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Operationalizing Kubernetes with a Full-Stack Platform

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IDC opinion

Kubernetes has rapidly evolved from a cutting-edge technology into the industry standard for modern application deployments, driving digital transformation and cloud-native adoption across a diverse range of organizations.

Deploying Kubernetes successfully in an enterprise today is about mastering complexity. To function as a container platform, there are many elements that must be integrated into Kubernetes, as evidenced by the huge and ever-growing portfolio of CNCF projects. But enterprises also demand cohesive platforms that deliver reliability, scalability, and security out of the box.

One often overlooked area is the physical and virtual machine (VM) infrastructure underneath Kubernetes, which is a critical element of how reliable, secure, and agile a Kubernetes deployment will be. And given that VM-based applications are not going away anytime soon, the need for a unified and full-stack integrated container and VM platform is growing as enterprises not only require more sophisticated and feature-rich platforms than ever but also want turnkey systems that reduce the overhead of managing complex infrastructure, from the physical infrastructure all the way up to the container.

Enterprise Kubernetes platforms

Kubernetes has become the undisputed industry standard for container deployments. Major organizations across industries rely on Kubernetes to power digital transformation and accelerate cloud-native strategies, thanks to its modern design, proven reliability, scale, open source nature, and ecosystem maturity.

While Kubernetes is absolutely the foundational key element in any container platform, what is required for enterprise use goes well beyond just Kubernetes itself. A good analogy is that Kubernetes is comparable to the Linux kernel. The kernel is essentially Linux, but to make Linux consumable in the enterprise, users need a Linux distribution that includes a wide range of user space tools, external tooling for installation and monitoring, and a steady flow of security fixes and feature updates. Likewise, Kubernetes provides foundational scheduling, scaling, and container management, but Kubernetes needs many supporting elements around it to make it operable in enterprise environments. One only has to look at the vast array of projects in the CNCF to get an idea of the sort of extensive tooling required to operate Kubernetes.

Beyond orchestration: The full platform

Building a complete, enterprise-ready container platform today is a high bar to meet as container deployments have become more sophisticated. Early Kubernetes distributions were practically bare bones compared with now. Users today demand highly robust, pre-integrated solutions for diverse operational needs, with greater "out of the box" expectations. Functionality spans adoption (day 1) and ongoing management (day 2 and beyond).

A sample of what might be required to operate Kubernetes includes:

- **Stateful storage:** Reliable data persistence for complex applications across a range of common storage protocols, for both structured and unstructured data
- **Data services:** Data services such as storage migration and container native backup and restore capabilities for business continuity
- **Service mesh:** Traffic control, observability, and security for microservices
- **Ingress gateway:** Advanced HTTP routing, SSL/TLS termination, and external access management
- **CI/CD integration:** Streamlined pipelines for automated build, test, and deployment processes
- **GPU access and management:** Support for resource-intensive artificial intelligence (AI)/ML or high-performance workloads
- **Multicluster management:** Unified fleet operations across hybrid and multicloud footprints
- **FinOps/cost tools:** Visibility and control for resource consumption and cost optimization
- **Policy management:** Centralized compliance, role-based access control (RBAC), and enforcing organizational policies
- **Advanced networking:** L4 and L7 load balancing, DNS, and network security policies
- **Observability:** Integrated logging, metrics, and tracing for full-stack insights and troubleshooting
- **Security:** Comprehensive security controls, from secrets management to zero trust networking
- **Flexible integration:** Ability to integrate with existing developer workflows, GitOps, and open APIs

