2021

Kubernetes Adoption Survey

Executive Summary

The events of 2020 stretched a lot of businesses to their limit. Many companies were forced to accelerate their digital transformation by rolling out new apps and services to help them adapt to the new world of remote work and the disruption to markets and supply chains caused by Covid-19. Others simply hunkered down and tried to do more with less.

In the midst of all this, Kubernetes played a huge role in this transformational year. Portworx by Pure Storage commissioned a new survey of enterprise users to assess the state of Kubernetes and find out how its adoption and usage evolved in the last 12 months and what the future may hold. We also explored how the pandemic impacted IT users' attitudes toward their jobs.

The picture we got back is of a technology that is playing an ever more timely and critical role in business. Most respondents (68%) in our survey said they increased their usage of Kubernetes as a result of the pandemic, primarily to accelerate their deployment of new applications and increase their use of automation. Reducing IT costs was also a significant factor, and more than a quarter of respondents said they expect to reduce costs by 30% or more annually as a result of using Kubernetes.

Despite the added pressures, our survey found that most IT professionals (52%) enjoyed their jobs more during the pandemic than they did before it. Being able to spend more time with family and concentrate more on work were the top reasons cited. Our survey also revealed that IT staff who are the most familiar with Kubernetes tend to earn higher salaries than those who are less familiar. For example, 64% of respondents who were "very knowledgeable" about their company's Kubernetes use reported their annual gross income at between $100,000 and $250,000, versus 59% who said they were "knowledgeable" and 50% who were "somewhat knowledgeable."

Another theme to emerge is that Kubernetes is spreading its wings to take on an expanded role within the enterprise. While container orchestration is still at its core, Kubernetes is being used to manage more demanding workloads, and respondents believe it will play a wider role in their infrastructure management in the years ahead.

For example, 84% of respondents have used a Kubernetes environment to test or develop AI models and applications. Such a high rate of usage surprised even us and speaks to the value of Kubernetes for scaling and managing resource-intensive workloads. Meanwhile, 89% of respondents said they expect Kubernetes to play a larger role in the management of their infrastructure over the next 2-3 years.

Our survey also looked at where the Kubernetes stack needs to mature further, and security was seen as the top area, cited by 54% of respondents. Other areas identified as needing to evolve include application development frameworks (75%), storage and data management (68%), and monitoring and observability (57%).

This was the third year we've conducted a survey on cloud-native technology use and adoption (see recent prior reports here and here) and the results continue to surprise us. We'll now dig deeper into this year's findings, and we hope you find the results as enlightening and useful as we did.

68%
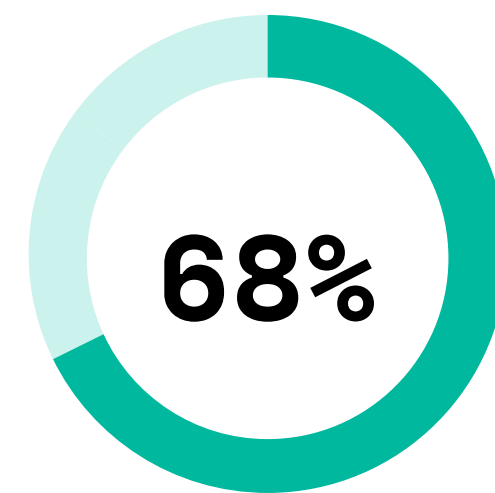
increased their usage of Kubernetes as a result of the pandemic.

52% of IT professionals enjoyed their jobs more during the pandemic than they did before it.
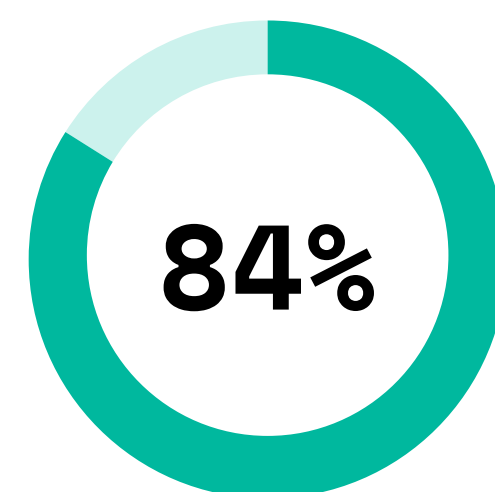
84%

of respondents have used a Kubernetes environment to test or develop AI models and applications

The role of Kubernetes is expanding

The finding that 84% of respondents have used Kubernetes to develop and test AI models is a sign of its strength as a platform for the most demanding workloads. For AI, businesses need an infrastructure that allows data science teams to quickly experiment with different algorithms and models in a range of different computing environments. Kubernetes —with its easy scalability, portability, and fast iteration cycle—is an effective way to enable this rapid development.

Beyond AI, organizations are using Kubernetes to manage and automate their storage, network, and compute infrastructure. This is made possible by extensions like the Container Network Interface (CNI), Container Runtime Interface (CRI), and Container Storage Interface (CSI). With more such extensions being developed, it makes sense that the vast majority of respondents (89%) see Kubernetes expanding its role in infrastructure management in the years ahead.

