Data Storage Technology Update

Hal Woods
Vice President and Chief Architect
HGST Elastic Storage Platforms
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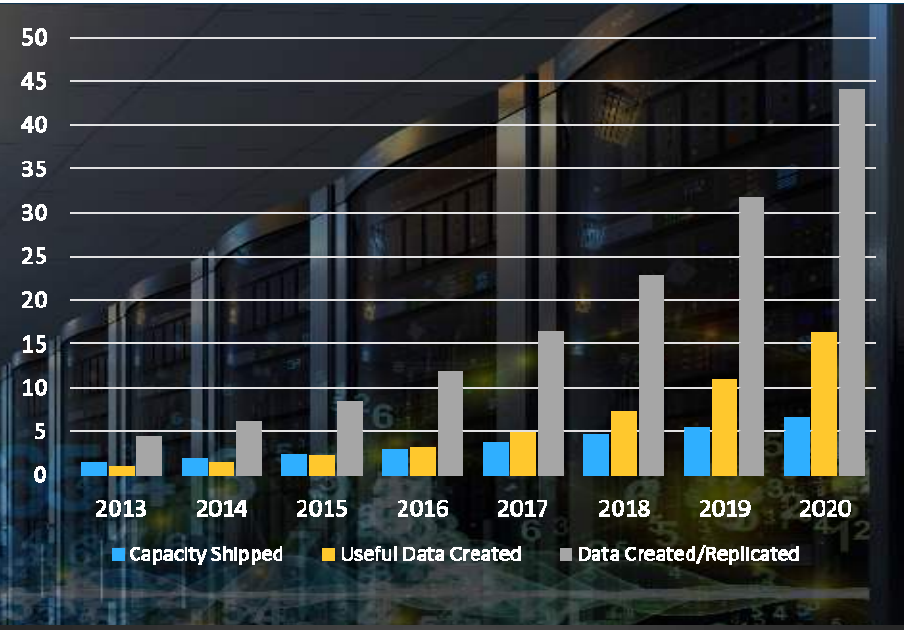
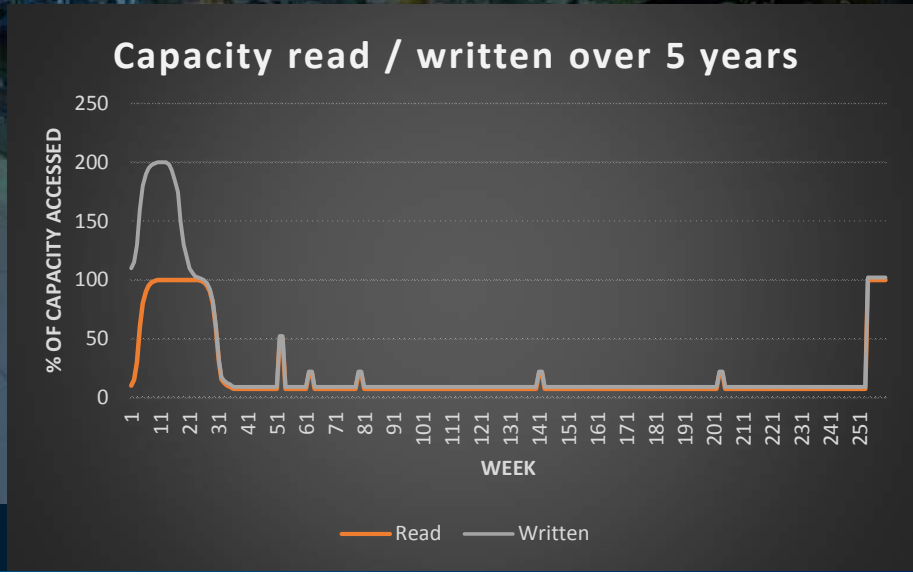
a Western Digital company

I have some bad news for you… and good news for me…

- You are a data hoarder, an addict in fact
- You want to keep everything
- You admit that most of what you want to keep will never be useful
- You want to be even more, not less, of a data hoarder - if only you could afford it
- But you keep data because it might be useful, sometime, maybe, but probably not
- But when you need it, you really need it
- If only you can find the important pieces
- I am here to tell you, store it all, forever!

