



Chelsio FCoE Initiator for Windows

Installation and User's Guide



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I. Chelsio Unified Wire

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 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 100Gb 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 datacenters, cloud service installations and high-performance computing environments, Chelsio Terminator adapters bring a new level of performance metrics and functional capabilities to the computer networking industry.

1.1. Features

Chelsio Unified Wire for Windows is an easy to use utility developed to provide installation of 64-bit Windows based drivers and tools for Chelsio's Unified Wire adapters.

It consists of the following component(s):

- FCoE Storport Miniport Driver
- Virtual Bus Driver (VBD)

1.2. Hardware Requirements

The Chelsio Unified Wire supports all x64 architectures supporting PCIE (x4, x8, x16) slots.

- AMD CPUs, 64-bit (x86_64/amd64)
- Intel CPUs, 64-bit (x86_64)




The Chelsio Unified Wire supports 3.3v PCI bus only. Running an adapter on a PCI x4 slot is not recommended as performance will be significantly reduced by the limitations of PCI.



T4 family of adapters are not supported.

1.3. Software Requirements

The Chelsio Unified Wire software has been developed to run on Windows based platforms. To know more about the complete list of versions supported by each driver/software, please refer their respective sections.

 **Note** *Drivers are WHQL certified.*

1.4. Package Contents

- **Unified Wire Installer**


Chelsio Unified Wire comes with an interactive installer and support documentation. The documentation, consisting of README, Release Notes and User's Guide (this document), can be found in the <system_drive>\ChelsioUwire\docs\ directory after installing Chelsio Unified Wire.

- **Zip Package**

The zip package contains driver files, firmware binaries, adapter configuration binaries and support documentation (*docs* folder).

2. Hardware Installation


- i. Shutdown/power off your system.
- ii. Power off all remaining peripherals attached to your system.
- iii. Unpack the Chelsio adapter and place it on an anti-static surface.
- iv. Remove the system case cover according to the system manufacturer's instructions.
- v. Remove the PCI filler plate from the slot where you will install the Ethernet adapter.
- vi. For maximum performance, it is highly recommended to install the adapter into a PCIE x8/x16 slot.

 **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. Verify if the adapter was installed successfully. To do so, open **Device Manager** in **Control Panel**.
- xiii. 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
 - Physical function 4: for all NIC functions of the card
 - Physical function 5: for iSCSI
 - Physical function 6: for FCoE
 - Physical function 7: Currently not assigned
- xiv. Once the Unified Wire package is installed, open **Device Manager** again. Expand **Network adapters** section and now Chelsio adapter should be listed.

 **Note** *Network device names for Chelsio's physical ports are assigned using the following convention: the port farthest from the motherboard will appear as the first Ethernet 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. Software/Driver Installation

Chelsio Unified Wire can be installed using the Installer or the zip package. Refer the relevant section below depending on the method of installation selected.

Important *If you are planning to install Unified Wire in a cluster, it should be done on all the members. Using different versions of Unified Wire is not supported.*

3.1. Prerequisites

Please make sure that the following requirements are met before installation:

- Latest Microsoft Visual C++ Redistributable packages for Visual Studio (x86 and x64) are required if you are planning to use installer.
- Windows update KB2685811 should be installed on Windows 7 Client and 2008 R2 Server. It will be installed if *Automatic Updates* is configured or can be installed manually from <https://www.catalog.update.microsoft.com/Search.aspx?q=KB2685811>

3.2. Unified Wire Installer

Chelsio Unified Wire Installer provides two methods of installation: **GUI** or **CLI** mode. GUI mode provides an interactive GUI installer with customizable options. Whereas, CLI mode enables unattended installation of Chelsio drivers and software thereby relieving the user from monitoring the installation process and providing input via dialog boxes.

3.2.1. Enabling Test Signing

In case the drivers in the package are not WHQL certified, follow the steps mentioned below to enable test signing on your system:

- Goto Start->Run command option, enter "cmd" and press OK. This will open the command prompt utility.
- Run the following command:

```
C:\Users\Administrator> bcdedit /set testsigning on
```

- Reboot the machine for the changes to take effect.

3.2.2. GUI mode (Installer)

- Run the **ChelsioUwire_x.x.x.x_WIN_yyy.y.yy.exe** installer application.
- Click **Next** for the Chelsio End User License Agreement Window.

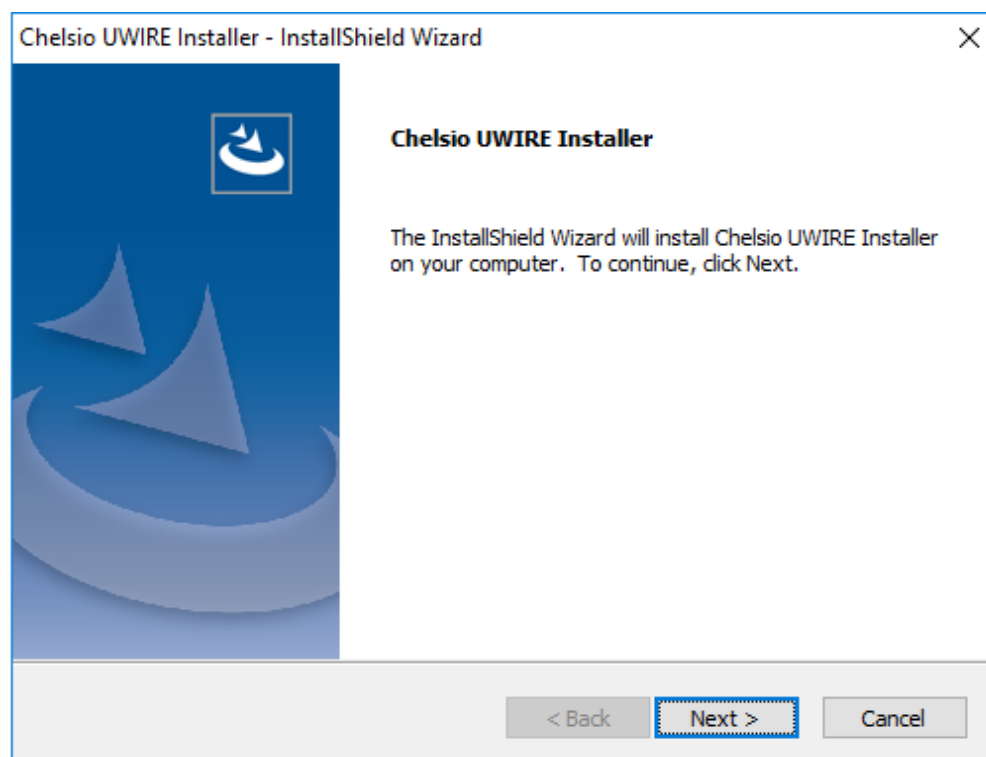


Figure 1 - Unified Wire installer welcome window

- iii. Select the radio button **I accept the terms of the license agreement** and click **Next**

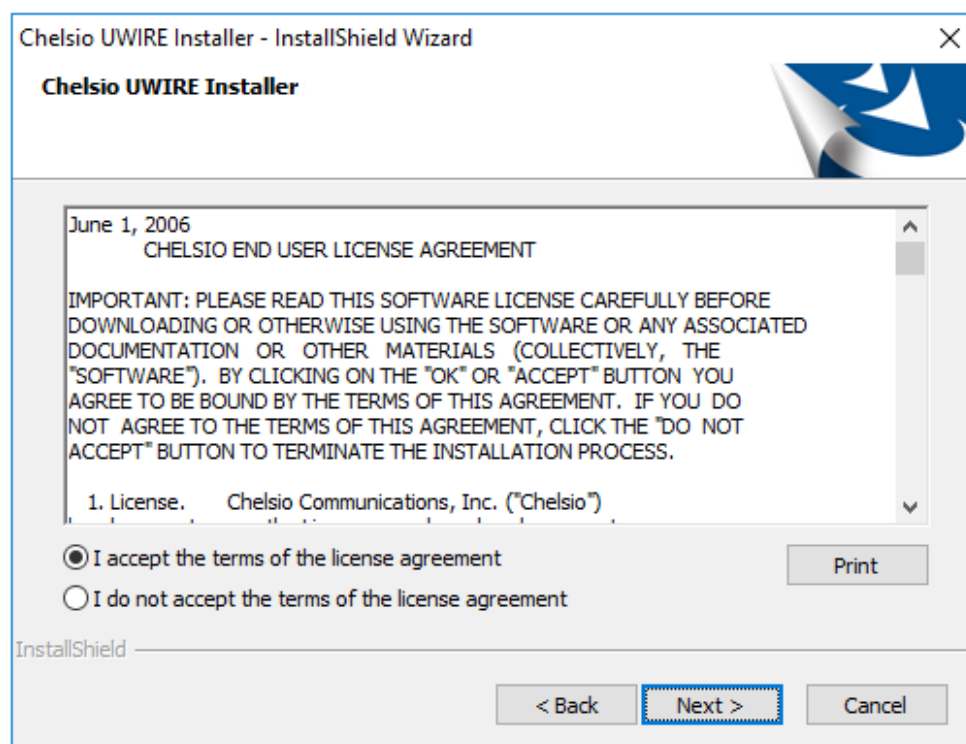


Figure 2 - Chelsio EULA window

- iv. Select **Complete** for complete package installation.

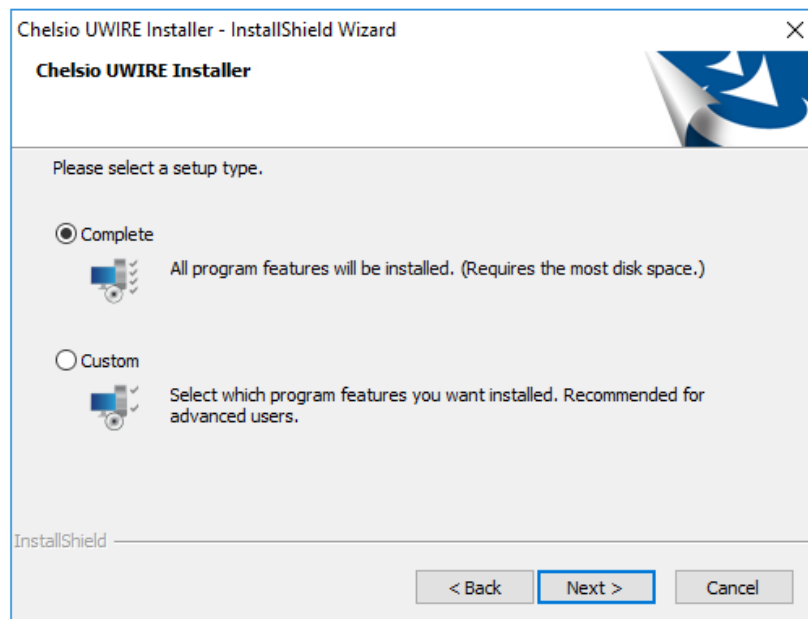


Figure 3 - Select setup (installation) type

- v. Click **Install** to start the installation.

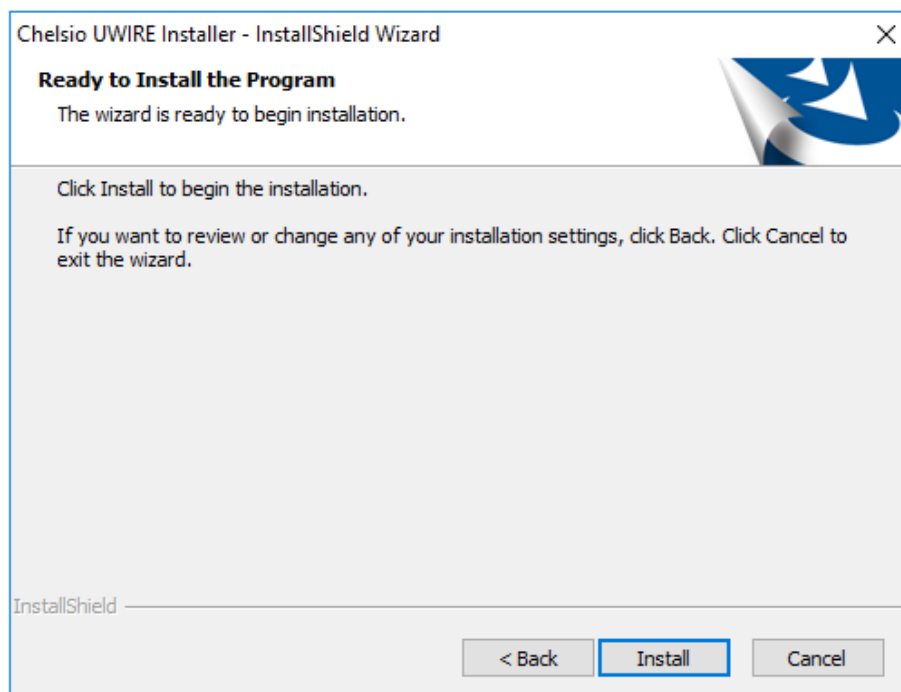


Figure 4 - Start installation

vi. FCoE Storport Miniport and NIC drivers will now be installed.

