

**Western Digital®**

Western Digital's compelling  
Enterprise portfolio  
*The Ultrastar® Family of Products*

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# The Universe of Data is Evolving Rapidly

## Past few decades ...

From **250,000** years to compute what would take ...

**<1%** of the generated data deemed useful leading to unused dark data

**Data siloed** within individual applications

Data privacy **not a primary consideration**



## Next few years ...

... **1 day** to compute today

**10%+** of data generated deemed useful including past dark data  
(e.g., \$15B in annual value just from dark data healthcare)

Emerging technologies will enable **data exchanges**

Data privacy becoming **increasingly relevant** to society

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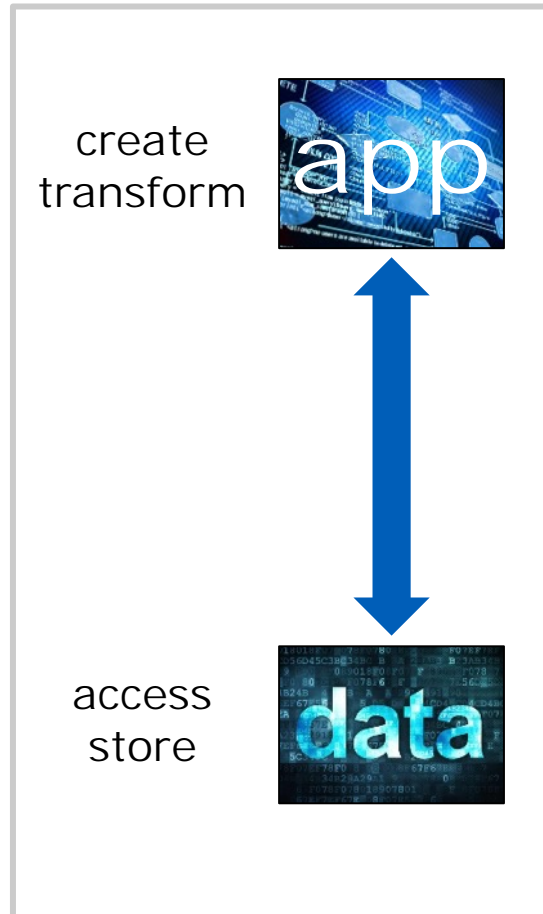
A Data-Centric World

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# Data Interaction is Changing

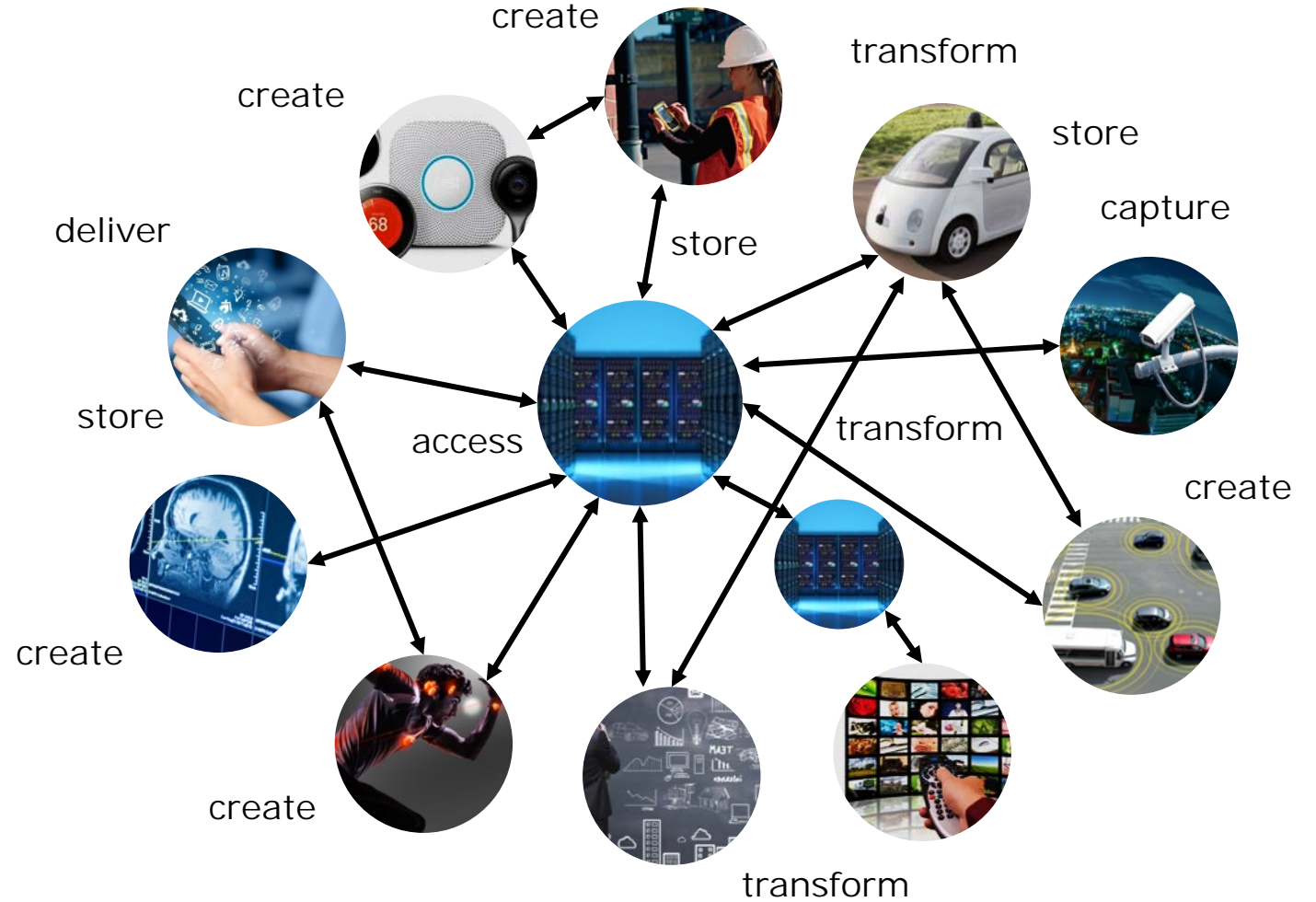
## Past

Data Held Captive by Single Application



## Current and Future

Data Pooled and Shared by Multiple Applications



# The Evolving Role of Data

Creating the data-driven economy

Richness

## Data as a record



164	94	45	73	38	99
166	172	10	30	85	40
896	2.132	2.390	3.850	2.175	1.280
2.845	1.001	1.920	1.748	2.387	2.3
1.133	1.308	3.028	3.176	2.514	
2.697	1.710	1.287	1.272	2.593	
1.844	1.725	2.110	1.926	1.5	
1.903	1.442	3.292	3.253	1.5	
1.198	2.453	1.272	1.926		

INVOICE			
047-464-1234		1 Your Address	
your@email.com		City, State, Country	
yourwebsite.com		ZIP CODE	
Bills To:	Invoice Number:	Invoice Total:	
Client Name:	000000	\$4520.00	
1 Client Address:	Date Of Issue:		
City, State, Country:	10/07/14		
ZIP CODE:			
Description	Unit Cost	Qty / Hr Rate	Amount
Your Item Name	\$1000	1	1000
Item description goes here			

## Data as communication



## Data as efficiency



## Data as currency

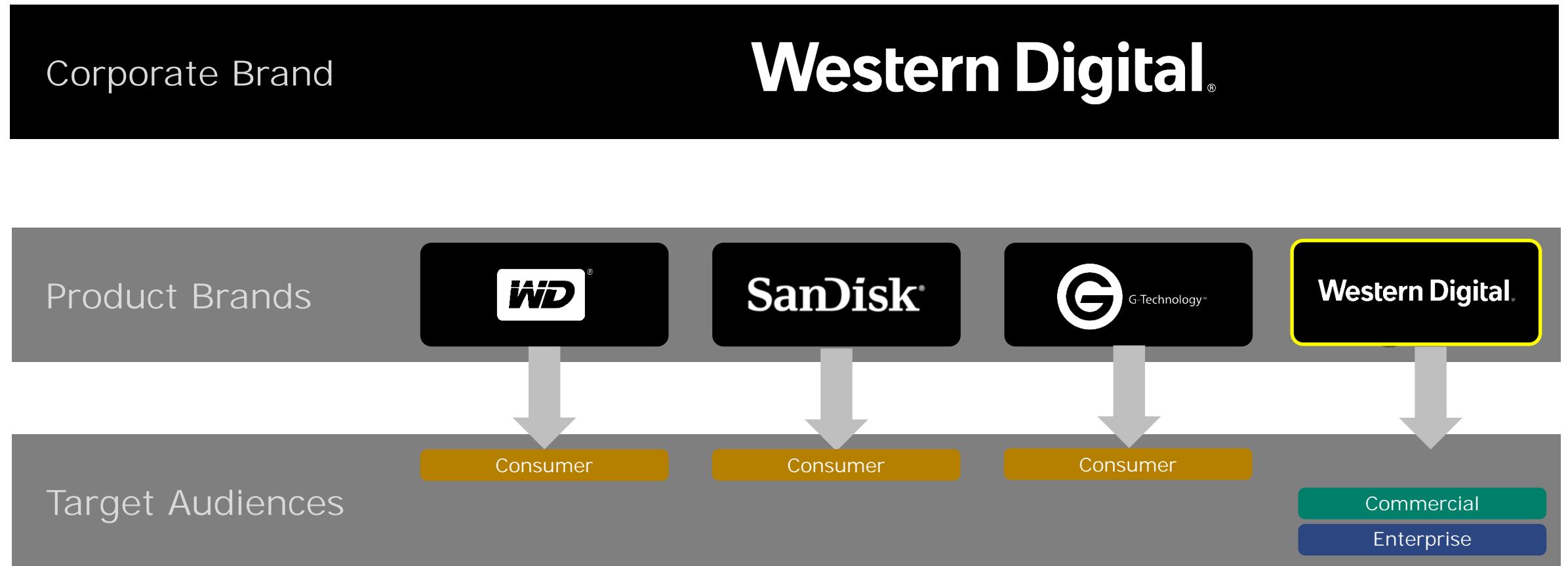


Value



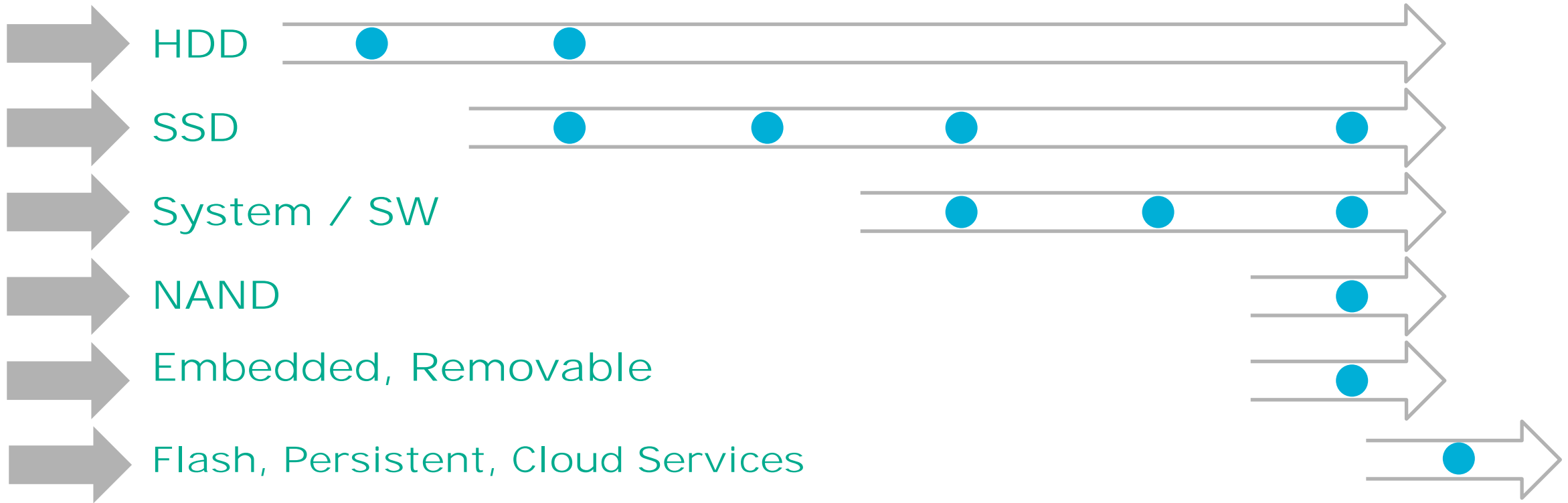
# Corporate and Product Brand Structure

New: Devices Group Commercial and Enterprise



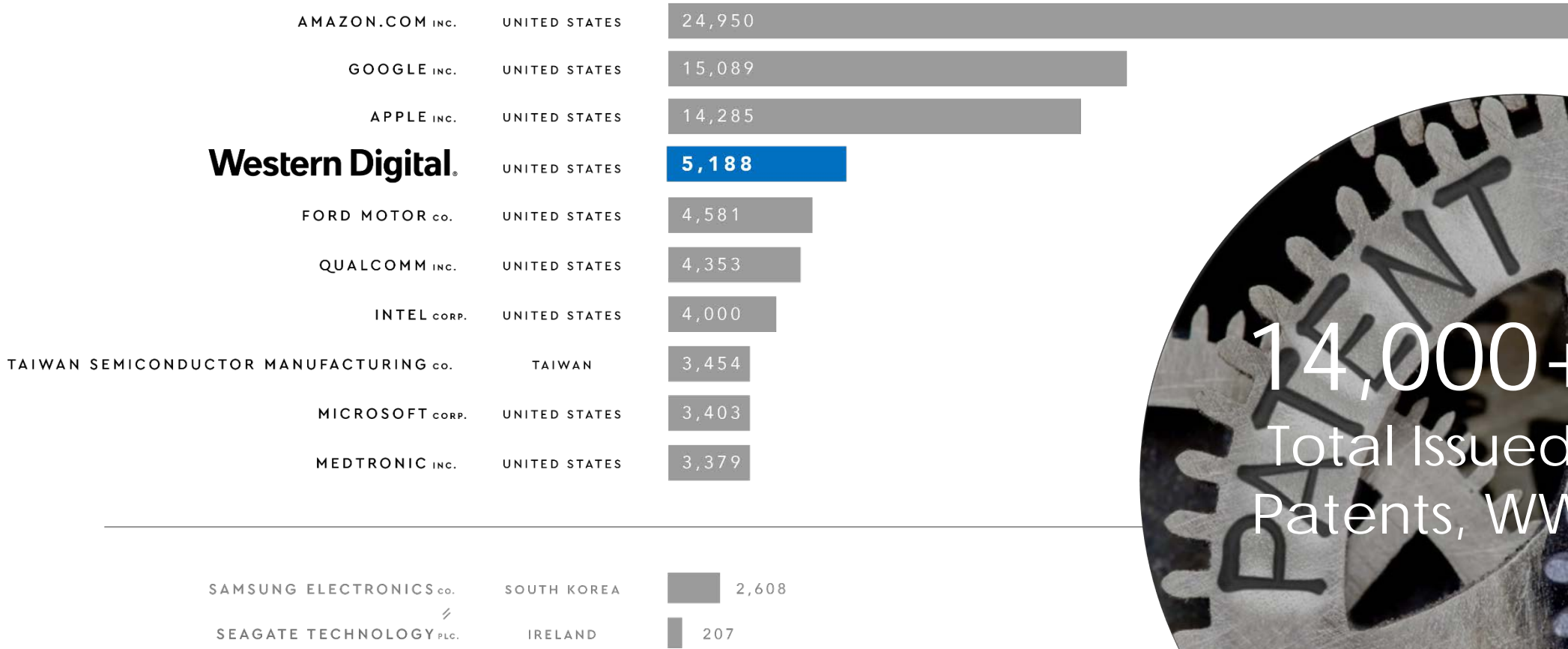
Commercial = OEM & Cloud Service Provider (CSP)

