SNIA CMSI | COMPUTE, MEMORY, AND STORAGE

EDSFF: Taking Center Stage in the Data Center

A SNIA Webcast with

Cameron Brett, KIOXIA and Jonmichael Hands, Chia Network

November 10, 2022, 8:00 am PT

Today's Speakers

Jonmichael Hands
Chia Network
Co-Chair
SNIA Solid State Drive
Special Interest Group

Cameron Brett
KIOXIA
Co-Chair
SNIA Solid State Drive
Special Interest Group

SNIA Legal Notice

- The material contained in this presentation is copyrighted by the SNIA unless otherwise noted.
- Member companies and individual members may use this material in presentations and literature under the following conditions:
  - Any slide or slides used must be reproduced in their entirety without modification
  - The SNIA must be acknowledged as the source of any material used in the body of any document containing material from these presentations.
- This presentation is a project of the SNIA.
- Neither the author nor the presenter is an attorney and nothing in this presentation is intended to be, or should be, construed as legal advice or an opinion of counsel. If you need legal advice or a legal opinion please contact your attorney.
- The information presented herein represents the author's personal opinion and current understanding of the relevant issues involved. The author, the presenter, and the SNIA do not assume any responsibility or liability for damages arising out of any reliance on or use of this information.

  NO WARRANTIES, EXPRESS OR IMPLIED. USE AT YOUR OWN RISK.

What Does SNIA Do?

- SNIA is a non-profit global organization dedicated to developing standards and education programs to advance storage and information technology.

Industry Leading Organizations

180

Active Contributing Members

2,500

IT End Users & Storage Pros Worldwide

50,000

Who is CMSI?

- Part of SNIA, the SNIA Compute, Memory, and Storage Initiative is a community of storage professionals and technical experts who support:
  - The industry drive to combine processing with memory and storage,
  - The creation of new compute architectures and software to analyze and exploit the explosion of data creation over the next decade.
- CMSI's three Special Interest Groups – Computational Storage, Persistent Memory, and Solid State Drives – evangelize and educate on these technologies to the industry

www.snia.org/cmsi

Visit the SNIA Solid State Drive Form Factors webpage

https://www.snia.org/forums/cmsi/knowledge/formfactors

- Provides descriptions, dimensions, and listings of mechanical/electrical specifications, connector specifications, and protocols for
  - E1.S and E1.L
  - E3.S and E3.L
  - M.2
  - U.3
  - Add-in cards

Solid State Drive Form Factors

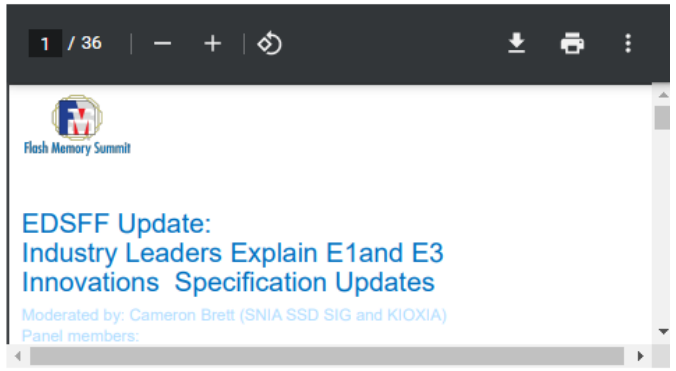
Basic Page *Solid State Drive Form Factors* has been updated.

Updated November 202

Solid-state drives (SSDs) are commonly used in client, hyperscale and enterprise compute environments. They typically come in three flavors: NVMe™, SAS, and SATA. Since SSDs are made from flash memory, they can be built in many different form factors. This resource guide is designed to provide information on the most common and current SSDs in their various form factors. In addition to the form factor dimensions, information such as use case, interface, protocol, and mechanical/electrical and connector specifications are provided.

Click on the names below to learn more about the many different SSD sizes and formats in a variety of form factors:

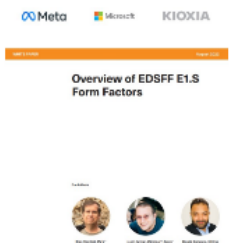
- EDSFF
- M.2
- 2.5-inch (U.2)
- Add In Cards



NVMe SSDs service many use cases in the data center. The NVMe SSD Classification page shows the different types of NVMe SSDs for different hyperscale and enterprise use cases.

The SNIA SFF Technology Affiliate is developing a broad range of standards for new connectors, form factors, and transceivers. **Learn more about their work.**

And for the latest on EDSFF form factors, view the PDF from an EDSFF Update Panel at Flash Memory Summit 2022 and download new white papers written by SNIA members Dell, HPE, KIOXIA, Meta, and Microsoft.



Updated EDSFF Specifications - as of 11/10/22

E3 Form Factors	Description
SNIA SFF-TA-1008 Rev 2.0.2	Enterprise and Datacenter Device Form Factor (E3)
SNIA SFF-TA-1002 Rev 1.3	Protocol Agnostic Multi-Lane High Speed Connector
SNIA SFF-TA-1009 Rev 3.0a	Enterprise and Datacenter Standard Pin and Signal Specification (EDSFF)
SNIA SFF-TA-1023 Rev 1.0a	Thermal Characterization Specification for EDSFF Devices

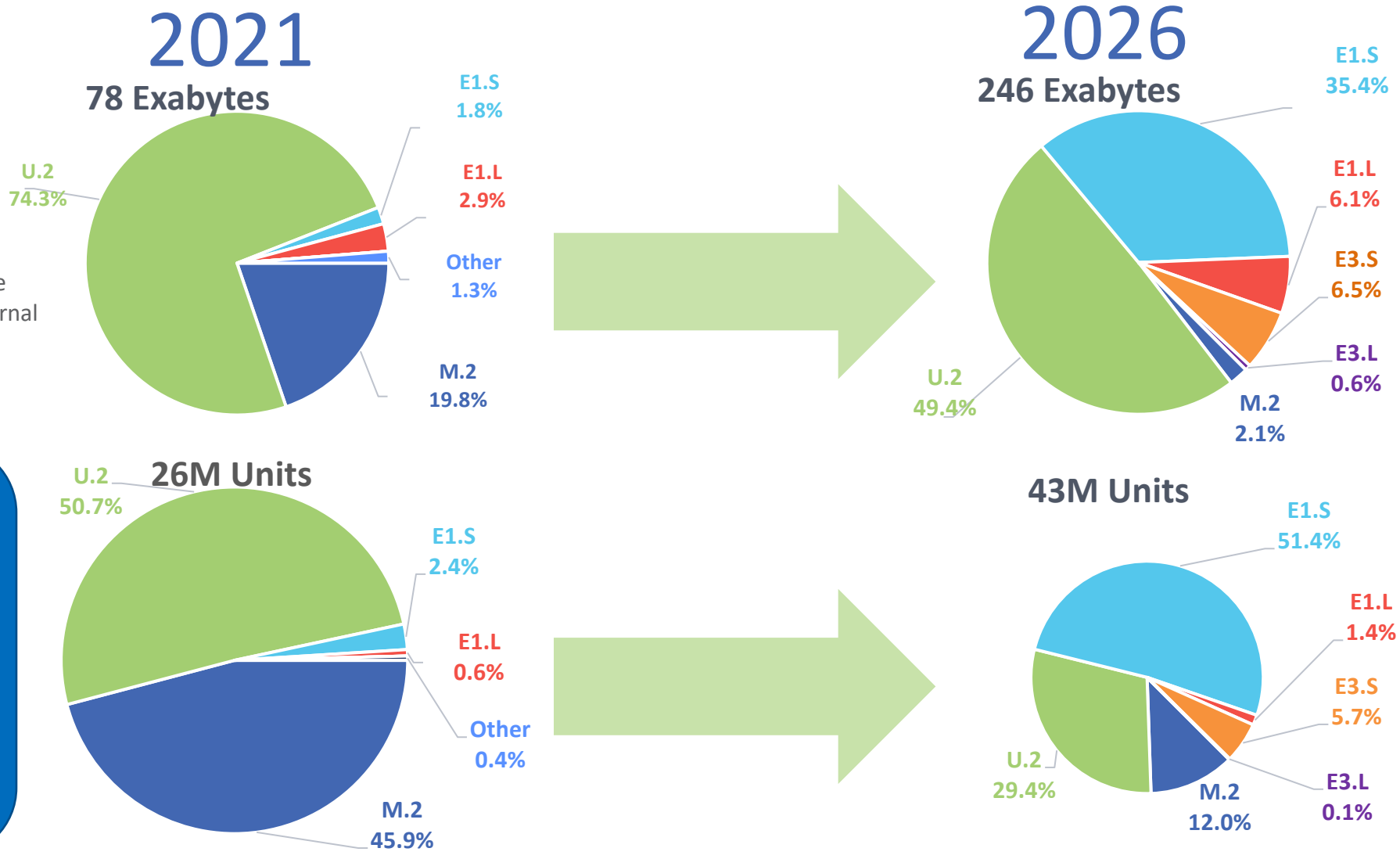
E1 Form Factors	Description
SNIA SFF-TA-1006 Rev 1.5	Enterprise and Datacenter 1U Short Device Form Factor (E1.S)
SNIA SFF-TA-1007 Rev 1.2	Enterprise and Datacenter 1U Long Device Form Factor (E1.L)
SNIA SFF-TA-1002 Rev 1.3	Protocol Agnostic Multi-Lane High Speed Connector
SNIA SFF-TA-1009 Rev 3.0a	Enterprise and Datacenter Standard Pin and Signal Specification (EDSFF)
SNIA SFF-TA-1012 Rev 1.0	Pin Assignment Reference for SFF-TA-1002 Connectors