Has your organization used a Kubernetes environment to either test or develop AI models and applications?
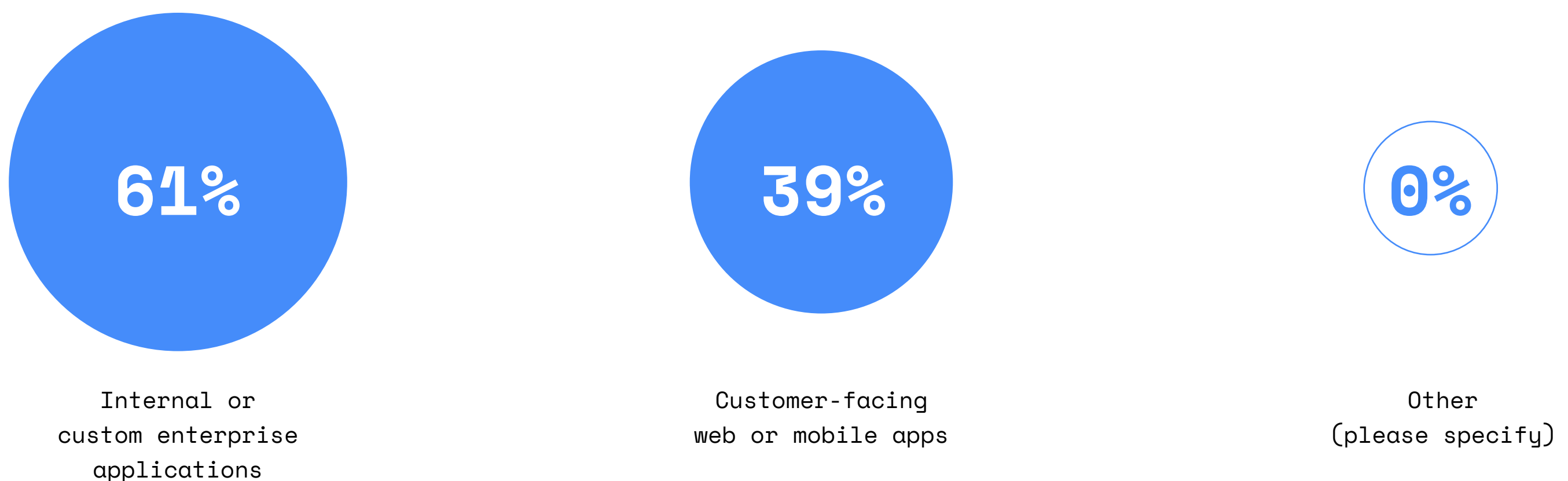
Yes	84%
No	11%
Maybe	5%
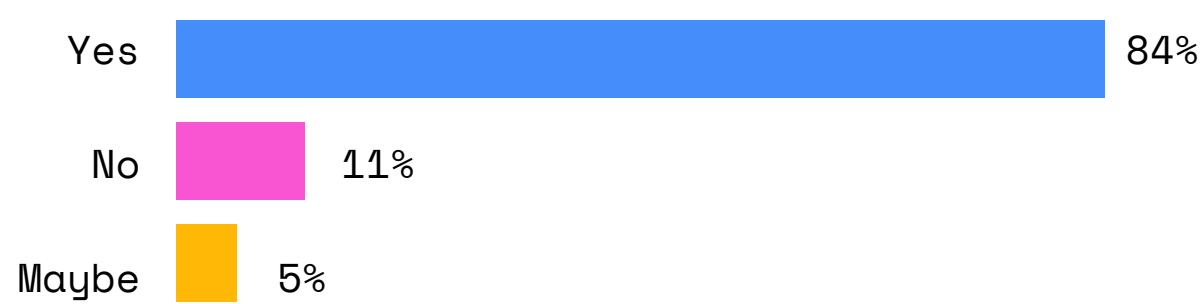
In the next 2-3 years, do you expect Kubernetes to play a larger role in your organization's infrastructure management?

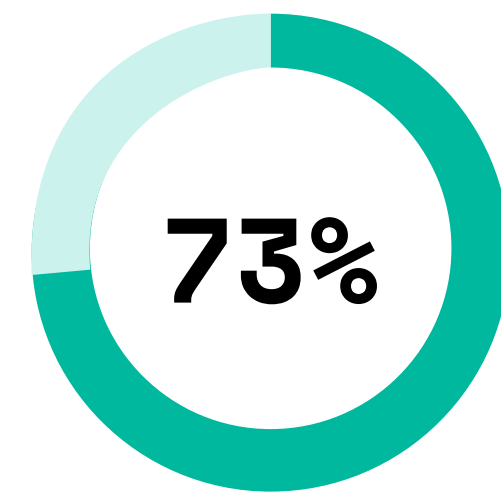|	
Yes	89%
No	5%
Maybe	6%
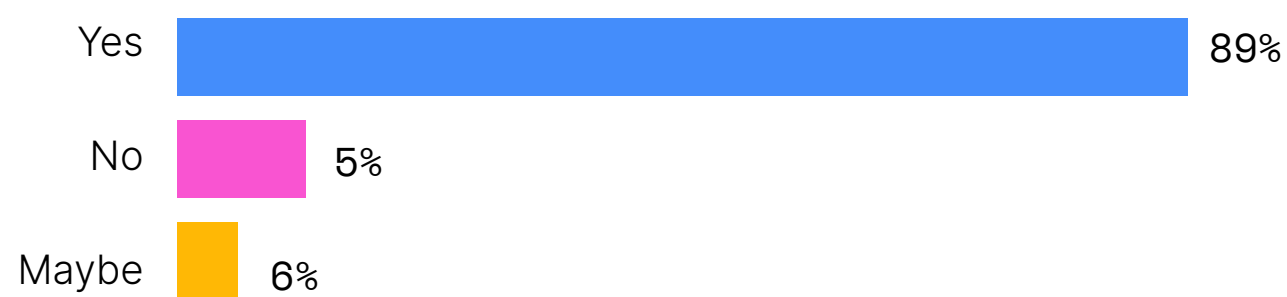
89% of respondents see Kubernetes expanding its role in infrastructure management in the years ahead.

