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by Pure Storage

2022 **Kubernetes Adoption Survey**

Contents

Executive summary

Kubernetes enables faster deployments, cost-effective resource utilization, and support for automated infrastructure scaling and management.

Given these promising benefits, it's no surprise that many organizations turned to this transformational technology as they raced to roll out new apps and services in response to the changing market, supply chain constraints, and work-from-home initiatives. But will cloud-native technology use and adoption continue to grow now that we're two years into the COVID-19 pandemic?

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 have evolved over the last 12 months, whether the changes companies made to adapt to the pandemic are here to stay, and what challenges and opportunities come with this technology.

Our fourth annual survey revealed that Kubernetes continues to play a critical role in business. Companies are running an average of 45% of their databases and data services on Kubernetes. And 87% of survey respondents expect Kubernetes will play an even larger role in their organizations' infrastructure management in the next two to three years.

More than three-quarters of respondents (77%) reported that their organizations' **use of Kubernetes increased over the last two years**.

Kubernetes adoption is increasing because organizations need more automation and lower IT costs.

Top reasons for the increased adoption included the **need for more automation and to reduce IT costs.** Another consistent theme that emerged was Kubernetes' ability to help organizations combat staffing-related challenges, including instilling greater levels of job satisfaction with IT professionals and their teams.

Despite the growing adoption, respondents indicated there's still room for improvement in the Kubernetes tech stack, particularly in the areas of storage and data management as well as monitoring and observability capabilities.

More than half (53%) of companies indicated that data protection is a top challenge associated with running databases on Kubernetes, and a third (33%) cited disaster recovery as an issue. This becomes increasingly troublesome considering 56% of companies that are running more than 60% of their new apps in containers have been hit by a ransomware attack. And of the 87% of companies that have experienced at least one outage in the last 12 months, 83% of those outages were Kubernetes related.

This report details the findings of the 2022 survey of 500 full-time employees in IT departments of companies with at least 500 employees. All respondents were at least somewhat knowledgeable about how IT and Kubernetes technology were used in their organizations. Certain questions were repeated from a similar study in 2021 to enable trend analysis. Schlesinger Group, a research panel company, provided the sample.

The ongoing adoption
of Kubernetes technology

In 2021, the use of Kubernetes increased as companies were forced to roll out new apps and services to adapt to remote work, market disruption, and financial pressures. Respondents indicated that they now have an average of 45% of their databases and data services running on Kubernetes. And 87% expect Kubernetes to play a larger role in their organizations' infrastructure management in the next two to three years.
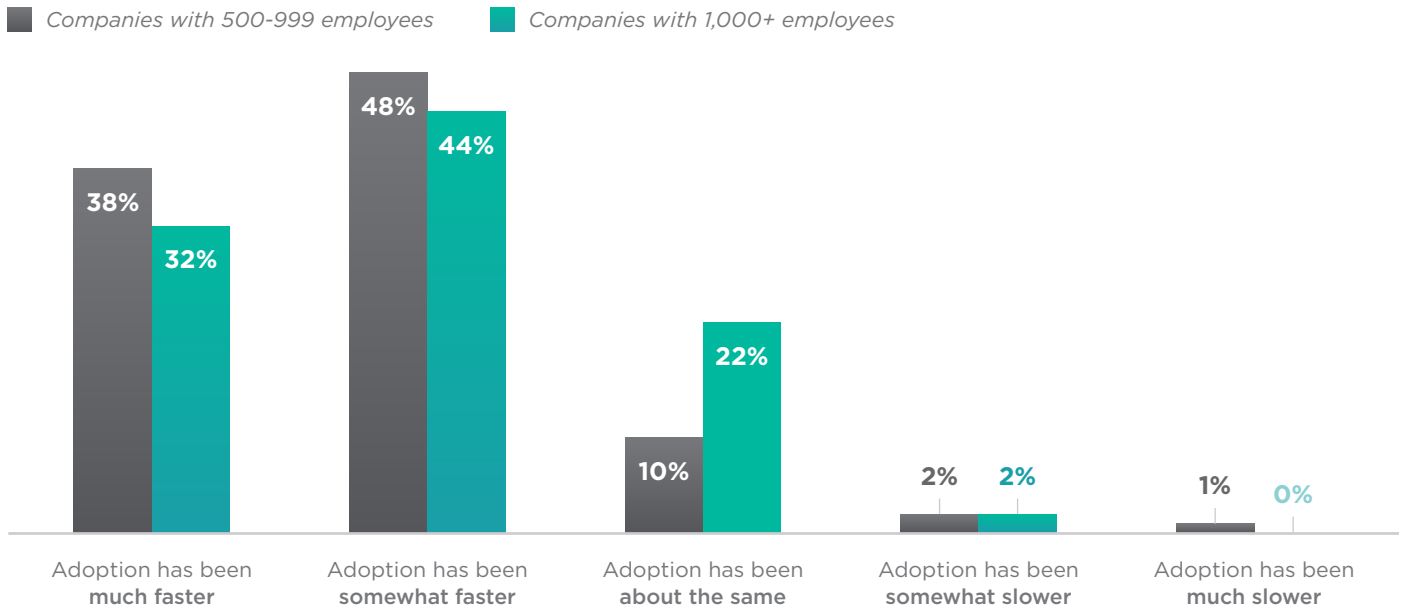
Nearly three out of four respondents (72%) believe that the pandemic accelerated the overall adoption of Kubernetes. This was especially true for companies with fewer than 1,000 employees; in 2021 and 2022, 50% of smaller companies increased their use of Kubernetes significantly as compared to 2020. Only 32% of their larger counterparts significantly increased their use of the technology. When asked whether the changes made in 2020 related to Kubernetes were still in place today, 81% of respondents indicated that most or all of them were.

Whether the pandemic spurred companies to embrace Kubernetes, adoption is, in fact, growing. The pace of adoption has accelerated for 79% of companies surveyed; however, smaller companies are embracing Kubernetes at a faster rate. Reasons for adoption include the need to increase use of automation, reduce costs, get to market faster, and overcome staffing issues.
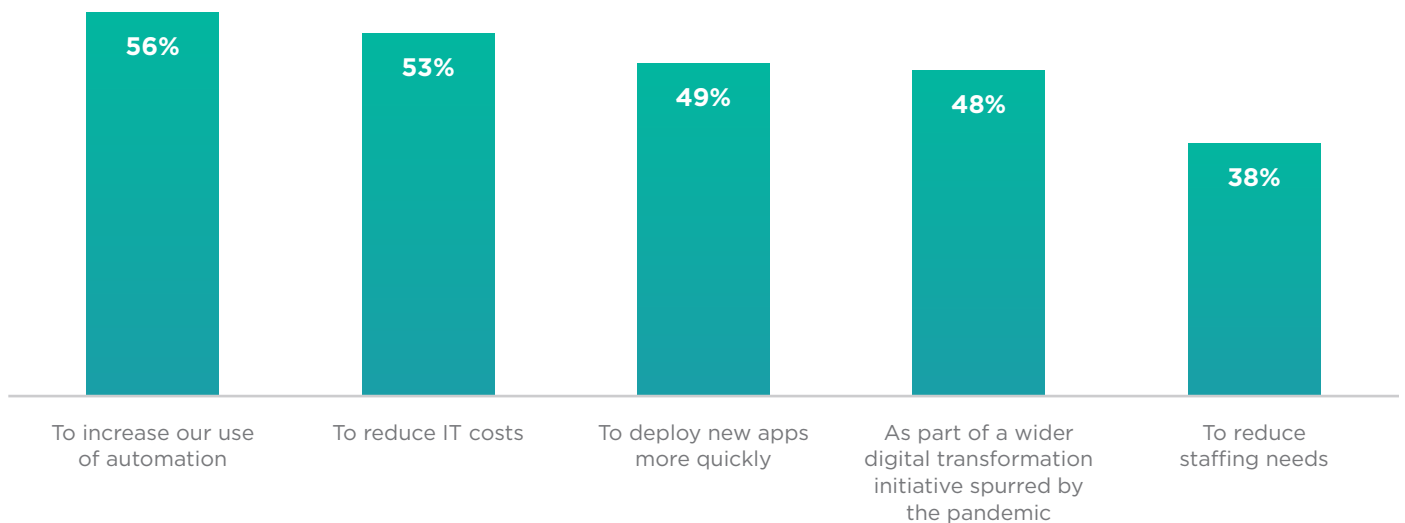
45% of databases and data services run on Kubernetes

In 2021, the top reasons for using Kubernetes were to support program areas that needed to mature and evolve and to address changes to the company's business strategy. These two reasons remain at the top in 2022; however, this year, respondents cited an increasing need to address budget and resource constraints, team changes, and pressure from leadership to accelerate digital transformation initiatives.

