Dual Port NVMe Offers Enterprise-Class Availability Plus High Speed

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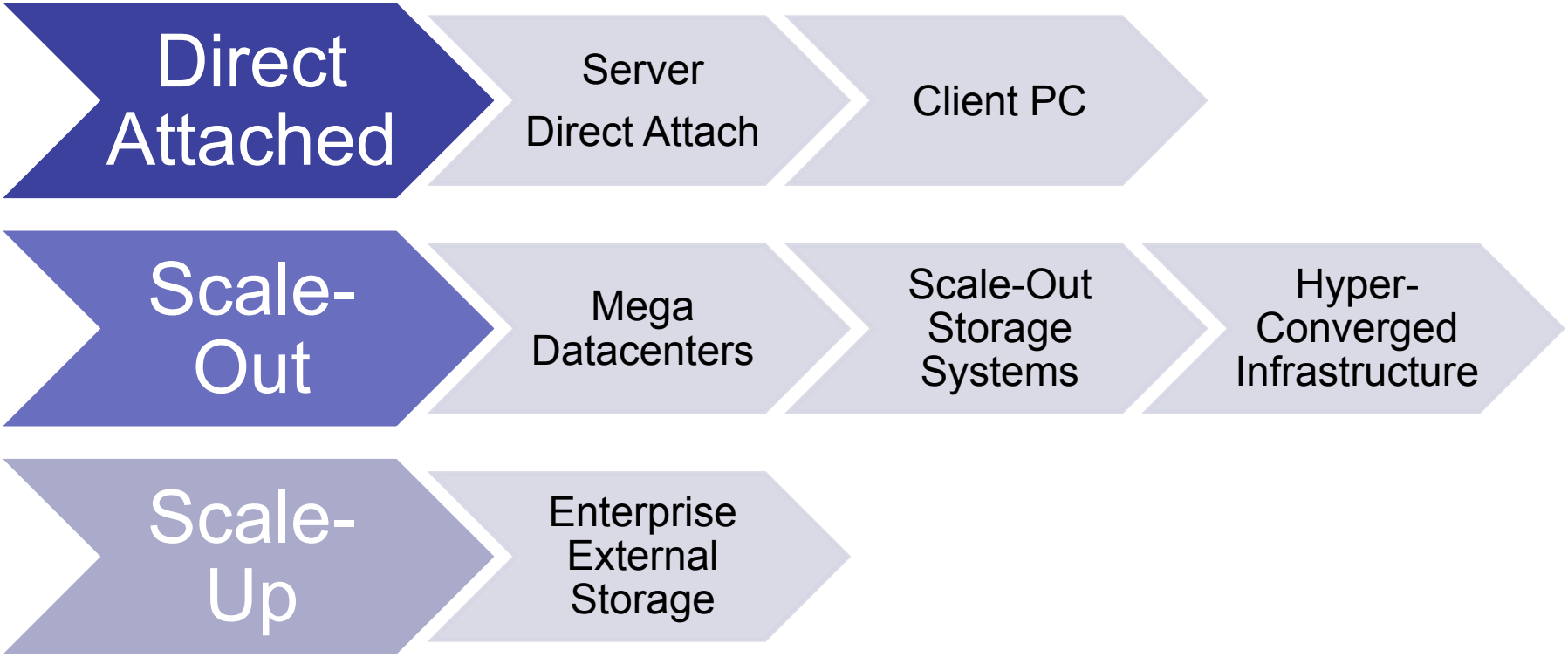
Why Dual-Port NVMe for All-Flash?

1. Enterprise Features (Safety!)
2. Performance & Latency
3. Future Proof Your Datacenter

VS.

