5,000 Years of Storage

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General Observations about the 2016 CES

- Even fewer raw storage showings on the show floor—mostly in hotel suites
- Big themes are wearables, IoT, drones and VR
- Sands exhibit space was full of new companies with interesting and odd products and services
- Storage Visions theme was: Storage for the Next 5,000 Years (it was at the Luxor…)

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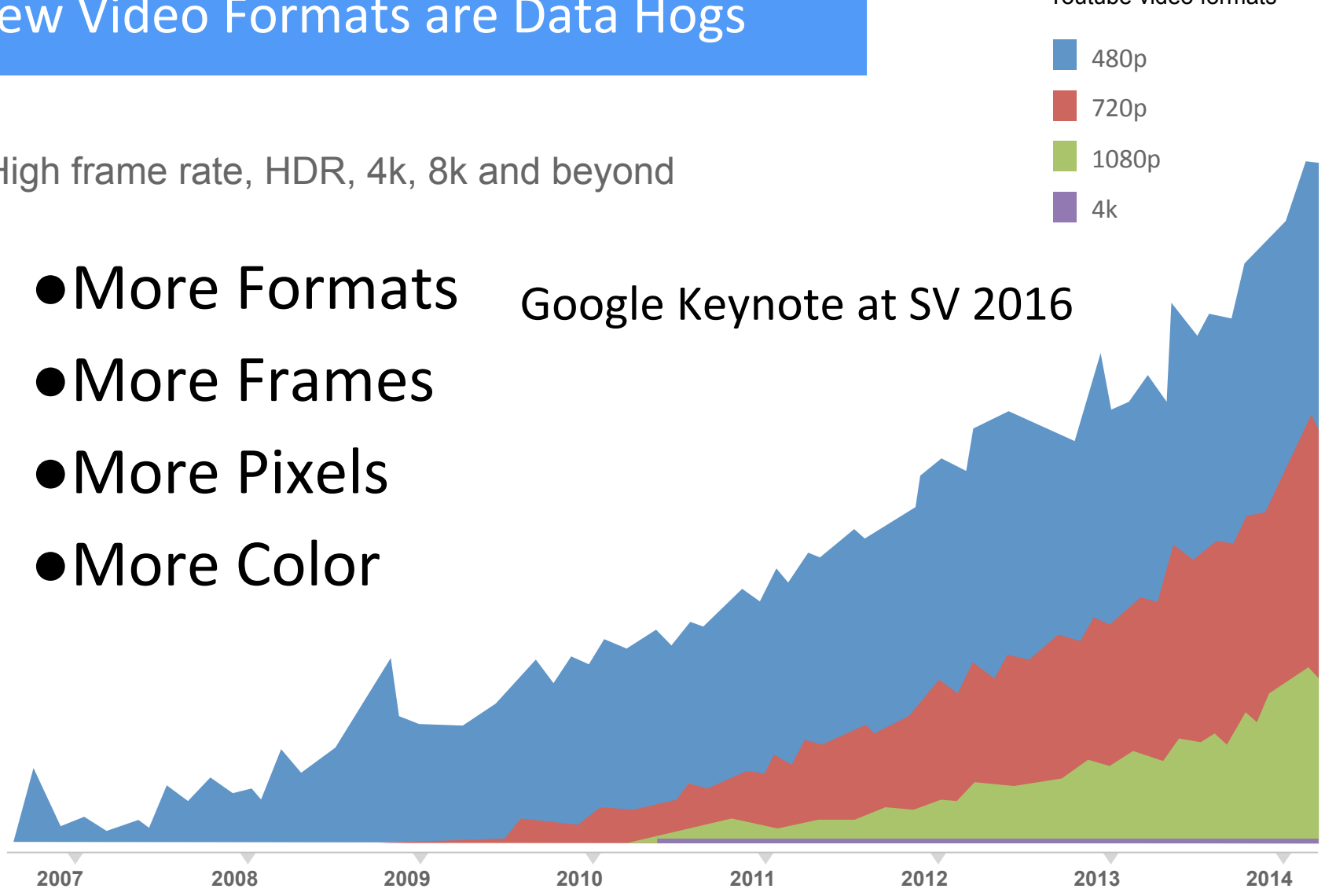
New Video Formats are Data Hogs

