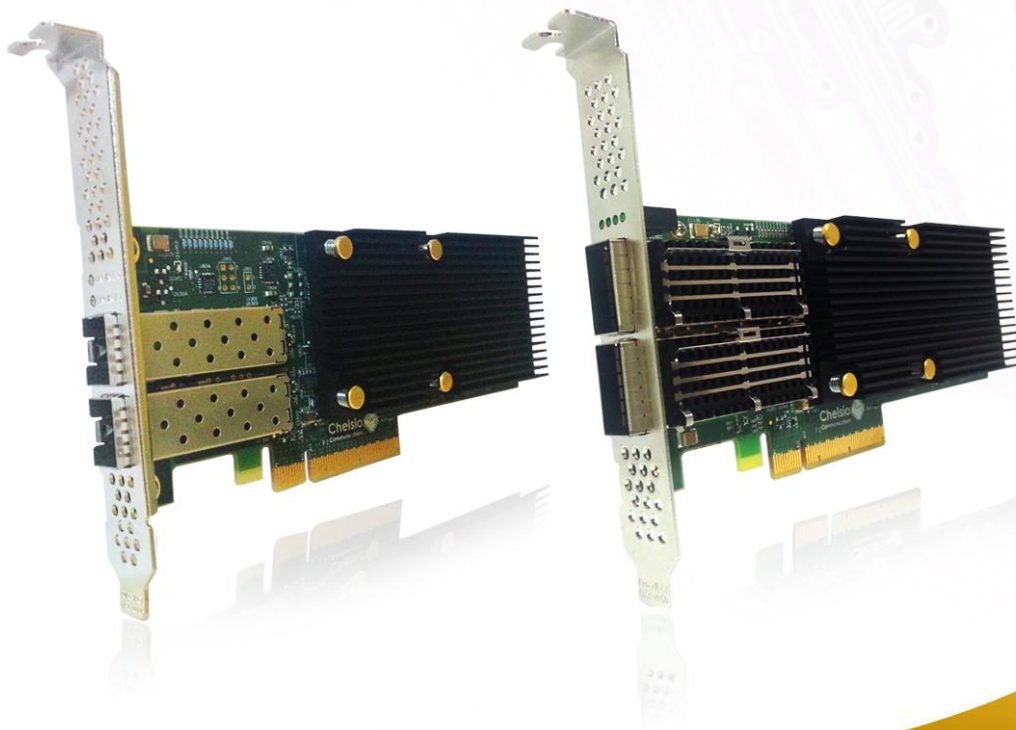




Chelsio T5/T4 Unified Wire for Windows

Installation and User's Guide



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

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

All third party trademarks are copyright of their respective owners.

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

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



Chelsio Communications (Headquarters)

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

www.chelsio.com

Tel: 408.962.3600

Fax: 408.962.3661

Chelsio (India) Private Limited

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

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

Chelsio KK (Japan)

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

Tel: 03-6234-4353

Sales

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

Support

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

Copyright © 2013 Chelsio Communications. All Rights Reserved.

Chelsio® is a registered trademark of Chelsio Communications.

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

Version History

Version	Revision Date
1.0.0	10/10/2011
1.0.1	10/18/2011
1.0.2	10/25/2011
1.0.3	10/31/2011
1.0.4	01/09/2012
1.0.5	01/18/2012
1.0.6	06/07/2012
1.0.7	07/11/2012
1.0.8	03/04/2013
1.0.9	03/21/2013
1.1.0	06/24/2013
1.1.1	07/19/2013
1.1.2	08/21/2013
1.1.3	09/04/2013
1.1.4	09/18/2013
1.1.5	09/23/2013
1.1.6	09/30/2013
1.1.7	10/12/2013
1.1.8	11/12/2013
1.1.9	12/02/2013

TABLE OF CONTENTS

I.	CHELSIO UNIFIED WIRE	5
1.	Introduction	6
1.1.	Features	6
1.2.	Hardware Requirements	6
1.3.	Software Requirements	7
1.4.	Package Contents	7
2.	Hardware Installation	8
3.	Software/Driver Installation	9
4.	Firmware Update	10
5.	Software/Driver Update	11
II.	NDIS FUNCTION	12
1.	Introduction	13
1.1.	Hardware Requirements	13
1.2.	Software Requirements	13
2.	Software/Driver Configuration and Fine-tuning	14
2.1.	Assigning IP address to the Chelsio Network Adapter	14
2.2.	Advanced Configuration	14
2.3.	Enabling SMB Direct	20
2.4.	Verifying RDMA	20
2.5.	Troubleshooting	20
III.	UM FOR WIN PE	22
1.	Introduction	23
1.1.	Hardware Requirements	23
1.2.	Software Requirements	23
1.3.	Examples	24
IV.	APPENDIX	28
	Chelsio End-User License Agreement (EULA)	29

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).

