Serverless Computing Is Eclipsing Abstracted Kubernetes

Cloud-Native Adoption Trends Reflect Shifts in the Enterprise IT Market

Jay Lyman Senior Research Analyst

Cloud-native adoption remains strong, but there has been a detectable shift in the market from Kubernetes, which is increasingly abstracted, toward serverless and service mesh, while microservices remains the most critical cloud-native technology for most companies.

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Executive Summary

Introduction

Adoption of cloud native technologies and processes is growing, now led by serverless and service mesh, which are catching up in adoption to more mature technologies such as containers and Kubernetes, helped along by both their abstraction and efficiency benefits. The growth of serverless is driven by a few things, including broader functionality beyond serverless compute, a growing number of serverless-first companies that view the approach to be their primary strategy, and growing traction for open-source software, which is also driving service mesh. Enterprise adoption of an array of hybrid IT and multicloud architectures, where cloud-native capabilities such as auto-scaling, API-driven provisioning, and automation support application portability, is also fueling demand for cloud native technologies.

About This Report

Reports such as this showcase insights derived from a variety of market-level research inputs, including financial data, M&A information, and other market data sources both proprietary to S&P Global and publicly available. This input is combined with ongoing observation of markets and regular interaction with vendors and other key market players.

This report specifically includes data from the following sources. See the Methodology section at the end of the report for more details.

– **451 Research's Voice of the Enterprise: DevOps, Workloads and Key Projects 2022**, a primarily North American survey of 502 enterprise IT decision-makers and practitioners familiar with DevOps, fielded during February and March 2022.

Key Findings

When it comes to full deployment across all of IT, serverless (25%) leads other cloud-native technologies including containers (23%) and Kubernetes (20%) for the first time in our Voice of the Enterprise: DevOps surveys.

Cloud-native adoption is being driven by benefits including efficiency (64%), security (52%), and developer speed and productivity (41%) as it is applied to more enterprise applications.

Cloud-native technology such as Kubernetes continues to be deployed across hybrid and multicloud infrastructure that includes SaaS (54%), IaaS (53%), modern on-premises (45%), legacy on-premises (36%) and edge (31%) environments.

The Take

For the first time since we started asking in 2019, serverless adoption has eclipsed Kubernetes in terms of full adoption across of all of IT, according to 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2022 survey. The ability to support a broader array of serverless functions, "serverless-first" strategies and traction for open source have driven the steady adoption of serverless and service mesh, while the underlying complexity of Kubernetes is increasingly abstracted. Cloud-native adoption continues to be fueled by the cost and development efficiencies and speed that initially drove virtual machines (VMs), along with scale, security and a myriad of application developer advantages. Cloud-native deployment is ubiquitous across all hybrid IT and multicloud architectures including public clouds, private clouds, on-premises, and at the public/private "edge." While momentum is brisk, enterprises still face practical challenges including security, where containers still have deficiencies compared with multi-tenant VMs. In addition, managing costs, complexity, and a lack of skills/personnel remain persistent headwinds.

The Rise of Serverless

For the first time in our VotE: DevOps surveys, which debuted in 2019, serverless adoption led all other cloud-native technologies in terms of full adoption across all of IT in our respondents' organizations (see Figure 1). While containers still lead in overall adoption, which also includes partial use and proofs-of-concept, this marks an inflection point in cloud-native adoption whereby serverless and service mesh technologies are catching up to containers and Kubernetes in terms of maturity and adoption. Serverless, which sometimes represents cloud-native adoption that can bypass the complexity of DIY containers or Kubernetes, was also ranked among the most critical cloud-native technologies and methodologies at 42%, second only to microservices (43%) and tied with containers (42%), which have consistently led in previous surveys.

While 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2022 shows that when considering the adoption of cloud native technologies and processes across 100% of the IT organization, serverless and service mesh lead containers and Kubernetes, that survey is focused on a DevOps view versus the more general IT audience in 451 Research's Voice of the Enterprise: Cloud Native, Adoption & Usage 2022 survey, where containers lead in full adoption across all of IT.

