SDC 19

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Next-Gen Performance & Efficiency with EDSFF SSD and QLC Technology

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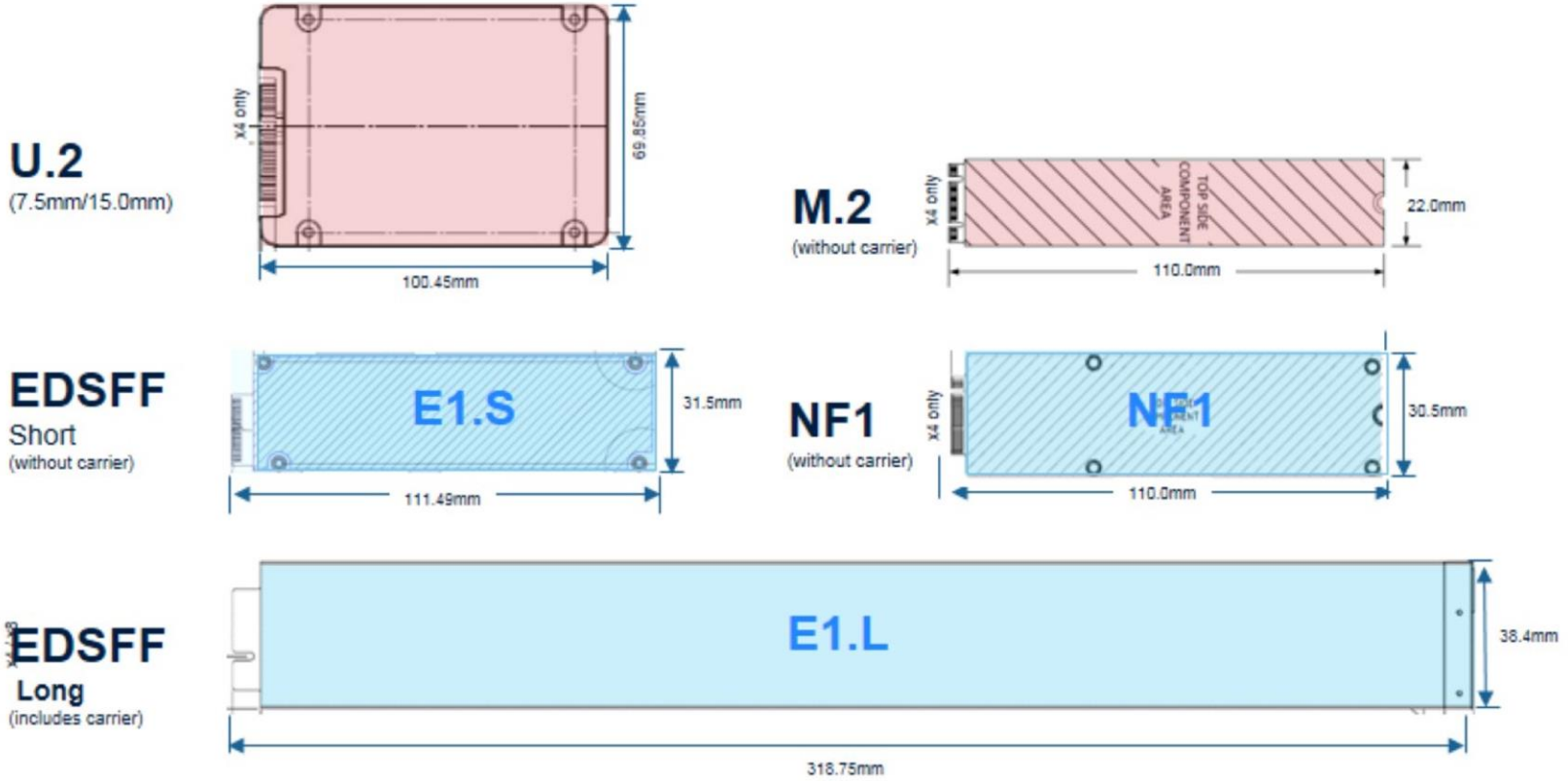
NVMe Form Factor Comparison



Why do we need new SSD form factors?

