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Enterprise IT shops now choose SSD storage

Solid-state storage still factors into only a small percentage of companies' enterprise capacity, but the technology is gaining consideration among organizations whose needs for high performance tend to offset their cost concerns.

Even budget-conscious government agencies and not-for-profit institutions are weighing the merits of the more expensive solid-state storage for their most I/O-intensive workloads. Ron Wilson, a technologist supervisor at Delaware Health and Social Services, said he may choose [solid-state drives \(SSDs\)](#) if the applications that the state must deploy to comply with recent health-care legislation push the limits of the existing systems.

"Our Tier 1 right now is just 15,000 rpm drives," Wilson said. "A lot more SQL databases and an increased need for performance with these new applications may drive the need for us to go SSD."

Disabled American Veterans, a nonprofit organization headquartered in Cold Spring, Ky., might [choose SAN-based solid-state storage](#) at the time of its next upgrade if the cost isn't overly prohibitive, according to Dave Wilson, an operations manager.

"We've looked at it," he said. "We definitely like the idea of solid state. We use the technology on a smaller scale, primarily in laptops, and it is extremely impressive."

According to a recent study from International Data Corp. (IDC), 72% of 1,014 IT managers surveyed said their organizations either use or plan to use [solid-state storage in their data centers](#) within 12 months. Jeff Janukowicz, a research director at the Framingham, Mass., market research firm, said IDC's research clearly suggests momentum behind solid-state storage, even though most IT shops likely fall into the "plan to use" category.

The 2012 first-half report from TheInfoPro (TIP), a service of New York City-based 451 Research LLC, revealed that [solid-state drives/cache](#) accounted for a mere 2% of the storage capacity purchased last year by some 200 companies and public institutions with revenues from \$100 million to more than \$40 billion.

But, TheInfoPro survey also indicated the growth rate for [SSDs/flash cache](#) could reach 36% this year. Exploring the [solid-state deployment choices](#) users face, the poll showed that 45% of the surveyed IT organizations currently use solid state in [hybrid arrays](#) that combine SSDs and hard disks, while only 11% run solid state in servers and 7% employ [all-solid-state arrays](#).

"Where we're really seeing solid state today is as a shared resource in the traditional place in the storage network," said Marco Coulter, research director of storage at TheInfoPro. He noted that IT shops tend to purchase solid state with a specific use case in mind, such as I/O-intensive databases or ERP and CRM applications.

Baron Capital Inc. [chose single-level cell \(SLC\) SSDs](#) for the top tier of its Dell Compellent Series 3 array mainly to boost SQL Server performance. Serge Kovarsky, a senior system administrator at the

New York City-based financial services firm, said the SSDs are especially helpful with database transaction logs.

"This is where the most read/writes happen, and putting them on SSD really improved the performance of the database dramatically," Kovarsky said. "My developer was just amazed."

A storage administrator at a major retailer, who asked not to be identified, said the company's IT team purchased a handful of SSDs for its Compellent array rather than buy 20 or more 15,000 rpm drives after an Exchange Server expert informed them of the [IOPS requirements](#) for the transaction logs in the new version of the mail server.

Solid-state storage use breaks up logjams

With some service providers, solid-state storage has become an essential part of the infrastructure. Ecommerce Inc. bought SSDs about two years ago for customers that consume huge amounts of IOPS, especially businesses that need to send enormous quantities of email during the day. The Columbus, Ohio-based service provider has several all-SSD Dell EqualLogic SANs and also uses SSDs in some blade servers, according to chief technology officer Tim Perry.

"The key is [putting the SSD](#) where it will relieve the IOPS bottleneck," Perry said. "We don't need it on an Apache Web server, but we do want it on a database server."

Another service provider, Expedient Communications in Pittsburgh, started to use SSDs about two years ago to address the needs of a large e-commerce customer preparing for the holiday season. The SSDs continue to help the service provider meet stringent service-level agreements.

"If we fail to meet that performance or reliability commitment, there's a monetary penalty that goes to the customer at the end of the day, so we've got to be on our game," said Alex Rodriguez, vice president of systems engineering and product development at Expedient.

Yet another important driver for [choosing SSDs](#) is the virtual desktop infrastructure (VDI) boot storm that happens when a high volume of end users simultaneously log into the system. The IT team at a major university in the Northeast learned during the pilot phase that its SATA-based Dell EqualLogic SANs could barely handle 30 concurrent sessions, no matter how many spindles it included. SAN use hit 100% IOPS and stayed there, according to Ed Swindelles, a manager of advanced computing at the university.

