SNAPSHOT INSIGHT

Understanding the complexity barrier in enterprise Kubernetes deployments

The Register's survey of Kubernetes user organizations finds challenges still to be overcome before that ROI fully kicks in

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Organizations across sectors and industries are grappling with the challenge of Kubernetes. The open-source container orchestration platform automates the deployment, scaling and management of containerized applications. It promises to tame container farms, but comes with its own complexity.

Containers promised to make complex systems more manageable, and they do, but they create their own infrastructure problems. Companies can end up running thousands of them, creating a complex infrastructure that must heal itself when critical containers go down and stay responsive when demand spikes. That means spawning the right containers on the right physical hardware. Containers must be able to discover each other's services, and update appropriately as new container images become available. It's a form of digital cat-herding that Kubernetes promises to help with by abstracting away some of those complexities. In doing so, it can simplify routine operations for overstretched IT engineering teams.

Handling the Kubernetes conundrum

The problem is that Kubernetes is also complex. As a deployment scales out, its own complexity scales up. Kubernetes' adaptability creates its own complexity. Deployments often span multiple clusters, host a wide range of stateful applications, and increasingly operate across hybrid or multicloud architectures.

This creates a paradox. Kubernetes provides a powerful, robust platform for managing containerized applications at scale. But its inherent complexity, steep learning curve, and operational overhead can create new problems for the very organizations it's there to help. We can call this the Kubernetes conundrum.

To avert some of this complexity, IT leaders have to think exceedingly hard about the Kubernetes adoption choices they make when it comes to specifying platforms, distributions (pre-packaged versions of Kubernetes software that bundles-in tools, default configurations and extensions), infrastructure, and workloads.

This *Register* Snapshot Insight sets out to explore enterprise Kubernetes adoption patterns through primary survey research conducted among IT directors and infrastructure managers that are just starting their modernization efforts, as well as input from IT teams already managing large-scale fleet deployments. Respondents were employed at enterprises generating annual revenues of between $10 million and $1 billion.

We wanted to understand where organizations believe they are at in their cloud native journey, and discover some of the challenges a cross-section of Kubernetes adopters are working to resolve.

Adoption across primary industries and state of progress

With most transformative waves of IT, it's usually the private sector that takes the lead as early adopters. But with Kubernetes an unexpected leader has emerged in the enterprise technology landscape: government and public sector.

Application containerization and Kubernetes deployment are expanding across the public sector, with 96 percent of segment respondents to the latest Nutanix **Public Sector Enterprise Cloud Index** research saying that their organization is at least in the process of containerizing applications.

Respondents from the government public sector made up 11.3 percent of the sample of this survey. This group was the third largest constituency behind technology and software at 37.3 percent and financial services at 14.1 percent.

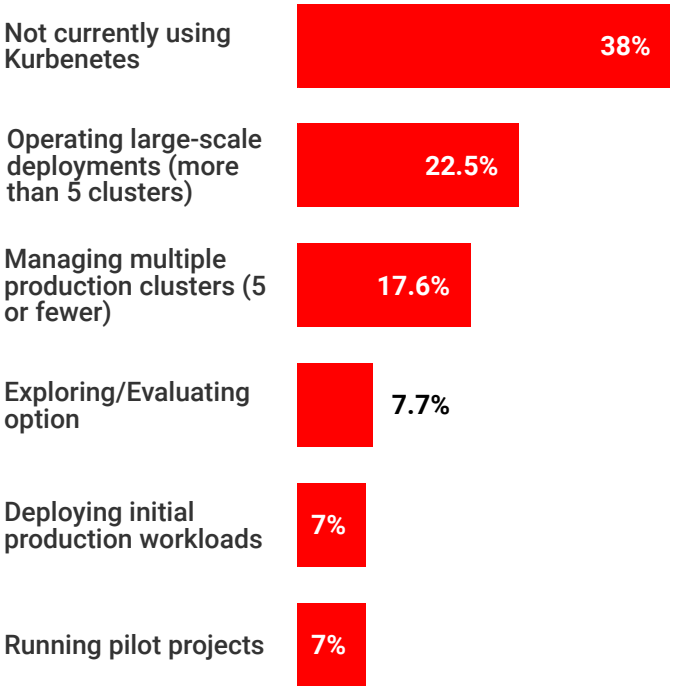
At 1.4 percent, the smallest constituency of respondents was from retail and e-commerce. This sector faces some of the steepest challenges in its Kubernetes adoption journeys due to its reliance on legacy IT systems.

