

# IT *in* Europe

## STORAGE EDITION

Special European edition of Storage magazine | [www.SearchStorage.co.UK](http://www.SearchStorage.co.UK)



# Break free of vendor lock-in with open source storage

**Read how IT departments  
are using open source  
storage to gain cost-  
saving advantages.**

### **ALSO INSIDE**

**Thin provisioning in depth**

**Exchange 2010 and storage**

**Backing up remote and mobile devices**

**Tape's comeback?**

FROM OUR SPONSORS



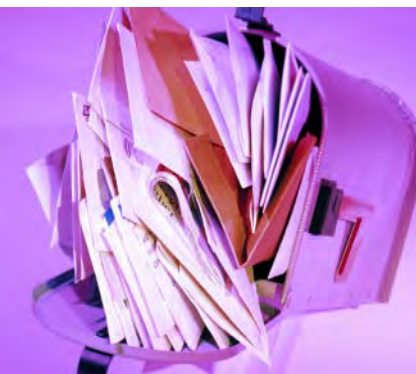
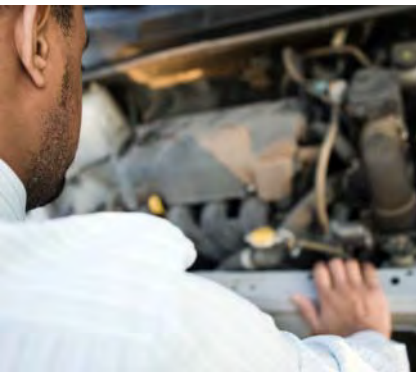
**HITACHI**  
Inspire the Next

 Hitachi Data Systems

# IT *in* Europe

## STORAGE EDITION

### *inside*



#### **Are we in the Arab Spring of storage?**

- 5 EDITORIAL** The big vendors with their storage software locked to hardware can be overthrown. *by* ANTONY ADSHEAD

#### **Open source: Storage users break free of vendor lock-in**

- 8** Open source storage frees users of the need for proprietary software on top of commodity disk. Read how UK IT departments have used it to gain cost-saving advantages. *BY* MANEK DUBASH

#### **Thin provisioning in depth**

- 14** Thin provisioning can help you get the most out of your disk capacity, but you need to know how it works. *BY* STEPHEN FOSKETT

#### **Exchange 2010 and storage systems**

- 22** The latest version of Exchange Server has some significant changes that will impact the storage supporting the mail system. Here's what you need to know. *BY* BRIEN M POSEY

#### **Backup for remote and mobile devices**

- 29** The problem of backing up remote site servers and mobile computing devices has been with us awhile. It's time to get a handle on remote backups. *BY* W CURTIS PRESTON

#### **Tape makes a comeback (but was it ever gone?)**

- 35 COMMENTARY** Somebody's spreading rumors about the death of tape, but there's plenty of life left in tape tech. *BY* RICH CASTAGNA

#### **Where is the cloud storage market headed?**

- 38 COMMENTARY** Break down the cloud storage services market and you'll find players both big and small jockeying for position in key segments. *BY* JEFF BYRNE

#### **Vendor resources**

- 42** Useful links from our advertisers.





**STOP**  
JUGGLING

**START**  
UNIFYING

# Acronis® Backup & Recovery® 11

[LEARN MORE](#)





# Are we in the Arab Spring of storage?

*The main obstacles to a new storage world order are awareness and enough IT professionals passionate about freedom from storage system dictatorship.*

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

Sponsor  
resources

**STORAGE COSTS** a lot. It's probably the biggest single-ticket item in the data centre.

On SearchStorage.co.UK [we recently examined](#) the supposed sub-\$10,000/euro 6,000 SAN market, and the conclusion was that there really wasn't one; we determined that the few products available at this price point lacked dual controllers or support and maintenance, and you'd actually need to spend more like \$20,000/euro 12,000 to get a decent entry-level SAN.

That's entry level, remember. Realistically, to deploy a fully redundant SAN with a reasonable amount of options plus maintenance you're looking at around euro 100,000 for, say, 10 TB of shared storage from the likes of EMC, HP or IBM.

But does enterprise-class shared storage have to be that expensive? Well, right now there aren't very many options. The overwhelming majority of storage products are those produced by the major vendors. They consist of controller software and a bunch of disk enclosures. There's nothing very special at all about the latter, but the former is proprietary software and is what costs the customer so much.

We've seen ([and written about in a previous column](#)) that in the IT universe not all such software/hardware lock-ins last forever. The breaking of ties between Unix flavours and specific RISC processors was the stand-out example, and Linux OSes on commodity x86 servers were the agent of change to bring this about in the early part of the last decade.

The parallels of the situation and pointers to change are there in storage. We have the hardware/software lock-in, and the possibility exists to separate the software-based controller intelligence and the commodity drives underneath. We also have a very compelling motive: the potential to save a lot of money.

Let's look at some examples of current alternatives to the existing regimes. Firstly, there's Coraid, with its ATA-over-Ethernet offering. Its controller software, evolved from Linux, runs commodity drives (SATA, SAS, SSD) in a scale-out fashion with Ethernet as its connect instead of Fibre Channel or TCP/IP (iSCSI).

It puts ATA commands inside Ethernet frames, so no TCP/IP overhead and no expensive HBAs, and of course it'll run over whatever bandwidth Ethernet network you want it to, so it's potentially very fast indeed.

And it does all this at a very attractive cost; Coraid claims less than \$500 per terabyte, so the sub-\$10,000 array is possible here.

Then there's Nexenta, which is a storage OS distribution based on ZFS that provides high-end enterprise NAS on commodity hardware and includes customers such as Korea Telecom, which has 20 PB installed. Nexenta claims cost savings for an installed system of 70% to 80% compared with the main vendors.

So, it's entirely possible to come up with workable enterprise storage alternatives to the existing big-vendor regime and its software/hardware lock-in. You can go down that route with the help of companies like Coraid and Nexenta. You can even do it yourself.

As I write this, UK political pundits are abuzz with the idea of the network vs the hierarchy. It's an idea fuelled by the Arab Spring, where Facebook- and Twitter-connected leaderless groups of activists helped mobilise masses of people to topple regimes that had lasted for decades in Middle Eastern capitals. Here in the UK the same concept is being applied to the sudden fall from positions of influence over government of Rupert Murdoch's News International media empire.

So, could the same happen in storage? Could the network of so-called Storage 3.0 vendors and open storage devotees land some killer blows against big storage iron?

Well, maybe, but probably not too soon or too suddenly. Coraid has been floating about, doing what it does for years. It's been five years since Robin Harris over at [Storage Mojo](#) talked of the game-changing potential of Coraid's product. It's hardly set the world alight since. But now it has a new round of funding, and Nexenta too is on a PR drive. In these cash-strapped times there surely has to be a potential willing market for capable enterprise storage at cut prices.

That said, there seem to be many obstacles to open storage. As with open source software, there is a simple lack of awareness. Add to that some variation along the lines of, "You never get sacked for buying IBM (or EMC or NetApp)" plus system integrator links to existing vendors, and it looks like the big vendors are safe in their bastions.

But then again, many people said the same thing in Tahrir Square in early January. ☹

---

Antony Adshead is Bureau Chief for [SearchStorage.co.UK](#).

Could the network of  
so-called Storage 3.0  
vendors and open  
storage devotees  
land some killer  
blows against big  
storage iron?



Compellent

# Fluid Data storage helps you save time and slash costs.

Manage data efficiently

Scale on a single platform

Automate with a single tool

See a Webinar on  
Dell Compellent Storage  
Solutions featuring

Fluid Data  
Technology

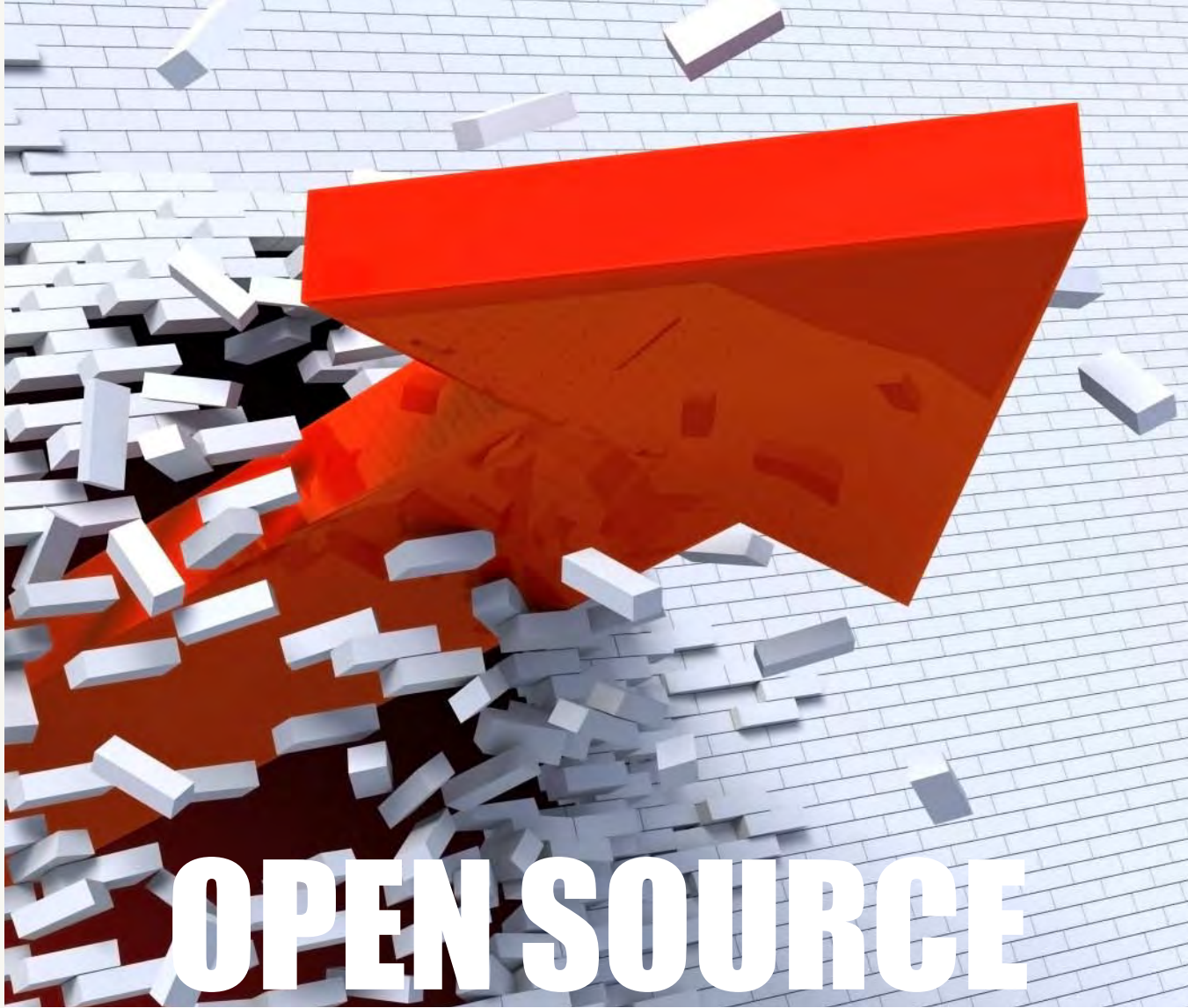
[EfficientVirtualStorage.com](http://EfficientVirtualStorage.com)



