



Chelsio T5/T4 Unified Wire for Windows

Installation and User's Guide



This document and related products are distributed under licenses restricting their use, copying, distribution, and reverse-engineering.

No part of this document may be reproduced in any form or by any means without prior written permission by Chelsio Communications.

All third party trademarks are copyright of their respective owners.

THIS DOCUMENTATION IS PROVIDED “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

THE USE OF THE SOFTWARE AND ANY ASSOCIATED MATERIALS (COLLECTIVELY THE “SOFTWARE”) IS SUBJECT TO THE SOFTWARE LICENSE TERMS OF CHELSIO COMMUNICATIONS, INC.



Chelsio Communications (Headquarters)

209 North Fair Oaks Avenue,
Sunnyvale, CA 94085
U.S.A

www.chelsio.com

Tel: 408.962.3600
Fax: 408.962.3661

Chelsio (India) Private Limited

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

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

Chelsio KK (Japan)

Yamato Building 8F,
5-27-3 Sendagaya,
Shibuya-ku,
Tokyo 151-0051,
Japan

Sales

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

Support

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

Copyright © 2016 Chelsio Communications. All Rights Reserved.

Chelsio® is a registered trademark of Chelsio Communications.

All other marks and names mentioned herein may be trademarks of their respective companies.

Document History

Version	Revision Date
1.3.6	11/16/2015
1.3.7	12/04/2015
1.3.8	12/11/2015
1.3.9	01/18/2016
1.4.0	01/28/2016
1.4.1	02/18/2016
1.4.2	02/26/2016
1.4.3	03/04/2016
1.4.4	05/10/2016

TABLE OF CONTENTS

I.	CHELSIO UNIFIED WIRE	7
1.	Introduction	8
1.1.	Features	8
1.2.	Hardware Requirements	9
1.3.	Software Requirements	9
1.4.	Package Contents	9
2.	Hardware Installation	10
3.	Software/Driver Installation	11
3.1.	Manual Installation	11
3.2.	Nano Server: Driver Installation	12
4.	Configuring Chelsio Network Interfaces	14
4.1.	Configuring 40G adapters	14
4.2.	Assigning IP address	17
5.	<i>cxgbtool/cxgbnano help</i>	18
6.	Firmware Update	59
7.	Software/Driver Uninstallation	60
7.1.	Manual Uninstallation	60
8.	Software/Driver Update	62
II.	NDIS FUNCTION	63
1.	Introduction	64
1.1.	Hardware Requirements	64
1.2.	Software Requirements	64
2.	Software/Driver Configuration and Fine-tuning	65
2.1.	Advanced Configuration	65
2.2.	NVGRE Offload	72
2.3.	VXLAN Task Offload	72
2.4.	PacketDirect	72
2.1.	Virtual RSS (vRSS)	73
III.	SMB DIRECT	74
1.	Introduction	75
1.1.	Hardware Requirements	75
1.2.	Software Requirements	75
2.	Software/Driver Configuration and Fine-tuning	76
2.1.	Enabling SMB Direct	76
2.2.	Verifying RDMA	76
2.3.	RDMA/NVGRE concurrent (Mode 2)	76
2.4.	Troubleshooting	78

IV. NDIS SR-IOV	79
1. Introduction	80
1.1. Hardware Requirements	80
1.2. Software Requirements	80
2. Software/Driver Configuration and Fine-tuning	81
2.1. Host Configuration	81
2.2. Guest (VM) Configuration	83
V. ISCSI STORPORT MINIPORT	84
1. Introduction	85
1.1. Hardware Requirements	85
1.2. Software Requirements	86
2. Software/Driver Configuration and Fine-tuning	87
2.1. Configuring iSCSI Initiator	87
2.2. iSCSI Target Discovery and Login	93
VI. DATA CENTER BRIDGING (DCB)	101
1. Introduction	102
1.1. Hardware Requirements	102
1.2. Software Requirements	102
2. Software/Driver Configuration and Fine-tuning	103
2.1. Installing DCB	103
2.2. Quality of Service (QoS)	103
2.3. Configuring Dell Force10 Switch	104
VII. UNIFIED WIRE MANAGER (UM)	107
1. Introduction	108
1.1. Features	108
1.2. Reference Architecture	109
1.3. Unified Wire Manager Components	109
1.4. Authentication and encryption	110
2. Hardware and Software	111
2.1. Supported Adapters	111
2.2. Platform/Component Matrix	111
2.3. Platform/Driver Matrix	111
3. Installing Unified Wire Manager	112
3.1. Pre-requisites	112
3.2. Installation	113
4. Configuring Unified Wire Manager	118
4.1. Configuring Management Station	118
5. Verifying UM components status	120
5.1. Verifying Management Agent	120

5.2.	Verifying Management Client	121
5.3.	Verifying Management Station	121
6.	Management Agent	122
6.1.	Communication	122
6.2.	Service configuration	122
6.3.	Firewall	122
7.	CLI client	123
7.1.	CLI Help system	123
7.2.	Client conflict resolution	123
8.	Web GUI client	124
8.1.	Management Station	124
8.2.	Accessing Web Management Interface	125
8.3.	Layout and Navigation	127
8.4.	Home page	128
8.5.	System page	138
8.6.	Network page	142
8.7.	Storage	157
8.8.	Hardware Features	181
9.	Uninstalling Unified Wire Manager	194
VIII.	UM FOR WIN PE	195
1.	Introduction	196
1.1.	Hardware Requirements	196
1.2.	Software Requirements	197
1.3.	Examples	197
IX.	APPENDIX	201
	Chelsio End-User License Agreement (EULA)	202

I. Chelsio Unified Wire

1. Introduction

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

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

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

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

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

1.1. Features

Chelsio Unified Wire for Windows is a software package developed to provide 64-bit Windows based drivers and tools for Chelsio's T5 and T4 Unified Wire adapters.


It consists of the following components:

- NDIS Function driver (NIC)
- NVGRE Offload
- VXLAN Task Offload
- PacketDirect (Kernel Mode and ARM Moderation)
- SMB Direct
- RDMA/NVGRE concurrent (Mode 2)
- NDIS SR-IOV
- Virtual RSS (vRSS)
- iSCSI Storport Miniport
- Data Center Bridging (DCB)
- Unified Wire Manager (UM)
- UM for Win PE

1.2. Hardware Requirements

The Chelsio T5/T4 Unified Wire supports all x64 architectures supporting PCIE (x4, x8) slots.

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

 **Note** *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.*

1.3. Software Requirements

Chelsio T5/T4 Unified Wire 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 to their respective sections.

1.4. Package Contents

Chelsio T5/T4 Unified Wire driver package contains driver files, UM installer, UM for Win PE application, firmware binaries, adapter configuration binaries and support documentation (*docs* folder).

2. Hardware Installation

1. Shutdown/power off your system.
2. Power off all remaining peripherals attached to your system.
3. Unpack the Chelsio adapter and place it on an anti-static surface.
4. Remove the system case cover according to the system manufacturer's instructions.
5. Remove the PCI filler plate from the slot where you will install the Ethernet adapter.
6. For maximum performance, it is highly recommended to install the adapter into a PCIE x8 slot.
7. Holding the Chelsio adapter by the edges, align the edge connector with the PCI connector on the motherboard. Apply even pressure on both edges until the card is firmly seated. It may be necessary to remove the SFP (transceiver) modules prior to inserting the adapter.
8. Secure the Chelsio adapter with a screw, or other securing mechanism, as described by the system manufacturer's instructions. Replace the case cover.
9. After securing the card, ensure that the card is still fully seated in the PCIE x8 slot as sometimes the process of securing the card causes the card to become unseated.
10. Connect a fiber cable, multi-mode for short range (SR) optics or single-mode for long range (LR) optics, to the 10Gb Ethernet adapter or regular Ethernet cable for the 1Gb Ethernet adapter.
11. Power on your system.
12. Verify if the adapter was installed successfully. To do so, open **Device Manager** in **Control Panel**.
13. 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

14. Once the Unified Wire package is installed, open **Device Manager** again. Expand **Network adapters** section and now Chelsio adapter should be listed.



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 and T420-BT 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 any of the following methods:

- a. Chelsio's Unified Wire Installer
- b. Manual Installation

Alternatively, you can install or remove driver files in an offline Windows image using procedures mentioned in 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>

3.1. Manual Installation

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

3.1.1. Virtual Bus Driver


1. Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on the **System Devices**, right click on the **Chelsio T5/T4 40G/10G Enumerator** and select **Update Driver Software**.

 **Note** *In case of Virtual Functions in VM, select **Other Devices**, right click on **Network Controller**.*

2. Select **Browse my computer for driver software**.
3. Select **Let me pick from a list of device drivers on my computer** and click **Next**.
4. Click on **Have Disk** Button and on the next screen browse for **chvbdx64.inf** file and click **Open** and then **OK**.
5. Click **Next** and driver installation will progress. Click **Finish** once the installation is complete.

3.1.2. NDIS Miniport driver

1. 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 **Update Driver Software**.

 **Note** *In case of Virtual Functions in VM, select **Other Devices**, right click on **Chelsio Ndis Function**.*

2. Select **Browse my computer for driver software**.

3. Select **Let me pick from a list of device drivers on my computer**.
4. Click on **Have Disk** Button and on the next screen browse for **chnetx64.inf** file and click **Open** and then **OK**.
5. Click **Next** and driver installation will progress. Click **Finish** once the installation is complete.
6. Repeat the above steps for the other **Chelsio Network Adapters**.

3.1.3. iSCSI Storport Miniport driver

1. Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on the **System Devices**, right click on the **Chelsio T5/T4 40G/10G Enumerator** and select **Properties**.
2. Under **Advanced** tab, select **iSCSI Instances** and set the Value to **default**. Click **OK**.
3. Under **Other Devices**, select **Chelsio iScsi Function on Port#00**, right-click and select **Update Driver Software**.
4. Select **Browse my computer for driver software**.
5. Select **Let me pick from a list of device drivers on my computer** and click **Next**.
6. Click on **Have Disk** Button and on the next screen, browse for **cht4iscsi.inf** file and click **Open** and then **OK**.
7. Click **Next** and driver installation will progress. Click **Finish** once the installation is complete.

Repeat the same procedure for other ports.

3.1.4. Generic Function

1. Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on the **Network Adapters**, right click on the **Chelsio T5/T4 40G/10G Generic Function** and select **Update Driver Software**.
2. Select **Browse my computer for driver software**.
3. Select **Let me pick from a list of device drivers on my computer**.
4. Click on **Have Disk** Button and on the next screen browse for **chnullx64.inf** file and click **Open** and then **OK**.
5. Click **Next** and driver installation will progress. Click **Finish** once the installation is complete.

3.2. Nano Server: Driver Installation

Before installing Nano Server, the Chelsio driver package needs to be added to the boot image file. The following steps explain step-by-step procedure to add Chelsio VBD, NDIS and Null drivers to the image file:

1. Copy *NanoServer.wim* image file from Windows Server 2016 (build>=10586) ISO to a folder on your hard drive.

-
2. Open a command prompt with administrative privileges (elevated command prompt).
3. Determine the index number of image file.

```
C:\Windows\system32>dism /get-wiminfo /wimfile:<path>\NanoServer.wim
```

-
-
-
4. Mount the image file:

```
C:\Windows\system32>dism /mount-wim /wimfile:<path>/NanoServer.wim  
/index:<index_number> /mountdir:<mount_directory>
```

-
-
-
-
5. Copy the Microsoft OEM driver set package from *NanoServer\Packages* folder in the ISO to your hard drive and add it to the image file:

```
C:\Windows\system32>dism /image:<path>\<mount_directory> /add-package  
/packagepath:<path>\Microsoft-NanoServer-OEM-Drivers-Package.cab
```

-
-
-
-
-
6. Add Chelsio drivers to the image file:

```
C:\Windows\system32> dism /image:<path>\<mount_directory> /add-driver  
/driver:<path>\ChelsioUwire-x.x.x.xx\chvbdx64.inf /forceunsigned
```

```
C:\Windows\system32> dism /image:<path>\<mount_directory> /add-driver  
/driver:<path>\ChelsioUwire-x.x.x.xx\chnetx64.inf /forceunsigned
```

```
C:\Windows\system32> dism /image:<path>\<mount_directory> /add-driver  
/driver:<path>\ChelsioUwire-x.x.x.xx\chnulx64.inf /forceunsigned
```

-
-
-
-
-
-
7. Commit and save the image file:

```
C:\Windows\system32>dism /unmount-wim /mountdir:<mount_directory> /commit
```

-
-
-
-
-
-
-
8. Finally, add the image file to WDS server and install Nano Server (with Chelsio drivers) using PXE boot.
9. Reboot the Nano Server machine for changes to take effect.

4. Configuring Chelsio Network Interfaces

In order to test Chelsio adapters' features, it is required to use at least two machines, each with Chelsio's network adapters (T5, T4 or both). These machines can be connected directly (back-to-back) or with a switch.

4.1. Configuring 40G adapters

Chelsio T5 40G adapters can be configured in the following three operational modes:

- i. **DEFAULT (2X40G):** This is the default mode of operation where each port functions as 40Gbps link. The port nearest to the motherboard will appear as the first network interface (Port 0).
- ii. **SPIDER (4X10G):** In this mode, port 0 functions as 4 10Gbps links and port 1 is disabled.
- iii. **QSA (2X10G):** This mode adds support for QSA (QSFP to SFP+) modules, enabling smooth, cost-effective, connections between 40 Gigabit Ethernet adapters and 1 or 10 Gigabit Ethernet networks using existing SFP+ based cabling. The port farthest from the motherboard will appear as the first network interface (Port 0).

To configure Chelsio adapter in any of the three modes mentioned above, use the *chelsio_adapter_config.ps1* configuration script. The script will be present in *ChelsioUwire-x.x.x.xx\Adapter Configuration* folder. Follow the steps mentioned below:

4.1.1. Windows GUI Machine

- i. Copy *cxgbtool.exe* from *ChelsioUwire-x.x.x.xx* folder to *<system_drive>\Windows\System32*
- ii. Open PowerShell with administrative privileges.
- iii. Change your working directory to *ChelsioUwire-x.x.x.xx\Adapter Configuration* folder.
- iv. Run the adapter configuration script and select *Windows Technical Preview GUI* (option 1) as the Windows version. Hit [Enter].

```
PS D:\ChelsioUwire-x.x.x.xx\Adapter Configuration>
.\chelsio_adapter_config.ps1
```

```
PS D:\ChelsioUwire-5.0.0.57\Adapter Configuration> .\chelsio_adapter_config.ps1
1. Windows Technical Preview GUI
2. Windows Technical Preview Nano Server
Input: 1

chelsio_adapter_config Version 2.0
Please stop all the traffic on Chelsio adapters before updating !!
```

Figure 1 - Adapter Configuration Utility

- v. Enter the index of the Chelsio 40G adapter for which the configuration needs to be updated. Hit [Enter].

```
Select the Adapter
1.T580-SO-CR      S/N:PT39131112
Input : 1
```

Figure 2 - Selecting adapter

- vi. Select *Port settings* (option 3) as the configuration type. Hit [Enter].

```
Choose the configuration type:
1. NON-SRIOV (Default)
2. SRIOV
3. Port settings
Input : 3
```

Figure 3 - Port Settings

- vii. Select the operation mode and then enter y to confirm. Hit [Enter].

```
Choose the type:
1. DEFAULT (2 x 40G)
2. SPIDER (4 x 10G)
3. QSA (2 x 10G)
Input : 2
Do you want to continue (y/n): y
Successfully updated the selected configuration type.
Verification: Passed
```

Figure 4 - Operation mode

- viii. Open **Device Manager**, click on **System Devices** and right-click on the 40G Chelsio Adapter selected in step (v).
- ix. Select **Disable** and then **Enable**, for changes to take effect.

4.1.2. Nano Server Machine

- i. Connect to Nano Server Machine.
- ii. Copy *ChelsioUwire-x.x.x.xx* folder to a desired location.
- iii. Copy *cxgbtnano.exe* from *ChelsioUwire-x.x.x.xx* folder to `<system_drive>\Windows\System32`
- iv. Change your working directory to *ChelsioUwire-x.x.x.xx\Adapter Configuration* folder.
- v. Run the adapter configuration script and select *Windows Technical Preview Nano Server* (option 2) as the Windows version. Hit [Enter].

```
[nanomachine-ip]: PS D:\ChelsioUwire-x.x.x.xx\Adapter Configuration>
.\chelsio_adapter_config.ps1
```

```
[10.193.187.62]: PS D:\ChelsioUwire-5.0.0.57\Adapter Configuration> .\chelsio_adapter_config.ps1
1. Windows Technical Preview GUI
2. Windows Technical Preview Nano Server
Input: 2
chelsio_adapter_config Version 2.0
Please stop all the traffic on Chelsio adapters before updating !!
```

Figure 5 - Adapter Configuration Utility

- vi. Enter the index of the 40G adapter for which the configuration needs to be updated

```
Select the Adapter
1. T580-S0-CR      S/N:PT39131112
Input : 1
```

Figure 6 - Selecting adapter

- vii. Select *Port settings* (option 3) as the configuration type. Hit [Enter].

```
Choose the configuration type:
1. NON-SRIOV (Default)
2. SRIOV
3. Port settings
Input : 3
```

Figure 7 - Port Settings

- viii. Select the operation mode and then enter y to confirm.

```
Choose the type:
1. DEFAULT (2 x 40G)
2. SPIDER (4 x 10G)
3. QSA (2 x 10G)
Input : 2
Do you want to continue (y/n): y
Successfully updated the selected configuration type.
Verification: Passed
```

Figure 8 - Operation mode

- ix. Determine the Instance ID of the Adapter using the *Get-PnpDevice* command:

```
[10.193.187.132]: PS D:\ChelsioUwire-5.0.0.57\Adapter Configuration> Get-PnpDevice |Where-Object {$_.FriendlyName -like "Chelsio"} |select name, InstanceId, status
```

name	InstanceId	status
Chelsio T580-CR 40G Generic function	PCI\VEN_1425&DEV_5500&SUBSYS_00001425&REV_00\4&110e1c6d&080508	OK
Chelsio T580-CR 40G Generic function	PCI\VEN_1425&DEV_5000&SUBSYS_00001425&REV_00\4&110e1c6d&080008	OK
Chelsio T580-CR 40G Generic function	PCI\VEN_1425&DEV_5000&SUBSYS_00001425&REV_00\4&110e1c6d&080108	OK
Chelsio T580-CR 40G Generic function	PCI\VEN_1425&DEV_5000&SUBSYS_00001425&REV_00\4&110e1c6d&080208	OK
Chelsio T580-CR 40G Generic function	PCI\VEN_1425&DEV_5000&SUBSYS_00001425&REV_00\4&110e1c6d&080308	OK
Chelsio T580-CR 40G Generic function	PCI\VEN_1425&DEV_5600&SUBSYS_00001425&REV_00\4&110e1c6d&080608	OK
Chelsio T580-CR 40G Bus Enumerator	PCI\VEN_1425&DEV_5400&SUBSYS_00001425&REV_00\4&110e1c6d&080408	OK
Chelsio Network Adapter #5	CHT5BUS\CHNET\5&1501f891&0&0000	OK
Chelsio Network Adapter #6	CHT5BUS\CHNET\5&1501f891&0&0001	OK

Figure 9 - Adapter Instance IDs

- x. Use the Instance ID obtained from the previous step to Disable and Enable the Adapter for changes to take effect.

```
[10.193.187.132]: PS D:\ChelsioUwire-5.0.0.51\Adapter Configuration> disable-PnpDevice "PCI\VEN_1425&DEV_5400&SUBSYS_00001425&REV_00\4&110E1
1D&0&0408"

Confirm
Are you sure you want to perform this action?
Performing the operation "Disable" on target "Win32_PnPEntity: Chelsio T580-CR 40G Bus Enumerator (DeviceID =
"PCI\VEN_1425&DEV_5400&SUBSYS_00001425&REV_00\4&110E11D&0&0408")".
[Y] Yes [A] Yes to All [N] No [L] No to All [?] Help (default is "Y"): Y
[10.193.187.132]: PS D:\ChelsioUwire-5.0.0.51\Adapter Configuration> enable-PnpDevice "PCI\VEN_1425&DEV_5400&SUBSYS_00001425&REV_00\4&110E1C
&0&0408"

Confirm
Are you sure you want to perform this action?
Performing the operation "Enable" on target "Win32_PnPEntity: Chelsio T580-CR 40G Bus Enumerator (DeviceID =
"PCI\VEN_1425&DEV_5400&SUBSYS_00001425&REV_00\4&110E11D&0&0408")".
[Y] Yes [A] Yes to All [N] No [L] No to All [?] Help (default is "Y"): Y
[10.193.187.132]: PS D:\ChelsioUwire-5.0.0.51\Adapter Configuration>
```

Figure 10 - Committing changes

4.2. Assigning IP address

- i. Double click on the Network Connections icon and choose the Chelsio card entry and double click it.
- ii. Click on the Properties button from the Local Area Connection X Status.
- iii. Select "Internet Protocol (TCP/IP)" from the list and click on Properties button below it.
- iv. From the Internet Protocol (TCP/IP) Properties window, assign an IP Address (e.g. 192.169.1.10) and subnet mask (e.g. 255.255.255.0).
- v. Click on Ok and close on the other window.
- vi. Check to see if you can ping to some other address on this subnet.

5. *cxg*btool/*cxg*bnano help

The *cxgbtool* (*cxgbnano* for Nano Server) 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.

Definitions

[*nicInterface*] is the name of the network device to work on, given in the format "nic[0,1,..n]"

[*vbdInterface*] is the name of the Chelsio Bus Enumerator instance to work on, given in the format "vbd[0,1,...n]"

Syntax

```
cxgbtool [vbdInterface|nicInterface][parameters][(optionalParameters)]
```

In case of Nano Server, run the commands using **cxqbnano** instead of **cxqbttool**, i.e.,

```
cxgbnano [vbdInterface|nicInterface][parameters][(optionalParameters)]
```

- $-h$

Description: Displays help

Syntax: cxgbtool -h

- cim la

Description: Displays results of logic analyzer trace.

Syntax: cxbtool [*vbdInterface*] cim_la

Example:

```
C:\Users\Administrator>cxgbttool vbd0 cim_la
```

Status	Data	PC	LS0Stat	LS0Addr	LS0Data
.					
.					
c0	00000001	1ffffc4a	00000000	00000000	00000000000000000000000000000000
c0	00000001	1ffffc4a	00000000	00000000	00000000000000000000000000000000
fe	1ffffc4a	1ffffc4a	00000000	00000000	00000000000000000000000000000000
c0	00000001	1ffffc4d	00000000	00000000	00000000000000000000000000000000
fe	1ffffc4d	1ffffc4d	00000000	00000000	00000000000000000000000000000000
.					
.					

- **context**

Description: Shows an SGE context.

Syntax: cxgbtool [*vbdInterface*] context [*contextType*] [*queueId*]

Context Type Parameters:

Egress: Egress queue context.

fl: Free list manager context.

response: Response queue context.

ingress: Ingress queue context.

cq: RDMA completion queue context.

cong: Congestion context.

Example:

```
C:\Users\Administrator>cxgbtool vbd0 context egress 0
Response Data:
00000000      00000000 00000000 00000000 00000000
00000010      00000000 00000006 00000074 00000000
00000020      00000001 00000050 00000000 00000000
00000030      00000000 00000000 00000000 00000000
00000040      00000000 00000000 00000000 00000000
00000050      00000000 00000000 00000000 00000000
00000060      00000000 00000000 00000000 00000000
00000070      00000000 00000000 00000000 00000000
In show_t4_ctxt: p->mem_id = 0
StatusPgNS:      0
StatusPgRO:      0
FetchNS:         0
FetchRO:         0
Valid:           1
PCIeDataChannel: 0
DCAEgrQEn:       0
DCACPUID:        0
FCThreshOverride: 0
.
.
.
```

- **filter**

Description: Displays list of configured hardware filters

Syntax: cxgbtool [*nicInterface*] filter

Example:

```
C:\Users\Administrator>cxgbtool nic0 filter
```

Ftid	Prot	FPORT	LPORT	Type	Que Id	DMAC Idx	Locked	Hits
------	------	-------	-------	------	--------	----------	--------	------

- loadfw

Description: Loads firmware image.

Syntax: cxgbttool [*vbdInterface*] loadfw [*firmwareImage*]


 Note *The Firmware input file used must be a binary and not a header file.*

Example:

```
C:\Users\Administrator>cxgbtool vbd0 loadfw t5fw-1.11.18.0.bin
```

- **loadcfg**

Description: Loads firmware configuration file or clears configuration flash region.

 **Note** *The configuration file used must be in text format and not a header file.*

Syntax: cxgbtool [*vbdInterface*] loadcfg [*[firmwareConfigurationFile]*|clear]

Example:

Loading T5 firmware configuration file:

```
C:\Users\Administrator>cxgibttool vbd0 loadcfg t5-config.txt
Flashing configuration file C:\Users\Administrator\Desktop\t5-config.txt of
size 22607 ...
```

Clearing the configuration file region in flash

```
C:\Users\Administrator>cxgbttool vbd0 loadcfg clear
Clearing configuration file in flash...
```

- **loadphy**

Description: Loads phy firmware.

Syntax: cxgbtool [*vbdInterface*] loadphy [*phyFile*]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 loadphy .\Firmware_1.25.c1.Chelsio.cld
```

- **loadboot**

Description: Flashes the Option ROM image.

Syntax: cxgbtool [*vbdInterface*] loadboot [*bootImageFile*] [pf {0|1|2|...|7}|offset {*val*}|clear]

Parameters:

pf{*val*}: Flash Option ROM image to the offset defined by the PFs EXPROM_OFST in the serial configuration.

offset {*val*}: Flash Option ROM image to the offset specified by the user.

clear: The flash area reserved for Option ROM image will be cleared.

Example:

Flashing Option ROM image to the offset defined by the PFs EXPROM_OFST:

```
C:\Users\Administrator>cxgbtool vbd0 loadboot cuwlb4.bin pf 0
```

Flashing Option ROM image to user specified offset:

```
C:\Users\Administrator>cxgbtool vbd0 loadboot cuwlb4.bin offset 0x100
```

- **loadboot-cfg**

Description: Loads boot configuration file.

Syntax: cxgbtool [*vbdInterface*] loadboot-cfg [[*bootConfigImageFile*]|clear]

Parameters:

clear: The flash area reserved for boot configuration file will be cleared.

Example:

```
C:\Users\Administrator>cxgbtool vbd0 loadboot-cfg .\boot-config.bin
cxgb_CmdLoadBootCfg: BootROM length: 1664, value2add:0
```

- **mdio**

Description: Reads/writes MDIO register.

Syntax: cxgbtool [*vbdInterface*] mdio
 [*physicalAddress*][*manageableDevicesAddress*][*registerAddress*] [(*writeValue*)]

Example

Read MDIO register

```
C:\Users\Administrator>cxgbtool vbd0 mdio 0 0 0
```

Write MDIO register

```
C:\Users\Administrator>cxgbtool vbd0 mdio 0 0 0 0
```

- **meminfo**

Description: Displays memory info.

Syntax: cxgbtool [*vbdInterface*] meminfo

Example:

```
C:\Users\Administrator>cxgbtool vbd0 meminfo
EDC0:          0-0x2ffffff [3.00 MiB]
EDC1:          0x3000000-0x5ffffff [3.00 MiB]

RQUDP region:  0xffffffff-0xffffffffe [0 B]
iSCSI region:  0xffffffff-0xffffffffe [0 B]
Tx payload:    0-0x17ffffff [384 MiB]
Rx payload:    0-0x7affffff [123 MiB]
IMSG contexts: 0x17b280-0x23b27f [768 KiB]
ULPTX state:   0x23b280-0x2443bf [36.3 KiB]
ULPRX state:   0x2443c0-0x248bbf [18.0 KiB]
Pstructs:     0x248bc0-0x2c89bf [511 KiB]
Rx FL:        0x2c89c0-0x2c9e3f [5.12 KiB]
.
.
.
```

- **mtus**

Description: Prints hardware MTU table.

Syntax: cxgtool [vbdInterface] mtus

Example:

```
C:\Users\Administrator>cxgbtool vbd0 mtus
Path mtus : 88 256 512 576 808 1024 1280 1488 1500 2002 2048 4096 4352 8192
9000 9600
```

- **qsets**

Description: Reads # of qsets

Syntax: cxgbtool [nicInterface] qsets

Example:

```
C:\Users\Administrator>cxgbtool nic0 qsets
```

QueType	AbsId	RelId	Fl0Id	Fl1Id	Msix	QDepth
TxEth	8	8	n/a	n/a	n/a	1024
TxEth	9	9	n/a	n/a	n/a	1024
TxEth	10	10	n/a	n/a	n/a	1024
TxEth	11	11	n/a	n/a	n/a	1024
TxCtrl	12	12	n/a	n/a	n/a	1024
TxRdma	13	13	n/a	n/a	n/a	1024
RxIng	1	1	0	0	6	1023
RxEth	2	2	0	0	8	3071
RxEth	3	3	1	0	2	3071
RxEth	4	4	2	0	4	3071
RxEth	5	5	3	0	14	3071
RxRdma	6	6	4	0	16	511
RxRdma	7	7	5	0	10	511
RxRdma	8	8	6	0	12	511
RxRdma	9	9	7	0	22	511

- **qstats**

Description: Displays statistics for each Tx & Rx queue.

Syntax: cxgbtool [nicInterface] qstats [queueType [(clr)]]

Queue Type parameters:

txeth: Tx tunnel queue statistics.

rxeth: Rx tunnel queue statistics.
txvmq: Tx VM queue statistics.
rxvmq: Rx VM queue statistics.
txtoe: Chimney Tx queue statistics.
rxtoe: Chimney Rx queue statistics.
txrdma: RDMA Tx queue statistics.
rxrdma: RDMA Rx queue statistics.
txctrl: Chimney control queue statistics.
txfwd: Chimney forwarding queue statistics.
txnvgre: Tx NVGRE statistics.
rxnvgre: Rx NVGRE statistics.
clr: Clear Queue statistics.

Example of rxeth qstats:

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

StatsType	RxEth#2	RxEth#3	RxEth#4	RxEth#5
UcPkts	31	27	81	0
UcBytes	2980	3216	10860	0
McPkts	579	612	543	0
McBytes	43866	45371	42950	0
BcPkts	29	102	1422	0
BcBytes	2472	24786	131544	0
CoalPkts	0	0	0	0
CoalBytes	0	0	0	0
DropPkts	0	0	0	0
RecvNbIs	639	741	2046	0
RxCsumGood	600	735	2025	0
VLANex	0	0	0	0
RssProc	1	2	3	1
RssGroup	0	0	0	0

• reg

Description: Reads/writes register.

Syntax:

Register Read: `cxgbtool [vbdInterface] reg [readAddress]`

Register Write: `cxgbtool [vbdInterface] reg [[writeAddress] = {val}]`

Example:

Register read:

```
C:\Users\Administrator>cxgbtool vbd0 reg 0x19428
00000008 [8]
```

Register write:

```
C:\Users\Administrator>cxgbtool vbd0 reg 0x19428 = 0x3
```

- **regdump**

Description: Displays registers of a hardware module. Not specifying any parameter will display registers for all the modules. Not all modules are available on all adapters.

Syntax:

Display registers for all available modules: `cxgbtool [vbdInterface] regdump`

Display registers for specific module: `cxgbtool [vbdInterface] regdump [registerModule]`

Register module parameters:

Module parameter	Description
<i>sge</i>	Scatter-Gather DMA Engine common register set.
<i>pci</i>	PCI Express Interface common register set. This module implements the PCI-Express SR-IOV physical logical, data link, and transaction layers.
<i>dbg</i>	Debug Engine Common register set.
<i>mc0</i>	Memory controller 0 common register set. This module implements the memory controller for the optional external DDR-II/DDR-III SDRAM.
<i>mc1</i>	Memory controller 1 common register set. This module implements the memory controller for the optional external DDR-II/DDR-III SDRAM.
<i>ma</i>	Memory Arbiter common register set. This module implements the arbitration of memory requests from the various on-chip sources to the memory hierarchy consisting of on-chip eDRAM, external DDR2/DDR3 memory, and host memory that is accessed through the PCIe.
<i>edc0</i>	eDRAM and Controller 0 common register set. This is the on-chip eDRAM and controller.
<i>edc1</i>	eDRAM and Controller 1 common register set. This is the on-chip eDRAM and controller.
<i>cim</i>	CIM common register set. This module implements the CPU interface and μ P is the embedded microprocessor. The CIM incorporates functions to improve the performance of CPU accesses to external memory.
<i>tp</i>	Transport Protocol Engine common register set. This module implements the main packet processing pipeline.
<i>ulp_rx</i>	Ingress Upper Layer Protocol common register set. This module implements the upper layer protocol processing in the ingress direction for protocols that are layered on top of TCP, such as iSCSI and

	RDMA.
<i>ulp_tx</i>	Egress Upper Layer Protocol common register set. This module provides Upper Layer support for RDMA and iSCSI offload in the transmit direction, and also implements LSO/TSO functionality.
<i>pmrx</i>	Ingress Payload Manager common register set. These modules implement the payload manager for receive/ingress.
<i>pmtx</i>	Egress Payload Manager common register set. These modules implement the payload manager for transmit/egress.
<i>mps</i>	Multi-port support common register set. This module implements the multi-port support for T4, and switches egress packets to the ingress path when their Ethernet DA (Destination Address) matches an address in the exact match Ethernet Address database, or if the outer-VLAN indicates that the packet is destined to another virtual machine connected to the T4, or if another virtual machine is subscribing to an L2 multicast group that is the MAC destination address of the packet.
<i>cp/sw</i>	CPL Switch common register set. This module implements a configurable switch for ingress CPL messages to the SGE and/or CIM. The embedded μ P is assigned a receive queue number and can be assigned one or more MAC addresses and IP addresses, and any of these can be used to switch ingress packets to the μ P for processing.
<i>smb</i>	System Management Bus common register set. This module implements an SMBus Master/Slave for system management.
<i>i2c</i>	I2C-Bus Master common register set. This module implements an I2C-Bus Master for PHY management and I/O expansion.
<i>mi</i>	MI common register set. This module implements an MDIO Master for PHY management.
<i>uart</i>	
<i>pmu</i>	Power Management Unit common register set. Power management unit.
<i>sf</i>	Serial Flash controller common register set. This module implements the serial flash controller. It interfaces to the external serial flash device.
<i>pl</i>	PIO Local Bus controller common register set. This module implements the PIO Local Bus controller. It is physically distributed across T4/T5.
<i>le</i>	Lookup Engine Common register set. The Lookup Engine implements the connection, filter and ACL databases. This module includes a TCAM Memory controller that interfaces with the on-chip TCAM memory array, and it implements the interface to the external memory that is used to scale the support of the connection database to 1M connections. The LE stores ACL rules, it stores routing information to handle routing for SYN-cookie mode offloaded listening servers, and it stores tuple information for offloaded connections, and FCoE exchanges.
<i>ncsi</i>	Network Controller sideband Interface common register set. The module implements the NCSI (Network Controller Sideband Interface) protocol.
<i>xgmac</i>	
<i>mac</i>	MAC common register set.
<i>hma</i>	

T4 Register Modules	T5 Register Modules
sge	sge
pci	pci
dbg	dbg
mc	mc0
ma	mc1
edc0	ma
edc1	edc0
cim	edc1
tp	cim
ulp_rx	tp
ulp_tx	ulp_rx
pmrx	ulp_tx
pmtx	pmrx
mps	pmtx
cplsw	mps
smb	cplsw
i2c	smb
mi	i2c
uart	mi
pmu	uart
sf	pmu
pl	sf
le	pl
ncsi	le
xgmac	ncsi
	mac
	hma

Example:

Displaying all available module registers:

```

C:\Users\Administrator>cxgbtool vbd0 regdump
[0x1e000] SGE_PF_KDOORBELL          0          0
    31:15 QID                      0          0
    14:14 Priority                   0          0
    13:13 Type                      0          0
    12:0 PIDX                      0          0
[0x1e004] SGE_PF_GTS                0          0
    31:16 IngressQID                0          0
    15:13 TimerReg                  0          0
    12:12 SEIntArm                  0          0
11:0 CIDXInc                       0          0
.
.
.

```

Displaying specific (*mps*) module registers:

```
C:\Users\Administrator>cxgbtool vbd0 regdump mps
[ 0x9000] MPS_CMN_CTL                                0x1      1
    4:4 LpbkCrdtCtrl                                0        0
    3:3 Detect8023                                    0        0
    2:2 VFDDirectAccess                              0        0
    1:0 NumPorts                                      0x1      1
.
.
.
```

- **tcb**

Description: Read hardware TCP Control Block, which contains details regarding all offloaded connections.

Syntax: cxgbtool [*nicInterface*] tcb [*tid*]

Example:

```
C:\Users\Administrator>cxgbtool nic0 tcb 5070
HW TCB
ulp_type           : 0x7
ulp_raw            : 0x0
l2t_ix             : 0xf40
smac_sel            : 0x36
tf_suspend         : 0x0
tf_non_offload     : 0x0
tf_lock_tid        : 0x0
tf_keepalive       : 0x0
tf_dack            : 0x0
tf_dack_mss        : 0x0
tf_dack_not_acked  : 0x0
tf_nagle           : 0x0
.
.
.
```

- **tpi**

Description: Displays TP indirect registers.

Syntax: cxgbtool [*vbdInterface*] tpi

Example:

```
C:\Users\Administrator>cxgbtool vbd0 tpi
TP_PIO
[ 0x20] TP_RX_SCHED_MAP                0x55555555 1431655765
 31:24 S_RXMAPCHANNEL3                0x55      85
 23:16 S_RXMAPCHANNEL2                0x55      85
 15:8  S_RXMAPCHANNEL1                0x55      85
 7:0   S_RXMAPCHANNEL0                0x55      85
[ 0x21] TP_RX_SCHED_SGE                0xf       15
 15:12 S_RXSGEMOD1                    0         0
 11:8  S_RXSGEMOD0                    0         0
 3:3   S_RXSGECHANNEL3                0x1       1
.
.
.
```

- **sgedbg**

Description: Displays sge debug indirect registers.

Syntax: cxgbtool [*vbdInterface*] sgedbg

Example:

```
C:\Users\Administrator>cxgbtool vbd0 sgedbg
SGE_DEBUG_DATA_HIGH00                0x3000000 50331648
SGE_DEBUG_DATA_HIGH01                0         0
SGE_DEBUG_DATA_HIGH02                0         0
SGE_DEBUG_DATA_HIGH03                0         0
SGE_DEBUG_DATA_HIGH04                0         0
SGE_DEBUG_DATA_HIGH05                0         0
SGE_DEBUG_DATA_HIGH06                0         0
SGE_DEBUG_DATA_HIGH07                0         0
SGE_DEBUG_DATA_HIGH08                0x2602000 637665280
SGE_DEBUG_DATA_HIGH09                0         0
SGE_DEBUG_DATA_HIGH10                0x3       3
SGE_DEBUG_DATA_HIGH11                0         0
.
.
.
```

- **dumpctx**

Description: Displays Adapter Context.

Syntax: cxgbtool [*nicInterface*] dumpctx

Example:

```
C:\Users\Administrator>cxgbtool nic0 dumpctx
```

Type	Value
Link State	Connected
Link Speed	10 Gbps
Hw Addr	00:07:43:04:7d:60
Cur Addr	00:07:43:04:7d:60
Port No	0
NetIfIdx	18
Mtu	1500
.	
.	
.	

- **version**

Description: Displays the Adapter Part Number, Serial Number, Device ID, Firmware Version, TP, NDIS Driver version, and VBD version.

Syntax: cxgbtool [*vbdInterface*] version

Example:

```
C:\Users\Administrator>cxgbtool vbd0 version
```

```
P/N: 11011605002
S/N: RE14130227
NIC DeviceID 5401 (T520-CR)
NIC FW Version 1.14.4.0
NIC TP Version 0.1.4.8
Ndis Driver Version 5.5.11.0
VBD Version 5.5.11.0
```

- **fwtoc**

Description: Converts Firmware binary file to source file header.

Syntax: cxgbtool [*vbdInterface*] fwto [firmwareFile] filename= [CFileName].bin

Example:

```
C:\Users\Administrator>cxgbtool vbd0 fwto .\Chelsio-Uboot-1.0.0.68\t4fw-1.12.14.0.bin filename=t4fw-1.12.14.0.bin
```

- **inst**

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

Syntax: cxgbtool [*vbdInterface*] inst [*infFilePath*]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 inst .\chnetx64.inf
ENTER:  DriverPackageInstallA
ENTER:  DriverPackageInstallW
Installing INF file '.\chnetx64.inf' (Plug and Play).
Looking for Model Section [Chelsio.NTamd64.6.2]...
Installing devices with Id "CHT5BUS\chnet" using INF
"C:\Windows\System32\DriverStore\FileRepository\chnetx64.inf_amd64_dd8d3a55aa5c4536\chnetx64.inf".
Installation did not occur because the current driver on the device is the same or better.
No drivers installed. Drivers contained in
'C:\Windows\System32\DriverStore\FileRepository\chnetx64.inf_amd64_dd8d3a55aa5c4536\chnetx64.inf' are not better than current one's.
RETURN: DriverPackageInstallW (0x103)
RETURN: DriverPackageInstallA (0x103)
```

- **uninst**

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

Syntax: cxgbtool [*vbdInterface*] uninstall [*infFile*]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 uninstall .\chnetx64.inf
Removing device instance CHT<4|5>BUS\CHNET\5&39B01C76&1&0000
```

- **update**

Description: Updates driver package.

Syntax: cxgbtool update [*infFile*]

Example:

```
C:\Users\Administrator>cxgbtool update C:\ChelsioT4\driver\2k12\amd64\  
Driver for HwId:CHT5BUS\CHNET updated successfully!!!  
Driver for HwId:PCI\VEN_1425&DEV_5610&SUBSYS_00001425&REV_00 updated  
successfully!!!  
Driver update for HwId:PCI\VEN_1425&DEV_5409&SUBSYS_00001425&REV_00 failed  
No more data is available.
```

- **rescan all**

Description: Scans for hardware changes in the device manager.

Syntax: cxgbtool [*vbdInterface*] rescan all

Example:

```
C:\Users\Administrator>cxgbtool vbd0 rescan all
```

- **trace**

Description: Enables driver debug prints.

Syntax: trace [*nicInterface*/*vbdInterface*] trace [*nic*/*vbd*] [(*flags*)][(*level*)]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 trace vbd 8 7  
Tracing vbd flags=0x8 level=7  
Press 'q' to quit tracing:
```

- **seeprom**

Description: Reads/Writes SEEPROM (init+VPD) data.

