

Broadcom Emulex Gen 7 FC HBA has Significantly Improved Performance over Gen 6

Tech Note by

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Summary

As the adoption of All-Flash Arrays (AFA) over Fabric for the public cloud continues to grow, server HBA standards must steadily rise to ensure maximum workload performance and security are intact.

Dell EMC and Broadcom have partnered together to test the new Gen 7 Emulex HBA and compare its performance to the previous generation.

The results serve to be a reminder that data center networking can quickly and critically impact system performance in our rapidly evolving technical climate.

Gen 7 FC HBA

Data centers are undergoing a transformation with the emergence of all-flash arrays (AFAs), faster media types and more efficient ways to access media. These forms of storage deliver record speeds and lower latencies to significantly improve application performance. One key technology that is driving this rapid evolution is NVMe over Fabrics (NVMe-oF). Swift speeds have proven the value of running AFAs over Fabrics, and now networking HBA's are being further developed to avoid bottlenecking performance. The latest storage networking standard, Gen 7 FC (Fibre Channel) HBA, provides the ideal combination of performance improvements plus features to support this data center transformation, while maintaining backward compatibility with existing Fibre Channel infrastructure.

These bold claims of performance, security and efficiency improvements over the previous generation compelled Dell EMC to dive deeper, in hopes that our latest PowerEdge products would utilize Gen 7 to achieve significant read/write IOPS (I/O Operations per Second) within a flash-oriented datacenter. To determine the latency and read/write performance advantages compared to its Gen 6 predecessor, three tests were conducted with the newest Emulex Gen 7 LPe35000-series HBAs (Host Bus Adapters) by Broadcom.



Figure 1: Emulex Gen 7 LPe35000-series LPe35002

Test Procedure and Results

To measure Gen 7 HBAs latency improvement, two important interfaces of the HBA were prepared: The Fiber Channel port as it connects to the SAN, and the PCIe interface of the host computer. Two protocol logic analyzers were used on each connection with synchronized clocks to ensure that both analyzers measured the timing of a full iteration (from when a FC frame is received at the HBA FC port until it was converted to the PCIe protocol).

To measure Gen 7 HBA write IOPS improvement, both HBA performance metrics were compared in an Oracle Database 12c server with data stored on a NetApp AFF A800 all-flash array. HammerDB benchmark was used to simulate an OLTP client load of 128 virtual SQL transaction users to a 500GB TPC-C-like dataset representing 5000 warehouses.

1. Gen 7 has ~1/3 latency of Gen 6 (Figure 2)

The fast path hardware architecture design reduces average hardware latency to one third of the latency seen in the previous generation Gen 6 HBA. This dramatic reduction in latency impacts every frame that moves from the SAN to host PCIe bus in either direction as it passes through the HBA.

2. Gen 7 has ~3x greater read & write IOPS (Figures 3 and 4)

Running synthetic, I/O workloads, Broadcom Emulex Gen 7 HBAs delivered nearly 3x as many IOPS across two ports in both the read and write tests. This serves as an excellent example of the increased application value gained through updating HBA's on an already existing server and storage investment.

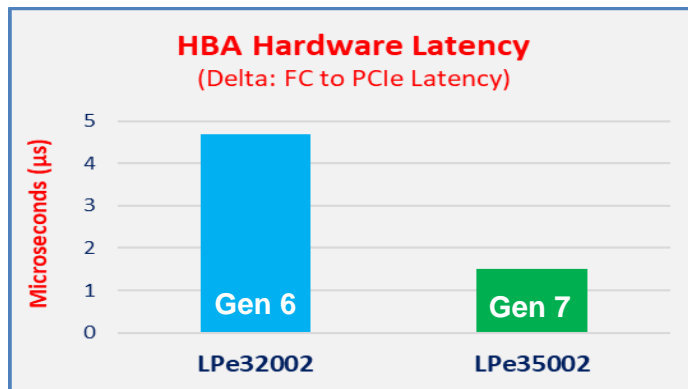


Figure 2: Gen 7 has 1/3 the latency of Gen 6, which is better

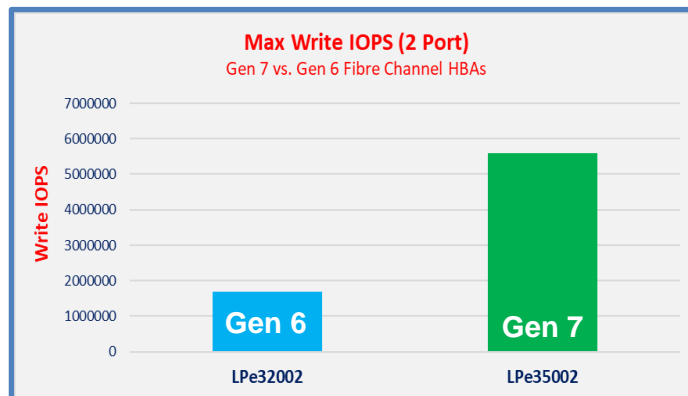


Figure 3: Gen 7 significantly outperforms Gen 6 for Write IOPS

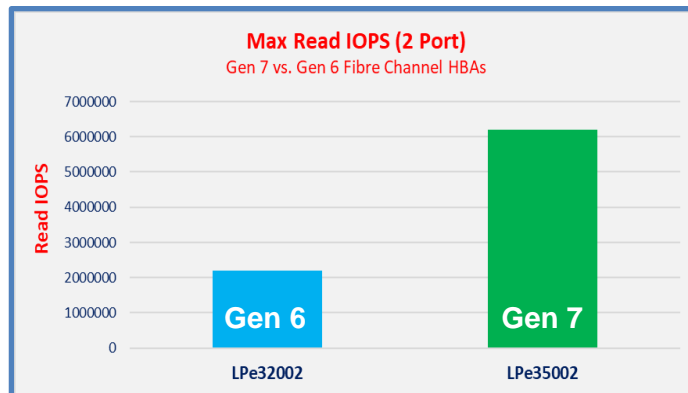


Figure 4: Gen 7 significantly outperforms Gen 6 for Read IOPS

Additional Improvements to Gen 7

- **Trunking:** Supports up to 64GFC on a single port by aggregating multiple physical ports to form a single, logical, extremely high-bandwidth port.
- **Supports PCIe 4.0:** Gen 7 is the first HBA with PCIe 4.0 supporting 2x the bit transfer rate compared to PCIe 3.0
- **Enhanced security with support for Dell Cyber-resiliency:** Checks for authentic firmware every time the system is booted and before installing any new firmware.

In Conclusion

The test results point to the conclusion that servers using a dense number of high speed storage devices, such as Dell EMC AFAs, NVMe devices, or Connectrix 32GFC switches, could be under-optimized if using an outdated HBA. By updating the previous Gen 6 FC HBA to the current Gen 7 FC HBA, users ensure that their networking components are not limiting the optimal performance that the PowerEdge system was built to yield.

Notes:

1. ESG, [2019 Data Storage Predictions](#), 1/7/2019
2. Demartek Evaluation, [Emulex Gen 7 Fibre Channel HBAs by Broadcom](#), 12/2018



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