Kubernetes adopters are in discovery mode

Slightly more than 40 percent of our respondents are embarked on Kubernetes deployments, with 22.5 percent operating large-scale deployments (more than five clusters) followed by 17.6 percent of respondents managing multiple production clusters (five or fewer).

An equal number of respondents are either exploring options (7.7 percent), deploying initial production workloads or have pilot projects underway (each of those at 7 percent). It's likely that there's a crossover of objectives between those three categories.

Where is your organization currently in its Kurbenetes adoption journey? (Select one)



According to Jose Gomez, director of technical marketing engineering, NKP and cloud native at Nutanix, many Kubernetes-minded organizations are currently in heads-down discovery mode, learning about Kubernetes before they initiate projects.

IT skills availability is a controlling factor when it comes to gauging the pace of adoption, he says: "A common challenge across any organization, regardless of where it is in its Kubernetes journey, is finding people who know about not just Kubernetes, but all the other tools around it required to run containerized applications in production."

This showed up in our question about challenges facing Kubernetes deployments. Almost seven in ten respondents found hiring and retaining staff with the relevant expertise to be a challenge.

Please rate the following challenges your organization faces with Kurbenetes deployments:

	Not a challenge	Slight challenge	Moderate challenge	Major challenge	Critical challenge
Managing tool and vendor...	39.5%	19.3%	19.3%	9.2%	12.6%
Scaling across cloud and on-prem	45.3%	18.8%	15.4%	8.5%	12%
Hiring and keeping kurbenete...	31.3%	19.1%	17.4%	12.2%	20%
Integrating storage and data services	39.3%	26.8%	16.1%	4.5%	13.4%
Ensuring backup and disaster...	40.4%	20.2%	21.9%	7%	10.5%
Cost and resource management	28.6%	21%	24.8%	8.6%	17.1%
Maintaining security and compliance	25.2%	18.4%	26.2%	12.6%	17.5%
Scaling applications effectively	31.1%	29.1%	16.5%	9.7%	13.6%
Managing VMs & containers	42.3%	20.2%	13.5%	8.7%	15.4%

This knowledge gap widens when organizations are running Kubernetes across more than one provider, Gomez adds, increasing the complexity of the environment: "This calls for finding not just platform engineers who know [how to work with] more than one infrastructure provider, or with two different cloud providers," he says. "An organization's developers must also be able to work with those different providers."

