Enterprise Development Trends 2016

Cloud, Container and Microservices Insights from 2,100 JVM Developers

Lightbend

About This Report

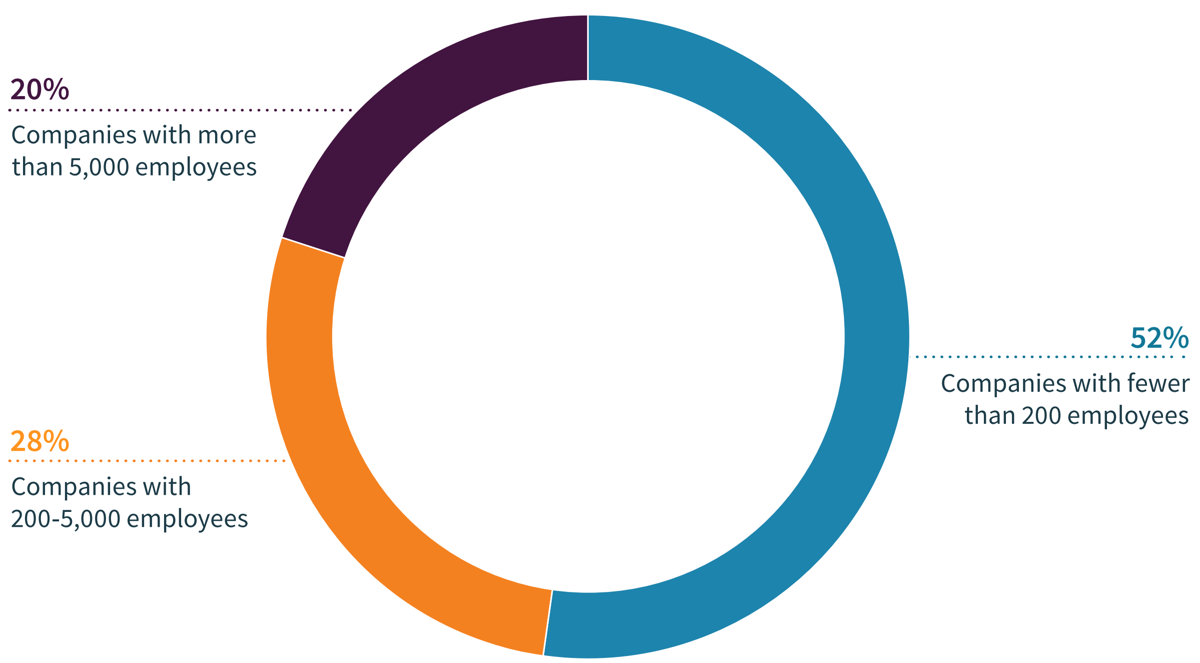
Lightbend surveyed 2,151 global Java Virtual Machine (JVM) developers to discover:

- Correlations between development trends and IT infrastructure trends
- How organizations at the forefront of digital transformation are modernizing their applications
- Real production usage break-downs of today's most buzzed about emerging technologies

The survey gathered responses from a diverse range of companies, with **20%** of respondents hailing from companies with more than 5,000 employees (large organizations), **28%** from companies with 200-5,000 employees (medium sized organizations) and **52%** from companies with fewer than 200 employees.

While each respondent claimed involvement with software development at their organization, the titles represented a diverse set of other responsibilities. **50%** were Developer titles, **27%** had Architect titles, **16%** were in Management, and **7%** designated themselves as "Other."

Survey Respondents by Company Size



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Executive Summary

The old world where JVM language developers relied on operators to do the work around deploying applications is in the midst of major upheaval, as the entire Java EE stack built around heavyweight app servers is losing relevance.

Where in the past infrastructure was left to the operators, today JVM developers are being brought into the DevOps tent based on the new characteristics of the modern enterprise application, as well as major new innovations in the infrastructure itself. In this report we examine the main drivers behind this shift, through the lens of thousands of Java and Scala developers.

Finding 01 | Microservices and Fast Data Are Driving Major Application Modernization Efforts

(see page 8)

Unlike its SOA predecessor, microservices are rapidly making their way into production, and together with "Fast Data" patterns are driving the modernization agenda. 34 percent of respondents said that most of their data processing today is real-time. More than 30 percent are already running microservices in production, with 20 percent 'seriously piloting' and 25 percent more in the early POC stages with microservices.

Finding 02 | Lightweight Containers Are Democratizing Infrastructure and Challenging the Old Guard Java EE App Servers

(see page 11)

The fragile model of bundling services into JARs and EAR files on app servers for isolation is rapidly giving way to the much more refined foundation of service isolation through Linux Containers, Docker and Unikernals. The Java EE monolith is losing relevance with 57 percent who believe that containers will disrupt the JVM landscape.

Finding 03 | Benefits of Portability and Flexibility are Driving the "Cloud-Native" Agenda

(see page 14)

Developers want the flexibility of moving applications and workloads between on-prem and any cloud provider of choice. 31 percent are already running most of their applications in the cloud and 21 percent are in the process of creating a cloud-native strategy. Scala developers are running 42 percent of their applications in the cloud ... a much higher rate than Java developers (26 percent).

Introduction

Meet the New Kind of Software That's Eating the World

The software that Marc Andreessen famously predicted would eat the world doesn't look much like yesterday's monoliths. Today's most popular services—from Twitter to Apple Siri—are distributed by default, and designed for unprecedented numbers of concurrent users and data volumes and speeds.

The characteristics of Reactive systems—designed to be Responsive, Resilient, Elastic and Message Driven to support these new extremes—are becoming table stakes for bringing new software to market.

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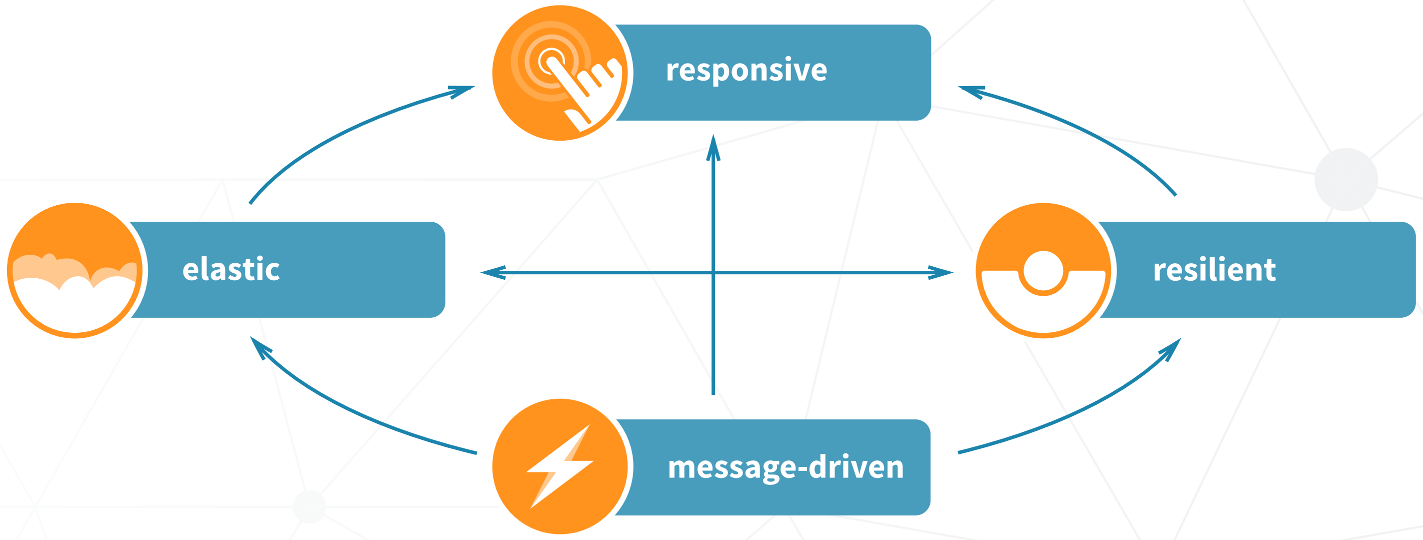


