Maximizing the Efficiency and Endurance of Solid State Drives

The Storage System Perspective
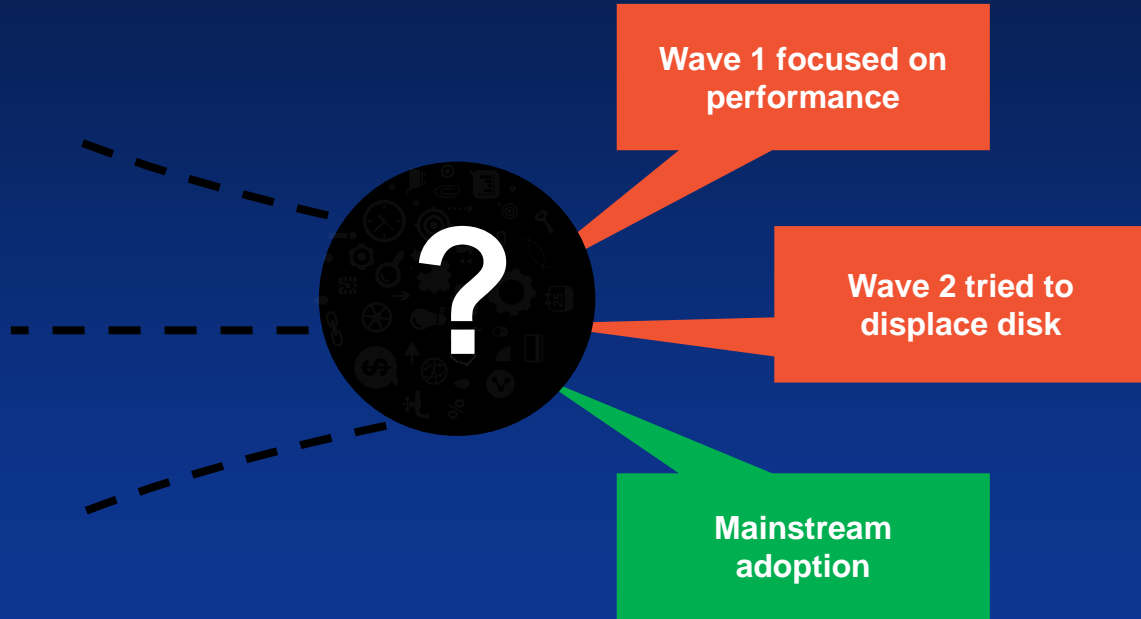
Aravindan Gopalakrishnan

Sr. Product Manager, HP Storage

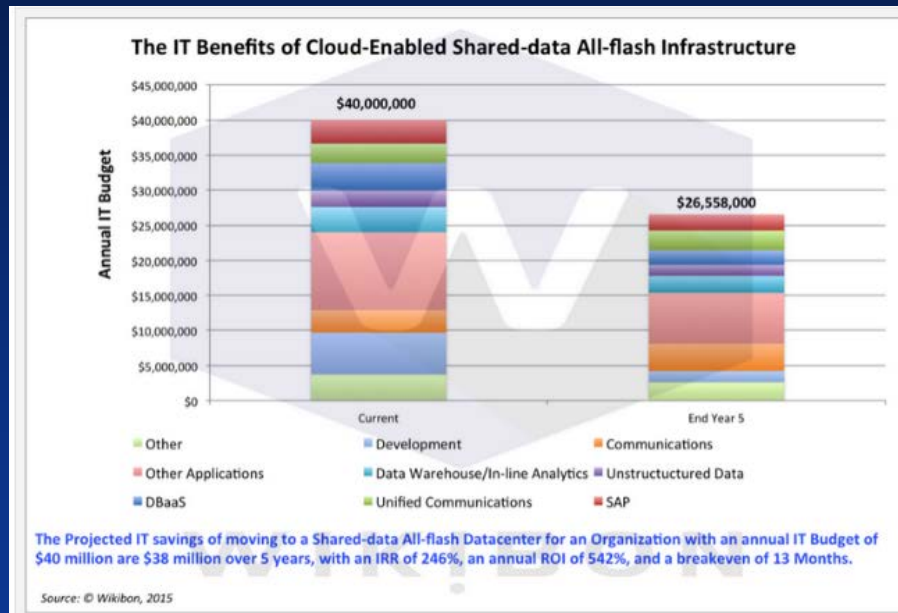# All-flash arrays have been at a tipping point…

