Frequently Asked Questions
About SATA 6Gb/s and the SATA Revision 3.0 Specification
(May/June 2009)

Q1: What is Serial ATA Revision 3.0?
A1: SATA Revision 3.0 is the latest specification from the SATA International Organization (SATA-IO), the industry group that drives the continuing evolution of this high-performance, low-cost interface. The new specification increases SATA transfer speeds to 6 gigabits per second (6Gb/s), doubling the 3 gigabits per second (3Gb/s) transfer rate of the previous SATA Revision 2.6 specification. Other new SATA features include advances for data streaming, better power management as well as solutions for smaller footprint optical disk drives and hard disk drives.

Q2: What is SATA 6Gb/s?
A2: SATA 6Gb/s is the transfer speed defined in SATA Revision 3.0, the latest evolution of SATA technology. The 6Gb/s transfer rate of the third-generation specification doubles the 3Gb/s transfer speed of the previous SATA Revision 2.6 specification. The introduction of SATA 6Gb/s technology will enhance the appeal of the high-performance, low-cost interface, solidifying its dominance as the most popular internal storage interface.

Q3: What are the benefits of SATA 6Gb/s?
A3: By doubling the transfer speed from 3Gb/s to 6Gb/s, SATA 6Gb/s will allow users to spend less time transferring data. SATA 6Gb/s delivers on the increasing demand for speed and data mobility. As end-users amass ever-increasing amounts of high-resolution photos, videos, music, and other data, basic transfer rates become crucial. SATA 6Gb/s will enable the movement of large amounts of data at a much faster rate.

Q4: What is the significance of the increased transfer rate achieved by the Serial ATA Revision 3.0 specification? Which applications can take advantage of all that speed?
A4: The higher transfer rate provides greater bandwidth for emerging high-performance storage solutions that directly utilize the increased transfer rates. Today's computer applications rely on interface technologies that can accommodate high bandwidth for faster transfers of multimedia content. By increasing the transfer rate up to 6Gb/s or 600 MB/s (megabytes per second), SATA technology enables faster transfer of short bursts of data to and from the drive cache.
For example, high-end PCs used for bandwidth-hungry applications like video editing would be good candidates for SATA 6Gb/s because they require high performance access to memory. High-end solid state drives (SSDs) are already pushing the limits of available interfaces, impacting read speeds. Moving to SATA 6Gb/s will remove the bottleneck for SSDs to enable faster read and write speeds.

In addition, SATA Revision 3.0 supports higher bandwidth aggregation achieved through port multipliers, which allow a single Serial ATA port to communicate with multiple drives. Port multipliers provide cost-effective and expanded drive scalability to storage systems. Simplified cabling allows the host to be connected to up to fifteen SATA devices by a single cable. In addition, several silicon companies offer a chip that enables four or five SATA drives to be connected to the host SATA port via a single SATA connection. Previously, this link would have been limited to 3Gb/s, but a SATA 6Gb/s port multiplier enables full utilization of the aggregated bandwidth.

RAID controllers also rely on the aggregated bandwidth of several hard disk drives to maximize the throughput advantages available through the faster bus. RAID cards which are designed for data redundancy and performance in particular are expected to benefit from the move to SATA 6Gb/s architectures.

Q5: Are there any other benefits to SATA Revision 3.0 besides doubling the speed?

A5: In addition to doubling storage device transfer speeds, the SATA Revision 3.0 specification includes the following new features:

- Serial ATA Native Command Queuing (NCQ) Streaming Command which accommodates isochronous data transfers, making SATA more suitable for audio/video applications
- NCQ Queue Management which allows the host to manage and process outstanding NCQ commands to optimize performance
- Automatic Partial to Slumber mode transition which eliminates the need to enter Active mode, thereby improving power management
- Low Insertion Force (LIF) connector which further shrinks the 1.8-inch hard disk drive footprint and brings SATA technology into compact, embedded storage applications
- Connector solution for 7mm optical disk drives enabling thinner and lighter mobile notebook PCs.

Q6: When will SATA 6Gb/s be shipping in volume?
A6: Individual vendors of SATA products are better suited to address specific plans and availability schedules for their products. The release of the SATA Revision 3.0 specification supports immediate product development. The features and capabilities included in the new specification will be represented in hard disk drives, cables, enclosures and controllers. Enterprise system vendors are also planning platforms with SATA.

Q7: Where can I see SATA 6Gb/s technology?
A7: SATA-IO will demonstrate 6Gb/s products in Booth #H813 at Computex on June 2-6 in Taipei. In addition, please inquire with individual vendors about their plans and expected availability of products using the SATA Revision 3.0 specifications. The breadth of technology solutions included in the SATA Revision 3.0 specification are geared for OEM and channel customers as well as end-users of SATA products..

Q8: What does backward compatible mean?
A8: Backward compatibility means that SATA 6Gb/s hosts and drives will operate when connected to 3Gb/s or 1.5G/bs drives and hosts, by automatically dropping to the appropriate transfer rates.

