

# **Chelsio Unified Wire for VMware ESXi 7.0**

## Installation and User Guide



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TABLE	OF	COI	NT	EN	TS
-------	----	-----	----	----	----

I.	CHELSIO UNIFIED WIRE	6
1. In	troduction	7
1.1.	Features	7
1.2.	Hardware Requirements	7
1.3.	Software Requirements	8
1.4.	Package Contents	8
2. H	ardware Installation	9
3. So	oftware/Driver Installation	11
4. So	oftware/Driver Uninstallation	12
5. So	oftware/Driver Update	13
II.	NATIVE NETWORK DRIVER WITH SR-IOV SUPPORT	14
1. In	troduction	15
1.1.	Hardware Requirements	15
1.2.	Software Requirements	15
2. So	oftware/Driver Loading	17
3. So	oftware/Driver Configuration and Fine-tuning	18
3.1.	Multiple Adapters	18
3.2.	cxgbtool	18
3.3.	Adapter Configuration	18
3.4.	Firmware Update	19
3.5.	Connecting a Virtual Machine	19
3.6.	Virtual Functions (SR-IOV)	19
4. So	oftware/Driver Unloading	26
III.	ISCSI OFFLOAD INITIATOR DRIVER	27
1. In	troduction	28
1.1.	Hardware Requirements	28
2. So	oftware/Driver Loading	29
3. So	oftware/Driver Configuration and Fine-tuning	30
3.1.	Configuring Initiator	30
3.2.	Connecting to Target	32
3.3.	Configurable Options	35
4. So	oftware/Driver Unloading	36
IV.	ISER OFFLOAD INITIATOR DRIVER	37
1. In	troduction	38
1.1.	Hardware Requirements	38
	oftware/Driver Loading	39
	oftware/Driver Configuration and Fine-tuning	40
3.1.	Configuring Initiator	40
3.2.	Connecting to Target	44
3.3.	Configurable Options	47

4. Software/Driv	. Software/Driver Unloading				
V. NVME-O	F OFFLOAD INITIATOR DRIVER	49			
1. Introduction		50			
1.1. Hardwar	e Requirements	50			
2. Software/Driv	ver Loading	51			
3. Software/Driv	ver Configuration and Fine-tuning	52			
3.1. Connect	ing to NVMe target	52			
3.2. Disconne	ecting from NVMe target	54			
4. Software/Driv	ver Unloading	55			
VI. APPEND	IX	56			
1. Troubleshoot	ing	57			
2. Chelsio End-U	ser License Agreement (EULA)	58			

# I. Chelsio Unified Wire

### 1. Introduction

Thank you for choosing Chelsio Unified Wire adapters. These high speed, single chip, single firmware cards provide enterprises and datacenters with high performance solutions for various Network and Storage related requirements.

The **Terminator** series of adapters is Chelsio's next generation of highly integrated, hypervirtualized 1/10/25/40/50/100GbE controllers. The adapters are 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 to true 100Gb 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.

Ideal for all data, storage and high-performance clustering applications, Chelsio 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 datacenters, cloud service installations and highperformance computing environments, Chelsio 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 Unified Wire software for VMware ESXi and its various components.

# 1.1. Features

The Chelsio Unified Wire package installs various drivers and utilities and consists of the following software:

- Native Network (NIC) driver with SR-IOV support
- iSCSI Offload Initiator Driver
- iSER Offload Initiator Driver
- NVMe-oF Offload Initiator Driver

Onte Drivers are not VMware certified.

For detailed instructions on loading, unloading and configuring the drivers/tools please refer to their respective sections.

# **1.2. Hardware Requirements**

The Chelsio Unified Wire software supports Chelsio Terminator series of Unified Wire adapters. To know more about the list of adapters supported by each driver, please refer to their respective sections.

### **1.3. Software Requirements**

The Chelsio Unified Wire software has been developed to run on 64-bit ESXi based platforms.

- ESXi 7.0
- ESXi 7.0 Update 3

**1** Note iSER is supported only on ESXi 7.0.

# 1.4. Package Contents

The Chelsio Unified Wire driver package consists of the following files/directories:

- **cxl-\*.vib**: Native Network driver VIB file.
- cheiscsi-\*.vib: iSCSI, NVMe-oF Offload Initiator driver VIB file.
- cheiwarp-\*.vib: iSER Offload Initiator driver VIB file.

### 2. Hardware Installation

Follow these steps to install the Chelsio adapter in your system:

- i. Shutdown/power off your system.
- ii. Power off all remaining peripherals attached to your system.
- iii. Unpack the Chelsio adapter and place it on an anti-static surface.
- iv. Remove the system case cover according to the system manufacturer's instructions.
- v. Remove the PCI filler plate from the slot where you will install the Ethernet adapter.
- vi. For maximum performance, it is highly recommended to install the adapter into a PCIe x8/x16 slot.



All 4-ports of T6425-CR adapter will be functional only if PCIe x8 -> 2x PCIe x4 slot bifurcation is supported by the system and enabled in BIOS. Otherwise, only 2-ports will be functional.

- vii. 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 transceiver modules prior to inserting the adapter.
- viii. Secure the Chelsio adapter with a screw, or other securing mechanism, as described by the system manufacturer's instructions. Replace the case cover.
- ix. After securing the card, ensure that the card is still fully seated in the PCIE x8/x16 slot as sometimes the process of securing the card causes the card to become unseated.
- x. Connect a fiber/twinax cable, multi-mode for short range (SR) optics or single-mode for long range (LR) optics, to the Ethernet adapter or regular Ethernet cable for the 1Gb Ethernet adapter.
- xi. Power on your system.
- xii. Verify if the adapter was installed successfully by using the Ispci command

~]# lspci   grep -i Chelsio	
0 Ethernet controller: Chelsio Communications Inc T6225-CR Unified Wire Ethernet	Controller
1 Ethernet controller: Chelsio Communications Inc T6225-CR Unified Wire Ethernet	Controller
2 Ethernet controller: Chelsio Communications Inc T6225-CR Unified Wire Ethernet	Controller
3 Ethernet controller: Chelsio Communications Inc T6225-CR Unified Wire Ethernet	Controller
4 Ethernet controller: Chelsio Communications Inc T6225-CR Unified Wire Ethernet	Controller
5 SCSI storage controller: Chelsio Communications Inc T6225-CR Unified Wire Stora	age Controller
6 Fibre Channel: Chelsio Communications Inc T6225-CR Unified Wire Storage Control	ller
2 Ethernet controller: Chelsio Communications Inc T6225-CR Unified Wire Ethernet 3 Ethernet controller: Chelsio Communications Inc T6225-CR Unified Wire Ethernet 4 Ethernet controller: Chelsio Communications Inc T6225-CR Unified Wire Ethernet 5 SCSI storage controller: Chelsio Communications Inc T6225-CR Unified Wire Stora	Controller Controller Controller age Controller

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

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

Once native network driver (*cxl*) is installed and loaded, examine the output of dmesg to see if the card is discovered. You should see a similar output:

Chapter I. Chelsio Unified Wire

2017-09-26T04:09:20.207Z cpu6:66032)cxl1.0: cxl port init:874: mbox 0 pf 0 chan 0 viid c0
2017-09-26T04:09:20.209z cpu6:66032)DMA: 646: DMA Engine 'cxl-0000:04:00.0' created using mapper 'DMANull'.
2017-09-26T04:09:20.209Z cpu6:66032)cxl1.0: cxl config queues:1091: max filters 120
2017-09-26T04:09:20.209z cpu6:66032)VMK_PCI: 765: device 0000:04:00.0 allocated 32 MSIX interrupts
2017-09-26T04:09:20.209Z cpu6:66032)cxl1.0: cxl_intr_alloc_msix:2581: net q 14 rss q 16 non rss q 13 tx q 8
2017-09-26T04:09:20.211Z cpu6:66032)cxl1.0: cxl rss do init:5221: pool 0 rss viid c1
2017-09-26T04:09:20.212Z cpu6:66032)cxl1.0: cxl rss init:2501: pool 0 rss mode 31
2017-09-26T04:09:20.212Z cpu6:66032)Chelsio T6225-CR rev 0 25G NIC PCIe 8 GT/s x8 MSI-X S/N: RE35160002, P/N: 11012096002

The above outputs indicate the hardware configuration of the adapter as well as serial number.

Note Network device names for Chelsio's physical ports are assigned using the following convention: The port farthest from the motherboard appears as the first network interface. However, for T5 40G adapters, the association of physical Ethernet ports and their corresponding network device names are opposite. For these adapters, the port nearest to the motherboard appears as the first network interface.

### 3. Software/Driver Installation

- i. Download the driver package from Chelsio Download Center.
- ii. Use the vSphere Client (desktop or web) to place the host in maintenance mode.

