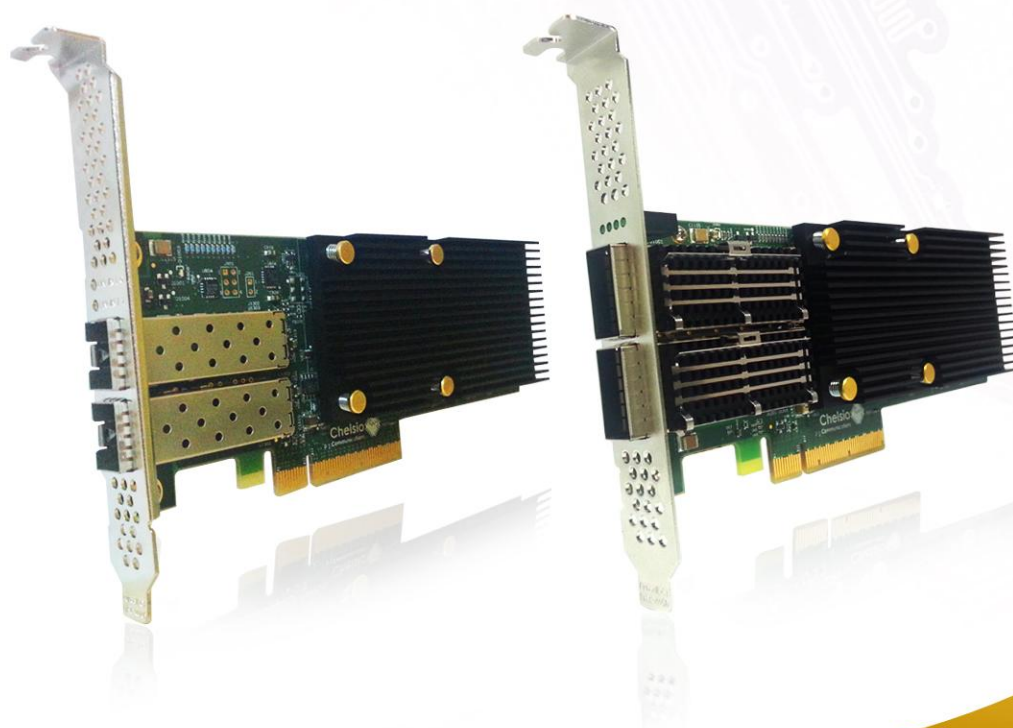




Chelsio T5/T4 Network Driver for Solaris

Installation and User's Guide



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TABLE OF CONTENTS

1. Introduction	5
1.1. Features	5
1.2. Hardware Requirements	6
1.3. Software Requirements	6
1.4. Package Contents	6
2. Hardware Installation	8
3. Software/Driver Installation	11
4. Software/Driver Configuration and Fine-tuning	12
4.1. Kernel tuning	12
4.2. Firmware update	12
4.3. Troubleshooting	12
5. Software/Driver Uninstallation	14
6. Software/Driver Update	15
7. Appendix	16
7.1. Chelsio End-User License Agreement (EULA)	16

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 40/10/1GbE 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

This driver package has the Chelsio T5/T4 ASIC based 40/10/1Gb PCI Express network adapter driver for Solaris. The driver package installs two kernel modules - t4nex and cxgbe. The t4nex is the bus nexus driver that attaches to the Chelsio adapter. The cxgbe is the network driver for each port and attaches to the t4nex bus nexus.

The driver supports Jumbo Frames, Transmit/Receive checksum offload, and TCP segmentation offload (TSO). A high performance fully offloaded and fully featured TCP/IP stack meets or exceeds software implementations in RFC compliance.

1.2. Hardware Requirements

1.2.1. Supported Adapters

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

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

1.3. Software Requirements

The Chelsio Network driver has been developed to run on Intel based Solaris platforms. Currently the driver is available for following version:

- Solaris 11.1

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

1.4. Package Contents

- **CHLScxgbe.i386.pkg**: driver binary.
- **tools**:
 - **cxgbetool**: The cxgbetool 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.

- **docs:** The directory contains support documents - README, Release Notes and User's Guide (this document) for the software.

2. Hardware Installation

Follow these steps to install Chelsio Adapter in your system:

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 10Gb 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 10Gb Ethernet adapter or regular Ethernet cable for the 1Gb Ethernet adapter.
11. Power on your system.
12. Verify if the Chelsio adapter was installed successfully by using the following command:
 - a. For T5 adapters :

```
root@host:~# scanpci -v
.
.
pci bus 0x0007 cardnum 0x00 function 0x04: vendor 0x1425 device 0x5410
Chelsio Communications Inc T580-LP-CR Unified Wire Ethernet Controller
CardVendor 0x1425 card 0x0000 (Chelsio Communications Inc, Card unknown)
  STATUS      0x0010  COMMAND 0x0046
  CLASS       0x02 0x00 0x00  REVISION 0x00
  BIST        0x00  HEADER 0x80  LATENCY 0x00  CACHE 0x40
  BASE0       0xf8f80000 SIZE 524288  MEM
  BASE2       0xf9000000 SIZE 16777216 MEM
  BASE4       0xf8f7e000 SIZE 8192  MEM
  BASEROM     0x00000000  addr 0x00000000
  MAX_LAT     0x00  MIN_GNT 0x00  INT_PIN 0x01  INT_LINE 0x0b
.
.
```