Figure 1: Cloud-Native Adoption
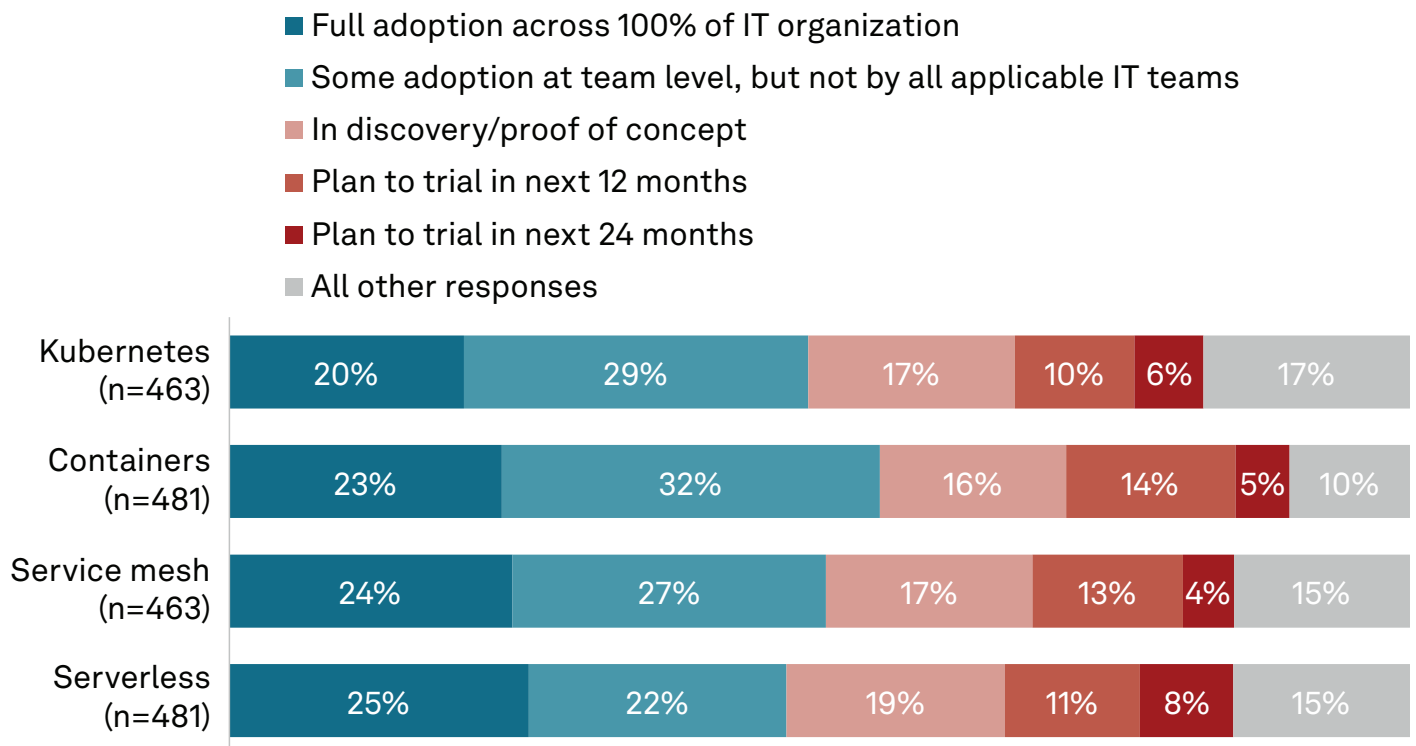
Q. What is your organization's adoption status for the following technologies?
Base: All respondents
Source: 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2022

