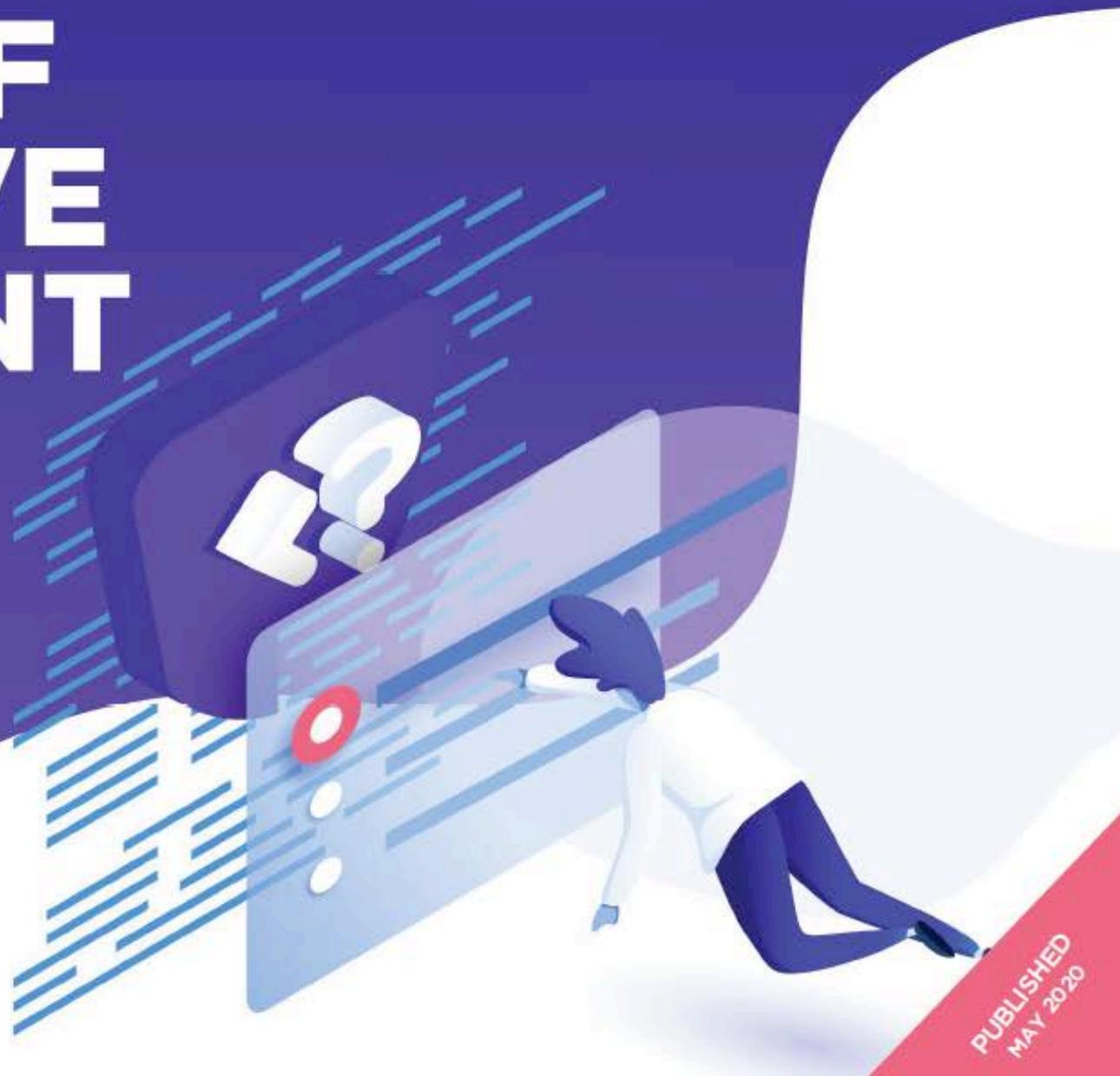


DEVELOPER ECONOMICS

THE STATE OF CLOUD NATIVE DEVELOPMENT

The latest trends from our Q2 2019
survey of 6,752 developers



Created by



Commissioned by



PUBLISHED
MAY 2020



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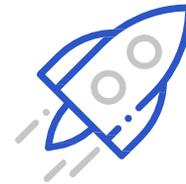
WHO DEVELOPERS ARE

Developer population sizing
Developer segmentation



WHAT THEY BUY

Why developers are adopting
competitor products – and how you
can fix that



WHERE THEY ARE GOING

Emerging platforms – augmented &
virtual reality, machine learning

/DATA

Trusted by the leading tech brands and media



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Key Findings:

- 4.7 million cloud native developers exist around the globe.
- 1.7 million developers are using Kubernetes.
- 3.3 million developers are using serverless architectures and cloud functions.
- Kubernetes users are more likely to influence buying decisions.
- 51% of serverless users are using AWS Lambda.
- 68% of cloud native developers are using AWS as a cloud hosting provider.

1. INTRODUCTION

The standardised use of containers has changed how software is developed and helped usher in the age of DevOps and more flexible and robust applications based on cloud native development. Commissioned by the Cloud Native Computing Foundation (CNCF), /Data has performed an in depth analysis of cloud native developers to better understand the current state of this ecosystem. The analysis is based on /Data's Developer Economics biannual survey of 17,000+ software developers which was fielded in May and June of 2019. Of the total respondents, 4,096 answered questions relating to the development of backend services and the technologies they use.

Throughout this analysis, the data is segmented by self defined categories. Each survey respondent was asked to self-identify through their responses to various questions. With a few exceptions, we do not define developer groups beyond how developers see themselves and how they interoperate the answer options provided.

1. INTRODUCTION

a) Defining Cloud Native Computing

What do we mean by cloud native developer? For this analysis, we are using the Cloud Native Computing Foundation's definition of cloud native computing as a guide.

The CNCF definition reads:

Cloud native technologies empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds. Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

Key to the CNCF definition is the use of automation to make high impact changes frequently and predictably with minimal work. Through the /Data survey, cloud developers were asked what technologies they are using to build backend services. While respondents may interpret the term backend services in different ways, it is intended to refer to applications and code that run on a server that is supporting other devices. These servers could be housed on-premise, or in a third party's data centre. These developers' answers help us identify true cloud native developers.

If automation is the core of cloud native development, container orchestration is at the centre of this process. Consequently, we have limited the definition of cloud native developers to those that are using some sort of container orchestration. This could be a self implementation of Kubernetes, leveraging a CaaS or orchestration platform, or using a serverless solution that runs an orchestration engine under the hood. While the use of containers may be an important first step in moving to cloud native development, without automation, it is only the first step.

1. INTRODUCTION

b) Market size

Our estimates put the global number of **cloud native developers** at **4.7 million or 36% of backend developers**. This includes, **2.9 million** who are **using orchestration** and **3.3 million** developers who are **using cloud functions or serverless architecture**. This equates to 22% and 25% of backend developers respectively.

The estimate also considers the **1.5 million developers** that are **using both orchestration and serverless technologies**.

