

REPORT

2018 CONTAINER ADOPTION BENCHMARK SURVEY



EXECUTIVE SUMMARY

Docker's container format is perhaps the most rapidly and widely adopted datacenter technology in history. This application delivery technology, based on ideas that have been around for more than a decade, is now driving an inexorable transformation of how modern applications are built, delivered and deployed in the enterprise.

But as IT organizations gain confidence in containers, many of them are starting to appreciate the flexibility and cost savings enabled by deploying containers on bare-metal servers. Two-thirds of the IT leaders surveyed say they either plan or are considering moving workloads from virtual machines to containers and two-fifths say they plan to replace virtual machines with containers. Obviously, virtual machines are not going to disappear overnight. But in this Diamanti survey of 576 IT leaders, the data suggests something is very clearly starting to change in terms of what IT organizations consider to be their default platform for deploying modern applications.

Consider:

- Nearly half (47 percent) of IT leaders surveyed said they plan to deploy containers in a production environment, while another 12 percent say they already have.
- Over a third of IT leaders (34 percent) adopting containers plan to allocate at least \$100,000 to those projects in 2018.
- 71 percent of respondents have deployed containers on a virtual machine, while 35 percent have deployed them on a public cloud, and 34 percent have deployed containers on a private cloud.
- More than two-fifths (44 percent) of respondents plan to replace some virtual machines with containers. Over half (55 percent) spend more than \$100,000 annually on VMware licensing fees, and over one third (34 percent) spend more than \$250,000 annually on VMware licensing fees.

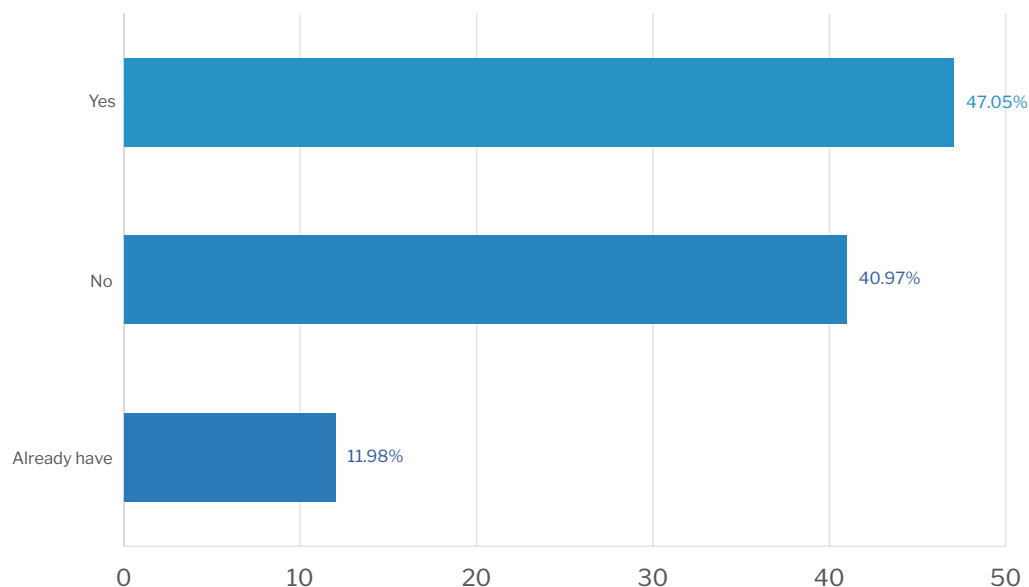


01 THE CURRENT STATE OF CONTAINER ADOPTION

Containers are nothing less than a new atomic unit on which application workloads are being both built and deployed. Containers not only represent a better way to build more resilient software, they also inject unprecedented levels of flexibility and agility into enterprise applications.

Container adoption has hit a benchmark with the percentage of enterprises deploying containers (47 percent plan to; 12 percent already have) exceeding those who have not (41 percent).

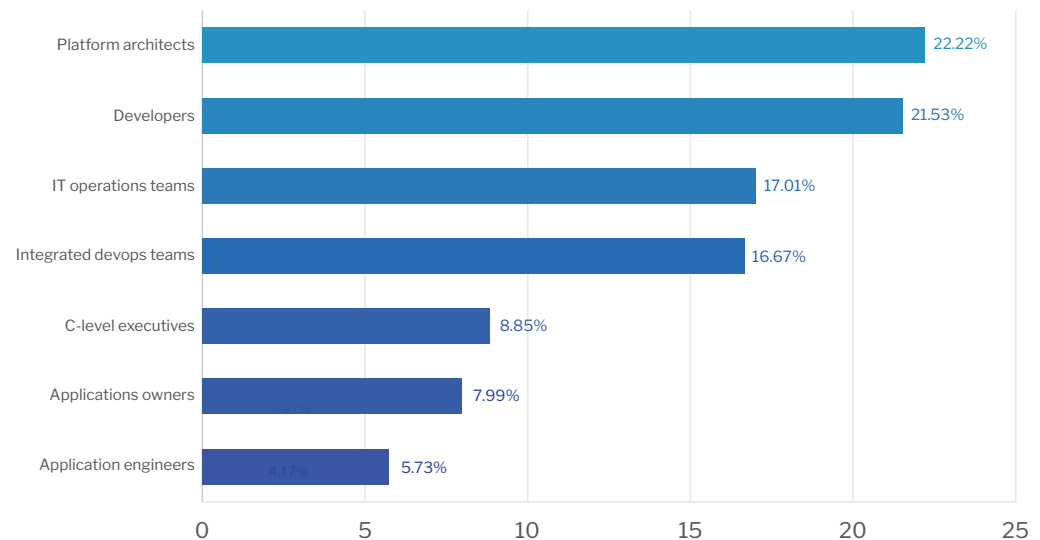
DO YOU PLAN TO DEPLOY CONTAINER TECHNOLOGIES IN A PRODUCTION ENVIRONMENT IN 2018?