Scan to see a snapshot  
of customer success  
with Dell Compellent  
storage.







[Table of contents](#)

[Big-vendor overthrow?](#)

[Freedom from lock-in via open source storage](#)

[Thin provisioning in depth](#)

[Exchange 2010 storage changes](#)

[Backup for remote and mobile devices](#)

[Tape makes a comeback](#)

[Cloud storage predictions](#)

[Sponsor resources](#)

# OPEN SOURCE

## storage users break free of vendor lock-in

**Open source storage frees users of the need for proprietary software on top of commodity disk.**

**Read how UK IT departments have used it to gain cost-saving advantages. BY MANEK DUBASH**

**OPEN SOURCE STORAGE:** It's an idea that makes so much sense. After all, the storage systems most of us buy are simply comprised of a bunch of disks with proprietary controller software on top. Such disk systems cost people the largest chunk of their storage spending, and a proprietary system locks them into their vendor's roadmap and support structure.

Open source storage is a potential solution to this Faustian accord, however. Unlike a fully commercial product, the controller software is open source. This doesn't mean it's free necessarily, but it can be, or nearly so. And unless you choose to buy a preconfigured system from



an open source vendor, you are free to build your storage with commodity drives. Whatever you do with open source, it's likely to cost you far less than proprietary storage and offer some benefits of flexibility that you wouldn't get by striking a pact with a fully commercial vendor.

The fundamental concept of all open source products is that the development community produces the software and opens the source code to anyone who wants it. If companies want to develop products incorporating that code, under the terms of the GPL (General Public License) they must make any alterations to that source code freely available too.

Consequently, while there's no restriction on selling open source software, the most common business model is to provide the software free and sell a package of support services on top. Linux OS distributor Red Hat is probably the most successful and widely known company to rely on this business model.

The benefits of open source storage are the same as those of other open source categories. If you need a new feature or modifications to the product, you can suggest them to the developers or develop new features yourself.

With open source storage, you may not get the latest enterprise features, such as replication, data deduplication or thin provisioning, although these are found in an increasing number of open source products. But, what open source storage will deliver is reliable, high-performing software, together with the ability for users to tailor its configuration to the precise needs of their situation.

Vendors and developers include Nexenta, whose NexentaStor is based on OpenSolaris, and FreeNAS, whose product is based on FreeBSD. Both offer community and enterprise editions of the product—the latter requires a fee and includes a support package—and both utilise Sun's open source file system ZFS. Both sets of products are aimed at the NAS market, share files using CIFS and FTP, and will attach using NFS and iSCSI. Openfiler, a Linux-based open source storage system, offers similar features.

All the above include snappy GUIs that help to simplify and automate management tasks. However, support for Apple's file-sharing protocol, AFP, lags as neither Nexenta nor Openfiler support it, although Nexenta is considering it.

If brand name familiarity is important, Red Hat offers a fully featured version of Linux in the form of its Enterprise Linux Advanced Platform, and although this is not a storage-specific implementation, it has a file system and storage management elements.

**The fundamental concept of all open source products is that the development community produces the software and opens the source code to anyone who wants it.**

Having downloaded and installed open source storage software, you will need to marry it to the disk hardware. Some open source suppliers do this for you. In the case of FreeNAS, iXsystems, the commercial sponsor of the software, can provide a hardware platform with FreeNAS installed.

Open source storage projects plug the gap between simplified, home-user products from companies such as Iomega and NetGear and enterprise-level systems from companies such as EMC and NetApp. Open source storage generally does not compete in large enterprises, where storage systems are complex and where the cost of acquisition is dwarfed by the need for high-end features such as global management, single namespace and active failover.

An exception is Gluster, which has developed an open source, distributed file system for managing huge data stores in data centres; the company claims the file system offers high performance and can scale quickly to hundreds of petabytes using a single namespace. The system is designed to run on and manage large numbers of nodes based on inexpensive hardware.

Nexenta planned to launch similar technology with its Namespace Cluster product in August 2011. It will offer a single namespace and management for up to 256 machines.

Generally speaking, while open source storage is behind open source server software in terms of its evolution, there seem to be few technological barriers to its future success. Server software has already blazed the trail for open source software in general so any hurdles are likely to be technological rather than in the acceptance of open source products.

Open source storage projects plug the gap between simplified, home-user products from companies such as Iomega and NetGear and enterprise-level systems from companies such as EMC and NetApp.

## OPEN SOURCE STORAGE AT VESK

Vesk, a provider of hosted virtual desktops, uses Nexenta's open source storage software to deliver services to its customers. According to James Mackie, Vesk's technical director, "People need high-speed desktops as they use them all day, so they need high performance. The performance comes from storage—it's about IOPS on the disk rather than the servers."

Vesk has about 150 TB under its command in three JBODs attached using LSI enclosures and host bus adapters (HBAs), with two of them mirrored using ZFS RAID-Z and the other as a hot standby. "It gives us about 100 TB of usable storage," Mackie said, adding that the architecture

is fairly simple and expansion is easy: Vesk just buys extra disk capacity.

"Each JBOD is connected by SAS so the head node can fail and you get an eight-second failover," Mackie said. "The VMs [containing the virtual desktops] all remain logged in and working. We use SSDs for ZFS' read and write cache, all mirrored in each JBOD so anything can fail, including the power supply unit, and you still have the data and the performance."

Mackie said Vesk had tried systems from Dell EqualLogic but they were not fast enough. "With more than 150 users, it hit performance snags," he said. For Mackie, the other problem was that the Dell system was "a lot more expensive, and it didn't do what we needed. We learned the hard way that we had to do everything ourselves."

Going open source while aiming for zero downtime meant testing for reliability, performance and security with configuration done using the command line. "Nexenta command lines are very powerful, but you can just type help and the command, and it tells you how to set it up," Mackie said.

There are drawbacks, of course. "You need to manage it more closely than if you had a NetApp or Equal-Logic," Mackie said. "The tools in Nexenta are great, but we have to manage disk failure, and we need to understand how the high availability works. There's just more work that has to go in with open source."

"For example, are you prepared to manage disks, JBODs, software, applications? That all needs to be thought about and managed. Everything else is a benefit, and the benefits outweigh the drawbacks. We have four third-line guys who all know how the storage works. All of us understand that and have documented it and how to fix it."

Mackie said it would be possible to bring in outside consultants to manage the systems but that this would raise costs to the level of proprietary systems. "We build our own storage," he said. "Moving away from that would not be good for us."

**"The tools in Nexenta are great, but we have to manage disk failure, and we need to understand how the high availability works. There's just more work that has to go in with open source."**

—JAMES MACKIE, technical director, Vesk

## OXFORD ARCHAEOLOGY GOES OPEN SOURCE

Oxford Archaeology is an independent archaeology and heritage practice with about 350 specialist staff and permanent offices in Oxford, Lancaster and Cambridge.

CIO Chris Puttick said the company uses open source storage for its flexibility, features and lower costs. For Puttick, that applies particularly



to TCO, including exit costs. "Support was the main requirement—it had to be clear where third-party support could be sourced from and that there were multiple sources. The quality of available documentation was also considered before choosing the technology."

The company uses two open source storage technologies. One is a 3 TB Oracle Solaris OpenStorage-based system, which manages a Sun Storage J4200 chassis; the other is an Ubuntu Linux-based solution managing 24 TB of expandable storage built on Dell PowerVault MD1000 hardware. Puttick's team members put the systems together themselves and maintain them without outside help.

"The Linux-based solution is the future and has the capacity for growth. It's flexible; it can deliver the data volumes as iSCSI or as SMB shares, among other options," he said. Puttick plans to convert the system to BTRFS (B-tree File System) once it is stable. "This will give feature parity or better with proprietary solutions, with the added advantage of many of the features being at a file system level, and thus the storage layer itself becomes portable to other front ends," he said.

Open source software manages most of the company's storage and provides backup targets. "Over the coming 12 months, all data will be migrated to the main 20 TB file store, and an asynchronous replica set up in a branch office to provide business continuity," Puttick said. "Replication will be asynchronous because of bandwidth limitations, and we estimate [a delay of] a few hours ... at peak creation and churn times."

The benefits of open source storage for Puttick are that feature parity "is more or less already there, and costs are considerably lower. Additionally, open source can survive the financial collapse of a given supplier, whereas closed source software does not." The main drawback is that "the solution is not fronted by a single shiny GUI, so each element has to be configured separately, which requires the staff involved to be of the more capable variety," he said.

