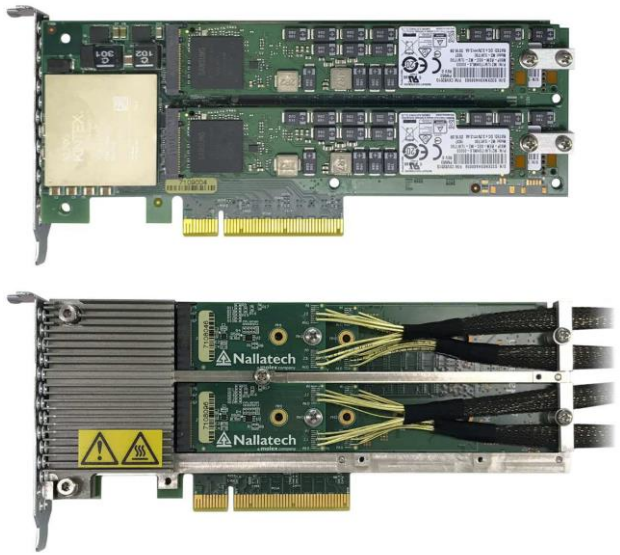
OpenCAPI and CAPI2 Adapters

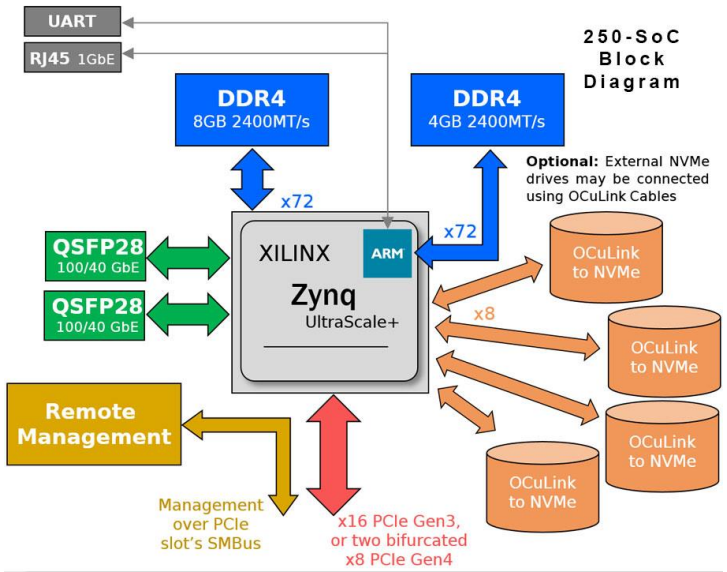


Nallatech 250S+

Storage Expansion

- Xilinx US+ KU15P FPGA
- 4 GB DDR4
- PCIe Gen4 x8 and CAPI2
- 4x M.2 Slots
- M.2 to MiniSAS or Oculink for U.2 drive support

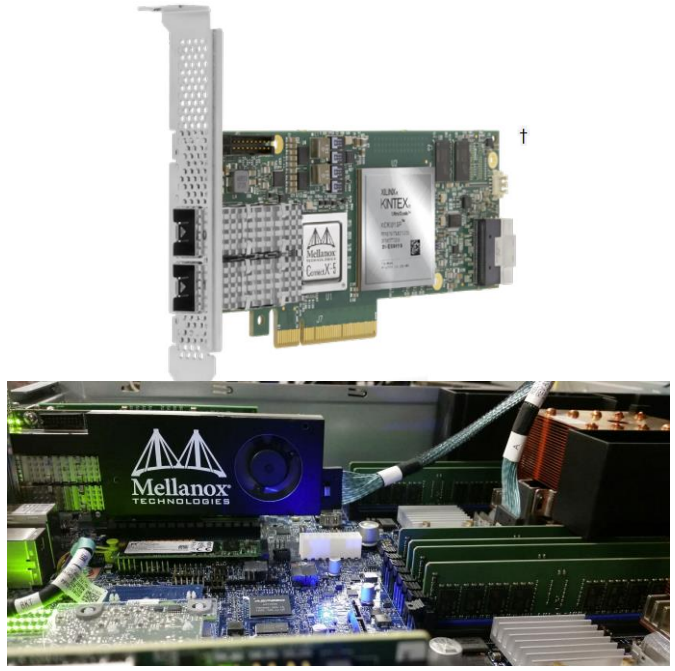
CAPI Flash API, Accelerated DB, Burst Buffer



