

eBook

Building a Foundation for Cloud-Native Success

A Platform Engineering Guide to Kubernetes
in Hybrid Multicloud Environments

NUTANIX



Cloud-Native Computing Drives Software Success

IDC estimates that by 2026 developers will create 750 million new applications, more than during the past 40 years combined.¹ However, the accelerating pace of application development results in a long list of complications, including poor workload placement, excessive costs, performance degradation, increased security risks, compliance issues, and poor business service performance.²

Cloud-native technologies empower platform engineering teams to remedy this chaos by building and running scalable applications faster and with higher quality across datacenters, public clouds and the edge. Containers, Kubernetes, and the large and growing ecosystem of cloud-native technologies enable enhanced business agility, greater efficiency, and faster time to market, yielding a competitive advantage to organizations that successfully master them.

Choosing the right infrastructure strategy to maximize the benefits of cloud-native technology and accelerate the delivery of modern software is essential for companies to thrive in the digital age.

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¹IDC, 750 Million New Logical Applications: More Background, doc #US48441921, December 2021

²Gartner Predicts 2022: The Distributed Enterprise Drives Computing to the Edge, October 2021



Nutanix's secure, resilient, and scalable cloud platform allows us to modernize our manufacturing environment and move away from traditional compute and storage.

Anand Bahl
Chief Information Officer
Micron

The Building Blocks of a Cloud-Native Enterprise

Cloud-native technologies offer a competitive advantage to organizations that adopt them. Here are the key building blocks of a cloud-native enterprise.

Containers Allow Applications to be Built from Composable Pieces

Containers are a lightweight, portable and self-contained method of packaging application code with dependencies. Containers isolate applications from the underlying infrastructure, making it easier to run applications consistently across different operating systems and cloud platforms.

Containers can be spun up and down quickly, allowing for dynamic scaling of an application in response to changes in workload demands. They allow applications to be built as small, independent, and reusable services that can be integrated to build complex applications. When used with a container management platform like Kubernetes, *microservices architecture* allows applications built on containers to be operated efficiently in hybrid multicloud environments.

Kubernetes Orchestrates Containerized Workloads

Kubernetes has become the de facto standard for container orchestration and cloud-native operations. It automates the deployment, scaling and management of containerized workloads, providing a framework that can be used on-premises, across clouds and at the edge. This enables organizations to easily deploy containerized workloads across multiple environments with greater consistency. Kubernetes monitors and manages application availability and resource utilization, ensuring that applications remain in a healthy state.

Kubernetes can detect changes in a workload and scale out the number of running container instances to adapt to demand. Built-in service discovery and load balancing enable you to manage containerized services and improve application performance, with the application workload distributed across multiple container instances to improve performance and reliability.

Hyperconverged Infrastructure Simplifies Cloud-Native Infrastructure

Containers, Kubernetes, and other elements of the cloud-native ecosystem put new demands on infrastructure. Given the steep learning curve associated with cloud-native technologies, infrastructure modernization has become essential to success. Hyperconverged infrastructure (HCI) is rapidly replacing traditional hard-to-manage three-tier environments with a centralized, easily managed system that can support the growing demand for automation—while allowing your operations to extend from the datacenter to the cloud and beyond.

Advantages of Deploying HCI*

97%

reduction in unplanned downtime

43%

reduction in TCO

356%

average five-year ROI, 12-month payback

63%

faster deployment

53%

more efficient IT management

IDC White Paper, sponsored by Nutanix,
The Business Value of Nutanix Cloud Platform,
October 2022 (#US49715622)

