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Modern Cloud Infrastructure

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Build a hybrid
cloud environment

Explore hyperconverged
infrastructure

Secure your modern
cloud infrastructure

Nutanix | Hewlett Packard Enterprise
Special Edition

Lawrence C. Miller

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Introduction

Many organizations have fully embraced a public cloud strategy to enable business agility and increase speed to market. The public cloud offers flexible consumption and rapid on-demand scalability while eliminating the need for complex infrastructure management.

However, when you look a bit more closely at the value proposition for an all-in public cloud strategy, you start to see cracks in the foundation. Difficult migrations, vendor lock-ins, compliance and regulatory concerns, loss of control, usage overruns, and egress charges start to eclipse the shine of public cloud's image.

Because of these factors, many businesses are re-evaluating their public cloud strategies and increasingly keeping more of their data and IT resources in their on-premises datacenters. However, this approach runs contrary to all the reasons that these organizations embraced public cloud services in the first place: Traditional datacenters require significant capital investments in infrastructure, increase complexity, provide slow or limited scalability, and ultimately reduce business agility and increase time to market.

There has to be a middle road.

The right strategy involves a blend of public and private cloud services. Your business should be able to leverage the elastic nature of public cloud services, along with the ease of management and usability, but with the security, control, and performance of the private cloud. A hybrid cloud approach ensures that unpredictable applications can be hosted in the public cloud while mission-critical applications and data remain in your private cloud within your enterprise. To evolve to this hybrid cloud vision, your first step is building a foundation based on a private cloud model.

Hyperconverged infrastructure (HCI) technology has emerged as the top infrastructure choice for cloud building, enabling web-scale architecture within the enterprise. By eliminating legacy siloed architectures in your datacenter, you can empower your IT team to manage operations with less effort and more speed. This productivity boost frees them up to focus on making IT more strategic to your organization. Your company benefits from a rock-solid infrastructure and a strategic focus within your IT department.

About This Book

This book consists of five chapters that explore:

- » The evolution to modern cloud infrastructure (Chapter 1)
- » The building blocks of hyperconverged infrastructure (Chapter 2)
- » Modernizing your datacenter infrastructure to enable a hybrid cloud environment (Chapter 3)
- » Securing your modern cloud infrastructure (Chapter 4)
- » Advantages of a modern cloud infrastructure (Chapter 5)

Each chapter is written to stand on its own, so if you see a topic that piques your interest, feel free to jump ahead to that chapter. You can read this book in any order that suits you.

Icons Used in This Book

Throughout this book, I occasionally use special icons to call attention to important information. Here's what to expect:



REMEMBER

This icon points out important information you should commit to your nonvolatile memory, your gray matter, or your noggin — along with anniversaries and birthdays.



TIP

Tips are appreciated, but never expected — and I sure hope you'll appreciate these useful nuggets of information.

- » Recognizing how legacy infrastructure restricts innovation
- » Adopting the cloud and supporting digital transformation
- » Modernizing datacenter infrastructure to enable the hybrid cloud

Chapter 1

Looking at the Evolution of Cloud Infrastructure

In this chapter, you learn about the limitations and challenges of traditional datacenter infrastructure, how the cloud and digital transformation are driving the need for change in enterprise IT, and how modernizing your datacenter infrastructure can help you build a hybrid cloud environment to successfully address your organization's needs today and in the future.

Traditional Server, Storage, and Networking Hardware

Legacy datacenter infrastructure — with separate servers, storage, and network components acquired piecemeal over time from various vendors — is burdensome to IT departments. Expensive to purchase, complex to manage, and difficult to protect, these legacy three-tier architectures often require the support of multiple teams of specialists just to operate smoothly and protect them from sophisticated threats and widespread attacks. When IT departments act as their own system integrators in this way — taking on the job of ensuring the compatibility and interoperability

of components from various high-tech providers — unforeseen security, complexity, and cost challenges tend to arise with the system as a whole.

For starters, customer-integrated systems are not often tested together thoroughly, which increases their attack surface for intruders and makes them inherently more vulnerable to threats. Additionally, the complexity of legacy systems can make finding specialists to maintain them difficult. And finally, legacy infrastructure is often costly. A recent global survey (“The State of Innovation: Priorities and Challenges”) of IT and finance leaders conducted by Rimini Street, found the following obstacles to innovation:

- » “We are spending too much keeping the lights on” (77 percent)
- » “Our complex legacy infrastructure makes innovation difficult” (76 percent)
- » “We lack the skills to deliver on innovation” (74 percent)
- » “We are locked into vendor contracts that restrict innovation” (74 percent)



REMEMBER

According to Enterprise Strategy Group (ESG) research, 38 percent of organizations have a problematic shortage of existing IT skills in IT architecture and planning.

The Rise of the Cloud and Other Disruptive Trends

Public cloud services — including Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) — are disrupting the status quo for enterprise IT. According to the “2019 RightScale State of the Cloud Report” from Flexera, public cloud adoption among enterprise and small and medium business (SMB) respondents is at 91 percent, private cloud adoption is at 72 percent, and hybrid cloud adoption is at 69 percent.

Many enterprises are undertaking digital transformation initiatives, seeking to engage with customers and satisfy their needs

through digital technologies. Line-of-business managers, application developers, and IT leaders tasked with achieving these goals are attracted by the public cloud, but when they bypass enterprise IT in favor of public cloud alone, they face a host of security, data protection, and compliance issues for the entire organization.

UNDERSTANDING DIFFERENT CLOUD TYPES

Public cloud

An external company provides a cloud interface from which virtual machines (VMs) can be provisioned. The interface abstracts the hardware and removes hardware planning from the equation. Usage is billed on a consumption basis and treated as an operating expense. Public cloud often takes the form of Infrastructure as a Service (IaaS).

Private cloud

An organization's internal IT team provides a self-management and provisioning portal for end-users. The services are similar to what the public cloud offers, but access is restricted. Private cloud services may be hosted and/or managed by an external cloud service provider with your IT team retaining some or all of the control over resources and networking.

Hybrid cloud

A hybrid cloud combines elements of private and public cloud. Some of your workloads run on-premises, while others run in a public cloud (such as Google Cloud Platform, Amazon Web Services, or Azure) or at a cloud service provider.

Multi-cloud

As cloud computing becomes ubiquitous for enterprises, workloads are increasingly being distributed across multiple private clouds, public clouds, remote and branch offices, field deployments, and service providers. This model is referred to as *multi-cloud*. With workloads distributed across public and private clouds, the risk of vendor lock-in may be reduced.

What's needed is a platform that merges the agility, simplicity, and control of public cloud services with the reliability, disaster recovery, and predictable workloads of a private cloud and is capable of meeting all your IT needs from core datacenters to the edge of your network.

To deliver on the promise of digital transformation, you need a unified infrastructure that fuses public and private cloud with the latest technology trends such as distributed and edge computing. This gives you the flexibility to support new technologies and data-driven analytics where you need them while avoiding the potential problems associated with “shadow IT” and enabling your IT team to deliver the services and user experience customers want. IT teams are looking at a combination of private cloud and public cloud services — what is commonly referred to as a *hybrid cloud* — to meet these needs.