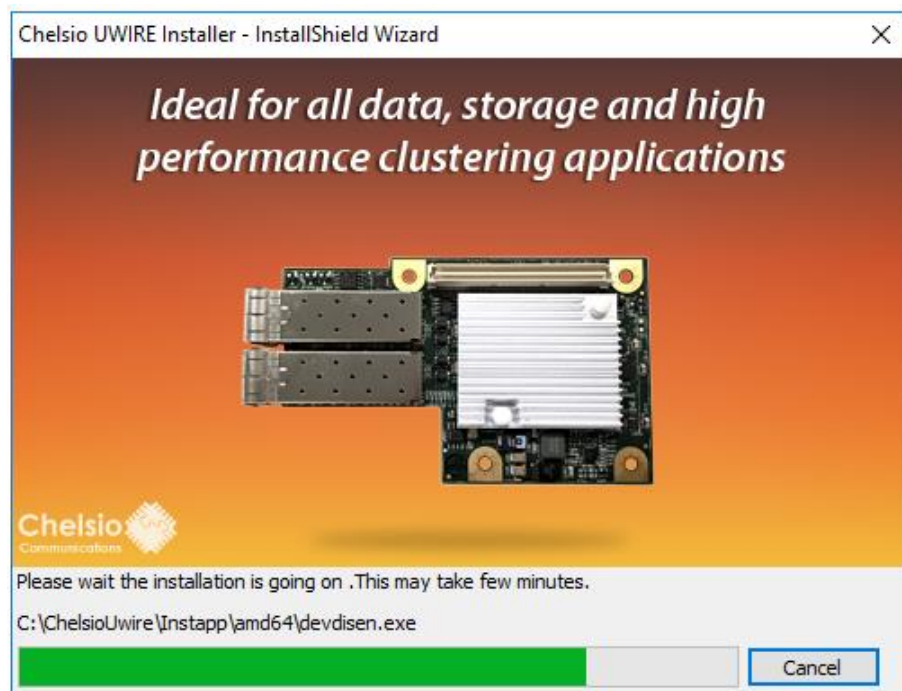


Figure 5 - Installation in progress

vii. Click **Finish** to exit from the Unified Wire Installer.

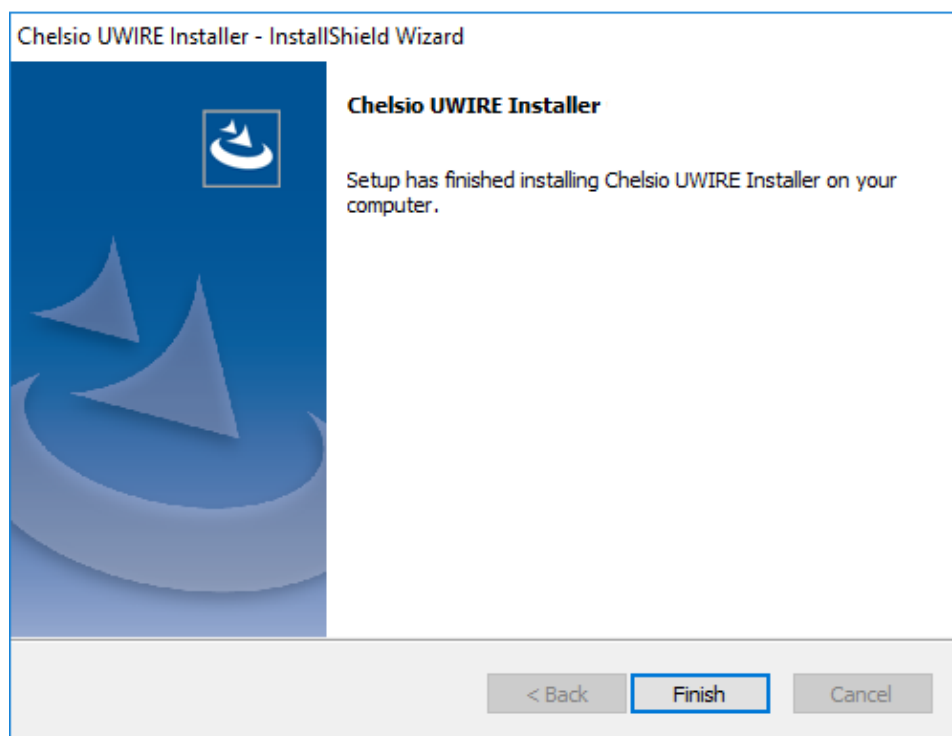


Figure 6 - Finishing Unified Wire installation

3.2.3. CLI mode (Silent Installation)

To install the driver using this feature, open **command prompt** and execute the following command:

```
C:\Users\Administrator> ChelsioUwire_x.x.x.x_WIN_yyy.y.yy.exe -in all
```

The above command will install NIC and FCoE Storport Miniport drivers.

To know more about other parameters and options, execute the following command:

```
C:\Users\Administrator> ChelsioUwire_x.x.x.x_WIN_yyy.y.yy.exe -help
```

The above command will create a help file, *ChelsioUwire_x.x.x.x_WIN_yyy.y.yy_help.txt*, in the present working directory which contains the complete list of command line syntax required for performing all the necessary CLI operations.



Note A log file, *ChelsioUwire_x.x.x.x_WIN_yyy.y.yy.log*, is created in the same directory which keeps a record of all the commands executed and their results.

3.3. Zip Package

Chelsio Unified Wire zip package provides two methods of installation: **Manual** and using **Offline Windows Image**. In Manual method, the driver components must be individually installed using the Device Manager. Using the second method, you can add Chelsio driver components to an offline OS image. The image can then be used to install Windows on your system.

3.3.1. Enabling Test Signing

In case the drivers in the package are not WHQL certified, please follow the steps mentioned below to enable test signing before installing Unified Wire:

- i. Open command prompt and run the following command to enable test signing:

```
C:\Users\Administrator>bcdedit /set testsigning on
```

- ii. Change your working directory to *ChelsioUwire_x.x.x.x_WIN_yyy.y.yy/Selfsign/* and run the following commands:

```
C:\ ChelsioUwire_x.x.x.x_WIN_yyy.y.yy\Selfsign> .\certmgr.exe -add  
.\chelsiocert1.cer -s -r LocalMachine root -all  
C:\ ChelsioUwire_x.x.x.x_WIN_yyy.y.yy\Selfsign> .\certmgr.exe -add  
.\chelsiocert1.cer -s -r LocalMachine trustedpublisher -all
```

- iii. Reboot the machine for the changes to take effect.

3.3.2. Drivers location

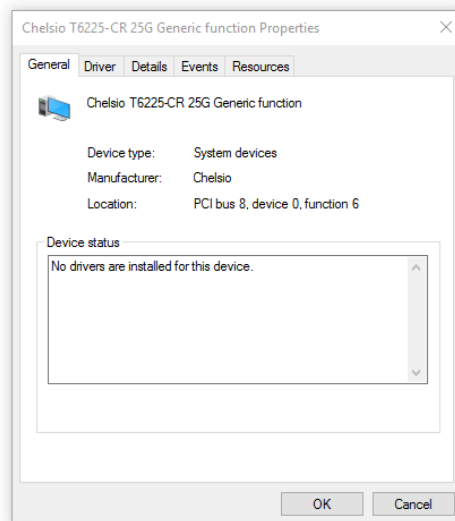
The driver files should be manually picked from:

- *ChelsioUwire_x.x.x.x_WIN_yyy.y.yy\drivers\Win19* for Server 2019.
- *ChelsioUwire_x.x.x.x_WIN_yyy.y.yy\drivers\Win10* for Server 2016 and 10 Client.

3.3.3. Manual

- !
Important

 - *The driver components need to be installed strictly in the order described here. Using any other order is not supported.*
 - *Before proceeding, open Device Manager and disable NDIS Miniport driver (Network adapters->Chelsio Network Adapter) followed by Virtual Bus Driver (System devices->Chelsio Bus Enumerator).*
- **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 in the zip package. Click **Open** and then **OK**.
 - v. Click **Next** and driver installation will progress. Click **Close** once the installation is complete.
 - **FCoE Storport Miniport driver**
 - i. 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**.



- ii. Under **Driver** tab, select **Update Driver...**
- iii. Select **Browse my computer for driver software.**
- iv. Select **Let me pick from a list of device drivers on my computer** and click **Next**.
- v. Click on **Have Disk** Button and on the next screen, browse for **csiofcoe.inf** file in the zip package. Click **Open** and then **OK**.
- vi. 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** file in the zip package. 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.

- **Generic Function**

- i. 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**.
- 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 **chnulx64.inf** file in the zip package. Click **Open** and then **OK**.
- v. Click **Next** and driver installation will progress. Click **Close** once the installation is complete.

3.3.4. Offline Windows Image

You can use Windows Deployment Image Servicing and Management (DISM) tool to add Chelsio driver components (.inf files) to an offline Windows image. For more information, visit the following links:

- <http://technet.microsoft.com/en-us/library/hh825070.aspx>
- <http://blogs.technet.com/b/heyscriptingguy/archive/2012/09/27/use-the-powershell-dism-cmdlets-to-manage-windows-8.aspx>

4. Firmware Update

The driver will auto-load the firmware if an update is required. The firmware version can be verified using *cxgbtool*:

```
C:\Users\Administrator>cxgbtool nic0 debug version
```

In case of installer, the firmware binaries will be copied to `<system_drive>\ChelsioUwire\Firmware\` folder during installation.

For zip package, the binaries will be present in `ChelsioUwire_x.x.x.x_WIN_yyy.y.yy\Firmware\` folder.

5. *cxgbtool* help

The *cxgbtool* command queries or sets various aspects of Chelsio network interface cards. It complements standard tools used to configure network settings and provides functionality not available through such tools.

Some of the commands provided can be used to query running statistics to aid in debugging.

Syntax

```
cxgbtool <vbdIface|nicIface|iSCSIIface|rdma> <category> <command> <options>
```

Definitions

nicIface is the name of the network device to work on, given in the format *nic0*, *nic1*.

vbdIface is the name of the Chelsio Bus Enumerator instance to work on, given in the format *vbd0*, *vbd1*

iscsIface is the name of the Chelsio iSCSI interface to work on, given in the format *iSCSI0*, *iSCSI1*

rdma is the name of the Chelsio RDMA interface to work on.

fcoeIface is the name of the Chelsio FCoE interface to work on, given in the format *Scsi1*, *Scsi2*

category is one of the *cxgbtool* categories, i.e., *boot*, *cudbg*, *debug*, *firmware*, *hardware*

command is the action you wish to perform on the adapter or property you wish to view/change.

option is the optional parameter to be provided with *command*.

- **Help**

- Displaying *cxgbtool* help: *cxgbtool*
- Displaying list of available *cxgbtool* commands: *cxgbtool -h all*
- Displaying category specific help:
cxgbtool <vbdIface|nicIface|iSCSIIface> <category> -h
- Displaying list of *cudbg* entities: *cxgbtool <vbdIface> cudbg dbg -h*
- Displaying RDMA help: *cxgbtool rdma -h*
- Displaying FCoE help: *cxgbtool fcoe -h*

- **FCoE**

Description: Display FCoE information.

Syntax: `cxgbtool fcoe -a [FCoEAdapterIndex] <options>`

Examples:

- Scanning for available Chelsio adapters.

```
C:\Users\Administrator>cxgbtool fcoe --scan
Chelsio Adapter device : Scsi1
```

- Printing adapter status and parameters.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-hw
Name           :
Model          : T6225-CR
Serial No.     : RE41160001
HW Version     :
Driver Version : 2.0.3.0
Vendor-Id      : 1425
Device-Id      : 6601
Device Instance : 0
ASIC Revision  : 0
Firmware rev   : 1.16.63.00
PF number      : 6
Master function : FALSE
Initiator Mode : TRUE
Target Mode    : FALSE
No.of ports    : 2

Port-0 Status  : LINK UP
ENode MAC      : 00-07-43-04-B4-26
Speed          : 10G

Port-1 Status  : LINK DOWN
ENode MAC      : 00-07-43-04-B4-2E

Interrupt Mode : MSI-X

Firmware Event Queue:
    IQ-Idx     : 0
    MSIX       : 2

No.of SGE Queues: 19
```

- Printing adapter statistics.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-hw-stats
State      : READY

Active-Q events      : 0
Free-Q events       : 512
Dropped events      : 1
Unexpected events    : 0
Unexpected CPL Message : 0
PCI-channel offline : 0
Link-UP Miss        : 1
CPL FW6 Message     : 13
CPL FW6 payload      : 1446
PL Unexpected Interrupt : 0
PL Interrupt count   : 0
Stray Interrupts     : 0
Total Errors         : 0
Fatal Errors         : 0
NoMEM Errors         : 0
IO Errors            : 0

Current Event        : CSIO_HWE_INIT_DONE
Previous Event       : CSIO_HWE_INIT

HW State-Machine Events statistics
    CSIO_HWE_CFG             : 1
    CSIO_HWE_INIT            : 1
    CSIO_HWE_INIT_DONE       : 1
    CSIO_HWE_FATAL           : 0
    CSIO_HWE_PCIERR_DETECTED : 0
    CSIO_HWE_PCIERR_SLOT_RESET : 0
    CSIO_HWE_PCIERR_RESUME    : 0
    CSIO_HWE_QUIESCED        : 0
    CSIO_HWE_HBA_RESET        : 0
    CSIO_HWE_HBA_RESET_DONE   : 0
    CSIO_HWE_FW_DLOAD         : 0
    CSIO_HWE_PCI_REMOVE       : 0
    CSIO_HWE_SUSPEND          : 0
    CSIO_HWE_RESUME           : 0
```

