Technology Showcase

Storage Architecture Considerations: SAN & HCI

Date: June 2018 **Author:** Scott Sinclair, Senior Analyst

Abstract: The emergence of hyperconverged infrastructure (HCI) offers an alternative to established storage area networks (SAN) prevalent in data center environments. By consolidating multiple IT elements—compute, virtualization, networking, and storage—into a single system, organizations can gain opportunities to simplify, but new challenges can arise as well. A modern data center will likely feature multiple architectures; however, the impact of the architectural differences should be considered prior to deciding between HCI and SAN architectures.

Introduction

The IT vendor community has responded to the increase in IT demands with new and more diverse innovation. As each innovation offers its own set of benefits, the resulting increase in consumer choice can also add complexity. IT decision makers want to select the best option for their business, balancing the need for greater performance and scale while staying within budgets. As a result, selecting the right technology for your specific organization and workload set requires not only an understanding of each new innovation but how those innovations compare to the existing IT landscape.

One example of this phenomena is the emergence of hyperconverged infrastructure (HCI) as an alternative to the more prevalent storage area network (SAN) architectures. HCI solutions often integrate compute, virtualization, and data storage into a single system that leverages a scale-out architecture. The resulting consolidation can deliver some advantages but those advantages can also introduce tradeoffs.

Infrastructure Considerations

In order to better understand the drivers and challenges associated with HCI technology, ESG surveyed 324 IT professionals currently responsible for their organization's on-premises infrastructure.[1] To participate, respondents' organizations had to have deployed or had imminent plans to deploy converged and/or hyperconverged infrastructure technology

As part of this study, participants that had deployed HCI were asked to identify the expectations that contributed to their purchase decision. When these expectations are reviewed, a theme of simplicity emerges. For example, the most commonly identified expectations that contributed to a HCI purchase decision were improved scalability (31%), improved TCO (28%), ease of deployment (26%), and simplified systems management (24%), with increased agility in virtual machine provisioning, simplified storage management, and speed of deployment tied at 22%.

These factors align with the core premise of HCI: by consolidating multiple infrastructure elements into a single system, managing the infrastructure becomes less complicated. It can also become easier to scale since IT organizations can scale

[1] Source: ESG Master Survey Results, *Converged and Hyperconverged Infrastructure Trends*, October 2017. All other ESG research references and charts in this technology showcase have been taken from the master survey results set.

by simply adding another HCI node to the cluster to scale compute and storage. As a result, deployments are expedited and simplified with less infrastructure to manage.

Concerns When Evaluating HCI

To fully understand the implications of HCI, it is important to review not just the organizations that chose to deploy it, but also the concerns that led others to go in a different direction. As part of the study into HCI trends, ESG asked IT decision makers who had not deployed HCI to identify their concerns with the technology. The concern that non-adopters most commonly identified with HCI was cost (32%).

While this may seem to conflict with data from the previous section, where 28% of HCI users identified improved TCO as a factor in the decision to select HCI, it is important to remember that the specific application of the technology and organizational requirements play a large role in whether a specific technology delivers cost improvements. For example, if an IT organization needs to simply scale capacity without scaling compute, a SAN architecture allows for the purchase of only the component needed. If the organization already has a SAN in place, expanding existing investments can also be more cost-effective then switching to an entirely new architecture. In other words, some firms may be able to improve TCO with HCI's architecture, while others may see costs increase with HCI.

Similar organizational considerations also can influence whether other HCI expectations come to fruition. On the potential to improve scalability, for example, the consolidated architecture common to HCI, where compute is deployed with capacity, can lead to inefficiencies if demands for compute or capacity scale independently or in a ratio other than what is offered by the vendor. Similarly, expected simplicity benefits from HCI are all tied to the specific IT skills present within an organization. If an organization already has SAN expertise in place, then extending the existing infrastructure would likely be more familiar, easier, and faster to deploy than re-architecting with something unfamiliar.

Other commonly identified concerns with HCI related to being locked into a specific vendor or configuration, with 24% selecting vendor "lock-in" as a top concern, and the potential inefficiency of the resulting HCI solution. With HCI, "lock-in" concerns can apply to multiple architectural elements. The consolidated architecture of HCI often limits and, in some cases, can inhibit the ability to share infrastructure components between different management environments. In addition, some HCI vendors do not permit the mixing of multiple hypervisors in the same environment, limiting the options available in future architecture decisions. Concerns with possible HCI inefficiencies included lack of flexibility when scaling (19%), lack of configuration flexibility (17%), and inefficient use of storage (13%).

