STORAGE

MANAGING THE INFORMATION THAT DRIVES THE ENTERPRISE

Hot data storage technologies for 2016

What's hot? What's not? These techs will have an impact on your data centers in the coming year.

DECEMBER 2015, VOL. 14, NO. 9

TechTarget

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EDITOR'S LETTER
RICH CASTAGNA

A data-centric view of storage

Building more intelligence into the data we store will pave the way for smarter storage systems.

ARE STORAGE PROS really just a bunch of bit-pushers—shoving gazillions of zeroes and ones from here to there, hoping that they'll arrive intact and on time where they're needed? I don't think anyone who's been a keeper of the corporate jewels—all that invaluable IP—would ever picture themselves like that. But the lack of smart, effective data storage tools is handcuffing anyone who's responsible for storing, saving and protecting company data.

And as long as we look at the data that ends up on disks, flash, tape or whatever as a commodity—a block, a chunk, a thing—we're doomed to a Sisyphean routine of moving bits and bytes around, like checkers on a checkerboard. But most of us don't see data that way. We know that those collections of aughts and ones add up to the information that our companies run on.

OLD DATA HANDLING TOOLS CAN'T CUT IT

But, for the most part, we're stuck with clumsy pre-millennium data storage tools that still treat information as if it was just a bunch of dumb lumps with no intrinsic value.

Backup is a great example of how a brute-force approach effectively devalues the data that it is protecting. Most backup processes, including the latest flat backup techniques, see data the same way that backup apps from 40 or more years ago did.

Sure, the newer methods are far more efficient and leave less clutter in the data center, but they still don't have an intelligent perspective of what the data really represents and how important—or unimportant—it is to the company.

In the best of all possible worlds, the data itself should be smart enough to know how it should be used, who or what will use it, how long it should live and if it has any practical usefulness beyond its immediate application.

But until we can build that kind of intelligence into the data, even a potentially efficient operation like flat backup is essentially a "blind process." It's still just bumping around a bunch of things with no sense of what's actually inside.

When you think about how application- and data-centric we're becoming, and how that new perspective is reshaping data centers, you've got to wonder why so few vendors in the storage space have rolled out data storage

tools that stop treating data so opaquely.

The processes for handling data may continue to improve, but we're approaching a time when those improvements will be nullified by a lack of insight. As long as data is treated as some kind of commodity rather than the valuable information it may represent, there will be more missed opportunities for making better use of that data.

But there is some hope.

OBJECT STORAGE LENDS INTELLIGENCE

Object storage—with its ability to include expanded, more detailed metadata with the objects that it stores—is a promising development. Of course, adding that metadata is the responsibility of the applications and users that create and use the data objects. But there's no denying the potential benefits.

You could, for example, tag a data object with an appropriate shelf life based on the type of file, the contents, the people who created it and modified it, their departments and so on.

That metadata information could, in turn, inform a storage system or a data handling application that the object can't be copied to the cloud or that it should be deleted on a certain date or archived to a data warehouse.

That kind of intelligence could eliminate a ton of "touches" and manual operations, and could cut down on the number of copies of data that are retained. The smarter the data gets, the smarter the processes surrounding it will become and data handling operations will become policy-driven events.

SMARTER STORAGE HAS ARRIVED

A handful of vendors have also begun to address some of these issues with new data storage tools.

DataGravity's Discovery Series of storage arrays has built-in intelligence that allows their systems to do more than just store data. It maintains detailed data related to individual files to track and control who has access to particular information, uses policies to determine data retention and provides an audit report that details activities related to files. DataGravity's systems represent a significant step toward making data smarter.

IN THE BEST OF ALL POSSIBLE WORLDS, THE DATA ITSELF SHOULD BE SMART ENOUGH TO KNOW HOW IT SHOULD BE USED.

Another data storage tool vendor, Qumulo, recently introduced what it calls data-aware, scale-out NAS. Its systems analyze the data that gets stored on them, and uses the metadata to classify files and other objects. It also provides detailed performance information that can drill down to specific clients and data paths, revealing any potential bottlenecks.

Tarmin uses an object storage system as the basis of its data-defined storage. Tarmin drapes a global namespace over object storage that may comprise several geographic locations. Processes like data tiering, archiving, retention

and encryption can all be controlled via policies.

Newcomer Primary Data also makes storage data a little more intelligent by employing a single namespace that can stretch over DAS, NAS, block or cloud storage. It uses policies to determine data placement and has the capacity to include substantial metadata with the files it manages. That metadata can be tapped into by applications via the APIs that Primary Data provides. The policies that users develop can handle a range of rights and activities, including the use of files, directories and volumes, with safeguards such as limiting where particular files can be copied.

These are all steps in the right direction and deserve our attention. But until the real value of data is understood by the systems and processes that are attempting to manipulate it, we will undoubtedly store more than we should, make too many copies of that data and probably lose track of what's really important.

Smart storage depends on smarter data … and smarter data storage tools. ■

RICH CASTAGNA *is TechTarget's VP of Editorial.*

The Z(ettabyte) apocalypse

A data outbreak is afoot and only one technology can combat the inevitable Z apocalypse—that's Z as in zettabyte.

JUST BACK FROM the Fujifilm Global IT Executive Summit, with a side trip to Spectra Logic's Analyst Day, and I am up to my ears in fresh data. The annual Fujifilm event sported one of the best signal-to-noise ratios of just about any tech conference in recent memory. As always, I left with pads of notes from all of the informative sessions.

The big news, of course, in the Fujifilm domain is the continuing advance of tape technology and tape storage capacity. By that, I mean the constituent technologies are keeping linear digital storage in the game despite the hostile rhetoric and disinformation campaigns of silicon and disk storage-makers.

So far this year, we have seen a demonstration of a 220 TB capacity on a single LTO Ultrium-style cartridge courtesy of Fujifilm and IBM. It will be a few years until products appear in the market using the underlying technologies for perpendicular magnetic recording (PMR) on tape media, improved servo tracking and head positioning hardware and software, and the like—but not that long.

BARIUM FERRITE DRIVES TAPE STORAGE TECHNOLOGY ADVANCES

LTO vendors have adopted Fujifilm's Barium Ferrite (BaFe) data storage magnetic particle layer technology and have mapped at least the next three generations of their drives to the steady improvements in track and areal recording densities that are enabled by the technology.

Tape has been enjoying a significant renaissance over the past few years, in part because of the ability of BaFe coatings to store a bit using a smaller amount of turf while still enabling its signal to be heard above the din (thermal and electromechanical) of the drive. In the next cycle of development, this same technology will leverage the unique properties of BaFe, when subjected to a static magnetic field during manufacturing, to align its crystalline structures vertically.

VENDORS IMPROVE TAPE STORAGE CAPACITY

As was the case with disk, where perpendicular recording took drives from gigabytes of capacity to terabytes, when

PMR is implemented on tape using BaFe, cartridge capacities will grow quickly toward that demonstrated 220 TB capacity. Until that happens, BaFe is already delivering significant tape storage capacity improvements. LTO 7 is delivering a respectable 15 TB per cartridge compressed. Other "enterprise" cartridges from IBM and Oracle that also use the media are also enjoying significant tape storage capacity improvements with each generation.

DEPENDING ON THE PUNDIT YOU CONSULT, 2020 WILL SEE TOTAL DATA GENERATION OF BETWEEN 20 ZETTABYTES AND 60 ZETTABYTES.

Okay, so tape storage capacity will be huge. So what? Most companies made the choice to move away from tape about the same time as they moved away from mainframes. Yet, a lot of companies attending the Summit said they regretted that decision and were in the process of reversing it. Even the big industrial farmers of the cloud world were in the room to hear the latest about tape.

So, to a growing number of users, tape improvement stats mean a lot. Tape is much less expensive to own than disk or flash and perfect for the huge quantities of data that are rarely if ever re-referenced or changed. Moreover, the Linear Tape File System is providing a painless way to grow the capacity of a NAS head "invisibly" to users by simply spanning the onboard disk and flash kit to a back-end tape library for seamless file directory listings and file retrievals from either the disk pool or the back-end tape.