01 THE CURRENT STATE OF CONTAINER ADOPTION

The survey suggests that as IT leaders across titles / disciplines are being tasked to drive digital business transformation, at the core of almost every one of those initiatives is some form of container technology. Most of that adoption is being driven not only by developers, but also IT leaders eager to position their organizations to take advantage of the next big shift in enterprise IT.

WHO MOST DRIVES CONTAINER ADOPTION IN YOUR ORGANIZATION?

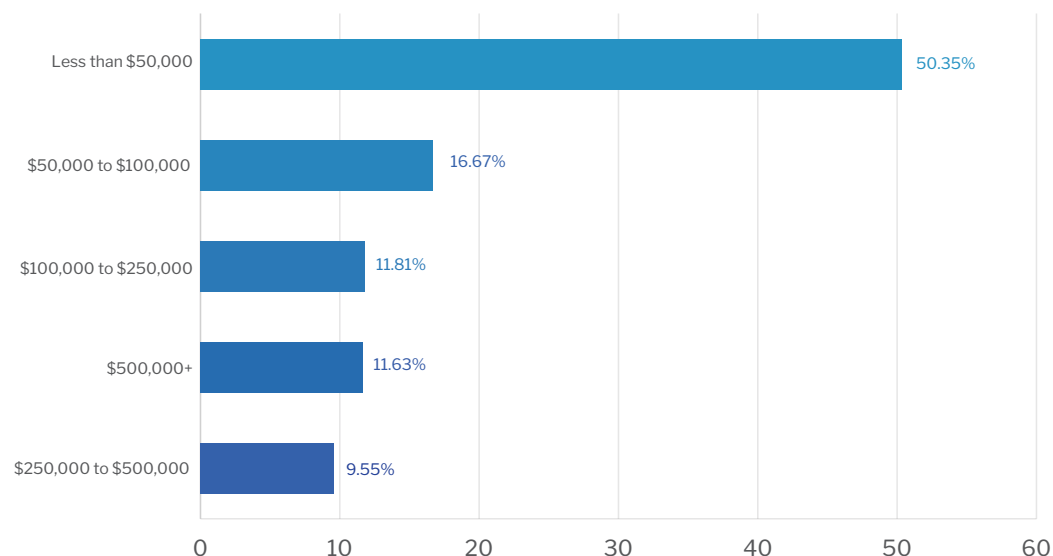


Platform architects and developers are driving most of the decisions to adopt containers at 22 percent each, respectively. Interestingly, IT operations teams and integrated DevOps teams are starting to exercise more influence at 17 percent each.

01 THE CURRENT STATE OF CONTAINER ADOPTION

While \$100,000 may not seem like a large sum as percentage of the total IT budget, it's important to remember only a small amount of the IT budget gets allocated to innovative new projects each year. Well over 70 percent of most IT budgets get allocated to simply keeping the lights on. Containers are unique in that they enable IT organizations to become more agile, while at the same time reducing the total cost of computing by facilitating consolidation of both physical servers and virtual machines. In effect, investments in containers pay for themselves.

HOW MUCH MONEY IS YOUR ORGANIZATION LIKELY TO INVEST IN CONTAINER TECHNOLOGIES IN 2018?



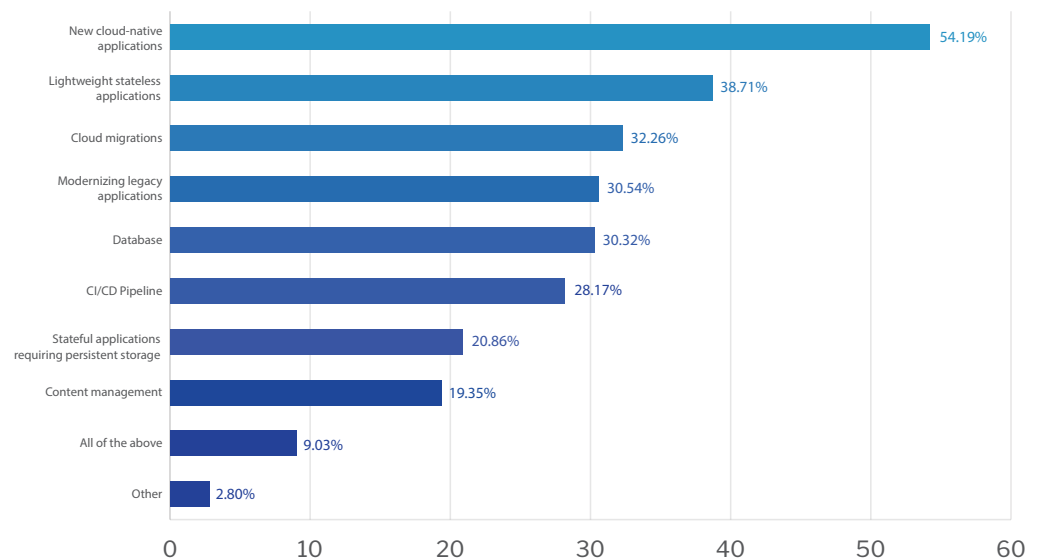
Over half of organizations plan to spend over \$50,000 on deploying containers in 2018. Almost a third (32 percent) said they will spend well over \$100,000.

01 THE CURRENT STATE OF CONTAINER ADOPTION

In terms of use cases, over half of IT leaders (54 percent) say they will employ containers to build cloud-native applications; followed by 39 percent planning to build lightweight, stateless applications. Cloud migrations and modernizing legacy applications came in at 32 and 31 percent, respectively. That suggests that beyond using containers to build new applications, containers are starting to play a critical role in migrating applications to the cloud.

Thirty percent of respondents running containers cited databases as their main use case while 21 percent said they were looking to build stateful applications. Various forms of persistent storage technologies that are integrated with Kubernetes and containers using standard application programming interfaces (APIs) are just now becoming available. Access to persistent storage is, of course, required to build a stateful application

IN WHAT USE CASES WILL CONTAINERS BE EMPLOYED?
(CHECK ALL THAT APPLY).



