CNCF SURVEY 2019

Deployments are getting larger as cloud native adoption becomes mainstream

The Cloud Native Computing Foundation (CNCF) survey takes the pulse of the community to better understand where and how cloud native technologies are being adopted. Given the growth of the CNCF community in recent years, we're in an excellent position to discern patterns and highlight changes taking place among users of open source technologies.This is the seventh time CNCF has conducted an assessment of the cloud native marketplace.

Key Takeaways:

- Usage in production has increased for almost all CNCF projects.
- 78% of respondents are using Kubernetes in production, a huge jump from 58% last year.
- 18% of respondents indicated they are using a service mesh in production, while a total of 47% are evaluating the use of service mesh in their organization.
- At least 41% of respondents are using serverless technologies.
- An increase in both the number and reliability of CI/CD tools is driving a decrease in manual release cycles and an acceleration of release cycles.
- The use of containers in production has increased significantly – 84% of respondents are using containers in production, a jump of more than 15% from 2018.

ABOUT THE SURVEY METHODOLOGY & RESPONDENTS

CNCF conducted the survey of its community during September and October 2019 and received 1,337 responses.

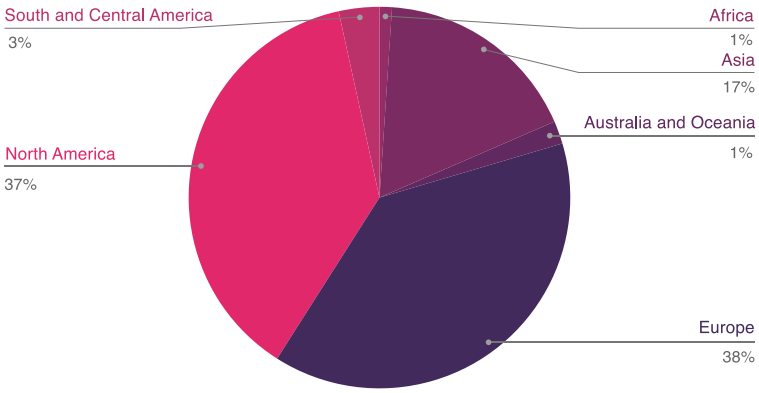
There was a nearly even proportion of respondents from Europe (37%) and North America (38%), followed by Asia (17%). The majority of respondents (71%) were from organizations with at least 100 employees, the largest portion of these coming from enterprises with more than 5,000 employees (30%).

Two-thirds of the respondents were in the software and technology industry, with the remainder coming from other professional service industries.

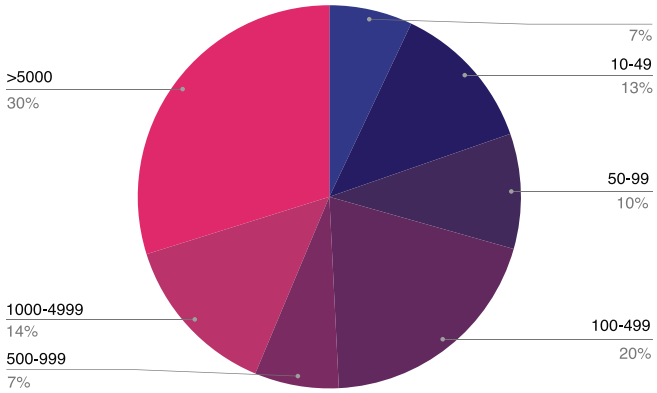
The top job functions were software architect (41%), DevOps manager (39%), and back-end developer (24%).

This survey was conducted in English.

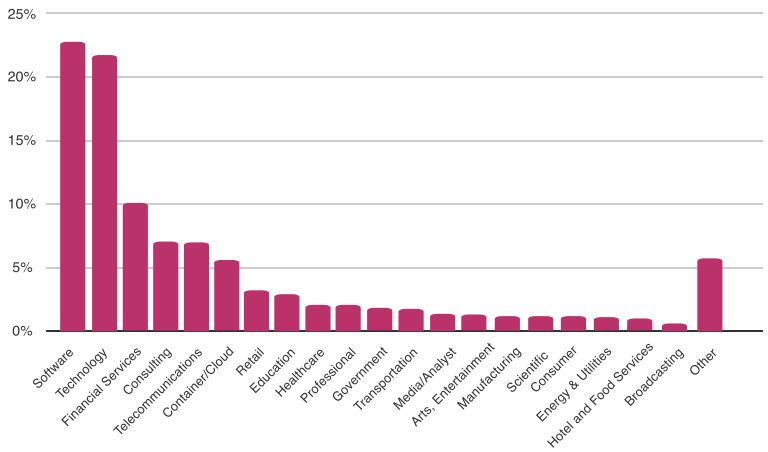
Geographic Location



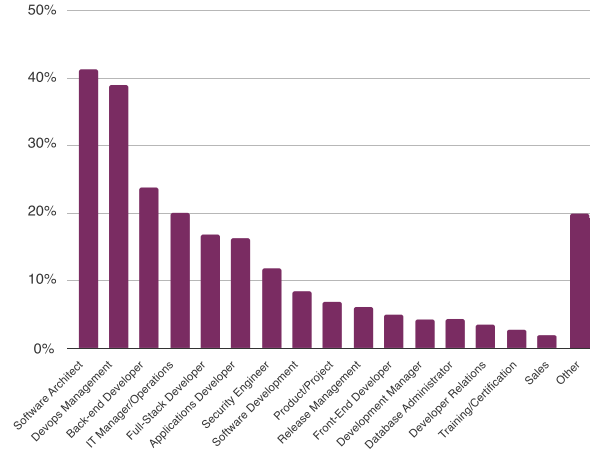
Size of Organization



Industry



Job Function

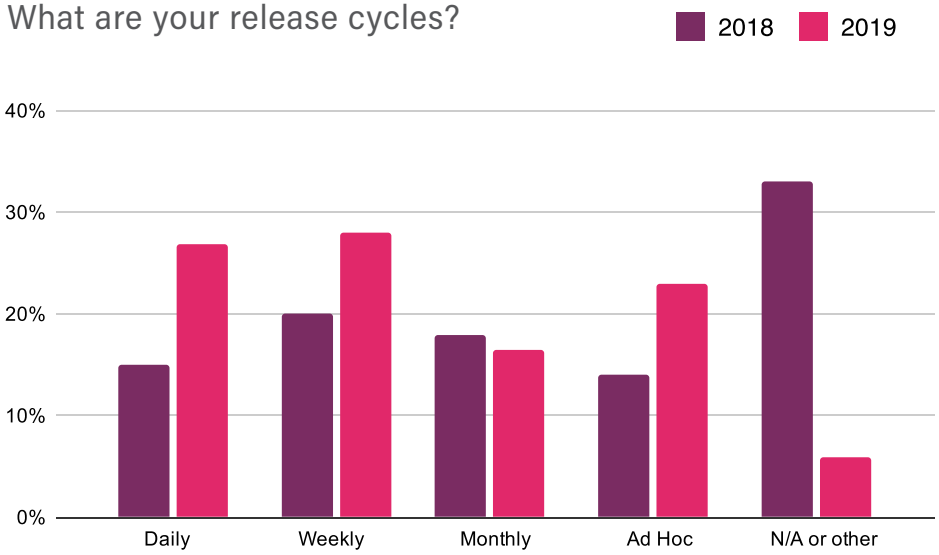


Release cycles continue to accelerate

For a second year, we asked questions on code check in and release cycles, providing insight into how companies are managing their software development cycles.

We're seeing that release cycles are accelerating, driven by the rise of DevOps, CI/CD tools, and agile methodologies. Those with daily release cycles increased from 15% in 2018 to 27%, and weekly release cycles have increased 20% to 28%. Monthly releases decreased slightly from 18% to 16%.

What are your release cycles?



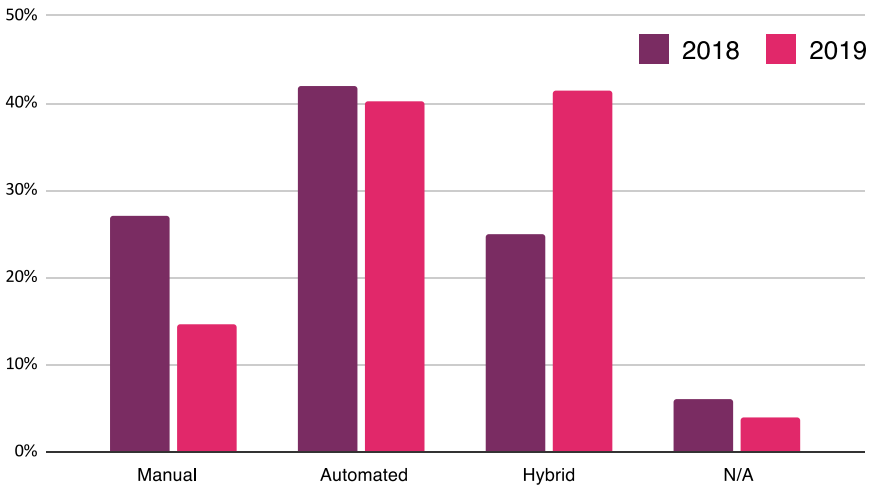
Responses were multiple choice in 2019 vs. fill in the blank in 2018

There was not much change in the percentage of developers automating their releases, which remains in the 40% range for both 2018 and 2019.

Where we see a change is in those using a hybrid approach vs. fully manual releases. Hybrid approaches, using a combination of manual and automated tools, are up to 41% in 2019 compared to 25% last year. Doing releases manually has dropped to 14% from 27%.

This can be attributed to a rise in available CI/CD tools, the most popular being Jenkins (58%), followed by GitLab CI/CD (34%), and CircleCI (13%). These tools are also becoming more reliable. Less than 11% of respondents indicated they built custom scripts this year, down from 26% in 2018.