1. INTRODUCTION

c) Usage of cloud native technologies across regions

The adoption of cloud native technology varies significantly across global regions.

In general, the adoption of containers is much greater in Europe and North America than in Asia. In Eastern Europe, the use of containers has seen significant penetration, with 54% of backend developers using containers. Penetration is also high in developed regions such as North America and Western Europe. Half of backend developers in North America, Western Europe, and Israel are adopting containers. Orchestration technology that manages these containers is another popular tool in these three regions with between 25-26% of backend developers using it.

Adoption of cloud native technology in Oceania follows a unique pattern. While containers are not as prevalent in this region as others, technologies such as serverless and container orchestration are seeing the greatest adoption in Oceania compared to any other region across the globe.

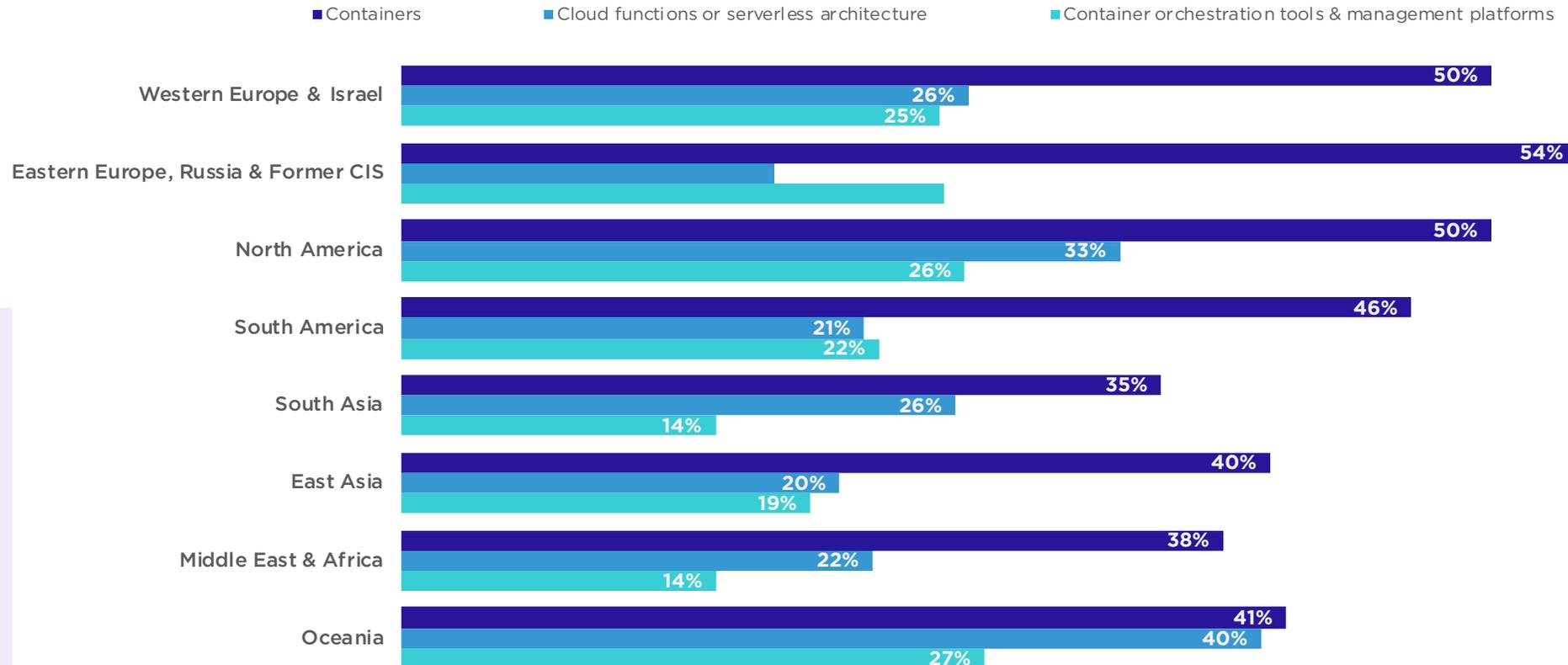
Developers in Asia, the Middle East, and Africa are slower to adopt containers and cloud native technologies. Chinese companies have been lagging in the migration to the cloud and the usage of cloud native technologies is following the same trend. As Alibaba's CaaS offering gains market traction, we may see more cloud native developers in East Asia in the future.

1. INTRODUCTION

Cloud native focused in Europe and North America

% of backend developers (n=4,096)

Usage of cloud native technologies across regions



2. WHERE ARE CLOUD NATIVE DEVELOPERS RUNNING THEIR CODE?

a) Cloud native developers are leveraging multiple infrastructures

The flexibility of cloud native development enables organisations to operate more flexible and distributed infrastructures and allocate workloads to compute resources best suited for any particular job. For this reason we wanted to get a better understanding of how cloud native developers are taking advantage of this flexibility and where they are running their code compared to developers that are not developing natively in the cloud.

We ask backend developers if they are running code on public clouds, private clouds, hybrid clouds, or on-premise servers. These options are not mutually exclusive. For greater clarity, within the survey we define private cloud as a cloud that is only available to certain users regardless of whether it is hosted on-premise or in a third party's data centre. We also define hybrid clouds as using a public and private cloud for a single project.

Developers running native cloud technologies are indeed leveraging a wider variety of compute infrastructure compared to non cloud native developers. These developers are more likely to be running code in all four of the environments that we covered (private cloud, public cloud, hybrid cloud, and on-prem servers) and are using 1.8 of the four environments on average compared to 1.5 for non cloud native developers. Our data shows that 2.7 million cloud native developers (58%) are running backend code on a public cloud, 2.2 million developers (47%) on a private cloud, 2.2 million (47%) on on-premise servers, and 1.7 million (36%) on a hybrid cloud.

