



# Chelsio Unified Boot

## Installation and User's Guide



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## I. Unified Boot Option ROM

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## 1. Introduction

Thank you for choosing Chelsio 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** series is Chelsio's next generation of highly integrated, hyper-virtualized 1/10/25/40/50/100GbE controllers. The adapters are 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 to 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.

Ideal for all data, storage and high-performance clustering applications, the Unified Wire 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 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 (OS) to an FC/FCoE disk and then booting from it. iSCSI SAN boot process involves installation of an OS 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 adapters. It adds functionalities like PXE, FCoE and iSCSI SAN boot.

### 1.1. Hardware Requirements

#### 1.1.1. Supported Adapters

The following are the Chelsio Adapters that are supported:

- T62100-CR
- T62100-LP-CR
- T62100-SO-CR\*
- T62100-SO-OCP3\*
- T6425-CR
- T6225-CR
- T6225-LL-CR
- T6225-OCP3\*
- T6225-SO-OCP3\*
- T6225-SO-CR\*

- T580-CR
- T580-LP-CR
- T580-SO-CR\*
- T540-CR
- T540-LP-CR
- T520-CR
- T520-LL-CR
- T520-SO-CR\*
- T520-BT
- T540-BT

*\* Only PXE supported*

### 1.1.2. Supported Hardware

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

- DELL PowerEdge R610
- DELL PowerEdge R720
- IBM X3650 M4\*
- Lenovo X3650 M5
- Lenovo ThinkSystem SR650
- HP ProLiant DL180 gen9
- HP ProLiant DL385G2
- Supermicro X10DRi
- Supermicro X11SSL-CF
- ASUS z390
- QuantaGrid D51B-1U
- AMD EPYC 7551

\* 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 Option ROM onto Chelsio adapters.

The installation of the following Linux distributions is supported using Chelsio inbox drivers.

Linux Distribution	Drivers
RHEL/Rocky/AlmaLinux 9.3, 5.14.0-362.8.1.el9_3.x86_64	PXE, FCoE, iSCSI
RHEL/Rocky/AlmaLinux 9.2, 5.14.0-284.11.1.el9_2.x86_64	
RHEL/Rocky/AlmaLinux 8.9, 4.18.0-513.5.1.el8_9.x86_64	
RHEL/Rocky/AlmaLinux 8.8, 4.18.0-477.10.1.el8_8.x86_64	
RHEL 7.9, 3.10.0-1160.el7.x86_64	

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

## 1.3. Pre-requisites

- A DOS bootable USB flash drive or Floppy Disk is required for updating firmware, Option ROM etc.

## 1.4. 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 (*boot.cfg*) and a flash utility (*cfut4.exe*), which can be used to flash the Option ROM onto Chelsio adapters. It also contains Firmware files.
- **WindowsDrivers:** This directory contains driver packages to be added to WDS server and boot images.
- **ESXiDrivers:** This directory contains Chelsio driver component to be added to the ESXi installation ISO image.
- **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 as per 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.

**Note** *All 4-ports of T6425-CR adapter will be functional only if PCIe x8 -> 2x PCIe x4 slot bifurcation is supported by the system and enabled in BIOS. Otherwise, only 2-ports will be functional.*

- 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/x16 slot as sometimes the process of securing the card causes the card to become unseated.
- x. Connect a fiber/twinax cable, multi-mode for short range (SR) optics or single-mode for long range (LR) optics, to the 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@hostname ~]# update-pciids
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           %             %             Dload  Upload  Total  Spent    Left   Speed
100  227k  100  227k    0     0  68592      0  0:00:03  0:00:03 --:--:-- 68610
Done.
```

- xiii. Verify if the adapter was installed successfully:

- On Linux and ESXi systems, run `lspci` command and you should see a similar output:

```
[root@hostname ~]# lspci | grep -i Chelsio
81:00.0 Ethernet controller: Chelsio Communications Inc T62100-LP-CR Unified Wire Ethernet Controller
81:00.1 Ethernet controller: Chelsio Communications Inc T62100-LP-CR Unified Wire Ethernet Controller
81:00.2 Ethernet controller: Chelsio Communications Inc T62100-LP-CR Unified Wire Ethernet Controller
81:00.3 Ethernet controller: Chelsio Communications Inc T62100-LP-CR Unified Wire Ethernet Controller
81:00.4 Ethernet controller: Chelsio Communications Inc T62100-LP-CR Unified Wire Ethernet Controller
81:00.5 SCSI storage controller: Chelsio Communications Inc T62100-LP-CR Unified Wire Storage Controller
81:00.6 Fibre Channel: Chelsio Communications Inc T62100-LP-CR Unified Wire Storage Controller
```

- On Windows systems, follow these steps:
  - a. Open **Device Manager** in **Control Panel**.
  - b. 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 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, *VBD* and *NDIS* for Windows systems, and *cxl* for ESXi systems.

xv. Finally, verify if the card is discovered:

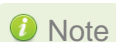
- For Linux systems, examine the output of *dmesg* and you should see a similar output:

```
[ 1119.854346] cxgb4 0000:81:00.4: Chelsio T62100-LP-CR rev 0
[ 1119.854347] cxgb4 0000:81:00.4: S/N: RE41160042, P/N: 11012106003
[ 1119.854348] cxgb4 0000:81:00.4: Firmware version: 1.1.0.0
[ 1119.854349] cxgb4 0000:81:00.4: Bootstrap version: 255.255.255.255
[ 1119.854350] cxgb4 0000:81:00.4: TP Microcode version: 0.1.23.2
[ 1119.854351] cxgb4 0000:81:00.4: No Expansion ROM loaded
[ 1119.854351] cxgb4 0000:81:00.4: Serial Configuration version: 0x7002000
[ 1119.854352] cxgb4 0000:81:00.4: VPD version: 0x52
[ 1119.854354] cxgb4 0000:81:00.4: Configuration: NIC MSI-X, non-Offload capable
[ 1119.854355] eth0: Chelsio T62100-LP-CR (eth0) 100GBASE-CR4_QSFP
```

The above output indicates the hardware configuration of the adapters as well as the Serial numbers.

- For Windows systems, open **Device Manager** again. Expand **Network adapters** section and now Chelsio adapter should be listed.
- For ESXi systems, examine the output of *dmesg* and you should see a similar output:

```
2017-09-26T04:09:20.207Z cpu6:66032)cxl1.0: cxl port init:874: mbox 0 pf 0 chan 0 viid c0
2017-09-26T04:09:20.209Z cpu6:66032)DMA: 646: DMA Engine 'cxl-0000:04:00.0' created using mapper 'DMANull'.
2017-09-26T04:09:20.209Z cpu6:66032)cxl1.0: cxl config_queues:1091: max_filters 120
2017-09-26T04:09:20.209Z cpu6:66032)VMK_PCI: 765: device 0000:04:00.0 allocated 32 MSIX interrupts
2017-09-26T04:09:20.209Z cpu6:66032)cxl1.0: cxl intr alloc msix:2581: net q 14 rss q 16 non rss q 13 tx q 8
2017-09-26T04:09:20.211Z cpu6:66032)cxl1.0: cxl rss do init:5221: pool 0 rss viid c1
2017-09-26T04:09:20.212Z cpu6:66032)cxl1.0: cxl rss init:2501: pool 0 rss mode 31
2017-09-26T04:09:20.212Z cpu6:66032)Chelsio T6225-CR rev 0 25G NIC PCIe 8 GT/s x8 MSI-X S/N: RE35160002, P/N: 11012096002
```



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 network interface. However, for T5 40G adapters, the association of physical Ethernet ports and their corresponding network device names is opposite. For these adapters, the port nearest to the motherboard will appear as the first network interface.*

### 3. Secure Boot

**Secure Boot**, a high-performance computing software solution is a method to restrict which binaries can be executed to boot the system. With Secure Boot, the system BIOS will only allow the execution of boot loaders that carry the cryptographic signature of trusted entities. In other words, anything run in the BIOS must be “signed” with a key that the system knows is trustworthy. With each reboot of the server, every executed component is verified.

The Chelsio Drivers are in-boxed in major Linux Distributions mentioned in the [Software Requirements](#). These Linux in-boxed drivers and WHQL Certified Windows Drivers (provided in the package) can be used for OS installation after enabling Secure Boot in System BIOS.

## 4. Flashing Firmware and Option ROM

Depending on the boot mode selected, Chelsio Unified Boot provides the following methods to flash Firmware, Option ROM, and boot configuration onto Chelsio adapters:

- Legacy mode:
  - cfut4
- uEFI mode:
  - HII
  - drvcfg
  - Firmware Manager Protocol (FMP)

These methods also provide the functionality to update/erase Hardware configuration and Phy Firmware files.

**Important**

*It is highly recommended to use the same Option ROM (type and version) on all the Chelsio adapters present in the system.*

### 4.1. 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:

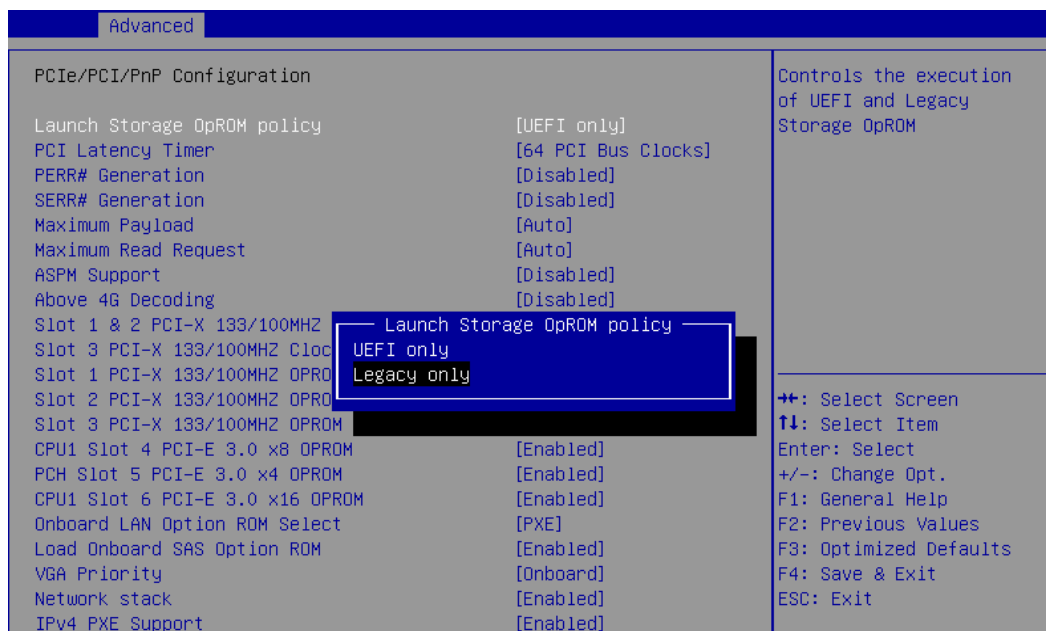
- Create a DOS bootable USB flash drive. ([Click here](#) for instructions)
- Create a directory *CHELSIO* on the USB flash drive.
- If you haven't done already, download *Chelsio-Uboot-x.x.x.x.zip* from [Chelsio Download Center](#)
- Unzip the downloaded package and change your working directory to *OptionROM* directory.

```
[root@host~]# unzip Chelsio-Uboot-x.x.x.x.zip
[root@host~]# cd Chelsio-Uboot-x.x.x.x/OptionROM
```

- Copy all the files and place them in the *CHELSIO* directory created on the USB flash drive.
- Plug-in the USB flash drive in the system on which the Chelsio adapter is installed.
- Reboot the system.

## 4.2. Legacy

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



- ii. Boot the system from the plugged in USB flash drive and change your working directory to CHELSIO directory.

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

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

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

```
C:\CHELSIO>cfut4 -l

Chelsio T5/T6 Flash Utility v1.5

Index  ChelsioAdaptertype  DevId
=====
[0]    T6225-CR          6001
```

- iv. Delete any previous version of Option ROM flashed on the adapter.

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

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

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

Chelsio T5/T6 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 T5/T6 Flash Utility v1.5

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

- vi. Delete any previous Option ROM settings.

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

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

Chelsio T5/T6 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.

```
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 T6FW-1~1.BIN

Chelsio T5/T6 Flash Utility v1.5

Erasing serial flash sector(s) ... Done
Writing Image at Base 00080000 ... Done
Writing Image at Base 00080000 ... 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
Writing Image at Base 000f8000 ... Done
Reboot machine for changes to take effect
```



- viii. Flash the Unified Boot Option ROM using the following command.

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

Here, `cubt4.bin` is the Unified Boot Option ROM image file present in the *CHELSIO* directory.

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

Chelsio T5/T6 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 boot configuration setting which will enable PXE and disable iSCSI and FCoE.

```
C:\CHELSIO>cfut4 -d <idx> -uc boot.cfg
```

```
C:\CHELSIO>cfut4 -d 0 -uc boot.cfg

Chelsio T5/T6 Flash Utility v1.5

Erasing serial flash sector(s) ... Done
Writing Image at Base 00070000 ... Done
```

- x. In case of multiple adapters in the system, please repeat the steps from iv. to ix. to update/flash the firmware, Option ROM, and boot configuration on all of them.
- xi. To configure the base MAC address (optional), use the below command.

```
C:\CHELSIO>cfut4 -d <idx> -um <Hex MAC Address>
```

*Example:*

```
C:\CHELSIO>cfut4 -d 0 -um 000743000123
```

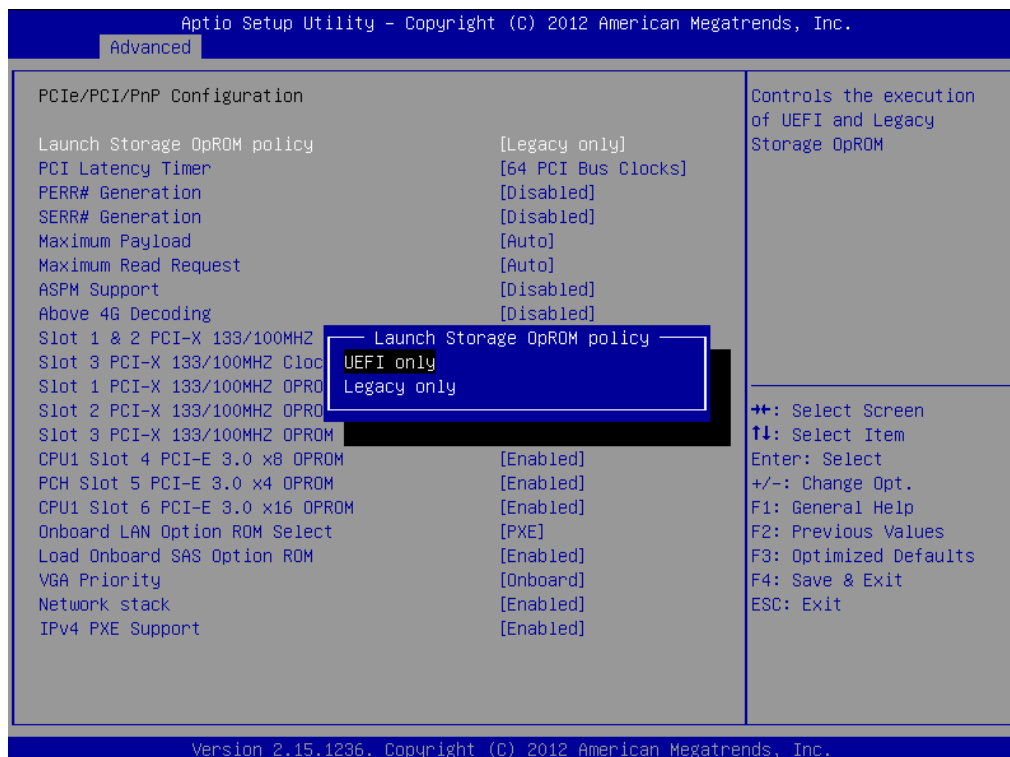
- xii. Reboot the system for changes to take effect.



## 4.3. uEFI

### 4.3.1. Loading uEFI driver

- i. In BIOS, configure the system having Chelsio adapter 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 already loaded. The below image shows that the driver is loaded.

```

A4 00000001 ? - - - <UNKNOWN> SBDXE
A6 00000010 B - - 5 5 AMI Console Splitter Driver ConSplitter
A9 00000010 D - - 1 - <UNKNOWN> GraphicsConsole
AA 0000000A D - - 4 - Generic Disk I/O Driver DiskIoDxe
AB 0000000B B - - 1 3 Partition Driver(MBR/GPT/El Torito) PartitionDxe
AC 00000010 D - - 2 - PCH Serial ATA Controller Initializ SataController
AE 00000010 B - - 1 2 AMI Generic LPC Super I/O Driver GenericSio
B0 00000001 ? - - - - AMI IDE BUS Driver IdeBusSrc
B2 00000010 ? - - - - AMI PS/2 Driver PS2Main
B4 00A50105 B - - 2 72 <UNKNOWN> PciBus
B6 00000010 B - - 2 2 <UNKNOWN> TerminalSrc
B7 00000010 B - - 1 1 <UNKNOWN> TerminalSrc
B8 0000000A D - - 2 - Simple Network Protocol Driver SnpDxe
B9 0000000A B - - 2 8 MNP Network Service Driver MnpDxe
BA 0000000A B - - 2 2 ARP Network Service Driver ArpDxe
BB 0000000A B - - 2 2 DHCP Protocol Driver Dhcp4Dxe
BC 0000000A D - - 2 - IP4 CONFIG Network Service Driver Ip4ConfigDxe
BD 0000000A B - - 2 18 IP4 Network Service Driver Ip4Dxe
BE 0000000A B - - 4 4 MTFTP4 Network Service Mtftp4Dxe
BF 0000000A B - - 12 20 UDP Network Service Driver Udp4Dxe
C0 0000000A D - - 1 - FAT File System Driver Fat
C1 0000000A D - - 2 - iSCSI Driver IScsiDxe
C2 0000000A D - - 2 - iSCSI Driver IScsiDxe
C4 0000000A ? - - - - SCSI Bus Driver ScsiBus
C5 0000000A ? - - - - SCSI Disk Driver ScsiDisk
FA 00000010 ? - - - - AMI CSM Block I/O Driver CsmBlockIo
FB 00000024 B - - 1 1 BIOS[INT10] Video Driver CsmVideo
FC 00000010 ? - - - - <UNKNOWN> <UNKNOWN>
158 0100005E B X X 3 3 Chelsio Unified Driver Offset(0x3834,0x1D)

```

If the driver is not loaded, continue to step (v)

- iv. Note the handle and unload the driver.

```
fs0:\CHELSIO\> unload -n <driver_handle>
```

Example:

```

FS1:\CHELSIO\> unload -n 1A1
Unload - Handle [72892A18] Result Success.

```

- v. Load the uEFI driver (*ChelsioUD.efi*) present in the *CHELSIO* directory.

```

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

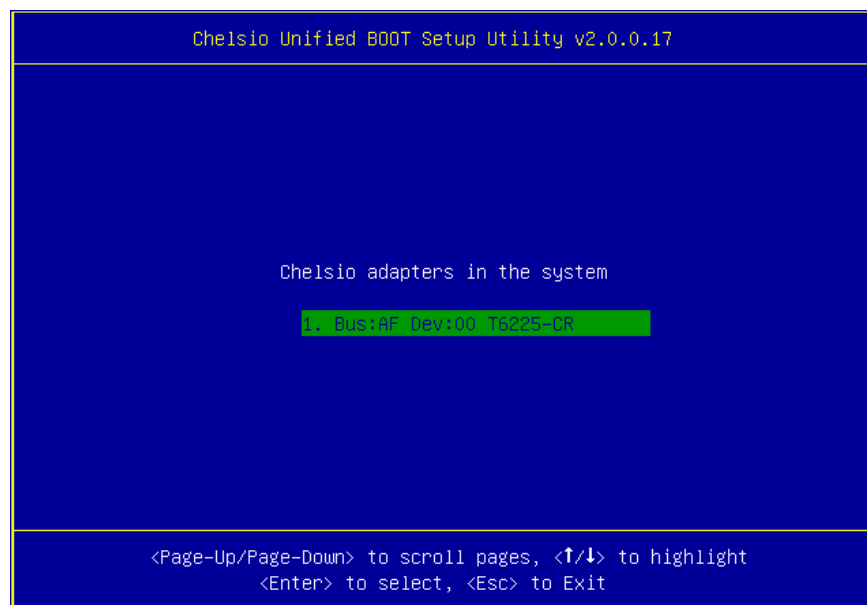
```

### 4.3.2. drvcfg

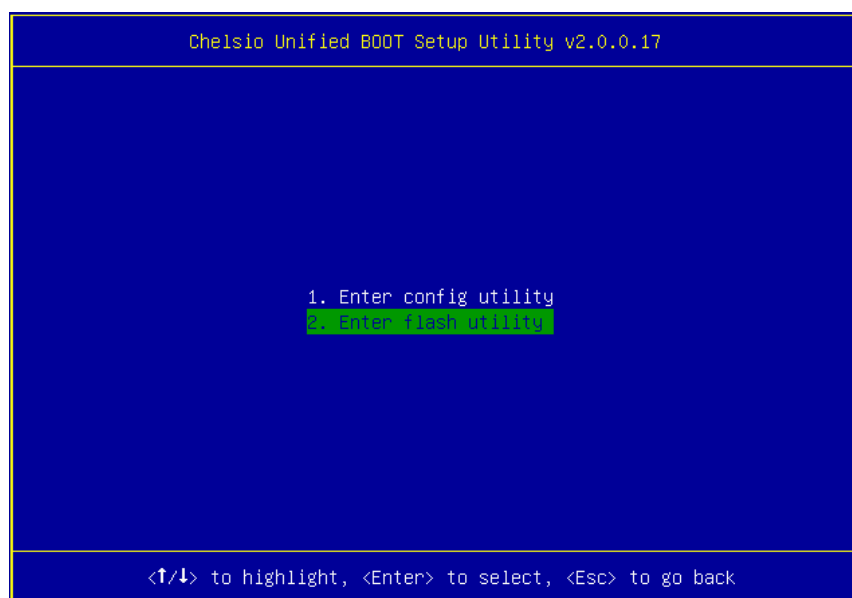
- i. Please ensure that Chelsio uEFI driver is loaded correctly as mentioned in [Loading uEFI driver](#) section.
- ii. Run the following command to launch the Unified Boot Setup utility.

```
fs0:\> drvcfg -s_
```

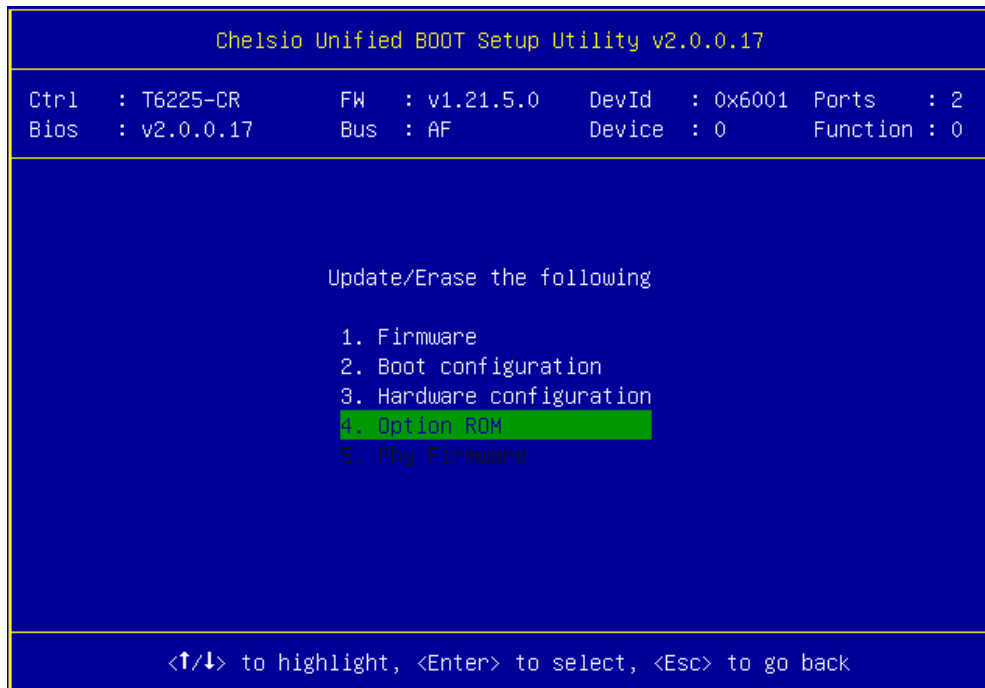
- iii. Choose the Chelsio adapter which needs to be configured.



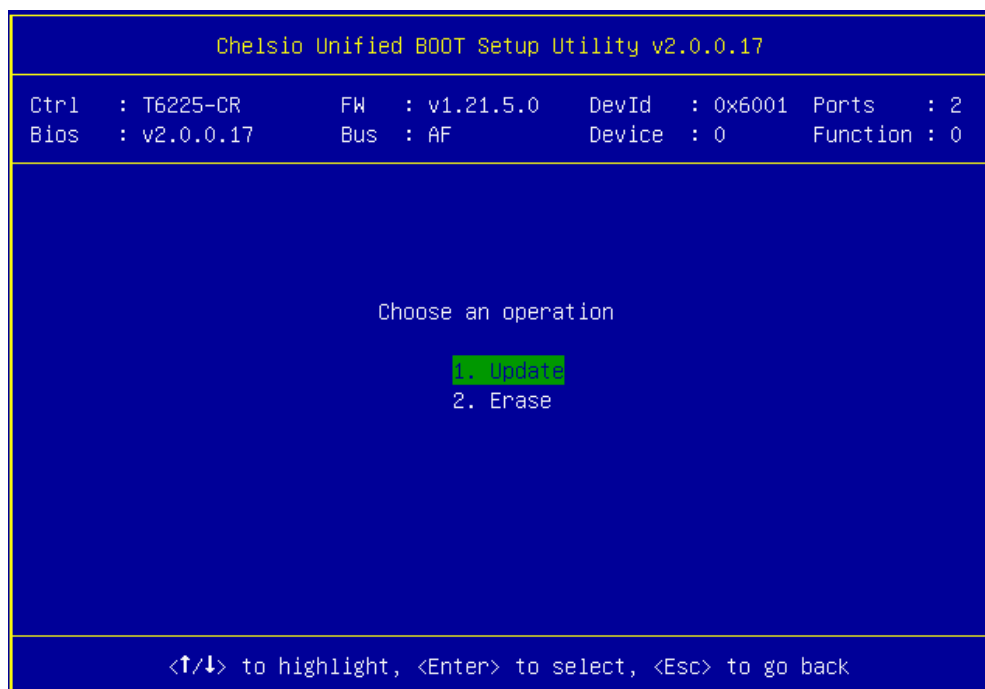
- iv. Highlight **Enter flash utility** and press [Enter].



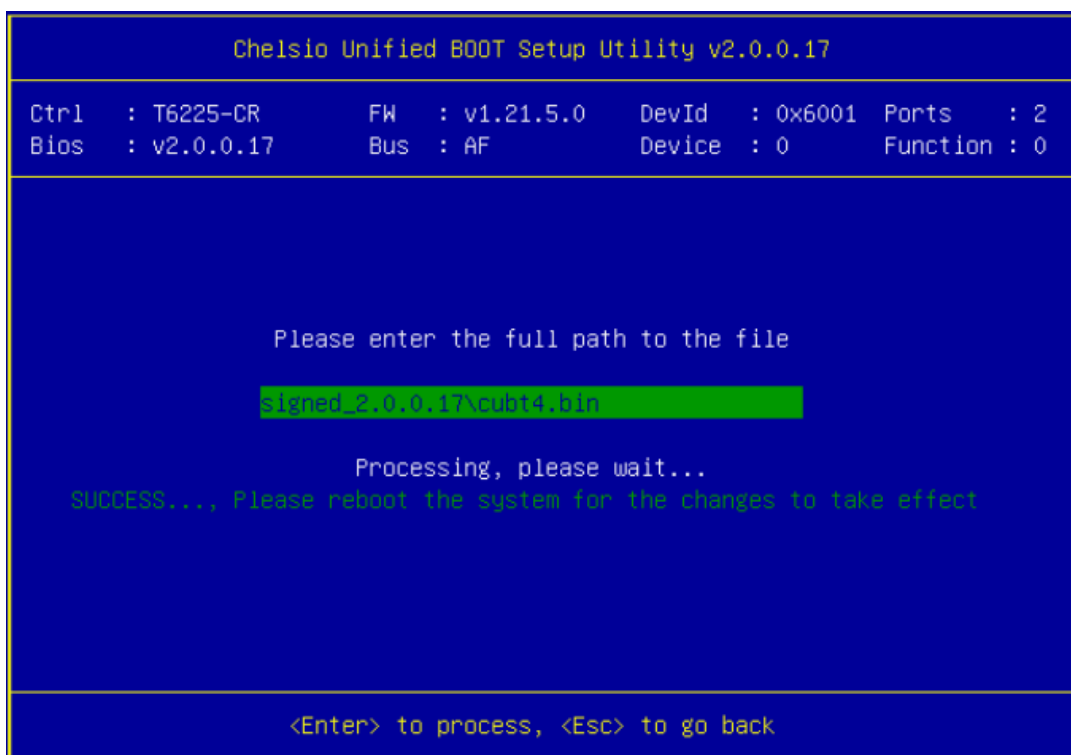
- v. Highlight **Option ROM** and press [Enter].



- vi. Highlight **Update** and press [Enter].



- vii. Enter the path to the Option ROM file and press [Enter].



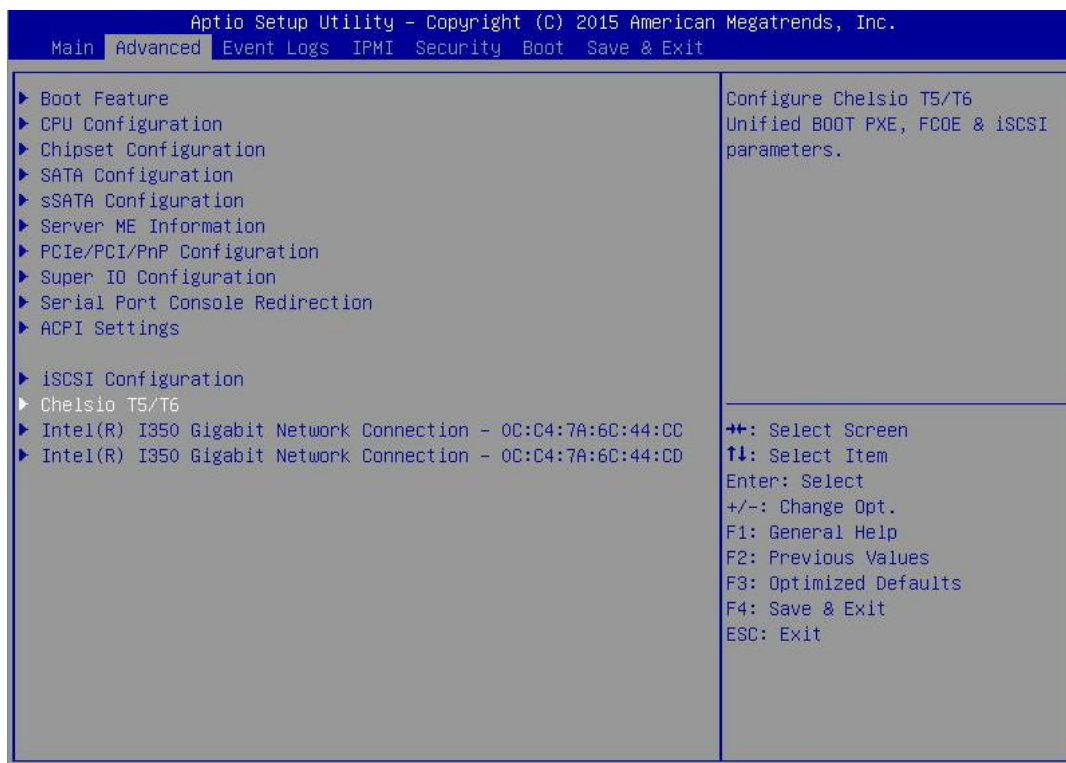
- viii. Similarly, you can use the above method to update firmware (*t6fw-x.xx.x.x.bin/t5fw-x.xx.x.x.bin*) and boot configuration (*boot.cfg*) present in the *CHELSIO* directory.
- ix. In case of multiple adapters in the system, please repeat the above steps to update/flash the firmware, Option ROM, and boot configuration on all of them.
- x. Reboot the machine for changes to take effect.

### 4.3.3. HII

- Go into the BIOS setup.
- Chelsio HII should be listed as **Chelsio T5/T6** as shown below. Highlight it and press [Enter].

If Chelsio T5/T6 is not listed,

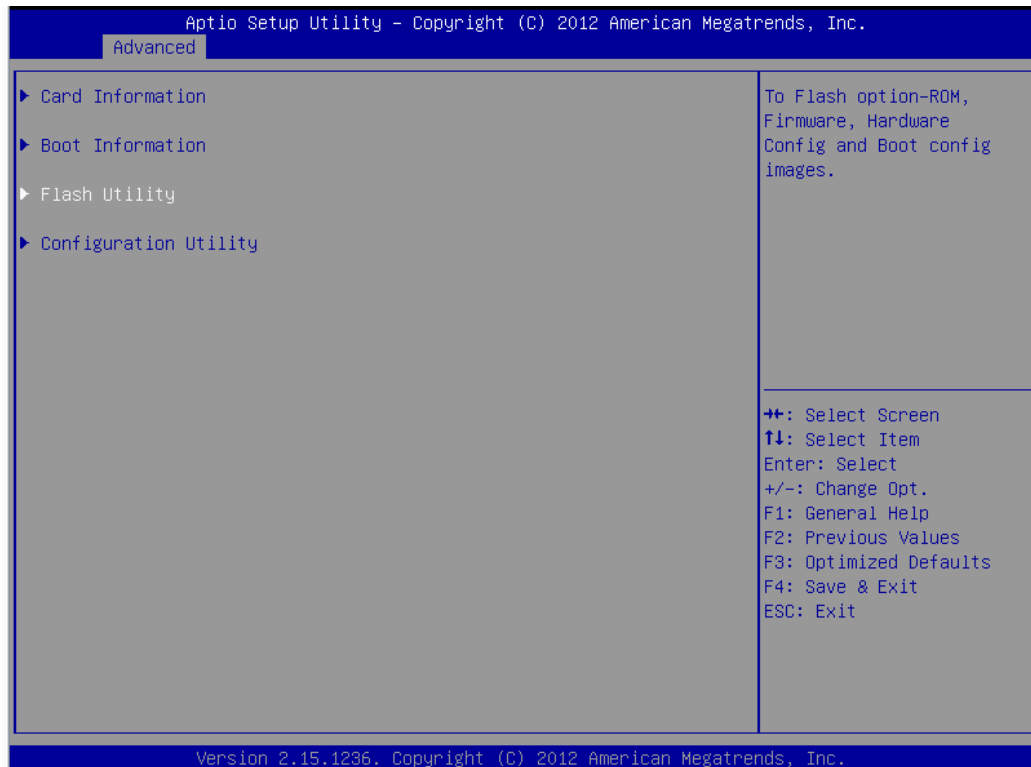
- Load the Chelsio uEFI driver as mentioned in [Loading uEFI driver](#) section.
- Flash the Option ROM and Firmware as mentioned in [drvcfg](#) section.



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



- iv. Highlight **Flash Utility** and press [Enter].



- v. Erase or update firmware using the methods explained below:
- a. **Erase existing firmware**
    - i. Select [Erase] as Flash Operation
    - ii. Select [FW File] as Flash File Type
    - iii. Select Update/Erase
    - iv. Press [Y] to confirm
  - b. **Update firmware**
    - i. Select [Update] as Flash Operation
    - ii. Select [FW File] as Flash File Type
    - iii. Enter full path to the firmware file for Enter File Name, e.g., CHELSIO\t6fw-1.26.6.0.bin.
    - iv. Press [Enter]
    - v. Select Update/Erase
    - vi. Press [Y] to confirm
- vi. Similarly, you can use the above method to update/erase Option ROM (*cubt4.bin*) and boot configuration (*boot.cfg*) present in the *CHELSIO* directory.
- vii. In case of multiple adapters in the system, please repeat the above steps to update/flash the firmware, Option ROM, and boot configuration on all of them.
- viii. Reboot the machine for changes to take effect.

#### 4.3.4. Firmware Management Protocol (FMP)

HP machines support Firmware Management Protocol (FMP) interface, in addition to HII. This can be used to update the Option ROM on Chelsio adapters.

- **Enabling FMP**

- Please ensure that Chelsio uEFI driver is loaded correctly as mentioned in [Loading uEFI driver](#) section
- Run the command `fwupdate -l` and Chelsio T6 adapter should be listed as shown below:

```
FS1:\CHELSIO> fwupdate -l
* [BIOS] System ROM - U20 v2.20 (05/05/2016)
* [RAID.Slot.2.1]Slot 2 : Smart HBA H240 Controller - U2.52_B0
* [NIC.LOM.1.3]Embedded LOM 1 : HP Ethernet 1Gb 2-port 361i Adapter - NIC - 1.1067.0
* [NIC.Slot.3.1]Slot 3 : Chelsio T6 Controller - NIC - 1.1067.0
```

- **Upgrading Firmware**

- **Using CLI**

- Use the adapter's device name to update the firmware:

```
FS1:\CHELSIO> fwupdate -d <device_name> -f cubt4.bin
```

Example:

```
FS1:\CHELSIO> fwupdate -d NIC.Slot.3.1 -f cubt4.bin
Loading firmware file 'cubt4.bin'. It might take several minutes.
Current Firmware Version is 1.1067.0.
Continue with firmware update? (y/n):y
Firmware update completed successfully.
```

- Reboot machine for changes to take effect.

- **Using FMP**

- Reboot system and press F9 to access **System Utilities**
- Go to **Embedded Applications** → **Firmware Update** → **Chelsio T6 Controller**

```
System Utilities
Embedded Applications + Select a device to update + Firmware Update

Slot 3 : Chelsio T6 Controller - NIC
▶ Select a firmware file
Selected firmware file:
Current Firmware Version:
Image Description          [Chelsio Option ROM package]

Start firmware update
```



- iii. Highlight **Select a firmware file** option and hit [Enter].
- iv. Select the USB flash drive which contains the latest Option ROM and hit [Enter].

```
File Explorer

Press ENTER to select.

▶ [SSS_X64FRE_] Rear USB 1 : SanDisk Ultra
[ANAconda] Embedded CD/DVD ROM : Dynamic Smart Array B140i - SATA Optical Drive 1
[IGPT] Slot 2 : Smart HBA H240 Controller
```

- v. Select Option ROM file *cubt4.bin* and hit [Enter].

```
File Explorer

\ [SSS_X64FRE_] Rear USB 1 : SanDisk Ultra \ <CHELSIO>

Press ENTER to select.

bootcfg
cfut4.exe
ChelsioUD.efi
▶ cubt4.bin
```

The file should show up in the **Selected firmware file** field.

```
System Utilities

Embedded Applications + Select a device to update + Firmware Update

Slot 3 : Chelsio T6 Controller - NIC

Select a firmware file
▶ Selected firmware file: cubt4.bin
Current Firmware Version:
Image Description [Chelsio Option ROM package]

Start firmware update
```

- vi. Select **Start firmware update** and hit [Enter].

```
System Utilities
Embedded Applications → Select a device to update → Firmware Update

Slot 3 : Chelsio T6 Controller - NIC

Select a firmware file
Selected firmware file:          cubt4.bin
Current Firmware Version:       v2.8.8.1
Image Description                [Chelsio Option ROM package]

▶ Start firmware update
```

- vii. After **Firmware update completed successfully** prompt appears, reboot the machine for changes to take effect.

```
System Utilities
Embedded Applications → Select a device to update → Firmware Update

Slot 3 : Chelsio T6 Controller - NIC

Select a firmware file
Selected firmware file:          cubt4.bin
Current Firmware Version:       v2.8.8.1
Image Description                [Chelsio Option ROM package]

▶ Start firmware update

Firmware update completed successfully.
```

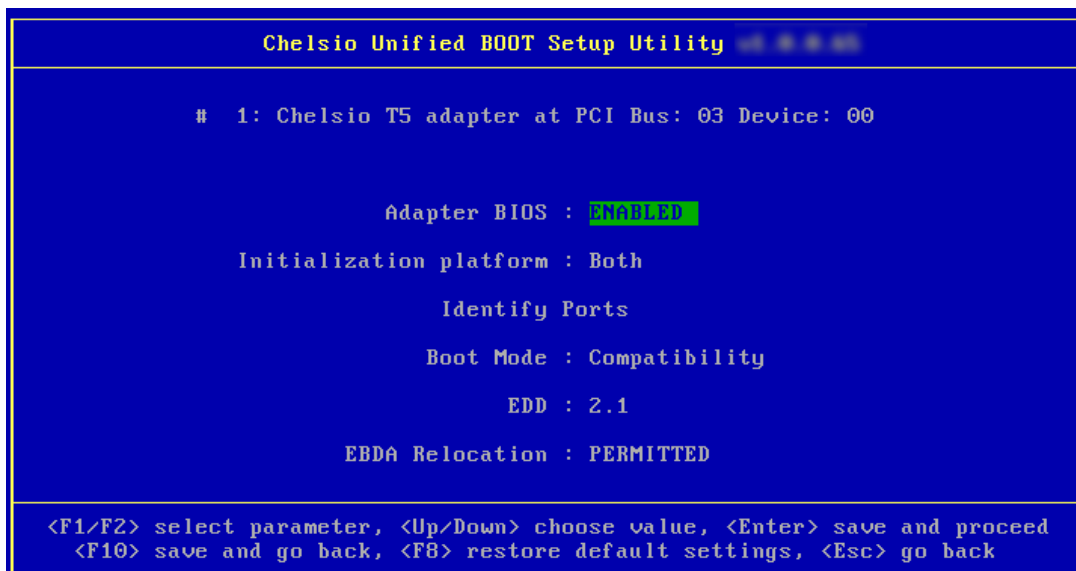
## 4.4. Default Option ROM Settings

If you wish to restore Option ROM settings to their default values, i.e., PXE enabled, iSCSI and FCoE disabled, use any of the methods mentioned below:

### 4.4.1. Using Option ROM (boot level)

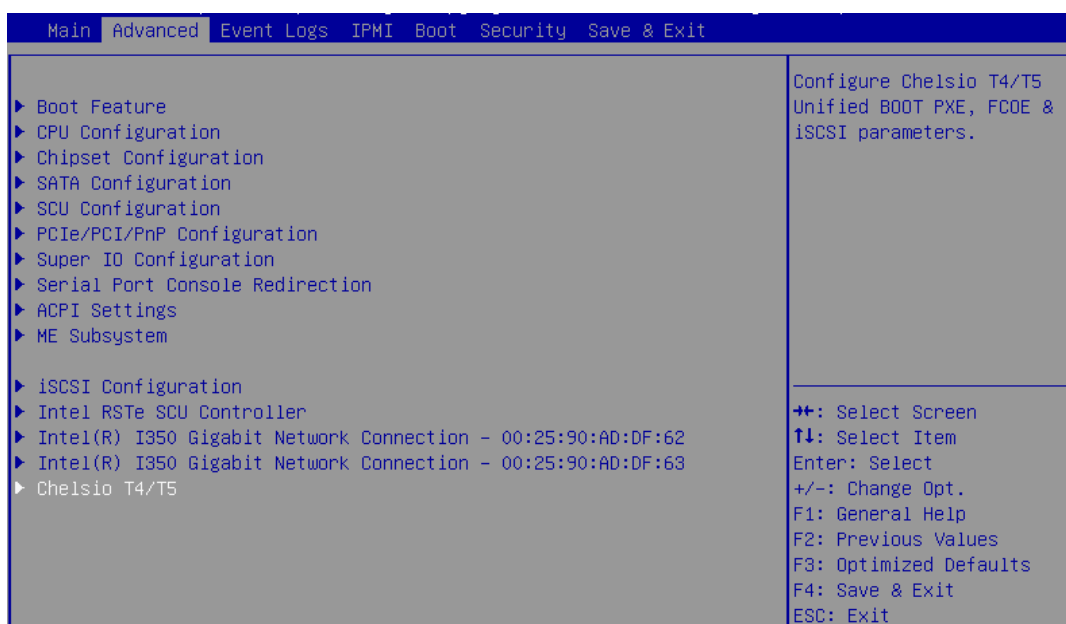
- **Legacy PXE**

Boot system into Chelsio's Unified Boot Setup utility and press F8.



- **uEFI PXE**

Boot system into uEFI mode and press F3.




## 5. Configuring PXE Server

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

- DHCP Server
- TFTP Server

PXE server configuration steps for different operating systems can be found in following links:

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

- **Linux**
  - [https://access.redhat.com/documentation/en-us/red\\_hat\\_enterprise\\_linux/7/html/installation\\_guide/chap-installation-server-setup](https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html/installation_guide/chap-installation-server-setup)
- **Windows**
  - <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>
- **VMware**
  - <http://www.vstellar.com/2017/07/25/automating-esxi-deployment-using-pxe-boot-and-kickstart/>
  - <http://fdo-workspace.blogspot.in/2016/11/building-tftp-dhcp-for-pxe-esxi-65.html>

## 6. PXE boot process

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

### 6.1. Legacy PXE boot

- i. Configure the PXE server and make sure it works. Reboot the client machine.
- ii. Press [Alt+C] when the message to configure Chelsio adapters appears on the screen.

```
Chelsio Unified Boot BIOS
Copyright (C) 2003-2016 Chelsio Communications
Press <Alt-C> to Configure T5/T6 Card(s). Press <Alt-S> to skip BIOS.
```

- iii. The configuration utility will appear as below.

```
Chelsio adapters in the system
1. Bus:81 Dev:00 T6225-CR
```

Choose the adapter on which you flashed the Option ROM image. Hit [Enter].

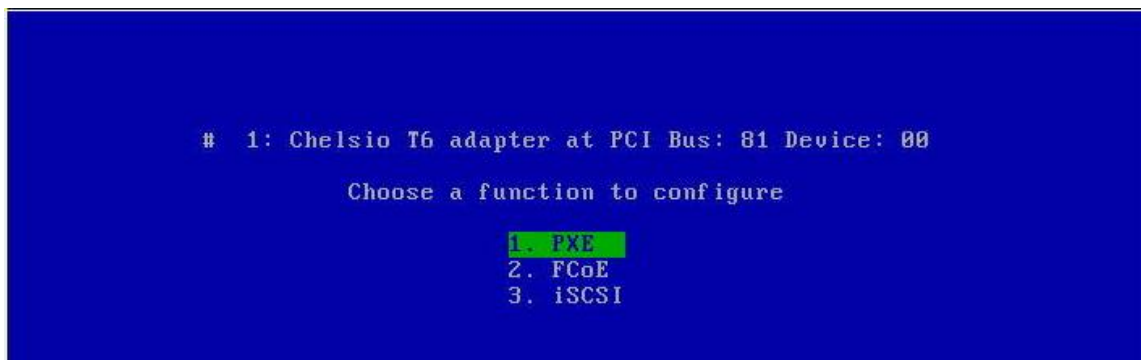
- iv. Enable the adapter BIOS using arrow keys if not already enabled. Hit [Enter].

```
# 1: Chelsio T6 adapter at PCI Bus: 81 Device: 00

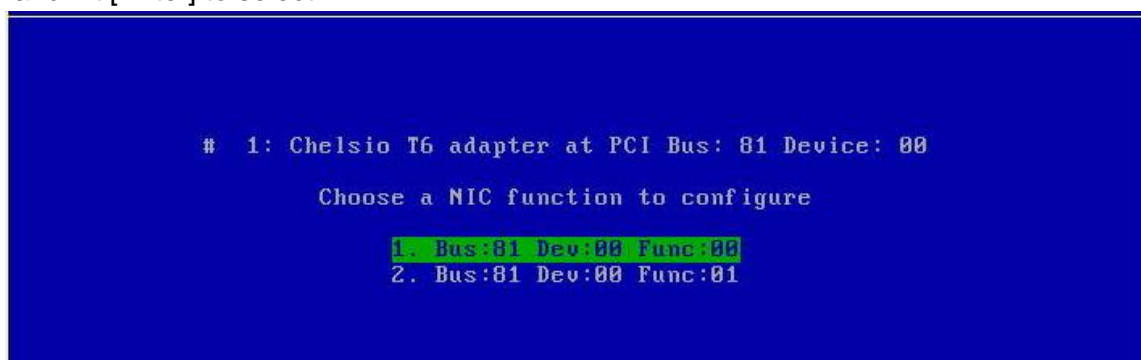
Adapter BIOS : ENABLED
Initialization platform : Both
Identify Ports
Boot Mode : Compatibility
EDD : 2.1
EBDA Relocation : PERMITTED
```

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

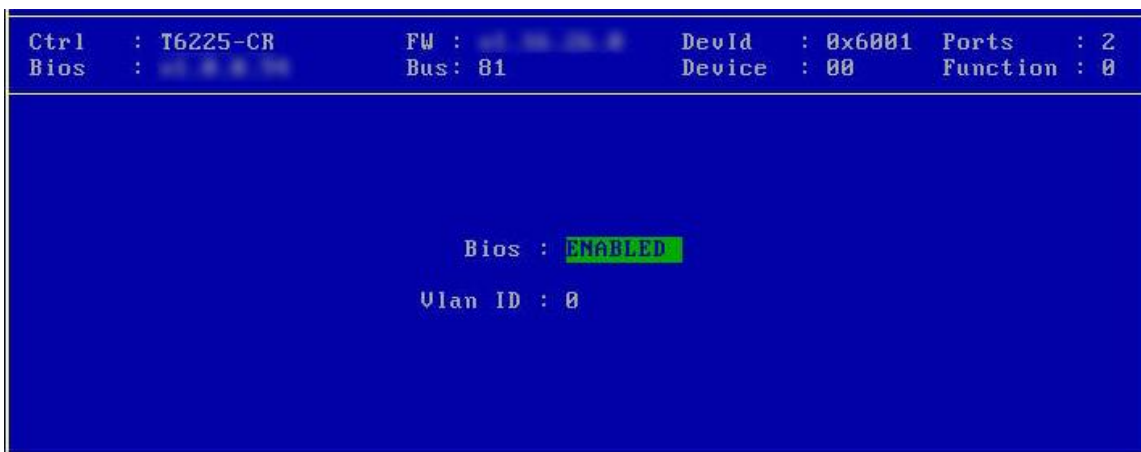
- v. Choose **PXE** from the list to configure. Hit [Enter].



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



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



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.

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

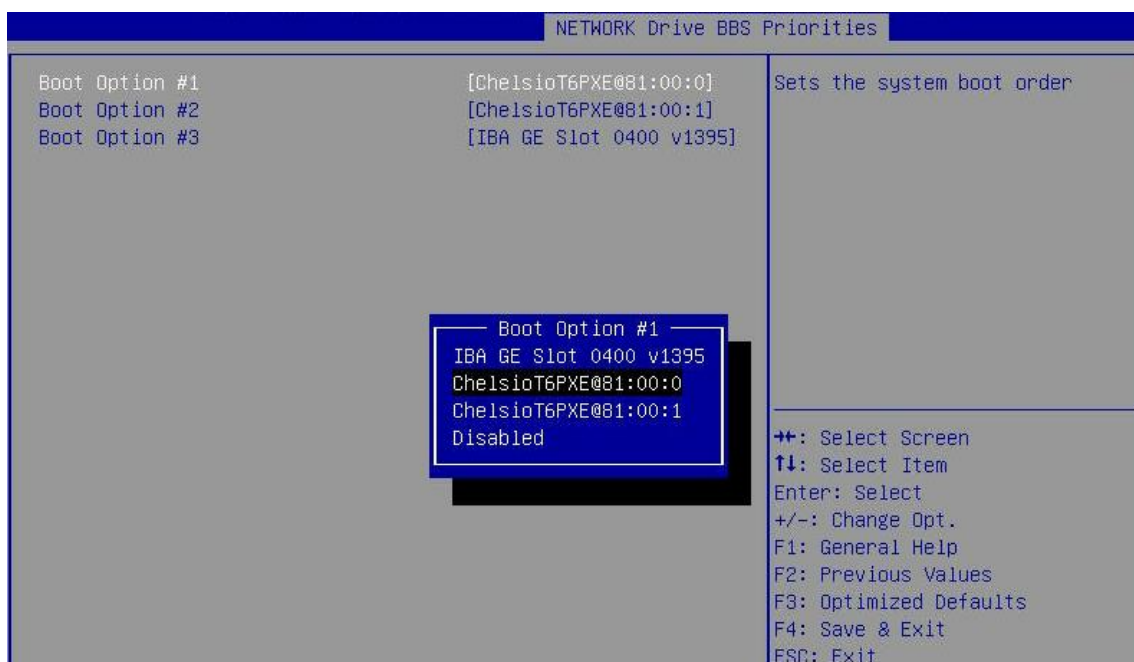


- ix. Reboot the system.
- x. Allow the Chelsio Option ROM to initialize and setup PXE devices. DO NOT PRESS ALT-S to skip Chelsio Option ROM.

```

Loading Chelsio PXE BIOS v1.0.0.95
PCI BIOS v2.1 , PCI FW v3.0 , PnP BIOS : YES PMM Entry is passed by BIOS
Chelsio FW v1.16.29.0
PXE BIOS Loaded Successfully!
1: ChelsioT6PXE00:00:0
2: ChelsioT6PXE00:00:1
    
```

- xi. In the system setup, choose any of the Chelsio PXE devices as the first boot device.



- xii. Reboot. DO NOT PRESS ALT-S to skip Chelsio Option ROM, during POST.
- xiii. Hit [F12] key when prompted to start PXE boot.

## 6.2. uEFI PXE Boot

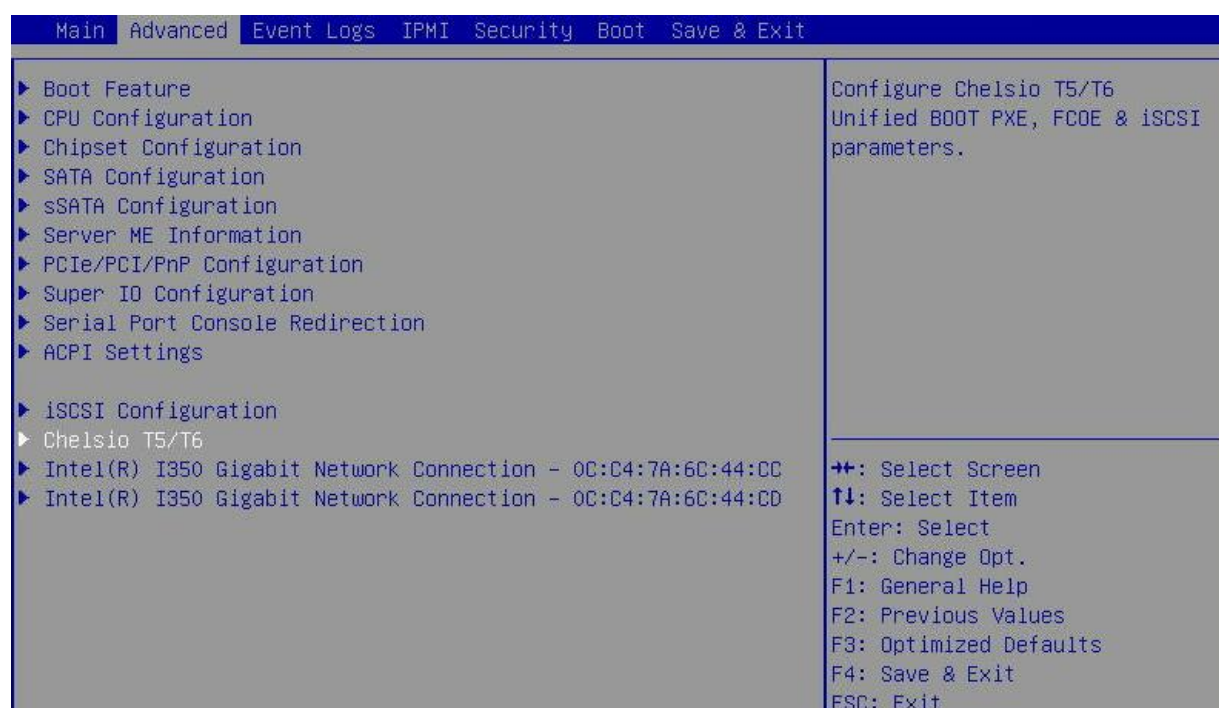
### Important

- Only uEFI v2.3.1, v2.4 and v2.5 supported.
- Any other uEFI version is **NOT SUPPORTED** and may render your system unusable.

### 6.2.1. HII

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

- Reboot the system and go into the BIOS setup.
- Chelsio HII should be listed as **Chelsio T5/T6**. Highlight it and press [Enter].



### Note

Please ensure that Chelsio uEFI driver is loaded correctly as mentioned in [Loading uEFI driver](#) section.

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

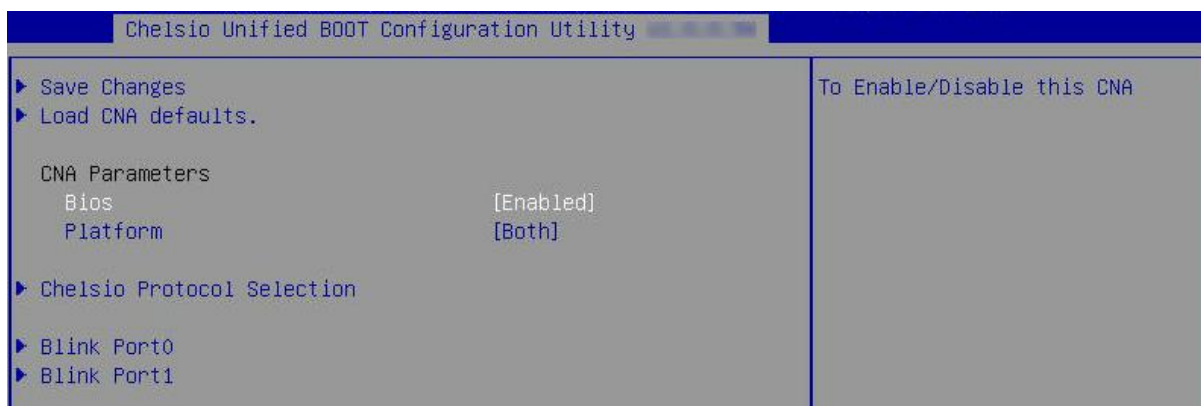




- iv. Select **Configuration Utility** and press [Enter].

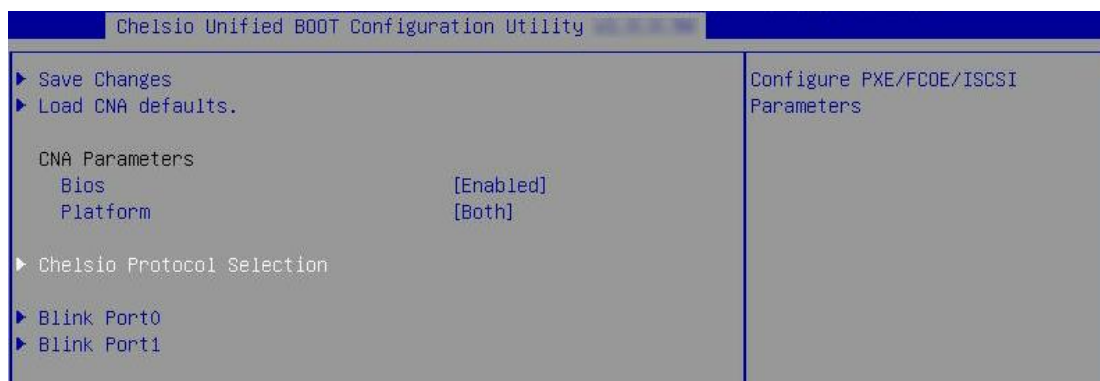


- v. Enable adapter BIOS if not already enabled.

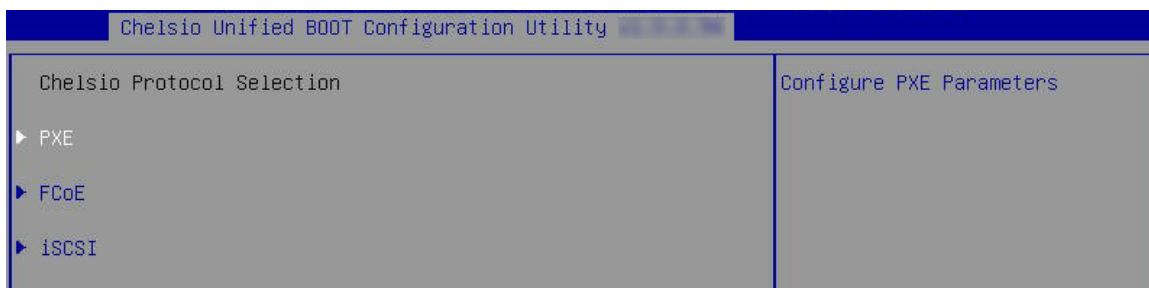


**Note** *It is highly recommended that you use the **Save Changes** option every time a parameter/option is changed.*

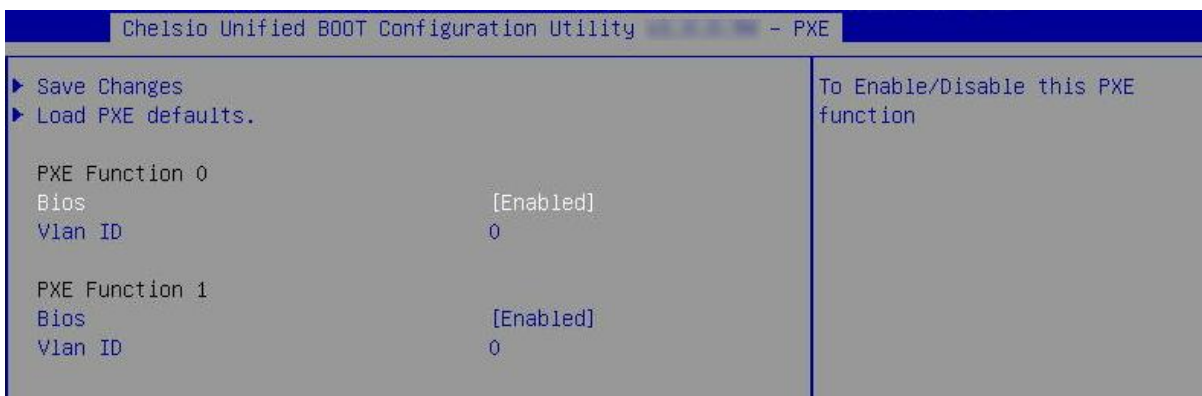
- vi. Select **Chelsio Protocol Selection** and press [Enter].



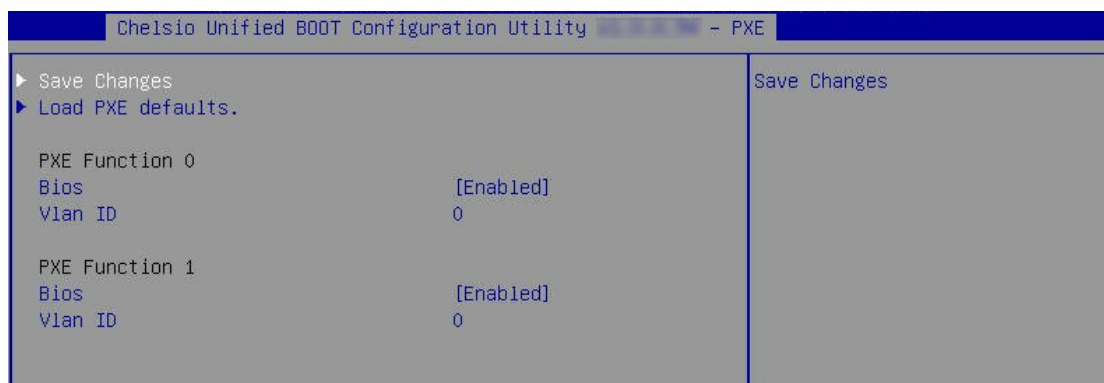
- vii. Select **PXE** and press [Enter].



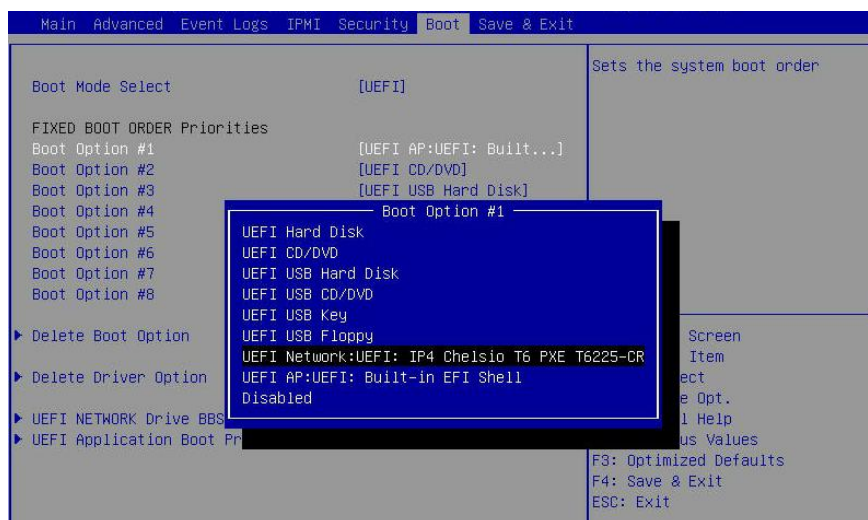
- viii. Choose the boot port to try PXE boot. It is recommended to enable only those functions and ports which are going to be used. Please note that enabling PXE Function 0 will enable port 0 for PXE, enabling PXE Function 1 will enable port 1 and so on, for NIC function.



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



- x. Reboot the system and in BIOS, choose any of the available Chelsio PXE devices.



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

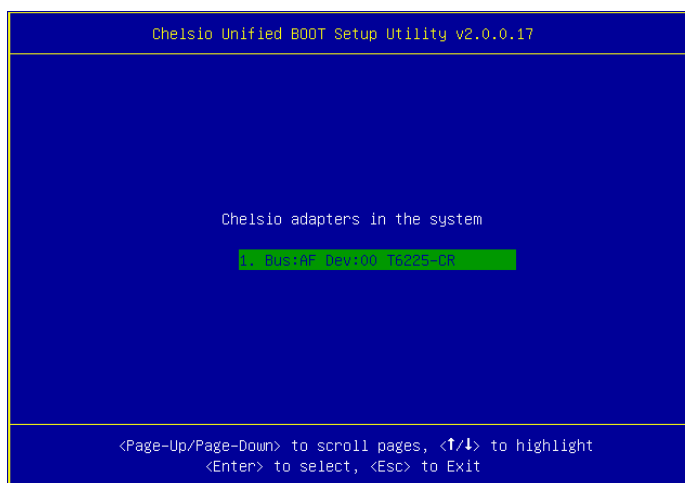
## 6.2.2. drvcfg

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

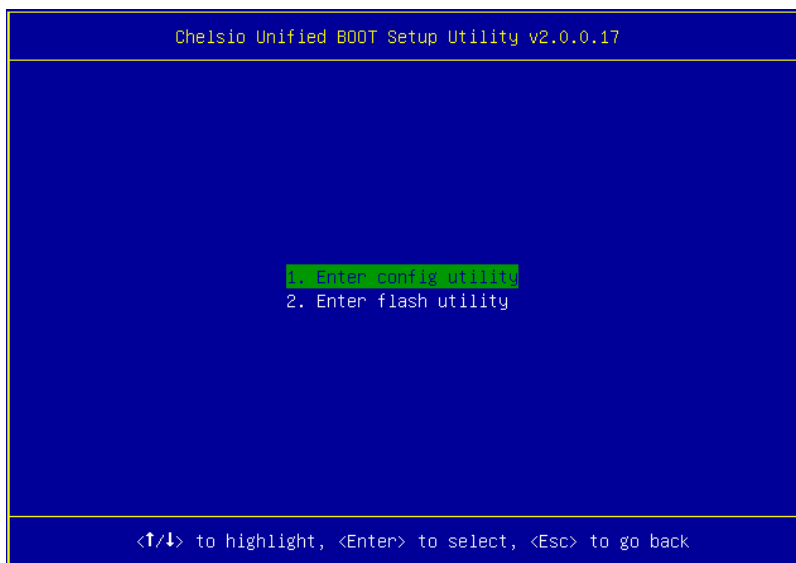
- i. Boot the system into EFI shell.
- ii. Run the following command to launch the Unified Boot Setup utility.