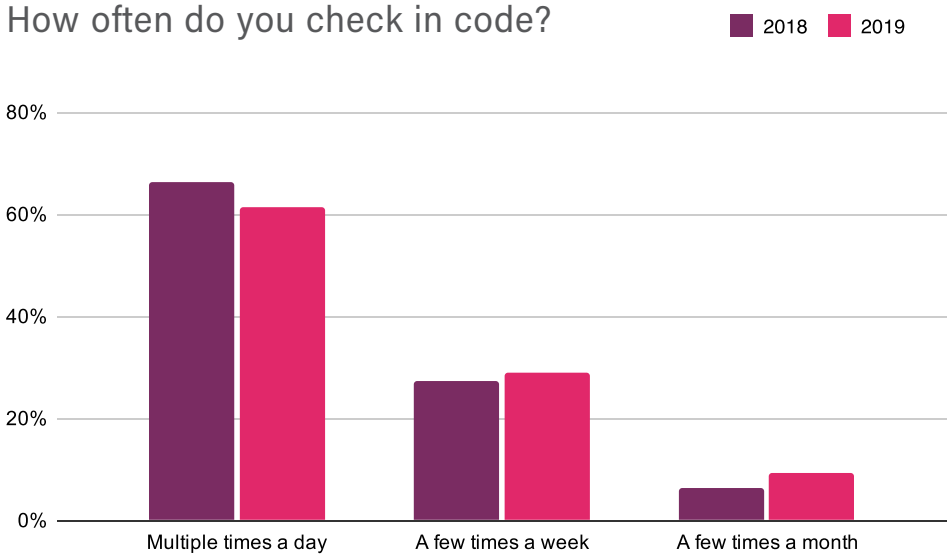
Are release cycles manual or automated?



Responses were multiple choice in 2019 vs. fill in the blank in 2018

More machines and longer check in cycles

How often do you check in code?



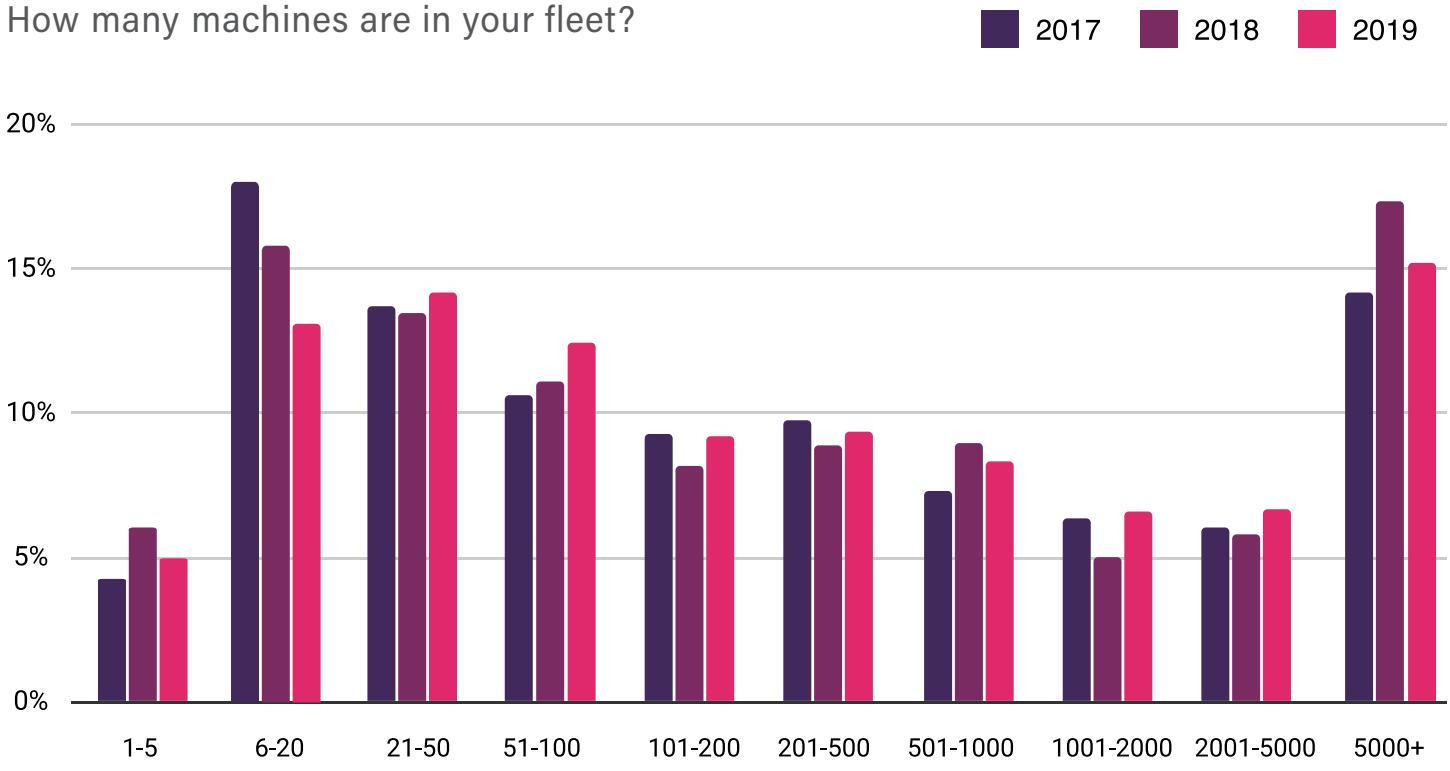
Comparing the data from 2019 and 2018, respondents are checking in code less frequently. This year, 61% of respondents check in code multiple times a day – a slight decline from last year when 67% checked in multiple times a day. Instead, more are checking in code a few times per week or month.

At the same time, the number of machines in an organization's fleet continues to increase. Looking back to 2017, 77% of respondents had more than 20 machines in their fleets. This increased to 79% last year and 81% this year.

More than 15% of respondents had more than 5,000 machines in their fleets, which was the most selected response. The most significant drop occurred in those using between 2-6, which has dropped from 18% in 2017 to 13%.

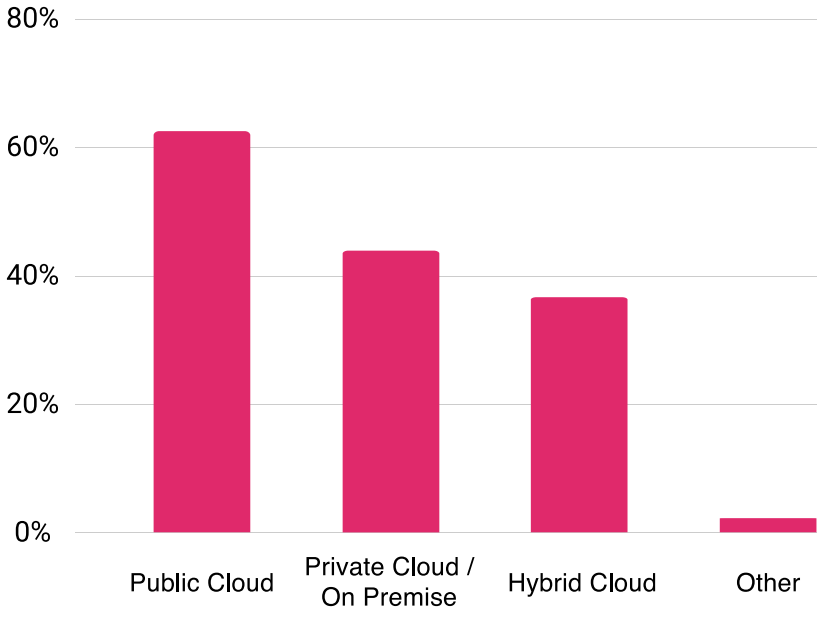
There are a number of reasons companies would have a larger number of machines in their fleet including, more customers, more products, the growing size of applications, more lines of code, geographic expansion, and/or company expansion or acquisition/consolidation.

How many machines are in your fleet?



WHERE IS YOUR CLOUD?

While responses differed slightly from last year's survey (hybrid was not an option; instead, private and on-premise were broken out), we can still conclude that public cloud is the most popular data center approach, chosen by the majority of respondents – 62% in 2019 and 77% in 2018. While hybrid was a new response, it was selected by 38% of respondents, indicating that it is a widely used approach. We fully expect this trend to continue as enterprises seek more control and aim to avoid vendor lock-in.

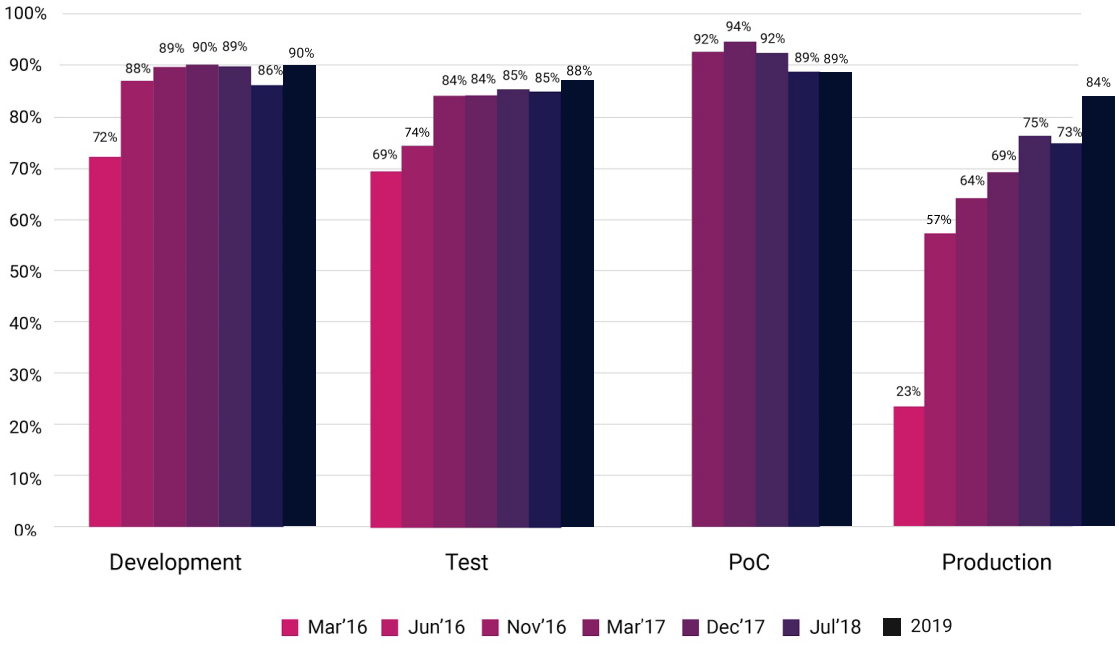


CONTAINERS

Containers have become the norm...