Syntax:

Read SEEPROM data to a bin file: cxgbtool [*vbdInterface*] seeprom read

Display SEEPROM data in console: cxgbtool [*vbdInterface*] seeprom dump

Write SEEPROM data: cxgbtool [*vbdInterface*] seeprom write [*seepromFile*]

Verify SEEPROM data: cxgbtool [*vbdInterface*] seeprom verify [*seepromFile*]

Example:

Read SEEPROM data:

```
C:\Users\Administrator>cxgbtool.exe vbd0 seeprom read
Reading Seeprom data to seeprom.bin
```

Write SEEPROM data:

```
C:\Users\Administrator>cxgbtool.exe vbd0 seeprom write seeprom.bin

Changing the init/vpd can cause the card to become inaccessible if the
operation is interrupted

Do you want to flash your T580-LP-CR
(SN:PT02141264,PN:110116450B0,NA:000743291420) card? (y/n) : y
Hardware configuration changed successfully.
Please reboot for the changes to take effect
```

Verify SEEPROM data:

```
C:\Users\Administrator>cxgbtool.exe vbd0 seeprom verify seeprom.bin
Verifying seeprom data against seeprom.bin

verification started
Verification : PASSED
```

- **serialinit**

Description: Reads/Writes serialinit data.

Syntax:

Read serialinit data to a bin file: cxgbtool [*vbdInterface*] serialinit read

Display serialinit data in console: cxgbtool [*vbdInterface*] serialinit dump

Write serialinit data: cxgbtool [*vbdInterface*] serialinit write [*initdataFile*]

Verify serialinit data: cxgbtool [*vbdInterface*] serialinit verify [*initdataFile*]

Example:

Read serialinit data

```
C:\Users\Administrator>cxgbtool vbd0 serialinit read
Reading Serial Init data to seeprom_init.bin
```

Write serialinit data

```
C:\Users\Administrator>cxgbtool vbd0 serialinit write C:\ChelsioT4\Adapter
Configuration\SRIOV\t520_cr_init_gen3_250_825_Pf4vf.bin
Changing the init/vpd can cause the card to become inaccessible if the
operation is interrupted

Do you want to flash your T520-CR
(SN:PT05140526,PN:110116050D0,NA:0007432962F0) card? (y/n): y
Hardware configuration changed successfully.
```

Verify serialinit data

```
C:\Users\Administrator>cxgbtool vbd0 serialinit verify C:\ChelsioT4\Adapter
Configuration\SRIOV\t520_cr_init_gen3_250_825_Pf4vf.bin
Verifying Serial Init data against C:\ChelsioT4\Adapter
Configuration\t520_cr_init_gen3_250_825_Pf4vf.bin
verification started
Verification: PASSED
```

- **vpd**

Description: Reads/writes VPD data.

Syntax:

Read VPD data: `cxgbtool [vpdInterface] vpd`

Write VPD data to serial EEPROM on chip: `cxgbtool [vpdInterface] vpd [vpdFile]`

Example:

Read VPD Data:

```
C:\Users\Administrator>cxgbtool vbd0 vpd
```

Write VPD Data:

```
C:\Users\Administrator>cxgbtool vbd0 vpd vpd.bin
```

- **vpdparams**

Description: Displays the adapters Serial Number, Device ID, EC, Core Clock, Part Number, and Network Address (MAC).

Syntax: cxgbtool [*vbdInterface*] vpdparams

Example:

```
C:\Users\Administrator>cxgbtool vbd0 vpdparams
Serial Number   : RE14130227
Id              : T520-CR
Ec              : 0000000000000000
Core Clock      : 250000
Pn              : 11011605002
Network Addr    : 000743047D60
```

- **wtp**

Description: Traces the Ingress and Egress path of a packet through the Chelsio adapter.

Syntax: `cxgbtool [vbdInterface] wtp`

Example:

```
C:\Users\Administrator>cxgbtool vbd0 wtp
LOW      0x00000000
HIGH     0x00aa0000
LOW      0x0003f000
HIGH     0x00660022
LOW      0x00000000
HIGH     0x0000eeee
LOW      0x00000000
HIGH     0x0000eeee
LOW      0x00000000
HIGH     0x00aa00aa
LOW      0x0070000b
HIGH     0x0000eeee
LOW      0x00000008
HIGH     0x0000eeee
LOW      0x00000013
HIGH     0x00550033
LOW      0x00000016
HIGH     0x0002006e
LOW      0x0000000b
HIGH     0x00880022
LOW      0x00c00001
HIGH     0x00000000
LOW      0x00000001
HIGH     0x00000000
LOW      0x00000000
HIGH     0x00000000
LOW      0x00000000
HIGH     0x00000000
LOW      0x01534745
HIGH     0x45475301
LOW      0xfeacb8ba
HIGH     0xbab8acfe
ifaces = nic0 nic1
*****EGGRESS (TX) PATH *****
MOD :   core---->PCIE---->SGE<-|      #Ring Doorbell
SOP      ?      ???      |
EOP      ?      ???      |
MOD |<-core<----PCIE<----SGE<-|      #Request Work Request
SOP |    lfe      a
EOP |    ?      a
MOD |->core---->PCIE---->SGE----->CIM/uP->| #Work Request to uP
```

```

SOP      1fe      a      0      |
EOP      1fe      a      0      |
MOD |<-core<----PCIE<----SGE<-----UTX<----|      #Request DATA
SOP |      3fc      2      1c
EOP |      ?      2      1c
MOD |->core-->PCIE-->SGE-->UTX---->TPC----->TPE---->MPS---->XGMAC--->wire
SOP      3fc      1c      1c      19 (19) 19      ff 12 (182) 182      3fc      ffffffff
EOP      3fc      1c      1c      19 (19) 19      ff 12 (182) 182      3fc      ffffffff
DROP: ???      ???      ???      ???      0      0      ???
*****INGRESS (RX) PATH*****
MOD      core<-PCIE<---SGE<--CSW<----TPC<-URX<--TPE<----MPS<----XGMAC<--wire
SOP      3fc      1c      6      5      19      2      2      2      92      92      3fc      fffffc
EOP      3fc      1c      6      5      19      2      2      2      92      92      3fc
DROP: ???      ???      ???      0(mib)      0(err)      0(overflow) f8(cls)
INTS:      f<-      e      f<-      6      f<-      0      f<-      0 (PCIE<-SGE, channels 0 to 3)

```

- **stats**

Description: Prints MAC statistics for a given port or TP MIB statistics.

Syntax: cxgbtool [*vbdInterface*] stats [*mac{portInstance}*][*mib*]

Example:

```

C:\Users\Administrator>cxgbtool vbd0 stats mac0
LOW      0x00000000
HIGH     0x00000066
LOW      0x0003f000
HIGH     0x00aa00ee
LOW      0x00000000
HIGH     0x0000eeee
LOW      0x00000000

HIGH     0x0000eeee
LOW      0x00000000
HIGH     0x00000000
LOW      0x0070000b
HIGH     0x0000eeee
LOW      0x00000013
HIGH     0x0000eeee
LOW      0x00000013
HIGH     0x001199cc
LOW      0x00000016
HIGH     0x00020491
LOW      0x0000000b
.
.
.

```

- **cpl_stats**

Description: Displays CPL Request and Response Statistics for all channels.

Syntax: cxgbtool [*vbdInterface*] cpl_stats

Example:

```
C:\Users\Administrator>cxgbtool vbd0 cpl_stats
                channel 0   channel 1   channel 2   channel 3
CPL requests:           4           3           0           0
CPL responses:          3           3           0           0
```

- **debugfs**

Description: When used in conjunction with other options, *debugfs* displays useful information regarding Chelsio adapters.

Syntax: cxgbtool [*vbdInterface*] debugfs [option]

debugfs options:

- **cctrl**

Description: Displays congestion control table.

Syntax: cxgbtool [*vbdInterface*] debugfs cctrl

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs cctrl
0:   24  108  236  268  384  492  620  724
    730  981 1004 2028 2156 4076 4480 4780      1 0.5
1:    8   36   78   89  128  164  206  241
    243  327  334  676  718 1358 1493 1593      1 0.5
.
.
.
```


- **cim_qcfg**

Description: Displays CIM queue configuration details.

Syntax: cxgbtool [*vbdInterface*] debugfs cim_qcfg

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs cim_qcfg
```

Queue	Base	Size	Thres	RdPtr	WrPtr	SOP	EOP	Avail
TP0	0	2048	0	40	40	2	2	2048
TP1	800	2048	0	0	0	0	0	2048
ULP	1000	2048	0	0	0	0	0	2048
SGE0	1800	2048	0	7e0	7e0	476	476	2048
SGE1	2000	2048	0	0	0	0	0	2048
NC-SI	2800	2048	0	0	0	0	0	2048
ULP0	0	2048		130	130	805	805	2048
ULP1	800	2048		80	80	648	648	2048
ULP2	1000	2048		0	0	0	0	2048
ULP3	1800	2048		0	0	0	0	2048
SGE	2000	2048		340	340	136	136	2048
NC-SI	2800	2048		0	0	0	0	2048

- **clk**

Description: Displays the core clock.

Syntax: cxgbtool [*vbdInterface*] debugfs clk

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs clk
```

```
Core clock period: 4 ns
TP timer tick: 32.768 us
TCP timestamp tick: 1048.576 us
DACK tick: 8.192 us
DACK timer: 488 us
Retransmit min: 960 us
Retransmit max: 9765440 us
Persist timer min: 960 us
Persist timer max: 9765440 us
Keepalive idle timer: 7031116800 us
Keepalive interval: 73240800 us
Initial SRTT: 137437100448 us
FINWAIT2 timer: 9765440 us
```


- **ddp_stats**

Description: Displays DDP(Direct Data Placement) statistics.

Syntax: cxgbtool [*vbdInterface*] debugfs ddp_stats

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs ddp_stats
Frames: 0
Octets: 0
Drops: 0
```

- **cudbg**

Description: Redirects all hardware debug logs to a file.

Syntax: cxgbtool [*vbdInterface*] debugfs cudbg [*fileName*]


Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs cudbg cudbg_debug
cxgbtool: This may take a while. Please be patient
cxgbtool: Writing cudbg block to file cudbg_debug... size: 12006043 bytes
cxgbtool: Done writing cudbg data to file cudbg_debug
```

- **edc0**

Description: Redirects EDC0 memory details to a file.

Syntax: cxgbtool [*vbdInterface*] debugfs edc0 [*fileName*]

 **Note** *It is recommended that the fileName should be provided without any extension.*

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs edc0 edc0
cxgbtool: This may take a while. Please be patient
cxgbtool: Reading MEM_EDC0 (0) memory of size 3145728 bytes
cxgbtool: Writing memory block to file edc...
cxgbtool: Done writing memory block to file edc0
```

- **edc1**

Description: Redirects EDC1 memory details to a file.

Syntax: cxgbtool [vbdInterface] debugfs edc1 [fileName]

 **Note** *It is recommended that the fileName should be provided without any extension.*

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs edc1 edc1
cxgbtool: This may take a while. Please be patient
cxgbtool: Reading MEM_EDC1 (1) memory of size 3145728 bytes
cxgbtool: Writing memory block to file edc1...
cxgbtool: Done writing memory block to file edc1
```

- **flash**

Description: Redirects Flash memory details to a file.

Syntax: cxgbtool [vbdInterface] debugfs flash [fileName]

 **Note** *It is recommended that the fileName should be provided without any extension.*

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs flash flash
cxgbtool: This may take a while. Please be patient
cxgbtool: Reading Flash memory of size 4194304 bytes
cxgbtool: Writing memory block of size 4194304 bytes to file flash...
cxgbtool: Done writing memory block to file flash
```

- **ibq_tp**

Description: Displays CIM TP inbound queue.

Syntax: cxgbtool [vbdInterface] debugfs ibq_tp[{0|1}]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs ibq_tp0
000000: 078003ff ffc04102 2e8003ff 00000000
0x0010: 2effc041 00000000 00000000 00000000
0x0020: 078103ff ffc04202 2e8103ff 00000000
0x0030: 2effc042 00000000 00000000 00000000
.
.
```

- **ibq_ulp**

Description: Displays CIM ULP inbound queue.

Syntax: cxgbtool [*vbdInterface*] debugfs ibq_ulp

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs ibq_ulp
000000: 00000000 00000000 00000000 00000000
0x0010: 00000000 00000000 00000000 00000000
0x0020: 00000000 00000000 00000000 00000000
0x0030: 00000000 00000000 00000000 00000000
.
.
.
```

- **ibq_sge**

Description: Displays CIM SGE inbound queue.

Syntax: cxgbtool [*vbdInterface*] debugfs ibq_sge[*{0|1}*]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs ibq_sge0
000000: 82000003 0000002a 00000001 2eae1676
0x0010: 00000052 00000077 00000001 29acd250
0x0020: 00000001 29acd2b4 00000000 00000000
0x0030: 08000010 c0901005 01ca01ca 00000000
.
.
.
```

- **ibq_ncsi**

Description: Displays CIM NCSI inbound queue.

Syntax: cxgbtool [*vbdInterface*] debugfs ibq_ncsi

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs ibq_ncsi
000000: 00000000 00000000 00000000 00000000
0x0010: 00000000 00000000 00000000 00000000
0x0020: 00000000 00000000 00000000 00000000
0x0030: 00000000 00000000 00000000 00000000
.
```

- **mc**

Description: Displays MC memory.

Syntax: `cxgbtool [vbdInterface] debugfs mc[{0|1}] [dumpFileName]`

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs mc1 mc1
cxgbtool: This may take a while. Please be patient
cxgbtool: Reading MEM_MC1 (3) memory of size 1073741824 bytes
cxgbtool: Writing memory block to file mc1...
cxgbtool: Done writing memory block to file mc1
```

 **Note** *It is recommended that the dumpFileName should be provided without any extension.*

- **mps_tcam**

Description: Displays MPS TCAM configuration.

Syntax: `cxgbtool [vbdInterface] debugfs mps_tcam`

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs mps_tcam
```

Idx	Ethernet address	Mask	Vld	Ports	PF	VF	Repl	P0	P1	P2	P3	ML
0	01:80:c2:00:00:0e	ffffffffffffff	Y	0x3	7	92	Y	0	0	0	0	0
1	00:07:43:29:0a:b0	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
2	33:33:00:00:00:01	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
3	01:00:5e:00:00:01	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
4	33:33:00:01:00:03	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
5	33:33:00:00:00:0c	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
6	33:33:ff:00:00:11	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
7	33:33:ff:b8:3f:b8	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
8	01:00:5e:7f:ff:fa	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
9	01:00:5e:00:00:fc	ffffffffffffff	Y	0x1	4	65	N	0	0	0	0	0
10	-											
11	-											
12	-											
13	-											

- **mps_trc_rd trace**

Description: Reads MPS trace filter.

Syntax: `cxgbtool [vbdInterface] debugfs mps_trc_rd trace[traceQueueId]`

Example:

[illegible]

- **mps_trc_wr trace**

Description: Sets MPS trace filter.

Syntax:

```
cxgbrtc [vbdInterface] debugfs mps_trc_wr trace[0|1|2|3] [tx[portInstance]|rx[portInstance]]
```

Example:

Setting up trace0 with tx0 (tx0 is port0 Tx path)

```
C:\Users\Administrator>cxgbtool vbd0 debugfs mps trc wr trace0 tx0
```

- **mbox**

Description: Displays the last command in each mailbox.

Syntax: cxgbrtc [vbdInterface] debugfs mbox[{0|1|2|...|7}]

Example:

[illegible]

- **obq_ulp**

Description: Displays ULP outbound queue.

Syntax: cxgbtool [*vbdInterface*] debugfs obq_ulp[{0|1|2|3}]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs obq_ulp0
000000: 00000000 00000000 00000000 00000000
0x0010: 82000002 00000022 00000001 09119152
0x0020: 00000134 00000000 00000001 168966c0
.
.
```

- **obq_sge**

Description: Displays SGE outbound queue.

Syntax: cxgbtool [*vbdInterface*] debugfs obq_sge

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs obq_sge
000000: 00000020 00000801 00000000 00000000
0x0010: 00000020 00001301 00010000 67400052
0x0020: 00001020 00001301 0000037f e0800606
0x0030: 00000020 00000801 01fd206d 00907803
.
.
.
```

- **obq_ncsi**

Description: Displays NCSI outbound queue.

Syntax: cxgbtool [*vbdInterface*] debugfs obq_ncsi

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs obq_ncsi
000000: 00000000 00000000 00000000 00000000
0x0010: 00000000 00000000 00000000 00000000
0x0020: 00000000 00000000 00000000 00000000
0x0030: 00000000 00000000 00000000 00000000
.
.
.
```

- **obq_sge_rx_q**

Description: Displays CIM SGE outbound queue.

Syntax: cxgbtool [*vbdInterface*] debugfs obq_sge_rx_q[{0|1}]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs obq_sge_rx_q0
000000: 00000000 00000000 00000000 00000000
0x0010: 00000000 00000000 00000000 00000000
0x0020: 00000000 00000000 00000000 00000000
0x0030: 00000000 00000000 00000000 00000000
.
.
.
```

- **pm_stats**

Description: Displays page memory statistics.

Syntax: cxgbtool [*vbdInterface*] debugfs pm_stats

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs pm_stats

                Tx cycles    Tx bytes
Read:                0          0
Write bypass:       53350       396
Write mem:           0          0
Bypass + mem:        0          0

                Rx cycles    Rx bytes
Read:                0          0
Write bypass:       20820       242
Write mem:           0          0
Flush:              0          0
```

- **tcp_stats**

Description: Displays IPv4/IPv6 TCP statistics.

Syntax: cxgbtool [*vbdInterface*] debugfs tcp_stats

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs tcp_stats
```

	IP	IPv6
OutRsts:	0	0
InSegs:	0	0
OutSegs:	0	0
RetransSegs:	0	0

- **tp_err_stats**

Description: Displays TP error statistics for channel 0-3.

Syntax: cxgbtool [*vbdInterface*] debugfs tp_err_stats

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs tp_err_stats
```

	channel 0	channel 1	channel 2	channel 3
macInErrs:	0	0	0	0
hdrInErrs:	0	0	0	0
tcpInErrs:	0	0	0	0
tcp6InErrs:	0	0	0	0
tnlCongDrops:	0	0	0	0
tnlTxDrops:	0	0	0	0
ofldVlanDrops:	0	0	0	0
ofldChanDrops:	0	0	0	0
ofldNoNeigh:	0			
ofldCongDefer:	0			

- **tp_la**

Description: Dumps TP la.

Syntax:

```
cxgbtool [vbdInterface] debugfs tp_la
```

```
cxgbtool [vbdInterface] debugfs tp_la [{2|3} ]
```


Example:

```

C:\Users\Administrator>cxgbtool vbd0 debugfs tp_la
TP LA Debug Mode: 3

RcfOpCodeOut: 4 State: 0 WcfState: 0 RcfOpSrcOut: 1 CRxError: 0 ERxError: 0
SanityFailed: 0 SpuriousMsg: 1 FlushInputMsg: 0 FlushInputCpl: 0
RssUpBit: 0 RssFilterHit: 0 Tid: 0 InitTcb: 0 LineNumber: 0 Emsg: 0
EdatOut: 0 Cmsg: 0 CdataOut: 0 EreadPdu: 0 CreadPdu: 0 TunnelPkt: 1
RcfPeerFin: 0 RcfReasonOut: 0 TxCchannel: 0 RcfTxChannel: 0
RxEchannel: 2 RcfRxChannel: 0 RcfDataOutSrdy: 0 RxDvld: 0 RxOoDvld: 0
RxCongestion: 0 TxCongestion: 0

CplCmdIn: 238 MpsVfVld: 0 MpsPf: 0 MpsVf: 0 SynIn: 0 AckIn: 0 FinIn: 0
RstIn: 0 DataIn: 0 DataInVld: 0 PadIn: 0 RxBufEmpty: 1 RxDdp: 0
RxFbCongestion: 0 TxFbCongestion: 0 TxPktSumSrdy: 1 RcfUlpType: 0
Eread: 0 Ebypass: 1 Esave: 0 Static0: 1 Cread: 0 Cbypass: 1 Csave: 0
CPktOut: 0 RxPagePoolFull: 2 RxLpbkPkt: 0 TxLpbkPkt: 0 RxVfValid: 1
SynLearned: 0 SetDelEntry: 0 SetInvEntry: 0 CpcmdDvld: 1 CpcmdSave: 0
RxPstructsFull: 0 EpcmdDvld: 0 EpcmdFlush: 0 EpcmdTrimPrefix: 0
EpcmdTrimPostfix: 0 ERssIp4Pkt: 0 ERssIp6Pkt: 0 ERssTcpUdpPkt: 0
ERssFceFipPkt: 0

RcfOpCodeOut: 14 State: 14 WcfState: 0 RcfOpSrcOut: 0 CRxError: 0 ERxError: 0
SanityFailed: 0 SpuriousMsg: 0 FlushInputMsg: 0 FlushInputCpl: 0
RssUpBit: 0 RssFilterHit: 0 Tid: 17 InitTcb: 0 LineNumber: 5 Emsg: 0
EdatOut: 1 Cmsg: 0 CdataOut: 0 EreadPdu: 1 CreadPdu: 0 TunnelPkt: 0
RcfPeerFin: 0 RcfReasonOut: 8 TxCchannel: 2 RcfTxChannel: 0
RxEchannel: 0 RcfRxChannel: 0 RcfDataOutSrdy: 0 RxDvld: 0 RxOoDvld: 0
RxCongestion: 0 TxCongestion: 0

.
.
.

```

- **tid_info**

Description: Displays TID info.

Syntax: cxgbtool [*nicInterface*] debugfs tid_info

Example:

```

C:\Users\Administrator>cxgbtool nic0 debugfs tid_info
TID range: 0..1919/2048..18431, in use: 0
STID range: 1920..1951, in use: 4
ATID range: 0..4095, in use: 0
FTID range: 1952..1967
HW TID usage: 0 IP users, 0 IPv6 users

```

- **tx_rate**

Description: Displays TX rate for NIC and offload traffic.

Syntax: cxgbtool [*vbdInterface*] debugfs tx_rate

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs tx_rate
          channel 0      channel 1      channel 2      channel 3
NIC B/s:           0           0           0           0
Offload B/s:       0           0           0           0
```

- **ulprx_la**

Description: Dumps ULP RX LA.

Syntax: cxgbtool [*vbdInterface*] debugfs ulprx_la

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs ulprx_la
      Pcmd      Type  Message      Data
0000000000000000      0 00000000 00000000000000000000000000000000
0000000000000000      0 00000000 00000000000000000000000000000000
0000000000000000      0 00000000 00000000000000000000000000000000
.
```

- **devlog**

Description: Prints firmware device log information.

Syntax: cxgbtool [*vbdInterface*] devlog

Example:

```
C:\Users\Administrator>cxgbtool vbd0 devlog
Seq#      Tstamp      Level      Facility      Message
0         318517      INFO      CORE          log initialized @ 0x20084000
size 32768 (128 entries)
fwrev 0x00000000pcie_fw
0x0014cc10
1         388309      INFO      CORE          bootstrap firmware took 27
msecs to run
.
```

- **rss**

Description: Prints RSS info.

Syntax: cxgbtool [*vbdInterface*] rss

Example:

```
C:\Users\Administrator>cxgbtool vbd0 rss
0:   1023    0    0    0    0    0    0    0
8:     0     0    0    0    0    0    0    0
16:  1023    0    0    0    0    0    0    0
24:     0     0    0    0    0    0    0    0

.
.
.
```

- **rss_config**

Description: Prints RSS Configuration.

Syntax: cxgbtool [*vbdInterface*] rss_config

Example:

```
C:\Users\Administrator>cxgbtool vbd0 rss_config
TP_RSS_CONFIG: 0x300003c
  Tnl4TupEnIpv6: no
  Tnl2TupEnIpv6: no
  Tnl4TupEnIpv4: no
  Tnl2TupEnIpv4: no
  TnlTcpSel:     no
  TnlIp6Sel:     no
  TnlVrtSel:     yes
  TnlMapEn:      yes
  OfdHashSave:   no
  OfdVrtSel:     no
  OfdMapEn:      no
  OfdLkpEn:      no
  Syn4TupEnIpv6: no
  Syn2TupEnIpv6: no
  Syn4TupEnIpv4: no
  Syn2TupEnIpv4: no

.
.
.
```

- **rss_key**

Description: Prints RSS Key.

Syntax: cxgbtool [*vbdInterface*] rss_key

Example:

```
C:\Users\Administrator>cxgbtool vbd0 rss_key
c62ee59b4b9d292c2c8e195c582f8fd032568e579f03cdeb1b66ed910dab1d414c5516e6bdb1
9289
```

- **rss_pf_config**

Description: Prints RSS PF Configuration

Syntax: cxgbtool [*vbdInterface*] rss_pf_config

Example:

```
C:\Users\Administrator>cxgbtool vbd0 rss_pf_config
PF Map Index Size = 0
```

	RSS				PF		VF	Hash Tuple				Enable	Default	
	Enable				IPF		Mask	IPv6				IPv4	UDP	Queue
PF	Map	Chn	Prt	Map	Size	Size		Four	Two	Four	Two	Four	Ch1	Ch0
1	yes	no	no	1	4	7		no	no	no	no	no	0	0
2	yes	no	no	2	4	7		no	no	no	no	no	0	0
3	yes	no	no	3	4	7		no	no	no	no	no	0	0
4	yes	no	no	4	4	7		no	no	no	no	no	0	0
5	yes	no	no	5	4	7		no	no	no	no	no	0	0
6	yes	no	no	6	4	7		no	no	no	no	no	0	0
7	yes	yes	no	7	4	7		yes	yes	yes	yes	no	0	0

- **rss_vf_config**

Description: Prints RSS VF Configuration.

Syntax: cxgbtool [*vbdInterface*] rss_vf_config

Example:

```
C:\Users\Administrator>cxgbtool vbd0 rss_vf_config
```

RSS			Hash Tuple Enable											
Enable			IVF	Dis	Enb	IPv6		IPv4		UDP	Def	Secret	Key	
VF	Chn	Prt	Map	VLAN	uP	Four	Two	Four	Two	Four	Que	Idx	Hash	
1	no	no	0	no	no	no	no	no	no	no	0	0	0	
2	no	no	0	no	no	no	no	no	no	no	0	0	0	
3	no	no	0	no	no	no	no	no	no	no	0	0	0	
.														
.														
.														

- **coalesce**

Description: Changes the coalescing settings for tunnel Rx queues of the specified Ethernet device.

Syntax: `cxgbtool [nicInterface] coalesce [rx-usecs-irq {val}] [rx-frames-irq {val}] [(persistent)]`

Parameters

rx-usecs-irq: Rx Coalescing Timer. Number of microseconds after which interrupt will be sent.

rx-frames-irq: Rx Coalescing Threshold Packets. Number of packets after which interrupt will be sent.

Example:

Setting Rx Coalescing Timer:

```
C:\Users\Administrator>cxgbtool nic0 coalesce rx-usecs-irq 5
```

Setting Rx Coalescing Threshold Packets

```
C:\Users\Administrator>cxgbtool nic0 coalesce rx-frames-irq 20
```

- **eps**

Description: Prints endpoints (eps) if NDK/ND is enabled.

Syntax: `cxgbtool [nicInterface] eps`

Example:

```
C:\Users\Administrator>cxgbtool nic0 eps
ep FFFFE00005734AE0 cm_id FFFFE000071C0250 state 1 flags 0x0 stid 1920
backlog 1024 fe80:0000:0000:0000:2c51:690a:9289:f 543:5445

ep FFFFE00004822810 cm_id FFFFE000049261C0 state 1 flags 0x0 stid 1928
backlog 1024 169.254.245.67:5445
```

- **qps**

Description: Prints queue pairs (qps) if NDK/ND is enabled.

Syntax: cxgbtool [*nicInterface*] qps

Example:

```
C:\Users\Administrator>cxgbtool nic0 qps
rc qp sq id 1026 in_use 0 rq id 1180 in_use 176 state 1 onchip 0 ep tid 152
state 7 0.0.0.0:4341->0.0.0.0:5445
rc qp sq id 1027 in_use 0 rq id 1393 in_use 256 state 1 onchip 0 ep tid 114
state 7 0.0.0.0:4322->0.0.0.0:5445
rc qp sq id 1039 in_use 0 rq id 1823 in_use 256 state 1 onchip 0 ep tid 414
state 7 0.0.0.0:4884->0.0.0.0:5445
rc qp sq id 1044 in_use 0 rq id 1374 in_use 256 state 1 onchip 0 ep tid 136
state 7 0.0.0.0:4333->0.0.0.0:5445
rc qp sq id 1048 in_use 0 rq id 2169 in_use 256 state 1 onchip 0 ep tid 78
state 7 0.0.0.0:4304->0.0.0.0:5445
```

- **rdma_stats**

Description: Prints RDMA statistics if NDK/ND is enabled

Syntax: cxgbtool [*vbdInterface*] rdma_stats

Example:

```
C:\Users\Administrator>cxgbtool vbd0 rdma_stats
```

Object:	Total	Current	Max	Fail
PDID:	65536	0	0	0
QID:	31744	0	0	0
TPTMEM:	40265280	0	0	0
PBLMEM:	273804160	0	0	0
RQTMEM:	80530624	0	0	0
OCQPMEM:	0	0	0	0
DB FULL:	0			
DB EMPTY:	0			
DB DROP:	0			
DB State:	NORMAL Transitions 0			
TCAM_FULL:	0			
ACT_OFLOD_CONN_FAILS:		0		
PAS_OFLOD_CONN_FAILS:		0		
AVAILABLE IRD:	589824			

- **stags**

Description: Prints STAG contents if NDK/ND is enabled.

Syntax: cxgbtool [*nicInterface*] stags

Example:

```
C:\Users\Administrator>cxgbtool nic0 stags
```

```
Stag(0):0x600
0x83ae200 0000000000000000 0000000000000000 0000000000000000
0000000000000000
0x083ae200: (inactive): stag idx 0x0600 key 0x00 state INV type NSMR pdid
0x0
                        perms none rem_inv_dis 0 addr_type ZBTO
                        bind_enable 0 pg_size 4096 qpid 0x0 pbl_off 0x0000
                        pbl_addr 0x0b414780 len 0 va 0000000000000000
                        bind_cnt 0

Stag(1):0x900
0x83ae260 0000000000000000 0000000000000000 0000000000000000
0000000000000000
0x083ae260: (inactive): stag idx 0x0900 key 0x00 state INV type NSMR pdid
0x0
                        perms none rem_inv_dis 0 addr_type ZBTO
                        bind_enable 0 pg_size 4096 qpid 0x0 pbl_off 0x0000
                        pbl_addr 0x0b414780 len 0 va 0000000000000000
                        bind_cnt 0

Stag(2):0xf00
0x83ae320 0000000000000000 0000000000000000 0000000000000000
0000000000000000
```

```
0x083ae320: (inactive): stag idx 0x0f00 key 0x00 state INV type NSMR pdid
0x0
                        perms none rem_inv_dis 0 addr_type ZBTO
                        bind_enable 0 pg_size 4096 qpid 0x0 pbl_off 0x0000
                        pbl_addr 0x0b414780 len 0 va 0000000000000000
                        bind_cnt 0
```

- **chim_sock**

Description: Prints chimney statistics.

Syntax: cxgbtool [*nicInterface*] chim [*tcb {tid}*]*sock*]

tcb: Prints Hardware TCB information for given tid of an offloaded connection.

sock: Prints driver per socket statistics.

Example:

Print Hardware TCB information

```
C:\Users\Administrator>cxgbtool nic0 chim tcb 9210
HW TCB
ulp_type           : 0x5
ulp_raw            : 0x0
l2t_ix             : 0x1
smac_sel           : 0x82
tf_suspend         : 0x0
tf_non_offload     : 0x0
tf_lock_tid        : 0x1
```

Print driver per socket statistics:

```
C:\Users\Administrator>cxgbtool nic0 chim sock
102.1.1.56:5001 =====> 102.1.1.62:49169
=====
ChRcvBytes          : 1460
ChRcvCredits         : 1460
ChRcvMaxSeq         : 0
ChRcvWndAdjusted    : 324776
Cached flag         : 0x2 :Nagle
Const flag          : 0x6 :SACK:WS
RcvIndicationSize   : 128
RcvNxt              : 1871353069
.
.
.
```


- **l2t**

Description: Displays l2t table contents.

Syntax: cxgbtool [*nicInterface*] l2t

Example:

```
C:\Users\Administrator>cxgbtool nic0 l2t
IDX      REF_COUNT      MTU      DEST_ADDR      DEST_MAC
```

- **hw_sched**

Description: Displays hardware schedule information

Syntax: cxgbtool [*vbdInterface*] hw_sched

Example:

```
C:\Users\Administrator>cxgbtool vbd0 hw_sched
Scheduler  Mode   Channel  Rate (Kbps)   Class IPG(0.1 ns)  Flow IPG(us)
0          class    0      29640261      disabled      disabled
1          class    1      29640261      disabled      disabled
2          class    2      29640261      disabled      disabled
3          class    3      29640261      disabled      disabled
4          class    0      29640261      disabled      disabled
5          class    0      29640261      disabled      disabled
6          class    0      29640261      disabled      disabled
7          class    0      29640261      disabled      disabled
```

- **mbox_log**

Description: Prints firmware mailbox command/reply log information.

Syntax: cxgbtool [*vbdInterface*] mbox_log

Example:

```
C:\Users\Administrator>cxgbtool vbd0 mbox_log
```

```
Seq#    Tstamp    Atime    Etime    Command/Reply
```

```

42      589890      0      0    08c00400 00000004 020b0000 00000000 020c0000
00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000
00000000 00000000 00000000

43      589890      0      1    08000400 00000004 020b0000 08d87840 020c0000
0918783f 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

44      589890      0      0    1bc00000 00030002 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

45      589890      0      1    1b000000 00030002 001fc904 c1cac1ca 05ee0300
0000c0c0 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

46      589890      0      0    14b00400 80000004 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

47      589890      0      1    14000400 80000004 04c00007 432df7c0 00000000
00000000 00400000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

48      589890      0      0    1bc00001 00030002 001fc904 c1cac1ca 05ee0300
0000c0c0 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

49      589890      0      1    1b000001 00030002 001fc904 c1cac1ca 05ee0300
0000c0c0 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

50      589890      0      0    14b00400 80000004 00000000 00000000 10000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

51      589890      0      1    14000400 80000004 04c10007 432df7c8 10000000
00000000 00400000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

52      589890      0      0    14900400 40000004 04c00000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

53      589890      0      1    14000400 40000004 04c00000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

