



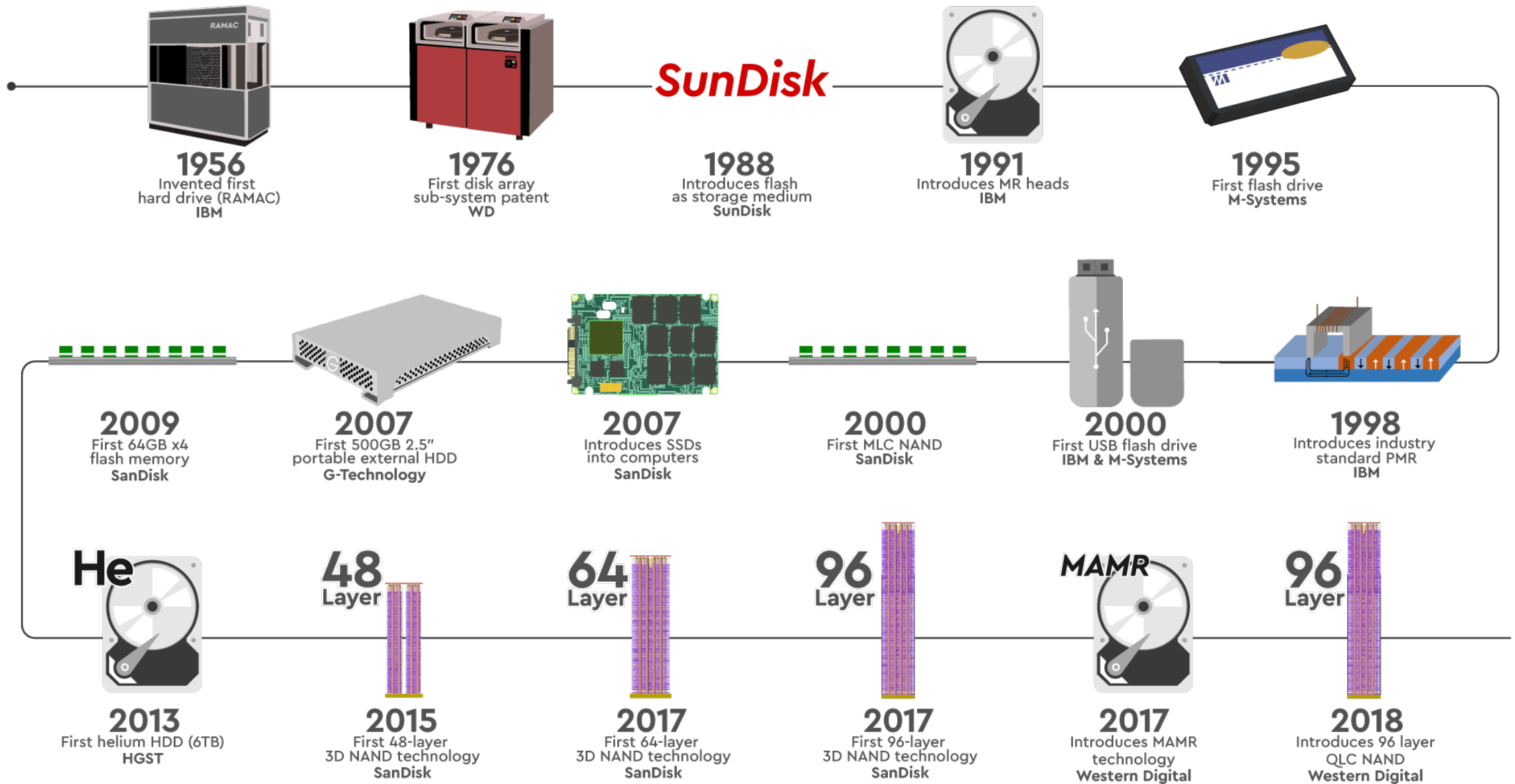
Технологии Western Digital для корпоративного хранения данных