For example, Dternity, an archival cloud from Fujifilm, uses a NAS gateway technology to enable both local and cloud-based tape storage for smooth corporate file archiving. At the event, they announced that the gateway appliance that once provided the bridge between disk and tape can now run as a virtual machine. So, you don't need any extra gear to get that limitless back-end storage repository you've always wanted.

Those use cases—tape in a cloud-based archive or tape as a back end to NAS—were not even the big topics of discussion at the event. The largest companies there, and the big cloud vendors, were keen to strategize about how they would cope with the analyst community's latest projections around data growth. Depending on the pundit you consult, 2020 will see total data generation of between 20 and 60 zettabytes (ZB). That is a number followed by 21 zeroes, or a billion terabytes per zettabyte. That's a problem.

EXPERTS: FLASH, DISK STORAGE LACK CAPACITY OF TAPE

Where the heck do you store 20 ZB to 60 ZB of data? Experts like Tom Coughlin and Fred Moore testified that there will not be enough capacity in either flash or disk storage to store all of the bits—that conclusion considers all of the stuff already deployed, the kit in development or on the street, and factors in the overall capacity of the

industry to create more stuff. Too many bits, too little capacity for silicon or disk, period.

The alternatives are simple. Either discard a lot of data that is being created (as they currently must in Large Hadron Collider experiments, for example) or find some alternative storage mechanisms.

Despite Facebook's recent interest, optical storage still looks like a dead end for mass storage. That industry has finished healing from the HD DVD versus BluRay fratricide of the last decade and is now working to put out a BluRay disk with 300 GB "at some point in the near future," then a 500 GB optical spindle "some time later," and ultimately a disk with 1 TB of capacity "at a date yet to be determined."

Assuming that they achieve those goals, an assumption one would be smart to hedge, that just means that the industry will need to produce 20 billion to 60 billion of their Frisbees before 2020: another Herculean feat, especially with a dwindling consumer market.

TAPE OFFERS NECESSARY CAPACITY TO STORE ZETTABYTES

So that leaves tape. Tape is the only technology with real storage capacity growth requiring modest investments for manufacturing adjustments. The combination of Barium Ferrite and more durable substrate layers (the plastic backing that makes it a tape) offer higher density and longer tape lengths to be spooled onto the cartridge hub.

Tape is, in fact, the only hope that mankind has for storing 20-plus zettabytes (mostly new data, by the way) by the next decade. That's why, for this holiday season, I am asking Santa for a new tape library. Call it a survival strategy for the coming Z apocalypse (that's Z as in zettabyte).

TAPE IS THE ONLY TECHNOLOGY WITH REAL STORAGE CAPACITY GROWTH REQUIRING MODEST INVESTMENTS FOR MANUFACTURING ADJUSTMENTS.

It is worth noting that Spectra Logic has diversified its product portfolio to add another augment to tape storage. Its ArcticBlue appliance leverages Seagate's latest shingled magnetic recording (SMR) drives that can provide, according to Spectra Logic spokespersons, most of the economies of tape, but with the random access of rotational media. Assuming that their drives can be pushed to a longer lifecycle via periodic power-down, they may have come up with a way to take some of the latencies out of tape-based data access. Watch this space. ■

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Hot data storage technologies for 2016

These hot techs are poised to shake up your storage shop this coming year.

BY STORAGE MEDIA GROUP

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HERE WE GO again—our list of Hot Techs for 2016! For the past 13 years, we've honored the best and brightest technologies of the upcoming year. And, as always, we are proud to present a batch of technologies we believe will make a big impact.

Our list leans toward practicality—most of our hot techs are "newish" rather than futuristic, because we want to focus on the techs that are mature enough that we know they are proven and generally available.

Buckle up and get a ready for a ride through our picks for what's hot in storage for 2016.

COPY DATA MANAGEMENT

Managing numerous physical copies of the same data from multiple tools remains expensive, continues to be a management headache and even poses a security threat. That's why copy data management (CDM), which uses a single live clone for backup, archiving, replication and other data services, is one of the storage technology trends poised for stronger adoption in 2016.

The market has grown to include startups Cohesity Inc. and Rubrik, which have recently unveiled products, along with traditional vendors such as Catalogic Software,

Commvault, Hitachi Data Systems and NetApp. Research firm IDC estimates copy data will cost IT organizations nearly $51 billion by 2018.

Actifio is the pioneer in this space with its copy data virtualization platform that decouples data from infrastructure and consolidates siloed data protection processes.

Cohesity launched its Cohesity Data Platform designed to converge all secondary storage workloads with an Intel-based 2U appliance that serves as a building block for its scale-out architecture. Its Cohesity Open Architecture for Scalable, Intelligent Storage (OASIS) software includes quality of service management to converge analytics, archiving and data protection on a single platform.

Rubrik came out with its data management product in 2015, selling a 2U appliance with built-in software that performs backup, deduplication, compression and version management. Hitachi leverages its Hitachi Data Instance Director (HDID) and the Hitachi Virtual Storage Platform to help reduce copies.

CDM greatly differs from traditional storage management because it streamlines a silo process in which customers use multiple tools from multiple vendors, particularly for data protection.

"Today, there is a bunch of fragmentation in secondary storage," said Cohesity CEO Mohit Aron. "A customer goes and buys a bunch of different products from multiple vendors and somehow has to interface them together manually, managing them through multiple UIs. That becomes a major manageability headache."

Aron acknowledged the evolution of CDM products with varying capabilities.

"Cohesity Data Platform converges all your data protection workflows on one appliance," Aron said. "We have a single pane of glass that can be used to manage all these workloads. The analogy I use is that our infrastructure is similar to what Apple did with the iPhone. We are building the infrastructure and the platform that can deploy some native applications to solve these customer use cases. In the future, we want to expand and have other vendors and even third parties write software on our platform."

"There are three kinds of companies who say they do copy data management," said Ash Ashutosh, founder and CEO of Actifio. "First, there are backup guys. They take snapshot management and put lipstick on it and call it copy data management. Then you have guys who say 'if you have 14 storage devices, buy ours as the fifteenth.' What we do is different. We're completely independent of infrastructure. We want to manage data from the time it's created across its entire lifecycle. We provide instant access, and manage data to scale, regardless of where it is."

The goal for all these products is to maintain a balance between safe and accessible data by reigning in the amount of rogue copies of sensitive data created via conventional data protection platforms.

ERASURE CODING

Growing adoption of object storage, cloud-based backup storage and the emergence of high-capacity hard disk drives (HDDs) have turned up the temperature of erasure coding over the past few years, and it is projected to be one

(Continued on page 12)

Report card: Grading our hot tech picks from last year

We must've found the right crystal ball last year—or maybe we just love following storage technology trends. In either case, we had a pretty good run with last year's hot tech picks.

A	**Enterprise all-flash arrays**	All-flash arrays were all the rage in 2015, with old and new vendors adding key enterprise features like snapshots, replication and dedupe. AFAs got that close to becoming mainstream last year.
B+	**Cloud-based disaster recovery**	A B+ might be generous for cloud DR but we'll take it. Cloud DR emerged as possibly the best-ever DR plan—even if adoption has been a little slower than expected.
B+	**Hybrid storage arrays**	OK, so maybe we snuck this one in just to fatten our grade-point average, but you have to admit that hybrid arrays took off in 2015. Not only does everyone sell one, everyone bought one!
B	**VMware Virtual Volumes**	VMware Virtual Volumes—or VVOLs—were in the news a lot in 2015. But we jumped the gun a bit as the tech is just now making its way into shipping storage products.
B	**Flash caching**	Flash caching was a pretty big deal in 2015, but it mostly came as part of a hybrid or AFA array—not so much as standalone software. So we didn't whiff on this one, but we didn't knock it out of the park either.
B	**Networking server-based storage**	Hyper-converged systems got an awful lot of attention in 2015, but the DIY approach to building software arrays got much less attention. Our prognostication was a little hazy in that regard, hence the so-so B grade.