*Among organizations using Nutanix Cloud Platform



Challenges of Running Kubernetes in Hybrid Multicloud Environments

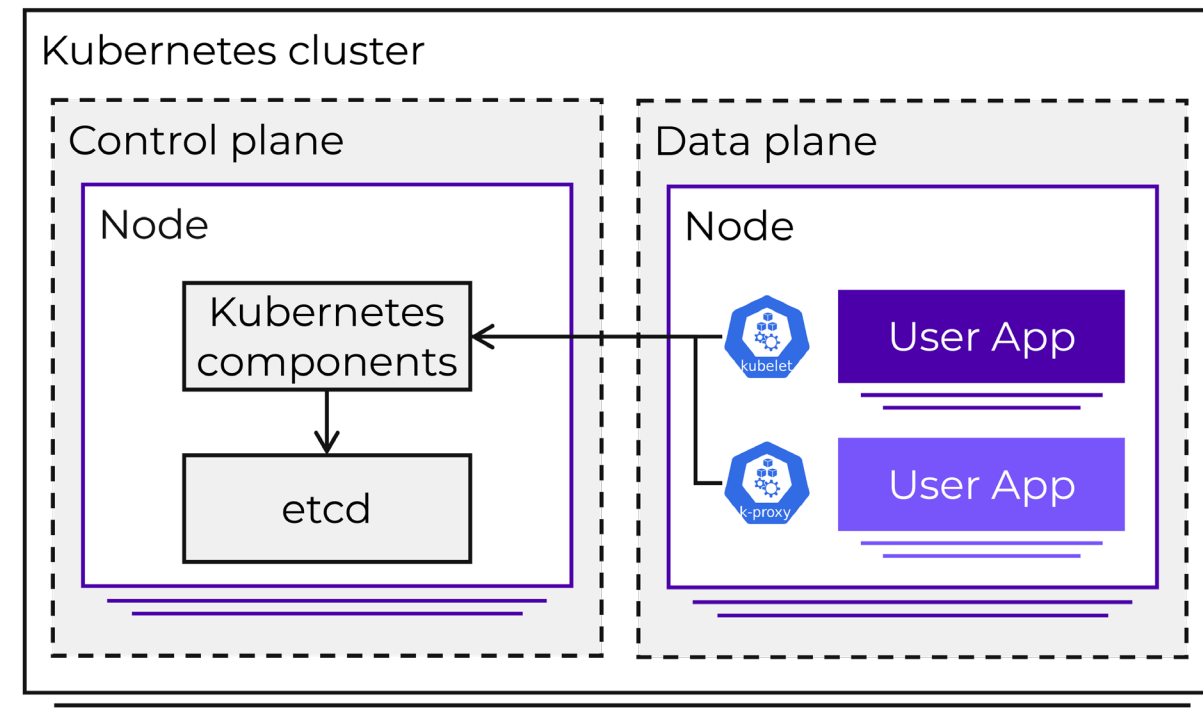
Cloud-native computing holds out the promise of running any workload anywhere—on-premises, in the cloud and at the edge. Yet many organizations struggle to achieve this goal. IT operators, used to working in legacy IT environments, find configuring and managing storage, networking, monitoring, and security—*while also* contending with Kubernetes lifecycle management tasks—challenging. This becomes a recipe for disaster as you extend your digital footprint to multiple clouds.

The following section explores the infrastructure challenges associated with cloud-native environments. The chapters that follow look at how the Nutanix Cloud Platform—with its industry-leading HCI architecture—can better address your hybrid multicloud requirements.

Legacy Infrastructure Can't Handle the Resource Demands of Kubernetes

Legacy three-tier infrastructure isn't designed for the way Kubernetes and containerized applications use compute, storage, and network resources. Kubernetes is a dynamic, distributed platform that offers rapid scaling and resiliency. It continuously creates and destroys container instances to adapt to changing demands.

Kubernetes necessitates a different approach. A Kubernetes cluster typically consists of a control plane plus one or more worker nodes. Worker nodes are where “pods,” consisting of one or more containers, run. Kubernetes can be configured to autoscale compute resources in response to workload by increasing or decreasing the number of pods of a specific type. To accommodate all this activity may require hundreds or thousands of times a day. Microservices need new network topologies with secure, trusted interconnectivity. Organizations building cloud-native Kubernetes environments are often beset by complexity. Productivity is impacted when infrastructure resources aren't in lockstep with developer and application needs.



Organizations Struggle to Build and Optimize Hybrid Multicloud Kubernetes

The legacy infrastructure model is hard to extend to hybrid and multicloud operations. Kubernetes enables application portability, making it possible to move applications across environments including public, private and hybrid clouds—as well as ROBO and edge locations—without modification.

