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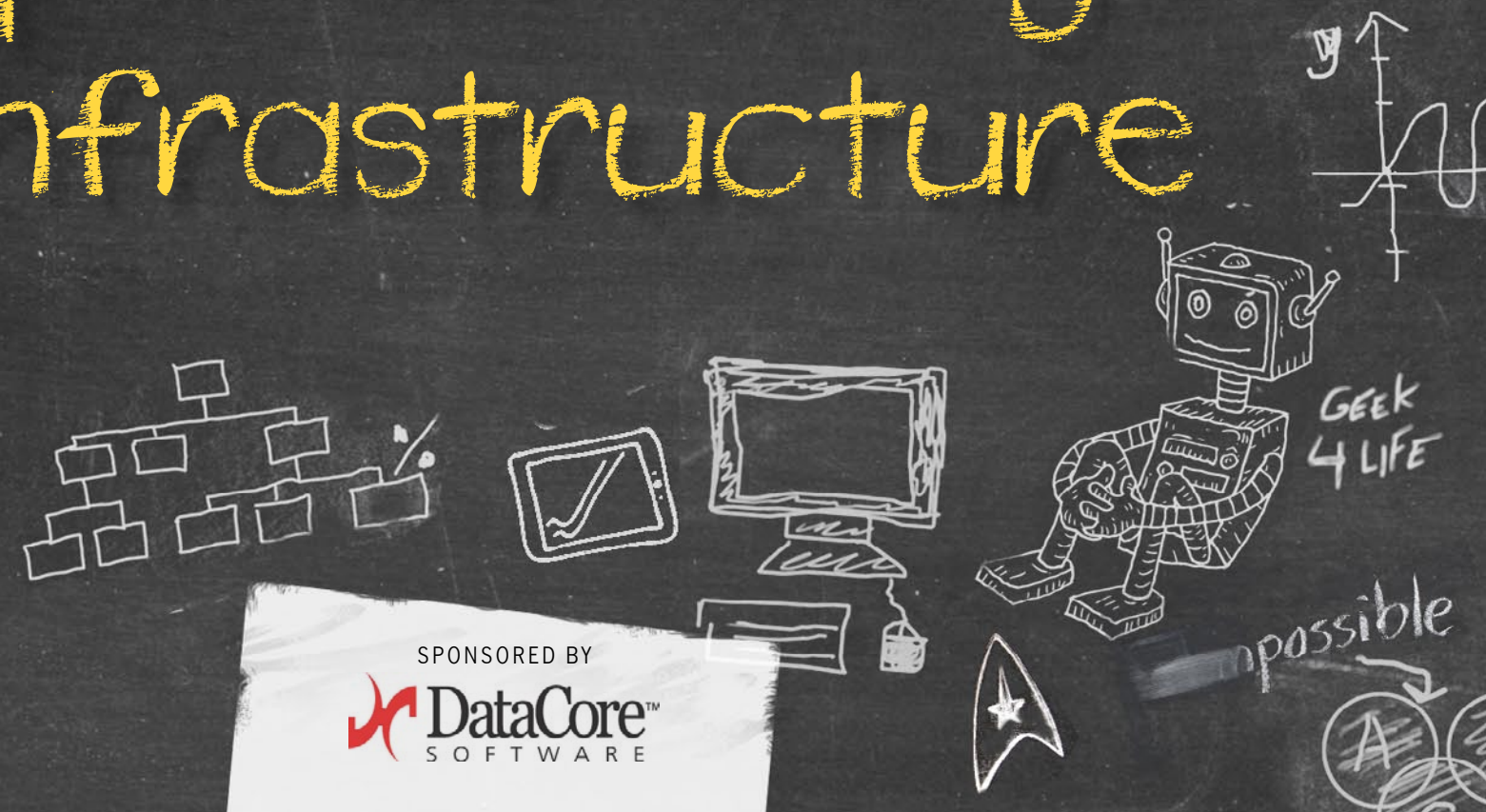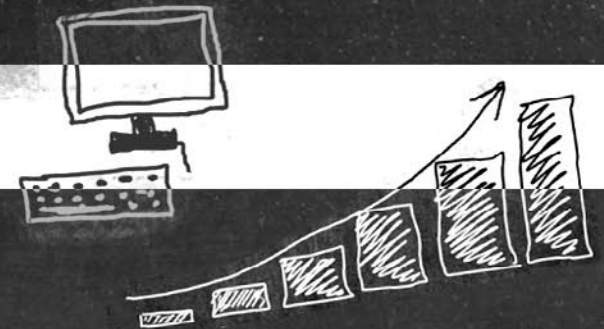
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Impossible

Hyper-converged systems modernize the enterprise data center

BY DAVID STROM

The notion of hyper-converged infrastructure is becoming increasingly popular, as it delivers more efficient storage and supports a wider collection of virtualized and nonvirtualized applications.