Integration and turnkey experience

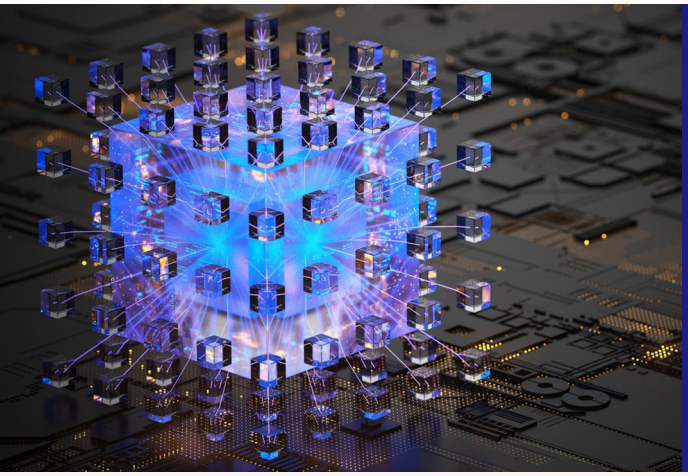
Modern enterprises increasingly expect a highly integrated, turnkey Kubernetes experience, favoring platforms with built-in, pre-integrated components over traditional DIY approaches or assembling disparate components. This shift reduces operational overhead, enhances supportability, and enables teams to focus on delivering innovation and applications rather than maintaining infrastructure software. Consequently, enterprise platforms are designed to require less multivendor integration and provide a unified customer experience from day 1.

For enterprises that are running Kubernetes on premises versus in the public cloud, there is also the additional responsibility of having to deploy and manage the layers underneath Kubernetes, namely the hardware and the VM/cloud IaaS layer. These layers are not to be undervalued, as Kubernetes is highly reliant on having a robust and modern cloud infrastructure provided for it, and the scope of Kubernetes does not manage these lower levels of the stack. Tight integration between Kubernetes and the infrastructure layers below it can greatly improve cluster deployment and management, scaling, utilization, and security.

Versatile delivery models

To meet diverse enterprise needs, Kubernetes platforms must be available across a spectrum of delivery models: traditional on-premises software, public cloud, hybrid deployments, and edge environments. This flexibility allows organizations to run workloads wherever business demands dictate, leveraging Kubernetes as the common foundation for application delivery across any infrastructure footprint.

Kubernetes has matured into a critical and reliable core, but it is the full ecosystem of integrated tools, flexible deployment models, and turnkey capabilities that defines what it means to be an enterprise Kubernetes platform today.



Kubernetes platforms' flexible availability across a spectrum of delivery models allows organizations to run workloads wherever business demands dictate, leveraging Kubernetes as the common foundation for application delivery across any infrastructure footprint.

Key container trends

VM and container convergence

The market and vendor dynamics surrounding virtualization have shifted, as organizations rethink infrastructure strategies shaped primarily by the long-standing dominance of virtual machines. Enterprise container adoption is accelerating as many enterprises now see containers as the foundation of modern applications.

With both types of compute set to be significant for the foreseeable future, organizations are seeking integrated models that drive convergence between VMs and containers to maximize flexibility, security, and efficiency. Containers, with their faster start-up times, efficient size, and portability, offer clear advantages for application modernization. At the same time, VMs still provide key functions for secure multitenancy, workload isolation, and resource allocation. The fact is that enterprises typically have hundreds or thousands of applications running in VMs, most of which will never get refactored to run in containers.

VMs and containers are already highly interlinked, as many containers are deployed in VMs. Kubernetes was not designed to address lower-level infrastructure problems, and it expects a user to provide a robust cloud IaaS to operate on. Virtualization serves

a critical role underneath containers to securely isolate tenants, partition, and provision servers to manage utilization and scaling, and for overall manageability. This explains why all major cloud providers deploy Kubernetes on virtualized infrastructure rather than bare metal.

There are also many applications that cross VM and container boundaries. Mixed-mode applications are apps that have components in both VMs and containers, a common pattern in the enterprise today. For example, the database might be in a VM, while the front end is in containers. Siloed VM and container systems management make coordinating deployments of VM and container components more difficult as well as ongoing operations such as observability that must span both systems. AI will increase the importance of mixed-mode support, as AI will be grafted onto nearly everything existing today, much of which is in VMs. But the newer modern AI parts may be built on containers and linked to existing VMs.

Unifying the management of both VMs and containers can bring many benefits. A unified platform merges shared subsystems — including networking, storage, and management — into a cohesive environment. This greatly reduces the overhead of supporting separate systems and enables smoother operations for mixed-mode applications.

Storage is one particular area that can offer benefits in a unified platform as it is a critical subsystem for both VMs and containers, which rely heavily on specific storage features and enterprise-grade data services to operate. Integrating external storage can be complex

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and expensive, one of the reasons hyperconverged infrastructure (HCI) became popular. Similarly, for containers, it can eliminate complexity and integration issues if a storage system can be inherited from and shared with VMs.