```
fs0:\> drvcfg -s_
```

- iii. Choose the Chelsio adapter which needs to be configured.



- iv. Highlight **Enter config utility** and press [Enter].



- v. Further configuration steps are similar from step (iv) of [Legacy PXE Boot](#) section.

## 7. FCoE boot process

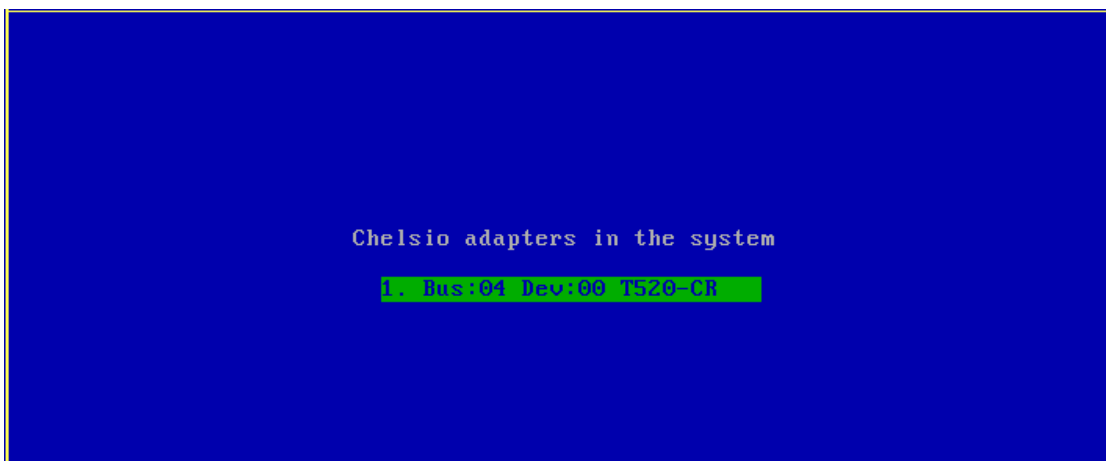
Before proceeding, please ensure that the Chelsio adapter has been flashed with the provided firmware, Option ROM, and boot configuration (See [Flashing firmware and Option ROM](#)).

### 7.1. Legacy FCoE boot

- i. Reboot the system.
- ii. Press [Alt+C] when the message to configure Chelsio adapters appears on the screen.

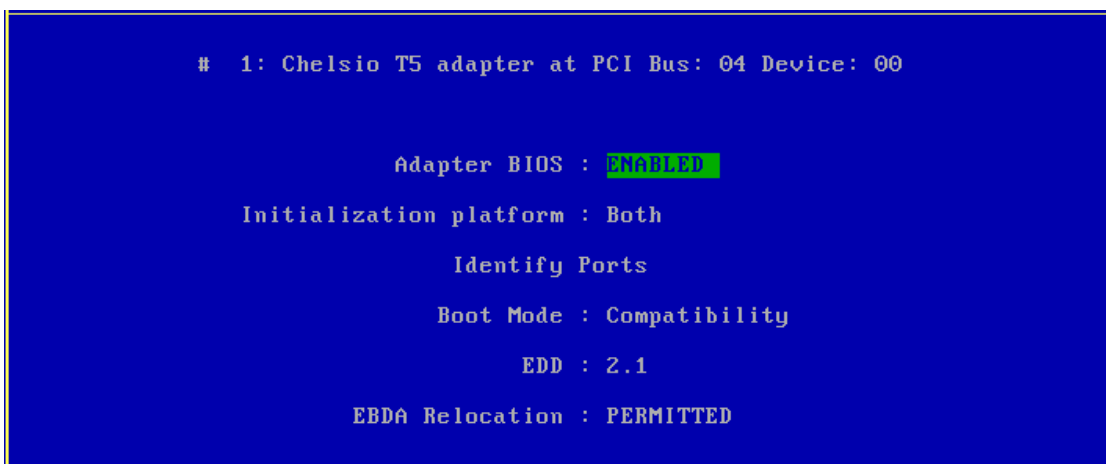
```
Chelsio Unified Boot BIOS
Copyright (C) 2003-2016 Chelsio Communications
Press <Alt-C> to Configure T5/T6 Card(s). Press <Alt-S> to skip BIOS.
```

- iii. The configuration utility will appear as below.



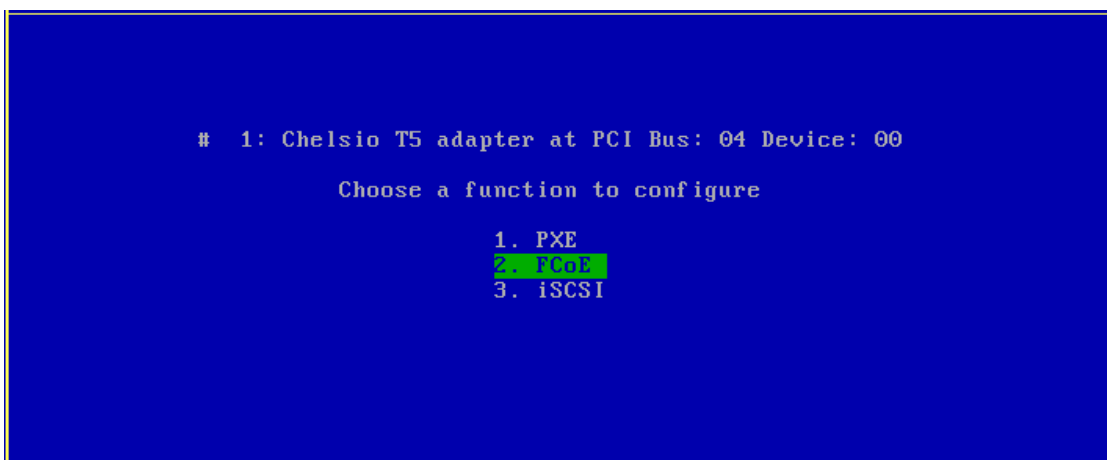
Choose the adapter on which you flashed the Option ROM image. Hit [Enter].

- iv. Enable the adapter BIOS if not already enabled. Hit [ENTER].

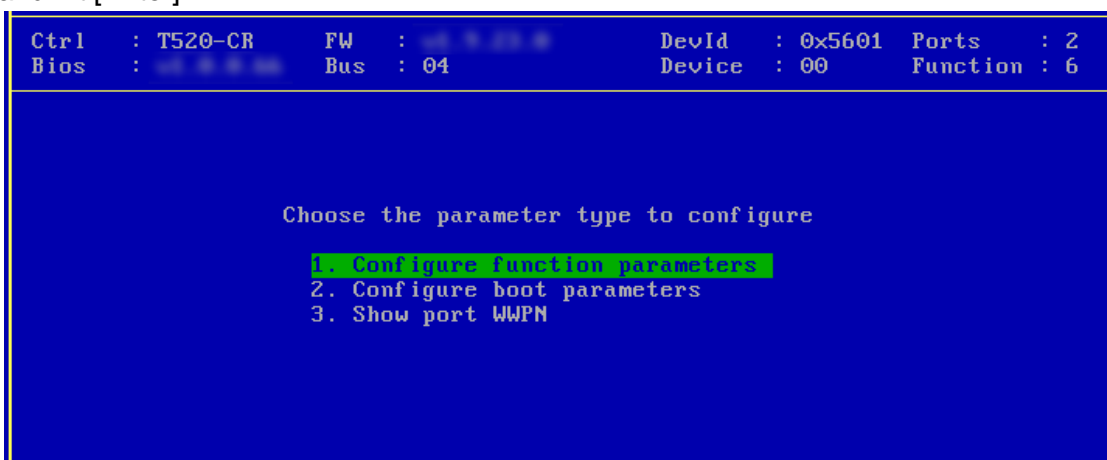


**Note** Use the default values for Boot Mode, EDD and EBDA Relocation parameters, unless instructed otherwise.

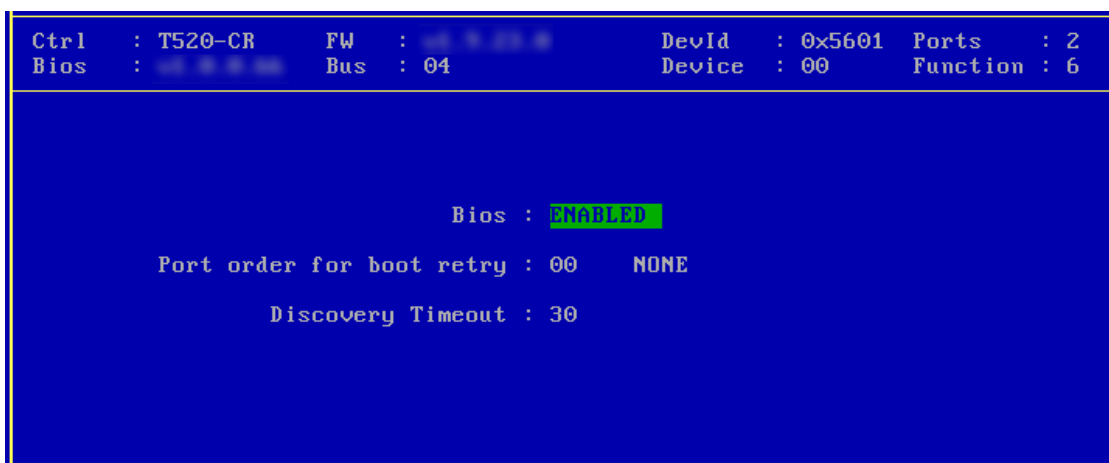
- v. Choose **FCoE** from the list to configure and hit [Enter].



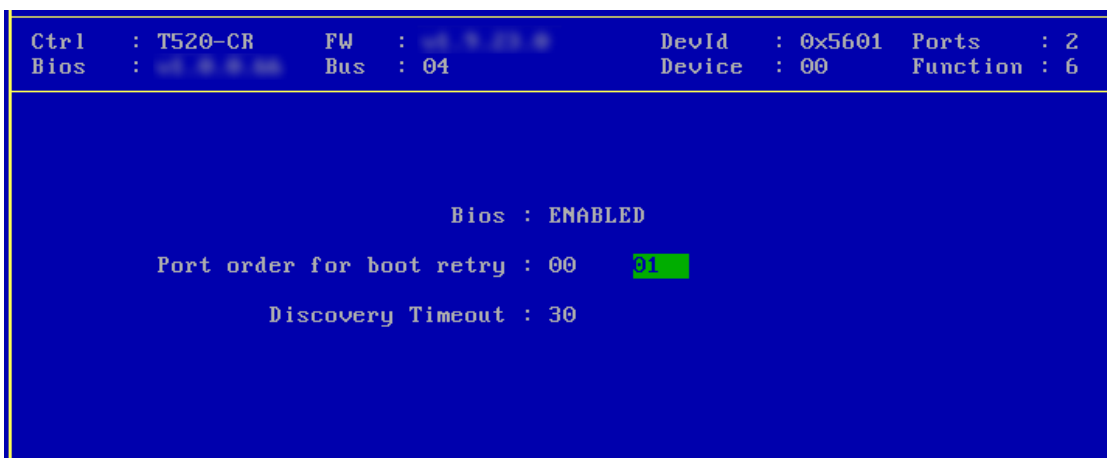
- vi. Choose the first option, **Configure function parameters**, from the list of parameter type and hit [Enter].



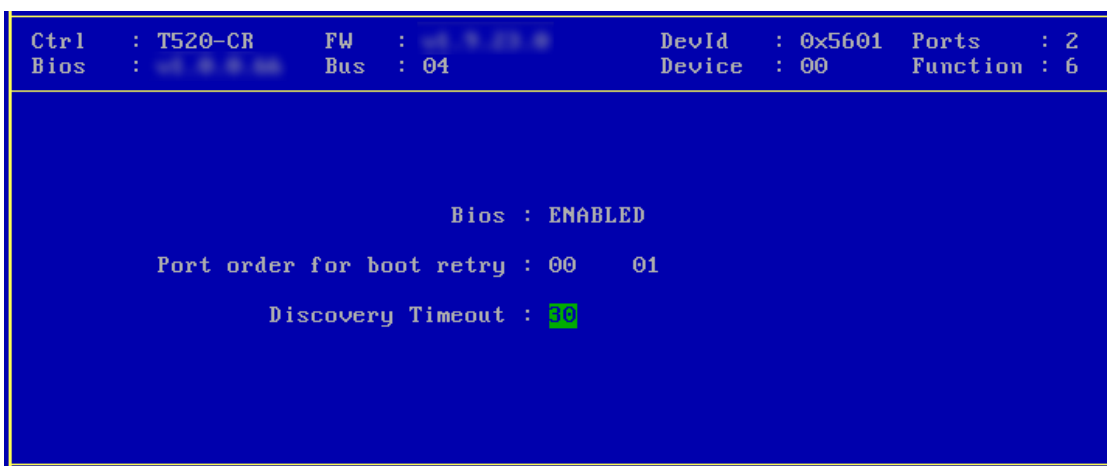
- vii. Enable FCoE BIOS if not already enabled.



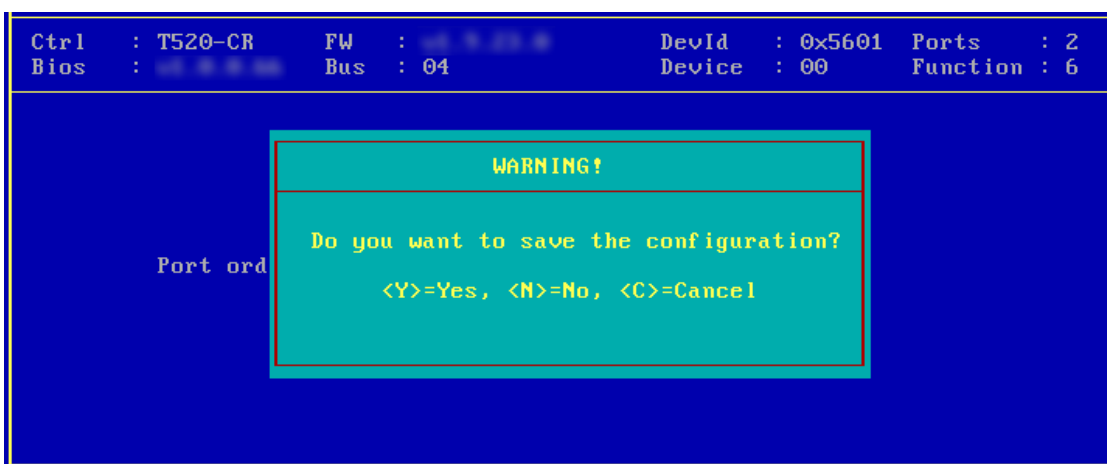
- viii. Choose the order of the ports to discover FCoE targets.



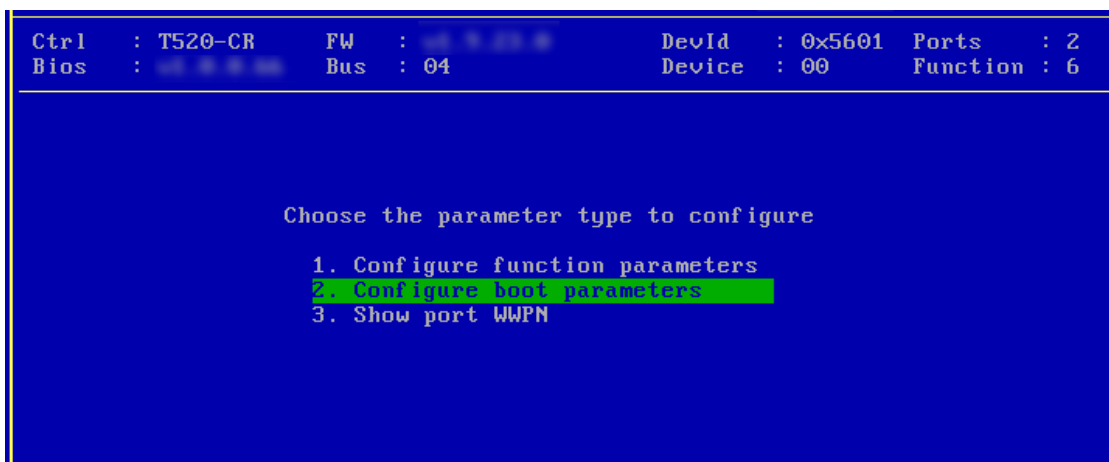
- ix. Set discovery timeout to a suitable value. Recommended value is  $\geq 30$ .



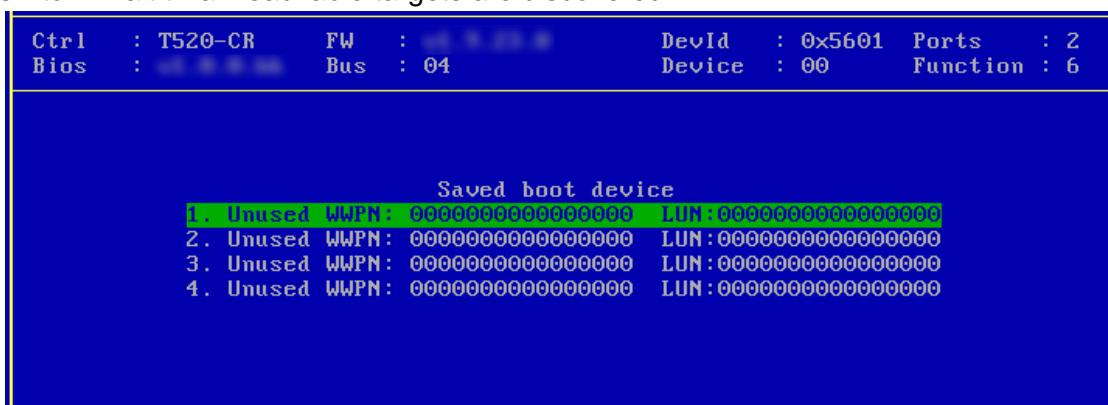
- x. Hit [F10] or [Esc] and then [Y] to save the configuration.



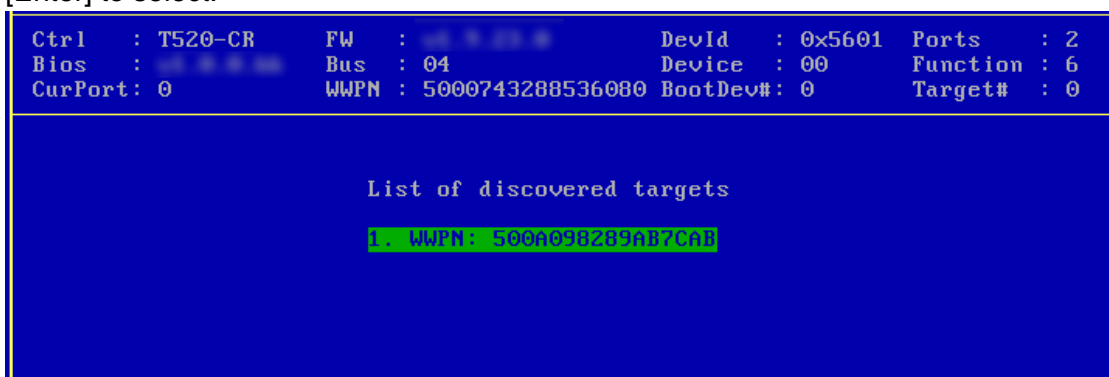
- xi. Choose **Configure boot parameters**.



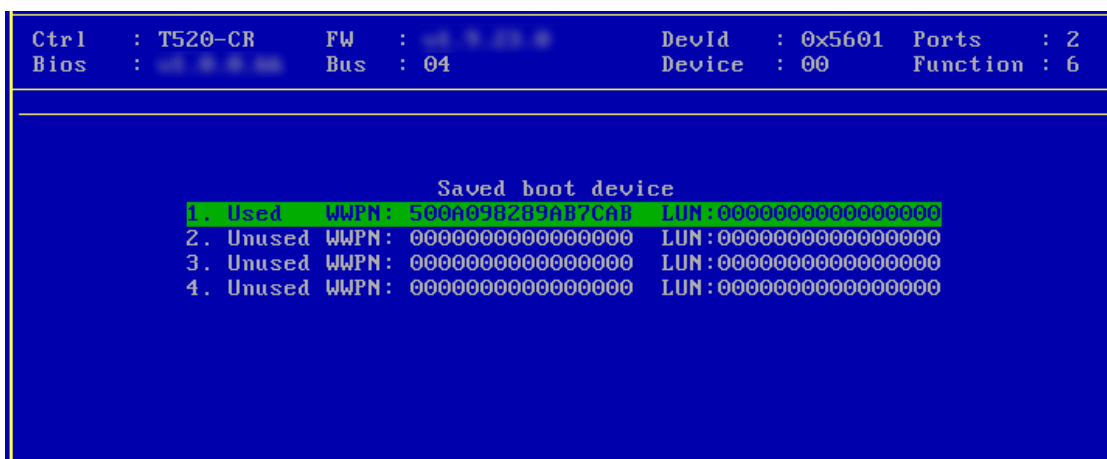
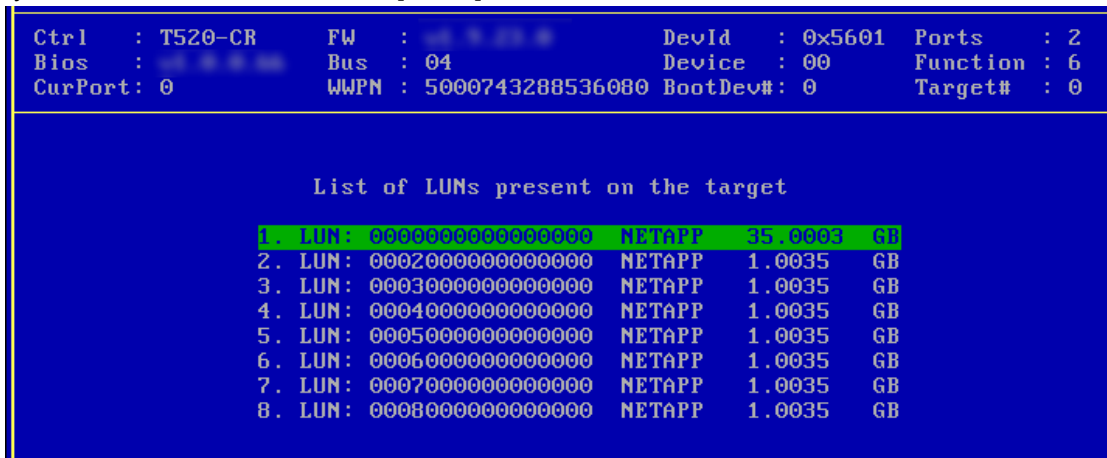
- xii. Select the first boot device and hit [Enter] to discover FC/FCoE targets connected to the switch. Wait till all reachable targets are discovered.



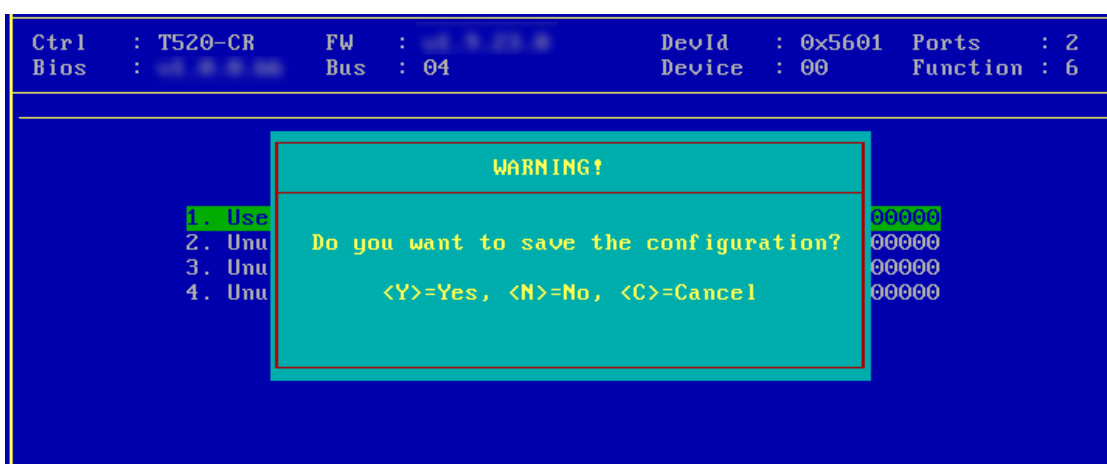
- xiii. List of discovered targets will be displayed. Highlight a target using the arrow keys and hit [Enter] to select.



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



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



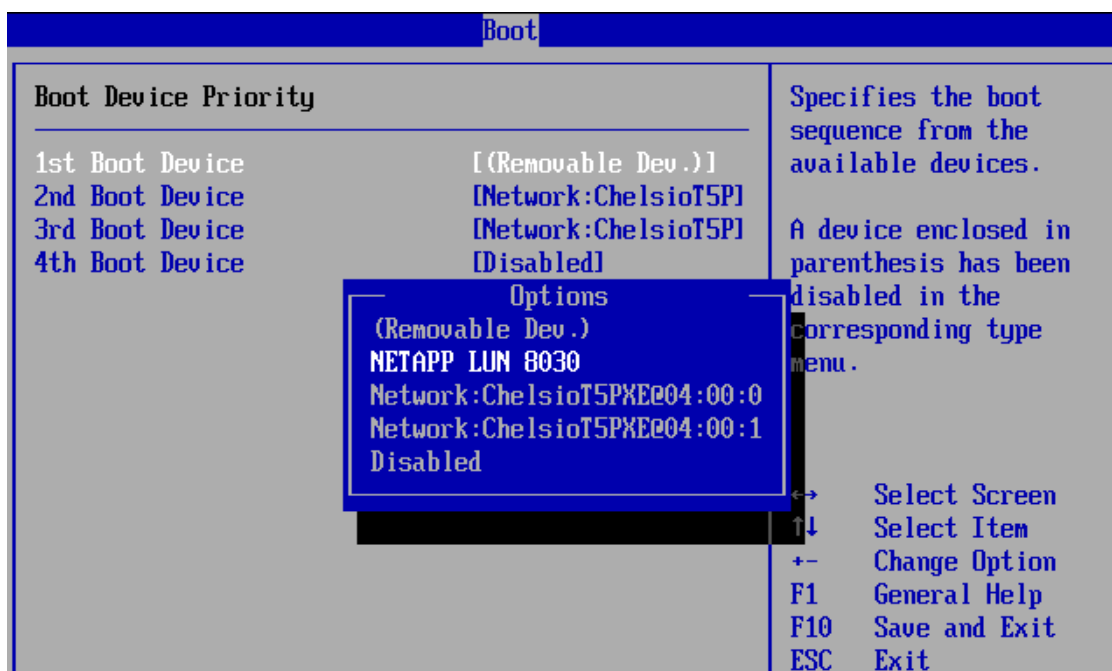
- xvi. Reboot the machine.



- xvii. During POST, allow the Chelsio Option ROM to 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!
```

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



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

## 7.2. uEFI FCoE Boot

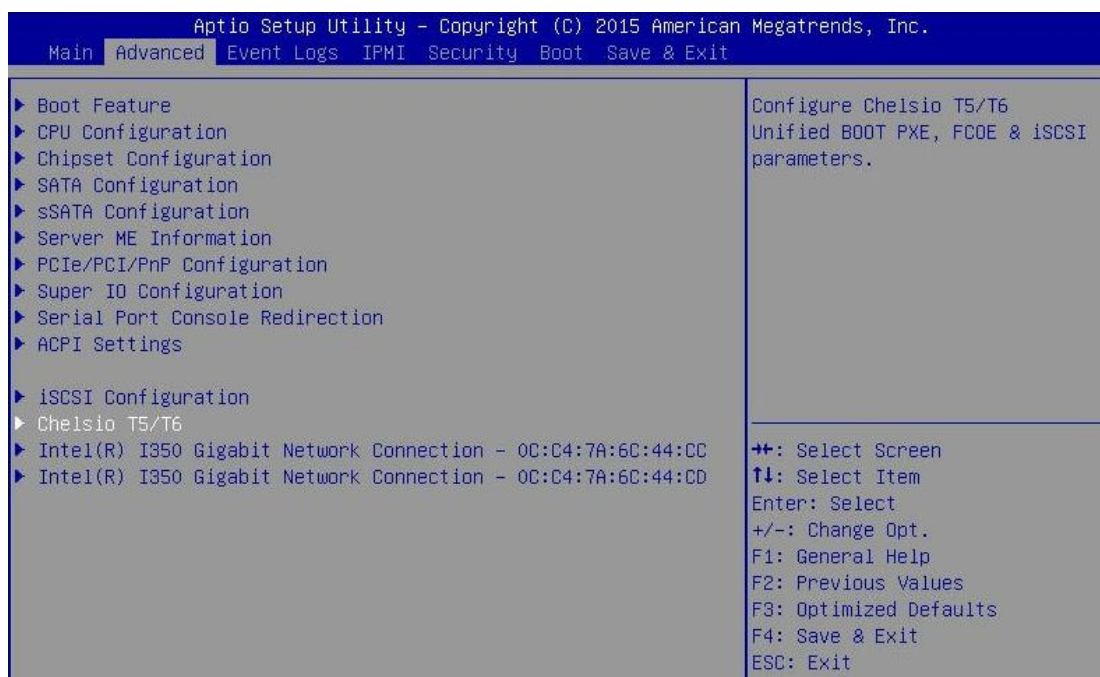
### Important

- Only uEFI v2.3.1, v2.4 and v2.5 supported.
- Any other uEFI version is NOT SUPPORTED and may render your system unusable.