	.204.79   Monitor Cor	ACTIONS V Actions - 10.193.204.79			ource Pools	Datastores	Networks	Updates			
5	Hypervisor: Model: Processor Typ	🔁 New Virtual Machine		7	3.50GHz				CPU Used: 1.56 GHz	Free: 12.44 Capacity: 14	
	Logical Proces NICs:			10 @ 0	5.500112				Memory	Free: 43.3	_
	NICS: Virtual Machin	🚼 New vApp							Used: 4.57 GB Storage	Capacity: 47.8 Free: 308	
	State: Uptime:	Maintenance Mode	٠	🛃 Enter	r Maintenance Mo	ie			Used: 29 GB	Capacity: 337	.5 GB
		Connection	۲	🛃 Exit I	Maintenance Mode						
		Power	٠Ì								
0	I for the host has	Certificates	٠							Suppress Warni	
(1) SSH for th	ne host has been	Storage	٠							Suppress Warni	ng
Hardware		<u>9</u> Add Networking			~	Configurati	on				~
		Host Profiles	•								5
Tags		Export System Logs			^	Related Ob	jects				^
Assigned Tag		Reconfigure for vSpher		on							~
				_							*
✓ Status	~ t 0% ⊗	Settings		DCALV	Queued F Admi 4 ms	or `	✓ Start Time ↓ 04/16/2020, 7:		Completion Time V	Server 10.193.204.16	~ ^
		Move To		,						Mor	e Tasks

iii. Install the drivers.

```
[root@host:~] cp *.zip /productLocker/
[root@host:~] cp *.zip /var/log/vmware/
[root@host:~] esxcli software component apply --depot=/productLocker/VMW-
esx-7.0.0-Chelsio-Drivers-5.3.0.33-10EM.700.1.0.15843807.zip --no-sig-check
```



- iv. Once the installation or update is successfully completed, exit from maintenance mode and reboot the host.
- v. Verify that the drivers are installed successfully.

```
[root@host:~] esxcli software component vib list --component=Chelsio-Drivers
```

[root@azure1:~] esxcli software component vib list --component=Chelsio-Drivers Name Version Vendor Acceptance Level Install Date cheiwarp 5.3.0.33-10EM.700.1.0.15843807 CHL VMwareCertified 2025-02-25 5.3.0.33-10EM.700.1.0.15843807 CHL VMwareCertified 2025-02-25 cxl cheiscsi 5.3.0.33-10EM.700.1.0.15843807 CHL VMwareCertified 2025-02-25

### 4. Software/Driver Uninstallation

**1** Note Before proceeding with the uninstallation, ensure that no iSCSI, iSER, or NVMe-oF session or connection is active and running.

i. Use the vSphere Client (desktop or web) to place the host in maintenance mode:

10.193.204.79	ACTIONS ~	~	
Summary Monitor C Hypervisor: Model: Processor Ty Logical Proc NICs: Virtual Mach	New Virtual Machine     Deploy OVF Template      New Resource Pool      New Nexo	Resource Pools Datastores Networks Updates	Free: 12.44 GHz Capacity: 14 GHz Free: 43.32 GB Capacity: 47.89 GB Free: 308.5 GB
State: Uptime:	Maintenance Mode Connection Power	Enter Maintenance Mode      Uver: 29 GB      Uver: 29 GB	Capacity: 337.5 GB
<ul> <li>ESXi Shell for the host ha</li> <li>SSH for the host has been</li> </ul>	Certificates		Suppress Warning Suppress Warning
Hardware	🔮 Add Networking	Configuration	~
Tags Assigned Tag	Host Profiles Export System Logs Reconfigure for vSpher	Related Objects	^ U
V Status V	♥→ Assign License       t       Settings       Move To	✓         Queued For         ✓         Start Time ↓         ✓         Completion Time           DCAL\Admi         4 ms         04/16/2020, 7:47:59 PM	V Server V 10.193.204.16 V More Tasks

ii. Uninstall the drivers.

```
[root@host:~] esxcli software component remove --component=Chelsio-Drivers
[root@azure1:~] esxcli software component remove --component=Chelsio-Drivers
Removal Result
Components Installed:
Components Removed: Chelsio-Drivers_5.3.0.33-10EM.700.1.0.15843807
Components Skipped:
Message: The update completed successfully, but the system needs to be rebooted for the changes to be effective.
Reboot Required: true
```

#### iii. Reboot the host.

[root@host:~] reboot

### 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 Download Center for regular updates on various software/drivers. You can also subscribe to our newsletter for the latest software updates.

# **II.** Native Network Driver with SR-IOV Support

### 1. Introduction

Chelsio's Unified Wire adapters provide extensive support for NIC operation. A high performance fully offloaded and fully featured TCP/IP stack meets or exceeds software implementations in RFC compliance. Chelsio's Terminator engine provides unparalleled performance through a specialized data flow processor implementation and a host of features designed for high throughput and low latency in demanding conditions and networking environments.

### **1.1. Hardware Requirements**

### 1.1.1. Supported Adapters

The following are the adapters that are compatible with the Chelsio native network driver:

- T62100-CR
- T62100-LP-CR
- T62100-SO-CR
- T6425-CR
- T6225-CR
- T6225-LL-CR
- T6225-SO-CR
- T580-CR
- T580-LP-CR
- T580-SO-CR
- T540-CR
- T540-LP-CR
- T540-SO-CR
- T540-BT
- T520-CR
- T520-LL-CR
- T520-SO-CR
- T520-BT

### **1.2.** Software Requirements

#### 1.2.1. ESXi Requirements

The native network driver has been developed to run on the following 64-bit ESXi platforms:

• Host:

- ESXi 7.0
- ESXi 7.0 Update 3

10 Note iSER is supported only on ESXi 7.0.

- Virtual Machine (with VFs):
  - RHEL/Rocky Linux 9.5, 5.14.0-162.6.1.el9\_1.x86\_64
  - RHEL/Rocky Linux 9.4, 5.14.0-70.13.1.el9\_0.x86\_64
  - RHEL/Rocky Linux 8.10, 4.18.0-425.3.1.el8.x86\_64
  - RHEL/Rocky Linux 8.9, 4.18.0-372.9.1.el8.x86\_64
  - Kernel.org 6.12.16
  - Kernel.org 6.6.79
  - Windows Server 2025
  - Windows Server 2022

#### 1.2.2. SR-IOV Requirements

- SR-IOV should be enabled in the BIOS.
- Intel Virtualization Technology for Directed I/O (VT-d) should be enabled in the BIOS.
- PCI Express Slot should be ARI capable.

### 2. Software/Driver Loading

After rebooting the ESXi Host, the driver loads automatically. However, it is possible to manually load the driver by using the command below:

```
[root@host:~] vmkload_mod cxl
```

Execute the following command so that the device manager performs a rescan:

[root@host:~] kill -SIGHUP \$(cat /var/run/vmware/vmkdevmgr.pid)

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

### **3.1. Multiple Adapters**

By default, the cxl driver initializes the eight Chelsio ports. In case of using multiple adapters, set the *max\_ports* module parameter and reboot the machine.

```
[root@host:~] esxcfg-module -s max_ports=N cxl
[root@host:~] reboot
```

10 Note This setting is persistent across reboots and need not be applied every time.

Example: To use three numbers of T540-CR (4-port) adapters, with a total of 12 Chelsio ports:

```
[root@host:~] esxcfg-module -s max_ports=12 cxl
[root@host:~] reboot
```

## 3.2. cxgbtool

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. The tool will be installed by default on installing the driver.

#### Syntax and Usage

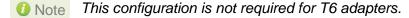
To use cxgbtool, use the syntax:

```
[root@host:~] /opt/chelsio/bin/cxgbtool <options>
```

**(**) Note For information on available parameters and their usage, refer to cxgbtool help by running the /opt/chelsio/bin/cxgbtool -h command.

### 3.3. Adapter Configuration

The adapter's configuration should be updated for optimal performance in ESXi environment.



Run the following *cxgbtool* command and reboot the machine.

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c esxcfg -set
[root@host:~] reboot
```

### 3.4. Firmware Update

The driver will auto-load the firmware if an update is required. The version can be verified using:

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c version
```

### 3.5. Connecting a Virtual Machine

Follow the steps mentioned below to connect the Chelsio adapter to a virtual machine:

i. Create a new virtual switch.

[root@host:~] esxcfg-vswitch -a vSwitchN

ii. Link a Chelsio adapter to the newly created virtual switch.

[root@host:~] esxcfg-vswitch -L vmnicN vSwitchN

iii. Create a new port group on the vSwitch.

[root@host:~] esxcfg-vswitch -A <port group name> vSwitchN

iv. From the vSphere client, right-click on the virtual machine, select the virtual network adapter to be used, and attach the newly created port group.



#### 3.6.1. Instantiate VFs

Follow the steps mentioned below to instantiate virtual functions:

i. *max\_vfs* is a comma separated module parameter that specifies the maximum number of VFs per port. Load the Native Network driver (cxl) with *max\_vfs* parameter and set it to a non-zero value. In case of multiple adapters, use ',,' to separate the number of VFs per adapter:

[root@host:~] esxcfg-module cxl -s max\_vfs=W,X,,Y,Z

Where,

W: Number of VFs per port 0 of adapter 0.

- X: Number of VFs per port 1 of adapter 0.
- Y: Number of VFs per port 0 of adapter 1.
- Z: Number of VFs per port 1 of adapter 1.

*i* Note A maximum of 16 VFs can be instantiated per port.

Example: To instantiate 3 VFs for port 1 of adapter 0 and 4 VFs for port 0 of adapter 1:

[root@host:~] esxcfg-module cxl -s max vfs=0,3,,4,0

ii. Verify *max\_vfs* setting using the *-g* option:

[root@host:~] esxcfg-module -g cxl

- iii. Reboot the ESXi host to apply the changes.
- iv. Check if VFs were instantiated successfully on the PCI bus by either using the shell prompt (using *lspci*) or GUI.