Adoption of Kubernetes in 2021 and 2022 compared to 2020

■ *Companies with 500-999 employees* ■ *Companies with 1,000+ employees*

38% / 32%	48% / 44%	10% / 22%	2% / 2%	1% / 0%
Adoption has been **much faster**	Adoption has been **somewhat faster**	Adoption has been **about the same**	Adoption has been **somewhat slower**	Adoption has been **much slower**

Reasons for the increased use of Kubernetes in 2021 and 2022

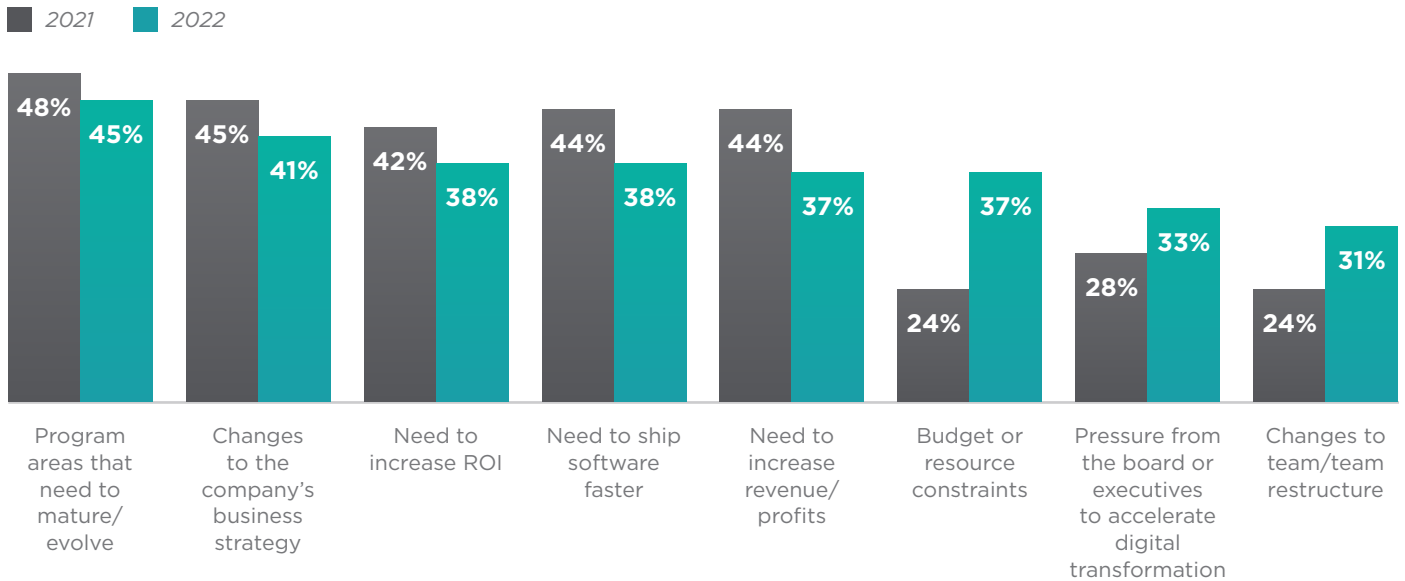| 56%	53%	49%	48%	38%
To increase our use of automation	To reduce IT costs	To deploy new apps more quickly	As part of a wider digital transformation initiative spurred by the pandemic	To reduce staffing needs

Given that staffing and budgetary challenges are growing in terms of their influence on Kubernetes use, it makes sense that one of the biggest benefits that comes from adopting Kubernetes is a reduction in IT and staffing costs. At 66%, reduced staffing costs is second only to the ability to deploy new apps faster (68%).
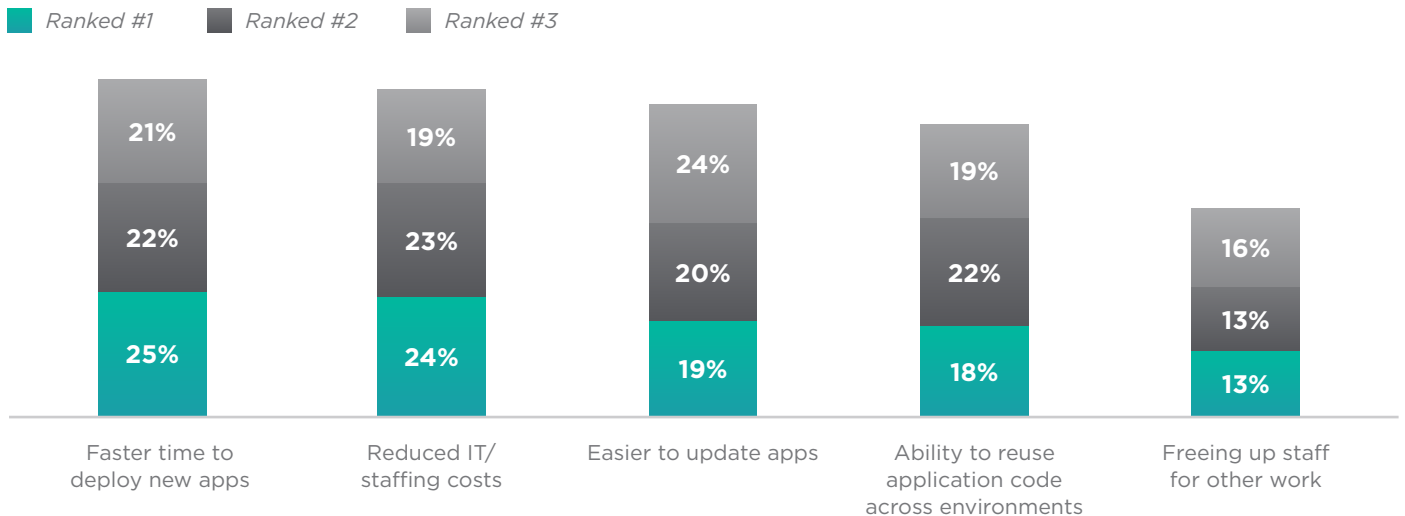
Faster time to deploy new apps was listed as the number-one benefit of adopting Kubernetes in 2021 (73%) and in 2022 (68%).

Primary reasons for using Kubernetes in 2021 versus 2022

■ *2021*   ■ *2022*

	2021	2022
Program areas that need to mature/evolve	48%	45%
Changes to the company's business strategy	45%	41%
Need to increase ROI	42%	38%
Need to ship software faster	44%	38%
Need to increase revenue/profits	44%	37%
Budget or resource constraints	24%	37%
Pressure from the board or executives to accelerate digital transformation	28%	33%
Changes to team/team restructure	24%	31%

The biggest benefits of adopting Kubernetes (rank the top three)

■ *Ranked #1*   ■ *Ranked #2*   ■ *Ranked #3*

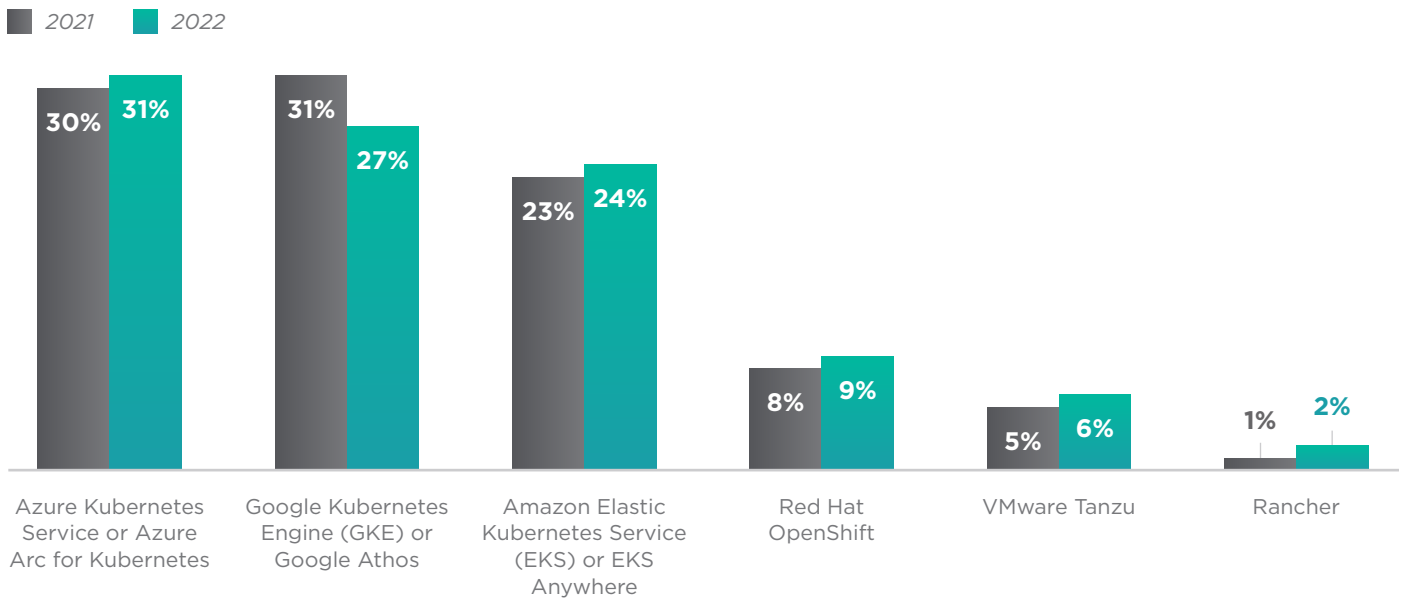|	Ranked #1	Ranked #2	Ranked #3
Faster time to deploy new apps	25%	22%	21%
Reduced IT/staffing costs	24%	23%	19%
Easier to update apps	19%	20%	24%
Ability to reuse application code across environments	18%	22%	19%
Freeing up staff for other work	13%	13%	16%

Azure, Google, and AWS remain the top three Kubernetes platforms used. Though this year, survey responses indicate that Red Hat, VMware, and Rancher have seen some slight gains. Azure also replaced Google as the leading primary platform.

Nearly two-thirds of all workloads running in containers are internal or custom applications. The remaining 40% comprise customer-facing web or mobile apps. Companies deploy these containers across private clouds, hybrid clouds, public clouds, and on-premises. At 36% and 31%, respectively, private clouds and hybrid clouds are the primary locations for container deployment.

More than three-quarters of organizations use Kubernetes to orchestrate applications running in virtual machines in addition to containers, and 84% expect to do so in the next 12 months.

Primary Kubernetes platform in 2021 versus 2022

2021 *2022*

	Azure Kubernetes Service or Azure Arc for Kubernetes	Google Kubernetes Engine (GKE) or Google Athos	Amazon Elastic Kubernetes Service (EKS) or EKS Anywhere	Red Hat OpenShift	VMware Tanzu	Rancher
2021	30%	31%	23%	8%	5%	1%
2022	31%	27%	24%	9%	6%	2%

#1 reason for using...

aws
Our program area needs to mature/evolve (22%)

Google
We need to ship software faster (19%)

Microsoft
We need to increase ROI (19%)

The prevalence of outages
and their associated impacts

Every organization strives to minimize unscheduled downtime, but this goal is often not realized. Only 12% of our survey respondents indicated that they hadn't experienced an outage in the past 12 months. Of those reporting outages, 25% had one outage that was Kubernetes related, 41% had two to five, and 17% had six or more. Companies with fewer than 1,000 employees were more likely to report a higher number of outages overall and more Kubernetes-related outages than their larger counterparts.

