

エンタープライズシステム向け キオクシア SSD最新テクノロジー

2022年10月

キオクシア株式会社

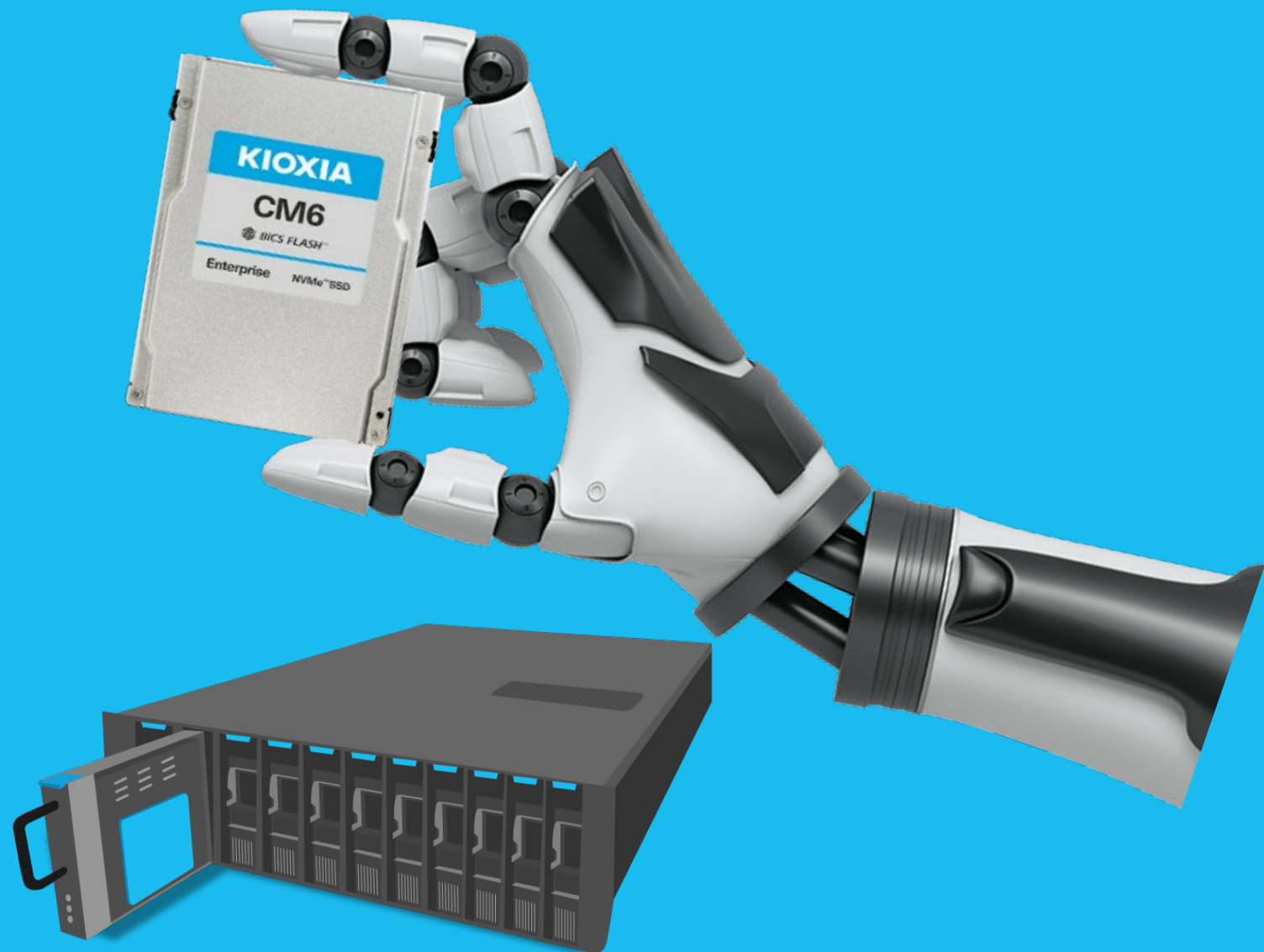
SSD応用技術部

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SSDAE-A-48188

Agenda

1. キオクシアについて
2. KIOXIA SSD製品紹介
3. 新技術への取り組み



キオクシアについて

What is KIOXIA ??

KIOXIA Corporation

KIOKU×AXIA

KIOXIA (kee-ox-ee-uh) is a combination of the Japanese word 記憶 meaning “memory” and the Greek word axia meaning “value.” Kioku, which underpins our mission and vision, goes beyond the notion of memory as mere data to broadly encompass experiences, emotions and ideas.

「記憶」で世界をおもしろくする

「記憶」の可能性を追求し、新しい価値を創り出すことで、これまでにない体験や経験を生み出し、世界を変えていく

Uplifting the world with “memory”

By evolving “memory,” we create uplifting experiences and change the world.

