Chelsio Communications

Accelerate

Chelsio T5/T4 Unified Wire for Windows

Installation and User's Guide

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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's T5/T4 Unified Wire package contains Chelsio's NDIS function driver. The driver supports NIC and NDK functionalities. The software package also contains management tool, UM for Win PE (Windows Preinstallation Environment).

Note *Chelsio T5/T4 NDIS function driver supports NIC, NDK and NVGRE Offload functionalities.*

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 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.

Note

Network device names for Chelsio's physical ports are assigned using the following convention: the port farthest from the motherboard will appear as the first Ethernet interface. However, for T5 40G 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.**

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 **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.**

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

[*adapterInterface*] 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*|*adapterInterface*][*parameters*][(*optionalParameters*)]

- ### -h

Description: Displays help

Syntax: cxgbtool -h

- ### cim_la

Decription: 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
WRLength:          0
WRLengthKnown:     0
ReschedulePending: 0
OnChipQueue:       0
FetchSizeMode      1
FetchBurstMin:     64
FetchBurstMax:     512
FLMcongMode:       1
MaxuPFLCredits:    64
FLMcontextID:      2
uPTokenEn:         1
UserModeIO:        0
uPFLCredits:       0
```

```
uPFLCreditEn:      1
FID:               0
HostFCMode:        0
HostFCOwner:       1
CIDXFlushThresh:   1
CIDX:              228
PIDX:              211
BaseAddress:       0x1ba46a000
QueueSize:         385
QueueType:         1
CachePriority:     0
```

- ## eeprom

Syntax: cxgbtool [*vbdInterface*] eeprom [*OffsetAddress*] [*eepromImage*]

Description: Writes to EEPROM

Example:

```
C:\Users\Administrator>cxgbtool vbd0 eeprom 0 .\eeprom.bin
```

- ## 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 cuwlbt4.bin pf 0
```

Flashing Option ROM image to user specified offset:

```
C:\Users\Administrator>cxgbtool vbd0 loadboot cuwlbt4.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:          0-0x2fffff [3.00 MiB]
EDC1:          0x300000-0x5fffff [3.00 MiB]

RQUDP region:  0xfffffffff-0xfffffffe [0 B]
iSCSI region:  0xfffffffff-0xfffffffe [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]
Tx FL:         0x2c9e40-0x2cde3f [16.0 KiB]
Pstruct FL:    0x2cde40-0x2d337f [21.3 KiB]
LE hash:       0x2d3380-0x31337f [256 KiB]
TCBs:          0x313380-0x5fffff [2.92 MiB]
DBQ contexts:  0x8100000-0x81bffff [768 KiB]
FLM cache:     0x81c0000-0x821ffff [384 KiB]
Timers:        0x8220000-0x85fffff [3.87 MiB]
TDDP region:   0x8600000-0x8dae13f [7.67 MiB]
TPT region:    0x8dae140-0xb41477f [38.3 MiB]
STAG region:   0x8dae140-0xb41477f [38.3 MiB]
TXPBL region:  0xb414780-0x1b9332ff [261 MiB]
PBL region:    0xb414780-0x1b9332ff [261 MiB]
RQ region:     0x1b933300-0x205fffbf [76.7 MiB]

uP RAM:        0x3a802000-0x405fffff [93.9 MiB]
uP Extmem2:    0-0xffffffff [0 B]

1968 Rx pages of size 64KiB for 1 channels
6144 Tx pages of size 64KiB for 2 channels
8184 p-structs

Port 0 using 2 pages out of 432 allocated
Port 1 using 2 pages out of 432 allocated
Port 2 using 2 pages out of 432 allocated
Port 3 using 2 pages out of 432 allocated

Loopback 0 using 0 pages out of 144 allocated
Loopback 1 using 0 pages out of 144 allocated
Loopback 2 using 0 pages out of 144 allocated
Loopback 3 using 0 pages out of 144 allocated
```

qsets

Description: Reads # of qsets

Syntax: cxgbtool [*adapterInterface*] 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 [*adapterInterface*] qstats [*queueType* [(clr)]]

Queue Type parameters:
txeth: Tx tunnel queue statistics.
rxeth: Rx tunnel 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.
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
RecvNbls    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
sge	Scatter-Gather DMA Engine common register set.
pci	PCI Express Interface common register set. This module implements the PCI-Express SR-IOV physical logical, data link, and transaction layers.
dbg	Debug Engine Common register set.
mc0	Memory controller 0 common register set. This module implements the memory controller for the optional external DDR-II/DDR-III SDRAM.
mc1	Memory controller 1 common register set. This module implements the memory controller for the optional external DDR-II/DDR-III SDRAM.
ma	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.
edc0	eDRAM and Controller 0 common register set. This is the on-chip eDRAM and controller.
edc1	eDRAM and Controller 1 common register set. This is the on-chip eDRAM and controller.
cim	CIM common register set. This module implements the CPU interface and µP is the embedded microprocessor. The CIM incorporates functions to improve the performance of CPU accesses to external memory.
tp	Transport Protocol Engine common register set. This module implements the main packet processing pipeline.
ulp_rx	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.
ulp_tx	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.
pmrx	Ingress Payload Manager common register set. These modules implement the payload manager for receive/ingress.
pmtx	Egress Payload Manager common register set. These modules implement the payload manager for transmit/egress.
mps	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.
cplsw	CPL Switch common register set. This module implements a configurable switch for ingress CPL messages to the SGE and/or CIM. The embedded µP 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 µP for processing.
smb	System Management Bus common register set. This module implements an SMBus Master/Slave for system management.
i2c	I2C-Bus Master common register set. This module implements an I2C-Bus Master for PHY management and I/O expansion.
mi	MI common register set. This module implements an MDIO Master for PHY management.
uart	
pmu	Power Management Unit common register set. Power management unit.
sf	Serial Flash controller common register set. This module implements the serial flash controller. It interfaces to the external serial flash device.
pl	PIO Local Bus controller common register set. This module implements the PIO Local Bus controller. It is physically distributed across T4/T5.
le	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.
ncsi	Network Controller sideband Interface common register set. The module implements the NCSI (Network Controller Sideband Interface) protocol.
xgmac	
mac	MAC common register set.
hma	

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 VFDirectAccess                                 0          0
    1:0 NumPorts                                       0x1        1

.
.
.
```

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
      2:2 S_RXSGECHANNEL2                          0x1        1
      1:1 S_RXSGECHANNEL1                          0x1        1
      0:0 S_RXSGECHANNEL0                          0x1        1
 [   0x22] TP_TX_SCHED_MAP                          0x7777     30583
    15:12 S_TXMAPCHANNEL3                          0x7        7
     11:8 S_TXMAPCHANNEL2                          0x7        7
      7:4 S_TXMAPCHANNEL1                          0x7        7
      3:0 S_TXMAPCHANNEL0                          0x7        7
 .
 .
 .
```

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                          0x26020000 637665280
SGE_DEBUG_DATA_HIGH09                          0          0
SGE_DEBUG_DATA_HIGH10                          0x3        3
SGE_DEBUG_DATA_HIGH11                          0          0
SGE_DEBUG_DATA_HIGH12                          0          0
SGE_DEBUG_DATA_HIGH13                          0          0
SGE_DEBUG_DATA_HIGH14                          0x45475301 1162302209
SGE_DEBUG_DATA_HIGH15                          0xbab8acfe 3132665086

SGE_DEBUG_DATA_LOW00                           0          0
SGE_DEBUG_DATA_LOW01                           0x3f000    258048
SGE_DEBUG_DATA_LOW02                           0          0
SGE_DEBUG_DATA_LOW03                           0          0
SGE_DEBUG_DATA_LOW04                           0          0
SGE_DEBUG_DATA_LOW05                           0x70000b   7340043
SGE_DEBUG_DATA_LOW06                           0x19       25
SGE_DEBUG_DATA_LOW07                           0xb        11
SGE_DEBUG_DATA_LOW08                           0x17       23
SGE_DEBUG_DATA_LOW09                           0xe        14
SGE_DEBUG_DATA_LOW10                           0          0
SGE_DEBUG_DATA_LOW11                           0          0
SGE_DEBUG_DATA_LOW12                           0x390      912
SGE_DEBUG_DATA_LOW13                           0          0
SGE_DEBUG_DATA_LOW14                           0x1534745  22234949
SGE_DEBUG_DATA_LOW15                           0xfeacb8ba 4272732346
```

dumpctx

Description: Displays Adapter Context.

Syntax: cxgbtool [*adapterInterface*] 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
Pkt Filter      0xb
CurOfldCaps     0xd7fe00
Tx Pend         42
FwdTx Pend      0
CtrlTx RefCount 1
ToeTx Pend      0
RdmaTx RefCount 1
Rx Pend         0
ToeRx Pend      0
ToeRxData Pend  0
Ndk Connect     0
Ndk Accept      0
Ndk ConnectFail 0
Ndk ConnectErr  0
Ndk Active      0
Ndk CQErr       0
```

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 1.12.14.0
NIC TP Version 0.1.4.7
Ndis Driver Version 5.3.12.0
VBD Version 5.3.12.0
```

fwtoc

Description: Converts Firmware binary file to source file header.

Syntax: cxgbtool [*vbdInterface*] fwtoc [*firmwareFile*] filename= [C*FileName*].bin

Example:

```
C:\Users\Administrator>cxgbtool vbd0 fwtoc .\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_dd8d3a55a
a5c4536\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*] uninst [*infFile*]

Example:

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

rescan all

Description: Scans for hardware changes in the device manager.

Syntax: cxgbtool [*vbdInterface*] rescan all

Example:

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

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 |    1fe        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   fffffffc
EOP      3fc     1c    1c    19 (19) 19   ff  12 (182) 182   3fc   fffffffc
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(oflow) 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
HIGH   0x00cc0022
LOW    0x00c0000a
HIGH   0x00000000
LOW    0x0000000a
```

```
HIGH   0x00000000
LOW    0x00000000
HIGH   0x00002222
LOW    0x00000000
HIGH   0x00000000
LOW    0x01534745
HIGH   0x45475301
LOW    0xfeacb8ba
HIGH   0xbab8acfe
Print mac0
tx_octets              28095
tx_frames              244
tx_bcast_frames        93
tx_mcast_frames        151
tx_ucast_frames        0
tx_error_frames        0
tx_frames_64           10
tx_frames_65_127       200
tx_frames_128_255      16
tx_frames_256_511      18
tx_frames_512_1023     0
tx_frames_1024_1518    0
tx_frames_1519_max     0
tx_drop                0
tx_pause               0
tx_ppp0                0
tx_ppp1                0
tx_ppp2                0
tx_ppp3                0
tx_ppp4                0
tx_ppp5                0
tx_ppp6                0
tx_ppp7                0
rx_octets              4553
rx_frames              48
rx_bcast_frames        29
rx_mcast_frames        19
rx_ucast_frames        0
rx_too_long            0
rx_jabber              0
rx_fcs_err             0
rx_len_err             0
rx_symbol_err          0
rx_runt                0
rx_frames_64           4
rx_frames_65_127       43
rx_frames_128_255
rx_frames_256_511      0
rx_frames_512_1023     0
```

```
rx_frames_1024_1518     0
rx_frames_1519_max      0
rx_pause                0
rx_ppp0                 0
rx_ppp1                 0
rx_ppp2                 0
rx_ppp3                 0
rx_ppp4                 0
rx_ppp5                 0
rx_ppp6                 0
rx_ppp7                 0
rx_ovflow0              0
rx_ovflow1              0
rx_ovflow2              0
rx_ovflow3              0
rx_trunc0               0
rx_trunc1               0
rx_trunc2               0
rx_trunc3               0
```

- ### 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>cxgbtool vbd0 debugfs cim_pif_la
Cntl ID DataBE   Addr                 Data
 01  01  f000  e1003060 40004044400040444000404440004044
 81  00  f000  e1003060 00004044000040444000404400004044
 81  00  f000  e1003060 40003044400030444000304440003044

.
.
.
```

- **cim_ma_la**

Description: Displays results of CIM MA logic analyzer trace.

Syntax: cxgbtool [*vbdInterface*] debugfs cim_ma_la

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs cim_ma_la
.
.
00000000000000000000000000000000
00000000000000000000000000000000

Cnt ID Tag UE       Data       RDY VLD
    0  0   0    0 0000000000000000  0   0
    0  0   0    0 0000000000000000  0   0
    0  0   0    0 0000000000000000  0   0
```

```
    0  0  0    0 0000000000000000  0    0
    0  0  0    0 0000000000000000  0    0
    0  0  0    0 0000000000000000  0    0
.
.
```

- **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
```

- **edc0**

Description: Redirects EDC0 memory details to a file.

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

Note *It is recommended that the fileName provided is edc0 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 provided is edc1 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 [vbd*Interface*] debugfs flash [*fileName*]

Note *It is recommended that the fileName provided be flash 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
```

- **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 ffffffffffff  Y   0x3   7  92   Y   0  0  0  0  0
  1 00:07:43:29:0a:b0 ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
  2 33:33:00:00:00:01 ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
  3 01:00:5e:00:00:01 ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
  4 33:33:00:01:00:03 ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
  5 33:33:00:00:00:0c ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
  6 33:33:ff:00:00:11 ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
  7 33:33:ff:b8:3f:b8 ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
  8 01:00:5e:7f:ff:fa ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
  9 01:00:5e:00:00:fc ffffffffffff  Y   0x1   4  65   N   0  0  0  0  0
 10         -
 11         -
 12         -
 13         -
```

- **mps_trc_wr trace**

Description: Sets MPS trace filter.

Syntax:

cxgbtool [*vbdInterface*] debugfs mps_trc_wr trace[0|1|2|3] [tx[*portInstance*]|rx[*portInstance*]]

Example:

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

```
C:\Users\Administrator>cxgbtool vbd0 debugfs mps_trc_wr trace0 tx0
```

- ## mps_trc_rd trace

Description: Reads MPS trace filter.

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

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs mps_trc_rd trace0
tracer is capturing nic0 Tx, snap length: 0, min length: 0
packets captured match filter
filter pattern:
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000/000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000@0
```

- ## mbox

Description: Displays the last command in each mailbox.

Syntax: cxgbtool [*vbdInterface*] debugfs mbox[{0|1|2|…|7}]

Example:

```
C:\Users\Administrator>cxgbtool vbd0 debugfs mbox0
mailbox[0] owned by driver
0000000000000000
0000000000000000
0000000000000000
0000000000000000
0000000000000000
0000000000000000
0000000000000000
0000000000000000
```

- **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
0x0030: 04010008 00901003 81000000 00000020

.
.
.
```

- **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 RcfOpcSrcOut: 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
        EdataOut: 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 RcfOpcSrcOut: 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
        EdataOut: 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 [*adapterInterface*] 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
2             392333         INFO           CORE           pcie: npf 7
                                                           (pfbitmap 0x7f)
                                                           nvf 64 (pf 0..3
                                                           0x10 0x10 0x10
                                                           0x10)
3             403154         INFO           CORE           flr_timer_start:
                                                           flowc_id 96
                                                           00000000205FFF80
                                                           buf
                                                           00000000205FCF40
4             506767         INFO           DUMMY          cf_parse: file
                                                           memtype 0x1
                                                           memaddr 0x5e0000
                                                           mapped @
                                                           00000000205E0000:
```

```
5               507961          INFO            CORE            configured with
                                                                caps nbm|link
                                                                0x00000005
                                                                switch|nic
                                                                0x00030003
                                                                toe|rdma
                                                                0x00010003
                                                                iscsi|fcoe
                                                                0x00000000
6               507997          INFO            HW              hw_tp_tcp_tunings:
                                                                tuning for cluster
                                                                environment
.
.
.
```

- **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
    Syn4TupEnIpv6:  no
    SynIp6Sel:      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 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 [*adapterInterface*] 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 [*adapterInterface*] 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 [*adapterInterface*] 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_OFLD_CONN_FAILS:          0
PAS_OFLD_CONN_FAILS:          0
AVAILABLE IRD:     589824
```

- **stags**

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

Syntax: cxgbtool [*adapterInterface*] 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**

Description: Prints chimney statistics.

