

Chelsio Unified Wire for Arm (64-bit) Platform

Chelsio T5/T6 Adapters & Qualcomm Centriq 2400 Processor Family

The Qualcomm Centriq 2400 Processor Family

Qualcomm Datacenter Technologies, Inc., recently introduced the Qualcomm Centriq 2400, the world’s first 10nm server processor. The first in the Qualcomm Centriq™ product family, the Qualcomm Centriq 2400 series features up to 48 cores of the Qualcomm Falkor™ CPU, Qualcomm Datacenter Technologies’ custom Armv8-compliant core. The CPU is highly optimized to deliver both high performance and power efficiency, purpose-built for performance-oriented datacenter applications, and optimized for server-class, microservices, scale out, containerized, multi-tenant workloads.

The Qualcomm Centriq 2400 introduction represents a dramatic achievement in delivering leading-edge, high performance Arm-based server processors to the datacenter. Qualcomm’s Centriq 2400 is uniquely positioned to address the needs of cloud customers seeking new server solutions optimized for total cost of ownership while meeting performance, efficiency and power demands.

Chelsio 10/25/40/50/100Gb Unified Wire Ethernet adapters provide the optimal and scalable networking building block for the Qualcomm Centriq 2400 processor. Designed for industry-leading performance, efficiency, and with the unique ability to fully offload TCP/IP, iSCSI and iWARP protocols using a single ASIC and firmware, Chelsio adapters unburden communication responsibilities and processing overhead from servers and storage systems by enabling a true converged Unified Wire solution resulting in a dramatic increase in application performance with a minimum of CPU cycles.

Qualcomm has also developed the QDF2400 Server, a Reference Evaluation Platform (REP) for customers and partners to experience, test, and validate Centriq 2400 CPU performance. The QDF2400 REP supports multiple versions of Linux distributions including RHEL 7.3. Windows Server support is in progress. Qualcomm has also established an Approved Vendor List (AVL) for qualified solutions on the REP.



- Single Node REP Server**
- 1U rack mount chassis
 - 6x 2DPC DIMMs
 - 2x PCIe x16 slots with risers
 - Up to 8x SAS/SATA HDDs
 - 750W PSU with 8x fans

- Dual Node REP Server**
- 1U rack mount chassis
 - 12x 2DPC DIMMs
 - 4x PCIe x16 slots with risers
 - Up to 8x SAS/SATA HDDs
 - 1100W PSU with 8x fans

Figure 1: Qualcomm QDF2400 Server Reference Evaluation Platforms (REP)

To know more about Qualcomm Centriq 2400 Processor family, please click [here](#).

The Chelsio 10/25/40/50/100Gb Unified Wire Ethernet Adapters

Chelsio is a recognized leader in high performance 10/25/40/50/100Gb Ethernet adapters for networking and storage within virtualized enterprise datacenters, public and private hyperscale clouds, and cluster computing environments. Chelsio’s Sixth generation ASIC technology (T6), has taken the unified wire to the next level with integrated Cryptography offload capabilities to accelerate IPsec/TLS/SSL/DTLS functions.

The Chelsio Unified Wire offloads all protocol traffic, providing no-compromise performance with high packet processing capacity, sub-microsecond hardware latency and high bandwidth. Chelsio offers a single chip Ethernet solution for NIC, TOE, SR-IOV, iSCSI, ISER and iWARP RDMA that concurrently offloads Crypto functions too.

Based on Terminator 5 (T5) and Terminator 6 (T6) ASICs, Chelsio offers the following line of highest quality, 10/25/40/50/100Gb Unified Wire Ethernet adapters. These adapters are certified and listed on Qualcomm’s Approved Vendor List (AVL) for the REP Platforms.

