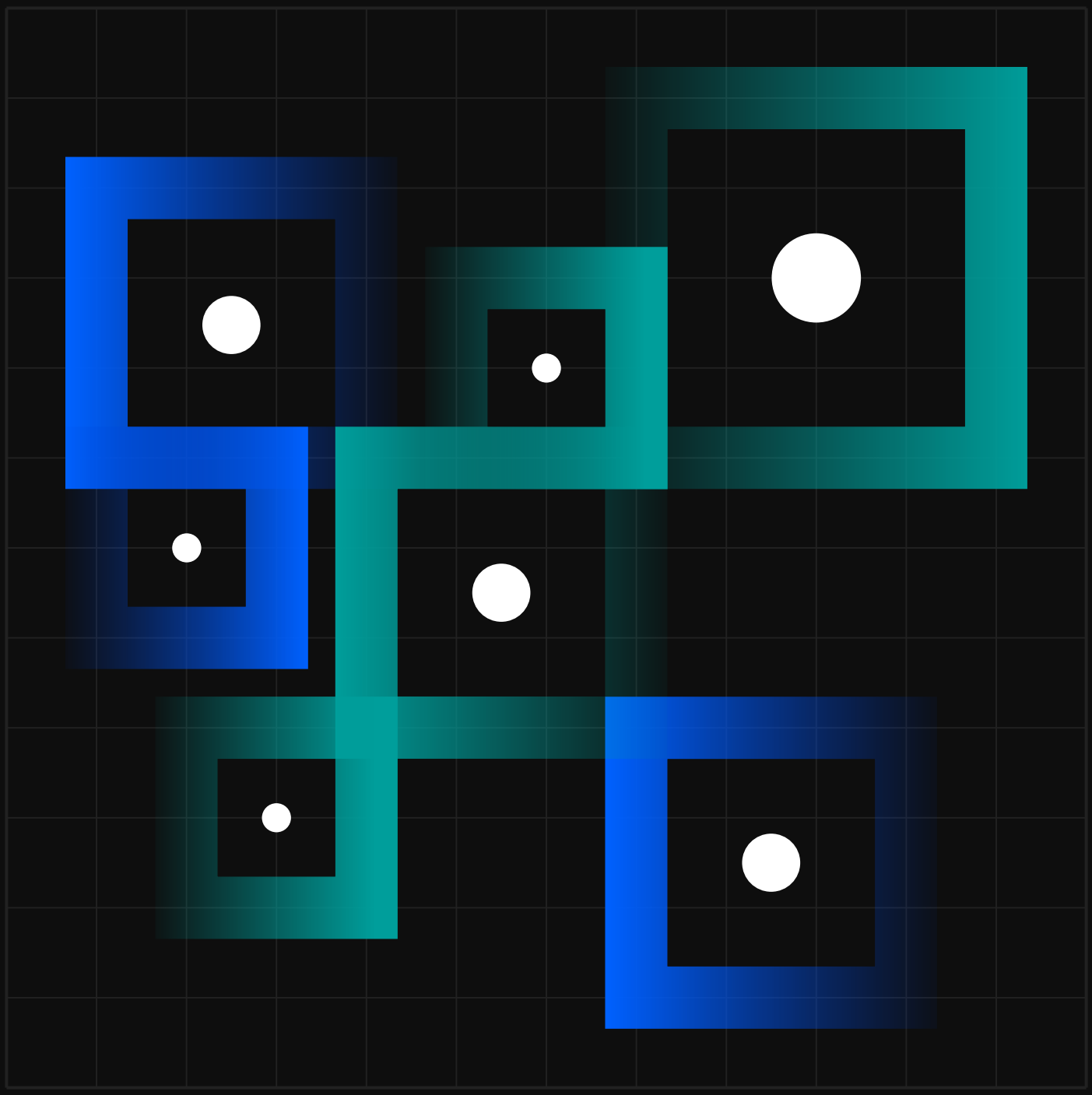
Containers in the enterprise

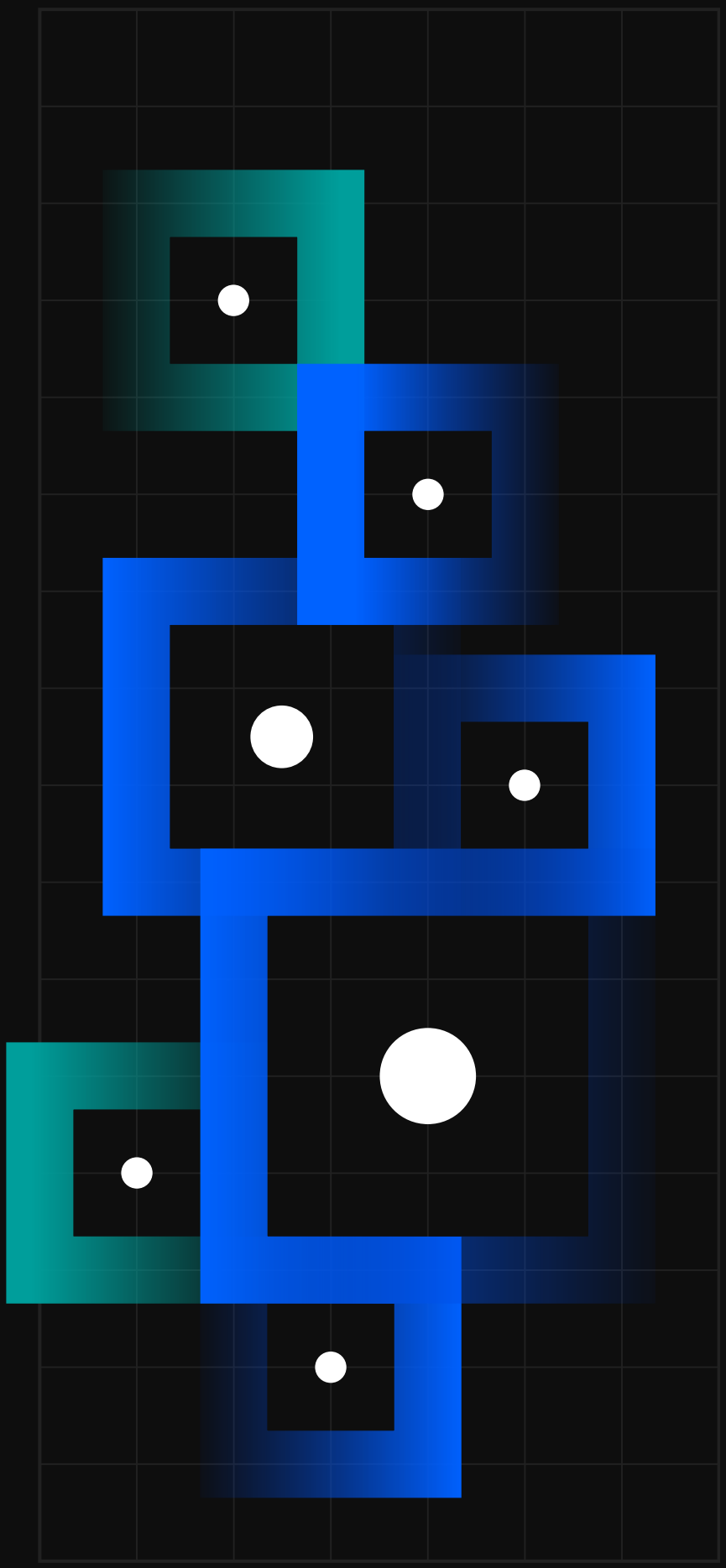
Rapid enterprise adoption continues

Results from research conducted in 2020
by *IBM Market Development & Insights*



ABOUT THE RESEARCH

During March 2020, the IBM Market Development & Insights team conducted multipart outreach to individuals in leading IT and development roles across North America. Through hundreds of telephone interviews and responses to a blinded, in-depth online survey, current users and nonusers were asked about their initial expectations and real-world experiences with containers and container orchestration solutions. The research offers a fresh perspective on the opportunities, challenges and lessons learned from implementing containerized applications.



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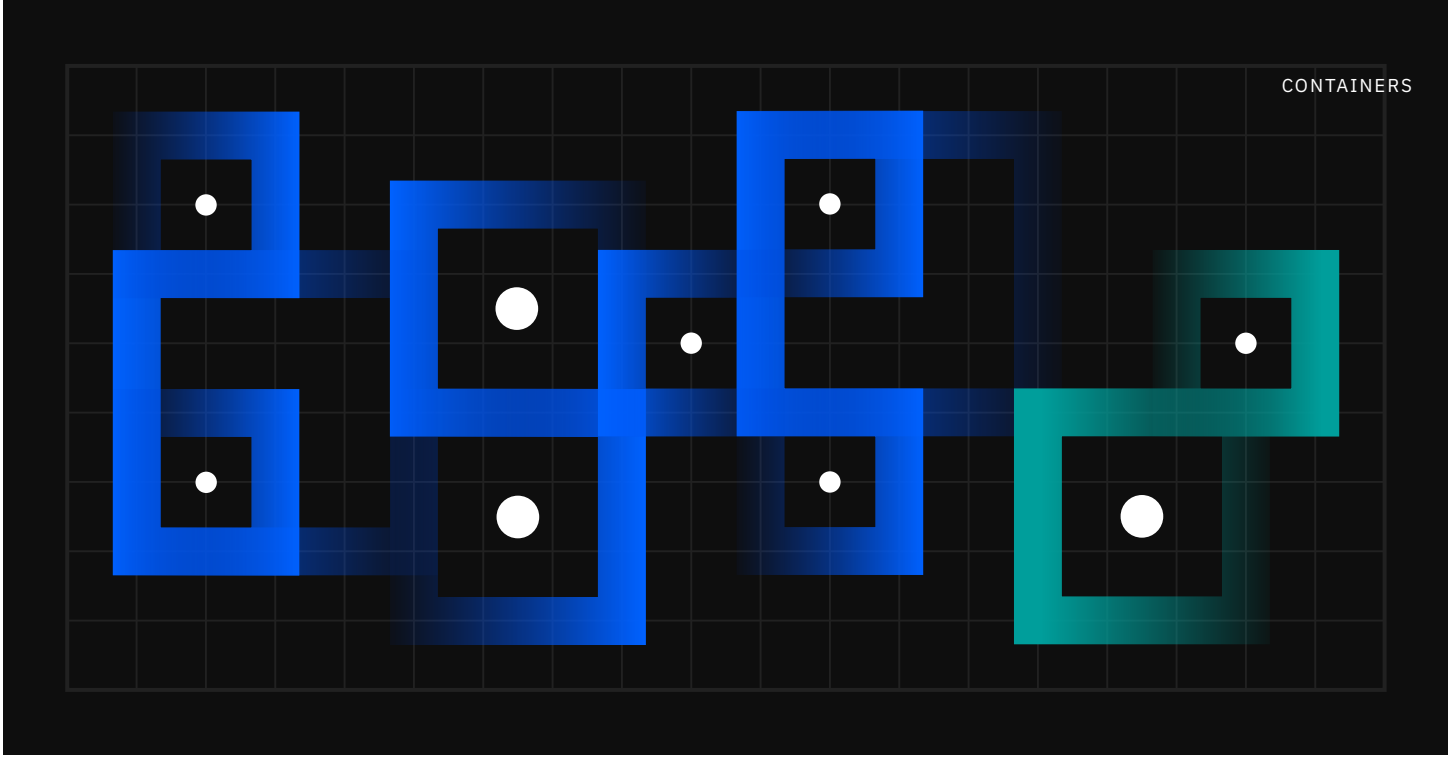