Григорий Никонов, системный инженер

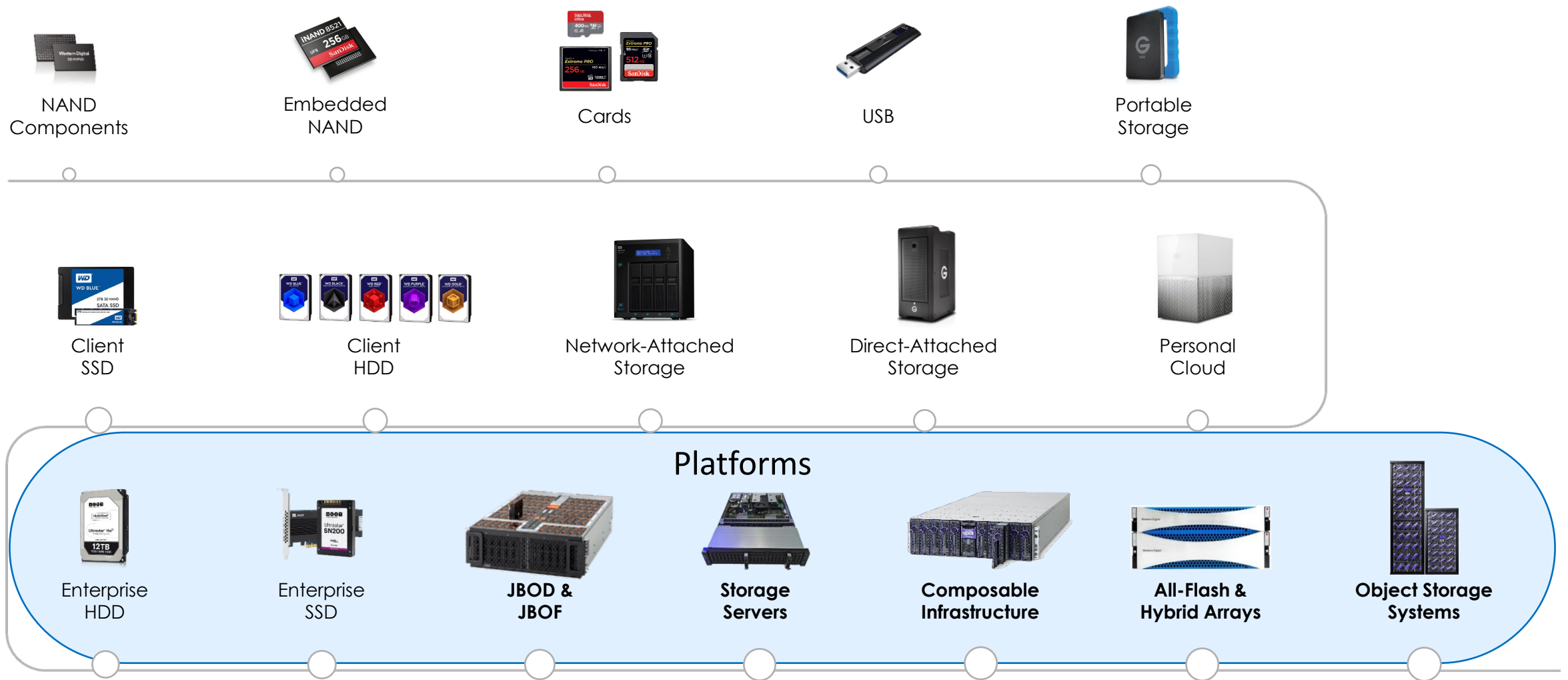
grigory.nikonov@wdc.com

Сентябрь 2019, Москва

HISTORY OF FOUNDATIONAL INNOVATION



Western Digital Portfolio

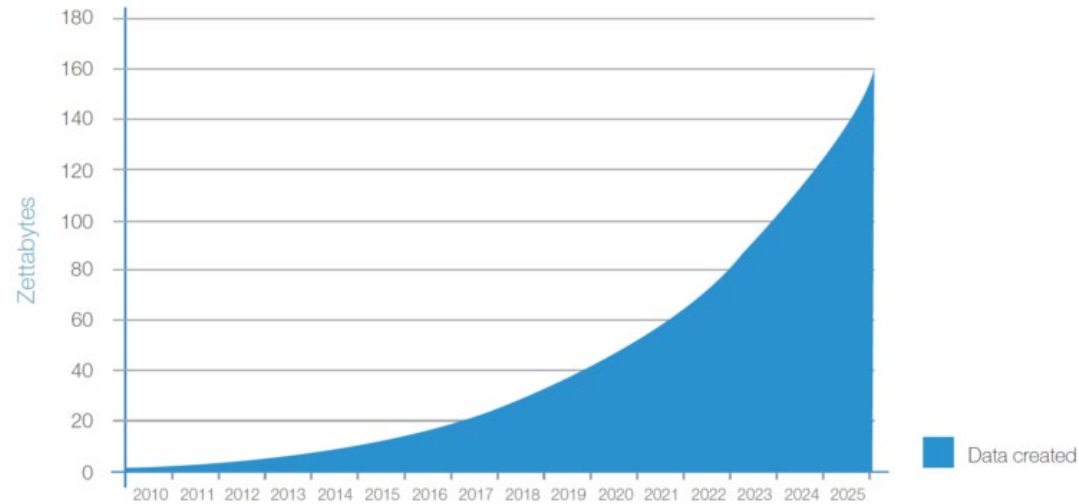


SanDisk®

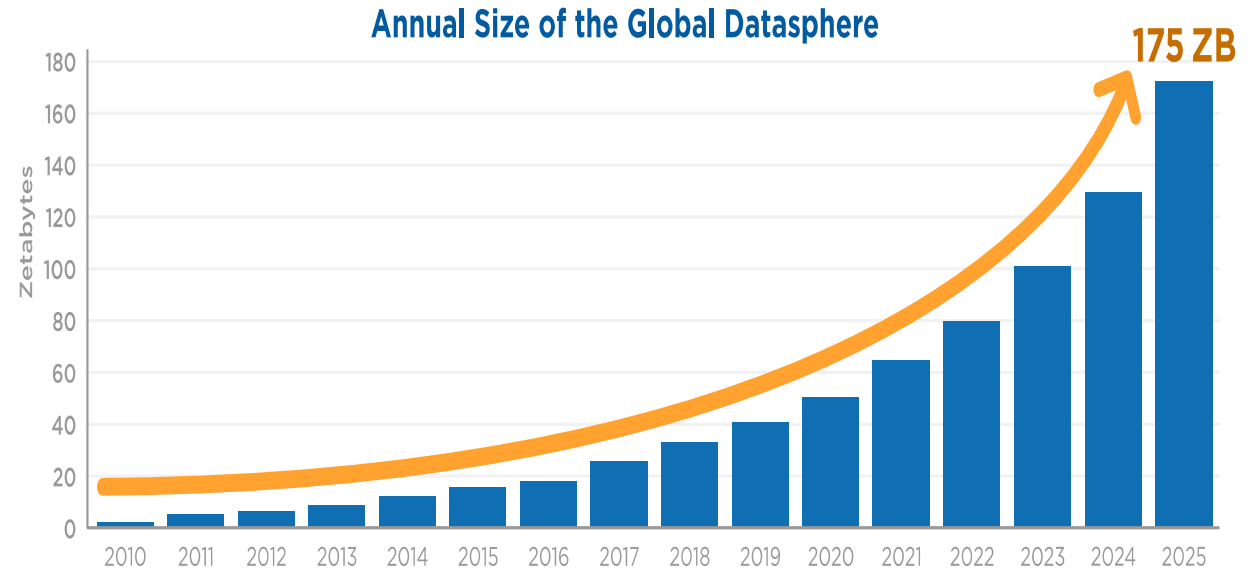


Western Digital®

Рост создаваемых данных



Source: IDC's Data Age 2025 study, sponsored by Seagate, April 2017

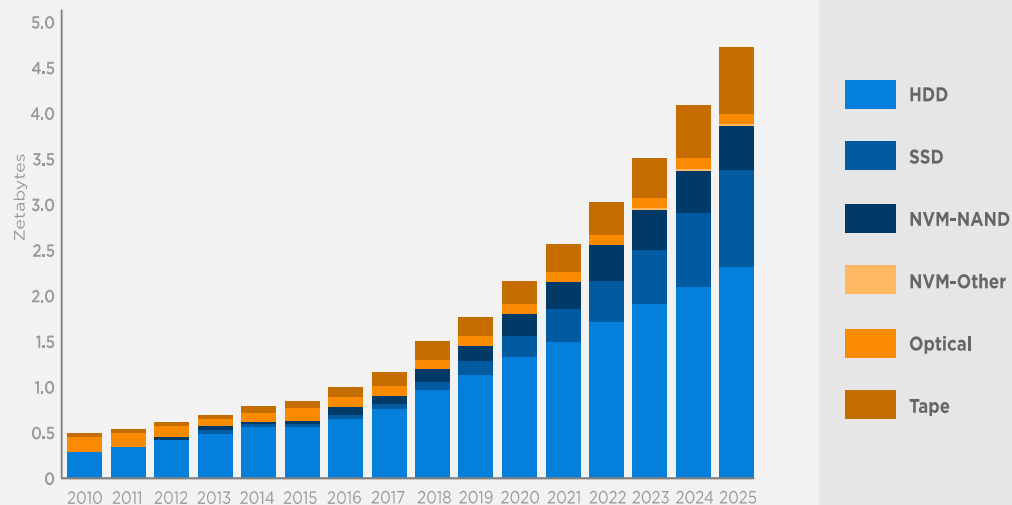


Source: Data Age 2025, sponsored by Seagate with data from IDC Global DataSphere, Nov 2018

- В 2018 объем создаваемых данных в мире – 33 ZB
- Прогнозы становятся менее консервативными → 175 ZB к 2025
- С 2018 по 2025 ожидается поставка на рынок 22 ZB емкости хранения
- Ожидается восстановление позиций enterprise/cloud

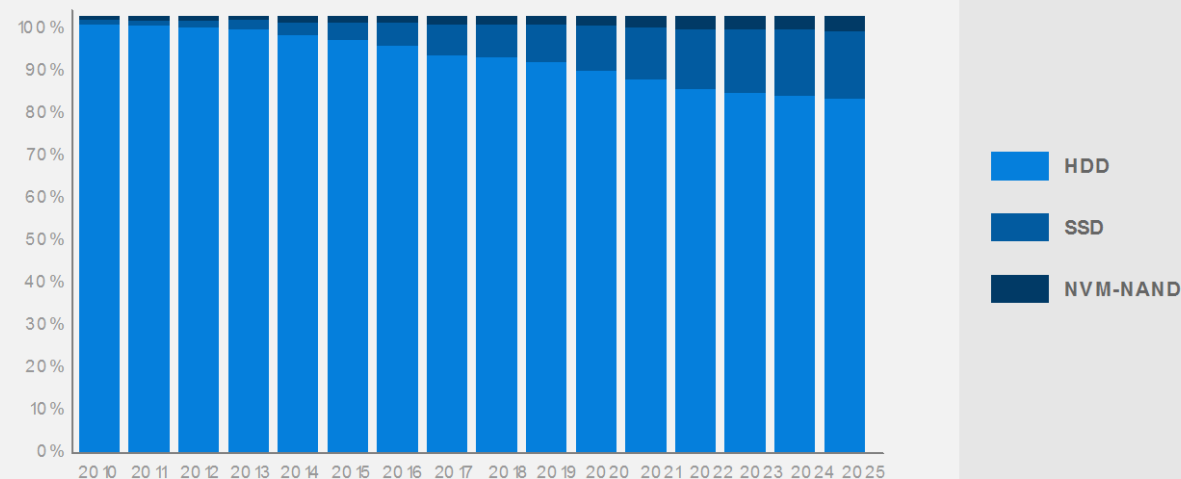
Судьба жесткого диска

Worldwide Byte Shipments by Storage Media Type



Source: Data Age 2025, sponsored by Seagate with data from IDC Global DataSphere, Nov 2018

Share Worldwide Byte Shipments into the Enterprise Core and Edge by Storage Media Type



Source: Data Age 2025, sponsored by Seagate with data from IDC Global DataSphere, Nov 2018

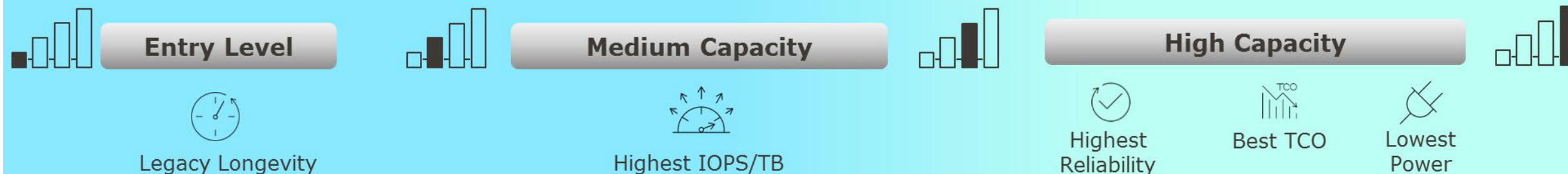
