THE STATE OF CLOUD NATIVE DEVELOPMENT

THE LATEST TRENDS FROM OUR Q4 2019 SURVEY OF 17,000+ DEVELOPERS

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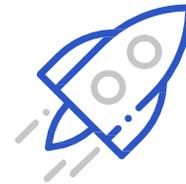
WHO DEVELOPERS ARE
Developer population sizing
Developer segmentation

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

WHERE THEY ARE GOING
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KEY FINDINGS

- 6.5 million cloud native developers exist around the globe, 1.8 million more than in Q2 2019.

- 2.7 million developers are using Kubernetes.

- 9 out of 10 developers using container orchestration tools are aware of Kubernetes.

- 4 million developers are using serverless architectures and cloud functions.

- 46% of serverless users are using AWS Lambda.

- 62% of cloud native developers are using AWS as a cloud hosting provider.

A. Defining cloud native computing

The way software is developed has drastically changed since containers came about and cloud native technology gained popularity. Commissioned by Cloud Native Computing Foundation (CNCF), /Data has performed an in-depth analysis of the cloud native developer ecosystem to better understand its current state and expected evolution. The analysis is based on /Data's Developer Economics biannual survey of 17,000+ software developers which was fielded between November 2019 and February 2020. 4,179 survey participants answered questions relating to the development of backend services and the technologies they use. This report is based on their responses.

What do we mean by a cloud native developer? We use CNCF's definition of cloud native computing as a guide for this analysis:

"*Cloud native technologies empower organisations 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.*"

In our survey, cloud developers were asked what technologies they use 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 which supports other devices. These servers could be housed on-premise or in a third party's data centre. These developers' answers help us to identify true cloud native developers.

As CNCF was initially developed around Kubernetes and container orchestration, we consider these to be at the core of cloud native computing. 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 remains exactly that: only the first step.

B. Market size

Our estimates put the global number of cloud native developers at 6.5 million, or 44% of backend developers. This includes 4.3 million who are using orchestration and 4 million who are using cloud functions or serverless architecture. This corresponds to 29% and 27% of backend developers respectively.

The above estimate also considers the 1.8 million developers that are using both orchestration and serverless technologies, corresponding to 12% of backend developers.

C. Usage of cloud native technologies across regions

As shown in our Q2 2019 report, the adoption of containers and cloud native technologies varies greatly by region. That being said, **in the last six months, there has been a significant increase in the global adoption of cloud native technologies**, especially for containers and container orchestration tools.

More than half of backend developers around the world are using containers, with North America, South America, Europe, and Oceania leading the way. 60% of developers from these regions report that they have implemented containers in their backend development tasks in the last 12 months. Compared to Q2 2019, **there has been, on average, an increase of 10 percentage points (pp) in the use of containers.** Oceania shows the largest increase (+16 pp), while Eastern Europe the smallest (+5 pp). These patterns indicate that the use of containers is gradually becoming a standard procedure in the production of backend services. We predict that the penetration of containers will continue in the following months as the technology improves and gains further popularity among developers.

The increase in the adoption of container orchestration tools closely resembles the positive trend for containers, with an average increase of about 7 pp compared to Q2 2019. With the exception of Oceania, where the increase has only been 2 pp, in all regions, the use of orchestration tools has seen a significant increase in penetration, ranging from +6 to +10 pp. North America, South America, and Europe lead the way with an adoption rate of over 30%. This indicates that, as the use of containers becomes more common, the need for tools that allow developers to manage and orchestrate workflow in an efficient manner also becomes more evident. Whether developers choose a self-implemented solution, such as Kubernetes, or opt for a CaaS or orchestration platform likely depends on their skill set, as well as on their need to exercise control over specific features of the tools.

As opposed to the significant increase in the penetration of orchestration tools, **the usage of cloud functions and serverless architecture has instead remained stable**, with most of the regions showing none to little increase in adoption - on average, +3 pp - compared to Q2 2019. North America (36%), South Asia (32%), and Oceania (29%) are the regions with the highest adoption rates for cloud functions and serverless architecture, whereas Eastern Europe has the lowest adoption rate (19%).
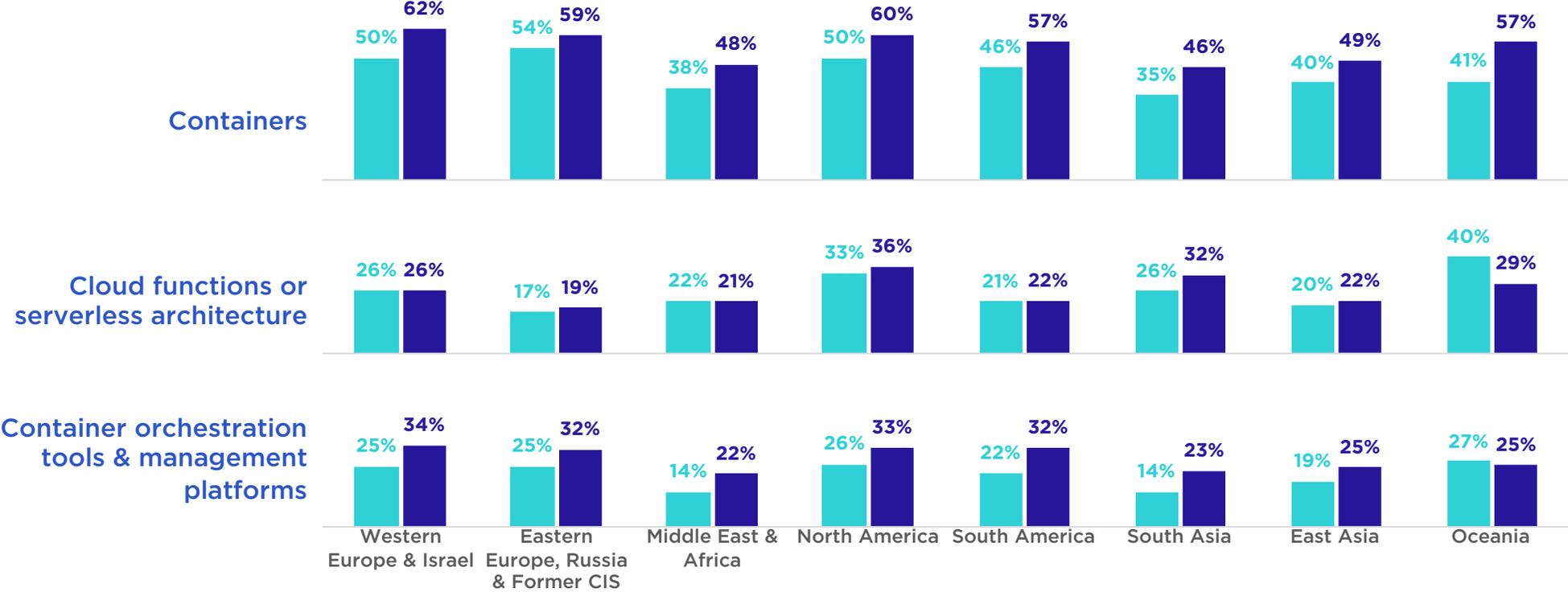
Cloud native is more widely used in Europe, America, and Oceania but is rapidly growing in MEA and Asia as well