From 2018 to 2019, there was an uptick in the use of containers across development, testing, and production. Most notably, the use of containers in production increased significantly. This year, 84% of respondents are using containers in production, an impressive jump from 73% in 2018, and from 23% in our first survey in 2016. This is a result of organizations having more trust in containers, and using them more in user-facing applications. Another 14% have future plans to use containers in production.

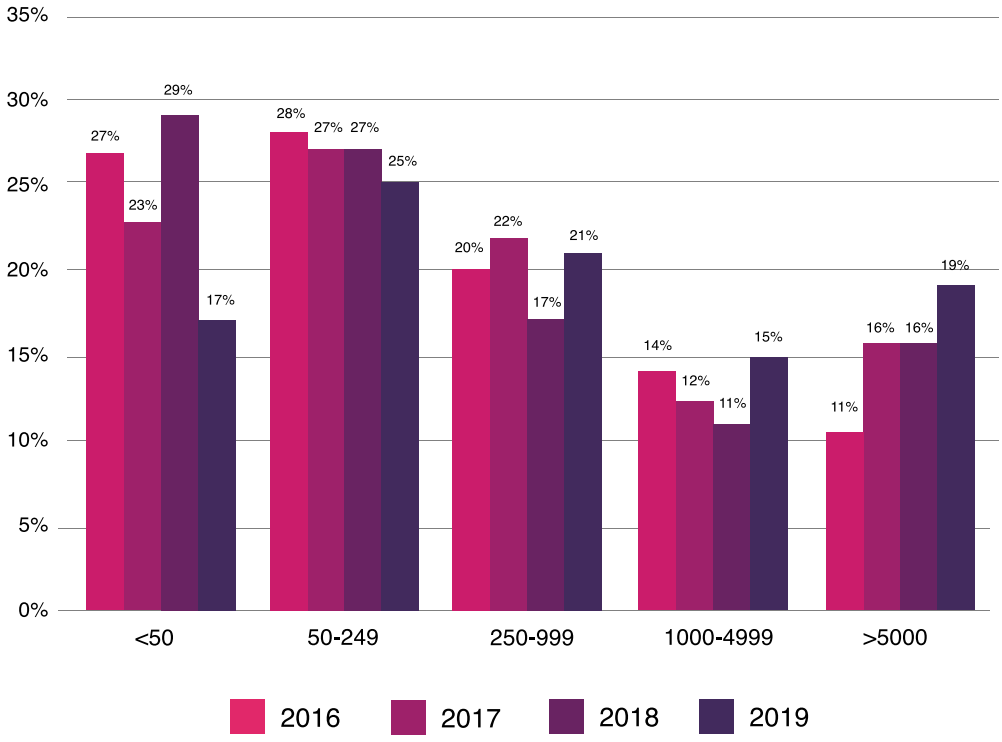
Use of Containers since 2016



Proof of concept is the only area where we see a gradual decline over the past few years, meaning containers are less of an "idea" and are being adopted in production in the real world. Further, only slightly more than 2% of respondents report no plans to use containers in

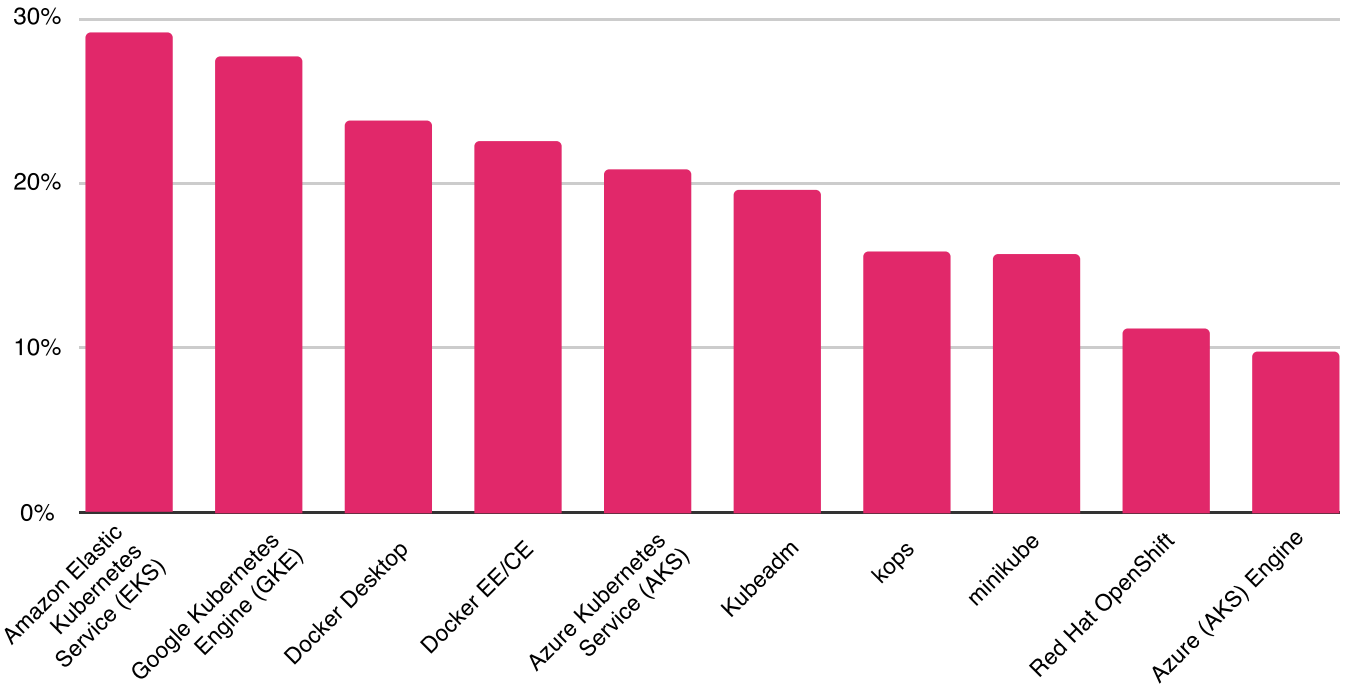
As organizations are trusting their production workloads to containers, they are also using more of them. The number of respondents using 249 containers or less dropped by 26% since 2018. Conversely, the number of respondents using 250 or more increased by 28%, to more than half. The most significant change was in those using fewer than 50 containers, which dropped by 43%.

Number of Containers in Production



According to [CNCF's Cloud Native Landscape](), there are more than 109 tools to manage containers, but 89% are using different forms of Kubernetes. This is an increase from 83% using different forms of Kubernetes in 2018. The top 10 tools are:

Your company/organization manages containers with: Please select all that apply.

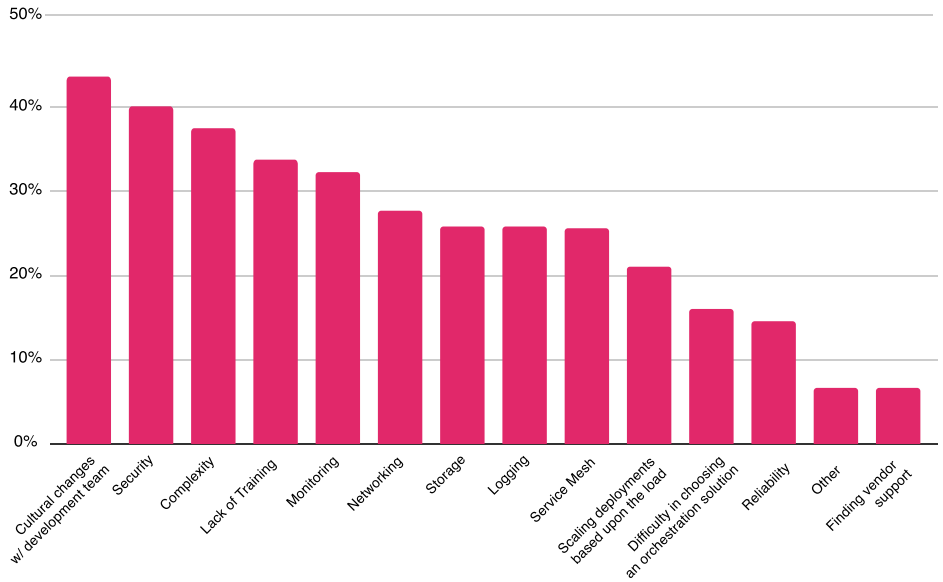


**This is the first year we included everything on the landscape. We'll be asking the question this way, going forward. This graph represents the top 10 responses.*

...But some challenges remain

Cultural challenges with the development team remain the top challenge in using/deploying containers (43%). Security (40%) and complexity (38%) remained high on the list. Lack of training, which was at 40% last year, saw a drop of 15% this year as more training options became available. Monitoring again closed out the top five (32%). Service mesh was added this year as a new response and was selected by 26% of respondents.

What are your challenges in using/deploying containers? Please select all that apply.