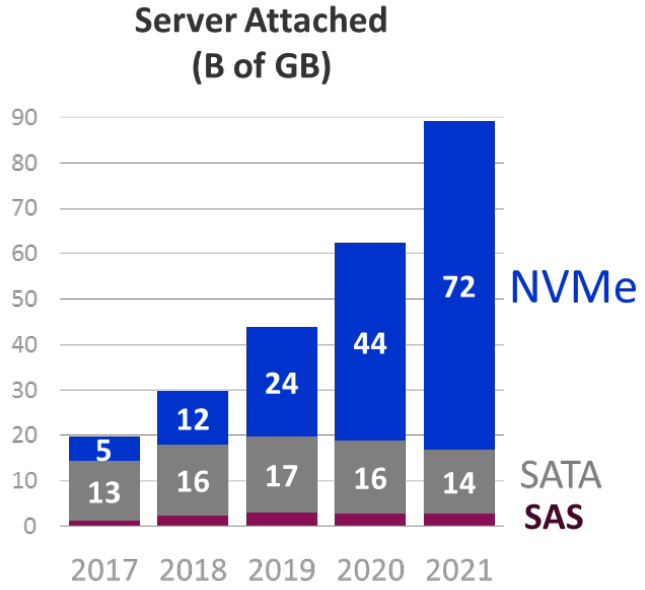
NVMe Adoption Waves

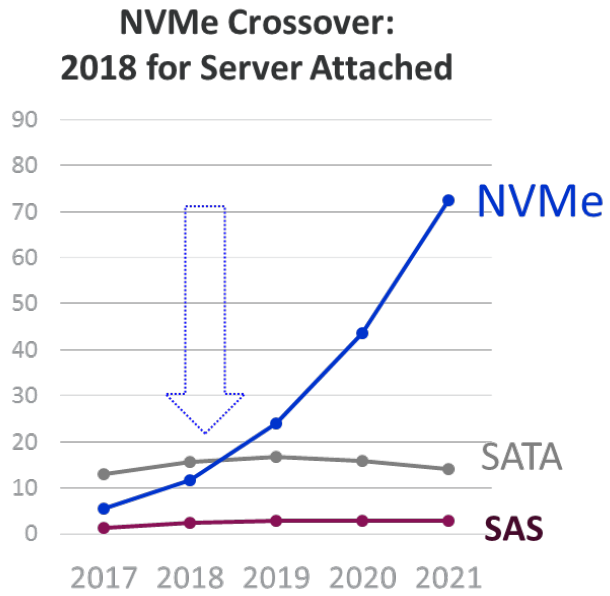


NVMe Adoption Waves

Direct Attached	**Already Happened**
Scale-Out	**Happening Now**
Scale-Up	**Just Starting**

