

White Paper

Lenovo Helps Customers Drive Real World Benefits with its Portfolio of VMware-Based Hyperconverged Solutions

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IN THIS WHITE PAPER

Hyperconverged infrastructure solutions deliver the benefits of traditional converged systems, with the addition of a software-defined, scale-out architecture. This paper outlines features and benefits provided by hyperconverged solutions which – when aligned to meet emerging infrastructure needs – can deliver new levels of agility, flexibility, scale and public cloud economics into the datacenter. In addition, this paper explores how technologies from VMware and Lenovo can deliver a core datacenter infrastructure stack.

SITUATION OVERVIEW

General challenges of today's datacenters

Enterprises of all sizes are undertaking digital transformation projects intended to streamline the costs of doing business, strengthen customer relationships, capitalize on new sources of revenue and improve workforce productivity. This transformation has placed IT at the forefront of strategic decisions related to redefining business processes and revenue streams. For companies undertaking such digital transformation, this can mean a shift from a physical product to a subscription service, targeting an entirely new market or reaching new customers that brings a different level of scale.

The need to digitally transform is having a profound impact on datacenter teams around the world. Decades of building up silos of infrastructure and skill sets have left many teams with a deep in-house knowledge of their infrastructure. Unfortunately, this has become an impediment to the undertaking of key digital transformation initiatives that require an agile and more responsive team that spends less time on lower-value infrastructure tasks. In short, IT teams are being asked to adapt to changing needs within the datacenter.

Not surprisingly, IT departments are leveraging new types of infrastructure to help better align with the needs of their business. Datacenter teams are finding that the levels of scale and agility needed to support complex digital transformation initiatives simply cannot be achieved using their long-standing practice of buying individually managed silos of datacenter resources. Indeed, the long-standing practice of deploying silos of resources that are managed independently by corresponding silos of experts has created an untenable increase in resources needed to manage these silos. For every dollar spent purchasing a physical server, for example, an average datacenter budget will require nearly four dollars of spending related to power, cooling, and management of that server. As a result,

IT organizations around the world are shifting their resources toward technologies and reporting structures that eliminate datacenter silos and help focus on business-centric rather than infrastructure-centric decisions. This has driven a global shift away from standalone servers, networking, and storage systems in favor of converged solutions that can be centrally managed with tools that offer new levels of automation.

Convergence of Datacenter Infrastructure Leads to Hyperconverged Infrastructure

Converged systems represent a consolidation of core datacenter technologies (servers, storage systems, networking and management software) into a single system that can be deployed, managed, and supported more efficiently than buying and building these technologies separately. Converged systems help to remove complexity and risk associated with managing enterprise-grade datacenter infrastructure so that IT teams can confidently focus their time on higher-value projects and tasks.

Technology suppliers have been offering converged system solutions for nearly a decade. The adoption of converged systems has grown quickly during that time, with global spending on converged systems surpassing \$12.5 billion in 2017. Broadly speaking, the first generation of converged systems represent a consolidation of disparate datacenter technologies. Fundamentally, converged systems were differentiated from traditional hardware platforms and architectures in that they are designed to be deployed quickly using a modular building-block approach to rapidly scale up resources and workloads. The most common use cases driving adoption of enterprise converged systems have changed several times since these solutions first surfaced nearly a decade ago. Very early adoption of converged systems was driven by companies looking for a platform to consolidate virtual environments that expanded to take up vast amounts of datacenter space. Demand for converged systems then shifted to environments looking for a solution that could safely (i.e., without risk) provide new levels of operational simplicity and agility to support digital transformation initiatives.

Hyperconverged Infrastructure

Recently, we have seen the emergence of a new type of converged system architecture called hyperconverged infrastructure (HCI). HCI solutions deliver the proven benefits of traditional converged systems, but do so through a software-defined, scale-out architecture. HCI solutions are built as clusters of commodity servers (x86). Each server node within a cluster contributes all its resources to an abstracted pool of capacity, memory, and CPU cores that are used as the foundation for all server-centric workloads (the hypervisor, VMs and applications) as well as storage-centric workloads (e.g., data persistence, data access and data management).