Nallatech 250-SoC

Multipurpose Converged Network / Storage

- Xilinx Zynq US+ ZU19EG FPGA
- 8/16 GB DDR4, 4/8 GB DDR4 ARM
- PCIe Gen4 x8 or Gen3 x16, CAPI2
- 4 x8 Oculink Ports support NVMe, Network, or OpenCAPI
- 2 100Gb QSFP28 Cages



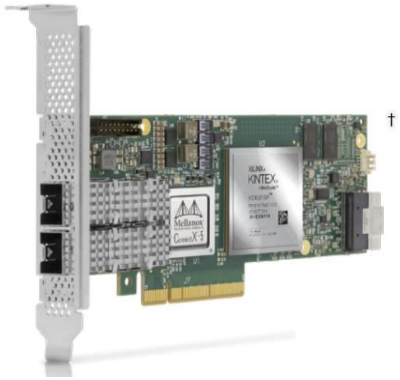
Mellanox Innova2

Network + FPGA

- Xilinx US+ KU15P FPGA
- Mellanox CX5 NIC
- 16 GB DDR4
- PCIe Gen4 x8
- 2 25Gb SFP Cages
- X8 25Gb/s OpenCAPI Support

Network Acceleration (NFV, Packet Classification), Security Acceleration

OpenCAPI and CAPI2 Adapters



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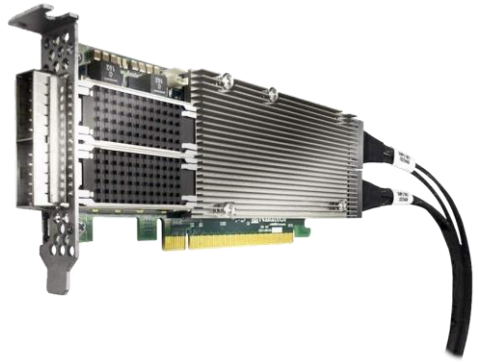
Available in HDK



Nallatech 250-SoC

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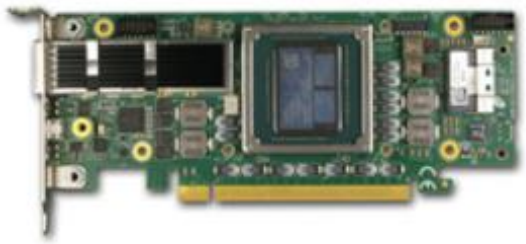
- 4 x8 Oculink Ports support NVMe, Network, or OpenCAPI
- 2 100Gb QSFP28 Cages

NVMEoF Target, High BW Storage Server

Available in OC-Accel and HDK



AlphaData ADM-9H3

Medium FPGA with 8GB HBM

- Xilinx Virtex US+ VU33P-3 FPGA + HBM
- 8GB High Bandwidth Memory
- PCIe Gen4 x8 or Gen3 x16, CAPI2
- 1 x8 25 Gb/s OpenCAPI Ports
- 1 2x100Gb QSFP28-DD Cage

ML/DL, Inference, System Modeling, HPC

Available in OC-Accel and HDK

AlphaData ADM-9H7

Large FPGA with 8GB HBM

- Xilinx US+ VU37P FPGA + HBM
- 8GB High Bandwidth Memory
- PCIe Gen4 x8 or Gen3 x16, CAPI2
- 2 x8 25 Gb/s OpenCAPI Ports (support up to 50 GB/s)
- 4 100Gb QSFP28 Cages

