BLACK & WHITE PAPER

The Realities of Hyperconvergence in the Enterprise Datacenter

APRIL 2017

A COMMISSIONED RESEARCH PAPER

About this paper

A Black & White paper is a study based on primary research survey data that assesses the market dynamics of a key enterprise technology segment through the lens of the "on the ground" experience and opinions of real practitioners – what they are doing, and why they are doing it.

About 451 Research

451 Research is a preeminent information technology research and advisory company. With a core focus on technology innovation and market disruption, we provide essential insight for leaders of the digital economy. More than 100 analysts and consultants deliver that insight via syndicated research, advisory services and live events to over 1,000 client organizations in North America, Europe and around the world. Founded in 2000 and headquartered in New York, 451 Research is a division of The 451 Group.

NEW YORK
1411 Broadway
New York, NY 10018
+1 212 505 3030

SAN FRANCISCO
140 Geary Street
San Francisco, CA 94108
+1 415 989 1555

LONDON
Paxton House
30, Artillery Lane
London, E1 7LS, UK
+44 207 426 1050

BOSTON
75-101 Federal Street
Boston, MA 02110
+1 617 598 7200

Introduction

Hyperconverged Infrastructure (HCI) presents an interesting new option for addressing a number of IT production workloads, but there is a substantial amount of hyperbole regarding HCI's suitability as a replacement for classic datacenter architectures. The goal of this paper is to take a realistic, data-driven and pragmatic look at the issues surrounding the adoption of HCI in the mid to large enterprise, and to provide useful information based on polling data collected from 100 enterprise customers that have evaluated HCI and have either chosen to reject or adopt the platform for their intended use cases.

We will also focus on the important questions surrounding HCI's capabilities as an alternative to tier one primary storage systems, and the extent to which HCI technology delivers on the marketing promises of simplified operation, scale-out expansion, flexibility, performance and resilience when viewed through the lens of IT decision-makers who considered or experienced HCI deployments.

For the purposes of this paper we define these terms as follows:

Software-defined storage (SDS) – Dedicated modular storage platforms designed to provide shared storage based on a combination of software and commodity server hardware and onboard storage interconnected via a common Ethernet network. Most SDS platforms focus on providing shared, scale-out, tier two storage for file-based or object storage applications for multiple client systems on common Ethernet networks. Examples are systems from Nexenta, DataCore and HPE's StorVirtual.

Hyperconverged infrastructure (HCI) – General-purpose server systems that combine the features of an SDS platform with a complete virtualization software stack. These pre-integrated, scale-out systems are designed to run production workloads using commodity server hardware and onboard storage. Examples are systems such as Nutanix, SimpliVity, Maxta and HPE Hyper Converged 250.

Executive Summary

Hyperconvergence is currently the darling of the IT industry, promising a brave new world of scale-out modularity based on commodity hardware and empowered by the magic of software. Imbued with this power, you too can knock down silos, shatter paradigms and disrupt everything in sight, but those who have been in the IT industry long enough have heard this all before. There's no doubt that the future of IT is software-enabled, but this doesn't mean that everything that's come before is no longer of value, and it doesn't mean that IT professionals should forget all the lessons they've learned the hard way.

Hyperconverged infrastructure is a close relative of converged infrastructure, which introduced the appliance model to the datacenter in the form of a pre-integrated and certified rack of servers, dedicated storage and networking, plus a software stack that was modular and self-contained. One vendor, one SKU, one 'neck to choke' if things go wrong. HCI simply compresses that model into a 2U server form factor that combines compute, onboard storage and a software stack that lets customers simply cluster multiple nodes to deliver pools of software-defined compute, storage and networking resources that scale linearly as new nodes are added.

Our poll of enterprise customers that have evaluated HCI/SDS systems provided these insights.

- Of the 100 respondents, 44 indicated that they've considered the adoption of HCI/SDS systems and have chosen not to adopt them for enterprise use.
- 55% of the companies that chose to adopt HCI/SDS anticipated that it would necessitate a substantial refresh or upgrade of their datacenter network.
- 78% of the respondents were looking at installations made up of eight or fewer nodes.
- 82% of the enterprise customers that have evaluated or adopted HCI stated that they currently use a separate, dedicated network for storage-specific traffic.
- 65% of polled respondents said they prefer Fibre Channel as a storage protocol.
- Half of the 10 respondents who chose to integrate HCI in production expressed dissatisfaction with system capabilities.

Below we have highlighted some of the key concerns of adopting HCI – where compute and storage tasks are shared by the same hardware and network – in comparison to classic IT infrastructure.

- Unlike storage area network (SAN) systems, HCI platforms are unable to provide primary, tier one storage to midrange and mainframe systems. This contradicts the premise that HCI will reduce the complexity of a datacenter environment, and instead adds another potential silo of resources to manage in a mixed enterprise infrastructure.
- The operational efficiency promised by HCI vendors can be highly variable, and is highly dependent on the relative complexity of existing systems that have also been moving toward more open and automated management capabilities.

- HCI vendors imply that their system performance and capacity is limitlessly scalable, although there are no large enterprise installations available for reference. In addition, most HCI vendors do not allow the publication of independent, third-party evaluations of their performance and scalability claims.
- HCI/SDS modules are not interchangeable between vendors, so the decision to adopt an HCI or SDS platform translates into what could be a long-term commitment to a single vendor for both hardware and software. Even though these HCI/SDS systems are based on commodity server hardware, their software environment creates a different level of potential lock-in.
- HCI systems' dependence on onboard storage capacity forces the expansion of computing and storage resources in lockstep. To add storage capacity, you must add server nodes, and adding nodes for compute capacity may add unnecessary storage.

