CXL 2.0 Use Case
Using Both DDR4 & DDR5 on the Same Server to Allow Memory & Bandwidth Scaling

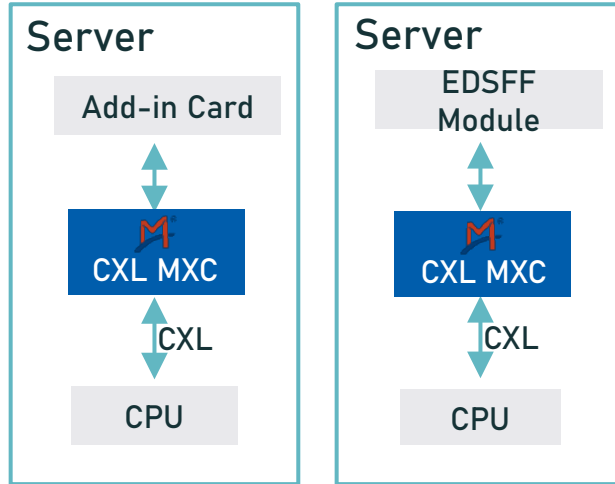Presented by: Geof Findley, WW VP Sales & Business Development
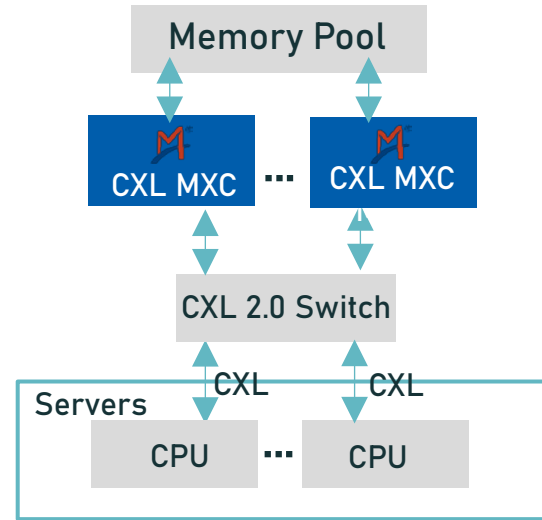
About Montage Technology

- More than 20 years in memory products – leading the industry on DDR4 and DDR5 memory interface products

- PCIe Gen 4 and 5 Retimer portfolio with design wins around the world

- Leading in shipments and mass production of CXL controllers.

- Ecosystem enabling in cloud computing & data center markets

CXL technology–based solutions available today and future products in the pipeline!
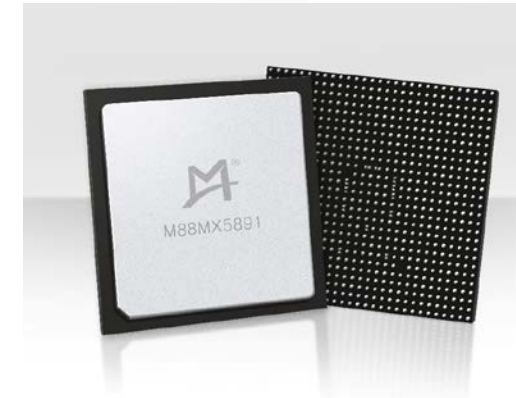
CXL Adoption in the Datacenter