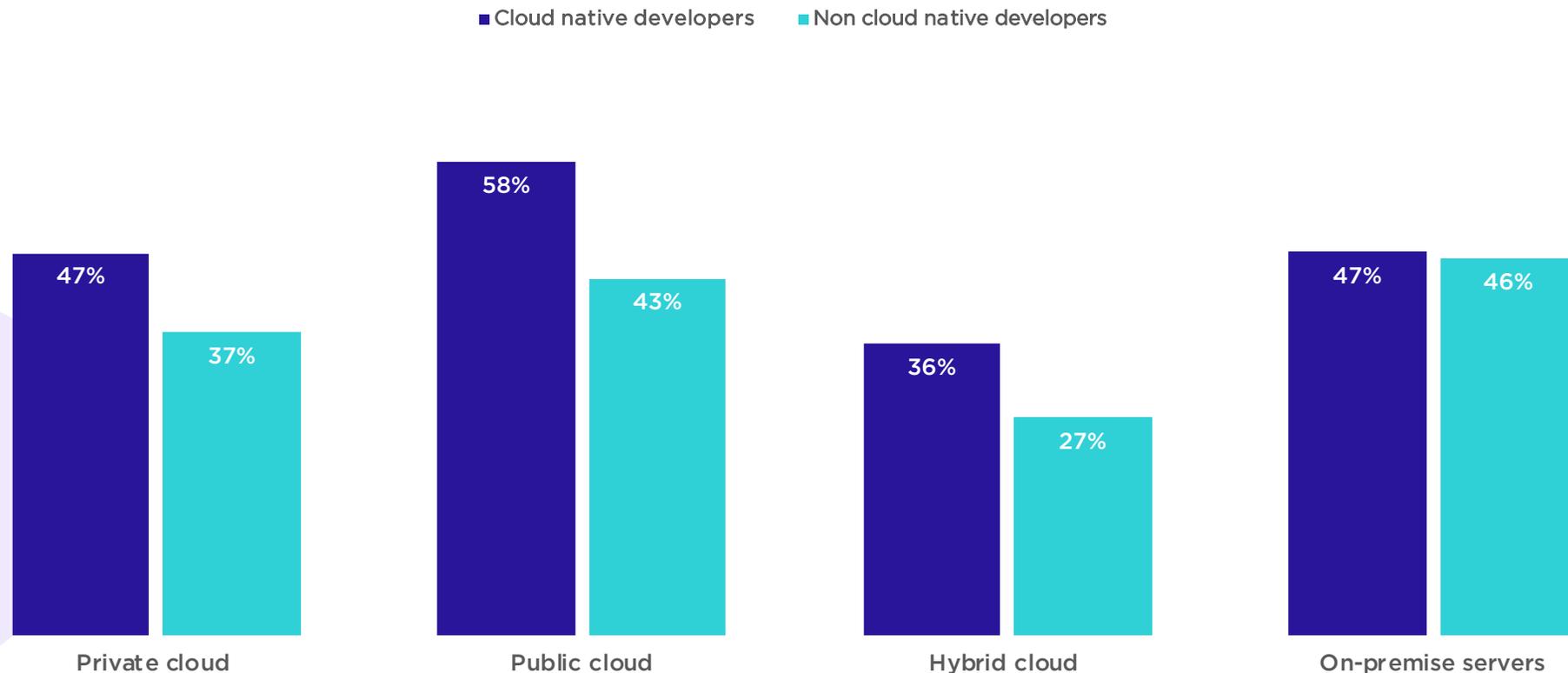
Both cloud native and traditional developers are running code on on-premise servers at the same rate. This indicates that while cloud native developers have embraced the flexibility of the cloud, they have not abandoned their on-premise servers.

2. WHERE ARE CLOUD NATIVE DEVELOPERS RUNNING THEIR CODE?

58% of cloud native developers are running code in public cloud

% of backend developers (n=5,416)

Infrastructure use by cloud native developers and non cloud native developers



2. WHERE ARE CLOUD NATIVE DEVELOPERS RUNNING THEIR CODE?

b) Cloud usage varies by vertical industries

As developers adopt cloud native development strategies, the compute resources used to run this software tends to vary across vertical industries.

For example, **software companies** are more inclined to run code in a public cloud than on-prem servers or private cloud. Almost two-thirds of cloud native developers working at software firms run code in a public cloud vs. only half of the developers in this industry that are running code on a private cloud.

When we look at usage across industries, developers in the **data analytics & business intelligence and hardware verticals** are more likely to run software on public clouds. Cloud native developers in these markets are 7 percentage points more likely to be running code in a public cloud compared to the average of developers in other verticals.

Cloud native developers that work in industries that rely on sensitive data are more likely to run code on on-premise servers or on a private cloud. In particular, cloud native developers in the **financial services vertical** are 12 percentage points more likely to run code on on-premise servers and developers in **healthcare** are 8 percentage points more likely.

By keeping computing on-premise, they can maintain greater control of their sensitive data.

Cloud native developers in **marketing, entertainment, and real-estate** are less likely to run code on on-premise servers. These industries are very content-oriented, requiring easy and quick access to assets. On-premise servers presumably cannot meet the accessibility and performance requirement vital to success in these sectors.

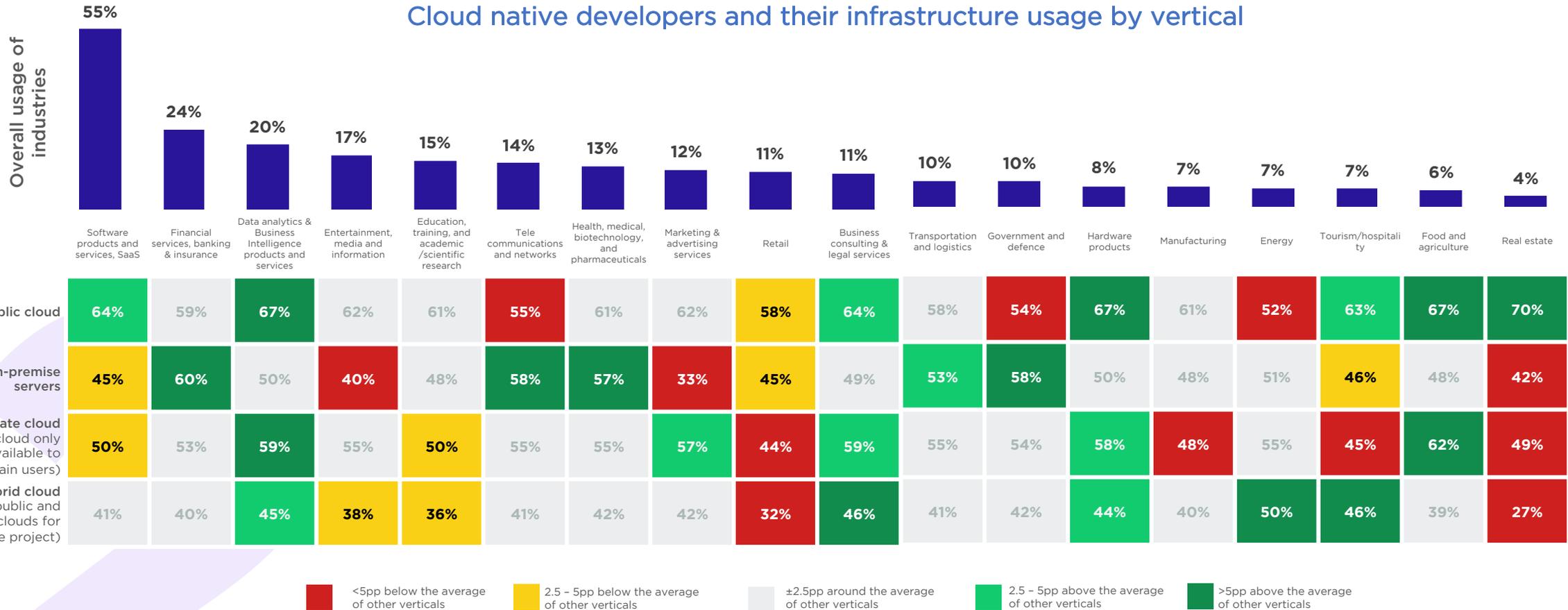
Cloud native developers in the **telecom** and **government/defence** spaces are using private and public clouds, and on-premise servers at the same rate. These developers are also less likely to use public clouds. Cloud native developers in the telecom and government spaces require greater security and control which makes public clouds less attractive.