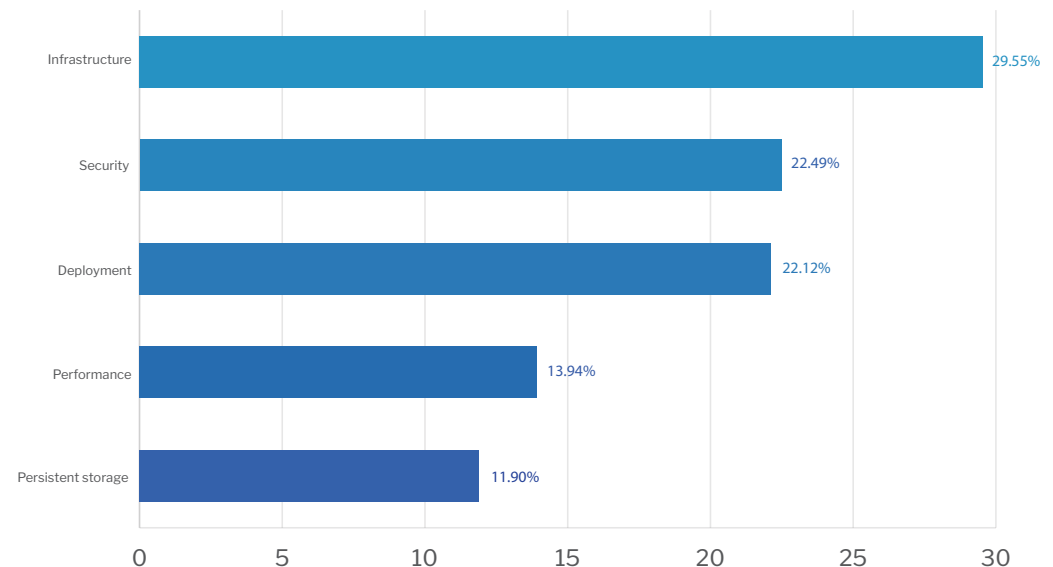
Primary use case for containers are cloud-native applications (54 percent), lightweight stateless applications (39 percent), cloud migrations (32 percent) and modernizing legacy applications (31 percent). Interestingly, databases and stateful applications requiring access to persistent storage are cited by 30 and 21 percent, respectively.

01 THE CURRENT STATE OF CONTAINER ADOPTION

on top of a database. These stateful applications are typically the workhorses of any enterprise IT environment. As the ability to build and deploy stateful applications on container platforms becomes more robust, the number of these applications that will be natively deployed on platforms such as Kubernetes or, alternatively Docker Swarm, should dramatically increase both on-premises and in public clouds.

Another important container use case is that IT organizations are embracing microservices as a simpler way to build applications at scale that enable much higher levels of agility across an integrated set of DevOps processes. Containers are generally the most efficient way to construct those microservices.

IF YOU ARE RUNNING CONTAINERS IN PRODUCTION, WHAT IS YOUR BIGGEST CHALLENGE IN HOW THEY PERFORM IN YOUR INFRASTRUCTURE?

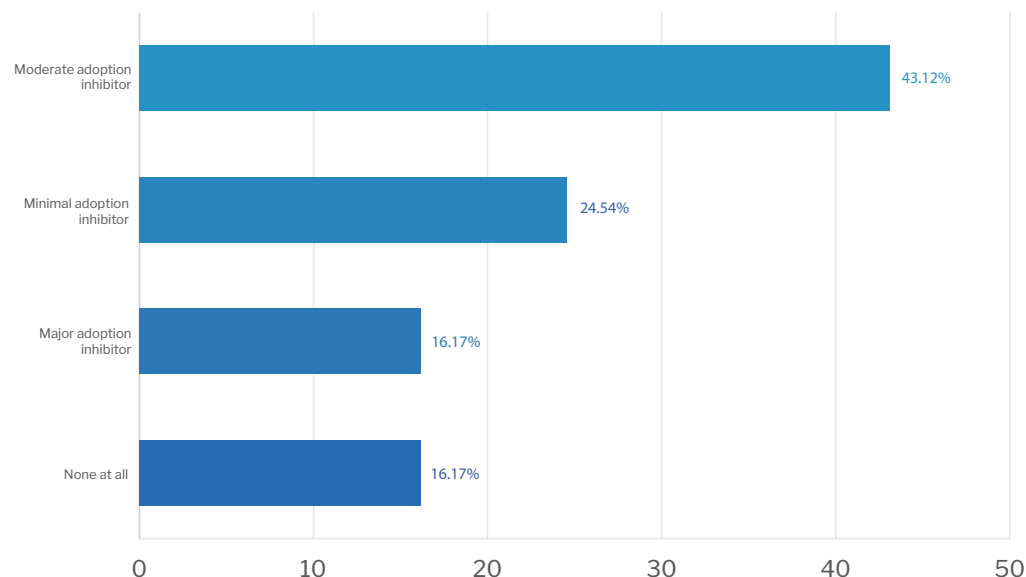


The biggest issues with running containers in a production environment are infrastructure (30 percent), security (22 percent), deployment (22 percent), performance (19 percent) and persistent storage (12 percent), which are all issues a vibrant container community is rapidly addressing.