Form Factor Volume Estimates

Source:
TRENDFOCUS

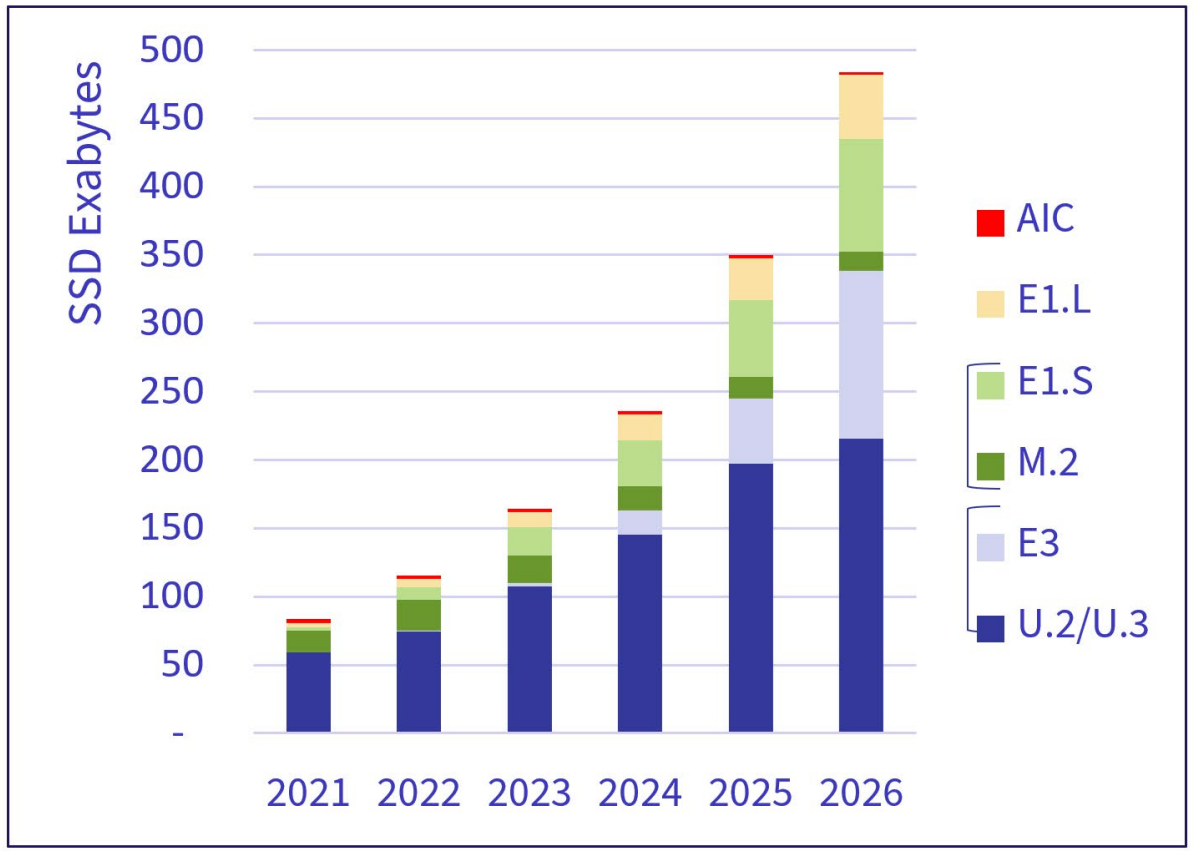
Note: Data excludes SSD consumption where companies buy NAND and build SSDs for internal use.

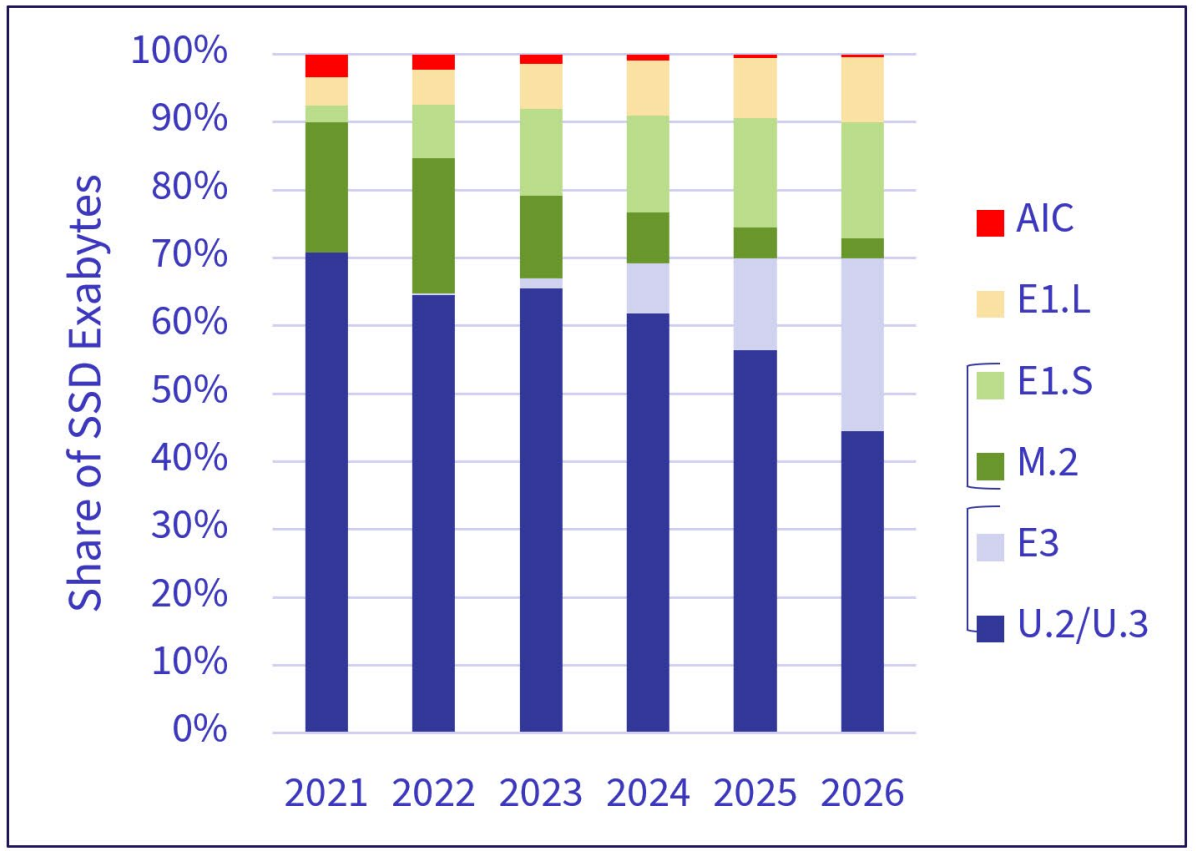
Key Message:
SSD Unit and Byte volume forecasted to shift to EDSFF. M.2 volume winding down.