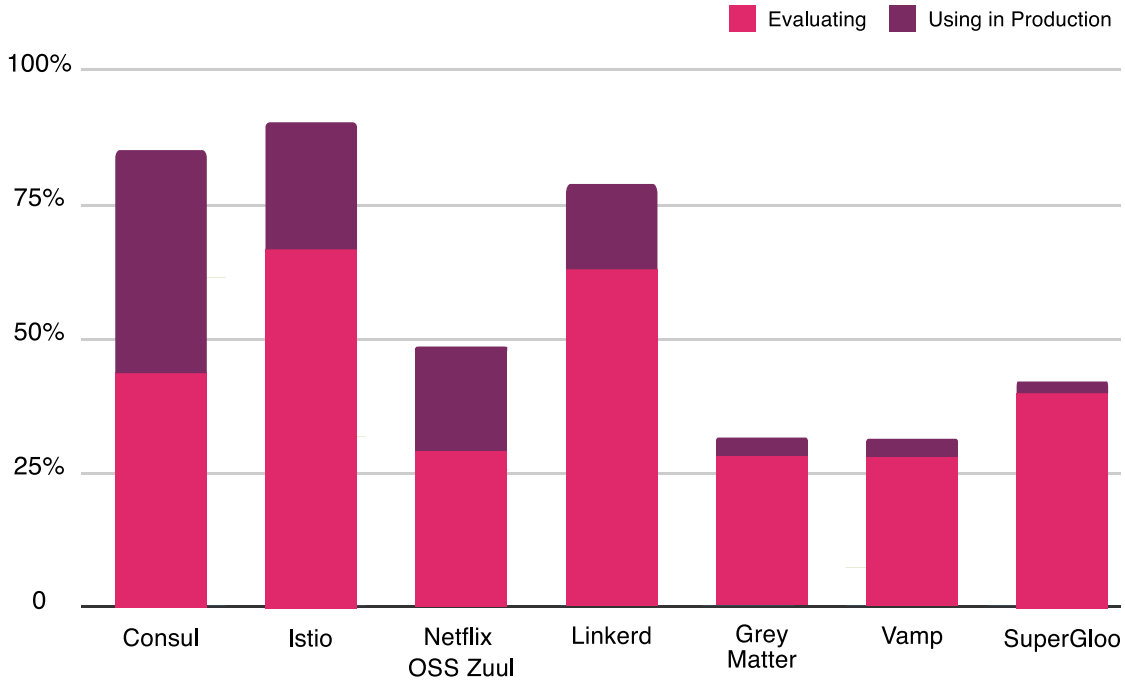


CLOUD NATIVE TOOLS

Service Mesh

Given the rise in interest we've seen around service mesh, we added a question on the topic to the 2019 survey. While use in production is still rather low with 18% of those who responded indicating they use a service mesh project, 47% are evaluating the use of a service mesh. Service mesh technology is still rather new, and we are seeing that nearly half of respondents are already evaluating this technology. In our future surveys, we expect to see use in production climb over the next few years.

For those evaluating or using service mesh projects, the most popular were:

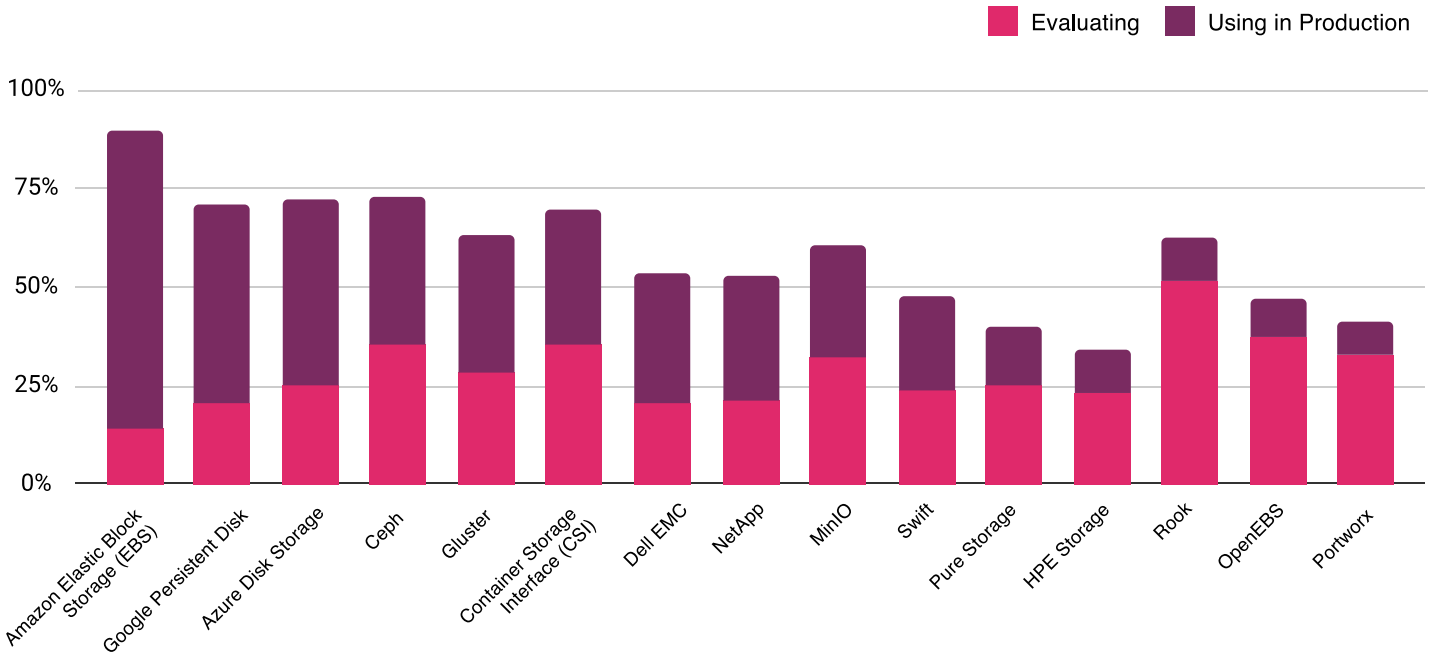


For those evaluating service mesh tools, Istio (69%) and Linkerd (64%) were the top two, suggesting they will see significant increases in use in production in coming years.

Cloud Native Storage

Given a considerable increase in the number of cloud native storage projects, we changed the storage question this year to include each storage project or product listed on the CNCF landscape. 14% of respondents are using storage projects in production, with another 27% evaluating storage projects. Only 5% of respondents indicated they were not planning on using or evaluating any storage projects.

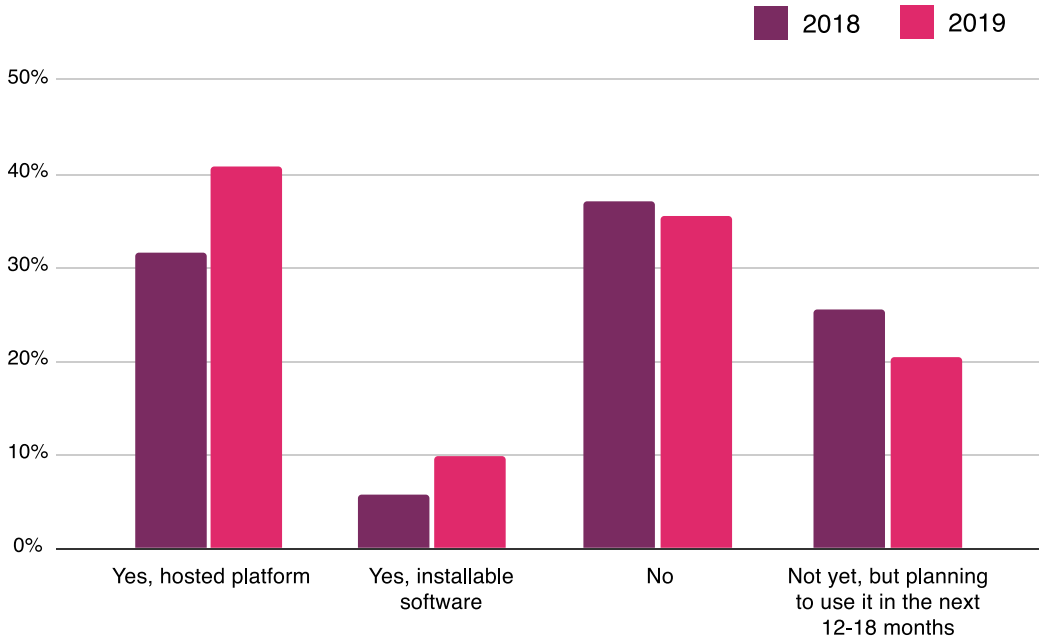
Of those using storage projects in production, the most popular were:



More than half of respondents were evaluating Rook – more than any other project – so we expect to see the use of Rook grow in the coming years.

