

# HYPERCONVERGED: THE POWER TO SIMPLIFY IT

HCI can deliver **complex IT capabilities** that once seemed out of reach for many organizations.

## EXECUTIVE SUMMARY

The demand for IT resources puts data center operators under a consuming pressure to deliver. The rise of Big Data, the consumerization of technology and the explosion of network-enabled devices create a need for data centers that can both handle the load generated by those requirements and respond dynamically to changing demands. A few years ago, reconfiguring data centers for new needs required substantial planning, lead time to order appropriate equipment and careful architectural design. Today, the advent of hyperconverged infrastructure means data centers can be flexible and scalable, allowing for rapid reconfiguration at a cost-effective price.

From the CIO's perspective, hyperconverged infrastructure makes financial sense. Organizations can purchase the core building blocks of compute, storage and networking in modular units and take advantage of hyperconvergence software to reallocate those resources as needed. Essentially, hyperconvergence brings the scalability and simplicity of the cloud to enterprise data centers — without requiring siloed technical expertise to configure and manage different layers of the technology stack. This technology makes the software-defined data center a practical reality.

## Hyperconverged Infrastructure: An IT Evolution

Until a few years ago, the state of the art in data center management was to treat each of the three major disciplines of enterprise infrastructure as a silo of expertise. Organizations hired experts in server management, storage management and network engineering and, typically, organized them into teams dedicated to these disciplines. Those teams sometimes reported to the same senior manager but sometimes did not, leading to even greater isolation. These teams managed their infrastructures in a similarly siloed manner, not sharing a great deal of contact and coordination.

Not surprisingly, this discipline-focused approach to IT led to tremendous waste. Developers and application administrators, responsible for providing a superior customer experience, naturally overprovisioned their requests for resources to ensure that they could meet future peak demands. At the same time, server, storage and networking teams also overprovisioned their resource pools so they could meet unknown future demands from service teams. This double layer of overprovisioning led to a high degree of unused resources in the data center. Services were assigned capacity that they might use only to satisfy a peak that occurred once a year, if at all, while engineering teams installed extra unassigned capacity to meet future demand. It was not unusual to find that a data center operating under this model ran at 50 percent efficiency or less.

### The Rise of Convergence

Converged infrastructure solutions seek to resolve this inefficiency by bringing server and storage resources into a single appliance managed by a virtualization layer. This approach reduces the need for dedicated expertise in storage management and brings the storage closer to the servers, eliminating the need to separately manage storage area networks (SANs). IT professionals can manage both the server and storage resources of a converged infrastructure solution from a single management platform, simplifying the administration of the data center.

This approach allows for dynamic reallocation of resources as computing demands shift. If an application requires more computing, administrators can simply shift CPUs away from lower-priority services to meet that demand and then return them to the resource pool when they are no longer needed. Similarly, if an application requires additional storage, it can be allocated from the centralized storage pool on a just-in-time basis. This approach greatly reduces the need to overprovision resources service by service.

While converged infrastructure addresses some of the inefficiencies of the traditional data center, it also creates issues that make data center management challenging. Chief among

these is the ability to scale the data center appropriately. At first, it may sound appealing that converged infrastructure solutions leverage appliances that combine compute and storage on a single device — and it is a significant benefit over traditional

architectures. However, this approach makes it difficult to add capacity, because it assumes that the organization will need to add storage and computing at the same time and in a proportion available as an appliance. What if the organization has excess storage capacity and simply needs more compute resources, or vice versa? An integrated appliance will wind up adding to the surplus and decreasing the efficiency of the data center.



The percentage of organizations that have adopted a hyperconverged infrastructure solution<sup>1</sup>

### Convergence Leads to Hyperconvergence

Hyperconverged infrastructure addresses this core inefficiency of converged infrastructure by modularizing storage and compute resources using

commodity hardware. The HCI platform offers an easily scaled software-defined data center approach that dynamically allocates resources among applications but can be expanded easily as the organization's technology needs evolve.