(Continued from page 10)

of the hot storage technology trends in 2016. Petabyte- and exabyte-scale data sets make use of RAID untenable, said George Crump, president of IT analyst firm Storage Switzerland.

"As we move into (using) 6 TB and 8 TB drives, erasure coding is the only technology that can provide data protection feasible for larger volumes of data. If you put high-capacity drives in an array, you're looking at weeks of recovery with RAID. With erasure coding, you're looking at hours," Crump said.

Erasure coding uses a mathematical formula to break data into multiple fragments, and then places each fragment in a different location within a storage array. Redundant data components are added during the process, and a subset of the components is used to reproduce original data should it get corrupted or lost.

The goal of erasure coding is to enable faster drive rebuilds. The process of copying data and scattering it across multiple drives is similar to RAID. However, erasure coding differs from RAID in scale and data longevity. If data gets corrupted or lost, only some of the "erased" fragments are needed to reconstruct the drive. The technique also preserves data integrity by tolerating multiple drive failures without performance degradation.

Today, the use of erasure coding is considered table stakes for object storage providers, including leading vendors such as Amplidata (acquired by HGST), Caringo, IBM Cleversafe and Scality. But, block and file storage vendors are getting in on the action as well. Hyper-converged array vendor Nutanix in July integrated proprietary EC-X erasure coding in a version upgrade to its Nutanix Operating System. Scale-up vendor Nexenta Systems added support for block and object storage in a version upgrade to its NexentaEdge software in May.

Erasure coding is the core data protection mechanism for cloud-based object storage, due to scalability of protecting vast amounts of data. Thus far, users are moving data to the cloud mostly for specific use cases such as backup and active archiving, a trend that is expected to continuously rise.

"Erasure coding is the type of design that's ideal for an object storage system: a scale-out, multi-node storage infrastructure. It is a way to provide RAID-like protection across nodes, instead of contained within a single storage system," Crump said.

NEXT-GENERATION STORAGE NETWORKING

Flash and virtualization are key drivers fueling the rise of next-generation storage networking as a storage technology trend, whether its Fibre Channel (FC), Ethernet or InfiniBand.

Shipments of 16 Gigabit per second (Gbps) FC switches and adapters should remain hot next year, while 32 Gbps gear starts to warm up. Brocade and Cisco will focus their roadmaps on 32 Gig switches. QLogic got the ball rolling this fall with 16 Gbps/Gen 5 FC adapters that customers can upgrade to 32 Gbps/Gen 6 in 2016.

Vikram Karvat, vice president of products, marketing and planning at QLogic, said flash storage vendors were "banging down the door" for 16 Gbps quad-port FC

adapters, capable of delivering 16 lanes of PCI Express 3.0, to address the many demands of virtualization, analytics and transaction-heavy workloads.

"This level of performance isn't for everybody, but when you need it, you need it," said Karvat. "Ethernet is very good at certain things. I haven't got a bias one way or the other. But, there are certain workloads that Fibre Channel has been tuned for. It just works."

Casey Quillin, director of SAN, network security and data center appliance market research at Dell'Oro Group, said 16 Gbps FC has largely been a switch story to date because there weren't many 16 Gbps ports on servers or storage arrays. He expects 16 Gbps FC adapters to play "catch up" next year and reach nearly 50% of total FC port shipments by the end of 2016.

Quillin said Brocade is working with FC adapter

Heating up, but not quite hot, techs

We were itching to pull the trigger on these five storage technology trends but, alas, we felt they were still a few degrees short of hot on our technology thermometer.

THE TECH	THE VERDICT
New server-side flash techs	There's some really cool stuff happening with NVDIMM and other new flash techs that are blurring the line between memory and storage. But they're still just a little *too* cool.
Cloud-to-cloud backup	We're firmly convinced that C2C backup is going to take off—eventually. We need to see more data in the cloud first.
Containerized storage	If you got a nickel for every time the work "container" was used in 2015, you'd be rich. But that's the problem—there's been more talk than real stuff.
Converged data protection systems	These systems break new ground for data protection, but it's going to take a little while for storage managers to embrace the new approach.
Flat backup	Backup without a backup app? Backup using only snapshots and replication? Great ideas! But not so simple, and not so easy to use in mixed-gear environments.

companies to "make sure the ecosystem is better rounded out" with 32 Gbps than it was with 16 Gbps. But, he still expects the ramp to 32 Gbps to be slower than the migration to 16 Gbps.

The main trend in Ethernet-based storage networking will be 25 Gigabit switch and adapter chips with ports that enable companies to use the same class of cables they deployed with 10 Gigabit Ethernet (10 GbE). The original Ethernet roadmap called for a jump from 10 GbE to 40 GbE, but 40 GbE technology required a upgrade to thicker, more expensive cables.

Networking vendors rallied around standards for new single-pin 25 GbE switch and adapter chips in response to the needs of hyperscale cloud service providers. The ports on the new 25 GbE chips use the same number of pins and lanes on the server PCIe bus as 10 GbE ports do. The roadmap extends to 50 GbE and 100 GbE, with the latter using four lanes of 25 GbE.

"The big advantage of 25 (GbE) to 50 (GbE) is you don't have to replace what you've got to get to 100. It's a much simpler progression of getting higher performance without adding a lot of cost. That's why it's going to take off," said Marc Staimer, president of Dragon Slayer Consulting. "The next gen is going to be 25 (GbE) to 50 (GbE); 40 Gig's going to end up dying on the vine."

Networking options are already available for both speeds. Dan Conde, an enterprise networking analyst at Enterprise Strategy Group, said users are deciding whether to go to 25 GbE or 40 GbE based on vendor support and cost savings.

Meanwhile, InfiniBand continues to focus on high-performance computing (HPC). The current dominant speed is 56 Gbps, but the transition to 100 Gbps should heat up in 2016 fueled by HPC, big data and Web 2.0 applications, according to Kevin Deierling, vice president of marketing at Mellanox Technologies.

Sergis Mushell, a research director at Gartner Inc., said flash will give users reason to upgrade to next-generation storage networking. "Because flash is going to drive higher IOPS, bandwidth and latency are becoming more and more important. If you really want to get the value out of the flash, you need lower latency and higher bandwidth," he said.

Yet, more than higher bandwidth, the most prominent storage networking trend in 2016 could be the emergence of products supporting non-volatile memory express (NVMe) over FC, Ethernet or InfiniBand fabrics, according to Mushell. He said the lighter NVMe protocol layer reduces the command set to address the array and improves performance.

Deierling said the ever-increasing amount of data that must be available in real time will start to drive software-defined flash storage utilizing remote direct memory access (RDMA). He said flash storage needs fast RDMA-capable interconnects, where the higher-speed networking comes into play.

OBJECT STORAGE

We first pronounced object storage a hot technology in 2012, and it's even hotter now. With more complete offerings from vendors and concrete use cases defined,

the technology is poised to make a bigger splash among storage technology trends in 2016.

Unlike file systems, object storage systems store data in a flat namespace with unique identifiers that allow data to be retrieved without a server knowing where that data is located. The flat namespace also allows a far greater amount of metadata to be stored than can be stored on a typical file system, making tasks like automation and management simpler for the administrator. These days, the technology is being used for long-term data retention, backup and file sharing.

Until recently, object storage system options were limited—most were systems that used a REST-based protocol on proprietary hardware. "Now, object vendors are packaging systems in such a way that traditional IT can take advantage of them," said Crump. "They're providing more protocol access like NFS, CIFS and iSCSI, and they're also providing more cost-effective back ends."

Some of today's vendors are focusing more on the software so that users can select their own hardware for a lower cost and easier integration into the main data center. Object storage software vendor Caringo, for example, in September launched FileFly software, which allows users to move their data between object storage and file systems.

"Broad adoption has to be in the legacy data center, and the legacy data center is seeing what cloud providers are doing and adopting that capability into that use case," Crump said.

This is also demonstrated by HGST's March acquisition of object vendor Amplidata, and IBM's October acquisition of Cleversafe—signs that legacy vendors realize how important object technology is for backup and archiving strategies.