- Higher storage density - more TB per rack unit
- Higher efficiency - thermal and power performance
- Higher capacity – vendor technology competition
- Better cost per GB – vendor price competition
- Storage disaggregation
  - Improved resource management
  - Heavy compute applications (HPC)
  - GPU based applications

What is EDSFF*?

1 A group of **15** companies working together[1]

2 Industry standard connector and form factor **optimized** for NVMe*

3 Built for increased operational efficiency and dense storage

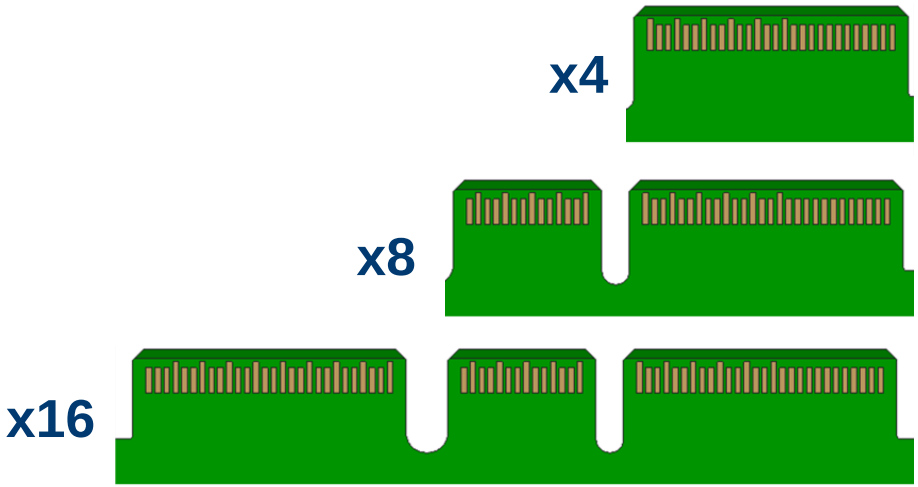
Intel® SSDs with EDSFF* Form Factor

E1.S

E1.L 18mm

E1.L 9.5mm

ALL EDSFF* SSDs support the same:



PCIe* 4.0 and 5.0 ready[7]

