BROADCOM®

Solution Brief

Emulex Fibre Channel HBA

Advantages of Dynamic Multi-Core Architecture

Overview

Applications continue to grow in size and scale. To support them, enterprises are increasingly turning to new server technologies that contain hundreds of processor cores as well as high-performance storage solutions including low-latency NVMe, all-flash arrays (AFAs). NVMe can significantly increase the performance of storage area networks (SANs), making the selection of high-speed networking technology the critical element for achieving maximum system-wide performance.

Fibre Channel is purpose-built for storage networks, meeting the requirements for high availability, scalability, predictable performance, and low latency. The Emulex® Gen 7 Fibre Channel Host Bus Adapters (HBAs) utilize the next generation XE601 I/O controller (IOC) for demanding mission-critical workloads and emerging applications.

The unique Emulex Dynamic Multi-core Architecture of the XE601 delivers unparalleled performance and more efficient port utilization as well as delivering the highest reliability via redundant data paths than other HBAs.

This technology brief explains both the reliability and performance differentiation of the Emulex Gen 7 architecture.

Unparalleled Reliability

At the heart of XE601 architecture are eight Fast Path data acceleration engines and 16 threads that work in concert to process the I/O transaction which ensure that our customers' data is delivered with the priority and predictability that it deserves with 100% redundancy built in for all engines. Should there be an error in any of the eight data paths, the redundant architecture automatically reroutes the I/O transactions to the other Fast Path data engines without any disruption to the application being run on the server. Every Fast Path data engine has its dedicated memory block to ensure that adequate Fibre Channel resources are allocated to match the data engine's processing capabilities.

The Fast Path architecture is highly resilient against link failures such as Link Initialization Protocol (LIP) bootstorms. Link failures on one port do not disrupt the full operation of the other ports on the HBA and the data engines are reassigned to the healthy ports.

Each port on the Emulex HBA has its own dedicated Fast Path data engine and any of the available Fast Path data engines can be dynamically applied to any port's I/O transactions as depicted in Figure 1 to provide maximum performance and uptime to all ports on the Fibre Channel HBA. In contrast, QLogic's port isolation architecture does not offer any redundancy for the legacy RISC processor based architecture and any error or disruption in the data path can potentially lead to port failure(s).