2. WHERE ARE CLOUD NATIVE DEVELOPERS RUNNING THEIR CODE?

64% of cloud native developers at software firms run code on public cloud

% of cloud native developers (n=1,325)

Cloud native developers and their infrastructure usage by vertical



3. USAGE OF CLOUD SERVICE VENDORS

a) Usage of cloud service vendors by cloud native, non cloud native, and other developers

As we drill into where developers are deploying software and the public cloud vendors they are using, we see cloud native developers use different cloud vendors than traditional backend developers to host code. Developers that are writing front end code or other types of software also gravitate toward a different set of cloud vendors.

Amazon, the most used cloud vendor, is much more popular with cloud native developers than with other backend developers or even developers writing front end code. Cloud native developers are 20 percentage points more likely to be using Amazon than traditional backend developers.

Developers that are building backend services without cloud native technologies are more likely to be self-hosting software. These developers are 9 percentage points more likely to be leveraging in-house systems than cloud native practitioners. The technology leadership of third party clouds is presumably a more conducive environment for cloud native developers who are innovating new approaches to IT and software development.

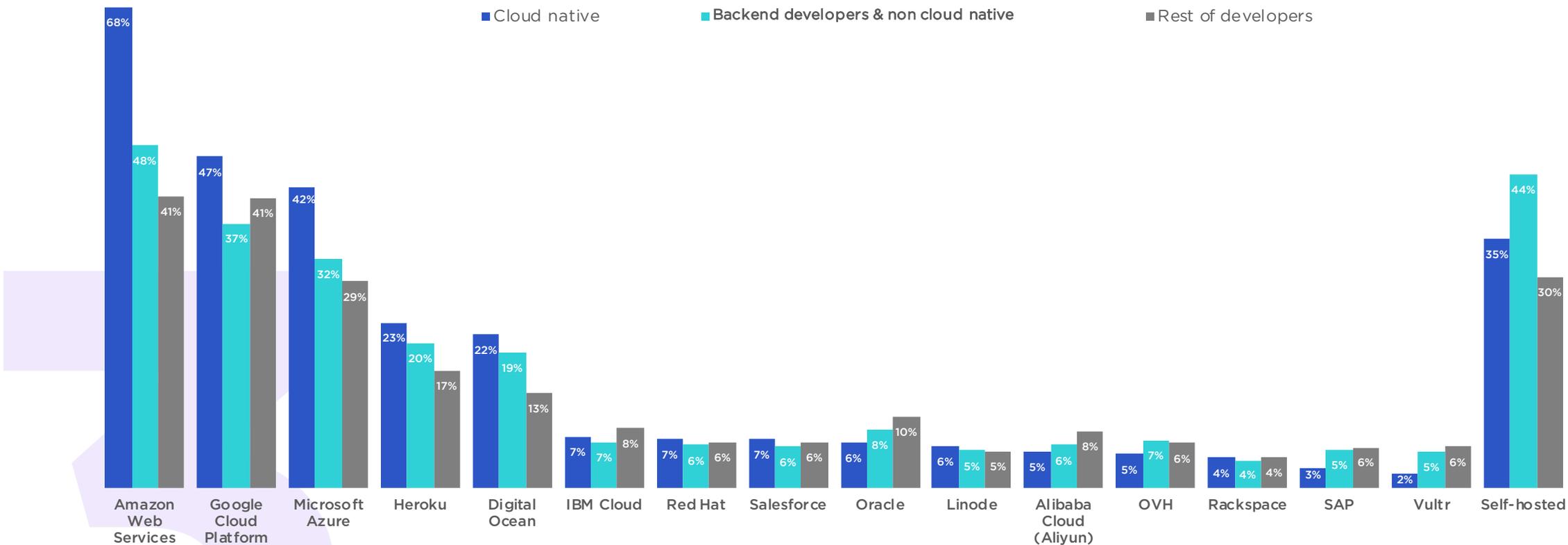
All three developer groups (non cloud native backend developers, cloud native backend developers, and the rest of the developer community) tend to use Google as a cloud platform at similar rates. Ten percentage points separate the three groups. Google's cloud platform provides many web development tools, making it more popular with front end developers. Front end developers are also more likely than the other two groups to use hosting services from large enterprise software vendors like IBM and Oracle.

3. USAGE OF CLOUD SERVICE VENDORS

AWS is more popular with cloud native developers

% of cloud developers (n=7,932)

Usage of cloud service vendors by cloud native, non cloud native and other developers



3. USAGE OF CLOUD SERVICE VENDORS

b) Private cloud usage by cloud native and non cloud native developers

As we saw earlier, 47% of cloud native developers are running code in a private cloud compared to 37% of developers that are not building cloud native apps. Many of these developers are using third parties to help manage these private clouds but the degree of usage varies across the two groups.

Cloud native developers are more inclined to use a third party to manage their private cloud. Many of these developers are using multiple third party vendors and are more likely to be using most of the vendors covered in our research than typical backend developers.

Cloud native developers are significantly more likely to use AWS as a private cloud vendor with 60% of cloud native developers using AWS as their private cloud vendor. However, the difference in usage of Microsoft as a private cloud vendor between cloud native developers and a typical backend developer is only marginal.

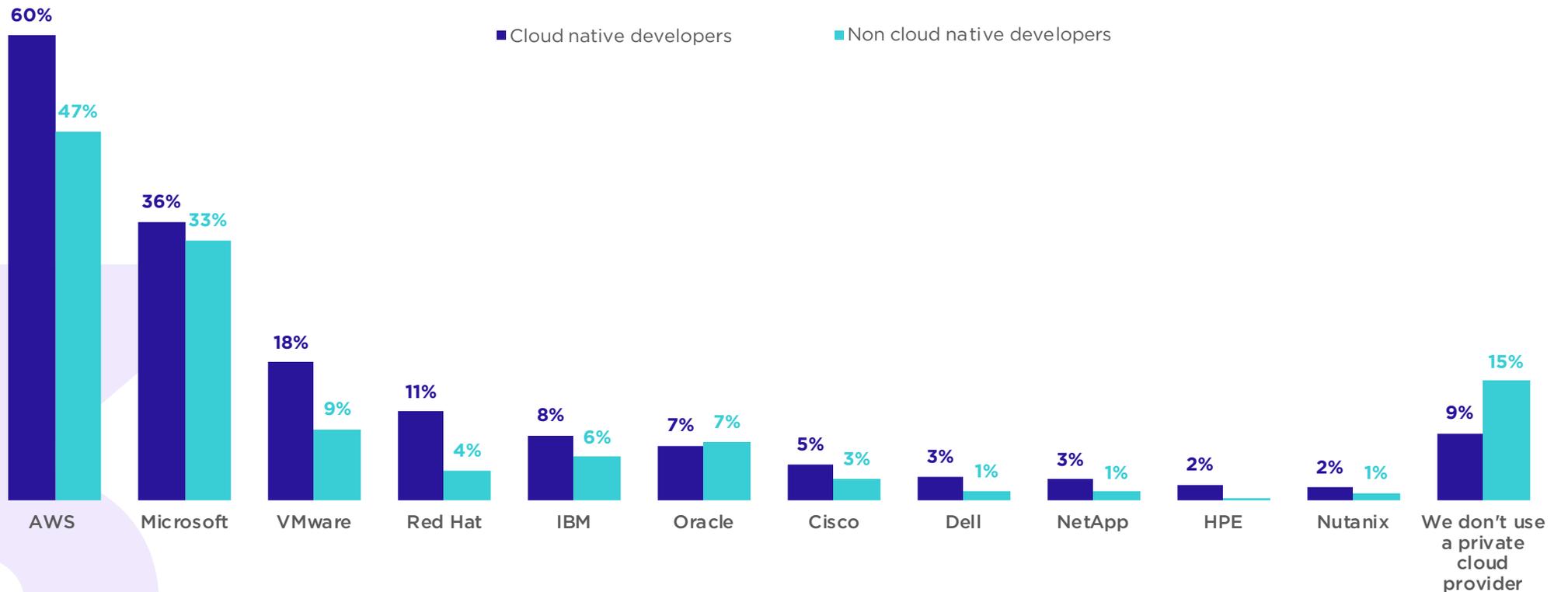
When we compare those that are using cloud native technologies to those that are not, cloud native developers are much more likely to be using VMware or Red Hat.