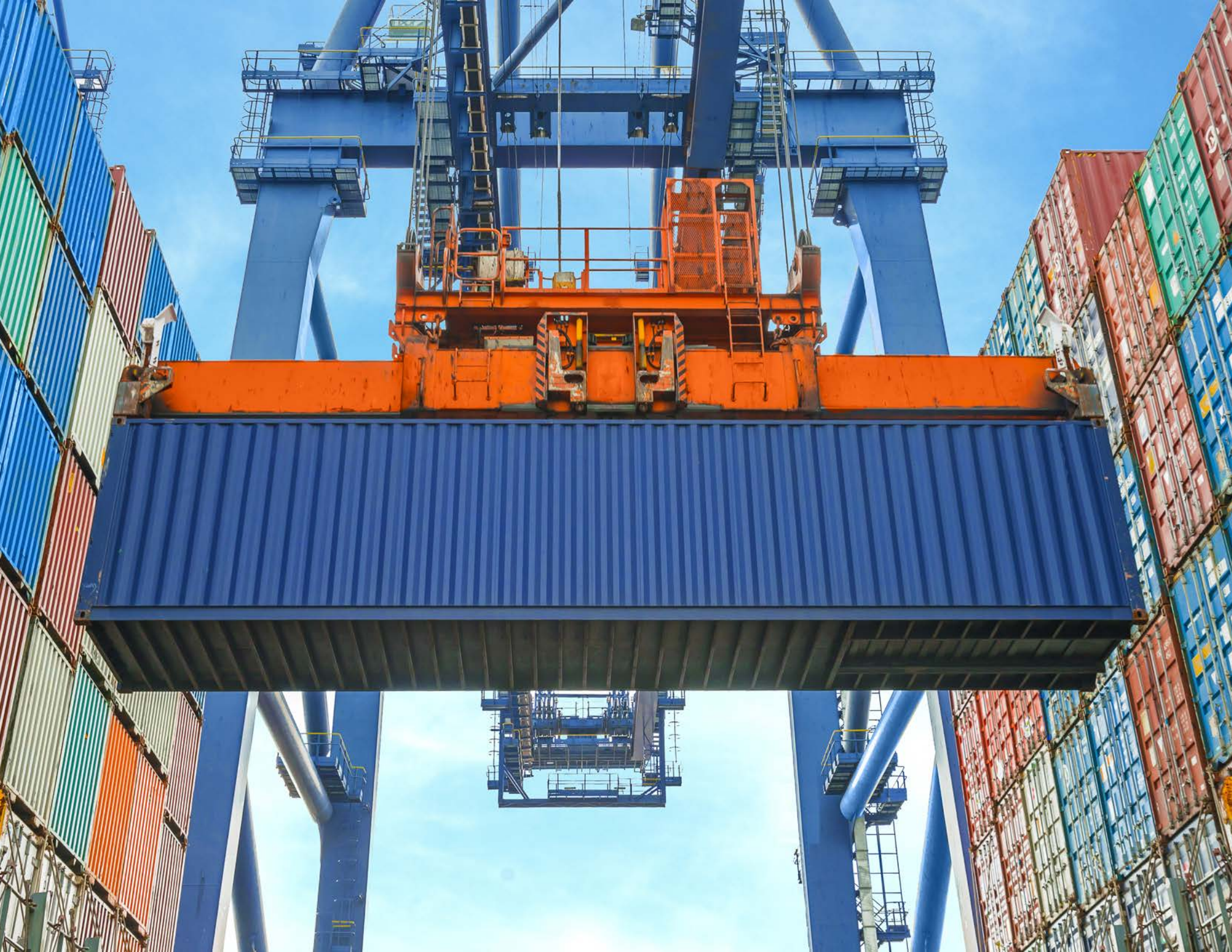
01 THE CURRENT STATE OF CONTAINER ADOPTION

Arguably, the biggest obstacle to adoption of any new technology platform such as containers is inertia. Enterprise IT organizations simply don't shift direction overnight. However, despite the relative immaturity of containers, only 16 percent identified availability of IT professionals with container skills as major inhibitor of adoption while 43 percent identified skills issues as being a moderate inhibitor. Looming much larger as a potential issue are infrastructure (30 percent), security (22 percent) and deployment (22 percent) concerns.

HOW WILL THE CURRENT SHORTAGE OF PEOPLE WITH THE NECESSARY SKILLS IMPACT ADOPTION?



Access to IT talent with container skills is of a moderate concern to 43 percent of IT organizations. Only 16 percent cited this issue as a major concern.

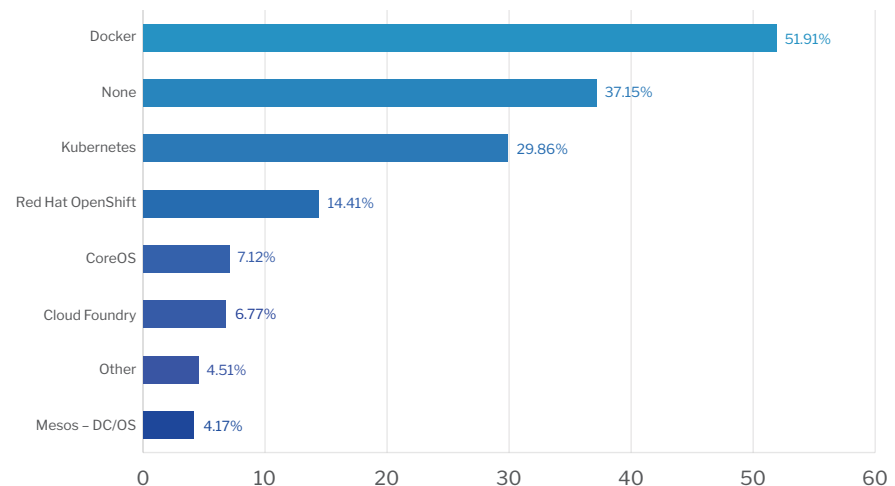


02 WHAT'S IN MY CONTAINER STACK?

The survey finds the most widely-adopted container technologies are Docker (52 percent) and Kubernetes (30 percent). Most organizations are just starting to experiment with Kubernetes clusters as a platform for deploying containers. What makes Kubernetes unique as a platform is that it unifies the management of compute, storage and networking within a Kubernetes cluster. Couple that capability with the inherent portability of Docker and Kubernetes, and the opportunity to rely less on traditional virtual machines both inside and out of the cloud quickly becomes apparent.

