

Storage Solutions for the Data-Driven World

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Data 4.0 Era

SAMSUNG



Data 1.0

Stone Age Cave Painting
(Cueva de Altamira)



Data 2.0

Letterpress printing
(Gutenberg)



Data 3.0

Digital Data
(IBM Ramac HDD)



Data 4.0

Data-driven compute
(Data Center)

Data 4.0 Era

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Data Driven Compute

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Five Pillars of Storage Innovation

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The diagram is shaped like a classical building. It features a wide, dark blue horizontal band across the top, a triangular roof above it, and a grey base at the bottom. Five blue rectangular pillars support the top band. Each pillar contains text. The word 'Speed' is green in the first pillar, 'Density' is green in the second, 'Security' is green in the third, 'Interfaces' is green in the fourth, and 'Intelligent' is green in the fifth. The other words are white.

Storage Innovation

The
Speed
of Storage
Solutions

The
Density
of Storage
Solutions

The
Security
of Storage
Solutions

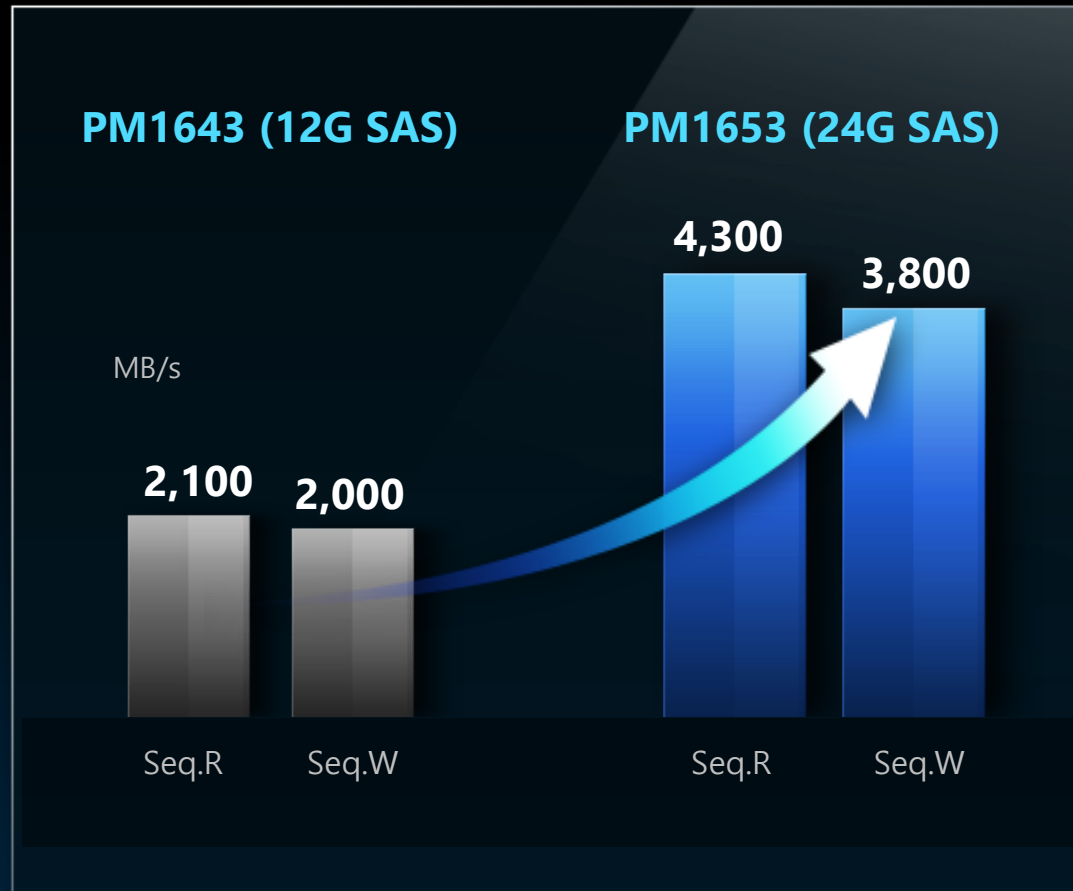
New
Interfaces
of Storage
Solutions

New
Intelligent
Storage
Solutions

Reliability and Speed – 24G SAS

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**2x Performance with
24G Speed**



Hot plug support



High scalability - SAS expander



High reliability - Dual port



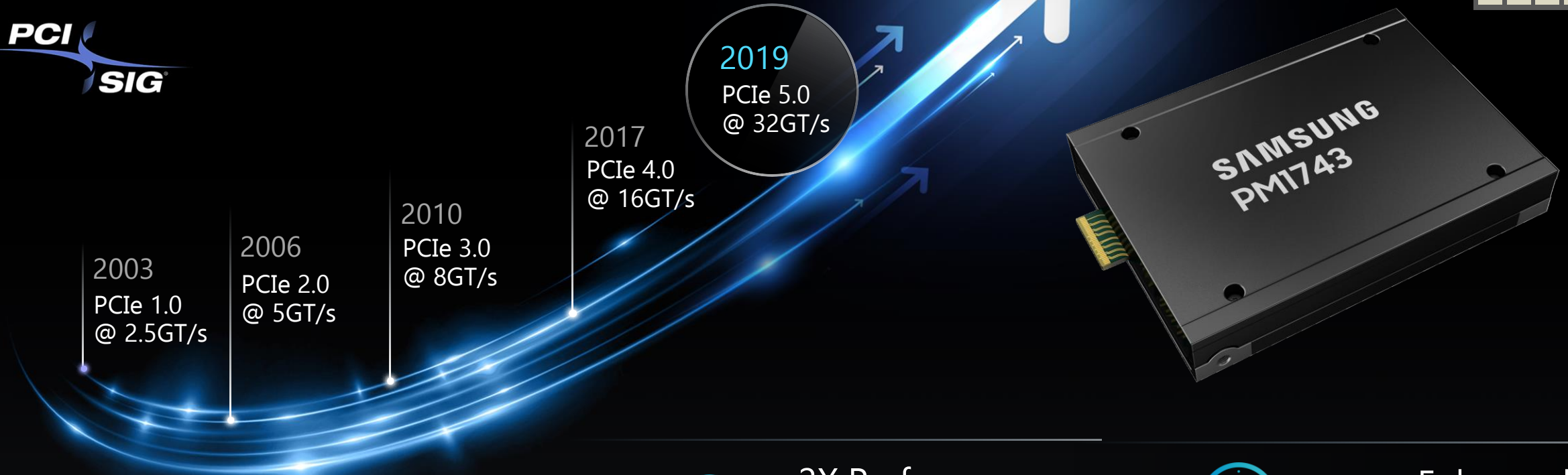
**Lower risk of
device-level failure - HBA**