四日市工場

Site Area: 694,000m²



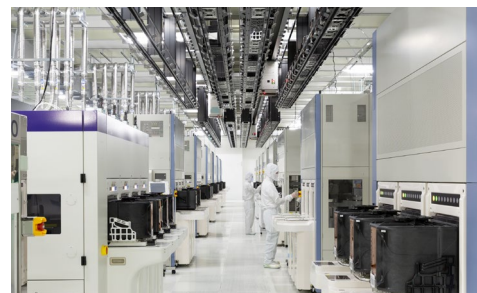
歴史

1992年 設立（1993～2002年 DRAM生産）
2002年 SanDiskとのJVにてNANDの生産開始
2005年 Y3棟 生産開始
2007年 Y4棟 生産開始
2011年 Y5棟 生産開始
2016年 N-Y2棟 生産開始
2018年 Y6棟 生産開始

特徴

世界最大級のフラッシュメモリ工場

- 生産能力を相互補完する
5棟統合生産
- 高度に自動化したクリーン
ルームにおける高効率生産
- 開発部門との密な連携



Y6 クリーンルーム



メモリ開発センター



歴史

第1製造棟 (K1)
2018年7月 着工
2022年10月 竣工
2020年 生産開始

特徴

将来の需要増加を取り込むための第2製造拠点

- ITを駆使し四日市工場と緊密に連携しモノづくり力を強化
- 3次元フラッシュメモリの生産拡大のため敷地拡張を計画

新たな成長のステージへ

四日市工場 第7製造棟（Y7）



- BiCS FLASH™の生産能力の増強
 - 人工知能(AI)を活用した生産システム導入
- | | |
|---------|---------|
| 2021年2月 | 着工 |
| 2022年春 | 第1期分の竣工 |