# Acquisitions for Storage Technology Breadth ...



... and Strategic Investments

# The World's Most "Valuable" Patent Portfolios



14,000+  
Total Issued  
Patents, WW

Source: IEEE includes SanDisk, WDC, and Skyera



90% of the world's data  
created in the past 2 years

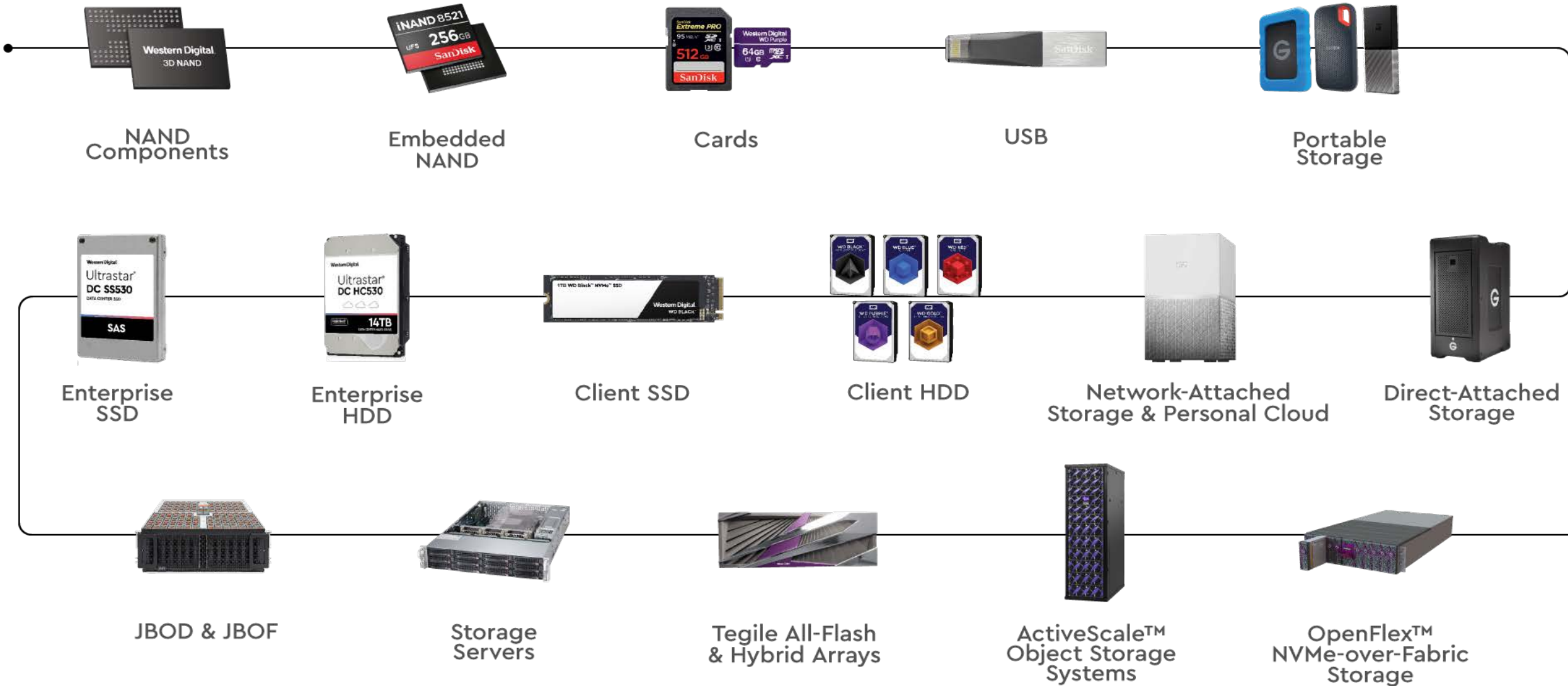
163 ZB  
data  
generated  
by 2025



850EB  
of storage  
shipped in  
2017 (HDD  
and SSD)

65% to 80%  
of Data Center spend is on storage

# Broadest Portfolio of Storage Solutions





# Western Digital<sup>®</sup>

## Ultrastar HDD

Data Center HDD Leadership

# Ultrastar Series

## Product Benefits

### High Workload

- Workload rating up to 550TB per year rating
- 10x the rating of desktop HDDs

### RVS for Vibration

- Enhanced Rotational Vibration Safeguard
- Sophisticated electronics improve data center performance

### HelioSeal<sup>®</sup> Technology

- HelioSeal enables highest capacity point
- Featured in over 30 million enterprise HDDs
- 5 generations of HelioSeal

### Dual Stage Micro Actuator

- Actuation moved closer to head allows for finer head control
- Better positioning and RV Robustness

# Data Technology Innovations

## Firmware Architecture

### Media Cache Plus

- Vastly improved write performance
- 100% data integrity with NVC

### Secure Drive

- Protected by RSA-signed firmware
- Secure Factory Processes

### Dual Safe Firmware

- Power Safe, Non Destructive Firmware Update

### SED Options

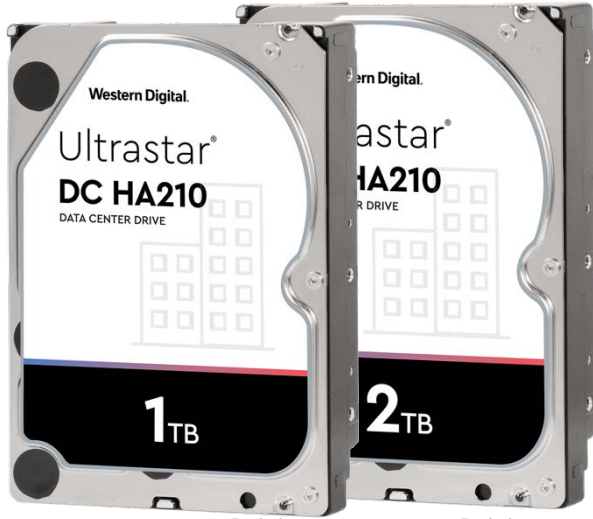
- SATA: TCG
- SAS: TCG, TCG-FIPS

# End-to-End Storage

## Data Center Drives

### HA200 Series

SATA Only



Rainier

Rainier

### HC300 Series



Vela-A

Vela-A

Vela-AP

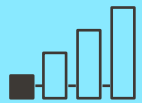
### HC500 Series



Libra-He10

Leo-A He12

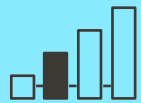
Leo-B He14



Entry Level



Legacy Longevity



Medium Capacity



Highest IOPS/TB



High Capacity



Highest Reliability



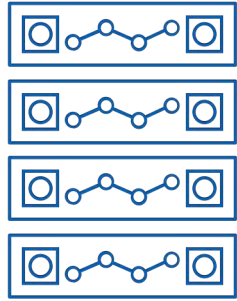
Best TCO



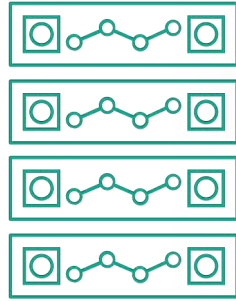
Lowest Power

# 21% Lower Storage Cost

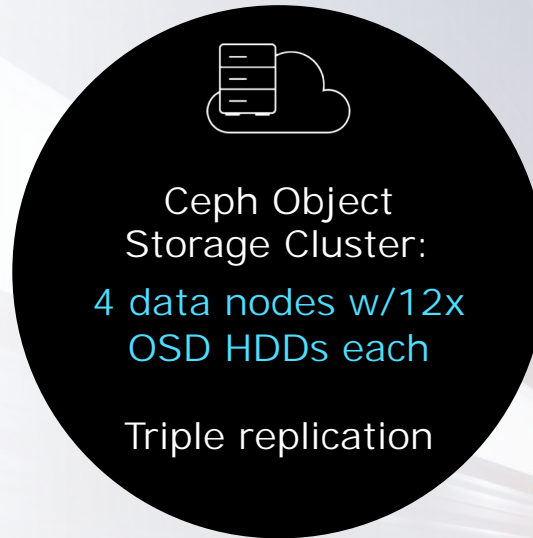
More Capacity. Less Power.



8TB Servers



14TB Servers



Key Components		Cost Ratio
48	HDDs	50% HDDs
4	SSDs (NVMe)	50% Non-HDD Storage
4	Servers	
8U	Rack Space + Shared costs	

### System Costs Include:

- Chassis
- Power supply
- Mainboard
- Processor(s)
- DRAM
- Networking card
- Secondary storage (boot drive, journaling)
- RAID controller
- Cable interconnect

### Shared System Costs Include:

- % of TOR networking
- % of outside internet connection (aggregator)
- % of rack cost
- % of UPS for rack
- % of colocation/lease cost

	Capacity (TB)	Power (W)	Watts/TB	TCO \$/TB
8TB Air	384	355	0.93	Baseline
14TB Helium	+75% 672	-26% 264	-58% 0.39	-21% @ \$/TB parity

# Data Center Leadership to Deliver 18TB CMR and 20TB SMR HDDs\*



Western Digital.

## Extreme Capacity

**18TB** CMR HDD for hyperscale, cloud, and enterprise storage  
20TB Host-managed SMR HDD

## Areal Density

9-disk platform with **6<sup>th</sup> generation HelioSeal** technology and **energy assisted recording** drives  
capacity/density leadership

## TCO

Cost-optimized configurations for **availability**  
every important capacity point first half of 2020





# Western Digital<sup>®</sup>

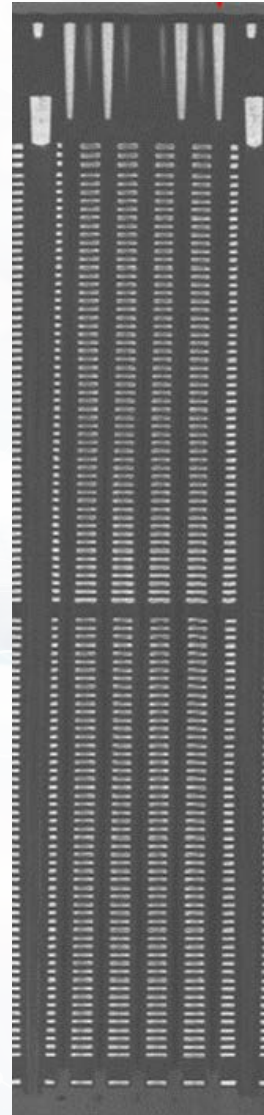
## Ultrastar SSD

*Highest performing SSDs in the market*

# A Tradition of Technology Leadership

World's first 128 / 96-layer and 64-layer 3D NAND; first high volume production of both technologies

Development of highest capacity, 1.33Tb die on 96-layer QLC



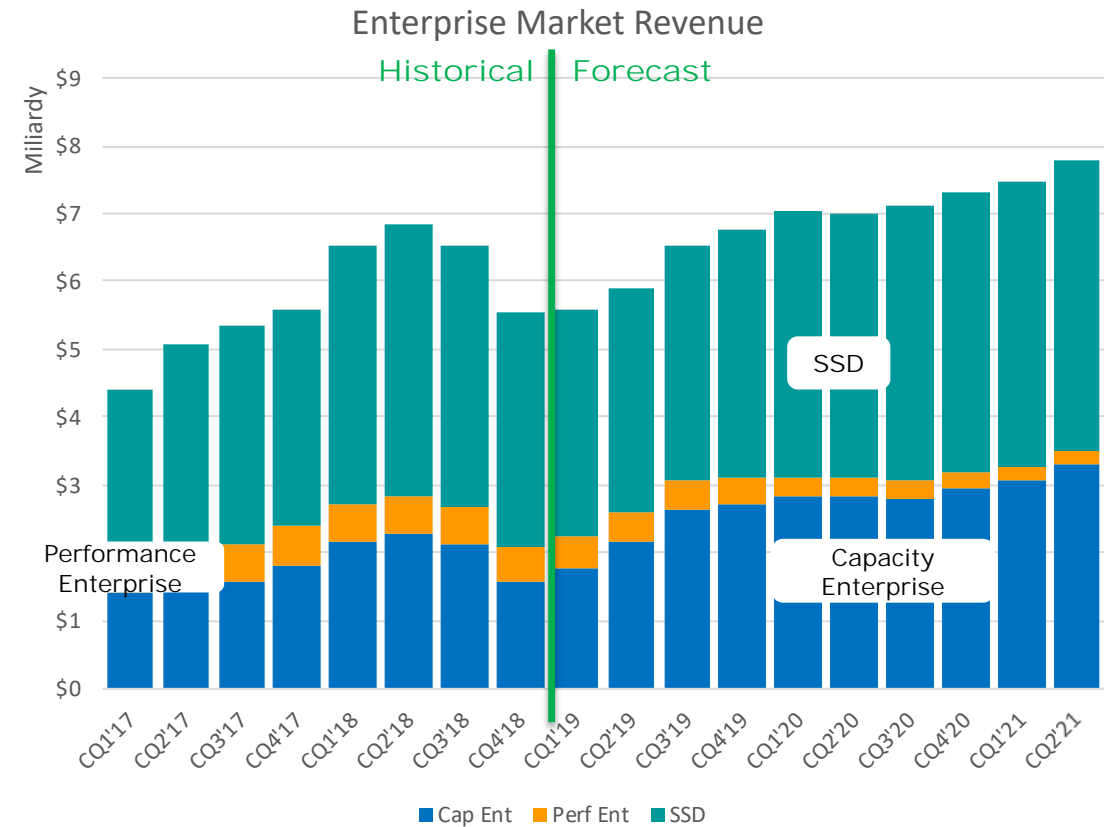
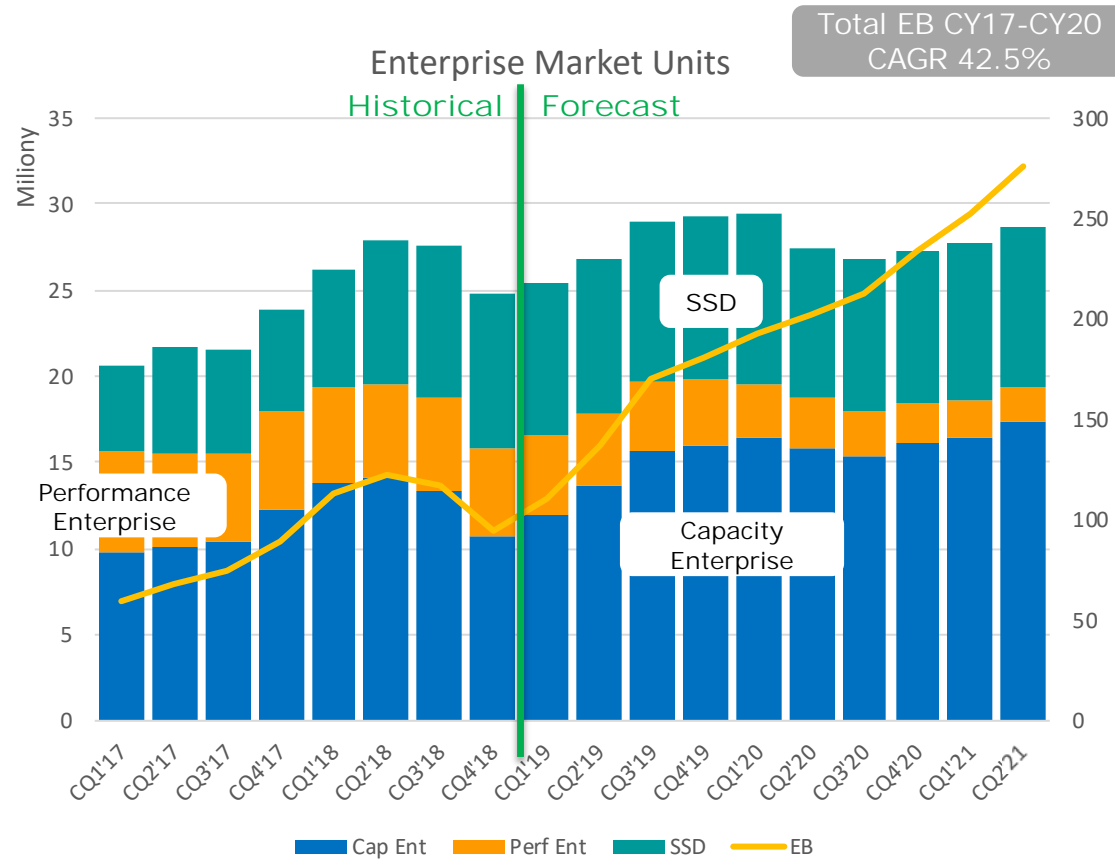
World's Smallest 256Gb and 512Gb die based on charge trap technology

Broadest product portfolio built on 64- and 96-layer 3D NAND



# WDC Enterprise Market View

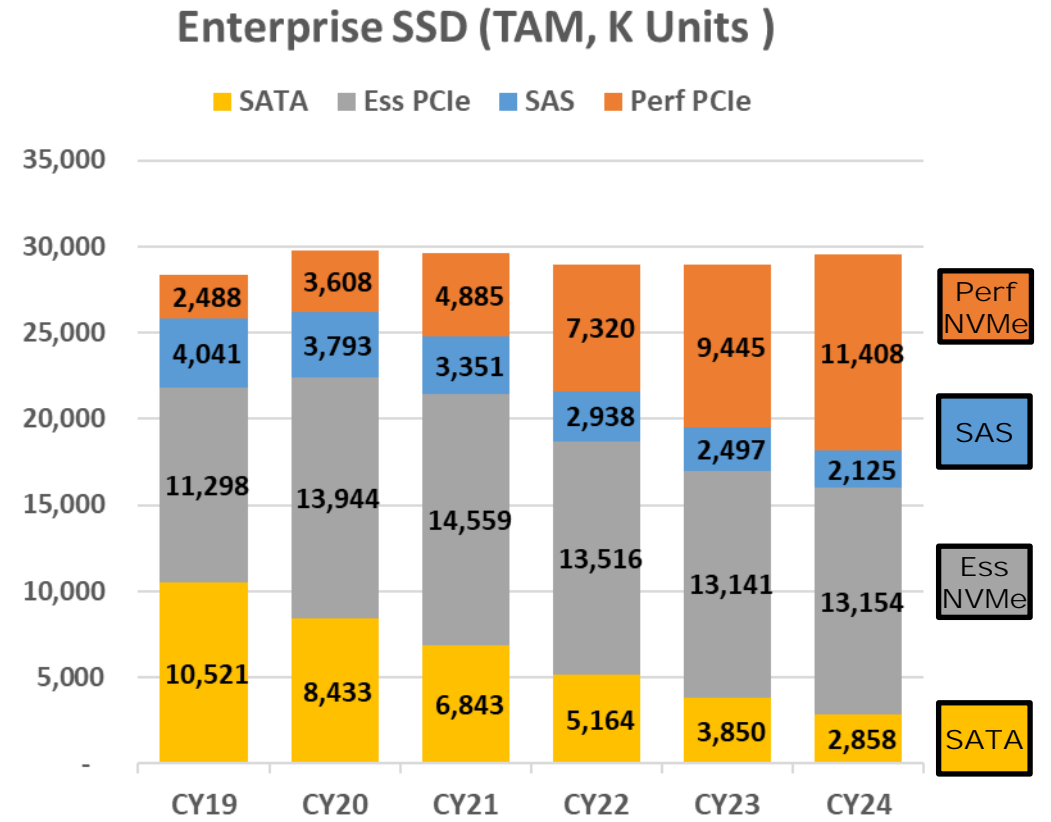
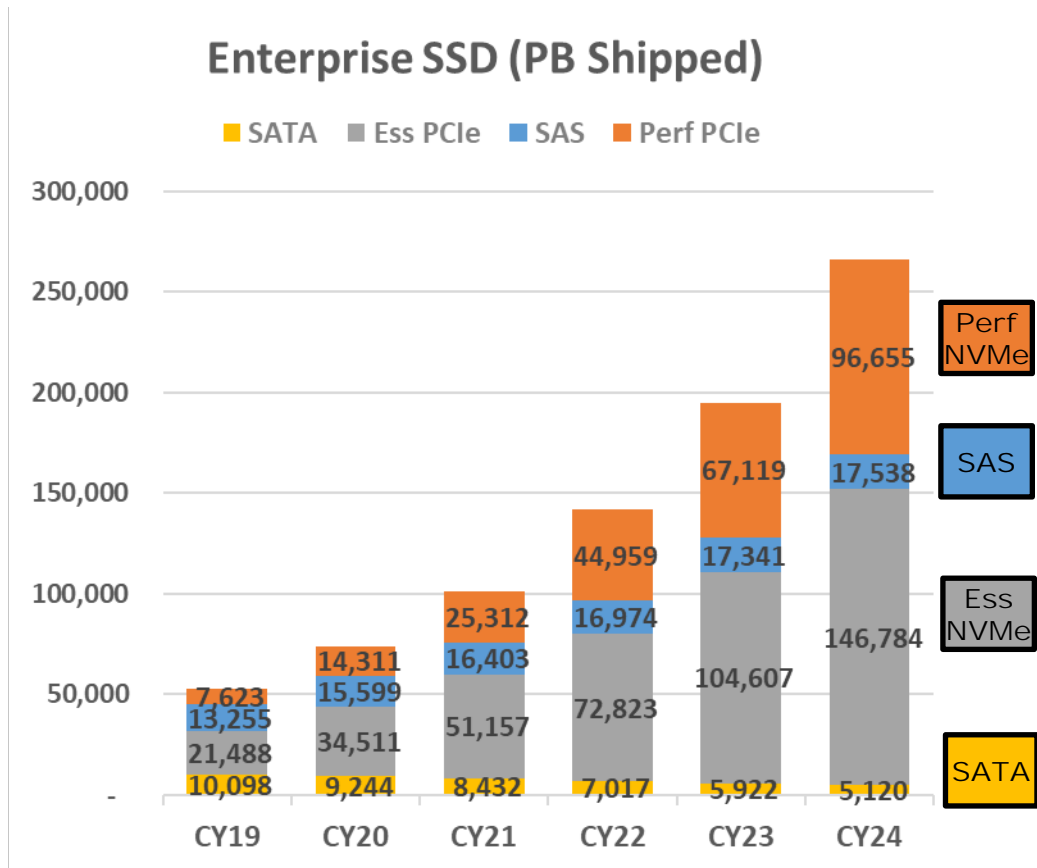
## TAM by Units & Revenue