Kubernetes essentially virtualizes the underlying IT infrastructure on which the containers are deployed without requiring a hypervisor while providing the means for orchestrating and updating thousands of containers that make up any number of microservices. Container orchestration provides the mechanism through which IT operations teams provision hosts for containers, instantiate a set of containers, reschedule containers that fail to run, link

ARE YOU WORKING TODAY WITH ANY OF THESE CONTAINER TECHNOLOGIES? (CHECK ALL THAT APPLY).



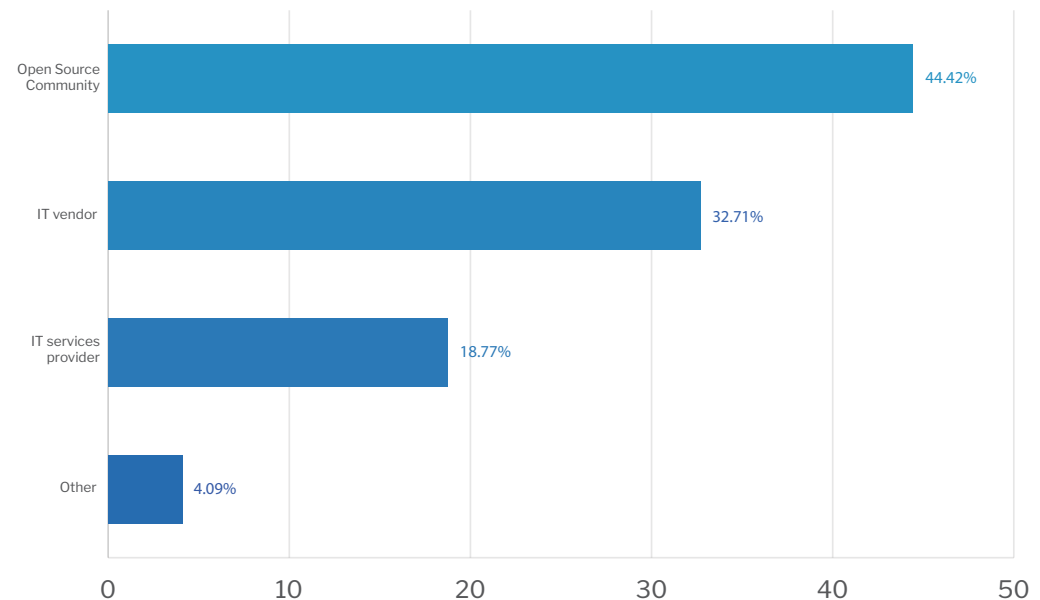
More than half of organizations (52 percent) are working with Docker, while 30 percent are working with Kubernetes. As a de facto standard for container orchestration, it's clear Kubernetes's momentum is accelerating.

02 WHAT'S IN MY CONTAINER STACK?

containers together via application programming interfaces (APIs), scale container clusters up and down by adding or subtracting containers, and expose services to machines outside the cluster.

There's no disputing that open source software (OSS) is the heart of the innovation in the container revolution. From the prominence of Docker and Kubernetes, to the proliferation of “new stack” frameworks for containerized workloads within the Cloud Native Computing Foundation—the hottest technologies are OSS, and early container adopters have an open source-first mentality.

WHAT IS YOUR PRIMARY SOURCE FOR CONTAINER PLATFORM TECHNOLOGIES?

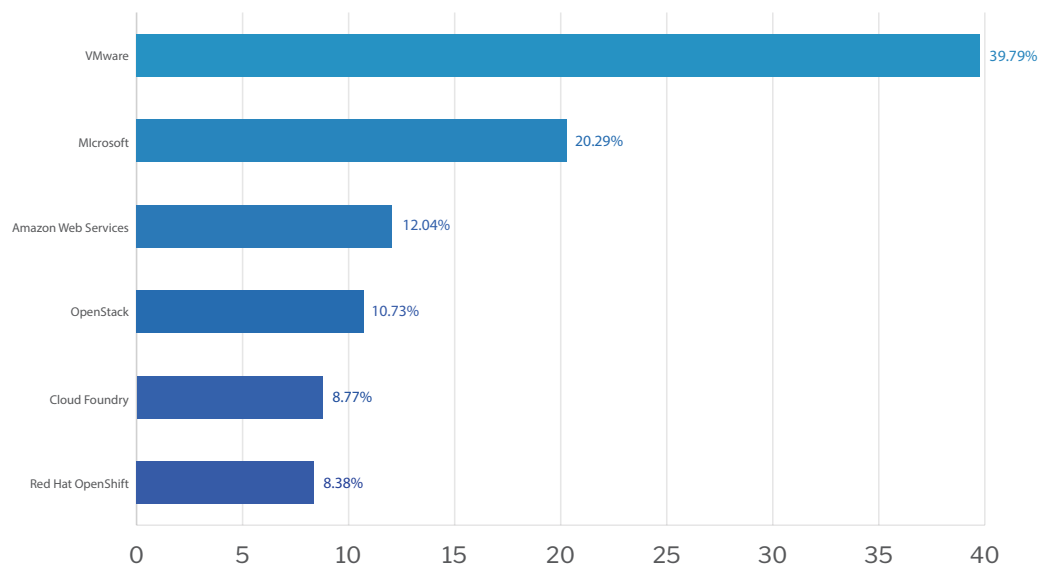


IT organizations are clearly more comfortable engaging with the open source community directly (44 percent) than relying on IT vendors (32 percent) or IT services providers (19 percent) as intermediaries.

02 WHAT'S IN MY CONTAINER STACK?

Whenever this degree of rapid transformation occurs inside enterprise IT, it's only a matter of time before new players and entrants begin to disrupt the status quo.

WHICH PLATFORMS HAVE THE MOST TO LOSE FROM ADOPTION OF CONTAINERS? (CHECK ALL THAT APPLY).