北上工場 第2製造棟（K2）

- 2021年春 整備工事着工

横浜テクノロジーキャンパス 技術開発新棟（仮称） 新子安研究拠点（仮称）



▲ 技術開発新棟（仮称）

▼ 新子安研究拠点（仮称）



- 拠点集結によりイノベーションを促進し、研究開発力を強化

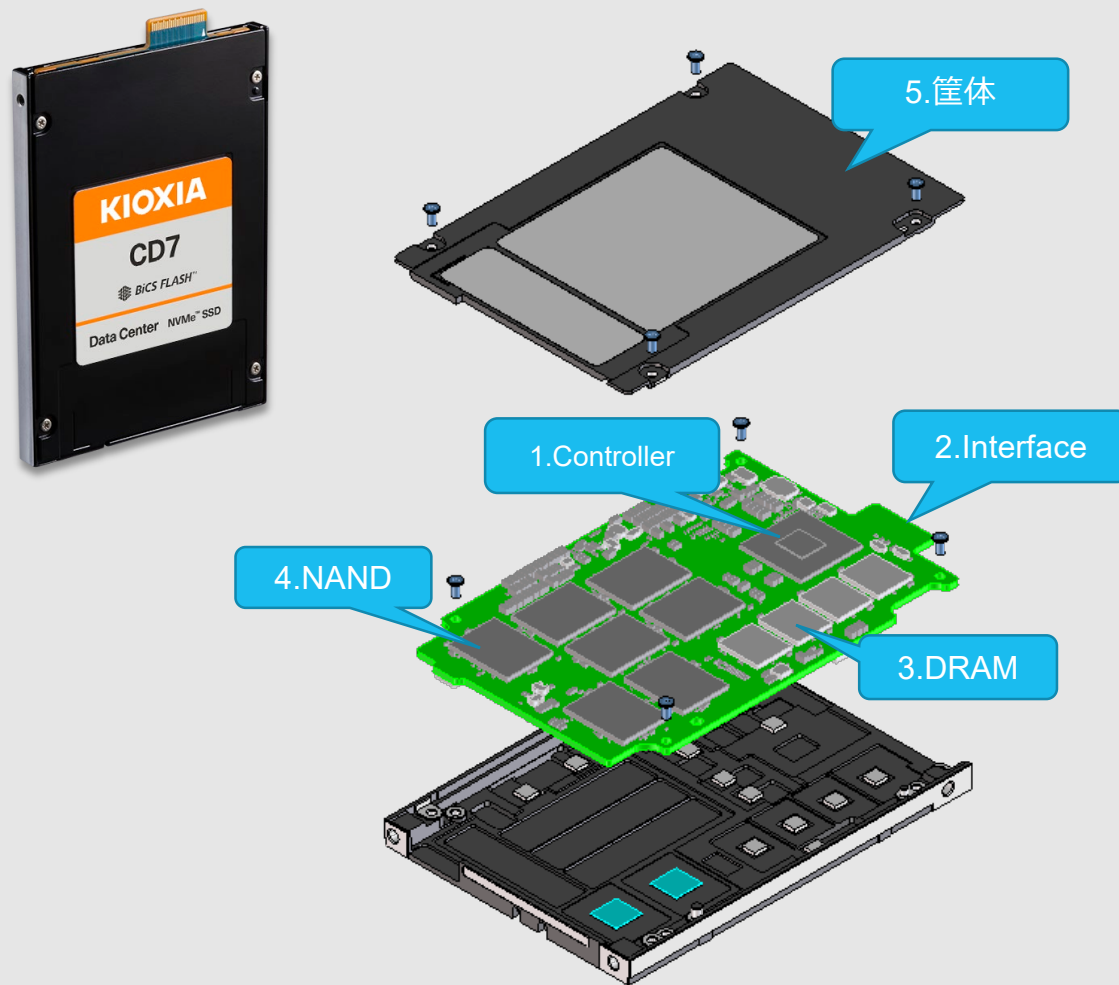
□ 技術開発新棟（仮称）

2021年秋	着工
2023年夏	竣工

□ 新子安研究拠点（仮称）

2023年夏	稼働予定
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高速化、大容量化への取り組み例



No	項目	内容
1	Controller	周波数の高速化
2	Interface	PCIe®3.0~PCIe®5.0
4	NAND	大容量化 ・ NAND 3D Layer ・ TLC~QLC ・ 小型PKG化 ・ PKGのメモリStack数大 高速化 ・ Toggle Speed向上
5	筐体	放熱設計

KIOXIA SSD製品紹介

KIOXIA Solid State Drive Solutions

Enterprise Class



**SAS 24G
SSD Series**
2.5-inch



**PCIe® 4.0
SSD Series**
2.5-inch

Data Center Class



**PCIe® 4.0
SSD Series**
2.5-inch



**PCIe® 5.0
SSD Series**
EDSFF



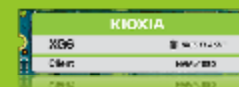
**PCIe® 4.0
SSD Series**
EDSFF



Client Class



**PCIe® 4.0
SSD Series**
M.2



**PCIe® 3.0
SSD Series**
M.2



**PCIe® 3.0
SSD Series**
M.2, BGA



Our broad portfolio includes SSDs for client PCs, data center/hyperscale and high-end servers and storage systems. KIOXIA SSDs leverage our leading-edge BiCS FLASH™ 3D flash memory and advanced controller design to deliver best-in-class quality, performance and reliability.

KIOXIA Enterprise SSDs

Designed to boost
high-performance
and high-availability
servers and storage
systems for the most
demanding
workloads



CM6 Series

- ✓ PCIe® 4.0 / NVMe™ SSD
- ✓ Dual-Port
- ✓ 2.5 inch, 15mmH
- ✓ SFF-TA-1001 (U.3)
- ✓ Up to 30,720GB
- ✓ BiCS FLASH™



PM6 Series

- ✓ SAS-4 24G SSD
- ✓ Dual-Port
- ✓ 2.5 inch, 15mmH
- ✓ Up to 30,720GB
- ✓ BiCS FLASH™



FL6 Series

- ✓ PCIe® 4.0 / NVMe™ SSD
- ✓ Dual-Port
- ✓ 2.5 inch, 15mmH
- ✓ SFF-TA-1001 (U.3)
- ✓ Up to 3.84GB
- ✓ XL-FLASH™

Definition of capacity: 1 GB = 1,000,000,000 (10⁹) bytes (see full disclaimer at end of presentation) .

KIOXIA Data Center SSDs

Designed to elevate
and data centers and
cloud-based
applications with a
balanced power to
performance
ratio



CD7 Series

- ✓ PCIe® 4.0 / NVMe™ SSD
- ✓ 2.5 inch, 15mmH
- ✓ SFF-8639 (U.2)
- ✓ Up to 15,360 GB
- ✓ BiCS FLASH™



- ✓ PCIe® 5.0 / NVMe™ SSD
- ✓ EDSFF E3.S, 7.5mm
- ✓ Up to 7,680 GB
- ✓ BiCS FLASH™

サンプル出荷中



XD6 Series

- ✓ PCIe® 4.0 / NVMe™ SSD
- ✓ EDSFF E1.S, 9.5/15/25mm
- ✓ Up to 3.840GB
- ✓ BiCS FLASH™

Definition of capacity: 1 GB = 1,000,000,000 (10⁹) bytes (see full disclaimer at end of presentation)

KIOXIA Announces 2nd Generation 24G SAS SSD With a Focus on Performance and Security

Tokyo – Targeted at enterprise applications and use cases – including high-performance computing, artificial intelligence, caching layer, and financial trading and analysis – the new drive brings improved performance, reliability and security to enterprise servers and storage.