- **SSD and HDD Capacity Enterprise are driving revenue expansion**
- **Performance Enterprise squeezed by SSD for highest IOPs**
- **Capacity Enterprise defined by both: lowest \$/TB for TCO, and low ASP for traditional IT applications**
- **HDD Exabyte CAGR driven by Hyperscale and Cloud applications**

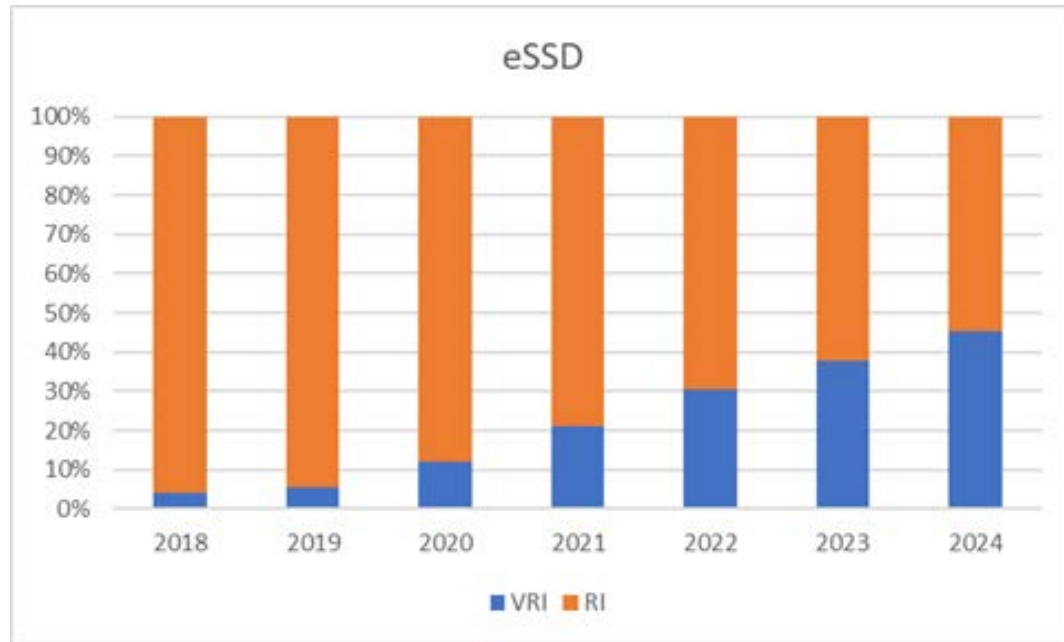
# Enterprise NAND SSD Market Outlook (Units/PB)

Enterprise SSD Exabyte Growth without Self-Built - 38% PB CAGR 2019-2024

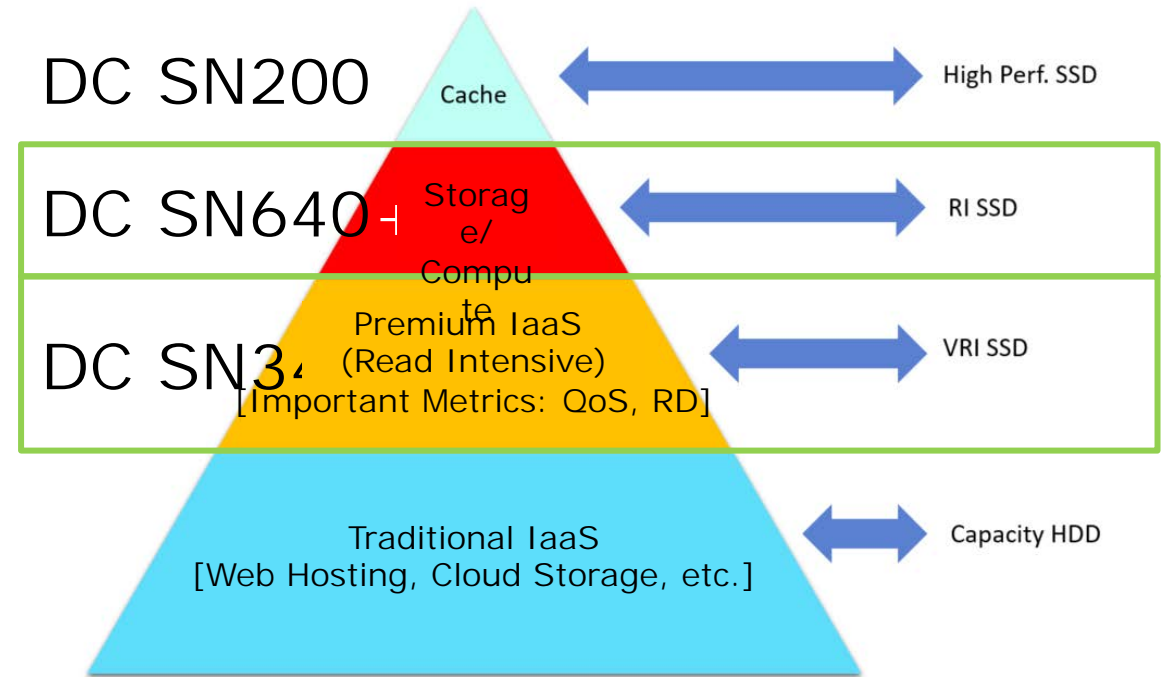


# Enterprise NAND SSD Market Outlook (Units/PB)

Enterprise SSD Exabyte Growth 38% PB CAGR 2019-2024\*



5Y VRI/RI TAM View



NVMe SSDs for Tiered Cloud Storage 2024 View

Go after major growth opportunity in VRI and RI based on dense SSD TAM

\*Western Digital Internal Market Analysis

# Complete Data Center SSD Portfolio



2.5-inch & M.2 22 Up to 2TB

DC SA210



Up to 15.36TB

DC SS530

## VRT Performance RT



Up to 7.68TB

M.2 22x80 Up to 2TB

DC SN340 & CL SN720



Up to 7.68TB

DC SN630 → DC SN640



Up to 30.72TB

EDSFF Long



M.2 22x110

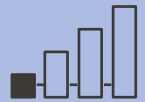
Up to 3.84TB



x8 HH-HL & x4 2.5-inch U.2

Up to 7.68TB

DC SN200



6Gb/s SATA

Boot & Edge Applications, Cost-Effective Flash Deployment



12 Gb/s SAS

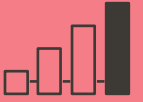
Scalable, Dual-Port, High-Endurance Options



PCIe Gen 3 NVMe™

Server Boot & Cloud Edge Lowest \$/GB NVMe

Essential NVMe Class Optimized for Best IOPS/WATT



Performance Class with Dual-Port Support

\* One gigabyte (GB) is equal to 1,000,000,000 bytes (one billion bytes) and one terabyte (TB) is equal to 1,000GB one trillion bytes) when referring to storage capacity. Accessible capacity will vary from the stated capacity due to formatting and partitioning of the drive, a computers' operating system, and other factors.

# NVMe™ SSD Segmentation

## Ultrastar NVMe SSDs For Data Centers

0.3 or below DW/D

< 1 DW/D

1-3 DW/D

10+ DW/D

### VRI Storage

- Very Read-Intensive Workloads
- Content Delivery Networks
- Cloud Gaming Storage

### RI Storage

- Read-Intensive Workloads
- Scale-out Architectures
- Cloud SQL & Object Storage
- Hyperscale and Cloud Services

### Caching & Compute

- Mixed Workloads
- SSD Caching Layer
- Hyper Converged & Database
- Compute-Intensive Workloads: AI/ML, Analytics, E-Commerce

### Accelerator

- Write-Intensive Workloads
- In Memory Database Accelerator
- ERP, SaaS, Financial
- Memory Extension

## Increasing NVMe Performance & Endurance Requirements

### DC SN340 NVMe SSDs

- 3.84TB & 7.68TB in 7mm 2.5" U.2
- Focused on large block writes (32K/128K/..)
- Delivers best IOPS/WATT and Optimized for Read QoS



### DC SN640 NVMe SSDs

- 800GB to 7.68TB in 2.5" U.2
- 4K/8K Writes support
- Read/Write QoS optimized



### DC SN200 NVMe SSDs

- Up to 7.68TB in Choice of HH-HL AIC or 2.5-inch SFF
- Optimized for 4K Random R/W Workloads -> up to 1.2M IOPS



### DC ME200 Memory Extension

- 1-4TB in Choice of HH-HL AIC or 2.5-inch SFF
- Combines Software + Hardware Solution for Transparent Memory Caching





**Western Digital<sup>®</sup>**

# Ultrastar™ Memory ME200

- Answer to Need for Large Memory



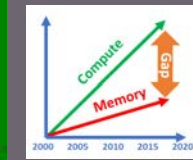
# Market Trends & Challenges

## User Experience



Superior application performance increasingly necessitates trend towards in-memory computing

## Memory Technology



DI MM module size is not scaling at the same rate as compute power

## Server Platforms



Number of DIMMs on newer server platforms is either flat or reduced, requiring scale-out solutions

## DRAM Pricing



DRAM cost is high and tight market conditions means price is not declining as expected

*Trend towards in-memory computing – but cost is high...*

# Introducing: Ultrastar DC ME200 Memory Drive

Western Digital's first product to optimize in-memory system capacity and performance for running demanding applications that drive today's real-time analytics and business insights.

- Drop-in for most x86 servers, software creates virtualized memory pools on Ultrastar NVMe devices
- Augments physical DRAM
  - e.g., 1:8 ratio (DRAM: DC ME200)
  - customer cases will vary ratio
- NVMe U.2 and AIC Interfaces
  - Capacity point options:
    - 1TiB, 2TiB, 4TiB
- Prefetch algorithms achieve near-DRAM performance
  - benchmarks to be published at launch:
    - Redis, Memcached, SGEMM, MySQL™
- Go-to-market:
  - global availability, direct and channel sales

Now Shipping!