HCI and SDS systems are showing relatively high adoption rates, but these estimates rarely delve deeper into just how they fit into the context of a datacenter that depends on large quantities of highly available and protected storage. HCI and SDS systems will continue to move further up the production spectrum, but it's highly questionable that they are a viable replacement across the board for mission-critical environments based on dedicated, tier one enterprise storage architectures. There are a number of things to consider in the adoption of HCI, and we hope the information in this report will help you decide for yourself where HCI fits in your infrastructure plans.

Customer Insights

RESPONDENT OVERVIEW

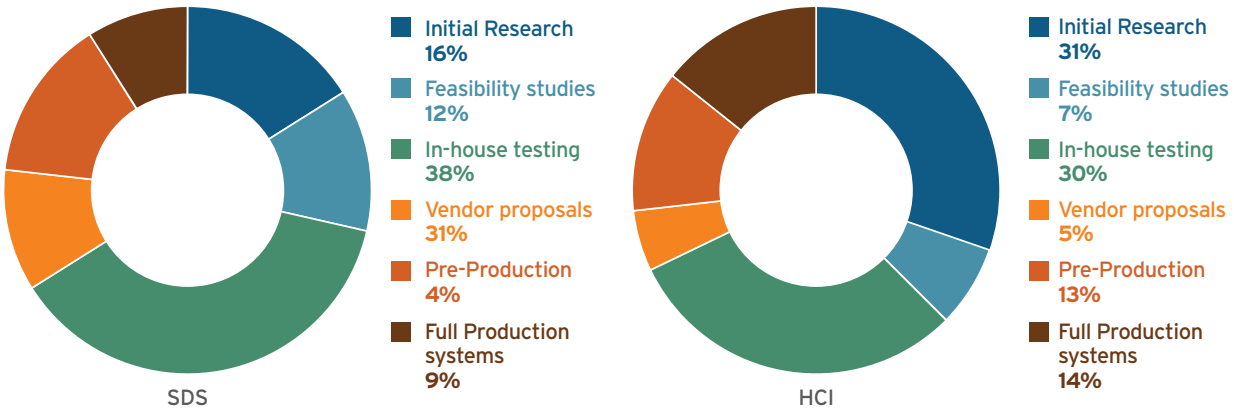
We surveyed 100 IT professionals in selected markets around the globe – including the US, UK, France, Germany, India, Hong Kong, South Korea, Australia and South Africa – with companies of 500-50,000+ employees, and sampled business organizations in the multiple industrial verticals including financial services, manufacturing, technology and media, government, healthcare, and professional services. Part of the criteria for selecting respondents was a requirement that they had either evaluated and adopted or evaluated and rejected HCI as part of their IT infrastructure. The following sections compare the level of engagement, intended use cases and priorities of both adopters and non-adopters of HCI/SDS technology.

HCI/SDS-ADOPTING CUSTOMERS - ENGAGEMENT LEVELS, INTENDED USE CASES AND PRIORITIES

Of the 100 total respondents to this HCI survey, 56% chose to adopt HCI after multiple levels of evaluations. We first determined what level companies have reached in their evaluation process (see Figure 1).

Figure 1: Adopter Evaluation Level Achievements

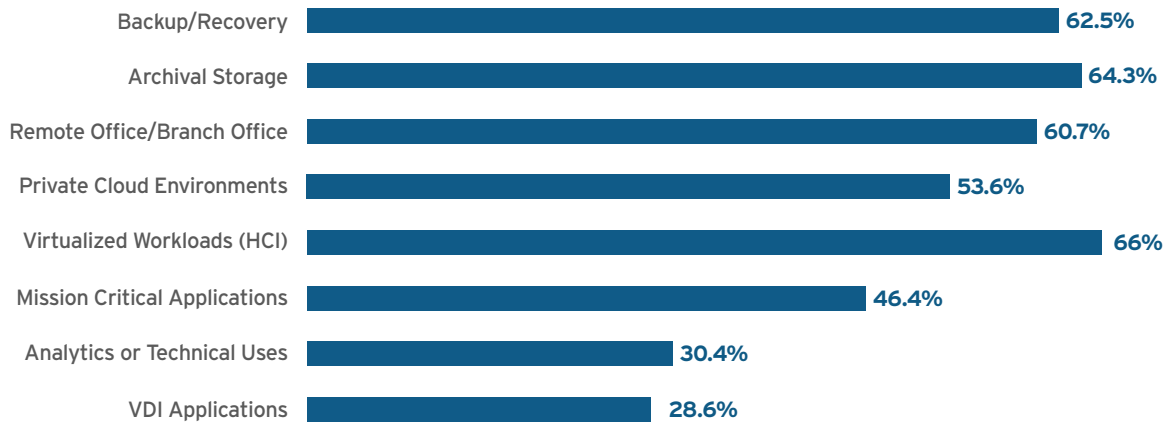
Q: How far have you progressed in exploring SDS storage-specific systems / HCI computer + storage systems? N=56



After determining HCI adopter evaluation levels, we further charted their intended use cases.

Figure 2: HCI/SDS Adopter – Intended Use Cases

Q: What are your production use cases? (Please check all that appy). N=56



Based on the information in Figure 2, the majority of the customers that have adopted HCI/SDS are focusing on a mix of secondary storage for backup and archive purposes, as well as generalized virtualized workloads and remote office/branch office (ROBO) applications. Just under half of the respondents in this group classified their HCI/SDS needs as mission-critical, although it's possible that this covers other use cases that, although secondary in nature, could also be considered mission-critical. In researching the decision drivers for HCI/SDS adoption (see Figure 3), management and scalability led the key concerns for HCI adopters, and surprisingly, storage costs and the HCI consumption fell toward the bottom of the list of decision drivers.

