

Chelsio TOE vs. Solarflare NIC 10GbE Performance

Bandwidth, Connection/Request/Response, Apache Bench and SCP Results

Overview

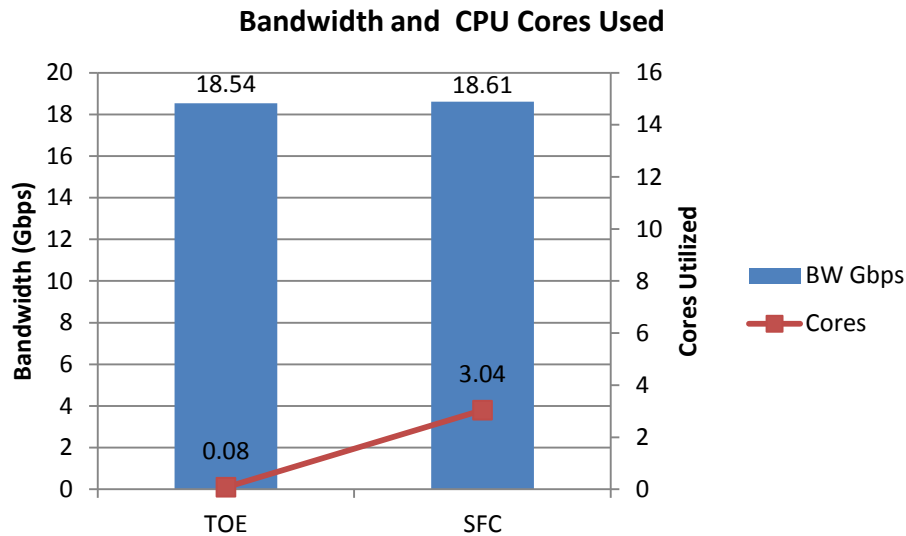
Chelsio is the leading provider of network protocol offloading technologies, and Chelsio's Terminator *TCP Offload Engine (TOE)* is the first and currently only engine capable of full TCP/IP at 10/40Gbps.

The unique ability of a *TOE* to perform the full transport layer functionality in hardware is essential to obtaining tangible benefits. The vital aspect of the transport layer is that it provides process-to-process communication, i.e. the data passed to the *TOE* comes straight from the application process, and the data delivered by the *TOE* goes straight to the application process. In contrast, lower network layers only provide unreliable delivery functionality, which limits the usability of the data at these levels. This opens the way for very powerful extensions to pure protocol offload, including:

1. Direct Data Placement (DDP), which addresses the memory subsystem bottleneck problem on receive
2. Direct Data Sourcing (DDS), which addresses the memory subsystem bottleneck problem on send
3. Application layer data integrity check (CRC) offload, typically used in data critical applications, which are not satisfied with the relatively weak Internet checksum protection (e.g., iSCSI header and payload digests)
4. Reliable remote direct memory to memory access with RDMA
5. Further application layer offload, such as application layer payload recovery for end-to-end security protocol offload
6. Per connection TCP level traffic management and quality of service

The Terminator series – Terminator 4 (T4) and Terminator 5 (T5) – adapters can flexibly offload TCP/IP processing per connection, per-server or per-interface, while selectively and simultaneously tunnel traffic from non-offloaded connections to the host processor for the native TCP/IP stack to process. The Terminator series adapters provide a powerful zero copy capability for regular TCP connections, requiring no changes to the sender or receiver applications, to deliver line rate performance at minimal CPU and memory utilization, interrupts and context switches.

iperf Bandwidth Test Results



iperf: setup/commands

Setup: `modprobe t4_tom`

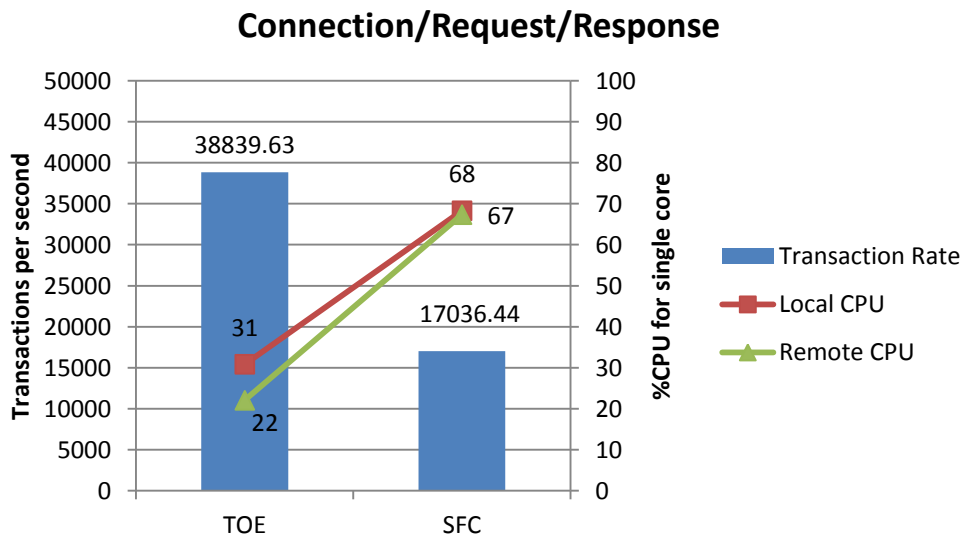
Server: `iperf -s -w 128K -p 1001`

Client: `iperf -c <10G server ip> -w 128K -t 10 -p 1001 -P 4 -d`

CPU: `mpstat 1`

The figure above shows that 10GbE TOE provides the same line rate bandwidth as NIC while freeing up 3 CPU cores for useful applications.