Memory Expansion

Server
- Add-in Card
- CXL MXC
- CPU
- CXL

Server
- EDSFF Module
- CXL MXC
- CPU
- CXL

Memory Pooling

- Memory Pool
- CXL MXC ... CXL MXC
- CXL 2.0 Switch
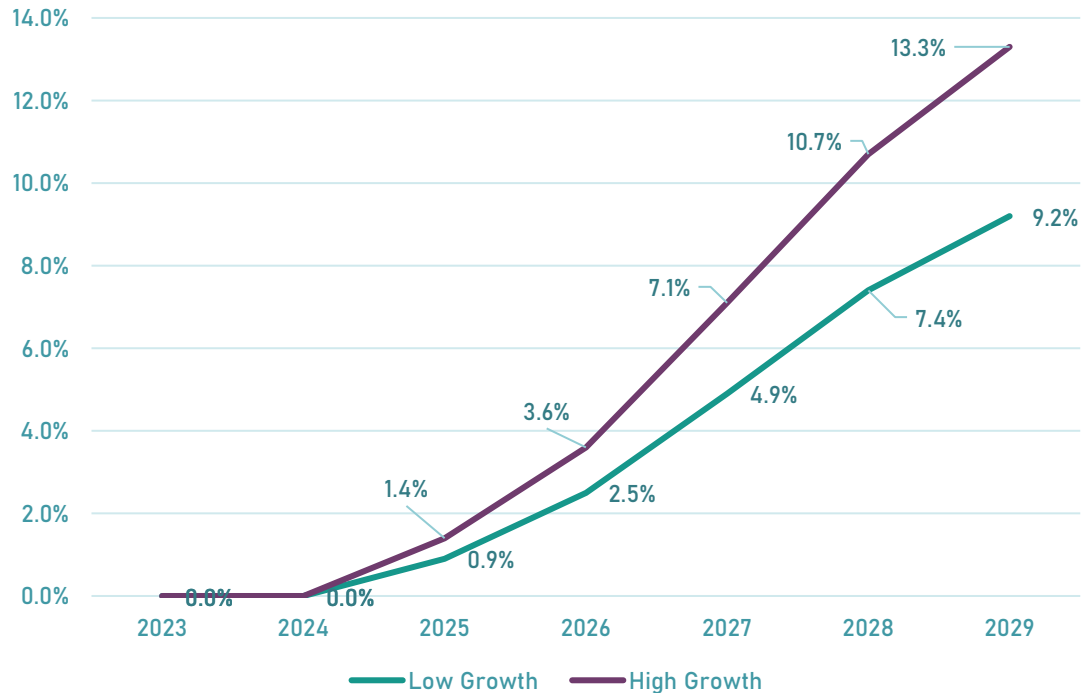- Servers: CPU ... CPU
- CXL

M88MX5891

- Industry's leading Type 3 CXL Memory eXpander Controller (MXC)
- Providing high-bandwidth and low-latency interconnect between CPU and CXL-based devices to enable memory expansion and pooling for data centers
- Compliant with DDR4/DDR5 JEDEC and CXL 2.0 specifications, supporting PCIe 5.0 speeds
- Designed for use in Add-In Card (AIC), EDSFF Memory Module and CXL pooled memory
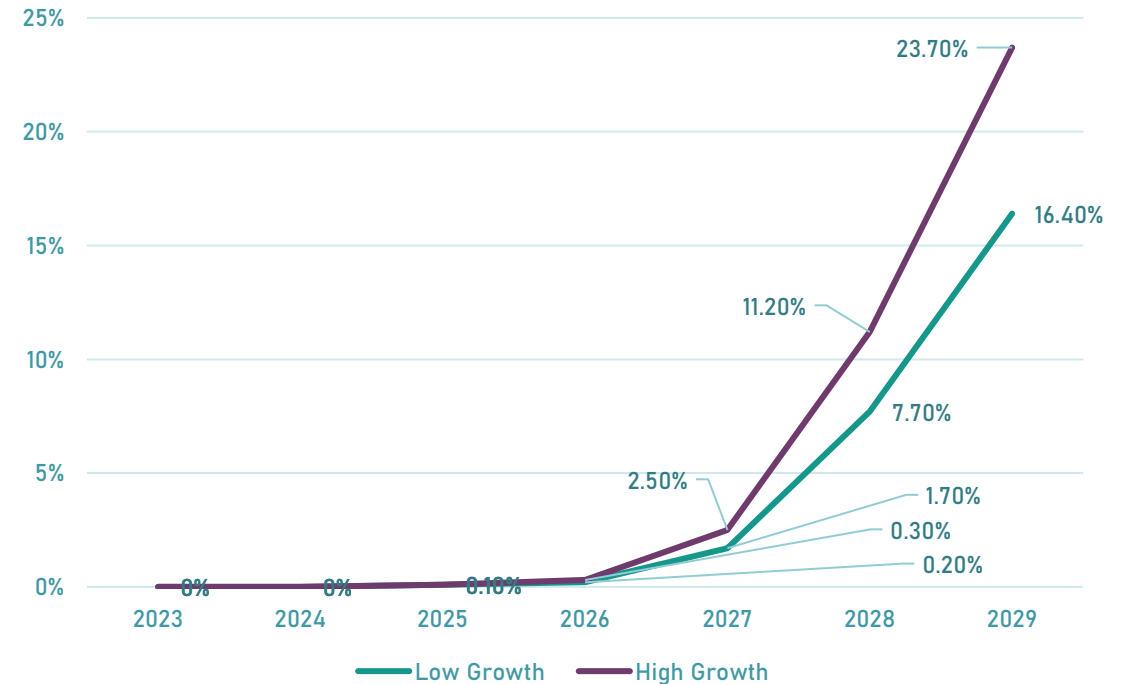
CXL Adoption in the Datacenter

Expansion usage is being challenged by 32Gb monolithic die (and corresponding 128GB RDIMM) & the emergence of MRDIMM (with higher bandwidth).