Industry NVMe Adoption – Server Attached

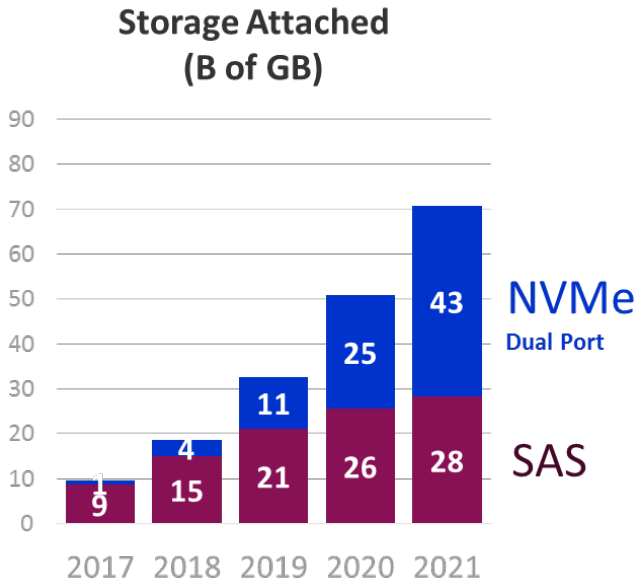


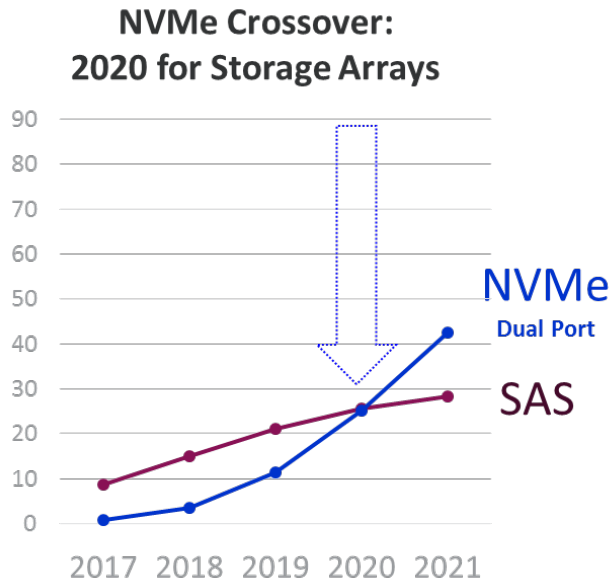


Mega Datacenter Driving Server Adoption

Source: Forward Insights 2017 Q1

Industry NVMe Adoption – Storage Array





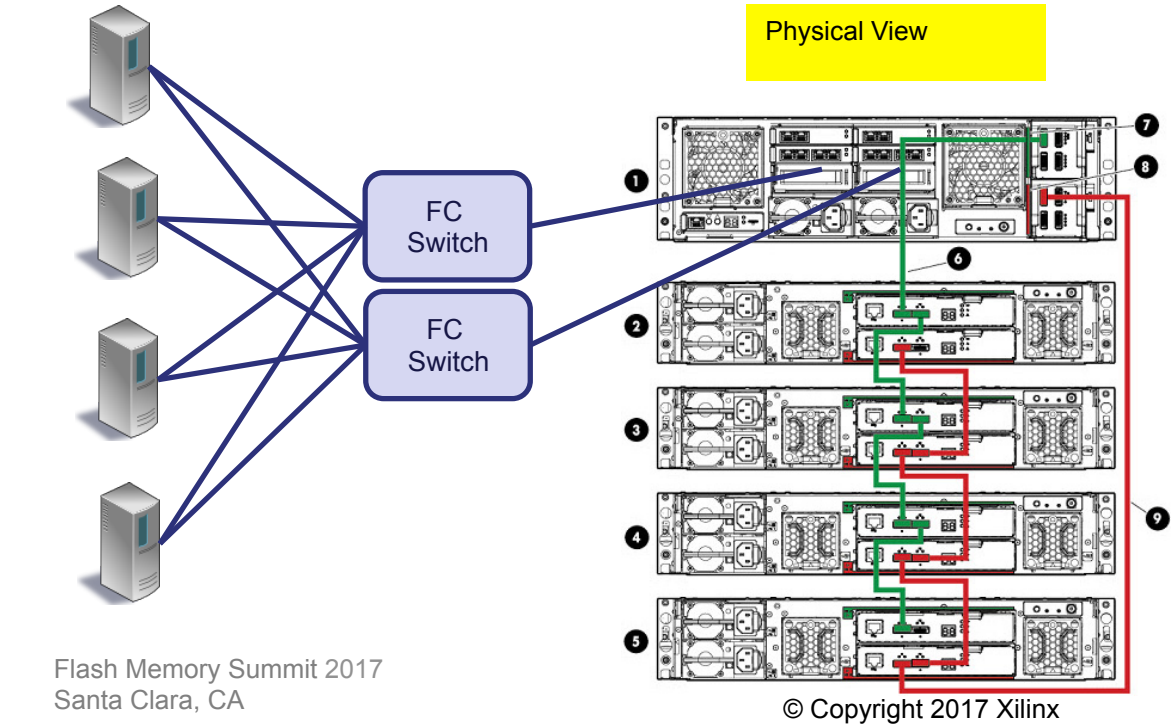
High-End AFAs in 2018 & Mainstream AFAs in 2019

→ 17 Potential NVMe-based AFA Competitors

Source: Forward Insights 2017 Q1

Enterprise Features

SAS Storage Array, Physical View



Required

Dual Port
High Availability
Redundant Connections

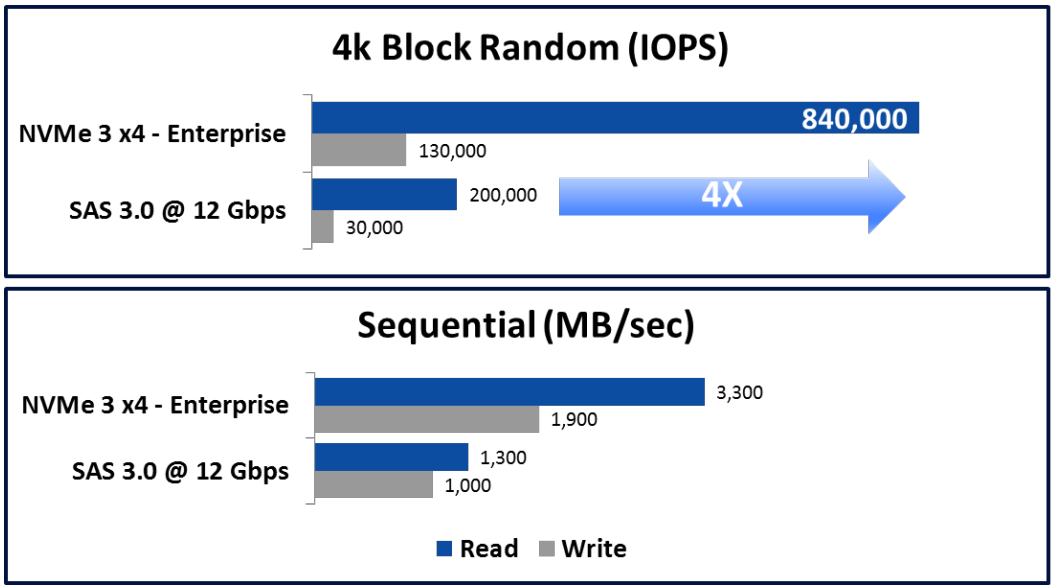
Enterprise U.2 NVMe SSDs

- ✓Dual Port, High Availability (HA)
- ✓U.2 Connector with Hot-Plug
- ✓Reliability, Accessibility, Serviceability (RAS)
- ✓Single Root I/O Virtualization (SR-IOV)
- ✓Data Integrity Field/Extension (DIF/DIX)
- ✓Power Loss Protection