Netperf Connection/Request/Response Test Results

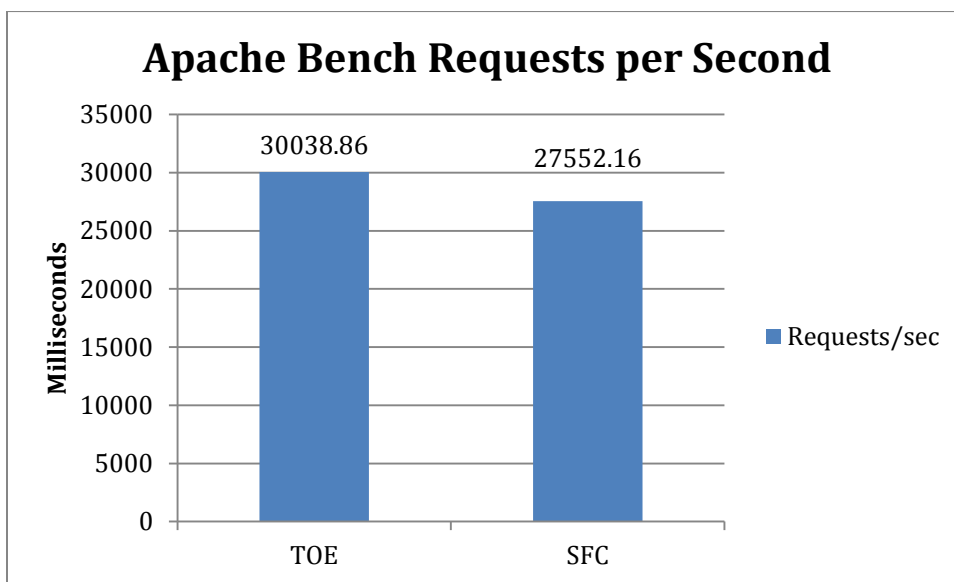


netperf: setup/commands

Setup: `modprobe t4_tom`
Server: `netserver -D -4`
Client: `netperf -H <10G server ip> -t TCP_CRR -Cc`
CPU: `mpstat 1`

The 10GbE TOE results show 56% improvement in performance with 2 to 3 times lower CPU utilization for single core.

Apache Bench Results

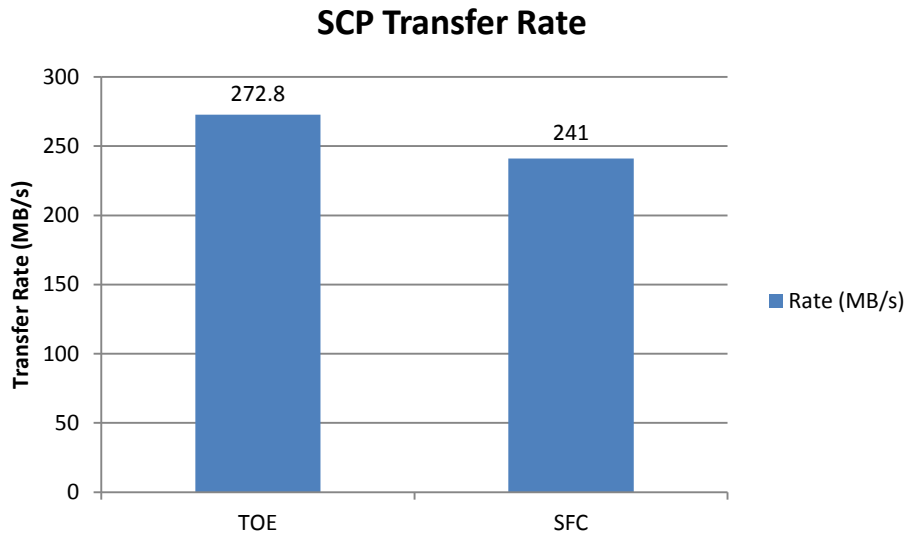


Apache Bench: setup/commands

Setup: `modprobe t4_tom`
Server: `apachectl -k restart`
Client: `ab -n 1000000 -c 1000 http://<10G server ip>/`
CPU: `mpstat 1`

The 10GbE TOE results show an increase in requests per second by 8%.

SCP 10GB File Copy



SCP: setup/commands

Setup: modprobe t4_tom; fallocate -l 10G <10GB filename>

Server: service sshd restart

Client: scp <10GB filename> <10G server ip>:

CPU: mpstat 1

The 10GbE TOE results above show a 10% improvement in SCP file copy.

Conclusions

TOE improves performance for all TCP applications from a simple SCP file copy to Apache webserver while freeing up CPU resources to be used for the application processing. Using a Chelsio adapter along with the Unified Wire Software package available as part of the Chelsio solution, users can create and maintain a true Converged Fabric cluster where all storage and networking traffic runs over a single 10/40Gb network, rather than having to build and maintain multiple networks, resulting in significant acquisition and operational savings.

About Chelsio

Chelsio is a leading technology company focused on solving high performance networking and storage challenges for virtualized enterprise data centers, cloud service installations, and cluster computing environments. Now shipping its fifth generation protocol acceleration technology, Chelsio is delivering hardware and software solutions including Unified Wire Ethernet network adapter cards, unified storage software, high performance storage gateways, unified management software, bypass cards, and other solutions focused on specialized applications.