b. For T4 adapters

```
root@host:~# scanpci -v
.
.
pci bus 0x0007 cardnum 0x00 function 0x04: vendor 0x1425 device 0x4403
Chelsio Communications Inc T440-CR Unified Wire Ethernet Controller
CardVendor 0x1425 card 0x0000 (Chelsio Communications Inc, Card unknown)
  STATUS      0x0010  COMMAND 0x0046
  CLASS       0x02 0x00 0x00  REVISION 0x00
  BIST        0x00  HEADER 0x80  LATENCY 0x00  CACHE 0x40
  BASE0       0xf9fc0000 SIZE 262144  MEM
  BASE2       0xfa000000 SIZE 8388608  MEM
  BASE4       0xf9fbe000 SIZE 8192  MEM
  BASEROM     0x00000000  addr 0x00000000
  MAX_LAT     0x00  MIN_GNT 0x00  INT_PIN 0x01  INT_LINE 0x0b
.
```

Once driver is installed and loaded, examine the output of `kstat t4nex` to see if the card is discovered:

```
module: t4nex                instance: 2
name:  config                 class:  nexus
bus_speed                    2
bus_type                     pci-express
bus_width                    x8 lanes
chip_ver                     0
core_clock                   500000
crttime                      545.520653069
driver_version                3.0.0.2c197
ec_level                     0000000000000000
fw_vers                      1.9.23.0
id                           T580-LP-CR
part_number                  11011645003
pci_device_id                 0x5410
pci_vendor_id                 0x1425
port_cnt                     2
port_type                     40G/40G/-/-
serial_number                 PT25130313
snaptime                     6592.705007638
tp_vers                      0.1.4.7
```

The above output indicates the hardware configuration of the card as well as the Serial number. As observed by the x8, the card is properly installed in an x8 slot on the machine.



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 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

The driver must be installed by the root user. Any attempt in installing the driver as a regular user will fail.

- i. Remove any previous versions of the driver installed in the system. Driver uninstallation is explained in the [Software/Driver Uninstallation](#) section.
- ii. Install the driver package using the following commands:

```
root@host:~# cd cxgbe-solaris-x.x.x.x
root@host:~# pkgadd -d CHLScxgbe.i386.pkg
```

- iii. Reboot the system.
- iv. After reboot, run the following command before using the cxgbe devices. This command will reconfigure new attached devices without returning any output.

```
root@host:~# devfsadm
root@host:~#
```

4. Software/Driver Configuration and Fine-tuning

4.1. Kernel tuning

The driver's behavior and performance can be influenced by a variety of kernel tunables. General information about TCP/IP tuning on Solaris can be found at <http://www.solarisinternals.com/wiki/index.php/Networks>

The use of MSI-X interrupts is recommended. This can be achieved by adding below line(s) to the `/etc/system` (depending on the Solaris version). A server restart is necessary for the changes in `/etc/system` to be effective.

```
set ddi_msix_alloc_limit=8
```

4.2. Firmware update

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

```
root@host:~# kstat t4nex
```

4.3. Troubleshooting

Run the commands in this section in order, save their output, and contact support@chelsio.com if you have any problems installing or running the driver.

- i. What system is this?

```
root@host:~# uname -a
root@host:~# cat /etc/release
```

- ii. Is the driver installed? Is it the right version?

```
root@host:~# pkginfo | grep CHLS
root@host:~# pkginfo -l CHLScxgbe
root@host:~# /usr/xpg4/bin/grep -e cxgbe -e t4nex /etc/driver_aliases
root@host:~# /usr/xpg4/bin/grep -e cxgbe -e t4nex /etc/name_to_major
```

- iii. Are there any Chelsio cards in the system? (Look for 1425 in the output of these commands.)

```
root@host:~# scanpci (or /usr/X11/bin/scanpci)
root@host:~# prtconf -p
```

- iv. Is the driver loaded? Did it attach to the Chelsio cards in the system? (Look for 1425, cxgbe, t4nex in the output of these commands.)

```
root@host:~# modinfo | /usr/xpg4/bin/grep -e cxgbe -e t4nex
root@host:~# dmesg
root@host:~# prtconf -v
```

- v. Are the network ports registered with the kernel?

```
root@host:~# dladm show-link
root@host:~# dladm show-linkprop
root@host:~# ifconfig -a
```

- vi. Is a link established? Can packets be transmitted and received?

```
root@host:~# ipadm create-addr -T static -a a.b.c.d/nm <interface>
```

where a.b.c.d is the IP address and nm is the netmask for cxgbeX interface

```
root@host:~# netstat -I netX 1
```

Run the above command while attempting to send/receive traffic.

- vii. Detailed information about the driver state and statistics.

```
root@host:~# kstat t4nex
root@host:~# kstat cxgbe
```

5. Software/Driver Uninstallation

Make sure that there are no VLANs/VNICs and aggregations using any of the Chelsio interfaces. If there are any, unplumb and destroy them before proceeding. The package uninstaller unplumbs all of the plumbed cxgbeX interfaces.

Uninstall the package using package manager

```
root@host:~# pkgrm CHLScxgbe
```

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.

7. Appendix

7.1. 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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