



# 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)**

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

[www.chelsio.com](http://www.chelsio.com)

Tel: 408.962.3600  
Fax: 408.962.3661

**Chelsio (India) Private Limited**

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

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

**Chelsio KK (Japan)**

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

Tel: 03-6234-4353

**Sales**

For all sales inquiries please send email to [sales@chelsio.com](mailto:sales@chelsio.com)

**Support**

For all support related questions please send email to [support@chelsio.com](mailto:support@chelsio.com)

Copyright © 2015 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.

---

## Version History

| Version | Revision Date |
|---------|---------------|
| 1.0.0   | 10/10/2011    |
| 1.0.1   | 10/18/2011    |
| 1.0.2   | 10/25/2011    |
| 1.0.3   | 10/31/2011    |
| 1.0.4   | 01/09/2012    |
| 1.0.5   | 01/18/2012    |
| 1.0.6   | 06/07/2012    |
| 1.0.7   | 07/11/2012    |
| 1.0.8   | 03/04/2013    |
| 1.0.9   | 03/21/2013    |
| 1.1.0   | 06/24/2013    |
| 1.1.1   | 07/19/2013    |
| 1.1.2   | 08/21/2013    |
| 1.1.3   | 09/04/2013    |
| 1.1.4   | 09/18/2013    |
| 1.1.5   | 09/23/2013    |
| 1.1.6   | 09/30/2013    |
| 1.1.7   | 10/12/2013    |
| 1.1.8   | 11/12/2013    |
| 1.1.9   | 12/02/2013    |
| 1.2.0   | 12/05/2013    |
| 1.2.1   | 12/16/2013    |
| 1.2.2   | 01/13/2014    |
| 1.2.3   | 01/23/2014    |
| 1.2.4   | 02/05/2014    |
| 1.2.5   | 02/11/2014    |
| 1.2.6   | 02/28/2014    |
| 1.2.7   | 04/22/2014    |
| 1.2.8   | 05/27/2014    |
| 1.2.9   | 07/21/2014    |
| 1.3.0   | 09/01/2014    |
| 1.3.1   | 11/06/2014    |
| 1.3.2   | 11/25/2014    |
| 1.3.3   | 03/25/2015    |
| 1.3.4   | 06/05/2015    |
| 1.3.5   | 08/21/2015    |

---

## **TABLE OF CONTENTS**

|             |  |           |
|-------------|--|-----------|
| <b>I.</b>   | <b>CHELSIO UNIFIED WIRE</b>                          | <b>7</b>  |
| <b>1.</b>   | <b>Introduction</b>                                  | <b>8</b>  |
| 1.1.        | Features   | 8         |
| 1.2.        | Hardware Requirements                                | 9         |
| 1.3.        | Software Requirements                                | 9         |
| 1.4.        | Package Contents                                     | 9         |
| <b>2.</b>   | <b>Hardware Installation</b>                         | <b>10</b> |
| <b>3.</b>   | <b>Software/Driver Installation</b>                  | <b>11</b> |
| 3.1.        | Manual Installation                                  | 11        |
| <b>4.</b>   | <b><i>cxgbtool</i> help</b>                          | <b>13</b> |
| <b>5.</b>   | <b>Firmware Update</b>                               | <b>53</b> |
| <b>6.</b>   | <b>Software/Driver Uninstallation</b>                | <b>54</b> |
| 6.1.        | Manual Uninstallation                                | 54        |
| <b>7.</b>   | <b>Software/Driver Update</b>                        | <b>56</b> |
| <b>II.</b>  | <b>NDIS FUNCTION</b>                                 | <b>57</b> |
| <b>1.</b>   | <b>Introduction</b>                                  | <b>58</b> |
| 1.1.        | Hardware Requirements                                | 58        |
| 1.2.        | Software Requirements                                | 58        |
| <b>2.</b>   | <b>Software/Driver Configuration and Fine-tuning</b> | <b>59</b> |
| 2.1.        | Assigning IP address to the Chelsio Network Adapter  | 59        |
| 2.2.        | Advanced Configuration                               | 59        |
| 2.3.        | NVGRE Offload  | 66        |
| 2.4.        | VXLAN Task Offload                                   | 66        |
| 2.5.        | PacketDirect   | 66        |
| <b>III.</b> | <b>SMB DIRECT</b>                                    | <b>67</b> |
| <b>1.</b>   | <b>Introduction</b>                                  | <b>68</b> |
| 1.1.        | Hardware Requirements                                | 68        |
| 1.2.        | Software Requirements                                | 68        |
| <b>2.</b>   | <b>Software/Driver Configuration and Fine-tuning</b> | <b>69</b> |
| 2.1.        | Enabling SMB Direct                                  | 69        |
| 2.2.        | Verifying RDMA                                       | 69        |
| 2.3.        | RDMA/NVGRE concurrent (Mode 2)                       | 69        |
| 2.4.        | Troubleshooting                                      | 71        |
| <b>IV.</b>  | <b>NDIS SR-IOV</b>                                   | <b>73</b> |
| <b>1.</b>   | <b>Introduction</b>                                  | <b>74</b> |
| 1.1.        | Hardware Requirements                                | 74        |
| 1.2.        | Software Requirements                                | 74        |

---

|   |               |
|---|---------------|
| <b>2. Software/Driver Configuration and Fine-tuning</b> | <b>75</b>     |
| 2.1. Adapter Configuration                              | 75            |
| 2.2. vSwitch Configuration                              | 76            |
| 2.3. Guest (VM) Configuration                           | 76            |
| <br><b>V. UNIFIED WIRE MANAGER (UM)</b>                 | <br><b>77</b> |
| <b>1. Introduction</b>                                  | <b>78</b>     |
| 1.1. Features   | 78            |
| 1.2. Reference Architecture                             | 79            |
| 1.3. Unified Wire Manager Components                    | 79            |
| 1.4. Authentication and encryption                      | 80            |
| <b>2. Hardware and Software</b>                         | <b>81</b>     |
| 2.1. Supported Adapters                                 | 81            |
| 2.2. Platform/Component Matrix                          | 81            |
| 2.3. Platform/Driver Matrix                             | 82            |
| <b>3. Installing Unified Wire Manager</b>               | <b>83</b>     |
| 3.1. Pre-requisites                                     | 83            |
| 3.2. Installation                                       | 84            |
| <b>4. Configuring Unified Wire Manager</b>              | <b>92</b>     |
| 4.1. Configuring Management Station                     | 92            |
| <b>5. Verifying UM components status</b>                | <b>94</b>     |
| 5.1. Verifying Management Agent                         | 94            |
| 5.2. Verifying Management Client                        | 95            |
| 5.3. Verifying Management Station                       | 95            |
| <b>6. Management Agent</b>                              | <b>97</b>     |
| 6.1. Communication                                      | 97            |
| 6.2. Service configuration                              | 97            |
| 6.3. Firewall   | 97            |
| <b>7. CLI client</b>                                    | <b>98</b>     |
| 7.1. CLI Help system                                    | 98            |
| 7.2. Client conflict resolution                         | 98            |
| <b>8. Web GUI client</b>                                | <b>99</b>     |
| 8.1. Management Station                                 | 99            |
| 8.2. Accessing Web Management Interface                 | 100           |
| 8.3. Layout and Navigation                              | 102           |
| 8.4. Home page  | 103           |
| 8.5. System page  | 116           |
| 8.6. Network page                                       | 123           |
| 8.7. Storage  | 144           |
| 8.8. Hardware Features                                  | 176           |
| <b>9. Uninstalling Unified Wire Manager</b>             | <b>190</b>    |

---

|  |            |
|--|------------|
| <b>VI. UM FOR WIN PE</b>                         | <b>191</b> |
| <b>1. Introduction</b>                           | <b>192</b> |
| 1.1. Hardware Requirements                       | 192        |
| 1.2. Software Requirements                       | 193        |
| 1.3. Examples                                    | 193        |
| <b>VII. APPENDIX</b>                             | <b>197</b> |
| <b>Chelsio End-User License Agreement (EULA)</b> | <b>198</b> |

## 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
- 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 this adapter, 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. Windows Update
- b. Chelsio's Unified Wire Installer
- c. 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

The driver components need to be installed in the order described here:

#### 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. 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.



**Important** *Installing drivers using any other order is not supported.*

## 4. `cxgbtool` help

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

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

## 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)]
```

- $-h$

**Description:** Displays help

**Syntax:** cxgbtool -h

- **cim\_la**

**Description:** Displays results of logic analyzer trace.

**Syntax:** `cxbtool [vbdInterface] cim_la`

**Example:**

```
C:\Users\Administrator>cxgbtool 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:** cxgbtool [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>cxgbtool 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>cxgbtool 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 $\mu$ 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 $\mu$ 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 $\mu$ 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\_pif\_la**

**Description:** Displays CIM PIF logic analyzer trace.

**Syntax:** cxgbtool [*vbdInterface*] debugfs cim\_pif\_la

**Example:**

```
C:\Users\Administrator>cxgbttool vbd0 debugfs cim_pif_la
```

| Cntl | ID | DataBE | Addr     | Data                                |
|------|----|--------|----------|-------------------------------------|
| 01   | 01 | f000   | e1003060 | 40004044400040444000404440004044    |
| 81   | 00 | f000   | e1003060 | 00004044400004044400004044400004044 |
| 81   | 00 | f000   | e1003060 | 40003044440003044440003044440003044 |

```
.  
.  
.
```

- **cim\_ma\_la**

**Description:** Displays results of CIM MA logic analyzer trace.

**Syntax:** cxgbtool [*vbdInterface*] debugfs cim\_ma\_la

**Example:**

[illegible]

- **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*]





- **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 paris (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
```

## 5. 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.

## 6. Software/Driver Uninstallation

Chelsio Unified Wire can be uninstalled using any of the following methods:

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

### 6.1. Manual Uninstallation

The driver components need to be uninstalled in the order described here:

#### 6.1.1. 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 above step for the other **Chelsio Network Adapters**.

#### 6.1.2. 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**.

#### 6.1.3. 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 above step for the other **Generic Functions**.

 **Important** *Uninstalling drivers using any other order is not supported.*

## 7. 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               |
| T502-BT         | NIC, NVGRE, VXLAN               |
| T520-CR         | NIC, NVGRE, VXLAN, PacketDirect |
| T580-CR         | NIC, NVGRE, VXLAN, PacketDirect |
| T580-LP-CR      | NIC, NVGRE, VXLAN, PacketDirect |
| T580-SO-CR      | NIC, NVGRE, VXLAN               |
| T520-LL-CR      | NIC, NVGRE, VXLAN               |
| T520-SO-CR      | NIC, NVGRE, VXLAN               |
| T540-CR         | NIC, NVGRE, VXLAN               |
| T522-CR         | NIC, NVGRE, VXLAN               |
| T420-CR         | NIC                             |
| T440-CR         | NIC                             |
| T422-CR         | NIC                             |
| T420-LL-CR      | NIC                             |
| T440-LP-CR      | NIC                             |
| T420-CX         | NIC                             |
| T420-SO-CR      | 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 versions:

- Windows Server Technical Preview 3
- Windows Server 2012 R2

Driver WHQL certified

## 2. Software/Driver Configuration and Fine-tuning

### 2.1. Assigning IP address to the Chelsio Network Adapter

1. Double click on the Network Connections icon and choose the Chelsio card entry and double click it.
2. Click on the Properties button from the Local Area Connection X Status.
3. Select "Internet Protocol (TCP/IP)" from the list and click on Properties button below it.
4. 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).
5. Click on Ok and close on the other window.
6. Check to see if you can ping to some other address on this subnet.

### 2.2. 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.

#### 2.2.1. VBD Driver Parameters


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

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

#### 2.2.2. NDIS Miniport Driver Parameters

To see all tunable NDIS Miniport Driver parameters, open the **Device Manager** (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.

- **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



Note

*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:* Disabled | 4088 Bytes | 9014 Bytes
  - *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:* 1-8
  - *Default:* 8
- **Maximum Number of RSS Queues**
  - *Description:* Change the number of RSS Queues.
  - *Value:* 1-8
  - *Default:* 4
- **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:* 1

- **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

### • TCP Offload

- *Description:* Enable or disable of TCP Offload.
- *Range:* Disabled | Enabled
- *Default:* Disabled



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

### • 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



*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

- **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.*

## 2.3. 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.

## 2.4. 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.

## 2.5. 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.

## 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
- T502-BT
- T580-CR
- T580-LP-CR
- T520-LL-CR
- T540-CR
- T522-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 versions:

- Windows Server Technical Preview 3
- Windows Server 2012 R2

## 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. Please note that this is possible only on SR-IOV capable systems.

- 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:



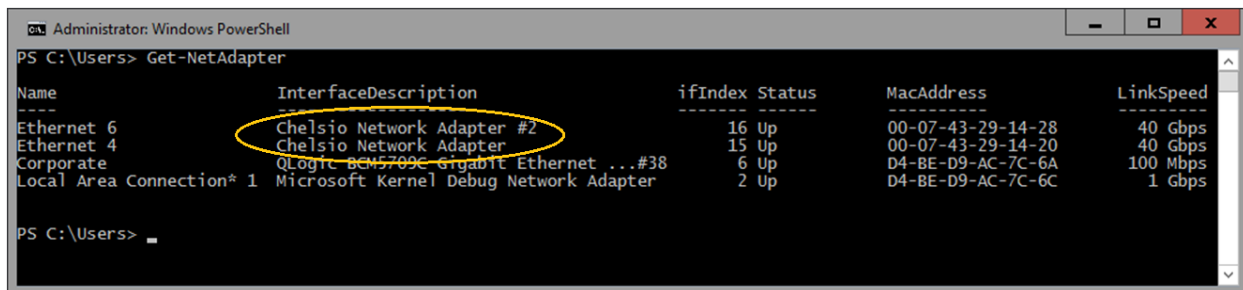
```

Administrator: Windows PowerShell
PS C:\Users\Administrator> Get-VMHost | fl "iov*"

IovSupport      : True
IovSupportReasons :

PS C:\Users\Administrator>
  
```

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



```

Administrator: Windows PowerShell
PS C:\Users> Get-NetAdapter

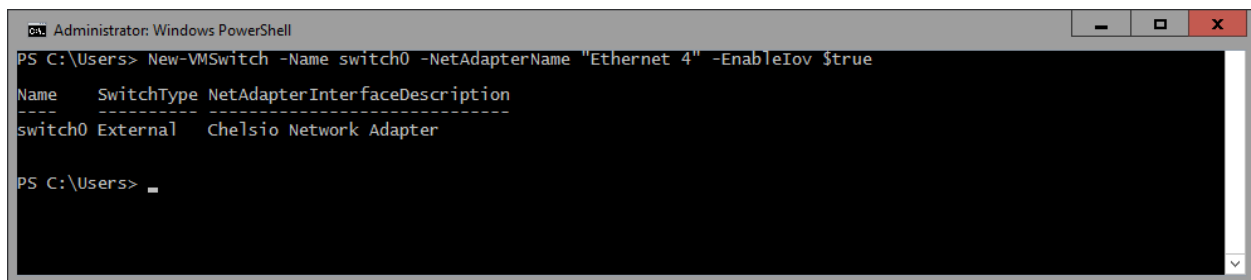
Name                InterfaceDescription      ifIndex Status   MacAddress      LinkSpeed
-----
Ethernet 6          Chelsio Network Adapter #2 16 Up      00-07-43-29-14-28 40 Gbps
Ethernet 4          Chelsio Network Adapter    15 Up      00-07-43-29-14-20 40 Gbps
Corporate           QLogic BCM5709C Gigabit 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

PS C:\Users>
  
```

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

```

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



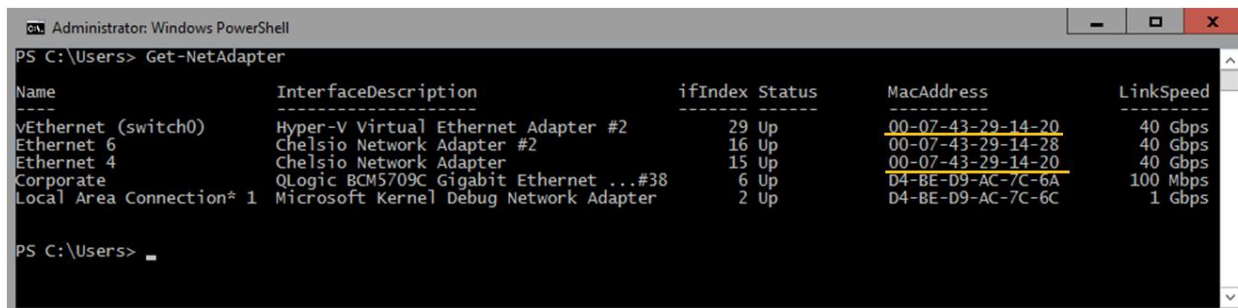
```

Administrator: Windows PowerShell
PS C:\Users> New-VMSwitch -Name switch0 -NetAdapterName "Ethernet 4" -EnableIov $true

Name      SwitchType NetAdapterInterfaceDescription
-----
switch0 External Chelsio Network Adapter

PS C:\Users>
  
```

- v. 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
  
```

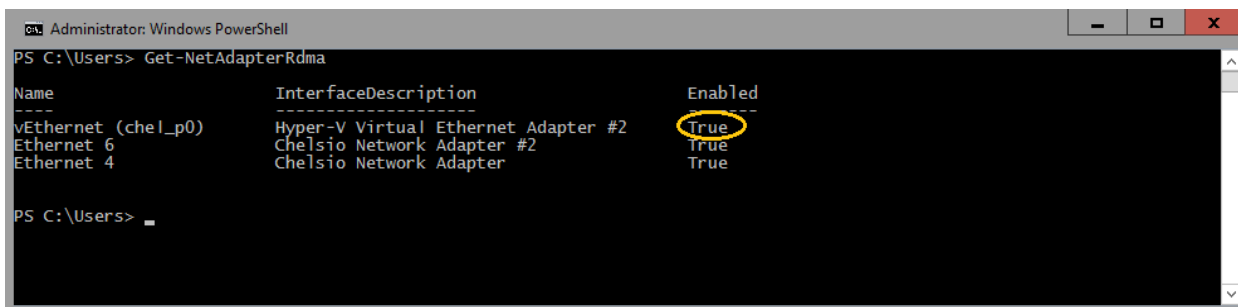
- vi. Enable RDMA on the virtual switch using *Enable-NetAdapterRdma* command.



```

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

- vii. 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
  
```

## 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 3 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
- T502-BT
- T520-CR
- T580-CR
- T580-LP-CR
- T580-SO-CR
- T520-LL-CR
- T520-SO-CR
- T540-CR
- T522-CR

### 1.2. Software Requirements

---

#### 1.2.1. Linux Requirements

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

- Windows Server Technical Preview 3
- Windows Server 2012 R2

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

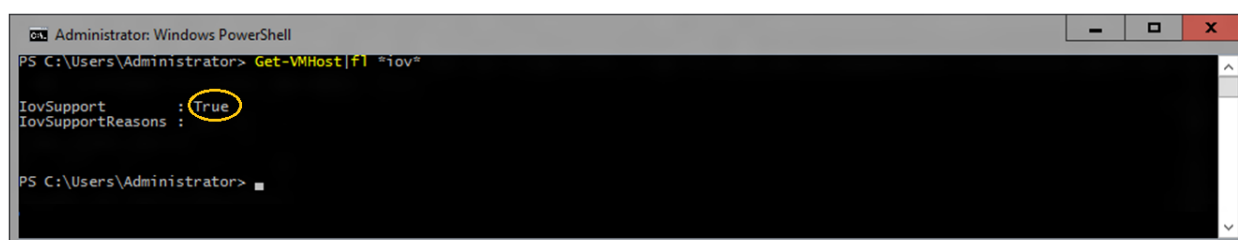
## 2. Software/Driver Configuration and Fine-tuning

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.

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:



### 2.1. Adapter 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\*. Open PowerShell with administrative privileges and follow the steps mentioned below:

- i. Change your working directory to *ChelsioUwire-x.x.x.xx\Adapter Configuration\*
- ii. Run the adapter configuration script and enter the index of the adapter for which the configuration needs to be updated:

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

```
PS D:\ChelsioUwire-5.0.0.44\Adapter Configuration> .\chelsio_adapter_config.ps1
chelsio_adapter_config Version 1.0
Please stop all the traffic on Chelsio adapters before updating !!
Select the Adapter
1. T580-LP-CR      S/N:PT02141264
2. T580-LP-CR      S/N:PT02141246
Input : 1_
```

- iii. Enter 2 as the configuration type and 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.
PS C:\Users\Administrator\Desktop\ChelsioUwire-5.0.0.44> _
```

- iv. Reboot system for changes to take effect.

## 2.2. vSwitch Configuration

---

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

## 2.3. 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. 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 anytime 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.