Figure 1: Emulex Dynamic Multicore Architecture with Full Redundancy

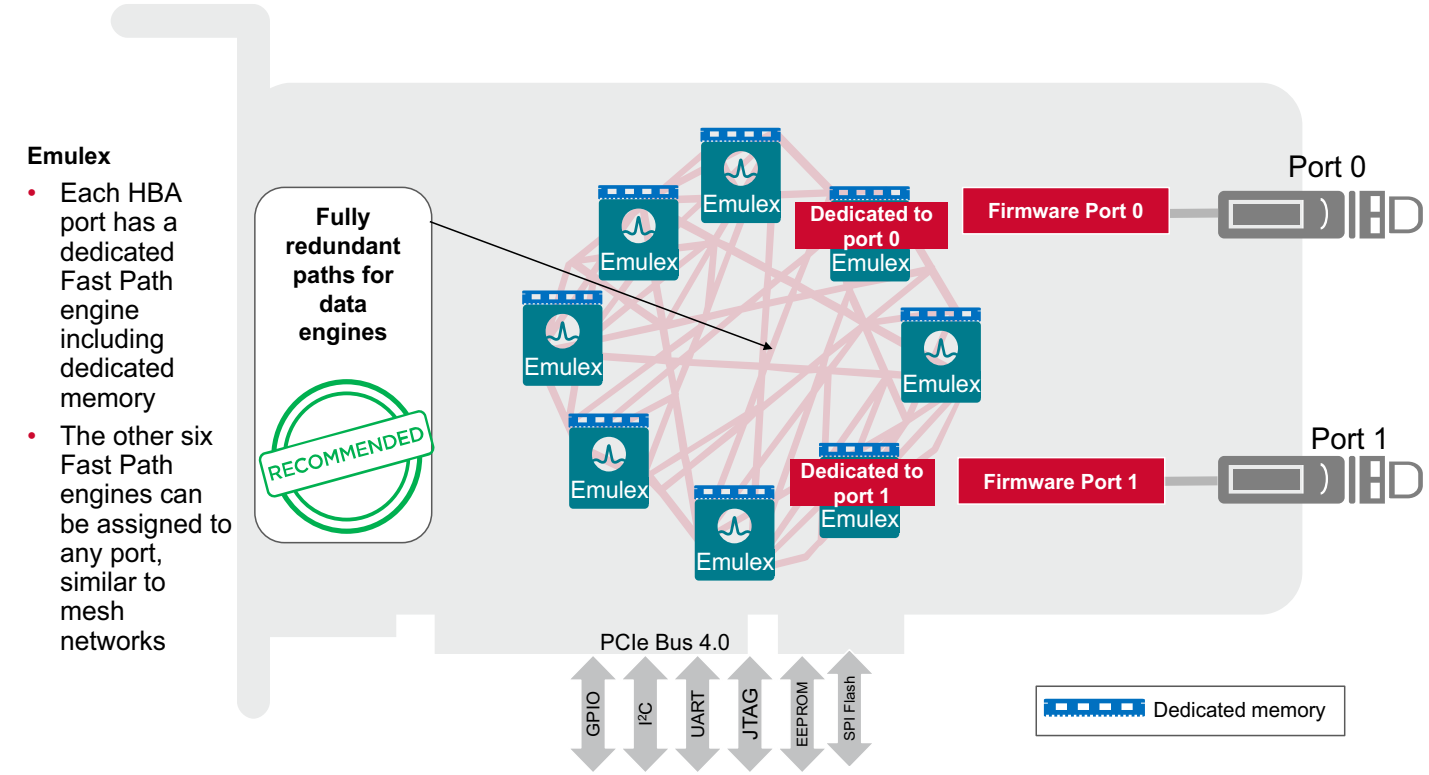
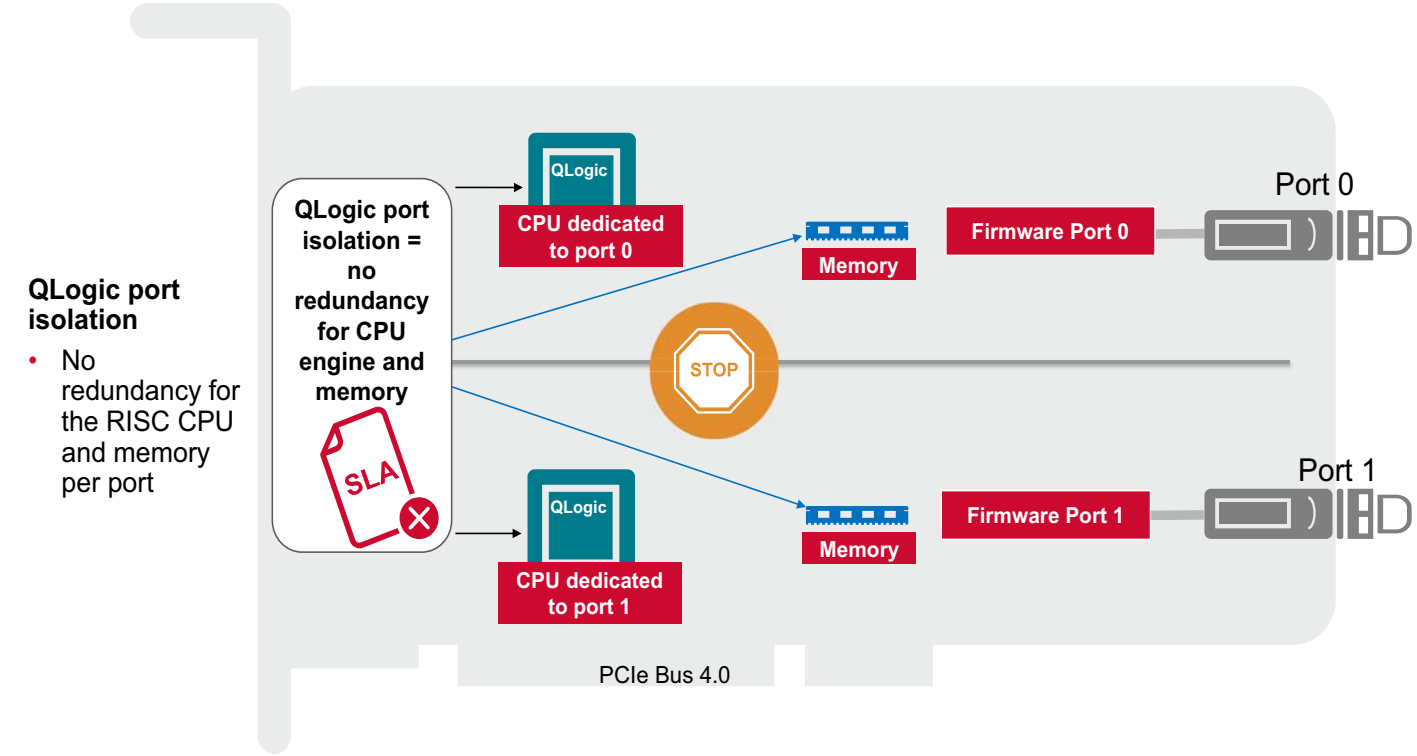