К концу 2025 года **80%** данных в ЦОД
по-прежнему будут на HDD

Western Digital Ultrastar HDD

Data Center Drives



Available Sept'18



10TB Ultrastar DC HC330 Highlights

Optimized 6-Disk Air HDD

Ultrastar DC HC330

Key Concepts

- Proven air platform extended to a 6D design for 10TB
- Common electronics, firmware, heads/media leveraged from HC310/320 (4/6/8TB)

Key Features

- 10TB, 6-disk (1.67 TB/p)
- 7200 RPM, 6Gb SATA/12Gb SAS, 256MB Cache
- Media Cache Plus NVC
- Security Models: Base (SE), SED: TCG-Ent, SED-FIPS (SAS)
- Ultrastar reliability, warranty and workload
 - 2M hours MTBF, 5-yr limited warranty,
 - Up to 550TB/yr workload



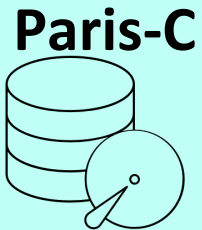
Target Markets

- High end of mid-cap market
- RAID, Data Center and Cloud Computing applications that require higher IOPs

Ultrastar DC HC550 Highlights

Industry's Highest Capacity CMR Helium HDD

Ultrastar DC HC550



Key Concepts

- 9 disk mechanical design increases capacity
- Common Sealed Technology & Code Base
- Common Code Base and MFG process with 14TB HC530
- TDMR Reader Technology
- Triple Stage Actuator improves performance
- ePMR Energy Assist Recording