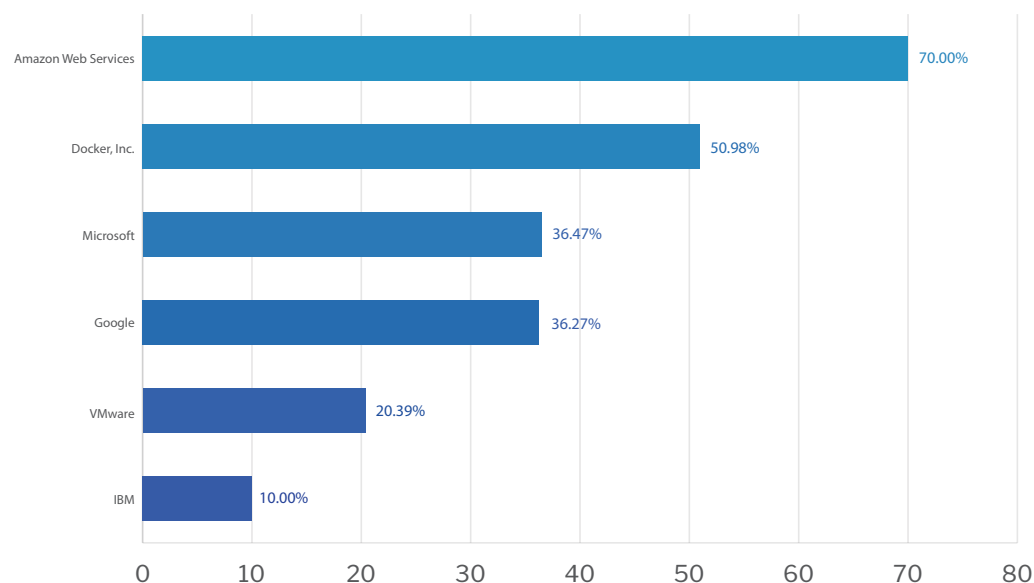


A full 40 percent cited VMware as having the most to lose, followed by Microsoft at a distant 20 percent.

02 WHAT'S IN MY CONTAINER STACK?

Clearly, the rise of containers will have a significant impact on which vendors ultimately dominate the landscape. A full 70 percent of respondents said AWS benefits the most, followed by 51 percent identifying Docker Inc. The Microsoft Azure and Google Cloud Platform (GCP) clouds are tied for third at 36 percent each. VMware came in at 20 percent, which stands in sharp contrast to the 40 percent that identified VMware as having the most to potentially lose. Coming in second in terms of potential loss of influence is Microsoft at 20 percent.

WHICH VENDORS HAVE THE MOST TO GAIN FROM THE ADOPTION OF CONTAINERS? (CHECK ALL THAT APPLY).

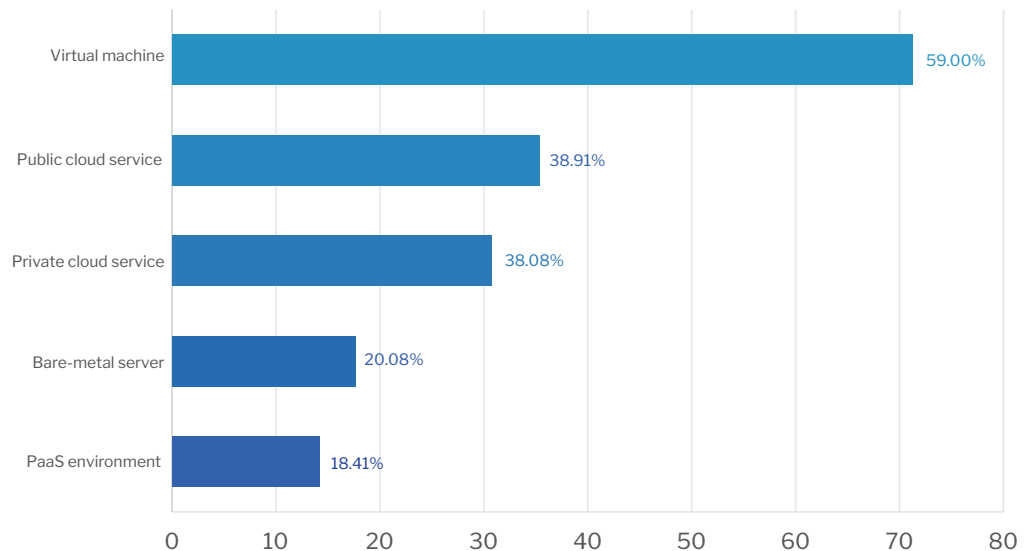


Amazon Web Services (70 percent) has the most to gain from the shift to containers, followed by Docker, Inc. (at 51 percent). Interestingly, only 20 percent cited VMware.

02 WHAT'S IN MY CONTAINER STACK?

Given the substantial capital investments enterprises have made in virtualization and the years of experience teams have managing VMs, it's natural to consider running a container environment within an existing virtualization environment. See Diamanti's white paper, "[Five Reasons You Should Run Containers on Bare Metal, Not VMs](#)," to learn more about why most of the organizations who try to run containers on VMs find this approach does not scale economically.

WHAT TYPE OF PLATFORM WILL YOU DEPLOY CONTAINERS ON? (CHECK ALL THAT APPLY).



Seventy-one percent report they are deploying containers on virtual machines largely as a matter of convenience. But as container confidence grows, organizations are also employing public clouds (35 percent), private clouds (31 percent) and bare-metal servers (18 percent).

