Factors Driving Enterprise NVMe™ Growth

Sponsored by NVM Express™ organization, the owner of NVMe™, NVMe-oF™ and NVMe-MI™ standards

Speaker

Gary Kotzur

DELL EMC

Overview

With the increased availability and awareness of NVMe^{TM} products, more enterprises are making the transition to NVMe. Join our panel discussion to learn how server and storage vendors are helping make this transition possible.

NVMe™ SSD Technology Trends

- **Lower costs**
  - Natural market decreases
  - Technology advances
- **Capacity is increasing**
  - More layers
  - More levels: TLC → QLC
  - Die per package increasing
- **Performance is increasing**
  - Media: SCM
  - Interface: PCIe ® 3.0 → 4.0 transition, 5.0 is coming
- **Power levels are sustaining**
  - Media
  - Interfaces

Addressing Customer Expectation Gaps

- Enhanced Serviceability
  - PCI-SIG® work group added new features
  - All OS vendors have support plans

- Decreased Costs
  - Infrastructure costs are dropping
  - Switched and direct connectivity
  - Modality of device ports

- More "Data Protection" Options

- Security

- Management

Expanding Ubiquity

- Wide adoption across all segments: Enterprise → Client

- NVMe™ support is expanding throughout Enterprise / Data Center products

- Native OS and OSV driver support

- Increased "Data Protection" options

- Native Fabric support → NVMe-oF™

- Increased Media choices → Flash & SCM

- In summary → SSDs are converging on NVMe

Flash Memory Summit

Consolidation

- SSD Form Factor

- Incumbent Form Factor adoption: SD, XD

- Storage Device Interface

- NVMe-oF^{TM} variants

- Modality of device ports

Challenges → Opportunities

1. Flash Performance Density

2. PCIe ® Distance

3. Computational Storage

4. Block → Key Value

Speaker

Steve McQuerry

PURESTORAGE®

NVMe™ in Enterprise Storage Arrays Overview

- More storage Arrays are being built as all flash platforms for enterprise deployments

- These platforms are optimized for performance and capacity

- NVMe™ has become a key component when using flash in enterprise products

- Many all flash arrays are adopting NVMe as the preferred protocol

- NVMe-oF™ connectivity is providing additional benefits of extending the NVMe protocol outside of chassis directly to the client or to expansion shelves

NVMe^{TM} Implementation Case Study

We are looking at Pure Storage as a specific case study in the implementation and use of NVMe^{TM} technologies. This is not a product endorsement by NVMe Express.
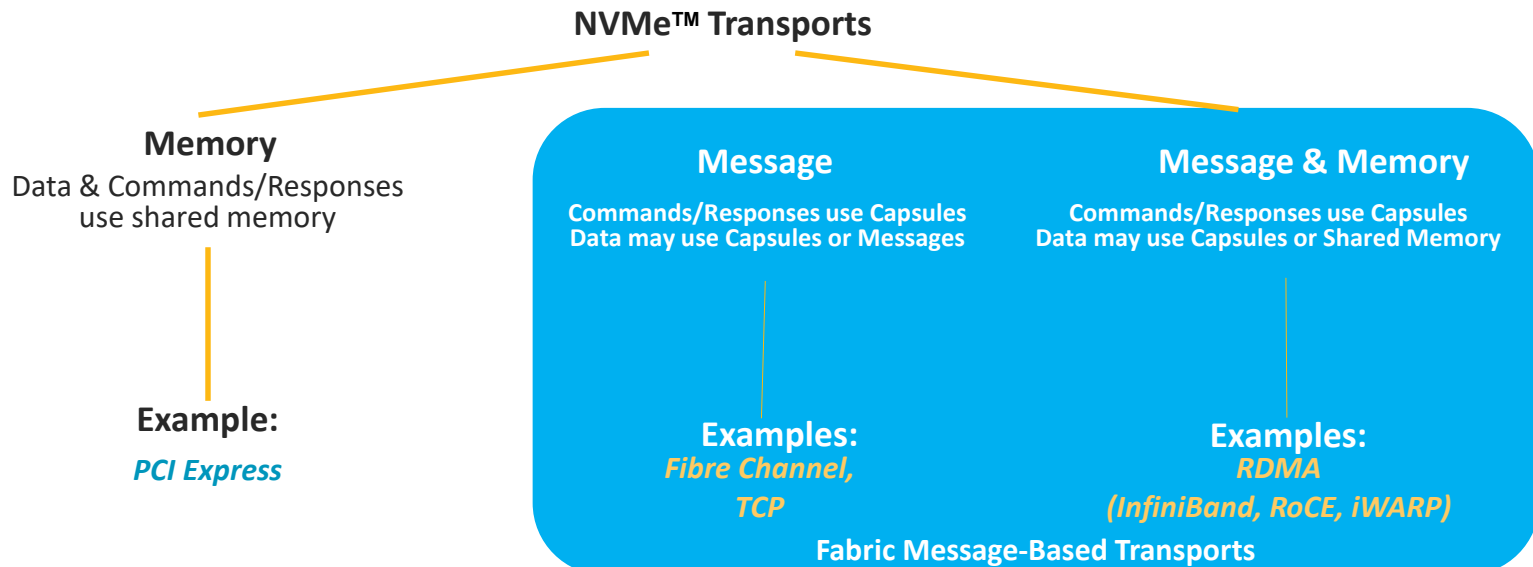
- As all flash became a component in block storage arrays, the initial protocol was still SCSI