Figure 2: QLogic Port Isolation Architecture with No Redundancy



Full Data Protection

- The Emulex Host Bus Adapters thwart malicious firmware with Silicon Root of Trust and digitally signed firmware complying with NIST 800-193 framework. The digital signature is verified during firmware download and power-on.
- Guarantee driver security with Broadcom® digitally signed drivers.
- Secure Boot guarantees UEFI boot code security with digitally signed boot code.
- Data Integrity Field (T10 DIF) protects data from corruption.

In addition, each port on the Emulex HBA has its own firmware image and the no reboot firmware upgrades feature of the Emulex HBA enables our customers to minimize maintenance windows and maximize uptime.

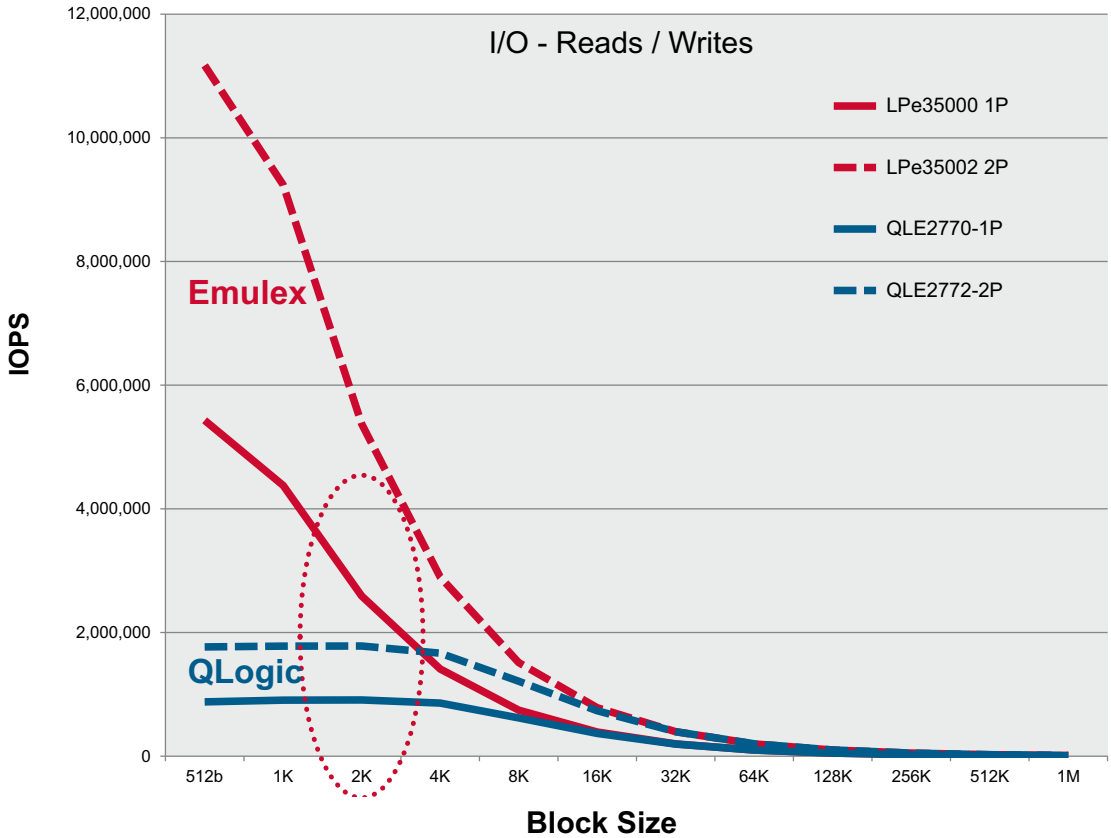
Unparalleled Performance

The Emulex Dynamic Multi-core Architecture delivers unparalleled performance and the most efficient port utilization with eight Fast Path data engines and 16 threads that dynamically apply ASIC resources to any port that requires them, ensuring SLAs are met. XE601 delivers up to 12,300 MB/s full-duplex bandwidth, 3x better hardware latency, and industry-leading up to 11 million IOPS with 64GFC optical modules.

