



Technology Analysis

What Happens When You Add Super to AIT?

Abstract: *Sony is developing a new tape technology called S-AIT. S-AIT leverages Sony's AIT architecture, but will use a half-inch cartridge and longer media to yield significantly higher capacities than AIT and other tape products.*

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Key Issue

What changes in technologies and vendor dynamics will shape the storage industry?

Strategic Planning Assumptions

Sony's new S-AIT technology meets many of the requirements for success in the market; however, as with any new format, S-AIT will be severely challenged to achieve market acceptance and mind share amid the array of tape technologies that already exist (0.9 probability).

To avoid becoming a niche product, Sony must be committed to providing significant marketing resources to carry the S-AIT message to the end user to create market demand (0.8 probability).

Technology Description/Overview

Sony announced on 2 November 2001 that it is developing a new tape technology, which it calls S-AIT. With its roots based in Sony's Advanced Intelligent Tape (AIT), S-AIT is the answer to the title of this document: "What Happens When You Add Super to AIT?" The S-AIT drive will leverage the architecture of AIT, but S-AIT will be a different format that will yield significantly higher capacities per tape cartridge than AIT and other tape products that are shipping today.

Why S-AIT?

Sony's reasoning behind the introduction of another tape format is multifaceted. The company believes that a paradigm shift in tape drive design is required to achieve a tape capacity of 1TB by 2006 and advance to even higher capacities after that. The thinking here is that this amount of capacity on a tape cartridge is necessary to maintain parity with trends in hard disk drives, both in matching the individual disk drive capacities and also in meeting the growth requirements of digital content for existing and new applications. In addition, the drives that result from the new technology must have performance features that match the capacity. Sony felt the best way to accomplish its goal would be to use its proven helical scan technology — AIT. However, because the extended AIT roadmap using 8mm-wide media would not allow AIT to get to the desired level of capacity and performance in the right time frame, Sony decided to leverage the AIT density roadmap, but with a new format based on wider and longer media.

S-AIT Technology

S-AIT will still be based on helical scan recording technology. However, instead of using tape that is 8mm wide (such as AIT and Exabyte's MammothTape and VXA tape technologies) and a cartridge that contains two reels of tape, S-AIT will use media that is 0.5 inches wide that is housed in a "square," single reel cartridge similar to an LTO cartridge. Because it will use this type of half-inch cartridge, this new technology should be "library ready" and relatively easy to integrate into existing libraries that were designed to hold LTO cartridges. The position of the cartridge opening may be an issue; however, the LTO drives from Hewlett-Packard, Seagate and IBM do not have the cartridge opening on the front of the drive aligned the same, even among the three products. The media planned for the first S-AIT drive will have a length of 600 meters, and like the AIT cartridge, the cartridge containing the media will have a Remote Memory in Cassette (R-MIC) built in to improve the access time to data. Plans call for the use of Advanced Metal Evaporated (AME) media because of its areal density capabilities. As with other helical scan tape drives, the media wraps around the head during a write operation and during a low-speed search. S-AIT will feature a dual-mode tape path design in which the tape is not wrapped around the head during a high-speed search or during a rewind operation. When used with the R-MIC,

this high-speed search capability will provide for faster access times to data than competing linear tape technologies while also reducing tape friction because the tape is not in contact with the head. The first generation of S-AIT is expected to have an average file access time of less than 50 seconds, including the time to load and initialize the cartridge, compared with access times (including cartridge load to ready times) in the range of 82 to 88 seconds for linear technologies, SDLT and LTO.

The S-AIT drive is being designed to a 5.25-inch form factor; albeit, it will be slightly longer than the standard length of a 5.25-inch drive. Each generation of S-AIT will essentially achieve its capacity by utilizing the areal density of the latest-generation AIT drive. But, because it has five times the amount of tape on which to record data, the result is a product with five times the capacity. For example, the first generation of S-AIT will use the areal density of the AIT-3 drives, but its native capacity will be 500GB compared with the 100GB of AIT-3. SAIT-2 utilizes the areal density of AIT-4 and so on. With this amount of capacity on a cartridge, a 2U rack-mountable automation solution could provide an uncompressed capacity of 4TB and a 1,000-cartridge tape library could store more than 500TB (uncompressed) of data. Because of the high track densities that are possible with helical scan recording and the fact that more space on the tape is used than with linear formats because of their track spacing, S-AIT technology has much higher areal densities than linear-serpentine tape formats. Sony is specifying an areal density of 720 Mb/sq. in. on the first-generation S-AIT drive, which compares to 100 Mb/sq. in. on the first-generation LTO drives and 119 Mb/square inch on the first generation of SDLT.