Performance & Latency

Flash Memory Summit

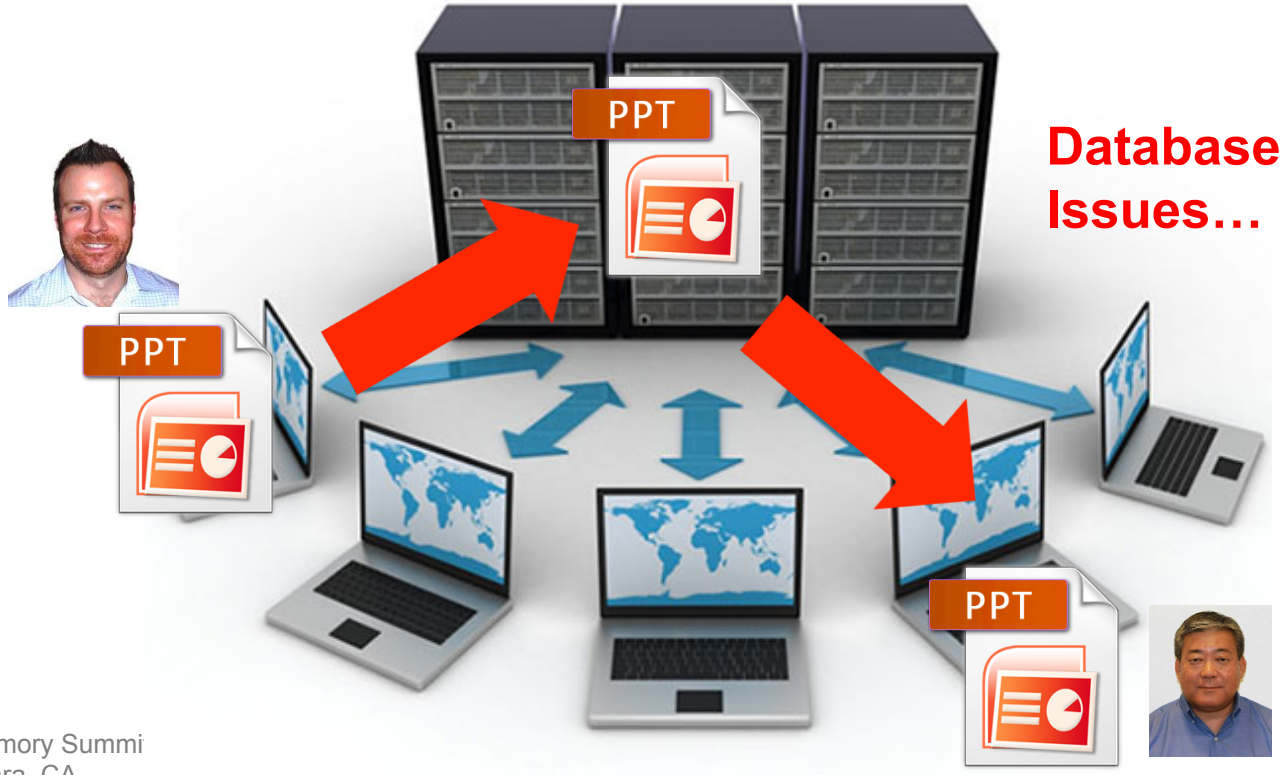
NVMe (U.2 Gen 3 x4): Up to 4X SAS Performance



Coming Soon: PCIe Gen 4 doubles the Bandwidth

Source: Samsung

What about Latency?