What is the primary workload type that your organization runs in containers?

61%
Internal or custom enterprise applications

39%
Customer-facing web or mobile apps

0%
Other (please specify)

portworx
by Pure Storage

Speed of deployment is king

In the past year, businesses have had to adapt to a fast-changing world. Retailers were forced to quickly roll out new apps to enable services like click-and-collect and curbside pickup, while manufacturers built new algorithms to reorganize disrupted supply chains. It makes sense then that 73% of respondents said the top benefit from adopting Kubernetes was the ability to deploy new apps more quickly.

The primary reasons cited for using Kubernetes were to support program areas that need to evolve (48%), to support changes in business strategy (45%), and to help increase revenue or profits (44%).
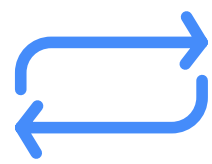
Overall, cloud native remains the primary model for new app development: One-third of survey respondents said that at least 61% of their new applications over the past year were deployed in containers.

73%

of respondents said the top benefit from adopting Kubernetes was the ability to deploy new apps more quickly.

What's the biggest benefit you've seen for your business or team from adopting Kubernetes?
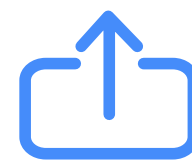
Rank the top 3.
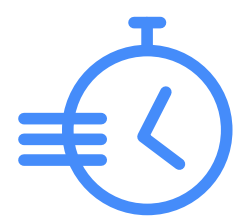
|	Faster time to deploy new apps	Ability to reuse application code across environments	Easier to update apps	Reduced IT / staffing costs	Freeing up staff for other work
RANKED TOP 3	73%	61%	61%	59%	47%
RANKED #1	28%	19%	19%	21%	14%
RANKED #2	23%	21%	22%	17%	17%
RANKED #3	22%	22%	19%	21%	16%

What percentage of your organization's new applications (within the last 12 months) are running in containers?

<20%	6%
21-40%	19%
41 - 60%	40%
61 - 80%	23%
80%>	10%
Don't know	2%
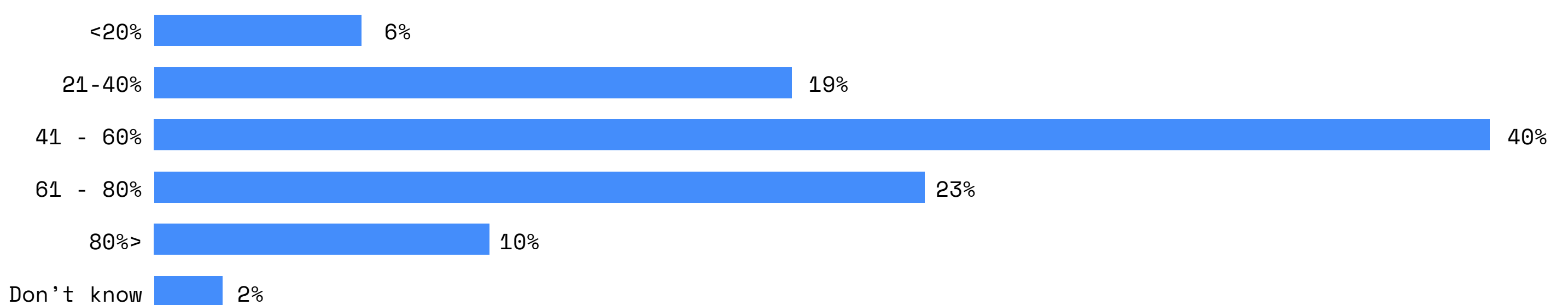
What are the primary reasons your organization is using Kubernetes?

Rank the top 3.

	Top 3	RANKED #1	RANKED #2	RANKED #3
Program areas that need to mature / evolve	48%	17%	17%	14%
Changes to the company's business strategy	45%	14%	17%	14%
Need to increase revenue / profits	44%	14%	13%	17%
Need to ship software faster	44%	19%	13%	12%
Need to increase ROI	42%	14%	15%	13%
Pressure from Executives to accelerate digital transformation	28%	9%	9%	10%
Changes to team / team restructure	24%	8%	7%	9%
Budget or resource constraints	24%	6%	9%	10%

The Kubernetes stack has some room to mature

Despite technological advances and solid maturity in many areas, there is still some work to be done when it comes to the Kubernetes stack. Securing containerized applications is challenging due to their distributed nature. Each layer of the stack—cloud, clusters, containers, and code—requires specific security and management capabilities.

Asked about the current biggest challenges of using the Kubernetes stack, respondents listed security (54%) and data management (43%) as presenting the greatest challenges for their organizations to overcome. Data management can be complex in a cloud-native environment, which is why it's useful to have a comprehensive platform that provides persistent storage, data protection, disaster recovery, and data security.