Extreme Bandwidth – PCIe Gen5

High performance and high efficiency



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2X Performance
QoS



Enhanced
Telemetry



RoT Support
Secure Storage



Multi-Tenancy

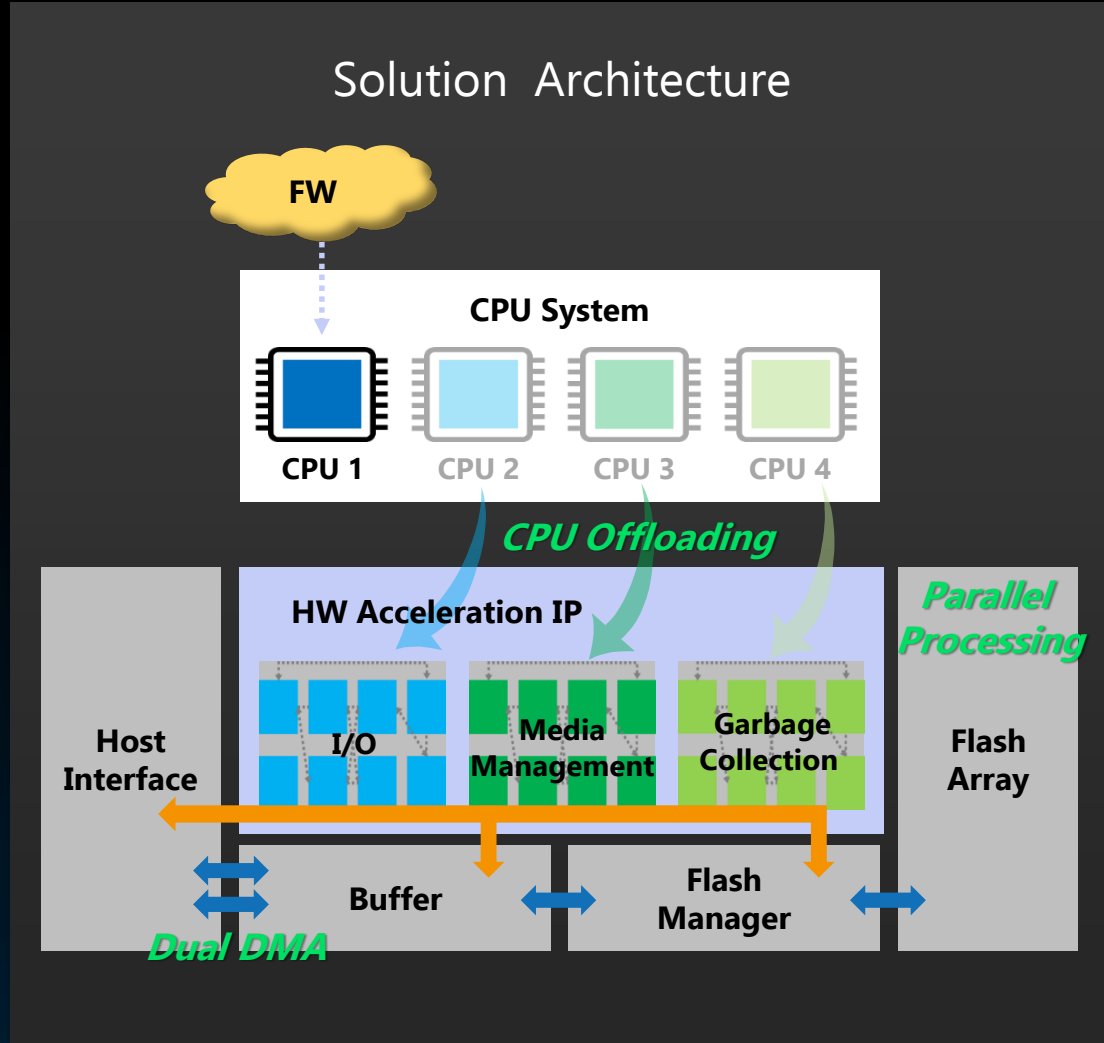
(Intel Interview)

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Hardware Acceleration

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Intelligent
Interfaces
Security
Density
Speed



Speed up random write performance
(KIOPS)



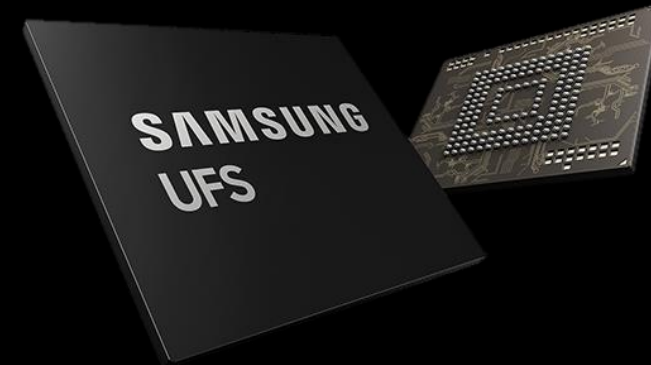
Power efficiency with max performance (Mbps/Watt)