According to IDC's “CloudView Survey,” nearly 80 percent of large organizations have already adopted a hybrid cloud IT strategy. Research by Vanson Bourne on behalf of Nutanix found that 85 percent of enterprises rank hybrid cloud as the ideal IT operating model (see Figure 1-1) and hybrid clouds will see the most growth over the next five years. The reasons enterprises prefer hybrid clouds include:

- » **Security:** The hybrid cloud model is perceived to be the most secure option — even more than private clouds and traditional datacenters — because it enables enterprises to extend many of the security benefits of the public cloud to their private clouds and datacenters and align their operations across all environments.
- » **Flexibility:** Application mobility across clouds and cloud types is essential, dynamically enabling business applications to run on the optimum IT infrastructure.
- » **Expanding cloud options:** With the growth of new cloud options such as managed, on-premises, private cloud services, enterprises can now match workloads to the right cloud on an application-by-application basis.

A combination of on-premises IT services and cloud-based services can deliver substantial business benefits and give your company a competitive edge.

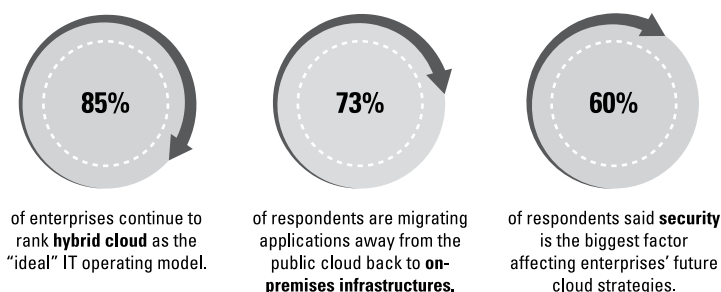


FIGURE 1-1: Key enterprise cloud trends. (Source: Vanson Bourne, *The Nutanix Enterprise Cloud Index 2019*)

Modernizing Your Datacenter Infrastructure

For many companies, rolling out a new service or application can still take weeks or even months as the request passes from the server team to the storage team to the networking team. Legacy datacenter infrastructure can’t keep up with the speed of business today. But modernizing your datacenter infrastructure isn’t just about upgrading hardware to the latest server processors, flash storage arrays, and network controllers. Managing separate silos for compute, storage, virtualization, and networking is too slow and requires too much IT specialization.

There’s a better way: a modern, software-defined hyperconverged infrastructure solution that natively integrates all IT resources to run any application. By leveraging many of the same solutions that you’re already using in public clouds, you can transform your on-premises datacenter into a private cloud and extend it to the public cloud to create IT nirvana: the hybrid cloud.

A private or hybrid cloud has substantial benefits for enterprise IT as well. The move from dedicated infrastructure and purpose-built hardware for each application to standardized infrastructure reduces your reliance on and need for expensive and hard-to-find IT specialists in favor of IT generalists. Some organizations see a substantial benefit from changing CapEx to OpEx, freeing up capital for other uses.

The initial idea of private cloud was to bring the capabilities of public cloud services on-premises. However, many enterprises

encounter limitations with this approach. Many existing enterprise applications aren't well suited to run in the cloud. They often require the addition of automated orchestration capabilities with application blueprints and runbooks to streamline deployments and showback/chargeback abilities so the business users consuming resources know what their costs are. Thus, any private cloud vendor must provide these features so IT can embrace them as a legitimate alternative to the ease and cost visibility of the public cloud.

As organizations look to adopt hybrid cloud strategies, it's important to consider two aspects of any cloud:

- » **The interface:** How do end-users see and access the cloud?
How do administrators manage it?
- » **The infrastructure:** What technology is the cloud built on?

To succeed, you have to get both the interface and the infrastructure right. If you get the interface wrong, your end-users will be tempted to go elsewhere to address their needs.

Even IT administrators may be tempted by the public cloud when management interfaces are too complex, not flexible enough, or make dealing with new additions or upgrades nearly impossible. And even the best interface won't make up for a bad foundation. Your cloud infrastructure must:

- » Scale quickly and easily
- » Respond readily to business changes and directives
- » Minimize or eliminate the effects of noisy neighbors
- » Support your developers and DevOps efforts
- » Accelerate the process of application deployment and management

To develop your hybrid cloud strategy, you need to answer some hard questions:

- » How much of the cloud experience will you deliver to users?
- » Where should different workloads run? On-premises? At a cloud service provider (CSP)? At a SaaS provider? In a public cloud such as Amazon Web Services (AWS), Google Cloud

Platform (GCP), or Microsoft Azure? Users, of course, don't care where an application workload runs, they care about the service levels delivered — and the cost.

- » What infrastructure will you deploy on-premises?
- » Even if your users don't want or need the full cloud-like experience, how can your business benefit from a hybrid cloud strategy?

Implementing a private cloud on top of traditional enterprise IT infrastructure with separate servers and storage connected by storage networks can be challenging. Despite its familiarity, traditional IT infrastructure is difficult to scale, slow to respond to business needs, prone to noisy neighbor problems, and complicated to manage. These challenges are amplified in a cloud environment.

Using hyperconverged building blocks that provide compute capacity and storage capacity on each node, enterprises can build their own private cloud using the same approach as many large public cloud providers. The right hyperconverged infrastructure (discussed in Chapter 2) provides many of the same capabilities available in the public cloud, including self-healing, simplified capacity planning, easier automation, and reduced management overhead.

- » Identifying hyperconverged infrastructure components
- » Simplifying datacenter management and operations
- » Leveraging machine learning and automation

Chapter 2

Learning the Basics of Hyperconverged Infrastructure

In this chapter, you learn about the key capabilities and components to look for in a hyperconverged infrastructure (HCI) for your hybrid cloud environment.

Full-Stack Infrastructure and Platform Services

HCI combines the entire datacenter stack — including compute, storage, storage networking, and virtualization — to create flexible building blocks that replace legacy datacenter hardware (see Figure 2-1). This legacy hardware consists of separate servers, storage arrays, and storage networks, that are complex and expensive purchase, operate, and maintain.

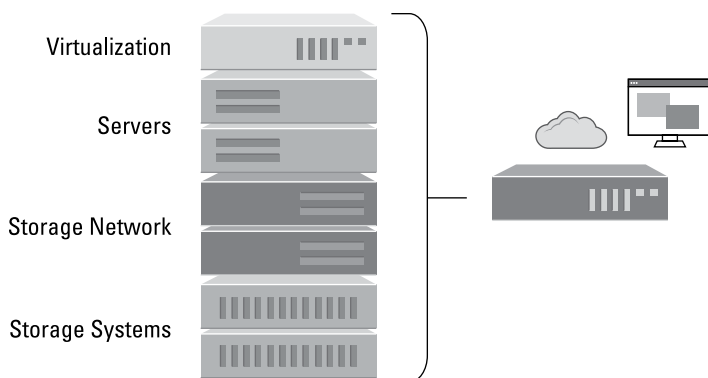


FIGURE 2-1: An HCI platform combines servers, storage, storage networks, and virtualization in a full-stack solution.

HCI consists of two main components:

- » The **distributed data plane** runs across a cluster of nodes delivering storage, virtualization, and networking services for guest applications — including virtual machines (VMs) and container-based apps.
- » The **management plane** lets you easily administer HCI resources from one place and one view and eliminates the need for separate management solutions for servers, storage networking, storage, and virtualization.

HCI effectively eliminates storage as a tier of infrastructure in the datacenter. Rather than existing as a separate resource, storage and compute resources are added to server hosts and managed by software. They simply become additional resources to be consumed by the business as needed.

Like most modern workloads, HCI leverages virtualization technology. In fact, the hypervisor is an integral part of each node in an HCI cluster. Each HCI node in a cluster runs a hypervisor (such as Nutanix AHV, VMware ESXi, or Microsoft Hyper-V), and the HCI control features run as a separate VM on every node, forming a fully distributed fabric that can scale resources with the addition of new nodes.