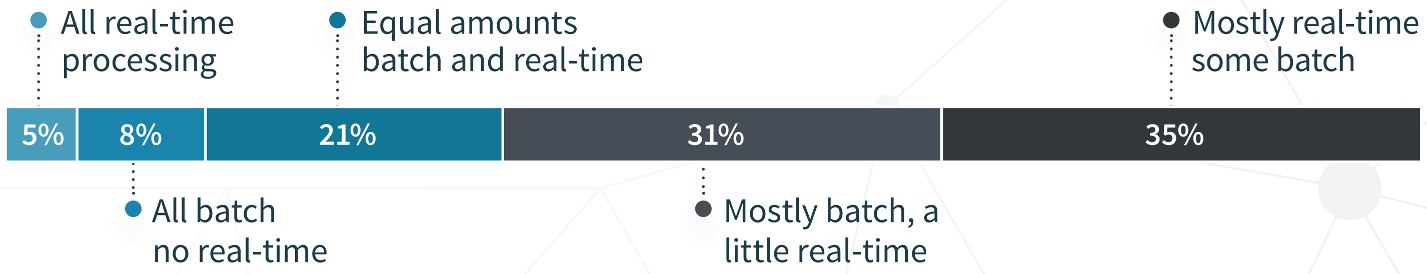
Introduction

Meet the New Kind of Software That's Eating the World

Real-time data is part of the fabric of the new enterprise application. The importance of streaming has grown in recent years, even for data that doesn't strictly require it, because it's a competitive advantage to reduce the time gap between data arrival and information extraction.

With frameworks like Apache Spark, Kafka, and Akka on the rise, systems are being architected to bring services closer to the data stores, and data streams are being built into the applications.

How would you best describe your organization's overall data processing systems or practices today?



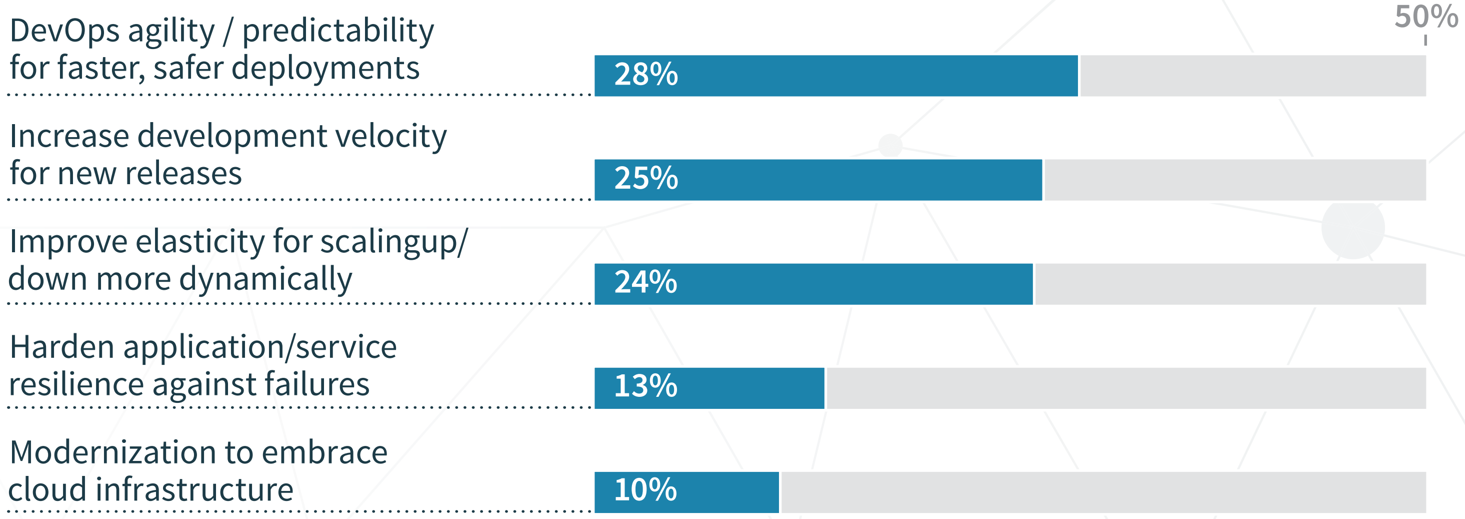
Introduction

Meet the New Kind of Software That's Eating the World

The hardening of the Agile software methodology and frequent release cycles have emphasized speed and flexibility as key attributes for developers to win, in the new distributed form factor.

If you're still releasing software every 12-18 months, you might as well go back to the Waterfall model. Taking advantage of rapid iteration and development sprints requires that the applications can be reasoned with by operations and deployed to production as fast as they are created.

Which best describes the main reason WHY your organization is embracing microservices?

