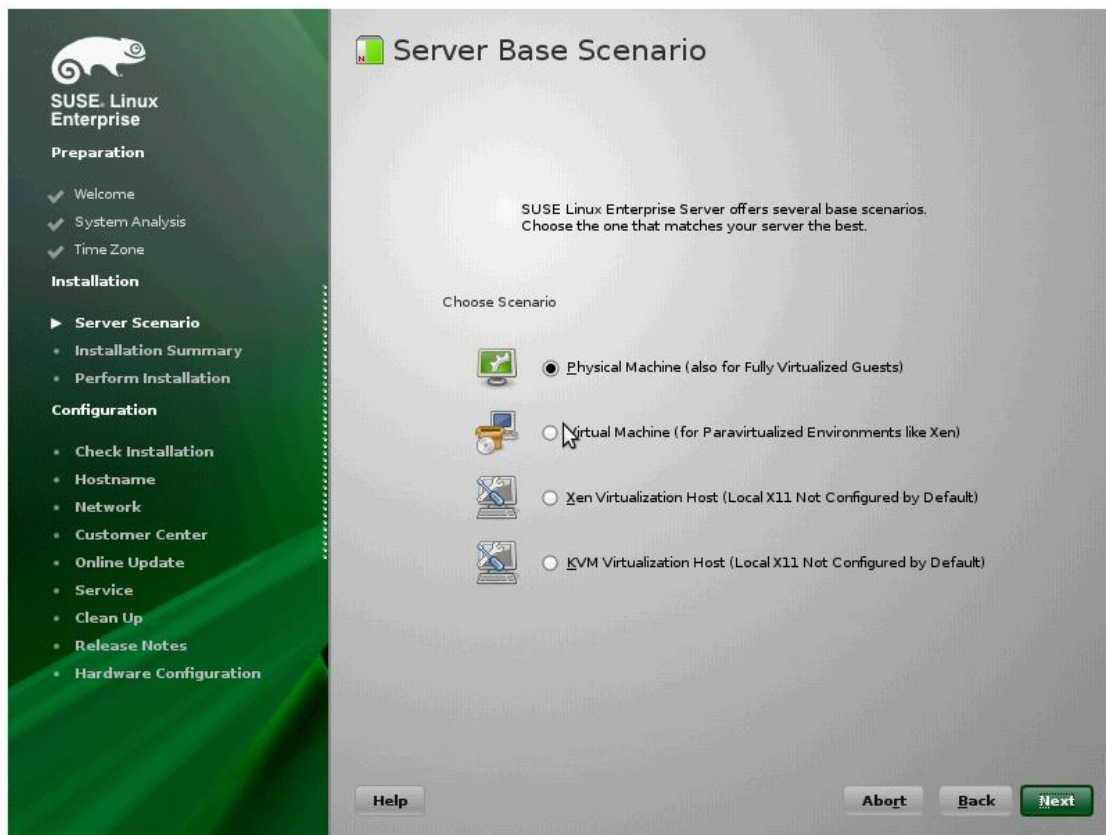
- i. Choose installation language and Keyboard layout type. Select the checkbox **I Agree to the License terms** and click **Next**.



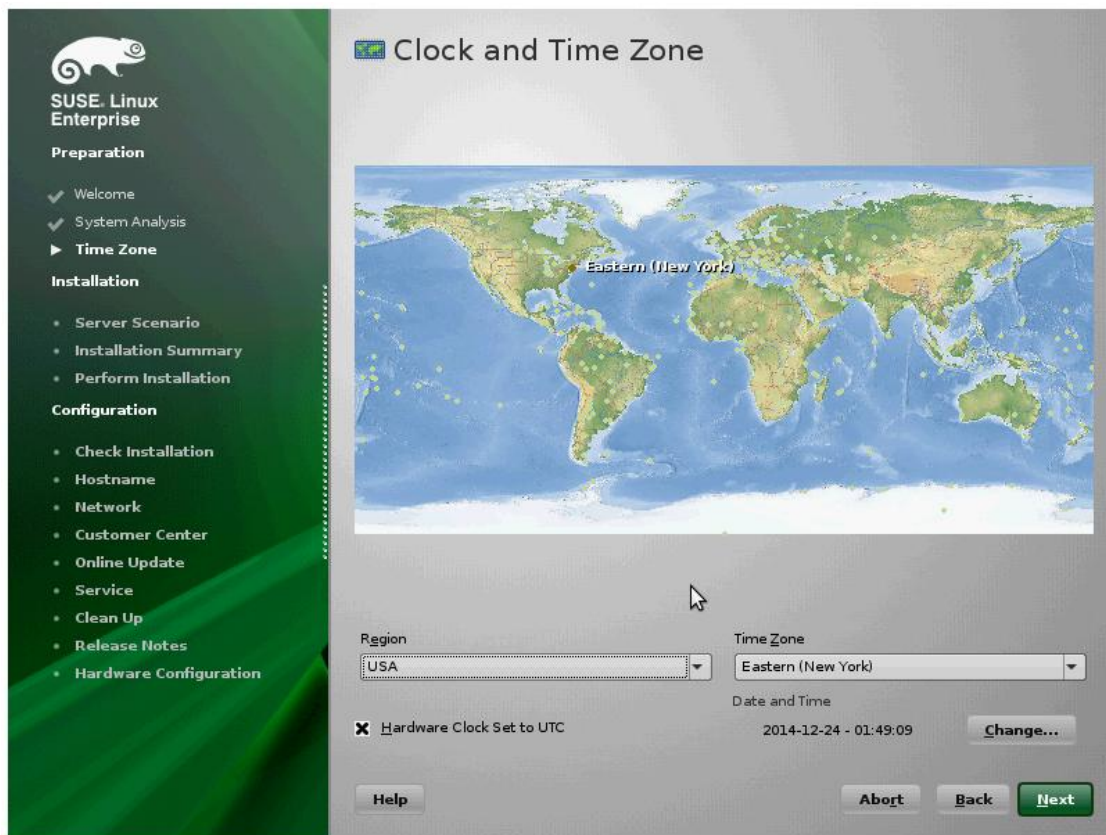
- ii. Select **New Installation** to perform a fresh installation and click **Next**.



iii. Choose from the available server base scenarios and click **Next**.



iv. Configure Clock and Time Zone settings. Click **Next**.

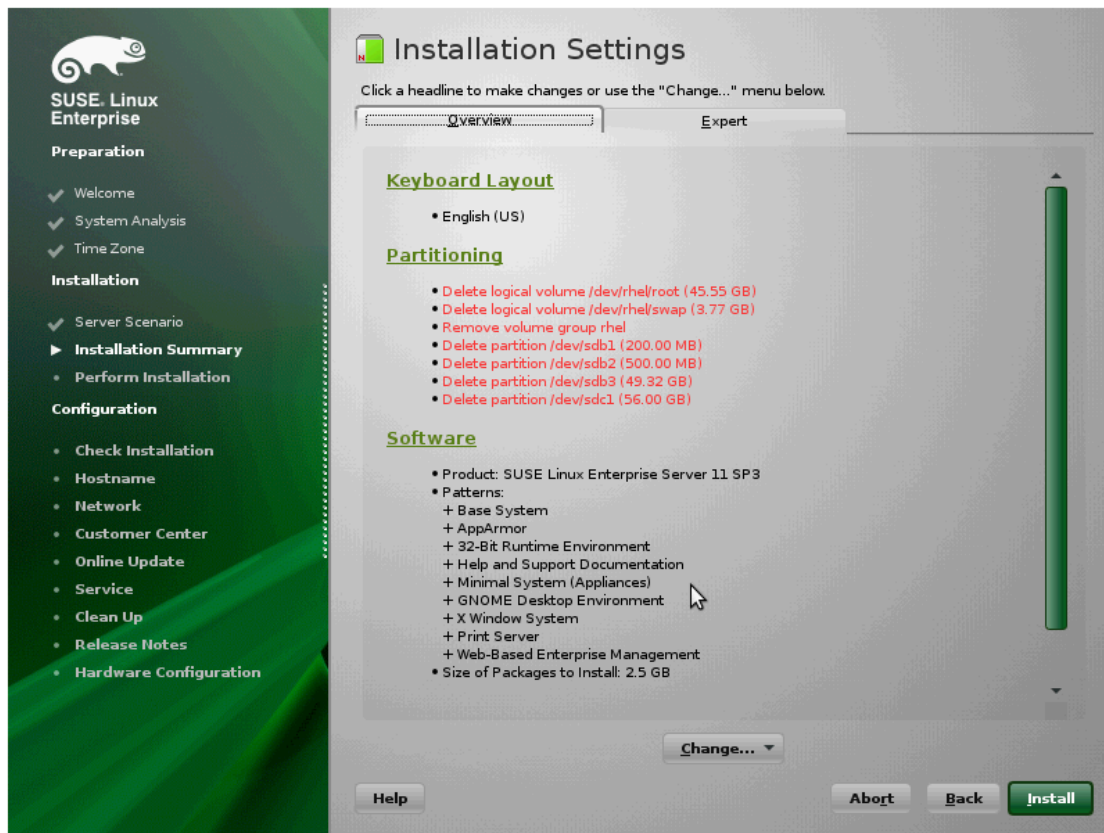


- v. The discovered FC/FCoE LUNs will appear in the **Preparing Hard Disk** screen. Select the LUN which was saved as boot device in system BIOS. Click **Next**.

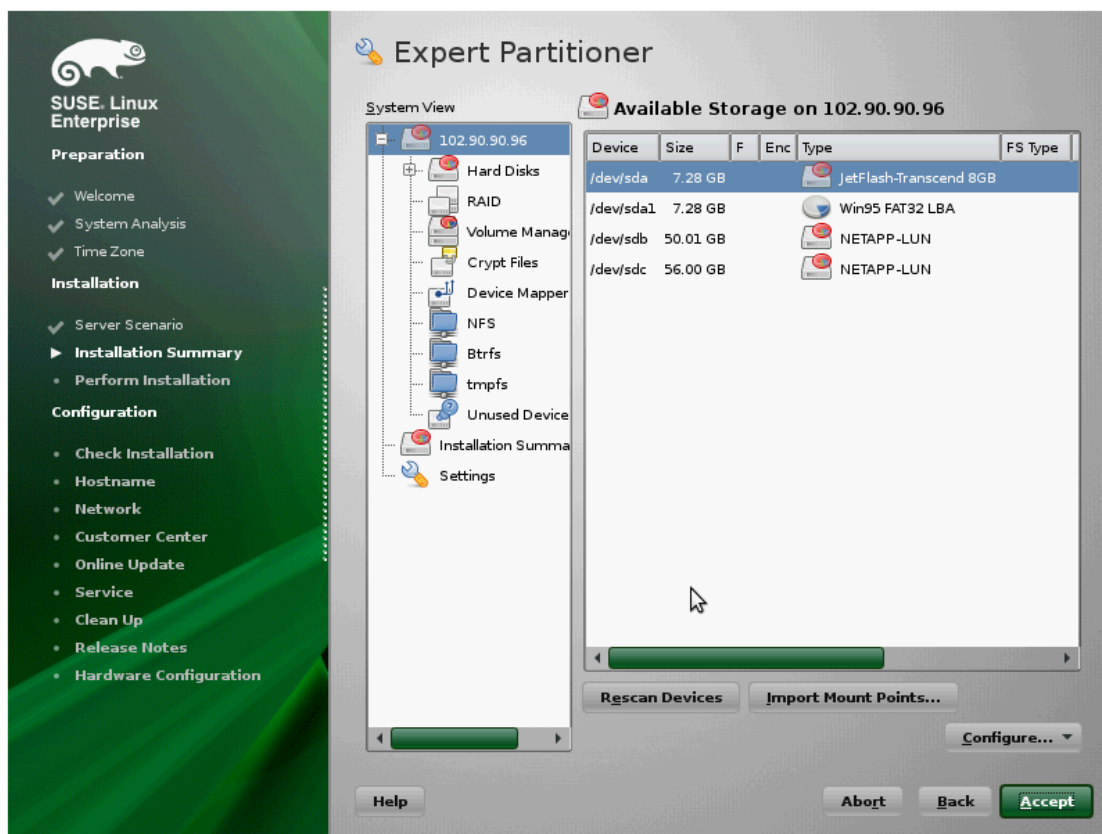


Note *Make sure the same LUN discovered at the Option ROM stage is selected for OS installation.*

- vi. The **Installation Settings** screen displays the summary of user-selected and YaST-suggested options for the installation. You can review and modify them if required. Basic settings can be changed in the **Overview** tab and advanced settings can be changed in the **Expert** tab. To change, click on one of the headlines or click **Change** and select the category. Finally, click **Next**.



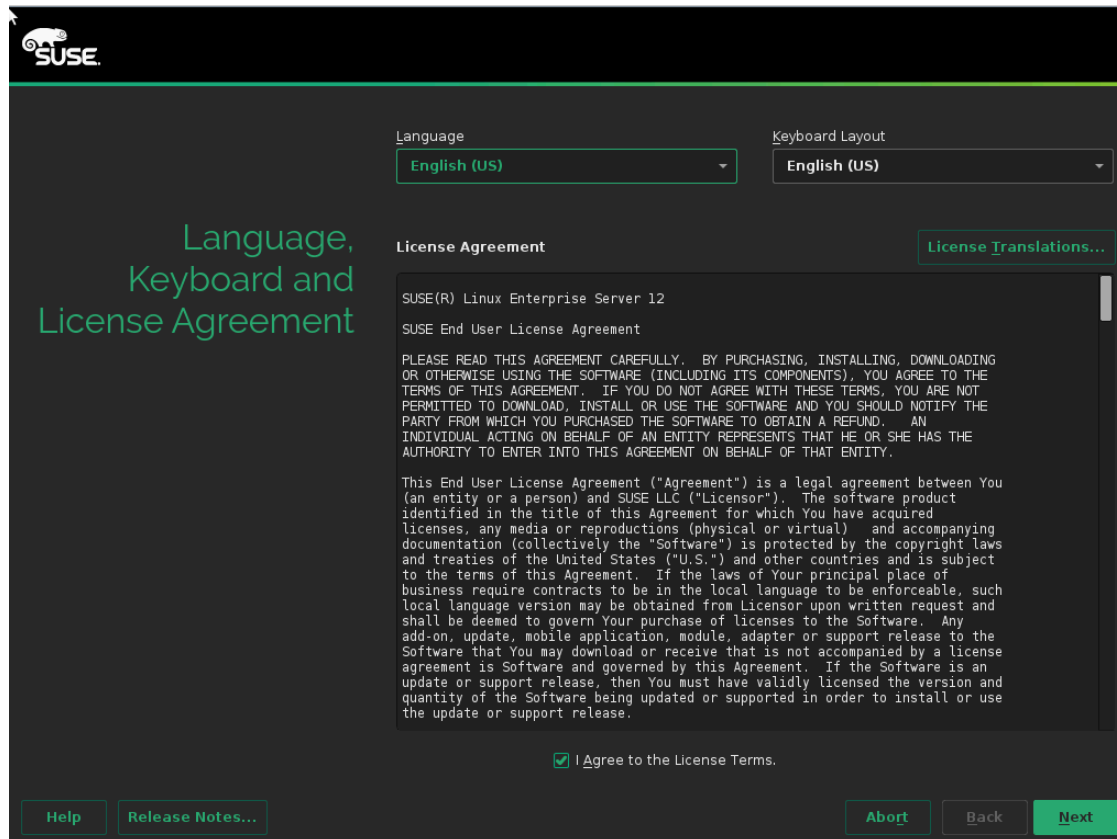
- vii. The **Expert Partitioner** screen displays the partition setup suggested by the installer. Click on the device selected in step (v) and click **Accept**.