Form Factor Mix – 3 Major Variants

FORWARD INSIGHTS
Forward Thinking

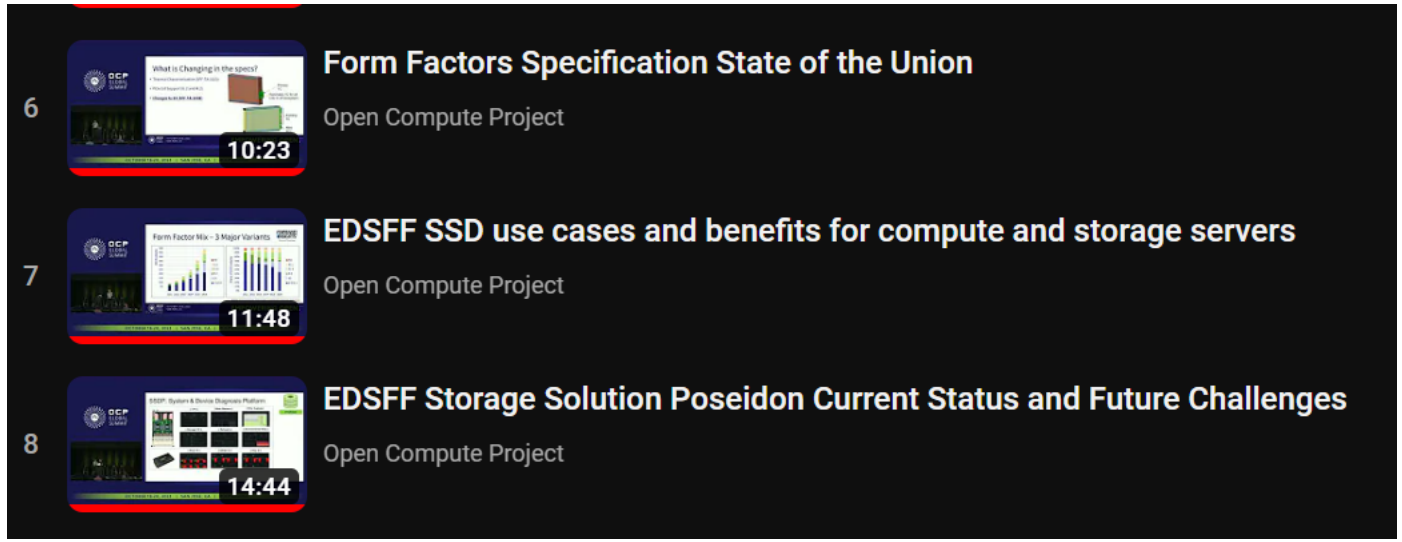




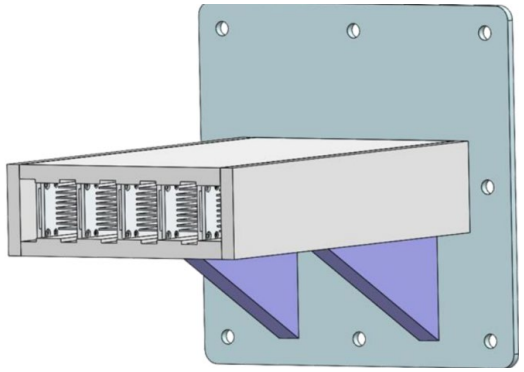
Source: Forward Insights, SSD Insights, 22Q3 Report. Used with permission.

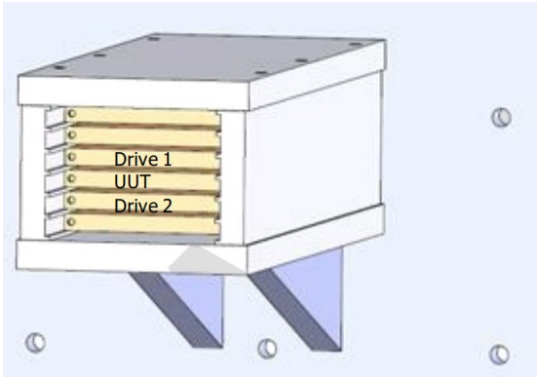
Go watch the EDSFF presentations in the storage track!

https://www.youtube.com/c/OpencomputeOrg



Thermal Characterization (SFF-TA-1023)





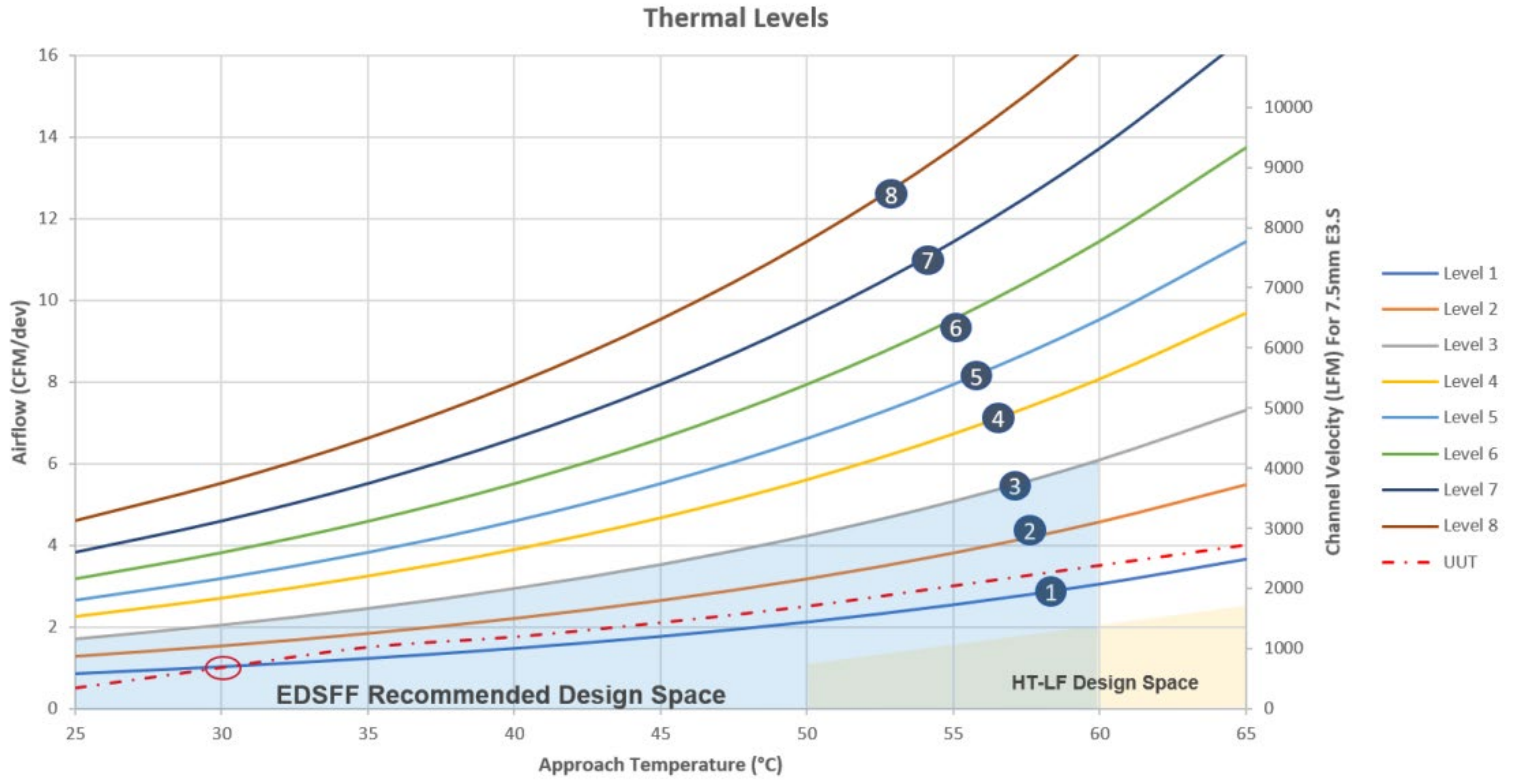
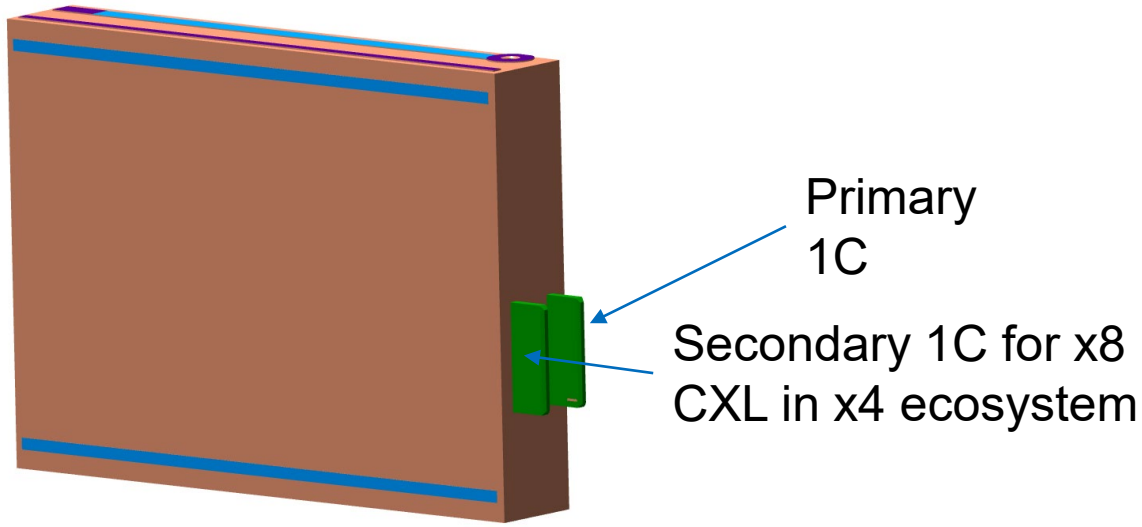
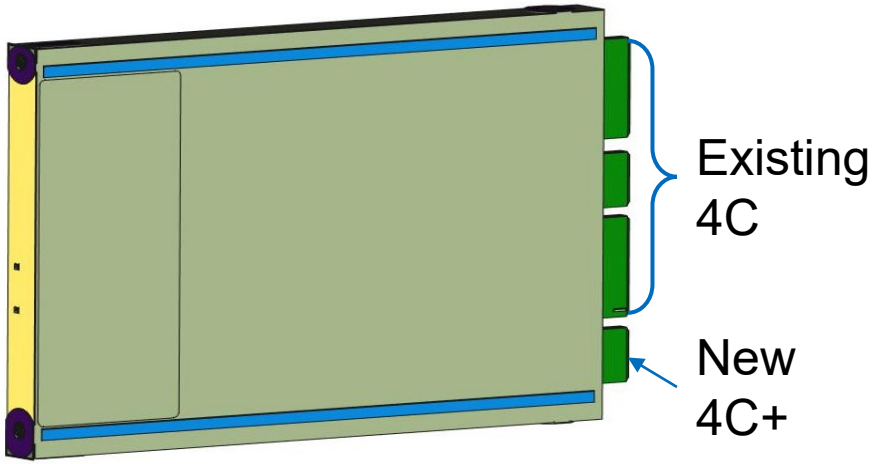