% of backend developers in each region (Q2 2019 n=4,096 | Q4 2019 n=4,179)

Usage of cloud native technologies across regions

■ Q2 2019   ■ Q4 2019

Containers

	Western Europe & Israel	Eastern Europe, Russia & Former CIS	Middle East & Africa	North America	South America	South Asia	East Asia	Oceania
Q2 2019	50%	54%	38%	50%	46%	35%	40%	41%
Q4 2019	62%	59%	48%	60%	57%	46%	49%	57%

Cloud functions or serverless architecture

	Western Europe & Israel	Eastern Europe, Russia & Former CIS	Middle East & Africa	North America	South America	South Asia	East Asia	Oceania
Q2 2019	26%	17%	22%	33%	21%	26%	20%	40%
Q4 2019	26%	19%	21%	36%	22%	32%	22%	29%

Container orchestration tools & management platforms

	Western Europe & Israel	Eastern Europe, Russia & Former CIS	Middle East & Africa	North America	South America	South Asia	East Asia	Oceania
Q2 2019	25%	25%	14%	26%	22%	14%	19%	27%
Q4 2019	34%	32%	22%	33%	32%	23%	25%	25%

A. Infrastructure usage by cloud native developers and non-cloud native developers

One of the greatest advantages of using containers and cloud native technologies is the flexibility with which organisations can operate. Developers can leverage distributed infrastructures to allocate workloads in an optimal way for any particular job. In this section, we analyse how cloud native developers are taking advantage of this flexibility and where they are running their code as compared to developers that are not developing natively on the cloud.

We asked backend developers if they are running code on public clouds, private clouds, hybrid clouds, multi clouds, or on-premise servers. These options are not mutually exclusive. For greater clarity, within the survey, we define a 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 combination of public and private clouds for a single project, and multi clouds as using multiple public clouds for a single project.

Compared to non-cloud native developers, **developers using cloud native technologies rely on a wider variety of computing infrastructures**. In fact, they are more likely to be running code in all of the cloud environments that we covered (private cloud, public cloud, hybrid cloud, and multi cloud). Our data shows that 3.2 million developers (49%) are running backend code on a public cloud, 2.7 million (41%) on a private cloud, 3 million (46%) on on-premise servers, 1.8 million (28%) on hybrid clouds, and 1.6 million (25%) on multi clouds.

At first glance, there seems to be a decrease in the usage of public clouds compared to six months ago. In our Q2 2019 survey, however, the option of multi cloud was not present. Therefore, to correctly assess the trend in the usage of public clouds, we need to compare the Q2 2019 public clouds figures to the Q4 2019 combined figures for multi and public clouds, since several developers who reported using public clouds, among others, in Q2 2019 selected the available multi-cloud option in Q4 2019. By doing this, we find that there is no drop in the usage of public clouds. In fact, by looking at those who are using either public and/or multi clouds, **we see that the use of public clouds by cloud native developers has grown 1 pp in the last six months**. Non-cloud native developers' usage of public clouds instead decreased by 7 pp.

A. Infrastructure usage by cloud native developers and non-cloud native developers

In six months, the usage of private and hybrid clouds has decreased for both cloud native and non-cloud native developers. Such attrition could be attributed to developers who were leveraging both public and private/hybrid cloud infrastructures and decided to drop the latter. Since public cloud vendors are implementing stricter security controls in response to users' concerns, public clouds are benefitting from increasing levels of trust.