Ultrastar DC ME200 Memory Extension Drive  
NVMe U.2 and AIC HH-HL form factors

# Ultrastar™ Memory Drive – Proven Performance



Distributed in-memory data cache for web applications

85% -91%  
DRAM  
performance

4x-8x memory  
expansion



In-memory data structure store and messaging service

86-94%  
DRAM  
performance

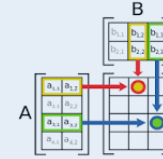
4x memory  
expansion



Relational DBMS

74-80%  
DRAM  
performance

4x-8x  
memory  
expansion



SGEMM Matrix  
Multiplication  
for AI /ML

93% DRAM  
performance

8x memory  
expansion



SAP S/4HANA

95% DRAM  
performance

8x memory  
expansion



# Western Digital<sup>®</sup>

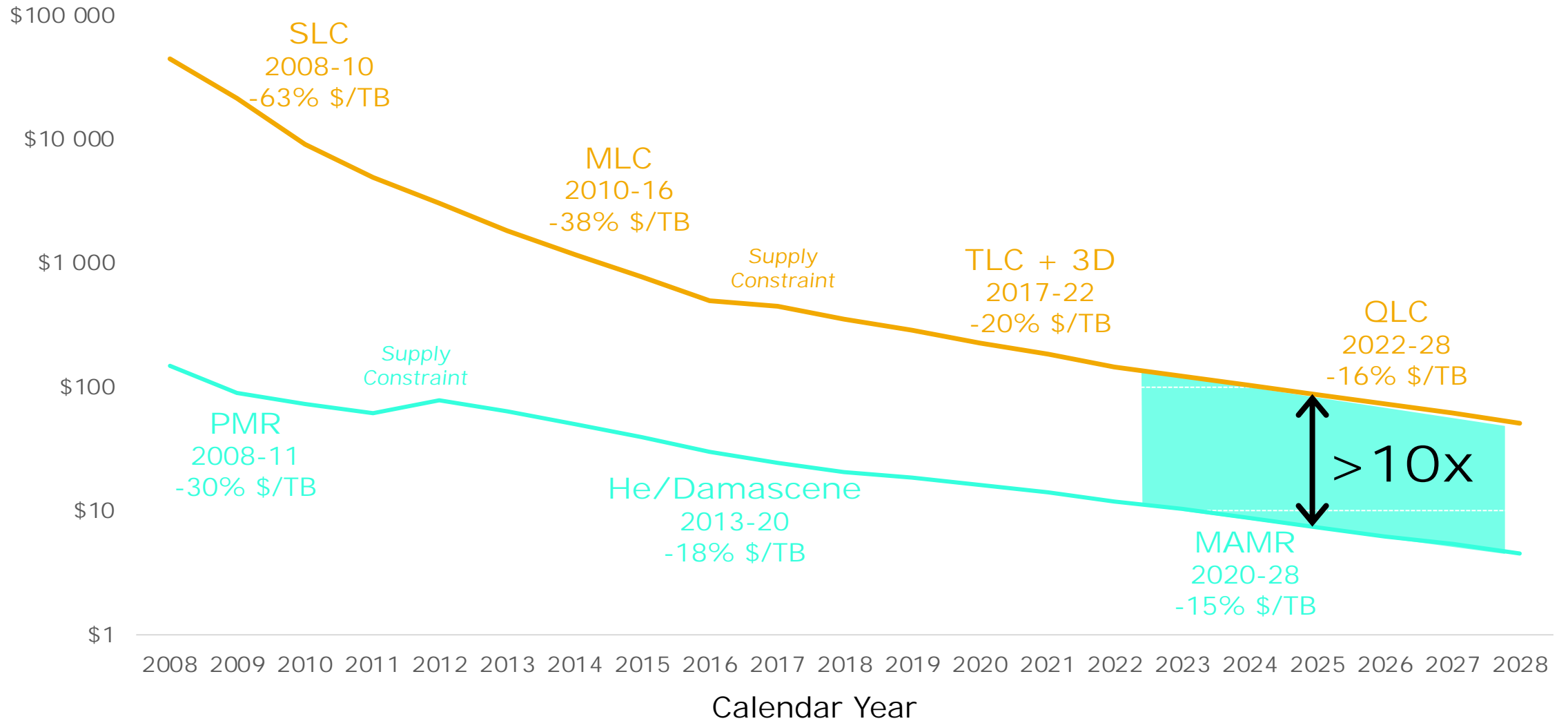
## HDD vs SSD battle

*And the winner is ...*

# Enterprise HDD vs. Flash SSD \$/TB

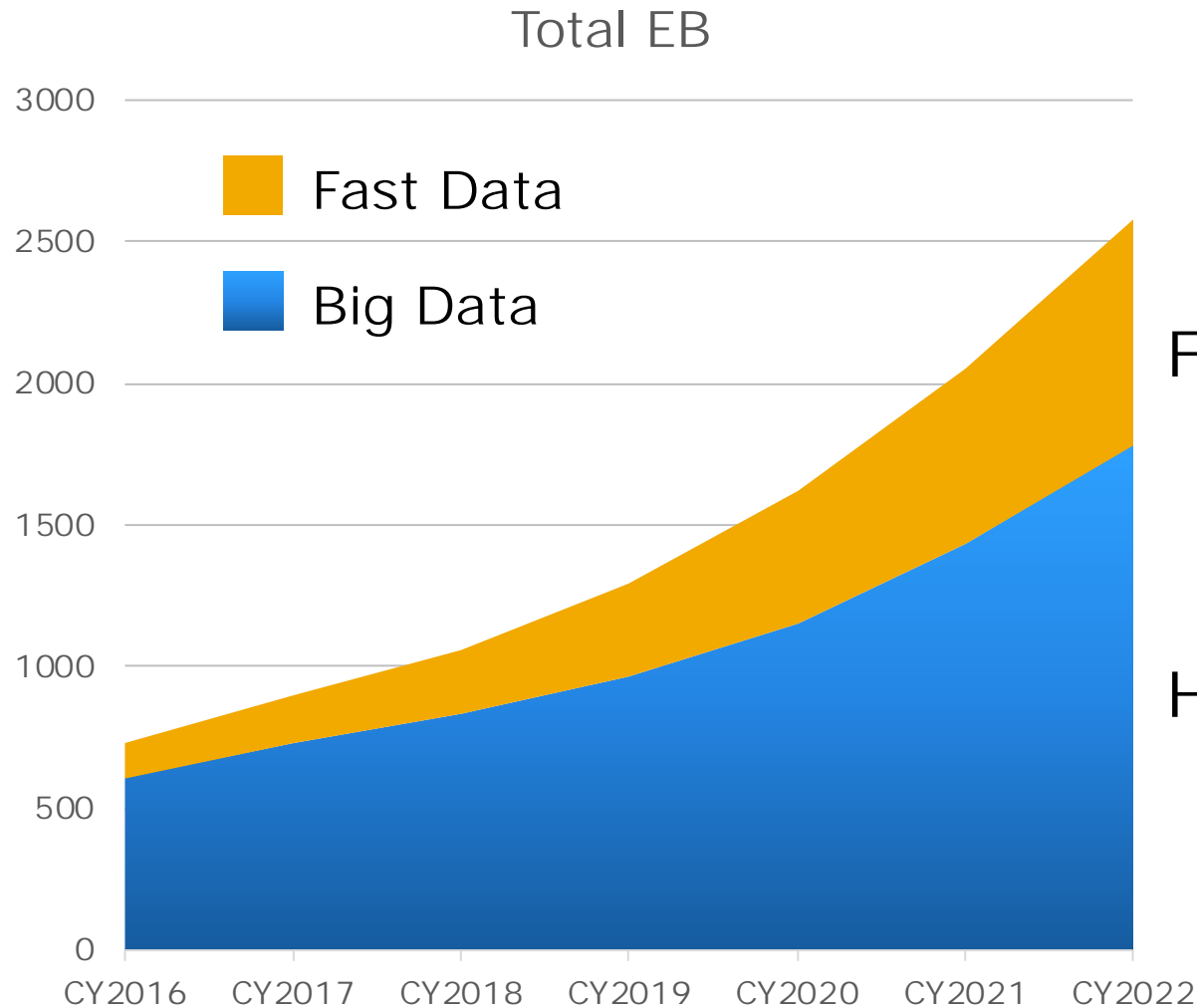
## Annual Takedown Trend

MAMR will enable continued \$/TB advantage over Flash SSDs



# Insatiable Growth in Data

HDDs continue to play an important role in the future of data storage



Flash

HDD

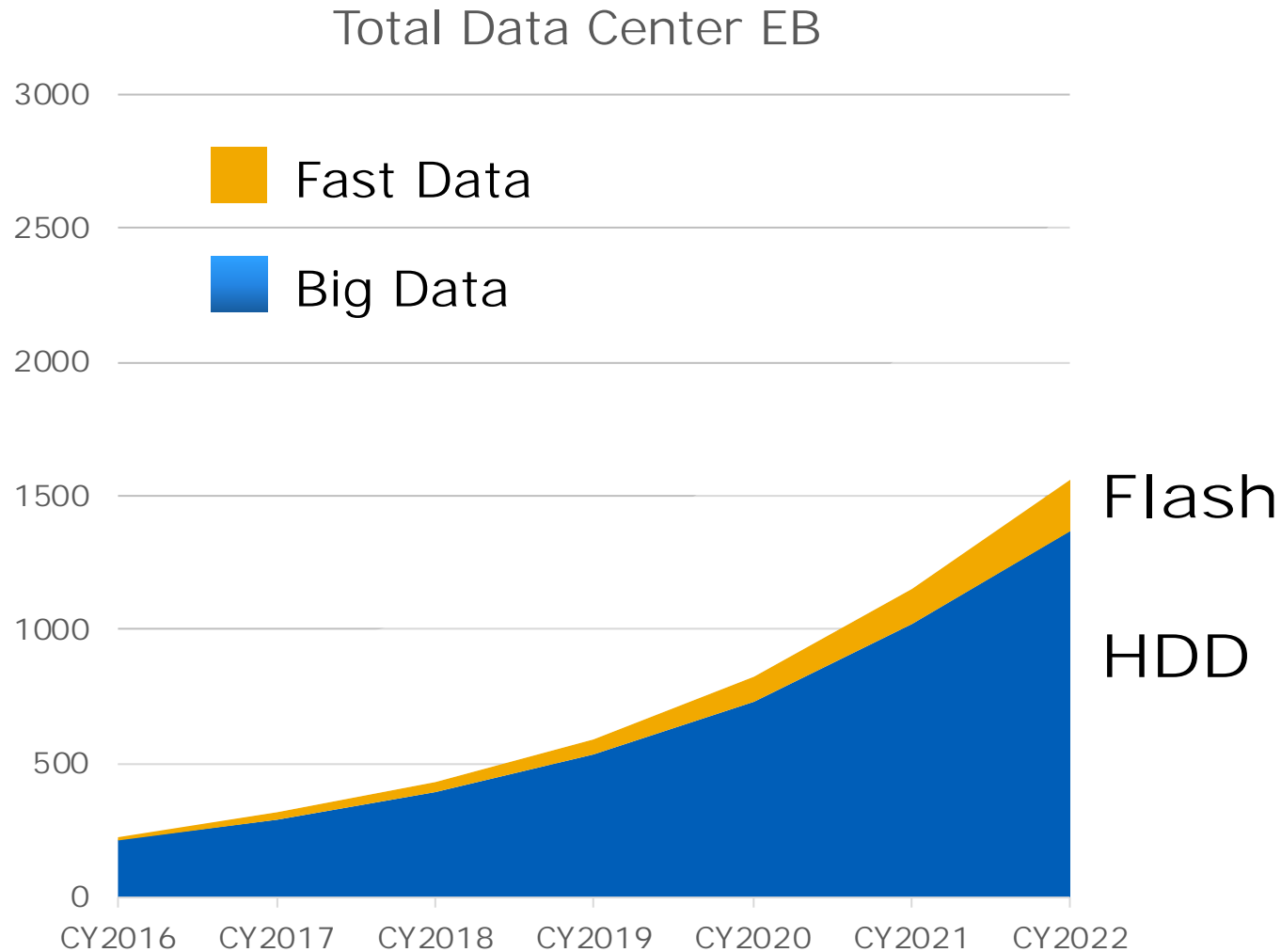
By 2022

~ 70%

of exabytes  
will still reside  
on HDDs

# Insatiable Growth in Data

*In the data center, HDDs continue to play an even bigger role*



By 2022

~ 90%

of data center exabytes will still reside on HDDs

# Western Digital®

## Platforms





# Platform Portfolio - Western Digital Ultrastar

JBOD

Ultrastar® Data60



Ultrastar Data102



JBOF

2U24 All-Flash



SAS/SATA HDD/SSD Server

Ultrastar Serv24-A



Ultrastar Serv24+6



Ultrastar Serv60+8



NVMe Flash Storage Servers

Ultrastar Serv24



Ultrastar Serv24-HA



Ultrastar Serv24-4N



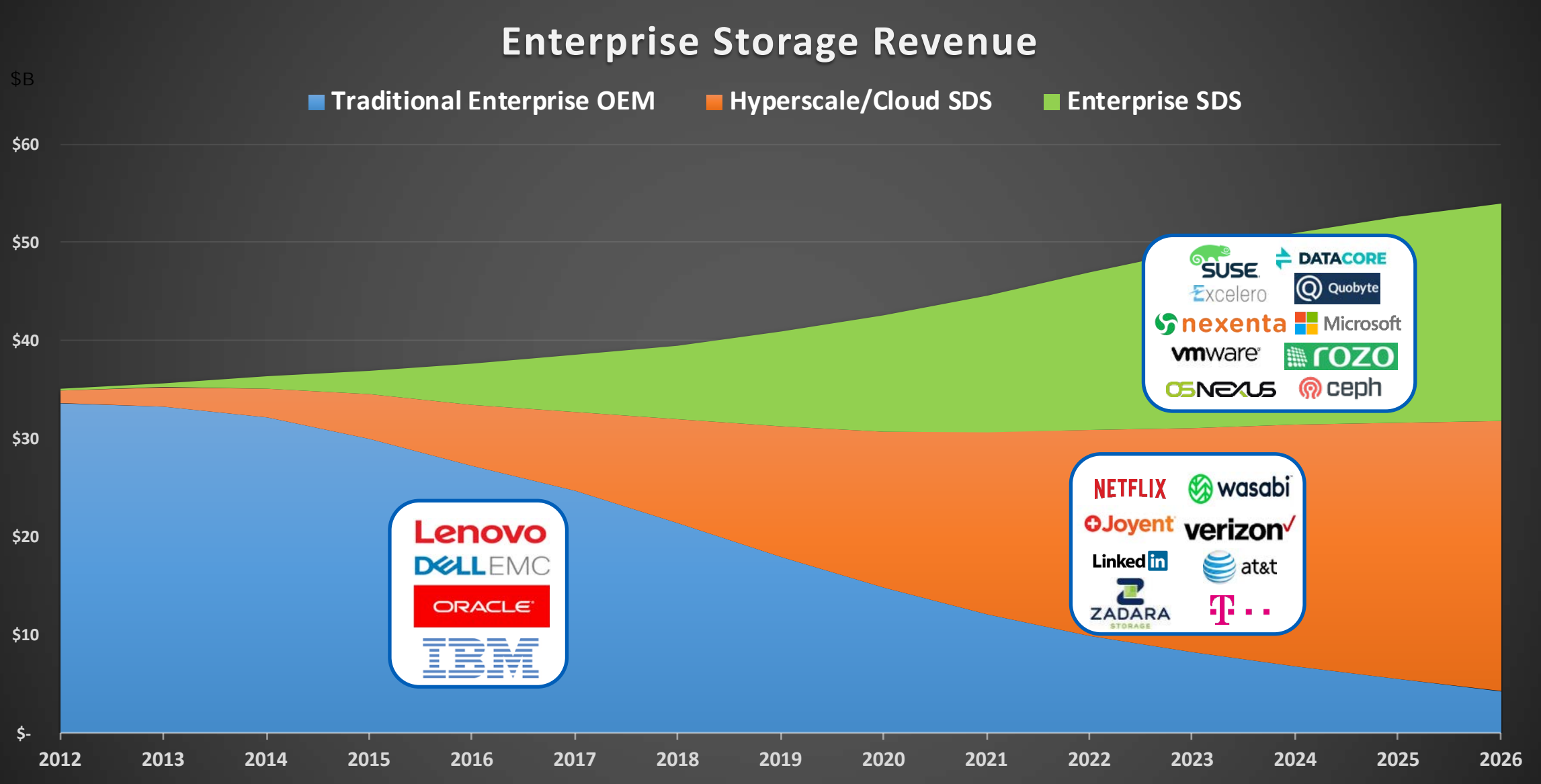
# The IT World is Changing

- The way IT managers are purchasing and building their infrastructure is changing rapidly. The days of general purpose mainframes for all computing tasks are slowly dwindling, and the days of “software-defined everything” are rising.

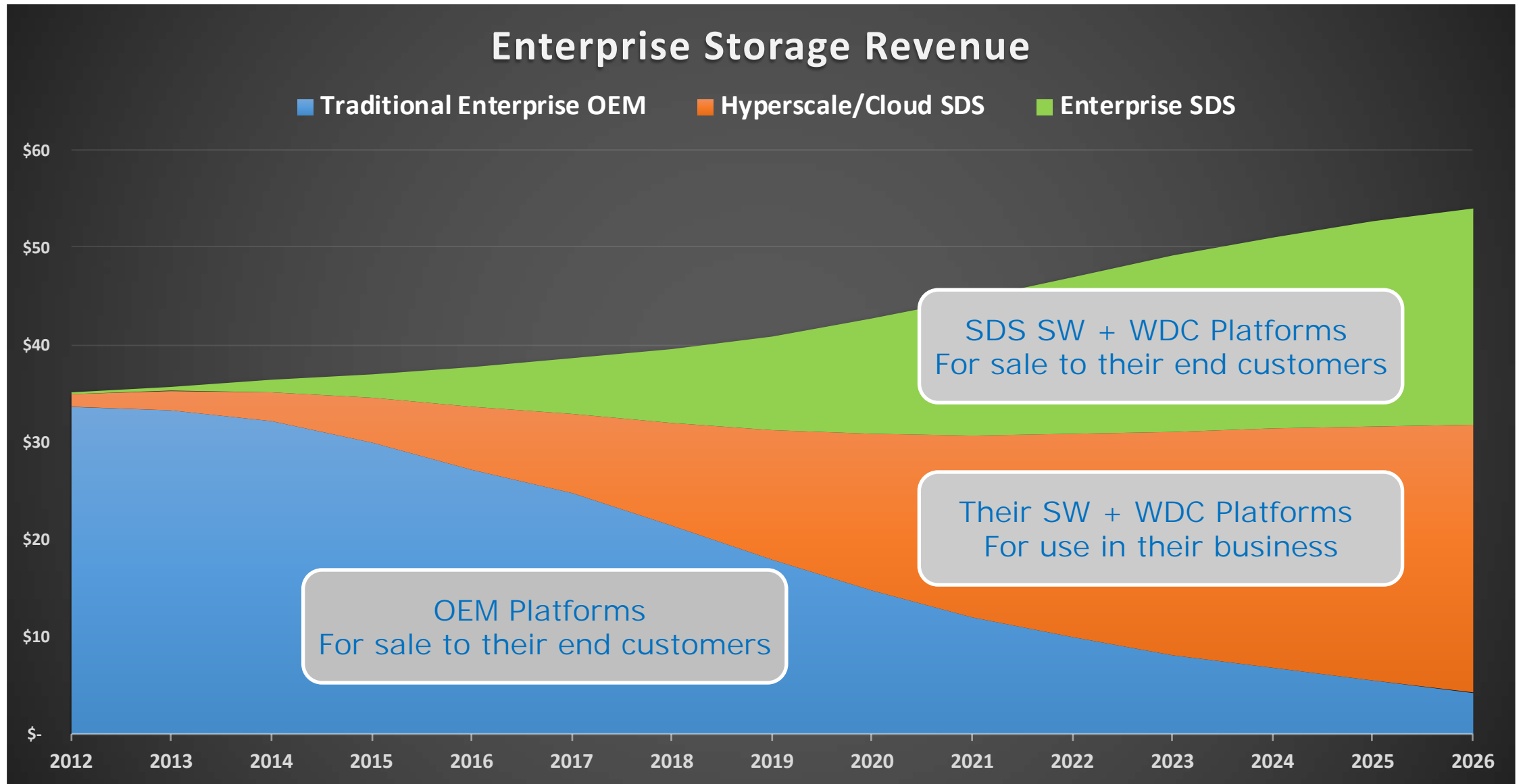


- They are buying off-the-shelf components or systems and install them together with the management software of their choice. This enables purchasing flexibility, reduces cost, and dependence on a single HW vendor.