However, this requires access to similar compute, storage and networking resources in every environment. If your cloud-native application was built to run on-premises, some work may be necessary for it to run in the cloud and vice versa—and the management processes and tools in each environment may be completely different.

Optimizing your cloud-native operations across a hybrid multicloud environment requires having access to the same tooling and processes everywhere. With few integrated solutions, deployment in a hybrid or multicloud environment often requires far too much time and toil.

Managing Cloud-Native Application Data

The ephemeral nature of containers makes managing application data more challenging. Kubernetes uses the container storage interface (CSI) to define persistent volumes (PVs) that enable file and block storage to persist as container instances come and go.

As more applications are refactored or implemented with containers and microservices, configuring different types of storage becomes a roadblock. Platform teams need to figure out which storage services they need to make available to their Kubernetes clusters and how to make the same or similar services available in every environment. This can include file, block and object storage as well as database services, message brokers, caching services and more.

The Kubernetes Ecosystem is Rapidly Evolving

With an average of three releases every year, Kubernetes—and the cloud-native ecosystem around it—is evolving rapidly. This creates many options for enterprises running cloud-native applications. But it can also create a lifecycle management nightmare as you struggle to keep up with the latest releases, security fixes, and other updates for your hardware without impacting production applications.

Kubernetes Solutions Need to Simplify Management

A final challenge for companies adopting Kubernetes is that expertise is in short supply. To succeed, you need enterprise-grade Kubernetes management that dramatically simplifies provisioning, day-to-day operations, and lifecycle management for Kubernetes clusters.

Important Capabilities Include:

- Deploy production-ready Kubernetes clusters with a few clicks
- Provide the cloud-native data services needed by modern applications
- Integrate and automate enterprise storage features like snapshots and clones
- Scale without limit
- Integrate best-in-class open-source tools for cluster monitoring, logging and alerting
- Full stack support

Your goal should be to take the complexity out of deploying cloud-native workloads—in any environment—while automating ongoing management to the greatest extent possible to ensure your operations will scale with your expanding digital footprint.

Nutanix Solves Your Cloud-Native Challenges

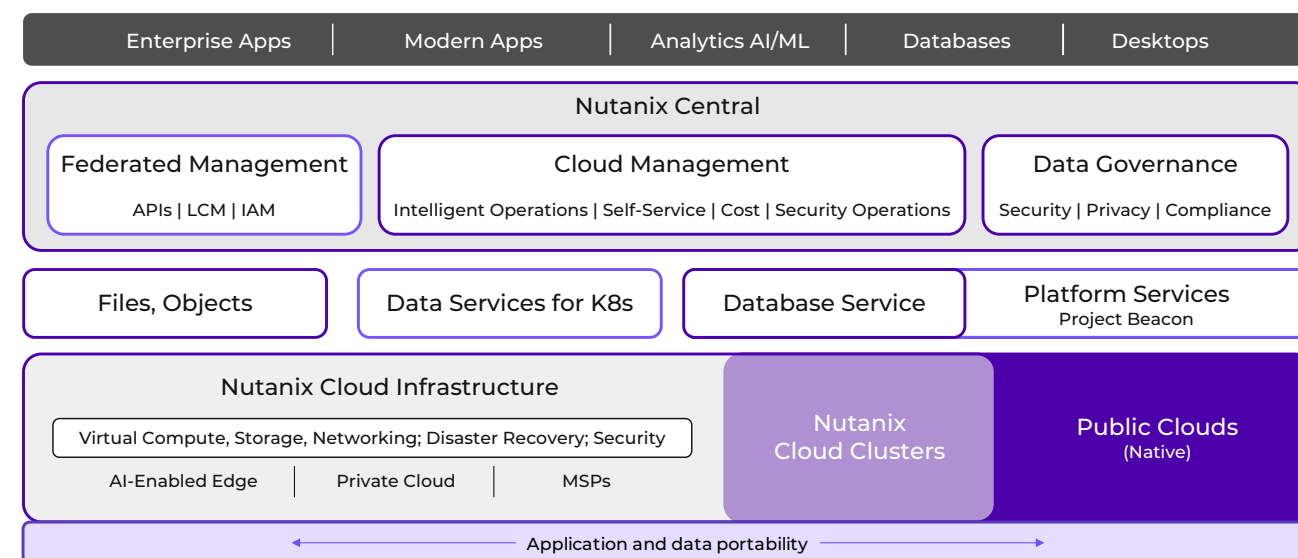
Kubernetes and cloud-native technologies offer a path to faster, more efficient application deployment, overcoming the limitations of traditional development. A hyperconverged platform provides the foundation for a robust cloud-native enterprise. Many organizations have chosen Nutanix HCI and Nutanix Cloud Platform for their cloud-native journey because it offers significant operational benefits.

