Accelerate Access to Networked Flash with FC-NVMe

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Agenda

- State of Storage
- Extending NMVe over Fabrics – Choices
- Block & File Storage deployments - Today/Tomorrow
- Fibre Channel as a Fabric for Flash (FC-NVMe)
- FC-NVMe – State of the Union

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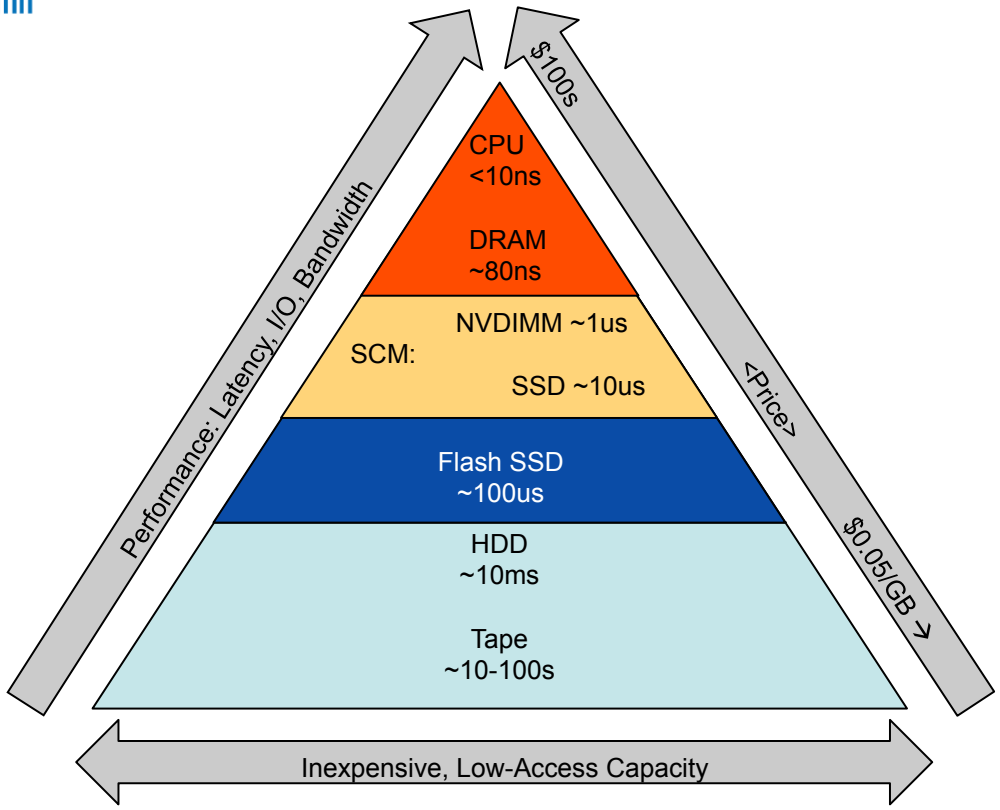
Flash Memory Summit

State of Storage – Price/Performance Hierarchy



~1000x

~5x SAS

~20x SATA

HDD: hard disk drive; I/O: input/output;
SSD: solid-state drive
Source: Gartner (March 2017)

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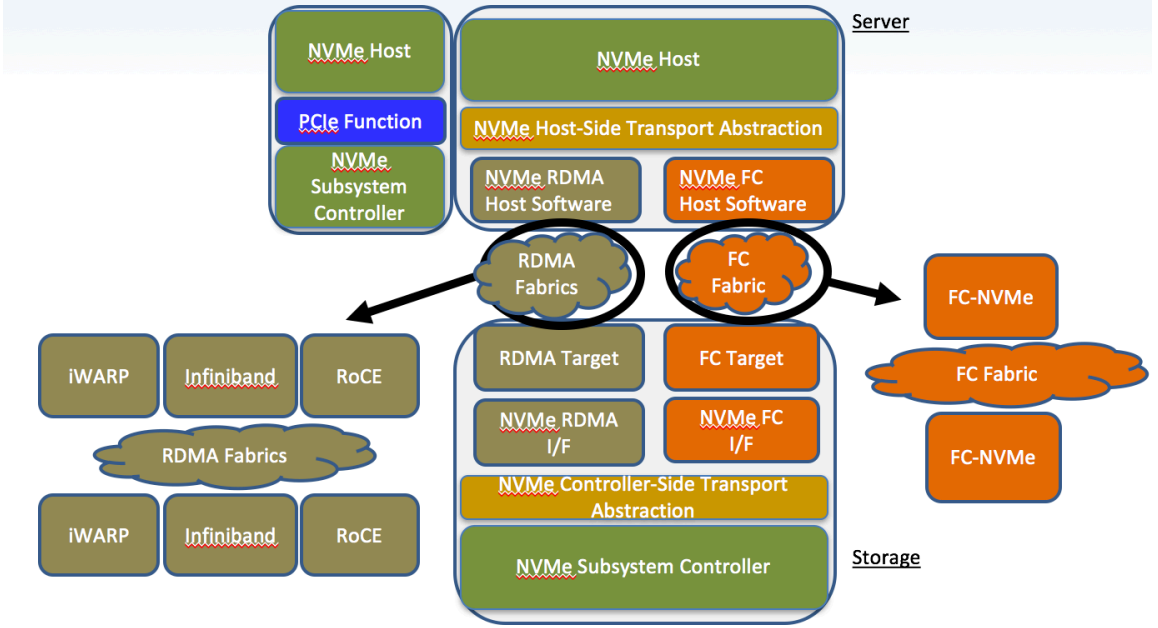
Why Fabric for NVMe?