1 Connector

Drives high volumes

2 Pinout

Allows interoperability, simplifies backplane design

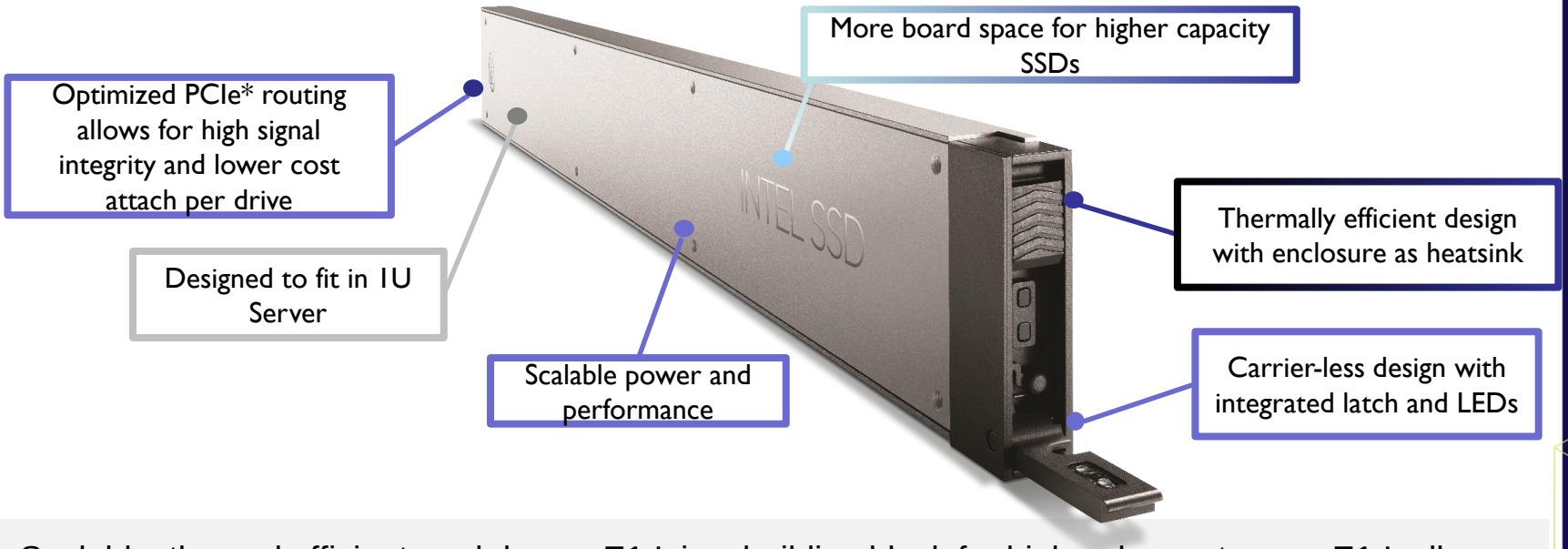
3 Base Features

But differentiated by segment and use case

Systems Designed with Flexibility for Storage and Beyond

*Other names and brands may be claimed as the property of others.
Source – Amphenol ICC*. https://www.amphenol-icc.com/connect/cool-edge-high-speed-high-power-card-edge.html. Additional detail: https://EDSFFspec.org/introduction-to-EDSFF/

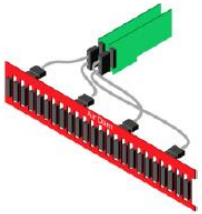
E1.L storage reimagined.



Scalable, thermal efficient, and dense, E1.L is a building block for high-volume storage. E1.L allows high storage density, scalability, serviceability, and efficient cooling optimized for 1U servers.

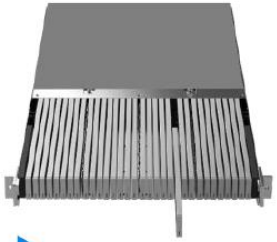
Ruler vs. 2.5” Storage Chassis Implementation

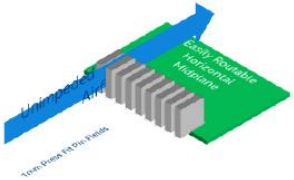
2.5” FORM FACTOR

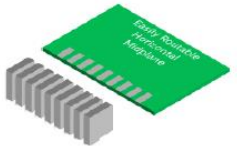


- Backplane requires cut outs to optimize thermals
- Cables add cost and complicate installation, thermals
- LED controller adds failure point
- Drive cages add cost, failure points

E1.L FORM FACTOR



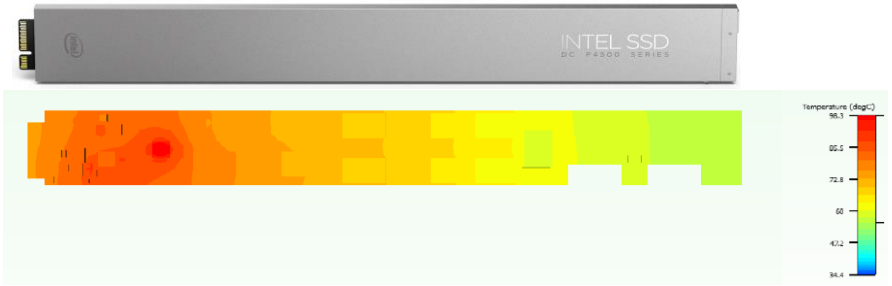




- Eliminate the backplane
- Simplified thermal implementation
- No add in cards required
- No cables to SSDs
- Geographic drive mapping for simplified drive management

