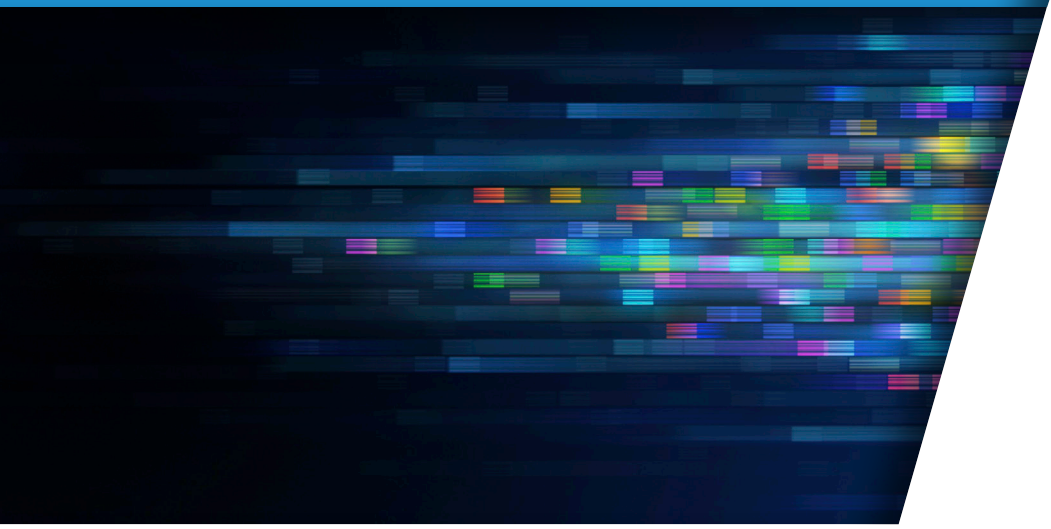
IDG Tech Dossier

HP CONVERGED STORAGE:
A Next Gen Virtualized Architecture



ORGANIZATIONS THAT SET THEIR SIGHTS ON CONVERGENCE CAN TAME THE VIRTUAL STORAGE BEAST

IN TODAY'S HYPERCONNECTED WORLD, with its multiple mobile devices, ubiquitous Internet access and pervasive social media platforms, people expect immediate access to information and services. These expectations are increasingly felt in corporate IT departments, where business units demand instant applications and turn-on-a-dime services.

Virtualization and cloud computing can help corporate IT meet these demands by helping it become more flexible and agile. But the ultimate solution is to transform the way IT is delivered. Many enterprises have already started on the journey toward a full IT as a service (ITaaS) model.

As organizations travel this road, however, they often run into a wall. Actually, several walls, including those between the server, storage and networking functions. The traditional IT infrastructure is often too rigid to enable companies to fully utilize their IT resources. In many cases, servers, storage and networking have been built and managed separately, creating functional silos. And within the storage architecture, an explosion in the amount and types of data—coupled with new demands from the virtualization of servers and clients—has made storage increasingly inflexible and complicated to manage.

These factors stand in the way of the kind of adaptability, agility and integrated management that the enterprises require. If organizations are to continue toward the goal of delivering ITaaS, they need to break down these barriers and lay the groundwork for a next-generation architecture.

THE LIMITS OF TRADITIONAL STORAGE

The typical storage architecture was designed 20 years ago, when workloads were predictable and data was structured. But today companies are dealing with an unprecedented amount of information, including unstructured data such as audio and video, which requires massive capacities. Storage systems must accommodate many different types of workloads with different performance requirements. Add to the mix increasingly demanding applications, distributed data center environments, legacy business processes that

InfoWorld
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THE JOURNEY TO AN EFFICIENT ENTERPRISE

Organizations typically pass through five phases as they transform their traditional operations into an IT as a service (ITaaS) model:

must be supported and nonstandard infrastructure inherited through acquisitions, and you get a gerrymandered architecture comprising many discrete storage resources that must be managed individually. Such an architecture is disruptive to scale, expensive to own and operate and increasingly difficult and labor-intensive to manage.