HCI Challenges and Considerations after Deployment

After the purchase decision has been made, additional challenges or concerns can arise. Study participants with HCI deployments were asked to identify the challenges their IT organization experienced with the technology (see Figure 1). While no solution is free of at least some challenges, these responses shed some light on additional HCI factors to consider. The list of HCI challenges encountered post deployment align with a couple of high-level themes: inherent challenges associated with consolidation of storage and compute, and challenges associated with scaling that consolidated infrastructure.

Inherent Challenge of Consolidation

Consolidation can increase simplicity, but it can also make managing the individual elements more difficult. For example, the most commonly identified challenge with HCI environments was difficulty finding the root cause of issues (20%). Additionally, changes to individual components can impact other elements in the system, as increased downtime due to upgrades of the virtualization software was identified by 18% of participants. Other challenges, such as the inefficient use of storage media (17%) and lack of configuration flexibility (13%), could also be considered inherent to the consolidated

design of HCI. When simplicity is delivered with fewer options, the IT organization has fewer options with which to optimize the environment.

Challenges Scaling Consolidated Compute and Storage

Just as consolidation can obscure elements, scaling a consolidated architecture such as HCI can introduce new concerns. For example, the second most commonly identified HCI challenge was related to performance issues around data locality (19%). When new HCI nodes are added to a cluster, data on the storage may not always closely reside near the corresponding application, resulting in increased latency. Different HCI solutions attempt to mitigate this challenge in different ways, but the performance impact was still identified by nearly one in five respondents. Additionally, 18% of respondents identified the need to upgrade the network infrastructure to accommodate increased traffic as a challenge. As HCI environments scale, more data moves back and forth across the interconnects, including not just data traffic but control traffic as well, to ensure that the data stores stay aligned with their corresponding virtual machines as the environment evolves.

Security Considerations

As with any security-related technology consideration, it must be understood that there are multiple aspects to an effective cybersecurity strategy. Both HCI and SAN architectures can deliver a secure environment for data storage and be part of an effective multi-layer data security approach. For organizations familiar with Fibre Channel SAN, however, there are some security-related differences with an HCI-based architecture that should be understood prior to making a switch.

- Scope of Data Access: In an external storage architecture, more specifically with a Fibre Channel SAN, each host is only allowed access to the specific data volume or LUN assigned to it. Any malicious attack to that host is isolated from the remaining data by a separate layer of protection, either at the storage, or the storage network, or both. With HCI architectures, each physical host has visibility to all the storage within the cluster, increasing the amount of data that could be exposed in the event of an attack. This difference relates to the cybersecurity best practice of least privileged access control by segmenting the data.