- Dual-port to support redundancy for storage systems that require high reliability
- Flash Die Failure Protection
- Endurances: read-intensive (1 DWPD) and mixed-use (3DWPD)
- Security options available; SIE, SED and FIPS 140-2 validation ^[1]
FIPS 140-3 validation is in process (expected to be completed in 2022/M.)

I/O PERFORMANCE

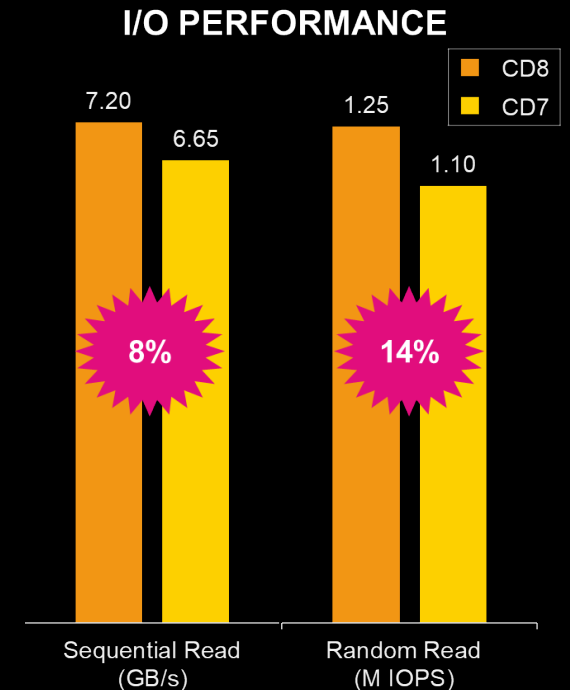


New KIOXIA CD8 Series Improves Performance Approximately 14% Over Previous Generation SSD

Tokyo – KIOXIA Corporation announced that it has built on this achievement by introducing its 2nd generation SSDs. KIOXIA CD8 Series data center NVMe™ SSDs are optimized for hyperscale data center and enterprise server-attached workloads.

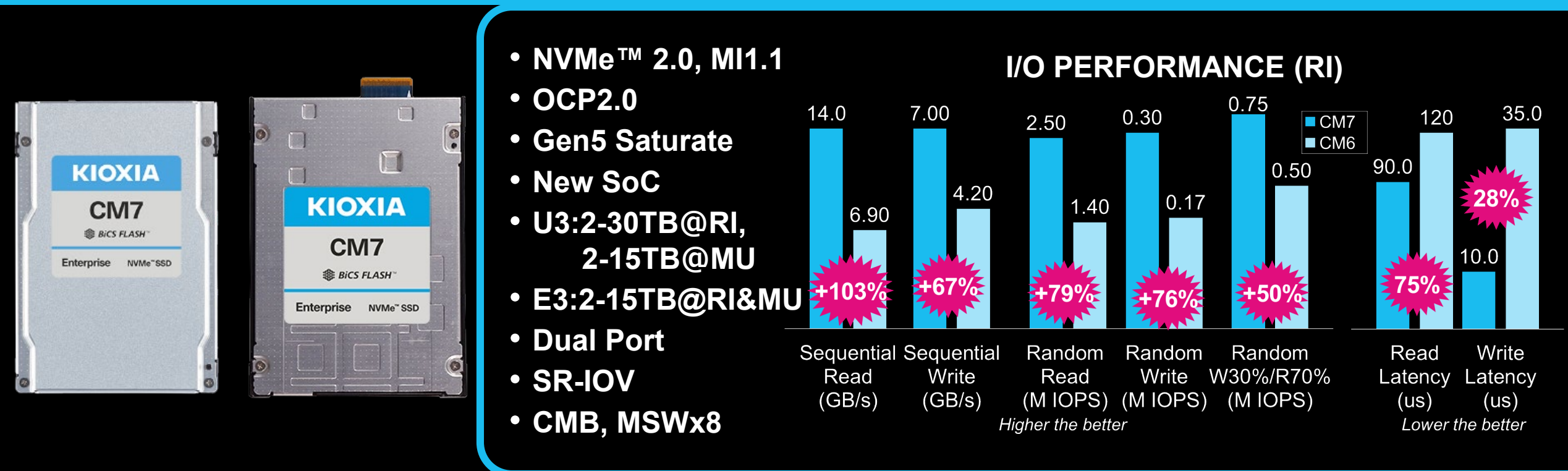


- **Endurances:** read-intensive (1 DWPD) and mixed-use (3DWPD)
- **Capacities:** from 800GB to 15.36TB
- **Delivers up to 1.25M random read IOPS and 7.2GB/s sequential read throughput**
- **Security options available:** SIE, SED^[1]
- **Utilizing 5th generation BiCS FLASH™ technology**
- **Designed to the PCIe 5.0, Open Compute Project (OCP) Datacenter NVMe™ SSD 2.0 and NVMe™ 1.4 specifications**