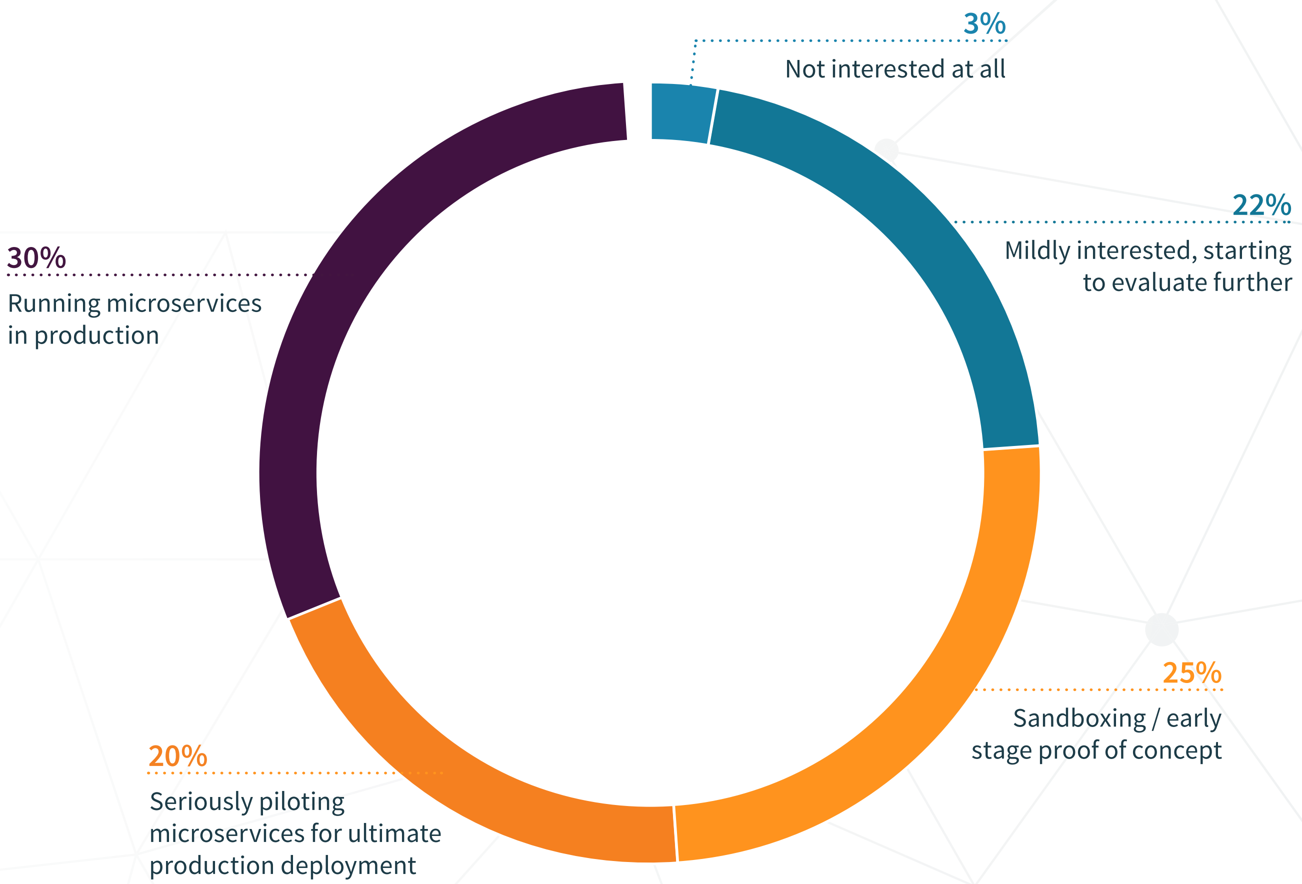


Microservices and Fast Data Are Driving Application Modernization Efforts

Microservices-Based Architecture is a simple concept: it advocates creating a system from a collection of small, isolated services, each of which owns their data, and is independently isolated, scalable and resilient to failure. Services integrate with other services in order to form a cohesive system that's far more flexible than legacy monolithic applications.

10 years ago, service-oriented architecture (SOA) embodied many of the same principles as microservices, and had great promise for the design of interfaces and decomposing applications. But where SOA failed was the lack of emphasis on the infrastructure. Microservices is being widely adopted today because in addition to service isolation it embodies deployment and lifecycle concerns that were never adequately handled by SOA.

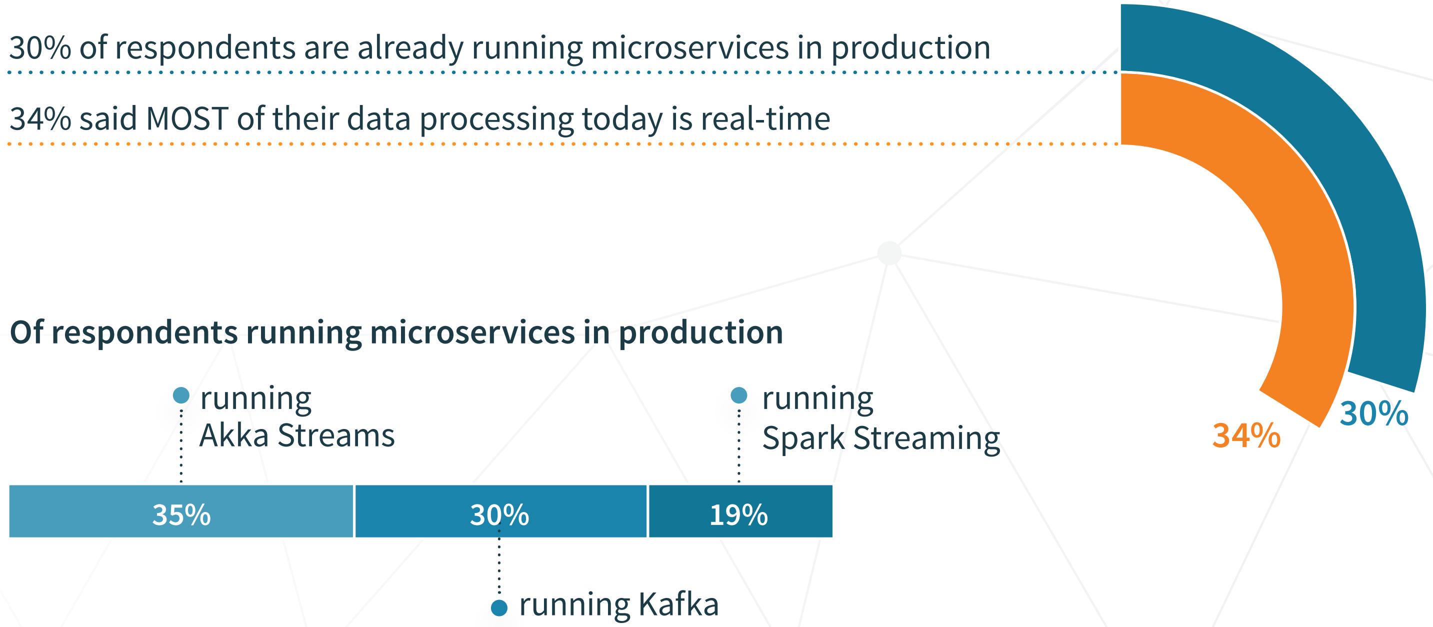
Which best describes your interest in microservices?



Microservices and Fast Data Are Driving Application Modernization Efforts

For the first time any application can take advantage of data not even written to disk. Machine Learning and Analytics are the initial killer apps, but the entire nature of app dev is transforming based on data use cases. Our survey findings showed a close correlation between Microservices and Fast Data adoption, as agility at the data tier is driving the need for applications that are more responsive with data-in-motion.