Figure 4-4: Example Device Thermal Profile

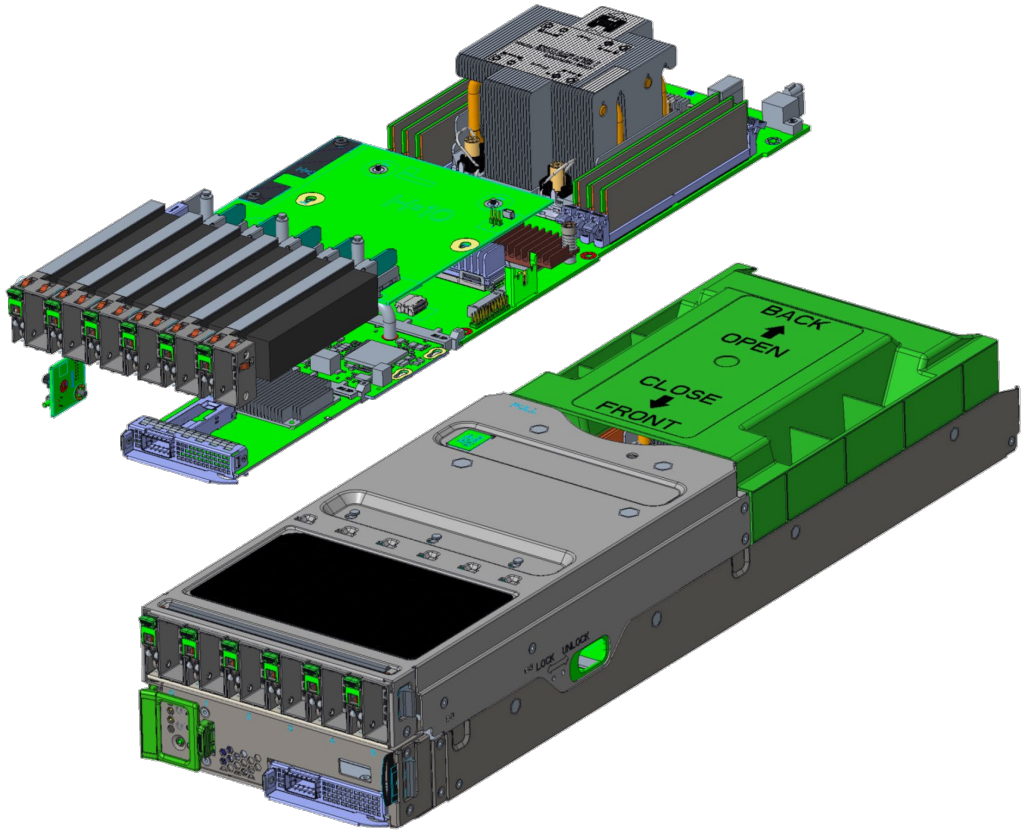
Changes to E3 (SFF-TA-1008)





Hyperscale

Yosemite V3: Sierra Point E1.S 2OU Flash Blade and Expansion Board Design Specification



E1.S Faceplate Reference Design

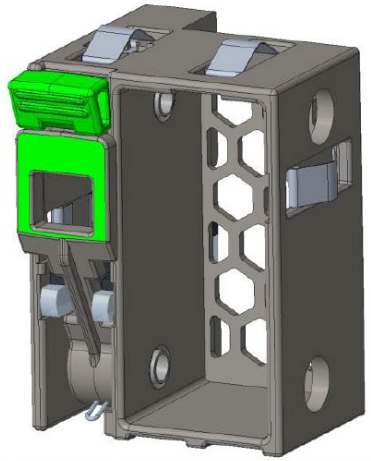


Figure 4-1 – Faceplate design for Optional 25mm Asymmetric Enclosure

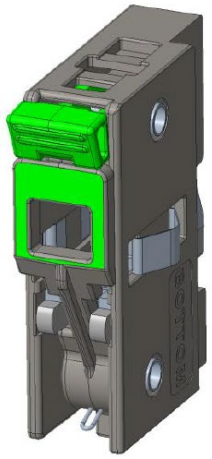


Figure 4-2 – Faceplate design for Option 9.5mm Symmetric Enclosure

In figure 5-3, you can see a reference implementation of the E1.S faceplates in a server design.

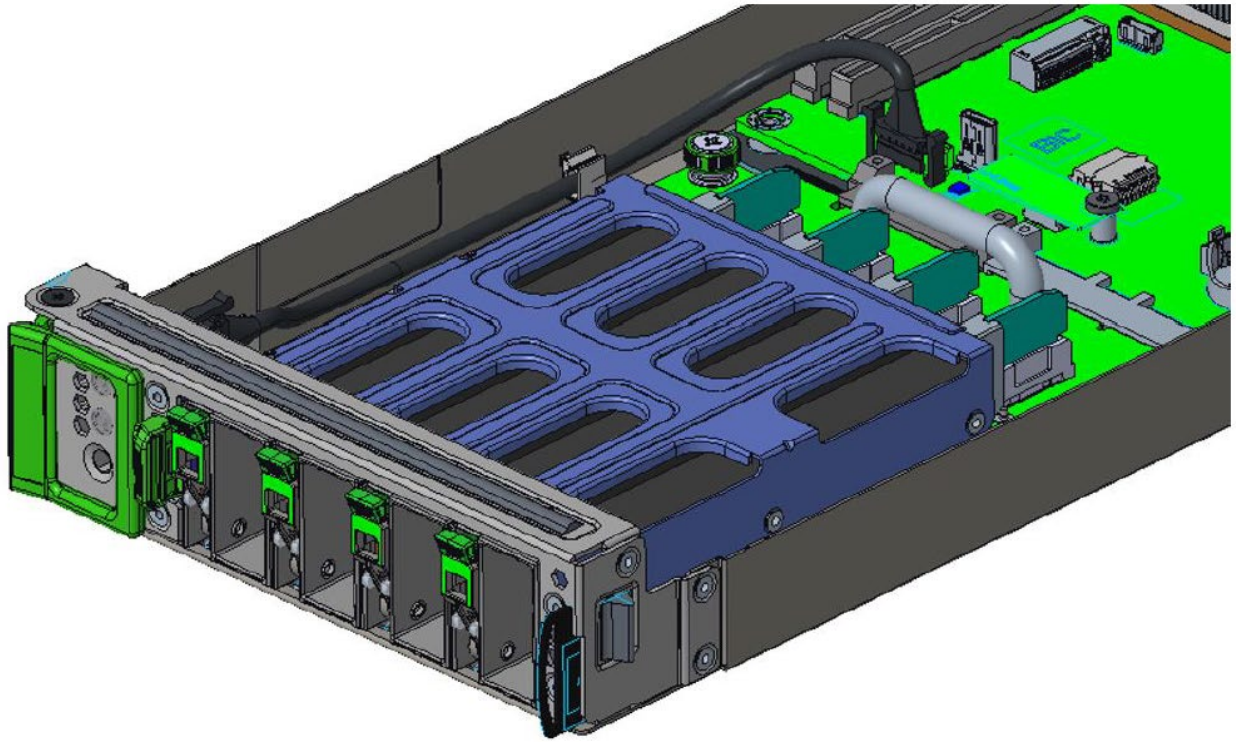
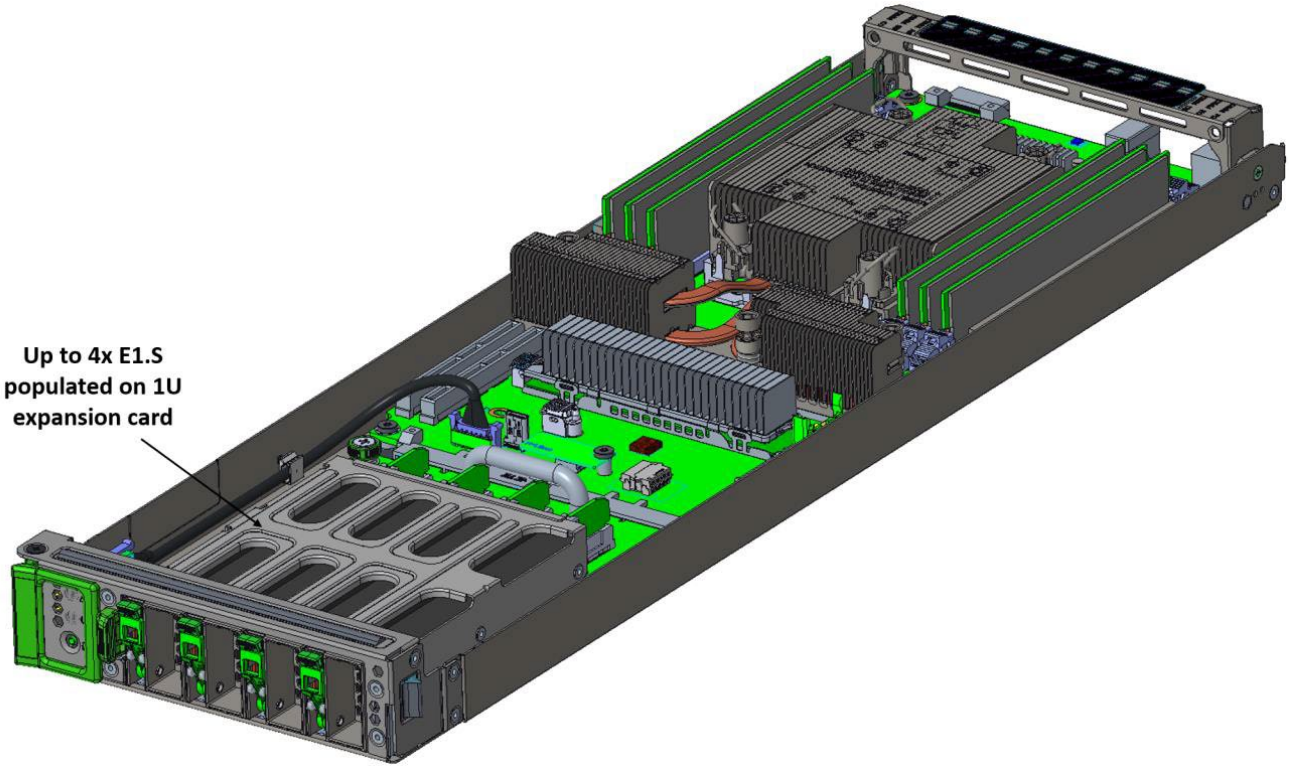
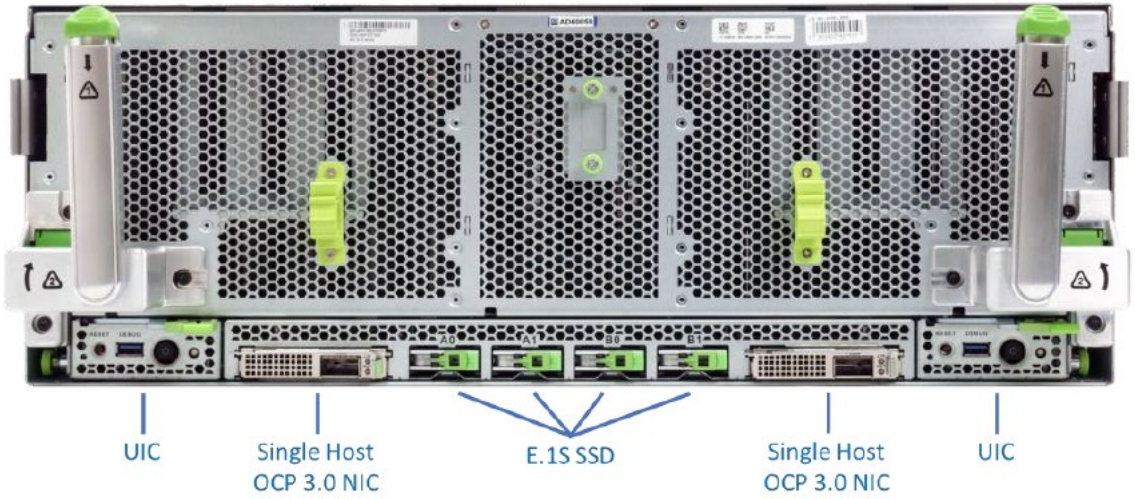