Figure 3: HCI/SDS Adopter – Decision Drivers

Q: What factors influenced your decision to adopt HCI/SDS-based storage? N=56

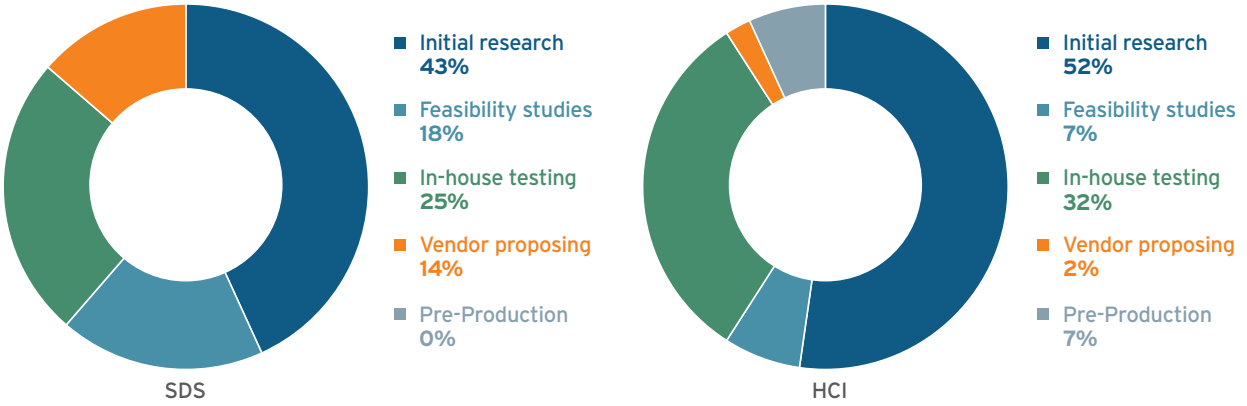
Non-HCI/SDS-Adopting Customers – Engagement Levels, Use Cases and Priorities

OF THE 100 TOTAL RESPONDENTS, 44 INDICATED THAT THEY'VE CONSIDERED THE ADOPTION OF HCI/SDS SYSTEMS AND HAVE CHOSEN NOT TO ADOPT THEM FOR ENTERPRISE USE.

We posed the same question to customers that chose to adopt HCI/SDS, asking what level the companies have reached in their evaluation process (see Figure 4).

Figure 4: Non-Adopter – Evaluation Level Achievements

Q: How far have you progressed in exploring SDS storage-specific systems / HCI computer + storage systems? N=44



A comparison of the evaluation levels of adopters/non-adopters shows a greater amount of initial research went into the non-adopter's evaluation of both SDS and HCI systems, while the amount of in-house testing stayed relatively the same. As with the adopter group, we asked a similar group of questions involving the use cases they intended for HCI (see Figure 5).

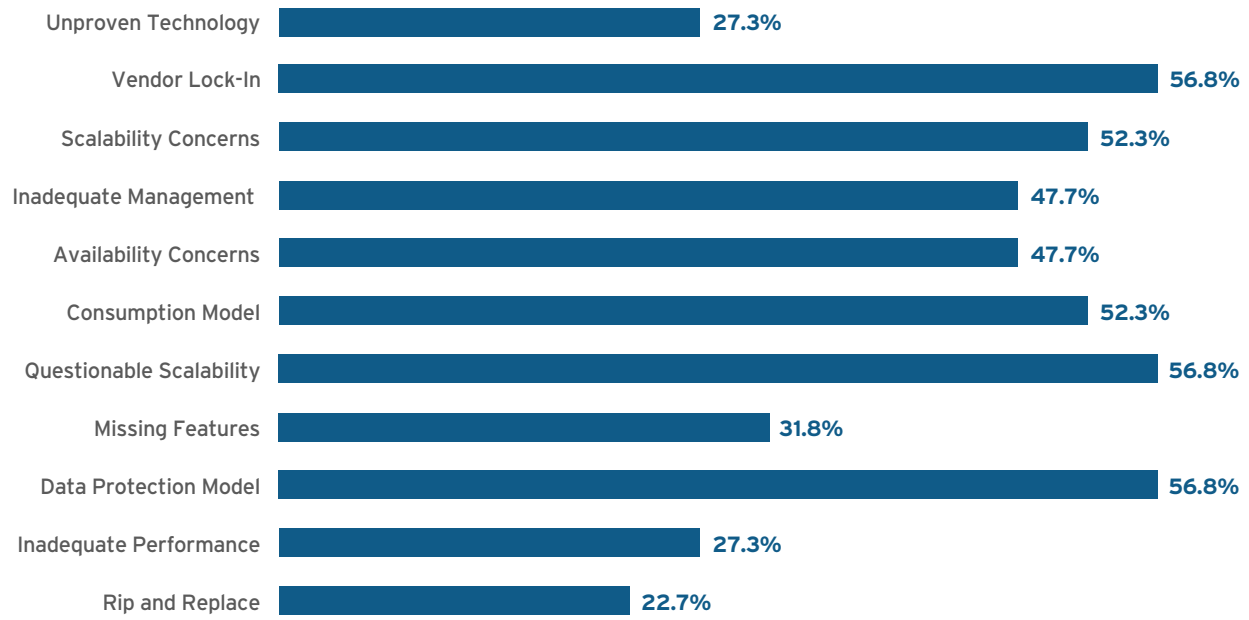
Figure 5: Non-Adopter – Intended Use Cases

Q: What production use cases did /would you consider? (Please check all that apply). N=44

A comparison between intended use cases for adopters and non-adopters shows many similarities, but the greatest difference was that HCI adopters placed greater emphasis on virtualized workloads. This could be attributed to HCI vendors specifically targeting virtualization as a key part of their intended market. However, the most telling chart addresses the reasons non-adopters chose for rejecting HCI/SDS (see Figure 6).