In short, HCI consolidates servers, storage, the hypervisor, and some network functions into a software-centric solution deployed

on commodity hardware. HCI uses intelligent software to combine x86-based server and storage resources into a 100 percent software-defined solution with no dependency on proprietary hardware. It replaces the components of legacy datacenter infrastructure with one unified system, creating a highly scalable datacenter.



REMEMBER

An HCI platform is a turnkey solution that runs on industry-standard servers that enable enterprises to start small and scale one node at a time. Software running on each server node distributes all operating functions across the cluster for superior performance and resilience.

There are many benefits of moving from complex legacy datacenter infrastructure to the simplicity of an HCI platform including lower total cost of ownership (TCO), improved performance, and greater productivity within IT teams.

One Operating System, One-Click Simplicity

The right HCI platform bridges efficiency and performance gaps with a single software fabric that unifies your private and public clouds, delivering one-click simplicity for managing multi-cloud deployments.



REMEMBER

The right HCI platform enables application mobility across clouds on any hardware, hypervisor, or cloud.

An HCI platform delivers private cloud value in a modern datacenter through a combination of:

- » Full-stack infrastructure and platform services that deliver turnkey hybrid infrastructure for any app at any scale, anywhere
- » One-click operations for cloud-like operational simplicity
- » Pay-as-you-grow economics that allow you to buy and use only the IT resources you need, as you need them
- » Integrated security and control that simplifies security validation
- » Application mobility that eliminates infrastructure lock-in

With the right HCI platform in your datacenter, you have a foundation with the agility and features you need for a hybrid cloud environment. You can reap the benefits of cloud, taking the complexity out of your IT infrastructure and simplifying planning.

Driving Zero-Click Operations with Machine Learning and Automation

A consistent pain point for any IT environment is keeping system software and firmware up to date. IT administrators spend countless evening and weekend hours on upgrade tasks, not to mention the expensive professional services required with some platforms. The right HCI platform takes the pain and disruption out of upgrades, allowing them to be executed during normal business hours. Intelligent software does all the heavy lifting, eliminating the need for detailed upfront planning.



TIP

The Nutanix operating system (Acropolis) software and hypervisor (AHV) software on each node is updated using a rolling methodology that eliminates maintenance downtime and disruption to running jobs.

In the event of alerts or failures, the HCI management software suggests remediation actions that you can initiate to correct problems quickly. With one-click remediation, the mean time to repair and restore services is greatly reduced, significantly improving availability.



TIP

Nutanix provides a universal control plane spanning private and public cloud, eliminating management complexity. An intuitive interface and comprehensive representational state transfer (REST) application programming interfaces (APIs) covers the entire stack: VM operations, virtualization, compute, storage, backup, applications, and disaster recovery across a single site, multiple sites, public cloud, private cloud, multi-cloud, and hybrid cloud.

Artificial intelligence and machine learning have enabled advanced automation and orchestration of complex processes across the entire IT environment. HCI is no exception. You can automate

many simple, repetitive storage management tasks and orchestrate more complex tasks. Automatic infrastructure optimization and remediation take the place of many routine tasks with the end goal of eliminating the need for daily operator involvement.



TIP

Nutanix Prism Pro lets you automate and orchestrate security hardening, application auto-scaling, and other big jobs in your environment. For example, with Prism Pro's proactive remediation capabilities, you can create playbooks for common remediation or troubleshooting steps. Those playbooks can be triggered automatically based on alert policies that you define.

SAN FRANCISCO DA'S OFFICE LEVERAGES NUTANIX IN DX

The San Francisco district attorney's office is the legal agency responsible for prosecuting crimes in the city and county of San Francisco. In addition to the thousands of court cases handled per year, the DA's office offers a variety of proactive community services to its constituents, including a victim services unit and a neighborhood outreach program that educates youth on crime prevention.

"Our goal is to make San Francisco one of the safest large cities in the U.S., but we also want to prevent the crimes from happening in the first place. That's where our outreach programs come into place," noted Herman Brown, CIO.

IT challenges

Brown and his team are responsible for supporting the IT needs of the agency's 320 attorneys and staff members, and up to 100 student interns that work in the office throughout the year. "The role of technology in the DA's office has become increasingly important over the past few years," Brown said. "There has been a steady progression of IT from just being a support center, to having a seat at the table with the executive team where we talk about overall agency strategy and direction, and examine how technology can us help meet our goals."

One of the biggest challenges Brown faces as CIO is keeping up with the ever-increasing expectations of the agency's end-users while staying within the allocated IT budget. "My primary goal is to implement all of the new applications and innovative technologies our employees

(continued)

need to be productive, ensuring that everything runs as simply, reliably, and quickly as possible — within our annual budget,” explained Brown.

The Nutanix solution

Brown and his team started looking for new IT infrastructure to replace the aging Hewlett Packard Enterprise (HPE) server environment in 2018. The team evaluated several hyperconverged solutions. “We created a matrix of the pros, cons, and benefits of each solution. Nutanix was the clear winner in every measure, including performance, cost, and reliability,” Brown reported.

The DA’s office made the decision to purchase Nutanix OS software and deploy it on HPE ProLiant hardware. “We’ve always been happy with our HPE servers — it’s a solid solution. Finding out that Nutanix was compatible with HPE was just the icing on the cake,” said Brown. The DA’s office is now running all of its enterprise, legal, and office productivity applications file sharing and print servers, DHCP, Active Directory, and SQL Server workloads on the Nutanix platform.

Customer outcomes

- **More time to innovate.** The move to Nutanix has eliminated nearly all of the overhead and maintenance tasks associated with the legacy infrastructure. Brown and his team are also using Nutanix’s analytics and dashboards to present information in real-time, not only for the IT support services staff, but for the entire agency.
- **Keeping up with the influx of new data.** The separate worlds of technology and law have collided in a big way recently with the rollout of body cameras worn by police officers. Surveillance, video, Nest, and other monitoring solutions are now available to the average citizen. As a result, a large number of the DA’s cases now involve cellphone video evidence or photos people have taken on the street.
- **Empowering a mobile workforce.** The DA’s office is committed to helping its employees work remotely. All of the agency’s staff and legal professionals are now given a mobile device so they can work equally well inside or outside of the office, including in the courtroom. Brown and his team are also implementing a new case

management system that will support the staff's ability to easily access files remotely.

- **Reigning in costs.** One of the ways the DA's office was able to reign in IT costs was by moving from VMware to AHV, the Nutanix hypervisor. "We were getting tired of paying the annual subscription fees for vSphere," admitted Brown. "Migrating to AHV allowed us to move away from that paid service to a more economical and efficient solution, allowing us to spend our IT budget more strategically. Nutanix is enabling us to modernize our law firm, resulting in more efficient use of tax dollars. Our constituents in San Francisco should be very happy that we're utilizing Nutanix technology because it enables us to do more with less."
- **Improving data security.** The DA's office is also responsible for the security and compliance of all data in its criminal justice information system (CJIS). Nutanix is helping the DA's office address the all-important security aspect of its data through encryption at rest for digital records, consolidating everything into one "source of truth" on Nutanix.

- » Transforming your datacenter into a private cloud
- » Enabling application portability between private and public clouds
- » Deploying a hybrid cloud for your enterprise

Chapter 3

Building Your Hybrid Cloud Environment

In this chapter, you learn how to modernize and transform your datacenter into a private cloud, extend your private cloud to the public cloud, and deliver the benefits of a hybrid cloud model for your organization.

