[Tech Trends]

A Solid Choice

Solid-state drives offer better performance at competitive prices. Find out if they are right for your IT shop.

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TangoWire's Bryan Brown says transactions run much faster on the company's Web site, thanks to solid-state drives.

Computer storage gets no respect. Sure, it's the workhorse of computing, storing data and serving it up on demand. But for years, there haven't been many improvements other than increased capacity and better prices.

Today, that's changing in a big way. The latest news in the world of data storage is the solid-state drive (SSD) — a primary storage device that uses less costly and more efficient Dynamic Random Access Memory (DRAM) or flash memory instead of the magnetic media of the traditional hard drive.

Physically, SSDs look very much like traditional hard drives, with similar 1.8- , 2.5- or 3.5-inch form factors and AT Attachment (ATA) or Serial ATA (SATA) drive interfaces. Similar to a traditional hard drive, the SSD resides inside a notebook or desktop computer, offering the same basic functions as a hard drive. Right now, capacities can reach 160 gigabytes per drive.

But that's where the similarities end. Although traditional hard drives are fairly reliable, with acceptable performance, the newest generation of SSDs are orders of magnitude better in terms of performance and reliability.

SSDs solve a problem that has plagued the storage industry for years — the need for speed.

With traditional hard drives, when a user searches for data on a standard disk drive, the system will locate the data on a specific drive, such as sector 50, disk 29. Starting with the sector, it will spin around to find the right disk, and if part of the data is on another disk in another sector, it can take a long time to find.

"Seek times are long, and disk drives have miserable rotational latency," explains Arun Taneja, founder of Taneja Group, a Hopkington, Mass., consultancy.

Faster and More Reliable

Unlike disk drives, which store data on spinning disks, SSDs store data mostly on DRAM at this point, although flash memory is fast gathering steam. And unlike disk drives, SSDs use 100 percent random access, meaning they don't need to read or write in a sequential fashion. That fact alone means that SSDs are much faster than standard hard drives — as much as 200 percent faster in

read speed and 60 percent faster in write speed.

“Because there are no mechanical parts or rotating media, it’s faster,” says Jeffrey Janukowicz, an analyst with International Data Corp. (IDC) in Framingham, Mass. “You don’t have to wait for the disk to spin around to find the data, which means end users can access their data much faster. Depending on the usage, the increased productivity savings — such as boot times — could be significant.”

And because there are fewer moving parts, less can go wrong. For organizations that require as much reliability as possible, that’s a major reason to consider the technology.

Finally, the drives can result in significant power savings. “If you have multiple drives in the system, think about the power savings you could amass,” Janukowicz says.

Speed and reliability were major selling factors for TangoWire, a Seattle-based social networking company with more than 4,000 special-interest online communities and millions of members. The company, which has only five employees, has seen the number of users increase significantly since its inception in 2001, causing it to outgrow its original combination of SCSI-based database servers running RAID 10.

“We had a lot more data to deal with and a lot more users spending time on our site, which resulted in much greater loads on our units,” explains Bryan Brown, chief technology officer at TangoWire. “It became increasingly difficult to distribute the load we had on our server, and speed was really becoming an issue.”

The company first tried mitigating the problem by separating the load onto multiple databases and servers. However, the databases became too unwieldy, and Brown was concerned about recovery and failure issues, as well as overall speed and the decreasing Input/Output per second (IOPS) rate.

According to Texas Memory Systems, the vendor’s slowest SSD is capable of 100,000 random IOPS, compared with 300 IOPS for conventional hard disks and 10,000 IOPS for the best RAID system. TMS also claims that its SSDs have a 15-microsecond access time — 250 times faster than traditional hard-disk drives.

In spring 2007, Brown decided to buy a RamSan 400 SSD from Texas Memory Systems with 4 gigabytes of Fibre Channel storage and 4x InfiniBand interfaces, capable of more than 400,000 random IOPS. Brown connected the unit to an Intel Dual Xeon Windows 2003 server.

BizTech Quick Poll

How likely are you to consider using solid-state drives to replace magnetic media?

34% Unsure
29% Not very likely
19% Somewhat likely
15% Not at all likely
3% Extremely likely

Source: CDW poll of 377 BizTech readers

The advantages were immediately apparent. Not only has it allowed the company to consolidate many of its database servers into a single database and device, making administration much easier, but the increase in IOPS is staggering.

“The site is running much faster, and the transactional data is operating much more quickly,” Brown says. “And it’s been extremely stable, with not a single hiccup.”