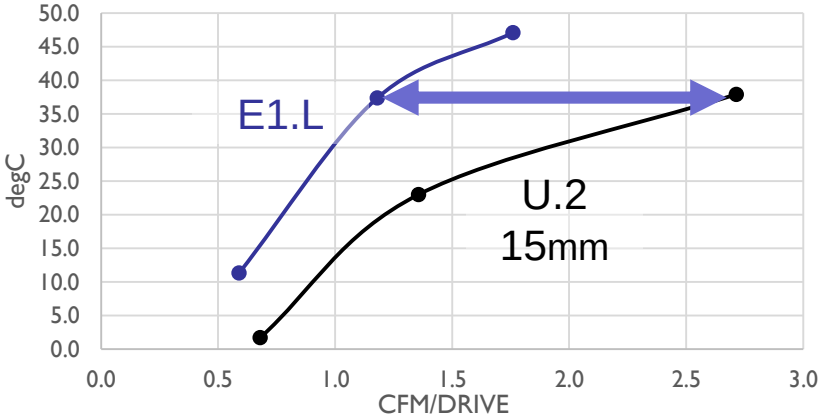
Less complicated chassis
Reduced component cost per SSD
Simple hot swap with high density capabilities

Advantage. Thermal efficiency.



Thermal efficiency

Up to 55% less airflow[4] vs U.2 15mm



Benefits of E1.L Versus U.2

Reduce System Complexity

Remove complicated cabling and backplane solutions

Capacity

Increase capacity with more media sites

Efficiency

Up to **2x**

Less required airflow[1]

Density

2.5x

Higher[2]

Hot Pluggable

Front serviceability

Enabling Future Technology

PCIe* Gen 4.0 and 5.0 ready

E1.L: Optimized for Storage

Key Benefits:

- Scalable bandwidth, drives, and PCIe* lanes
- NVMe* drives for 1U rack space
- Dense JBOF, disaggregated storage
- Thermally optimized form factor

1. Source – Intel. Comparing airflow required to maintain equivalent temperature of a 4TB U.2 15mm Intel® SSD DC P4500 to a 4TB "Ruler" form factor for Intel® SSD DC P4500. Results have been estimated or simulated using internal analysis or architecture simulation or modeling, and provided for informational purposes. Simulation involves three drives for each form factor in a sheet metal representation of a server, 12.5mm pitch for "Ruler" form factor, 1000m elevation, limiting SSD on case temp of 70C or thermal throttling performance, whichever comes first. 5C guard band. Results used as a proxy for airflow anticipated on EDSFF spec compliant "Ruler" form factor Intel® SSD P4510.
2. Source – Intel. Comparing maximum capacity per 1 rack unit of Intel® Server Board S2600WP Family, 24 U.2 bay option using 4TB U.2 15mm Intel® SSD DC P4500 to 8TB Intel® AF1000 Server design, 32 "ruler" drive bays using 8TB "ruler" form factor for Intel® SSD DC P4500.

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QLC vs TLC

- QLC has 4-bits per cell, while TLC has 3-bits per cell.
  - 33% capacity improvement
- QLC costs 32% less than TLC
  - Closing the price gap between SSDs and HDDs
- QLC EDSFF using 16K block writes
- QLC EDSFF: 15.36TB now, 30.72TB in Oct/Nov.
- TLC EDSFF: 15.36TB in Oct/Nov.
- QLC EDSFF endurance is <0.5 DWPD
  - 8TB drive * 1 DWPD = 8TB per day
  - 16TB drive * .5 DWPD = 8TB per day

EDSFF Long SSD is the first QLC flash drive

Intel® SSD D5-P4326 Key specifications

Optimized for Read Intensive Workloads[1]

Rand. Read / Write	580K / 11K IOPs†
Seq. Read/ Write	3200/1600 MB/s†
Endurance: Rand/Seq.	**0.18/0.9 DWPD†**
Average Read Latency	137µs

†Derived using 15.36TB drive and 16K aligned

Space Efficient Capacity

Form Factor	Capacity		
U.2 15mm	15.36TB/30.72TB[4]		
E1.L	15.36TB/30.72TB[4]		
	U.2 (15.36TB)	**HDD (4TB)**	**E1.L (30.72TB)**
Capacity per 2U[5]	737TB	192TB	1,966TB

