White Paper

Hyperconverged Transformation: Getting the Software-defined Data Center Right

By Colm Keegan, ESG Senior Analyst

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Contents

Hyperconverged Infrastructure on the Rise 3
What Is Hyperconverged Infrastructure? 3
Start Small and Scale Granularly? 4
Limited Storage Services 4
The VxRail Appliance—An EMC VCE Hyperconverged Infrastructure Solution 4
Flexible Configuration Options 4
Performance Optimized 4
All-Flash Hyperconverged Appliance 4
Storage Service Efficiency 5
Automated Performance Management 5
Support for Virtualized and Bare Metal Servers 6
Private/Hybrid Cloud Integration 6
NSX Integration 6
Centralized Visibility and Control 7
SDDC Building Block Design 7
Configuration Flexibility and High Scalability 7
The Bigger Truth 8

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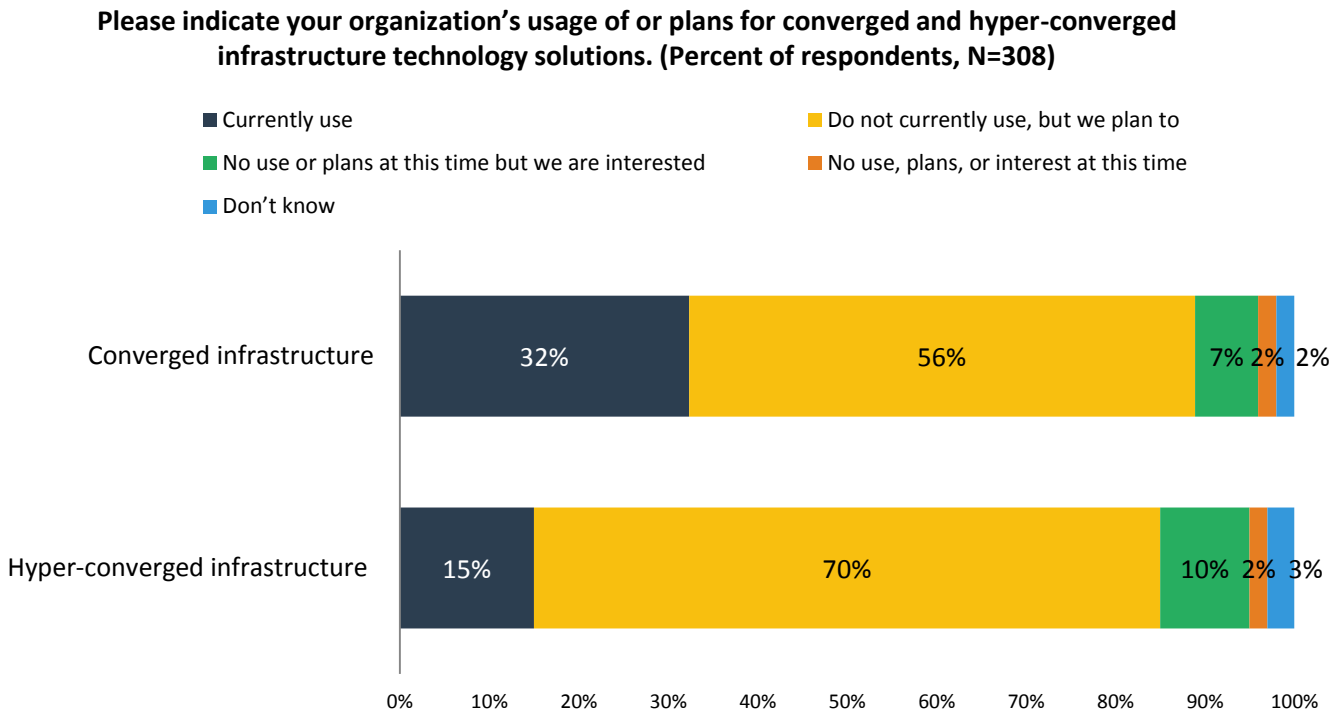
Hyperconverged Infrastructure on the Rise