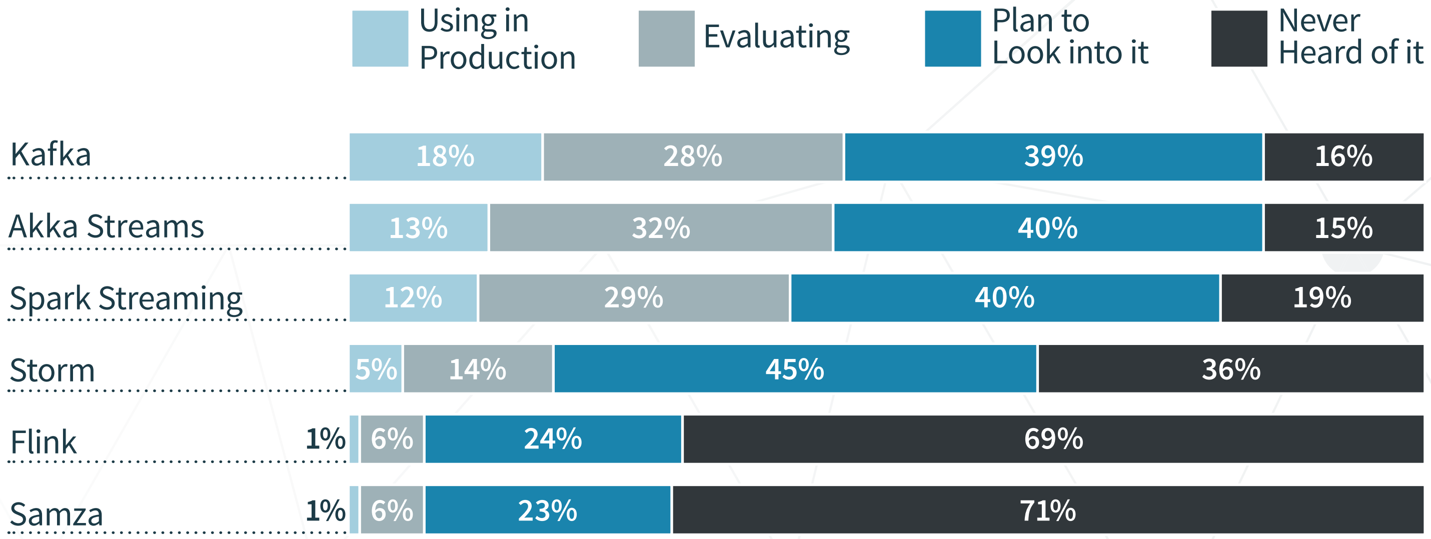
There is a strong connection between microservices and Fast Data technologies, with **35%** of those running microservices also running Akka Streams in production, **30%** running Kafka, and **19%** running Spark Streaming. The phrase ‘Fast Data’ captures the range of new systems and approaches, which balance various tradeoffs to deliver timely, cost-efficient data processing, as well as higher developer productivity.



Microservices and Fast Data Are Driving Application Modernization Efforts

For scalable data stream processing, Kafka is well known and widely deployed or under consideration. It provides distributed storage of data organized into topics. For processing the data, Akka Streams and Spark Streaming are most popular, with Storm attracting strong interest. Flink and Samza are less well known, but interest is growing.

What is your experience with the following data stream processing technologies?



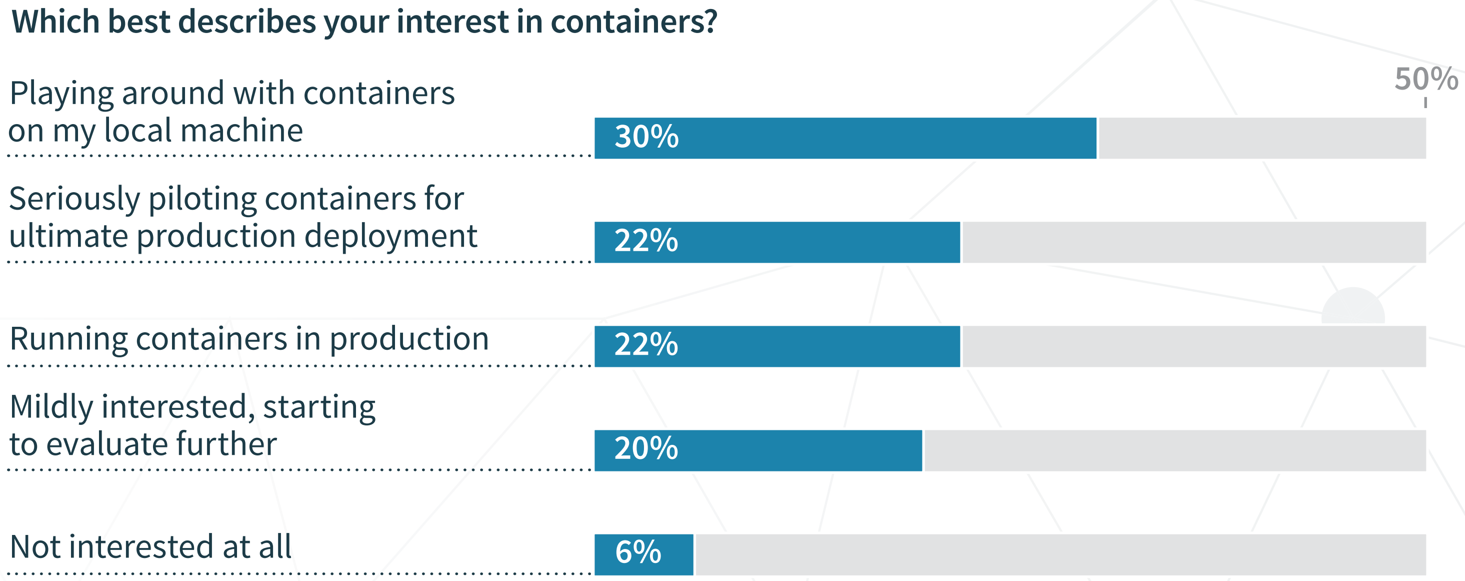
“Microservices—much more than being just a buzzword—represent a common sense way of developing and deploying a highly distributed system. Building services that care for a specific domain and its use cases means planning, development and deployment of these components are done independently and more frequently without the need of turning everything into lock step.”

Srividhya Narayanan, Director of the OnCue Cloud Platform at Verizon

Lightweight Containers Are Democratizing Infrastructure and Challenging the Old Guard Java EE App Servers

The momentum around containers has gone much more quickly than many anticipated. People are looking at containers as that great hope for infrastructure portability that they've been chasing for a long time.

And containers in production is really happening. **22%** of respondents said they are seriously piloting containers for production deployment, **30%** are playing around with containers on their local machines, **20%** are starting to evaluate containers, and only **6%** said they are not interested in containers.

