

# Scaling Enterprise Storage with SAS Hard Drives

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## Introduction

Data center workloads have increased exponentially in recent years, requiring IT managers to find new ways of scaling their enterprise storage resources in a way that is both highly reliable and cost-effective. With the introduction of complementary serial interface technologies, IT managers now have the flexibility to deploy either high performance SAS drives or cost-effective Serial ATA (SATA) drives in a Serial Attached SCSI (SAS) storage environment. Hardware compatibility between the new interfaces will provide unprecedented design flexibility for server and storage subsystem deployments.



SAS was designed to be the successor to parallel SCSI, which has been used effectively as an enterprise storage interface for more than 20 years. SAS supports the SCSI command set and protocol, maintaining compatibility with the last 20 years of application software investment. SAS will support faster data transfer rates and more devices per controller, as well as reduce the size and complexity of the cables and connectors (thus enabling smaller, more densely-packed disk arrays).

SAS is a point-to-point serial architecture, meaning that each drive has a dedicated connection to the host. Eliminating the shared (parallel) bus bottleneck results in higher overall performance because the host will deliver full bandwidth to each individual hard drive. These dedicated, point-to-point connections provide full-duplex connectivity at 3Gb/s for superior performance.

SAS is a dual-port interface that provides two separate data paths into the drive. This delivers higher levels of performance and eliminates the “single point of failure” that is a drawback of the current parallel SCSI interface. The SAS specification calls for ongoing data transfer rate improvements to 6 Gb/s and 12 Gb/s, ensuring high-performance for the long term.

## Greater device support

One of the primary limitations of the parallel SCSI interface is that it only supports up to 15 drives on a single bus. SAS improves drive addressability and connectivity with the use of fan-out and edge expanders. Fan-out expanders can address up to 128 edge expanders and each edge expander can address up to 128 SAS devices for a total connectivity of 16,384 SAS devices. This allows large amounts of storage to be easily aggregated over multiple SAS links.

This highly scalable method of connecting SAS hard drives in a system enables IT managers to develop storage solutions that support multi-node clustering and dynamic load balancing. Dynamic load balancing is an application that distributes the load across multiple controllers and data paths to eliminate bottlenecks and increase throughput.

## Serial interface compatibility

SAS and SATA share the same physical interface, which will enable IT managers to deploy both types of drives in a single enclosure. This will be a major benefit to IT managers that are deploying tiered storage, which is a method of classifying and storing data based on assigned business value. By using high-capacity, inexpensive SATA drives to store infrequently accessed reference data, IT managers can minimize costs and simplify data management. Primary data, commonly used in online transaction processing and other mission-critical applications, will likely be stored on higher performance SAS hard drives.

The compatibility between backplanes, connectors and cabling will reduce cost and complexity, but also simplify the process of changing the “mix” of drives within an enclosure. The ability to replace a SATA drive with a SAS drive, or vice versa, will eliminate the need to replace entire systems when additional performance or capacity is required.

For enterprise customers that require flexibility and the ability to scale up as data center workloads increase, SAS hard drives will be a major step forward. With global storage requirements set to increase substantially in coming years, flexibility and scalability will be of the utmost importance to system builders and their customers.

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