As it did when the AIT technology was first announced, Sony has laid out a roadmap for S-AIT that includes four drive generations. The first-generation drives are planned for delivery to the market by the end of 2002. At each step of the roadmap, both the capacity and transfer rate doubles. The native capacity goes from 500GB on the first generation drive to 1TB on SAIT-2; SAIT-3 has a capacity of 2TB and SAIT-4 has a capacity of 4TB. The native data transfer rate of SAIT-1 is 30 MB/sec and the transfer rate goes to 60 MB/sec for the second generation and to 120 MB/sec and 240 MB/sec on the third and fourth generations. The drum on the first-generation drive will have a rotational speed of 5,000 rpm, which is 1,000 rpm less than the drum speed Sony uses on its AIT-3 drive. Current plans call for the drum speed to increase with each product generation, moving to 6,667 rpm, then 8,889 rpm and 10,000 rpm for the fourth generation. The S-AIT migration path shows a change from a Hyper Metal, Super Laminate head technology to magnetoresistive (MR) technology for the second and third generations, and then to giant magnetoresistive (GMR) for the fourth generation. The track pitch is also reduced with each generation, going from 5.5 microns on the first generation to a track pitch of less than 2 microns on generation four.

The first implementation of S-AIT will be offered with either an Ultra 160 SCSI interface or a Fibre Channel interface.

The only pricing that has been given out by Sony for the initial S-AIT drives is "a list price of under \$10,000." However, Sony is positioning the first generation of S-AIT either just above or head-to-head with the first-generation LTO and SDLT drives. Gartner Dataquest expects that the next generation of LTO and SDLT products will have prices considerably below \$10,000 and therefore, the first generation of S-AIT will also have to be priced well below the \$10,000 mark.

Sony believes that multiple manufacturing sources, for the drives and the media, are key to the market acceptance of S-AIT. Therefore, in conjunction with the S-AIT technology announcement, Sony announced the signing of a Memorandum of Understanding (MOU) with Matsushita Kotobuki Electronics (MKE), and Matsushita Electric Industrial (MEI), known for Panasonic-brand products. The MOU outlines the intention of the companies to collaborate in bringing S-AIT to market. MKE will provide the market with an alternative manufacturing source for S-AIT drives, and MEI will be an alternative manufacturer of the S-AIT media. Sony and the Matsushita companies intend to cooperate on S-AIT drive and media development to improve product development time; however, in the marketplace, MKE and MEI will be competing against Sony for S-AIT drive and media customers.

Gartner Dataquest Perspective

When it enters the market, S-AIT will encounter considerable competition from other so-called "super drives," including LTO from HP, Seagate and IBM; SDLT from Quantum and Tandberg; M3 from Exabyte, and even Sony's own AIT-3 drives. Sony sees its main competitive advantages with S-AIT over LTO and SDLT as a capacity that is five times greater and its performance of 30 MB/sec. However, Quantum plans to bring a higher-performance, higher-capacity, first-generation SDLT drive to market in the first half of 2002, which will boost the capacity of SDLT to a native capacity of 160GB, with a transfer rate of 16 MB/sec. And Quantum is targeting the second half of 2003 for production of the second generation of SDLT, which is slated for a native capacity and data transfer rate of 320GB and 32 MB/sec. Also, Gartner Dataquest expects to see second-generation LTO drives enter the market in late 2002 — the same time frame that is planned for S-AIT. Second-generation LTO products will have native capacities of 200GB and are expected to have data transfer rates of at least 30 MB/sec. Sony will therefore be going up against well-established technologies from large name-brand companies, and it will no longer have a transfer rate advantage. By moving to a 5.25-inch form factor and a half-inch cartridge package, Sony will also give up the form factor advantage against LTO and SDLT that it has with its AIT products. But, in an automation system with an equivalent number of drives and cartridges, Sony's S-AIT technology will still have a capacity advantage over other half-inch cartridge technologies.

