The Latest on Form Factors

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Co-chair SSD SIG

SNIA COMPUTE, MEMORY, AND STORAGE SUMMIT

Solutions, Architectures, and Community
VIRTUAL EVENT, MAY 21-22, 2024

EDSFF Value

- Optimized form factor for different enterprise and data center use cases
  - Compute SSD: E1.S, designed to fit in 1U server, hot plug, modular, heat sink options for different environments. Higher capacity than M.2, same performance as U.2
  - Storage: E1.L, E3.L, designed for max capacity per rack unit
  - Mainstream enterprise server: E3.S, support 1U and 2U server, higher drive count than U.2 for more io performance
  - CXL: E3.S 2T,
- Performance scaling
  - More drives per server for higher throughput and IOPS
- Interface future-proof
  - Support for PCIe 5.0, 6.0, CXL 2.0/3.0
- Thermal efficiency
  - Lower airflow to reduce power from fans, heatsink options

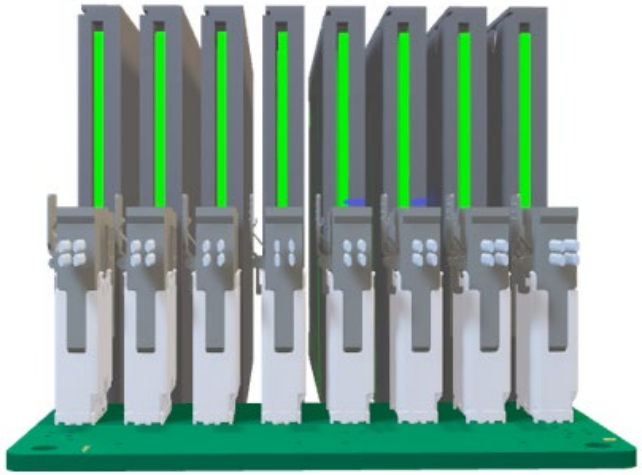
EDSFF Spec Update

SFF Spec	Title	Description	Latest Version	New Features
SFF-TA-1006	E1.S	1U short form factor	1.5 (Aug 2021)	Power is informative now
SFF-TA-1007	E1.L	1U long form factor, capacity optimized	1.2 (July 2021)	
SFF-TA-1008	E3	Defines E3.S, E3.S 2T, E3.L, E3.L 2T	2.1 (Oct 2023)	Addition of NIC sidebands, 2x1C, clarifications
SFF-TA-1002	Connector	Protocol Agnostic Multi-Lane High Speed Connector	1.5 (April 2024)	PCIe 6.0 support, additional SM thickness, errata. SFF-TA-1033: Internal High-Speed Cable / Modular Connector System
SFF-TA-1009	Pin and Signal Specification	pin list and pin placement, function of the pins, device specific electrical requirements, and specific features of enterprise and datacenter-based devices	4.0 (May 2024)	PCIe 6.0 support, CXL LED
SFF-TA-1034	Pluggable Multipurpose Module (PMM)	New specification built for general purpose devices in a front or rear loadable form factor	1.0 (May 2024)	
SFF-TA-1023	EDSFF Thermal	Defines thermal and airflow requirements	1.0a	

EDSFF Delivers Superior System Design

Superior Signal Integrity

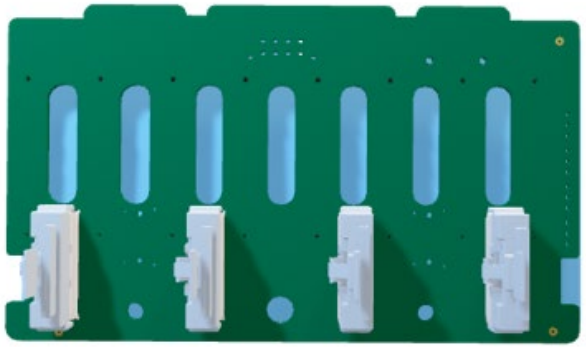
- Mainboard direct connection to SFF-TA-1002 1C connectors/SSDs and reduce the backplane routing signal loss
- Reduce ~40% of the signal loss