54      589890      0      0    14900400 40000004 04c10000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000

```

6. Firmware Update

The driver will auto-load the T5 and T4 firmwares if an update is required. The firmware version can be verified using *cxgbtool*:

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

The Firmware binaries are present in *ChelsioUwire-x.x.x.xx/firmware/* directory.

7. Software/Driver Uninstallation

7.1. Manual Uninstallation

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

7.1.1. NDIS Miniport driver

1. 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**.

Note *In case of Virtual Functions in VM, use **Chelsio VF Network Adapter**.*

2. Select the **Delete the driver software for this device** checkbox when **Confirm Device Uninstall** is prompted and click **OK**.
3. Repeat the same procedure for the other **Chelsio Network Adapters**.

7.1.2. iSCSI Storport Miniport

1. Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on **Storage controllers**, right-click on **Chelsio T5 iSCSI Initiator** and select **Uninstall**.
2. Select **Delete the driver software for this device** checkbox when **Confirm Device Uninstall** is prompted and click **OK**.
3. Repeat the same procedure for other Initiator ports.

7.1.3. Virtual Bus Driver

1. Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on the **System Devices**, right click on the **Chelsio T5/T4 40G/10G Bus Enumerator** and select **Uninstall**.

Note *In case of Virtual Functions in VM, use **Chelsio T5/T4 40G/10G Bus Enumerator [Virtual Function]**.*

2. Select the **Delete the driver software for this device** checkbox when **Confirm Device Uninstall** is prompted and click **OK**.

7.1.4. Generic Function

1. Open the **Device Manager** (Control Panel -> System & Security-> System -> Device Manager), click on the **Network Adapters**, right click on the **Chelsio T5/T4 40G/10G Generic Function** and select **Uninstall**.
2. Select the **Delete the driver software for this device** checkbox when **Confirm Device Uninstall** is prompted and click **OK**.
3. Repeat the same procedure for the other **Generic Functions**.

8. Software/Driver Update

For any distribution specific problems, please check README and Release Notes included in the release for possible workaround.

Please visit Chelsio support web site <http://service.chelsio.com/> for regular updates on various software/drivers. You can also subscribe to our newsletter for the latest software updates.

II. NDIS Function

1. Introduction

Chelsio's T5/T4 series of Unified Wire Adapters provide extensive support for NIC operation, including all stateless offload mechanisms for both IPv4 and IPv6 (IP, TCP and UDP checksum offload, LSO - Large Send Offload aka TSO - TCP Segmentation Offload, Network Direct and assist mechanisms for accelerating LRO - Large Receive Offload).

1.1. Hardware Requirements

1.1.1. Supported Adapters

Following is the list of NDIS components and supported Chelsio adapters:

Chelsio Adapter	NDIS components
T520-BT	NIC, NVGRE, VXLAN, vRSS
T520-CR	NIC, NVGRE, VXLAN, PacketDirect, vRSS
T580-CR	NIC, NVGRE, VXLAN, PacketDirect, vRSS
T580-LP-CR	NIC, NVGRE, VXLAN, PacketDirect, vRSS
T580-SO-CR	NIC, NVGRE, VXLAN, vRSS
T520-LL-CR	NIC, NVGRE, VXLAN, vRSS
T520-SO-CR	NIC, NVGRE, VXLAN, vRSS
T540-CR	NIC, NVGRE, VXLAN, vRSS
T420-CR	NIC
T440-CR	NIC
T422-CR	NIC
T420-LL-CR	NIC
T440-LP-CR	NIC
T420-CX	NIC
T420-BT	NIC
T404-BT	NIC

1.2. Software Requirements

1.2.1. Windows Requirement

Currently Chelsio T5/T4 NDIS Function driver is available for the following Windows versions:

- Server 2016 Technical Preview
- 2016 Client
- Nano Server
- 10 Client
- Server 2012 R2

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

2. Software/Driver Configuration and Fine-tuning

2.1. Advanced Configuration

The Chelsio Network driver provides advanced configuration options under the Device Properties. In the Network Connections window, select the Chelsio Adapter's Local Area Connection interface (right-click -> properties). Click the **Configure** button.

2.1.1. VBD Driver Parameters

To see all tunable VBD driver parameters, open the **Device Manager**, click on the **System Devices**, double click on the **Chelsio T5/T4 40G/10G Bus Enumerator**, and then click the **Advanced** tab.

- **iSCSI Instances**

- *Description:* Specify the number of iSCSI instances.
- *Value:* 0-2 | default
- *Default:* 0

- **Nic Instances:**

- *Description:* Specify the number of NIC instances.
- *Value:* 0-8 | default
- *Default:* default

2.1.2. NDIS Miniport Driver Parameters

To see all tunable NDIS Miniport Driver parameters, open the **Device Manager**, click on the **Network adapters**, double click on any **Chelsio Network Adapter**, and then click the **Advanced** tab.

- **Encapsulated Task Offload**

- *Description:* Enable or disable the stateless offloads (checksums, LSO, VMQ and filtering) of encapsulated traffic.
- *Value:* Disabled | Enabled
- *Default:* Enabled

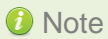


Note

This parameter is available only for T5 adapters.

- **Encapsulation Overhead**

- *Description:* Specify the amount of overhead required in Ethernet frames due to virtual network overlay encapsulation such as VXLAN and NVGRE.
- *Value:* 0-256
- *Default:* 0



This parameter is available only for T5 adapters.

- **Flow Control**

- *Description:* Enable or disable the receipt or transmission of PAUSE frames. If Rx is enabled, all incoming PAUSE frames will be honored. If Tx is enabled, the HW will send PAUSE frames when its MAC Rx FIFO usage is beyond a high-watermark. If Disabled option is selected, no PAUSE will be sent. When Rx MAC FIFO gets full, further ingress packets will be dropped. If Rx & Tx Enabled is selected, both Rx and Tx options will be enabled.
- *Value:*
 - Disabled
 - Rx & Tx Enabled
 - Rx Enabled
 - Tx Enabled
- *Default:* Rx & Tx Enabled

- **Interrupt Moderation**

- *Description:* Control the interrupts generated by NIC hardware.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Interrupt Moderation Rate**

- *Description:* Set the interrupt rate.
- *Value:*
 - Extreme
 - High
 - Low
 - Minimal
 - Moderate
- *Default:* Low

- **IPv4 Checksum Offload**

- *Description:* Allow the checksum to be computed by the adapter for IPV4 packets.
- *Value:*
 - Disabled
 - Rx & Tx Enabled
 - Rx Enabled

- Tx Enabled
- *Default:* Rx & Tx Enabled
- **Jumbo Packet (Maximum Transmission Unit)**
 - *Description:* Specify the Maximum Transmission Unit (MTU) value.
 - *Value:*
 - 4088 Bytes
 - 9014 Bytes
 - Disabled
 - *Default:* Disabled
- **Large Send Offload V2 (IPv4)**
 - *Description:* Allow for configuring Large Send Offload (LSO) using version 2 for the IPv4 traffic.
 - *Value:* Disabled | Enabled
 - *Default:* Enabled
- **Large Send Offload V2 (IPv6)**
 - *Description:* Allow for configuring Large Send Offload (LSO) using version 2 for the IPv6 traffic.
 - *Value:* Disabled | Enabled
 - *Default:* Enabled
- **Locally Administered Address**
 - *Description:* Specify a new MAC address for the port. If Not Present, the default MAC from EEPROM is used. If specified, the new MAC overwrites the default MAC. This specified MAC is persistent across machine reboot.
 - *Value:* Not Present | Any legal 6-byte MAC address
 - *Default:* Not Present
- **Maximum Number of RSS Processors**
 - *Description:* Change the number of RSS Processors.
 - *Value:* 1 | 2 | 4 | 8
 - *Default:* 8
- **Maximum Number of RSS Queues**
 - *Description:* Change the number of RSS Queues.
 - *Value:* 1-8
 - *Default:* 4

- **Maximum RSS Processor Number**

- *Description:* Set the number of RSS processors to help the overall performance of the computer.
- *Value:* 0-63
- *Default:* 63

- **NDIS QoS**

- *Description:* Enable or disable NDIS Quality of Service for DCB interface.
- *Value:* Disabled | Enabled
- *Default:* Disabled

- **NetworkDirect Functionality**

- *Description:* Enable or disable Network Direct Functionality.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **NetworkDirect Interrupt Moderation**

- *Description:* Control the interrupts generated during NDK traffic.
- *Value:* Disabled | Enabled
- *Default:* Enabled

For more information, refer <http://msdn.microsoft.com/en-us/library/windows/hardware/ff556017%28v=vs.85%29.aspx>

- **Nvgre Task Offload**

- *Description:* Enable or disable offloading processing of NVGRE encapsulated frames.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Packet Direct**

- *Description:* Enable or disable PacketDirect feature.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Receive Side Scaling (RSS)**

- *Description:* Control the RSS functions. If on, the Microsoft RSS function is enabled. If off, the Chelsio RSS function is enabled.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Recv Segment Coalescing (IPv4)**

- *Description:* Enable or disable the Receive Segment Coalescing feature for IPv4 traffic. This is a receiver packets aggregating feature which helps reduce the receive host CPU

load and improve throughput in a 40/10Gb network environment where CPU can be the bottleneck.

- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Recv Segment Coalescing (IPv6)**

- *Description:* Enable or disable the Receive Segment Coalescing feature for IPv6 traffic. This is a receiver packets aggregating feature which helps reduce the receive host CPU load and improve throughput in a 40/10Gb network environment where CPU can be the bottleneck.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **RSS Base processor**

- *Description:* Specify the number of the base RSS processors.
- *Value:* 0-16
- *Default:* 0

- **RSS load balancing profile**

- *Description:* Control the RSS load balancing profile.
- *Value:* Closest Processor | Closest Processor Static | Conservative Scaling | NUMA Scaling | NUMA Scaling Static
- *Default:* NUMA Scaling Static

For more information, refer <http://technet.microsoft.com/en-us/library/hh997036.aspx>

- **Rx Ethernet Queue Size**

- *Description:* Set different Rx Queue sizes. Driver ships with reasonable defaults.
- *Value:* 512-4096
- *Default:* 2048

- **Rx Offload Queue Size**

- *Description:* Set different Offload Rx Queue sizes. Driver ships with reasonable defaults.
- *Value:* 256-2048
- *Default:* 512



Note

This feature is not fully tested and available for experimental usage only.

- **SR-IOV**

- *Description:* Enable or disable SR-IOV feature.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **TCP Checksum Offload (IPv4):**

- *Description:* Enable or disable computation of TCP checksum by the adapter for IPv4 packets.
- *Value:*
 - Disabled
 - Rx & Tx Enabled
 - Rx Enabled
 - Tx Enabled
- *Default:* Rx & Tx Enabled

- **TCP Checksum Offload (IPv6):**


- *Description:* Enable or disable computation of TCP checksum by the adapter for IPv6 packets.
- *Value:*
 - Disabled
 - Rx & Tx Enabled
 - Rx Enabled
 - Tx Enabled
- *Default:* Rx & Tx Enabled

- **Tx Ethernet Queue Size**

- *Description:* Set different Tx Queue sizes. Driver ships with reasonable defaults.
- *Value:* 512-4096
- *Default:* 1024

- **Tx Offload Queue Size**

- *Description:* Set different Offload Tx Queue sizes. Driver ships with reasonable defaults.
- *Value:* 256-4096
- *Default:* 512

 **Note** *This feature is not fully tested and available for experimental usage only.*

- **UDP Checksum Offload (IPv4)**

- *Description:* Enable or disable computation of UDP checksum by the adapter for IPv4 packets.
- *Value:*
 - Disabled
 - Rx & Tx Enabled
 - Rx Enabled
 - Tx Enabled
- *Default:* Rx & Tx Enabled

- **UDP Checksum Offload (IPv6)**

- *Description:* Enable or disable computation of UDP checksum by the adapter for IPv6 packets.
- *Value:*
 - Disabled
 - Rx & Tx Enabled
 - Rx Enabled
 - Tx Enabled
- *Default:* Rx & Tx Enabled

- **User Mode NetworkDirect**

- *Description:* Enable or disable Microsoft's Remote Direct memory Access (RDMA) interface for high speed, low latency networks.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Virtual Machine Queues**

- *Description:* Enable or disable the virtual machine queue feature on the interface.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Virtual Switch RSS**

- *Description:* Enable or disable Virtual Receive Side Scaling.
- *Value:* Disabled | Enabled
- *Default:* Disabled

- **VLAN Identifier**

- *Description:* Specify the VLAN ID to be inserted.
- *Value:* 0-4095
- *Default:* 0

- **VMQ LookAhead Split**

- *Description:* Enable or disable the ability to split receive buffers into lookahead and post-lookahead buffers.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **VMQ VLAN ID Filtering**

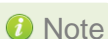
- *Description:* Enable or disable the ability to filter network packets by using the VLAN identifier in the media access control (MAC) header.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Vxlan Task Offload**

- *Description:* Enable or disable offloading processing of VXLAN encapsulated frames.
- *Value:* Disabled | Enabled
- *Default:* Enabled

- **Vxlan UDP Port Number**

- *Description:* Specify the current VXLAN UDP destination port number that is currently operational in the NIC.
- *Value:* 1-65535
- *Default:* 4789



Note

This parameter is available only for T5 adapters.

2.2. NVGRE Offload

Chelsio's T5 based adapters are uniquely capable of offloading the processing of NVGRE encapsulated frames such that all stateless offloads (checksums, LSO, VMQ and filtering) are preserved, resulting in significant performance benefits. This feature is enabled by default. Configure the relevant customer and provider network settings on the host.

2.3. VXLAN Task Offload

Virtual Extensible LAN (VXLAN), an extension of the existing VLAN protocol, is an encapsulation protocol which creates an overlay network on the existing Layer 3 infrastructure. VXLAN not only extends VLAN's Ethernet Layer 2 network services but also provides more extensibility, flexibility and scalability for large scale cloud deployments than VLAN.

Chelsio's T5 based adapters are capable of offloading the processing of VXLAN encapsulated frames such that all stateless offloads (checksums, LSO, VMQ, RSS and filtering) are preserved, resulting in significant performance benefits. This feature is enabled by default.

2.4. PacketDirect

PacketDirect Provider Interface (PDPI), an extension to the existing NDIS miniport driver model, gives applications complete control over buffers, poll processors, and sending and receiving packets over a miniport adapter.

Chelsio's T5 based adapters offer extensive support for this feature leading to a higher throughput performance. This feature is enabled by default.

2.1. Virtual RSS (vRSS)

Network throughput of a multi-core virtual machine is limited by the processing power of a single virtual processor, since only one processor handles all the interrupts from a virtual network adapter. Virtual RSS or vRSS solves this bottleneck by distributing the network traffic across multiple virtual processors. This feature is disabled by default and can be enabled using the Device Manager.

III. SMB Direct

1. Introduction

SMB Direct is an extension of the Server Message Block (SMB) technology by Microsoft used for file operations. The *Direct* part implies the use of various high speed Remote Data Memory Access (RDMA) methods to transfer large amounts of data with little CPU intervention. By using RDMA as a transport medium for SMB, unprecedented levels of performance and efficiency can be achieved. With fully offloaded RDMA support, Terminator 5 based adapters deliver large performance and efficiency gains to Windows users in a seamless, plug and play fashion.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio adapters that are compatible with Chelsio SMB Direct driver:

- T520-BT
- T580-CR
- T580-LP-CR
- T520-LL-CR
- T540-CR
- T520-CR
- T420-CR
- T440-CR
- T422-CR
- T404-BT
- T440-LP-CR
- T420-BT
- T420-LL-CR
- T420-CX

1.2. Software Requirements

1.2.1. Windows Requirement

Currently Chelsio T5/T4 SMB Direct driver is available for the following Windows versions:

- Server 2016 Technical Preview
- 2016 Client
- Nano Server
- Server 2012 R2

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

2. Software/Driver Configuration and Fine-tuning

2.1. Enabling SMB Direct

SMB Direct is installed and enabled by default. RDMA functionality on Chelsio adapters will be enabled after installing the driver from the package.

You can use the PowerShell command `Get-NetAdapterRdma` to get a list of RDMA capable interfaces in your system. At least one adapter should indicate “RDMA Capable” true to take advantage of SMB RDMA capability.

The next step is to configure your network so that SMB server and client machines can communicate with each other. Please configure the Microsoft firewall to allow traffic between the SMB clients and server.

2.2. Verifying RDMA

There are number of ways to verify if RDMA is working:

2.2.1. Verify active connections using PowerShell

Open PowerShell window and execute the command `Get-SmbConnection`

2.2.2. Use Event Viewer

You can use Event Viewer to view SMB connection events. To do this:

- i. Open Event Viewer
- ii. In the console tree, expand **Event Viewer**.
- iii. Navigate to **Application and Service Logs-> Microsoft->Windows->SMBClient ->Operational**

2.3. RDMA/NVGRE concurrent (Mode 2)

In this mode, you can run RDMA traffic using a virtual switch. This feature is enabled by default in the driver, but must be enabled on the Hyper-V Virtual Ethernet adapter. Follow the steps mentioned below to enable the feature:

- i. If you haven't done already, install the Chelsio Unified Wire driver package.

- ii. Verify if the driver is installed and loaded using the *Get-NetAdapter* command. The *InterfaceDescription* field should list Chelsio adapter as shown in the image below:

```
PS C:\Users> Get-NetAdapter
```

Name	InterfaceDescription	ifIndex	Status	MacAddress	LinkSpeed
Ethernet 6	Chelsio Network Adapter #2	16	Up	00-07-43-29-14-28	40 Gbps
Ethernet 4	Chelsio Network Adapter	15	Up	00-07-43-29-14-20	40 Gbps
Corporate	QLogic BCM5709C Gigabit Ethernet ...#38	6	Up	D4-BE-D9-AC-7C-6A	100 Mbps
Local Area Connection* 1	Microsoft Kernel Debug Network Adapter	2	Up	D4-BE-D9-AC-7C-6C	1 Gbps

Figure 11 - Verifying Chelsio driver

- iii. Next, create a virtual switch using the following syntax:

```
PS C:\Users\Administrator> New-VMSwitch -Name <virtual_switch> -
NetAdapterName <chelsio_interface>
```

```
PS C:\Users> New-VMSwitch -Name switch0 -NetAdapterName "Ethernet 4"
```

Name	SwitchType	NetAdapterInterfaceDescription
switch0	External	Chelsio Network Adapter

Figure 12 - Creating virtual switch

- iv. Using *Get-NetAdapter* command, verify if the virtual switch is created successfully. The Mac address of the switch and the port on which the switch was created, should be same.

```
PS C:\Users> Get-NetAdapter
```

Name	InterfaceDescription	ifIndex	Status	MacAddress	LinkSpeed
vEthernet (switch0)	Hyper-V Virtual Ethernet Adapter #2	29	Up	00-07-43-29-14-20	40 Gbps
Ethernet 6	Chelsio Network Adapter #2	16	Up	00-07-43-29-14-28	40 Gbps
Ethernet 4	Chelsio Network Adapter	15	Up	00-07-43-29-14-20	40 Gbps
Corporate	QLogic BCM5709C Gigabit Ethernet ...#38	6	Up	D4-BE-D9-AC-7C-6A	100 Mbps
Local Area Connection* 1	Microsoft Kernel Debug Network Adapter	2	Up	D4-BE-D9-AC-7C-6C	1 Gbps

Figure 13 - Verifying virtual switch

- v. Enable RDMA on the virtual switch using *Enable-NetAdapterRdma* command.

```
PS C:\Users> Enable-NetAdapterRdma
PS C:\Users>
```

Figure 14 - Enabling RDMA on virtual switch

- vi. Run *Get-NetAdapterRdma* command to verify if RDMA is enabled on the switch.

```
PS C:\Users> Get-NetAdapterRdma
```

Name	InterfaceDescription	Enabled
vEthernet (chel_p0)	Hyper-V Virtual Ethernet Adapter #2	True
Ethernet 6	Chelsio Network Adapter #2	True
Ethernet 4	Chelsio Network Adapter	True

Figure 15 - Verifying RDMA on virtual switch

2.4. Troubleshooting

If RDMA is not working in your system, please check for the following:

- Operating system version should be Windows Server Technical Preview (and Client) or Server 2012 R2.
- Verify network interface configurations on both sides.
- Please ensure that the interfaces are reachable using *ping* command.
- In the Event Viewer (on the client side), please ensure that the traffic running is not over TCP.
- Verify that SMB driver is loaded and working. Open PowerShell window and execute the following command:

```
C:\Users\Administrator>driverquery.exe | findstr /I smb
```

- Verify that Chelsio driver is loaded and working. Open PowerShell window and execute the following command:

```
C:\Users\Administrator>driverquery.exe | findstr /I chel
```

- Confirm that traffic is running over Chelsio adapter.
- Look for potential errors in Event Log.

IV. NDIS SR-IOV

1. Introduction

The ever increasing network infrastructure of IT enterprises has lead to a phenomenal increase in maintenance and operational costs. IT managers are forced to acquire more physical servers and other data center resources to satisfy storage and network demands. To solve the Network and I/O overhead, users are opting for server virtualization which consolidates I/O workloads onto lesser physical servers thus resulting in efficient, dynamic and economical data center environments. Other benefits of Virtualization include improved disaster recovery, server portability, cloud computing, Virtual Desktop Infrastructure (VDI), etc.

Chelsio's T5 and T4 Unified Wire family of Adapters deliver increased bandwidth, lower latency and lower power with virtualization features to maximize cloud scaling and utilization. The adapters also provide full support for PCI-SIG SR-IOV to improve I/O performance on a virtualized system.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio Adapters that are compatible with the Chelsio NDIS SR-IOV driver:

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

1.2. Software Requirements

1.2.1. Windows Requirements

Currently, the NDIS SR-IOV driver is available for the following Windows versions:

- Server 2016 Technical Preview
- Nano Server
- Server 2012 R2

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

2. Software/Driver Configuration and Fine-tuning

Please ensure that Unified Wire is installed on the host before proceeding. Refer [Software/Driver Installation](#) section of the **Chelsio Unified Wire** chapter for step-by-step instructions.

2.1. Host Configuration

The adapter's configuration should be updated to make use of the SR-IOV feature. You can do this by running the *chelsio_adapter_config.ps1* configuration script. The script will be present in *ChelsioUwire-x.x.x.xx\Adapter Configuration* folder.

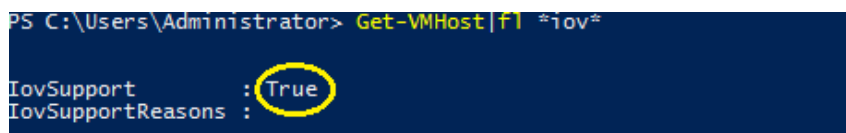
2.1.1. Enabling SR-IOV on GUI Host

Open PowerShell with administrative privileges and follow the steps mentioned below:

- i. Check if the machine is SR-IOV capable using the following command:

```
PS C:\Users\Administrator> Get-VMHost | fl *iov*
```

The *IovSupport* field should display “True” as shown in the image below:

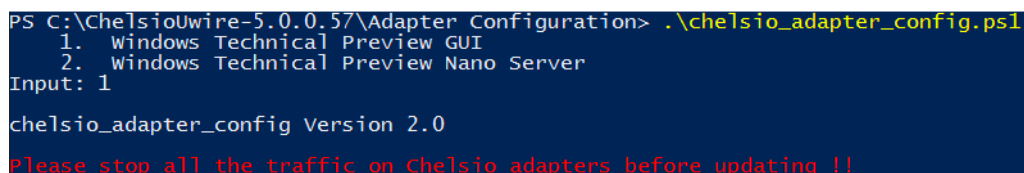


The screenshot shows a PowerShell terminal window with the command `Get-VMHost | fl *iov*` executed. The output displays `IovSupport : True` and `IovSupportReasons :`. The word `True` is circled in yellow.

Figure 16 - Checking SR-IOV capability

- ii. Copy *cxgbtool.exe* from *ChelsioUwire-x.x.x.xx* folder to *<system_drive>\Windows\System32*
- iii. Change your working directory to *ChelsioUwire-x.x.x.xx\Adapter Configuration*
- iv. Run the adapter configuration script and select *Windows Technical Preview GUI (option 1)* as the Windows version. Hit [Enter].

```
PS D:\ChelsioUwire-x.x.x.xx\Adapter Configuration>
.\chelsio_adapter_config.ps1
```



The screenshot shows a PowerShell terminal window with the command `.\chelsio_adapter_config.ps1` executed. The output displays a menu with two options: `1. Windows Technical Preview GUI` and `2. Windows Technical Preview Nano Server`. The user has entered `Input: 1`. Below the menu, it says `chelsio_adapter_config Version 2.0` and `Please stop all the traffic on Chelsio adapters before updating !!`.

Figure 17 - Adapter Configuration Utility

- v. Enter the index of the Chelsio adapter for which the configuration needs to be updated. Hit [Enter].

```
Select the Adapter
1. T520-CR          S/N:PT12140909
Input : 1
```

Figure 18 - Selecting adapter

- vi. Select SRIOV (option 2) as the configuration type and enter y to confirm. Hit [Enter].

```
Choose the configuration type:
1. NON-SRIOV (Default)
2. SRIOV
Input : 2
Do you want to continue (y/n): y
Successfully updated the selected configuration type.
Verification: Passed
Please reboot the machine for changes to take effect.
```

Figure 19 - Setting the configuration type

- vii. Reboot system for changes to take effect.

2.1.2. Enabling SR-IOV on Nano Server

- i. Connect to Nano Server Machine.
- ii. Check if the machine is SR-IOV capable using the following command:

```
[nanomachine-ip]: PS C:\> Get-VMHost | fl *iov*
```

The *IovSupport* field should display “True” as shown in the image below:

```
[10.193.187.62]: PS C:\> Get-VMHost | fl *iov*

IovSupport      : True
IovSupportReasons :
```

Figure 20 - Checking SR-IOV capability

- iii. Copy ChelsioUwire-x.x.x.xx folder to a desired location.
- iv. Copy *cxgbtnano.exe* from *ChelsioUwire-x.x.x.xx* folder to `<system_drive>\Windows\System32`
- v. Change your working directory to *ChelsioUwire-x.x.x.xx\Adapter Configuration*
- vi. Run the adapter configuration script and select *Windows Technical Preview Nano Server (option 2)* as the Windows version. Hit [Enter].

```
[nanomachine-ip]: PS D:\ChelsioUwire-x.x.x.xx\Adapter Configuration>
.\chelsio_adapter_config.ps1
```

```
[10.193.187.62]: PS D:\ChelsioUwire-5.0.0.57\Adapter Configuration> .\chelsio_adapter_config.ps1
1. Windows Technical Preview GUI
2. Windows Technical Preview Nano Server
Input: 2
chelsio_adapter_config Version 2.0
Please stop all the traffic on Chelsio adapters before updating !!
```

Figure 21 - Adapter Configuration Utility

- vii. Enter the index of the Chelsio adapter for which the configuration needs to be updated. Hit [Enter].

```
Select the Adapter
1. T580-S0-CR      S/N:PT39131112
Input : 1
```

Figure 22 - Selecting adapter

- viii. Select SRIOV (option 2) as the configuration type and enter y to confirm. Hit [Enter].

```
Choose the configuration type:
1. NON-SRIOV (Default)
2. SRIOV
3. Port settings
Input : 2
Do you want to continue (y/n): y
Successfully updated the selected configuration type.
Verification: Passed
Please reboot the machine for changes to take effect.
```

Figure 23 - Setting the configuration type

- ix. Reboot the Nano Server system for changes to take effect.

2.1.3. vSwitch Configuration

- Create a vSwitch with SR-IOV enabled using Chelsio adapter.
- Assign a virtual network adapter with SR-IOV enabled to the VM.
- Bring up the VM.

2.2. Guest (VM) Configuration

Please ensure that Unified Wire is installed on the guest before proceeding. Refer [Software/Driver Installation](#) section of the **Chelsio Unified Wire** chapter for step-by-step Installation instructions.

To uninstall Unified Wire, please refer [Software/Driver Uninstallation](#) section of the **Chelsio Unified Wire** chapter for step-by-step instructions.

V. iSCSI Storport Miniport

1. Introduction

The Chelsio Terminator series of Adapters support iSCSI acceleration and iSCSI Direct Data Placement (DDP) where the hardware handles the expensive byte touching operations, such as CRC computation and verification, and direct DMA to the final host memory destination:

- **iSCSI PDU digest generation and verification**

On transmitting, Chelsio h/w computes and inserts the Header and Data digest into the PDUs. On receiving, Chelsio h/w computes and verifies the Header and Data digest of the PDUs.

- **Direct Data Placement (DDP)**

Chelsio h/w can directly place the iSCSI Data-In or Data-Out PDU's payload into pre-posted final destination host-memory buffers based on the Initiator Task Tag (ITT) in Data-In or Target Task Tag (TTT) in Data-Out PDUs.

- **PDU Transmit and Recovery**

On transmitting, Chelsio h/w accepts the complete PDU (header + data) from the host driver, computes and inserts the digests, decomposes the PDU into multiple TCP segments if necessary, and transmit all the TCP segments onto the wire. It handles TCP retransmission if needed.

On receiving, Chelsio h/w recovers the iSCSI PDU by reassembling TCP segments, separating the header and data, calculating and verifying the digests, then forwarding the header to the host. The payload data, if possible, will be directly placed into the pre-posted host DDP buffer. Otherwise, the payload data will be sent to the host too.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio Adapters that are compatible with the iSCSI Storport Miniport:

- T520-BT
- T520-CR
- T580-CR
- T580-LP-CR
- T520-LL-CR
- T540-CR

1.2. Software Requirements

1.2.1. Windows Requirement

Currently iSCSI Storport Miniport driver is available for Windows versions.

- Server 2016 Technical Preview
- 2016 Client
- 10 Client
- Server 2012 R2

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

2. Software/Driver Configuration and Fine-tuning

2.1. Configuring iSCSI Initiator

Follow the steps mentioned below to assign IP, Subnet Mask, Default Gateway and VLAN IDs on port 0.

1. Open **Device Manager**, right click on **Chelsio T5 iSCSI Initiator** and click on **Properties**.

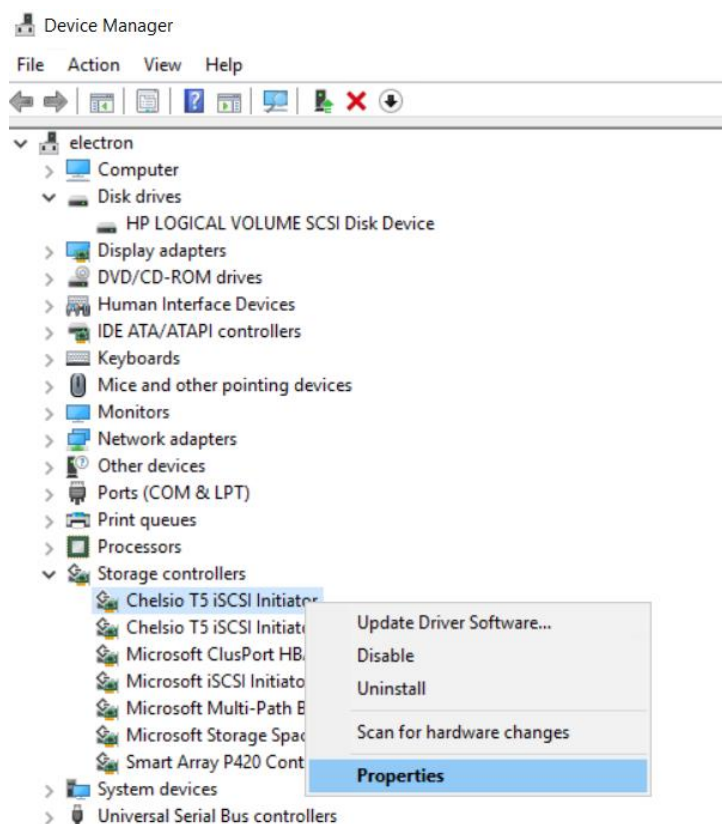


Figure 24 - Device Manager

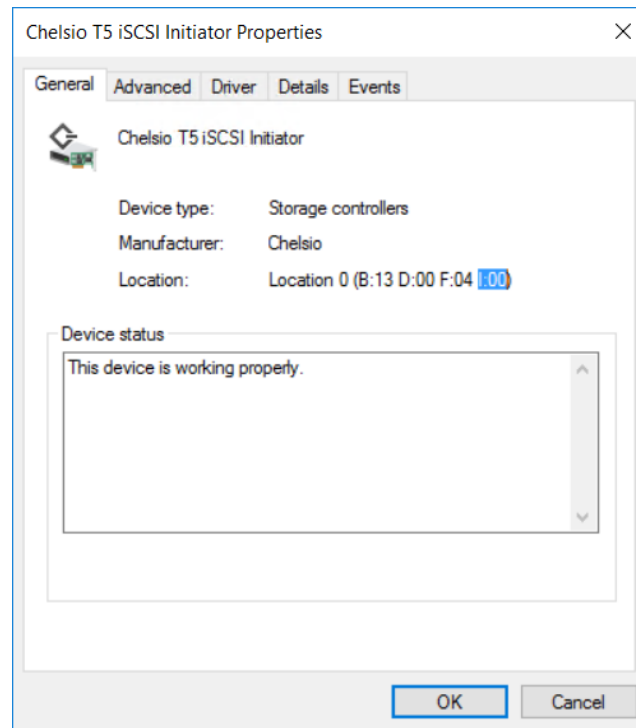


Figure 25 - Chelsio T5 physical port properties

2. Click on **Advanced** tab and select IP option and add IP. Similarly add subnet mask and default gateway.

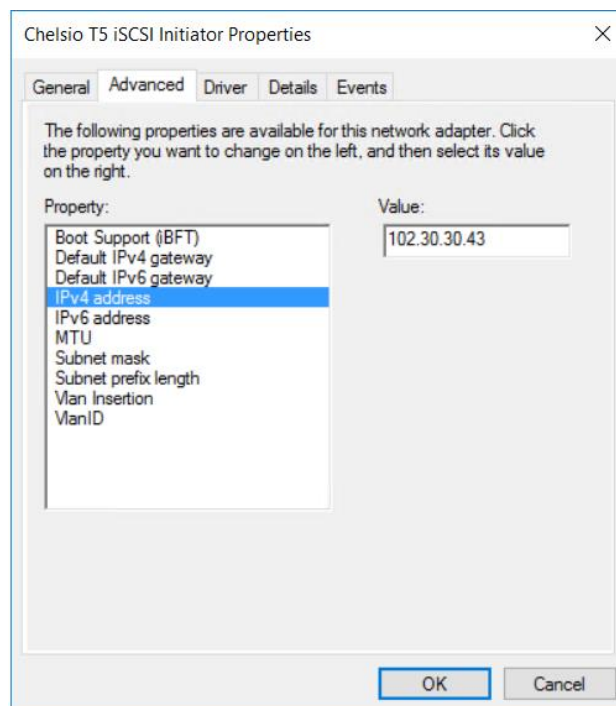
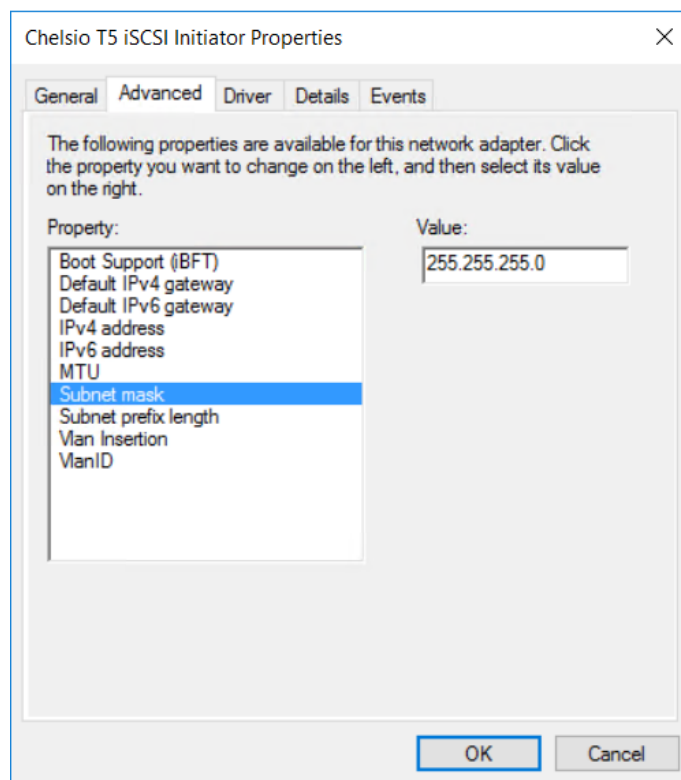
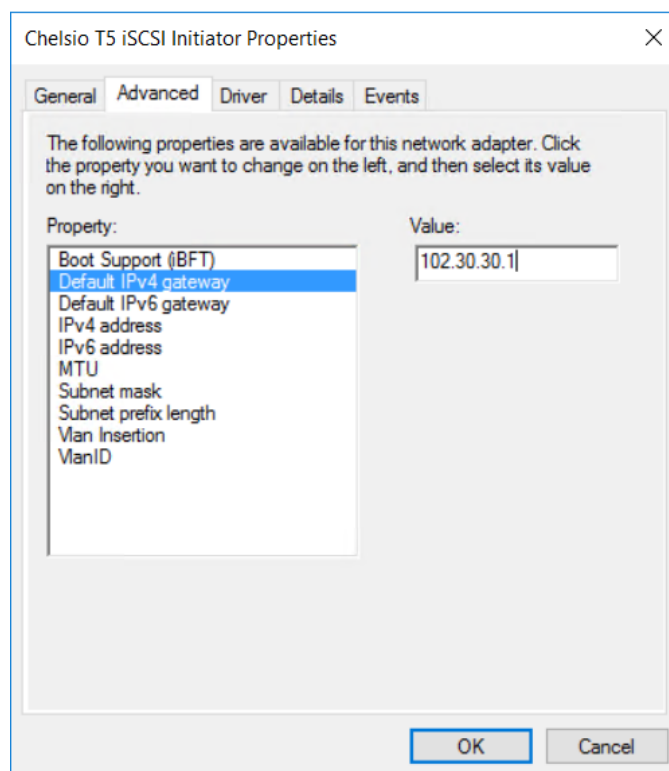


Figure 26 - Assigning IPv4 address

*Figure 27 - Adding Subnet mask**Figure 28 - Adding Default IPv4 gateway*

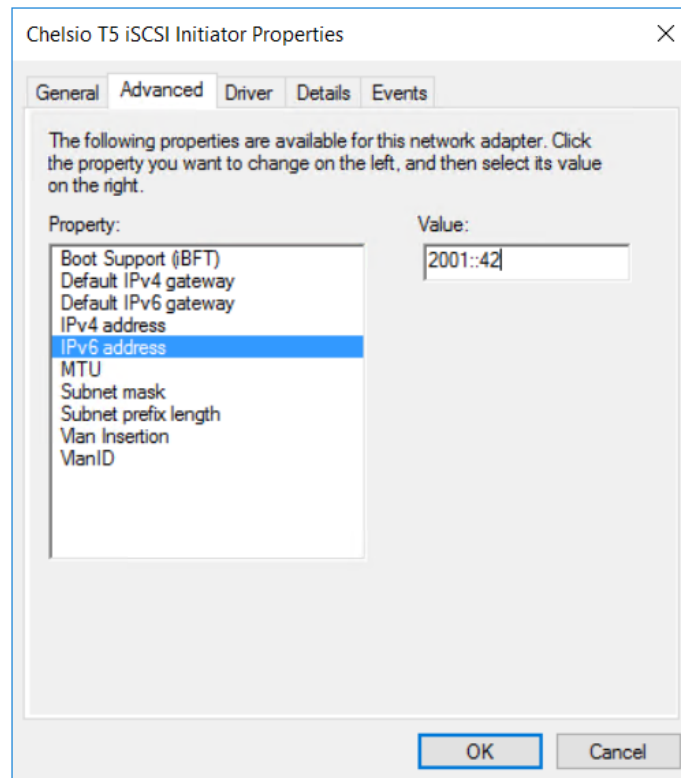


Figure 29 - Assigning IPv6 address

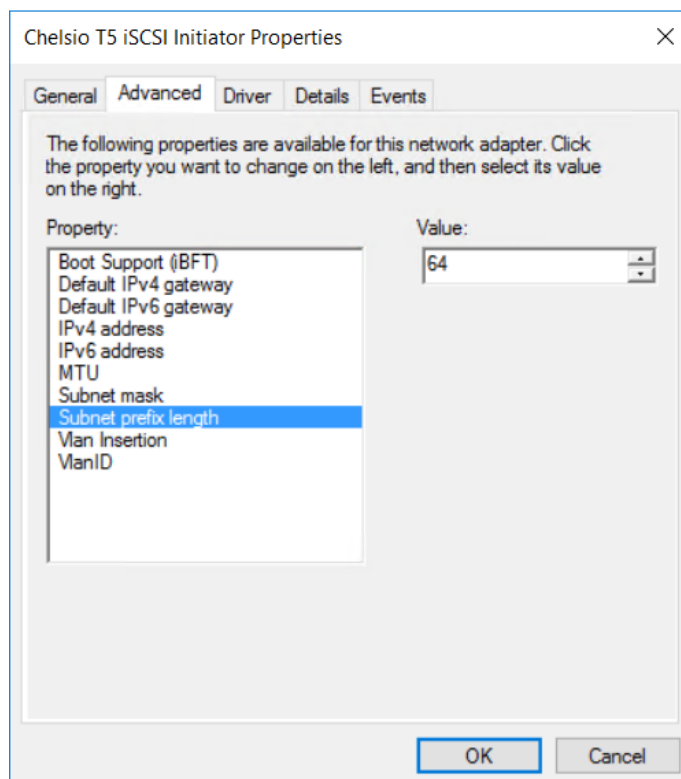


Figure 30 - Adding Subnet prefix length

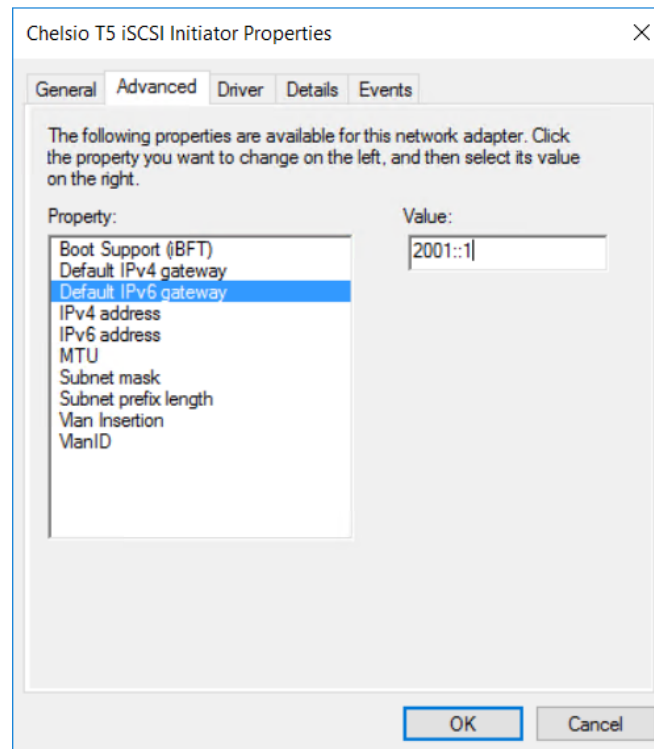


Figure 31 - Adding Default IPv6 gateway

3. Select MTU and assign value as per requirement.

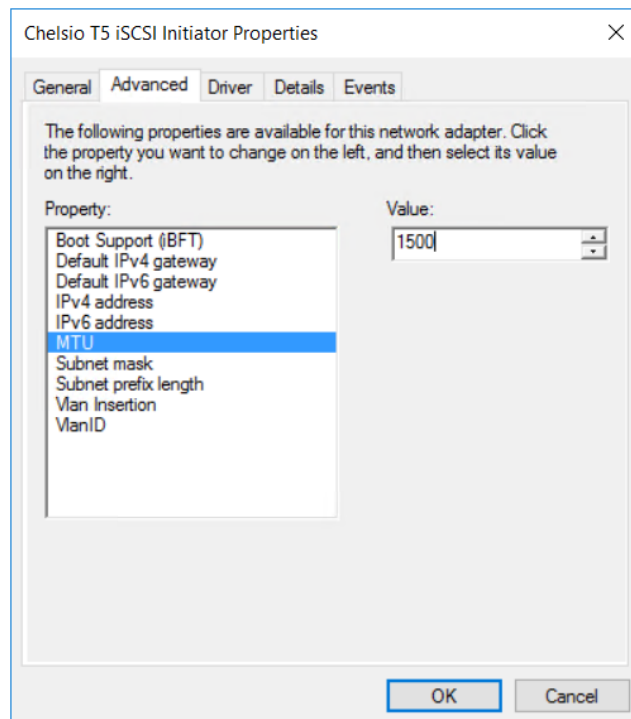


Figure 32 - Setting MTU

4. VLAN is disabled by default, so to enable, click on “Vlan Insertion” and select value as “Enabled”.

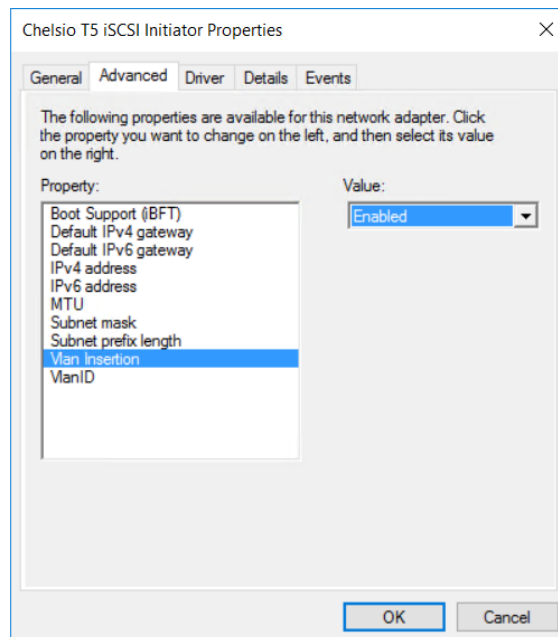


Figure 33 - Enabling VLAN

5. Assign the required VLAN ID and click **OK**.

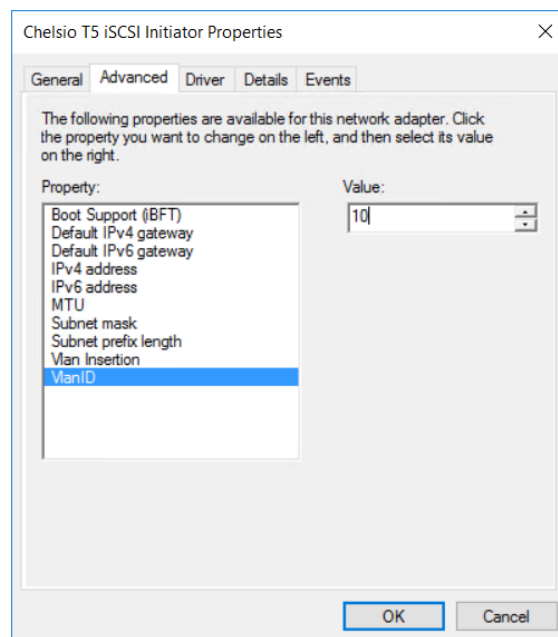


Figure 34 - Assigning VLAN Id

Repeat the above mentioned steps to assign these driver properties on other ports.

2.2. iSCSI Target Discovery and Login

Before target discovery, make sure a static IP address is assigned in the Device Manager to the respective Chelsio T5 iSCSI node.

Following are the set of instructions to discover the target and login to it using the Chelsio T5 iSCSI interface:

1. To start the Initiator configuration, go to Control Panel and click on the **iSCSI Initiator** option.

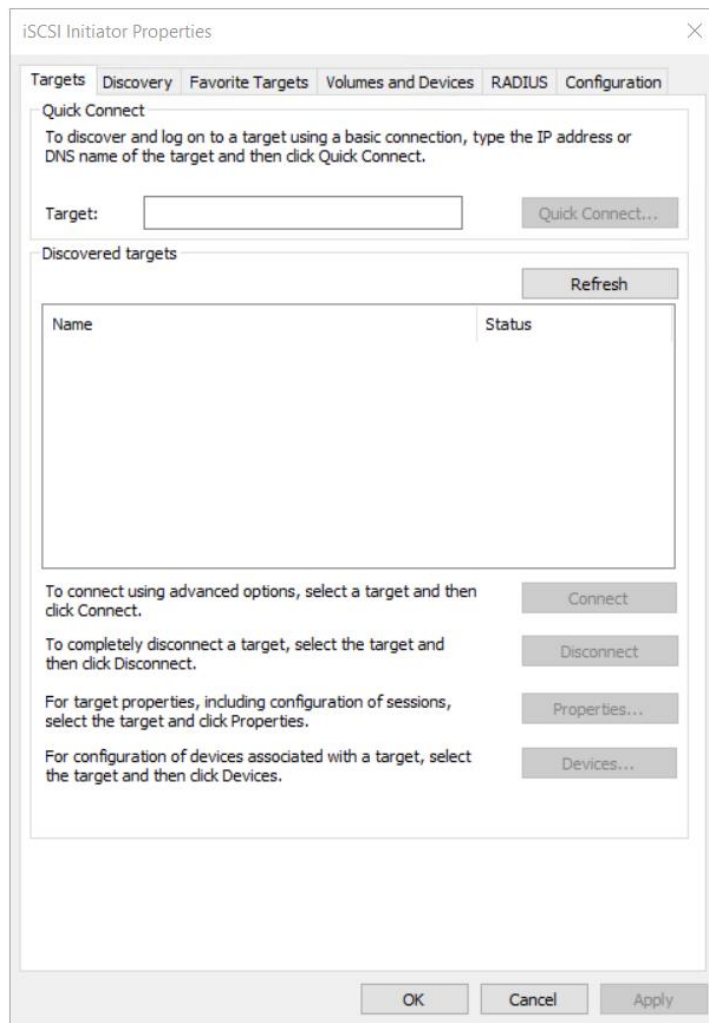


Figure 35 - iSCSI Initiator Properties: Targets tab

2. Choose the **Discovery** tab and click on **Discover Portal**.

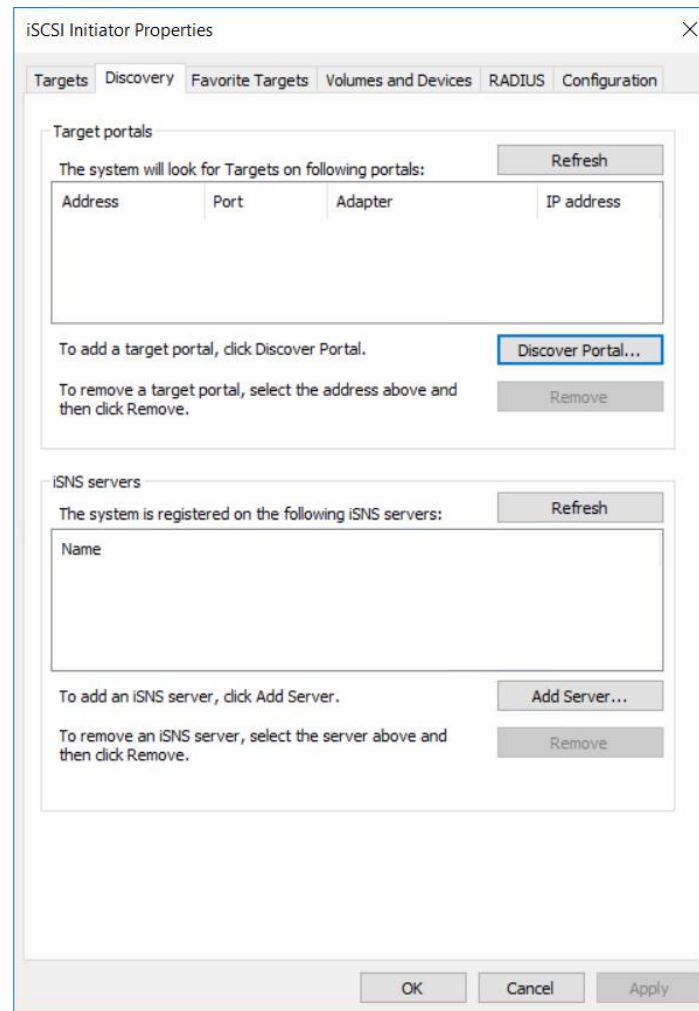


Figure 36 - iSCSI Initiator Properties: Discovery tab

3. Click on the **Advanced** button.

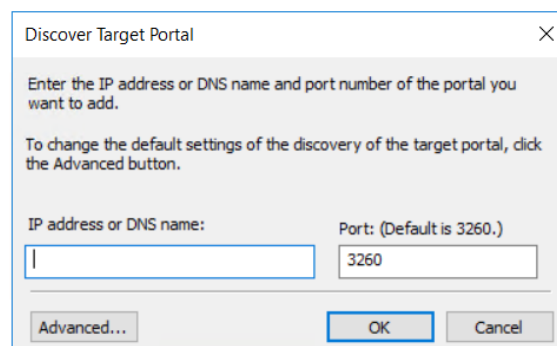


Figure 37 - Discovery Target Portal window

4. In the **Advanced Settings** window, select **Chelsio iSCSI interface** as the local adapter.

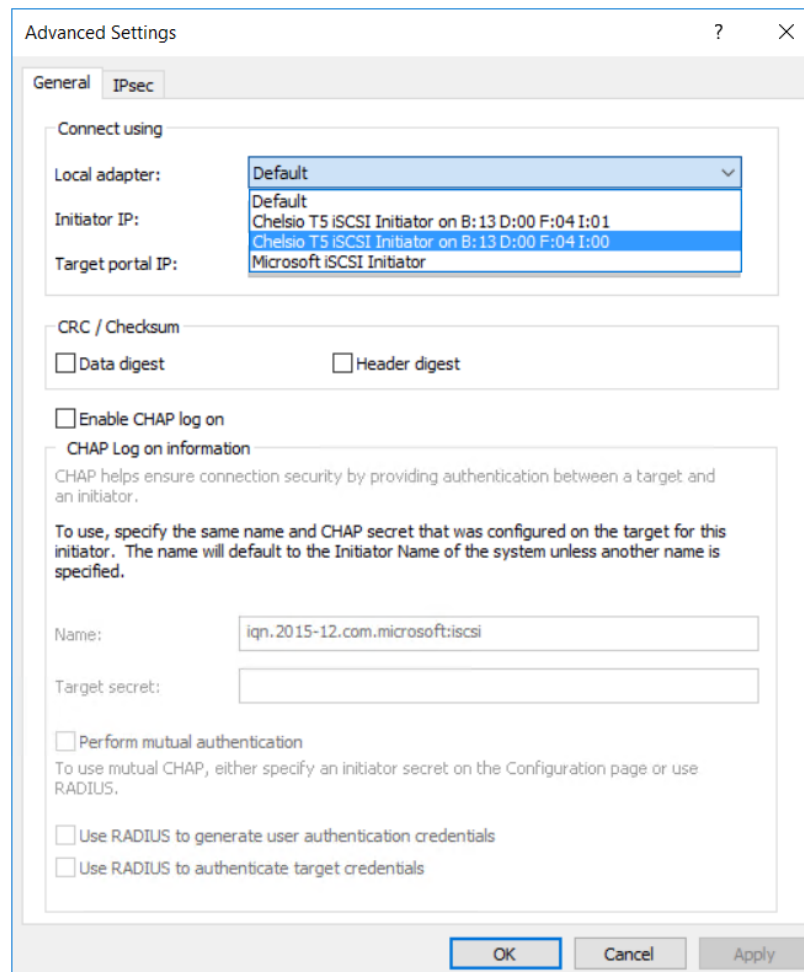


Figure 38 - Discovery Target Portal Advanced Settings: Selecting Local adapter

5. Select the corresponding Chelsio iSCSI Interface IP as the Initiator IP and click **OK**.

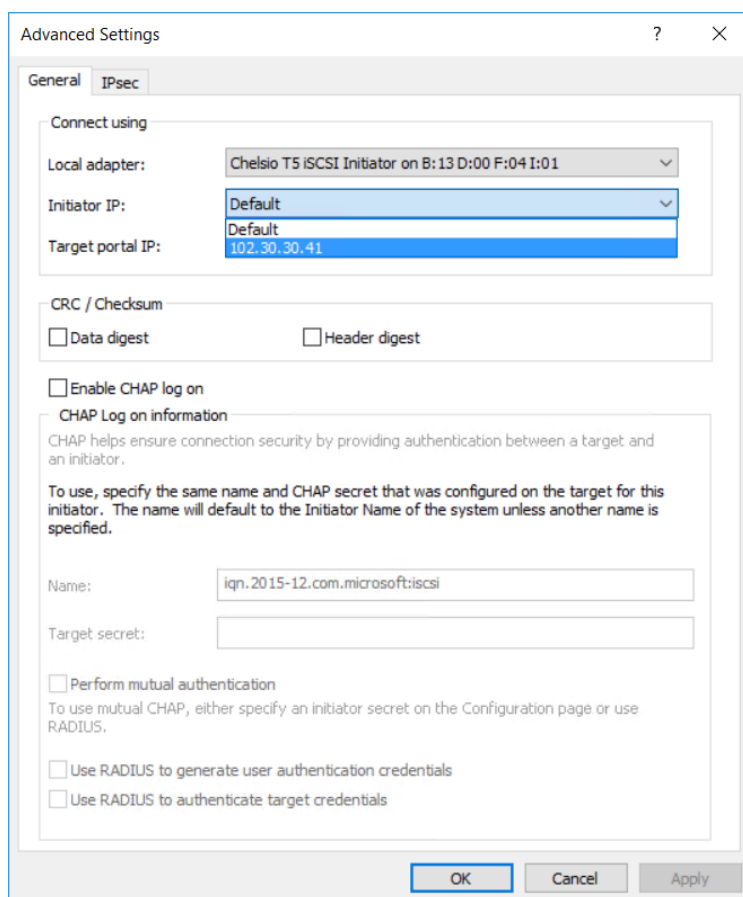


Figure 39 - Discovery Target Portal Advanced Settings: Specifying Target portal IP

6. Enter the IP address (DNS name not supported) of the target machine and the corresponding port number and click **OK** on the **Discover Target Portal** Window. Note that the default port number for iSCSI traffic is 3260.

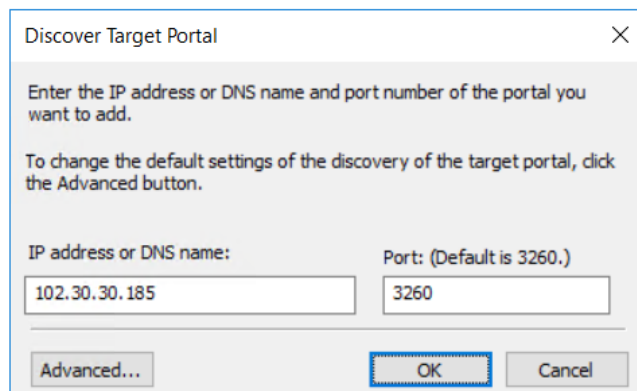


Figure 40 - Adding Target portal

7. Once target portal is added, details like target and initiator machine IP, Port number and Chelsio iSCSI interface IP will be displayed.

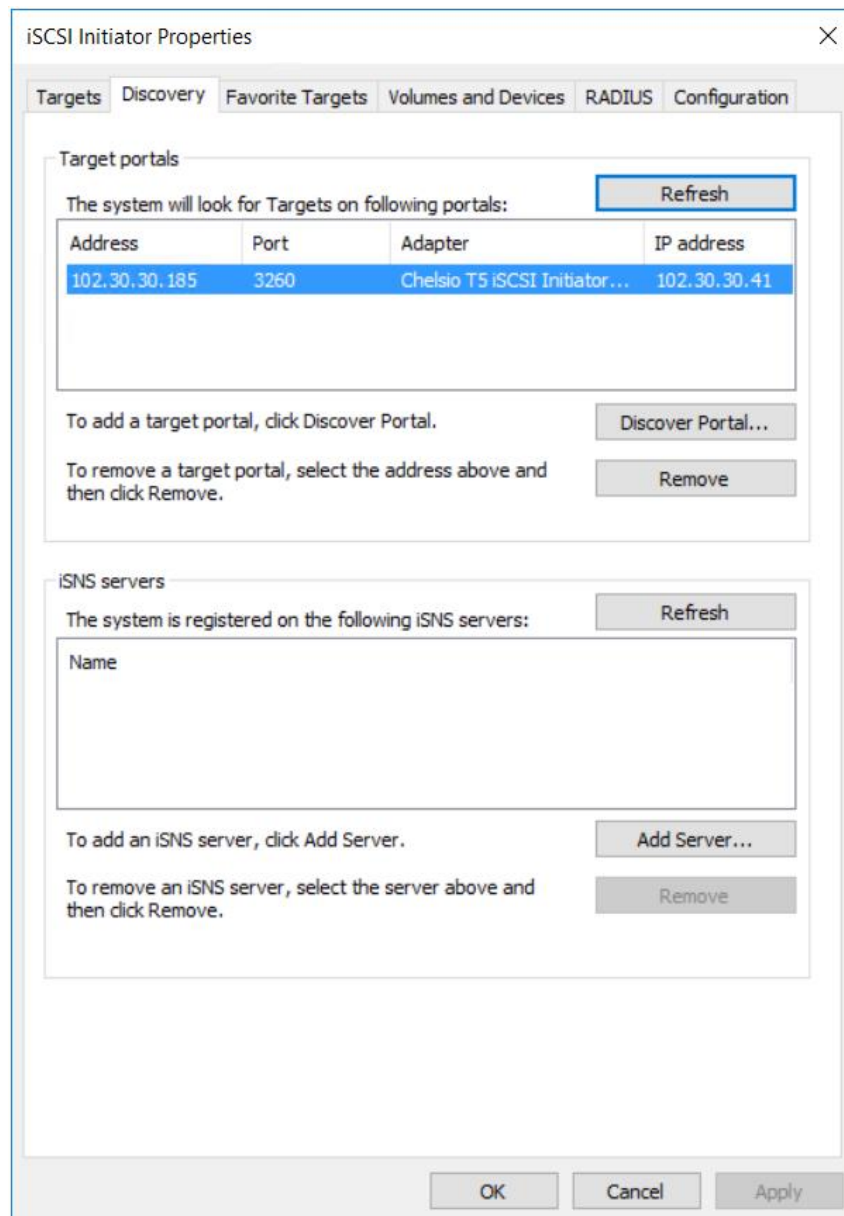


Figure 41 - Target portal added

8. Click on the **Targets** tab to see the list of targets available, choose a particular target and click on **Connect**.

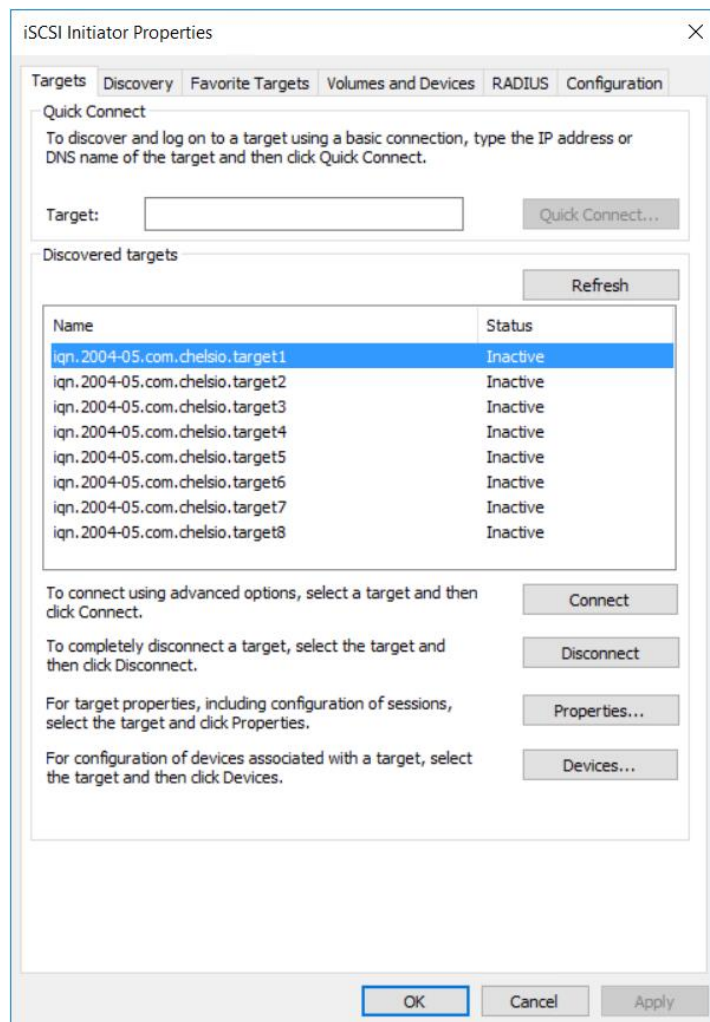


Figure 42 - Targets tab displaying list of available targets

9. A window pops up showing the Target Name, Click **OK**.

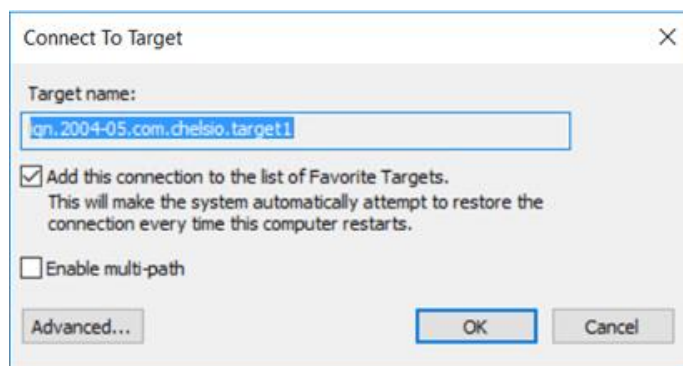


Figure 43 - Connecting to Target

10. After logging in to the target, the state of the target will change from *Inactive* to *Connected*.

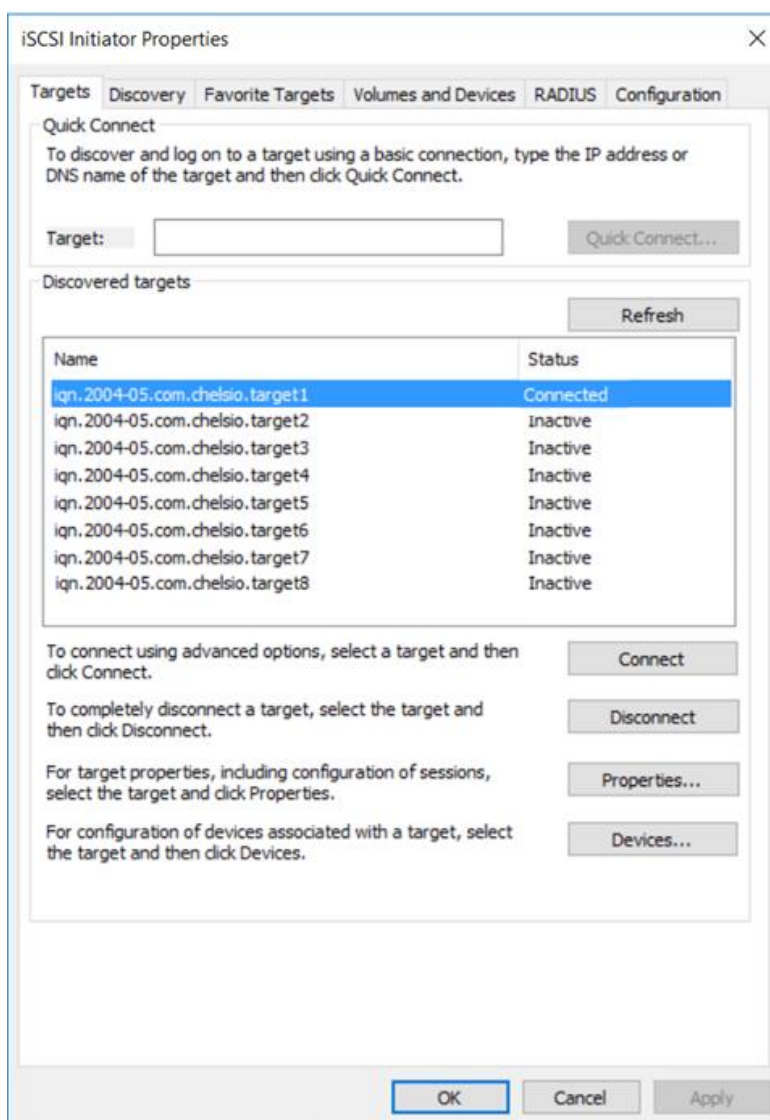


Figure 44 - iSCSI target connected

11. After successful login, go to **Disk Management** and make the respective volume online.

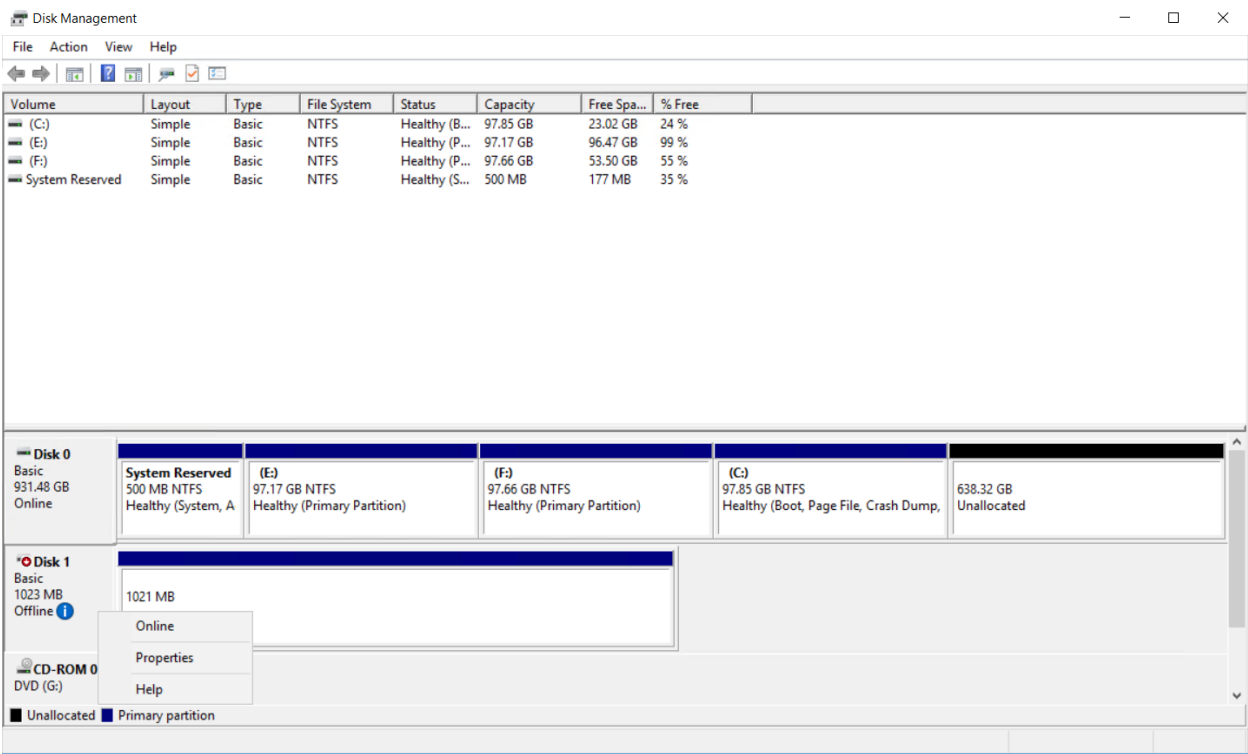


Figure 45 - Disk Management: making volume online

VI. Data Center Bridging (DCB)

1. Introduction

Data Center Bridging (DCB) refers to a set of bridge specification standards, aimed to create a converged Ethernet network infrastructure shared by all storage, data networking and traffic management services. An improvement to the existing specification, DCB uses priority-based flow control to provide hardware-based bandwidth allocation and enhances transport reliability.

One of DCB's many benefits includes low operational cost, due to consolidated storage, server and networking resources, reduced heat and noise, and less power consumption.

Administration is simplified since the specifications enable transport of storage and networking traffic over a single unified Ethernet network.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio Adapters that are compatible with Chelsio's DCB feature:

- T520-BT
- T520-CR
- T580-CR
- T580-LP-CR
- T520-LL-CR
- T540-CR

1.2. Software Requirements

1.2.1. Windows Requirements

Currently Chelsio's DCB feature is available for the following Windows versions:

- Server 2016 Technical Preview
- 2016 Client
- Nano Server
- Server 2012 R2

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

2. Software/Driver Configuration and Fine-tuning

2.1. Installing DCB

To install DCB on the host machine, open PowerShell with administrative privileges and run the following command:

```
PS C:\Users\Administrator> Install-WindowsFeature -Name "Data-Center-Bridging" -IncludeAllSubFeature -IncludeManagementTools
```

Although not mandatory, it is recommended to reboot the machine after installation.

2.2. Quality of Service (QoS)

Quality of Service (QoS) is an advanced Windows feature used to prioritize and manage the outgoing network traffic. The feature ensures efficient usage of resources and minimizes the impact of bandwidth congestion.

2.2.1. Enabling QoS

QoS can be enabled by using either Device Manager or PowerShell:

- **Using Device Manager**

- i. Open the **Device Manager** (Start > Control Panel -> System & Security-> System -> Device Manager), click on the **Network adapters**, double click on any **Chelsio Network Adapter**, and then click the **Advanced** tab.
- ii. Select the **NDIS QoS** property and change the value to *Enabled*.

- **Using PowerShell**

Open PowerShell with administrative privileges and run the following command:

```
PS C:\Users\Administrator> Get-NetAdapterRdma | where  
{$_ .InterfaceDescription -like "Chelsio*"} | Enable-NetAdapterQos'
```

2.2.2. Verifying QoS

To verify if QoS is enabled, use the PowerShell command *Get-NetAdapterQos* and observe the results. You should see a similar output:

```
PS C:\Users\Administrator> Get-NetAdapterQos
Name           : Chelsio_p1
Enabled        : True
Capabilities    :
Hardware       :
Current        :
-----
MacSecBypass   : NotSupported NotSupported
DcbxSupport    : IEEE         IEEE
NumTCs (Max/ETS/PFC) : 8/8/8    8/8/8
```

2.3. Configuring Dell Force10 Switch

2.3.1. Enabling DCB

To enable DCB functions on a Dell Force10 switch, follow the steps mentioned below:

- i. Log in to the switch and enter the configuration mode:

```
Login: admin
Password:
Force10#enable
Force10#configure
```

- ii. Enable DCB and LLDP:

```
Force10(conf)#enable dcb
Force10(conf)#protocol lldp
Force10(conf-lldp)#no disable
```

- iii. Set DCBx version to *auto*:

```
Force10(conf-lldp)#dcbx version auto
```


iv. Specify the intervals between hello packets:

```
Force10(conf-lldp)#hello 5
```

v. Create a DCB map. For example, here we are configuring 2 groups/classes:

- Group 0 has BW of 80% with *pfc* enabled.
- Group 1 had BW of 20% with *pfc* disabled.
- Assigning priority groups: Priority 5-7 are under group 0 and 0-4 are under group 1.

```
Force10(conf)#dcb-map win_dcb
Force10(conf-dcbmap-win_dcb)# priority-group 0 bandwidth 80 pfc on
Force10(conf-dcbmap-win_dcb)# priority-group 1 bandwidth 20 pfc off
Force10(conf-dcbmap-win_dcb)# priority-pgid 1 1 1 1 1 0 0 0
```

vi. Enter interface configuration mode and configure protocol LLDP:

```
Force10(conf)#interface tengigabitethernet 0/17
Force10(conf-if-te-0/17)#protocol lldp
Force10(conf-if-te-0/17-lldp)#no disable
```

vii. Set DCBx version to *auto*:

```
Force10(conf-if-te-0/17-lldp)#dcbx version auto
```

viii. Apply the DCB-MAP created:

```
Force10(conf-if-te-0/17)#dcb-map win_dcb
```

2.3.2. Verifying

To verify remote and operational QoS configurational parameters, run the *Get-NetAdapterQos* command on the host machine. You should see a similar output:

```
PS C:\Users\Administrator> Get-NetAdapterQos
Name                               : Chelsio_p1
Enabled                           : True
Capabilities                       :
                                   Hardware      Current
                                   -----      -
                                   MacSecBypass  : NotSupported NotSupported
                                   DcbxSupport   : IEEE         IEEE
                                   NumTCs (Max/ETS/PFC) : 8/8/8       8/8/8

OperationalTrafficClasses         : TC  TSA      Bandwidth Priorities
                                   --  ---      -
                                   0  ETS      80%      5-7
                                   1  ETS      20%      0-4

OperationalFlowControl            : Priorities 5-7 Enabled
OperationalClassifications        : Not Available
RemoteTrafficClasses              : TC  TSA      Bandwidth Priorities
                                   --  ---      -
                                   0  ETS      80%      5-7
                                   1  ETS      20%      0-4

RemoteFlowControl                  : Priorities 5-7 Enabled
RemoteClassifications             : Not Available
```

VII. Unified Wire Manager (UM)

1. Introduction

Chelsio's Unified Wire Manager is a powerful management software tool, allowing you to view and configure different aspects of the system, including Chelsio hardware installed in the system. The software includes a command line interface (CLI) tool and a web management interface (Web GUI) to help you manage all Chelsio network adapter cards on the network across multiple operating systems.

Unified Wire Manager enables the management of all aspects of the client side of the iSCSI SAN in two main areas. The ability to configure Chelsio adapter's boot option ROM without entering each individual adapter's configuration screen and manage group of iSCSI initiators remotely from a common user interface saves administrator's time considerably. Unified Wire Manager fully supports Microsoft iSCSI initiator. All supported Chelsio FCoE initiators available on Linux can be managed.

Users can manage Option ROM (PXE and FCoE) capability for Chelsio cards using various tools available in the software.

Additionally, Unified Wire Manager allows for Chelsio adapter NIC and TOE parameters to be centrally managed through the same easy-to-use user interface. It can bring interfaces up or down, tune parameters for optimal performance, and any number of administrative tasks normally done at each individual machine.

Chelsio's Unified Wire Manager is an indispensable tool for saving administrator's time for managing the network and SAN. Chelsio's high performance network adapters with its Unified Wire approach to networking can now be managed centrally in a simple and fast way!

1.1. Features

Chelsio's Unified Wire Manager is designed to provide the following features to the end-user:

- Remotely manage Chelsio adapters and various related tasks like driver installation from a single application.
- Single tool with CLI and Web interface that works across Storage, Networking and Hardware.
- Manage all Chelsio adapters installed on the system.
- Tool for FAE to debug issues on the Customer front.
- Freedom to choose various modes of management i.e. CLI or Web GUI.

1.2. Reference Architecture

Chelsio's Web GUI is a web-based management interface that lets you remotely manage several Chelsio CNAs from anywhere, at any time on the network using a web browser. The Web GUI provides a great amount of flexibility, efficiency and accessibility to system administrators in managing the Network and SAN. The users have the freedom to access the interface using any of the major browsers available, based on individual preferences and corporate policy.

System performance degradation issues will not be observed when using the Web GUI, since it's lightweight and utilizes very less system resources.

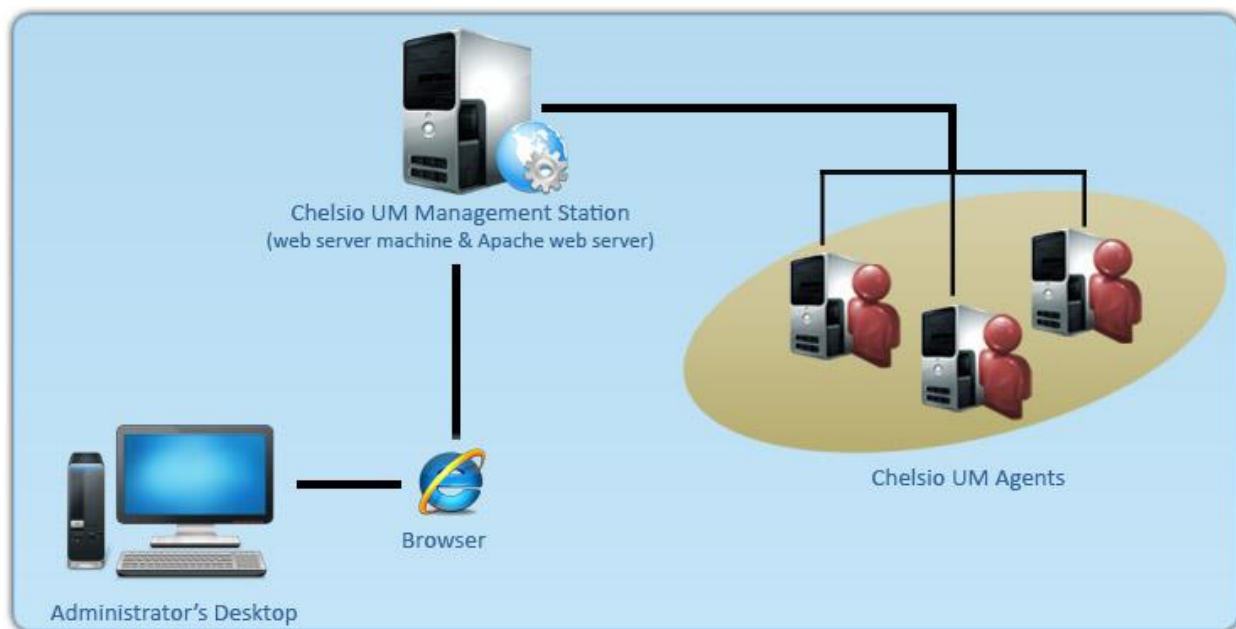


Figure 46 - Chelsio Unified Wire Manager with web interface (Web GUI)

1.3. Unified Wire Manager Components

1.3.1. Management Agent

The Management Agent is a binary executable, which runs as a service on the system that has at least one Chelsio card installed. It is installed along with libraries that can manage various components of the system and enabled during system startup.

1.3.2. Management Client

The Management Client can be used to connect to agents and manage them. Once connected you can view and configure Chelsio CNAs and related networking, storage and hardware properties. You can use either the CLI or Web GUI client to manage agents based on your

preference. It makes service requests based on the command issued by the user and returns the appropriate information.

- **CLI Client**

The **CLI Client** (*chelsio_uwcli*) is an executable binary which allows you to manage and configure agents using the command-line interface. It is not a command shell with a prompt; it accepts all command parameters as arguments when launching it, making it script-friendly.

- **Web GUI Client**

The **Web Management Interface** (Web GUI) client is a web-based management interface which allows you to securely manage agents from anywhere using a web browser. The management interface uses a secure 256-bit encrypted HTTP connection, ensuring that authentication and configuration data are protected during transmission from the web browser to the system and vice versa. Many agents can be accessed on single interface making it very efficient & user-friendly.

Currently supported browsers are **Internet Explorer 9+**, **Mozilla Firefox 3.6.9+**, **Google Chrome 5+** and **Apple Safari 5+**.

1.4. Authentication and encryption

The Unified Wire Manager requires user authentication to manage a system. A user must have administrative privileges to manage a system. The authentication credentials, as well as all data exchanged between the CLI client or the Web GUI and the agent, are encrypted using SSL. This ensures that the data cannot be accessed when it is being transmitted over the network.

2. Hardware and Software

2.1. Supported Adapters

Following are the currently shipping Chelsio Adapters that are compatible with Chelsio Unified Wire Manager:

- **T5 Adapters**
 - T520-CR
 - T580-CR
 - T580-LP-CR
 - T580-SO-CR
 - T520-LL-CR
 - T520-SO-CR
 - T540-CR
- **T4 Adapters**
 - T420-CR
 - T440-CR
 - T422-CR
 - T404-BT
 - T420-BT
 - T420-LL-CR
 - T440-LP-CR
 - T420-CX

2.2. Platform/Component Matrix

The table below lists the Windows versions and the supported UM components.

Version/Distribution	Supported UM Components
Windows Server 2012 R2	Management Agent, Management Client, Management Station

2.3. Platform/Driver Matrix

The table below lists the Chelsio T5/T4 driver(s) and their supported versions:

Chelsio driver	Version
NIC	6.1.17.0

3. Installing Unified Wire Manager

3.1. Pre-requisites

Please ensure that the following requirements are met, before proceeding with the installation.

3.1.1. Management Agent

If you wish to install Management Agent, please make sure that **Microsoft .Net Framework 3.5** is installed before proceeding with the installation

3.1.2. Management Station

If you wish to install Management Station, please make sure that the following requirements are met before proceeding with the installation:

1. Install **Python 2.6.6 (32-bit)**. (Download from [here](#))
2. Ensure that the path to python binary (typically "C:\Python26"), is added to PATH system variable.
3. Install **Apache HTTP Server 2.2** with SSL. (Download from [here](#))
4. If the Apache Server is running, it should be stopped before starting the installation process.

3.2. Installation

The following section describes the procedure to install UM. If an older version of the software exists, the Installer will upgrade it to the current version.

1. Run the **UnifiedWireManager-x.x.xx-x64** installer application.
2. Click the **Next** button for the Chelsio End User License Agreement Window.

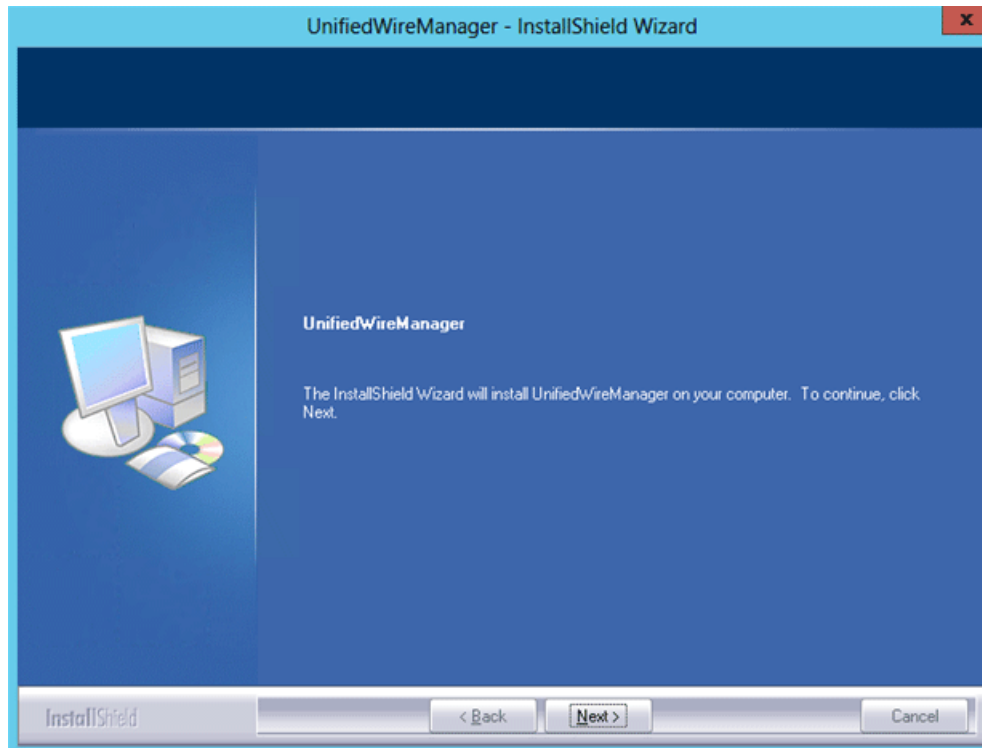


Figure 47 - UM installer welcome window

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

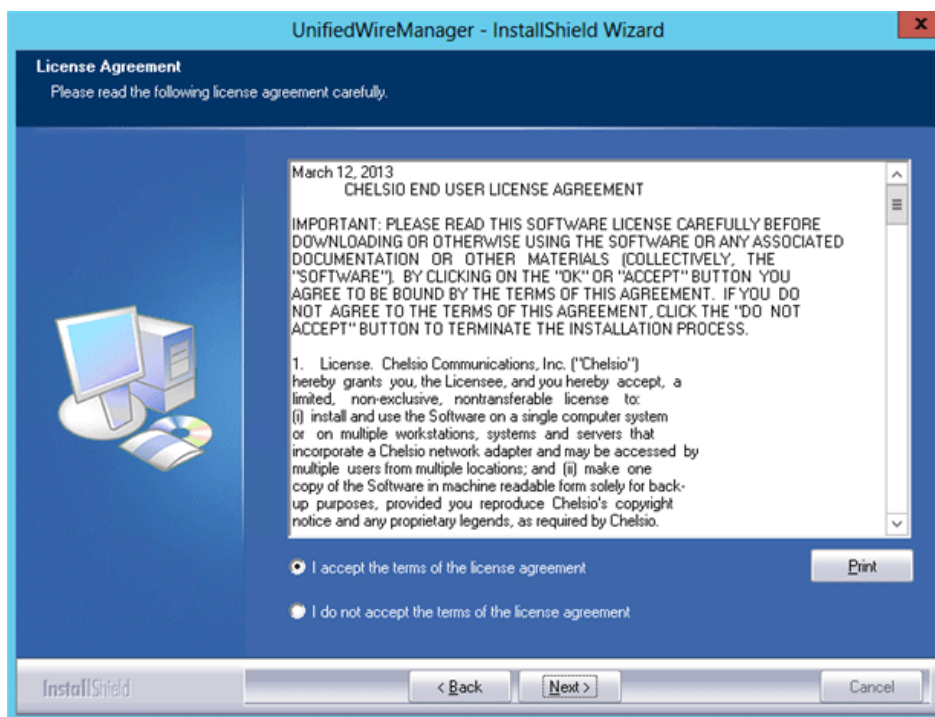


Figure 48 - Chelsio EULA window

4. The next window will display the pre-requisites for various UM components. Ensure that they are met before proceeding. Click **Next**.

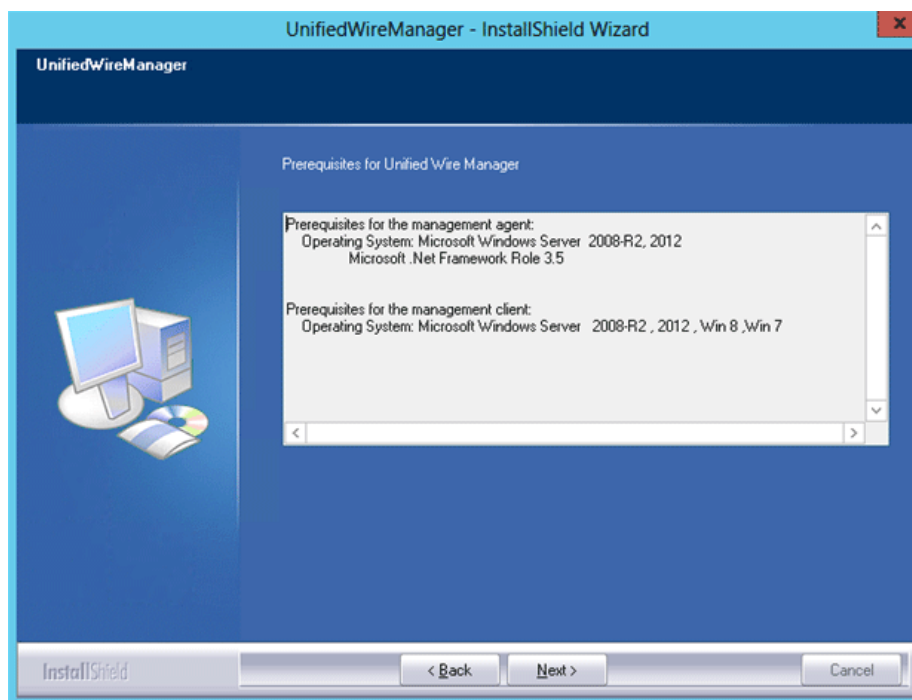


Figure 49 - UM prerequisites window

5. Now, either select **Complete** for complete package installation or else select **Custom** radio button to customize the installation. Click **Next**.

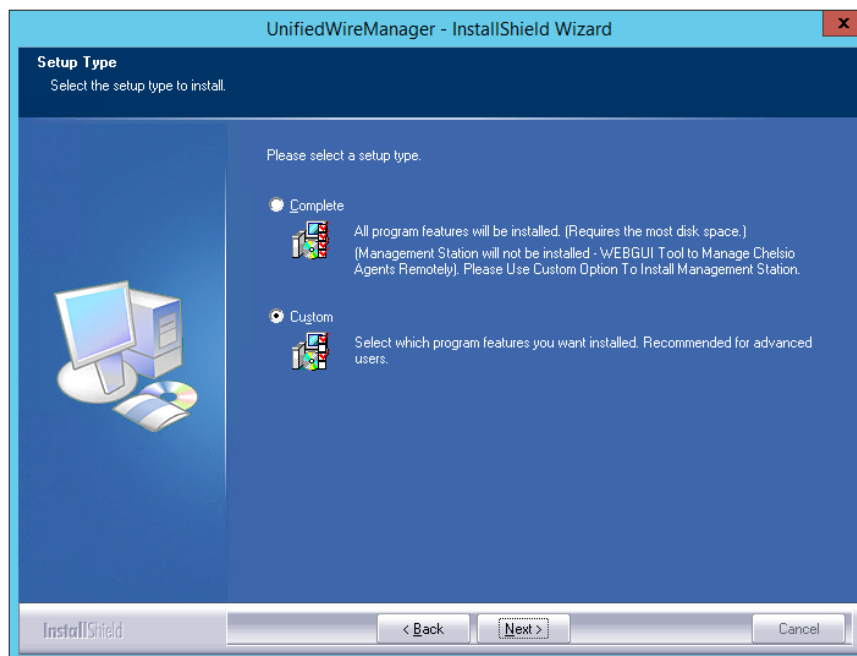


Figure 50 - Select setup (installation) type

- i. If you selected **Custom**, the next window will display the location where UM will be installed by default. You can change the location by using the **Change** button or click **Next** to continue with the default path.

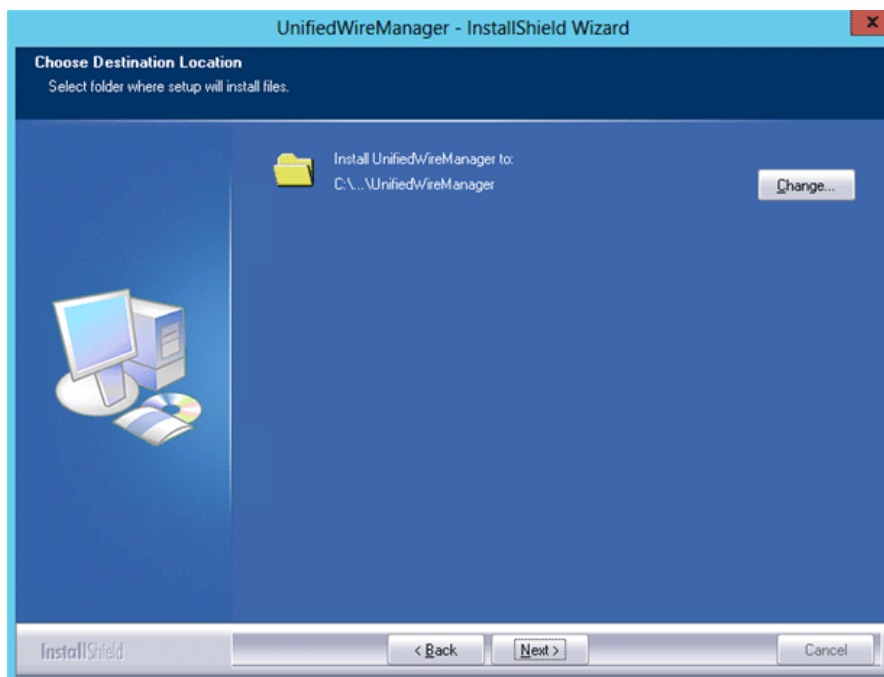


Figure 51 - Changing UM installation path

- ii. Next, you can choose the UM components you wish to install. Deselect the components you don't wish to install and click **Next**.

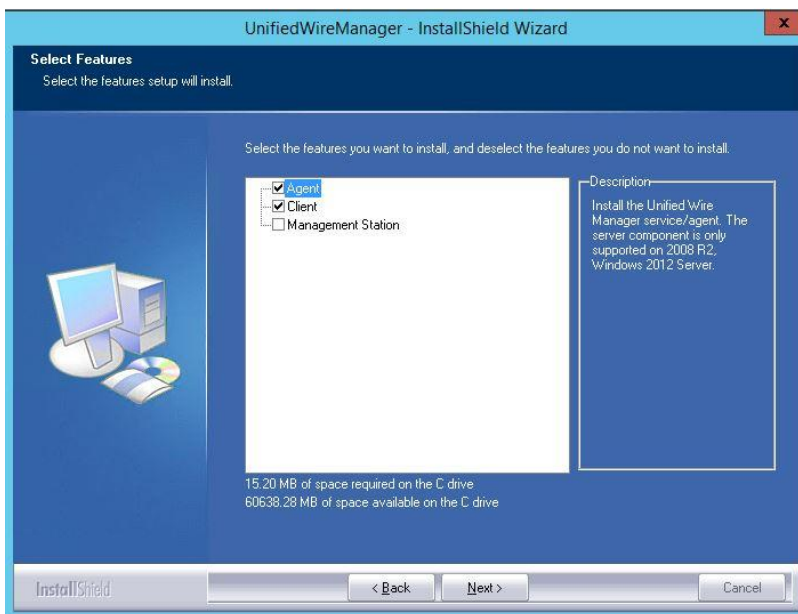


Figure 52 - Selecting UM components to install

Note If Management Station is selected, please make sure that all related prerequisites are met before proceeding (See [Pre-requisites](#)) or else the component will be skipped during installation.

6. Click **Install** to start the installation. Unified Wire Manager will now be installed with the selected options.

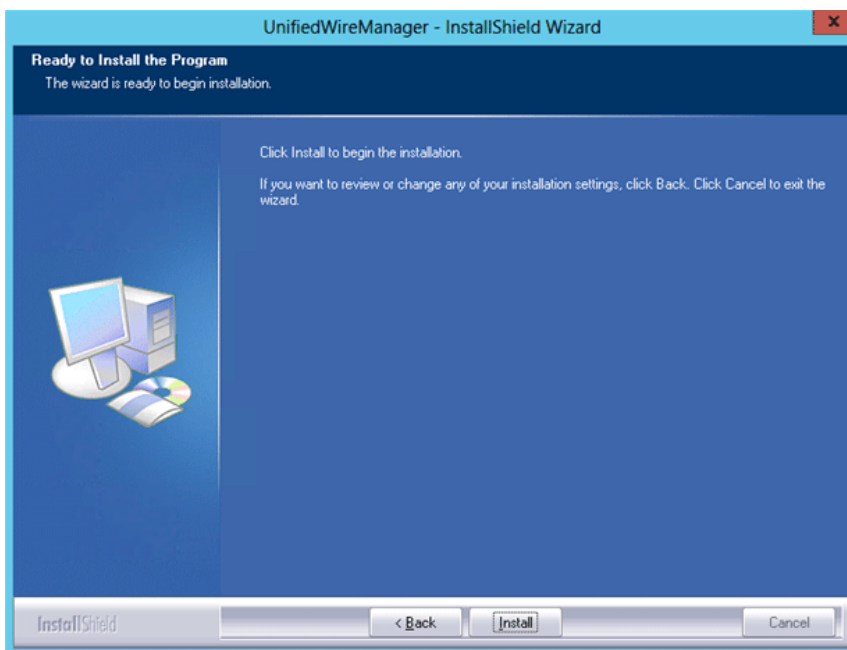


Figure 53 - Starting UM installation

7. Select **Finish** to exit the UM Installer.

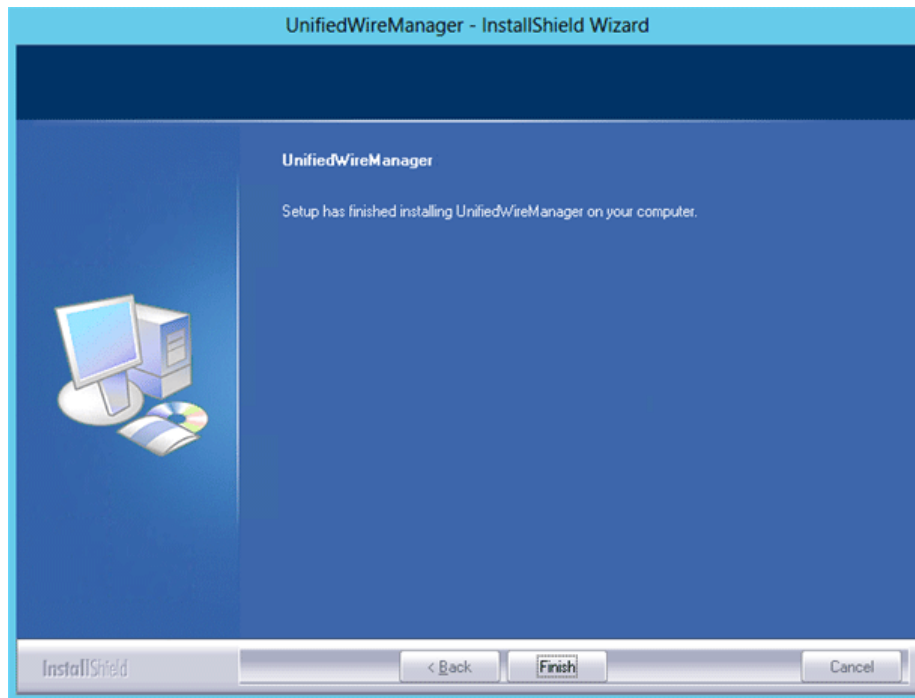


Figure 54 - Finishing UM installation

4. Configuring Unified Wire Manager

4.1. Configuring Management Station

Follow the steps mentioned below to configure Apache Server and SSL certificate.

4.1.1. Apache HTTP Server

1. Assuming that Apache HTTP Server 2.2 is installed at the default location, append the following lines in *C:\Program Files (x86)\Apache Software Foundation\Apache2.2\Conf\httpd.conf*

