The future of container adoption

What can we learn from enterprises in Europe that are deploying containers?

Red Hat | Hewlett Packard Enterprise

Exclusive research by IDG CONNECT

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Introduction:
Learning from the pioneers of containerization

In this survey, developers, operations professionals and senior IT managers at early adopter enterprises share what they've learned about the challenges and benefits.

Lessons from the pioneers

Containerization is a young, disruptive and rapidly-evolving technology (Kubernetes only became available as an open source product five years ago). Yet the potential of cloud-native applications is enormous. Perhaps the most important benefit of all is accelerated development and delivery schedules. Using containers for development, enterprises can achieve continuous integration and continuous delivery (CI/CD), releasing new code far more frequently.

It's no exaggeration to say that for many enterprises, containerization has become pivotal to the three key aspirations of the digital era: improving agility, accelerating innovation and defending against new sources of competition.

As a result, the pace of innovation is blisteringly fast. Adoption is occurring across public cloud, on-premise, in hybrid and multi-cloud environments. New models and techniques for security are proliferating. Developers were the early adopters, but increasingly, IT operations professionals are both driving container adoption and assuming responsibility for managing containerized applications and services. As the pace of deployment quickens, development teams are confronting the need to restructure their operations and source new talent.

In this survey, IDG Connect explore the thinking of senior IT professionals in organizations with 1,000+ employees where containers have been deployed either in production, or in test or development. As we'll see, these pioneers regard the challenges of deployment as significant. But so too are the perceived advantages.

Who are the early adopters?

Nearly half of our respondents described themselves as Head of IT or IT Director. Exactly one-third worked in IT operations. 22% worked in development. In aggregate, this audience told us that their organizations are already running as much as 50% of their organization's workloads in containers.

IDC predicts that container instances in non-hyperscale environments will become the dominant use case scenario by 2021.[1] For now, however, containerization remains in the midst of transition to the mainstream.

The earliest pioneers of containerization tended to be hyperscale web platforms and SaaS vendors. Adoption has broadened out since then. Even so, the early adopters IDG Connect surveyed are not a typical cross-section of what we might call the enterprise economy. Almost 70% work for organizations clustered in specific verticals, including software and services, computer-related manufacturing, banking and finance, e-commerce, cloud and online services.

These are the pioneers. They work for organizations that have pressed forward aggressively with the transition to cloud computing and container-based services. Collectively, they can tell us a lot about what the future looks like, and how we're likely to get there.

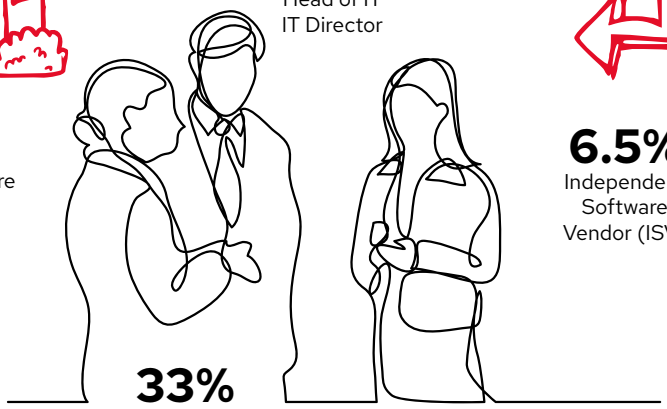
NEXT:
Hybrid, public and private clouds: where is deployment happening?

By business size

53%
1,000 to 4,999 employees

47%
5,000 or more employees

By job description



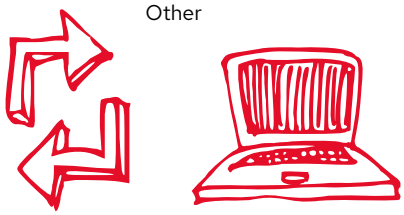
45%
Head of IT
IT Director

33%
IT Operations

22%
Application or Software Developer

By industry/sector

70%
Other



6.5%
Independent Software Vendor (ISV)

23.5%
Software /Computer services

Percentage of respondents

[1] IDC, Containerizing Traditional Workloads: Evaluating the Approaches to Meet Persistent Storage Demands In Containers (March 2019)

Where is deployment happening?

