CONVERGED VS HYPER-CONVERGED INFRASTRUCTURE

Converged Infrastructure 101

As a result of ongoing technology evolution, demand for a new type of hardware has reached a fever pitch. Today's businesses want IT to have fewer moving parts while offering the same or even expanded resources to users. This has resulted in a shift away from a one-to-one relationship between physical servers and storage towards a many-to-one relationship between virtual machines and a single-storage controller. One major complication is that virtualizing workloads prompts increased storage capacity requirements, which leads to an enormous volume of redundant data. Needless to say, this conundrum results in lots of wasted time, wasted effort, redundant work and other issues. Fortunately, converged infrastructure has emerged as a viable solution. But even within that solution, multiple options and approaches exist.

What is Converged Infrastructure?

Converged infrastructure, or CI, is an approach to data center management that aims to minimize compatibility issues between storage systems, servers and network devices. At the same time, it seeks to reduce costs that are associated with floor space, cooling, cabling and power. CI combines storage and compute into a single physical appliance that is small, dynamic and powerful. This approach brings many benefits to the table, including reduced costs of deployment, simplified management and reduced maintenance and support costs.

To gain a clearer understanding of CI, it is helpful to consider the differences between converged storage, unified architecture, CI itself and hyper- or ultra-converged infrastructure:

- Converged Storage - Traditional storage typically involves a controller and a rack of shelves with SSD or HDD arrays. Converged storage consolidates these components into a node-based storage platform that offers exceptional redundancy. Everything is included in a single box, and it can be scaled out by adding more nodes as the need arises. Converged storage solutions are available in a wide range of sizes, and they may be all flash or may include hybrid arrays. This option makes sense when an organization already has a network and compute platform but would like to deploy different types of storage for sets or virtual machines, or VMs. Rather than adding a new shelf, this option allows an organization to offload the workload to a converged storage system and ensures that it has a viable data storage solution for the foreseeable future. There are many advantages to this solution, including better integration, easier management and lower costs.
- Unified Architecture - With unified architecture, compute, network and storage are typically still separate components. However, they are all directly connected via a fabric backplane. This option makes sense for organizations that need to deploy data center platforms that use the same vendor across multiple hardware technologies. It also enhances security considerably. With all of that being said, unified architecture tends to be fairly pricey, so cost is definitely

something to consider in this situation.

- CI - Now, with CI, compute and storage are combined into a single physical appliance. Networking is important to an extent and is typically accomplished via the hypervisor, which means that no actual pieces of networking hardware are needed. As opposed to virtual architecture, CI is almost always made up of just storage and compute. This approach allows organizations to integrate with abstract services and hypervisor technologies as they integrate with underlying physical architecture. There are many advantages to taking this approach. Organizations can save time on deployment, enjoy reduced costs of deployment and can simplify overall management through the unification of data center controls.
- Hyper Converged Infrastructure - Also known as ultra-converged infrastructure, hyper converged infrastructure, or HCI, is widely regarded as being the future of data center design. With this approach, software controls all of the resources that are atop the hypervisor. This software perspective approach has allowed new data center concepts to emerge. HCI systems can be deployed on any kind of hypervisor and on any piece of hardware through virtual machine translation technologies and APIs. Organizations can create their own CI platforms by deploying overlying software that allows them to manage compute and storage. As an added bonus, if a second location is running a different hypervisor, convergence software is capable of translating virtual machines from one hypervisor to the other--the underlying hardware requirements just need to be met. What's more is that through APIs, an organization can integrate further with public cloud components, extend their data center beyond private architecture and integrate with other hypervisors. From there, an organization can integrate orchestration and automation controls across platforms to achieve a next-generation cloud and data center model.

CI Implementation Options

There are a few different ways to implement CI:

- CI Reference Architecture Approach - With this approach, the vendor supplies the customer with pre-tested recommendations about how to use hardware components in their data center to meet requirements for specific workloads.
- IT Appliance Approach - With this option, the vendor supplies the customer with a single box that includes a tightly integrated combination of storage, compute, virtualization and networking resources from the vendor and, in some cases, the vendor's partners. This approach offers horizontal scalability in that additional appliances can be added as the need arises.
- Hyper-Convergence Approach - In this scenario, the vendor abstracts networking, compute and storage resources from the physical hardware. Virtualization software is bundled with their CI offerings. In many instances, the vendor also provides additional functionality for disaster recovery and cloud bursting. This allows the admins to manage the virtual and physical infrastructure in a federated manner via a single pane of glass.

Converged Infrastructure vs Hyper-Converged Infrastructure

For all intents and purposes, the easiest way to distinguish CI from HCI is that the former has a hardware-focused, building-block approach while the latter has a software-defined approach.

CI consists of building blocks. Each of the components in one of these building blocks is discrete

and can be used on its own for its intended purpose. In other words, for instance, the server can be separated and used strictly as a server.

In contrast, with HCI, the technology is software-defined. All of the technology is completely integrated, which means that it cannot be broken down into separate components.

Non-Converged Architecture vs. Converged Architecture vs. Hyper-Converged Architecture

To gain an even clearer understanding of the nuances between the various technologies, it is helpful to consider the key differences between non-converged architecture, converged architecture and hyper-converged infrastructure.