Figure 6: Key Factors that Influenced the Rejection of HCI/SDS

Q: What factors influenced /do you expect to influence your decision to reject HCI/SDS-based storage? N=44



SCALABILITY, DATA PROTECTION AND VENDOR LOCK-IN TOPPED THE CHART AS MAJOR CONCERNS OVER THE ADOPTION OF HCI.

Readers should bear in mind that these statistics are based on the responses from relatively large enterprise customers that have a well-established set of requirements for data protection, capacity, availability and connectivity, typically based on the needs of a very large and mixed computing infrastructure. There are a number of use cases for a generalized SDS/HCI environment within the enterprise for virtualized applications, private cloud and ROBO applications, but these lighter-weight applications are somewhat self-contained when compared to the challenges and tasking of the larger enterprise datacenter requiring a large and well-established tier one SAN storage environment.

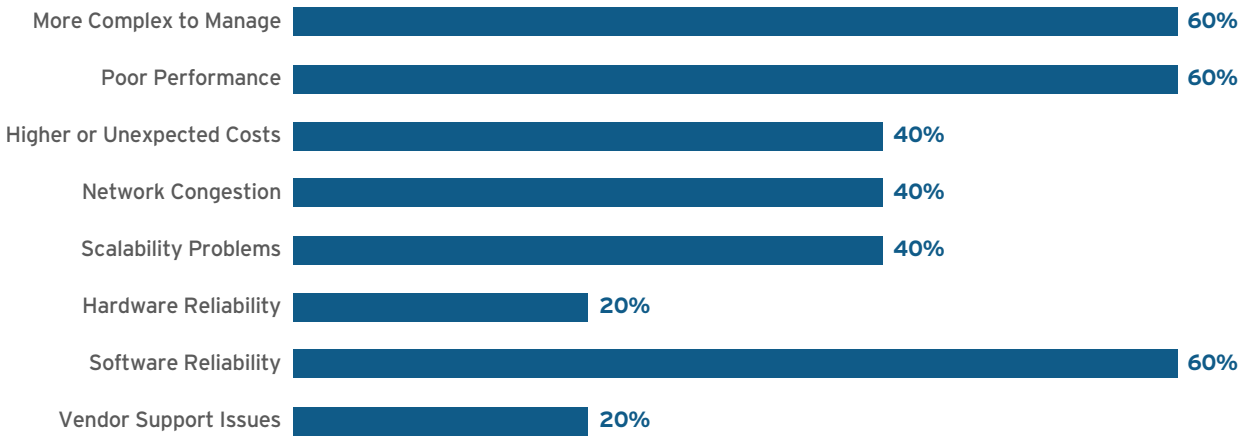
HCI/SDS Adopters – Negative Experiences

OF THE 56 OF 100 RESPONDENTS WHOSE COMPANIES CHOSE TO ADOPT HCI/SDS, THERE WERE 10 WHO MENTIONED THAT THEY HAD PLACED HCI/SDS IN PRODUCTION. OF THOSE, 50% EXPRESSED DISAPPOINTMENT WITH THEIR SYSTEMS, CITING MANAGEMENT COMPLEXITY, POOR PERFORMANCE AND SOFTWARE RELIABILITY AS KEY ISSUES (SEE FIGURE 7).

To follow up, we asked them to define those issues. Unfortunately, these customers declined to participate in a more detailed interview that would have shed more light on the specific nature of these failings, so it's difficult to say whether this was a problem with initial system specifications, pre-sale communication between customer and vendor, or some other variable that may have been overlooked in the process. Regardless of the root cause, this is useful information that points to valid concerns that should be considered in the HCI/SDS evaluation process.

Figure 7: HCI/SDS Adopters – Failed Expectations

Q: And in what ways has HCI/SDS failed to meet expectations? (Select all that apply) N=5



Enterprise Adoption Considerations

A GENERAL COMPARISON OF PLATFORMS

The majority of shared, tier one enterprise storage today is based on SAN systems – purpose-built platforms that provide primary, block-level storage and are capable of supporting all forms of computing platforms. A SAN operates as a storage-specific platform and is typically connected to client systems via a dedicated Fibre Channel storage network that provides consistent security, performance and redundancy for mission-critical applications. SAN systems are designed to host a very large number of client systems, and their physical/logical separation from the computing platforms they support allows for storage growth to occur independently from the systems they host.

In comparison, both SDS and HCI systems are based on commodity x86 server hardware, which essentially repackages the ubiquitous 2U server with a combination of software-defined storage and virtualization. With the exception of systems from SimpliVity that utilize a field-programmable gate array coprocessor for storage, HCI systems don't offer anything remarkable from a hardware perspective. These systems provide network connectivity via a shared 10GbE network switching hardware for connection between nodes. In both HCI and SDS, storage is based on internal disk capacity, with each server node contributing to the total capacity of a cluster, and all storage services are delivered by the software-defined storage environment of choice.