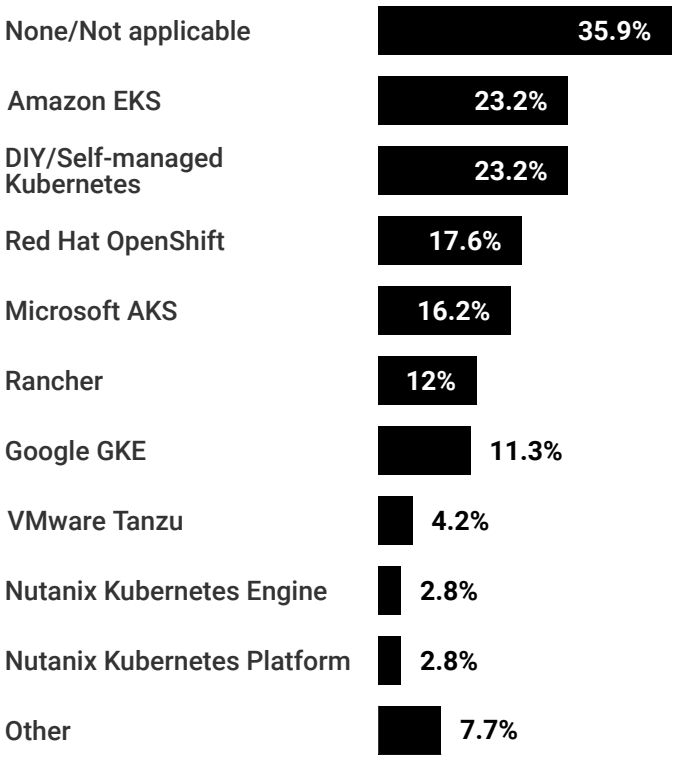
No clear leader in Kubernetes platforms

Our survey responses suggest that no clear leader has emerged among Kubernetes distributions. This leaves user organizations with greater flexibility.

Many of them (23.2 percent) are platforming a DIY or self-managed approach. This seems bold, given the operational complexity, high requirements for specialized expertise and resources, and potential for performance and reliability issues due to misconfigurations. They seem undeterred by the hidden costs of DIY approaches such as duplication of work, in-house maintenance burden, and an impact on team productivity.

Is DIY Kubernetes management sustainable? That question becomes more pressing as organizations struggle to secure the resources needed to maintain Kubernetes in-house. But they're hell-bent on trying. For the last couple of years, Nutanix has indeed seen an increase in the number of organizations interested in expanding their platform to on-premises, Gomez reports. Our survey also found 15.5 percent of respondents planning to increase their investment in this approach.

Which Kurbenetes platforms or distributions are your organization currently using? (Select all that apply)



On-prem data centers come top for container deployments

On-premises data center usage came out as the top form of infrastructure used to run containerized applications, which may come as a surprise to ardent public cloud advocates. On-premises data centers are the most popular among respondents to this survey (31 percent), with DIY/self-managed Kubernetes (24.6 percent) pulling ahead of Amazon EKS (21 percent), and Microsoft AKS with 14.8 percent.

The 28.2 percent of respondents who said they did not avail themselves to infrastructure or that the question was not applicable to them might correspond with those not currently using Kubernetes (38 percent).

According to **Synergy Research**, on-premises facilities account for just 34 percent of the total worldwide capacity of all data centers. It expects that will drop to 22 percent by 2030. However, as the market shifts further toward hybrid cloud models, on-premises data center capacity is getting a boost thanks to generative AI applications and the repatriation of selected workloads to on-premises infrastructure.

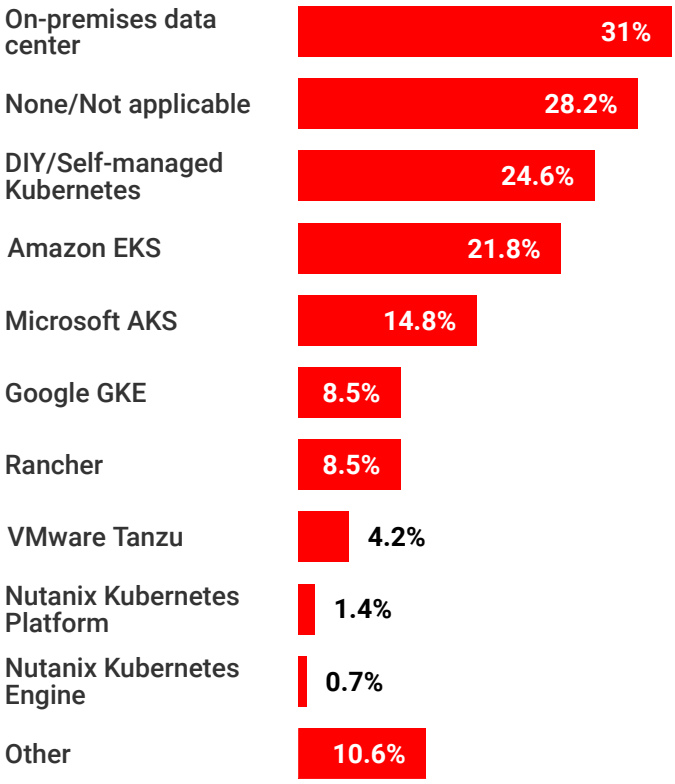
"Many organizations are repatriating their predictable workloads to on-premises, in their own data centers, or managed service providers," says Gomez. "The reason is quite simple: it's more cost-effective to run them on their own infrastructure."