3. USAGE OF CLOUD SERVICE VENDORS

AWS is also more popular with cloud native developers as a private cloud

% of backend developers using a private cloud (n=2,776)

Private cloud usage by cloud native and non cloud native developers



4. AWARENESS AND USE OF KUBERNETES

a) 60% of developers using orchestration are using Kubernetes

Any developer interested in containers and cloud native technology is aware of Kubernetes as it has become the industry standard for orchestration. However, our research shows that not all these developers are using it, although a majority are. Sixty percent of developers are using orchestration engines or a CaaS, equating to 1.7 million developers using Kubernetes. Thirty percent of orchestration users are aware of Kubernetes but not using it, and the remaining 10% are not even aware of Kubernetes.

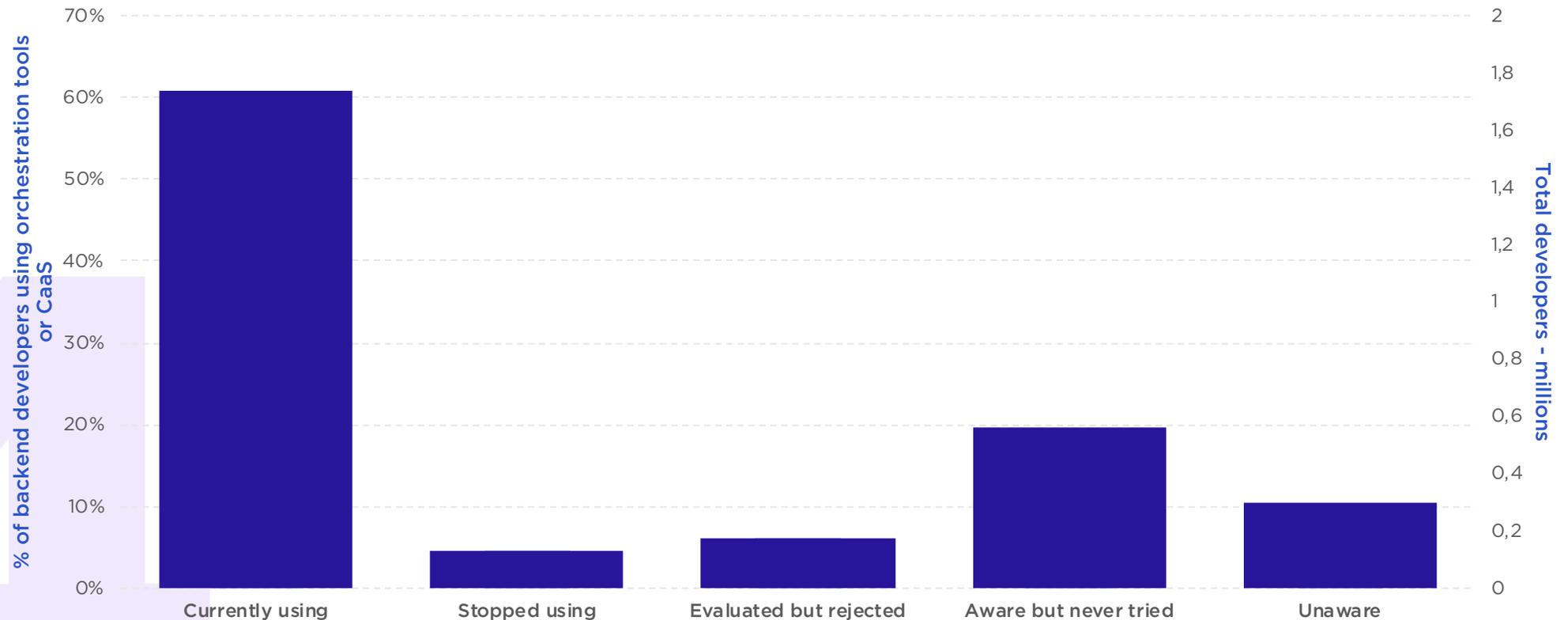


4. AWARENESS AND USE OF KUBERNETES

60% of developers using container orchestration are using Kubernetes

% of backend developers using orchestration tools or CaaS (n=807)

Kubernetes usage and awareness



4. AWARENESS AND USE OF KUBERNETES

b) 21% of developers using orchestration are using a CaaS but not Kubernetes

While Kubernetes has become the industry standard, developers are leveraging it in different ways, making it less apparent to some developers. Some developers are implementing Kubernetes on their own, while other developers are using a Containers-as-a-Service (CaaS) platform to help manage their Kubernetes clusters. Of developers using Kubernetes, 27% are using it without a vendor-supplied management layer or CaaS, and 39% are using Kubernetes with a CaaS.