IT planners are increasingly turning toward hyperconverged infrastructure (HCI) solutions to simplify and speed up infrastructure deployments, ease day-to-day operational management, reduce costs, and increase IT speed and agility. In fact, according to recent ESG research, 70% of IT respondents indicated they plan to invest in HCI over the next 24 months (see Figure 1).[1]

FIGURE 1. Usage of/Plans for Converged and Hyperconverged Infrastructure Technology Solutions



Source: Enterprise Strategy Group, 2016

What Is Hyperconverged Infrastructure?

HCI consists of a nodal-based architecture whereby all the required virtualized compute, storage, and networking assets are self-contained inside individual nodes. These nodes are, in effect, discrete virtualized computing resources "in a box." However, they are typically grouped together to provide resiliency, high performance, and flexible resource pooling. And since HCI appliances can scale out to large configurations over time, these systems can provide businesses with investment protection and a simpler, more agile, and cost-effective way to deploy virtualized computing infrastructure.

Another important attribute of HCI is ease of management. With minimal training, HCI systems can typically be mastered by the veteran administrator or the IT novice alike.

VSPEX BLUE was EMC and VMware's initial HCI solution offering. This platform combines VMware vSphere and Virtual SAN, along with server compute, tiered storage (flash and HDD) resources and networking components to deliver a fully integrated, software-defined data center (SDDC) solution. As a first generation HCI product, however, VSPEX BLUE often paled in comparison with competitive HCI technologies.

[1] Source: ESG Research Report, *The Cloud Computing Spectrum, from Private to Hybrid*, to be published.

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Start Small and Scale Granularly?

One of the primary limitations on the first generation edition of VSPEX BLUE is that it didn't provide for the same levels of flexible deployment and granular scaling capabilities that end-users have come to expect from HCI platforms. For example, many competitive HCI solutions allow users to start with a three-node configuration and then scale up in increments as small as a single node. VSPEX BLUE, on the other hand, required a four-node configuration starter kit and could only scale up in four-node increments. This rigidity in scaling a VSPEX BLUE environment could very likely result in overprovisioned and underutilized infrastructure and ultimately, a higher total cost of ownership compared with other solutions. This is particularly true for smaller data center environments and remote/branch offices where the ability to granularly scale server compute and storage resources is especially important.

Limited Storage Services

Another limitation with VSPEX BLUE is its lack of data storage services like data deduplication and compression. Data deduplication can deliver significant storage savings to virtual desktop infrastructure (VDI), user file sharing applications, and email systems. Likewise, data compression can deliver up to 50% storage reductions in database application environments like Microsoft SQL. Lacking these storage services, businesses will likely consume more storage resources faster and incur higher costs over time.

The VxRail Appliance—An EMC VCE Hyperconverged Infrastructure Solution

"VxRail" is a hyperconverged appliance offering delivered by VMware and EMC VCE that addresses the shortcomings of the VSPEX BLUE offering. Designed to meet the virtualized computing requirements of mid-sized data centers and remote enterprise edge locations, VCE's VxRail Appliance will be sold and supported by VCE, EMC, VMware, and their combined partner ecosystems. Through tight integration with vSphere 6.0 and Virtual SAN 6.1, VxRail administrators can continue leveraging the same VMware management tools that they are already familiar with to manage a holistic, software-defined data center stack of virtualized compute, storage, and networking resources.

Flexible Configuration Options

To address the shortcomings of the VSPEX BLUE offering, VMware and EMC co-developed the VxRail Appliance to create a cost-effective and highly scalable HCI solution that provides flexible configuration and deployment options; more granular scaling of compute, memory, and storage resources; and highly efficient deduplication storage data services. VSPEX BLUE customers who wish to integrate their existing environment into a VCE VxRail Appliance configuration can do so through a no-charge EMC VCE professional services engagement.