CXL Expansion Adoption (% of servers using CXL)

Year	Low Growth	High Growth
2023	0.0%	0.0%
2024	0.0%	0.0%
2025	0.9%	1.4%
2026	2.5%	3.6%
2027	4.9%	7.1%
2028	7.4%	10.7%
2029	9.2%	13.3%

CXL Pooling Adoption (% of servers using CXL)

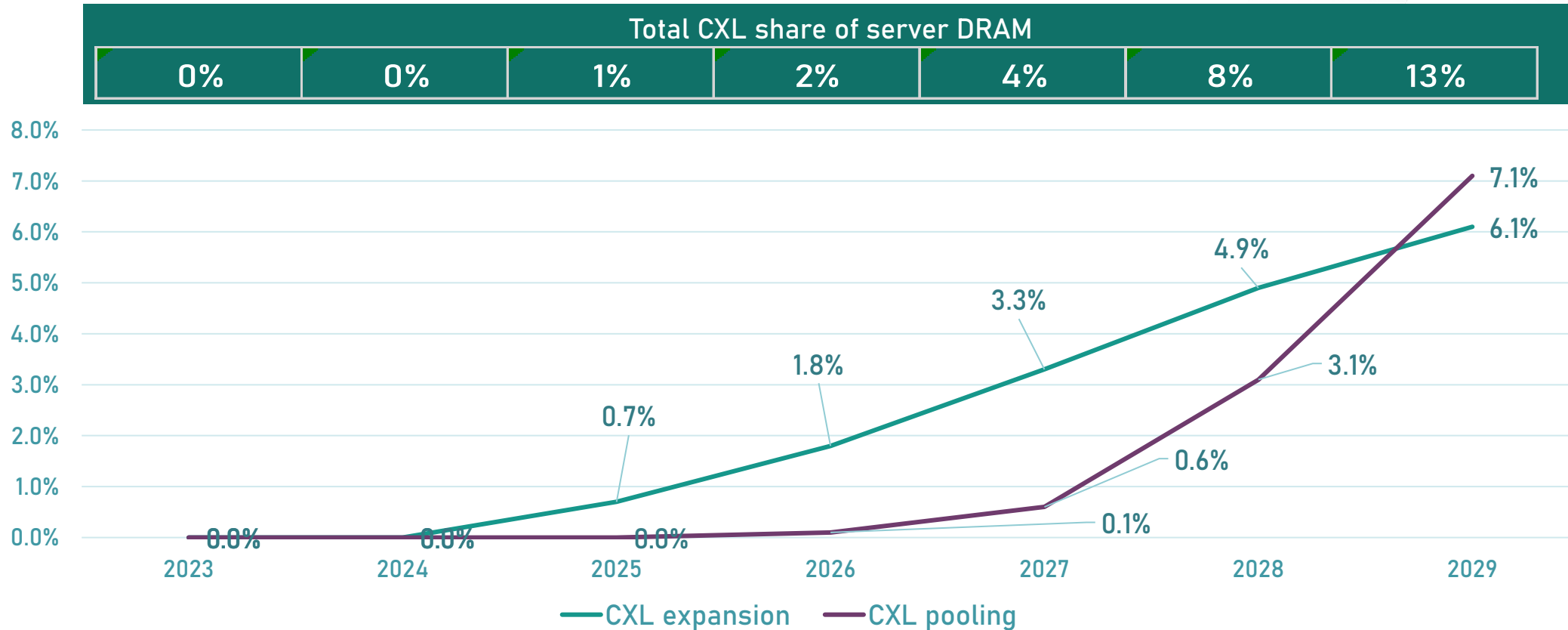| Year	Low Growth	High Growth	(thin line)
2023	0%	0%	
2024	0%	0%	
2025	0.10%	0.10%	
2026			
2027	2.50%	2.50%	
2028	7.70%	11.20%	0.30%
2029	16.40%	23.70%	1.70% / 0.20%

Source: Tech Insights

CXL Share of Server Bit Demand

DRAM behind CXL will grow to ~10% of server DRAM by 2029.