Even though SDS/HCI systems are built on independent nodes – complete with full CPU and RAM capacity – they must be combined with other nodes to form data-protection clusters. This is true of both SDS and HCI systems, but beyond that, the key difference between the two platforms is relatively simple. While SDS system nodes are specifically dedicated to storage tasks alone, HCI systems add server virtualization capabilities on top of an SDS system to provide a 'one size fits all' solution for enterprise computing and storage. The idea of linearly scalable, modular storage has actually been around for more than a decade, but adding virtualized production workloads to a generic server already running an SDS platform presents a completely different set of issues.

It's this principle that raises a number of questions: the premise that commodity server platforms can deliver enterprise-level storage along with virtualized production workloads at any scale. HCI vendors have been making a lot of claims across the IT spectrum, touting limitless scalability, dramatically lower total cost of ownership, decreased management costs and freedom from dependence on vendor lock-in over proprietary storage systems. The HCI premise has proven effective for a number of smaller applications – typically four- to eight-node clusters, but vendor claims of limitless HCI scalability merit a deeper look into just how much HCI is actually being used, and for what applications, as well as whether the platform is living up to some of the claims its vendors have been making.

HARDWARE CHOICES AND VENDOR OPTIONS

Regardless of the other issues surrounding the combination of SDS and virtualized server workloads on the same nodes, the simple truth is that HCI systems are not interchangeable. Even though the HCI nodes from Vendor A and Vendor B can be physically identical in every way, they are not compatible, and you can't mix nodes from different HCI vendors. This means that once a customer embarks on an HCI initiative, it arguably becomes equally, or perhaps even more, locked in to a single vendor than it was with the systems it is replacing. Software-based lock-in is no different than hardware-based lock-in.

HCI vendors play on the fact that their software-defined platforms can run on any x86 server, and most have established partnerships with key vendors to prove it. But as you drill down, that 'freedom from lock-in' they refer to is only superficial, because even though they may offer a limited variety of pre-certified server options from several vendors, the potential for lock-in simply moves to a different level. With one or two exceptions, the x86 servers used for HCI platforms are physically no different than any other server hardware, which leaves the underlying storage, virtualization and management software stack as the only real differentiator between an HCI node and a server already running virtualized workloads.

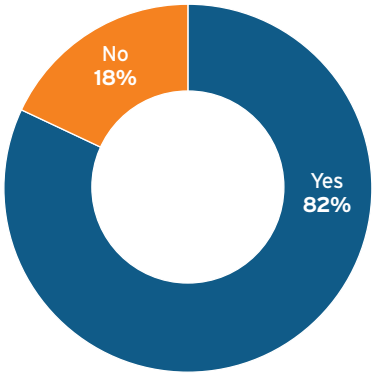
NETWORK CONSIDERATIONS

This is an area where classic architectures and HCI systems substantially diverge. The vast majority of classic SAN systems in use today are connected to client servers using a dedicated Fibre Channel storage network.

IN OUR POLL OF 100 ENTERPRISE CUSTOMERS THAT HAVE EVALUATED OR ADOPTED HCI, WE FOUND THAT 82% CURRENTLY USE A SEPARATE, DEDICATED NETWORK FOR STORAGE-SPECIFIC TRAFFIC (SEE FIGURE 8).

Figure 8: Dedicated Storage Network

Q: Does your existing external storage platform utilize a dedicated storage network? N=100



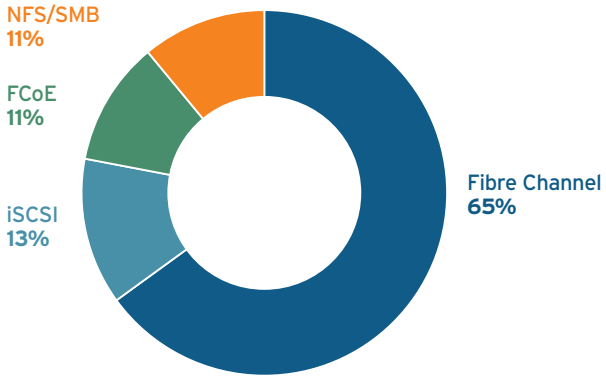
THIS SHOWS THAT MOST LARGE ENTERPRISES CONTINUE TO USE A SEPARATE, DEDICATED STORAGE NETWORK TO PROVIDE CONNECTIVITY BETWEEN A CENTRALIZED TIER ONE STORAGE SYSTEM AND ITS CLIENTS.

More importantly, all storage traffic between drives and controllers in a SAN system is further isolated from the client systems through the use of a low-latency internal network, so the only traffic running on the external storage network is dedicated to fulfilling client requests.

WHEN ASKED ABOUT THEIR STORAGE NETWORK PREFERENCES, 65% LISTED FIBRE CHANNEL AS THE PROTOCOL OF CHOICE (SEE FIGURE 9).

Figure 9: Network Protocol Preferences

Q: What is your preferred storage networking protocol? N=100

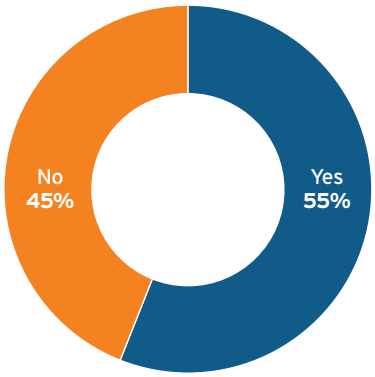


In contrast, HCI systems and their underlying storage software universally share a common Ethernet network for both east-west storage traffic between nodes and any IP-based traffic that's generated by the virtualized applications running on the same nodes. HCI systems consume internal disks in 'just a bunch of disks' (JBOD) form, which means that all the traffic for striping data across all the disks of a cluster in a distributed, node-based storage system is directed to the shared Ethernet network. As a rule, most HCI and SDS systems require a minimum of 10GbE connectivity, with some SDS vendors choosing to adopt 40GbE or faster interconnects between nodes based on the nature of the applications they serve.