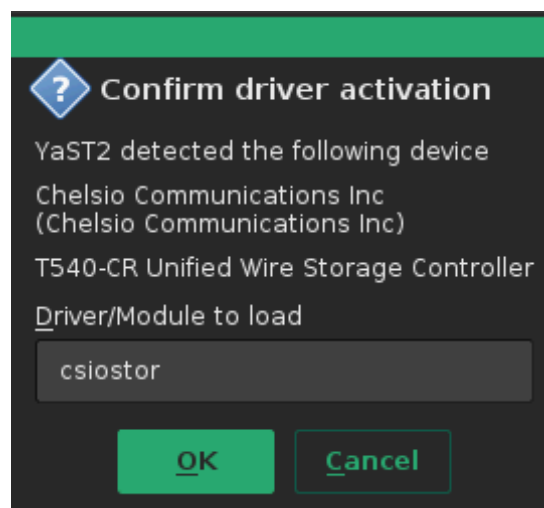
- viii. Proceed with installation as usual.

3.2.4. SLES12 Installation

- i. Choose installation language and keyboard layout type. Select the checkbox **I Agree to the License terms** and click **Next**.

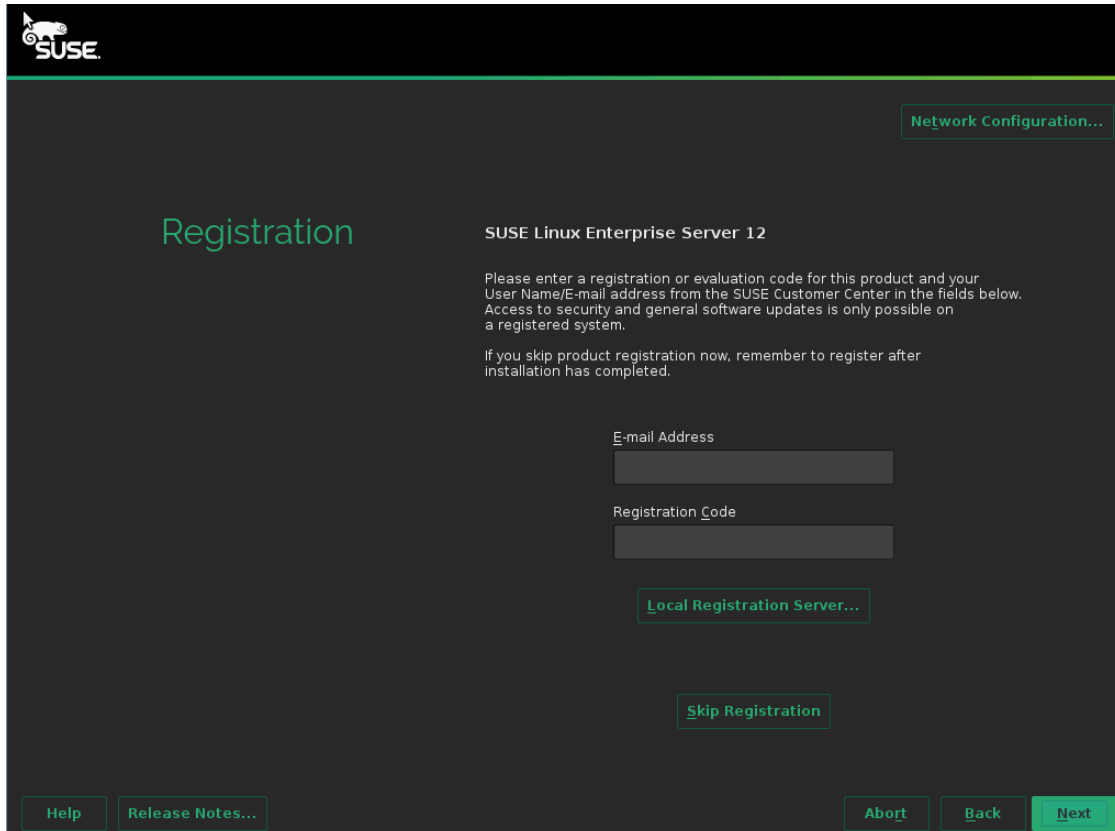


- ii. During system probe, the YaST installer will detect Chelsio FCoE driver `csistor` present in the DUD and prompt for confirmation to load/activate. Press [OK].



- iii. To receive the latest updates for your operating system and technical support, you will need to register your system. Enter the registration or evaluation code for your copy of SLES12 and email id associated with your Suse Customer Care (SCC) account and click **Next**.

To bypass registration, click **Skip Registration** and then **Yes** on the pop-up window that appears.



The image shows the SUSE Linux Enterprise Server 12 Registration window. The window has a dark background with a SUSE logo in the top left corner. The title bar says "SUSE". The main content area is titled "Registration" in large green letters. Below the title, it says "SUSE Linux Enterprise Server 12". The text reads: "Please enter a registration or evaluation code for this product and your User Name/E-mail address from the SUSE Customer Center in the fields below. Access to security and general software updates is only possible on a registered system." Below this, it says: "If you skip product registration now, remember to register after installation has completed." There are two input fields: "E-mail Address" and "Registration Code". Below the input fields, there are three buttons: "Local Registration Server...", "Skip Registration", and "Next". At the bottom left, there are two buttons: "Help" and "Release Notes...". At the bottom right, there are three buttons: "Abort", "Back", and "Next".

Registration

SUSE Linux Enterprise Server 12

Please enter a registration or evaluation code for this product and your User Name/E-mail address from the SUSE Customer Center in the fields below. Access to security and general software updates is only possible on a registered system.

If you skip product registration now, remember to register after installation has completed.

E-mail Address

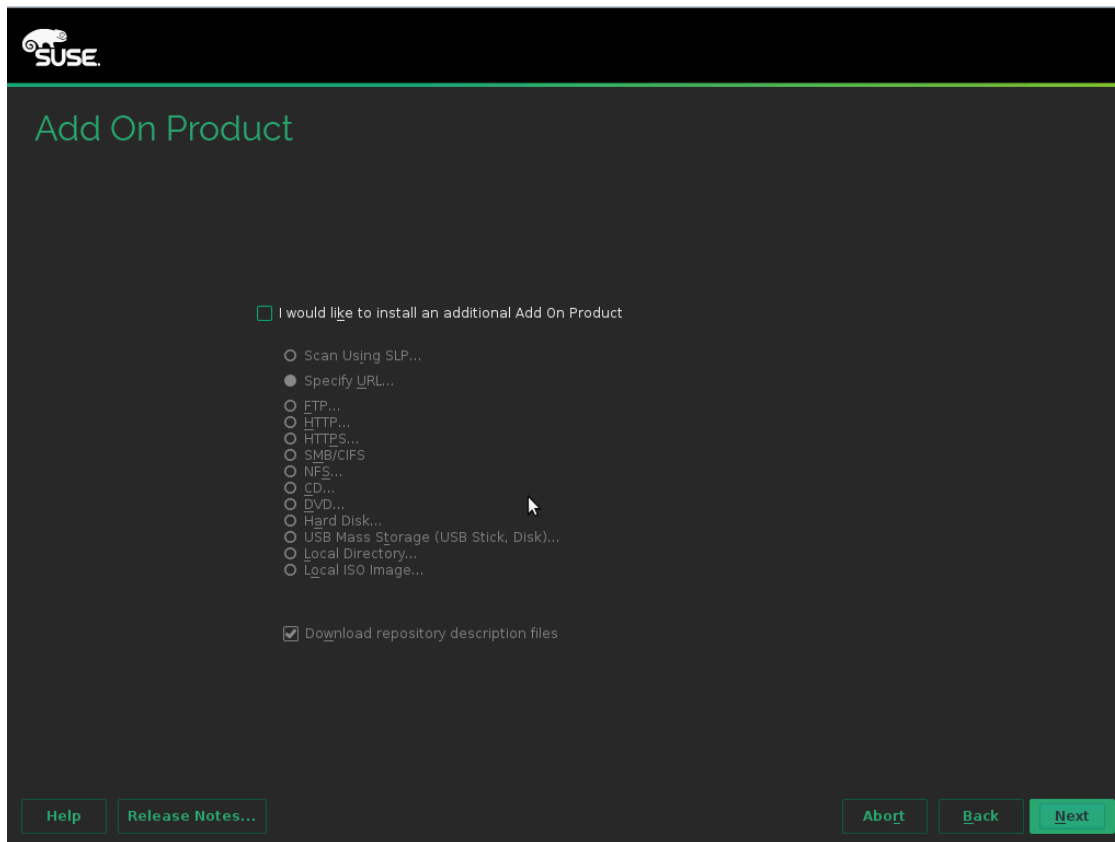
Registration Code

Local Registration Server...

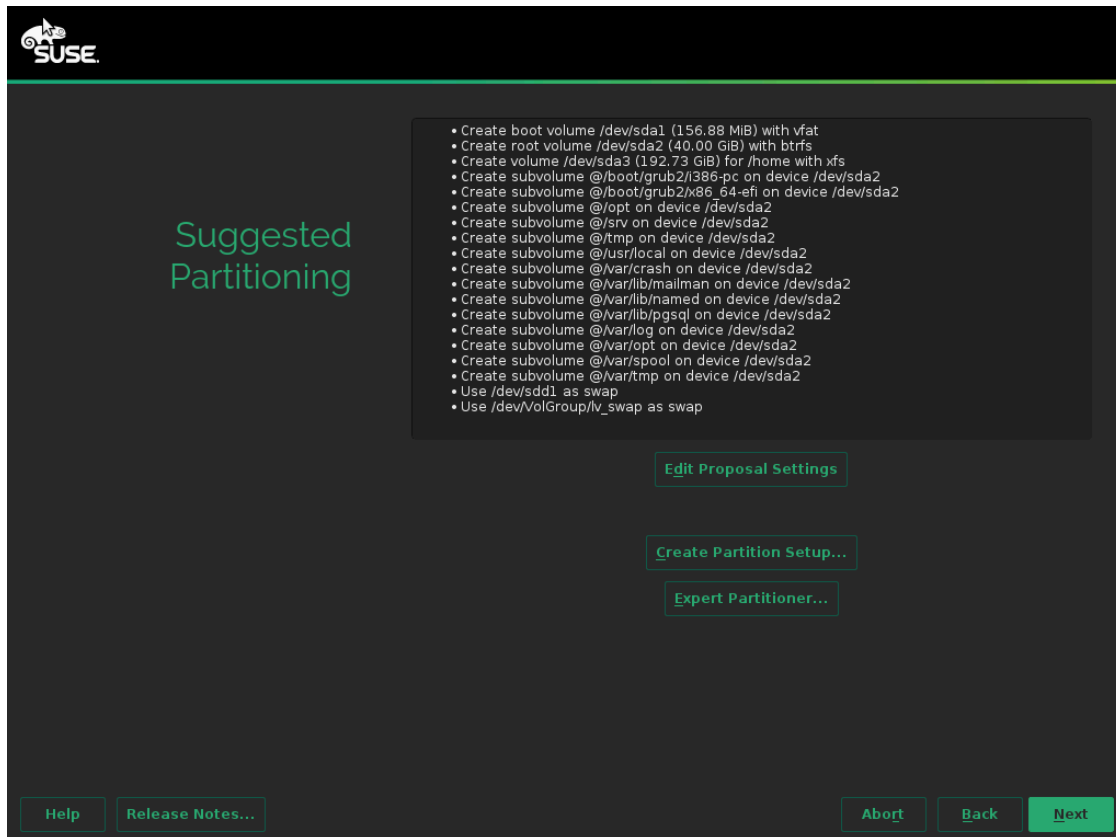
Skip Registration

Help Release Notes... Abort Back Next

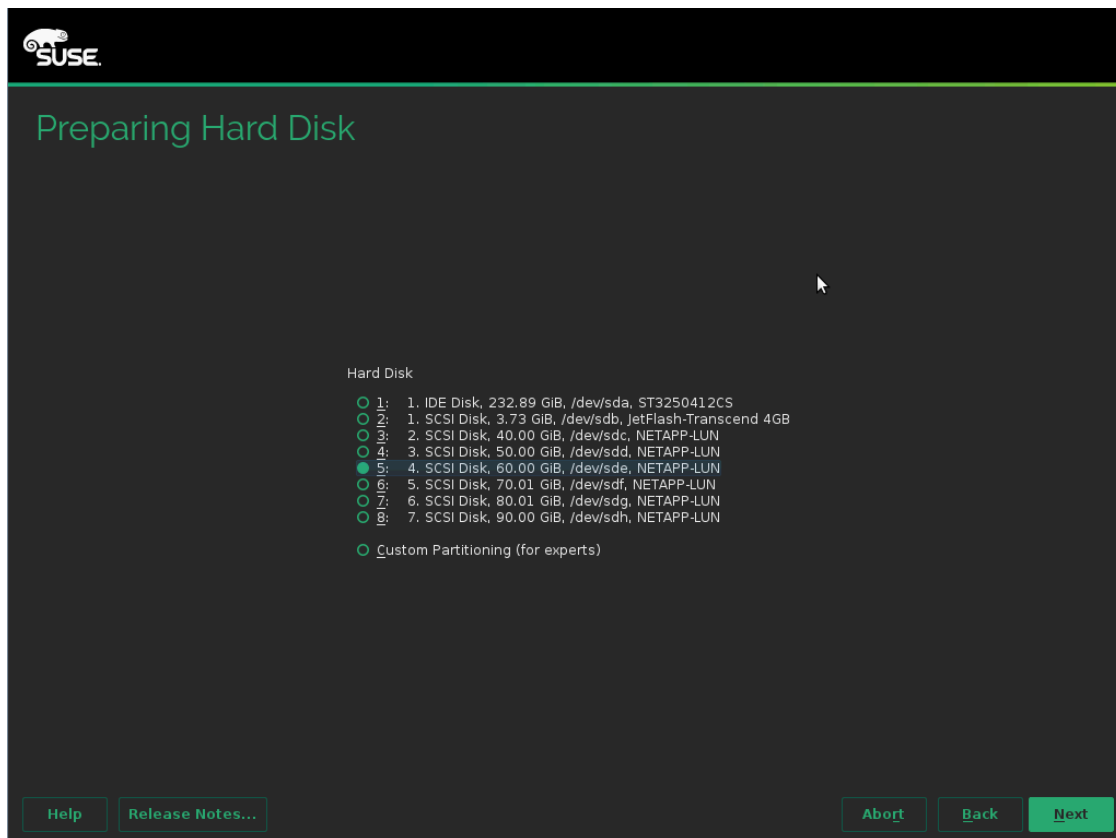
- iv. The next screen will display a list of add-ons and extensions available for SLES12. To install, select the checkbox *I would like to install an additional Add On Product*, then select the radio button for the add-on/extension you wish to install, and click **Next**.



- v. On the *Suggested Partitioning* screen, YaST generated partition setup will be displayed. To change the suggested settings click **Edit Proposal Settings**. To select the disk on which to apply the proposed settings, click **Create Partition Setup**. To change the partition setup click **Expert Partitioner**.

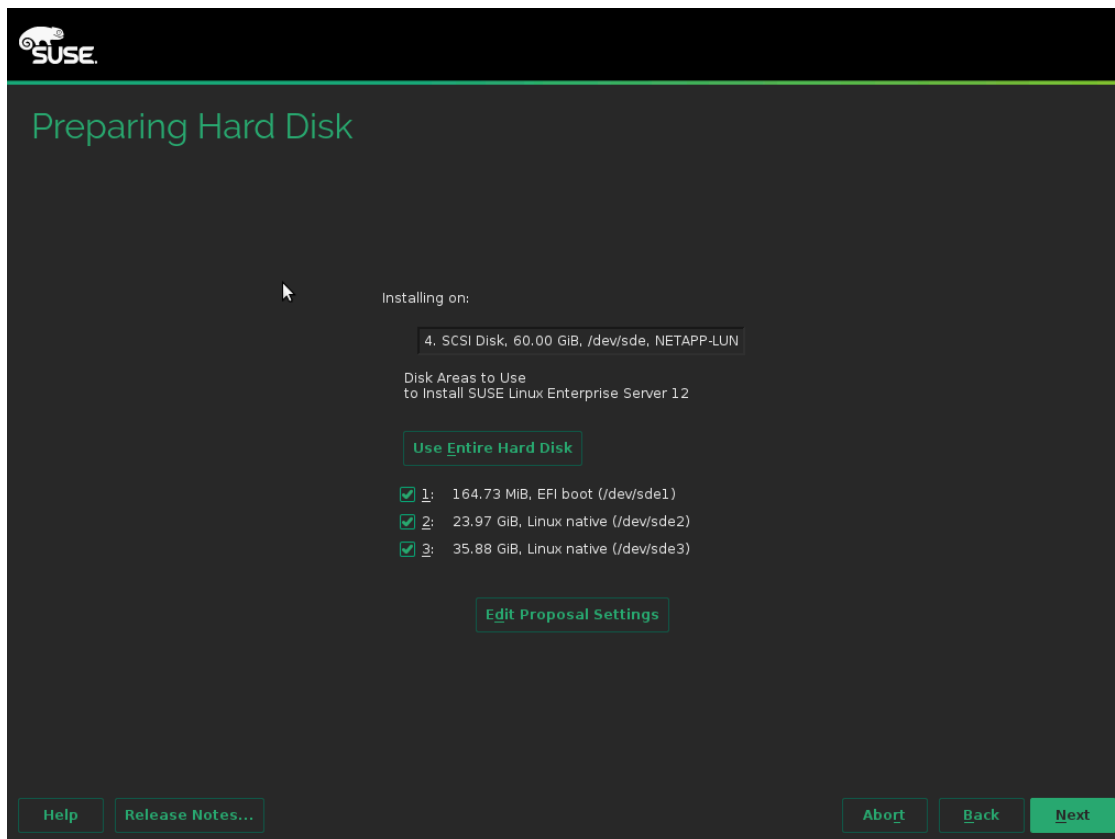


- vi. Click **Create Partition Setup** and select the LUN which was saved as boot device in system BIOS. Click **Next**.