A minority of respondents –40%– said they were experiencing a Kubernetes-related skills shortage, which is encouraging. For those who said there is a shortage, the top three skills they're lacking are security (68%), networking (59%), and storage and data management (52%).

Top missing skills

68%
security

59%
networking

52%
storage and data management

In order to run Kubernetes, what are the top 3 challenges that have been the most difficult for your organization to overcome?
Rank the top 3.

	Top 3	RANKED #1	RANKED #2	RANKED #3
Security	54%	22%	19%	13%
Data management	43%	14%	14%	15%
Cross datacenter support	38%	12%	12%	14%
Networking	29%	9%	9%	11%
Reliability	29%	10%	8%	10%
Scalability	27%	9%	8%	9%
Persistent storage	24%	6%	8%	10%
Disaster recovery	23%	6%	7%	10%
Logging	17%	5%	8%	5%
Graphical UI	16%	6%	7%	4%

Which areas of the Kubernetes tech stack need to mature the most to make it easier to deploy cloud-native apps?
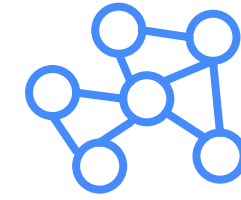
Rank the top 3.
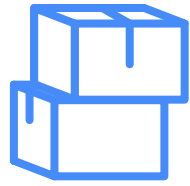
	Application development frameworks	Storage and data management	Monitoring and observability	Networking	Orchestration and management
RANKED TOP 3	75%	68%	57%	54%	46%
RANKED #1	25%	25%	16%	20%	15%
RANKED #2	25%	23%	18%	18%	15%
RANKED #3	25%	20%	23%	17%	15%

Are you experiencing a shortage of any skills related to Kubernetes?

40%	58%	3%

■ Yes ■ No ■ Don't know

What Kubernetes skills are you in need of?

Select all that apply.
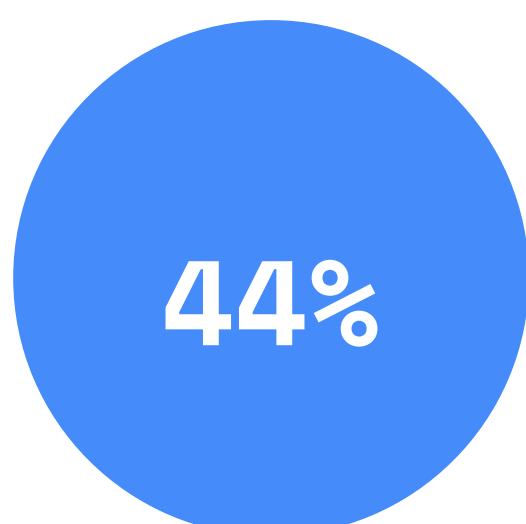
68%
Security

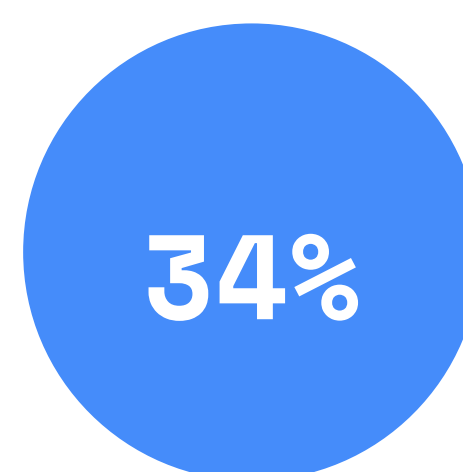**59%**
Networking
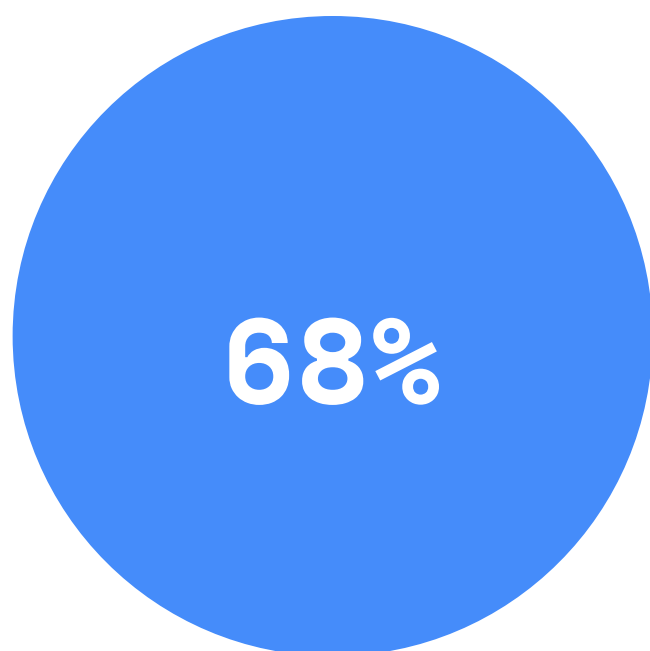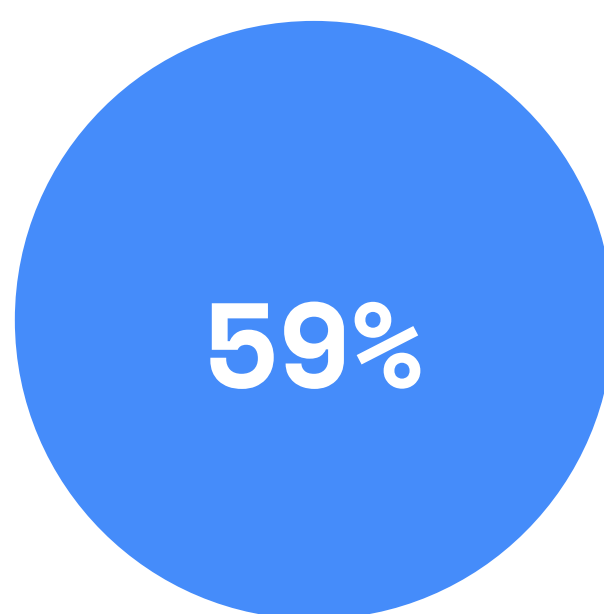
52%
Storage & data management