The challenge for open source generally is one of brand recognition. "Without the sales and marketing money available to open source storage vendors, buyers tend to not recognise it as valid," Puttick said. "Instead of properly assessing solutions available to them, they tend to ignore those they do not know." ☉

"The Linux-based solution is the future and has the capacity for growth. It's flexible; it can deliver the data volumes as iSCSI or as SMB shares, among other options."

—CHRIS PUTTICK, CIO, Oxford Archaeology

Manek Dubash is a UK-based freelance journalist.

The data that drives our world is evolving. Innovations in virtualisation, cloud computing, automation and sustainable IT aren't just transforming your data centre — they're opening up a new universe of possibilities for your business.

Because when there's no centre,  
everything is within reach.

# DATA HAS NO CENTRE



Network Rail is transforming its data centre to be more economically and ecologically sustainable by consolidating and better using existing assets. Hitachi Data Systems delivers savings for Network Rail so they can keep costs down for you. Learn more at:

[hds.com/nocentre](http://hds.com/nocentre)



© Hitachi Data Systems Corporation 2011. All Rights Reserved.





# Thin provisioning in depth

BY STEPHEN FOSKETT

Thin provisioning can help you use your disk capacity much more efficiently, but you need to get under the hood a little to understand how thin provisioning will work in your environment.

n

**NOBODY WANTS TO** pay for something they're not using, but enterprise data storage managers do it all the time. The inflexible nature of disk storage purchasing and provisioning leads to shockingly low levels of capacity utilisation. Improving the efficiency of storage has been a persistent theme of the industry and a goal for most storage professionals for a decade, but only thin provisioning technology has delivered tangible, real-world benefits.

[Table of contents](#)

[Big-vendor overthrow?](#)

[Freedom from lock-in via open source storage](#)

[Thin provisioning in depth](#)

[Exchange 2010 storage changes](#)

[Backup for remote and mobile devices](#)

[Tape makes a comeback](#)

[Cloud storage predictions](#)

[Sponsor resources](#)



The concept of thin provisioning may be simple to comprehend, but it's a complex technology to implement effectively. If an array allocates only storage capacity that contains data, it can store far more data than one that allocates all remaining (and unnecessary) "white space." But storage arrays are quite a few steps removed from the applications that store and use data, and no standard communication mechanism gives them insight into which data is or isn't being used.

Storage vendors have taken a wide variety of approaches to address this issue, but the most effective mechanisms are difficult to implement in existing storage arrays. That's why next-generation storage systems, often from smaller companies, have included effective thin provisioning technology for some time, while industry stalwarts may only now be adding this capability.

## THIN ALLOCATION-ON-WRITE

Traditional storage provisioning maintains a one-to-one map between internal

# WHAT YOU SHOULD ASK ABOUT THIN PROVISIONING

**WHEN EVALUATING A** storage array that includes thin provisioning, consider the following questions, which reflect the broad spectrum of approaches to this challenge. Note that not all capabilities are required in all situations.

- Is thin provisioning included in the purchase price, or is it an extra-cost option?
- Does the array support zero page reclaim? How often does the reclamation process run?
- What is the page size or thin provisioning increment?
- Does thin provisioning work in concert with snapshots, mirroring and replication? Is thick-to-thin replication supported?
- What does the array do when it entirely fills up? What's the process of alerting, freeing capacity and halting writes?
- Does the array support WRITE\_SAME? What about SCSI UNMAP or ATA TRIM?
- Is there a VMware vStorage APIs for Array Integration (VAAI) "block zeroing" plug-in? Is it the basic T10 plug-in or a specialised one for this array family?

disk drives and the capacity used by servers. In the world of block storage, a server would “see” a fixed-size drive, volume or LUN, and every bit of that capacity would exist on hard disk drives residing in the storage array. The 100 GB C drive in a Windows server, for example, would access 100 GB of reserved RAID-protected capacity on a few disk drives in a storage array.

The simplest implementation of thin provisioning is a straightforward evolution of this approach. Storage capacity is aggregated into “pools” of same-sized pages, which are then allocated to servers on demand rather than on initial creation. In our example, the 100 GB C drive might contain only 10 GB of files, and this space alone would be mapped to 10 GB of capacity in the array. As new files are written, the array would pull additional capacity from the free pool and assign it to that server.

This type of “allocate-on-write” thin provisioning is fairly widespread today. Most midrange and enterprise storage arrays, and some smaller devices, include this capability either natively or as an added-cost option. But there are issues with this approach.

One obvious pitfall is that such systems are only thin for a time. Most file systems use “clear” space for new files to avoid fragmentation; deleted content is simply marked unused at the file system layer rather than zeroed out or otherwise freed up at the storage array. These systems will eventually gobble up their entire allocation of storage even without much additional data being written. This not only reduces the efficiency of the system but risks “over-commit” issues, where the array can no longer meet its allocation commitments and write operations come to a halt.

That doesn’t suggest, however, that thin provisioning is useless without thin reclamation (see [“The enemies of thin”](#)), but the long-term benefit of the technology may be reduced. Plus, since most storage managers assume that thin storage will stay thin, effectively reclaiming unused space is rapidly becoming a requirement.

**Storage capacity is aggregated into “pools” of same-sized pages, which are then allocated to servers on demand rather than on initial creation.**

## THE THIN RECLAMATION CHALLENGE

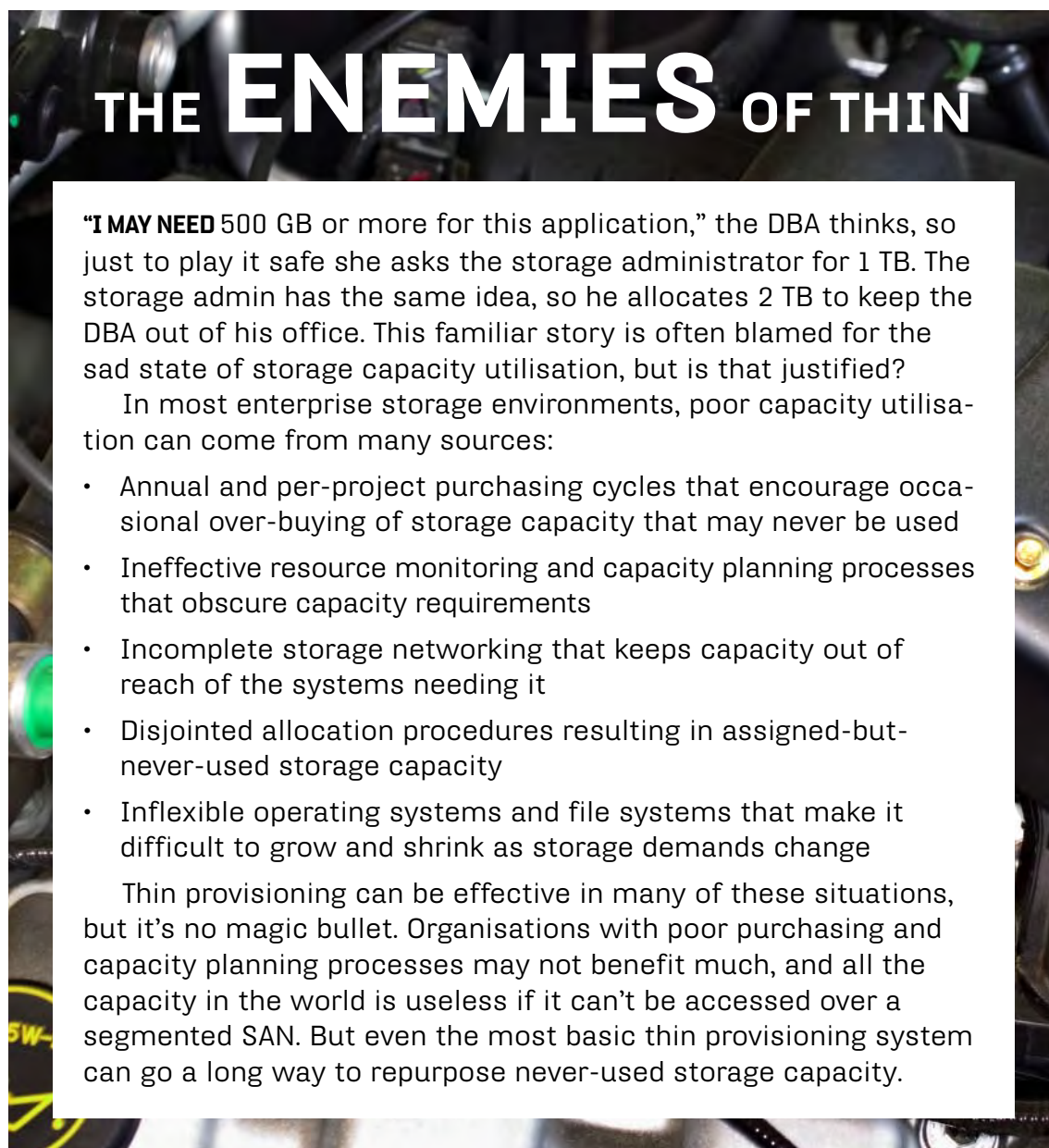
The tough part of thin provisioning technology is reclaiming unused capacity rather than correctly allocating it. Returning no-longer-used capacity to the free pool is the key differentiator among thin provisioning implementations, and the industry is still very much in a state of flux in this regard.

The root cause of the thin reclamation challenge is a lack of communication between applications and storage systems. As noted earlier, file systems aren’t generally thin-aware, and no mechanism exists to report when capacity

is no longer needed. The key to effective thin provisioning is discovering opportunities to reclaim unused capacity; there are essentially two ways to accomplish this:

- The storage array can snoop the data it receives and stores, and attempt to deduce when an opportunity exists to reclaim capacity
- The server can be modified to send signals to the array, notifying it when capacity is no longer used

The first option is difficult to achieve but can be very effective, since operating system vendors don't seem eager to add thin-enhancing features to their file systems. Products like Data Robotics' Drobo storage systems snoop



## THE ENEMIES OF THIN

**"I MAY NEED 500 GB or more for this application,"** the DBA thinks, so just to play it safe she asks the storage administrator for 1 TB. The storage admin has the same idea, so he allocates 2 TB to keep the DBA out of his office. This familiar story is often blamed for the sad state of storage capacity utilisation, but is that justified?