The term *hyper-converged* refers to both hardware and software that combines many features into a smaller footprint to deliver networking, computing and storage in one package. Moreover, these systems are useful in a variety of circumstances, such as bringing up a private cloud, deploying virtual desktop infrastructure (VDI), or creating large-scale compute clusters.

Hyper-converged systems have become the basic building blocks of the software-defined data center, but they are anything but basic, and their future is bright. Private equity firm Robert W. Baird & Co. estimates that the current market for hyper-converged systems is $500 million, but that it will grow quickly in the coming years to tens of billions of dollars.

Why such potential? The technology packs a punch. Before these products were available, IT teams designed separate infrastructures for virtualized and nonvirtualized

workloads. Storage area networks (SANs) usually were sold separately and ran on different hardware from servers running virtual machine (VM) hypervisors, which in turn were connected with specialized networking gear. These separate systems are being consolidated for a variety of reasons including:

Flash-based storage is becoming less expensive, more compelling and more flexible. It also offers higher performance and lower read/write latencies. Most of the hyper-converged products start with some form of flash as the basis for their storage solution, either by combining flash with traditional magnetic storage to form hybrid arrays or by

using RAM as a storage cache for boosting performance.

Commodity hardware and more sophisticated virtualization management software make it easier to deploy and operate hyper-converged systems. Specialized skills are no longer required. With hyper-converged storage systems, a variety of elements can be combined into a single appliance and support massive collections of VMs. The systems can also be clustered for larger scale operations. Most of these products come in 2U rack-mounted devices and can easily add capacity to handle the largest virtualized workloads. This has a side benefit of reducing power and cool-

ing costs, since these servers occupy less rack space and are more efficient in how they draw on electric power.

More data centers are moving to the cloud for economic and agility reasons. Data centers also need better solutions for handling larger workloads with heavier virtualization requirements. What Google, Amazon and Twitter have been building for years is finally available to any IT department at a competitive price point.

Having a software-defined data center is all about flexibility of operations. Being able to match workloads with the right kinds of computing and storage resources is

also critical. IT organizations used to purchase and configure their infrastructure to match particular applications and usage patterns.

Having software-defined resources allows for new features and bandwidth without having to upgrade or change out particular hardware.

Better analytics and automation tools are available to measure workload needs. Such tools provide near real-time information about server operations, driving even more flexibility and responsiveness. ⓘⓣ

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Hyper-converged systems have become the basic building blocks of the software-defined data center, but they are anything but basic, and their future is bright.

A quickly evolving market with newcomers and some old-timers too

Projected worldwide revenue on the hyper-converged system in 2019

$3.9B

T he market for hyper-converged systems is quickly evolving. While traditional storage infrastructure vendors remain the largest installed base, software-defined and hyper-converged storage providers represent the fastest growing market segment, with some of the latter vendors rapidly increasing their market share. IDC reports that hyper-converged systems sales (including hardware and software) are expected to double in 2015 to more than $800 million, and it projects an annual growth rate in total sales of nearly 60% from 2014 to 2019. In the past year alone, there have been numerous product announcements, a large influx of venture capital funding of startups, and dozens of companies entering the market, some of them established storage and software management vendors.

IDC considers hyper-converged systems those that have distributed file system or object storage, along with VM hypervisors. They usually come with Ethernet switching features, although this is optional for their purposes of inclusion. Leaders in this market include Nutanix, with its Virtual

Computing Platform, and SimpliVity's OmniCube and OmniStack storage devices. These account for the lion's share of hyper-converged systems sold to date, according to IDC. There are other major traditional storage hardware players as well, including Dell and HP – both of which have been late to the market but are shipping systems by combining forces with a variety of software management tools.

