White Paper

Strategies for Building Digital Infrastructure Resiliency: Global Survey Results

Sponsored by: VMware

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IDC OPINION: DIGITAL BUSINESS PRIORITIES DRIVE ENTERPRISE INFRASTRUCTURE PRIORITIES

Worldwide, organizations that once planned to gradually invest in digital transformation, remote work, and advanced analytics are being forced to make radical changes on the fly in the face of unpredictable, rapidly evolving markets. Existing mission-critical workloads are being updated and integrated with emerging cloud-native applications overnight. Supply chains and partnerships are rapidly reorganizing, while online ordering and remote collaboration are in demand. Maintaining, managing, and scaling digital infrastructure are required for business success now more than ever, as more and more organizations rapidly digitalize business.

IDC's recent worldwide survey of 901 enterprise IT decision makers, representing organizations with primarily 1,000+ employees across multiple industries, shows that many are struggling with the operational complexity that results from having to support multiple generations of applications and infrastructure silos simultaneously. IT teams are being asked to do it all — supporting bare metal and virtual machine (VM) workloads and servers, public cloud services, and microservices-based applications running on containers and Kubernetes. These resources are typically distributed across traditional datacenters, colocation or outsourced datacenters, private clouds, public cloud infrastructure, and edge locations, making it even more difficult to ensure consistent security, compliance, performance, and cost management across the board.

IT decision makers participating in this survey have responsibility for cloud and container strategies. They identify the need to have common, consistent infrastructure platforms and management control planes across on-premises and public cloud environments as vital to ensuring business resiliency in uncertain times. Major survey findings include:

- 55% of organizations think it is mission critical or very important to deploy VMs and containers on a single infrastructure platform.
- 53% of organizations believe a single infrastructure platform will improve IT staff productivity.
- 50% of organizations believe a single infrastructure platform will improve security.
- 46% of organizations believe it is mission critical/very important to have a common cross-cloud management control plane.

This white paper discusses the results of this survey, considers how VMware Cloud Foundation (VCF) is addressing these important enterprise priorities, and provides a framework for enterprise IT decision makers to craft their future digital infrastructure strategy.

SITUATION OVERVIEW: VMS AND CONTAINERS WILL WORK TOGETHER TO POWER MISSION-CRITICAL WORKLOADS WELL INTO THE FUTURE

IDC forecasts that enterprises around the world will accelerate their shift to cloud-centric digital infrastructure and applications at twice the rate they were planning prior to the COVID-19 pandemic. IDC expects that, from 2019 to 2023, over 500 million new applications will be deployed, equal to the sum total of applications deployed in the 40 years before 2019.

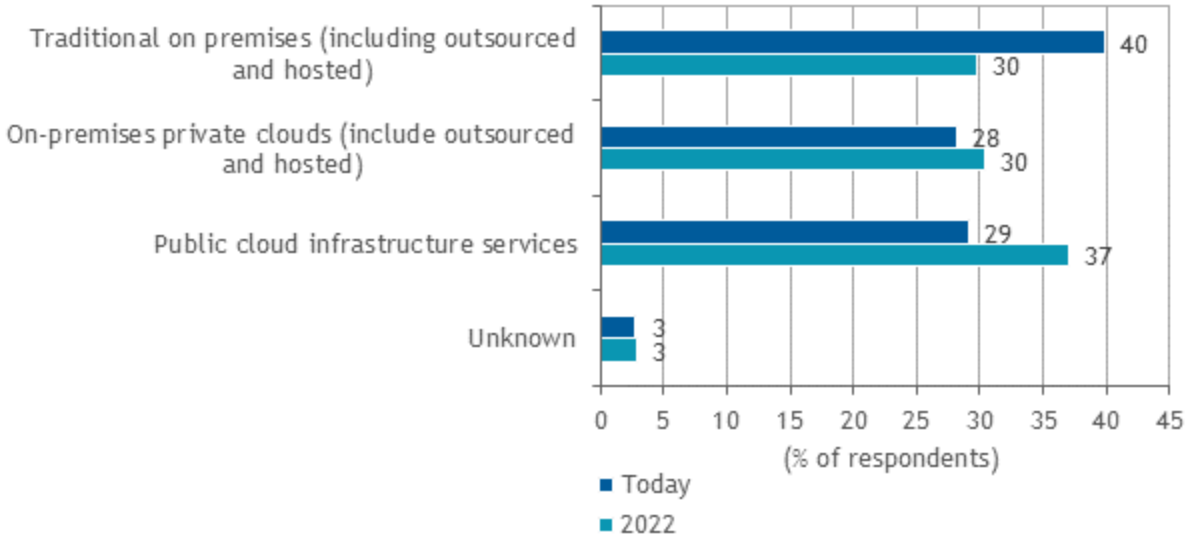
IDC expects the pace of digital innovation will only continue to increase as the global economy improves. Yet most enterprise-scale organizations expect to continue to rely on a large, important set of existing applications, data, and on-premises infrastructure resources for many years — even as they ramp up the adoption of cloud services and cloud-native container-based applications.

The majority of enterprises expect to rely on a mix of traditional on-premises datacenter infrastructure, on-premises private clouds, and public cloud infrastructure services in the coming years (see Figure 1). Workloads will gradually migrate from traditional IT to cloud architectures depending on the business case for workload and infrastructure updates.

FIGURE 1

Cloud Use: Today and 2022

Q. Please indicate approximately how applications are distributed across your organization's infrastructure computer platforms today and expected to be distributed in 2022. Your estimate should include production and development applications combined.



n = 901

Source: IDC, 2020

Many organizations are facing substantial operational and security challenges related to managing and securing multiple generations of bare metal, virtual machine–, and container-based infrastructure. The introduction of DevOps development strategies that automate constant application updates using microservices and Agile development methods further complicates day-to-day IT operations requirements.

