EDSFF: Mainstream NVMe for the (Datacenter) Masses
Many different types of systems, but most servers today: rack-mount and fit in multiple of the “1U” rack space.
Datacenter SSD – Our Previous Options

**Adapter Cards**

**Good:** High-perf Cache
**Bad:** Steal PCIe slots from IO
**Ugly:** $$$, You might fit two?

**Consumer SSD**

**Good:** Small and Modular
**Bad:** Low capacity, no hot-plug, connector less reliable
**Ugly:** More expensive once adapted to enterprise needs

**HDD form factors**

**Good:** Hot-plug, Storage features
**Bad:** Designed for HDD, not SSD
**Ugly:** Blocks airflow to the hottest components in server

Need an optimized common building block across server designs.
Datacenter server systems

Server designs have evolved with Moore’s law integration, except for one component: storage.

As mechanical devices, HDD have not followed the miniaturization path of semiconductors. Legacy form factors for SSD carry forward this same baggage.

Flash is now a necessity in the datacenter and quickly migrating from cache to main storage.

Legacy SSD are not optimized for datacenter servers and storage systems. This reduces opportunity for additional system function and density.
EDSFF 1U Short

Vision:
Create a smaller, high density solid state drive standard that is optimized for the datacenter.

EDSFF 1U Short (E1.S):
• Mainstream NVMe drive
• Compact, modular form factor
  • Vertical fit in 1U height
  • Fits in depth of 2.5” drive
• High Performance and Capacity
• Supports hot-plug and enterprise feature set
• +12V main power for reduced system cost
• LEDs on-drive for lower cost and easier integration

Optimized for the NVMe drive design and use across all datacenter systems to scale as mainstream storage.
## DRIVE VOLUME AND DATACENTER SYSTEM FRONT AREA

<table>
<thead>
<tr>
<th>Drive</th>
<th>Dimension (without cage)</th>
<th>Volume</th>
<th>GB/cm³</th>
<th>IOPS/cm³</th>
<th># Drives in 1U Front</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5&quot;</td>
<td>10.2 cm x 2.54 cm x 14.6 cm</td>
<td>378.3 cm³</td>
<td>21.1</td>
<td>528</td>
<td>4</td>
</tr>
<tr>
<td>2.5&quot; (HDD compatible bay)</td>
<td>6.99 cm x 1.5 cm x 10 cm</td>
<td>104.9 cm³</td>
<td>76.3</td>
<td>1906</td>
<td>12</td>
</tr>
<tr>
<td>(thin)</td>
<td>6.99 cm x 0.7 cm x 10 cm</td>
<td>48.9 cm³</td>
<td>163.6</td>
<td>4089</td>
<td>24?</td>
</tr>
<tr>
<td>EDSFF 1U Short (E1.S)</td>
<td>3.15 cm x 0.5 cm x 11.15 cm</td>
<td>17.5 cm³</td>
<td>457.1</td>
<td>11428</td>
<td>36</td>
</tr>
</tbody>
</table>

*EDSFF E1.S enables more space in servers and one use for this is density.*
Industry Standard datacenter-optimized NVMe drive that provides significant new system benefits

• **Key benefits:**
  – Much **smaller** enabling high **density** storage
  – Significantly improved **system airflow** and thermal solution
  – Most **efficient** modular **scaling** of NVMe capacity and performance
  – Enhanced feature set in **space-constrained** servers
  – **Lower** base system infrastructure and drive **costs**
E1.S Server System Benefits

Higher drive count enables faster acceleration while leaving physical space for more slower and cheap capacity storage.

Performance scales especially well, unlocking the inherent performance of the flash media on each drive without expensive, high-end controllers.

Even in dense configurations such as six E1.S drives per 2 x 2.5” bay, additional open space enables more airflow and better system cooling.
Future EDSFF applications for system benefits

• EDSFF connector: SFF-TA-1002 is well suited to further extend capabilities and features of devices in the EDSFF standard form factors.

• The EDSFF connector can support over 40W in all implementations and device power is typically limited first by system thermal requirements.

• Interesting future applications to consider for EDSFF:
  • Emerging Non-Volatile Memory
  • NVMe-oF
  • Computational storage
  • Compute and accelerators
  • IO and networking
Thank you!