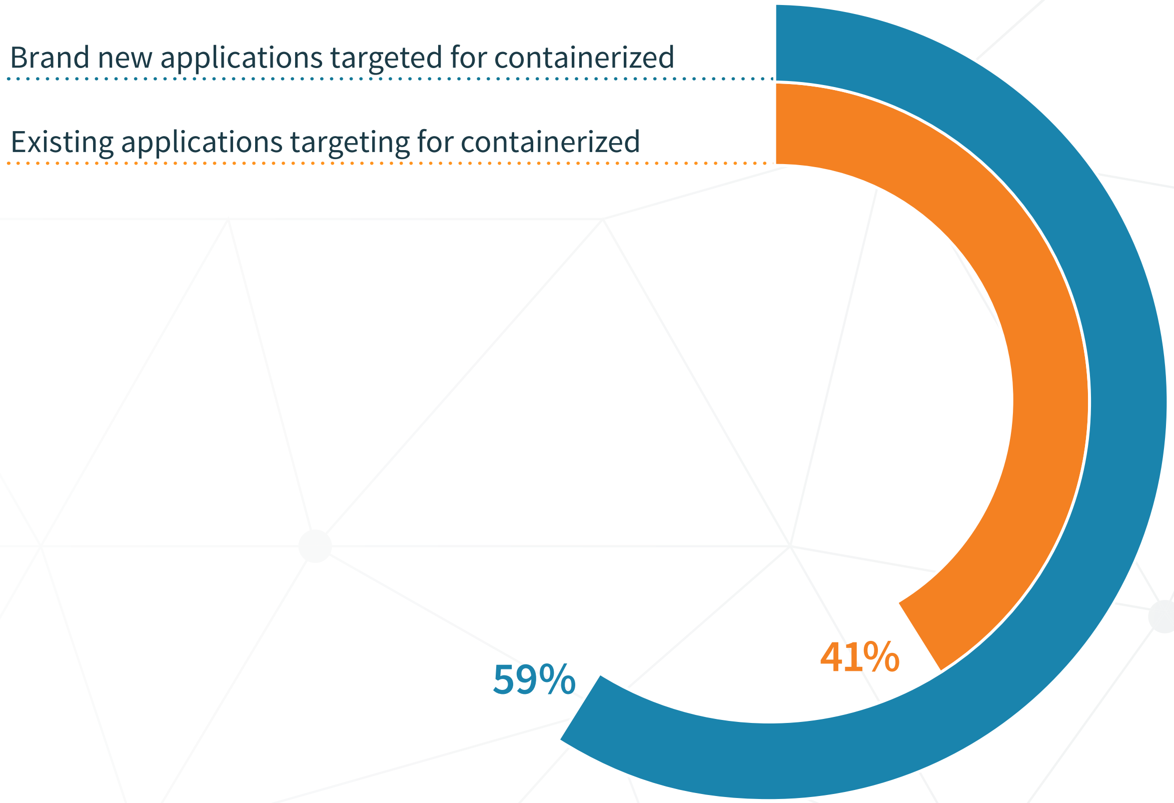


Lightweight Containers Are Democratizing Infrastructure and Challenging the Old Guard Java EE App Servers

What types of applications are people putting in containers is the million dollar question. Today it's primarily greenfield applications, with far fewer examples of legacy applications being modernized for containers in production.

Signs indicate that most early container adopters are web-scale startups who are unencumbered by legacy applications and infrastructure.

Which best describes the types of applications you are primarily targeting for containers?

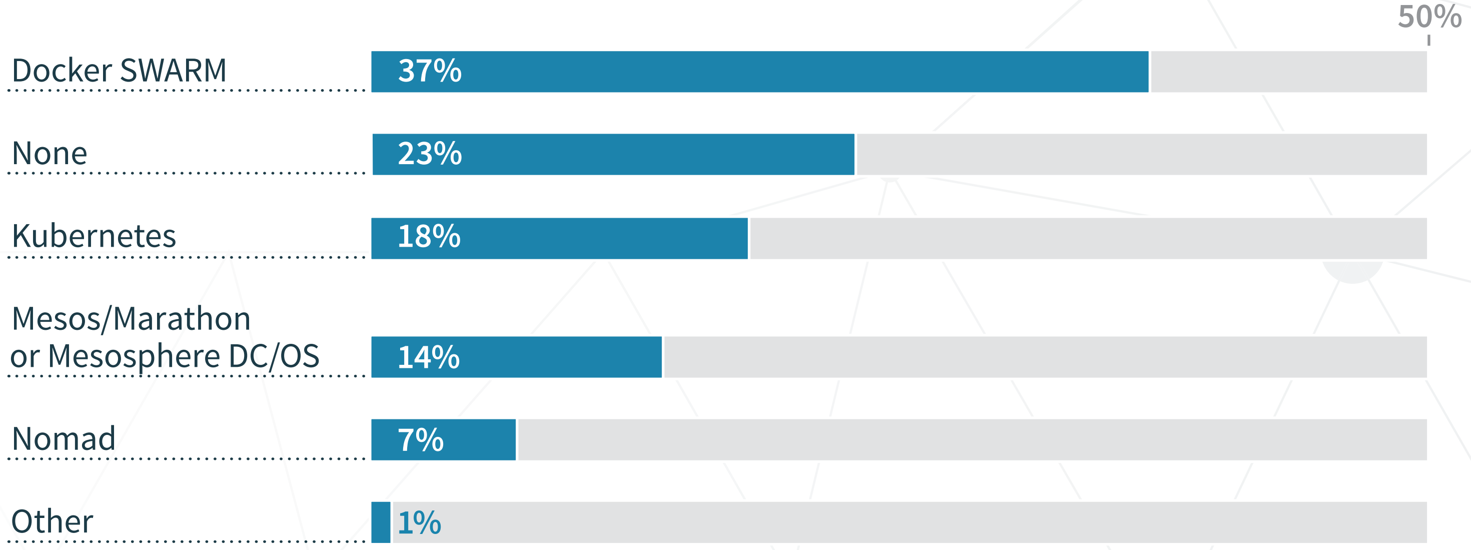


Lightweight Containers Are Democratizing Infrastructure and Challenging the Old Guard Java EE App Servers

There is a tightly contested battle in the container orchestration platform wars, with **37%** of overall respondents saying they are betting on Docker SWARM, **18%** on Google Kubernetes, and **14%** on Mesos / Marathon or Mesosphere DC/OS.

Among those who are actually running containers in production, the race gets even closer (and Mesos overtakes Kubernetes for second on the list), with **30%** betting on Docker Swarm, **21%** on Mesos / Marathon or Mesosphere DC/OS, and **20%** betting on Kubernetes.

Which container orchestration technology is your organization primarily betting on?

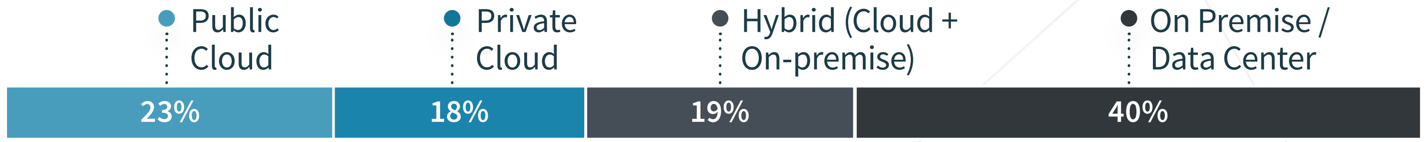


Benefits of Portability and Flexibility are Driving the “Cloud-Native” Agenda

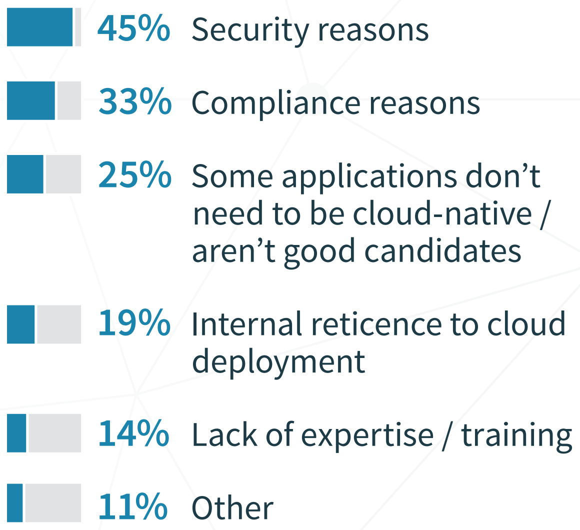
For most, cloud-native is either already here, or near. **31%** of respondents are already running most of their applications in the cloud. **29%** are beginning the process of creating a Cloud-Native application strategy. **31%** do not have plans to accelerate Cloud-Native Applications.