IDC notes in its report that VMware and EMC are big players in the general virtualization space. The latter is included not for its traditional storage arrays but for the acquisition of ScaleIO, which is software-only and the basis for a new line of converged platforms. VMware has two independent hyper-converged efforts, the first being its EVO:RAIL so-

lution, which is a specialized hyper-converged series of specifications that starts with four independent computers, each running its own ESXi hypervisor connecting to redundant network adapters, power supplies and storage. Dell is one of the first OEMs to sell this kind of system. The other VMware product, from the company's acquisition of Virsto several years ago, is Virtual SAN, which extends its vSphere management software to manage virtual storage resources. *–D.S.*

SOURCE: IDC'S WORLDWIDE HYPERCONVERGED SYSTEMS 2015–2019 FORECAST

Worldwide
hyper-converged systems revenue by workload type

Virtual desktop and client virtualization applications, which are included in the IT infrastructure category, have been a significant driver of early adoption of hyper-converged systems.

	2014 $373.2M	2019 $3.9B
IT infrastructure	60.8%	37.8%
Collaborative	15.1%	20.1%
Business processing	11.8%	23.6%
Web infrastructure	6.2%	3.7%
Decision support	5.3%	12.4%
Application/ software dev	0.8%	2.5%

SOURCE: IDC'S WORLDWIDE HYPERCONVERGED SYSTEMS 2015–2019 FORECAST

KEY CONSIDERATIONS

Must-haves for your shopping list

Managing storage and making sure it delivers sufficient performance and reliability continues to be a challenge for large, dense VM deployments. As data centers have converted more of their physical servers to virtual ones, the storage implications are changing and becoming more demanding. Here are five key features to look for when shopping for new storage.

Multiple vendor support. Look for the ability to work across multiple hypervisors, because many enterprises use more than one vendor in their data centers for hardware, software, hypervisors and operating systems. Storage management must handle a mixture of vendors to be cost effective.

Thin provisioning. This conserves space by sharing commonly used files for running the operating system and popular applications. This means you don't have to separately store multiple copies of these files, which is especially important in VDI deployments, where hundreds or thousands of virtualized

desktops are accessing copies of the Windows 7 OS, for example. Most hyper-converged systems support thin provisioning natively, and some also support dynamic provisioning, so you can adjust the size of virtual storage repositories while VMs are running, and you don't have to bring down your entire virtual infrastructure.

Deduplication. This is another way to remove duplicate files. Backup software has supported deduplication for years, and it can have a significant impact on overall storage requirements – sometimes enabling you to cut storage footprints down to a 10th of the original size.

Continuous data protection. Removing duplicate files only goes so far. Continuous data protection is the ability to make backups while databases and other applications have open files on the storage repository. This can also be used to mirror two or more servers so that data is always available irrespective of any host or application.

Scale. You want to be able to scale up your environment as space gets consumed or as you add new VMs to handle additional virtual workloads. Your storage infrastructure should be able to grow and keep up with the requirements of both physical and virtual servers. *–D.S.*

IN PRACTICE

Bentleys, Great Plains Communications, Skullcandy boost performance, cut costs with hyper-converged systems

oth a challenge and an opportunity of hyper-converged systems is that they have different use cases. Here are examples where this technology helped to increase performance and deliver faster VDI solutions, consolidate databases using flash-based storage, and better support the bridging of multiple data centers.

Bentleys is a collection of mostly rural and small business accountants spread across Queensland, Australia. The company had virtualized several of its servers five years ago and wanted to upgrade its fleet of aging Windows XP desktops, which were too slow to run the more modern apps. Rather than replace all of its ancient hardware, it wanted to deploy VDI to allow standard desktop images to be run across the company and support access on tablets and other mobile devices. "We could see that virtualizing desktops would give us a great deal of improved time management for managing desktops," said Garry Patmore, the company's network administrator.

Bentleys used a three-node Nutanix Virtual Computing Platform cluster running VMware Horizon View and upgraded XP desktops to

VDI instances running Windows 7. One big advantage was reduced power and cooling bills, as it was coming up near the maximum for both in its data center.

"The big selling point was improving our computer services division's ability to speed and simplify day-to-day administration, including moving users from one machine to another in case their machine has an issue," said Patmore. Deploying VDI also meant that IT staff was able to push out desktop upgrades online, without having to spend lots of time touching individual physical desktops.

Prior to the implementation, staff had to access their applications us-

ing a Citrix remote terminal server when working at a client's office. "It was a nightmare for them technically," said Patmore. "Now their experience has improved greatly, and VDI has also eliminated errors and data loss associated with the previous methods."