Serverless

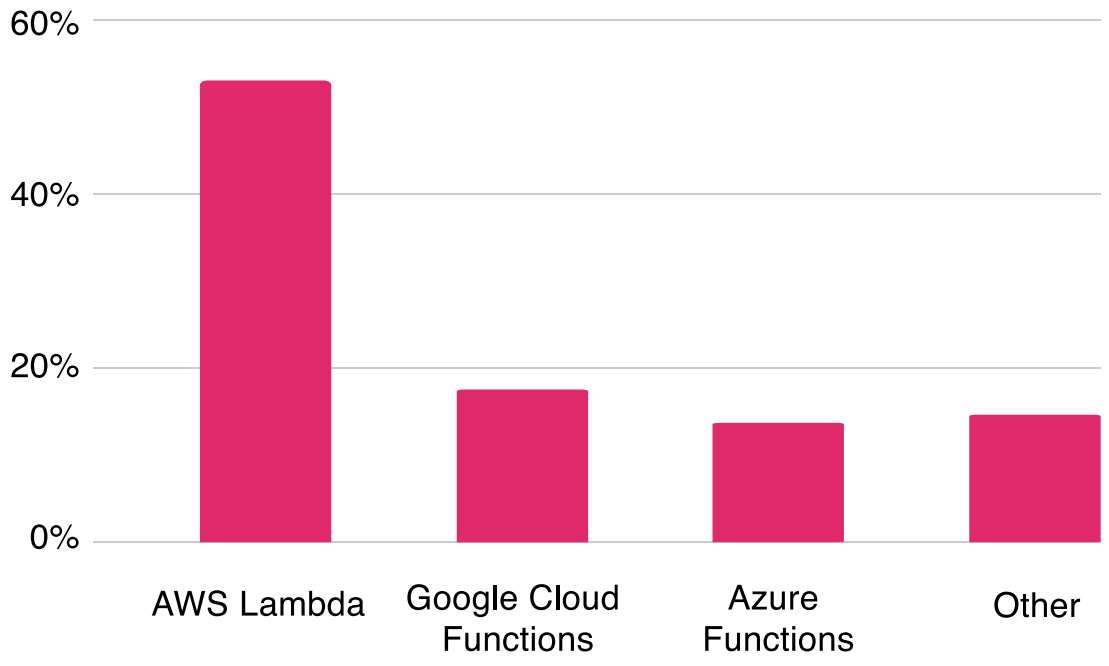
This year the number of respondents not using serverless technologies is down to 34% in 2019 from 37% in 2018. At least 41% of respondents reported using serverless technologies, with another 20% planning to use serverless technologies in the next 12-18 months. Of those who are using serverless, 80% use a hosted platform and 20% use installable software.



Note, respondents could choose both hosted and installable as their serverless platform.

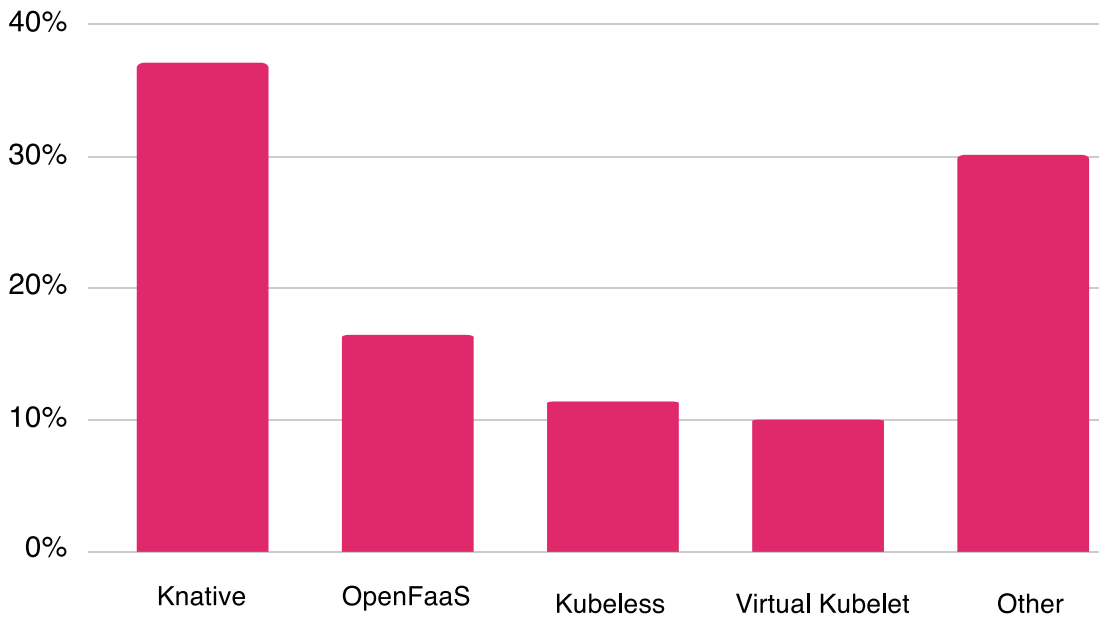
Of those using a hosted platform, the top tool is AWS Lambda (53%). Google Cloud Functions (18%) and Azure Functions (14%) are a distant second and third.

Hosted Serverless Platforms



Of those using installable software, Knative is the tool of choice (34%), followed by OpenFaaS (15%) and Kubeless (11%).

Installable Serverless Platforms



CNCF TECHNOLOGIES

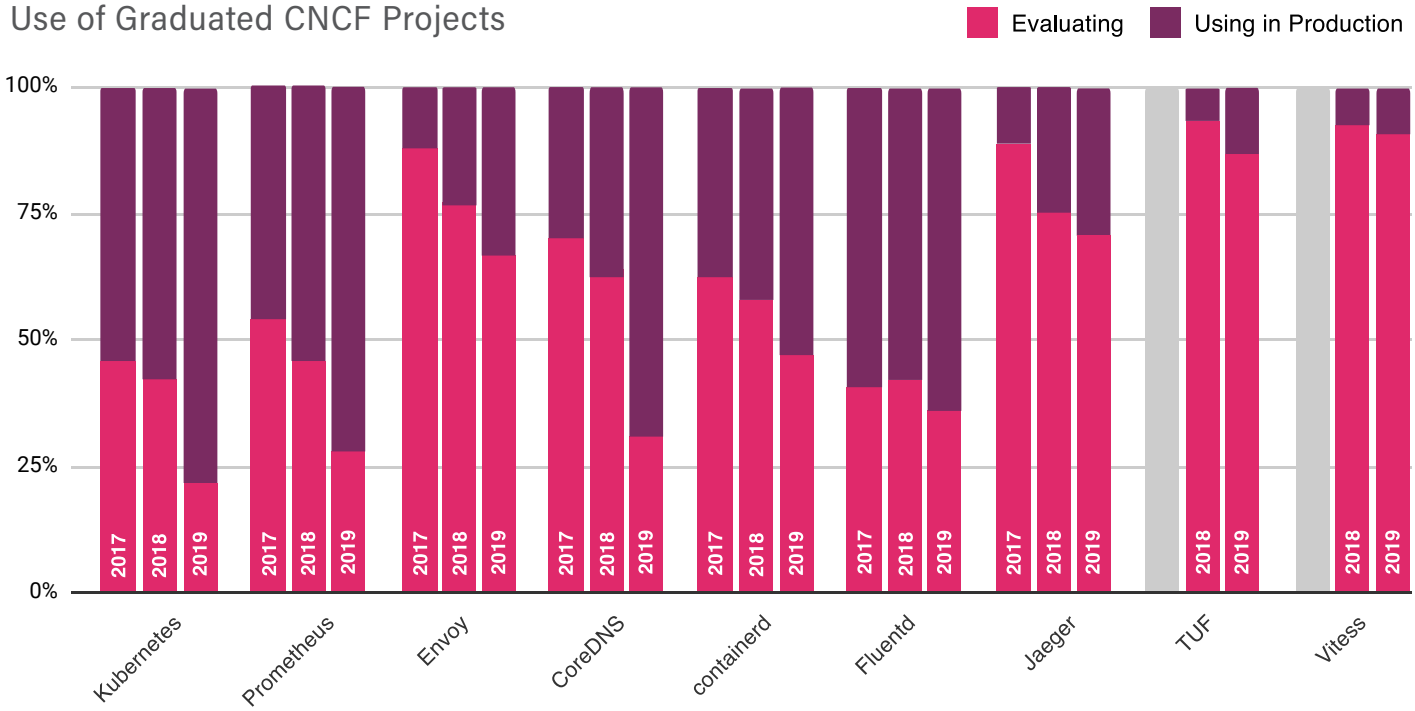
According to respondents who are using or evaluating CNCF technologies, the use of all but one graduating and incubating project in production (for which we have data) has increased since last year. More than half of graduated projects have reached more than 50% use in production, and all graduated projects saw increased use in production.

99% of respondents indicated they are using or evaluating at least one graduated or incubating CNCF technology in production.

Kubernetes use in production has grown dramatically: 78% of respondents are using Kubernetes in production, a huge jump from 58% last year. Those evaluating Kubernetes decreased by 48% as they moved to use in production.

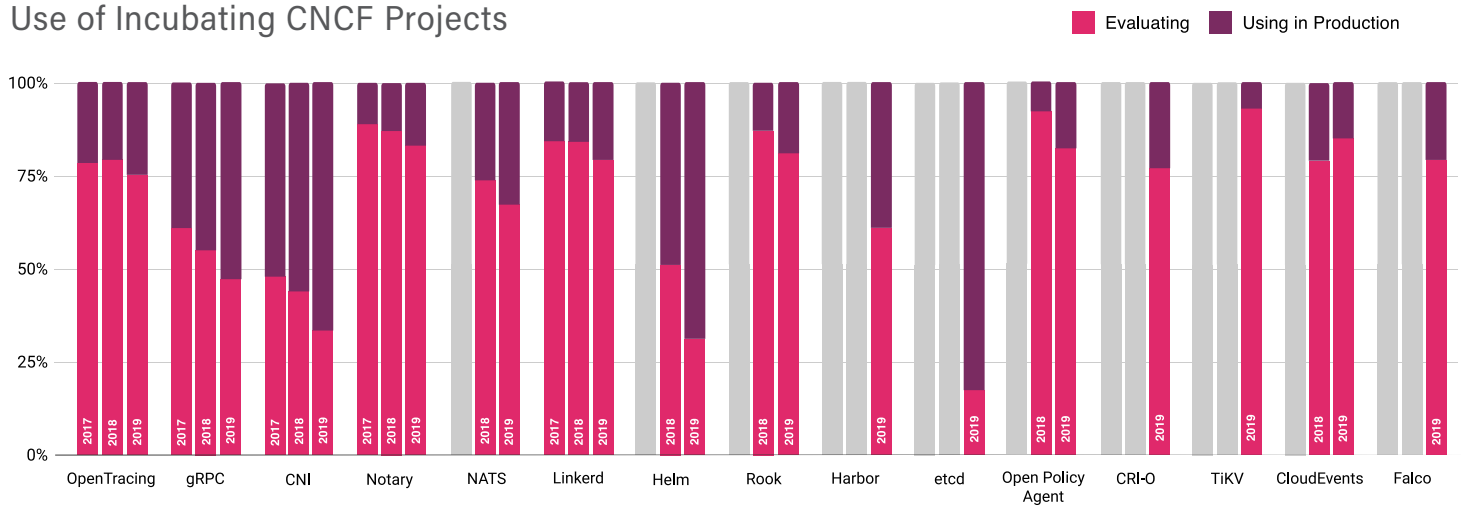
Prometheus and CoreDNS also saw considerable jumps in use in production. Prometheus increased 36% over last year to 72%, and CoreDNS had an impressive 92% jump to 69%.