Hyperconverged systems found early success within mid-sized environments and targeted workloads. Broader acceptance of hyperconvergence and increased awareness of the benefits these solutions bring to the table (agility, flexibility, scale, web-scale economics, and ease of use) have driven rapid innovation and growth in this market. Today, the breadth of workloads running on hyperconverged solutions is expanding rapidly. Highly virtualized and mission-critical business applications are more common than people may realize.

Growth of new hyperconverged deployments and expansion of workloads running on these systems has helped drive total 2017 hyperconverged sales (including hardware and software) up 68% to more than \$3.9 billion in global sales. Past IDC surveys about HCI deployments offer further proof of HCI's effectiveness and the degree to which HCI solutions have matured in recent years. Indeed, recent in-

depth interviews of companies leveraging HCI within their datacenters returned the following interesting insights related to rates of HCI expansion this year:

- The number of workloads and VMs running on HCI was expected to increase by more than 100%
- The number of HCI nodes in use was expected to increase by 81%
- The number of HCI clusters deployed was expected to increase by 99%

Such market growth and expansion of systems can be attributed to the considerable benefits hyperconverged solutions provide. In addition, HCI solutions offer:

- **Lower capex.** This can be achieved through the elimination of SAN-based storage solutions in favor of industry standard servers that offer fully virtualized compute and data services. The scale-out architecture of hyperconverged solutions further lowers capital costs by helping to reduce the need to overprovision resources. Instead, customers can buy only the nodes required at the time of initial deployment and scale later as needed.
- **Reduced opex.** Reduced overprovisioning and elimination of storage silos have positive impacts beyond capex. In fact, these benefits can directly lead to lower costs of power, cooling and floor space within the datacenter. HCI solutions often integrate management software that automates many of the complex tasks needed during initial deployment while also reducing the number of steps required to provision new workloads. The result is improved IT staff productivity and increased agility within the datacenter. These same solutions also help IT departments to leverage IT generalists for low value tasks, thus freeing up time for infrastructure specialists to work on more innovative projects.
- **Reduced risk.** The highly automated nature of HCI solutions also helps to reduce risk of downtime associated with common lifecycle management tasks (e.g., firmware upgrades, system refresh). The scale-out, software-defined nature of HCI solutions help to eliminate the need for complex and risky forklift upgrades which have become all too common within the datacenter. Many companies leverage hyperconverged solutions to improve their DR/HA processes and costs in ways not possible just a few short years ago.

Review of Lenovo Converged Solutions

Lenovo's portfolio of converged systems is covered within the company's ThinkAgile branding. Products with the ThinkAgile brand are designed to offer a complete software-defined solution built on Lenovo ThinkSystem hardware. ThinkAgile solutions are designed to dramatically increase operational simplicity within the datacenter by eliminating complexities related to system integration and lifecycle management.

VMware-Based Lenovo Hyperconverged Solutions

Partnering with other technology suppliers has always been an important part of Lenovo's DNA. This is especially true for its ThinkAgile portfolio of converged systems, where the company works closely with many of today's most important software-defined infrastructure suppliers. In this paper, IDC focuses on Lenovo's partnership with VMware and the converged solutions it has created through this partnership.

Lenovo offers multiple VMware-based converged solutions designed to meet the needs of a wide range of customer needs. These solutions include the following:

Lenovo Ready Nodes for VMware vSAN and VMware Cloud Foundation (VCF)

Lenovo Ready Nodes for VMware vSAN and VMware Cloud Foundation (VCF) are complete ThinkSystem servers that have been certified to support vSAN and VCF. Customers that leverage Lenovo's ReadyNodes for VMware vSAN or VCF can choose from a range of preconfigured Lenovo ThinkSystem servers that have been tested and certified by Lenovo. Using Ready Nodes as the building blocks for a hyperconverged deployment provides all the benefits listed earlier, but also requires customers (or their preferred value-added partner) to build the solution on their own. This DIY approach to hyperconvergence is often attractive to organizations that have the in-house expertise required to integrate all aspects of the system and to maintain the solution over its entire lifecycle. Customers heading down this path will receive Ready Node support from Lenovo and software support from VMware.