ML/DL, Inference, System Modeling, HPC

Available in OC-Accel and HDK

OpenCAPI and CAPI2 Adapters

AlphaData ADM-9V3

High Performance Reconfigurable Computing

- Xilinx US+ VU3P FPGA
- 16 / 32 GB DDR4
- PCIe Gen3 x16 or Gen4 x8 and CAPI2
- 2 QSFP28 Cages
- **X8 25Gb/s OpenCAPI SlimSAS**

Data Center, Network Accel, HPC, HFT

AlphaData ADM-9H7

Large FPGA with 8GB HBM

- Xilinx US+ VU37P FPGA + HBM
- 8GB High Bandwidth Memory
- PCIe Gen4 x8 or Gen3 x16, CAPI2
- **2 x8 25 Gb/s OpenCAPI Ports (support up to 50 GB/s)**
- 4 100Gb QSFP28 Cages

ML/DL, Inference, System Modeling, HPC

AlphaData ADM-9V5

High Performance Reconfigurable Computing

- Xilinx Virtex US+ VU9P-3 FPGA
- 16 / 32 GB DDR4
- PCIe Gen3 x8 and CAPI2
- 4 QSFP-DD Cages
- **X8 25Gb/s OpenCAPI SlimSAS**

LLT, Network Accel, HFT

Molex Flash Storage Accelerator (FSA)

Hyper Converged Acceleration Platform

Each Card contains:

- x8 25Gb/s OpenCAPI Port
- Xilinx Zynq ZU19 US+ FPGA with ARM core
- Up to 256GB DDR4 Memory
- 8 NVMe x4 connections (16TB)
- 2 100Gb/s IO Cages

Designed to fit 4 cards in BarrelEye G2

- **200 GB/s Bidirectional BW to host CPUs**
- **200 GB/s Bidirectional IO**
- **64TB NVMe**
- **1 TB DDR4 Memory**

200 GB/s IO

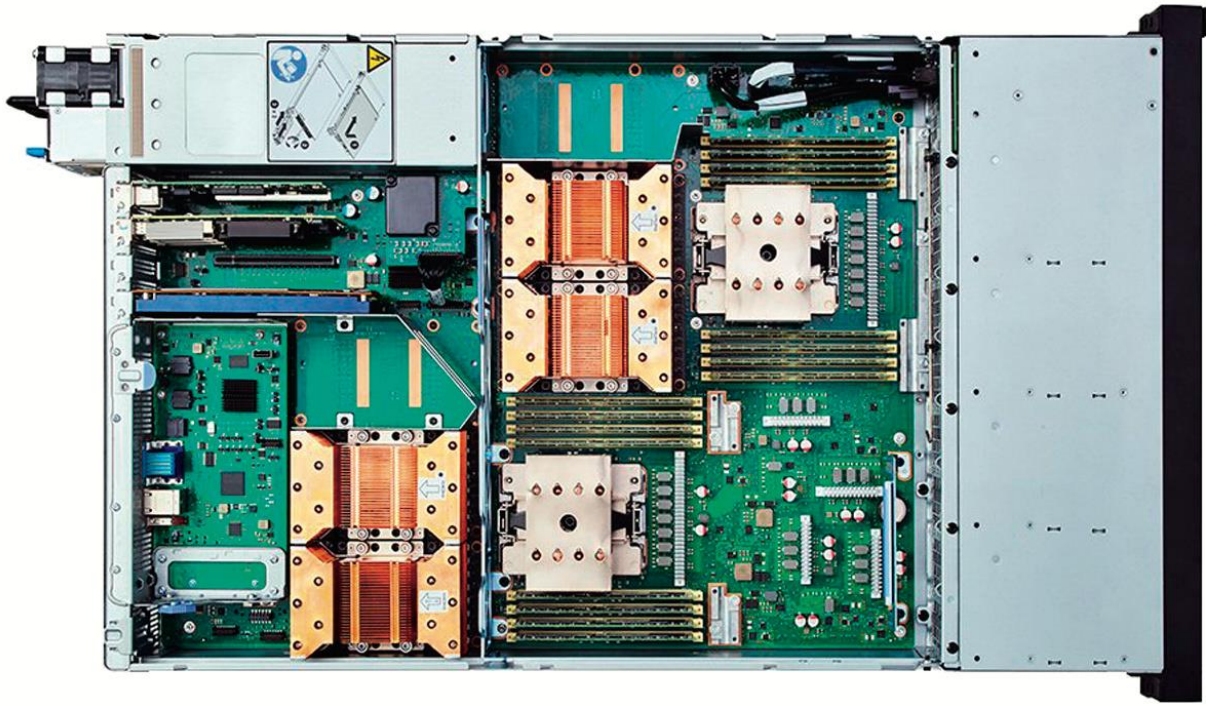
"FSA is designed to natively support the benefits of OpenCAPI by providing the lowest possible latency and highest bandwidth to NVMe Storage with the added benefits of OpenCAPI Flash functionality and near storage FPGA acceleration. HPDA applications such as Graph Analytics, In-Memory Databases and Bioinformatics are expected to benefit greatly from this platform."