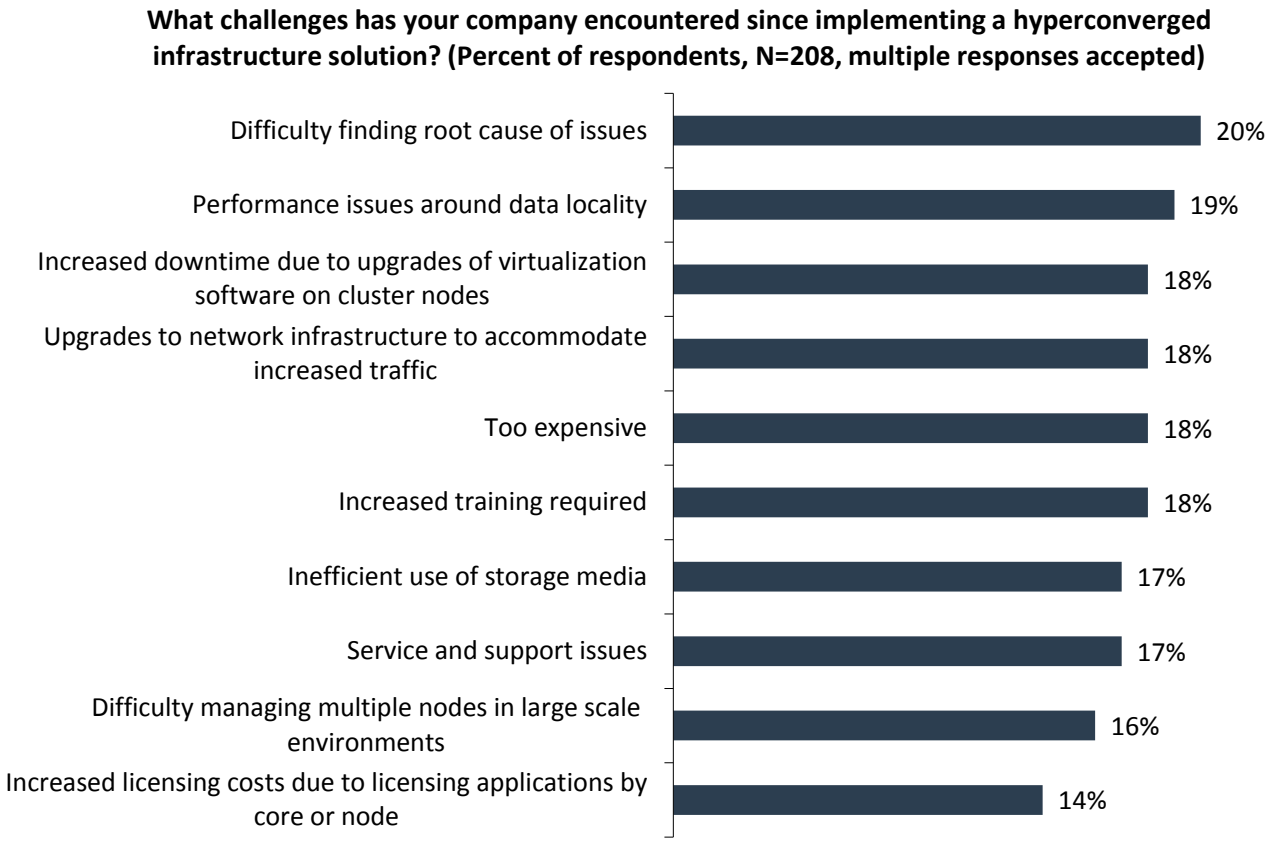
- Employee Accessibility: In the typical IT organization models, a larger number of individuals has access to the server nodes, such as the server team, the hypervisor team, or the network teams, than the external storage array. A shift to an HCI architecture increases the number of employees who have access to the entire data storage pool.

- Visibility into the Storage Area Network: External storage architectures can leverage the monitoring features inherent in some Fibre Channel switch technologies, such as those from Brocade, to monitor for possible rogue activity. For example, Brocade's MAPS feature can monitor for specific fabric and switch events and then generate an SNMP trap or send an email alert to administrators. This feature can be used to monitor specific security events such as unsuccessful login attempts, device access control policy, and other ACL policy violations.

- Common Versus Isolated Network: HCI architectures often feature a common network, typically Ethernet, for both data plane and control plane communication. This common architecture can increase the likelihood of a rogue host accessing adjacent neighbor hosts and subsequently gaining access to the data plane communication. Networking best practices can mitigate this risk. However, having a separate air-gapped network, such as with Fibre Channel, can help to even further mitigate the risk.

The introduction of new architectures can often create ripple effects regarding data security. Elements that were once considered secure can introduce new considerations or risks to monitor when altered. Both HCI and SAN architectures can be part of an effective data security strategy, but it is important to understand how the security landscape changes with an architectural shift.

Figure 1. Top Ten Challenges Encountered Since Implementing HCI



Source: Enterprise Strategy Group

The Bigger Truth

There is no one single infrastructure option that is ideal for every IT environment and workload. The variety of innovations offers new benefits to enjoy while simultaneously introducing new tradeoffs to consider. HCI offers simplicity with its consolidated architecture, but that same consolidation can create concerns with infrastructure efficiency and issue isolation and introduce new considerations with data security.

The factors that determine the right IT solution likely extend beyond the products and include the specific attributes of the particular IT organization making the decision. A likely deciding factor may be that organizations with skilled storage organizations trust in their abilities to achieve higher optimization and greater efficiency with SAN architectures. IT organizations that have shortages in enterprise storage skills may leverage HCI as a means to compensate for that lack of expertise through greater simplicity, despite the fact that the solution may possibly result in a less efficient architecture. Ultimately, each technology has benefits and tradeoffs, and it is important to know both prior to making a decision.