Lenovo ThinkAgile VX Series

ThinkAgile VX Series are complete hyperconverged solutions that are fully tested and supported by Lenovo. All ThinkAgile VX Series systems are built and tested by Lenovo with VMware vSAN certified components and ship fully configured to the customer's site. Lenovo's professional services team can install the systems, which helps to eliminate risk and ensure the system is ready to operate immediately. ThinkAgile VX Series customers receive unified support through the Lenovo ThinkAgile Advantage program. This provides a single support line for all hardware- and software-related support needs, including VMware software.

Ongoing lifecycle management is an important benefit provided by Lenovo. The company invests considerable resources into the lifecycle management tools that come with all ThinkAgile VX Series solutions. Lenovo continuously tests all hardware, firmware and software updates holistically to ensure complete interoperability. Customers benefit by receiving completely tested updates and patches that can be deployed using Lenovo's automated tools throughout the entire life of the system. The core elements of Lenovo's ThinkAgile VX Series include:

- **ThinkAgile VX appliances**, which are fully tested and qualified Lenovo ThinkSystem servers
- **VMware ESXi and vCenter** for complete hypervisor and virtualization management
- **VMware vSAN** to provide the software-defined and hyperconverged data services
- **Lenovo's VX Installer** which provides a standardized and automated installation that ensures a consistent deployment of a ThinkAgile VX Cluster
- **XClarity Administrator with VMware Integration**, which fully integrates the insights and functionality provided by Lenovo XClarity directly into vCenter to provide an administrator with the ability to auto-discover, monitor and manage physical and virtual resources from a single pane of glass. Leveraging XClarity within vCenter helps to greatly reduce management complexity and the amount of time needed for system provisioning. A key feature of the integration between XClarity and VMware vCenter is the ability to eliminate maintenance downtime through non-disruptive, rolling firmware updates or server reboots by automating the process of applying updates, migrating VMs and server reboots without workload interruption.
- **Network Orchestrator for VMware ESXi**, which provides automated network provisioning and dynamic synchronization between the virtual machine layer and the physical switch. ThinkAgile Network Orchestrator is software-based on Lenovo's CNOS Ethernet switches that fully integrates with VMware's vCenter software so that any changes to the virtual machines impacting the virtual networks will trigger an API call to the physical Lenovo switches which then dynamically reconfigure VLAN settings to accommodate the required changes.

- **Lenovo Professional Services and ThinkAgile Advantage**, which is designed to provide the professional services that may be needed to accelerate system deployments, reduce risks of downtime and provide customers with a single line of support.

Lenovo VMware SDDC

Lenovo VMware SDDC is a reference architecture that combines Lenovo hardware and software with a complete cloud stack based on VMware's Software-Defined Data Center (SDDC) suite of software. Lenovo VMware SDDC uses ThinkAgile VX systems as its core building blocks as well as Lenovo's advanced systems management tools reviewed in the previous section (e.g., XClarity Administrator with VMware Integration, Network Orchestrator for VMware ESX, Lenovo VX Installer, XClarity Integrators for vRealize Automation and vRealize Orchestrator).

Lenovo VMware SDDC extends the notion of virtualization to encompass all core datacenter infrastructure (compute, networking, storage, and security) to create a full cloud software stack that is fully automated and holistically managed. The modularity of point offerings and the orchestration and management capabilities within a well-defined, integrated framework present a great value proposition to customers who can progressively advance their datacenter modernization agenda at their own pace. VMware's SDDC software goes well beyond core hypervisor/virtualization management software to include:

- **VMware vSAN** for software-defined and fully hyperconverged data services
- **VMware NSX** for software-defined networking that provides overlay networks with the same capabilities available in the physical network
- **VMware vRealize Operations** to enable the automation of operations related to configuration, application discovery and infrastructure monitoring
- **vRealize Automation**, which provides a self-service, policy-enabled services catalog for deploying and provisioning infrastructure as a private cloud service

Lenovo's VMware SDDC offering combines all the required hardware and software needed to accelerate the design and deployment of a complete private cloud. Once deployed, datacenter teams will be able to leverage Lenovo's VMware SDDC to greatly ease operational and management burdens related to datacenter infrastructure by offering the following:

- Standardization of datacenter designs at the rack level
- Automation of complex management tasks
- Built-in lifecycle management tools
- Single pane of glass management