In most enterprise storage environments, poor capacity utilisation can come from many sources:

- Annual and per-project purchasing cycles that encourage occasional over-buying of storage capacity that may never be used
- Ineffective resource monitoring and capacity planning processes that obscure capacity requirements
- Incomplete storage networking that keeps capacity out of reach of the systems needing it
- Disjointed allocation procedures resulting in assigned-but-never-used storage capacity
- Inflexible operating systems and file systems that make it difficult to grow and shrink as storage demands change

Thin provisioning can be effective in many of these situations, but it's no magic bullet. Organisations with poor purchasing and capacity planning processes may not benefit much, and all the capacity in the world is useless if it can't be accessed over a segmented SAN. But even the most basic thin provisioning system can go a long way to repurpose never-used storage capacity.



on certain known partition and file system types to determine which disk blocks are unused and then reclaim them for future use. But that approach is extremely difficult in practice given the huge number of operating systems, applications and volume managers in use.

Therefore, the key topic in enterprise thin provisioning involves the latter approach: improving the communication mechanism between the server and storage systems.

## ZERO PAGE RECLAIM

Perhaps the best-known thin-enabling technology is zero page reclaim. It works something like this: The storage array divides storage capacity into “pages” and allocates them to store data as needed. If a page contains only zeroes, it can be “reclaimed” into the free-capacity pool. Any future read requests will simply result in zeroes, while any writes will trigger another page being allocated. Of course, no technology is as simple as that.

Actually writing all those zeroes can be problematic, however. It takes just as much CPU and I/O effort to write a 0 as a 1, and inefficiency in these areas is just as much a concern for servers and storage systems as storage capacity. The T10 Technical Committee on SCSI Storage Interfaces has specified a SCSI command (WRITE\_SAME) to enable “deduplication” of those I/Os, and this has been extended with a so-called discard bit to notify arrays that they need not store the resulting zeroes.

Most storage arrays aren’t yet capable of detecting whole pages of zeroes on write. Instead, they write them to disk, and a “scrubbing” process later detects these zeroed pages and discards them, so they appear used until they’re scrubbed and discarded. This process can be run on an automated schedule or manually initiated by an administrator. And some arrays detect zeroed pages only during a mirror or migration, further reducing capacity efficiency.

**Most storage arrays aren't yet capable of detecting whole pages of zeroes on write.**

## BUILDING BRIDGES

Even if an array has a feature-complete zero page reclaim capability, it will be functional only if zeroes are actually written. The server must be instructed to write zeroes where capacity is no longer needed, and that’s not the typical default behavior. Most operating systems need a command, like Windows’ “sdelete -c” or something on the order of NetApp’s SnapDrive, to make this happen, and these are run only occasionally.

Some applications, including VMware ESX volumes, do indeed zero-out new space, and the ESX command “eagerzeroedthick” will even clear out

Table of contents

Big-vendor overthrow?

Freedom from lock-in via open source storage

Thin provisioning in depth

Exchange 2010 storage changes

Backup for remote and mobile devices

Tape makes a comeback

Cloud storage predictions

Sponsor resources

# THIN PROVISIONING AND TCO

Table of contents

Big-vendor overthrow?

Freedom from lock-in via open source storage

Thin provisioning in depth

Exchange 2010 storage changes

Backup for remote and mobile devices

Tape makes a comeback

Cloud storage predictions

Sponsor resources

**COMPARING THE** total cost of ownership (TCO) for enterprise storage solutions is controversial, with self-serving and incomplete models the norm for storage vendors. Before spending money on cost-saving, efficiency-improving technologies like thin provisioning, it's wise to create a model internally to serve as a reality check for vendor assumptions and promises.

A complete TCO includes more than just the cost of hardware and software—operations and maintenance, data centre costs and the expenses associated with purchasing, migration and decommissioning storage arrays must be considered. And it's a good idea to consider the multiplier effect of

inefficient allocation of resources: Leaving 1 GB unused for every 1 GB written doubles the effective cost of storage. With end-to-end storage utilisation averaging below 25%, this multiplier can add up quickly.

Such cost models often reveal the startling fact that storage capacity on hard disk drives (or new solid-state disks, or SSDs) is a small component of TCO—often less than 15% of total cost. But that doesn't mean that driving better capacity utilisation is wasted effort. Eliminating the multiplier effect from inefficient utilisation can have a far-greater impact on TCO than merely packing more bits onto a disk drive.

Consider the operational impact of thin provisioning, as well as its mechanical impact on storage density. Thin systems may require less administration because capacity can be allocated without traditional constraints, but that could lead to a nightmare scenario of overallocated arrays running out of capacity and bringing apps to a halt. The best thin storage systems are also highly virtualised, flexible and instrumented, allowing improved operational efficiency and high utilisation.

**Consider the operational impact of thin provisioning, as well as its mechanical impact on storage density.**

space. Although certain compatibility issues remain, notably with VMotion, ESX is becoming increasingly thin-aware. The vStorage APIs for Array Integration (VAAI), added in ESX 4.1, includes native “block zeroing” support for certain storage systems. ESX uses a plug-in, either a special-purpose one or the generic T10 WRITE\_SAME support, to signal an array that VMFS capacity is no longer needed.

Symantec is also leading the charge to support thin provisioning. The Veritas Thin Reclamation API, found in the Veritas Storage Foundation product, includes broad support for most major storage arrays. It uses a variety of communication mechanisms to release unneeded capacity and is fully integrated with the VxFS file system and volume manager. Storage Foundation also includes the SmartMove migration facility, which assists thin arrays by transferring only blocks containing data.

Thin awareness in other systems is coming more slowly. Another standard command, ATA TRIM, is intended to support solid-state storage, but it could also send thin reclamation signals, along with its SCSI cousin, UNMAP. Microsoft and Linux now support TRIM, so thin provisioning support could be added in the future as well. The way in which storage is allocated and released in those file systems could also be modified.

## GETTING THINNER

Thin provisioning is not without its challenges, but the benefits are many. It's one of the few technologies that can improve real-world storage utilisation even when the core issue isn't technology-related. Indeed, the ability of thin provisioning to mask poor storage forecasting and allocation processes contributed to the negative image many, including me, had of it. But as the technology improves and thin reclamation becomes more automated, this technology will become a standard component in the enterprise storage arsenal. ☺

**Thin provisioning  
is not without its  
challenges, but the  
benefits are many.**

---

**Stephen Foskett is an independent consultant and author specializing in enterprise storage and cloud computing. He is responsible for Gestalt IT, a community of independent IT thought leaders, and organizes the group's Tech Field Day events.**

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

Sponsor  
resources



## Memorizing RAID level definitions and knowing which level does what can be:

- ☐ A Confusing
- ☐ B Hard to Remember
- ☐ C Useful
- ☒ D All of the above

So how much do you think you know about RAID?

Find Out For Yourself and Test Your Knowledge with Our Exclusive RAID Quiz!

And don't forget to bookmark this page for future RAID-level reference.

Test your knowledge at [SearchSMBStorage.com/RAID Quiz](https://SearchSMBStorage.com/RAID_Quiz)



**SearchStorage.co.UK**

*The Web's best storage-specific information resource for IT professionals in the UK*

[Table of contents](#)

[Big-vendor overthrow?](#)

[Freedom from lock-in via open source storage](#)

[Thin provisioning in depth](#)

[Exchange 2010 storage changes](#)

[Backup for remote and mobile devices](#)

[Tape makes a comeback](#)

[Cloud storage predictions](#)

[Sponsor resources](#)



# Exchange 2010 and storage systems

*The latest version of Exchange Server has some significant changes that will impact the storage supporting the mail system.* BY BRIEN M POSEY

**WITH EXCHANGE SERVER 2010**, Microsoft made some major changes to the database structure that underlies the email application. These architectural changes have a significant impact on planning for Exchange Server's data storage requirements.

The biggest change Microsoft made was eliminating single-instance storage (SIS). Previously, if a message was sent to multiple recipients, only one copy of the message was stored within the mailbox database. User mailboxes received pointers to the message rather than a copy of the entire message.

The elimination of single-instance storage means that when a message is

sent to multiple recipients, every recipient receives a full copy of the message. In terms of capacity planning, the overall impact of this change will vary depending on how many messages include attachments.

Text- and HTML-based messages are typically small and will have a minimal impact on capacity planning, and Microsoft further reduces the impact by automatically compressing such messages. However, if you have users who routinely send large attachments to multiple recipients, those messages could have a major impact on database growth. Microsoft's primary goal in designing the new database architecture was to decrease database I/O requirements. As such, Microsoft chose not to compress message attachments because of the additional I/O that would have been required to compress/decompress them.

It may seem odd that at a time when storage managers are looking to reduce duplication in primary storage Microsoft removes a data reduction feature from Exchange. But the company scrapped single-instance storage because Exchange mailbox databases perform much more efficiently without it. Microsoft claims database I/O requirements have been reduced by approximately 70% in Exchange 2010.

One of the most common methods of keeping Exchange 2010 mailbox databases from growing too large is to use mailbox quotas. Quotas prevent individual mailboxes from exceeding a predetermined size, and the quotas in Exchange 2010 work as they did in previous versions of Exchange with one notable exception. Exchange 2010 introduces the concept of archive mailboxes (discussed later). If a user has been given an archive mailbox, the mailbox quota won't count the archive mailbox's contents when determining how much storage the user is consuming. Exchange does, however, let you manage archive storage through a separate quota.

The use of mailbox quotas is a tried-and-true method for limiting data storage consumption. But Microsoft has been encouraging organisations to make use of low-cost storage rather than mailbox quotas. The argument is that organisations can accommodate the increased database size without spending a lot on expensive storage solutions.