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 for Win PE application 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 network interface. However, for T420-BT adapter, 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 **Windows Update** or **Chelsio's Unified Wire Installer**. 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>

4. 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
```

5. 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:

- 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

1.2. Software Requirements

1.2.1. Windows Requirement

Currently Chelsio T5/T4 NDIS Function driver is available for 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.

- **Max VMQueues:**

- *Description:* Specifies the maximum number of virtual machine queues.
- *Value:* 0-16
- *Default:* 4

- **Nic Port x:**

- *Description:* Enables/Disables the Nic port x.
- *Value:* Enabled | Disabled
- *Default:* Enabled

- **Port x Speed & Duplex:**

- *Description:* Specifies the Port x operation speed and mode.
- *Value:*
 - 100Mbps/Full Duplex
 - 1Gbps/Full Duplex
 - Auto Detect
- *Default:* Auto Detect



This parameter is valid only for 1G port. User can specify any of the above 1G or 100M full duplex modes. If Auto-Detect is selected, the 1G port will do auto-negotiation.

- **iScsi Port x:**

- *Description:* Enables/Disables the iScsi port x.
- *Value:* Enabled | Disabled
- *Default:* Disabled

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.

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

- **Large Send Offload V2 (IPv6):**

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

- **NetworkDirect Interrupt Moderation:**

- *Description:* This parameter controls the interrupts generated during NDK traffic.
- *Value:* Enabled | Disabled
- *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:* Enabled | Disabled
- *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 10Gb network environment where CPU can be the bottleneck.
- *Value:* Enabled | Disabled
- *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 10Gb network environment where CPU can be the bottleneck.
- *Value:* Enabled | Disabled
- *Default:* Enabled

- **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:* Closest Processor


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:* 3072

- **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):**

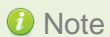
- *Description:* This parameter enables or disables computation of TCP checksum by the adapter for IPv4 packets.
- *Value:*
 - Disabled
 - Rx & Tx Enabled
 - Rx Enabled
 - Tx Enabled
- *Default:* Rx & Tx Enabled

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



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



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

- **Virtual Machine Queues:**

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

- **VLAN Identifier:**

- *Description:* Specifies the VLAN ID to be inserted.
- *Value:* 0-4094
- *Default:* 0

- **VMQ LookAhead Split:**

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

2.3. Enabling SMB Direct

SMB Direct is installed and enabled by default on Windows Server 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.



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. Disable firewall for Chelsio adapters when using SMB.

2.4. Verifying RDMA

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

2.4.1. Verify active connections using PowerShell

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

2.4.2. 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**

2.5. Troubleshooting

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

- Operating system version should be Windows Server 2012 R2.
- Verify network interface configurations on both sides.
- Please ensure that the interfaces are reachable using *ping* command.
- In the Event Viewer (on the client side), please ensure that the traffic running is not over TCP.

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

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

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

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

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



Note

Please configure the Microsoft firewall to allow traffic between the SMB clients and server.

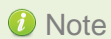
III. UM for Win PE

1. Introduction

Chelsio **UM for Win PE** 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.

In order to use the tool, you will have to add it to boot image when creating bootable Windows PE media. For more information, visit the following link: <http://technet.microsoft.com/en-us/library/cc749312%28v=ws.10%29.aspx>



Only local systems can be managed currently using this tool.

1.1. Hardware Requirements

1.1.1. Supported Adapters

The following are the currently shipping Chelsio Adapters that are compatible with Chelsio UM for Win PE:

- T520-CR
- 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
```

```
X:\windows\system32>chelsio_uwlite.exe chelsio
-----Usage-----
chelsio_uwlite <Service-Name>
                    [StackName] <Command> [SubCommand] [Arguments]
Where
    Service-Name      : SYSTEM\CHELSIO
    Command           : A command supported by the service
                      : <see service help for a list of commands>
    Arguments         : Arguments expected by the command
                      : <see command help for more details>
Note:
    All arguments should be in the <key=value> format
    eg: <ip=192.168.1.1>
    Required parameters are enclosed within <> brackets
    Optional parameters are enclosed within [] brackets
Service:
    CHELSIO
Commands
-----
    ListAdapters
    ListAdapterProps
    ListPorts
    GetCardStats
    GetPortStats
    SetCardProperty
    SetPortProperty
    GetProperty
    SetProperty
    FlashRom
    EraseRom
    EraseSettings
    Defaultconfig
```