Hyperconvergence brings other advantages to the data center by allowing administrators to leverage value-added services within the HCI stack. In addition to supporting the mobility of resources between workloads, HCI facilitates high availability and data protection by giving administrators a single interface to shift workloads when resources suddenly become unavailable. It also provides storage redundancy that protects against the simultaneous failure of multiple hardware devices.

### The Growth of Hyperconverged Infrastructure

HCI is growing at a rapid clip as the technology matures and organizations begin to recognize the value of this approach to data center management. Gartner estimates that the hyperconverged market was \$1.3 billion in 2016 and will almost double to \$2.5 billion in 2017. It projects another doubling in the market over the next two years, reaching \$5 billion by 2019. While that still represents a small fraction of global IT spending, the near-quadrupling of the market size in just three years is an unmistakable trend in IT purchasing.

### Understanding the Benefits of Hyperconvergence

HCI offers seven key benefits to organizations seeking to modernize their data centers.

**1. Scalability and flexibility:** Hyperconvergence allows technology teams to meet dynamically changing business requirements for IT resources by shifting resources between workloads on a just-in-time basis. The IT infrastructure scales in a flexible manner that matches the needs of the organization, rather than expecting the organization to adapt to the capacity of the technology platform.

**2. Quick deployment:** In addition to rapidly reallocating resources between applications, the use of commodity hardware in HCI environments lets the organization rapidly deploy additional storage and computing capacity in the proportions demanded by business workloads.

**3. Data protection:** Consolidating storage within the HCI platform allows organizations to rethink their data protection solutions and manage data protection across the entire infrastructure, rather than server by server.

**4. Workload mobility:** The dynamic nature of HCI facilitates the easy migration of IT applications and workloads across platforms as needs change and capacity fluctuates.

**5. High availability:** HCI allows organizations to improve fault tolerance by adding a layer of high availability. In addition to managing availability at the application layer, organizations can leverage redundancy in their HCI platform to isolate workloads from the impact of failed computing nodes and storage devices.

**6. Data efficiency:** HCI delivers greater performance in a smaller form factor, improving the efficiency of storage solutions. HCI platforms can integrate traditional spinning disks and solid-state drives and shift data between storage media to efficiently balance performance and cost.

**7. Cost efficiency:** HCI eliminates the need for dramatic overprovisioning, allowing the organization to purchase additional capacity when it is needed and to share capacity among workloads to meet peak demand, without having storage and compute resources sitting idle.

Those benefits form the core argument for the use of HCI as the foundation of on-premises enterprise data centers. As organizations shift greater proportions of their workloads to HCI,

they will achieve corresponding increases in efficiency, flexibility and mobility while decreasing their capital infrastructure expenditures.

## What Can Hyperconverged Infrastructure Do for You?

While HCI has strong benefits across enterprise IT, the technology particularly shines in a variety of use cases. Those include consolidating data centers, building private cloud environments, supporting virtual desktop infrastructure (VDI) deployments, serving as backup and disaster recovery platforms, enabling test and development environments, and supporting Big Data analytics. In each of these use cases, HCI provides benefits that make it an ideal solution compared with either a traditional data center or a converged infrastructure platform.

## Data Center Consolidation

As organizations transition from a legacy data center model, they often find themselves with more data center space than they need spread across multiple locations. Data centers occupy expensive real estate, require costly cooling and power infrastructure, and consume space that could be used for other purposes. The increased availability of high-speed networking reduces the need to locate data centers in proximity to end users and allows for consolidation of data centers to reduce costs. That, in turn, reduces both capital expenditures to obtain and fill data center space and the operating expenses associated with each facility.

Organizations seeking to consolidate data centers can take advantage of the fact that HCI products can integrate seamlessly with existing environments. HCI provides a compact, high-density solution that offers computing and storage capacity in a smaller footprint than other approaches, letting organizations increase their infrastructure capacity while reducing the size and number of data centers. The simplified deployment and management of an HCI solution makes it an excellent option for organizations looking to provide flexible computing options in fewer locations with fewer human resources. That all adds up to a strong value proposition for deploying hyperconverged platforms to meet a wide variety of business requirements across the organization.