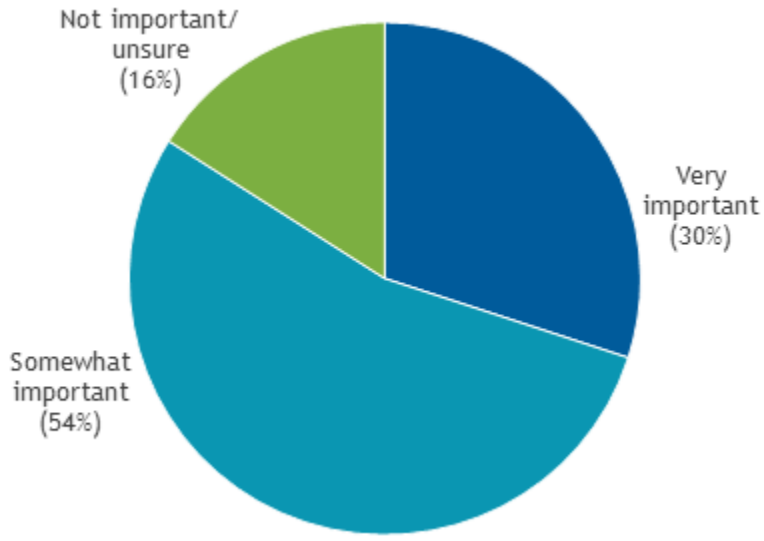
To help reduce operational complexity and ensure comprehensive security and compliance, many organizations are developing hybrid cloud management strategies that allow production workloads to be migrated and managed consistently across both on-premises platforms and multiple public clouds. The survey shows that most (84%) enterprises believe it is very important (30%) or somewhat important (54%) to implement consistent management across multiple/hybrid cloud environments (see Figure 2).

The deployment of multicloud/hybrid cloud architectures and the adoption of consistent cross-cloud management approaches are being driven by concerns related to security, the desire to improve reliability and scalability, and the need to be more flexible and better able to react and adapt to unexpected conditions.

FIGURE 2

Importance of Consistent Management Across Multiple/Hybrid Clouds

Q. How important is it for your organization to implement a hybrid cloud strategy that allows production workloads to be migrated and managed consistently across both on premises and multiple public clouds?



n = 901

Source: IDC, 2020

VMs Will Continue to Support Critical Business Requirements for Many Years

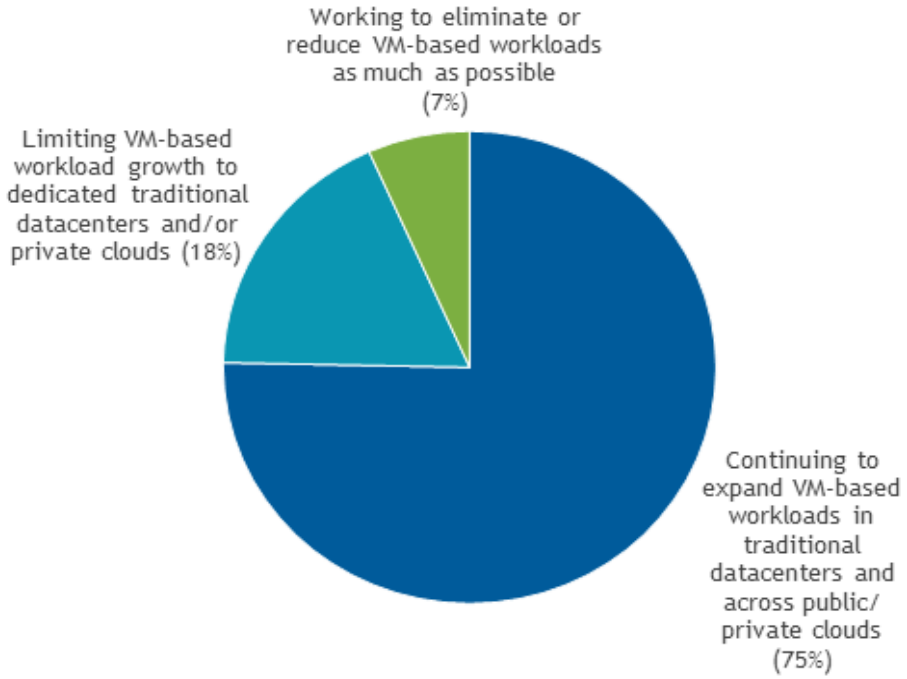
VM-based workloads are expected to continue to support the majority of critical enterprise workloads for many years, even as more and more organizations embrace containers and Kubernetes to fuel new software-driven innovation.

Over 93% of IT decision makers plan to continue to grow their VM estate, even as they simultaneously introduce container platforms (see Figure 3). Three-quarters (75%) expect to continue to expand use of VM-based workloads across connected, hybrid, and multicloud environments as part of their long-term business and IT strategy. Specifically, these architectures incorporate use of VM-based applications across traditional datacenters as well as private clouds and public cloud-based infrastructure.

FIGURE 3

Plans for VM-Based Workloads

Q. Which statement best describes your organization's plans regarding the evolution of VM-based workloads?



n = 901

Source: IDC, 2020

In many cases, these workloads may be modernized as part of a migration from legacy hardware to newer private on-premises or public cloud infrastructure. Making the decision to migrate existing VM workloads "as is" or to pivot to cloud-native container-based infrastructure depends on having a viable business case to justify the costs and time involved in refactoring or completely rewriting applications.

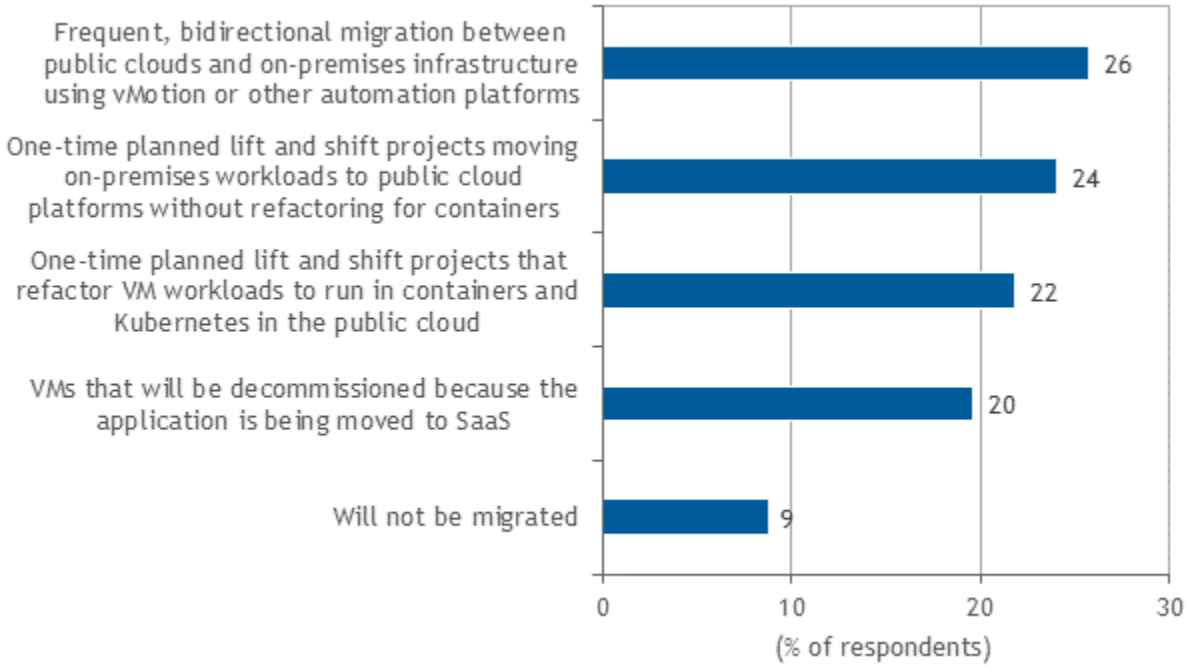
Enterprises must consider more than the direct costs related to rewriting code or shifting to container platforms, and they also need to evaluate the operational costs over the life cycle of the application and the development velocity of the application.