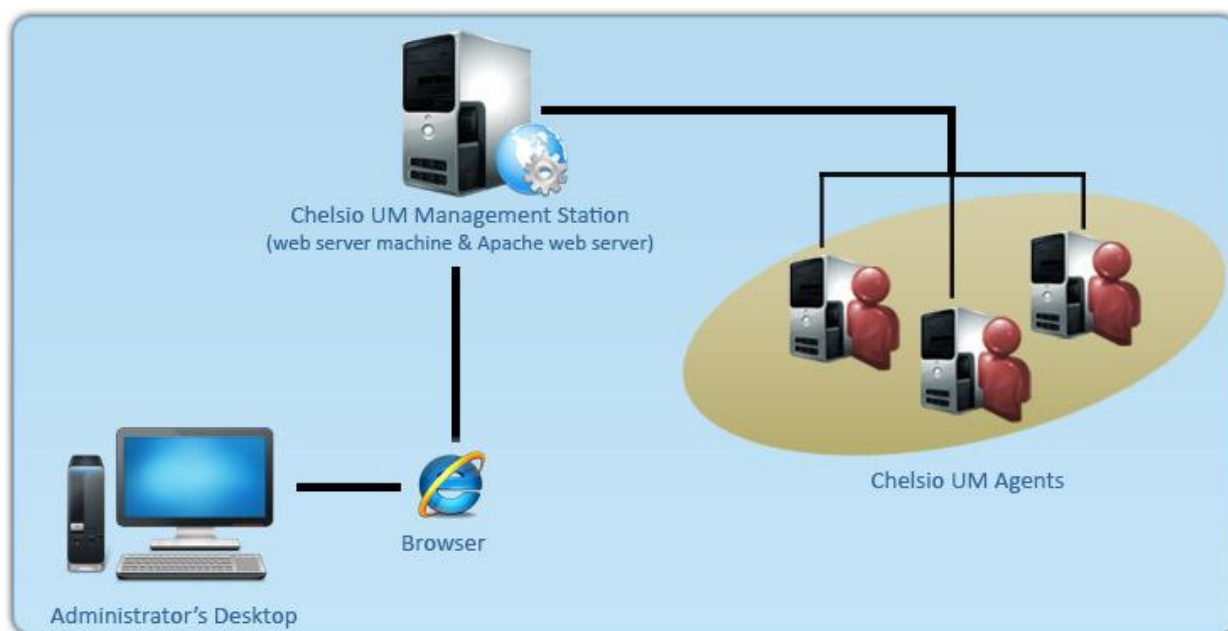


Figure 1.2 – Chelsio Unified Wire Manager with web interface (Web GUI)

## 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**
  - T502-BT
  - T520-CR
  - T580-CR
  - T580-LP-CR
  - T580-SO-CR
  - T520-LL-CR
  - T520-SO-CR
  - T540-CR
  - T522-CR
- **T4 Adapters**
  - T420-CR
  - T440-CR
  - T422-CR
  - T404-BT
  - T420-BT
  - T420-LL-CR
  - T440-LP-CR
  - T420-CX
  - T420-SO-CR

### 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            | 5.5.11.0 |

## 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

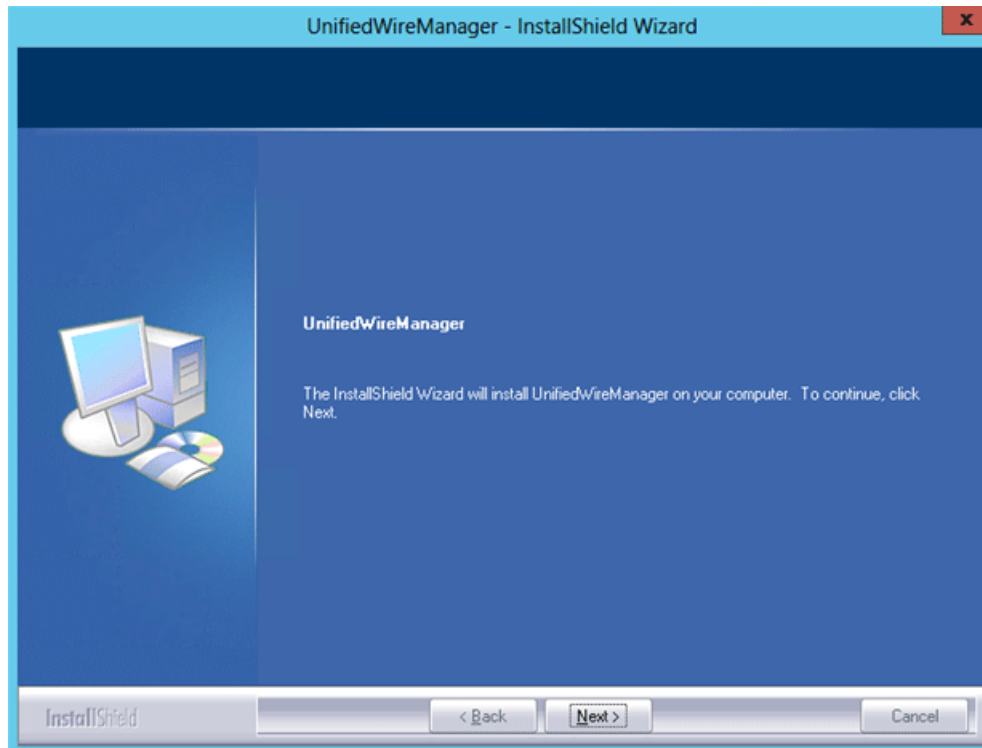
If you wish to install Management Station, please make sure that the following requirements are met before proceeding with the installation:

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 3.2 (a) – UM installer welcome window*

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

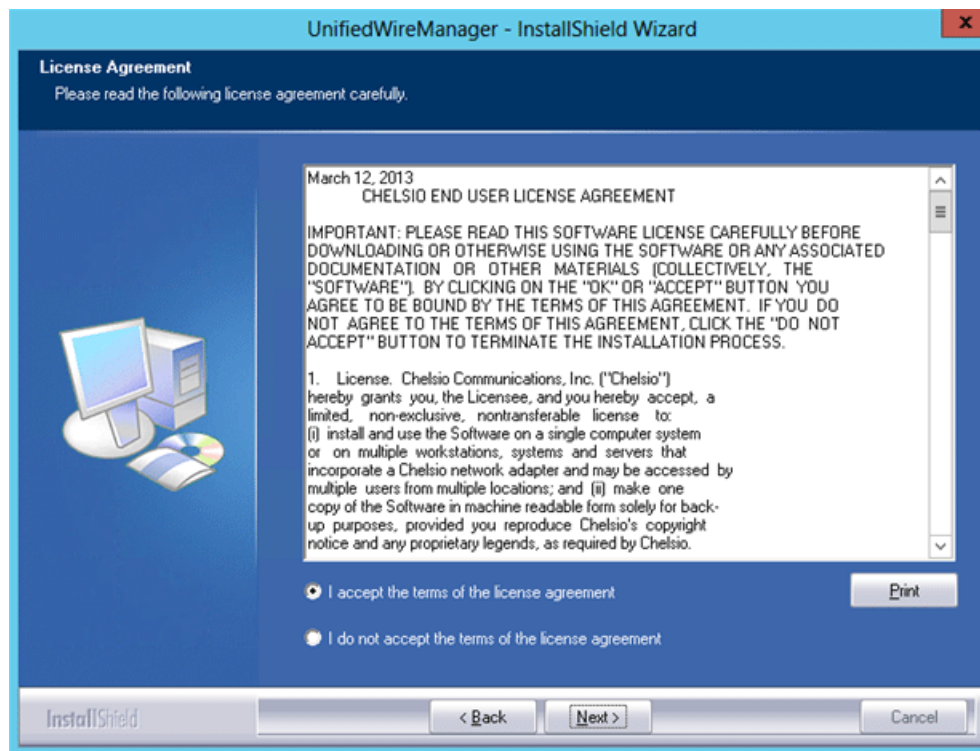
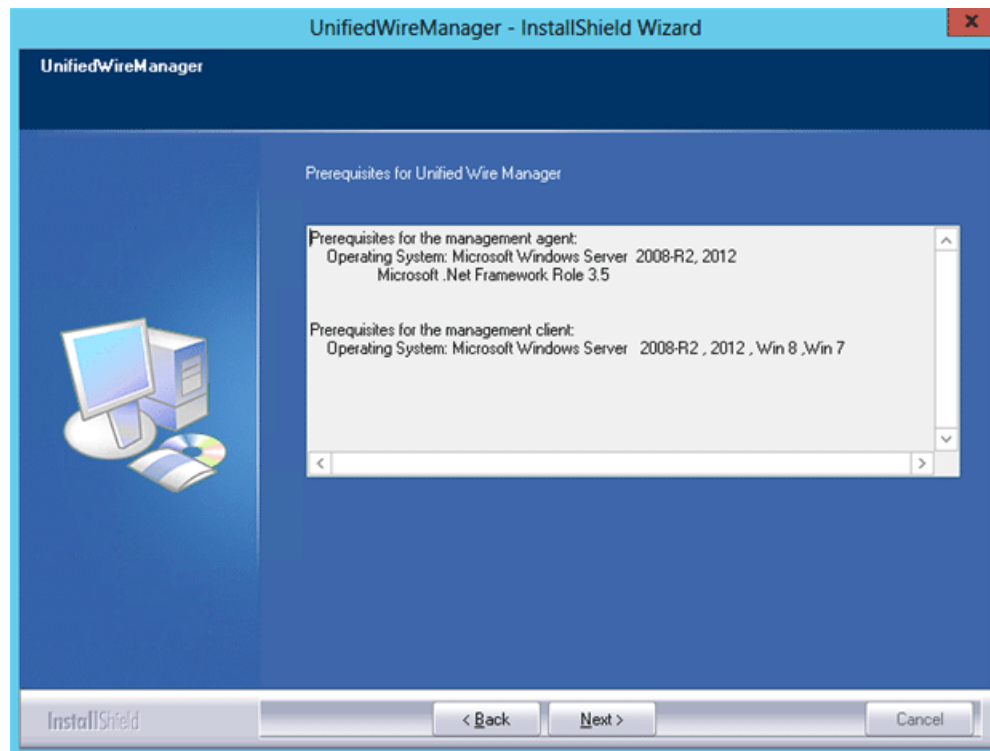


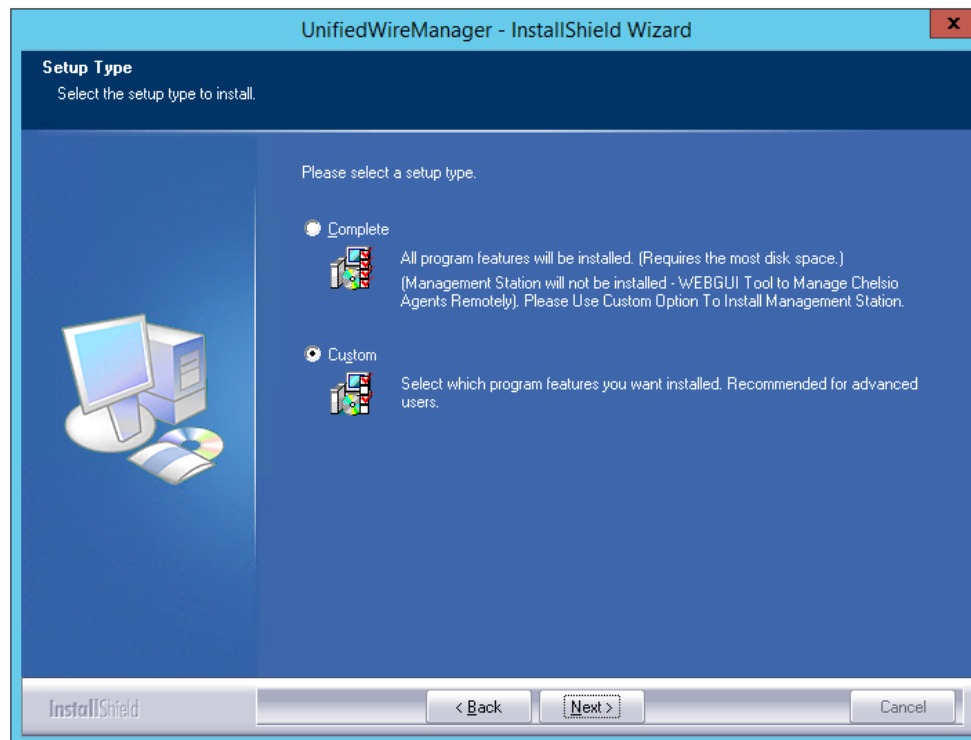
Figure 3.2 (b) – Chelsio EULA window

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



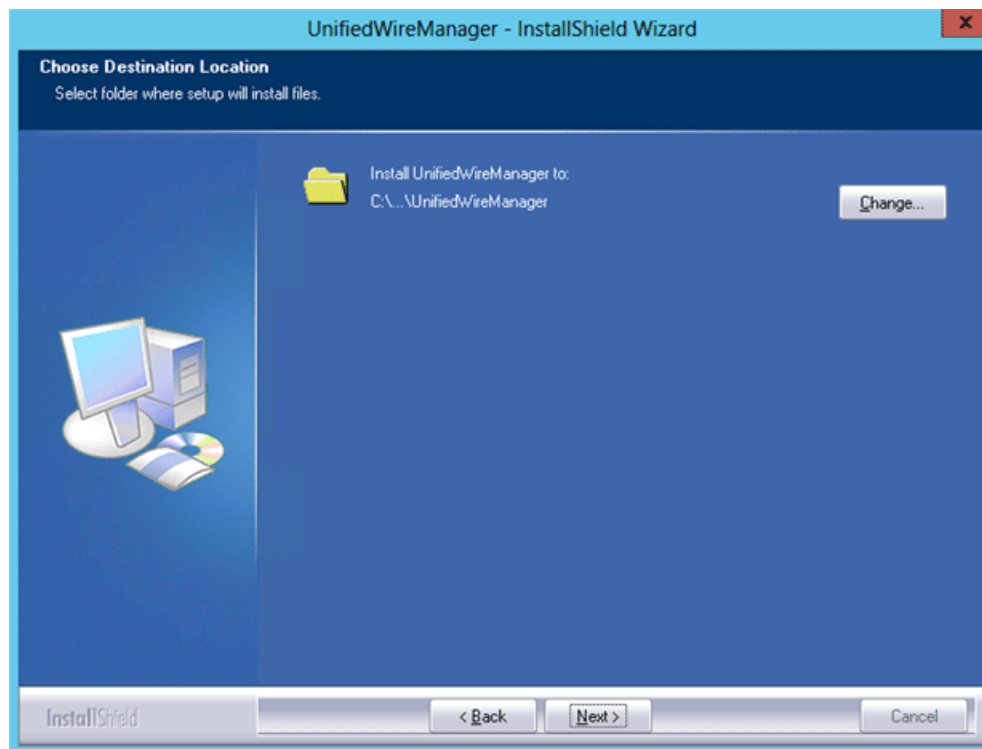
*Figure 3.2 (c) – UM prerequisites window*

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



*Figure 3.2 (d) – 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 3.2 (e) – 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**.

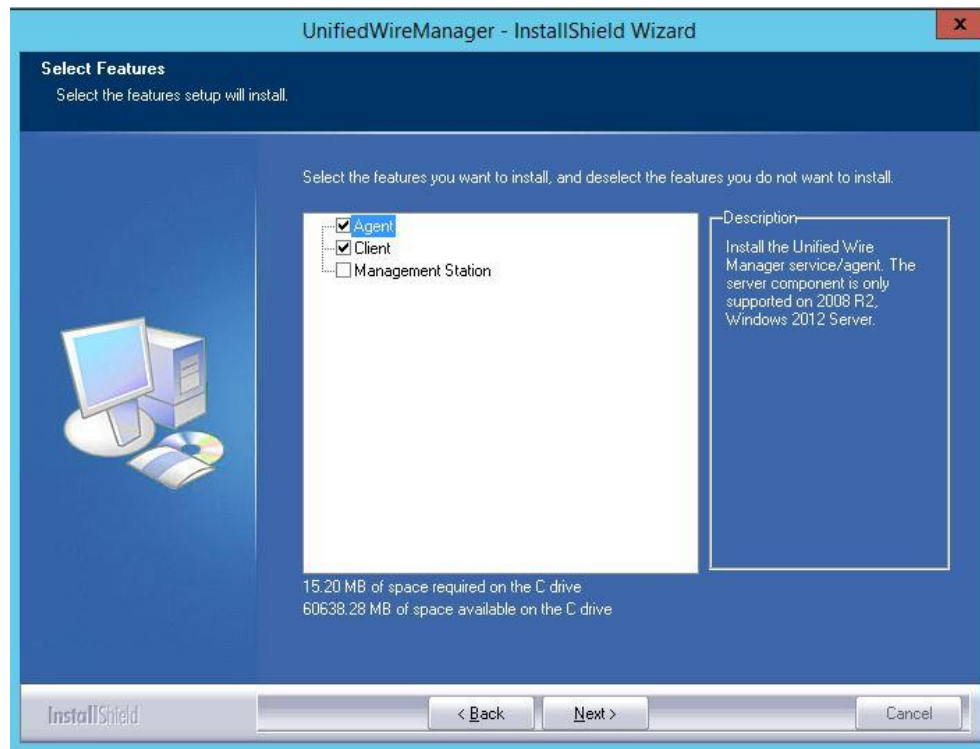
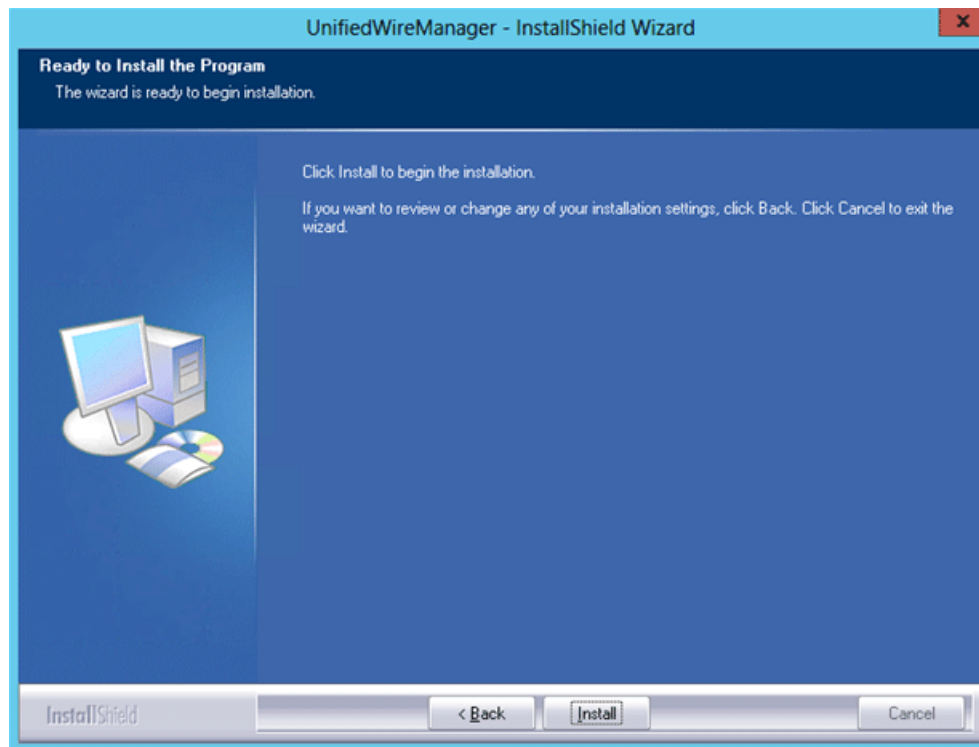


Figure 3.2 (f) – Selecting UM components to install

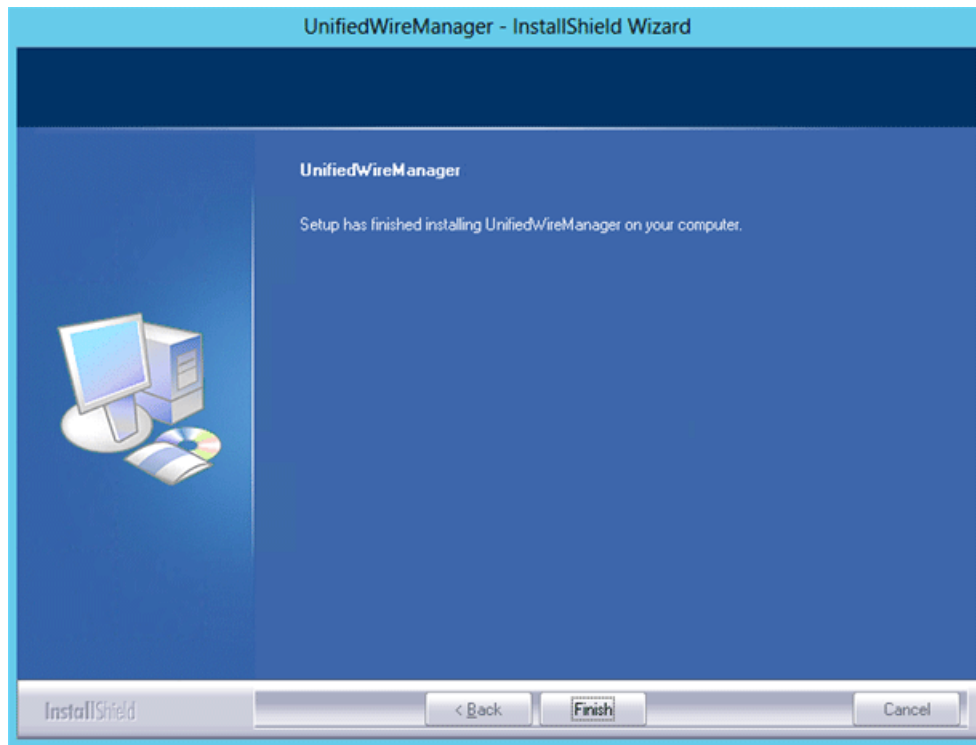
**Note** If Management Station is selected, please make sure that all related prerequisites are met before proceeding (See [Pre-requisites](#)) or else the component will be skipped during installation.

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



*Figure 3.2 (g) – Starting UM installation*

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



*Figure 3.2 (h) – 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.

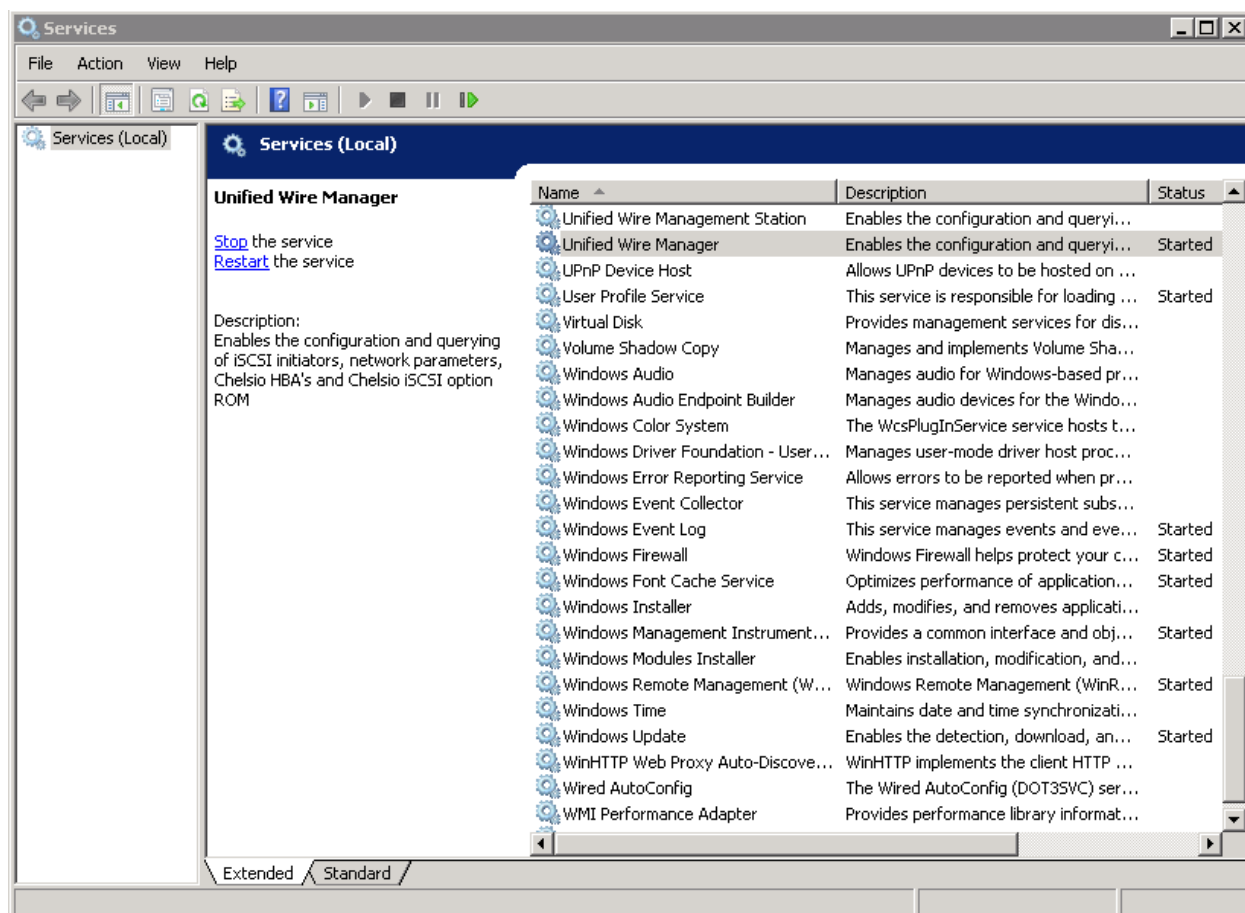


Figure 5.1(a) – Windows Services

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.