The low-cost storage recommendation is based on more than just storage cost. Many organisations have been forced to set stringent mailbox quotas that have caused users to delete important messages. Ostensibly, cheaper storage will allow for larger mailbox quotas or for the elimination of quotas altogether.

Previously, using lower-end storage subsystems in production Exchange Server environments was unheard of, but Exchange 2010's reduced I/O requirements make storage options such as SATA drives practical. And Exchange Server 2010 is flexible in terms of the types of storage it can use; it will work with direct-attached storage (DAS) or storage-area network (SAN) storage (or with

**One of the most common methods of keeping Exchange 2010 mailbox databases from growing too large is to use mailbox quotas.**

an iSCSI connection to a storage pool). However, Microsoft does prevent you from storing Exchange Server data on any storage device that must be accessed through a mapped drive letter. So you won't be able to store a mailbox database on a network-attached storage (NAS) system unless it supports iSCSI connectivity.

## ADDITIONAL CONSIDERATIONS

Even though low-cost storage might provide adequate performance, it's still important to choose a storage subsystem that also meets your organisation's

### CAN EXCHANGE SERVER'S ARCHIVING AND E-DISCOVERY REPLACE THIRD-PARTY PRODUCTS?

Prior to the release of Exchange Server 2010, an entire industry emerged around creating archival and e-discovery products for Exchange Server. Now that Exchange 2010 offers native support for user archives and has built in e-discovery capabilities, it seems only natural to consider whether these new features can replace third-party products.

Exchange 2010's e-discovery and archiving features may be sufficient for some smaller organizations, but they're not enterprise-ready. The archiving and e-discovery features both have limitations you won't encounter with most third-party tools.

For example, Exchange 2010's archive mailboxes aren't a true archiving solution. Archive mailboxes let users offload important messages to a secondary mailbox that's not subject to strict retention policies or storage quotas. But if you want to do true archiving at the organizational level you still must use Exchange's journaling feature. The journal works, but third-party archivers provide much better control over message archival, retention and disposal.

The situation's the same for Exchange 2010's multi-mailbox e-discovery search feature. Multi-mailbox search has some major limitations. For example, it can be used only with Exchange 2010 mailboxes, so you'll still need a third-party product to search legacy Exchange mailboxes or PSTs.

Multi-mailbox search also lacks some of the rich reporting options and export capabilities commonly found in specialized e-discovery products.

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

Sponsor  
resources



reliability requirements. For instance, if you opt for SATA storage, it's best to create a fault-tolerant SATA array. Microsoft recommends using RAID 1+0 arrays. Some organizations use RAID 5 because it's less costly and still provides fault tolerance, but RAID 1+0 arrays generally offer better performance.

It's worth noting that database size can have a direct impact on performance. As a general rule, mailbox databases on standalone mailbox servers should be limited to 200 GB or less. If a mailbox database grows larger than 200 GB, you may benefit from dividing the database into multiple, smaller databases. For mailbox databases that are part of a Database Availability Group, the recommended maximum database size is 2 TB.

## DETERMINING STORAGE REQUIREMENTS

Determining the storage requirements for an Exchange 2010 deployment can be a big job, but Microsoft offers a free tool that can help. The [Exchange 2010 Mailbox Server Role Requirements Calculator](#) is an Excel spreadsheet that calculates your Exchange storage requirements based on your organisation's Exchange usage.

To use the Exchange 2010 Mailbox Server Role Requirements Calculator, fill in a series of cells by answering questions related to the intended Exchange Server configuration and usage (see "Exchange 2010 Mailbox Server Role Requirements Calculator" screenshot below). For instance, the spreadsheet asks questions about the average size of an email message and the number of messages users send and receive each day. Formulas built into the spreadsheet will use the information you provide to determine the required storage architecture.

Keep in mind, however, that while the Exchange 2010 Mailbox Server Role Requirements Calculator may be the best tool available for estimating Exchange mailbox server storage requirements, the recommendations it offers are only

as accurate as the data you provide. To compensate, Microsoft recommends you provision enough disk space to accommodate at least 120% of the calculated maximum database size.

## EXCHANGE ARCHIVE MAILBOXES

There are other factors to consider that may impact your Exchange Server storage planning, such as

Table of contents

Big-vendor overthrow?

Freedom from lock-in via open source storage

Thin provisioning in depth

Exchange 2010 storage changes

Backup for remote and mobile devices

Tape makes a comeback

Cloud storage predictions

Sponsor resources

## PROTECTING EXCHANGE DATA

Exchange Server has always been somewhat difficult to protect. If you do a traditional nightly backup of your Exchange servers, a failure could result in the loss of a full day's worth of messages. For most companies, such a loss is unacceptable.

Exchange administrators have taken a number of steps to prevent substantial data loss. In Exchange 2007, for example, it was a common practice to use continuous replication to replicate mailbox data to another mailbox server. A continuous replication solution provides fault tolerance and acts as a mechanism for protecting data between backups. (Of course, using a near-continuous data protection solution such as System Center Data Protection Manager is also a good option.)

Some observers feel Microsoft is working toward making Exchange Server backups completely unnecessary. The idea is that Database Availability Groups will eventually make Exchange resilient enough that you won't need backups.

Database Availability Groups are an Exchange 2010 feature that lets you create up to 16 replicas of a mailbox database. These replicas reside on other mailbox servers, and it's even possible to create database replicas in alternate data centres. Despite the degree to which Database Availability Groups can protect mailbox data, you shouldn't abandon your backups just yet.

Having multiple replicas of each database makes it easier to protect Exchange Server, but if a mailbox database becomes corrupted or gets infected with a virus, the corruption or viral code is copied to the replica databases.

But Microsoft does offer a delayed playback feature in which lagged copy servers are used to prevent transactions from being instantly committed to replica databases. If a problem occurs, you'll have enough time to prevent the bad data from being committed to a replica database. Once you've stopped the bad data from spreading, you can revert all your mailbox databases to match the state of the uncorrupted replica.

While this approach sounds great in theory, Microsoft still has a lot of work to do to make it practical. Right now the procedure requires you to take an educated guess as to which transaction log contains the first bit of corruption and then work through a complicated manual procedure to prune the log files. So while Exchange 2010's storage architecture makes it easier to protect your data by way of Database Availability Groups, you shouldn't rely on them as the only mechanism for protecting Exchange data.

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

Sponsor  
resources

whether you will implement user archive mailboxes, a new and optional feature. User archive mailboxes are secondary mailboxes that can be used for long-term retention of messages. What makes archive mailboxes different from other Exchange archiving methods is that unlike a more traditional archive (such as a journal mailbox), the user retains ownership of the items in the archive mailbox. As such, each user's archives are readily accessible.

Archive mailboxes are designed to take the place of PST files. But unlike PST files, archive mailboxes are stored within a mailbox database on the Exchange Server, where they can be managed and regulated by the Exchange administrator.

In the original RTM release of Exchange 2010, user archive mailboxes were in the same mailbox database as users' primary mailboxes. In SP1, Microsoft provided the option of relocating user archive mailboxes to a separate mailbox database that allows the archives to be offloaded so they don't impact the primary mailbox storage.

Microsoft generally recommends placing the archive mailboxes on a low-end mailbox server that uses inexpensive direct-attached storage (such as a SATA array). Remember that if a mailbox database contains only archive mailboxes then it won't be subject to the same I/O load as a mailbox database that's used to store the user's primary mailboxes. Another advantage to using low-cost storage for user archive mailboxes is that doing so makes it practical to set a high mailbox capacity quota on the archive mailboxes. (See ["Can Exchange Server's archiving and e-discovery replace third-party products?"](#))

**What makes archive mailboxes different from other Exchange archiving methods is that unlike a more traditional archive (such as a journal mailbox), the user retains ownership of the items in the archive mailbox.**

## JOURNAL JUGGLING

Another factor to take into account is the journal mailbox. If you use journaling to archive messages at the hub transport level, all the archived messages are placed into the journal mailbox.

I've never come across any Microsoft best practices for the placement of journal mailboxes, but I like to put the journal mailbox in its own mailbox database. This is because the journaling process tends to be very I/O-intensive, and placing the journal mailbox in a dedicated mailbox database ensures its I/O doesn't degrade the performance of the other mailbox databases. If all messages are journaled, locating the journal mailbox within the same store as the user mailboxes will double the I/O requirements because Exchange 2010 doesn't use single-instance storage. In other words, journaling causes

an extra copy of each message to be created within the mailbox store.

If you were to create the journal mailbox in the same database as the user mailboxes, it would have a major impact on the replication process (assuming that Database Availability Groups are being used—see “[Protecting Exchange data](#)”).

Another advantage to locating the journal mailbox in a separate mailbox database is that it makes it easy to manage storage quotas and message retention based on mailbox function. You can create one set of policies for user mailboxes and another set of requirements for the journal mailbox.

## DISCOVERY MAILBOX

The last type of mailbox you should consider when planning for Exchange 2010 storage is the discovery mailbox. The discovery mailbox is only used when a multi-mailbox search (e-discovery) is performed. The search results are stored in the discovery mailbox.

By default, the discovery mailbox is assigned a 50 GB quota. This sounds large, but it may be too small for performing e-discovery in a large organisation.

When it comes to choosing a storage location for a discovery mailbox, capacity is generally more important than performance. While the e-discovery process is I/O-intensive, the I/O load is split between the database containing the user mailboxes and the database holding the discovery mailbox.

If e-discovery isn't a priority, then you may consider not even bothering to create a discovery mailbox until you need it. If that's not an option, your best bet is to place the mailbox in a dedicated mailbox database that lives on a low-cost storage system with plenty of free disk space.