T6 Adapters							
Chelsio P/N	T62100-CR	T62100-LP-CR	T62100-SO-CR	T61100-OCP	T6225-OCP	T6225-SO-CR	T6225-LL-CR
Ports	2x40/50/100G			1x40/50/100G	2x1/10/25G		
Connector Type	QSFP28				SFP28		
Host Interface	PCIe Gen3 x16				PCIe Gen3 x8		
Form Factor	Half Size	Low Profile		OCP		Low Profile	
Concurr. Conn.	32k			256 → 1k			32k
Power (Typical)	22W	19W	16W	18W	15W	10W	16W
Airflow	200 LFM (Linear Feet Per minute)						
T5 Adapters							
Chelsio P/N	T580-OCP	T580-SO-CR	T580-LP-CR	T580-CR	T6425-CR	T6225-CR	
Ports	2x40G				4x1/10/25G	2x1/10/25G	
Connector Type	QSFP+ Cage				SFP28		
Host Interface	PCIe Gen3 x8						
Form Factor	OCP	Low Profile		Half Size		Low Profile	
Concurr. Conn.	256 → 1k			32k			
Power (Typical)	12W	17W	21W	26W		13W	
Airflow	200 LFM (Linear Feet Per minute)						
T5 Adapters							
Chelsio P/N	T520-OCP	T520-SO-CR	T520-CR	T520-LL-CR	T540-CR	T540-BT	T520-BT
Ports	2x1/10G				4x1/10G	4x100M/1G/10G	2x100M/1G/10G
Connector Type	SFP+ Cage					RJ-45	
Host Interface	PCIe Gen3 x8						
Form Factor	OCP	Low Profile			Half Size		Low Profile
Concurr. Conn.	256 → 1k			32k			
Power (Typical)	9W	12W	16W	16W	26W	20W	
Airflow	200 LFM (Linear Feet Per minute)						

Figure 2: Qualcomm AVL Certified - Chelsio 10/25/40/50/100Gb Ethernet Adapters

With a clear emphasis on performance and delivering only robust offload solution, as opposed to simple speeds and feeds, Chelsio has set itself apart from the competition. Designed for deployment in virtualized datacenters, cloud service installations and high-performance computing environments, Chelsio Ethernet adapters bring a new level of network performance metrics and functional capabilities to the Qualcomm’s Centriq 2400 processor based Armv8 server platforms and address the demand for scalable performance under the unique characteristics of workload optimized cloud infrastructure.

Supported Operating Systems

- Red Hat® Enterprise Linux® Server for 64-bit Arm (AArch64) (Based RHEL 7.3)
- Microsoft® Windows® Server for 64-bit Arm (Work in Progress)

Supported Features and Capabilities

Performance for networking, storage, and data security applications combined with the Qualcomm Centriq 2400 processor based Armv8 servers, enable a high performance, scale out, containerized, multi-tenant workloads in datacenters. A continuous effort is in place by Chelsio to work closely with the Qualcomm teams to optimize the end-application performance. Chelsio 10/25/40/50/100Gb Ethernet adapters support a wide set of features and capabilities. Following are the key supported features of the Chelsio adapters qualified for the Qualcomm Centriq 2400 processor based Armv8 servers:

- Low Latency L2 Networking, and full TCP/IP Stack Offload
- Small packet line-rate performance for Open Virtual Switch (OvS) by offloading its kernel datapath
- 10/25/40/50/100Gb iSCSI Offload (Target/Initiator)
- iWARP RDMA based use cases, NVMe Over Fabrics (NVMe-oF), iSER (iSCSI over RDMA), NFS/Lustre-RDMA
- Disk encryption, web server (Apache) inline traffic encryption (IPsec/TLS/SSL Offload)

Following are the core applications available and optimized for the Red Hat Enterprise Linux Server for Arm solution:

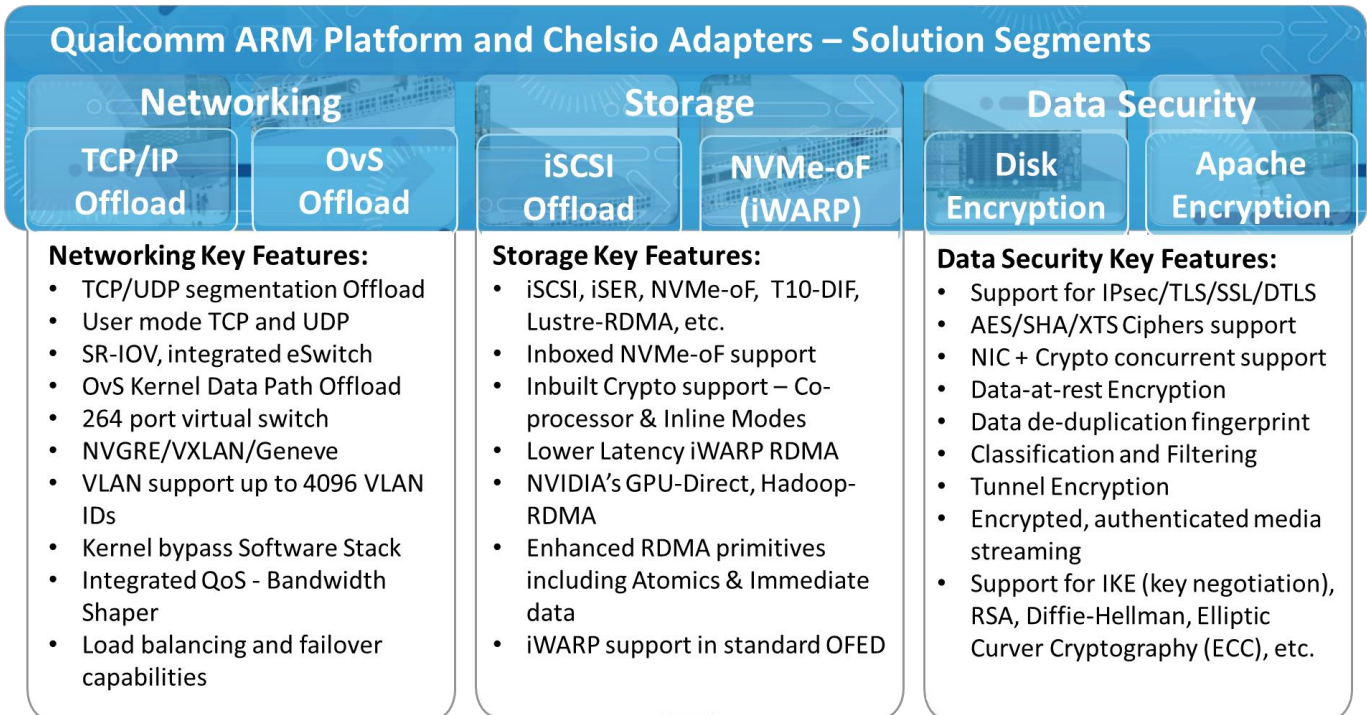


Figure 3: Networking, Storage and data Security Application Solution Segments

Performance Benchmarks

Chelsio adapters deliver excellent unidirectional and bidirectional throughput across the board, reaching line-rate performance for small and big network packets. Such performance and complimentary support for traffic QoS, packet classification and filtering, and Cryptography functions make Chelsio’s adapters an ideal fit for the Armv8 servers. Combination of the Qualcomm processor based servers with Chelsio’s industry-leading Unified Wire adapter solution delivers compelling performance, power and total cost of ownership (TCO) advantages, enabling innovative topologies and networked computing models to address the most demanding cloud datacenter infrastructure needs.



Figure 4 – QDF2400 REP Server and T6 adapters

Chelsio 10/25/40/50/100GbE NVMe over Fabrics (NVMe-oF) - Target/Initiator Solution

Chelsio T5 and T6 based iWARP RDMA implementation provides a low latency, high throughput, plug-and-play Ethernet solution for connecting high performance NVMe SSDs over a scalable, congestion controlled and traffic managed fabric, with no special configuration needed.

The graph presents READ, WRITE IOPS and throughput results of Chelsio NVMe over 100G iWARP fabric solution in a Qualcomm QDF2400 REP setup using Ramdisk as a storage array.

Using iWARP RDMA enables the NVMe based storage to be shared, pooled and managed more effectively across a low latency, high performance network. The results show that T6 NVMe over iWARP RDMA solution delivers:

- **Line-rate throughput of 97 Gbps**
- **IOPS exceeding 2.5M**

To Know more about 100Gb NVMe-oF Performance, please click [here](#).