- Printing physical port statistics of adapter.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-port
*****[Port: 0]*****
Tx Broadcast Bytes Transmitted : 0
Tx Broadcast Frames Transmitted : 0
Tx Multicast Bytes Transmitted : 64
Tx Multicast Frames Transmitted : 1
Tx Unicast Bytes Transmitted : 2475462316408
Tx Unicast Frames Transmitted : 1204826250
Tx Frames Dropped : 0
Tx Offload Bytes Transmitted : 0
Tx Offload Frames Transmitted : 0
Rx Broadcast Bytes : 0
Rx Broadcast Frames : 0
Rx Multicast Bytes Received : 1179120
Rx Multicast Frames Received : 14739
Rx Unicast Bytes Received : 6308551330
Rx Unicast Frames Received : 73316221
Rx Error Frames Received : 0
*****[Port: 1]*****
Tx Broadcast Bytes Transmitted : 0
Tx Broadcast Frames Transmitted : 0
Tx Multicast Bytes Transmitted : 0
Tx Multicast Frames Transmitted : 0
Tx Unicast Bytes Transmitted : 0
Tx Unicast Frames Transmitted : 0
Tx Frames Dropped : 0
Tx Offload Bytes Transmitted : 0
Tx Offload Frames Transmitted : 0
Rx Broadcast Bytes : 0
Rx Broadcast Frames : 0
Rx Multicast Bytes Received : 0
Rx Multicast Frames Received : 0
Rx Unicast Bytes Received : 0
Rx Unicast Frames Received : 0
Rx Error Frames Received : 0
```

- Printing DCB parameters.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --dcb-params
***** Desired DCBX Paramters[Port: 0] *****
Priority Group ID of Priority 0      : 0
Priority Group ID of Priority 1      : 0
Priority Group ID of Priority 2      : 0
Priority Group ID of Priority 3      : 1
Priority Group ID of Priority 4      : 0
Priority Group ID of Priority 5      : 0
Priority Group ID of Priority 6      : 0
Priority Group ID of Priority 7      : 0

Bandwidth Percentage :
-----
Bandwidth Percentage of Priority Group 0: 50
Bandwidth Percentage of Priority Group 1: 50
Bandwidth Percentage of Priority Group 2: 0
Bandwidth Percentage of Priority Group 3: 0
Bandwidth Percentage of Priority Group 4: 0
Bandwidth Percentage of Priority Group 5: 0
Bandwidth Percentage of Priority Group 6: 0
Bandwidth Percentage of Priority Group 7: 0

Number of Traffic Classes Supported : 8

Strict Priorate :
-----
Strict Priorate for Priority 0      : 0
Strict Priorate for Priority 1      : 0
Strict Priorate for Priority 2      : 0
Strict Priorate for Priority 3      : 0
Strict Priorate for Priority 4      : 0
Strict Priorate for Priority 5      : 0
Strict Priorate for Priority 6      : 0
Strict Priorate for Priority 7      : 0

PFC Enabled/Disabled :
-----

Number of Traffic Classes Supported : 8

PFC for Priotity 0      : Disabled
PFC for Priotity 1      : Disabled
PFC for Priotity 2      : Disabled
PFC for Priotity 3      : Enabled
PFC for Priotity 4      : Disabled
PFC for Priotity 5      : Disabled
PFC for Priotity 6      : Disabled
PFC for Priotity 7      : Disabled
```

- Printing driver parameters.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --drv-params
LUN Queue depth      : 32
Max Tx length        : 65536
Max Boot init delay   : 65
```

- Printing SCSI statistics.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-scsi-stats
SCSI STATISTICS:
    Good I/Os                      :37498313
    Remote-node-not-ready Errors    :0
    HW-module-not-ready Errors      :0
    DMA map Erros                   :0
    Too-many-SGEs Errors            :0
    Out-of-IOWords Errors           :0
    CSIO_BUSY Errors                :0
    FW_HOSTERROR I/O                :0
    Response Errors                 :42
    Auto-sense Replies              :1
    Overflow Errors                 :0
    Underflow Errors                :0
    Remote-Device-Not-Ready Errors  :0
    Remote-Device-Lost Errors       :0
    Remote-Device-Logged-Out Errors :0
    Link-Down Errors                :0
    Unknown SCSI Errors             :0
    Aborted I/Os                    :32
    Abort Timed-outs                :0
    Abort Failures                   :0
    Abort Race-Completions          :0
    Abort CSIO_BUSY Errors          :0
    Closed IOWords                  :0
    Close CSIO_BUSY Errors          :0
    IOWords in Res_wait_q           :0
    IOWords in Active_q             :32
    TMs in Active_q                 :0
    IOWords in Worker cbfn_q        :0
    IOWord Freelist Entries         :2016
    DDP Misses                      :0
    Invalid CPL Opcodes             :0
    Invalid SCSI Opcodes            :0
```

- Printing FCFs information connected to the adapter.

```

C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-fcf
*****[Index: 0]*****
Priority          : 128
FCF MAC          : 00-05-73-D3-0A-80
Name ID          : 23:e8:00:05:73:d3:0a:81
Fabric          : 23:e8:00:05:73:d3:0a:81
VF_ID           : 1000
VLAN ID         : 232
Max Frame Size   : 2128
FCF Map          : 0efcff
FKA ADV Period   : 8
FCFI            : 0x9c20
Link Affected    : 0
FPMA            : 1
SPMA            : 0
Available for Login: 1
Port-id         : 0
SPMA MAC        : 00-00-00-00-00-00

Adapter Statistics - FCF Stats:

FIP Tx Port Bytes Transmitted Without Error      : 613976
FIP Tx Port Frames Transmitted Without Error     : 16311
No.of Keep Alives sent from the Enode MAC        : 14978
No.of Multicast Advertisement received           : 14866
No.of Unicast Advertisement received             : 0
No.of Unicast Solicitations sent                 : 0
No.of VLAN Requests sent                         : 0
No.of VLAN Replies received                      : 0
No.of Clear Virtual Link messages received       : 0
No.of times Virtual Link went down               : 0
No.of times Virtual Link came up                 : 0
No.of times a LOGO was sent                      : 0
No.of times a FLOGI request was sent              : 0
No.of times a reply to FLOGI was received        : 0
No.of times a FDISC request was sent              : 0
No.of times a reply to FDISC was received        : 0
No.of times the Keep Alive interval changed      : 1
No.of times the FC MAP value changed             : 1
No.of times the VF_ID value changed             : 1
No.of times the switch disabled the
    requirement for KeepAlives to be sent        : 0
No.of times adapter was out of resources
    for a new VN_Port                            : 1

```

- Printing local nodes information.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-lnode
*****[Index: 0]*****
LNode Device ID: 39940
VNPI      : 0x9c04
FCFI      : 0x9c20
MAC       : 0E-FC-FF-1C-02-60

Port Id : 0
Nport id: 1c0260
State   : READY

WWPN      : 50:00:74:30:4b:42:60:80
WWNN      : 50:00:74:30:4b:42:60:00
NPIV      : SUPPORTED
Total VPorts : 0

No.of RNodes : 1

Common Service Params:
    Rcv size: 2068
    ED-TOV  : 2000

Class Service Params:
Class 1: NOT SUPPORTED
Class 2: NOT SUPPORTED
Class 3: SUPPORTED
    Initiator ctl      : 0
    Recipient ctl      : 0
    Rcv size           : 2068
    Total concurrent seq : 0
    EE Credit          : 0
    Open Sequence per Exchange: 0

Class 4: NOT SUPPORTED
*****[Index: 1]*****
State   : UNINIT

WWPN      : 50:00:74:30:4b:42:e1:80
WWNN      : 50:00:74:30:4b:42:e1:00
```


- Printing local nodes statistics.

```

C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-lnode-stats
*****[Index: 0]*****
VNPI          : 0x9c04
FCFI          : 0x9c20
NPort-id     : 1c0260
WWPN         : 50:00:74:30:4b:42:60:80
State        : READY

Statistics
  Link up      : 1
  Link down    : 0
  Errors       : 0
  Memory failures : 0
  Invalid Params : 0
  RNode match  : 1309
  Unexpected events: 0
  Dropped events : 0
  FDMI errors  : 0
  Device-loss Timeouts: 151

Current Event      :RSCN_DEV_LOST
Previous Event     :RSCN_DEV_LOST

LNode SM Event statistics
  CSIO_LNFE_LINK_INIT      : 0
  CSIO_LNFE_NPIV_INIT      : 0
  CSIO_LNFE_LINKUP         : 1
  CSIO_LNFE_FAB_INIT_DONE  : 1
  CSIO_LNFE_NAME_REGD      : 0
  CSIO_LNFE_SCAN           : 0
  CSIO_LNFE_LINK_DOWN      : 0
  CSIO_LNFE_DOWN_LINK      : 0
  CSIO_LNFE_LINK_DOWN_DONE : 0
  CSIO_LNFE_LOGO           : 0
  CSIO_LNFE_RESET          : 0
  CSIO_LNFE_CLOSE          : 0

FW RDEV Event statistics
  PLOGI_ACC_RCVD          : 6
  PLOGI_RJT_RCVD          : 0
  PLOGI_RCVD              : 653
  PLOGO_RCVD              : 4
  PRLI_ACC_RCVD           : 4
  PRLI_RJT_RCVD           : 0
  PRLI_RCVD               : 653
  PRLO_RCVD               : 0
  NPORT_ID_CHGD           : 0
  FLOGO_RCVD              : 0
  FLOGI_ACC_RCVD          : 1
  FLOGI_RJT_RCVD          : 0
  FDISC_ACC_RCVD          : 0
  FDISC_RJT_RCVD          : 0
  FLOGI_TMO_MAX_RETRY     : 0
  IMPL_LOGO_ADISC_ACC      : 0
  IMPL_LOGO_ADISC_RJT     : 0
  IMPL_LOGO_ADISC_CNFLT    : 0
  PRLI_TMO                : 0
  ADISC_TMO               : 0
  RSCN_DEV_LOST           : 0

Adapter Statistics - Lnode (VNP) Stats:
No.of Keep Alives sent from the VN_Port MAC      : 1336
No.of times FLOGI was rejected                    : 0
No.of times FDISC was rejected                    : 0
No.of Unsolicited ELS requests received           : 0
No.of times FLOGI failed due to
  invalid service parameters in LS_ACC             : 0
No.of times FDISC failed due to
  invalid service parameters in LS_ACC             : 0
No.of times adapter was out of resources to
  add a MAC address filter in MPS TCAM             : 0
No.of times adapter received an invalid FCoE frame : 0
No.of Unsolicited SCSI Command requests received  : 0
No.of times a remote VN_Port was implicitly logged out : 0
No.of times adapter was out of resources for a new Session : 0

```

- Printing remote nodes information.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-rnode

*****[Index: 0]*****
SSNI           : 0x9800
VNPI           : 0x9c04
FCFI           : 0x9c20
WWPN           : 20:01:00:05:73:d3:0a:bf
WWNN           : 23:e8:00:05:73:d3:0a:81
Nport id       : FFFFFE
State          : READY
FCP Flags      : 0
Role           : Fabric

Class Service Params:
Class 1: NOT SUPPORTED
Class 2: NOT SUPPORTED
Class 3: SUPPORTED
Class 4: NOT SUPPORTED

*****[Index: 1]*****
SSNI           : 0x9801
VNPI           : 0x9c04
FCFI           : 0x9c20
WWPN           : 25:0d:00:05:73:d3:0a:80
WWNN           : 23:e8:00:05:73:d3:0a:81
Nport id       : FFFFFC
State          : READY
FCP Flags      : 0
Role           : Name-Server

Class Service Params:
Class 1: NOT SUPPORTED
Class 2: NOT SUPPORTED
Class 3: SUPPORTED
Class 4: NOT SUPPORTED

*****[Index: 2]*****
SSNI           : 0x9803
VNPI           : 0x9c04
FCFI           : 0x9c20
WWPN           : 25:0b:00:05:73:d3:0a:80
WWNN           : 23:e8:00:05:73:d3:0a:81
Nport id       : FFFFFA
State          : READY
FCP Flags      : 0
Role           : N-Port

Class Service Params:
Class 1: NOT SUPPORTED
Class 2: NOT SUPPORTED
Class 3: SUPPORTED
Class 4: NOT SUPPORTED
```