Benefiting from Deep Integration of Lenovo and VMware's Enterprise Technology

Lenovo and VMware's Long-Standing Partnership

The partnership between Lenovo and VMware has been an important pillar within the enterprise IT industry for decades. These two companies represent leading suppliers within the datacenter infrastructure and private cloud markets. VMware and Lenovo's shared commitment to the technology partnership that helped create the products outlined within this document can be seen through the degree of integration of their respective products. Combined, Lenovo and VMware can offer a complete portfolio of converged systems that drive real world benefits through simplified deployment, holistic management, increased automation, and cloudlike flexibility for their customer's on-premise

workloads. The following are highlights of the unique strengths VMware and Lenovo bring to their long-standing partnership.

VMware: A Commitment to the Software-Defined Datacenter and Robust Vendor Ecosystem

The software-defined, hyperconverged products that Lenovo and VMware have brought to market represent the future of datacenter infrastructure. Simply stated, this future is server-based, software-defined, highly automated and mission-critical. Technology suppliers like VMware clearly understand this and have shown a true commitment to leading the way to a software-defined datacenter. VMware offers a datacenter infrastructure model for the future while also providing critical features required within today's mission-critical environments. Equally important is VMware's vast ecosystem of technology partners actively developing products that are designed to complement VMware's software. This has ultimately turned VMware software into a large platform and a source of rapid innovation that extends to thousands of other technology suppliers.

Lenovo: A Trusted Infrastructure Supplier with a Global Reach and Proven Track Record

As one might expect from an established global infrastructure supplier, Lenovo offers a comprehensive portfolio of resilient datacenter solutions that are complimented by its world-class support structure, global supply chain and extensive number of established VARs. The company's broad portfolio of ThinkSystem servers and system management software brings choice and flexibility to the diverse data center infrastructure market. Lenovo's ThinkSystem servers also bring a long history of deployments within the most demanding datacenters where quality, reliability and security are always high priorities. Lenovo's strengths go well beyond its product portfolio. The company has a long track record of working with enterprises as a true partner at all stages of the investment process. Lenovo's customers frequently rely on the company to provide insights and guidance needed to match the best solutions to their unique datacenter needs. This has been true for many years and will be true for those working with Lenovo and VMware on the deployment of the software-defined hyperconverged solutions reviewed throughout this paper.

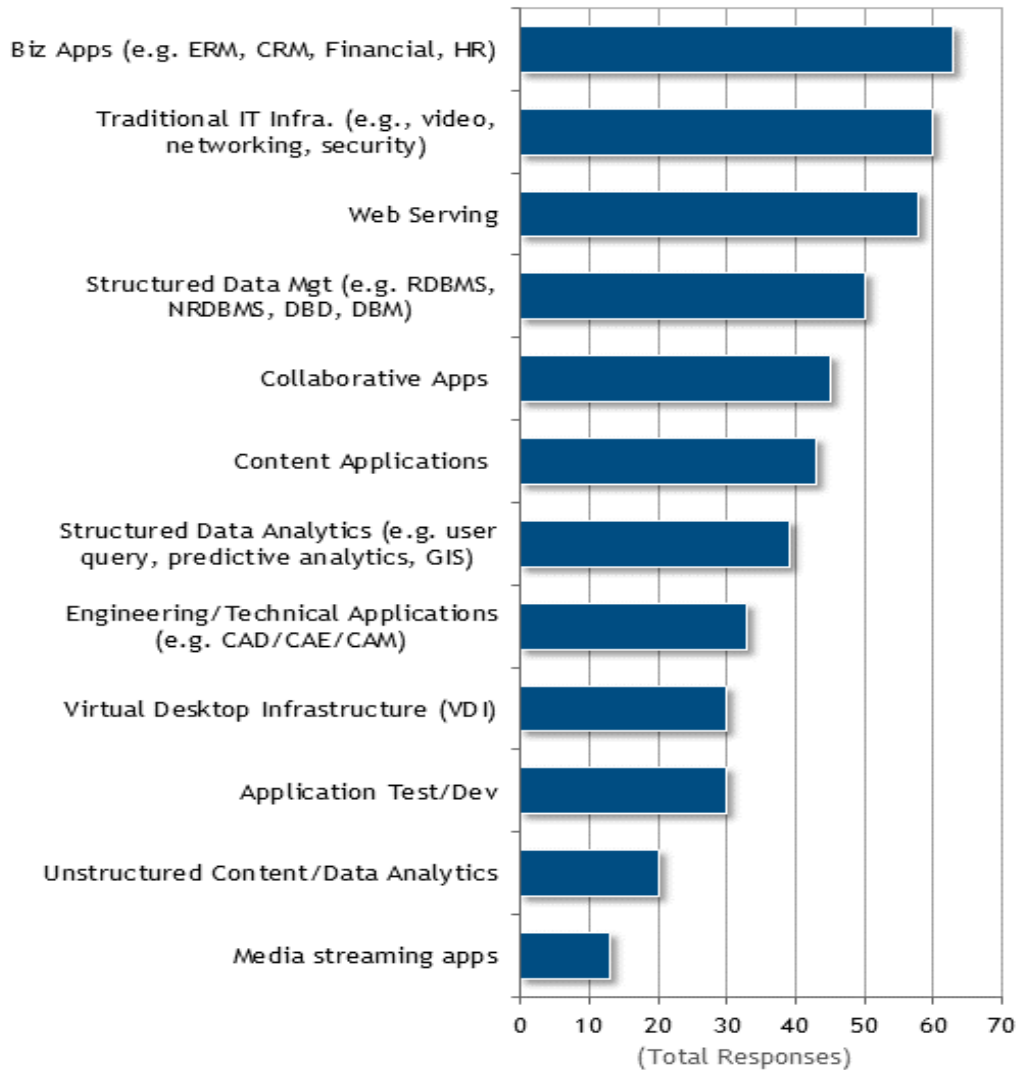
Real World Benefits of Leveraging VMware vSAN to Build Hyperconverged Infrastructure