"We were already thinking of SSDs, but that [pilot] really reinforced it," said Swindelles.

The VDI architecture needed to accommodate 700 concurrent sessions -- including a maximum of 50 persistent sessions -- through the school's VMware View VDI client. The IT staff followed a Dell reference architecture and purchased two EqualLogic PS6010XVS hybrid arrays with single-level cell (SLC) SSDs and 15,000 rpm SAS disks.

In June, the school added a third hybrid array, a newer EqualLogic PS6110XS, with seven [enterprise MLC \(eMLC\)](#) SSDs and 17 10,000 rpm SAS drives. Through automated tiering, the storage system shifts most I/O operations to the SSDs during the VDI boot storm when the students log in, Swindelles said.

For the upcoming academic year, the university plans to scale the architecture to handle 1,000 concurrent nonpersistent sessions and separate the system to two data centers for redundancy. But, rather than buy additional hybrid arrays, the IT staff decided on VMware reference architecture with SSDs in blade servers for the nonpersistent sessions, in which the machine refreshes after a user logs out, with no session data retained. The [hybrid EqualLogic SAN](#) will continue to handle an undetermined amount of persistent sessions.

"That [setup] will give us all the IOPS performance we need, but it will be less expensive than continuing to buy hybrid SANs," Swindelles said.

To save additional money, the university purchased 20 Vertex 4 Series SSDs directly from OCZ Technology Group Inc., and the IT staff plans to install the drives in the school's blade servers. The university opted for MLC drives in the hard disk drive (HDD) form factor rather than [PCI Express cards](#) because the cost-per-terabyte was lower, Swindelles said.

"The OEMs are really putting a premium on SSD right now," he said. "We can get them a lot less expensively ourselves."

MLC drives in place of eMLC

Cost was also the main reason the university chose MLC drives rather than the more costly eMLC or SLC drives, even though the latter two options carry the promise of greater reliability and endurance. Swindelles said the university couldn't justify the extra expense for eMLC or SLC in the absence of solid, independent data on the actual reliability and lifecycle of the drives in practice. He noted that vendors haven't sold the technology long enough to know if it will truly last five years.

"The cost of [MLC](#) versus eMLC is so much less that if we have to do a little bit more work, we feel that it's worth it," he said.

To address the risks associated with MLC, Swindelles said the university will set aside four of the 20 MLC SSDs in the event of a drive failure, even though its OCZ warranty runs for five years. The university considered the \$600 cost for each of the 512 GB MLC drives as reasonable enough to justify the purchase of four spares.

If a drive fails, the user session will shift to another machine in the VMware cluster while the IT staff takes the node offline to replace the SSD. The university plans to use eight servers, each with two SSDs configured together in RAID 0 for optimal performance.

"We feel confident that they're going to perform well and last a while, but a lot of what we're doing here is uncharted waters," Swindelles said. "We're going to have to monitor the performance to make sure it isn't degrading. If we have failed drives, we're going to have extra stock on hand to do rebuilds quickly."

Server-side SSDs are already providing great benefit to a major Midwestern university. Replacing the hard disks with SSDs in a Dell PowerEdge server resulted in a dramatic performance boost for the school's Multi Router Traffic Grapher (MRTG) software. The university's goal was to poll roughly a million network ports at five-minute intervals but could do no better than seven or eight minutes using traditional disk. With SSDs, the polls complete in less than 20 seconds, according to Bob Plankers, a virtualization architect at the university.

"There's a certain level of satisfaction at just throwing hardware at a problem," Plankers said. "It's now all-SSD, and it rocks."

Yet another use case for server-based SSDs at the Midwestern university is boosting the performance of VMware hosts that require local storage at remote locations. The school uses [LSI Corp.'s CacheCade](#) caching software with SSDs to service the reads of hot data and finds the setup also helps to speed the writes, according to Plankers.

"It basically takes a lot of the read traffic off the other drives so the writes get faster," Plankers said. He noted that the server-based caching approach held appeal because "it's cheap, and it's easy to do."

Plankers expressed interest in additional emerging server-side caching options, such as the read/write [Fluid Cache](#) that Dell has under development.

"Should I spend \$250,000 to put a tray of SSDs in the Hitachi with all the subsequent licensing? Or, should I spend 100 grand and put cache on all of my hosts?" Plankers asked rhetorically. "I don't know."

TheInfoPro's Coulter said IT organizations no longer debate if they should use solid state, but rather, they're exploring how they can optimally use the technology. "Among large enterprises, the experience is getting more sophisticated. They're understanding the decisions and, in essence, they're looking for guidance," he said.

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