As was also the case in Q2 2019, **there is no difference in the usage of on-premise servers between cloud native and non-cloud native developers.** This indicates that cloud native developers see the flexibility offered by the cloud as an add-on feature to their existing on-premise servers, which they are not otherwise willing to abandon. This behaviour could be explained by several factors. For instance, companies' policies may request developers to run their code on on-premise servers to maintain a certain level of security and control over the data.
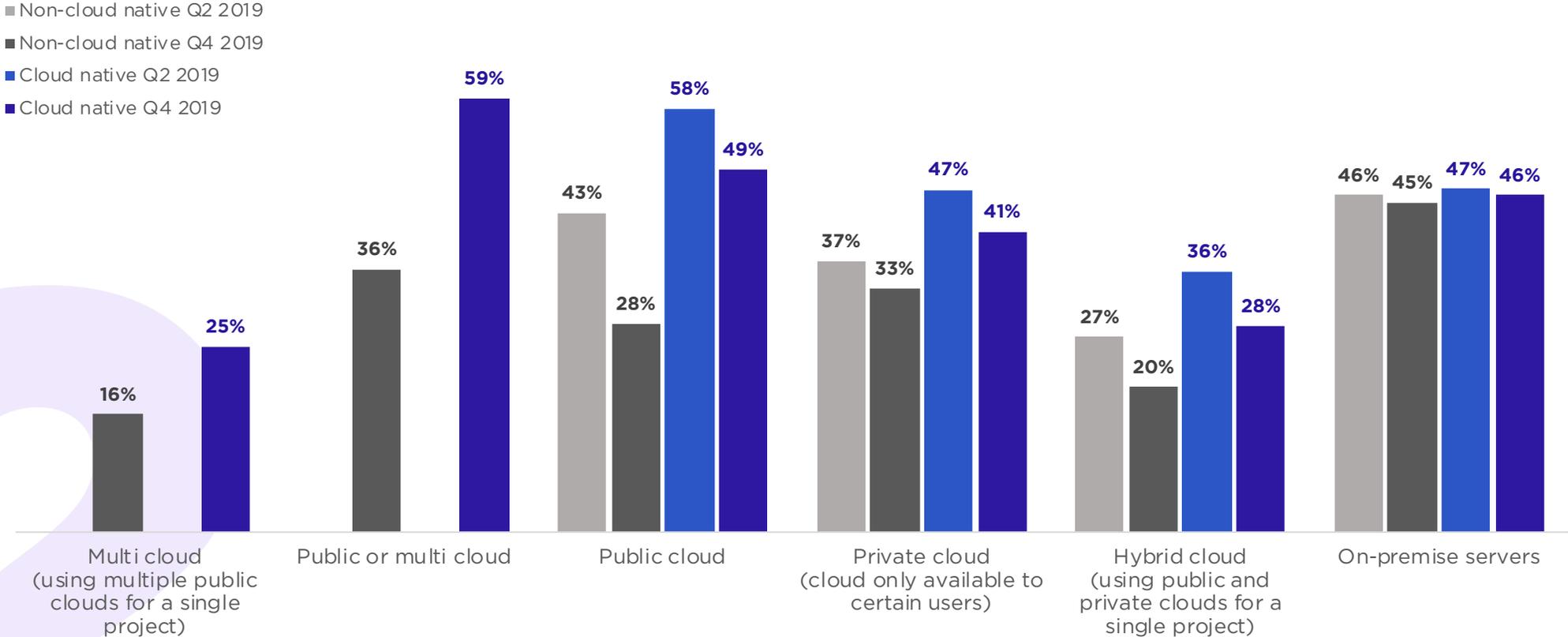
The usage of private and hybrid clouds for both cloud native and non-cloud native developers has decreased

% of backend developers (Q2 2019 n=5,416 | Q4 2019 n=5,499)

Where cloud native developers run their code

Legend:
- Non-cloud native Q2 2019
- Non-cloud native Q4 2019
- Cloud native Q2 2019
- Cloud native Q4 2019

Multi cloud (using multiple public clouds for a single project)
- 16%
- 25%

Public or multi cloud
- 36%
- 59%

Public cloud
- 43%
- 28%
- 58%
- 49%

Private cloud (cloud only available to certain users)
- 37%
- 33%
- 47%
- 41%

Hybrid cloud (using public and private clouds for a single project)
- 27%
- 20%
- 36%
- 28%

On-premise servers
- 46%
- 45%
- 47%
- 46%

Note: In Q2 2019 "Multi cloud" was not available as an option

KEY INSIGHTS FOR THE CLOUD NATIVE COMPUTING FOUNDATION THE STATE OF CLOUD NATIVE DEVELOPMENT Q4 2019

B. Cloud native developers and their infrastructure usage by verticals

Vertical industries significantly differ in how they allocate resources to cloud native development. In this section, we look within and across industries to identify those where backend developers are the most and the least likely to leverage specific infrastructures.

Developers working in **software** companies are more likely to run their code on public or multi clouds (71%) than on private clouds or on-premise servers (48% and 49%, respectively). Compared to the average of other industries, software firms are significantly less likely to run code on on-premise servers and hybrid clouds. These patterns may be explained by two different factors; one relates to the ongoing production of software, and the other to its maintenance after deployment. Developers tend to work simultaneously on the development of software, therefore needing large computing resources. Public clouds typically cut down on management expenses, compared to both on-premise servers and private clouds, making development more efficient and less costly. Additionally, once the software is deployed, relying on public clouds allows companies to fully exploit the scalability and portability that this infrastructure offers. Bugs can be more easily fixed and new versions released.

Industries where high levels of security are needed because of sensitive data being handled, such as **government and defence, and telecommunications and networks,** show a very specific pattern. Their reliance on on-premise servers (both 64%) is significantly above the average of the other industries, whereas their usage of public or multi clouds (64% and 65%, respectively) is significantly below the average.

Long-established firms, such as those investing in **energy,** including oil, gas, electricity, and water, and in **automotive**, are leveraging both public clouds (64% and 67%, respectively) and on-premise servers (both 60%). These findings suggest that these industries may actually be willing to embrace cloud native technologies and exploit the scalability and flexibility granted by these technologies. However, the large amount of data they have stored in on-premise servers may be slowing down their full migration to the cloud.

On the other hand, industries where content and data need to be readily available and easily accessible to end users, such as **entertainment, real estate, tourism, and non-profit organisations**, are strongly in favour of having their software running on cloud infrastructures, be it public, multi, hybrid or even private.

