Using Converged and Hyper-Converged Infrastructure to Support VDI

Get to know the facts about using converged and hyper-converged infrastructure to support virtual desktops and learn what HCI vendors have to offer.
Decisions, Decisions

Converged and Hyper-Converged infrastructure vendors tout their products as the solution to VDI problems, but companies have to decide whether to go with CI or HCI, and then pick a vendor.

There are several reasons converged and hyper-converged infrastructure could be the right choice for companies looking to deploy virtual desktops. With both options, all the infrastructure components come from the same vendor, so companies can rest assured that they’ll work together—and there’s one throat to choke when something goes wrong. Hyper-converged platforms offer tightly integrated storage, networking and compute that are software-defined and tailored to run virtualization workloads. They also come with a management interface that can help IT administrators deploy, control and troubleshoot virtual desktops. All these advantages make it fast and easy to deploy VDI, and shops can add more components as their deployments grow.

There are a lot of moving parts to consider and options to weigh. Deciding whether to deploy HCI goes beyond the question of use case. Companies must also consider which vendor to buy from. Nutanix, SimpliVity and VMware are the major players today, but the market is poised for growth and the vendors all offer different packages. Get started with the decision making process with this three-part guide to converged and hyper-converged infrastructure for VDI.

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Converged and Hyper-Converged Infrastructure Basics

**Deploying VDI is** complex, and it brings both cost and risk to IT departments. One way to reduce the risk is to use converged infrastructure or hyper-converged infrastructure. Both CI and HCI aim to simplify the infrastructure layer and allow simple, size-based platform selection. But they simplify things differently and are useful in different situations.

Converged infrastructure packages existing technologies: a set of servers, some network switches, a storage array and a storage network. These are the same parts you can buy from a catalog, but when you buy CI, the parts are chosen for you. The CI vendor specifies every part and configuration option, and validates the collection of components, firmware, software and settings. The CI vendor even assembles the hardware into a rack and delivers a working virtualization platform to your site.

CI removes the uncertainty of building a virtualization platform and turns it into a single line item to purchase. Companies typically choose CI systems based on capacity. For VDI, that is the number of light load users the platform can host. Usual CI sizes are medium, large and extra-large. A medium CI system might support 500 desktops whereas an extra-large might support 10,000. CI vendors include VCE, NetApp and Hewlett Packard Enterprise.

Rather than simply using existing components as CI does, hyper-converged infrastructure is a redesign of the basic infrastructure for running VMs. One of the key characteristics of HCI is a scale-out, node-based architecture. Virtualization platforms usually have scale out for CPU and RAM with multiple hypervisor nodes, but the storage is centralized in an array that the hypervisor nodes share. HCI eliminates the storage network and array and replaces it with clustered storage. Software on each node forms the storage cluster and makes
it available to the hypervisor nodes to run VMs. Usually a 10GB Ethernet network serves as the storage network, and it can also be used for management and VM networking.

An HCI cluster is formed with a group of these nodes, usually with a minimum of two or three nodes. A typical node can handle one or two hundred lightweight desktops. Additional nodes are added until the cluster has the required capacity. Another key feature of HCI is that adding nodes brings additional resources of all four types—CPU, RAM, network and storage. This scale-out architecture removes the risk that one of the resources will run out as the environment expands. With a conventional storage array, the storage performance is fixed. It can be exhausted by adding compute nodes for additional desktops. With an HCI platform adding nodes also adds storage capacity and performance. To date, the most successful HCI vendor is Nutanix, and SimpliVity is in second place, but the market is poised for growth.

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which hurts performance. Neither of these is very palatable in VDI.

CI is far easier to deploy in large environments where you’ll need multiple CI pods to meet the workload. These large environments are also the ones best able to manage the ongoing maintenance of the dedicated storage networks and arrays. Smaller environments may lack the processes and controls required to keep consistent configurations and patching on these complex systems.

Still, HCI is not without its faults. Cost can become an issue at large scale. There is a resource cost to having software on each node act as the storage cluster. This is sometimes called the HCI resource tax and can be as much as 10% of each node’s resources. These are resources that could be used to run VMs if they were not consumed by the storage cluster. HCI can also lead to opposition from the established storage team within the organization. HCI effectively makes the storage team redundant and so is a threat to those jobs. Finally HCI tends to come from start-up vendors that lack the history or financial wherewithal of a more established enterprise supplier.

Both converged and hyper-converged infrastructure are good solutions for many VDI deployments. Both simplify the processes of deploying and operating the virtualization platform that underpins a VDI deployment. CI is likely to suit larger VDI deployments where there are larger support teams and where the larger block size won’t limit deployment. HCI suits smaller deployments where the simplicity of management is valuable along with the lower entry cost. HCI also suits a slower growing VDI deployment where the large purchase cost of each CI unit would cause financial issues.

—Alastair Cooke
Compare Top Vendors’ HCI Offerings

The major hyper-converged vendors—SimpliVity, Nutanix and VMware with EVO: RAIL—design infrastructure to scale, with some noteworthy differences.