Syntax: cxgbtool [*adapterInterface*] 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
.
.
.
```

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 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

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

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

*NDK Functionality not supported

NVGRE Offload supported

1.2. Software Requirements

1.2.1. Windows Requirement

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

- Windows Server 2012 R2*
- Windows Server 2012
- Windows 2008 R2*
- Windows 8.1 (64-bit)
- Windows 8 (64-bit)
- Windows 7 (64-bit)*

* Driver on these versions is WHQL certified.

Note *NDK functionality is supported only on Windows Server 2012 R2 and 2012 and NVGRE Offload functionality is supported only on Windows Server 2012 R2.*

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*: Specifies 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.*

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

IPv4 Checksum Offload

- *Description*: Allows 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*: Specifies the Maximum Transmission Unit (MTU) value.
- *Value*: 1500-9000
- *Default*: 1500

Large Send Offload V2 (IPv4)

- *Description*: Allows for configuring Large Send Offload (LSO) using version 2 for the IPv4 traffic.
- *Value*: Disabled | Enabled
- *Default*: Enabled

Large Send Offload V2 (IPv6)

- *Description*: Allows for configuring Large Send Offload (LSO) using version 2 for the IPv6 traffic.
- *Value*: Disabled | Enabled
- *Default*: Enabled

Locally Administered Address

- *Description*: Specifies 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*: For changing the number of RSS Processors.
- *Value*: 1-8
- *Default*: 8

Maximum Number of RSS Queues

- *Description*: For changing the number of RSS Queues.
- *Value*: 1-8
- *Default*: 4

NetworkDirect Functionality

- *Description*: For enabling or disabling Network Direct Functionality.
- *Value*: Disabled | Enabled
- *Default*: Enabled

NetworkDirect Interrupt Moderation

- *Description*: This parameter controls 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

Receive Side Scaling (RSS)

- *Description*: This parameter controls 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*: Enables or Disables 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*: Enables or Disables 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*: This parameter is used to specify the number of the base RSS processors.
- *Value*: 0-16
- *Default*: 1

RSS load balancing profile

- *Description*: This parameter controls 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*: This parameter is used to set different Rx Queue sizes. Driver ships with reasonable defaults.
- *Value*: 512-4096
- *Default*: 2048

Rx Offload Queue Size

- *Description*: This parameter is used to 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.*

TCP Checksum Offload (IPv4)

- *Description*: This parameter enables or disables 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*: This parameter enables or disables 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*: Controls the enable or disable of TCP Offload.
- *Range*: Disabled | Enabled
- *Default*: Disabled

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

Tx Ethernet Queue Size:

- *Description*: This parameter is used to set different Tx Queue sizes. Driver ships with reasonable defaults.
- *Value*: 512-4096
- *Default*: 1024

Tx Offload Queue Size:

- *Description*: This parameter is used to set different Offload Tx Queue sizes. Driver ships with reasonable defaults.
- *Value*: 256-4096
- *Default*: 512

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