The hyperconverged solutions brought to market through the Lenovo VMware partnership represent proven solutions that are enterprise-class and that are already being leveraged within mission-critical environments around the world. This section offers insights from a recent IDC survey of companies currently running datacenter infrastructure built with VMware's vSAN, the software-defined storage technology that is at the core of all hyperconverged solutions outlined in this paper. The results of the survey indicate that a large percentage of the companies were using VMware vSAN to support business-critical workloads. The most common business critical workloads running on VMware vSAN-based solutions can be seen in Figure 1.

FIGURE 1

Business Critical Applications Running on VMware vSAN

Q. Which of the following applications are deployed on your VMware vSAN hyper-converged solution and considered to be business critical?



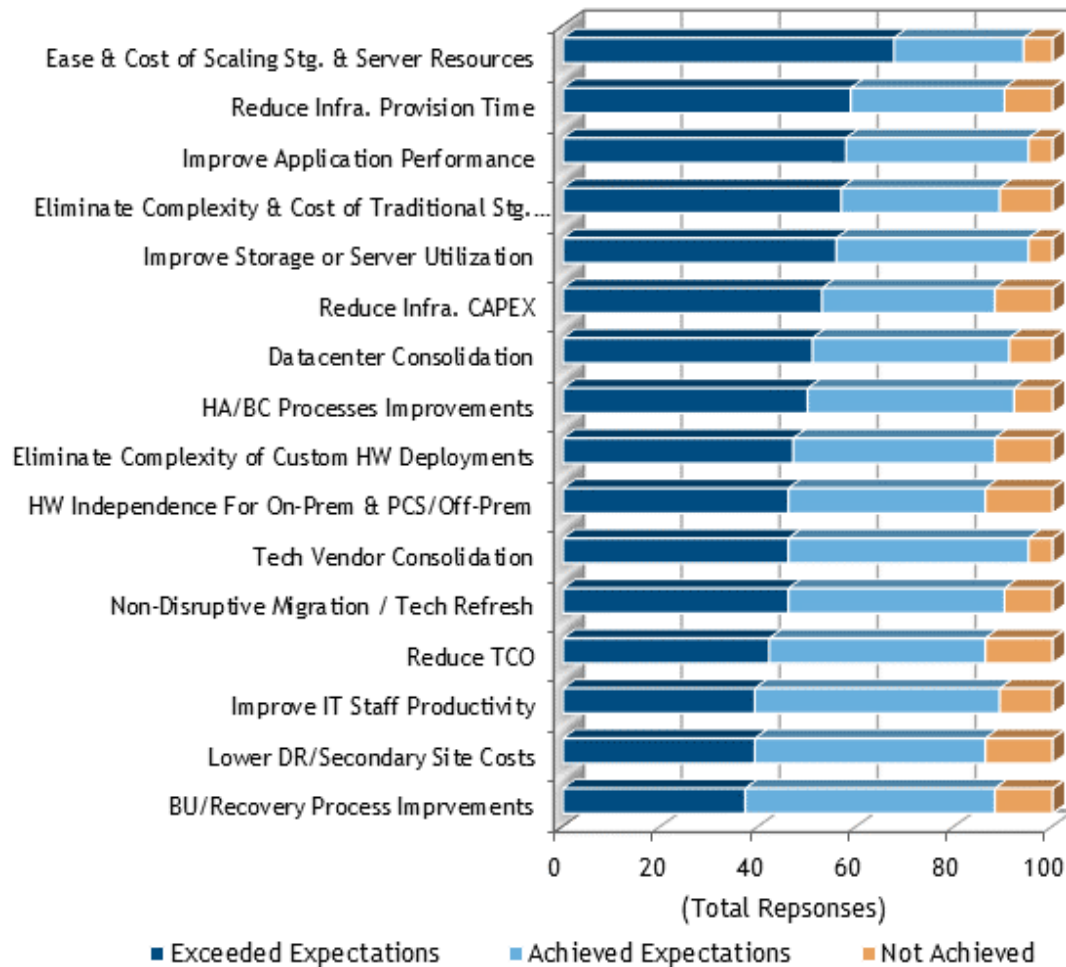
Source: IDC, 2H2017 Survey of VMware vSAN Customers (n=101)

According to this IDC survey of VMware vSAN users, the benefits directly attributable to hyperconverged solutions built on VMware vSAN were wide-ranging (see Figure 2). Ease and cost of scaling infrastructure, reduced time spent on infrastructure provisioning, improved application performance and elimination of complexity/cost related to refreshing traditional storage were most commonly listed as having provided benefits that exceeded expectations.

FIGURE 2

Benefits Achieved Through VMware vSAN Deployments

Q. To what degree were you able to achieve the following benefits as a direct result of your vSAN solution?



Source: IDC, 2H2017 Survey of VMware vSAN Customers (n=101)

Figure 3 shows VMware vSAN's ability to reduce total cost of ownership (TCO) within the datacenter. The graph offers several ways of looking at TCO reduction. On average, VMware vSAN reduced TCO by 40%. Additional TCO results include:

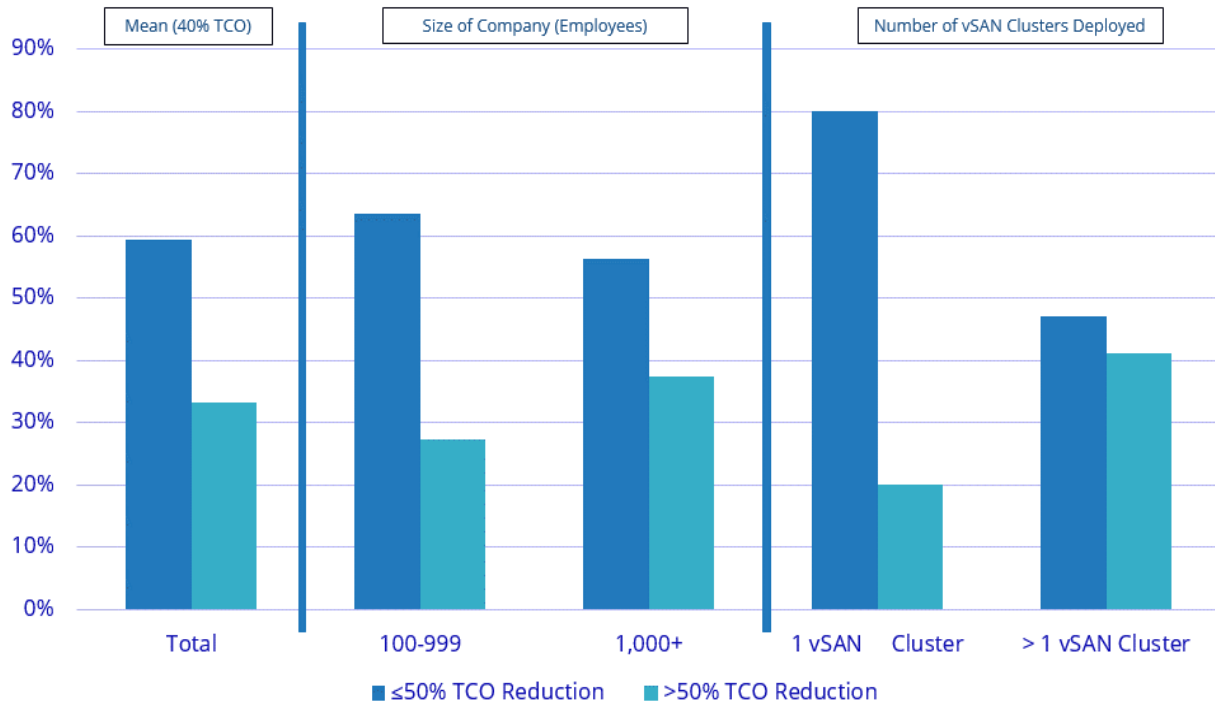
- One-third of survey respondents reduced TCO by more than 50%
- TCO gains tend to be higher within larger organizations, which indicates that larger organizations are deploying vSAN within environments that affect a considerable portion of the organization

- TCO gains tend to be far higher for those that have deployed multiple vSAN clusters, which should be seen a