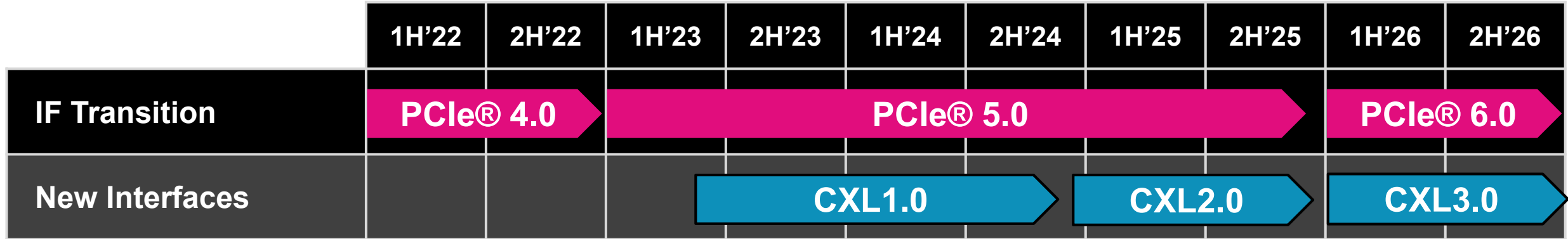
Kioxia Introduces New Levels of Performance with Enterprise NVMe™ SSD Family Designed with PCIe® 5.0 Technology

Tokyo – In another move that delivers next-generation levels of performance to enterprise data centers, Kioxia Corporation announced that its KIOXIA CM7 series enterprise NVMe™ SSDs are now shipping to select customers. Optimized for the needs of high-performance, highly efficient servers and storage, the KIOXIA CM7 series family is designed with PCIe® 5.0 technology in Enterprise and Datacenter Standard Form Factor (EDSFF) E3.S and 2.5-inch form factors^[1].