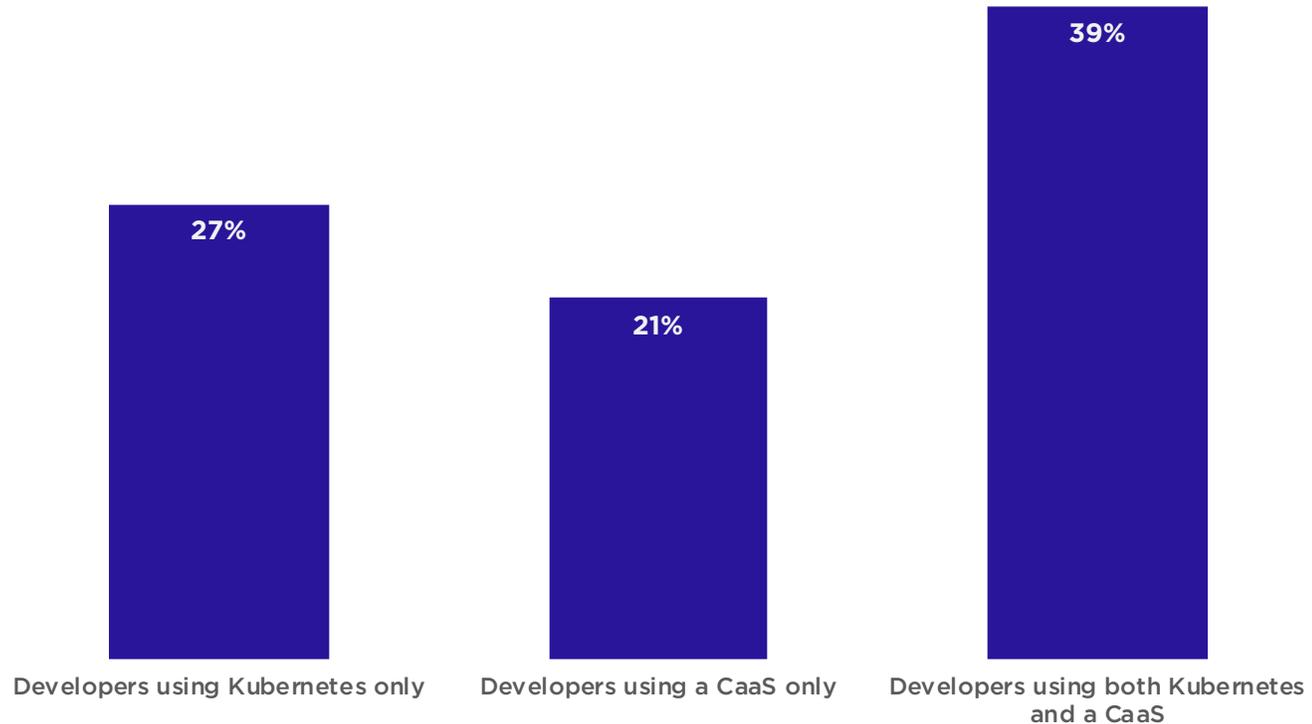
Our analysis also shows that 21% of developers using orchestration are using a CaaS but not Kubernetes. As the market standardises on Kubernetes as the underlying orchestration engine to run a CaaS offering, this 21% requires some additional exploration.

4. AWARENESS AND USE OF KUBERNETES

21% of developers using orchestration are using CaaS but not Kubernetes

% of backend developers using orchestration (n=899)

Overlap of Kubernetes and CaaS users



4. AWARENESS AND USE OF KUBERNETES

c) Developers not using Kubernetes use AWS ECS

The vast majority of the developers that are using a CaaS but not Kubernetes are using AWS ECS or EKS (68%). Presumably, these are mostly developers using the old ECS which is not built on Kubernetes. Azure Container Service is used by 25%, and 14% are using Docker Swarm.

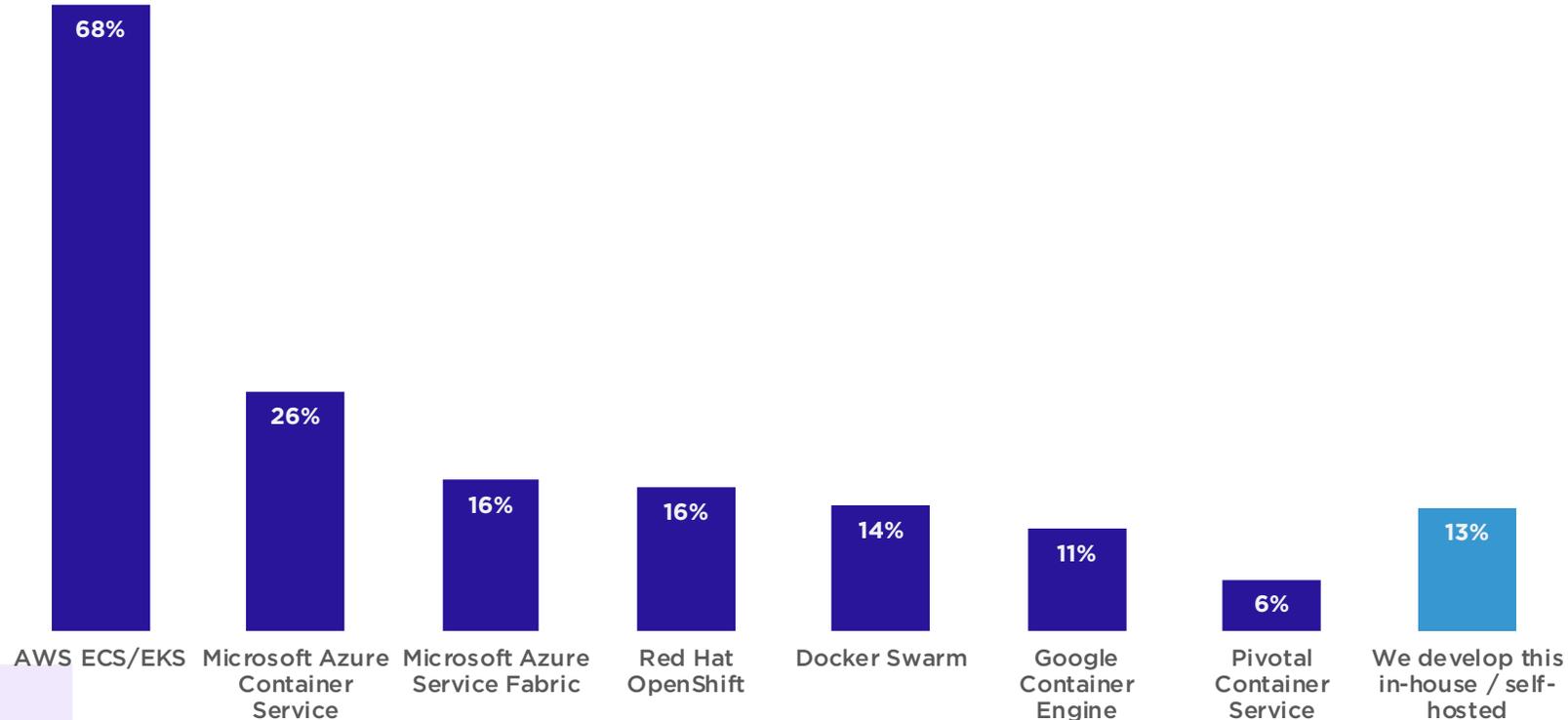
Curiously, 11% of those that say they are not using Kubernetes are using Google Container Engine (GCE). This may point to developers using GCE without realising that they are using Kubernetes under the hood or don't consider Kubernetes the primary technology but the management layer on top. This data suggests that, yes, it is possible that developers are using Kubernetes without knowing it or even being aware of the technology.

4. AWARENESS AND USE OF KUBERNETES

Developers not using Kubernetes use AWS ECS

% of backend developers using orchestration tools but not Kubernetes (n=175)

CaaS solutions used by developers not indicating they use Kubernetes



4. AWARENESS AND USE OF KUBERNETES

d) Kubernetes users influence buying decisions

Of those developers that have indicated that they are using Kubernetes, 71% are involved with making recommendations or influencing decision makers. This is 25 percentage points more than those developers that are not using Kubernetes.