UDP Checksum Offload (IPv4):

- *Description*: This parameter enables or disables 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*: This parameter enables or disables 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*: Specifies 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

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. Enabling SMB Direct

SMB Direct is installed and enabled by default on Windows Server 2012 and 2012 R2 systems. RDMA functionality on Chelsio adapters will be enabled after installing the driver from the package.

You can use the following PowerShell command `Get-NetAdapterRdma` to get a list of RDMA capable interfaces in your system.

Note *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.

2.5. Verifying RDMA

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

2.5.1. Verify active connections using PowerShell

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

2.5.2. 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**

2.6. Troubleshooting

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

- Operating system version should be Windows Server 2012 or 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.

III. 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.

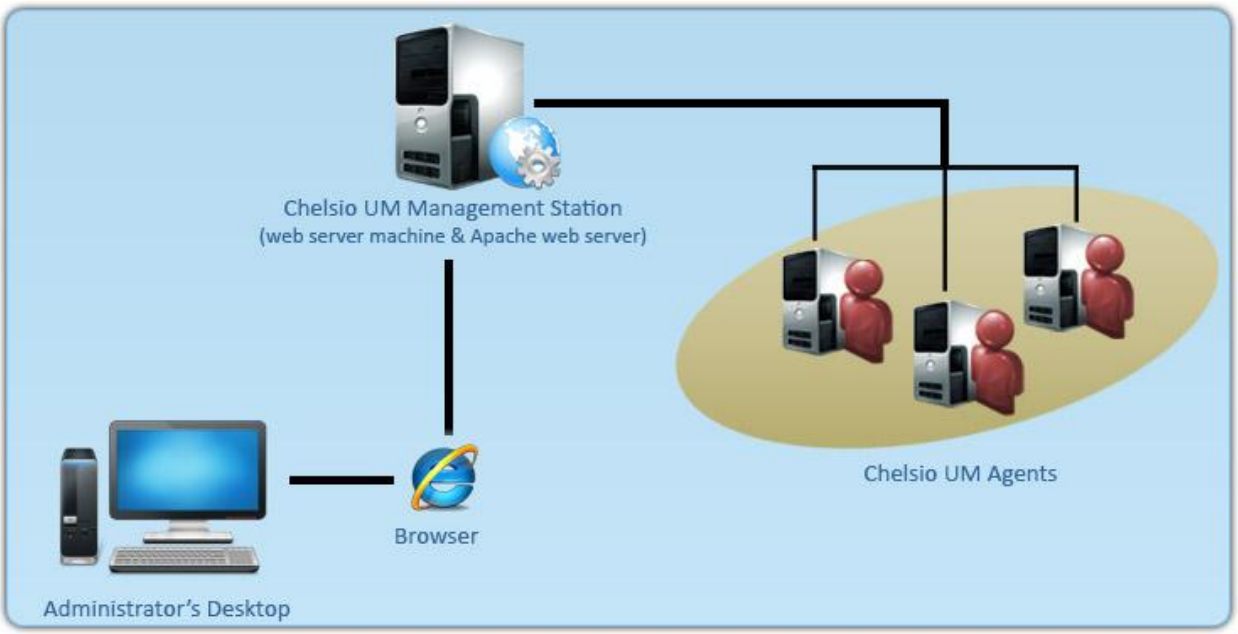


Figure 1.2 – Chelsio Unified Wire Manager with web interface (Web GUI)

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
Windows Server 2012	Management Agent, Management Client, Management Station

Windows Server 2008 R2	Management Agent, Management Client, Management Station
Windows 8.1 (64-bit)	Management Client, Management Station
Windows 8 (64-bit)	Management Client, Management Station
Windows 7 (64-bit)	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	5.3.22.0

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 http://www.python.org/ftp/python/2.6.6/python-2.6.6.msi)
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 http://www.apache.org/dist/httpd/binaries/win32/httpd-2.2.25-win32-x86-no_ssl.msi)
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.

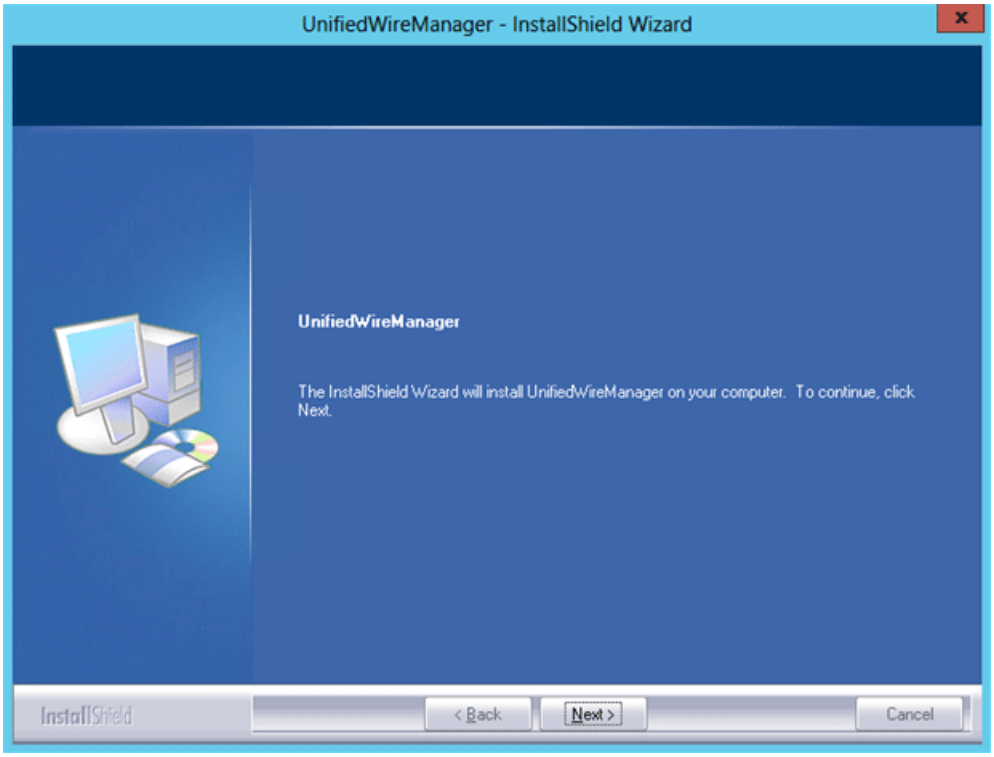


Figure 3.2 (a) – UM installer welcome window

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

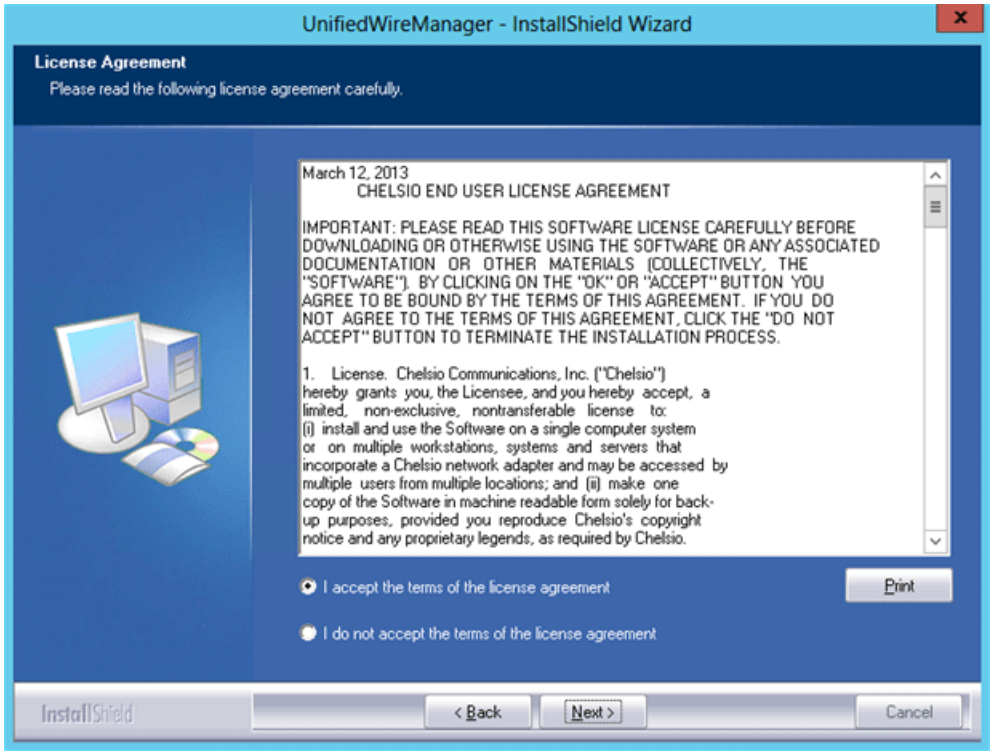


Figure 3.2 (b) – Chelsio EULA window

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

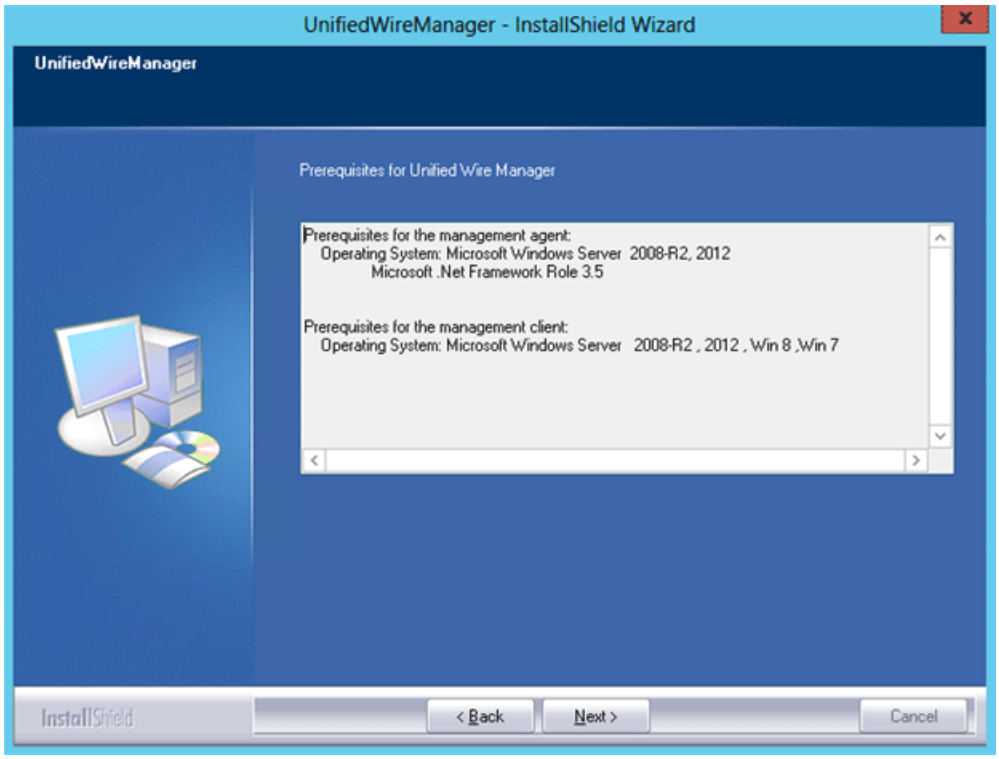


Figure 3.2 (c) – UM prerequisites window

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

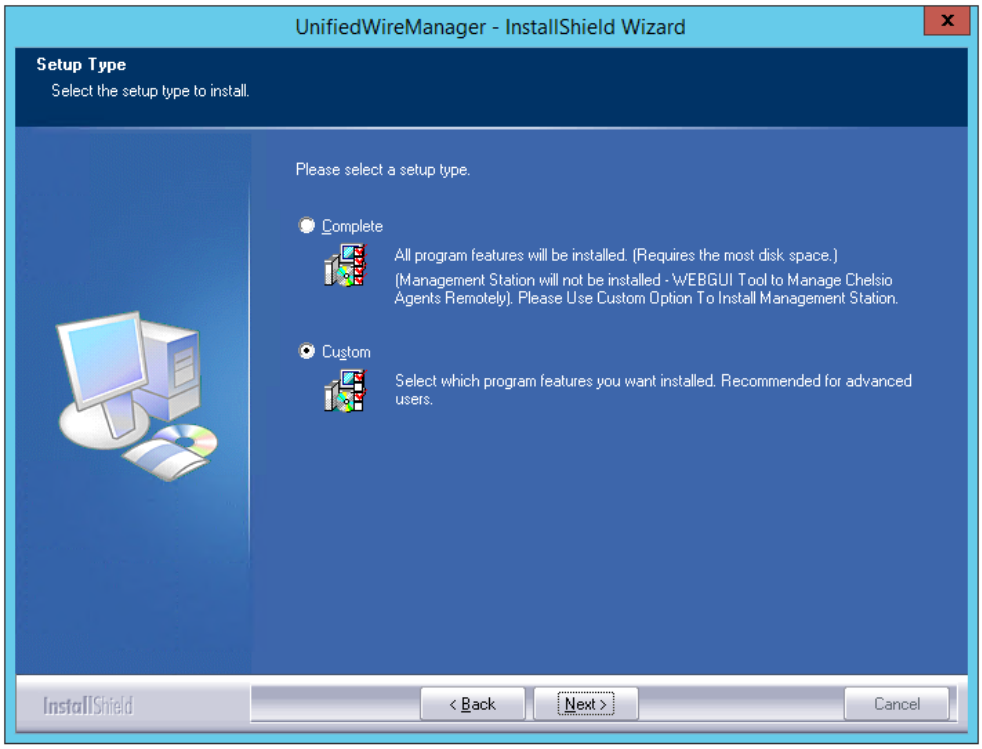


Figure 3.2 (d) – Select setup (installation) type

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.

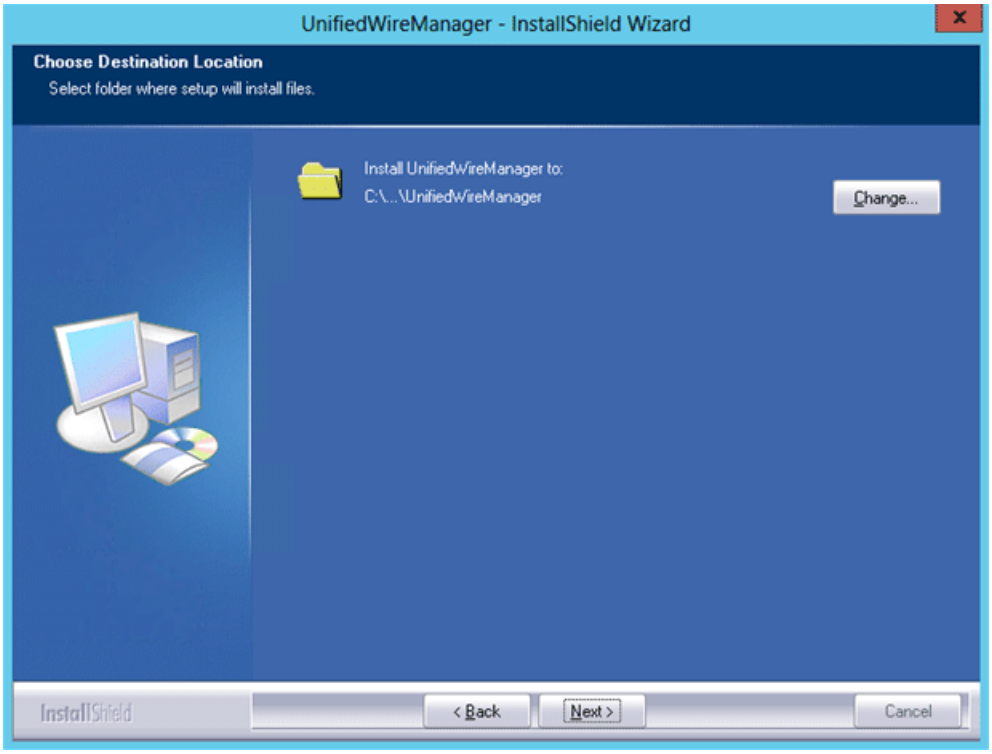


Figure 3.2 (e) – Changing UM installation path

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

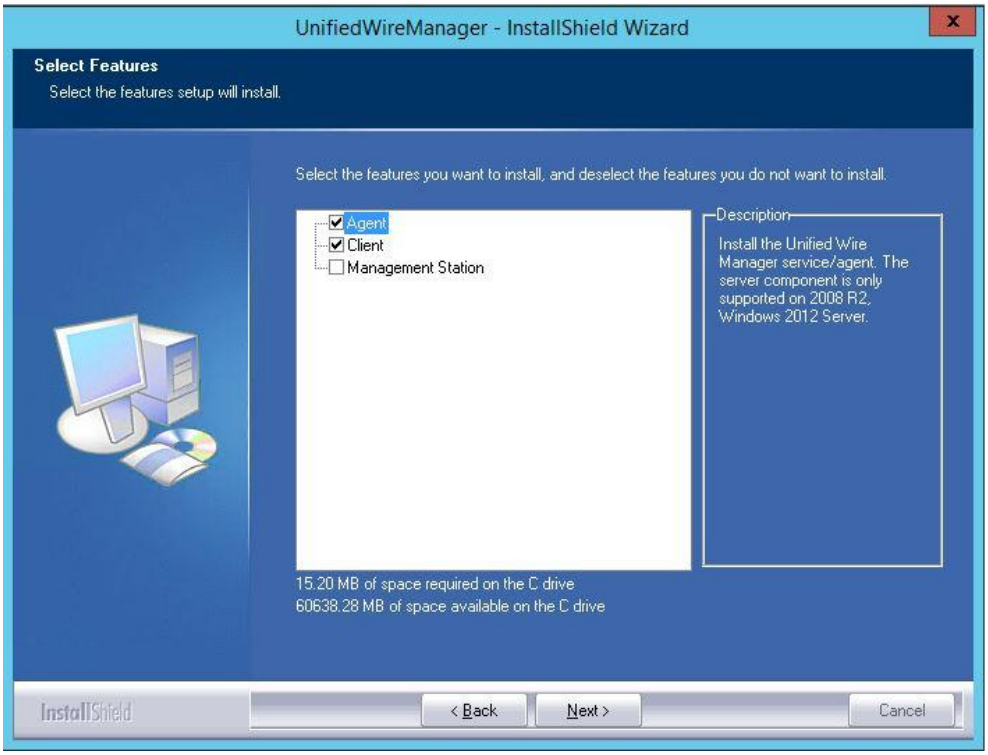


Figure 3.2 (f) – Selecting UM components to install

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.

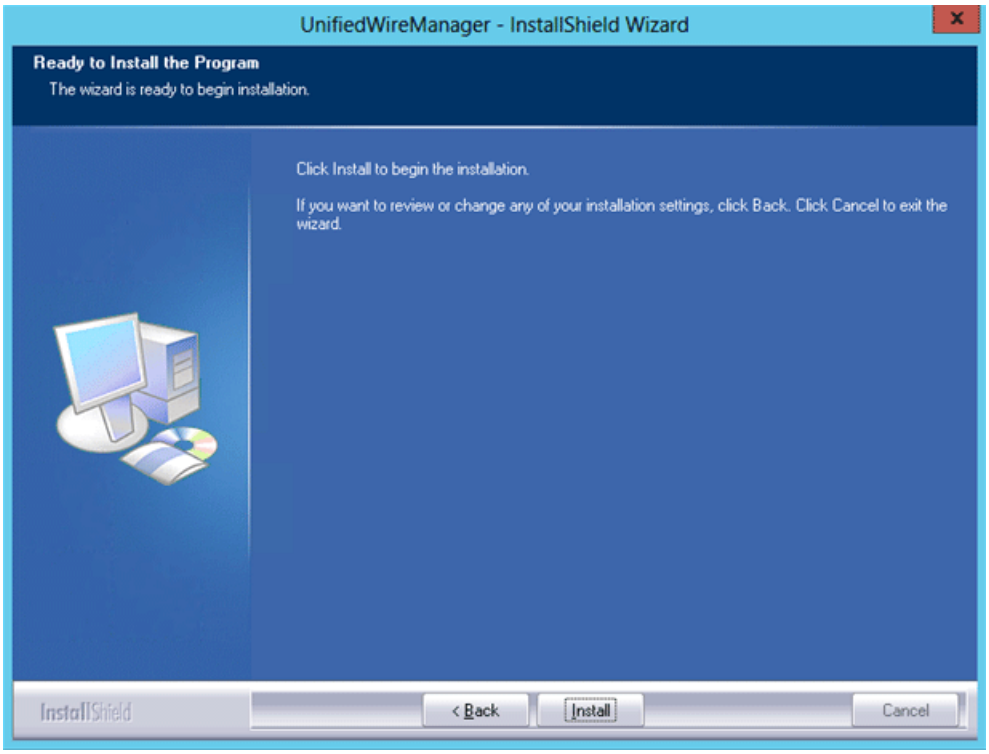


Figure 3.2 (g) – Starting UM installation

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

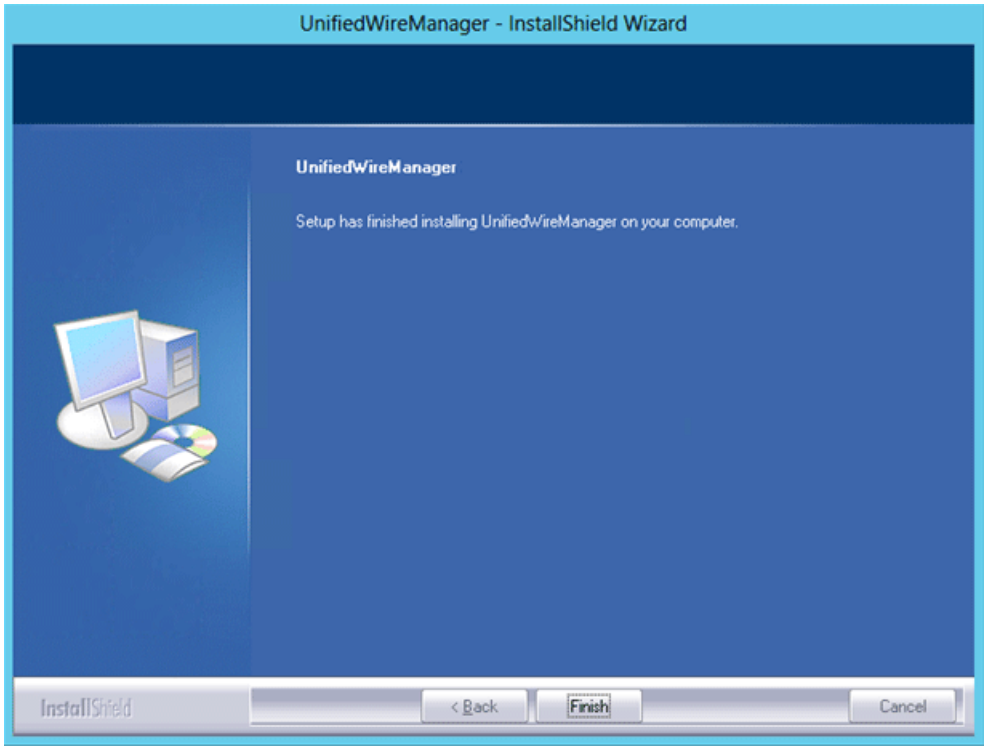


Figure 3.2 (h) – Finishing UM installation

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

1. 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.

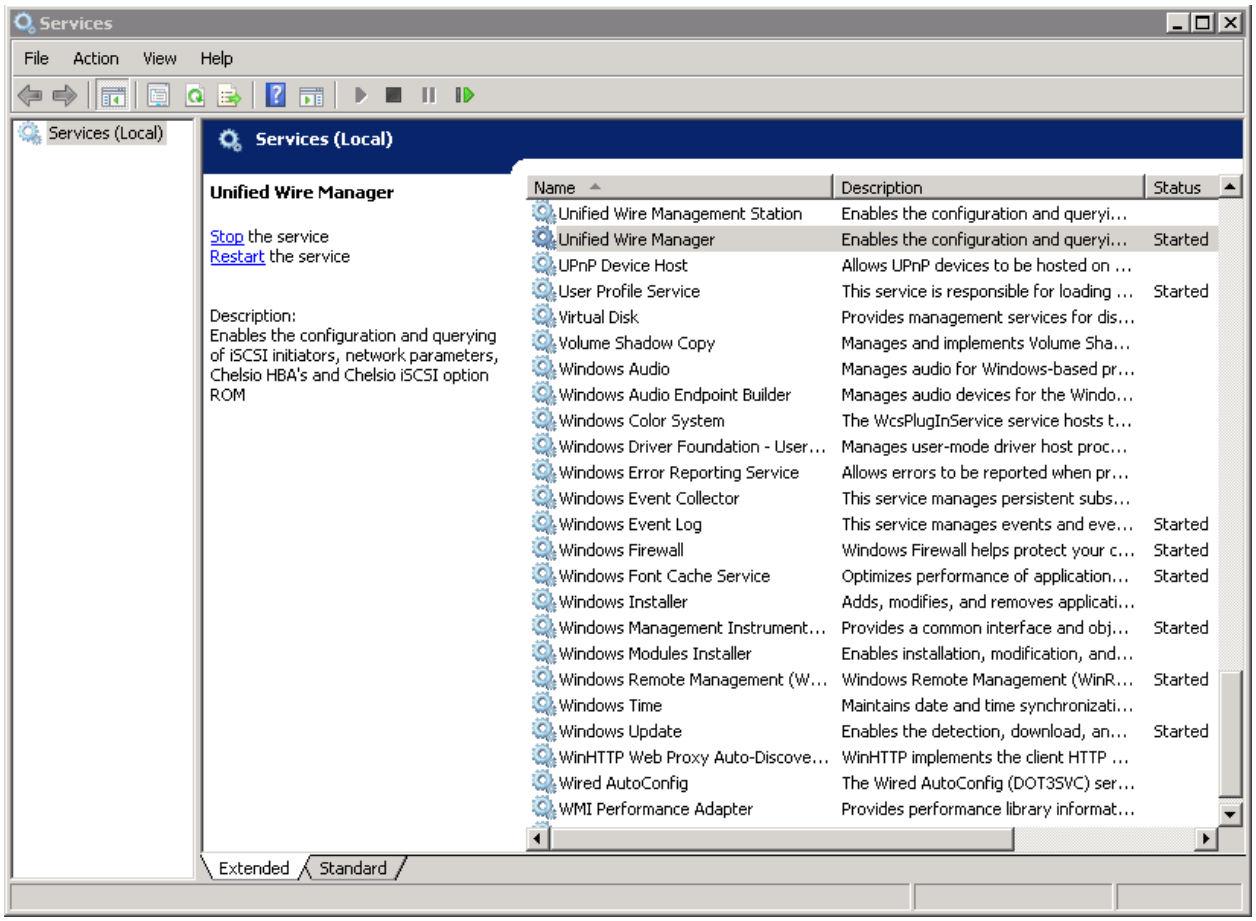


Figure 5.1(a) – Windows Services

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.

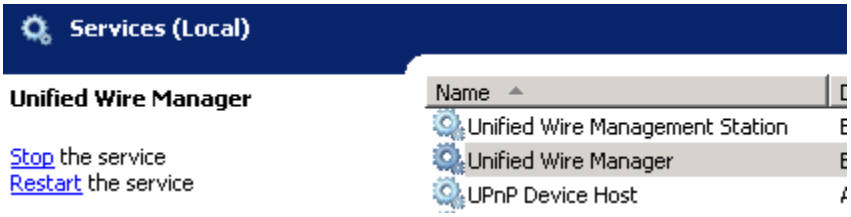


Figure 5.1(b) – Actions available for Unified Wire Manager service

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.

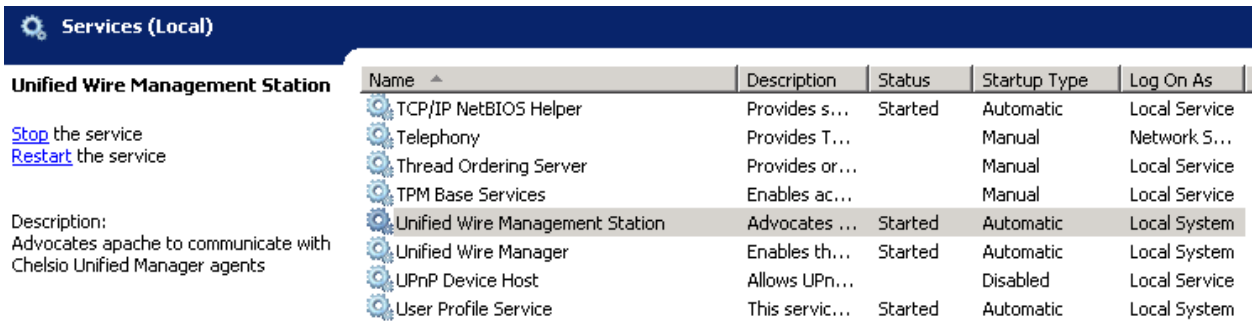


Figure 5.3 – Verifying Management Station service status

