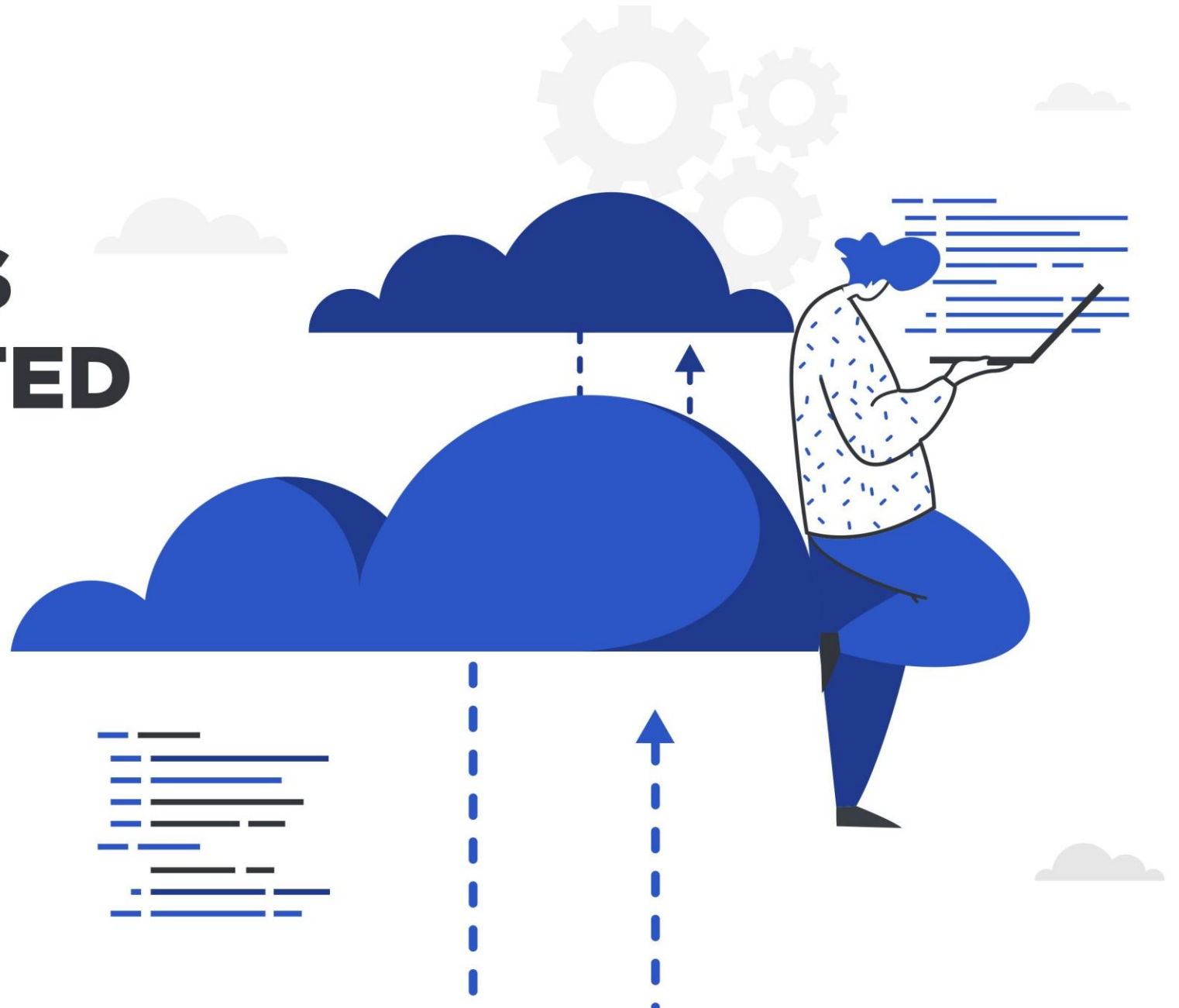# DEVELOPER PERCEPTIONS OF DISTRIBUTED CLOUD

Akamai + /DATA

# Can I share data from this report?

## 1. License Grant

This report is licensed under the Creative Commons Attribution-NoDerivatives Licence 4.0 (International) . Put simply, subject to the terms and conditions of this license, you are free to:

**Share** — You can reproduce the report or incorporate parts of the report into one or more documents or publications, for commercial and non-commercial purposes.

Under the following conditions:

**Attribution** — You must give appropriate credit to SlashData™ and to Akamai Technologies Inc. as sponsors of this report, and indicate if changes were made. In that case, you may do so in any reasonable manner, but not in any way that suggests that SlashData™ endorses you or your use.

**NoDerivatives** — you cannot remix or transform the content of the report. You may not distribute modified content.

## 2. Limitation of Liability

SlashData™, believes the statements contained in this publication to be based upon information that we consider reliable, but we do not represent that it is accurate or complete and it should not be relied upon as such. Opinions expressed are current opinions as of the date appearing in this publication only and the information, including the opinions contained herein, are subject to change without notice. Use of this publication by any third party for whatever purpose should not and does not absolve such third party from using due diligence in verifying the publication's contents. SlashData™ disclaims all implied warranties, including, without limitation, warranties of merchantability or fitness for a particular purpose.

SlashData™, its affiliates, and representatives shall have no liability for any direct, incidental, special, or consequential damages or lost profits, if any, suffered by any third party as a result of decisions made, or not made, or actions taken, or not taken, based on this publication.
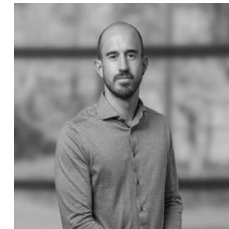
## Liam Dodd

*Senior Market Research Analyst*

Liam is a researcher with an interest in data analytics and its ability to impact society. He holds a PhD in Physics, and previously worked generating intelligence and insights for the European automotive market.

✉ liam.dodd@slashdata.co

## Brayton Noll

*Senior Market Research Analyst*
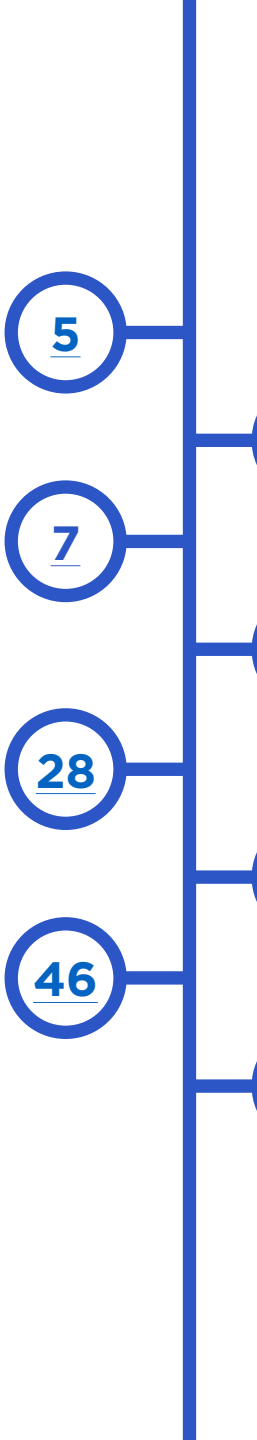
Brayton Noll is a behavioral scientist with a background in climate change and environmental research. He holds a PhD from TU Delft in computational social-science with his thesis focusing on human behavioral dynamics and climate adaptation. He has five years of experience working with data analytics.

✉ brayton.noll@slashdata.co

# ABOUT THE AUTHORS

_/DATA_

# TABLE OF CONTENTS

# ⓘ EXECUTIVE SUMMARY

Among developers involved in building, deploying, or managing applications in the cloud, we find a high level of interest in distributed cloud computing, as well as a significant proportion of developers already using distributed cloud solutions in some capacity. Crucially, this high level of interest is found across all industries, but with a higher interest in industries like data analytics. The developers surveyed were frequently most motivated and intrigued by features that help them to better serve their customers with lower latency and a better ability to scale services across a range of geographies.

Developer apprehensions around distributed cloud are commonly found with concerns about the costs of implementing and managing a distributed cloud network, as well as security concerns that emerge from a wider threat surface. Developers suggest that the increased adoption and proliferation of standards for data security and interoperability is important to assist their own adoption of distributed cloud solutions.

However, while there is a high level of interest and excitement from cloud developers around distributed cloud, many may find themselves unprepared once this future arrives. Many observations throughout this study suggest that developers may still be viewing the distributed cloud through a platform-centric lens, which is impacting their imagination about how distributed clouds operate differently from the current legacy cloud framework.

In a positive light, developer expectations of vendors suggest developers are keen to embrace this open, cloud-native future. Developers primarily expect their cloud infrastructure providers to ensure high reliability of uptime and a flexible and scalable service. This provides the backbone upon which they can build and begin to take advantage of all of the benefits and opportunities they previously outlined.

# KEY INSIGHTS

- 55% of developers in this study were already using a distributed cloud in some form during their current development. ➜

- The proportion of developers currently using distributed cloud is higher among North American developers (61%). ➜

- Across most industries, there is a high level of interest in using distributed cloud solutions. ➜

- The most appealing benefit of distributed cloud is its potential to improve the user experience due to reducing latency (38%), followed by flexibility in scaling at different geographies (34%) and a greater capacity for handling data-intensive applications (33%). ➜

- Industry standards developers believe are essential for distributed cloud computing include data security and privacy standards (39%), followed by open cloud standards (26%), otherwise known as interoperability. ➜

- Developers also want to see improvements for increased portability (22%), which will be crucial as developers move away from a platform-specific framework to one that seeks a standardized way for developers to build, deploy, and manage applications across a range of cloud infrastructure options. ➜

- While developers have frequently identified security as a concern or challenge, only 38% believe that robust security features should be expected from cloud infrastructure providers. This suggests they instead expect to pick and choose the best tools for their needs outside of their providers. ➜

- Developers are most likely to consider the costs of implementations (36%) and the potential for increased security risks (35%) as their greatest concerns. ➜

- A small percentage of developers (13%) highlight a lack of adequate infrastructure as a major obstacle, either from a genuine lack of infrastructure, or developers' platform-centric perception of "infrastructure" making them unaware of what currently exists. ➜

- Developers believe that the primary responsibility of their cloud infrastructure providers is to ensure high uptime and reliability (51%) and flexibility and scalability (45%). ➜

- Developers working in entertainment (38%), gaming (38%), marketing (38%), and energy (34%) are more likely than other developers to believe more robust service level agreements (SLAs) are required for a distributed cloud future. ➜

INTRODUCTION

01

# 1. Introduction

Software development has seen a series of monumental shifts and changes in practices and technologies over the past few decades. However, at every stage of new technological advancement, these novel approaches have succeeded because they match the needs of developers, whether to serve their development goals or customer success. Developers are smart and will pursue technologies that they can see and understand the proposition value of.

Developers are now facing another such shift in technology with distributed cloud computing, which has the potential to transform the cloud computing ecosystem by bringing processing and compute closer to the end-point consumers. The potential benefits and use cases for moving compute closer to the end users are numerous; several of which we explore in this report. However, it is important for those developing distributed cloud computing infrastructure and solutions to listen to developers and understand their perceptions and likely use cases of decentralized cloud resources that are centrally managed. This allows providers to cater to developer needs, support the avenues they wish to explore, as well as identify areas where developers may need more education and information on various aspects.

The findings of this report are based on a survey of more than 700 professional developers who deploy, build, or manage services and applications in the cloud, between June and July 2023. These developers come from over 50 countries, and across a wide range of industries.

This report, authored by SlashData and commissioned by Akamai, explores the perceptions of and interest in the current state of distributed cloud. For this report, respondents were provided the following definition of distributed cloud computing: "*Distributed cloud computing is the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.*"

Further, this report also examines the advantages developers are most interested in exploring in a distributed and decentralized world, as well as what challenges they expect to face. Developers were also asked to consider the development standards they believe are most important, as well as which technologies they feel need greater development to support their adoption of a more distributed cloud.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

Developers in this survey were asked to identify the types of cloud environments they used in a professional capacity. In addition, they were also asked to identify their involvement with various cloud-related activities. For this report, the majority of developers deployed some of their projects to hybrid cloud environments (55%), with private cloud (40%), and network infrastructure (39%) as the next most popular deployments. Among this developer segment, 35% identified themselves as already using distributed cloud in a professional capacity.