Share of server bit demand*

Total CXL share of server DRAM						
0%	0%	1%	2%	4%	8%	13%

CXL expansion: 0.0% (2023), 0.0% (2024), 0.7% (2025), 1.8% (2026), 3.3% (2027), 4.9% (2028), 6.1% (2029)

CXL pooling: 0.0% (2023), 0.0% (2024), 0.0% (2025), 0.1% (2027), 0.6%, 3.1% (2028), 7.1% (2029)

— CXL expansion — CXL pooling

* Excludes GDDR and HBM

Source: Tech Insights

CXL Memory eXpander Controller: MXC

Industry's Leading Memory Expander Controller

- CXL Type 3 Memory Expander
- CXL 1.1/2.0 compliant
- PCIe Add-In Cards
- Backplane
- EDSFF memory modules
- DIMMS or soldered down Memory
- DDR4-3200 and DDR5-6400
- Rich RAS features supported
- High BW utilization & efficiency
- Ultra Low power optimized for Modules

Module Partners TODAY...

- Samsung
- SK hynix

DRAM Bandwidth and Capacity Aggregation across Multiple CXL™ Modules

CXL DRAM Memory Controller (MXC)

- CXL Type3 Memory Expander
- CXL 1.1 / 2.0 Compatible
- CXL.IO Gen5 support, up to 32GT/s
- Fully JEDEC DDR4/5 complaint and capable
- Rich RAS features supported
- DDR4 up to 3200 MT/s and DDR5 up to 6400 MT/s
- High BW utilization & efficiency
- Single Numa Hop Memory Latency optimized
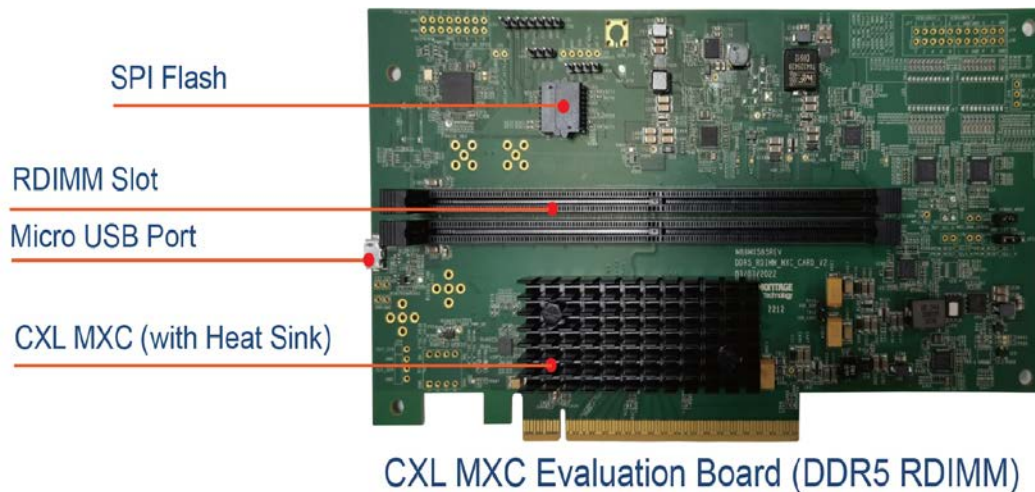- Ultra-Low Power Design optimized for Modules