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 s*ervices.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 s*ervices.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 s*ervices.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.

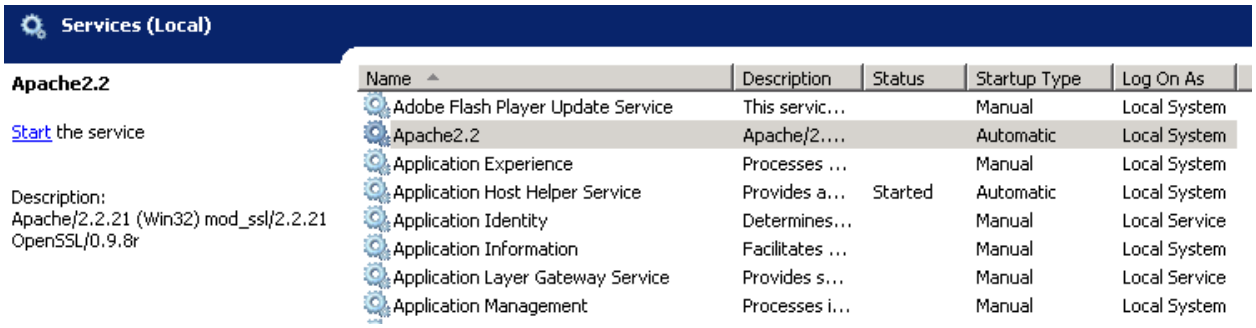


Figure 8.1.1 (a) – Starting Apache HTTP server

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

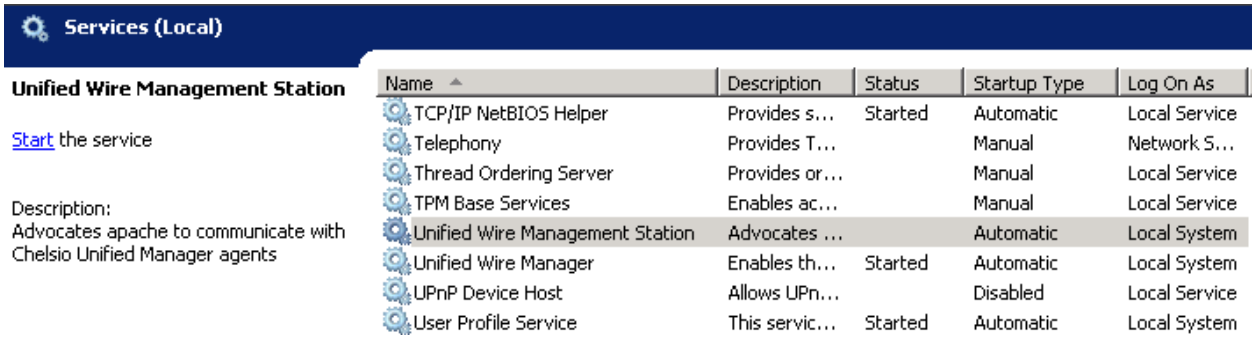


Figure 8.1.1(b) – Starting Management Station service

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.

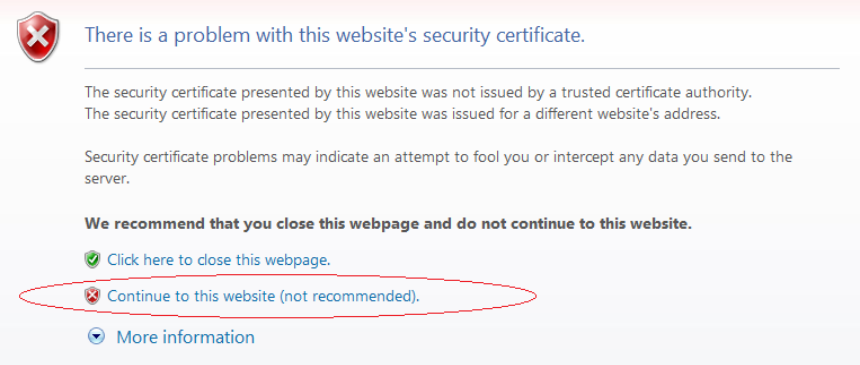


Figure 8.2 (a) - Security Certificate prompt in Internet Explorer

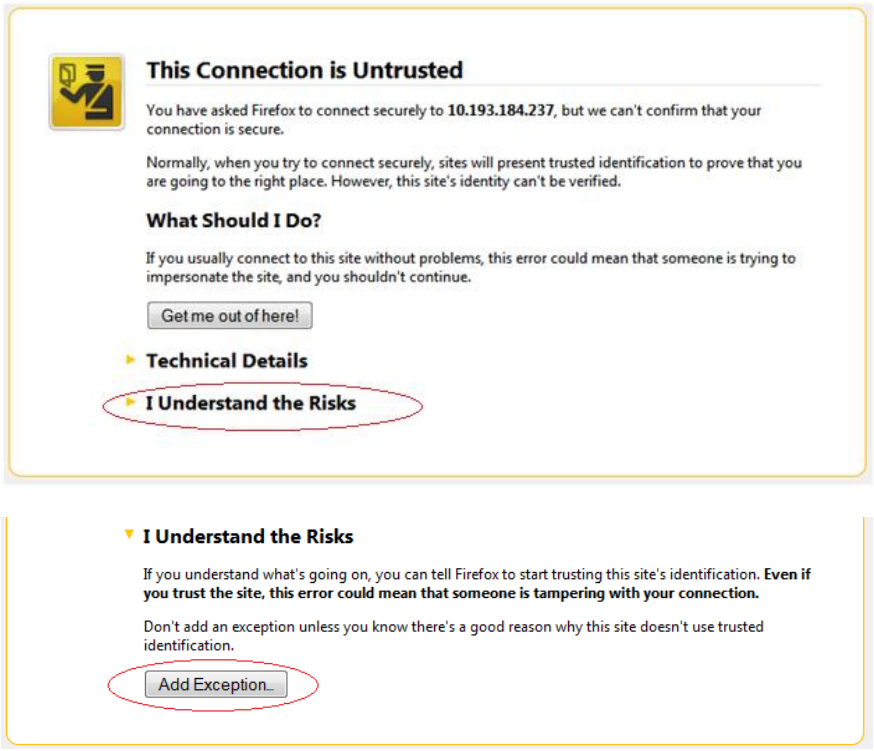


Figure 8.2 (b) - Security Certificate prompt in Mozilla Firefox

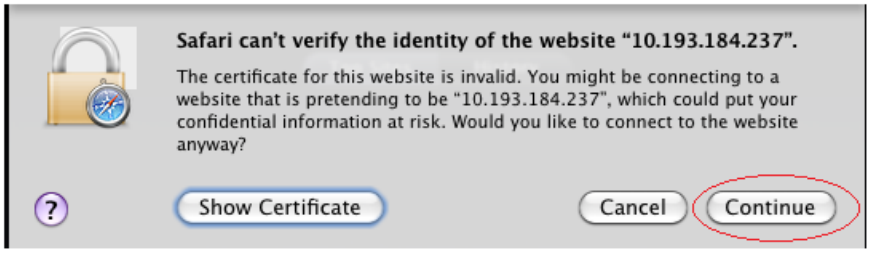


Figure 8.2 (c) - Security Certificate prompt in Apple Safari

Figure 8.2 (d) - Security Certificate prompt in Google Chrome

3. The web interface requires password authorization to be accessed. Enter the username and corresponding password that was set up on the management station system and click on the *Login* button.

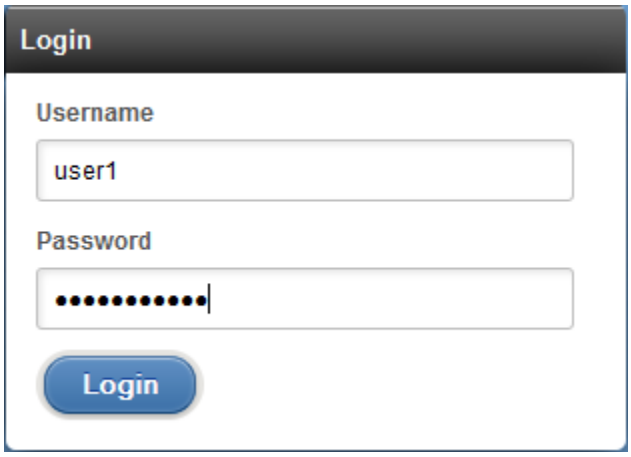


Figure 8.2 (e) - Web GUI Login page

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.*

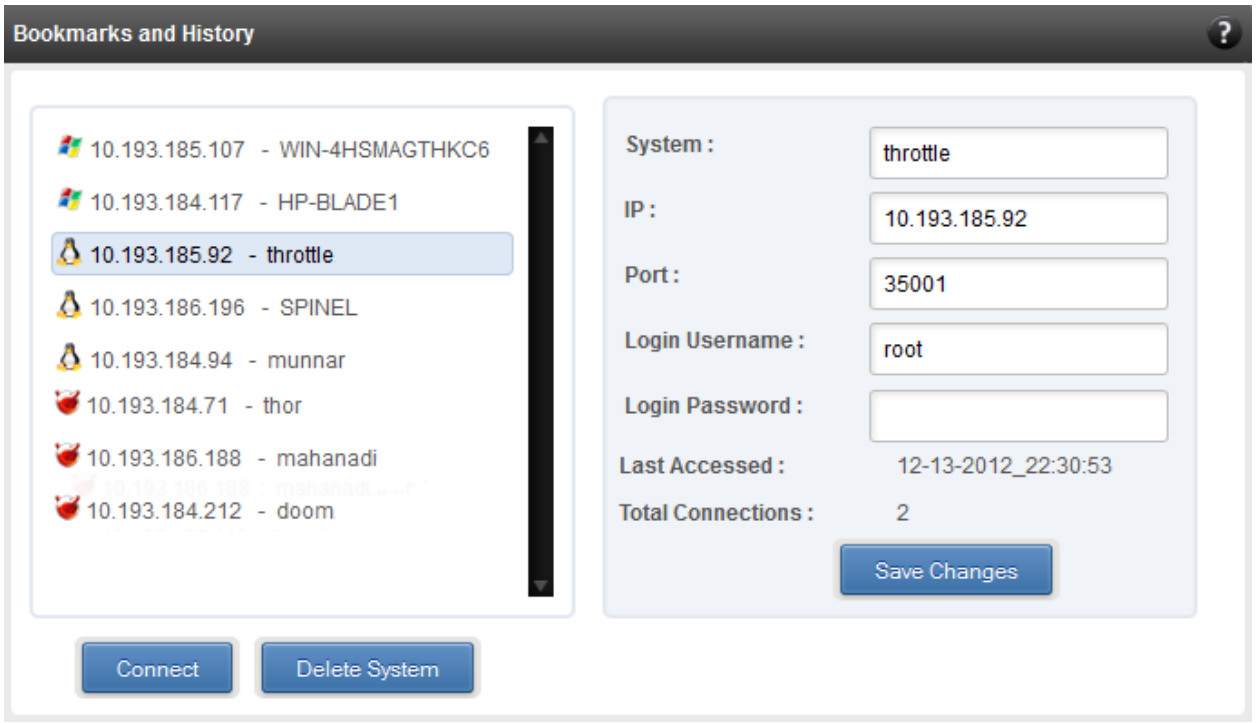


Figure 8.4.1 (a) - Bookmarks and history module

- **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.

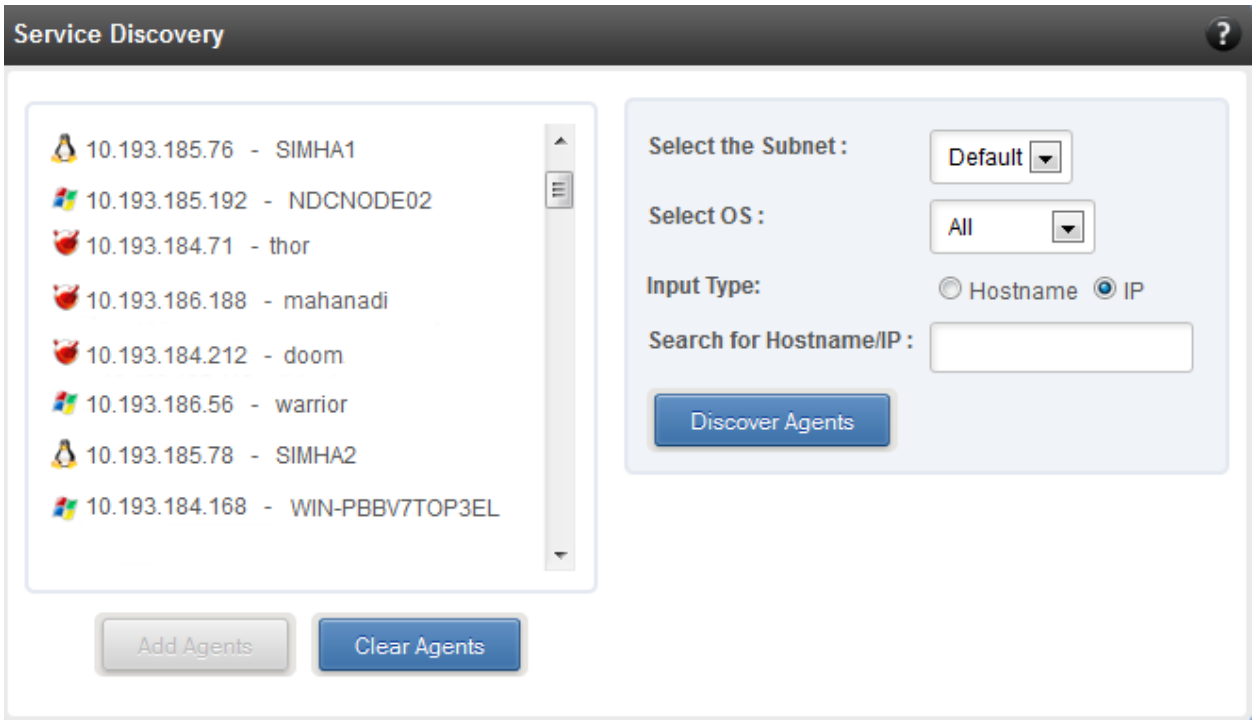


Figure 8.4.1 (b) - Services Discovery module

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.
5. Locate the driver package.
6. Click **Install** button to install the driver.

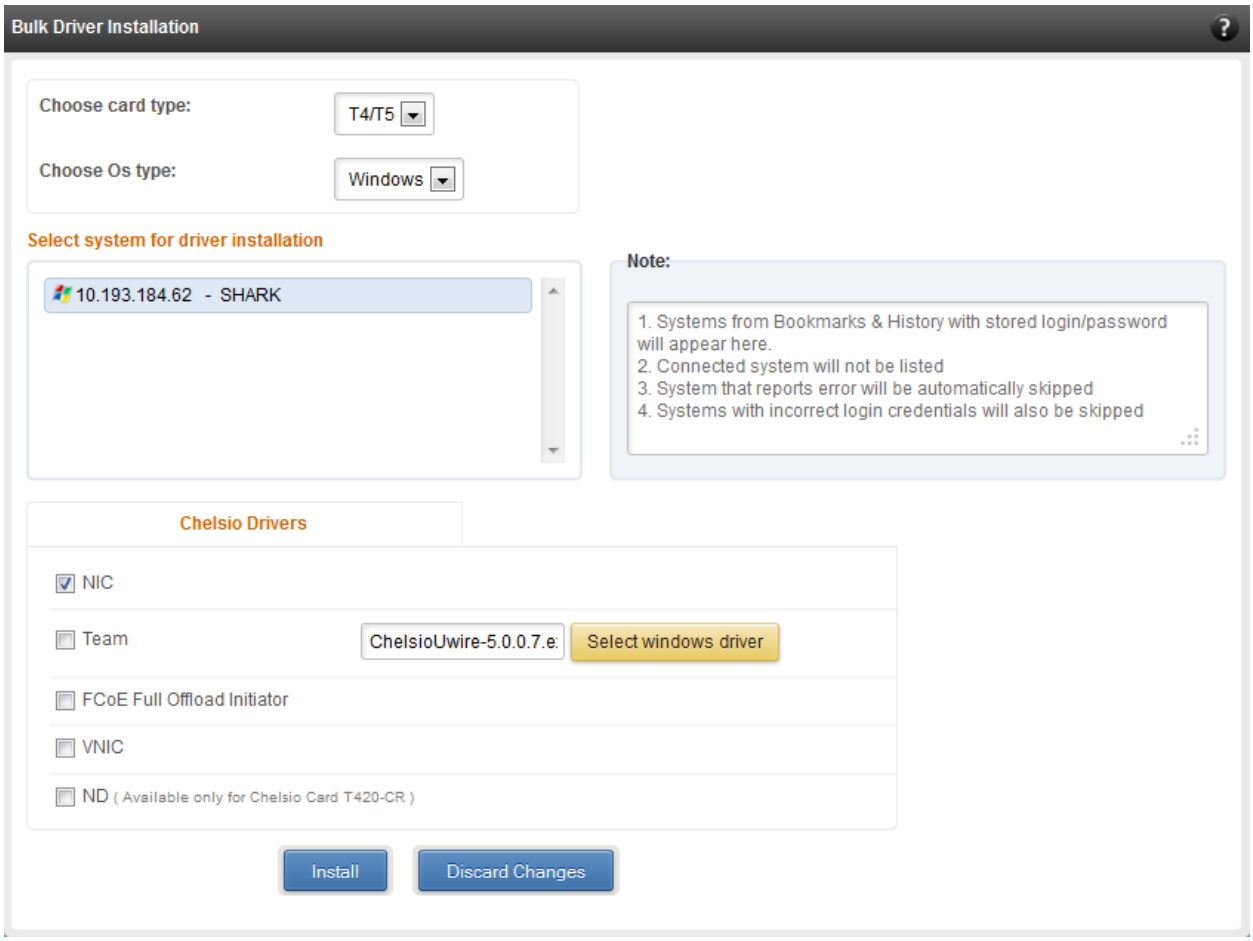


Figure 8.4.1 (c) - Bulk Driver Installation module

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

8.4.2. Add System

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

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

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

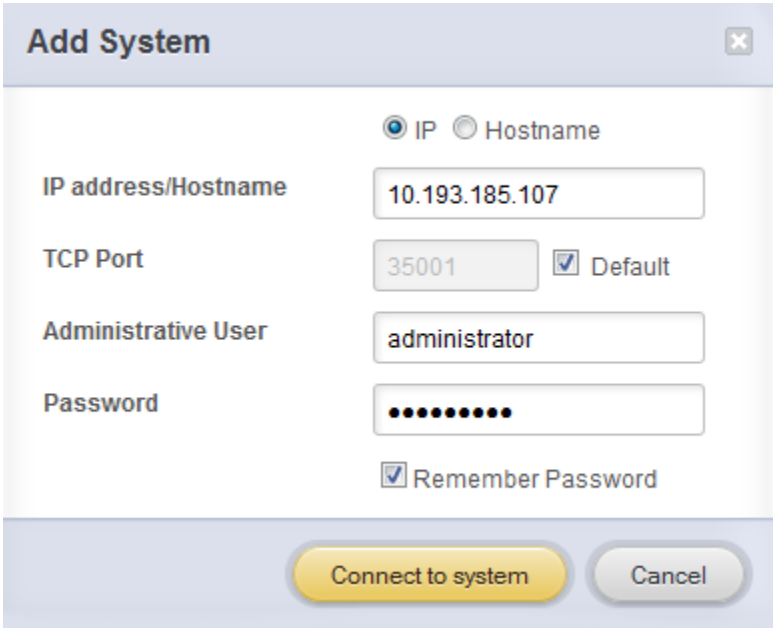


Figure 8.4.2 (a) - Adding a UM Agent

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 Syste*m. Then click *Yes* to confirm.

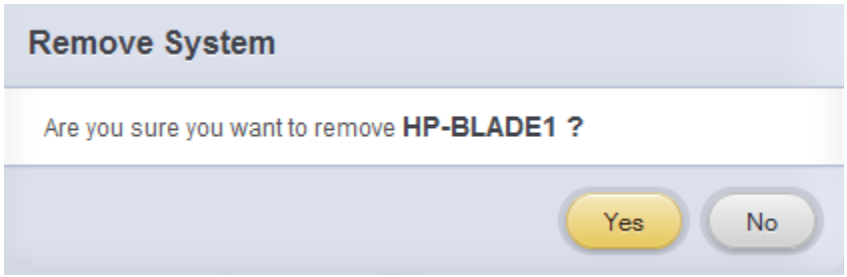


Figure 8.4.3 - Removing a UM Agent

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.**

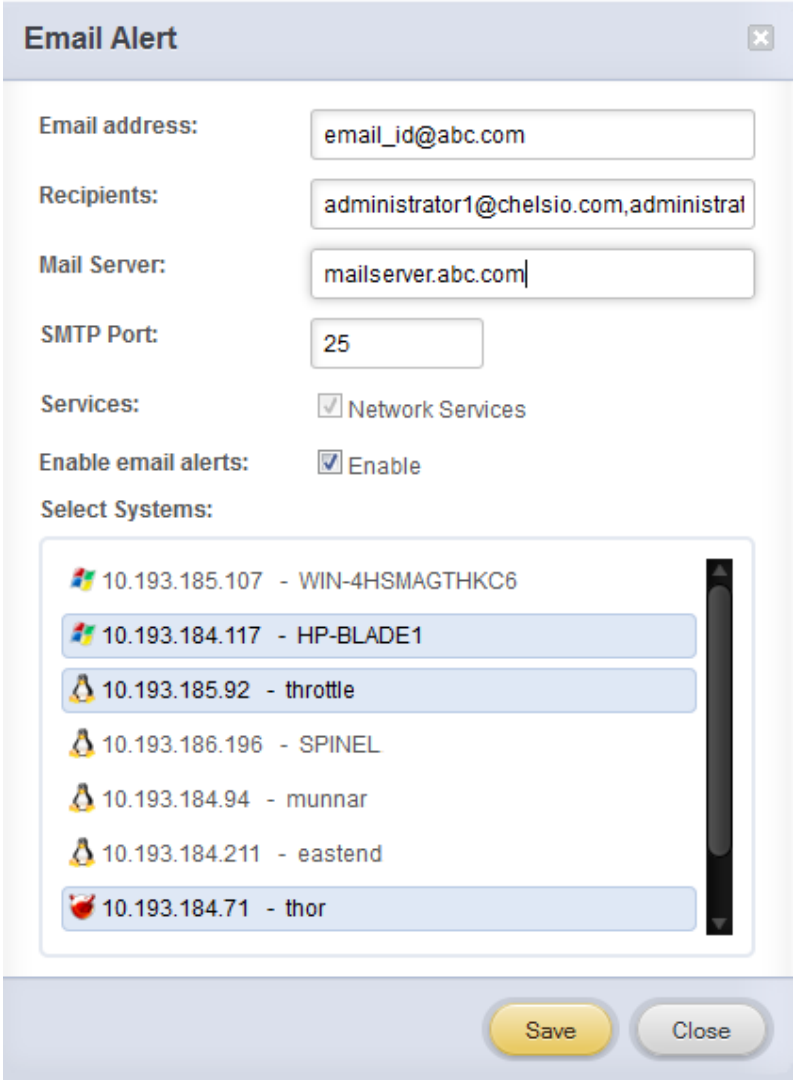


Figure 8.4.5 - Subscribing to Email Alerts

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).**

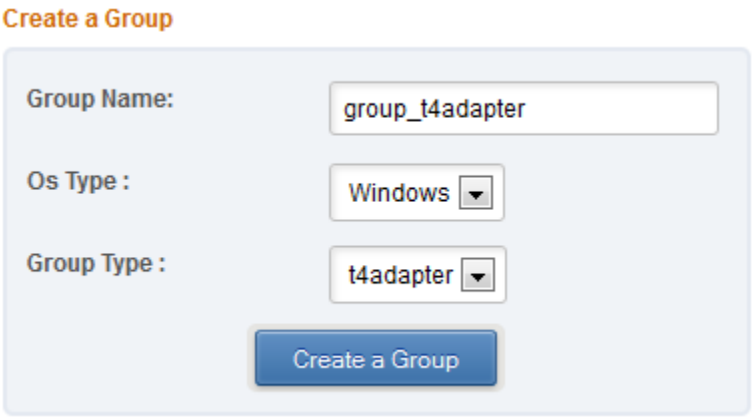


Figure 8.4.6 (a) – Creating a group

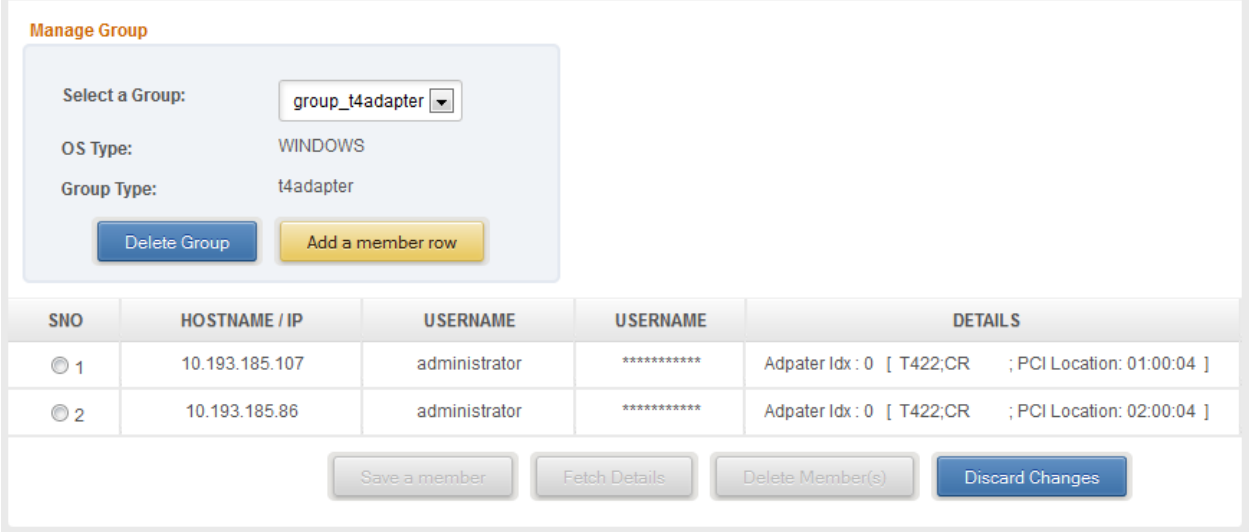


Figure 8.4.6 (b) – Managing a group

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.

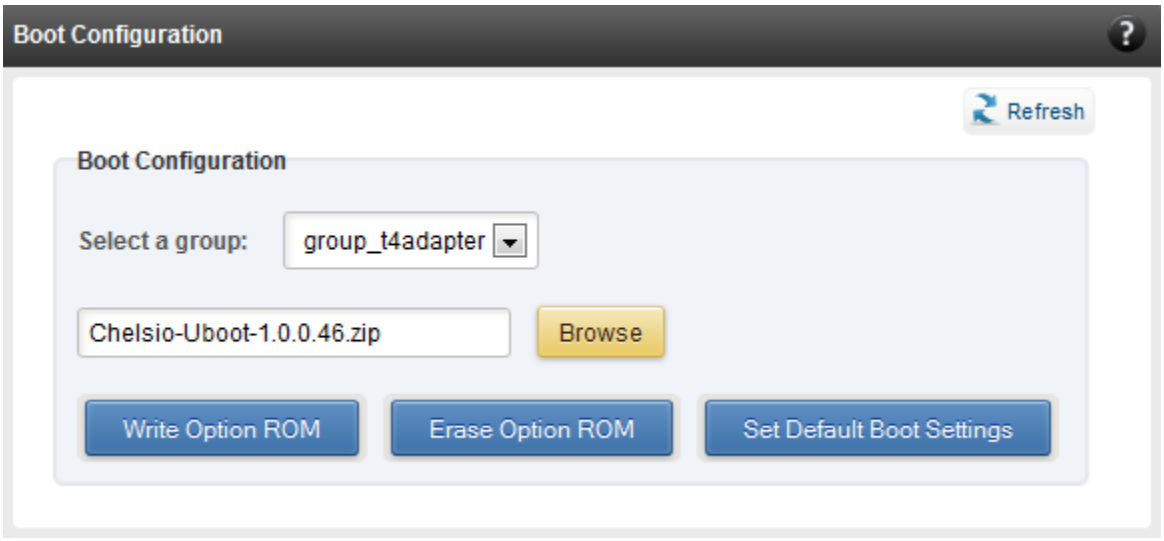


Figure 8.4.6 (c) – Boot Configuration module

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.

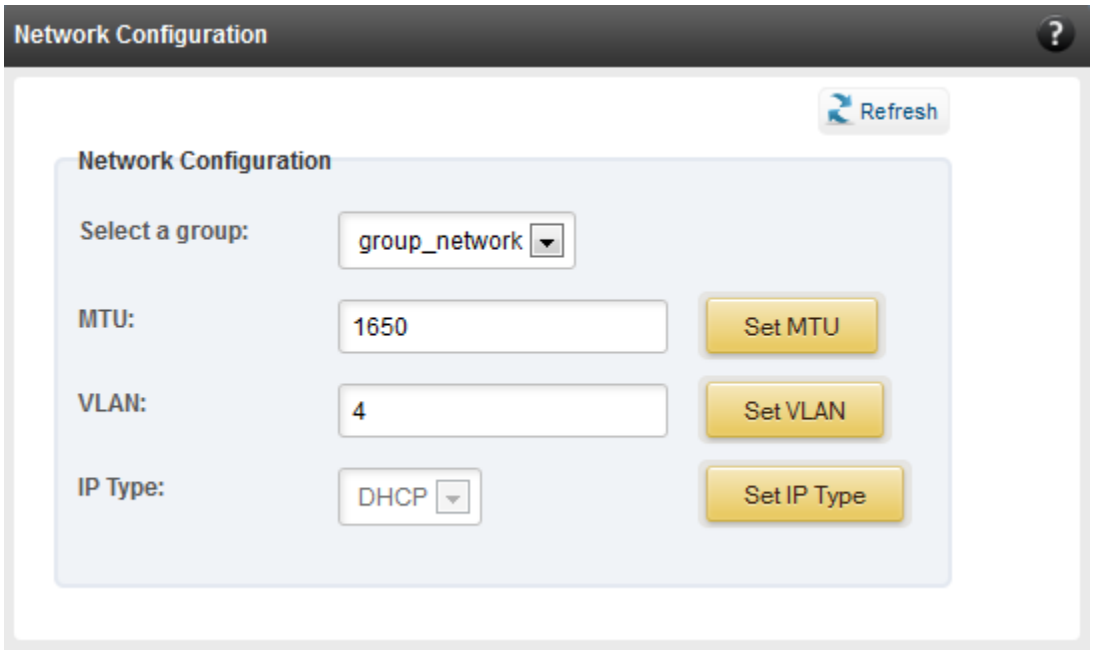


Figure 8.4.6 (d) – Network Configuration module

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).

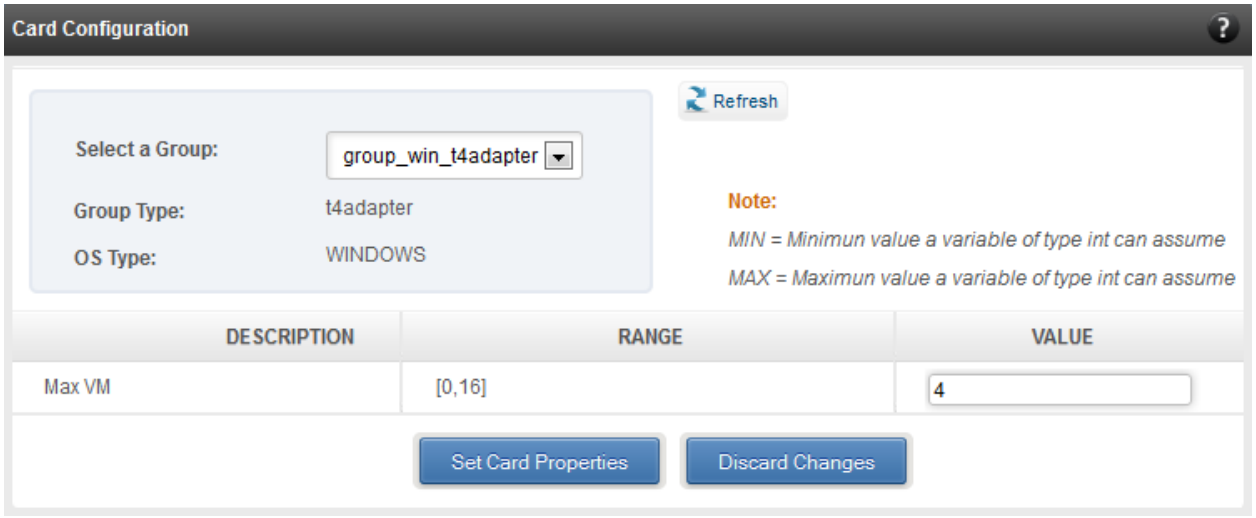


Figure 8.4.6 (e) – Card Configuration module

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.

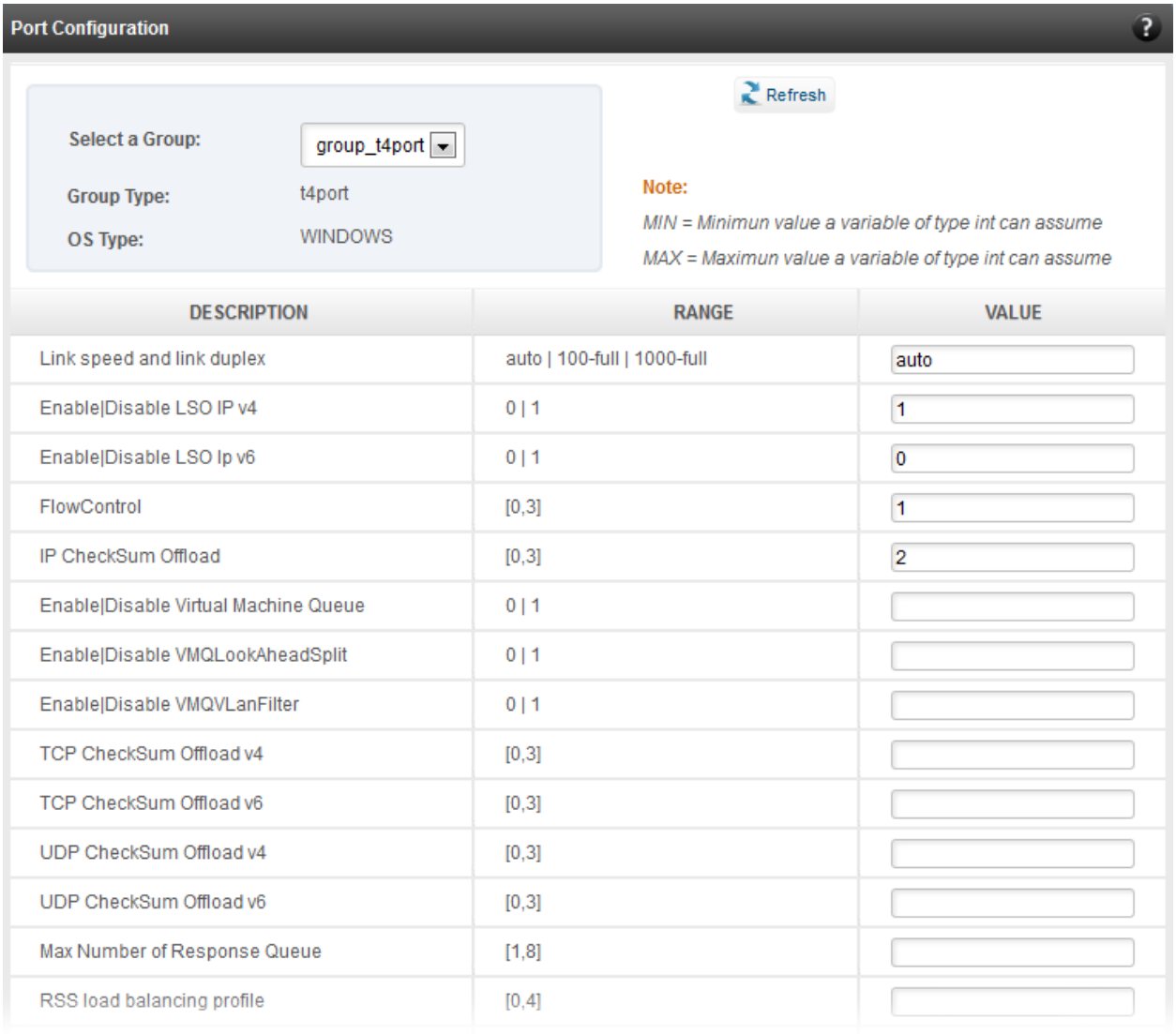


Figure 8.4.6 (f) - Port Configuration module

Bypass Configuration

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

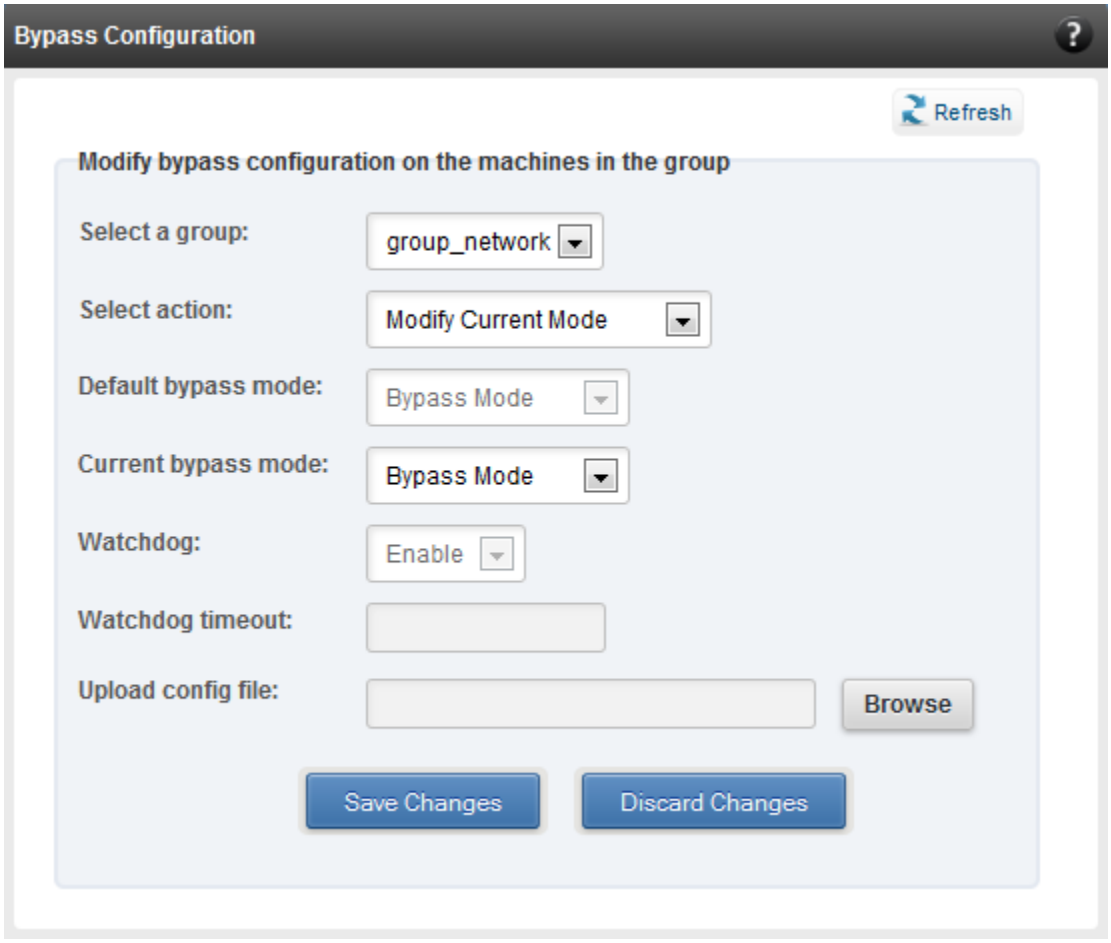


Figure 8.4.6 (g) - Bypass Configuration module

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.

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.

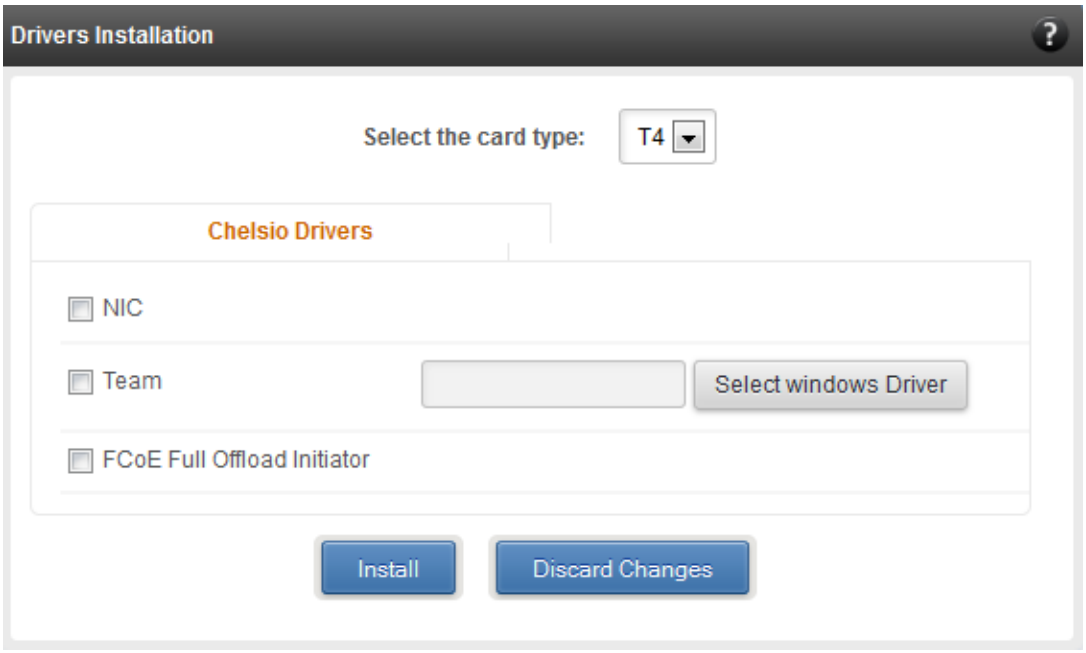


Figure 8.5.2 (a) - Drivers Installation module connected to Windows Agent

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**.

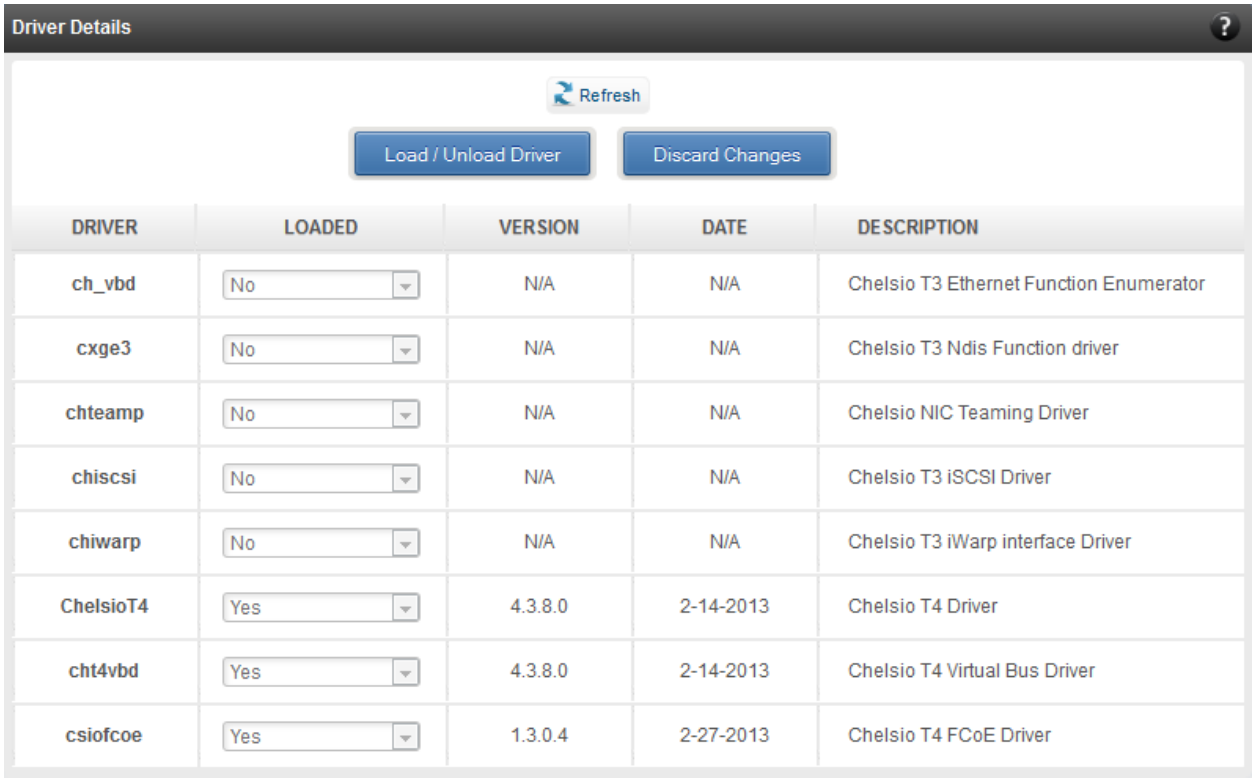


Figure 8.5.3 - Driver Details module

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.

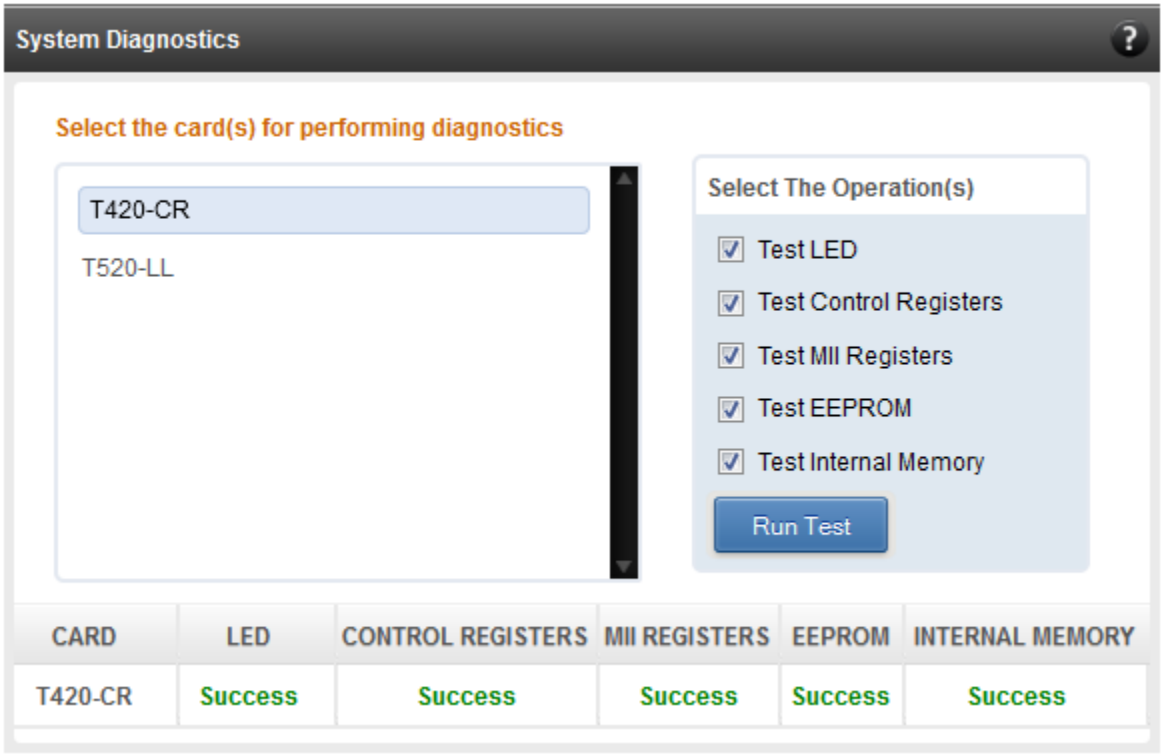