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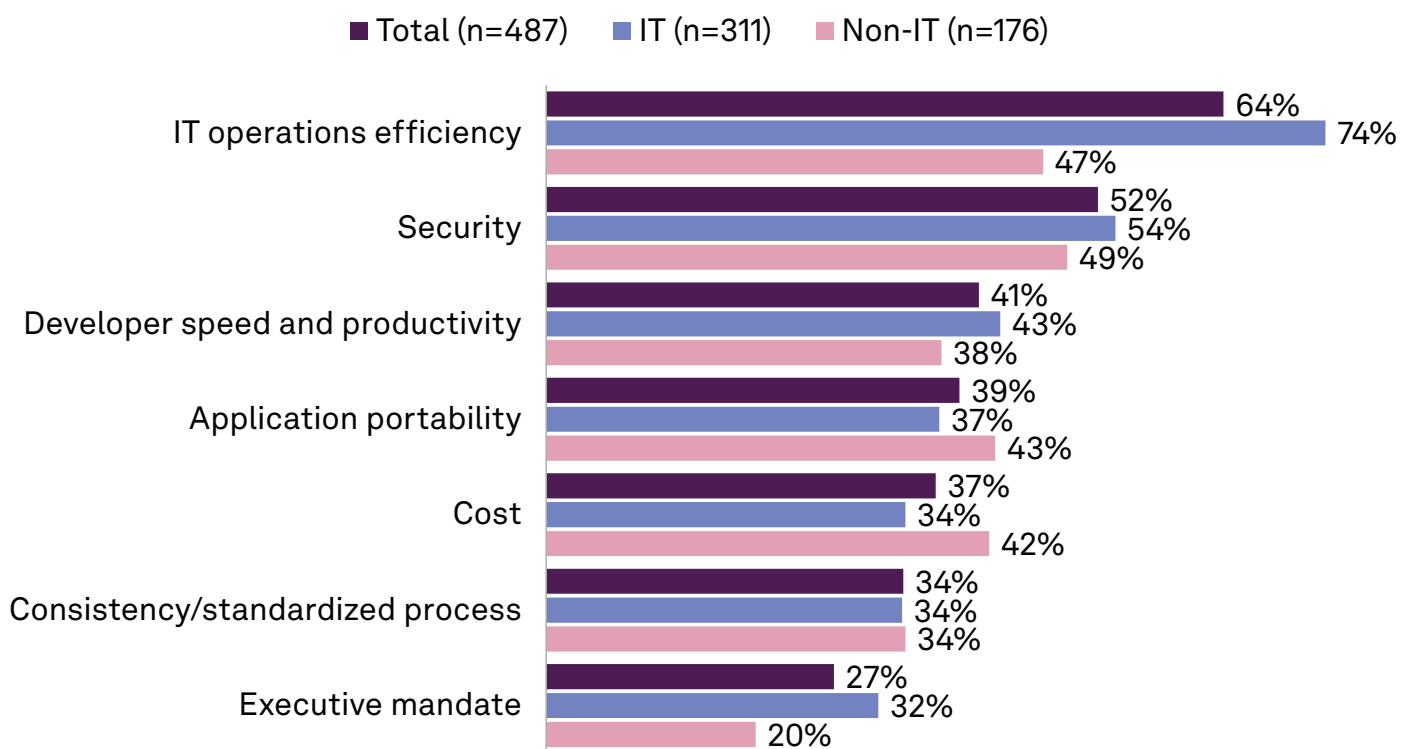Serverless adoption is being driven by three key factors.

- First, serverless itself has expanded well beyond functions-as-a-service and compute to include many additional capabilities. The top serverless functions leveraged by enterprises in our VotE: DevOps, Organizational Dynamics survey in 2021 were storage (51%), database (50%), networking (46%) and monitoring (42%). This means more companies are leveraging more serverless functions across greater portions of their application portfolios. We also highlight the growing number of enterprises that are taking a "born-in-the-cloud" or "serverless-first" approach to software development and IT operations.

- Second, more traditional organizations are shifting more applications and services to serverless, often driven by their maturing use of containers, microservices and Kubernetes. Serverless offers a greater level of abstraction and, by reducing complexity, is attractive to organizations seeking to improve and expand their cloud-native deployments.

- Third, the serverless market is rapidly expanding beyond first-mover Amazon Web Services Inc.'s AWS Lambda, which proved the viability of the market, and is also growing from the traction of open-source software in the space. In early 2022, the open-source Knative serverless project was accepted as a Cloud Native Computing Foundation project, mitigating fears of vendor control and spurring growth and vitality for the software, which is now widely supported. Open source has also been a driver for service mesh, which has also grown in terms of deployment across all of IT and benefits from traction for the open-source Istio service mesh software, which also became a CNCF project this year.