Operating Your Datacenter as a Private Cloud

Public cloud services such as Amazon Web Services (AWS) and Microsoft Azure have reset business expectations for enterprise IT. Traditional datacenters and legacy technologies are unable to deliver the ease of access and agility necessary to support the business in a timely manner, driving stakeholders elsewhere for the applications and services they need. The resulting shadow IT increases your company's total IT costs and risks, compromising your organization's security posture.

To deliver on business needs and accelerate digital transformation, IT teams need the simplicity and scalability of public clouds, paired with the security and control of on-premises

datacenters — with the ability to satisfy strict service-level agreements (SLAs) and tight budgets.

Modernizing your datacenter infrastructure with the right hyper-converged infrastructure provides IT teams with an opportunity to operate their enterprise datacenters as private clouds. This goal is accomplished by leveraging a high degree of infrastructure and application automation and ensuring that your infrastructure investments keep pace with changing workload requirements. Simple, scalable infrastructure is combined with consolidated data services, intelligent operations, and native data protection, with security and governance built into every facet of the solution (see Figure 3-1).

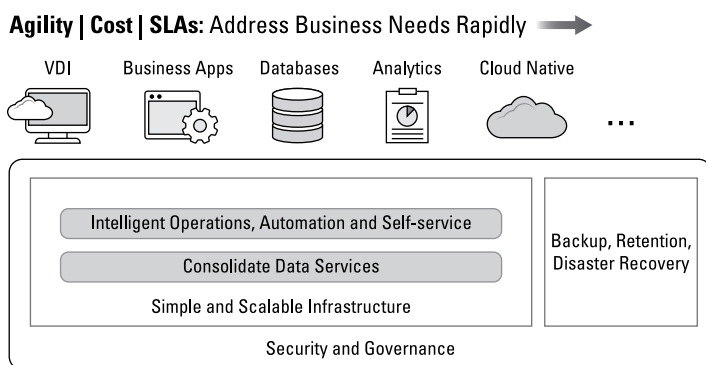


FIGURE 3-1: Addressing business needs rapidly and securely with a private cloud.



TIP

An HCI solution must also support containers. This can be done in a couple of ways. The first is to deploy a virtual machine that itself becomes a container host. The second is to use a platform that provides native container orchestration, automation, and management with integrated persistent storage services, like Nutanix with Karbon. Nutanix Karbon is a private cloud, turnkey-curated, enterprise-grade Kubernetes service offering that simplifies the provisioning, operations, and lifecycle management of Kubernetes. Karbon makes it simple to deploy a highly available Kubernetes cluster and operate web-scale workloads.

Some key design elements to consider as you plan your private cloud deployment include:

- » **Simple and scalable infrastructure:** HCI reduces the cost and complexity of legacy IT architectures built with separate storage, networking, and compute resources. With HCI technology, simple building blocks create a powerful and flexible scale-out architecture. You can start small and scale as needed without upfront guesswork or expensive overprovisioning. Scaling is predictably linear, so you can add compute and storage resources incrementally as needs grow — avoiding large, unexpected capital outlays.
- » **A platform for data services:** Your IT operations may be burdened with a variety of legacy storage systems to accommodate both structured and unstructured data. Not only is this expensive and challenging to manage, it limits insight into critical business data and makes data integration difficult or impossible. An HCI solution allows you to consolidate all your data services on the same platform that supports your compute resources, eliminating the need to architect and manage separate siloed storage solutions for your private cloud. This includes block storage for transactional data, file storage for file system data, and object storage for massive amounts of unstructured data. A single, flexible and scalable storage pool simplifies provisioning and management while increasing capacity utilization.
- » **Intelligent IT operations, automation, and self-service:** With most organizations devoting a significant percentage of their total IT spend to operational expenses, there's an urgent need to reduce IT complexity. By simplifying infrastructure management across the entire lifecycle, automating operations, and enabling self-service, an HCI solution helps you create a private cloud that delivers the scalability, availability, and flexibility to enable business success.
- » **Backup, retention, and disaster recovery:** Private cloud resiliency and business continuity are critical to prevent disrupting important applications and users. Your HCI platform should provide native data protection to simplify your infrastructure, eliminate bottlenecks, and streamline backup management.

- » **Monitoring, metering, and chargeback:** A private cloud solution should give you the ability to monitor, meter, and chargeback actual costs to end-users and departments with deep visibility into consumption patterns across your private cloud, as well as public cloud deployments.
- » **Security and governance:** Ensuring that a private cloud meets security, corporate governance, and regulatory requirements can be a significant challenge. In private cloud environments, two important capabilities are data encryption and policy-based microsegmentation.

Extending Your Private Cloud to the Public Cloud

Extending your private cloud to the public cloud enables you to move diverse application workloads (see Figure 3-2) dynamically between public and private clouds based on different — and often changing — performance, security, and governance requirements.

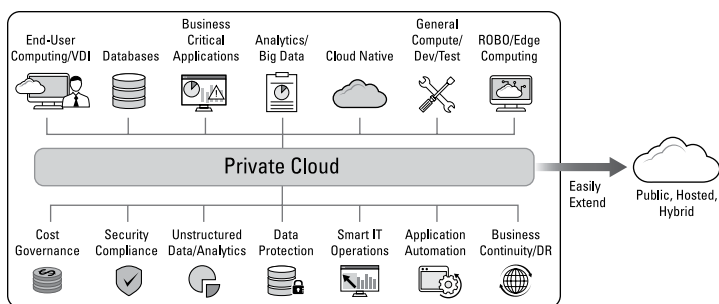


FIGURE 3-2: Extending your private cloud to the public cloud.

Key capabilities that enable enterprises to create a hybrid cloud environment by extending their private cloud to the public cloud include:

- » **Full-stack infrastructure and platform services** that deliver a turnkey infrastructure for any app at any scale,

anywhere, through a combination of on-premises datacenters and public cloud services.

- » **Zero-click operations and artificial intelligence/machine learning** to enable operational simplicity through automation and insights.
- » **Rapid elastic consumption** that allows the business to buy and use only the IT resources it needs, and non-disruptively scale when demands grow.
- » **Integrated security and governance** that covers the entire infrastructure stack across private and public clouds, leveraging automation to maintain a security baseline.
- » **Application-centric mobility** that lets businesses place and move applications anywhere, with no infrastructure lock-in.

Recognizing the Benefits of a Hybrid Cloud Environment

Many organizations would like to operate their applications and data in a hybrid environment spanning on-premises datacenters and public clouds. However, expanding from private to public cloud environments poses many challenges, including the need to learn new technology skills, need to re-architect applications, and multiple tools and silos to manage cloud accounts.

There is a pressing need for a single platform that can span private, distributed, and public clouds so that operators can manage their traditional and modern applications using a consistent cloud platform.

Key benefits of a hybrid cloud environment include:

- » Span on-premises and public clouds with a single platform
- » Extend applications to public clouds without retooling
- » Easily burst additional capacity to meet cyclical needs

THE HOME DEPOT PARTNERS WITH NUTANIX TO DRIVE IT INNOVATION

The Home Depot lives by a simple premise: Put customers and associates first, and the rest will take care of itself. The Home Depot has grown exponentially to become the world's largest home improvement retailer today.

The company employs nearly 400,000 associates and operates more than 2,200 stores in the U.S., Canada, and Mexico. It also has a successful e-commerce business that offers more than one million products to its do-it-yourself customers and professional contractors throughout North America.

The Home Depot has achieved its great success through decades of hard work, with a strong and unwavering commitment to providing the industry's best products and exemplary customer service. In order to attain these goals and continue to grow, IT innovation is more important than ever for The Home Depot. From inventory tracking, to online ordering, to supply chain management — The Home Depot is always looking for new ways to improve productivity and operational efficiency for its retail store and e-commerce business.

