High Performance macOS Driver

Powered by Chelsio T6 Adapters

Executive Summary

The Chelsio macOS driver provides essential Layer 2 NIC functionality, allowing Mac systems to integrate into high-speed Ethernet networks with robust and reliable connectivity. Whether in storage networking, virtualized enterprise data centers, cloud service infrastructures, or high-performance computing environments, the driver enables high-speed communication with minimal overhead. This release extends Chelsio's proven performance and reliability to the macOS platform, delivering a powerful solution for professionals requiring efficient and scalable networking capabilities.

This paper shows Chelsio 100G Network adapter T62100-SO delivering 87 Gbps throughput, enable seamless macOS networking for data-intensive workflows. LRO implementation reduces overall CPU utilization by over 50% at MTU 1500.

Test Results

The below graph shows the transmit performance of the T62100-SO (1-port) adapter with LRO enabled and MTU 1500, comparing CPU utilization and bandwidth across 1-connection (green) and 4-connection (orange) setups for I/O sizes of 4K and 256K. The orange bars and line (4-conn) show significantly higher throughput (87 Gbps), especially with larger I/O, but also increased CPU usage, particularly at 4K. The green bars and line (1-conn) maintain lower CPU usage with moderate bandwidth. The data highlights that increasing both I/O size and connection count boosts performance, though with a trade-off in CPU load.

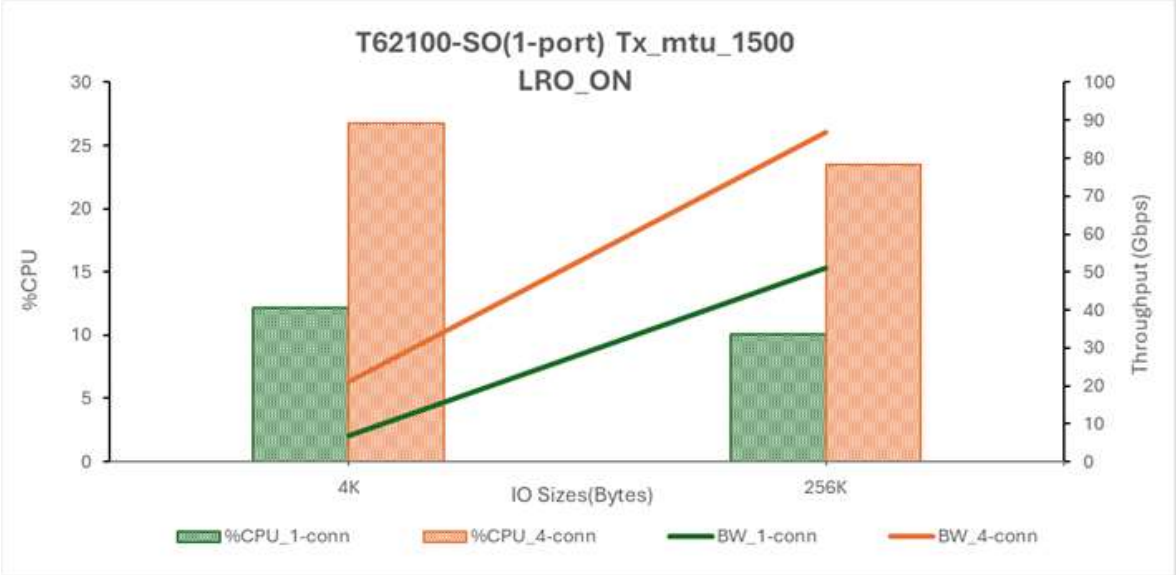


Figure 1 – TX performance, BW vs %CPU varying IO sizes and connections

The below graph shows the receive performance of the T62100-SO (1-port) adapter at MTU 1500, comparing LRO-OFF (light green and light orange) and LRO-ON (dark green and dark orange) modes for 1-connection and 4-connection configurations across 4K and 256K I/O sizes. The solid bars represent CPU utilization, while the dashed lines represent bandwidth. Enabling LRO (dark green and dark orange) leads to a significant reduction in CPU usage to nearly half, especially in the 4-connection setup, compared to LRO-OFF (light green and light orange). Despite this CPU drop, bandwidth remains nearly the same, indicating that LRO improves efficiency by reducing CPU overhead without affecting throughput.