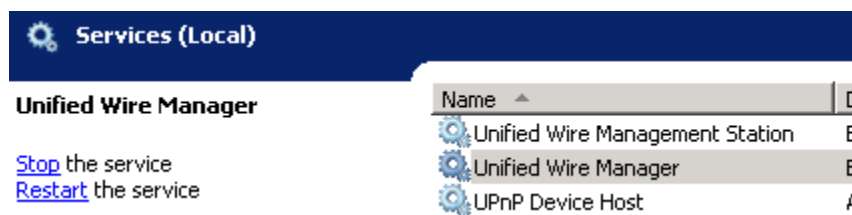


Figure 5.1(b) – Actions available for Unified Wire Manager service

## 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.

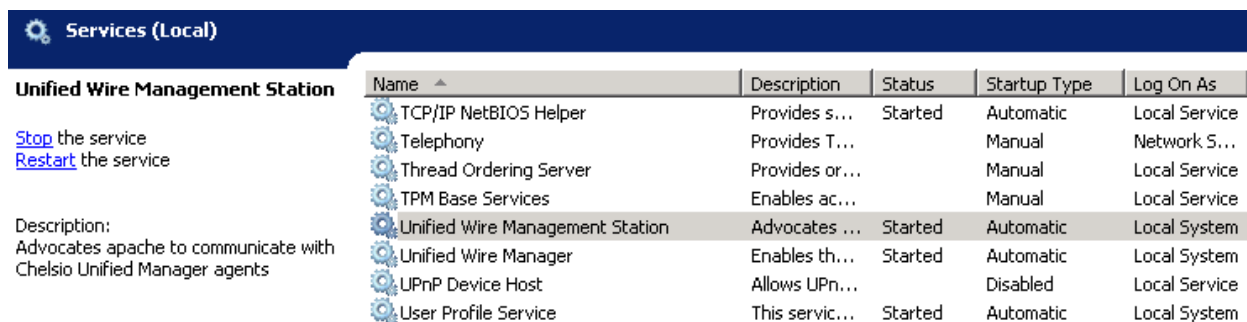


Figure 5.3 – Verifying Management Station service status



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.

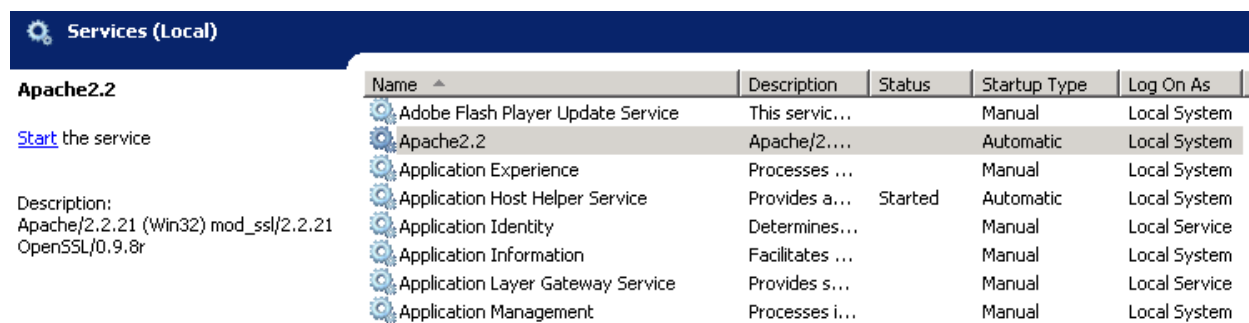


Figure 8.1.1 (a) – Starting Apache HTTP server

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

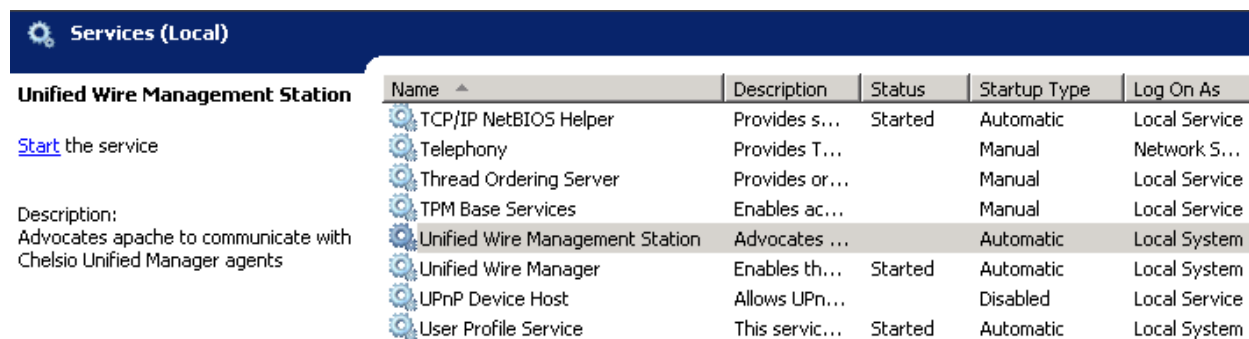


Figure 8.1.1(b) – Starting Management Station service

## 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.

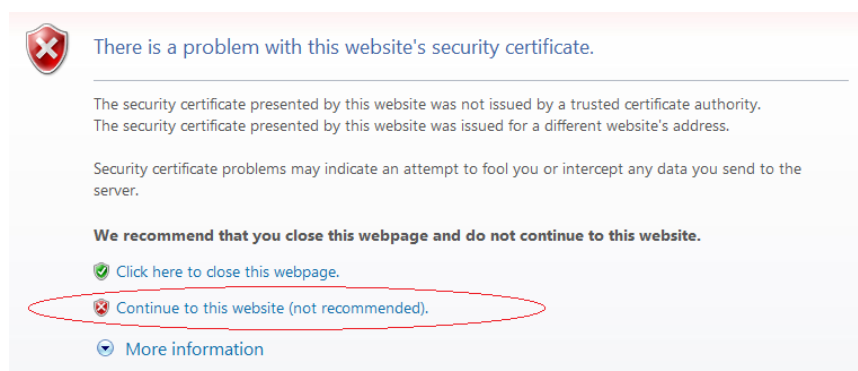


Figure 8.2 (a) - Security Certificate prompt in Internet Explorer

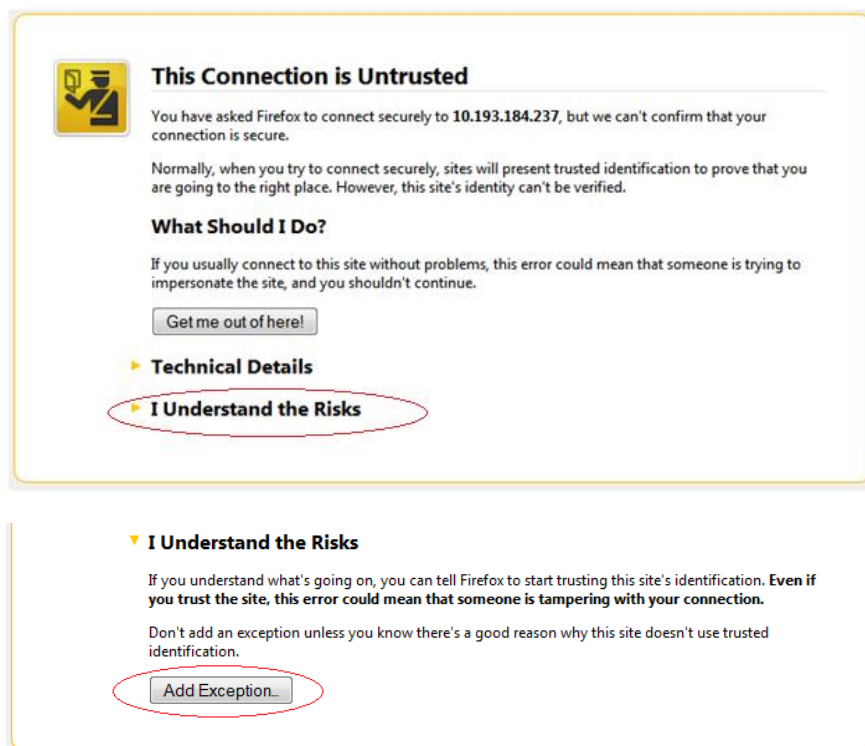


Figure 8.2 (b) - Security Certificate prompt in Mozilla Firefox

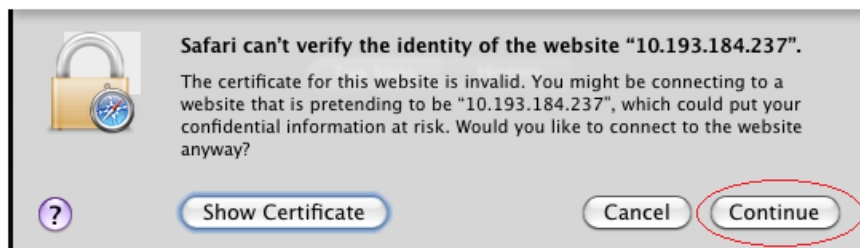


Figure 8.2 (c) - Security Certificate prompt in Apple Safari



Figure 8.2 (d) - 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.

A screenshot of a web GUI login page. The page has a title "Login". Below the title, there are two input fields: "Username" with the value "user1" and "Password" with masked characters. Below the fields is a blue "Login" button.

Figure 8.2 (e) - 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 8.3 – 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.***

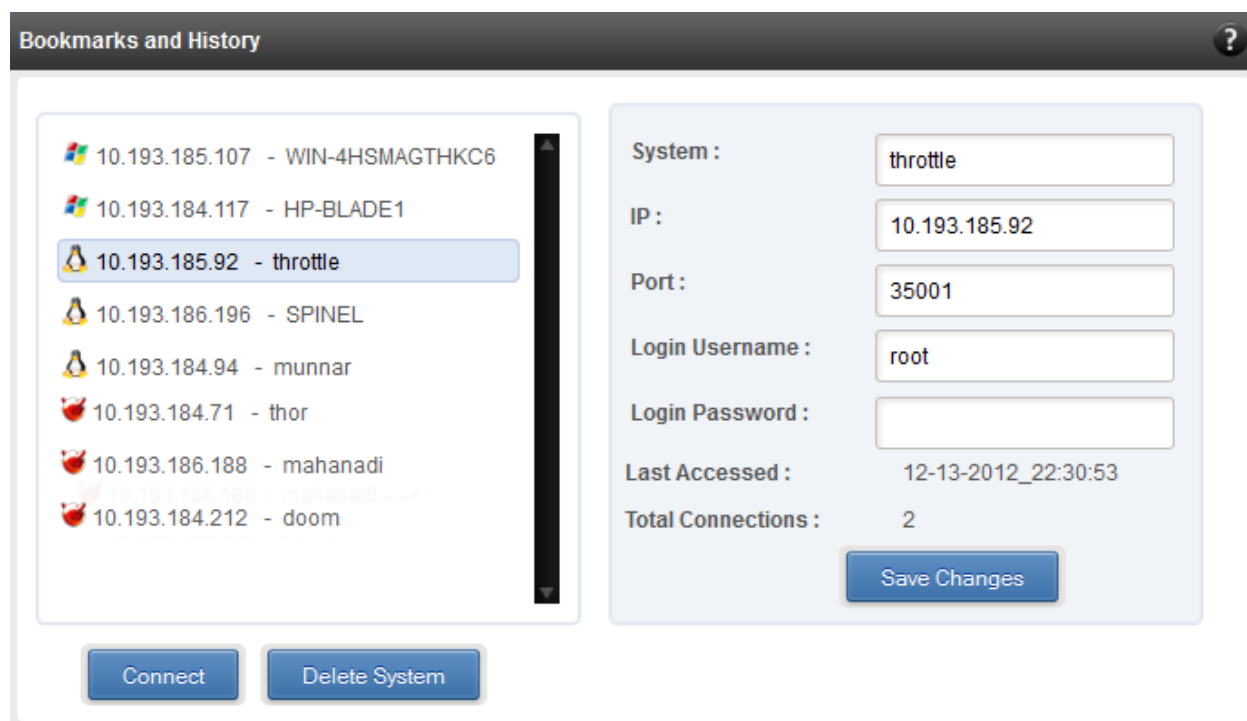


Figure 8.4.1 (a) - Bookmarks and history module

- **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.

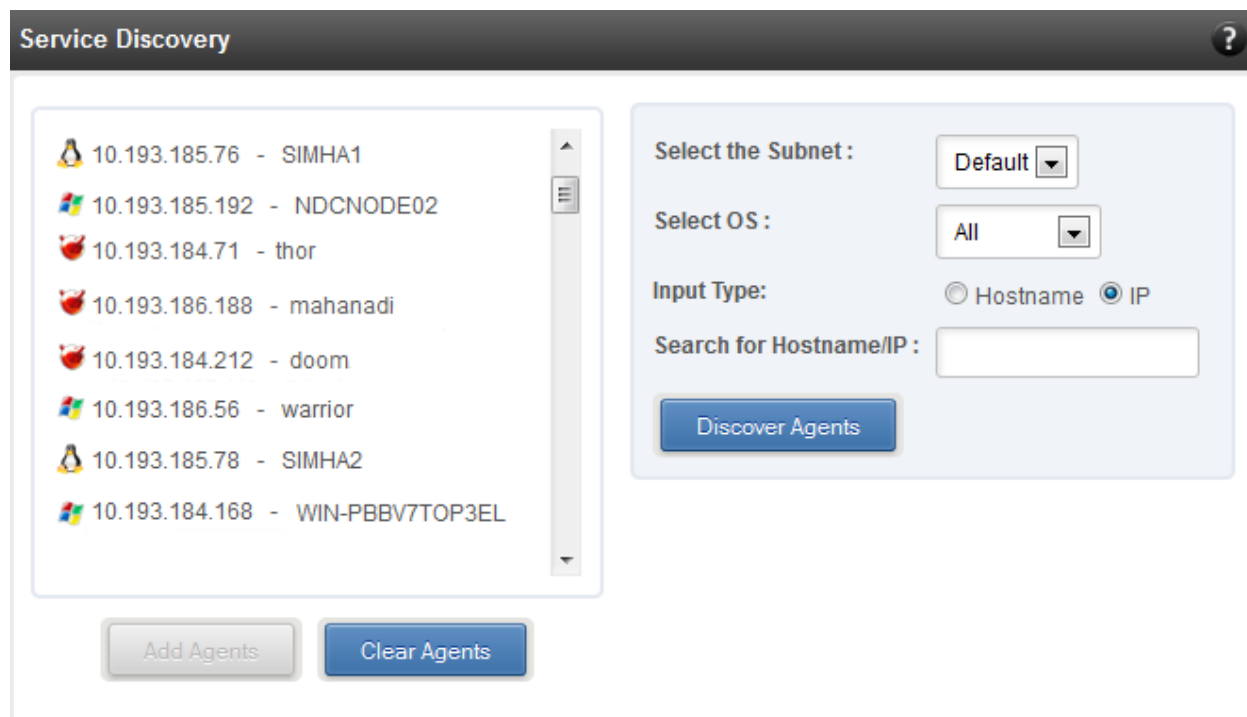


Figure 8.4.1 (b) - Services Discovery module

### • 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](http://service.chelsio.com).
5. Locate the driver package.
6. Click **Install** button to install the driver.

The screenshot shows the 'Bulk Driver Installation' window. At the top, there are two dropdown menus: 'Choose card type:' set to 'T4/T5' and 'Choose Os type:' set to 'Windows'. Below these is a section titled 'Select system for driver installation' containing a list box with one entry: '10.193.184.62 - SHARK'. To the right of this list is a 'Note' box with four points: 1. Systems from Bookmarks & History with stored login/password will appear here. 2. Connected system will not be listed. 3. System that reports error will be automatically skipped. 4. Systems with incorrect login credentials will also be skipped. Below the system list is a section titled 'Chelsio Drivers' with a list of driver options: 'NIC' (checked), 'Team', 'FCoE Full Offload Initiator', 'VNIC', and 'ND ( Available only for Chelsio Card T420-CR )'. The 'Team' option has a text field next to it containing 'ChelsioUwire-5.0.0.7.e' and a 'Select windows driver' button. At the bottom of the window are two buttons: 'Install' and 'Discard Changes'.

Figure 8.4.1 (c) - Bulk Driver Installation module



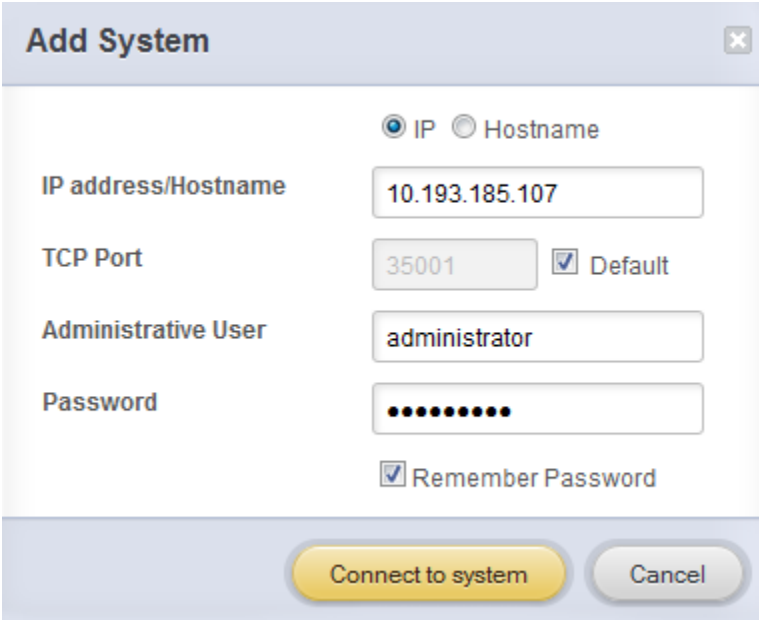
*Agents that report errors or whose passwords are not stored, will be automatically skipped during the driver installation.*

### 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 screenshot of a software dialog box titled "Add System" with a close button (X) in the top right corner. The dialog contains several input fields and checkboxes. At the top, there are two radio buttons: "IP" (selected) and "Hostname". Below this, the "IP address/Hostname" field contains the text "10.193.185.107". The "TCP Port" field contains "35001" and has a checked checkbox labeled "Default". The "Administrative User" field contains the text "administrator". The "Password" field is masked with ten black dots. Below the password field is a checked checkbox labeled "Remember Password". At the bottom of the dialog, there are two buttons: "Connect to system" (highlighted in yellow) and "Cancel".

**Add System** [X]

☒ IP ☐ Hostname

IP address/Hostname: 10.193.185.107

TCP Port: 35001 ☒ Default

Administrative User: administrator

Password: .....

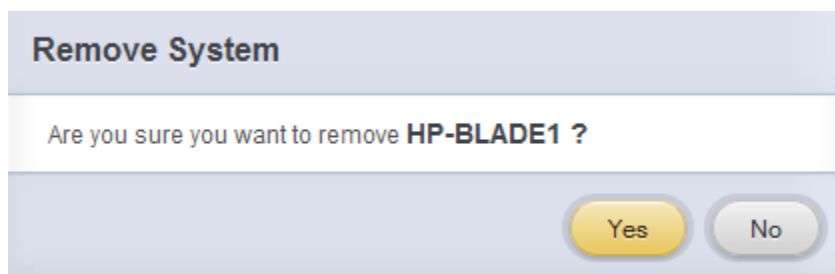
☒ Remember Password

Connect to system Cancel

*Figure 8.4.2 (a) - 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.



*Figure 8.4.3 - 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).