clear indication that customers deploying VMware vSAN in small/targeted environments may be missing out on its full potential.

FIGURE 3

Total Cost of Ownership Reduction Attributable to VMware vSAN Deployments

Q. By what percentage has your TCO been reduced as a result of your VMware vSAN deployment?



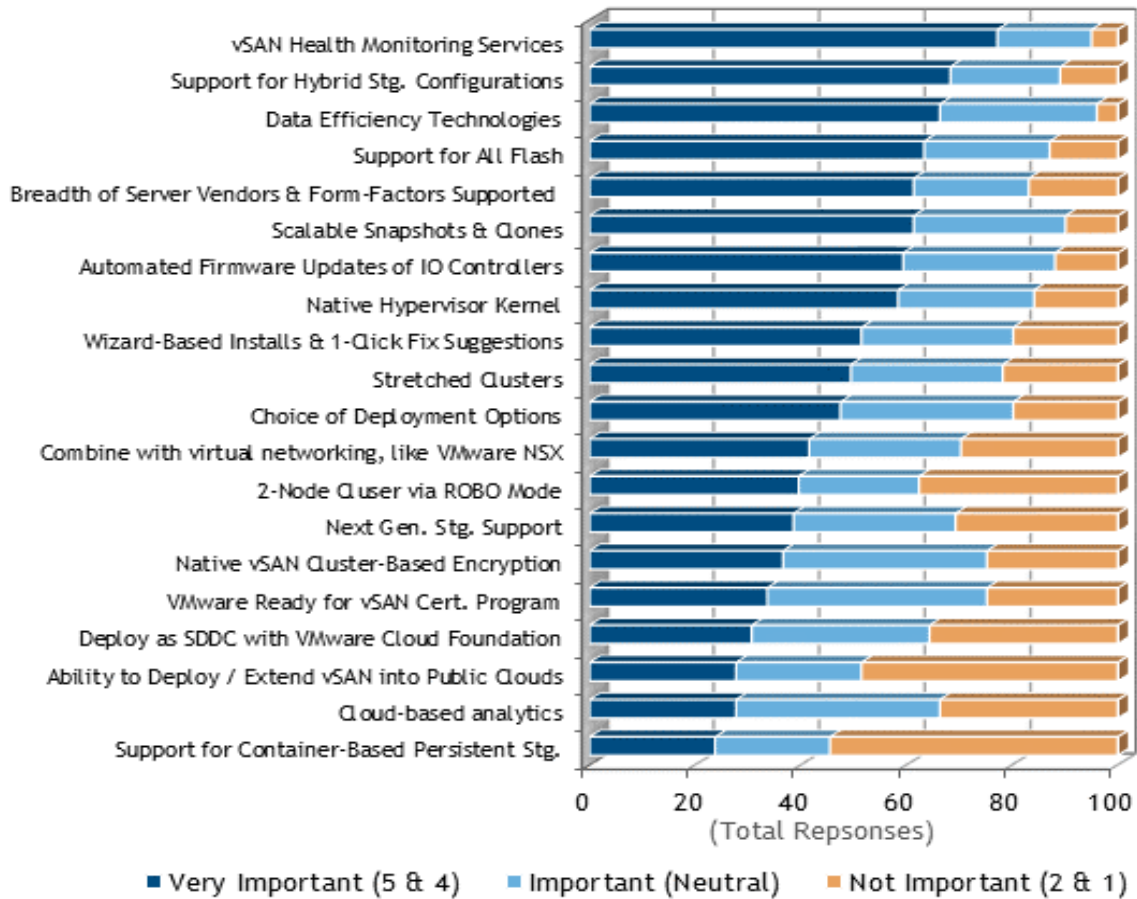
Source: IDC, 2H2017 Survey of VMware vSAN Customers (n=101)