Cloud usage varies greatly by vertical industries

% of backend developers using any technology (n=1,445)

Overall usage of industries

Vertical industries
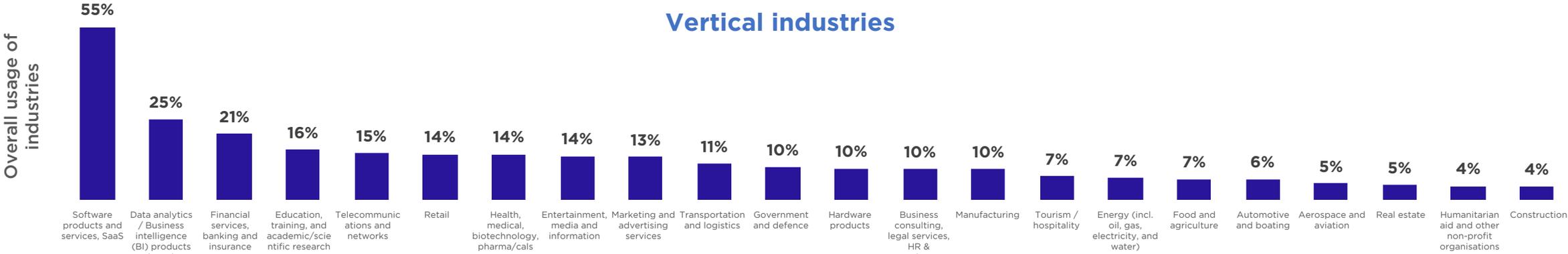
	Software products and services, SaaS	Data analytics / Business intelligence (BI) products and services	Financial services, banking and insurance	Education, training, and academic/scientific research	Telecommunications and networks	Retail	Health, medical, biotechnology, pharma/cals	Entertainment, media and information	Marketing and advertising services	Transportation and logistics	Government and defence	Hardware products	Business consulting, legal services, HR & recruitment services	Manufacturing	Tourism / hospitality	Energy (incl. oil, gas, electricity, and water)	Food and agriculture	Automotive and boating	Aerospace and aviation	Real estate	Humanitarian aid and other non-profit organisations	Construction
	55%	25%	21%	16%	15%	14%	14%	14%	13%	11%	10%	10%	10%	10%	7%	7%	7%	6%	5%	5%	4%	4%
Public cloud	61%	53%	56%	62%	55%	60%	58%	55%	63%	61%	56%	61%	62%	60%	64%	64%	62%	67%	56%	63%	72%	72%
Multi cloud	32%	35%	34%	32%	39%	40%	29%	31%	40%	29%	35%	37%	44%	34%	32%	37%	36%	30%	42%	47%	39%	44%
Public or multi cloud	71%	66%	67%	71%	65%	72%	67%	66%	73%	70%	64%	72%	74%	70%	72%	73%	74%	75%	69%	72%	81%	79%
Private cloud (cloud only available to certain users)	48%	53%	52%	46%	51%	46%	46%	55%	53%	44%	55%	51%	51%	58%	48%	52%	47%	47%	67%	61%	46%	54%
Hybrid cloud (using public and private clouds for a single project)	33%	37%	40%	35%	38%	38%	31%	39%	40%	39%	30%	42%	42%	45%	36%	35%	39%	41%	49%	51%	37%	47%
On-premise servers	49%	52%	57%	56%	64%	51%	57%	54%	52%	48%	64%	59%	57%	64%	51%	60%	53%	60%	69%	61%	61%	64%

Legend:
- <5pp below the average of other verticals
- 2.5 – 5pp below the average of other verticals
- ±2.5pp around the average of other verticals
- 2.5 – 5pp above the average of other verticals
- >5pp above the average of other verticals

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

Next, we look at which cloud vendors are used by cloud native developers. We compare their vendor preferences to those of traditional backend developers and to those of other developers writing frontend code or other types of software.

Amazon is the most used cloud vendor among backend developers, both for cloud native (62%) and non-cloud native (45%). Cloud native developers are, however, 17 pp more likely to use it than non-cloud native developers. With a very wide range of services offered to significantly improve the experience of building cloud native applications, AWS allows cloud native developers to focus their efforts on building their products, rather than being worried about the infrastructure supporting the app.

Fifteen pp behind AWS is Google Cloud Platform, which is the second most used vendor for cloud native developers (47%). These developers are 11 pp more likely to use Google than other backend developers. Google is also the cloud vendor that is most used by frontend and other developers (44%), who are likely attracted by the rich selection of web development tools that Google Cloud Platform offers. Frontend developers are also more likely than the other two groups to use hosting services from large enterprise software vendors such as IBM and Oracle.

The third most used platform for cloud native developers is Microsoft Azure, right behind Google Cloud Platform with 5 pp of difference. Cloud native developers are about ten pp more likely to rely on public cloud services by Microsoft Azure than the rest of the developers.

When it comes to self-hosted solutions, cloud native developers are only 4 pp less likely to deploy software on self-hosted servers than non-cloud native developers. As we discussed earlier, this suggests that despite developers deploying their code natively, they have not abandoned self-hosted servers, which grant them greater security and control over data.
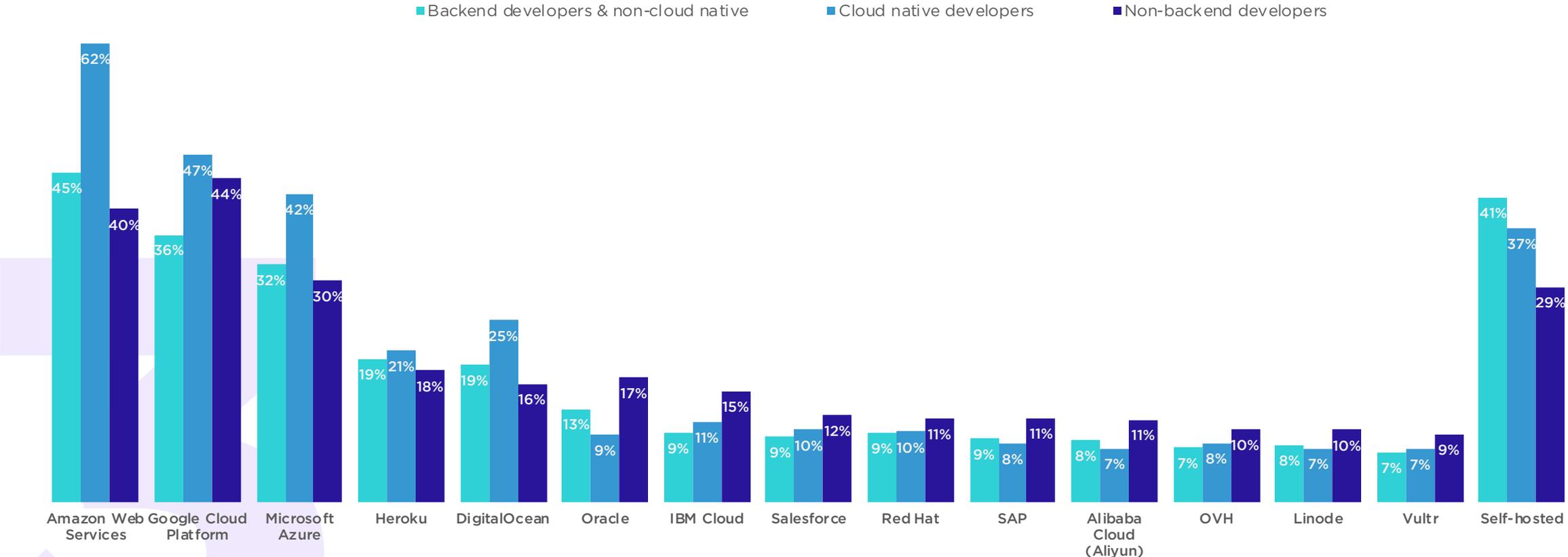
Compared to Q2 2019, AWS has lost 6 pp with cloud native developers, who have shown a small, yet consistent shift (i.e., +2-4 pp) towards vendors with smaller cloud communities, such as DigitalOcean, Salesforce, Red Hat, and SAP. These patterns suggest that the market is still growing and that there are opportunities for minor vendors to grow their share of the market.