- Run the following command to view syntax and usage for a sub-command:

```
X:\windows\system32> chelsio_uwlite.exe chelsio <sub-command> /?
```

E.g. To view syntax and usage of *EraseSettings* sub-command under *chelsio* service:

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

```
X:\windows\system32>chelsio_uwlite.exe chelsio erasesettings /?
This command not supported
-----Usage-----
chelsio_uwlite <Service-Name>
                    [StackName] <Command> [SubCommand] [Arguments]
Where
    Service-Name      : SYSTEM!CHELSIO
    Command           : A command supported by the service
                      : (see service help for a list of commands)
    Arguments         : Arguments expected by the command
                      : (see command help for more details)
Note:
    All arguments should be in the <key=value> format
    eg: <ip=192.168.1.1>
    Required parameters are enclosed within <> brackets
    Optional parameters are enclosed within [] brackets
Service:
    CHELSIO
Note:
    <adapter=adapter index> is the Adapter # obtained from the ListAdapters command
chelsio_uwlite
    Chelsio
    EraseSettings
    <adapter=adapter index>
    <force=Boolean>
```

1.3.2. Flashing Option ROM

- Run the following command to list all Chelsio CNAs present in the system. The list displays a unique index for each CNA found.

```
X:\windows\system32> chelsio_uwlite.exe chelsio listadapters
```

```
X:\windows\system32>chelsio_uwlite.exe chelsio listadapters

Adapter information:
Adapter #           : 0
Model               : T440-CR
Serial Number       : PT04111342
PCI Vendor ID:Device ID : 1425:1133
PCI Location        : 02:00:04
Factory MAC address  : 00:07:43:AB:CD:EF
Connector           : 10G BP4_AP
PHY                 : No Phy / No information Available
OPROM               : Not Present
```

- ii. Now, run the following command to flash option ROM onto the adapter:

```
X:\windows\system32> chelsio_uwlite.exe chelsio flashrom adapter=<idx>
path=<option_rom_image>
```

Here, `idx` is the CNA index found in step i (0 in this case) and `option_rom_image` is the path to Option ROM image file, `cuwlb4.bin`