Database Issues…

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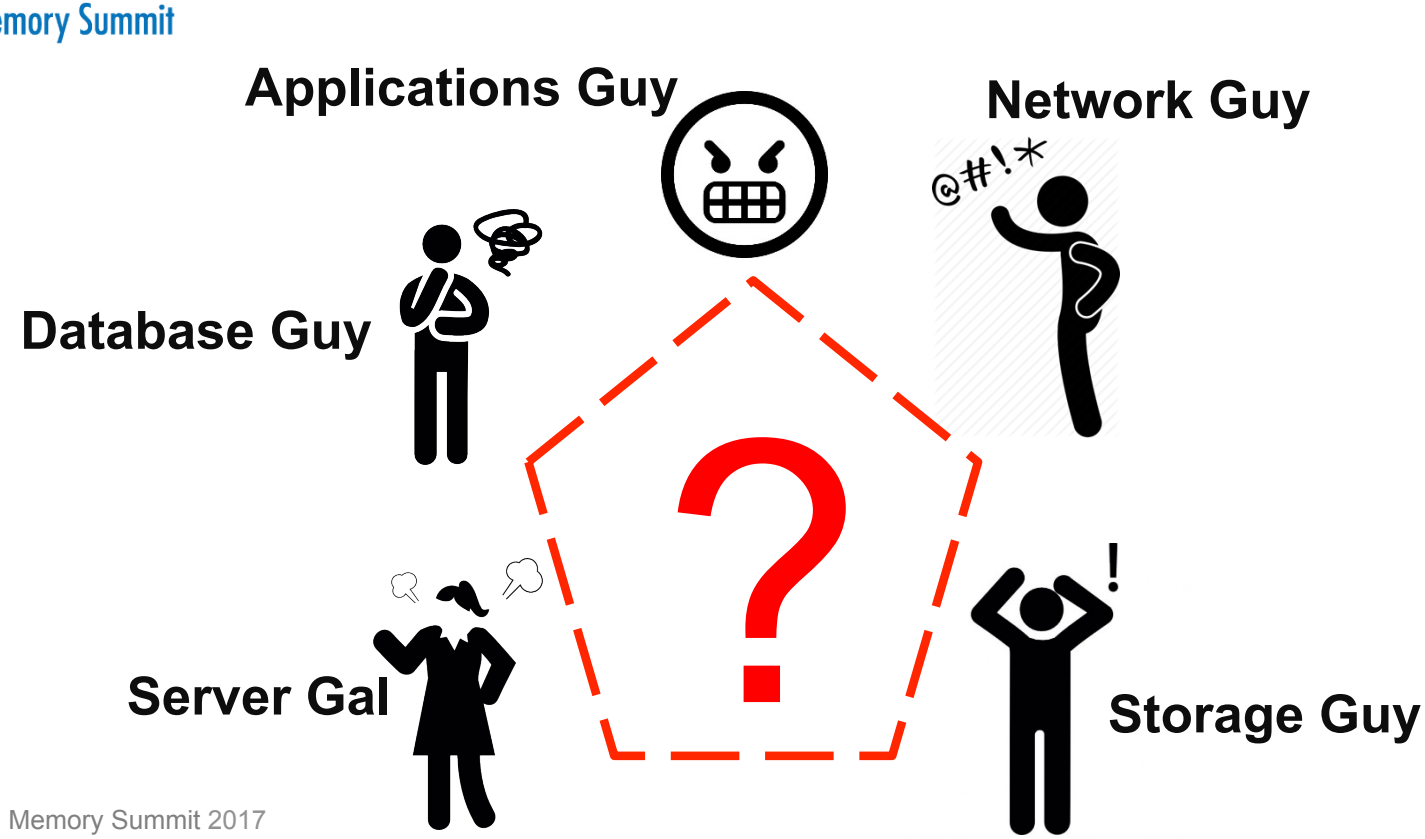
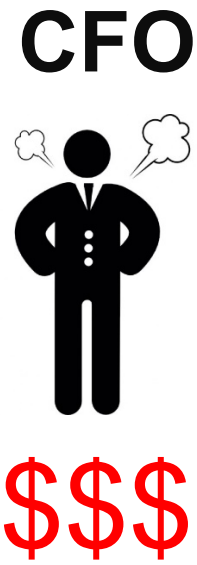
Image source: www.pixane.net

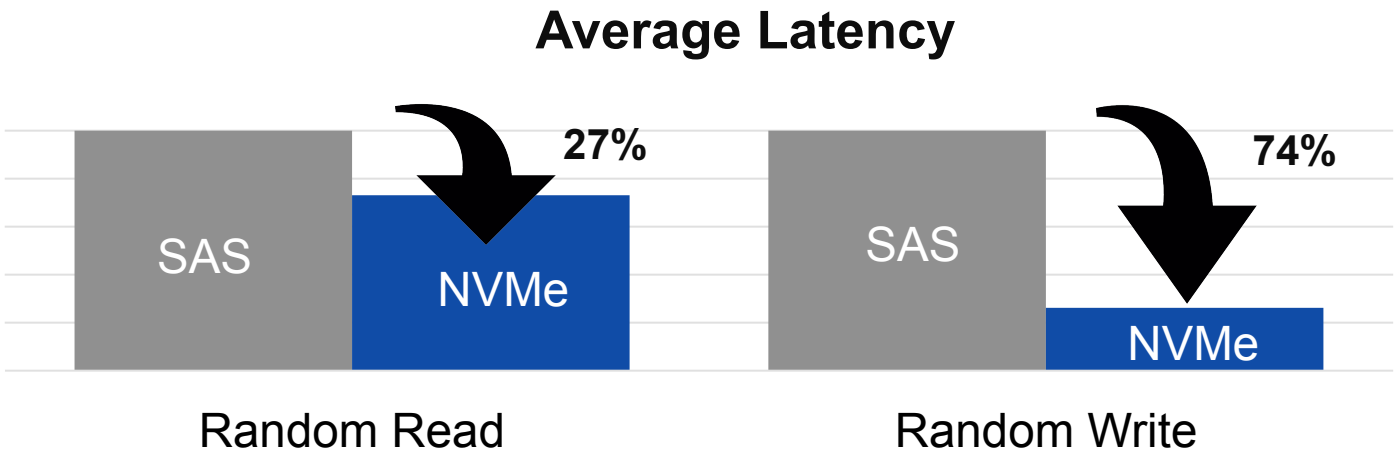
What about the Cost of IT?