Overall outages by company size   **Kubernetes-related outages by company size**
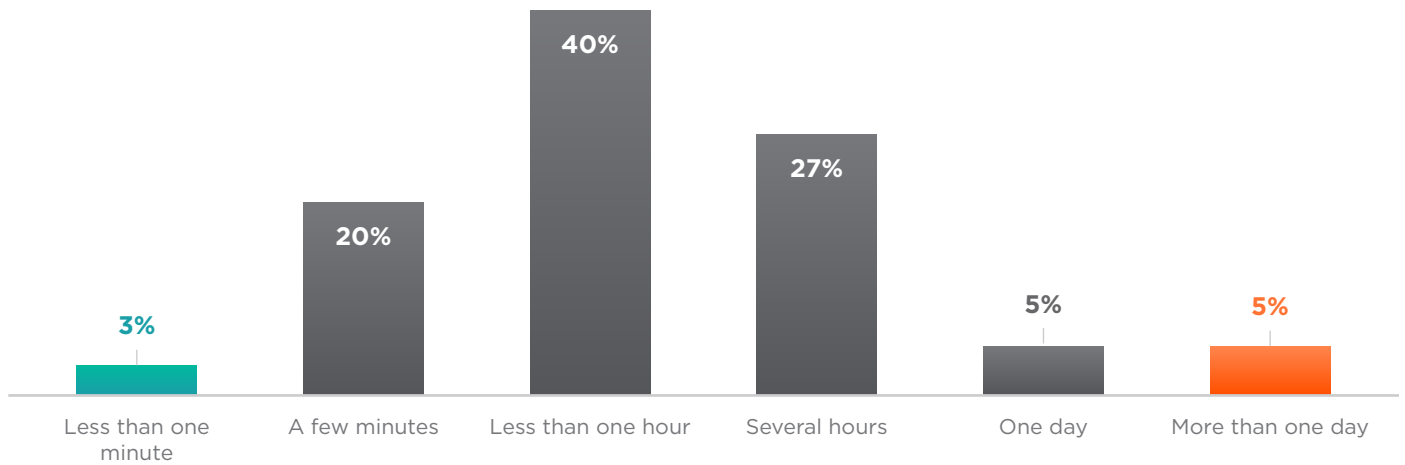
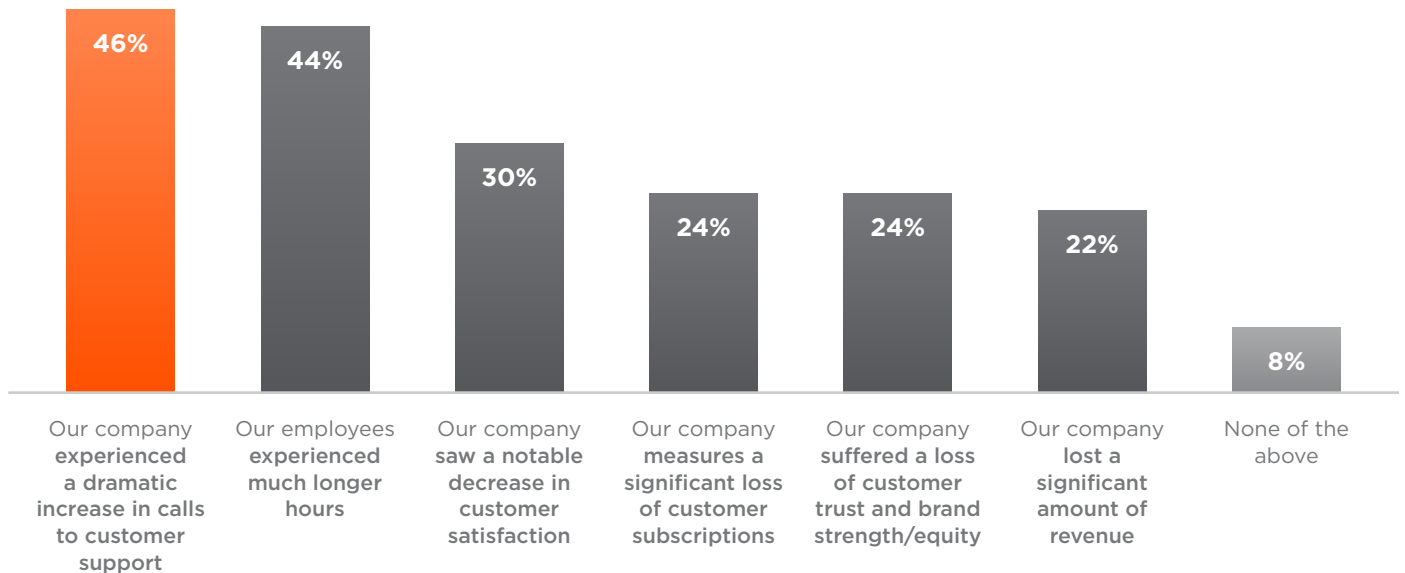■ *500-999 employees*   ■ *1,000+ employees*
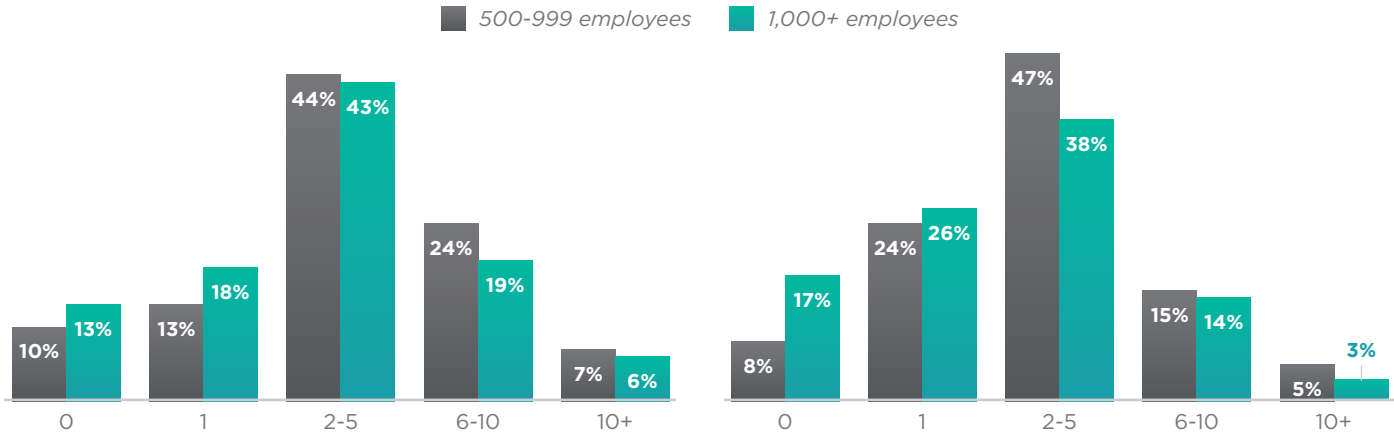
87% of companies reported at least one outage in the past 12 months – of those outages, 83% were Kubernetes related.

For nearly two-thirds of the respondents (63%), outages lasted less than one hour; however, 10% experienced outages that lasted for one day or longer. Only 8% of respondents indicated their companies hadn't experienced any negative impacts from the outages. The remaining 92% saw a mix of issues, with an influx of customer support calls and longer hours for employees being the most prevalent.

Length of outages

Less than one minute	A few minutes	Less than one hour	Several hours	One day	More than one day
3%	20%	40%	27%	5%	5%

Results of outages

Our company experienced a dramatic increase in calls to customer support	Our employees experienced much longer hours	Our company saw a notable decrease in customer satisfaction	Our company measures a significant loss of customer subscriptions	Our company suffered a loss of customer trust and brand strength/equity	Our company lost a significant amount of revenue	None of the above
46%	44%	30%	24%	24%	22%	8%

Ransomware attacks in the Kubernetes environment

Lately, it seems the news is filled with stories of ransomware attacks. And based on results of this year's survey, it's clear that ransomware is an issue that should be top of mind for every organization.

More than 4 in 10 respondents (44%) indicated that their organizations have been victims of ransomware attacks. Smaller companies saw 11% more ransomware attacks than companies with more than 1,000 employees.

Companies running apps in containers aren't immune to the risk – and based on responses to our survey, companies that have more than 60% of their new apps running in containers experienced 24% more ransomware attacks than companies with 40% or fewer new apps in containers. Of the companies reporting a ransomware attack, 35% primarily deploy their containers in private clouds, and 35% primarily deploy to hybrid clouds. Companies that primarily deploy containers on-premises were least likely to experience a ransomware attack, with only 9% reporting they'd been hit.

The attacks keep coming. Forty-five percent of respondents indicated that ransomware attacks on their companies occur a few times a year, and 21% struggle with these attacks at least monthly. Three out of four companies have been hit within the last six months; only 8% indicated that they haven't been attacked within the last year.
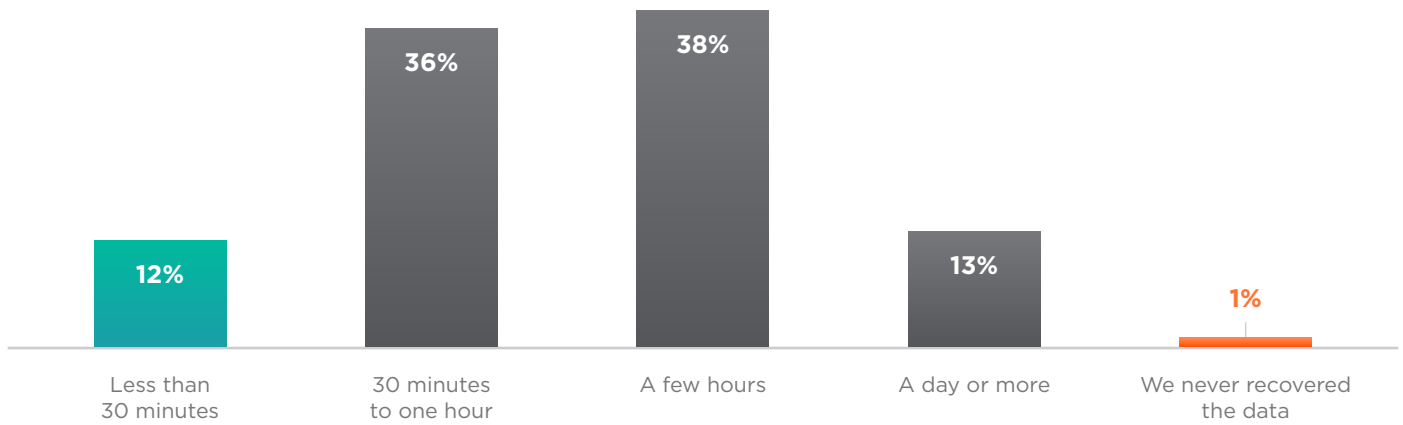
56% vs. 32%