The activities of developers in this survey show clear overlaps, with the most popular activity (55%) among these developers being to deploy applications on a combination of both on-premise and cloud-based infrastructure. This sample also includes a high proportion of developers who are involved in building strategies for load balancing (46%) and implementing security protocols (45%). Another important aspect of this developer population is the higher proportion of developers who manage deployments across geographically distributed servers (46%) than those who explicitly state they deploy to distributed cloud (35%). This highlights that geographic distribution of servers is a practice many developers are currently involved in, even if they are not specifically deploying to services they call distributed cloud.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# The types of cloud environment(s) used and cloud-related activities developers are involved in

% of developers (n=777)

## Types of cloud environment(s) used

| | |
|---|---|
| Hybrid cloud | 53% |
| Private cloud | 40% |
| Network infrastructure (incl. fog/edge computing) | 39% |
| Multicloud | 39% |
| Distributed cloud | 35% |
| Single public cloud | 34% |

## Current cloud-related activities developers are engaged in

| | |
|---|---|
| Deployed applications on a combination of on-premises and cloud-based infrastructure | 55% |
| Engaged in application management across different cloud environments (e.g. Kubernetes) | 49% |
| Managed deployment across geographically distributed servers | 46% |
| Built strategies for load balancing, failover, or data synchronization across multiple cloud environments | 46% |
| Managed a content delivery network (CDN) or similar system to optimize delivery | 45% |
| Implemented security protocols across various cloud providers | 45% |
| Implemented edge computing technologies | 40% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

CURRENT INTEREST IN AND PERCEPTION OF DISTRIBUTED CLOUD

02

## 2. Current interest in and perception of distributed cloud

In this chapter, we establish the current level of familiarity, usage, and interest of distributed cloud solutions by the developers surveyed. We also dive into how interest in distributed cloud varies by the industries that developers are involved in. This is followed by a look at the potential benefits that excite developers the most about using a distributed cloud solution, as well as how this varies by the industry that developers are involved in.

For the developers within this survey, we found that when developers were asked about their familiarity with distributed clouds, a very high percentage were using distributed cloud services (55%) in some capacity during their development. This high usage suggests that there are many developers who are beginning to adapt their processes to a more decentralized and distributed world. Further, among the developers surveyed, there is a very small minority (7%) who are neither familiar nor interested in distributed cloud services. This again highlights that many developers are continually exploring and looking for new directions they can take their solutions in, with a much smaller proportion expressing disinterest in this.

Of the developers who are not already using distributed cloud services but are interested in learning more, we see that interest is very high. 65% of these developers were either very or extremely interested in distributed cloud solutions. This interest is higher for developers with more familiarity with distributed cloud. Of those who were somewhat familiar, 74% of developers expressed this high level of interest, while for those who were not very familiar, only 40% were extremely or very interested. This suggests that as developers increase their knowledge of distributed cloud solutions, their interest grows, likely as a consequence of them being able to better envision how these solutions will work with their current projects.
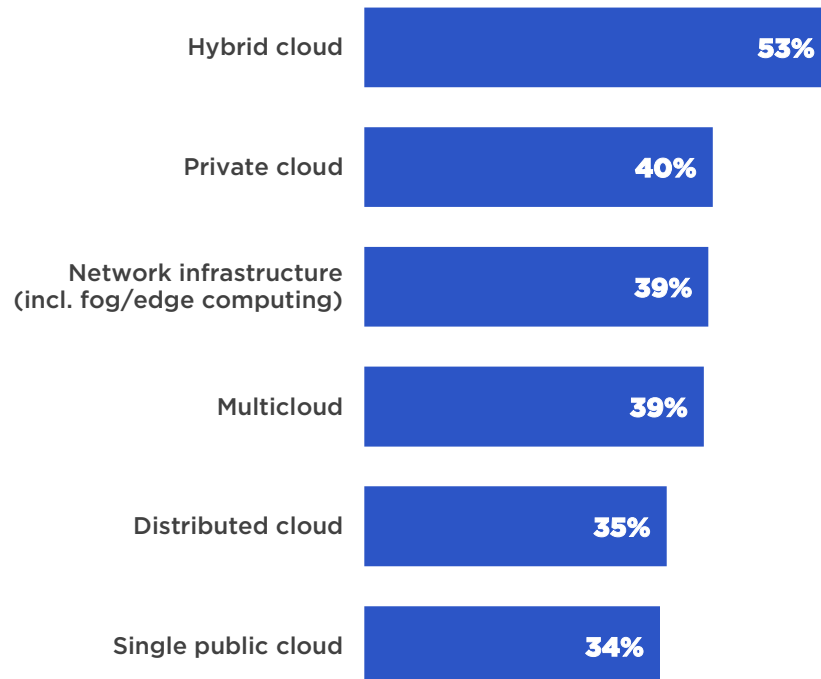
**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.
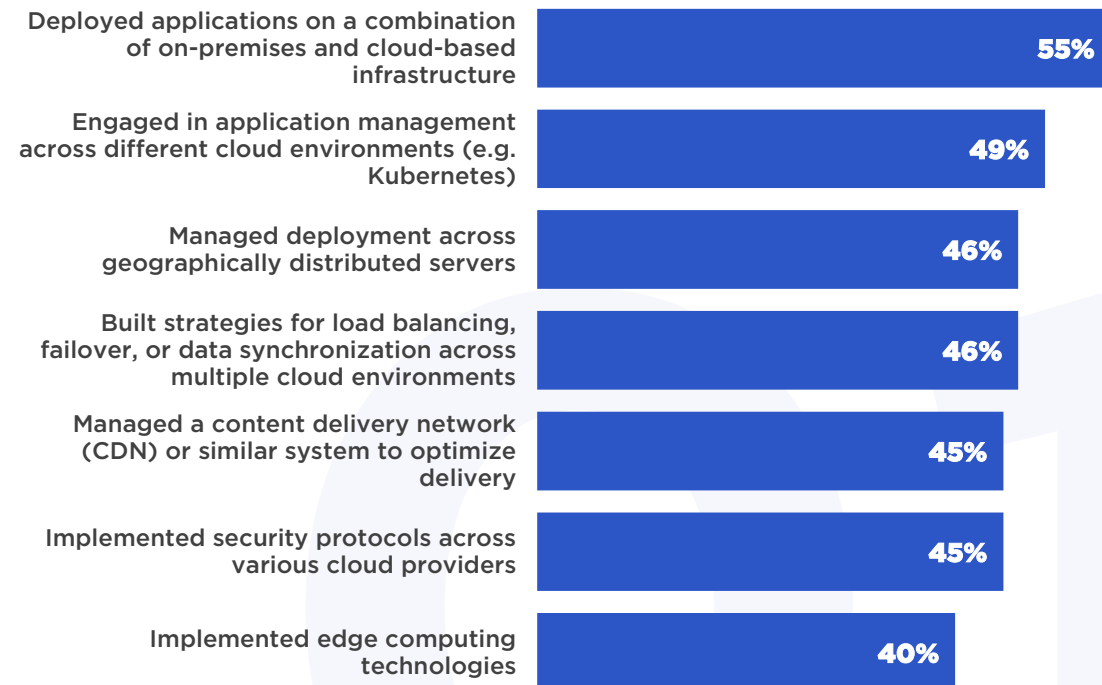
## 2. Current interest in and perception of distributed cloud

### ⚙ Industry deep-dive

Developers working in data analytics or business intelligence show the highest level of interest in distributed cloud solutions, with 81% indicating that they are either extremely or very interested. However, of this 81% of developers, only a quarter are extremely interested in distributed cloud solutions. Comparing this to those in education and/or academic research and SaaS, who have an overall lower proportion of developers in the very or extremely interested group, a higher proportion say they are extremely interested.

This observation underscores the nuanced approaches required when engaging developers across diverse industries about distributed cloud solutions. For instance, developers in data analytics/business intelligence and ecommerce are likely recognizing the broader benefits of distributed cloud solutions for their sector. The potential for real-time data analytics and scalability in these sectors is evident. However, within SaaS companies, interest can be more intricately tied to a developer's specific experience and projects.

In addition to observed differences based on the industries developers work in, we also see regional differences in familiarity and interest. A larger proportion of North American developers are very familiar with distributed cloud (61%) compared to their Western European counterparts (51%). However, 70% of Western European developers who are not very familiar with distributed clouds are extremely or very interested, compared to 60% of North American developers. This suggests that while adoption may be greater in North America, this is not due to a lack of interest in the space. Instead, North America may just be ahead of the curve, with more of these interested developers having already started working with distributed cloud solutions, possibly to improve their global reach.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Developers' familiarity with distributed cloud services

% of developers (n=777)
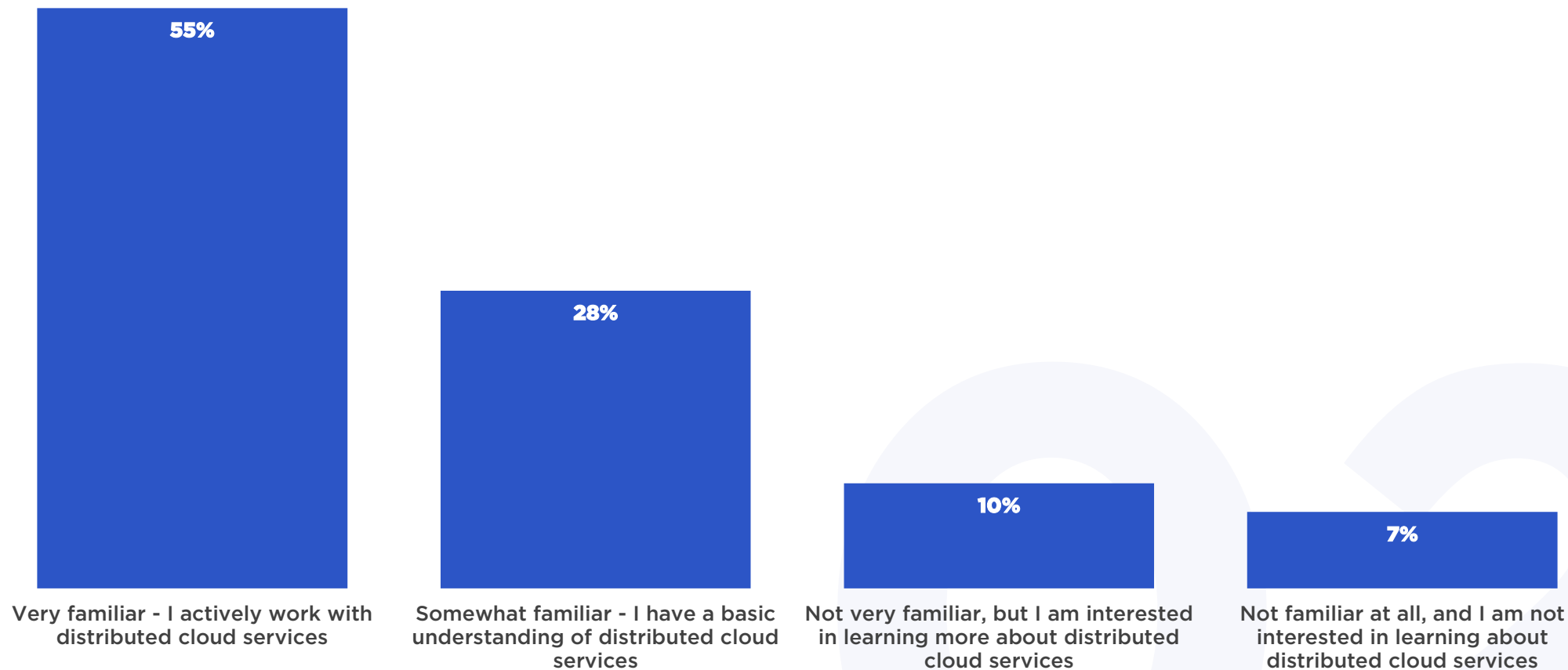


**55%** — Very familiar - I actively work with distributed cloud services

**28%** — Somewhat familiar - I have a basic understanding of distributed cloud services

**10%** — Not very familiar, but I am interested in learning more about distributed cloud services

**7%** — Not familiar at all, and I am not interested in learning about distributed cloud services

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Interest in distributed cloud solutions by the industry involvement of developers

% of developers involved in each industry (n=295)

■ Slightly interested   ■ Moderately interested   ■ Very interested   ■ Extremely interested

**Data analytics / business intelligence products and services** — 2% | 18% | 56% | 25%

**Business consulting, legal services, HR & recruitment services** — 2% | 20% | 49% | 29%

**E-commerce and retail** — 25% | 51% | 24%

**Software products and services, SaaS** — 7% | 20% | 41% | 32%

**Education, training, and academic research** — 2% | 36% | 29% | 33%

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

## 2. Current interest in and perception of distributed cloud

### ⚙ Industry deep-dive

The leading benefit that developers find appealing about distributed cloud solutions is their potential to improve user experience due to reducing latency (38%). As both an easy-to-envision benefit and a current problem that developers face, this is likely the motivation for many developers choosing it. Flexibility in scaling in different geographies (34%) and a greater capacity for handling data-intensive applications (33%) are the second and third most popular benefits.

However, the least popular benefit selected by developers in our survey is the potential for innovation with localized computing power (23%). This stands as one of the benefits that distributed clouds offer to developers that differentiates it from other cloud solutions, and its low ranking as a benefit likely represents a lack of knowledge and information about the uses of distributed clouds in real-world applications. This may stem from developers viewing distributed cloud solutions through the lens of traditional edge computing, rather than recognizing its broader potential to create novel experiences. Further, it may suggest that developers are still viewing distributed clouds from a platform-centric view and therefore have yet to imagine how they could utilize a distributed cloud system's local compute.

The industry a developer works in is also seen to lead to different priorities of benefits, frequently related to specific use cases of interest to their industry-specific requirements. For example, those in government or defense (32%), entertainment (32%), or transportation and logistics (31%) show a higher interest in innovations from local computing power. With innovations in warehouse automation, smart cities, and local processing for gaming applications, there are immediate and clear use cases in these industries. Those in gaming also show a higher interest in flexibility for scaling in different geographic locations (40%). This feature would allow game developers to responsively and efficiently scale their services to match and support the needs of players.