When a decision is made to move off existing hardware, VMs are most often migrated in a one-time, one direction way from on-premises platforms to VMs or containers in the public cloud (see Figure 4). Only 26% of workloads migrations involve frequent, bidirectional moves between public clouds and on-premises infrastructure using vMotion or other automation. Roughly a quarter (24%) of existing VMs are expected to be migrated one time to public clouds "as is" to run as VMs in public clouds. 22% of VM workloads will be refactored or repackaged in some way to allow them to run on public cloud container platforms.

FIGURE 4

VM Migration Plans Over the Next Two Years

Q. Considering your organization's existing VM workloads, please indicate the percentage that will be migrated in the following ways over the next two years.



n = 901

Source: IDC, 2020

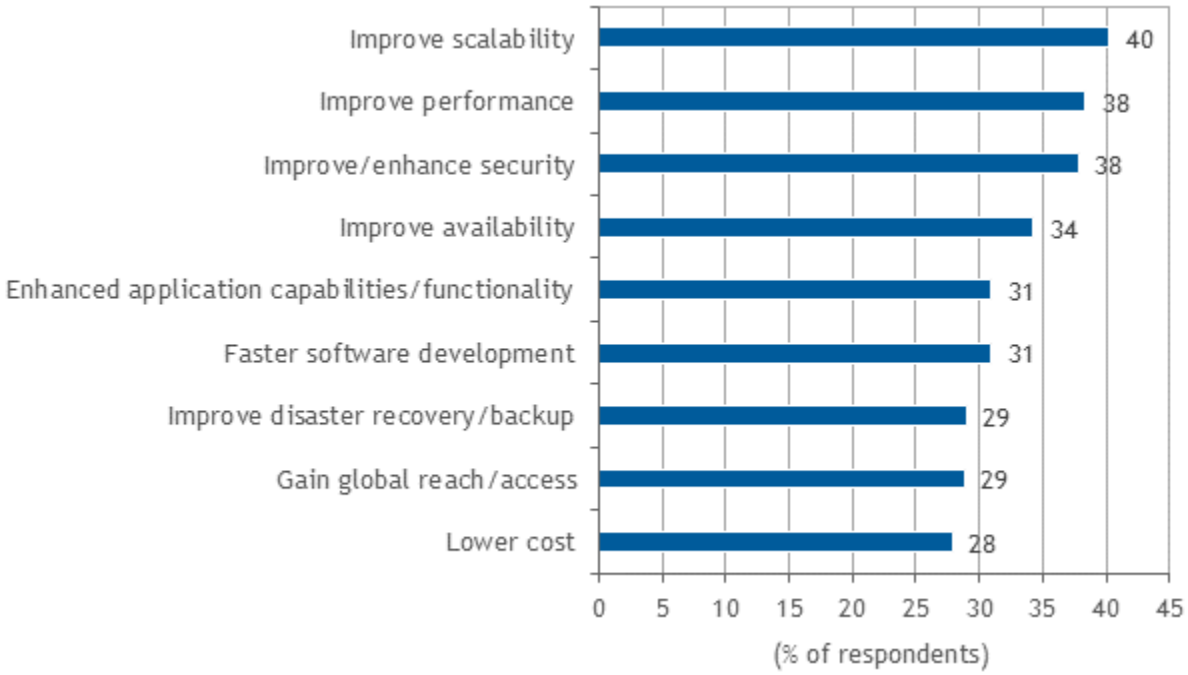
Survey respondents report that decision making about when or if to migrate VMs often focuses on increasing scalability, performance, and security (see Figure 5). Enterprises see the public cloud providing greater server, storage, and network infrastructure flexibility and agility via on-demand access to infrastructure supported by native automation and performance optimization tooling. During the global pandemic, rapidly scalable public cloud infrastructure has enabled many organizations to

shift to work-from-home or learn-from-home models while maintaining digital engagement with customers who could no longer visit physical locations.