Performance Optimized

The VxRail Appliance is integrated with vSphere 6.0 and Virtual SAN 6.1 to provide businesses with a highly scalable architecture that can be configured with a mix of flash and hard disk drives, or deployed as an all-flash array. This gives businesses the ability to support a wide variety of application workloads, from virtual desktops and test and development environments to end-user file sharing and business applications. Moreover, through the storage I/O and cache optimization enhancements delivered in Virtual SAN 6.1, application workloads can gain up to a 2x performance boost. These performance improvements can enhance application service levels and potentially increase infrastructure efficiencies by enabling virtual administrators to increase VM to server densities across their environments.

All-Flash Hyperconverged Appliance

Many organizations are opting to deploy all-flash appliances as a way to provide the highest levels of storage I/O performance for their business-critical applications. In addition to performance improvements, all-flash arrays can

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potentially enable businesses to pack more VMs per host, thus improving the ROI on their virtual infrastructure investments. The VxRail appliance can be implemented as an all-flash storage configuration to help deliver sustainable application performance improvements and increased VM to server densities across growing virtualized data center environments.

Storage Service Efficiency

The VxRail Appliance can yield up to 50% storage savings thanks to in-line data deduplication. Optimized for all flash array configurations, VxRail's data deduplication services can help extend the life of flash investments and reduce flash storage consumption by reducing write I/O activity. This is especially important in application environments where there is a high degree of data commonality. Virtual machine and virtual desktop images, for example, often contain much of the same operating system data, boot files, etc. But without deduplication, these images and all their requisite data have to be protected on persistent storage. Data deduplication helps eliminate this redundancy, so that more information can be stored on less physical storage capacity, helping to improve storage efficiencies and reduce ongoing costs.

VCE is also providing support for data compression services on the VxRail Appliance. This will provide additional storage efficiencies for database application workloads.

Automated Performance Management

In addition to these enhancements, VMware and VCE are enabling virtualized workload performance automation on the VxRail Appliance, through virtual machine quality-of-service (QoS) policies. VxRail Appliance administrators will be able to assign application performance policies at a VM level to ensure that business-critical application performance remains consistent. This is an especially important capability given that contention for CPU and storage I/O resources can increase in highly virtualized, multi-tenant environments. In fact, according to ESG research, virtual administrators cite maintaining consistent application performance as a necessary development in the improvement of their server virtualization environment (see Figure 2).[2]

By enabling virtual administrators to pre-allocate and prioritize access to IOPS based on the performance profile requirements of the VM, VxRail's QoS technology can enable businesses to improve application service levels and mitigate risk.

[2] Source: ESG Research, VMware Cloud Operations Management Research, 2015.

