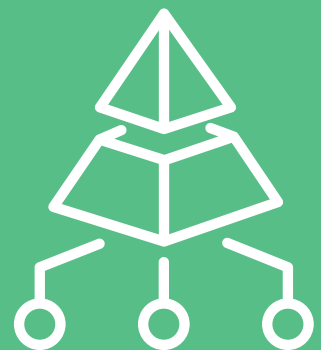


BRIEF

Deliver Private Cloud at Scale with NetApp HCI

Delivering the scalability, guaranteed performance, easy automation, and cloud connectivity needed to power your private cloud at scale now and in the future.





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Private Cloud Requires a Modern Approach to Infrastructure

In today's digital workplace, IT teams are tasked to deliver more, and to deliver it faster. New applications and data are needed across multiple platforms. A recent [survey of 650 IT decision makers across the globe](#) found that increasing IT operational efficiency was the number one digital transformation goal, followed closely by improving the customer experience. Modernizing legacy infrastructure was cited as the most important initiative to achieve those goals.

Legacy infrastructure with separate silos for each application adds friction to cross-functional workflows and prevents data from being shared easily across teams. A new platform is needed to deliver the results necessary to drive digital workflows. This platform must scale with ease, deliver predictable performance to each workload, and take advantage of advanced automation to eliminate manual tasks.

Many enterprises once thought that public cloud was the solution to these challenges. However, IT teams quickly learned that despite agility and easy consumption, public cloud is not the answer for every workload. Enterprise IT teams today are striking a smarter balance between on-premises workloads—running on a private cloud—and workloads in the public cloud. The success of this hybrid cloud approach requires a private cloud that can deliver agility and self-service—and full control over performance and availability—while reducing costs versus public cloud.

The key decision that many IT teams are faced with is what infrastructure to choose to facilitate modernization and private cloud initiatives. Different stakeholders (see Figure 1) have specific requirements that must be addressed. CIOs are interested in driving digital transformation and adopting new consumption models to control cost. Application teams want a solution that helps them meet new business demands, ensures performance, and protects availability. Storage teams must respond more rapidly to growing data demands, even while budgets and staff are flat or shrinking.

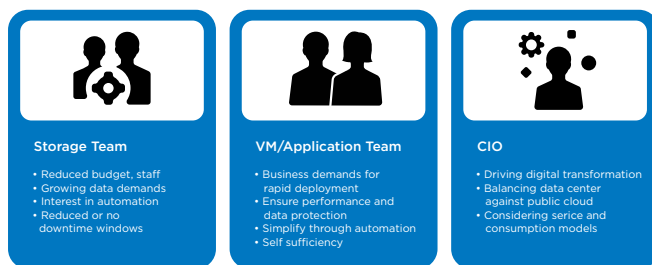


Figure 1) Different stakeholders within your IT organization all have requirements that your private cloud must satisfy.

Enterprise IT teams are increasingly turning to hyper converged infrastructure (HCI) as a means to modernize legacy infrastructure, address the needs of diverse stakeholders, and enable private cloud. But, not every HCI architecture is the

same. Only NetApp® HCI delivers the scalability, guaranteed performance, easy automation, and cloud connectivity needed to power your private cloud at scale, meeting your needs now and in the future.

NetApp HCI Simplifies Private Cloud at Scale

Eliminate the barriers to private cloud success

There are a variety of factors that can hamper the success of a private cloud.

- **Difficulty scaling.** Traditional infrastructure solutions can be difficult and time consuming to scale in the face of dynamic business demands, while many HCI solutions scale inefficiently and have narrow effective scaling limits.
- **Performance issues.** With a private cloud, you consolidate diverse workloads on the same infrastructure, and you may not always know what those workloads are or how they are changing day to day. Tenant workloads must not negatively impact the performance of other adjacent workloads and decrease user satisfaction.
- **Complex automation.** Traditional infrastructure can require complex and often fragile automation. With many infrastructure solutions—both traditional and hyperconverged—automation has been bolted on as an afterthought, limiting effectiveness. Deep automation allows IT teams to respond to user requirements much more efficiently.
- **Lack of cloud connectivity.** Your data centers are now part of a larger hybrid cloud environment. Success increasingly depends on being able to connect all elements together, but many solutions lack the services to allow your private cloud to become part of an integrated hybrid cloud solution.

NetApp HCI is an enterprise-scale hyper converged infrastructure solution designed to address these challenges and simplify and accelerate private cloud at scale. NetApp HCI (See Figure 2) integrates flexible compute options and proven all-flash storage in a turnkey scale-out solution that's simple to manage and easy to automate. This approach enables your private cloud environment to expand with no disruptions and no costly surprises.