Allan Cantle, Founder of Nallatech

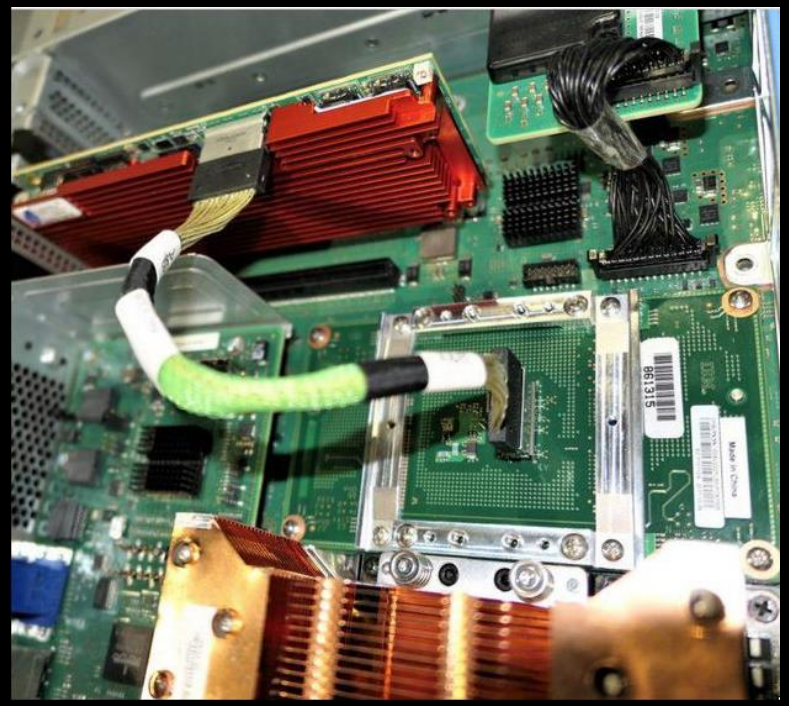
Power9 Systems with OpenCAPI

IBM AC922

Air Cooled



* Future Support



System Details

- 2 – Socket 2U
- Up to 40 cores
- Up to 2TB memory (16 DDR4 Dimms)
- 4 Gen4 PCIe Slots, 3 CAPI2.0 Enabled
- 2 2.5” SFF Drive Bays
- 4 OpenPOWER Mezzanine Sockets
  - Up to 4 NVLink V100 GPUs
  - Up to 4 socketed OpenCAPI Adapters*
  - Up to 2 cabled OpenCAPI Cards w/ SlimSAS adapter*

IBM IC922

- **System Details**
  - 2 Socket 2U
  - Up to 44 cores
  - Up to 4 TB memory (32 DDR4 DIMMs)
  - 4 Gen4 PCIe Slots, CAPI2.0 Enabled
  - 6 Gen3 PCIe Slots
  - Up to 24 SFF / 12 LFF Drives
  - 4 x8 25 Gbps Ports
    - Up to 4 cabled OpenCAPI Adapters*