FIGURE 5

VM Migration Drivers

Q. What are the primary drivers for migrating existing VM workloads from their current locations?



n = 901

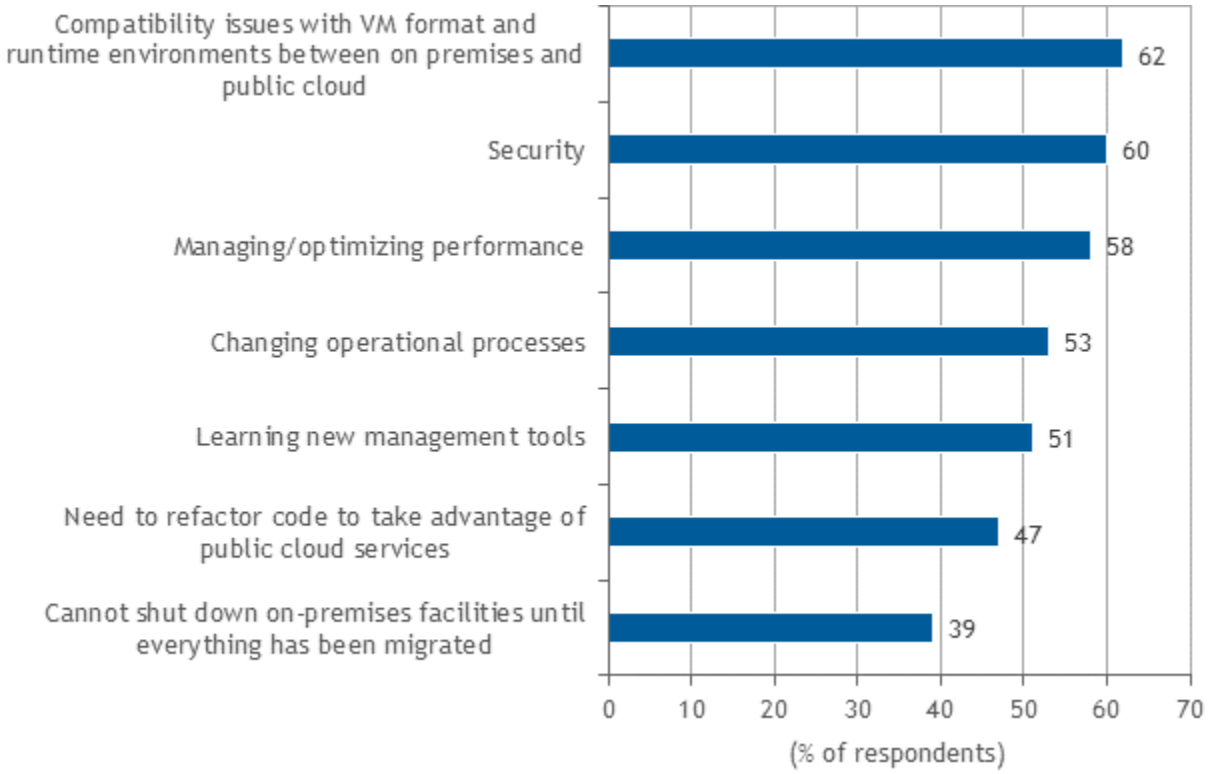
Source: IDC, 2020

Despite the benefits, many organizations also confront risks and challenges when migrating VMs to public clouds. Almost two-thirds (62%) of organizations have struggled with compatibility issues between on-premises and public cloud VM formats and runtimes (see Figure 6). Security (60%) and challenges related to optimizing performance (58%) are also common. Many of these challenges stem from the fact that most public clouds utilize a different virtual infrastructure platform than what enterprises have in their datacenters.

FIGURE 6

Top VM Migration Challenges

Q. When migrating VMs to the public cloud, what are the top challenges your organization has experienced or expects to experience?



n = 901

Note: Multiple responses were allowed.

Source: IDC, 2020

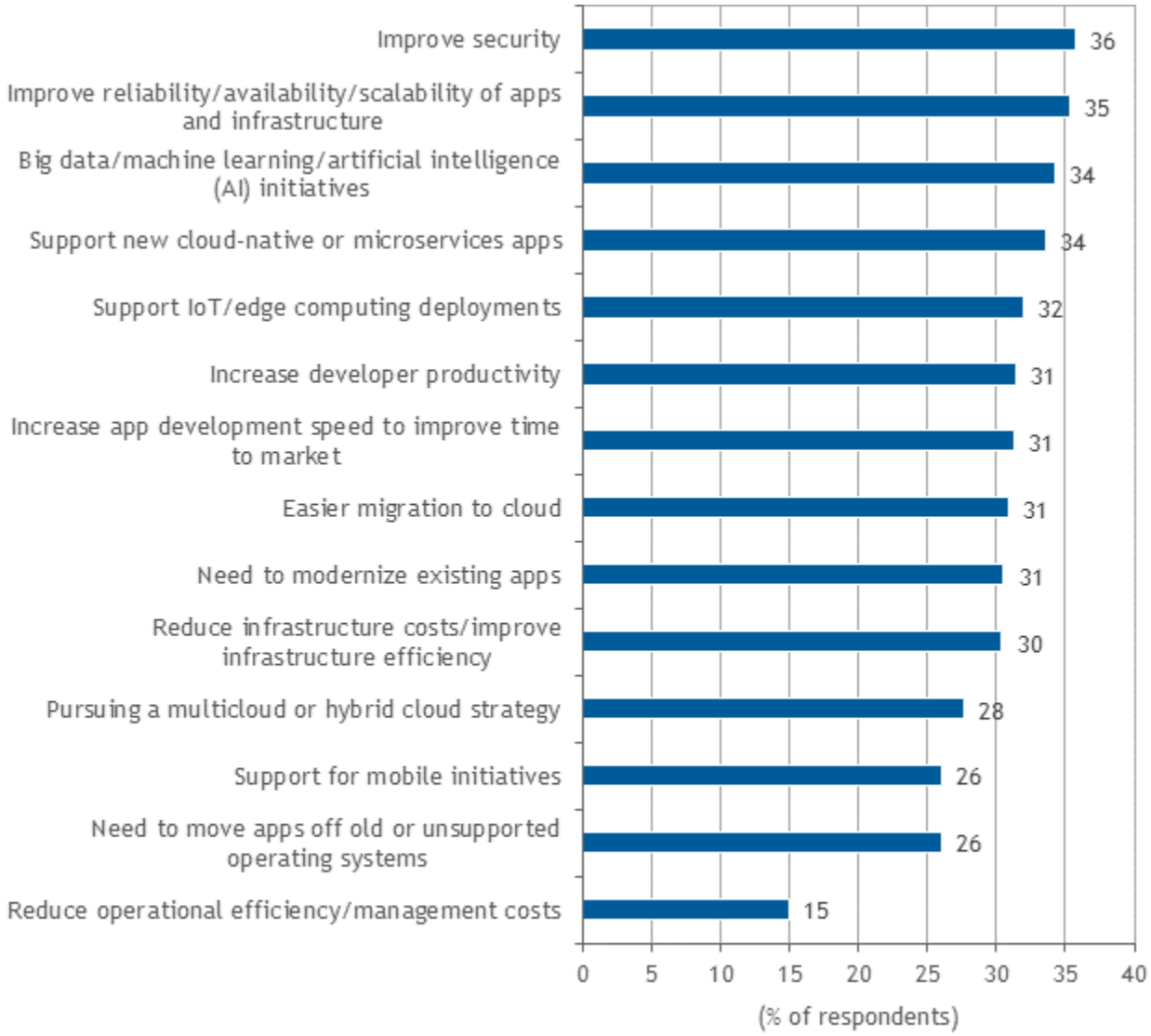
Containerized Workloads Will Run Beside VM Workloads and Data

Beyond straightforward VM migrations, many organizations are simultaneously moving selected workloads to newer cloud-native container-based architectures. Organizations are embracing containers for a number of reasons, including improved security, better application and infrastructure reliability and scalability, and the ability to support modern applications such as artificial intelligence/machine learning (AI/ML), microservices, and IoT/edge (see Figure 7). Containers allow organizations to move away from manual and error-prone patching programs that can leave them open to security risks. Container images are secured centrally and deployed automatically without the need for downtime. The efficiency and agility of containers better support microservices-based applications that are often shipped using automated continuous integration/continuous delivery (CI/CD) pipelines that deploy updated containers.