Hyper-converged infrastructures package all the IT components from compute and storage to hypervisor-based virtualization for an application or service to grow. This removes the traditional one-to-one relationship between a physical system and an instance of an operating system. This package is sourced from one vendor and requires little effort or expertise to build. Traditional hardware platforms require a forklift replacement or expansion to scale up, which is typically a very expensive process.

Real or virtual, data centers require resources to run and grow. Compute (processing power and memory), storage and network bandwidth determine what workloads a system can handle and its ability to scale. Hyper-converged shoppers will want to compare SimpliVity vs. Nutanix vs. VMware EVO:RAIL on processor count and power as well as the number of nodes per system to determine scalability. This comparison focuses on the highest-powered system that each provider offers.

Virtualization Support and CPU Offerings
Nutanix, SimpliVity and VMware support the ability to run VMware as the virtualization environment. Nutanix also supports Microsoft Hyper-V and the Nutanix Acropolis Hypervisor.

All the hyper-converged offerings are Intel-based but cover a wide range of the current CPU offerings. VMware and Nutanix offer Intel E5 processors. Depending upon the appliance model, these can be third-generation Ivy Bridge CPUs or the fourth-generation Haswell processors. For its part, SimpliVity’s line is based on Intel’s Xeon server CPUs: the Xeon...
E5-2600 v2 (Ivy Bridge) and the Xeon E5-2600 v3 (Haswell).

**SimpliVity OmniCube Appliance**
SimpliVity’s OmniCube line includes five appliances, each progressively more powerful than the one below it. The OmniCube provides one compute node per appliance, versus some of the Nutanix and VMware appliances that have up to four nodes per appliance.

At its high end, the OmniCube CN-5400 provides 28 cores of dual Intel Haswell processors, 1,400 gigabyte (GB) of memory, 4 x 4 GB of solid-state drives (SSD) and a 20 x 1.2 terabyte (TB) hard disk. It has a network capacity of up to 4 x 10 gigabit Ethernet (GbE) plus 2 x GbE.

**Nutanix Xtreme Platform**
The Nutanix Xtreme Computing Platform comes in a range of systems from single to four node appliances.

Unlike SimpliVity, Nutanix offers eight configurations of one, two and four node per-appliance systems. The systems are designed to tune resources to different environments, not so one model offers more of every resource than another.

There are Nutanix nodes providing up to 36 cores of dual Intel Haswell processors, 768 GB of memory, two 1.6 TB of SSDs and five hard drives of up to 6 TB capacity each. Networking capacity is up to a quad-port 10 GbE.

Different appliances in the Xtreme Computing line offer different maximum configurations. There does not appear to be a single super appliance with the maximum offering of all resources.

**VMware EVO:RAIL**
VMware is the incumbent in many environments and is a leading virtualization vendor, but its hyper-converged infrastructure offering is unlike Nutanix and SimpliVity’s designs. VMware does not actually sell the EVO:RAIL appliance as VMware-branded hardware. Partners such as Dell, Supermicro and others provide the hyper-converged package based on VMware’s specs.

VMware EVO:RAIL can scale out to eight
appliances per cluster for a total of 32 ESXi virtual hosts.

On a per-node basis, VMware notes up to 12 cores of Intel E5 processors (Ivy Bridge/Haswell), 192 GB of memory, 400 GB of SSD and 3.6 TB raw capacity of hard drive space. Networking capacity is 2 x 10 GbE of network interface cards plus an Ethernet management port.

**EVALUATING NUTANIX VS. VMWARE VS. SIMPLIVITY**

While each vendor supports a broad range of functions, there are differences to consider. Where VMware is an acknowledged leader in the virtualization space, it is a relative newcomer to hyper-convergence, as it announced EVO:RAIL in 2014. Nutanix and SimpliVity started in 2009 and focused exclusively on building these software-defined hyper-converged appliances.

At the time of writing, VMware has nine hardware partners for EVO:RAIL, versus Nutanix, which works exclusively with Dell. The Nutanix argument is that it can focus on ease of use and quality of integration with a single vendor. IT shops purchase the Nutanix appliance directly from Dell, which is potentially a streamlined transition to hyper-converged infrastructure for existing Dell customers.

If your environment can benefit from more sophisticated management, look at longer-established hyper-converged infrastructure vendors.

Nutanix and SimpliVity offer advanced functions currently absent from the VMware EVO:RAIL offering. Features such as data deduplication and compression/decompression can have a big effect on storage requirements and application performance as well. The EMC EVO:RAIL offering includes features for storage management; others do not. If your data environment can benefit from more sophisticated management, look more closely at longer-established hyper-converged infrastructure vendors Nutanix and SimpliVity, or other competitors in the market.
From a hardware perspective, all offerings from VMware EVO:RAIL, SimpliVity and Nutanix are highly scalable. VMware and other virtualization platforms have already proven their ability to allocate and reallocate physical resources dynamically and nondisruptively, and these current hyper-converged infrastructure products certainly seem to meet the demands of any commercial environment. For sheer power, most users will find that any of the three offer more than sufficient scalability.