新技術への取り組み

Industry Interface Technology Trend



KIOXIA achieved

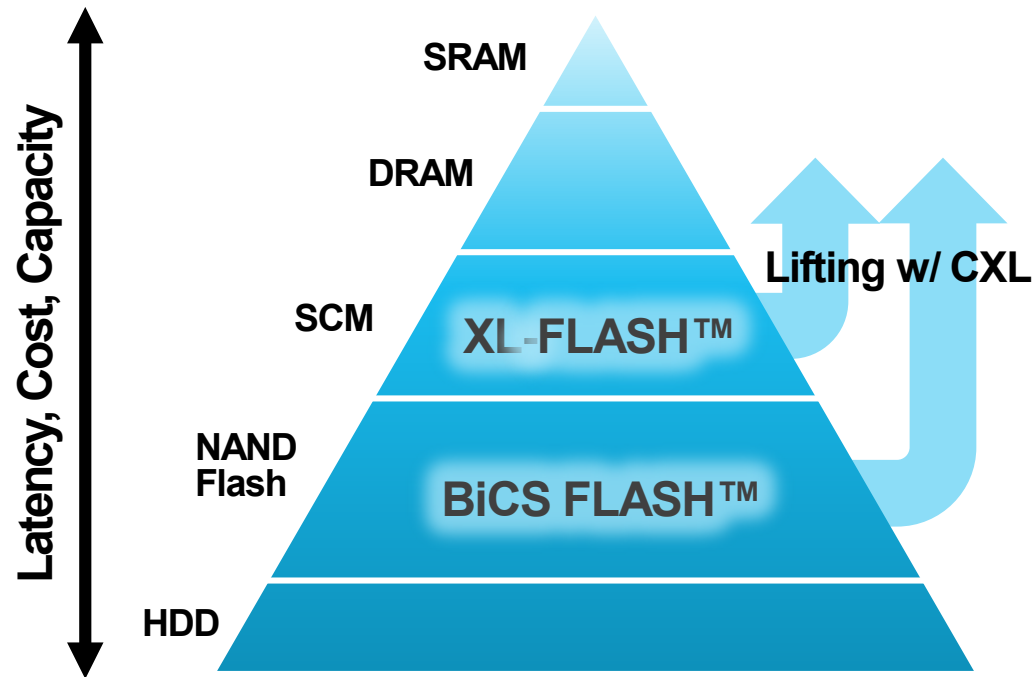
The 1st PCIe® Gen4, KIOXIA CM6 in 2020

The 1st PCIe® Gen5, KIOXIA CD7 both 2.5” and E3.S in 2021

Targeting PCIe® Gen6 products as a leader of Technology

CXL is new Interface of Flash Memory device for a Memory Tier

We Are Ready For NEXT: KIOXIA View on Flash Native Memory Hierarchy



BiCS FLASH™ as Capacity Storage

- ✓ Leading GB density

XL-FLASH™ as Storage Class Memory

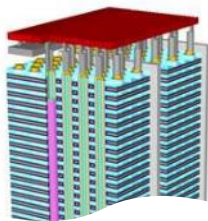
- ✓ Low latency & high endurance flash

BiCS FLASH™ for Memory Expansion with CXL

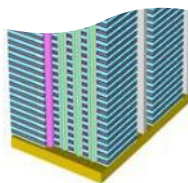
- ✓ Cost efficient “capacity memory”

Flash memory continues to expand its applications

BiCS FLASH™ Leading Technology



BiCS FLASH™
Next Gen.



*Gen. is an abbreviation for *generation*.

Vertical and Lateral Scaling Technology

2XX Layers

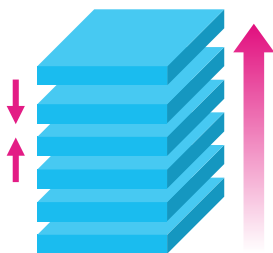
Up to 2Tb/die

4Plane

IF speed ~3.2Gbps

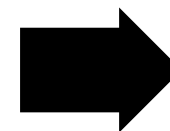
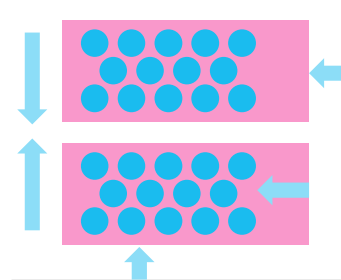
Vertical Scaling