Power9 Systems with OpenCAPI

wistron Mihawk

- 2 Socket 2U
- Up to 48 cores
- Up to 4TB memory (32 DDR4 DIMMs)
- 4 Gen4 PCIe Slots, CAPI2.0 Enabled
- 6 Gen3 PCIe Slots
- Up to 24 SFF / 12 LFF Drives
- 4 x8 25 Gbps Ports
  - Up to 4 cabled OpenCAPI Adapters*

"In order to provide the best backend architecture in AI, Big Data, and Cloud applications, Wistron POWER9 system design incorporates OpenCAPI technology through 25Gbps high speed link to dramatically change the traditional data transition method. This design not only improves GPU performance, but also utilizes next generation advanced memory, coherent network, storage, and FPGA. **This is an ideal system infrastructure to meet next decade computing world challenges.**"

Donald Hwang, CTO and President of EBG at Wistron Corporation.

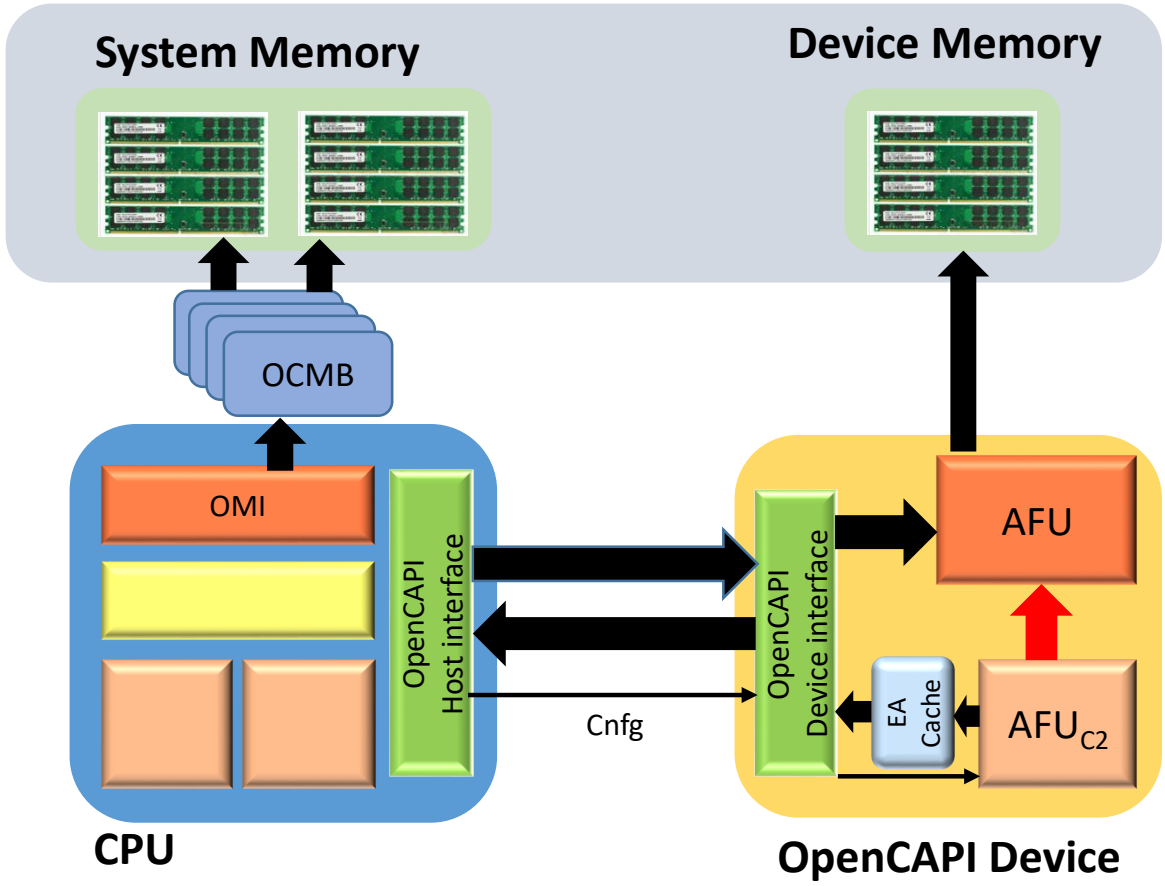
OpenCAPI in Power 10

OpenCAPI attach capabilities are broken into two subclasses

- Compute (AFU_c) for function acceleration using a more traditional IO model with DMAs mastered by the device
- Memory (AFU_m) for attaching various memory technologies using Loads / Stores mastered by the host