Meanwhile, those in data analytics rank greater capacity for handling data processing highest (41%) as they have a clear benefit for such capabilities. This is especially relevant with the current rise of AI, where heavy compute may still be done centrally, but data ingestion and more lightweight compute will be done closer to the edge. Those in telecommunications considered reduced latency as their greatest potential benefit (45%) due to the importance of real-time communication and exchange of information in this sector.
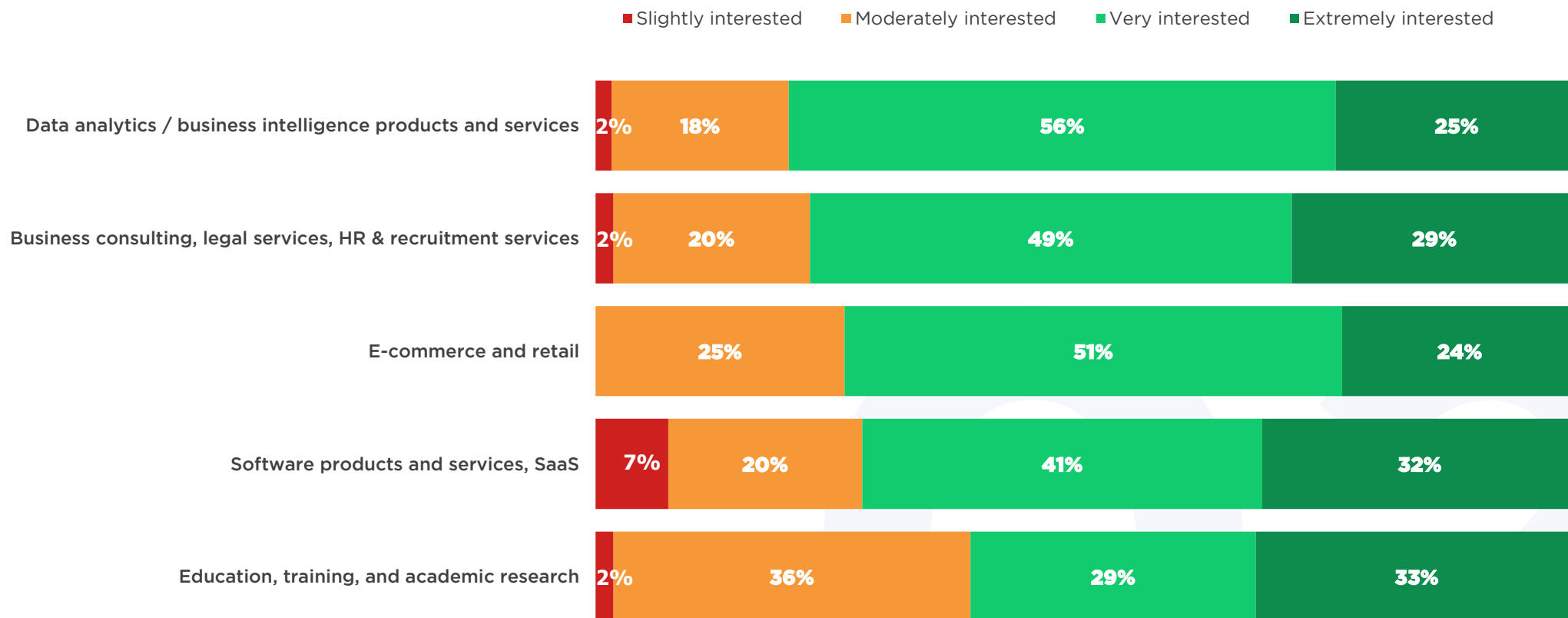
**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

**2. Current interest in and perception of distributed cloud**

# Most appealing benefit of using a distributed cloud solution
% of developers involved in each industry (n=719)

| Benefit | % |
|---|---|
| Improved user experience due to reduced latency | 38% |
| Flexibility in scaling in different geographical locations | 34% |
| Greater capacity for handling data-intensive applications | 33% |
| Cost-effectiveness due to localized resources | 33% |
| Increased resilience due to geographical distribution | 30% |
| Improved support for remote workforce | 29% |
| Enhanced support for real-time applications | 27% |
| Enhanced data sovereignty through precise location control | 25% |
| Potential for innovation with localized compute power | 23% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

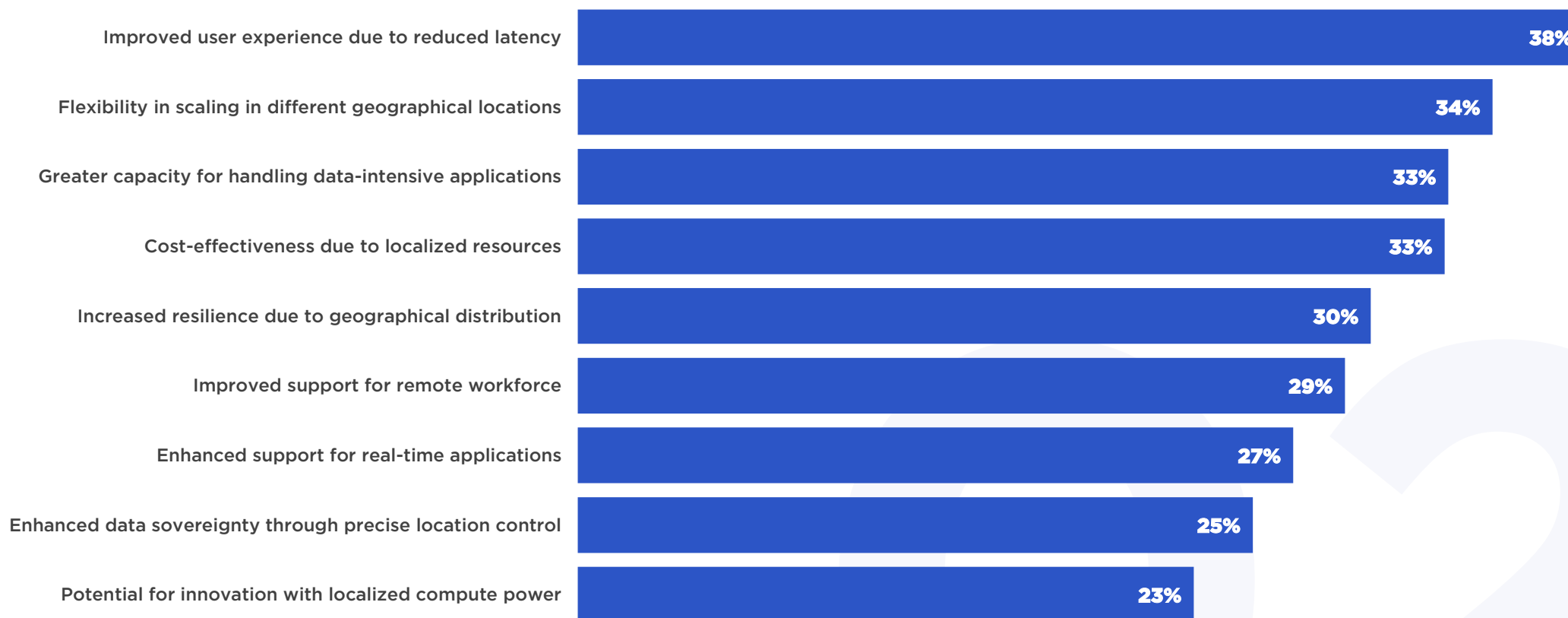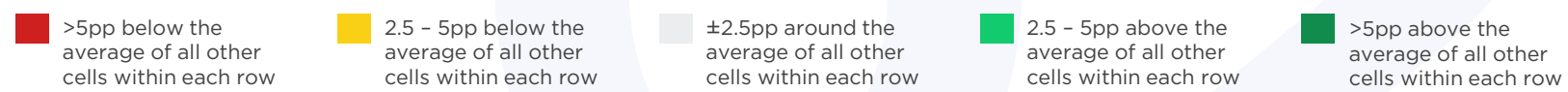# The most appealing benefits of a distributed cloud by the industry that developers are involved in

% of developers in each industry (n=719)

**Industry Involvement**

| Benefits of distributed cloud developers are most interested in | Business consulting, legal services, HR & recruitment services | Data analytics / business intelligence products and services | Ecommerce and retail | Education, training, and academic research | Energy (incl. oil, gas, electricity, and water) | Entertainment, media, and information | Financial services & banking | Gaming (software, gambling, etc.) | Government and defense | Health, medical, biotechnology, and pharmaceuticals | Machine learning or artificial intelligence | Marketing and advertising services | Software products and services, SaaS | Telecommunications and networks | Transportation and logistics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Improved user experience due to reduced latency | 37% | 33% | 39% | 41% | 34% | 36% | 36% | 32% | 38% | 40% | 34% | 34% | 40% | 45% | 33% |
| Increased resilience due to geographical distribution | 31% | 31% | 32% | 34% | 26% | 30% | 33% | 34% | 28% | 20% | 34% | 28% | 34% | 29% | 28% |
| Enhanced data sovereignty through precise location control | 29% | 30% | 25% | 26% | 32% | 28% | 30% | 30% | 17% | 29% | 23% | 29% | 24% | 26% | 29% |
| Flexibility in scaling in different geographical locations | 40% | 35% | 35% | 34% | 33% | 42% | 38% | 40% | 35% | 39% | 36% | 45% | 34% | 36% | 37% |
| Cost-effectiveness due to localized resources | 39% | 33% | 32% | 32% | 41% | 39% | 33% | 36% | 45% | 34% | 36% | 38% | 37% | 36% | 38% |
| Potential for innovation with localized compute power | 28% | 26% | 24% | 23% | 32% | 32% | 28% | 27% | 32% | 27% | 23% | 20% | 22% | 27% | 31% |
| Enhanced support for real-time applications | 27% | 26% | 29% | 32% | 35% | 33% | 23% | 31% | 28% | 27% | 38% | 37% | 28% | 32% | 32% |
| Greater capacity for handling data-intensive applications | 28% | 41% | 28% | 23% | 26% | 23% | 27% | 35% | 29% | 27% | 37% | 34% | 35% | 30% | 34% |
| Improved support for remote workforce | 30% | 28% | 31% | 31% | 21% | 28% | 36% | 25% | 33% | 32% | 27% | 23% | 26% | 30% | 30% |

Legend:
- >5pp below the average of all other cells within each row
- 2.5 – 5pp below the average of all other cells within each row
- ±2.5pp around the average of all other cells within each row
- 2.5 – 5pp above the average of all other cells within each row
- >5pp above the average of all other cells within each row

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Best use cases

Further to the benefits developers find most appealing about distributed clouds, they were asked what they believe are the use cases that are most likely to benefit from distributed cloud solutions. This differs from the potential benefits by asking developers to instead indicate which areas of development are most likely to benefit from distributed clouds, independent of their own development needs.

Big data and analytics is the use case suggested by most developers as the best use case for distributed cloud solutions (48%). This is followed by real-time applications (42%) and machine learning (ML) and artificial intelligence (AI) workloads (39%). As mentioned previously, the new approach to AI may push compute closer to the edge, which is likely behind the relative popularity of this option, as well as the overall popularity of big data and analytics as the best use case.

### Industry deep-dive

Unsurprisingly, the belief in big data as the best use case is even higher among those working in data analytics (53%) but is also highest among those in business consulting (49%), entertainment and media (49%), and ecommerce (47%). These industries also work with large amounts of data to be analyzed and processed, with key decisions also being data driven, leading them to envision this as the greatest use case for distributed cloud solutions. As one example, both entertainment and ecommerce employ complex algorithms to display the most relevant content to their users. Distributed cloud technology has the potential to allow big data to be input, processed, and have decisions determined closer to the end-user, while still having centralized servers to engage in the heavy processing to adapt the overall algorithms.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

However, not all developers believe their area of development is going to be the best use case, as those in gaming or finance don't view benefits to their real-time applications as the best use cases (45% and 42%, respectively). Instead, this use case is suggested more by those in marketing and advertising (49%) and ML/AI (46%). While this may initially seem counterintuitive, those in marketing and ML/AI have clear benefits for improved real-time applications, for more accurate and reactive advertising solutions, and for deploying ML/AI applications to users that can adapt in real-time.

Those in financial services instead consider disaster recovery as the greatest use case, key for service continuity in the modern world of instantaneous financial transactions. Those in the gaming industry consider remote workforce support as the greatest use case, reflective of the globally distributed and collaborative studios that exist in contemporary game development. There are many possible explanations for why those in gaming rank lower real-time applications as the best use case than other sectors, but it may also be a consequence of the legacy of the gaming sector's decades-long battle to reduce latency.

The gaming sector has long deployed geographically distributed content servers, peer-to-peer networking, and player-rentable servers to improve experiences for their players. As such, while not an unpopular best use case, these developers may be content with their current approaches and are not considering distributed cloud with the same importance and urgency as those in other business operations.