56% of companies with more than 60% of their new apps running in containers reported a ransomware attack, compared to only 32% of companies with less than 40% of their apps running in containers.
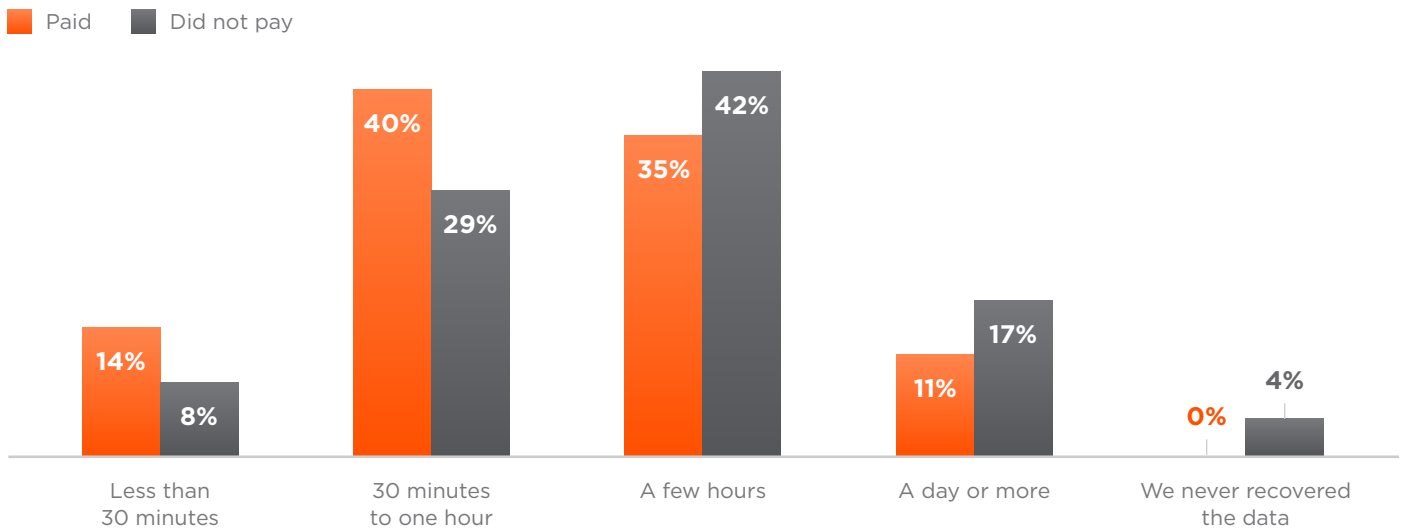
Equally important to note is the length of time companies need to recover their applications and data from these attacks. Half were able to recover in an hour or less, but 13% indicated it took a day or more. Unfortunately, 1% of respondents indicated they were never able to recover.

Sixty percent of companies that were attacked paid the ransom. In an unfortunate story that crime pays, the companies that paid the ransom were able to recover their applications and data faster than those that didn't. More than half of paying companies (54%) recovered in an hour or less, whereas only 37% of companies that didn't give in to the demands were able to recover within 60 minutes.

Time to recover applications following a ransomware attack

Less than 30 minutes	30 minutes to one hour	A few hours	A day or more	We never recovered the data
12%	36%	38%	13%	1%

Recovery time for paying versus not paying the ransom

■ Paid   ■ Did not pay

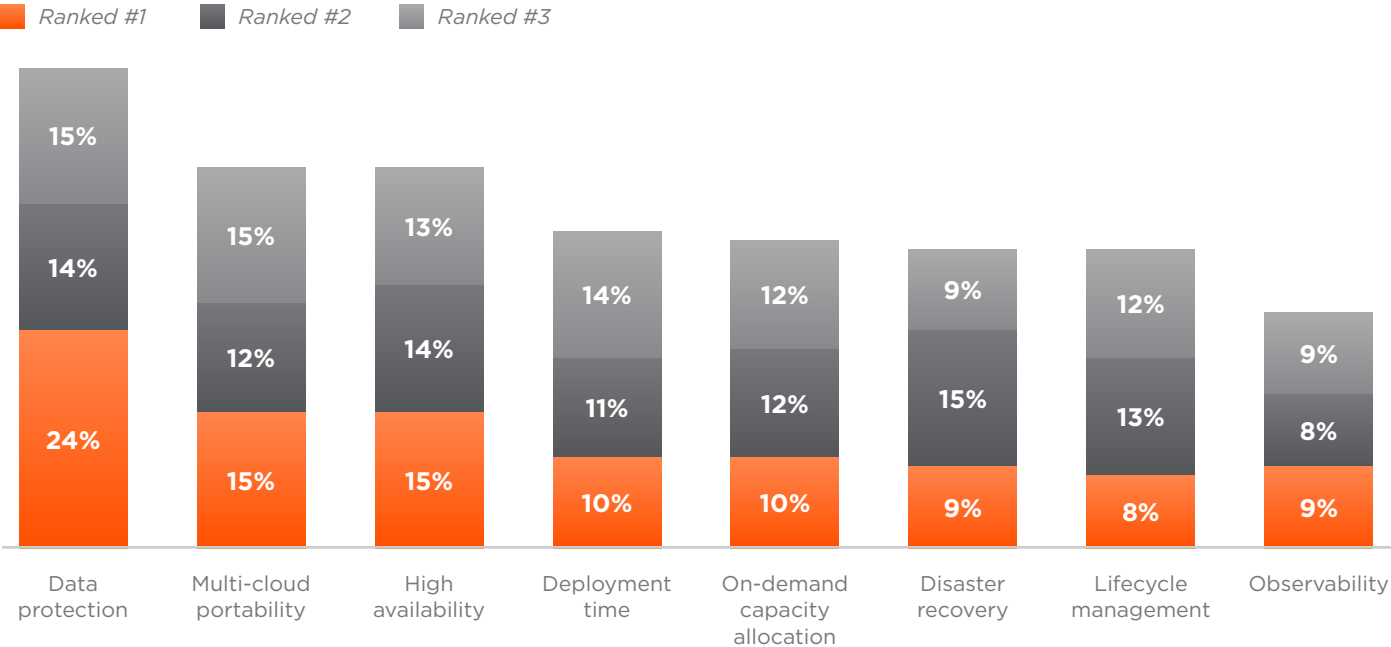|	Less than 30 minutes	30 minutes to one hour	A few hours	A day or more	We never recovered the data
Paid	14%	40%	35%	11%	0%
Did not pay	8%	29%	42%	17%	4%

Kubernetes and the
data protection challenge

When it comes to Kubernetes technology, data protection is the most-pressing challenge facing respondents. One-quarter of respondents listed it as their number-one issue, and 53% included it in their top three.
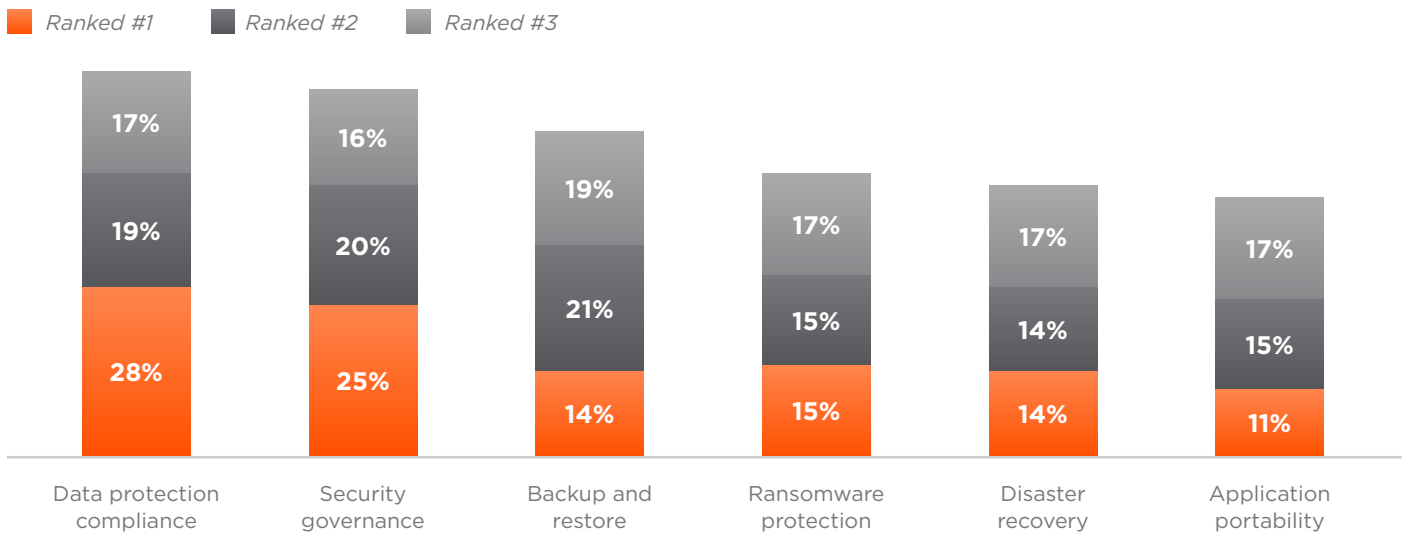
What makes data protection so difficult? Compliance and security governance are the most-pressing concerns, with 63% and 60% of respondents, respectively, ranking these challenges in their top three. When breaking out these challenges by company size, smaller organizations (those with fewer than 1,000 employees) struggle more with backup and restore and application portability, whereas larger entities are challenged by disaster recovery.