Why containerization is taking off

The idea for containerization of applications has been around for decades, but recently, adoption has been steadily gaining momentum as evolving container technology intersects the growing imperative for organizations to modernize their operations and infrastructure. Increasingly, they're moving to cloud-native development and hybrid, multicloud computing environments for greater flexibility and speed to market.

Applications that are built as microservices and deployed in containers orchestrated using technologies such as Kubernetes offer that critical flexibility and speed. The portability enabled by containers—packaging code, configuration files, libraries and any dependencies into a lightweight, platform-agnostic executable software bundle—is ideal for these modern environments.

MORE RESEARCH: BIGGER PICTURE, BIGGER BENEFITS

Containers and container orchestration are key technologies in a modern hybrid multicloud infrastructure that is already delivering outsized value for customers compared to a single-cloud, single vendor approach. Read the report.

Containers are becoming a business imperative

Survey results overview

Today, around half of all businesses have containerized at least a portion of their applications. In this research, users share their experiences, offering insight into how their own companies are employing containers and container orchestration solutions successfully, and what they plan for the near future. They discuss where their challenges lie and how they can be overcome. In addition, current nonusers explain their concerns with container technologies, detailing their remaining barriers to adoption.

What emerges is that containerization is considered a highly effective approach to application development and deployment for many types of workloads. More than ever, it's an approach whose time has come.

Among current users of containers:

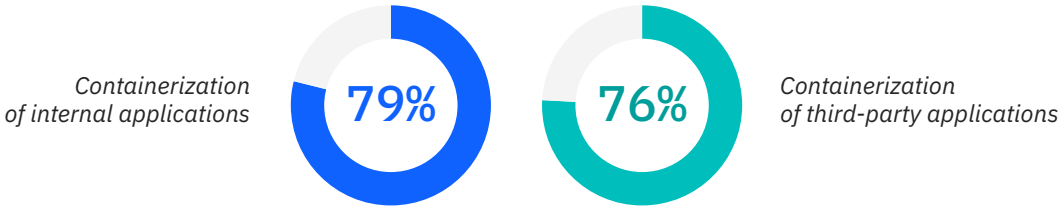
- More than **75 percent** report improved application quality, faster responses to changes in the marketplace and faster time to market.
- **61 percent** use a container orchestration solution—and another **30 percent** plan to.
- **Open source distributions and hosted managed solutions** are the most commonly used orchestration platforms by far.

How containers are being used

An important strategic tool

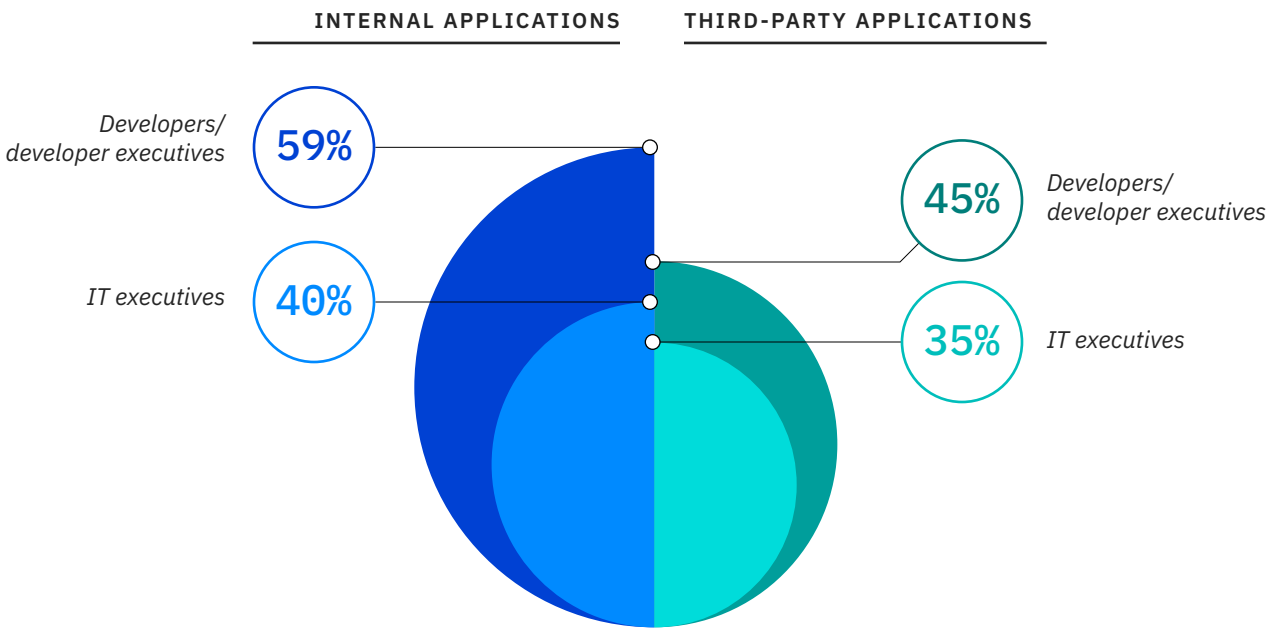
Although survey respondents reported diverse current use cases for containers, most fell into three basic areas: migrating current applications to the cloud; updating existing applications; and developing new, industry-specific applications. Regardless of the application, users recognize the value of containerizing applications, including third-party applications.

Respondents rated the following as important or very important:



See Figure 1 for complete data.

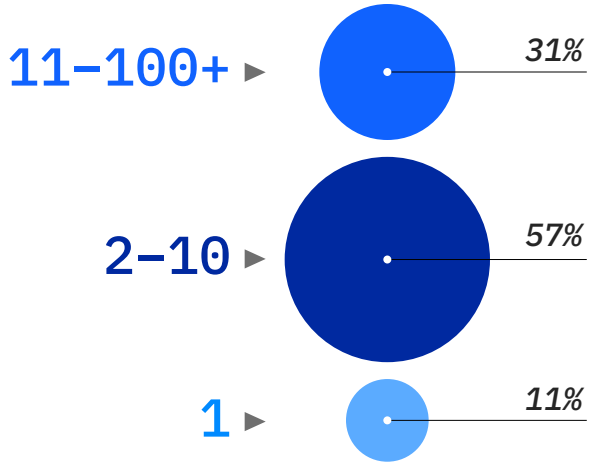
Developers and developer executives in particular, as compared to IT executives, found containerization to be very important.



See Figure 1 for complete data.

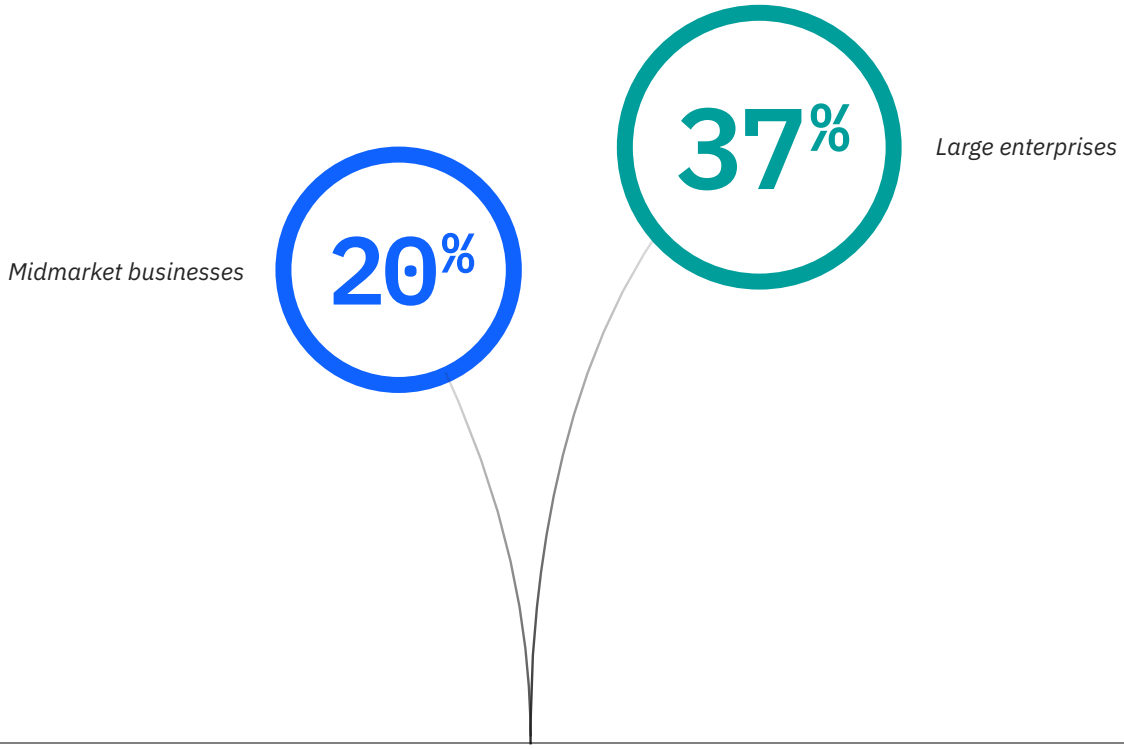
How many containers are being used per application?