### 7.2.1. HII

This section describes the method to configure and use Chelsio uEFI FCoE interfaces using HII.

- Reboot the system and go into BIOS setup.
- Select **Chelsio T5/T6** and press [Enter]



### Note

Please ensure that Chelsio uEFI driver is loaded correctly as mentioned in [Loading uEFI driver](#) section.

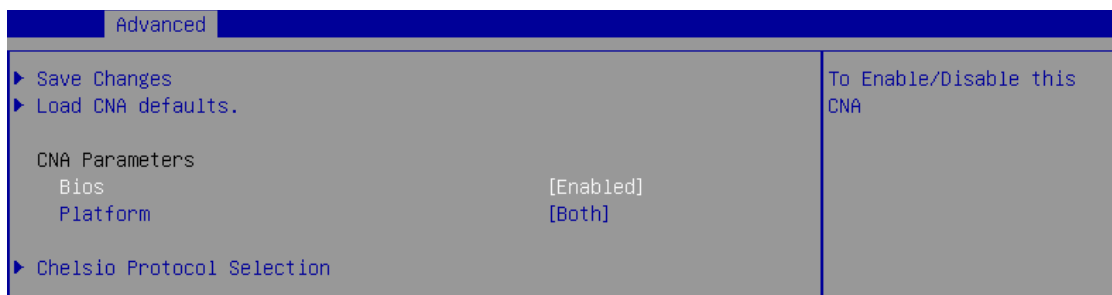
- Select the Chelsio adapter to be configured and press [Enter].



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

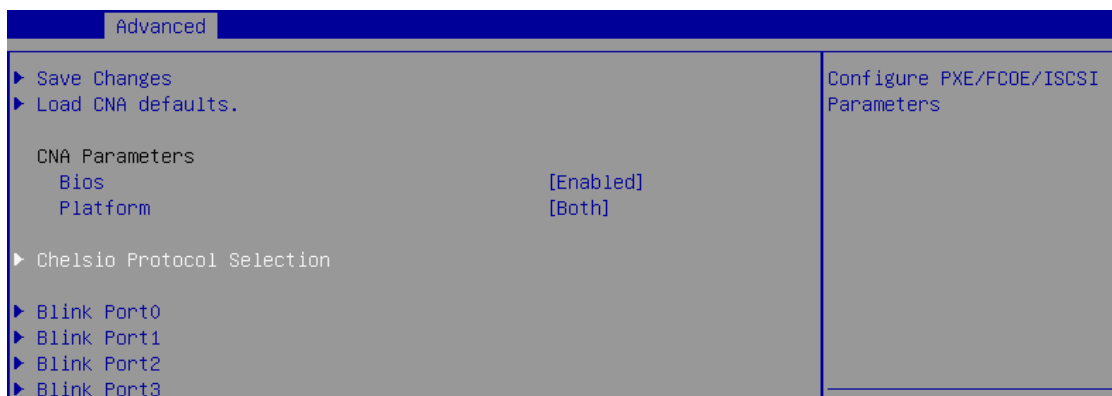


- v. Enable adapter BIOS if not already enabled.



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

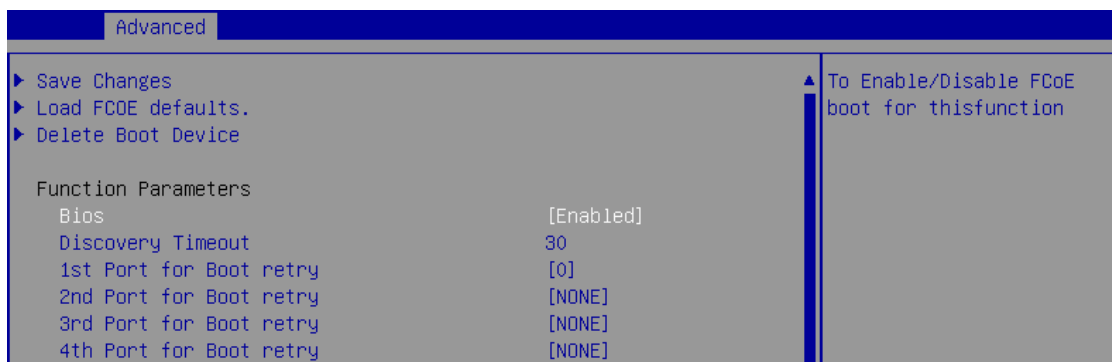
- vi. Select **Chelsio Protocol Selection** and press [Enter].



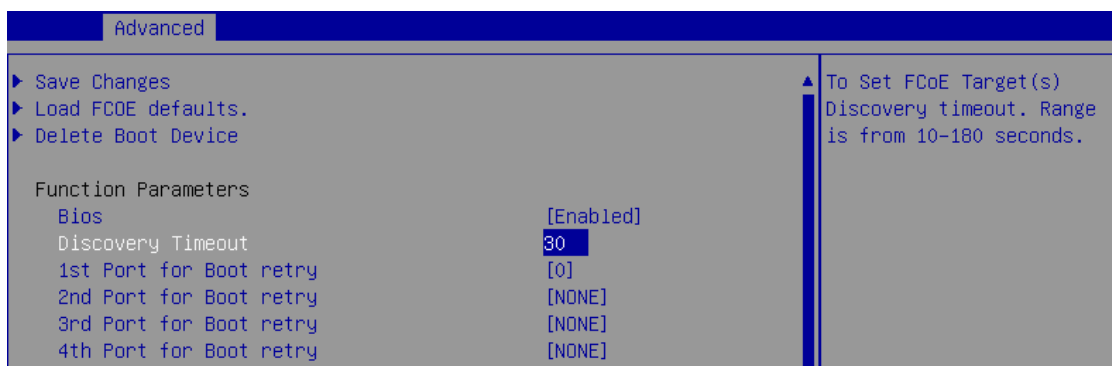
- vii. Select **FCoE** and press [Enter].



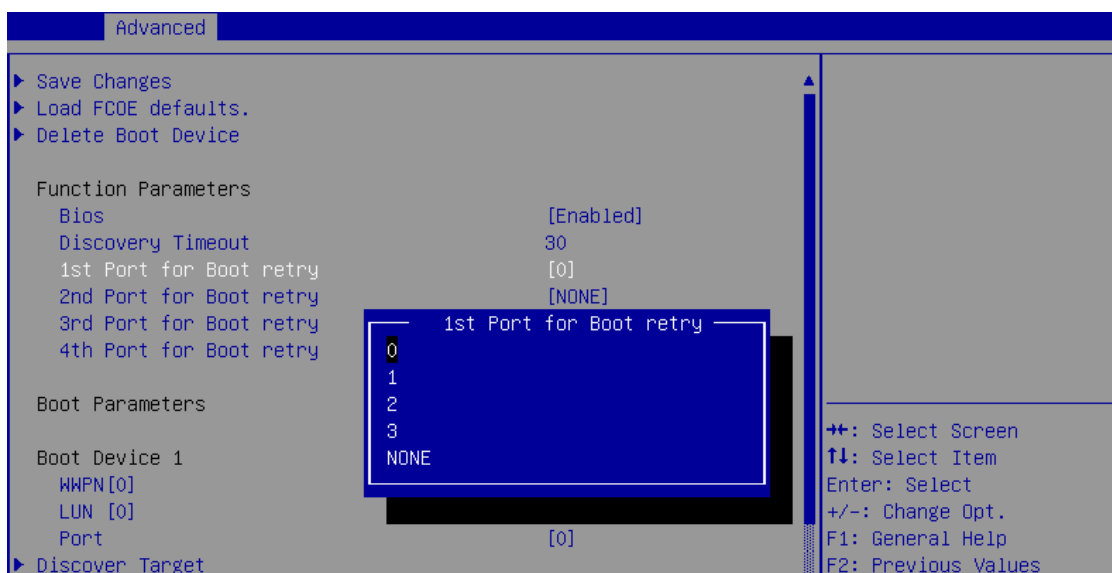
- viii. Under **Function Parameters**, enable FCoE BIOS, if not already enabled.



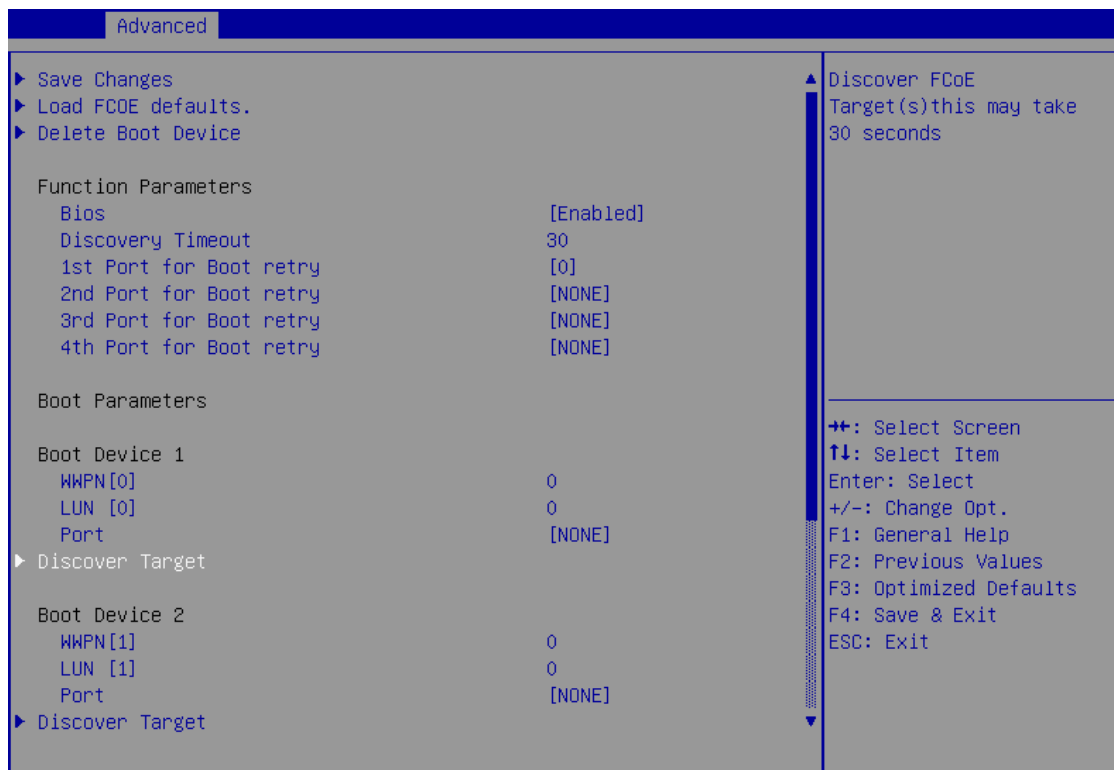
- ix. Set discovery timeout to a suitable value. Recommended value is  $\geq 30$



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



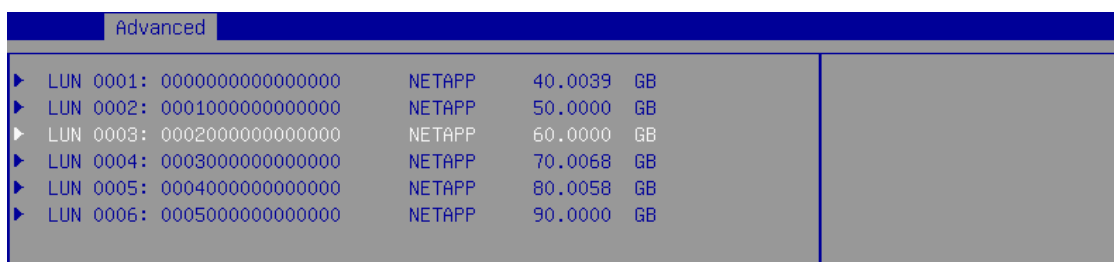
- xi. Under the first boot device, select **Discover Target** and press [Enter] to discover FC/FCoE targets connected to the switch. Wait till all reachable targets are discovered.



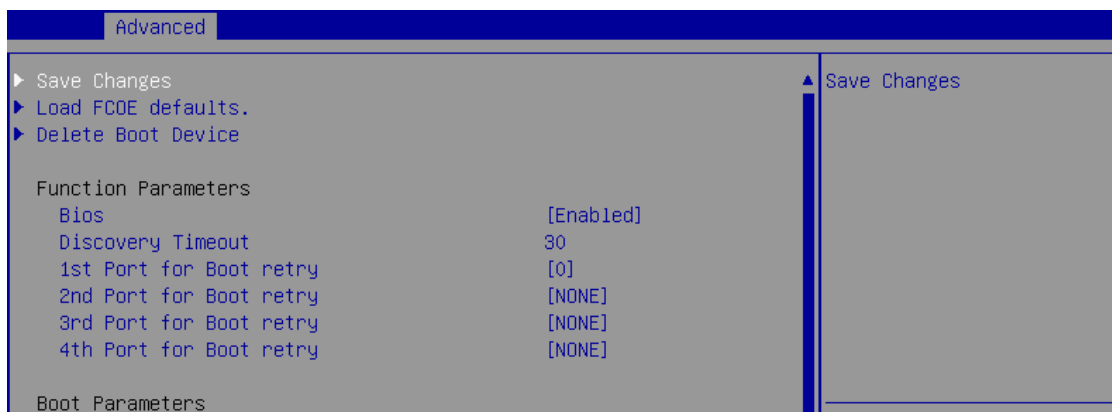
- xii. List of discovered targets will be displayed. Highlight a target to select it and hit [Enter].



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

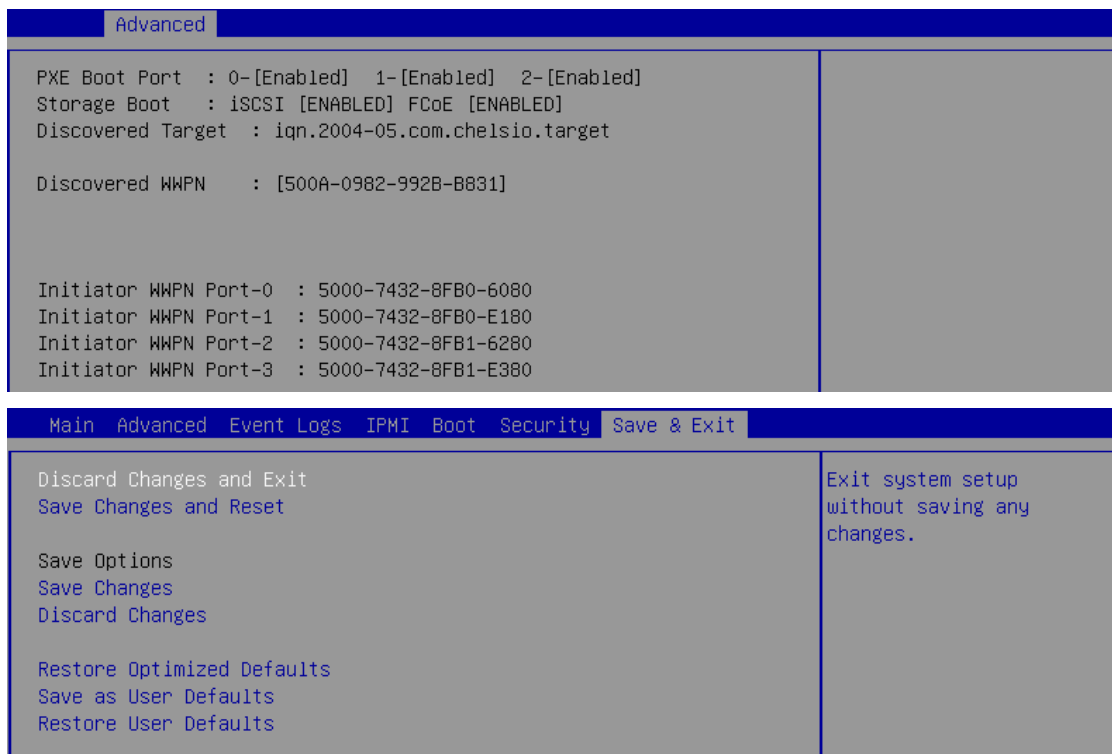


- xiv. Select **Save Changes** and press [Enter].



- 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.

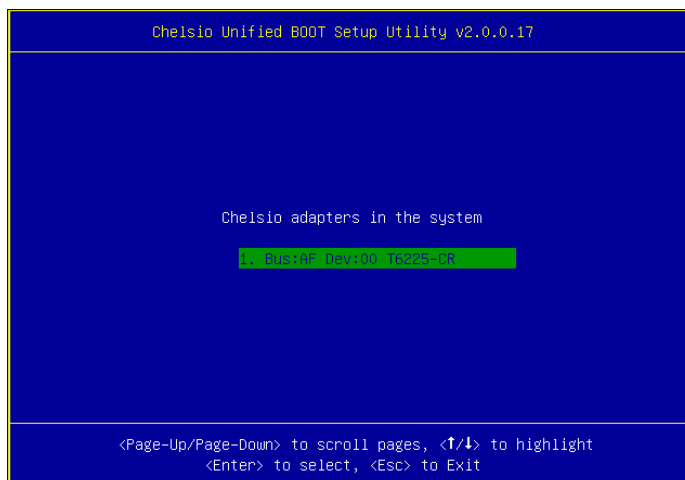
## 7.2.2. drvcfg

This section describes the method to configure and use Chelsio uEFI FCoE interfaces using drvcfg.

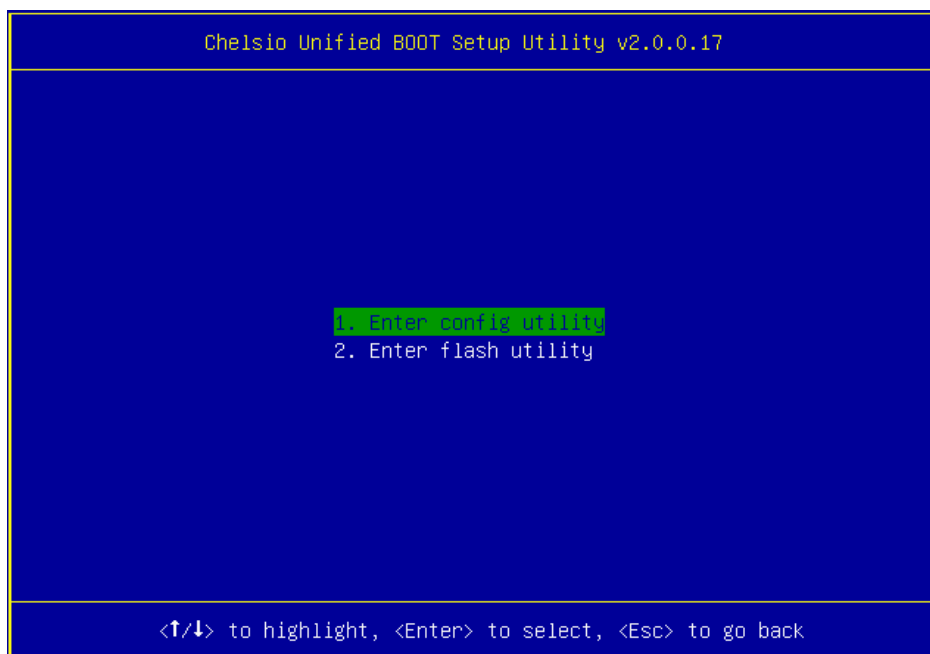
- i. Boot the system into EFI shell.
- ii. Run the following command to launch the configuration utility.

```
fs0:\> drvcfg -s_
```

- iii. Choose the Chelsio adapter on which needs to be configured.



- iv. Highlight **Enter config utility** and press [Enter].



- v. Further configuration steps are similar from step (iv) of [Legacy FCoE Boot](#) section.

## 8. iSCSI boot process

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

### 8.1. Legacy iSCSI boot

- i. Reboot the system.
- ii. Press [Alt+C] when the message to configure Chelsio adapters appears on the screen.

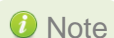
```
Chelsio Unified Boot BIOS
Copyright (C) 2003-2016 Chelsio Communications
Press <Alt-C> to Configure T5/T6 Card(s). Press <Alt-S> to skip BIOS.
```

- iii. The configuration utility will appear as below:



Choose the adapter on which you flashed the Option ROM image. Hit [Enter].

- iv. Enable the adapter BIOS if not already enabled. Hit [Enter].



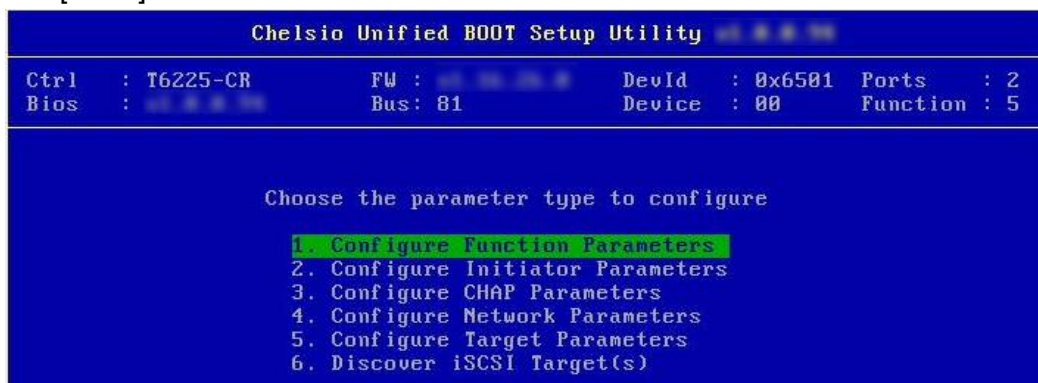
**Note** Use the default values for Boot Mode, EDD and EBDA Relocation parameters, unless instructed otherwise.



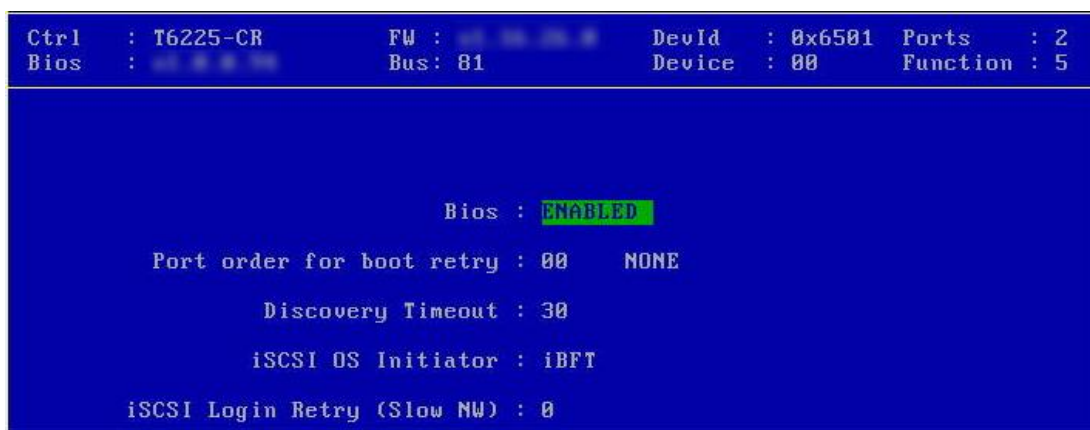
- v. Choose **iSCSI** from the list to configure and hit [Enter].



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



- vii. Enable iSCSI BIOS if not already enabled. Select the iSCSI OS Initiator based on the OS you are installing. iBFT (iSCSI Boot Firmware Table) will be selected by default.
- Linux: Only iBFT is supported.
  - Windows: Select CBFT to use Chelsio iSCSI Initiator, *cht4iscsi* during OS installation. If iBFT is selected, MS iSCSI Initiator will be used.
  - ESX: Select CBFT to use Chelsio iSCSI Initiator, *cheiscsi* during OS installation. If iBFT is selected, ESXi iSCSI Initiator will be used.

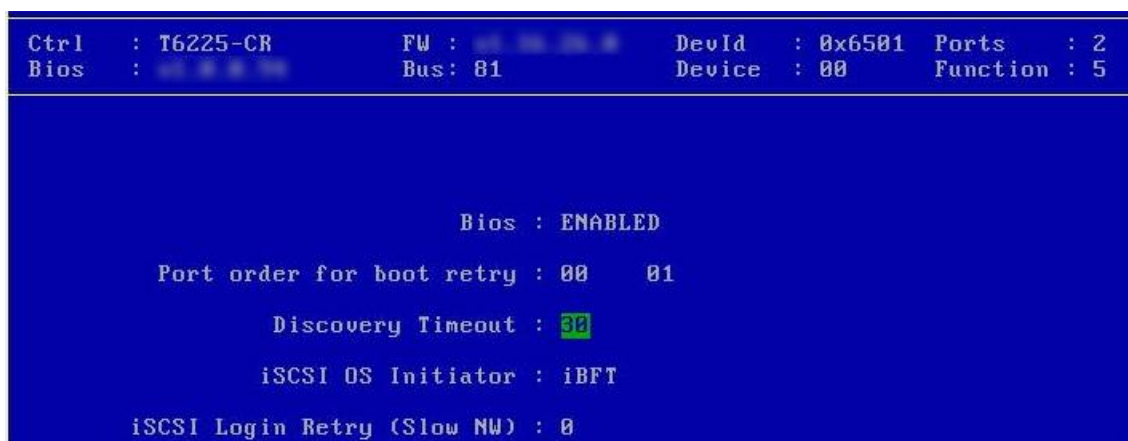


You can also configure the number of iSCSI login attempts (retries) in case the network is unreachable or slow.

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



- ix. Set discovery timeout to a suitable value. Recommended value is  $\geq 30$ .



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



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

```

Ctrl : T6225-CR      FW : 00.00.00.00      DevId  : 0x6501  Ports   : 2
Bios  : 00.00.00.00  Bus: 81          Device : 00      Function: 5

Choose the parameter type to configure

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)

```

- xii. 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.

```

Initiator IQN : .com.chelsio.boot:00074304B160
Header Digest : None
Data Digest   : None
InitialR2T    : No
ImmediateData : Yes
MaxOutstandingR2T : 1
DefaultTime2Wait : 20
DefaultTime2Retain : 20
FirstBurstLength : 65536
MaxBurstLength   : 262144

```

 **Note** *MaxBurstLength and FirstBurstLength range from 512 to 16777215 bytes.*

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

```

Ctrl : T6225-CR      FW : 00.00.00.00      DevId  : 0x6501  Ports   : 2
Bios  : 00.00.00.00  Bus: 81          Device : 00      Function: 5

Choose the parameter type to configure

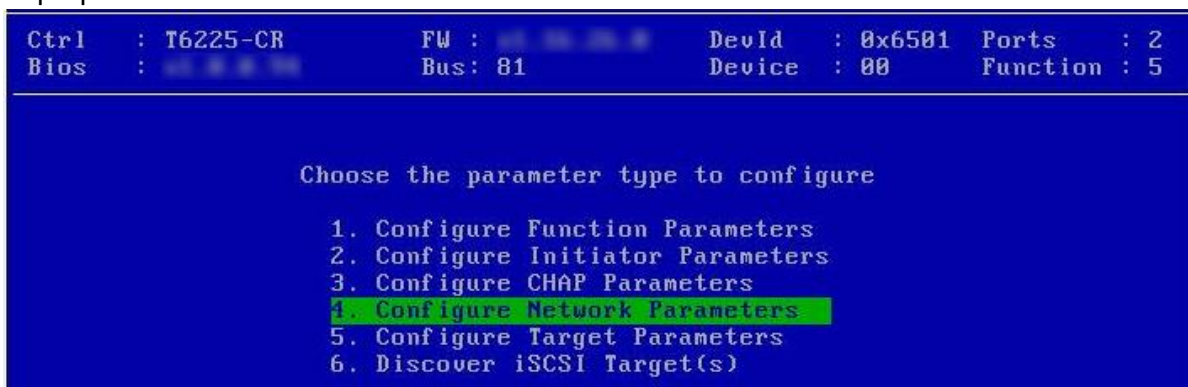
1. Configure Function Parameters
2. Configure Initiator Parameters
3. Configure CHAP Parameters
4. Configure Network Parameters
5. Configure Target Parameters
6. Discover iSCSI Target(s)

```

- xiv. Enable CHAP authentication by selecting ONE-WAY or MUTUAL in the **CHAP Policy** field. Next, choose the CHAP method. Finally, provide Initiator and Target CHAP credentials as per the authentication method selected. Hit [F10] to save.



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



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





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

Ctrl	: T6225-CR	FW	: 10.10.10.10	DevId	: 0x6501	Ports	: 2
Bios	: 10.10.10.10	Bus	: 81	Device	: 00	Function	: 5

Port 0 network parameter configuration

VLAN ID : 0  
 IP Version : IPV4  
 Enable DHCP : No  
 IP address : 102.80.80.92  
 Subnet mask : 255.255.255.0  
 Gateway : 0.0.0.0  
 Ping IP address : 0.0.0.0  
 Ping IP

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

Ctrl	: T6225-CR	FW	: 10.10.10.10	DevId	: 0x6501	Ports	: 2
Bios	: 10.10.10.10	Bus	: 81	Device	: 00	Function	: 5

Choose the parameter type to configure

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)

- xix. 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.

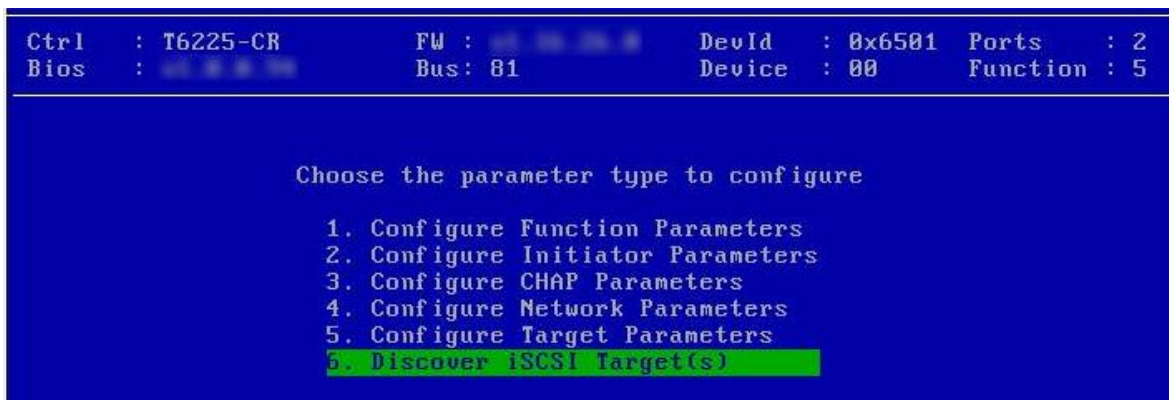
Ctrl	: T6225-CR	FW	: 10.10.10.10	DevId	: 0x6501	Ports	: 2
Bios	: 10.10.10.10	Bus	: 81	Device	: 00	Function	: 5

Discover Boot Target via DHCP : No

Target IP Version : IPV4  
 Target IP address : 102.80.80.106  
 Target TCP port : 3260

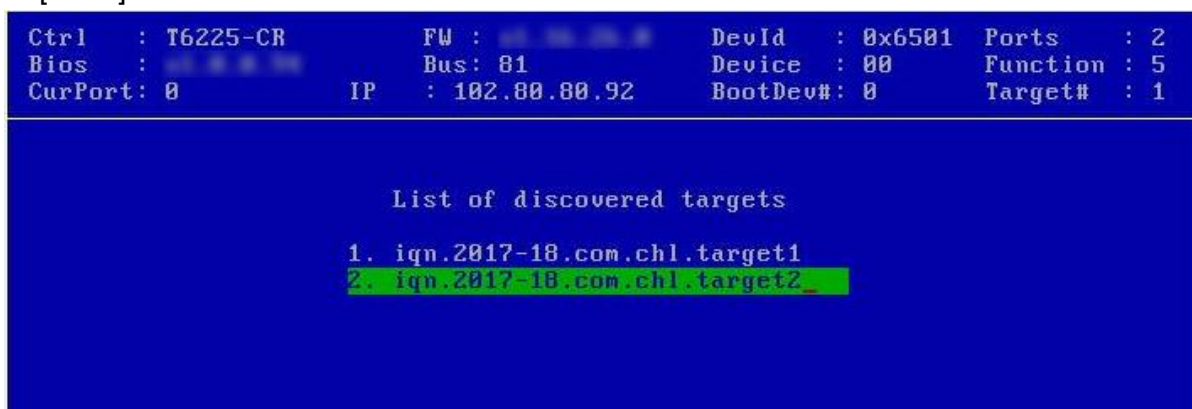
xx. Go back and choose **Discover iSCSI Target (s)** to connect to a target.