Efficiency, Security Remain Top Cloud-Native Benefits

Cloud native continues to be driven by high-impact operational benefits to organizations. When asked to name the primary advantages of cloud native, survey respondents most frequently identify IT operations efficiency (64%), security (52%), developer speed and productivity (41%), and application portability (39%).

There are differing perspectives on cloud-native benefits among those working in IT and those who are not (see Figure 2). Those identified as having IT job functions are much more likely to cite efficiency and security as top cloud-native benefits compared to their non-IT counterparts, who are more likely to rate portability and cost as advantages. These differing views can be attributed to a greater focus by IT professionals on technical considerations such as efficiency and security, while non-IT professionals are more focused on business considerations such as cost.

Figure 2: IT and Non-IT Perspectives on Cloud-Native Benefits

Legend: ■ Total (n=487) ■ IT (n=311) ■ Non-IT (n=176)

Benefit	Total	IT	Non-IT
IT operations efficiency	64%	74%	47%
Security	52%	54%	49%
Developer speed and productivity	41%	43%	38%
Application portability	39%	37%	43%
Cost	37%	34%	42%
Consistency/standardized process	34%	34%	34%
Executive mandate	27%	32%	20%

Q. What are the primary advantages of cloud native technology, such as containers, Kubernetes or serverless, for your organization?
Base: All respondents (n=487)
Source: 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2022

Security is consistently highlighted as both a top advantage and top challenge of cloud-native technology. In terms of security benefits, cloud native represents, again, lighter-weight packaging and simplified updates. It also includes some integrated and automated security capabilities, for instance the different types of application security testing that are included in Kubernetes. The main security challenge for containers is that they are not on par with multi-tenant VMs, which have been battle tested in the industry for years, though this is changing as container multi-tenancy matures and evolves. Cloud-native security can also be challenging in terms of expensive and specialized skills, as well as overcoming organizational inertia bringing DevSecOps to the table.

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Developer speed and productivity have always been foundational benefits of cloud native, with teams able to onboard faster and focus on applications, features and innovation, rather than on provisioning infrastructure, thanks to the automation and abstraction of cloud native. Cloud native is also known for its portability across hybrid and multicloud infrastructures, and this is also consistently identified as a key benefit.

According to our survey, containers are increasingly shifting from deployment on VMs (31%) to running on cloud services (58%), standard operating systems (46%), container-specific operating systems (33%), or bare metal (23%) without a hypervisor, thus producing even greater virtualization efficiency benefits than those that drove VMs to replace physical servers. Additional efficiency advantages to cloud-native designs include lighter-weight packaging, automated updates, and the fact that container applications typically share the host operating system kernel, rather than running on top of it.

Technical, Organizational and Cultural Challenges Remain

While cloud-native benefits continue to drive the trend, it does represent a new paradigm for enterprise IT, and this means both technical challenges, such as security and complexity, as well as organizational and cultural challenges such as cost and resistance to change. Many organizations adopt containers and microservices without fully understanding the impact to security, storage, networking and other IT elements that, thus far, were built primarily on VMs, physical servers and mainframes.

This is apparent when looking at the top challenges for those implementing cloud-native designs, which are security (47%), cost (37%) and complexity (35%) (see Figure 3).

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Figure 3: Cloud-Native Challenges Depend on Breadth of DevOps Adoption

- Total (n=487)
- Full adoption across 100% of IT organization (n=247)
- Some adoption at team level, but not by all applicable IT teams (n=212)
- In discovery/proof of concept (n=28)

