



Study of Converged Infrastructure & Hyper Converge Infrastructre As Future of Data Centre

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Abstract: Conventional approaches to IT cannot accommodate the business agility, which are challenged to accomplish. Businesses must transform their infrastructure-centric service delivery model to meet the rising expectations of business and extended ecosystem. Converged systems are rapidly gaining acceptance as a way to improve overall business agility and the productivity of IT staff and increase the quality and speed of services delivered to clients. This paper studies about Converge Infrastructure (CI), Hyper Converge Infrastructure (HCI) & about Virtual Data Centers. This paper provides information about CI & HCI, which seems to solve many provisioning problems and act as little islands of capability for ERP, SharePoint, VDI & also act platform for utility computing, grid computing, shared services, SOA or the cloud.

Keywords: CI, HCI, SDS, SDN, SDDC, VDI, Hypervisor, Private Cloud.

I. WHAT IS CONVERGED INFRASTRUCTURE (CI)?

CI brings compute, data storage devices, networking equipment, software for IT infrastructure management, automation, orchestration and server virtualization into a single chassis that you can manage centrally. Various terms used to describe CI are "converged system", "unified computing", "fabric-based computing", "dynamic infrastructure", "Infrastructure 2.0" and "Next Generation Data Center" etc. The combination of storage and compute into a single entity is known as converged storage [9]. CI projected \$402B total available market by 2017 of which, nearly 2/3rds of the infrastructure that supports enterprise applications will be packaged in some type of converged solution by 2017 [3].

The high level of virtualization and flexibility found in CI deployments is often a precursor to private cloud deployments or even some type of software-defined data center. The hardware you get in your CI bundle is pre-configured to run whatever workload you buy it for. The pieces of your CI bundle can also stand independently [4]. A server you purchase in a CI bundle functions just fine without the other infrastructure components. CI are built by discrete components (server, switch and storage) each has their own package of hardware and software. Every component is managed and scaled independently- Multiple administration layers. Lots of competence is required to manage all bits and pieces [8].

II. BENEFITS OF CI

1. Used to centralize the management of IT resources, to consolidate systems, to increase resource-utilization rates, and to lower costs.
2. Implements pools of computers, storage and networking resources that can be shared by multiple applications and managed centrally using policy-driven processes [12].
3. Addresses the problem of siloed architectures and IT sprawl.
4. Provides both technical and business efficiencies & contributes to efficient data centers.

5. Enhance the ability of cloud computing systems to handle enormous data sets, using only a single integrated IT management system [6].
6. Helps to transform the economics of running the datacenter & accelerating the transition to IP storage.
7. Lower capital expenses resulting from higher utilization, less cabling, and fewer network connections & lower operating costs resulting from reduced labor via automated data center management and a consolidating storage and network management infrastructure teams [1].
8. Increased IT agility by virtualizing IP and Fibre Channel storage networking allowing for single console management.
9. Provide environment for making clear distribution of responsibilities.
10. Provides enhanced time to production and a potential for cost savings.
11. Energy savings. Reduced power consumption for operation and cooling.
12. Greater opportunities for datacenter automation.

III. NEED FOR CI

1. Data centers around the world are reaching limits in power, cooling and space [11]. At the same time, capital constraints are requiring organizations to rethink data center strategy. CI offers a solution to these challenges.
2. Serve as an enabling platform for private and public cloud computing services, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) offerings, which is very much necessary for building infrastructures that are "cloud-ready" [5].
3. Has the ability to pool IT resources, which is needed to automate resource provisioning and to scale up and down capacity quickly to meet the needs of dynamic computing workloads.
4. "nodes" and "links", which act as fabrics which is the building block for Fabric computing.

- Act as platform like the Azure Services Platform and grid computing.

IV. HYPER CONVERGED INFRASTRUCTURE (HCI)

Hyper convergence is a further development of the concepts and architectures that have emerged for CI. This involves complete products in which servers, storage and network functions are accommodated in a single unit – a kind of “all-in-one” solution. Since all components are combined in a single chassis. The chassis is a standard PC server with built in storage of different flavors. All functionality is built in a software layer that covers not only storage and data management functionality but can also run the virtual server instance [8].

HCI consist of a number of standard PC server with a software layer installed on top to aggregate the combined storage resources for all the chassis. On the same PC the hypervisor and its management tool is normally installed. There is only one administration point, The Hypervisor. Hypervisor software is used to focus fully on server virtualization [16]. A HCI can replace a number of different separate products: servers, storage devices for various levels (disk, SSD, backup), control devices for storage networks (SAN), load balancers, WAN optimization, etc [2]. HCI also called as Hyper-Converged Integrated System (HCIS).

V. BENEFITS OF HCI

- Support common data center availability and reliability requirements, infrastructure is managed and workloads are deployed through a single interface to the underlying operating hardware [14].