One of the main drawbacks to object technology is latency introduced due to the amount of metadata. But the most obvious use cases are ones where performance is not a primary concern. In-house file sync and share, for example, is becoming more popular as a means to reduce shadow IT and increase business productivity.

We also saw an increased interest in big data lakes over the past year. The addition of multi-protocol support from many vendors means object storage is now extremely suitable for housing this data because of its low-cost, scalable nature.

"The biggest problem that was holding it back was nobody was going to buy object storage just because it was object storage. It had to solve a problem and now we've better identified what those problems are," Crump said.

SOFTWARE-DEFINED STORAGE APPLIANCES

After two years of non-stop talk about software-defined storage, vendors are realizing even the best storage software still requires good hardware to work.

The pendulum began swinging back to hardware in 2015. We saw startup Savage IO release a hardware array built to run somebody else's storage software. Those software-defined storage products such as EMC's ScaleIO and Cloudian HyperStore came out on appliances. Dell came out with its Blue Thunder project that makes its hardware available for other vendors' storage software, and lined

up VMware, Microsoft, Nutanix, Nexenta and Red Hat as partners. SanDisk launched the InfiniFlash IF100, a flash-only array that runs other vendors' software and signed up software-defined storage vendor Nexenta as one of its first partners.

The hardware doesn't necessarily have to be new to be a part of this trend. Curvature Solutions will even sell used storage bundled with DataCore SANsymphony-V, which was software-defined storage long before it became cool.

With more hardware options available, vendors' unabashed claims of being software-defined began subsiding. "We're definitely not software-defined storage, since we include a rack-mounted appliance," said Brian Biles, founder and CEO of Datrium, when the startup launched with its DVX Server Flash Storage System in July. When was the last time you heard a storage vendor say that? Datrium does have DVX software, but it only runs on its storage. Still, vendors in the past few years might have tried to position that type of setup as software-defined storage.

Savage IO took the notion of a storage appliance up a few notches. The SavageStor 4800 is a 4U 48-drive system with 12-core processors, which supports Fibre Channel, InfiniBand and solid-state drives. It is designed for high-performance computing, big data analytics and cloud storage. However, Savage IO doesn't develop software—SavageStor must run either commercial storage management software or open source applications, such as Lustre, OpenStack or CentOS. "This is a Ferrari powertrain you can match up to your software if you need that type of performance," John Fithian, Savage IO's director of business development, said of SavageStor.

EMC ScaleIO Node and Cloudian HyperStore FL3000 appliance package applications originally designed as software-defined storage on hardware for customers who don't want to build their own storage. And that's apparently most customers.

"The mainstream storage buyer still wants an integrated appliance," said Ashish Nadkarni, IDC program director for enterprise storage and servers. "They want to benefit from software-defined storage, but aren't ready to trade that for the comfort of having it all on one box."

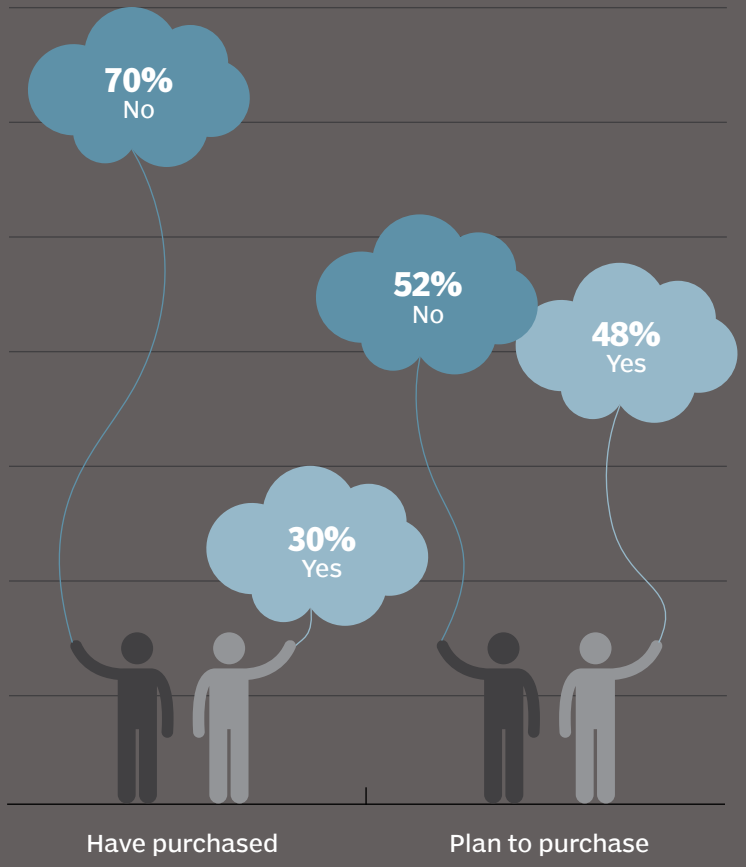
We certainly haven't heard the last of software-defined storage, or software-defined technology in general. But we expect the hardware that actually stores the data to receive its fair share of attention now. ■

ANDREW BURTON, **RICH CASTAGNA**, **GARRY KRANZ**, **SONIA LELII**, **DAVE RAFFO**, **CAROL SLIWA** *and* **SARAH WILSON** *are all members of TechTarget's Storage Media Group.*

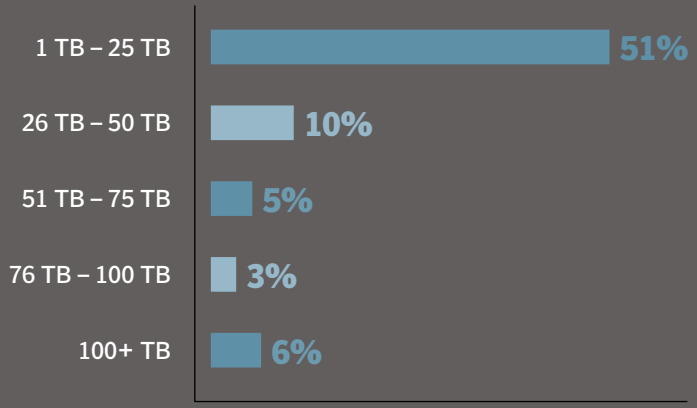
Snapshot 1

Nearly one-third of shops using cloud storage, but more plan to start

Have you purchased cloud storage services in the last 12 months, or plan to in the next 12 months?



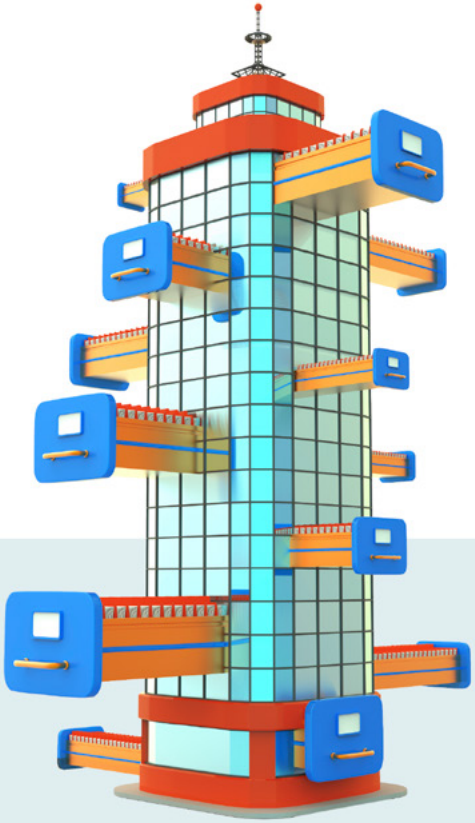
How much data do you currently have stored in cloud storage services?



32

Average amount of terabytes of data stored in cloud storage services

VDI



Architecting storage for virtual desktops

VDI brings a lot to the table but puts stress on storage.

BY GEORGE CRUMP

NOMADSOUL1/ISTOCK

IMPLEMENTING VIRTUAL DESKTOPS is one of those IT projects that looks good on paper but is difficult to execute in the real world. To some extent, it is a throwback to the days of dumb terminals where IT had 100% control over the user experience. The problem is that a user's desktop is much more than a dumb terminal. The primary roadblock to user adoption is the performance of the virtual desktop, and most of these virtual desktop infrastructure (VDI) performance issues are directly linked to the storage infrastructure.