E3.S SSD + EDSFF Backplane

Better Air Flow

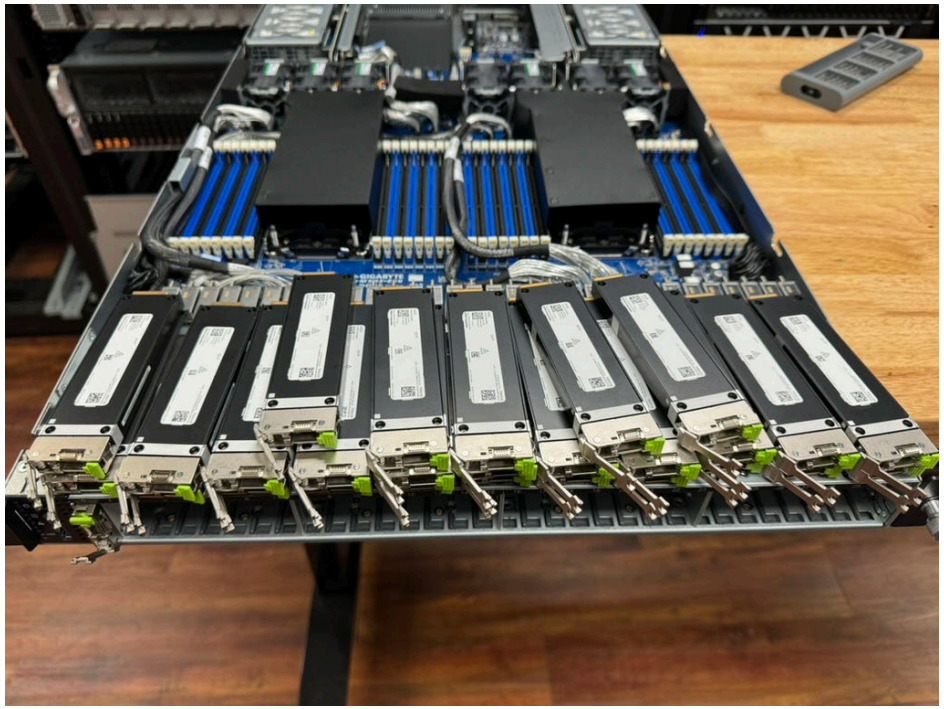
- No vertical backplane blocking the air flow
- ~ 75% increase front opening
- ~ 20% improve system CFM

