Eight Best Practices for Running Kubernetes Environments at Scale

A guide for I&O leaders

Get Started

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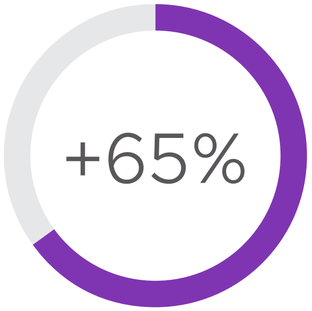
Introduction

App modernization is a top priority for enterprises. As container adoption goes mainstream, Kubernetes has become the de facto orchestrator for deploying, managing and scaling containerized applications.

Almost all organizations see clear benefits from Kubernetes—from improved resource utilization to easier application maintenance and shorter software development cycles. However, Kubernetes brings a unique set of challenges. Organizations point to inadequate internal experience and expertise as the top barrier to successfully scaling Kubernetes deployments.[2] In addition, in an expanding multi-cloud world, companies are running Kubernetes across clouds, vendors and distributions, making provisioning and management complex and prone to inconsistencies and inefficiencies.

While much of the Kubernetes conversation is focused on the developer experience, it is imperative that I&O leaders can build and deliver a secure, multi-cloud container infrastructure. Whether you are just getting started or have experienced the pain of Kubernetes management at scale, these best practices highlight ways to optimize Kubernetes operations across your IT estate.



More than 65 percent of organizations are using Kubernetes in production.[1]

Today, **76 percent** of enterprises use two or more clouds, which is projected to grow to **86 percent** by 2023.[3]

1. VMware, Inc. “The State of Kubernetes 2021.” 2021. (Based on a survey of 357 IT and software development professionals.)
2. VMware, Inc. “The State of Kubernetes 2022.” 2022.
3. HashiCorp. “HashiCorp State of the Cloud Strategy Survey: Welcome to the Multi-Cloud Era.” 2021.

Best practices for running Kubernetes environments at scale

1. Operate consistently across clouds

Provisioning and managing a distributed container infrastructure can be complexity laden, especially as the number of containers and clusters increase across clouds. To simplify Kubernetes for developers and operators—and achieve better performance and security at the application and cluster level—consistency is key. Seek to deploy an enterprise-ready Kubernetes runtime that packages together open source technologies and automation tools to streamline app delivery and multi-cloud, multi-cluster operations at scale.

2. Centralize management and governance

With so much complexity across clouds, organizations need a centralized hub for Kubernetes management to control and secure Kubernetes clusters without affecting DevOps speed or developer autonomy. To increase developer productivity, enhance operational efficiency and strengthen security, focus on centrally managing the lifecycle of Kubernetes clusters and modern apps. By centralizing management, teams can apply consistent policies across clusters and clouds, and perform backups at scale across multiple environments.

How VMware helps

Use existing data center tools and workflows in your VMware private cloud to give developers secure, self-service access to conformant Kubernetes clusters. Then, extend the same consistent Kubernetes runtime across your public cloud and edge environments with VMware Tanzu® for Kubernetes Operations.

Tanzu for Kubernetes Operations simplifies provisioning and managing a distributed container infrastructure by providing a consistent Kubernetes runtime across on-premises, public cloud and edge environments. Tanzu manages all this through a centralized management hub that is always up-to-date and API-extensible, to take advantage of the latest VMware and third-party technical innovations.

3. Empower developers

To efficiently scale and speed innovation, organizations need to provide developers with self-service access to Kubernetes clusters and namespaces across clusters and clouds. Additionally, Kubernetes infrastructure must run the same across the data center, public cloud and edge for a consistent, secure experience for all teams. Enable developers with a container infrastructure that offers easy access to Kubernetes so they can focus on building great apps instead of wrestling with underlying infrastructure. Allow them to quickly get started with preconfigured templates for cloud native patterns and provide a rich set of tooling and a path to production to build and deploy software quickly and securely.

4. Containerize legacy applications

Developing cloud native applications is one leg of the app modernization journey. It is important to evolve crucial business applications and eliminate inflexible app servers and stacks that do not support automation. After successfully establishing an enterprise-grade container infrastructure, do not forgo moving more enterprise applications onto it. Take a pragmatic approach to app modernization: Use a modern, cloud native architecture orchestrated by Kubernetes to update parts of your existing applications, leave other parts alone, and run containers side by side with your existing virtual machines.