The cost of running distributions like Amazon Elastic Kubernetes Service or Azure Kubernetes Service isn't in Kubernetes itself, but in all the other 'hidden' costs around network traffic between machines. These include unused compute resources, external services such as observability, storage, and so on, which are not part of Kubernetes, Gomez says. These need to be added to any cloud native platform in order to run containerized applications in production.

Gomez also points out that sovereignty is an issue too. Organizations are likely seeking an escape strategy from public cloud providers as legal frameworks change in jurisdictions where information is generated, collected or stored. "So, they need to find a way to run some of what they now have on the public cloud on-premises."

Ultimately, though, self-managed Kubernetes users face an uphill struggle. "It's possible that many of those DIY/self-managed organizations haven't updated their Kubernetes platform for years," he says. "Organizations following a DIY strategy cannot keep up with the complexity of having to test and validate all the tools working together every time they need to update their cloud native platform."

What infrastructure are you currently using to run your containerized applications? (Select all that apply)



Kubernetes users want it for web applications and APIs

Custom web applications and APIs top the list of workloads that people were running or planning to run on Kubernetes, at 71.8 percent. This is by far the largest, with the runner-up, databases and stateful services, garnering 45.8 percent. In third place, respondents cite legacy application modernization at 36.6 percent.

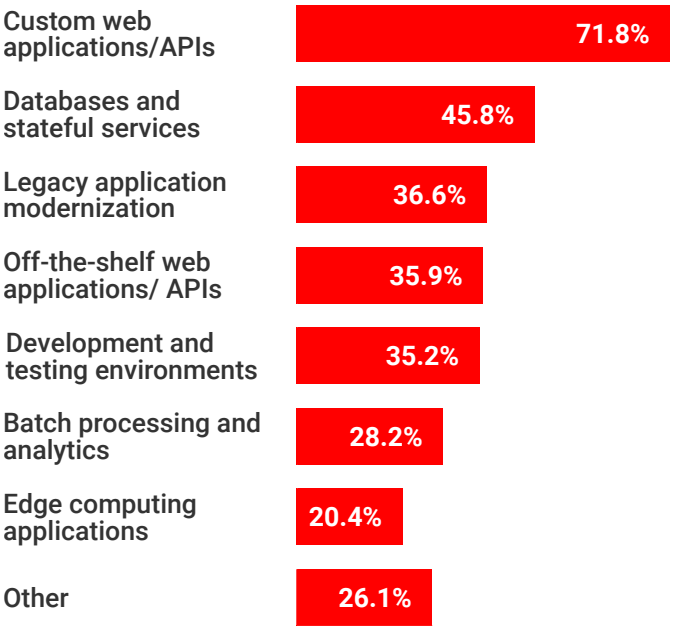
This again shows that organizations face the challenge of balancing existing legacy applications with the need to adopt modern, cloud-native technologies, Gomez explains. Modernizing applications has become a critical task for enterprises striving to stay competitive.

Transitioning from legacy virtualization to Kubernetes offers significant advantages, including enhanced flexibility, scalability, and efficiency. Yet legacy application modernization is not without its pitfalls, Gomez cautions.

"I have seen this itemized on CIOs' transformation roadmaps, but after almost 10 years of organizations trying to modernize applications when migrating to public cloud, the reality is that organizations have struggled to truly accomplish it," says Gomez, "leading to overspending, with many of them even giving-up."