44%
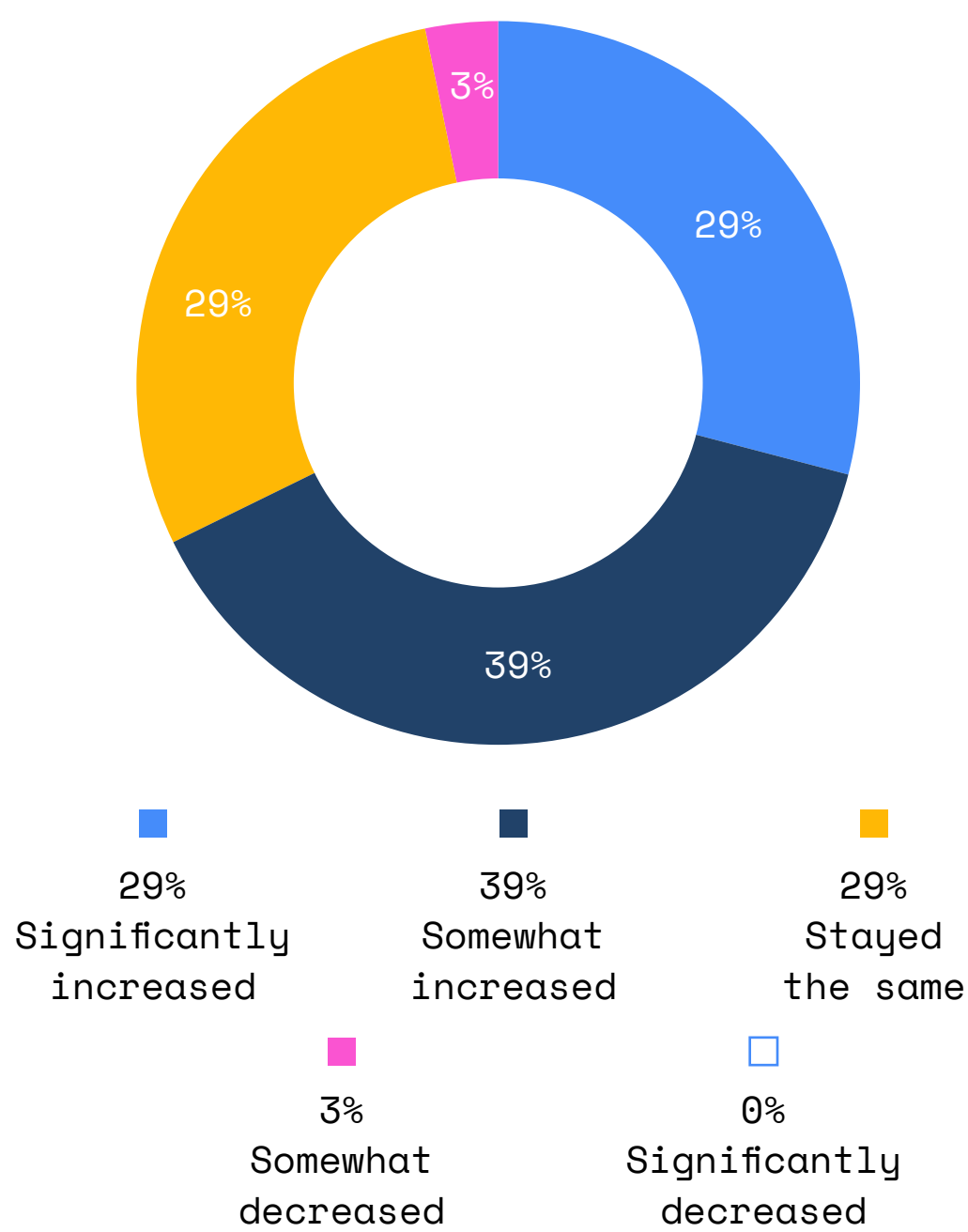Kubernetes operations

34%
How to build distributed applications
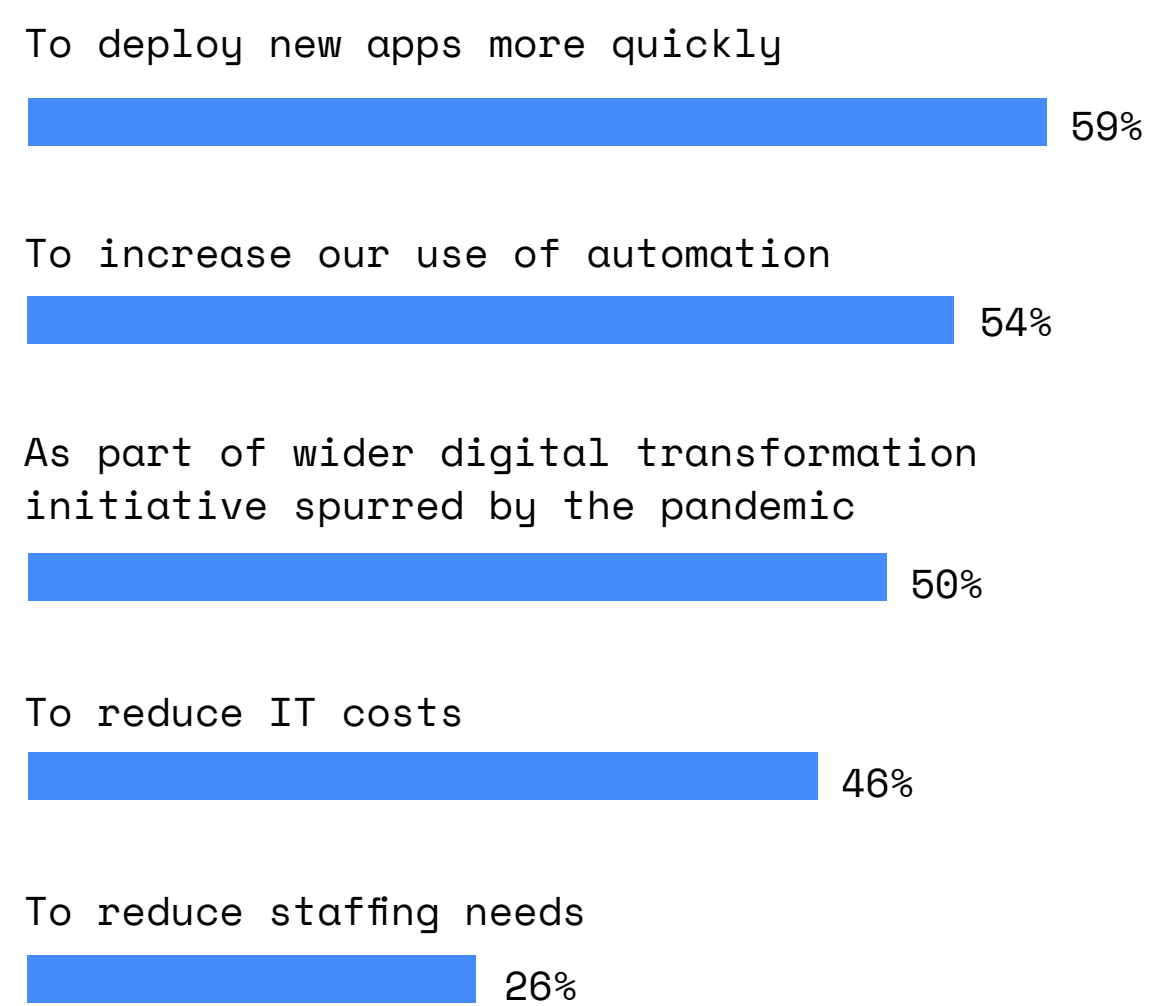
The impact of Covid-19 on Kubernetes usage

The COVID-19 pandemic has impacted nearly every business in some way. Many companies were planning or in the process of a digital transformation, and the pandemic forced businesses to accelerate these efforts. That may explain why more than two-thirds of respondents (68%) said their Kubernetes usage increased significantly or