- NVMe provided significant performance improvements over the SCSI protocol

- In order to get the benefits all flash arrays would need to transition users from an end to end SCSI experience to an end to end NVME experience

NVMe™ Transports

NVMe™ Transports

Memory
Data & Commands/Responses
use shared memory

Example:
PCI Express

Message
Commands/Responses use Capsules
Data may use Capsules or Messages

Examples:
Fibre Channel,
TCP

Message & Memory
Commands/Responses use Capsules
Data may use Capsules or Shared Memory

Examples:
RDMA
(InfiniBand, RoCE, iWARP)

Fabric Message-Based Transports

Capsule = Encapsulated NVMe Command/Completion within a transport message
**Data** = Transport data exchange mechanism (if any)

NVMe^{TM} Implementation Case Study

- The first step to providing NVMe^{TM} capabilities within the Array Chassis

- From a buy or build perspective NVMe platform availability was limited until recently

- Customers were able to get the benefits of NVMe within the array, but the initiator, fabric, and in some instances expansion shelves were still using SCSI



Controller CPU

PCIe

NVMe

FLASH

Array Chassis
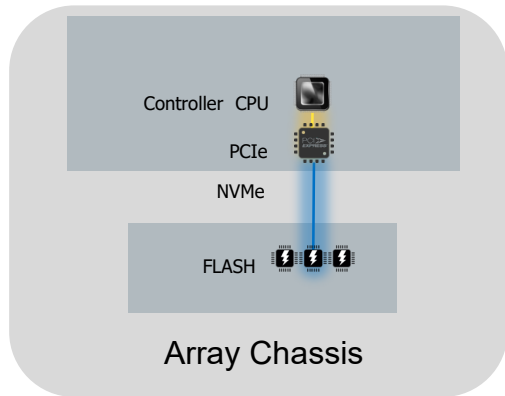
NVMe™ over Fabrics Backend Implementation example

- The next step was to extend NVMe™ capabilities to the shelves

- Transport choices included PCIe or NVMe-oF™, in the case of Pure Storage we chose NVMe-oF specifically NVMe™/RoCE