"These findings indicate that any new enterprise application will be 'born' in containers, while the traditional applications will continue to run on virtual machines," he adds. That's because organizations have very robust operations and processes around VMs, without having to introduce unnecessary risk. That said, challenges due to maintaining separate management silos for VMs and containers, and the operational inefficiencies this creates, will not go away.

What are the main types of workloads your organization is running or planning to run on Kurbenetes? (Select up to 3)



Kubernetes users can't get no satisfaction

All is not well in Kubernetes land. Nearly a third (29 percent) of respondents are dissatisfied or very dissatisfied with their current approach to managing Kubernetes. A third of respondents are neutral on the matter. Only 37.3 percent

are satisfied or very satisfied with their management methods.

In spite of this, people are flocking to Kubernetes. **Mordor Intelligence** forecasts that the Kubernetes market will be worth $7.07 billion by 2030, growing at a 22.4 percent CAGR. So why are companies investing in a technology that 29 percent say isn't delivering for them?

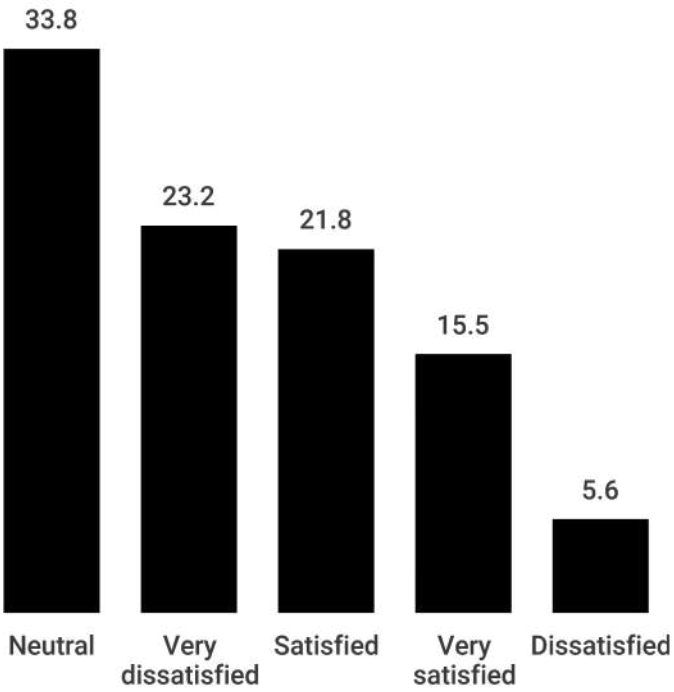
"I see two main contexts here," says Gomez. "The first is about organizations underestimating the complexity of maintaining a cloud native platform. Kubernetes is just an orchestrator of containers. It lacks all the other required tools, like monitoring, logging, storage, networking and disaster recovery, to actually run in production."

The second key to understanding these responses is that containers are all about getting new features out as fast as possible. But Kubernetes and its tools ecosystem may not be keeping pace.

This is a challenge for organizations, Gomez contends, because velocity isn't just about adopting containers. "They must embrace DevOps principles with agility and be able to update their system at the same cadence Kubernetes and the ecosystem releases new versions," he says. "The reality is that organizations are not adapting their processes or embracing the technology for how it was designed, but instead pushing to treat cloud native the same way they operate their existing traditional infrastructure."

The highest number of respondents say that they are neither satisfied or dissatisfied with their current approach to managing Kubernetes in production. That reflects the current state of market maturity in 2025. So many companies are still evaluating the technology and awaiting outcomes that will inform their deployment strategies.