One Platform. Nutanix delivers a single unified platform that minimizes complexity and maximizes efficiency, enabling you to run apps and data anywhere. Nutanix HCI supports traditional enterprise applications running in VMs *and* cloud-native applications—at the same time. And Nutanix gives you the flexibility to deploy and operate the Kubernetes platform of your choice, including industry-leading [OpenShift](#) from our strategic partner Red Hat, [EKS Anywhere](#) from Amazon Web Services, and our own offering, the Nutanix Kubernetes Engine (NKE).

Runs Everywhere. Nutanix gives organizations the freedom to choose the best operating environments for the job. Nutanix Cloud Platform extends our proven HCI architecture to run in your datacenter, at the edge, in AWS and Azure clouds, and at some of the world's leading service providers. Run your applications your way—on your preferred technology stack—without compromising on performance or adding excessive costs. Nutanix turns cloud complexity into multicloud simplicity.

The Services You Need. Nutanix Cloud Platform integrates many of the services you need for cloud-native success, providing a complete infrastructure solution to support Kubernetes and your cloud-native apps. Critical capabilities include integrated data protection and DR, advanced network security, data-at-rest encryption, database services, and block, file, and object storage services.

Nutanix Cloud Platform: One Platform for Hybrid Multicloud



Case Study: Nymbus Takes Advantage of Nutanix-Red Hat Partnership

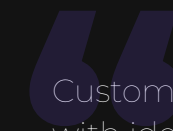
Nymbus has developed a full suite of banking technology applications to modernize and optimize existing banks. Initially, Nymbus did not own its digital banking platform. This limited its flexibility to develop specialized features for clients and maintain its growing portfolio of customizations. “When we decided to bring the core platform for our solutions in-house, we decided to take a modular containerized approach to give us the desired flexibility and simplify management by maintaining customization as configurations,” says Larry McClanahan, chief product officer at Nymbus.

After extensive market research, Nymbus selected Red Hat OpenShift running on Nutanix Cloud Platform as the foundation of its in-house approach. “Red Hat OpenShift is the standard Kubernetes platform for enterprises. Everyone understands it, and it’s well supported,” says Matt Gibb, vice president of alliances at Nymbus. “Nutanix is the industry leader in HCI and hybrid cloud management. Nutanix Cloud Platform is very extensible, providing comprehensive hybrid cloud management.”

With a container-based platform running on Nutanix Cloud Platform, Nymbus can quickly design and implement solutions to serve new market niches and differentiate itself in the competitive digital banking solutions industry. “Customers regularly come to Nymbus with ideas,” added McClanahan. “Our container infrastructure from Red Hat and Nutanix helps us build custom, niche solutions to meet their needs and help them reach strategic goals faster.”