- Scaling for large workloads
  - Scale beyond a single server
- High Availability & Reliability
  - Multiple servers connected to storage
  - Failover protection & load balancing
- Offload storage services
  - Shared storage for offloading snapshots/replication
- Proven technology
  - Shared storage model is well supported



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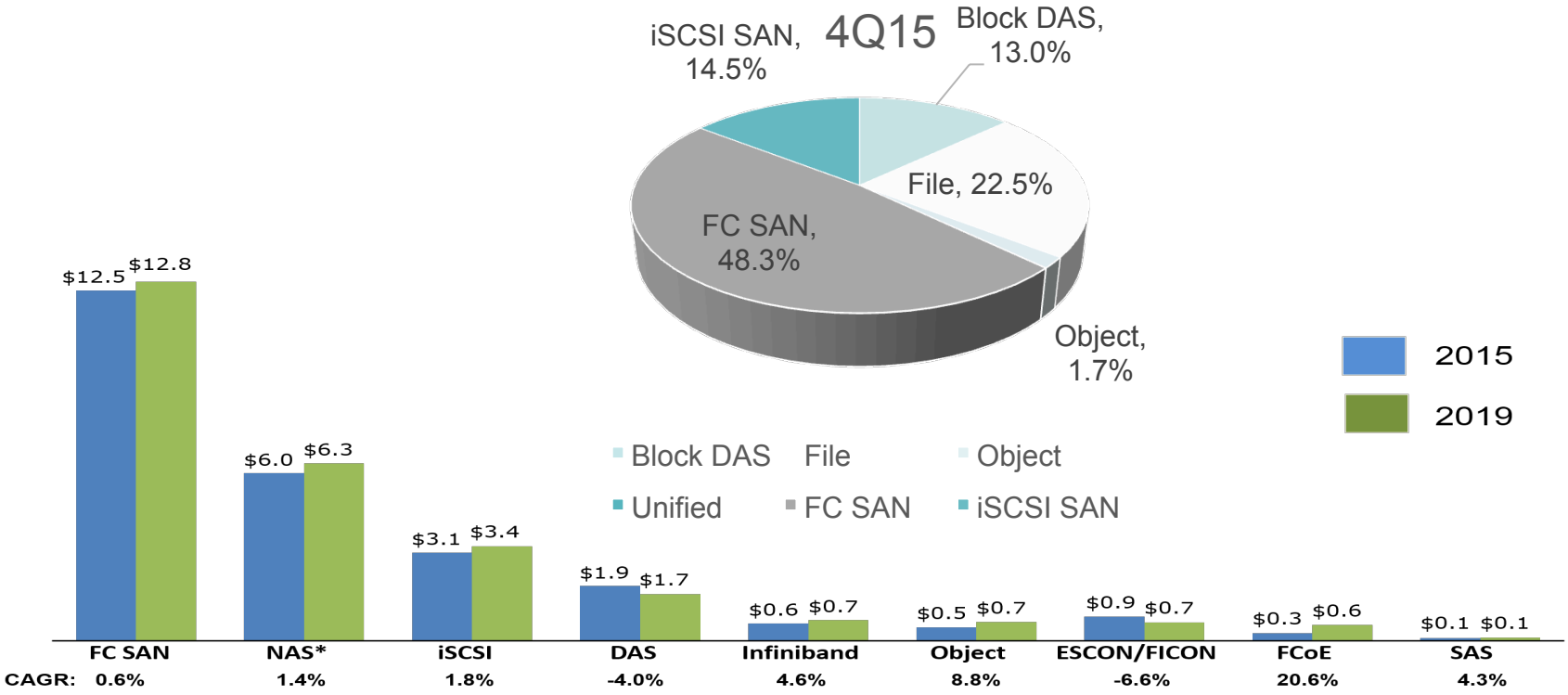
Fibre Channel ~80% of front end for AFAs