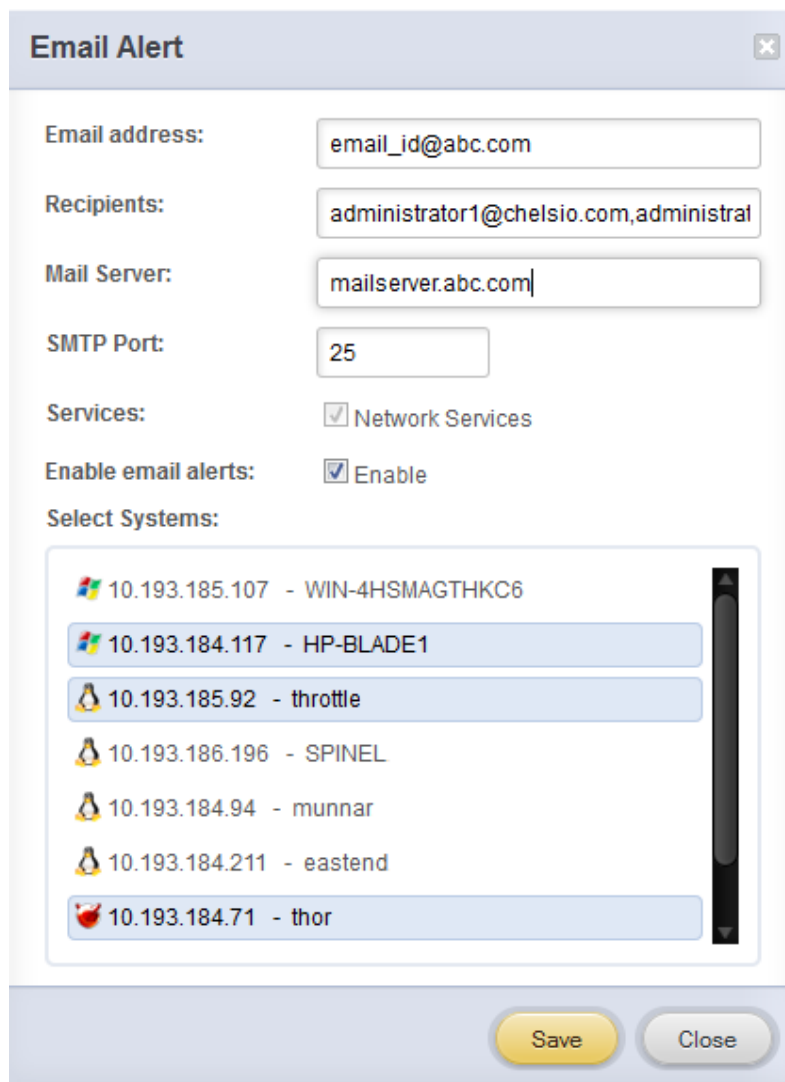
To reload an Agent, click on the name of the system in the tree menu in the left and click “Refresh”. You can use this option to update any changes made to system settings like load/unload drivers.

### 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**.



The image shows a software window titled "Email Alert" with a close button in the top right corner. The window contains several input fields and checkboxes for configuring email alerts. The fields are: "Email address:" with the value "email\_id@abc.com", "Recipients:" with the value "administrator1@chelsio.com,administrat", "Mail Server:" with the value "mailserver.abc.com", and "SMTP Port:" with the value "25". There are two checkboxes: "Services:" with "Network Services" checked, and "Enable email alerts:" with "Enable" checked. Below these is a section titled "Select Systems:" containing a list of systems with their IP addresses and names. The systems listed are: "10.193.185.107 - WIN-4HSMAGTHKC6", "10.193.184.117 - HP-BLADE1", "10.193.185.92 - throttle", "10.193.186.196 - SPINEL", "10.193.184.94 - munnar", "10.193.184.211 - eastend", and "10.193.184.71 - thor". At the bottom right of the window are two buttons: "Save" and "Close".

| IP Address     | System Name     |
|----------------|-----------------|
| 10.193.185.107 | WIN-4HSMAGTHKC6 |
| 10.193.184.117 | HP-BLADE1       |
| 10.193.185.92  | throttle        |
| 10.193.186.196 | SPINEL          |
| 10.193.184.94  | munnar          |
| 10.193.184.211 | eastend         |
| 10.193.184.71  | thor            |

Figure 8.4.5 - 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:                                   | <input type="text" value="group_t4adapter"/> |
| Os Type :                                     | <input type="text" value="Windows"/>         |
| Group Type :                                  | <input type="text" value="t4adapter"/>       |
| <input type="button" value="Create a Group"/> |  |

Figure 8.4.6 (a) – 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 8.4.6 (b) – 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** ?

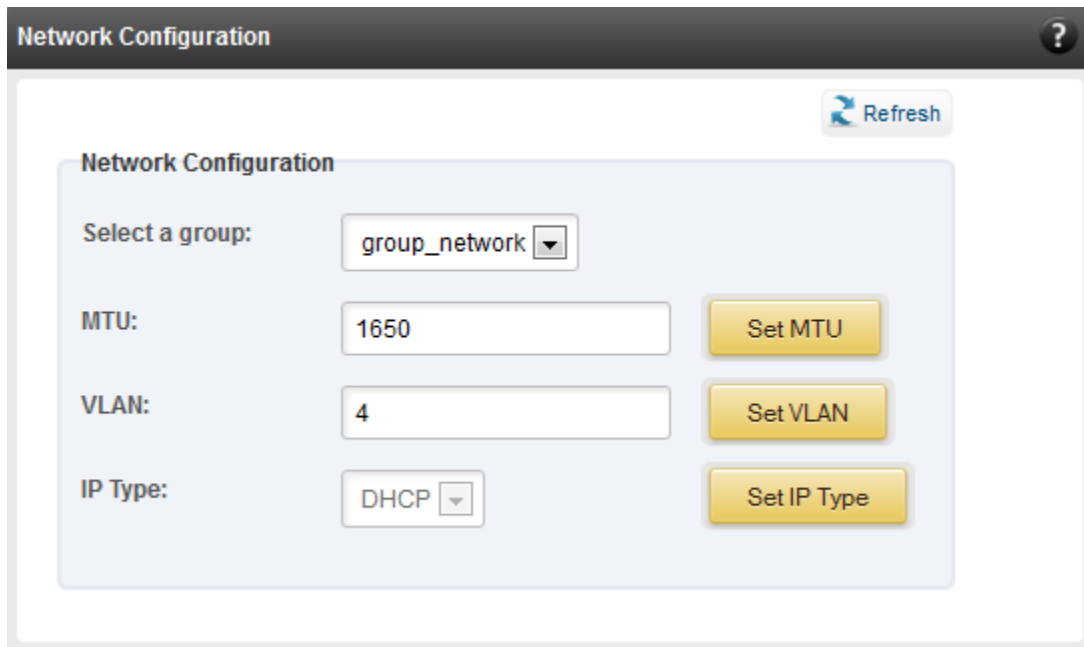
**Boot Configuration**

Select a group:

Figure 8.4.6 (c) – 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 a web-based interface for the 'Network Configuration' module. At the top, there is a dark header bar with the title 'Network Configuration' and a help icon (question mark). Below the header, there is a 'Refresh' button with a circular arrow icon. The main content area is titled 'Network Configuration' and contains three rows of configuration options. Each row has a label, a text input field, and a 'Set' button. The first row is 'Select a group:' with a dropdown menu showing 'group\_network'. The second row is 'MTU:' with a text input field containing '1650' and a 'Set MTU' button. The third row is 'VLAN:' with a text input field containing '4' and a 'Set VLAN' button. The fourth row is 'IP Type:' with a dropdown menu showing 'DHCP' and a 'Set IP Type' button.

Figure 8.4.6 (d) – 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).

Card Configuration

Refresh

Select a Group: group\_win\_t4adapter

Group Type: t4adapter

OS Type: WINDOWS

**Note:**  
MIN = Minimum value a variable of type int can assume  
MAX = Maximum value a variable of type int can assume

| DESCRIPTION | RANGE  | VALUE |
|-------------|--------|-------|
| Max VM      | [0,16] | 4     |

Set Card Properties Discard Changes

Figure 8.4.6 (e) – 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

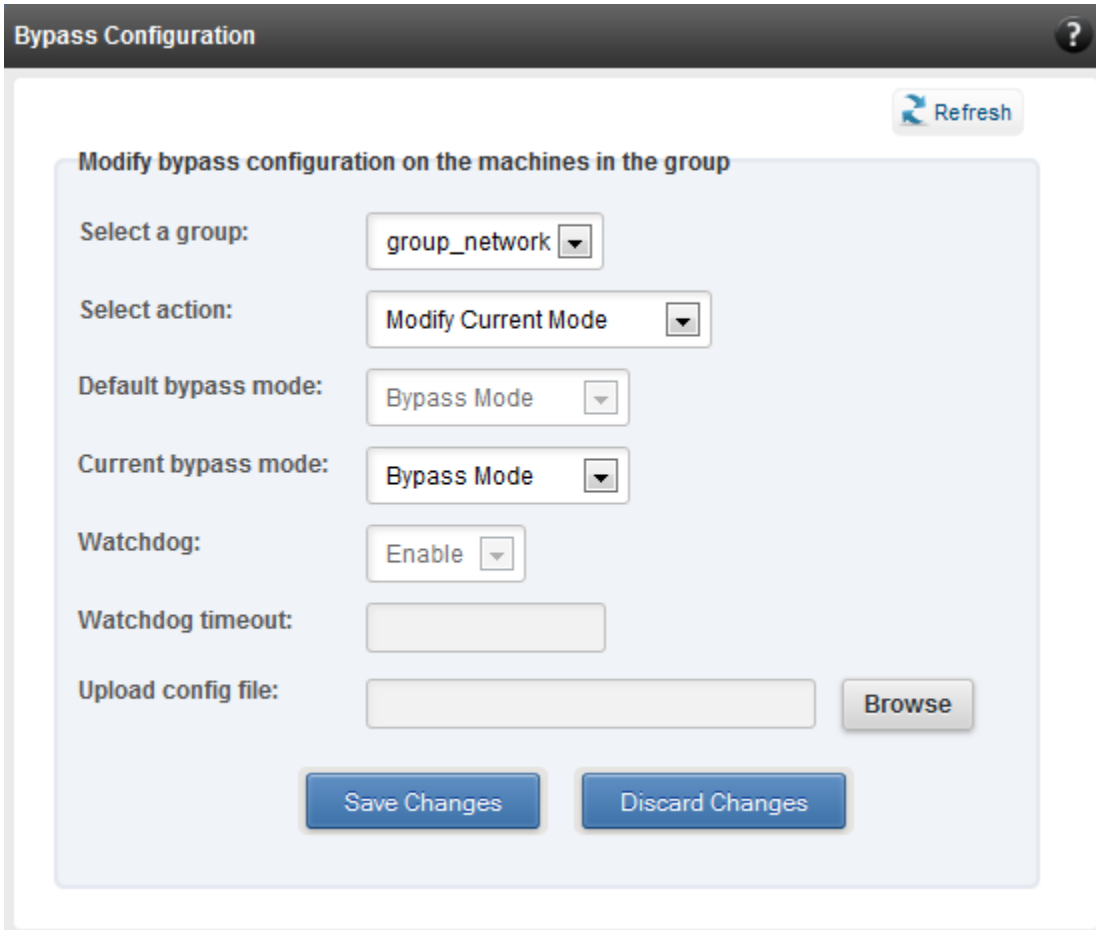
MAX = Maximun value a variable of type int can assume

| 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 8.4.6 (f) - 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 is a title bar with the text 'Bypass Configuration' and a help icon (question mark). Below the title bar, there is a 'Refresh' button with a circular arrow icon. 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'.

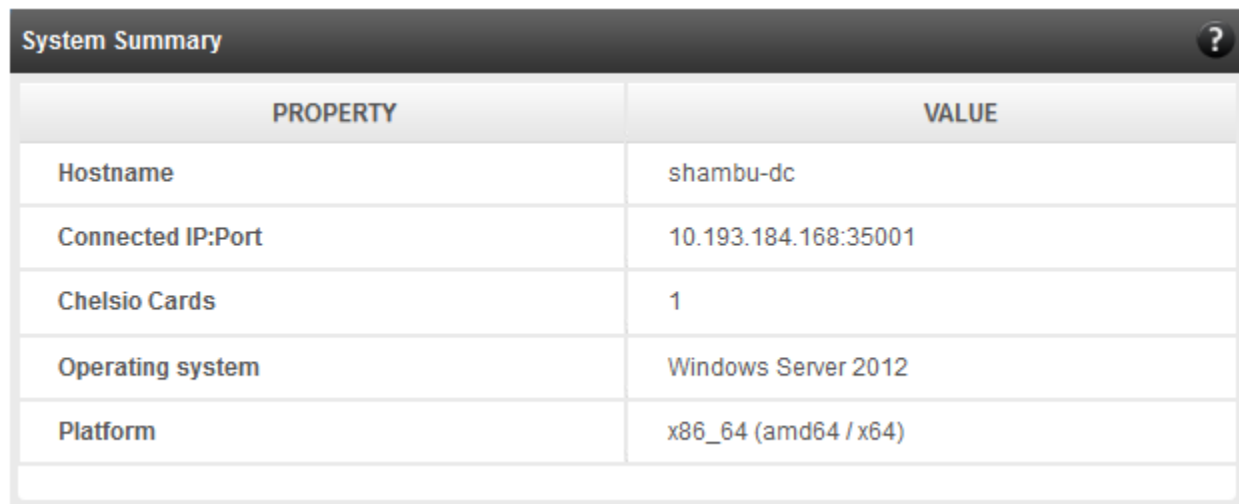
*Figure 8.4.6 (g) - Bypass Configuration module*

## 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.



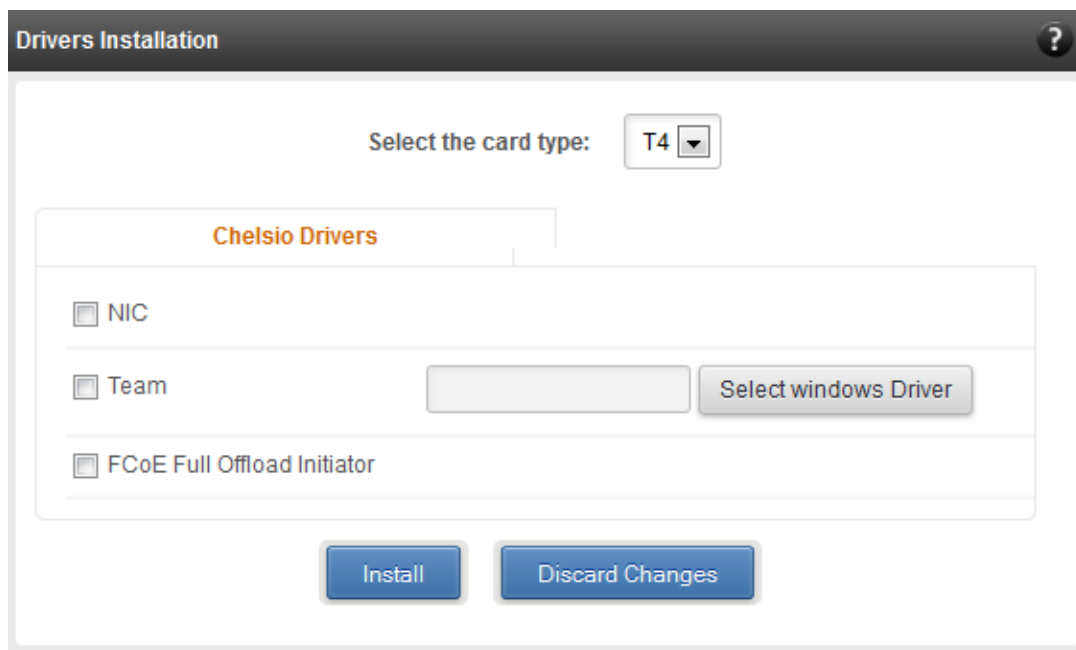
The screenshot shows a window titled "System Summary" with a help icon in the top right corner. Inside the window is a table with two columns: "PROPERTY" and "VALUE". The table contains five rows of system information.

| 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 8.5.1 (a) - System Summary module

### 8.5.2. Drivers Installation

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



*Figure 8.5.2 (a) - 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 <span>?</span>                                      |        |         |           |   |
|--|--------|---------|-----------|---|
| <div>Refresh</div> <div>Load / Unload Driver Discard Changes</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 8.5.3 - Driver Details module

### 8.5.4. System Diagnostics

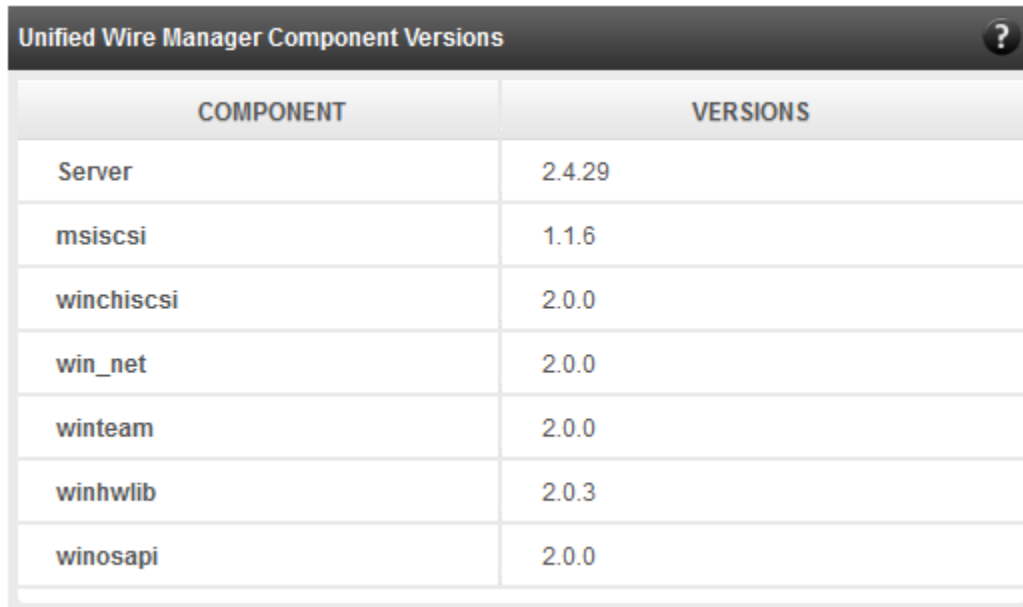
Using this module, you can run various diagnostic tests on Chelsio adapters to troubleshoot adapter related issues. Select the adapter(s) from the list for which you want to run the test, select the operation (type of test; you can run more than one test at a time) and click **Run Test**. After the tests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

| CARD    | LED     | CONTROL REGISTERS | MII REGISTERS | EEPROM  | INTERNAL MEMORY |
|---------|---------|-------------------|---------------|---------|-----------------|
| T420-CR | Success | Success           | Success       | Success | Success         |

Figure 8.5.4 - 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.



The screenshot shows a window titled "Unified Wire Manager Component Versions" with a help icon in the top right corner. Inside the window is a table with two columns: "COMPONENT" and "VERSIONS". The table lists seven components and their corresponding versions.

| 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 8.5.5 - 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.

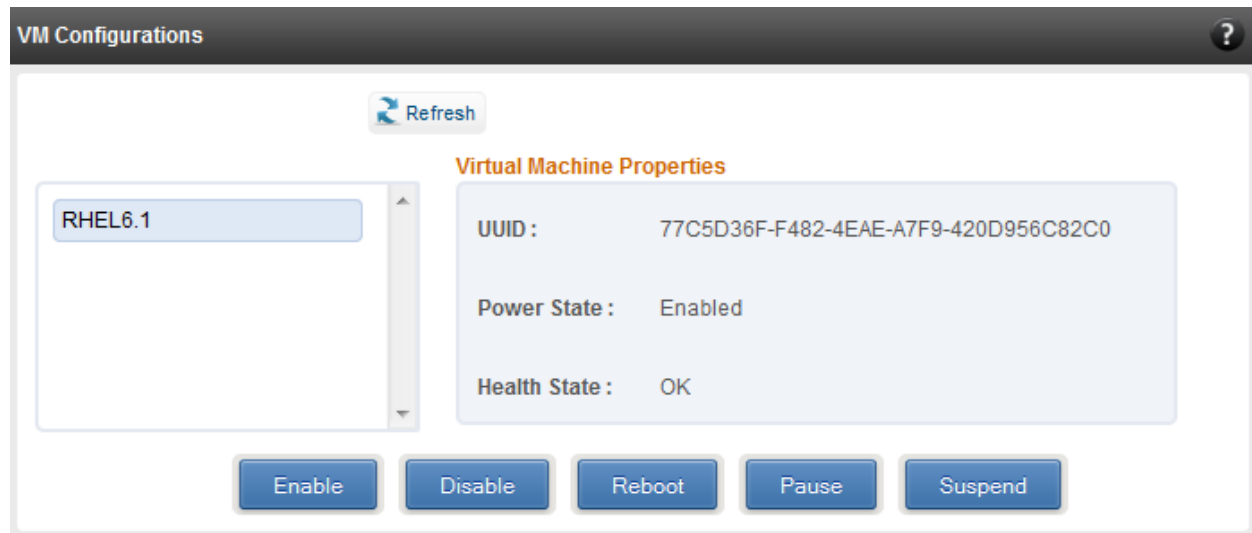


Figure 8.5.6 - VM Configurations module

### 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.

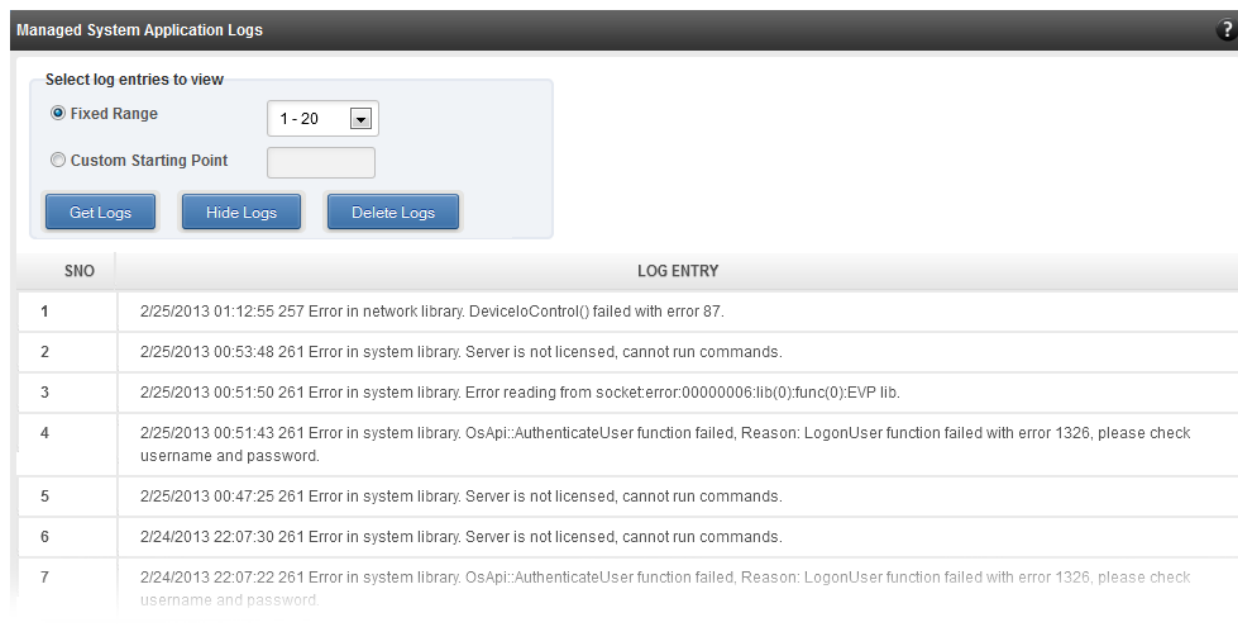


Figure 8.5.7 - Managed System Application Logs module for Windows Agent

## 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 8.6.1 - 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.

| Card Summary <span>?</span>                  |  |
|--|--|
| 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 8.6.2 (a) - 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 ) ?