Key Features

- 18TB, 9-disk (2 TB/p)
- 16TB, 9-disk (1.78 TB/p)
- 7200 RPM, 6G SATA/12G SAS, 512MB Cache
- Security Models – Standard (SE), SED: TCG, TCG-FIPS (SAS). SecureDrive
- Ultrastar reliability, warranty and workload
 - 2.5M hours MTBF, 5-yr limited warranty,
 - Up to 550TB/yr workload

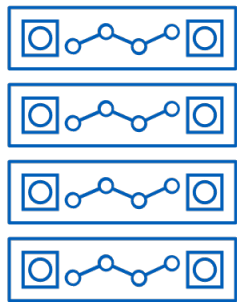


Target Markets

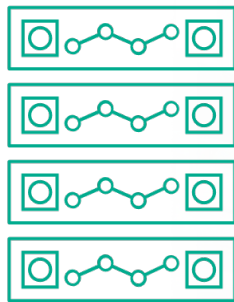
- Hyperscale & Cloud Storage segments
- Delivers High Capacity, Low Power and TCO savings

21% Lower Storage Cost

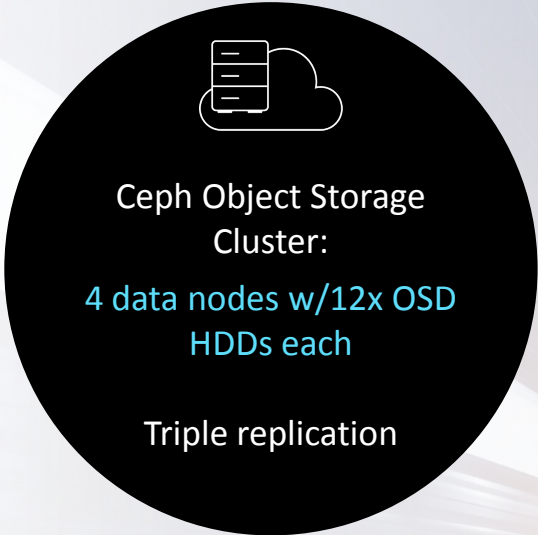
More Capacity. Less Power.



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	

	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

System Costs Include:

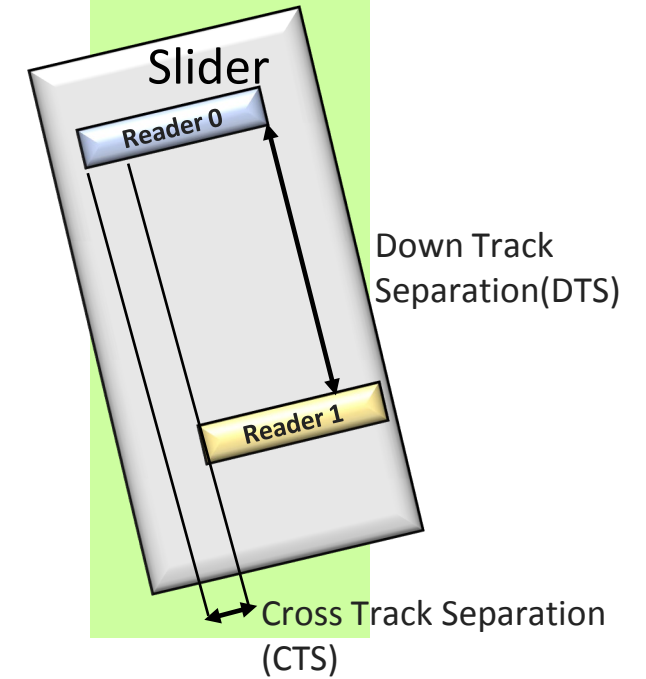
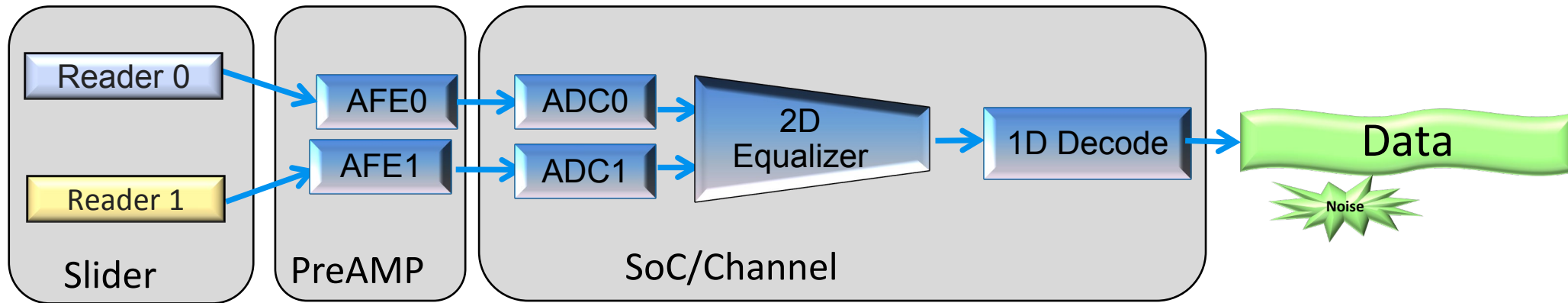
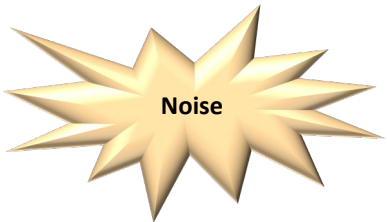
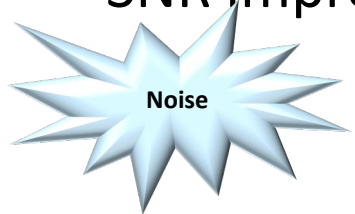
- Chassis
- Power supply
- Mainboard
- Processor(s)
- DRAM
- Networking card
- Secondary storage (boot drive, journaling)
- RAID controller
- Cable interconnect

Shared System Costs Include:

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

TDMR Introduction

- Multiple readers to cancel electronic noise
- 2D equalizer maximizes data & minimizes noise
- SNR improvement contributes capacity gains