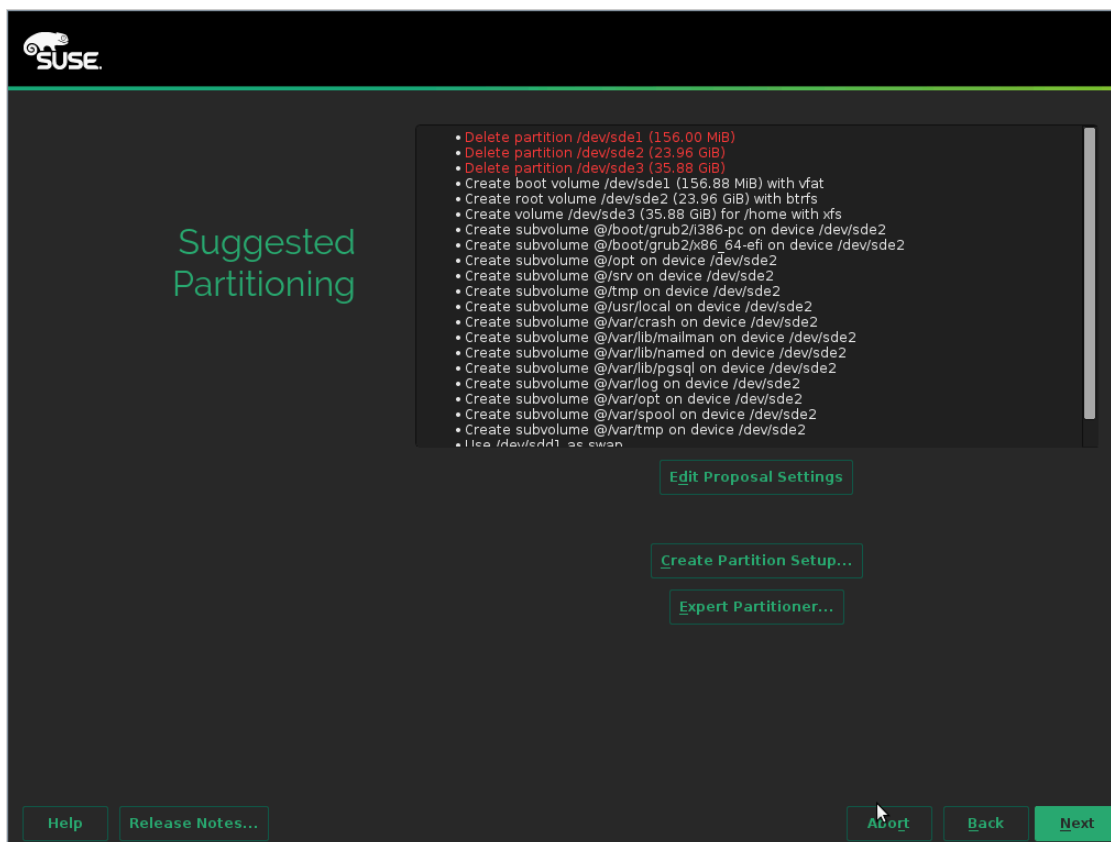


Note *Make sure the same LUN discovered at the Option ROM stage is selected for OS installation.*

- vii. To use the entire LUN for installation, click **User Entire Hard Disk**. Please note that this will delete all the existing partitions. To install operating system on an existing partition, select the partition from the list displayed. Click **Next**.



viii. The selected LUN should now appear in the *Suggested Partitioning* screen. Click **Next**.



ix. Proceed with installation as usual.

3.3. Installation on iSCSI LUN

- If you are installing using CD/DVD, please make sure that the USB drive with DUD image is inserted. Also, change the boot priority to boot from CD/DVD in the BIOS setup.
 - i. Insert the OS installation disc into your CD/DVD ROM.
 - ii. On the Grub menu, choose *Install or upgrade an existing system* option if not already selected.
 - iii. Type *e* and then *dd* at the boot prompt for RHEL 7. For RHEL 6 and SLES distributions, press *Tab* and then *dd*.
 - iv. Load Chelsio Driver Update Disk depending on the Linux distribution ([Click here](#) for RHEL 7.x; [Click here](#) for RHEL6.x; [Click here](#) for SLES11 SPx).
- If you are installing from a PXE server, please refer **3.1. Installation using Chelsio DUD (PXE boot)** ([Click here](#) for RHEL 7.x; [Click here](#) for RHEL6.x; [Click here](#) for SLES11 SPx) section to load Chelsio Driver Update Disk.

Note No separate DUD required for SLES 12 OS installation, as inbox drivers can be used.

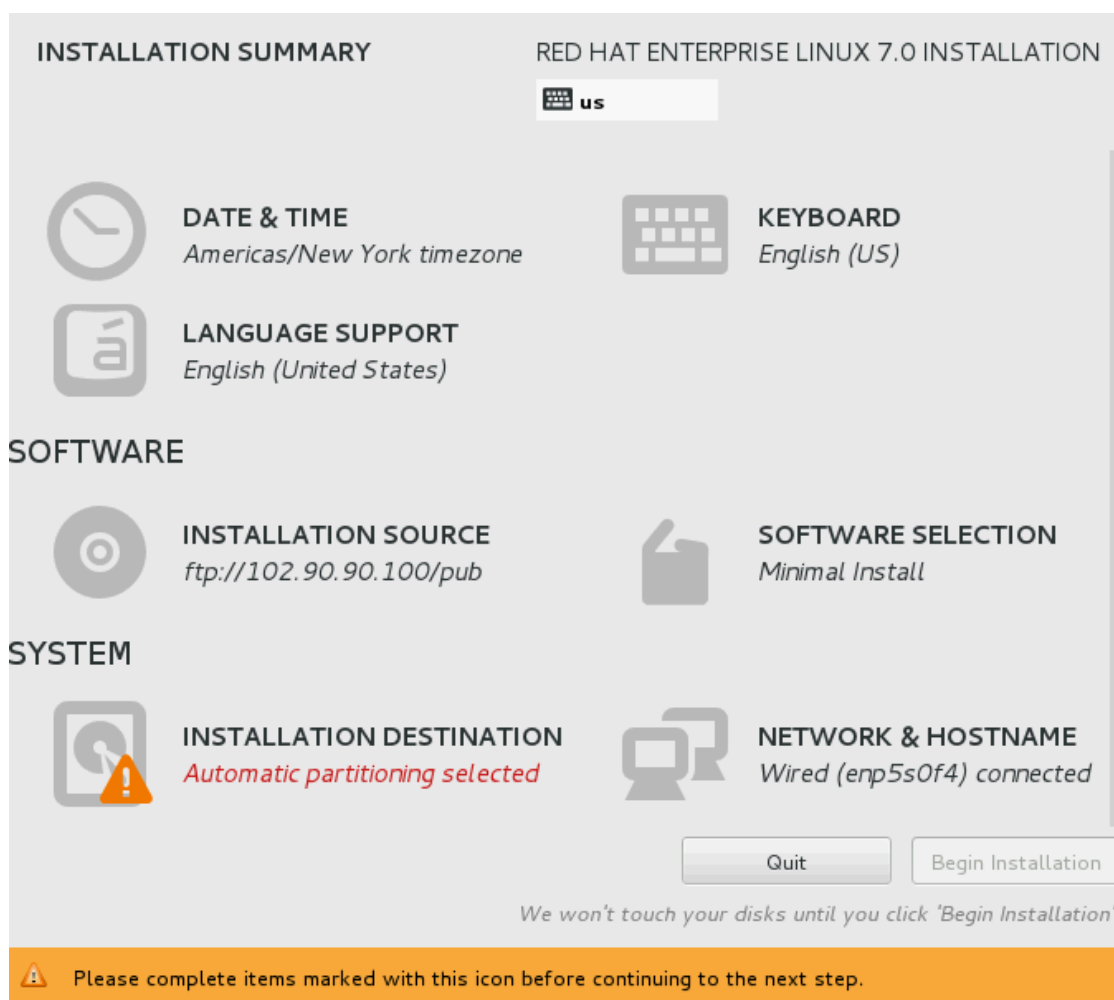
After successfully loading Chelsio DUD, follow the procedure mentioned below to continue installation, based on the distribution.

3.3.1. RHEL 7.x

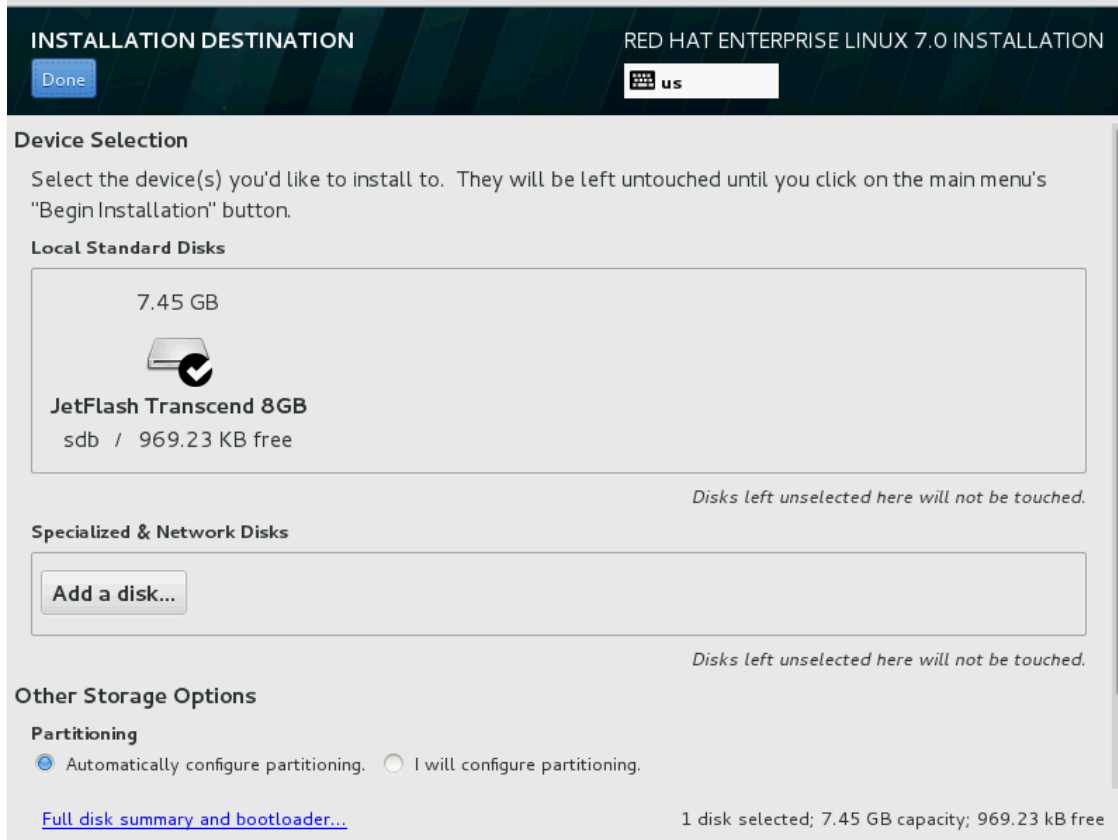
- i. On the installer welcome screen, choose your installation language and click **Continue**



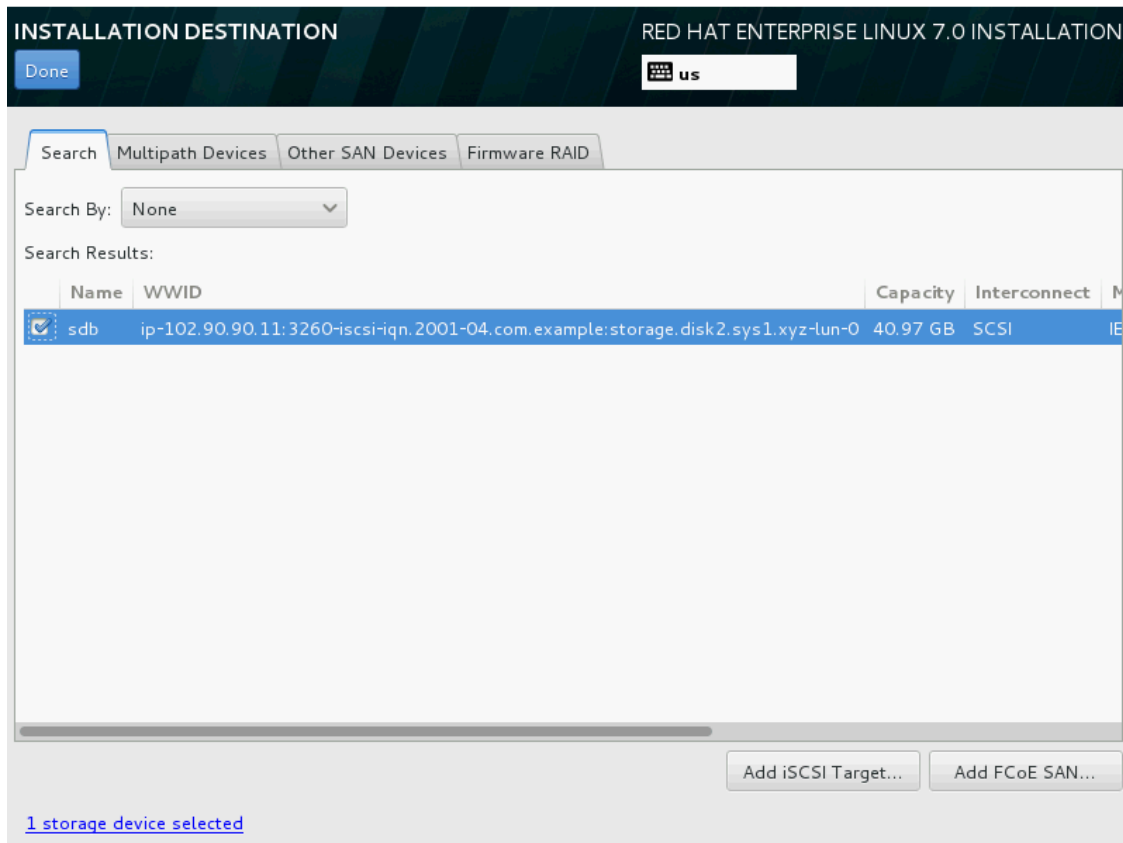
- ii. Click **Installation Destination** under **SYSTEM**.



iii. Click **Add a disk**

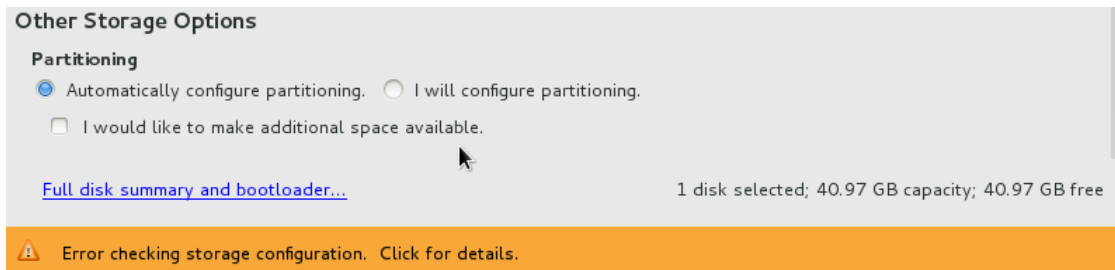


- iv. The discovered iSCSI LUNs will appear in the **Search** tab. Select it and click **Done**.