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



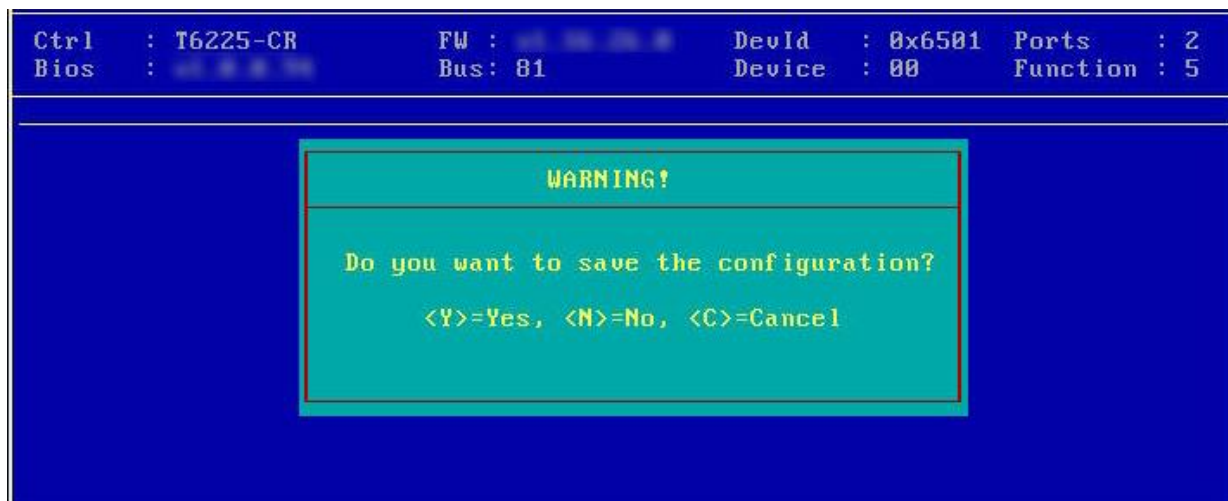
xxii. A list of available targets will be displayed. Select the target you wish to connect to and hit [Enter].



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

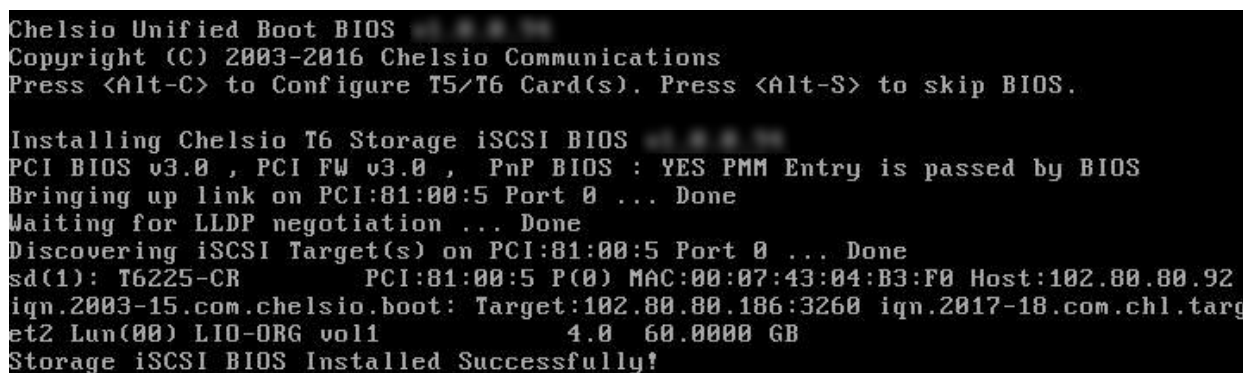


xxiv. Hit [Esc] and then [Y] to save the configuration.

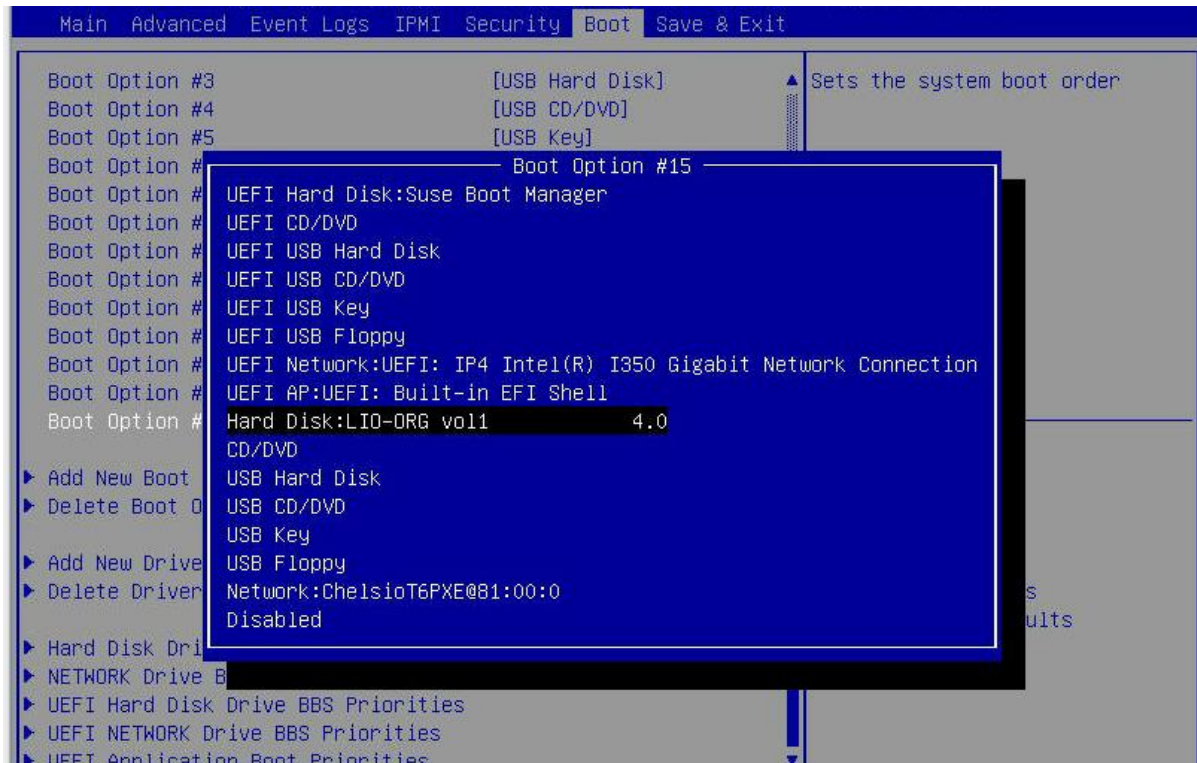


xxv. Reboot the machine.

xxvi. During POST, allow the Chelsio Option ROM to discover iSCSI targets.



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



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

## 8.2. uEFI iSCSI Boot

### Important

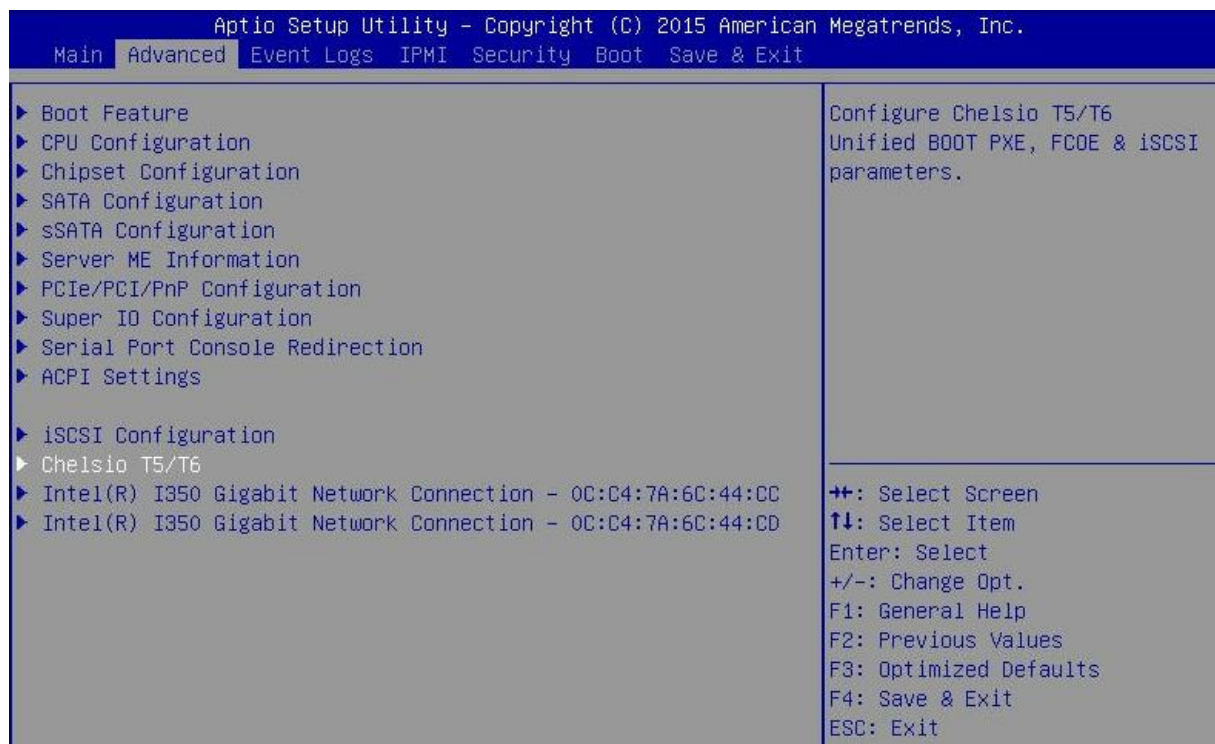
- Only uEFI v2.3.1, v2.4 and v2.5 supported.
- Any other uEFI version is NOT SUPPORTED and may render your system unusable.

### 8.2.1. HII

This section describes the method to configure and use Chelsio uEFI iSCSI interfaces using HII.

- Reboot the system and go into BIOS setup.
- Select **Chelsio T5/T6** and press [Enter]





**Note** Please ensure that Chelsio uEFI driver is loaded correctly as mentioned in [Loading uEFI driver](#) section.

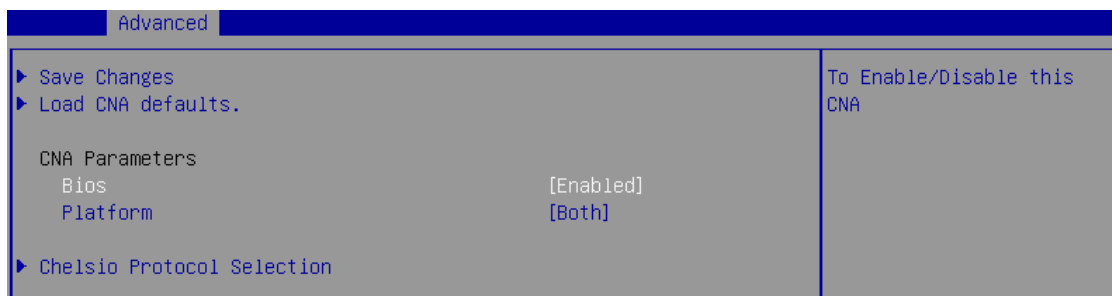
iii. Select the Chelsio adapter to be configured and press [Enter].



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

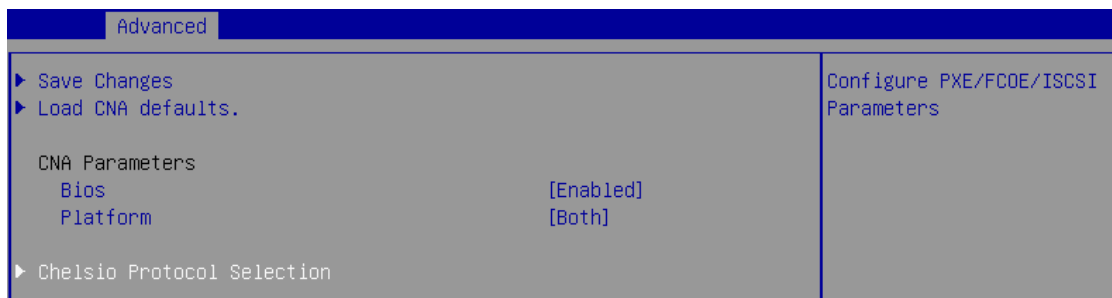


- v. Enable adapter BIOS if not already enabled.

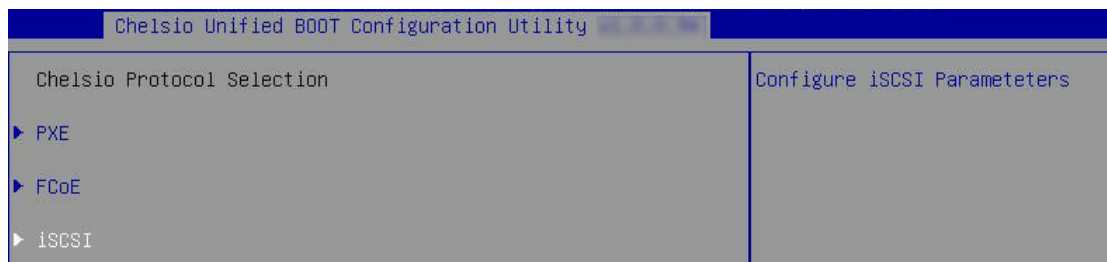


**Note** *It is highly recommended that you use the **Save Changes** option every time a parameter/option is changed.*

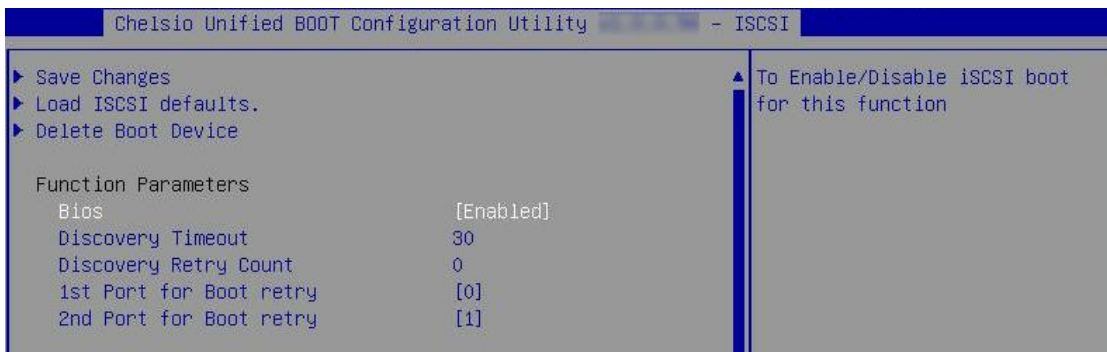
- vi. Select **Chelsio Protocol Selection** and press [Enter].



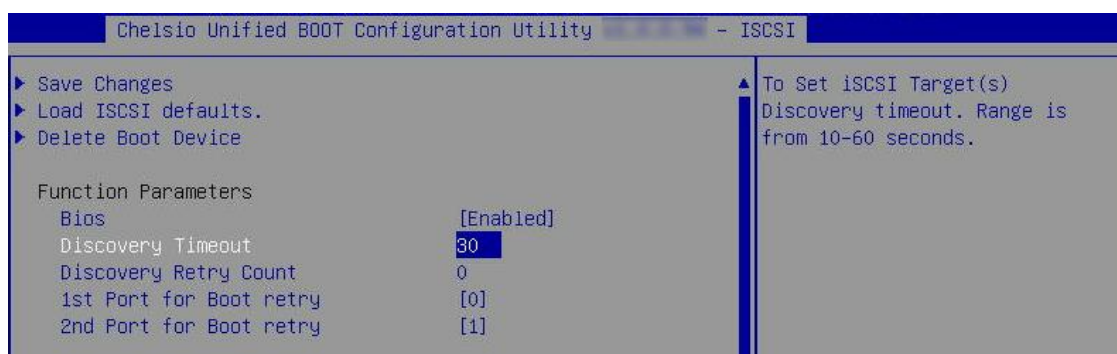
- vii. Select **iSCSI** and press [Enter].



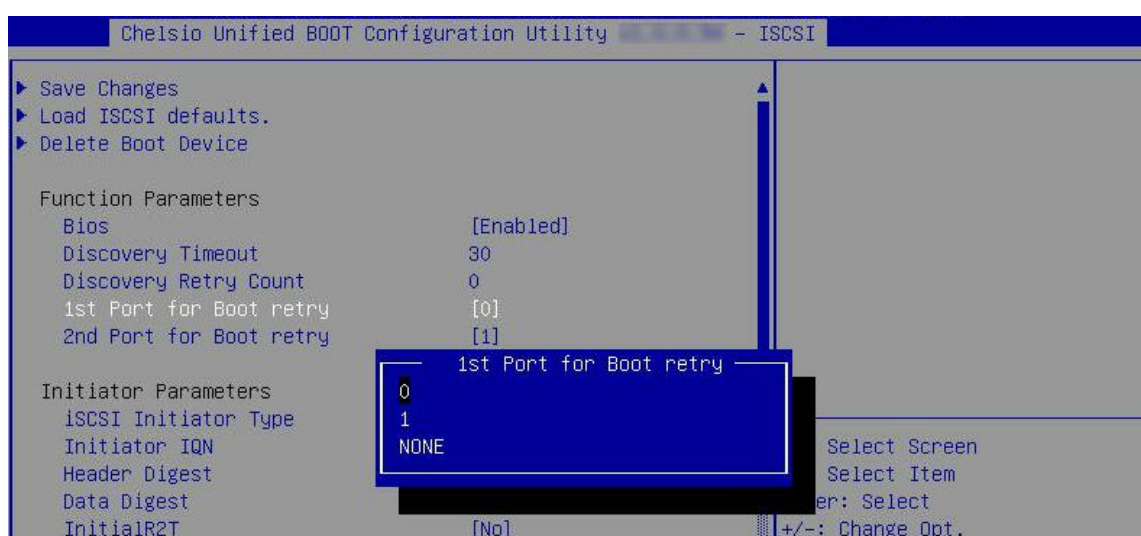
- viii. Under **Function Parameters**, enable iSCSI BIOS, if not already enabled.



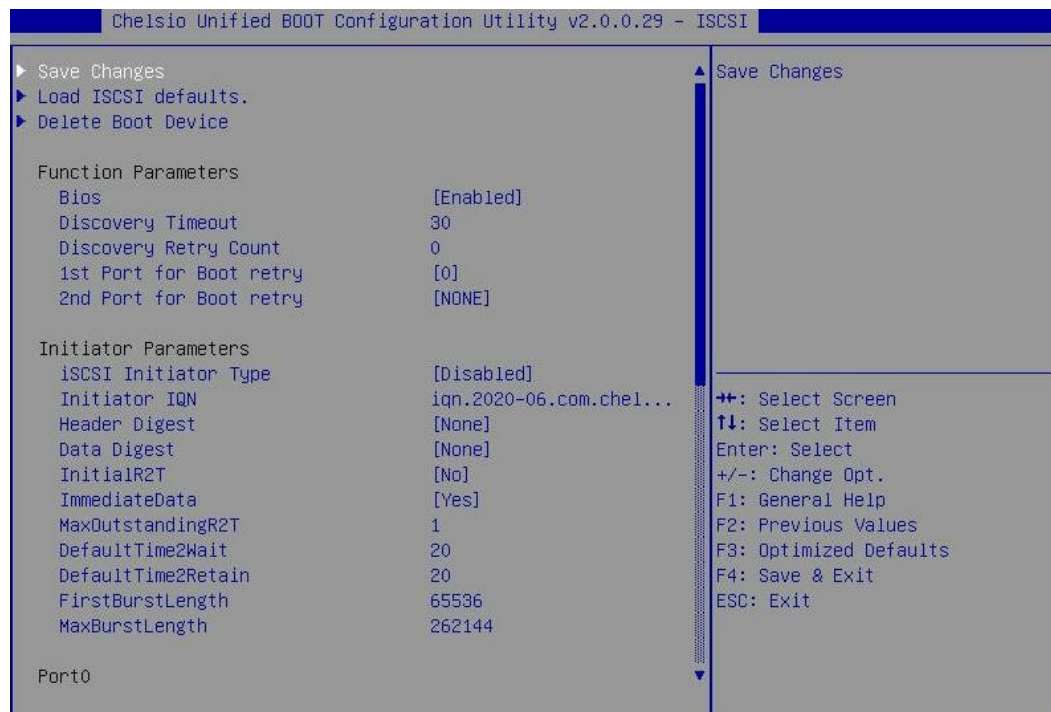
- ix. Set discovery timeout to a suitable value. Recommended value is  $\geq 30$



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

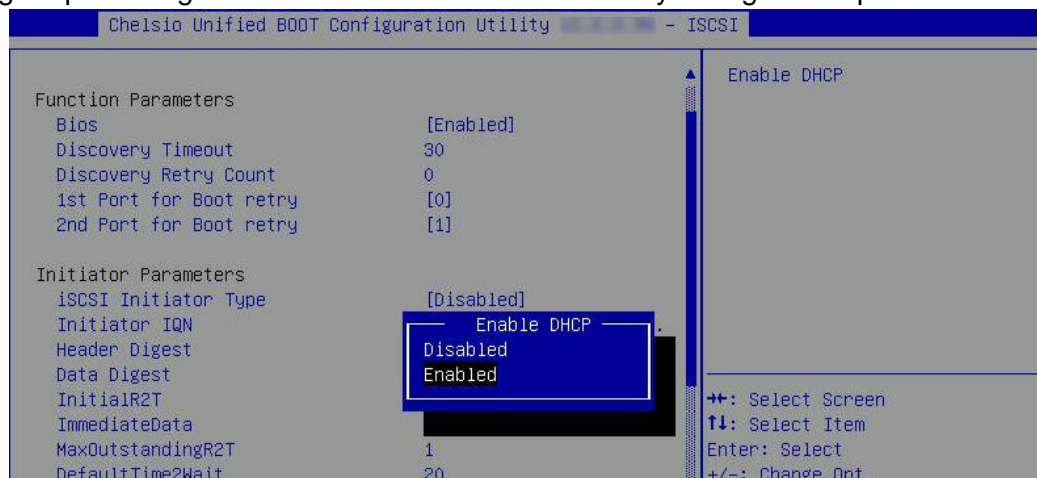


- xi. Under **Initiator Parameters**, iSCSI Initiator properties like IQN, Header Digest, Data Digest, etc will be displayed. Change the values appropriately or continue with the default values.

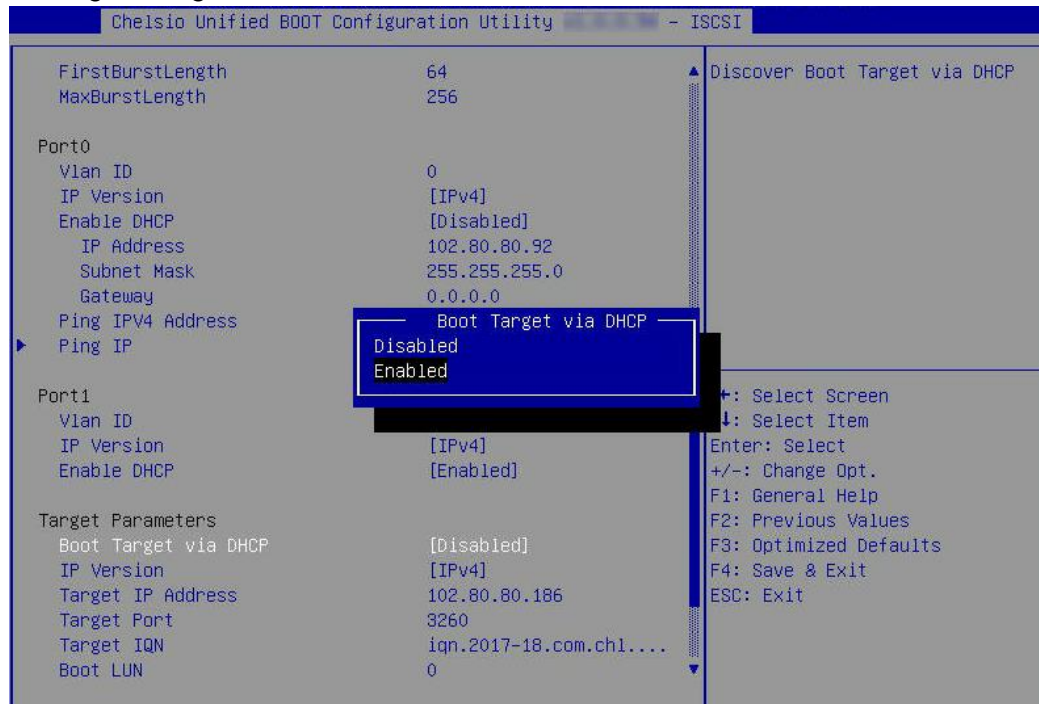


**Note** *MaxBurstLength and FirstBurstLength range from 512 to 16777215 bytes.*

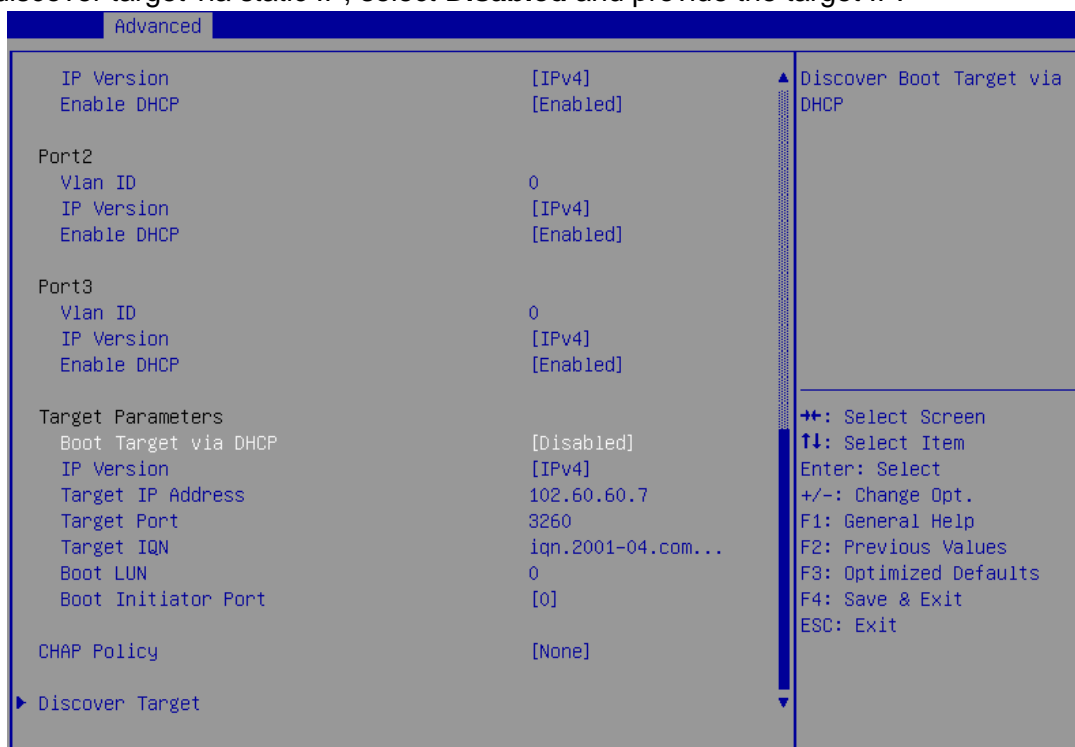
- xii. Under the first port, select **Enable DHCP** field, hit [Enter] and select **Enabled**. This will configure port using DHCP. Select **Disabled** to manually configure the port.



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

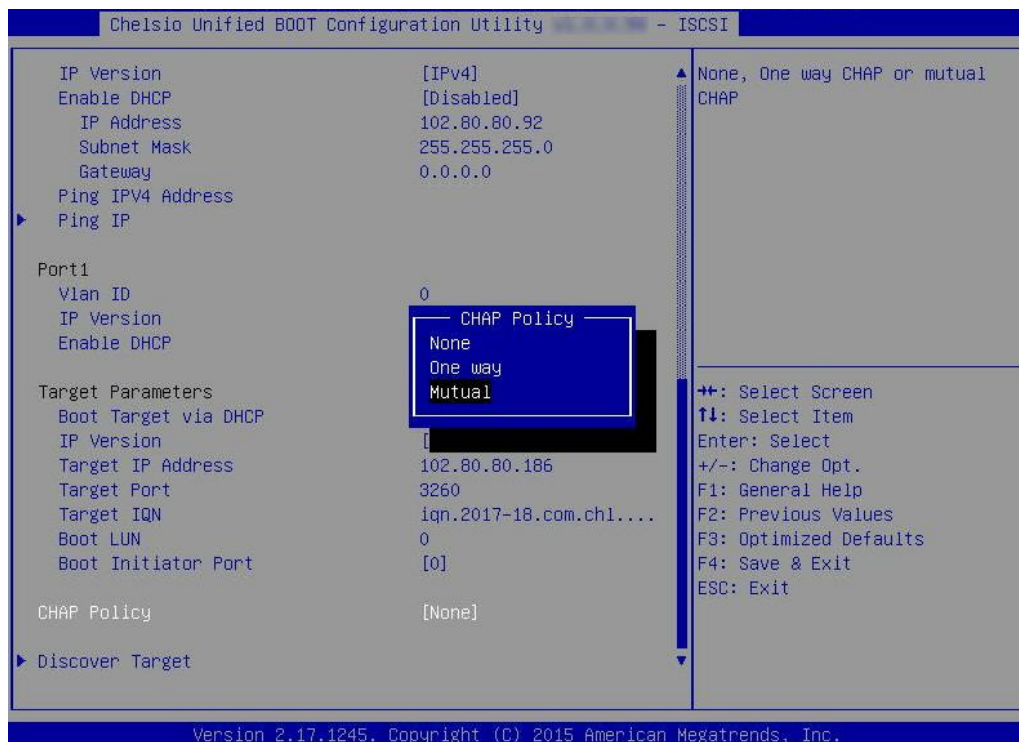


To discover target via static IP, select **Disabled** and provide the target IP.