ITaaS requires a pool of storage that's flexible and fungible. The IT staff must be able to quickly configure storage for a particular need and then just as quickly reconfigure it so it can be used again elsewhere. The storage must be malleable so that capacity can be quickly expanded, data and applications can be easily and securely migrated and workloads can be automatically rebalanced. Applications need to be online 24/7/365, so high availability is paramount. Finally, management of the entire storage pool, as well as coordination with virtualized servers and networking, should be streamlined and simplified.

// THE PATH TO IT AS A SERVICE

Organizations need a strategy for rearchitecting storage so that it enables, rather than constricts, the delivery of IT services. According to HP, it's all about Converged Storage, which breaks through the barriers, reducing complexity so that IT can expand storage on a "pay as you grow" basis. It involves the creation a pool of storage based on modular building blocks that can be moved and reconfigured on the fly to support a range of needs. In fact, HP's approach to Converged Storage incorporates several core capabilities:

- **MULTI-TENANCY:** the ability to securely host many different applications in a single pool of storage, delivering the appropriate level of resources and performance for each application
- **FEDERATION:** the ability to geographically distribute storage resources and move data among those resources without disrupting user access to that data
- **EFFICIENCY:** the ability to allocate resources in the most cost-effective manner through thin provisioning and other techniques
- **AUTONOMIC MANAGEMENT:** the capability to reconfigure itself, balancing workloads and ascertaining the appropriate tiering of data without manual intervention

The first step in enabling this new architecture is to solve the challenges that have arisen between server virtualization and storage. Corporate IT needs next-generation, scalable storage solutions that can meet the demands of virtual servers in terms of performance, availability, storage efficiency and management complexity.

// THE PROBLEM WITH VIRTUALIZATION

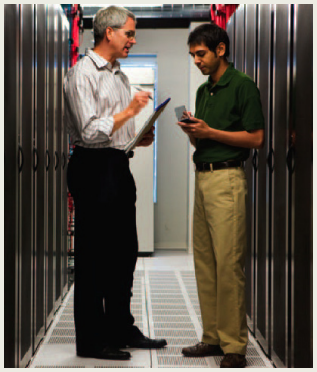
Server virtualization has transformed corporate IT over the last several years, and with good reason. By virtualizing, companies reduce hardware expense, save floor space and cut energy use, all of which adds up to major cost savings. And because virtual servers can be created, moved, copied or deleted so easily, organizations gain flexibility and efficiency, a key step toward enabling ITaaS. Server virtualization also allows for a more cost-effective, simpler way to implement business continuity to avoid planned and unplanned downtime and recover from disasters or outages.

For storage, though, virtualization has created problems. When flexible servers come up against rigid storage architectures, some of the cost and efficiency benefits can be wiped out. Storage that wasn't built with virtualization in mind can become a bottleneck. Traditional storage arrays in a virtual server environment typically have low utilization rates, inadequate availability, poor efficiency and complex management:

Case Study: Opus Interactive

Getting Storage Right with HP P4000

When it comes to converged storage, it's all about the underlying infrastructure—and the right infrastructure drives dramatic business value in the real world. That's exactly what Opus Interactive—a premier provider of virtualized servers and storage—discovered when the company set out revitalize its service model. With HP P4000, Opus enjoys a 50 percent avoidance in storage acquisition costs and projects a 50 percent reduction in rebuilding. But the real benefits played out on the customer front—evidenced by an expanded customer base of 70 percent. In addition to paying only for capacity used, Opus customers benefited from improved business performance and agility. The proof is in the numbers—and the numbers are all spelled out in this informative case study.



Virtualization increases server utilization, which, in turn, increases demands on storage performance.