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

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
```

IV. Appendix

Chelsio End-User License Agreement (EULA)

Installation and use of the software implies acceptance of the terms in the Chelsio End-User License Agreement (EULA).

IMPORTANT: PLEASE READ THIS SOFTWARE LICENSE CAREFULLY BEFORE DOWNLOADING OR OTHERWISE USING THE SOFTWARE OR ANY ASSOCIATED DOCUMENTATION OR OTHER MATERIALS (COLLECTIVELY, THE "SOFTWARE"). BY CLICKING ON THE "OK" OR "ACCEPT" BUTTON YOU AGREE TO BE BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, CLICK THE "DO NOT ACCEPT" BUTTON TO TERMINATE THE INSTALLATION PROCESS.

1. License. Chelsio Communications, Inc. ("Chelsio") hereby grants you, the Licensee, and you hereby accept, a limited, non-exclusive, nontransferable license to:

(i) install and use the Software on a single computer system or on multiple workstations, systems and servers that incorporate a Chelsio network adapter and may be accessed by multiple users from multiple locations; and (ii) make one copy of the Software in machine readable form solely for back-up purposes, provided you reproduce Chelsio's copyright notice and any proprietary legends, as required by Chelsio.

2. Restrictions. This license granted hereunder does not constitute a sale of the Software or any copy thereof. Except as expressly permitted under this Agreement, you may not:

(i) reproduce, modify, adapt, translate, rent, lease, loan, resell for profit, distribute, or create derivative works of or based upon, the Software or any part thereof; or

(ii) make available the Software, or any portion thereof, in any form, on the Internet. The Software contains trade secrets and, in order to protect them, you may not decompile, reverse engineer, disassemble, or otherwise reduce the Software to a human-perceivable form. You assume full responsibility for the use of the Software and agree to use the Software legally and responsibly.

3. Ownership of Software. As Licensee, you own only the media upon which the Software is recorded or fixed, but Chelsio retains all right, title and interest in and to the Software recorded on the original media and all subsequent copies of the Software, regardless of the form or media in or on which the Software may be embedded.

4. Confidentiality. You agree to maintain the Software in confidence and not to disclose the Software, or any information or materials related thereto, to any third party without the express written consent of Chelsio. You further agree to take all reasonable precautions to limit access of the Software only to those of your employees who reasonably require such access to perform their employment obligations and who are bound by confidentiality agreements with you.

5. Term. This license is effective in perpetuity, unless terminated earlier. You may terminate the license at any time by destroying the Software (including the related documentation), together with all copies or modifications in any form. Chelsio may terminate this license, and this license shall be deemed to have automatically

terminated, if you fail to comply with any term or condition of this Agreement. Upon any termination, including termination by you, you must destroy the Software (including the related documentation), together with all copies or modifications in any form.

6. Limited Warranty. Chelsio warrants only that the media upon which the Software is furnished will be free from defects in material or workmanship under normal use and service for a period of thirty (30) days from the date of delivery to you. CHELSIO DOES NOT AND CANNOT WARRANT THE PERFORMANCE OR RESULTS YOU MAY OBTAIN BY USING THE SOFTWARE OR ANY PART THEREOF. EXCEPT FOR THE FOREGOING LIMITED WARRANTY, CHELSIO MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, AND HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, BUT NOT LIMITED, TO NON-INFRINGEMENT OF THIRD PARTY RIGHTS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow the exclusion of implied warranties or limitations on how long an implied warranty may last, so the above limitations may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

7. Remedy for Breach of Warranty. The sole and exclusive liability of Chelsio and its distributors, and your sole and exclusive remedy, for a breach of the above warranty, shall be the replacement of any media not meeting the above limited warranty which is returned to Chelsio. If Chelsio or its distributor is unable to deliver replacement media which is free from defects in materials or workmanship, you may terminate this Agreement by returning the Software.

8. Limitation of Liability. IN NO EVENT SHALL CHELSIO HAVE ANY LIABILITY TO YOU OR ANY THIRD PARTY FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, HOWEVER CAUSED, AND ON ANY THEORY OF LIABILITY, ARISING OUT OF OR RELATED TO THE LICENSE OR USE OF THE SOFTWARE, INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR LOSS OF ANTICIPATED PROFITS, EVEN IF CHELSIO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL CHELSIO'S LIABILITY ARISING OUT OF OR RELATED TO THE LICENSE OR USE OF THE SOFTWARE EXCEED THE AMOUNTS PAID BY YOU FOR THE LICENSE GRANTED HEREUNDER. THESE LIMITATIONS SHALL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY.

9. High Risk Activities. The Software is not fault-tolerant and is not designed, manufactured or intended for use or resale as online equipment control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of the Software could lead directly to death, personal injury, or severe physical or environmental damage. Chelsio specifically disclaims any express or implied warranty of fitness for any high risk uses listed above.

10. Export. You acknowledge that the Software is of U.S. origin and subject to U.S. export jurisdiction. You acknowledge that the laws and regulations of the United States and other countries may restrict the export and re-export of the Software. You agree that you will not export or re-export the Software or documentation in any form in violation of applicable United States and foreign law. You agree to comply with all applicable international and national laws that apply to the Software, including the U.S. Export Administration Regulations, as well as end-user, end-use, and destination restrictions issued by U.S. and other governments.

11. Government Restricted Rights. The Software is subject to restricted rights as follows. If the Software is acquired under the terms of a GSA contract: use, reproduction or disclosure is subject to the restrictions set forth in the applicable ADP Schedule contract. If the Software is acquired under the terms of a DoD or

civilian agency contract, use, duplication or disclosure by the Government is subject to the restrictions of this Agreement in accordance with 48 C.F.R. 12.212 of the Federal Acquisition Regulations and its successors and 49 C.F.R. 227.7202-1 of the DoD FAR Supplement and its successors.

12. General. You acknowledge that you have read this Agreement, understand it, and that by using the Software you agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between Chelsio and you, and supersedes any proposal or prior agreement, oral or written, and any other communication between Chelsio and you relating to the subject matter of this Agreement. No additional or any different terms will be enforceable against Chelsio unless Chelsio gives its express consent, including an express waiver of the terms of this Agreement, in writing signed by an officer of Chelsio. This Agreement shall be governed by California law, except as to copyright matters, which are covered by Federal law. You hereby irrevocably submit to the personal jurisdiction of, and irrevocably waive objection to the laying of venue (including a waiver of any argument of forum non conveniens or other principles of like effect) in, the state and federal courts located in Santa Clara County, California, for the purposes of any litigation undertaken in connection with this Agreement. Should any provision of this Agreement be declared unenforceable in any jurisdiction, then such provision shall be deemed severable from this Agreement and shall not affect the remainder hereof. All rights in the Software not specifically granted in this Agreement are reserved by Chelsio.

Chelsio reserves the right to modify this license agreement at any time without notice, and any modified version of this agreement shall supercede any earlier versions.

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

Chelsio Communications, Inc.
370 San Aleso Ave.
Sunnyvale, CA 94085