Multicontainer applications are commonplace, with the number of containers typically used per application reported as:



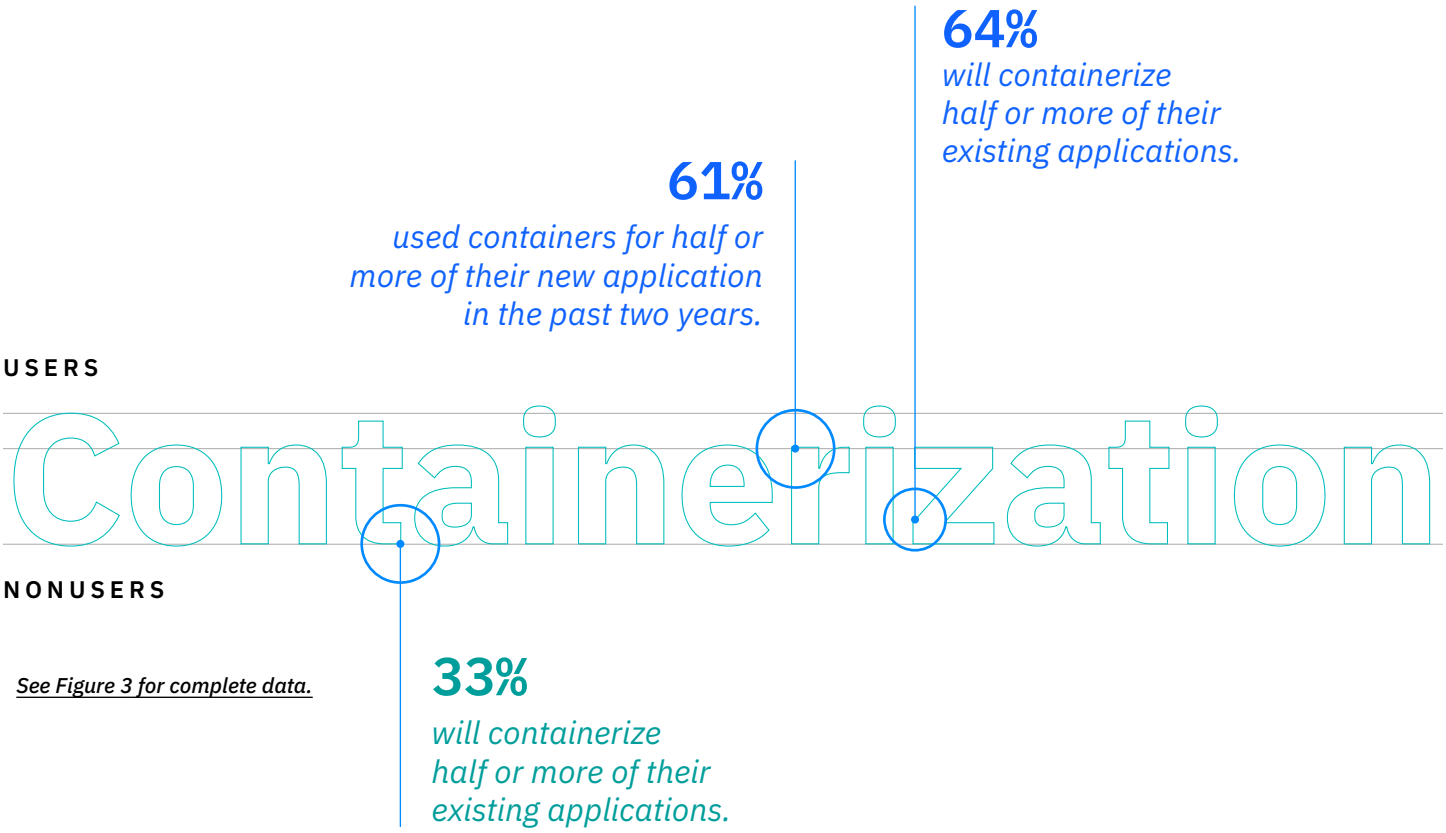
See Figure 2 for complete data.

Large enterprises showed greater propensity for using more containers in a typical application as compared to midmarket businesses. The percentage of organizations using 11 or more containers in a typical application were reported to be:



Near-future plans

A significant number of new applications have been built using containers in the past two years by current users—who also plan to containerize a large portion of their existing applications over the years. Only a third of nonusers have the same plan for their existing applications.



See Figure 3 for complete data.

Both current users and those planning to adopt a containerization approach cite key benefits they expect from the approach:

- **Portability and reliability** *as applications are shifted between computing environments*
- **Efficiency and time to market** *in building, deploying and scaling applications*
- **Simplifying development operations,** *including enabling scalability and streamlining quality assurance*

Containers are delivering real-world business benefits

Although containerization may not be the best approach for every application or workload, organizations that containerize do experience real benefits across industries and geographies.

78%
Improved application quality/reduced defects

78%
Faster response to changes in our market segment

76%
Faster time to market

74%
Improved employee productivity

74%
Higher customer satisfaction

73%
Better security of company/ customer data

73%
Reduced application downtime

72%
Better governance and risk management

70%
Greater levels of innovation

See Figure 4 for complete data.

KEY TAKEAWAYS

IT executives and application development professionals who currently use a containerization approach express confidence that containers provide a range of quantifiable business benefits.

Identifying challenges

Adopting a containerization approach is delivering powerful, real-world benefits to users, but it's not without challenges. We asked current users and those who expect their organization to adopt containerization within the next 12 months about barriers to adoption or expansion of containerization.

53%
Insufficient internal expertise

53%
Complexity of learning containerization strategies and technologies

50%
Challenges in redesigning existing on-premises enterprise application for containers

50%
Immaturity of internal, homegrown tools for container development and management

45%
Uncertainty regarding the time and costs involved in container projects

44%
No clear way to assess return on investment (ROI) or track benefits concretely

44%
Difficulty predicting container performance, undermining confidence in meeting service level agreements (SLAs)

43%
Difficulty cataloging, curating and managing containers as they proliferate across our environment

43%
Difficulty managing, sharing and securing data across containers

40%
Lack of enterprise-grade security capabilities

See Figure 5 for complete data.

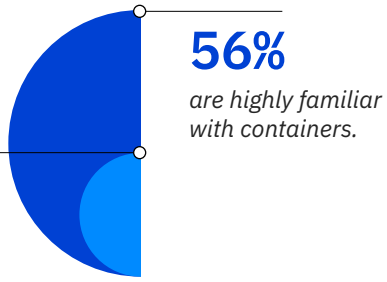
KEY TAKEAWAYS

Many of the challenges—both real and perceived—revolve around the need for new talent acquisition and thoughtfully implemented container orchestration technologies.

Container orchestration solutions

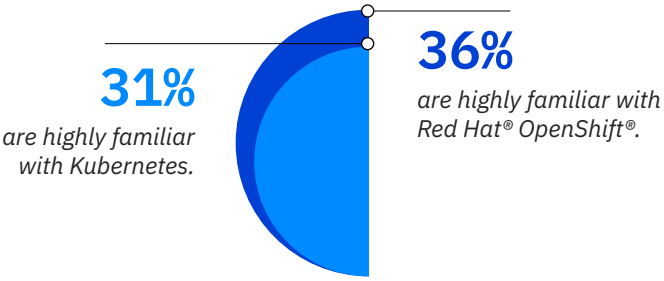
Operating hundreds or thousands of containers across a distributed system can quickly become untenable without an orchestration solution that automates and schedules tasks such as deployment, management, scaling and networking throughout the application lifecycle.

Container orchestration platforms such as Kubernetes, an open source project that has become one of today's most popular platforms, handle these essential responsibilities. The research shows that, although containers are well understood by most respondents, far fewer felt confident that they understood fully what a container management or orchestration platform is.



See Figure 6 for complete data.

Interestingly, a greater percentage of respondents reported being highly familiar with orchestration platforms when presented with brand names:

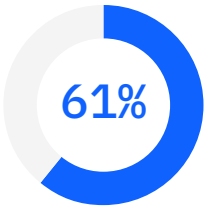


KEY TAKEAWAYS

With only around a quarter of respondents expressing a high degree of familiarity, there is confusion in the marketplace about the role and function of orchestration platforms.

Adoption by solution type

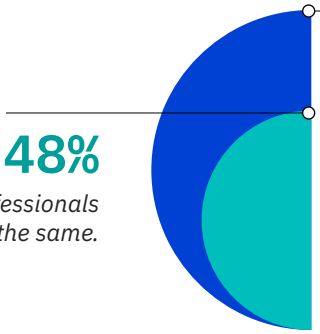
Although developer and IT professionals may not have great familiarity with container orchestration platforms, they are in use in organizations that have adopted a containerization approach.



use a container orchestration solution.

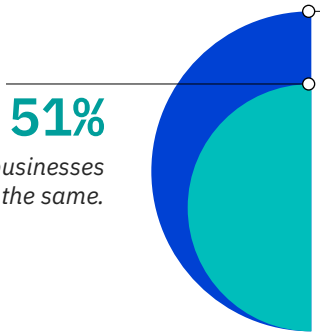
See Figure 7 for complete data.