# Shifting Enterprise Storage Market

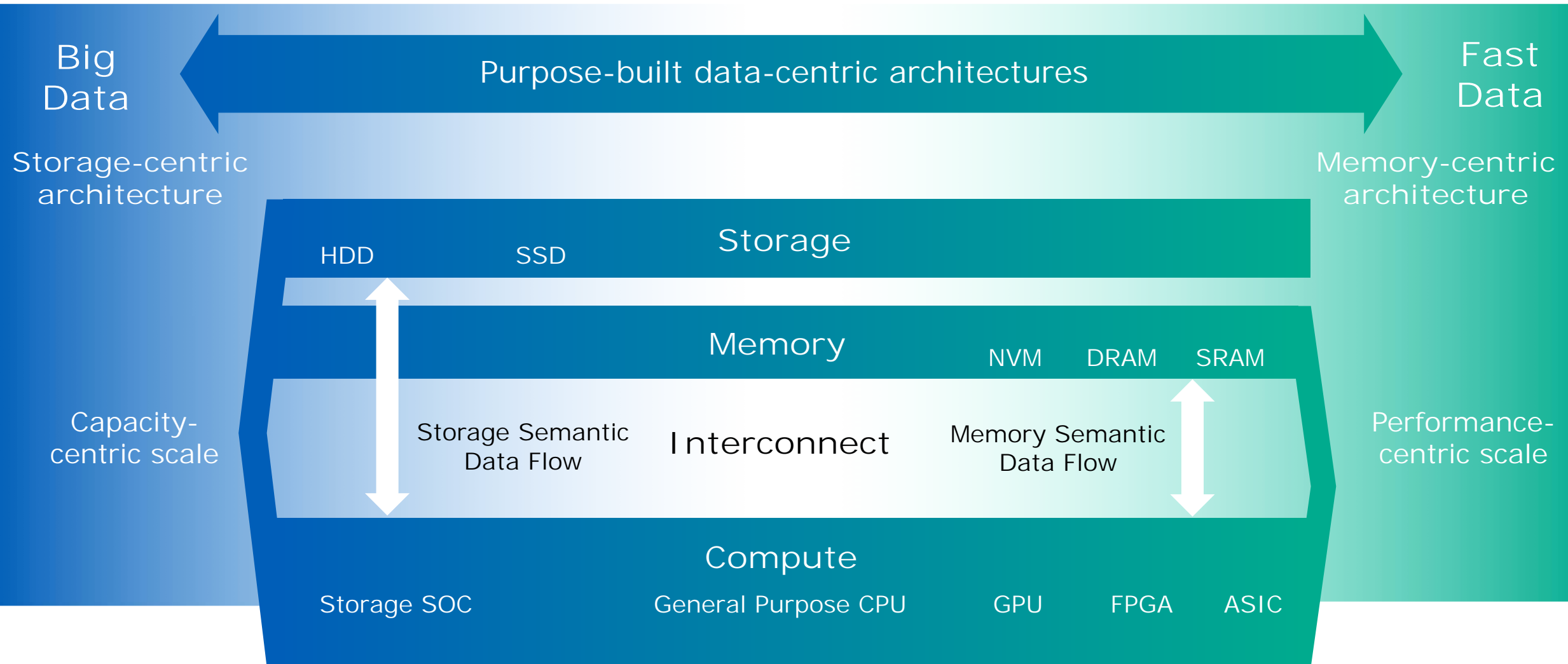


# Shifting Enterprise Storage Market

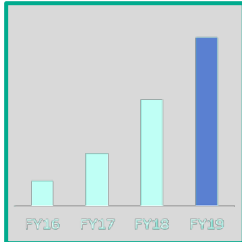


Source: Wikibon, Hyperscale and Hyperconverged Server SAN Project 2017

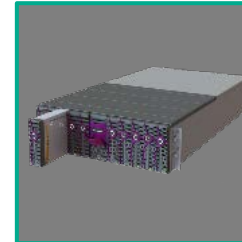
# Workload Diversity Demands Diverse Technologies and Architectures



# Data Center Systems Business Unit



17x Revenue Growth  
Q1FY16 to Q1FY19

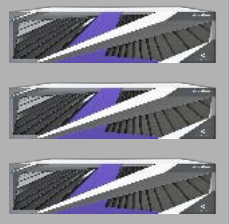


3000+ Total Customers

8500+ Systems and Platforms Deployed



3+ Exabytes Shipped in 2018



Adding 150+ New Customers Every Quarter



400+ R&D Engineers

# Why Platforms from Western Digital?



- Rich Experience  
60+ years of designing storage
- Vertical integration
- Patents in our Platforms  
Built on patents in our Devices
- Fastest Time to Market

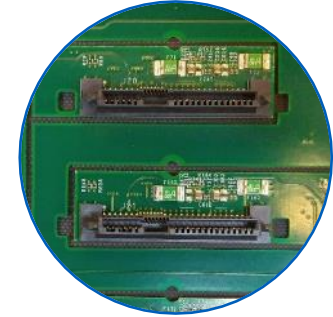


## Quality, Reliability & Energy Efficiency

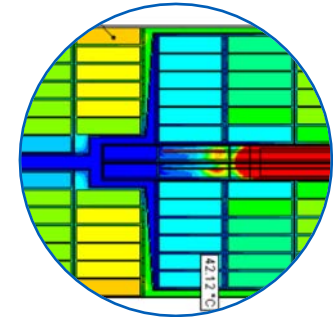
- First in the industry to offer a 5-yr warranty on HDDs
- First in the industry to offer a 5-yr warranty on storage and server platforms

# Ultrastar® Data Family – Patented Innovations

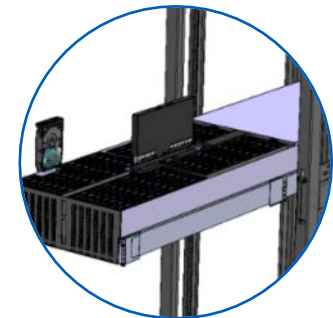
- IsoVibe™ Patented Vibration Isolation Technology



- ArcticFlow™ patented thermal zone cooling technology

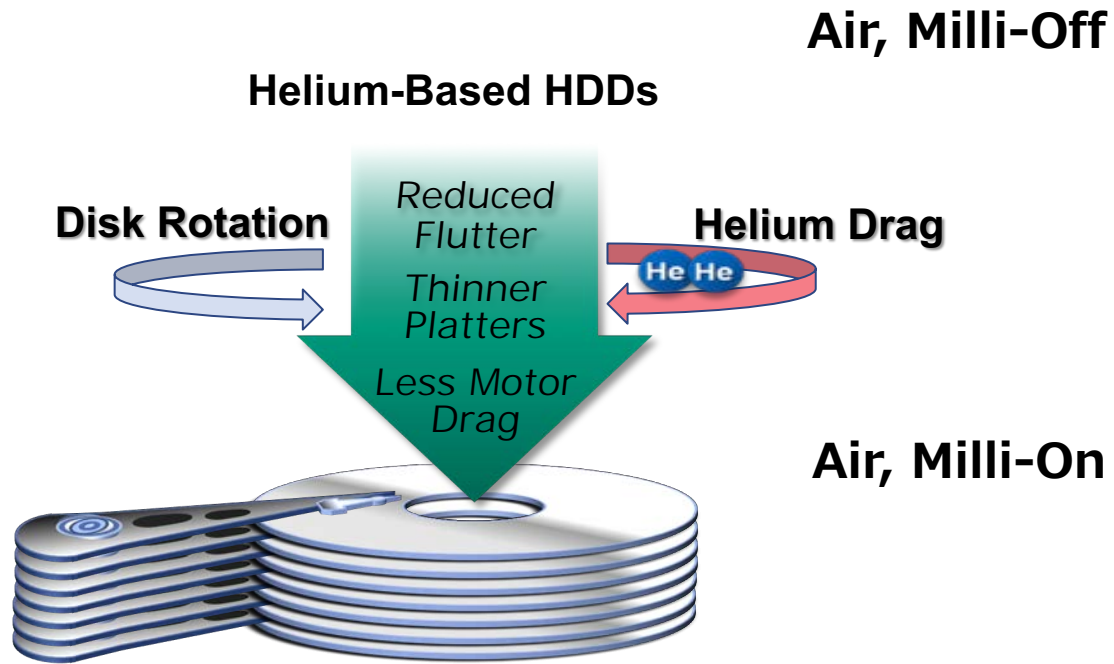


- Serviceability – maximizing “cold aisle” access

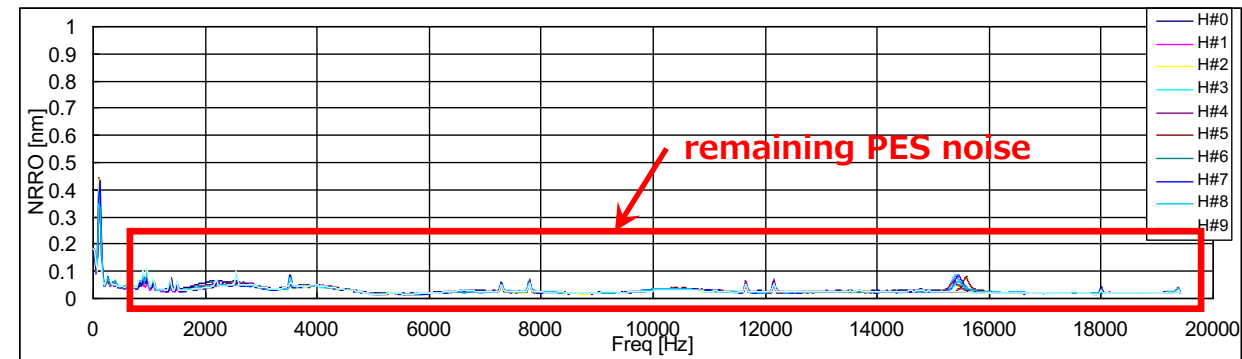
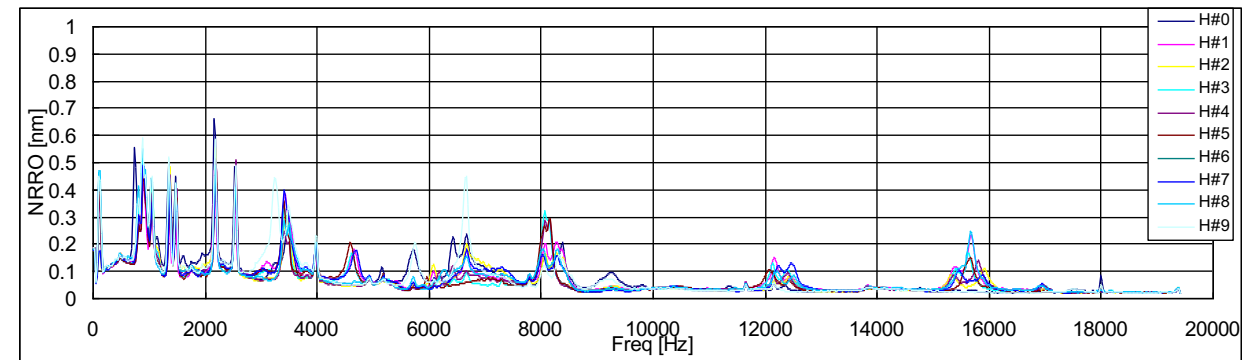
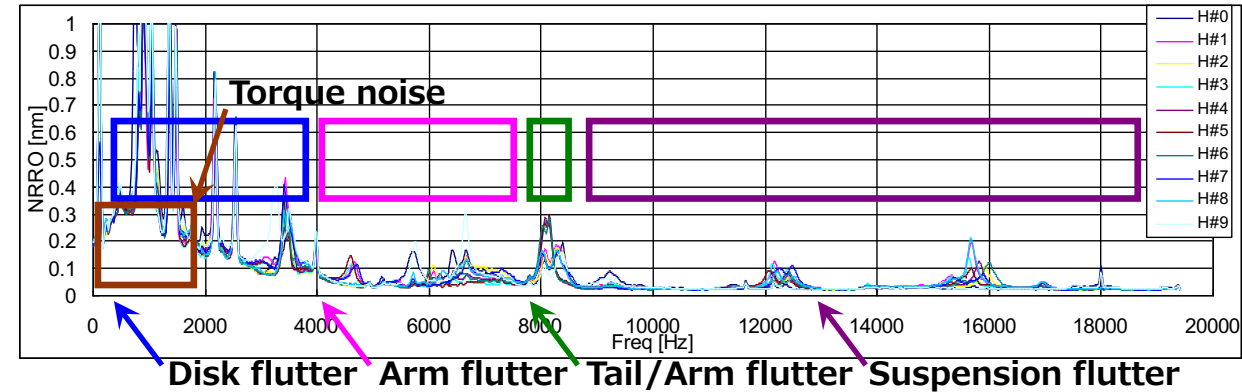




# We've got Helium and Helium comes with less vibration



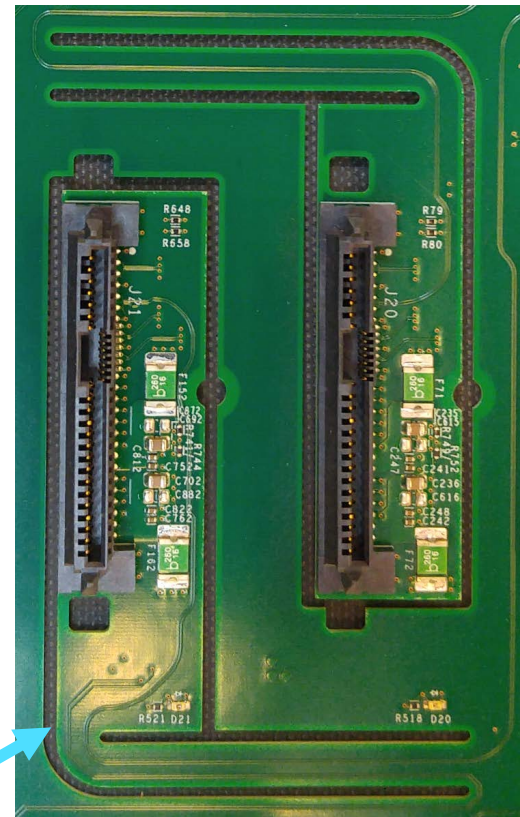
**Helium, Milli-On**



# Patented Innovation - IsoVibe™

*We understand how our drives vibrate better than any other platform supplier!*

- ✓ Precise cuts in the baseboard provide “suspension” for the HDDs
- ✓ Reduces the vibration transmitted from one drive to another
- ✓ Performance is maintained across the platform, even when all the drives are working hard



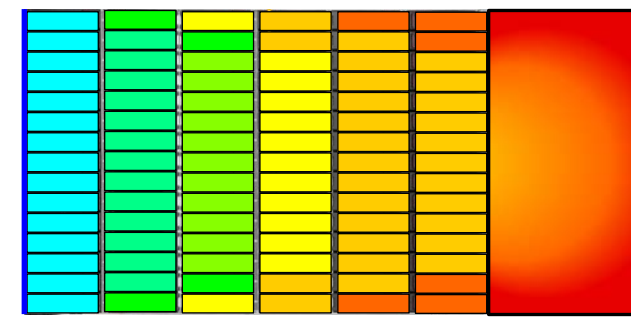
Drive Suspension Cuts

IsoVibe™

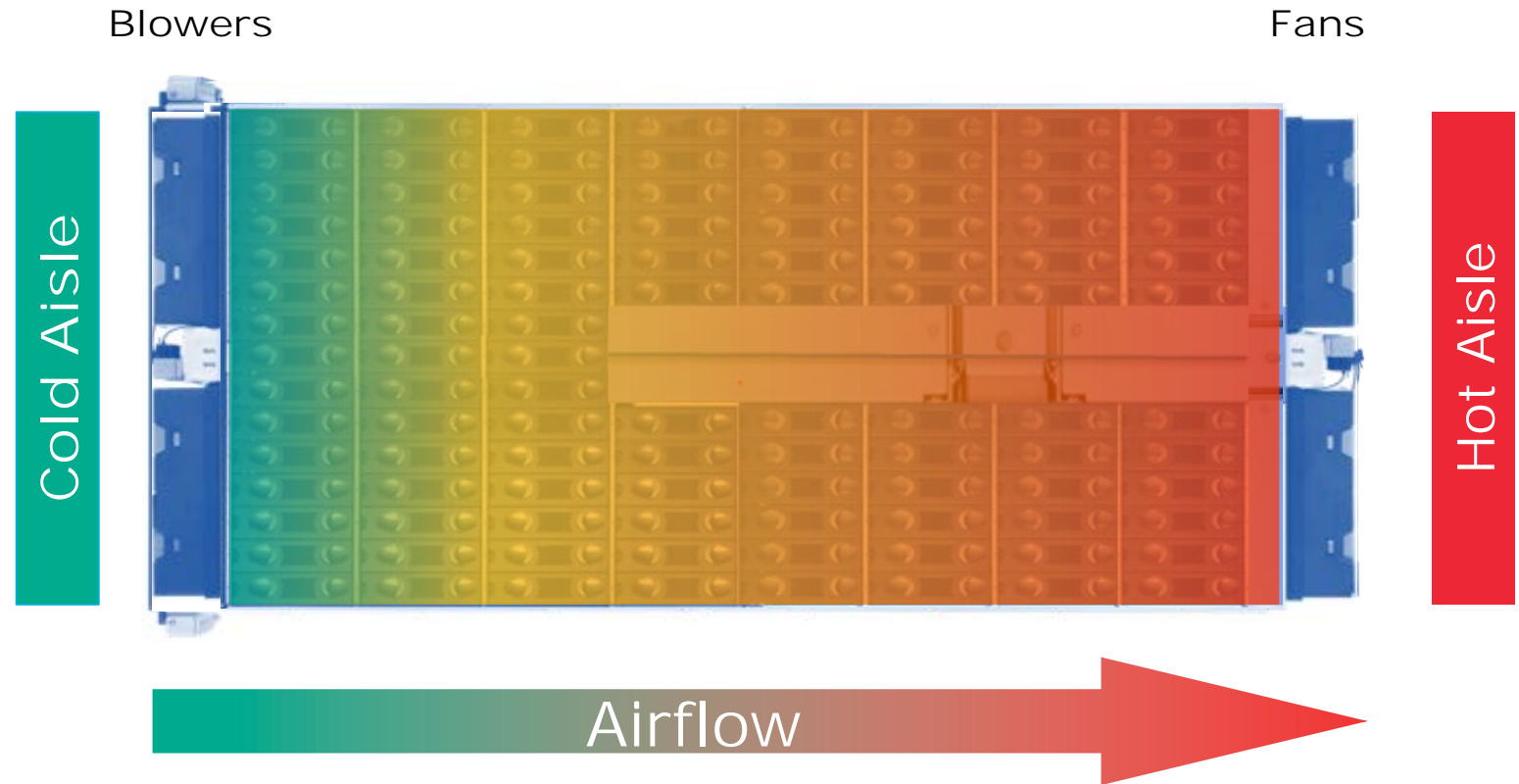
- Less Vibration Crosstalk
- Stable Performance

# The Problem with Dense HDD Shelves

*Air is heated by successive rows of drives*

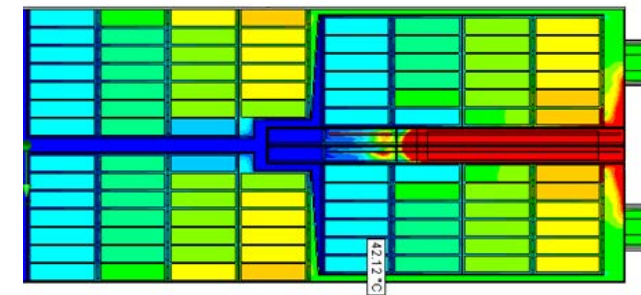


- ✓ Higher power required
- ✓ Higher energy cost
- ✓ Higher noise levels
- ✓ Higher vibration
  - ... leading to performance degradation
- ✓ Higher temperatures
  - ... likely affecting reliability and data retention