somewhat as a result of the pandemic, and 59% said the reason for the increase was to deploy new apps more quickly.

The pandemic also created financial uncertainty for many businesses, and minimizing wasted expenditure became a priority. Close to half, or 46%, of respondents said they increased their use of Kubernetes last year to help reduce IT costs. Of those, 27% expected to reduce IT costs by 31% or more.
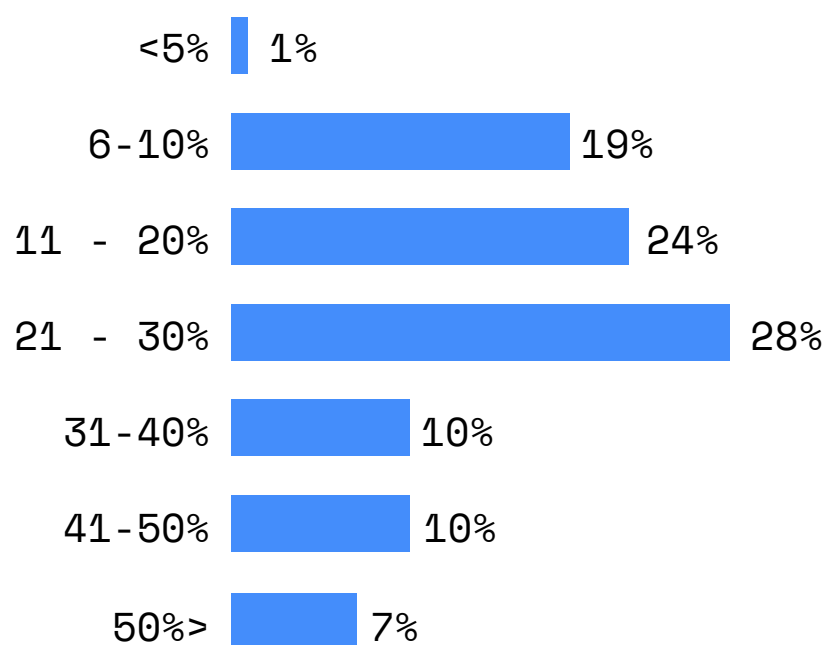
## How has the pandemic impacted your company's use of Kubernetes?