Figure 8.5.4 - System Diagnostics module for a T4 CNA

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.

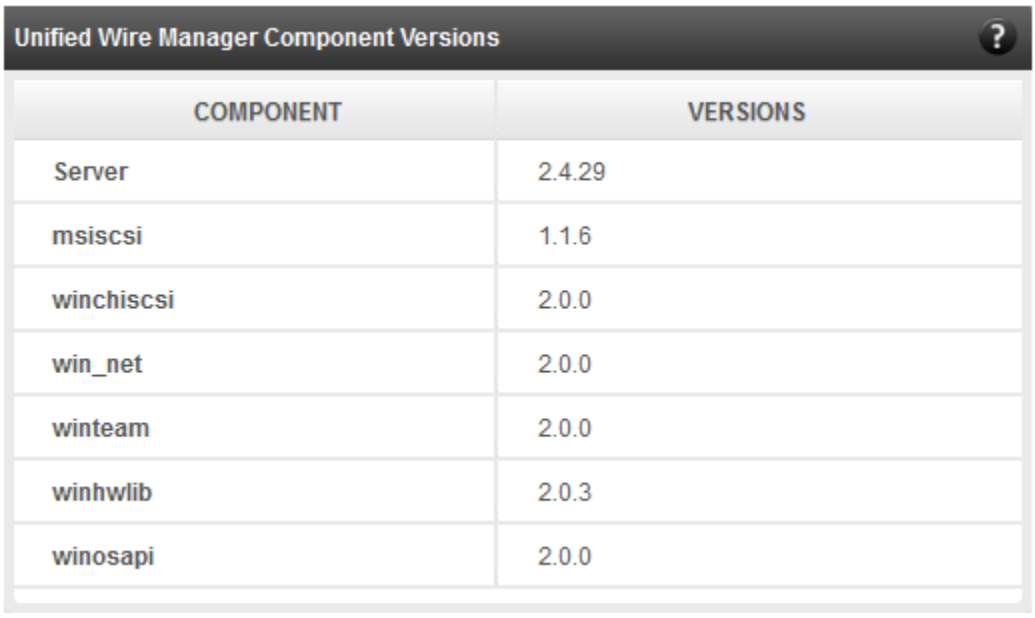


Figure 8.5.5 - Unified Wire Manager Component Versions module

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.

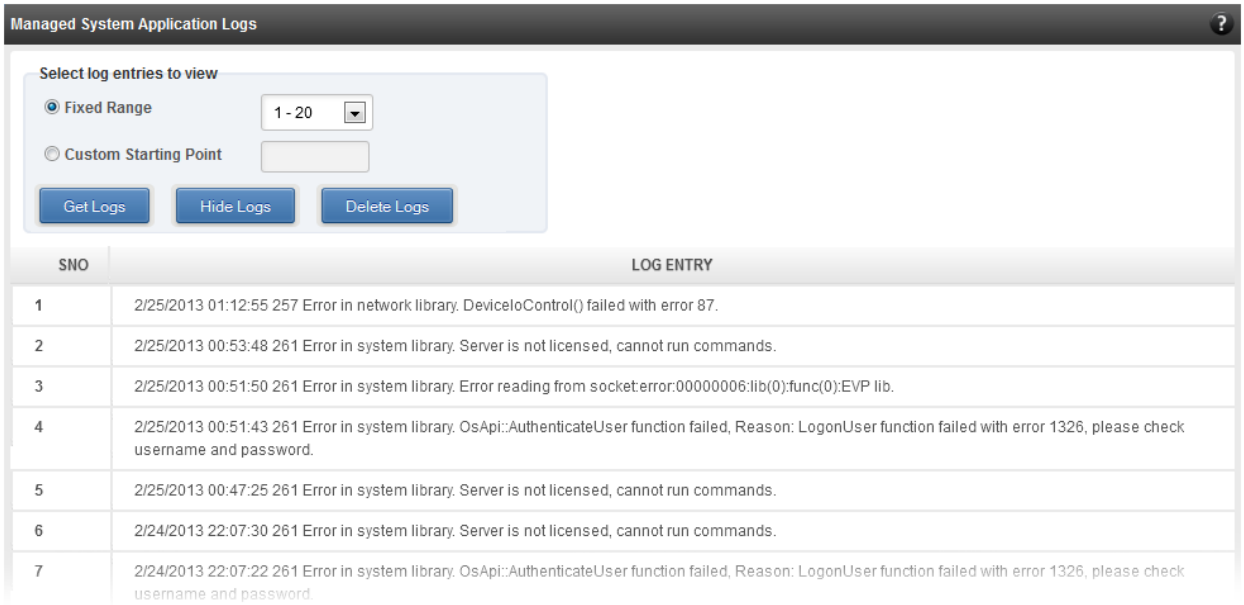


Figure 8.5.7 - Managed System Application Logs module for Windows Agent

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.

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.

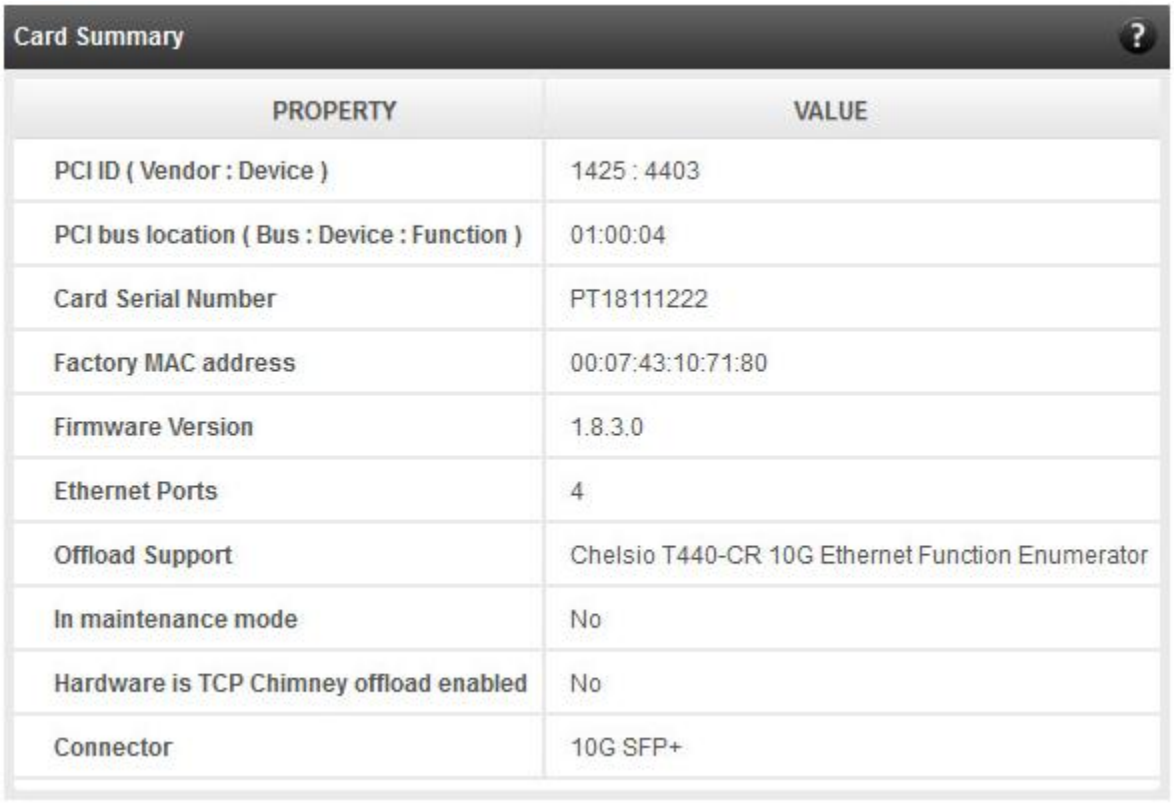


Figure 8.6.2 (a) - Card Summary module for a Windows Agent

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.

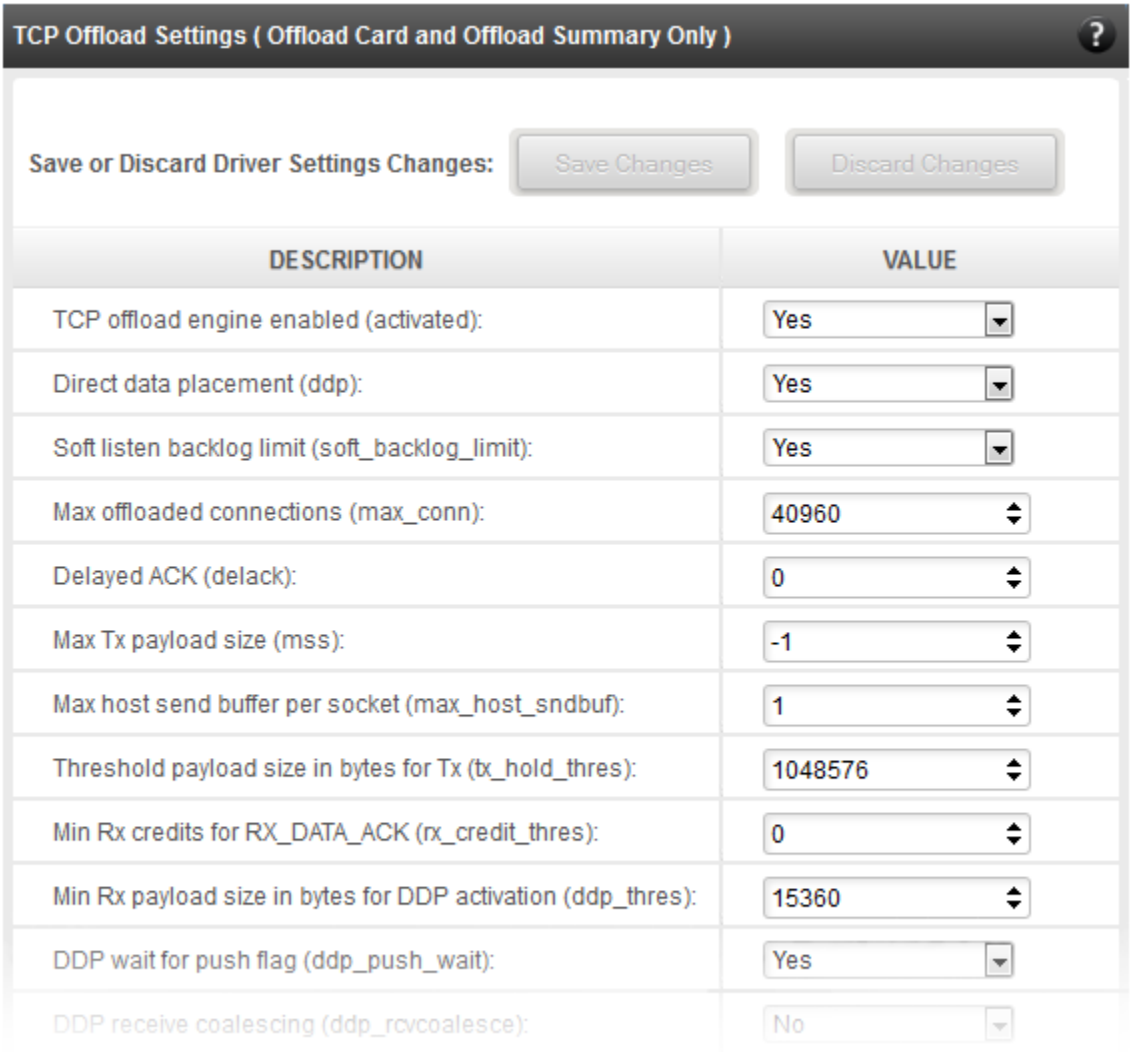


Figure 8.6.2 (b) - TCP Offload Settings module for a FreeBSD Agent

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.

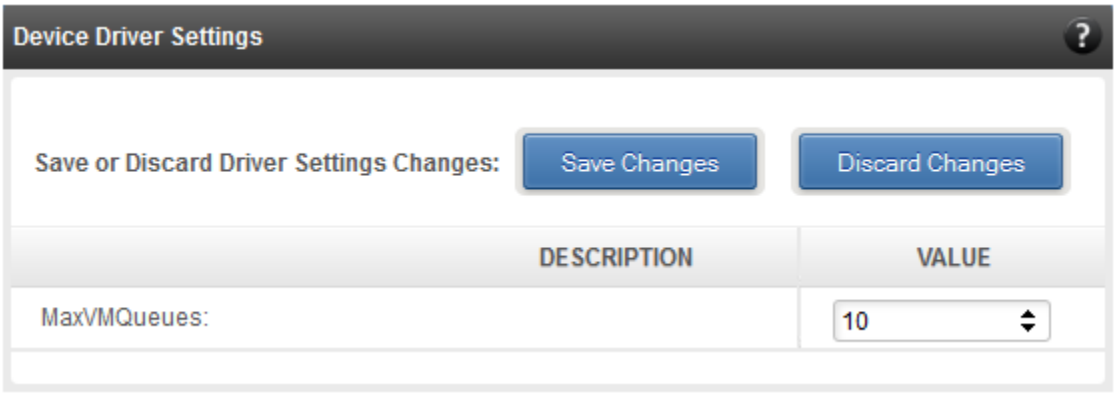


Figure 8.6.2 (c) - Device Driver Settings module for a Windows Agent

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.

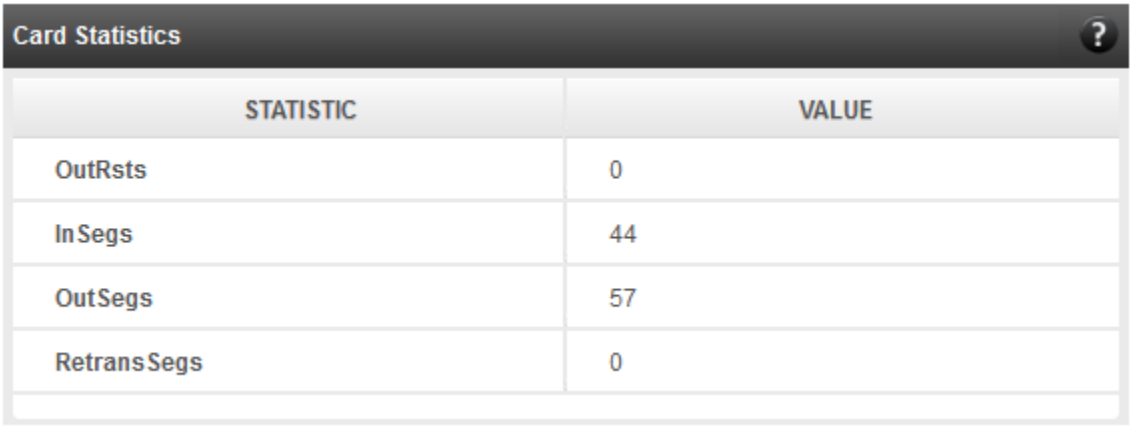


Figure 8.6.2 (d) - Card Statistics module

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.

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.

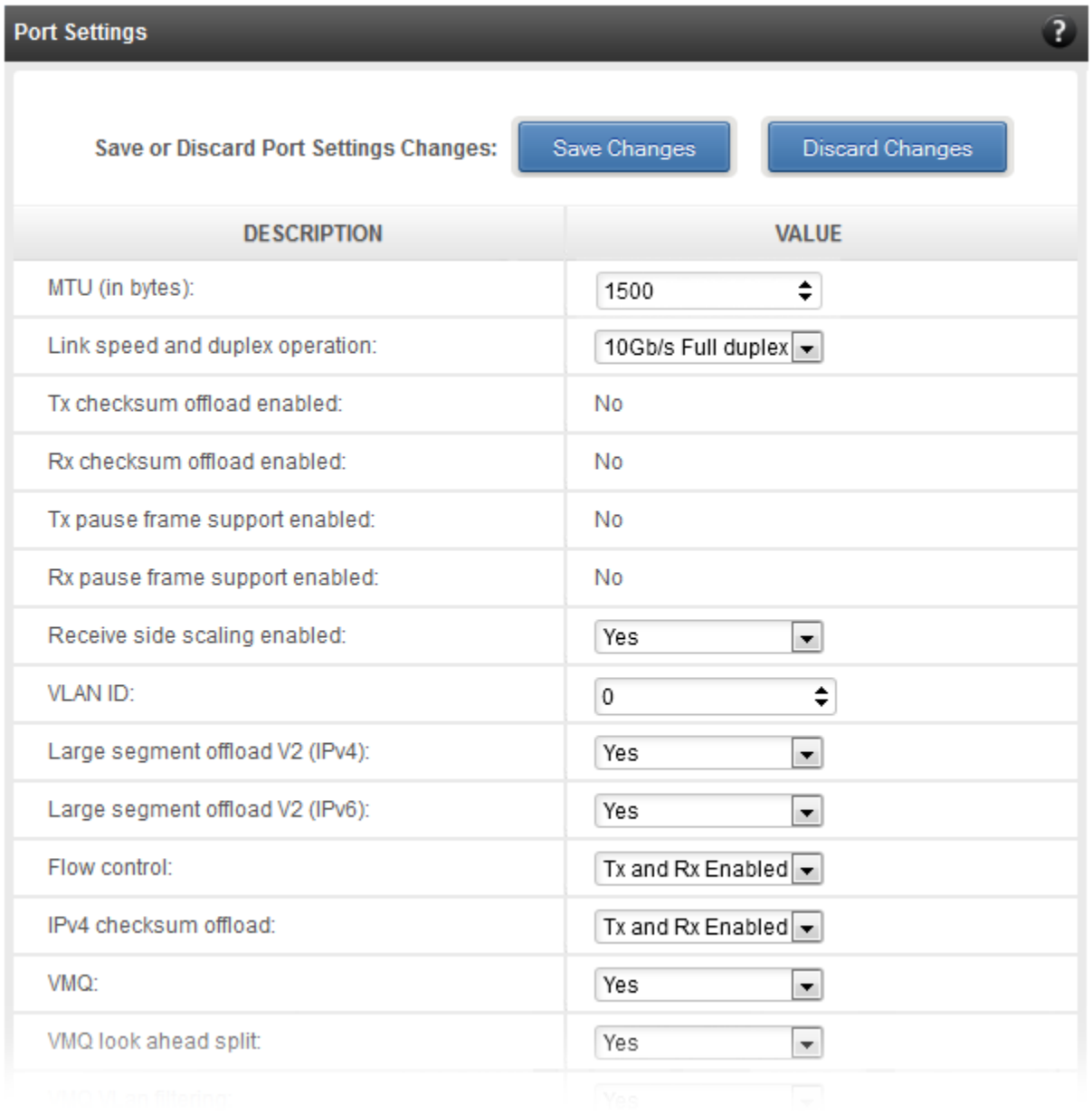


Figure 8.6.2.1 (b) - Port Settings of T4 CNA

Port statistics

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

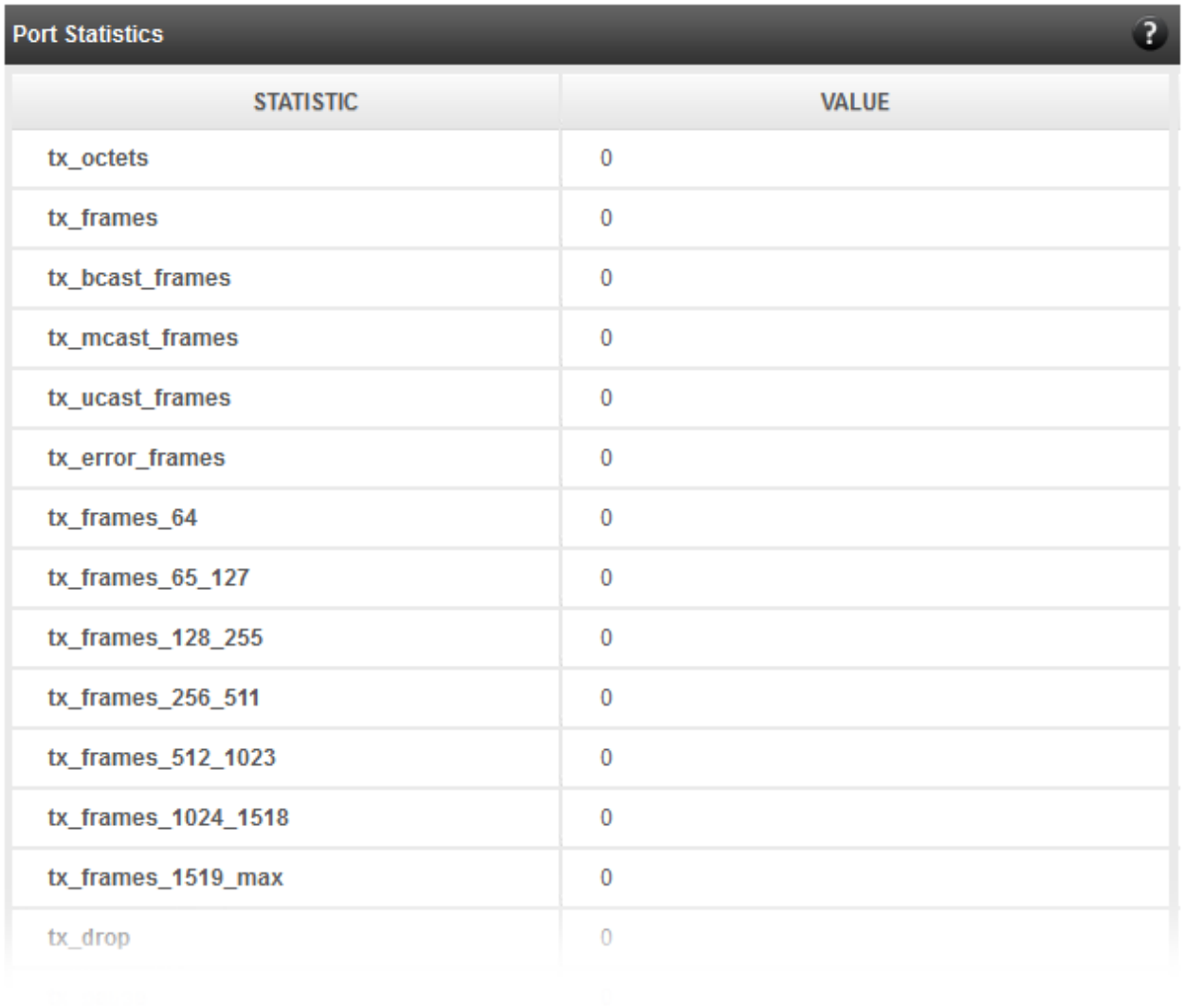


Figure 8.6.2.1 (c) - Port Statistics of T4 CNA on Windows Agent

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.

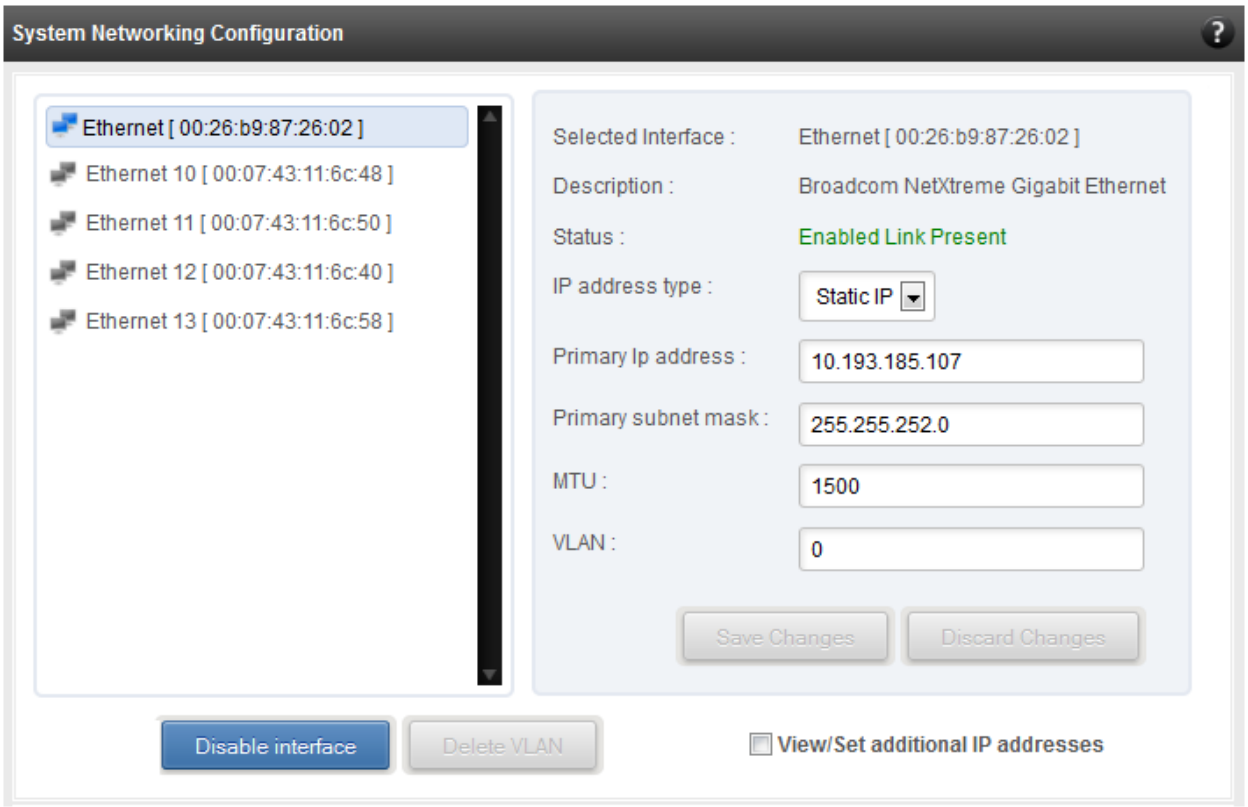


Figure 8.6.3 (a) - System network configuration module

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.

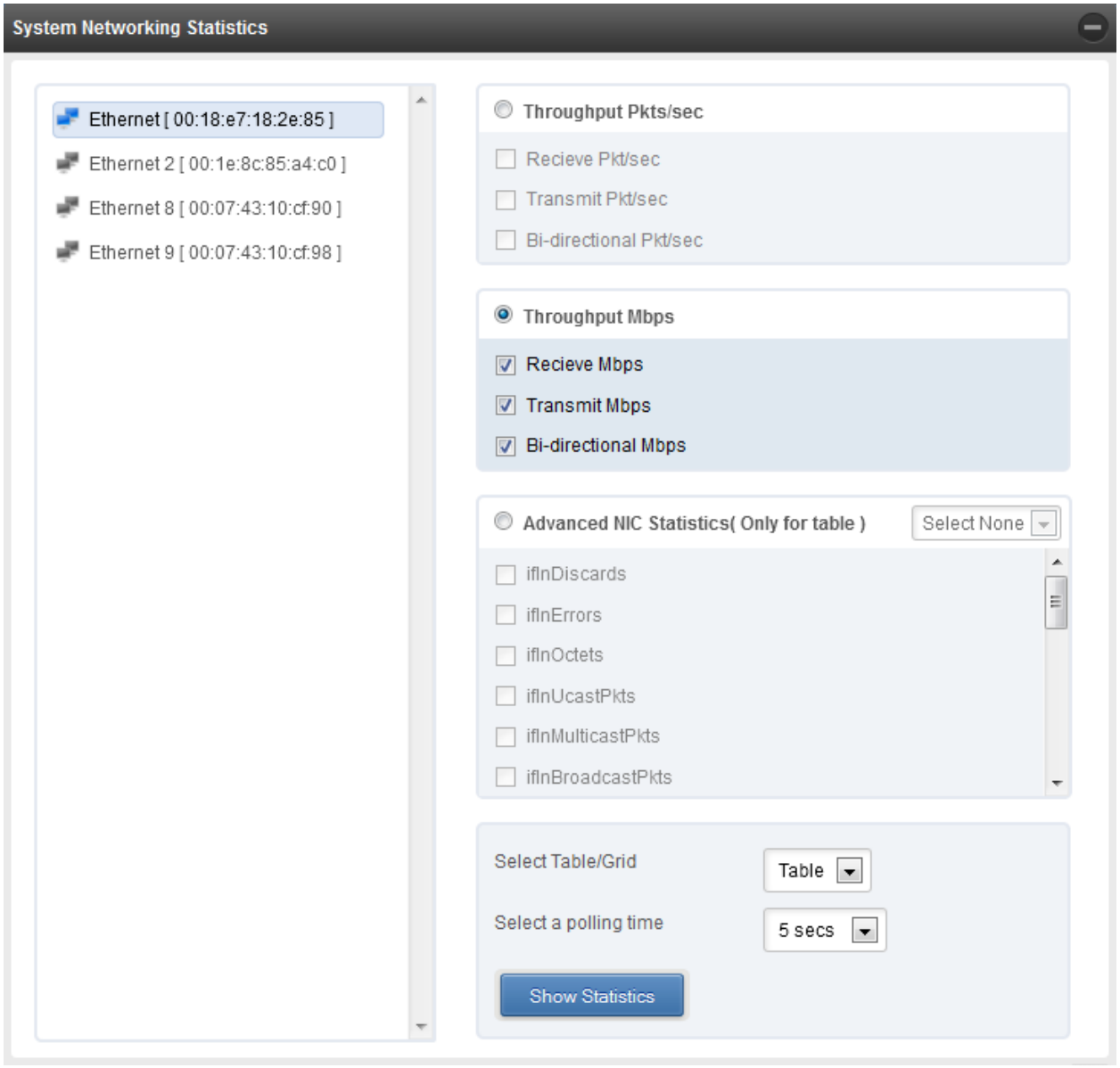


Figure 8.6.3 (c) - System network statistics module

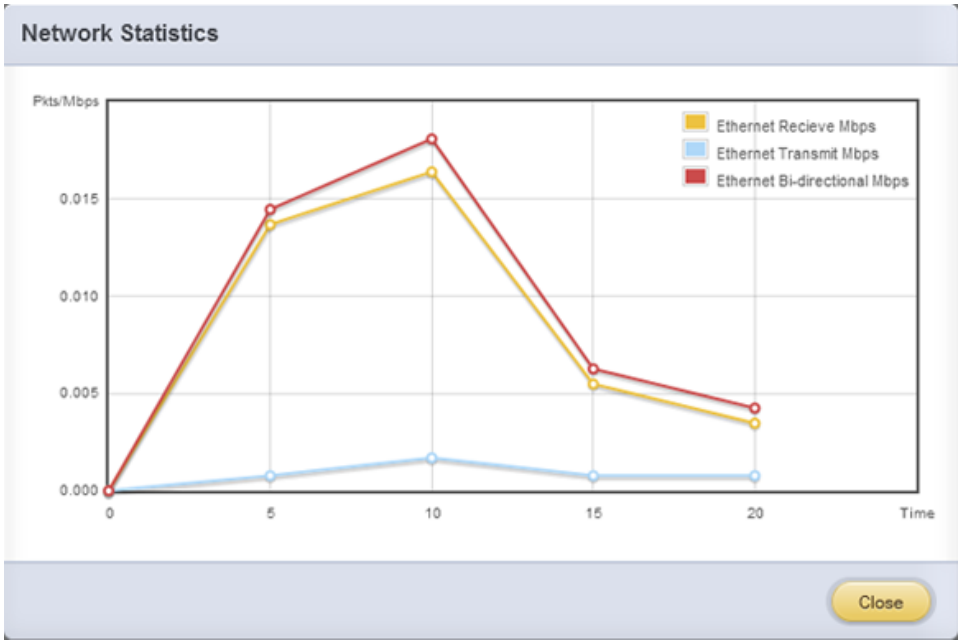


Figure 8.6.3 (d) - Network Throughput Vs Time instant Graph

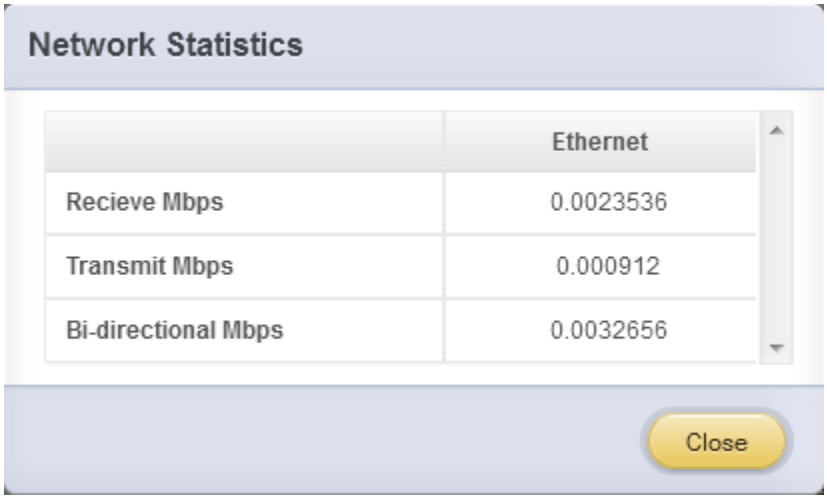


Figure 8.6.3 (e) - Network Throughput Vs Time instant Table

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.

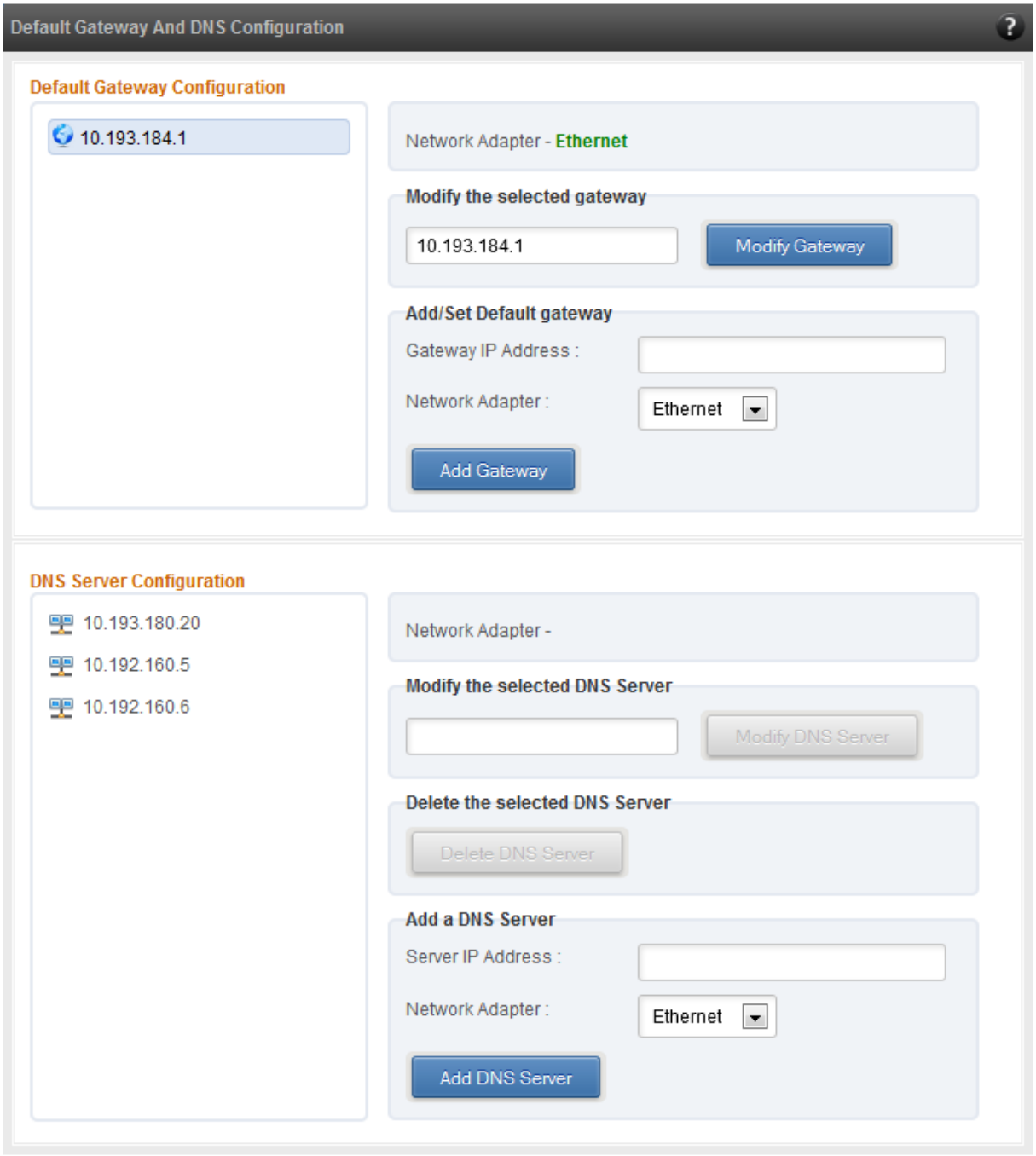


Figure 8.6.3 (f) - Default gateway and DNS configuration module for a Windows Agent

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.

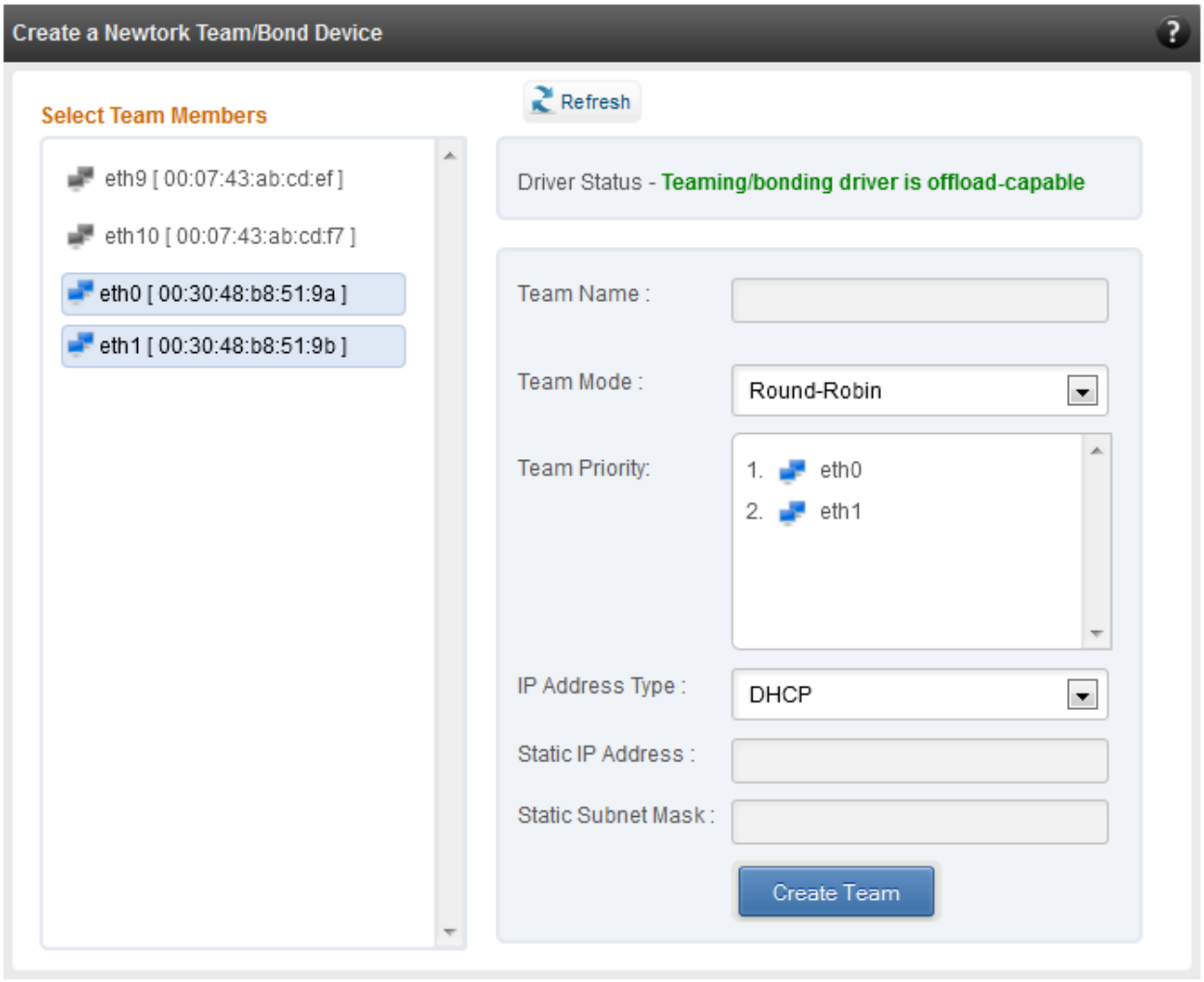


Figure 8.6.3 (g) - Create a network team/bond device module for Linux Agent

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.

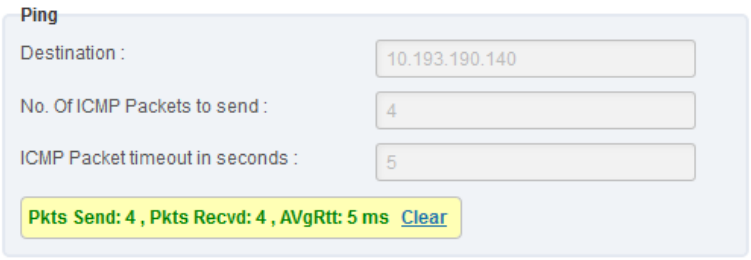


Figure 8.6.3 (h) - Ping Utility

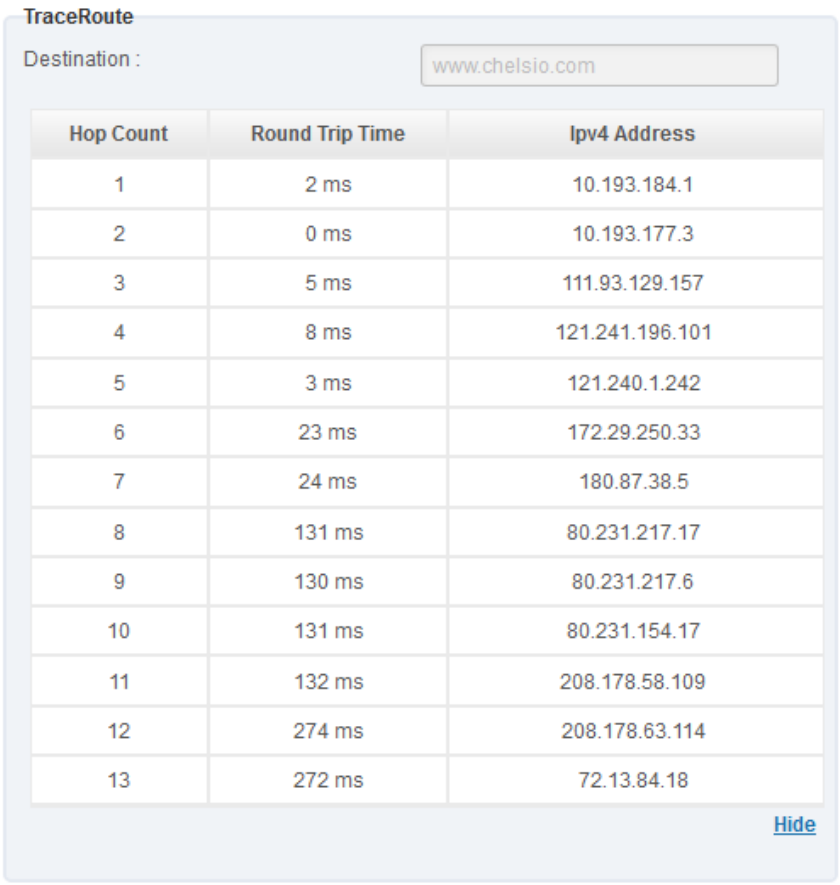


Figure 8.6.3 (i) - TraceRoute Utility

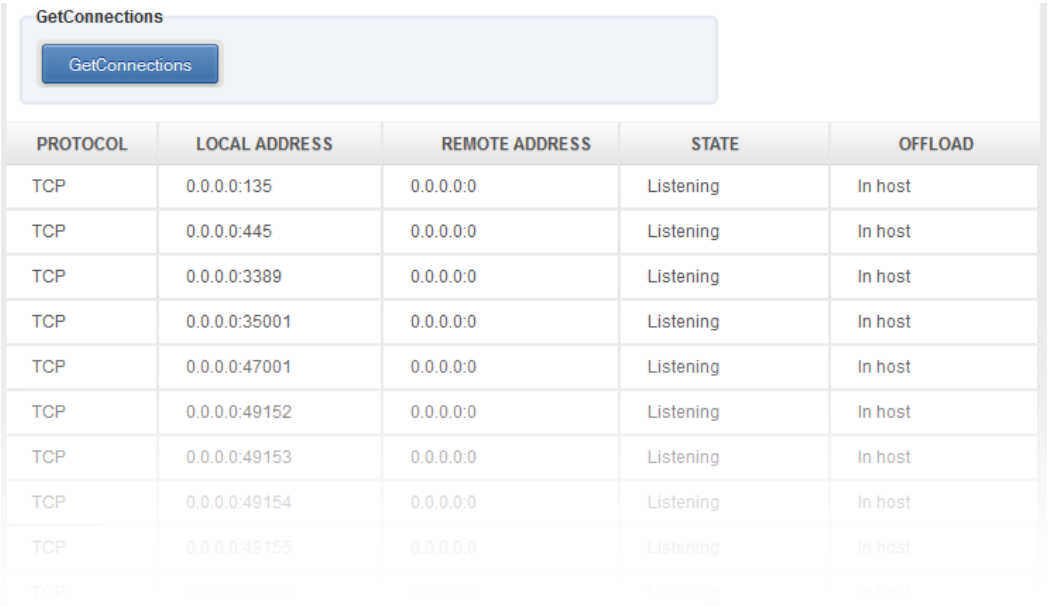


Figure 8.6.3 (j) - GetConnections Utility

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.

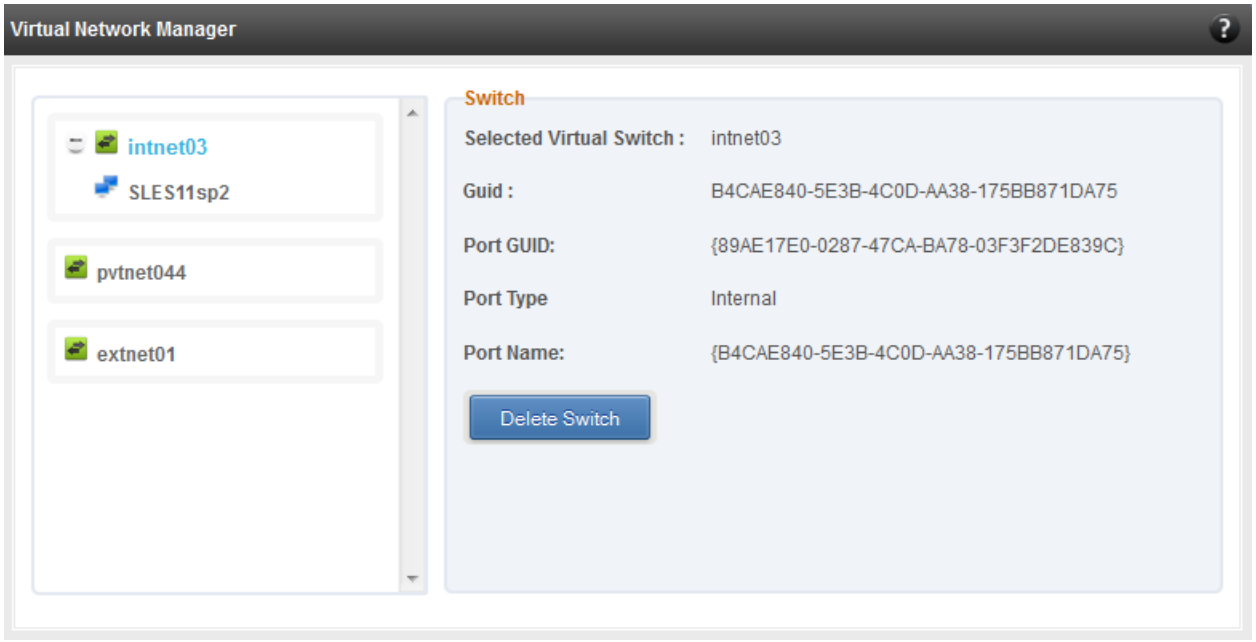


Figure 8.6.3.1 (a) – Virtual Network Manager module

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.

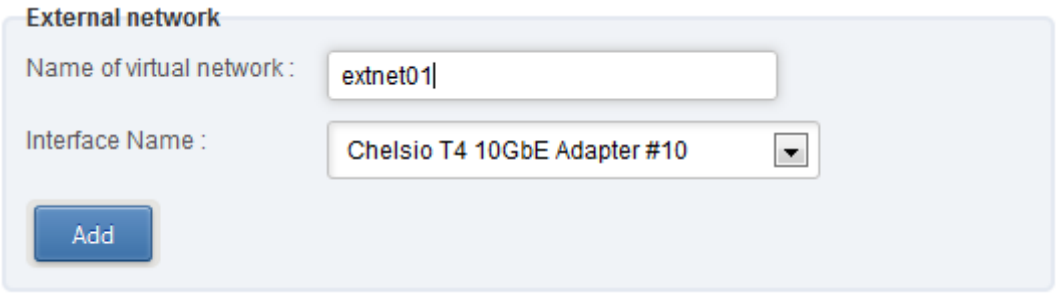


Figure 8.6.3.1 (b) – Creating external virtual network

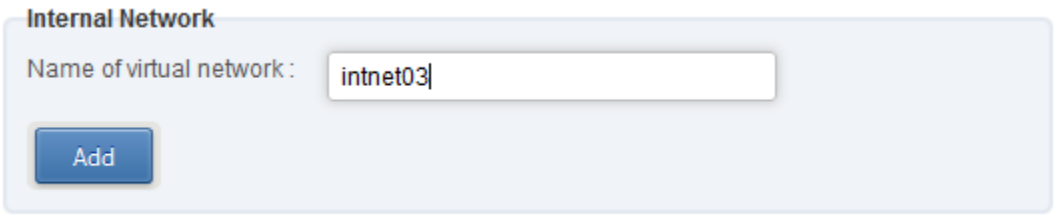


Figure 8.6.3.1 (c) – Creating internal virtual network

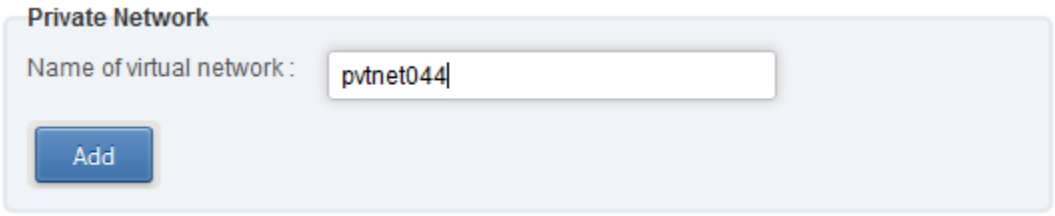


Figure 8.6.3.1 (d) – Creating private virtual network

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*.

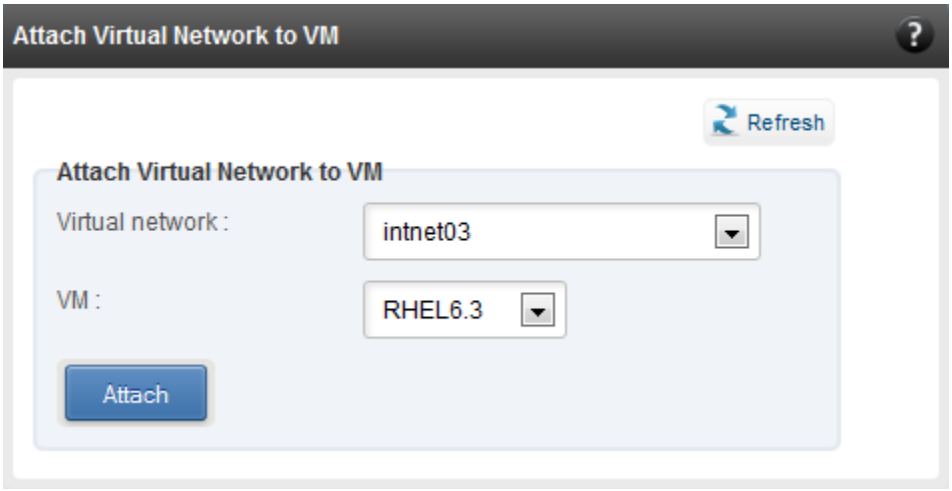


Figure 8.6.3.1 (e) – Attaching Virtual Network to VM

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.

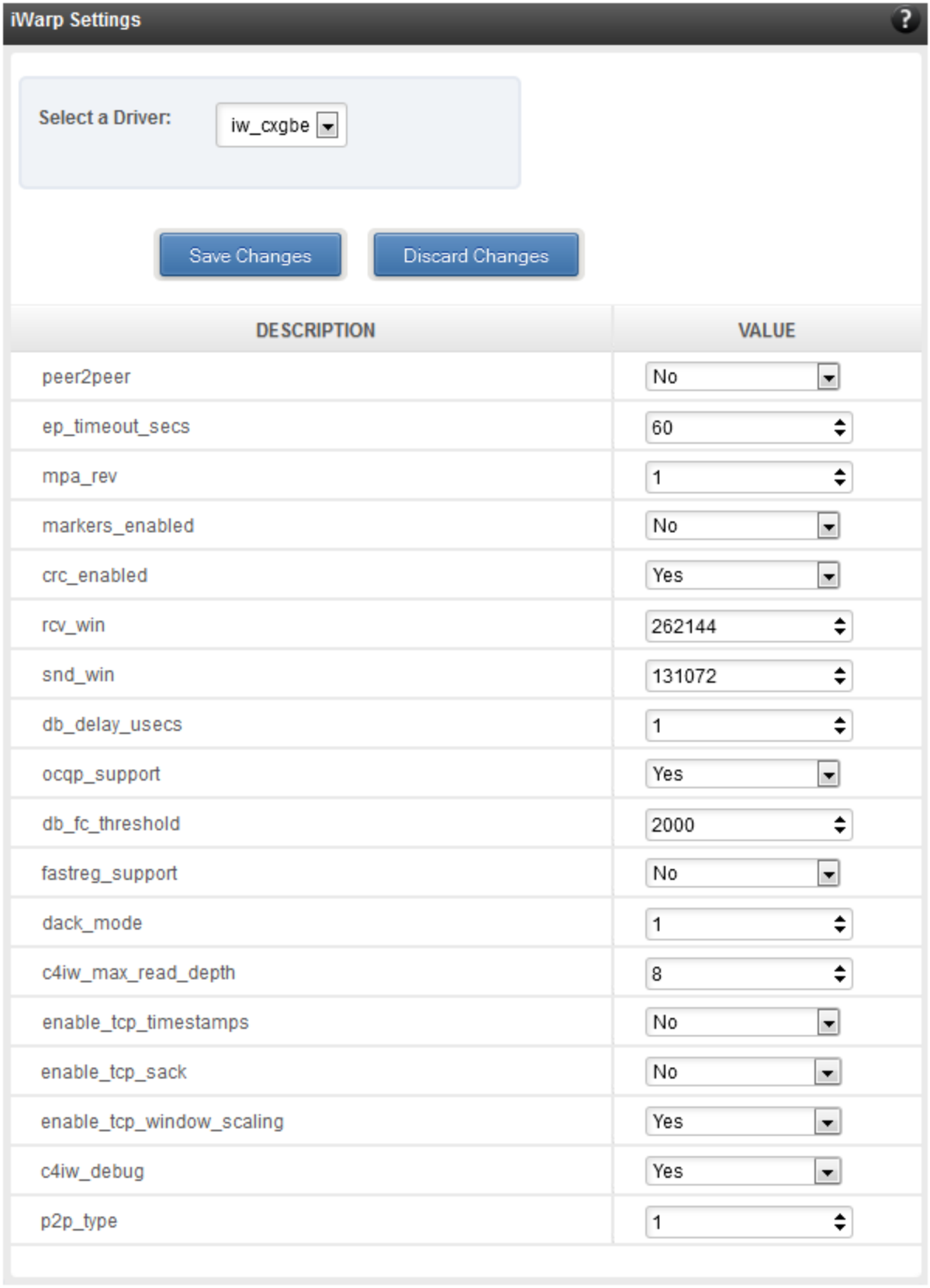


Figure 8.6.4 (a) – iWARP settings for T4 CNA for FreeBSD Agent

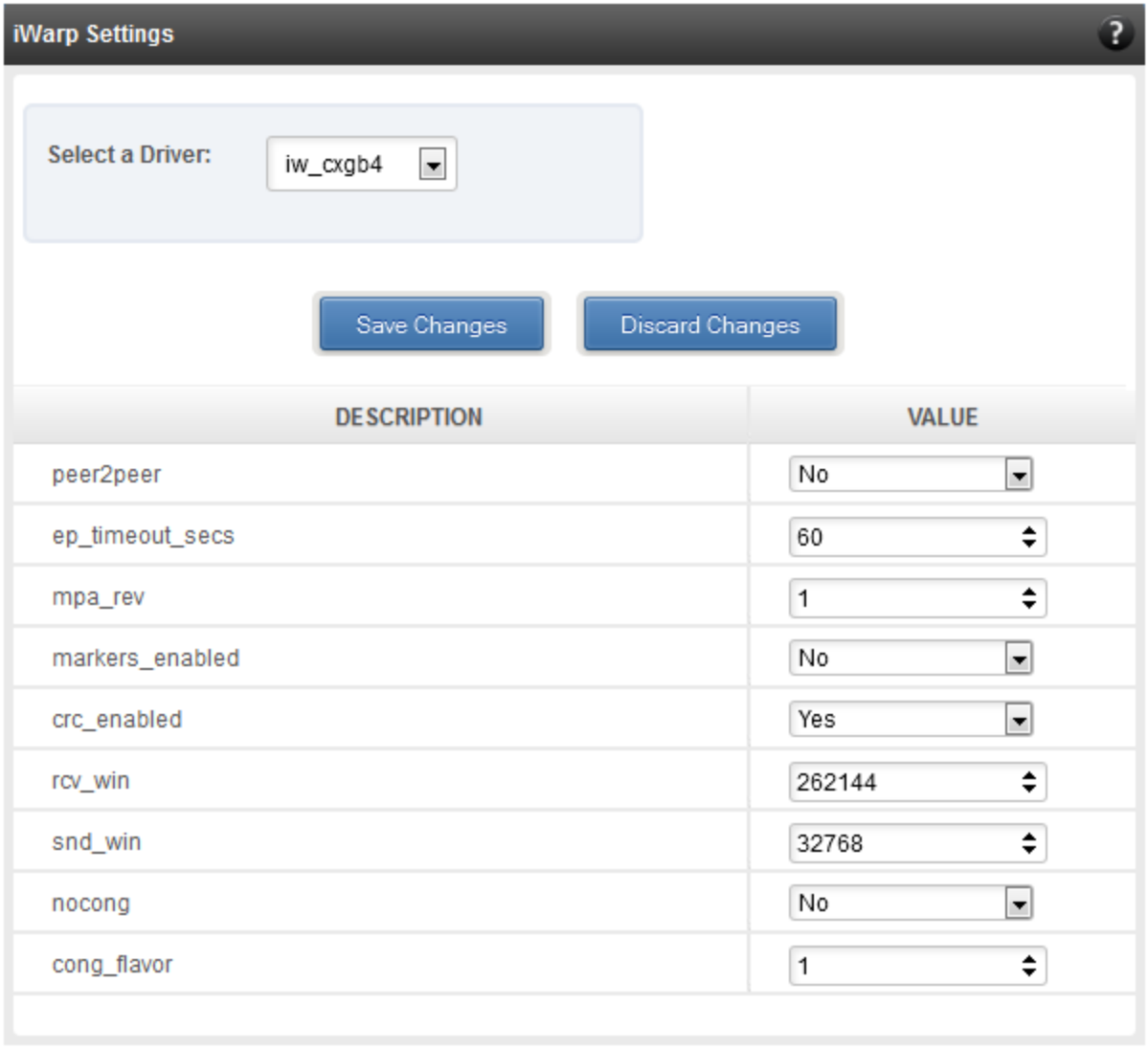


Figure 8.6.4 (b) – iWARP settings for T4 CNA for Linux Agent

8.7. Storage

Storage Summary

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

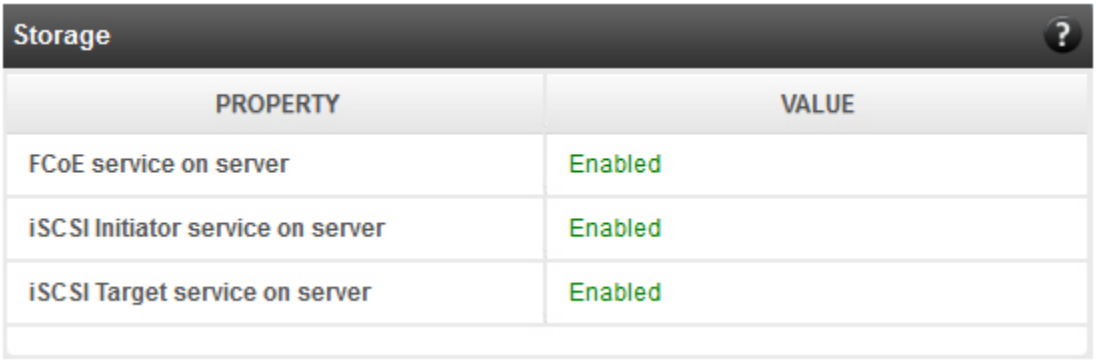


Figure 7.7 – Storage Summary Module