Ultrastar DC SS530 Series

Product Overview

Ultrastar DC SS530 SAS SSD

(Bear Cove Plus)

Highlights

- ✓ High capacity – up to 15.36TB
- ✓ High endurance – up to 10 DW/D
- ✓ Best-in-class performance
- ✓ 64-layer 3D NAND
- ✓ Dual & wide port capability
- ✓ TCG + FIPS options
- ✓ 2.5M hours MTBF



Ideal For Customers In Need Of:

- Trusted SAS interface
- Higher endurance options
- Security requirements

**Targeted for OEM Server &
Storage Array Vendors**

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

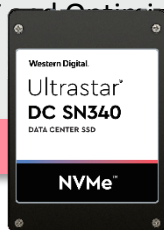
Accelerator

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

Increasing NVMe Performance & Endurance Requirements

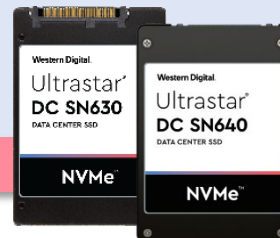
DC SN340 NVMe SSDs

- 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 Capacity



Ultrastar® Data60 и Data102

Гибридные полки высокой доступности

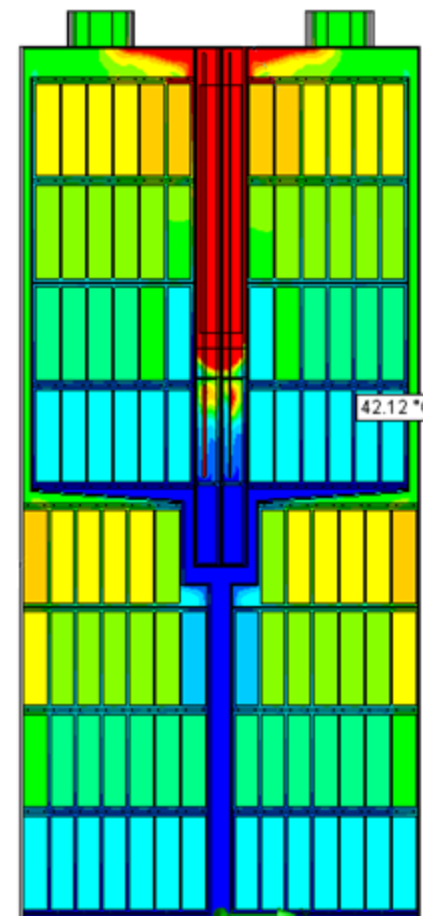
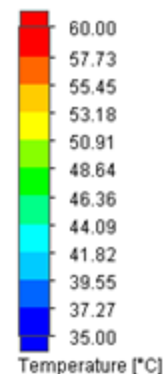
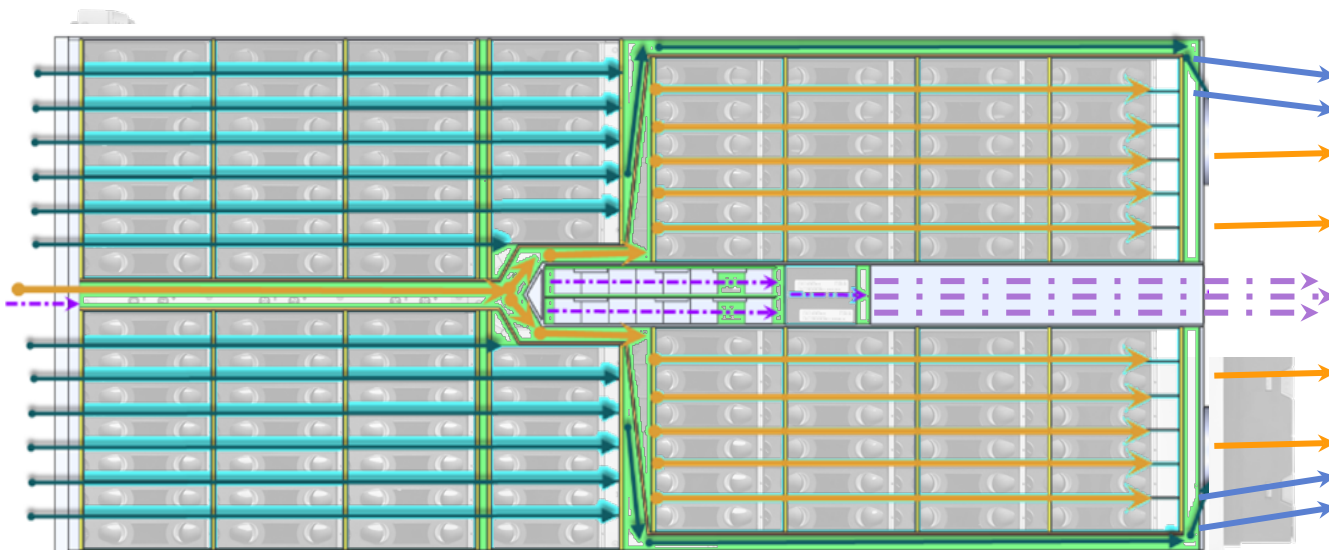
- До 102 двухпортовых HDD и SSD (макс. 24) с горячей заменой
- 6# 4-полосных mini-SAS HD портов на один IOM
- Поддержка дисков 12Gb/s SAS-3 или 6Gb/s SATA-3
- До 12W на диск в полной набивке
- Поддержка отключения питания T10 Pin3
- Горячая замена всех FRU
- In-band и Out Of Band управление полкой
 - Out Of Band через IPMI / Redfish
 - In-band через SES-3
- Два блока питания 80+ Platinum 1600W