Security
- 47%
- 49%
- 45%
- 39%

Cost
- 37%
- 36%
- 38%
- 36%

Complexity
- 35%
- 31%
- 40%
- 32%

Lack of skills/personnel
- 34%
- 32%
- 36%
- 43%

Compliance concerns
- 34%
- 34%
- 34%
- 29%

Resistance to change
- 27%
- 32%
- 23%
- 21%

Existing processes are sufficient
- 25%
- 30%
- 20%
- 14%
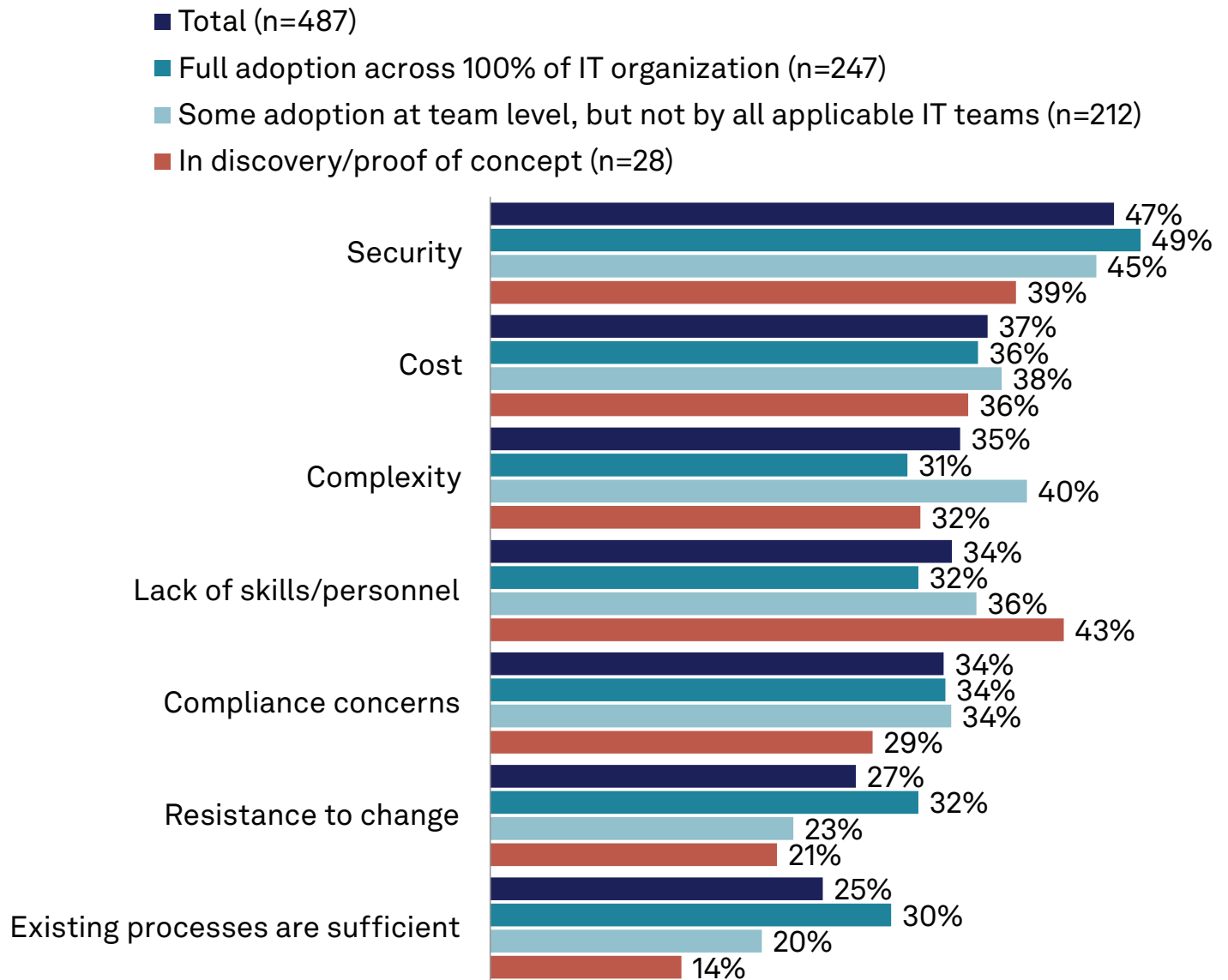
Q. What are the primary challenges of using cloud native technology such as containers, Kubernetes or serverless in your organization?
Base: All respondents (n=487)
Source: 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2022

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The security challenges of cloud native center on the high bar of multi-tenant security set by VMs. Cost issues relate to tighter budgets coming out of the coronavirus pandemic and the fact that cloud-native initiatives often represent new spending that must be justified. Complexity has always been a challenge of cloud-native software, and even though cloud-native capabilities such as auto-scaling and API provisioning have helped to automate and abstract DevOps, there are still many different tools, platforms, open-source projects and players in the market, adding to the complexity of software such as Kubernetes, which has significant configuration and provisioning overhead as well. This is why we have seen more automation and abstraction of Kubernetes in services such as AWS's EKS, Microsoft Corp.'s AKS and Google Inc.'s Kubernetes Engine so customers can use Kubernetes without becoming Kubernetes experts.