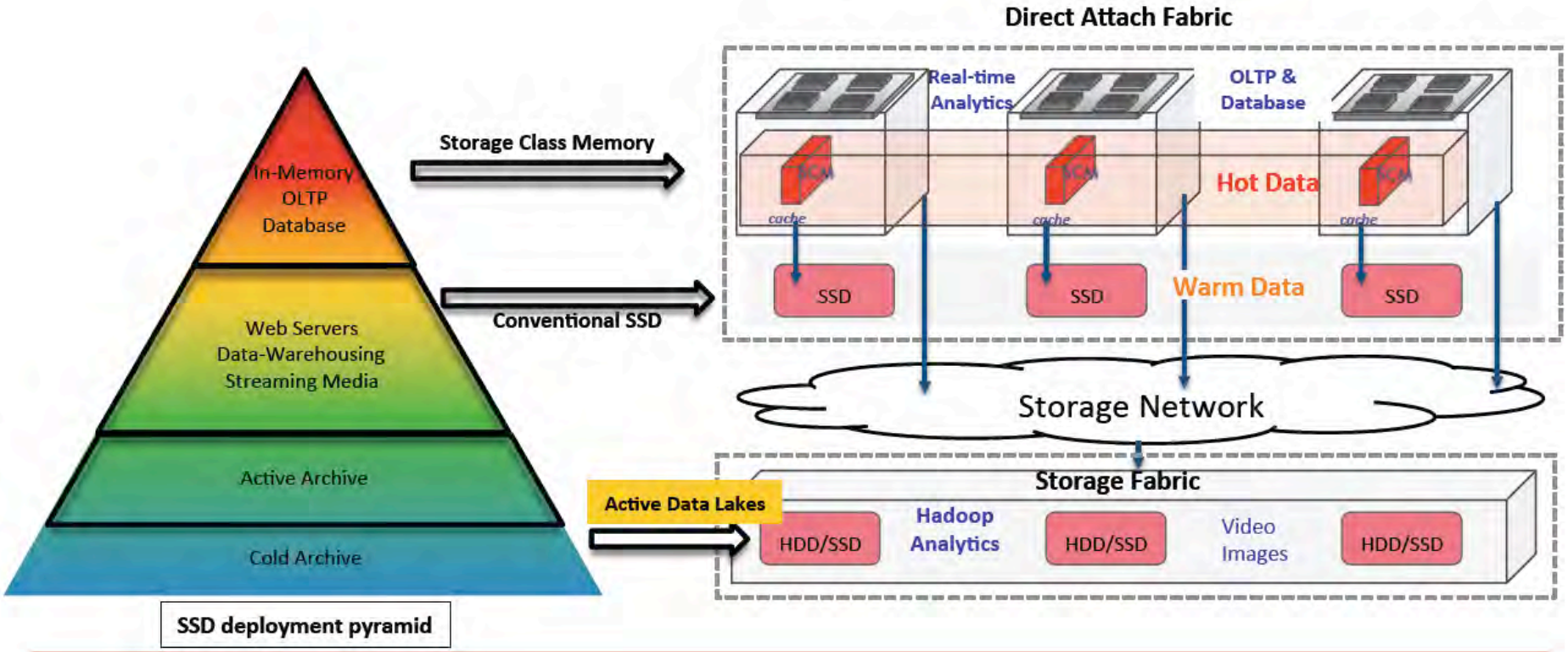
High frame rate, HDR, 4k, 8k and beyond

- More Formats
- More Frames
- More Pixels
- More Color

Google Keynote at SV 2016



New Storage Hierarchy
(SanDisk at SV 2016)



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LaCie Chrome by Neil Poulton