Regulatory and governance constraints. Legacy applications that are hard to shift. The need for a measured transition from on-premise data centers to the cloud.

There are plenty of reasons why traditional enterprises might want to operate private clouds and integrate them into a hybrid strategy. In fact, multiple studies have confirmed that a substantial majority of European enterprises combine on-premise or hosted private clouds with public cloud.

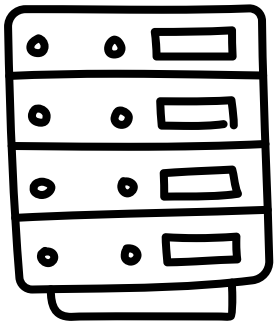
In this respect, our early adopters are different. Only one-third (36%) are using containers across both public and private clouds.

Why so few? A relatively high proportion of them come from vertical sectors like software, e-commerce and online services. On this basis, IDG Connect suspect that many are cloud-native, in the sense that they are wholly committed to public cloud.

As traditional enterprises deploy more containerized applications, we expect the number of hybrid cloud users to increase. It's also worth noting that even among our audience of early adopters, 25% are running containers in private clouds only. Here, the drivers are modernization of legacy applications, increased agility and the efficiency gains that come from dispensing with virtual machines.

NEXT:
Beyond experimentation

39%
Only in the public cloud (e.g. AWS, Microsoft Azure or Google Cloud Platform)



25%
Only on premises in a private cloud

36%
A mixture of public and private cloud

Percentage of respondents

Beyond experimentation

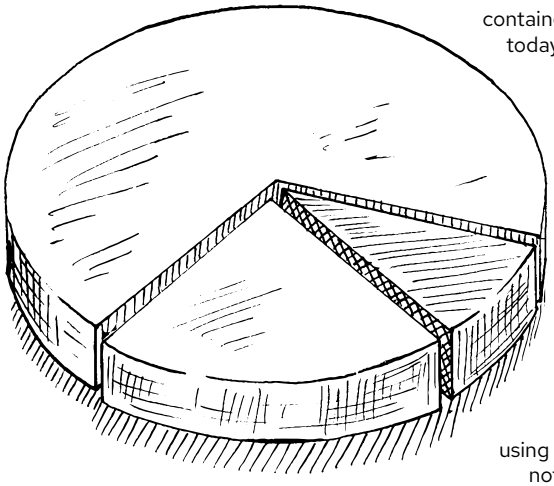
Most IT organizations are still in the early stages of container deployment. Experimentation is widespread. Production use is far more limited. According to one survey, the number of enterprises that have managed to containerise up to 10% of workloads using containers is significantly larger than the percentage that have containerized more than 10% of their workloads. Meanwhile, four in 10 enterprises aren't using containers in production at all.[2]

By contrast, our entire audience of respondents from across Europe indicated their organizations are using containers. A substantial majority (65%) say their organizations are using containers in production environments. Clearly, organizational scale matters: as a general rule, the larger the organization, the greater the likelihood that it is using containers in production environments.

NEXT:
Been there, done that: the advantages

Separately, IDG Connect asked our audience what percentage of their IT workloads is currently running in containers. The mean across all respondents today was 50%. In three years' time, our respondents collectively expect 65% of workloads to be containerized at their organization.

Are you currently using containers in your IT environment? *(Select one)*



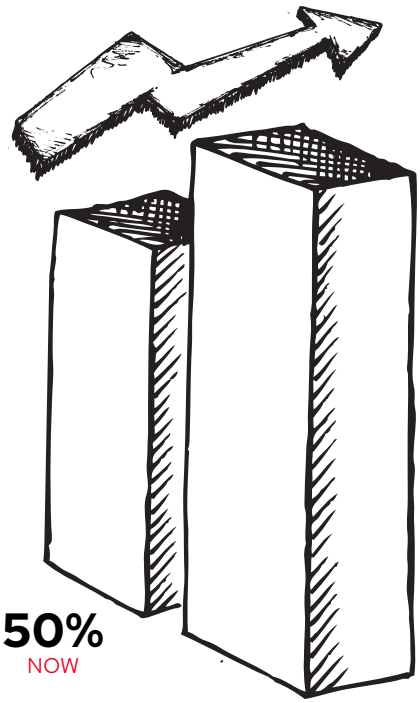
65%
Yes, we have containers being used today in production environments

