



Chelsio T5/T4 Network Driver for XenServer

Installation and User's Guide



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Chelsio Communications (Headquarters)

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

www.chelsio.com

Tel: 408.962.3600
Fax: 408.962.3661

Chelsio (India) Private Limited

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

Tel: +91-80-4039-6800
Fax: +91-80-4039-6807

Chelsio KK (Japan)

Regus Place Canada
Akasaka 7-3-37
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

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Document History

Version	Revision Date
1.0.0	05/18/2012
1.0.1	04/24/2015
1.0.2	01/13/2016

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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.

This document describes the installation, use and maintenance of Network driver for XenServer and its various components.

1.1. Features

Chelsio's Network driver package for XenServer is an ISO image which installs drivers for Chelsio's T5/T4 Unified Wire adapters on XenServer.

1.2. Hardware Requirements

1.2.1. Supported Adapters

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

- T520-BT
- T580-CR
- T580-SO-CR
- T520-LL-CR

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

1.3. Software Requirements

1.3.1. XenServer Requirements

Chelsio's Network driver has been developed to run on XenServer platforms. Currently the software is available for the following version:

- Citrix XenServer Host 6.5.0
Kernel version: 3.10.0+2

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

1.3.2. Resource Requirements

- **Control Domain (Dom0) memory:** Based on the number of 40/10/1G ports, driver allocates memory enough to run at the desired rate. It is suggested to increase the control domain memory to 2GB using the procedure explained in <http://support.citrix.com/article/CTX134951>
- **SW-IOMMU Size:** Increasing SW-IOMMU size by appending `swiotlb=128` to `/boot/extlinux.conf` avoids PCI-DMA: Out of SW-IOMMU space for <size> bytes at device <BDF> messages.

1.4. Package Contents

The software supplied is an ISO image. It consists of the following:

- RPM packages containing drivers and associated tools, firmware, etc.
- Shell script to install the driver package.

2. Hardware Installation

Follow the steps to install Chelsio Adapter in your system:

1. Shutdown and 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/x16 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 40/10Gb Ethernet adapter or regular Ethernet cable for the 1Gb Ethernet adapter.
11. Power on your system.
12. Run `update-pciids` command to download the current version of PCI ID list

```
[root@host~]# update-pciids
%   Total   % Received   %   Xferd   Average Speed   Time   Time   Time   Current
   Total   % Received   %   Xferd   Average Speed   Time   Time   Time   Current
 100 198k   100   198k     0     0    491k   0  --:--:--  --:--:--  --:--:--  626k
Done.
```

13. Verify if the adapter was installed successfully by using the `lspci` command
 - a. For T5 adapters :

```
[root@host~]# lspci |grep -i Chelsio
07:00.0 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
07:00.1 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
07:00.2 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
07:00.3 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
Wire Ethernet Controller
07:00.4 Ethernet controller: Chelsio Communications Inc T520-LL-CR Unified
```

```
Wire Ethernet Controller
07:00.5 SCSI storage controller: Chelsio Communications Inc T520-LL-CR
Unified Wire Storage Controller
07:00.6 Fibre Channel: Chelsio Communications Inc T520-LL-CR Unified Wire
Storage Controller
```

b. And for T4 adapters :

```
[root@host~]# lspci | grep -i Chelsio
03:00.0 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller
03:00.1 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller
03:00.2 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller
03:00.3 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller
03:00.4 Ethernet controller: Chelsio Communications Inc T420-CR Unified Wire
Ethernet Controller
03:00.5 SCSI storage controller: Chelsio Communications Inc T420-CR Unified
Wire Storage Controller
03:00.6 Fibre Channel: Chelsio Communications Inc T420-CR Unified Wire
Storage Controller
03:00.7 Ethernet controller: Chelsio Communications Inc Device 0000
```

For Chelsio T5/T4 adapters, the physical functions are currently assigned as:

- Physical functions 0 - 3: for the SR-IOV functions of the adapter
- Physical function 4: for all NIC functions of the adapter
- Physical function 5: for iSCSI
- Physical function 6: for FCoE
- Physical function 7: Currently not assigned

Once driver is installed and loaded, examine the output of `dmesg` to see if the card is discovered.