## MORE PLANNING REQUIRED

Clearly, there are a number of factors that must be taken into account when planning an Exchange Server storage architecture. Even though Exchange 2010 isn't as I/O-intensive as its predecessors, I/O performance should still be a major consideration in the design process. Other important considerations include capacity and fault tolerance. ☹

---

**Brien M Posey** is a seven-time Microsoft MVP for his work with Exchange Server, Windows Server, Internet Information Server (IIS) and file systems/storage. He has served as CIO for a US chain of hospitals and was once a network administrator for the US Department of Defense at Fort Knox.

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

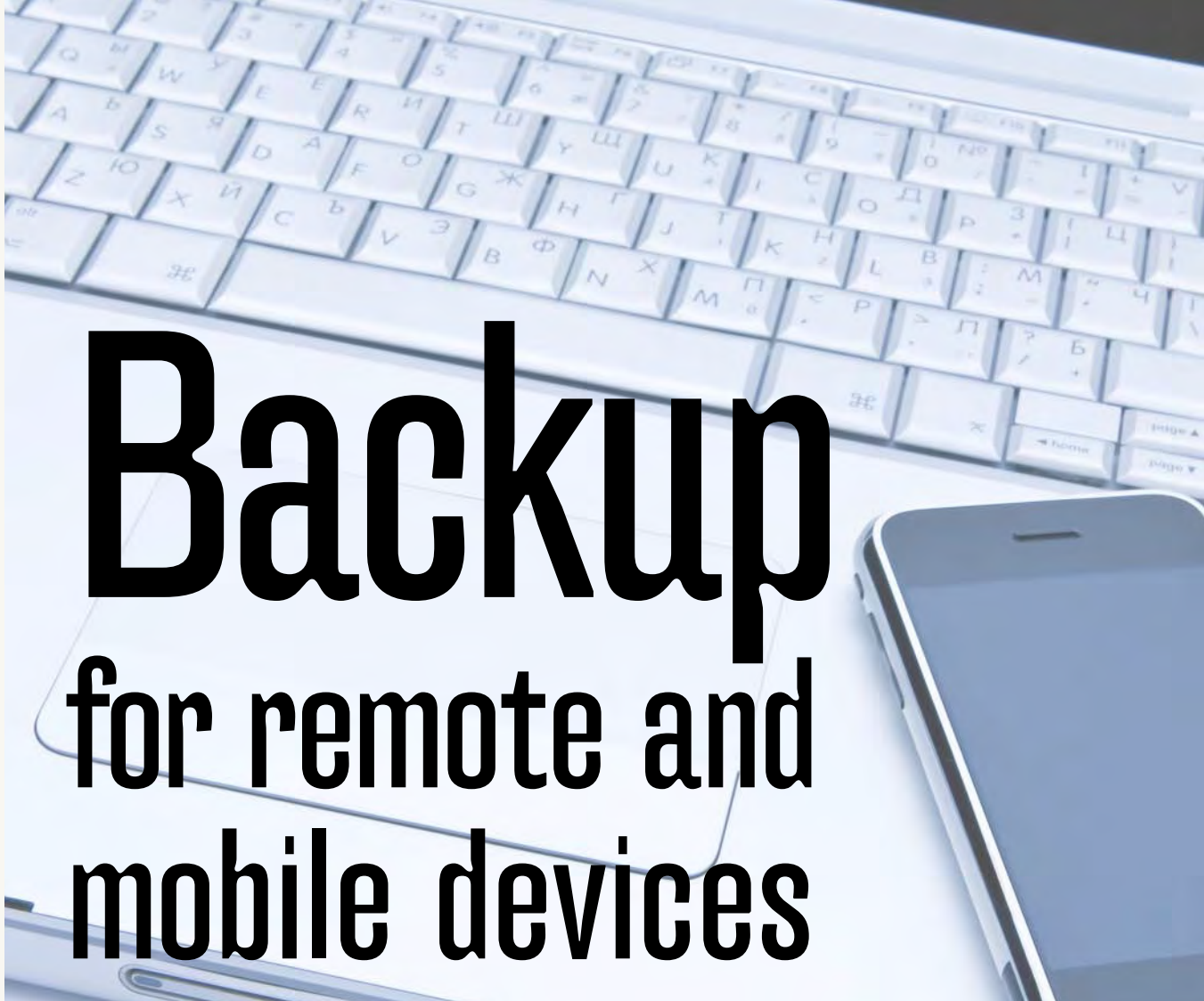
Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

Sponsor  
resources





# Backup for remote and mobile devices

[Table of  
contents](#)

[Big-vendor  
overthrow?](#)

[Freedom from  
lock-in via open  
source storage](#)

[Thin  
provisioning  
in depth](#)

[Exchange 2010  
storage  
changes](#)

[Backup for  
remote and  
mobile devices](#)

[Tape makes a  
comeback](#)

[Cloud storage  
predictions](#)

[Sponsor  
resources](#)

The problem of properly backing up remote site servers and mobile computing devices has been with us a long time. But with a workforce that's getting more mobile, it's time to get a handle on remote backups.

*BY W CURTIS PRESTON*

**R**EMOTE DATA CENTRES and mobile users represent the last frontier of backup and recovery. And that frontier spirit is often reflected in the way many companies rein in backup and recovery of remote and mobile data. Remote data centres, as well as users of laptops or other mobile devices, are often left on their own to make do with inferior methods (or none at all), while the “big” data centre enjoys a modern-day backup and recovery environment. But with so much data being created and carried around outside the main data centre, it's time for a change.

## THE ROOT OF THE PROBLEM

Remote data centres often use standalone backup systems with limited connections to the corporate backup system. And because they typically deal with smaller data sets, remote centres often use less-expensive software and hardware. So, while the central data centre may be running an enterprise-class backup product backing up to a large target data deduplication system or tape library, remote data centres often have workgroup-class backup products feeding backups to small autoloaders or even individual tape drives.

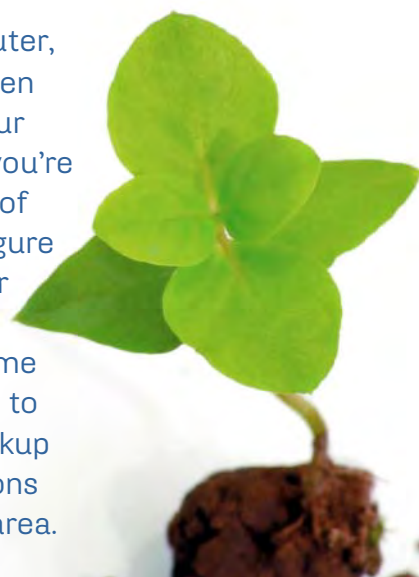
Likewise, the corporate data centre is likely to have a contract with a media vaulting company to ensure that backups are taken off-site every day. Even better, the data centre may be using a deduplication system that replicates backups off-site immediately. Remote data centres, on the other hand, often have backup systems that may go unmonitored, with backups that may end up in the backseat of someone's car, if they leave the premises at all.

Mobile data backup is in even worse shape. Many companies don't have a policy for backing up mobile data at all other than instructing mobile users to copy important data to a file server. That's more about ignoring the problem than having a viable backup policy in place.

The typical mobile computer user simply doesn't think about backing up his data on a regular basis. And requiring mobile users to synchronise their important data to a file server also ignores one basic fact—they're mobile and

## PLANTING THE BACKUP SEED

**THE FIRST BACKUP** from a remote computer, referred to as the "seed," must be taken into consideration when designing your backup plan for remote data. Unless you're backing up extremely small amounts of data (a few gigabytes), you need to figure out a way to transfer the seed to your central site. Typically, this is done by backing up to a portable device of some sort that's then physically transferred to the central site and copied to the backup server. Make sure to discuss the options your backup vendor can offer in this area.



there's a good chance they don't have the bandwidth to synchronise large files or lots of smaller files.

Given the increased mobility of today's workforce, a significant amount of what your company considers its intellectual property may reside solely on unprotected remote devices.



Given the increased mobility of today's workforce, a significant amount of what your company considers its intellectual property may reside solely on unprotected remote devices.

## WHY MOBILE BACKUP IS SO HARD

Unfortunately, there are reasons why remote and mobile backup data sets have typically been handled so haphazardly. It's important to understand these reasons before attempting to fix the problem.

The main reason why both remote and mobile data sets aren't treated the same way as data in the corporate data centre is the most obvious one: They're not in the corporate data centre. Slow connections between remote sites or users and the central data facility mean the remote systems can't use the same backup software used in the data centre. Those backup applications expect quick connections to servers in the data centre and tend to perform very poorly when trying to speak to remote servers. Bandwidth limitations prevent the software from transferring large amounts of data, and latency creates delays that cause chatty backup apps to make a lot of roundtrips between the backup server and client.

Another challenge is that the computers being backed up can't be counted on to be powered on at all times the way servers are in a data centre. Most laptop users (and users of other types of remote devices) power down their devices or put them to sleep when they're not in use. Less obvious, perhaps, is that users in remote data centres often do the same thing with their servers and desktop PCs. Not a monumental issue, but one that must be addressed.

The next challenge is at the other end of the spectrum: Some users leave their computers on—and apps open—24 hours a day. So any viable remote backup system must address the issue of open (and possibly changing) files.

Finally, there's the requirement for bare-metal recovery. In the corporate data centre, there are plenty of alternatives when a piece of hardware fails, such as a quick swap of an already-imaged drive. The best alternative a remote user may have is a WAN connection with a decent download speed and the hope that someone from corporate IT is available. If your remote servers or laptops have on-site service, the vendor can replace the hard drive or any other broken components. But then you'll need some type of automatic recovery that requires only the most basic steps (for example, inserting a CD and rebooting).

Table of contents

Big-vendor overthrow?

Freedom from lock-in via open source storage

Thin provisioning in depth

Exchange 2010 storage changes

Backup for remote and mobile devices

Tape makes a comeback

Cloud storage predictions

Sponsor resources



## REMOTE AND MOBILE BACKUP SOLVED

The typical way the remote bandwidth challenge is solved today is by using a block-level incremental-forever backup technology. The key to backing up over slow links is to never again transfer data that has already been transferred. Full backups are no more, and even traditional incremental backups transfer too much data. You must back up only new, unique blocks.