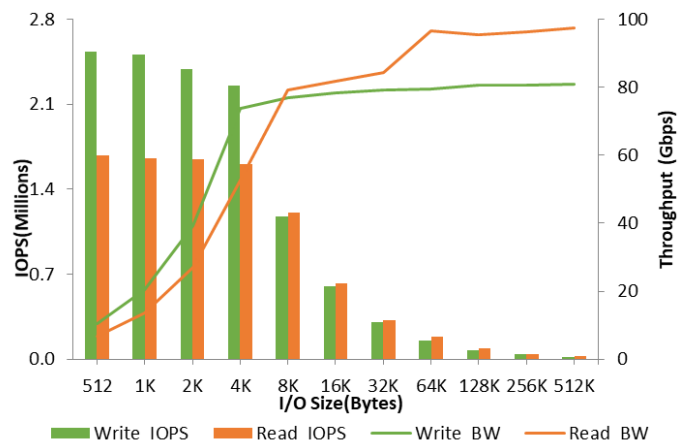


Figure 5 – 100GbE NVMe-oF Performance

Chelsio 10/25/40/50/100GbE iSCSI Offload - Target/Initiator Solution

iSCSI hardware offload capabilities of Chelsio T5/T6 Unified Wire adapters are fully compatible with the existing industry iSCSI ecosystem for both Target and Initiator functionalities and allows highly scalable and cost-effective storage solution using regular Ethernet infrastructure. Leveraging routable and reliable TCP/IP as a foundation, Chelsio iSCSI storage solution enables largest target & initiator ecosystem and most of the native initiator drivers are in-boxed in all major operating systems and hypervisors.

The graph presents 100GbE iSCSI IOPS and Throughput results for Chelsio’s T62100-CR Unified Wire adapter in a Qualcomm Arm based server. The adapter performs consistently under load and delivers **line-rate READ throughput of 96 Gbps**. Chelsio T6 iSCSI solution provides an all-round SAN solution for exceptional I/O performance and efficiency. To Know more about 100Gb iSCSI Offload Performance, please click [here](#).

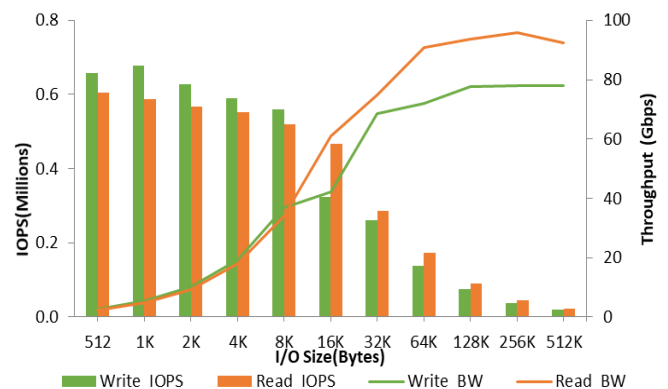


Figure 6 – 100GbE iSCSI Offload Performance

Chelsio 10/25/40/50/100GbE OvS Kernel Datapath Offload Solution

Open vSwitch's forwarding path (the in-kernel datapath) also known as OVS DP, is designed to be amenable to "offloading" packet processing to hardware chipsets, in a classic hardware switch chassis or in an end-host NIC. The advantage of hardware integration is that both bare-metal and virtualized hosting environments can be managed using the same mechanism for automated network control.