- The most popular method for acquiring the version of software defined storage (SDS).
- Companies no longer need to rely [15] on different compute and storage systems.
- Simplify management and increase resource-utilization.
- Helps in switching physical PCs to virtual desktops, because it often comes with a lot of flash, which is great for virtual desktop performance.
- Make it easier to support virtual desktop infrastructures (VDI) and desktop virtualization.
- Improves I/O, reduces the effects of boot storms, and lets you run virus and other scans in the background without users ever knowing.

VI. CI VS HCI

- CI brings the four core aspects of a data center compute, storage, networking and server virtualization into a single chassis while HCI adds tighter integration between more components through software.
- Individual components of storage, compute, and networking controlled by single software architecture, whereas in CI individual components have their own controlling software.
- CI is mainly hardware-focused, and the software-defined data center (SDDC) is usually hardware-agnostic; HCI combines these two aspects.
- HCI is suitable for more workloads than CI.

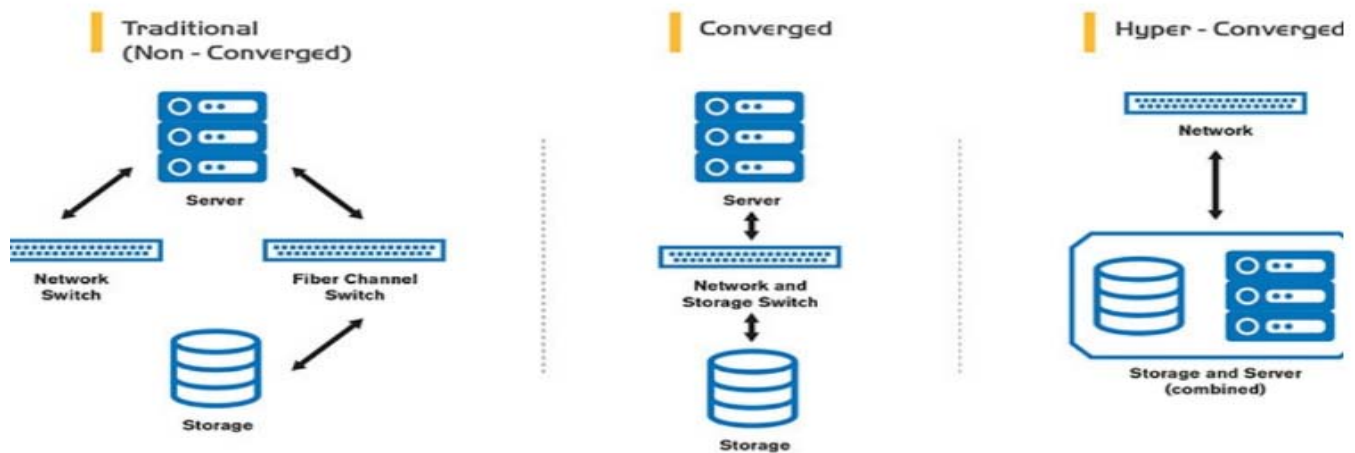


Fig 1: Comparison between Non-Converged, Converged & Hyper Converge Infrastructure [10].

VII. CI - THE FUTURE OF DATA CENTRE

CI has proven itself a powerful option for the modern data center. CI can potentially provide a more robust, flexible and better-managed high-performance virtualized infrastructure than typical heterogeneous data centers. CI is highly disruptive it replaces the existing data center infrastructure as well as the investment made in that existing infrastructure, software licenses and service agreements [17].

Few organizations are willing to throw away the major capital invested in a current data center in favor of an entirely new platform, they are finding out CI as a good alternate.

Nowadays, the trend is moving towards a fully virtualised environment in which even storage and networks are controlled by means of software. New concepts came into the scenario like SDS (Software-Defined Storage), SDN (Software-Defined Networking) and SDDC (Software-Defined Datacentre). HCI are often described as fully virtualised and given the SDD label [18]. In IT networking, siloed legacy infrastructure that takes time to manage, requires multiple teams to provision and deploy, and eats up too much power, sunk costs and scarce budgets. Virtualization and automation were supposed to relieve some of this burden. This is where CI comes into play [19] CI Breaks Down or Builds Silos.

Businesses need today applications and services faster to meet the demands placed by the cloud, big data, BYOD, ERP, CRM, BPM and so on.

Virtualization and cloud were going to accomplish much of the same thing. Private clouds are often isolated into single racks by hardwired data center infrastructures. CI seems to solve many provisioning problems and act as little islands of capability for ERP, SharePoint or VDI. CI sounds a little like utility computing, grid computing, shared services, SOA or the cloud. CI at its core eliminates the busywork of provisioning

servers, SAN, LAN and applications, which takes multiple teams of people, and replaces it with plug-and-play options that come ready to go out of the box. Next generation datacenter infrastructure - Convergence and hyper convergence are shaping the IT infrastructure of tomorrow. With CI & HCI the functions are by definition all made in software and build a scale out architecture based on commodity hardware. This is a key trend in the datacenters and described as software defined datacenters.