VDI STORAGE CHALLENGES

One challenge with VDI is meeting user expectations for performance. Most IT planners design their VDI to meet the performance challenges of a hard disk-based laptop. The reality is that users are becoming more accustomed to the instantaneous nature of flash. The modern laptop is flash-based, and users are beginning to expect near immediate response from any device they use, including a virtual desktop.

Another challenge is related to budget. The typical justification for a VDI project is its ability to reduce the operational expenses associated with supporting user desktops and laptops. Reaching a low cost per virtual desktop means stacking as many virtual machines as possible

onto as few physical servers as possible and connecting them to a single storage system. There is typically plenty of CPU horsepower in the physical hosts to support a high number of virtual desktops. But high virtual desktop density creates storage I/O contention issues. While the IOPS requirement per virtual desktop is small, directing hundreds of desktops at a single storage system can accumulate into a very large problem.

VDI PERFORMANCE ISSUES CAN BE ADDRESSED WHILE KEEPING COSTS IN CHECK.

The third storage challenge is dealing with the capacity demands that result from centralizing hundreds of desktops. Most desktop virtualization products have the ability to clone desktops from a master image to significantly reduce the overall capacity requirement. The problem is that cloning increases the storage I/O requirement. There are two types of desktop "modes" that VDI administrators can select. The most popular is to use persistent desktops. This allows users to personalize their desktop and install unique applications. However, combining persistent desktops with cloning and thin provisioning can lead to a write amplification problem. These data efficiency techniques must occur before each write, data capacity has to be allocated, and a link off of the master image has to be established. In other words, one write operation can lead to three to five I/O operations.

Another option is to use nonpersistent desktops. In this implementation, desktops are created on the fly as users log into the environment, only consuming capacity as the desktop is used. In the past, the drawback to using nonpersistent desktops was their lack of personalization. Today there are several software platforms and profile managers that allow users to customize nonpersistent-desktops. There is still a storage challenge, however. The time to create a user desktop, on the fly, is critical to user acceptance. If hundreds of users all log in at about the same time, it can take a while for desktop instances to become available, leading to user frustration.

The final challenge, no matter the desktop mode, is delivering consistent and predictable performance. The storage system has to respond to morning login storms, anti-virus scans, software updates and just the general I/O that hundreds of desktops will create on a busy day. Delivering predictable performance is made more difficult as the solutions to the above problems are implemented. As mentioned, each "solution" has a ripple effect on VDI performance issues.

SOLVING VDI STORAGE CHALLENGES

The good news is that VDI performance issues can be addressed while keeping costs in check. The following five implementations can be used to solve performance problems. At the heart of each of them is flash storage. Hard disks, while cost-effective on a price-per-GB basis, simply can't keep up with the massive random I/O requirement that VDI demands.

■ **Server-side flash.** For current VDI projects relying on hard disk drive-based arrays for storage, a server-side flash product may be a quick fix. These products typically combine server-based caching software with server flash storage. When server-based caching products first came to market, they only cached reads. The read-only nature made them a poor fit for VDI storage acceleration because most of the above storage I/O challenges are write I/O related. Now, however, many server-side caching products can safely cache write I/O by either mirroring the write to another server or a shared flash storage area.

■ **Hybrid flash arrays.** Early hybrid flash arrays used a minimal amount of flash to keep costs down, which made it difficult to determine what performance would be when under load. As flash storage prices have decreased, the amount of flash included with a hybrid system has increased dramatically. Today, it is practical to have a flash tier that represents 25% of overall capacity, making the chances of a cache miss small.

Hybrid arrays, of course, also have a hard disk storage tier that can be used to store user data. In this design, the desktop and its applications are stored on and load from flash. The user data is stored on the hard disk tier exclusively. Some hybrid storage systems are multi-protocol (block and file) and can eliminate the need for a separate NAS for user data altogether.

■ **All-flash arrays.** All-flash arrays are the performance sledgehammer. Assuming a well-designed storage network, they overcome all of these VDI performance issues. The biggest challenge with an all-flash array is, of course, cost. This design means replacing the least expensive storage, a laptop utilizing consumer flash, with the most expensive shared enterprise flash-based array. Despite the initial cost disadvantage, these systems can support a significantly higher number of virtual desktops while delivering performance that will make users prefer their virtual desktop instead of tolerating it. While it is unlikely that an organization would select an all-flash array specifically for VDI, an all-flash array, of course, can support a variety of workloads. As such, some shops may use an all-flash array to support VDI alongside additional applications.

■ **Storage system data efficiency.** Most all-flash arrays and some hybrid arrays have a key advantage: built-in data efficiency. Techniques like thin provisioning, snapshots, cloning, deduplication and compression allow the storage system to minimize capacity consumption, without impacting virtual desktop or physical host performance. Allowing the storage system, with its dedicated storage processors, to perform these functions instead of the capabilities built into the VDI software saves host processing power for supporting a large number of desktops.

■ **Hyper-converged architectures.** Hyper-converged architectures (HCA) have proven to be very popular for VDI projects, which are often greenfield, meaning they will need new servers and storage at the same time, which HCAs provide. HCAs also provide a safe and cost effective way to use server-based flash. HCAs aggregate flash resources across all the servers to create a global,

parity protected pool of storage. Like all-flash arrays, they provide data efficiency to further reduce storage costs. They also scale in a manner that is complementary to the way VDI scales. Each additional desktop is going to require more compute to drive those desktops, which will then need more storage capacity and performance. Each addition of an HCA node provides all of these resources; compute, capacity and I/O performance.

The challenge with HCAs is maintaining predictable performance, especially under load. The HCA expects the compute tier to run everything; virtual machines, networking, storage software and data efficiency, a spike in one area may cause other functions to suffer. Many HCAs offer enough processing power for VDI that even at an extreme load the user will not experience performance problems. However, it is something that you need to be aware of and be prepared to purchase additional compute resources to stay ahead of the problem.

OPTIONS ABOUND

VDI is potentially the most challenging environment for the storage infrastructure to provide consistent, predictable performance while still being cost-effective. In the past, it seemed the only possible option was to leverage server-based flash and ignore shared storage. However, thanks to the decreasing cost of high-performance flash, shared storage is more suited to address these VDI performance issues.

The key is to use the technology to create density. The more desktop instances you can load on each host results in better cost per desktop.

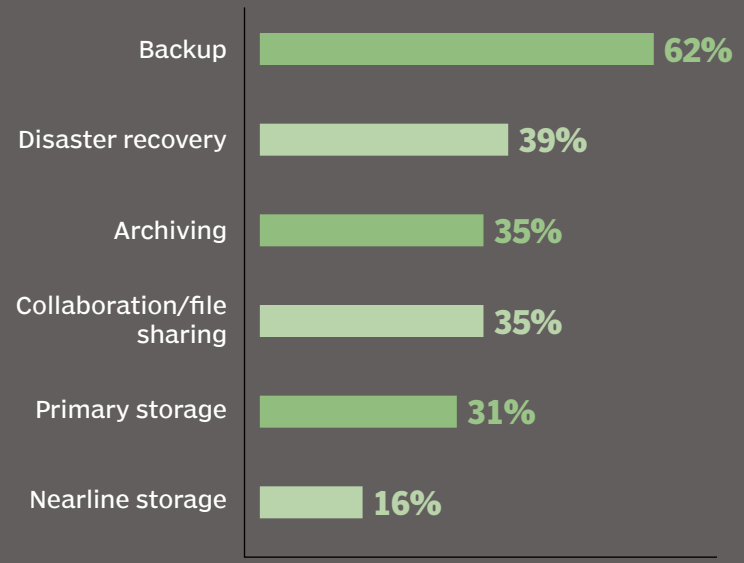
An aggressive price per desktop allows IT professionals to meet the financial expectations of the project and gain operational efficiencies while meeting the most critical requirement, user acceptance. ■

GEORGE CRUMP *is president of Storage Switzerland, an IT analyst firm focused on storage and virtualization.*

Snapshot 2

Top cloud storage use case—data protection, but security still a concern

Which applications do you primarily use cloud storage services for?