Close coordination with the underlying VM and storage layer can also make deploying and managing Kubernetes simpler and easier, from the control plane, scaling worker nodes, HA/DR, and integration with various infrastructure subsystems. Enterprises generally achieve higher utilization and lower management overhead by carefully layering the two technologies.

AI platforms and containers

Artificial intelligence represents a disruptive workload that is shaping next-generation infrastructure decisions. AI training and inference workloads demand specialized capabilities such as accelerator optimization, east-west networking efficiency, and the handling of massive data pipelines. Containers are the preferred foundation for AI platforms because they provide agility, rapid scaling, and a modular way to deploy complex systems. Support for AI needs in the infrastructure will be key to considering any VM or container platform. In addition, many vendors are building AI application platforms that layer on top of VM and container infrastructures. These offer templated workflows, blueprints for common patterns, and pluggable model serving and inference pipelines to accelerate the building and deployment of AI applications. Decisions surrounding virtualization and container convergence must therefore consider not only today's requirements but also how to enable AI workloads that will dominate enterprise landscapes in the coming years.

Case study 1

Business challenge

A leading health insurance company in Europe faced critical infrastructure modernization challenges as it wanted to transform customer engagement with digital service models. It needed to establish a reliable, scalable platform for running containerized applications while maintaining strict cost controls over the next five years.

The customer's initial adoption of containers used a handful of scattered tools, but the solution lacked scalability and a unified standard. The core challenge was to provide greater visibility, observability, and security for the company's containerized environment while keeping costs in check.

NKP deployment

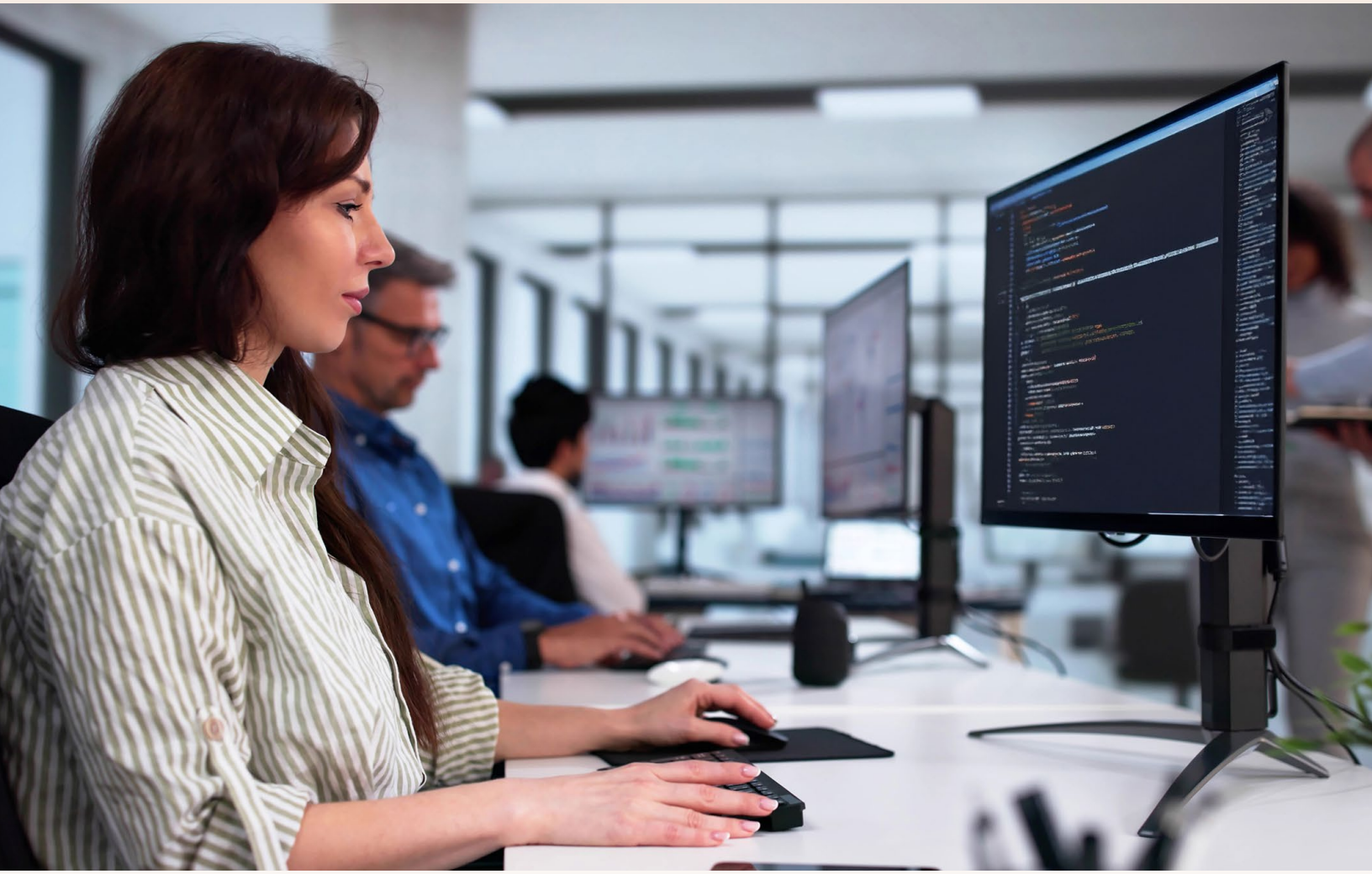
The company implemented Nutanix Kubernetes Platform (NKP), leveraging preexisting Nutanix hardware and storage platforms that were already in place for a VDI deployment. This previous experience with Nutanix for VDI resulted in confidence in its infrastructure as a base for containers. The key application hosted on containers is an optical character recognition app, with observability tools such as Prometheus and Grafana also a key workload. Future plans are considering deploying AI workloads and ERP on the NKP platform.