With the rise in the number and power of virtualized servers, the demands on the storage system increase exponentially. As organizations realize the kind of savings server virtualization produces, they virtualize as much infrastructure as possible. But consider the impact on the typical storage area network (SAN). Maybe it used to handle six servers with six applications. But now those six servers are in a cluster, with each individual physical machine hosting eight virtual machines. That means that 48 different applications are now pointed to that same SAN, increasing I/O traffic exponentially. How can a storage administrator possibly fine-tune SAN operation for such unpredictable workloads?

Virtualization software increases the availability and redundancy of host systems and workloads, but that could all be for naught without high availability and redundancy in the storage system.

With each physical server hosting multiple virtual machines, availability and redundancy in storage systems are more important than ever. In fact, the impact of a downed storage system, such as the one in the previous example, handling 48 different applications, is exponentially greater than before. Although virtualization software includes features for ensuring high availability and redundancy of servers, those features typically depend on the storage being operational. Thus, storage can become a new single point of failure.

Server virtualization is dynamic, enabling IT to quickly and easily create, copy and move workloads. Storage systems can't flex that easily, however.

Typical SANs are monolithic, consisting of a dual controller behind which are multiple disks. This type of rigid structure requires a tight coupling between workloads and storage, making it difficult to create a volume, expand its size or move it without disruption. This architecture also requires IT to buy storage capacity before it's needed, which translates into high up-front costs.

Server virtualization has an impact on storage capacity and utilization, which can lower storage efficiency and increase costs.

As the number of virtual machines increases, so does the need for snapshots of backup and replication for high availability and disaster recovery. This can quickly eat up storage capacity. Without a storage architecture that supports the advanced requirements of virtualization—with features such as thin provisioning and pay-as-you-grow modules—increased storage costs can offset some of the cost savings from server virtualization.

Management across physical and virtual servers and storage is complex and difficult.

IT organizations often do not have a good management view of their storage systems; in fact, some still use spreadsheets. What's worse is the lack of an integrated management view across physical as well as virtual servers in addition to storage. Furthermore, embedded capabilities that automate functions such as application backup and recovery are critical. Without that, management can be an overwhelming and time-consuming task.

// *VIRTUALIZATION-FRIENDLY STORAGE*

The solution to these problems is to rearchitect storage in a way that supports and extends the benefits of virtualization. HP is making that a reality with a clustered architecture. Rather than a bunch of disk drives attached to a controller, storage is based on a unified pool made up of nodes that incorporate their own processors, disk drives, memory and

connections. This makes storage extremely flexible; adding a node increases not only capacity but also performance. All available capacity and performance is aggregated and available to every volume in the cluster. On top of that, thin provisioning and reservationless snapshots allocate space only as data is written.

When combined with the ability to scale storage clusters dynamically, the storage platform breaks out of the scaling constraints of traditional systems and enables pay-as-you-grow flexibility to match the needs of a virtual environment. It also frees storage from physical constraints, enabling the deployment of new storage whenever and wherever it's required, from one central management console. Now storage volumes can be easily created, copied, moved and modified at a pace that can keep up with virtual servers.

What's more, specialized RAID technology makes these nodes highly fault-tolerant. This technology enables data to be written across the storage nodes within the cluster. It essentially stripes and protects multiple copies of data across a cluster of storage nodes, so volumes remain intact even when a node goes offline for any reason. This innovative capability enables IT to take one SAN and locate nodes in a cluster across two different physical locations, effectively creating an enterprise-class, highly available infrastructure. It eliminates storage as a single point of failure. Also, because of the high-availability architecture, a single storage cluster can now host volumes with different RAID levels, with each volume's availability and performance level matched to the needs of the application.