Major Latency Improvement w/ NVMe

Latency Measurement: PM1633a SAS vs. PM1725a NVMe



Test Info:

- Performed at Samsung Memory Solutions Lab, Aug 2017
- Measured using Flexible I/O Tester Synthetic Benchmark
- 3.84TB Capacity SSDs, 4KB Random Transfer at Queue Depth = 1

Source: Samsung

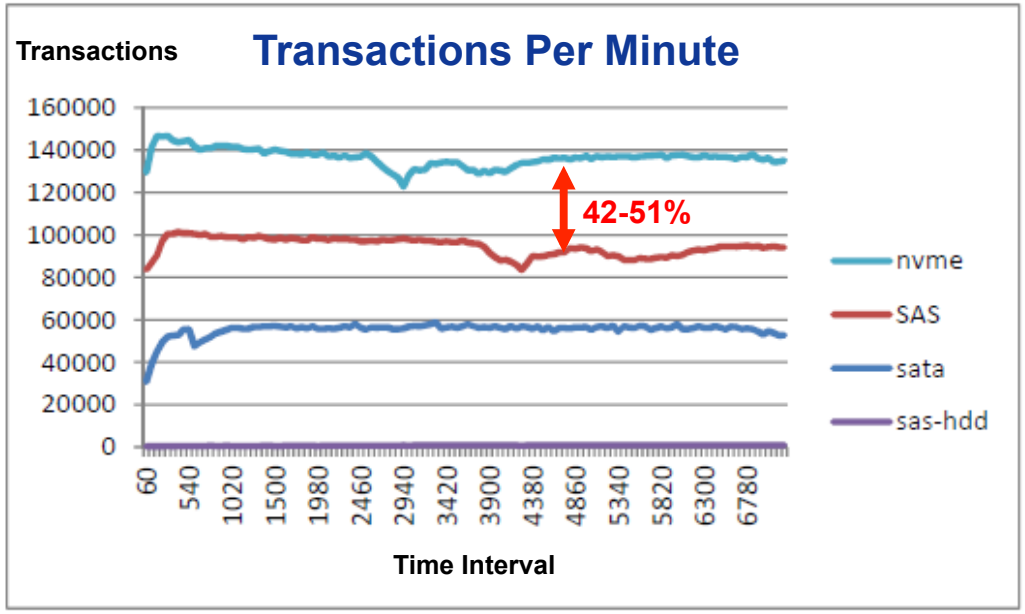
How about a Case Study?

Accelerating Database Performance with NVMe SSDs

- MySQL Server (Relational Database Management System - RDBMS)
  - Most used open-source, client-server RDBMS
  - Tested using Percona Server – open source MySQL Server Enhancement
- Database OLTP (Online Transactional Processing) Applications
  - Examples: ATM withdrawals, online purchases, stock buy/sell orders
  - TPC-C benchmark: 23 year-old benchmark simulates that online store
  - “Users” place orders, make payments, and check the status of their orders while “warehouses” make deliveries and check their stock levels

http://www.samsung.com/us/labs/pdfs/collateral/samsung-tpcc-mysql-whitepaper-final-1.pdf

Performance Benefits



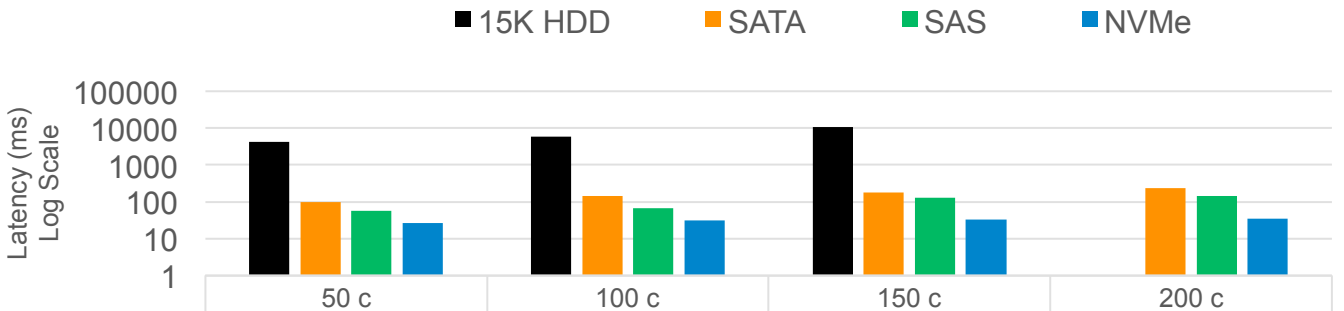
NVMe performance (transactions per minute) is 42% to 51% higher than SAS SSD

→ 100s of times higher than 15K HDDs

Source: Samsung

Latency Benefits

Average Latency (95th Percentile)



	50 c	100 c	150 c	200 c
15K HDD	4182	5872	10847	
SATA	100	142	181	239
SAS	57	68	128	145
NVMe	26	32	33	34