Source: Gartner

The Building Blocks of Fibre Channel Technology

Continuous Innovation

- ✓ In its **6th Generation, Fibre Channel** technology drives more external storage ports than any other I/O interconnect
- ✓ **StorFusion™** improves TCO
- ✓ **New Standards** - Gen 7 FC and FC-NVMe

Performance and Scalability

- ✓ **Fully offload**, **zero-copy, lossless** protocol access delivers I/O without burdening server processing resources.
- ✓ **Deterministic and Scalable performance**

Availability and Security

- ✓ **Dedicated fabric** secured by strong access controls – no "plug-in to access"
- ✓ **Field hardened** and robust Fibre Channel stack trusted by Enterprise IT across millions of deployments

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Fibre Channel and NVMe –Trusted meets Fast!

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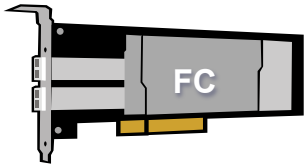

“SCSI” Over Fibre Channel	Non-Volatile Memory “Express”
#1 in Storage Connectivity	Low Latency, No bottleneck
Reliable, Secure, Available	Concurrency, Efficiency
Billions Invested, AFA	Future of All Flash Storage

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Introducing – FC-NVMe!

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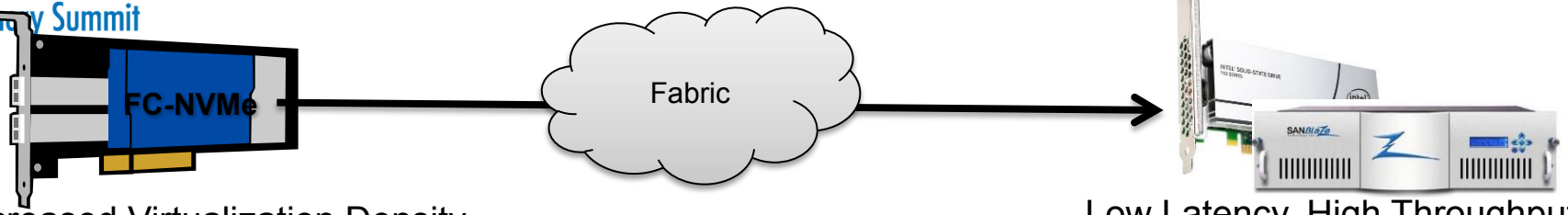

Increased Virtualization Density

"NVMe" Over Fibre Channel

Greater OPEX Efficiency

Low Latency, High Throughput
Non-Volatile Memory "Express"

