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Top 10 Facts Every Cloud Leader Needs To Know About Kubernetes And Containers

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Summary

Every cloud leader has heard something about Kubernetes — the de facto standard to orchestrate containerized applications at scale. Decision-makers must grapple with a barrage of information ranging from tech-heavy documentation from the open source community to vendors claiming to have “automagically” solved Kubernetes’ notorious complexity. This report provides guidance to cloud leaders as they consider Kubernetes adoption.

Kubernetes Is Coming At Cloud Leaders — Fast

Containers have made application development and deployment easier and faster by combining apps and their dependencies in a lightweight package, rather than in virtual machines. To run containers across your organization, you need an orchestrator: That's where Kubernetes (K8s) comes in. It's part of the broader shift to cloud-native computing, which sparks innovation while facilitating massive scaling and cloud portability. Born-in-the-cloud companies like Airbnb and Lyft have embraced Kubernetes for this reason, as have big financial services companies such as Fidelity Investments. Today, IT vendors of all kinds offer products and services to enable wider enterprise adoption of Kubernetes. Users can mix and match code from scores of Kubernetes-related open source projects to build their own solutions, or they can find a vendor (more often two or more vendors) to do it for them. As you evaluate your options, keep these points in mind:

1. **Cloud-native is a way of working, not just a set of technologies.** Cloud-native technologies (e.g., container, serverless, and cloud platform use at large) add little value without modernized practices and systems. The implications span creative architecture, processes, governance, skills, financing, and licensing. Cloud-native tech also trains your organization and delivers solutions to facilitate innovation for these modernization initiatives and others. Companies that invest in the technology but stop short of other changes will find that costs soar, with little added value and more challenges in manageability and observability. Ultimately, the primary challenges are cultural, not technical, in nature.

2. **Cloud-native doesn't necessarily mean open source.** The cloud has accelerated adoption of open source in the enterprise. Still, many organizations need the help of a vendor to guide and mediate open source innovation. The hyperscalers will happily sell you powerful services tied to Cloud Native Computing Foundation (CNCF) projects, but their customizations essentially transform the solution into a proprietary one. Taking this path may accelerate the modernization process, but it could lead to increased lock-in, too. With this lock-in, public cloud providers deliver easy, early access to an assortment of new innovations — containers, Kubernetes, and serverless are just some of the examples. Some companies jump at the opportunity, while others ponder less proprietary approaches and delay adoption.

3. **Kubernetes is optional, even when orchestrating containers at scale.** Containers transform app development by enabling developers with a build-anywhere, run-

anywhere experience that minimizes or eliminates runtime dependencies. But this value exists with or without K8s. According to the Flexera 2021 State of the Cloud Report of 750 cloud decision-makers, 49% use containers as a service, with another 24% experimenting with such services. That category includes products such as Elastic Container Services and Fargate from Amazon Web Services (AWS) as well as Google's Cloud Run and Microsoft's Azure Container Instances. HashiCorp's Nomad provides a non-K8s approach to implementing containers at scale.

4. **Public cloud is not a requirement for Kubernetes.** In popular usage, "cloud native" can imply "public cloud" — but most early examples leveraged containers and Kubernetes on-premises, not in the public cloud. Multicloud container development platforms like Google Anthos, Red Hat OpenShift, and VMware's Tanzu methodically help customers transform their infrastructure with Kubernetes stacks. There's a long list of these multicloud container development platforms that deliver their capabilities on the platform of your choice, including on-premises platforms. For example, Volkswagen Group's IT services group built an on-premises private cloud using Red Hat OpenShift.

5. **Containers can also benefit monolithic apps.** Much of the container excitement focuses on microservices-based apps. However, the container platforms of legacy monolithic apps (and newer microservices-based apps as well) provide a clean way to package application code for deployment and operation. With Docker containers (the foundation for Open Container Initiative), developers assemble layers of everything needed at runtime — application code, application runtimes, database runtimes, and non-kernel elements of the operating system — into a single file called a container image that a container platform runs. The packaging improvements support cleaner, clearer handoffs from developers to operations. But beware: Teams often assume savings without careful process improvements or without the full portfolio of tools required to support a production workload. If you skip these steps, the time, as well as the money, will quickly add up.

