

Let's Talk About Serial ATA



The Basics

Serial ATA (SATA) is the next-generation interface standard for low-cost direct-attached storage in desktop PC, workstation, and entry-level server environments. As a serial technology (bits transmitted in a single stream, rather than along parallel paths) SATA eliminates the restrictions on performance, reliability, and scalability that are inherent in today's parallel ATA (IDE) standard. Because SATA cost-effectively enables RAID protection, is easily scalable, and has a high performance roadmap, it will become the dominant direct-attach storage interface for budget-conscious users.

Storage Interface Evolution

When it was introduced nearly twenty years ago, parallel ATA, also known as IDE, provided a simple low-cost storage interface standard that met the performance and flexibility needs of desktop PCs. Concurrently, the more robust and costly SCSI interface evolved to fulfill the higher performance, reliability, and scalability requirements of enterprise-class applications.

However, as CPU capabilities and the complexity of applications and data types accelerate, technology restrictions limit the future applicability of parallel interfaces. To better meet future processing needs, both ATA and SCSI are moving to more flexible and capable serial technology. Over time, SATA for the low-end and Serial-Attached SCSI (SAS) for the high-end will become the industry standard storage interfaces.

Why SATA?

SATA has been developed as a backward compatible, evolutionary replacement for ATA. Employing a serial technology version of the ATA design, SATA offers compelling technology, performance, and usability benefits for data-intensive applications in direct-attached storage environments. Within the next three years SATA will replace ATA/IDE as the low-cost interface-of-choice.

Parallel vs. Serial Interfaces

Interface	Technology	Transfer Rate		Cabling	Connectivity
		Current	Planned		
ATA/IDE	Parallel	~133 MB/s	At max today	Wide ribbon 40-pin 18-inch length	2 drives per channel Master/slave relationship Shared bandwidth among drives
SATA	Serial	~150 MB/s	~600 MB/s	Thin, round ribbon 4-pin 1-meter length	Single driver per channel Point-to-point connection Full bandwidth per drive
SCSI	Parallel	~320 MB/s	None planned	Wide, round ribbon 68-pin 12.5 meter (LVD) length	Up to 15 devices per channel
SAS	Serial	~300 MB/s	~1200 MB/s	Thin, round ribbon 6-meter length	128 devices Expanders allow up to 16,000 devices

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Features	Benefits
High performance roadmap (1.5 to 6.0 gigabits/sec)	Scalable performance growth
Lowest-cost per megabyte	Wide market appeal
Command optimization	Makes SATA RAID more practical
Point-to-point connections	Greater data reliability
Full backward compatibility	Easier, faster, cheaper migration
Single thin 1-meter cable	Greater flexibility; space savings
Backplane connection	Hot-plug/hot-swap flexibility

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When to Choose SATA

The low-cost/high-benefit nature of SATA makes it an ideal fit for budget-conscious desktop, high-end workstation, and entry-level server users whose application needs require high performance without either the additional robustness, or the external connectivity features of SCSI technologies.

Interface	Cost	Optimal Data Type	Storage Environment	Application Environments
ATA/IDE	Low	Reference data; low frequency access; sequential data; e.g., file sharing, email, web, backup, archive	Internal DAS	Desktop PCs
SATA				Desktop PCs, workstations, entry-level servers
SCSI	Moderate	High-frequency transactional & random access data; e.g., database, online purchases, OLTP, CRM	Internal DAS & External NAS/SAN	Mission critical enterprise servers, networked storage
SAS				Mission critical enterprise servers, large-scale networked storage

Glossary

ATA	“Advanced Technology Attachment,” a storage interface designed over 15 years ago and now the de facto I/O standard for desktop PCs. Though adequate for low data-demand applications, the combination of increased CPU capabilities, greater application throughput demands, and faster, more capable hard drives, severely limits the future usefulness of this interface.	Parallel Technology	A design that allows a device (hard drive) to receive multiple bits of information at the same time. Parallel interfaces use short, wide cables carrying multiple signals, and pose inherent design limitations on data transfer speed and multiple device connections.
Command Optimization	Commands to a device are queued for immediate execution, without having to wait for responses, increasing performance and making RAID more practical.	Point-to-Point	Direct connection between the backplane and the storage device, allowing for the high-performance, full utilization of bandwidth.
CRM	“Customer Resource Management” software.	SAN	“Storage Area Network,” a storage design that connects all the storage devices on a network with all the servers on a network for enhanced reliability and performance.
IDE	“Integrated Device Electronics,” the current low-cost storage interface standard for desktop and portable PCs, synonymous with ATA.	SAS	“Serial Attached SCSI,” the serial implementation of the SCSI standard, providing greater flexibility, performance, reliability, and connectivity.
NAS	“Network Attached Storage,” a storage design that connects a server to externally enclosed hard drives via a local area network.	SATA	“Serial ATA” is an evolutionary replacement for the Parallel ATA physical storage interface.
OLTP	“Online Transaction Processing” database.	SCSI	“Small Computer System Interface,” the predominant storage I/O technology for high-reliability, high-performance server applications.
		Serial Technology	A design that allows data to be sent one bit at a time. Serial interfaces use thin cables, and are capable of faster speeds, greater reliability, and more flexibility in attaching multiple drives.

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