IT challenges

The Home Depot has a long reputation as a technology leader. In 2015, the company decided to revolutionize its IT environment to enhance the performance and scalability of its infrastructure and reduce the total cost of ownership (TCO). "We used to try to cut costs by just upgrading to faster servers and more efficient storage," noted Kevin Priest, senior director at The Home Depot. "We needed to find a better way to reduce TCO."

The Nutanix solution

The Home Depot evaluated multiple hyperconverged infrastructure (HCI) vendors and storage virtualization solutions for its next-generation architecture. "We looked for vendors that shared our vision of moving to a software-driven world," says Priest.

The Home Depot started by moving its non-production applications to Nutanix, followed by the company's production workloads,

including those on Cloud Foundry. The Home Depot also virtualized its Apache Tomcat grid implementation and deployed a virtual desktop infrastructure (VDI) environment using Nutanix as the underlying infrastructure platform. More than 98 percent of The Home Depot's datacenter virtual workloads — including those supporting its retail operations, decision analytics, and supply chain — are now delivered by Nutanix. "Our decision was reinforced by the ability to run Nutanix on whatever hardware platforms we chose."

Customer outcomes

- **Significant TCO reduction:** One of the biggest benefits of partnering with Nutanix has been the reduction in TCO. "Since the introduction of Nutanix, I have been able to lower the internal chargeback costs to my customers by almost half," says Priest. Because of the lower TCO, The Home Depot's development teams have been able to reallocate their budgets to launch additional development projects and add more virtual machines to increase the performance of existing applications and services.
- **Provisioning time reduced from three weeks to one hour:** Another benefit of moving to Nutanix was the increased speed of deploying new capacity. "Our developers used to have to wait three weeks for us to provision technology resources to them. With Nutanix, it's done in less than an hour," explains Priest. With the faster provisioning, The Home Depot's developers have been able to dramatically accelerate delivery of their software development projects, resulting in a faster launch of new services and applications to internal end-users and customers.
- **Enabling capacity management:** There wasn't an easy way to perform capacity management on the legacy architecture. As a result, The Home Depot's IT team would deploy new server pods and then keep adding workloads until they ran out of resources. Application performance would inevitably degrade over time, and the operations team would have to manually tweak the system in different ways, but only after the performance issues had already occurred. The Home Depot is now using Nutanix Prism Pro to obtain comprehensive visibility and control over the entire environment. The company can now shift capacity from one cluster to another to provide an "infrastructure-as-code" management experience.

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- **Consolidating teams:** By moving to Nutanix, The Home Depot was able to consolidate its server, storage, and virtualization groups into a single operations team. Prism Pro provides the combined team with full visibility into the entire environment, rather than aggregating information from separately managed infrastructure silos. “By consolidating teams, our admins are finally able to see the bigger picture. The consolidated team has unleashed a wave of innovation across the organization,” says Priest.
- **A “justifiably famous” support experience:** “The Nutanix Support team has been impressive,” Priest stated. “When you call in with an issue, you’re immediately connected to someone who actually understands your problem. Nutanix has set the standard of what customer-centric technology support should look like.”
- **Applications on-premises or the cloud:** The Home Depot is currently running a mix of workloads on-premises and in the cloud. “We do know that it’s easier to do infrastructure in the external cloud, but cloud costs are variable and must be managed differently,” said Priest. “Nutanix has equipped us to enhance our decision on when to run something externally or on internal servers and that has made a fundamental difference for us.”

- » Securing datacenter infrastructure throughout its entire lifecycle
- » Enabling consistency across different cloud environments
- » Certifying and accrediting secure configurations

Chapter 4

Securing Modern Cloud Infrastructure

The growing scale and sophistication of cyberattacks, as well as recent high-profile security breaches, have elevated the importance of security in IT infrastructure decisions. Rather than rushing to retrofit security capabilities to existing datacenter infrastructure, security must be a core requirement from the beginning.

In this chapter, you look at some important security considerations for a modern datacenter infrastructure.

Engineering a Hardened Platform

Securing an inherently vulnerable system is a challenge no IT organization should ever have to undertake. Effective cybersecurity is difficult enough just protecting your environment from external and internal threats. Deploying engineered systems that are hardened for secure operation by default helps organizations achieve a stronger security posture.

From protection of the firmware at initial boot-up through ongoing operation to single sign-on, role-based access controls, data-at-rest encryption, perimeter and inside-the-firewall

protection, and constant monitoring of a known security baseline, this section gives you a closer look at how Nutanix and HPE deliver robust hardened HCI platforms.

The Nutanix AHV hypervisor (the foundation of Nutanix HCI software) is hardened by design, adhering to the principle of least privilege and delivering a true defense-in-depth model. Its custom security baseline conforms to the requirements of the U.S. Department of Defense (DoD). Meeting these high security standards enables Nutanix to be compliant in bidding on contracts with the DoD.

Nutanix combines several security features and capabilities into its security development lifecycle, including:

- » **Role-based access control (RBAC):** Restrict access to the infrastructure and sensitive data using RBAC to reduce the risk of unauthorized access and comply with regulatory requirements.
- » **Single sign-on (SSO) and multi-factor authentication (MFA):** Mitigate the risk of account compromise and credential theft by using Security Assertion Markup Language (SAML) 2.0 authentication mechanisms for SSO and MFA for system administrators.
- » **Data-at-rest encryption:** Safeguard sensitive user and application data from theft or loss with self-encrypting drives or software encryption that meets regulatory compliance requirements for your industry. See “Encrypting Data at Rest” later in this chapter.

These features and capabilities are integrated into product development to help meet the most stringent security requirements. Nutanix systems have been certified to meet strict security and guidelines across a broad set of evaluation programs.

Nutanix HCI design is fundamentally more secure than mix-and-match infrastructure because it eliminates untested attack surfaces in the gaps between components. All the HCI storage, compute, and virtualization software are tightly integrated and tested with security-configuration best practices applied by design. Patches are thoroughly tested across the storage, compute,

and virtualization software elements to help ensure they are fully compatible and error-free before they are sent to the customer.

The Nutanix Security Technical Implementation Guide (STIG) is more than a guide or best-practices document; it's machine-readable, and Nutanix software uses it to automatically configure itself to a hardened standard. Nutanix automates the regular health-checking of the applied STIG, and if the system configuration is not compliant, the software reapplies the baseline settings.

Nutanix Flow micro-segmentation secures east-west traffic inside the perimeter to prevent any breach from propagating within the virtual environment. Nutanix Flow provides granular control and governance of all traffic into and out of virtual machines (VM) or groups of VMs.

Nutanix software provides superior security against perimeter threats and against propagation of damage at the VM and application level in the event of a breach. Hackers have invented new kinds of attacks, however, that no software can protect against. These attacks target vulnerabilities at the firmware level, below the level of the operating system or hypervisor. The best protection against these firmware-level threats is to be secured in the silicon. Today's servers can run more than a million lines of firmware code before launching the operating system. This firmware attack surface is becoming a more frequent target for attacks because the firmware code operates in a privileged mode. If compromised, a breached system can go for months without being detected.

HPE's Silicon Root of Trust protects against firmware attacks and exposes previously undetectable firmware and malware threats. It can recover itself to a known secure state, with trusted firmware, and without manual intervention.

The key to Silicon Root of Trust is that all firmware is scanned and monitored through a series of integrity checks that are initiated from a silicon fingerprint. When the server is manufactured, a digital fingerprint is created. Every time the system boots up, that digital fingerprint is compared to the firmware; if they don't match, the system is smart enough to know that the firmware has been corrupted and the server won't boot. In addition, the system can regularly check the firmware while the system is operating and not solely at boot-up time to make sure no one has tampered with it, and it can automatically recover to a known-good state.