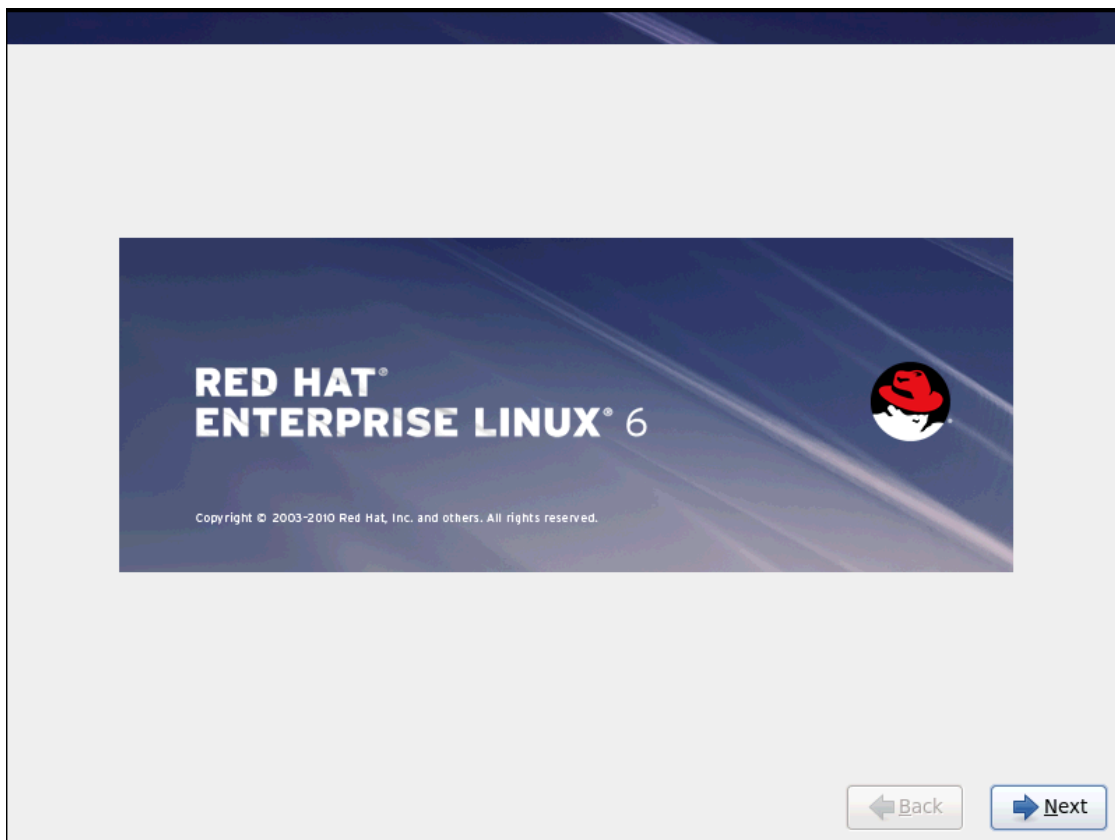
Note *Make sure the same LUN discovered at the Option ROM stage is selected for OS installation.*

- v. Under **Other Storage Options**, you can either chose to configure partition automatically or manually. Select the appropriate option and click **Done**. Then proceed with the installation as usual.



3.3.2. RHEL 6.x

- i. Click **Next** when the graphical installer screen appears.



- ii. Select **Specialized Storage Devices** radio button and click **Next**.

What type of devices will your installation involve?

Basic Storage Devices

- ☐ Installs or upgrades to typical types of storage devices. If you're not sure which option is right for you, this is probably it.

Specialized Storage Devices

- ☒ Installs or upgrades to enterprise devices such as Storage Area Networks (SANs). This option will allow you to add FCoE / iSCSI / zFCP disks and to filter out devices the installer should ignore.

- iii. The discovered LUNs will appear in the **Basic Devices** tab. Select the LUN which was saved as boot device in system BIOS and click **Next**.

Please select the drives you'd like to install the operating system on, as well as any drives you'd like to automatically mount to your system, below:

Basic Devices

Firmware RAID

Multipath Devices

Other SAN Devices

Search

<input type="checkbox"/>	Model	Capacity (MB)	Interconnect	Serial Number	Identifier
<input checked="" type="checkbox"/>	IET VIRTUAL-DISK	71683	SCSI	1494554000000000078797a00000000000000000000000000000000	1:49:45:54:00:00:00:00:00:00
<input type="checkbox"/>	NETAPP LUN	46084	SCSI	360a98000572d5465574a71557a706952	3:60:a9:80:00:57:2d:54:65:5
<input type="checkbox"/>	UFD USB Flash Drive 960	960	USB	302AC709081234071107	30:2A:C7:09:08:12:34:07:11

Device Options

+ Add Advanced Target

1 device(s) (71683 MB) selected out of 3 device(s) (118727 MB) total.

Tip: Selecting a drive on this screen does not necessarily mean it will be wiped by the installation process. Also, note that post-installation you may mount drives you did not select here by modifying your `/etc/fstab` file.

Back

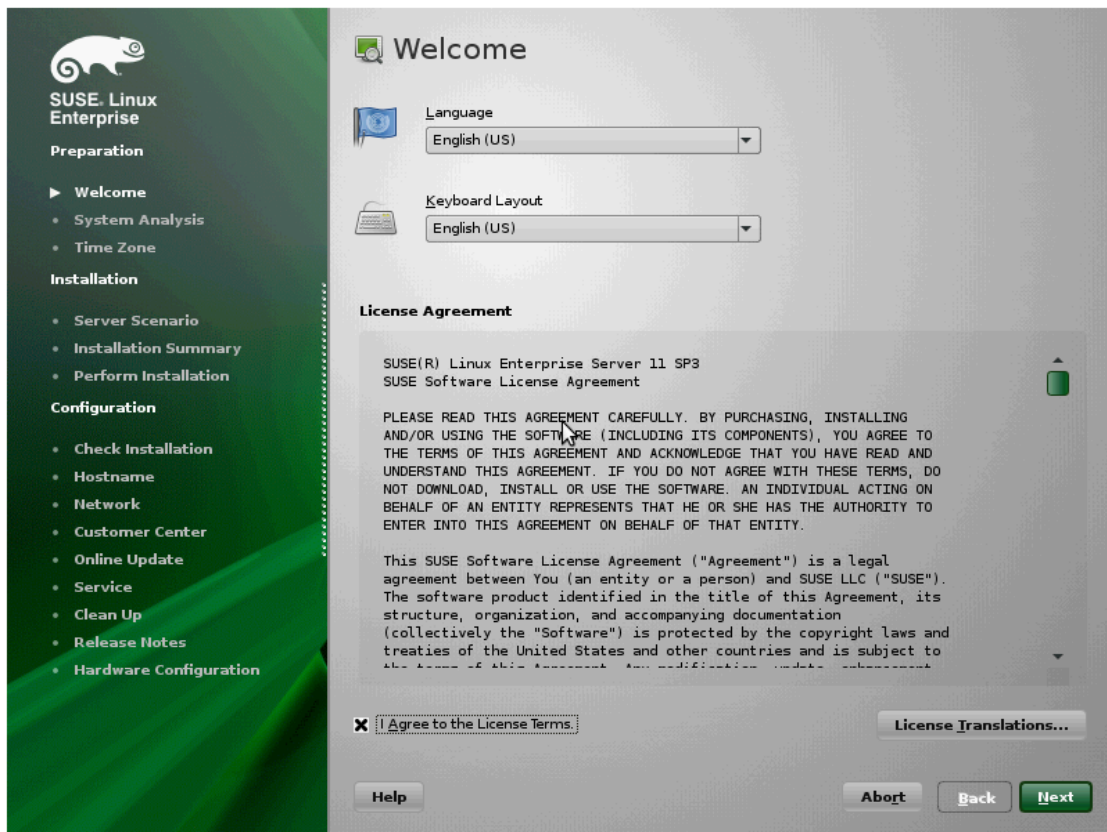
Next

Note *Make sure the same LUN discovered at the Option ROM stage is selected for OS installation.*

- iv. Proceed with the installation as usual.

3.3.3. SLES11 SPx installation

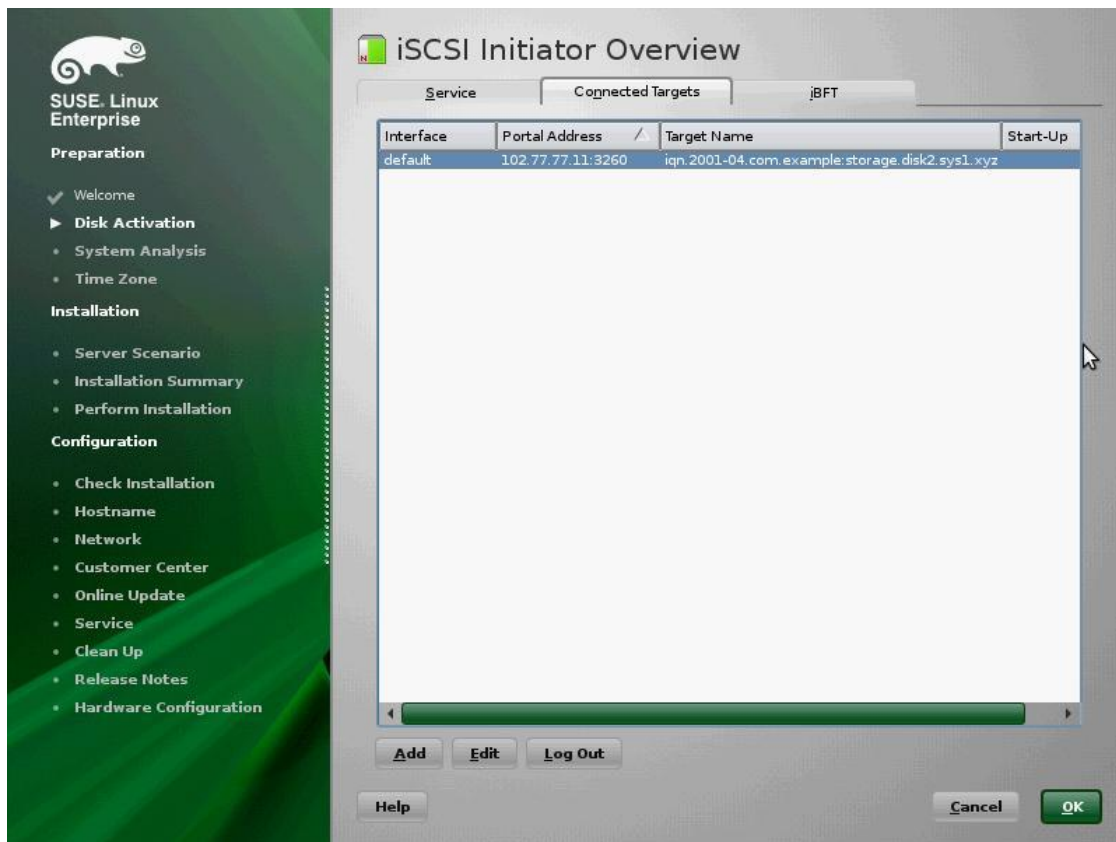
- i. Choose installation language and Keyboard layout type. Select the checkbox **I Agree to the License terms** and click **Next**.



- ii. Click **Configure iSCSI Disks** in the **Disk Activation** screen.



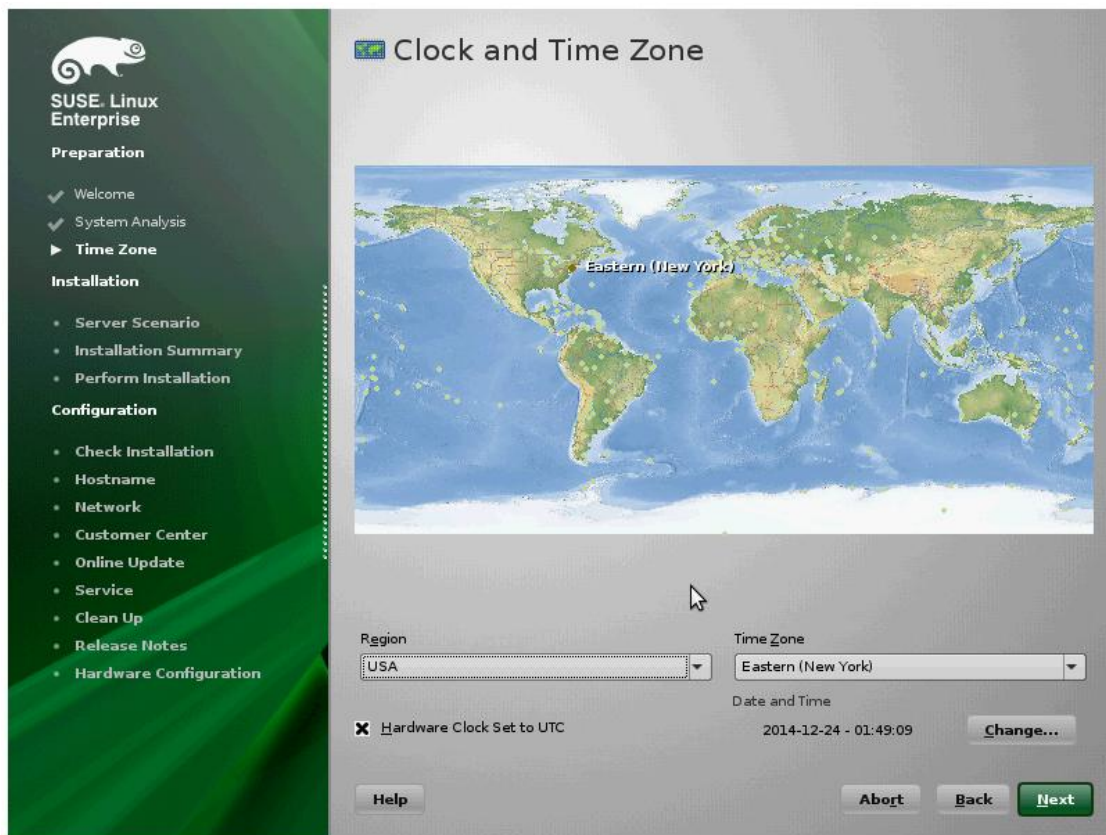
- iii. The discovered LUNs will appear in the **Connected Targets** tab. Select the LUN which was saved as boot device in system BIOS and click **OK**.