- USB 3.1 Gen 2 (10 Gb/s) —up to 940 MB/s
- Pair of M.2 SATA SSDs in a RAID 0 Configuration
- USB-C connector
- Magnetized cable management
- Chrome Finish

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USB-C
(Seagate Exhibit at CES)

USB 3.0

USB-C

- USB-C connector. An interface that is a lot like the Apple Lightning cable. There is no wrong way to insert it. Both sides of the cable are identical too.
- • USB 3.1 Gen 1 = 5Gb/s = USB 3.0 (LaCie Porsche Design)
- • USB 3.1 Gen 2 = 10Gb/s (LaCie Chromé)
- • Gen 1 and Gen 2 have USB-C connector
- ▪ Unique Power Delivery feature for laptop charging (LaCie Porsche Design only)

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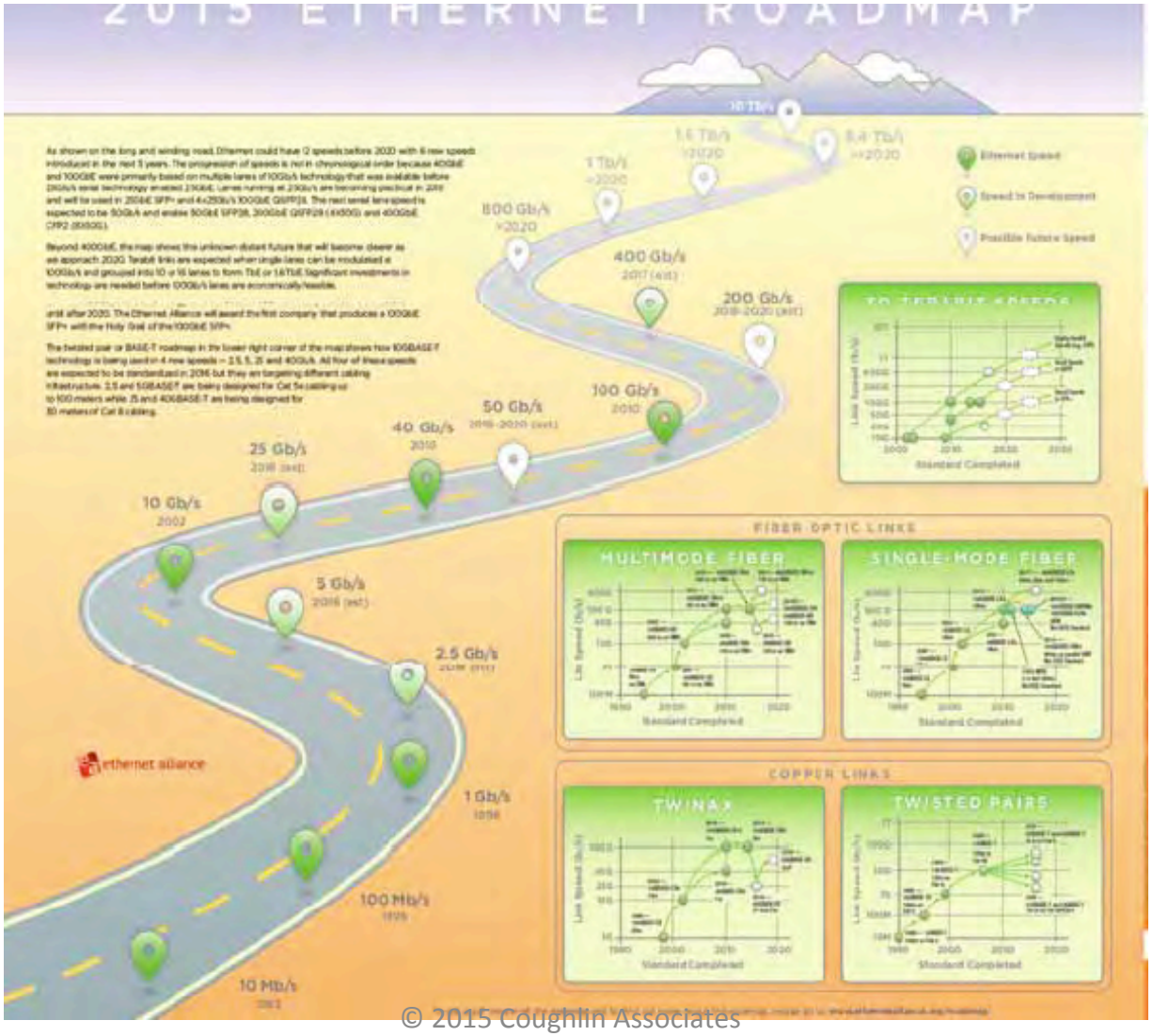
Ethernet Roadmap
(Scott Kipp, Ethernet Alliance, SV 2016)