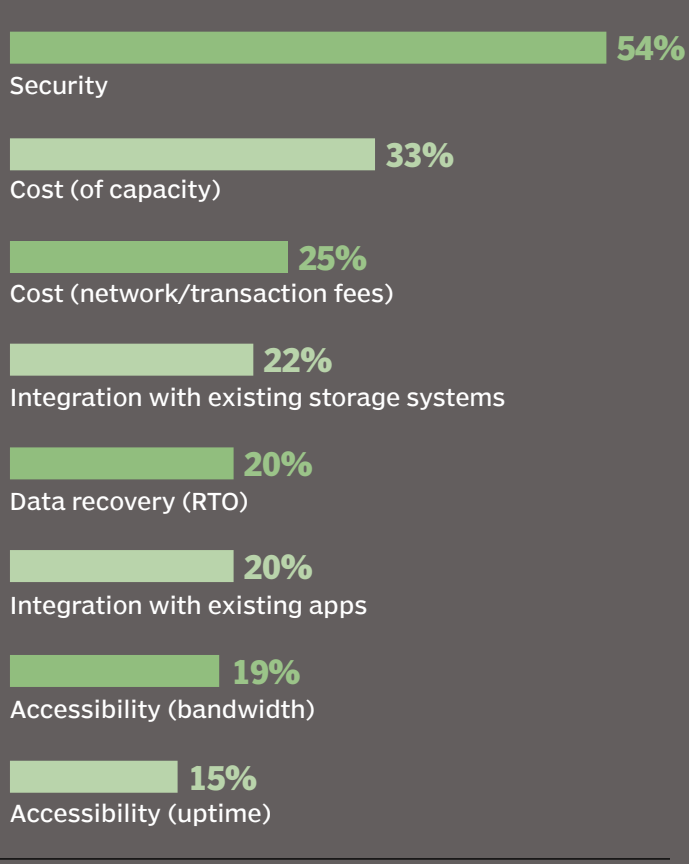


* MULTIPLE SELECTIONS PERMITTED

22%

Average portion of total storage capacity kept in cloud storage services

Do you have any concerns with your existing cloud storage services?

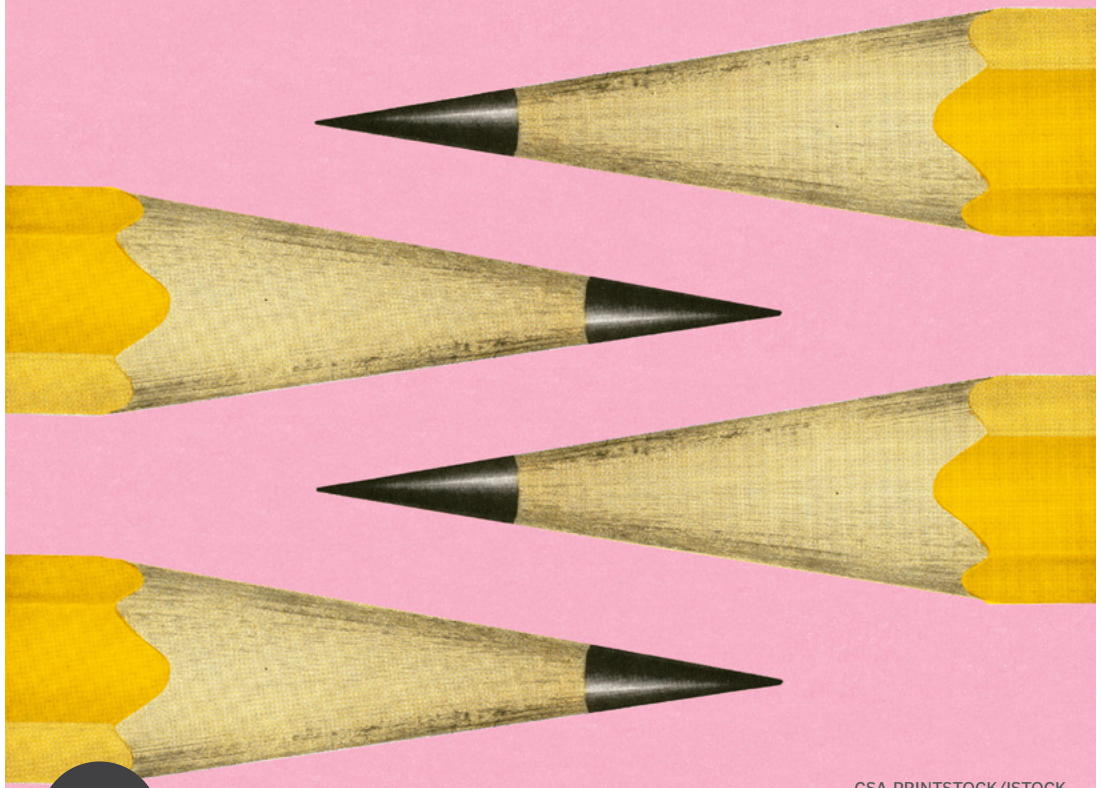


* MULTIPLE SELECTIONS PERMITTED

Get back to DR basics

Five experts weigh in on disaster preparedness. Sound advice for DR planning.

BY JASON BUFFINGTON, JON TOIGO, GEORGE CRUMP, MARC STAIMER, PAUL KIRVAN



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YEAR AFTER YEAR, we read surveys that indicate many organizations are still not confident in their ability to restore normal business operations in a reasonable timeframe following a disaster event. Regardless of statistics that tell us every minute of downtime can cost a business umpteen thousands of dollars, many shops haven't yet established a business disaster recovery (DR) plan that they know they can rely on.

If you are in this boat—come on, it's OK to admit it—or if you just need a refresher on DR best practices, we've got you covered. We put together a group of trusted data protection experts, to drop knowledge on five essential parts of any disaster recovery plan.

Class is in session, people. Listen up.

YOU CAN'T RESTORE WHAT YOU DON'T PROTECT

There's no getting around it: The first step of BC/DR planning is to ensure the survival of your data; and the basis for most data protection strategies is backup, meaning a recurring copy of data stored on another on-site system. But, to protect against a site-wide outage or disaster event such as a fire or flood, you must send an additional copy of data offsite. Traditionally, this meant sending tapes offsite and, for many organizations, it still does. But shops are increasingly turning to replication to accomplish this task.

Modern backup software products enable this approach in a number of ways. Many products integrate with storage system snapshot and replication functionality to send data offsite. Others offer native replication functionality. Almost every backup software product on the market today has some way to send data to the cloud as well. And, virtual server backup products even have the ability to replicate entire virtual machines to a secondary site or cloud.

The method you choose to replicate copies from your on-premises backup software to your BC/DR site/service will directly affect your recovery speed. So, first establish your recovery time objective, or the amount of downtime your organization can tolerate, and then choose the backup approach that meets those needs.

For example, if you replicate data to an off-premises storage system, you have a storage array with your data on it, but you don't have immediate access to applications. But, if your backup server replicates the data to another server instance—as is the case with many virtual server backup products—you can run applications off-site while restoring your on-site infrastructure.

—JASON BUFFINGTON, *senior analyst, Enterprise Strategy Group*

GET [DATA] OUT OF TOWN!

While replicating data to an off-site system or service offers benefits, it comes with a number of challenges. Whether your strategy is to replicate the data across a WAN to a secondary site or a cloud-based DR service provider, there are a number of things you need to consider in your business DR plan.

First, the location of your DR site/service is critical, because the radius of severe weather disasters often exceeds several hundred miles. For example, in 2012, Hurricane Sandy spanned more than 1,100 miles. If you opt for a DR service, the cloud data center to which your data is being copied may be fairly close to your primary data center. Be sure to check it out.

75

Percentage of events that required invocation of BC/DR plans were related to technology—IT or telecom.