- Printing remote nodes statistics.

```

C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-rnode-stats

*****[Index:  0]*****
SSNI      : 38912
VNPI      : 39940
FCFI      : 39968
WWPN      : 20:01:00:05:73:d3:0a:bf
NPort-id: FFFFFE
State     : READY

Statistics
  No.of LUN Reset: 0
  No.of LUN Reset Failures: 0
  Errors          : 0
  Memory Failures : 0
  Unexpected Events: 0
  Dropped Events  : 0

Current Event      : FLOGI_ACC_RCVD
Previous Event     : NONE

RNode SM Event statistics

      CSIO_RNFE_NONE           : 0
      CSIO_RNFE_LOGIN          : 0
      CSIO_RNFE_DO_ADISC       : 0
      CSIO_RNFE_ADISC_ACC      : 0
      CSIO_RNFE_ADISC_REJ      : 0
      CSIO_RNFE_LOGGED_IN      : 1
      CSIO_RNFE_PRLI_DONE      : 0
      CSIO_RNFE_PLOGI_RECV     : 0
      CSIO_RNFE_PRLI_RECV      : 0
      CSIO_RNFE_LOGO_RECV      : 0
      CSIO_RNFE_PRLO_RECV      : 0
      CSIO_RNFE_DOWN           : 0
      CSIO_RNFE_CLOSE          : 0
      CSIO_RNFE_NAME_MISSING    : 0

```

- Displaying FCoE statistics.

```

C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-fcoe-stats

      channel 0      channel 1      channel 2      channel 3
octetsDDP:      3228899           0           0           0
framesDDP:       1667           0           0           0
framesDrop:        0           0           0           0

```

- Displaying internal memory information.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-meminfo
EDC0:      0-0x3ffffff [4.00 MiB]
EDC1:      0x400000-0x7ffffff [4.00 MiB]
MC:        0x800000-0x407ffffff [1.00 GiB]

RQUdp region: 0xffffffff-0xfffffffffe [0 B]
IMSG contexts: 0x27d600-0x3375ff [744 KiB]
ULPTX state:  0x337600-0x34147f [39.6 KiB]
ULPRX state:  0x341480-0x34607f [19.0 KiB]
Pstructs:     0x346080-0x3c587f [510 KiB]
Rx FL:        0x3c5880-0x3c6cbf [5.06 KiB]
Tx FL:        0x3c6cc0-0x3cacbf [16.0 KiB]
Pstruct FL:   0x3cacc0-0x3d01ff [21.3 KiB]
LE hash:      0x3d0200-0x4101ff [256 KiB]
TCBs:         0x410200-0x67ffff [2.43 MiB]
Rx payload:   0x680000-0x7ffffff [121 MiB]
DBQ contexts: 0x818000-0x823a67f [745 KiB]
FLM cache:    0x823a680-0x8351bbf [1.09 MiB]
Timers:       0x8351bc0-0x87fffff [4.68 MiB]
TDDP region:  0x880000-0x9dbc5ff [21.7 MiB]
iSCSI region: 0x9dbc600-0xa1bc5ff [4.00 MiB]
TPT region:   0xa1bc600-0xc5f64ff [36.2 MiB]
STAG region:  0xa1bc600-0xc5f64ff [36.2 MiB]
TXPBL region: 0xc5f6500-0x1bc4d3ff [246 MiB]
PBL region:   0xc5f6500-0x1bc4d3ff [246 MiB]
RQ region:    0x1bc4d400-0x204c127f [72.4 MiB]
Tx payload:   0x20800000-0x387fffff [384 MiB]

uP RAM:       0x394de000-0x407ffffff [115 MiB]
uP Extmem2:   0-0xffffffff [4.00 GiB]

1944 Rx pages of size 64KiB for 1 channels
6144 Tx pages of size 64KiB for 2 channels
8160 p-structs

Port 0 using 0 pages out of 2 allocated
Port 1 using 0 pages out of 1 allocated
Port 2 using 2047 pages out of 2047 allocated
Port 3 using 2047 pages out of 2047 allocated

Loopback 0 using 2047 pages out of 2047 allocated
Loopback 1 using 2047 pages out of 2047 allocated
Loopback 2 using 2047 pages out of 2047 allocated
Loopback 3 using 2047 pages out of 2047 allocated
```

- Displaying firmware debug logs.

```
C:\Users\Administrator>cxgbtool fcoe -a scsi1 --show-fw-log
Seq#      Tstamp      Level  Facility  Message
87         1935097      INFO   PORT      port_hss_sigdet[0]: hss_sigdet changed to 0x1
88         1935098      INFO   PORT      hw_mac_link_status[0] int_cause 0x301df0, link_status 0x12
89         3335038      INFO   PORT      hw_mac_link_status[0] int_cause 0x301df0, link_status 0x12
90         3535039      INFO   PORT      port[0] link up (1) (speed 0x4 acaps 0xf0006 lpcaps 0xf0000)
91         3535041      INFO   PORT      port[0] set PAUSE PARAMS: pppen 0 txpe 0x1 rxpe 0x1
92         3535042      INFO   DCB       dcbx_run_version_sm[0] DCBX_VER_STATE_RUN_IEEE
93         3535047      INFO   FOFCE     fcoe_notify : FCoE LINKUP: port 0x0, event 0x1
94         3535048      INFO   FOFCE     fcoe_notify : Update new DCBX values VI state 0x3 pri 0x3 schedcl 0xff dcbx_done 0x0
95         3535049      INFO   PORT      port[0] update (flowcid 40410 rc 0)
96         3536105      INFO   DCB       dcbx_run_version_sm[0] DCBX_VER_STATE_RUN_CEE
97         4536324      INFO   TM        pktsched_cl_rl[0:0]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
98         4536326      INFO   TM        pktsched_cl_wrr[0:0]: weight 50
99         4536327      INFO   TM        pktsched_cl_rl[0:1]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
100        4536328      INFO   TM        pktsched_cl_wrr[0:1]: weight 50
101        4536328      INFO   TM        pktsched_cl_rl[0:2]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
102        4536329      INFO   TM        pktsched_cl_wrr[0:2]: weight 0
103        4536330      INFO   TM        pktsched_cl_rl[0:3]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
104        4536331      INFO   TM        pktsched_cl_wrr[0:3]: weight 0
105        4536331      INFO   TM        pktsched_cl_rl[0:4]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
106        4536332      INFO   TM        pktsched_cl_wrr[0:4]: weight 0
107        4536332      INFO   TM        pktsched_cl_rl[0:5]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
108        4536333      INFO   TM        pktsched_cl_wrr[0:5]: weight 0
109        4536333      INFO   TM        pktsched_cl_rl[0:6]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
110        4536334      INFO   TM        pktsched_cl_wrr[0:6]: weight 0
111        4536335      INFO   TM        pktsched_cl_rl[0:7]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
112        4536336      INFO   TM        pktsched_cl_wrr[0:7]: weight 0
113        4536337      INFO   PORT      port[0] set PAUSE PARAMS: pppen 1 txpe 0x8 rxpe 0x8
114        4536339      INFO   FOFCE     fcoe_notify : DCBX : port 0x0, priority 0x3 ulptxch 0x0 class 0x1
115        4536340      INFO   FOFCE     fcoe_notify : Update new DCBX values VI state 0x7 pri 0x3 schedcl 0x1 dcbx_done 0x1
116        5536390      INFO   TM        pktsched_cl_rl[0:0]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
117        5536392      INFO   TM        pktsched_cl_wrr[0:0]: weight 50
118        5536392      INFO   TM        pktsched_cl_rl[0:1]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
119        5536393      INFO   TM        pktsched_cl_wrr[0:1]: weight 50
120        5536394      INFO   TM        pktsched_cl_rl[0:2]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
121        5536395      INFO   TM        pktsched_cl_wrr[0:2]: weight 0
122        5536395      INFO   TM        pktsched_cl_rl[0:3]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
123        5536396      INFO   TM        pktsched_cl_wrr[0:3]: weight 0
124        5536396      INFO   TM        pktsched_cl_rl[0:4]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
125        5536397      INFO   TM        pktsched_cl_wrr[0:4]: weight 0
126        5536398      INFO   TM        pktsched_cl_rl[0:5]: mode | unit | rate 0x000000 min 0 max 100 pktsize 0
127        5536398      INFO   TM        pktsched_cl_wrr[0:5]: weight 0
```

- Creating NPIV ports for the parent WWN.

```
PS C:\Windows\system32> cxgbtool fcoe --adapter=scsi1 --create-npiv --wwn=50:00:74:30:4b:42:60:80 --uwn=50:00:74:30:4b:42:60:00 --vwn=50:00:74:30:4b:42:60:00 --vsn=50:00:74:30:4b:42:60:00
PS C:\Windows\system32>
```

- Deleting NPIV ports for the parent WWN.

```
PS C:\Windows\system32> cxgbtool fcoe --adapter=scsi1 --delete-npiv --wwn=50:00:74:30:4b:42:60:80 --uwn=50:00:74:30:4b:42:60:00 --vwn=50:00:74:30:4b:42:60:00 --vsn=50:00:74:30:4b:42:60:00
PS C:\Windows\system32>
```

- Printing NPIV ports for the parent WWPN.

```
PS C:\Windows\system32> cxgbtool fcoe --adapter=scsi1 --list-npiv --wwn=50:00:74:30:4b:42:60:80
Parent WWPN      : 50:00:74:30:4b:42:60:80
Total Uports     : 1
*****[Index: 0]*****
NPIV WWPN        : 50:00:74:30:4b:42:60:80
NPIV UWN         : 50:00:74:30:4b:42:60:80
Nport id         : 1c0260
MAC              : 0E-FC-FF-1C-02-60
```

- **Debug**

- **version**

Description: Display adapter information like part number, serial number, device ID, firmware version, TP, etc.

Syntax: cxgbtool <vbdIface|nicIface|iscsiIface> debug version

Example:

```
C:\Users\Administrator>cxgbtool nic0 debug version
P/N:          11012096004
S/N:          PT43160304
DeviceId:     6401 (T6225-CR)
FW Ver:       1.16.38.0
TP Ver:       0.1.23.2
Driver Ver:   6.5.4.10
Nic File Ver: 6.5.4.10
VBD File Ver: 6.5.4.10
Cudbg lib Ver: 1.14.0
SCFG Ver:     0x1402000
```

- **inst**

Description: Install driver package specified in the setup information file (.inf).

Syntax: cxgbtool debug inst <file>

Example:

```
C:\Users\Administrator>cxgbtool debug inst Desktop\chvbdx64.inf
ENTER: DriverPackageInstallA
ENTER: DriverPackageInstallW
Installing INF file 'C:\Users\Administrator\Desktop\chvbdx64.inf' (Plug and Play).
Looking for Model Section [Chelsio.NTamd64]...
Installing devices with Id "PCI\VEN_1425&DEV_5410&SUBSYS_00001425&REV_00" using INF "C:\Windows\System32\DriverStore\FileRepository\chvbdx64.inf_amd64_db5d99a4eb080b3f\chvbdx64.inf".
Installation did not occur because the hardware isn't currently present.
Installing devices with Id "PCI\VEN_1425&DEV_6401&SUBSYS_00001425&REV_00" using INF "C:\Windows\System32\DriverStore\FileRepository\chvbdx64.inf_amd64_db5d99a4eb080b3f\chvbdx64.inf".
ENTER: UpdateDriverForPlugAndPlayDevices...
RETURN: UpdateDriverForPlugAndPlayDevices.
Installation was successful.
Marked Phantom Device with Hardware/Compatible Id 'PCI\VEN_1425&DEV_5410&SUBSYS_00001425&REV_00' for reinstall on next plug-in.
Install completed
RETURN: DriverPackageInstallW (0x0)
RETURN: DriverPackageInstallA (0x0)
```

- **update**

Description: Update driver package.

Syntax: cxgbtool debug update <file>

Example:

```
C:\Users\Administrator>cxgbtool debug update C:\Users\Administrator\Desktop\v6.5.8.0\bin\fre\x64\chvbdx64.inf
Driver for HwId:PCI\VEN_1425&DEV_6407&SUBSYS_00001425&REV_00 updated successfully!!!
```

▪ **uninst**

Description: Uninstall driver package specified in the setup information file (.inf).

Syntax: cxgbtool debug uninst <file>

Example:

```
C:\Users\Administrator>cxgbtool debug uninst Desktop\chvbdx64.inf
Removing device instance PCI\VEN_1425&DEV_6401&SUBSYS_00001425&REV_00\4&2A43D483&0&0410
Removing device instance PCI\VEN_1425&DEV_5410&SUBSYS_00001425&REV_00\4&31024D2F&0&0418
ENTER: DriverPackageGetPathA
RETURN: DriverPackageGetPathA (0x7A)
ENTER: DriverPackageGetPathA
RETURN: DriverPackageGetPathA (0x0)
ENTER: DriverPackageUninstallA
ENTER: DriverPackageUninstallW
Uninstalling driver package C:\Windows\System32\DriverStore\FileRepository\chvbdx64.inf_amd64_db5d99a4eb080b3f\chvbdx64.inf...
Successfully uninstalled 'C:\Windows\INF\oem6.inf'.
No devices found for C:\Windows\System32\DriverStore\FileRepository\chvbdx64.inf_amd64_db5d99a4eb080b3f\chvbdx64.inf uninstall.
Successfully deleted properties for driver store entry 'C:\Windows\System32\DriverStore\FileRepository\chvbdx64.inf_amd64_db5d99a4eb080b3f\chvbdx64.inf'.
Uninstall completed.
RETURN: DriverPackageUninstallW (0x0)
RETURN: DriverPackageUninstallA (0x0)
```

▪ **rescan**

Description: Scan for hardware changes in the device manager.

Syntax: cxgbtool debug rescan

Example:

```
C:\Users\Administrator>cxgbtool debug rescan
```

▪ **qstats**

Description: Display statistics for each Tx & Rx queue.

Syntax: cxgbtool <nicIface|iscsiIface> debug qstats <queueType|clr>

clr: Clear queue statistics.

Queue Type	Description
<i>txeth</i>	Tx tunnel queue statistics.
<i>rxeth</i>	Rx tunnel queue statistics.
<i>txvirt</i>	Tx VM queue statistics.
<i>rxvirt</i>	Rx VM queue statistics.
<i>txtoe</i>	Tx Chimney queue statistics.
<i>rxtoe</i>	Rx Chimney queue statistics.
<i>txrdma</i>	Tx RDMA queue statistics.
<i>rxrdma</i>	Rx RDMA queue statistics.
<i>txctrl</i>	Chimney control queue statistics.
<i>txfwd</i>	Chimney forwarding queue statistics.
<i>txnvgre *</i>	Tx NVGRE statistics.
<i>rxnvgre *</i>	Rx NVGRE statistics.
<i>txiscsi</i>	Tx iSCSI queue statistics.
<i>rxiscsi</i>	Rx iSCSI queue statistics.

<i>txpd</i>	Tx PacketDirect queue statistics.
<i>rxpd</i>	Rx PacketDirect queue statistics.

* not supported on T6 adapters

Qstats Parameter	Description
<i>BcBytes</i>	Broadcast packet size in bytes.
<i>BcPkts</i>	Number of broadcast packets.
<i>CoalBytes</i>	Coalesced packet size in bytes.
<i>CoalPkts</i>	Number of coalesced packets.
<i>DropPkts</i>	Number of dropped packets.
<i>EncapBytes</i> #	NVGRE/VXLAN packet size in bytes.
<i>EncapPkts</i> #	Number of NVGRE/VXLAN packets.
<i>VlanMismatch</i>	Number of packets with VLAN mismatch.
<i>Fw4Ack</i>	Number of SGE update requests.
<i>LargeRxDropPkts</i>	Dropped packets due to large size counter.
<i>LSO</i>	Number of large send offloaded packets.
<i>McBytes</i>	Multicast packet size in bytes.
<i>McPkts</i>	Number of multicast packets.
<i>NbIsRecv</i>	Total NbIs received.
<i>NbIsSent</i>	Total NbIs sent.
<i>NoRxBufs</i>	Packets couldn't process because of lack of memory.
<i>NvPkts</i>	Send NVGRE packets.
<i>PeerAbort</i>	Peer abort request.
<i>CqComp</i>	Number of CQ completions.
<i>PktsDefrag</i>	Number of defragged packets.
<i>PktsDrop</i>	Total packets dropped.
<i>PktsQued</i>	Total packets queued.
<i>PktsSent</i>	Total packets sent.
<i>Quefull</i>	Number of time queue full happened.
<i>RecvNbIs</i>	Total NbIs received.
<i>RssGroup</i>	RSS group number allocated to queue.
<i>VPortId</i>	Vport ID of queue.
<i>RssProc</i>	RSS processor number allocated to queue.
<i>RxCsumErr</i>	Number of received packets with checksum error.
<i>RxCsumErrIp</i>	Number of received IP packets with checksum error.
<i>RxCsumErrTcp</i>	Number of received TCP packets with checksum error.
<i>SysThreadEvts</i>	Number of system thread events.
<i>TxCsumOfld</i>	Number of checksum offloaded Tx packets.
<i>UcBytes</i>	Unicast packets size in bytes.
<i>UcPkts</i>	Number of unicast packets.
<i>VlanEx</i>	Number of VLAN extracted packets.
<i>VLANin</i>	Number of VLAN inserted packets.

supported only on T6 adapters

Example of rxeth qstats

```
C:\Users\Administrator>cxgbtool nic0 debug qstats rxeth
```

StatsType	RxEth#36	RxEth#37	RxEth#38	RxEth#39
UcPkts	21	3	3	1
UcBytes	1324	260	239	93
McPkts	0	2	3	0
McBytes	0	180	258	0
BcPkts	6	0	45	0
BcBytes	360	0	4572	0
CoalPkts	0	0	0	0
CoalBytes	0	0	0	0
DropPkts	0	0	0	0
RecvNbIs	27	5	51	1
RxCsumErr	0	0	0	0
RxCsumErrTcp	0	0	0	0
RxCsumErrIp	0	0	0	0
VLANex	0	0	0	0
SysThreadEvs	0	0	0	0
LargeRxDropPkts	0	0	0	0
RssProc	0	16	24	32
RssGroup	0	0	0	0

- **hardware**

- **sensor**

Description: Display sensor data.

Syntax: cxgbtool <nicIface> hardware sensor

Example:

```
C:\Users\Administrator>cxgbtool nic0 hardware sensor
Temperature: 80C
Core VDD: 855mV
```

- **fec**

Description: Set/Display Forward Error Correction (FEC) parameters.

Syntax:

```
cxgbtool <nicIface> hardware fec [<config params>]
```

Example:

- Displaying currently set FEC mode.

```
C:\Users\Administrator>cxgbtool nic0 hardware fec
supported: : Base-R/Reed-Solomon Reed-Solomon
advertising:: no FEC
```

- Setting FEC mode:

```
C:\Users\Administrator>cxgbtool nic0 hardware fec rs
C:\Users\Administrator>cxgbtool nic0 hardware fec
supported:  : Base-R/Reed-Solomon Reed-Solomon
advertising:: Reed-Solomon
```

- **link_cfg**

Description: Set/Display link configuration parameters.

Syntax:

```
cxgbtool <nicIface> hardware link_cfg <options>
```

Example:

- Displaying link configuration information:

```
C:\Users\Administrator>cxgbtool nic0 hardware link_cfg
Link Configuration
Supported ports           : [ FIBRE ]
Supported link modes      : 1000baseT/Full
                          : 10000baseT/Full
                          : 25000baseCR/Full
Supported auto-negotiation : Yes
Advertised link modes     : 1000baseT/Full
                          : 10000baseT/Full
                          : 25000baseCR/Full
Advertised auto-negotiation : Yes
Speed                     : 25Gbps
port                      : Other
Auto-negotiation          : On
```

- Enabling/Disabling auto-negotiation:

Auto-negotiation is enabled by default. To disable it, use the *autoneg off* parameter on all connected machines of the link.

```
C:\Users\Administrator>cxgbtool nic0 hardware link_cfg autoneg off
C:\Users\Administrator>cxgbtool nic0 hardware link_cfg
Link Configuration
Supported auto-negotiation : Yes
Advertised auto-negotiation : No
Speed                     : 25Gbps
Auto-negotiation          : Off
Link State                 : Disconnected
```

- Changing link speed:

25G port can be set to 10G and 100G port can be set to 25G/40G/50G. Auto-negotiation should be disabled on all connected machines while changing link speed.

```
C:\Users\Administrator>cxgbtool nic0 hardware link_cfg autoneg off speed 10000  
  
C:\Users\Administrator>cxgbtool nic0 hardware link_cfg  
Link Configuration  
Supported auto-negotiation      : Yes  
Advertised auto-negotiation     : No  
Speed                           : 10Gbps  
Auto-negotiation                : Off  
Link State                      : connected
```

Important Before setting 40G or 10G speeds, FEC should be disabled on the port using:

```
C:\Users\Administrator>cxgbtool nic0 hardware fec off
```

- **cudbg**

- **collect**

Description: Collect Chelsio adapter debug logs to a compressed file.

Syntax: cxgbtool <vbdIface> cudbg collect <entities> <outputFile> <options>

Examples:

- Collecting debug log for all entities

```
C:\Users\Administrator>cxgbtool vbd0 cudbg collect all dump_file  
cxgbtool: This may take a while. Please be patient  
cxgbtool: Writing cudbg block to file dump_file... size: 12634452 bytes  
cxgbtool: Done writing cudbg data to file dump_file
```

- Collecting debug log skipping specific debug entities

```
C:\Users\Administrator>cxgbtool vbd0 cudbg collect all dump_file skip edc1,edc0  
cxgbtool: This may take a while. Please be patient  
cxgbtool: Writing cudbg block to file dump_file... size: 12082984 bytes  
cxgbtool: Done writing cudbg data to file dump_file
```

- Collecting debug log avoiding entities that can affect running traffic

