The state of container-based app development

2 Key takeaways
3 Outlook on containers by role
4 Factors driving adoption
6 Adoption analysis
7 The future of container development
8 The value of container development
9 Comparing platforms
11 Investing in containers
12 Appendix
In order of importance, enterprise-grade security, tools that ease operational challenges, support for cloud and on-premises environments, and flexible application architectures are the key drivers of container-based cloud platform adoption.

In terms of using and adopting container-based platforms, solving challenges related to the new technology currently overshadows the demand for advanced services like AI and big data analysis tools.

Using containers is associated with improving app quality, reducing both app development costs and production app downtime, and facilitating user experience innovation.

Container usage for production enterprise workloads is expected to increase from 25 percent to 44 percent within the next three years. Deployment will shift heavily to Hybrid Cloud and support for on-premises, serverless containerized environments. Deploying only on public clouds will decrease.

Respondents see enterprise applications as best suited for container-based application development. Over 40 percent of respondents consider apps involving data analytics best positioned to benefit from being containerized, and approximately a third consider web serving, database and CRM apps best positioned to benefit.

Commercial solutions could be the catalyst for container-based development to expand beyond open source frameworks. Commercial solutions are perceived as highly correlated with DevOps, microservices development and automation tools that reduce the operational and uncertainty challenges that currently overburden the container market.

Cloud platform support for developing and easily migrating apps is fundamental for fostering investment in container-based development. Two-thirds of respondents value the ability to allow users to design container compute environments.

Consulting services are considered only necessary for complex endeavors — for example (and especially), when companies seek to leverage AI within containerized apps and need support for non-x86 architectures.

Compared to IT executives, developers favor container-based technologies and are likely to report strategic benefits from using them. Developers are especially interested in AI, Machine Learning, big data, non-x86 and industry use cases.

Across the range of roles, respondents see insufficient internal expertise as one of the significant challenges of adopting container-based app development. IT executives are concerned with time and cost uncertainty, whereas developers are bogged down by operational challenges like redesigning on-premises apps and managing data across containers.

Developers value a platform that is best suited to support diverse environments. For developers and IT executives, compatibility with their current IT environment and ease of use rank among the top reasons why a container platform is selected.

The primary buyers and leading influencers of container investments are the heads of IT operations and senior IT executives. However, app development leaders, DevOps teams and app developers are also highly influential.
The outlook on containers by role

**Developer executives**

In terms of business value, business executives focus most on practical benefits, **highly valuing (61%)** the potential of containers to reduce costs related to production downtime, **improve application quality (56%)** and **employee productivity (53%)**. While remaining wary of containers’ **unproven efficiency (55%)**, business executives nevertheless see the **potential efficiencies in the DevOps pipeline (77%)** as the single most valuable potential benefit in using containers.

**IT executives**

IT executives also focus on practical benefits. They see **improved software quality (61%)** as the highest business value of containers, and **enhancing security (72%)** as the greatest technical opportunity. In contrast, IT executives see the **skepticism of top business executives as the biggest challenge (65%)**.

**Developers**

Due to recent market-disrupting companies achieving success on container-based platforms, business leaders might be expected to focus on innovation. However, **developers (66%)** are the ones who focus on that, seeing the **potential to quickly respond to changes in the market (64%)**. For them, the most important thing about containers and their environments is the **potential for high security (84%)**. **Lack of adequate expertise within their organization is the biggest concern (62%)**.
Factors driving adoption

What are the most important solutions and capabilities helping companies adopt container-based app development?

77% Enterprise-grade security solutions

71% Tools to automate deployment and mgmt

70% Tools to accelerate DevTest and production rollout

70% Support public cloud and on-prem environments

69% Easy to use IDE

69% Integrated operational tools, including support for add-ons and third-party tools

68% Solutions optimized for preferred container platform

67% CSP allows personal design of container compute environment

66% Security across multiple cloud environments and providers

66% Commercial container solutions

64% Support Windows and non-x86 Linux-based containers

63% Tools to move containers easily across platforms

56% Tools linking containers with microservices development

54% Container consulting services

52% Compelling industry use cases

48% Support non-x86 architectures

45% Leverage AI/analytics within containerized apps

Companies most require enterprise-grade security solutions

Tools that automate and accelerate development, deployment, and management are perceived as key.