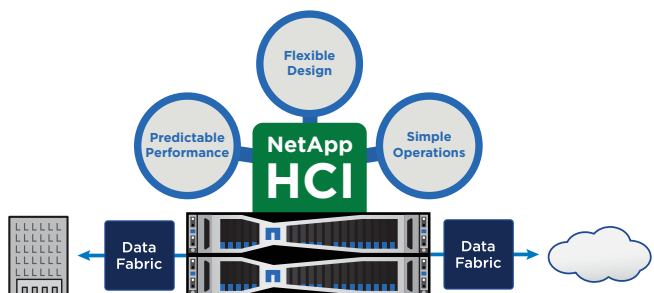


Figure 2) NetApp HCI combines a flexible, scalable design with predictable performance, automated operations, and superior cloud integration.

NetApp HCI addresses both the business and technical challenges of Private Cloud with an innovative platform that is scalable, predictable, automated, and integrated.

Scale on Your Terms Without Disruption

Take the pain out of scaling private cloud infrastructure

NetApp HCI simplifies private cloud deployment with an agile, scale-out architecture that future-proofs your investments. Start small and grow as needed without disruption to operations or users. NetApp HCI eliminates painful migrations and forklift upgrades. You can integrate newer node technology with your existing cluster, so you never have to wait three years for an upgrade.

Because your business needs are constantly evolving, you can't expect a private cloud that scales compute and storage resources in lockstep to meet your needs. Each application has different resource requirements, and workloads come and go, making it difficult to accurately predict future resource needs.

NetApp HCI provides independent scaling of compute and storage, allowing you to dynamically scale on demand, while avoiding costly and inefficient over-provisioning and simplifying capacity and performance planning. By scaling compute and storage independently, NetApp HCI avoids the inefficiencies of HCI solutions with tightly coupled compute and storage. If compute is the limiting factor, with NetApp HCI you can simply add more compute nodes. If you need more storage capacity or I/O performance, simply add storage nodes. New storage nodes integrate seamlessly, so there's never any need to rip and replace the infrastructure that's already in place to scale your environment. You're never forced to add compute resources when you need storage or vice versa, and planned downtime is a thing of the past.

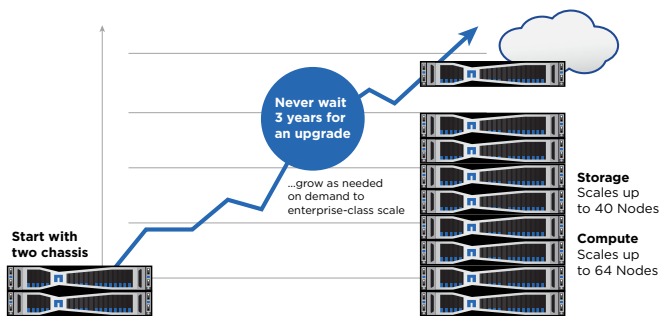


Figure 3) NetApp HCI scales compute and storage independently allowing you to grow resources to match needs without over-provisioning or purchasing resources you don't need.

An elastic design allows you to dynamically scale resources up or down independently for cloud-like agility. Each new node delivers a precise amount of compute performance—or storage performance and capacity—for predictable resource scaling. Application placement is automatically load-balanced in the background.

A unique open and flexible architecture enables you to preserve existing infrastructure investments, lowering total cost of ownership. Leverage existing virtualization infrastructure, licenses, and compute in conjunction with NetApp HCI to lower initial acquisition costs while integrating with existing platforms and operations.

Predictable Performance Delivery

Guarantee performance for every private cloud workload

In a private cloud, you often have less insight into the nature of running workloads. Your marketing or sales team may decide to run I/O-intensive analytics, or a DevOps team may kickoff a demanding software build touching thousands of files. With traditional approaches to storage infrastructure and previous approaches to HCI, this unpredictability leads to inevitable slowdowns and user complaints. With those solutions, the only option is often to over-provision resources, moving back in the direction of the inefficient, siloed environment you were trying to escape. Some enterprises have become somewhat disillusioned with private cloud for exactly these reasons.

NetApp HCI eliminates these problems by preventing workloads from interfering with each other. All applications are able to deliver predictable performance, even in the face of big spikes in activity, increasing productivity and eliminating complaints. The unique architecture of NetApp HCI prevents spikes in activity and runaway processes from interfering with other workloads running in the same cluster. NetApp HCI manages performance automatically and gives you the tools to address performance issues instantaneously.



