Kubernetes in the Enterprise Annual Report

Production deployments increase, but challenges persist.

Second annual study highlights strong Kubernetes adoption and ongoing challenges, as new opportunities emerge around artificial intelligence and analytics.
Executive Summary

The world digitally transformed during the last 18 months, as the COVID-19 pandemic drove even the most laggard organizations to the cloud. To capitalize on the agility provided by the cloud, many organizations are adopting Kubernetes to power the breakthrough applications and analytics required to compete in the digital economy. In fact, three quarters (75%) of organizations already use Kubernetes in production (40%), development or pre-production (35%), representing widespread adoption across the globe.

Organizations look to improve agility in the never-ending quest to drive more efficient operations, enhance customer experiences and enable data-driven decision making.

While Kubernetes remains the technology of choice for powering cloud native journeys, organizations must navigate both new and existing challenges as they manage deployments from Day 0 to Day 2 production environments. With that in mind, it’s not surprising that 100% of organizations agree that there are challenges with Kubernetes adoption, up from 95% in the 2020 survey. From complexity and security to governance and cluster sprawl, organizations must effectively manage Kubernetes deployments when scaling in production environments. These challenges are also increasing the strain on developers and architects, which is leading to both burnout and job-hunting.

Organizations are expanding their use of Kubernetes to support both critical workloads and innovation-driven projects. These use cases are evolving with the enterprise as organizations look to improve agility in the never-ending quest to drive more efficient operations, enhance customer experiences and enable data-driven decision making. For example, data analytics and machine learning are now the most popular Kubernetes workloads for most organizations.

This report will share Kubernetes deployment insights from a comprehensive survey of IT leaders and developers from organizations of all sizes and industries, conducted by independent research firm Vanson Bourne. It will also compare adoption trends and challenges with the 2020 survey, highlighting the market’s direction as organizations expand and scale Kubernetes deployments. As organizations continue on their Kubernetes journey, they need to identify partners that can guide and support their teams to ensure long-term success.
### Key Insights from the Study

#### Length of Journey
Most Kubernetes journeys are still in their infancy, meaning organizations are just scratching the surface of the technology’s potential. On average, organizations that are using Kubernetes, initially adopted it two years ago. And organizations still expect to complete their Kubernetes journey in about two years.

#### Time to Production
Getting Kubernetes deployments to production environments remains critical, as Day 2 operations is where the business impact is realized.

Three quarters (77%) of respondents stated that it took six months or less to get their organization’s Kubernetes deployments to production.

#### Most Popular Use Case
Data is often viewed as an organization’s most critical asset and enterprises are now tapping Kubernetes to help unlock its value. Forty-three percent of organizations cite data analytics or machine learning as the top workload for Kubernetes deployments, the most popular use case in the survey.
Kubernetes is (Still) Critical

Kubernetes is still vital to an organization’s digital transformation strategy. As the technology matures, it is meeting new business needs and driving innovation. According to more than a third (36%) of senior IT decision makers, successfully running applications on Kubernetes in Day 2 operations is critical to the long-term success of their company.

Kubernetes use cases are also evolving. When it comes to workloads, Kubernetes is increasingly being used to tap an organization’s greatest asset—its data. Digital transformations have inundated many organizations with too much data to manage with manual or legacy processes. It’s not surprising then that 43% of respondents cited data analytics or machine learning as the most popular Kubernetes workload, moving up three places to take the top spot in this year’s survey. Kubernetes growth in AI and ML workloads displaced the 2020 survey’s top choice of application build structures, which came in second in the 2021 survey with 40% of respondents citing it as the most popular workload. Rounding out the top four most popular Kubernetes workloads were Windows containers (34%) and distributed data services (33%).

When it comes to running data analytics or machine learning, 41% of organizations use their own on-prem, cloud or hybrid environment on an end-to-end platform, 35% use offerings from the major cloud providers, 35% use tools like Tableau or Cloudera, 35% use SaaS services, 34% run on their own environment using a collection of tools, and 33% run on Kubernetes. In addition, 88% of organizations agree that in the next two years, Kubernetes will be the platform of choice for running AI and ML workloads. The diversity in workloads represents the growing popularity of Kubernetes across the enterprise. For instance, 81% or organizations are implementing edge/IoT projects on Kubernetes, with 61% running in production environments.
While getting Kubernetes to production environments remains a priority, there is a growing disconnect between perception and reality. Fifty-three percent of IT decision makers believe that all applications running on Kubernetes successfully made it to production environments, while only 34% of developers and architects felt the same. This is likely further proof of Kubernetes’ struggles in production environments.

One method for ensuring successful Kubernetes deployments in production environments is through effective governance and management as the deployment scales. The good news is that many organizations are moving Kubernetes to Day 2 production environments. Forty percent of organizations use Kubernetes in production environments and 35% use it in development or pre-production.

