

chelsio iwarp installation and setup guide

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Chelsio iWARP Installation and Setup Guide

In modern data centers, the demand for high performance, low latency networking is growing rapidly. One technology that has gained traction is **Chelsio iWARP**, a RDMA (Remote Direct Memory Access) solution that delivers InfiniBand like performance over standard Ethernet infrastructure. This guide walks you through every step of installing and configuring Chelsio iWARP on a Linux system, from hardware prerequisites to advanced performance tuning. Whether you're a system administrator, a networking engineer, or a developer building low latency applications, this comprehensive walkthrough will help you get the most out of your Chelsio adapters.

1. Overview of Chelsio iWARP

Chelsio iWARP is an RDMA technology that enables direct memory access between servers without involving the CPU, thereby reducing latency and CPU overhead. Unlike traditional TCP/IP, iWARP operates over Ethernet but still benefits from InfiniBand's high throughput and low jitter. Chelsio's iWARP adapters are widely used in high performance computing, storage, and cloud environments because they are compatible with standard Ethernet switches and can be deployed in existing data center fabrics.

Key Features

- RDMA over TCP/IP for easy integration with existing networks
- Zero copy data transfer and off loading of network stack operations
- Hardware acceleration for encryption, compression, and checksum calculation
- Support for multi queue and SR-IOV virtual functions
- Robust driver and firmware ecosystem across Linux and Windows platforms

2. Prerequisites

Before you begin, make sure you have the following items ready:

1. A Chelsio iWARP adapter (e.g., T5 or T6 series) installed in a PCIe slot.
2. Root or sudo privileges on the target system.
3. Kernel version 5.4 or later (recommended 5.10+).
4. Internet connectivity to download drivers and firmware.
5. Basic knowledge of Linux networking commands.

For Windows installations, refer to the **Chelsio iWARP Windows Driver Guide** and ensure you have a supported OS version (Windows Server 2016 or later).

3. Hardware Setup

Physically install the Chelsio adapter into an available PCIe slot. Once the server boots, verify the device is recognized by the kernel:

```
$ lspci | grep -i chelsio
```

```
00:1c.0 Chelsio Communications, Inc. T5/T6 iWARP Adapter
```

If the adapter does not appear, double check the slot and power connections. Some motherboards may require BIOS settings for PCIe slot enablement or to disable ASPM for optimal performance.

4. Software Installation

4.1 Installing the Chelsio Driver

Chelsio provides a dedicated kernel module for iWARP. Follow these steps to install the latest driver:

1. Download the driver package: Navigate to the Chelsio download portal and locate the Linux driver for your adapter model.

2. Extract the package:

```
$ tar -xvf t5iw-5.0.0.0.tar.gz
```

3. Build and install:

```
$ cd t5iw-5.0.0.0
```

```
$ make
```

```
$ sudo make install
```

4. Load the module:

```
$ sudo modprobe t5iw
```

5. Verify the module is loaded:

```
$ lsmod | grep t5iw
```

```
t5iw          65536  0
```

For distributions that ship with the driver in the kernel tree (e.g., RHEL 8+), you can simply enable the module using modprobe and skip the manual build.

4.2 Configuring the iWARP NIC

Once the driver is loaded, you need to set up the network interface. Chelsio adapters expose the interface as ethX (e.g., eth0). Use the ifconfig or ip utility to assign an IP address:

```
$ sudo ip addr add 192.168.100.10/24 dev eth0
```

```
$ sudo ip link set dev eth0 up
```

Alternatively, you can configure the interface via /etc/network/interfaces or Netplan for Ubuntu 18.04+. The key is to ensure the interface is up and reachable on your network.

4.3 Updating Firmware

Firmware updates can unlock new features and fix bugs. Use the t5fwupdate utility that comes with the driver package:

```
$ sudo t5fwupdate -d /dev/t5iw0 -f firmware.bin
```

After updating, reboot the system to load the new firmware. Verify the firmware version with:

```
$ sudo t5fwupdate -d /dev/t5iw0 -v
```

5. Network Configuration

5.1 IP Addressing and Subnetting

iWARP operates over standard Ethernet, so you must follow conventional IP addressing practices. Assign static IPs or use DHCP as per your network design. Ensure that the subnet mask and gateway are correctly configured.

5.2 Routing and ARP

Because iWARP uses TCP/IP, standard routing tables apply. Verify that the default route points to your gateway:

```
$ ip route show
default via 192.168.100.1 dev eth0
192.168.100.0/24 dev eth0 proto kernel scope link src 192.168.100.10
```

Check ARP entries to confirm connectivity:

```
$ arp -n
```

5.3 Firewall Rules

Open necessary ports for iWARP traffic. The default iWARP port is **18514**(TCP). Add a rule to allow inbound/outbound traffic:

```
$ sudo ufw allow 18514/tcp
```

For systems using iptables, insert a rule accordingly.

6. Testing the iWARP Connection

6.1 Using ibstat

Confirm that the RDMA device is recognized by the system:

```
$ ibstat
CA: t5iw0
   CA type: Chelsio T5
...
```

6.2 Using ibv_devinfo

Display detailed device information:

```
$ ibv_devinfo -d t5iw0
Device t5iw0:
  Name: t5iw0
  Vendor ID: 0x15b3
  Device ID: 0x0006
...
```

6.3 Using iWARP Tools

Chelsio ships with iwarp-test utilities to verify end to end connectivity. Run a simple ping over RDMA:

```
$ iwarp-ping 192.168.100.20
```

A successful ping indicates that RDMA traffic is properly routed through the network.

7. Common Issues and Troubleshooting

7.1 Driver Not Loading

- Check kernel logs: `dmesg | grep t5iw`
- Ensure the module name matches your adapter (e.g., `t5iw` vs. `t6iw`).
- Verify that Secure Boot is disabled if using unsigned modules.

7.2 Firmware Mismatch

- Firmware and driver versions must be compatible. Refer to Chelsio's version matrix.
- Re flash firmware using `t5fwupdate` if you encounter errors like Firmware version mismatch.

7.3 Network Misconfiguration

- Incorrect IP subnet can cause unreachable RDMA endpoints.
- Ensure that the switch port is configured for 10/25/40/100 Gbps as per adapter capability.
- Check for VLAN tagging; iWARP traffic must be allowed on the VLAN.

8. Performance Tuning

8.1 Tuning Driver Parameters

Chelsio drivers expose several `sysctl` entries. For example, to increase the maximum number of outstanding send requests, edit `/etc/sysctl.d/99-t5iw.conf`:

```
net.t5iw.t5iw0.max_send_sge=512
```

Apply changes with `sysctl -p`.

8.2 Offloading Features

Enable hardware checksum offload, segmentation offload, and GSO if supported:

```
$ sudo ethtool -K eth0 tx off sg off tso off gso off
```

These settings can reduce CPU usage for RDMA traffic.

8.3 Queue Depth and Queue Pair Configuration

Adjust the number of queue pairs (QPs) per port based on application load. Use `ibv_devinfo` to view current QP limits and increase via driver configuration if needed.

9. Security Considerations

9.1 iWARP over TLS

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