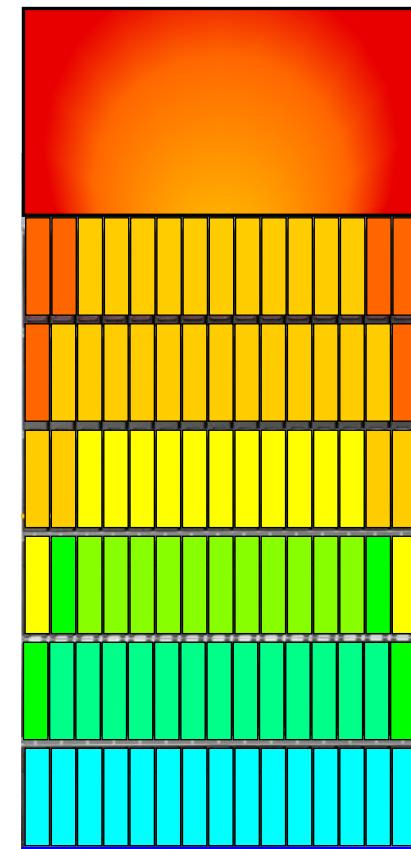
До **1,224 ТБ**
в 4U x 1200mm

Система охлаждения ArcticFlow™

- Параметры моделирования
 - @ 12W на каждый диск
 - 35°C окружающая температура
 - Разброс < 10°
 - Макс. Температура 54.11°C
 - He12 (8D HDD) работает на 9.8W
 - He10 (7D HDD) работает на 9.5W



HGST 4U102



Альтернативная
4U90

IsoVibe™

- Микрокод привода HDD и акселерометры компенсируют вибрацию и резонанс (спец. микрокод)
- Диски крепятся к шасси мини-салазками
- Салазки и винты не нужны
- Все диски механически изолированы эластичными посадочными местами в бэкплейне
- Вибрация на 60% ниже по сравнению с конкурентами
- Максимальная производительность для дисков с высоким TPI
- Продлевает срок службы дисков
- Минимизирует количество ошибок

Ultrastar® Serv60+8

Гибридный сервер хранения

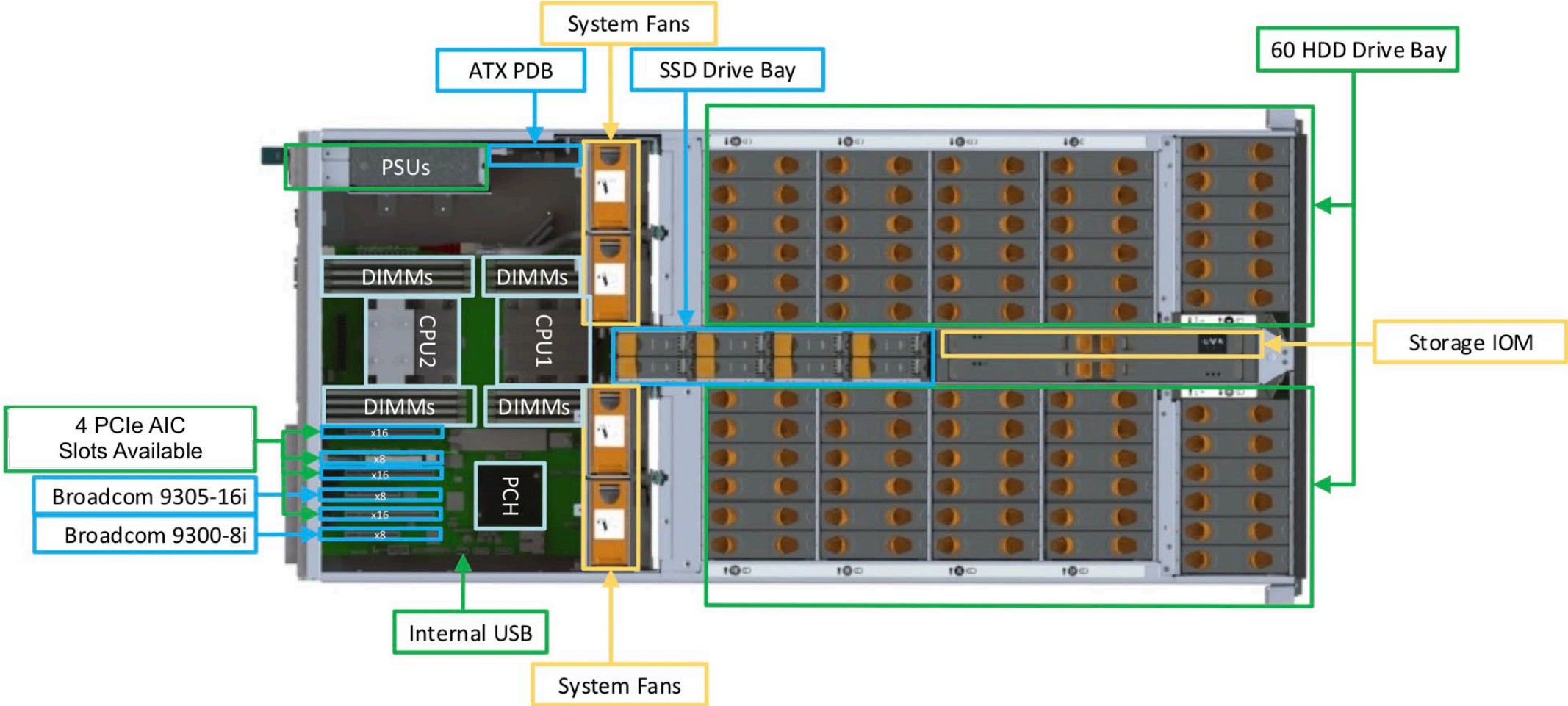


Ultrastar® Serv60+8 Hybrid Storage Server

- A 4U Storage Server with 60 HDD bays and 8 SSD bays
- Single server node
 - Dual “Skylake” CPUs
 - Hybrid support: up to 60 HDDs plus up to 8 SSDs
 - Additionally, up to 24 of the HDD slots can hold SSDs
- Same product family as Ultrastar Data60/102
 - Incorporates ArcticFlow™ and IsoVibe™
 - Backed by a 5-year limited warranty
- Public and private cloud, backup, archive, logs/images



Ultrastar® Serv60+8 System Map



Ultrastar® Serv24

2U NVMe сервер хранения



Ultrastar® Serv24-NA 2U NVMe двухузловой кластерный сервер



Ultrastar Serv24-4N четырехузловой NVMe сервер хранения

Launch at Flash Memory Summit

August 5, 2019



Ultrastar Serv24+6 гибридный сервер хранения

Launch at Flash Memory Summit

August 5, 2019



Ultrastar Serv24+6 Highlights

- Innovative design for 24 HDD bays plus 6 NVMe SSDs
 - Flexible options for rear bays: 6 x NVMe SSDs, 4 x HDDs, 4 x SAS or SATA SSDs
 - Up to 420TB in 2U
- Designed for software-defined storage
- Flexible options for capacity and performance