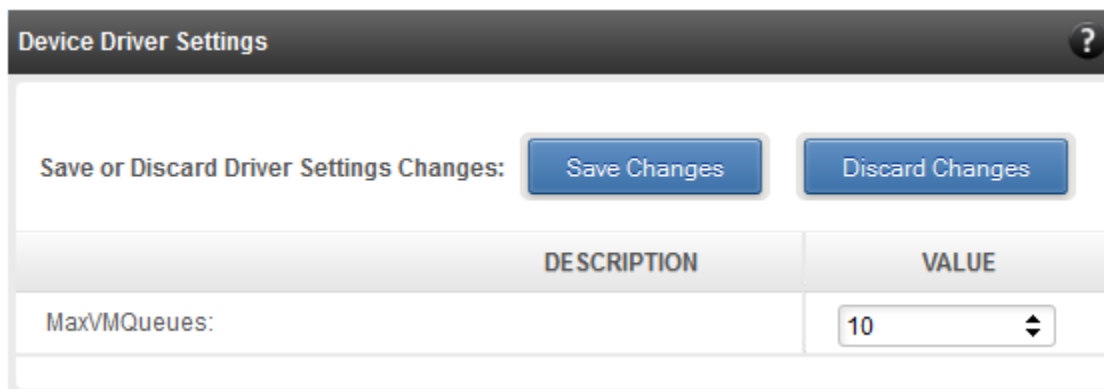
Save or Discard Driver Settings Changes: Save Changes Discard Changes

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

Figure 8.6.2 (b) - 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.

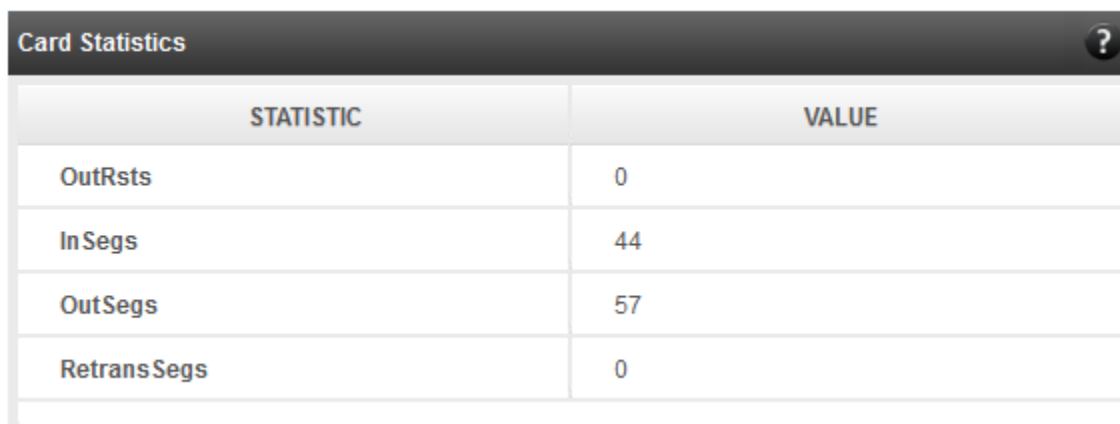


| DESCRIPTION  | VALUE |
|--------------|-------|
| MaxVMQueues: | 10    |

Figure 8.6.2 (c) - 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 8.6.2 (d) - 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.



The screenshot shows a window titled "Port Summary" with a help icon in the top right corner. The window contains a table with two columns: "PROPERTY" and "VALUE". The table has two rows: "Port Name" with the value "Local Area Connection 89" and "Link" with the value "Link up".

| PROPERTY  | VALUE                    |
|-----------|--------------------------|
| Port Name | Local Area Connection 89 |
| Link      | Link up                  |

Figure 8.6.2.1 (a) - 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

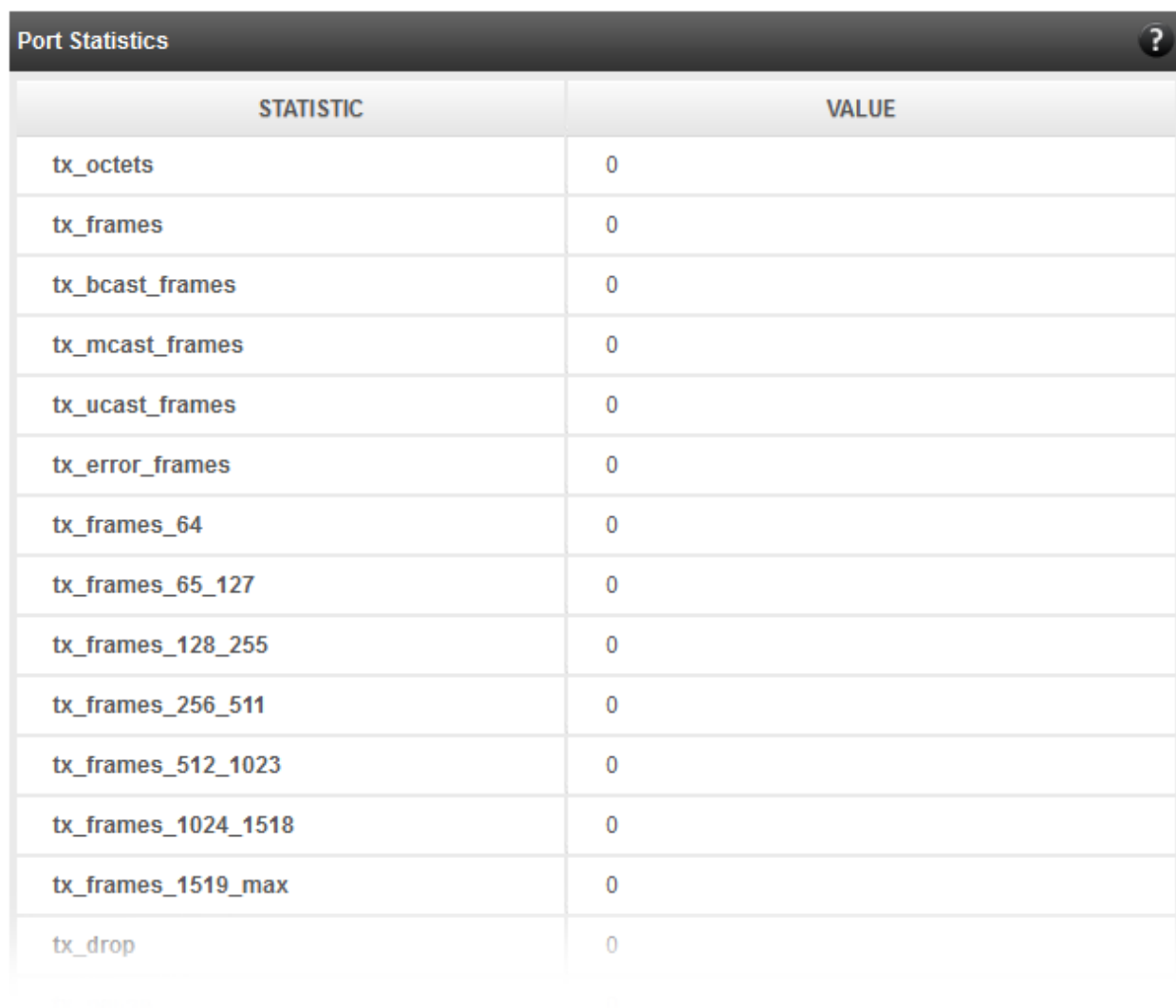
| DESCRIPTION                      | VALUE              |
|----------------------------------|--------------------|
| MTU (in bytes):                  | 1500               |
| Link speed and duplex operation: | 10Gb/s Full duplex |
| Tx checksum offload enabled:     | No                 |
| Rx checksum 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 WQ on filtering:             | Yes                |

Figure 8.6.2.1 (b) - Port Settings of T4 CNA



- **Port statistics**

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



The screenshot shows a window titled "Port Statistics" with a help icon in the top right corner. Below the title bar is a table with two columns: "STATISTIC" and "VALUE". The table lists 15 statistics, all of which have a value of 0. The statistics include tx\_octets, tx\_frames, tx\_bcast\_frames, tx\_mcast\_frames, tx\_ucast\_frames, tx\_error\_frames, tx\_frames\_64, tx\_frames\_65\_127, tx\_frames\_128\_255, tx\_frames\_256\_511, tx\_frames\_512\_1023, tx\_frames\_1024\_1518, tx\_frames\_1519\_max, and tx\_drop.

| 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 8.6.2.1 (c) - 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.

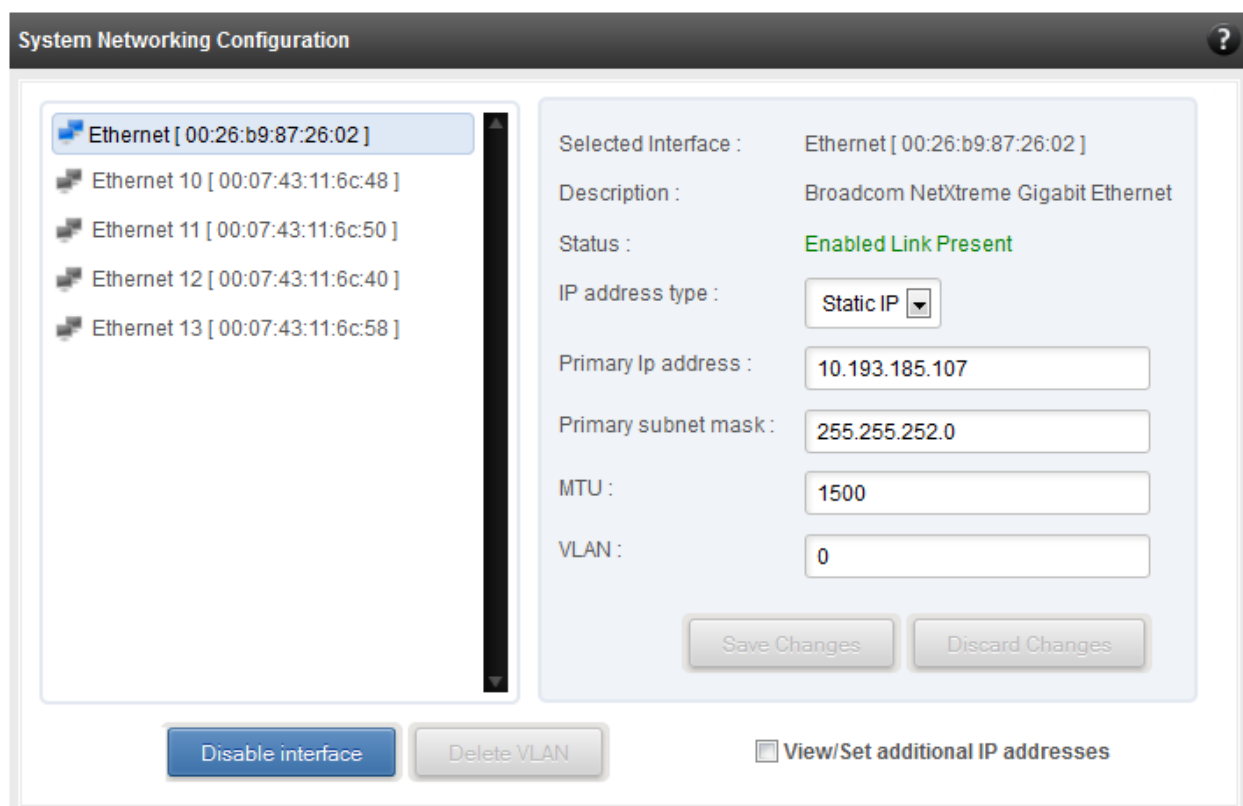


Figure 8.6.3 (a) - System network configuration module

The screenshot displays the Unified Wire Manager (UM) interface for managing IP aliases. On the left, a list titled "Additional IP Address" contains one entry: "10.193.185.105 / 255.255.252.0". To the right, there are three main sections: "Add IP Address" with input fields for IP (10.193.185.103) and Mask (255.255.252.0) and an "Add" button; "Modify Selected IP Address" with input fields for IP (10.193.185.105) and Mask (255.255.252.0) and a "Modify" button; and a "Delete Selected IP Address" button at the bottom.

*Figure 8.6.3 (b) – 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.

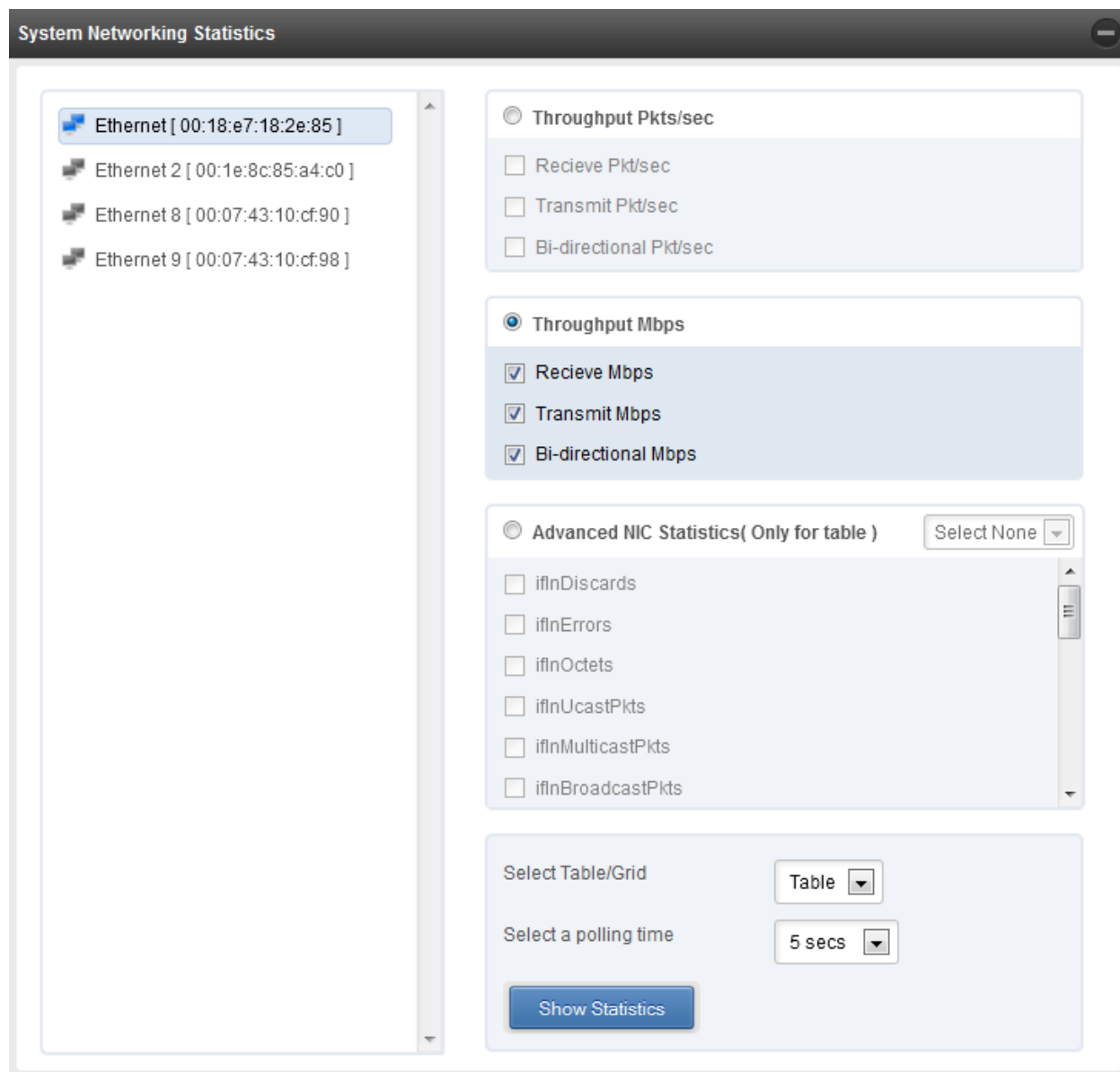


Figure 8.6.3 (c) - System network statistics module

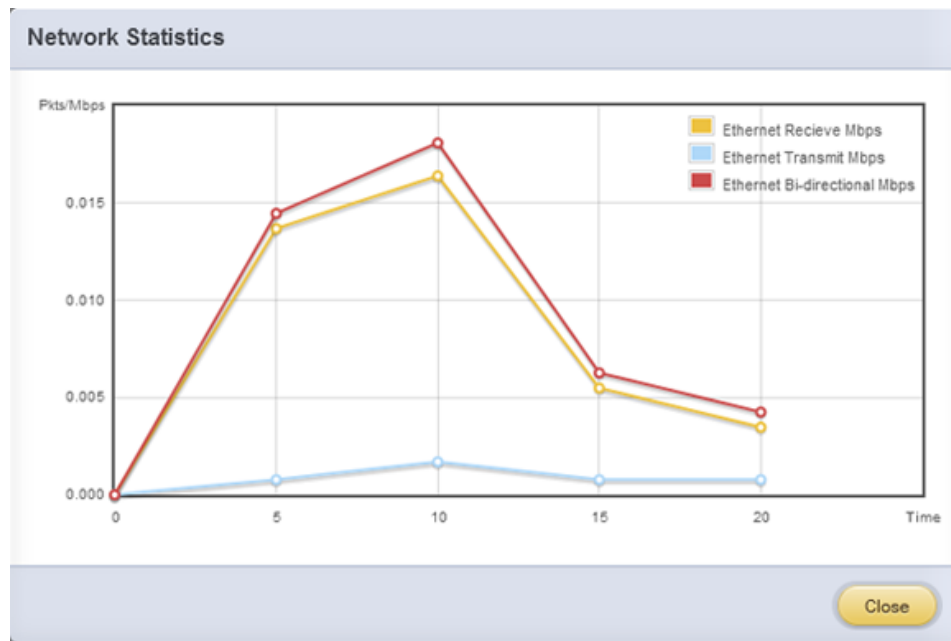


Figure 8.6.3 (d) - Network Throughput Vs Time instant Graph

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

Figure 8.6.3 (e) - 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. Use the option to set multiple default gateways with caution, since it may cause the system to stop communicating with external networks.

The screenshot shows a window titled "Default Gateway And DNS Configuration" with a help icon in the top right corner. The window is divided into two main sections: "Default Gateway Configuration" and "DNS Server Configuration".

**Default Gateway Configuration:**

- A list on the left shows a single gateway: 10.193.184.1.
- On the right, the "Network Adapter" is set to "Ethernet".
- The "Modify the selected gateway" section shows the IP address 10.193.184.1 in a text box and a "Modify Gateway" button.
- The "Add/Set Default gateway" section includes a "Gateway IP Address" text box, a "Network Adapter" dropdown menu set to "Ethernet", and an "Add Gateway" button.

**DNS Server Configuration:**

- A list on the left shows three DNS servers: 10.193.180.20, 10.192.160.5, and 10.192.160.6.
- On the right, the "Network Adapter" is set to "Ethernet".
- The "Modify the selected DNS Server" section has an empty text box and a "Modify DNS Server" button.
- The "Delete the selected DNS Server" section has a "Delete DNS Server" button.
- The "Add a DNS Server" section includes a "Server IP Address" text box, a "Network Adapter" dropdown menu set to "Ethernet", and an "Add DNS Server" button.

Figure 8.6.3 (f) - 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.

Create a Newtork Team/Bond Device

Select Team Members

Refresh

Driver Status - Teaming/bonding driver is offload-capable

Team Name :

Team Mode : Round-Robin

Team Priority:

1. eth0
2. eth1

IP Address Type : DHCP

Static IP Address :

Static Subnet Mask :

Create Team

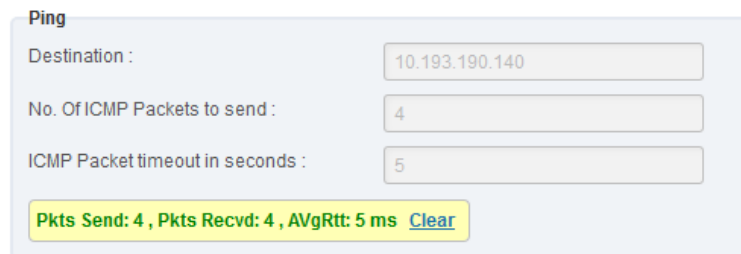
Figure 8.6.3 (g) - Create a network team/bond device module for Linux Agent

- **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.



The screenshot shows a 'Ping' utility window. It has three input fields: 'Destination :' with the value '10.193.190.140', 'No. Of ICMP Packets to send :' with the value '4', and 'ICMP Packet timeout in seconds :' with the value '5'. Below these fields is a yellow status bar that reads 'Pkts Send: 4 , Pkts Recvd: 4 , AVgRtt: 5 ms' followed by a blue 'Clear' button.

*Figure 8.6.3 (h) - 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 8.6.3 (i) - TraceRoute Utility

**GetConnections**

| PROTOCOL | LOCAL ADDRESS | REMOTE ADDRESS | STATE     | OFFLOAD |
|----------|---------------|----------------|-----------|---------|
| TCP      | 0.0.0.0:135   | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:445   | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:3389  | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:35001 | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:47001 | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:49152 | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:49153 | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:49154 | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:49155 | 0.0.0.0:0      | Listening | In host |
| TCP      | 0.0.0.0:49156 | 0.0.0.0:0      | Listening | In host |

Figure 8.6.3 (j) - 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.