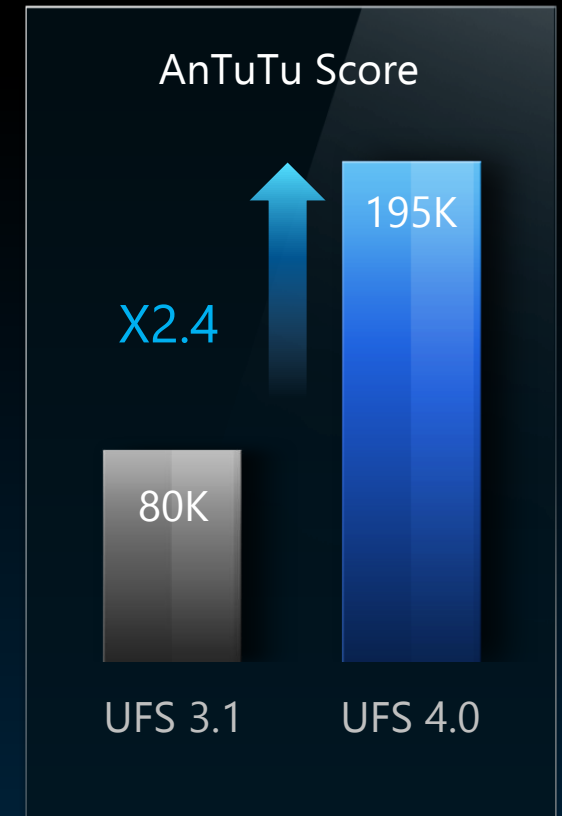
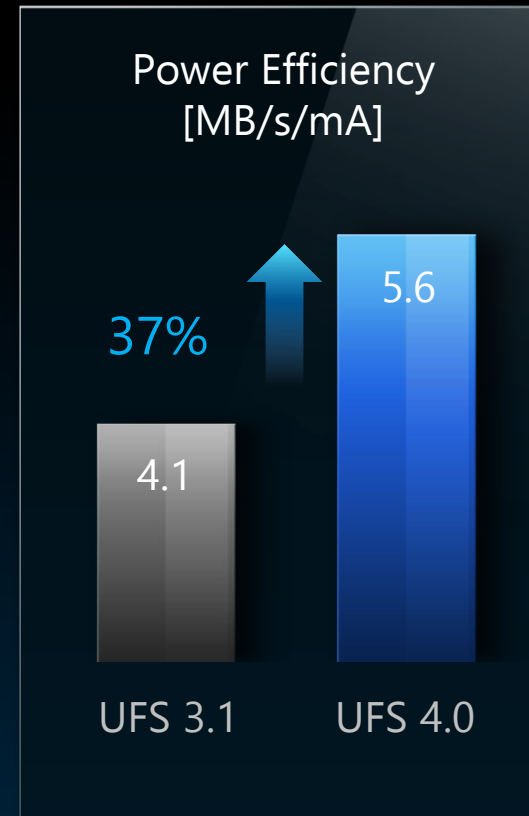
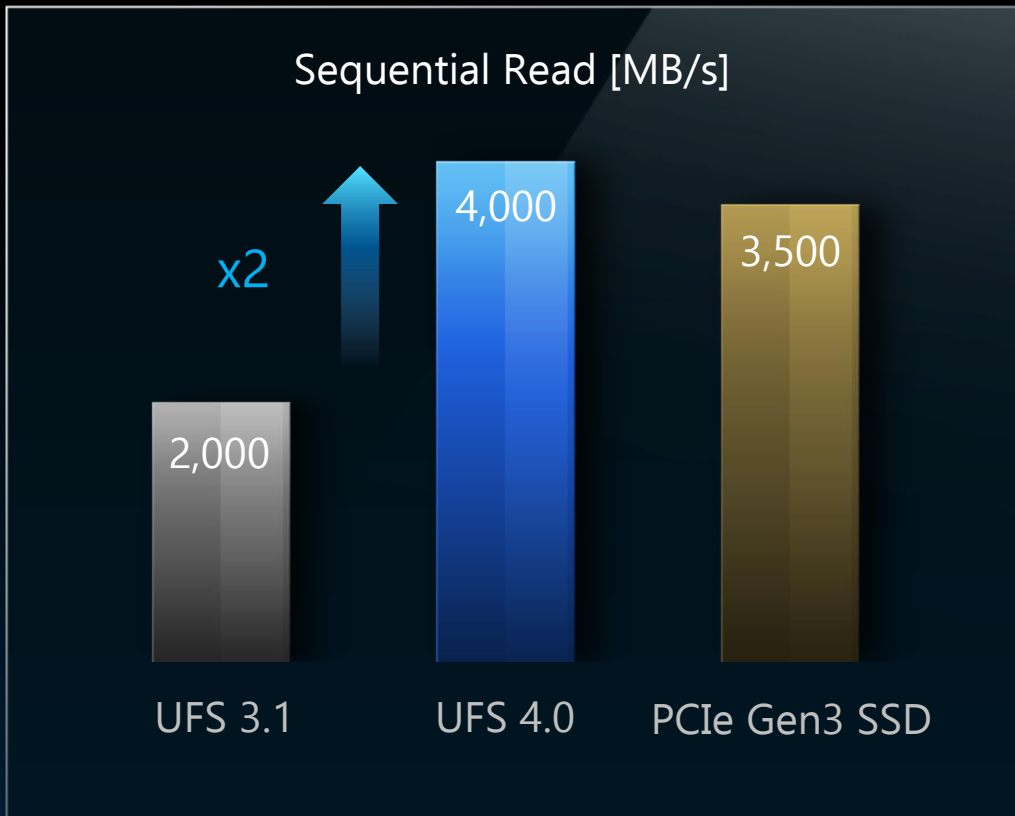
■ PM9A3 (PCIe Gen4) ■ PM983a (PCIe Gen3) * 4TB case

New User Experience - UFS 4.0

- UFS4.0 achieves SSD comparable performance
- Power Efficiency 30%↑, Benchmark Score X2.4↑