NKP's life-cycle management and straightforward upgrades were key reasons NKP was selected, making a laborious process easy and fast. The company conducted stress testing to ensure the platform would hold up during high loads and even tested doing an upgrade during the stress test, which all completed without problems. While networking integration presented an initial hurdle, involving a complex integration with its existing networking vendor, the core Nutanix offering provided critical

consistency, ease of integration, and solid technical support. Storage was one area that presented no integration challenges; it worked out of the box on day 1. The customer extensively uses object storage on Nutanix for its containerized apps.

Outcomes and benefits

NKP enabled the customer to standardize its container deployment, streamline monitoring, accelerate deployment times, and keep costs predictable by integrating compute and storage in a single stack. The team benefited from seamless upgrades, strong vendor support, and reliable data storage via Nutanix's Unified Storage (NUS) product suite. The platform's scalable architecture has positioned the customer for rapid growth in container workloads and future AI integration. The company expects to rapidly ramp up its container deployments over the next five years. The ability to run robust container infrastructure without needing a large number of superstar Kubernetes experts in-house was also a key factor, as the company has limited staff resources.



Case study 2

Business challenge

A diversified Asian conglomerate with operations in multiple industry verticals sought to modernize its IT infrastructure to boost operational efficiency and support its rapidly evolving business needs. The company required robust, scalable, and secure platforms to handle both legacy and next-generation workloads.

The customer previously managed a mix of legacy bare metal servers and virtual machines, scattered across multiple locations and platforms. This fragmented infrastructure resulted in operational inefficiencies, high maintenance costs, and slow rollouts of new applications. The customer also had a previous container platform that was a self-built, self-supported Kubernetes-based system that was very labor intensive to maintain. Creating a custom Kubernetes platform was very complex due to the need for integrating many external components and open source projects and keeping up-to-date with the constant version upgrades of every component. In addition, upgrading the production clusters was very difficult and risky due to a lack of robust operational tools, often resulting in downtime.