FIGURE 7

Top Drivers for Containers and Kubernetes

Q. What were the primary drivers that caused your organization to initially deploy or plan to deploy containers and/or Kubernetes?



n = 901

Note: Multiple responses were allowed.

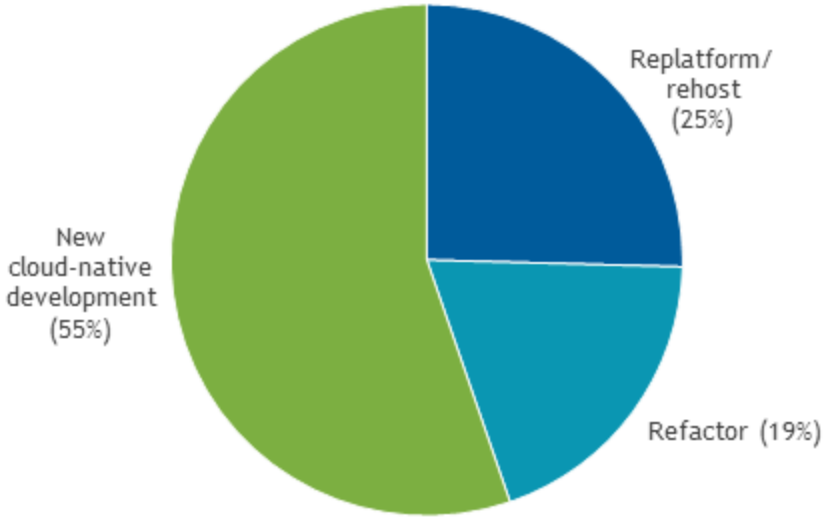
Source: IDC, 2020

Among surveyed organizations, about half (55%) of current containerized workloads will be written net new by 2022, while the rest will represent existing VM-based applications that were refactored into microservices or VM workloads that were simply replatformed or rehosted to containers with little to no code changes (see Figure 8). The result is that containerized environments will increasingly support a diverse variety of application architectures, from fully modern cloud native to legacy monoliths and many shades in between, given that many applications are often only partially refactored.

FIGURE 8

Sources of Containerized Workloads by 2022

Q. By 2022, to what extent do you expect containerized workloads will be developed net new versus lifting and shifting or refactoring of existing applications?



n = 901

Source: IDC, 2020

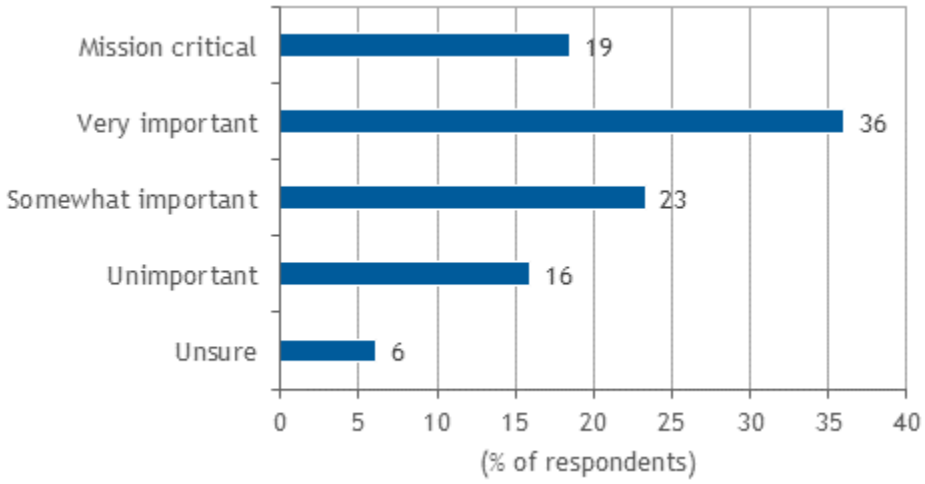
FUTURE OUTLOOK: UNIFIED INFRASTRUCTURE PLATFORMS AND CONTROL PLANES

VMs and containers will coexist and deeply interconnect for the foreseeable future. Even within a single application, some parts of the application may be in VMs and other parts in containers. As IT decision makers consider how to ensure reliable end-to-end services and end-user experiences across these interconnected, multigenerational application and infrastructure architectures, the majority of IT decision makers believe it will be important to deploy and manage VM- and container-based workloads on a common shared infrastructure environment using a unified control plane to ensure consistent compliance, security, and cost management across all resources (see Figure 9).

FIGURE 9

Importance of Deploying VMs and Containers on a Single Infrastructure Platform in the Future

Q. To what extent will it be important to deploy VMs and containers on a single infrastructure software platform in the future?



n = 901

Source: IDC, 2020

Organizations that rely on multiple cloud and on-premises datacenter resources frequently find that divergent platform or service-specific management consoles, monitoring agents, template build tools, and operational automation controls can vary widely and be difficult to coordinate across dozens or even hundreds of different applications. Most IT decision makers anticipate that operational complexity will continue to increase over time, unless specific steps are taken to better standardize and simplify configuration, access control, change management, and cost optimization.

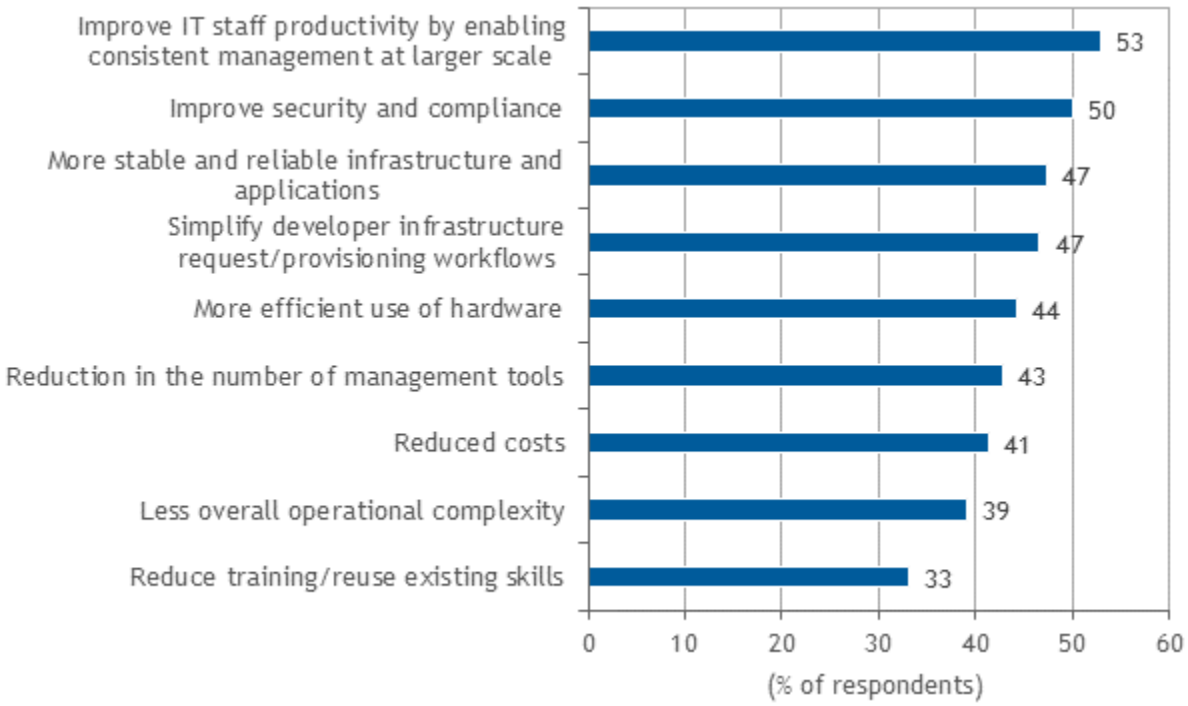
These IT decision makers see significant opportunities for improving IT staff productivity and consistency at larger scale, improving security and compliance, and enabling more stable and reliable infrastructure and applications by deploying a consistent, unified VM and container infrastructure software platform and management framework across all workloads and physical locations — connecting on-premises and public cloud resources as well as edge locations.