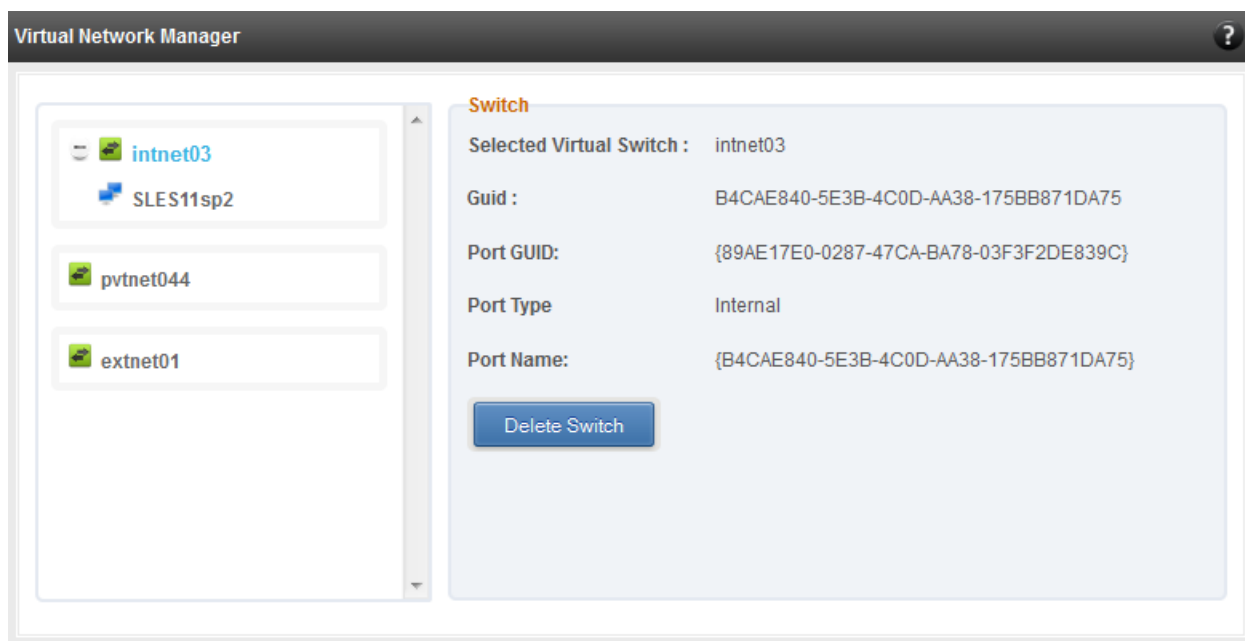


Figure 8.6.3.1 (a) – Virtual Network Manager module

- **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.



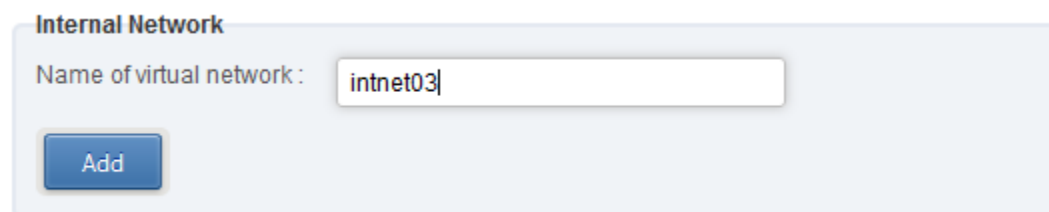
**External network**

Name of virtual network : extnet01

Interface Name : Chelsio T4 10GbE Adapter #10

Add

*Figure 8.6.3.1 (b) – Creating external virtual network*

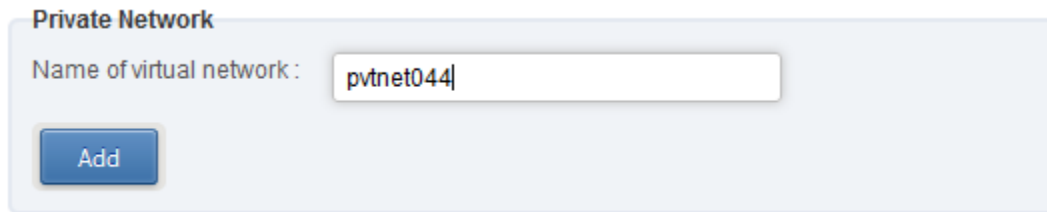


**Internal Network**

Name of virtual network : intnet03

Add

*Figure 8.6.3.1 (c) – Creating internal virtual network*



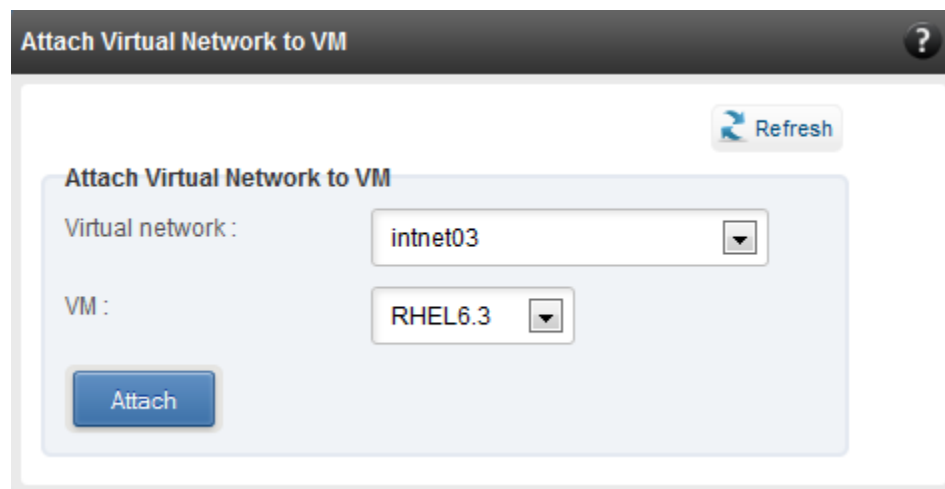
**Private Network**

Name of virtual network :

Figure 8.6.3.1 (d) – 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*.



**Attach Virtual Network to VM** ?

**Attach Virtual Network to VM**

Virtual network :

VM :

Figure 8.6.3.1 (e) – 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 8.6.4 (a) – 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 8.6.4 (b) – 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 7.7 – 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 to **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               | csistor ( 1.1.0.9 ) |
| No. of FCoE enabled cards | 2                   |
| No. of FCoE Ports         | 6                   |

Figure 8.7.1 (a) – 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 8.7.1.1 (a) – 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     |

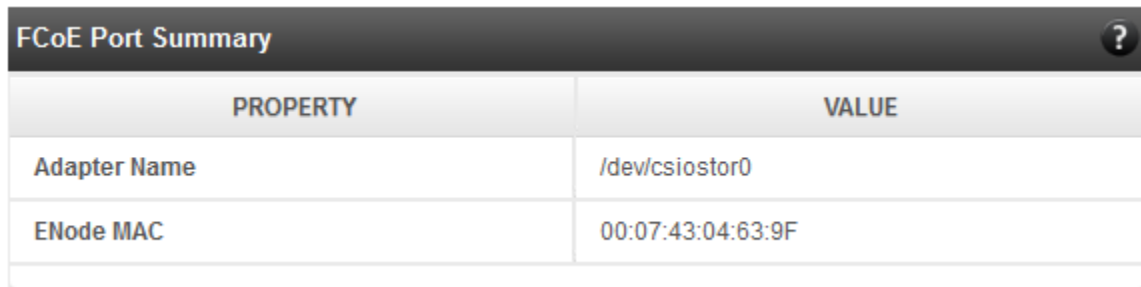
Figure 8.7.1.1 (b) – FCoE Attributes module

### 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/csiostor0    |
| ENode MAC         | 00:07:43:04:63:9F |

Figure 8.7.1.2 (a) – 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 <span>?</span> |                            |
|-------------------------------------|----------------------------|
| 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 8.7.1.2 (b) – 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.

- i. Manual: Where the user can manually create a virtual port by providing a value to the WWPN and WWNN fields.
- ii. 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**.

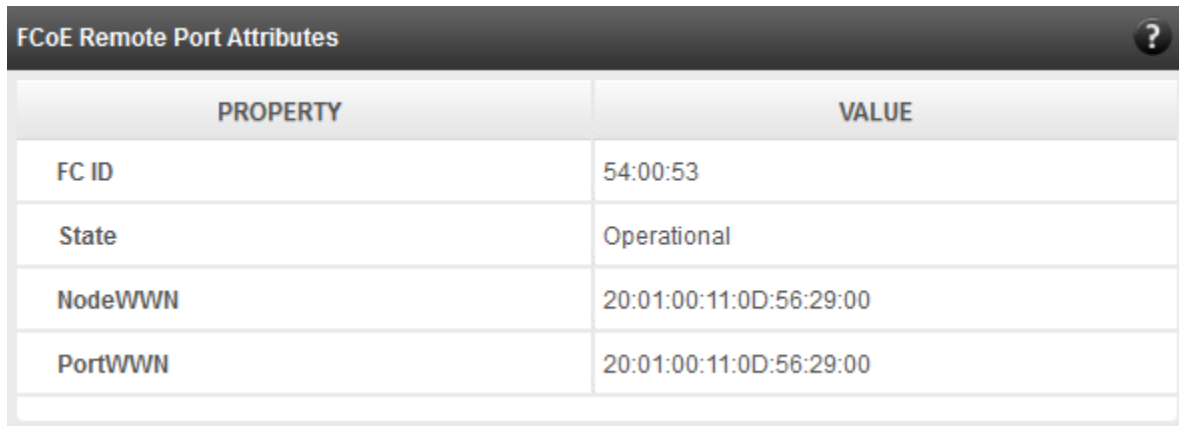
Figure 8.7.1.2 (c) – FCoE NPIV management module

### 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.



| 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 8.7.1.3 (a) – 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.

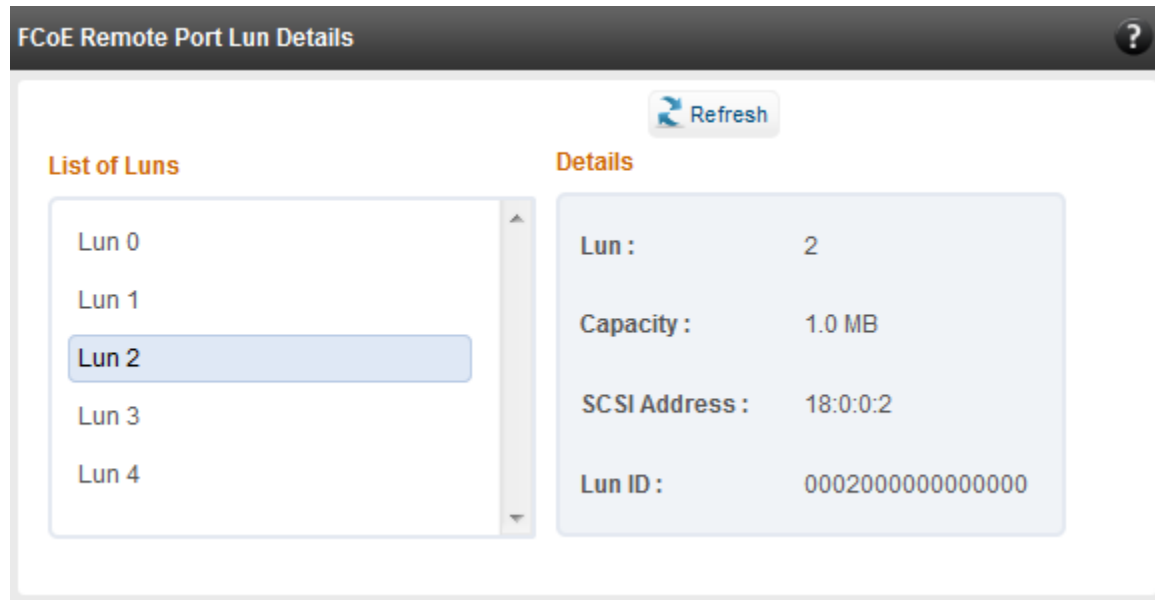


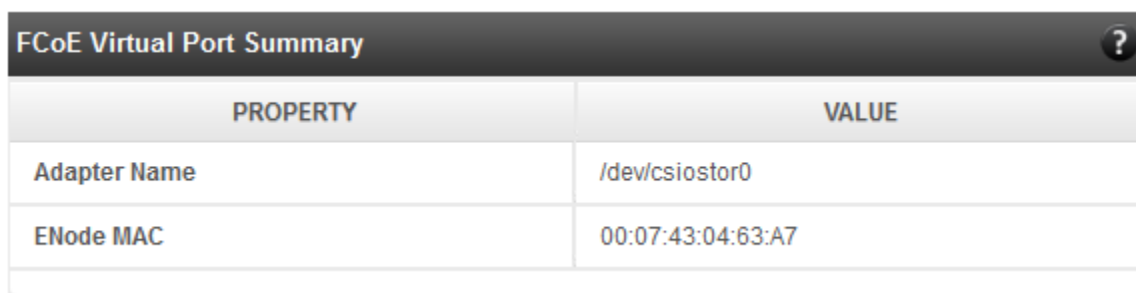
Figure 8.7.1.3 (b) – FCoE Remote Port Lun Details module

#### 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 8.7.1.4 (a) – 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.

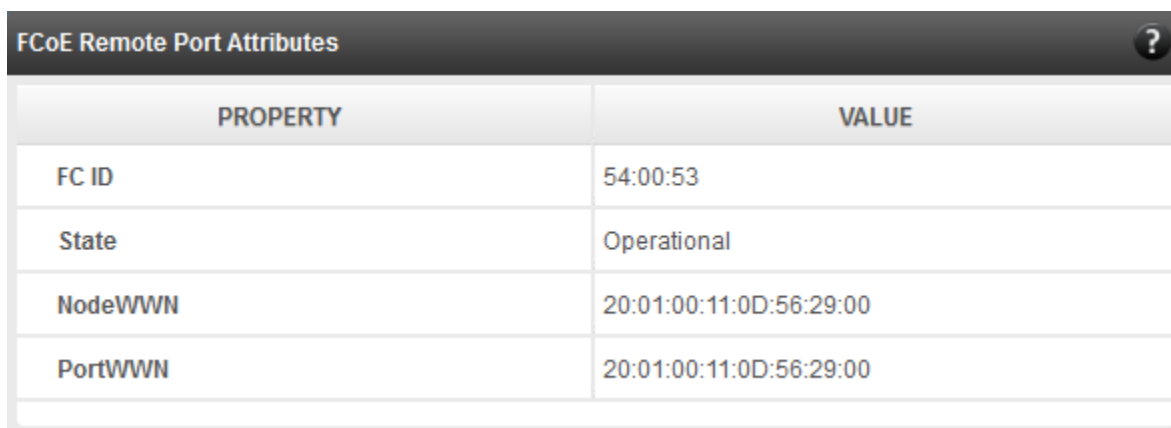
| FCoE Virtual Port Attributes <span>?</span> |                            |
|---|----------------------------|
| PROPERTY                                    | VALUE                      |
| State                                       | Operational                |
| NodeWWN                                     | 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 8.7.1.4 (b) – 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.

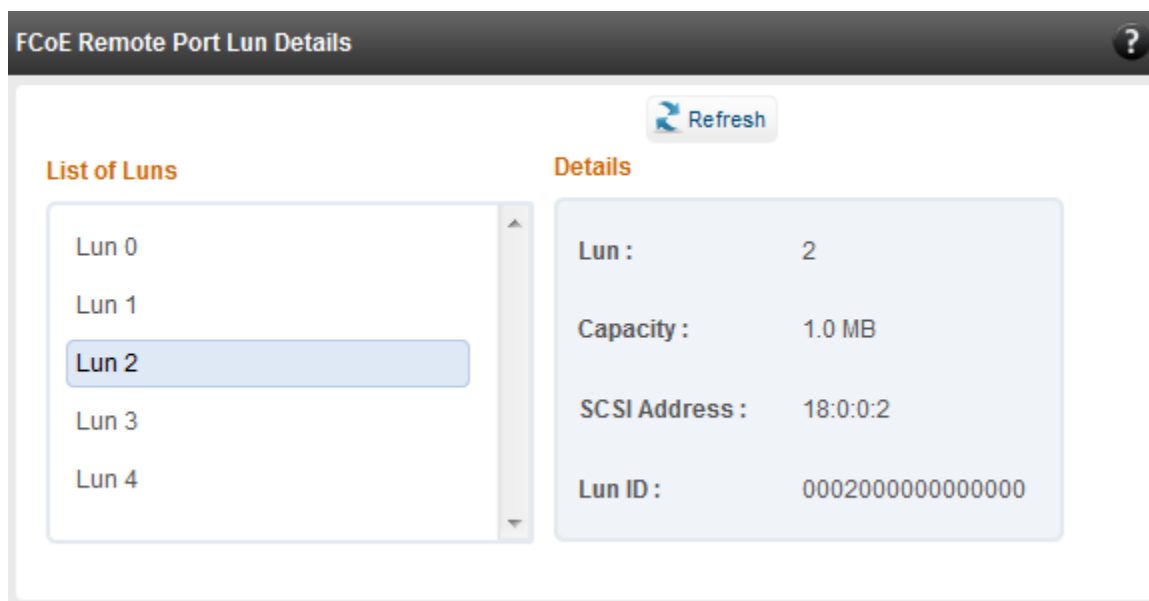


| PROPERTY | VALUE                   |
|----------|-------------------------|
| FC ID    | 54:00:53                |
| State    | Operational             |
| NodeWWN  | 20:01:00:11:0D:56:29:00 |
| PortWWN  | 20:01:00:11:0D:56:29:00 |

Figure 8.7.1.4 (c) – 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.



FCoE Remote Port Lun Details

Refresh

**List of Luns**

- Lun 0
- Lun 1
- Lun 2**
- Lun 3
- Lun 4

**Details**

Lun : 2

Capacity : 1.0 MB

SCSI Address : 18:0:0:2

Lun ID : 0002000000000000

Figure 8.7.1.4 (d) - 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.".

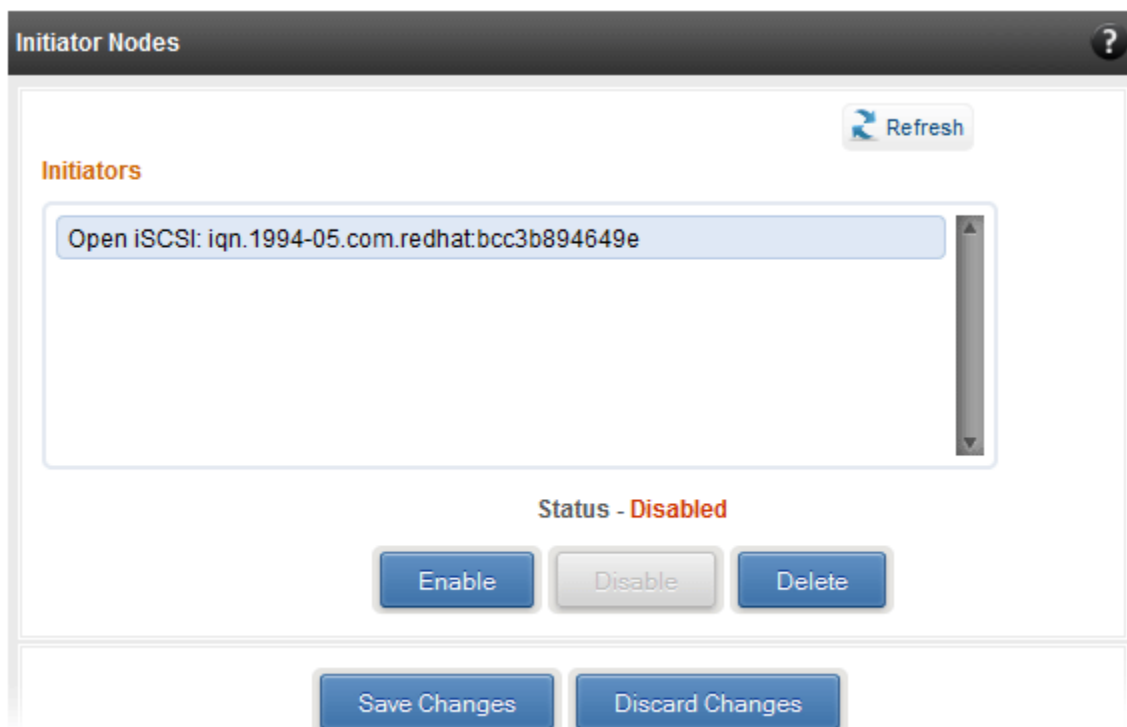


Figure 8.7.2 (a) - Open iSCSI initiator

**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**

| DESCRIPTION   | VALUE              |
|---------------|--------------------|
| InitiatorName | iqn.chelsioone.com |

Figure 8.7.2 (b) - 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 8.7.2 (c) - 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.*

The screenshot shows a web-based interface titled "Discover Targets". At the top right is a help icon (?). Below the title bar is a "Refresh" button with a circular arrow icon. The interface is divided into two main sections. The top section, titled "Discovery Portals", contains two columns. The left column, labeled "Portal :", has a list box containing "Target - 102.11.11.155 : 3260". The right column, labeled "Targets :", has a list box containing "iqn.2004-05.com.kapil.chelsio.target". Below these two columns is a "Delete" button. The bottom section, titled "Discover an iSCSI target", contains a "Choose the initiator stack" label with a dropdown menu showing "Open iSCSI". Below this is a "Target Ip address : Port" label with two input fields: "102.11.11.155" and "3260". At the bottom of this section is a "Discover Target" button.

Figure 8.7.2 (d) - 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.