On average, 53% of all an organization’s projects are currently in production on Kubernetes. This is an increase from last year’s survey which found that 42% of projects were currently in production using Kubernetes. Kubernetes adoption is expected to continue, with organizations predicting that 58% of projects will be in production on Kubernetes one year from now, when asked to those who are using or planning to use Kubernetes.

Approximately four out of ten (42%) organizations claim that all applications running on Kubernetes successfully made it to Day 2 environments (ongoing production). However, the 2020 survey found that 60% of organizations successfully moved all of their applications running on Kubernetes into production environments, highlighting that developers and architects may be right—Kubernetes challenges are increasing with broader adoption.

The time it takes to move Kubernetes to production environments is shrinking. Three quarters (77%) of organizations stated that it took six months or less to get their organization’s Kubernetes platform to production. The average time that it took was four and a half months, down a half month from 2020.

With increased adoption comes increased pain points as more applications running on Kubernetes head to production. While decision makers are embracing change and see the long-term sustainability of Kubernetes, developers and architects are battling challenges to ensure a deployment’s success. It’s critical that investments in infrastructure, training, and resources are prioritized to realize the full potential and impact of Kubernetes in the enterprise.
Adopting and Deploying Kubernetes

Organizations adopt Kubernetes to be more competitive in all areas of their business. Of those respondents whose organization is using or planning to use Kubernetes, over a third state that this journey began to improve operations (35%) and/or to be more agile and adaptable to customer/market demands (35%). While adopting Kubernetes to improve operations was also the top selection in the 2020 survey, the desire to be more agile and adaptable was the biggest mover from last year’s survey, where it ranked 5th in the top reasons to use Kubernetes. Rounding out the top 5, Kubernetes is also being deployed to drive new revenue (34%), improve customer experience (33%) and reduce IT costs (32%).

With so many popular use cases, it’s not surprising that Kubernetes adoption is being driven by various groups across the organization. IT is currently the biggest driver with almost four in ten (37%) respondents reporting that Kubernetes adoption decisions are made in their central IT organization. Slightly fewer report that the decision lies within the lines of business (27%) or at the C-suite level (20%). This differs slightly from last year’s survey where 40% of respondents felt Kubernetes decisions were made at the C-suite and 26% believed decisions were made within central IT. The shift to IT-led Kubernetes adoption points to the increase in deployments across most enterprises.

When it comes to deploying Kubernetes, organizations use or plan to use various methods and resources. Organizations running Kubernetes often utilize outside resources, with a cloud SaaS service (44%), Kubernetes management platform (37%), and public cloud (37%) remaining the top three choices in this year’s survey. While not in the top three, organizations deploying Kubernetes at the edge/IoT increased over the last year, from 16% of organizations in 2020 to 23% of organizations in 2021.

Just over a third (36%) of organizations deploy applications to Kubernetes through packaged deployments, while slightly fewer (30%) do so via traditional DevOps tooling. Last year’s top deployment choice, automated deployments, fell to third on this year’s list at 19%. As Kubernetes deployments grow, enterprises are adopting different approaches to meet existing IT infrastructure requirements and new business demands.
Complexities of Kubernetes Leads to Challenges

While Kubernetes is carving a well-trodden path, of those respondents whose organizations are using or planning to use Kubernetes, 100% said that there are challenges with adoption. This is up from 95% of organizations that ran into Kubernetes challenges in 2020.

The most prevalent challenges point to the continued growth of Kubernetes adoption across the enterprise. A lack of IT resources is the most likely (36%) top three ranked challenge, followed by effective scaling (34%) and being able to keep up with the rapid advancement of underlying technology (33%). Overall, the most popular challenges related to Kubernetes were complexity, the biggest mover on this year’s list compared to the 2020 survey, and lack of IT resources, which is not surprising as complexity can often be solved with IT resources and talent. As open source Kubernetes evolves (and improves) and becomes more widely deployed, challenges will continue to arise as organizations seek to harness its benefits.

Looking specifically at moving Kubernetes workloads to production environments, the challenges become more enterprise IT traditional, with security (30%) and the reliability of the production environment (30%) tying for the top spot. Rounding out the most likely top-three challenges is difficulties troubleshooting problems (29%). While challenges in production keep IT leaders up at night, these results may be a good sign for Kubernetes, as existing processes and technologies may be available to help.

The impact of Kubernetes challenges was felt across IT decision-makers and developers with nearly half (42%) of respondents claiming Kubernetes add-ons are a source of pain or complexity. Of those organizations, 23% found outside add-ons hard to integrate and 18% built add-ons in-house, but it required significant effort.