The cost, complexity, and risk of managing divergent, interdependent computing platforms are rising concerns for many organizations. When considering the use of a unified VM and container infrastructure platform, the opportunity to improve IT staff productivity by enabling consistent management at larger scale is the number 1 benefit cited, followed by opportunities to improve security and compliance and end-to-end system stability (see Figure 10).

FIGURE 10

Benefits of Deploying VMs and Containers on a Single Infrastructure Platform

Q. What do you think are the greatest benefits of running VMs and containers on a single infrastructure software platform?



n = 901

Source: IDC, 2020

When IDC probed a bit deeper about concerns related to managing increasingly complex future environments built around large-scale reliance on multiple clouds and blended VM- and container-based workloads, concerns about consistency of security, analytics, and staff training were all cited (see Figure 11).

Most organizations recognize that the introduction of container platforms and Kubernetes for use in large-scale runtime application environments brings a new set of requirements for IT operations. Some enterprises have created dedicated site reliability engineering teams to support these modern workloads and related infrastructure and capacity management requirements. Initially, these teams may operate separately from mainstream infrastructure operations staff and be more tightly aligned with development organizations.

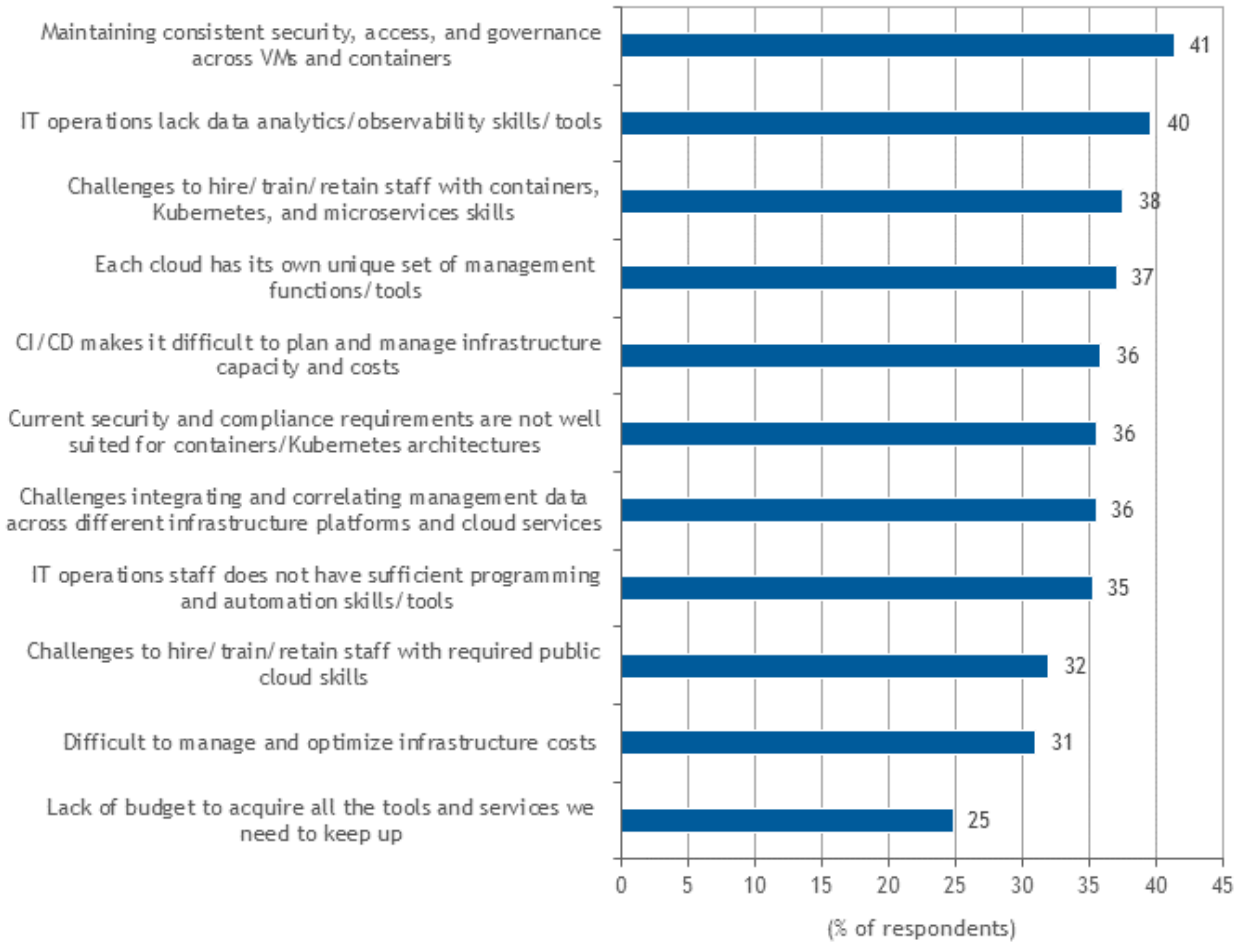
As production use of hybrid/multicloud and blended VM- and container-based applications escalates, more mature organizations are recognizing that all IT operations staff need to evolve, modernize, and upgrade their capabilities. New approaches to decision making and governance are required. As organizations mature, they increasingly recognize the need for collaborative centers of excellence,

training for existing staff, and elimination of operational silos between container and VM management teams (see Figure 12).