Figure 4 provides a ranking of VMware vSAN's capabilities based on customer responses. Survey respondents were asked to rank the importance of 20 available features on a five-point scale (5 being very important and 1 being not at all important). The graph combines results of 5 and 4 (labeled as very important), and combines results of 2 and 1 (labeled as not important). Support for flash storage (hybrid and all-flash) and data efficiency technologies (e.g., deduplication, compression) were clearly very important to vSAN customers. This aligns with broader market trends, where HCI conveys a high affinity for the same storage and efficiency features with an eye on performance and a desire to avoid the need for performance tuning. VMware vSAN's Health Monitoring Services were most frequently listed as very important to our survey respondents.

FIGURE 4

Most Important VMware vSAN Capabilities

Q. On a scale from 1 to 5 (where 1 indicates "not at all important" and 5 indicates "very important") please estimate how important each of the following VMware vSAN features/capabilities are to your environment.



Source: IDC, 2017 Survey of VMware vSAN Customers (n=101)

CHALLENGES/OPPORTUNITIES

IDC views hyperconverged offerings like the Lenovo and VMware products reviewed in this document as the next phase of the converged systems market development. While the market remains relatively young, such hyperconverged solutions are very much driving real world benefits by redesigning datacenter infrastructure and allowing customers to:

- Collapse silos of storage, compute, and data management services into standard nodes of x86 servers

- Collapse silos of IT experts by allowing customers to leverage common virtualization tools to manage the vast majority (if not all) of the infrastructure tasks required to support virtualized workloads
- Reduce the need to deploy many types of dedicated appliances and separately licensable infrastructure within the datacenter, including data efficiency and data protection solutions.

Broader acceptance of hyperconvergence and increased awareness of the benefits these solutions bring to the table are driving rapid growth within this market. As the market expands, so too does the portfolio of workloads that run on these systems. IDC data shows the use of hyperconverged systems for business-critical business applications to be growing rapidly. Growth of new hyperconverged deployments and expansion of workloads running on these systems has helped to drive total 2017 hyperconverged sales (including hardware and software) up 68% to more than \$3.9 billion in global sales, which now represents 30% of all global spending on converged systems.

CONCLUSION

IDC believes the architecture, features and benefits provided by hyperconverged solutions like those outlined in this paper are aligned to drive the inexorable need for infrastructure that can introduce new levels of agility, flexibility, scale and public cloud economics into the datacenter. IDC views the Lenovo and VMware partnership as an important part of this market's success. The two companies bring products to market that combine each company's strengths and drive real world benefits to their customers.

Looking forward, converged systems will be increasingly influenced by software-defined solutions running on server-based platforms that incorporate hybrid cloud into an administrator's workflow. While this change has undeniably begun, it is still in its early days. IT teams should work closely with companies like Lenovo and VMware to make sure their datacenter investments are able to drive real world TCO reductions that allow IT teams to focus on applications and business outcomes rather than low-level infrastructure management.

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