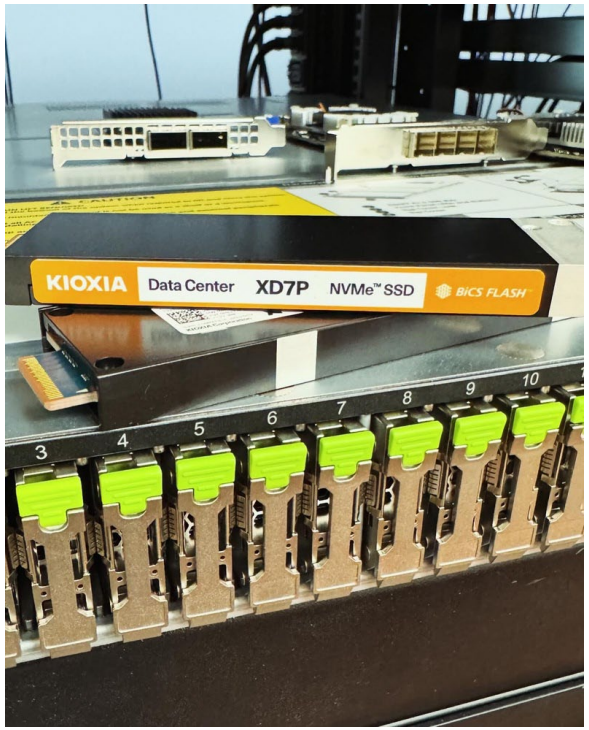


U.2 SSD + Backplane

Source: Supermicro

E1.S Trends





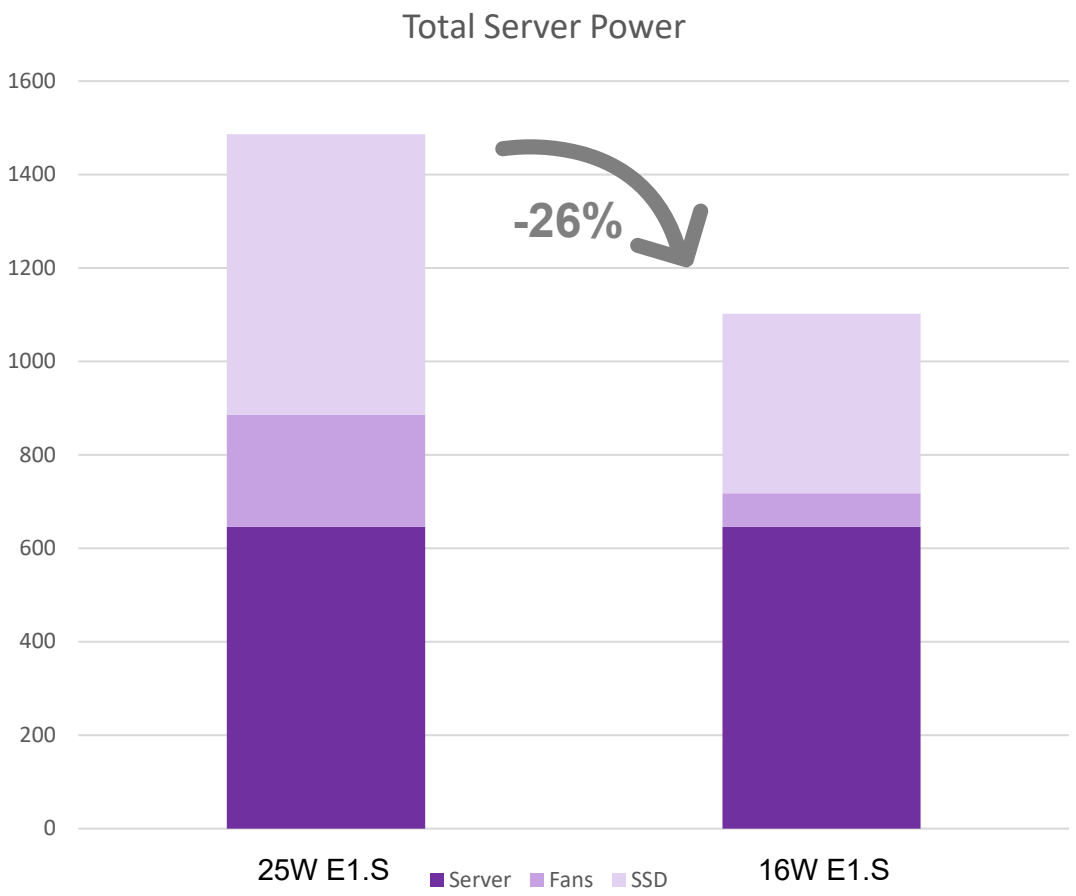
Pictures courtesy of StorageReview

E3.S Platforms

Pictures courtesy of StorageReview

https://www.storagereview.com/review/dell-poweredge-r660-e3-s-backplane-review