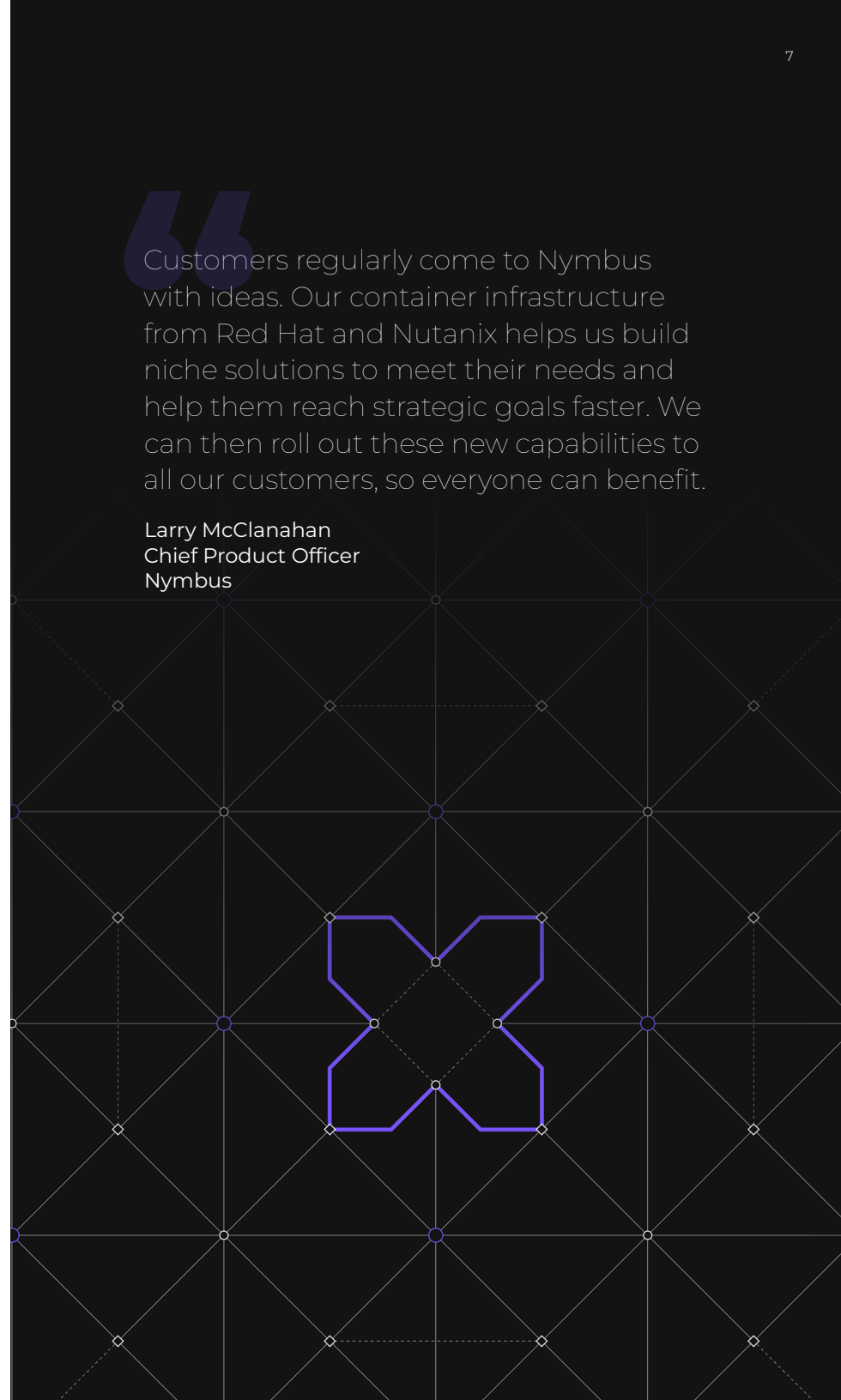
As a growing enterprise in the financial services market, Nymbus has to be able to prove that its solutions meet strict industry security and compliance requirements. The company offers compliance support as-a-service for many of its client banks.