- 29% Significantly increased
- 39% Somewhat increased
- 29% Stayed the same
- 3% Somewhat decreased
- 0% Significantly decreased

What is the reason for the increase? Select all that apply.

To deploy new apps more quickly	59%
To increase our use of automation	54%
As part of wider digital transformation initiative spurred by the pandemic	50%
To reduce IT costs	46%
To reduce staffing needs	26%

By approximately how much do you expect to reduce your costs annually?

<5%	1%
6-10%	19%
11 - 20%	24%
21 - 30%	28%
31-40%	10%
41-50%	10%
50%>	7%

If the pandemic accelerated your adoption of Kubernetes, please estimate by how much time.

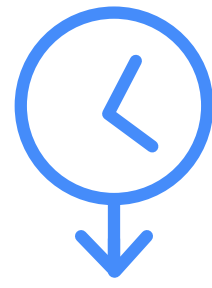|	
< Month	12%
1-2 months	26%
3-6 months	45%
7-12 months	12%
1 year >	5%
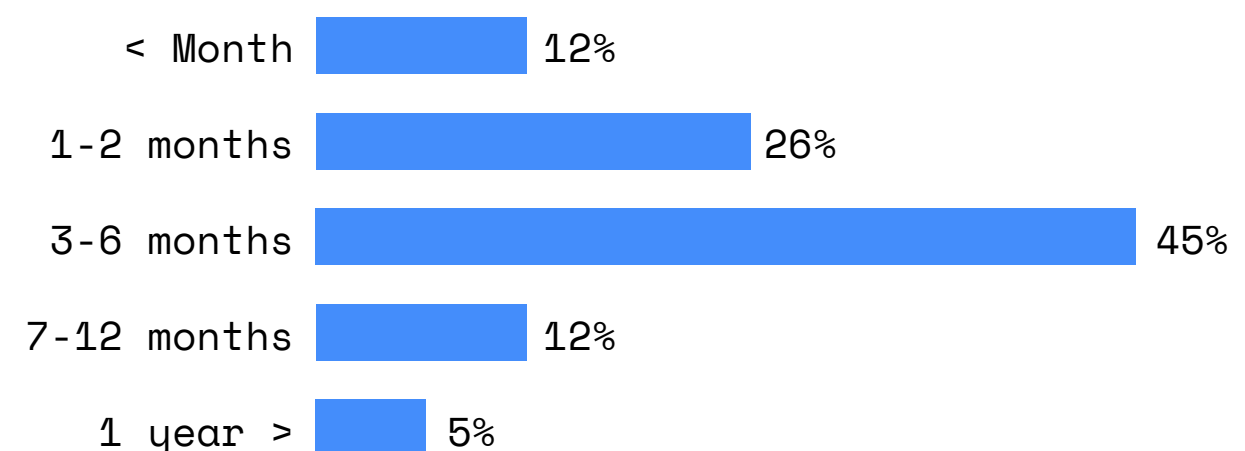
How has your IT organization been impacted by COVID-19?

Select all that apply.
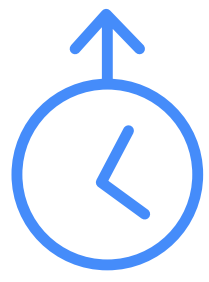
37%
We have reduced workload/hours

28%
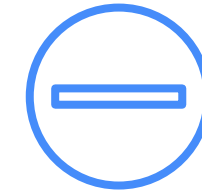We have increased workload/hours

26%
We have made staff cuts

22%
We have hired additional staff

20%
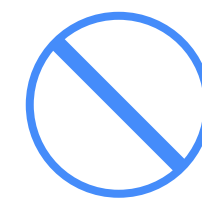We have increased salaries

19%
We have cut benefits

17%
We have made salary cuts

2%
Other

15%
No impact

Kubernetes know-how can lead to a higher income

Knowledge of Kubernetes is a valuable skill to have, and our survey results suggest that IT staff who are more familiar with the technology tend to earn more than those who are less familiar with it. Almost two-thirds (64%) of respondents who said they were "very knowledgeable" about their company's Kubernetes usage reported an annual income of $100,000 to $250,000, versus 59% who said they were "knowledgeable" about their Kubernetes usage and 50% who were "somewhat knowledgeable."

	VERY KNOWLEDGEABLE	KNOWLEDGEABLE	SOMEWHAT KNOWLEDGEABLE
$50,000<	1%	0%	6%
$50,000 - $74,999	9%	12%	13%
$75,000 - $99,999	16%	24%	23%
$100,000 - $149,999	38%	33%	34%
$150,000 - $199,999	16%	16%	11%
$200,000 - $249,999	10%	10%	5%
$250,000 - $299,999	3%	1%	6%
$300,000 - $349,999	2%	2%	2%
$400,000 - $499,999	1%	1%	0%
$500,000>	3%	1%	0%

How Covid-19 impacted employees

The pandemic disrupted not only businesses but also the personal and professional lives of the people who work at them. To learn how people who use Kubernetes as part of their job were affected, we explored this in our survey, and discovered that the pandemic led to both positive and negative effects.