13%
Yes, we are using containers but not in production environments

22%
Yes, we are in the early stages of deploying containers

Percentage of respondents

What percentage of your enterprise IT workloads do you have in containers?



50%
NOW

64%
IN 3 YEARS

[2] Red Hat, Global Customer Tech Outlook 2019

Been there, done that: the advantages

In any fast-growing market, claims made by vendors tend to predominate in the marketplace of ideas. So IDG Connect asked this audience of IT professionals about their own perceptions now that they have the benefit of (at least some) experience and hindsight.

Specifically, we asked them to choose from a list of potential advantages conferred by containers. The list contained 10 options.

The largest number of respondents (70%) told us that containerization delivered on a fundamental promise: rapid deployment of IT services and applications.

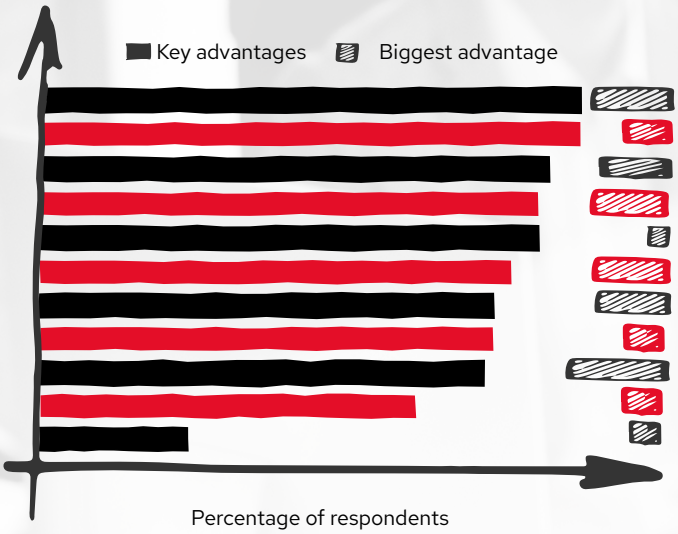
Arguably, however, the more important finding is the high number of respondents who identified multiple benefits. In fact, over six out of 10 respondents identified seven or more benefits from container deployment. The bottom line: IT professionals clearly perceive multiple advantages flowing from containerization.

We also asked respondents to identify the single most important benefit of containerization. When asked to narrow down their choice in this way, respondents tended to place less emphasis on reduced license costs and consistency of application environments.

By contrast, they tended to upgrade the relative importance of security based on isolation, simplified patching and maintenance, support for DevOps, more autonomy for developers and more granular controls in comparison with virtual machines. Among our audience of developers, operations professionals and IT managers, these are the advantages that seem to have a persistent appeal.

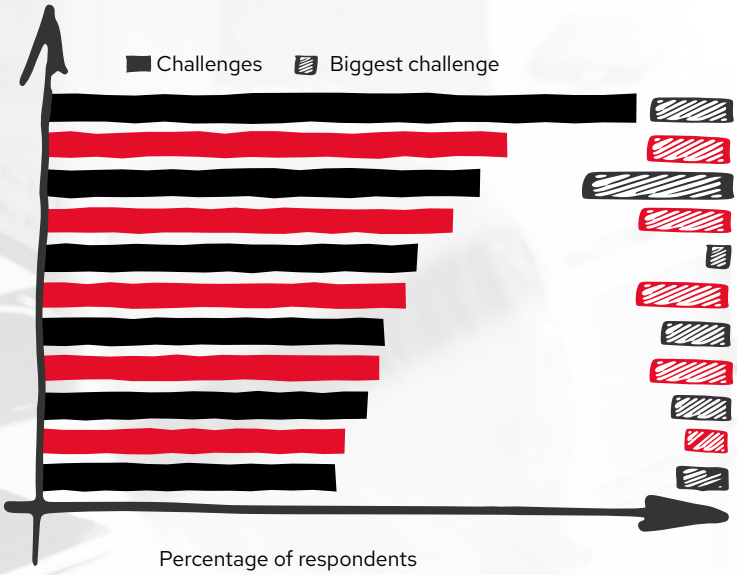
NEXT: **Problem-solving pioneers:** overcoming challenges