[root@ :~] lspci | grep Chelsio 0000:05:00.0 Network controller: Chelsio Communications Inc. T580-LP-CR Unified Wire Ethernet Controller [vmnic4] 0000:05:00.1 Network controller: Chelsio Communications Inc. T580-LP-CR Unified Wire Ethernet Controller [vmnic5] 0000:05:00.3 Network controller: Chelsio Communications Inc. T580-LP-CR Unified Wire Ethernet Controller [vmnic6] 0000:05:00.3 Network controller: Chelsio Communications Inc. T580-LP-CR Unified Wire Ethernet Controller [vmnic7] 0000:05:00.4 Network controller: Chelsio Communications Inc. T580-LP-CR Unified Wire Ethernet Controller [vmnic7] 0000:05:00.5 Mass storage controller: Chelsio Communications Inc T580-LP-CR Unified Wire Storage Controller 0000:05:00.6 Serial bus controller: Chelsio Communications Inc T580-LP-CR Unified Wire Storage Controller 0000:05:01.0 Network controller: Chelsio Communications Inc T580-LP-CR Unified Wire Storage Controller 0000:05:01.1 Network controller: Chelsio Communications Inc T580-LP-CR Unified Wire Ethernet Controller 0000:05:01.1 Network controller: Chelsio Communications Inc T580-LP-CR Unified Wire Ethernet Controller 0000:05:01.1 Network controller: Chelsio Communications Inc T580-LP-CR Unified Wire Ethernet Controller [PF\_0.5.0\_VF\_0] 0000:05:01.1 Network controller: Chelsio Communications Inc T580-LP-CR Unified Wire Ethernet Controller [Pf\_0.5.0\_VF\_1] 0000:05:01.4 Network controller: Chelsio Communications Inc T580-LP-CR Unified Wire Ethernet Controller [Pf\_0.5.0\_VF\_1]

Host	System	Hardware	Licensing	Packages	Services	Security & users				
Manage										
Monitor	PCI Dev	ices	8	Toggle passthrough	🖉 🥖 Config	gure SR-IOV 🥒 Hardware label 🔹 Reboot host 🕴 🤁 Refresh			Q Search	
D Virtual Machines	4 Power I	llanagement		Address	~	Description	~ SR-IOV	Passthrough v	Hardware Label	~
Storage	3			0000:00:02.0		Intel Corporation Xeon E7 v2/Xeon E5 v2/Core i7 PCI Express Root Port 2a	Not capable	Not capable		
				0000:04:08.5		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:08.4		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:08.1		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:08.0		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:07.5		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:07.4		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:07.1		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:07.0		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:06.5		Chelsio Communications Inc T6225-CR Unified Wire Ethernet Controller [VF]	Not capable	Active		
				0000:04:06.4		Chelsin Communications Inc T6225-CR Unified Wire Ethernet Controller IVEI	Not canable	Active		
			Q	uick filters		v			241 i	item

#### 3.6.2. Assigning VFs to VMs

Once the SR-IOV VFs are enabled/instantiated successfully on the host, they can be associated with Virtual Machines (VMs). The VFs can be assigned to VMs as:

- SR-IOV passthrough network adapters
- PCI Devices
- Note
- Unloading host network driver (cxl) when VFs are attached to VMs is not supported by VMware.
- T5 Adapters are not supported in Windows VMs with SR-IOV.

### • SR-IOV passthrough network adapters

i. Right Click on the VM and select Edit Settings. Click Add Network Adapter.

rtual Hardware VM Options		
Add hard disk 🛤 Add netwo	rk adapter 🗧 Add other device	
CPU 🛕	12 ~ (1)	
Memory 🥂	32 GB ~	
🔜 Hard disk 1 🛕	55 GB ~	$\otimes$
SCSI Controller 0	VMware Paravirtual	$\otimes$
SATA Controller 0		$\otimes$
Metwork Adapter 1	VM Network   Connect	$\otimes$
ightarrow CD/DVD Drive 1	~	$\otimes$
Video Card	Specify custom settings ~	
M Security devices	Not configured	

ii. Select the required Port Group and select Adapter Type as SR-IOV passthrough.

🔁 Edit settings - RHEL95_177 (ESXi 7.0	virtual machine)		
		8	
SATA Controller 0		$\otimes$	
Network Adapter 1	VM Network 🗸 VI Connect	$\otimes$	
<ul> <li>New Network Adapter</li> </ul>	T6 VM Network V	$\otimes$	
Status	Connect at power on		
Adapter Type	SR-IOV passthrough ~		
Memory reservation	To enable PCI passthrough or SR-IOV, the VM's memory will be reserved.		
Physical function	T6225-CR Unified Wire Ethernet Controller - 0000:42:00.0 ~		
MAC Address	T6225-CR Unified Wire Ethernet Controller - 0000:42:00.0           T6225-CR Unified Wire Ethernet Controller - 0000:42:00.1		l
Guest OS MTU Change	Disallow		
	×	8	
	Sa	ve Canc	el

iii. Select the required Physical Function (Port) to use and click Save.

#### • PCI Devices

i. Right-click on the VM and select Edit Settings. Click Add other device and select PCI device.

🗗 Edit settings - RHEL95_177 (ESXi 7.0	virtual	l mac	hine)				
Virtual Hardware VM Options							- I
Add hard disk M Add network ada	apter		Add other device				_
🕨 🗖 CPU 🚹	12	0	CD/DVD drive				
Memory 🅂		-	Floppy drive				- 1
	32	010	Serial port				
🕨 🔜 Hard disk 1 🛕	55	P	Parallel port				$\otimes$
SCSI Controller 0	VM	÷	USB controller				8
SATA Controller 0							
		0	Sound controller				8
Network Adapter 1	VM	a.	PCI device	~	Connect		8
► i CD/DVD Drive 1			Dynamic PCI device	~			$\otimes$
▶ 🛄 Video Card	Spe	¢	SCSI controller				
	<u> </u>	SATA	SATA controller				
Ecurity devices	Not c		NVMe controller				
		8	Watchdog Timer			Save	Cancel
		8	Precision Clock		_	_	A

ii. Select the required Chelsio VF and click Save.

/irtual Hardware VM Options		
Add hard disk Mark Add netwo	rk adapter 🛛 🔚 Add other device	
🕨 🖬 CPU 🛕	12 🗸 🚺	
Memory 🛕	32 GB ~	
🕨 🔜 Hard disk 1 <u>/</u>	55 GB ~	$\otimes$
SCSI Controller 0	T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:01.0	8
SATA Controller 0	T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:01.1 T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:01.4	8
Network Adapter 1	T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:01.5	8
Solution State     Solution     Solutio	T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:02.0 T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:02.1	8
Video Card	T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:02.4 T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:02.5	
New PCI device	T6225-CR Unified Wire Ethernet Controller [VF] - 0000:42:01.0 V	$\otimes$

For more information on configuring SR-IOV, refer to VMware's official documentation.

#### 3.6.3. Using VFs in Linux VM

To use the newly attached VFs in a virtual machine, follow the steps mentioned below:

- i. Power-on the Virtual Machine with VF attached to it.
- ii. Verify that the Chelsio VF shows up in the VM using the *lspci* command.

```
[root@host~]# lspci | grep Chelsio
00:08:0 Ethernet controller: Chelsio Communications Inc T580-LP-CR Unified
Wire Ethernet Controller [VF]
```

iii. Download the latest *Chelsio Unified Wire* driver package, from Chelsio Download Center. iv. Untar the tarball using the following command.

[root@host~]# tar zxvf ChelsioUwire-x.xx.x.tar.gz

v. Change you current working directory to *ChelsioUwire-x.xx.x.x* directory and install the VF driver using the following command.

[root@host~]# make vnic install

vi. Load the VF driver in the VM using the below command.

[root@host~]# modprobe cxgb4vf

**1** Note To know more about Chelsio Virtual Function driver, refer to the Chelsio Unified Wire for Linux User Guide.

vii. Bring up the VF interface with the IP address and it will communicate with other VFs or hosts.

[root@host~]# ifconfig ethX <IPv4/IPv6 address> up

#### 3.6.4. Using VFs in Windows VM

To use the newly attached VFs in a virtual machine, follow the steps mentioned below:

- i. Power-on the Virtual Machine with VF attached to it.
- ii. Download the latest Chelsio Unified Wire driver package, from Chelsio Download Center.
- iii. Install the Chelsio Unified Wire using the installer or zip package.

10 Note Refer to the Chelsio Unified Wire for Windows User Guide for detailed instructions.

iv. Assign the required IP addresses for the VF in Network Connections.

**1** Important T5 Adapters are not supported in Windows VMs with SR-IOV.

#### 3.6.5. VF Link State

VF link state depends on the physical port link status by default. To override this and always enable the VF link, follow the below procedure. This enables VF to VF communication irrespective of the physical port link status.

i. Update the vfstate using the following command on the host.

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c vfopt -idx <VF ID> -vfstate 2 -a
<adap> -p <port>
```

```
[root@zojila:~] /opt/chelsio/bin/cxgbtool -c vfopt -idx 2 -vfstate 2 -a 0 -p 1
Setting vf link status successful
```

ii. View the current vfstate.

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c vfopt -idx <VF ID> -a <adap> -p
<port>
```

[root@zojila:~] /opt/chelsio/bin/cxgbtool -c vfopt -idx 2 -a 0 -p 1
vf link state: 2

iii. Toggle the VF interface on the VM to apply the changes.

[root@host~]# ifconfig ethX down
[root@host~]# ifconfig ethX up

vfstate can be set to 1 for default behavior.

#### 3.6.6. Example

i. In this example, two VFs are instantiated per port, hence a total of four VFs instantiated on the host. The host is then rebooted.

```
[root@host:~] esxcfg-module cxl -s max_vfs=2,2
[root@host:~] reboot
```

- ii. Four VMs are set up in the following combination:
  - VF0 of PF0 (VF marked with the bus-id <PCIslot.01.0>) is assigned to VM1
  - VF1 of PF0 (VF marked with the bus-id <PCIslot.01.4>) is assigned to VM2
  - VF0 of PF1 (VF marked with the bus-id <PCIslot.01.1>) is assigned to VM3
  - VF1 of PF1 (VF marked with the bus-id <PCIslot.01.5>) is assigned to VM4
- iii. VMs are powered up one after another.
- iv. VF driver (*cxgb4vf*) is installed and loaded in all the VMs.

The above configuration results in the following connectivity:

- VFs of the same port can communicate with each other. That is VM1 can communicate with VM2, and VM3 can communicate with VM4.
- VFs of port 0 (VM1 and VM2) will be able to communicate with any peer connected to port 0 of the network adapter.
- VFs of port 1 (VM3 and VM4) will be able to communicate with any peer connected to port 1 of the network adapter.

### 3.6.7. Configuring VLANs

If the VFs are attached as SR-IOV passthrough network adapters to the VMs, VLAN can be configured at the port group. After configuring the VLAN, the VF network driver should be reloaded on the VM to apply the changes.

```
[root@host~] # rmmod cxgb4vf
[root@host~] # modprobe cxgb4vf
```

For Windows VMs, disable and enable the **Chelsio Bus Enumerator [Virtual Function]** in System Devices of the Device Manager to apply the changes.