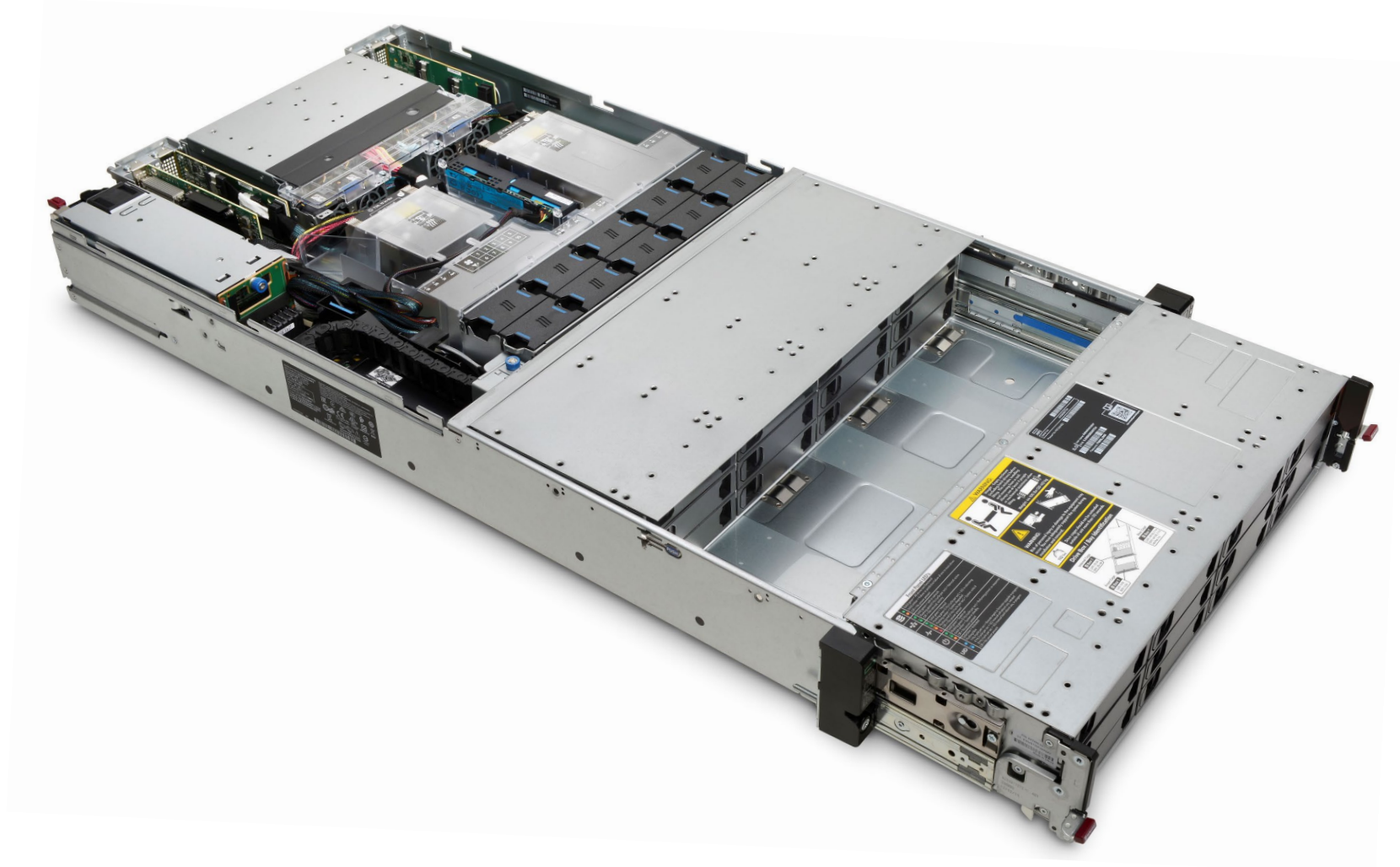
Ultrastar® Serv24+6 Hybrid Storage Server

Overview

- **Hybrid Big Data Storage Server, 2U 24+6**
- **Single Server Node**
 - Single / Dual “Cascade Lake” up to 165W
 - Up to 28 Cores per processor
 - 16 DIMM DDR4 ECC slots, 1 TB max
 - Hybrid support: Up to 24 HDD plus 6 NVMe SSD devices
 - 2x PCIe x24, 2x PCIe x16 & 1x PCIe x8 (Gen3)
 - Less than 32.5” Depth
- **Target applications**
 - SDS environments, Big data, Public and private clouds, Data analytics, Edge storage, Multi-Tier/Hybrid and IT 4.0 Architecture
 - Content distribution, streaming media, front-end web applications
 - Back-up, archive, replication, logs/images, file server, database, messaging, email
- **Expansion to Ultrastar Data60/102/Serv60+8 family**
- **High Capacity HelioSeal HDD’s**
 - Ultrastar DC HC520 – He12: 12TB CMR SATA/SAS
 - Ultrastar DC HC530 – He14: 14TB CMR SATA/SAS
 - Ultrastar DC HC620 – Hs15: 15TB SMR Host Managed SATA/SAS
- **Full Range of NVMe SSD Capacity and Endurance options**
 - Ultrastar DC SN200: 1 & 3 DPWD: 1.6TB - 7.68TB NVMe
 - Ultrastar DC SN630: 0.8 & 2 DWPD: 800GB - 7.68TB NVMe
 - Ultrastar DC SN640: 1 & 3 DWPD: 800GB - 15.36 TB NVMe
 - Ultrastar DC SN840: 1 & 3 DWPD: 1.6TB - 30.72TB NVMe
- **Customer Choices**
 - CPU Qty, Core, & Speed
 - Memory Qty, Size, & Speed
 - Network Qty & Speed
 - HBA / Raid Controller Qty & Cache
 - HDD Capacity, Format, & Security
 - SSD Capacity, Endurance, & Security