B. Private cloud usage by cloud native and non-cloud native developers

As we saw earlier, 41% of developers who are deploying software natively run their code on private clouds, compared to 33% of non-cloud native developers. In our survey, we define a private cloud as one that is only available to certain users regardless of whether it is hosted on-premise or in a third party's infrastructure. Therefore, some of these developers use third parties to manage private clouds. In this section, we compare cloud native to non-cloud native developers with respect to their usage of third parties to manage private clouds.

Overall, **cloud native developers show a greater tendency to use third parties to manage private clouds.** Many of these developers are also using multiple third-party vendors more extensively than traditional backend developers. Compared to on-premise servers, relying on third parties cuts down on expenses by reducing managing efforts and ensuring secure infrastructure. These factors are seen as strongly appealing to cloud native developers.

The most used vendor is Amazon with 52% of cloud native developers using it to manage private clouds, compared to 35% of non-cloud native developers. Since Q2 2019, AWS has experienced an attrition rate of 7 and 8 pp among non-cloud native and cloud native developers, respectively. Since the cloud native population is growing, competing vendors are catching up with AWS to claim part of the growing population, and therefore AWS is losing market share. Similarly, developers new to the cloud native ecosystem might come with potential new needs that are not fully covered by the AWS offering.

Nevertheless, AWS continues to hold onto first place. More than 10 pp behind AWS, Google (41%) and Microsoft (37%) are the second and third most competitive cloud service vendors among developers deploying software on private clouds. The difference in the usage of Google and Microsoft by cloud native and other backend developers is 15 and 8 pp, respectively.
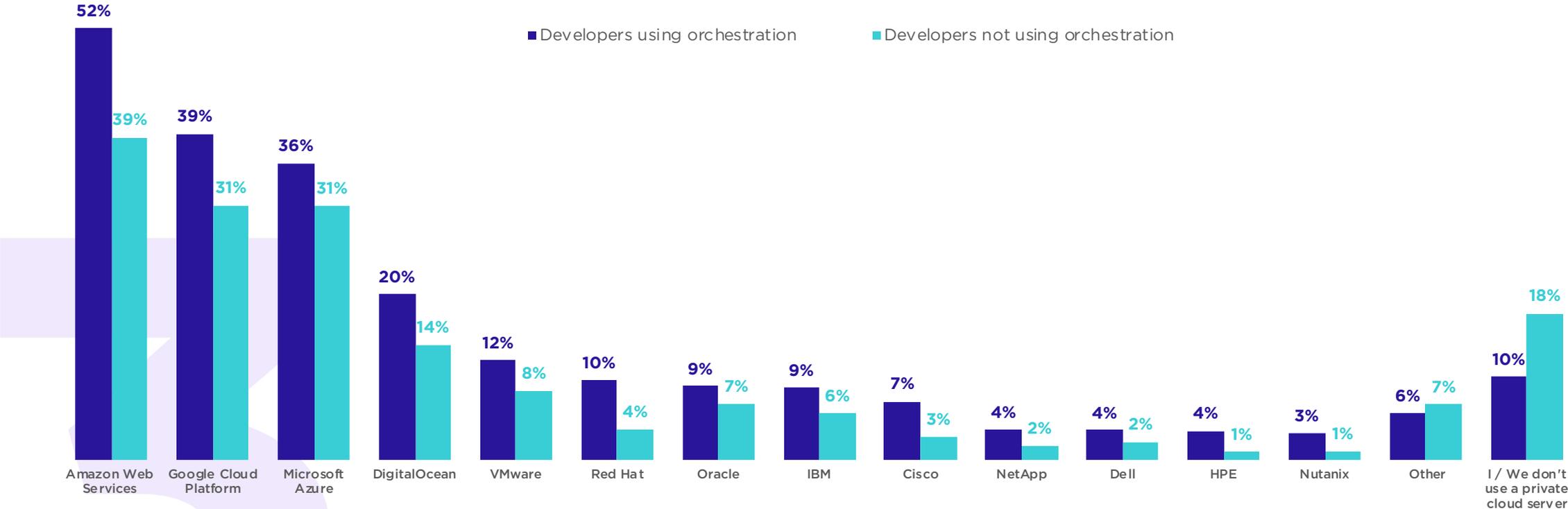
Comparing those that are using cloud native technologies to those that are not, cloud native developers are also much more likely to be using DigitalOcean or Red Hat. DigitalOcean, already one of the most popular virtual private server (VPS) vendors, has recently invested in improving the experience of cloud native users, whilst Red Hat is building a whole system based on open source. Both factors, user experience and the fact that it is open source, may be very attractive for cloud native developers.

