Windows FCoE Initiator Performance

Line Rate Throughput and IOPs

Executive Summary

The Terminator 6 (T6) ASIC from Chelsio Communications, Inc. is a sixth generation, high-performance 2x100Gbps unified wire engine. T6 supports full FCoE offload, with hardware support for FC CRC, Direct Data Placement, T10-DIX enhanced data integrity, and FCoE RSS for CPU load balancing. T6 also supports the DCB protocol suite, including PFC, ETS and QCN, with a native DCBX protocol implementation for automatic configuration. Fully compliant with the FC-BB-5 standard, T6 is the industry's first high performance full FCoE offload solution with SAN management software support. Furthermore, FCoE support in T6 is part of a complete, fully virtualized unified wire offload suite that includes iSCSI, iWARP RDMA, TCP/UDP sockets and user space I/O capabilities. All traffic types and protocols benefit from comprehensive traffic management functionality, and enhanced data integrity and reliability features.

This paper reports FCoE performance results for Chelsio's T6225-CR adapter in Windows Server 2016. The results using a single FCoE initiator connected through a 10Gb FCF switch to a 10Gb FCoE Target, show I/O numbers reaching line rate throughput with minimal CPU Utilization.

Test Results

The following graph plots the throughput and IOPs results across I/O sizes ranging from 4 to 256 Kbytes, using Iometer tool with an access pattern of random reads and writes.
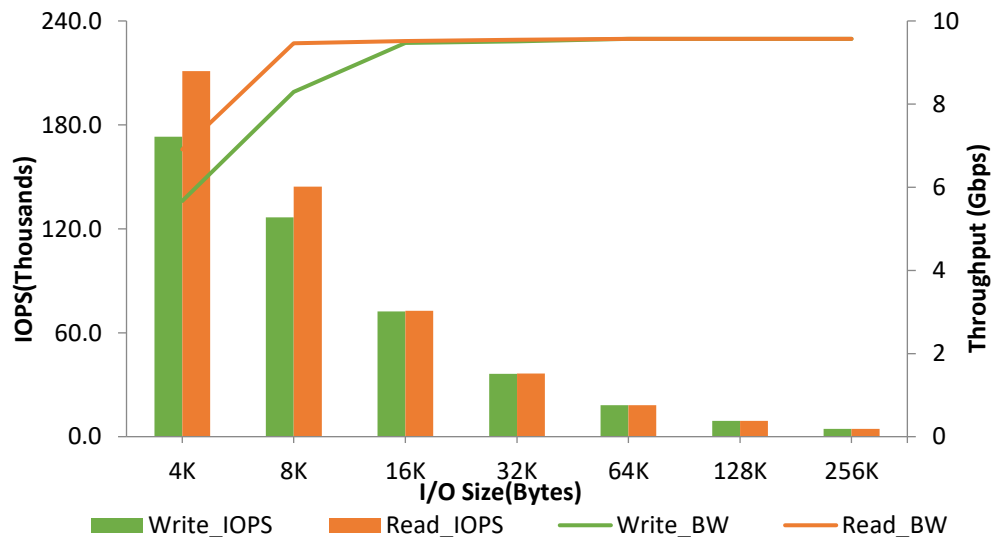

Figure 1 – Throughput and IOPS vs. IO size

As evident from the graph, Windows FCoE Initiator delivers line-rate 10 Gbps throughput for both READ and WRITE. The CPU Utilization at 4K I/O size is around 20% and reduces to 2% at 256K I/O proving the worth of FCoE Offload.

Test Configuration

The setup consists of a Windows FCoE initiator machine connected to a Linux FCST FCoE target machine through a 10Gb FCF switch using single port on each system. MTU of 2180B was used on Linux target machine. The latest Unified Wire drivers for Windows and Linux were installed on the initiator and target machines respectively.
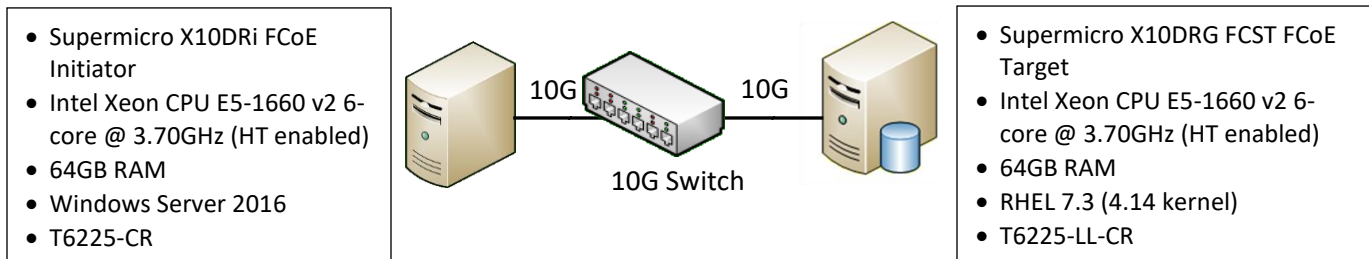

- Supermicro X10DRi FCoE Initiator
- Intel Xeon CPU E5-1660 v2 6-core @ 3.70GHz (HT enabled)
- 64GB RAM
- Windows Server 2016
- T6225-CR

10G 10G Switch 10G

- Supermicro X10DRG FCST FCoE Target
- Intel Xeon CPU E5-1660 v2 6-core @ 3.70GHz (HT enabled)
- 64GB RAM
- RHEL 7.3 (4.14 kernel)
- T6225-LL-CR

Figure 2 – Test Setup

Storage Topology and Configuration

The target is configured with 5 Ramdisk LUNs, each of 1GB size. The initiator connects to the target and Iometer is run with single worker thread per target device and 4 outstanding I/Os.

Conclusion

This paper reported performance results for Chelsio's offloaded FCoE solution running with T6225-CR Unified Wire adapter in Windows environment. The results demonstrate that Chelsio's adapter delivers line rate FCoE performance with perfect scaling to 10Gbps.

Part of Chelsio's Unified Wire Ethernet solution, the T6 FCoE implementation provides the same unique combination of uncompromising performance and rich feature set as the rest of the offloaded protocols. With concurrent support for iSCSI, iSER and NVMe-oF initiators, Chelsio Unified Wire adapters are the best in class and well suited for Windows environments.

Related Links

Chelsio Adapters
Microsoft Windows Unified Wire and CNA Solutions
Windows iSCSI Performance at 100Gbps
Windows iSER Performance at 100Gbps
Windows NVMe over Fabrics Performance