Once authenticated, the chain of trust is then passed upward to the Unified Extensible Firmware Interface (UEFI)/Basic Input/Output System (BIOS), the operating system bootloader, and the hypervisor, as shown in Figure 4-1.

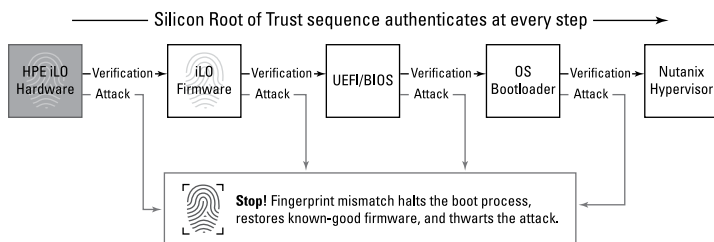


FIGURE 4-1: The HPE Silicon Root of Trust.

Other HCI systems use roots of trust and chains of trust, but HPE Silicon Root of Trust provides the following distinguishing features:

- » Only HPE manufactures its own custom application-specific integrated circuit (ASIC), the HPE Integrated Lights-Out (iLO) 5 chipset, with the fingerprint burned into the custom silicon right in the fabrication facility. This unbreakable connection between the silicon and firmware protects the system starting early in the production process and continuing through supply-chain shipping and distribution to the customer's final location.
- » Silicon Root of Trust verifies all the firmware not only at boot time but as often as daily. This includes firmware for iLO, complex programmable logic devices (CPLDs), innovation engines (IEs), server platform services (SPS), UEFI/BIOS, and option read-only modules (ROMs).
- » Not only does Silicon Root of Trust identify a fingerprint mismatch and prevent booting up, but it can also recover automatically from a compromised firmware event by reverting to a known-good, secure state.

HPE systems include many security features in addition to Secure Root of Trust, including a single security dashboard, Commercial National Security Algorithm (CNSA) security modes, data collection for forensic evaluation, one-button secure erase, and secure VM isolation, among others.

Running Consistent Policies Across Clouds

As organizations adopt enterprise cloud strategies, they often attempt to apply the same policies and processes used in their on-premises environments to the cloud. Inevitably, many of these policies and processes do not translate well in the cloud and end up being modified or replaced altogether. In other cases, on-premises policies and processes are a “force fit” in the cloud and may create inefficiencies that eliminate some of the benefits of the cloud, such as flexibility and on-demand self-service.

Modernizing your datacenter infrastructure provides an opportunity to operate your on-premises datacenter as a private cloud (see Chapter 3). This further enables organizations to develop cloud-native security policies and processes (as well as other operational policies and processes) that are applicable across all their operating environments.

Certification and Accreditation

Another key benefit of pre-engineered systems is that many such platforms take the additional step of certifying and accrediting their configurations against key industry standards, including:

- » **Common Criteria — EAL2:** International specifications and guidelines for evaluating information security products
- » **FIPS 140-2:** The Federal Information Processing Standard (FIPS) information technology security accreditation program for cryptographic modules
- » **NIST-SP800-131A:** National Institute of Standards and Technology (NIST) Special Publication SP800-131A, which provides guidance for the use of stronger cryptographic keys and more robust algorithms
- » **NSA Suite B Support:** RSA 2048, Elliptic Curve (EC) DSA-256 (Suite B to Secret), EC DSA-384 (Suite B to Top Secret)
- » **Section 508 VPAT:** The Voluntary Product Accessibility Template (VPAT) tool developed by the Information Technology Industry Council (ITIC) to evaluate how a product or service adheres to the Section 508 Accessibility Standards

» **TAA Compliant:** Trade Agreement Act (TAA) guidelines that validate products made in free-trade friendly countries

Xi BEAM FOR MULTI-CLOUD SECURITY COMPLIANCE

Xi Beam ensures security compliance for organizations by providing the necessary visibility, optimization, and control over their cloud security. Cloud operators are empowered with security audit checks. Beam automates these security compliance checks to provide a real-time view into the state of cloud infrastructure and data security along with one-click fixes.

Beam provides multi-cloud security compliance to help organizations identify and fix their security issues across Nutanix Private Cloud as well as public clouds. Beam offers these features:

- **Visibility into security compliance.** Beam provides businesses with a security heatmap and complete visibility into the security posture of their environment. Beam also identifies any security vulnerabilities using more than 550 automated audit checks based on industry best practices.
- **Optimization of security compliance.** Beam provides cloud operators with a one-click feature to easily fix security issues. Beam also provides out-of-the-box security policies to automate the checks for common regulatory compliance policies, such as the Health Insurance Portability and Accountability Act (HIPAA), Payment Card Industry Data Security Standards (PCI-DSS), NIST, General Data Protection Regulation (GDPR), and others.
- **Control over security compliance.** With Beam you can set policies that continuously detect security vulnerabilities in real-time and automate the actions needed to fix them. You can also create your own custom audit checks in Beam to meet your business specific security compliance needs.

Beam's extensive customization capabilities help customers meet their specific requirements to keep their cloud infrastructure secure and compliant with industry best practices. Beam provides continuous security compliance across multi-cloud environments.

Encrypting Data at Rest

Encrypting data at rest helps prevent sensitive data from being compromised due to a breach or other unauthorized access. Nutanix offers several options for data encryption including:

- » **SW+Native Key Manager** is a FIPS 140-2 Level 1 compliant option that uses Nutanix Software-Based (SW) Encryption with Nutanix built-in Native Key Manager. This option eliminates the cost of Self-Encrypting Drives (SED) and third-party key manager license and support costs.
- » **SW+EKM** provides a SW Encryption capability as an alternative to using SED and supports numerous third-party External Key Manager (EKM) solutions.
- » **SED+EKM** uses hardware-based SED, which requires a third-party EKM. This is the recommended option for organizations that require FIPS 140-2 Level 2 compliance.
- » **SED+SW+EKM** provides dual protection (two data encryption schemes) using SED with Nutanix SW Encryption. This level of protection may be required for customers with extremely sensitive data requirements in which having two protection keys is better than one third-party EKM.

NUTANIX SUPPORTS THE SAIC VOLKSWAGEN PRIVATE CLOUD

The IT revolution has brought many changes to the automotive industry. To take advantage of new opportunities, companies in the auto industry must update their products and explore new business models while maintaining stable growth of existing businesses.

SAIC Volkswagen is a Sino-German joint venture between Shanghai Automotive Industry Corporation (SAIC) and Volkswagen Group. The joint venture agreement for SAIC Volkswagen was signed in October 1984, which makes it one of the oldest auto joint ventures in China. As one of the largest passenger vehicle makers in China, SAIC Volkswagen owns two auto brands, Volkswagen and Skoda, with products covering several market segments.

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IT challenges

With the expansion in business development, SAIC Volkswagen's requirements for full-system security, operation, and maintenance, have become more stringent. According to Wang Chunxiao, SAIC Volkswagen project leader, IT support is required in all aspects of the company's business, including research and development (R&D), manufacturing, transportation and logistics, car sales, after-sales services, and new forms of consumer relations programs.

Currently, SAIC Volkswagen has two datacenters in Shanghai and a disaster recovery datacenter under construction in Jiangsu. Previously, the applications and databases at SAIC Volkswagen were mostly deployed on Unix-based small computers. In addition, it also had many web servers and small application servers. As a result, the total number of servers exceeded 1,000.