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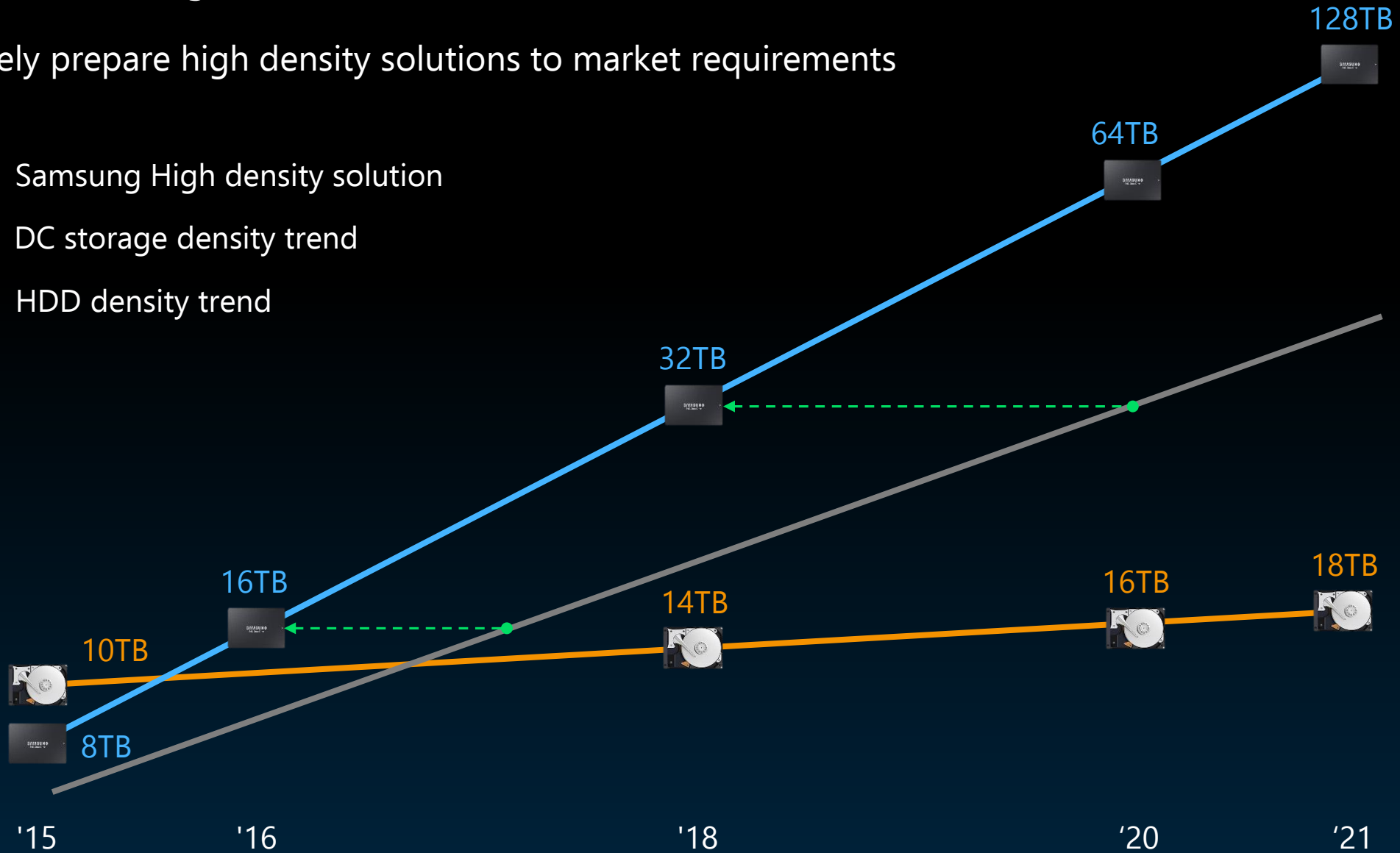
High Density Solutions

Preemptively prepare high density solutions to market requirements

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Intelligent
Interfaces
Security
Density
Speed

- Samsung High density solution
- DC storage density trend
- HDD density trend



High Density Solutions

Form Factor proliferation tailored to various needs

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Intelligent
Interfaces
Security
Density
Speed

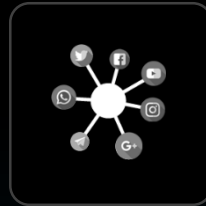
Divergent applications



5G



Edge



Many cloud
services

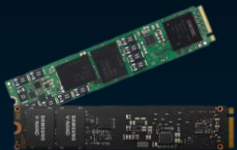


AI

Different racks and servers



Various Form factors



M.2

Compaction



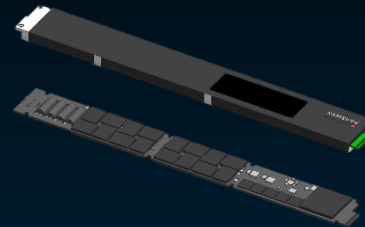
E1.S

Space efficiency



2.5"

Capacity



E1.L

Space efficiency,
capacity



HHHL

Performance



E3

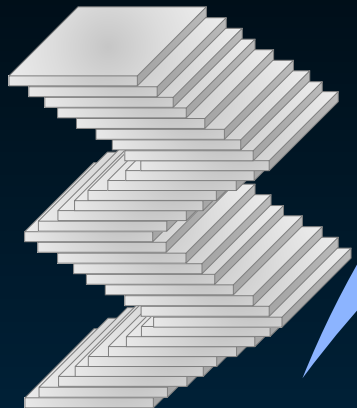
Capacity,
Enhanced power

128 TB SSD

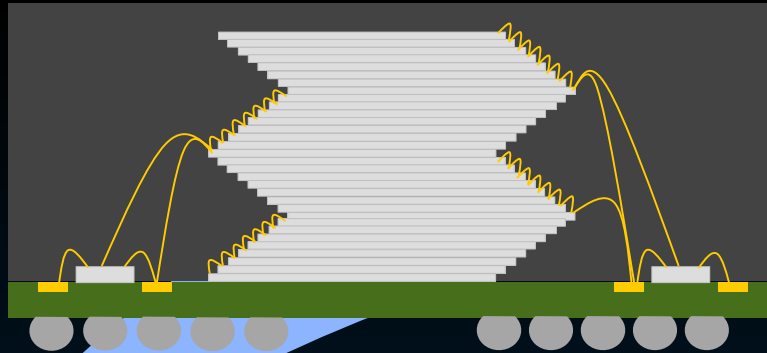
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Intelligent
Interfaces
Security
Density
Speed