Power 9: OpenCAPI 3.0 @ 25 Gbps
- AFU_{C1}, AFU_{M1}

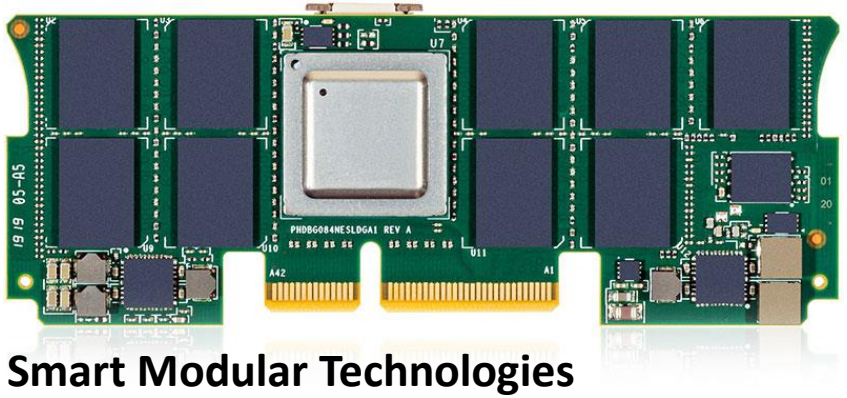
Power 10: OpenCAPI 3.1 @ 25.6 Gbps
- OpenCAPI Memory Interface (OMI)



OMI Products

Microchip Smart Memory Controller
SMC 1000 X825G

- 1 × 8, 1 × 4 support
- OIF-28G-MR
- Up to 25.6 Gbps link rate
- Dynamic low-power modes

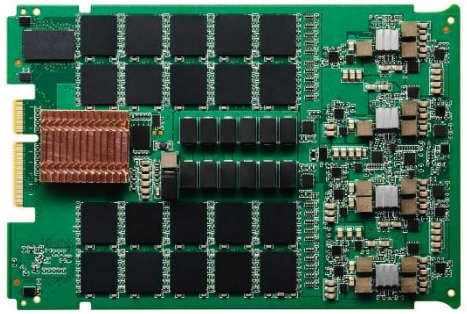


Smart Modular Technologies
DDR4 Differential DIMM (DDIMM)

- Throughput of 25.6GB/s
- Latency of 40ns
- Serial interface
- High speed data transfer rates
- High density up to 256GB