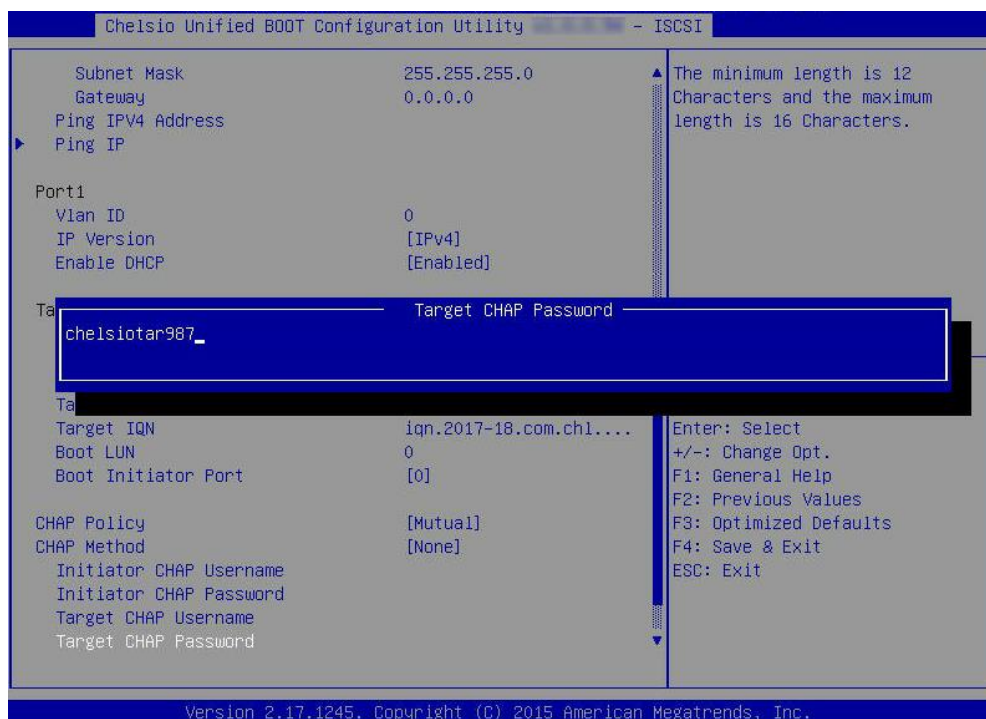




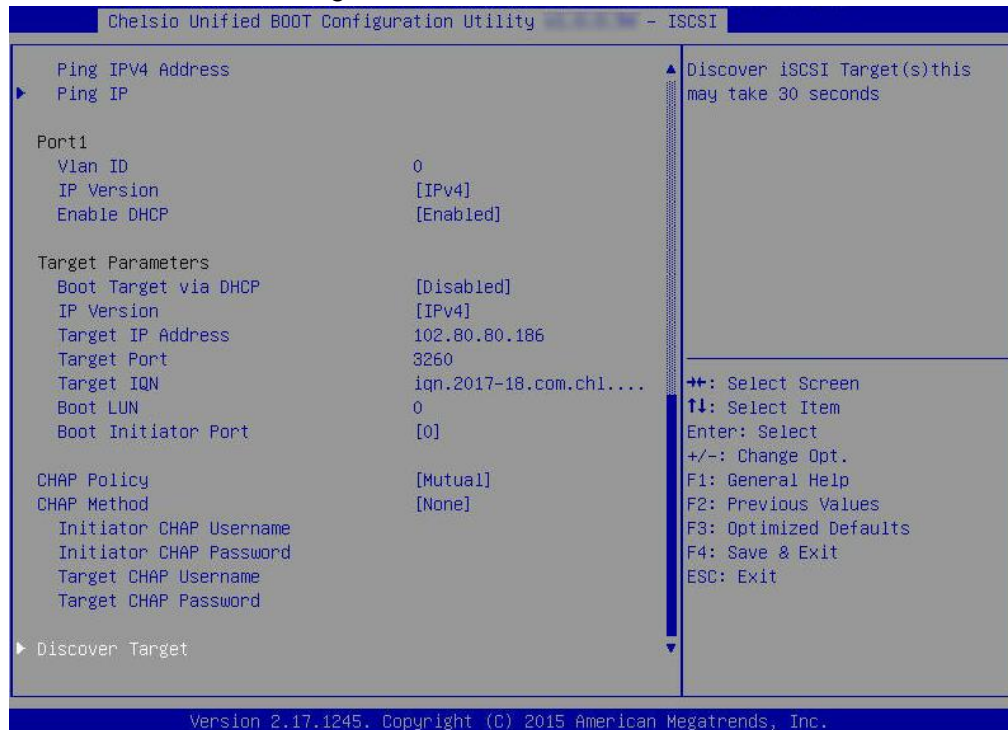
- xiv. CHAP authentication is disabled by default. To enable and configure, highlight **CHAP Policy** and hit [Enter]. Select the policy type from the corresponding pop-up and hit [Enter] again.



- xv. Provide Initiator and Target CHAP credentials as per the the CHAP policy selected.



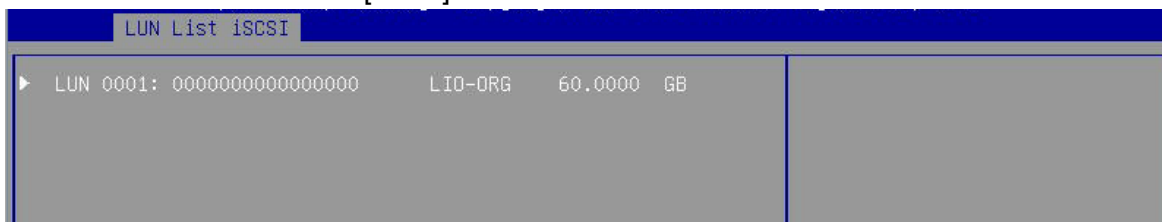
- xvi. Select **Discover Target** and press [Enter] to discover iSCSI targets connected to the switch. Wait till all reachable targets are discovered.



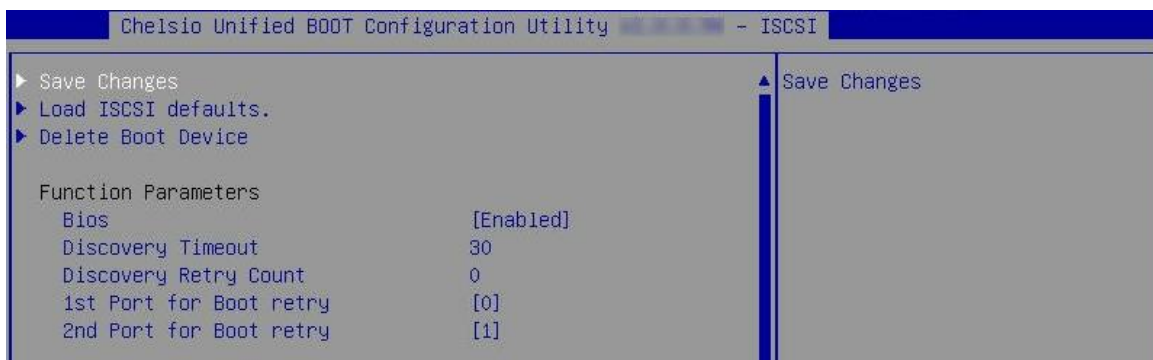
- xvii. A list of available targets will be displayed. Select the target you wish to connect to and hit [Enter].



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

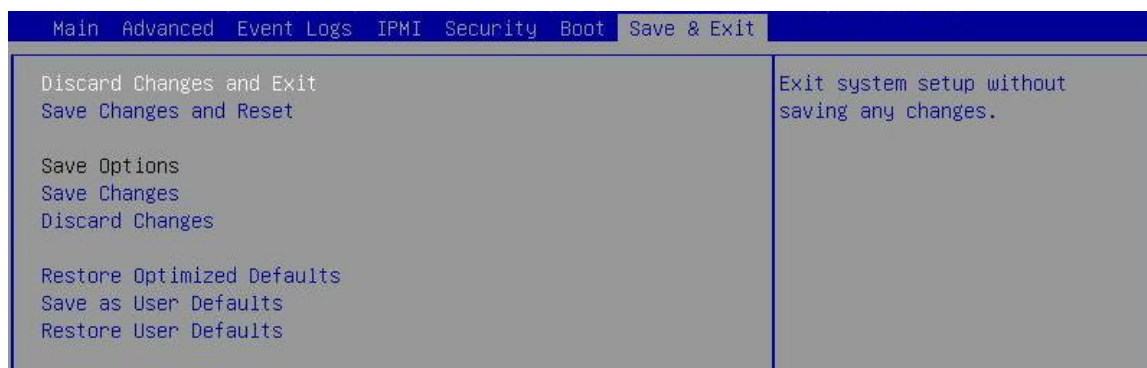
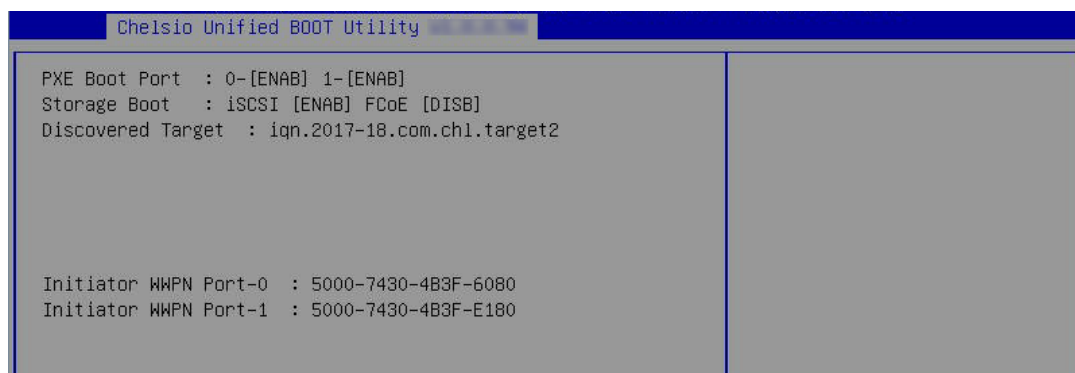


xix. Select **Save Changes** and press [Enter]



xx. Reboot the system for changes to take effect.

xxi. The discovered LUN should appear in the **Boot Configuration/ Boot Information** 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.



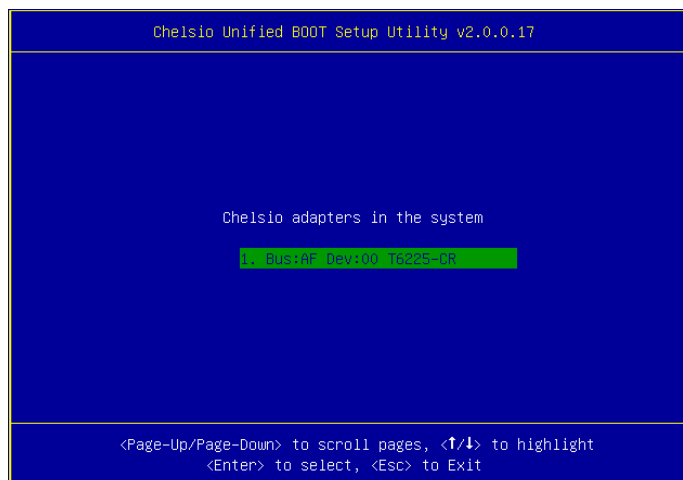
### 8.2.2. drvcfg

This section describes the method to configure and use Chelsio uEFI iSCSI interfaces using drvcfg.

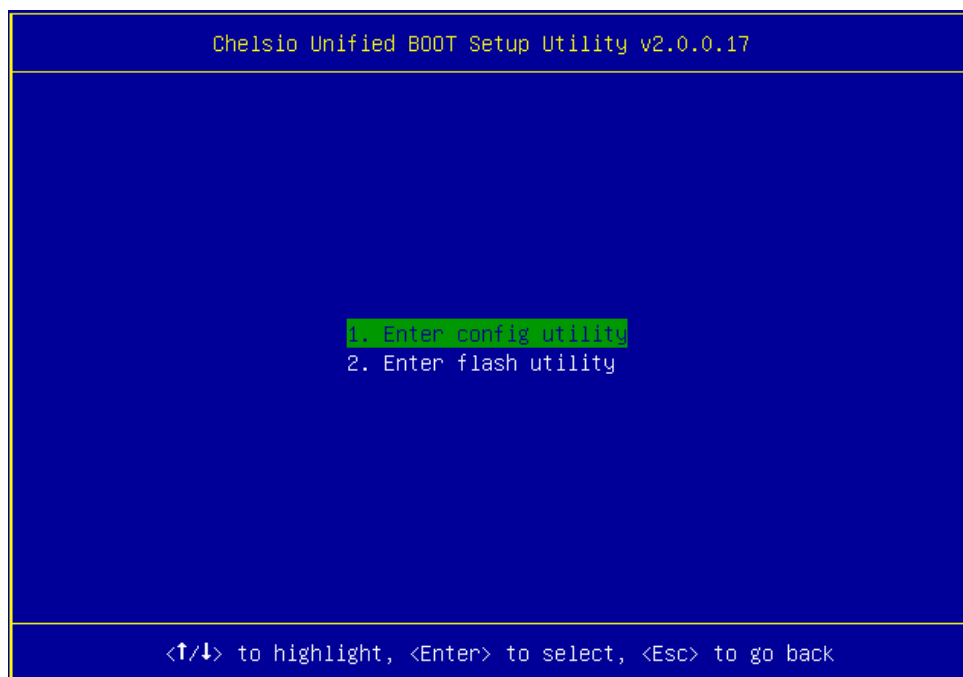
- i. Boot the system into EFI shell.
- ii. Run the following command to launch the configuration utility.

```
fs0:\> drvcfg -s_
```

- iii. Choose the Chelsio adapter on which needs to be configured.



- iv. Highlight **Enter config utility** and press [Enter].



- v. Further configuration steps are similar from step (iv) of [Legacy iSCSI Boot](#) section.

## 9. iPXE

iPXE is the leading, free, open source network boot firmware. It provides a full PXE implementation enhanced with additional features such as boot from a web server via HTTP, automating boot commands etc. The following are supported:

- TFTP Boot – Legacy & uEFI
- HTTP Boot – uEFI
- Linux (RHEL 9.2), Windows (10 Client, Server 2019/2022)
- Chainload into iPXE

### 9.1. Configuring iPXE Server for Linux OS Installation

Before proceeding, please ensure that the Linux iPXE Server is configured for [TFTP boot](#) or [HTTP boot](#). Follow the below steps to chainload iPXE.

- i. Clone the iPXE repo.

```
[root@server ~]# git clone https://github.com/ipxe/ipxe
[root@server ~]# cd ipxe
[root@server ipxe]# git checkout 06e229590c6e94c1dd8606a374714f7cfc50241a
```

- ii. Build the code to generate *undionly.kpxe* for Legacy or *ipxe.efi* for uEFI modes.

#### Legacy:

```
[root@server ipxe]# cd src
[root@server src]# make bin/undionly.kpxe
```

#### uEFI:

```
[root@server ipxe]# cd src
[root@server src]# make bin-x86_64-efi/ipxe.efi
```

- iii. Copy the generated files to TFTP or HTTP server directories.

#### Legacy TFTP:

```
[root@server ~]# mkdir -p /var/lib/tftpboot/ipxe
[root@server ~]# cp undionly.kpxe /var/lib/tftpboot/ipxe/.
```

#### uEFI TFTP:

```
[root@server ~]# mkdir -p /var/lib/tftpboot/ipxe
[root@server ~]# cp ipxe.efi /var/lib/tftpboot/ipxe/.
```

**uEFI HTTP:**

```
[root@server ~]# mkdir -p /var/www/ipxe
[root@server ~]# cp ipxe.efi /var/www/ipxe/.
```

- iv. Update the dhcp server configuration file */etc/dhcp/dhcpd.conf*

**Legacy/uEFI TFTP:**

```
option client-architecture code 93 = unsigned integer 16;
if exists user-class and option user-class = "iPXE" {
    filename "http://101.1.1.66/boot.php";
} elseif option client-architecture = 00:00 {
    filename "ipxe/undionly.kpxe";
} else {
    filename "ipxe/ipxe.efi";
}
```

**uEFI HTTP:**

```
if option client-architecture = encode-int ( 16, 16 ) {
    option vendor-class-identifier "HTTPClient";
    filename "http://101.1.1.66/ipxe/ipxe.efi";
} else {
    filename "http://101.1.1.66/boot.php";
}
```

- v. Extract the OS installation DVD and copy *initrd.img* and *vmlinux* to the required http path.
- vi. Configure *boot.php* with the iPXE commands.

```
[root@server ~]# vim /var/www/boot.php
#!/ipxe
set base http://101.1.1.66/RHEL92/

prompt -k 0x197e -t 10000 Press F12 to install RHEL9.2... || exit

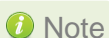
:start
menu Welcome to Chelsio iPXE Boot Menu

item Install_RHEL_9_2 RHEL 9.2 Installation

choose --default Install_RHEL_9_2 --timeout 30000 target && goto ${target}
##### Menu Items #####

:Install_RHEL_9_2
kernel ${base}/images/pxeboot/vmlinux fastboot initrd=initrd.img
inst.repo=${base}
initrd ${base}/images/pxeboot/initrd.img
boot

goto start
```



**Note** The above configurations are provided for example purposes only. Please update them based on your environment. For more information, please refer to [iPXE documentation](#).

## 9.2. Configuring iPXE Server for Windows OS Installation

Before proceeding, please ensure that the Linux iPXE Server is configured for [TFTP boot](#) or [HTTP boot](#).

- i. Follow the steps i to iv of [Configuring iPXE Server for Linux OS installation](#).
- ii. Generate the Windows PE installation files using the steps from [Microsoft Article](#).
- iii. Copy the WinPE folder to http root path of the iPXE Server (/var/www/).
- iv. Download the latest *wimboot* binary to the WinPE folder.

```
[root@server ~]# cd /var/www/winpe/amd64
[root@server amd64]# wget
https://github.com/ipxe/wimboot/releases/latest/download/wimboot
```

 **Note** To use older/different versions of *wimboot*, download from [iPXE Wimboot](#).

- v. Configure *winpe.php* with the iPXE commands.

```
#!/ipxe

set base http://101.1.1.66/winpe/amd64

prompt -k 0x197e -t 10000 Press F12 to install Windows Operating System...
|| exit

:start

menu Welcome to Chelsio iPXE Boot Menu

item Install_WIN_22 Win 2022 Installation

choose --default Install_WIN_22 --timeout 30000 target && goto ${target}

:Install_WIN_22

kernel ${base}/wimboot
initrd ${base}/install.bat install.bat
initrd ${base}/winpeshl.ini winpeshl.ini
initrd ${base}/media/Boot/BCD BCD
initrd ${base}/media/Boot/boot.sdi boot.sdi
initrd ${base}/media/sources/boot.wim boot.wim

boot

goto start
```

- vi. Create *winpeshl.ini* file and *install.bat* files.

```
[root@server amd64]# cat winpeshl.ini
[LaunchApps]
"install.bat"
```

```
[root@aqua2 amd64]# cat install.bat
wpeinit
net use z: \\101.1.1.76\extracted_2022 /user:administrator <password>
z:
setup.exe
```

*install.bat* points to the ISO extracted SMB share.

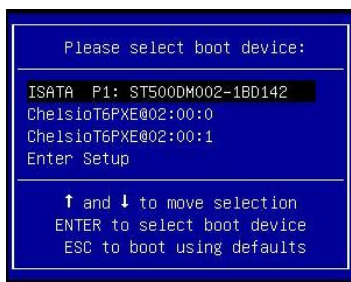
## 9.3. Legacy iPXE TFTP Boot

Before proceeding, please ensure that the Chelsio adapter on the client machine has been flashed with the provided firmware, Option ROM, and boot configuration (See [Flashing Firmware and Option ROM](#)).

### 9.3.1. Linux OS Installation

- i. Reboot the system and go into the BIOS Boot Manager. *Chelsio PXE* device should be listed. Select it and press ENTER.

If it is not listed, please follow the instructions in [Legacy PXE Boot](#) section.



```
Chelsio UNDI, PXE-v2.0.0.47
Copyright (C) 2003-2016 Chelsio Communications
Copyright (C) 1997-2008 Intel Corporation

PCI Bus:Dev:Fn = 02000
VLAN Disabled

Initializing link in port:0 Done

CLIENT MAC ADDR: 00 07 43 04 AE 80 GUID: 00000000-0000-0000-0000-0CC47A6C6F8E
CLIENT IP: 101.1.1.50 MASK: 255.255.255.0 DHCP IP: 101.1.1.66
PXE->EB: !PXE at 95B8:0060, entry point at 95B8:00FA
        UNDI code segment 95B8:3E88, data segment 8AA2:B160 (554-615kB)
        UNDI device is PCI 02:00.0, type DIX+802.3
        554kB free base memory after PXE unload
iPXE initialising devices...
PCI Bus:Dev:Fn = 02000
VLAN Disabled
```

- ii. iPXE will start to initialize. Press F12, when prompted.

```

iPXE initialising devices...
PCI Bus:Dev:Fm = 02000
VLAN Disabled

Initializing link in port:0 Done
ok

iPXE 1.21.1+ (g22653) -- Open Source Network Boot Firmware -- https://ipxe.org
Features: DNS HTTP iSCSI TFTP AoE ELF MBOOT PXE bzImage Menu PXEXT

net0: 00:07:43:04:ae:80 using undionly on 0000:02:00.0 (Ethernet) [open]
[Link:up, TX:0 TXE:1 RX:0 RXE:0]
[TXE: 1 x "Network unreachable (https://ipxe.org/20006011)"]
Configuring (net0 00:07:43:04:ae:80)..... ok
net0: 101.1.1.51/255.255.255.0
Next server: 101.1.1.66
Filename: http://101.1.1.66/boot.php
http://101.1.1.66/boot.php... ok
boot.php : 818 bytes [script]
Press F12 to install RHEL9.2...
    
```

- iii. The OS installation menu will show up. Select the required OS, press Enter and continue with the Linux OS installation.



### 9.3.2. Windows OS Installation

- i. Reboot the system and go into the BIOS Boot Manager. *Chelsio PXE* device should be listed. Select it and press ENTER.

If it is not listed, please follow the instructions in [Legacy PXE Boot](#) section.



```
Chelsio UNDI, PXE-v2.0.0.48
Copyright (C) 2003-2016 Chelsio Communications
Copyright (C) 1997-2008 Intel Corporation

PCI Bus:Dev:Fn = 02001
VLAN Disabled

Initializing link in port:1 Done

CLIENT MAC ADDR: 00 07 43 04 AE 88 GUID: 00000000-0000-0000-0000-0CC47A6C6F8E
CLIENT IP: 101.1.1.100 MASK: 255.255.255.0 DHCP IP: 101.1.1.66
PXE->EB: !PXE at 95B8:0060, entry point at 95B8:00FA
        UNDI code segment 95B8:3E80, data segment 8AA2:B160 (554-615kB)
        UNDI device is PCI 02:00.1, type DIX+802.3
        554kB free base memory after PXE unload
iPXE initialising devices...

PCI Bus:Dev:Fn = 02001
VLAN Disabled
```

- ii. iPXE will start to initialize. Press F12, when prompted.

```
iPXE initialising devices...

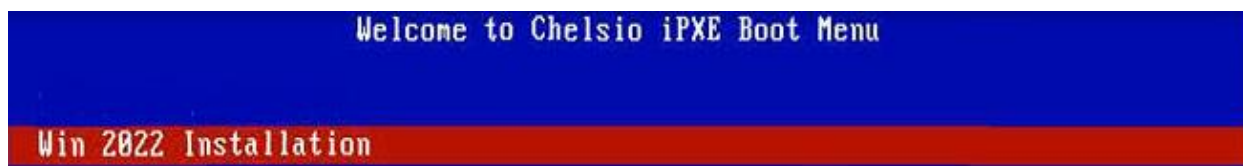
PCI Bus:Dev:Fn = 02001
VLAN Disabled

Initializing link in port:1 Done

iPXE 1.21.1+ (g59f27) -- Open Source Network Boot Firmware -- https://ipxe.org
Features: DNS HTTP iSCSI TFTP AoE ELF MBOOT PXE bzImage Menu PXEXT

net0: 00:07:43:04:ae:88 using undionly on 0000:02:00.1 (Ethernet) [open]
[Link:up, TX:0 TXE:1 RX:0 RXE:0]
[TXE: 1 x "Network unreachable (https://ipxe.org/20086011)"]
Configuring (net0 00:07:43:04:ae:88).... ok
net0: 101.1.1.149/255.255.255.0
Next server: 101.1.1.66
Filename: http://101.1.1.66/winpe.php
http://101.1.1.66/winpe.php... ok
winpe.php : 1349 bytes [script]
Press F12 to install Windows Operating System...
```

- iii. The OS installation menu will show up. Select the required OS and press Enter.



- iv. The installation files will be downloaded. Continue with the Windows OS installation.

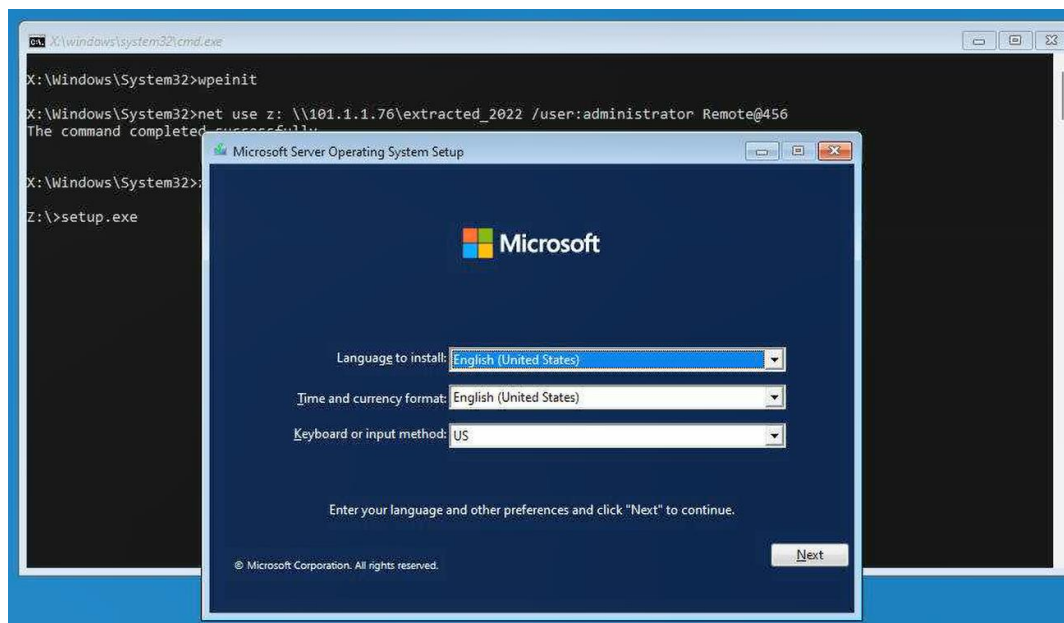


```
http://101.1.1.66/winpe_2022/amd64/winboot... ok
http://101.1.1.66/winpe_2022/amd64/install.bat... ok
http://101.1.1.66/winpe_2022/amd64/winpeshl.ini... ok
http://101.1.1.66/winpe_2022/amd64/media/Boot/BCD... ok
http://101.1.1.66/winpe_2022/amd64/media/Boot/boot.sdi... ok
http://101.1.1.66/winpe_2022/amd64/media/sources/boot.win... ok

winboot v2.7.6 -- Windows Imaging Format bootloader -- https://ipxe.org/winboot

Found initrd at [0x66926000,0x78db0033)
Blzcnjnz.i.vatfr4.at [0x669c5000,0x78e4f033)
Using winpeshl.ini via 0x669c607c len 0x1b
Using BCD via 0x669c7074 len 0x40000
Using boot.sdi via 0x66a00078 len 0x306000
```

```
...patching WIM header at [0x0,0xd0)
...patching WIM install.bat at [0x1213ffbb,0x12140016)
...patching WIM winpeshl.ini at [0x12140016,0x12140031)
...patching WIM lookup.copy at [0x12140038,0x121a8a0c)
...patching WIM lookup.boot at [0x121a8a0c,0x121a8a3e)
...patching WIM lookup.file at [0x121a8a3e,0x121a8a70)
...patching WIM lookup.file at [0x121a8a70,0x121a8aa2)
...patching WIM boot.copy at [0x121a8aa8,0x125f49e8)
...patching WIM directory at 0x121b2090 from [0x12213510,0x1223ae38)
...patching WIM length 0x1213ffbb->0x1261c468
...found file "\Windows\Boot\PXE\bootmgr.exe"
Using bootmgr.exe via 0x54580 len 0xb0360
...extracted bootmgr.exe
...found file "\Windows\Boot\Fonts\seghono_boot.ttf"
Using seghono_boot.ttf via 0x5466c len 0xb2f4
...found file "\Windows\Boot\Fonts\segoen_slboot.ttf"
Using segoen_slboot.ttf via 0x54758 len 0x1918c
...found file "\Windows\Boot\Fonts\segoe_slboot.ttf"
Using segoe_slboot.ttf via 0x54844 len 0x19220
...found file "\Windows\Boot\Fonts\wgl4_boot.ttf"
Using wgl4_boot.ttf via 0x54930 len 0xc37c
Emulating drive 0x02
Placing initrd at physical [0xc6d9c5000,0xc7fe4f033)
Entering bootmgr.exe with parameters at 0x258c0
```





## 9.4. uEFI iPXE TFTP Boot

Before proceeding, please ensure that the Chelsio adapter on the client machine has been flashed with the provided firmware, Option ROM, and boot configuration (See [Flashing Firmware and Option ROM](#)).

### 9.4.1. Linux OS Installation

- i. Reboot the system and go into the BIOS Boot Manager. *uEFI: IP4 Chelsio PXE* device should be listed. Select it and press ENTER. If it is not listed, please follow the instructions in [uEFI PXE Boot](#) section.

```

Please select boot device:

UEFI: Built-in EFI Shell
Red Hat Enterprise Linux (P1: ST500DM002-1BD142)
RedHat Boot Manager (P1: ST500DM002-1BD142)
UEFI OS (P1: ST500DM002-1BD142)
UEFI: ATEN Virtual CDROM YS0J, Partition 1
UEFI: Chelsio T6 PXE T6225-CR-0
UEFI: IP4 Chelsio T6 PXE T6225-CR-0
UEFI: IP6 Chelsio T6 PXE T6225-CR-0
UEFI: Chelsio T6 PXE T6225-CR-1
UEFI: IP4 Chelsio T6 PXE T6225-CR-1
UEFI: IP6 Chelsio T6 PXE T6225-CR-1

>>Checking Media Presence.....
>>Media Present.....
Downloading NBP file...

Succeed to download NBP file.

```

- ii. iPXE will start to initialize. Press F12, when prompted.

```

iPXE initialising devices...ok

iPXE 1.21.1+ (g22653) -- Open Source Network Boot Firmware -- https://ipxe.org
Features: DNS HTTP iSCSI TFTP VLAN SRP AoE EFI Menu

net2: 00:07:43:04:ae:80 using NII on NII-0000:02:00:0 (Ethernet) [open]
  [Link:down, TX:0 TXE:1 RX:0 RXE:0]
  [Link status: Unknown (https://ipxe.org/1a086194)]
  [TXE: 1 x "Network unreachable (https://ipxe.org/28086090)"]
Configuring (net2 00:07:43:04:ae:80)..... ok
net0: fe80::ec4:7aff:fe6c:6f8e/64 (inaccessible)
net1: fe80::ec4:7aff:fe6c:6f8f/64 (inaccessible)
net2: 101.1.1.51/255.255.255.0
net2: fe80::207:43ff:fe04:ae80/64
net3: fe80::207:43ff:fe04:ae88/64 (inaccessible)
Next server: 101.1.1.66
Filename: http://101.1.1.66/boot.php
Root path: iscsi:101.1.1.66:::iqn.2015-12.org.linux-iscsi.chelsio.target1
Registered SAN device 0x80
http://101.1.1.66/boot.php... ok
boot.php : 818 bytes [script]
Press F12 to install RHEL9.2...

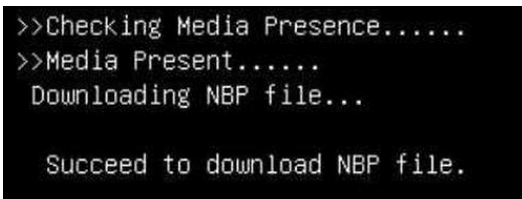
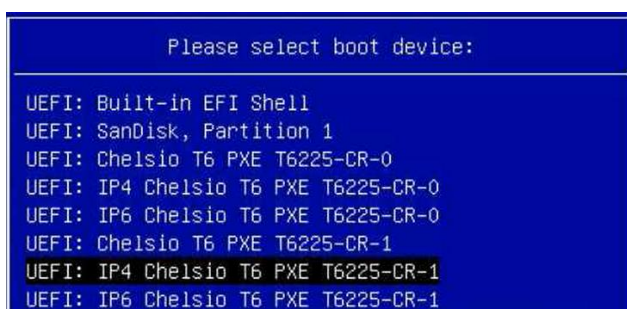
```

- iii. The OS installation menu will show up. Select the required OS, press Enter and continue with the Linux OS installation.

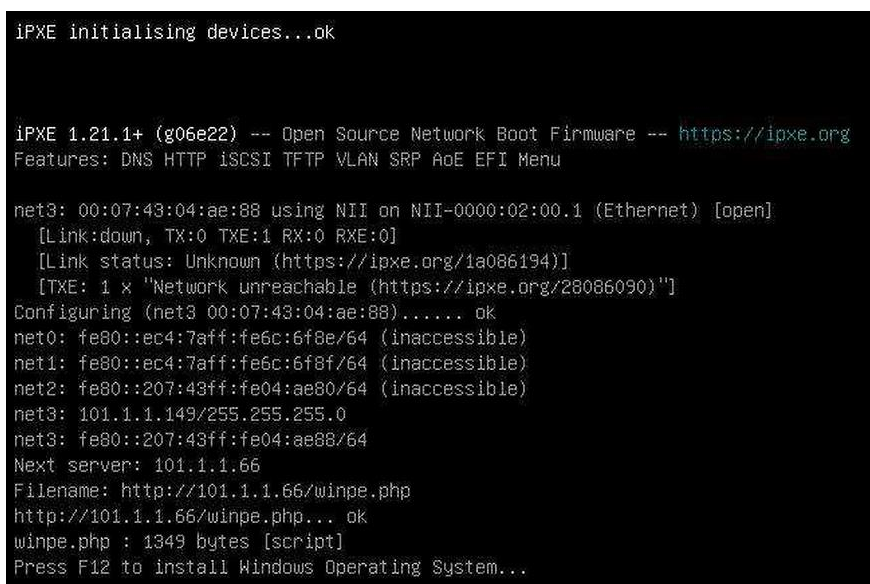


### 9.4.2. Windows OS Installation

- i. Reboot the system and go into the BIOS Boot Manager. *uEFI: IP4 Chelsio PXE* device should be listed. Select it and press ENTER. If it is not listed, please follow the instructions in [uEFI PXE Boot](#) section.