OUR POLLING SHOWED THAT 55% OF THE COMPANIES THAT CHOSE TO ADOPT HCI/SDS ANTICIPATED THAT DOING SO WOULD NECESSITATE A SUBSTANTIAL REFRESH OR UPGRADE OF THEIR DATACENTER NETWORK (SEE FIGURE 10).

Figure 10: HCI/SDS Impact on Network

Q: Will the adoption of HCI/SDS require a data center network refresh/upgrade? N=56



Potential security and resilience issues aside, the use of a single shared network for storage striping between nodes and cluster-to-client and application-based IP network traffic eventually raises questions regarding network contention challenges at scale, and several vendors are already looking to develop load-balancing capabilities to address the challenges of managing both east-west storage and north-south application traffic. Some of this can be alleviated by the choice of network topology and clustering strategy, and network utilization should be a consideration when specifying a single network environment for all traffic as part of any mission-critical production environment.

SCALABILITY AND PERFORMANCE

SAN systems are based on a model where redundant controllers are used to control numerous disk chassis containing thousands of drives. Commonly called 'scale-up,' these systems are constrained by the processing power of the controllers, so scaling a SAN system once it's reached its maximum designed performance or drive capacity can involve upgrading the controllers themselves. But up until that maximum is reached, capacity is increased by simply adding more shelves of disks. In addition, SAN systems focus on delivering and protecting block-level LUN volumes, so there is no additional overhead needed to deliver file systems or other application interfaces.

Because of their modular, decentralized design, HCI systems take a substantially different approach to scalability and performance. Each independent node of an HCI platform is a fully capable x86 server, so compute performance and IO capabilities technically scale linearly with the addition of nodes to a given cluster. However, HCI platforms are limited to their embedded disk storage capacity, and by definition, the expansion of compute and storage must be scaled in lockstep on HCI systems because each node increment is based on a complete, disk-filled server as the sole option for storage expansion. This approach to compute/storage scalability has proven to be suitable for applications such as virtual desktop Infrastructure and some cloud environments where resource needs also tend to grow in a linear fashion, but that isn't always the case for enterprise datacenter workloads.

In a classic architecture where SAN storage is abstracted from compute, this is not an issue, so in response, some HCI vendors offer the option of a storage capacity expansion via a storage-only node based on the SDS platform of choice, but without the virtualization stack. Although this doesn't substantially reduce the hardware costs of a storage-only node, it does save on the virtualization software licensing fee. Of course, this doesn't work the same for scaling compute alone, so customers wishing to increase compute capacity must resort to buying nodes with limited physical disk installed.

On the surface, it seems easy to point to the linear scalability of HCI as a proof point for unlimited performance scalability, but the problem with making scale/performance comparisons between classic, tier one SAN and HCI lie in the fact that the platforms aren't actually equivalent, in spite of what vendors may say. The goal of tier one SAN storage is to provide extremely massive, highly available, highly protected centralized storage to a broad variety of systems in the form of block-level LUNS.

The goal of HCI storage is to provide a variety of generalized block, file and object-based services for an embedded compute platform, and they do so using an object-based core framework that offers a distributed back end and flexible front end. Of course, this comes at a cost in the form of storage processing overhead, so the question becomes: At what point does that overhead, combined with the resource needs of the additional virtualized workloads hosted on that same node, create potential bottlenecks caused by contention for CPU, memory and IO resources? That's difficult enough to calculate for a storage environment alone, much less when you add the unpredictable resource needs of a mixed set of virtualized workloads. Unfortunately, the HCI vendor community has been opposed to the release of third-party performance evaluations, so the only way to establish the capabilities and tipping point of an HCI infrastructure is to test it in a customer environment. This has yet to occur at an extremely large scale, much less with testing based on mixed enterprise workloads.

MANAGEMENT AND PERSONNEL-RELATED ISSUES

All things considered, management and personnel-related issues are probably the most subjective comparisons to make. So much of the cost of the management of an IT infrastructure is based on the capabilities of the personnel and how they're tasked. The trend of IT infrastructure is toward abstracted simplification, or 'cloud-like delivery' if you prefer. This is a global trend that has been underway for more than a decade, as opposed to the benefits provided by a single technology platform. It actually started with the movement toward virtualization and has progressed through the automation and orchestration capabilities forwarded by cloud and traditional IT vendors alike. The HCI vendors are enjoying the benefits of that movement.

One of the key claims of HCI is the operational simplicity it offers and how it can reduce management costs, so to get a real-world answer, we asked our respondents what impact they thought HCI would have on their staffing.

OUT OF THE 56 RESPONDENTS WHO CHOSE TO ANSWER, THE VAST MAJORITY BELIEVED THAT THE ADOPTION OF AN SDS/HCI SYSTEM WOULD EITHER CAUSE NO CHANGE OR WOULD CAUSE AN INCREASE IN THE NUMBER OF ADMINISTRATIVE STAFF REQUIRED (FIGURE 11) AND THEIR SKILLSETS (FIGURE 12).