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.

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.

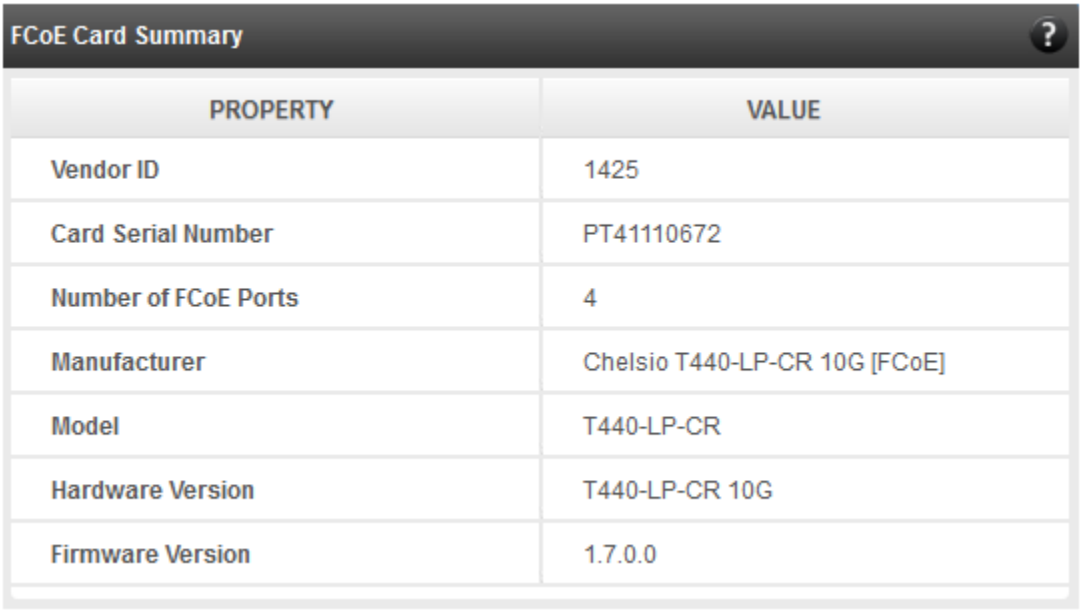


Figure 8.7.1.1 (a) – FCoE Card Summary module

- **FCoE Attributes**

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

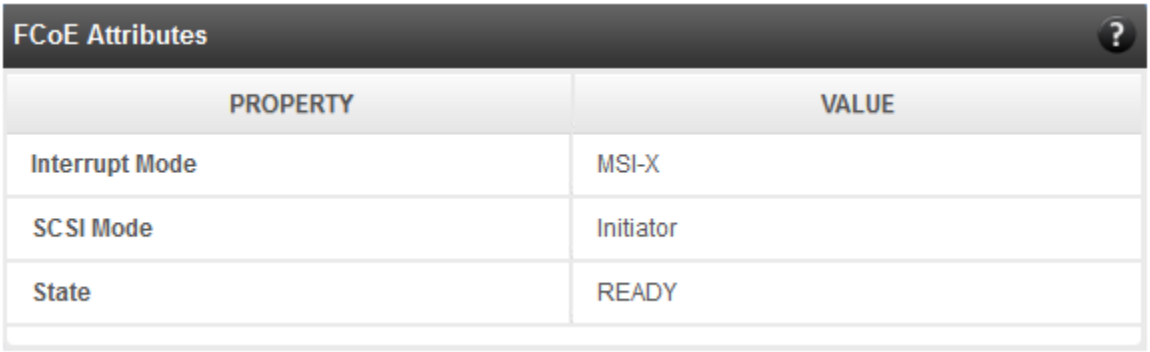


Figure 8.7.1.1 (b) – FCoE Attributes module

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.

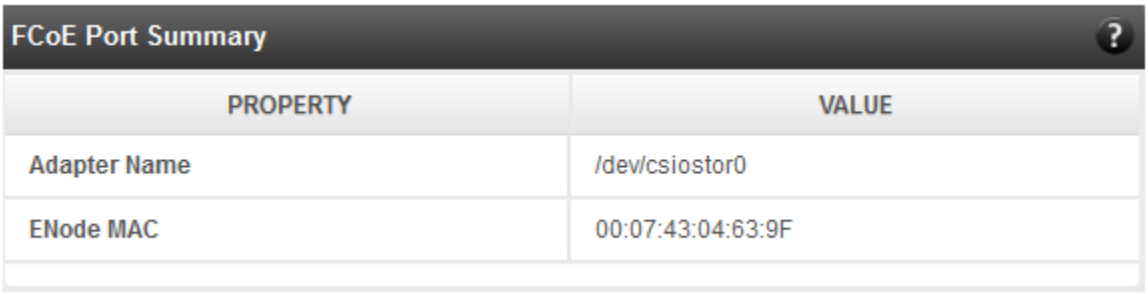


Figure 8.7.1.2 (a) – FCoE Port Summary module for Linux Agent

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

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 Atrributes 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**.

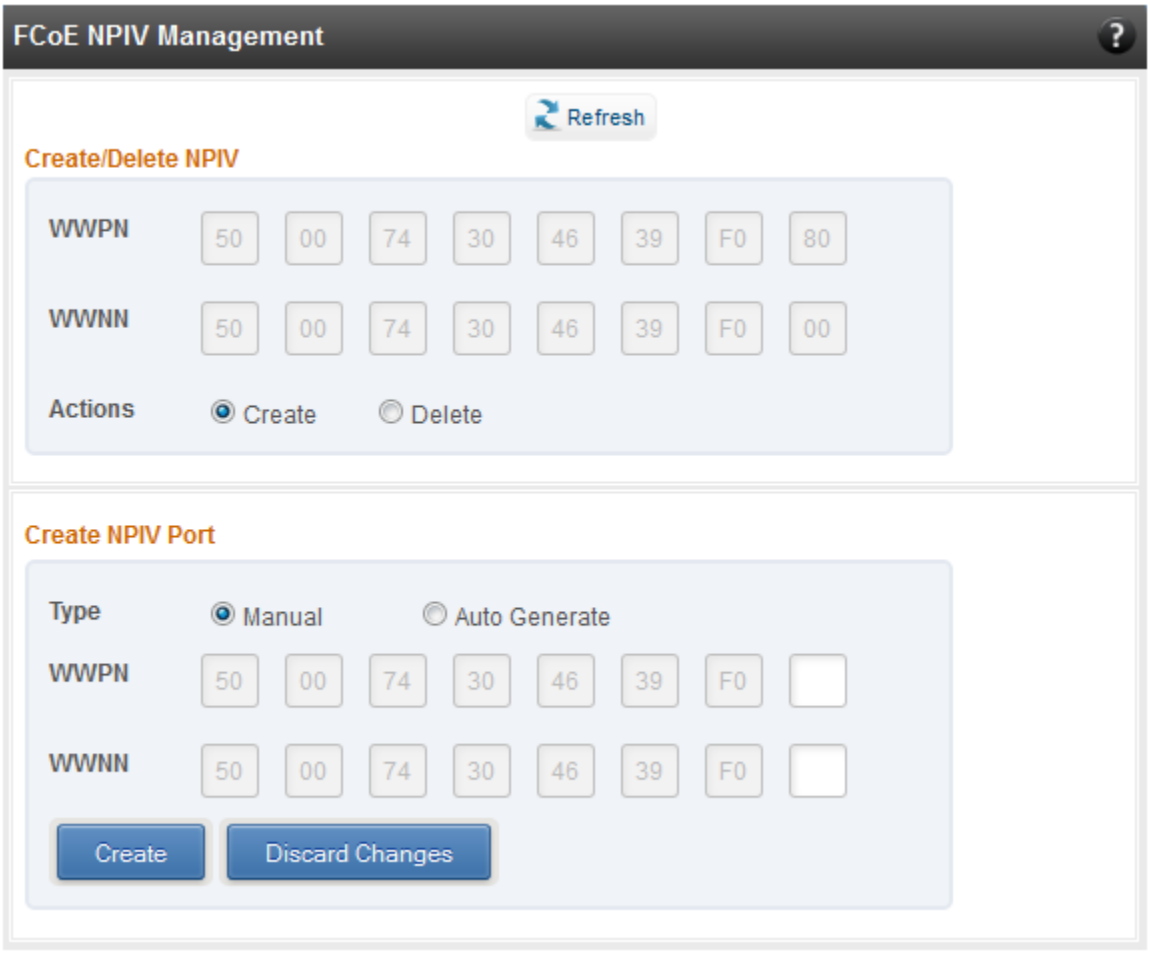


Figure 8.7.1.2 (c) – FCoE NPIV management module

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.

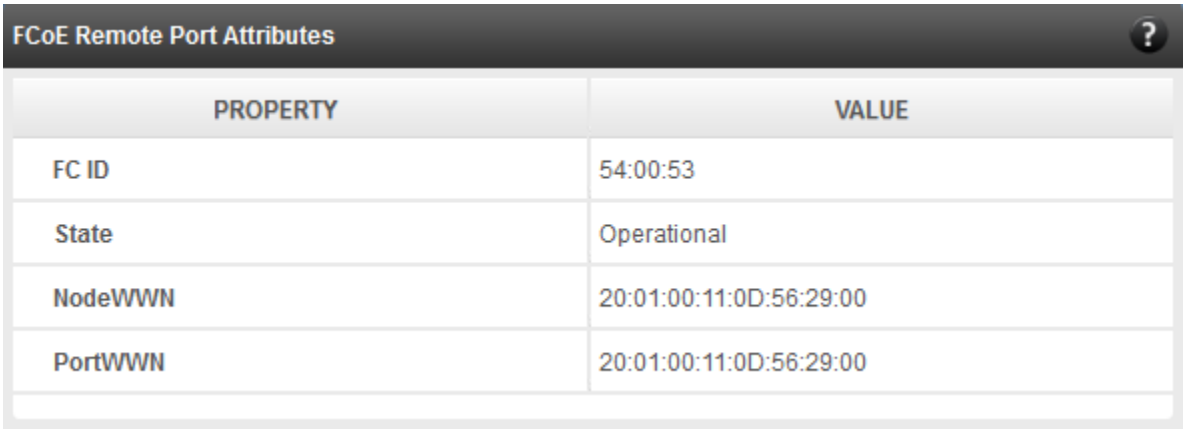


Figure 8.7.1.3 (a) – FCoE Remort Port Attributes module

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.

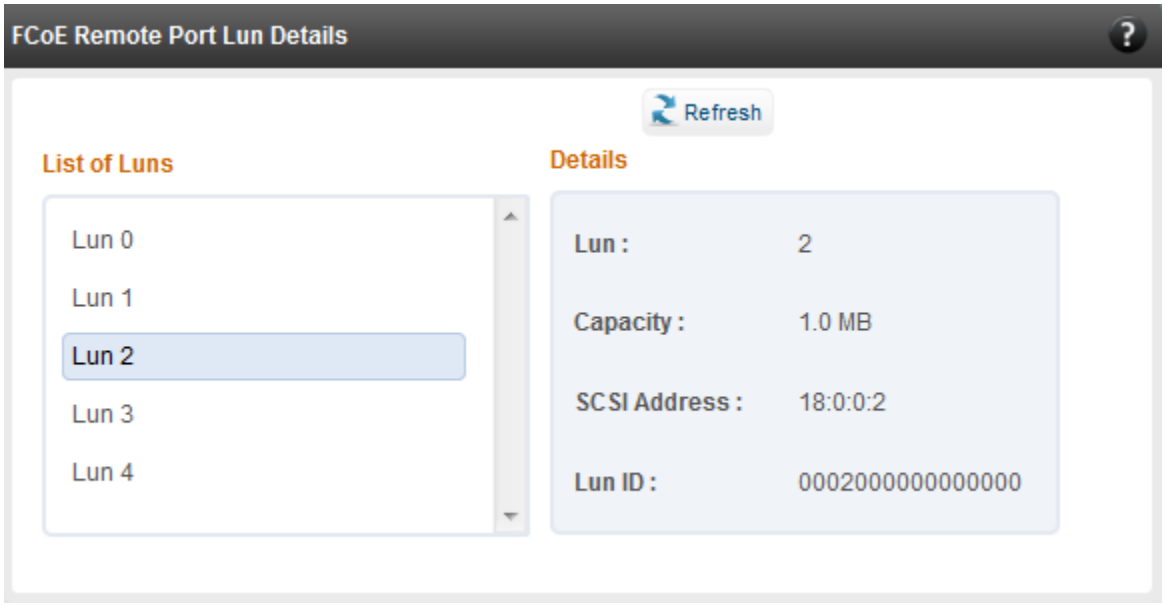


Figure 8.7.1.3 (b) – FCoE Remote Port Lun Details module

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.

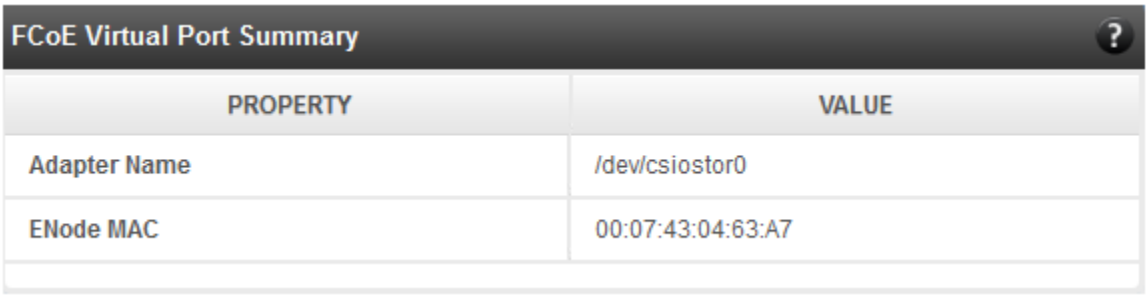


Figure 8.7.1.4 (a) – FCoE Virtual Port Summary module for Linux Agent

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

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.

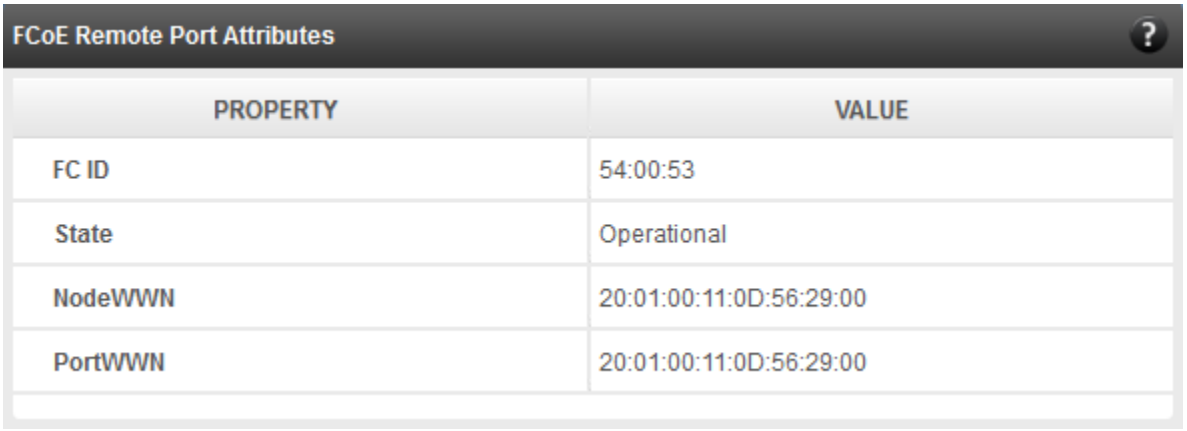


Figure 8.7.1.4 (c) – FCoE Remort Port Attributes module

FCoE Remote Port Lun Details

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

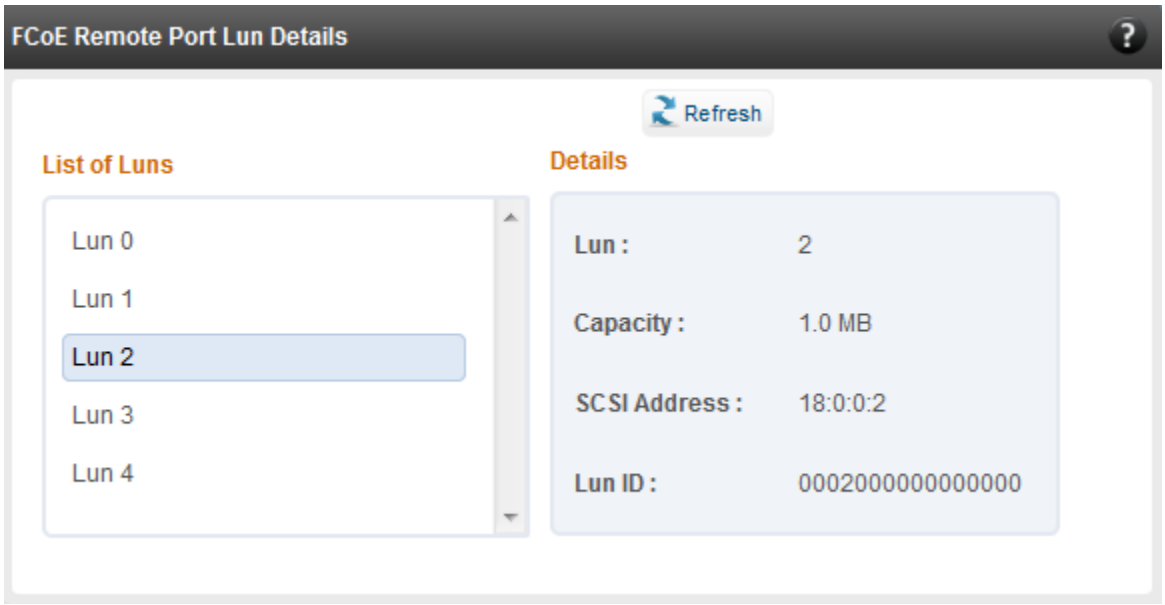


Figure 8.7.1.4 (d) - FCoE Remote Port Lun Details module

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.".

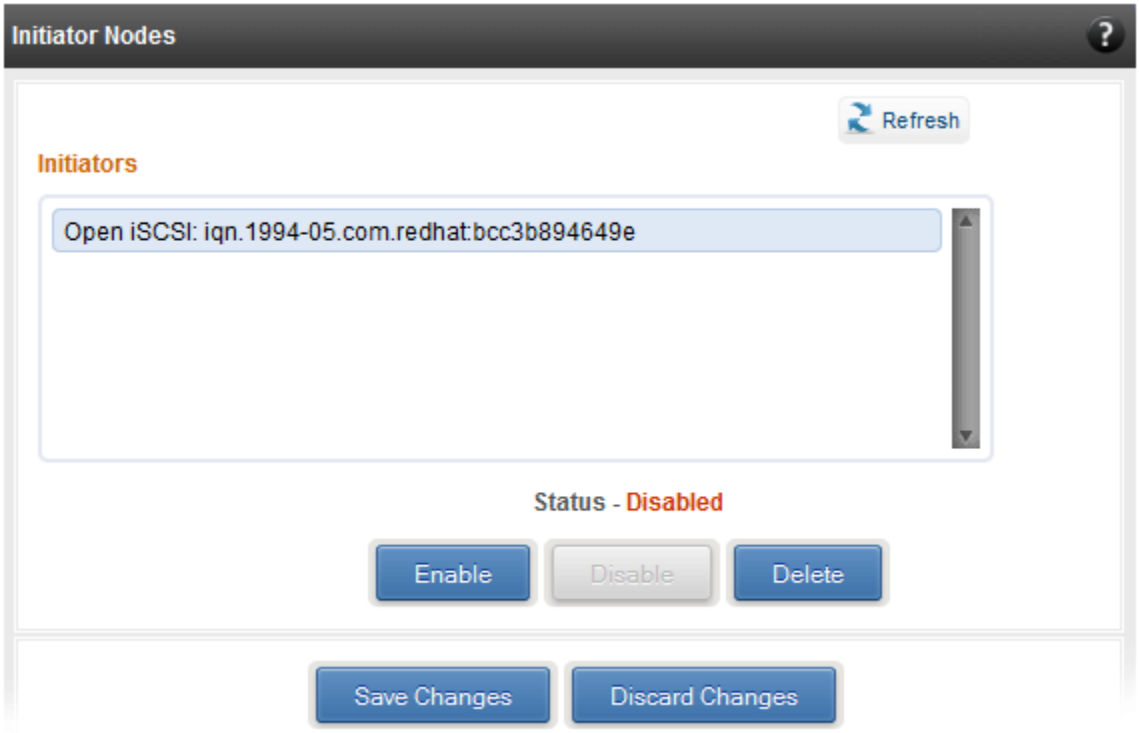


Figure 8.7.2 (a) - Open iSCSI initiator

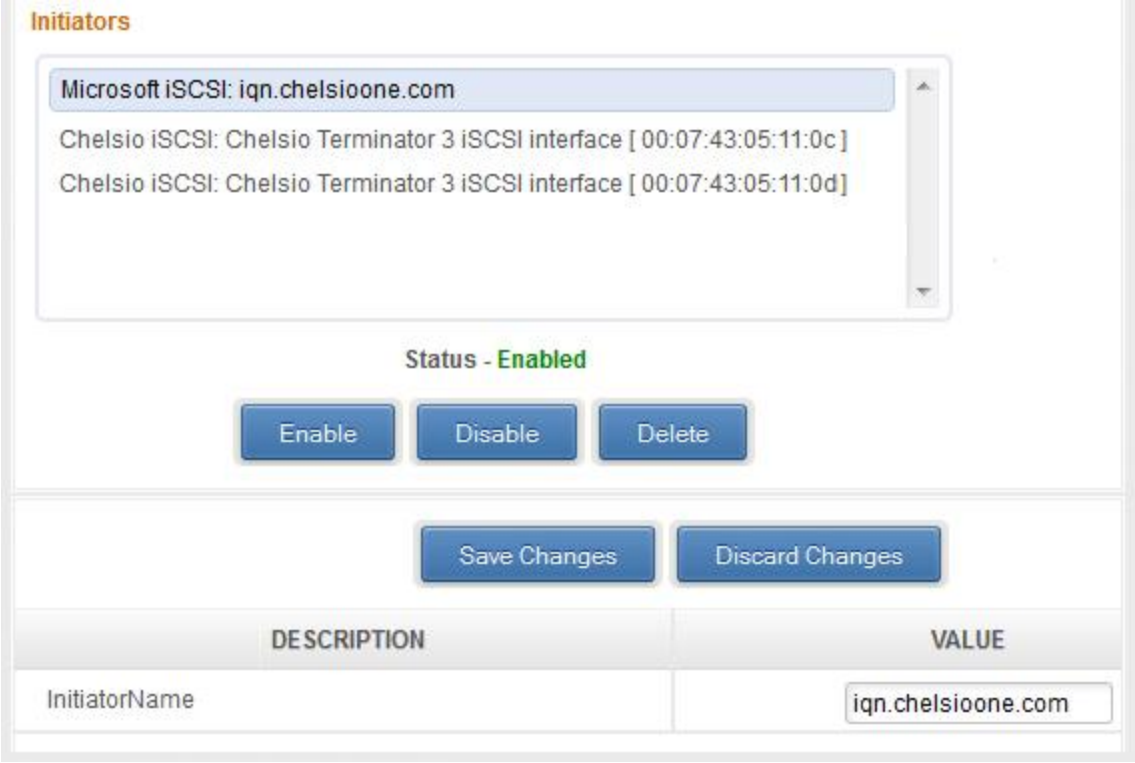


Figure 8.7.2 (b) - Microsoft iSCSI initiator

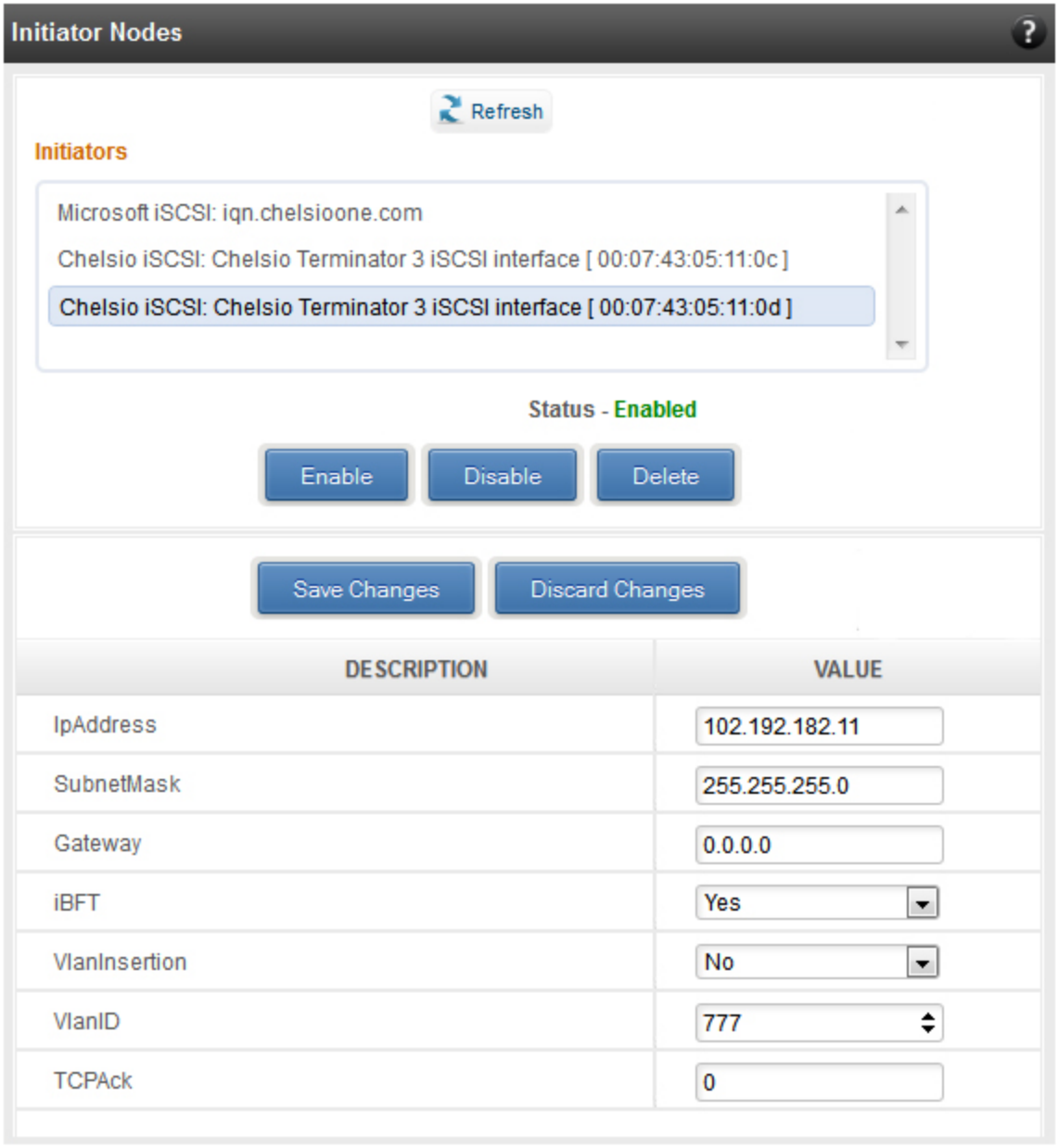


Figure 8.7.2 (c) - Chelsio iSCSI initiator

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.*

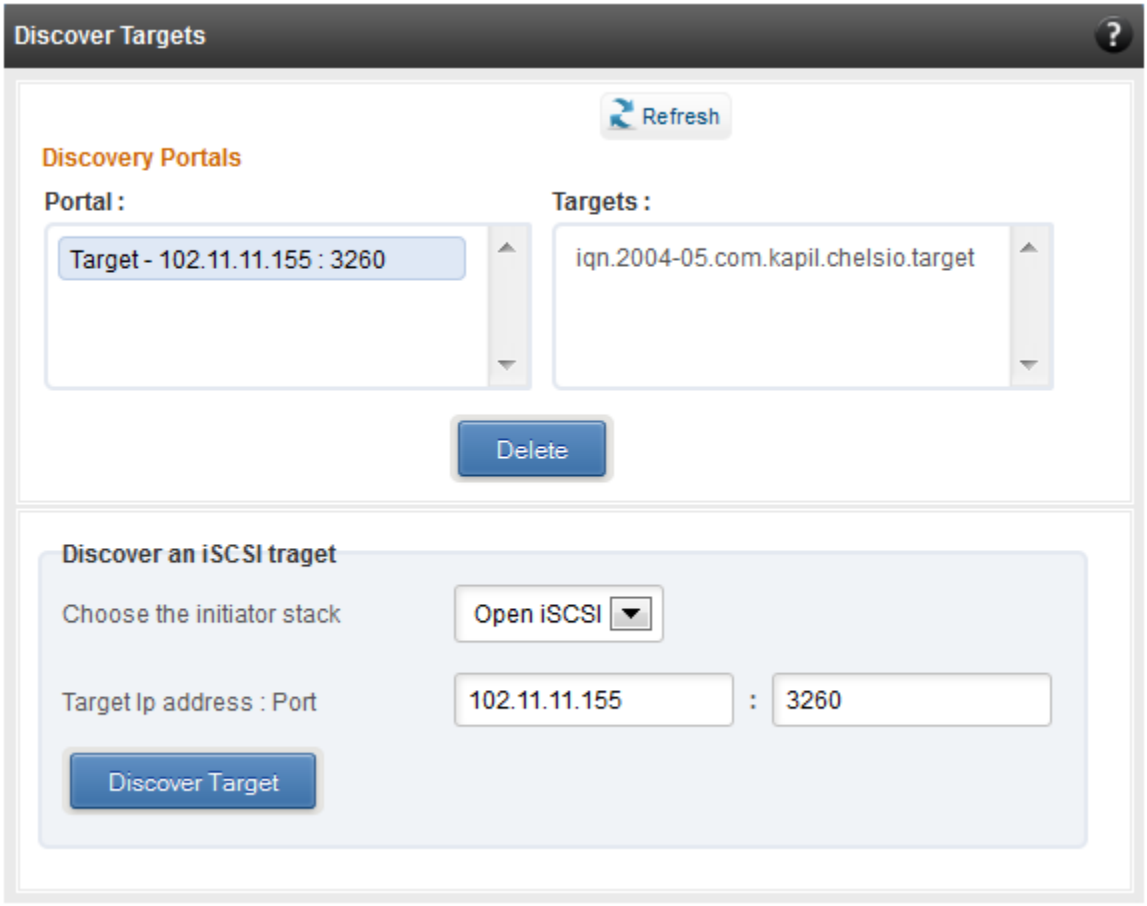


Figure 8.7.2 (d) - Discover targets module

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.

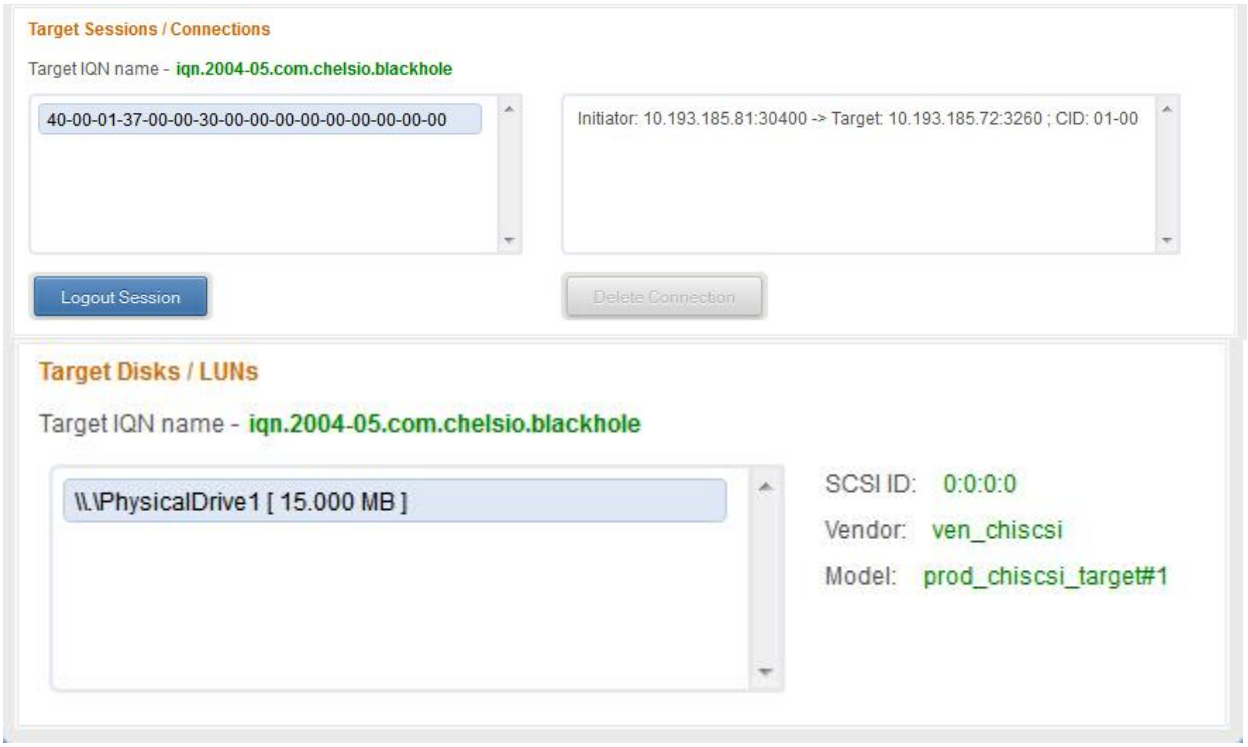


Figure 8.7.2 (e) - Targets module after logging in

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.

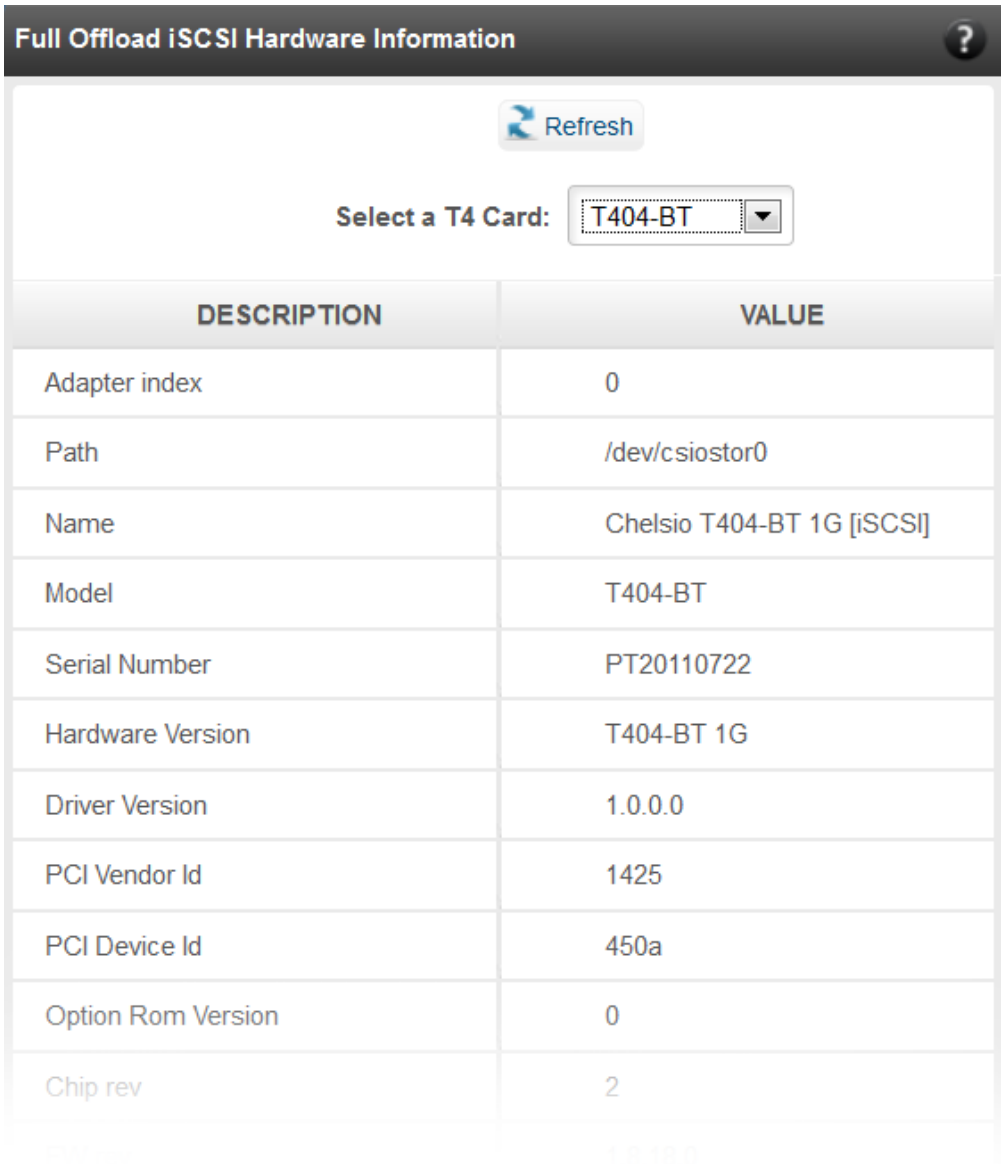


Figure 8.7.3 (a) - Full Offload iSCSI Hardware Information module

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.

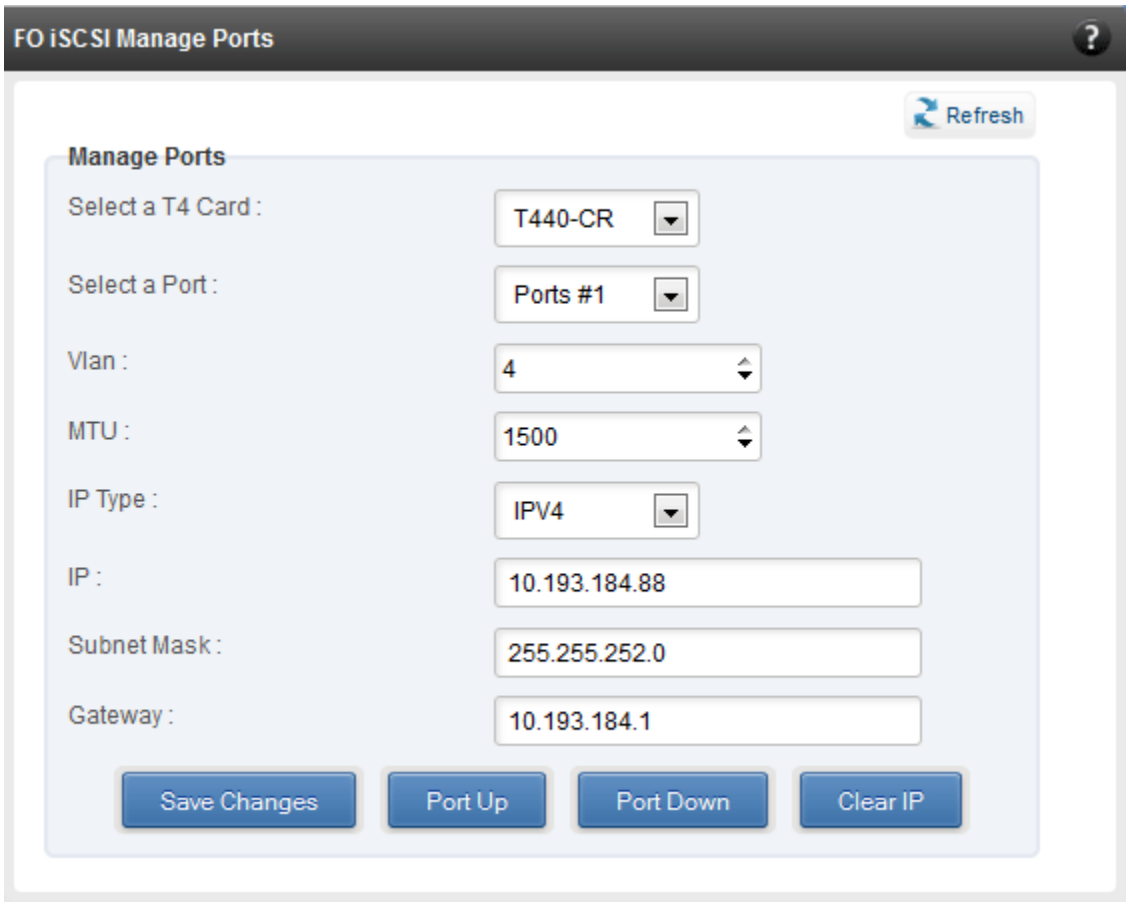


Figure 8.7.3 (b) - FO iSCSI Manage Ports module

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.

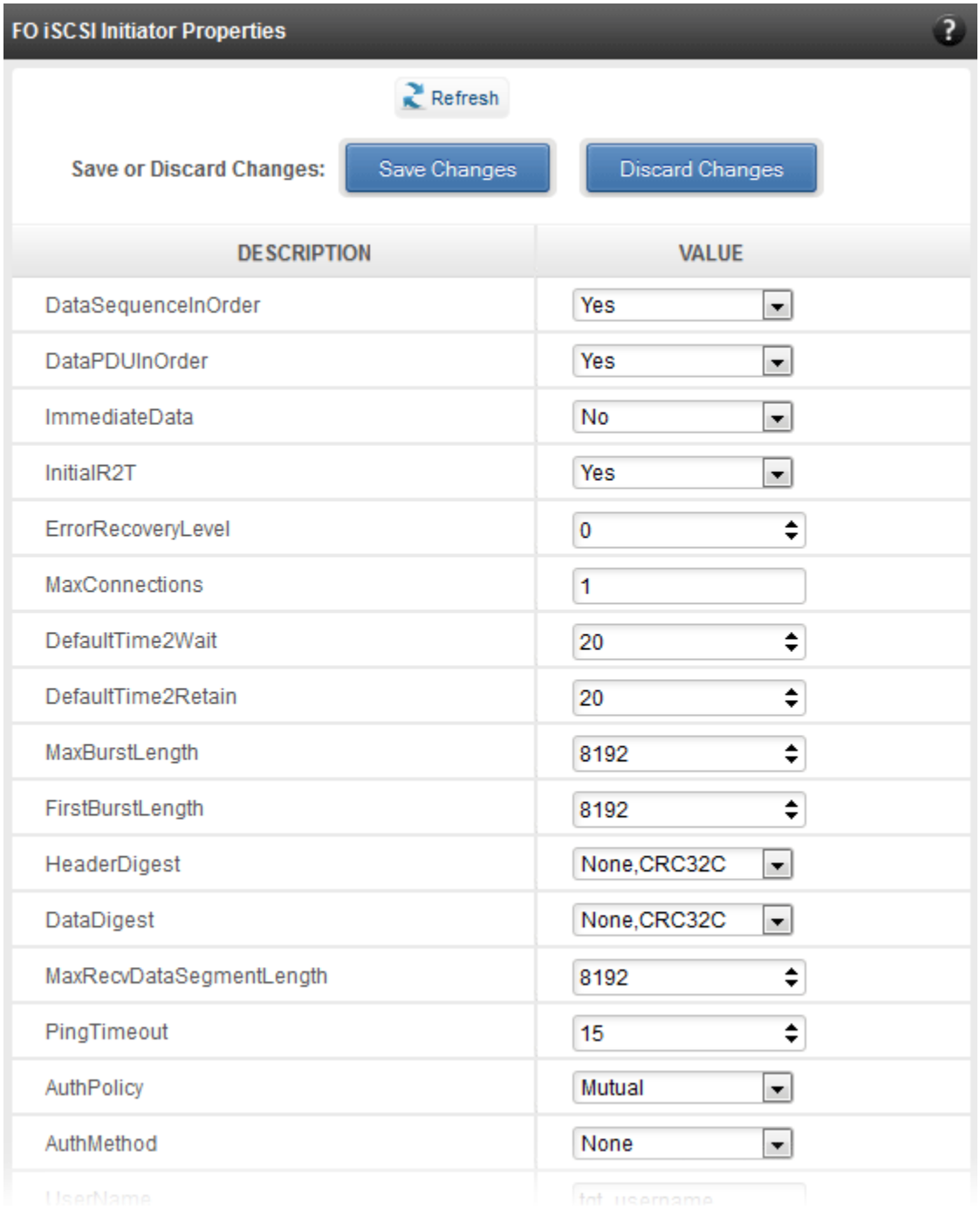


Figure 8.7.3 (c) - FO iSCSI Initiator Properties

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.

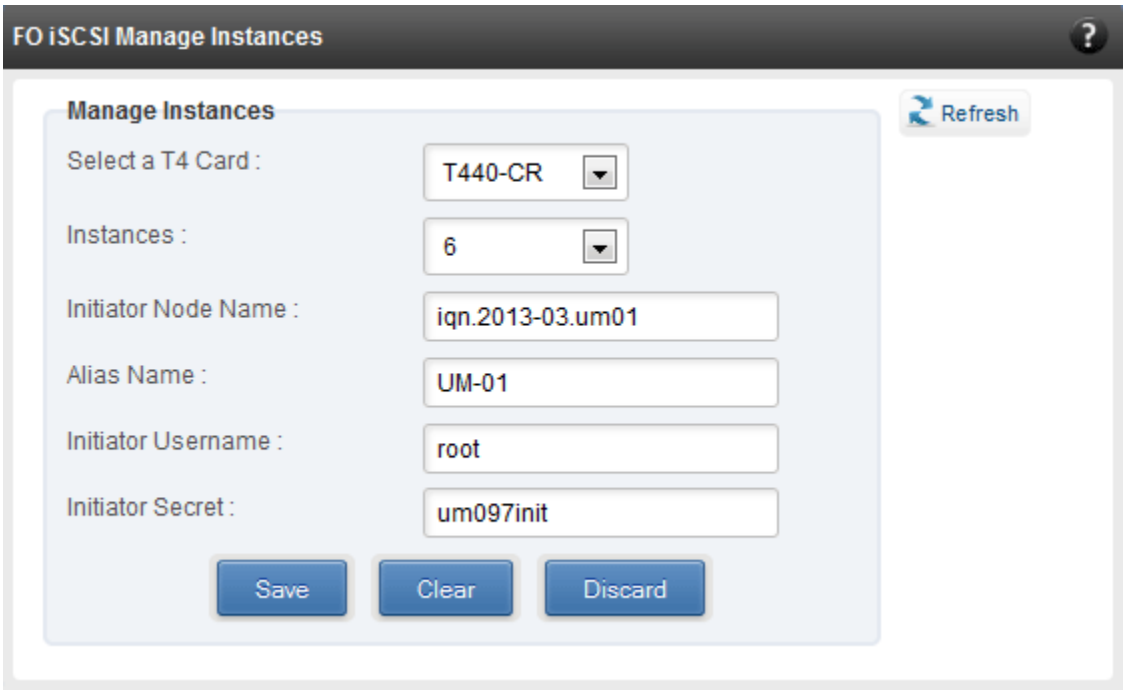


Figure 8.7.3 (d) - FO iSCSI Manage Instances module

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.

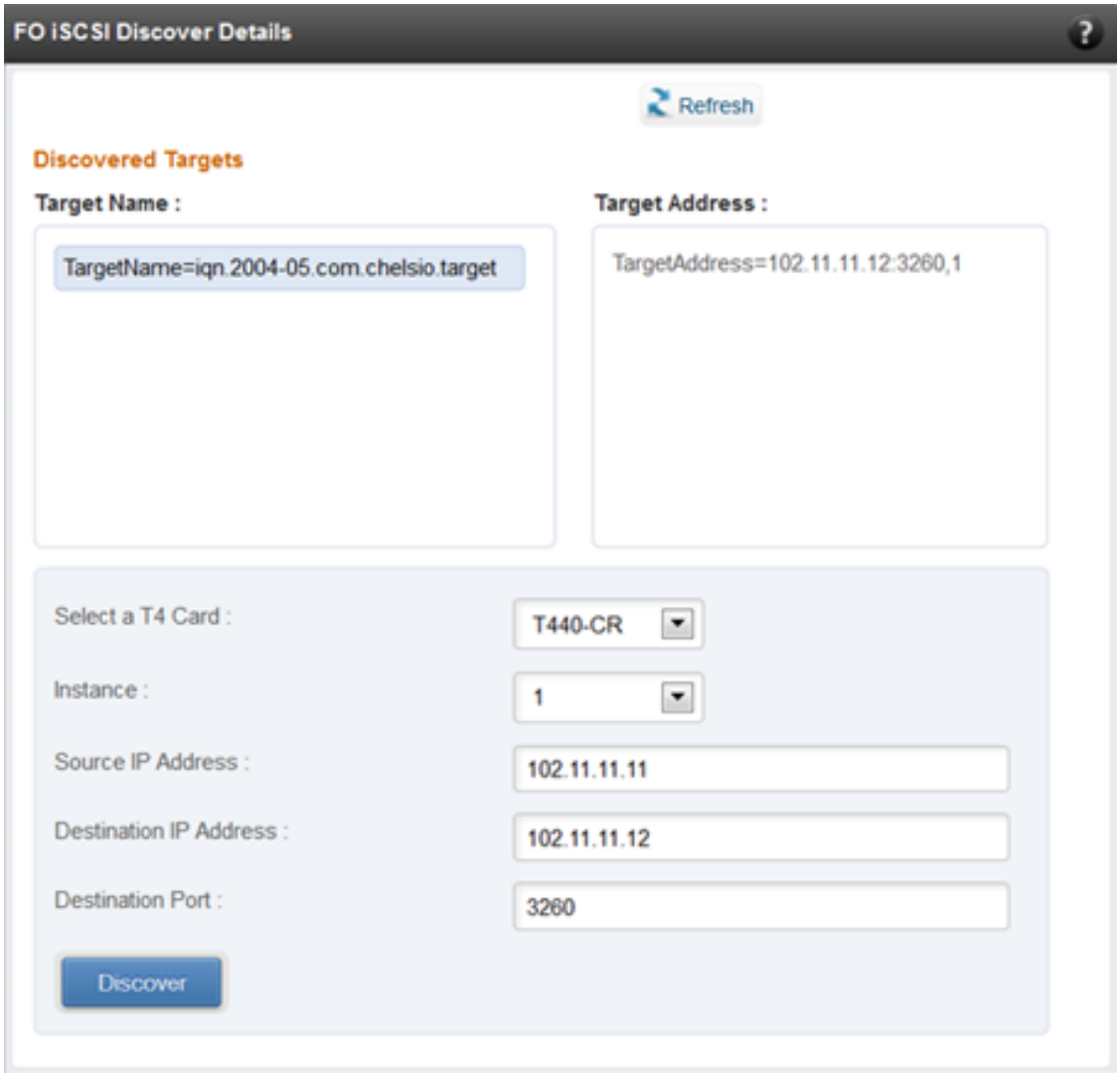


Figure 8.7.3 (e) - FO iSCSI Discover Details module

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.

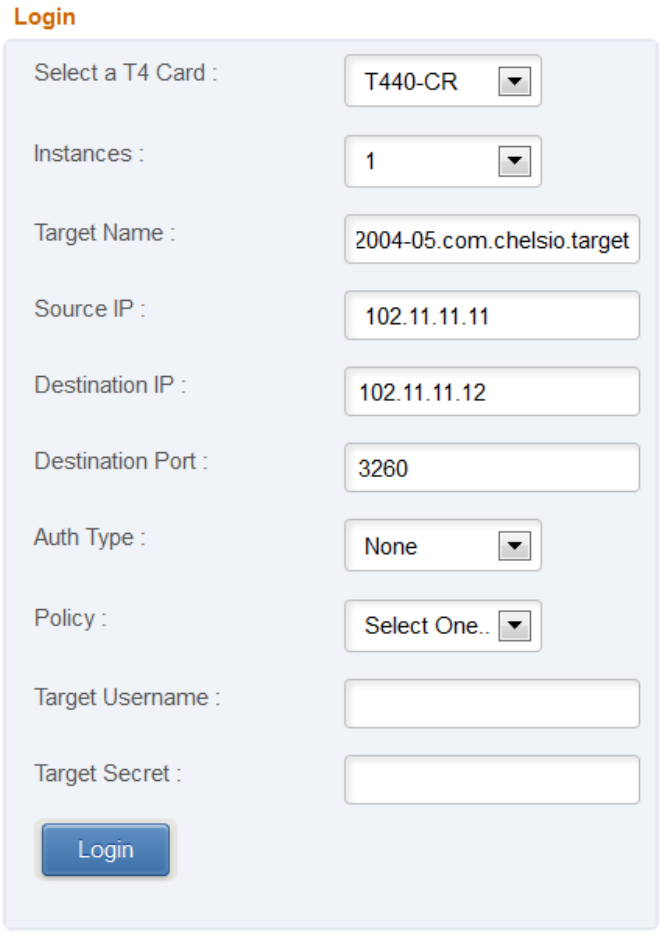


Figure 8.7.3 (f) - FO iSCSI Session Details module: Login

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**.

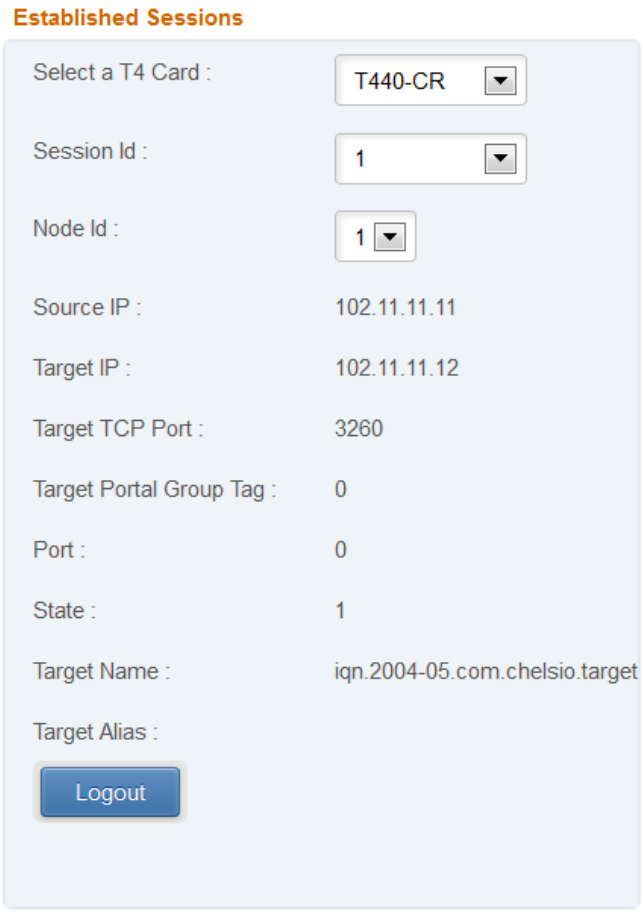


Figure 8.7.3 (g) - FO iSCSI Session Details module: Established Sessions

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.

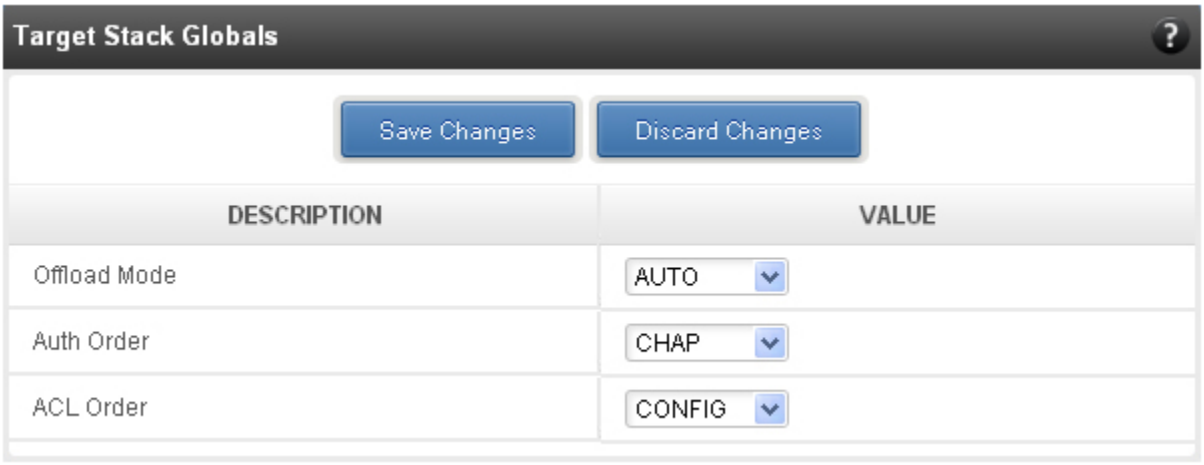


Figure 8.7.4 (a) - Target Stack Globals module

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.

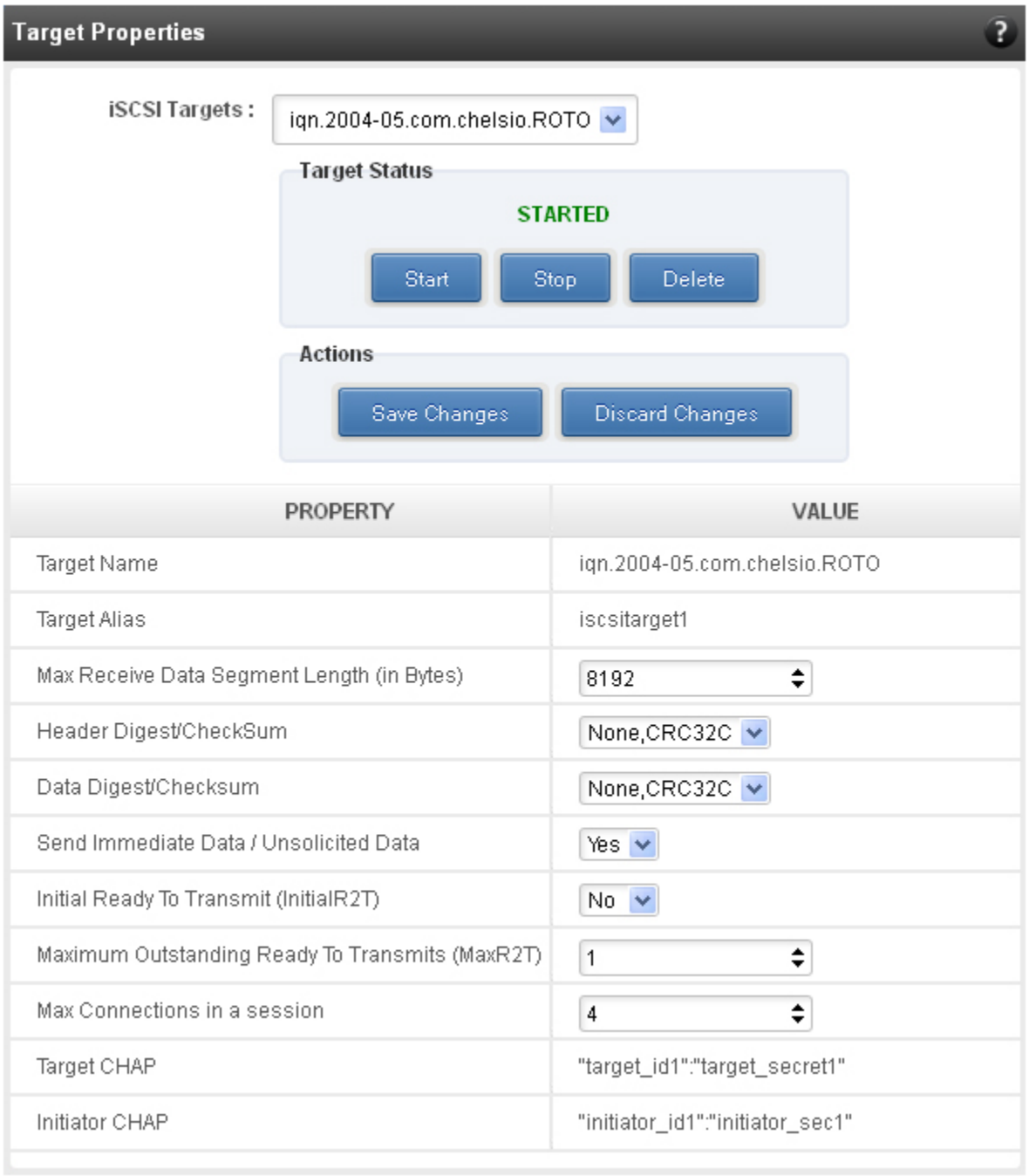


Figure 8.7.4 (b) - Target properties module

Session details