Great Plains Communications is a fast-growing telecom and Internet service provider in Nebraska that needed to better connect its two data centers located 10 miles apart. Application-based solutions performed miserably, so the company turned to hyper-converged storage with virtualized servers to deliver the needed throughput and

resiliency. Using a combination of VMware vSphere, Fusion-io hybrid storage arrays, and DataCore Software storage management tools, it was able to significantly improve its operations.

"Our solution allows us to be incredibly flexible, for both scheduled and emergency maintenance as well as for unexpected outages," explained Wyatt Leehy, manager of the company's Network Operations Center. "We have an incredible level of resiliency at an appealing price point. The ability to have active-active, mutually redundant data centers is a powerful way of ensuring that our IT infrastructure is able to support nonstop

business operations."

The result is that applications can easily be relocated from one data center to the other and then given access to the fastest storage resources without having to interrupt any users. Response time on many applications has dropped from minutes to seconds with the infrastructure changes.

Skullcandy is a 12-year-old company that makes specialized audio components such as headphones. It has a large virtualized infrastructure that hosts various client databases, a data warehouse, forecasting systems and business analytics. Its data storage needs can quickly

change as it tracks new consumer trends or adds new production applications. Owing to the large amount of data and its I/O-intensive processes, it had performance issues in its production systems.

"Unplanned, large and dynamic data additions to production systems makes handling large, growing volume of datasets a difficult task," said Brent Allen, director of infrastructure and web operations. "Our production systems were grinding to a halt."

Skullcandy eventually chose Pure Storage's FlashArray, to improve performance, consolidate several different systems and give its IT team more flexibility in designing

and deploying systems. "We were blown away by its data throughput levels," said Allen. *–D.S.*

The first 5 questions you need to ask

Before you dive into the hyper-converged market, you need to understand the dimensions of your storage-related problems, whether they are high latency, congested bandwidth, or issues relating to scale and heavy virtualization workloads. Here are some key questions you need to ask about how hyper-converged storage works and whether a particular system is right for your needs.

How much flash storage do you need? You want to make sure that you can easily add additional storage when it is required, and that you have a reasonable growth plan. Also, another feature that can help accelerate storage throughput is the ability to make use of random access memory for storage acceleration.

Can you mix and match virtual and physical workloads or different VM hypervisors on the same hardware? Some storage arrays are designed more for physical or particular virtual solutions. The ideal hyper-converged storage system should be able to handle both types, as well as run multiple hypervisors to provide the ultimate in flexible operations.
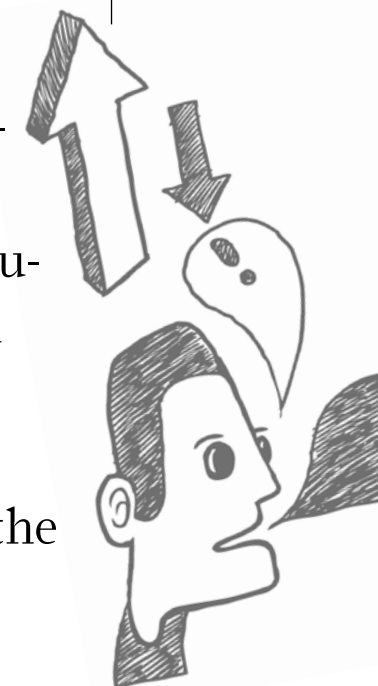
Does the product come with advanced storage-saving features, such as thin provisioning and deduplication? These features can significantly reduce storage requirements and improve performance of the storage solution.

How much can you scale up? Many hyper-converged systems can be clustered together as your needs change for additional server resources. Some products also support adding multiple network adapters and large amounts of RAM, as well as being clustered and managed together or tying servers that are operating in different cities via higher-speed data links for redundant operations.

How is the overall storage allotment managed? Can you manage a variety of storage pools and arrays, including both virtual SANs and cloud-based storage, from a single management point? When you are in the market for a storage management tool, you should consider the three basic approaches and kinds of products available. These are:

Hypervisor-constrained: Storage services are managed by the VM hypervisor software directly and used by the workload virtualized by that hypervisor exclusively.

Hypervisor-agnostic: Storage services are managed by a third-party software product that enables managed storage to be shared across more than one type of hypervisor.