Figure 11: HCI/SDS Impact on Staffing Numbers

Q: How will adopting HCI/SDS affect the number of storage administrators needed to support your enivornment? N=56

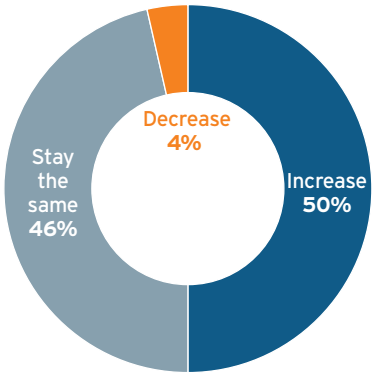
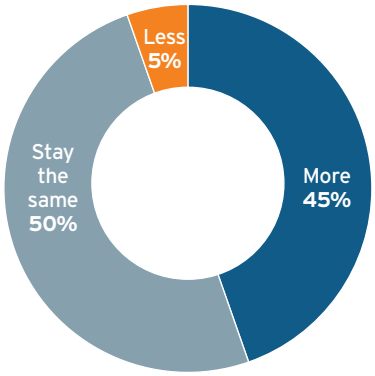


Figure 12: HCI/SDS Impact on Staff Skills

Q: How will adopting HCI/SDS affect the skill requirments of your storage admins? N=56

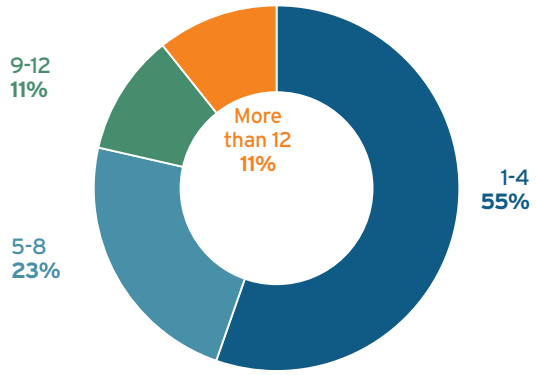


It wasn't within the scope of our study to explore the specific reasons why customers believed that HCI wouldn't reduce their IT staffing, but much of it may have to do with the fact that none of our respondents were proposing a large-scale adoption of HCI across the enterprise.

WHEN WE ASKED CUSTOMERS HOW MANY TOTAL NODES THEY PLANNED TO DEPLOY COMPANY-WIDE, 78% OF THE RESPONDENTS WERE LOOKING AT INSTALLATIONS OF EIGHT OR FEWER NODES (SEE FIGURE 13).

Figure 13: HCI/SDS Adopters – Total Node Deployment

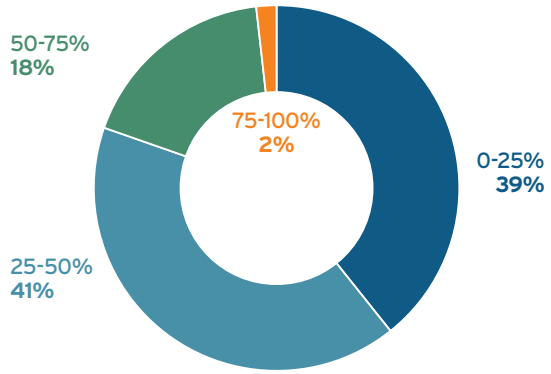
Q: How many HCI/SDS nodes do you plan to deploy in your company overall? N=56



In addition, 72% said less than half of the total nodes would be deployed in the datacenter (see Figure 14).

Figure 14: HCI/SDS Adopters – Datacenter Node Deployment

Q: What percentage of those HCI/SDS systems will be deployed in your data center? N=56



There's little doubt that the industry is looking for simplification overall, and although HCI systems have been designed from scratch to offer simplicity, classic IT vendors have also been working to improve their environments. Many of the challenges presented by the oldest legacy systems are no longer an issue, and the newest tier one SAN systems now offer many of the same simplification and automation capabilities as HCI while retaining the deep optimization and management capabilities needed to address a broad mix of primary storage requirements. The demand for automation and orchestration capabilities has touched every aspect of the enterprise IT market, and when it comes to evaluating the management needs of a given IT infrastructure, it's important to compare new to new, rather than new to old technology platforms.

Findings

THE FUTURE OF TIER ONE SAN TECHNOLOGY

Modern business is dependent more than ever on computer systems. This, by extension, means that the business data generated and used by those systems may now be the most valuable asset any company is challenged to protect. This means that 'Job One' of any primary, tier one storage system is the protection of data, and like the vault at Fort Knox, the modern SAN has evolved to provide a similar, titanium-clad level of data protection and availability. Along the way, technologies such as replication and snapshots were developed to improve, automate and refine the data-protection capabilities of the storage platforms that are expected to protect massive quantities of data and provide highly available access for very large groups of systems.

Of course, not all data merits this level of protection, but whether it is a small amount of database information or part of the massively growing amount of unstructured data in the form of documents, emails and media files, much of this data is still work product, so storing structured and unstructured data should still be considered a mission-critical task. The lines between tier one and tier two storage applications are shifting, and SDS and HCI platforms are proving to be an increasingly viable solution for storage applications that are continually moving further up the application ladder. However, the need for high-performance and dedicated tier one storage for mission-critical applications is unlikely to disappear in the foreseeable future.