Blockchains and distributed ledgers is the least selected best use case (25%), likely as a result of this both being a smaller area of active development and the current "crypto-winter" and Web3 dip that the technology sector is weathering. However, we see that those in the energy sector show considerably more belief in this being the best use case of distributed cloud solutions (39%). With many in the energy sector being excited about the potential of smart contracts and distributed ledgers to revolutionize the energy market, their more positive view of this use case demonstrates how developers can have different visions of how to use distributed cloud computing based on their market aims.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Developer perceptions of what the best use cases are for distributed cloud solutions

% of developers (n=769)
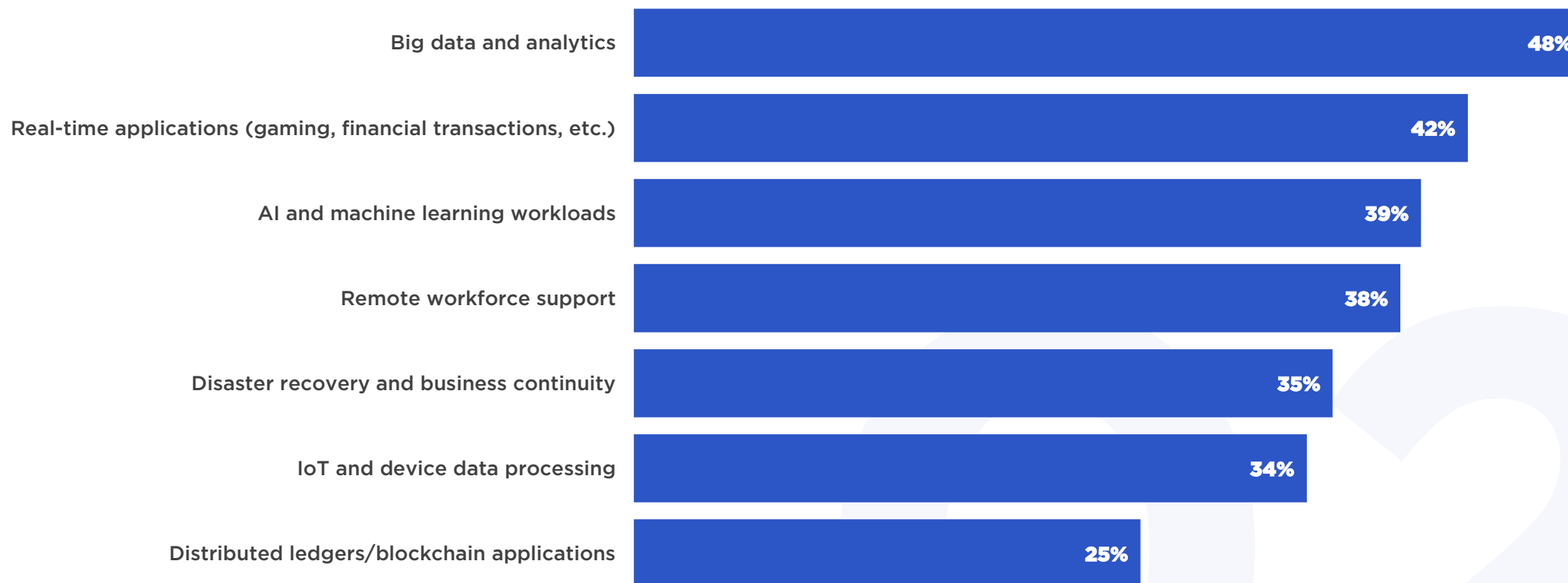
| Use case | % |
|---|---|
| Big data and analytics | 48% |
| Real-time applications (gaming, financial transactions, etc.) | 42% |
| AI and machine learning workloads | 39% |
| Remote workforce support | 38% |
| Disaster recovery and business continuity | 35% |
| IoT and device data processing | 34% |
| Distributed ledgers/blockchain applications | 25% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Perception of the best use cases for distributed cloud solutions by developer's industry involvement

% of developers in each industry (n=769)

**Industry involvement**

| Best use cases for distributed cloud | Business consulting, legal services, HR & recruitment services | Data analytics / business intelligence products and services | Ecommerce and retail | Education, training, and academic research | Energy (incl. oil, gas, electricity, and water) | Entertainment, media, and information | Financial services & banking | Gaming (software, gambling, etc.) | Government and defense | Health, medical, biotechnology, and pharmaceuticals | Machine-learning or Artificial Intelligence | Marketing and advertising services | Software products and services, SaaS | Telecommunications and networks | Transportation and logistics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Big data and analytics | 49% | 53% | 47% | 46% | 36% | 49% | 42% | 42% | 39% | 41% | 45% | 44% | 44% | 42% | 43% |
| Real-time applications (gaming, financial transactions, etc.) | 40% | 39% | 45% | 41% | 46% | 46% | 45% | 42% | 42% | 42% | 46% | 49% | 40% | 39% | 42% |
| AI and machine learning workloads | 46% | 44% | 39% | 40% | 40% | 36% | 42% | 42% | 26% | 39% | 57% | 39% | 42% | 43% | 43% |
| Remote workforce support | 35% | 42% | 37% | 43% | 35% | 35% | 36% | 45% | 49% | 41% | 34% | 33% | 40% | 40% | 33% |
| Disaster recovery and business continuity | 40% | 34% | 35% | 41% | 46% | 43% | 48% | 44% | 51% | 49% | 34% | 49% | 41% | 42% | 43% |
| IoT and device data processing | 38% | 38% | 39% | 30% | 42% | 42% | 30% | 37% | 36% | 28% | 37% | 46% | 40% | 39% | 45% |
| Distributed ledgers/blockchain applications | 32% | 30% | 26% | 28% | 39% | 28% | 31% | 35% | 33% | 33% | 29% | 29% | 27% | 35% | 27% |

Legend:
- >5pp below the average of all other cells within each row
- 2.5 – 5pp below the average of all other cells within each row
- ±2.5pp around the average of all other cells within each row
- 2.5 – 5pp above the average of all other cells within each row
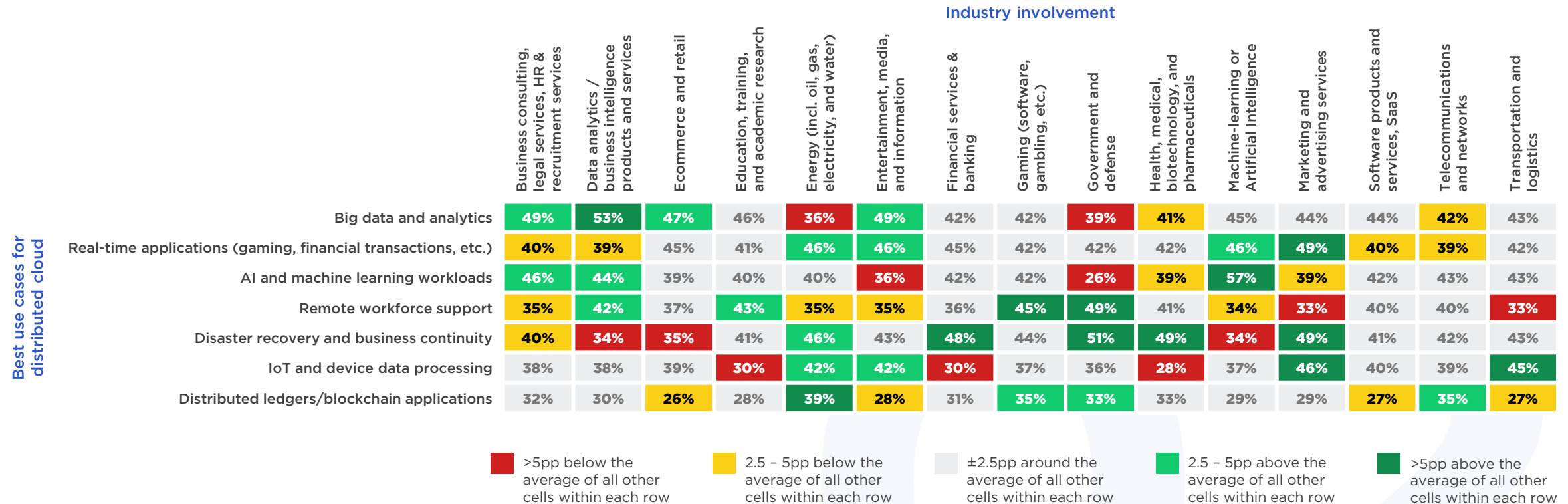- >5pp above the average of all other cells within each row

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Challenges

To conclude the chapter on current perceptions, we asked developers to identify what they believe will be their greatest challenges in migrating to, building applications for, or managing distributed cloud solutions.

The three leading challenges developers expect from distributed cloud solutions are cost concerns (36%), potential security risks (35%), and the complexity of managing distributed systems (35%). These challenges are also listed by substantially more developers, at least a third, compared to other challenges, which are listed by around a quarter of developers. Cost concerns is the most commonly listed challenge for developers across most industries, with three very notable exceptions: transportation and logistics, financial services, and government and defense.

## 💡 Industry deep-dive

For those in transportation and logistics, the complexity of managing distributed systems is much more likely to be selected (42% vs 30%), as well as concerns about increased latency for certain applications (38%).

Integrating manufacturing timelines, delivery schedules, warehouse maintenance, and final-mile distribution are just a few examples of system components that need to work synchronously. While distributed cloud solutions can improve many aspects of the systems, such as allowing warehouses to be managed locally, there are risks associated with the (mis)management across multiple components that have the potential to cascade into a wider range of problems. Under traditional cloud solutions, centralized control and compute minimizes the risk of such desynchronizations, and as such, is something that will be a major concern for developers involved in this sector when considering distributed cloud.

Developers in finance or government and defense, however, are more likely to indicate challenges around security (41% and 39%) than cost (36% and 26%). Security presents risks across all industries, but within financial services and government and defense, the stakes are generally higher, due to their ownership of privileged and private information for a wide range of people that can lead to not only the organization being at risk, but their customers/citizens, too.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

## 2. Current interest in and perception of distributed cloud

Difficulty in managing and tracking resource usage is selected by less than a quarter of all developers surveyed (23%) but is selected by almost a third of developers in transportation and logistics (33%) or gaming (31%). With the issues developers in logistics have with many complicated systems interacting together, different demands and different times may make this a larger concern for these developers.

For those in gaming, the modern gaming industry requires managing multiple content servers for different services as well as network infrastructure to connect up to millions of players simultaneously, on top of any backend services that support such online games. This is all on top of ensuring that any issues are localized and don't impact a wide swathe of players. Introducing greater decentralization has the potential to make this even more complex if developers are not adequately skilled and may seem like a daunting task.

Further, those in the gaming industry are among the most likely to list concerns about latency in their applications (35%). As highlighted, performance for online and multiplayer games is an area the gaming industry has worked hard to improve over the decades, and technologies or processes that may increase ping are going to create unhappy customers. Even if distributed cloud can improve performance, it is going to be a central concern for this sector.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

## 2. Current interest in and perception of distributed cloud

For developers in SaaS companies and the data analytics sector, concerns about the cost of implementing and managing distributed cloud solutions is the leading challenge, but those in data analytics are more likely to list security risks (36%) than those in SaaS (33%). With those in data analytics having more specific exposure to security and breach risks, they are more likely to be aware and focused on preventing any exposure of their sensitive data.

A relatively stark difference in the perceived challenges between these two industries is around increased latency in certain applications. Developers at SaaS organizations are the least concerned about increased latency (27%), reflecting their primary focus on feature development and usability rather than real-time application responsiveness. This can also be seen with these developers' lower selection of real-time applications as the best use case (40%) compared to developers in other sectors.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

/DATA

# Developers' biggest perceived challenges or drawbacks about distributed cloud solutions

% of developers (n=715)

| Challenge | % |
|---|---|
| High costs of implementation and maintenance | 36% |
| Potential security risks due to distribution | 35% |
| Complexity of managing distributed systems | 35% |
| Regulatory compliance issues with data in multiple locations | 27% |
| Limited availability of skilled professionals for distributed cloud | 27% |
| Difficulty in ensuring consistent performance | 25% |
| Increased latency for certain applications | 25% |
| Potential data sovereignty issues | 25% |
| Difficulty in managing and tracking resource usage | 23% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Developers' biggest perceived challenges or drawbacks about distributed cloud solutions by industry involvement

% of developers in each industry (n=715)

**Industry involvement**

| Challenges of distributed cloud | Business consulting, legal services, HR & recruitment services | Data analytics / business intelligence products and services | Ecommerce and retail | Education, training, and academic research | Energy (incl. oil, gas, electricity, and water) | Entertainment, media, and information | Financial services & banking | Gaming (software, gambling, etc.) | Government and defense | Health, medical, biotechnology, and pharmaceuticals | Machine-learning or Artificial Intelligence | Marketing and advertising services | Software products and services, SaaS | Telecommunications and networks | Transportation and logistics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Complexity of managing distributed systems | 29% | 31% | 34% | 36% | 32% | 39% | 35% | 34% | 29% | 36% | 29% | 37% | 33% | 30% | 42% |
| Potential security risks due to distribution | 37% | 36% | 35% | 39% | 31% | 33% | 41% | 30% | 39% | 32% | 27% | 26% | 33% | 35% | 25% |
| Increased latency for certain applications | 37% | 31% | 23% | 27% | 35% | 31% | 23% | 35% | 33% | 34% | 29% | 37% | 27% | 31% | 38% |
| Difficulty in ensuring consistent performance | 27% | 22% | 24% | 27% | 27% | 25% | 19% | 27% | 29% | 25% | 25% | 26% | 25% | 26% | 25% |
| High costs of implementation and maintenance | 33% | 40% | 33% | 39% | 40% | 37% | 36% | 35% | 26% | 43% | 39% | 35% | 41% | 37% | 30% |
| Limited availability of skilled professionals for distributed cloud | 29% | 31% | 33% | 29% | 34% | 27% | 29% | 34% | 33% | 27% | 33% | 32% | 27% | 31% | 22% |
| Regulatory compliance issues with data in multiple locations | 29% | 27% | 31% | 27% | 24% | 31% | 27% | 29% | 22% | 25% | 31% | 32% | 29% | 30% | 36% |
| Potential data sovereignty issues | 27% | 27% | 27% | 29% | 35% | 29% | 30% | 26% | 33% | 27% | 32% | 31% | 26% | 27% | 28% |
| Difficulty in managing and tracking resource usage | 24% | 23% | 20% | 24% | 21% | 27% | 25% | 31% | 29% | 24% | 26% | 22% | 23% | 23% | 33% |