## Private Cloud

Cloud computing promises many benefits to organizations seeking to optimize resource utilization, provide flexible and scalable computing environments, and automate operational activities. While some organizations turn to the public cloud, many organizations build their own private cloud environments that achieve the same benefits in a self-contained, dedicated computing environment. Whether their goal is to provide greater control of the computing platform, meet security and regulatory requirements, or achieve greater cost efficiency, in some cases the private cloud approach offers advantages over a public cloud model.

Many HCI architectures support software-defined storage services that deliver the cloud's flexible and modular scalability

## HCI Enables the Software-Defined Data Center

The software-defined data center brings the benefits of the public cloud's Infrastructure as a Service computing model to enterprise data centers. Over the past decade, many organizations turned to the public cloud to achieve many of the benefits that HCI offers, with an added advantage: automation. IaaS models thrive on their ability to give developers programmatic access to computing and storage resources. This allows for the creation of environment-aware applications that can provision their own resources as needs arise.

For example, consider a Big Data analytics environment that receives a massive compute job requiring the temporary use of a large number of processing cores. In an environment-aware model, the application can make a call to the compute platform to request additional resources and then automatically return them to the shared resource pool when the job is complete. This approach has long been available through the application programming interfaces (APIs) exposed by public cloud providers. HCI brings this to the data center, exposing similar APIs that may be integrated into critical business applications, further increasing the data center's agility and flexibility.

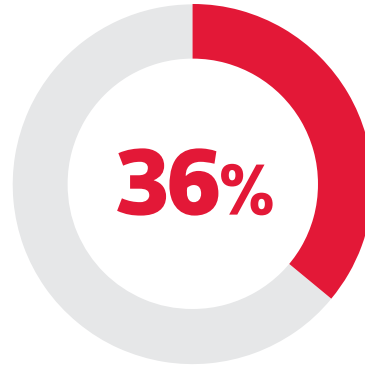


within an organization's own data center space. That elasticity enables a cost-effective approach to building a private cloud platform. HCI also provides powerful management and automation capabilities so organizations can centrally control resource utilization across the private cloud environment and build cloud-centric applications that can automatically provision and release computing and storage resources as business needs fluctuate.

### Virtual Desktop Infrastructure

VDI deployments appeal to organizations with a wide variety of use cases. In this approach, the organization creates virtual desktops that run on a centralized platform in the data center. Individuals can then use a thin client or a personally owned computer, tablet or other device to connect to that virtual desktop and leverage the shared resource pool. VDI technology has many use cases, including:

- Giving users a secure computing environment that avoids leaving residual data on the untrusted devices they use to connect to the VDI desktop
- Offering a flexible approach to pooling expensive software licenses that may be shared among VDI users
- Reducing support costs by creating a consistent end-user



The percentage of IT professionals who think hyperconverged solutions would be a good fit for an infrastructure refresh project<sup>2</sup>

experience that the IT team can manage without modifying the settings on end-user devices

- Allowing compute-intensive processes to temporarily allocate additional processing power to meet short-term needs
  - Providing access to centralized data storage without requiring direct access through perimeter firewalls

VDI deployments can be complex, but several HCI vendors produce custom-made appliances that simplify VDI rollout. This enables virtualized desktops that greatly improve security and IT management, without straining IT staff. Hyperconverged systems also deliver the performance necessary to meet the unique demands of VDI deployments.

### Data Protection

Every IT leader understands the importance of data protection to the continued viability of an organization.

Every organization depends on critical elements of information to provide goods and services, manage ongoing operations and analyze performance. Without that information, operations would be crippled, in the best case, and possibly shut down. For this reason, IT leaders must emphasize designing and implementing a data protection strategy that incorporates routine backups and disaster recovery strategies. Unfortunately, that work often falls by the wayside because of the complexity of designing a robust data protection strategy, the costs of implementing the design and the routine drudgery of data protection work.