Finally, this type of platform is relatively efficiently and easily managed. HP storage integrates with storage and management interfaces of the leading virtualization software platforms. This includes support for VMware vSphere Storage APIs, vCenter Site Recovery Manager, vCenter Server and application-aware snapshots for both Microsoft and VMware virtualization. This integration enables certain tasks, such as migration, copying and provisioning, to be performed wherever they can be done most efficiently. Offloading some of these tasks to the storage array, for example, improves performance, scalability and resource utilization. In addition, nodes can be managed by a single administrator from one central console. Through integration with virtualization software such as VMware ESX and Microsoft HyperV, management can extend across the storage and server realms.

HP incorporates all these features into its Converged Storage, creating a storage architecture that matches and supports the flexibility and adaptability of virtualized servers. Converged Storage breaks down the barriers between individual storage systems as well as between storage and servers, creating a solid framework on which to build IT as a service.

// ONE STEP AT A TIME

Implementing Converged Storage is an evolution and does not require immediate wholesale replacement of current systems. But by putting a plan into place now, enterprises can optimize their current storage investments while building toward a converged future and accruing concomitant benefits along the way. The plan should include three basic tenets:

- **UPDATE, STANDARDIZE AND CONSOLIDATE PLATFORMS:** use standard hardware and operational processes as a base on which to build a data center infrastructure. This reduces sprawl, lowers costs and eases management.
- **ADD SOFTWARE INNOVATIONS:** implement software that enables scaling without disrupting data or applications, to create and easily move storage modules and change configurations for growth. With scale-out storage, the physical form factor is no longer a limitation, allowing for more predictable operational costs while enabling flexibility.
- **INTEGRATE MANAGEMENT:** add tools that facilitate management across servers, storage and networks. This enables IT to operate as a utility, deploying new applications in minutes and provisioning resources on demand.

By using these concepts as a base, organizations can develop a storage platform that is ideal for supporting virtual and cloud computing. Indeed, HP's Converged Storage will enable organizations to deploy storage faster, reduce the time it takes to deliver IT services, reduce energy use and physical space requirements and cut the time and expense of managing storage systems. ■

Click here to learn how HP's LeftHand Storage built on industry-standard HP ProLiant and BladeSystem delivers on virtualization-friendly storage.

Suggested Reading

These additional resources include business white papers and previously published articles from IDG Enterprise.

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Extend your data center's life expectancy

Companies can extend the life of their data centers by two to five years through a combination of IT strategies

By Sandra Gittlen
Computerworld

This year marks the 10th anniversary of the 1,200-square-foot data center at the Franklin W. Olin College of Engineering — that means the facility has been operating three years longer than CIO and vice president of operations Joanne Kossuth had originally planned. Now, even though the school needs a facility with more capacity and better connectivity, Kossuth has been forced to set aside the issue because of the iffy economic times.

"Demand has certainly increased over the years, pushing the data center to its limits, but the recession has tabled revamp discussions," she says.

Like many of her peers, including leaders at Citigroup and Marriott International, Kossuth has had to get creative to eke more out of servers, storage, and the facility itself. To do so, she's had to re-examine the life cycle of data and applications, storage array layouts, rack architectures, server utilization, orphaned devices and more.

Rakesh Kumar, research vice president at Gartner, says he's been bombarded by large organizations looking for ways to avoid the cost of a data center upgrade, expansion or relocation. "Any data center investment costs at minimum tens of millions, if not hundreds of millions, of dollars. With a typical data center refresh rate of five to 10 years, that's a lot of money, so companies are looking for alternatives," he says.

While that outlook might seem gloomy, Kumar finds that many companies can extract an extra two to five years from their data center by employing a combination of strategies, including consolidating and rationalizing hardware and software usage; rolling out virtualization; and physically moving IT equipment around. Most companies don't optimize the components of their data center and, therefore, bump up against its limitations faster than necessary, he says.

Here are some strategies that IT leaders and other experts suggest to push data centers farther.

Relocate noncritical data. One of the first areas that drew the attention of Olin College's Kossuth was the cost of dealing with data. As one example, alumni, admissions staff and other groups take multiple CDs worth of high-resolution photos at every event. They use server, storage, and bandwidth resources to edit, share, and retain those large images over long periods of time.