```
ScriptAlias /python/ "C:/Program Files (x86)/Apache Software
Foundation/Apache2.2/htdocs/chelsio/python/"

<Directory "C:/Program Files (x86)/Apache Software
Foundation/Apache2.2/htdocs/chelsio/python/">
    PythonPath ["'C:/Program Files (x86)/Apache Software
Foundation/Apache2.2/htdocs/chelsio/python'+sys.path"

    SetHandler mod_python
    PythonHandler mod_python.publisher
    PythonDebug on
</Directory>

LoadModule python_module modules/mod_python.so
ThreadStackSize 8388608
```

2. Perform the following tasks in *C:\Program Files (x86)\Apache Software Foundation\Apache2.2\Conf\httpd.conf* file
 - i. Change "DocumentRoot" to "C:/Program Files (x86)/Apache Software Foundation/Apache2.2/htdocs/chelsio"
 - ii. Uncomment "LoadModule rewrite_module modules/mod_rewrite.so"
 - iii. Uncomment "Include conf/extra/httpd-ssl.conf"
 - iv. Uncomment "LoadModule ssl_module modules/mod_ssl.so"
 - v. Add the following lines:



```
RewriteEngine On
RewriteCond %{HTTPS} !=on
RewriteRule ^/?(.*) https://%{SERVER_NAME}/$1 [R,L]
```

4.1.2. SSL Certificate


1. Execute the following lines in command prompt and provide info to generate OpenSSL certificate and keys:

```
cd "C:\Program Files (x86)\Apache Software Foundation\Apache2.2\conf"
..\bin\openssl req -config openssl.cnf -new -out blarg.csr -keyout blarg.pem
..\bin\openssl rsa -in blarg.pem -out blarg.key
..\bin\openssl x509 -in blarg.csr -out blarg.crt -req -signkey blarg.key -
days 365
```

2. Browse to the following location:
C:\Program Files (x86)\Apache Software Foundation\Apache2.2\conf\extra
3. Open the file *httpd-ssl.conf* and make the following modifications:
 - i. Modify "SSLCertificateFile" to "C:\Program Files (x86)\Apache Software Foundation\Apache2.2\conf\blarg.crt"
 - ii. Modify "SSLCertificateKeyFile" to "C:\Program Files (x86)\Apache Software Foundation\Apache2.2\conf\blarg.key"

 **Note** *On some installation, Apache is seen to report problems regarding SSL cache. In such a case, do the following in C:\Program Files (x86)\Apache Software Foundation\Apache2.2\conf\extra\httpd-ssl.conf*

- i. *Uncomment the following line*
SSLSessionCache "dbm:C:/Program Files (x86)/Apache Software Foundation/Apache2.2/logs/ssl_scache"
- ii. *Comment the following line*
SSLSessionCache "shmcb:C:/Program Files (x86)/Apache Software Foundation/Apache2.2/logs/ssl_scache(512000)"

 **Note** *Use the Windows Event Log (Event Viewer) for troubleshooting any installation related issues.*

5. Verifying UM components status

The following section explains how to verify status of various UM components.

5.1. Verifying Management Agent

1. On the system running Management Agent, launch **Services** from the Control Panel. You can also type `services.msc` in the **Run** command. This will open the **Services** window.

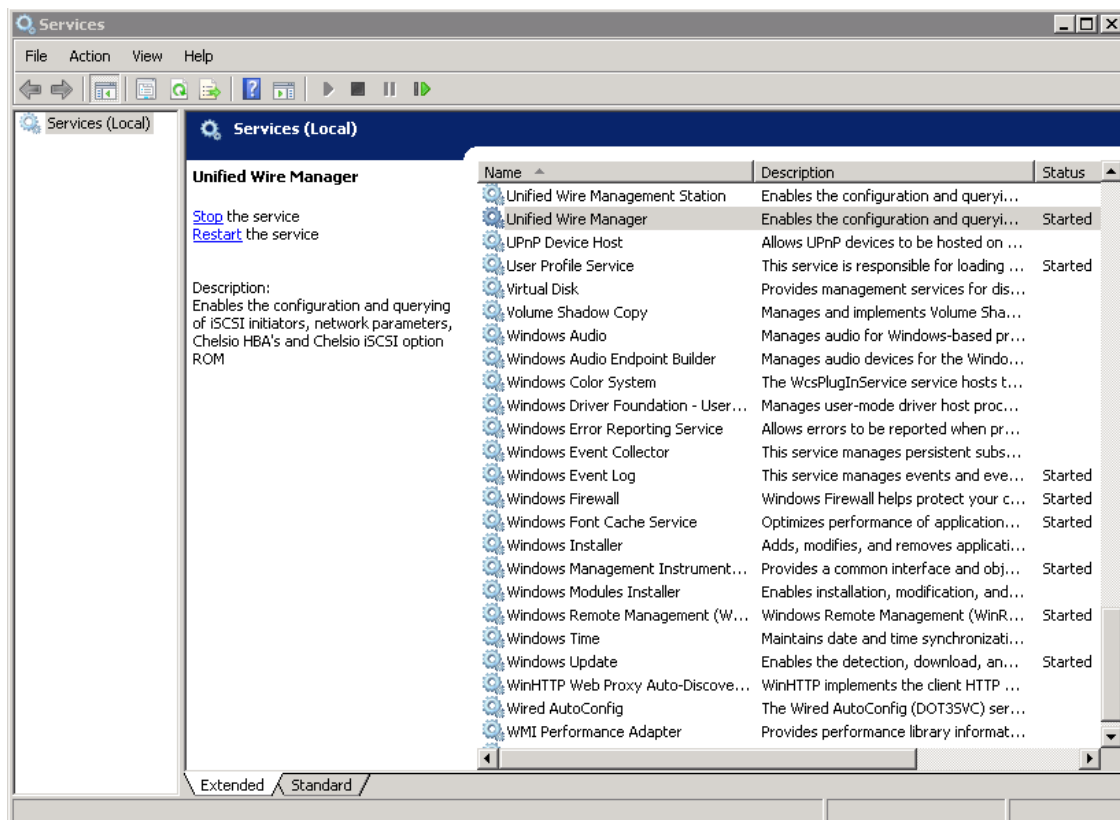


Figure 55 - Windows Services

2. Search for *Unified Wire Manager* in the list of services. You should get the options to stop and restart in the *Actions* menu on the left side, indicating that Management Agent is already running.

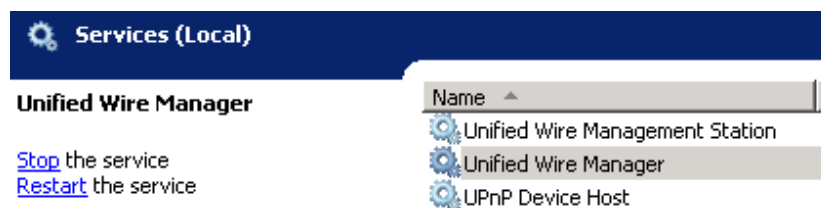


Figure 56 - Actions available for Unified Wire Manager service

5.2. Verifying Management Client

Execute the following query command to determine if Management Client is installed:

```
C:\Users Administrator>chelsio_uwcli.exe -V
```

The above query should confirm that Management Client is installed by displaying a similar result:

```
Unified Manager client CLI version : 2.x.yy
```

5.3. Verifying Management Station

1. Launch **Services** from the Control Panel. You can also type *services.msc* in the **Run** command. This will open the **Services** window.
2. Search for *Unified Wire Management Station* in the list of services. You should get the options to stop, start and restart the service in the *Actions* menu on the left side.

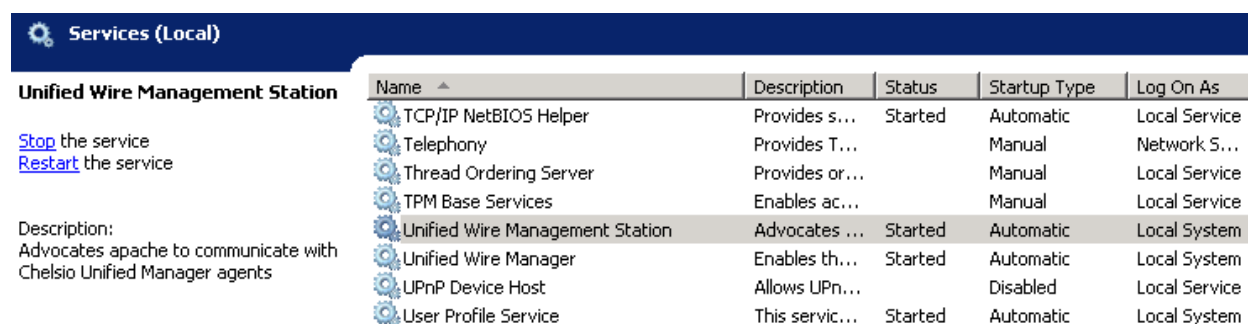


Figure 57 - Verifying Management Station service status

Note While accessing the Web Management Interface, if an error “Management Station is not running” is displayed at the log-in page, follow the above steps to restart Management Station and try again.

6. Management Agent

6.1. Communication

The agent uses a TCP connection over IP to communicate with the client. After the connection is established, SSL (Secure Sockets Layer) encryption is enabled using the Open SSL libraries. The agent listens on a TCP port for new incoming connections from clients. This port is set to 35001 by default.

6.2. Service configuration

The agent is installed as a service on the system, and enabled to start on boot. The following sections will describe the procedure to configure service startup manually:

6.2.1. Service startup configuration

The service name on Windows is *Unified Wire Manager* and the service startup configuration can be changed by following these steps:

1. Launch **Services** from the Control Panel. You can also type `services.msc` in the **Run** command. This will open the **Services** window.
2. Scroll and highlight the "Unified Wire Manager" service, and double-click on it.
3. Select the startup type, either "Automatic (Delayed Start)", "Automatic", "Manual", or "Disabled".

6.2.2. Service start/stop/restart

1. Launch **Services** from the Control Panel. You can also type `services.msc` in the **Run** command. This will open the **Services** window.
2. Scroll and highlight the "Unified Wire Manager" service.
3. Click on **Start/Stop/Restart** to carry out the respective tasks in the Description section on the left.

6.3. Firewall

If the system has a firewall configured, it should be configured to allow traffic to the management agent's default TCP port configured i.e. 35001. Review the firewall documentation and configure it appropriately. If there is a firewall appliance / software protecting the network that the system is on, and you wish to connect to the system from a different network, using the client, the firewall appliance also needs to be configured appropriately.

7. CLI client

7.1. CLI Help system

A detailed help and usage documentation is built into the CLI, and is accessible through its help system. The help can be invoked by the usual argument of `/?` or `--help`.

7.1.1. Viewing help

1. Open command prompt by typing `cmd` in the **Run** command.
2. Type `chelsio_uwcli.exe --help`. Press enter to view the built-in help.

7.2. Client conflict resolution

The CLI and Web GUI cannot manage the same system at the same time by default. This is to ensure that configuration changes being applied by one client are not interrupted by another client. Also, two different Web GUI or CLI clients cannot connect to a management agent at the same time. There is no mechanism to allow this scenario.

8. Web GUI client

8.1. Management Station

In order to access the Web Management Interface, start the Apache HTTP server, if it's not running already. Also, Cookies and Javascript must be enabled in the browser.

8.1.1. Running Management Station

1. Launch **Services** from the Control Panel. You can also type `services.msc` in the **Run** command. This will open the **Services** window.
2. Search for “*Apachex.x*” in the list of services and click **Start** in the **Action** menu on the left.

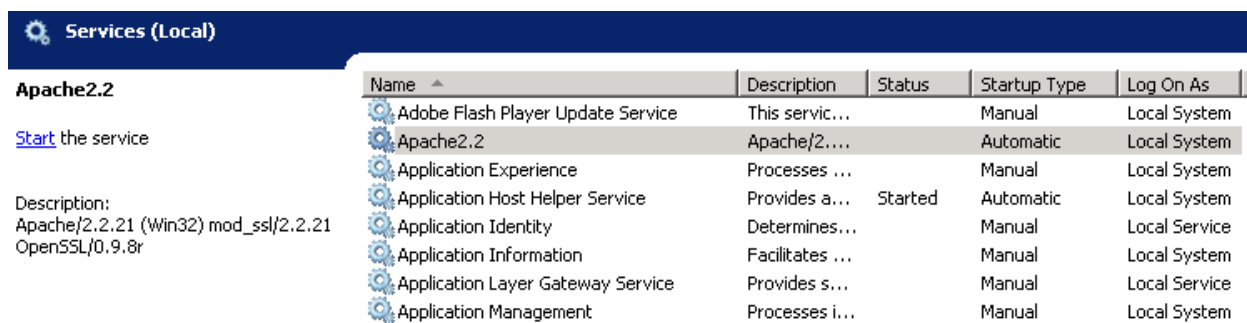


Figure 58 - Starting Apache HTTP server

3. Search for “*Unified Wire Management Station*” and click **Start** in the **Action** menu on the left.

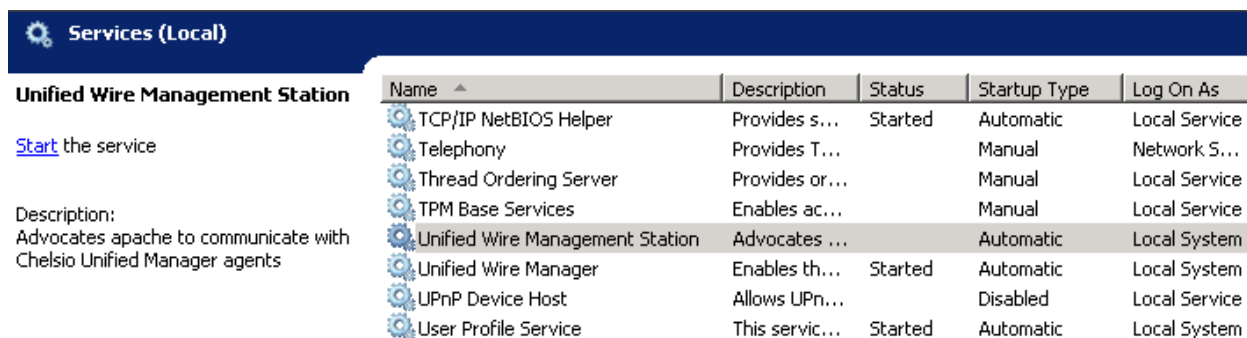


Figure 59 - Starting Management Station service

8.2. Accessing Web Management Interface

1. To access the Web GUI, type in the URL https://<management station IP address> in a web browser.
2. The security certificate used by the web server is a generic one. It may cause the following types of prompts in different browsers. You will need to select the correct option to continue.

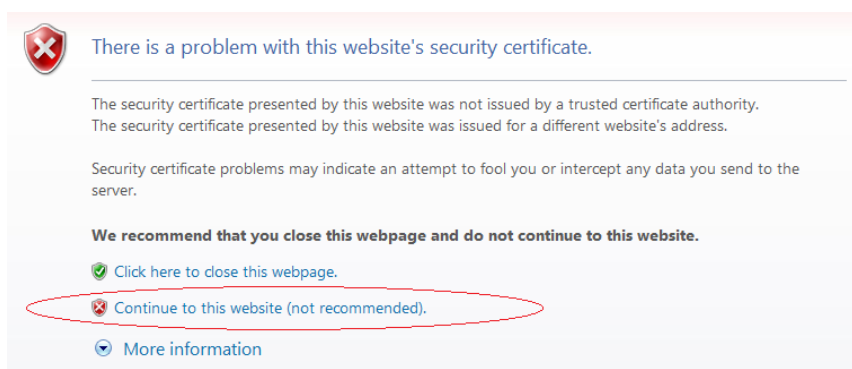


Figure 60 - Security Certificate prompt in Internet Explorer

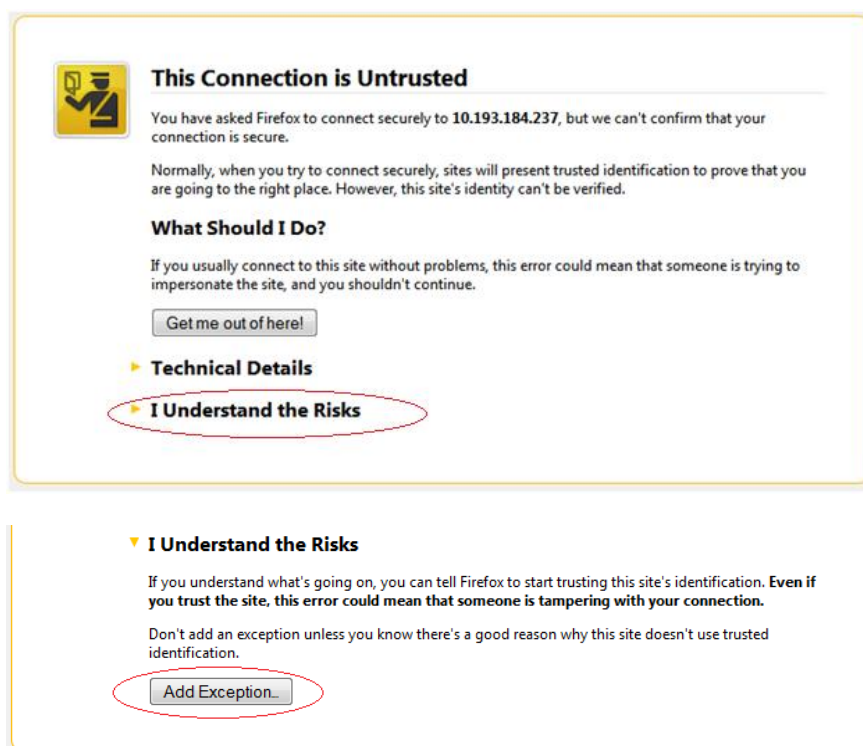


Figure 61 - Security Certificate prompt in Mozilla Firefox

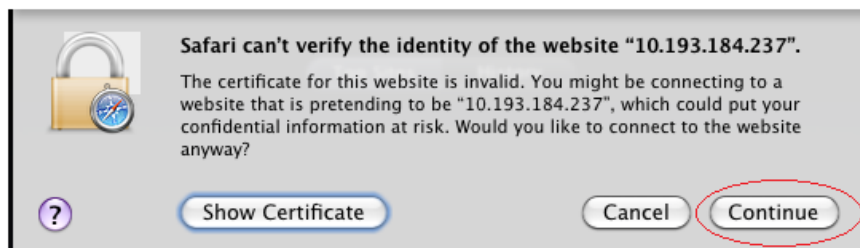


Figure 62 - Security Certificate prompt in Apple Safari

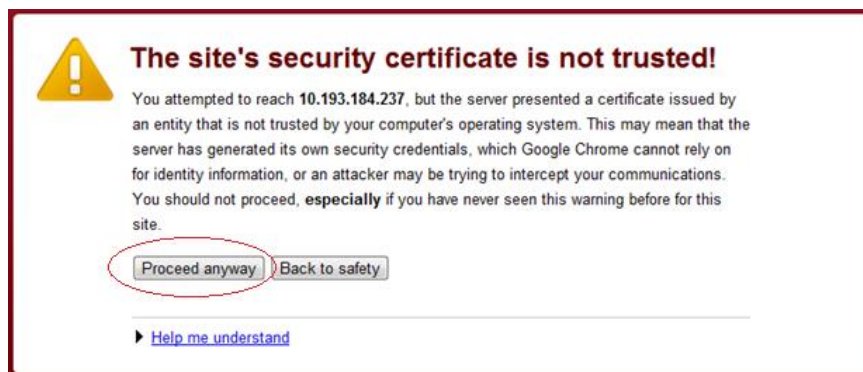


Figure 63 - Security Certificate prompt in Google Chrome

3. The web interface requires password authorization to be accessed. Enter the administrator/root credentials that were set up on the management station system and click on the *Login* button.

Figure 64 - Web GUI Login page



Note Not performing any operation/action for 5 minutes will result in session timeout. You will have to re-login and connect to the Agents again.

8.3. Layout and Navigation

The Web Management Interface consists of the following:

- **Title bar** displaying the username on the left, Unified Wire Manager logo and name in the centre; and a Logout button on the right.
- **Menu Bar** consisting of the **Home**, **Add System**, **Remove System**, **Refresh**, **Subscribe** and **Bulk Configuration** buttons.
- The **Navigation Pane** with a cascading tree of links to various configuration modules for a UM Agent. You can navigate between connected agents and various sections of the managed agent's interface. You can view and hide the configuration modules for each Agent by clicking on the "+" and "-" links respectively
- The **Details Pane** on the right displaying panels associated with the tree menu item selected in the **Navigation Pane**. The panels can be expanded and collapsed by clicking on the panel heading.
- The **Bottom bar** has the **About** link on the right and copyright details on the left.



Figure 65 - Web Management Interface

8.4. Home page

The home page is displayed by default on launching the Web GUI. It displays **Bookmarks and History**, **Service Discovery** and **Bulk Driver Installation** modules. Options to go back to home page, add/remove system, refresh and configure email alerts are also available.

8.4.1. Home

This option will display the home page.

- **Bookmarks and History**

A history of the last 128 systems that were managed from this system, by the current user, will be shown here in a list. Each system's management IP address, TCP port, and Login details are also stored. This may be edited and saved. Any systems that are not required in the list may be deleted.



Important

Storing login passwords for the managed systems is inherently insecure. The passwords are encrypted, but it is still advisable to store passwords only if the system you are running the GUI client on, is secure.

Bookmarks and History	
10.193.185.107 - WIN-4HSMAGTHKC6	<p>System : <input type="text" value="throttle"/></p> <p>IP : <input type="text" value="10.193.185.92"/></p> <p>Port : <input type="text" value="35001"/></p> <p>Login Username : <input type="text" value="root"/></p> <p>Login Password : <input type="password"/></p> <p>Last Accessed : 12-13-2012_22:30:53</p> <p>Total Connections : 2</p> <p><input type="button" value="Save Changes"/></p>
10.193.184.117 - HP-BLADE1	
10.193.185.92 - throttle	
10.193.186.196 - SPINEL	
10.193.184.94 - munnar	
10.193.184.71 - thor	
10.193.186.188 - mahanadi	
10.193.184.212 - doom	
<p><input type="button" value="Connect"/> <input type="button" value="Delete System"/></p>	

Figure 66 - Bookmarks and history module

- **Connecting to a system**

Select the system from the Bookmark list and click *Connect*. Once successfully connected, the system will appear on the left pane with different related modules on the right to view and manage.

- **Deleting a system**

Select the system from the Bookmark list and click *Delete system* to remove it.



Note

Once removed, the system will no longer appear in the Bookmarks and History module. If you wish to manage that system again, you will have to use the “Add system” option.

- **Service Discovery**

Using this module, all the Unified Wire Manager agents connected in the same or different subnet can be discovered. One can choose to discover agents based on OS type or search for a particular agent if the agent's IP or hostname is known. Select the appropriate discovery method and provide the relevant information. For example, to search using hostname, select *Hostname* as the **Input Type** and provide the agent's hostname in the **Search for Hostname/IP** field. Finally click **Discover Agents**.

The **Add Agents** button adds the selected system to the list of discovered agents in the **Bookmarks and History** module. The **Clear Agents** button resets the list of discovered agents.

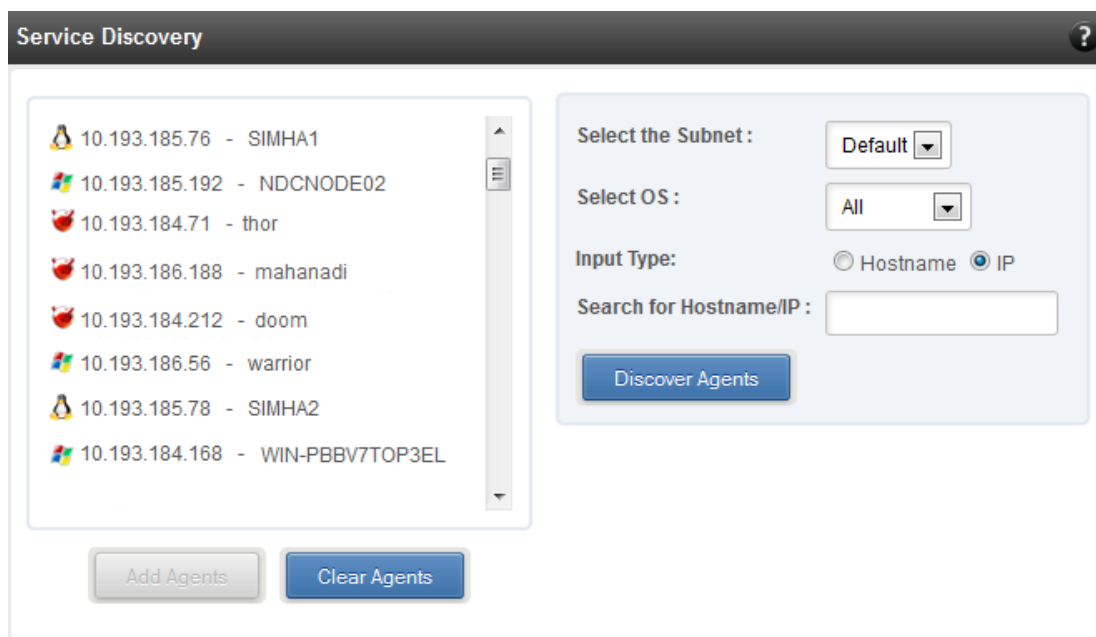


Figure 67 - Services Discovery module

• Bulk Driver Installation

This module allows you to install drivers for multiple systems simultaneously. Drivers available for installation for a particular system may differ depending on the network adapter (T5, T4 or T3) and operating system selected.

• Installing Driver

1. In the **Choose the card** fields, select T3 or T4/T5 depending on the chip revision of the network card.
2. Select the operating system for which drivers are to be installed in the **Choose the OS Type** field. All the systems with the selected operating system will be displayed in the list below.
3. Select a system or systems from the list and choose the driver to be installed in the **Driver Installation** section.
4. Download the appropriate driver from Chelsio's Download Center, service.chelsio.com.
5. Locate the driver package.
6. Click **Install** button to install the driver.

Figure 68 - Bulk Driver Installation module



Note

Agents that report errors or whose passwords are not stored, will be automatically skipped during the driver installation.

8.4.2. Add System

Use this option to connect to new Agents using their IP or Hostname. The TCP port for connection is by default 35001. You will have to provide correct user credentials for the agent in order to connect successfully.

After connecting to the Agent, the menu bar on the left will display the connected system and its related modules.

If you deselect the 'Remember Password' option, you will be asked to enter the password every time you try to connect to the system.

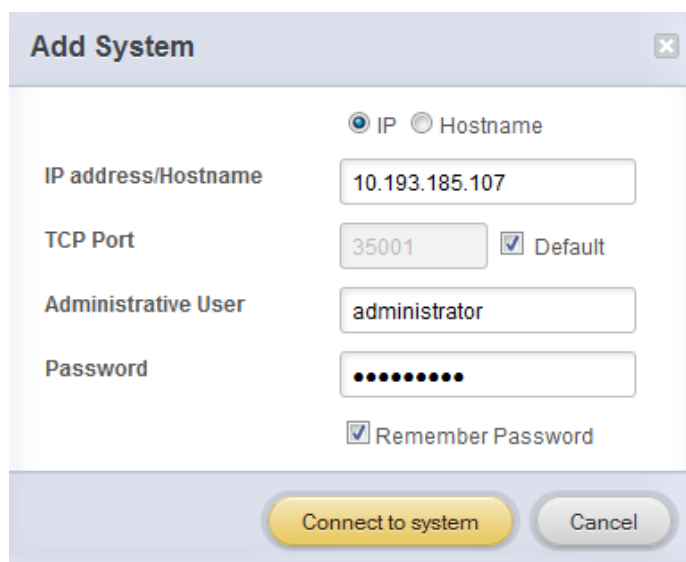
A dialog box titled "Add System" with a close button in the top right corner. It contains two radio buttons: "IP" (selected) and "Hostname". Below these are four input fields: "IP address/Hostname" with the value "10.193.185.107", "TCP Port" with the value "35001" and a checked "Default" checkbox, "Administrative User" with the value "administrator", and "Password" with masked characters "••••••••". At the bottom, there is a checked "Remember Password" checkbox and two buttons: "Connect to system" and "Cancel".

Figure 69 - Adding a UM Agent

8.4.3. Remove System

Use this option to disconnect an Agent. To remove an agent, click on the name of the system in the tree menu in the left and click *Remove System*. Then click *Yes* to confirm.

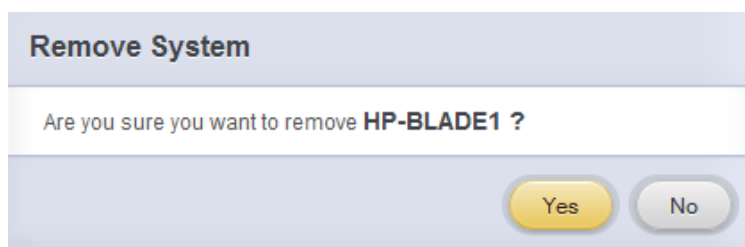
A dialog box titled "Remove System". It contains a single line of text: "Are you sure you want to remove HP-BLADE1 ?". At the bottom, there are two buttons: "Yes" and "No".

Figure 70 - Removing a UM Agent

8.4.4. Refresh

This option can be used to reload the Web GUI or UM Agent.

To reload the Web GUI, navigate to the Home page (by clicking on the “Home” button and click Refresh. You can use this option to refresh Home page panes (Bookmarks and History, Service Discovery and Bulk Driver Installation).

To reload an Agent, click on the name of the system in the tree menu in the left and click “Refresh”. You can use this option to update any changes made to system settings like load/unload drivers.

8.4.5. Subscribe (Email Alerts)

This feature is available only on the Web Management Interface.

Using this option, you can receive email alerts regarding the link status of a Chelsio Network Interface Card. This feature sends email notifications regarding the port and the card, on which the link up/down event has occurred. Not only can you configure multiple email addresses to receive notifications, but also customize the email id of the sender for troubleshooting purposes.

To subscribe to **Email Alerts**, enter the sender’s email address in the *Email address* field. It should be in the format of <name>@<domain>.<extension>. You can enter multiple email addresses for the *Recipients* field separated a comma. Enter Mail server details and ensure that the “Enable email Alerts” field is enabled. Select the Agent(s), for which you want to receive alerts and Click on **Save**.

Figure 71 - Subscribing to Email Alerts

8.4.6. Bulk Configuration

The **Bulk Configuration** page allows you to execute common configuration changes to multiple agents and their network adapters simultaneously. You can conveniently perform bulk operations like installing option ROM, setting MTU and VLAN ID, changing adapter and port parameters on various devices, without having to access multiple modules and thus saving considerable amount of administration time.

Various configurable parameters have been categorized into several modules like **Boot Configuration** module to install and erase option ROM, **Network Configuration** module to set MTU and VLAN ID, **Card Configuration** module to change driver parameters, etc.

Before accessing these modules, you will have to create **groups** and then add **members** to that group. Once done, you can select the group in the modules and the new setting will be applied to all members of that particular group.

- **Manage Groups**

This is where you can add, delete and manage groups. Use the **Create a Group** section to create a group by specifying agent's platform and group type. There are various types of groups to choose from depending on the type of configuration setting you want to change. For example, to change the MTU size of a network interface (in the Network Configuration module), create a group with group type *Network*. To install or erase option ROM on a Chelsio T4 adapter (in the Boot Configuration module), create a group with group type *t4adapter*.

Here is a list of available configuration modules and corresponding group type:

- **Boot Configuration:** t3adapter, t4adapter, t5adapter
- **Network Configuration:** Network
- **Card Configuration:** t3adapter, t4adapter, t5adapter
- **Port Configuration:** t3port, t4port, t5port
- **Bypass Configuration:** Network

After the group has been created, add members to that group using the **Add a member row** button. Depending on the group type selected, you may be asked to provide additional details for the new member. Use the **Fetch Details** button to do so and finally click **Save a member** button to add the member to the group.

To delete a group, select it from the **Select a Group** drop-down list, and click **Delete Group**. To delete a member from a group, select the group to which the member belongs, select the radio button corresponding to the member to be deleted in the **SNO** field and finally click **Delete Member(s)**.

Create a Group

Group Name:

Os Type :

Group Type :

Figure 72 - Creating a group

Manage Group

Select a Group:

OS Type: WINDOWS

Group Type: t4adapter

SNO	HOSTNAME / IP	USERNAME	USERNAME	DETAILS
1	10.193.185.107	administrator	*****	Adpater Idx : 0 [T422;CR ; PCI Location: 01:00:04]
2	10.193.185.86	administrator	*****	Adpater Idx : 0 [T422;CR ; PCI Location: 02:00:04]

Figure 73 - Managing a group

- **Boot Configuration**

Using this module, you can install option ROM or erase option ROM on Chelsio network devices. The **Set Default Boot Settings** button will reset the adapter to factory boot settings.

Boot Configuration ?

Boot Configuration

Select a group:

Figure 74 - Boot Configuration module

• Network Configuration

In the **Network Configuration** module, you can set Maximum Transfer Unit (MTU), Virtual LAN (VLAN) ID and change the IP address type for the members (network interfaces) of the *Network* group. MTU can be set between 1500-9000 bytes. VLAN id can be set for an adapter within the range 0-4094 (enter 0 to disable it). The IP type can be static or DHCP.

The screenshot shows the 'Network Configuration' window. It has a title bar with a question mark icon. Inside, there's a 'Refresh' button with a circular arrow icon. Below that, the 'Network Configuration' section contains a 'Select a group:' dropdown menu with 'group_network' selected. To the right of this are three rows of settings: 'MTU:' with a text box containing '1650' and a 'Set MTU' button; 'VLAN:' with a text box containing '4' and a 'Set VLAN' button; and 'IP Type:' with a dropdown menu showing 'DHCP' and a 'Set IP Type' button.

Figure 75 - Network Configuration module

• Card Configuration

The **Card Configuration** module allows you to set various adapter settings including TCP Offload. Offload settings are only available when using the TOE capable drivers (*t3_tom* and *toecore* for T3 cards; *t4_tom* and *toecore* for T4 cards).

The screenshot shows the 'Card Configuration' window. It has a title bar with a question mark icon. Inside, there's a 'Refresh' button with a circular arrow icon. Below that, the 'Card Configuration' section contains a 'Select a Group:' dropdown menu with 'group_win_t4adapter' selected. To the right of this are two rows of settings: 'Group Type:' with the value 't4adapter' and 'OS Type:' with the value 'WINDOWS'. To the right of these is a 'Note:' section with two lines of text: 'MIN = Minimun value a variable of type int can assume' and 'MAX = Maximun value a variable of type int can assume'. Below this is a table with three columns: 'DESCRIPTION', 'RANGE', and 'VALUE'. The table has one row with 'Max VM' in the 'DESCRIPTION' column, '[0,16]' in the 'RANGE' column, and a text box containing '4' in the 'VALUE' column. At the bottom of the window are two buttons: 'Set Card Properties' and 'Discard Changes'.

DESCRIPTION	RANGE	VALUE
Max VM	[0,16]	4

Figure 76 - Card Configuration module

• Port Configuration

In the **Port Configuration** module, you can set various port settings like enabling Tx checksum and TCP segmentation offload, setting Link speed and link duplex mode, etc. The settings depend on the device driver installed.

Port Configuration

?

Select a Group:

group_t4port

Group Type:

t4port

OS Type:

WINDOWS

Refresh

Note:

MIN = Minimun value a variable of type int can assume

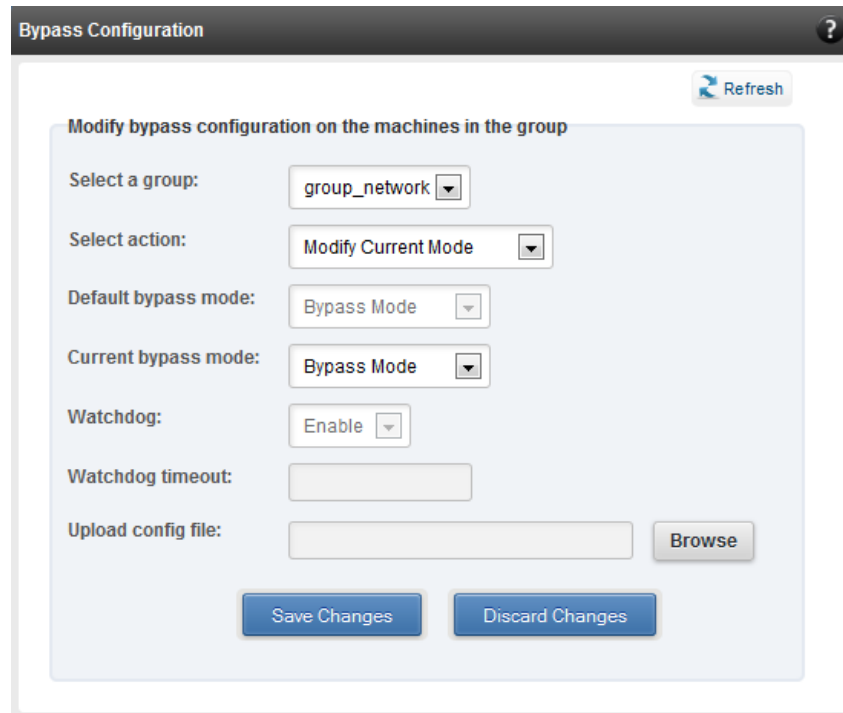
MAX = Maximun value a variable of type int can assume

DESCRIPTION	RANGE	VALUE
Link speed and link duplex	auto 100-full 1000-full	auto
Enable Disable LSO IP v4	0 1	1
Enable Disable LSO Ip v6	0 1	0
FlowControl	[0,3]	1
IP CheckSum Offload	[0,3]	2
Enable Disable Virtual Machine Queue	0 1	
Enable Disable VMQLookAheadSplit	0 1	
Enable Disable VMQVLanFilter	0 1	
TCP CheckSum Offload v4	[0,3]	
TCP CheckSum Offload v6	[0,3]	
UDP CheckSum Offload v4	[0,3]	
UDP CheckSum Offload v6	[0,3]	
Max Number of Response Queue	[1,8]	
RSS load balancing profile	[0,4]	

Figure 77 - Port Configuration module

- **Bypass Configuration**

Use the **Bypass Configuration** module to configure Chelsio's bypass adapters like B420-SR and B404-BT.



The screenshot shows the 'Bypass Configuration' window. At the top, there's a title bar with a question mark icon. Below it, a 'Refresh' button with a circular arrow icon is visible. The main content area is titled 'Modify bypass configuration on the machines in the group'. It contains several configuration options: 'Select a group:' with a dropdown menu showing 'group_network'; 'Select action:' with a dropdown menu showing 'Modify Current Mode'; 'Default bypass mode:' with a dropdown menu showing 'Bypass Mode'; 'Current bypass mode:' with a dropdown menu showing 'Bypass Mode'; 'Watchdog:' with a dropdown menu showing 'Enable'; 'Watchdog timeout:' with an empty text input field; and 'Upload config file:' with an empty text input field and a 'Browse' button. At the bottom of the configuration area, there are two buttons: 'Save Changes' and 'Discard Changes'.

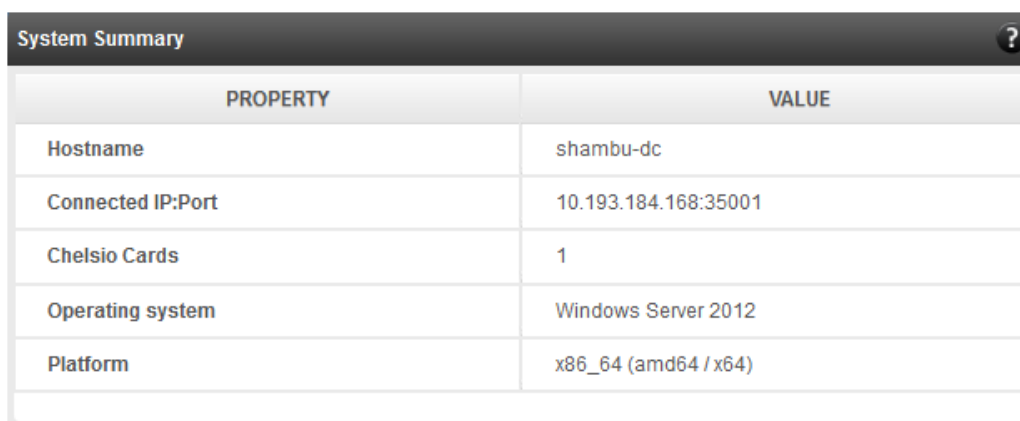
Figure 78 - Bypass Configuration module

8.5. System page

The system page is displayed, when the system hostname / IP address is selected in the tree menu on the left. On adding a system, this item is automatically selected, and this page is displayed. The system page contains generic system and support modules which are discussed below:

8.5.1. System summary

This module lists the system Hostname, Operating System, platform and also gives the count of the Chelsio cards found.

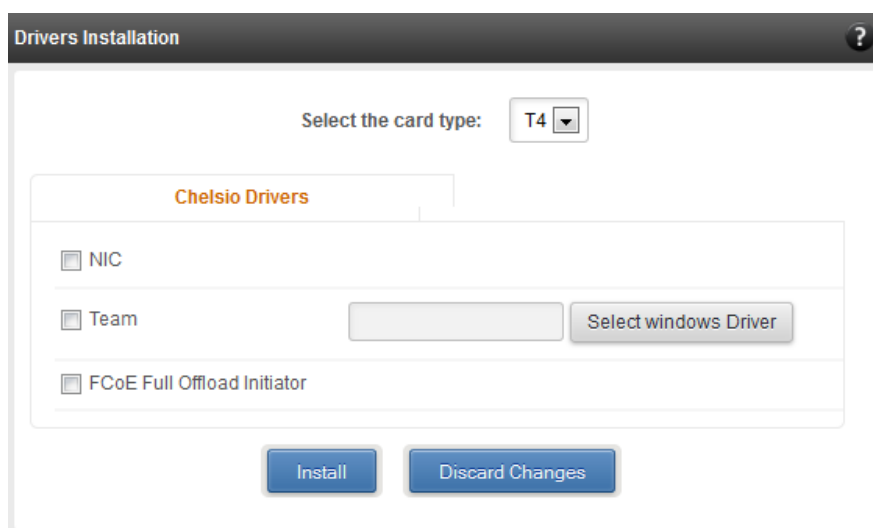
The image shows a window titled "System Summary" with a question mark icon in the top right corner. It contains a table with two columns: "PROPERTY" and "VALUE".

PROPERTY	VALUE
Hostname	shambu-dc
Connected IP:Port	10.193.184.168:35001
Chelsio Cards	1
Operating system	Windows Server 2012
Platform	x86_64 (amd64 / x64)

Figure 79 - System Summary module

8.5.2. Drivers Installation

Using this module, one can install various Chelsio drivers for different operating systems.

The image shows a window titled "Drivers Installation" with a question mark icon in the top right corner. It contains a form with a "Select the card type:" label and a dropdown menu showing "T4". Below this is a section titled "Chelsio Drivers" with three checkboxes: "NIC", "Team", and "FCoE Full Offload Initiator". The "Team" checkbox is selected, and there is a text input field next to it. To the right of the text input field is a button labeled "Select windows Driver". At the bottom of the window are two buttons: "Install" and "Discard Changes".

Select the card type: T4

Chelsio Drivers

☐ NIC

☒ Team

☐ FCoE Full Offload Initiator

Figure 80 - Drivers Installation module connected to Windows Agent

8.5.3. Driver Details

A list of Chelsio device drivers with related information like driver description, version, current load status and installation date is shown in this module. To load or unload a particular driver, select the appropriate option (Yes to load, No to unload) in the corresponding cell of the *Loaded* column and click **Load/Unload Driver** button. Click **Refresh** if changes are not reflected immediately. To reject the load/unload option selected, click **Discard Changes**.

Driver Details ?				
<div>Refresh</div> <div> <div>Load / Unload Driver</div> <div>Discard Changes</div> </div>				
DRIVER	LOADED	VERSION	DATE	DESCRIPTION
ch_vbd	No	N/A	N/A	Chelsio T3 Ethernet Function Enumerator
cxge3	No	N/A	N/A	Chelsio T3 Ndis Function driver
chteamp	No	N/A	N/A	Chelsio NIC Teaming Driver
chiscsi	No	N/A	N/A	Chelsio T3 iSCSI Driver
chiwarp	No	N/A	N/A	Chelsio T3 iWarp interface Driver
ChelsioT4	Yes	4.3.8.0	2-14-2013	Chelsio T4 Driver
cht4vbd	Yes	4.3.8.0	2-14-2013	Chelsio T4 Virtual Bus Driver
csiofcoe	Yes	1.3.0.4	2-27-2013	Chelsio T4 FCoE Driver

Figure 81 - Driver Details module

8.5.4. System Diagnostics

Using this module, you can run various diagnostic tests on Chelsio adapters to troubleshoot adapter related issues. Select the adapter(s) from the list for which you want to run the test, select the operation (type of test; you can run more than one test at a time) and click **Run Test**. After the tests are completed, the results will be displayed in a tabular format.

CARD	LED	CONTROL REGISTERS	MI I REGISTERS	EEPROM	INTERNAL MEMORY
T420-CR	Success	Success	Success	Success	Success

Figure 82 - System Diagnostics module for a T4 CNA

8.5.5. Unified Wire Manager Component Versions

A list of the Unified Wire Manager agent components installed on the managed system is shown in this module. The versions of the components are useful in case of reporting an issue to support.



COMPONENT	VERSIONS
Server	2.4.29
msiscsi	1.1.6
winchiscsi	2.0.0
win_net	2.0.0
winteam	2.0.0
winhwlib	2.0.3
winosapi	2.0.0

Figure 83 - Unified Wire Manager Component Versions module

8.5.6. VM Configurations

The VM Configurations module allows you to view UUID and Power and Health state of Virtual Machines. You can perform various system power options like enable (start VM), disable (stop VM), reboot (restart VM), pause and suspend (save VM state).

You can perform similar actions on multiple virtual machines. To do so, click on the machine names in the list. The properties box will display the domain state of the machines selected. Now, click on any of the system power actions provided at the bottom.

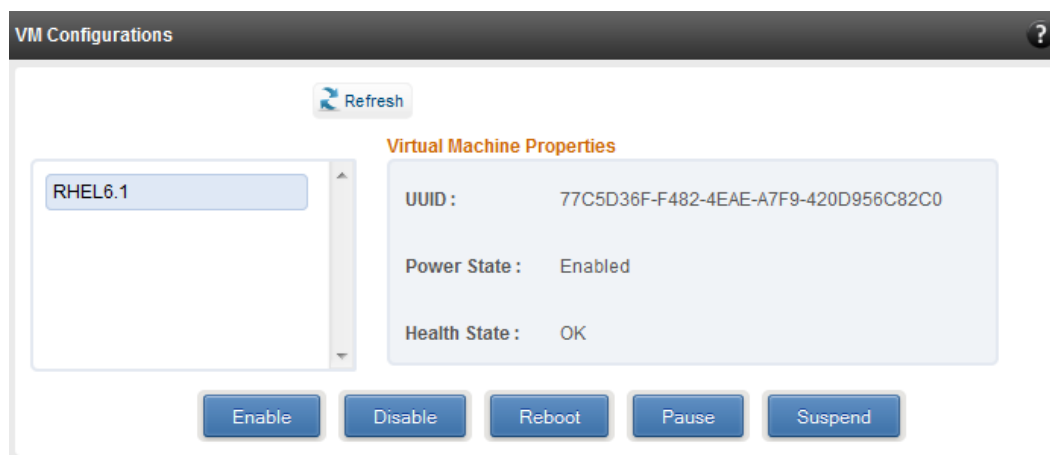


Figure 84 - VM Configurations module

8.5.7. Managed system application logs

The management agent logs its activities and any errors that occur, in `/var/log/chelsio` in *Linux* and *FreeBSD* and in the Event log, in *Windows*. This log can be obtained in this module. Only 20 entries can be obtained and viewed at a time. Logs can be viewed by either choosing from a list of fixed range or by specifying a custom starting point.

Use the **Get Logs** button to retrieve, and **Hide Logs** button to clear the log entries. The **Delete Logs** button will remove the logs permanently from the agent.

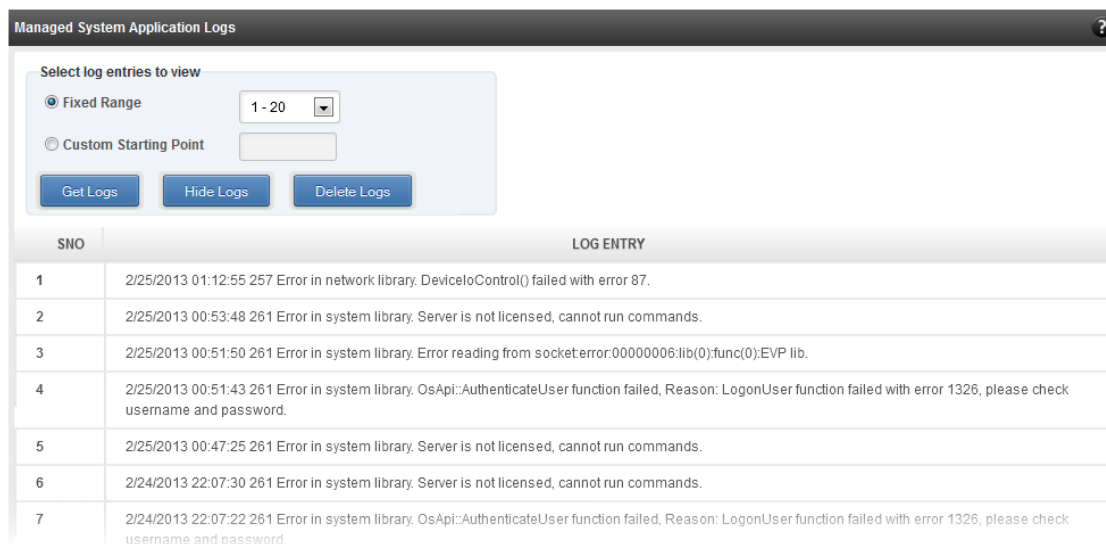


Figure 85 - Managed System Application Logs module for Windows Agent

8.6. Network page

8.6.1. Network summary

The **Network Summary** module provides the total number of Chelsio adapters present, including the number of T5, T4 and T3 adapters. It also provides the total number of Network interfaces including corporate and Chelsio interfaces and VLANs.

Network	
PROPERTY	VALUE
No. Of Chelsio Cards	2
No. Of T4 Cards	1
No. Of T3 Cards	1
No. Of Network Interfaces	7

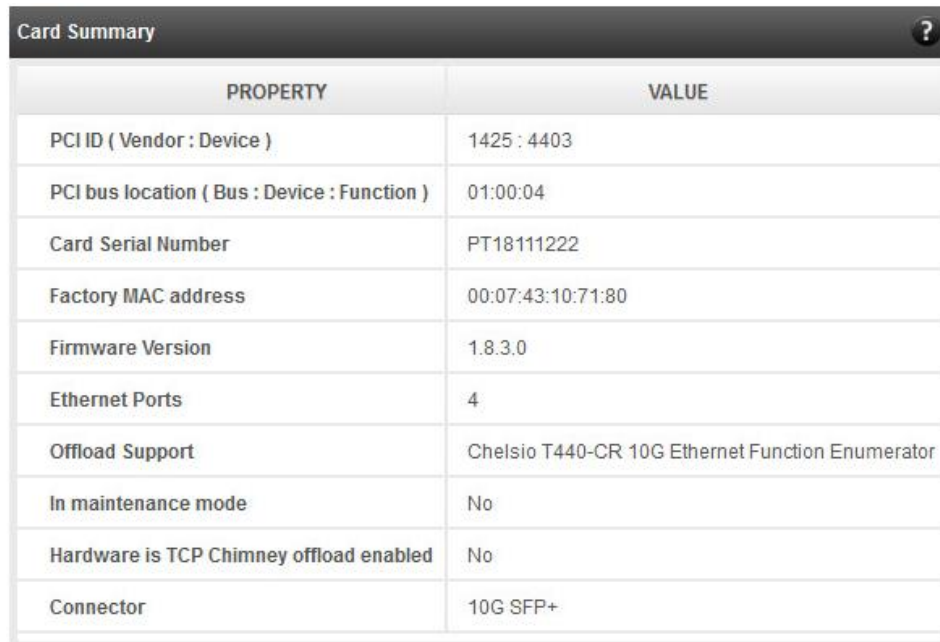
Figure 86 - Network Summary module

8.6.2. Chelsio card page

When a Chelsio card is selected in the tree menu on the left, this page is displayed. It provides details of the card and associated settings. It also displays any card specific statistics that the hardware provides. The modules available on this page are as below:

- **Card summary**

This module provides PCI, firmware and other details of the card. The card's serial number and factory MAC address are also provided for inventory purposes.



PROPERTY	VALUE
PCI ID (Vendor : Device)	1425 : 4403
PCI bus location (Bus : Device : Function)	01:00:04
Card Serial Number	PT18111222
Factory MAC address	00:07:43:10:71:80
Firmware Version	1.8.3.0
Ethernet Ports	4
Offload Support	Chelsio T440-CR 10G Ethernet Function Enumerator
In maintenance mode	No
Hardware is TCP Chimney offload enabled	No
Connector	10G SFP+

Figure 87 - Card Summary module for a Windows Agent

• TCP Offload settings (Linux & FreeBSD)

The TCP offload settings applicable to the card are shown here. These settings are only available when using the TOE capable drivers (*t3_tom* and *toecore* for T3 cards; *t4_tom* and *toecore* for T4 cards). On changing the settings, the changed settings may not reflect immediately on refreshing the data. Highlight the system item in the tree menu on the left, and click "Refresh", to refresh data from the system, in case the updated settings are not being shown.

TCP Offload Settings (Offload Card and Offload Summary Only) ?

Save or Discard Driver Settings Changes:
 Save Changes
Discard Changes

DESCRIPTION	VALUE
TCP offload engine enabled (activated):	Yes ▼
Direct data placement (ddp):	Yes ▼
Soft listen backlog limit (soft_backlog_limit):	Yes ▼
Max offloaded connections (max_conn):	40960 ↕
Delayed ACK (delack):	0 ↕
Max Tx payload size (mss):	-1 ↕
Max host send buffer per socket (max_host_sndbuf):	1 ↕
Threshold payload size in bytes for Tx (tx_hold_thres):	1048576 ↕
Min Rx credits for RX_DATA_ACK (rx_credit_thres):	0 ↕
Min Rx payload size in bytes for DDP activation (ddp_thres):	15360 ↕
DDP wait for push flag (ddp_push_wait):	Yes ▼
DDP receive coalescing (ddp_rcvcoalesce):	No ▼

Figure 88 - TCP Offload Settings module for a FreeBSD Agent

• Device Driver settings (Windows)

The device driver settings applicable to the card are shown here. For Chelsio T5 and T4 adapters, only the *MaxVMQueues* field will be displayed. On changing the settings, the changed settings may not reflect immediately on refreshing the data. Highlight the system item in the tree menu on the left, and click **Refresh**, to refresh data from the system, in case the updated settings are not being shown.

DESCRIPTION	VALUE
MaxVMQueues:	10

Figure 89 - Device Driver Settings module for a Windows Agent

• Card statistics

Certain statistics are maintained on a per card basis (instead of a per port basis), since the card has a TCP/IP offload capability. The statistics are for TCP and IP protocol processing done in the card's hardware. These statistics may only be applicable if the card is TOE enabled.

STATISTIC	VALUE
OutRsts	0
InSegs	44
OutSegs	57
RetransSegs	0

Figure 90 - Card Statistics module

8.6.2.1. Chelsio card's port

The port page is displayed on selecting a port of a Chelsio card listed in the tree menu on the left. It provides details of the port and port settings. It also displays any port specific statistics that the hardware provides. The modules available on this page are as below:

• Port summary

The port details such as the Ethernet adapter name and link details are shown in this module.

Port Summary	
PROPERTY	VALUE
Port Name	Local Area Connection 89
Link	Link up

Figure 91 - Port Summary of T4 CNA

• Port settings

Port settings such as MTU, Link speed and others can be set in this module. The settings depend on the device driver installed.

Port Settings

Save or Discard Port Settings Changes:
Save Changes
Discard Changes

DESCRIPTION	VALUE
MTU (in bytes):	1500
Link speed and duplex operation:	10Gb/s Full duplex
Tx checksum offload enabled:	No
Rx checksum offload enabled:	No
Tx pause frame support enabled:	No
Rx pause frame support enabled:	No
Receive side scaling enabled:	Yes
VLAN ID:	0
Large segment offload V2 (IPv4):	Yes
Large segment offload V2 (IPv6):	Yes
Flow control:	Tx and Rx Enabled
IPv4 checksum offload:	Tx and Rx Enabled
VMQ:	Yes
VMQ look ahead split:	Yes
VMQ offload enabled:	Yes

Figure 92 - Port Settings of T4 CNA

- **Port statistics**

Ethernet statistics and additional hardware statistics for the port are displayed in this module.

Port Statistics ?	
STATISTIC	VALUE
tx_octets	0
tx_frames	0
tx_bcast_frames	0
tx_mcast_frames	0
tx_ucast_frames	0
tx_error_frames	0
tx_frames_64	0
tx_frames_65_127	0
tx_frames_128_255	0
tx_frames_256_511	0
tx_frames_512_1023	0
tx_frames_1024_1518	0
tx_frames_1519_max	0
tx_drop	0

Figure 93 - Port Statistics of T4 CNA on Windows Agent

8.6.3. Networking Management page

The system networking configurations are shown on this page. IP addresses, MTU, VLAN Ids, DNS and default gateway settings can be viewed and modified here. Network adapters can also be enabled or disabled as required. The modules available on this page are as below:

- **System Network configuration**

The list of network adapters on the system is displayed in a list on the left. The icon for the adapter indicates whether it is administratively enabled and if it is connected to the network. The primary IP address (IPv4) can be set for the adapter, when it is selected. There is an option to add/modify/delete additional IP addresses or aliases for the specified adapter. Use the option to add additional IP addresses with caution, since multiple IP addresses configured on the same adapter, for the same network, may result in unpredictable behavior of the system's networking

stack. Maximum Transfer Unit (MTU) can be set between 1500-9000 bytes. VLAN id can also be set for an adapter within the range 0-4094 (enter 0 to disable it).

You can use the View/Set IP addresses option to add, modify or delete IP aliases.

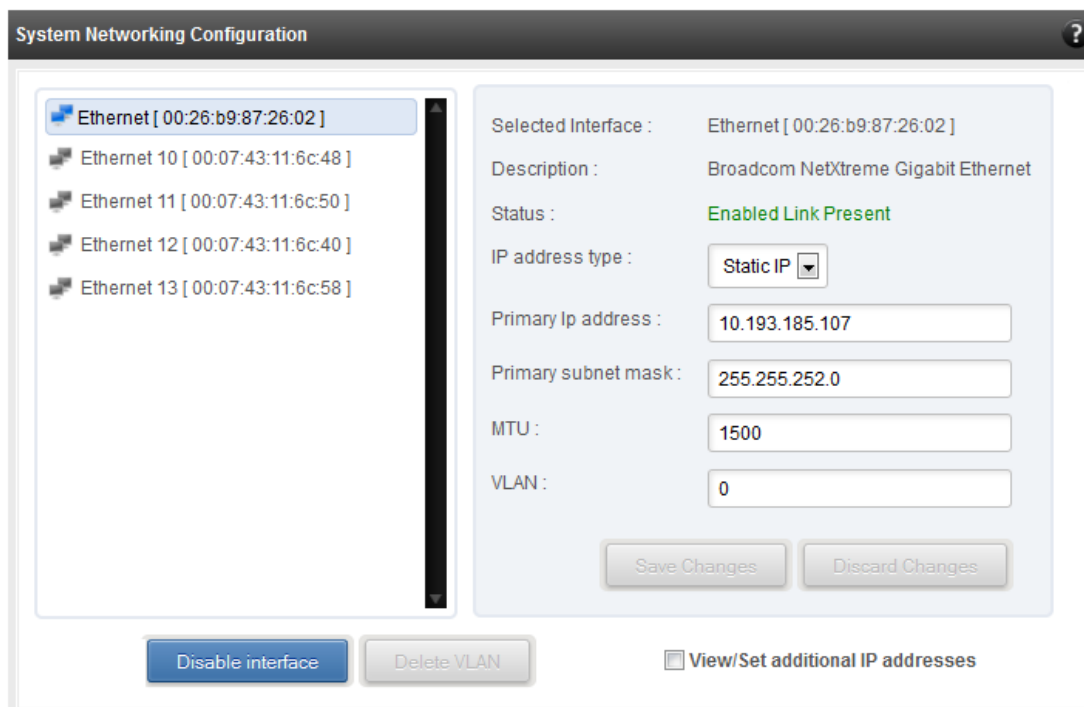


Figure 94 - System network configuration module

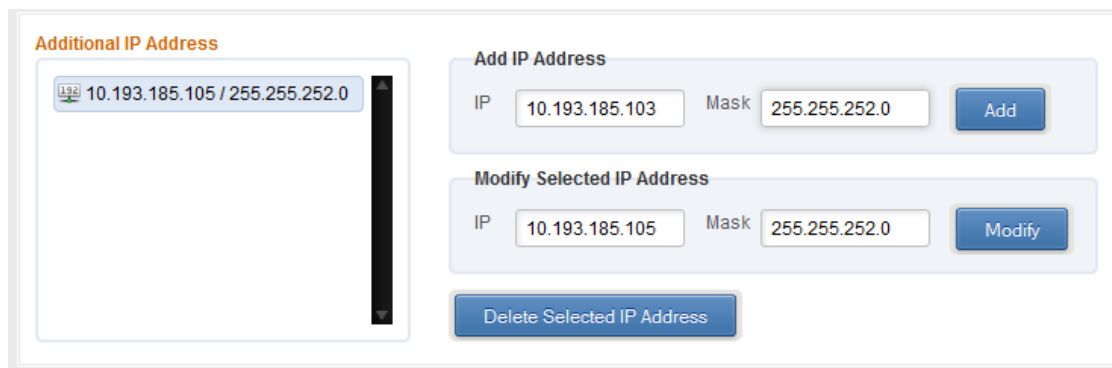


Figure 95 - Managing IP aliases

• System network statistics

Using this module, one can generate reports based on Throughput pkts/sec and Throughput Mbs (Receive, Transmit, Bi-direction) in Table and Graph format for a network adapter. A report for hardware statistics can be generated based on different parameters, only in the Table view

in the **Advanced NIC characteristics**. The **polling time** field sets the average time (in seconds) based on which the table/graph updates the report.

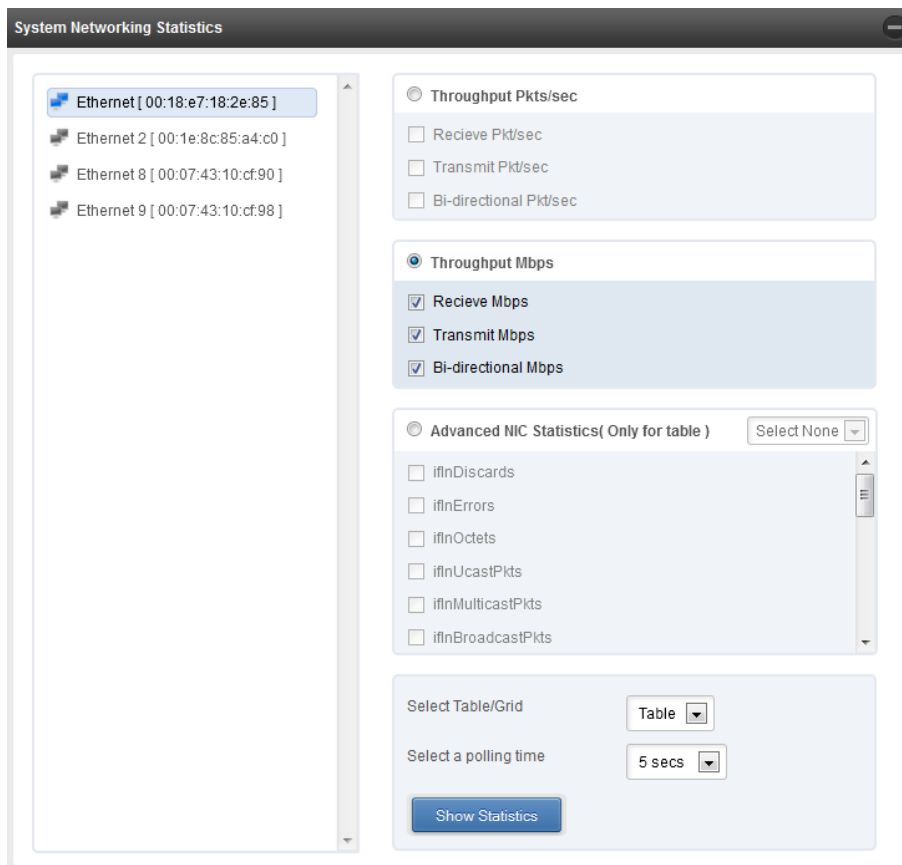


Figure 96 - System network statistics module

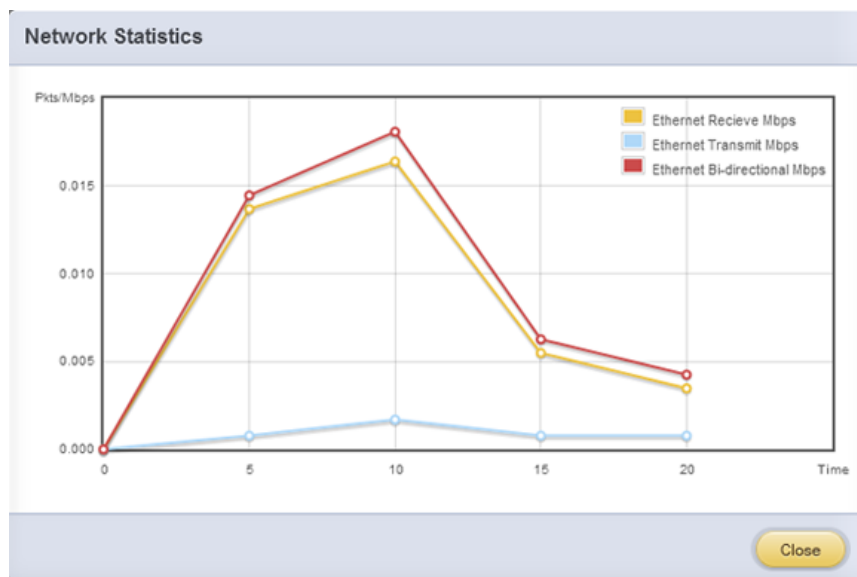


Figure 97 - Network Throughput Vs Time instant Graph

Network Statistics	
	Ethernet
Recieve Mbps	0.0023536
Transmit Mbps	0.000912
Bi-directional Mbps	0.0032656

Figure 98 - Network Throughput Vs Time instant Table

• Default Gateway and DNS configuration

The DNS servers list can be set here. The default gateway for remote networks and the Internet can also be set here. On Linux and FreeBSD, only one default gateway is allowed. On Windows, you may set multiple default gateways with caution, since it may cause the system to stop communicating with external networks.

Figure 99 - Default gateway and DNS configuration module for a Windows Agent

• Create a network team/bond device (Linux and FreeBSD)

A list of regular network adapters is provided here, to create a Network Team / Bond device. The available modes for the team depend on the OS teaming / bonding driver in use. On Linux

the team may be created with a DHCP or Static IP address. Please check with the driver documentation for the supported modes for creating a team / bond, with offload enabled Chelsio cards. All modes may not be available with all configurations / combinations. Also, the team members can only be 2 ports of a single offload-enabled card, and not across Chelsio cards. Do not mix third party cards and offload-enabled Chelsio cards in a single team.

The screenshot shows a window titled "Create a Network Team/Bond Device" with a help icon in the top right. On the left, under "Select Team Members", there is a list of network interfaces: eth9 [00:07:43:ab:cd:ef], eth10 [00:07:43:ab:cd:f7], eth0 [00:30:48:b8:51:9a], and eth1 [00:30:48:b8:51:9b]. The last two are highlighted with blue selection boxes. On the right, there is a "Refresh" button and a "Driver Status" message: "Teaming/bonding driver is offload-capable". Below this, the "Team Name" field is empty. The "Team Mode" dropdown is set to "Round-Robin". The "Team Priority" list shows two items: 1. eth0 and 2. eth1. The "IP Address Type" dropdown is set to "DHCP". There are empty input fields for "Static IP Address" and "Static Subnet Mask". At the bottom right is a "Create Team" button.

Figure 100 - Create a network team/bond device module for Linux Agent

• Network troubleshooting

This module allows detecting and troubleshooting various network connectivity issues. The Ping utility helps to contact a system by specifying IP address, Number of ICMP packets to send and packet timeout. The result of the ping can be viewed by clicking on the **Ping Result** button.

Using **TraceRoute** one can determine the route taken by packets across an IP network.

Use the **GetConnections** utility to view currently active TCP/UDP connections. Offload status for each connection is also displayed if protocol offload hardware is available. This is useful for troubleshooting any connectivity issues for clients to various services.

Ping

Destination :

No. Of ICMP Packets to send :

ICMP Packet timeout in seconds :

Pkts Send: 4 , Pkts Recvd: 4 , AVgRtt: 5 ms [Clear](#)

Figure 101 - Ping Utility

TraceRoute

Destination :

Hop Count	Round Trip Time	Ipv4 Address
1	2 ms	10.193.184.1
2	0 ms	10.193.177.3
3	5 ms	111.93.129.157
4	8 ms	121.241.196.101
5	3 ms	121.240.1.242
6	23 ms	172.29.250.33
7	24 ms	180.87.38.5
8	131 ms	80.231.217.17
9	130 ms	80.231.217.6
10	131 ms	80.231.154.17
11	132 ms	208.178.58.109
12	274 ms	208.178.63.114
13	272 ms	72.13.84.18

[Hide](#)

Figure 102 - TraceRoute Utility

GetConnections

[GetConnections](#)

PROTOCOL	LOCAL ADDRESS	REMOTE ADDRESS	STATE	OFFLOAD
TCP	0.0.0.0:135	0.0.0.0	Listening	In host
TCP	0.0.0.0:445	0.0.0.0	Listening	In host
TCP	0.0.0.0:3389	0.0.0.0	Listening	In host
TCP	0.0.0.0:35001	0.0.0.0	Listening	In host
TCP	0.0.0.0:47001	0.0.0.0	Listening	In host
TCP	0.0.0.0:49152	0.0.0.0	Listening	In host
TCP	0.0.0.0:49153	0.0.0.0	Listening	In host
TCP	0.0.0.0:49154	0.0.0.0	Listening	In host
TCP	0.0.0.0:49155	0.0.0.0	Listening	In host
TCP	0.0.0.0:49156	0.0.0.0	Listening	In host

Figure 103 - GetConnections Utility

8.6.3.1. Hypervisor

• Virtual Network Manager

This module allows you to view and manage virtual networks. The left pane displays a list of different virtual networks created. Clicking on a virtual network name will display related properties on the right.

If a virtual network is added to a virtual machine, a “+” link appears. Expanding the link will display the virtual machines to which the network is attached. Click on the virtual machine names to view their properties on the right.

To delete a virtual network, click on the network name and then click “Delete Switch”. If it is attached to a virtual machine, you will have to detach the virtual machine first. To do so, click on the virtual machine and click “Detach”. Similarly, detach all the virtual machines and then use the “Delete Switch” to delete the virtual network.

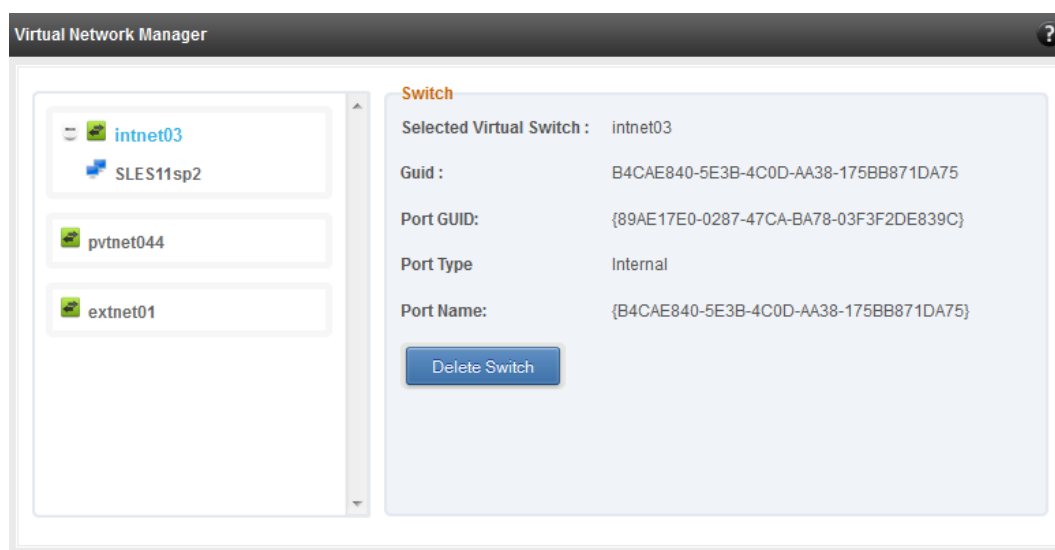


Figure 104 - Virtual Network Manager module

• Add Virtual Network Configuration

There are three kinds of virtual networks you can create using this module:

- **External network:** Using this type, you can provide virtual machines access to external networks and vice versa via a physical network adapter in the host system. The virtual machines can also communicate with each other on the same virtual network.
- **Internal Network:** This type allows communication between virtual machines in the same virtual network and also between the virtual machines and the host. This type of virtual network is not bound to any physical network adapter and no access to external networks is provided.

- **Private Network:** A Private Network is similar to Internal Network in that physical adapter is not required for setup and access to external networks is not provided. However, unlike Internal Network, guest operating systems can only communicate with guest operating systems in the same private network and not with the host. The host operating system cannot access the virtual machines on private network.

Once created, you can manage the virtual networks in the **Virtual Network Manager** module.

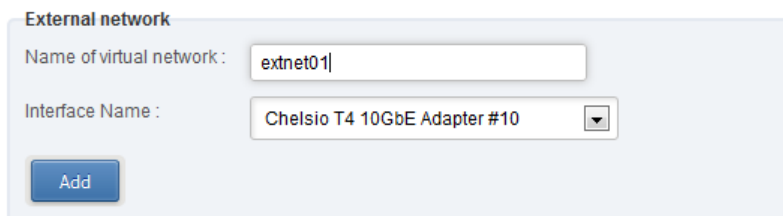


Figure 105 - Creating external virtual network

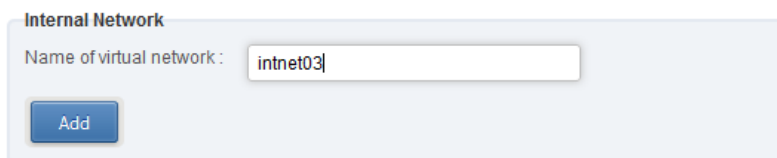


Figure 106 - Creating internal virtual network

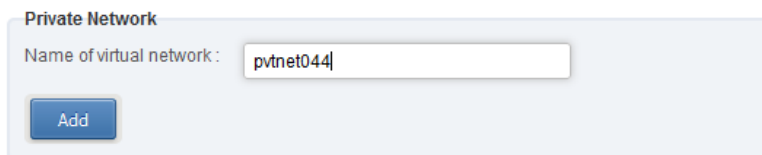


Figure 107 - Creating private virtual network

• Virtual Network Settings

To attach a virtual network to a virtual machine, select the virtual network from the **Virtual Network** list and the virtual machine from the **VM** list. Finally click *Attach*.

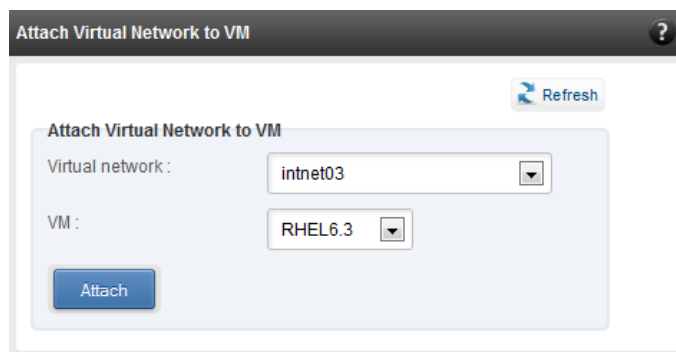


Figure 108 - Attaching Virtual Network to VM

8.6.4. iWARP

- **iWARP Settings**

On Linux Agents, iWARP parameter settings for Chelsio's RDMA capable NICs can be set using this module. These settings can be set only when iWARP driver (*iw_cxgb4* for T4 and T5; *iw_cxgb3* for T3) is loaded. If you set any parameter for a T5 adapter, it applies for all the T5 adapters present. Same applies for T4 and T3 adapters.

On Windows Agents, only T3 HBAs are supported currently. Parameters can be set per port.

On FreeBSD Agents, only T4 CNAs are supported. iWARP parameter settings can be set only when *iw_cxgbe* driver is loaded.

?

iWarp Settings

Select a Driver:

iw_cxgbe

Save Changes

Discard Changes

DESCRIPTION	VALUE
peer2peer	No
ep_timeout_secs	60
mpa_rev	1
markers_enabled	No
crc_enabled	Yes
rcv_win	262144
snd_win	131072
db_delay_usecs	1
ocqp_support	Yes
db_fc_threshold	2000
fastreg_support	No
dack_mode	1
c4iw_max_read_depth	8
enable_tcp_timestamps	No
enable_tcp_sack	No
enable_tcp_window_scaling	Yes
c4iw_debug	Yes
p2p_type	1

Figure 109 - iWARP settings for T4 CNA for FreeBSD Agent

iWarp Settings

Select a Driver:

iw_cxgb4

Save Changes

Discard Changes

DESCRIPTION	VALUE
peer2peer	No
ep_timeout_secs	60
mpa_rev	1
markers_enabled	No
crc_enabled	Yes
rcv_win	262144
snd_win	32768
nocong	No
cong_flavor	1

Figure 110 - iWARP settings for T4 CNA for Linux Agent

8.7. Storage

- Storage Summary

The **Storage** module lists the status of configuration modules under Storage section, running on the agent.

Storage	
PROPERTY	VALUE
FCoE service on server	Enabled
iSCSI Initiator service on server	Enabled
iSCSI Target service on server	Enabled

Figure 111 - Storage Summary Module

8.7.1. FCoE Initiator (Linux, Windows, XenServer)

All supported Chelsio FCoE initiators available on the operating system can be managed from this page. FCoE support is extended on Linux, Windows and XenServer platforms. Please refer [Platform/Driver Matrix](#) section on the list of operating systems that are supported.

- **FCoE Initiator Summary**