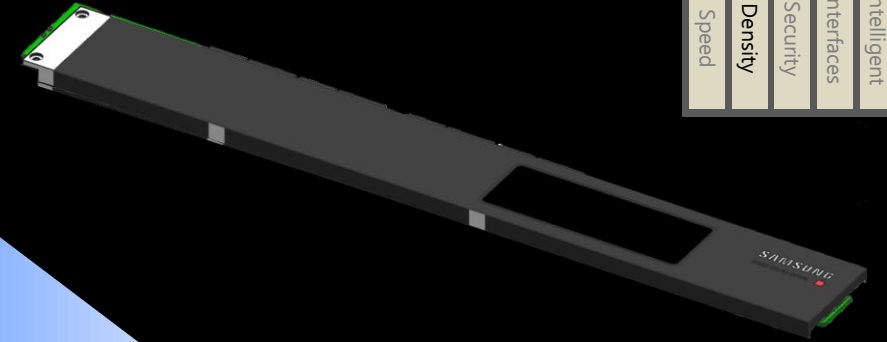
1 Tb QLC Die



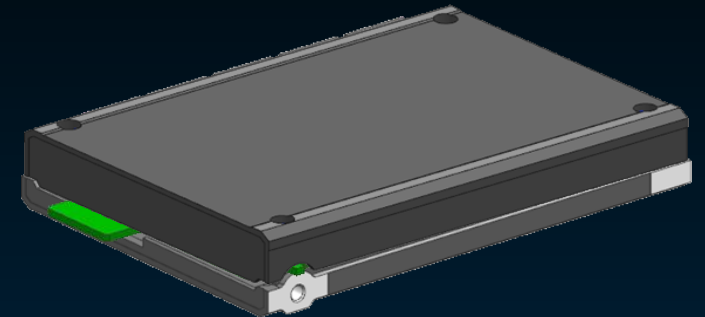
4TB Chip (32 Dies)



128TB E1.L (32 Chips)



128TB E3.S (32 Chips)



QLC Solutions

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PC, NOTEBOOK
CONSUMER



'18. 1st QLC



MOBILE



SERVER STORAGE,
DC RACK



Intelligent
Interfaces
Security
Density
Speed



128 TB
Extreme Density



PCIe Gen4
Performance



Advanced
Cell Healthcare
VSURE™

Security Solutions

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Intelligent
Interfaces
Security
Density
Speed

- State-of-the-art security practices are implemented in Samsung SSD

Security Products



Full security line-ups
supporting ISE, TCG, and FIPS

Self-Encrypting Drive



SED feature with strong key
protection scheme

RoT



Hardware-based protection of
FW Integrity

Next Security Solutions

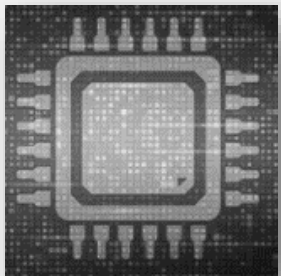
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- Foundation of trusted environment for cloud computing

*IDE: Integrity and Data Encryption

Secure Domain



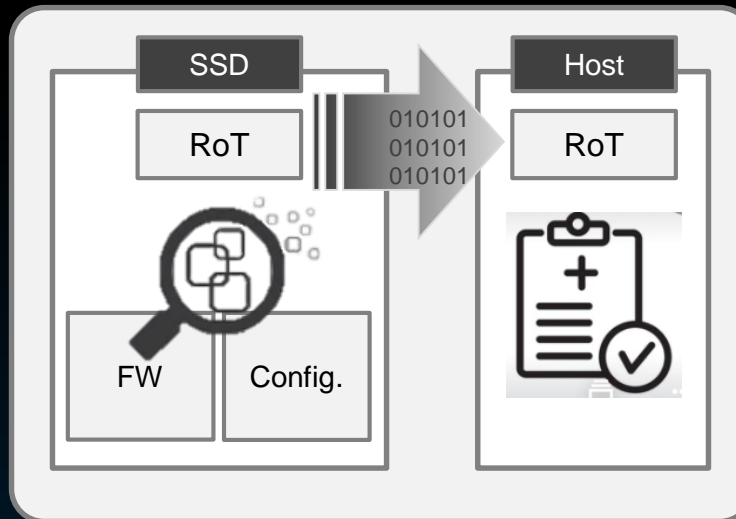
General
Processor



Secure
Processor

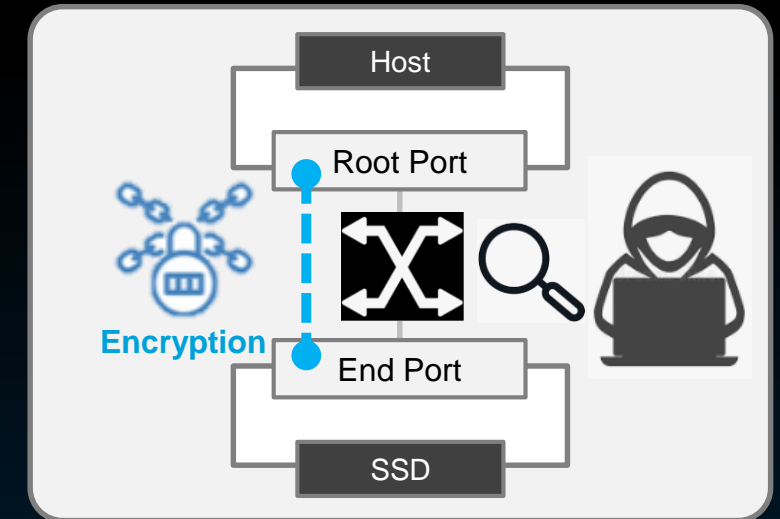
Isolated secure domain
with a dedicated security core