NKP deployment

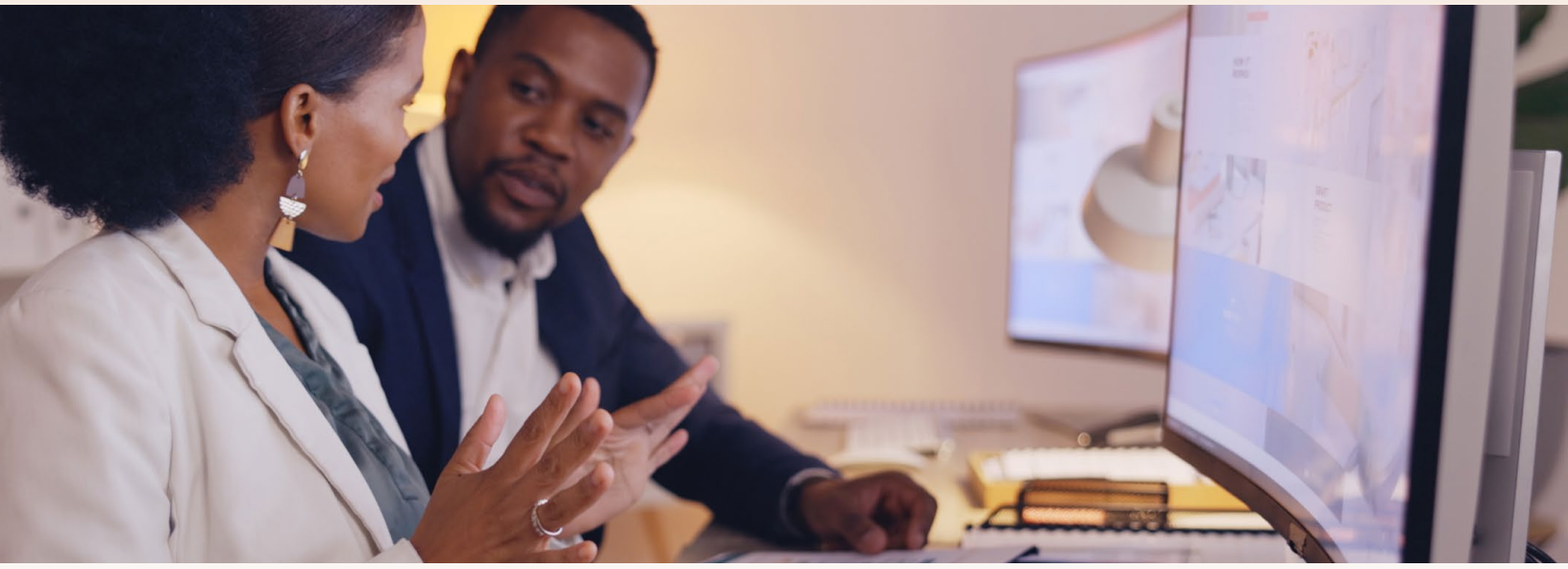
After an extensive evaluation process, the customer chose Nutanix Cloud Infrastructure (NCI) paired with the Nutanix Kubernetes Platform, running on Cisco UCS servers. The primary driver was the need for a unified, scalable, and easy-to-manage environment that could support both traditional VM-based workloads (roughly 80%) and a growing suite of containerized, microservices-based applications (20% and growing). The customer wanted to move away from siloed legacy infrastructure, and Nutanix was one of the few vendors that could offer the full stack.

NKP's native life-cycle management, pre-integrated marketplace components, database support, and robust storage services such as backup and continuous protection were key factors in the platform's selection. The marketplace offered the customer a wide range of components that it needed, all conveniently updated and certified, a major problem with its previous custom platform. The customer also prioritized the need for efficient shared storage for stateful container apps such as logging and data lakes. It also needed a rich set of data services such as backup and BCDR that the Nutanix system excelled at. The nature of Nutanix's full-stack offering made these storage services instantly available to containers without having to do any integration work.

Outcomes and benefits

The shift to Nutanix HCI with NKP resulted in measurable operational improvements and cost savings. The customer consolidated from a scattered infrastructure to a centralized system, reducing overhead and infrastructure complexity. Application performance saw a dramatic improvement: Financial "end of day" reports that previously took 45 minutes now complete in just 9 minutes. A key element of the performance improvement was the move to NVMe flash with Nutanix storage, which will also be important as the company experiments with AI workloads that require high-throughput storage. Through centralized management, faster deployments, and enhanced scalability, the customer estimates a total cost savings of over 30% across five years compared with legacy infrastructure or public cloud alternatives.