Latency is a separate issue. Just because a product does block-level incremental backups doesn't mean it was designed for use as a remote application. You need to ensure that the backup software understands it's communicating over a remote connection and avoids "roundtrips" whenever possible. Even if you have a remote connection with enough bandwidth, the latency of the connection can severely hamper your backup performance if your backup software isn't prepared for it.

## DEDUPE DOES IT ALL

The technology that most people have adopted to solve many of these problems is data deduplication, which significantly reduces the number of bytes that must be transferred. A dedupe system that's aware of multiple locations will back up only bytes that are new to the entire system, not just bytes that

## DEVICES GETTING MORE MOBILE



iPad users come in two varieties: those who use the iPad to view data and those who use it to create or modify data. You don't have to worry about those in the first category. But the second group—those who are actually creating or altering information on the go—needs to be instructed on how to back up their devices. The easiest way to do this is to make sure users

sync their iPad with their laptop or desktop PC and then ensure that device gets backed up. It's not a perfect solution, but it's probably the best we have right now given the architecture of the iPad. The main challenge is that each application is given its own file space. Even if there's an application that can back up data remotely over the Internet, it wouldn't necessarily have access to the file spaces where data is being created or modified.

Table of contents

Big-vendor overthrow?

Freedom from lock-in via open source storage

Thin provisioning in depth

Exchange 2010 storage changes

Backup for remote and mobile devices

Tape makes a comeback

Cloud storage predictions

Sponsor resources

are new to a particular remote or mobile location. So if a file has already been backed up from one laptop and the same file resides on another laptop, the second instance of the file won't be backed up.

There are two basic types of deduplication: target deduplication (appliance) and source deduplication (software). Target deduplication appliances are designed to replace the tape or standard disk drives in your existing backup system so your backup software sends backup data to the appliance that dedupes the backups and stores only the new, unique blocks. Using a dedupe appliance has an added benefit, as switching from tape to disk as your initial backup target will likely increase the reliability of remote site backups.

To use target deduplication, you'll have to install an appliance at each remote site and direct backups to the appliance. After the appliance dedupes the remote site's backup, it can be replicated back to a central site. Because it requires an appliance of some sort, target deduplication isn't appropriate for mobile data.

Source deduplication is backup software that dedupes the data at the very beginning of the backup

process. The server or mobile device being backed up communicates with the source deduplication server and "describes" the segments of data it has found that need to be backed up. If the source deduplication server sees that a segment has already been backed



There are two basic types of deduplication: target deduplication (appliance) and source deduplication (software).

up, the segment isn't transferred across the network. This saves disk space on the server and reduces the amount of bandwidth the backup process uses.

Source deduplication can be used to back up both remote sites and mobile users. All you need to do is install source deduplication software on the computer to be backed up and initiate the backup. (This is a bit of an oversimplification, of course, and ignores the challenge of completing the initial full backup.)

## CONTINUOUS BACKUP OF REMOTE DATA

Another technology that should be considered for remote site and mobile user backup is continuous data protection (CDP). Think of CDP as replication with a "back" button. Like replication, it's a continuous process that runs throughout the day, incrementally transferring new blocks to a remote backup server. But unlike standard replication products, CDP systems also store a log of changes so that a protected system can be restored to any point in time within its retention period in a few seconds or less. While a traditional backup system (including one using deduplication) can restore a client to the last time a backup ran, a CDP system can restore a client to only seconds ago, since the backup is continuously occurring. A CDP product can be used to back up both remote

sites and mobile users because it's also a block-level incremental-forever technology.

## INTEGRATED DATA PROTECTION

Remote sites may have another option, using what's sometimes referred to as self-healing storage. This broad term refers to storage that has backup and recovery integrated as a core feature. Typically, it's used to describe storage arrays that use redirect-on-write snapshot technology to provide historical versions of blocks and files within the volume being protected. The snapshots are then replicated to another volume (typically located in an alternate location), providing both history and relocation of data without using traditional backup methodologies. To use one of these products to back up a remote site would, of course, require installing a storage array at each remote site that would replicate to another larger array in a central site.

## WHAT ABOUT THE CLOUD?

A cloud backup service is simply another method of delivering one of the above options. Some cloud backup services use source dedupe, while others use CDP. And some services provide an on-site target appliance that then replicates to the cloud or acts as a target for the replicated backups from your deduplication appliance. There are self-healing storage arrays that know how to replicate to the cloud as well.

The bare-metal recovery issue is one that can only be addressed with a backup software product or service that has the feature built into the product. Give careful consideration to the importance of this feature for your environment. And like everything else in IT, don't just believe what the vendors say; test the product or service to see if it does exactly what you need it to do.

You should also ask how a vendor's products handle backing up systems that aren't always turned on or connected to the WAN. While most products and services can accommodate these occurrences, the way they do it can significantly impact the user experience. Suppose, for example, that a laptop hadn't been connected to the Internet for a long time and when it finally did connect, the backup product started the long-overdue backup. That might seem like a good idea, but it may also consume all of the laptop's available resources. That could prompt a help desk call or cause a user to stop the backup process because it interferes with other work. Make sure you understand the load the backup application places on the system it's backing up under various conditions. ☺

---

W Curtis Preston is an independent consultant, writer and speaker. He is the webmaster at [BackupCentral.com](http://BackupCentral.com) and the founder of Truth in IT.

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

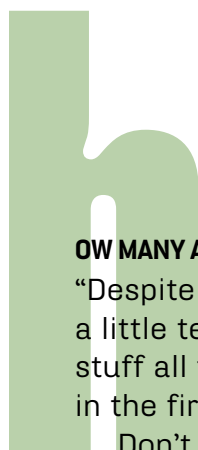
Sponsor  
resources





# Tape makes a comeback (but was it ever gone?)

*Somebody out there is spreading rumours about the death of tape, but there's plenty of life left in this venerable storage technology.*



**HOW MANY ARTICLES** have you read in the past year that begin along the lines of “Despite reports to the contrary, tape isn’t dead”? A lot, right? Not only is it a little tedious to have to deal with the same “tape is dead/tape isn’t dead” stuff all the time, you have to wonder who actually pronounced tape dead in the first place.

Don’t look at me—I have nothing against tape. And although journalists get blamed all the time for dumping the tried and true in favor of the latest, coolest technologies, I think it might be the dedupe, virtual tape library (VTL) and disk backup target guys who are trying to drive a stake through tape’s heart. Wasn’t it Data Domain that used to hand out those “Tape Sucks, Move On” bumper stickers at trade shows? And if you read the name of VTL-maker Sepaton from right to left it says “no tapes.”

In any event, if tape is really dying, it’s dragging out the process even longer than Spain’s Generalissimo Francisco Franco did when he took his sweet time shuffling off this mortal coil back in 1975.

But tape’s not dying. In fact, at times it seems to be developing and taking on new tasks even faster than its nemesis (hard disk drive technology) has managed. Just consider tape capacities. Oracle’s latest incarnation of its T10000 tape drive—the “C” model—has a capacity

of 5 TB. That’s 5 TB of native, uncompressed capacity, so the T10000C leapfrogs LTO-5’s 1.5 TB (3 TB compressed) capacity. A 5 TB tape is pretty amazing when you consider that in November 2005, T10000’s capacity was 500 GB—a 10x improvement in just about six years. Although 3 TB hard disk drives are now available and hard disk drive technology has progressed at nearly the same 10x clip over the same period of time, tape is still the capacity king.

Our purchasing research surveys also show how tape has evolved over the years. The biggest change is that companies are spending less money on tape gear. If we go back just four years, 33% of companies said they were increasing

**A 5 TB tape is pretty amazing when you consider that in November 2005, T10000's capacity was 500 GB—a 10x improvement in just about six years.**

Table of contents

Big-vendor overthrow?

Freedom from lock-in via open source storage

Thin provisioning in depth

Exchange 2010 storage changes

Backup for remote and mobile devices

Tape makes a comeback

Cloud storage predictions

Sponsor resources

the amount of money they planned to spend on tape systems, while 24% were cutting back. Fast forward to today and those numbers are reversed, with 34% now planning to reduce their spending. But that's not surprising given the role of disk in most companies' backup operations. Our surveys also show that IT shops buying new libraries are, on average, buying smaller ones: Back in 2006 the average tape library purchased had 159 slots; today it's approximately 92. That's a 42% drop, but during the same time, drive capacities went up several hundred percent.

So, disk has definitely made a dent and tape technology itself is making smaller look bigger. But according to our most recent survey, 77% of firms still spin off all or some backup data to tape. They just need a little less tape gear to do it these days.

Backup probably isn't the biggest part of the "future of tape" story. Two other areas have heated up over the last few years, where tape is either in the thick of things already or positioned to be there. The first is media and entertainment, specifically for video production. Digitised movies need tons of storage space to handle all the

raw footage that needs to be whittled down, edited and made into a commercial product. And hundreds of television stations (big and small) across the country need huge amounts of capacity to store years' worth of footage. In many cases, these media companies are using tape as a "sub-primary" tier, where these big files can reside until they're needed and then streamed back to disk. Tape is perfect for this because of its ample capacity, portability and low cost of operation. (Hmm, weren't those the same reasons tape got big in backup in the first place?) Other organisations in fields that require working with massive files, like genomics, geo exploration and healthcare, are also looking at tape in a new light these days.

Maybe the best application for tape is one of its old standbys—archiving—which is getting renewed interest these days as IT shops have to simultaneously deal with mountains of new data while cleaning up existing data storage systems to make better use of them. Tape makes a lot of sense as part of an archive scheme; large amounts of tape-based data can be easy to access and available, although it won't be delivered with the kind of immediacy that primary storage offers.