Amazon is the most popular vendor with cloud native developers leveraging private clouds

% of backend developers (n=2,776)

Private Cloud usage

■ Developers using orchestration   ■ Developers not using orchestration

Vendor	Using orchestration	Not using orchestration
Amazon Web Services	52%	39%
Google Cloud Platform	39%	31%
Microsoft Azure	36%	31%
DigitalOcean	20%	14%
VMware	12%	8%
Red Hat	10%	4%
Oracle	9%	7%
IBM	9%	6%
Cisco	7%	3%
NetApp	4%	2%
Dell	4%	2%
HPE	4%	1%
Nutanix	3%	1%
Other	6%	7%
I / We don't use a private cloud server	10%	18%

A. Kubernetes and containers: usage and awareness among backend developers

Since the first release of Kubernetes in 2015, it has been the most popular way to efficiently manage multiple, interconnected containers.

We asked over 5,000 backend developers about their awareness and usage of both Kubernetes and containers. This large sample comprises both cloud native developers and non-cloud native and provides an unbiased picture of how well-known these cloud native technologies are among the whole population of backend developers.

In this section, we explore backend developers' awareness and usage of Kubernetes in relation to containers. It is evident from our data that **while containers are popular among backend developers, not all have heard of or use Kubernetes as a tool to manage them**. Whereas 59% of backend developers have used containers in the last 12 months, only 27% of developers have used Kubernetes to manage them. Furthermore, 23% of backend developers say they have heard of Kubernetes, but are not sure about what it does, compared to 13% for containers, and another 14% say they have not even heard of it, compared to 5% for containers.

Why is Kubernetes less well-known among backend developers? By collecting responses from a large sample of backend developers, including those who are not involved in cloud native development, we expected to see a discrepancy between containers and Kubernetes. The adoption of containers drastically changed the way software is developed, shifting away from a monolithic vision of software towards a much more flexible, scalable, and portable version of it. Such a revolution has likely reached a large portion of backend developers, including those who are not deploying software natively. Therefore, the awareness of containers has skyrocketed.

On the other hand, Kubernetes has likely experienced a more delimited reach. Despite its undoubted contribution to the noted technological shift, its popularity may have reached mostly backend developers who were already interested in or heading towards cloud native computing. Indeed, our data shows that **9 out of 10 cloud native developers who actively use container orchestration tools are aware of Kubernetes.**
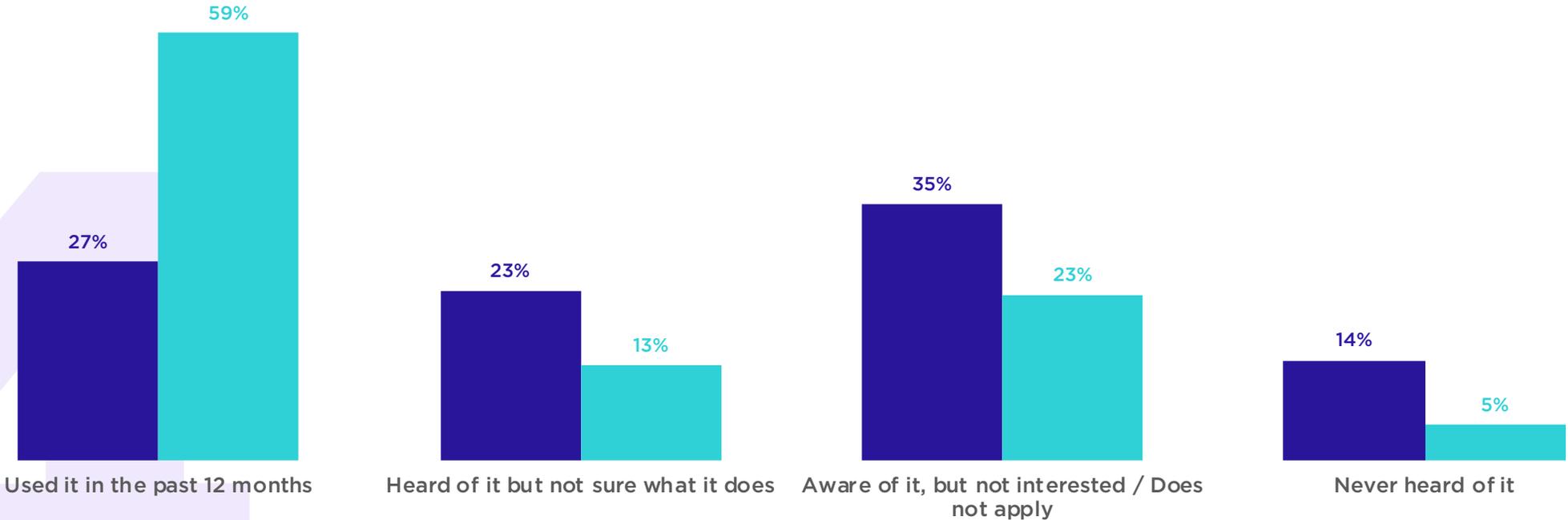
Kubernetes has plenty of room to grow in terms of awareness and adoption

% of backend developers (n=5,469)

Cloud native technology usage and awareness

■ Kubernetes   ■ Containers (e.g. Docker containers)

	Used it in the past 12 months	Heard of it but not sure what it does	Aware of it, but not interested / Does not apply	Never heard of it
Kubernetes	27%	23%	35%	14%
Containers	59%	13%	23%	5%

B. Overlap of Kubernetes and CaaS users

In this section, we go a level deeper and look at the usage of Kubernetes by developers using orchestration tools. Of these developers, almost half say they are using a CaaS solution in combination with Kubernetes. Less than a fifth report that they are exclusively using either a CaaS solution (19%) or Kubernetes (15%). These patterns suggest that there is a large overlap between developers using Kubernetes, and those relying on a platform where an orchestration engine runs under the hood.