- For T5 adapters:

```
eth4: Chelsio T520-LL rev 0 10GBASE-SFP RNIC PCIe 5 GT/s x8 MSI-X, Offload
capable
0000:07:00.4: S/N: PT03140177, P/N: 110116750C0
```


- And, for T4 adapters:

```
eth0: Chelsio T420-CR rev 2 10GBASE-SFP RNIC PCIe x8 MSI-X  
0000:04:00.4: S/N: PT18111226, P/N: 110112140D0
```

The above outputs indicate the hardware configuration of the adapters as well as the Serial numbers. As observed by the x8, the card is properly installed in an x8 slot on the machine and using MSI-X interrupts.



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 network interface. However, for T5 40G and T420-BT adapters, the association of physical Ethernet ports and their corresponding network device names is opposite. For these adapters, the port nearest to the motherboard will appear as the first network interface.

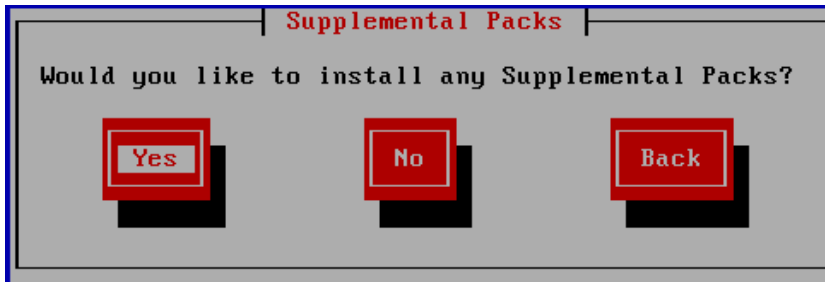
3. Software/Driver Installation

Chelsio Network driver must be installed by the root user. Any attempt to install the software as a regular user will fail.

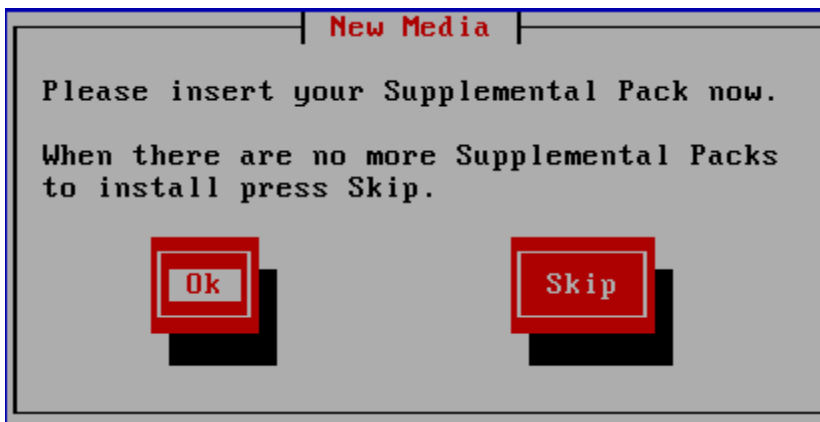
There are two methods of installation: During operating system installation and Runtime.