# 4. Software/Driver Unloading

To unload the Native Network driver, execute the command below:

[root@host:~] vmkload\_mod -u cxl



If iSCSI, iSER or NVMe-oF Offload Initiator Driver is loaded, unload it before unloading the native network driver.

## **III. iSCSI Offload Initiator Driver**

### 1. Introduction

The Chelsio Unified Wire series of adapters are Independent Hardware iSCSI adapters. They support iSCSI acceleration and iSCSI Direct Data Placement (DDP) where the hardware handles the expensive byte touching operations, such as CRC computation and verification, and direct DMA to the final host memory destination:

#### • iSCSI PDU digest generation and verification

On transmit -side, Chelsio hardware computes and inserts the Header and Data digest into the PDUs. On receive-side, Chelsio hardware computes and verifies the Header and Data digest of the PDUs.

#### • Direct Data Placement (DDP)

Chelsio hardware can directly place the iSCSI Data-In or Data-Out PDU's payload into preposted destination host-memory buffers based on the Initiator Task Tag (ITT) in Data-In or Target Task Tag (TTT) in Data-Out PDUs.

#### • PDU Transmit and Recovery

On transmit-side, Chelsio hardware accepts the complete PDU (header + data) from the host driver, computes and inserts the digests, decomposes the PDU into multiple TCP segments if necessary, and transmits all the TCP segments onto the wire. It handles TCP retransmission if needed. On the receive-side, Chelsio hardware recovers the iSCSI PDU by reassembling TCP segments, separating the header and data, calculating and verifying the digests, then forwarding the header to the host. The payload data, if possible, will be directly placed into the pre-posted host DDP buffer. Otherwise, the data will be sent to the host too.

### 1.1. Hardware Requirements

### 1.1.1. Supported Adapters

The following are the adapters that are compatible with Chelsio iSCSI Offload Initiator driver:

- T62100-CR
- T62100-LP-CR
- T6425-CR
- T6225-CR
- T6225-LL-CR
- T6225-SO-CR (Memory Free; 256 IPv4/128 IPv6 offload connections supported)
- T580-CR
- T580-LP-CR
- T540-CR
- T540-LP-CR
- T540-BT
- T520-CR
- T520-LL-CR
- T520-BT

### 2. Software/Driver Loading

After rebooting the ESXi Host, the driver loads automatically. However, it is possible to manually load the driver.

```
[root@host:~] vmkload mod cheiscsi
```

Execute the following command, so that the device manager performs a rescan:

```
[root@host:~] kill -SIGHUP $(cat /var/run/vmware/vmkdevmgr.pid)
```



Execute the below command to restore the Advanced Options of storage adapter after cheiscsi reload:

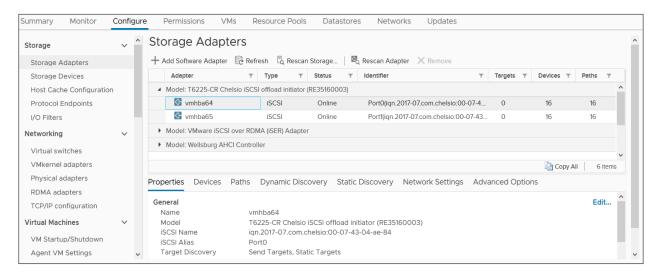
[root@host:~] esxcfg-rescan -A

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

The following sections describe the method to configure the Chelsio iSCSI Offload Initiator and connect to target.

# 3.1. Configuring Initiator

- i. Log in to vCenter Server through vSphere Web Client using a web browser.
- ii. If you have already created and configured the host intended to be used as initiator, skip to step (iii).
  - a. Under **Hosts and Clusters**, right-click and click **New Datacenter...** Provide a name and click **OK**.
  - b. Right-click on the newly created datacenter and click **Add Host...** Follow the onscreen instructions and provide information to add the host. Click **Finish**.
- iii. Select the host and under the **Configure** tab, select **Storage Adapters**. This displays the list of available Chelsio iSCSI adapters.



You can also view the list in CLI using:

[root@host:~] esxcli iscsi adapter list

iv. In the Adapter Details section, click Network Settings tab and then Edit.

v. Configure IPv4 address for the adapter and click OK.

	Edit IP and DNS Co	nfiguration vmhba64	1	×
			•	~
	✓ IPv4 settings			
		○ No IPv4 sett	ings	
			settings automatically	
		<ul> <li>Use static IP</li> </ul>		
		IPv4 address:		
		10.200.200.79		
		Subnet mask fo	r IPv4:	
		255.255.255.0		
		Default gateway	of or IPv4:	
		10.200.200.1	10111-04.	
	> IPv6 settings			Disabled ~
	> DNS settings			
				CANCEL OK
ns	Dynamic Discovery	Static Discovery	Network Settings	Advanced O



vi. To use IPv6 address, use the below command.

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c chnet -set -6 -ipaddr <IPv6
address> -gw <IPv6 gateway> -plen <subnet mask> -p <port>
```