Those scenarios aren't all that new, but they've become more feasible because of tape's growing capacities and throughput. But what might turn out to be the biggest new development in tape technology in decades has largely lingered under the radar for the year or so it's been available. Devel-

**In many cases, media companies are using tape as a "sub-primary" tier, where these big files can reside until they're needed and then streamed back to disk.**

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

Sponsor  
resources

oped by IBM as part of its LTO consortium efforts, the Linear Tape File System (LTFS) can turn tape into something it decidedly isn't—disk. Well, not really; it just sort of looks like disk.

LTFS carves out a bit of an LTO-5 tape cartridge's capacity and reserves it for a file system or an index of the contents of the tape. That makes it look a lot like a disk system with its file system. In fact, an application that's looking for NAS storage could just as easily hook up with the LTFS-enabled tape instead. All that's required, in addition to an LTO-5 drive and media, of course, is a bit of client software you can get for free from IBM. With that software, when you mount an LTFS-enabled LTO-5 cartridge, browse its index and retrieve the specific file or files you need by dragging and dropping to and from the tape.

Taken a step further, if backup app vendors decide to adopt the LTFS interface, tapes could be interchangeable among different backup applications. Or, put another way, you'd be able to replace your current backup app with another one tomorrow and still have easy access to all the data you parked on tape with the prior backup app. That kind of interchangeability is bound to make backup vendors nervous, so you're not likely to see them jumping on LTFS any time soon, but archive vendors are actively adapting their apps to take advantage of LTFS.

So, if those rumours are true and tape is really dead, it's doing a damn good job of haunting disk and backup vendors. ☹

---

Rich Castagna is editorial director of the Storage Media Group.



# Where is the cloud storage market headed?

*Break down the cloud storage services market and you'll find players both big and small jockeying for position in key segments.*

Table of contents

Big-vendor overthrow?

Freedom from lock-in via open source storage

Thin provisioning in depth

Exchange 2010 storage changes

Backup for remote and mobile devices

Tape makes a comeback

Cloud storage predictions

Sponsor resources

**THE CLOUD STORAGE** market is just beginning to hit its stride. For the past few years, cloud storage was largely the province of developers, who have used it as a cost-effective, pay-as-you-go resource to park data for particular projects. But now we're beginning to see the cloud being embraced by traditional IT teams for a whole new set of storage applications. Based on conversations with vendors and users, we believe 2011 will be a cross-over year with midsized and enterprise IT stepping up to drive the cloud storage agenda and, increasingly, the adoption of cloud storage technologies.

This shift from development to production is one of the macro trends shaping the market for cloud storage products, profiled in Taneja Group's "Emerging Market Forecast for Cloud Storage." Based on our research, the cloud storage products market is currently a \$4 billion (euro 2.8 billion) space that will grow to almost \$10 billion (euro 7 billion) by 2014. The cloud will sharply influence the characteristics of next-generation data storage technologies, including how and where they get deployed.

In looking at where the cloud storage market is headed, we find it useful to divide the market into two broad areas: primary storage technologies behind the cloud; and technologies that enable users, systems and applications to connect to the cloud. Much of the first wave of competitive activity falls into the latter bucket, so let's focus on that first.

**Based on our research, the cloud storage products market is currently a \$4 billion space that will grow to almost \$10 billion by 2014.**

## CLOUD-CONNECTING TECHNOLOGIES

We see three major technology categories that enable connections to the cloud:

- **General-purpose gateways.** As public and private clouds become more pervasive, users will need faster and more cost-effective access to their cloud-based storage. Improved access will come in several forms, including general-purpose gateways, which are devices that connect users to content



and primary I/O storage. Vendors such as Nasuni and TwinStrata have already introduced such products. While small today, this segment promises to grow well in excess of 100% per year through 2014.

- **Cloud-based backup.** A second category of access solutions will enable cloud-based backup, which lets users connect backup data to cloud repositories across the wire. Established suppliers such as CommVault, Riverbed Technology (with its Whitewater product) and Symantec are already offering solutions. This segment will grow rapidly, though not quite at the two-times-per-year clip of general-purpose gateways.

- **Data movement and access.** Buoyed by the continuing growth of virtual machines, applications and storage repositories, and the need to overcome the constraints of long distances and increased latency, data movement and access products will play a big role in allowing users to efficiently move large chunks of information and interact with cloud-resident content. Cisco Systems, Juniper Networks and Riverbed (Steelhead products) will be among the primary participants here. Riverbed, in particular, could emerge as a breakout leader in this market segment. It has always been about accessing distributed stuff; now it's also connecting distributed stuff in new ways.

**Improved access will come in several forms, including general-purpose gateways, which are devices that connect users to content and primary I/O storage.**

## REINVENTING PRIMARY STORAGE FOR CLOUD INFRASTRUCTURES

Primary storage behind the cloud represents a market that will undergo significant change as traditional storage players—including industry behemoths—adapt their technologies and offerings to the new storage model. We divide primary storage in the cloud into two major buckets: content and I/O.

Content will need to be stored, accessed and distributed differently than primary I/O storage. File technologies that have met demands for content in traditional infrastructures typically don't have the scalability and accessibility required to service content needs in the cloud. Instead, content in the cloud will largely be supported by object technologies, which will enable content and archival storage to thrive in highly scalable, multi-tenant, Web-accessible repositories. This market will be driven primarily by service providers in the near term but will eventually find uptake in private clouds within enterprise walls. We expect smaller players such as DataDirect Networks (with Web Object Scaler), Nirvanix (hNode) and Mezeo (Cloud Storage Platform) to join major vendors like EMC, Hewlett-Packard (HP) and NetApp as platform providers for cloud-based content storage. The growth will be solid, but not as spectacular

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

Sponsor  
resources

as what we'll see in most of the cloud-connecting markets profiled above.

That brings us to the largest cloud storage opportunity of all: the market for primary I/O behind cloud infrastructures. Already more than \$2 billion (euro 1.4 billion) in size, this market is being served principally by a subset of next-generation Fibre Channel technologies, although unified storage products are also playing a role. We believe primary I/O storage will experience a renaissance in the cloud, driven in large part by intelligent block technology. Intelligent block will rapidly displace legacy systems as the storage behind both private and public cloud infrastructures, and will largely differentiate winners from losers among storage system vendors. We believe that Dell (EqualLogic), HP/3PAR and NetApp will all prosper as providers of primary I/O storage behind the cloud. HP's 3PAR platform, in particular, is a system to watch. 3PAR has long targeted this space as a utility storage innovator across service providers and enterprises, and it has some unique business programs currently under the Cloud Agile banner.

## CLOUD: THE NEW BATTLEGROUND

While it's too early to definitively pick winners and losers, we're confident the rapidly growing cloud market will significantly shuffle positions on the data storage vendor leader board. The winners in this battle will find success by executing the right business model on top of the right platforms that enable scale-out and utility storage. ☉

---

Jeff Byrne is a senior analyst and consultant at Taneja Group.

TechTarget Storage Media Group

## STORAGE

Vice President of Editorial Mark Schlack

Editorial Director Rich Castagna

Senior Managing Editor Kim Hefner

Executive Editor Ellen O'Brien

Creative Director Maureen Joyce

### Contributing Editors

Tony Asaro, James Damoulakis,  
Steve Duplessie, Jacob Gsoedl



Senior Site Editor Sue Troy

UK Bureau Chief Antony Adshead

Assistant Site Editor Francesca Sales



Executive Editor Ellen O'Brien

Senior News Director Dave Raffo

Senior News Writer Sonia Lelii

Senior Writer Carol Sliwa

Senior Managing Editor Kim Hefner

Associate Site Editor Megan Kellett

Assistant Site Editor Rachel Kossman

Assistant Editor Hillary O'Rourke



Senior Site Editor Andrew Burton

Managing Editor Heather Darcy

Features Writer Todd Erickson

Assistant Site Editor John Hilliard



Senior Site Editor Sue Troy

Assistant Site Editor Francesca Sales

### Storage Decisions

#### TechTarget Conferences

Director of Editorial Events Lindsay Jeanloz

Editorial Events Associate Jacquelyn Hinds

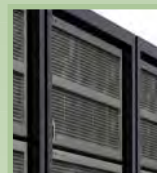
Storage magazine Subscriptions:  
[www.SearchStorage.com](http://www.SearchStorage.com)

IT in Europe magazine

Marble Arch Tower, 55 Bryanston St, London W1H7AA  
[editor@searchstorage.co.uk](mailto:editor@searchstorage.co.uk)

# IT *in* Europe

## STORAGE EDITION



## COMING IN WINTER

### Managing storage for virtual servers

Virtual servers and storage systems don't have to exist in separate worlds. Learn about new tools and plug-ins that provide single-console management of virtual servers and storage.

### Virtual machine backup

Most IT shops are still relying on traditional backup apps with their server clients to back up virtual servers, but that approach has its limitations. Today, there are plenty of good alternatives for virtual machine backup.

### 10 easy steps to better storage performance

Given the choice between fine-tuning data storage for capacity or for performance, most data storage managers would choose the latter. Tips and tricks to boost storage speed are common, but they're not all equally effective in every environment. Here are 10 ways to pump up the performance of arrays and networks in your environment.

**And don't miss our  
columns and commentary.**

Table of  
contents

Big-vendor  
overthrow?

Freedom from  
lock-in via open  
source storage

Thin  
provisioning  
in depth

Exchange 2010  
storage  
changes

Backup for  
remote and  
mobile devices

Tape makes a  
comeback

Cloud storage  
predictions

Sponsor  
resources



*See ad page 4*

- [Acronis SMB Guide to Backup and Recovery](#)
- [IDC Analyst Connection: How to Choose a Cost Efficient Data Protection Strategy](#)
- [Acronis® Backup & Recovery™ 11](#)



*See ad page 7*

- [Fluid Data Storage: A How To Guide](#)
- [7 Ways Compellent Optimizes VMware Server Virtualization](#)

**HITACHI**  
Inspire the Next

 Hitachi Data Systems

*See ad page 13*

- [IDC White Paper: The Evolution of the Data Center](#)
- [Cloud Storage for Dummies](#)