



Hardware Assets

Rugged Storage Products

Flash Drives Zoom toward Rugged Storage Dominance

Flash solid-state drives are poised to displace magnetic hard disks as the preferred rugged storage option. Sealing the deal is flash's ability to do speedier secure erase.

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Senior Editor

It's no secret that the number of embedded computers used in military electronic systems continues to climb. And those computers are being tasked to crunch, process and collect greater amounts of data. As a consequence, system designers hunger for rugged storage products with ever-greater levels of density and performance. For a long time, ruggedized rotating magnetic media offered storage capacities and speeds that other alternatives couldn't match.

But in recent years, flash-based solid-state disks (F-SSDs) have gained ground on those metrics. Today, if the dynamics in the flash memory chip market and the roadmaps of flash chip vendors are any guide, it looks like F-SSDs are poised to quell any arguments for staying with traditional rugged hard drives. Throw in the major advantages in ruggedness and security that F-SSDs enjoy and the contrast becomes even more vivid. Responding to the growing demand for F-SSDs, the major vendors of F-SSD products—including Adtron, BiTMICRO, M-Systems and Memtech—continue to ramp the capacity, performance and security features of their products.

Demand for NAND is Strong

Trends in the NAND-architecture flash semiconductor market have been good news for F-SSDs. In the past couple of years, flash costs have decreased dramatically—so dramatically that flash prices are around 1/20th of what they were three years ago.

“That trend has increased affordability and increased acceptance of flash—not only in the Mil-Aero and industrial embedded area—but in the consumer side as well”, says Stephen Uriarte, V.P. of corporate development at BiTMICRO, a maker of F-SSDs.

Because F-SSDs targeted for military and aerospace apps use the same fundamental flash components as the consumer realm, the price advantages can be leveraged across all markets. The increased market demand for flash storage has led to the emergence of new suppliers moving into the NAND flash arena, including ST Micro, Micron Technology, Hynix and Infineon, all of which intend to supply NAND flash devices in 2004. Densities of NAND flash chips continue to ramp up, with 2 Gbit flash chips sampling or available today, and 8 Gbit chips starting to sample. Once the 8 Gbit devices become available, F-SSD vendors will be able to boost

their 3.5-inch products, for example, from 75 Gbytes of capacity to a whopping 600 Gbytes.

On the interface side, IDE and SCSI-compatible F-SSDs remain the standard today. As designers call for faster transfer speeds, serial interfaces are coming into play. Serial interface technologies like Fibre Channel, FireWire, USB, Serial ATA and various Ethernet flavors are among those expected to usurp traditional parallel approaches. For his part, Alan Fitzgerald, Chief Technology Officer at Adtron, predicts that Gbit Ethernet and Serial ATA are the most likely to dominate in the future. The two types of Gbit Ethernet tailored to storage interfacing are iSCSI and direct Network Attached Storage (NAS) using NFS (network file system). “Those are literally just plug and play onto an Ethernet network. Gbit Ethernet is getting a lot of attention in the military because it's a common, inexpensive, lightweight and very, very maintainable interface,” he says.

Secure Erase Now a Must

Besides the ramp-ups in speed and capacity, the most significant trend in F-SSDs is the accelerated emphasis on security, and secure erase in particular. Secure erase refers to the process of completely

eliminating data on a disk drive such that the data can't be recovered. F-SSDs report that demand for secure erase has always been there, but it was only last year when not having secure erase became a deal breaker.

The issue of secure erase started moving to the forefront of decision makers' minds back in 2001, when the U.S. Navy surveillance plane EP-3E ARIES II had to make a forced landing in China. The crew had less than 20 minutes to erase crypto keys, classified software and data from the on-board computer hard drives and destroy CD-ROMs, floppy disks and key pieces of equipment. Because magnetic disk media takes hours to completely erase, the crew reportedly had to destroy the hardware with hammers and axes. For more details on the ARIES II incident, see the M-Systems article "Flash Disks: Enabling Mission-Critical Systems" in this section.

The ARIES II incident helped to make secure erase a requirement to play in the military rugged storage market. The requirement has given an added boost toward F-SSDs. Destroying the data on a 20 Gbyte hard drive can take quite a number of hours, because you have to overwrite it between 3 and 5 times (per NSA secure erase requirements) to completely eliminate the flux transitions in the magnetic media.

In a hard disk, overwriting a bit with a new bit value doesn't necessarily destroy the old bit value. The new one is at a stronger amplitude because that's what gets picked up. In contrast, F-SSDs can be securely erased in 20 to 40 seconds, depending on the capacity. Unlike hard disks, F-SSDs don't require any computer processing to control the erasure function. Flash disks can build in algorithms that enable the drive to start a secure erase operation at the push of a button. ■■

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