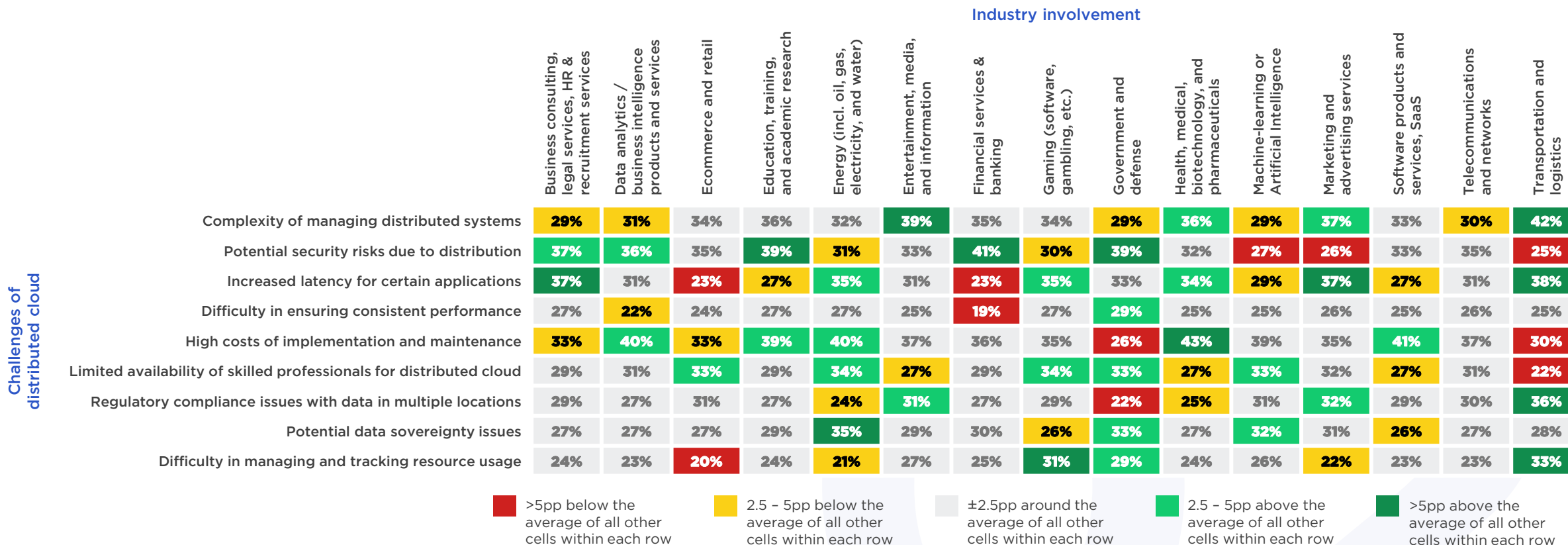| | | | | |
|---|---|---|---|---|
| 🟥 >5pp below the average of all other cells within each row | 🟨 2.5 – 5pp below the average of all other cells within each row | ⬜ ±2.5pp around the average of all other cells within each row | 🟩 2.5 – 5pp above the average of all other cells within each row | 🟩 >5pp above the average of all other cells within each row |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

DISTRIBUTED CLOUD: WHAT'S MISSING FOR DEVELOPERS?

03

## 3. Perceptions of distributed cloud shortfalls among developers

Next, we asked developers what they feel is missing from distributed cloud solutions, focusing on three questions. Firstly, if they could influence the future direction of distributed cloud technology, what would they prioritize for increased adoption? What standards do they believe are essential for distributed cloud computing to be a viable option? And, lastly, what are the current obstacles and limitations preventing them from utilizing distributed cloud in their own projects?

We began by asking developers to identify features they feel are lacking. Developers overall are most likely to feel clear cost savings (30%), more robust security features (27%), and enhanced tools for managing distributed systems (26%) were features they consider the most important to improve. However, the next most commonly selected option is the lack of skilled professionals (24%). Cloud development has been a dominant practice in software development for many years and has created many developers with deep experience, and distributed cloud technology introduces new challenges that require different technical experience. Furthermore, a distributed cloud requires a move away from a platform-centric view of cloud development and necessitates different development styles and approaches.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# 3. Perceptions of distributed cloud shortfalls among developers

## ⚙ Industry deep-dive

Developers involved in entertainment (38%), gaming (38%), marketing (38%), and energy (34%) are more likely to suggest a greater need for more robust service level agreements (SLAs). While a less technical aspect of support, their importance in outlining the performance, uptime, resource allocations, latency, and throughput, among other aspects, means that they can be critical in a distributed cloud. The energy sector has specific requirements for real-time data and monitoring of infrastructure, as well as for regulatory compliance that are likely driving a greater importance on more robust SLAs. While the needs in different industries vary, SLAs that address the needs of developers, for both their development and business needs, are likely to increase in importance to many developers.

Those in the gaming sector are also some of the most likely to highlight a greater need for skilled professionals (30%). Those in the gaming industry have previously indicated concerns about latency issues, as well as managing resources, and are therefore hesitant to move their services unless they can guarantee the same performance, at a minimum. As such, professionals with relevant and applicable skills are going to be crucial for any wider adoption, allowing these developers to ensure they can maintain a happy customer base.
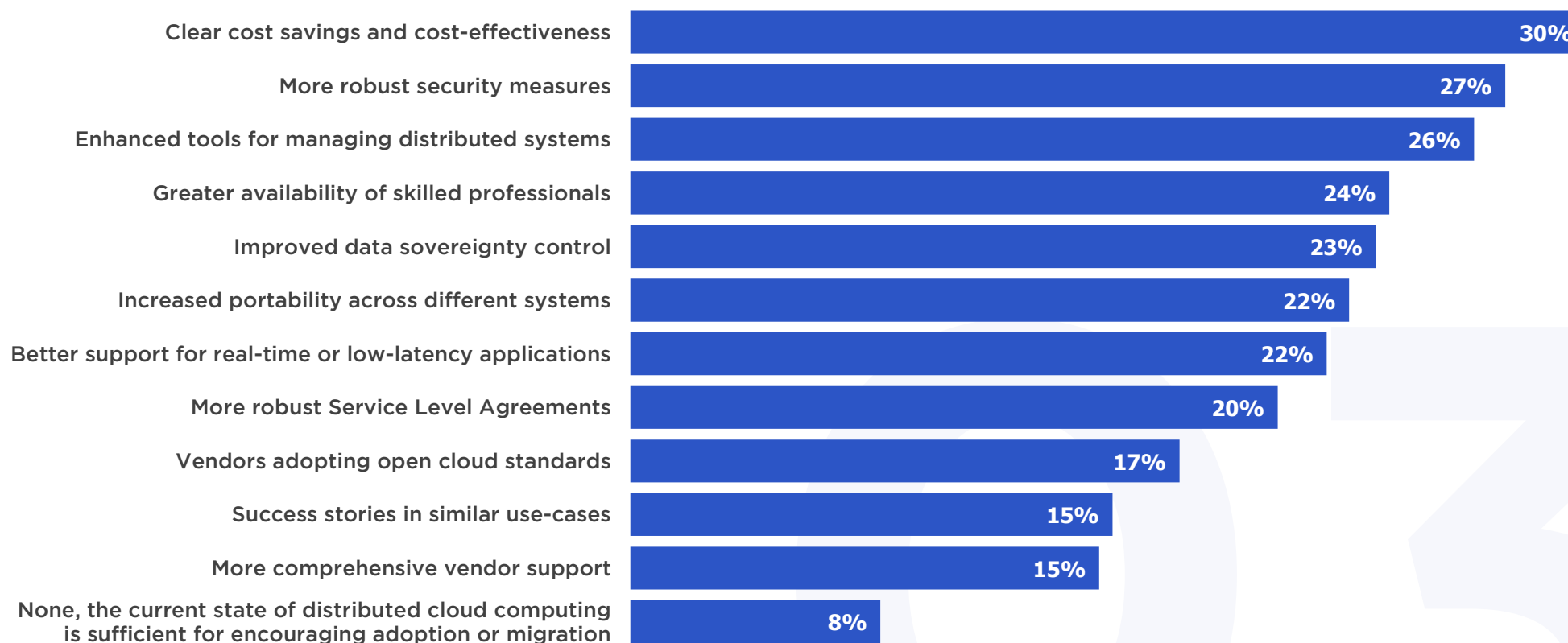
While cost-effectiveness is commonly selected by all developers, it is highest among those in SaaS (35%). SaaS is a business model focused on scalability. As a result, they may be more sensitive to the cost-effectiveness of their hosting solutions than other areas, and how these costs react as a service is scaled up. However, these concerns may be amplified by developers considering their services through the current platform-centric mindset, where data egress and transfer costs can rapidly spiral, which can be approached differently under a distributed cloud solution.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

/DATA

# Advancements or improvements developers would prioritize to encourage adoption of distributed cloud solutions

% of developers (n=719)

| Category | % |
|---|---|
| Clear cost savings and cost-effectiveness | 30% |
| More robust security measures | 27% |
| Enhanced tools for managing distributed systems | 26% |
| Greater availability of skilled professionals | 24% |
| Improved data sovereignty control | 23% |
| Increased portability across different systems | 22% |
| Better support for real-time or low-latency applications | 22% |
| More robust Service Level Agreements | 20% |
| Vendors adopting open cloud standards | 17% |
| Success stories in similar use-cases | 15% |
| More comprehensive vendor support | 15% |
| None, the current state of distributed cloud computing is sufficient for encouraging adoption or migration | 8% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Advancements or improvements developers would prioritize to encourage adoption of distributed cloud solutions, by their industry involvement

% of developers in each industry (n=719)

**Industry involvement**

| Advancements or improvements developers would prioritise to encourage migration to distributed cloud | Business consulting, legal services, HR & recruitment services | Data analytics / business intelligence products and services | Ecommerce and retail | Education, training, and academic research | Energy (incl. oil, gas, electricity, and water) | Entertainment, media, and information | Financial services & banking | Gaming (software, gambling, etc.) | Government and defense | Health, medical, biotechnology, and pharmaceuticals | Machine-learning or Artificial Intelligence | Marketing and advertising services | Software products and services, SaaS | Telecommunications and networks | Transportation and logistics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| None, the current state of distributed cloud computing is sufficient for encouraging adoption or migration | 4% | 3% | 5% | 1% | 3% | 4% | 2% | 3% | 1% | 0% | 13% | 3% | 4% | 6% | 23% |
| Enhanced tools for managing distributed systems | 32% | 26% | 26% | 27% | 31% | 27% | 35% | 29% | 28% | 34% | 26% | 38% | 30% | 33% | 24% |
| More robust security measures | 30% | 31% | 26% | 31% | 27% | 22% | 27% | 27% | 29% | 27% | 25% | 22% | 26% | 29% | 22% |
| Greater availability of skilled professionals | 24% | 26% | 22% | 24% | 21% | 28% | 20% | 30% | 32% | 18% | 16% | 14% | 21% | 22% | 12% |
| Clear cost savings and cost-effectiveness | 30% | 26% | 30% | 29% | 27% | 27% | 31% | 32% | 32% | 35% | 26% | 26% | 35% | 28% | 22% |
| More comprehensive vendor support | 14% | 16% | 19% | 16% | 17% | 17% | 19% | 18% | 19% | 17% | 14% | 15% | 16% | 18% | 13% |
| More robust service level agreements | 26% | 24% | 27% | 28% | 34% | 23% | 31% | 38% | 26% | 31% | 31% | 38% | 23% | 24% | 20% |
| Vendors adopting open cloud standards | 19% | 19% | 19% | 18% | 17% | 20% | 16% | 18% | 17% | 18% | 22% | 18% | 18% | 17% | 16% |
| Increased portability across different systems | 22% | 23% | 21% | 28% | 20% | 25% | 24% | 27% | 19% | 28% | 20% | 22% | 23% | 22% | 19% |
| Success stories in similar use-cases | 15% | 16% | 14% | 17% | 19% | 16% | 15% | 13% | 12% | 15% | 12% | 17% | 14% | 12% | 13% |
| Improved data sovereignty control | 27% | 29% | 25% | 30% | 33% | 26% | 27% | 26% | 33% | 28% | 27% | 31% | 27% | 31% | 23% |
| Better support for real-time or low-latency applications | 22% | 25% | 22% | 24% | 25% | 27% | 30% | 21% | 26% | 24% | 23% | 34% | 27% | 21% | 28% |

Legend:
- >5pp below the average of all other cells within each row
- 2.5 – 5pp below the average of all other cells within each row
- ±2.5pp around the average of all other cells within each row
- 2.5 – 5pp above the average of all other cells within each row
- >5pp above the average of all other cells within each row

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

## 3. Perceptions of distributed cloud shortfalls among developers

Following surveying developers about features that are currently missing from distributed cloud solutions, we examined which standards developers would like to see implemented in this sector before they migrate services to a distributed cloud. Data security and privacy standards were in the clear lead at 39%. However, security and privacy standards can cover a wide range of options. We can take into account that developers have previously indicated a desire for more robust security measures and concerns about increased security risks due to distribution, meaning we can hypothesize that these standards likely need to address the full breadth of developers' activities.