Figure 4) With NetApp HCI you can mix diverse workloads in a single private cloud. Databases, traditional enterprise applications, containers and more can share the same infrastructure without interfering with one another.

With NetApp HCI you can:

- **Deliver predictable storage performance for each application.** With traditional storage infrastructure, the penalty for getting capacity and performance allocations wrong is complicated and time-consuming data migration or even re-architecting. NetApp HCI is ideal for private cloud environments because you can allocate capacity and performance independently for every workload and application and easily adjust allocations.
- **Automate data distribution and load balancing.** To guarantee performance, NetApp HCI balances pools of performance and capacity across the HCI cluster. Resources are provisioned to meet the needs of each volume or virtual

disk with performance defined in terms of minimum, maximum, and burst characteristics. Changes to these performance and capacity policies take effect immediately without the need to move data to different storage.

- **Confidently mix workloads.** A single private cloud platform can support a mix of workload including databases, virtual desktops, and cloud-native apps. Every application gets the performance it needs with no impact to other applications.
- **Provision storage the same way you provision virtual compute resources.** Storage resources are allocated to each individual volume, virtual volume, or virtual disk from available capacity and IOPS with no storage expertise required.
- **Address performance problems instantly.** NetApp HCI eliminates the penalty for underestimating performance requirements. You simply modify quality-of-service policies to change the settings for minimum, maximum, and burst, and the new settings take effect immediately. No storage vMotion or physical data movement is needed to change performance levels.
- **Minimize the impact of failures:** Availability is critical to private cloud. NetApp HCI can absorb multiple concurrent faults without affecting application performance. Recovering from a drive or node failure takes only minutes and is fully automatic, requiring no operator intervention and eliminating the fire drills that typically occur when a component fails.

These capabilities are essential for a private cloud operating at scale.

Complete System Automation

Meet diverse business needs with simple, fast automation

Automation may be the Achilles' heel for most infrastructure solutions for private cloud. For many solutions, automation was bolted on after the fact, and—because the platforms themselves are complex to design, install, operate, and scale—automation to create unique workflows and services is complicated.

To deliver on the self-service needs of cloud users, common provisioning and management tasks need to be automated so they can be performed without your IT team having to get involved. Automating tasks and allowing users to initiate them directly, is essential for delivering a public-cloud experience from your private cloud.

NetApp HCI greatly simplifies infrastructure and storage management. No storage knowledge is required, and you can provision storage with workflows that are as simple as those for provisioning a VM. You just select the initial capacity and IOPS for each volume.

Because NetApp HCI is simple to provision and manage, it's easy to automate customized storage provisioning as part of a self-service portal. Users can provision and modify storage to address their workload needs without having to understand

the complexities of LUNs, storage tiers, and so on. If they get the allocation wrong initially, they can modify capacity and performance instantly by changing the settings.

NetApp HCI was designed from the ground up to be 100% programmable, so you can rapidly deploy applications and services that incorporate HCI functions to address business needs. With comprehensive, well-documented APIs and deep integration with management and orchestration platforms, NetApp HCI interoperates with everything in your environment. (See Figure 2.) You can use the automation tools you prefer, including tools you already use in production, and simplify management as your private cloud grows.

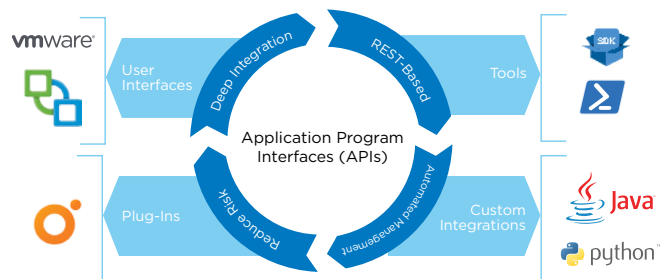


Figure 5) NetApp HCI was designed from the ground up to provide compatibility and programmability.

To simplify ongoing management tasks, you can manage NetApp HCI entirely from the installed VMware vSphere web client, including monitoring and changing quality of service (QoS) settings for performance. After initial configuration, there's no need to touch the NetApp HCI user interface to control storage. You can manage everything through the VMware vSphere interface.

The VMware Storage Policy Based Management (SPBM) model allows storage resources to be provisioned to meet specific application requirements. Storage services can be dynamically created, delivered, and managed based on policies that align a VM or virtual disk to storage capabilities. You modify the storage capabilities for a VM by changing the associated storage policy.