What do you see as key advantages of containers? (Select as many as apply)
And what is the biggest advantage? (Select one)



%	
70/13	Rapid deployment of IT services
69/8	Reduced software licence costs
66/11	Workload portability across platforms
65/10	Simplification of patching and management
65/4	Consistency of application environments
63/10	Support for devops
61/10	Greater autonomy for developers
61/7	Support for business scalability and flexibility
60/15	Increased security via isolation
52/7	More granular control than VMs
18/6	Other

What are your challenges in implementing container solutions? (Select as many as apply)
And which of these is the biggest challenge? (Select one)



%	
63/10	IT infrastructure support
54/10	Access to necessary skills
52/17	Ensuring security and governance
50/11	Finding budget
47/2	Organizational issues (e.g. Internal communications and teamworking)
46/11	Experience adopting new technologies
44/9	Gaining executive business support
44/10	Aligning with business goals
43/8	Support for concept from developers
41/5	New platform with many dependencies
40/7	Moving from a proof-of-concept to scalable, highly available production across the enterprise

[See chart on previous page]

Problem-solving pioneers: overcoming challenges

IT professionals in organizations adopting containers freely identify a range of challenges with containerization – a pattern characteristic of disruptive technologies entering the mainstream.

The big challenges center on the expertise required to get containers into production. Almost two-thirds (63%) of respondents told us that integrating containers with existing infrastructure is a pain point. To some extent, this reflects a mismatch between the rising tide of adoption and the skills available. It therefore comes as no surprise to see access to skills prominently cited as a challenge. The third most frequently cited challenge was security.

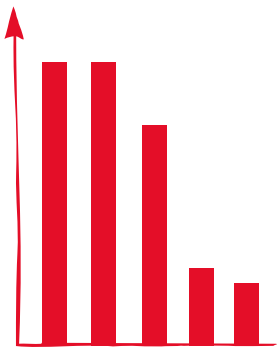
However, when IDG Connect asked respondents to select one single challenge as the biggest, their focus changed substantially.

At this point, respondents placed additional emphasis on security and governance, as well as a range of non-technical factors, including lack of experience adopting new technologies, securing budget for investment, aligning with business goals and gaining support from business executives as well as developers.

The emphasis placed on security and governance as both the number one challenge and advantage is intriguing. One in five identify this as the biggest challenge in containerization. We've already seen that a smaller proportion (15%) identify it as the biggest single advantage. The clear suggestion is that IT organizations are situated along a very wide continuum. Some are satisfied with their container-based security solutions. Others are far from satisfied.

NEXT: **Container-native storage:** increasingly necessary

Have you deployed, or are you considering, using container-native storage? (Select one)



Percentage of respondents

Considering	Already deployed in production environments	Already deployed in non-production environments	No pans	Don't know
31%	31%	28%	6%	4%

Container-native storage: increasingly necessary

There's nothing new about this: for some time, traditional enterprises have cited storage as one of the main obstacles to adopting containers. However, recent improvements to Kubernetes have opened the door to running stateful data-driven applications in containers, with support from container-native storage. In parallel, storage vendors are innovating around SAN/NAS, DAS and, of course, container storage-as-a-service.[3]

As a result, enterprises can now envisage traditional workloads including ERP, PeopleSoft, Oracle and Hadoop on containers. The possibility of lift-and-shift migrations – from traditional to container-based environments – is beginning to open up.