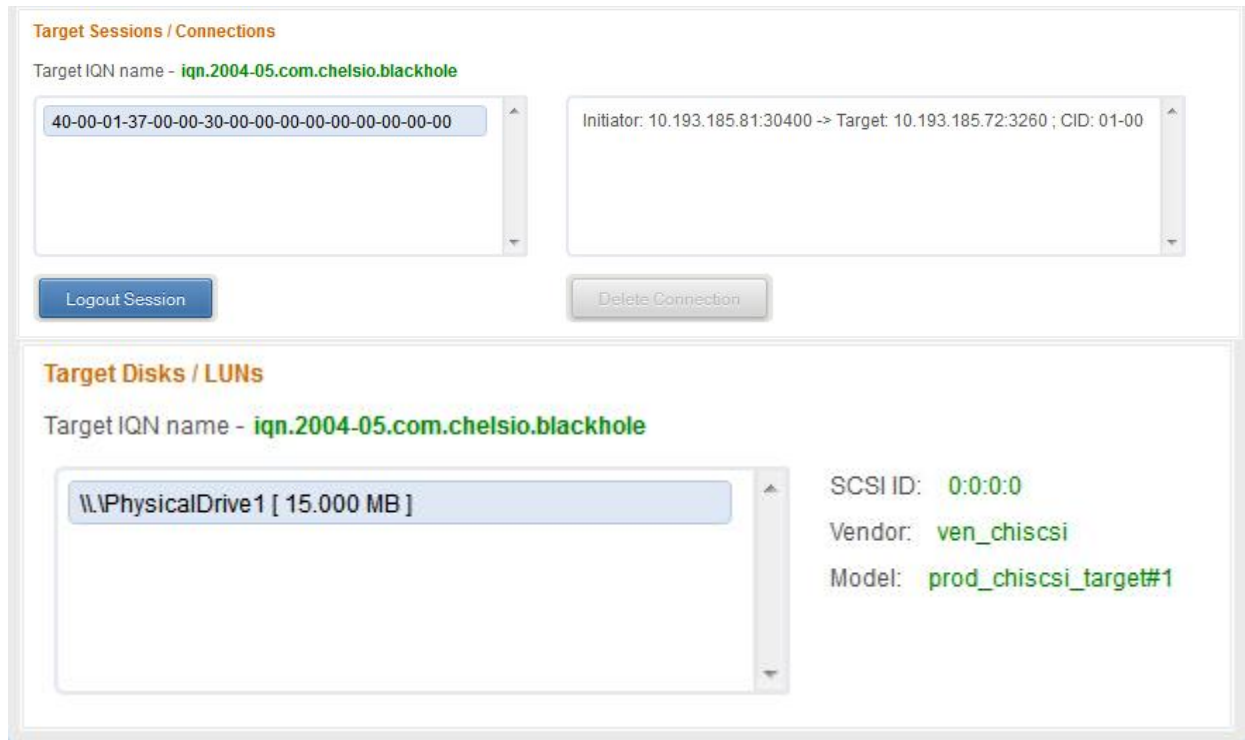


Figure 8.7.2 (e) - Targets module after logging in

### 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.

Full Offload iSCSI Hardware Information

?

Refresh

Select a T4 Card: T404-BT

| 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                          |

1.0.0.0

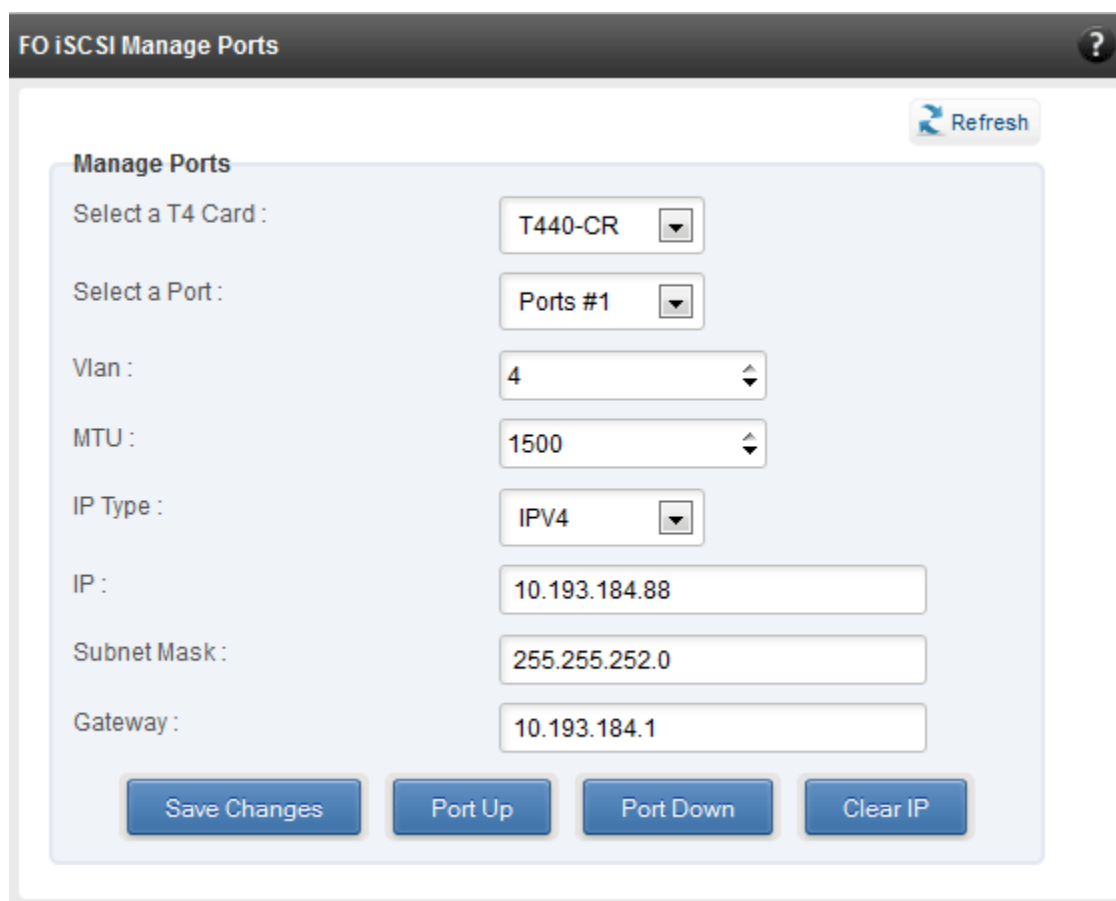
1.0.0.0

Figure 8.7.3 (a) - 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 has a title bar with a question mark icon. Inside, there's a 'Refresh' button with a circular arrow icon. Below that is a 'Manage Ports' section. It contains several form fields: 'Select a T4 Card' with a dropdown menu showing 'T440-CR'; 'Select a Port' with a dropdown menu showing 'Ports #1'; 'Vlan' with a numeric input field showing '4'; 'MTU' with a numeric input field showing '1500'; 'IP Type' with a dropdown menu showing 'IPV4'; 'IP' with a text input field showing '10.193.184.88'; 'Subnet Mask' with a text input field showing '255.255.252.0'; and 'Gateway' with a text input field showing '10.193.184.1'. At the bottom of the form are four buttons: 'Save Changes', 'Port Up', 'Port Down', and 'Clear IP'.

Figure 8.7.3 (b) - FO iSCSI Manage Ports module



### • FO iSCSI Initiator Properties

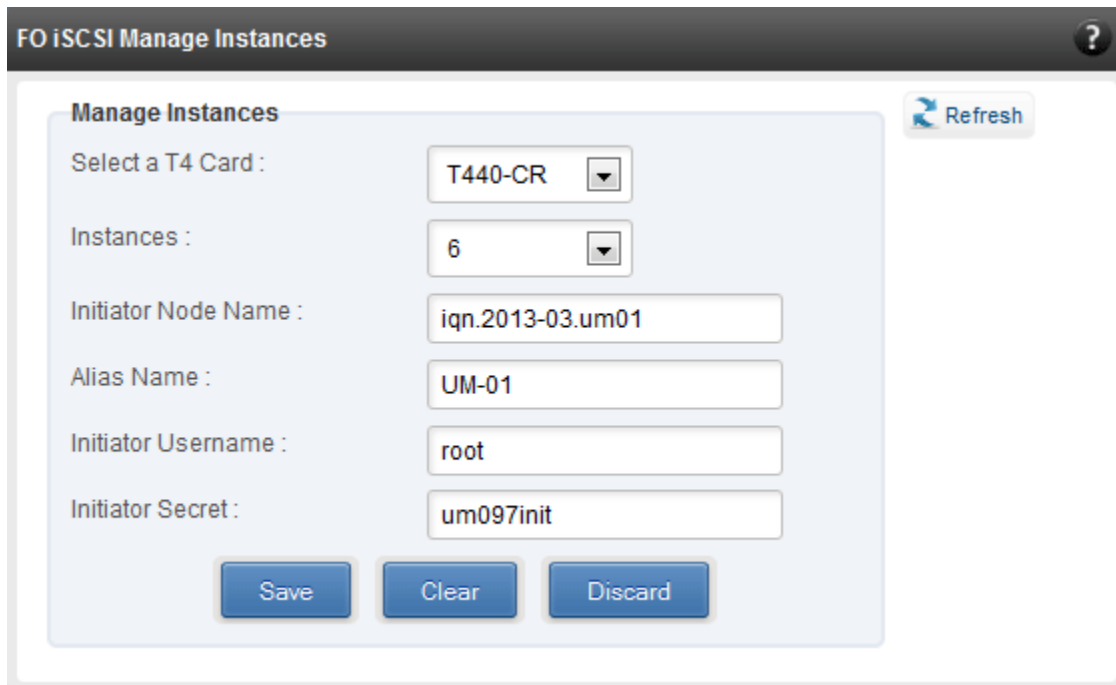
In the **FO iSCSI Initiator Properties** module, you can configure FO iSCSI Initiator by setting different properties like enabling/disabling CHAP authentication, setting Header and Data digest, etc.

| DESCRIPTION              | VALUE        |
|--------------------------|--------------|
| DataSequenceInOrder      | Yes          |
| DataPDUInOrder           | 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                 | tgt_username |

Figure 8.7.3 (c) - 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 a web-based interface titled "FO iSCSI Manage Instances" with a help icon (?) in the top right corner. The main content area is titled "Manage Instances" and contains several configuration fields:

- Select a T4 Card :** A dropdown menu with "T440-CR" selected.
- Instances :** A dropdown menu with "6" selected.
- Initiator Node Name :** A text input field containing "iqn.2013-03.um01".
- Alias Name :** A text input field containing "UM-01".
- Initiator Username :** A text input field containing "root".
- Initiator Secret :** A text input field containing "um097init".

At the bottom of the form are three buttons: "Save", "Clear", and "Discard". To the right of the form is a "Refresh" button with a circular arrow icon.

*Figure 8.7.3 (d) - 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. At the top right is a help icon (?). Below the title bar is a 'Refresh' button. The main area is divided into two sections. The top section, titled 'Discovered Targets', contains two large text boxes. The left box is labeled 'Target Name :' and contains the text 'TargetName=iqn.2004-05.com.chelsio.target'. The right box is labeled 'Target Address :' and contains the text 'TargetAddress=102.11.11.12:3260,1'. The bottom section is a light blue box containing several input fields. It starts with 'Select a T4 Card :' followed by a dropdown menu showing 'T440-CR'. Below that is 'Instance :' followed by a dropdown menu showing '1'. Then there are three text input fields: 'Source IP Address :' with the value '102.11.11.11', 'Destination IP Address :' with the value '102.11.11.12', and 'Destination Port :' with the value '3260'. At the bottom left of this section is a blue 'Discover' button.

Figure 8.7.3 (e) - 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 8.7.3 (f) - 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](#)

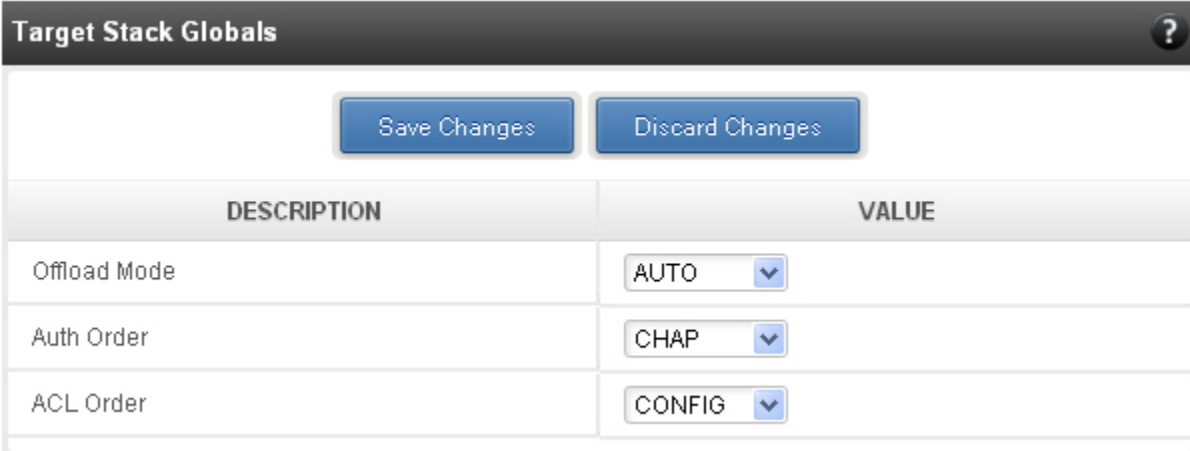
*Figure 8.7.3 (g) - FO iSCSI Session Details module: Established Sessions*

### 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.



| DESCRIPTION  | VALUE  |
|--------------|--------|
| Offload Mode | AUTO   |
| Auth Order   | CHAP   |
| ACL Order    | CONFIG |

Figure 8.7.4 (a) - 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**

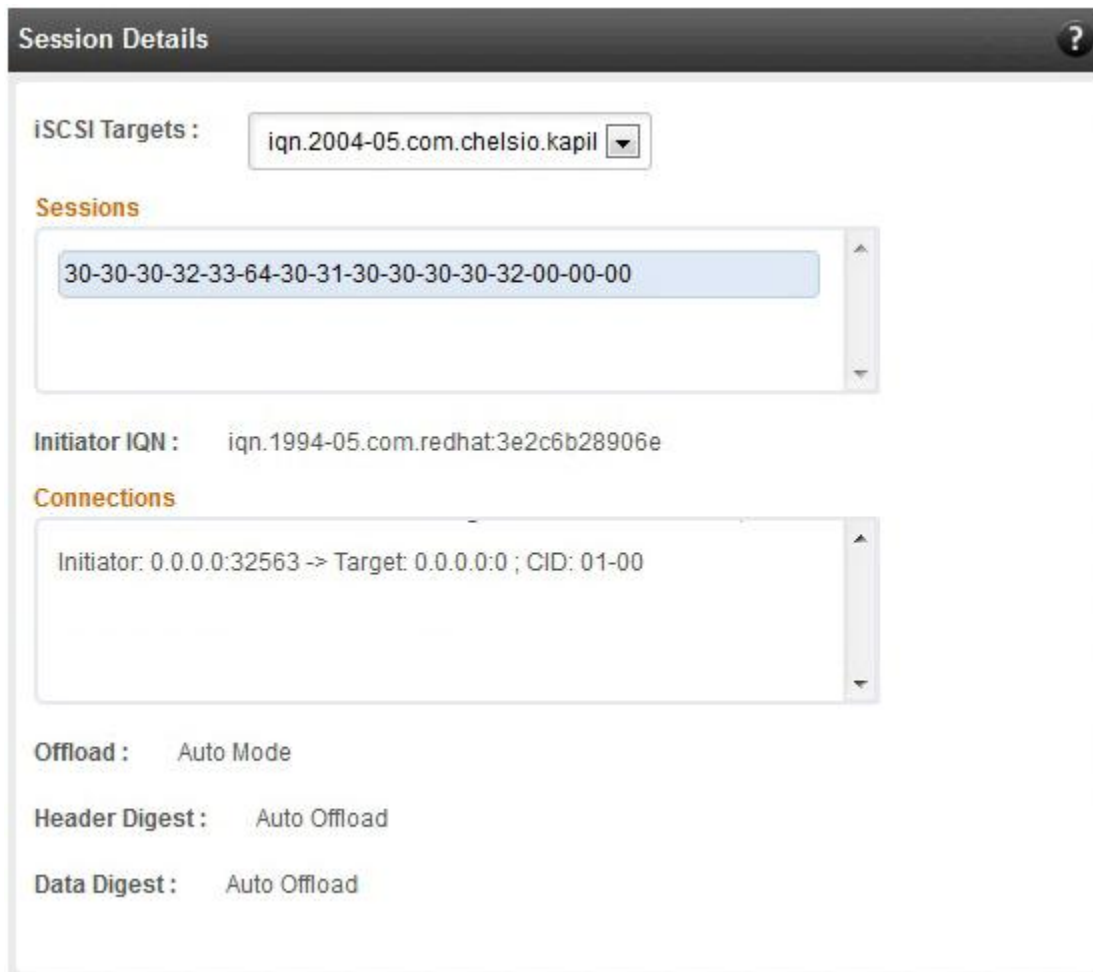
Save Changes Discard Changes

| 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 8.7.4 (b) - 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.




*Figure 8.7.4 (c) – Session Details module*



- **New Target Creation**

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



The image shows a 'New Target Creation' dialog box. It has a dark grey header bar with the title 'New Target Creation' and a question mark icon on the right. Below the header is a light blue box titled 'Session Details'. Inside this box, there are two text input fields. The first is labeled 'Target IQN Name' and contains the text 'iqn.chelsio.com'. The second is labeled 'Target Alias' and contains the text 'iscsitarget2'. Below these fields is a blue button with the text 'Save'.

*Figure 8.7.4 (d) - 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**

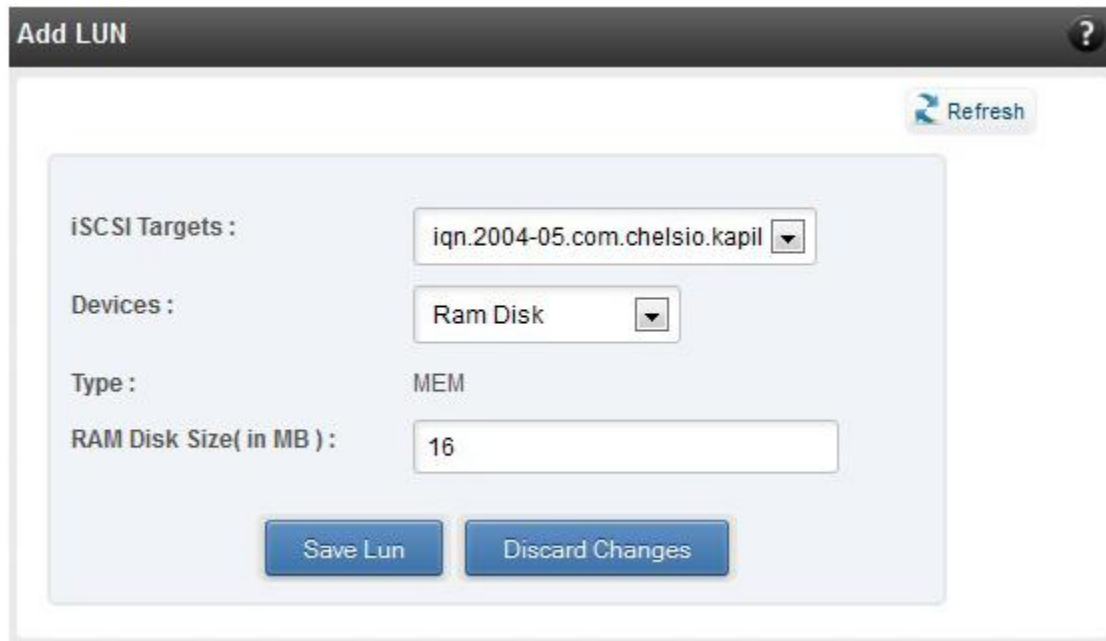
This module displays various Logical Units created in an iSCSI Target. Selected LUNs can be deleted.

The screenshot shows a web-based interface titled "View/Edit iSCSI Target LUNs". 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 area is divided into two columns. The left column, labeled "LUN List", contains a single entry "/dev/sda5". The right column, labeled "Edit LUN List", contains three buttons: "Move Up", "Move Down", and "Delete LUN". Below these buttons is the "Edit Selected LUN" section, which includes fields for "LUN Name" (containing "/dev/sda5"), "RAM Disk Size" (containing "12288"), and radio buttons for "Permissions" (RO and RW, with RW selected), "Device Type" (FILE, MEM, and BLK, with BLK selected), and "Options" (SYNC, NULLRW, and NONEXCL, with NULLRW and NONEXCL selected). At the bottom of the interface are two buttons: "Save Changes" and "Discard Changes".

Figure 8.7.5 (a) - 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 image shows a software window titled "Add LUN" with a question mark icon in the top right corner. In the top right of the window's content area, there is a "Refresh" button with a circular arrow icon. The main area contains a light blue rounded rectangle with the following fields: "iSCSI Targets :" with a dropdown menu showing "iqn.2004-05.com.chelsio.kapil"; "Devices :" with a dropdown menu showing "Ram Disk"; "Type :" with the text "MEM"; and "RAM Disk Size( in MB ) :" with a text input field containing "16". At the bottom of this light blue area are two buttons: "Save Lun" and "Discard Changes".

*Figure 8.7.5 (b) - 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 the 'View/Edit iSCSI Target Portals' window. At the top, there's a title bar with a question mark icon. Below it, the 'iSCSI Targets' section features a dropdown menu with 'iqn.2004-05.com.chelsio.kapil' selected and a 'Refresh' button. The 'Target Status' is displayed as 'STARTED' in green. The main area is divided into two panels. The left panel, titled 'Portal List', contains a single entry: '1@102.44.44.155:3260'. The right panel, titled 'Edit Portal List', includes three buttons: 'Move Up', 'Move Down', and 'Delete Portal'. Below these is the 'Portal Details' section, which contains 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 unchecked. An 'Update List' button is located at the bottom of the 'Portal Details' section. At the very bottom of the window, there are two buttons: 'Save Changes' and 'Discard Changes'.

Figure 8.7.6 (a) - 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.



The image shows a software dialog box titled "Add Portal" with a question mark icon in the top right corner. In the top right of the dialog area, there is a "Refresh" button with a circular arrow icon. The main area contains four labeled input fields: "iSCSI Targets :" with a dropdown menu showing "iqn.2004-05.com.chelsio.kapil"; "IP Address :" with a text box containing "102.44.44.155"; "Port :" with a text box containing "3260"; and "Redirect Tag :" with an empty text box. At the bottom of the dialog, there are two blue buttons: "Save Portal" and "Discard Changes".