Compared to Q2 2019, there has been a significant increase in the percentage of developers using both Kubernetes and CaaS products, paired with a significant decrease in the number of developers using Kubernetes exclusively. This suggests that fewer developers are building their own Kubernetes implementations and are gradually moving towards CaaS solutions, which are less challenging and demanding from a technical point of view. With the growing popularity of cloud native technologies, organisations will likely need CaaS solutions that are accessible to people with different skill sets and degrees of experience with orchestration tools.

4. AWARENESS AND USE OF KUBERNETES

There has been a significant increase in the usage of Kubernetes in combination with any CaaS solution

% of backend developers using orchestration (Q2 2019 n=899 | Q4 2019 n=1,038)

Overlap of Kubernetes and CaaS users

■ Q2 2019   ■ Q4 2019

39%	46%

Developers using Kubernetes and Caas

21%	19%

Developers using CaaS only

27%	16%

Developers using Kubernetes only

C. Solutions used by developers not indicating they use Kubernetes

In this section, we look at developers using orchestration tools who reported not using Kubernetes. AWS ECS/EKS is by far the most used solution amongst those who say they are not using Kubernetes, followed by Google Kubernetes Engine (GKE), Docker Swarm, and Azure's offering, each reaching about one quarter of developers.

However, it is important to highlight that some of the most popular orchestration tools are managed Kubernetes services, with a Kubernetes engine running under the hood, such as AWS, EKS, GKE, or Microsoft AKS. This suggests that developers may either be unaware of the engine underlying the solution or do not consider that as using Kubernetes. Nevertheless, **this shows that the market is strongly shaped by Kubernetes and managed Kubernetes services.**

Popular CaaS solutions have a Kubernetes engine running under the hood

% of backend developers using orchestration tools but not self-managed Kubernetes (n=200)

Solutions used instead of Kubernetes

Managed Kubernetes solutions

- 68% — AWS ECS/EKS
- 27% — Google Kubernetes Engine
- 24% — Microsoft Azure Kubernetes Service (AKS)
- 15% — Red Hat OpenShift Container Platform
- 12% — Pivotal Container Service
- 26% — Docker Swarm
- 22% — Microsoft Azure Service Fabric
- 9% — HashiCorp Nomad
- 8% — Helios
- 7% — Mesosphere DC/OS
- 24% — We develop this in-house / self-hosted
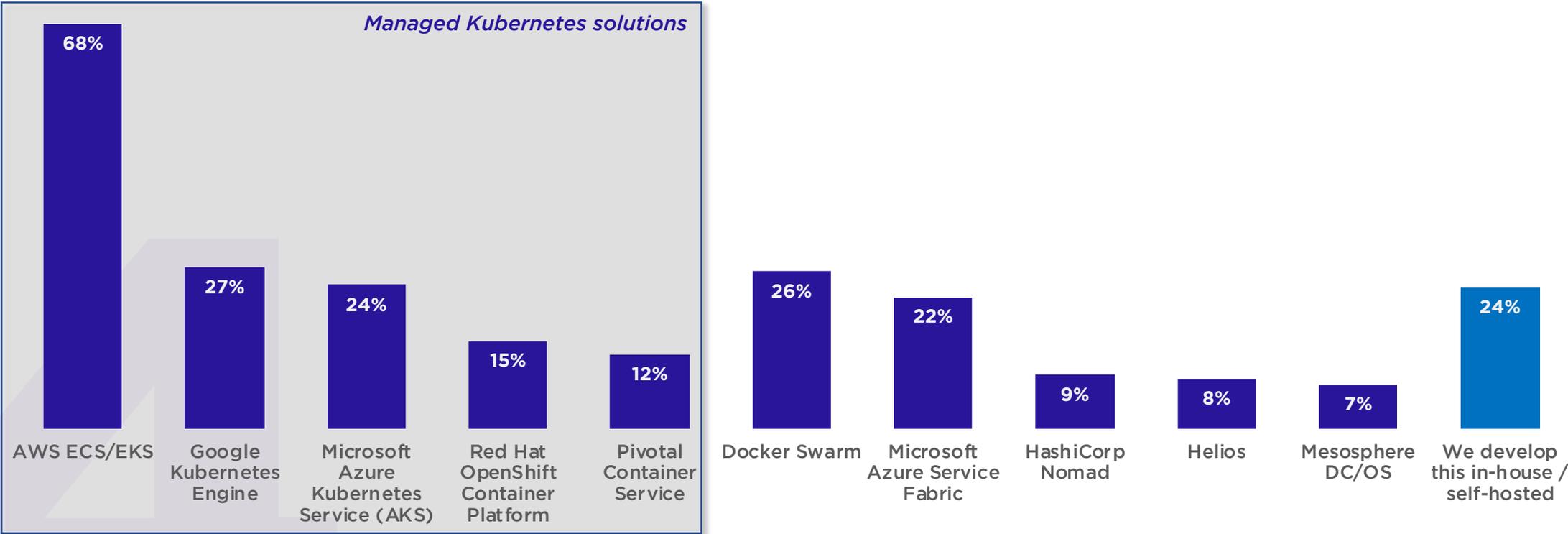
A. Usage and awareness of serverless solutions

As we noted in the introduction, 4 million developers are using cloud functions or a serverless architecture. This corresponds to 27% of the backend population. Here, we look at which serverless solutions are the most popular among cloud native developers.

AWS Lambda continues to be the most used serverless solution with 46% of serverless developers using it. Google Cloud Functions and Azure Functions follow with 38% and 29%, respectively. Lambda's primacy stems from the fact that it was the first serverless product to be put on the market. Compared to Q2 2019, though, Google has advanced notably, gaining 8 pp in the last six months.

Overall, the top three competitors are getting closer in terms of both awareness and adoption and leaving behind other vendors, for which usage and awareness drops considerably.