More # of Layers



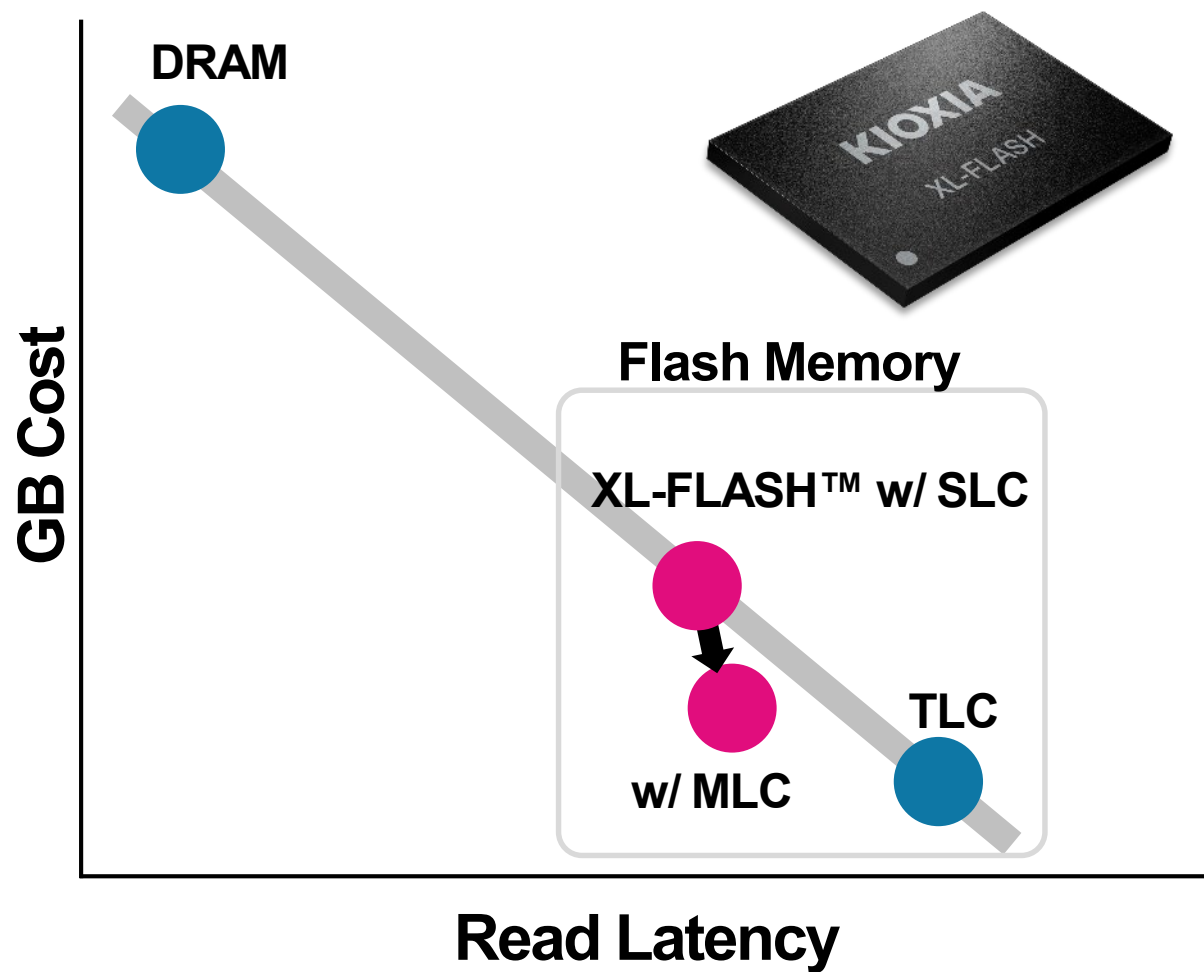
Lateral Scaling

Efficient Layout



**Leading
GB
density**

2nd Generation XL-FLASH™ with MLC offers improved balance of cost & performance



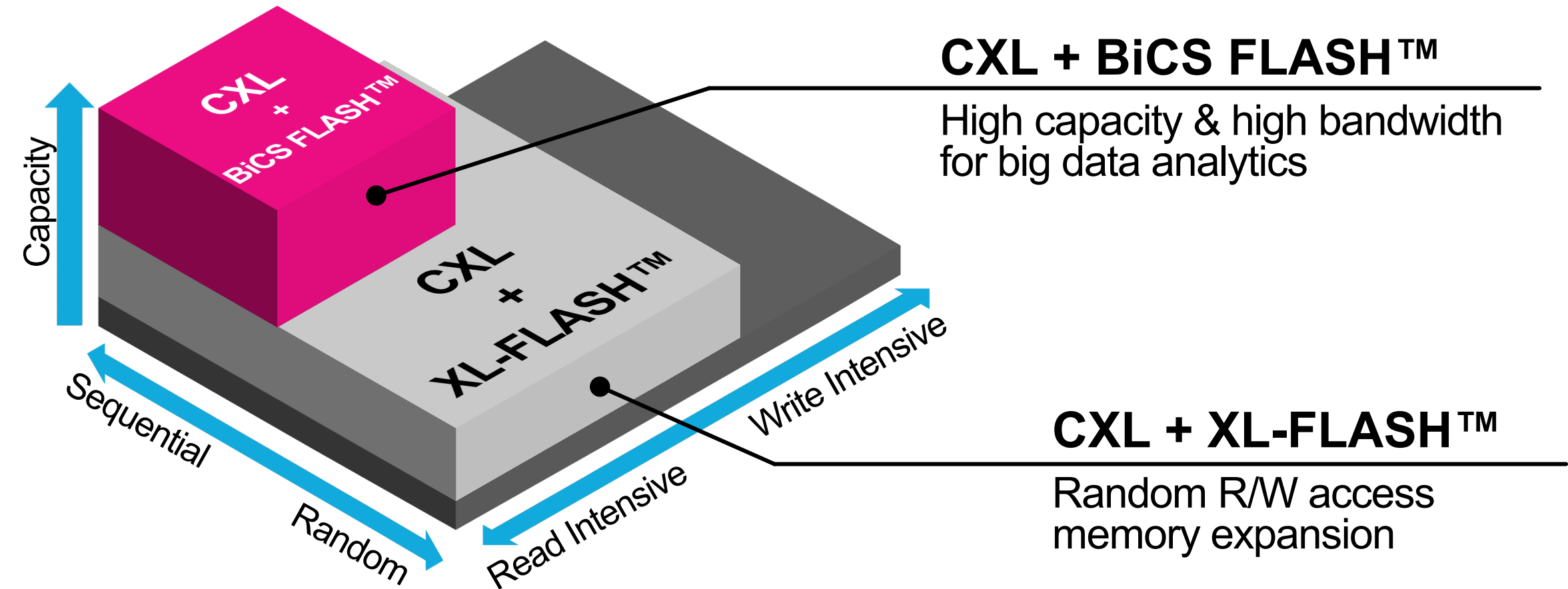
MLC enabled 2nd Gen. XL-FLASH™ is coming!!