The SAIC Volkswagen IT team faced three key challenges: First, the existing legacy datacenter server and storage infrastructure ran a wide variety of IT applications. As a result of the expansion of applications and services, the pressures and costs of managing hardware infrastructure had increased. Moreover, the computing and storage capacity was not being fully utilized. Finally, the scale-up expansion model of legacy hardware infrastructure could hardly meet the performance demands of applications.

The Nutanix solution

To overcome these challenges, SAIC Volkswagen ran a private cloud trial. The hardware used in the private cloud trial was standard x86 hardware. Once the final decision to deploy in a private cloud was made, SAIC Volkswagen started selecting vendors. SAIC Volkswagen found that the products offered by Nutanix were very much in line with its planned private cloud project. The distributed storage of Nutanix products saves the trouble of buying the entire fiber-optic network and centralized storage. Following a proof of concept (POC) and several technical discussions with the Nutanix team, SAIC Volkswagen decided to build its private cloud with seven Nutanix nodes.

"After the early-stage test, we found that Nutanix's products are very much consistent with the SAIC Volkswagen's plan for private cloud in both functions and performance. Some of its features are even

beyond our expectation,” said Wang Chunxiao. “In addition, Nutanix is [a pioneer] in hyper-convergence, and its Enterprise Cloud technology is in a leading position in the market, which echoes SAIC Volkswagen’s leading position in the auto industry.”

Customer outcomes

- **Rapid deployment and faster time to market:** In less than a day, all the environments were in place and the users could deploy their applications directly on the enterprise platform. As such, the R&D process of new products and launch of new projects was accelerated, which greatly shortened the period of the project.
- **Simplified management and maintenance:** Wang Chunxiao was impressed by the ease of use and high efficiency of the Nutanix solution during deployment and utilization. “To upgrade the system, all you need to do is to download the upgrade package from the official website, upload via the web management interface, and click the button to upgrade. All the seven nodes were automatically upgraded, and the user at the front would not even notice the upgrade during the whole process.” The ease of the management process makes it most suitable for teams with limited manpower. Wang’s department, which is responsible for operating of the infrastructure, has only 20 staff, but manages more than 1,000 servers. Thanks to the efficient and trouble-free solutions of Nutanix, the IT team of SAIC Volkswagen can direct more of its energy to application innovation and client service.
- **Reduced datacenter footprint:** The Nutanix solution also saves physical space in the datacenter. The seven Nutanix-based nodes need only 4U of cabinet space, while the previous servers, storage, and fiber-optic storage area network (SAN) required at least 20U of space.

IN THIS CHAPTER

- » Taking advantage of flexible purchasing, virtualization, and deployment options
- » Simplifying your environment and automating tasks to eliminate human error
- » Securing your datacenter infrastructure and extending it to the public cloud
- » Maximizing your return on investment and lowering your total cost of ownership

Chapter 5

Eight Advantages of Modern Cloud Infrastructure

Nutanix, a leader in HCI software, has partnered with HPE to offer a line of all-in-one hyperconverged infrastructure (HCI) integrated systems based on highly secure HPE ProLiant DX servers. In this chapter, I explain some key advantages you'll find in a modern datacenter infrastructure on Nutanix HCI powered by HPE.

Buy It Any Way You Like

Legacy-based IT infrastructure procurement models stifle innovation and limit business agility. With Nutanix HCI, you can adopt the pay-as-you-go consumption model of the public cloud while providing a common foundation upon which to run both legacy and cloud-native apps.



TIP

HPE GreenLake delivers a cloud-like consumption model for your on-premises infrastructure based on pre-designed and certified workload solutions as well as customizable infrastructure models. Outcome-based IT consumption delivers a range of benefits that you can't get from solutions built completely from scratch or purchased in the public cloud. Delivering the best of both worlds, HPE GreenLake enables (see Figure 5-1):

- » **Better economics** with a flexible, pay-per-use model that offers simplicity and financial clarity
- » **Faster time to value** with solutions that are ready quickly and evolve ahead of your needs
- » **On-premises deployment** for complete control over compliance, performance, and security
- » **Standby capacity** that is always available to immediately handle spikes in workloads

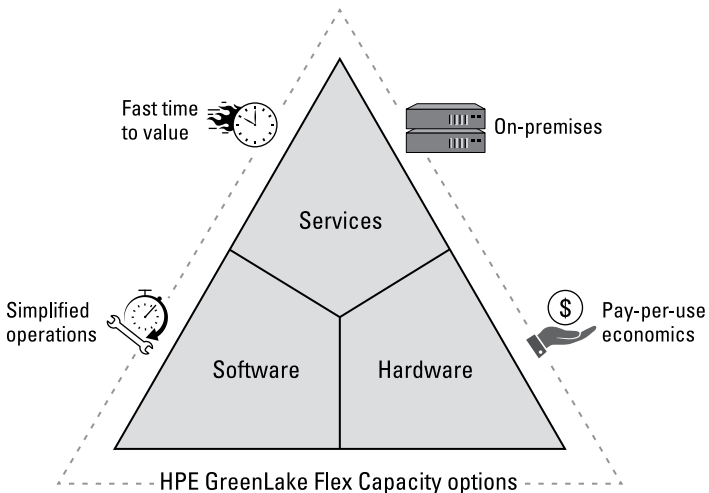


FIGURE 5-1: HPE GreenLake business value.

Virtualize It Your Way

The Nutanix HCI solution delivers enterprise-class storage, compute, and virtualization in a single platform, bringing both the performance and the economic benefits of web-scale together in

an architecture that is easy to manage and deploy. Nutanix HCI fully supports popular hypervisors including VMware vSphere ESXi and Microsoft Hyper-V, as well as Nutanix's own native Nutanix AHV.

When evaluating a virtualization solution and hypervisor, consider the same common set of criteria for the platform that you would for any IT infrastructure investment. The top functionality areas to think about include:

- » **Manageability:** How easy is the system to manage? What system management tools are available? A system is only as good as it is simple to manage.
- » **Data protection:** To be considered “enterprise ready,” any environment — virtual or physical — must provide features to protect a given solution and make it and its application data recoverable per disaster or business continuity plans.
- » **High availability and fault tolerance:** Availability is imperative for business-critical applications. Solutions should have minimal single points of failure, tolerate hardware and software service disruptions, and be able to self-heal with little administrative action. Can the system stay online and active in the event of a planned or an unplanned interruption in system availability? Such a service interruption could relate to issues including the environment (for example, power fluctuations), hardware failure, a hypervisor availability problem, system upgrades, and so on. In HCI, where the hypervisor resides alongside the storage, what if a storage malfunction creates a service concern?
- » **Operational insight:** At a glance, can you view information about potential troubles, whether you are nearing a capacity or resource runway limit, or how the cluster is performing? Is there a dashboard that presents predictive analysis to help the administrator? If so, can you customize it?
- » **Performance:** Can the hypervisor adapt to changes in performance? Can it predict and analyze the workloads that are currently running? Can it move workloads around to remove hotspots in the environment?



TIP

As of Q2 FY 2020, 47 percent of the Nutanix nodes sold had customers choose Nutanix AHV for their virtualization needs. Enterprises choose AHV for:

- » **Ease of management:** With AHV, virtualization management is combined with the simplicity of HCI. Easily manage storage and virtualization all from Nutanix Prism.
- » **Native security:** Take the burden off your teams with factory-applied security best practices, network microsegmentation, and built-in configuration audit and remediation.
- » **Low operational costs:** Customers and studies show that using Nutanix with AHV provides better total cost of ownership (TCO) than other virtualization solutions.
- » **Exceptional performance:** AHV not only streamlines operations; it is tuned to deliver optimal application performance on Nutanix HCI for the most demanding enterprise applications.

