

Windows Server 2012 R2 40G NIC Performance

Chelsio T580-SO-CR vs. Mellanox ConnectX-3 VPI

Executive Summary

This paper presents stateless offload NIC performance results for Windows Server 2012 R2, comparing Chelsio's T580-SO-CR adapter, based on the Terminator 5 (T5) ASIC, and Mellanox's latest ConnectX-3 Pro adapter. The results show Chelsio's adapter reaching 40Gbps line rate throughput with standard 1500B frames at significantly smaller I/O sizes than the competition. In addition, the Chelsio adapter is noticeably more efficient in CPU usage per Gbps, making Chelsio's solution both the highest performance and highest efficiency adapter for Windows.

Overview

The Terminator 5 (T5) ASIC from Chelsio Communications, Inc. is a fifth generation, high-performance 2x40Gbps/4x10Gbps hyper-virtualized server adapter engine with Unified Wire capability, allowing storage, compute and networking traffic to run simultaneously. Furthermore, T5 is a fully virtualized NIC engine with separate hardware configuration and traffic management for 128 virtual interfaces, and includes an on-board switch that offloads the hypervisor v-switch.

While T5-based adapters are high performance drop-in replacements for FibreChannel storage adapters and InfiniBand RDMA adapters, they also excel at normal server adapter functionality, providing high packet processing rate, high throughput and low latency for common network applications. T5 supports all stateless offloads for both IPv4 and IPv6, including IP, TCP and UDP checksum offload, Large Send Offload, Large Receive Offload, Receive Side Steering/Load Balancing, and flexible line rate Filtering.

This paper presents stateless offload server adapter benchmark results that compare the T5-based 40GbE adapters to the Mellanox ConnectX-3 Pro 40GbE adapters in Windows Server 2012 R2. The results confirm Chelsio's performance and efficiency lead, demonstrating that the fully-featured T5 adapters in no way compromise on server NIC functionality, performance or efficiency, and thus remain the only true all-in-one adapters.

Test Results

The following graphs compare single port unidirectional and bidirectional throughput results, for the two adapters at different I/O sizes, using the **ntttcp** tool.

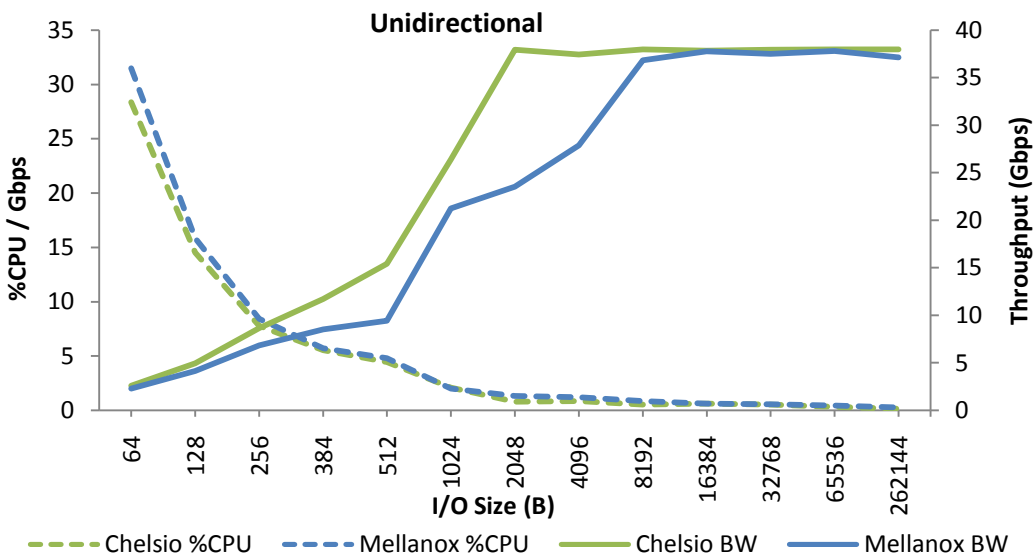


Figure 1 – Chelsio vs. Mellanox Unidirectional Throughput

The graph above shows Chelsio’s T580-SO-CR performance to be superior in both CPU utilization and throughput, reaching line rate at ¼ the I/O size needed for Mellanox’s ConnectX-3 Pro.