Job role plays a part:



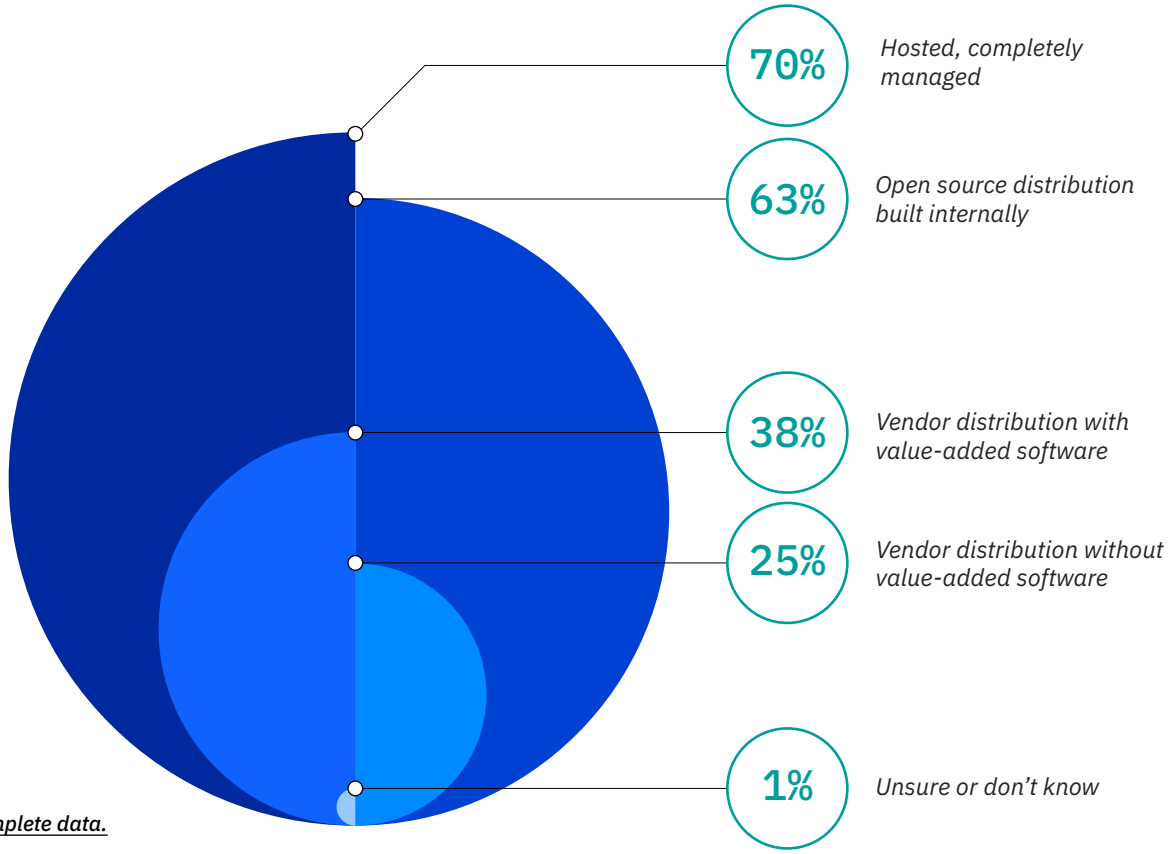
See Figure 7 for complete data.

As does the size of the organization:



See Figure 7 for complete data.

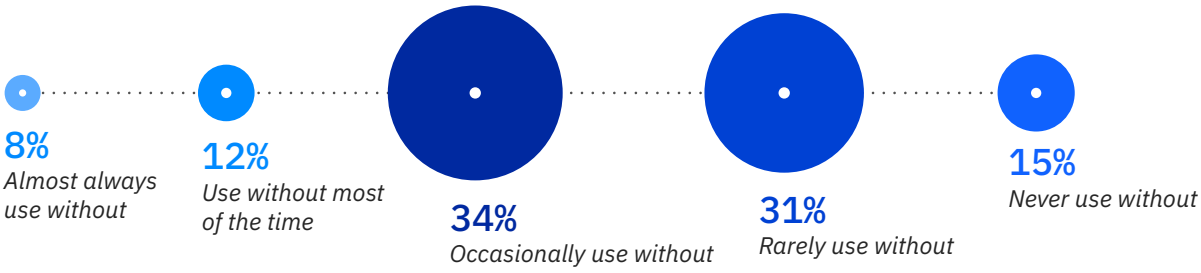
Several types of container management or orchestration solution strategies are popular. More than one type of approach may be used by the organization:



See Figure 7 for complete data.

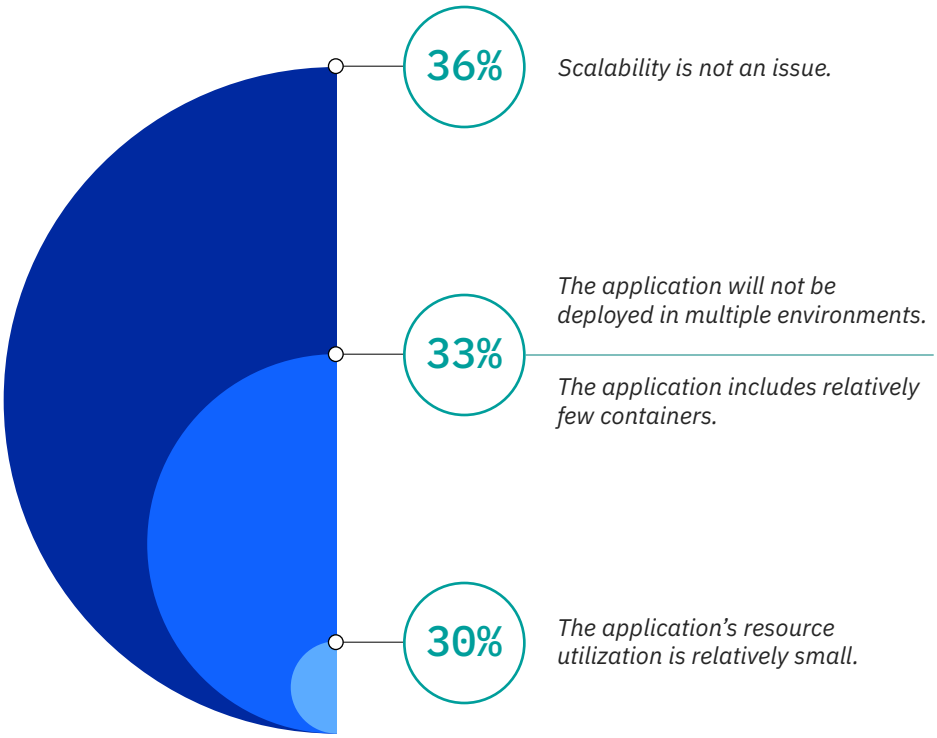
Orchestration isn't always needed

More than half of respondents report that they don't always use container orchestration platforms for their containerized applications. Asked how often they used containers without orchestration, here's what they said:



See Figure 8 for complete data.

There were a number of reasons given for not using an orchestration platform for certain containerized applications, largely centering around issues of scalability and complexity. Respondents were asked when they were most likely to use containers without orchestration (multiple answers possible):



See Figure 8 for complete data.

KEY TAKEAWAYS

- Using open source code to "build our own" was the most common response when users were asked about the orchestration platform they were employing.
- Users who adopted external orchestration solutions named "hosted, completely managed solutions" as the most popular approach.

Container orchestration solutions are delivering business value

Most users of container orchestration solutions are experiencing tangible, quantifiable benefits. Respondents called out nearly 20 benefits as important or highly important (4 or 5 on the 1–5 scale), with most centering around issues of security, productivity, portability, cost and reliability. The top 10 reasons given were:

86%
Provides robust security

85%
Increases productivity

81%
Is easily portable and vendor agnostic

81%
Minimizes human error

81%
Delivers cost savings by optimizing resource usage

80%
Reduces the risk of application downtime with rolling deployments and automated rollbacks

79%
Auto-scales to fit the needs of particular applications, incoming traffic and load

79%
Reduces the risk of downtime through self-monitoring/ self-healing capabilities

79%
Supports hybrid cloud environments

78%
Provides a consistent UI and experience across clouds in a multicloud environment

See Figure 9 for complete data.

Barriers to the usage of container orchestration solutions

Several barriers to adoption or increased usage of container orchestration solutions were identified. However, in most cases, fewer than half of the respondents reported them to be a significant issue. We asked those surveyed whether they agreed with the following statements:

It can be difficult to assess, enhance and manage container security.

It's overkill for most of our needs.

Adoption is cumbersome and requires too much time and effort.

They are very complex and can reduce productivity and release cycles.

Managed orchestrators are more expensive than bring your own (BYO).

Third-party orchestrators increase risk of vendor lock-in.

Finding talent is difficult and expensive.

See Figure 10 for complete data.