Scala developers are embracing cloud-native more strongly than java developers. For survey respondents who run Scala applications in production, **42%** said they are running most of their applications in the cloud (compared to **26%** for Java developers). Traditional Java applications running on Java EE application servers were never intended to run in a distributed cloud environment.

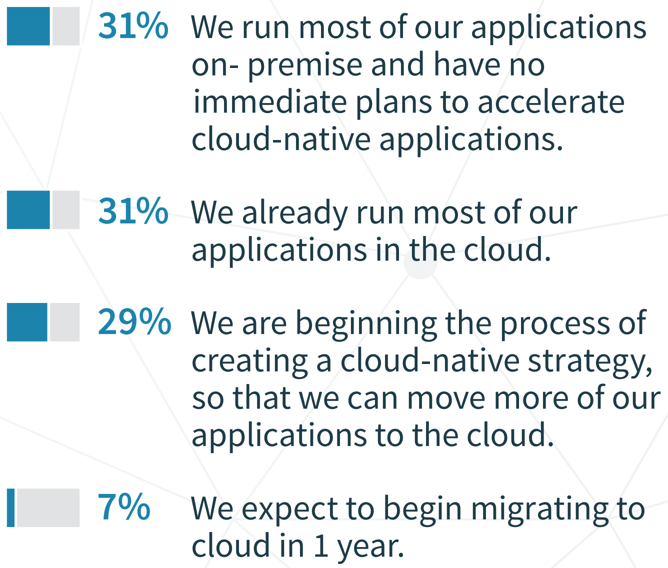
Which best describes where the majority of your primary systems are hosted?



For the applications that you continue to write for on-premise only, what reasons explain why those applications are being written for this environment?



Which of the following best describes your organization’s cloud strategy?

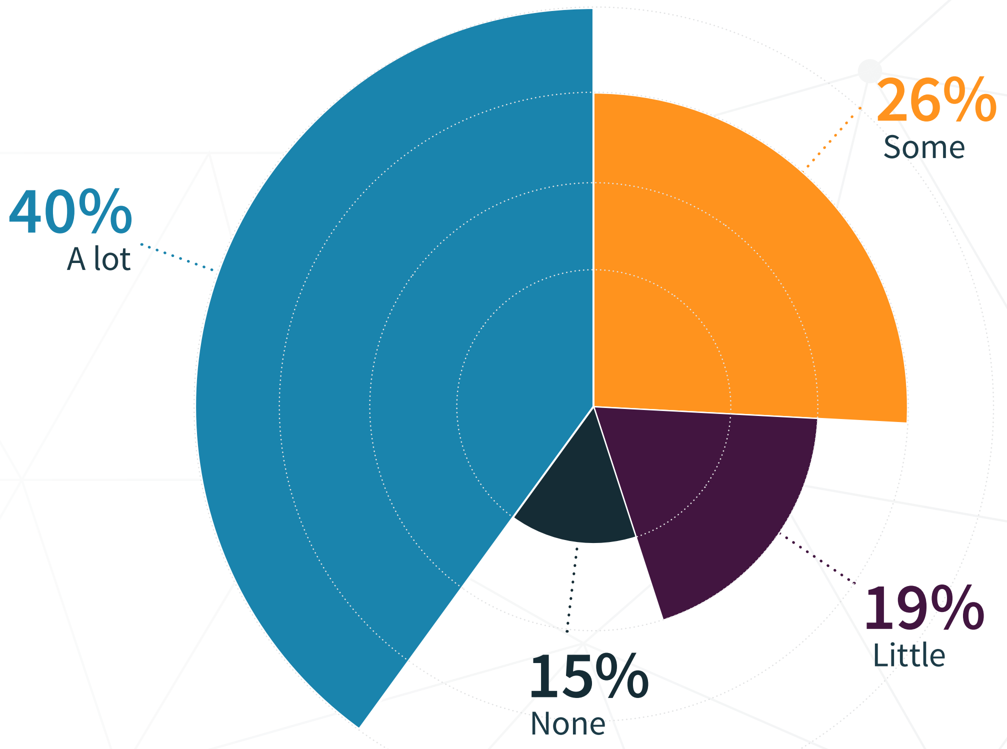


Benefits of Portability and Flexibilityare Driving the "Cloud-Native" Agenda

Developers have influence on technology choices. **40%** of respondents said they had a lot of influence on cloud architecture and technology choices, while **26%** said they had some, **19%** said they had a little, and **15%** said they had none.

The smaller the company, the more developer influence on cloud technology choices. Developers at small companies (1-200 employees) wield huge influence, with **49%** saying a lot of cloud technology adoption at their organizations are driven by developers (compared to only **25%** at companies with 5,000 or more employees).

How much influence do development teams have on your company's cloud architecture and technology choices overall?

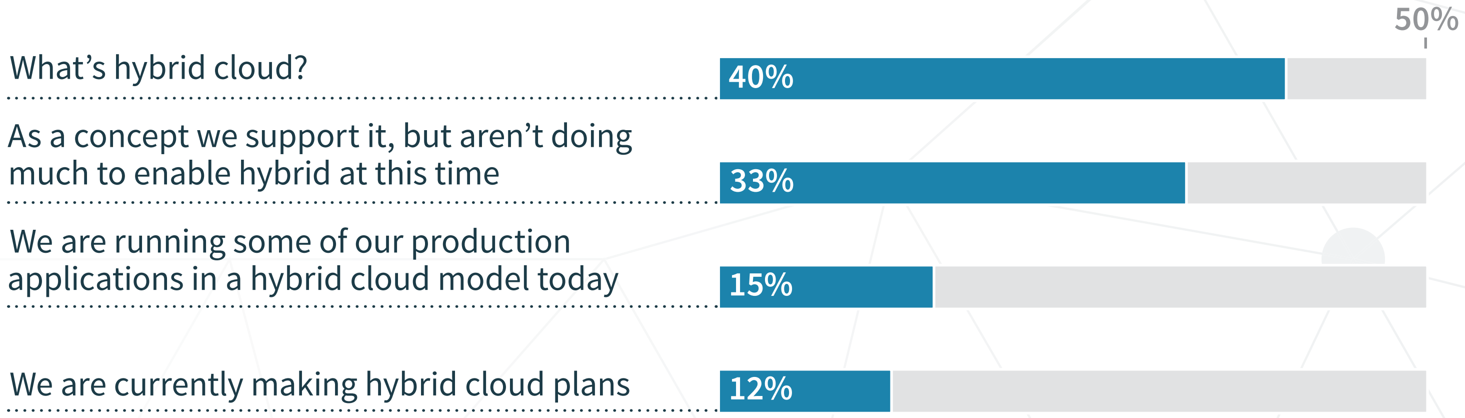


Benefits of Portability and Flexibility are Driving the “Cloud-Native” Agenda

What’s Hybrid Cloud? Lack of general awareness is one of hybrid cloud’s biggest challenges, with the majority of respondents (**40%**) not even knowing what it is.