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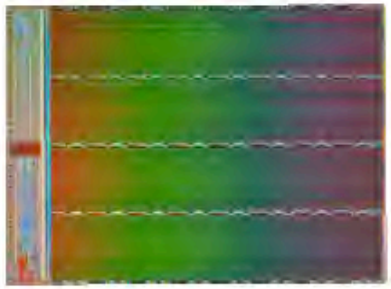
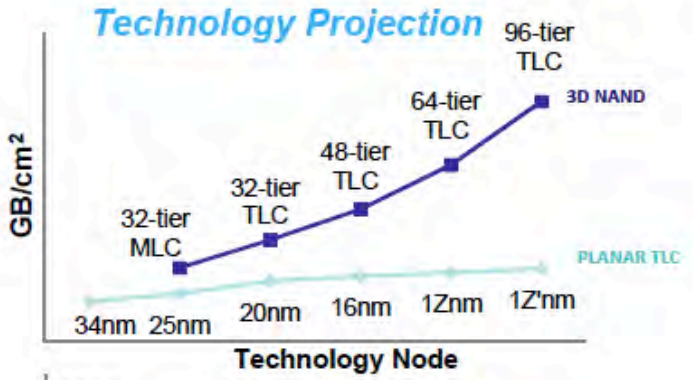
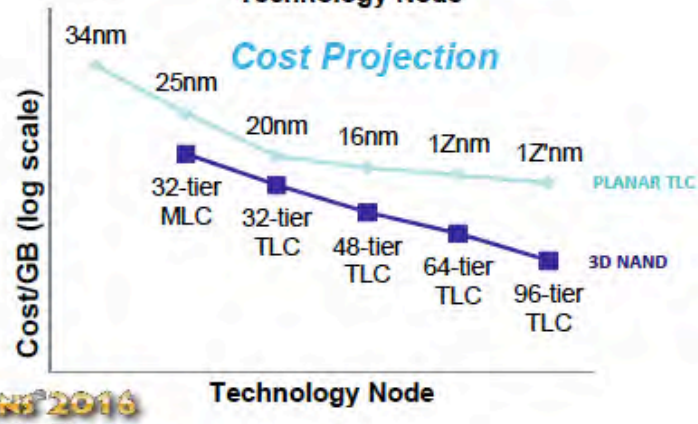
3D NAND
(Rob Peglar, Micron SV 2016 Keynote)

3D NAND Comparison with Planar NAND Scaling



- Planar NAND scaling
  - Planar can be scaled below 16nm, but performance and cost are not competitive with 3D NAND
- 3D NAND scaling
  - 3D NAND cost improvement over planar expands with subsequent nodes
  - 3D NAND cell architecture enables significant performance improvement relative to planar technology