# Patented Innovation - ArcticFlow™

Dividing the enclosure into 2 thermal zones for HDDs

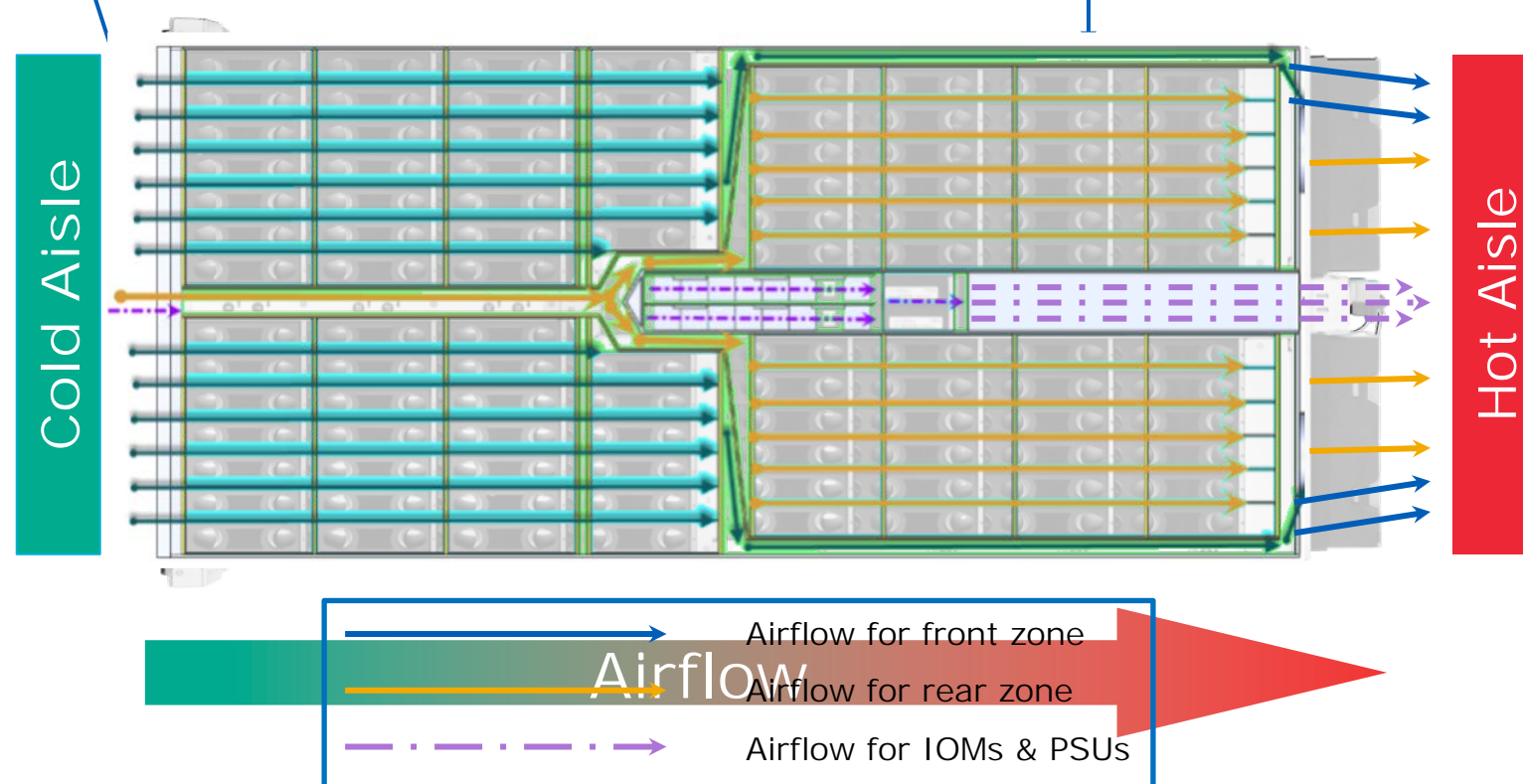


Air warmed by the front four rows is directed around the chassis sides

- ✓ Patented airflow management
- ✓ Warmed air from the front zone is ducted away from the rear drives
- ✓ Cool air is drawn into the center of the enclosure for the rear zone

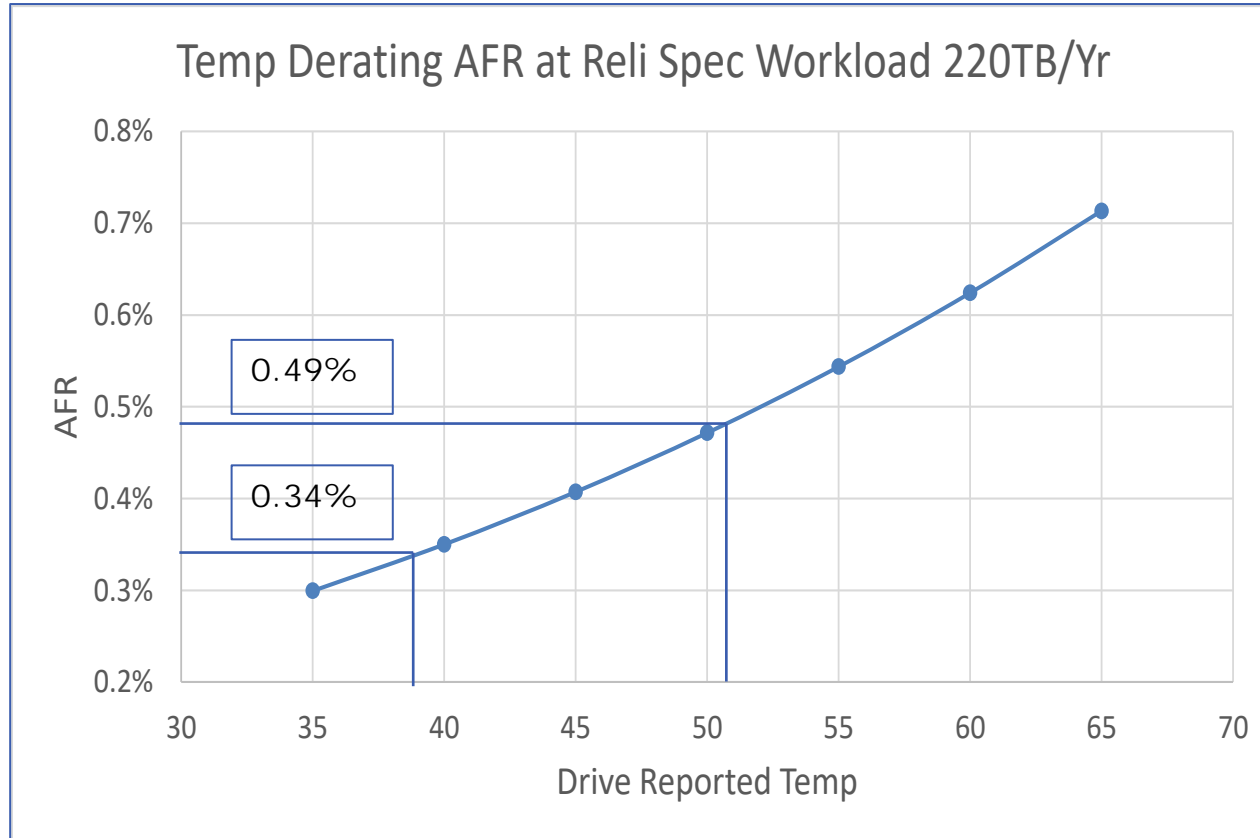
Cold air tunnel in center of chassis provides cool air for rear drives  
Front Zone

Rear Zone



# ArcticFlow™ Reliability Difference Calculation

- HDD AFR Follows Arrhenius Model on Temperature



Calculation:

- 70% of the drives run at comparable temperatures
- 30% of the drives in the competitive boxes run an average of 13°C hotter
- Using the temperature derating chart, AFR is increased from 0.34% to 0.49%
- 30% of the drives in the competitive box will have a 44% higher likelihood of failure

Conclusion:

- On average, systems without ArcticFlow are likely to have 13% more drive failures over time caused by operating at elevated temperatures

# ArcticFlow™ Power Savings Calculation

## ArcticFlow Energy Savings

### Per Slot Power & Cooling Only

Competitors average power		3.26 W per HDD Slot	
Ultrastar Data102 power		1.64 W per HDD Slot	
Per slot power savings		1.62 W per HDD Slot	
Number of drives		102 HDDs	
Power saving per enclosure		165.24 W per enclosure	
Power savings per year		1448 kWh per year	
Cost /kWh	\$	0.12 \$/kWh	Varies by state and by country
Cost saving/enclosure	\$	173.70 per year	
PUE		1.8	Ranges from 2.2 (typical) to 1.2 (most efficient)
Total data center savings	\$	312.66 Per year	
Typical lifecycle		5 Years	
<b>Life savings per enclosure</b>	<b>\$</b>	<b>1,563.30 Over 5-year lifecycle</b>	

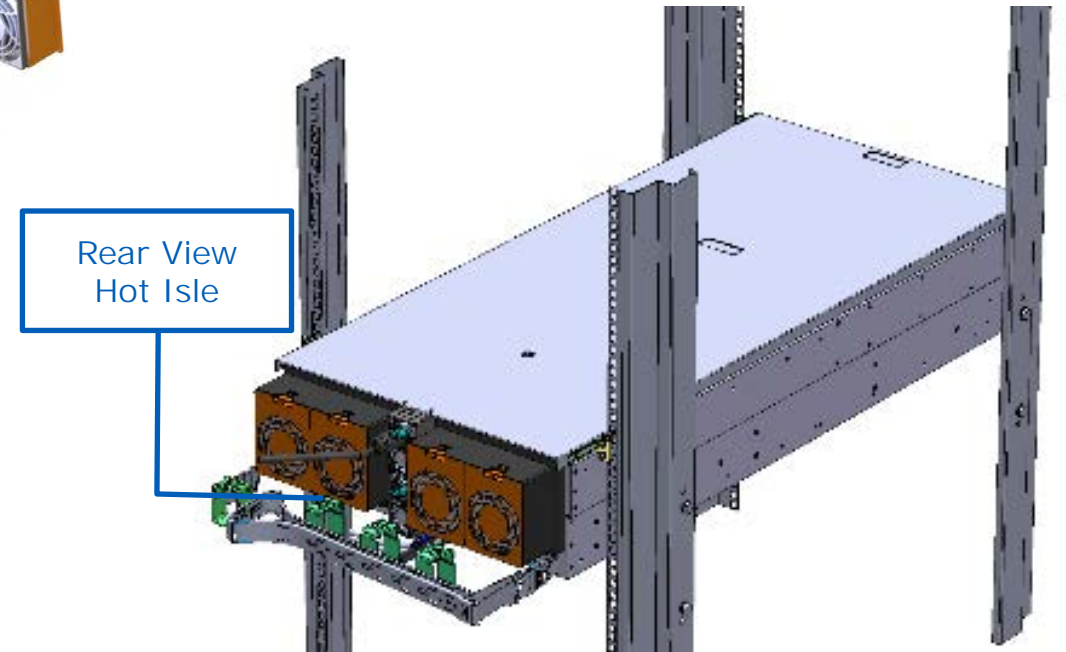
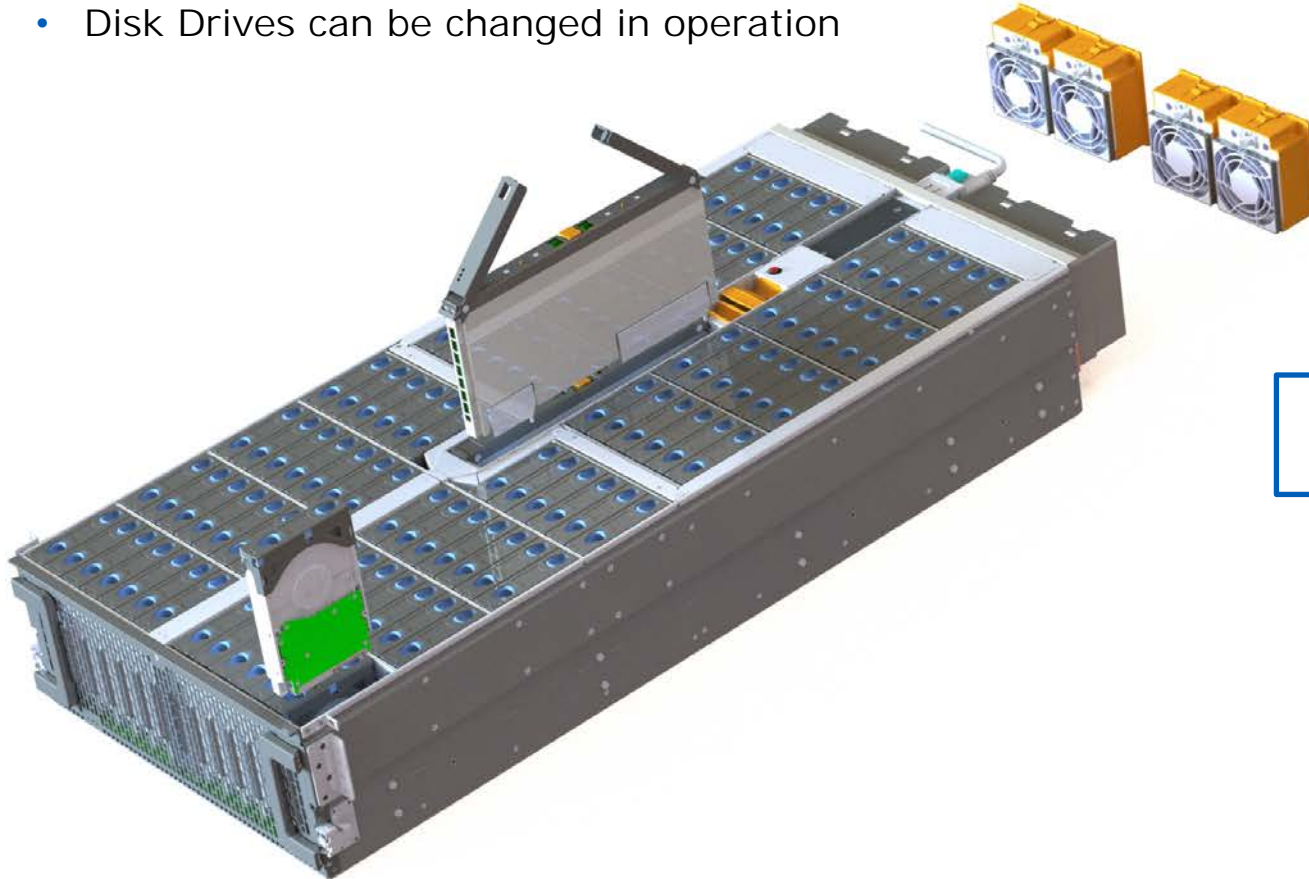
# Rack Mounting & Serviceability

## Cold Aisle Service

- Industry-leading, cable-free
- Hot-swap IOM & Fans
  - Blowers can be changed individually
- Easy-swap, high-availability HDDs & SSDs
  - Disk Drives can be changed in operation

## Hot Aisle Service

- PSUs
- CMA pivots away for easy access
- Cables fixed to rack and held by CMA
- Vibration Isolated Fans