Challenges running databases on Kubernetes (rank the top three)

■ *Ranked #1* ■ *Ranked #2* ■ *Ranked #3*

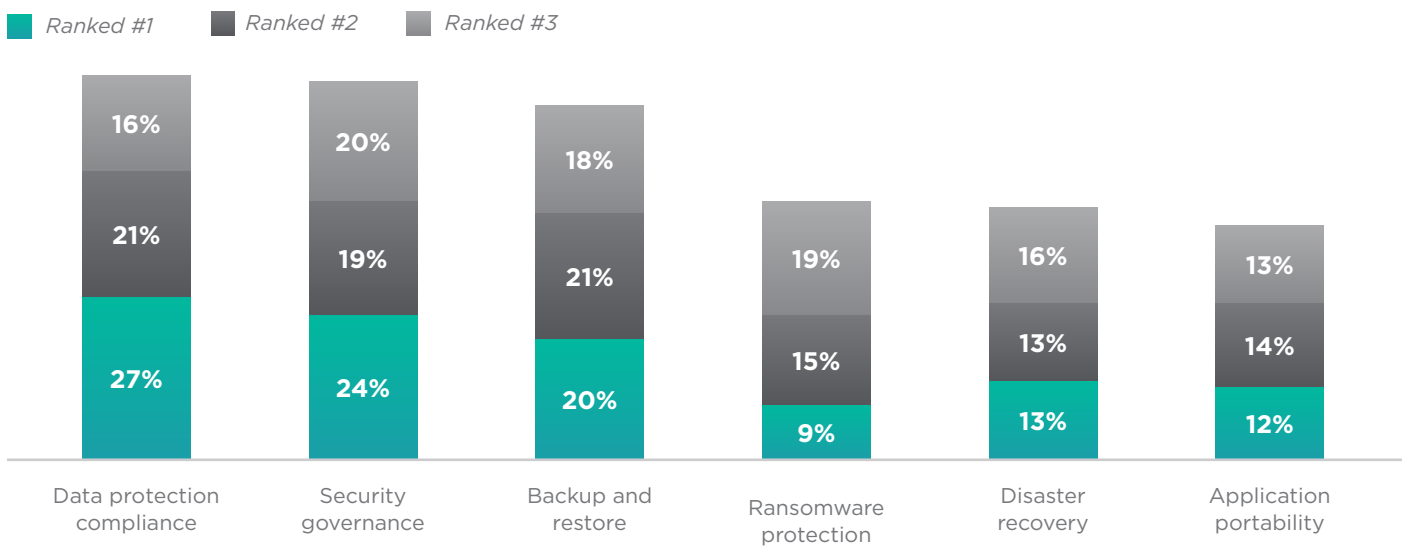| Challenge	Ranked #1	Ranked #2	Ranked #3
Data protection	24%	14%	15%
Multi-cloud portability	15%	12%	15%
High availability	15%	14%	13%
Deployment time	10%	11%	14%
On-demand capacity allocation	10%	12%	12%
Disaster recovery	9%	15%	9%
Lifecycle management	8%	13%	12%
Observability	9%	8%	9%

The elements of data protection that organizations are investing in mirror the areas that are their biggest challenges. Data protection compliance and security governance are the top two areas, with 27% and 24% of respondents, respectively, naming these as their number-one investment areas. But for companies that are running more than 60% of their new apps in containers, ransomware is the top area of investment.

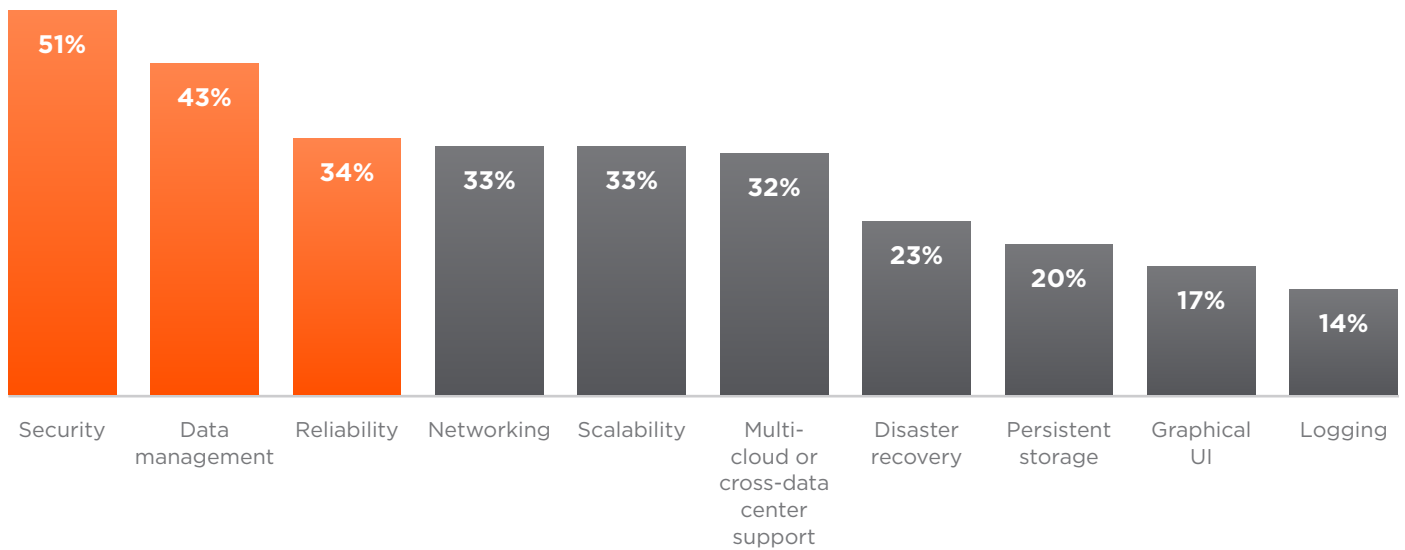**The most challenging elements of data protection (rank the top three)**

Ranked #1   Ranked #2   Ranked #3

	Data protection compliance	Security governance	Backup and restore	Ransomware protection	Disaster recovery	Application portability
Ranked #3	17%	16%	19%	17%	17%	17%
Ranked #2	19%	20%	21%	15%	14%	15%
Ranked #1	28%	25%	14%	15%	14%	11%

Elements of data protection companies are investing in (rank the top three)

Ranked #1   Ranked #2   Ranked #3

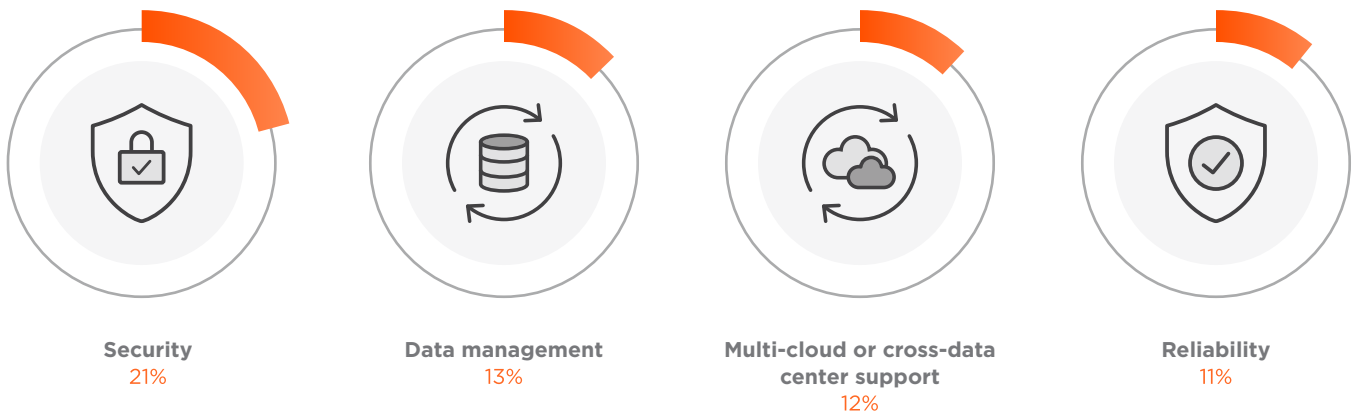|	Data protection compliance	Security governance	Backup and restore	Ransomware protection	Disaster recovery	Application portability
Ranked #3	16%	20%	18%	19%	16%	13%
Ranked #2	21%	19%	21%	15%	13%	14%
Ranked #1	27%	24%	20%	9%	13%	12%

Kubernetes can be complicated, and survey respondents indicated that security and data management are the challenges to running Kubernetes that are most difficult to overcome. More than one in five (21%) respondents ranked security as their most pressing challenge, and more than half (51%) ranked it in their top three. Data management follows closely behind, with 13% naming it their top challenge, and 44% ranking it in their top three.

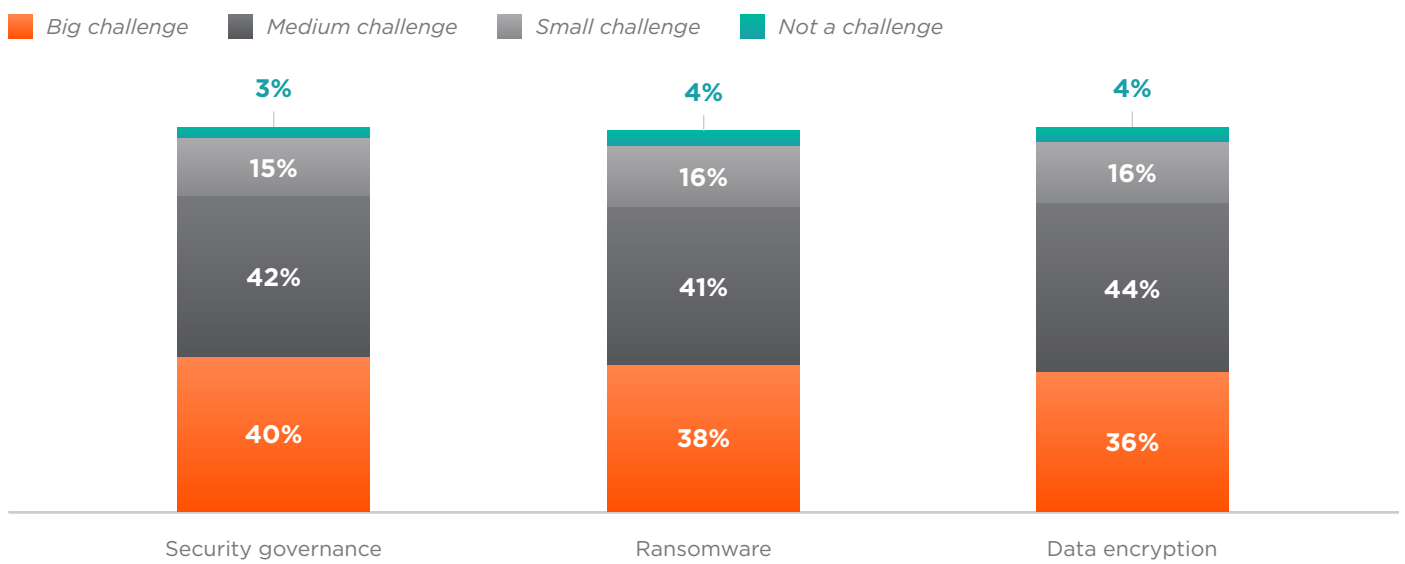**The challenges that are the most difficult to overcome when running Kubernetes (ranked top three)**