January 4, 2016

Rob Peglar, Micron Keynote

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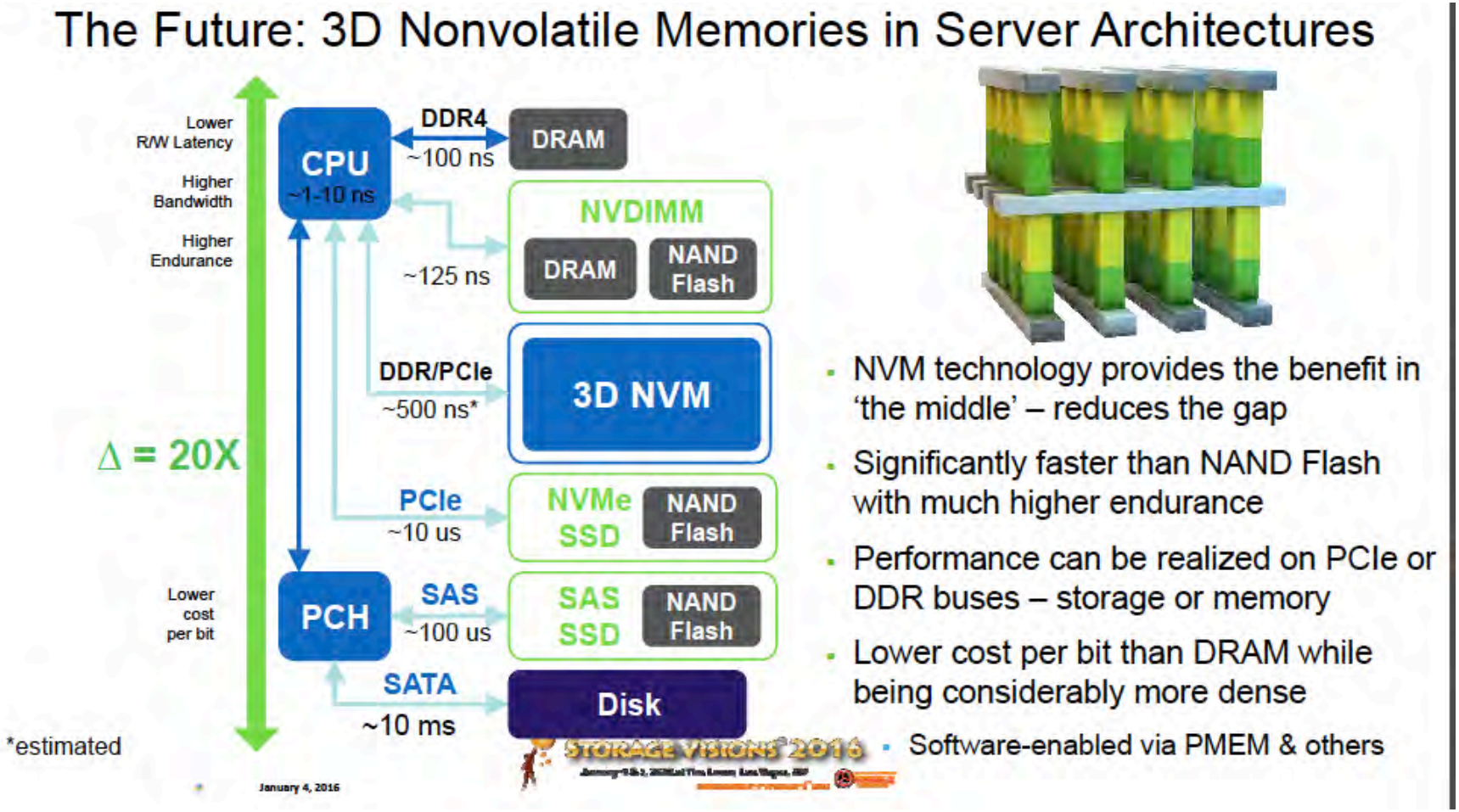
3D X-Point
(Rob Peglar, Micron SV 2016 Keynote)