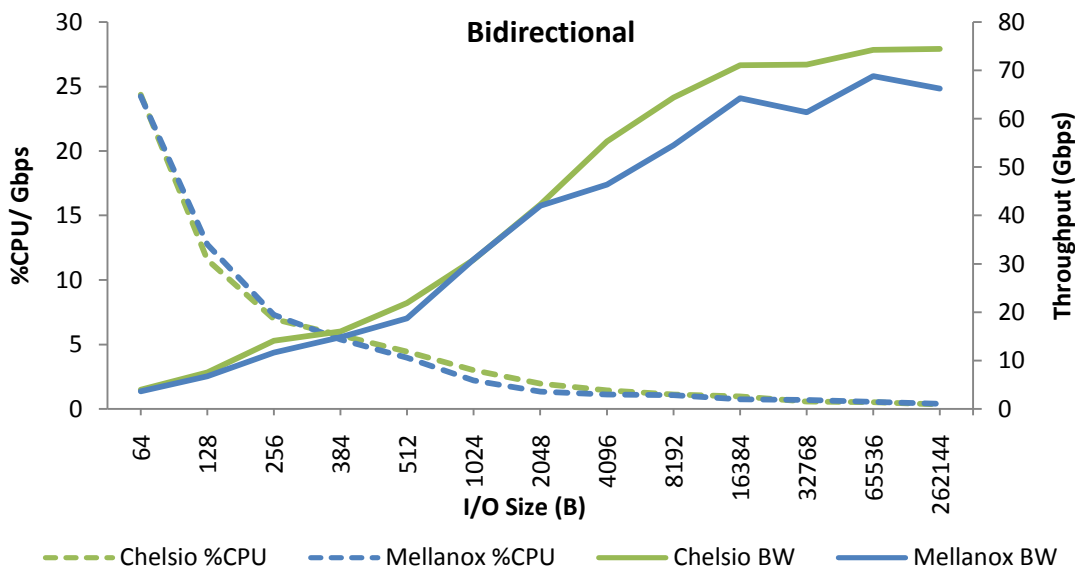


Figure 2 – Chelsio vs. Mellanox Bidirectional Throughput

The graph above similarly shows markedly superior performance across both performance and efficiency axes for the Chelsio adapter, reaching true bidirectional rate whereas the Mellanox adapter plateaus at 15% lower than capacity.

Test Configuration

The following sections provide the test setup and configuration details.

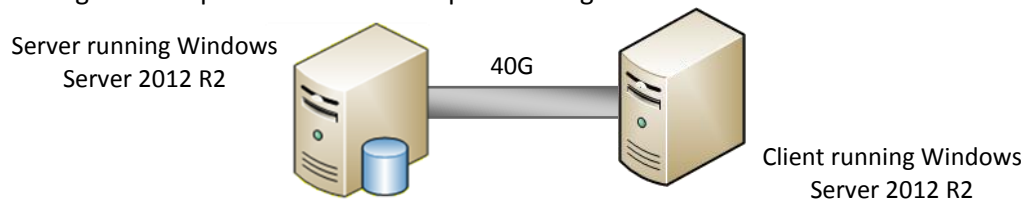


Figure 3 – Simple Back-to-Back Test Topology

Network Configuration

The test configuration consists of 2 machines connected back-to-back using a single port. A Server and Client, each with Intel Xeon CPU E5-1660 v2 processor clocked at 3.70GHz, with 64GB of RAM, run the Windows Server 2012 R2 operating system. Standard MTU of 1500B is configured.

The Chelsio setup uses one T580-SO-CR adapter installed in each system with Chelsio NDIS driver v5.3.3.0, whereas the Mellanox setup uses one MCX353A-FCBT adapter installed in each system, with Mellanox driver v4.70.10126.0

ntttcp is used to measure network throughput across a range of I/O sizes, from 64B to 256KB.

Commands Used

On the Client machine:

```
ntttcp -s -m <#conn>,*,<remote IP> -l <IO Size> -sb 512k -t <time>
```

On the Server machine:

```
ntttcp -r -m <#conn>,*,<Local IP> -l <IO Size> -rb 512k -t <time>
```

Conclusion

This paper compared performance results of Chelsio's T580-SO-CR server adapter and Mellanox's MCX353A-FCBT ConnectX-3 Pro adapter in Windows Server 2012 R2. T5 delivers line rate 40Gbps performance at small I/O sizes, which may be more representative of actual application use. Additionally, Chelsio's adapter provides higher efficiency, allowing more resources to be available for actual application load.

Related Links

[The Chelsio Terminator 5 ASIC](#)

[FreeBSD NIC at 40Gbps](#)

[iSCSI at 40Gbps](#)

[Solaris/OpenIndiana at 40Gbps](#)