When stepping outside of Kubernetes and looking specifically at implementing AI and ML, almost all (99%) respondents say that their organization is encountering/could encounter friction. Similar to challenges seen with Kubernetes adoption, IT resources is the most likely (37%) source of friction, followed by moving models from data scientist notebooks into production environments (33%), and scaling up effectively (32%). All of this tells us that deploying innovative technologies is both rewarding and challenging, and it's best not to tackle Kubernetes or AI and ML projects without expert guidance.
The people who get their hands dirty working with Kubernetes—developers and architects—have mixed feelings on the open source technology. They see its value to both their organization and their career, but can get frustrated with the complexity and challenges inherent in Kubernetes deployments. Beyond the technical challenges listed in the previous section, developers are facing their own personal struggles when it comes to building cloud native applications.

When it comes to satisfaction from working with Kubernetes, 41% of developers and architects say it makes them really excited to come to work every day. The same proportion (41%) state that it brings their entire IT team together. However, nearly one quarter (23%) of developers and architects claim Kubernetes makes them feel extremely burnt out and 22% go as far to say it makes them want to find a new job because it’s ruining their life. The good news is that there are signs things may be improving. Last year’s survey showed that 38% of developers and architects agreed that their work makes them feel extremely burnt out and a whopping 51% said it makes them want to find a new job.

Developers and architects are in agreement on the career impact of Kubernetes experience. Ninety-seven percent consider the adoption of Kubernetes to be at least slightly important to their career, personal success and future employability, with 50% saying it is very important or critical. The use of Kubernetes can have vast impacts for organizations, but also for individuals as almost nine in ten (89%) developers and architects agree that adopting Kubernetes at their organization increases their job security. This maps to last year’s survey where 93% agreed that adopting Kubernetes increases their job security.

While technology gaps widen across many IT roles, the broad adoption of Kubernetes should increase opportunities for developers and architects to learn new skills in a cloud-first world.
Disruption Caused by the COVID-19 Pandemic

No current survey would be complete without looking at the impact of the COVID-19 pandemic. Organizations had differing views when it came to the impact of COVID-19 on Kubernetes adoption, with 39% of organizations claiming it accelerated their adoption of Kubernetes and around a third (32%) of organizations reporting that it slowed their Kubernetes journey. A further quarter (25%) of respondents anticipate an effect of some sort in the future. This is likely driven by industry-specific trends and other external factors, as some sectors of the economy have experienced growth during the pandemic while others have contracted.

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Additional disconnects regarding the impact of the COVID-19 pandemic were driven by roles. 53% of senior IT decision makers believe that COVID-19 accelerated Kubernetes adoption and only 32% of developers and architects felt the same. The global narrative around accelerated digital transformations is likely behind this disconnect, as developers and architects are responsible for completing many of these initiatives where IT decision makers may not be as close to each project.
Conclusion

Kubernetes adoption is both growing and maturing across most enterprise organizations, as the agility it provides is an operational requirement in today’s digital-first world. Organizations are scaling and expanding Kubernetes deployments, while navigating challenges along the way, to meet evolving business needs. Without the right technology and expertise in place, complexity challenges will kill Kubernetes deployments in Day 2 production environments. The data in this survey points to both the promise and potential perils of Kubernetes. Every enterprise needs a partner in their corner to help simplify deployments, bolster security requirements and ensure continuity as the world around us evolves. D2iQ has a proven track record helping some of the world’s biggest brands grow Kubernetes deployments in Day 2 operations, ensuring success at each stage of the cloud native journey.

Methodology

The 2021 State of Kubernetes in Production Environments Study is based on an online, quantitative market research study commissioned by D2iQ and conducted by independent research firm Vanson Bourne in Q2 and Q3 2021. Respondents included 300 completed responses from in the U.S. via online surveys, including 200 developers, architects, DevOps employees (platform architects and cloud architects) and 100 senior IT decision makers.

About D2iQ

D2iQ is the leading provider of enterprise-grade cloud platforms that enable organizations to embrace open source and cloud native innovations while delivering smarter Day 2 operations. With unmatched experience driving some of the world's largest cloud deployments, D2iQ empowers organizations to better navigate and accelerate cloud native journeys with enterprise-grade technologies, training, professional services and support. Whether you are deploying your first Kubernetes workload, optimizing your business analytics with Spark or Jupyter, or looking to educate your developers on the benefits of cloud native, D2iQ has the expertise, services and technology to enable you on the journey. D2iQ is headquartered in San Francisco with additional offices in London and Hamburg, Germany. D2iQ investors include Andreessen Horowitz, Hewlett Packard Enterprise, Khosla Ventures, Koch Disruptive Technologies, Microsoft, and T. Rowe Price Associates, Inc. Find us at d2iq.com.