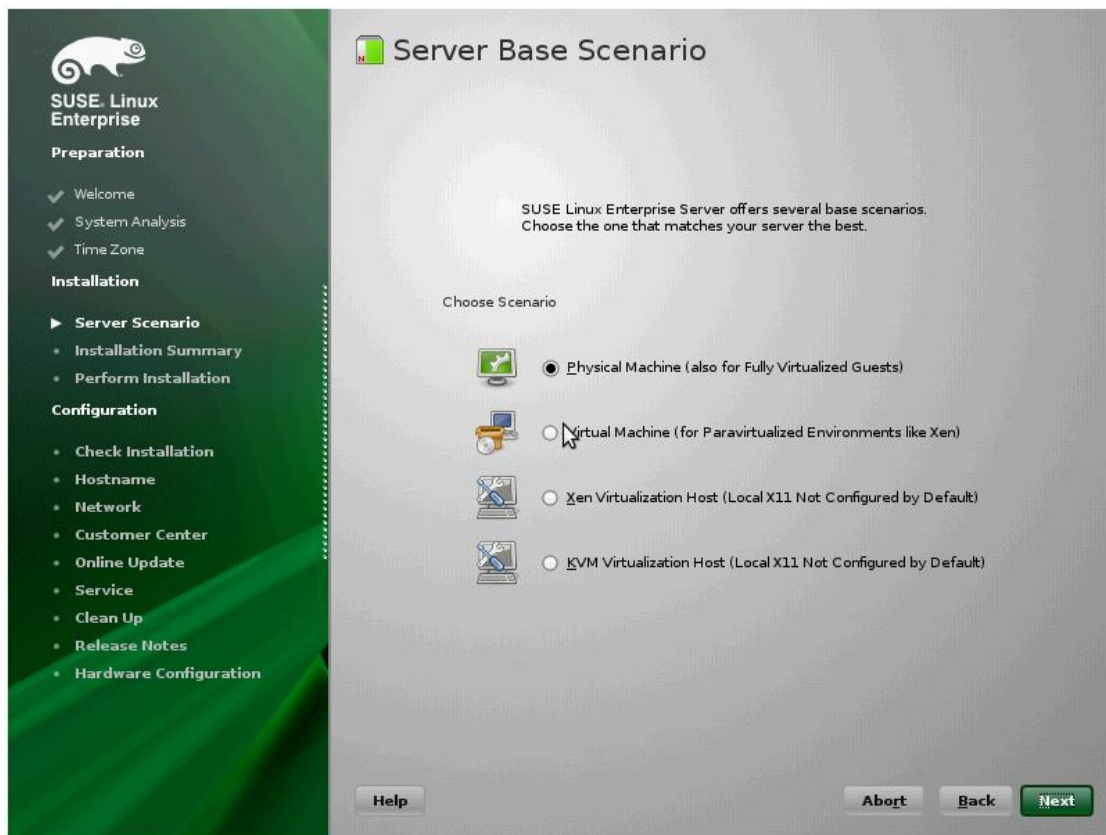
- iv. Select **New Installation** to perform a fresh installation and click **Next**.



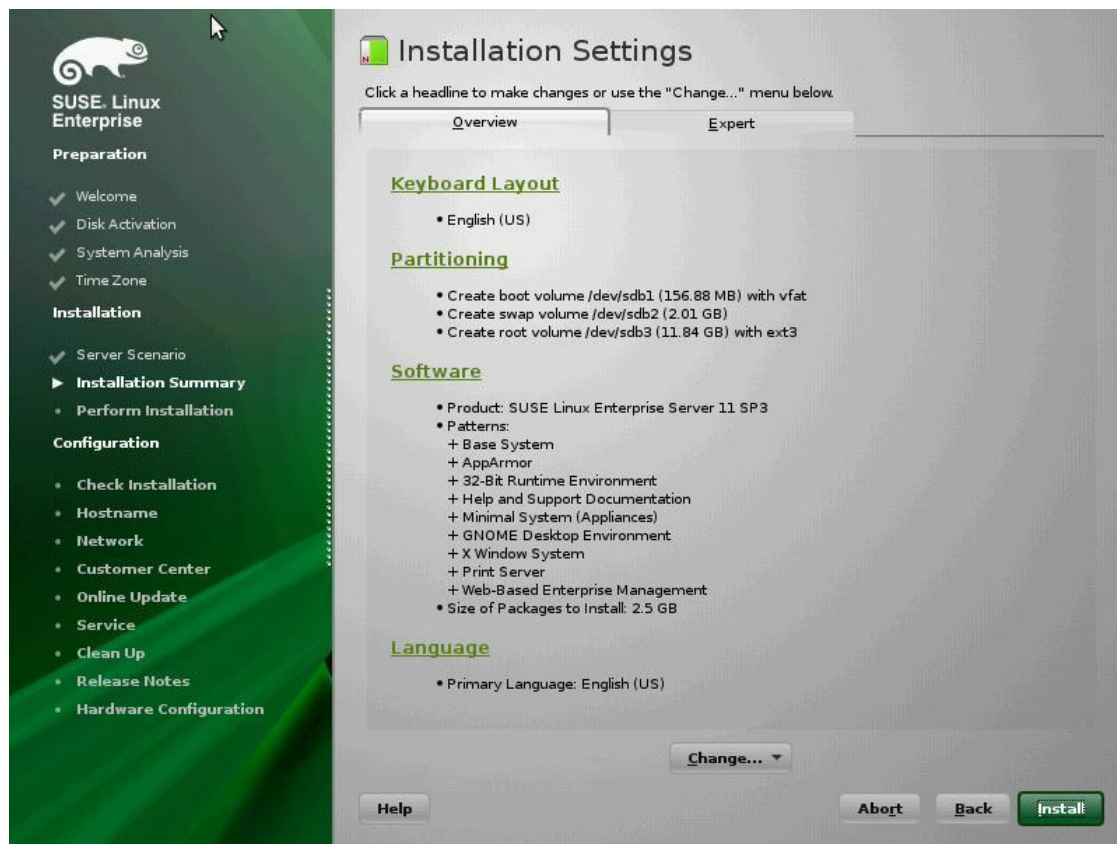
- v. Configure Clock and Time Zone settings. Click **Next**.



vi. Choose from the available server base scenarios and click **Next**.



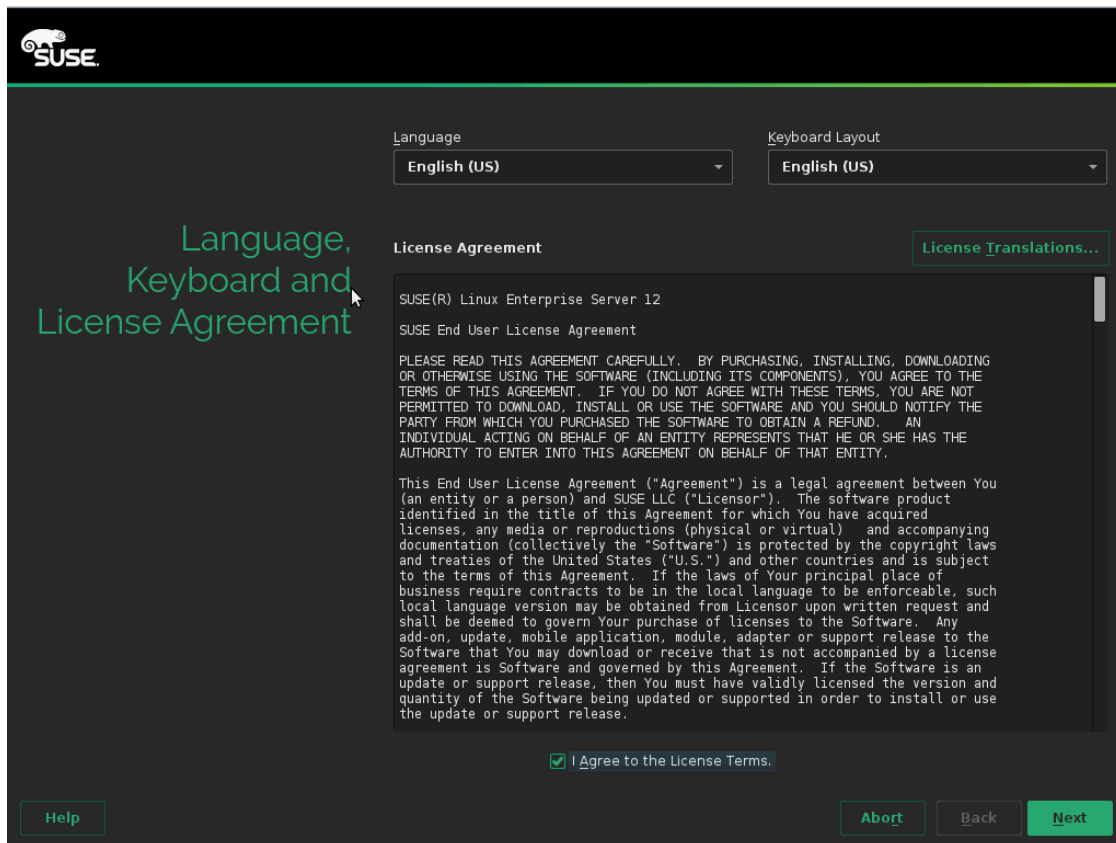
- vii. The **Installation Settings** screen displays the summary of user-selected and YaST-suggested options for the installation. You can review and modify them if required. Basic settings can be changed in the **Overview** tab and advanced settings can be changed in the **Expert** tab. To change, click on one of the headlines or click **Change** and select the category. Finally, click **Next**.



- viii. Proceed with installation as usual.

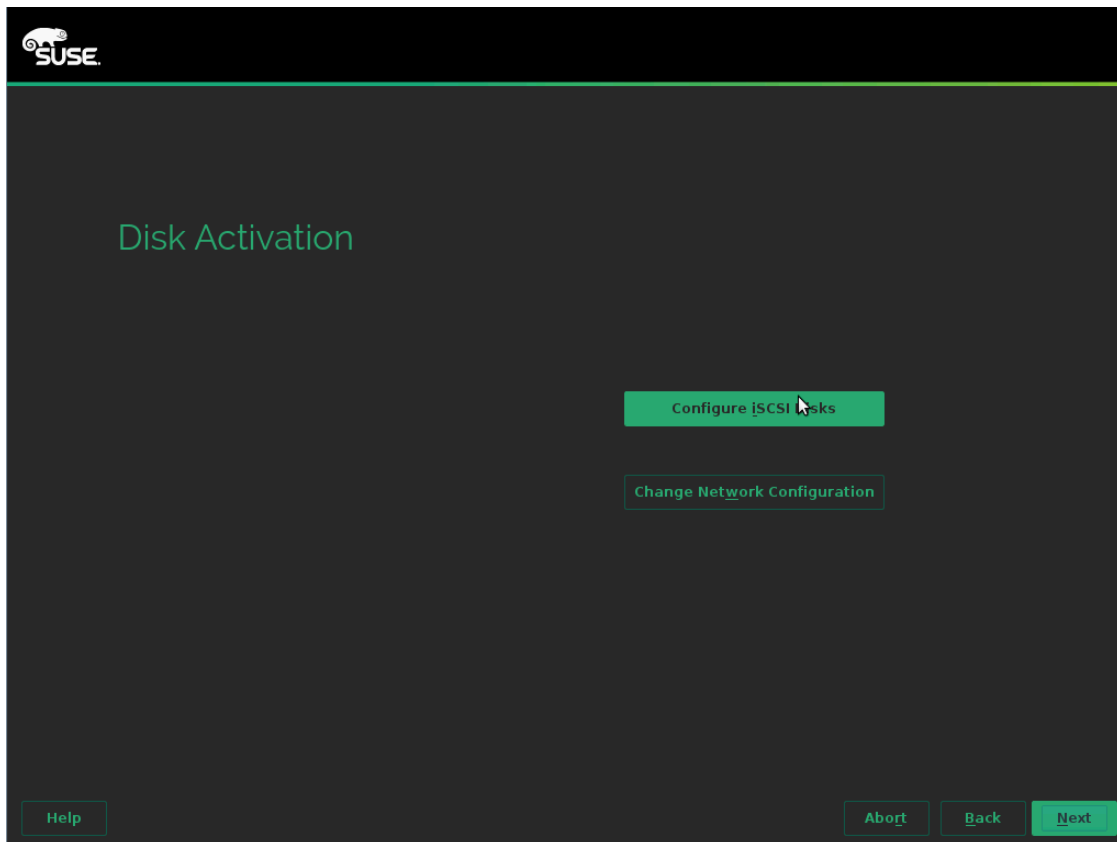
3.3.4. SLES12 Installation

- i. Choose installation language and Keyboard layout type. Select the checkbox **I Agree to the License terms** and click **Next**.

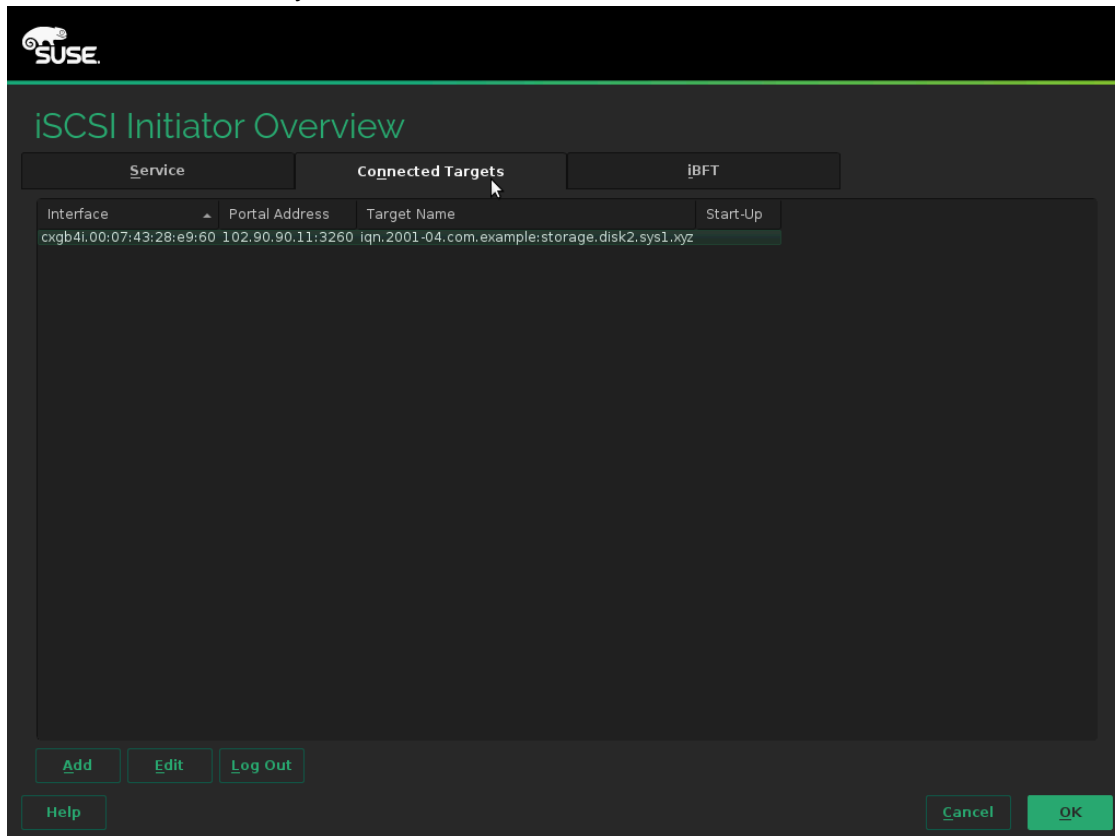


The screenshot shows the SUSE Linux Enterprise Server 12 installation window. At the top left is the SUSE logo. Below it, the text "Language, Keyboard and License Agreement" is displayed in green. The window has a dark background with light-colored text. At the top, there are two dropdown menus: "Language" and "Keyboard Layout", both set to "English (US)". Below these is a "License Agreement" section. It contains the text "SUSE(R) Linux Enterprise Server 12" and "SUSE End User License Agreement". The main body of the license agreement is visible, starting with "PLEASE READ THIS AGREEMENT CAREFULLY. BY PURCHASING, INSTALLING, DOWNLOADING OR OTHERWISE USING THE SOFTWARE (INCLUDING ITS COMPONENTS), YOU AGREE TO THE TERMS OF THIS AGREEMENT." At the bottom of the license agreement section, there is a checkbox labeled "I Agree to the License Terms." which is checked. At the very bottom of the window, there are three buttons: "Help", "Abort", and "Next".

- ii. Click **Configure iSCSI Disks** in the **Disk Activation** screen.



- iii. The discovered LUNs will appear in the **Connected Targets** tab. Select the LUN which was saved as boot device in system BIOS and click **OK**.



Note *Make sure the same LUN discovered at the Option ROM stage is selected for OS installation.*

- iv. 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 T5 and T4 adapters. The driver package consists of Network driver needed to install Windows operating system on iSCSI LUN using WDS server for Chelsio 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.

Chelsio is providing Network driver to be used during the PXE installation process from WDS server.