Rob Peglar, Micron Keynote

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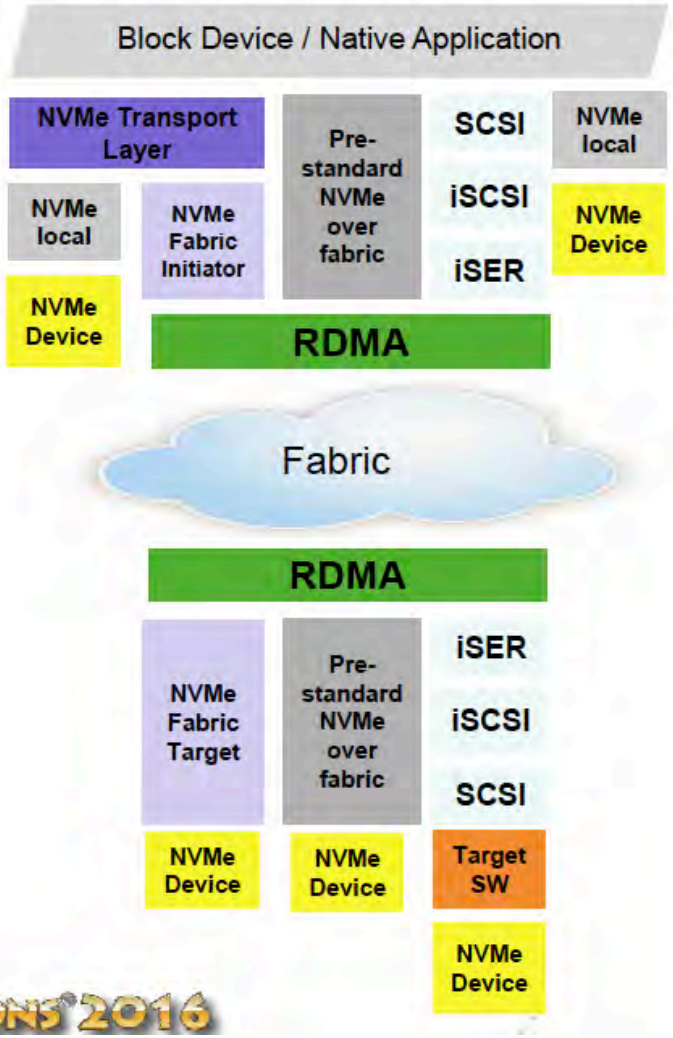
NVMe over Fabrics
(Mellanox SV 2016

NVMf

- The idea is to extend the efficiency of the local NVMe interface over the fabric
  - NVMe commands and data structures are transferred end to end
- Relies on RDMA for performance
  - Example: InfiniBand, RoCE
  - iSER uses SCSI for transport
- A few pre-standard versions are available today