For example, developers concerned about increased security risks from distribution may be specifically interested in end-to-end encryption standards, to ensure that data transmitted across multiple nodes is only accessible to those authorized to view the data and prevent the exposure of sensitive data. Similarly, they may also place a greater emphasis on vulnerability management standards. With a larger attack surface, these standards can both allow developers to better assess threats and their weak points, as well as support well-defined processes for patching vulnerabilities across a large distributed network.
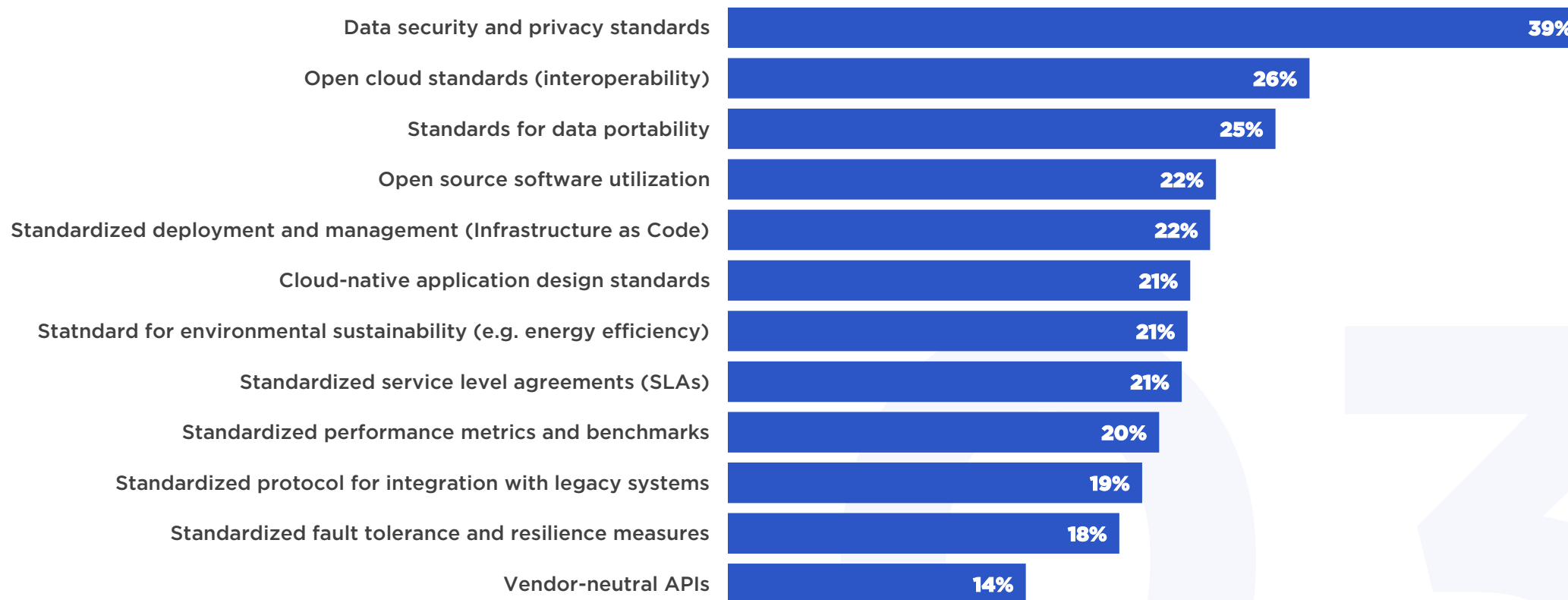
The second most commonly selected option was for open cloud standards. In a distributed cloud world, open standards, or interoperability, moves from a benefit to developers to a crucial aspect of allowing applications and services to work seamlessly across multiple cloud environments. This is also reflected in the features developers want to see improvements for, where 22% selected increased portability. Distributed cloud solutions require a fundamentally different paradigm for developers that moves away from a platform-specific framework to one that seeks a standardized way for developers to build, deploy, and manage applications.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

ADATA

# Standards developers believe must be adopted to make distributed cloud solutions viable

% of developers (n=774)



| Standard | % |
|---|---|
| Data security and privacy standards | 39% |
| Open cloud standards (interoperability) | 26% |
| Standards for data portability | 25% |
| Open source software utilization | 22% |
| Standardized deployment and management (Infrastructure as Code) | 22% |
| Cloud-native application design standards | 21% |
| Statndard for environmental sustainability (e.g. energy efficiency) | 21% |
| Standardized service level agreements (SLAs) | 21% |
| Standardized performance metrics and benchmarks | 20% |
| Standardized protocol for integration with legacy systems | 19% |
| Standardized fault tolerance and resilience measures | 18% |
| Vendor-neutral APIs | 14% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# 3. Perceptions of distributed cloud shortfalls among developers

While developers are most likely to report that costs of implementation as a primary obstacle for the adoption of a distributed cloud solution (34%), it is closely followed by the lack of necessary skills and training (31%). There are multiple challenges associated with migrating services to a distributed cloud solution that require additional training and skills, such as more advanced data management or complex networking configurations. Many of these challenges could be addressed through the introduction of open cloud standards, where developers are only required to become familiar and experienced with platform-neutral development, or a cloud-native, approach. As this was also listed as the second most popular standard developers are interested in, it indicates an overlap in requirements.

The current cloud computing world leans on developers developing experience and skills working within specific platforms, rather than developing skills in a vendor- or platform-neutral manner. This introduces vendor lock-in of their skills, as well as being locked out of opportunities at organizations using other cloud services. Similarly, organizations can also face loss of talent from wider pool of developers who are locked in to platform-native development practices. Platform-native approaches use tools and services for development and deployment that are within a vendor's ecosystem, rather than cloud-native's open and interoperable methods. As a result, open cloud standards would increase the number of developers who can work across multiple platforms, as well as having one of the key skills required for developing in a distributed world.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# 3. Perceptions of distributed cloud shortfalls among developers

However, developers with a greater familiarity with distributed clouds are less likely to select open cloud standards compared to developers who are not familiar. There are several possible explanations for this observation. One option is that while open cloud standards would address some of the concerns around developers having adequate skills and experience, the learning curve may be less of a hurdle once developers begin to familiarize themselves with implementing a distributed cloud. A second possibility may be that these developers have already begun to adopt solutions that are not reliant on cloud-native standards, and as such are prioritizing it less than other advancements.
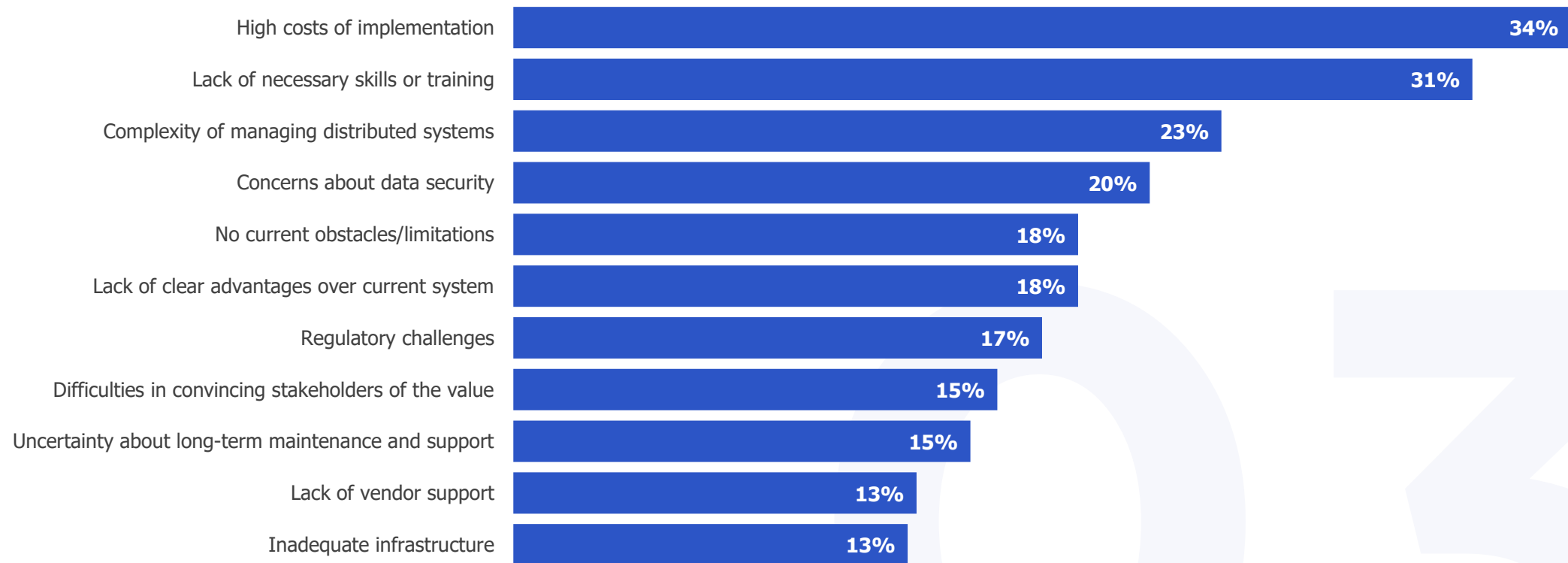
A small number of developers (13%) highlight a lack of adequate infrastructure as a major obstacle to them implementing a distributed cloud. This option is more commonly selected by those with a higher interest in distributed cloud, independent of their familiarity. However, this can represent two different issues for developers. The first may be a genuine lack of infrastructure that these developers can access for any distributed cloud projects they want to build. The other may be a perception issue, with developers' platform-centric development history making them less aware of the multiple ways that a distributed and decentralized solution can be implemented. Education and information about how infrastructure looks different in a distributed model would likely be extremely informative to many developers.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

/DATA

# Current obstacles or limitations that are preventing developers from adopting distributed cloud solutions

% of developers (n=349)

| Obstacle | % |
|---|---|
| High costs of implementation | 34% |
| Lack of necessary skills or training | 31% |
| Complexity of managing distributed systems | 23% |
| Concerns about data security | 20% |
| No current obstacles/limitations | 18% |
| Lack of clear advantages over current system | 18% |
| Regulatory challenges | 17% |
| Difficulties in convincing stakeholders of the value | 15% |
| Uncertainty about long-term maintenance and support | 15% |
| Lack of vendor support | 13% |
| Inadequate infrastructure | 13% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

DEVELOPER EXPECTATIONS OF TECHNOLOGIES AND VENDOR SUPPORT

04

# 4. Developer expectations of technologies and vendor support

To conclude, we look at the specific technologies and practices that developers are considering when imagining a distributed cloud future. This chapter discusses the practices that developers consider the most important when managing distributed cloud solutions. This is followed by comparing the tools and technologies developers think are missing for a distributed and decentralized cloud world against what developers expect from cloud infrastructure vendors in support of a distributed cloud world.

In the first chapter, we noted that more than one-third of developers indicated that security risks were a key challenge when moving their software to a distributed cloud platform. We see this sentiment again in developers' responses to the question: "Which practices are most important when managing distributed cloud solutions?" Security and compliance practices lead as the most commonly selected option (42%). However, we note that this is a belief especially popular among those with programmer (38%), system administrator (39%), or technology/engineering team lead roles (37%).