Use of Graduated CNCF Projects



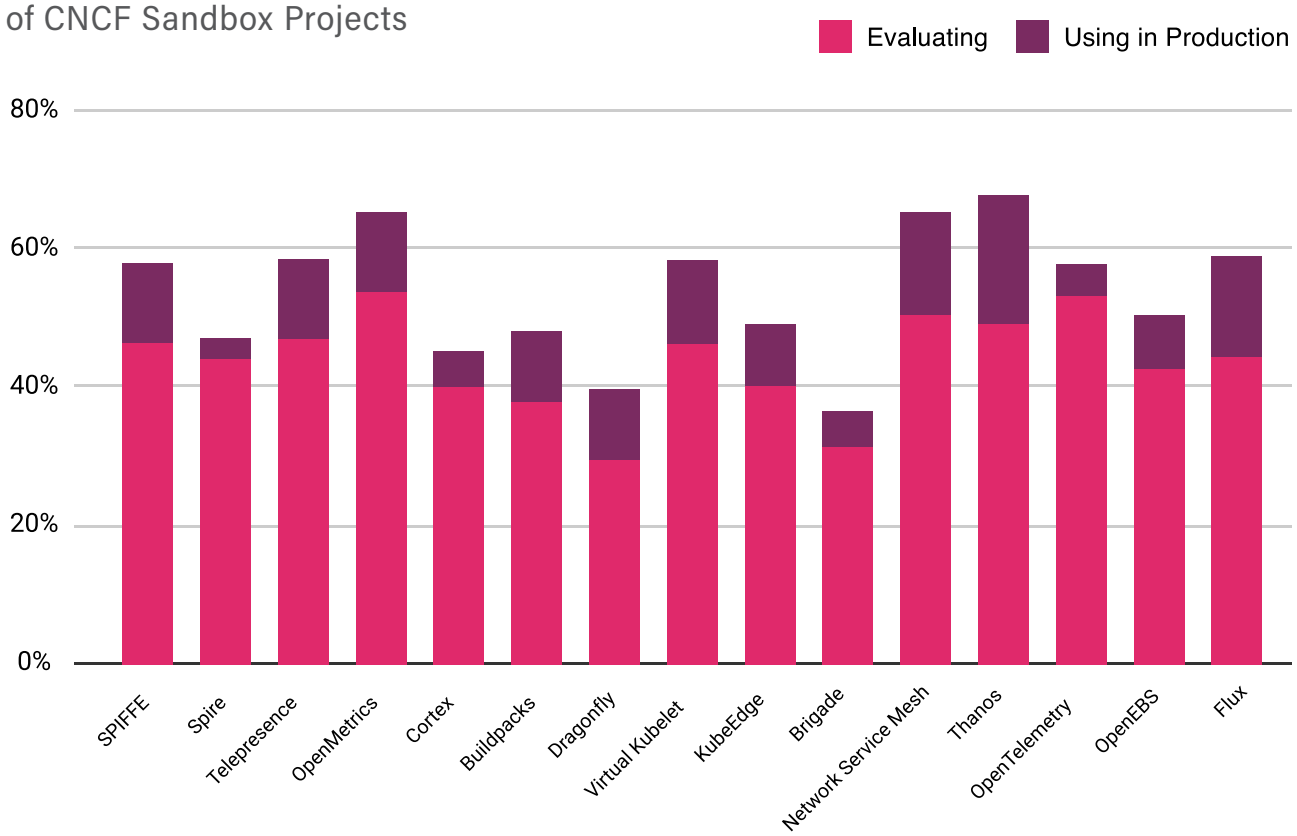
For incubating projects, Helm saw the largest increase since last year, growing 41% to reach 69% usage in production. etcd was the most widely used, with 83% use in production.

Use of Incubating CNCF Projects



The overall use of Sandbox projects was lower, with nearly 30% responding that they were not using any of the projects.

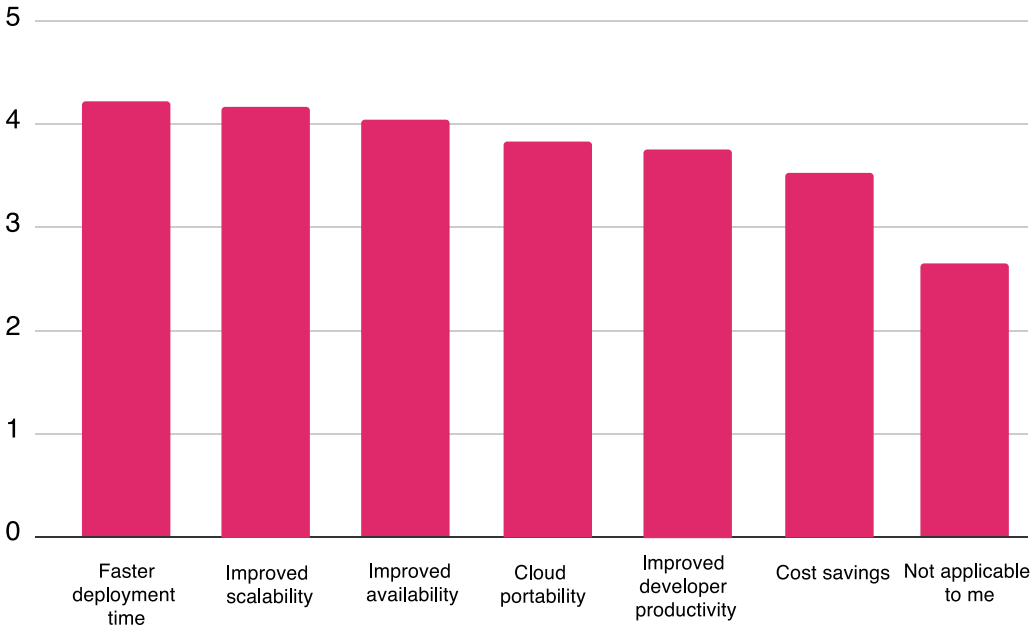
Use of CNCF Sandbox Projects



Since this survey was completed, in-toto, Strimzi, KubeVirt, Longhorn, and ChubaoFS have been added to the Sandbox. We do not have data for Sandbox projects from 2018 or before.

While there are many benefits provided by cloud native technologies, 52% of respondents ranked faster deployment time as the biggest benefit of using cloud native projects in production. This was followed by improved scalability at 45%, and cloud portability and improved availability tied with 39%. Interestingly, cost savings ranked the lowest on a weighted scale.

If you are using containers and cloud native projects like Kubernetes and Prometheus in production, rate the following benefits on a scale of 1 to 5 where 5 is the biggest benefit and 1 is no benefit

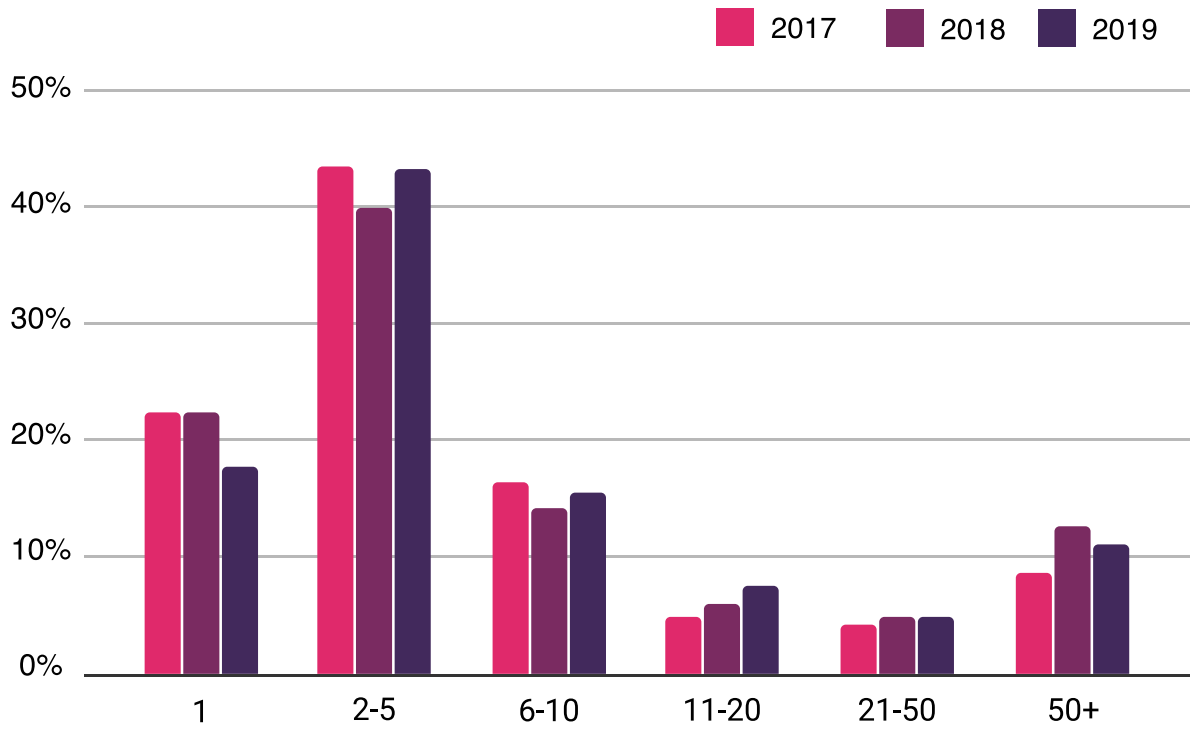


KUBERNETES

Of those using Kubernetes, most respondents have 2-5 clusters in production (43%). This was the largest category last year and increased again by 8%.

