DELL EMC

PowerEdge Product Group

Direct from Development

Dell EMC Offers a Seamless Transition to NVMe over Fibre Channel

Tech Note by:

Dell EMC Server Product Group

SUMMARY

NVMe over Fibre Channel is an emerging technology that enables the use of alternate transports to PCIe to extend the distance over which an NVMe host device and NVMe drive can connect. The benefits include lower latency, and higher performance.

The NVMe market is rapidly growing and is expected to exceed $57 Billion by 2020, with a compound annual growth rate (CAGR) of 95%. Further, 40% of all flash arrays (AFAs) are forecasted to use NVMe solid state disks (SSDs) in the same time period.[1.] NVMe over Fabrics options for connecting to NVMe AFAs include NVMe over RDMA (RoCE, iWARP, Infiniband), and NVMe over Fibre Channel. All told, hundreds of thousands of AFAs will connect with NVMe over Fabrics technology in the very near future.

While Dell EMC will support various NVMe over Fabric transports, this paper will focus specifically on Dell EMC's NVMe over Fibre Channel-enabled adapters for PowerEdge servers and how they are positioned to make this technology transition as seamless as possible.

Adoption of NVMe over Fibre Channel

With the appearance of all-flash-arrays on the scene, the protocol stack layer has been exposed as the next latency bottleneck. NVMe over Fibre Channel (NVMe over FC) is an emerging technology. The ecosystem for this technology will build out during the late 2017 and 2018 calendar years as HBA drivers, operating systems, enterprise features (such as MPIO), and storage array options mature and become available. Customers are able to future-proof their Dell EMC 14G PowerEdge servers by purchasing Gen6 FC16 and FC32 HBAs (note FC8 Gen4 adapters will not support NVMe over FC). Dell EMC HBAs will be time-to-market with NVMe over FC enablement for the different operating systems via driver and firmware updates.

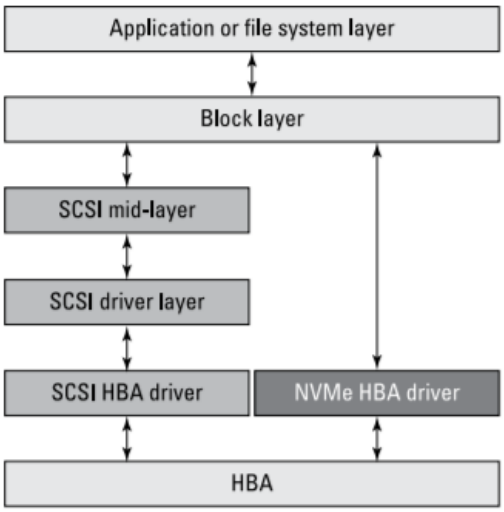
Fibre Channel is a well suited transport for the fast adoption of NVMe over Fabrics. Because Fibre Channel is a robust credit-based fabric designed for storage traffic, customers that use Fibre Channel do not need to change how they manage their Fibre Channel fabric to take advantage of NVMe over FC. Customers need the correct HBAs (available now), a compatible operating system, and they need to acquire an NVMe over FC storage array once they become available.

Storage Transition to NVMe over Fibre Channel

Modern datacenters require storage systems that support high bandwidth, high IOPs and low latency. All-flash arrays have addressed the first two requirements. However older storage protocols such as SCSI that were designed for rotating media have become the bottleneck, constraining the

highly scalable architectures of today's servers and remove performance bottlenecks that were exposed by high-speed flash storage. For example, NVMe supports 64K queues with a depth of 64K, and each I/O queue is architected for simultaneous multi-threaded processing, enabling an extraordinary number of parallel requests across a connection. As illustrated in Figure 1 below, the SCSI protocol stack has many extensions and support for legacy applications that has resulted in lower performance compared to the simpler NVMe stack, which has been optimized for memory-based storage media and modern operating systems. Coupled with NVMe drives, the optimization of the NVMe protocol stack yields a significant decrease in the latency of transactions.

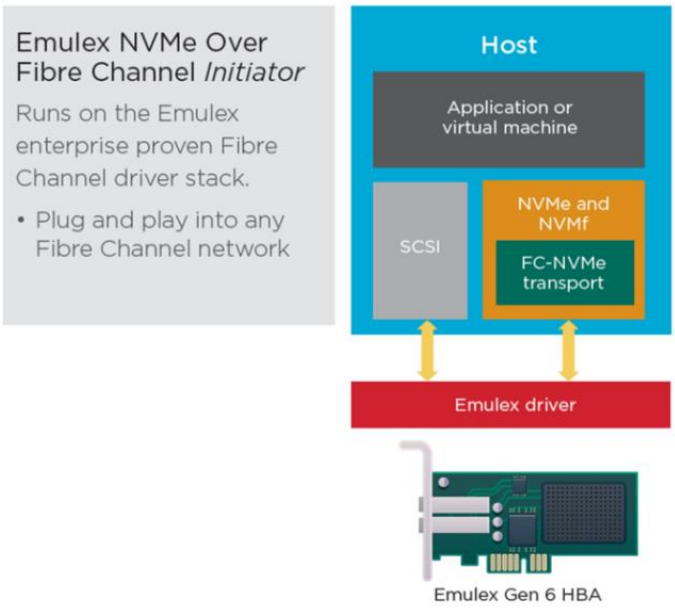
Figure 1: SCSI software stack and NVMe software stack comparison



Datacenter architects need to ensure that their storage strategies provide flexibility to address the business needs for "Faster Flash". As they plan for NVMe over Fabrics adoption, IT architects will seek technologies that simplify the transition.

Low Latency and Concurrent Access to SCSI and NVMe Storage Fabrics

Transitioning to NVMe over FC is simple with Dell EMC's NVMe over Fibre Channel-enabled Gen 6 adapters that provide up to 55% lower latency vs. SCSI adapters. Enterprises can continue to access their remote SCSI storage, while selectively adding NVMe storage to address their "Faster Flash" needs. By supporting simultaneous access to both fabrics (Figure 2), Fibre Channel eliminates the risk associated with transitioning to new technology. Fibre Channel will support both SCSI storage arrays and new NVMe over Fibre Channel storage on the same fabric and even the same Fibre Channel port. All major operating systems vendors are adding support for NVMe over FC in upcoming releases.



Requirements for NVMe over FC fabric

- Gen 6 HBAs with device drivers to support NVMe over Fabrics concurrently with SCSI
- Either a Gen 5 or Gen 6 Fibre Channel switch offers full compatibility with SCSI and NVMe over FC

Figure 2: Dell EMC branded NVMe-over Fibre Channel Adapters plug and play into any FC network.

NVMe over Fibre Channel: Lightning-fast NVMe-oF Protocol Meets an Enterprise-Proven Storage Network

Fibre Channel is purpose-built for storage. The reliable, lossless, high speed delivery of "bursty" storage traffic is the foundation of Fibre Channel architecture. Because it is isolated from the rest of the datacenter traffic, Fibre Channel networks provide the added benefit of "Air-gap" security. Existing name services and discovery mechanisms simplify NVMe deployments on the storage fabric. These attributes make the enterprise-proven Fibre Channel network an excellent foundation for deploying the new NVMe over Fabrics protocol.

Conclusion

NVMe over Fabrics represents the next storage transition to "Faster Flash." Fibre Channel is the leading storage network and offers a seamless transition to remote NVMe storage. The availability of Dell EMC NVMe over Fibre Channel-enabled adapters provides enterprises with both investment protection and the flexibility to move to NVMe storage at the pace of their business.

Sources cited:

1. G2M Inc. (2016) NVM Express Ecosystem Market Sizing Report