Figure 4-3 Example Implementation of E1.S Faceplate in System

E1.S 1OU Flash Blade and Expansion Board Design Specification – Vernal Falls



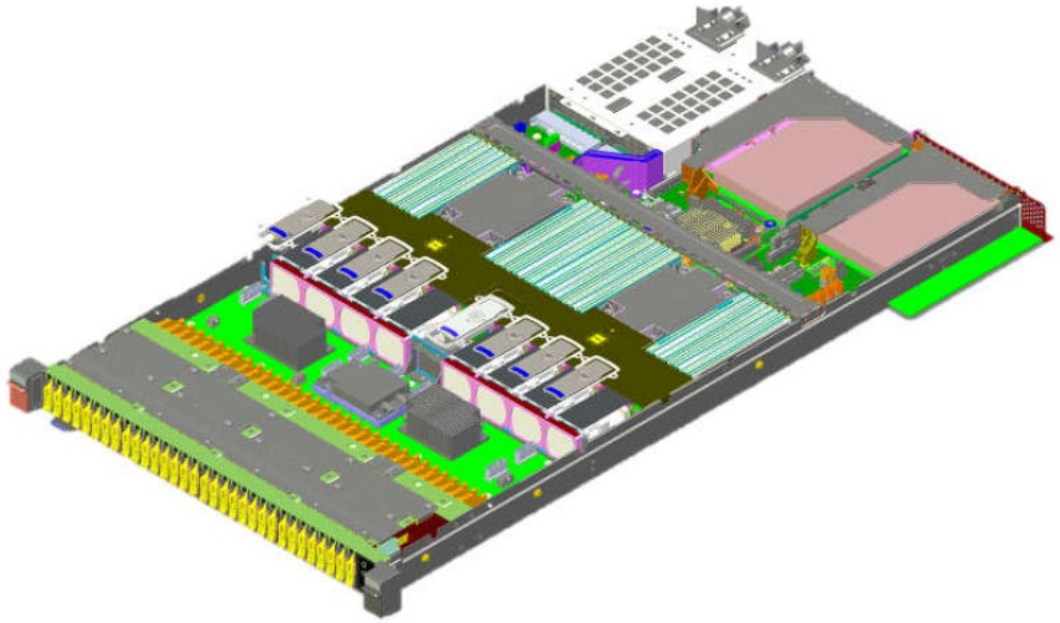
Grand Canyon System Specification



Type 5 (Dual Storage Server)

Figure 5.6: E.1S SSD

1U Open Storage Solution with E1.S



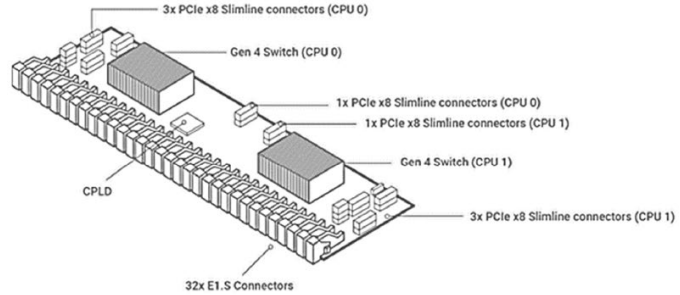


Figure 4 Poseidon system backplane

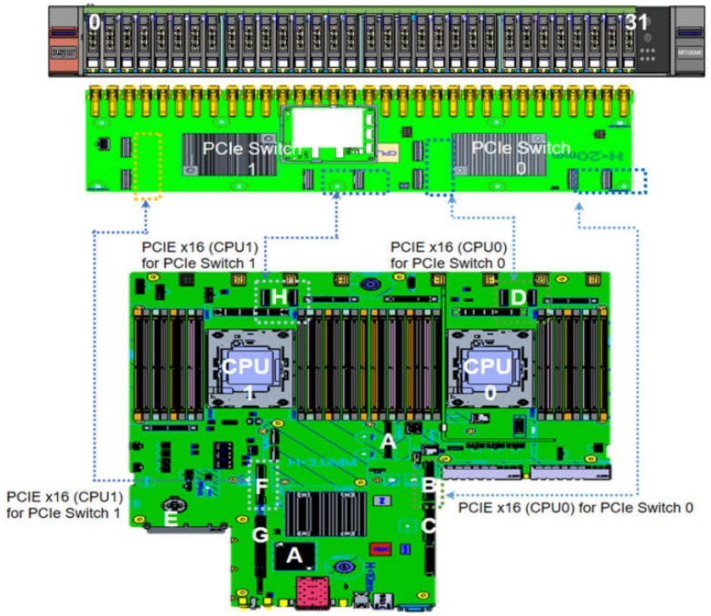
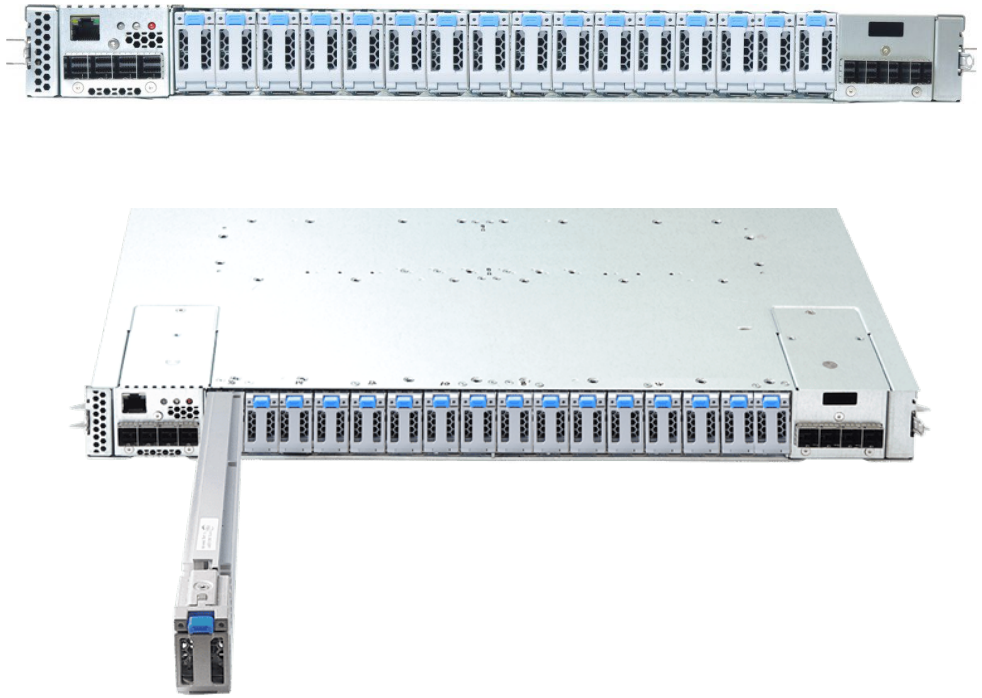