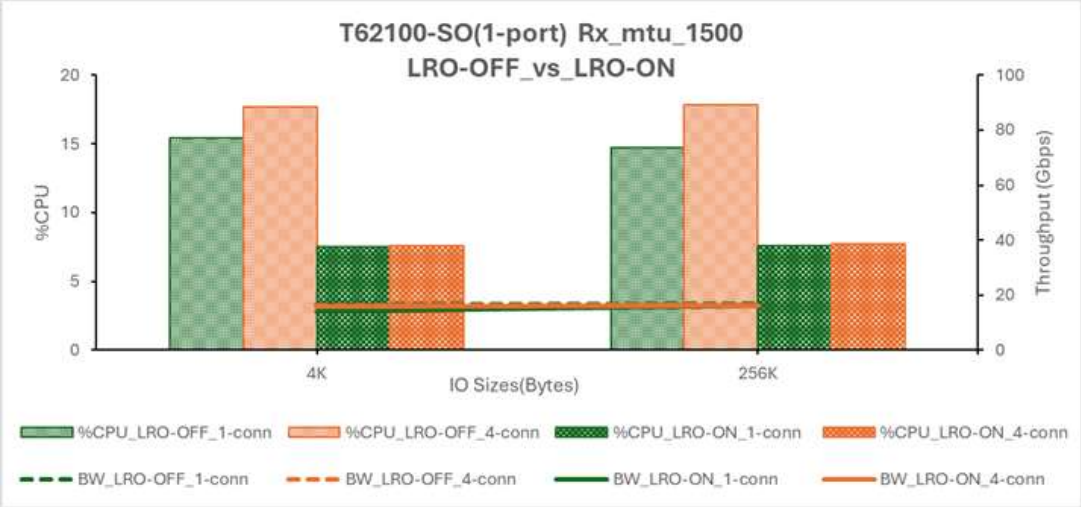
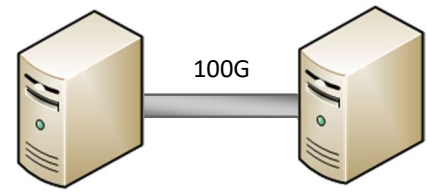


Figure 2 – RX performance LRO_OFF vs LRO_ON, BW vs %CPU varying IO sizes and connections

Test Configuration

The setup consists of a 2 Machines – 1 Test Machine (Mac Pro) connected to a Peer Machine with a single 100G port, MTU of 1500B is used.

- Mac Pro with macOS version 15.3.1
- Sequioa Operating System
- Apple M2 Ultra Chip
- 24-Core CPU
- 64 GB RAM
- Chelsio T62100-SO adapter is installed with driver version 1.25.1



- Intel® Xeon® E5-2650 v3 processor (2.30 GHz)
- 2×10 Cores
- 128 GB RAM
- Red Hat Enterprise Linux 8.5 with kernel version 6.1.46
- Chelsio T62100-CR installed in the Node1/CPU2 PCI slot
- T62100-CR firmware version 1.27.5.0
- Chelsio driver version 3.19.0.3

Figure 3 – Test Setup

Commands Used

For TX:

On Test machine: `iperf -c <peer machine test IP> -t30 -i5 -l <io_size> -P <conns>`
On Peer machine: `numactl --cpunodebind=1 --membind=1 iperf -s`

For RX:

On Test machine: `iperf -s`
On Peer machine: `numactl --cpunodebind=1 --membind=1 iperf -c 10.2.2.49 <Test machine test IP> -t30 -i5 -l <io_size> -P <conns>`

Conclusion

Chelsio High-speed network adapters can deliver consistent performance across various I/O sizes and connection counts. Larger I/O sizes and multiple connections generally improve bandwidth efficiency and reduce CPU utilization. Features like Large Receive Offload (LRO) further enhance performance by offloading packet processing, especially during receive operations. The results confirm that with proper configuration, modern network adapters can achieve high throughput while maintaining optimal CPU usage, making them suitable for demanding data center and enterprise environments.

Related Links

High Performance Network for Kubernetes
Advanced High Performance Networking Solutions for Red Hat OpenShift