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New Intel Xeon Scalable Platform-based servers and all-flash storage arrays drive demand for faster Broadcom networking solutions

By Barbara Porter | Posted: March 15, 2018

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Advances in Intel Xeon scalable architecture

This highly scalable design delivers a solution for almost every need. At the high end of the family, these new processors offer 28 cores per socket and support up to eight sockets with up to three Intel LPI (Link Power Integration) units. They also support up to 1.5 TB of 2.56TB 32GB memory. The number of PCI Express lanes per CPU has increased to 48 lanes of PCIe 3.0 per CPU.

The Xeon Scalable Platform was designed specifically for data center applications with a new mesh-based architecture that reduces latency at high core counts. Much architecture offers improved connectivity between processor cores compared with the ring architecture that has been a feature of Intel's data center processors since 2005.

In addition, the Xeon Scalable Platform significantly increases memory bandwidth by almost 50 percent by incorporating an additional two memory channels, moving up to a six-channel architecture versus the previous quad-channel platform. With a total of six memory channels available to the processor and an increase in memory speed, memory-bound applications will experience a dramatic boost in performance.

With the significant advances in compute power delivered by the Xeon Scalable Platform, the spotlight is now on storage systems and the network to deliver the necessary performance to match. On the storage side, new AFAs are delivering the performance required to solve storage bottlenecks with exponentially better IOPS and latency compared to hard disk drives. AFAs are so fast that even lower-end AFAs have the capacity to match the power of Xeon Scalable platform-based servers, which means traditional, enormous enterprise arrays are no longer required to achieve these performance levels. The focus is now on the network to deliver.

Why a Gen 6 Fibre Channel Network is required for Xeon Scalable Platform-based servers

The majority of AFAs are deployed with fibre channel because of its performance, extreme reliability and highly-scalable architecture. The newest, sixth generation of Fibre Channel was designed to meet the demands of high-speed data center architectures such as the Xeon Scalable Platform, NVMe over Fabric, growing deployments of AFAs and hyper-scale virtualization.

Testing has shown that Emulex Gen 6 HBAs and Broadcom Gen 6 switches provide the performance needed to alleviate network bottlenecks and dramatically improve data warehousing application performance versus earlier FC generations. New features boost reliability and deliver a suite of diagnostic, troubleshooting and deployment features.

Demoark tested Emulex Gen 6 HBAs and Broadcom's Gen 6 Q620 switch and found that they reduced Microsoft SQL Server 2014 data warehouse workload query time by almost half compared to 16GFC, and reduced it to a quarter compared to 8GFC-connected servers.

Completion Time of Decision Support Queries

Configuration	Completion Time (Seconds)
16GFC	~1500
8GFC	~2000
32GFC	~750

The Average I/O Response Time was reduced by 50 percent compared to 16GFC and was 70 percent lower than 8GFC, as indicated in the graph below.

Average I/O Response Time by Blocksize (lower is better)

Blocksize	16GFC	8GFC	32GFC
OLTP	~1.5	~1.0	~0.5
Email	~1.5	~1.0	~0.5
Data Warehousing (OLAP)	~2.5	~1.5	~0.8
Data Warehousing (SQL Server)	~4.5	~3.0	~1.5

On average, the Gen 6 HBA application response time was:
• 70% lower than the 16GFC HBA
• 50% lower than the 8GFC HBA (40% for OLTP)

Emulex architectural advantages

Emulex Gen 6 HBAs deliver 2x greater bandwidth than the previous generation – 12,800Mbps (2 ports, 32G, full duplex) – as well as less than half the latency and over 1.6 million IOPS in a single port. Improvements to Emulex Gen 6 Fibre Channel adapter technology include operating at faster clock rates and an increased number of hardware offloads that reduce the number of firmware “touch points” required for Fibre Channel connection initialization functions. One of the design goals of the new Emulex Gen 6 products was to lower latency in order to complement the new Xeon Scalable Platform and growing all-flash storage array adoption.

Emulex's unique Dynamic Multi-Core Architecture provides performance where it's needed. The architecture delivers tremendous IOPS performance – 1.6 million IOPS – in a single port, which is 2.5x more IOPS than other Gen 6 HBA designs can deliver. The advantages of this design are critical when using dual-port HBAs in an active-standby configuration. In fact, an estimated 80 percent of HBAs sold are dual-port and configured for active-standby fail-over mode.

Active-Standby Mode

Standby 1.6M IOPS

Active-Active Mode

800K IOPS 800K IOPS

Emulex database performance advantages versus QLogic

Testing by Emulex Labs with Oracle Database 12c on Xeon Scalable Platform servers has shown significant performance advantages when using Emulex HBAs. Compared to the equivalent QLogic Gen 6 HBAs, Emulex Gen 6 HBAs deliver up to 46 percent greater OLTP transactions per minute, using a TPC-C-like “order entry dataset.”

Data warehousing query times were up to 18 percent faster with Emulex using a TPC-H-like “DSS dataset”—a decision support benchmark. Emulex also delivered up to 45 percent higher Orion IO Subsystem IOPS. Oracle Orion is a tool to help predict performance of IO loads on Oracle databases. Orion is specifically designed for simulating and predicting IO bottlenecks against Oracle databases.

Oracle Results with Emulex vs. QLogic Gen 6 16GFC

Up to 18% faster data warehousing query completion time (TPC-H DSS Dataset)

46% greater OLTP transactions/min. (TPC-C Order Entry Dataset)

45% greater IO sub-system IOPS (Orion)

To maximize database performance, customers are making large investments in new Intel Xeon Scalable Platform servers, AFAs, as well as licensing costs for Oracle Database, Microsoft SQL Server and VMware. It only makes sense to upgrade from older network infrastructure such as 8GFC to Gen 6 Fibre Channel to reap all the performance gains and get maximum ROI on new infrastructure purchases.

1. TPC-C is an on-line transaction processing (OLTP) benchmark. TPC-C is more complex than previous OLTP benchmarks such as TPC-B because of its multiple transaction types, more complex database and overall execution structure. TPC-C involves a mix of five concurrent transactions of different types and complexity either executed on-line or queued for deferred execution. The database is comprised of nine types of tables with a wide range of record and population sizes. TPC-C is measured in transactions per minute (tpmC). While the benchmark purports the activity of a warehouse salesperson, TPC-C is not limited to activity of any particular business segment, but, rather represents any industry that must manage, sell, or distribute a product or service.

2. TPC-H is a decision support benchmark. It consists of a suite of business-oriented ad-hoc queries and concurrent data modifications. The queries and the data populating the database have direct industry-wide relevance.

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