STEPHANIE BALAOURAS, FORRESTER RESEARCH, WINTER 2014

The network can also be a hurdle. Replication exposes you to issues related to bandwidth, latency and jitter when transmitting over distance across a public shared network, and data deltas (differences between the data states at source and target nodes) that can make copied data unusable as a foundation for recovery. Also, restoring a large amount of data to your primary site in a timely manner over the Internet is difficult or impossible. The network link and bandwidth that enabled you to copy data to the remote site in dribs and drabs may prove woefully inadequate to the task of transporting all of your data back to you in a short timeframe following a disaster… and that is assuming that the network is still operating in the event of a regional catastrophe, which is by no means assured. As such, it is important that your disaster recovery plan consider whether you will be able to continue operations in some manner from your off-site location.

So, if you want to use disk-to-disk copies for DR, you

might consider using a tape-based copy as a safety net, as well. **—JON TOIGO**, *president, Toigo Partners International*

THE HARD PART: BRINGING DATA BACK

Backup is a priority for most organizations today, but ironically, establishing a restore plan is often overlooked. However, a well-documented plan for restoring data and applications is an essential part of every business disaster recovery plan. Restores are obviously required at the most stressful time—when something is broken and it needs to be fixed fast. In other words, the pressure is on. So, having a well-architected business disaster recovery plan is critical to meeting your RTO.

The key is to know in advance the order in which servers should be recovered, because not all data, servers or services have the same business value or operational requirements. Know what data needs to be protected best and restored first, and understand your recovery capabilities. For example, will recovery require you to move data from off-site storage before restoring applications? Or, will you be able to continue operations in some way from your DR system/service?

For most organizations, resuming critical day-to-day operations involves recovering less than 5% of the servers and 5% of the data. These are typically critical databases and the applications used to access those databases. The remaining 95% of data is reference or archival data. While often important, it is not critical to resume immediate operations. This data can be recovered later as time allows. It is important to understand the application eco-system, though. For example, if an application is accessed through a Web interface, then it is likely that the application, the database and a Web server will all need to be recovered. As a result, it is important to prioritize recovery in application groups.

Finally, it is important to understand if these applications can be recovered to a virtual environment since many of the top 5% applications are not virtualized while in production. If they can be virtualized, this will make the recovery effort easier, requiring less hardware at the DR site. But if they must remain bare-metal for either compatibility or performance reasons, then part of the business disaster recovery plan has to factor in having a standby server available to recover to.

Also, it is important to map out a variety of restore scenarios. Your recovery plan for restoring data if your primary systems are completely destroyed will look different from restoring operations following a power outage, for example. **—GEORGE CRUMP**, *president, Storage Switzerland*

60

Percentage of organizations never conduct full tests of BC/DR plans, opting instead for simulations or tabletop exercises.

STEPHANIE BALAOURAS, FORRESTER RESEARCH, WINTER 2014

MID-TERM EXAMS FOR YOUR DR PLANS

Every IT pro worth their salt knows deep down that you need to test business disaster recovery plans. It goes back to that old saw: plan the work and work the plan.

Unfortunately, many don't follow through or don't test in an effective manner. Testing is the only way to reveal flaws, issues, problems, shortcomings, mistakes and holes in your restore plan.

At least once a year—preferably twice—a truly representative test should be conducted. Representative could potentially mean recovering all of the mission-critical applications, their data, systems and processes. Or it could mean less. The key is to make the tests as close to reality as possible.

Take the example of restoring a mission-critical relational database. This might require that you bring up that database on different a physical, virtual or cloud platform. How long does it take to get the database application consistent, up and running? Are there automated (preferred) or manual tests that verify the data is sound and that the database is running properly? If not, how will it be known if the test succeeded or failed?

After the database is up and running and everything is good, the test is not over. It is imperative to test VPN re-routing, DNS updates and so on. Giving users access to applications and data is just as important to test as bringing up the database.

—MARC STAIMER, *CDS, Dragon Slayer Consulting*

CARE AND FEEDING OF YOUR PLAN

BC/DR plans should be considered "living documents" which need to be periodically reviewed and updated to ensure the business disaster recovery plan is accurate and the procedures defined in the business disaster recovery plan will facilitate recovery when performed.

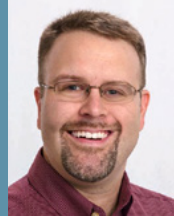
DR plan maintenance and updating activities should be implemented on both a scheduled and an ad hoc basis. The former activity establishes regular content reviews so that plans are examined at least annually and preferably twice a year. The latter addresses real-time changes in the business that could have a material effect on business disaster recovery plans and their associated program activities.

TESTING IS THE ONLY WAY TO REVEAL FLAWS, ISSUES, PROBLEMS, SHORTCOMINGS, MISTAKES AND HOLES IN YOUR RESTORE PLAN.

Change management is a formal process that ensures changes to a product, process or system are introduced and implemented in a controlled and coordinated manner. While many organizations have a formal change management process, disaster recovery is rarely included. To ensure that DR plans are kept up-to-date, include them as part of the overall change management process.

As noted in the previous section, business disaster recovery plan testing is an essential tool to validate the plan and its procedures. Following each test, examine the DR plan to see if lessons learned from the test can be used to update the plan.

—PAUL KIRVAN, *BC/DR consultant, Paul Kirvan Associates*



Data protection and the audacity of BYOD

A variety of factors, including BYOD, have led to a decentralization of IT control over data protection.

THESE DAYS, IT no longer has the same influence over what laptop, tablet or smartphone users choose. In the age of BYOD, IT must accommodate for the devices that users prefer. I call this phenomenon "the audacity of BYOD."

Data protection is heading down a similar path. Today, the backup administrator is no longer the unilateral king or queen of corporate data protection in most IT environments.

With BYOD, here's how things have played out:

- Ten years ago, many organizations' users would receive whichever device IT had determined to meet the corporate standard, unless the user had extenuating circumstances or was an executive.
- Five years ago, many IT departments offered a "menu" of approved devices, and users had choice within a range of what IT was willing and/or able to support.
- Today, many organizations allow or even require BYOD, and users bring in their own device(s). In this scenario, IT is chartered with delivering an infrastructure that supports any range of technologies that the users bring.

Today, many users choose their work devices based on what they use at home, instead of the other way around. And that makes a lot of sense. If individuals are responsible for their own productivity, shouldn't they be able to choose the device that best enables it?

IT often finds itself in a similar evolution in regard to corporate data protection:

- Ten years ago, the backup administrator chose the corporate data protection tool(s) to be used across the organization, often without much input from other constituents within IT.
- Five years ago, workload administrators (e.g., DBAs, virtualization admins and file/storage admins) began pushing back and requesting or demanding influence regarding which corporate data protection tool(s) were used across the organization.

- Today, workload administrators feel fully empowered to select their own data protection tool(s) for their own workloads, with or without interaction or influence from backup administrators.

Again, the premise makes sense for many organizations because the workload or platform administrator is ultimately responsible for the productivity platform. So those admins should have input, if not the final say, on how the data within the platform is protected to ensure recoverability.

But there are two new twists to what seem like parallel evolutions: compliance and operations.

PROTECT CORPORATE DATA TO CORPORATE STANDARDS

Workload administrators can, but often don't, protect their systems' data to the same degree that a backup administrator might have.

For example, many database administrators (DBAs) and backup administrators might be very focused on robust and rapid recovery of data within a 60-day window because it's the likely source for most recoveries tied to ensuring availability or BC/DR of those systems. However, those administrators are much less likely to ensure that data is retained for seven, 10 or perhaps 15 years for long-term regulatory compliance, as mandated by the broader organization.

This gap may lead to doubling the protection, with DBAs and backup admins operating in parallel. Or, more likely, the long-term data may not be retained, putting the overall organization at risk.

IT OPERATIONS HELP WITH DATA PROTECTION

One of the major reasons that workload administrators started exerting more influence over the corporate data protection tool(s) used within their environments was the lack of reliability or workload-centric functionality that many legacy tools offered.