```
[root@localhost:~] /opt/chelsio/bin/cxgbtool -c chnet -set -6 -ipaddr 2000::79 -gw 2000::1 -plen 64 -p 0
Setting chnet Configuration:
    Adapter name : vmhba64
    Node id : 0
    Operation : Setting Ipv6
    IP : 2000::79
    prefix len : 64
    Gateway : 2000::1
    Status : Success
```

vii. To apply the changes, rescan the iSCSI adapter.

10.193.204.79	ACTI	ons 🗸									
Summary Monitor	Configure	Permissions	VMs	Resource Pools	Datastores	Networks	Updates				
Storage	~ ^	Storage Ada	apters								
Storage Adapters		+ Add Software Ada	ipter 🗟 Re	fresh 🗓 Rescan	Storage 🕅	Rescan Adapter	× Remove				
Storage Devices		Adapter	Т	Туре т	Status T	Identifier	Ŧ	Targets	T Devices	T Paths	T
Host Cache Configuratio	n	Model: T6225-C	R Chelsio iSC	SI offload initiator (	RE35160003)						^
Protocol Endpoints		🚱 vmhba64		iSCSI	Online	Port0(ign.2017-0	7.com.chelsio:00-07-4	0	0	0	

# 3.2. Connecting to Target

There are two methods to discover and connect to targets:

- **Dynamic Discovery:** Discovers all the available targets for a given target server.
- Static Discovery: Discovers a specific target by manually entering target information.

#### 3.2.1. Dynamic Discovery

- Adding Target Server
- i. Select the iSCSI adapter to connect to the target and select Dynamic Discovery.

Summary Monitor	Configu	re Permissions VMs Re	esource Pools	Datastore	s Networks Updates				
Storage	~ ^	Storage Adapters							
Storage Adapters		+ Add Software Adapter 🛛 🗟 Refre	esh 🖏 Rescan	Storage   💐	Rescan Adapter X Remove				
Storage Devices		Adapter T	Туре т	Status T	Identifier T	Targets T	Devices T	Paths	Ψ
Host Cache Configuration		Model: T6225-CR Chelsio iSCSI	offload initiator (	(RE35160003)					
Protocol Endpoints		🔄 vmhba64	ISCSI	Online	Port0(iqn.2017-07.com.chelsio:00-07-4	0	0	0	
I/O Filters		🚱 vmhba65	ISCSI	Online	Port1(iqn.2017-07.com.chelsio:00-07-43	0	0	0	
Networking	~	Model: VMware iSCSI over RDM	A (iSER) Adapter						
Virtual switches		Model: Wellsburg AHCI Controlle	er						
Virtual switches VMkernel adapters							Dec. 1		
Physical adapters							Copy A	JI 6 Ite	ems
RDMA adapters		Properties Devices Paths	Dynamic Disco	overy Static	Discovery Network Settings Adva	anced Optio	ons		
RDMA adapters		+ Add × Remove Authentica	tion Advance						
T 00 /00									
TCP/IP configuration		ISCSI server							$\sim$

ii. Click Add and provide the target server IP. Click OK.

Add Send T	arget Server vmhba64	×
iSCSI Server:	102.1.1.247	
Port:	3260	\$
Inherit authenticat	ion settings from parent	

- iii. To apply the changes, rescan the iSCSI adapter.
- iv. All the available LUNs discovered on the given target server will be displayed in the **Devices** tab. You can perform various tasks like detach, rename, erase partitions, etc.

Storage	~	Storage Adapters										
Storage Adapters		+ Add Software Adapter	fresh 🖏	Rescan Ste	orage 🛛 🖉 Re	scan Adapter	× Remove					
Storage Devices		Adapter	т Туре	Ψ	Status T	Identifier		т Те	argets 🔻	Devices T	Paths T	
Host Cache Configu	iration	Model: T62100-CR Chelsio iS	CSI offload i	nitiator (P1	T09190708)							^
Protocol Endpoints		🔄 vmhba64	iSCSI		Online	Port0(iqn.201	7-07.com.chelsio:00-07	43	50	50	50	
I/O Filters		🔄 vmhba65	iSCSI		Online	Port1(iqn.2017	-07.com.chelsio:00-07-	43-5	0	0	0	1
Networking	>	Model: VMware iSCSI over RE	MA (iSER) A	Adapter								
	ŕ	M umbha66	ienei		Unbound	icor umnic0/ic	n 1000 01 com umuroro	local	0	0	0	~
Virtual Machines	>									Copy A	II 6 Item	IS
System	>	Properties Devices Paths	Dynami	c Discov	ery Static Dis	covery Net	work Settings Ad	vanced (	Options			
Hardware	>	Refresh   🗟 Attach 🕏 De Mark as Perennially Reserved	etach 📷 🕅 F	ename	🥝 Turn On LED	Turn Off LE	D 🛛 🔊 Erase Partitions	Hoo Ma	rk as HDD [	Disk 🛃 Mark a	as Local	
Virtual Flash	>	Name ~	LUN 🗸	Туре	<ul> <li>Capacity </li> </ul>	Datasto 🗸	Operational S 🗸	Hardware A	Accelera	Drive T	Transpor	t
Alarm Definitions		LIO-ORG iSCSI Disk (naa.600	1	disk	2.00 GB	Not Cons	Attached	Supported	l.	Flash	iSCSI	^
Scheduled Tasks		LIO-ORG ISCSI Disk (naa.600	6	disk	2.00 GB	Not Cons	Attached	Supported	1	Flash	ISCSI	
						Not Cono	Association	C			IC CCI	

The **Paths** tab displays LUN status and allows you to enable or disable them.

Properties	Properties Devices Paths		Dynamic Discovery	Static Discovery	Network Set	ttings	Advanced Optic	ns		
Enable Disa	able									
Runtime Nar	ne	~	Target		~	LUN	~	Status	~	
vmhba64:C	0:T0:L1					1		Active (I/O)		^
vmhba64:C	0:T5:L6					6		Active (I/O)		
vmhba64:C	0:T44:L45					45		Active (I/O)		
vmhba64:C	0:T9:L10					10		Active (I/O)		

These LUNs can now be attached to VMs or can be used to store VMs.

- Removing Target Server
- i. Under **Dynamic Discovery** tab, select target server, click **Remove** and then **OK** to confirm.

Properties	Devices	Paths	Dynamic Discovery	Static Discovery	Network Settings	Advanced Options			
+ Add Kemove Authentication Advanced									
ISCSI server									
102.1.1.247:3	3260						^		

ii. To apply the changes, rescan the iSCSI adapter.

#### 3.2.2. Static Discovery

- Adding Target Server
- i. Select the iSCSI interface to connect to the target and select Static Discovery tab.

Summary Monito	r Co	onfigure Permissions	VMs Resource	Pools Datas	tores Networks Updates				
Storage	$\sim$	Storage Adapt	ers						
Storage Adapters		+ Add Software Adapter	🗟 Refresh 🛛 🖏 Rescan	Storage   🔍 R	Rescan Adapter 🗙 Remove				
Storage Devices		Adapter	т Туре т	Status T	Identifier T	Targets T	Devices T	Paths T	r
Host Cache Configu	ration	Model: T62100-CR Ch	elsio iSCSI offload initiator	(PT09190708)					^
Protocol Endpoints		🔄 vmhba64	iSCSI	Online	Port0(iqn.2017-07.com.chelsio:00-07-43	. 0	50	50	
I/O Filters		🚱 vmhba65	ISCSI	Online	Port1(iqn.2017-07.com.chelsio:00-07-43-5	0	0	0	
Networking	>	Model: VMware iSCSI	over RDMA (iSER) Adapter						
Virtual Machines	>	🛆 umbha66	ienei	Unbound	icar.umnic2/ian.1009_01_cam.umwara:laca	0	Copy A	dl 6 Iter	ms 💙
System	>	Properties Devices	Paths Dynamic Disc	overy Static D	iscovery Network Settings Advan	ced Options			
Hardware	>	+ Add × Remove A	uthentication Advance						
Virtual Flash	>	ISCSI server		✓ Targe	et Name			~	~

ii. Click Add and provide the target server IP and target IQN. Click OK.



- iii. To apply the changes, rescan the iSCSI adapter.
- iv. All the available LUNs discovered on the given target server will be displayed in the **Devices** tab. You can perform various tasks like detach, rename, erase partitions, etc.

屆 10.193.184.1	69	ACTIONS Y							
Summary Monito	r C	onfigure Permissions V	Ms Resource F	Pools Datast	ores Networks Updates				
Storage	~	Storage Adapters							
Storage Adapters		+ Add Software Adapter 🛛 🗟 R	efresh 🗓 Rescan S	itorage   🖾 Re	scan Adapter 🛛 🗙 Remove				
Storage Devices		Adapter	т Туре т	Status T	Identifier	т	Targets 🔻	Devices T	Paths T
Host Cache Configu	ration	Model: T62100-CR Chelsio is	CSI offload initiator (F	PT09190708)					
Protocol Endpoints		S vmhba64	iSCSI	Online	Port0(iqn.2017-07.com.chelsio:00-07	7-43	1	1	1
I/O Filters		Vmhba65	iSCSI	Online	Port1(iqn.2017-07.com.chelsio:00-07	-43-5	0	0	0
etworking	>	Model: VMware iSCSI over R	DMA (iSER) Adapter						
/irtual Machines	>	C umbha66	10001	Unhound	icor umnic3/ian 1009.01.com umuora	local	0	Copy 4	All 6 Items
ystem	>	Properties Devices Paths	Dynamic Disco	very Static Dis	scovery Network Settings Ac	dvance	d Options		
lardware	>	Refresh   🔂 Attach 🐼 D Mark as Perennially Reserved	etach 🔊 Rename	. 🥥 Turn On LED	Turn Off LED	S H03	Mark as HDD [	Disk 🛃 Mark	as Local
/irtual Flash	>	Name ~	LUN 🗸 Type	<ul> <li>Capacity </li> </ul>	Datasto 🗸 Operational S 🗸	Hardwa	are Accelera	Drive T	<ul> <li>Transport</li> </ul>
larm Definitions		LIO-ORG iSCSI Disk (naa.600	1 disk	2.00 GB	Not Cons Attached	Suppo	rted	Flash	iSCSI
cheduled Tasks									

The Paths tab displays LUN status and allows you to enable or disable them.

Properties	Devices	Paths	Dynamic Discovery	Static Discovery	Network Se	ttings	Advanced Optic	ons		
Enable Disa	ible									
Runtime Nar	ne	~	Target		~	LUN	~	Status	~	
vmhba64:C	D:TO:L1					1		Active (I/O)		^

These LUNs can now be attached to VMs or can be used to store VMs.

#### Removing Target Server

i. Under Static Discovery tab, select the target server, click Remove and then OK to confirm.

Properties	Devices	Paths	Dynamic Discovery	St	atic Discovery	Network Settings	Advanced Options		
+ Add	K Remove	Authentic	ation Advanced						
ISCSI server				~	Target Name			$\sim$	
102.1.1.247:3	260				iqn.2015-16.org	.chelsio.iser1			^

ii. To apply the changes, rescan the iSCSI adapter.

# **3.3. Configurable Options**

The option to edit general initiator properties like alias and name is available under the **Properties** tab.

Edit Gei	Neral vmhba64	$\times$
iSCSI Name iSCSI Alias	iqn.2017-07.com.chelsio:00-07-43-50-f3-a4 Port0	<

Advanced parameters like Digest, MTU, etc., can be changed in the Advanced Options tab.

Option	Description	Value		
Header Digest	iSCSI adapter option : Header Digest		$\sim$	1
Data Digest	iSCSI adapter option : Data Digest		$\sim$	
мти	iSCSI adapter option : MTU	1500		
ErrorRecoveryLevel	iSCSI option : iSCSI Error Recovery Leve	el 0		
LoginRetryMax	iSCSI option : Maximum number of time	es 15		
MaxOutstandingR2T	iSCSI option : Maximum number of R2T	( 1		
FirstBurstLength	iSCSI option : Maximum unsolicited data	a i 262144		
MaxBurstLength	iSCSI option : Maximum SCSI data paylo	Da 262144		
MaxRecvDataSegLen	iSCSI option : Maximum data segment l	e 8192		
MaxCommands	iSCSI option : Maximum SCSI command	ls 0		
DefaultTimeToWait	iSCSI option : Minimum seconds to wait	<b>b</b> 20		
DefaultTimeToRetain	iSCSI option : Maximum seconds that a	<b>c</b> 20		~
			20 Item	1S

## 4. Software/Driver Unloading

Logout all the existing iSCSI sessions. Execute the command below to unload the iSCSI Offload Initiator driver:

```
[root@host:~] vmkload_mod -u cheiscsi
```

[root@KGF2:~] vmkload\_mod -u cheiscsi Module cheiscsi successfully unloaded

# **IV. iSER Offload Initiator Driver**

### 1. Introduction

The iSCSI Extensions for RDMA (iSER) protocol is a translation layer for operating iSCSI over RDMA transports, such as iWARP RDMA. Chelsio Unified Wire adapters supporting iWARP provide the higher bandwidth and lower latency required for block storage transfers. iSER is stable and provides benefits of the iSCSI protocol like security and high availability.

### **1.1. Hardware Requirements**

#### 1.1.1. Supported Adapters

The following are the adapters that are compatible with Chelsio iSER Offload Initiator driver:

- T62100-CR
- T62100-LP-CR
- T6425-CR
- T6225-CR
- T6225-LL-CR
- T6225-SO-CR (Memory Free; 256 IPv4/128 IPv6 offload connections supported)
- T580-CR
- T580-LP-CR
- T540-CR
- T540-LP-CR
- T540-BT
- T520-CR
- T520-LL-CR
- T520-BT

### 2. Software/Driver Loading

After rebooting the ESXi Host, the driver loads automatically. However, it is possible to manually load the driver.