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:

- T520-BT
- T580-CR
- T520-LL-CR
- T520-SO-CR*
- T520-CR
- T522-CR
- T540-CR
- T580-LP-CR
- T580-SO-CR*
- T420-CR
- T440-CR
- T422-CR
- T420-SO-CR*
- T420-BCH*
- T420-BT
- T404-BT

* Only PXE

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 R2

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



Note

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](#).

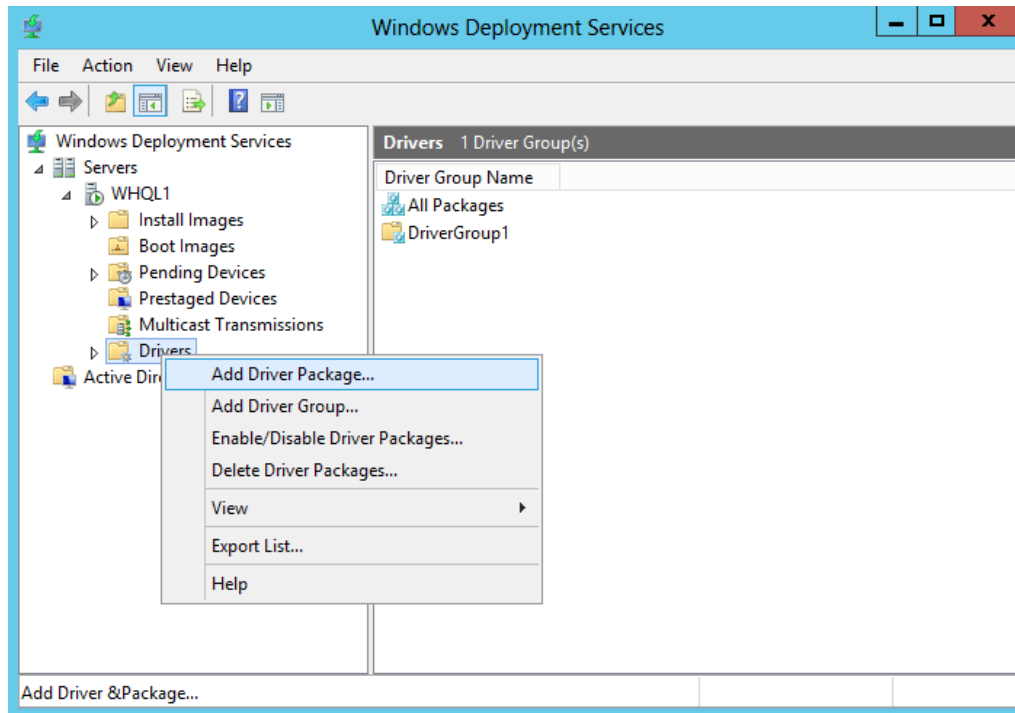
2.2. Adding Driver Packages to WDS Server

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

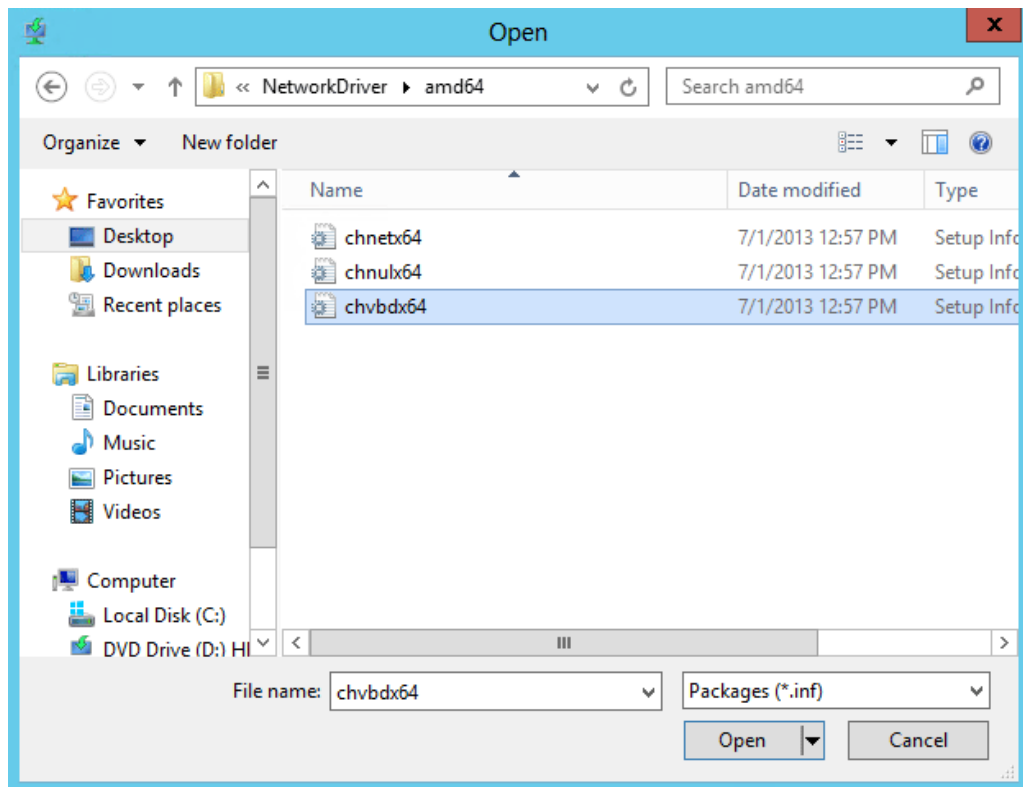
- i. Open the **Windows Deployment Services** MMC snap-in. Expand the **Servers** node and the node for your Windows Deployment Services server. Right-click the **Drivers** node and select **Add Driver Package**.



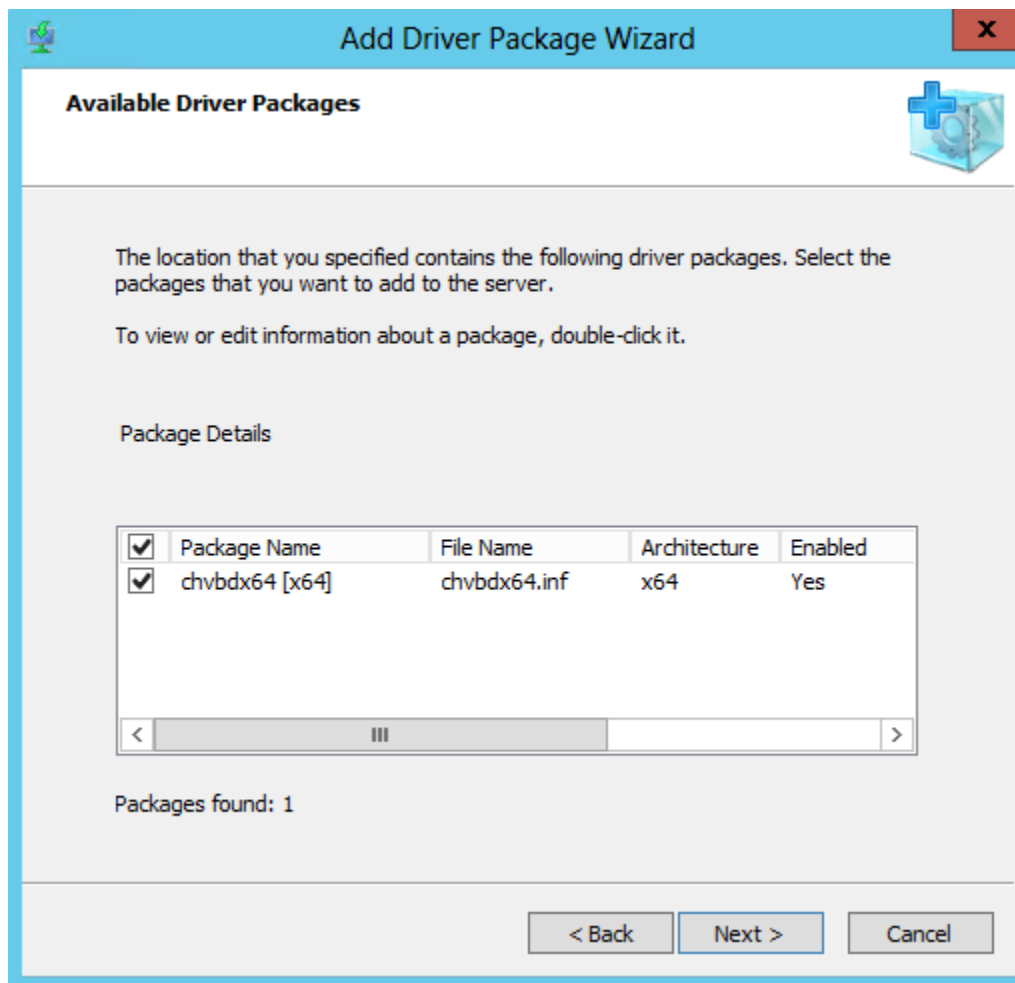
- ii. Select the *Select driver package from an .inf file* option and click **Browse**.



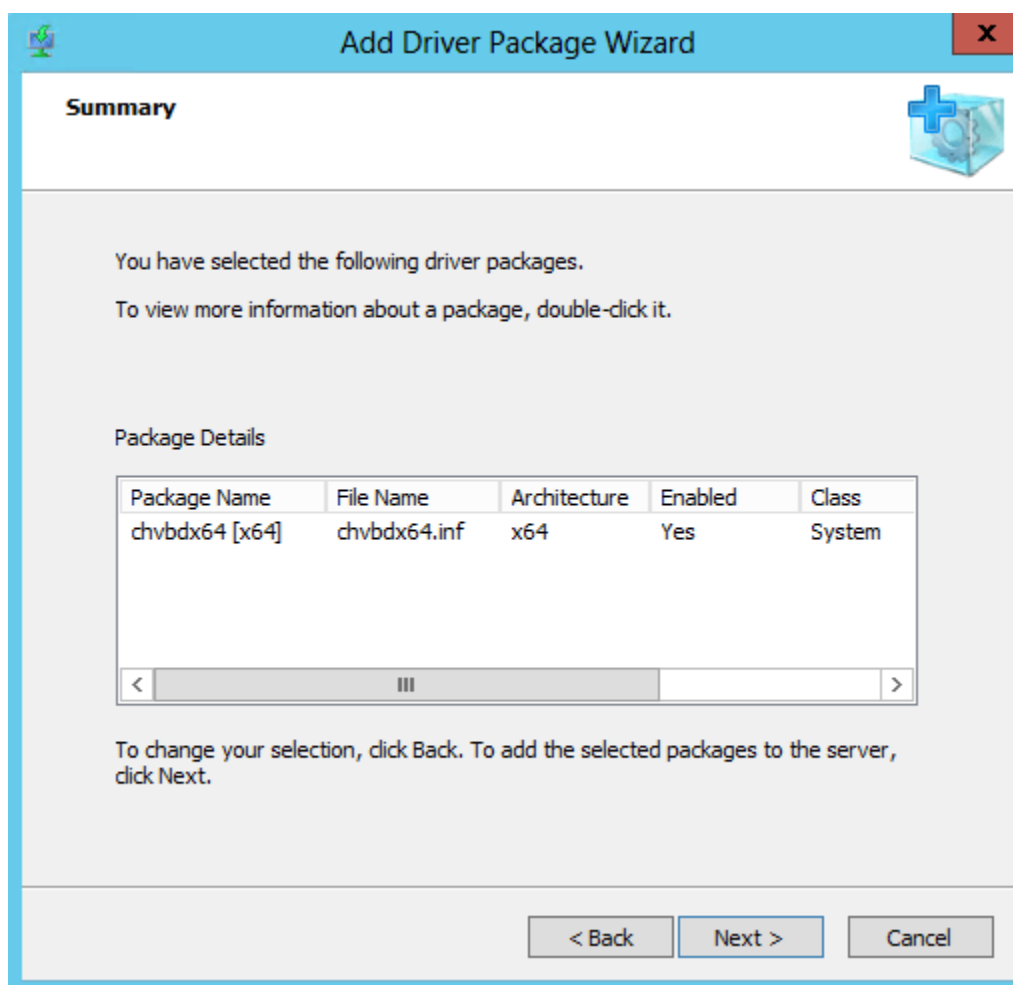
- iii. Locate the VBD driver (*chvbdx64.inf*) in *Chelsio-Uboot-x.x.x.xx/WindowsDrivers/NetworkDriver/amd64* and click **Open**.



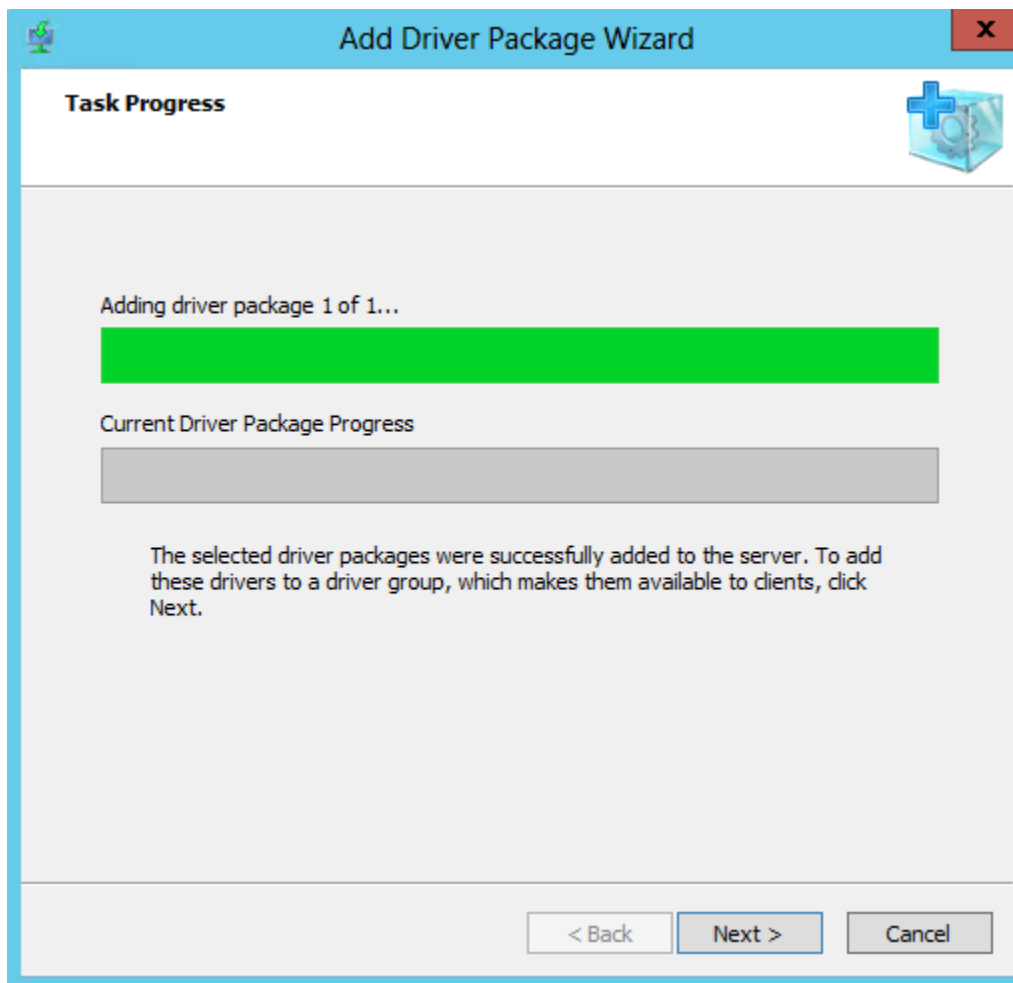
- iv. Please ensure that the checkbox for *chvbdx64[x64]* is selected and click **Next**.