```
C:\Users\Administrator>cxgbtool vbd0 cudbg collect all dump_file safe  
cxgbtool: This may take a while. Please be patient  
cxgbtool: Writing cudbg block to file dump_file... size: 48484 bytes  
cxgbtool: Done writing cudbg data to file dump_file
```

6. Software/Driver Uninstallation

Similar to installation, Chelsio Unified Wire can be uninstalled using the Installer or zip package. Refer the relevant section depending on the method of installation used to install drivers.

6.1. Installer

Chelsio Unified Wire Installer can be uninstalled using two methods: **GUI** or **CLI** mode. GUI mode requires user interaction and uninstallation occurs with options specified by the user. Whereas, CLI mode does not require any user input.

6.1.1. GUI mode (Installer)

- i. Run the **ChelsioUwire_x.x.x.x_WIN_yyy.y.yy.exe** application.
- ii. Select **Modify** to add or remove features. Select **Repair** to repair the previous installation. Select **Remove** to uninstall the application. After you have selected the appropriate option, click **Next**.

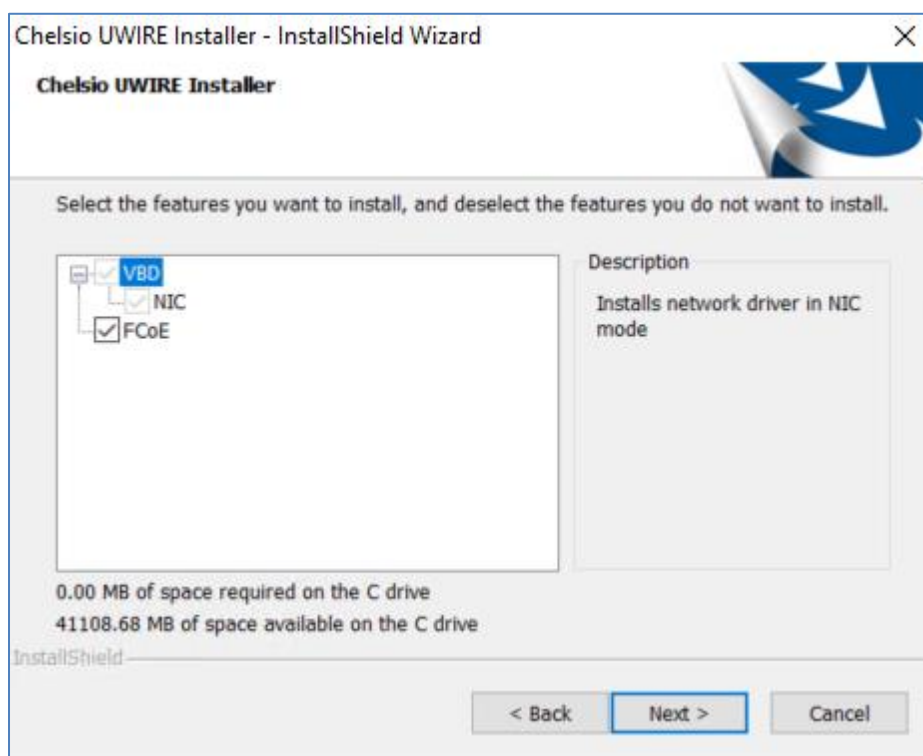


Figure 7 - Adding or removing features using 'Modify' option

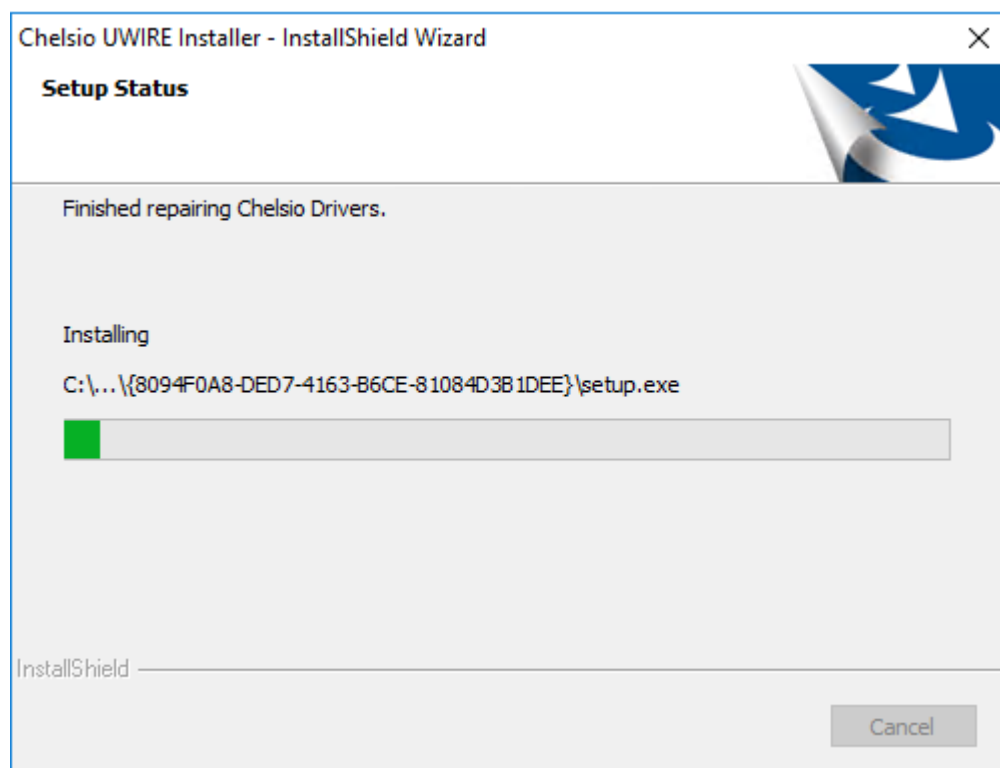


Figure 8 - Repairing previous installation using 'Repair' option

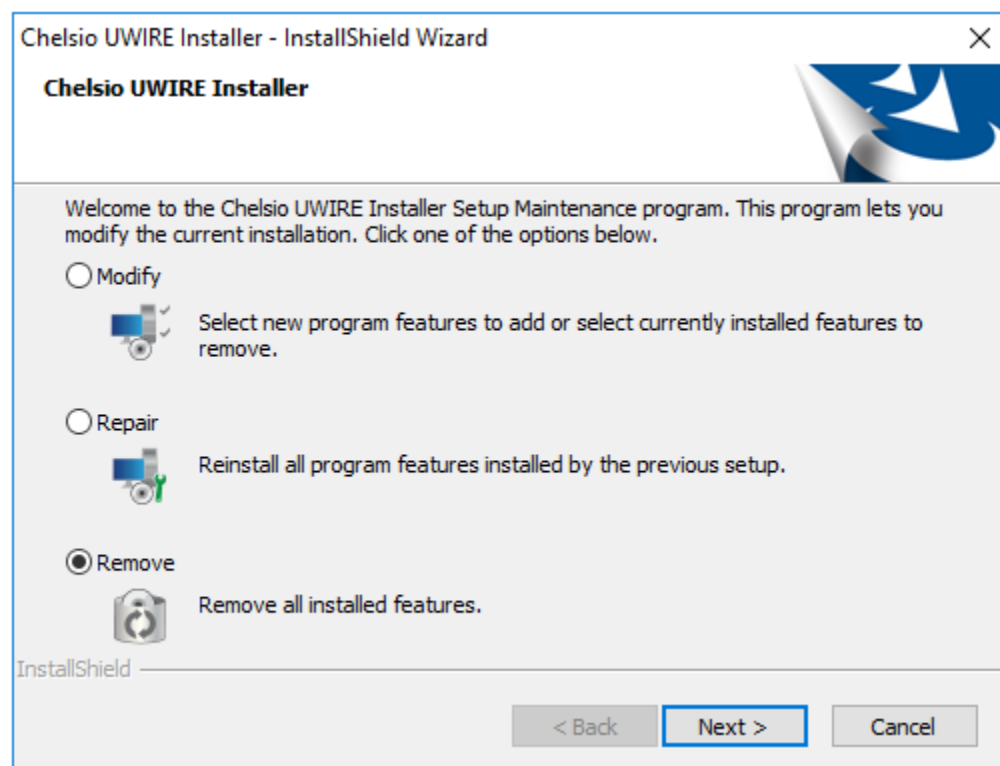


Figure 9 – Uninstalling Unified Wire using 'Remove' option

- iii. Click on the **Finish** button to exit from the installer.

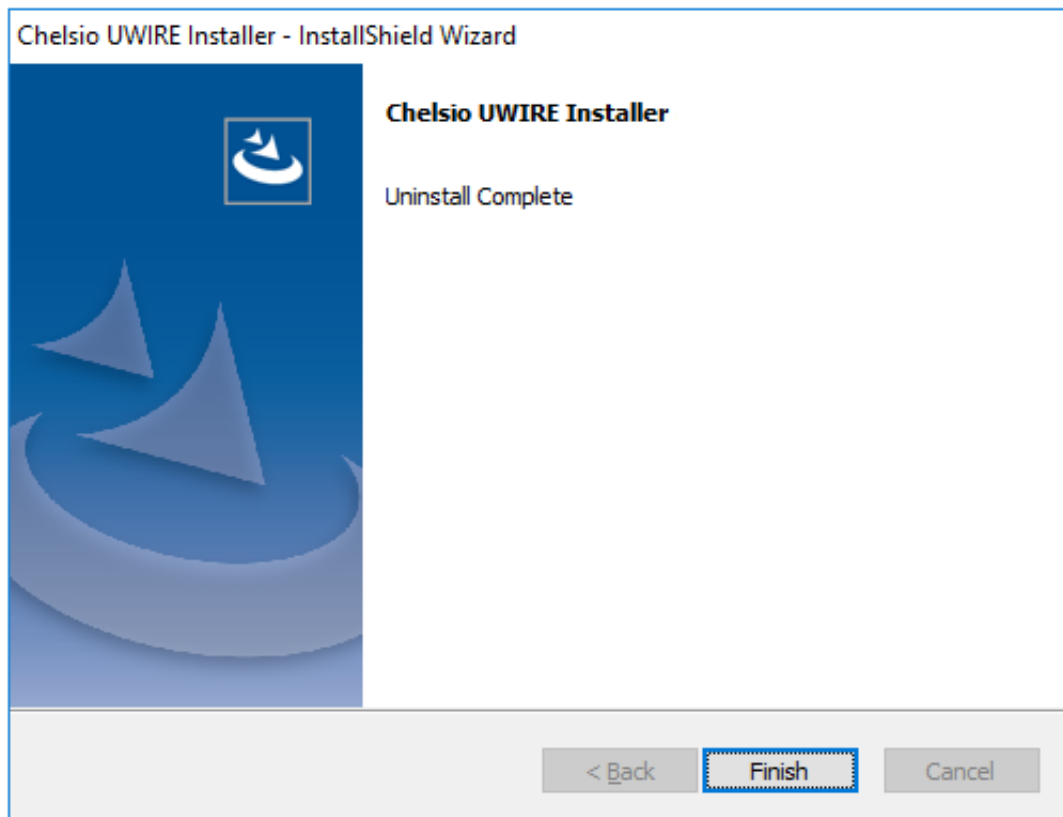


Figure 10 - Finishing uninstallation

Note *This method of uninstallation is possible only if the drivers were installed using Unified Wire Installer.*


6.1.2. CLI Mode

To uninstall FCoE Storport Miniport driver, execute the following command:

```
C:\Users\Administrator> ChelsioUwire_x.x.x.x_WIN_yyy.y.yy.exe -un all
```

6.2. Zip Package

If the driver components were installed using the zip package, they will have to be uninstalled manually. The following section lists the various components and their respective methods of uninstallation.

 **Important** *The driver components need to be uninstalled strictly in the order described here. Using any other order is not supported.*

- **NDIS Miniport driver**

- Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on the **Network Adapters**, right click on the **Chelsio Network Adapter** and select **Uninstall**.
- Select the **Delete the driver software for this device** checkbox when **Confirm Device Uninstall** is prompted and click **OK**.

Repeat the same procedure for the other **Chelsio Network Adapters**.

- **FCoE Storport Miniport**

Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on **Storage controllers**, right-click on **Chelsio [FCoE] function** and select **Uninstall**.

- **Virtual Bus Driver**

- Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on the **System Devices**, right click on the **Chelsio Bus Enumerator** and select **Uninstall**.
- Select the **Delete the driver software for this device** checkbox when **Confirm Device Uninstall** is prompted and click **OK**.

- **Generic Function**

- Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on the **Network Adapters**, right click on the **Chelsio Generic Function** and select **Uninstall**.
- Select the **Delete the driver software for this device** checkbox when **Confirm Device Uninstall** is prompted and click **OK**.

Repeat the same procedure for the other **Generic Functions**.

II. FCoE Storport Miniport

1. Introduction

Fibre Channel over Ethernet (FCoE) is a mapping of Fibre Channel over selected full duplex IEEE 802.3 networks. The goal is to provide I/O consolidation over Ethernet, reducing network complexity in the Datacenter.

Chelsio FCoE initiator maps Fibre Channel directly over Ethernet while being independent of the Ethernet forwarding scheme. The FCoE protocol specification replaces the FC0 and FC1 layers of the Fibre Channel stack with Ethernet. By retaining the native Fibre Channel constructs, FCoE will integrate with existing Fibre Channel networks and management software.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the adapters that are compatible with Chelsio FCoE storport miniport driver:

- T6225-CR
- T6225-LL-CR
- T520-CR
- T520-LL-CR
- T540-CR

1.2. Software Requirements

1.2.1. Windows Requirement

Currently Chelsio FCoE Storport Miniport driver is available for following Windows versions:

- Server 2019
- Server 2016
- 10 Client

2. Configuration and Fine-tuning

2.1. Configuring Cisco Nexus 5010 switch

2.1.1. Configuring the DCBX parameters

**Note**

By default, the Cisco Nexus switch enables DCBX functionality and configures PFC for FCoE traffic making it no drop with bandwidth of 50% assigned to FCoE class of traffic and another 50% for the rest (like NIC). If you wish to configure custom bandwidth, then follow the procedure below.

In this procedure, you may need to adjust some of the parameters to suit your environment, such as VLAN IDs, Ethernet interfaces, and virtual Fibre Channel interfaces.

To enable PFC, ETS, and DCB functions on a Cisco Nexus 5000 series switch:

- i. Open a terminal configuration setting.

```
Switch# config terminal
switch(config)#
```

- ii. Configure qos class-maps and set the traffic priorities: NIC uses priority 0 and FCoE uses priority 3.

```
Switch(config)#class-map type qos class-nic
Switch(config-cmap-qos)# match cos 0
Switch(config-cmap-qos)# class-map type qos class-fcoe
Switch(config-cmap-qos)# match cos 3
```

- iii. Configure queuing class-maps.

```
Switch(config)#class-map type queuing class-nic
Switch(config-cmap-que)#match qos-group 2
```

iv. Configure network-qos class-maps.

```
Switch(config)#class-map type network-qos class-nic
Switch(config-cmap-nq)#match qos-group
```

v. Configure qos policy-maps.

```
Switch(config)#policy-map type qos policy-test
Switch(config-pmap-qos)#class type qos class-nic
Switch(config-pmap-c-qos)#set qos-group 2
```

vi. Configure queuing policy-maps and assign network bandwidth. Divide the network bandwidth between FCoE and NIC traffic.

```
Switch(config)#policy-map type queuing policy-test
Switch(config-pmap-que)#class type queuing class-nic
Switch(config-pmap-c-que)#bandwidth percent 50
Switch(config-pmap-c-que)#class type queuing class-fcoe
Switch(config-pmap-c-que)#bandwidth percent 50
Switch(config-pmap-c-que)#class type queuing class-default
Switch(config-pmap-c-que)#bandwidth percent 0
```

vii. Configure network-qos policy maps and set up the PFC for no-drop traffic class.

```
Switch(config)#policy-map type network-qos policy-test
Switch (config-pmap-nq)#class type network-qos class-nic
Switch(config-pmap-nq-c)#pause no-drop
```



Note *By default, FCoE is set to pause no drop. In such a tradeoff, one may want to set NIC to drop instead.*

viii. Apply the new policy (PFC on NIC and FCoE traffic) to the entire system.

```
Switch(config)#system qos
Switch(config-sys-qos)#service-policy type qos input policy-test
Switch(config-sys-qos)#service-policy type queuing output policy-test
Switch(config-sys-qos)#service-policy type queuing input policy-test
Switch(config-sys-qos)#service-policy type network-qos policy-test
```

2.1.2. Configuring the FCoE/FC ports

In this procedure, you may need to adjust some of the parameters to suit your environment, such as VLAN IDs, Ethernet interfaces, and virtual Fibre Channel interfaces

- i. Following steps will enable FCoE services on a particular VLAN and does a VSAN-VLAN mapping. These steps are not required to be done every time, unless a new mapping is required.

```
Switch(config)# vlan 2
Switch(config-vlan)# fcoe vsan 2
Switch(config-vlan)#exit
```

- ii. Following steps help in creating a virtual fibre channel(VFC) and binds that VFC to an Ethernet interface so that the Ethernet port begins functioning as a FCoE port.

```
Switch(config)# interface vfc 13
Switch(config-if)#bind interface ethernet 1/13
Switch(config-if)# no shutdown
Switch(config-if)#exit
Switch(config)#vsan database
Switch(config-vsan-db)# vsan 2
Switch(config-vsan-db)#vsan 2 interface vfc 13
Switch(config-vsan-db)#exit
```



Note *If you are binding the VFC to a MAC address instead of an Ethernet port then make sure the Ethernet port is part of both default VLAN and FCoE VLAN*

- iii. Assign VLAN ID to the Ethernet port on which FCoE service was enabled in step1.