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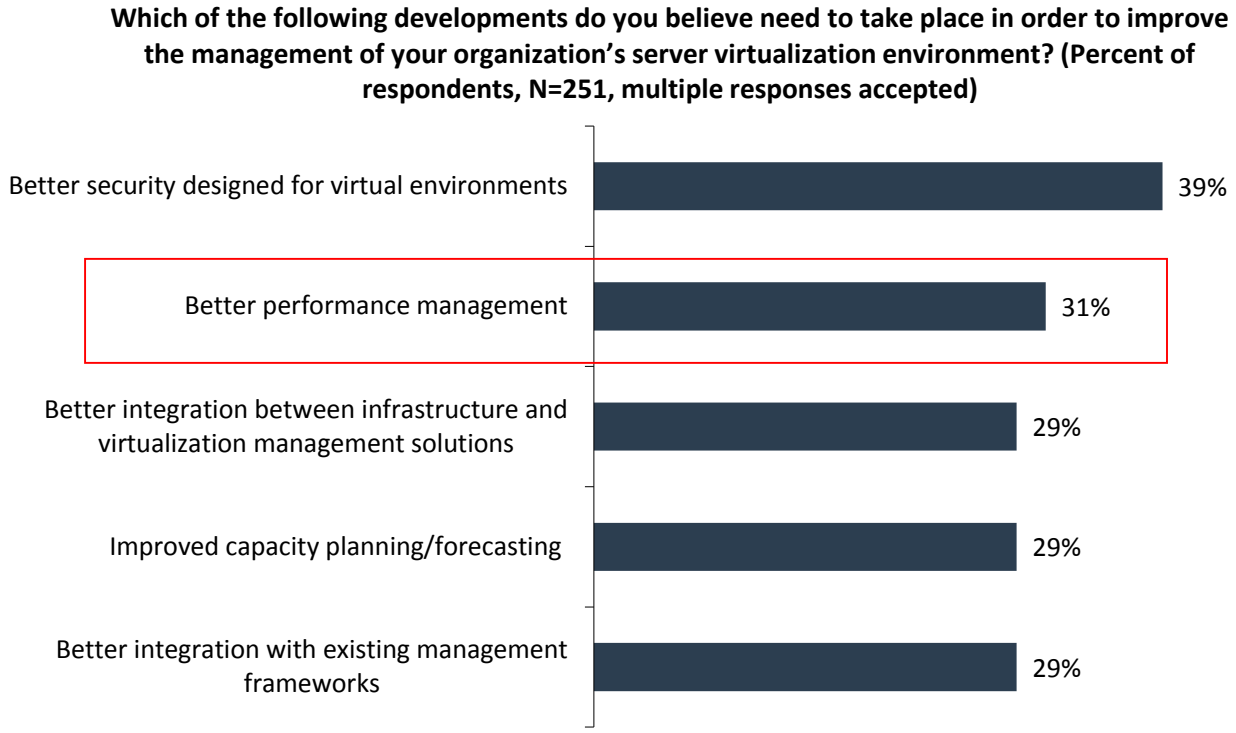
FIGURE 2. Developments Needed to Improve Management of Server Virtualization Environment



Source: Enterprise Strategy Group, 2016

Support for Virtualized and Bare Metal Servers

In the second half of 2016, the VxRail Appliance will release support for iSCSI data services. This feature will allow data centers to share VxRail Appliance virtualized storage resources with bare metal servers and third-party hypervisors, and will support Microsoft Cluster Server. This flexible resource sharing can provide IT administrators with a simplified way to manage a common pool of elastic private cloud storage resources that can be shared and centrally managed across both virtualized and physical hosts in the data center.

Private/Hybrid Cloud Integration

Many organizations are leveraging public cloud storage for low-cost data archiving, backup, and DR. EMC's CloudArray technology ships with VxRail Appliances to provide businesses with a simple way to integrate with public or private cloud storage resources (like AWS, Google, or vCloud Air) via iSCSI, CIFS, or NFS. This gives IT organizations multiple options for archiving and/or protecting data in centralized data centers or remote office locations—back to storage resources in either a private, public, or hybrid cloud fashion.

In addition, VxRail's multiple integration points with VMware vCloud Air provide businesses with essentially an "out-of-the-box" hybrid cloud computing platform to support additional use cases like dev/test, VDI, and application workload balancing in the public cloud.

NSX Integration

Virtualized network infrastructure is the third stool in the software-defined data center environment. While the VxRail Appliance provides integrated support with VMware's NSX network virtualization technology, businesses can choose to integrate VxRail with their existing physical network or utilize it with NSX. This choice of network preserves existing investments while helping IT organizations future-proof their environments.

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Centralized Visibility and Control

VCE's Vision management software is integrated with every VxRail Appliance to provide virtual and private cloud administrators with a single view of performance and system health. In addition, busy systems administrators can leverage Vision's automated patch and update process to save time and further simplify operational management.

SDDC Building Block Design

VxRail Appliances are built on a 2U form factor node, or SDDC building block, that starts at a four-node appliance configuration. Three-node VxRail Appliance deployments along with single-node scaling will soon be supported. Table 1 displays the four available VxRail models.