Security	Data management	Reliability	Networking	Scalability	Multi-cloud or cross-data center support	Disaster recovery	Persistent storage	Graphical UI	Logging
51%	43%	34%	33%	33%	32%	23%	20%	17%	14%

#1 Kubernetes challenge that's the most difficult to overcome

Security
21%

Data management
13%

Multi-cloud or cross-data center support
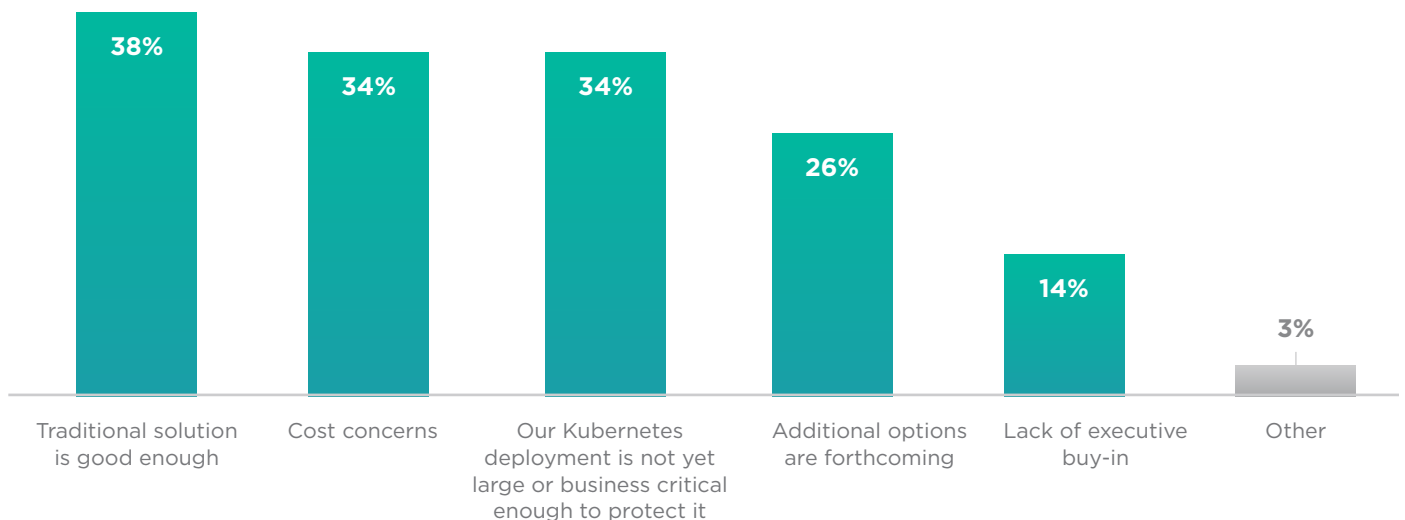12%

Reliability
11%

Diving deeper into security-related challenges, security governance, data encryption, and ransomware are universally medium to large issues for nearly four out of five respondents. Only 3% to 4% of respondents consider these issues to not be a challenge.

To protect their data, 84% of respondents use a solution built for Kubernetes. This number grows to 95% of companies that have experienced a ransomware attack; however, the survey didn't probe into whether these solutions were introduced into the environment before or after the attack. For those companies that chose not to use a data protection solution purpose built for Kubernetes, their reasons include the belief that the traditional solution is good enough, cost concerns, and non-business-critical deployments.
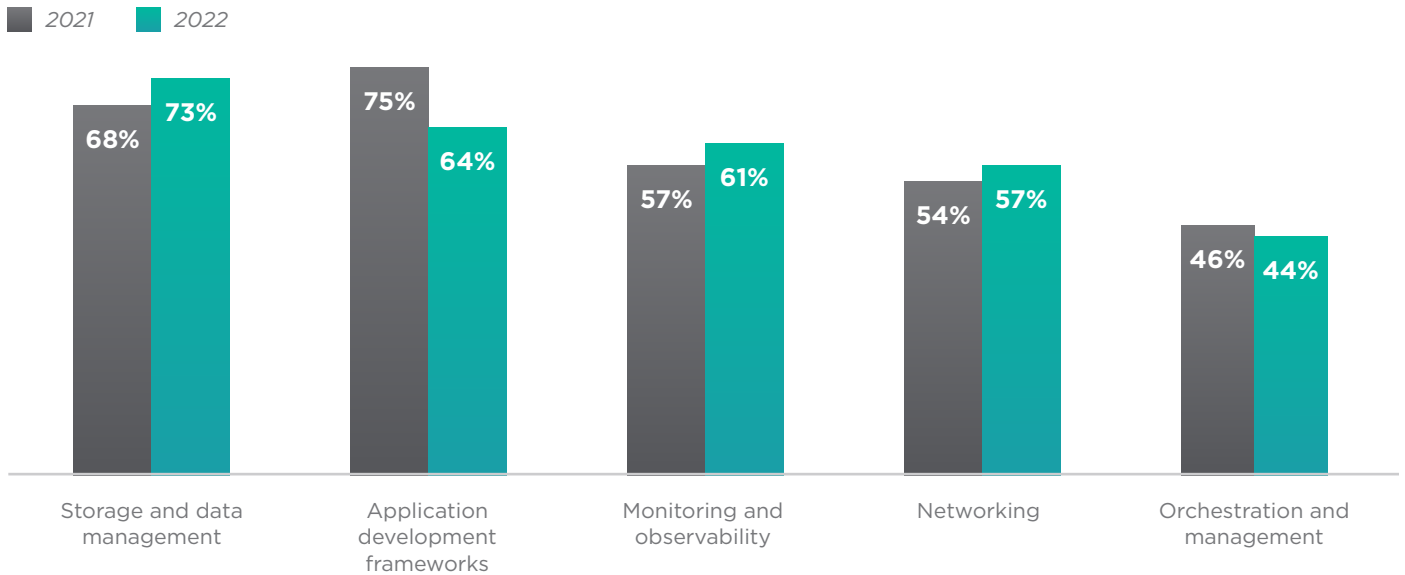
Security-related challenges

- Big challenge
- Medium challenge
- Small challenge
- Not a challenge

Security governance	Ransomware	Data encryption
3%	4%	4%
15%	16%	16%
42%	41%	44%
40%	38%	36%

Reasons for not using a data protection that's built for Kubernetes

Traditional solution is good enough	Cost concerns	Our Kubernetes deployment is not yet large or business critical enough to protect it	Additional options are forthcoming	Lack of executive buy-in	Other
38%	34%	34%	26%	14%	3%

As reported in the 2021 survey, despite technological advances and solid maturity in many areas, some work is still needed when it comes to the Kubernetes tech stack. Nearly three-quarters of respondents believe that storage and data management capabilities need improvement to make deploying cloud-native apps easier. Monitoring and observability and networking capabilities also garnered more attention this year than in 2021. However, last year's top-requested improvement – application development frameworks – saw a decrease of 11%; though at 64%, it's clearly still an area that could use some work.
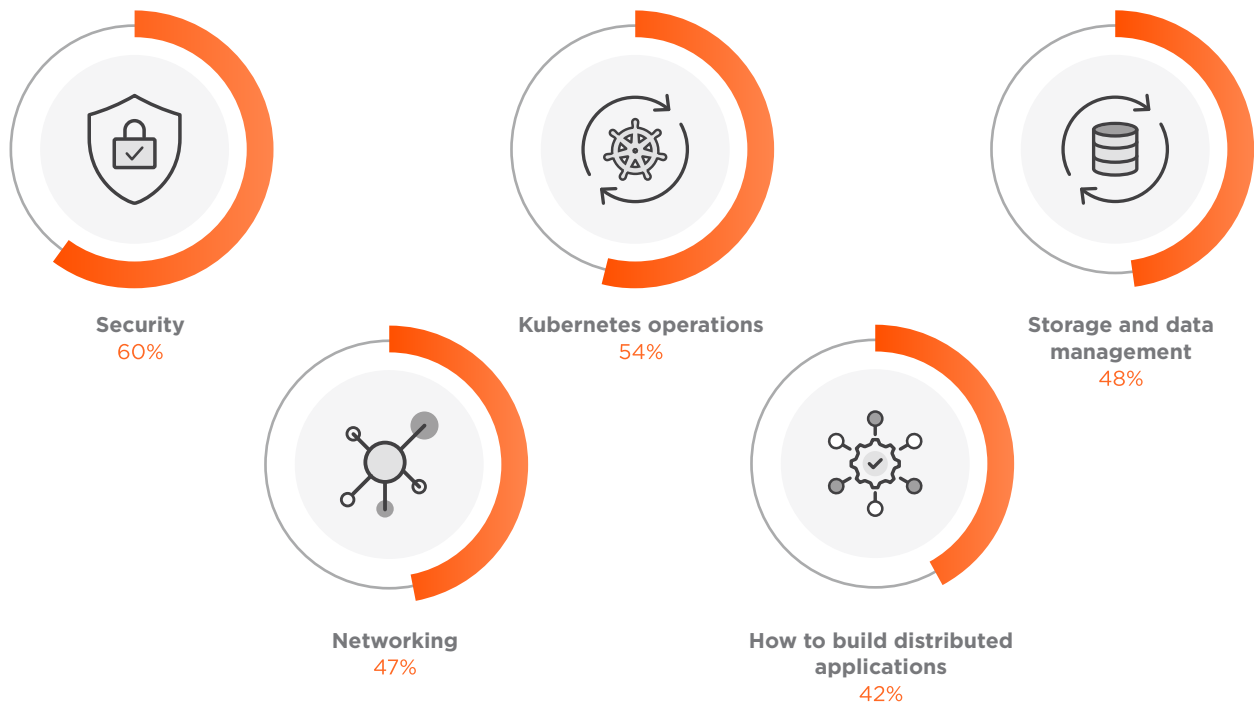
Areas of the Kubernetes tech stack that need to mature to make deploying cloud-native apps easier in 2021 versus 2022 (ranked top three)

■ *2021* ■ *2022*

	2021	2022
Storage and data management	68%	73%
Application development frameworks	75%	64%
Monitoring and observability	57%	61%
Networking	54%	57%
Orchestration and management	46%	44%

The impacts of Kubernetes technology **on staffing**

Over the last couple years, companies across numerous industries have been experiencing turnover, staffing shortages, and skills gaps. Based on responses from the 2022 survey, companies using Kubernetes technology are not immune to the impacts of the Great Resignation and other employment-related trends. More than half (55%) of respondents – up from 40% in 2021 – reported that their companies were experiencing a shortage of skills related to Kubernetes. For companies with fewer than 1,000 employees, this issue was even more prevalent; two-thirds of smaller companies indicated they were dealing with skills shortages.