OMI Products

IBM
POWER 10 E1080

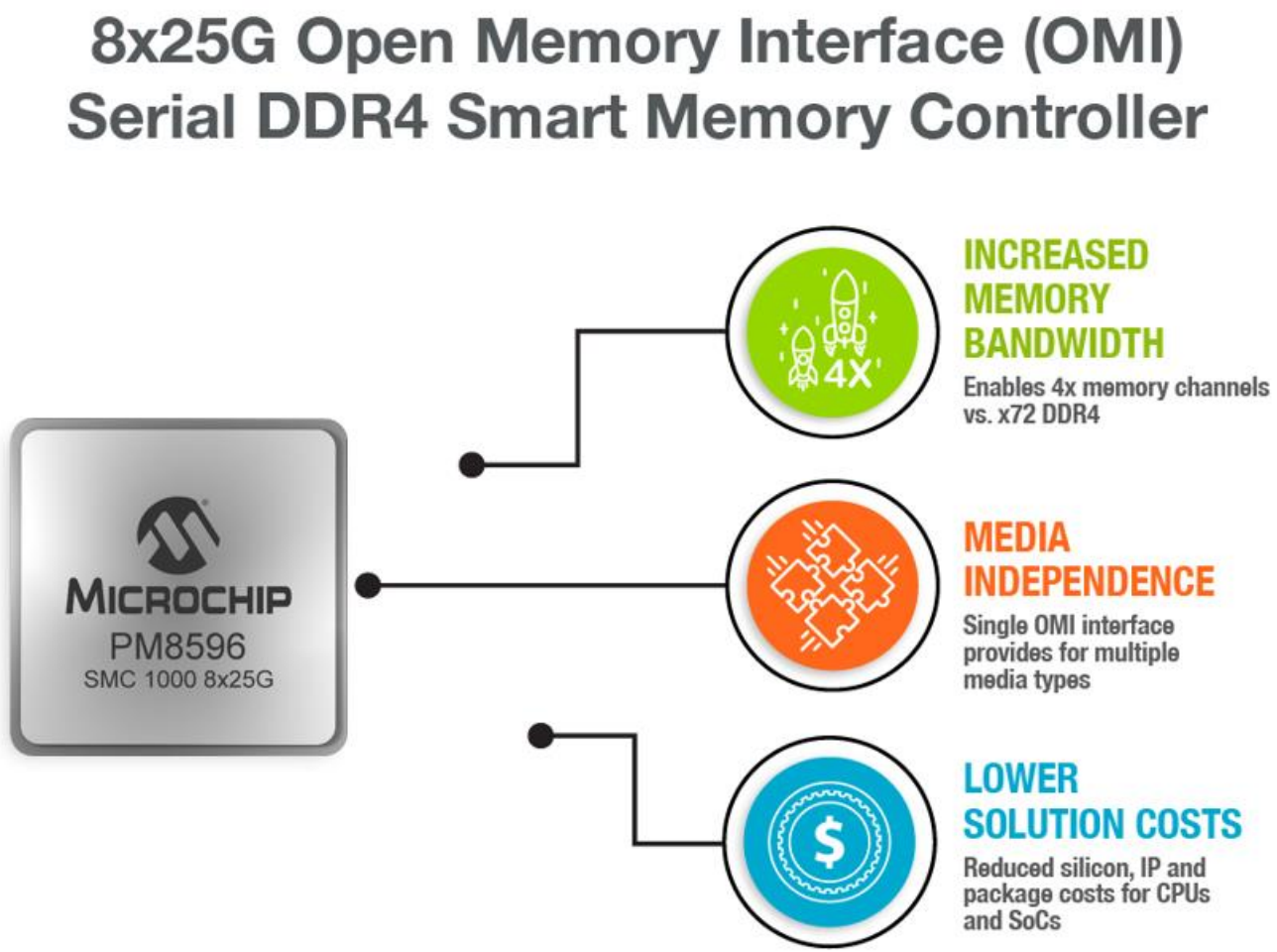


E1080 4U DDIMM Module

- 16 available high-speed OMI links driven by 8 on-chip memory controller units (MCUs)
- total aggregated bandwidth of up to 409 GBps per single chip module
- DDIMM densities supported are 32 GB, 64 GB,128 GB and 256GB

  2-node system has a maximum of 32 TB capacity
- 4-node system has a maximum of 64 TB capacity

OMI Products



What is the SMC 1000 8x25G

- **OMI Interface**
  - 1x8, 1x4 support
  - OIF-28G-MR
  - Up to 25.6 Gbps link rate
  - Dynamic low power modes
- **DDR4 Memory Interface**
  - x72 bit DDR4-3200, 2933, or 2666 MT/s memory support
  - Supports up to 4 ranks
  - Supports up to 16 GBit memory devices
  - 3D stacked memory support
- **Persistent Memory Support**
  - Support for NVDIMM-N modules
- **Intelligent Firmware**
  - Open Source Firmware
  - On-board processor provides DDR/OMI initialization, and in-band temperature and error monitoring
  - ChipLink GUI
- **Security and Data Protection**
  - Hardware root-of-trust, secure boot, and secure update
  - Single symbol correction/double symbol detection ECC
  - Memory scrub with auto correction on errors
- **Small Package and Low-Power**
  - Power optimized
  - 17 mm x 17 mm package
- **Peripherals Support**
  - Support for SPI, I^2C, GPIO, UART and JTAG/EJTAG