Speed

Affordability

Enterprise Resiliency & Data Services

?

Wave 1 focused on performance

Wave 2 tried to displace disk

Mainstream adoption

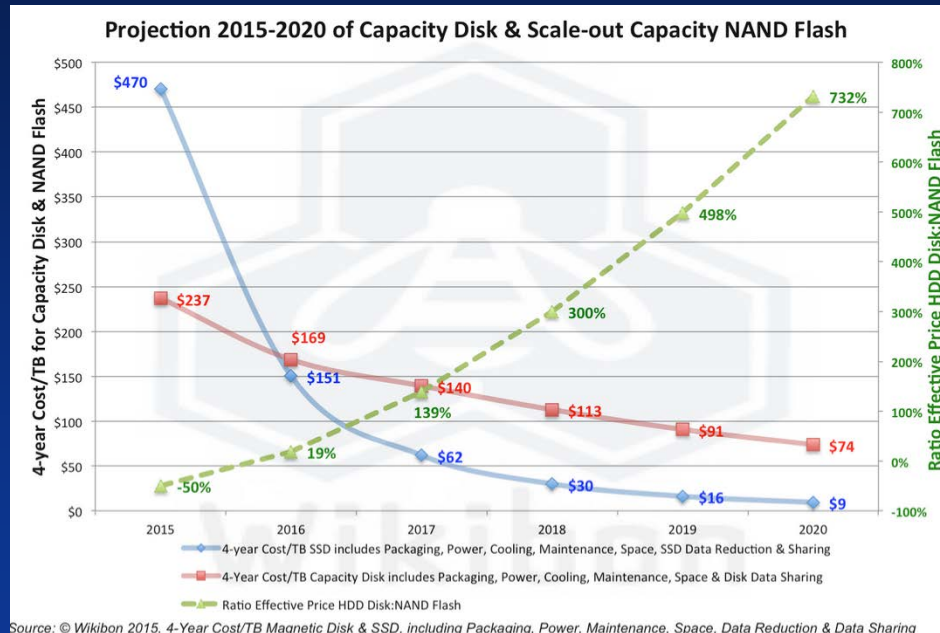# The future is an all-flash data center

Changes will enable new business models and increase productivity

- Workloads combined to share data using NAND flash as the active storage media
- Cloud-enabled converged infrastructure, this will reduce IT budgets, increase productivity
- Minimize physical copies, increase logical copies deployed from data
- Combine transactional, data warehouse & development data initially

The IT Benefits of Cloud-Enabled Shared-data All-flash Infrastructure

Annual IT Budget

$40,000,000

$26,558,000

Current — End Year 5

Legend:
- Other
- Other Applications
- DBaaS
- Development
- Data Warehouse/In-line Analytics
- Unified Communications
- Communications
- Unstructured Data
- SAP

The Projected IT savings of moving to a Shared-data All-flash Datacenter for an Organization with an annual IT Budget of $40 million are $38 million over 5 years, with an IRR of 246%, an annual ROI of 542%, and a breakeven of 13 Months.

Source: © Wikibon, 2015

Cost is a key driver

- All-flash solution costs have declined significantly over the past few years
- Systems are looking to be cheaper and denser
- Being able to ride that cost curve is a significant advantage

Projection 2015-2020 of Capacity Disk & Scale-out Capacity NAND Flash

Source: http://wikibon.org/wiki/v/Evolution_of_All-Flash_Array_Architectures

System architecture matters

Performance acceleration
Eliminate system bottlenecks

Efficiency Optimization
Extend life and utilization of Media

System resiliency
Provide constant application access

Enterprise Features
Proven data services and interoperability

To be successful an all flash architecture needs to possess all these attributes

How can you be efficient?