To deliver workflow automation, NetApp HCI is fully compatible with vRealize Orchestrator, allowing you to quickly and easily design and deploy scalable custom workflows from an intuitive graphical interface. The entire Element OS API has been integrated with Orchestrator as scriptable vRealize actions, allowing you to create custom workflows that utilize the full power of NetApp HCI.

In addition, NetApp HCI provides easy integration with the other automation tools such as PowerShell, Puppet, and Ansible that your teams may already be using, providing better control for large-scale environments. These integrations allow you to support agile development practices and DevOps needs. An API with over 200 methods allows for complete and direct control of the NetApp HCI platform, integrating directly with code or with

any tool you are using. You can drive software-defined storage management from any codebase including Java, Python, and .NET.

Data Fabric Integration

Connect with everything in your hybrid cloud environment

A private cloud environment needs to integrate easily with other IT operations, both on premises and in the cloud. Otherwise, it becomes another infrastructure silo, making your overall environment more complex. You must be able to manage and protect data globally and integrate with other important applications and services in your data centers and beyond.

NetApp HCI increases the agility of your end users and your business by delivering predictable performance and simplified operations on a highly flexible and efficient cloud architecture. Because NetApp HCI is Data Fabric ready out of the box, you can easily gain access to all your data across any cloud: public, private, or hybrid. By making data more accessible both on premises and in the cloud, the Data Fabric enables you to respond and innovate more quickly.

Integration with the Data Fabric allows NetApp HCI to provide a variety of advanced data services as part of your private cloud, including file services using ONTAP® Select, object services using StorageGRID®, replication services using SnapMirror®, data visibility using OnCommand® Insight, and backup and recovery services using AltaVault™. (See Figure 6.) These services increase the power and flexibility of your private cloud.

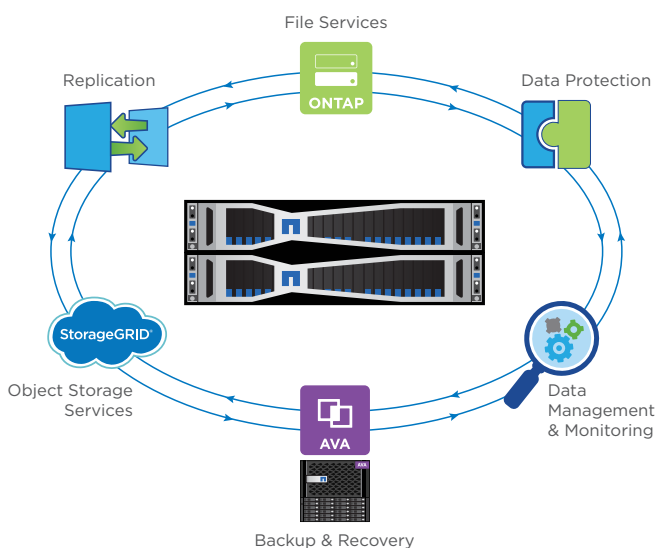


Figure 6) NetApp HCI provides full Data Fabric integration, providing advanced data services to your private cloud and full connectivity to other data center and cloud environments.

Through Data Fabric integration, your private cloud also has direct access to a range of NetApp Cloud Data Services, enabling data protection and other important workflows.

HCI at Enterprise Scale

A smarter approach to HCI, a better infrastructure solution for private cloud

No matter where you are on your cloud journey, NetApp can help you succeed. NetApp HCI delivers benefits for private cloud that traditional infrastructure solutions and other HCI solutions can't match. You can scale easily without artificial limitations, adding compute and storage independently, so you increase only the resources you need. You can confidently consolidate mixed workloads—including end-user computing, demanding databases, and cloud-native applications—on the same infrastructure with guaranteed performance. Advanced automation capabilities enable you to build out the self-service consumption that users demand from a private cloud.

NetApp HCI is an enterprise-scale hyper converged infrastructure solution that delivers predictable performance on a highly flexible, efficient architecture that is simple to deploy and manage. NetApp HCI allows you to meet rapidly changing IT needs so that you can focus on what matters most: growing your business.

Learn More

If you're ready to build a private cloud that operates at scale, NetApp is ready to help you. To learn more about NetApp HCI, visit:

- [NetApp HCI 360° Demo](#)
- [A Hyper Converged Future for Digital Transformation](#)
- [Gartner Report: Competitive Landscape for Hyperconverged Integrated System](#)

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