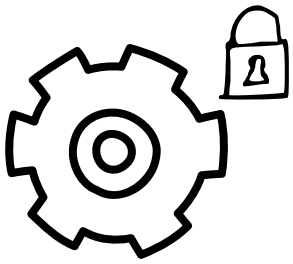
Early adopters are alive to the possibilities. Six out of 10 say their organizations have deployed container-native storage in production or non-production environments. With a few exceptions, pretty much everyone else told us they are considering container-native storage. (10% said they had no plans, or answered "don't know".) What buyers want most is secure performance, good technology and rapid deployment.

The market for container-native storage solutions is growing rapidly. These findings suggest that demand will continue to drive growth for the foreseeable future.

NEXT:
Container-native storage
Continued

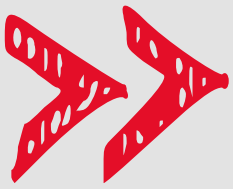
[3] IDC, Containerizing Traditional Workloads: Evaluating the Approaches to Meet Persistent Storage Demands In Containers (March 2019)

What do you look for in hardware providers to provide an ideal environment for containers? (Select the three most important)



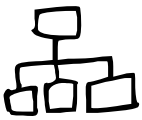
26%
Leading technology/Reputation for security

25%
Proven performance/
Rapid deployment



24%
High levels of
scalability

21%
Low cost



20%
Software-defined ability to deploy and manage physical and virtual storage, processing and networking

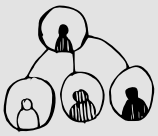
16%
Flexible prices based on utilization and capacity on demand

Strong support in deployment and optimization

Integration with existing solutions

15%
Support from container platform vendor to engage and inspire developers

13%
Well-known brand



12%
Training and enablement of developers/teams

Utility pricing

10%
Preconfigured and tested solution

9%
Single point of support

7%
Hyperconverged offerings

NEXT:
Rethinking security from the ground up

Rethinking security from the ground up

It makes sense that security should trump integration, deployment and performance as a perceived challenge among those who are already well-advanced with deployment. As enterprises shift more workloads on to containers, they become more adept at the mechanics. At this point, attention shifts to more enduring anxieties, including security.

With the benefit of hindsight, only one-third said their existing workflows and processes were sufficient to handle the security challenges of containerization.

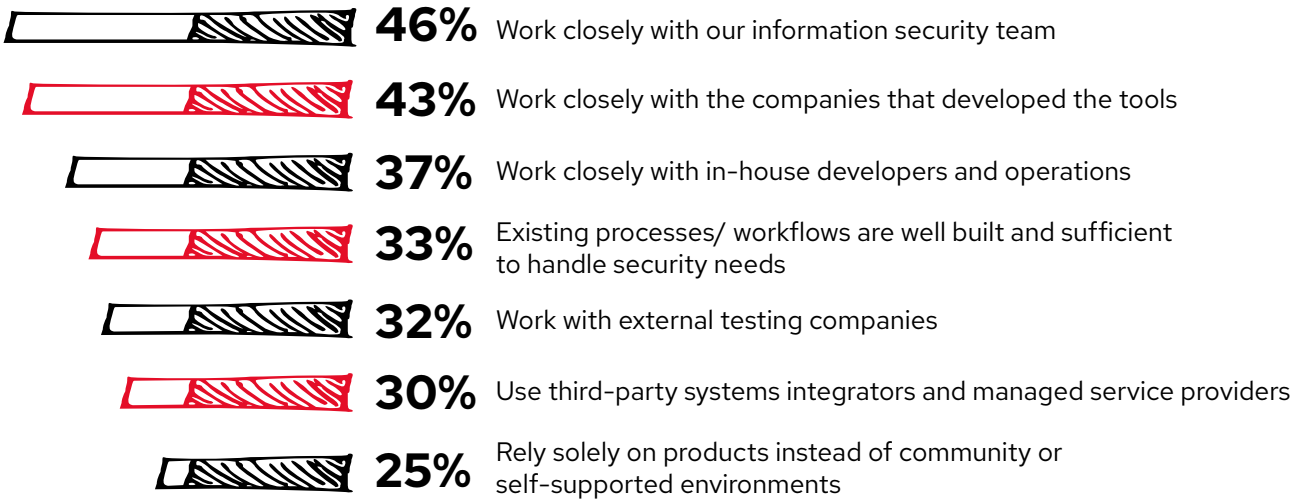
The effort to secure containers differs from the process with traditional architectures. For example, containers are very often ephemeral. According to a recent study, half of containers in use are alive for less than five minutes.[4]