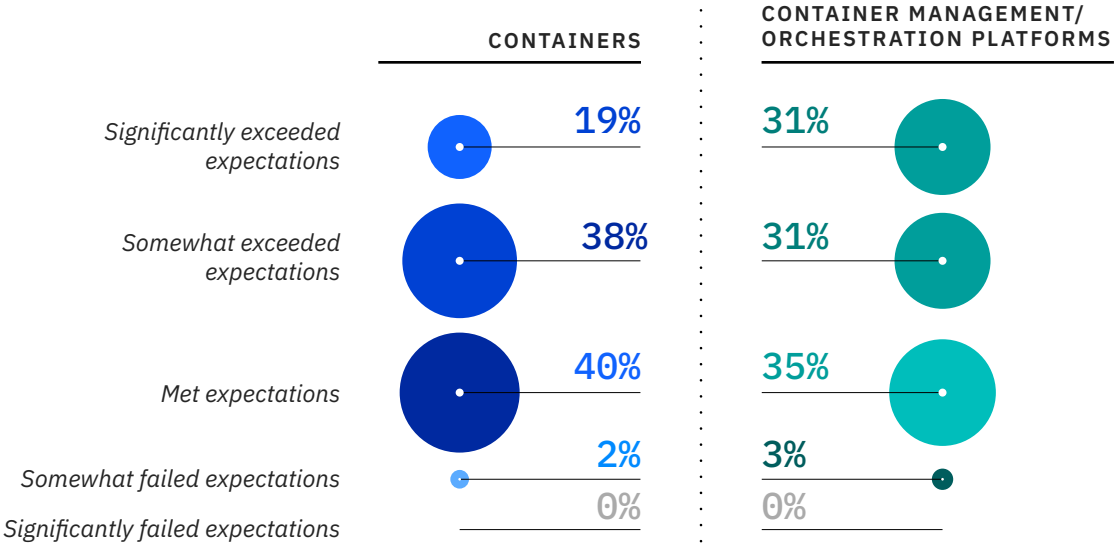
KEY TAKEAWAYS

- There is an apparent disconnect between the business benefits noted by current users of container orchestration solutions and the barriers to adoption. As a reminder, the top three business benefits identified were:
  - **86%** *Provides robust security*
  - **85%** *Increases productivity*
  - **81%** *Is easily portable and vendor agnostic*
- Security, productivity and vendor lock-in remain concerns for a sizable percentage of respondents, indicating that more education around overcoming these perceived barriers may be required.
- Interestingly, cost was reported to be among the lowest barriers to adoption, with only 34 percent of respondents unsure whether the cost of deploying a container orchestration solution is worth it.

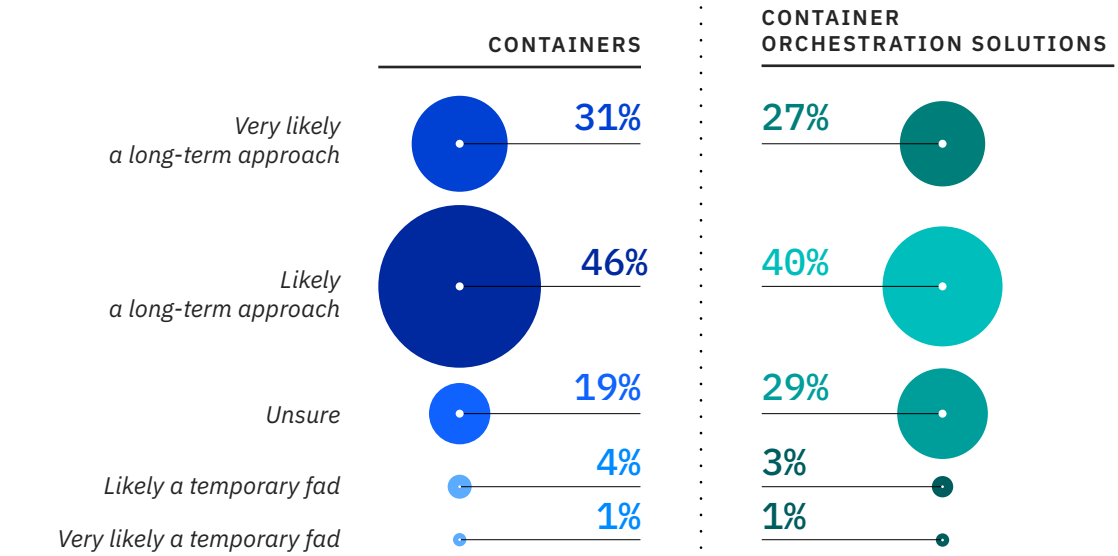
Your future will be containerized

Containers and container orchestration solutions are highly regarded by those who use them. Most respondents see them as viable long-term approaches, especially as more organizations implement a hybrid or multicloud strategy.

We asked users whether the performance of containers and orchestration solutions matched their expectations. Here's what they said:

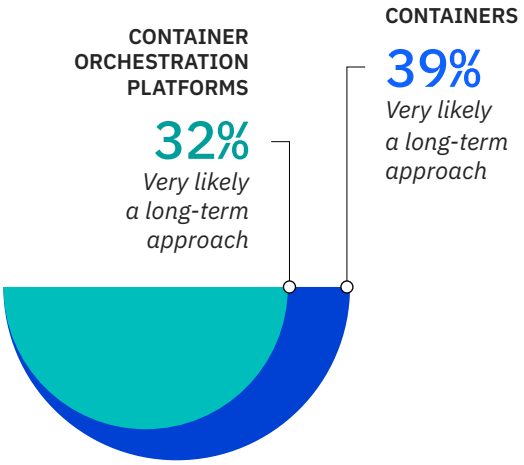


Not surprisingly, given these results, the future of containers looks bright for the long term. Here's what users said:

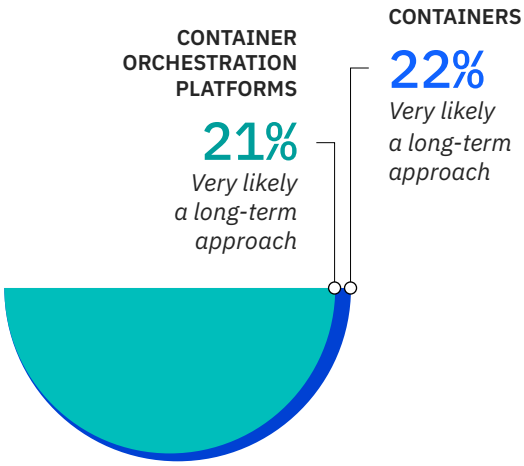


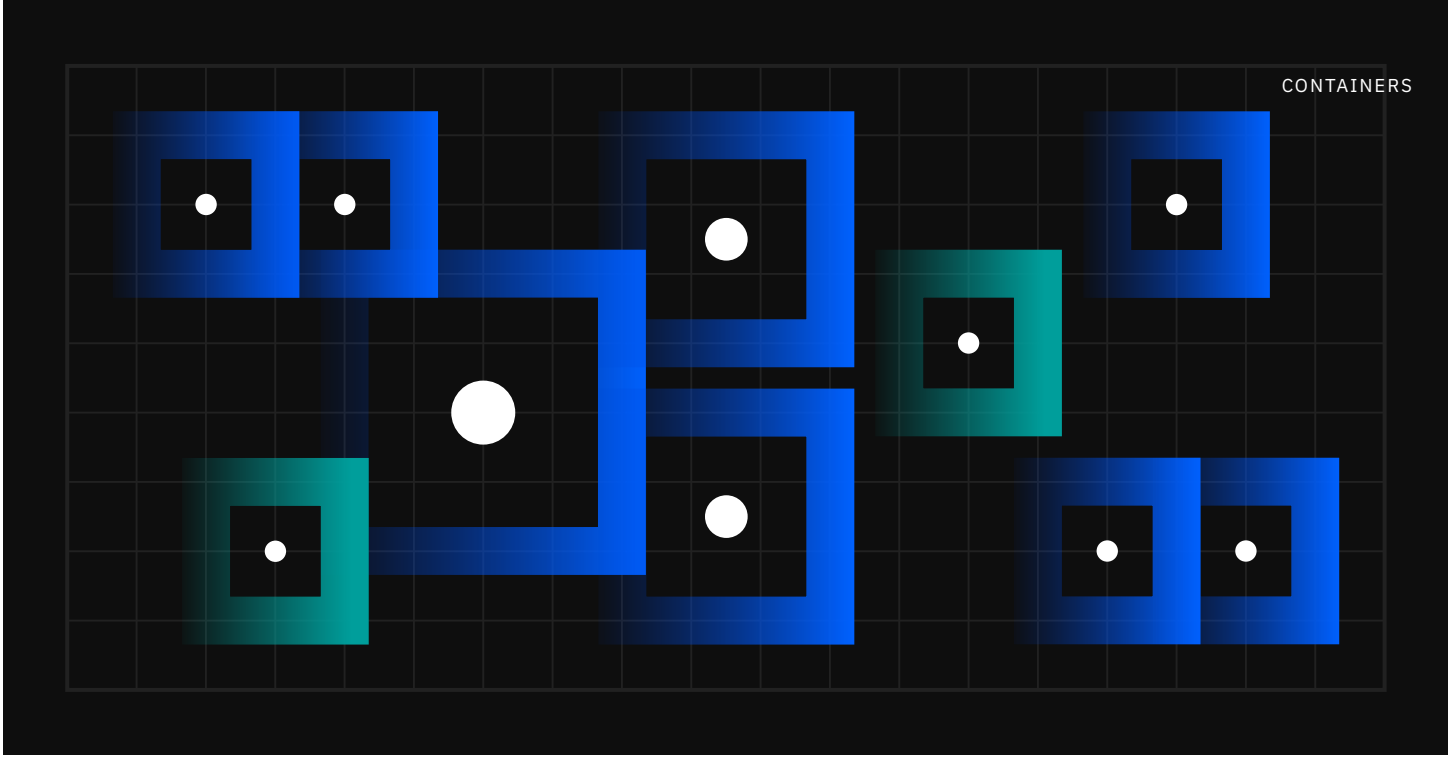
Role plays a part in influencing perspective as well, with more developers and developer executives than IT executives agreeing that containers offer a long-term approach:

DEVELOPERS AND DEVELOPER EXECUTIVES



IT EXECUTIVES





The path ahead

The research confirms that containers and container orchestration solutions have never been more relevant. Users are seeing real-world strategic and operational benefits—advantages that enable them to deliver applications faster and more reliably, with better quality and greater efficiency.

Perceived barriers to adoption remain, but those who adopted containerization have largely found that the barriers, while real, are often not as concerning as they may have appeared. Choosing the right container technologies and the right container orchestration platform can go a long way toward breaking down these barriers, enabling the organization to bring new applications to the marketplace faster, migrate legacy applications for the modern computing environment and, ultimately, seize opportunities to drive revenue.