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

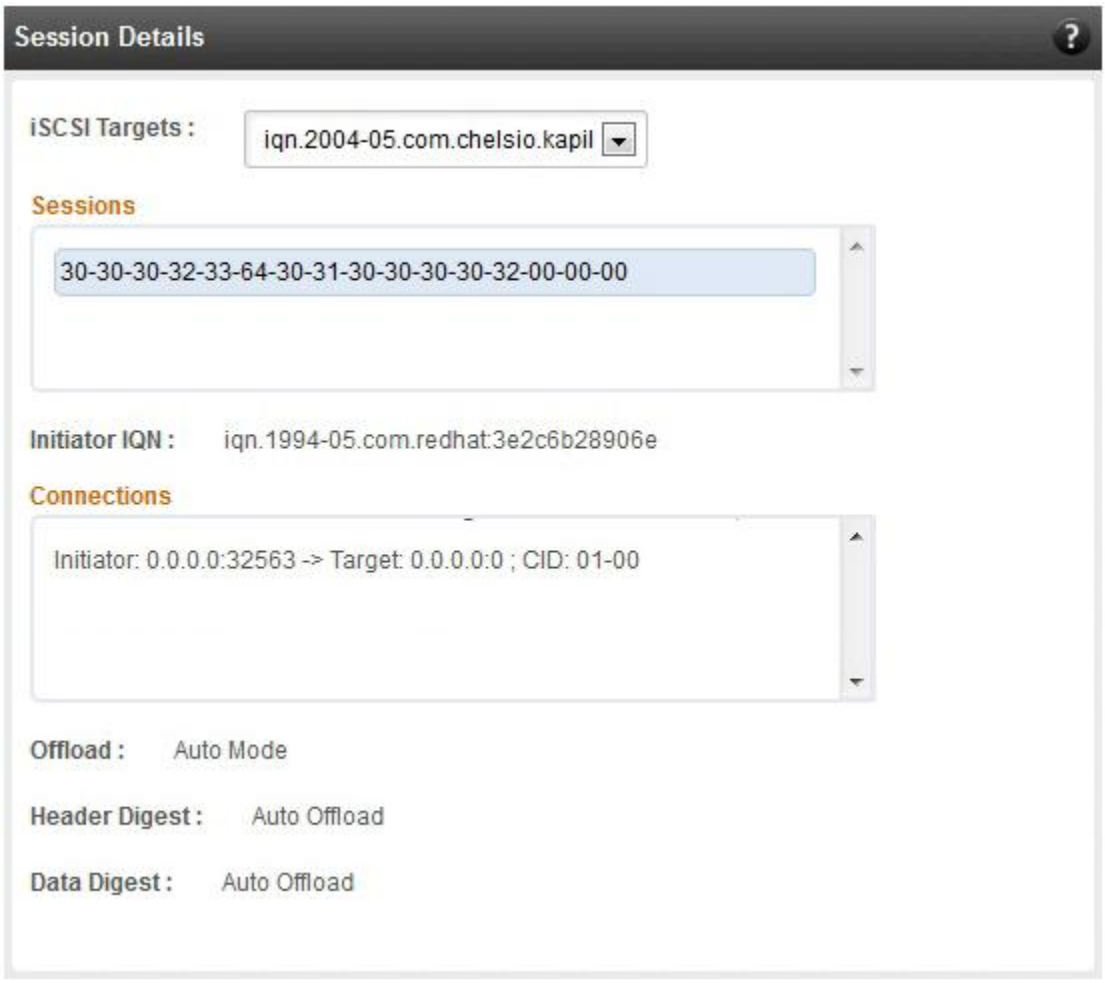


Figure 8.7.4 (c) – Session Details module

New Target Creation

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

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.

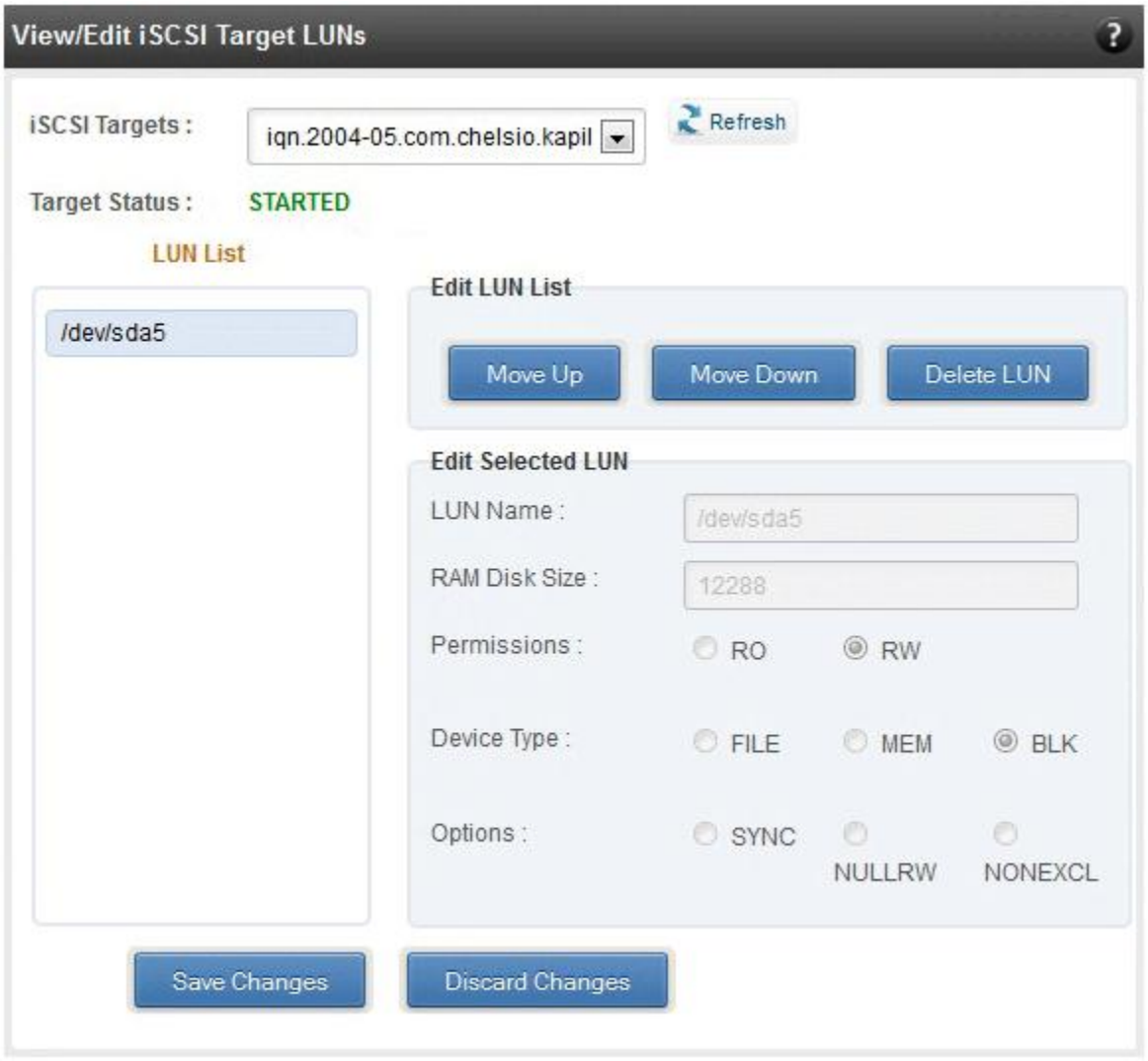


Figure 8.7.5 (a) - View/Edit iSCSI Target LUNs module

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.

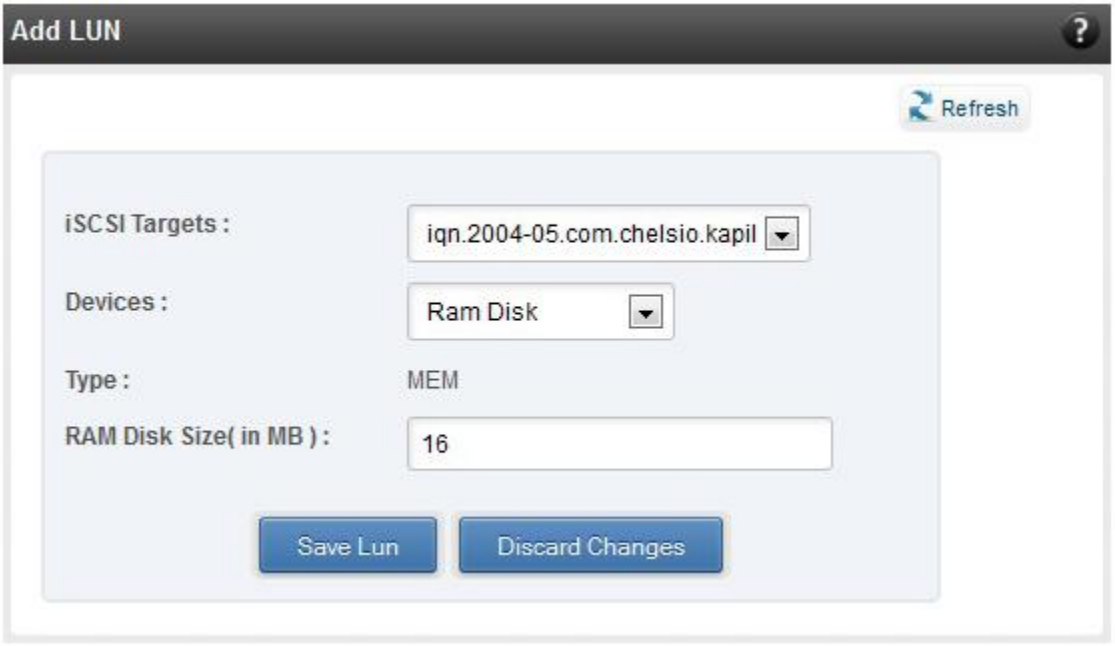


Figure 8.7.5 (b) - Adding a new LUN

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.

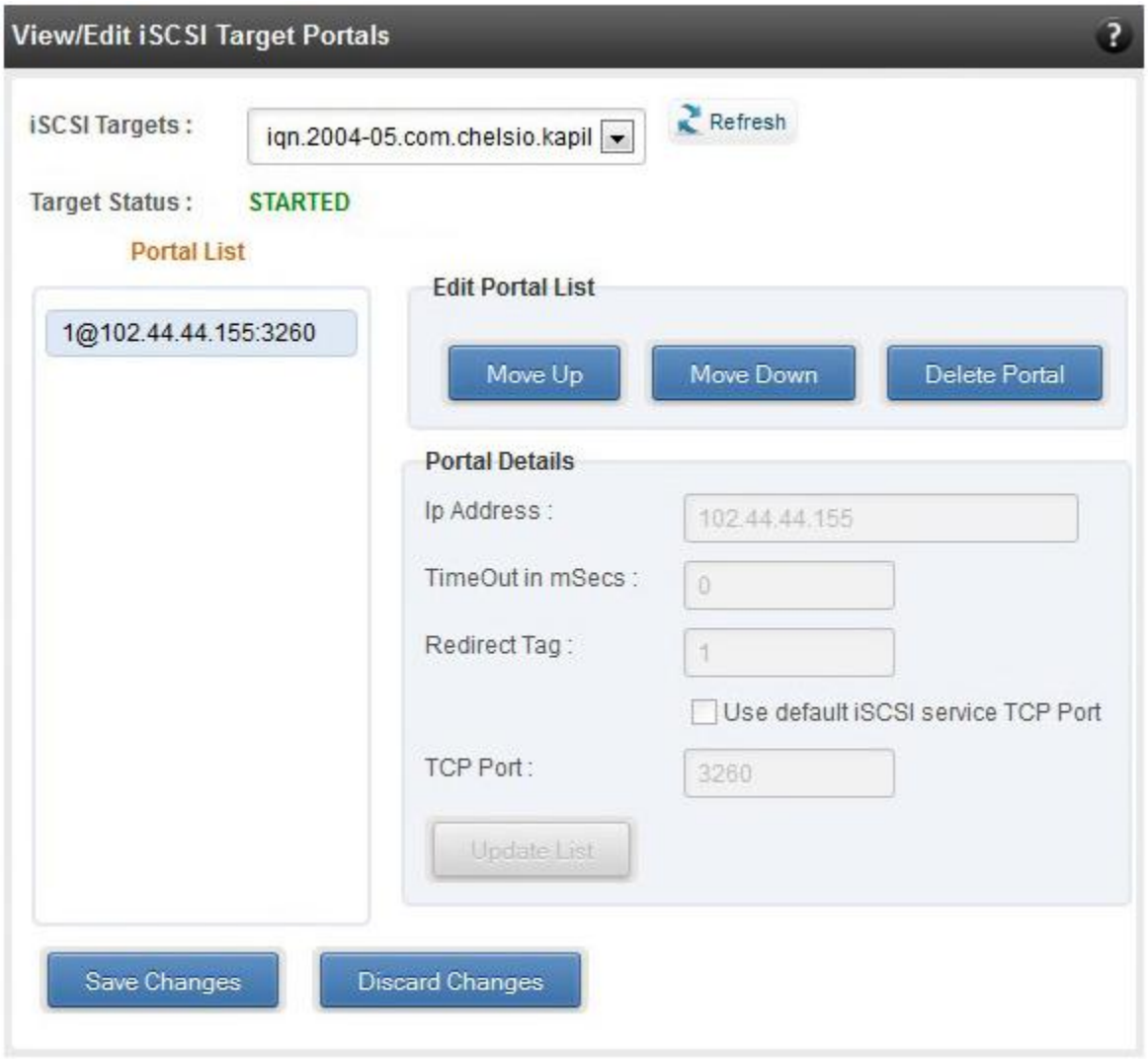


Figure 8.7.6 (a) - View/Edit iSCSI Target Portals module

Add Portal

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

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.

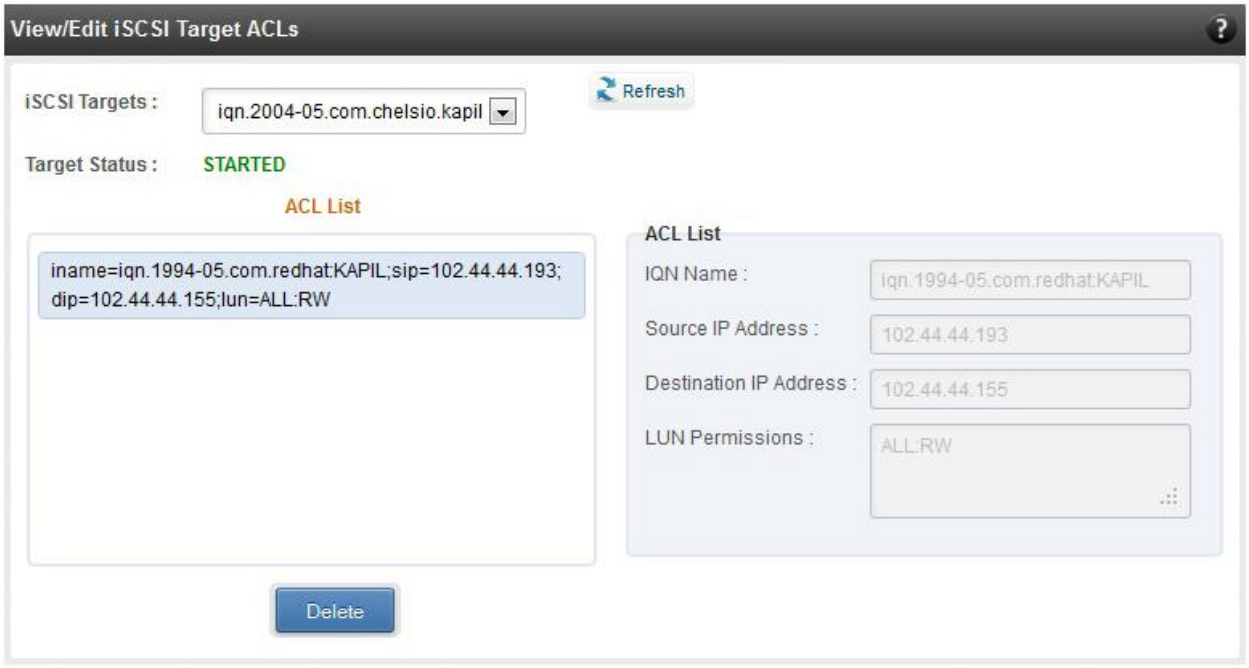


Figure 8.7.7 (a) - Target ACL operations module

Add ACL

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

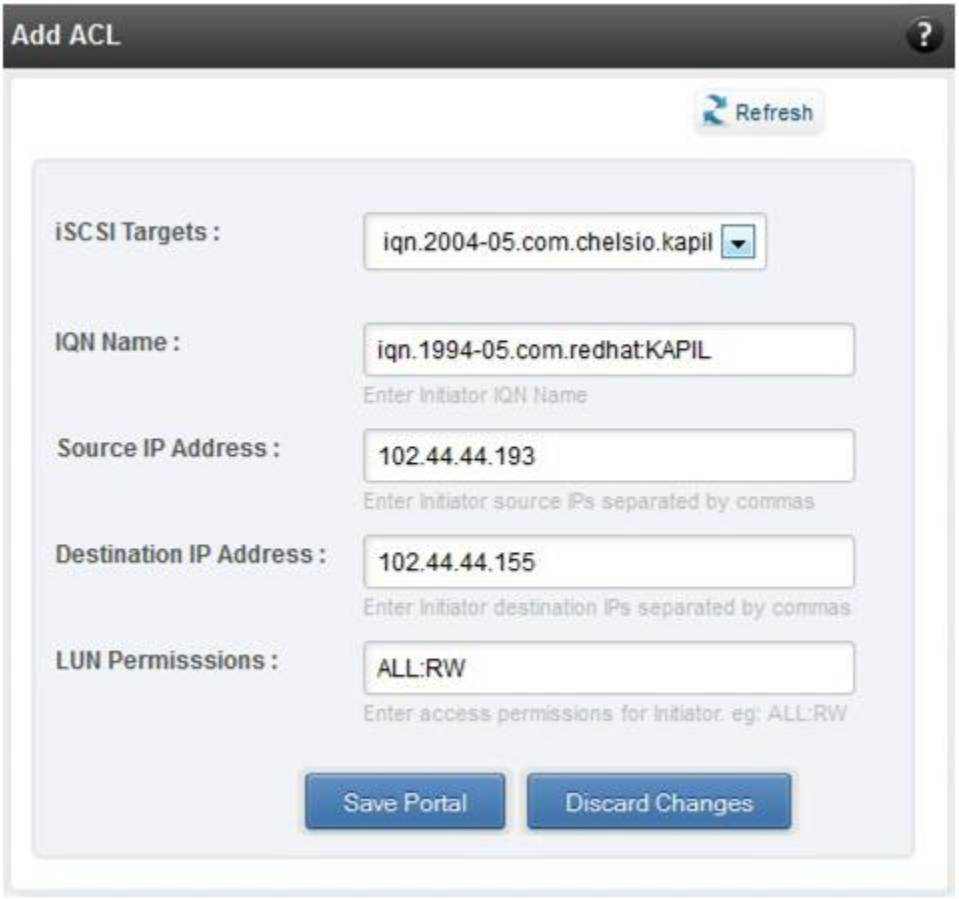


Figure 8.7.7 (b) - Adding new ACL

8.8. Hardware Features

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

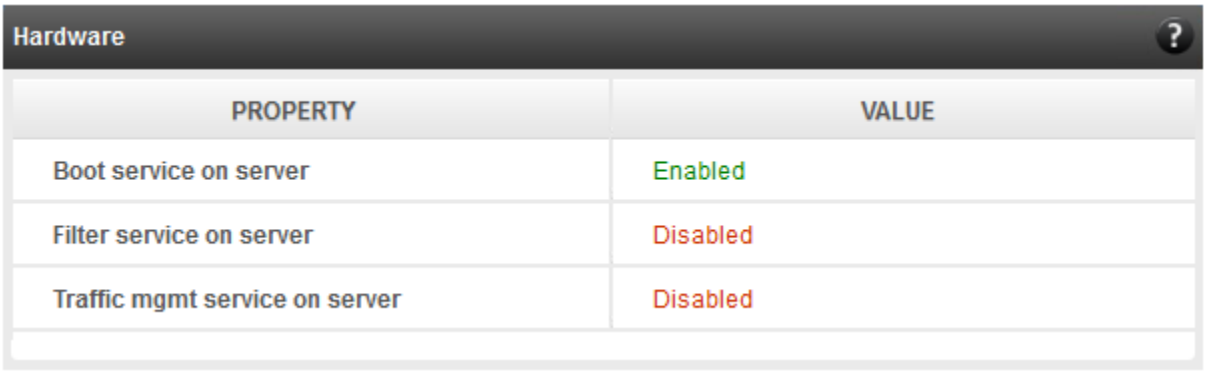


Figure 8.8 – Hardware module

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.

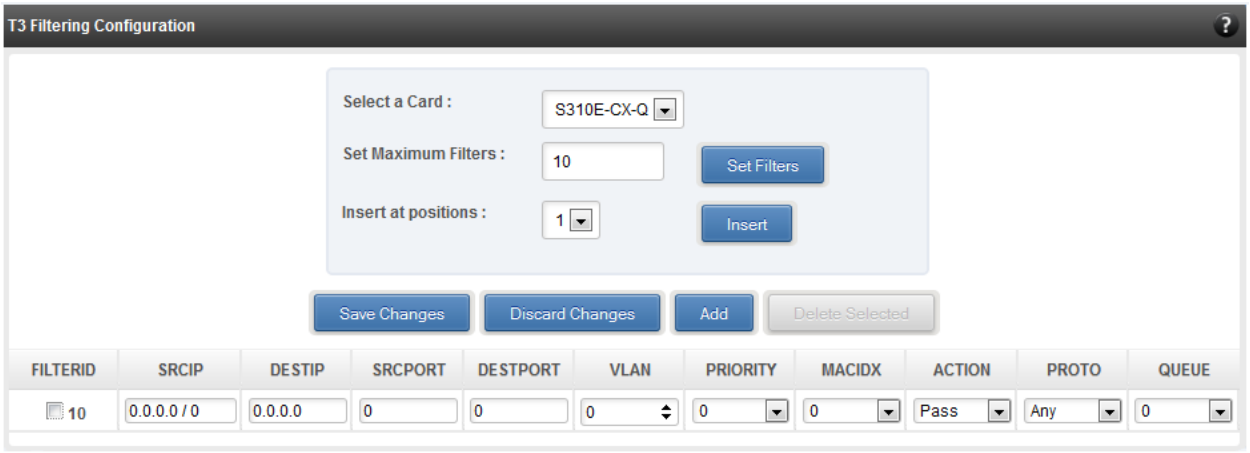


Figure 8.8.1 (a) - T3 Filtering Configuration module

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.*

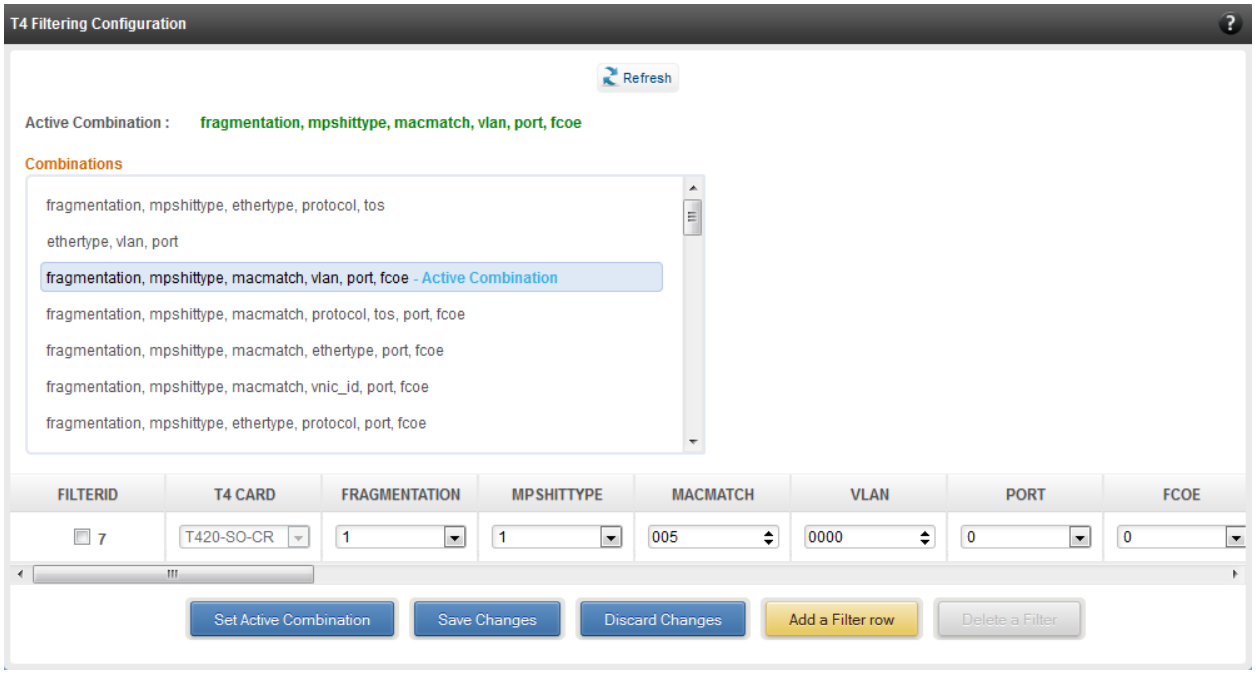


Figure 8.8.1(b) - T4 Filtering Configuration module

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.

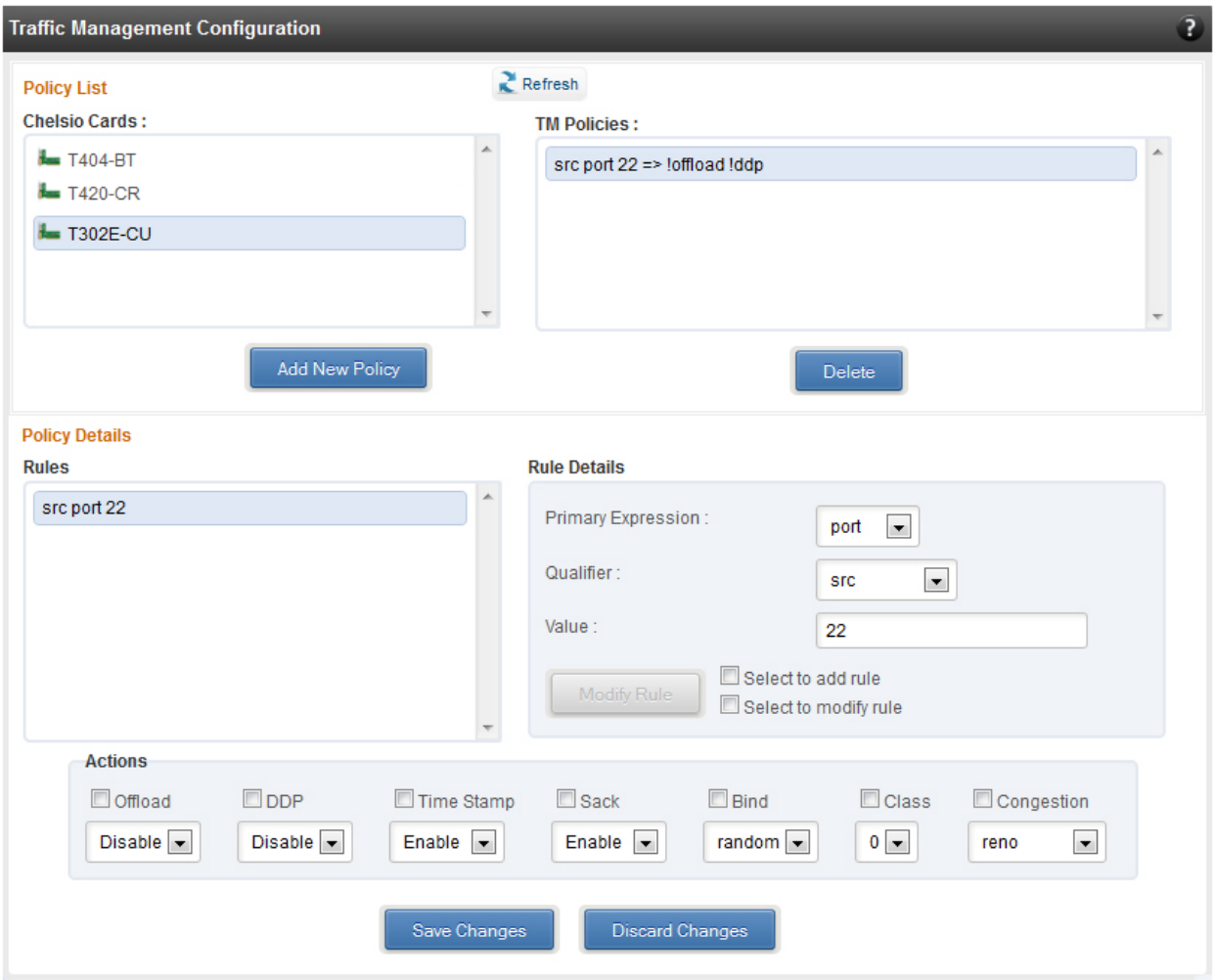


Figure 8.8.3 - Traffic Management Configuration module

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.

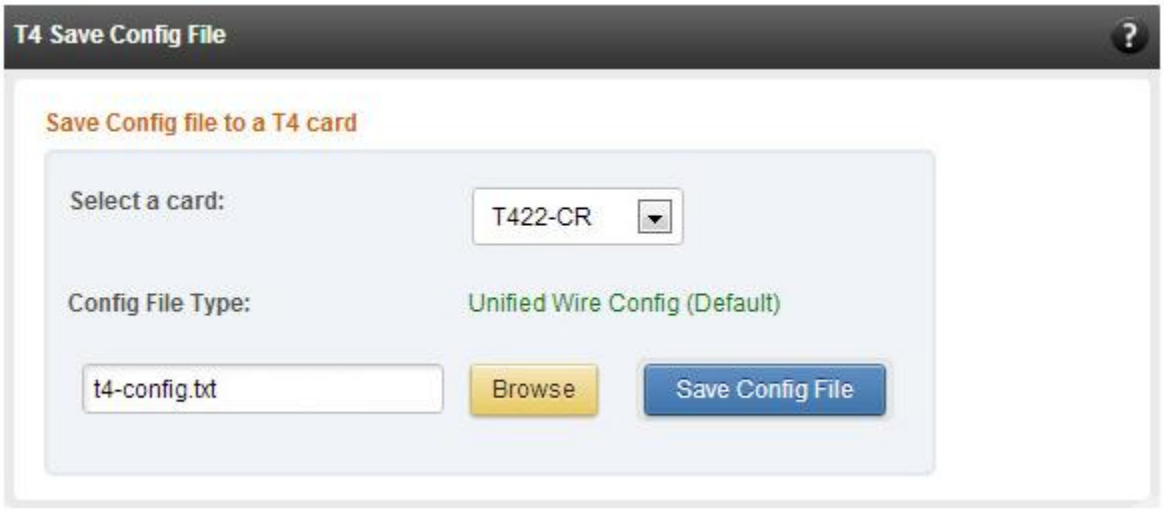


Figure 8.8.4 - T4 Save Config File module

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.

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

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.

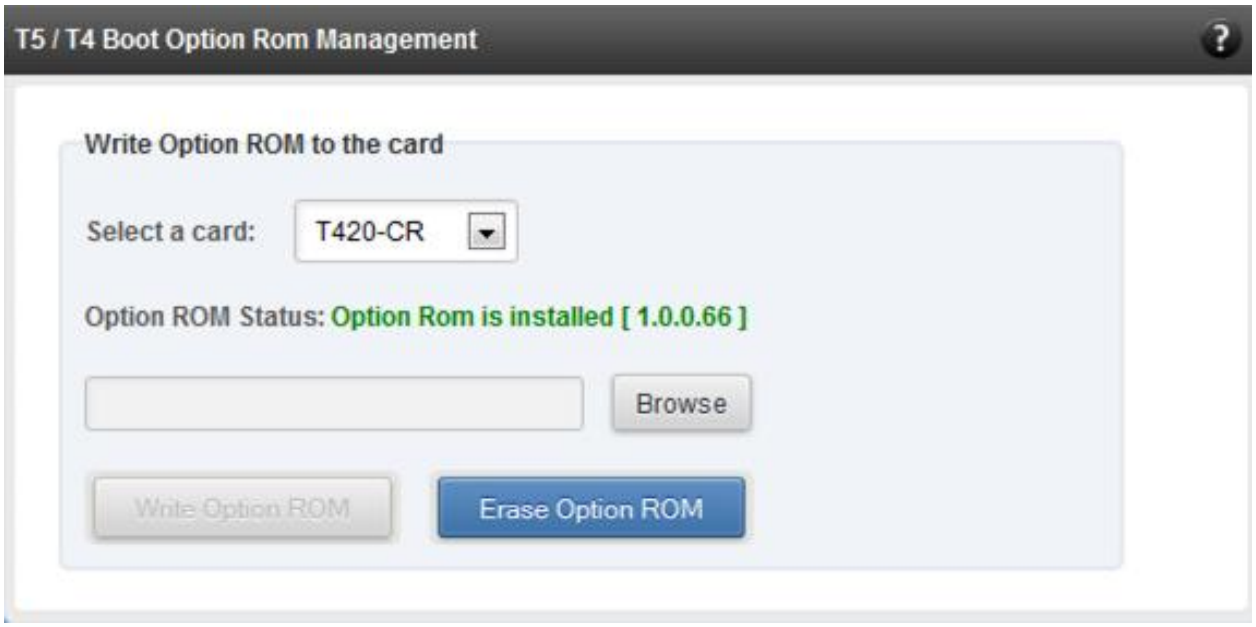


Figure 8.8.6 (a) – T5/T4 Option ROM Management module

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.

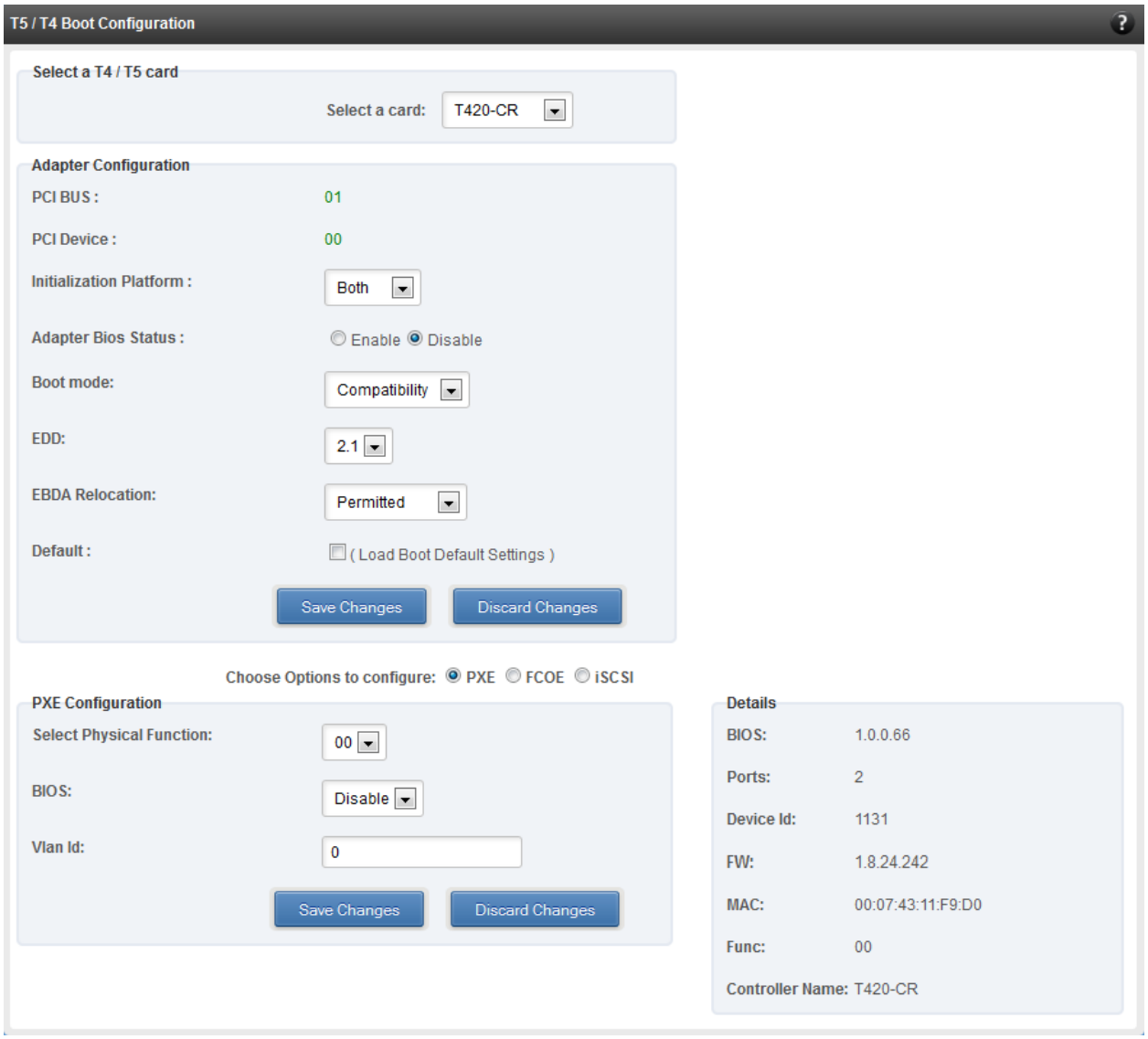


Figure 8.8.7 (a) - PXE Boot configuration for T4 CNAs

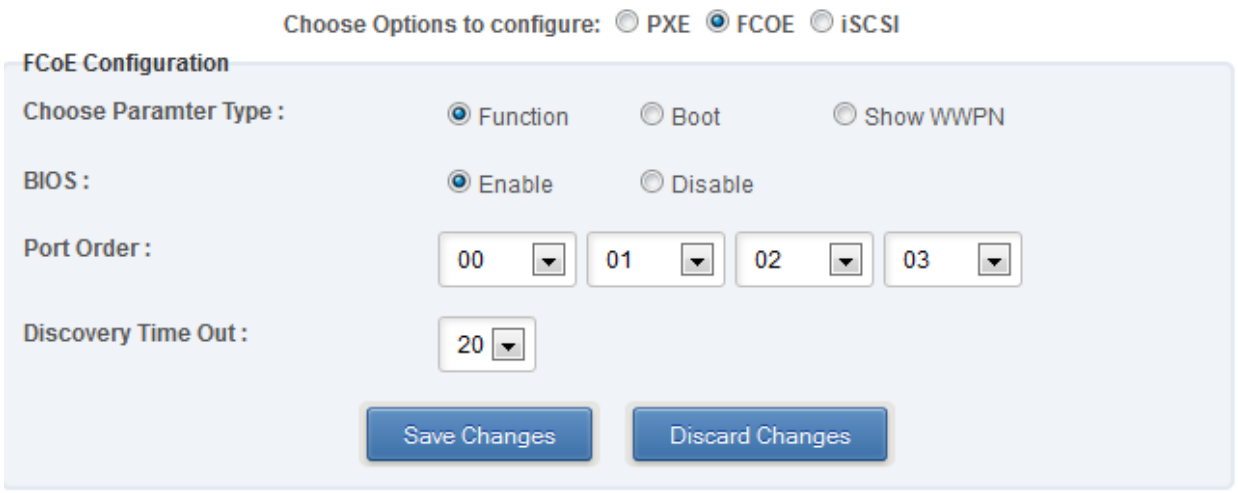


Figure 8.8.7 (b) - FCoE Boot configuration for T4 CNAs

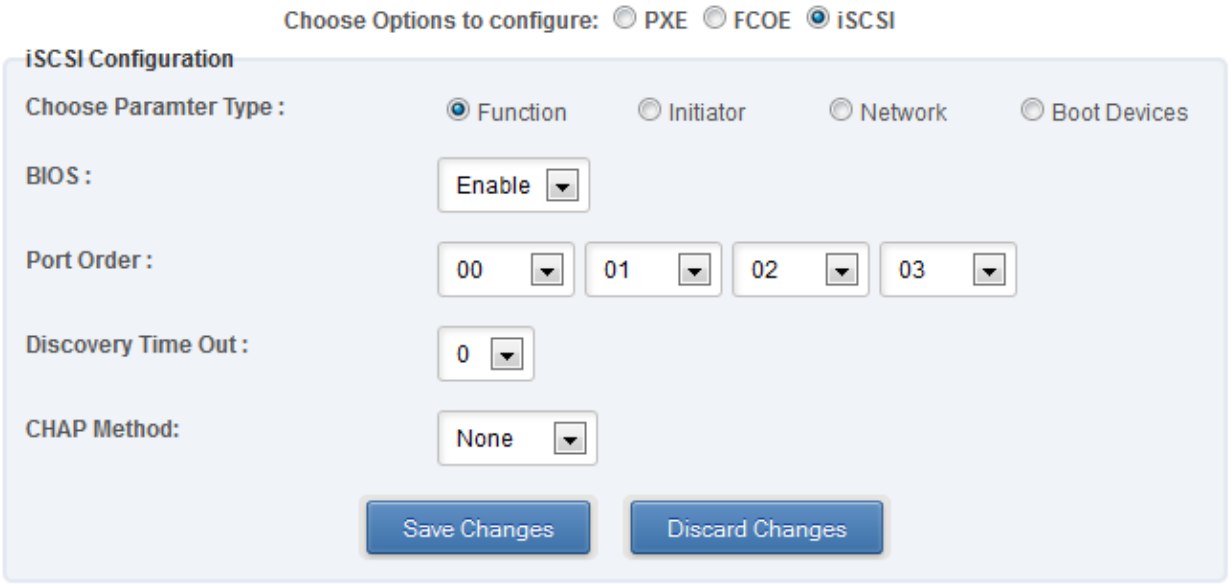


Figure 8.8.7 (c) - iSCSI Boot configuration for T4 CNAs

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 speciffied 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.

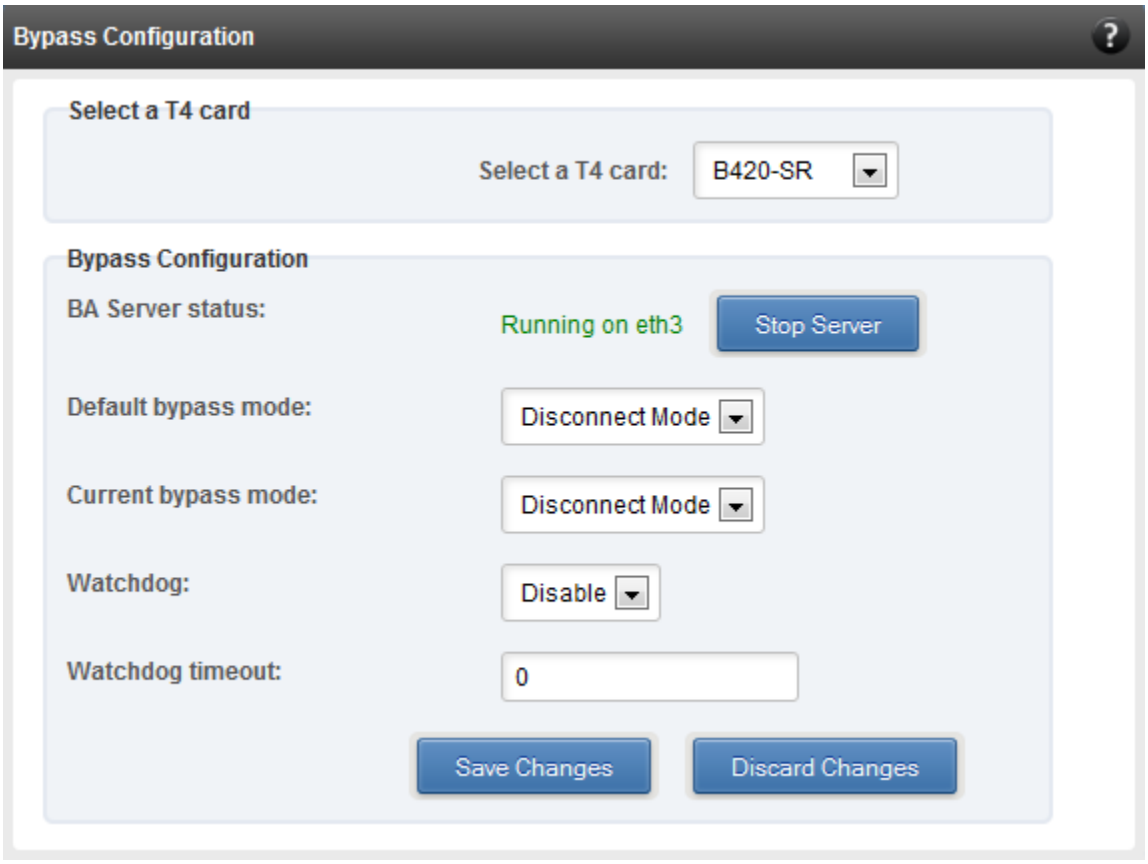


Figure 8.8.8 (a) - Bypass Configuration module

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 cretate 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 paremeters 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.

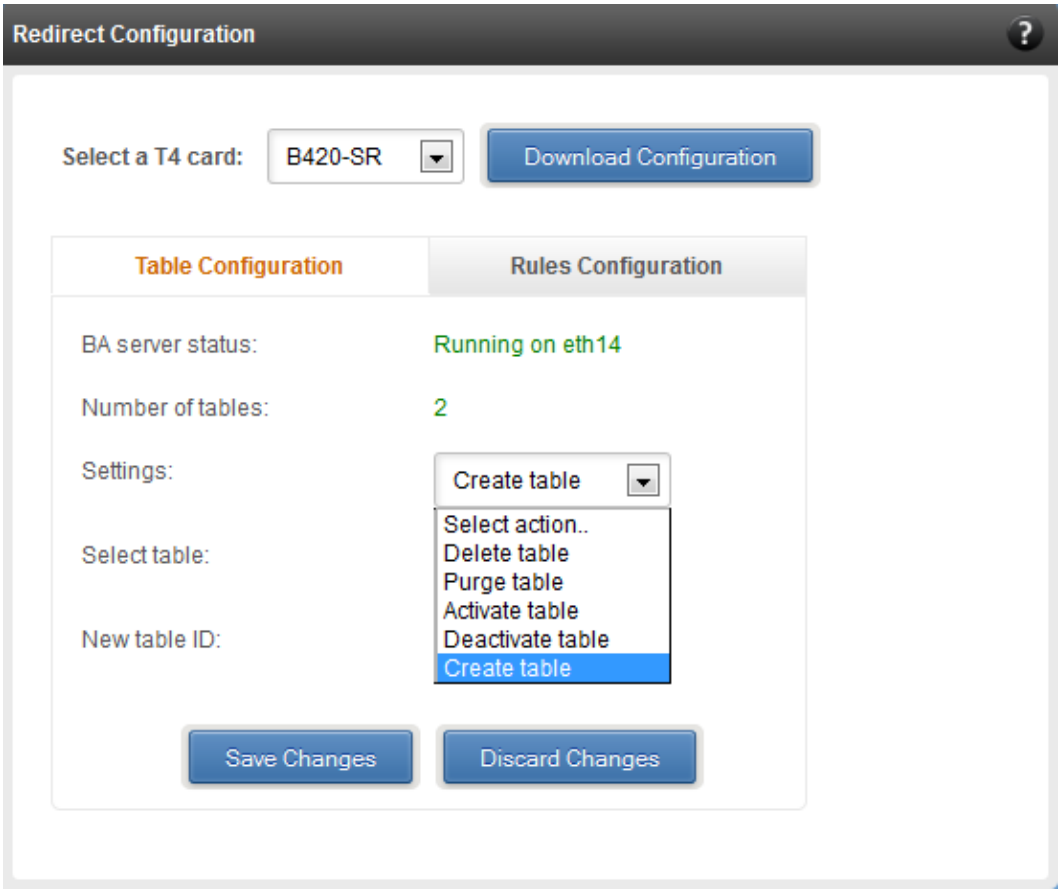


Figure 8.8.8 (b) - Redirect Configuration module: Table configuration tab

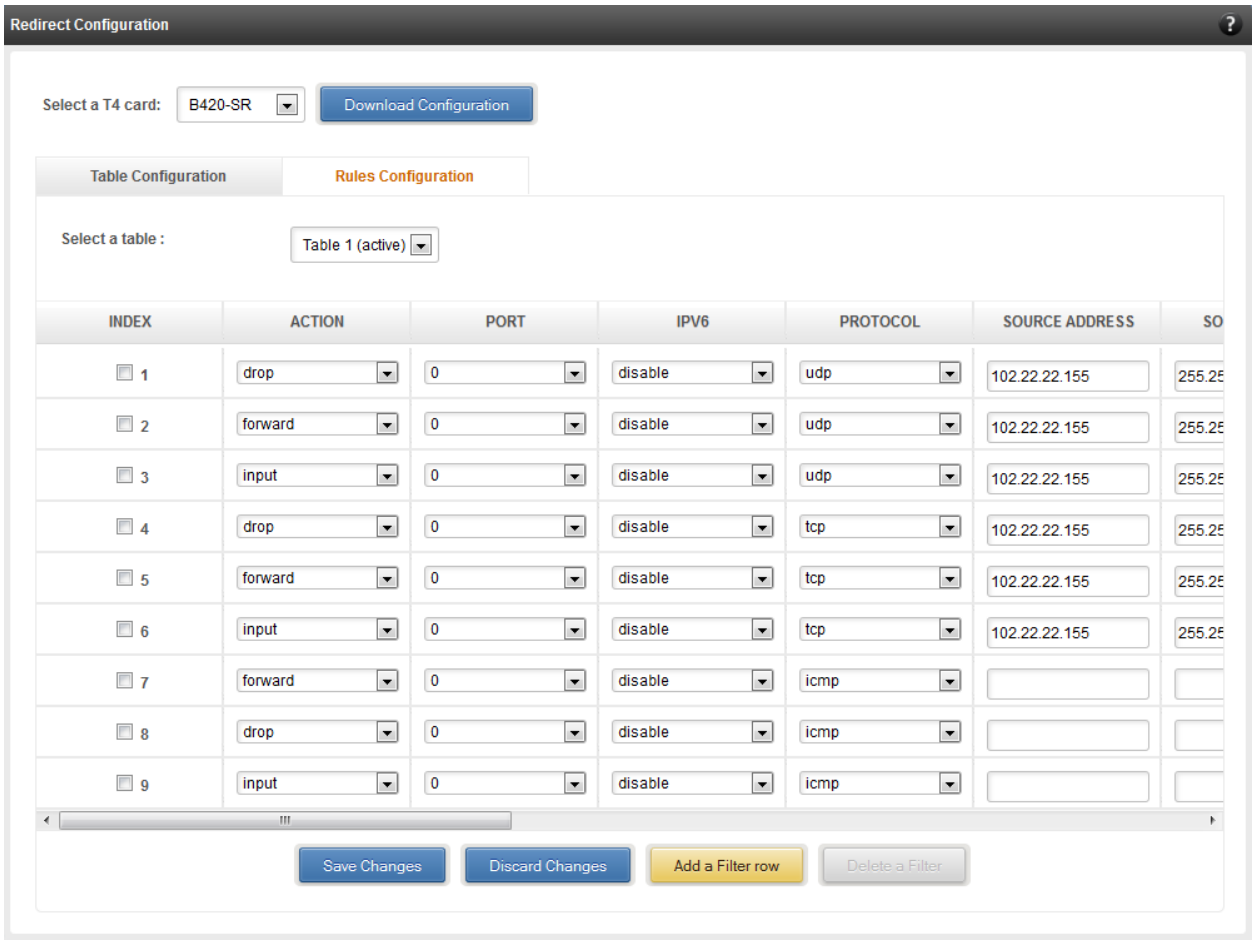


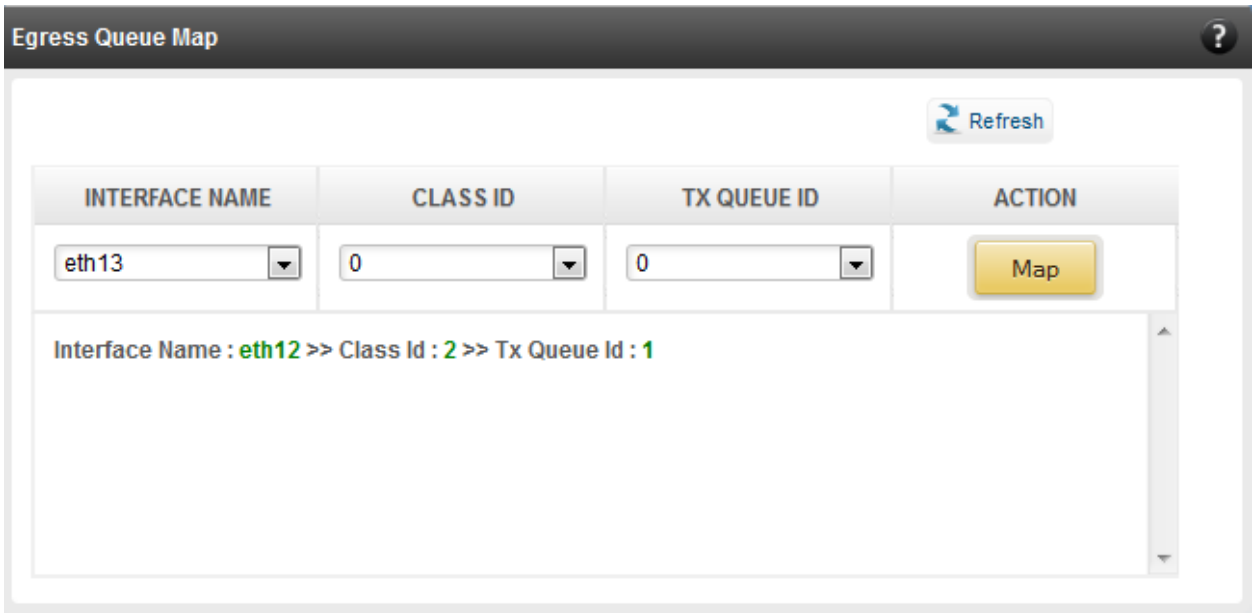
Figure 8.8.8 (c) - Redirect Configuration module: Rules configuration tab

8.8.9. T4 Egress Class Schedulers (Linux)

Schedulers can be set only when T5/T4 network driver (*cxgb4*) is loaded.

Egress Queue Map

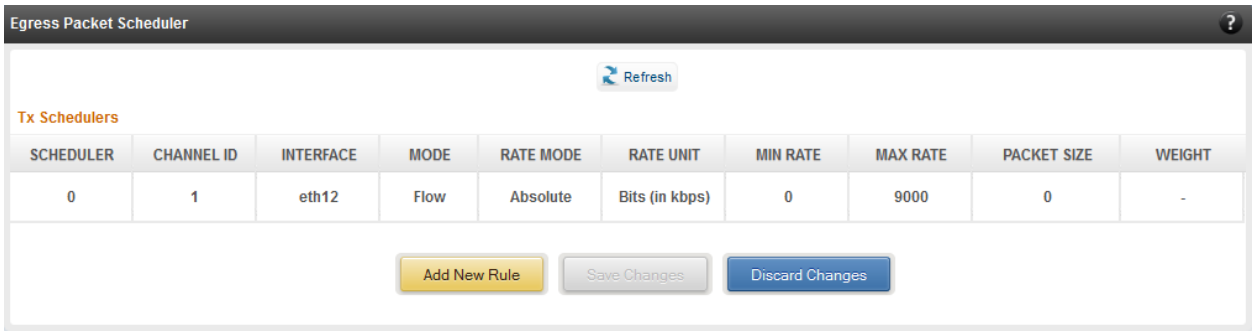
Using this module, you can bind (map) NIC (non-offloaded) Tx queues to Tx Scheduler classes.



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.



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**.

IV. 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

Note *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 Windows server 2012 R2.

1.3. Examples

1.3.1. Viewing help

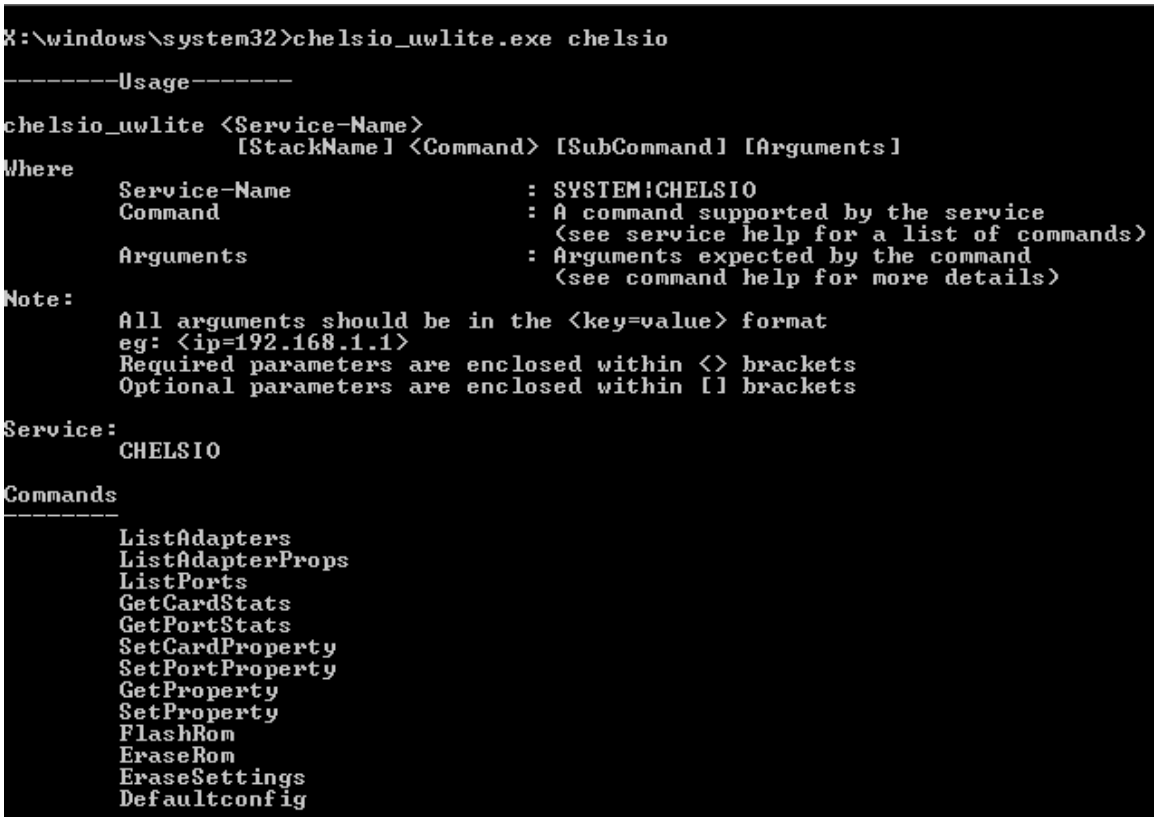
- Run the following command to view the list of commands available under a service.