Attestation



Transparency of
FW and security configurations

PCIe IDE*



Link encryption
to prevent low level attacks

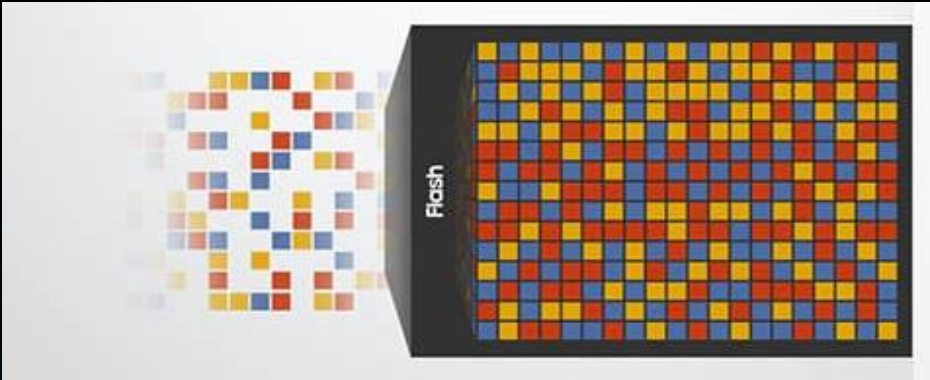
ZNS SSD

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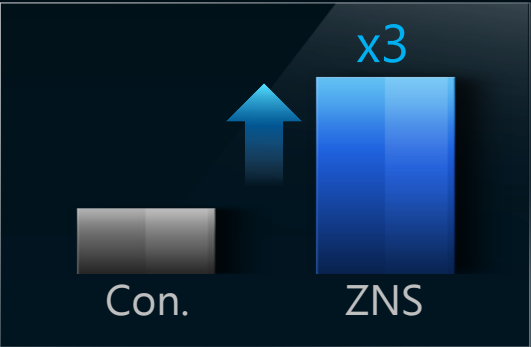
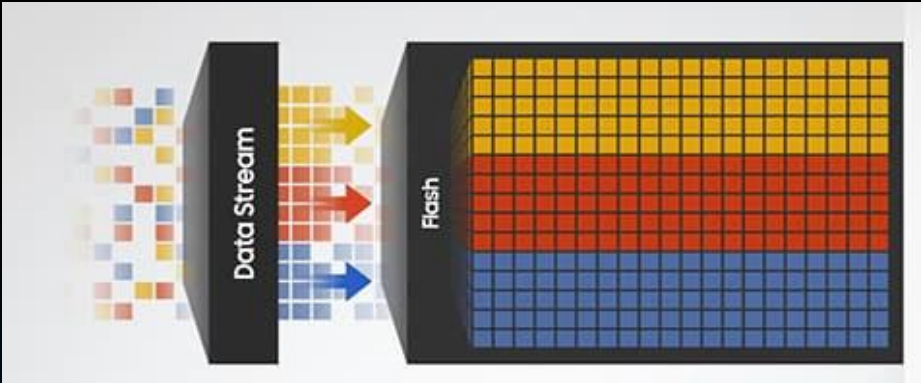
Intelligent
Interfaces
Security
Density
Speed

Maximum available storage capacity and longer lifespan

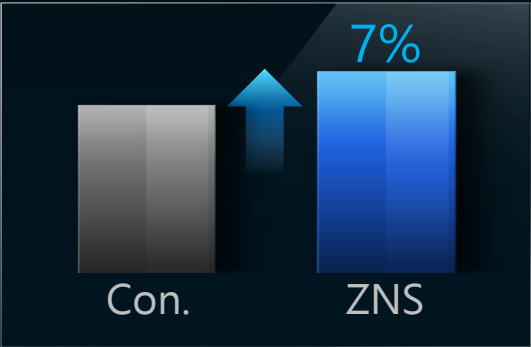
Conventional SSD



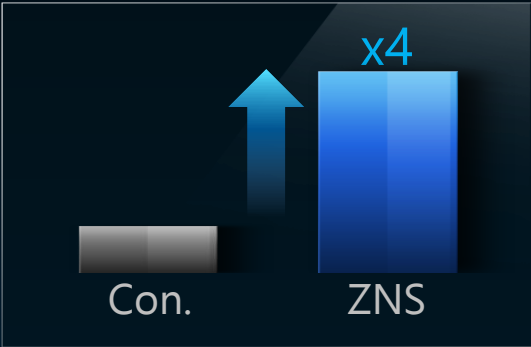
ZNS SSD



Performance improvement



Increased user capacities



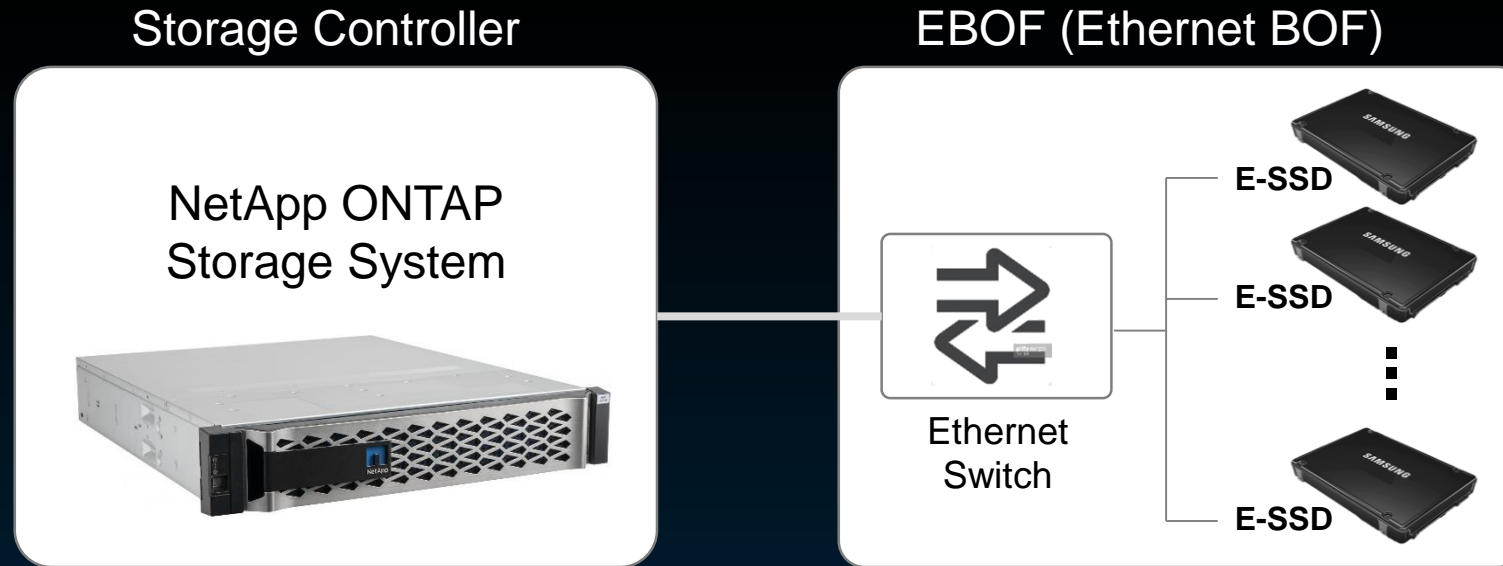
Extended lifespan

Ethernet SSD (E-SSD)