Containers are key components of an open hybrid cloud strategy that lets you build and manage workloads across all environments. ***Learn more***.

To get started right away with containers, ***sign up for an IBM Cloud account***.

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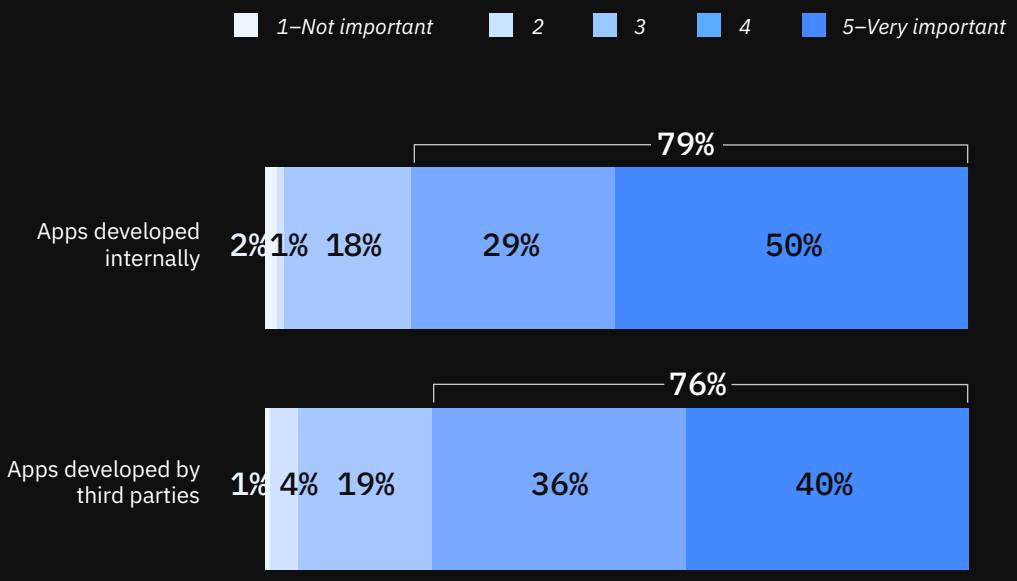
APPENDIX

Importance that applications are containerized



Containerization is more important for **dev/dev exec than IT**:
Internal apps: Dev/dev exec (59%) vs. IT (40%)
Third-party apps: Dev/dev exec (45%) vs. IT (35%)

Figure 1

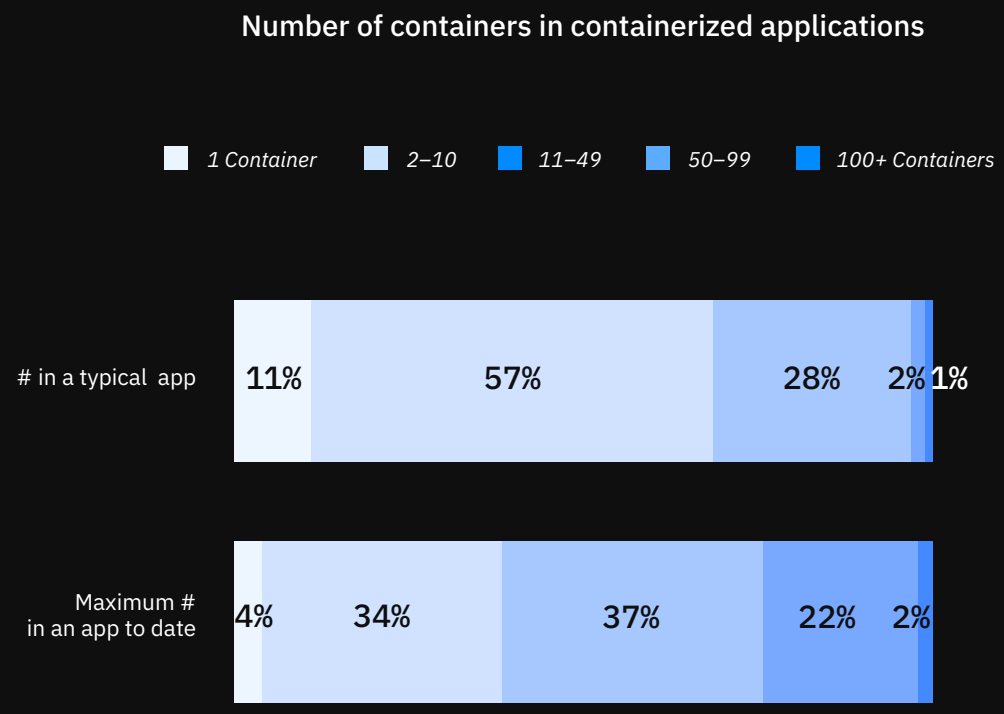

Number of containers in containerized applications
1 Container
2–10
11–49
50–99
100+ Containers
in a typical app
11%
57%
28%
2%
1%
Maximum # in an app to date
4%
34%
37%
22%
2%

Figure 2

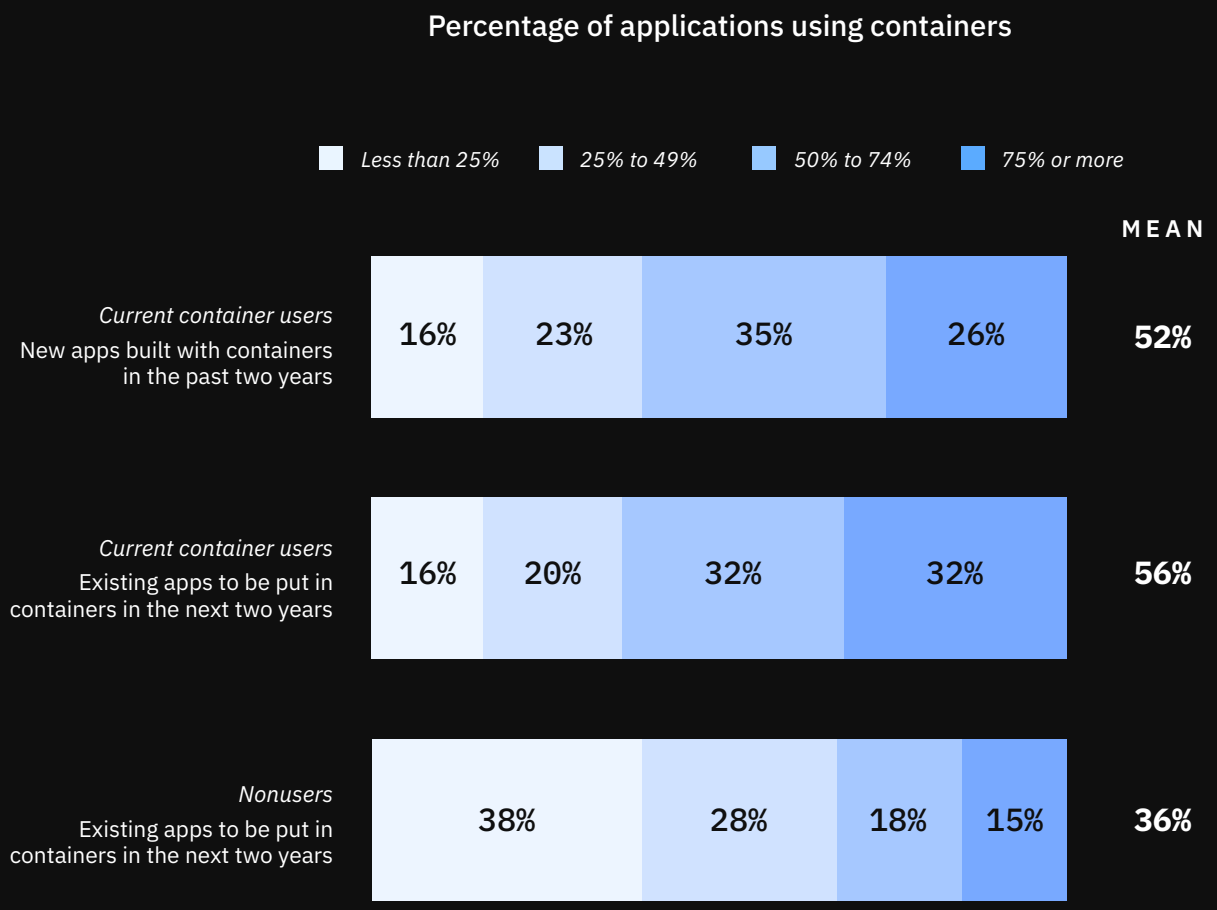

Percentage of applications using containers
Less than 25%
25% to 49%
50% to 74%
75% or more
MEAN
Current container users
New apps built with containers in the past two years
16%
23%
35%
26%
52%
Current container users
Existing apps to be put in containers in the next two years
16%
20%
32%
32%
56%
Nonusers
Existing apps to be put in containers in the next two years
38%
28%
18%
15%
36%

Figure 3

Business benefits experienced from adopting containers

(% rating 4 or 5 in degree of experiencing benefit on 1–5 scale)