The Emulex Gen 7 HBA outperforms QLogic's Gen 7 HBA as shown below where a single port of the Emulex Gen 7 HBA produces higher IOPS than the QLogic dual-port HBA and achieves near line rate throughput at 4K to 8K block sizes which is the sweet spot for many popular workloads that use Fibre Channel.

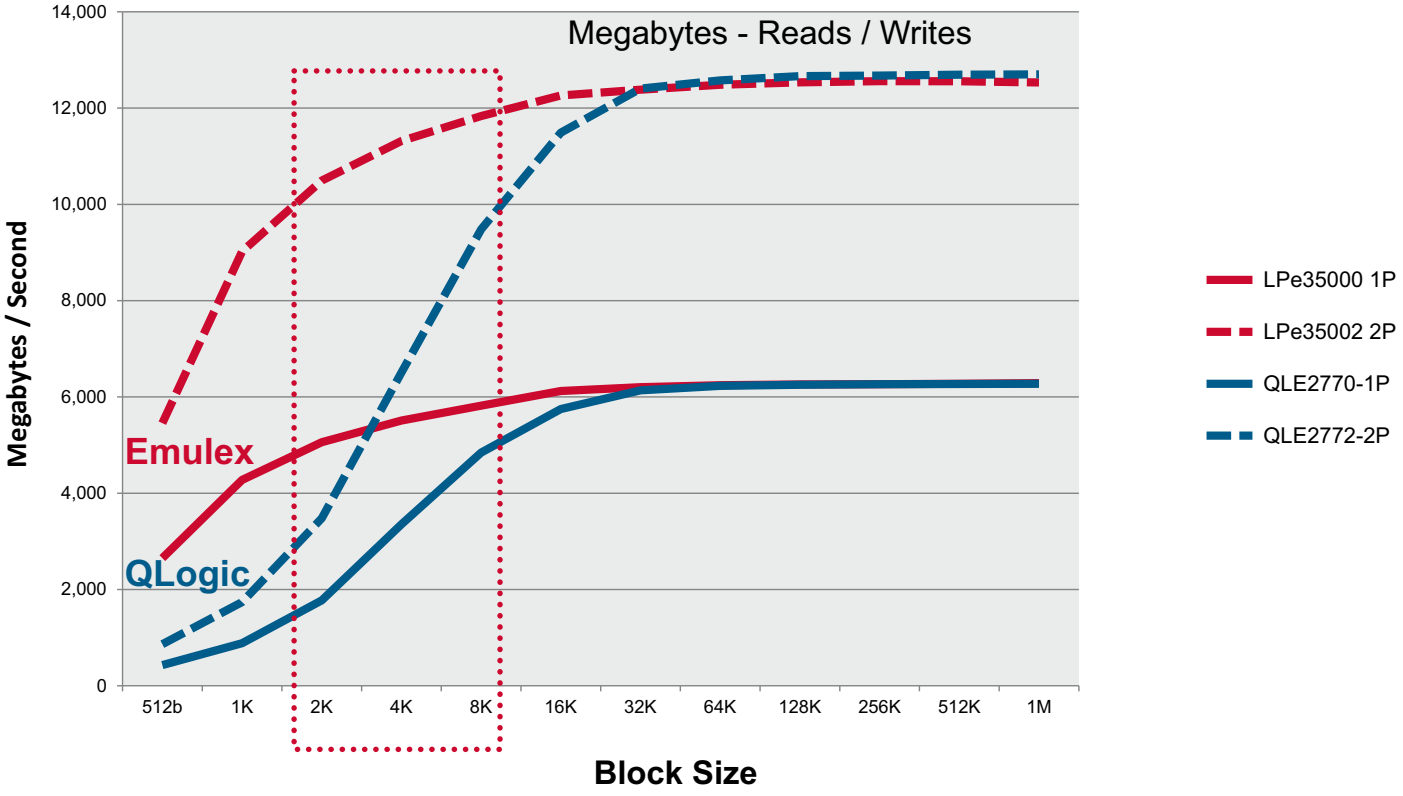
A single port of the Emulex HBA can generate more IOPS than two ports of the QLogic HBA at the 2K block size.

