Understanding Enterprise Solid State Drives (SSDs)

By Amphenol ICC

From mobile devices, laptops, to hyperscale data centers, the usage of storage devices in these equipment are well embedded in our daily lives. With the demand for enhanced efficiency in storage, most engineers are switching from conventional HDDs to smarter SSDs solutions. A reliable SSD will offer minimal bit error rates, better tolerance to extreme temperatures inside the data center, and high endurance. These are expected to be in service for multiple years catering to applications with high drive utilization.

Key market segments that use SSDs can be broadly classified into three: 1) Consumer SSDs used in mobile devices and tablets, 2) Client SSDs used in Laptops and Personal Computers and 3) Enterprise SSDs used in enterprise computing platforms like hyperscale computing and data centers. Connectors most commonly found inside SSDs are the SATA, M.2 and PCIe card edge connectors.

Enterprise SSDs use various form factors. A form factor is what defines how many SSDs can be fitted into your server chassis, or what data rate of SSDs, or how quickly it can be replaced without shutting down the entire system. Choosing the right one requires adequate research and knowledge.

There are wide arrays of form factors designed for your needs with definite pros and cons. However, the most common types are box-shaped forms factors (SAS, SATA, and U.2) and card-shaped form factors (PCIe-based AIC, and M.2). Similar SSDs may showcase varied performance levels with the change in the choice of form factors.

Cost-effective – SATA

SATA is considered as the first form of enterprise SSDs and are less expensive compared to its counterparts. These come in 2.5-inch and 3.5-inch box-shaped form factors and have bandwidth up to 6GT/s.

Faster and Reliable – SAS

A SAS SSD delivers faster data transfer rate, support dual-port operation and are more reliable regarding error correction, data integrity, and high signal quality. These are largely used in enterprise servers and storage arrays with application workloads requiring high availability and high input/output capabilities.

Small Form Factor - U.2

Also known as SFF8639, U.2 is the most common form factor. It comes in a box shape and can support 4 lane PCIe interfaces and mechanically supports SATA and SAS interfaces. It consumes power up to 20W and is hot-pluggable. It also supports redundant storage like JBOD/JBOF. It packs up to 24 such drives in a 2U server.

Power Profile - AIC (Add-In-Card)

AIC comes in a card shape and connects to the PCIe slot inside the server. This is available only for SSDs that supports PCIe interface. Unlike U.2 SSDs they are not hot-pluggable but can support more than 4 PCIe lanes.

Compact Form Factor - M.2

M.2 is the card-shaped SSD form factor mostly used in data center environments. This is the most compact form factor compared to the others. It uses PCIe or SATA to communicate.

Amphenol ICC's U.2 application for enterprise SSD can offer PCIe Gen 4 and Gen 5 performance. Similarly, PCIe Gen 3/4 and M.2 includes 16GT/s performance, and 24G SAS is available to address high bandwidth.

Next-Generation Solid State Drives (SSDs)

SSD form factors are constantly improving to meet the enhanced application demands. Amphenol ICC is always a step ahead in developing next-generation products, which is footprint compatible with legacy and current generation products.

While earlier generation SSDs were based on standards like SAS 2.0/3.0, future form factors follow advanced versions like SAS 4.0. Similarly, from PCIe 3.0 and 4.0, it has evolved to meet the 4th and 5th generation.

PCIe 4.0 and 5.0

EDSFF and NGSFF are two proposed SSD form factors capable of meeting the 4th and 5th generation PCIe/NVMe storage protocol for applications in the storage server and flash array. With hot-plugging capabilities and redundancy oriented dual port structures, these are effective replacements for M.2 in front service storage applications. EDSFF form factor is designed to accommodate 12.5mm slot pitch storage array, while NGSFF SSD can form 11mm slot-pitch array using up lesser space. However, both can be adjusted based on thermal performance. EDSFF has standardized 3 SSD form factors: 1U long, 1U short and 3", to meet different usage models.

24G SAS

24G SAS form factors will rule the mission-critical storage apps of tomorrow with their high data rates. SAS 4.0 offers a speed of 24GT/s which makes it a strong competitor to latest NVMe/PCIe SSD form factors. Its speed performance can be considered on par with NVMe SSDs.

Amphenol ICC offers many next-generation connectors to support these future SSD form factors. While our SAS 4.0 connectors support 24G SAS form factor SSDs, the Cool Edge connectors meet PCIe standards.

For more information on products from Amphenol ICC go to
www.mouser.com/amphenol-icc/

About Amphenol ICC

Amphenol ICC, a division of Amphenol, is a world leader providing interconnect solutions for the Information, Communications and Commercial electronics markets.

We design and manufacture a wide range of innovative connectors as well as cable assemblies for diverse applications including server, storage, data center, networking, industrial, business equipment and automotive.

With our global presence in R&D, manufacturing and sales, we are well positioned to support our customers wherever they operate.

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