Multi-cloud support is also seen as essential.

Platform support capabilities have less impact on adoption and expansion

The ability to integrate AI, IoT, Big Data, etc. has the least impact
## What is most important to whom?

Overall, developers see the most value in using containers while IT Execs see the least. App-differentiating technologies like Artificial Intelligence, Machine Learning, Big Data, non-x86, and industry use cases are held in significantly higher regard among developers.

<table>
<thead>
<tr>
<th></th>
<th>Developer executives</th>
<th>IT executives</th>
<th>Developers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise-grade security solutions</td>
<td>75% 2</td>
<td>84% 1</td>
<td>72% 1</td>
</tr>
<tr>
<td>Tools to accelerate DevTest and roll-out to production</td>
<td>77% 1</td>
<td>79% ↑</td>
<td>53% ↓</td>
</tr>
<tr>
<td>Support Public Cloud and on-prem environments</td>
<td>69%</td>
<td>73%</td>
<td>66% 3</td>
</tr>
<tr>
<td>Easy-to-use IDE</td>
<td>71%</td>
<td>80% 3</td>
<td>58% ↓</td>
</tr>
<tr>
<td>Integrated operational tools, including add-on/BYOT</td>
<td>68% 2</td>
<td>68%</td>
<td>69% 2</td>
</tr>
<tr>
<td>CSP enables container-compute environment design</td>
<td>69% 2</td>
<td>80% 2</td>
<td>51% ↓</td>
</tr>
<tr>
<td>Security across 2+ cloud environments and CSPs</td>
<td>74% 3</td>
<td>69%</td>
<td>55% ↓</td>
</tr>
</tbody>
</table>

---

Enterprise-grade security solutions rank highest for developers and IT executives and second behind tools to accelerate DevTest/production rollout for developer executives.

Cloud capabilities and support across environments also emerge as relevant drivers.
Adoption analysis

The capabilities and solutions helping companies adopt or expand the use of containers are highly linked in positive relationships: as one rises or falls in importance, so does the other. No capabilities work in isolation, as seen in the graph below.

**Enterprise-grade security** is highly correlated with commercial container solutions and tools that tightly link containers with microservices development.

Commercial container solutions are highly correlated with DevTest tools and tools that link microservices. These solutions are the bridge between DevOps and a microservices-based application architecture.

Companies seeking to leverage AI within containerized apps will be seeking container consulting services and support for non-x86 architectures (e.g., GPUs).

Though there is consistency across the perceived importance of solutions and capabilities driving container adoption, there is a discrepancy in their perceived availability. Of utmost importance and interest is enterprise-grade security. However only a quarter of respondents consider it widely available today.

Easy-to-use IDEs, integrated operational tools, solutions for preferred platform, and the ability to support containers securely across multiple cloud environments are also seen as important but not widely available. Respondents perceive DevTest and automation tools, public cloud on-premises support, the ability to design a compute environment, and commercial container solutions as widely offered. Lastly, though widely available, consulting services and industry use cases are not considered essential needs. Mainly, companies seeking to leverage Artificial Intelligence indicate the need for consulting services.
The future of container development

Already commonly deployed on cloud, essentially all containerized production apps will be on the cloud in three years. Hybrid cloud deployments will see the largest growth, while public cloud and hosted private cloud will see slight decreases.

Common environments for container development

Cloud today 81%

Cloud 3 years from now 98%

Largest growth

Slight decreases

Apps best suited for containers

Data analytics 42%

Web serving 34%

Database 33%

Customer Relationship Management (CRM) 18%

Shared characteristics: 1) Likely to run across several environments
2) Using microservices, supporting different DevOps teams working in parallel
The value of container development

Why choose containers?
Operational efficiencies are the most commonly associated benefits of adopting containers. However, improving response to market changes and achieving greater levels of innovation were cited as strategic benefits by at least 50 percent of respondents.