This module provides details about the driver installed; such as driver name and its version. The module also gives information about the number of FCoE enabled cards that are present on the machine.

FCoE Initiator Summary ?	
PROPERTY	VALUE
FCoE Driver	csiostor (1.1.0.9)
No. of FCoE enabled cards	2
No. of FCoE Ports	6

Figure 112 - FCoE Initiator Summary module for Linux Agent

8.7.1.1. FCoE Initiator Card

- **FCoE Card Summary**

Details pertaining to the card used such as model, firmware/hardware version etc, are provided in this module.

FCoE Card Summary ?	
PROPERTY	VALUE
Vendor ID	1425
Card Serial Number	PT41110672
Number of FCoE Ports	4
Manufacturer	Chelsio T440-LP-CR 10G [FCoE]
Model	T440-LP-CR
Hardware Version	T440-LP-CR 10G
Firmware Version	1.7.0.0

Figure 113 - FCoE Card Summary module

• FCoE Attributes

Information such as Interrupt modes (MSI/MSI-X/INTx), SCSI mode and the card state are provided in this module.

FCoE Attributes ?	
PROPERTY	VALUE
Interrupt Mode	MSI-X
SCSI Mode	Initiator
State	READY

Figure 114 - FCoE Attributes module

8.7.1.2. FCoE Port

This is an actual N_Port which communicates with the fabric and performs FIP and FCoE device discovery. This page lets the user to retrieve all the FCoE specific port information and also extend NPIV management support. It contains the following sections:

• FCoE Port Summary

The SCSI adapter name and the underlying ENODE MAC address of the physical port can be found here.

FCoE Port Summary ?	
PROPERTY	VALUE
Adapter Name	/dev/bsg0
ENode MAC	00:07:43:04:63:9F

Figure 115 - FCoE Port Summary module for Linux Agent

• FCoE Port Attributes

This module provides details about link status and port identifiers such as WWPN, WWNN, FC ID and NPort MAC Address. The module also contains fabric information such as fabric name, VLAN on which the FCoE service is currently running and the number of SCSI targets that are being discovered by this port. Port speed being mentioned in this section varies on the card

type (10G/1G) being used. Note that only class 3 service is supported by the initiator for now and the frame size is fixed to 2128 bytes as per spec.

FCoE Port Attributes ?	
PROPERTY	VALUE
State	Operational
NodeWWN	50:00:74:30:46:39:F0:00
PortWWN	50:00:74:30:46:39:F0:80
NPort MAC Address	0E:FC:03:53:00:23
Vlan ID	2
Fabric Name	20:02:00:05:73:D5:7A:C1
NPort ID	53:00:23
Type	NPort
Supported Class of Service	3
OS Device Name	/sys/class/fc_host/host119
Speed	10 GBPS
Maximum Frame Size	2128
No. of SCSI Targets	0

Figure 116 - FCoE Port Attributes module for Linux Agent

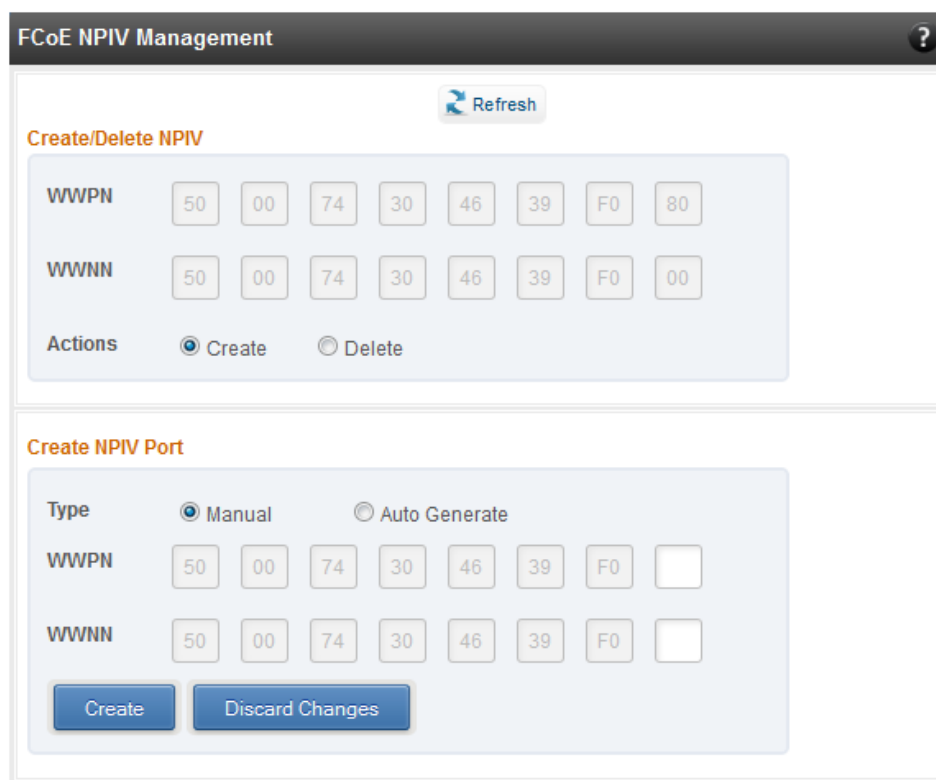
• FCoE NPIV management

NPIV is a fibre channel facility allowing multiple N_Port IDs to share a single physical N_Port. This module allows the user to manage virtual ports on the corresponding FCoE Port.

To create a virtual port, select the option **Create** and the GUI allows two ways of creating a virtual port.

- Manual: Where the user can manually create a virtual port by providing a value to the WWPN and WWNN fields.
- Auto-generate: Where the FCoE function auto-generates a WWPN and WWNN for the virtual port.

To delete a virtual port, select the option **Delete** and select the virtual port WWPN which you want to delete and click on **delete**.



The screenshot shows the 'FCoE NPIV Management' window. It has a 'Refresh' button at the top right. Below it is a section titled 'Create/Delete NPIV'. This section contains two rows of input fields for WWPN and WWNN, each with eight boxes. The WWPN row contains the values 50, 00, 74, 30, 46, 39, F0, and 80. The WWNN row contains 50, 00, 74, 30, 46, 39, F0, and 00. Below these fields are two radio buttons: 'Create' (selected) and 'Delete'. Below the 'Create/Delete NPIV' section is another section titled 'Create NPIV Port'. This section has a 'Type' label with two radio buttons: 'Manual' (selected) and 'Auto Generate'. Below the 'Type' are two rows of input fields for WWPN and WWNN, each with eight boxes. The WWPN row contains 50, 00, 74, 30, 46, 39, F0, and an empty box. The WWNN row contains 50, 00, 74, 30, 46, 39, F0, and an empty box. At the bottom of this section are two buttons: 'Create' and 'Discard Changes'.

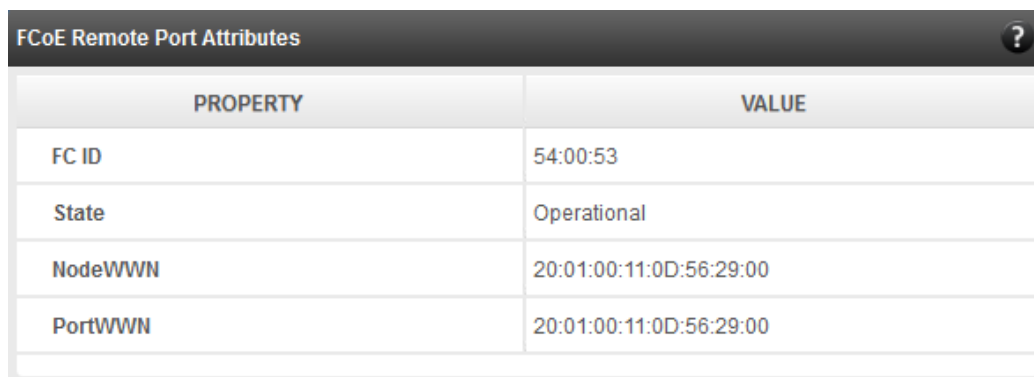
Figure 117 - FCoE NPIV management module

8.7.1.3. FCoE Remote Port

Remote ports are the SCSI targets that are discovered by their respective N_port/virtual ports. The GUI conveys the same via a tree structure so that the end user knows the initiator-target mapping.

- **FCoE Remote Port Attributes**

This module provides details about the discovered target such as target's FC ID, WWPN and WWNN so that the user can identify the discovered target accordingly.



The screenshot shows the 'FCoE Remote Port Attributes' window. It contains a table with two columns: 'PROPERTY' and 'VALUE'.

PROPERTY	VALUE
FC ID	54:00:53
State	Operational
NodeWWN	20:01:00:11:0D:56:29:00
PortWWN	20:01:00:11:0D:56:29:00

Figure 118 - FCoE Remote Port Attributes module

• FCoE Remote Port Lun Details

This module provides the LUN information such as size of the LUN, SCSI address, and LUN address. For Linux, the SCSI address is displayed in H:C:T:L (Host:Channel:Target:Lun) format and for Windows, it is displayed in P:B:T:L(SCSI Port:Bus:Target:Lun) format.

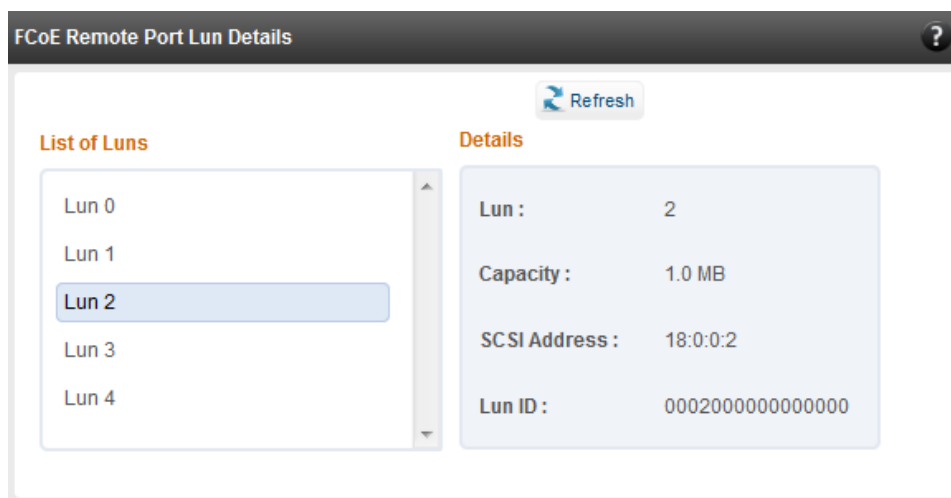


Figure 119 - FCoE Remote Port Lun Details module

8.7.1.4. FCoE Virtual Port

A virtual port allows multiple Fibre Channel initiators to occupy a single physical port, easing hardware requirements in SAN design, especially where virtual SANs are called for. The virtual ports appear under their respective N_Ports after creation and the GUI conveys it via a tree structure so that the end user knows the N_port-VN_Port mapping. It contains the following modules:

• FCoE Virtual Port Summary

The SCSI adapter name and the underlying ENODE MAC address of the physical port can be found here.

FCoE Virtual Port Summary	
PROPERTY	VALUE
Adapter Name	/dev/csiostor0
ENode MAC	00:07:43:04:63:A7

Figure 120 - FCoE Virtual Port Summary module for Linux Agent

• FCoE Virtual Port Attributes

The module provides details about link status and port identifiers such as WWPN, WWNN, FC ID and Virtual NPort MAC Address. The module also contains fabric information such as fabric name, VLAN on which the FCoE service is currently running and the number of SCSI targets that are being discovered by this virtual port. Port speed being mentioned in this section varies on the card type (10G/1G) being used. Note that only class 3 service is supported by the initiator for now and the frame size is fixed to 2128 bytes as per spec.

FCoE Virtual Port Attributes ?	
PROPERTY	VALUE
State	Operational
NodeWWN	50:00:74:30:46:3A:71:09
PortWWN	50:00:74:30:46:3A:71:89
NPort MAC Address	0E:FC:03:77:00:1D
Vlan Id	5
Fabric Name	20:05:00:05:73:D5:7A:C1
Nport ID	77:00:1D
Type	VN_Port
Supported Class Of Service	3
OS Device Name	/sys/class/fc_host/host127
Speed	10 GBPS
Maximum Frame Size	2128
No. of SCSI Targets	1

Figure 121 - FCoE Virtual Port Attributes module

• FCoE Remote Port Attributes

This module provides details about the discovered target for remote port associated with virtual port. Details such as target's FC ID, WWPN and WWNN are provided so that the user can identify the discovered target accordingly.

FCoE Remote Port Attributes ?	
PROPERTY	VALUE
FC ID	54:00:53
State	Operational
NodeWWN	20:01:00:11:0D:56:29:00
PortWWN	20:01:00:11:0D:56:29:00

Figure 122 - FCoE Remote Port Attributes module

• FCoE Remote Port Lun Details

This module provides LUN information for remote port associate with virtual port. Details such as size of the LUN, SCSI address, and LUN address are provided. For Linux, the SCSI address is displayed in H:C:T:L (Host:Channel:Target:Lun) format and for Windows, it is displayed in P:B:T:L(SCSI Port:Bus:Target:Lun) format.

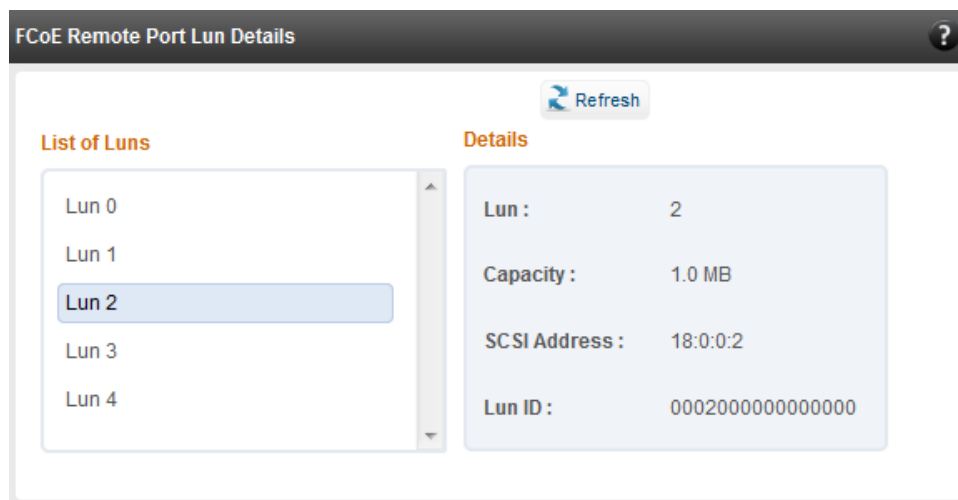


Figure 123 - FCoE Remote Port Lun Details module

8.7.2. iSCSI initiator (Linux, Windows)

All supported iSCSI initiators can be managed from this page. The supported initiators on Windows are Microsoft and Chelsio iSCSI initiator (T4 adapters). On Linux, Open iSCSI initiator is supported. The modules available on this page are:

• Initiator nodes

This module lists the initiator nodes / virtual adapters configured in the initiator stack. The node can be enabled or disabled (Chelsio node cannot be disabled in Windows), and its properties can be viewed and edited in this module. In the Chelsio Linux stack, new initiator nodes can be created too. Disabling the initiator causes it to log out of any iSCSI targets that it is connected to, thus removing any disks provided by the iSCSI targets that were connected. Use the **Disable** option with caution. The CHAP authentication secret should be between 12 and 16 characters in length, and the initiator's IQN name should start with "iqn.".

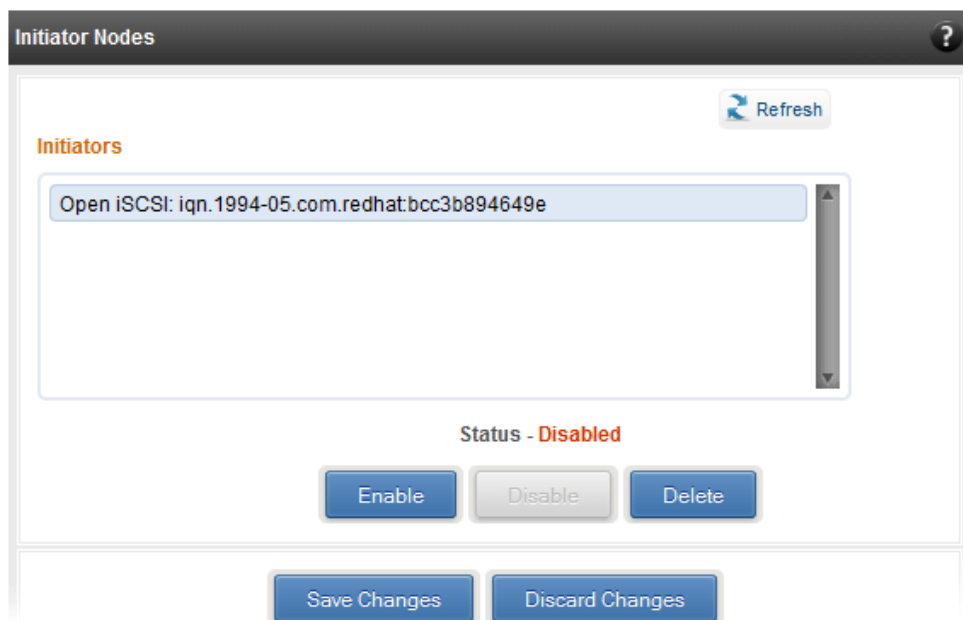


Figure 124 - Open iSCSI initiator

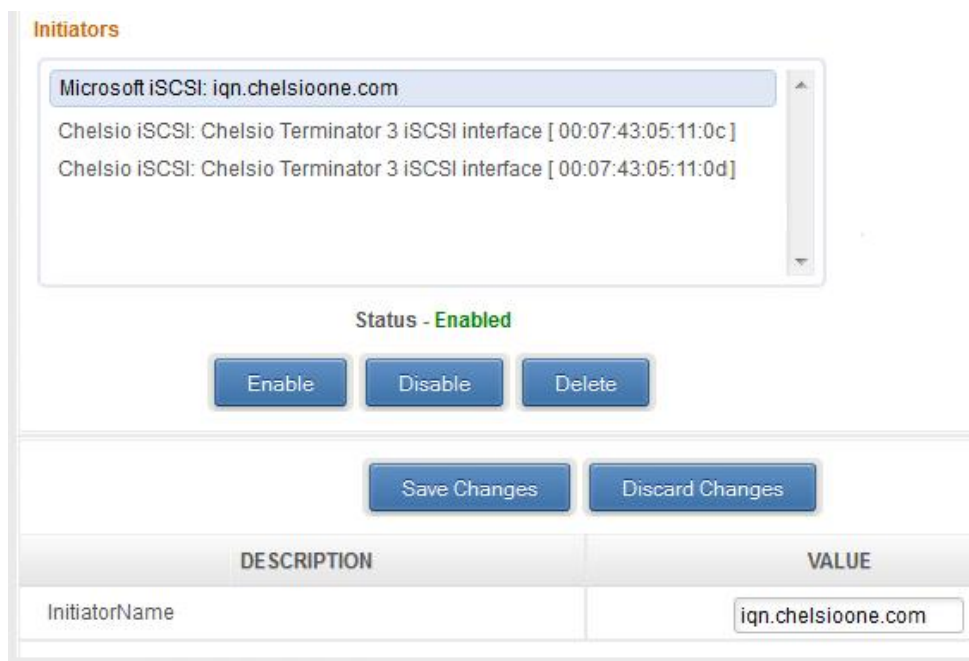


Figure 125 - Microsoft iSCSI initiator

Initiator Nodes

Refresh

Initiators

- Microsoft iSCSI: iqn.chelsioone.com
- Chelsio iSCSI: Chelsio Terminator 3 iSCSI interface [00:07:43:05:11:0c]
- Chelsio iSCSI: Chelsio Terminator 3 iSCSI interface [00:07:43:05:11:0d]**

Status - **Enabled**

Enable Disable Delete

Save Changes Discard Changes

DESCRIPTION	VALUE
IpAddress	102.192.182.11
SubnetMask	255.255.255.0
Gateway	0.0.0.0
iBFT	Yes
VlanInsertion	No
VlanID	777
TCPAck	0

Figure 126 - Chelsio iSCSI initiator

• Discover targets

iSCSI targets can be discovered by providing the IP address and TCP port (usually 3260) of the target. The discovery operation fetches the targets found at that Portal (combination of IP address and TCP port). The discovery operation also fetches all the other Portals that the target(s) are listening on. The discovered target can be deleted if required. Please note that all the Portals that the target sent are listed. The delete operation will not work on all the portals, only on the original discovery portal (the IP address and TCP Port specified when discovering the target).

Note *If there are any pre-existing iSCSI sessions established to the target, deletion of the target Portal from the discovered targets list will fail.*

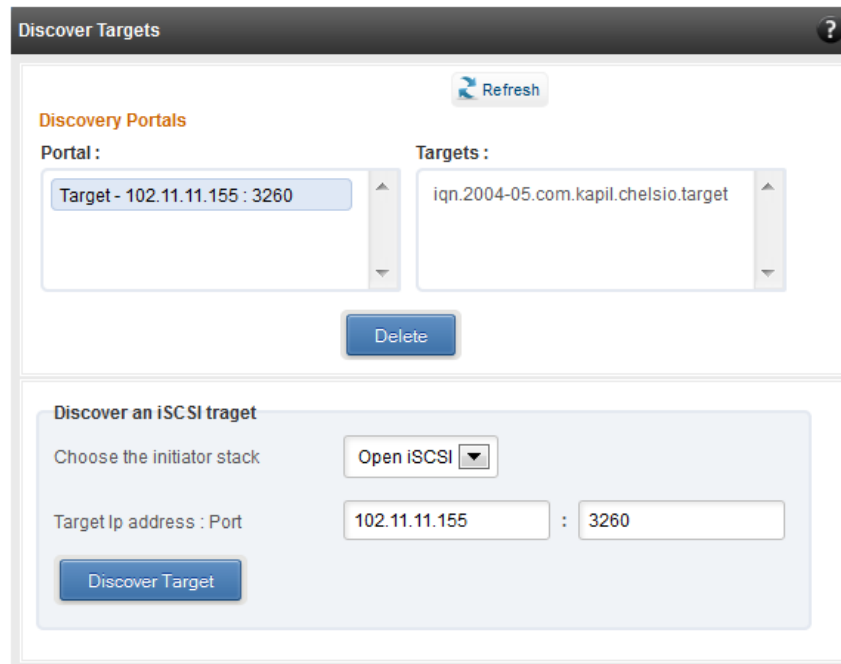


Figure 127 - Discover targets module

• Targets

The iSCSI targets that have been discovered, or are currently connected, are listed here. You may login, logout and delete the target from the initiator's configuration. If a target is connected, the sessions and connections to the target, and the disks provided by the target will be listed.

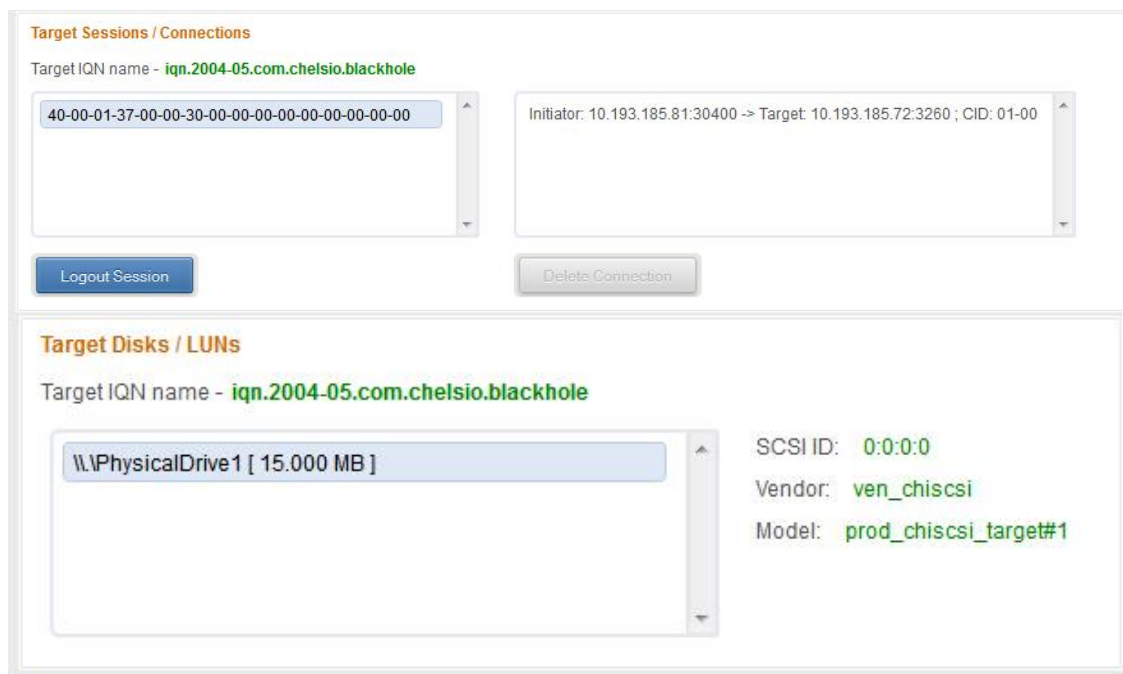
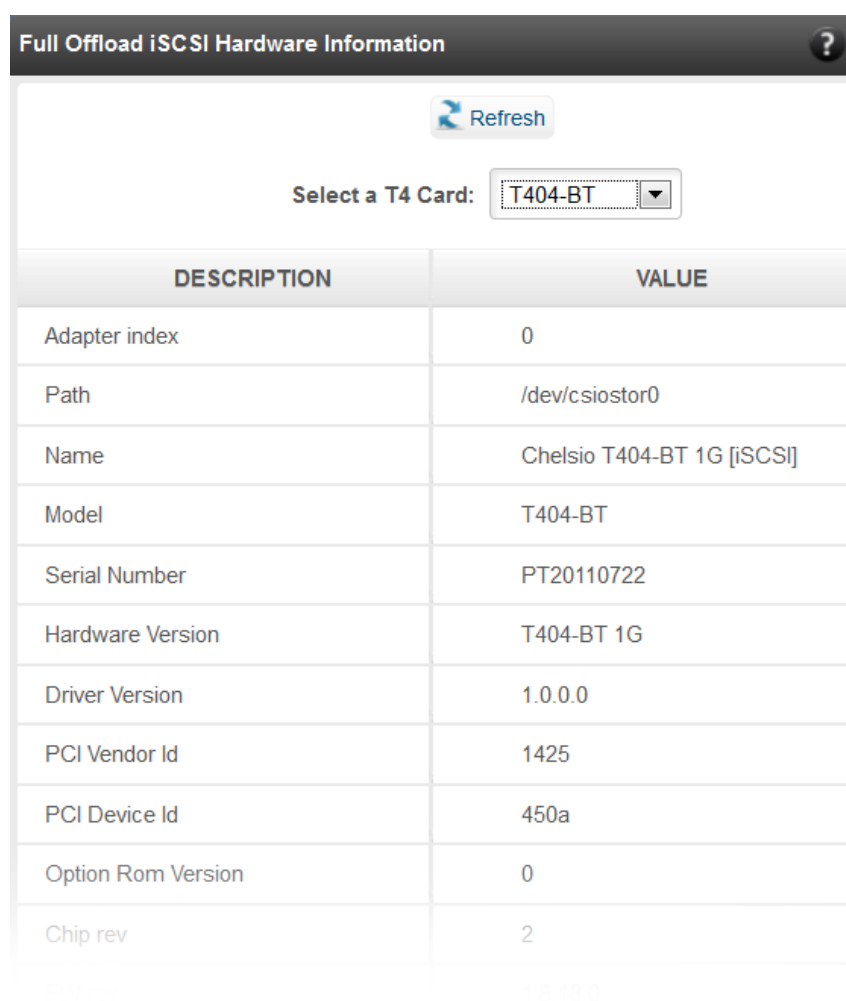


Figure 128 - Targets module after logging in

8.7.3. FO iSCSI Initiator (Linux)

- **Full Offload iSCSI Hardware Information**

PCI, firmware and other adapter related details are provided in this module. Select the Chelsio adapter for which you want to view properties from the **Select a T4 Card** drop-down list and the module will expand to display related properties. You can also view details like link id, status, enode mac, etc of all the ports of the selected adapter.



DESCRIPTION	VALUE
Adapter index	0
Path	/dev/csiostor0
Name	Chelsio T404-BT 1G [iSCSI]
Model	T404-BT
Serial Number	PT20110722
Hardware Version	T404-BT 1G
Driver Version	1.0.0.0
PCI Vendor Id	1425
PCI Device Id	450a
Option Rom Version	0
Chip rev	2

Figure 129 - Full Offload iSCSI Hardware Information module

- **FO iSCSI Manage Ports**

Here you can configure various port settings like VLAN id, Maximum Transmission Unit (MTU) and IP. Select a Chelsio adapter from **Select a T4 Card** drop-down list and then select the port for which you want set any of the aforementioned properties. MTU can be set between 1500-9000 bytes. VLAN id can be set within the range 0-4094 (enter 0 to disable it). The IP type can be *IPV4* (static) or *DHCP*.

The **Port Up** and **Port Down** buttons will enable and disable the selected port respectively. The **Clear IP** button deletes values set for the IP Type, IP, Subnet Mask and Gateway properties and resets them.

The screenshot shows the 'FO iSCSI Manage Ports' window. It features a 'Refresh' button in the top right corner. The main area is titled 'Manage Ports' and contains several configuration fields: 'Select a T4 Card' (dropdown menu showing 'T440-CR'), 'Select a Port' (dropdown menu showing 'Ports #1'), 'Vlan' (text input with '4'), 'MTU' (text input with '1500'), 'IP Type' (dropdown menu showing 'IPv4'), 'IP' (text input with '10.193.184.88'), 'Subnet Mask' (text input with '255.255.252.0'), and 'Gateway' (text input with '10.193.184.1'). At the bottom, there are four buttons: 'Save Changes', 'Port Up', 'Port Down', and 'Clear IP'.

Figure 130 - FO iSCSI Manage Ports module

• FO iSCSI Initiator Properties

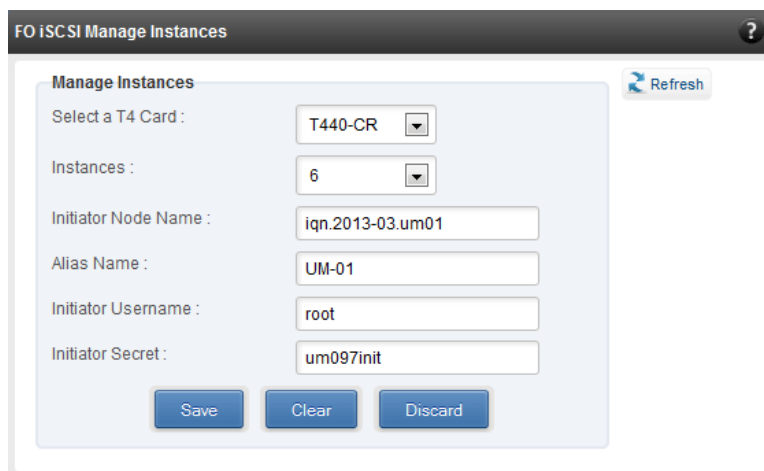
In the **FO iSCSI Initiator Properties** module, you can configure FO iSCSI Initiator by setting different properties like enabling/disabling CHAP authentication, setting Header and Data digest, etc.

DESCRIPTION	VALUE
DataSequenceInOrder	Yes
DataPDUIInOrder	Yes
ImmediateData	No
InitialR2T	Yes
ErrorRecoveryLevel	0
MaxConnections	1
DefaultTime2Wait	20
DefaultTime2Retain	20
MaxBurstLength	8192
FirstBurstLength	8192
HeaderDigest	None,CRC32C
DataDigest	None,CRC32C
MaxRecvDataSegmentLength	8192
PingTimeout	15
AuthPolicy	Mutual
AuthMethod	None
UserName	fst_username

Figure 131 - FO iSCSI Initiator Properties

• FO iSCSI Manage Instances

The FO iSCSI Initiator service maintains multiple instances of a target depending on the discovery method. In this module, you can set upto 8 instances. Configurable parameters include initiator node name (IQN), alias (friendly) name, Initiator (CHAP) Username and password.

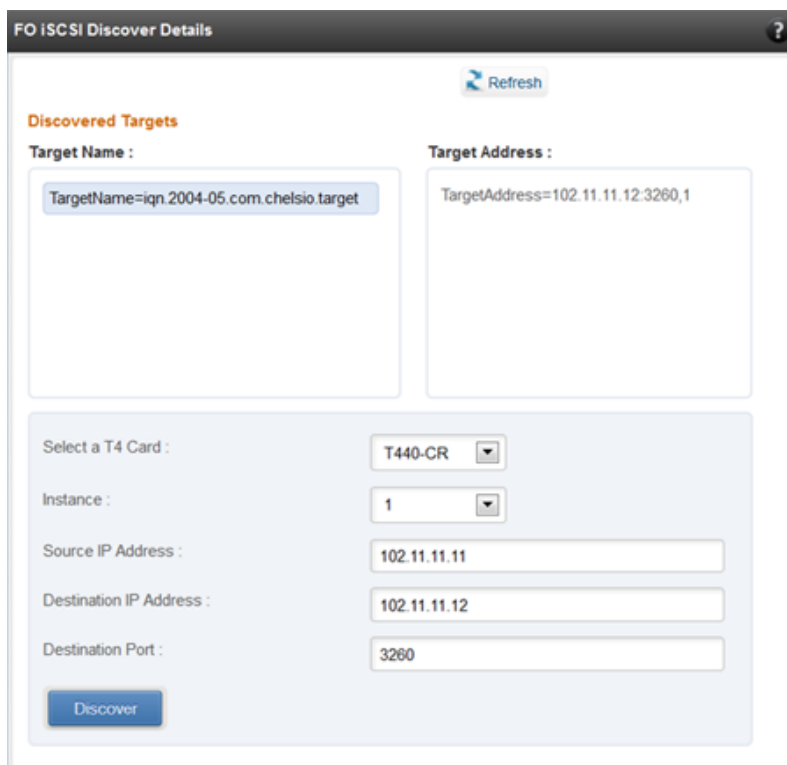


The screenshot shows the 'FO iSCSI Manage Instances' window. It has a title bar with a question mark icon. Inside, there's a 'Manage Instances' section with a 'Refresh' button. Below this, there are several input fields: 'Select a T4 Card' (dropdown menu showing 'T440-CR'), 'Instances' (dropdown menu showing '6'), 'Initiator Node Name' (text box with 'iqn.2013-03.um01'), 'Alias Name' (text box with 'UM-01'), 'Initiator Username' (text box with 'root'), and 'Initiator Secret' (text box with 'um097init'). At the bottom of this section are three buttons: 'Save', 'Clear', and 'Discard'.

Figure 132 - FO iSCSI Manage Instances module

- **FO iSCSI Discover Details**

iSCSI Targets can be discovered using this module. Select a Chelsio adapter and initiator instance using which you want to discover targets. Next, provide the source (initiator) and destination (target) IP. Finally, click **Discover**. After successful discovery, all the discovered targets will appear in the **Discovered Targets** section. To view more details, click on the Target name.



The screenshot shows the 'FO iSCSI Discover Details' window. It has a title bar with a question mark icon. Inside, there's a 'Refresh' button. Below it, the 'Discovered Targets' section is visible, showing 'Target Name' (TargetName=iqn.2004-05.com.chelsio.target) and 'Target Address' (TargetAddress=102.11.11.12:3260,1). Below this, there are input fields for discovery: 'Select a T4 Card' (dropdown menu showing 'T440-CR'), 'Instance' (dropdown menu showing '1'), 'Source IP Address' (text box with '102.11.11.11'), 'Destination IP Address' (text box with '102.11.11.12'), and 'Destination Port' (text box with '3260'). At the bottom of this section is a 'Discover' button.

Figure 133 - FO iSCSI Discover Details module

• FO iSCSI Session Details

The FO iSCSI Session Details module can be used to log onto targets and view details of established iSCSI sessions. You can also logout from a target

Use the **Login** section to connect to a target. *Adapter, (initiator) instance, Target Name, Source (Initiator) IP, Destination (Target) IP and Destination Port* are mandatory. After providing values for these fields, click **Login**.

By default, no authentication mechanism is used while connecting to a target. You can however configure CHAP for a secure iSCSI connection. **One-way** (target authenticates the initiator) and **Mutual** (target and initiator authenticate each other) authentication methods are supported.

Login

Select a T4 Card :	T440-CR
Instances :	1
Target Name :	2004-05.com.chelsio.target
Source IP :	102.11.11.11
Destination IP :	102.11.11.12
Destination Port :	3260
Auth Type :	None
Policy :	Select One..
Target Username :	
Target Secret :	
<input type="button" value="Login"/>	

Figure 134 - FO iSCSI Session Details module: Login

After successful login, details of the established iSCSI session will be displayed under the **Established sessions** section. Select the Adapter and session id. Details of the selected session will be displayed. To end the session, click **Logout**.

Established Sessions

Select a T4 Card :	T440-CR ▼
Session Id :	1 ▼
Node Id :	1 ▼
Source IP :	102.11.11.11
Target IP :	102.11.11.12
Target TCP Port :	3260
Target Portal Group Tag :	0
Port :	0
State :	1
Target Name :	iqn.2004-05.com.chelsio.target
Target Alias :	

[Logout](#)

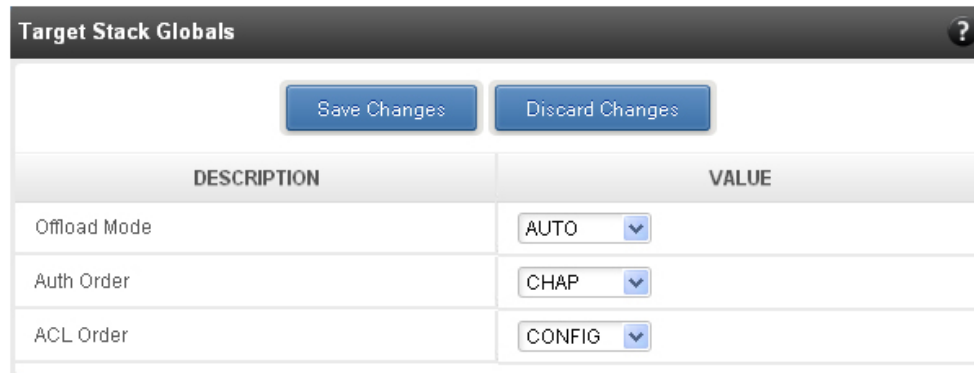
Figure 135 - FO iSCSI Session Details module: Established Sessions

8.7.4. iSCSI Target page (Linux)

This page allows to create new Targets and manage them (add/delete portals, add/delete LUNs, add/delete ACLs). It also provides information on Session details. Viewing and modifying Target properties is also available. The modules available on this page are as below:

- **Target Stack Globals**

This module displays various global properties of a currently connected iSCSI target. Authentication priority between CHAP and ACL can be set here.



The screenshot shows a web interface titled "Target Stack Globals" with a help icon (question mark) in the top right corner. Below the title bar are two buttons: "Save Changes" and "Discard Changes". The main content area is a table with two columns: "DESCRIPTION" and "VALUE".

DESCRIPTION	VALUE
Offload Mode	AUTO ▼
Auth Order	CHAP ▼
ACL Order	CONFIG ▼

Figure 136 - Target Stack Globals module

- **Target properties**

Properties such as Target name and Alias, Max Data Receive Length, Authentication mode related to a specific iSCSI target can be viewed and modified here. iSCSI targets can be started/stopped or deleted.

Target Properties

iSCSI Targets : iqn.2004-05.com.chelsio.ROTO

Target Status

STARTED

Start Stop Delete

Actions

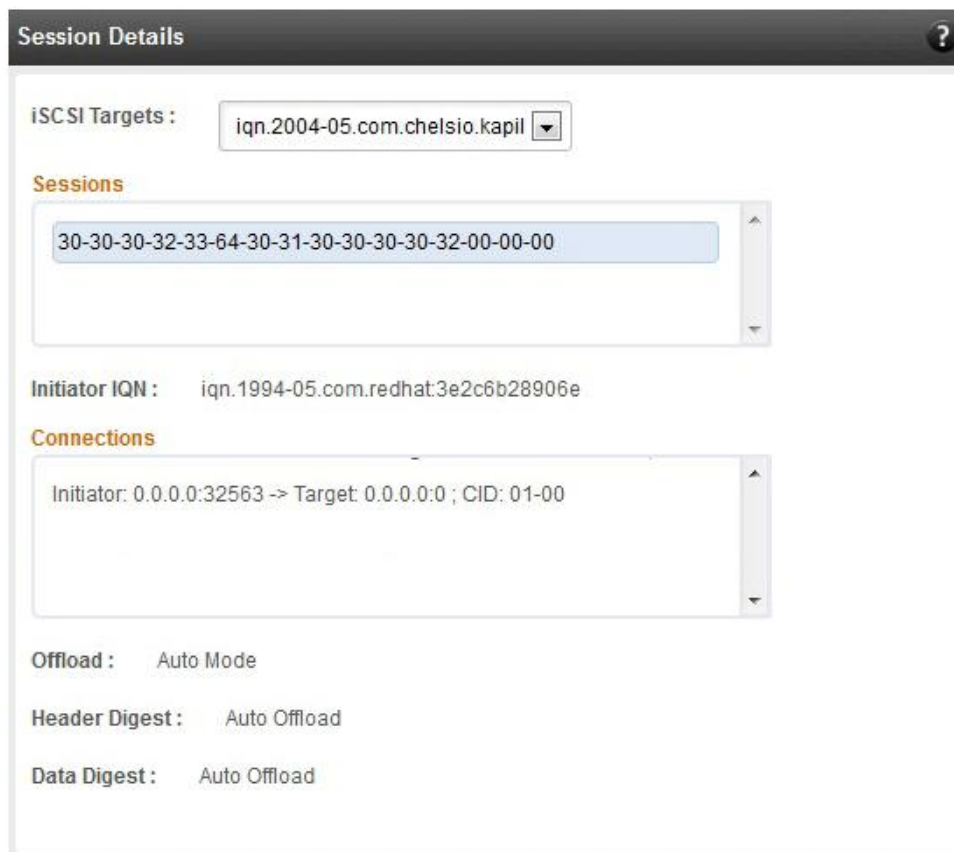
Save Changes Discard Changes

PROPERTY	VALUE
Target Name	iqn.2004-05.com.chelsio.ROTO
Target Alias	iscsitarget1
Max Receive Data Segment Length (in Bytes)	8192
Header Digest/Checksum	None,CRC32C
Data Digest/Checksum	None,CRC32C
Send Immediate Data / Unsolicited Data	Yes
Initial Ready To Transmit (InitialR2T)	No
Maximum Outstanding Ready To Transmits (MaxR2T)	1
Max Connections in a session	4
Target CHAP	"target_id1":"target_secret1"
Initiator CHAP	"initiator_id1":"initiator_sec1"

Figure 137 - Target properties module

- **Session details**

Details including Session ID, Initiator IQN and Connections List of all discovered and currently connected iSCSI targets are listed here.

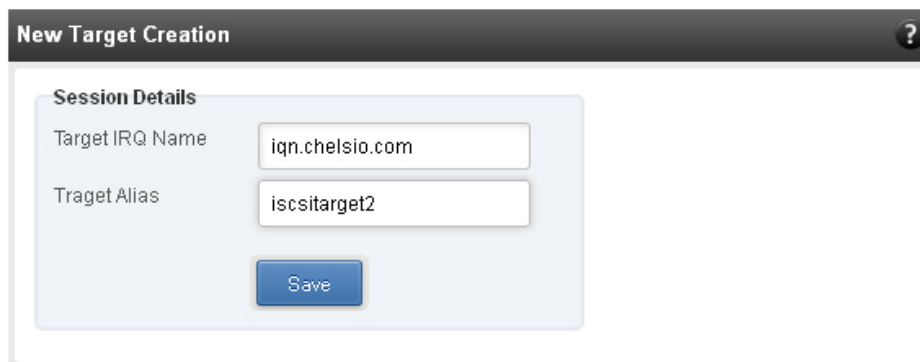


The screenshot shows the 'Session Details' window. At the top, there's a title bar with a question mark icon. Below it, the 'iSCSI Targets' section has a dropdown menu showing 'iqn.2004-05.com.chelsio.kapil'. The 'Sessions' section contains a list box with one entry: '30-30-30-32-33-64-30-31-30-30-30-30-32-00-00-00'. The 'Initiator IQN' field displays 'iqn.1994-05.com.redhat:3e2c6b28906e'. The 'Connections' section shows a single connection: 'Initiator: 0.0.0.0:32563 -> Target: 0.0.0.0:0 ; CID: 01-00'. At the bottom, there are three settings: 'Offload' set to 'Auto Mode', 'Header Digest' set to 'Auto Offload', and 'Data Digest' set to 'Auto Offload'.

Figure 138 - Session Details module

- **New Target Creation**

New iSCSI target can be created here by specifying the Target IQN and Target Alias name.



The screenshot shows the 'New Target Creation' window. It has a title bar with a question mark icon. Inside, the 'Session Details' section contains two text input fields: 'Target IQN Name' with the value 'iqn.chelsio.com' and 'Target Alias' with the value 'iscsitarget2'. Below these fields is a blue 'Save' button.

Figure 139 - New Target Creation module

8.7.5. LUNs

Various Logical Units created in an iSCSI Target can be managed here. The modules available on this page are as below:

- **View/Edit iSCSI Target LUNs**

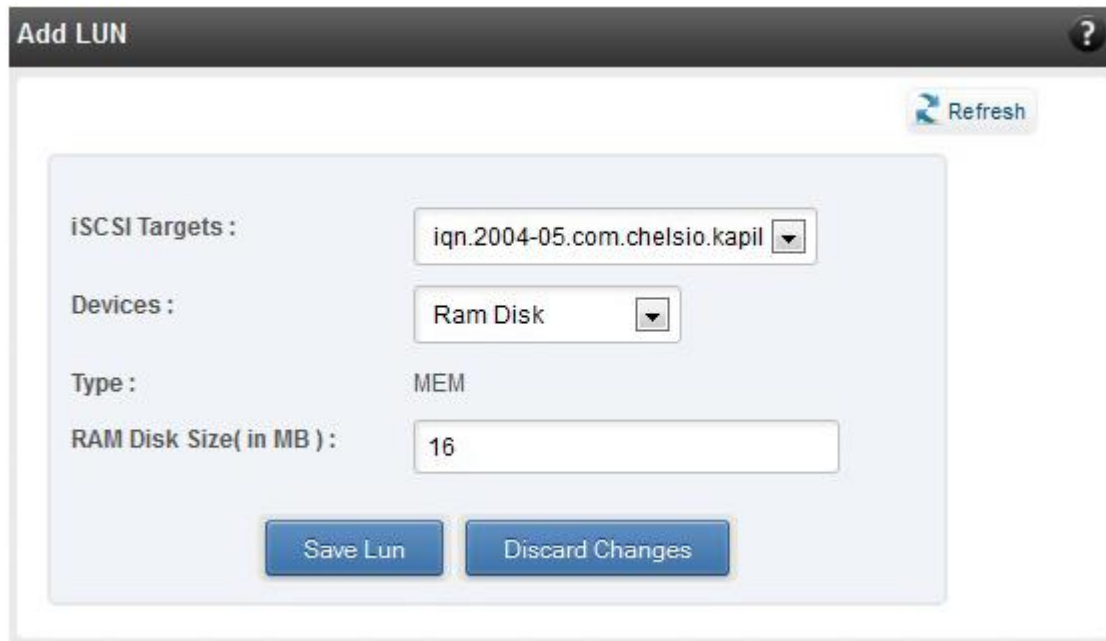
This module displays various Logical Units created in an iSCSI Target. Selected LUNs can be deleted.

The screenshot shows the 'View/Edit iSCSI Target LUNs' module. At the top, there's a title bar with a question mark icon. Below it, the 'iSCSI Targets' section shows a dropdown menu with 'iqn.2004-05.com.chelsio.kapil' selected and a 'Refresh' button. The 'Target Status' is 'STARTED'. The 'LUN List' section on the left contains a single entry '/dev/sda5'. To the right, the 'Edit LUN List' section has 'Move Up', 'Move Down', and 'Delete LUN' buttons. Below that, the 'Edit Selected LUN' section allows editing the selected LUN. It includes fields for 'LUN Name' (set to '/dev/sda5') and 'RAM Disk Size' (set to '12288'). The 'Permissions' section has radio buttons for 'RO' and 'RW', with 'RW' selected. The 'Device Type' section has radio buttons for 'FILE', 'MEM', and 'BLK', with 'BLK' selected. The 'Options' section has radio buttons for 'SYNC', 'NULLRW', and 'NONEXCL', with 'NONEXCL' selected. At the bottom, there are 'Save Changes' and 'Discard Changes' buttons.

Figure 140 - View/Edit iSCSI Target LUNs module

- **Add LUN**

New LUNs can be added here by providing various parameters like Target Name, Target Device and RAM Disk Size etc. RW (Read-Write) and RO (Read Only) are the two kinds of permissions that can be set. If Ram Disk is selected, then a minimum of 16 MB should be provided.



The screenshot shows a window titled "Add LUN" with a help icon in the top right corner. Inside the window, there is a "Refresh" button with a circular arrow icon. Below this, there is a light blue panel containing the following fields:

- iSCSI Targets :** A dropdown menu with the selected value "iqn.2004-05.com.chelsio.kapil".
- Devices :** A dropdown menu with the selected value "Ram Disk".
- Type :** A text field containing the value "MEM".
- RAM Disk Size(in MB) :** A text input field containing the value "16".

At the bottom of the light blue panel, there are two buttons: "Save Lun" and "Discard Changes".

Figure 141 - Adding a new LUN

8.7.6. Portal Groups

Portal details for currently connected iSCSI Targets can be viewed and added here. The modules available on this page are as below:

- **View/Edit iSCSI Target Portals**

Portal List on the left displays details of the portal group on which an iSCSI target is listening and the related info is displayed on the right under Portal Details. Selected portals can be deleted.

The screenshot shows a web-based interface titled "View/Edit iSCSI Target Portals". At the top, there is a dropdown menu for "iSCSI Targets" with the value "iqn.2004-05.com.chelsio.kapil" and a "Refresh" button. Below this, the "Target Status" is displayed as "STARTED". The main interface is divided into two columns. The left column, titled "Portal List", contains a single entry: "1@102.44.44.155:3260". The right column, titled "Edit Portal List", contains three buttons: "Move Up", "Move Down", and "Delete Portal". Below these buttons is the "Portal Details" section, which includes input fields for "Ip Address" (102.44.44.155), "TimeOut in mSecs" (0), "Redirect Tag" (1), and "TCP Port" (3260). There is also a checkbox for "Use default iSCSI service TCP Port" which is currently unchecked. An "Update List" button is located at the bottom of the "Portal Details" section. At the very bottom of the interface, there are two buttons: "Save Changes" and "Discard Changes".

Figure 142 - View/Edit iSCSI Target Portals module

- **Add Portal**

New Portals can be added here by choosing the specific target and Portal IP address. The Port number should be 3260.

Figure 143 - Adding a new Portal

8.7.7. ACLs

ACLs configured for currently connected iSCSI Targets can be managed here. The modules available on this page are as below:

- **View/Edit iSCSI Target ACLs**

This module displays details for all the ACLs configured for an iSCSI Target. Selected ACLs can be deleted.

Figure 144 - Target ACL operations module

- **Add ACL**

New ACLs can be configured by specifying Target name, initiator IQN name, IP address and permission type.

Figure 145 - Adding new ACL

8.8. Hardware Features

The **Hardware** module lists the status of configuration modules under Hardware Features section, running on the agent.

Hardware	
PROPERTY	VALUE
Boot service on server	Enabled
Filter service on server	Disabled
Traffic mgmt service on server	Disabled

Figure 146 - Hardware module

8.8.1. Filtering (Linux)

Using this page, one can control the traffic from a specific IP. The module available on this page is as below:

- **T3 Filtering configuration**

T3 Filtering options can be set only when offload driver (*t3_tom*) is not loaded.

This module lists the various parameters which can be set while determining filtering options for a system IP. You can set the maximum number of filters and also add/delete filters. A filter with default values (the **Action** field set to **pass**; the **Protocol** field set to **any**) is created at the time of configuring the filtering module. To remove the default filter, enter 0 in the **Set Maximum Filters** field and click on **Set Filters**. The fields **IfName** and **FilterId** are mandatory. The **Action** field is set to **pass** and the **Protocol** field is set to **any** by default. Other possible values for the **Protocol** field are **tcp**, **udp** and **frag**. The **Priority** field can be used to determine the priority of a filter when Vlan ids are same. **Insert at position** features allows user to add a filter at a specified position.

FILTERID	SRCIP	DESTIP	SRCPORT	DESTPORT	VLAN	PRIORITY	MACIDX	ACTION	PROTO	QUEUE
10	0.0.0.0/0	0.0.0.0	0	0	0	0	0	Pass	Any	0

Figure 147 - T3 Filtering Configuration module

Note

Results for actions like adding a new filter or setting maximum filters make some time to reflect. Highlight the system item in the tree menu on the left, and click "Refresh system", to refresh data from the system, in case the updated settings are not being shown.

• T4 Filtering configuration

T4 Filtering options can be set only when offload driver (*t4_tom*) is not loaded.

A list of pre-defined filter selection combinations is displayed. The combination *fragmentation, mpshittype, protocol, vlan, port, fcoe* is active by default. To select a different combination, highlight it in the **Combinations** list by clicking and click “Set Active Combination”.

You can create filter rules for any combination in the list. However, filter rule created only for the Active Combination will apply. To create a new rule, select a combination and click “Add a filter rule”. The **FILTERID** and **T4 CARD** fields are mandatory. After providing appropriate values for the parameters click “Save Changes”.



Note For a detailed explanation regarding different fields, please refer *cxgbtool manual* by running *man cxgbtool* command on Management Agent CLI.

T4 Filtering Configuration

Refresh

Active Combination : fragmentation, mpshittype, macmatch, vlan, port, fcoe

Combinations

- fragmentation, mpshittype, ethertype, protocol, tos
- ethertype, vlan, port
- fragmentation, mpshittype, macmatch, vlan, port, fcoe - Active Combination
- fragmentation, mpshittype, macmatch, protocol, tos, port, fcoe
- fragmentation, mpshittype, macmatch, ethertype, port, fcoe
- fragmentation, mpshittype, macmatch, vnic_id, port, fcoe
- fragmentation, mpshittype, ethertype, protocol, port, fcoe

FILTERID	T4 CARD	FRAGMENTATION	MPSHITTYPE	MACMATCH	VLAN	PORT	FCOE
7	T420-SO-CR	1	1	005	0000	0	0

Set Active Combination Save Changes Discard Changes Add a Filter row Delete a Filter

Figure 148 - T4 Filtering Configuration module

8.8.2. Traffic Management (Linux)

Using this page, one can add/delete/modify offload policies only in the presence of offload driver (*t3_tom* for T3 adapters; *t4_tom* for T4 adapters).

8.8.3. Traffic Management configuration

The **Chelsio Card** section on the left displays all the cards available in the server and their corresponding policies on the right. Policies can be added and deleted. Policy Details displays the primitives (maximum 8) and actions which can be modified. For more details on creating policies, please refer to COP man pages.

The screenshot shows the 'Traffic Management Configuration' window. It is divided into two main sections: 'Policy List' and 'Policy Details'.

Policy List: This section contains a 'Chelsio Cards' list on the left with three entries: 'T404-BT', 'T420-CR', and 'T302E-CU'. To the right is a 'TM Policies' list containing one policy: 'src port 22 => !offload !ddp'. There is a 'Refresh' button above the TM Policies list. Below the cards list is an 'Add New Policy' button, and below the TM Policies list is a 'Delete' button.

Policy Details: This section is for editing a specific policy. It has a 'Rules' list on the left containing 'src port 22'. To the right is the 'Rule Details' area, which includes:

- 'Primary Expression': a dropdown menu set to 'port'.
- 'Qualifier': a dropdown menu set to 'src'.
- 'Value': a text input field containing '22'.
- A 'Modify Rule' button.
- Two checkboxes: 'Select to add rule' (unchecked) and 'Select to modify rule' (checked).

Below the Rule Details is an 'Actions' section with seven items, each with a checkbox and a dropdown menu:

- 'Offload': checkbox unchecked, dropdown set to 'Disable'.
- 'DDP': checkbox unchecked, dropdown set to 'Disable'.
- 'Time Stamp': checkbox unchecked, dropdown set to 'Enable'.
- 'Sack': checkbox unchecked, dropdown set to 'Enable'.
- 'Bind': checkbox unchecked, dropdown set to 'random'.
- 'Class': checkbox unchecked, dropdown set to '0'.
- 'Congestion': checkbox unchecked, dropdown set to 'reno'.

At the bottom of the 'Policy Details' section are two buttons: 'Save Changes' and 'Discard Changes'.

Figure 149 - Traffic Management Configuration module

8.8.4. Boot

- **T4 Save Config File (Linux)**

This module displays the current T4 configuration tuning option selected. You can also change the tuning option by selecting the config file for each option located in `/ChelsioUwire-x.x.x.xx/src/network/firmware`. For instance, to select *Low latency Networking*, locate the file, `t4-config.txt`, in `/ChelsioUwire-x.x.x.xx/src/network/firmware/low_latency_config` directory.

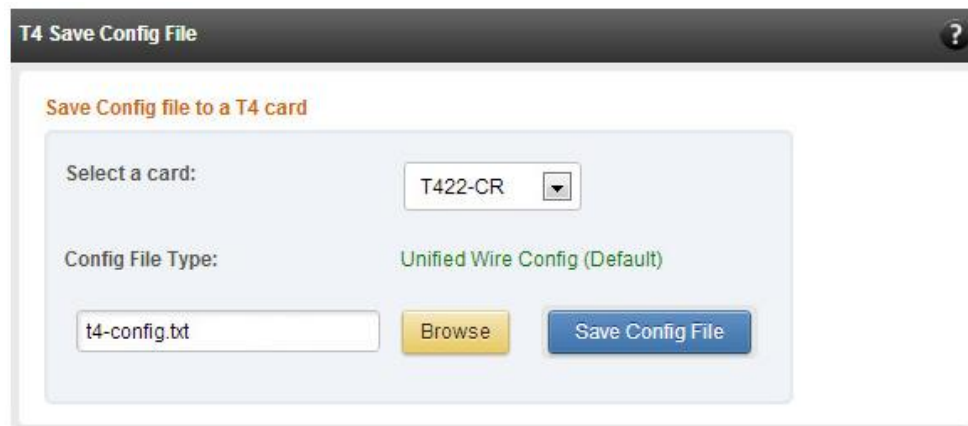


Figure 150 - T4 Save Config File module

8.8.5. T3 iSCSI / T3 PXE Boot Option Rom Management (Linux)

The Chelsio T3 card may be used for PXE or iSCSI boot. This module allows managing the boot capability. The Option ROM (PXE/iSCSI) may be installed to the card, or erased from the card. iSCSI boot Option ROM settings can be configured for the card here. Enable the iSCSI Option ROM only if you are planning to boot the system via iSCSI. Refer the iSCSI boot documentation for more details about its configuration.

T3 iSCSI / T3 PXE Boot Option Rom Management

Select a card: S320E-SR-X

Option ROM Status - iSCSI option rom is installed [2.0 build 202] & iSCSI option rom settings are valid.

Write iSCSI or PXE Option ROM to the card

Browse

Write Option ROM

Erase iSCSI or PXE Option ROM or Settings

Erase Option ROM

Erase iSCSI boot settings

Save Changes

Discard Changes

DESCRIPTION	VALUE
Card is enabled for iSCSI boot	No
Chelsio OS initiator is used for boot	No
Boot initiator IQN name	<input type="text"/>
Prefer header digests if available	No
Prefer data digests if available	No
CHAP authentication Policy	none
Initiator's CHAP username	
Initiator's CHAP secret	

Figure 151 - Option ROM management module for a T3 card

Chelsio T5/T4 Unified Wire for Windows

186

8.8.6. T5/T4 Boot Option ROM management

This module allows managing the PXE and FCoE boot capability for Chelsio T5 and T4 cards. The Option ROM (PXE and FCoE) may be installed to or erased from the card. The version of Option ROM flashed can be viewed here.

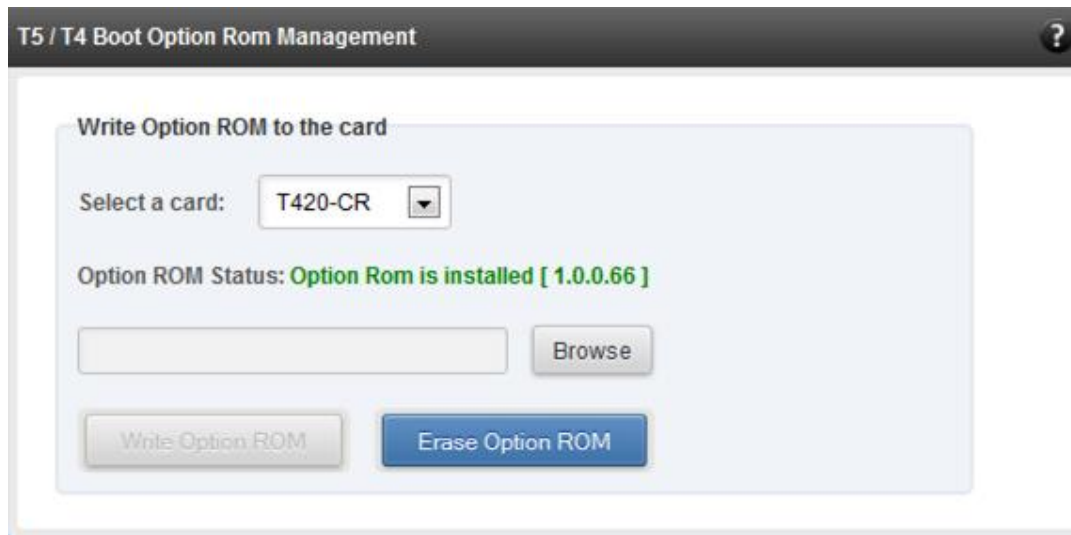


Figure 152 - T5/T4 Option ROM Management module

8.8.7. T5/T4 Boot Configuration

This module can be used to view and configure PXE and FCoE Option ROM settings for Chelsio T5 and T4 cards.

PXE physical functions and order of ports for PXE boot can be selected here. The same module can be used to configure FCoE Option ROM. Here port order for target discovery and discovery timeout can be set. Under the Boot section, LUN can be configured as boot device from the discovered FCoE targets.

Enable the Option ROM only if you are planning to boot the system via PXE or install the operating system on FCoE LUN.

The screenshot shows the 'T5 / T4 Boot Configuration' window. At the top, there's a header bar with a question mark icon. Below it, a section titled 'Select a T4 / T5 card' contains a dropdown menu labeled 'Select a card:' with 'T420-CR' selected. The main area is divided into two primary sections: 'Adapter Configuration' and 'PXE Configuration'. The 'Adapter Configuration' section includes fields for 'PCI BUS:' (01), 'PCI Device:' (00), 'Initialization Platform:' (Both), 'Adapter Bios Status:' (Disable selected), 'Boot mode:' (Compatibility), 'EDD:' (2.1), 'EBDA Relocation:' (Permitted), and a 'Default:' checkbox for '(Load Boot Default Settings)'. There are 'Save Changes' and 'Discard Changes' buttons at the bottom of this section. The 'PXE Configuration' section is selected, indicated by radio buttons for 'PXE', 'FCOE', and 'iSCSI'. It includes 'Select Physical Function:' (00), 'BIOS:' (Disable), and 'Vlan Id:' (0), with 'Save Changes' and 'Discard Changes' buttons. To the right of the PXE Configuration section is a 'Details' panel showing various system information: BIOS: 1.0.0.66, Ports: 2, Device Id: 1131, FW: 1.8.24.242, MAC: 00:07:43:11:F9:D0, Func: 00, and Controller Name: T420-CR.

Figure 153 - PXE Boot configuration for T4 CNAs

Choose Options to configure: ☐ PXE ☒ FCOE ☐ iSCSI

FCoE Configuration

Choose Paramter Type : ☒ Function ☐ Boot ☐ Show WWPN

BIOS : ☒ Enable ☐ Disable

Port Order :

Discovery Time Out :

Figure 154 - FCoE Boot configuration for T4 CNAs

Choose Options to configure: ☐ PXE ☐ FCOE ☒ iSCSI

iSCSI Configuration

Choose Paramter Type : ☒ Function ☐ Initiator ☐ Network ☐ Boot Devices

BIOS :

Port Order :

Discovery Time Out :

CHAP Method:

Figure 155 - iSCSI Boot configuration for T4 CNAs

8.8.8. Bypass (Linux)

You can use the **Bypass** page to configure various settings for Chelsio's bypass adapters like setting bypass operation mode, creating rules (filters), starting/stopping BA server, etc. There are two modules available: **Bypass Configuration** and **Redirect Configuration**.

- **Bypass Configuration**

In the **Bypass Configuration** module, you can view the status and start/stop the BA server accordingly. The adapter will redirect packets using the mode specified in the **Default bypass mode** field unless otherwise specified in the **Current bypass mode**.

The **Watchdog** timer is used to ensure that if there is a software failure, the switch will enter the default state. The **Watchdog timeout** value should be provided in milliseconds.

The screenshot shows a web-based configuration window titled "Bypass Configuration". At the top, there is a section "Select a T4 card" with a dropdown menu currently showing "B420-SR". Below this is the main configuration area. It starts with "BA Server status:" showing "Running on eth3" in green text, with a "Stop Server" button to its right. Next is "Default bypass mode:" with a dropdown menu set to "Disconnect Mode". This is followed by "Current bypass mode:" also with a dropdown menu set to "Disconnect Mode". Then, "Watchdog:" has a dropdown menu set to "Disable". Finally, "Watchdog timeout:" has a text input field containing the value "0". At the bottom of the configuration area are two buttons: "Save Changes" and "Discard Changes".

Figure 156 - Bypass Configuration module

• Redirect Configuration

In the **Redirect Configuration** module, you can set **rules** (filters), based on which the bypass adapter will redirect packets. You can group **rules** into **tables**. You can save the currently configured tables and rules for a bypass adapter into a shell script using the **Download Configuration** button.

The **Table Configuration** tab displays BA server status and the number of tables created. You can create new tables or perform various actions on the existing ones.

- **Delete table:** Delete the selected table and all the rules present in it.
- **Purge table:** Delete all the rules present in the selected table. This action will not delete the table.
- **Activate table:** Enable the selected table.
- **Deactivate table:** Disable the selected table.
- **Create table:** Create a new table. The new table created will be inactive by default. Use the **Activate table** option to enable it. You can create upto 5 tables.

In the **Rules Configuration** tab, you can add, delete and configure rules. Use the **Add a Filter row** button to add a new rule by specifying the rule id in the *INDEX* field and providing the required parameters. Finally, click **Save Changes**.

To edit an existing rule, select the corresponding checkbox, change the desired parameters and click **Save Changes**.

To delete a rule, select the corresponding checkbox and click **Delete a Filter**. Finally, click **Save Changes**. You can delete multiple rules using this method.

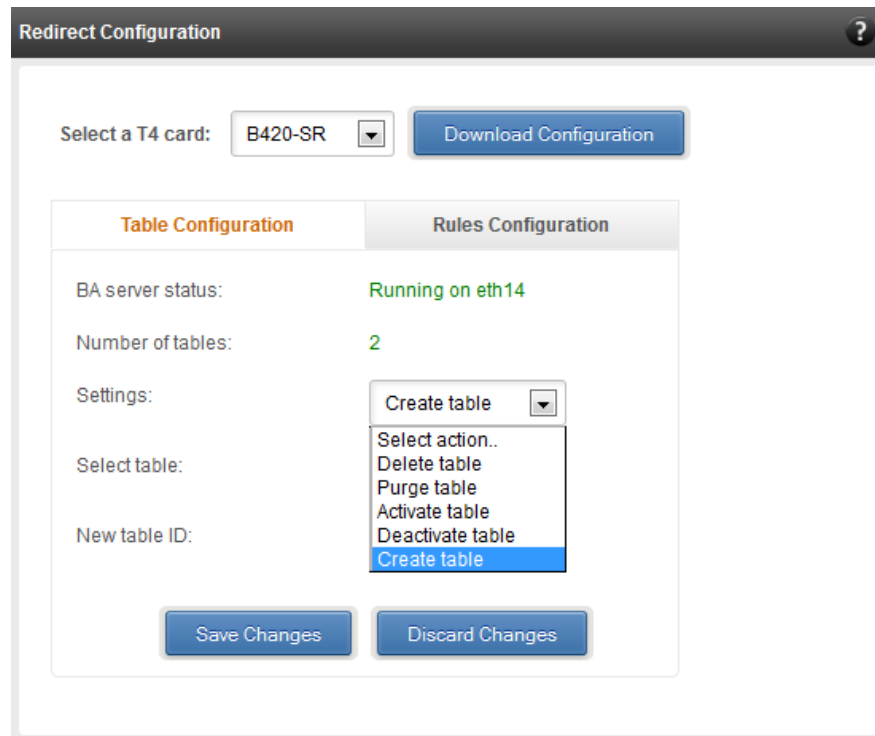


Figure 157 - Redirect Configuration module: Table configuration tab

Redirect Configuration

?

Select a T4 card:

B420-SR

Download Configuration

Table Configuration

Rules Configuration

Select a table :

Table 1 (active)

INDEX	ACTION	PORT	IPV6	PROTOCOL	SOURCE ADDRESS	SO
<input type="checkbox"/> 1	drop	0	disable	udp	102.22.22.155	255.25
<input type="checkbox"/> 2	forward	0	disable	udp	102.22.22.155	255.25
<input type="checkbox"/> 3	input	0	disable	udp	102.22.22.155	255.25
<input type="checkbox"/> 4	drop	0	disable	tcp	102.22.22.155	255.25
<input type="checkbox"/> 5	forward	0	disable	tcp	102.22.22.155	255.25
<input type="checkbox"/> 6	input	0	disable	tcp	102.22.22.155	255.25
<input type="checkbox"/> 7	forward	0	disable	icmp		
<input type="checkbox"/> 8	drop	0	disable	icmp		
<input type="checkbox"/> 9	input	0	disable	icmp		

Save Changes

Discard Changes

Add a Filter row

Delete a Filter

Figure 158 - Redirect Configuration module: Rules configuration tab

8.8.9. T4 Egress Class Schedulers (Linux)

Schedulers can be set only when T5/T4 network driver (*cxgb4*) is loaded.

- **Egress Queue Map**

Using this module, you can bind (map) NIC (non-offloaded) Tx queues to Tx Scheduler classes.

Egress Queue Map

Refresh

INTERFACE NAME	CLASS ID	TX QUEUE ID	ACTION
eth13	0	0	Map

Interface Name : eth12 >> Class Id : 2 >> Tx Queue Id : 1

Figure 159 - Egress Queue Map module

- **Egress Packet Scheduler**

Using this module you can configure different scheduler hierarchy levels (i.e. Class Rate Limiting, Class Weighted Round Robin and Channel Rate Limiting). Based on the parameters specified, different scheduler levels can be configured.

Egress Packet Scheduler

Refresh

Tx Schedulers

SCHEDULER	CHANNEL ID	INTERFACE	MODE	RATE MODE	RATE UNIT	MIN RATE	MAX RATE	PACKET SIZE	WEIGHT
0	1	eth12	Flow	Absolute	Bits (in kbps)	0	9000	0	-

Add New Rule Save Changes Discard Changes

Figure 160 - Egress Packet Scheduler module

9. Uninstalling Unified Wire Manager

To uninstall Unified Wire Manager, use **Programs and Features** in the **Control Panel**.

VIII. UM for Win PE

1. Introduction

Chelsio **UM for Win PE** (chelsio_uwlite) is a light-weight management tool developed for Windows PE (Windows Preinstallation Environment) platform and provides features to view and configure different aspects of the system, including Chelsio adapter installed.

The tool provides command-line options to view system related information like list of drivers installed, Chelsio adapters present, etc. You can also view and configure Chelsio adapter settings like card and port properties, flash and erase option ROM, etc. To view the complete list of commands available, invoke the help by typing `chelsio_uwlite.exe` in the command prompt.

The tool can be found in *ChelsioUwire-x.x.x.xx\UM* in the zip package. In order to use the tool, you will have to add it to boot image when creating bootable Windows PE media.

For more information, visit the following link: <http://technet.microsoft.com/en-us/library/cc749312%28v=ws.10%29.aspx>



Only local systems can be managed currently using this tool.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio Adapters that are compatible with Chelsio UM for Win PE:

- T520-CR
- T580-CR
- T580-LP-CR
- T580-SO-CR
- T520-LL-CR
- T520-SO-CR
- T540-CR
- T420-CR
- T440-CR
- T422-CR
- T420-LL-CR
- T440-LP-CR
- T420-CX
- T420-BT
- T404-BT

1.2. Software Requirements

1.2.1. Windows Requirement

Currently Chelsio UM for Win PE is available for the following Windows version(s):

- Server 2012 R2

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

1.3. Examples

1.3.1. Viewing help

- Run the following command to view the list of commands available under a service.