Larger companies care more about Hybrid Cloud. **22%** of companies with 10k or more employees are running applications in a hybrid cloud model (**70%** higher than the rest of the survey’s respondents).

Which best describes your efforts around Hybrid Cloud?



“While it’s going to take time for embedded, on-premises corporate applications to shift to cloud, many industry observers feel it’s going to happen sooner than later. Gartner, for one, predicts that by 2020, ‘a corporate ‘no-cloud’ policy will be as rare as a ‘no-internet’ policy is today.”

Forbes, 2016

Software Getting Reactive

As software innovation has become the key determining factor determining winners in today's competitive landscape, developers are being driven into new requirements for shipping more resilient code faster, with increasing infrastructure flexibility. Meanwhile, applications "built for data" are redefining systems architecture and creating a premium on languages and platforms with native capabilities for data. Here's how development teams are changing their outlook to shift to Reactive.

01 | Think Agility at the Infrastructure Level Too

The old way of deploying applications (12-18 month release cycles) does not meet the new requirements for scaling modern applications built with Agile methodology for distributed computing.

02 | Embrace Microservices for Agility

Small teams working in Continuous Development / Continuous Integration pipelines and releasing within sprints are finding great success with microservices.

03 | Think Exit Strategy Off Decaying Java EE App Server

JVM developers are moving off of traditional Java application servers and favoring containers as the new way to package and deploy.

04 | Embrace Data as the Lifeblood of Modern Software

For the first time any application can take advantage of data not even written to disk. Machine Learning and Analytics are the initial killer apps, but the entire nature of app dev is transforming based on data use cases.

05 | Think "Fast" Data

Speed and performance has supplanted data volumes (i.e., "big" data) as the key concern. Low latency and resilience are key requirements for applications built for fast data, and are further driving the Reactive agenda.

Appendix

Other Key Findings

1. **Scala Developers Are Way Ahead of Java Developers in Microservices Adoption** — 42% of respondents whose production applications are written primarily in Scala are running microservices in production. But only 28% of respondents whose production applications are written primarily in Java are running microservices in production.

2. **Container Adoption Among Scala Developers is Higher than With Java Developers** — 31% of respondents whose production applications are written primarily in Scala run containers in production (compared to 21% for Java).

3. **Containers in Production is Really Happening** — 22% of respondents said they are seriously piloting containers for production deployment, 31% are playing around with containers on their local machines, 20% are starting to evaluate containers, and only 6% said they are not at all interested in containers.

4. **There is a Close Battle Being Fought for Supremacy in Container Orchestration** — Of survey respondents who are actually running containers in production, 30% are betting on Docker SWARM for container orchestration, while 21% are betting Mesos / Marathon or Mesosphere DC/OS, and 20% rely on Kubernetes.

5. **Akka Streams, Kafka and Spark Streaming Are Starring in the New Fast Data Stack** — Of respondents whose production applications are written primarily in Scala, 28% are running Akka Streams in production, 28% are running Kafka in production, and 21% are running Spark Streaming in production.

6. **Scala Developers are Embracing Cloud-Native More Strongly Than Java Developers** — For survey respondents who selected Scala as their primary language for production applications, 42% said they are running most of their applications in the cloud (compared to 26% for Java developers).

7. **Smaller Companies Skew Towards Public Cloud** — 34% of small companies (1-200 employees) are running their primary systems in the public cloud. Only 12% of respondents with 201 or more employees are running their primary systems in the public cloud. And only 9% of companies with 5,000 or more employees host the majority of their primary systems in the public cloud.

8. **Larger Companies Care More About Hybrid Cloud** — 22% of companies with 10k or more employees are running applications in a hybrid cloud model (70% higher than the rest of the survey's respondents).

9. **It's Still Early for IoT Apps** — 77% of all respondents are still not writing apps for IoT devices. Of those writing IoT apps, 17% are writing for endpoints in the tens, 28% for endpoints in the hundreds, 38% for endpoints in the thousands, and 17% for endpoints numbering the millions.

10. **The Smaller the Company, the More Developer Influence on Technology Choices** — Developers at small companies (1-200 employees) wield huge influence on technology decisions, with 49% saying a lot of cloud technology adoption at their organizations are driven by developers (compared to only 25% at companies with 5,000 or more employees).

Appendix

Key Takeaways

Microservices

More than 30% of respondents are already running microservices in production — Another 20% are "seriously piloting" microservices for ultimate production deployment, and 25% are "sandboxing" / early stage proof of concept.

Large Enterprises are Microservices Laggards — Large enterprises (10,000 or more employees) appear to be struggling to run microservices in production (19%), compared to 32% at companies with fewer than 10,000 employees. That's a 41% delta in adoption figures between the large enterprises and the rest of the respondents.

Scala Developers Are Ahead of Java Developers in Microservices Adoption — 42% of respondents whose production applications are written primarily in Scala are running microservices in production. But only 28% of respondents whose production applications are written primarily in Java are running microservices in production.

Massive Scale and Microservices Adoption are Connected — Developers whose applications are supporting 10,000 or more concurrent users at peak intervals are running microservices in production at a higher rate (43%) than other survey respondents (30%).

For Large Enterprises, It's About Modernization — At large enterprises (10,000 or more employees), 36% of microservices efforts are related to modernizing legacy applications, compared to 26% at companies with fewer than 10,000 employees (who cite modernizing legacy apps as the main way they are using microservices).

DevOps Agility is The Key Benefit for Large Enterprises — 33% of large enterprises (more than 10,000 employees) cite the top reason for microservices as "DevOps agility for faster, safer deployments," followed by 24% who cite the ability to "increase development velocity for new releases."

Developer Agility is the Overall Top Benefit Cited for Production Microservices Users — For organizations actually running microservices in production, the number one benefit cited (by 30% of respondents) is the "increase in development velocity for new releases."

Larger Enterprises Have a Cultural Challenge — For companies with more than 5,000 employees, the cultural challenge is cited at an even higher rate (56%) as the main barrier to microservices (compared to 46% for all other respondents who cite cultural challenges as the main barrier to microservices).

Microservices Seem Easier to Operate, But Are They Really? — For companies actually running microservices in production, the immaturity of operations tools spiked as a concern for 34% (compared to 22% of total survey responses who cited immaturity of operations tools as a challenge for microservices).

Appendix

Key Takeaways

Containers

Developers Think Containers Have a Huge Potential to Disrupt the JVM Landscape — 57% of respondents said containers will disrupt the JVM landscape, 32% were not quite sure yet, while only 11% thought containers were mostly hype.

Containers in Production is Really Happening — 22% of respondents said they are seriously piloting containers for production deployment, 31% are playing around with containers on their local machines, 20% are starting to evaluate containers, and only 6% said they are not at all interested in containers.

Green Field is Leading Legacy Modernization as Targets for Containerized — 60% of respondents are primarily targeting brand new applications for containerized, while 40% are targeting existing applications for containerized.

Container Adoption Among Scala Developers is Higher than With Java Developers — 31% of respondents whose production applications are written primarily in Scala run containers in production (compared to 21% for Java).