*Figure 8.7.6 (b) – 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**

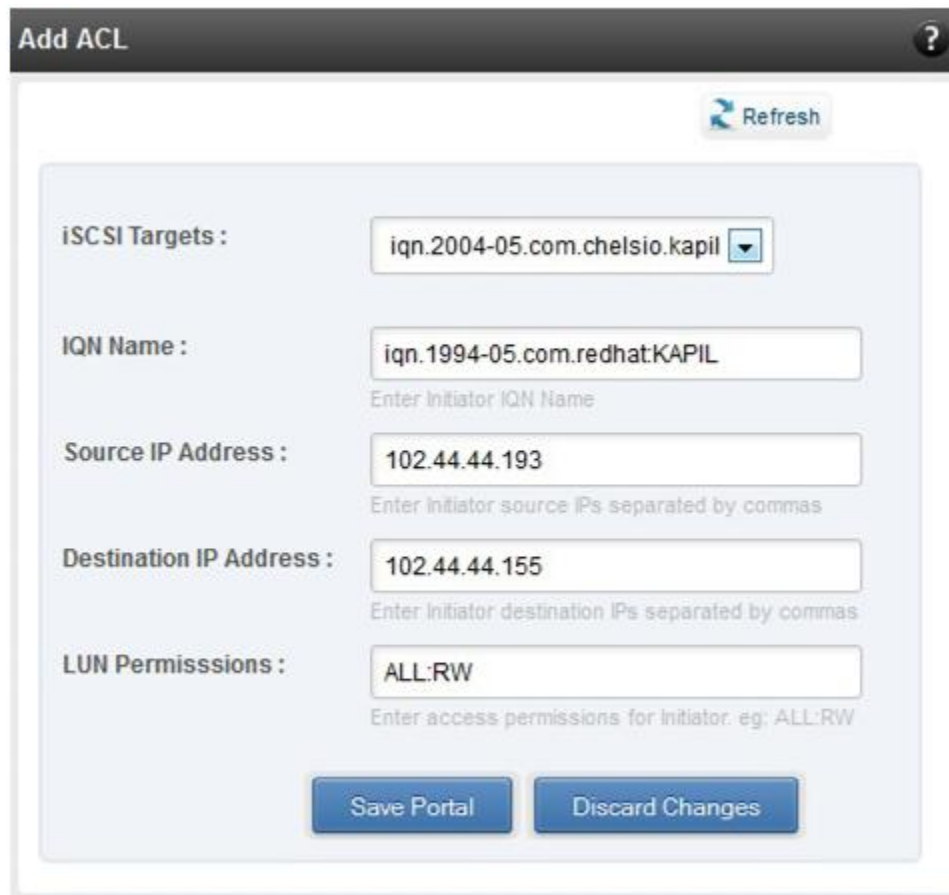
This module displays details for all the ACLs configured for an iSCSI Target. Selected ACLs can be deleted.

The screenshot shows a web-based interface titled "View/Edit iSCSI Target ACLs". 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 content area is divided into two sections. On the left, under the heading "ACL List", there is a text box containing the ACL configuration: "iname=iqn.1994-05.com.redhat:KAPIL;sip=102.44.44.193;dip=102.44.44.155;lun=ALL:RW". Below this text box is a "Delete" button. On the right, under the heading "ACL List", there is a form with four fields: "IQN Name" (value: iqn.1994-05.com.redhat:KAPIL), "Source IP Address" (value: 102.44.44.193), "Destination IP Address" (value: 102.44.44.155), and "LUN Permissions" (value: ALL:RW). A small grid icon is visible at the bottom right of the LUN Permissions field.

Figure 8.7.7 (a) - Target ACL operations module

- **Add ACL**

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

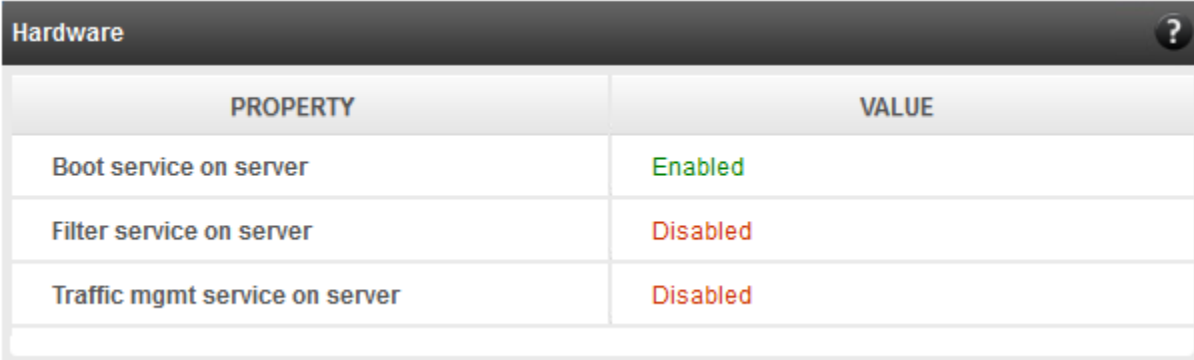


The image shows a software dialog box titled "Add ACL" with a question mark icon in the top right corner. Inside the dialog, there is a "Refresh" button with a circular arrow icon. Below this, there are five input fields arranged vertically, each with a label on the left and a text input on the right. The first field is labeled "iSCSI Targets :" and contains a dropdown menu with the selected value "iqn.2004-05.com.chelsio.kapil". The second field is labeled "IQN Name :" and contains the text "iqn.1994-05.com.redhat:KAPIL", with a hint "Enter Initiator IQN Name" below it. The third field is labeled "Source IP Address :" and contains "102.44.44.193", with a hint "Enter Initiator source IPs separated by commas" below it. The fourth field is labeled "Destination IP Address :" and contains "102.44.44.155", with a hint "Enter Initiator destination IPs separated by commas" below it. The fifth field is labeled "LUN Permisssions :" (note the typo) and contains "ALL:RW", with a hint "Enter access permissions for Initiator. eg: ALL:RW" below it. At the bottom of the dialog, there are two blue buttons: "Save Portal" and "Discard Changes".

*Figure 8.7.7 (b) - Adding new ACL*

## 8.8. Hardware Features

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



The screenshot shows a window titled "Hardware" with a help icon (question mark) in the top right corner. Below the title bar is a table with two columns: "PROPERTY" and "VALUE". The table contains three rows of data:

| PROPERTY                       | VALUE    |
|--------------------------------|----------|
| Boot service on server         | Enabled  |
| Filter service on server       | Disabled |
| Traffic mgmt service on server | Disabled |

Figure 8.8 – 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 8.8.1 (a) - 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 8.8.1(b) - 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'. A 'Refresh' button is located above the 'TM Policies' list. Below the lists are two buttons: 'Add New Policy' and 'Delete'.

**Policy Details:** This section is further divided into 'Rules' and 'Rule Details'.

**Rules:** A list box containing the rule 'src port 22'.

**Rule Details:** This area contains configuration options for the selected rule.
 

- Primary Expression:** A dropdown menu set to 'port'.
- Qualifier:** A dropdown menu set to 'src'.
- Value:** A text input field containing '22'.
- Modify Rule:** A button.
- Selection checkboxes:** Two checkboxes labeled 'Select to add rule' and 'Select to modify rule', both of which are currently unchecked.

**Actions:** A row of seven checkboxes and dropdown menus:
 

- Offload:** Unchecked, with a 'Disable' dropdown.
- DDP:** Unchecked, with a 'Disable' dropdown.
- Time Stamp:** Unchecked, with an 'Enable' dropdown.
- Sack:** Unchecked, with an 'Enable' dropdown.
- Bind:** Unchecked, with a 'random' dropdown.
- Class:** Unchecked, with a '0' dropdown.
- Congestion:** Unchecked, with a 'reno' dropdown.

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

Figure 8.8.3 - 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.

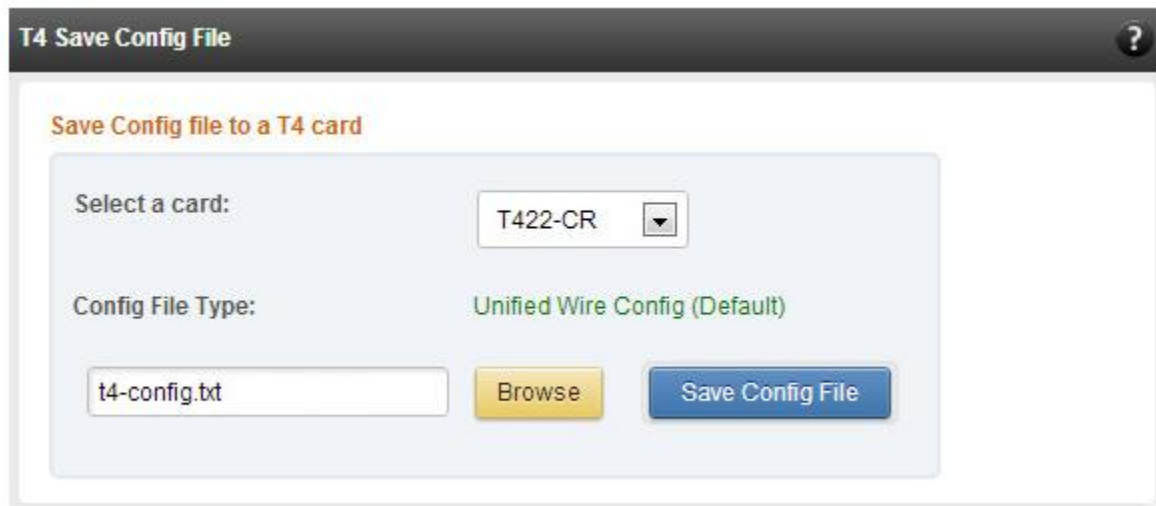


Figure 8.8.4 - T4 Save Config File module

### 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               |       |
| Prefer header digests if available    | No    |
| Prefer data digests if available      | No    |
| CHAP authentication Policy            | none  |
| Initiator's CHAP username             |       |
| Initiator's CHAP secret               |       |

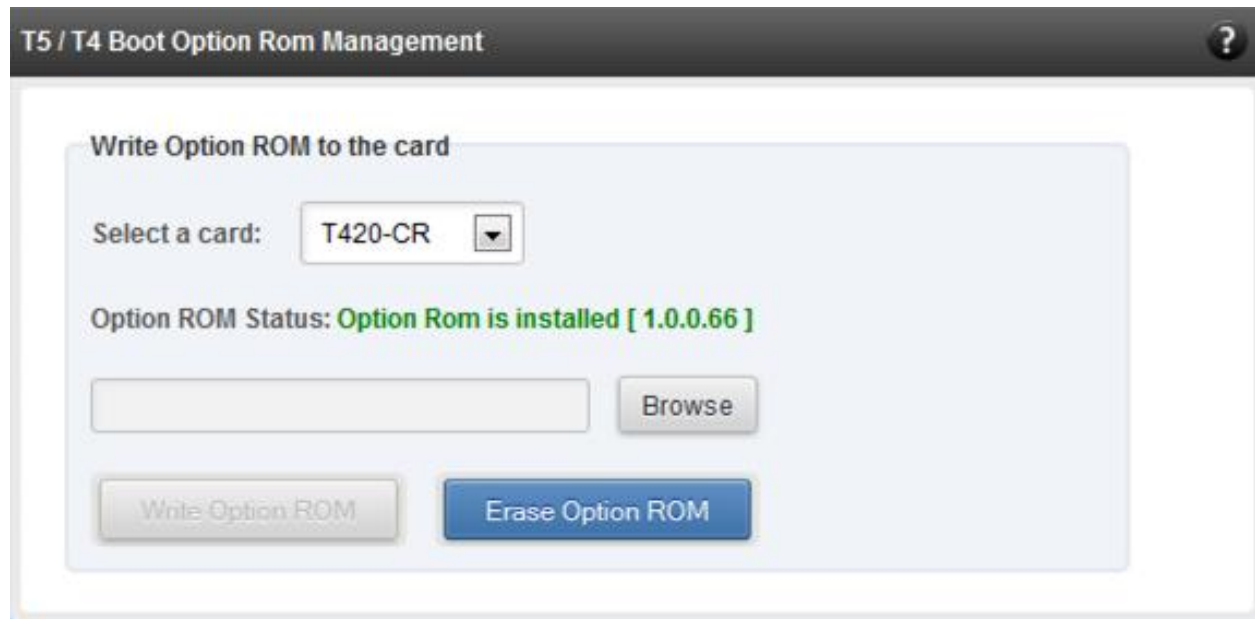
Figure 8.8.5 (a) - Option ROM management module for a T3 card

Chelsio T5/T4 Unified Wire for Windows

181

### 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 8.8.6 (a) – 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 displays the 'T5 / T4 Boot Configuration' window. At the top, a dropdown menu 'Select a T4 / T5 card' is set to 'T420-CR'. Below this is the 'Adapter Configuration' section with the following settings: 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 checkbox for 'Default' (Load Boot Default Settings) which is unchecked. 'Save Changes' and 'Discard Changes' buttons are at the bottom of this section. Below the adapter configuration is a row of radio buttons for 'Choose Options to configure': PXE (selected), FCOE, and iSCSI. The 'PXE Configuration' section includes 'Select Physical Function' (00), 'BIOS' (Disable), and 'Vlan Id' (0). It also has 'Save Changes' and 'Discard Changes' buttons. On the right side, a 'Details' panel lists: 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 8.8.7 (a) - 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 : 00 ▾ 01 ▾ 02 ▾ 03 ▾

Discovery Time Out : 20 ▾

Save Changes Discard Changes

Figure 8.8.7 (b) - FCoE Boot configuration for T4 CNAs

Choose Options to configure: ☐ PXE ☐ FCOE ☒ iSCSI

### iSCSI Configuration

Choose Paramter Type : ☒ Function ☐ Initiator ☐ Network ☐ Boot Devices

BIOS : Enable ▾

Port Order : 00 ▾ 01 ▾ 02 ▾ 03 ▾

Discovery Time Out : 0 ▾

CHAP Method: None ▾

Save Changes Discard Changes

Figure 8.8.7 (c) - iSCSI Boot configuration for T4 CNAs



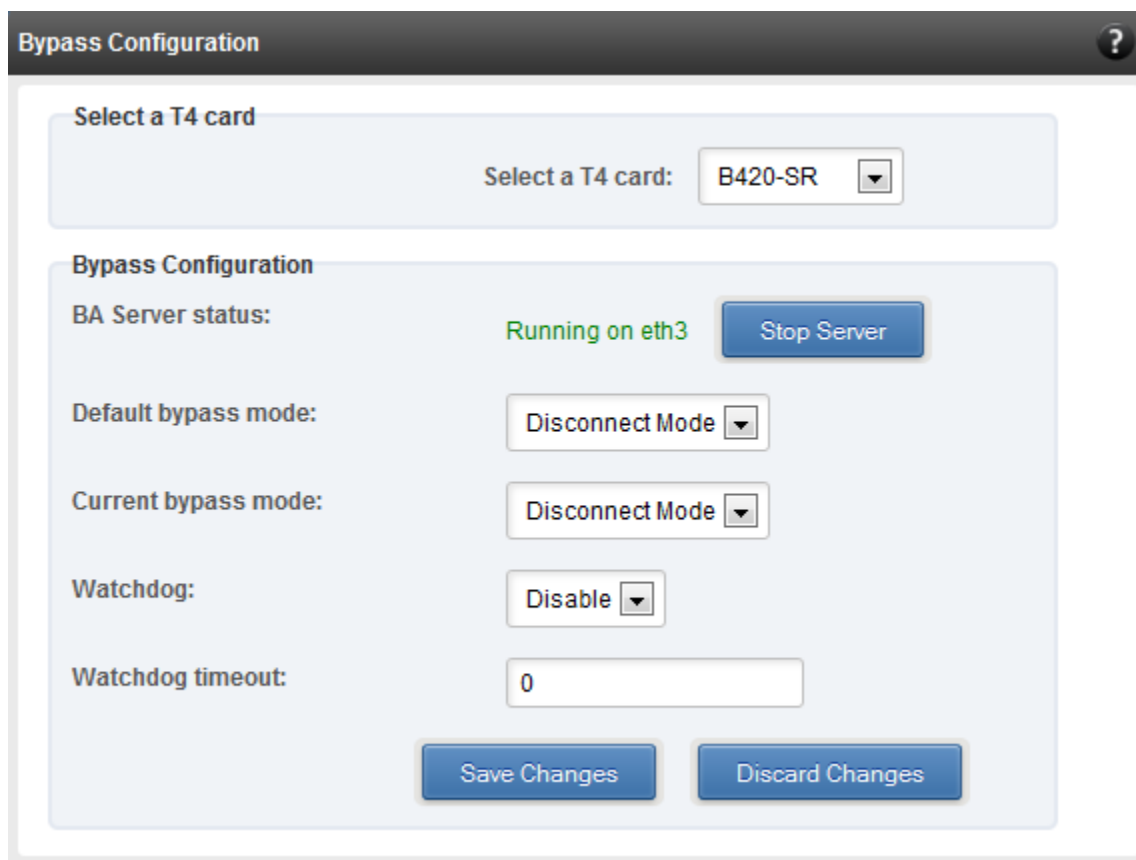
### 8.8.8. Bypass (Linux)

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 the 'Bypass Configuration' window. At the top, there's a header bar with the title 'Bypass Configuration' and a help icon. Below the header, there's a section 'Select a T4 card' with a dropdown menu currently showing 'B420-SR'. The main configuration area is titled 'Bypass Configuration' and contains several settings: 'BA Server status' is 'Running on eth3' with a 'Stop Server' button; 'Default bypass mode' is 'Disconnect Mode' with a dropdown; 'Current bypass mode' is 'Disconnect Mode' with a dropdown; 'Watchdog' is 'Disable' with a dropdown; and 'Watchdog timeout' is '0' with a text input field. At the bottom of the configuration area are two buttons: 'Save Changes' and 'Discard Changes'.

Figure 8.8.8 (a) - 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.

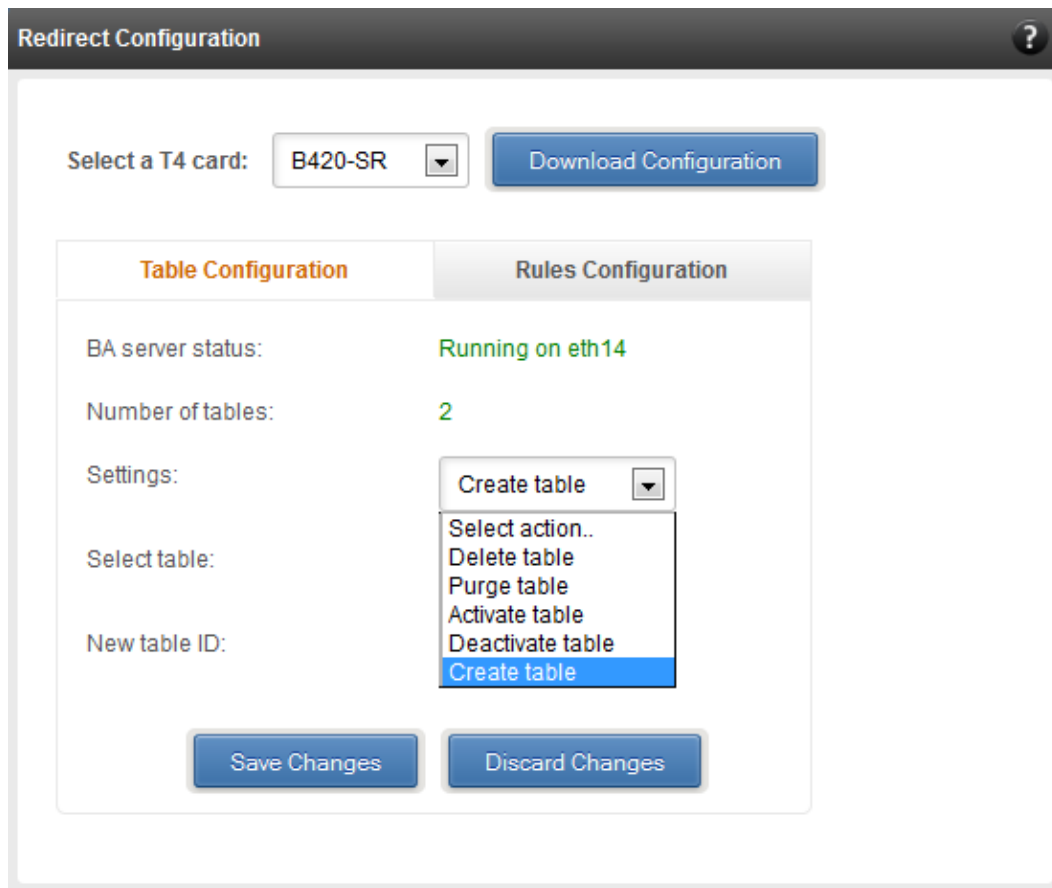


Figure 8.8.8 (b) - Redirect Configuration module: Table configuration tab

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 8.8.8 (c) - 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.

The screenshot shows the 'Egress Queue Map' window. It has a title bar with a question mark icon. Inside, there's a 'Refresh' button with a circular arrow icon. Below that is a table with four columns: 'INTERFACE NAME', 'CLASS ID', 'TX QUEUE ID', and 'ACTION'. The first row has dropdown menus for 'eth13', '0', and '0', and a 'Map' button. Below the table, there's a text area showing 'Interface Name : eth12 >> Class Id : 2 >> Tx Queue Id : 1'.

| INTERFACE NAME | CLASS ID | TX QUEUE ID | ACTION |
|----------------|----------|-------------|--------|
| eth13          | 0        | 0           | Map    |

Interface Name : eth12 >> Class Id : 2 >> Tx Queue Id : 1

8.8.9 (a) - 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.

The screenshot shows the 'Egress Packet Scheduler' window. It has a title bar with a question mark icon. Inside, there's a 'Refresh' button with a circular arrow icon. Below that is a section titled 'Tx Schedulers' with a table. The table has columns: 'SCHEDULER', 'CHANNEL ID', 'INTERFACE', 'MODE', 'RATE MODE', 'RATE UNIT', 'MIN RATE', 'MAX RATE', 'PACKET SIZE', and 'WEIGHT'. The first row has values: 0, 1, eth12, Flow, Absolute, Bits (in kbps), 0, 9000, 0, and -. Below the table are three buttons: 'Add New Rule', 'Save Changes', and 'Discard Changes'.

| 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

8.8.9 (b) – Egress Packet Scheduler module

## 9. Uninstalling Unified Wire Manager

To uninstall Unified Wire Manager, use **Programs and Features** in the **Control Panel**.

## VI. 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:

- T502-BT
- T520-CR
- T580-CR
- T580-LP-CR
- T580-SO-CR
- T520-LL-CR
- T520-SO-CR
- T540-CR
- T522-CR
- T420-CR
- T440-CR
- T422-CR
- T420-LL-CR
- T440-LP-CR
- T420-CX
- T420-SO-CR
- T420-BT
- T404-BT



## 1.2. Software Requirements

---

### 1.2.1. Windows Requirement

Currently Chelsio UM for Win PE is available for the following version(s):

- Windows Server 2012 R2

## 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

```

- 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>

```

### 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

```

- 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, `cuwlb4.bin`

```
X:\windows\system32>chelsio_uwlite.exe chelsio flashrom adapter=0 path=cuwlb4.bin
Flashing the Option ROM...

Success: Boot operation completed sucessfully
```

### 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
```

- 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
```

## VII. 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.  
370 San Aleso Ave.  
Sunnyvale, CA 94085