Although the transition posed minor challenges with integrating certain add-on components, the Nutanix support team resolved issues quickly. The simplified upgrade paths, comprehensive security features, and centralized monitoring have positioned the customer for future scale as it continues its digital transformation journey.



Nutanix profile

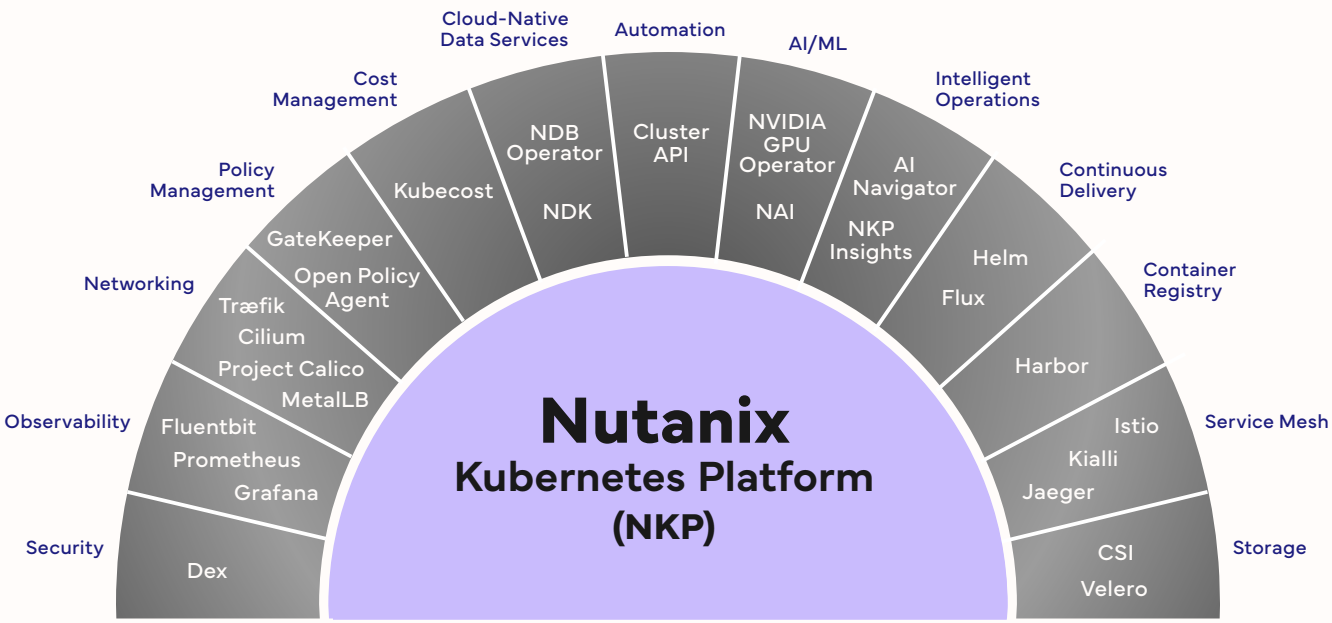
Nutanix Cloud Infrastructure is a software-defined, hyperconverged infrastructure platform that unifies compute, storage, networking, and virtualization into a single, scalable solution across private datacenters, edge, and public clouds.

NCI simplifies IT management and deployment by integrating key elements such as storage management, advanced security, networking, automation, and built-in virtualization with the Nutanix AHV hypervisor. Nutanix Cloud Clusters (NC2) extends the Nutanix platform to run on public clouds such as Google Cloud, AWS, and Azure, enabling hybrid cloud and multicloud deployments.

The Nutanix Kubernetes Platform is an enterprise-ready solution dedicated to simplifying and operationalizing the deployment, management, and scaling of Kubernetes clusters for organizations working across on-premises, edge, and public cloud environments. NKP addresses common Kubernetes management pain points by integrating key technology components, automation, and best practices into a single platform, offering consistency, security, and ease of use for developers and administrators **(Figure 1, next page)**.