In general, Kubernetes users tend to be more involved in the selection of developer tools throughout the process. Only 4% of Kubernetes users are not involved in the decision making process.

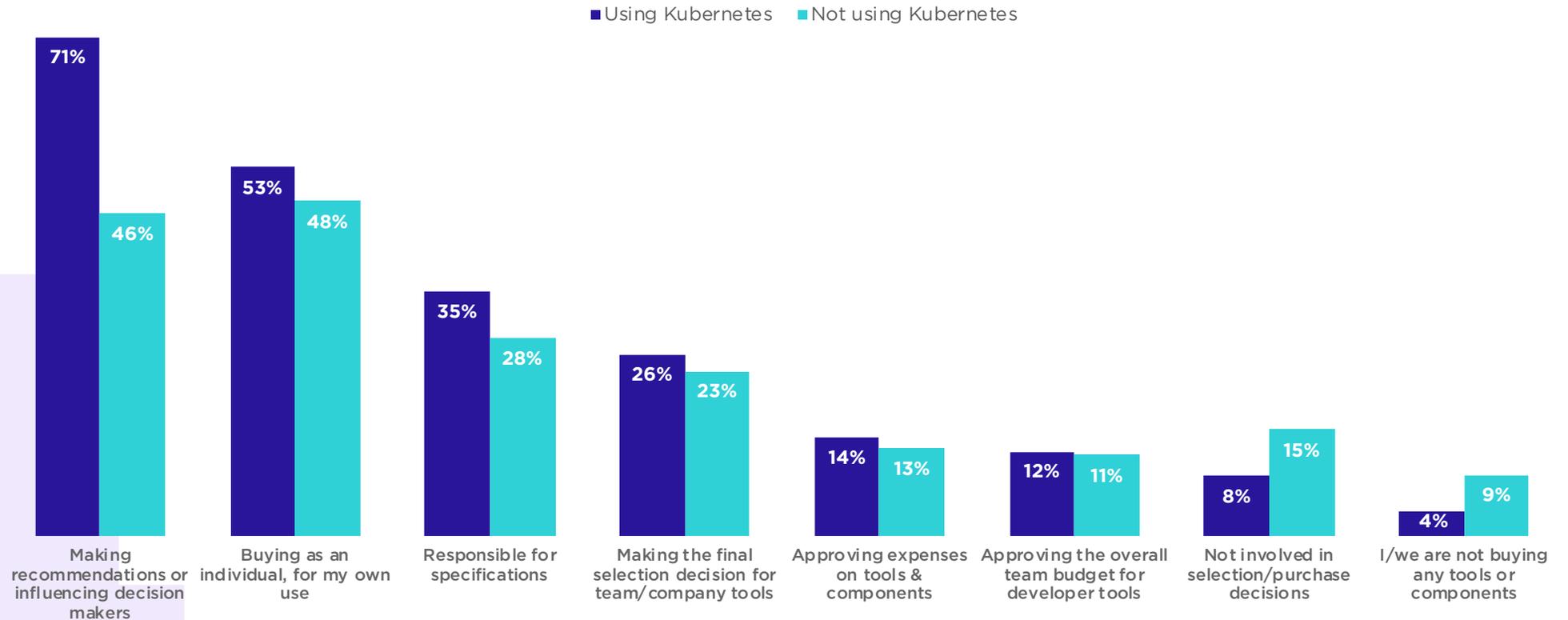
The greater influence of Kubernetes developers in the organisation helps explain its rapid adoption and standardisation in the industry. The fact that developers that say they are not using Kubernetes are less likely to be involved in the selection process may also explain how some developers are unaware that they are using the technology.

4. AWARENESS AND USE OF KUBERNETES

Kubernetes users influence buying decisions

% of backend developers using orchestration tools (n=1,680)

Influence in buying decision by Kubernetes users and Non Kubernetes users



5. SERVERLESS USAGE AND AWARENESS

a) Three players dominate the serverless market

Amazon birthed the serverless movement with the launch of Lambda and continues to enjoy the advantage of this early market entrance. Of the 3.3 million serverless users, 51% or 1.7 million developers are currently using Lambda, which is 21 percentage points ahead of Google Cloud Functions, its closest competitor. This is also 25 percentage points ahead of Azure Functions. Beyond these three vendors usage drops considerably.

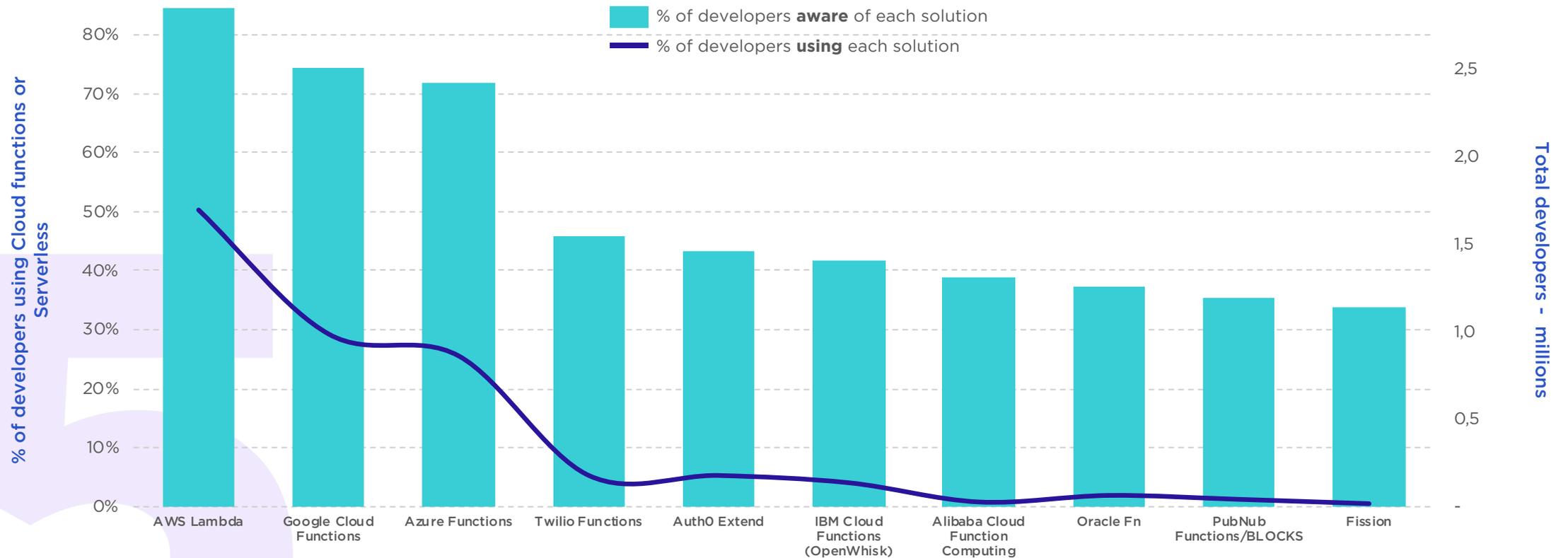
While Amazon is way ahead in usage, awareness of competing products, Google Cloud Functions and Azure Functions are at similar levels. Even though developers are aware of serverless offerings from Google and Azure, they are opting for AWS Lambda. Based on our research two important drivers in Lambda's continued popularity are its ease of use and scalability.