FIGURE 11

Top Infrastructure Management Concerns, 2022

Q. What concerns do you have regarding the planned approach to management and operations of your organization's IT infrastructure environment in 2022?



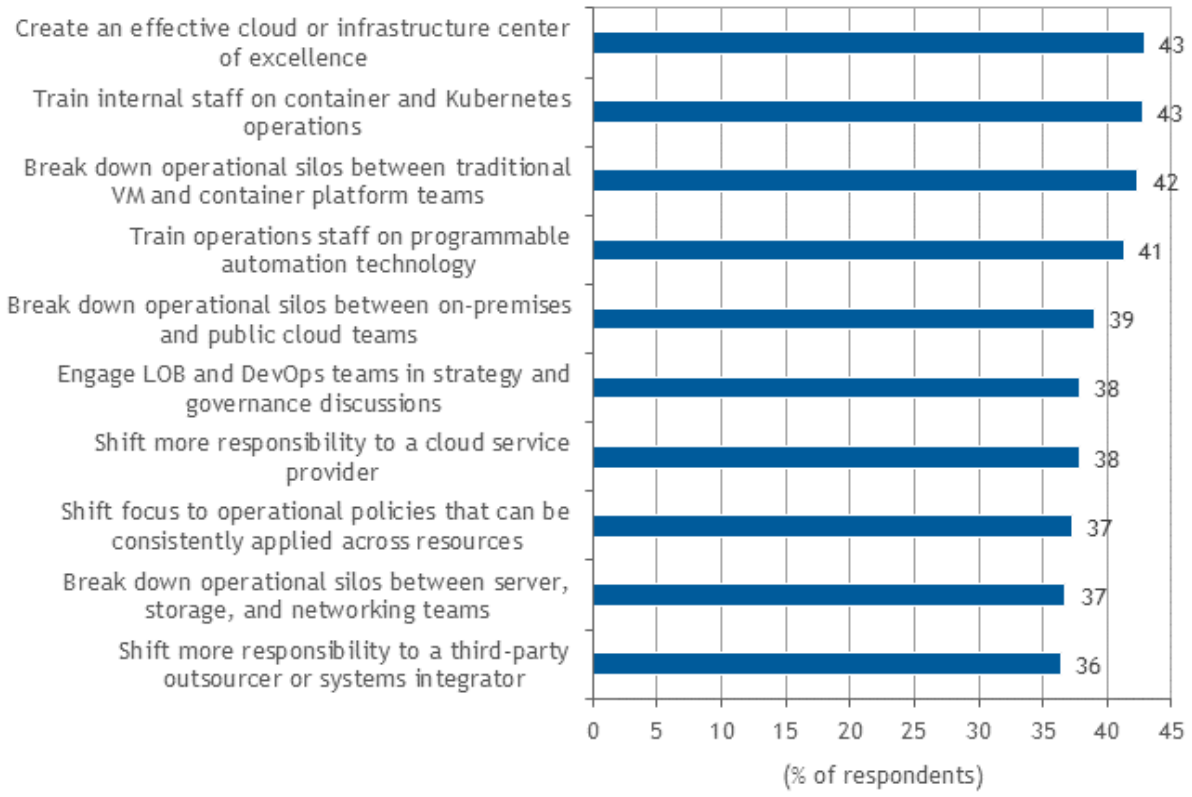
n = 901

Source: IDC, 2020

FIGURE 12

Infrastructure Management Organizational Priorities in the Next Two Years

Q. Given your organization's goals and concerns, what are the most important changes you expect to need to make in terms of people, skills, and organizational models to ensure the successful evolution of your enterprise infrastructure in the next two years?



n = 901

Source: IDC, 2020

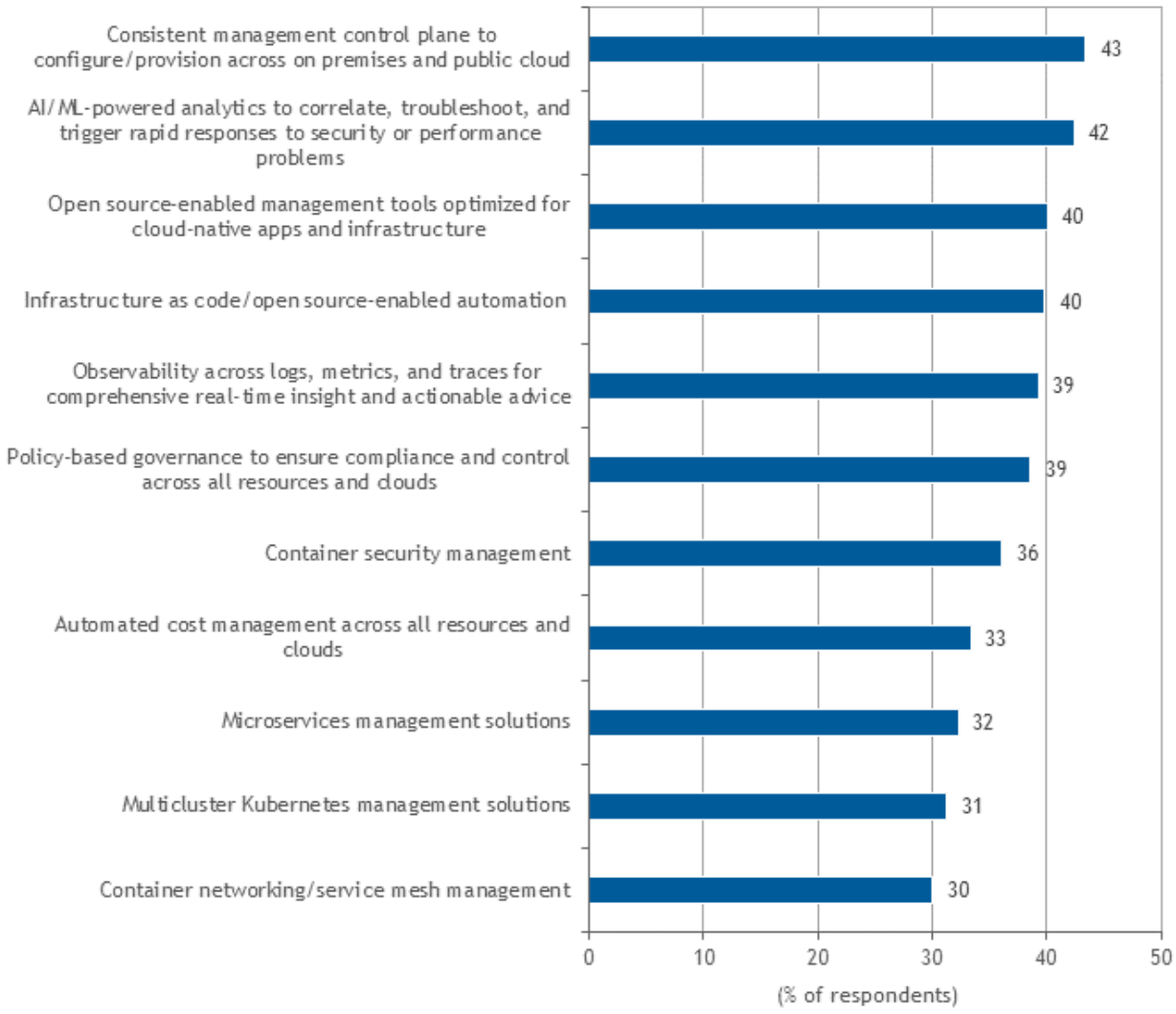
Unified teams will need to be able to define and apply standardized, validated security and compliance profiles; comprehensive monitoring and AI/ML-powered observability; and end-to-end operations automation and orchestration across all infrastructure resources. The emergence of open source, cloud-native tools and API-enabled cross-cloud control planes is providing new options for IT teams to better grapple with operational complexity. Cross-cloud management control planes allow for consistent policy and event-driven automation and management across multiple clouds and workload footprints using software-defined operational controls.