Making security an integral part of development is key. As part of this, enterprises need solutions for pre-deployment scanning of container images (over 50% of which are known to fail vulnerability testing).[5] Post-deployment, enterprises need runtime vulnerability detection to trigger alerts across a dynamic software estate that may include thousands of containers. Data compliance for regulatory regimes including PCI-DSS and GDPR is also frequently required.

NEXT: What do developers need ?

IDG Connect asked our audience how they maintained security standards during and after the transition to containers. We can summarize the answer in one word: collaboration – with internal IT security teams, with tool vendors, testing suppliers, system integrators and managed service providers.

How do you make sure that your security standards are maintained when you move to container solutions?
(Select as many as apply)



[4] Sysdig, 2019 Container Usage Report (2019) p3
[5] Sysdig, 2019 Container Usage Report (2019) p11

What do developers need?

Containers remove friction from the development process, accelerating the path to delivery of new code. That's the theory. In many cases, it's also the reality. But in order to realize the full potential of containers, our respondents tell us that they have had to make some significant changes.

Most striking of all, one-third (31%) of respondents told us containerization prompted a change in the structure of development teams. Even more prominent is a need for additional expenditure on tools (43%) and investment in retraining (41%).

Four out of 10 respondents told us they saw a need to add more developers. At first, this may seem counter-intuitive. But new technologies require new skills. In turn, this may generate a need for new employees, who will work alongside developers focusing on more traditional projects.

The need for new staff may also signal something else. In much the same way that a newly-built motorway or train line is rarely empty for very long, accelerating CI/CD pipelines tend to encourage an increased volume of demands from the enterprise.

Finally, look at what comes top of the wish list: support from container platform vendors to engage and inspire developers. This suggests something of a gap in the market – and in the marketing strategies of container platform vendors.

NEXT:
Conclusion: the road to mainstream adoption

What do you need to do to support your developers in adopting the container platform and provide a stable, secure container platform? (Select as many as apply)

45%
Support from Container Platform Vendor to engage and inspire developers

43%
Allocate more budget for tools

41%
Invest in reskilling

40%
Add more developers

34%
Provide more third-party expertise

31%
Change structure of development teams

Conclusion:
The road to mainstream adoption

These survey findings offer us a snapshot of a vastly promising technology entering the mainstream.

Between 60% and 70% of respondents identified with each the benefits IDG Connect suggested to them. By contrast, fewer respondents recognized challenges (typically, 40% to 60% of respondents recognized each of the implementation challenges we suggested to them).

These findings strongly suggest that the positive results of deployment strongly outweigh the challenges of getting there.

Security emerges – at first glance paradoxically – as both the single biggest advantage and the single biggest challenge confronting early adopters. One possible explanation is that these enterprises exist on a wide spectrum of competence. Some organizations are confident in their approach. Others are not, and it worries them.

The data contains another subtle warning signal. Our audience largely works in what we might call tech-friendly environments: the software industry, media and financial services, for example. Yet even here, challenges exist when it comes to business executives understanding what containers offer, and why they are important.

As containerization hits the mainstream, traditional enterprises will need to understand the technology at a strategic level – in the same way that "cloud" is now a broadly understood concept in the boardroom. Education is required: there's clearly more work to be done here.

The lessons learned by the early adopters have been largely positive. They support the argument that containerization has the potential to address the biggest challenge of all for traditional enterprises: the urgent need to deploy new services and applications rapidly. It remains to be seen how rapidly traditional enterprises make the transition, following in the footsteps of the pioneers.

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