9: Does SATA 6Gb/s require different connectors and cables to support the higher transfer speed?
A9**:** The same cables and connectors used for current SATA 1.5 and SATA 3.0 Gb/s implementations can be used to connect SATA 6Gb/s devices, although SATA-IO recommends quality components be selected to ensure data integrity and robust operation at the faster SATA 6Gb/s transfer rate. Keeping the existing SATA connector form factor enables SATA 6Gb/s to be designed into the same cost-conscious hardware architectures while minimizing infrastructure changes.

Q10: How does SATA compare with competitive technologies?
A10: SATA 6Gb/s will enhance the appeal of SATA as a high-performance, low-cost interface. Since its introduction in 2001, SATA has become the primary storage interface. According to analyst firm IDC, more than 1.1 billion SATA hard drives have shipped from 2001 through 2008. Last year, SATA captured more than 98 percent of internal hard disk drive shipments, demonstrating that SATA technology is now used in the vast majority of desktop and mobile PCs.*

Other devices adopting the SATA interface technology include optical disk drives, solid state drives, and multi-user storage applications. Many entry and mid-level servers as well as external storage systems now incorporate the technology.

Systems outfitted with high-speed FireWire can move data as fast as 393MB/s, while upcoming products based on the new USB 3.0 specification will provide data transfer speeds up to 5Gb/s. The faster 600MB/s transfer rates of SATA 6Gb/s provide a speedier, cost-effective solution and an easier upgrade path for high-bandwidth applications in the future. Unlike other interfaces, the SATA protocol is optimized for storage devices to provide the most efficient native drive interface.

**Source: IDC Doc #215614, "Economic Crisis Response: Worldwide 2008-2012 Forecast Update", December 2008*

Q11: What is the proper way to refer to the upcoming SATA 6Gb/s technology?
A11: When referring to the specification, use “Serial ATA Revision 3.0 specification” for the first reference. For successive references, this can be shortened to “SATA Revision 3.0.” Do not use “SATA 3.0.”

When referring to transfer rates, the technology can be correctly referred to as “SATA 6Gb/s.” Products themselves are to be called “SATA 6Gb/s <product name>.” For more information, SATA-IO has developed Naming Guidelines with detailed recommendations. **Please note: references to “Gen 3” embedded within the SATA Revision 3.0 specification are strictly related to technical specification items and should not be used for marketing and product naming purposes.**

Q12: What are the benefits of the NCQ streaming defined in SATA Revision 3.0?
A12: NCQ technology can increase drive performance by allowing the disk to internally optimize or “queue” multiple read and write commands to be processed in the most efficient way possible. This can reduce unnecessary drive head movement, resulting in increased performance for workloads where multiple simultaneous read/write requests are outstanding, such as in server-type applications. NCQ streaming allows information to be passed while simultaneously handling other media requests so that operations such as media playback can be enjoyed without interruption or performance degradation.

Q13: How does SATA Revision 3.0 differ from earlier generations of SATA technology with respect to power consumption or management?
A13: Serial ATA provides power management capabilities that allow the interface to be powered down during idle periods while providing a very fast recovery time. Those facilities defined in previous SATA specifications still apply to SATA 6Gb/s. Although 6Gb/s Phy designs may require higher active power (depending on the specific design and implementation), power efficiency of the overall system should not be adversely impacted because the active time required to complete the transfer of a given amount of data is approximately reduced by half as compared to 3Gb/s. Well-designed implementations can realize power efficiency improvements with 6Gb/s Phy active power over slightly lower 3Gb/s power requirements through reductions in effective duty cycles.

Q14: Were there any attenuation or jitter issues that had to be addressed with the jump to 6Gb/s?
A14: Ensuring signal integrity was the primary challenge in doubling the SATA transfer speed for a second time while using the same cables and connectors that were originally defined for the first generation 1.5Gb/s version.

Q15: What's the real-world data transfer rate of SATA 6Gb/s?
A15: The realizable transfer rate across a 6Gb/s SATA link depends on the efficiency of the controller design on both the host and device sides of the interconnect. The SATA 6Gb/s interface transmits information at 600MB/s, however not all 600MB/s are realized as the user data payload because the protocol includes other data and handshaking communications between the host and device. In general, the SATA interface is very efficient. Realized transfer rates are typically very close to the theoretical maximum, which is one of the primary benefits of SATA technology for mass storage devices.

Q16: What overhead brings the 6Gb/s transfer rate down to the real-world throughput?
A16: There are two general categories of overhead that come into play: a communication used to send commands and receive status, and a low-level communication that handles handshakes between the host and the devices to assure the integrity of the transmission.

Q17: What's next for SATA technology?
A17: While the SATA Revision 3.0 specification addresses the internal SATA market, the new SATA Revision 3.1 specification presently under development will add the external SATA (eSATA) extension to the SATA 6Gb/s family of solutions. For instance, SATA Revision 3.0 includes SATA specifications for the internal cabled interconnect, but does not yet include the definition for an external 6Gb/s SATA solution. One priority will be to solve the challenges of the external interconnect, which requires more rugged connectors while supporting cabling flexibility realized by longer cable lengths.