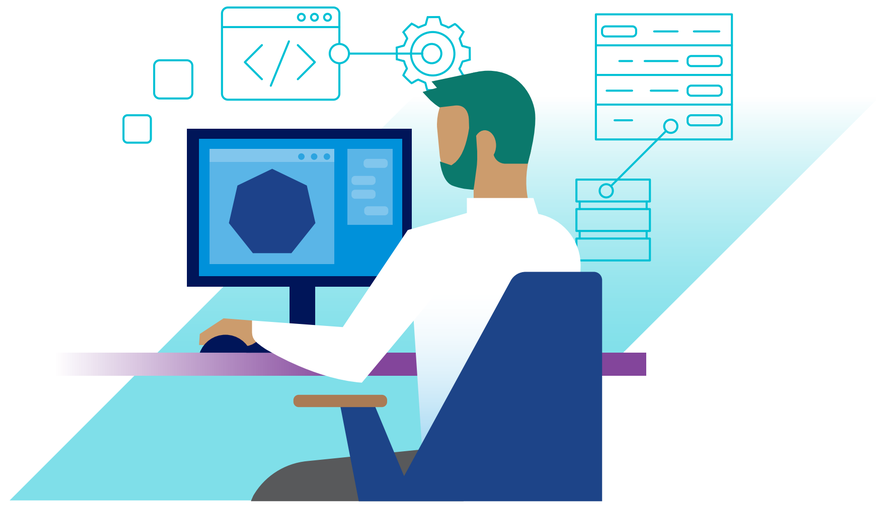
How VMware helps

The VMware Tanzu portfolio offers an expertly curated stack, including all the core elements needed to stand up and operate a modern, enterprise-grade container infrastructure, making it easy for IT organizations to provide developers with self-service access to Kubernetes clusters and namespaces across clouds.

Accelerate app modernization by using your existing VMware vSphere® environment to access a developer-ready Kubernetes platform and run Kubernetes workloads alongside virtual machines.

5. Establish governance policies

Define your organization's "best practice state" so you can immediately act if your organization drifts out of compliance. To begin, work with stakeholders to establish how cloud performance, usage and cost affect business metrics and service-level agreements. Then define and document what your organization considers to be standard configurations for infrastructure, resource consumption, performance and costs. Lastly, maximize operational efficiency and maintain the desired state via automation and continuous governance that integrates with and enables DevOps and CI/CD processes.



How VMware helps

VMware Tanzu for Kubernetes Operations delivers full visibility into both Kubernetes infrastructure and applications, including resources and capacity across your entire Kubernetes footprint. It also adds smart policies to execute better governance over platform and application performance and operating cost. The CloudHealth® by VMware Suite manages risk and governance across public cloud and Kubernetes environments, and identifies opportunities to reduce spend, remediate risks and streamline configuration.

6. Enforce security, networking and compliance requirements

Containerized applications bring a new set of security challenges. As applications and data are increasingly distributed across multiple clouds, traditional perimeter-based security approaches cannot deliver the fine-grain security and control needed to protect modern application components, such as microservices and APIs. Without a mature cloud operations and governance function, enterprises run the following risks:

- Shadow or rogue IT as developers and users provision their own cloud services with no accountability or oversight
- Exploding cloud costs due to lack of visibility into cloud usage by teams or departments and overprovisioning
- Undetected security threats resulting from unsanctioned services and misconfigurations
- Slower time to market for new and migrated cloud applications

You can reduce risk, increase visibility and improve your Kubernetes security posture with a cloud native model that leverages data, cloud APIs, change event streams, and native threat detection to better understand posture vulnerabilities, how assets are interconnected, and the associated risks and threats across clouds. A cloud native approach also enables security teams to build guardrails directly into the CI/CD pipeline. This “shift-left” security best practice enables continuous verification and collaboration between developers, operations and security. To further protect microservices, APIs and data, ensure that your container infrastructure and management platforms deliver end-to-end encryption, attribute-based access control, API threat detection and protection, full audit history and full-stack application connectivity services.

How VMware helps

VMware CloudHealth Secure State integrates security and compliance best practices automatically within CI/CD pipelines to identify and remediate violations before a deployment hits production.

7. Improve container costs and resource consumption

Allocating costs in a container environment surfaces unique challenges as compared to traditional cloud environments. It is important to use a cloud financial management platform that provides full visibility across all your infrastructure and applications, including your entire Kubernetes footprint, to establish a container cost allocation strategy, build policies to govern spending, and integrate tools to manage costs. A good starting place is the FinOps Certified Platforms at the FinOps Foundation.

8. Enable full-stack observability

It is important to gather information about key metrics and have a real-time unified view into the infrastructure, operating systems and applications running in your multi-cloud environments. To run performant and reliable Kubernetes environments, use Kubernetes-based observability tools that can monitor and analyze application and infrastructure health and performance at scale to boost performance and detect anomalies across clouds.

How VMware helps

CloudHealth by VMware supports Kubernetes-based cost distribution with visibility into container resource utilization, cost and usage by application, team, cost center and more.

VMware Tanzu for Kubernetes Operations offers full-stack, production-grade observability and a real-time unified view into the infrastructure, operating systems and applications of single and multi-cloud environments.

Achieve these best practices with VMware

Empower developers and DevOps teams to move faster, focus on innovation, and build the next great idea instead of worrying about underlying container infrastructure. VMware provides the foundation for building and operating a modern Kubernetes-based container infrastructure at scale across all clouds. Our solutions simplify container management, boost developer productivity, secure all apps and data, and optimize infrastructure performance across clouds.

VMware cloud native platform operations at a glance

Key capabilities

- Conformant Kubernetes runtime with developer self-service access to clusters
- Consistent operations and centralized container management across on-premises, public cloud and edge environments
- End-to-end connectivity and security for distributed applications

Key benefits

- Increase operational efficiency
- Enhance Kubernetes infrastructure and workload security
- Speed development and deployment of cloud native apps and services

VMware solutions

VMware Tanzu® for Kubernetes Operations

CloudHealth by vmware

To learn more about how VMware can help you build, run and manage Kubernetes at scale across all your clouds, visit VMware Tanzu for Kubernetes Operations and CloudHealth by VMware.

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