What Kubernetes skills are companies lacking?

Security
60%

Kubernetes operations
54%

Storage and data management
48%

Networking
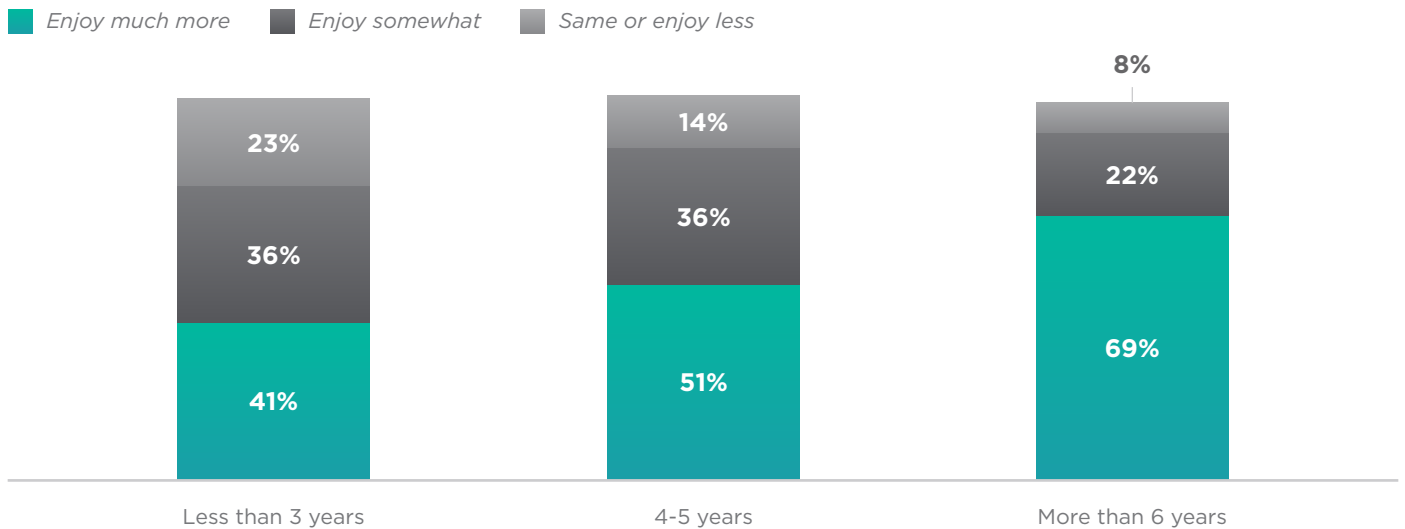47%

How to build distributed applications
42%

A potential bright spot on the staffing front: Kubernetes leads to higher job satisfaction, which means companies that adopt Kubernetes technology could have an edge in attracting and retaining key talent. According to survey respondents, 83% enjoy their jobs somewhat or much more because of their work with Kubernetes. And their satisfaction increases the longer they work with Kubernetes.

Working with Kubernetes is seen as a positive from both the team and individual level. The more apps that teams run in containers, the greater the team-level benefits are.

83% of respondents have greater job satisfaction because they work with Kubernetes.

Job satisfaction by length of time respondents have worked with Kubernetes

Enjoy much more   *Enjoy somewhat*   *Same or enjoy less*

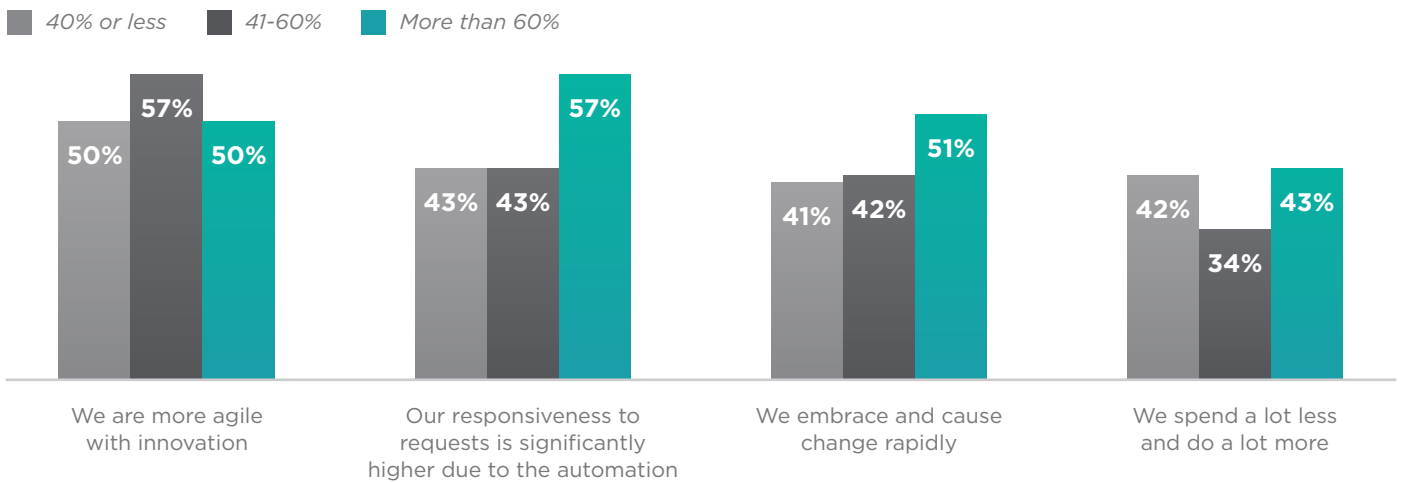|	Less than 3 years	4-5 years	More than 6 years
Same or enjoy less	23%	14%	8%
Enjoy somewhat	36%	36%	22%
Enjoy much more	41%	51%	69%

Why are individuals more satisfied with their jobs if they're working with Kubernetes? Most respondents agree or strongly agree that working with Kubernetes:
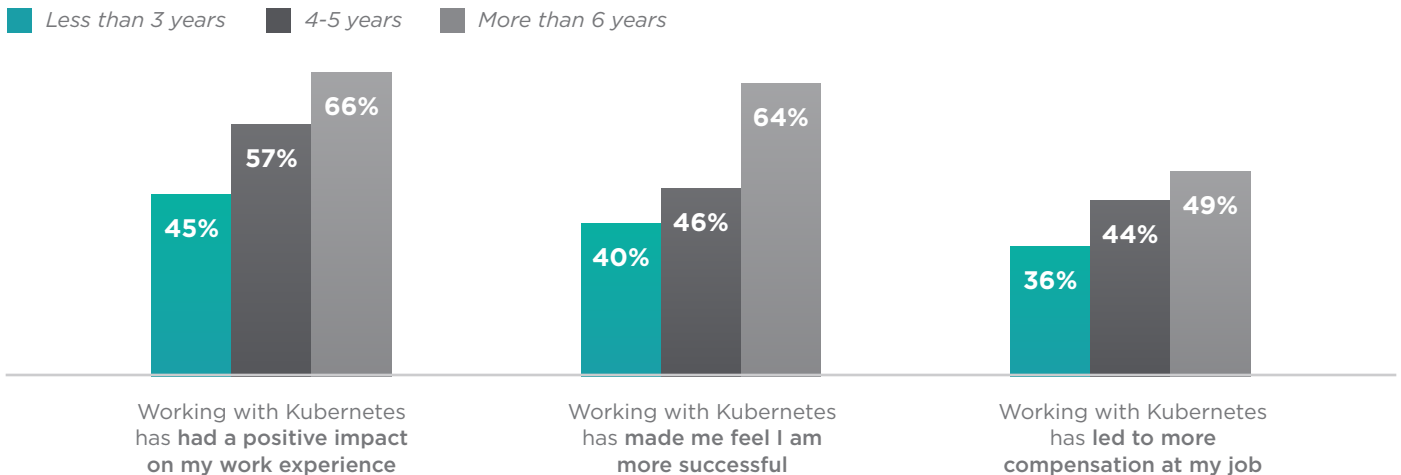
- Has had a positive impact on their work experience (90%)
- Makes them more interested in their jobs (86%)
- Has made their potential career choices better (88%)
- Has led to more compensation (77%)

Perhaps as an indication of how complex Kubernetes can be, the level of job satisfaction grows as professionals spend more time working with the technology. Companies should help new-to-Kubernetes employees become more comfortable with the technology and close skill gaps faster, perhaps by using technology partners to help automate the deployment and management of Kubernetes.

Reasons for greater team job satisfaction from working with Kubernetes by percentage of new apps on containers

40% or less   41-60%   More than 60%

	40% or less	41-60%	More than 60%
We are more agile with innovation	50%	57%	50%
Our responsiveness to requests is significantly higher due to the automation	43%	43%	57%
We embrace and cause change rapidly	41%	42%	51%
We spend a lot less and do a lot more	42%	34%	43%

Respondents strongly agree that Kubernetes has positively impacted their professional lives

Less than 3 years   4-5 years   More than 6 years

	Less than 3 years	4-5 years	More than 6 years
Working with Kubernetes has **had a positive impact on my work experience**	45%	57%	66%
Working with Kubernetes has **made me feel I am more successful**	40%	46%	64%
Working with Kubernetes has **led to more compensation at my job**	36%	44%	49%

Conclusion

This year's survey reveals that the adoption rate of Kubernetes shows no signs of slowing down. Companies are embracing this technology to get to market faster, reduce IT and staffing costs, and meet growing calls to expedite digital transformations.