Drive Power Efficiency Impact to Server Power

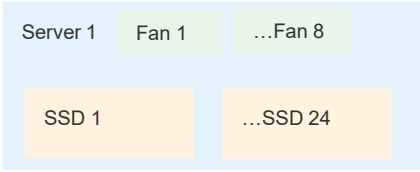


E1.S: 16W

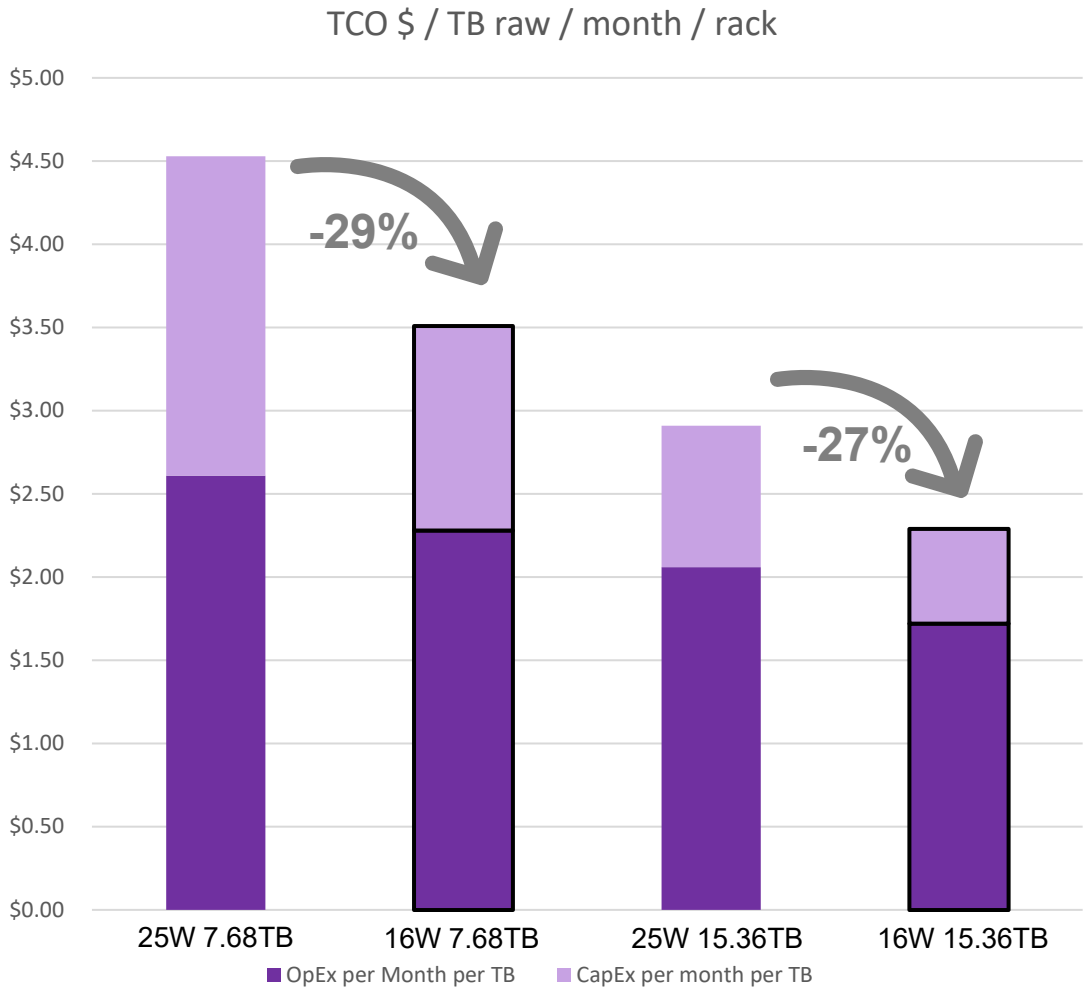
PCIe 5.0 E1.S: 25W

Server (CPU, DRAM, motherboard, NIC)

40mm fan: 30W



Drive Power Efficiency Impact to Rack Level TCO



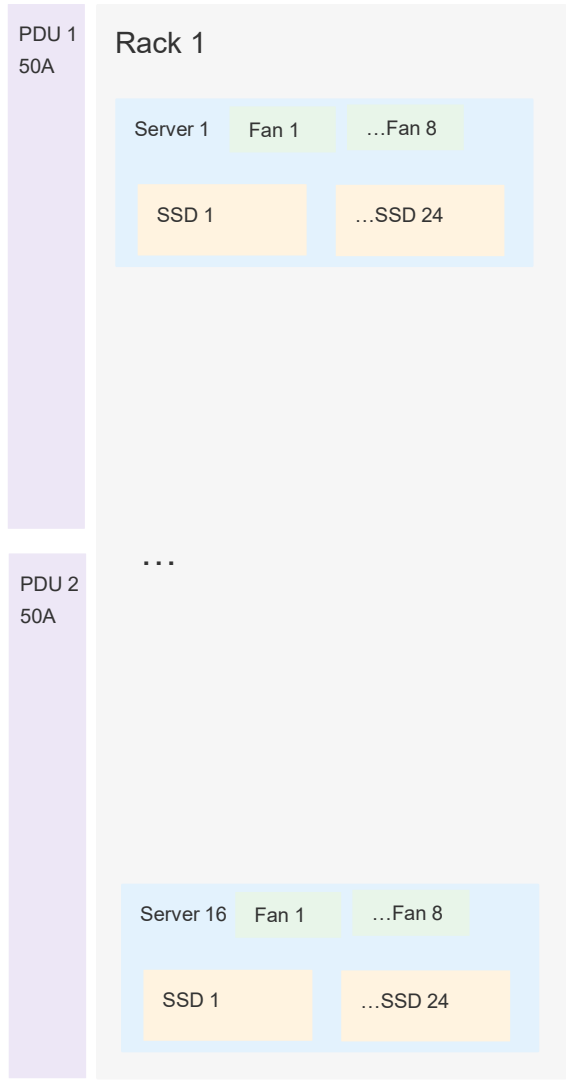
45% more servers per rack (PDU limit at ~15kW)