With non-converged architecture, physical servers operate a virtualization hypervisor that manages each of the virtual machines that have been created on the server. For data storage, there are typically three options: a storage-area network, or SAN; direct-attached storage, or DAS; and network-attached storage, or NAS.

By contrast, with converged architecture, storage is attached directly to the physical server. In this instance, flash storage is almost always used.

Finally, hyper-converged infrastructure has a storage controller function that runs as a service on every node in the cluster, which is why this is classified as software-defined storage. Most commonly, important data that needs to be accessed quickly is kept local while less crucial data is stored on the actual servers.

Advantages of Converged Infratstructure

When the top advantages of CI are considered, it is easy to see why so many organizations are adopting this technology. A few of the most compelling benefits of CI include:

- Plug and Play - CI is basically a plug-and-play solution. It is made up of standalone components that can be decoupled from the infrastructure and used separately. Individual blocks can literally be snapped together. Doing things this way is almost always cheaper than going the a la carte route.
- Reduced Support and Maintenance Costs - Because CI reduces redundancy so well, maintenance and support costs are dramatically reduced. IT specialists don't have as many repetitive tasks to perform to keep the system up and running, and this saves the organization a lot of money.
- Improved Agility and Efficiency - With CI, IT components are consolidated into a single, optimized platform with centralized management. This results in improved agility and efficiency. It also helps to reduce costs and increase utilization.
- Eliminate Compatibility Issues - Because everything is supplied by a single vendor--and, sometimes, the vendor's partners--compatibility issues are handily eliminated. This is yet another example of how CI helps to keep costs in check and helps to streamline the management of data centers.
- Streamlined Purchasing, Deployment and Use - Since all components are housed in a single box, purchasing, deploying and using CI is incredibly streamlined when compared with traditional, non-converged architectural environments.

- Eliminate Silos - Another advantage of CI is that it eliminates silos of technology, processes and people. Such silos are largely why data center management has traditionally been convoluted and difficult, this this represents a big step forward.
- On-Demand Growth Model - CI allows organizations to design, build and maintain specific segments of a virtualization stack while supporting an on-demand growth model. In the world of business, having the ability to quickly and effortlessly build upon data center needs is huge.

Evolution of CI Technology

Without question, CI represented a major breakthrough in the world of data center management. Like anything else in the technology world, however, it is constantly evolving and being improved upon. The next generation of CI pulls together compute, SAN and storage functionality into modular appliances that are based on commodity x86 hardware. This hardware can be scaled out by adding additional appliance nodes. It is also a single-vendor solution, which dramatically reduces acquisition costs and streamlines deployment.

This brings us to the subsequent generation, which is being developed now and is evident in HCI. HCI offers, by far, the best value for a very simple reason: Its design, delivery and support are all delivered by a single vendor.

Top Advantages of HCI

A basic description and explanation of HCI has already been provided. To understand the technology more fully, it is helpful to consider the many advantages that it brings to the table:

- Reduces operational expenses while also reducing or correcting interoperability and complexity issues.
- Offers streamlined acquisition, deployment, support and management of the solution, which reduces costs, increases productivity of staff and even improves profitability.
- Does away with the need for discrete IT components. This means that there are fewer moving parts which, of course, also means that there are fewer opportunities for hardware issues to arise. All IT services and infrastructure are combined below the hypervisor within a single, shared pool of x86 resources.
- Produces an environment that decreases costs. This enables cloud-level economics.
- Provides a scalable, building-block approach that can be easily expanded by adding additional units.
- Allows for the centralized management of virtual environments globally via a single interface, which helps to cut down on the amount of work that is needed to maintain the system and, therefore, increases productivity.
- Allows for an extremely efficient use of resources by: saving IOPS; eliminating duplicate services and devices; and offloading intensive processing from x86 processors, ensuring that maximum CPU resources are available at all times.
- Produces greater mobility by shifting management over to apps and virtual machines.
- Eliminates the need for third-party replication and backup software and hardware and third-party backup specialists because of virtual machine level backups and the replication of backup data between sites.
- Reduces the total cost of ownership.
- Enables rapid application deployment.

- Reduces the risk of over-provisioning and over-purchasing.
- Cuts down on labor-intensive activities.

When Does CI Make Sense?

Like anything that is IT-related, CI makes sense in many situations but may not be the right option in many others. Organizations that are interested in CI should weigh its benefits and gain a clear understanding of what is involved before "taking the plunge."

A few examples of situations in which CI is likely to be the ideal option include:

- When deploying new tier-one applications or when virtualizing applications
- When managing remote or branch office, or ROBO, infrastructure
- When managing remote disaster recovery sites
- When engaging in data center consolidation, whether within data centers or across them
- When implementing virtual desktop infrastructure, or VDI
- When performing data migration within sites or across them
- When testing or developing infrastructure

The above list is by no means comprehensive. Also, it is important to point out that many organizations would benefit even more from HCI.

The Bottom Line on CI

The simplest way to think of CI is as follows: Storage management in CI systems is processed as an application. This results in a converged, unified platform. The costs associated with CI vary depending on a variety of factors. Many organizations realize significant savings by adopting HCI, as the storage controller is the software service, which eliminates the need for costly NAS and SAN hardware. Therefore, when deciding which solution to use, an organization must determine what its overall goals are and how much cost savings come into play. Further, this technology continues to evolve and improve, so there will doubtlessly be yet another generation available in the not-too-distant future.

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