1	Make efficient use of capacity

2	Write intelligently to the media

How can you be efficient?

1	Make efficient use of capacity
2	Write intelligently to the media

- ✓ Avoid "reserved pools" of capacity

- ✓ Just in time space allocation

- ✓ Optimum allocation unit

- ✓ Reclaim unused space

How can you be efficient?

1	Make efficient use of capacity
2	Write intelligently to the media

✓ Use compaction technologies to avoid duplicate writes and reduce writes overall
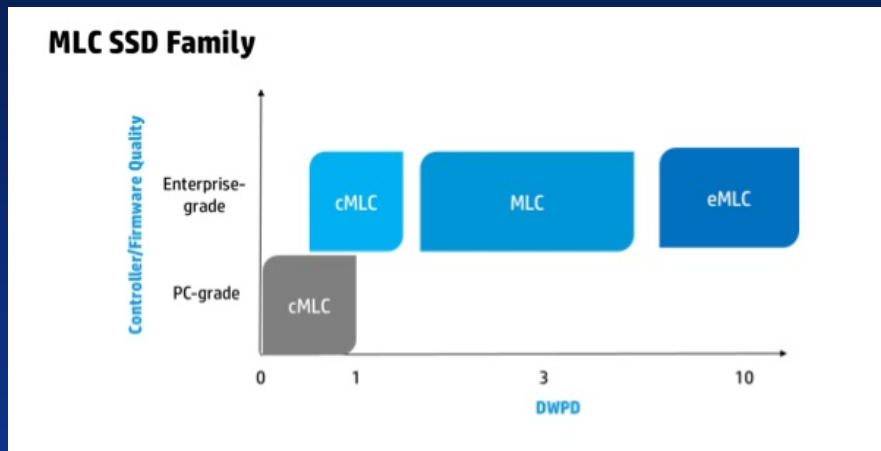
✓ Spread the load evenly – "wide striping"

✓ Adapt media writes to host IO sizes

..and when you are efficient

- An efficient architecture allows you to be at the leading edge of SSD cost decline
- Bringing the benefits of all-flash to a broader market

MLC SSD Family

The future is indisputably in this direction

Our experience

- Some insights from our journey from MLCs to cost effective commercial MLCs - based on data from our installed base

Customers deployment patterns and workload patterns same across drive types (one is >10 DWPD MLC, the other is ~1 DWPD cMLC)

Performance levels are similar… actually data shows higher overall throughput delivered by cMLC drives

Overall average flash wear for both cMLC and MLC is < 1%

A picture is worth a thousand words…

SSD % Life Left over 12 Months

Age of drive population. 4 months, 10 months, 11 months, 12 months

It's how you use it

- All-flash is rapidly becoming mainstream
- Cost and reliability are key in fueling this change
- Moving to newer and cost effective media is investable
- An architecture that can take advantage of this is critical

There can be economy only where there is efficiency
- Benjamin Disraeli

Architecture. Matters

HP 3PAR StoreServ Greatest Competitive Advantage

Architecture Whitepaper : http://h20195.www2.hp.com/V2/GetPDF.aspx%2F4AA3-3516ENW.pdf
Flash Optimized Whitepaper : http://h20195.www2.hp.com/V2/GetPDF.aspx%2F4AA4-7264ENW.pdf
Thin Technologies Whitepaper: http://h20195.www2.hp.com/v2/GetPDF.aspx%2F4AA3-8987ENW.pdf
Priority Optimization (Storage QoS)Whitepaper: http://h20195.www2.hp.com/V2/GetPDF.aspx%2F4AA4-7604ENW.pdf