- This extended the NVMe experience and allowed extra capacity without sacrificing the protocol benefits
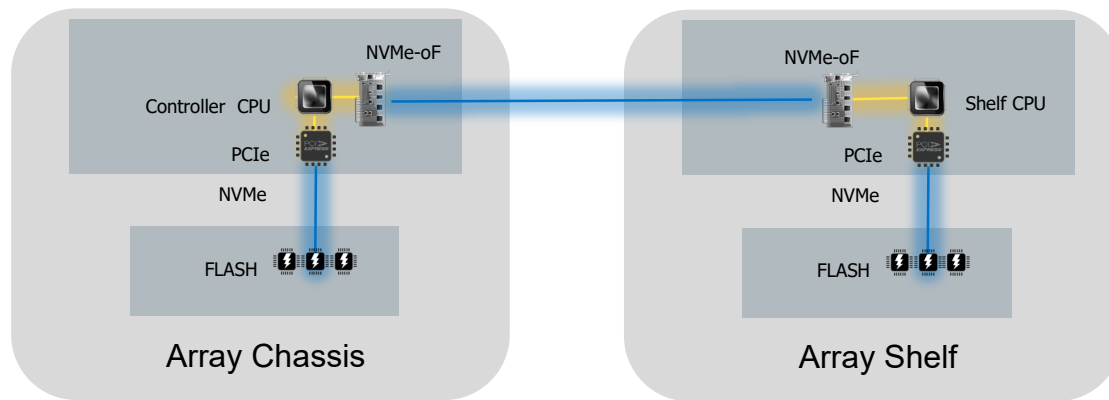
NVMe™ over Fabrics Frontend Implementation example
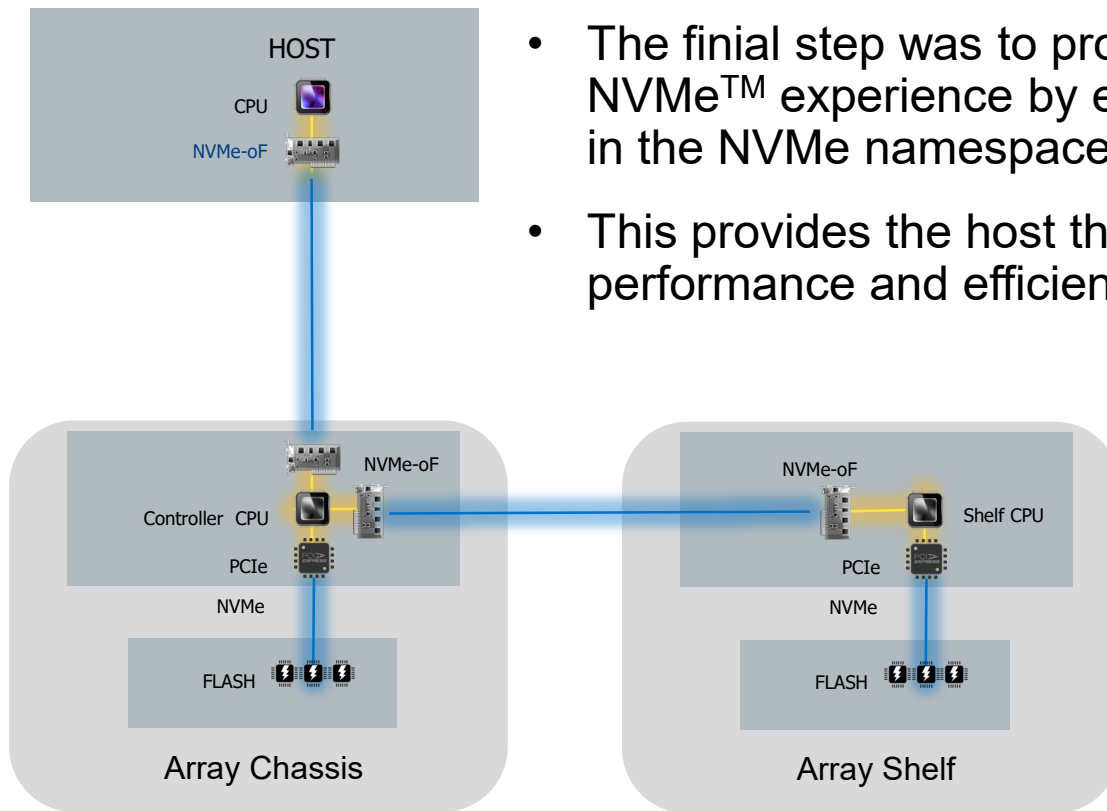
- The finial step was to provide an end-to-end NVMe™ experience by exposing the volumes in the NVMe namespaces across the fabric

- This provides the host the added benefits of performance and efficiency of NVMe

Summary

- When working with an All Flash Array, it makes sense to leverage NVMe™

- Customers are able to absorb NVMe into their environment without making significant changes to their infrastructure

- NVMe-oF™ makes it possible to extend the benefits of NVMe outside the chassis and all the way to the host to provide and end-to-end NVMe experience

- There is still work to be done on the OS Ecosystem and feature parity for NVMe-oF but the level of customer interest is increasing

Questions?