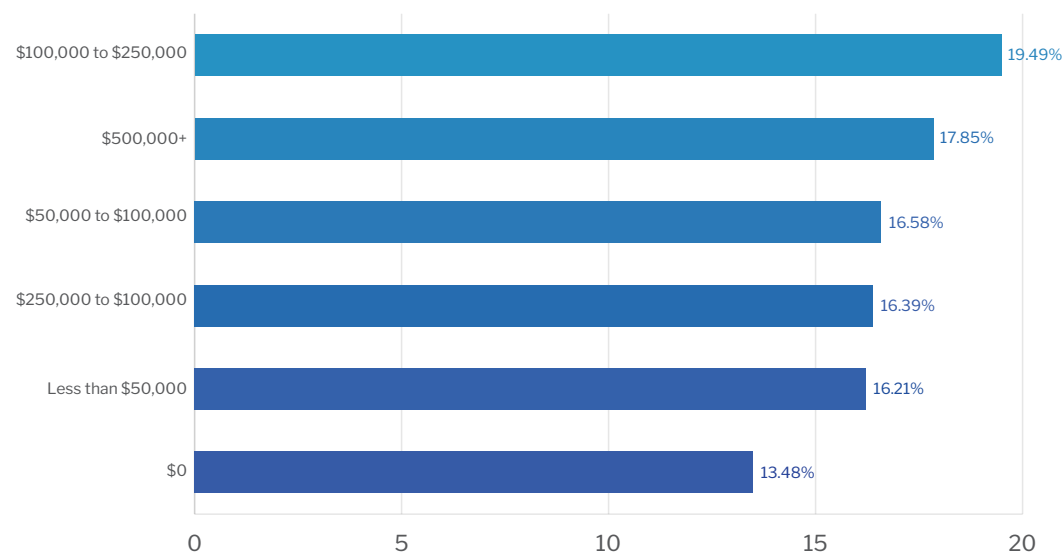
03 VMs VS. CONTAINERS (THE FUTURE LOOKS LESS VIRTUAL)

Enterprises stand to save hundreds of thousands of dollars by reducing their reliance on commercial virtualization technologies provided by VMware. Virtual machines have been around for 15 years, are well-entrenched, and not going away any time soon. But IT leaders clearly view containers as an opportunity to reduce their dependency on them.

Running containers on purpose-built bare-metal infrastructure instead of legacy virtual machines avoids the inefficiency of two layers of virtualization. This bare-metal approach allows many more containers to run per physical machine versus deploying containers on a virtual machine. With virtualization, each application needs to access its own guest operating system. In contrast, containers on bare metal share access to the same lightweight instance of their operating system.

In many cases a container may be deployed on top of a hypervisor largely because

HOW MUCH DOES YOUR ORGANIZATION SPEND ANNUALLY ON VMWARE LICENSING?

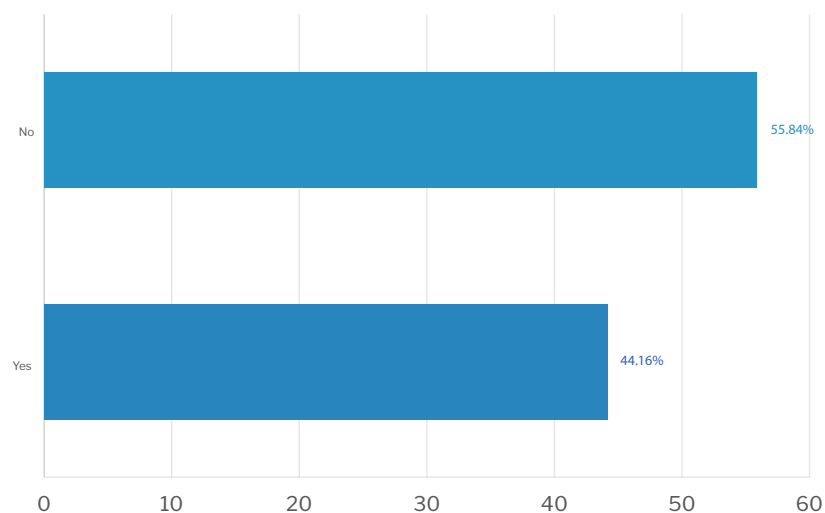


Well over half of respondents (55 percent) are spending over \$100,000 on VMware licensing fees. Over a third (34 percent) are spending more than \$250,000. Containers represent an opportunity to dramatically lower those annual operating costs.

03 VMs VS. CONTAINERS (THE FUTURE LOOKS LESS VIRTUAL)

most IT organizations don't have the tools and processes in place to manage containers running natively on a bare-metal server. But as concerns about performance and cost mount, it's only a matter of time before IT organizations attain the tools and expertise needed to make bare-metal servers the preferred means of hosting containerized applications running on a Kubernetes cluster.

HAVE YOU (OR DO YOU INTEND TO) REPLACE VIRTUAL MACHINES WITH CONTAINERS?

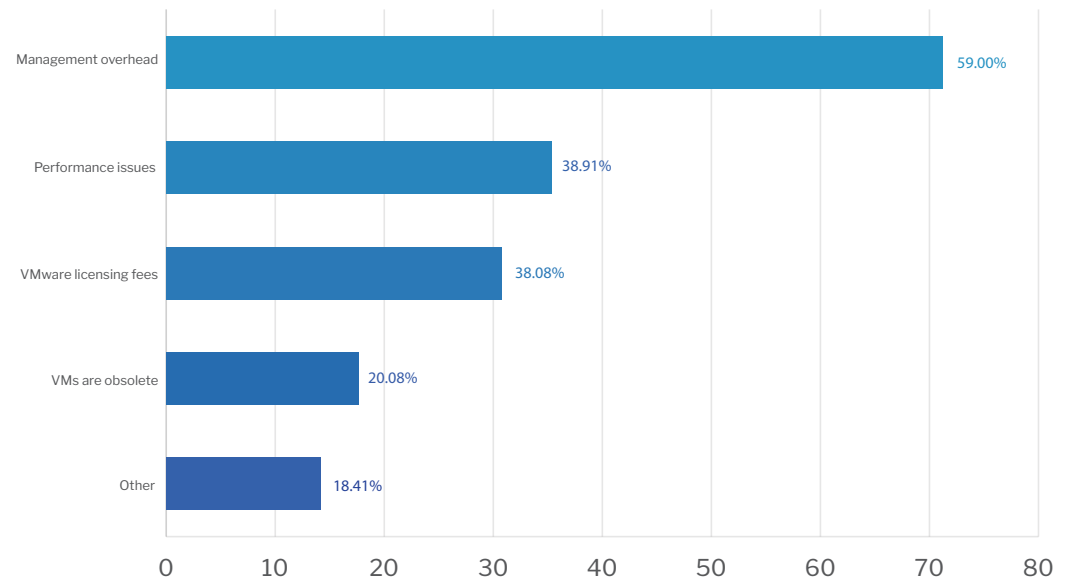


More than two-fifths (44 percent) say they already plan to replace some virtual machines with containers. Clearly, attitudes are already starting to change.