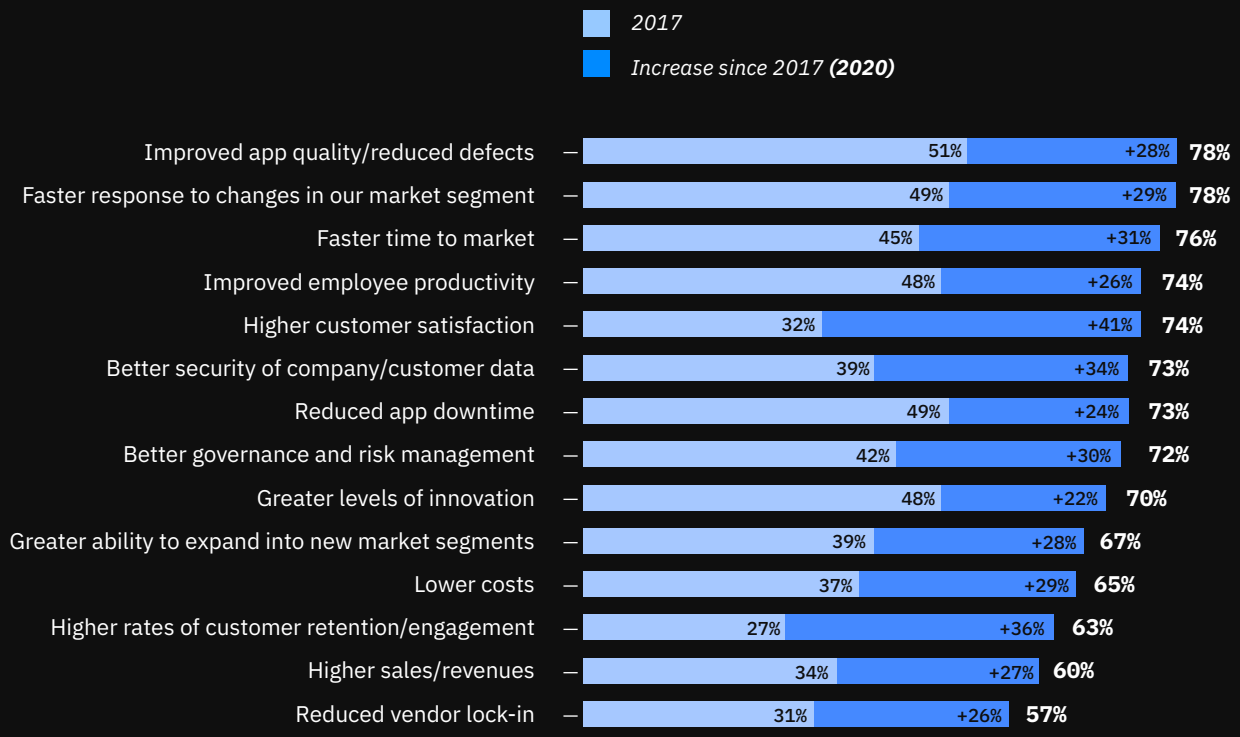


Figure 4

Challenges to adoption or expansion of container use

(% rating 4 or 5 in degree of experiencing benefit on 1–5 scale)

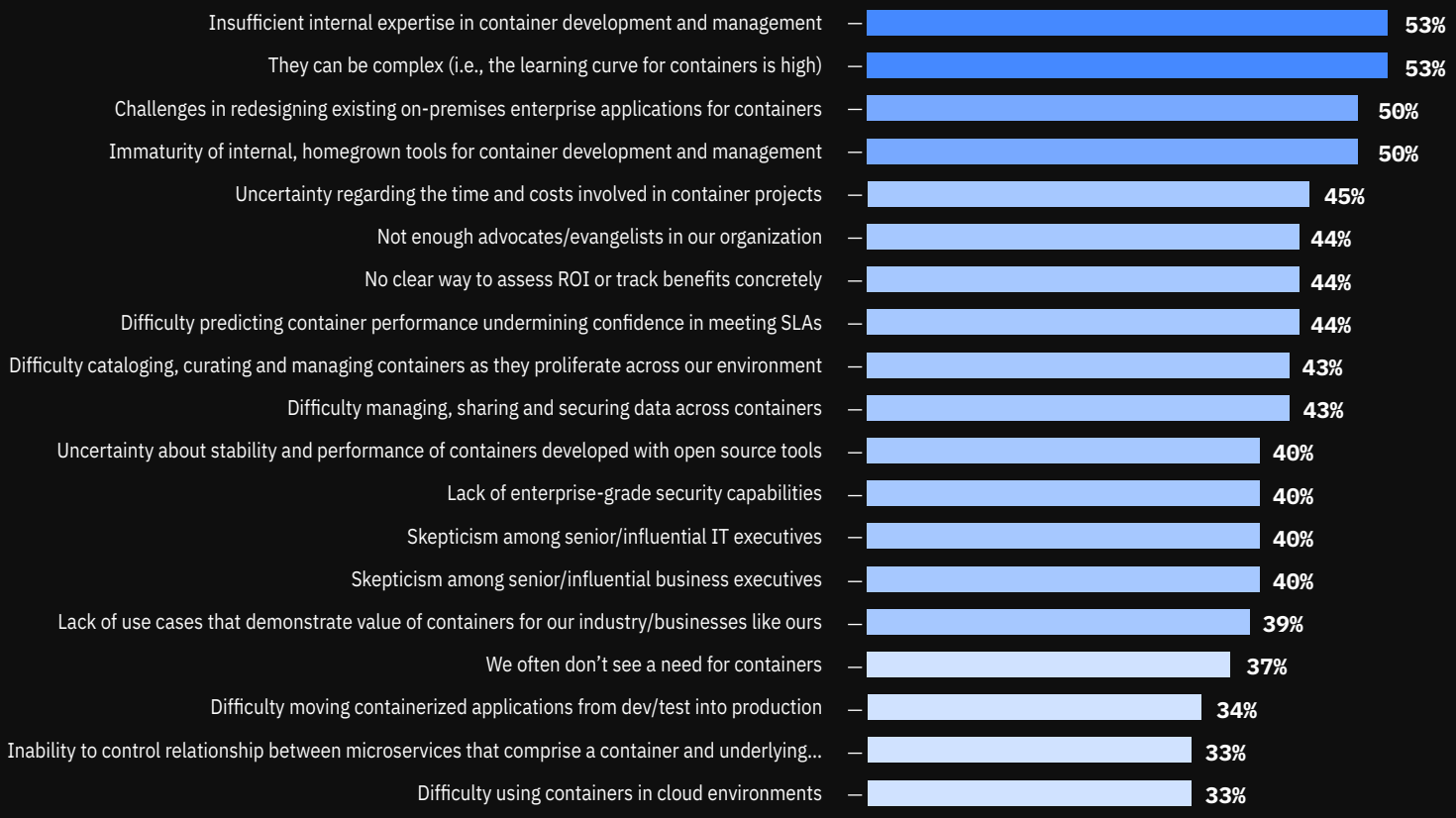


Figure 5

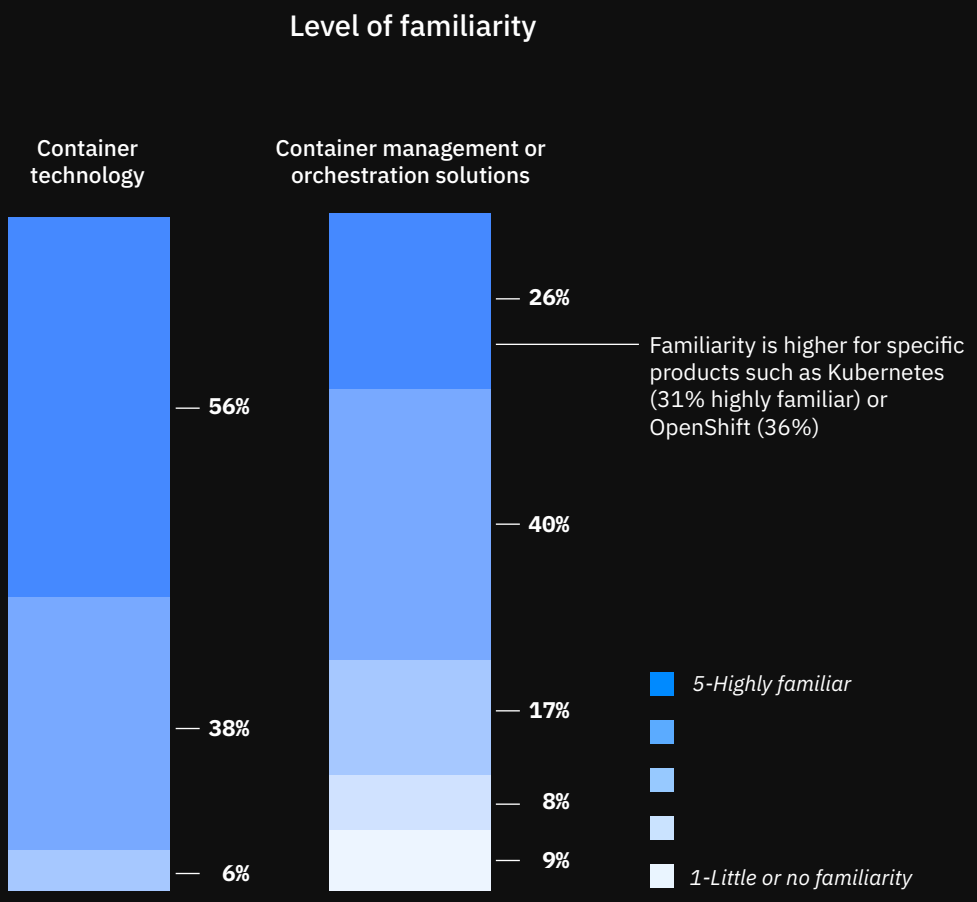
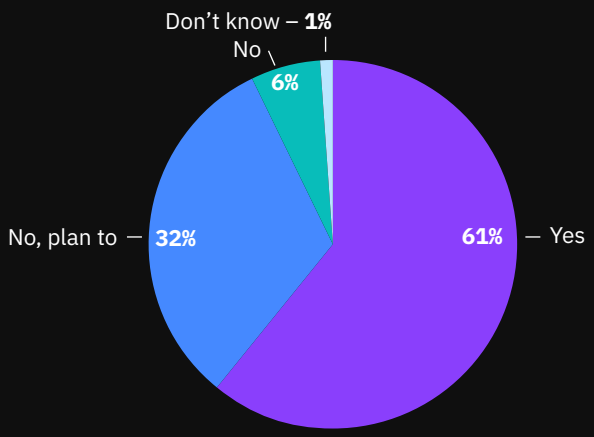

Level of familiarity
Container technology
Container management or orchestration solutions
56%
38%
6%
26%
40%
17%
8%
9%
Familiarity is higher for specific products such as Kubernetes (31% highly familiar) or OpenShift (36%)
5-Highly familiar
1-Little or no familiarity

Figure 6

Use container management/orchestration solution?