5. SERVERLESS USAGE AND AWARENESS

Three players dominate the serverless market

% of backend developers using cloud functions or serverless solutions (n=938)

Usage and awareness of serverless solution



5. SERVERLESS USAGE AND AWARENESS

b) Google Cloud Functions is more popular with business folks

The use of serverless vendors can vary based on developers' roles within an organisation. For example, Google is most competitive with business-focused developers. Developers that are also product managers/marketing/sales professionals and CEOs/Management are more likely to be using Google Cloud Functions compared to developers in other roles. These professionals are 15 to 17 percentage points more likely to be using Google Cloud Functions than their colleagues.

Amazon is the leader in the largest community: programmers and software developers, who make up 80% of serverless users. Among software developers, 30 percentage points separate usage of Lambda and Google Cloud functions.

Lambda has also gained a strong competitive position in the DevOps and Testing community with 72% of DevOps specialists and 73% of Tester/QA engineers using serverless using Lambda.

AWS is least dominant and Google is more competitive with UX and UI designers. Google is only 12 percentage points behind Lambda in usage by UI designers and 6 percentage points behind Lambda for UX designers.

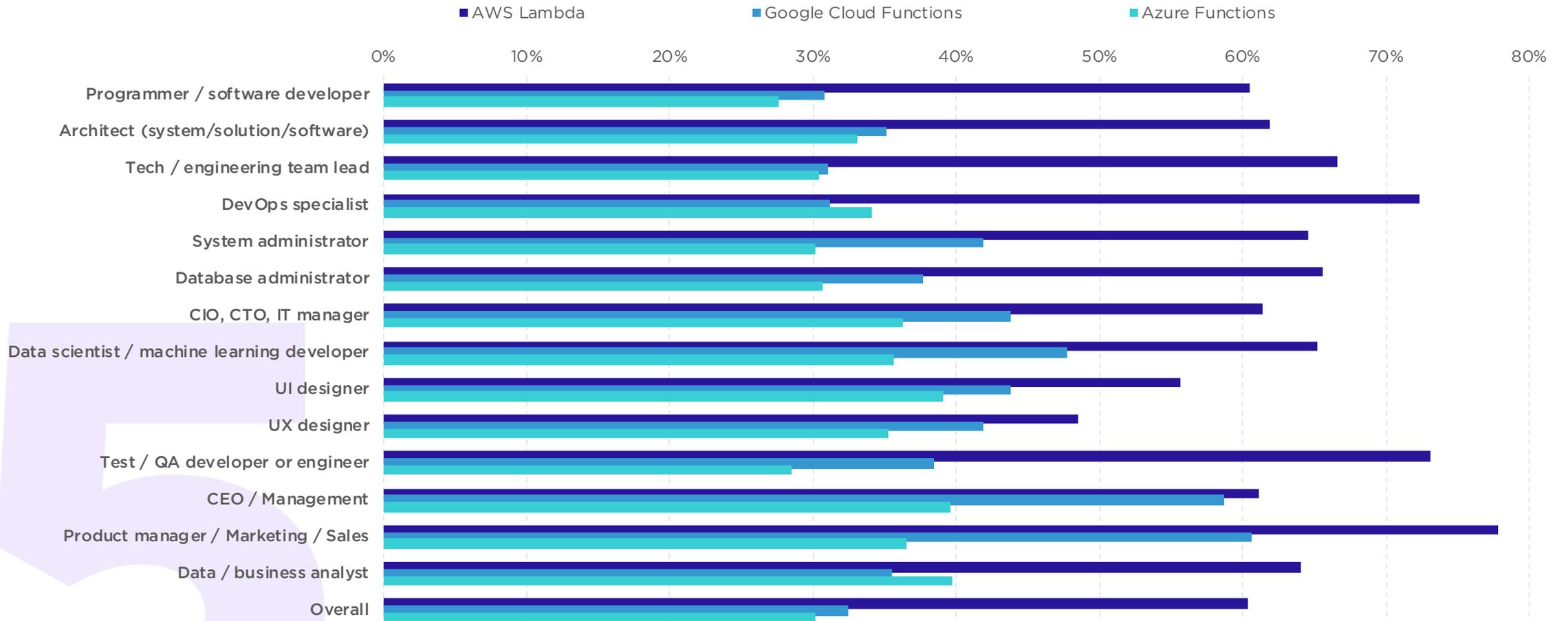
Microsoft Azure Functions finds the most adoption among data/business analysts. This is one of the only segments where Azure beats Google in usage. Azure is also only 24% less likely to be used compared to AWS Lambda. Microsoft's strong presence in the enterprise and the fact that Azure ML Studio is one of the most used machine learning platforms is presumably driving its popularity among data/business analysts.

5. SERVERLESS USAGE AND AWARENESS

Google Cloud Functions is more popular with business folks

% of backend developers using cloud functions or serverless solutions (n=938)

Usage of serverless solutions by role



METHODOLOGY

Developer Economics 17th edition reached 17,000+ respondents from 155 countries around the world. As such, the Developer Economics series continues to be the most global independent research on mobile, desktop, IoT, cloud, web, game, AR/VR, and machine learning developers and data scientists combined ever conducted. The report is based on a large-scale online developer survey designed, produced and carried out by SlashData over a period of eight weeks between June 2019 and August 2019.

Respondents to the online survey came from 155 countries, including major app, machine learning and IoT development hotspots such as the US, China, India, Israel, UK, and Russia and stretching all the way to Kenya, Brazil, and Jordan. The geographic reach of this survey is truly reflective of the global scale of the developer economy. The online survey was translated into eight languages in addition to English (simplified Chinese, traditional Chinese, Spanish, Portuguese, Vietnamese, Russian, Japanese, Korean) and promoted by more than 70 leading community and media partners within the software development industry.

To eliminate the effect of regional sampling biases, we weighted the regional distribution across eight regions by a factor that was

determined by the regional distribution and growth trends identified in our Developer Economy research. Each of the separate branches: mobile, desktop, IoT, cloud, web, games, augmented and virtual reality, and data science, and machine learning were weighted independently and then combined.

To minimise other important sampling biases across our outreach channels, we weighted the responses to derive a representative distribution for platforms, segments, and types of IoT project. Using ensemble modeling methods, we derived a weighted distribution based on data from independent, representative channels, excluding the channels of our research partners to eliminate sampling bias due to respondents recruited via these channels. Again, this was performed separately for each of mobile, IoT, desktop, cloud, web, games, augmented and virtual reality, and data science and machine learning.

For more information on our methodology please visit <https://www.slashdata.co/methodology>.

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TALK TO US WORK WITH US

We help you understand Developers.

If you could speak to 40,000+ developers what would you ask them?



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