E1.S: 16W

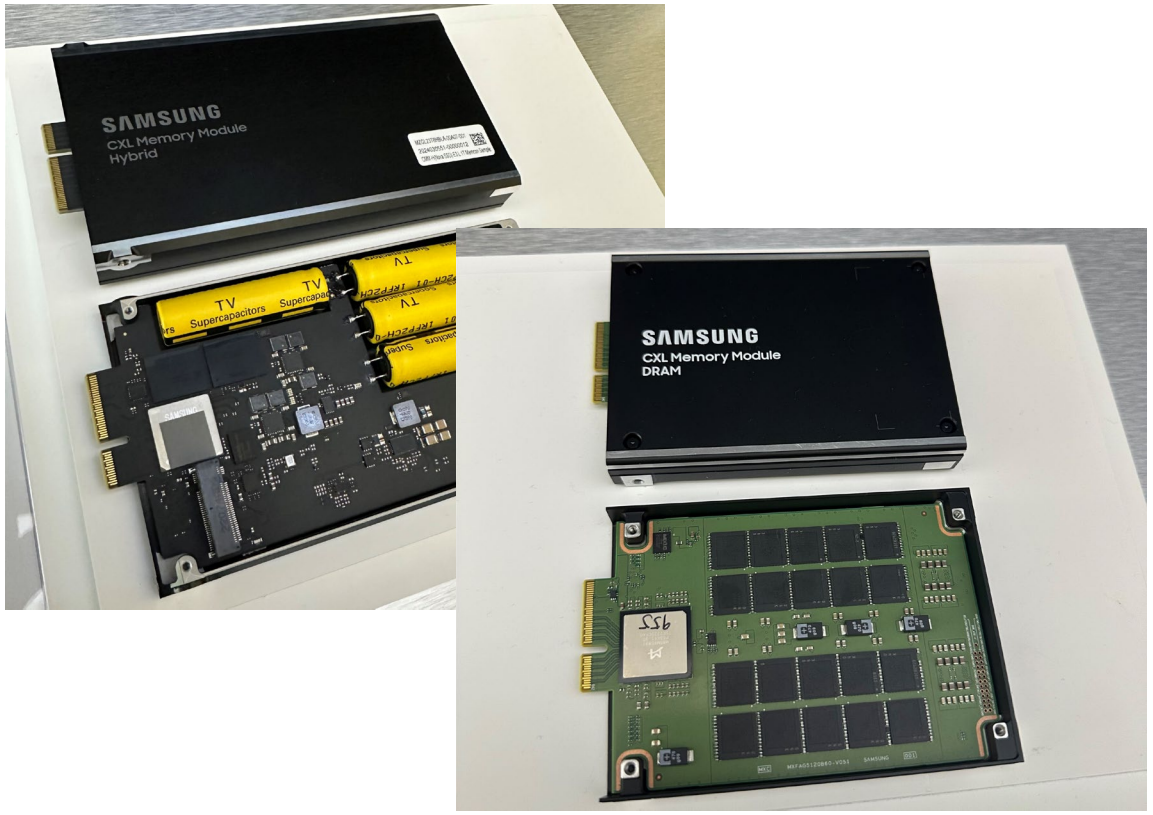
PCIe 5.0 E1.S: 25W

Server (CPU, DRAM, motherboard, NIC)

40mm fan: 30W



CXL Devices



Samsung CXL Devices, pictures taken at MemCon 2024

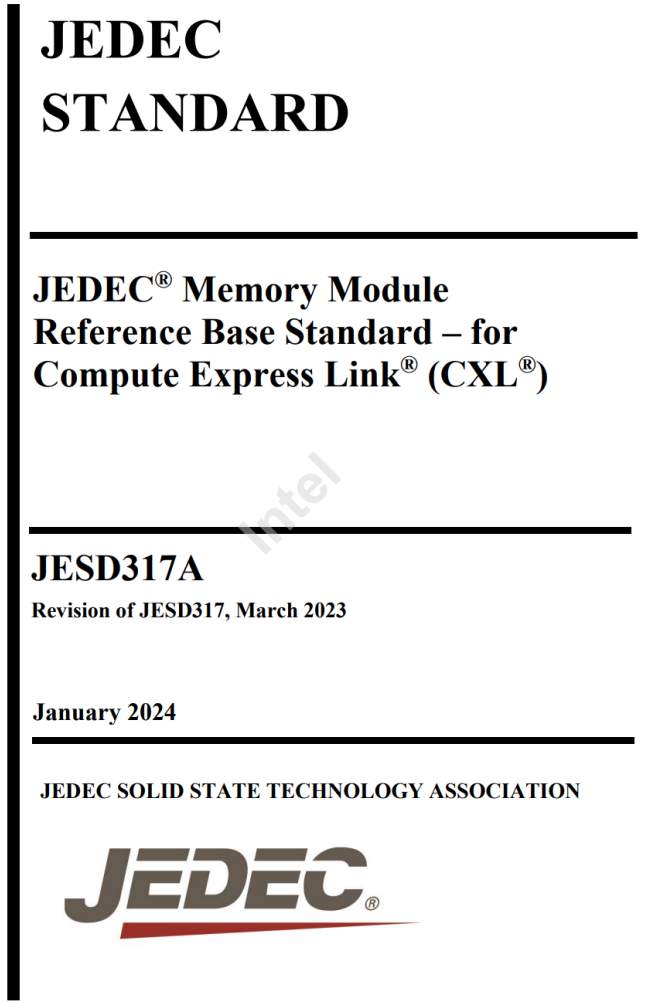
SK hynix CMM at CXL DevCon

Micron CZ120 memory expansion module

CXL Memory Modules (CMMs)