IT professionals also appreciate the impact Kubernetes has had on their careers and overall job satisfaction. As respondents indicated, these benefits will continue to increase as they become more comfortable with the technology the longer they work with it.

Cloud-native technology use and adoption are critical for virtually all businesses today. However, organizations should look for solutions and resources that can help them overcome the data protection and management challenges that are inherent to running mission-critical applications in containers. Only by making sure their data services are scalable, available, and secure can companies ensure that they are truly capitalizing on the benefits of Kubernetes.
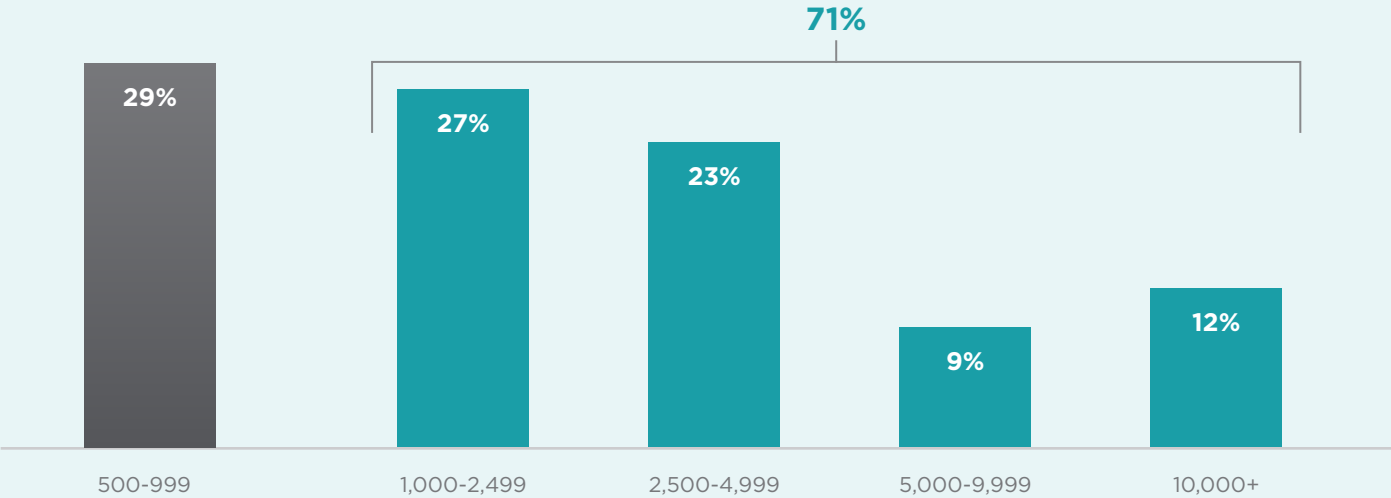
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Survey methodology

The survey gathered online responses from 500 respondents between April 22 and April 27, 2022. Respondents worked full-time in IT roles at companies with at least 500 employees and were knowledgeable about their companies' use of IT and Kubernetes technology. The sample was provided by Schlesinger Group, a research panel company.
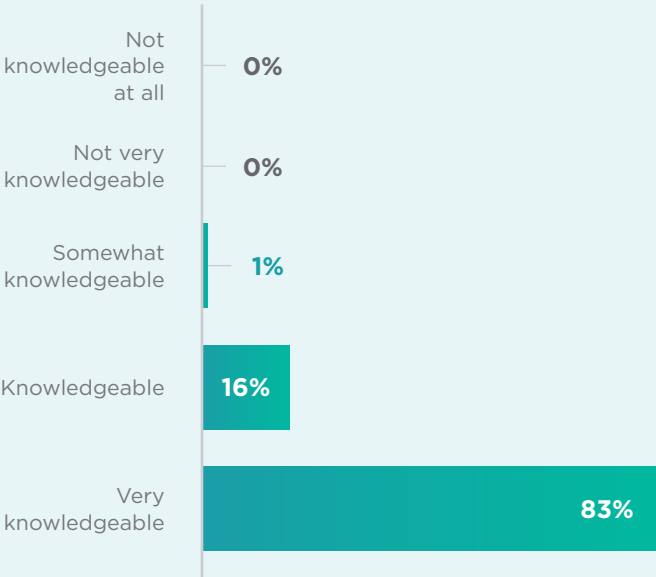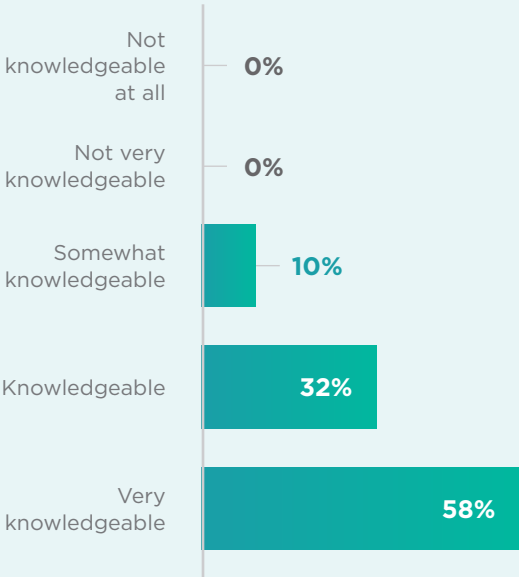
Age of respondents

- 44% — 35-44
- 30% — 25-34
- 15% — 45-54
- 10% — 55+
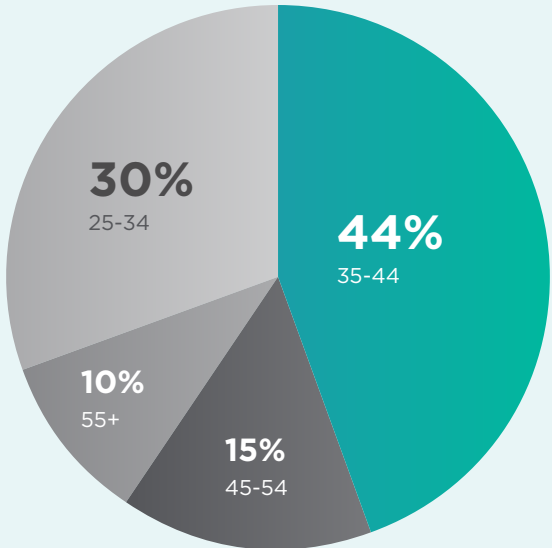
Company size by number of employees

71%

- 29% — 500-999
- 27% — 1,000-2,499
- 23% — 2,500-4,999
- 9% — 5,000-9,999
- 12% — 10,000+

Survey methodology

Level of knowledge of IT used by their company

Not knowledgeable at all	0%
Not very knowledgeable	0%
Somewhat knowledgeable	1%
Knowledgeable	16%
Very knowledgeable	83%

Level of knowledge of company's use of Kubernetes

Not knowledgeable at all	0%
Not very knowledgeable	0%
Somewhat knowledgeable	10%
Knowledgeable	32%
Very knowledgeable	58%

Length of time working with Kubernetes technology

Less than a year	1-3 years	4-5 years	6-10 years	More than 10 years
10%	35%	34%	15%	6%
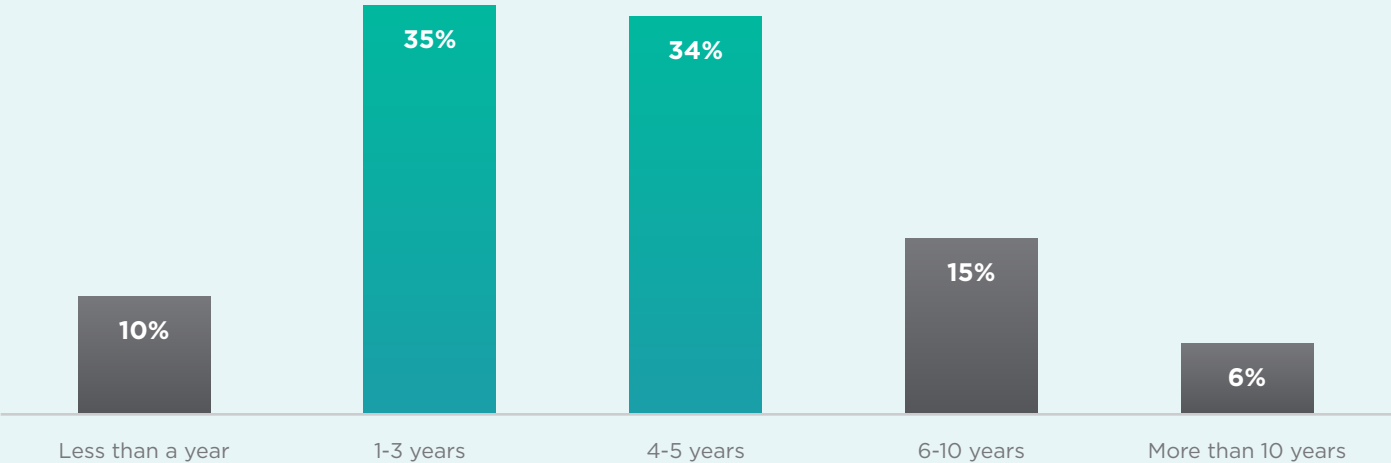
About Portworx by Pure Storage

Portworx, acquired by Pure Storage in October 2020, is the container storage company enterprises rely on to manage mission-critical data services in containers. By enabling data availability, data security, and backup and disaster recovery for Kubernetes-based applications running on-premises or across clouds, Portworx has helped dozens of Global 2000 companies such as Carrefour, Comcast, GE Digital, Lufthansa, T-Mobile, and SAIC run containerized data services in production. Portworx partners with Amazon, Google, IBM, VMware, and other leading enterprise software companies to accelerate container adoption. **For more information, visit portworx.com or follow @portwx.**

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