This may indicate what sort of security support developers expect from vendors. For example, programmers may be more interested in vendors providing secure APIs to allow them to integrate security solutions into their development processes. While those in system administrator roles may instead wish for vendors to support them with regular security updates that help address vulnerabilities across the wide network surface of their distributed solution.
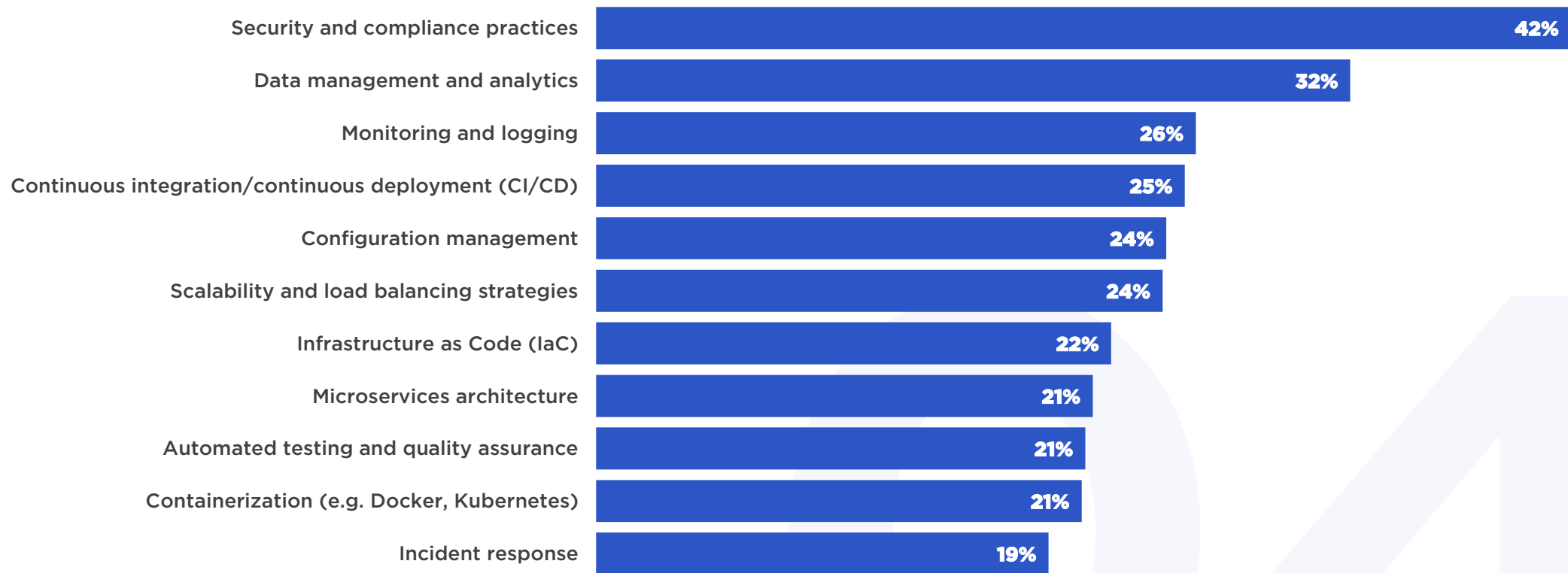
Conversely, security and compliance practices are less commonly selected by those in DevOps specialist (25%) and site reliability engineer (22%) roles. Those in DevOps specialist roles are more likely to select continuous delivery/continuous deployment (CI/CD) (39%) and Infrastructure as Code (32%), while site reliability engineers select CI/CD (45%) and configuration management (36%) as expectations. These follow logically from the roles and responsibilities of developers' roles.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Practices considered most important when managing a distributed and decentralized cloud solution

% of developers (n=638)

| Practice | % |
|---|---|
| Security and compliance practices | 42% |
| Data management and analytics | 32% |
| Monitoring and logging | 26% |
| Continuous integration/continuous deployment (CI/CD) | 25% |
| Configuration management | 24% |
| Scalability and load balancing strategies | 24% |
| Infrastructure as Code (IaC) | 22% |
| Microservices architecture | 21% |
| Automated testing and quality assurance | 21% |
| Containerization (e.g. Docker, Kubernetes) | 21% |
| Incident response | 19% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# 4. Developer expectations of technologies and vendor support

As a final insight into the perceptions of developers surrounding distributed cloud platforms, we asked developers what technologies they think are missing to make distributed clouds viable and what features they expect from vendors providing cloud infrastructure.

Security tools were the most popularly selected technology that is missing or under-developed (35%) and are also similarly commonly selected as a feature that vendors should provide (38%). However, only 42% of those who selected security tools think "robust security features" is a feature that vendors should provide, suggesting that while developers may continuously rank security highly, they may not be expecting this to be solely the responsibility of their cloud service providers. We see a similar pattern with only 33% of those who believe monitoring tools are missing or underdeveloped, stating that their cloud providers should have "advanced analytics and monitoring tools". This is further leaning towards developers appreciating more open cloud standards, where developers expect to have control over choosing the best solutions.

Overall, developers believe that the primary responsibility of their providers is to ensure high uptime and reliability (51%) and flexibility and scalability (45%). This suggests that while we have previously highlighted areas where developers may not have fully embraced what a decentralized cloud world would look like, their expectations from vendors are closer to how this future may be envisioned. Developers are placing a greater emphasis on vendors ensuring that their services are reliable, scalable, and with a greater flexibility in terms of where and how their applications are deployed.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# 4. Developer expectations of technologies and vendor support

## ⚙ Industry deep-dive

For developers in business consulting (56%), government and defense (55%), and ecommerce (55%) high reliability stands even further ahead as the most important feature. However, those in SaaS (51%) and entertainment (50%) are more likely to state that scalability is more important to them. While these industries have similar demands that would drive their expectations from a provider, the small differences highlight that different industries are going to place differing demands on providers, who should be ready to ensure they are serving each industry where it is most demanding.

However, across the range of industries we surveyed developers from, we see further differences that highlight that solutions targeting such industries have to be tailored correctly. Those in the energy sector (31%) and the gaming industry (29%) are the most likely to expect comprehensive and responsive customer support from their providers, most likely coming from the sensitivity to real-time disruptions in these industries.

In another example, developers in transportation and logistics (37%) and marketing (36%) expect their providers to be compliant with industry-specific regulations. Developers working in either marketing or advertising frequently interact with data that has to be pseudonymized to ensure the privacy of their consumers is maintained otherwise, they may face fines. Developers working in logistics have similar concerns due to handling identifiable information and are most likely to be deeply concerned with ensuring only the correct people have access to this information, even when distributed across a wider network.
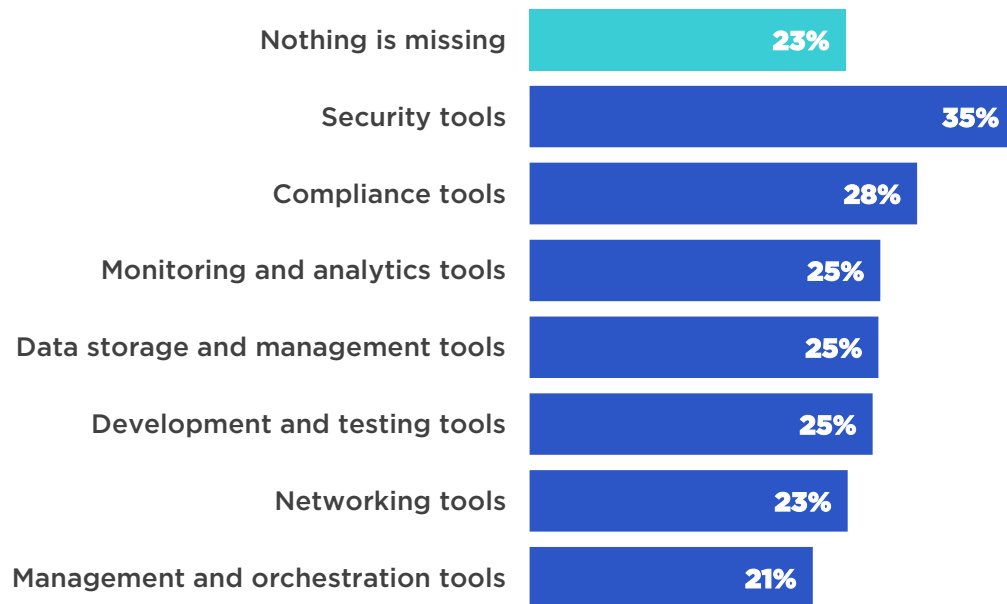
Of the developers surveyed, 23% said that there is nothing missing, which is a positive result that suggests there is a reasonable proportion of developers who are not being held back by concerns about technological shortcomings. Of this developer group who feel nothing is missing, 30% report that they also face no limitations or obstacles to migrating to or adopting distributed cloud solutions. However, 30% face challenges around a lack of sufficient skills and training, 18% have issues with the high cost of implementation, and 15% are concerned about long-term maintenance and support.

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.
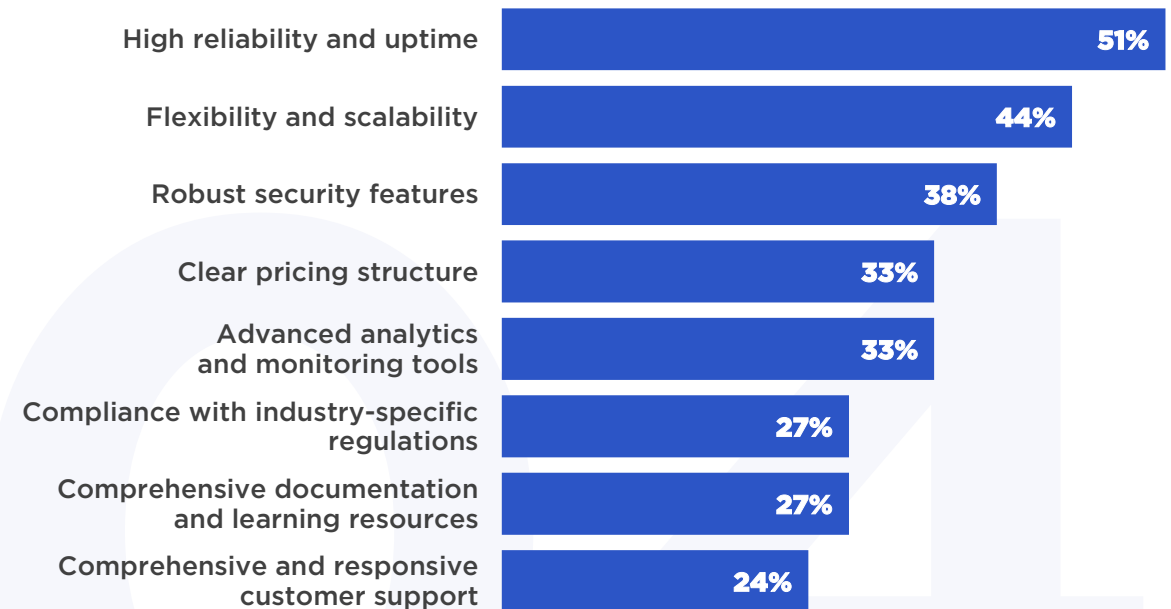
# Developer perceptions of under-realized technologies and vendor activities to support distributed cloud solutions

**Technologies developers believe are currently under-developed and under-realized for supporting distributed cloud solutions**
% of developers (n=717)

| | |
|---|---|
| Nothing is missing | 23% |
| Security tools | 35% |
| Compliance tools | 28% |
| Monitoring and analytics tools | 25% |
| Data storage and management tools | 25% |
| Development and testing tools | 25% |
| Networking tools | 23% |
| Management and orchestration tools | 21% |

**Features and attributes developers expect from their cloud infrastructure providers for distributed cloud solutions**
% of developers (n=639)

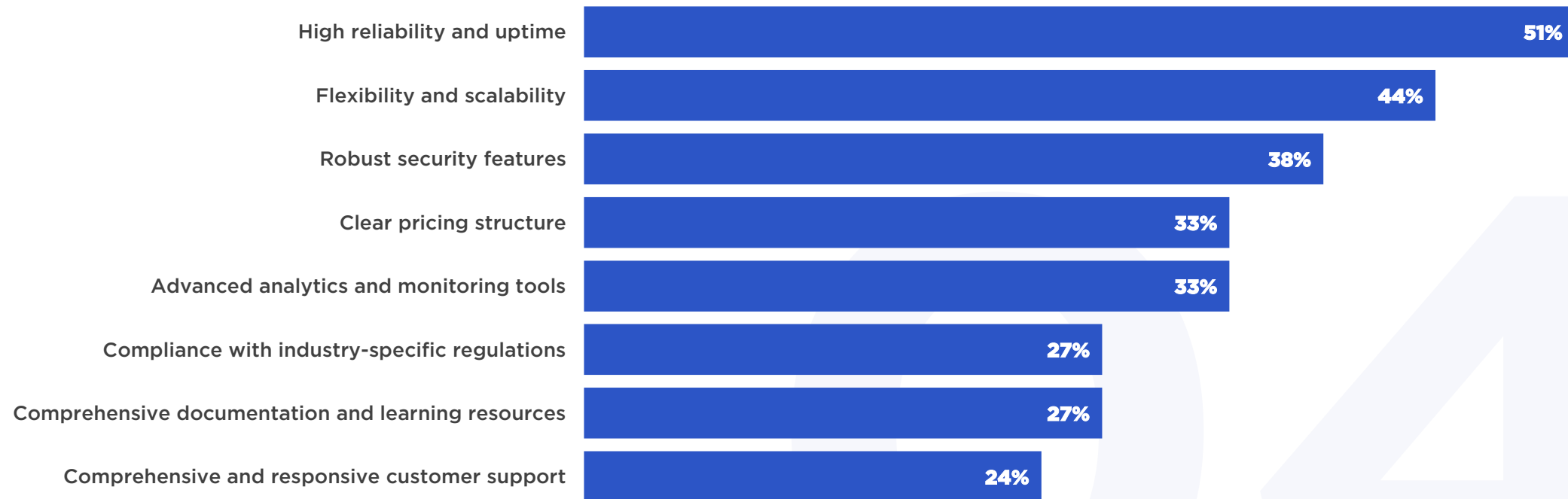| | |
|---|---|
| High reliability and uptime | 51% |
| Flexibility and scalability | 44% |
| Robust security features | 38% |
| Clear pricing structure | 33% |
| Advanced analytics and monitoring tools | 33% |
| Compliance with industry-specific regulations | 27% |
| Comprehensive documentation and learning resources | 27% |
| Comprehensive and responsive customer support | 24% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

# Developer perceptions of under-realized technologies and vendor activities to support distributed cloud solutions

## Features and attributes developers expect from their cloud infrastructure providers for distributed cloud solutions
% of developers (n=639)

| Feature | % |
|---|---|
| High reliability and uptime | 51% |
| Flexibility and scalability | 44% |
| Robust security features | 38% |
| Clear pricing structure | 33% |
| Advanced analytics and monitoring tools | 33% |
| Compliance with industry-specific regulations | 27% |
| Comprehensive documentation and learning resources | 27% |
| Comprehensive and responsive customer support | 24% |

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.