—Kevin Tolly
**Hyper-converged infrastructure**

systems can fundamentally change how an organization approaches VDI, including reducing IT’s management workload and making it easier to resolve data center issues.

Virtual desktops can benefit IT and workers, but only if a deployment is set up and managed properly, and has all the necessary back-end resources. One issue with VDI is that it’s an easy scapegoat. Boot storms, CPU loading, density issues, profile entanglement, network congestion and virtual machine (VM) resource contention are all pain points that often result in fingers pointing at the VDI deployment.

Why does VDI cause problems? It boils down to one basic issue: Infrastructure for VDI is fundamentally different than infrastructure for server workloads. The I/O profile, the memory footprint and the user-facing surface area of VDI are very different than a server environment.

One way to solve this problem is to separate VDI and server infrastructure. IT can simplify its job by using hyper-converged infrastructure (HCI) specifically for VDI. Hyper-converged systems include tightly integrated storage, network, hypervisor and compute resources delivered through a single pod-style platform. Hyper-converged infrastructure systems have a management interface that allows IT to balance resources and shape performance.

Organizations can also purchase infrastructure without that software layer—the management interface—which is called converged infrastructure (CI). CI provides many of the same benefits, but requires a little more IT management. Vendors such as Nutanix, SimpliVity, Cisco and Dell offer CI and HCI platforms, or IT can build one of these pods itself.

Hyper-converged systems that are tuned for VDI performance usually contain VDI-specific resource cards, such as offload or GPU cards.
The VDI deployment lives entirely inside this one HCI box and doesn’t need to share compute or storage with other infrastructure. One HCI or CI pod supports whatever volume of VDI users the IT staff sizes it for. If an organization needs to scale its deployment out, upgrading an HCI system is as simple as adding another node.

**If IT accidentally downs a VDI deployment, every user is unable to work. Workers are kicked out of their desktops and they are unproductive.**

SimpliVity offers the best user density, with published Login VSI performance-testing results showing that one SimpliVity Omni-Cube node can support up to 250 task workers at a time. Most of the other HCI vendors can support roughly half that number of virtual desktops per node, although that’s just one consideration when choosing a vendor. Nutanix, for example, offers 17 reference architectures compared to SimpliVity’s seven, and it has a VDI Assurance program where Nutanix helps size the back-end infrastructure for a VDI deployment and provides the extra hardware if it gets it wrong.

**REDUCE THE EFFECT OF DATA CENTER ISSUES**

VDI is a user-facing data center technology. Exchange and SQL servers are technically user-facing too, but if an admin accidentally unplugs the Ethernet cable from the organization’s Exchange server, all that will happen is that workers’ email accounts will freeze for a few moments until the admin plugs the Ethernet cable back in. But if IT accidentally downs a VDI deployment, every user is suddenly unable to work. Workers are kicked out of their desktops, they lose their trains of thought and they are unproductive during that time. Worst of all, they are immediately incensed.

HCI-deployed VDI eliminates the cross-pollination that causes most problems. A sudden hit to the storage area network because of a SQL reindex won’t affect VDI users whose desktops live on an HCI platform. Likewise, a memory leak in the Web server won’t slow
down performance at all. The reverse is also true: When a large number of users log in at 9 a.m., they won’t cause a boot storm that affects the application server. HCI reduces the number and severity of potential issues in the data center.

Some experts argue that IT shops can reap these same benefits by segregating VDI on conventional infrastructure, which is true and false. Conventional enterprise data center infrastructure requires a lot of folks working behind it. There are storage guys, network guys, virtualization experts and more. HCI simplifies the management of these disparate platforms by providing insight into VM-level performance issues and correlating performance degradation to resource constraints.

**TOP VDI USER EXPERIENCE CONCERNS**

The most common issues users bring up about virtual desktops relate to their speed compared to physical desktops and availability over a wide area network.

For example, if a specific subset of users complains about slow performance in conventional infrastructure, the whole IT team has to come together and the storage guys say, “The logs don’t show any problem.” Then the compute guys say, “The servers are storage-constrained.” Or a lone IT person in a smaller company will have to log into each system separately to correlate events and identify a root cause. Those processes are time consuming and rarely as efficient and effective as possible.

Those issues disappear in a robust HCI environment. Logging in to the management interface shows IT which VMs aren’t performing well and then gives a reason for the issues. For example, it might show that both storage and compute are adequate, but that network fabric between the host and the Internet is congested. It might then suggest adding an uplink to the virtual switch to resolve the issue.
Finally, don’t forget the boss in the corner office. Most IT managers like predictability, which the scale out architecture of HCI-deployed VDI provides. It only takes some simple math to figure out the cost per desktop as well as the total cost of ownership. And for broad VDI deployments, HCI or CI platforms can save administrators time, reduce errors, improve employee adoption and provide predictable metrics for management. —Todd Knapp
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