HCI eliminates the complexity in backup and disaster recovery, and it reduces the cost of operations. Rather than requiring the acquisition, installation and maintenance of separate data protection technology, HCI solutions provide integrated data protection capabilities. For many organizations, hyperconvergence delivers the ability to meet backup and disaster recovery goals that otherwise would be difficult or impossible to achieve. HCI also lowers the cost of maintaining backups by leveraging deduplication technology to reduce the amount of data that the organization must retain.

### Testing and Development

Whether an organization develops its own applications, uses commercial software or incorporates elements of both, testing and development environments are crucial to success. Every experienced IT professional has at least one war story of a major outage caused by an error made while updating software, modifying configurations or altering data in a production environment. In many of those cases, the outage would not have occurred if the change had been fully tested in a nonproduction environment before being rolled out.

The main reason that changes aren't fully tested is that organizations simply don't have robust test and development

### Real-World Results

Akron Public Schools, the fifth-largest school district in Ohio, recently moved from a legacy data center approach to an HCI built on technology from Nutanix. The district found itself facing significant challenges: an aging data center infrastructure that was unable to scale, the inability to schedule upgrades and maintenance, and high costs from unplanned downtime. In the words of Paul Doxsey, the district's network systems coordinator, "We hit a point where we had to upgrade one of our applications, and we knew that we had to do something completely different."

After a year of running a production HCI, Akron is pleased with the results. Doxsey cites the example of a poorly performing application that, once moved to the HCI platform, experienced immediate improvement. "Stuff that used to take hours was taking minutes and seconds," Doxsey says. He cites several other examples of the benefits Akron Public Schools achieved by moving to HCI:

- Twenty hours saved each week on financial report compute time
- Database restoration time reduced from 90 minutes to 15 minutes
- Simplified IT management
- Tenfold reduction in space and power requirements



environments for all their critical systems. Developers are forced to test changes in a less-than-ideal replica of the production environment or, in some cases, on their own notebooks. That makes it incredibly difficult to maintain high-quality standards and avoid serious outages.

Hyperconvergence makes it possible for organizations to have more robust test and development environments at reduced cost. HCI platforms provide management tools that can quickly clone production environments to create separate test instances and then eliminate the virtual machines belonging to those environments when testing is complete. Those tools also enforce strict logical separations between test and production environments, reducing the risk of an operational impact from testing. HCI facilitates testing, allowing organizations to hold developers and administrators to higher quality standards.

## Big Data Analytics

From predicting customer spending patterns to gauging sentiment on social media, Big Data analytics play an increasingly important role in the modern business. As organizations work to achieve valuable business insights from their data, they require new technology infrastructure designed to support the computational and storage needs of Big Data. The specialized architectures of Big Data rely upon distributing data across multiple nodes and rapidly performing sophisticated analyses on that data to reach conclusions that may have an actionable lifetime measured in seconds. For example, decisions about what advertisements to show a customer visiting a website

must be made in the fraction of a second between the customer requesting the page and the server returning the result. HCI's virtualization and container technology make it easier, faster and more cost-effective to deploy Big Data applications, such as Splunk. Hyperconvergence delivers cloudlike economics and agility for Big Data infrastructure while keeping operations on-premises. HCI eliminates the infrastructure complexities needed to support sophisticated data analytics tools, simplifying and accelerating their deployment. That lets organizations achieve the benefits and insights of data analytics more quickly.

## Best Practices for Implementing HCI

As organizations plan for HCI adoption, there are several best practices they can follow to facilitate a smooth transition from legacy infrastructure. Investing time in the careful planning of an HCI deployment will ensure that the organization understands its business and technical requirements, conducts an orderly migration of workloads from legacy to HCI, and lines up the appropriate staff and support resources to manage the transition.

First, it is critical that IT leaders take time to understand the characteristics of the workloads they plan to run on HCI. For most organizations with an existing data center, this means having a good understanding of the workloads they run and using this information to design an appropriate HCI environment. It is important to note that there is often a significant disparity between the compute, memory and storage that are provisioned for a service and those that a service requires. System engineering has a long history of overprovisioning resources to ensure that resource scarcity doesn't cause issues down the road. This approach simply isn't necessary in a hyperconverged environment. If the organization determines its HCI needs by simply summing the resources currently available in the data center, it is likely to vastly overprovision its HCI environment and miss out on the substantial cost-efficiency potential.