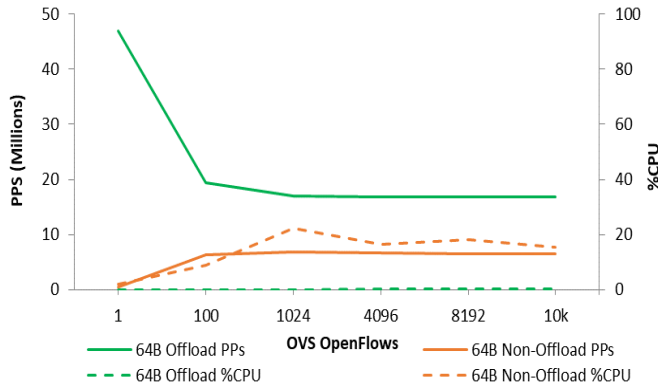


Figure 7 – PPS and %CPU vs. Number of Flows

Chelsio’s T6 Unified Wire solution offloads OVS datapath flow match entries and action processing onto Chelsio adapter and provides hardware acceleration. The graph presents packet processing rate (MPPS) and CPU utilization for offload and non-offload OpenFlow network traffic. The results are collected using pktgen tool with I/O size 64B and the number of OpenFlows varying from 1 to 10k.

Chelsio T62100-CR adapter delivers **up to 47 MPPS** while processing small I/O size (64B) network packets by offloading OVS kernel datapath onto the adapter, freeing CPU for other applications.

To know more about the OVS Offload performance, please click [here](#).

Chelsio 10/25/40/50/100GbE Apache Inline Encryption/decryption Solution

Chelsio’s Inline Crypto solution supports TCP/IP and TLS/SSL AES/SHA processing in cut-through fashion to achieve optimal bandwidth and latency. Offloaded connection is used to transmit and receive data. Handshake is executed in host while data is encrypted and decrypted by crypto engine offloaded onto hardware. Chelsio TLS/SSL offload solution is well suited for site-to-site security over WAN. Encryption and decryption processing for TLS/SSL is offloaded onto the T6 adapter, freeing CPU resources for other tasks.

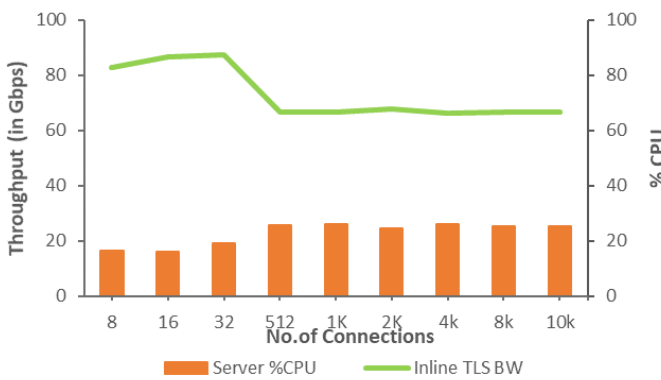


Figure 8– Inline-TLS/SSL Throughput & CPU Usage vs. # Connections

Chelsio T6 adapters on Qualcomm Centriq 2400 Arm Platform provide line-rate Inline-TLS/SSL bandwidth with minimal Server CPU usage. With **line-rate performance and CPU savings even with 10000 connections**, Chelsio’s solution proves to be the best choice for clients looking for highest level of data security and integrity, without compromising performance. Chelsio’s T6 crypto solution is the best when it comes to delivering performance coupled with the highest data security. T6 is currently the only secure engine capable of full TCP/IP Offload at 100Gbps. The introduction of integrated encryption within a NIC price and power envelope should further the migration towards secure cloud networks and

storage. To Know more about the Inline Crypto performance, please click [here](#).

References

- 100GbE iSCSI Offload Performance – [Technical Brief](#)
- 100GbE iSCSI Offload Performance – [Demo Video](#)
- 100GbE NVMe-oF Performance – [Technical Brief](#)
- 100GbE NVMe-oF Performance - [Demo Video](#)
- 100GbE OVS Kernel Datapath Offload Performance – [Technical Brief](#)
- 100GbE OVS Kernel Datapath Offload Performance – [Demo Video](#)
- 100GbE Inline TLS/SSL Encryption – [Technical Brief](#)
- 100GbE Inline TLS/SSL Encryption – [Demo Video](#)
- To know more about Chelsio Unified Wire solution for Qualcomm Centriq 2400 Arm Platform, please visit [Qualcomm Download Center](#)
- Chelsio latest software bits for the Arm Platform are available [here](#)