```
Switch(config)# interface ethernet 1/13
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan 2
Switch(config-if)#no shutdown
Switch(config)#exit
```

- iv. On the FC Ports, if a FC target is connected then perform the following steps -

```
Switch(config)#vsan database
Switch(config-vsan-db)#vsan 2
Switch(config-vsan-db)# vsan 2 interface fc 2/2
Switch(config-vsan-db)#exit
Switch(config)interface fc 2/2
Switch(config-if)# switchport mode auto
Switch(config-if)# switchport speed auto
Switch(config-if)# no shutdown.
```

- v. If you have not created a zone then make sure the default-zone permits the VSAN created, otherwise the initiator and the target on that particular VSAN although FLOGI'd into the switch will not talk to each other. To enable it, execute the below command.

```
Switch(config)# zone default-zone permit vsan 2
```

2.2. FCoE fabric discovery verification

2.2.1. Verifying Target Discovery

To check the summary of targets being discovered from FCoE ports, open device manger and follow the steps given below:

- Go to **Start->Control Panel->Device Manager** or launch device manager directly from **Start->Run->devmgmt.msc** and hit [Enter].
- Go to **Disk drives** section under which you will find the list of all the LUNS that were discovered.

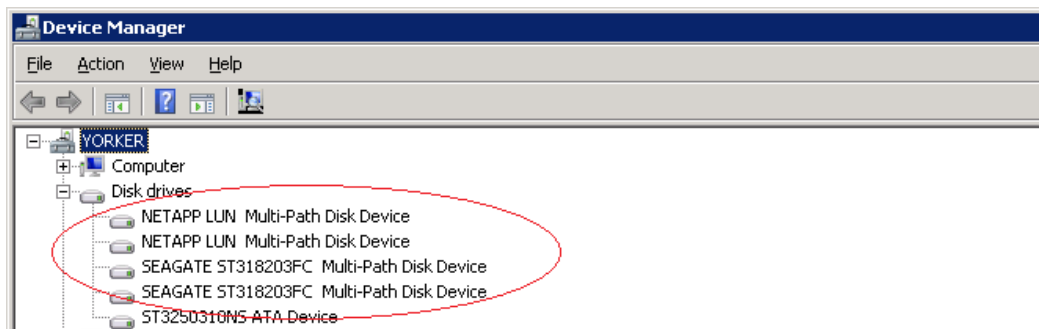


Figure 11 - Discovered Target LUNs

- iii. To bring the LUNs online, launch disk management by going to **Start->Run->diskmgmt.msc**. Right click on the LUN and select *online*.

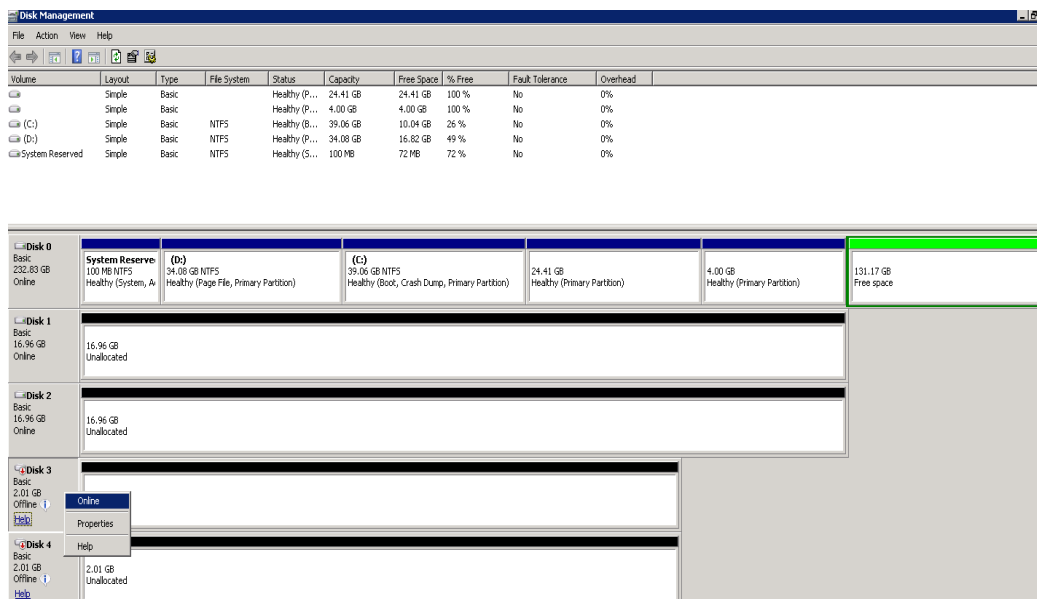


Figure 12 - Bringing LUNs online

- iv. Now format the LUN by right clicking on it and choosing any of the volume types. In this example, we will choose *New Simple Volume*. This will invoke the *New Simple Volume Wizard*.

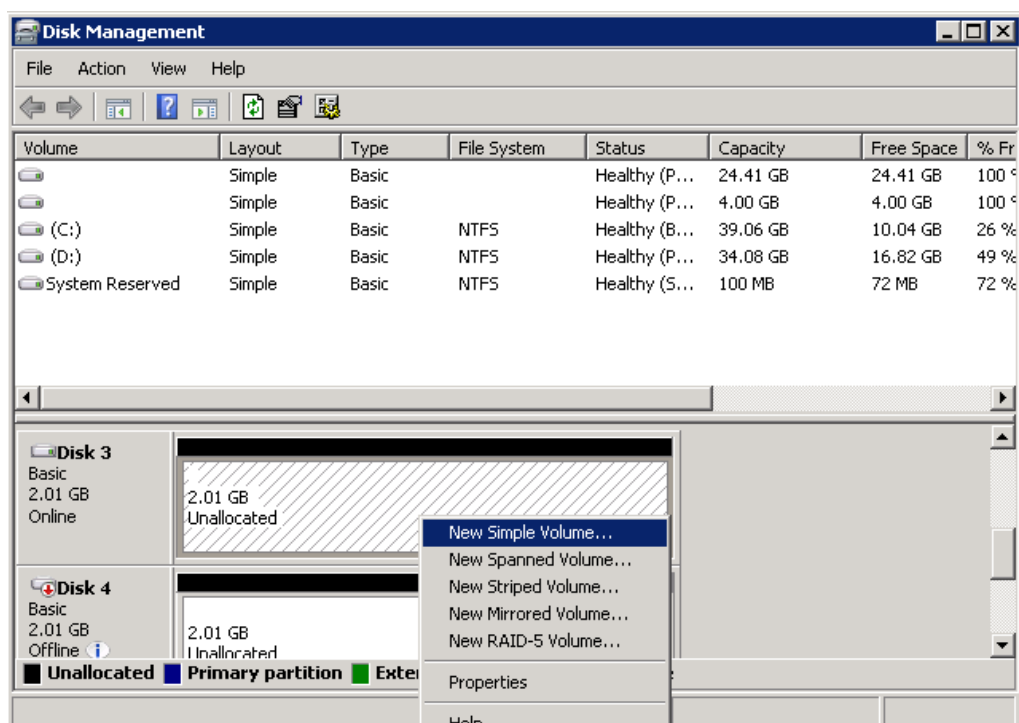


Figure 13 - Formatting LUNs

- v. Enter the volume size (the entire volume size is selected by default), and in the subsequent windows assign a driver letter to the volume and choose the file system.

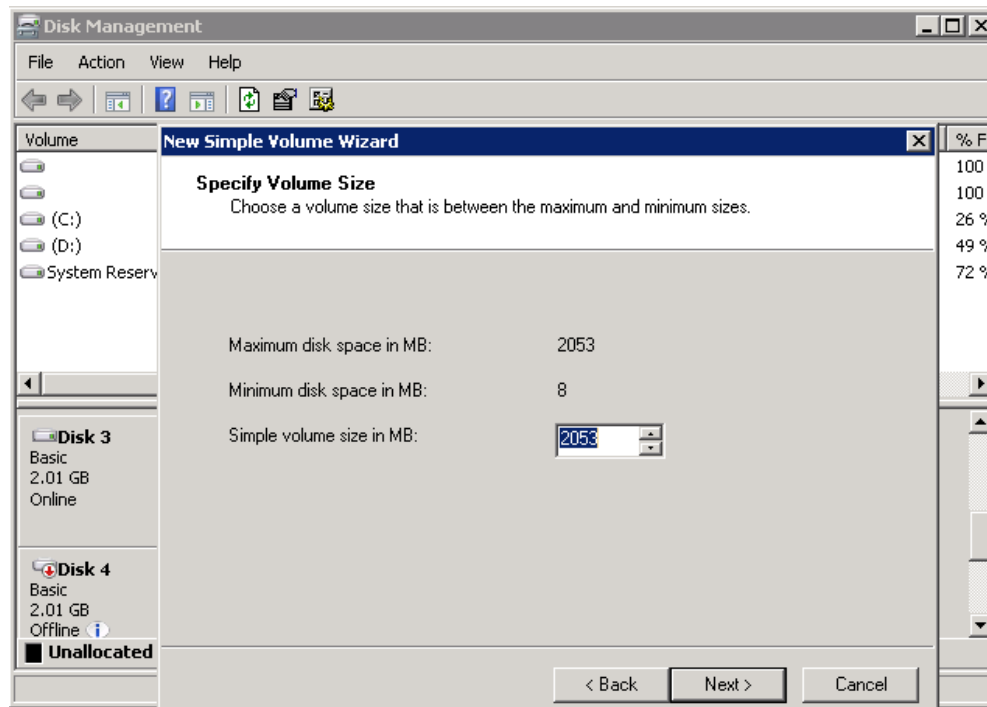


Figure 14 - Specifying Volume size

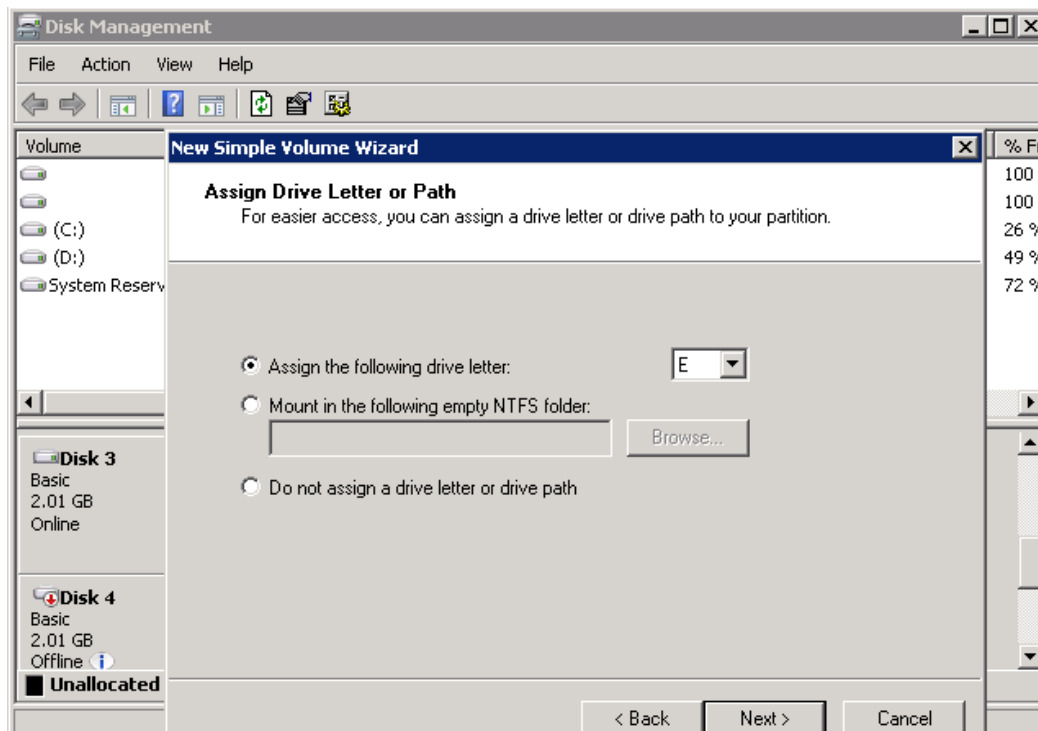


Figure 15 - Assigning drive letter or path

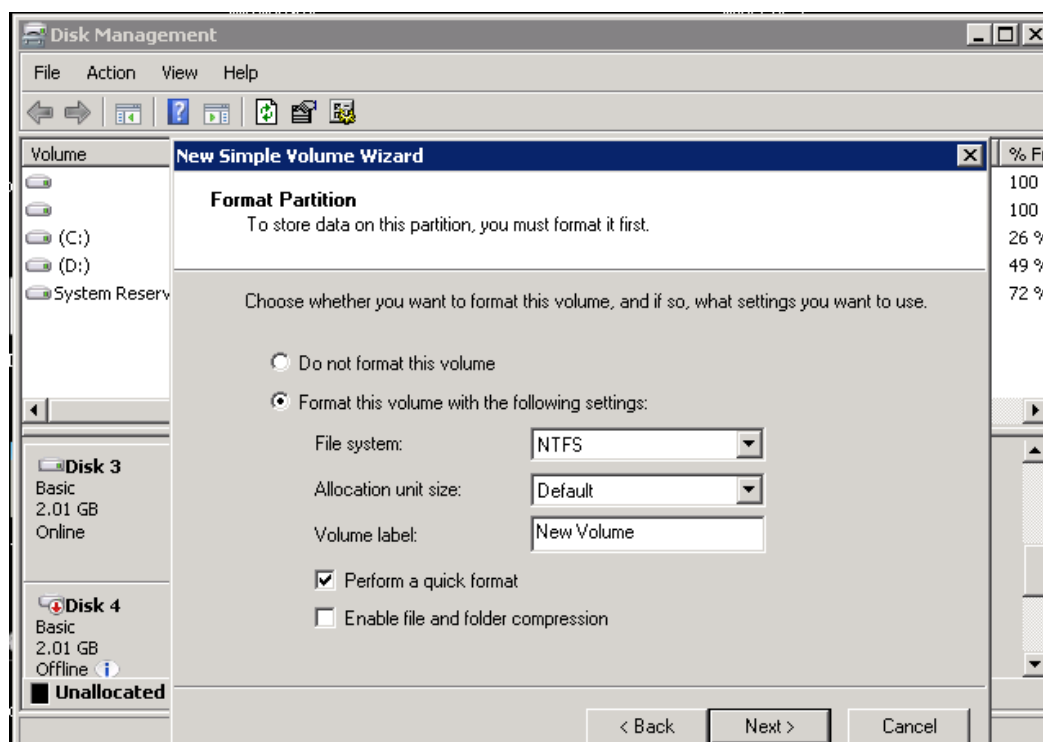


Figure 16 - Formatting the partition

- vi. Click **Finish** to close the wizard.

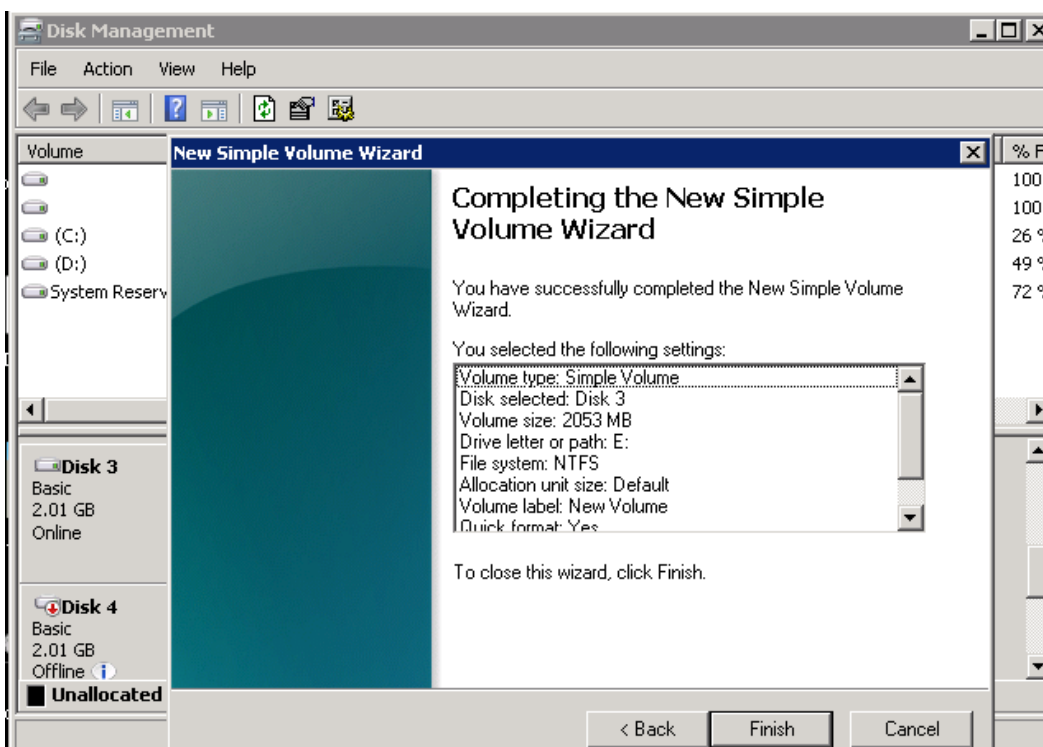


Figure 17 - Completing Simple Volume Wizard

vii. The volume should appear in *My Computer*.

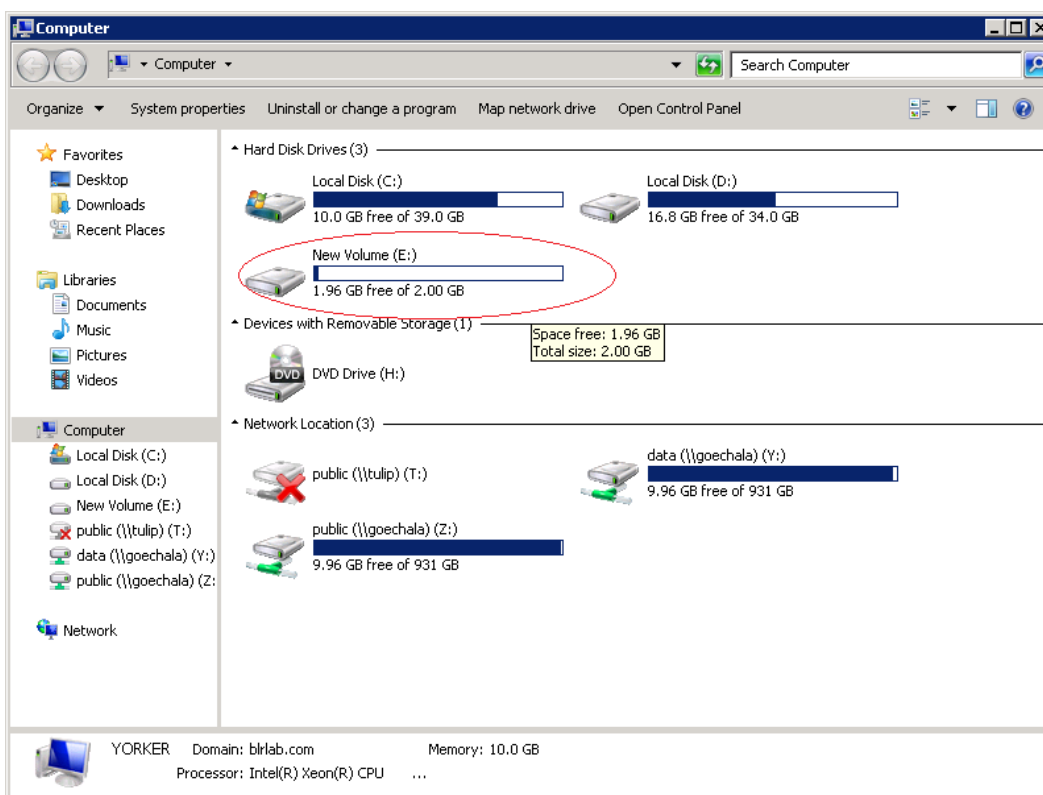


Figure 18 - The newly created volume in My Computer

2.2.2. Troubleshooting

- i. Always enable LLDP on the interfaces as there won't be FCoE link up until and unless a successful LLDP negotiation happens.
- ii. On switch, make sure *priority-flow-control* mode is always set to *auto* and *flowcontrol* is disabled.
- iii. Always configure the Ethernet interfaces on cisco switch in trunk mode.
- iv. If you are binding the VFC to MAC address in case of cisco nexus, then make sure you make the Ethernet interface part of both Ethernet VLAN and FCoE VLAN.
- v. If in any case the switch-port on the cisco nexus switch is reporting "pauseRateLimitErrDisable", then perform an Ethernet port shut/no shut.
- vi. While using NetApp target, if you are unable to format the FCoE LUN, please change the OS type to Linux and create the LUN again in NetApp target.

Also, note that only one FCoE function will be displayed under the **storage controllers** of the device manager, irrespective of the number of ports a card possesses. All ports will be using the same interface.

III. Appendix

1. Troubleshooting

• **Installer issues**

In case of any failures while running the Chelsio Unified Wire Installer, please collect the below:

- Screenshot of the failure.
- Installer logs from `<system_drive>\Windows\Temp\ChelsioUwire_x.x.x.x_WIN_y.y.y_logs` directory. Compress the directory to a zip package.

• **Logs collection**

In case of any other issues, follow the below procedure to collect the standard logs:

- Download the *Get-NetView.psm1* file from <https://github.com/microsoft/Get-NetView> and run the below commands.