Additional cloud-native challenges include lack of skills/personnel (34%) and compliance concerns (34%), which are nearly always a top priority of heavily regulated industries such as financial services and healthcare. Our research consistently highlights a lack of skills and experience in cloud native and DevOps, which are related since it is typically DevOps teams implementing cloud-native infrastructure and applications.

Organizations that have adopted DevOps fully across all of IT express a different perspective on key cloud-native challenges versus those that have only adopted among some teams. Those fully deployed are more likely to be touching security aspects and thus more focused on security challenges compared to those with DevOps deployed across some teams. Broader DevOps deployments also mean more automation (an effective tool to deal with complexity), which is less of a challenge for those fully deployed than those with DevOps adoption across some teams. At the same time, fuller DevOps deployment means more additional stakeholders, including traditional administrators and teams that are more likely to resist change or believe that existing processes are sufficient.

Building for a Hybrid/Multicloud World

Cloud-native adoption is also being fueled by the growth of hybrid and multicloud architecture strategies. Containers represent an ideal way to package applications that can be run across public clouds, private clouds (modern on-premises) and legacy on-premises environments, as well as edge, which has emerged as another avenue of hybrid deployment. Kubernetes, which in addition to container orchestration is a platform for distributed applications, is also serving as a central control plane across hybrid and multicloud infrastructure (see Figure 4). Kubernetes has historically been deployed evenly across cloud and on-premises infrastructure, and this trend continues, with SaaS services such as AWS's EKS and Microsoft Azure Kubernetes Service a primary deployment venue. Use of multiple public clouds has also transformed from a desired capability to an actual deployment model, with many enterprises leveraging more than one public cloud across their application portfolios.

Figure 4: Kubernetes Deployment Across Hybrid and Multicloud Infrastructure

Hybrid

Software as a service (SaaS)	54%
Public cloud infrastructure (IaaS)	53%
Modern on-premises environment	45%
Legacy on-premises environment	36%
At an edge environment	31%
Other off-premises environment	5%

Multicloud

■ Yes ■ No

65%	35%
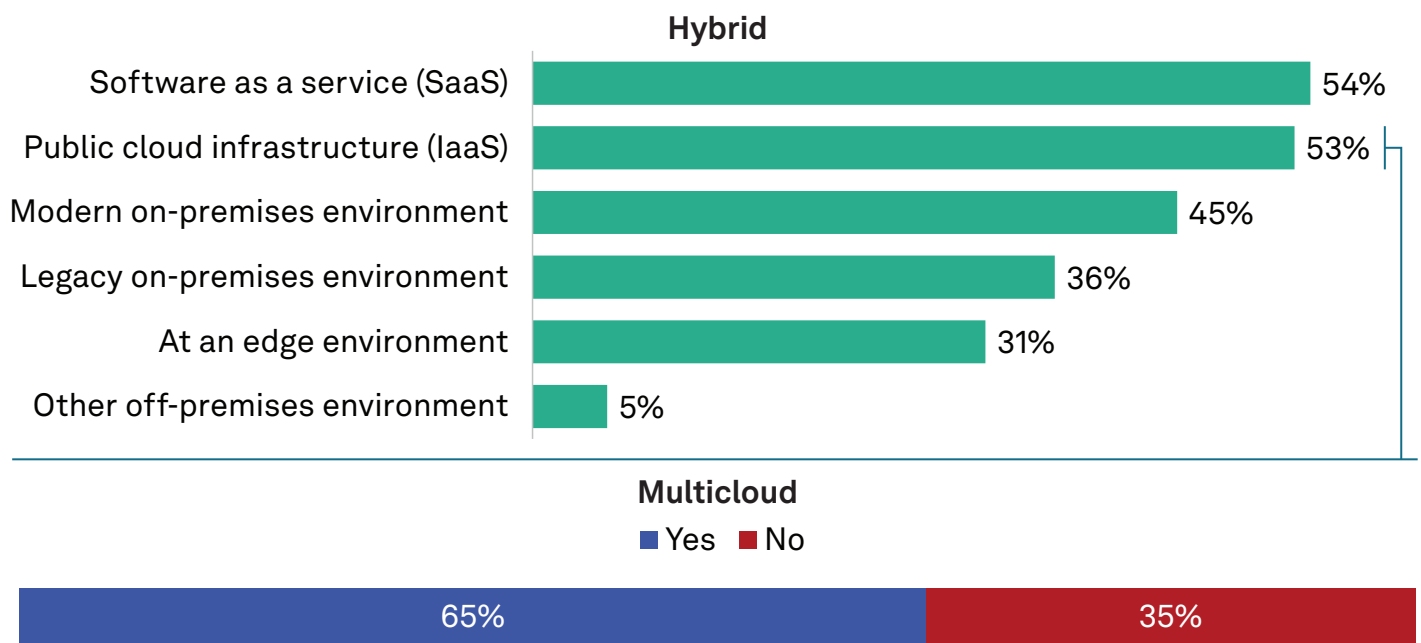
Q. Where does your organization run Kubernetes? Please select all that apply.
Base: Organizations where Kubernetes is in use or POC (n=270)
Q. Do you run Kubernetes on more than one cloud?
Base: Organizations that run Kubernetes on public cloud (n=154)
Source: Source: 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2022