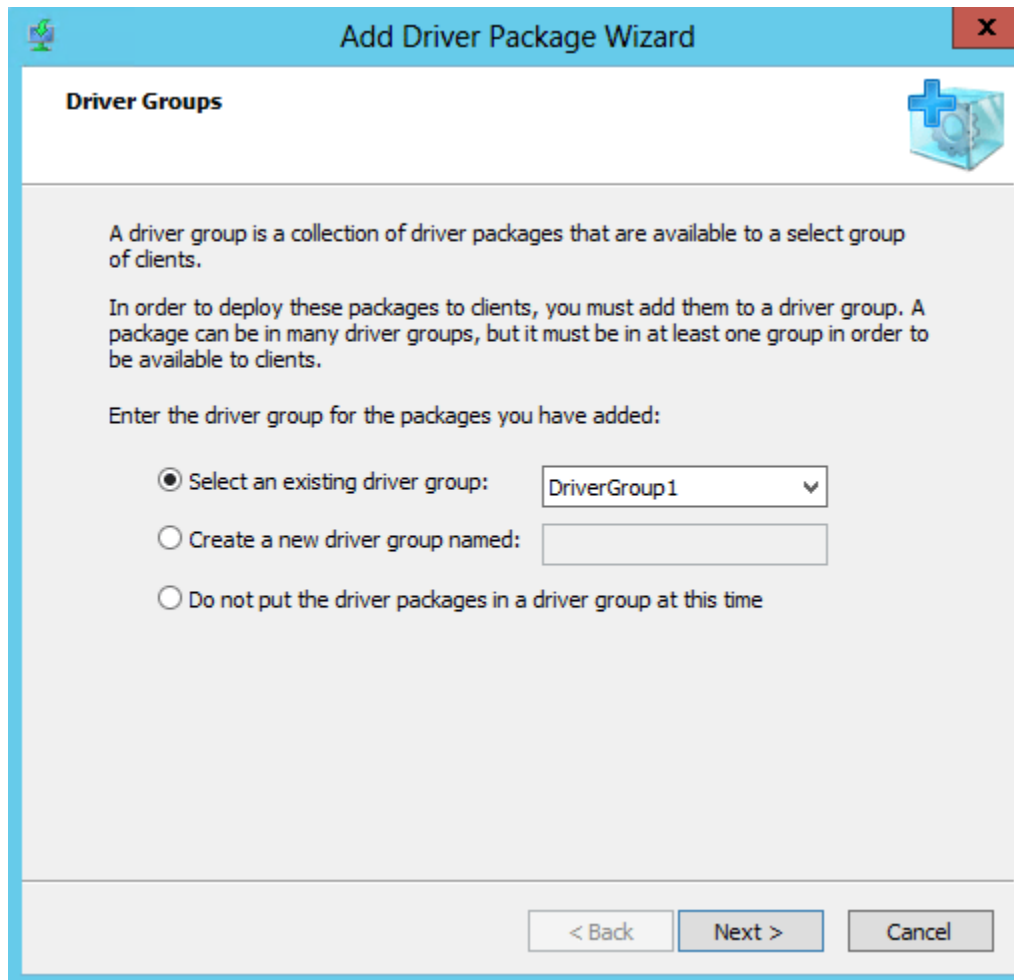
- v. To add the selected VBD driver, click **Next** or to change click **Back**.



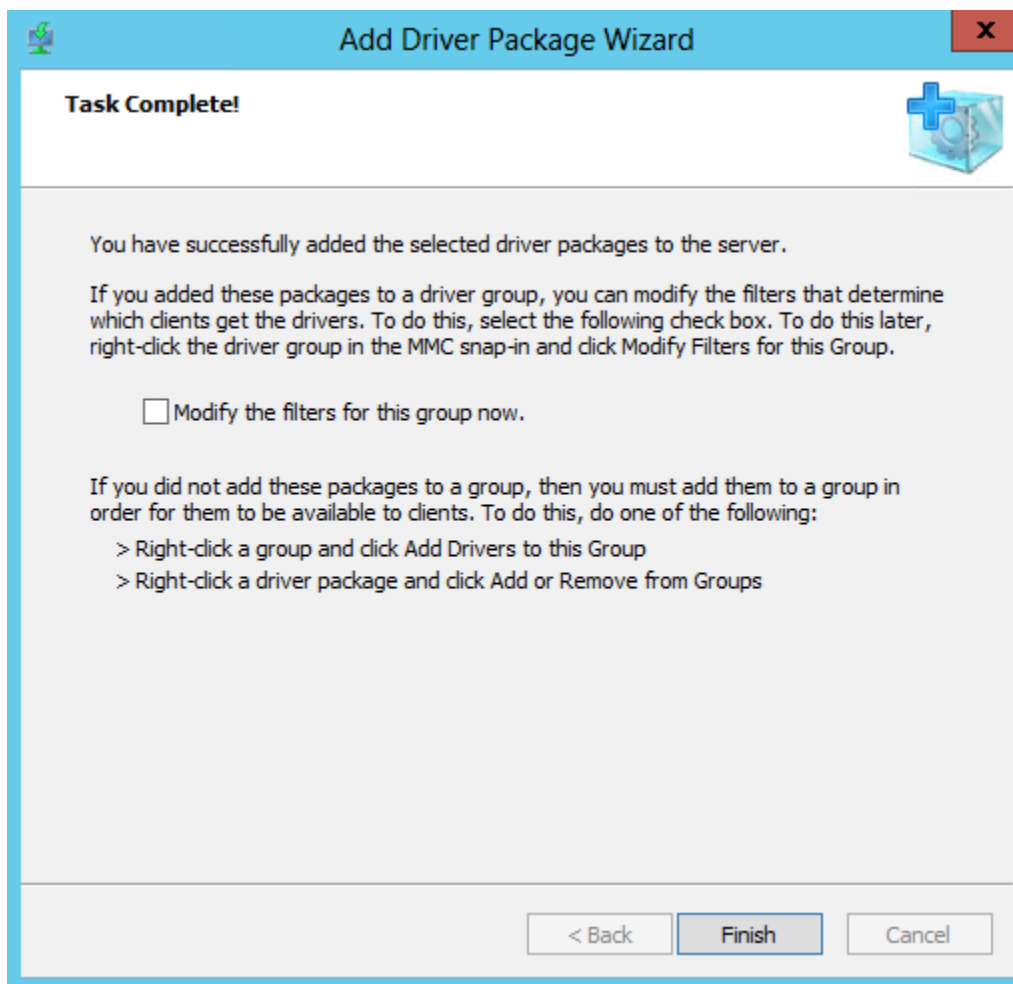
- vi. The selected driver will now be added to the server. After the task is complete, click **Next**.



- 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 (chnetx64.inf)

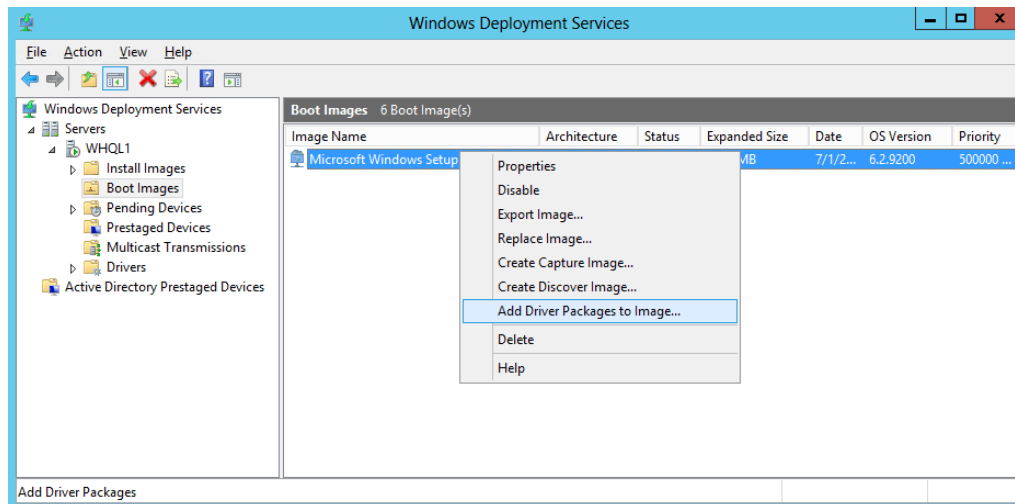
The procedure for adding NDIS driver to the WDS server is similar to VBD as explained in the previous section. In step (iii), locate and use the file *chnetx64.inf* and in step (iv), ensure that only *chnetx64[x64]* is selected.

2.3. Adding Driver Packages to Boot Images

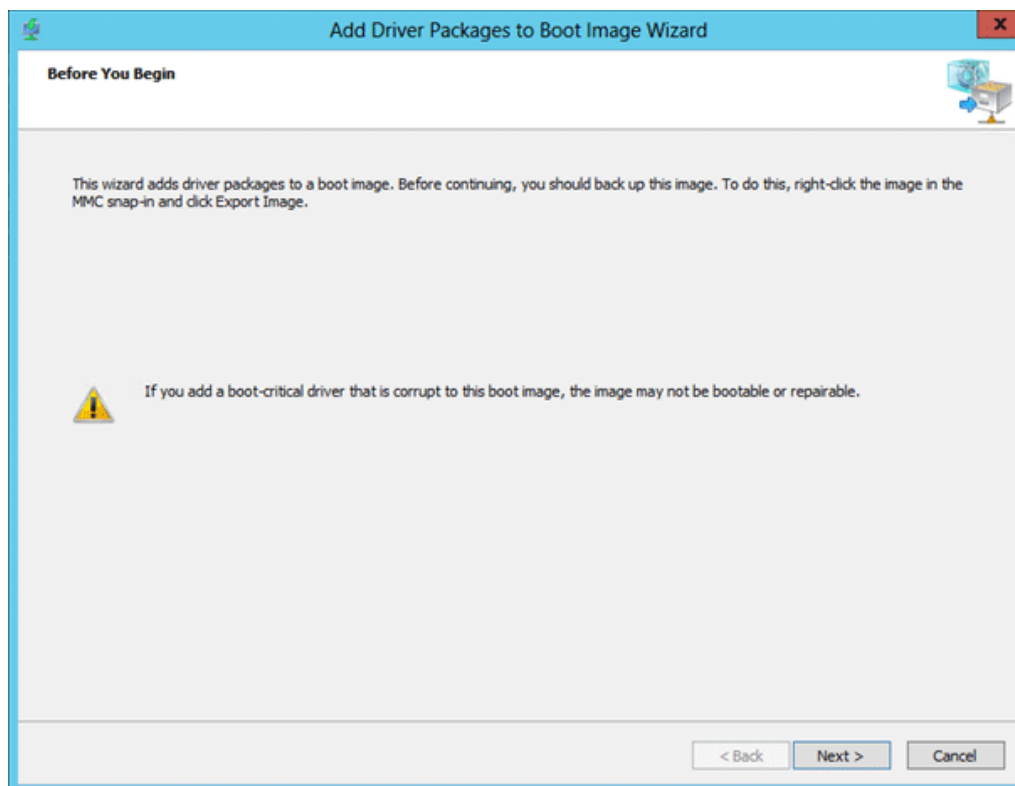
Please ensure that the VBD and NDIS drivers are added to the WDS server before proceeding (See [Adding Driver Packages to WDS Server](#)). Also, add VBD driver first and then followed by NDIS to the boot image. For more information, see [Managing and Deploying Driver Packages](#).

2.3.1. Adding VBD driver

- 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**.

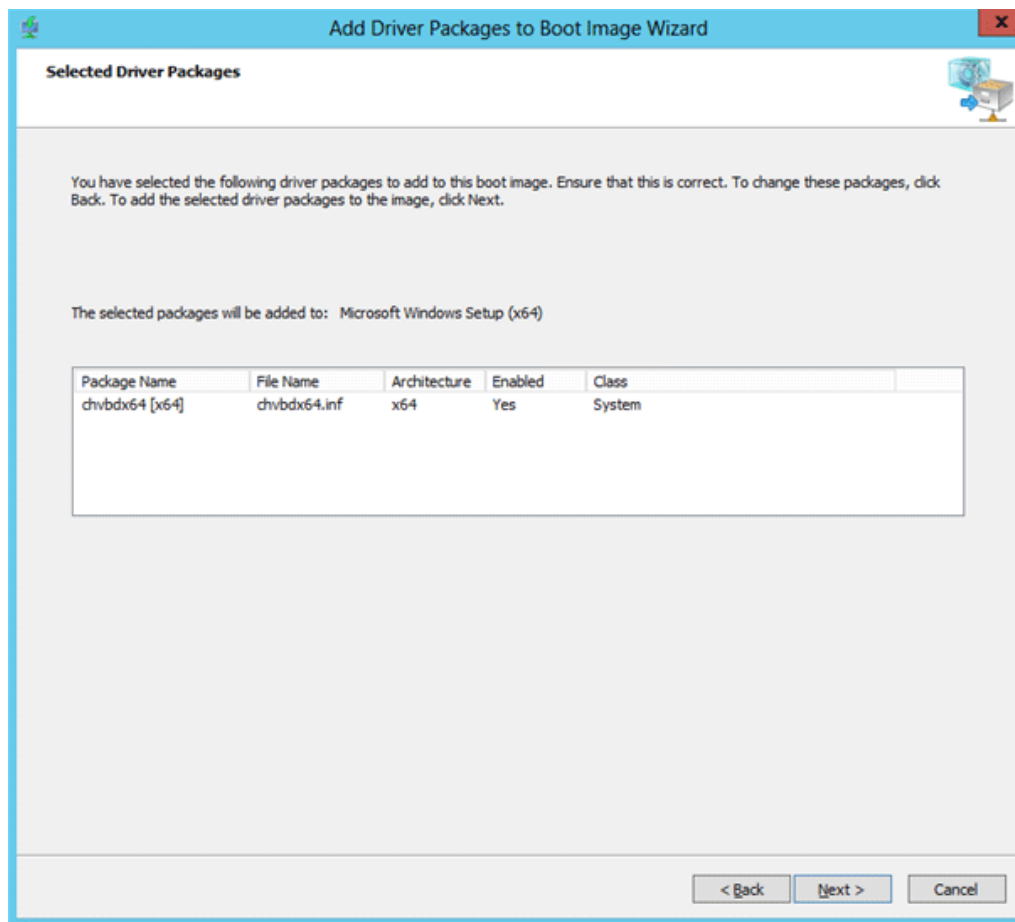
The screenshot shows the 'Add Driver Packages to Boot Image Wizard' window, specifically the 'Select Driver Packages' step. The window has a blue title bar and a light gray background. At the top, it says 'Select Driver Packages'. Below this, there is a 'Search' section with instructions: 'Search for the driver packages that you want by adding one or more search attributes. Only packages that match all of the attributes will appear in the results.' There is a table with three columns: 'Attribute Type', 'Operator', and 'Values'. The first row has 'Package Architect...' as the attribute type, 'Equal to' as the operator, and '"x64"' as the value. The second row has 'Package Class' as the attribute type, 'Equal to' as the operator, and '"Net","System","DiskDrive","hdc","SCSIAdapter"' as the value. To the right of the table are three buttons: 'Add...', 'Edit...', and 'Remove'. Below the table is a 'Search for Packages' button. Below the search section is a 'Search results' section with instructions: 'Clear the check box for packages that you do not want to add, and then click Next.' There is a table with five columns: 'Package Name', 'File Name', 'Architecture', 'Enabled', and 'Class'. The first row is 'chnetx64 [x64]', 'chnetx64.inf', 'x64', 'Yes', 'Net'. The second row is 'chvbdx64 [x64]', 'chvbdx64.inf', 'x64', 'Yes', 'System'. The checkbox for 'chvbdx64 [x64]' is checked. Below the table, it says 'Packages found: 2'. At the bottom of the window are three buttons: '< Back', 'Next >', and 'Cancel'.