6. **Pairing microservices with containers increases agility and optimizes your workload.** Pairing container adoption with microservice app design can improve agility for app deployment, scaling, and operation by breaking an app into granular, separately deployable units known as microservices to reduce delivery dependencies between teams. This approach allows operations to support a wider range of runtime platforms, which in turn allows teams to deliver into production on widely different schedules and to better utilize production infrastructure by independently scaling each part of an application as needed. Although it's important not to dismiss the value that containers can provide, the larger

opportunity pairs containers with modern app development practices like microservices.

7. **Kubernetes is both harder and easier than you think.** By design, Kubernetes is complex — the inherent result of creating a pared-down distributed operating system. Even born-in-the-cloud early K8s adopter Airbnb found 10 weird ways to blow up your Kubernetes before getting it right. Many eager enterprises try to follow in the footsteps of Bloomberg and the US Air Force by creating their own production-ready K8s distribution but quickly find themselves understaffed and overwhelmed. Easier paths do exist. Enterprises can lean on managed Kubernetes services from AWS, Azure, Google, and IBM and/or leverage multicloud container development platforms from Canonical, D2iQ, Mirantis, Platform9, Red Hat, SUSE Rancher, VMware, and others.

8. **Managed Kubernetes services isn't enough for most users.** Managed Kubernetes can help move K8s into production by taking operator effort away from managing a new control plane to focus instead on system availability. However, most enterprises find that they still need to supplement the capabilities of managed K8s. Stateful applications, for example, may require storage and disaster recovery capabilities that don't come in managed Kubernetes packages. Your operators will need to map out the functionality of their managed K8s service relative to the other capabilities they need to build a full solution.

9. **Kubernetes security is about much more than container security.** Tools have emerged in recent years to secure containers: scans for malicious or rogue container images, gates to prevent deployment of vulnerable images, and ongoing scans of container runtimes. Kubernetes itself is an attack surface that threat actors can leverage. The CNCF is addressing those challenges — but there's plenty of work ahead for vendors and users to implement CNCF recommendations for cloud-native security.

10. **Kubernetes (light) is powering the edge.** In 2021, it's become clear that Kubernetes will be key to edge computing. The decision by the CNCF to embrace SUSE Rancher K3s — a smaller version of Kubernetes — will help steer further development. Another key player is Mirantis' K0s, a single-binary version of Kubernetes that's also suitable for the edge and internet of things (IoT). These two efforts signal that Kubernetes will help bind a highly asymmetrical range of edge devices into a cohesive infrastructure in the 5G world.

Map Kubernetes To Your Modernization Efforts, Not Vice Versa

Kubernetes adoption can be part of modernization of infrastructure and applications, but only a part. It can't be cut and pasted to use across wider efforts to transform IT infrastructure for the cloud era. To ensure that Kubernetes helps you meet your IT modernization objectives:

- **Focus on your modernization goals.** Open source tends to converge around enabling technologies, which are then turned into enterprise-grade products with professional support —the various Linux distributions are a prime example. Kubernetes is no different. Some organizations opt for Kubernetes à la carte directly from the CNCF, but given the attendant complexity in doing so, most will not. Find the vendors and partners that can bring Kubernetes to bear in your modernization program, even if that means accepting some delays from the latest release of Kubernetes.

- **Roll up your sleeves and deploy Kubernetes to run stateful applications.** Kubernetes has established itself as foundational for massively scalable web applications. Running stateful applications in the enterprise usually requires more than Kubernetes alone can deliver. Be ready to provide additional effort to build out the databases and storage needed to run these apps with products and services from vendors or directly from open source code.

- **Run Kubernetes alongside legacy infrastructure for some time.** Alongside other cloud-native technologies, Kubernetes can help you address several challenges of IT modernization. There are plenty of other tasks, however, that Kubernetes can't tackle today. Modernizing mainframe workloads based on highly transactional applications requires a strategic approach, such as the Strangler pattern, to move functionality out of core apps.

- **Work with security and risk teams as equal stakeholders in Kubernetes.** Day-to-day challenges keep IT security staff busy enough, and Kubernetes brings additional challenges. Start with best practices emanating from the CNCF — but elaborate to meet the needs of your environment, adapt those best practices to your environment, and consider third-party tools to address new attack surfaces.

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