Implications

– Serverless adoption will continue to grow based on the same drivers we see today — expansion of functions, more cloud- and serverless-first companies, and open-source software — meaning serverless vendors will need to accommodate growing demand with more offerings and options.

– Kubernetes will continue to gain adoption, even though some of that adoption is obscured by abstraction. Its core role in automation and abstraction will also mean Kubernetes offerings will span management and orchestration as well as other key capabilities including cloud-native security, storage, CICD and data analytics.

– Enterprises will continue to take advantage of security, efficiency, portability and developer benefits offered by cloud-native software across more enterprise applications, including those running on-premises, in hybrid IT environments and at the edge.

– Cloud-native vendors will be smart to address head-on the key challenges raised in this survey with features and service capabilities including multitenant containers that reach parity with VMs for security, greater efficiency to reduce costs, and high levels of automation to address complexity and costs.

Further Reading

Voice of the Enterprise: DevOps, Workloads & Key Projects 2022

– Survey Data Hub

– Business objectives and benefits become top priority – Highlights from VotE: DevOps

Kubernetes primer: The technology and its market, August 2022

The State of the Kubernetes Market, June 2022

Methodology

Voice of the Enterprise: DevOps, Workloads & Key Projects 2022 provides you with actionable data and insight to understand the key dynamics driving the DevOps market. Combining 451 Research's industry-leading analysis with a proprietary global panel of IT decision-makers, Voice of the Enterprise: DevOps tracks the disruption occurring in the market and exposes the major opportunities for enterprises, IT vendors, suppliers and investors. This online survey of 502 respondents was conducted from February 25 to March 15, 2022.

Demographics

For full survey demographics, click here to go to the Survey Data Hub.

About the Author

Jay Lyman
Senior Research Analyst, DevOps

Jay Lyman is a Senior Research Analyst with the Cloud Native and Applied Infrastructure & DevOps Channels at 451 Research, a part of S&P Global Market Intelligence. He covers infrastructure software, primarily hybrid and multi-cloud environments, management and orchestration, and enterprise use cases that center on the confluence of software development and IT operations known as DevOps. Jay's analysis encompasses evolving IT operations and software release models, as well as the technology used to create, deploy and support infrastructure and applications in today's enterprise and service-provider markets. This includes running the semi-annual Voice of the Enterprise: DevOps survey of both IT decision-makers and practitioners. Key areas of research also include cloud native, open source software and enterprise end users.

Prior to joining 451 Research, Jay worked as a journalist for various media firms and publications including CMP Media, LinuxInsider, NewsForge, Time Magazine and the Associated Press.

As a 451 Research analyst, Jay has been a speaker at numerous industry events, including IC3, DevOps Days, LinuxCon and OSCON, covering topics such as cloud computing, DevOps, open source software and enterprise case studies.

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