3.1. During OS installation

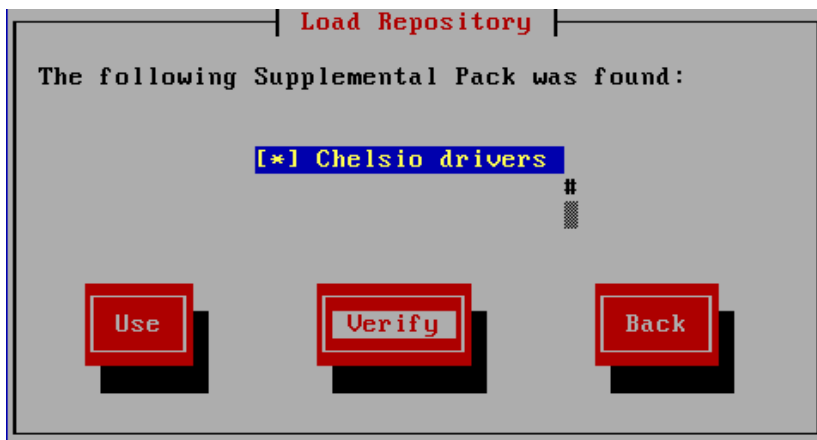
1. If you haven't done so already, download the Network driver(ISO image) from Chelsio Download Center, <http://service.chelsio.com>
2. Burn the image to a CD/DVD.
3. Start an interactive install of XenServer.
4. When the installer prompts, opt for installing drivers through Supplemental Packs. Choose "Yes" and hit [Enter].



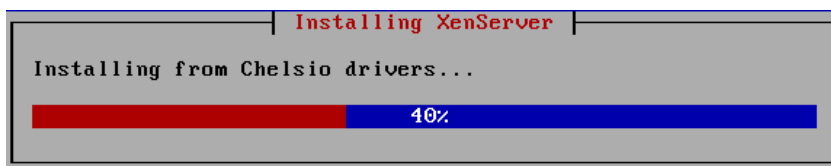
5. Insert the disc into disc drive. Choose "Ok" and hit [Enter].



- The installer will now search and display the drivers. Choose “Use” and hit [Enter].



- The selected drivers will now be installed.



- To install any additional drivers follow the same procedure mentioned above. Or choose “Skip” and hit [Enter] to complete the driver installation.

3.2. Runtime Installation

- If you haven't done so already, download the Network driver (ISO image) from Chelsio Download Center, <http://service.chelsio.com>
- Copy the ISO image on to a host running XenServer.
- Mount the image onto a directory by running the following commands:

```
[root@host~]# mkdir /tmp/iso
[root@host~]# mount -o loop <driver.iso> /tmp/iso
[root@host~]# cd /tmp/iso
```

- Run the `install.sh` script to install the drivers and tools:

```
[root@host~]# ./install.sh
```

5. Finally, unmount the ISO image:

```
[root@host~]# cd  
[root@host~]# umount /tmp/iso
```

3.3. Firmware Update

The T5 and T4 firmwares are installed on the system, typically in `/lib/firmware/updates/3.10.0+2/cxgb4/`, and the driver will auto-load them if an update is required.

The firmware version can be verified using *ethtool*:

```
[root@host~]# ethtool -i <iface>
```

4. Software/Driver Loading

The driver must be loaded by the root user. Any attempt to load the driver as a regular user will fail.

To load the driver, execute the following:

```
[root@host~]# modprobe cxgb4
```


5. Software/Driver Configuration and Fine-tuning

5.1. Instantiate Virtual Functions (SR-IOV)

To instantiate the Virtual functions, load the cxgb4 driver with `num_vf` parameter with a non-zero value. For example:

```
[root@host~]# modprobe cxgb4 num_vf=1,0,0,0
```

The number(s) provided for `num_vf` parameter specifies the number of Virtual Functions to be instantiated per Physical Function. The Virtual Functions can be assigned to Virtual Machines (Guests). A maximum of 64 Virtual Functions can be instantiated with 16 Virtual Functions per Physical Function.

 **Note** *To get familiar with physical and virtual function terminologies, please refer the PCI Express specification.*

6. Software/Driver Unloading

To unload the driver, execute the following:

```
[root@host~]# rmmod cxgb4
```

7. Software/Driver Uninstallation

1. Use the following query commands to determine the RPMs installed:

```
[root@host~]# rpm -qa | grep -i cxgb4  
[root@host~]# rpm -qa | grep -i chelsio
```

2. Now, with the results from the above queries, execute the following command to uninstall all related packages:

```
[root@host~]# rpm -e <package_name>
```


8. Software/Driver Update

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

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

9. Appendix

9.1. Chelsio End-User License Agreement (EULA)

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

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Chelsio Communications, Inc.
209 North Fair Oaks Avenue,
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