As the capacity stored on a single tape cartridge increases, growing concerns of end users are the time required to access a specific file on a tape and media management issues associated with the amount of time

required to move content from one tape cartridge to another. S-AIT drives will require about the same amount of time as LTO and SDLT to load and initialize a tape, but the drives will take significantly less time to access a specific file on the tape. And, for capacity-hungry applications such as the storage of video, document or medical images, large databases, and even seismic or aerospace applications, S-AIT, when integrated in tape libraries, will provide a solution with a clear capacity advantage over the nearest competition. It should also provide an excellent solution for archiving large amounts of data and appeal to applications that utilize hierarchical storage management (HSM) tools. If the first generation of S-AIT can be priced in the market at or near the price of LTO Generation 2 drives and Generation 1.5 of SDLT, then it should attract interest in the market.

Gartner Dataquest believes Sony will face market positioning issues among its various tape product lines. If S-AIT is to be positioned to compete against LTO and SDLT, then AIT must move down quickly in cost and in street price to allow for S-AIT to come in above it. We assume Sony is taking the necessary steps to make this scenario happen. But Sony also has another high-capacity tape product line, DTF, that is targeted for the same capacity-centric applications as S-AIT. The second-generation DTF-2 drives have a native capacity of 200GB and a transfer rate of 24 MB/sec. This drive and its cartridge have much larger form factors than the S-AIT drive and cartridge, and unless Sony takes a dramatic price reduction on this line of products, DTF-2 will be priced much higher than S-AIT. Sony's response to this is that DTF has its roots in digital broadcast technology, and its focus is more attuned to the entertainment sectors of the market. Sony also plans to continue to migrate DTF to higher levels of capacity and performance, and the next generation of DTF, DTF-3 (which is due out in 2003), will have a capacity (at 400GB) comparable to that of S-AIT. It will have a transfer rate of 48 MB/sec, which will move it well ahead of S-AIT in performance. Product comparisons aside, perhaps the overriding question is how much Sony is willing to expend in resources and marketing funds to ensure the success of S-AIT without usurping the funds that are still necessary to achieve higher market penetration for the AIT and DTF drives, and attain the strategic goals that Sony has laid out for those product lines?

With higher-capacity tape products, especially those that are targeted at library applications that require hundreds of cartridges, the price of the media/cartridge looms as a growing issue. Even with a starting capacity of 500GB, Gartner Dataquest does not believe that users will be willing to pay a price for an S-AIT cartridge that is multiples of the current price of an LTO or SDLT cartridge.

Gartner Dataquest agrees with Sony's assessment that multiple sources for drives and media are key ingredients for the success of a new tape technology. The large investment base that is brought to bear by multiple powerful companies (Sony, MKE and MEI) joining forces helps to give this new technology increased credibility in the marketplace.

Although multiple sources are by no means an assurance of success, they can act to remove a factor, which the competition could cite as a weakness for the technology. MKE has extensive experience in the design and manufacture of commercial and consumer products based on helical scan technology, and MEI has been involved for at least a decade in the development and manufacture of ME media. Therefore, the Matsushita "group" provides a capable and logical partner for Sony.

Other ingredients that Sony cited for market acceptance of S-AIT include exceeding market requirements, solid technology and a scalable roadmap. With the specifications outlined for S-AIT, there is little doubt that the technology will exceed market requirements. The AIT drives have built a reputation in the market for being robust, reliable products, and because S-AIT is based on AIT technology, it is grounded in solid technology. And by all appearances, S-AIT has a very scalable roadmap. However, the major challenge for this new format goes beyond the technology. No matter how good, any new technology would have a difficult time gaining market acceptance and mind share against the array of tape technologies that already exist. Sony has already obtained commitments from three library companies, ADIC, Qualstar and Spectra Logic, to integrate S-AIT into their libraries, and there is a good probability that the drives will be picked up by at least one major server OEM. But, in spite of this and to avoid becoming just a niche product, Gartner Dataquest believes Sony will need to carry the S-AIT message to the end user to create demand for the products. This will require a supreme commitment on the part of Sony Japan to provide the necessary marketing capital. At the same time, Sony must not appear to be reducing its commitment to the AIT technology, and the company must reinforce its commitment with increased backing to move the AIT products forward in the market.

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