# Rack Mounting & Serviceability

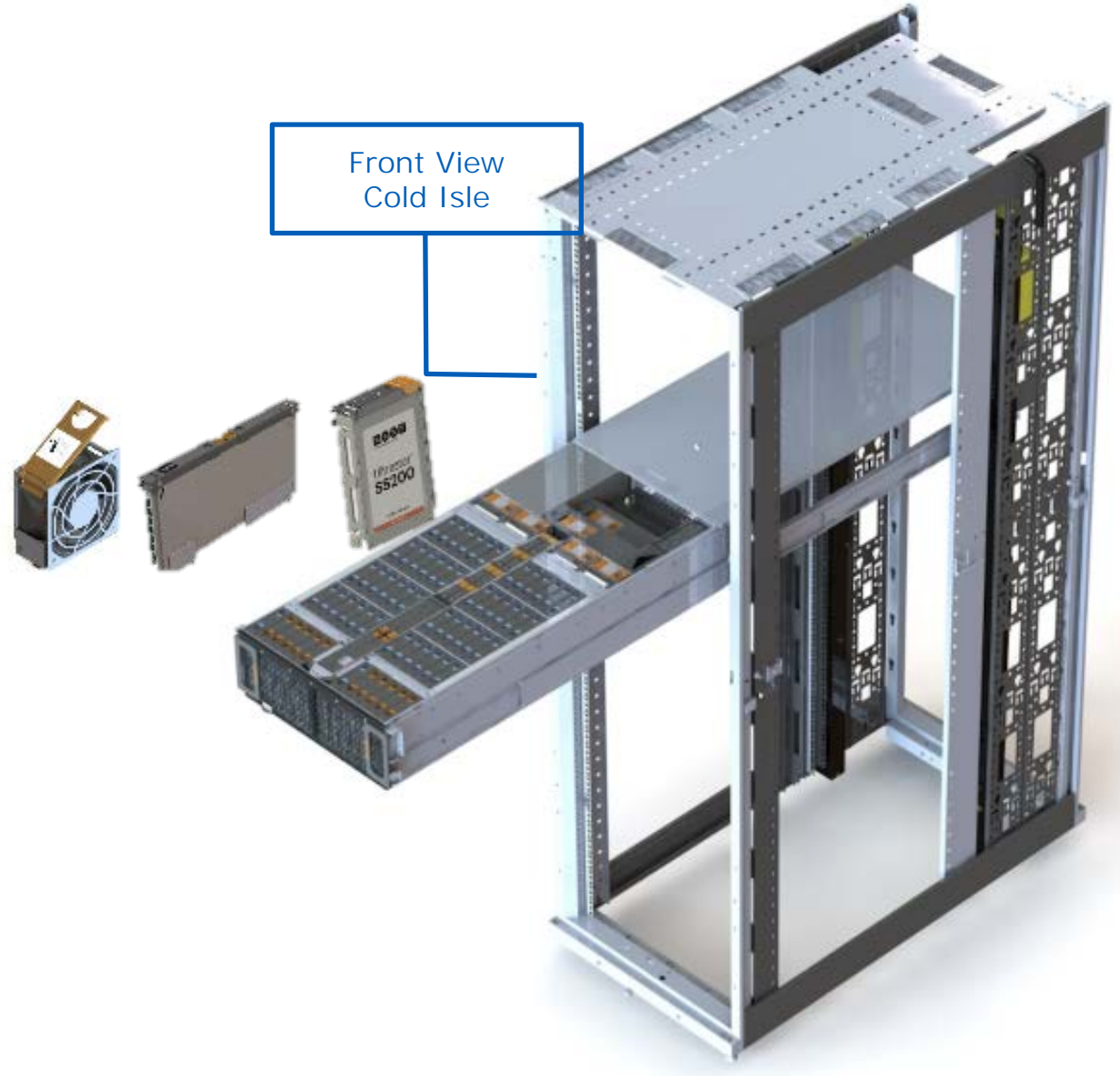
## Lid remains in rack

- Ease of use, prevents loss/damage

## Easy operation

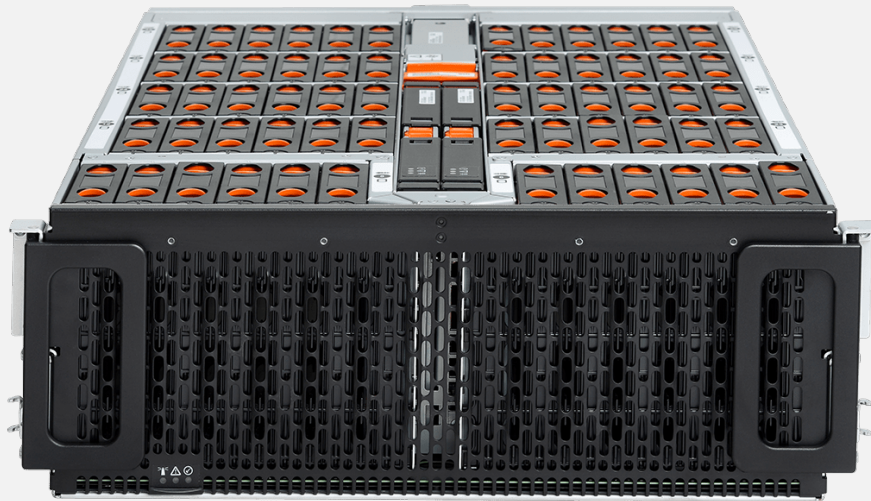
- No tools required at all

## Data60/102 FRUs





Ultrastar Data60  
Designed for Extreme Density



IsoVibe™

ArcticFlow™

# 60-Bay

Hybrid Storage Platform with up  
to 24 SSDs

HDD up to 14 TB  
SAS or SATA

SSD up to 15.36 TB

2x 6x 4x-12Gb/s  
SAS3 Host Ports

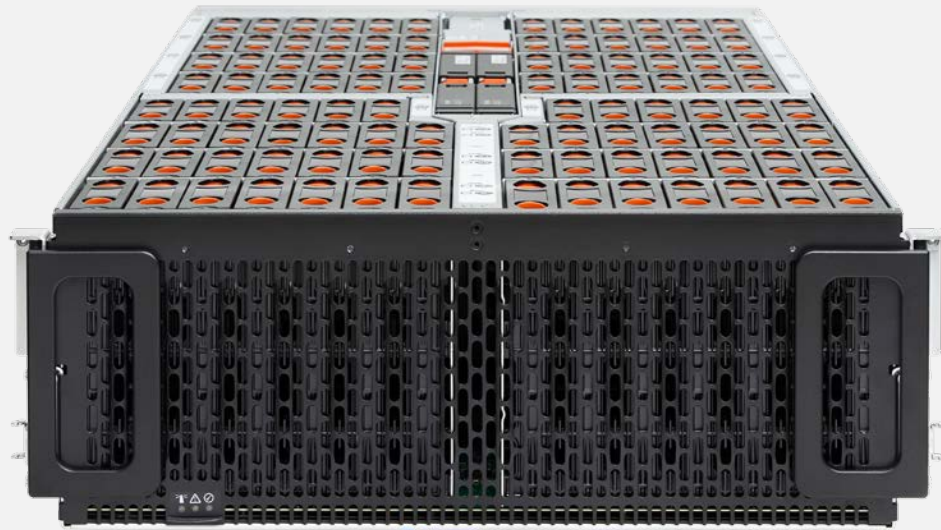
Available Capacities

57.6 GB/s Bandwidth

# 96TB - 840TB

Capacity

Ultrastar Data102  
Designed for Extreme Density



IsoVibe™

ArcticFlow™

# 102 – Bay

Hybrid Storage Platform with up  
to 24 SSDs

Dual-Port SAS or  
Single-Port SATA  
HDDs

2x 6x 4x-12Gb/s  
SAS3 Host Ports

Options

57.6 GB/s Bandwidth

360TB – 1.428PB

Capacity

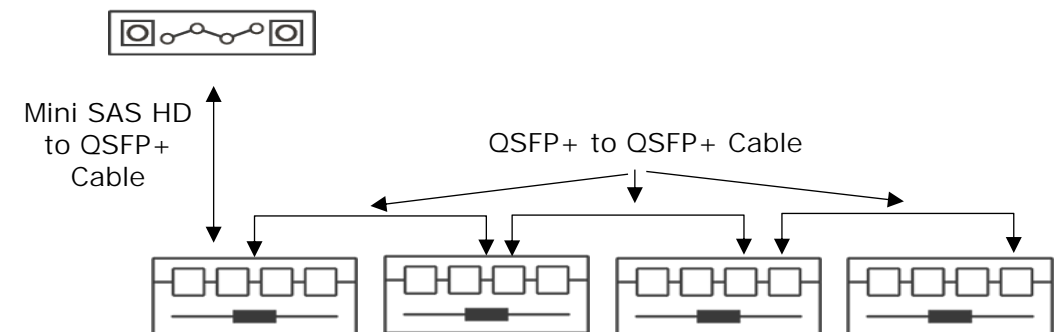
# High Availability Hybrid Platform

- 60/102 dual ported HDDs and SSDs (max. 24#) individually hot swappable
- 12Gb/s SAS-3 or 6Gb/s SATA-3 drives supported
  - 512n/4Kn/512e, SE/ISE/TCG
- 6# 4-lane powered and managed mini-SAS HD ports per IO Module (2 IOM)
- Hot swap of all FRUs including individual drives
- Dual redundant 80+ Platinum rated 1600W CRPS PSUs

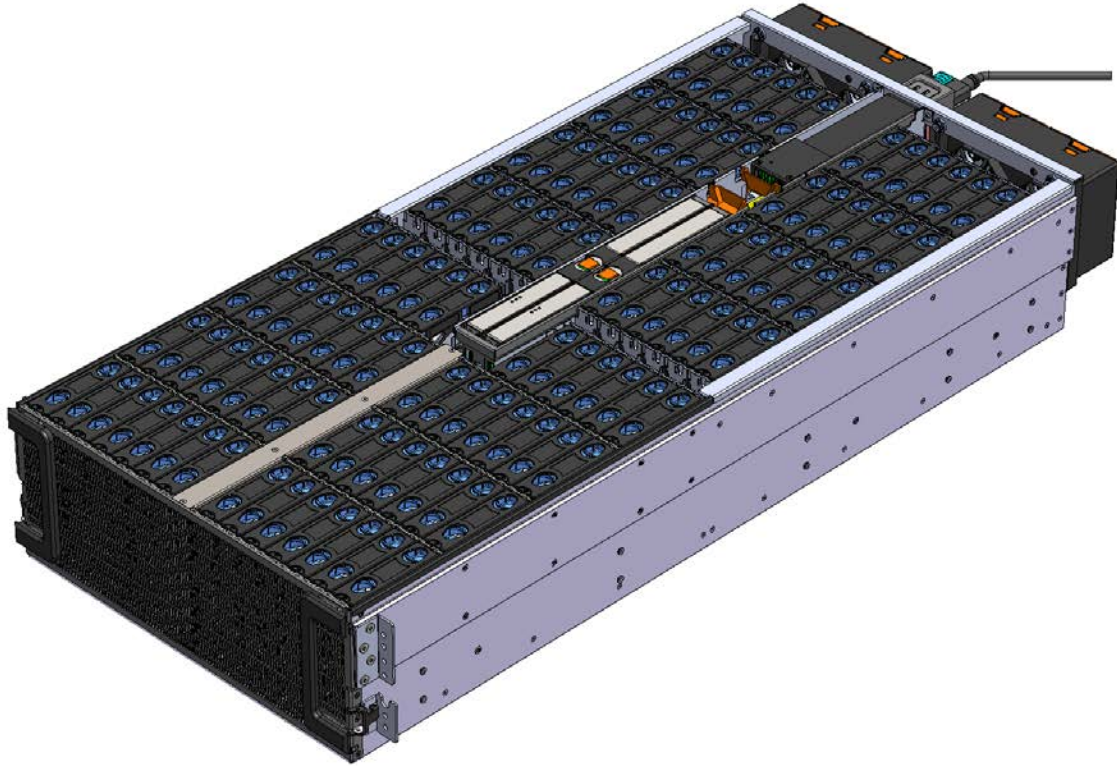


# Storage Enclosure special features

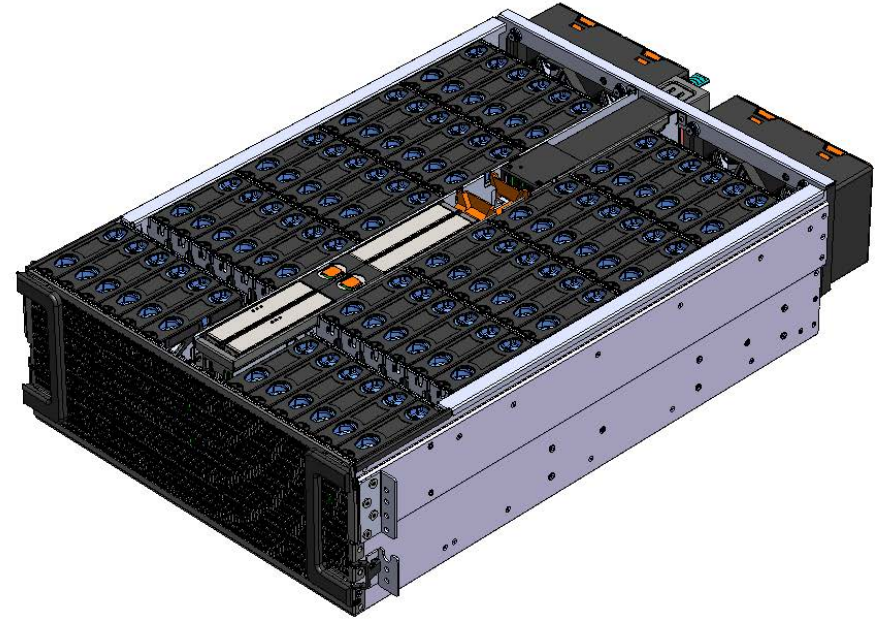
- In-band and Out Of Band enclosure management
  - Out Of Band management via Redfish
  - In-band via SES-3
- Firmware upgrade
- T10 Zoning
  - with up to 6 servers
  - Drive power off using T10 Power Disable (Pin 3)
- Daisy Chain Expansion



# Ultrastar Data60 & Data102



Data102  
System Length 1037 mm  
(1160 w/CMA)  
System Weight w/o railkit  
- ~ 32 kg w/o drives  
- ~ 109 kg w/ drives



Data60  
System Length 705 mm  
(850 mm w/CMA)  
System Weight w/o railkit  
- ~ 27 kg w/o drives  
- ~ 79 kg w/ drives

# Software Defined Storage for General IT Purposes

Customer Freedom to define and build their Storage

```
0 2 4 6 8 A C E
000: F3C6D63DB7EA5923 F3ABF9E11F328518
020: DD95C56179196FFB 21FE6A4E978F212C
040: A9FC2867D6867A32 7324A2A78C84A5C8
060: E065C8F6D7AAC3EF 7285699307895916
080: 09376EB782DB925B A48987BA0EF5843B
0A0: ACDAE051E1322F9E 9399C3C5ACE37062
0C0: 5286E76DFC97E1DF C718E65CE63863B1
0E0: 82334AB3D9F3F146 C7798826C6DDA650
100: C489D3CA822CA7FC 181901CC53BA8168
120: A0804858FF2C4829 486589F595873821
140: 9F80720D56D925F4 DFC3184A95BD1EA2
160: 48911989911D7D86 609D75735A827014
180: 2348057788DF9A07 565A6917EC807A9E
1A0: B917FD7DD107C59E 4762BCDE54008469
1C0: 9158CA46E67C4673 BD1D36729943D69D
1E0: 34803478FE2865AF 3FF39E78C308B761
```

Choice of  
Storage  
Software



Choice of  
Storage  
Hardware

**Western Digital.**

and others



Western Digital.



# Software Defined Solutions

Customer Freedom to define and build their Solution

```
0 2 4 6 8 A C E
000: F3C6D63DB7EA5923 F3ABF9E11F328518
020: DD95C56179196FFB 21FE6A4E978F212C
040: A9FC2867D6867A32 7324A2A78C84A5C8
060: E065C8F6D7AAC3EF 7285699307895916
080: 09376EB782DB925B A48987BA0EF5843B
0A0: ACDAE051E1322F9E 9399C3C5ACE37062
0C0: 5286E76DFC97E1DF C718E65CE63863B1
0E0: 82334AB3D9F3F146 C7798826C6DDA650
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120: A0804858FF2C4829 4B6589F595873821
140: 9F80720D56D925F4 DFC3184A95BD1EA2
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180: 2348057788DF9A07 565A6917EC807A9E
1A0: B917FD7DD107C59E 47628CDE54008469
1C0: 9158CA46E67C4673 BD1D36729943D69D
1E0: 34803478FE2865AF 3FF39E78C308B761
```

Choice of Application Software



Choice of Storage Hardware

Western Digital®

and others

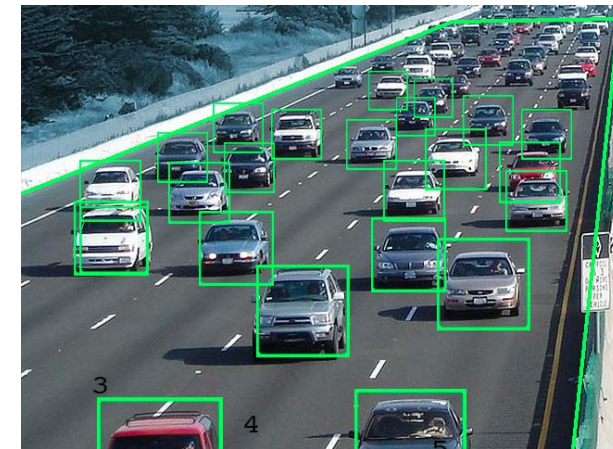
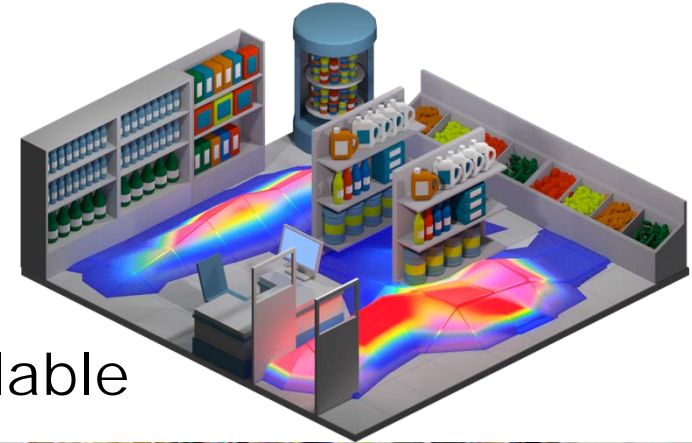


Western Digital.