Workload-agnostic: Storage services and capacity are managed by a third-party product that enables the allocation and sharing of storage assets across all workloads, whether virtualized or not. –*D.S.*
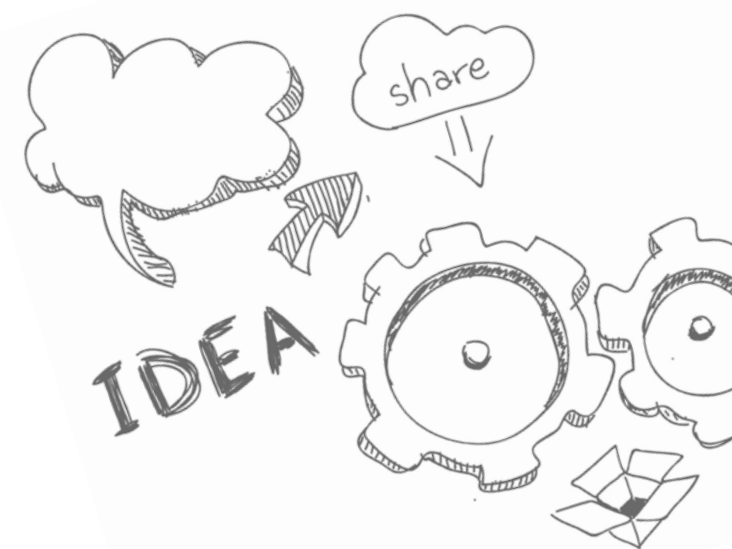
Users and experts share lessons learned

THERE'S VALUE IN PLUG AND PLAY

"We knew that we needed to replace everything – we had nothing that was worth saving. We wanted a new infrastructure with storage and compute that was not complex, was highly manageable, and would take up a smaller footprint in the data center. We could take our storage solution out of the box, and we were off and running. Everything is in a single chassis, managed off one pane of glass."

CHARLIE KAVALOSKI,
DIRECTOR OF IT, BAUER BUILT INC.

CENTRAL MANAGEMENT IS KEY

"Hyper-converged storage allows us to be array-agnostic, since we manage everything with one tool. We would like to stick with one array vendor, but we are very price-sensitive being a state agency, so this makes it a lot easier. Plus, we can attach all different kinds of storage to our network and manage it centrally."

BRYAN PETERSON,
ASSOCIATE DIRECTOR OF TECHNICAL SERVICES, UNIVERSITY OF UTAH, UTAH EDUCATION NETWORK

FASTER QUERIES

"SQL queries that used to take six hours now take four minutes. This is because our virtualized storage can handle virtual machines and virtual disks directly."

GLEN KENDELL,
PRESIDENT, HOSTING AND OPERATIONS, BEYOND NINES, SAAS-BASED FUNDRAISING AND NONPROFIT MANAGEMENT HOSTING SERVICES

PROVIDE COST SAVINGS *AND* REVENUE ENHANCEMENTS

"The flexibility and cost savings we realized from our storage virtualization made it possible to double the number of users from last year, grow our business 300% and save $5 million in hardware costs."

TOM ELOWSON,
PRESIDENT, ACXESS, A CLOUD COMPUTING MANAGEMENT SOFTWARE VENDOR

LESS DOWNTIME

"Our students were pleased at how quickly they could get online to their desktops with our VDI implementation, and we can update our lab configurations in mid-semester or anytime, without the complexity and the associated downtime that we used to have."
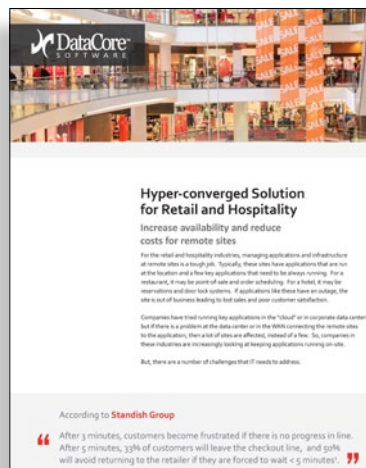
JASON STRICKLAND,
DIRECTOR OF IT, SOUTHEASTERN COMMUNITY COLLEGE

Resources

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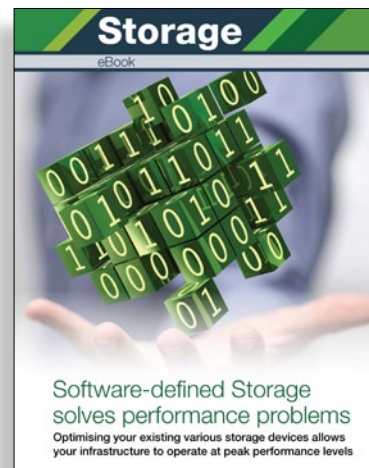
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