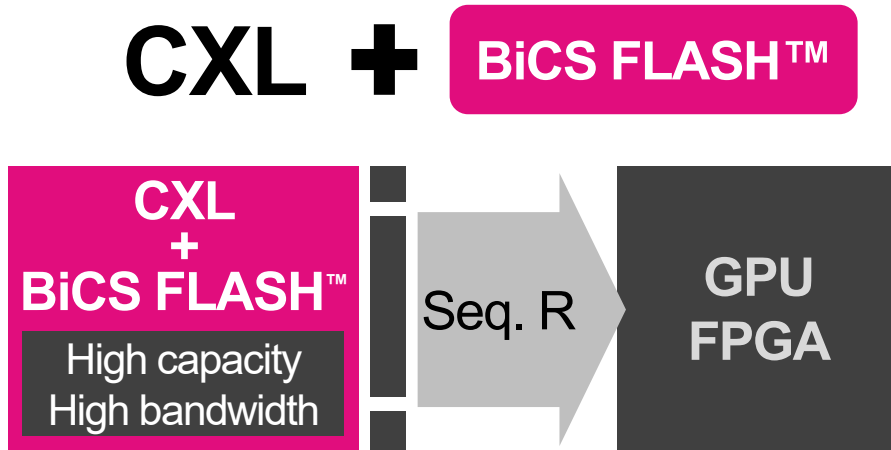
*Gen. is an abbreviation for *generation*.

Combination of CXL and BiCS FLASH™

delivering more capacity with competitive performance

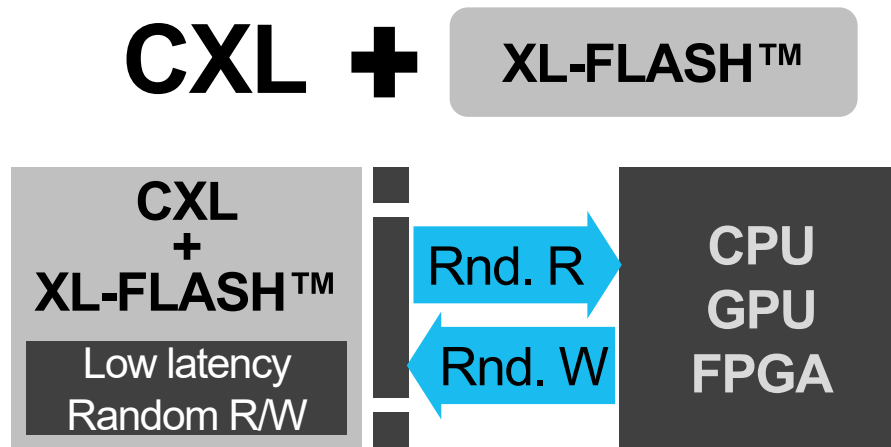


Targeting a broader set of applications by CXL with Flash memory



Targeting huge data processing

- Big data analytics
- AI/deep learning training

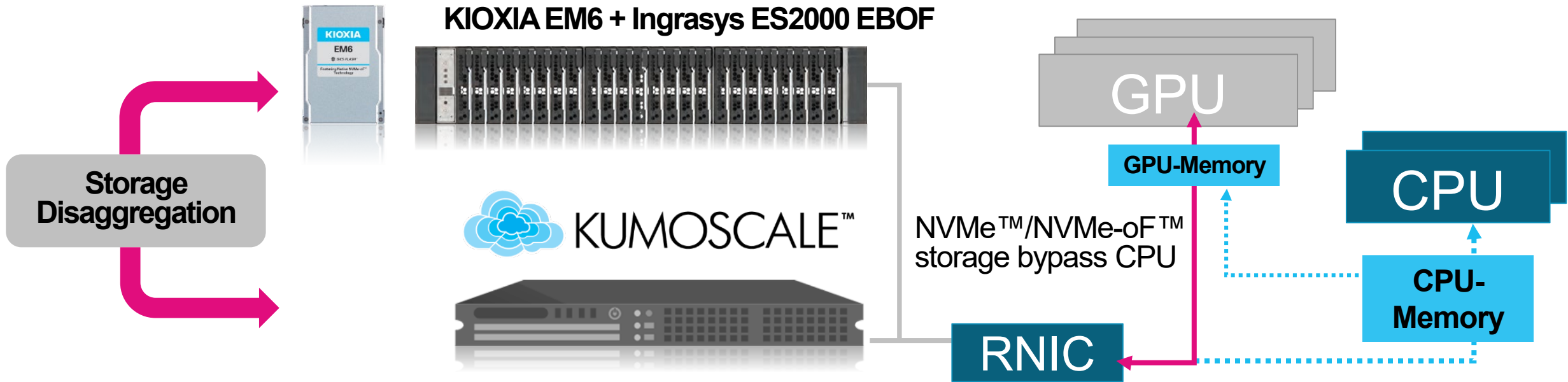


Covering wider application areas

- In-memory databases
- Graph processing
- AI/ML inference
- Memory extension for FaaS

Storage Disaggregation with KIOXIA NVMe-oF™ Technology

- KIOXIA has provided an NVMe-oF™ disaggregated storage solution for years
- Ethernet attached SSD provides complete disaggregation from any server host
- Now officially certified for GPUDirect Storage
 - EBOF and KumoScale™ work as backend storage for GPUDirect Storage, optimized for ML/AI use case



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