However, that too has changed. Today, most modern backup tools can successfully back up virtual machines, for example. Similarly, many tools now have substantive integrations with Oracle, SQL and other database platforms to ensure a workload-specific and reliable protection and recovery experience. However, there is still quite a bit of differentiation related to restore agility.

Recent ESG research on the topic shows that although workload administrators have taken on a great deal of influence throughout the current corporate data protection lifecycle (from evaluation, implementation and ongoing operation), IT expects those workload admins to reduce that participation over the next two years.

However, we are not returning to the days of the all-powerful backup administrator. Instead, ESG finds IT operations folks, whose role includes everything from provisioning to configuration to monitoring and management, will increase participation in data protection. The same rationale applies here as well: If they are responsible for every other aspect of a server's lifespan, why not its protection and recovery? Now that the workload owners

are satisfied that their workloads will be adequately protected and reliably restorable, it makes sense for the management to be centralized around the server as opposed to the application platform.

IT AND BACKUP ADMINS MUST PROTECT DATA TOGETHER

It remains to be seen whether the shift toward increased IT operations responsibility will continue. But as long as people other than backup admins are performing backups, the backup admins (who understand the corporate requirements for data protection and retention) and the workload admins/IT ops staff (who are growing their data protection influence) will have to collaborate.

They need to ensure, together, that corporate data is protected to corporate standards and that the application, platform or server is durable for the benefit of the organization and its users. ■

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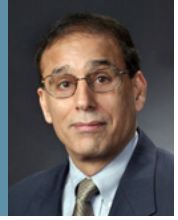
READ/WRITE
ARUN TANEJA



Survey: Storage performance still an issue

Taneja Group research shows that while storage acceleration technologies are available, IT struggles with performance.

IN FEBRUARY OF this year, Taneja Group conducted an online survey on storage acceleration and performance technologies. Nearly one-half of the survey respondents (48%) were from North America, with 22% from Europe and the rest from other parts of the world. The mix of industries was well-balanced and practically all major verticals were represented. We focused on midsize, large or very large enterprises. The titles of respondents ranged from IT architect to storage administrator, to manager/director/vice president of storage, with some having a broader range of responsibilities.

The survey was designed to gain insight into a number of areas:

- Which storage acceleration technologies were being used by IT and why
- The effectiveness of each technology
- The perceived value of a variety of features available in the market
- The perceived barriers for certain acceleration technologies

Approximately two years earlier, we conducted a similar survey on exactly the same topic and the findings gave us a solid understanding of how the market had—and had not—changed over that time.

The range of storage acceleration technologies included server-based PCI Express (PCIe) flash cards, flash-based read and/or read/write caching products, the addition of solid-state drives (SSDs) to existing hard-disk drive (HDD)-based arrays, specially designed hybrid arrays, all-flash arrays and purpose-built application accelerators.

Our findings were broad and revealing, but one thing jumped out: We as an industry are not closing the storage performance gap in the enterprise.

Enterprises continue to face significant storage performance challenges and the needle has barely moved in the past two years. More than one-third of respondents (38%) said storage performance was slowing application response time. More than one-fourth (26%) said storage performance issues were responsible for limited

transactional throughput. Twenty-four percent felt that storage Capex was still too high and restricted one's ability to buy what was needed. More than two-thirds of enterprises (70%) experience performance issues with at least some of their most important apps, and of those, one-half feel the need to boost the storage performance of "many to all" of their business-critical apps. Nearly three quarters (72%) are thinking about deploying one or more storage acceleration products.

These stats are nearly identical to those from two years ago, indicating that enterprise users have basically been treading water during that time, just to keep their most critical apps afloat. It is as if nothing changed over a two-year span. Why?

REASONS FOR STORAGE PERFORMANCE GAP

We believe there are several reasons for this performance gap. First, the number of new performance-hungry apps seems to be growing faster than the hardware available to address them. Server/client virtualization, private cloud and big data apps are severely testing the performance of storage systems, and many enterprises can't invest fast enough or intelligently enough to address the rapidly mounting performance needs.

And, a significant percentage—in our estimation, somewhere between 25% and 40%—of mainstream IT buyers and practitioners are still not educated about various storage technologies, nor what those technologies can do for them. In fact, we noticed a split in the market, between enterprises that have significant awareness of and experience with storage acceleration products, and those that do not.

The former tend to be more highly virtualized and leading edge when it comes to embracing new technologies. We believe that a majority of technology, financial services, healthcare, and media and entertainment companies fit into this category, along with Web 2.0/hyperscale enterprises (across multiple industries) and technology service providers.

The latter group—those that have less knowledge of and experience with acceleration products—tend to be in more conservative companies and industries, less virtualized, and still employing largely traditional and siloed IT infrastructures.

Nevertheless, there has been some progress. Categories of storage acceleration products have become better defined and more sophisticated buyers tend to cross segment lines when shopping for them. Products have become more fully featured, and buyer expectations for them have become more reasonable and realistic.

STORAGE ACCELERATION PRODUCT MIX CAUSES CONFUSION

However, there still remains a lot of confusion about the range of storage acceleration products, whether they work, and which approach makes the most sense for any particular use case or application. For example, when you encounter an IO-starved or non-responsive app, should you beef up an existing array with some SSDs, invest in a hybrid array with auto-tiering or look at deploying a

PCIe-based acceleration card in the server? Or should you simply add some read cache to get the job done?

Well-intentioned or not, most vendor attempts to steer buyers toward their specific products have muddied the waters further.

ACCELERATION PRODUCTS NEED MORE THAN FEEDS AND SPEEDS

Another reason for the continuing performance gap is the fact that buyers expect more than feeds and speeds in a storage acceleration product.

In the early days of flash-enabled acceleration, buyers focused primarily on performance metrics to decide on the best product. The primary question was, "Will this offering provide the latency reduction and IOPS boost that I need to achieve application performance goals?" When the buyer determined that the answer was "yes," they put that offering on the short list, without bothering to understand what the system might offer. The ultimate decision of which product to adopt usually came down to price.

This mindset has changed dramatically in the last few years, along with how companies approach evaluation and purchase. Today's buyers are also looking for other vital attributes, such as support for key features in the acceleration product. For example, availability features are almost always considered critical, since few enterprises can afford the risk of downtime of critical applications.

Regardless of the storage acceleration approach, users require products that maintain availability while improving performance. Buyers also focus on where the product will fit into the current environment, and how it will be managed.

MUST-HAVES IN STORAGE ACCELERATION PRODUCTS

Nearly one-third of respondents (30%) said they would not be willing to give up or compromise any features to solve an urgent performance problem. Only one-fifth of respondents were willing to give up on snapshots or the ability to run mixed workloads and one-fourth were willing to give up on deduplication or compression.

Clearly, features and capabilities has become the third leg of the stool in most buyers' minds, joining performance and cost as the essentials of a storage acceleration product. In general, customers are not willing to give up or compromise on key features or capabilities just to address a performance issue.

The short list of features that customers are willing to do without tend to be capabilities they use only sporadically or not at all. This was the case in 2013 and it continues to be the case today. So while vendor acceleration products are becoming more feature-rich, many of them are still not enterprise-ready in the eyes of the storage buyer.

FLASH STILL MORE EXPENSIVE THAN HDDS

Finally, while NAND flash pricing has improved dramatically in the past two years, it is still relatively costly, making flash-based products expensive compared to those based on traditional hard drives. Unless a customer is facing

a severe performance problem that impacts operations, they are not likely to pay a premium for an all-flash array. Sure, they might look at adding SSDs to an existing array or invest in a server-side product, but these approaches are typically focused on solving the problems of a particular app, rather than a broader set of performance issues. As a result, flash makes up less than 10% of total storage capacity in more than half of the enterprises surveyed.

Given the range of options in the market today, a storage acceleration product purchase should be a strategic decision, rather than a one-off tactical decision. In today's market, there is no need to compromise on enterprise features—availability, snapshots, replication, deduplication, compression, scale out, independent scaling of performance or capacity, auto-tiering and so on. But most importantly, before you look for a product, understand why and where the storage performance problem lies and this will more likely lead you to pick the right hardware. ■

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