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Intelligent
Interfaces
Security
Density
Speed

NetApp ONTAP Storage System and Samsung Ethernet SSDs Are Connected and Operated Together



Collaboration with NetApp

Peta-Byte SSD

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NVMe Subsystem for Disaggregated Storage Infra

Easy to scale out, using KV over NVMe-oF, focusing on emerging high-density workload



AI/ML



**Media
/Entertainment**



Higher Endurance

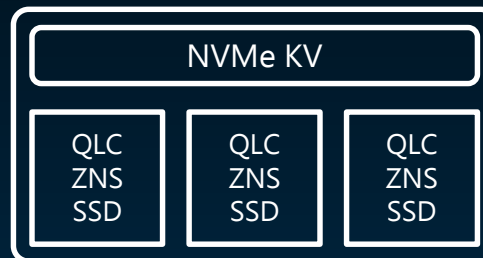


Hot Archives

- Easy to Scale out
- Up to 20% TCO Reduction

Peta-Byte SSD

Peta-Byte SSD



Peta-Byte SSD

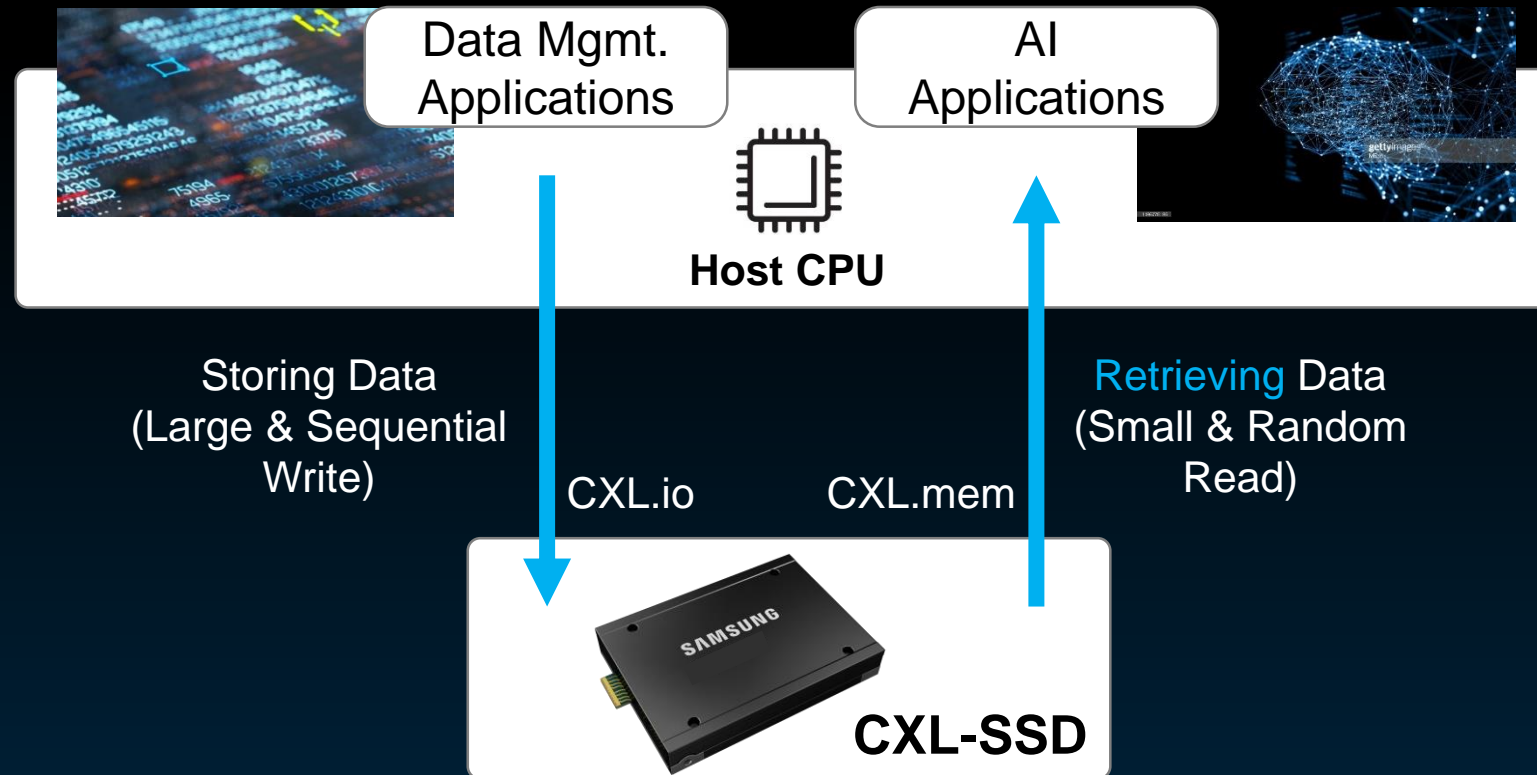
CXL-SSD

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Intelligent
Interfaces
Security
Density
Speed

Storing Large & Sequential Data over CXL.io

Retrieving Small & Random Data over CXL.mem Efficiently



Optimal Storage Solutions for AI Applications

SmartSSD Is All about Your Applications
It Helps Improve System Performance and Reduce Operational Costs