```
PS C:\Users\Administrator\Desktop> Set-ExecutionPolicy Unrestricted
PS C:\Users\Administrator\Desktop> Import-Module Get-NetView.psm1
```

- Run the below command and the logs will be collected in a zip package.

```
PS C:\Users\Administrator\Desktop> get-netview
```

```
Diagnostics Data:
-----
Get-NetView
Version: 2018.07.13.0
SHA256: C550E2F057669276AC1F77DB123A5805E82AD32E31BE22395F48FA128A16F742

C:\Users\Administrator\Desktop\msdbg.CORE96CN2-2018.09.20_03.53.50.zip
Size: 12.01 MB

C:\Users\Administrator\Desktop\msdbg.CORE96CN2
Size: 157.06 MB
Dirs: 128
Files: 416

Execution Time:
-----
5 Min 24 Sec
```

- Driver Event tracing logs can be collected using the below procedure:
 - Start the tracing.

```
PS C:\Users\Administrator\Desktop> cxgbtool debug trace nic 0xffff 5 vbd
0xffff
```

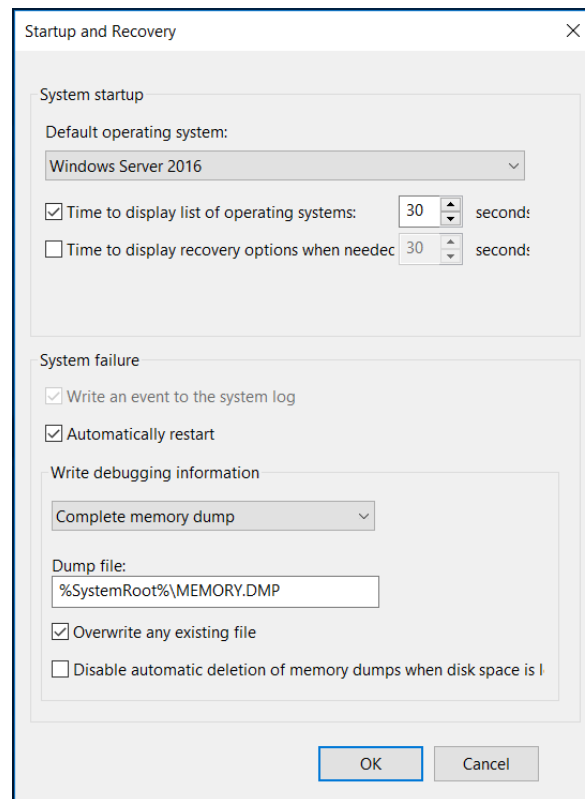
- Rerun the test to hit the observed issue.
- Stop tracing.

```
PS C:\Users\Administrator\Desktop> cxgbtool debug trace stop
```

cxgbtrace.etl file will be collected in the same path.

In case of BSOD, please collect the *MEMORY.DMP* from *<system_drive>\Windows*. It is recommended to provide complete memory dump. Change the memory dump setting from:

Control Panel -> System -> Advanced system settings -> Advanced -> Startup and Recovery Settings -> System Failure -> Write Debugging Information -> Complete memory dump



Please contact Chelsio support at support@chelsio.com with all the logs for any issues.

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

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

12. General. You acknowledge that you have read this Agreement, understand it, and that by using the Software you agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between Chelsio and you, and supersedes any proposal or prior agreement, oral or written, and any other communication between Chelsio and you relating to the subject matter of this Agreement. No additional or any different terms will be enforceable against Chelsio unless Chelsio gives its express consent, including an express waiver of the terms of this Agreement, in writing signed by an officer of Chelsio. This Agreement shall be governed by California law, except as to copyright matters, which are covered by Federal law. You hereby irrevocably submit to the personal jurisdiction of, and irrevocably waive objection to the laying of venue (including a waiver of any argument of forum non conveniens or other principles of like effect) in, the state and federal courts located in Santa Clara County, California, for the purposes of any litigation undertaken in connection with this Agreement. Should any provision of this Agreement be declared unenforceable in any jurisdiction, then such provision shall be deemed severable from this Agreement and shall not affect the remainder hereof. All rights in the Software not specifically granted in this Agreement are reserved by Chelsio. You may not assign or transfer this Agreement (by merger, operation of law or in any other manner) without the prior written consent of Chelsio and any attempt to do so without such consent shall be void and shall constitute a material breach of this Agreement.

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

Chelsio Communications, Inc.
735 N Pastoria Avenue,
Sunnyvale, CA 94085
U.S.A