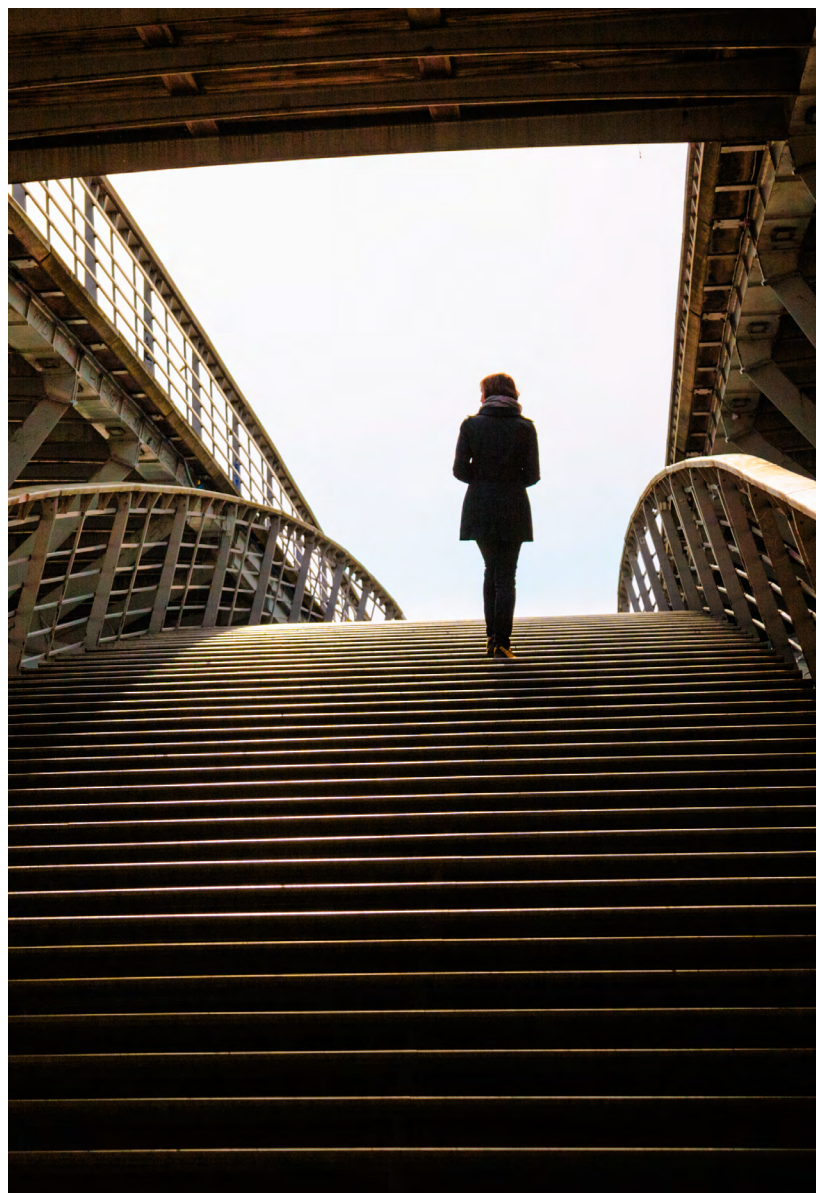
Operating on a standardized, certified technology stack with expert support from Nutanix and Red Hat helps Nymbus address regulatory compliance and keep its infrastructure updated with the latest patches and bug fixes. “We have built our in-house platform on trusted enterprise technology from vendors with strong brand recognition,” says Gibb. “Working with Red Hat and Nutanix makes our customers more comfortable and confident that we can protect their systems and data—and help them protect their customers as well.”



Customers regularly come to Nymbus with ideas. Our container infrastructure from Red Hat and Nutanix helps us build niche solutions to meet their needs and help them reach strategic goals faster. We can then roll out these new capabilities to all our customers, so everyone can benefit.

Larry McClanahan
Chief Product Officer
Nymbus





Nutanix Cloud Platform is the Ideal Choice for Hybrid Multicloud Kubernetes

Nutanix Cloud Platform is a secure, resilient, and self-healing platform that simplifies planning and deploying hybrid multicloud infrastructure to support *all* your workloads and use cases. Our proven HCI solution offers a robust, scalable, high-performance infrastructure for deploying and managing cloud-native workloads and Kubernetes alongside traditional applications.

Runs Everywhere

Nutanix Cloud Platform runs any workload anywhere with a unified platform that offers unparalleled support for virtual machines *and* containers. Whether you prefer to run your workloads on-premises, in a public cloud, at a service provider datacenter, or at the edge, Nutanix Cloud Platform has you covered, with consistent management processes and security across all environments.