Figure 1

Nutanix Kubernetes Platform



Source: Nutanix, 2025

Core features

NKP provides a consistent experience for deploying and operating clusters, leveraging upstream open source Kubernetes alongside critical supporting elements. The platform utilizes the open Kubernetes native Cluster API, enabling standardized management of cluster life cycles, upgrades, and configuration tasks. NKP is able to manage its own clusters as well as AWS EKS and Azure AKS public cloud clusters. Centralized fleet management helps prevent cluster sprawl and enforces policy consistency, enhancing governance and operational efficiency.

Observability and security

Full-stack observability is delivered through deep integration with monitoring tools such as Prometheus, Grafana, and Thanos, providing real-time insights, alerting, and data visualization across infrastructure and application layers. Advanced logging, anomaly detection (including AI-powered root cause analysis), and centralized policy enforcement

help organizations maintain secure, reliable environments. Role-based access control extends Kubernetes-native capabilities, integrating with directory services such as LDAP and Active Directory for flexible, multitenant access control.

Storage and data services

NKP seamlessly connects with Nutanix's storage ecosystem via Nutanix Data Services for Kubernetes (NDK), which provides key data services tailored for cloud-native applications and containerized data workloads. These capabilities include provisioning, scaling, migrating, and cloning container storage as well as BCDR and data management services. Nutanix also provides a scale-out object storage system as part of Nutanix Unified Storage that many modern apps prefer. The Nutanix Database Service add-on enables users to deploy and manage databases in a low overhead, as-a-service style.

Deployment flexibility

Organizations can deploy NKP on Nutanix's own infrastructure platform NCI, VMs, bare metal servers, public clouds, edge locations, or even air-gapped environments. Deploying on Nutanix infrastructure brings special integrations that enable simpler and faster deployments and access to a full suite of data services. In addition, the Nutanix infrastructure uses a distributed database architecture that provides an extra level of resiliency as the infrastructure for NKP.

Convergence

Running NKP on Nutanix Cloud Infrastructure also brings unified management of both virtualized and containerized workloads side by side, reducing operational costs and simplifying the infrastructure. A unified platform with NCI and NKP provides a centralized, shared, and distributed infrastructure for VMs and containers with a scale-out architecture for growth.

Nutanix Kubernetes Platform provides a full-stack, production-ready, and cloud-native platform for enterprises to operationalize Kubernetes across diverse environments and unlock advanced data services.

Challenges/opportunities

Opportunities

Nutanix's strong history in key infrastructure such as storage and virtualization presents a significant opportunity to leverage this in order to make deployment and management of containers easier and less complex. Creating synergy among the entire Nutanix portfolio can help NKP stand out in the market.

Challenges

Nutanix has a strong base in storage and is a rising virtualization player, but it is a newer competitor in the container space, having recently acquired D2iQ. The container market is maturing and is heavily competitive, so it will take time and effort by Nutanix to gain mindshare in this market. Product wise, the integration between NCI and NKP is a key differentiator and is already underway and will take time to fully realize.

Conclusion

Kubernetes has become the foundation for modern application platforms, but enterprise adoption requires more than just container orchestration.

Organizations need full stack integrated platforms that combine Kubernetes with critical capabilities such as storage, networking, security, observability, and lifecycle management. At the same time, virtual machines remain essential for many workloads, making convergence between VMs and containers a practical necessity for reducing complexity and improving operational efficiency. Kubernetes is also highly reliant on the underlying VM cloud infrastructure for agile operations. Platforms like Nutanix Kubernetes Platform (NKP) illustrate this approach by offering a full-stack experience that unifies infrastructure and container management across on-premises, cloud, and edge environments. As hybrid and multi-cloud strategies accelerate, enterprises will increasingly seek platforms that deliver consistent operations across diverse environments. Looking ahead, AI workloads will further amplify the need for flexible, resilient architectures that can support high-performance compute, advanced data services, and rapid scaling. **Ultimately, success will depend on unified platforms that simplify deployment and operations, which will enable organizations to focus on innovation and business outcomes rather than maintaining complexity.**

About the IDC analyst

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Gary Chen is IDC's research director for Software Defined Compute. His research focuses on server virtualization, container infrastructure and management and cloud system software (system software used to build IaaS clouds, such as OpenStack).

More about Gary Chen →

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