To free the data center from dealing with the almost 10TB of data those photos require, Kossuth opened a corporate account on Flickr and moved all processes surrounding management of those photos over there. Not only did it save her the cost of a $40,000 storage array she would have had to purchase, but also alleviated the pressure on the data center from the resource-intensive activity associated with high-resolution images.

"There is little risk in moving noncore data out of the data center, and now we have storage space for mission-critical projects," Kossuth says.

Take the pressure off of high-value applications and infrastructure. Early on, Olin College purchased an $80,000 Tandberg videoconferencing system and supporting storage array. Rather than exhausting that investment from overuse, Kossuth now prioritizes video capture and distribution, shifting lower-priority projects to less expensive videoconferencing solutions and YouTube for storage.

For example, most public relations videos are generated outside of the Tandberg system and are posted on the college's YouTube channel. "The data center no longer has to supply dedicated bandwidth for streaming and dedicated hardware for retention," she says. More importantly, the Tandberg system is kept pristine for high-profile conferences and mission-critical distance learning.

Read the full article

Suggested Reading

Burning questions: Virtualization

How storage, VM sprawl and security concerns impact the virtual data center

By Jon Brodkin
Network World

Virtualizing x86 infrastructure isn't just a one-step process -- as servers change, the whole data center must change as well. While server hypervisors such as VMware's ESX, Microsoft's Hyper-V and Xen can make IT more efficient and cost-effective, many of the virtualization advantages can be canceled out when data centers rely on technology and processes that haven't been updated for the virtualization age.

In our series of stories, we'll look at three of the "burning questions" related to server virtualization, namely the impact on storage systems, the risk of VM sprawl, and security risks.

Burning question: How can IT shops reduce server virtualization's impact on storage?

Virtualizing servers without adapting physical storage systems to the unique needs of virtual machines is a kiss of death for any virtualization project. In addition to consolidating five or 10 applications onto a single server, virtualization tools from the likes of VMware do "magical things" such as instantly move workloads from one running server to another, and replicate VMs for disaster-recovery purposes, notes analyst Arun Taneja of the Taneja Group.

All of this requires a larger storage buffer for "resume and suspend space", even if that extra space remains unused the majority of the time. In the past VMware has simply recommended that customers double storage capacity or at least significantly increase it, Taneja says. If a customer's storage utilization was at 40%, a typical rate, then in the virtualization world that could drop to 20% and storage efficiency has been chopped in half.

Read the full article

Server virtualization pushes storage demand to new highs

More than half of all workloads in a data center are now virtualized, and that figure is expected to eventually hit 78 percent

By Patrick Thibodeau
Computerworld

In 2001, VMware delivered its first virtualization products for x86 servers, setting off what has become one of today's biggest tech trends. But the benefits of virtualization, particularly its ability to allow users to rapidly provision new workloads, are pushing demand for storage to new highs.

Just over half of all workloads in a data center are now virtualized, a milestone that was hit this year, according to Nemertes Research, which benchmarks data collected from user organizations.

Ted Ritter, an analyst at Nemertes, believes that about 78 percent of all workloads will eventually be virtualized. The remaining workloads will continue to run on dedicated physical servers because of security and compliance issues, or in some cases because the software vendor doesn't yet support virtualization.

Another reason for keeping workloads on a dedicated physical server is for performance, such as that needed by high-speed trading applications. In those cases, users see no benefit to virtualization "because it adds some delay to the mix," said Ritter.

He presented new findings on virtualization deployment at the Afcom data center conference here.

In the pre-virtualization days, the process for requisitioning server space often required review by IT administrators. But virtualization "removes a lot of the natural friction in a data center; Now you can provision a new application in minutes, versus days, weeks, months," said Ritter.

Read the full article