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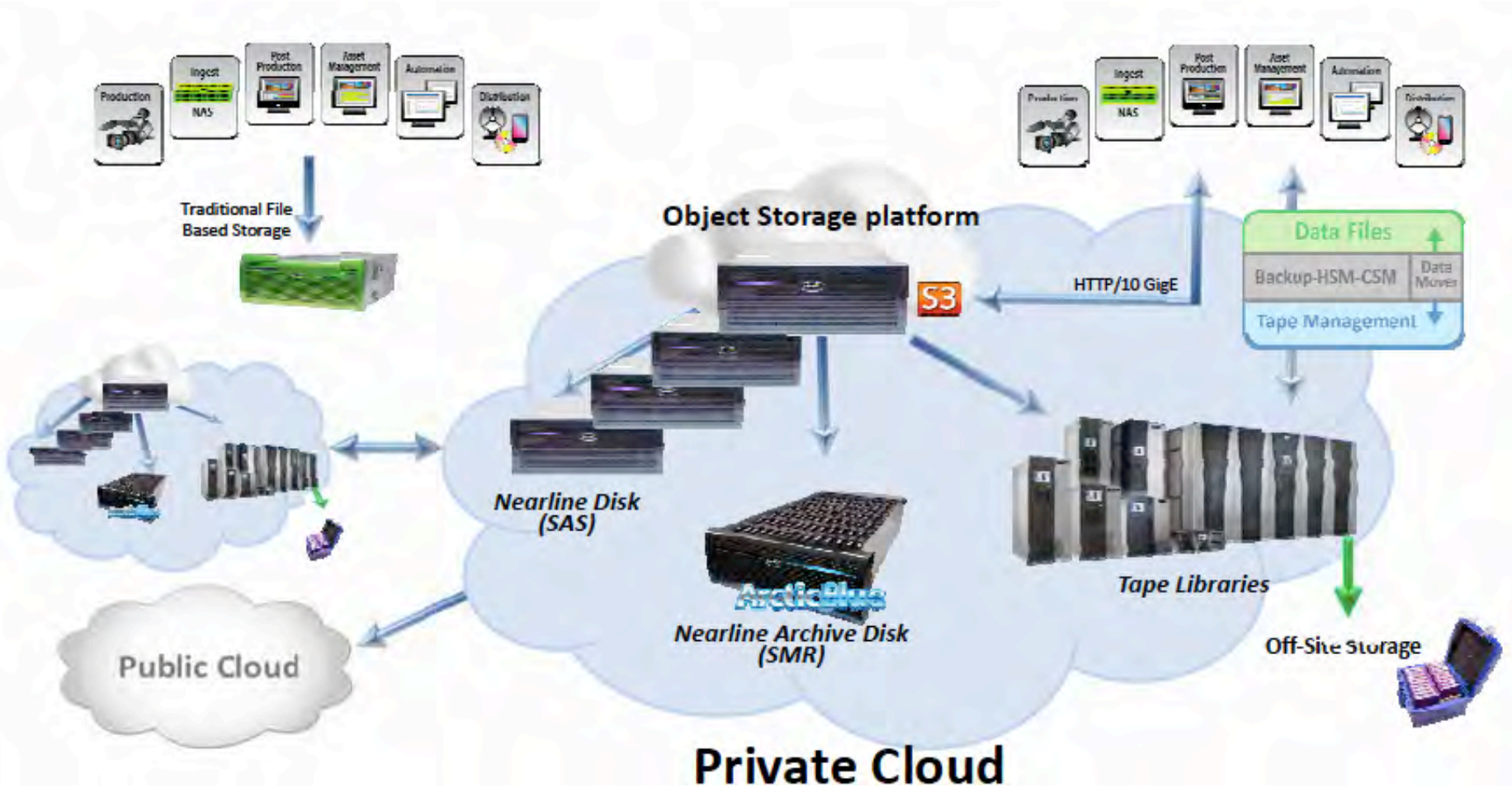
Cloud Storage
(Spectra Logic at SV 2016)



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Consumer Clouds and Storage

- Marvell introduced its Smart Home Cloud Center reference platform for home networking and automation, digital entertainment, secure storage and smart server with Kimono Software
- More companies including cloud storage with their external storage offerings—e.g. Seagate offering 2 years of 200 GB in the cloud with their ultra-slim drives
- At SV 2016 Storj said it cost them $3k for 1.5 PB of cloud storage using peer-to-peer technology

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Cold Storage (Tape and Optical)

LTO Y BaFe Tape

- 6.0 TB native capacity
- 300 MB/s native transfer rate
- Roadmap to LTO 10
- BaFe tape shows no loss of signal in 30 years

- Panasonic announced its freeze-ray Optical Disc-Based Data Archive System for data centers in collaboration with Facebook.
- Targeted especially at cold storage of consumer photographs and videos
- Facebook is currently implementing the current 100 GB Blu-ray write-once optical technology but plans to move to 300 GB discs as they become available in 2016

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Active Archives with HDD Object Storage
(HGST Keynote at SV 2016)

HGST Active Archive

- 4.7 PB raw capacity
- Fifteen 9s of data durability
- Distributed erasure coding
- Cloud Scale Object architecture

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Odds & Ends

Ehang Flying Drone

ASU Wearable Projector

Sensorwake
Alarm clock
aroma module

PicoBrew Home Brewery

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