Attribute Type	Operator	Values
Package Architect...	Equal to	"x64"
Package Class	Equal to	"Net","System","DiskDrive","hdc","SCSIAdapter"

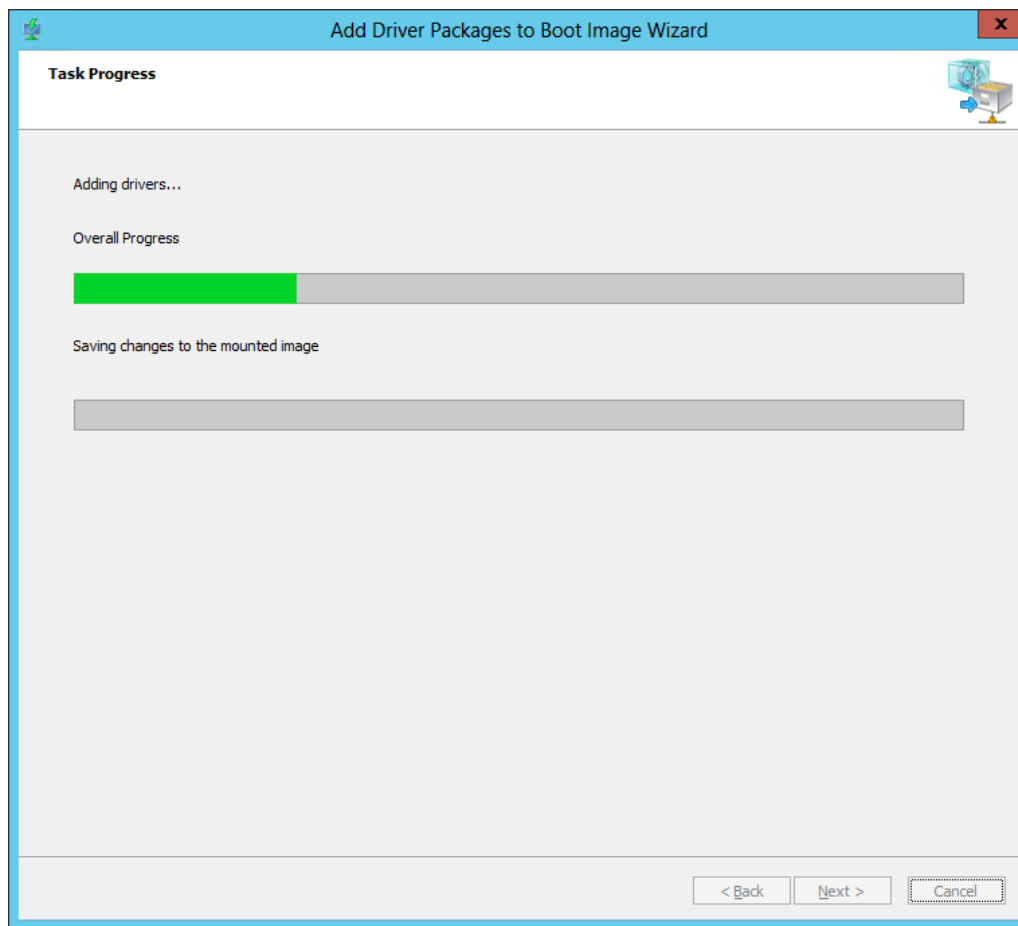
Package Name	File Name	Architecture	Enabled	Class
<input type="checkbox"/> chnetx64 [x64]	chnetx64.inf	x64	Yes	Net
<input checked="" type="checkbox"/> chvbdx64 [x64]	chvbdx64.inf	x64	Yes	System

Packages found: 2

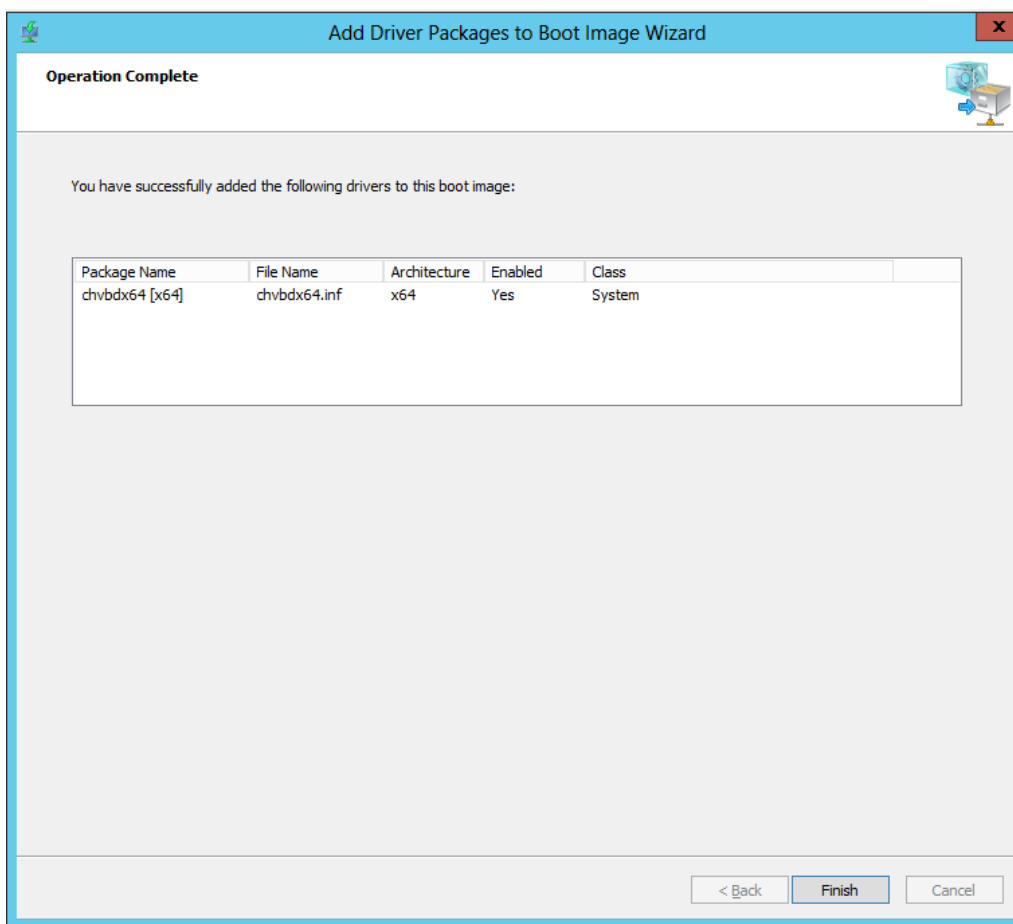
- v. To add the selected VBD driver, click **Next** or to change click **Back**.



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 (chnetx64.inf) 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]* only and click **Next**.



Note

If the image 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.

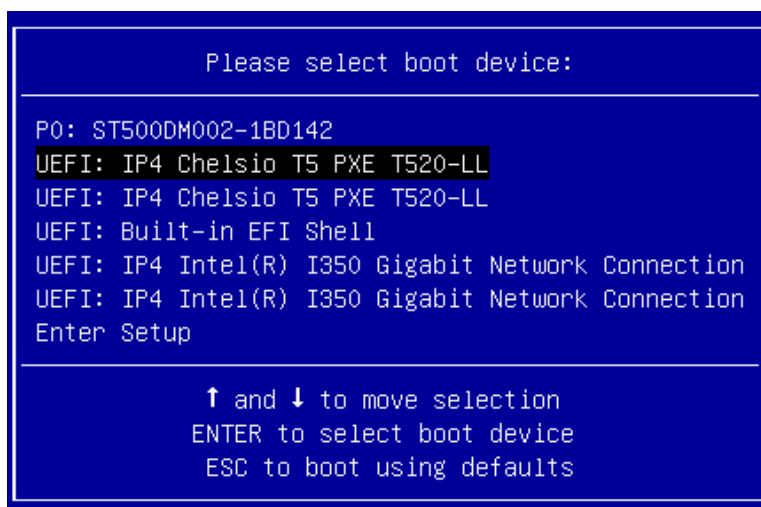
3. OS Installation

This is the recommended method for installing Windows OS on iSCSI LUN using Chelsio PXE boot. Please ensure that the necessary driver packages have been added to Windows boot image (*boot.wim*) as mentioned in the previous section before proceeding.

3.1. Installation on iSCSI LUN

3.1.1. Using PXE-WDS Server

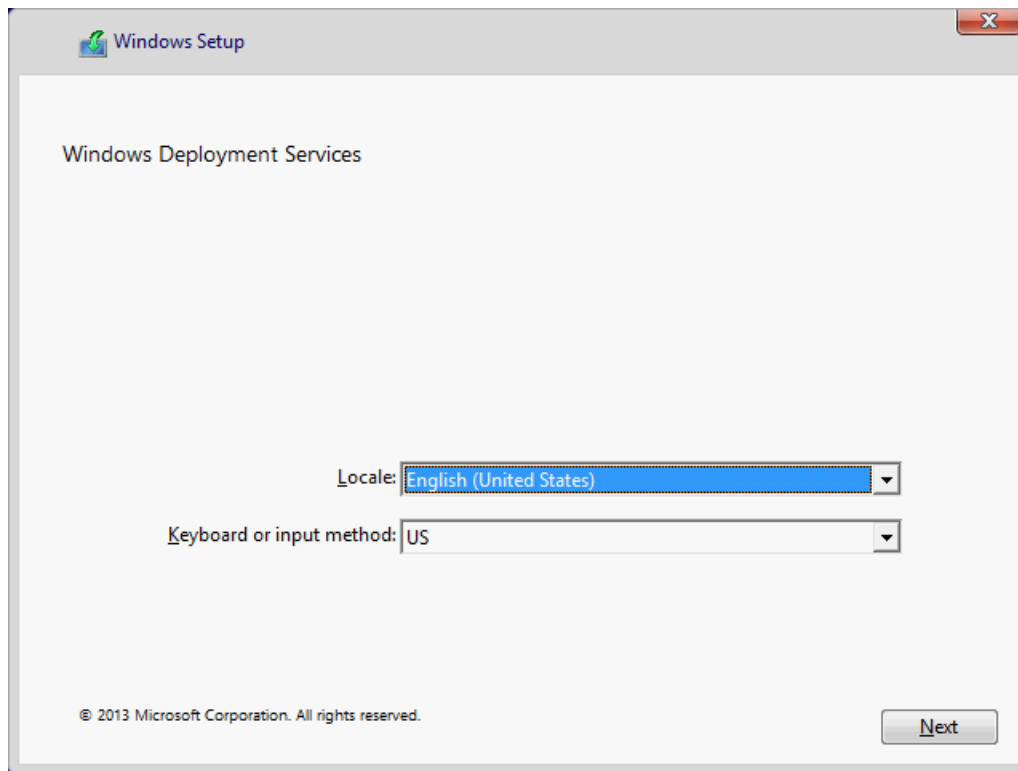
- i. Reboot the machine. In the boot menu, choose the port which was used to connect to the Target LUN during iSCSI boot.



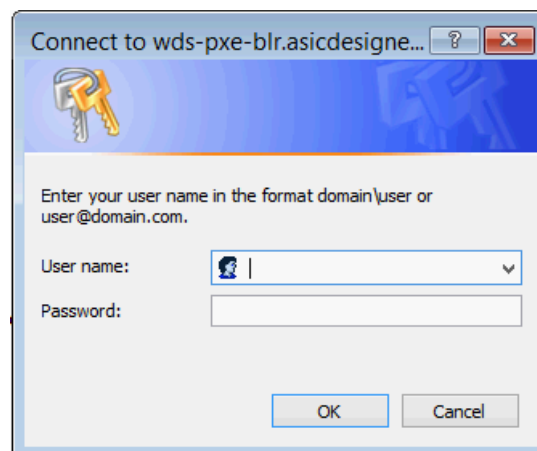
- ii. On successful connection, Windows boot image will load from the PXE-WDS server.



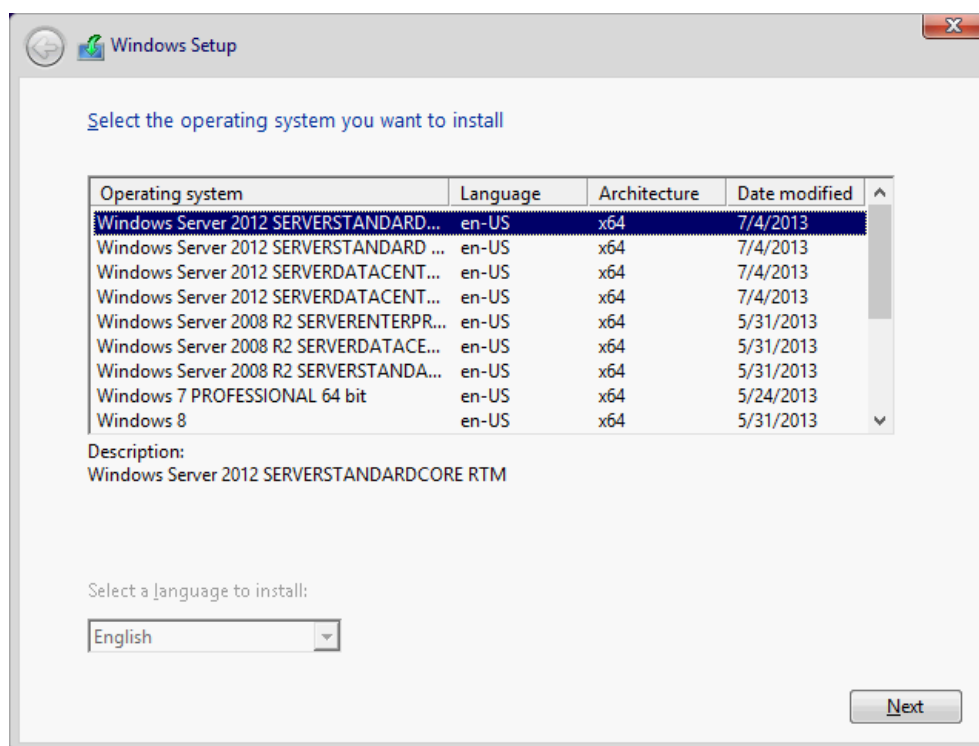
- iii. Next, the Windows Setup window will appear. Select the System Locale (language) and Keyboard/input method. Click **Next**.



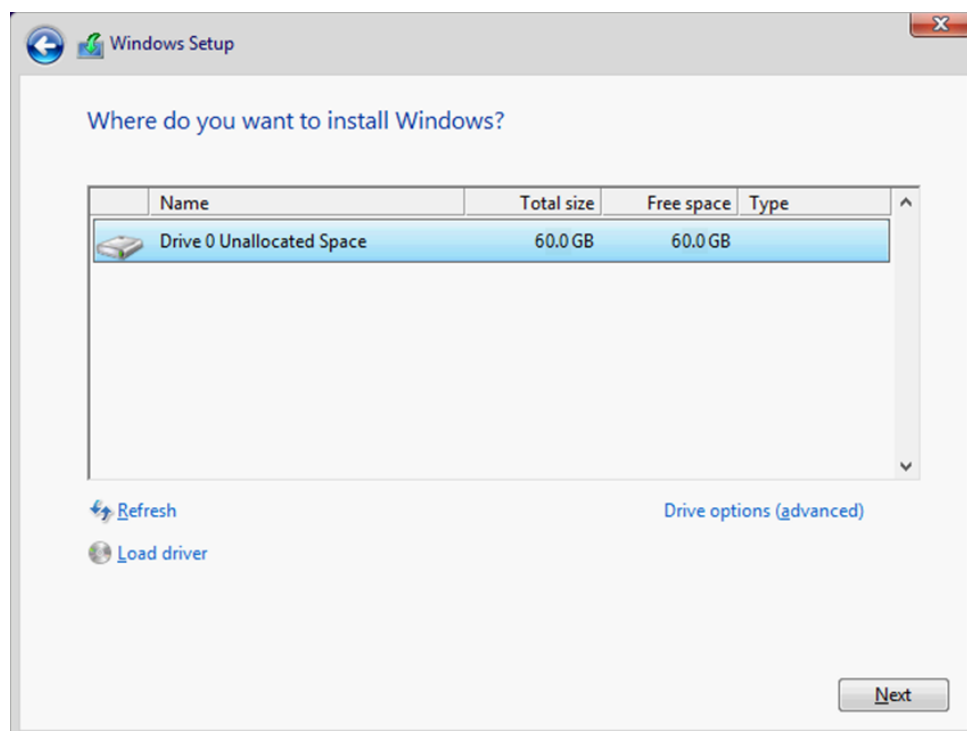
- iv. Enter server credentials and click **OK**.



- v. Select the operating system to be installed and click **Next**.



- vi. Select the Target LUN discovered using MS iSCSI Initiator and click **Next**.



- vii. Proceed with installation as usual.

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).

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370 San Aleso Ave.
Sunnyvale, CA 94085