The market is dominated by the top three vendors

% of backend developers using cloud functions or serverless solutions (n=1,104)

Usage and awareness of serverless solution

- % of developers **aware** of each solution
- % of developers **using** each solution
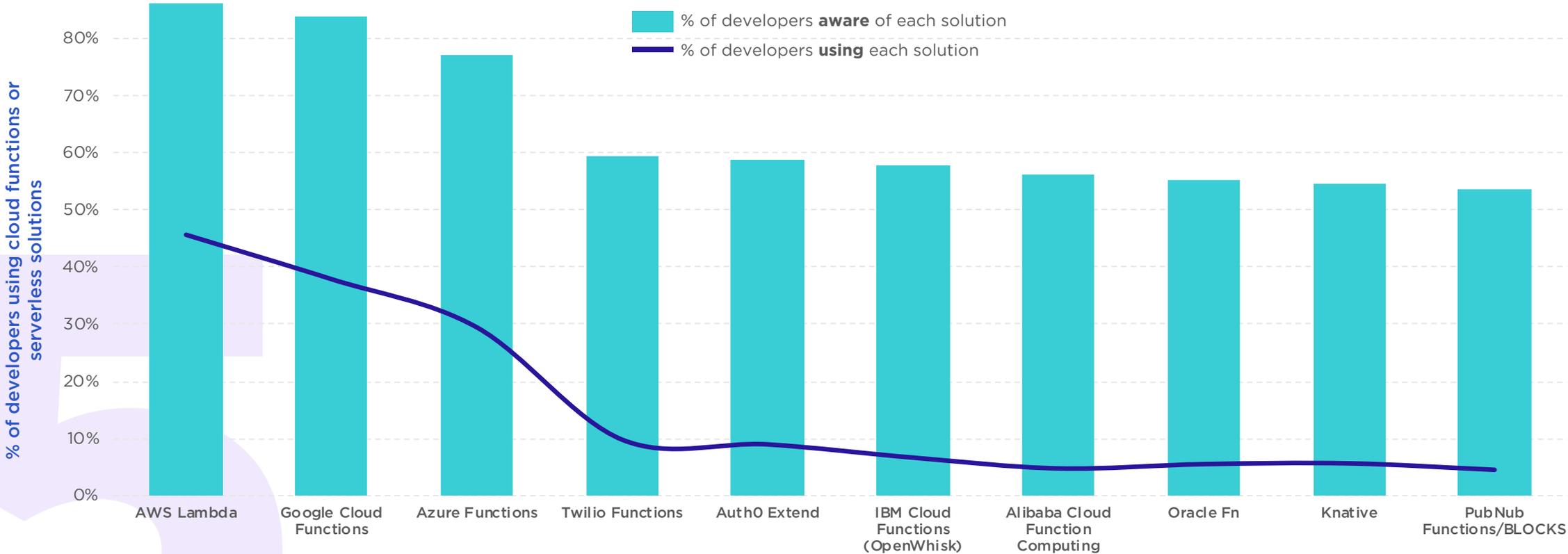
B. Usage of serverless solutions by role

The use of serverless vendors varies considerably with a developer's role within an organisation. **AWS Lambda is widely used by developers in technical roles**, such as programmers and software developers, architects, tech team leaders, CxO roles, and DevOps specialists. In all these cases, Amazon is about 9 pp more likely to be used than Google, its closest competitor. As noted before, Amazon's advantage among technical roles is due to its timeliness in being the first vendor to offer serverless services.

On the other hand, **Google Cloud Functions is most popular with business roles**. Product managers and marketing and sales professionals are more likely than other roles to be part of an organisation or team using Google Cloud Functions. These professionals are 32 pp more likely to be using Google Cloud Functions than Lambda.

In the last six months, Google has also become significantly more competitive than AWS with UX and UI designers and researchers, with 25 and 32 pp advantage over AWS, respectively.

Microsoft Azure Functions sees the highest adoption among data/business analysts. This is the only segment where Azure beats AWS in usage. 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.

The use of serverless vendors varies considerably with developers' role within an organisation

% of backend developers using cloud functions or serverless solutions (n=960)

Usage and awareness of serverless solution

Legend:
- AWS Lambda
- Azure Functions
- Google Cloud Functions

Categories (top to bottom):
- Programmer / software developer (incl. frontend, backend, full-stack)
- Architect (system/solution/software)
- Tech / engineering team lead
- CIO, CTO, IT manager
- DevOps specialist
- System administrator
- Data scientist, machine learning developer or data engineer
- Computer or data science student
- Database administrator
- UI designer
- Test / QA developer or engineer
- CEO / management
- UX designer
- Researcher
- Product designer
- Data / business analyst
- Product manager / marketing / sales

X-axis: 0% 10% 20% 30% 40% 50% 60% 70% 80%

METHODOLOGY

The Developer Economics Survey

Developer Economics 18th edition reached 17,000+ respondents from 159 countries around the world. As such, the Developer Economics series continues to be the most global independent research on mobile, desktop, industrial IoT, consumer electronics, 3rd party ecosystems, 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 twelve weeks between November 2019 and February 2020.

Respondents to the online survey came from 159 countries, including major app and machine learning 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.

Our respondents came from a broad age spectrum, from the young coders of under 18 to the seasoned ones over 55. Excluding those who would rather not answer about their age, the age profile of our respondents is shown below. As software development is still a man's world, 89% of our respondents were male and 11% female (excluding other options and those who did not specify their gender).

Respondents were asked which types of projects they are involved in out of the twelve under study (web apps / SaaS, mobile apps, desktop apps, backend services, augmented reality, virtual reality, games, data science, machine learning / AI, industrial IoT, consumer electronics devices, apps/extensions for 3rd party ecosystems). They also told us if they are into their areas of involvement as professionals, hobbyists, or students - or as any combination of these - and how many years of experience they have in each.

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, industrial IoT, consumer electronics, 3rd party ecosystems, 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 technologies used, and developer segments. 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, industrial IoT, consumer electronics, 3rd party ecosystems, 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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We help you understand Developers.

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

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