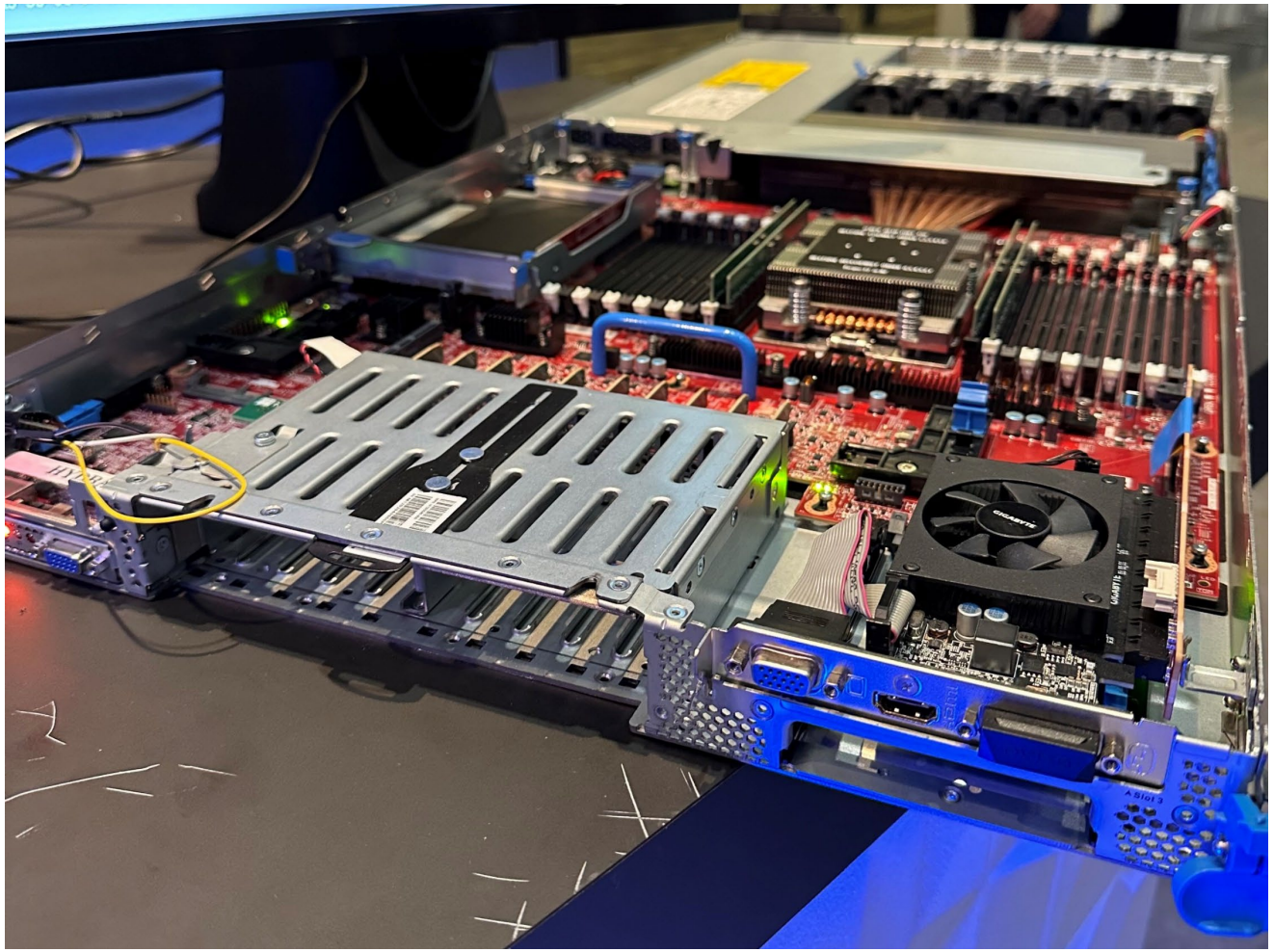
Figure 5 Poseidon V1 Motherboard

Microsoft

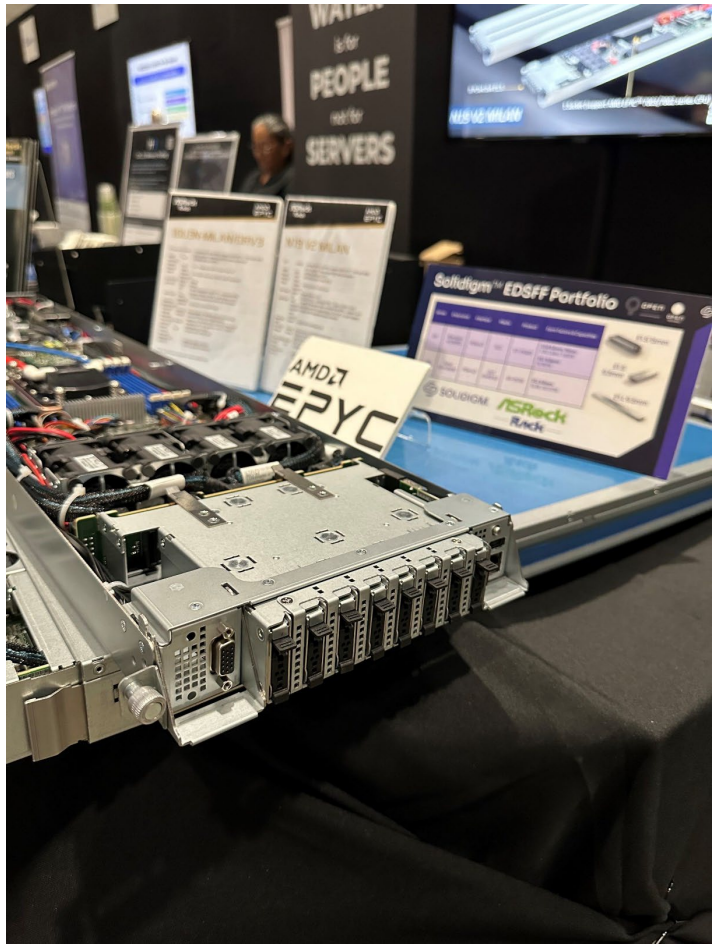
ST5100 Wiwynn JBOF



Sapphire Rapids Compute Server with 8 E1.S 15mm at PCIe 5.0



Asrock



OEM

Dell Prototype E3.S System

HPE

HPE ProLiant DL325 Gen11

Cost Optimized Solution

1U, 1P
HPE ProLiant DL325 Gen11

FEATURE	SPECS
Processors	**1x 4th Generation AMD EPYC™ processors up to 96 cores**
Memory	Up to **3TB DDR5***, CXL 1.1 supported
Front Drive Count	Up to 4 LFF HDD/SSD; SAS/SATA Up to 10 SFF HDD/SSD; SAS/SATA/NVMe **Up to 20 EDSFF 3.S 1T*; NVMe**
Rear Drive Count	No rear drive support
Boot Options	**Up to 1x internal access SATA/NVMe M.2 or 1x External access hot-pluggable raided M.2 NVMe** (NOTE: will not take up a PCIe slot)
GPU Support	**Up to 2SW or 2DW***
I/O	**Up to 2 x16 PCIe Gen5 slots** **Up to 2 x8 OCP3.0 slots (upgradable to x16)**
Storage Controller	Gen11 Controllers (PCIe and OROC)
Chassis Depth	SFF: 25.5"; **LFF/EDSFF: 27.9"; GPU front end: 32.2"**
Targeted Workloads	Software Defined Compute; CDN; low-end VDI

*DDR5 high capacity, EDSFF, GPU and 48SFF chassis support will be available 1H 2023

New features from the prior generation

2

HPE ProLiant DL345 Gen11

Single-socket scalable solution

2U, 1P
HPE ProLiant DL345 Gen11

FEATURE	SPECS
Processors	**1x 4th Generation AMD EPYC™ processors up to 96 cores**
Memory	Up to **3TB DDR5***, CXL 1.1 supported
Front Drive Count	Up to 12 LFF HDD/SSD; SAS/SATA Up to 24 SFF HDD/SSD; SAS/SATA/NVMe **Up to 36 EDSFF 3.S 1T*; NVMe**
Mid Tray Count	**Up to 8 SFF SAS/SATA/NVMe OR Up to 4 LFF SAS/SATA**
Rear Drive Count	**Up to 2 SFF SAS/SATA/NVMe OR Up to 4 LFF SAS/SATA**
Boot Options	**1x External access hot-pluggable raided M.2 NVMe** (NOTE: will not take up a PCIe slot)
GPU Support	**Up to 4SW or 2DW**
I/O	**Up to 6 x16 PCIe Gen5 slots** **Up to 2 x8 OCP3.0 slots (upgradable to x16)**
Storage Controller	Gen11 Controllers (PCIe and OROC)
Chassis Depth	**SFF/EDSFF: 25.4"; LFF: 26.1"; GPU front end: 31.4"**
Targeted Workloads	Software Defined Storage; Video Transcoding