It's always been very popular to attack tier one SAN technology, in part because it makes up the lion's share of data storage today, but also because of the odd belief that it's somehow easier and less complicated to reproduce SAN capabilities using a large collection of commodity hardware and software. Cheaper, perhaps, and maybe less cumbersome, but the one-size-fits-all approach doesn't necessarily stand up well for all applications. There is still a home for tier one SAN at the top of the storage ladder to protect the most critical workloads, as well as the largest and most complex systems of record. It's also important to note that both tier one SAN systems and Fibre Channel storage networking technology have been evolving in parallel with the rest of the IT industry to improve management simplicity, enable automation and increase performance across the board.

KEY CONSIDERATIONS FOR HCI EVALUATION

HCI systems and other next-generation, object-storage-based environments are gaining substantial popularity for several secondary storage use cases where rich metadata capabilities are becoming increasingly necessary for managing unstructured data. There are also a number of high-performance use cases where object-based SDS is a necessity for managing massive datasets, not to mention the fact that most cloud storage platforms from Amazon, Microsoft Azure and Google are based on object storage because it's the only storage platform that offers the immense scalability needed to handle trillions of files.

There are so many things right about the HCI model that there's no doubt it's going to continue to gain market share by leaps and bounds. HCI is a remarkably scalable modular platform that has incredible potential, but it's a mistake at this point to believe it's a universal solution for every IT need. Part of the problem lies in the assumption that because the technology has the potential for relatively unlimited scalability, it actually can deliver for every production context. This has yet to be demonstrated, in production, on anywhere near the scale of the thousands of nodes vendors say is theoretically possible. And scalability is only one of the concerns that customers have when it comes to making a massive adjustment to their infrastructure.

There are a number of perfectly reasonable issues that customers should address when it comes to adopting HCI. Concerns such as vendor lock-in, data protection and scalability are valid questions that must be satisfied in the context of a large-scale HCI initiative, and those answers can only be found by following the path of research, feasibility studies, testing and preproduction in a customer's environment. Another important step that we didn't add to the study is the importance of having an exit strategy so that there's a path to follow should things not work out as promised.

OPTIONS FOR HCI ADOPTION WITHIN AN EXISTING SAN INFRASTRUCTURE

As mentioned earlier, there are several excellent use cases for HCI in the large enterprise, but what's odd is the impression that it's somehow a binary decision. By and large, HCI systems are relatively self-contained, so there's no logical reason why they can't coexist in a larger IT context. The only real challenge is to work out a framework where HCI systems can communicate with existing tier one storage as needed and vice versa. This isn't really a huge problem to overcome, but unfortunately, there are some HCI and SDS vendors that are far more focused on the idea of killing and burying tier one SAN storage than they are in working together with classic infrastructure. When it comes right down to it, it's in the customer's best interest to put technical zealotry aside in favor of cooperation based on a realistic evaluation of all the complex factors that make up every IT infrastructure.

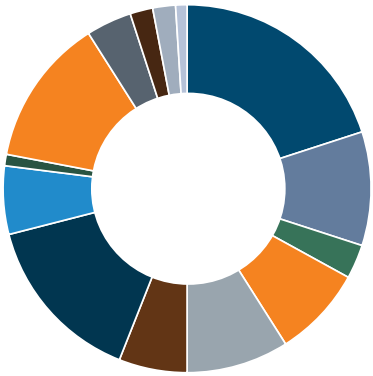
Appendix

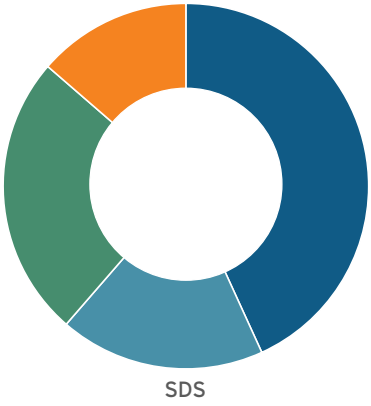
POLLING METHODOLOGY

This report is based on a custom survey conducted by 451 Research, mainly in August 2016. We carried out a telephone-based survey during which we posed about 25 questions to IT decision-makers about their requirements, their choices and practices, any use-case scenarios and deployment insights, and views about availability, scalability and performance. We discussed some of these issues further with five respondents.

We surveyed 100 professionals in selected markets around the globe, including the US, UK, France, Germany, India, Hong Kong, South Korea, Australia and South Africa, representing companies of 500-50,000+ employees, and sampled business organizations in multiple industrial verticals including financial services, manufacturing, technology and media, government, healthcare, and professional services.

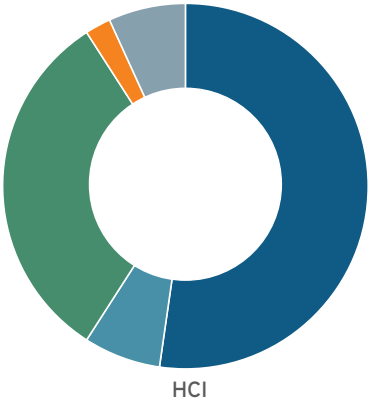
Demographic of Participants





- Initial research **43%**
- Feasibility studies **18%**
- In-house testing **25%**
- Vendor proposing **14%**
- Pre-Production **0%**

SDS



- Initial research **52%**
- Feasibility studies **7%**
- In-house testing **32%**
- Vendor proposing **2%**
- Pre-Production **7%**

HCI

- Up to $50M, **8%**
- $51M-$99.9M, **11%**
- $100M-$249.9M, **20%**
- $250M-$499.9M, **8%**
- $500M-$999.9M, **9%**
- $1B-$4.9B, **7%**
- $5B-$9.9B, **20%**
- >$10B, **15%**