Figure 3: : I/O Read/Write Comparison



The Emulex HBAs approach line rate throughput at 2K block sizes and achieve line rate throughput at 4K to 8K block sizes which are used for most Fibre Channel workloads.

Figure 4: Megabytes Reads/Writes Comparison

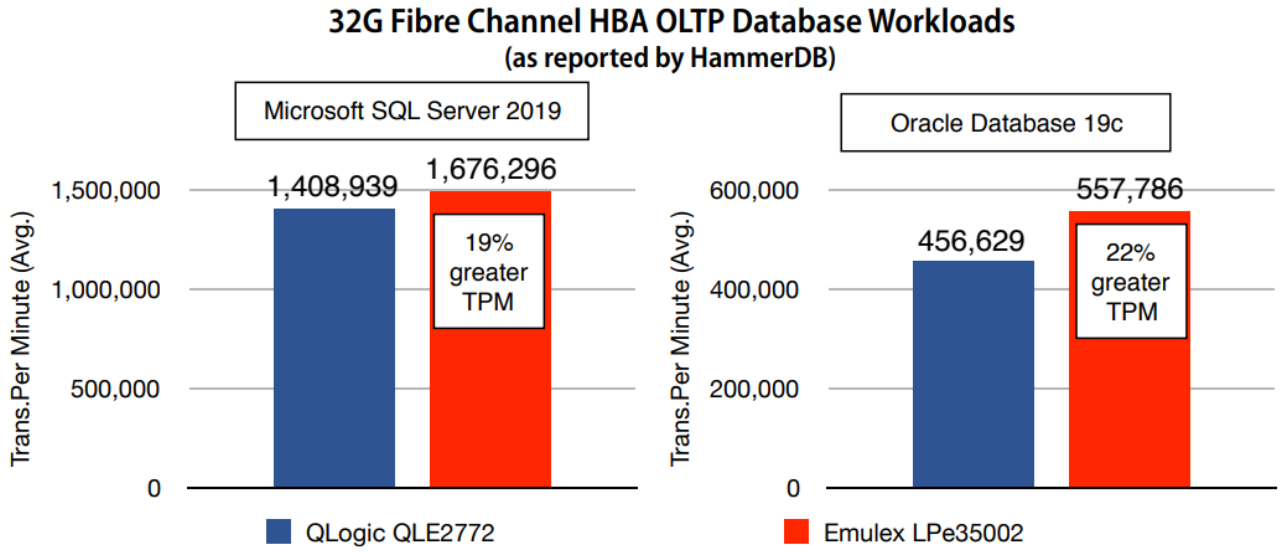


The following figure shows the application workload performance test results from the Tolly Group test report which compares the Emulex and QLogic Gen 7 32GFC HBAs side by side for real world applications. According to Tolly Group, the Emulex Gen 7 LPe35002 HBA demonstrated superior performance with approximately 20% more transactions per minute (TPM) for Microsoft SQL and Oracle Database OLTP application workloads.

The full report is available on the Broadcom website for further review.

Emulex 32G HBAs deliver up to 22% better performance than QLogic HBAs.

Figure 5: Online Transaction Processing (OLTP) Database Workload Comparisons



Note: HammerDB TPC-C load. Better of two runs reported. All flash NVMe array.
Source: Tolly, April 2020

Figure 3

Summary

Fibre Channel is known as the gold standard for network storage connectivity and the Emulex Gen 7 HBAs offer the highest reliability and performance for the Fibre Channel host connectivity. In summary, advantages of the Emulex architecture address the most crucial consideration for the modern data center storage network build out:

- The dynamic fully-redundant Fast Path data engines ensure maximum uptime.
- A full suite of data protection features such as silicon root of trust, signed drivers, and secure boot protect the HBA from malicious attacks.
- Emulex Gen 7 HBAs outperform the competition.
  - A single port generates more IOPs than two ports of the QLogic Gen 7 HBA at 2K to 8K block sizes
  - 5x higher IOPS performance and ½ the latency
  - 20% higher database workload performance
- A full suite of data protection features such as silicon root of trust, signed drivers, and secure boot protect the HBA from malicious attacks.