Transport NVMe Natively over Fibre Channel

Low Latency

Reliable, Secure, Available

Leverage Existing Investments in Fibre Channel

Joint Technology Demonstration

Expanding Ecosystem

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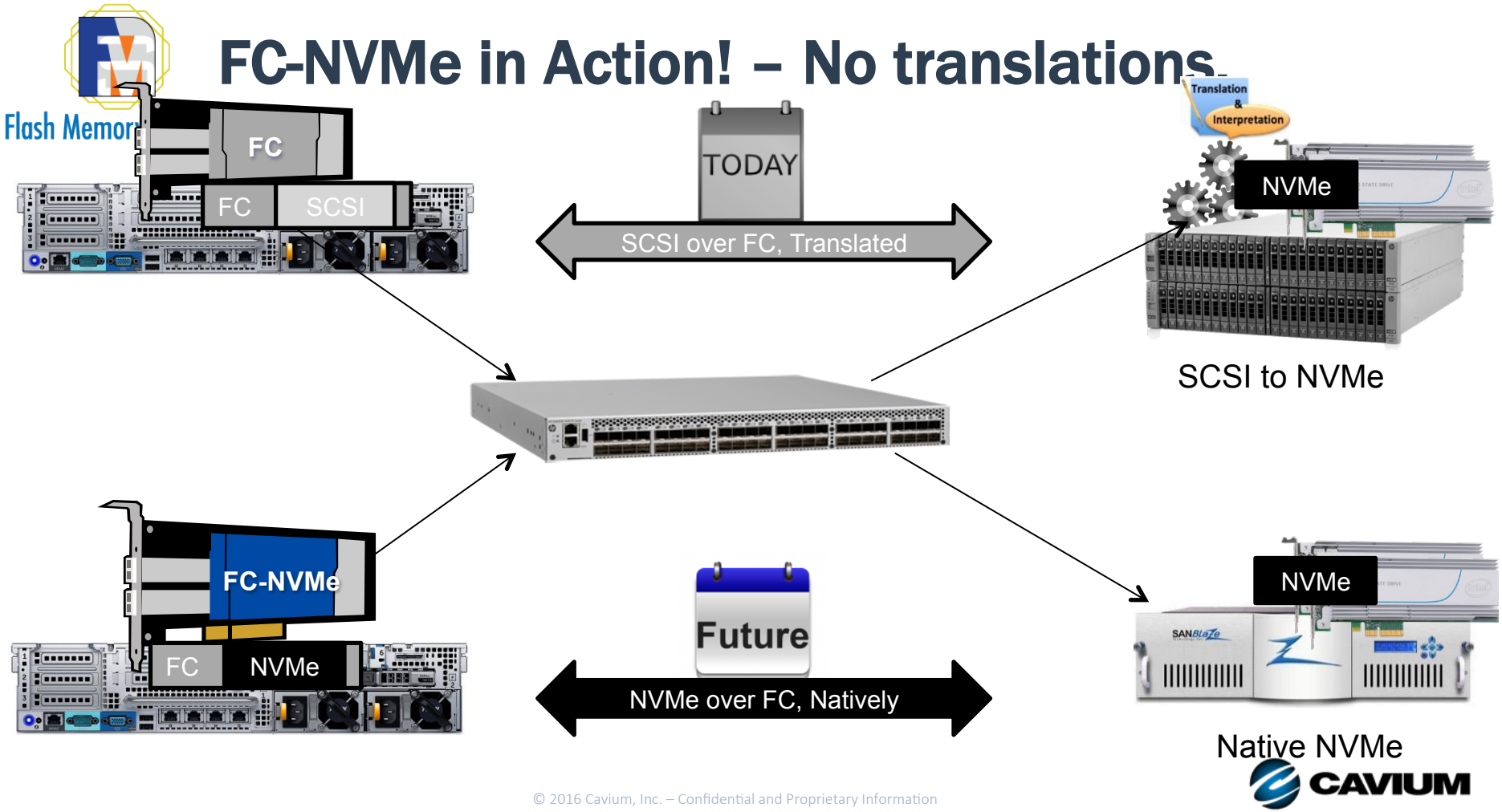
FC-NVMe in Action! – No translations



FC-NVMe: State of the Union

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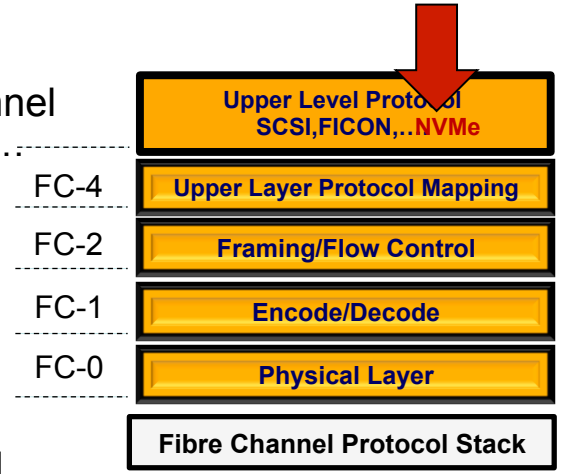
- FC-NVMe (NVMe over Fibre Channel) defines
  - A mapping protocol for applying NVMe interface to Fibre Channel
  - Currently SCSI and FICON use FCP for data transfer. Now NVMe…
- Co-existence of FCP and FC-NVMe traffic
- Leverage existing FC HBA and FC switch hardware
- FC-NVMe Standard (T11) ratified on 8/9/17 (y'day!)
  - Cavium is the FC-NVMe chair
  - Enhanced error recovery in follow-on spec.
- FC-NVMe Linux community driver update
  - NVMe-FC transport support now available in Linux 4.10 kernel.
  - FC support patch in 4.13
  - Initiator/Host (kernel) and Target (kernel / user (SPDK)) available
- Successfully demonstrated end-to-end FC-NVMe @ FMS
- Pre-GA code available NOW
  - GA in near future



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THANK YOU