**Please indicate your organization’s usage of or plans for converged technology solutions.
(Percent of respondents, N=308)**

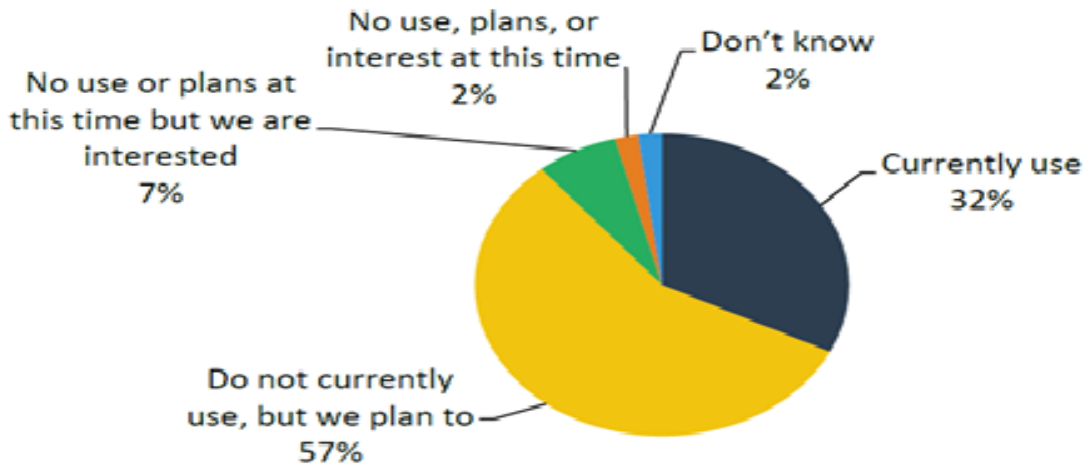


Fig 2 : Usage of Converged computing Platforms [20]

VIII. LIMITATIONS OF CI

CI platforms can bring greater efficiency in IT operation and systems management, but the technology is highly disruptive and may not fully interoperate with existing data centers. CI deployments should be clearly justified with a return on investment analysis and vetted with a thorough proof-of-principle project. In addition, organizations can reduce the potential for future disruption by evaluating the CI vendor’s product roadmap against anticipated computing needs. If the case for CI is simply too weak, organizations should stay with a more traditional data center model [17].

When a foreign device is connected to CI, a new heterogeneous situation occurs which can result in reduced performance, poor management insight or other interoperability problems. When CI get added to an existing data center environment as a platform for a private cloud, then CI usually exists as an island of infrastructure with its own unique management tools and standards of performance. Any existing infrastructure left to continue operating as it had previously, along with any other management tools. Supporting two “different” environments in this manner can pose a great deal of additional work for IT staff.

IX. CONVERGED ARCHITECTURE

Flash storage can play a significant role in any converged infrastructure architecture. Since most converged architectures support a high number of virtual machines

(VMs) per host, the primary role of flash is to allow the architecture to deal with the random I/O storms these environments can create [21]. For most of the bundled solutions, flash storage is simply a tier on the shared storage system. Some of the more customized solutions leverage the fact that they are server-side and ensure the data for each VM is stored on a flash storage area inside the host the VM is running on. That approach not only provides flash-based access to data, but it does so locally, thus eliminating network latency. Reference architectures for CI provide the opportunity to combine equipment of different makes and offer enormous scope in terms of capacity and performance, as well as several options in terms of manufacturer and product.

X. THE PLAYERS

The global HCI market will grow up to 71.6% until 2018. HCI products will go from being 3.5% of the overall CI market to 11.5% in 2018 [7]. Some of the most popular hyper-converged offerings (Reference architectures) are [8]

1. HPE OneView from HP features a next-generation multi-convergence approach where converged systems, hyper-converged systems and converged infrastructure are supported by a common software-defined management platform.
2. VCE has developed the reference architecture Vblock, where complete CI “stacks” are built up with storage from EMC, servers and network functions from Cisco and a hypervisor from VMware.

3. FlexPod is reference architecture for converged systems, with hardware from Cisco and NetApp.
4. EMC has the reference architecture VSPEX for CI. VSPEX forms the foundation for pretested and validated systems aimed at small and medium-sized organisations.
5. Hitachi Data Systems (HDS) has collated its CI in its Unified Compute Platform (UCP).

XI. CONCLUSION

IT executives are increasingly considering CI as an efficient way to increase their business agility. CI on-demand IT infrastructure and cite increased business agility, IT staff productivity, operational efficiency, and faster time to value. CI also provides greater simplicity reduces operations expenditures (OPEX) and risk and increases business agility. But how can this be achieved while reducing the costs and risks? In fact, IDC forecasts the converged systems market will grow at a five-year compound annual growth rate (CAGR) of 19.6 percent to \$17.9 billion USD in 2018, up from a value of \$7.3 billion USD in 2013 [13]. CI are capable for to deliver key benefits both as a replacement for legacy systems and as a foundation for emerging private cloud. With intent to improve the condition of business operations, many organizations are looking out for new solutions that can help them reform. While we do have a host of other IT alternatives, public cloud and hyperconverged infrastructure stands out among the rest and still remains to be the most viable technologies. However, it ultimately comes down to IT professionals on deciding between the two prevailing data center concepts [10].

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