# Surveillance

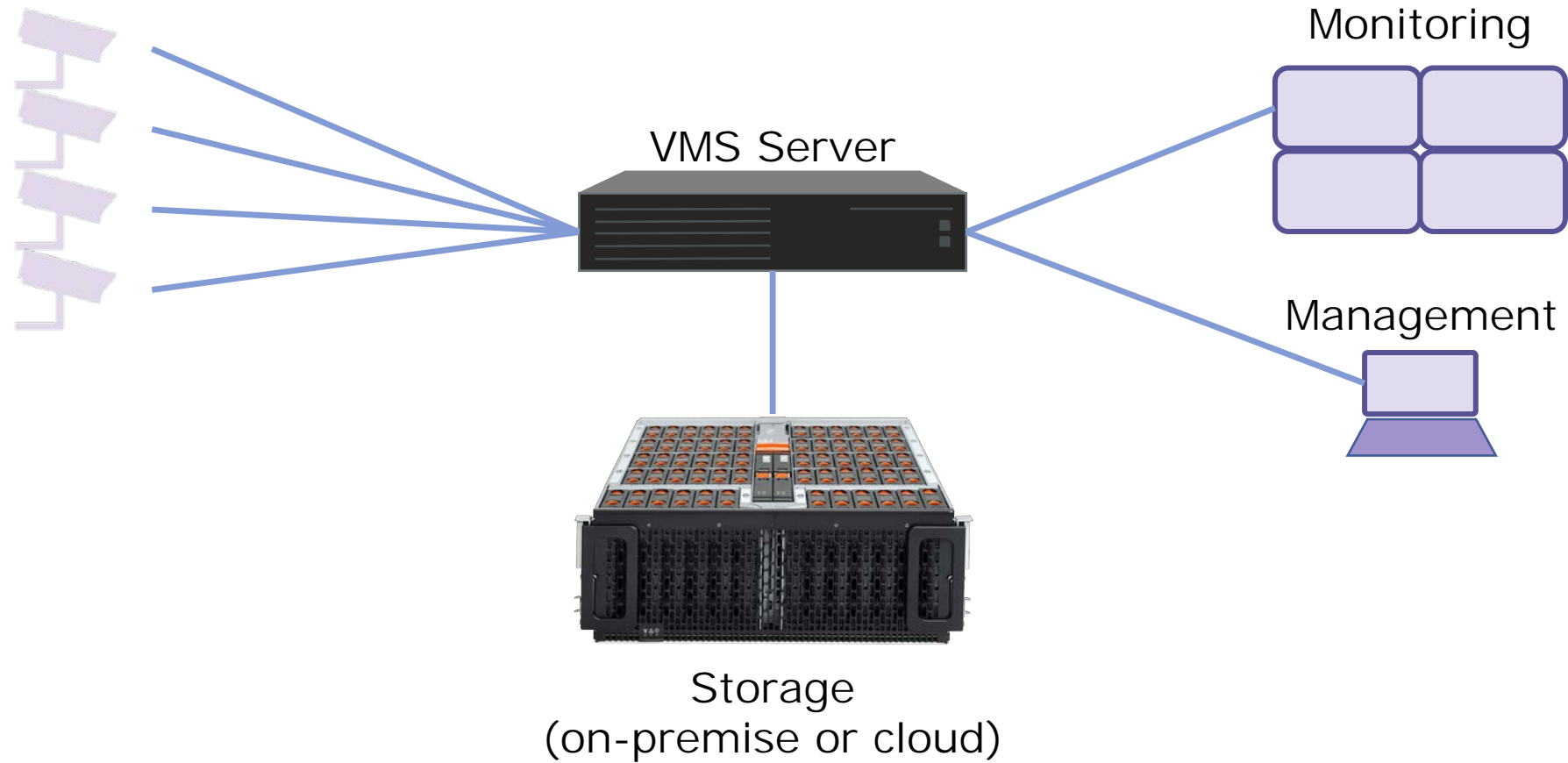
*Recording with real time analysis*

- Application demands the most robust storage available
- High workload
  - Heavy reads & writes
  - Random reads, sequential writes
- Very high storage demand
  - High capacity and high performance
  - Metadata & reference images ideal for flash tier
  - Multiple HDDs induce high vibration
- Durability & long term availability
  - Data center server environment
  - Expect highly reliable operation
  - High availability and redundancy





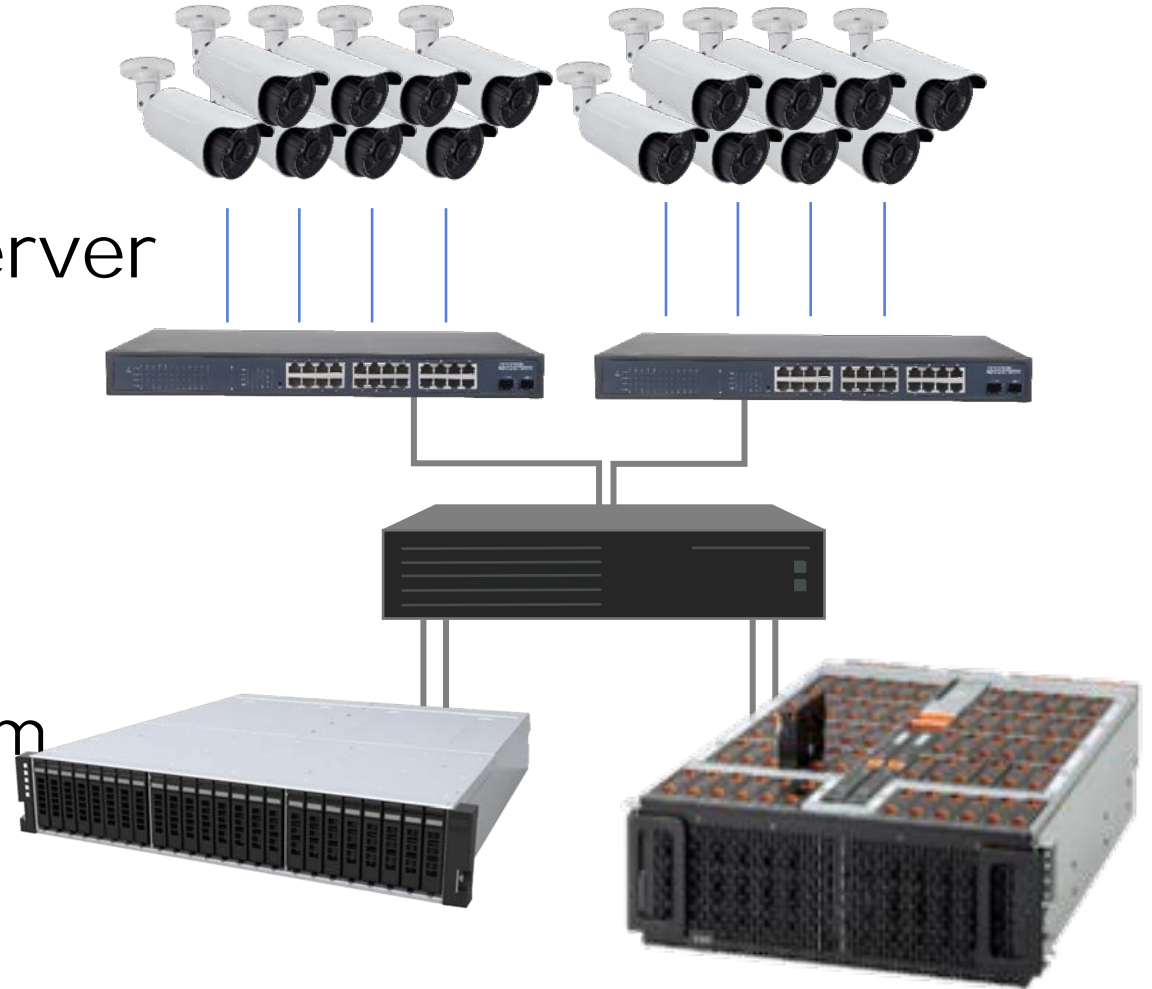
# Typical Video Management System (VMS)



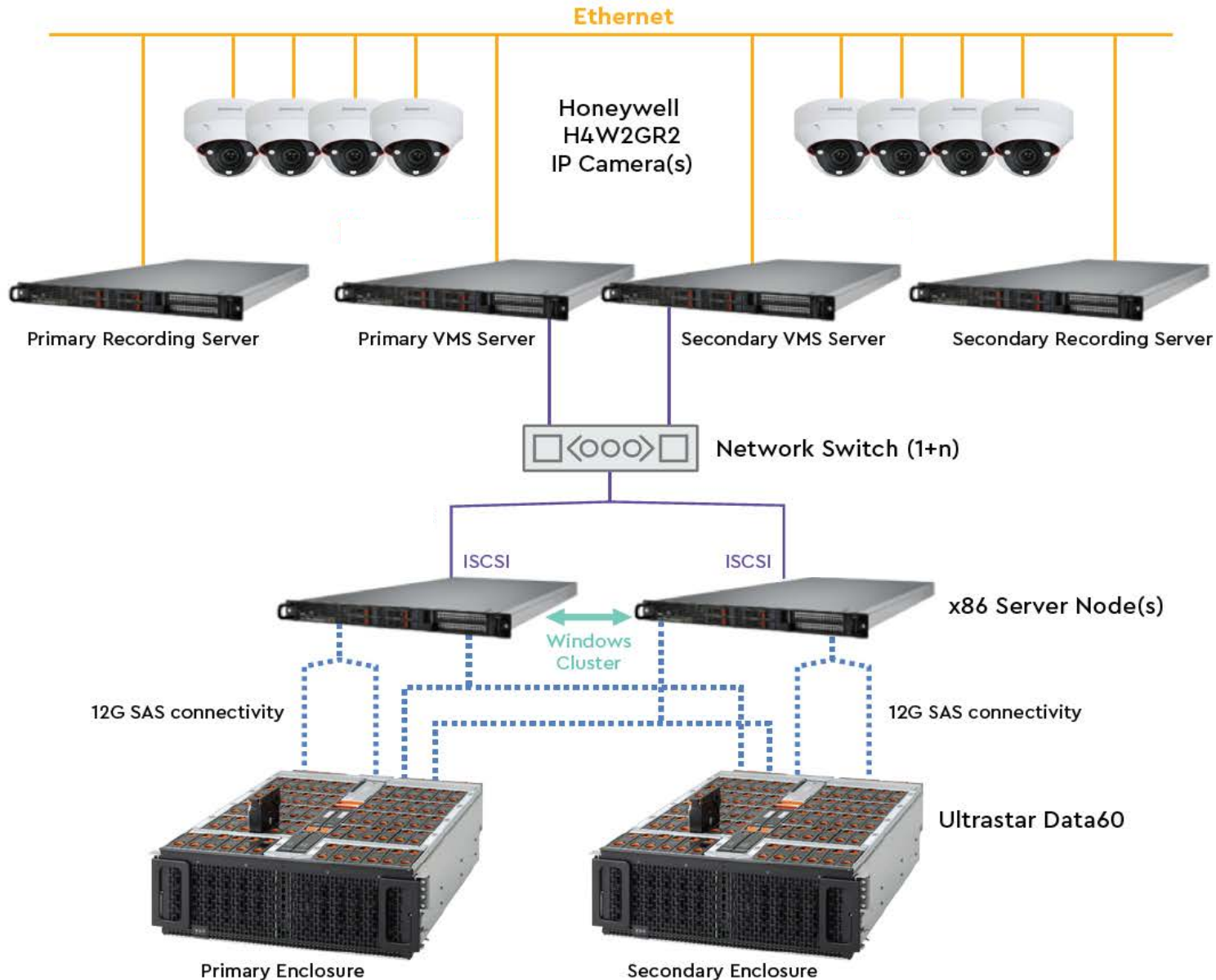
# Surveillance Solution

Ultrastar® Data60/102, 2U24

- Run Surveillance VMS on X86 server
- Attach JBOD and or JBOF
  - Ultrastar Data60/102 (up to 1.4PB)
  - Ultrastar 2U24 flash storage platform (up to 368TB)
- SSD, hybrid or HDD storage
  - Balance capacity / performance / cost



# High-Availability VMS Reference Architecture



**Cameras:** Up to 512 Honeywell H4W2GR2 IP cameras (for 4-month video data storage)  
**Servers:** standard x86 servers  
**Storage:** Ultrastar® Data60 Storage Platform  
**Software:** Honeywell MAXPRO® VMS

- VMS server(s) manage all cameras
- Recording of each camera is stored in both primary and secondary Ultrastar Data60 enclosure
- Virtual Disks from primary Data60 are used by the primary VMS server
- Virtual Disks from secondary Data60 are used by the secondary VMS server

# Winning with Ultrastar® Storage Platforms

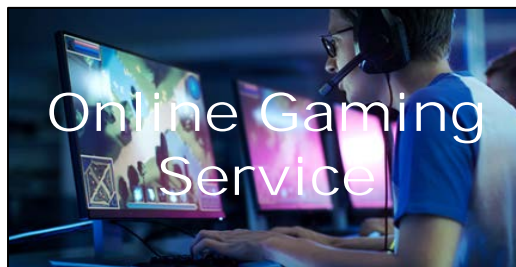


## Multi-PB eCommerce Website

- 100M+ online transactions per day
- Doubled annual ecommerce sales with no service interruption

### KEY VALUE

High performance, reliability, and resiliency



## Multi-Cloud Gaming

- Tournament-quality gaming experience for 1000s of users
- Freedom to play any content on almost any device

### KEY VALUE

Low-latency platform delivering high frame rates



## Massive Scale Data Backup

- High Performance data protection with enterprise backup and recovery software

### KEY VALUE

Simple, efficient, and consolidated compute and storage

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Flexible, High-Performance Platform for Custom Applications

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# Application Matrix

	Data60 Data102	2U24-AF	Serv60+8	Serv60+8 Serv24+6	Serv24	Serv24-HA Serv24-4N
Backup / Archive	+++		+++	+		
Surveillance	+++	++	+++	++	+	
Video on Demand		++			+++	
File Storage (NAS)	+	++	+++	++	+	
Block Storage (SAN)	++	++	++	+++	++	+
Parallel File Systems	+	++	+	++	+++	++
Object Storage	+			++	+++	++
Flash over Fabric					++	+++

# Warranty and Support

	Data60 / Data102	2U24 All-Flash Platform	Serv24, Serv24-HA
Warranty SSD	Earlier of 5 years or ≤1% endurance remaining 5 years 5 years	Earlier of 5 years or ≤1% endurance remaining  5 years	Earlier of 5 years or ≤1% endurance remaining  5 years
HDD Enclosure			
Support FRU/CRU RMA	Yes	Yes	Yes
Replacement on Receipt Mo-Fr Business Hours	Yes	Yes	Yes
Fee-based Services			
Advance Replacement Option	Yes	Yes	Yes
No Return Option	Yes	Yes	Yes
StorChoice Silver	1yr, 3yr, 5yr	1yr, 3yr, 5yr	1yr, 3yr, 5yr
StorChoice Gold	1yr, 3yr, 5yr	1yr, 3yr, 5yr	1yr, 3yr, 5yr
StorChoice GoldPlus	1yr, 3yr, 5yr	1yr, 3yr, 5yr	1yr, 3yr, 5yr

# StorChoice SLA Definitions

## Support Services<sup>1</sup>

Features	Basic Silver	Enterprise Gold	Enterprise Gold Plus <sup>5</sup>
Support Operations	24 x 7	24 x 7	24 x 7
Response Targets (severity 1)	1 hour	30 minutes	30 minutes
Hardware Service Terms <sup>3</sup>	1, 3 & 5 yrs	1, 3 & 5 yrs	1, 3 & 5 yrs
RMA/FRU Replacement	Next Business Day	4 hour <sup>4</sup>	4 hour <sup>4</sup>
Access	Phone/email	Phone/email	Phone/email
Response	Phone/email	Phone/email	Phone/email
On-site Field Technician	No	No	Yes
Access to SW & Firmware Updates <sup>6</sup>	Yes	Yes	Yes
No-Return Option <sup>7,8</sup>	Available for purchase	Available for purchase	Available for purchase

<sup>1</sup> All product units purchased by a customer must be under the same purchased support level, and all upgrades and/or expanded capacity for a product unit must be under the same purchased support level. May require a lead time of up to 90 days to set up service. May not be available in all locations. Contact your sales representative for availability of Next Business Day and Same Day parts replacement delivery services. Support Services must be purchased at the same time as the corresponding hardware purchase.

<sup>2</sup> Please see product warranty terms and conditions for details.

<sup>3</sup> Support service commences on the date of shipment for hardware, and on the date of transmission for software.

<sup>4</sup> RMA/FRU replacement service level time starts upon manufacturer determination that a FRU replacement is required. No-return options are available for Silver and Gold customers as an additional option to be charged separately.

<sup>5</sup> Gold Plus must be separately purchased in order to receive On-site Field Technician.

<sup>6</sup> Provides bug fixes, patches and software updates (minor versions) as available.

<sup>7</sup> Option only covers drives or flash and not other components of the system/platform. Available for purchase with Silver and Gold options.

<sup>8</sup> No-return option availability is subject to certain conditions and eligibility requirements.

# Reference Architectures:

- [High Performance, High Capacity Scalable Storage Solutions with Western Digital storage and DataCore SANsymphony software](#)
- [All-Flash Storage Solution with Ultrastar Serv24 NVMe and DataCore SANsymphony](#)
- [Tiered Storage Solution with Ultrastar Serv24 NVMe server, Data60 storage and DataCore SANsymphony software](#)
- [Tiered All-Flash Storage Solution with Ultrastar Serv24 NVMe server, 2U24 Flash Storage Platform and DataCore SANsymphony software](#)
- [Performance Tiered Storage Solution with Serv24 NVMe server, 2U24 storage, Data60 storage and DataCore SANsymphony software](#)
- [Honeywell with Ultrastar Data60 High Capacity, Fail-over Surveillance Solution](#)
- [High Capacity, Fail-over Surveillance Solution using MileStone VMS and Ultrastar Data60](#)



# Cases Studies, Solution Briefs and Whitepapers:

- [High-Performance Storage for Media & Entertainment Based on Western Digital Ultrastar Data60 and Rozo Systems Software](#)
- [Faster, More Reliable and Lower Cost Backups with Ultrastar Data60 and Veeam Backup & Replication Software](#)
- [Modernize your Storage with Ultrastar Data60 and Rozo Systems Software](#)
- [WDC, Quobyte and NEC Work Together to Deliver Powerful, Flexible Research Platform](#)
- [White Paper - Ultrastar Serv24, Fast and Flexible Storage for Windows Storage Spaces](#)

# WDC Platforms & Servers

## Innovation

- ArticFlow™
- IsoVibe™



Ultrastar  
Serv24



Ultrastar  
Serv24-HA

## Reliability

- Enterprise Grade components
- Ease of operation
- Platforms optimized for devices



Ultrastar  
Serv60+8



2U24 Flash  
Storage Platform

## Competitive

- SDS provides precise feature set
- Lower TCO than Tier-1 vendors
- Enables "Technology Disruption"



Ultrastar  
Data102



Ultrastar  
Data60

# WDC Business proposal

## Product

- BEST IN CLASS!!!

## Offer

- Volume discounts
- Special prices
- Programs
- Projects

## Common work

- One face to customer – partner + vendor
- Pre/Post sales support
- Assets
- Samples / demo / FRU



Ultrastar Serv24



Ultrastar Serv24-HA



Ultrastar Serv60+8



2U24 Flash Storage Platform



Ultrastar Data60



Ultrastar Data102



**Western Digital** **Creating environments for data to thrive**