Efficient Storage Acceleration[2]

	Intel® SSD D5-P4326	Intel® SSD D3-S4510	HDD
IOPS/TB	37,760	12,500	30

NVMe* Drive Serviceability[3]

Hot plug support	Yes
In-band monitoring	Yes (SMART standards)
Out-of-band monitoring	Yes (support NVMe*-MI standard)

Data Integrity and Availability

Projected Annual Failure Rate	Same as for TLC NVMe SSD - Intel® SSD DC P4510 Series
End-to-End data protection Features	
Power Loss Imminent	

1. Source: Intel. See product specifications for Intel® SSD D5-P4326.

2. Source: Intel. Intel® SSD D5-P4326 15.36TB random read workload 4KB QD 256, Intel® SSD D3-S4510 7.68TB random read workload 4KB QD 32 projections, 8TB Seagate* HDD https://www.tomshardware.com/reviews/seagate-10tb-hgst-ultrastar-he10-wd-gold-8tb-hdd-round-up,4684-5.html. IOPS/TB calculated using random read performance.

3. Source – NVM Express*, PCI SIG. http://nvmexpress.org/wp-content/uploads/NVM_Express_1_2_Gold_20141209.pdf, https://pcisig.com/specifications

4. Source: Intel. 30.72TB Intel® SSD D5-P4326 available in 2019. Schedule subject to change, please contact your Intel representative for the most up to date schedules and roadmaps.

5. Source: Intel. Assuming 24 HDD in a 2U chassis, assuming 24 U.2 in a 2U chassis, assuming 64 E1.L in a 2U space.

1U 32-bay NVMe EDSFF Long Server

SSG-1029P-NEL32R

CHASSIS DIMENSIONS: **H** 1.71" x **W** 17.26" x **D** 35.95" (43.6 x 438.4 x 913.1mm)
DRIVE BAYS: 32 x EDSFF long NVMe Hot-swap SSDs (2 sleds with 16 drives per sled)
SERVER CAPABILITY: Dual Socket Intel® Xeon® Scalable processor (SKL and CLX) 24 DIMMs for up to 6TB memory 2 M.2 boot drives
I/O: 2x X16 PCIe* slots, 2x 10GbE ports, 1x IPMI ports, 2x USB ports, 1x UID button, 1x Reset button
POWER SUPPLIES: 2x 1600W (N+1) 96% efficient Digital Platinum Level Redundant Power Supplies
COOLING: 8 x 40mm high speed Hot-swappable Fans

KEY FEATURES

- 1U Extremely high density/high capacity NVMe* storage server
- Supports 32 NVMe hot-swappable SSDs
- BMC for remote system power on/off and system monitoring
- Dual socket Intel® Xeon® Scalable processor server (SKL & CLX)
- Individual SSD power cycling
- Intel® QuickAssist Technology for HW 100Gb encryption/compression

*Other names and brands may be claimed as the property of others.

APPLICATIONS

- High Throughput Ingest
- High Density Hot Storage
- HPC / Data Analytics
- Media/Video Streaming
- Content Delivery Network (CDN)
- Big Data Top of Rack Storage

1U 32-bay NVME* EDSFF* JBOF (coming soon)

SSG136R-NEL32JBF

KEY FEATURES

- 1U Extremely High Density High Capacity NVMe Storage Enclosure
- Supports 32 NVMe Hot-swappable SSDs
- BMC for Remote System Power on/off and system monitoring
- Tool-less SSD tray
- Flexible to configure up to 8 Hosts
- Individual SSD power cycling
- PCIe* External Cable Spec 0.7 compliant
- Slide Rail included

CHASSIS DIMENSIONS:

H 1.71" x **W** 17.26" x **D** 31.95" (43.6 x 438.4 x 811.7mm)

DRIVE BAYS:

32 x EDSFF NVMe* Hot-swap SSDs

(2 sleds with 16 drives per sled)

HOST SCALEABILITY:

Supports up to 8 host systems with X16 AOCs

I/O:

4x X16 Mini-SAS HD ports , 2x X16 PCIe Slots, 2x IPMI ports, 1x UID button, 1x Reset button