The data storage industry thanks you…





This years theme - The big squeeze

- Several facets of IT infrastructure are undergoing a transformation where changes at the extremes are putting immense pressure on the things in the middle
- Transforming:
  - Business models
  - Storage Capacity
  - Enterprise Disk Arrays
  - Servers and Storage

The squeeze – Business Models

Not about technology but technology impact will be significant

- Ten companies will consume 50% of the IT infrastructure
- Herds of engineers writing custom applications for commodity H/W
- Infrastructure being sold at 1/2 of the margin it once sold at
- Revenues decline for the historical system companies
- What's left is under margin pressure due to top 10 cost transparency

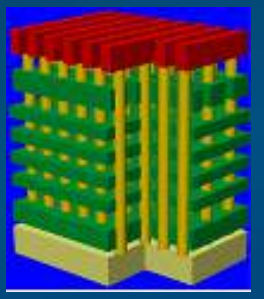
Component Providers 40%- 60%+ **System Providers**

Timing	Winners	Losers	Relevance
Now	Component providers and low-cost integrators, volume purchasers	Enterprise IT providers	COTS lower cost but do-it-yourself or work with low-cost integrator

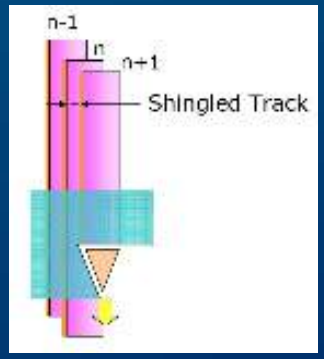
The squeeze – Storage Density

3D NAND and SMR HDD recording technologies squeeze maximum capacity at the expense of maintaining the long standing behavior software expects

3D NAND results in significant increases in solid state storage density, reductions in cost, but with reduced durability and reliability



SMR (shingled magnetic recording) keeps hard disk drive capacities growing - Random read, sequential write and overlapping writes are messy. When I write I might damage data written on previous track



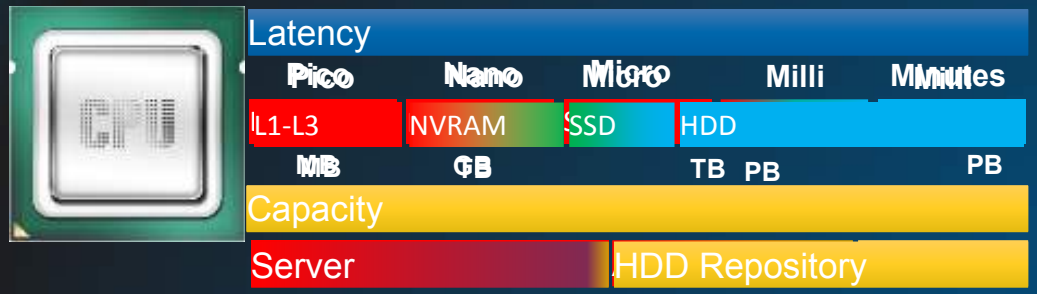
Performance can vary by orders of magnitude – more often

Reliability / integrity can vary by orders of magnitude – over time

Answer – Performance variations more tolerable than any risk of data integrity changing.

Timing	Winners	Losers	Relevance
2015+	Semiconductor Storage, HDD Suppliers	15K RPM Disk Drives	Bigger Fault Zones, Software must tolerate broader range of "normal" behavior

The squeeze – Enterprise Arrays



What if I could keep my entire working data set close to the CPU, shared, available

What if the rest of my data, including copies, were affordably accessible in milliseconds

New memory Hierarchy enablers:

- **Software defined storage for tiering and high availability**
- **Solid state technology memory alternative**
- **Low latency commodity interconnects**

Timing	Winners	Losers	Relevance
2017+	Semiconductor Storage, Disk Based Cloud Storage	Enterprise Storage Arrays	Higher performance applications, lower cost total storage, industry consolidation

The squeeze – Server and Storage

- What if I could run my application on my disk drive?
- What if I had a server with a petabyte of capacity?
- What is a server and what is storage, does it matter?
- Moving the application to the storage or the storage to the application, a matter of perspective
- Think of it as a platform for dynamically hosting software that is very close to the data with the premise that it is easier to change the software than move the data…
- What could you do with it?