/DATA

# Features and attributes developers expect from their cloud infrastructure providers to support distributed cloud solutions, by their industry involvement

% of developers in each industry (n=639)

**Industry involvement**

Features or attributes excepted from distributed cloud infrastructure providers

| | Business consulting, legal services, HR & recruitment services | Data analytics / business intelligence products and services | Ecommerce and retail | Education, training, and academic research | Energy (incl. oil, gas, electricity, and water) | Entertainment, media, and information | Financial services & banking | Gaming (software, gambling, etc.) | Government and defense | Health, medical, biotechnology, and pharmaceuticals | Machine-learning or Artificial Intelligence | Marketing and advertising services | Software products and services, SaaS | Telecommunications and networks | Transportation and logistics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High reliability and uptime | 56% | 52% | 54% | 55% | 48% | 49% | 49% | 52% | 55% | 47% | 42% | 44% | 46% | 47% | 51% |
| Flexibility and scalability | 42% | 46% | 42% | 43% | 38% | 50% | 43% | 45% | 47% | 41% | 46% | 39% | 51% | 43% | 41% |
| Robust security features | 40% | 37% | 35% | 32% | 38% | 32% | 36% | 39% | 35% | 38% | 45% | 33% | 41% | 39% | 27% |
| Clear pricing structure | 37% | 32% | 39% | 40% | 39% | 46% | 39% | 39% | 42% | 43% | 32% | 43% | 35% | 34% | 41% |
| Advanced analytics and monitoring tools | 38% | 37% | 39% | 31% | 36% | 27% | 35% | 33% | 21% | 34% | 42% | 36% | 33% | 38% | 29% |
| Compliance with industry-specific regulations | 26% | 29% | 25% | 25% | 34% | 24% | 31% | 25% | 34% | 31% | 25% | 36% | 23% | 31% | 37% |
| Comprehensive documentation and learning resources | 28% | 26% | 26% | 30% | 29% | 25% | 27% | 31% | 32% | 27% | 36% | 36% | 29% | 32% | 35% |
| Comprehensive and responsive customer support | 19% | 26% | 20% | 29% | 31% | 27% | 22% | 29% | 26% | 23% | 23% | 28% | 25% | 21% | 27% |

Legend:
- >5pp below the average of all other cells within each row
- 2.5 – 5pp below the average of all other cells within each row
- ±2.5pp around the average of all other cells within each row
- 2.5 – 5pp above the average of all other cells within each row
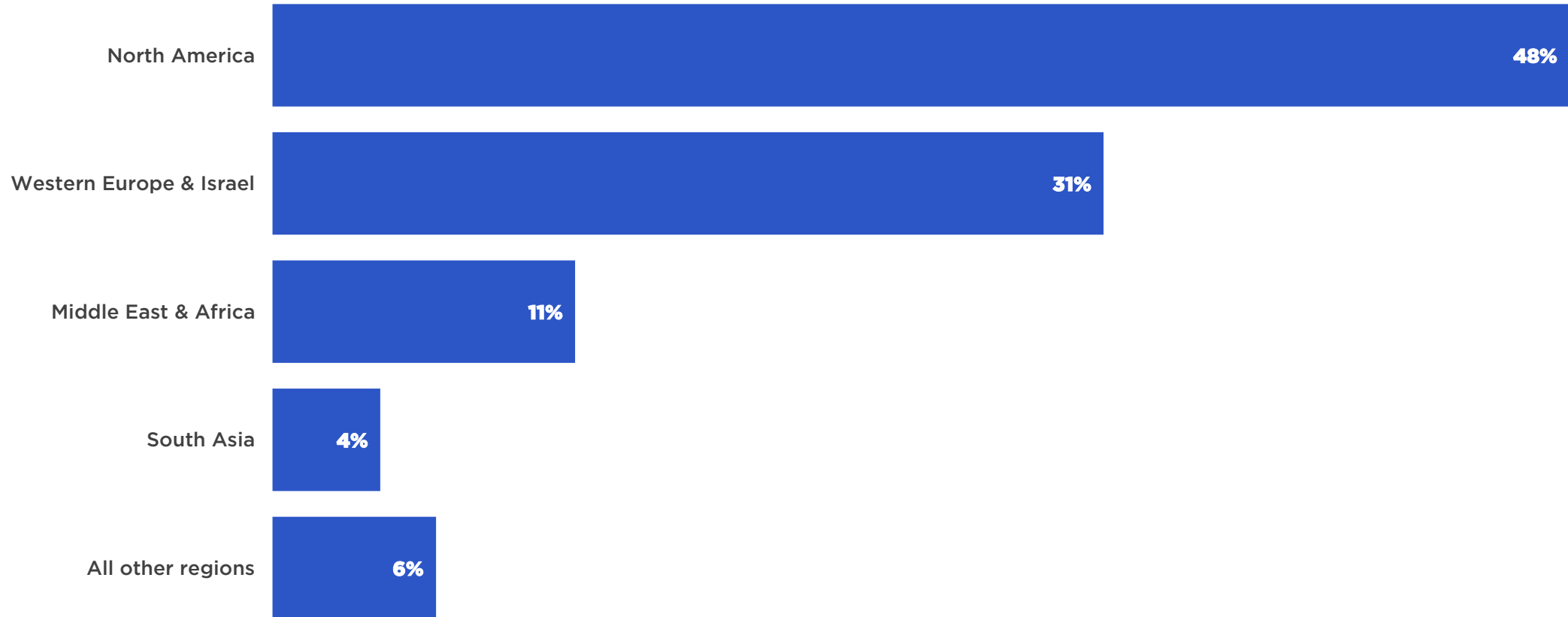- >5pp above the average of all other cells within each row

**Distributed cloud computing:** the practice of decentralizing cloud resources and services to be physically closer to the data source or user, while still being managed centrally.
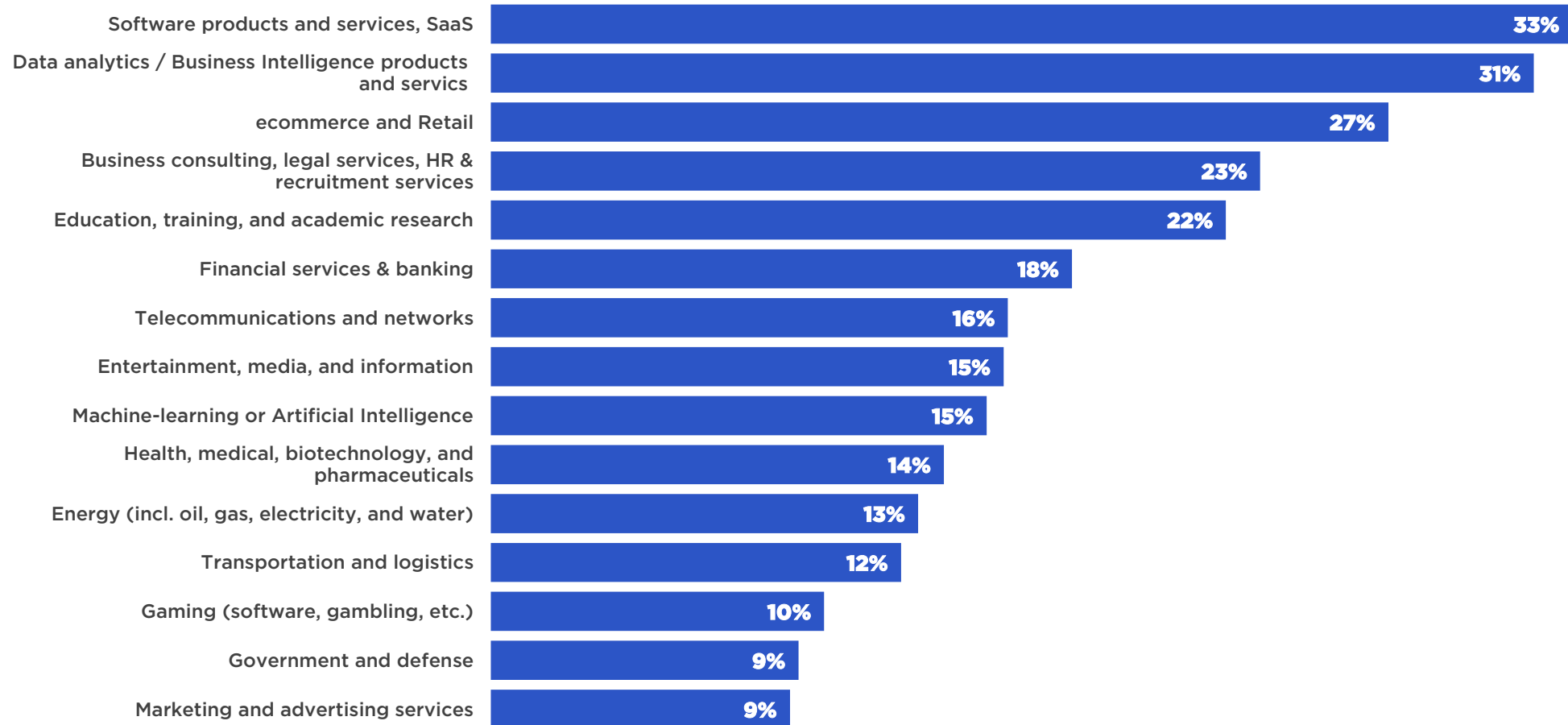
# APPENDIX

# Geographic distribution of developers

% of developers (n=777)



North America — 48%

Western Europe & Israel — 31%

Middle East & Africa — 11%

South Asia — 4%

All other regions — 6%

# Industry involvement of developers

% of developers (n=777)



| | |
|---|---|
| Software products and services, SaaS | 33% |
| Data analytics / Business Intelligence products and servics | 31% |
| ecommerce and Retail | 27% |
| Business consulting, legal services, HR & recruitment services | 23% |
| Education, training, and academic research | 22% |
| Financial services & banking | 18% |
| Telecommunications and networks | 16% |
| Entertainment, media, and information | 15% |
| Machine-learning or Artificial Intelligence | 15% |
| Health, medical, biotechnology, and pharmaceuticals | 14% |
| Energy (incl. oil, gas, electricity, and water) | 13% |
| Transportation and logistics | 12% |
| Gaming (software, gambling, etc.) | 10% |
| Government and defense | 9% |
| Marketing and advertising services | 9% |

# METHODOLOGY

In Q2 2023, SlashData designed and ran an online survey in conjunction with Akamai to explore the current state of developers' perceptions of, and interest in, distributed cloud solutions. We conducted the analysis presented in this report based on the 777 respondents who replied to this custom survey. Many of the questions in this custom survey are specifically designed and co-created to address Akamai's interests and questions related to developers considering distributed cloud solutions for their applications and services.

Every SlashData survey is monitored and cleaned to ensure the highest standards of retained responses. Our proprietary cleansing is designed to mitigate and remove opportunistic, fraudulent, and bot responses. Consisting of multiple criteria formulated around logic rules, speed, consistency, and response-taking behavior; this holistic assessment is key to our continued success.

# /DATA

# Understand developers. Inspire the future of technology.

We survey 30,000+ developers annually – across Web, Desktop, Cloud, Mobile, Industrial IoT, AR/VR, Machine Learning and Data Science, Games, Consumer Electronics and Apps/Extensions for 3rd party ecosystems - to help companies understand who developers are, what they buy and where they are going next.
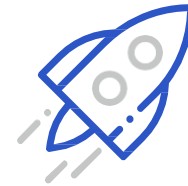
## WHO DEVELOPERS ARE
Developer population sizing
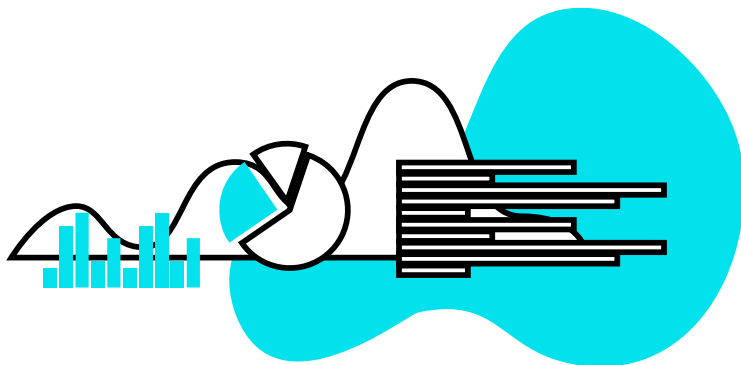Developer segmentation

## 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