POWER SUPPLIES:

2x 1000W (N+1) 96% efficient Digital Titanium Level Redundant Power Supplies

COOLING:

8 x 40mm high speed Hot-swappable Fans

APPLICATIONS

- High Throughput Ingest
- High Density Hot Storage
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Benefits of E1.S Versus M.2

Form Factor E1.S enables flexible designs and carrier cards	**Thermally Optimized** Better airflow and thermal zones	**Density** 66% Higher[1]
Hot Pluggable Front Serviceability	**Form factor Flexibility** Multiple widths, heat spreader, guide rails and latch enclosure	**Capacity** Up to 2x Per drive[1]

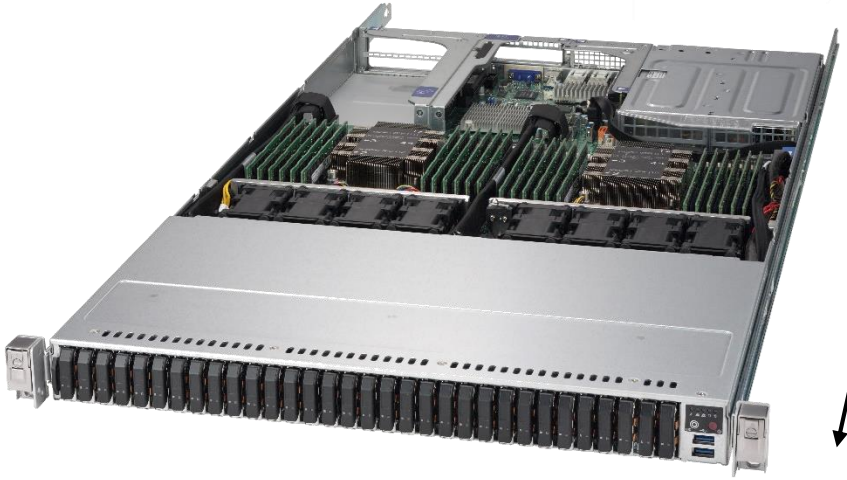
E1.S: Optimized Compute/Servers

Key Benefits:

- Improved system cooling for efficiency
- Reduce system complexity
- Low cost storage scaling
- Lower base system infrastructure cost
- Small servers with full feature set

1. 2x capacity when comparing generic M.2 SSD with 6 media sites, and generic EDSFF 1U Short with up to 12 media sites

1U 32-bay EDSFF Short Server



30”

Hot-swap
EDSFF module

SSG-1029P-NES32R

KEY FEATURES

- Up to 32 EDSFF short devices (128TB)
- Up to 6TB Memory (24 DIMM)
- RDMA optimized Configuration for low latency
- Redundant Power Supplies

System Specification

PROCCESSOR SUPPORT
Dual Intel Xeon Scalable processors (Socket P)
3 UPI Support

CHIPSET
Intel® C627 chipset

MEMORY
24 DIMM, Up to 6TB ECC 3DS LRDIMM,
768GB ECC RDIMM

Available for EXPANSION
2x PCI-E 3.0 x16 & 1x PCI-E 3.0 x4

EXTERNAL I/O SUPPORT
Dual 10Gbase-T and Dedicated IPMI port

DRIVE BAYS
32 EDSFF-S NVME bays

POWER SUPPLY
Redundant 1600W Power Supplies, 80PLUS Titanium

**Due to the complexity of integration, this product is sold as a completely assembled system only.

BigTwin™ E1.S SuperServer

BigTwin E1.S

Front View

- 4 nodes in 2U multi-node server
- 10 E1.S EDSFF drives per node
- Plus 2 M.2 drives per node
- Dual 2nd Gen Intel® Xeon® Scalable processors per node
- Up to 6TB memory in 24 DIMMs per node
- Intel® Optane™ DC persistent memory support
- Performance optimized CPU:drive ratio

Rear

Performance Optimized

Thank You

For more information, visit www.supermicro.com or contact marketing@supermicro.com

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