```
X:\windows\system32>chelsio_uwlite.exe <service-name>
```

E.g.

To view commands available under the *chelsio* service:

```
X:\windows\system32>chelsio_uwlite.exe Chelsio
```

```
X:\windows\system32>chelsio_uwlite.exe chelsio
-----Usage-----
chelsio_uwlite <Service-Name>
                  [StackName] <Command> [SubCommand] [Arguments]
Where
  Service-Name      : SYSTEM\CHELSIO
  Command           : A command supported by the service
                     <see service help for a list of commands>
  Arguments         : Arguments expected by the command
                     <see command help for more details>
Note:
  All arguments should be in the <key=value> format
  eg: <ip=192.168.1.1>
  Required parameters are enclosed within <> brackets
  Optional parameters are enclosed within [] brackets
Service:
  CHELSIO
Commands
-----
ListAdapters
ListAdapterProps
ListPorts
GetCardStats
GetPortStats
SetCardProperty
SetPortProperty
GetProperty
SetProperty
FlashRom
EraseRom
EraseSettings
Defaultconfig
```

Figure 161 – 'chelsio' service commands syntax and usage

- Run the following command to view syntax and usage for a sub-command:

```
X:\windows\system32>chelsio_uwlite.exe chelsio <sub-command> /?
```

E.g. To view syntax and usage of *EraseSettings* sub-command under *chelsio* service:

```
X:\windows\system32>chelsio_uwlite.exe chelsio erasesettings /?
```

```
X:\windows\system32>chelsio_uwlite.exe chelsio erasesettings /?
This command not supported
-----Usage-----
chelsio_uwlite <Service-Name>
                    [StackName] <Command> [SubCommand] [Arguments]
Where
    Service-Name      : SYSTEM!CHELSIO
    Command           : A command supported by the service
                      : (see service help for a list of commands)
    Arguments         : Arguments expected by the command
                      : (see command help for more details)
Note:
    All arguments should be in the <key=value> format
    eg: <ip=192.168.1.1>
    Required parameters are enclosed within <> brackets
    Optional parameters are enclosed within [] brackets
Service:
    CHELSIO
Note:
    <adapter=adapter index> is the Adapter # obtained from the ListAdapters command
chelsio_uwlite
    Chelsio
    EraseSettings
    <adapter=adapter index>
    <force=Boolean>
```

Figure 162 - 'EraseSettings' sub-command syntax and usage

1.3.2. Flashing Option ROM

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

```
X:\windows\system32>chelsio_uwlite.exe chelsio listadapters
```

```
X:\windows\system32>chelsio_uwlite.exe chelsio listadapters
Adapter information:
Adapter #           : 0
Model               : T440-CR
Serial Number       : PT04111342
PCI Vendor ID:Device ID : 1425:1133
PCI Location        : 02:00:04
Factory MAC address  : 00:07:43:AB:CD:EF
Connector           : 10G BP4_AP
PHY                 : No Phy / No information Available
OPROM               : Not Present
```

Figure 163 - Listing Chelsio Adapters

- ii. Now, run the following command to flash option ROM onto the adapter:

```
X:\windows\system32>chelsio_uwlite.exe chelsio flashrom adapter=<idx>
path=<option_rom_image>
```

Here, `idx` is the CNA index found in step i (0 in this case) and `option_rom_image` is the path to Option ROM image file, `cwlb4t4.bin`

```
X:\windows\system32>chelsio_uwlite.exe chelsio flashrom adapter=0 path=cwlb4t4.bin
Flashing the Option ROM...
Success: Boot operation completed successfully
```

Figure 164 - Flashing option ROM

1.3.3. Erasing Option ROM

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

```
X:\windows\system32>chelsio_uwlite.exe chelsio listadapters
```

```
X:\windows\system32>chelsio_uwlite.exe chelsio listadapters
Adapter information:
Adapter #           : 0
Model               : T440-CR
Serial Number       : PT04111342
PCI Vendor ID:Device ID : 1425:1133
PCI Location        : 02:00:04
Factory MAC address  : 00:07:43:AB:CD:EF
Connector           : 10G BP4_AP
PHY                 : No Phy / No information Available
OPROM               : Present
Bios Version        : 1.0.3.57
```

Figure 165 - Listing Chelsio Adapters

- ii. Now, run the following command to erase option ROM from the adapter:

```
X:\windows\system32>chelsio_uwlite.exe chelsio eraserom adapter=0 force=1
```

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

```
X:\windows\system32>chelsio_uwlite.exe chelsio eraserom adapter=0 force=1
Erasing the Option ROM...
Success: Boot operation completed sucessfully
```

Figure 166 - Erasing option ROM

IX. Appendix

Chelsio End-User License Agreement (EULA)

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

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

1. License. Chelsio Communications, Inc. ("Chelsio") hereby grants you, the Licensee, and you hereby accept, a limited, non-exclusive, non-transferable license to install and use the Software with one or more Chelsio network adapters on a single server computer for use in communicating with one or more other computers over a network. You may also make one copy of the Software in machine readable form solely for back-up purposes, provided you reproduce Chelsio's copyright notice and any proprietary legends included with the Software or as otherwise required by Chelsio.

2. Restrictions. This license granted hereunder does not constitute a sale of the Software or any copy thereof. Except as expressly permitted under this Agreement, you may not: (i) reproduce, modify, adapt, translate, rent, lease, loan, resell, distribute, or create derivative works of or based upon, the Software or any part thereof; or (ii) make available the Software, or any portion thereof, in any form, on the Internet. The Software contains trade secrets and, in order to protect them, you may not decompile, reverse engineer, disassemble, or otherwise reduce the Software to a human-perceivable form. You assume full responsibility for the use of the Software and agree to use the Software legally and responsibly.

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

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

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

6. Limited Warranty. If Chelsio furnishes the Software to you on media, Chelsio warrants only that the media upon which the Software is furnished will be free from defects in material or workmanship under normal use and service for a period of thirty (30) days from the date of delivery to you. CHELSIO DOES NOT AND CANNOT

WARRANT THE PERFORMANCE OR RESULTS YOU MAY OBTAIN BY USING THE SOFTWARE OR ANY PART THEREOF. EXCEPT FOR THE FOREGOING LIMITED WARRANTY, CHELSIO MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, AND HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, BUT NOT LIMITED TO, NON-INFRINGEMENT OF THIRD PARTY RIGHTS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow the exclusion of implied warranties or limitations on how long an implied warranty may last, so the above limitations may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

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

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

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

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

11. Government Restricted Rights. The Software is subject to restricted rights as follows. If the Software is acquired under the terms of a GSA contract: use, reproduction or disclosure is subject to the restrictions set forth in the applicable ADP Schedule contract. If the Software is acquired under the terms of a DoD or civilian agency contract, use, duplication or disclosure by the Government is subject to the restrictions of this Agreement in accordance with 48 C.F.R. 12.212 of the Federal Acquisition Regulations and its successors and 49 C.F.R. 227.7202-1 of the DoD FAR Supplement and its successors.

12. General. You acknowledge that you have read this Agreement, understand it, and that by using the Software you agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between Chelsio and you, and supersedes any proposal or prior agreement, oral or written, and any other communication between Chelsio and you relating to the subject matter of this Agreement. No additional or any different terms will be enforceable against Chelsio unless Chelsio gives its express consent, including an express waiver of the terms of this Agreement, in writing signed by an officer of Chelsio. This Agreement shall be governed by California law, except as to copyright matters, which are covered by Federal law. You hereby irrevocably submit to the personal jurisdiction of, and irrevocably waive objection to the laying of venue (including a waiver of any argument of forum non conveniens or other principles of like effect) in, the state and federal courts located in Santa Clara County, California, for the purposes of any litigation undertaken in connection with this Agreement. Should any provision of this Agreement be declared unenforceable in any jurisdiction, then such provision shall be deemed severable from this Agreement and shall not affect the remainder hereof. All rights in the Software not specifically granted in this Agreement are reserved by Chelsio. 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.
209 North Fair Oaks Avenue,
Sunnyvale, CA 94085
U.S.A