- ii. iPXE will start to initialize. Press F12, when prompted.



- iii. The OS installation menu will show up. Select the required OS and press Enter.

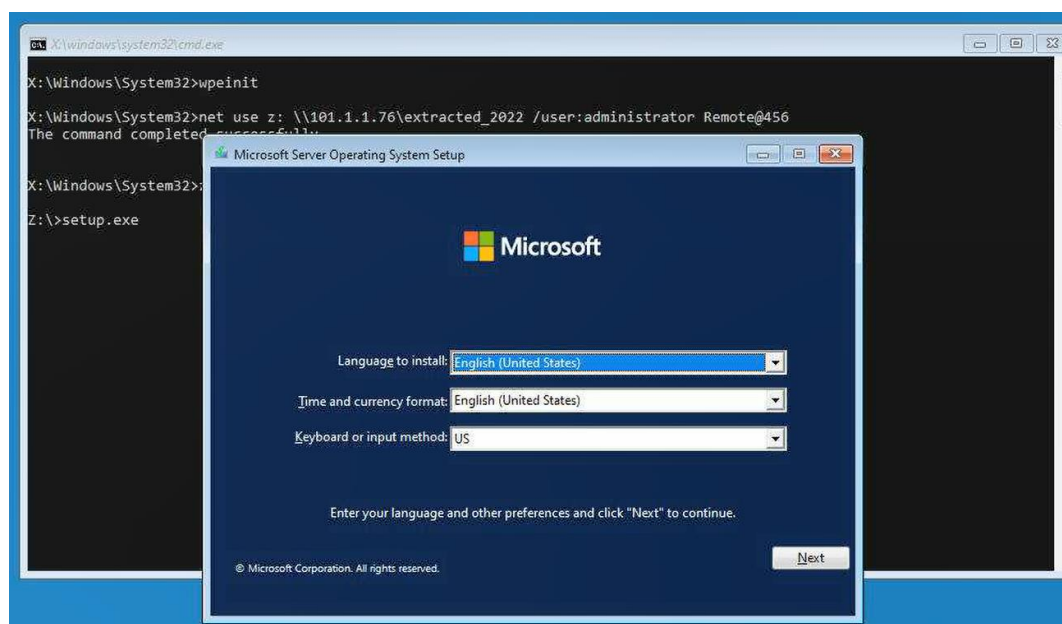


- iv. The installation files will be downloaded. Continue with the Windows OS installation.

```
http://101.1.1.66/winpe_2022/amd64/wimboot... ok
http://101.1.1.66/winpe_2022/amd64/install.bat... ok
http://101.1.1.66/winpe_2022/amd64/winpeshl.ini... ok
http://101.1.1.66/winpe_2022/amd64/media/Boot/BCD... ok
http://101.1.1.66/winpe_2022/amd64/media/Boot/boot.sdi... ok
http://101.1.1.66/winpe_2022/amd64/media/sources/boot.wim... ok

wimboot v2.7.6 -- Windows Imaging Format bootloader -- https://ipxe.org/wimboot

Command line: "wimboot"
Using install.bat via 0x716381b8 len 0x5b
Using winpeshl.ini via 0x71638278 len 0x1b
Using BCD via 0x71638338 len 0x40000
...found BCD
Using boot.sdi via 0x716383f8 len 0x306000
Using boot.wim via 0x716384b8 len 0x1213ffbb
...found _
```

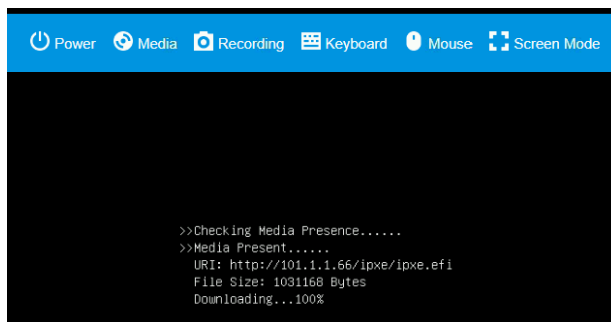
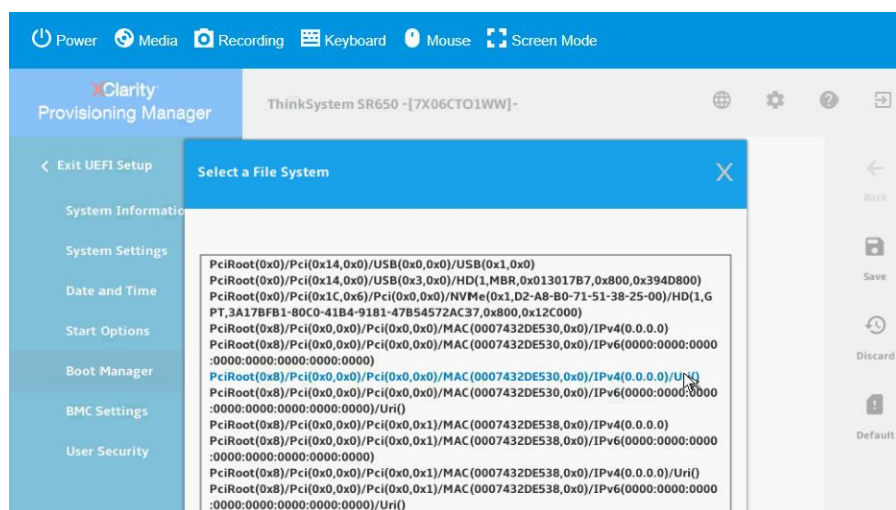


## 9.5. uEFI iPXE HTTP Boot

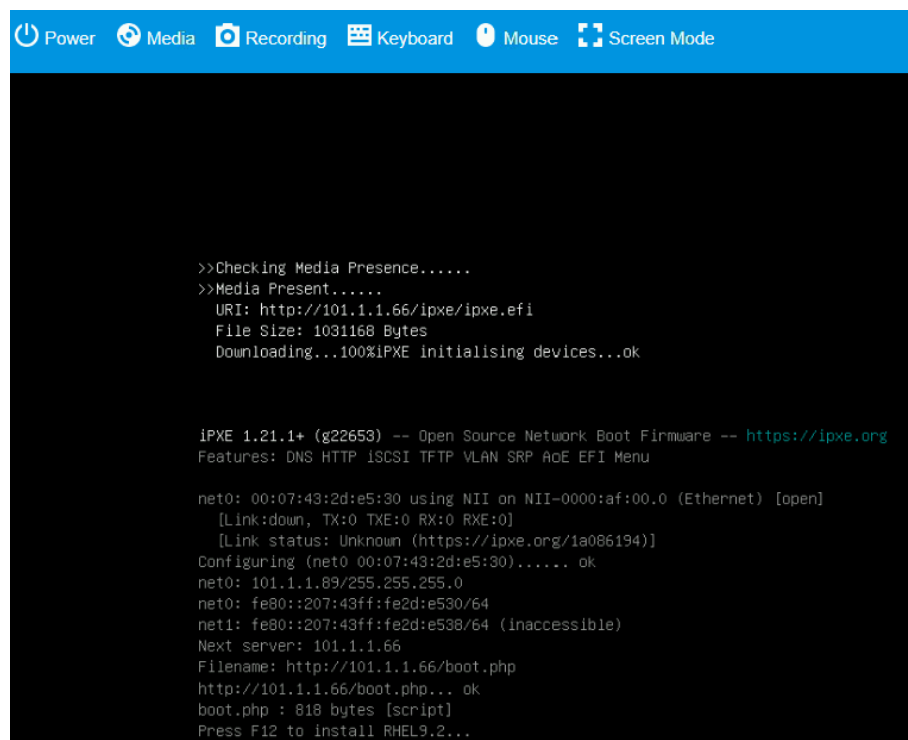
Before proceeding, please ensure that the Chelsio adapter on the client machine has been flashed with the provided firmware, Option ROM, and boot configuration (See [Flashing Firmware and Option ROM](#)).

- i. Reboot the system and go into the BIOS Boot Manager.  
*PCI/MAC(00:07:43:xx:xx:xx)/IPv4/Uri()* device should be listed. Select it and press ENTER.

If it is not listed, please follow the instructions in [uEFI PXE Boot](#) section.



- ii. iPXE will start to Initialize. Press F12, when prompted.



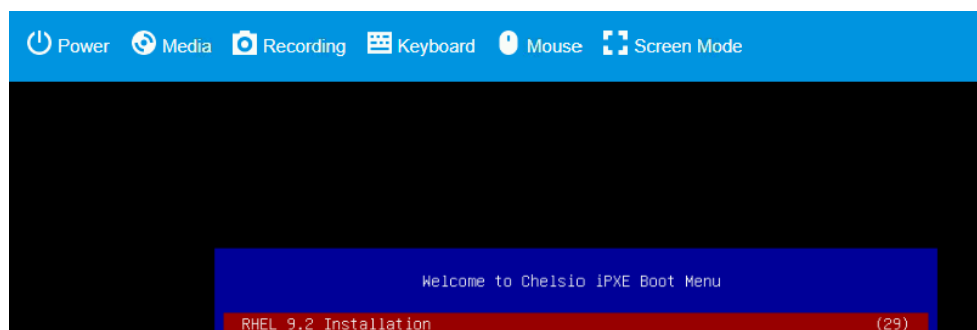
The screenshot shows a terminal window with a blue header bar containing icons for Power, Media, Recording, Keyboard, Mouse, and Screen Mode. The terminal text indicates the IPXE boot process: checking media presence, downloading the IPXE firmware from http://101.1.1.66/ipxe/ipxe.efi, and initializing devices. It then shows network configuration for net0 (00:07:43:2d:e5:30) using NII on NII-0000:af:00:0 (Ethernet). The next server is 101.1.1.66, and the filename is http://101.1.1.66/boot.php. The boot.php file is 818 bytes and is a script. The prompt 'Press F12 to install RHEL9.2...' is displayed at the bottom.

```
>>Checking Media Presence.....
>>Media Present.....
URI: http://101.1.1.66/ipxe/ipxe.efi
File Size: 1031168 Bytes
Downloading...100%IPXE initialising devices...ok

iPXE 1.21.1+ (g22653) -- Open Source Network Boot Firmware -- https://ipxe.org
Features: DNS HTTP iSCSI TFTP VLAN SRP AoE EFI Menu

net0: 00:07:43:2d:e5:30 using NII on NII-0000:af:00:0 (Ethernet) [open]
[Link:down, TX:0 TXE:0 RX:0 RXE:0]
[Link status: Unknown (https://ipxe.org/1a086194)]
Configuring (net0 00:07:43:2d:e5:30)..... ok
net0: 101.1.1.89/255.255.255.0
net0: fe80::207:43ff:fe2d:e530/64
net1: fe80::207:43ff:fe2d:e538/64 (inaccessible)
Next server: 101.1.1.66
Filename: http://101.1.1.66/boot.php
http://101.1.1.66/boot.php... ok
boot.php : 818 bytes [script]
Press F12 to install RHEL9.2...
```

- iii. The OS installation menu will show up. Continue with the OS installation.



## II. PXE-WDS Driver For Windows

---

## 1. Introduction

This section describes the use and configuration of Chelsio's PXE-WDS driver package for Chelsio's adapters. The driver package consists of drivers needed to install Windows operating system on iSCSI or FCoE LUN using WDS server for Chelsio adapters.

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 Chelsio adapters that are supported:

- T62100-CR
- T62100-LP-CR
- T62100-SO-CR\*
- T62100-SO-OCP3\*
- T6425-CR
- T6225-CR
- T6225-LL-CR
- T6225-OCP3\*
- T6225-SO-OCP3\*
- T6225-SO-CR\*
- T580-CR
- T580-LP-CR
- T580-SO-CR\*
- T540-CR
- T540-LP-CR
- T520-CR
- T520-LL-CR
- T520-SO-CR\*
- T520-BT
- T540-BT

*\* Only PXE supported*

## 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 WHQL certified and available for following versions:

- Server 2022
- Server 2019
- 11 Client
- 10 Client

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 installation 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 in the [Windows Deployment Services Getting Started Guide](#).

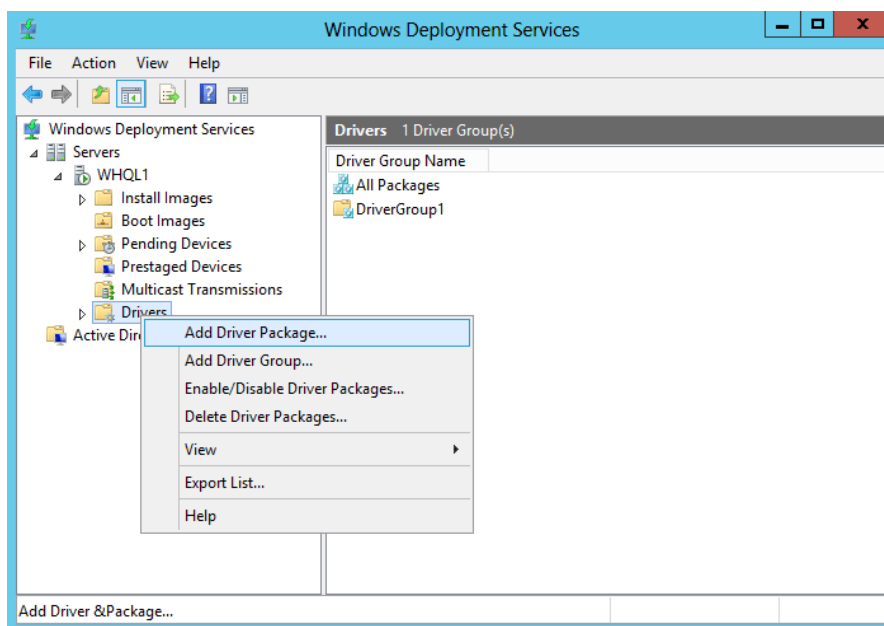
### 2.2. Adding Driver Packages to WDS Server

First add VBD, followed by NDIS and then iSCSI/FCoE drivers. For more information, see [Managing and Deploying Driver Packages](#).

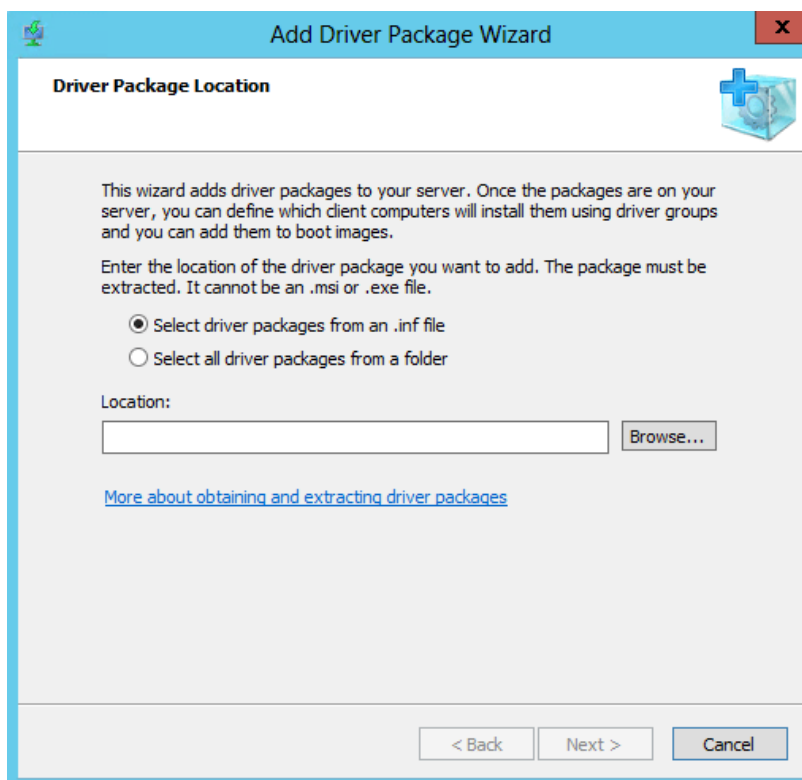
Before proceeding, download *Chelsio-Uboot-x.x.x.x.zip* from [Chelsio Download Center](#), and unzip the contents of the package to a desired location.

#### 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**.

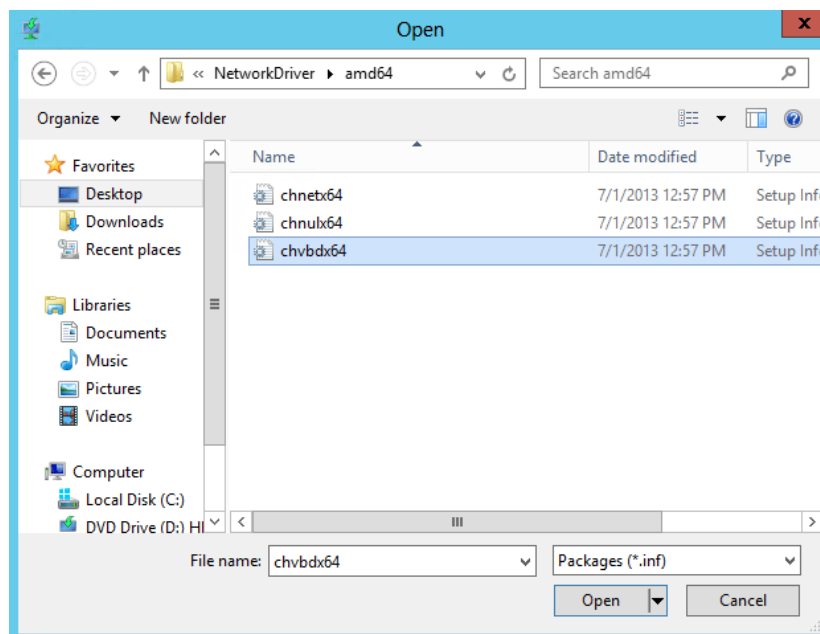


- ii. Select the *Select driver package from an .inf file* option and click **Browse**.

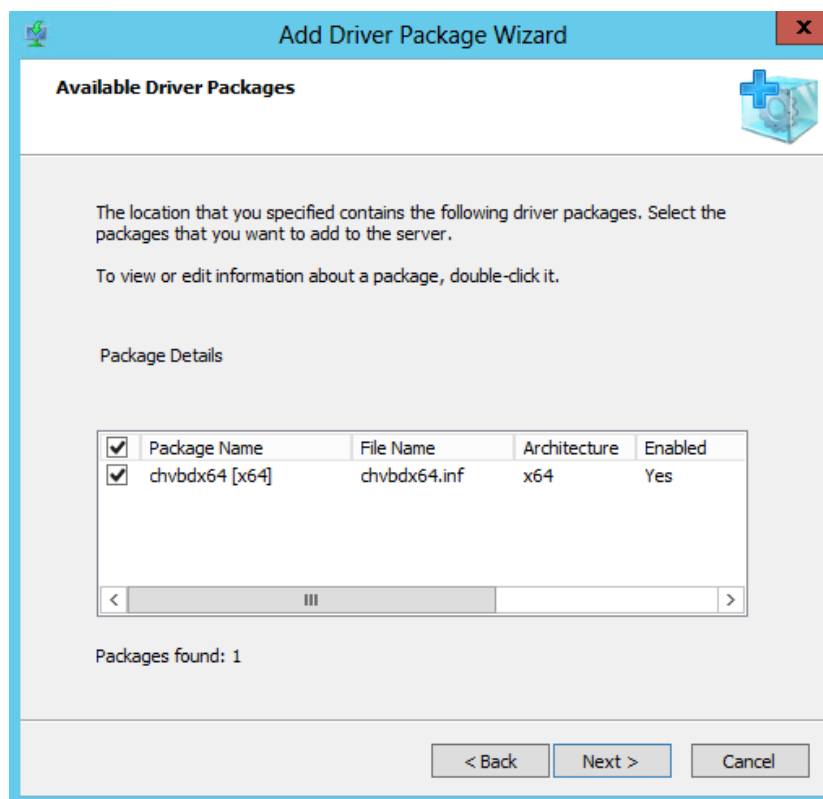


- iii. Locate the VBD driver (*chvbdx64.inf*) from below location and click **Open**.

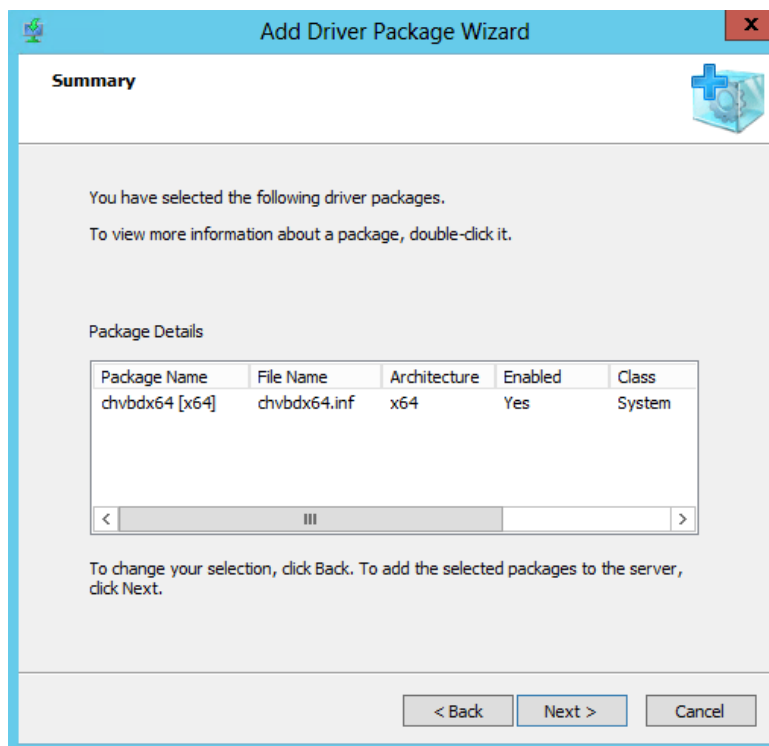
- *Chelsio-Uboot-x.x.x.x\WindowsDrivers\win19* for Server 2022, 2019 and 11 Client.
- *Chelsio-Uboot-x.x.x.x\WindowsDrivers\win10* for Server 2016 and 10 Client.



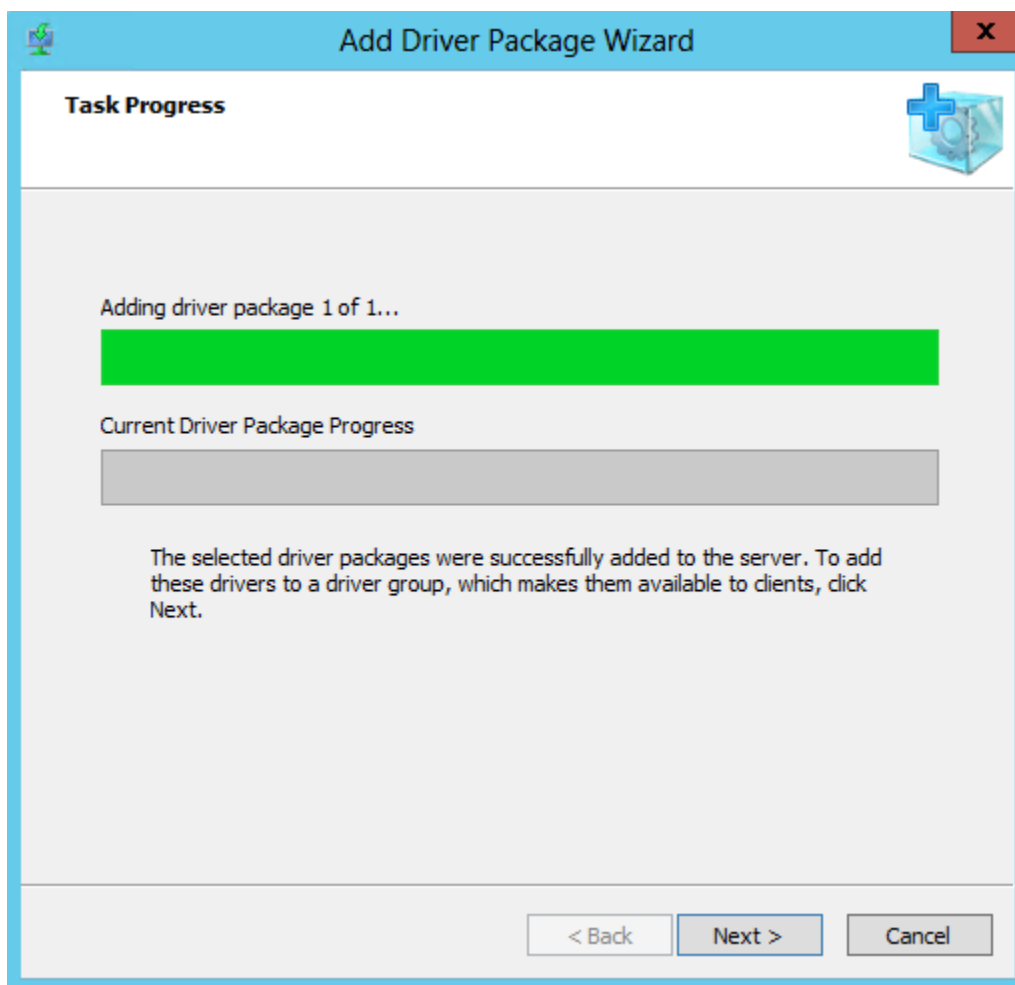
- iv. Please ensure that the checkbox for *chvbdx64[x64]* is selected and click **Next**.



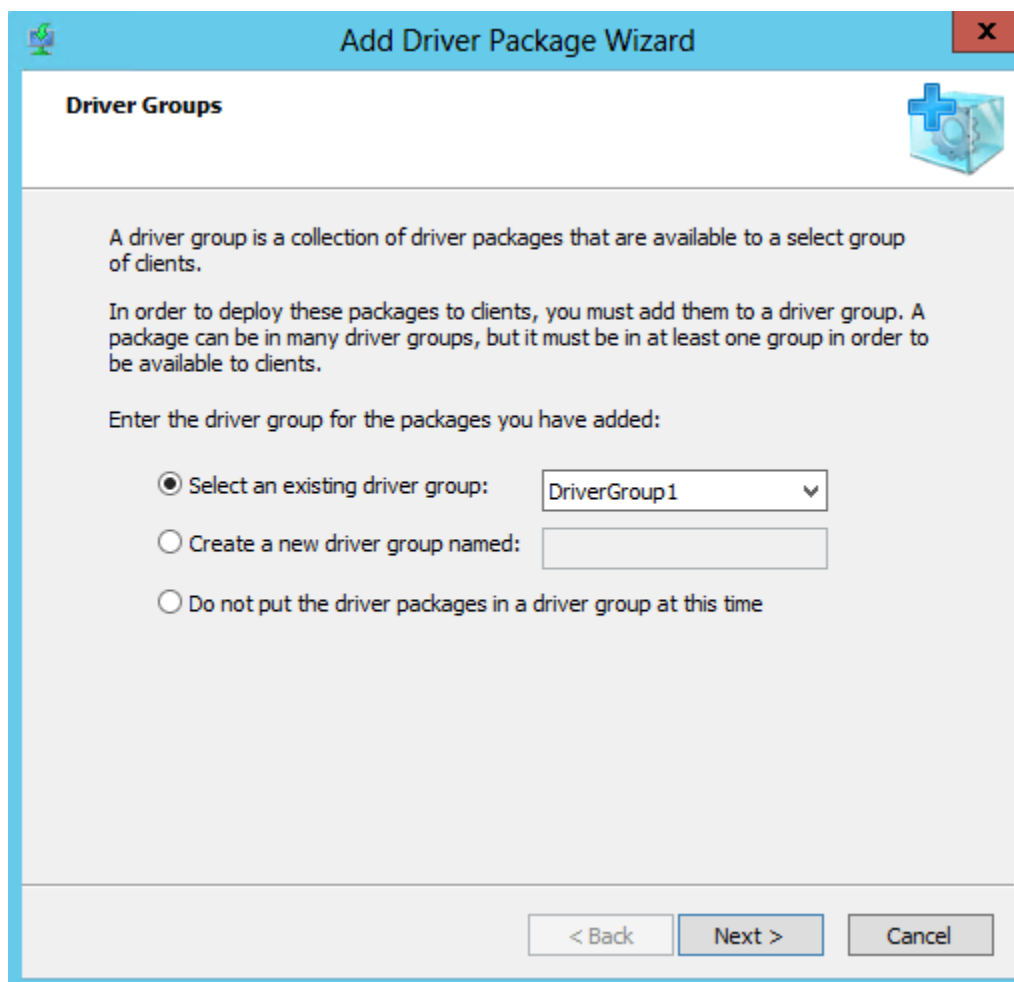
- v. To add the selected VBD driver, click **Next** or to change click **Back**.



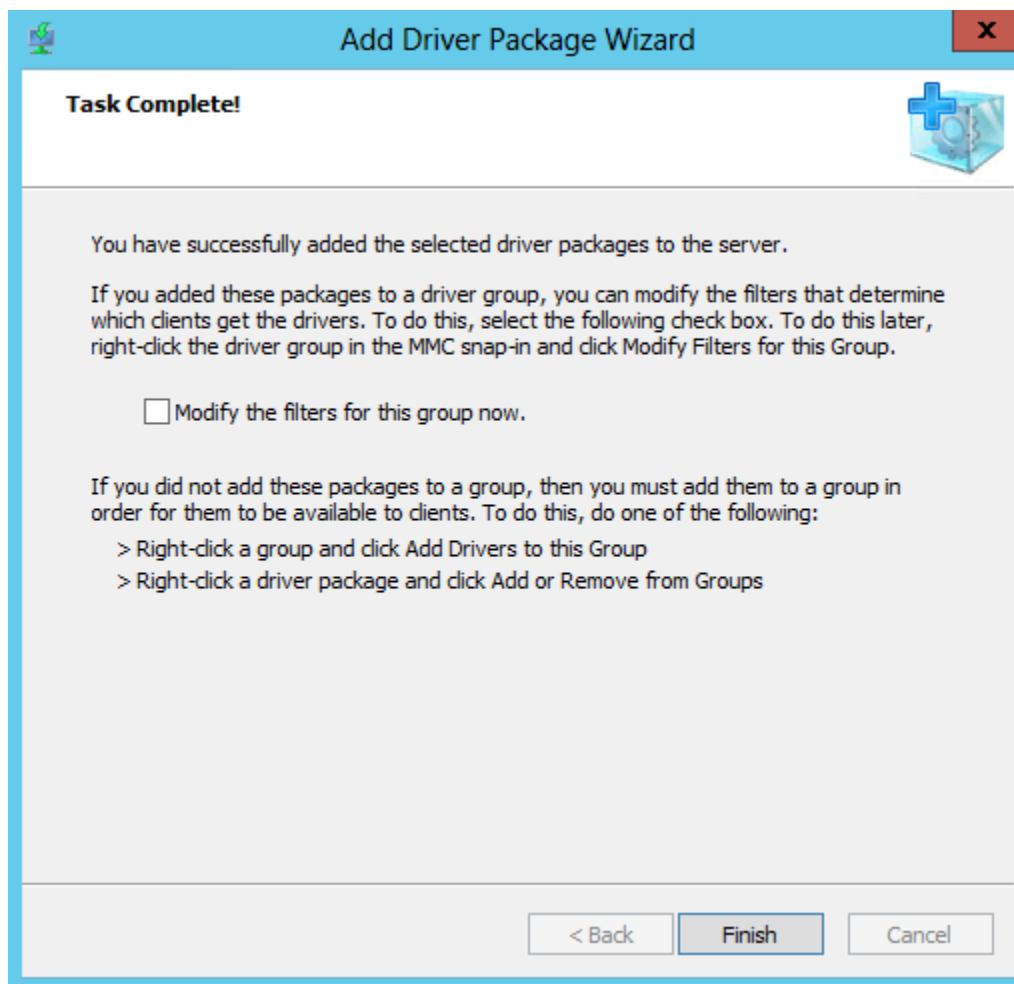
- vi. The selected driver will now be added to the server. After the task is complete, click **Next**.