Kubernetes users are also increasing the number of clusters they are using in production. There was a 10% jump in those using between 2 and 20 clusters.

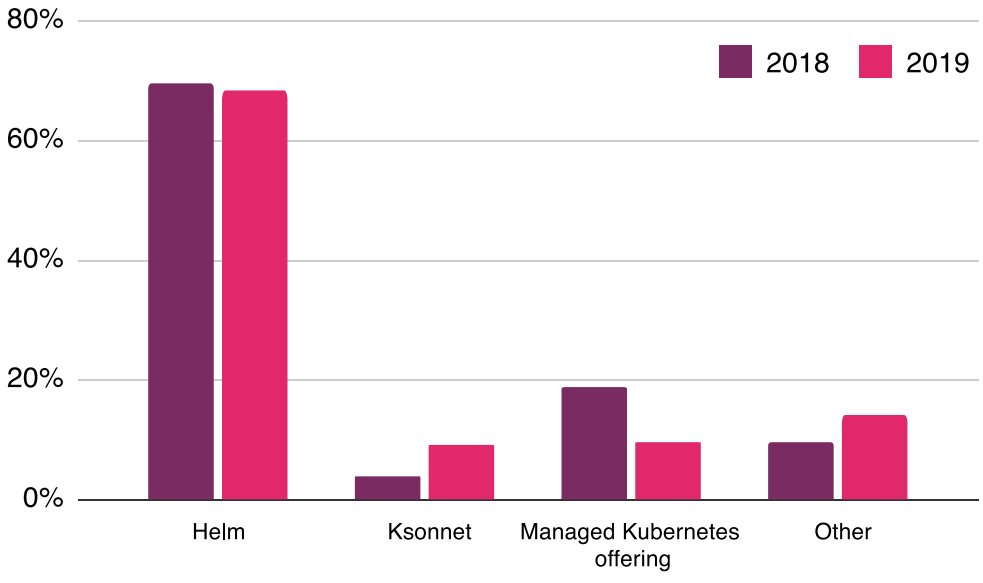
If you use Kubernetes, how many production clusters do you have?



We also asked respondents about the tools they use to manage various aspects of applications:

Packaging Applications

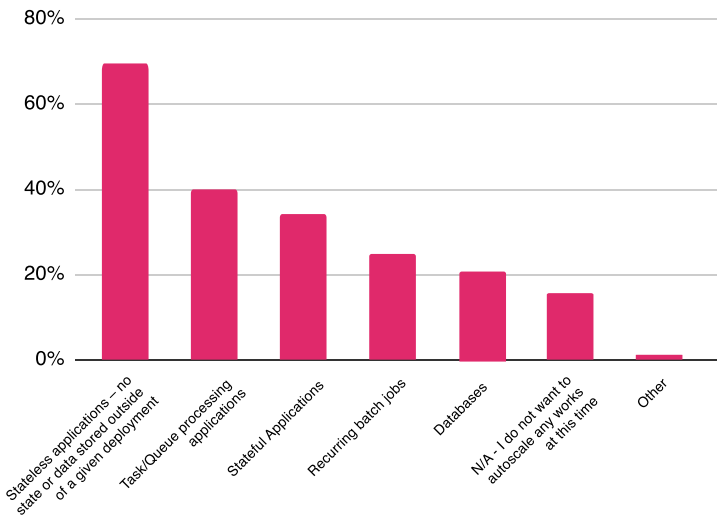
Helm remains the most popular tool for packaging Kubernetes applications.



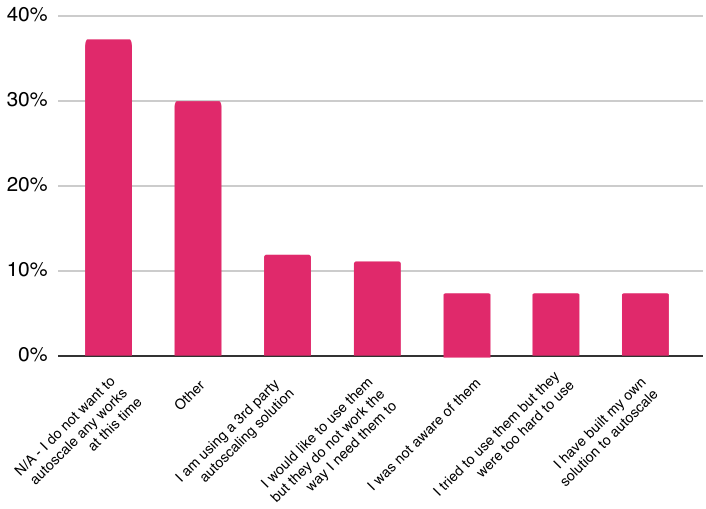
Autoscaling Workloads

Again this year, the majority (70%) of respondents plan to autoscale their stateless applications, followed by 40% for task/queue processing applications, and 34% of stateful applications. Of those who are not using Kubernetes autoscaling capabilities, 35% do not want to autoscale any works at this time, and 12% are using a third-party solution.

Autoscaling Workloads

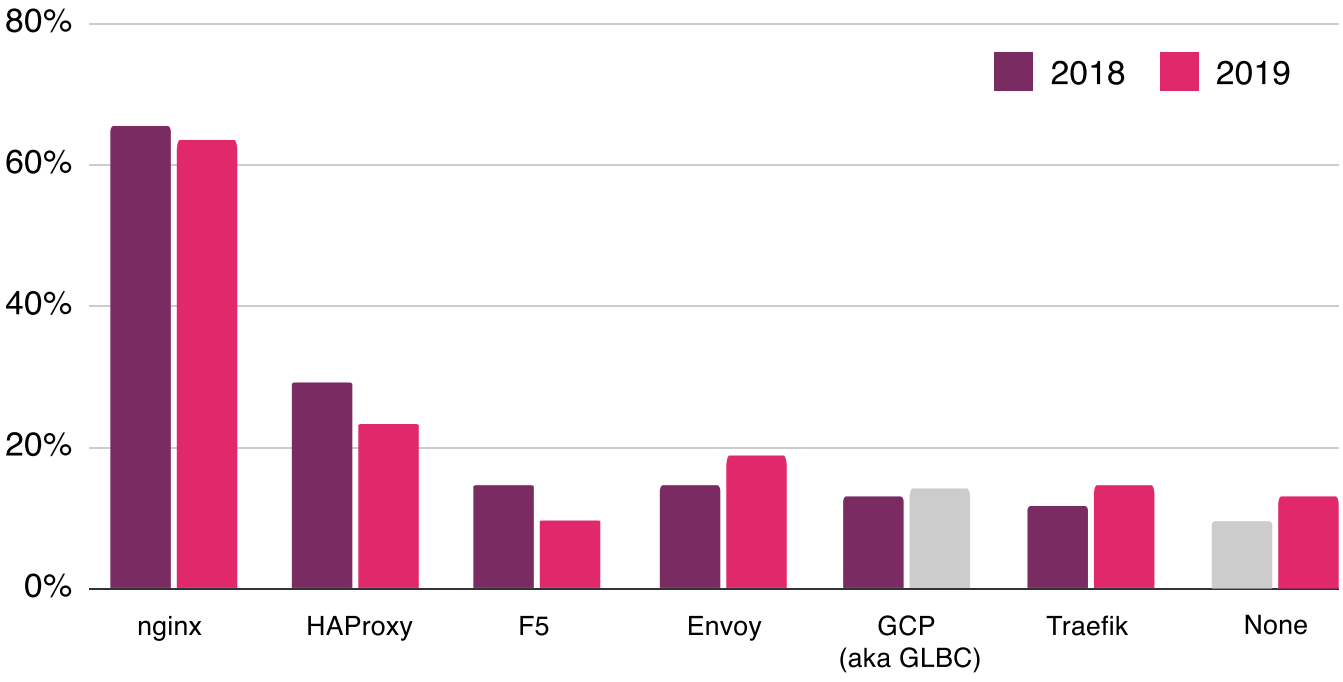


NOT using Kubernetes Autoscaling



Ingress Providers

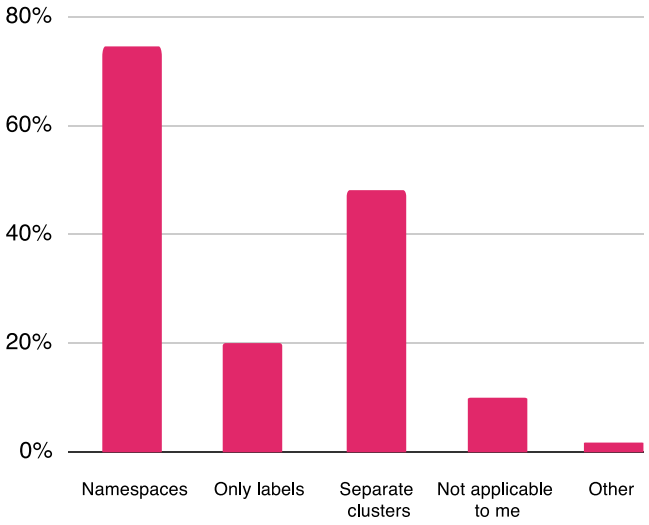
nginx kept its lead this year as the top Kubernetes ingress provider (62%), followed again by HAProxy (22%). Envoy overtook F5 for the third spot (up from 4 in 2018) with 19%. Fifty-nine percent of respondents are using Envoy in production, with 29% evaluating the technology, indicating continued growth.