- Leverages EDSFF Form Factors
  - E1.S with x8 (2C) connector
  - E3.S 2T with x8 (2C) connector
  - E3.S with x4 (1C), same as SSD
- CXL Memory Module Specification (CMM) with significant industry support: JESD317A

Specification available now for download:
https://www.jedec.org/system/files/docs/JESD317A.pdf


JEDEC
STANDARD

JEDEC® Memory Module
Reference Base Standard – for
Compute Express Link® (CXL®)

Intel

JESD317A
Revision of JESD317, March 2023

January 2024

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

JEDEC®

Mix NVMe and CXL Devices

SSD and CXL

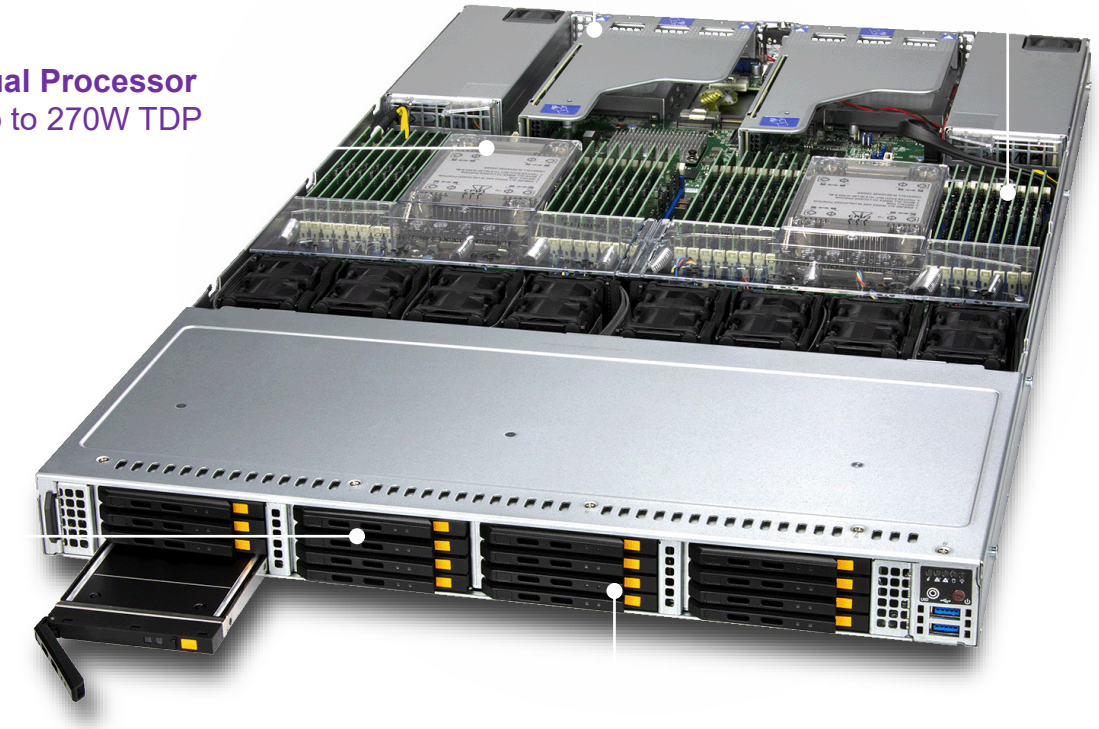
- Mix and match PCIe 5.0 NVMe and CXL 2.0 CMM

E3.S EDSFF
Next-gen form factor

PCIe 5.0 Slots
Up to 2 x16 slots +
2 AIOMs

DDR5 Slots
Up to 32 DIMMs

Dual Processor
Up to 270W TDP



Optional E3.S 2T x8
CXL Support

Redundant Power Supply
1600W (Titanium level)