03 VMs VS. CONTAINERS (THE FUTURE LOOKS LESS VIRTUAL)

When running containers on a VM-based stack, density (and thus the efficient utilization of compute resources) is limited. In many cases, only one container is run per VM as a temporary solution to shoehorn containers into an existing infrastructure. This can ease some network and storage integration issues at the tremendous cost of overhead, density, and performance. With bare-metal container infrastructure, container density goes up almost tenfold. And because resource overhead is substantially lower than with VM-based infrastructure, scaling is more efficient and less expensive.

WHAT ARE THE PRIMARY REASONS WHY YOU ARE REPLACING VIRTUAL MACHINES WITH CONTAINERS?

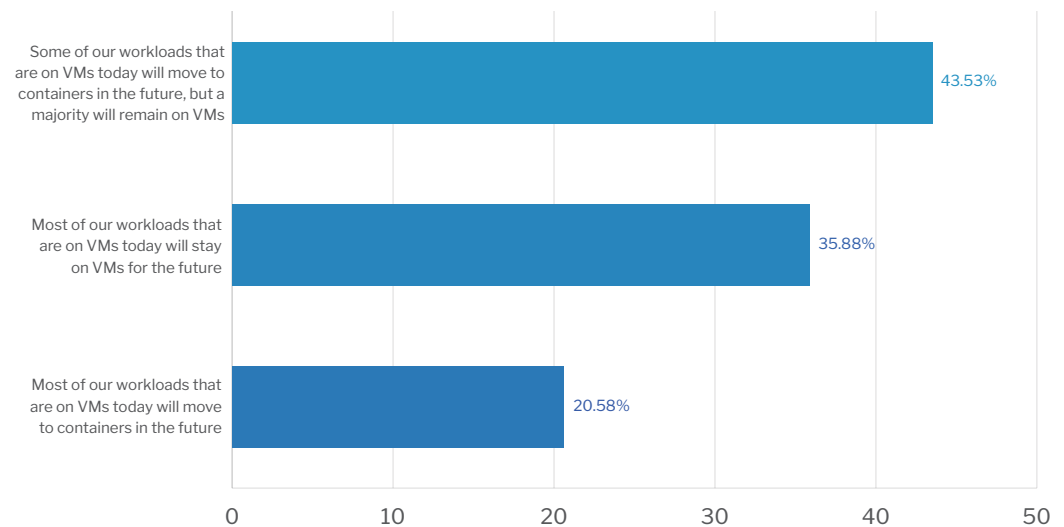


Management overhead (59 percent), performance (39 percent), VMware licensing fees (38 percent) are playing a significant role in driving organizations to move away from virtual machines in favor of containers. Remarkably, a total of 20 percent said they already believe virtual machines are obsolete.

03 VMs VS. CONTAINERS (THE FUTURE LOOKS LESS VIRTUAL)

Of course, both VMware and Microsoft have recognized the threat and opportunity posed by containers. If there is less reliance on operating systems such as Windows, much more of the Microsoft hegemony across the enterprise could be undermined. The threat to VMware is more straightforward. If organizations either reduce their dependency on virtual machines or eliminate them altogether, it's difficult to make a case for acquiring a complete stack of software that assumes there is one type of hypervisor installed. Because of this threat to its business, VMware is rapidly responding by first embracing Kubernetes and containers running on top of VMware as well as making available a container hosting platform based on its own lightweight distribution of Linux. VMware argues that virtual machines, containers and Kubernetes should all be managed from the same centralized control plane. The counter-argument is that running containers in VMs is not recommended since it brings redundant overhead for storage, compute, memory, and OS images.

WHICH MOST ACCURATELY DESCRIBES THE RELATIONSHIP BETWEEN CONTAINERS AND VIRTUAL MACHINES AT YOUR ORGANIZATION? (CHOOSE ONE)



Workloads are not locked into specific platforms. A total of 45 percent says they plan to migrate some workloads from virtual machines to containers. A full 21 percent say most of their workloads will move to containers.

FINAL THOUGHTS

Like most disruptive technologies it takes several years to appreciate the full import of a major transition. Client/server computing and virtualization were both a decade in the making. Cloud computing as we know it today is already 10 years old. Containers as a technology have been around in one form or another for two decades. But once Docker discovered a way to make containers portable between operating systems, interest in containers dramatically increased.

Developers naturally were the first to appreciate the agility enabled by Docker containers. Thanks to the rise of multiple digital business initiatives, developers are under increasing pressure deliver more applications faster than ever running on a multitude of platforms. As use of containers becomes more widespread, their impact will be profound. Everything will change dramatically, from how applications are deployed as microservices to the underlying infrastructure that runs those applications in the cloud and on-premises.

Obviously, those changes will not be limited to platforms and processes. The way IT departments are organized will change as well. Modern container platforms are required to unlock the density, agility, and performance that container technology

promises. Traditional hyperconverged infrastructure (HCI) platforms designed to support legacy virtual machines will not be able to meet this challenge.

IT administrators must be able to unify the management of compute, storage and networking at unprecedented scale. The days when dedicated specialists were required to manage compute, storage and networking in isolation are coming to a merciful end.

Developers, meanwhile, will expect IT infrastructure resources to be available on demand. Kubernetes, containers, and ultimately applications need to be deployed and moved into production faster to keep up with the speed of business.

Application and IT infrastructure decisions made today will have a significant impact on both IT and the business for years to come. The fundamental issue IT organizations will need to resolve is how those decisions today are influenced by inflexible monolithic applications versus modern microservices applications based on containers that are poised to dominate the IT landscape well into the next decade.



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