Ultrastar® Serv24+6 Hybrid Storage Server



IntelliFlash N-Series NVMe All-Flash Arrays



N-Series 5200 and 5800

N5200

- Memory:
 - 704 GB DDR4 per system
 - 32 GB NVDIMM per system
- Storage:
 - 24x dual-ported NVMe SSDs
 - 1 DWPD drives
 - 23 - 184 RAW TB
- CPU:
 - 32 cores per controller or 64 cores per array

N5200-25 = 24 * 960GB = 23TB
N5200-50 = 24 * 1.92TB = 46TB
N5200-100 = 24 * 3.84TB = 92TB
N5200-200 = 24 * 7.68TB = 184TB

N5800

- Memory:
 - 1.4 TB DDR4 per system
 - 32 GB NVDIMM per system
- Storage:
 - 24x dual-ported NVMe SSDs
 - 3 DWPD drives
 - 19 - 154 RAW TB
- CPU:
 - 40 cores per controller or 80 cores per array

N5800-20 = 24 * 800GB = 19TB
N5800-40 = 24 * 1.6TB = 38TB
N5800-80 = 24 * 3.2TB = 77TB
N5800-160 = 24 * 6.4TB = 154TB

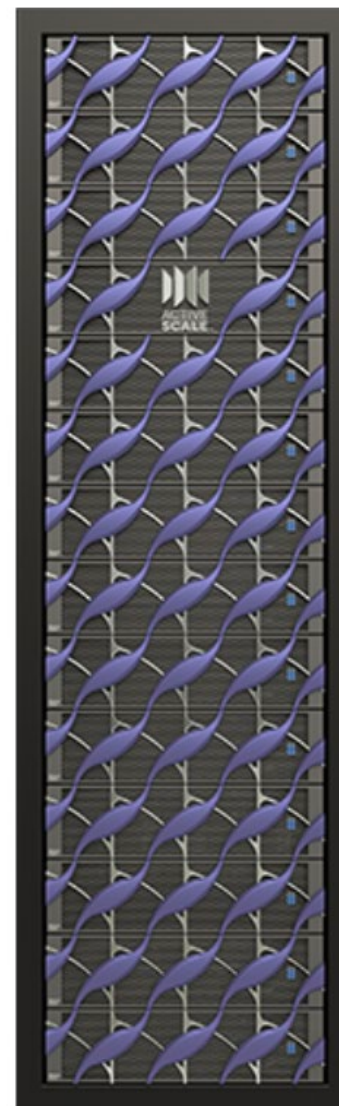
Объектные системы хранения



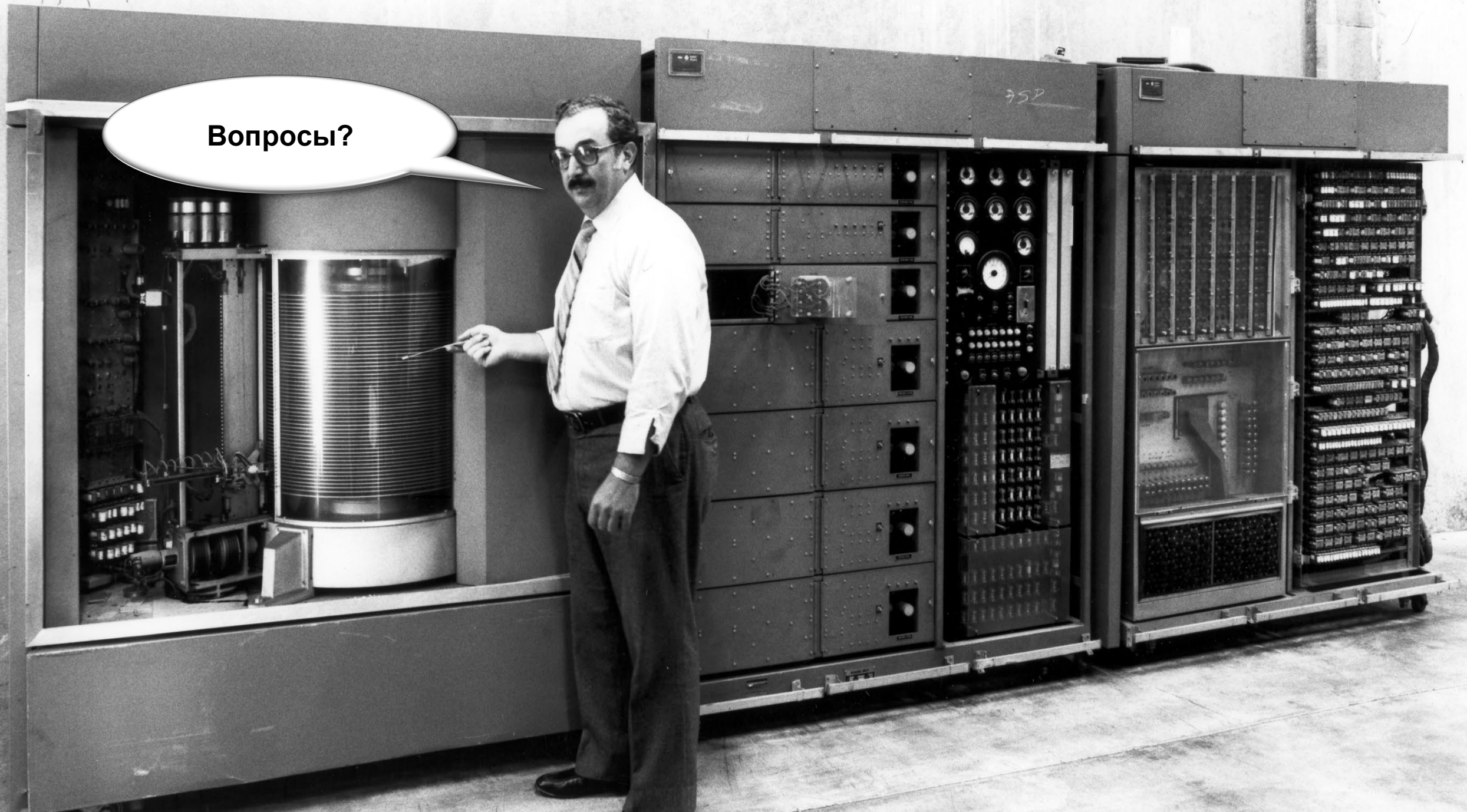
Модульная
ActiveScale P100



Интегрированная
ActiveScale X100



Вопросы?





Western Digital®