Once an organization understands its HCI requirements, it should turn to the marketplace and evaluate each available solution against those requirements. While all HCI solutions offer the core benefits of a shared resource pool, agile scalability, cost efficiency and data protection, they differ in the way they deliver those benefits. Key questions to ask when evaluating HCI solutions include:

- Does the solution support a single hypervisor, or can organizations run multiple hypervisors on the same platform if this is required?
- What flexibility does the solution provide in terms of hardware modules? Are there component requirements? Does the solution support commodity hardware, or must hardware be purchased from the HCI vendor?
- Does the solution offer storage capacity only to services running in the HCI environment, or is the storage accessible to other data center services?

After selecting an HCI product, the organization should begin to plan the HCI implementation before purchasing and installing hardware. Remember, one of the core benefits of HCI is rapid scalability. Organizations don't need to purchase the hardware

## HCI and Security

In a traditional data center, enterprise security teams control the flow of network traffic by using firewalls as an enforcement point. Firewalls certainly segment the data center from the internet and the rest of the enterprise network and often further segment the data center itself into zones based on security risk. In the world of physical servers, the firewall serves as this natural enforcement point because it physically sits between those networks, allowing it to scrutinize network packets before choosing whether to allow them to pass. This approach breaks down in a hyperconverged model because a significant portion of network traffic never leaves the HCI solution and therefore never sees a network firewall.

Cybersecurity teams in organizations adopting hyperconvergence should carefully consider the security features of each HCI solution during the selection phase. Many products offer built-in network security features that move policy enforcement from the network firewall to the individual HCI node, letting teams apply even higher levels of enforcement than they would achieve with a data center firewall through the HCI platform. Better yet, these approaches often allow for highly automated deployment of network security policies within the HCI solution through a consolidated management interface.



to support their end-state capacity. They can purchase enough to get through the first few workload migrations and scale the solution as they bring additional workloads online. That reduces an organization's upfront capital investment and lowers the risk if it decides to pursue another path.

Many organizations choose to begin their HCI deployments with a carefully selected pilot project. The project should migrate a workload selected to meet as many of the following criteria as possible:

- HCI migration will show immediate and needed performance or capacity benefits, demonstrating value to end users.
- The service owner supports the migration to HCI.
- The service and users will tolerate some disruption of the service's availability.
- There is a high likelihood of success.

A proof-of-concept deployment will pave the way for future migrations. After successfully implementing the pilot project, the organization may then move on to a phased implementation approach that migrates workloads on a schedule that meets the organization's business and technical needs. That might mean prioritizing workloads based on the expected risk of migration, the drain they cause on a data center capacity bottleneck, timing within the organization's business cycle or other situation-specific requirements.

Throughout planning and implementation, organizations should remember that they don't need to possess all the needed HCI expertise in-house. They can consider turning to a vendor, such as CDW, with specific HCI experience that can help them with each step along the road to hyperconvergence.

## CDW: An Infrastructure Partner That Gets IT

CDW solution architects serve as infrastructure partners to help organizations select, deploy and manage hyperconverged infrastructure implementations. They regularly work with businesses of all sizes seeking to build flexible, scalable infrastructure solutions that provide highly available and resilient computing at a cost-effective price.

CDW account managers and engineers assist customers at every phase as they select and implement the HCI technology they need. CDW's team of technology professionals takes a comprehensive approach to identifying and meeting the needs of every customer. Each engagement includes five phases designed to help clients achieve their objectives efficiently and effectively. Those phases include:

- An initial discovery session to understand goals, requirements and budget
- An assessment review of the existing environment and definition of project requirements
- Detailed vendor evaluations, recommendations, future environment design and proof of concept
- Procurement, configuration and deployment of the final solution
- 24/7 telephone support and ongoing product lifecycle support

**To learn how CDW can help you deploy hyperconverged infrastructure solutions and other advanced technologies, visit [CDW.com/datacenter](http://CDW.com/datacenter).**

## Featured Partners