NVMe latency is 54% to 77% lower than SAS SSD

→ 100s of times lower than 15K HDDs

Source: Samsung

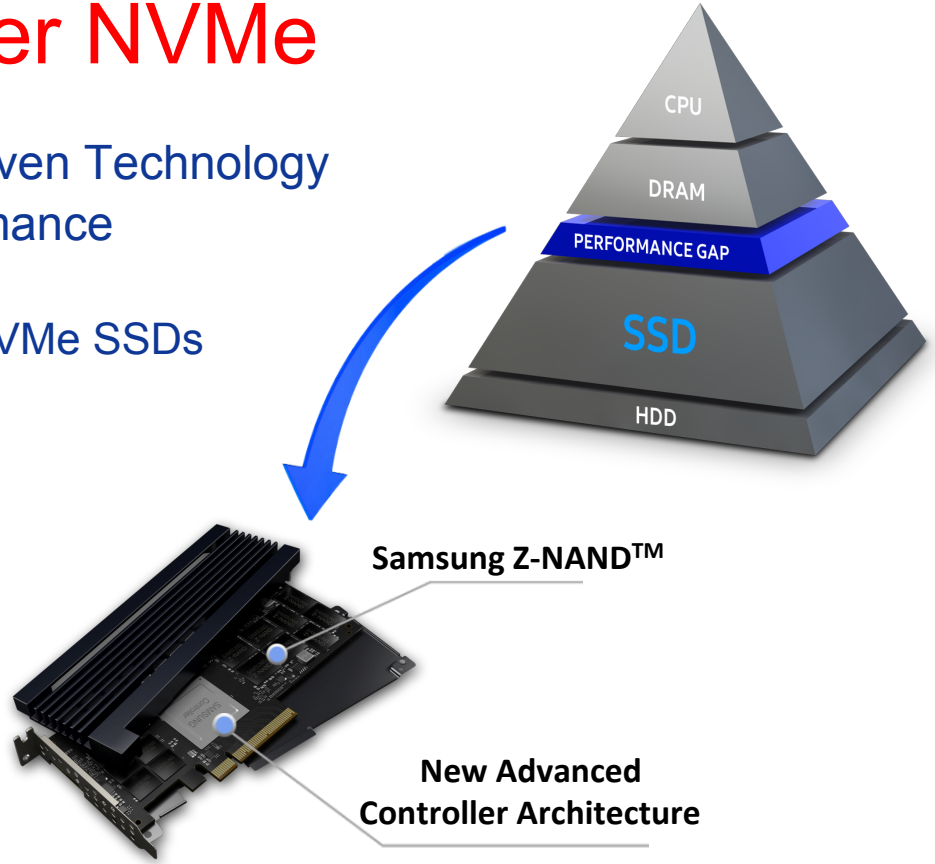
Key Points from Case Study

- NVMe Benefits:
  - Higher performance (transactions per minute)
  - Lower response times
  - More concurrent users
  - You will use fewer drives (= less space, less sheet metal, less OPEX, less power)

Future Proof Your Datacenter

Z-SSD™: Ultra-Low Latency Memory over NVMe

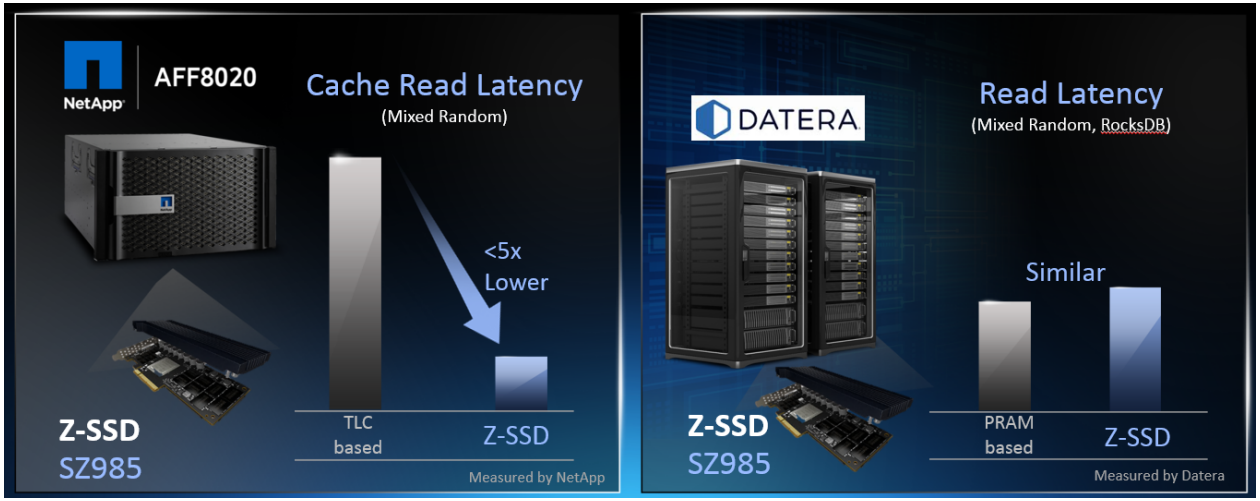
- Low Latency, based on Proven Technology
  - ✓ Extreme Sustained Performance
    - ✓ 15 µs latency
    - ✓ >70% Lower Latency vs. NVMe SSDs
    - ✓ Applies to all workloads
  - ✓ Proven NAND technology
    - ✓ Reliable
    - ✓ Scalable
    - ✓ Low Cost
  - ✓ PCIe Gen 3.0 x4
  - ✓ Industry Standard NVMe