How satisfied are you with your current approach to managing Kubernetes in production? (Select one)

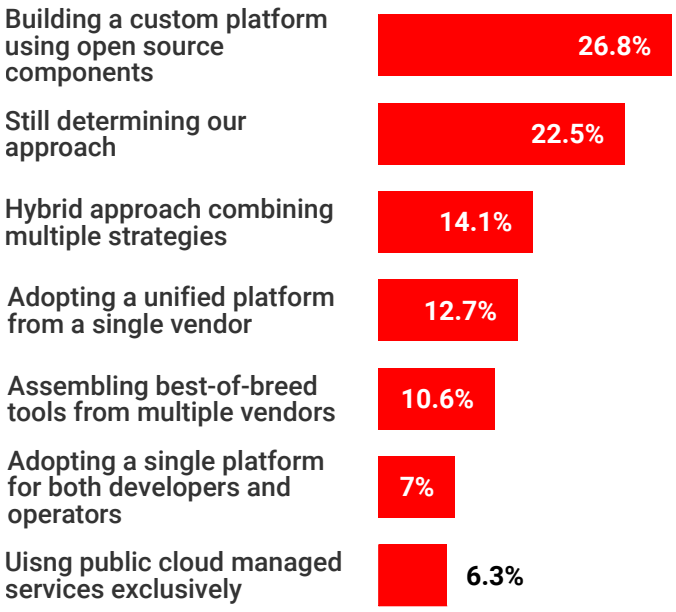


Building a custom platform using open source components is the most popular approach to cloud native infrastructure, at 26.8 percent of respondents, followed by embracing a hybrid approach combining multiple strategies (14.1 percent) and adopting a unified platform from a single vendor (12.7 percent). A tad more than 22 percent are still determining their approach.

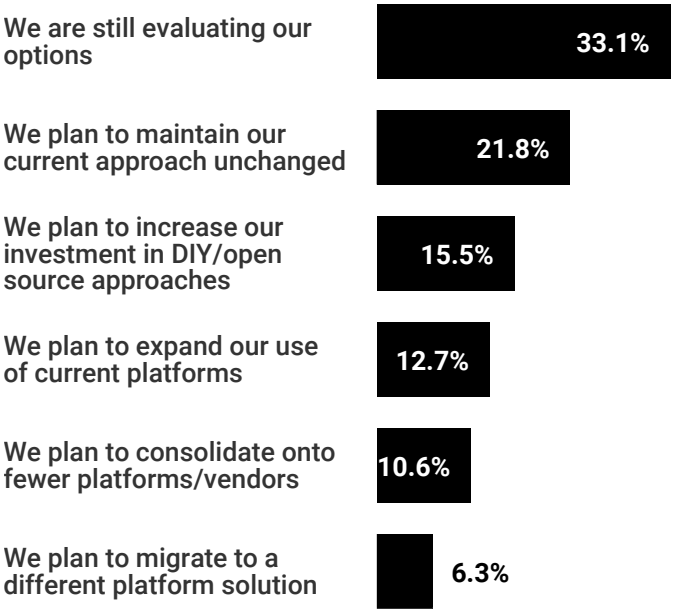
"Organizations look for a solution that seamlessly adapts to its business needs," says Gomez. "They don't just run one type of workload, so they must ensure they can customize it [a chosen solution] to support any application. The only way to accomplish this is to have the flexibility to customize the solution to your needs."

This shows up in future plans. Only 12.7 percent of those polled will expand their use of their Kubernetes platform in the next 12 months. The biggest proportion (33.1 percent) are still evaluating their platform options, and 6.3 percent intend to migrate away from Kubernetes to a different platform solution altogether.

In an ideal scenario, what would be your organization's preferred approach to building its cloud native infrastructure? (Select one)



Looking ahead 12 month, which statement best describes your organization's plans for Kurbenetes platform management? (Select one)



What's next?

2025 marks the Kubernetes' tenth anniversary, and it now has the status of being the world's fastest-growing open source project after Linux. Yet while many adopter companies are convinced Kubernetes is critical for their future IT strategies, deploying it to best advantage is putting pressure on their IT capabilities.

Kubernetes implementation and operational maturity is slow, due to its inherent complexity and the need for significant changes in processes and skill sets. Ideally, this core tech will become so customary that it blends seamlessly and invisibly into the background hum of IT operations. But for many Kubernetes adopters, that remains a future dream.

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