Cost can be a barrier for some companies. Today, SSDs are more expensive than traditional hard drives. Experts estimate that a typical SSD now costs about $10 per gigabyte, versus 30 cents per gigabyte for hard drives. Conventional wisdom says the cost must decrease to about $1 per gigabyte before it becomes affordable for many companies.

That will happen, Janukowicz says. Solid-state disk-component pricing has been declining at between 40 percent and 60 percent per year for the past few years, and IDC expects the drop to continue.

But it also depends on how you measure cost, IDC’s Janukowicz says. Although companies usually compare storage in terms of dollars-per-gigabyte, it makes more sense to compare it in terms of dollars-per-I/O (Input/Output). “When you compare metrics on an I/O basis, solid-state drives tend to be an attractive solution compared to hard drives.”

That was the approach TangoWire’s Brown took.

“We were looking at a capital investment either way,” he says. “We were going to have to add additional servers or spend more for a solid-state drive, but we knew the solid-state route would give us much better long-term scalability and reliability.”

Until the price decreases even further, companies eager to experience the performance and reliability of SSDs are dipping toes in the water, turning to the technology to satisfy specific needs. A database application that is very sensitive to latency is a good candidate, as are applications that are I/O-limited or I/O-intense. Mission-critical applications such as enterprise resource planning and customer relationship management also are a good choice.

“Because your business is tied to those applications, moving them to solid state can result in direct improvements to service, greater revenue and greater customer satisfaction, and that’s a good use of your money,” Taneja says.

Another reasonable option is migrating pieces of applications to SSDs. “If system performance is limited, you might consider migrating pieces of a database over to an SSD to increase the overall performance,” Janukowicz says. “When you think about moving just a smaller piece of your data, like some metadata, onto SSDs, it’s a more affordable solution.”

Progress Marches On

Although SSDs have come a long way, the products are far from mature. The first crop of SSDs proved the technology's value, but the second generation — coming later this year — will have improved read and write speeds and even greater reliability, particularly in areas such as data integrity and the error rate of data transmission. Another plus is that prices will continue to fall. IDC predicts that revenue from solid-state drives will increase 76 percent by 2011, while units shipped will grow by almost 200 percent worldwide.

By far, the biggest advance is the move toward basing SSDs on flash technology. Notebooks have been available with flash drives instead of magnetic hard disk drives for at least a year, from vendors such as Seagate and Samsung, but are considered niche offerings. The entire industry got a bump in January when EMC announced that it would introduce a line of SSDs using flash memory, manufactured by STEC (formerly SimpleTech), as an option in its Symmetrix storage arrays. Around the same time, Lexar Media's Crucial subsidiary introduced a flash-based SSD in 32GB and 64GB capacities.

Taneja, Janukowicz and other analysts predict that all SSD vendors will announce flash-based drives soon.

IT Takeaway

SSDs are faster and more reliable than traditional hard drives. Some highlights:

- The technology is expensive, so use SSDs for mission-critical applications or those that are I/O-constrained or I/O-intense.
- The next generation will be based on flash memory, which is less expensive. They will also have better read and write speeds and greater reliability.

Solid-State Drives Evolve

The solid-state drive has been around for decades. The drive began life in the semiconductor market, but was never able to gain the economic advantage necessary to push out of that niche.

In 1987, EMC introduced solid-state storage for minicomputers, but dropped the idea after a few years. SanDisk was founded in 1988 — a company that would one day be at the forefront of solid-state disk technology. In 1990, NEC introduced a 5.25-inch SCSI-based SSD.

By 1995, a handful of solid-state disk products had entered the marketplace but failed to gain traction. Vendors continued to push forward, rolling out improved technology. In February 2003, Texas Memory Systems and Imperial Technology announced the first terabyte-class SSD systems. But it wasn't until the inclusion of flash-based technology about a year ago that SSDs became truly viable. With a much lower cost, interest increased, and effort was put into solving other issues, such as reliability.

Based on that progress, vendors began to aggressively develop SSD technology, and advances became commonplace. In 2005, Texas Memory Systems introduced the first SSD with a 4 gigabit-per-second Fibre Channel interface, and later that year, SimpleTech introduced the first dual-interface SSD.

In 2006, Samsung Electronics began shipping a 1.8-inch 32GB flash SSD, along with a high-volume Windows XP notebook using SSDs. By 2007, more vendors entered the market. SanDisk made several noteworthy advances, as did Samsung, Crucial and STEC (formerly SimpleTech). Intel also joined in.

In early 2008, EMC announced the first flash-based SSD for enterprise-class arrays, which experts say will change the industry forever.

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