A little over half of the respondents said they enjoy their jobs more now than before the pandemic (31% much more; 21% somewhat more). The top reasons cited were being able to spend more time with family and being able to concentrate more on work.

There were still 16% of respondents who said they enjoyed their jobs less in the past year. Of those, just over half (53%) said it's because collaboration is more difficult, while 46% simply missed being in the office and seeing their colleagues.

How has the pandemic impacted your level of job satisfaction personally?

I enjoy my job much more compared to before the pandemic

31%

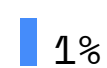I enjoy my job somewhat more compared to before the pandemic

21%

I enjoy my job the same as before the pandemic

31%

I enjoy my job somewhat less compared to before the pandemic

15%

I enjoy my job much less compared to before the pandemic

1%

What makes your job more enjoyable? Select all that apply.

55%
I can spend more time with my family

45%
I'm able to concentrate on my work more easily at home

40%
The acceptance or proliferation of collaboration tools makes team work more efficient

39%
I have more autonomy over my day

31%
I have shorter working hours

19%
I don't have to commute

What makes your job less enjoyable? Select all that apply

53%
Collaboration is more difficult

46%
I miss being in an office

46%
I miss my colleagues

42%
I have trouble concentrating from my home office

41%
Our teamwork is not as efficient

36%
I have too many video meetings

27%
I work longer hours

18%
I feel my work is less noticed and appreciated

It's a multi-cloud world

Amazon, Google, and Microsoft are in a race to dominate the multi-cloud services market and all three support Kubernetes. Amazon offers managed Kubernetes services through EKS Anywhere. Google's Anthos platform features a Kubernetes-based API that allows users to run applications across certain hosted environments using a single management interface. And Microsoft's Azure Arc allows users to deploy applications from Azure to Kubernetes distributions located inside or outside Azure.

Google Cloud Platform and Microsoft Azure were considered equally supportive of hybrid and multi-cloud deployments, with each cited by 30% of respondents, while 25% said Amazon Web Services is most supportive of hybrid and multi-cloud deployments.

However, when it comes to support for Kubernetes specifically, Microsoft Azure was the preferred cloud provider for almost all the categories we asked about. For example, 34% of respondents view Microsoft Azure as the most reliable public cloud provider for Kubernetes, and 31% consider it the most developer-friendly for Kubernetes.
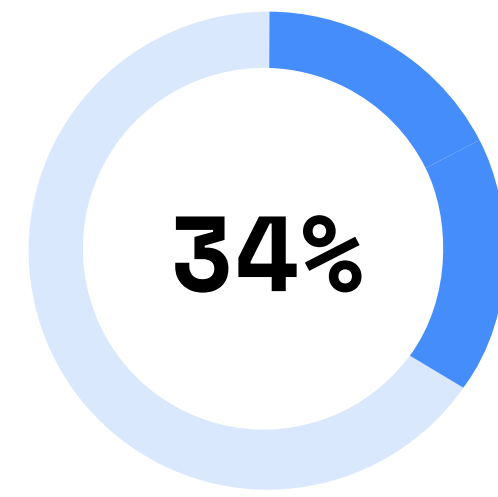
34%

of respondents view Microsoft Azure as the most reliable public cloud provider for Kubernetes

	Azure	Google Cloud	aws	IBM Cloud	ORACLE
Which public cloud provider do you consider to be most supportive of hybrid and multi-cloud deployments?	30%	30%	25%	8%	6%
Which public cloud provider has the most developer-friendly environment for running Kubernetes?	31%	27%	26%	11%	5%
Which public cloud provider do you view as the best value for money?	31%	27%	26%	11%	5%
Which public cloud provider do you view as most reliable for running Kubernetes?	34%	26%	25%	9%	4%

Which public cloud provider do you trust the most to keep your data and applications secure?

Rank from 1 (most trusted) to 5 (least trusted).

	Top 3	RANKED $1	RANKED $2	RANKED $3	RANKED $4	RANKED $5
Azure	83%	35%	28%	20%	10%	7%
Google Cloud	70%	25%	23%	23%	18%	12%
aws	69%	27%	24%	19%	15%	15%
IBM Cloud	50%	11%	16%	22%	28%	22%
ORACLE	28%	3%	8%	17%	29%	43%

Which Kubernetes platform do you primarily use?

31%

Google Kubernetes
Engine (GKE) or
Google Athos

30%

Azure Kubernetes
Service or Azure Arc
for Kubernetes

23%

Amazon Elastic
Kubernetes Service (EKS)
or EKS Anywhere

8%

Red Hat OpenShift

5%

VMware Tanzu

1%

Rancher

Conclusion

Our survey has shown how critical Kubernetes has become for cloud data management, with businesses leaning into it heavily over the past year to accelerate their digital transformation in the face of unprecedented challenges. We've also seen evidence that the role of Kubernetes continues to expand, and it will be fascinating to watch this play out as the extension projects under way at the Cloud Native Computing Foundation come to fruition.

The benefits that Kubernetes provides—including increased speed of deployment, cost-efficient resource utilization, and support for automated infrastructure scaling and management—are critical for virtually all businesses today. Organizations should be thinking broadly about the role Kubernetes can play in their own transformation projects and ensure that every aspect of their business is capitalizing on what the Kubernetes platform can provide.