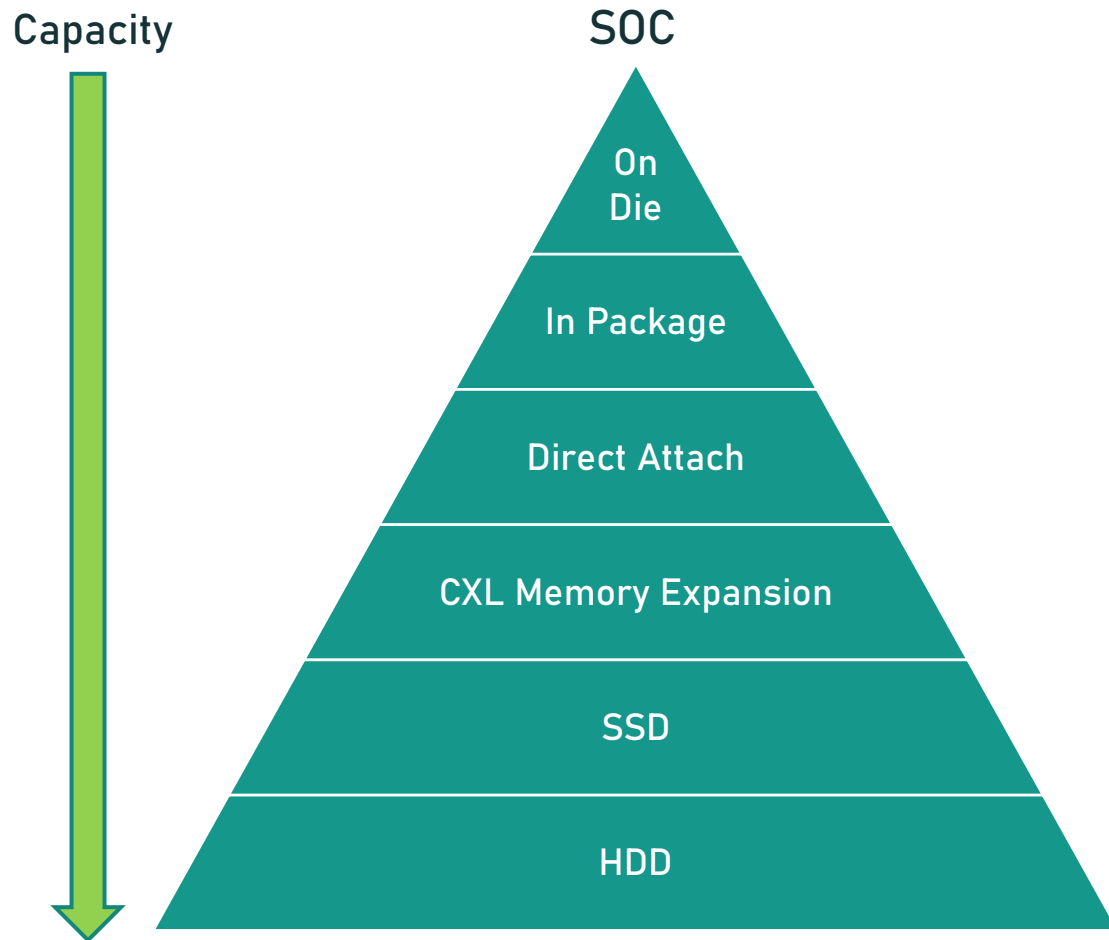**Partners:** MemVerge, MONTAGE Technology, SAMSUNG, SK hynix, Micron

MXC Features

The MXC provides *high-bandwidth and low-latency interconnect* between the CPU and the CXL-based devices, allowing them to share memory for higher performance, reduced software stack complexity, and lower data center TCO.

- **CXL Type 3 Memory eXpander Controller**
  - Integrated CXL Controller
  - DDR 4/5 Controller
  - RISC-V micro-processor
  - On-Chip PVT Sensor
  - SMBus, I3C, I2C, SPI Interfaces
  - 767 ball FCCSP package

- **CXL Controller**
  - Compliant with CXL 1.1 and CXL 2.0 RAS specifications
  - Supports CXL.mem and CXL.io protocols
  - X8 PCIe 5.0 interface up to 32GT/s
  - Rich RAS features

- **DDR Controller**
  - Compliant with JEDEC DDR4/5 standards
  - Supports DDR4/5 UDIMM, RDIMM, soldered down DRAM
  - Supports DDR4-3200 and DDR5-6400
  - Low-power consumption
  - Optimized DDR I/O equalization
  - Programmable I/O impedance

SPI Flash

RDIMM Slot

Micro USB Port

CXL MXC (with Heat Sink)

CXL MXC Evaluation Board (DDR5 RDIMM)

MXC Performance

Capacity

SOC

Direct Attach Memory is not able to keep up with the capacity requirements per core.

CXL Memory Expansion addresses this issue!

- 4 ranks DDR5 per sub channel
- Two 40bit DDR5 Sub Channels
- One 72-bit DDR4 channel
- 2 DIMMs per channel
- Accommodate up to 80 DRAM placements
- Low Power
- 1.28TByte Capacity with 3DS DRAM
- Latency Optimized to 1 NUMA hop

The pyramid (top to bottom): On Die, In Package, Direct Attach, CXL Memory Expansion, SSD, HDD

Status

✅ All major SOC suppliers

✅ All major memory suppliers

Contact your module provider for solution availability.

8/28/2024

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Call to Action

Now is the time to invest in CXL!

- The MXC CXL controller is available from Montage today, both as raw silicon and on a reference board.

- Add-in card, such as those offered by Samsung & SK Hynix, are available today.

- Servers with CXL slots are being offered by all major OEMs.

- Demonstrations are available showcasing CXL's increases in performance for memory-bound applications.

- View our demo featuring multiple suppliers with multiple technologies & speeds – all working on Intel's latest platform – in the Exhibitor Area!

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Thank You