Build It with the Pieces That Work Best for You

The Nutanix HCI platform is a software-defined solution built on industry-standard servers, storage, and storage networking components. You can leverage pre-engineered systems (discussed earlier in this chapter) or customize your datacenter infrastructure to fit your unique business requirements.

Modernizing your datacenter infrastructure with HCI also eliminates forklift “rip and replace” upgrades. Start with the pieces you need, and grow your system as your business needs grow and evolve.

Reduce Complexity

HPE ProLiant DX integrated systems include a number of tools and features that simplify the management of firmware and hardware components, along with a growing artificial intelligence (AI) element that automates maintenance tasks and moves toward a self-driving infrastructure. Nutanix Prism brings simple, comprehensive management of the virtualized environment from one dashboard. Together, HPE and Nutanix co-engineered this integrated HCI system to enable one-click lifecycle management from the VM down to the firmware and hardware.

HPE infrastructure automation with HPE InfoSight for Servers

HPE InfoSight for Servers provides a solution for customers challenged by the cost and complexity of managing IT infrastructure. InfoSight brings AI and predictive analytics to the data center to protect from system failure and security risks.

Data is collected from millions of sensors on hundreds of thousands of servers across the globe, tapping into the health and performance monitoring capabilities of Integrated Lights-Out (iLO) and Active Health System (AHS). This global data is then analyzed to predict and prevent problems locally before business operations can be disrupted.

The InfoSight for Servers wellness dashboard proactively monitors and identifies infrastructure issues, and it provides email notification for parts failures, security events, and software issues, including the firmware and drivers, in addition to the operating system.

Support cases can be created within InfoSight to provide support teams with access to all the AHS files collected from the servers to expedite support resolution.

Nutanix Prism for simplified lifecycle management

Nutanix Prism provides a single screen that allows IT admins an easy way to manage infrastructure and Nutanix virtualization environments from end to end: Prism provides a single screen that allows IT administrators to manage infrastructure and virtualization, gain access to operational insights, and fix problems — all with a few clicks.

Prism is designed for an uncluttered experience with an intuitive user interface (UI) that simplifies and streamlines common data center workflows, eliminating the need to have different management tools for different tasks. Prism enhances productivity through features such as:

- » **Instant search:** Integrated search enables users to query and perform actions quickly.

- » **Capacity planning:** The predictive analysis engine in Prism forecasts the capacity needs of applications running on a Nutanix cluster, giving the IT team the ability to proactively understand and plan for infrastructure needs.
- » **Customizable operations dashboard:** The visual dashboard gives an at-a-glance summary of the state of the application and infrastructure.
- » **Integrated management:** Infrastructure management, operational insights, and problem remediation are all integrated for simplicity.

Eliminate Human Error

Melding advanced application-level orchestration with a full cloud-driven infrastructure stack provides repeatable, simple, and automated application management across a variety of environments including private and public clouds. Nutanix Calm automation gives organizations the ability to run applications on multiple hypervisors and clouds without platform lock-in, empowering them to adjust workloads for business priorities while also eliminating human error in routine tasks.

Secure It So You Sleep at Night

Modernizing your datacenter infrastructure to support a hybrid cloud environment enables you to run your application workloads in the right environment, based on your performance, security, and compliance requirements.



TIP

Read Chapter 4 to learn more about the security and control capabilities in modern datacenter infrastructure.

Extend It to the Public Cloud

With Nutanix Calm, organizations can fully automate hybrid cloud architecture deployments, scaling both multitiered and distributed applications across different cloud environments, including Nutanix AHV, VMware ESXi, Amazon Web Services (AWS), AWS GovCloud, Google Cloud Platform (GCP), and Microsoft Azure.

Save More Money Than You Imagined

Modernizing your cloud infrastructure with Nutanix and HPE will enable your business to operate in a hybrid cloud model and combine the benefits of public cloud-like agility with the low cost and control of a software-defined, on-premises environment.

By reducing your datacenter footprint, avoiding costs tied to provisioning storage, and expanding existing resources as your needs demand, you can cut infrastructure costs by up to 60 percent.

You'll also see faster time-to-value (up to 30x faster) with solutions shipped in days and deployed in minutes with one-click simplicity that reduces complex IT tasks and dependence on IT specialists.



TIP

Based on customer interviews, IDC calculates that Nutanix customers will achieve average annual benefits of \$13.44 million per organization in 2020 (approximated to \$46,876 annual benefit per 100 employees/IT end-users), which would result in an average five-year ROI of 477 percent. Try the IDC total cost of ownership (TCO) calculator at <https://tco-roi.nutanixbv.com/> to see how much you can save and understand the business value of freeing yourself from the complexity and cost of legacy IT infrastructure.

NUTANIX HELPS TREK DESIGN AND DELIVER THE WORLD'S BEST BIKES

Trek is a 40-year-old, privately held family company that is world renowned for its high-quality bicycles. Trek also makes helmets, jerseys, pedals, kickstands, and equipment bags — essentially everything a person needs to enjoy riding a bike.

IT challenges

When Trek's legacy server storage environment was reaching the end of its life, the IT team decided to look at some of the newer solutions in the market. The platform Trek had previously chosen required

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substantial upfront investments, was falling short on performance, and was difficult to manage. “We needed a high-performance environment that could take everything we threw at it,” explained Brian Oamek, senior enterprise IT architect for Trek Bikes. “Agility, scalability, and management simplicity were also important since we don’t have a lot of extra IT resources to manage a complex, three-tier infrastructure.”

The Nutanix solution

Trek performed an extensive proof of concept (POC) before choosing its new platform, comparing Nutanix with two other hyperconverged vendors. “We really wanted to virtualize our remaining physical servers because we understood the agility it would provide, but they were just too big and everybody was afraid to take the risk on the legacy infrastructure,” explained Oamek. “Part of our POC was to virtualize our ‘biggest monster workload’ — our business intelligence environment. We obtained fantastic performance on the POC systems, exceeding the expectations of our business unit. That’s when we knew that Nutanix was the right solution for all of our enterprise workloads.”

Trek enlisted the help of Nutanix Consulting Services for the datacenter infrastructure modernization project. “Our consultant helped us migrate all of our virtual workloads over to Nutanix,” said Oamek. “That engineer really blew us out of the water with his technical knowledge. He enabled us to migrate every workload from the legacy infrastructure to Nutanix during the day, without any interruption to end users.”

Trek is now using Nutanix to run all of its on-premises workloads, including the company’s design and manufacturing applications and product life cycle management software. “Our most important workload is our JDE [J.D. Edwards] ERP [enterprise resource planning] system which handles our finance, accounting, warehousing, and distribution systems,” Oamek said. “That software is essential to our continued operations, and with Nutanix, we know it will be running all of the time.”

“Technology goes into every part of designing and building a bike — making it more efficient, aerodynamic, lighter, stronger, and faster,” noted Sandersen. “Our bikes are as advanced as possible, and all of our design and manufacturing processes are now being powered by Nutanix.”

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Evolve to a hybrid cloud vision

Your business can leverage the elastic nature and usability of public cloud services, but with the security, control, and performance of the private cloud. A hybrid cloud approach ensures that unpredictable applications can be hosted in the public cloud while mission-critical applications and data remain in a private cloud within your enterprise. This book is your guide to achieving the benefits of the hybrid cloud for your organization.

Inside...

- Move beyond legacy infrastructure
- Modernize your datacenter to enable the hybrid cloud
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