Scalable

Nutanix HCI combines compute, storage, and networking resources across a cluster of servers into a single resource pool that is managed as a unit, providing a highly available platform that can scale out or up to support modern microservices applications, high-performance databases, and traditional mission-critical applications.

Resilient

Self-healing infrastructure provides a highly available and resilient platform to ensure business continuity and minimize downtime. This is critical for cloud-native and edge computing environments, where traditional maintenance and repair practices may not be practical. Nutanix self-healing capabilities ensure that failures are automatically remediated, reducing the burden on IT staff and minimizing business disruptions due to unplanned *and* planned downtime.

Integrated

By giving organizations the capabilities they need out of the box, Nutanix simplifies the cloud-native stack and reduces tedious, time-consuming administrative tasks. Nutanix Cloud Manager (NCM) enables you to build and manage multicloud deployments more simply and quickly by automating routine operational tasks. With security and cost governance, NCM can help you increase the efficiency and security of your fast-growing cloud-native application environment, while driving financial accountability and aiding regulatory compliance.

Easily Upgraded

With frequent Kubernetes releases and patches, lifecycle management is a major headache for teams running Kubernetes, especially if it is on bare metal. Nutanix Lifecycle Manager (LCM) takes the pain out of planning and executing Kubernetes infrastructure upgrades—even in the busiest and most complex environments.

Nutanix Unified Storage

[Nutanix Unified Storage](#) (NUS) lets you consolidate all file, block and object data on a single platform—and scale capacity without disruption as needs grow. NUS provides easy access to structured and unstructured data and is built for high performance and seamless scalability—on-premises, in the cloud and at the edge.

Fully-Integrated, Persistent Storage

[Nutanix Container Storage Interface \(CSI\) driver](#) allows any cloud-native application to take advantage of Nutanix Volumes Block Storage and Nutanix Files Storage to provide scalable PVs to support diverse application needs. Nutanix Objects Storage provides S3-compatible object storage with great scalability and a level of performance that exceeds most other object stores.

Nutanix Database Service

[Nutanix Database Service](#) (NDB) simplifies database lifecycle management across on-premises and public clouds and makes it easy for platform teams to incorporate popular open-source and commercial databases as part of their cloud-native applications. In minutes with just a few commands, developers can easily spin up and manage Microsoft SQL Server, PostgreSQL, MySQL, and MongoDB databases, running on Nutanix Cloud Platform to support container-based applications directly from Kubernetes environments.

Using this approach, operators and DBAs maintain strict control over database configurations—including determining operating systems, database versions, and security parameters—to ensure that all databases deployed conform to the organization's security and compliance standards.

App-Aware Data Services

As the adoption of cloud-native applications continues to grow, there is a pressing need to provide application-aware data services for Kubernetes. Currently tools only address the container layer, necessitating multiple third-party tools to solve for the application and namespace layers.