*DDR5 high capacity, EDSFF, GPU and 48SFF chassis support will be available 1H 2023

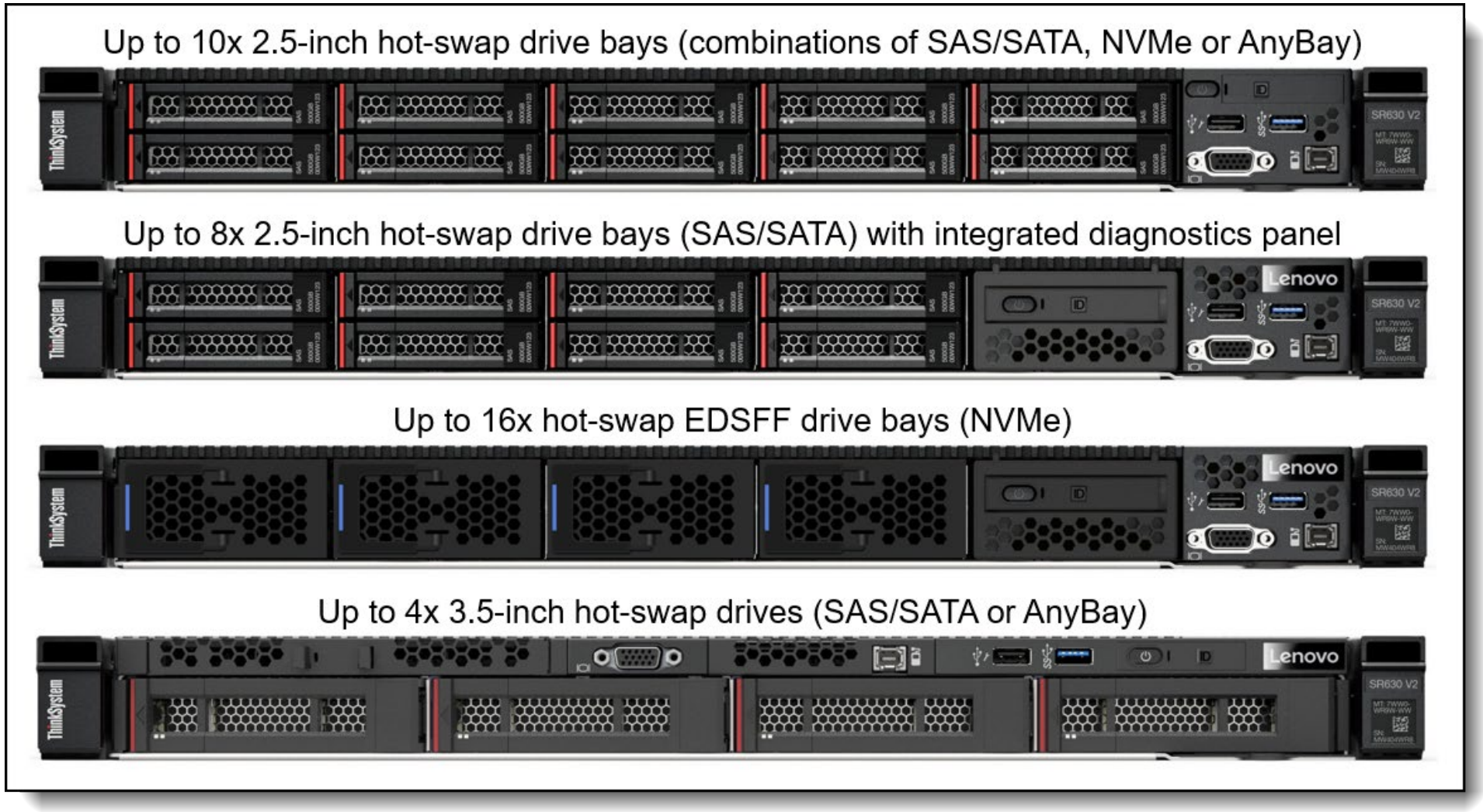
New features from the prior generation

3

Edge optimized	Storage optimized	Density optimized	Accelerator optimized	Cloud optimized
1U, 1P HPE ProLiant DL325 Gen11 AMD 4th Gen EPYC™ Processor	**2U, 1P** HPE ProLiant DL345 Gen11 AMD 4th Gen EPYC™ Processor	**1U, 2P** HPE ProLiant DL365 Gen11 AMD 4th Gen EPYC™ Processor	**2U, 2P** HPE ProLiant DL385 Gen11 AMD 4th Gen EPYC™ Processor	**1U, 1P** HPE ProLiant RL300 Gen11 Ampere® Altra® and Ampere® Altra® Max
Software Defined Compute Price performance Optimized Core Count Network Bandwidth New	**Software defined storage** Large storage capacity I/O bandwidth Memory bandwidth New	**High performance compute** Front-end serviceability Compute Density New	**Max GPU support** Network Bandwidth Core Count I/O Bandwidth New	**Cloud-native compute** Service Providers/Digital First Core Count Scale-out

https://www.servethehome.com/hpe-proliant-gen11-kicks-off-again-with-amd-epyc-genoa-ampere/

Lenovo



Inspur

2U Open Solution with E3.S

High-density E3.S on Inspur's 2U next-generation CPU architecture brings greater performance and flexible expansion for a variety of workloads.

V2 Features

Higher Performance with PCIe Gen5

Greater Capacity with EDSFF E3 Form Factor

Flexible Expansion with AI/ML accelerators, CXL Memory Expanders

Two types of backplanes Supporting E3.S and 2T

Modular Design, Versatile Configurations:

High-Performance Shared Storage
E3.S SSD x 24

High-Memory Server for Cloud Service
CXL Memory Expander x 8 + SSD x 8

Accelerator Server for AI/ML
E3.S SSD x 8 + SmartSSD x 8

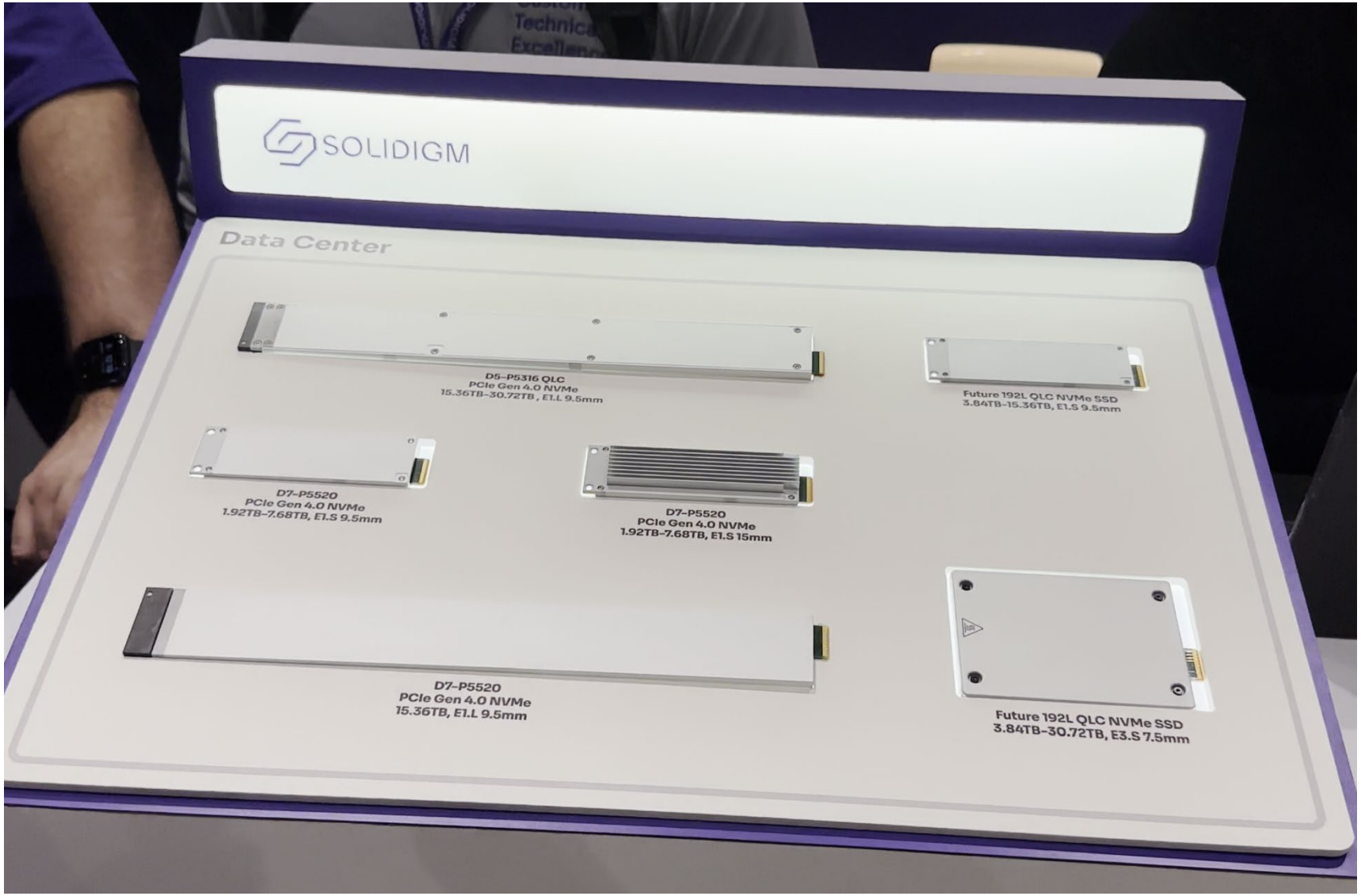
Drive Vendors

KIOXIA

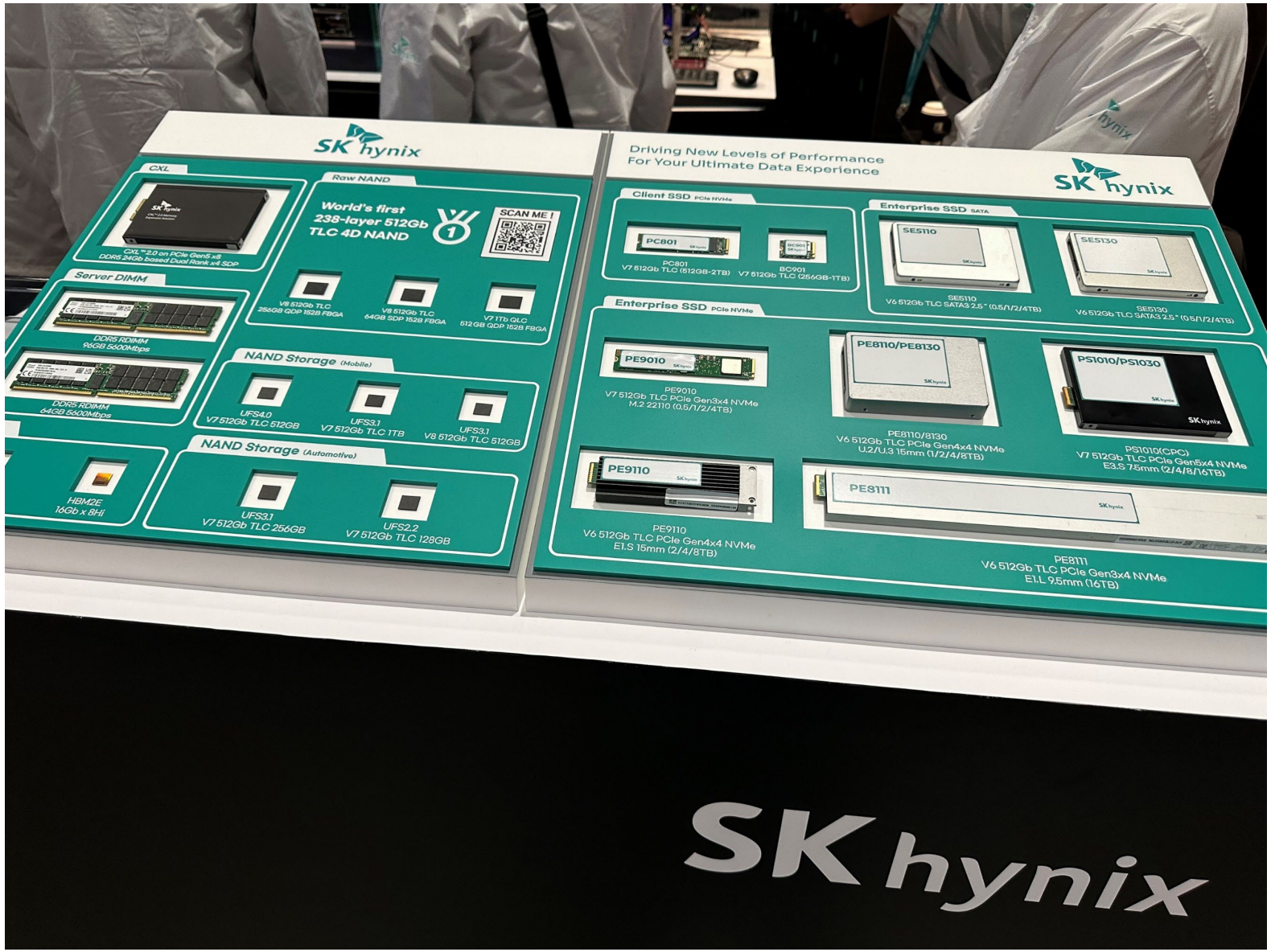
- Range of E1.S and E3.S standard drives
- PCIe® 4.0 and 5.0 versions

- E1.L sample of Software-Enabled Flash™ module (not shown)

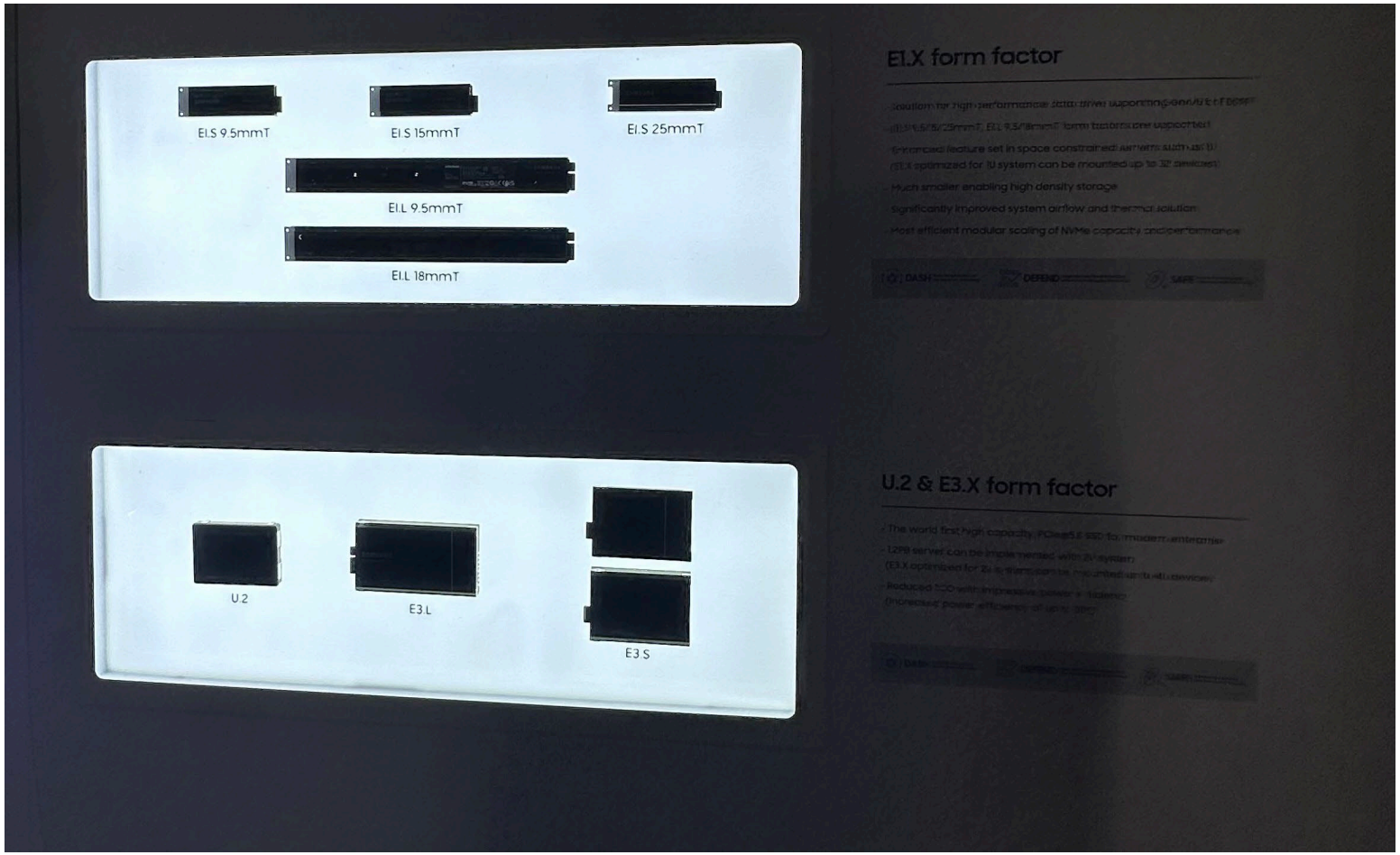
Solidigm



SK Hynix



Samsung



Questions?

Thanks for Watching Our Webcast

- Please rate this webcast and provide us with feedback
- A link to this webcast and the PDF of the slides are posted to the SNIA Compute Memory and Storage Initiative website at https://www.snia.org/forums/cmsi/knowledge/articles-presentations
- You can also find this webcast and many other videos and presentations on today's topics in the SNIA Educational Library
- A Q&A from this webcast will be posted to the SNIA Compute, Memory, and Storage Blog
- Learn more about Solid State Drive technology at https://www.snia.org/technology-focus/physical-storage