Timing	Winners	Losers	Relevance
Now to 2017	Device manufactures, low-cost integrators	Storage or Server only vendors, network vendors	Applications that can store / analyze locally, network limited environments

Hot off the presses

Announcing the HGST Active Archive System

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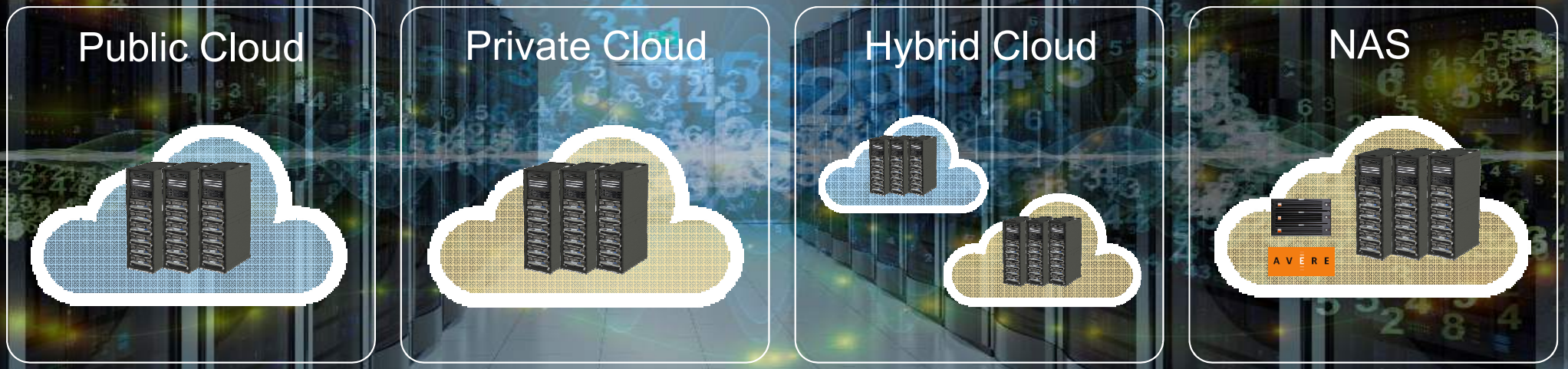
Simplicity at Scale ™ for a Broad Range of Environments



Scalability, Accessibility, Affordability and Simplicity for Rapidly Evolving Active Archive Needs and Environments

Enabling Business Transformation

HGST a Western Digital company	Building on Proven Device Leadership to Deliver Increasing Value
Active Archive System	Vertical Innovation Creates Superior Value to Preserve More Useful Data
New Era of Value and Agility	Beating White Box Economics with Open APIs and Optimized Design
Transformation Across Ecosystem	Giving Organizations the Agility to Harness the Power of Data

Introducing
HGST Active Archive System

Complete scale-out object storage system for cloud data centers

4.7PB
raw capacity per rack

Optimized for active archive workloads

Breakthrough TCO

Highest Density Improves Data Center Efficiency

Lowest Power per TB with Fast Data Access

Beats White Box Economics

Scales to Exabytes of Capacity

New Level of Purpose-Built Design for Active Archive Workloads

AMPLIDATA

Advanced Storage System Software → Cloud-Scale Resiliency & Unlimited Scalability

Active Archive Platform

Tuned Storage Enclosure → Highest Rack Density, Lowest Power per TB & Cloud Optimized

HelioSeal™

Helium-Filled Drives → Highest Capacity, Proven Reliability & Lowest Power

Vertical Innovation Enables Breakthrough Value and Scalability

Other Technology Trends and Q&A

- V^3, Volume, Velocity, Variety – the premise of Big Data and Anlytics
- Non Volatile Memories – PCM, resistive RAM,… when?
- Public versus Private Cloud
- IoT – Another big thanks from the Storage Industry
- Disaggregated AND Converged
- What else?