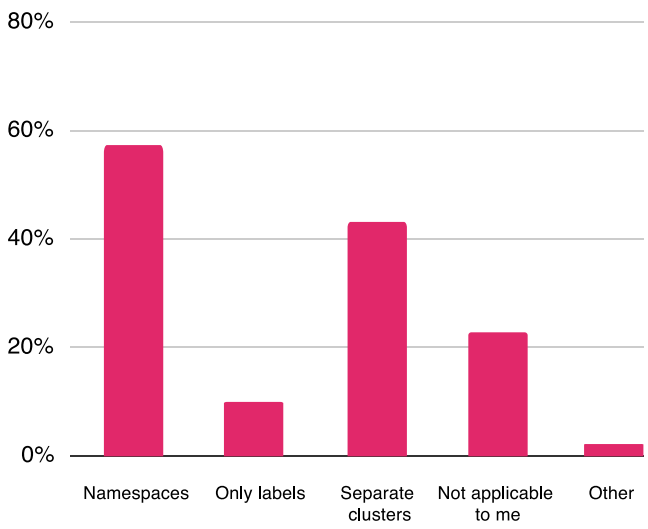
Separating Kubernetes Applications

Namespaces are the most popular way to separate Kubernetes applications for all respondents, including those with multiple teams.

Separating Kubernetes Applications



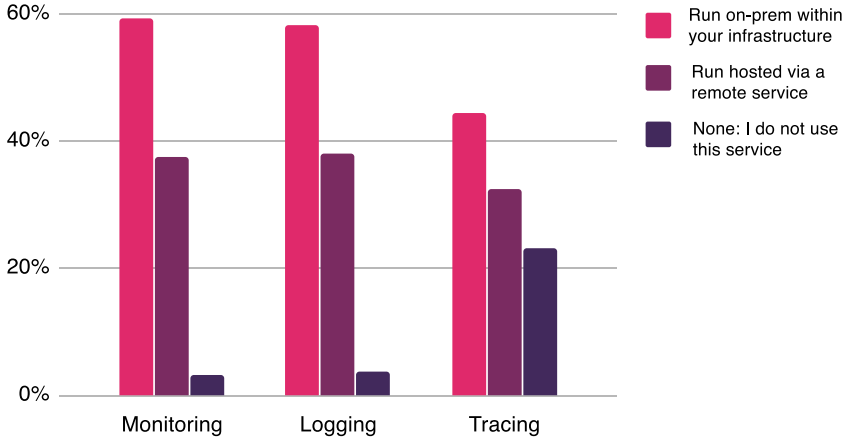
Separating Kubernetes Applications with Multiple Teams



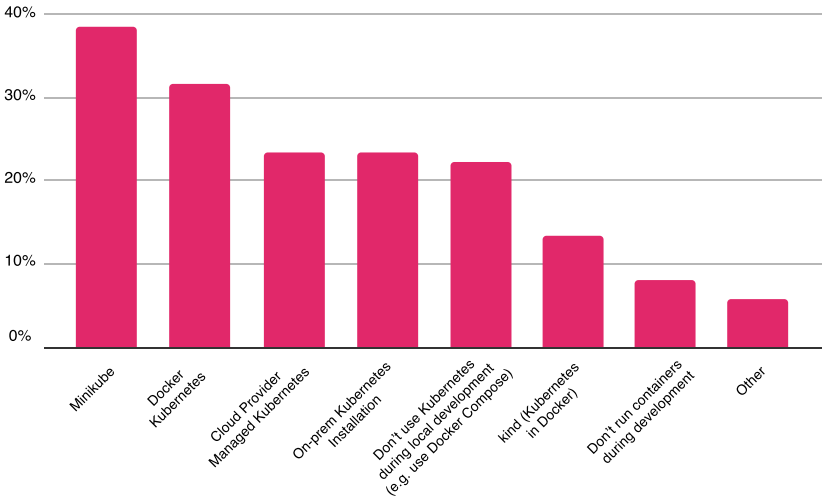
Monitoring, Logging, and Tracing

For monitoring, logging, and tracing, most respondents require the system to run on-premise within their infrastructure rather than hosted via a remote service. Monitoring and logging solutions are more widely used than tracing – 23% report that they do not use tracing, compared with just over 3% for both monitoring and logging.

For your monitoring, logging, and tracing solutions, do you require the system to:



What Kubernetes environment(s) do you target during local container development? Please select all that apply.

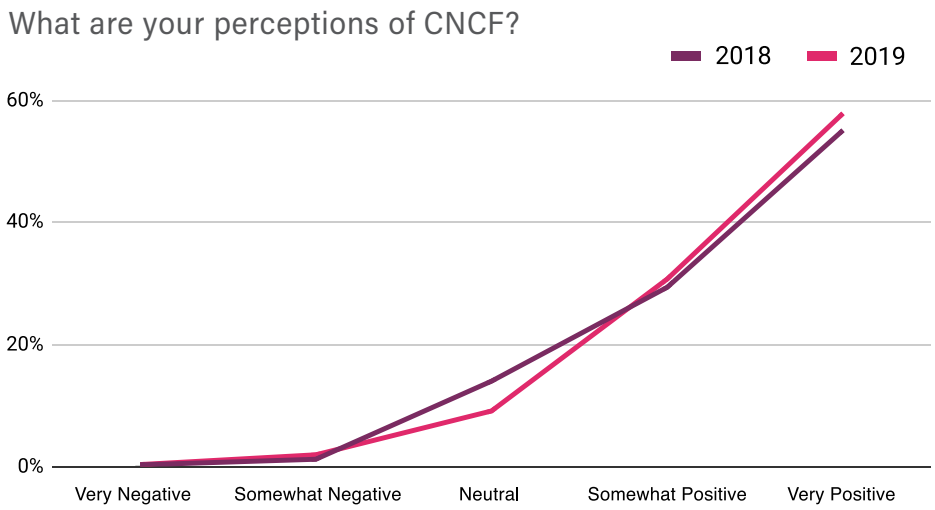


Kubernetes Environments

Minikube (39%) and Docker Kubernetes (32%) are the most popular Kubernetes environments during local container development.

When asked about CNCF, responses were overwhelmingly positive. About 94% of respondents would be likely to recommend CNCF technologies.

Almost 89% of survey respondents have a positive opinion of CNCF. This compares to about 85% positive opinions from 2018.



Want to learn more?

Documentation

The majority of respondents (71%) indicated that they learn about cloud native technologies from project documentation. Each graduated and incubating CNCF project hosts extensive documentation on their websites – a full list can be found here.

Events

Next is events, led by KubeCon + CloudNativeCon (58%). In 2020, we will again host our three flagship KubeCon + CloudNativeCon events, which will bring us to Amsterdam (March 30 - April 2, 2020), Shanghai (July 28-30, 2020), and Boston (November 17-20, 2020).

Half of the respondents indicated they learn about cloud native technologies at Meetups and local events. CNCF hosts more than 200 meetups under our umbrella across 54 countries, reaching more than 150,000 members. You can find your local meetup here.

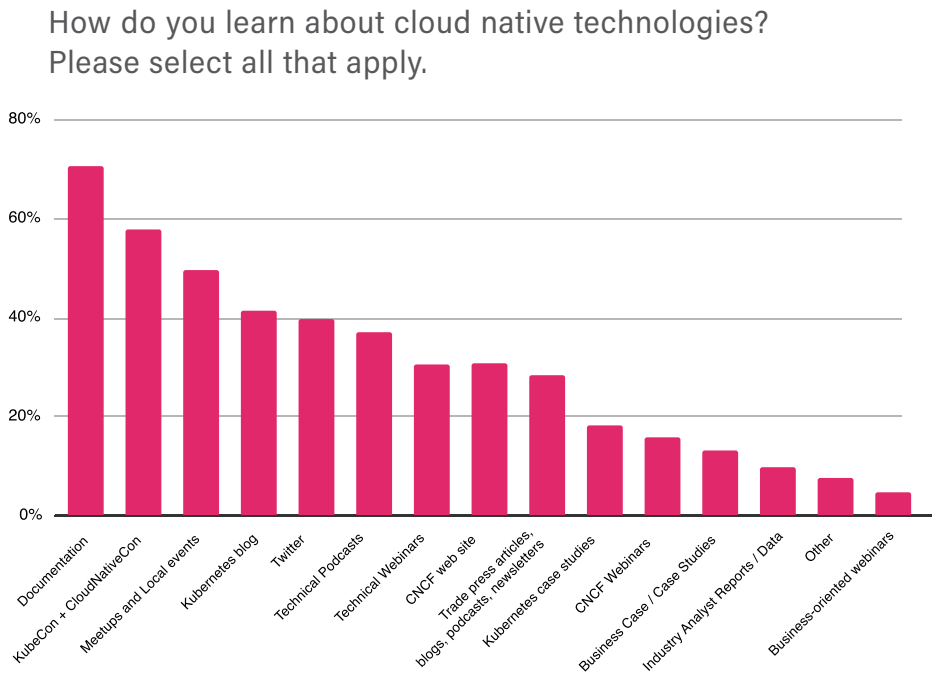
In 2019 we also kicked off Kubernetes Community Days, where community members organize their own events. You can learn more about hosting an event and find upcoming events across the globe here.

Twitter

40% of respondents get their info from Twitter. Be sure to follow @CloudNativeFdn for the latest CNCF and project news.

CNCF Website + Webinars

31% of respondents visit the CNCF website (cncf.io) for more information on projects events, training, certification, and more. Here you can also view and register to attend upcoming CNCF webinars (16%), and watch recordings of past webinars.



A huge thank you to everyone who participated in our survey!

Stay tuned for our follow-up to this survey with results from our Chinese survey coming out later this year!

You can also view the findings from past surveys here:

CNCF Survey: Use of Cloud Native Technologies in Production Has Grown Over 200%

March 2018: China is Going Native with Cloud

December 2017: Cloud Native Technologies Are Scaling Production Applications

June 2017: Survey Shows Kubernetes Leading as Orchestration Platform

January 2017: Kubernetes moves out of testing and into production

June 2016: Container Survey

March 2016: Container survey results