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™ 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
Consolidation

- SSD Form Factor
- Incumbent Form Factor adoption: SD, XD
- Storage Device Interface
- NVMe-oF™ 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™ Implementation Case Study

We are looking at Pure Storage as a specific case study in the implementation and use of NVMe™ 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

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™ Implementation Case Study

- The first step to providing NVMe™ 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
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 final 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 an 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?