(% selecting among container users)



Devs/dev execs (70%) more likely to report using than IT (48%)
Large enterprises (66%) more likely to use than midmarket (51%)

Type of container orchestration solution used

(% selecting among container users)

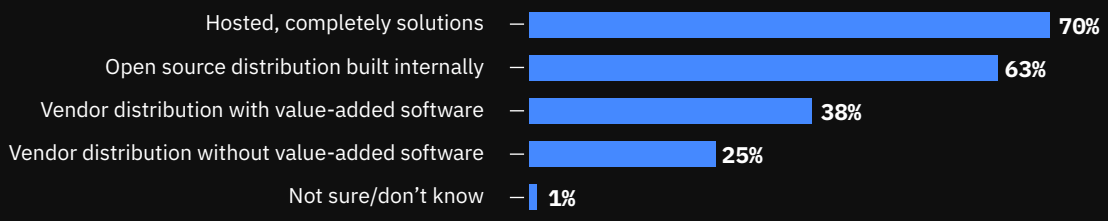
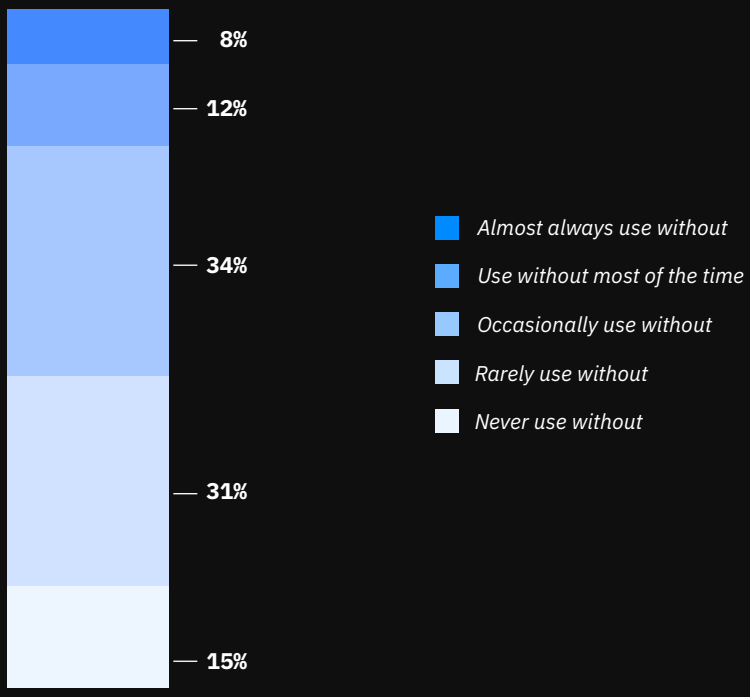


Figure 7

Use of containers without orchestration solution



Most likely to use without orchestration solution when:

(% selecting)

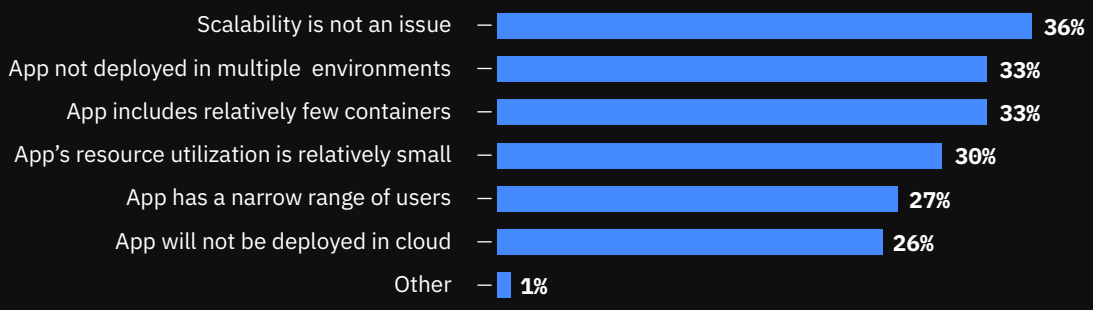


Figure 8

Benefits motivating container management/orchestration solution use

(% rating 4 or 5 in importance on 1–5 scale)

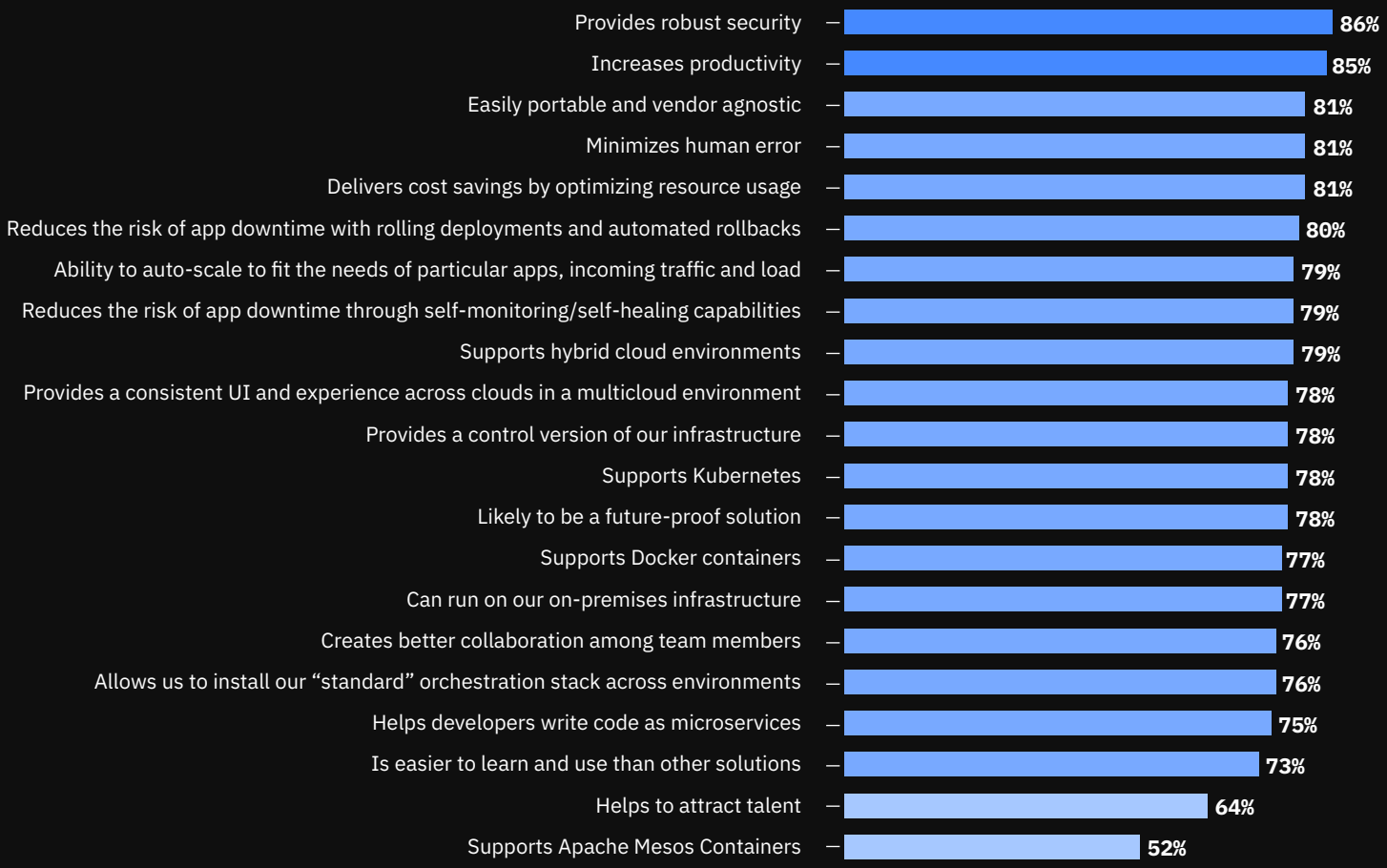


Figure 9

Challenges to usage of container orchestration platforms

(% agreeing)

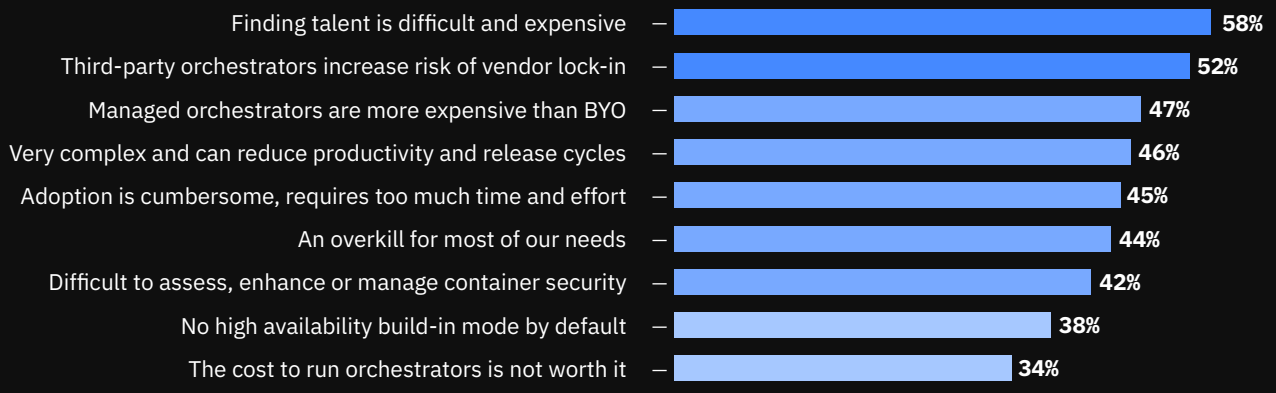


Figure 10