IoT Makes Containers More Likely — 28% of respondents writing IoT applications are running containers in production (27% higher than the 22% of overall survey respondents running containers in production).

There's a Major Connection Between Containers and Microservices — 41% of respondents running microservices in production are also running containers in production (compared to 22% of total respondents running containers in production, a 54% difference).

Container Orchestration

Which Technology Will Win the Container Orchestration Adoption Land Grab? — With production containers still in its early days, 37% of overall respondents said they are betting on Docker SWARM, 28% on Google Kubernetes, and 14% on Mesos / Marathon or Mesosphere DC/OS.

Orchestration Choice Preferences Change at the Large Enterprises — With large enterprises (10,000 or more employees, as defined by survey), 32% are betting on Docker SWARM, compared to 22% betting on Kubernetes and 12% betting on Mesos / Marathon / DC/OS.

But Actual Production Container Users' Orchestration Choices Suggest a Much Tighter Race — Of survey respondents who are actually running containers in production, 30% are betting on Docker SWARM for container orchestration, while 21% are betting Mesos / Marathon or Mesosphere DC/OS, just a point ahead of the 20% betting on Kubernetes.

Scala Developers Are More Interested in Mesos (than Non-Scala Developers)— 21% of respondents whose production applications are written primarily in Scala are betting on Mesos / Marathon / Mesosphere DC/OS for their container orchestration technology (compared to 14% overall).

How Container Orchestration Choices Play Out With Microservices — Of survey respondents running microservices in production, 33% said they are betting on Docker SWARM for container orchestration, 21% are betting on Kubernetes, and 19% are betting on Mesos / Marathon or Mesosphere DC/OS.

Appendix

Key Takeaways

But Amazon is Dominating in Containers in the Public Cloud—66% of survey respondents said that Amazon had the most compelling offerings (of the major public cloud providers) for developers working with containers, compared to 29% for Google and only 5% for Microsoft.

Fast Data

Real-Time Eating into Batch—Survey results indicated “Fast Data” patterns have momentum with developers as 34% of respondents said most of their data processing is real-time, and 22% cited equal amounts batch and real-time processing.

Akka Streams, Kafka and Spark Streaming Are Starring in the New Fast Data Stack—Of respondents whose production applications are written primarily in Scala, 28% are running Akka Streams in production, 28% are running Kafka in production, and 21% are running Spark Streaming in production.

Fast Data and Microservices Have Common Ground in Enabling Technologies—Of respondents running microserivces in production, 35% are also running Akka Streams in production, 30% are also running Kafka in production, and 19% are also running Spark Streaming in production.

Scale Affects Adoption for Some Fast Data Technologies—Developers whose applications are supporting 10,000 or more concurrent users run Kafka at a higher rate in production (28%, compared to 18%), Spark Streaming at a higher rate (17%, compared to 12%), Storm at a higher rate in production (9%, compared to 5%).

Container Usage Also Bumps Up Fast Data Technology Usage—Of survey respondents who are running containers in production, 33% are running Kafka in production, 23% are running Akka Streams in production, and 20% are running Spark Streaming in production.

Cloud Adoption Patterns

For Most, Cloud-Native Is Either Already Here, or Near—31% of respondents are already running most of their applications in the cloud. 29% are beginning the process of creating a Cloud-Native application strategy. 31% do not have plans to accelerate Cloud-Native Applications.

Scala Developers are Embracing Cloud-Native More Strongly Than Java Developers—For survey respondents who selected Scala as their primary language for production applications, 42% said they are running most of their applications in the cloud (compared to 26% for Java developers).

Microservices and Public Cloud Are Common Bedfellows—35% of survey respondents running microservices in production said the majority of their primary systems were hosted in the public cloud (compared to 23% of all respondents, a 52% difference).

Smaller Companies Skew Towards Public Cloud—34% of small companies (1-200 employees) are running their primary systems in the public cloud. Only 12% of respondents with 201 or more employees are running their primary systems in the public cloud. And only 9% of companies with 5,000 or more employees host the majority of their primary systems in the public cloud.

Appendix

Key Takeaways

Larger Companies Skew Towards On-Prem—Companies with 5,000 or more employees still have the majority (53%) of their primary systems hosted in on-premise datacenters.

OpenStack Trends Towards Larger Companies, At Scale, Running Containers—OpenStack usage is much greater at companies with 5,000 or more users (27%, compared to 17% otherwise). OpenStack usage is higher (25%) among developers whose applications support 10,000 or more concurrent users. And OpenStack usage is higher (25%) among developers running containers in production.

What's Hybrid Cloud?—Lack of general awareness is one of hybrid cloud's biggest challenges, with the majority of respondents (40%) not even knowing what it is.

Larger Companies Care More About Hybrid Cloud—At large enterprise survey respondents (10,000 or more employees) the number who are unaware of what hybrid cloud is dropped to 28%. And the percentage of respondents running applications in a hybrid cloud model was 70% higher at large enterprises (22%) than with the rest of respondents (13%).

Massive Scale Leads More Developers to Hybrid Cloud—Developers whose applications are supporting 10,000 or more concurrent users at peak intervals cited a 23% rate of running production applications in a hybrid cloud model today, a 53% higher rate than other respondents.

IoT

It's Still Early for IoT Apps—77% of all respondents are still not writing apps for IoT devices. Of those writing IoT apps, 17% are writing for endpoints in the tens, 28% for endpoints in the hundreds, 38% for endpoints in the thousands, and 17% for endpoints numbering the millions.

There is General Parity on IoT Participation Across Company Sizes—In companies with 1-200 employees, 24% are writing apps for IoT devices. Of companies with 201-5,0000 employees, 18%. Of companies with 5,001-10,000 employees, 26%. And of companies with over 10,000 employees, 26%.

But Larger Companies Have Way More Endpoints—In companies with 5,000 or more employees, 23% of apps are written for IoT endpoints exceeding the thousands (compared to companies with fewer than 5,000 employees, for whom only 11% of survey respondents are writing apps for IoT endpoints numbering in the thousands).

Appendix

Key Takeaways

Developer Influence on Technology Selection

Developers Have Influence on Technology Choices—40% of respondents said they had a lot of influence on cloud architecture and technology choices, while 26% said they had some, 19% said they had a little, and 15% said they had none.

The Smaller the Company, the More Developer Influence on Technology Choices—Developers at small companies (1-200 employees) wield huge influence on technology decisions, with 49% saying a lot of cloud technology adoption at their organizations are driven by developers (compared to only 25% at companies with 5,000 or more employees).

Scala Developers Have More Say than Java Developers—For survey respondents who selected Java as their primary language, 36% said that a LOT of their company's cloud technology adoption is driven by developers. For survey respondents who selected Scala as their primary language, 49% said that a LOT of their company's cloud technology adoption is driven by developers.

Lightbend

Lightbend (Twitter: @Lightbend) provides the leading Reactive application development platform for building distributed applications and modernizing aging infrastructures. Using microservices and fast data on a message-driven runtime, enterprise applications scale effortlessly on multi-core and cloud computing architectures. Many of the most admired brands around the globe are transforming their businesses with our platform, engaging billions of users every day through software that is changing the world.

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