Online Conferencing



Video Transcoding
in SmartSSD

Data Analytics



Data Scan/Filtering
in SmartSSD

Artificial Intelligence



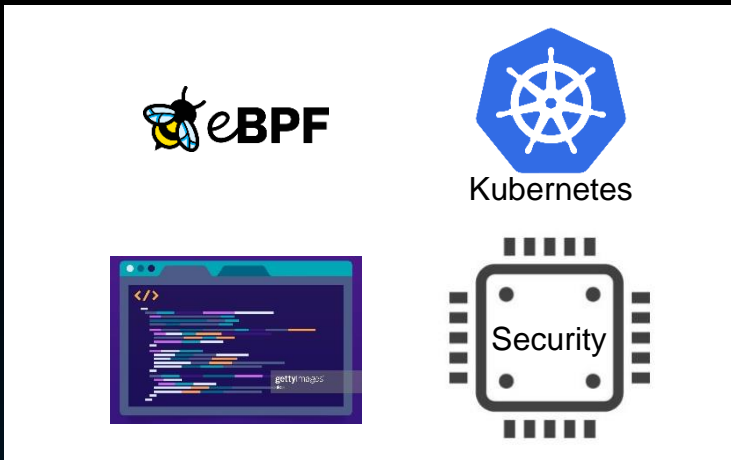
Preprocessing
in SmartSSD

SmartSSD with Homomorphic Encryption Processes Data As Encrypted



Cloud Applications Can Process Data Without Disclosing Personal Information

Samsung Will Continue to Contribute to the Computational Storage Ecosystems



Technologies

eBPF, Container, Programming Model,
Security (& Homomorphic Encryption)



Standards

SNIA Computational Storage TWG,
NVMe Computational Storage TG,
Open Compute Project



Open Source

SW Stack & Development Kit
Reference Implementations

Samsung Innovation

SAMSUNG



Mobile Storage



Client SSD



Sever & Storage SSD

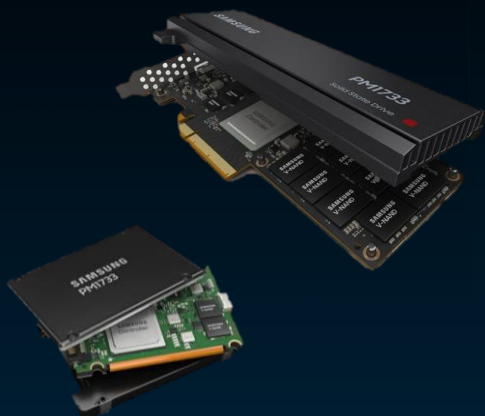


Automotive Storage

Samsung Innovation with Oracle

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Samsung
NVMe SSD



Gen5 PM1743 ('22)

Gen4 PM1733a ('21)
PM1733 ('19)

Gen3 PM1723b ('18)
PM1725a ('17)
PM1725 ('15)

Oracle

Cloud Infra

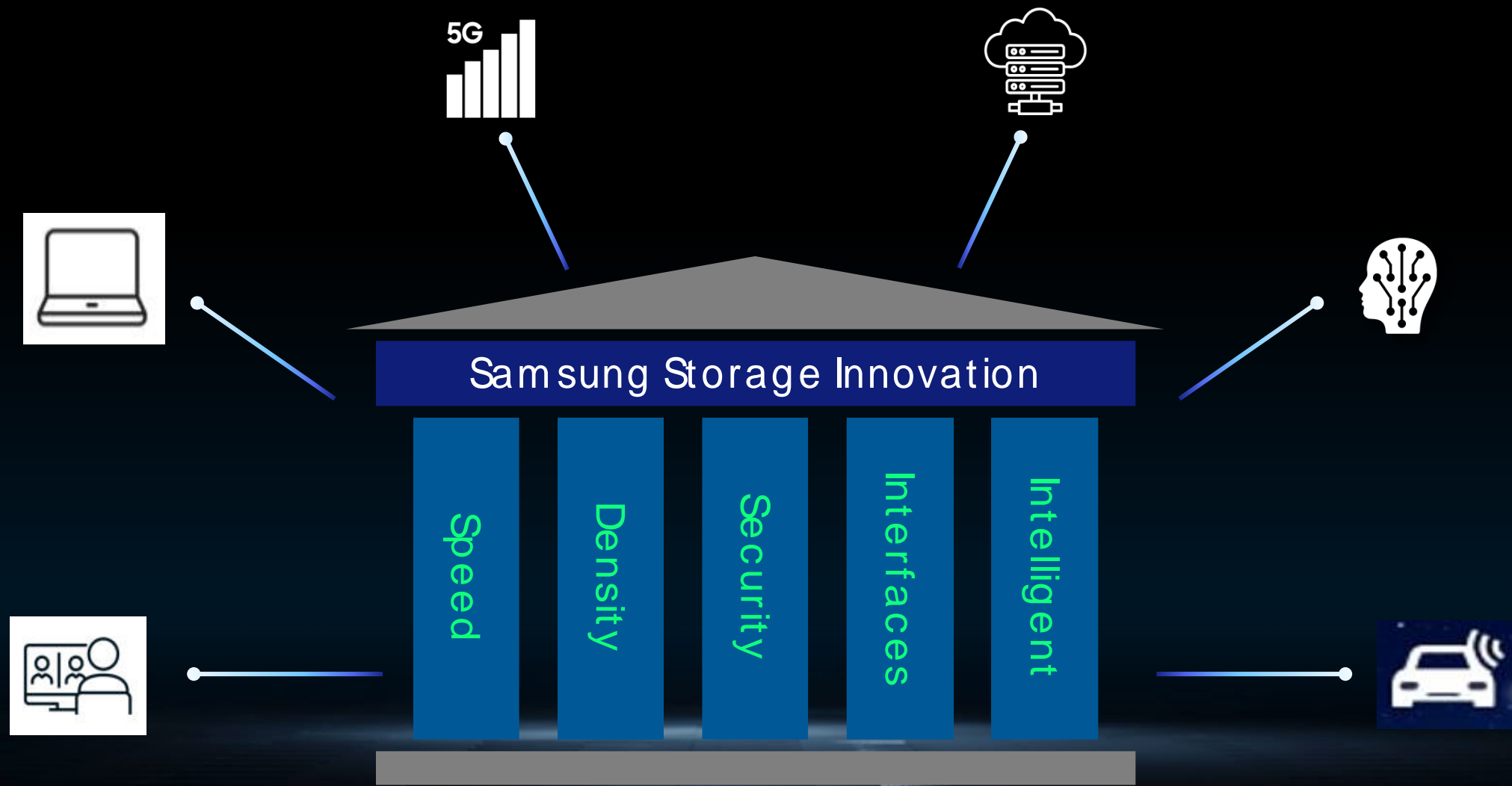


(Oracle Interview)

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The Innovation Partner - Samsung Storage

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