- 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.

### 2.2.3. Adding iSCSI (cht4iscsi.inf)

In case of installing Windows OS on an iSCSI LUN, the iSCSI Storport Miniport driver needs to be added to the WDS server. The procedure is similar to adding VBD. In step (iii), locate and use the file *cht4iscsi.inf* and in step (iv), ensure that only *cht4iscsi[x64]* is selected.

### 2.2.4. Adding FCoE (csiofcoe.inf)

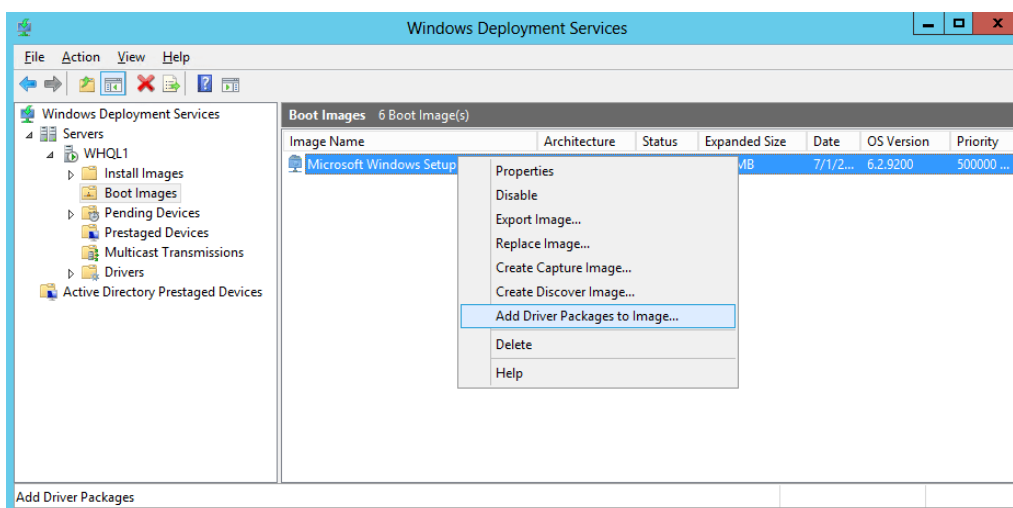
In case of installing Windows OS on an FCoE LUN, the FCoE Storport Miniport driver needs to be added to the WDS server. The procedure is similar to adding VBD. In step (iii), locate and use the file *csiofcoe.inf* and in step (iv), ensure that only *csiofcoe[x64]* is selected.

## 2.3. Adding Driver Packages to Boot Images

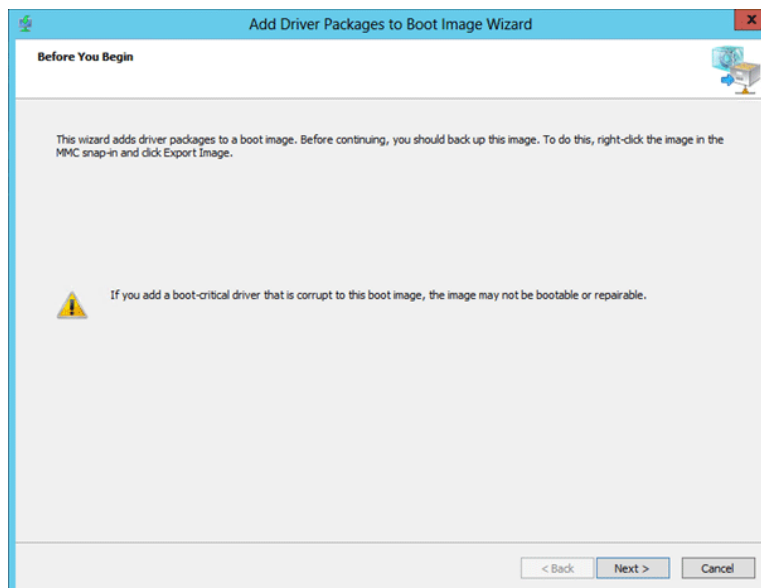
Please ensure that the VBD, NDIS and iSCSI/FCoE drivers are added to the WDS server before proceeding (See [Adding Driver Packages to WDS Server](#)). Also, add VBD first followed by NDIS and iSCSI/FCoE drivers to the boot image. For more information, see [Managing and Deploying Driver Packages](#).

### 2.3.1. Adding VBD driver

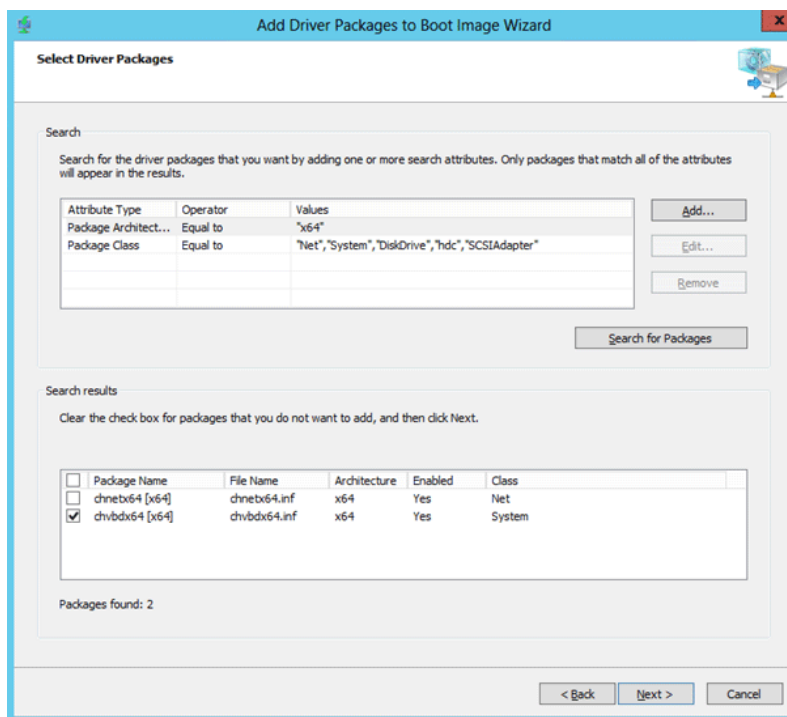
- i. Open the **Windows Deployment Services** MMC snap-in. Expand the **Servers** node and then **Boot Images** node.
- ii. Right-click on the boot image that you want to add the driver to, and select **Add Driver Packages to Image**.



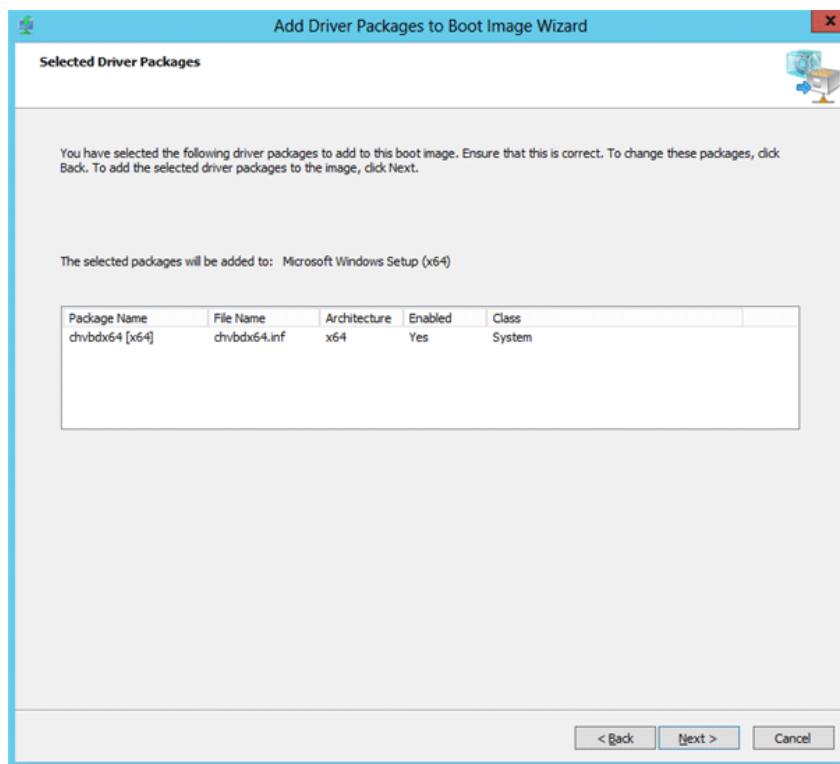
- iii. If required, back up the boot image by following the instruction on the screen or click **Next** to continue.



- iv. Click **Search for Packages**. Then in the **Search results** section, select the checkbox for *chvbdx64[x64]* only and click **Next**.

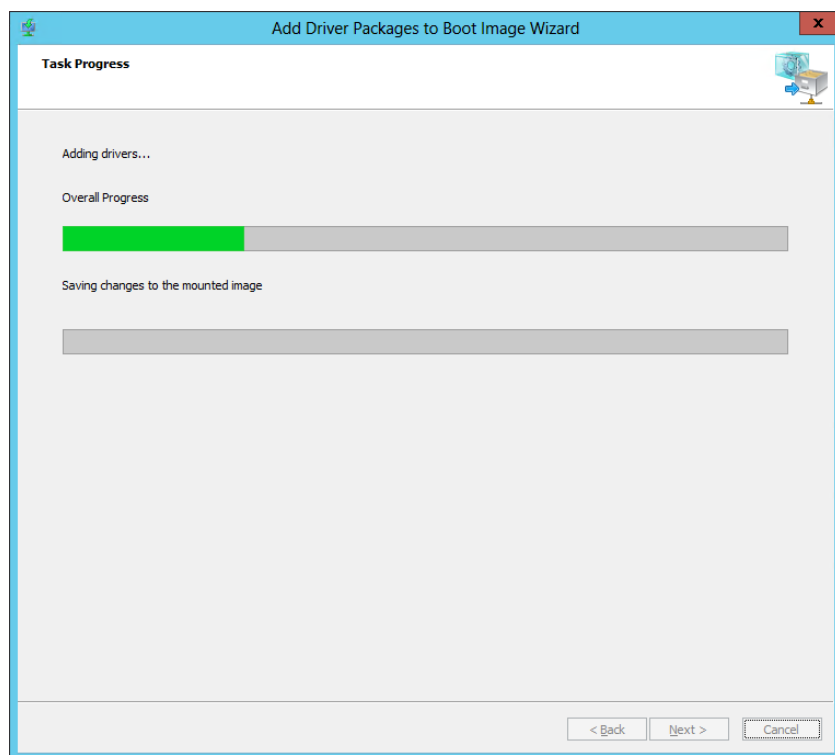


- v. To add the selected VBD driver, click **Next** or to change click **Back**.

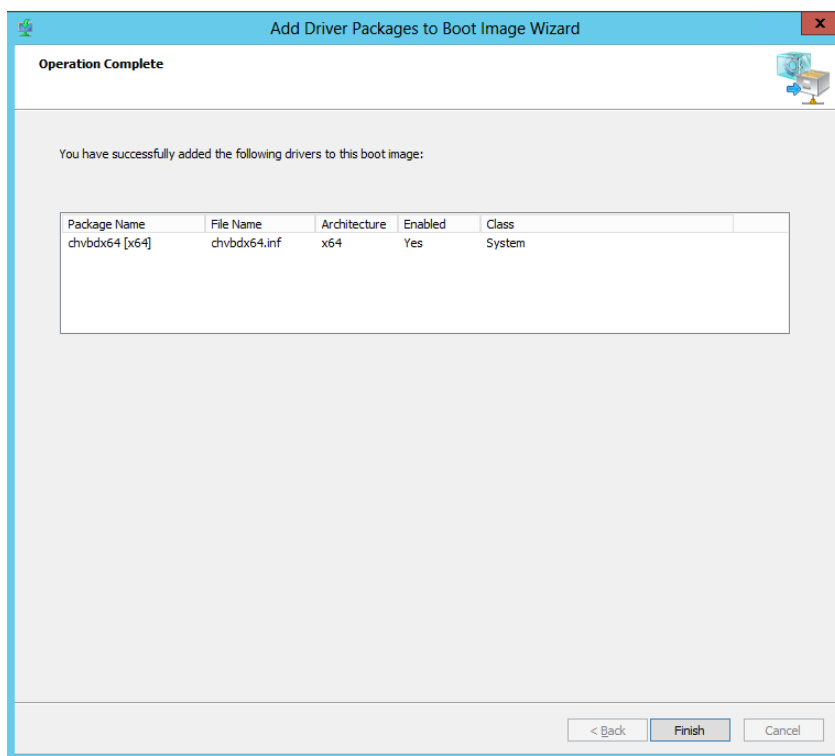




vi. The VBD driver will now be added to the boot image.



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**.

### 2.3.3. Adding iSCSI driver (cht4iscsi.inf) to Windows boot image

In case of installing Windows OS on an iSCSI LUN, the iSCSI Storport Miniport driver needs to be added to Windows Boot Image. The procedure is similar to VBD. In step (iv), select the checkbox for *cht4iscsi[x64]* only and click **Next**.

### 2.3.4. Adding FCoE driver (csiofcoe.inf) to Windows boot image

In case of installing Windows OS on an FCoE LUN, the FCoE Storport Miniport driver needs to be added to Windows Boot Image. The procedure is similar to VBD. In step (iv), select the checkbox for *csiofcoe[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.*

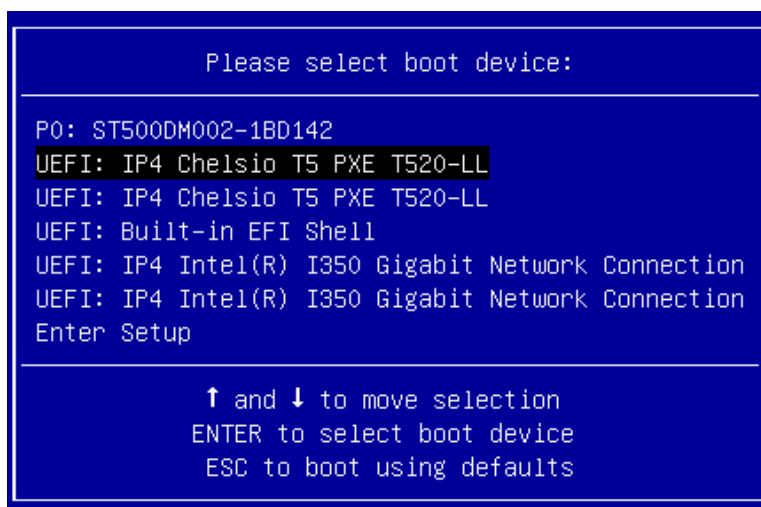
## 3. OS Installation

This is the recommended method for installing Windows OS on iSCSI or FCoE 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/FCoE LUN

#### 3.1.1. Using PXE-WDS Server

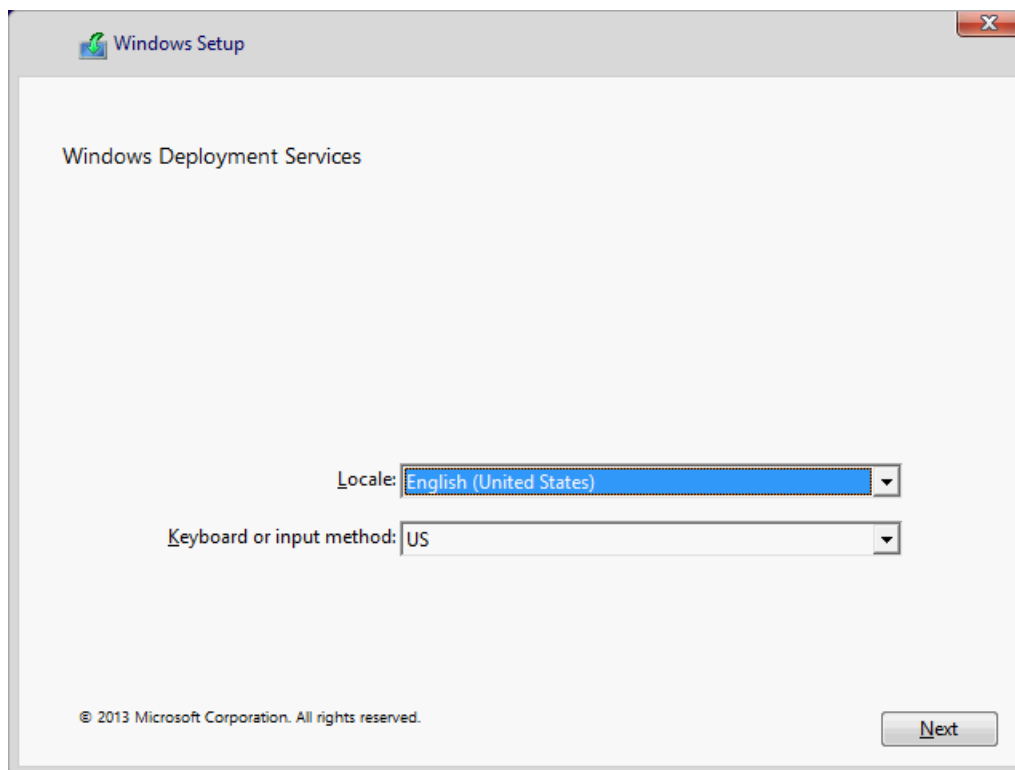
- i. Reboot the machine. In the boot menu, choose the port which was used to connect to the Target LUN during iSCSI boot.



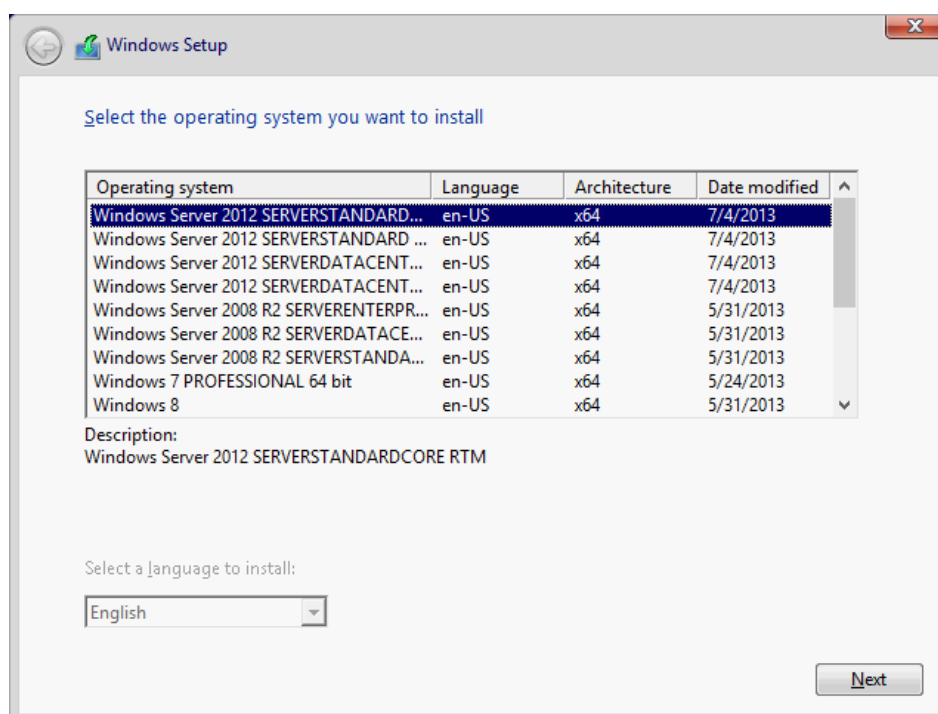
- ii. On successful connection, Windows boot image will load from the PXE-WDS server.



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

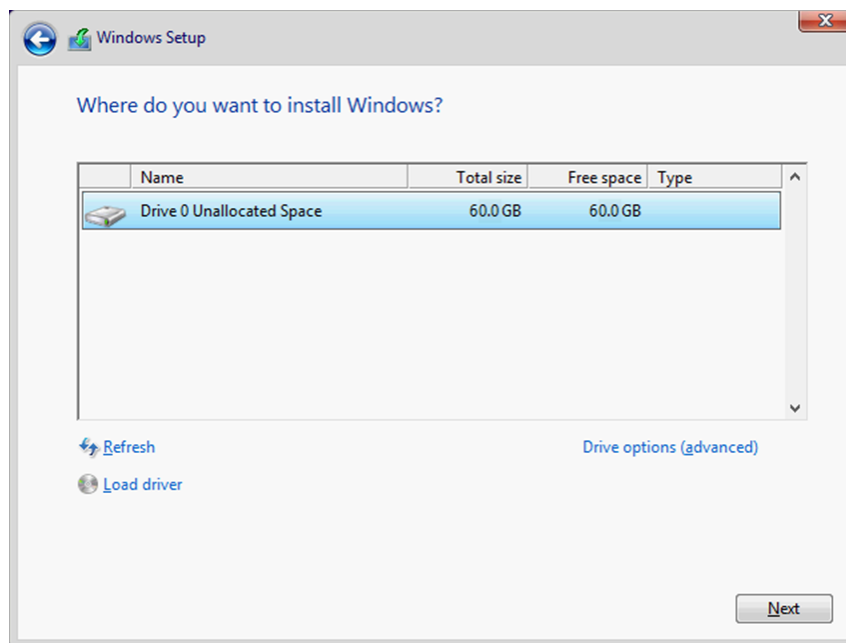


- iv. Enter server credentials and click **OK**.
- v. Select the operating system to be installed and click **Next**.



vi. Select the Target LUN discovered using iSCSI or FCoE Initiator and click **Next**.

- Chelsio iSCSI Initiator will be used if CBFT is configured in Option ROM.
- MS iSCSI Initiator will be used if IBFT is configured in Option ROM.



vii. Proceed with installation as usual.

## 4. Windows Update on iSCSI/FCoE LUN

The Chelsio Boot Drivers added to the WDS Server and the Boot Images in the above steps cannot be updated using *Windows Update*. Instead, they should be downloaded and updated to the latest version available from [Chelsio Microsoft Download Center](#) **before** running any Windows Update operation on the OS installed in iSCSI/FCoE LUN.



**Important**

*Using Windows Update without updating to the latest available Chelsio Boot drivers will render your system unusable.*

- a) Download the latest **Chelsio Unified Boot Option ROM and Flash Utility** package from the [Chelsio Microsoft Download Center](#).
- b) If the Unified Boot package has Windows drivers with version higher than the ones installed, please update the driver components strictly in the below order. The driver files should be manually picked from:

*Chelsio-Uboot-x.x.x.x\WindowsDrivers\win19* for Server 2022, 2019 and 11 Client.

*Chelsio-Uboot-x.x.x.x\WindowsDrivers\win10* for Server 2016 and 10 Client.

### • Virtual Bus Driver

- i. Open **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on **System Devices**, right click on **Chelsio Bus Enumerator** and select **Update Driver Software**.
- ii. Select **Browse my computer for driver software**.
- iii. Select **Let me pick from a list of device drivers on my computer** and click **Next**.
- iv. Click on **Have Disk** Button and on the next screen browse for **chvbdx64.inf** file and click **Open** and then **OK**.
- v. Click **Next** and driver installation will progress. Click **Close** once the installation is complete.

### • NDIS Miniport driver

- i. Open **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on **Network Adapters**, right click on the **Chelsio network adapter** and select **Update Driver Software**.
- ii. Select **Browse my computer for driver software**.
- iii. Select **Let me pick from a list of device drivers on my computer**.
- iv. Click on **Have Disk** Button and on the next screen browse for **chnetx64.inf** and click **Open** and then **OK**.
- v. Click **Next** and driver installation will progress. Click **Close** once the installation is complete.

Repeat the above steps for the other adapters.

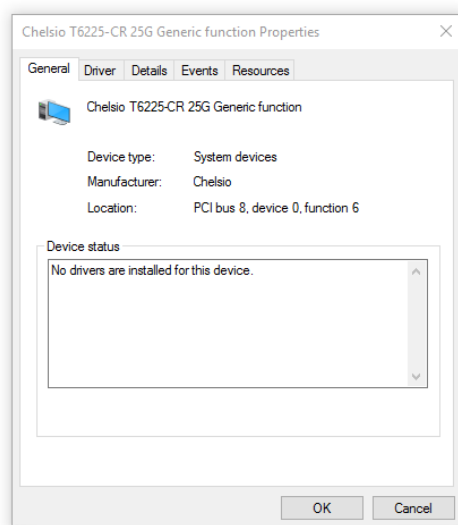
- **iSCSI Storport Miniport driver (iSCSI Boot)**

- Open **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on **System Devices**, right click on the **Chelsio Bus Enumerator** and select **Properties**.
- Under **Advanced** tab, select **iSCSI Instances** and set the *Value* to **default**. Click **OK**.
- Under **Other Devices**, select **Chelsio iScsi Function on Port#00**, right-click and select **Update Driver Software**.
- Select **Browse my computer for driver software**.
- Select **Let me pick from a list of device drivers on my computer** and click **Next**.
- Click on **Have Disk** Button and on the next screen, browse for **cht4iscsi.inf** file and click **Open** and then **OK**.
- Click **Next** and driver installation will progress. Click **Close** once the installation is complete.

Repeat the same procedure for other ports.

- **FCoE Storport Miniport driver (FCoE Boot)**

- Open **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on **System Devices**, right click on **Chelsio Generic function** with *function 6* and select **Properties**. In case the adapter is not listed, it may appear as **Fibre Channel Controller** under **Other devices**.



- Under **Driver** tab, select **Update Driver...**
- Select **Browse my computer for driver software**.
- Select **Let me pick from a list of device drivers on my computer** and click **Next**.
- Click on **Have Disk** Button and on the next screen, browse for **csiofcoe.inf** file in the zip package. Click **Open** and then **OK**.
- Click **Next** and driver installation will progress. Click **Close** once the installation is complete.

- **Generic Function**

- Open **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on **System Devices**, right click on **Chelsio Generic Function** and select **Update Driver Software**.
  - Select **Browse my computer for driver software**.
  - Select **Let me pick from a list of device drivers on my computer**.
  - Click on **Have Disk** Button and on the next screen browse for **chnulx64.inf** file and click **Open** and then **OK**.
  - Click **Next** and driver installation will progress. Click **Close** once the installation is complete.
- 
- Once the Chelsio drivers are updated, *Windows Update* can be run to update the other software and hardware in the system.
  - It is also advisable to update the Boot drivers in the WDS Server and Boot images for future OS installations using the detailed steps in [Adding Driver Packages to WDS Server](#) and [Adding Driver Packages to Boot Images](#) sections.



## III. ESXi

---

# 1. Introduction

The following section describes the procedure to PXE boot ESXi OS using Chelsio adapters.

## 1.1. Hardware Requirements

### 1.1.1. Supported Adapters

The following are the Chelsio adapters that are supported:

- T62100-CR
- T62100-LP-CR
- T62100-SO-CR\*
- T6425-CR
- T6225-CR
- T6225-LL-CR
- T6225-SO-CR\*
- T580-CR
- T580-LP-CR
- T580-SO-CR\*
- T540-CR
- T540-LP-CR
- T520-CR
- T520-LL-CR
- T520-SO-CR\*
- T520-BT
- T540-BT


*\* Only PXE supported*

## 1.2. Software Requirements

### 1.2.1. ESXi Requirements

The Chelsio Native Network driver has been developed to run on ESXi platforms. Currently the driver is available for the following versions:

- ESXi 7.0

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

## 1.3. Pre-requisites

Secure Boot should be disabled in the system BIOS.

## 2. Customized ISO

### 2.1. Adding Chelsio Drivers

Follow the below steps to add Chelsio driver component to ESXi installation ISO image.

#### Requirements

- Install Windows 2012 R2 on the system used to create the ISO image.
  - Download and install the latest vCenter Server and PowerCLI from VMware website.
  - Download the required ESXi standard software depot from VMware website.
- i. If you haven't done already, download *Chelsio-Uboot-x.x.x.x.zip* from [Chelsio Download Center](#).
  - ii. Extract the package. The Chelsio driver component will be in *Chelsio-Uboot-x.x.x.x\ESXiDrivers*
  - iii. Copy Chelsio driver component and the ESXi software depot to a desired location.
  - iv. Launch PowerCLI and add both the ESXi depot and driver component as software depots.

```
PowerCLI C:\> Add-EsxSoftwareDepot -DepotUrl <esxi_dev_depot>.zip,
<driver_component>.zip
```

```
PowerCLI C:\> Add-EsxSoftwareDepot -DepotUrl .\VMware-ESXi-7.0.0-15843807-dev-depot.zip,.\
VMW-esx-7.0.0-Chelsio-Drivers-5.3.0.23-10EM.700.1.0.15843807.zip
Depot Url
-----
zip:C:\VMware-ESXi-7.0.0-15843807-dev-depot.zip?index.xml
zip:C:\VMW-esx-7.0.0-Chelsio-Drivers-5.3.0.23-10EM.700.1.0.15843807.zip?index.xml
```

- v. Verify that the drivers are now available as software packages.

```
PowerCLI C:\> Get-EsxSoftwarePackage | findstr /I Chelsio
```

```
PowerCLI C:\> Get-EsxSoftwarePackage | findstr /I Chelsio
cheiwarp      5.3.0.23-10EM.700.1.0.15843807 Chelsio 6/22/2020 4:5...
cxl           5.3.0.23-10EM.700.1.0.15843807 Chelsio 6/22/2020 4:5...
cheiscsi      5.3.0.23-10EM.700.1.0.15843807 Chelsio 6/22/2020 4:5...
```

- vi. List all the image profiles available and note the name of ESXi image.

```
PowerCLI C:\> Get-EsxImageProfile|select Name
```

```
PowerCLI C:\> Get-EsxImageProfile | select Name
Name
----
ESXi-7.0.0-15843807-standard-with-test-certs
ESXi-7.0.0-15843807-rollback-testing-plugin-crash
ESXi-7.0.0-15843807-dev
ESXi-7.0.0-15843807-dev-no-tools
```

- vii. By default, the ESXi image is read-only. Hence, using the profile name obtained in the previous step, clone the image.

```
PowerCLI C:\> New-EsxImageProfile -CloneProfile "<image_profile_name>" -name
"<new_profile_name>" -Vendor "<vendor_name>"
```

```
PowerCLI C:\> New-EsxImageProfile -CloneProfile "ESXi-7.0.0-15843807-standard-with-test-ce
rts" -name "NewAsyncProfile" -Vendor "Chelsio"
```

Name	Vendor	Last Modified	Acceptance Level
NewAsyncProfile	Chelsio	3/16/2020 10...	PartnerSupported

- viii. Add the Chelsio drivers to the new image profile, specifying the package names obtained in step (v).

```
PowerCLI C:\> Add-EsxSoftwarePackage -ImageProfile "<new_profile_name>" -
SoftwarePackage <driver1>,<driver2>,<driver3>
```

```
PowerCLI C:\> Add-EsxSoftwarePackage -ImageProfile "NewAsyncProfile" -SoftwarePackage cxl,
cheiscsi,cheiwarp
```

Name	Vendor	Last Modified	Acceptance Level
NewAsyncProfile	Chelsio	3/10/2020 10...	PartnerSupported

- ix. Finally, export the new image profile as an ISO.

```
PowerCLI C:\> Export-EsxImageProfile -ImageProfile "<new_profile_name>" -
ExportToISO -filepath <path>.iso
```

As the Chelsio drivers are unsigned currently, use the above command with *-NoSignatureCheck* option.

```
PowerCLI C:\> Export-EsxImageProfile -ImageProfile "NewAsyncProfile" -ExportToISO -filepat
h ISO-with-drivers.iso -NoSignatureCheck
PowerCLI C:\>
```

---

## 2.2. PXE Server Configuration

---

The customized ISO with Chelsio driver component can be deployed in the PXE Server.

## 2.3. OS Installation

---

The client machine can now connect to the PXE Server over Chelsio network. ESXi 7.0 image (with Chelsio driver component) will start loading on the client machine. Select the Target LUN discovered using iSCSI Initiator on the *Select a Disk* screen and proceed with the installation.

- Chelsio iSCSI Initiator, *cheiscsi* will be used if CBFT is configured in Option ROM.
- ESXi iSCSI Initiator will be used if IBFT is configured in Option ROM.



Note

*In case the desired target LUN is not visible, press Alt+F1 to switch to shell console and execute the below command to rescan the LUNs.*

```
# esxcfg-rescan -A
```

*Press Alt+F2 to switch to Select a Disk screen.*

## IV. Appendix

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