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved application quality and reduced defects</td>
<td>59%</td>
</tr>
<tr>
<td>Reduced application downtime and associated costs</td>
<td>57%</td>
</tr>
<tr>
<td>Improved employee productivity</td>
<td>54%</td>
</tr>
<tr>
<td>Faster response to market changes</td>
<td>53%</td>
</tr>
<tr>
<td>Greater levels of innovation</td>
<td>51%</td>
</tr>
<tr>
<td>Lower operational costs</td>
<td>50%</td>
</tr>
</tbody>
</table>

Business benefits more commonly expected by non-users than actually experienced by users:

- Reduced app downtime and associated costs
  - 65% non-users
  - 50% users

- Lower costs
  - 60% non-users
  - 40% users
Comparing the platforms

Although Docker is the most widely used or considered software image management and orchestration platform, almost 40 percent use or would use more than one vendor because of uncertainty about which will fit best. This is due to varying developer preferences or no single platform having all the capabilities needed.

Client reasons for multi-platform usage

- Unsure which platform best fits our needs. Want to compare multiple platforms: 56%
- Developers and developer groups prefer different platforms: 41%
- No single platform has all the capabilities we need: 36%
- Vendor incentives urging us to try their platform: 35%
- Lack of sufficient internal governance around containers to restrict usage to a single standard platform: 18%
- Other: 4%
Choosing a primary platform
Compatibility and ease of use are commonly among the top three most important reasons for using a platform.

Top client reasons for using a platform

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most compatible with our IT environment</td>
<td>35%</td>
</tr>
<tr>
<td>Easiest platform to learn and use</td>
<td>32%</td>
</tr>
<tr>
<td>Supports diverse container deployment environments</td>
<td>31%</td>
</tr>
<tr>
<td>Recommended by industry analysts</td>
<td>30%</td>
</tr>
<tr>
<td>Best security capabilities</td>
<td>28%</td>
</tr>
<tr>
<td>Developer experience with the platform</td>
<td>24%</td>
</tr>
<tr>
<td>The most open source solution</td>
<td>23%</td>
</tr>
<tr>
<td>Best suited to support cloud deployments</td>
<td>23%</td>
</tr>
<tr>
<td>The closest platform to an industry standard</td>
<td>20%</td>
</tr>
<tr>
<td>Large user community for troubleshooting issues and best practices</td>
<td>20%</td>
</tr>
<tr>
<td>Used by other companies in our industry</td>
<td>17%</td>
</tr>
<tr>
<td>Offers support for popular languages</td>
<td>17%</td>
</tr>
</tbody>
</table>

More likely mentioned by those who primarily use Docker vs. another platform (36% vs. 23%)

How to choose a primary platform

Developer executives
Compatibility with IT environment and ease of use

IT executives

Developers
Support for diverse environments and best suited for cloud deployments
Investing in containers

The senior-most IT executive or head of IT Operations is the primary buyer for container-related investments in most companies; they are also commonly the leading influencers.

The investors and influencers

- **Developer executives**: Senior-most IT executive (40%), Head of IT operations (25%).
- **IT executives**: Senior-most IT executive (33%), Head of IT operations (30%).
- **Developers**: Senior-most IT executive (20%).

Developers and IT executives see the head of IT Operations as having the most influence on container investments. The senior-most IT exec leads for developer executives.

App development roles are the primary buyers in about 1/3 of companies.
About the research

This report presents findings from research conducted by IBM during a two-week online survey in August of 2017. Respondents were comprised of 206 developers, developer executives, and IT executives across 16 industries in 7 English-speaking markets (US, Canada, UK, Australia, India, Malaysia, and Singapore). Interviewees did not know the study was sponsored by IBM.

Stay connected

IBM Cloud Container Service
IBM Cloud Blog

Follow us

@IBMcloud
Facebook

Connect with us

LinkedIn
YouTube

© Copyright IBM Corporation 2018

IBM Corporation
1 New Orchard Road
Armonk, NY 10504-1722

IBM, the IBM logo, ibm.com, and IBM Cloud are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at “Copyright and trademark information” at https://www.ibm.com/legal/us/en/.

Produced in the United States of America, January 2018