TABLE 1. VxRail Models (SDDC Building Block)

VxRail 120	12 Cores with 2xIntel Xeon Processor E5-2620 v3 2.4GHz 128/192 GB RAM, 3.6-6 TB (per node) Supports up to 14 TB of flash
VxRail 160	16 Cores with 2xIntel Xeon Processor E5-2630 v3 2.4GHz 256/512 GB RAM, 4.8-6 TB (per node) Supports up to 19 TB of flash
VxRail 200	20 Cores with 2xIntel Xeon Processor E5-2660 v3 2.6GHz 256/512GB RAM, 4.8-6 TB (per node) Supports up to 19 TB of flash
VxRail 60	6 Cores with 1xIntel Xeon Processor E5-2603 v3 1.6GHz (Q2 2016)

Configuration Flexibility and High Scalability

Each VxRail Appliance model supports a mix of flash and HDD storage media, and these appliances can also be configured in all-flash configurations. Each appliance consists of four nodes and each node contains of CPU, storage, and networking I/O resources. Appliances can be clustered together, up to a maximum of 16 in a cluster, to provide for very high levels of scalability.

And to provide for more granular scaling of CPU and storage resources, it is possible to mix and match VxRail models within a cluster. For example, if a VxRail 120 cluster needs to incorporate additional CPU horsepower, 160 or 200 appliances can be added to the cluster non-disruptively. This enables businesses to flexibly configure their data center environment to stay in lock step with the changing needs of their application workloads.

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The Bigger Truth

In ESG's recent survey on hybrid cloud infrastructure trends, 85% of the respondents indicated that the foundation of their private cloud environment would be based on their existing investments in virtualized infrastructure.[3] As the clear leader in the virtualization market, VMware is in a unique position to help IT organizations extend the same operational benefits that they have realized through virtualized computing capabilities to their storage and networking environments and do so with hybrid cloud computing in mind. The challenge is that, while many organizations have been able to automate how they manage and provision virtualized computing resources, they are often still managing storage and networking infrastructure in discrete silos. This often leads to increased management complexity, higher costs, and protracted delays in delivering virtualized application resources for new business services. Hence the strong interest in HCI technology as a vehicle to unify, virtualize, and operationally automate the entire application infrastructure stack.

Suffice it to say, EMC's generation-one HCI offering, VSPEX BLUE, was not well received by the market. VMware and VCE, however, have given their HCI technology a much-needed facelift. The new VMware and VCE VxRail Appliance offering could make for a very compelling offering to those businesses that are looking for a way to implement a highly flexible and highly scalable HCI appliance in their environments, with private and hybrid cloud computing capabilities, while still leveraging the same VMware management tools that they have been using for years. With VxRail's tight integration of vSphere 6.0, Virtual SAN 6.1, and vCloud Air, mid-sized data center environments and enterprise edge locations can gain the benefits of management simplicity, application performance automation, enhanced infrastructure efficiency, and hybrid cloud computing scalability. These are all critically important capabilities given the fact that the IT skill sets required to manage separate silos of compute, storage, and networking infrastructure are often lacking in many of these environments.

It appears that the VxRail solution addresses many of the technical limitations and configuration shortcomings of its VSPEX BLUE forerunner to make it a much more appealing offering to IT buyers. Perhaps most notably, through VM-definable QoS policies, VxRail reflects VCE's intent to help deliver on the promise of VMware's software-defined data center (SDDC). And as businesses continue their virtualization journeys down the infrastructure stack, VMware's software-defined networking technology, NSX, will help make the SDDC that much more of a reality.

It is also important to point out that as part of the VCE family of Blocks, Racks, and Appliance technologies, VxRail can be leveraged as part of a core-to-edge strategy for those organizations wishing to get the best of both worlds from converged and hyperconverged technologies. And since VCE's Vision management software can be utilized to manage all of these offerings through a single pane of glass, it can provide IT organizations with the increased management simplicity and operational automation needed across private and hybrid cloud computing environments.

[3] Source: ESG Research Report, *The Cloud Computing Spectrum, from Private to Hybrid*, to be published.

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www.esg-global.com

contact@esg-global.com

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