Pictures courtesy of SUPERMICRO

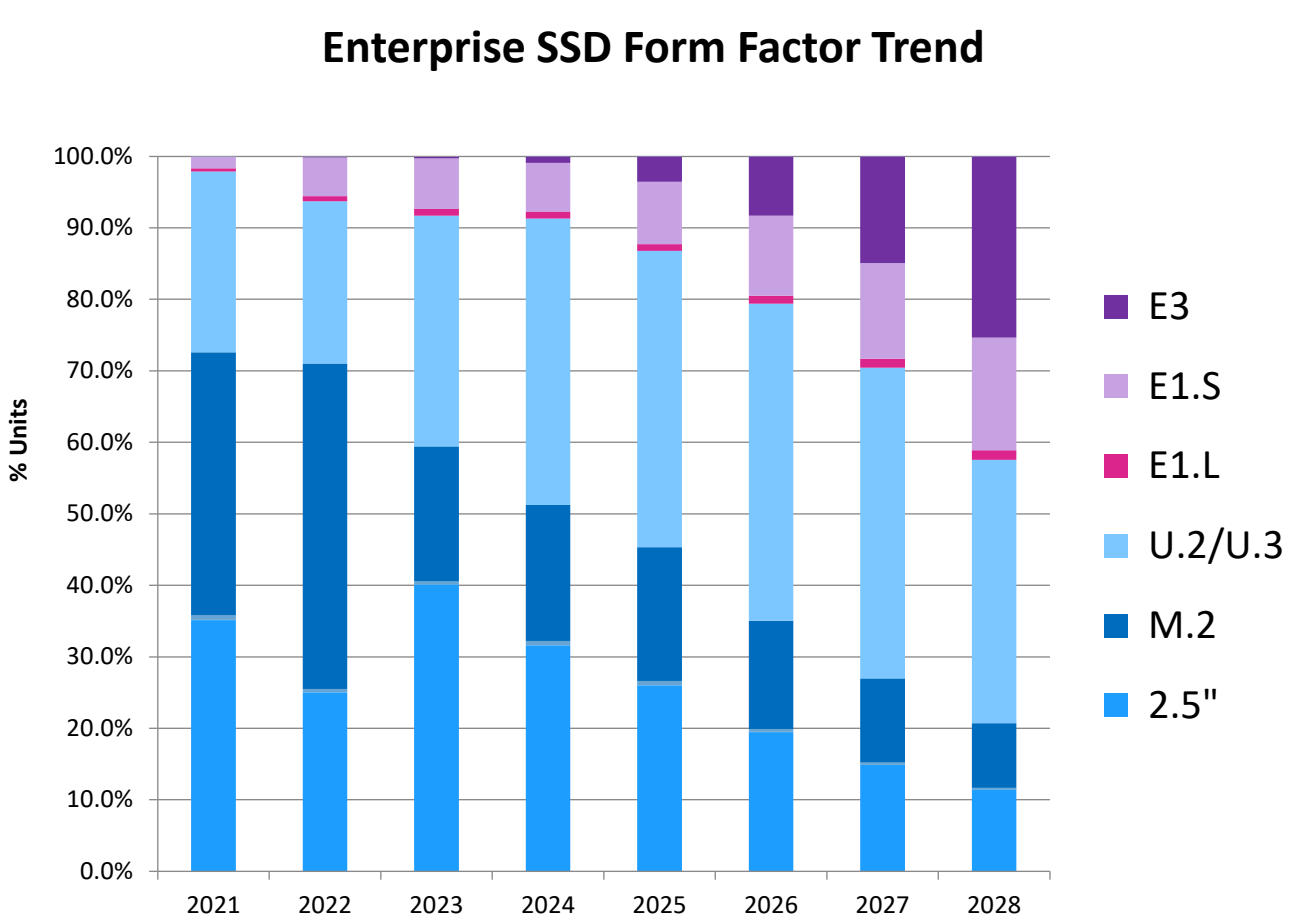
Workstations

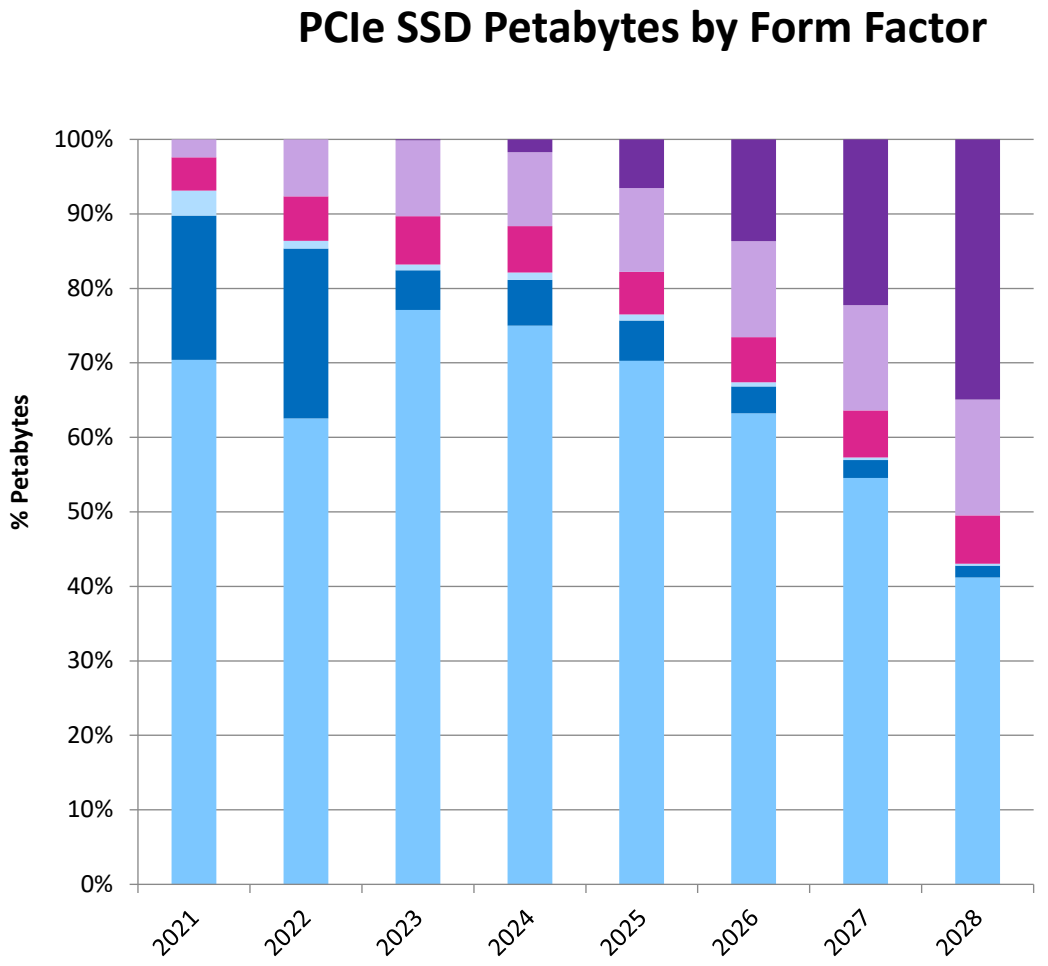
- Workstations and high-end desktops need to adopt EDSFF
- M.2 not suitable for gen 5 higher cap drives
- Power not an issue
- People don't want HDDs in a $15k workstation

https://www.storagereview.com/review/dell-precision-7875-review-96-core-threadripper-pro-and-dual-rtx-gpu-powerhouse

Pictures courtesy of StorageReview

EDSFF Market Update – Forward Insights





Source: Forward Insights SSD Insights Q1'24

Backup

SNIA SFF Completed projects in last 12 months (new)

- SFF-TA-1034: Pluggable Multi-Purpose Module
  - New specification built for general purpose devices in a front or rear loadable form factor.
- SFF-TA-1033: Internal High-Speed Cable / Modular Connector System
  - Designed to provide an internal cable and connector solution that supports both high-speed and power transmission
- SFF-TA-1031: SFP2 Cage, Connector, & Module Specification
  - SFP2 is an updated version of SFP to support 112Gb/s and beyond over a single lane
- SFF-TA-1027: QSFP2 Connector, Cage, & Module Specification
  - QSFP2 is an updated version of QSFP to support 112Gb/s and beyond over 4 lanes