```
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
```



- 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:

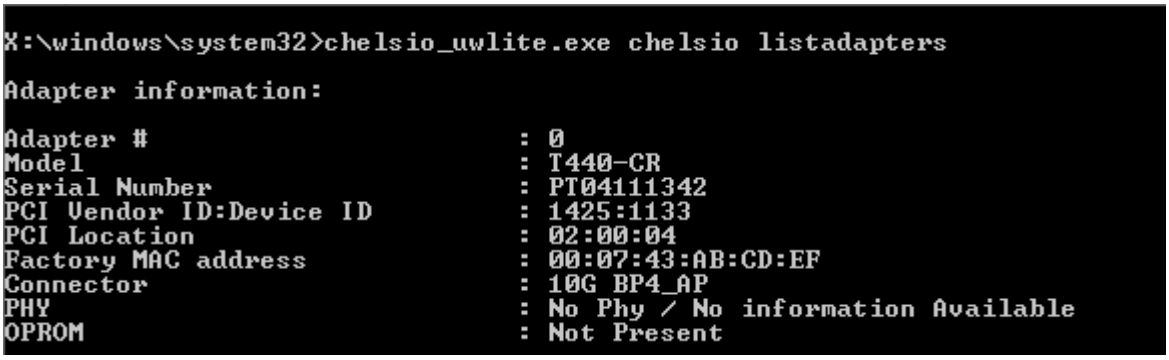
```
X:\windows\system32> chelsio_uwlite.exe chelsio erasesettings /?
```

```
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
```



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, *cuwlbt4.bin*

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
```

V. Appendix

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