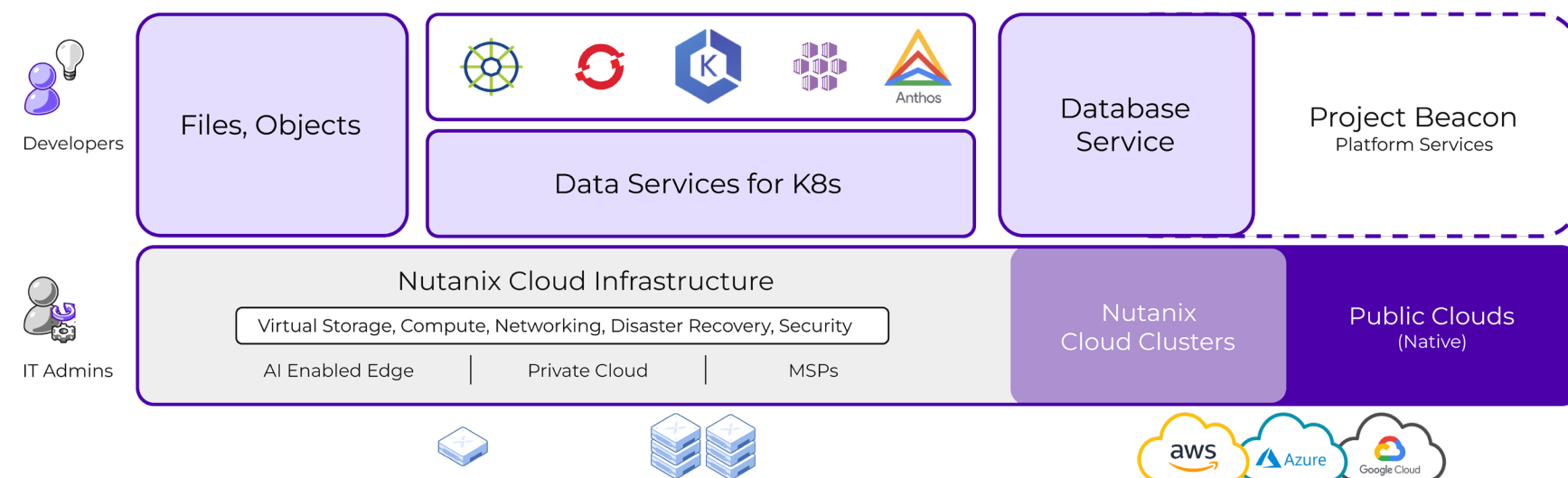
[Nutanix Data Services for Kubernetes](#) (NDK) simplifies and unifies the process of provisioning and operating applications by extending enterprise data services to containerized apps. For developers, NDK speeds time to value and reduces operational risk by introducing a cloud operating model.

For business owners, NDK increases cost efficiency and simplifies the delivery of resilient infrastructure. NDK will work with most Kubernetes offerings, including Red Hat OpenShift. NDK extends Nutanix and Red Hat joint engineering and provides a seamless support experience.

Infrastructure administrators and architects struggle to provision and manage applications as scale and complexity increase. Kubernetes storage drivers today provision and manage at the container level with little to no awareness of the application.

With NDK, you can easily manage Day 2 operations for the entire application, regardless of location. NDK provides data protection, recovery, migration, cloning and copy data management for modern applications on Kubernetes. Its application-aware solution reduces recovery time objective (RTO) and recovery point objective (RPO) from days to minutes while lessening the need for Kubernetes expertise.

Read the [NDK product brief](#) to find out more.



Project Beacon is a multi-year effort by Nutanix to deliver a portfolio of datacentric platform-as-a-service (PaaS)-level services available natively anywhere—including on Nutanix and on hyperscaler infrastructure.



Simplify Kubernetes with Nutanix Cloud Platform

Nutanix Cloud Platform addresses the challenges of cloud-native computing with an integrated platform that provides choice, flexibility, ease of use, and security. Nutanix makes it simple to develop and run all your applications—legacy apps running in VMs *and* containerized apps—on-premises, in public clouds and at the edge—reducing the complexity of infrastructure management so your teams can focus on developing and operating great applications.

At most companies, VMs and containers will continue to coexist for a long time. Nutanix Cloud Platform offers a single environment that provides exceptional support for both paradigms, with the freedom to choose your preferred Kubernetes distribution. Nutanix Kubernetes Engine (NKE), our native Kubernetes solution, simplifies provisioning, operations and lifecycle management. Because Nutanix software runs on supported hardware from leading vendors on public clouds and at leading service providers, you're never locked in.

Our Mission: One Platform for Any Kubernetes Solution



Nutanix Cloud Platform

AOS AHV

Nutanix Unified Data Services

DELL EMC Hewlett Packard Enterprise Lenovo ... AWS Microsoft Azure

¹Not a K8s distribution



Ready to Try Nutanix?

Kubernetes and cloud-native technologies can be challenging to configure and use in ways that drive business benefits. To simplify management across the entire lifecycle, you need an infrastructure built for Kubernetes. Unlike managed Kubernetes solutions, Nutanix Cloud Platform enables IT operations to deliver and manage an end-to-end, production-ready enterprise Kubernetes environment anywhere in your hybrid multicloud.

Increase Your Productivity with Nutanix Cloud Platform—the Ideal Infrastructure for Kubernetes.

[Take a Test Drive >](#)

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