- SFF-8612: MiniLink 4/8X Shielded Connector
  - Designed for use in high-speed serial, interconnect applications at multi-gigabit speeds

Completed projects in last 12 months (Revised)

- SFF-TA-1020: Cables and Connector Variants Based on SFF-TA-1002
  - Additional sizes, additional thickness, errata
- SFF-TA-1016: Internal Unshielded High Speed Connector System
  - Mechanical updates to tolerances, missing dimensions, errata fixes.
- SFF-TA-1009: Enterprise and Datacenter Standard Form Factor Pin and Signal Specification (EDSFF)
  - Addition of PCIe 6.0 support, CXL LED.
- SFF-TA-1008: Enterprise and Datacenter Standard Form Factor (E3)
  - Addition of NIC sidebands, 2x1C, clarifications
- SFF-TA-1002: Protocol Agnostic Multi-Lane High Speed Connector
  - PCIe 6.0 support, additional SM thickness, errata. SFF-TA-1033: Internal High-Speed Cable / Modular Connector System
- SFF-8614: Mini Multilane 4/8X Shielded Cage/Connector (HDsh)
  - Added SMT footprint and tolerance cleanup.
- SFF-8024: SFF Module Management Reference Code Tables
  - Additionna codes added for media interfaces and clarifications throughout document

Please take a moment to rate this session.

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