Persistent Memory's Initial Major Application Will Be Real-Time Analytics

Andy Walls

IBM Fellow, CTO Flash Storage

There are Major Shifts going on in Storage

Flash Memory Summit

- Primary Storage:
    - Flash adoption is accelerating and starting to replace hybrid for many new installations
- Secondary and unstructured data
    - Flash density, management and environmental factors driving flash into this market
- Cloud is changing everything
- Software Defined Storage is becoming essential. Virtualize is an example.
- NVMe brings a true flash optimized interface to the masses
    - SCSI was invented for HDDs (Although modified in recent years for Flash)
- Storage class memories about to burst on the scene
- New applications, Cognitive, Real Time analytics have new constraints on the storage.

Flash Effects on Applications so far

Flash Memory Summit

- The traditional data center applications:

  – Much lower average response time for data bases

  – VDI Boot Storm ease

  – Decrease in CPU Utilization due to IO Waits and decrease in core license requirements

  – Tighter distribution on response times

  – Storage consolidation

  – More IOPs available – but not necessarily consumed

- New applications and cloud scale

  – Density, power savings, floor space savings

  – Server consolidation

Analytics and Cognitive Today

- The Killer App in the Flash and SCM era

- Analytics Requirements today

  - You bring in lots of data into server memory

  - You process it and process it and process it and spit out results

  - Storage requirements are high throughput not low latency (generally)

- Limitations

  - DRAM Increasing in cost!

  - Large number of servers for all the memory

  - Relatively small data sets

Real Time Analytics

- The Need:
  - Real time fraud detection
  - On the fly cell tower adjustments
  - Security threat response
  - Etc

- Technology to the Rescue
  - NVMe and NVMeF
  - Storage Class Memories

- Limitations
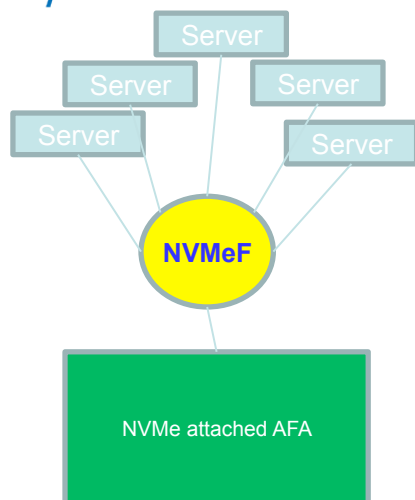 - Analytic Software is basically In Memory today

Let's remember what NVMe does

- Allows much quicker access of data by software stacks
- Provides parallelism far beyond SCSI
- RDMA
- And reduces CPU utilization! Frees up cores to do what they do best - applications

NVMe Topologies

Server
Server
Server
Server
Server

NVMeF

NVMe attached AFA

Server
Server
Server
Server
Server

NVMeF

Storage Box
Storage Box
Storage Box
Storage Box
Storage Box

Storag Rich Server
Storag Rich Server
Storag Rich Server
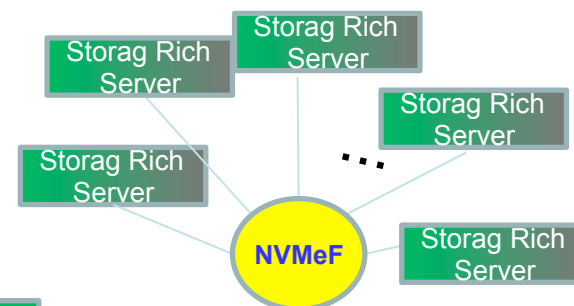Storage Rich Server
Storag Rich Server
Storag Rich Server

NVMeF

- Storage does not scale out but the AFA scales up
- Analytics (Spark clusters), Application acceleration
- Lite Driver on Host
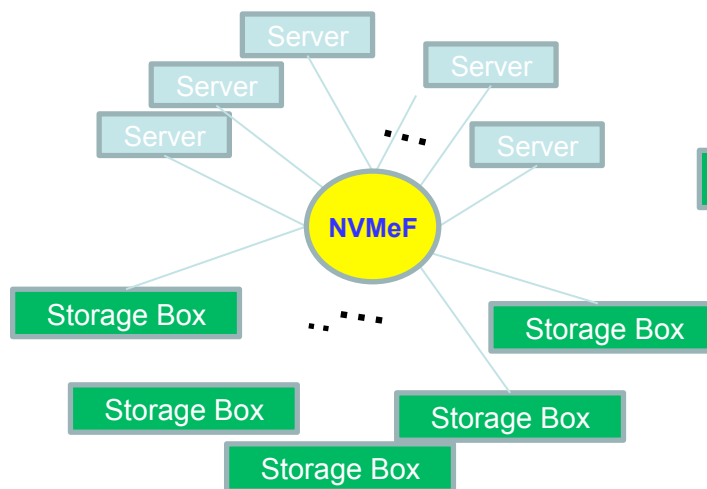
- Storage and Servers Scale Out Independently
- HPC
- Large Scale Cloud Clusters
- Heavy Software on Host doing RAID, LSA, etc.

- Web Scale Datacenters
- Can have Trapped unused Storage

Storage Class Memories

- 3DXP on memory bus would have least impact on applications
- 3DXP SSDs exist now
- Usage in Servers
- Usage in External Storage

Data Analytics Future

Flash Memory Summit

- Hyper Converged will certainly continue as a popular implementation choice

  - Software available or coming which helps the stranded capacity issues

- Shared or disaggregated storage

  - Central management and service and support and monitoring

  - Innovative RAID Schemes to bring down cost of redundancy

  - Tiering between SCMs and Flash

- NVMe over Fabrics is a huge enablement

- Software evolution

  - Intelligent paging in servers to allow for paging from fast storage of the right data into memory

  - Application changes to allow for and exploit this tiering