Samsung Z-SSD™ Demos at FMS

NetApp : "Z-SSD™ as a tier between DRAM and SSD with low latency"
Datera : "Z-SSD™ can help us deliver outstanding performance and latency for every application"

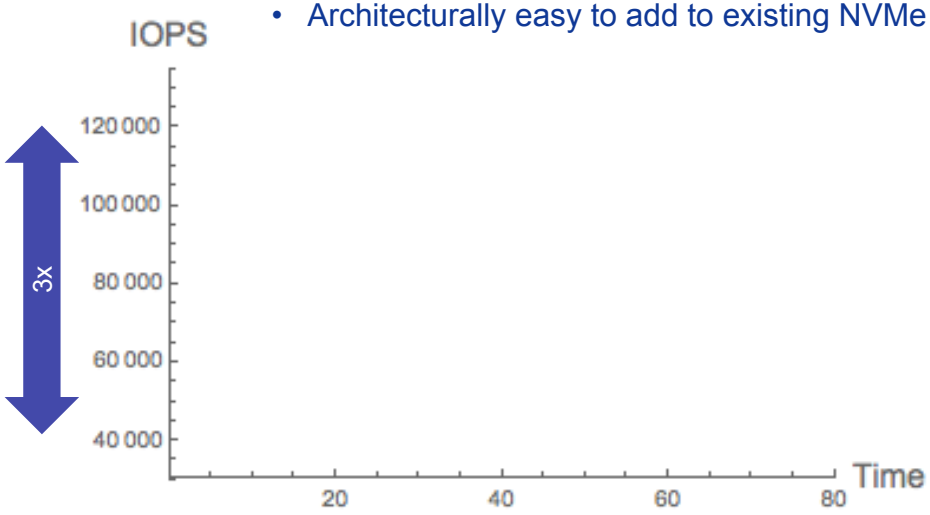
NetApp

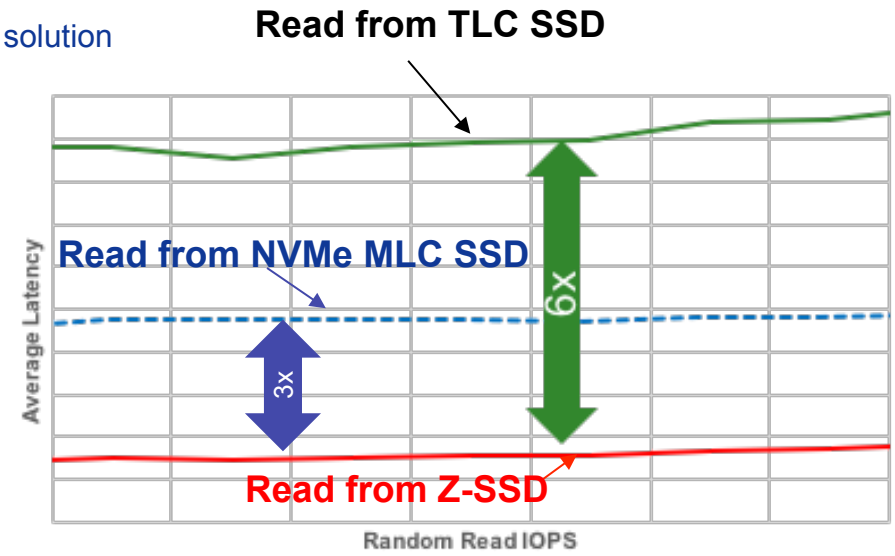


DATERA

NetApp: NVCache extends the value of Flash Cache to Z-SSD™

- **Z-SSD media over NVMe**
  - Significantly faster time to read 4K block from media
  - NVMe reduces transfer & protocol overhead
  - Architecturally easy to add to existing NVMe solution





Conclusion

1. Dual Port NVMe is coming to an AFA near you
2. It's all about the latency
3. It's all about being future proof

What is your AFA Provider's Plan for NVMe?

PM1725a NVMe SSD	http://www.samsung.com/semiconductor/global/file/insight/2016/08/Samsung_PM1725a-1.pdf
MySql Whitepaper	http://www.samsung.com/us/labs/pdfs/collateral/samsung-tpcc-mysql-whitepaper-final-1.pdf
NVMe over Fabrics Whitepaper	http://www.samsung.com/us/labs/pdfs/nvmf-disaggregation-preprint.pdf

Thank You!

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