```
[root@host:~] vmkload_mod cheiwarp
```

Execute the below command so that device manager performs a rescan:

[root@host:~] kill -SIGHUP \$(cat /var/run/vmware/vmkdevmgr.pid)

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

The following sections describe the method to configure Chelsio iSER Offload Initiator and connect to target.

# 3.1. Configuring Initiator

i. Enable the iSER adapter.

[root@host:~] esxcli rdma iser add

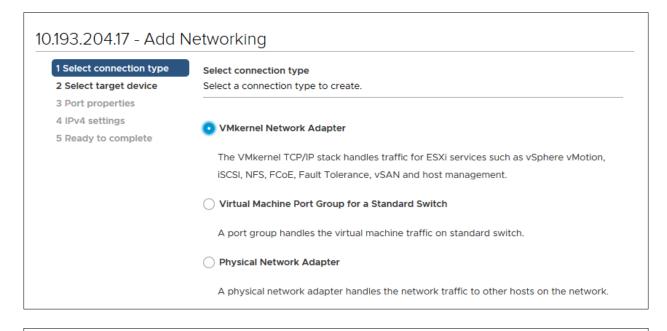
Once This is not persistent across reboots. To make it persistent, add the above command to /etc/rc.local.d/local.sh file.

- ii. Log in to vCenter Server through vSphere Web Client using a web browser.
- iii. If you have already created and configured the host intended to be used as initiator, skip to step (iv).
  - a. Under **Hosts and Clusters**, right-click and click **New Datacenter...** Provide a name and Click **OK**.
  - b. Right-click on the newly created datacenter and click **Add Host...** Follow the onscreen instructions and provide information to add the host. Click **Finish**.
- iv. Select the host and under the **Configure** tab, select **Storage Adapters**. This will display the list of available iSER adapters.

Summary	Monitor	Configu	re Permissions	VMs Resource Poe	ols Datastores	Networks	Updates	
Storage		~ ^	Storage Ada	oters				
Storage	Adapters		+ Add Software Adap	ter 🗟 Refresh 🛛 🖏 Res	can Storage 📔 💐 R	Rescan Adapter	× Remove	
Storage	Devices		Adapter	T	Туре т	Status	T Identifier	т
Host Cad	he Configuration	n	Model: ICH10 2 pc	rt SATA IDE Controller				
Protocol	Endpoints		Model: ICH10 4 pc	rt SATA IDE Controller				
I/O Filter	S		Model: VMware IS	CSI over RDMA (ISER) Ada	oter			
Virtual Fl Manager	lash Resource		🔄 vmhba68		ISCSI	Unbound	Iser-vmnic2	2(Iqn.1998-01.com.vmware:localhost.asicdesi
			🔄 vmhba69		ISCSI	Unbound	Iser-vmnic	3(iqn.1998-01.com.vmware:localhost.asicdesi
Networkin	g	~						
Virtual S	witches							
VMkerne	Adapters							
Physical	Adapters		Properties Device	s Paths Dynamic	Discovery Stati	c Discovery	Network Port Bi	nding Advanced Options
TCP/IP C	onfiguration		General					
Virtual Ma	chines	~	Name Model	vmhba68 VMware iSCSI over RDI	MA (iSER) Adapter			
VM Start	up/Shutdown		iSCSI Name	iqn.1998-01.com.vmwar	re:localhost.asicdesig	ners.com:12752	00167:68	
Agent VI	M Settings		iSCSI Alias Target Discovery	iser-vmnic2 Send Targets, Static Ta	raets			
Default \	/M Compatibility	,	raiget Discovery	Sena raigets, Static ra	ilgets			
Swap File	e Location		Authentication Method	None				
System		~						

v. Create a VMkernel adapter connected to Chelsio uplink by following the screenshots below.

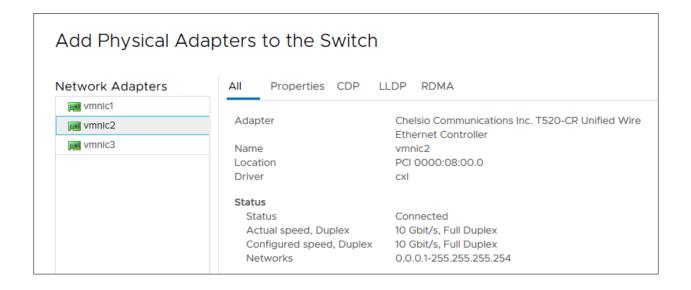
Summary Monitor	Config	gure Permis	sions	VMs F	Resource Po	ols Datas	tores	Networks	Updat	es	
Storage	> ^	VMkerne	el ada	pters							
Networking	~	Networ	king 🧕	Refresh	/ Edit )	K Remove					
Virtual Switches		Device	Ŧ	Network Lat	oel 🔻	Switch	Ŧ	IP Address	Ŧ	TCP/IP Stack	Ŧ
VMkernel Adapters		👥 vmk0		👰 Manag	ement N	Tryswitch0		10.193.204.17		Default	
Physical Adapters											
TCP/IP Configuration											



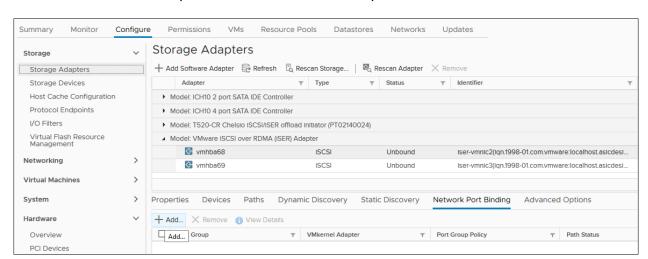
### 10.193.204.17 - Add Networking

1 Select connection type	Select target device		
2 Select target device	Select a target device for the new conne	ection.	
3 Create a Standard Switch			
4 Port properties	Select an existing network		
5 IPv4 settings			
6 Ready to complete			
			BROWSE
	Select an existing standard switch		
			BROWSE
	💿 New standard switch		
	MTU (Bytes) 1500	•	
	MTU (Bytes) 1500	•	

1 Select connection type	Create a Standard Switch	
2 Select target device	Assign free physical network	adapters to the new switch.
3 Create a Standard Switch 4 Port properties	Assigned adapters	
5 IPv4 settings	🛨   🗙 🏦 🐥	
6 Ready to complete	Add adapters	
	Standby adapters	
	Unused adapters	
		Select a physical network adapter from the
		list to view its details.



Summary Monitor	Config	gure Permissio	ons VMs	Resource Pool	s Datasto	res	Networks	Updat	es	
Storage	> ^	VMkernel	adapters							
Networking	~	🔮 Add Networkin	g 💮 Refresh	/ Edit 🗙	Remove					
Virtual Switches		Device	T Network	Label 🔻 S	witch	т	IP Address	т	TCP/IP Stack	T
VMkernel Adapters		📖 vmk0	👰 Με	nagement N	vSwitch0		10.193.204.17		Default	
Physical Adapters		pm vmk1	<u>9</u> vn	Ikernel	vSwitch1		10.200.200.17		Default	
TCP/IP Configuration										



vi. Bind the VMkernel adapter to the VMware iSER Adapter.

Binc	l vmhba68 with VM	lkei	rnel Adapter	10.193.204.1	7	$\times$
Only V	Mkernel adapters compatible with	the iS	CSI port binding require	ements and availa	ble physical network adapters are	listed.
	Port Group	Ŧ	VMkernel Adapter	т	Physical Network Adapter	Ŧ
	VMkernel (vSwitch1)		飅 vmk1		飅 vmnic2 (10 Gbit/s, Full)	

vii. To apply the changes, Rescan Adapter. The Status should show Online.

Summary	Monitor	Configur	e Permiss	ons V	Ms Resource	Pools I	Datastores	Networks	Up	pdates
Storage		~ ^	Storage	Adapt	ers					
Storage A	Adapters		+ Add Softw	are Adapter	Refresh	Rescan Stora	ge   🕅 🖓 F	lescan Adapter	imes Rer	emove
Storage [	Devices		Adap	ter		т Туре	Ŧ	Status	T	Identifier
Host Cac	he Configurati	on	Model: IC	H10 2 port	SATA IDE Controller					
Protocol	Endpoints		Model: IC	H10 4 port	SATA IDE Controller					
I/O Filters	5		▲ Model: V	Mware ISCS	l over RDMA (ISER)	Adapter				
Virtual Fla Managem	ash Resource		<b>C</b>	mhba68		ISCSI		Online		Iser-vmnic2(iqn.1998-01.com.vmware:localhost.asicdesi
managen	icine .		¢-	/mhba69		ISCSI		Unbound		iser-vmnic3(iqn.1998-01.com.vmware:localhost.asicdesi

## 3.2. Connecting to Target

Configure the iSER target machine with the IP Address, Target name, disks etc. For information on how to configure the iSER Target, refer to the *Chelsio Unified Wire for Linux User Guide*.

Important

Enable iwpmd service on the target machine. On RHEL7.X machines, use the following command:

[root@host~]# systemctl start iwpmd

There are two methods to discover and connect to targets:

- **Dynamic Discovery:** Discovers all the available targets for a given target server.
- Static Discovery: Discovers a specific target by manually entering target information.

#### 3.2.1. Dynamic Discovery

- Adding Target Server
- i. Select the iSER adapter to connect to the target and select Dynamic Discovery.

Summary Monitor	Configu	re Permissions	VMs R	esource Pools	Datastor	es Networks Updates					
Storage	~ ^	Storage Ad	apters								
Storage Adapters		+ Add Software Ad	lapter 🗟 Refi	esh 🗓 Rescar	Storage	o Rescan Adapter 🛛 🗙 Remove					
Storage Devices		Adapter	Ŧ	Туре т	Status T	Identifier	т	Targets 🔻	Devices T	Paths T	,
Host Cache Configuration		Model: T62100	CR Chelsio iSC	SI offload initiator	(PT09190708)						^
Protocol Endpoints		Model: VMware	ISCSI over RDI	MA (ISER) Adapte	r						
I/O Filters		🔄 vmhba6	6	iSCSI	Online	iser-vmnic2(iqn.1998-01.com.vmw	are:lo	0	0	0	
Networking	~	🚱 vmhba6	7	ISCSI	Unbound	iser-vmnic3(iqn.1998-01.com.vmw	are:lo	0	0	0	
Virtual switches		A Madal Mallab	ra ALICI Contro	llor					Copy A	II 6 Iter	ms
VMkernel adapters		Properties Devi	ces Paths	Dynamic Disc	overy Stati	Discovery Network Port Bind	ding /	Advanced O	ptions		
Physical adapters RDMA adapters		+ Add × Rem	ove Authentic	ation Advance	ed						
TCP/IP configuration		ISCSI server								· · · · ·	/
Virtual Machines	~										^

ii. Click Add and provide the target server IP. Click OK.

Add Send T	arget Server vmhba66	×
iSCSI Server:	102.1.1.247	
Port:	3260	•
Inherit authenticati	on settings from parent	

- iii. To apply the changes, Rescan Adapter.
- iv. All the available LUNs discovered on the given target server will be displayed in the **Devices** tab. You can perform various tasks like detach, rename, erase partitions, etc.

Summary Monitor	Confi	gure	Permissions	VMs F	Resource	Pools	Data	astores	Networks	Updates					
Storage	~	^	Storage Ada	pters											^
Storage Adapters			+ Add Software Ada	pter 🗟 Rei	fresh 🗓	Rescan	Storage	Reg R	escan Adapter	× Remove					
Storage Devices			Adapter	Ŧ	Туре	т	Status	T Io	dentifier		Targets T	Devices T	Paths	т	
Host Cache Configuration	n		Model: T62100-0	R Chelsio iSC	SI offload	initiator	(PT09190	708)						^	
Protocol Endpoints			Model: VMware i	SCSI over RD	MA (iSER)	Adapter									
I/O Filters			🚱 vmhba66		ISCSI		Online		iser-vmnic2(iqn.19	98-01.com.vmware:l	o 50	50	50		
Networking	$\sim$		🚱 vmhba67		iSCSI		Unbou	nd	iser-vmnic3(iqn.19	98-01.com.vmware:l	o 0	0	0		
Virtual switches			4 Madal: Mallaburg	ALICI Contro	llor							Copy .	All   6	v Items	
VMkernel adapters			Properties Device	es Paths	Dynam	ic Disco	overy	Static Dis	scovery Netw	vork Port Binding	Advanced (	Options			
Physical adapters			Refresh At		ta ala coñ	D	<b>0</b> T			D 🛛 🖉 Erase Partitio	an III Marka		Marilia	1	
RDMA adapters			Mark as Perennially Re		tacn 📷	Rename	: 🌝 IU	IM ON LED		D 🥥 Erase Partitio	Ins Mark a	IS HOD DISK	Mark as	Local	
TCP/IP configuration			Name	.serveu v		Trees		pacity ~	Determine	One set land Contract	Hardware Acce	lava i Dil	ve T V		1
Virtual Machines	$\sim$		LIO-ORG ISCSI Disk	-	LUN ~	Type disk	~ Ca	2.00 GB	Not Cons	Operational S V Attached	Supported	Fla		Th IS ^	
VM Startup/Shutdown		~	LIO-ORG iSCSI Disk	naa.600	48	disk		2.00 GB	Not Cons	Attached	Supported	Fla	sh	iS	~

#### The Paths tab displays LUN status and allows you to enable or disable them.

Properties	Devices	Paths	Dynamic Discovery	Static Discovery	Network	Port Binding	Advanc	ed Options	
Enable Disa	able								
Runtime Nar	ne	~	Target		~	LUN	~	Status	~
vmhba66:C	0:T2:L3		iqn.2015-16.org.chelsio.is	er3 :102.1.1.247:3260		3		Active (I/O)	^
vmhba66:C	0:T47:L48		iqn.2015-16.org.chelsio.is	er48 :102.1.1.247:3260		48		Active (I/O)	
vmhba66:C	0:T37:L38		ign.2015-16.org.chelsio.is	er38 :102.1.1.247:3260		38		Active (I/O)	

These LUNs can now be attached to VMs or can be used to store VMs.

#### Removing Target Server

During **Dynamic Discovery**, iSER targets also appear as static targets and need to be removed from the **Static** list.

- i. Go to the Static Discovery tab, and select all the target iSCSI servers.
- ii. Click **Remove** and then **OK** to confirm.

Properties Devices Paths Dynamic Discovery	Static Discovery Network Port Binding Advanced Options	
ADD REMOVE AUTHENTICATION ADVANCED		
SCSI server	Target Name	т
120.1.1.178:3260	iqn.2015-12.org.linux-iser.chelsio.1-target	
120.1.1.178:3260	iqn.2015-12.org.linux-iser.chelsio.2-target	
2   120.1.1.178:3260	iqn.2015-12.org.linux-iser.chelsio.3-target	

iii. Go to the Dynamic Discovery tab, and select all the target iSCSI servers.

#### iv. Click **Remove** and then **OK** to confirm.

Properties	Devices	Paths	Dynamic Discovery	Static Discovery	Network Port Binding	Advanced Options	
ADD R	EMOVE AU	THENTICATI	ON ADVANCED				
iscsi	server						т
120.1	1.1.178:3260						

v. To apply the changes, rescan the iSER adapter.

#### 3.2.2. Static Discovery

#### • Adding Target Server

i. Select the iSER interface to connect to the target and select Static Discovery.

Summary Mor	nitor	Configure	Permissions	VMs	Resource Pools	Datastores	Networks	Updates				
Storage		~ ^	Storage Ada	apters								^
Storage Adapte	ers		+ Add Software Ada	ipter 🗟 Re	efresh 🛛 🖏 Rescan	Storage 🛛 🖉 🛛	Rescan Adapter	× Remove				
Storage Devices	s		Adapter	٢	т Туре т	Status T	Identifier	Ŧ	Targets 🔻	Devices T	Paths	T
Host Cache Con	nfiguratio	on	Model: T62100-0	CR Chelsio iS	CSI offload initiator	(PT09190708)						^
Protocol Endpoi	ints		Model: VMware	iSCSI over R	DMA (iSER) Adapter							
I/O Filters			🚱 vmhba66		ISCSI	Online	iser-vmnic2(iqn.1	1998-01.com.vmware:lo.	0	0	0	
Networking		~	🚱 vmhba67		iSCSI	Unbound	iser-vmnic3(iqn.1	1998-01.com.vmware:lo.	0	0	0	
Virtual switches			Model: Wellsbur	g AHCI Conti	roller							
										The second	1	~
VMkernel adapt										Copy A	II   6 It	tems
Physical adapte			Properties Devic	es Paths	Dynamic Disco	overy Static D	iscovery Net	work Port Binding	Advanced C	Options		
RDMA adapters			+ Add × Remo	vo Authorit	tication Advance	d						
TCP/IP configura	ration		•	ve Addren	acaton Advance							
Virtual Machines		$\sim$	ISCSI server			✓ Target N	ame					×
VM Startup/Shu	utdown											-

ii. Click Add and provide the target server IP and target IQN. Click OK.

Add Static Ta	arget Server vmhba66	×
iSCSI Server:	102.1.1.247	
Port:	3260	-
iSCSI Target Name:	iqn.2015-16.org.chelsio.iser1	
☑ Inherit authentication	settings from parent	

- iii. To apply the changes, rescan the iSER adapter.
- iv. All the available LUNs discovered on the given target server will be displayed in the **Devices** tab. You can perform various tasks like detach, rename, erase partitions, etc.

Properties Devices	Paths	Dynam	ic Discover	y Static Dis	covery Net	work Port Binding	Advanced Options		
Refresh   🗟 Attach Mark as Perennially Reserve		tach 🔊	Rename	열 Turn On LED	Turn Off LI	ED 🛛 🐼 Erase Partitio	ns 🎟 Mark as HDD Dis	sk 🚪 Mark as	Local
Name	~	LUN $\sim$	Туре 🗸	Capacity 🗸	Datasto 🗸	Operational S 🗸	Hardware Accelera 🗸	Drive T 🗸	Th
LIO-ORG iSCSI Disk (naa.6	00	1	disk	2.00 GB	Not Cons	Attached	Supported	Flash	iS ^
								_	

The **Paths** tab displays LUN status and allows you to enable or disable them.

Properties	Devices	Paths	Dynamic Discovery	Static Discovery	Network	Port Binding	Advanc	ed Options		
Enable Disa	able									
Runtime Nar	ne	~	Target		~	LUN	~	Status	~	
vmhba66:C	0:T0:L1		iqn.2015-16.org.chelsio.is	er1 :102.1.1.247:3260		1		Active (I/O)		^

These LUNs can now be attached to VMs or can be used to store VMs.

- Removing Target Server
- i. Select the target server in Static Discovery tab.
- ii. Click **Remove** and then **Yes** to confirm.

Properties	Devices	Paths	Dynamic Discovery	Static Discovery	Network Port Binding	Advanced Options		
+ Add	X Remove	Authentic	ation Advanced					
ISCSI server			~	Target Name			$\sim$	
102.1.1.247:3	260			iqn.2015-16.org.ch	ielsio.iser1		^	

iii. To apply the changes, rescan the iSER adapter.

## 3.3. Configurable Options

The option to edit general initiator properties like alias and name is available under the **Properties** tab.

Edit Ger	neral vmhba66 ×	<
iSCSI Name iSCSI Alias	iqn.1998-01.com.vmware:localhost.asicdesigners.com:26396435:66 iser-vmnic2	

Advanced parameters like Digest, MTU, etc., can be changed in the **Advanced Options** tab.

Option	Description	Value	
Header Digest	iSCSI adapter option : Header Digest	Prohibited	~
Data Digest	iSCSI adapter option : Data Digest	Prohibited	~
ErrorRecoveryLevel	iSCSI option : iSCSI Error Recovery Level	0	
LoginRetr <mark>y</mark> Max	iSCSI option : Maximum number of times	4	
MaxOutstandingR2T	iSCSI option : Maximum number of R2T (	1	
FirstBurstLength	iSCSI option : Maximum unsolicited data i	262144	
MaxBurstLength	iSCSI option : Maximum SCSI data payloa	262144	
MaxRecvDataSegLen	iSCSI option : Maximum data segment le	131072	
MaxCommands	iSCSI option : Maximum SCSI commands	128	
DefaultTimeToWait	iSCSI option : Minimum seconds to wait b	2	
DefaultTimeToRetain	iSCSI option : Maximum seconds that a c	0	
LoginTimeout	iSCSI option : Time in seconds initiator wi	5	
			19 Item

## 4. Software/Driver Unloading

Logout all the existing iSER sessions. Execute the following command to unload the iSER Offload Initiator driver:

```
[root@host:~] vmkload_mod -u cheiwarp
```

# V. NVMe-oF Offload Initiator Driver

## 1. Introduction

NVMe over Fabrics specification extends the benefits of NVMe to large fabrics, beyond the reach and scalability of PCIe. NVMe enables deployments with hundreds or thousands of SSDs using a network interconnect, such as RDMA over Ethernet. Thanks to an optimized protocol stack, an end-to-end NVMe solution is expected to reduce access latency and improve performance, particularly when paired with a low latency, high efficiency transport such as RDMA. This allows applications to achieve fast storage response times, irrespective of whether the NVMe SSDs are attached locally or accessed remotely across enterprise or datacenter networks. Chelsio Unified Wire adapters with iWARP RDMA offload provide the high bandwidth and low latency fabric needed for NVMe-oF.

## 1.1. Hardware Requirements

#### 1.1.1. Supported Adapters

The following are the currently shipping Chelsio adapters that are supported:

- T62100-CR
- T62100-LP-CR
- T6425-CR
- T6225-CR
- T6225-LL-CR
- T6225-SO-CR (Memory Free; 256 IPv4/128 IPv6 offload connections supported)
- T580-CR
- T580-LP-CR
- T540-CR
- T540-LP-CR
- T540-BT
- T520-CR
- T520-LL-CR
- T520-BT

### 2. Software/Driver Loading

After rebooting the ESXi Host, the driver loads automatically. However, it is possible to manually load the driver by using the command below:

```
[root@host:~] vmkload_mod cheiscsi
```

Execute the following command, so that the device manager performs a rescan:

[root@host:~] kill -SIGHUP \$(cat /var/run/vmware/vmkdevmgr.pid)

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

# 3.1. Connecting to NVMe target

Configure the NVMe target machine with the IP Address, Target name, disks etc. For information on how to configure the NVMe Target, refer to the *Chelsio Unified Wire for Linux User Guide*.

Important Disable iwpmd service on the target machine. On RHEL7.X machines, use the following command:

[root@host~]# systemctl stop iwpmd

Follow the below procedure on NVMe Initiator machine to connect to the target.

- i. Log in to vCenter Server through vSphere Web Client using a web browser.
- ii. If you have already created and configured the host intended to be used as initiator, skip to step (iii).
  - a. Under **Hosts and Clusters**, right-click and click **New Datacenter...** Provide a name and Click **OK**.
  - b. Right-click on the newly created datacenter and click **Add Host...** Follow onscreen instructions and provide information to add the host. Click **Finish**.
- iii. Select the host and under the **Configure** tab, select **Storage Adapters**. This displays the list of available Chelsio storage adapters.

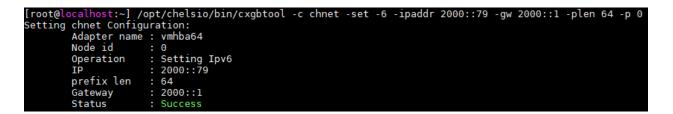
Summary Monitor (	Configure	Permissions VMs	Resource Pools	5 Datastore	es Networks Updates					
Storage	~ ^	Storage Adapte	rs							
Storage Adapters		+ Add Software Adapter	Refresh 🛛 🖓 Rescar	n Storage   🛙	o Rescan Adapter 🛛 🗙 Remove					
Storage Devices		Adapter	т Туре т	Status T	Identifier	Target	ts 🔻 De	evices 🔻	Paths	T
Host Cache Configuration		Model: T6225-CR Chels	sio iSCSI offload initiator	(RE35160003)						^
Protocol Endpoints		🔄 vmhba64	iSCSI	Online	Port0(iqn.2017-07.com.chelsio:00-07	7-4 0		16	16	
I/O Filters		🔄 vmhba65	iSCSI	Online	Port1(iqn.2017-07.com.chelsio:00-07	-43 0		16	16	
Networking	~	Model: VMware iSCSI o	ver RDMA (iSER) Adapte	er						
Virtual switches		Model: Wellsburg AHCI	Controller							~
VMkernel adapters								Copy A	II 6 Ite	ms
Physical adapters		Properties Devices P	Paths Dynamic Disc	coverv Static	Discovery Network Settings	Advanced	Options			
RDMA adapters							-			^
TCP/IP configuration		General Name	vmhba64						Edit.	-
Virtual Machines	~	Model iSCSI Name	T6225-CR Chelsio iqn.2017-07.com.c		itiator (RE35160003) 3-04-ae-84					
VM Startup/Shutdown Agent VM Settings	~	iSCSI Alias Target Discovery	Port0 Send Targets, Sta	itic Targets						

- iv. In the Adapter Details section, click Network Settings tab and then Edit.
- v. Configure IPv4 address for the adapter and click **OK**.

			Edit IP and DNS Co	nfiguration vmhba	64	×
			<ul> <li>IPv4 settings</li> </ul>			
				O No IPv4 se	ttings	
				Obtain IPv	4 settings automatically	
				<ul> <li>Use static</li> </ul>	Pv4 settings	
				IPv4 address:		
				10.200.200.7	9	
				Subnet mask f	or IPv4:	
				255.255.255.	0	
				Default gatew	ay for IPv4:	
				10.200.200.1		
			> IPv6 settings			Disabled V
			> DNS settings			
			/ Dito settings			
						CANCEL OK
)	Deviere	Dethe		Ctatia Diagonary	Network Cettings	Advenced Optic
Properties	Devices	Paths	Dynamic Discovery	Static Discovery	Network Settings	Advanced Optio
IP Address	and DNS C	onfigura	tion			
IPv4 add	ress	- 10	0.200.200.79 (static)			
Subnet m	nask for IPv	4 2	55.255.255.0			
	gateway for					
IPv6 add			lot enabled			
	d DNS serve					
Alternate	DNS serve	er ::				

vi. To use IPv6 address, use the below command.

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c chnet -set -6 -ipaddr <IPv6
address> -gw <IPv6 gateway> -plen <subnet mask> -p <port>
```



vii. Discover the target.

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c nvmf -tport <target_port> -
ipaddr <target ip address> -p <Chelsio Port #> -D
```

```
[root@localhost:~] /opt/chelsio/bin/cxgbtool -c nvmf -tport 4420 -ipaddr 10.200.200.5 -p 0 -D
process_nvmf_resp status 0x0 nrec 0x10
0) nvm subsys nvme-ram0 ctrl id 0xffff addr 10.200.200.5
1) nvm subsys nvme-ram1 ctrl id 0xffff addr 10.200.200.5
```

If *-p* is not specified, by default Port 0 will be used.

While using IPv6, specify the target IPv6 address within [].

[root@localhost:~] /opt/chelsio/bin/cxgbtool -c nvmf -tport 4420 -ipaddr [1000::146] -p 0 -D

Login to the target by specifying the target name.

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c nvmf -tport <target_port> -
ipaddr <target ip address> -p <Chelsio Port #> -L -subnqn <target name>
```

[root@localhost:~] /opt/chelsio/bin/cxgbtool -c nvmf -tport 4420 -ipaddr 10.200.200.5 -p 0 -L -subnqn nvme-ram0 login status 0 target id 0

viii. Rescan the storage adapter and the target LUNs will be visible.

[root@host:~] esxcfg-rescan -A

ix. List the logged in targets.

[root@host:~] /opt/chelsio/bin/cxgbtool -c nvmf -tlist -p <Chelsio Port #>

If -p is not specified, by default Port 0 will be used.

[root@localhost:~] /opt/chelsio/bin/cxgbtool -c nvmf -tlist
0) tgt\_id: 0, state: 5, IP: 10.200.200.5, Port: 4420, sub\_nqn: nvme-ram0

x. All the available LUNs will be displayed in the **Devices** tab. These LUNs can now be attached to VMs or can be used to store VMs.

Properties	Devices	Paths	Dynam	nic Discover	ry Static Dis	covery Net	work Settings	Advanced Options		
Refresh	Attack	n 🕅 De	tach 🔊	Rename						
Name		~	LUN ~	Туре 🗸	Capacity ~	Datasto 🗸	Operational S ~	Hardware Accelera ~	Drive T V	Th
NVMe iSCSI	Disk (t10.NV	/Me	0	disk	3.91 GB	Not Cons	Attached	Unknown	Flash	iS

#### 3.2. Disconnecting from NVMe target

To logout or disconnect from the NVMe target,

```
[root@host:~] /opt/chelsio/bin/cxgbtool -c nvmf -tport <target_port> -
ipaddr <target ip address> -p <Chelsio Port #> -LT -all
```

If -p is not specified, by default Port 0 will be used.

```
[root@localhost:~] /opt/chelsio/bin/cxgbtool -c nvmf -tport 4420 -ipaddr 10.200.200.5 -p 0 -LT -all
Log out: tgt id 0
Logout status 0
```

## 4. Software/Driver Unloading

Logout of all the existing NVMe-oF sessions. Execute the command below to unload the driver:

[root@host:~] vmkload\_mod -u cheiscsi

# VI. Appendix

### 1. Troubleshooting

Logs collection

In case of any issues, collect the below logs:

- /var/log/vmkernel.log
- Adapter logs (*dump\_file*) using the below command:

```
[root@host:~]/opt/chelsio/bin/cxgbtool -c cudbg -d all -f <dump_file> -a
<adap>
```

[root@localhost:~] /opt/chelsio/bin/cxgbtool -c cudbg -d all -f /productLocker/cudbg.dmp -a 0 Writing 51347516 bytes to /productLocker/cudbg.dmp

In case of a PSOD, additionally provide the vmkernel zdump from /var/core/ directory.

Please contact Chelsio support at <a href="mailto:support@chelsio.com">support@chelsio.com</a> with all relevant logs for any issues.

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