Overall, enterprise IT operations decision makers in the IDC survey ranked having a consistent management control plane to configure and provision resources across on premises and private clouds as their top management priority over the next two years. They also plan to invest in AI/ML analytics and open source technologies to enable robust, intelligent hybrid and multicloud operations (see Figure 13).

FIGURE 13

Top Infrastructure Management Capabilities Over the Next Two Years

Q. What are the most important new management and control capabilities your organization will need over the next two years?



n = 901

Source: IDC, 2020

CONSIDERING VMWARE CLOUD FOUNDATION WITH TANZU

VMware Cloud Foundation is a unified hybrid cloud platform for managing VMs and orchestrating containers. VCF is a fully software-defined datacenter platform that includes virtual compute, storage, and networking with vSphere, vSAN, and NSX-T technologies. VCF extends the core vSphere hypervisor using a standardized architecture that can be deployed consistently across public clouds and datacenters and managed using all the existing vRealize tools and skills. VCF's highly automated deployment process using the SDDC Manager helps streamline configuration and deployment. VCF is the foundation for VMware-based public clouds such as VMware Cloud on AWS, Azure, Google Cloud, and IBM Cloud. VCF allows which existing VMware VM-based applications to be migrated without refactoring due to the infrastructure platform consistency.

VCF is available with integrated VMware Tanzu Grid with Kubernetes enabling vSphere to host both VM and container workloads. VCF with Tanzu allows container- and Kubernetes-based workloads to be deployed and managed using the same set of VMware management tools that existing VM admins are familiar with today. It avoids disruptions to Kubernetes APIs and allows developers to manage VMs via Kubernetes if desired. Integrations with Tanzu Mission Control and Tanzu Observability allow DevOps teams to extend control across multicluster, multicloud deployments and have deep visibility into the application stack.

vSphere with Tanzu allows customers to use existing network and storage systems for Kubernetes workloads on vSphere. vSphere with Tanzu is positioned as developer-ready infrastructure that can be launched quickly and deliver value by leveraging existing network and storage infrastructure. The goal is to enable IT admins to provide developers with self-service access to Kubernetes clusters quickly and enable developers to integrate vSphere with Tanzu into development workflows and CI/CD pipelines using admin tools they already know.

CHALLENGES/OPPORTUNITIES

The introduction of containers and Kubernetes-based applications into production environments can be challenging as many elements of datacenter operations and architectures need to be updated. Kubernetes orchestration can scale and optimize the behavior of container pods running on a single cluster, but the configuration, integration, scaling, and security related to connected storage and network resources, as well as multicluster operations, all need to be addressed.

VCF offers a well-defined, highly integrated experience with strong end-to-end automation and monitoring that benefits larger environments and customers that have experience with vSAN and NSX-T. Smaller teams with less experience or larger organizations that are not ready to master the full VCF stack may want to consider vSphere with Tanzu.

VMware needs to continue to meet customers where they are by continuing to enhance the scalability and resiliency of the vSphere with Tanzu platform going forward. Tanzu brings a simplified upgrade path to containers for existing VMware customers. IDC expects that, over time, VMware will promote tighter federation and integration across the Tanzu management platform and the federated multicloud automation, monitoring, and governance capabilities found in the vRealize Cloud Management and CloudHealth by VMware portfolio.

CONCLUSION: COMMON PLATFORMS AND MANAGEMENT FOR VMS AND CONTAINERS CAN REDUCE RISK AND INCREASE DIGITAL RESILENCE

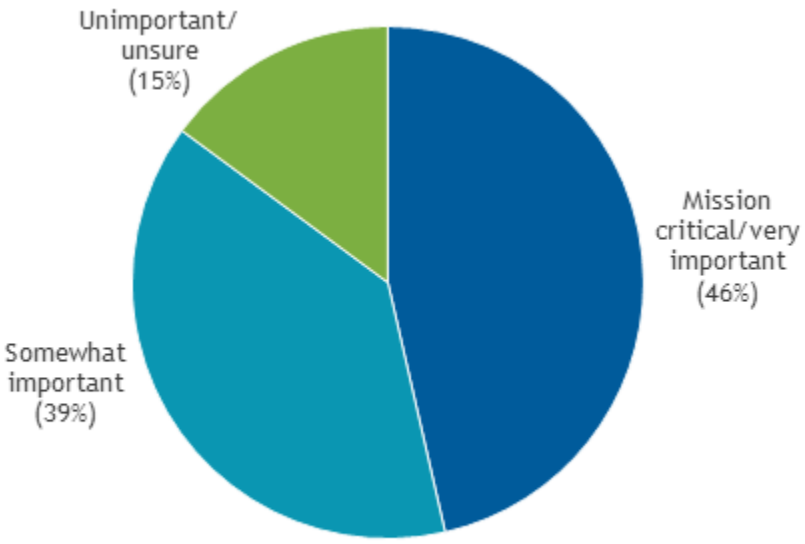
IDC's research highlights the operational complexity and management challenges related to enterprise use of hybrid and multicloud architectures that enable digital transformation using VMs and containers across edge, on-premises datacenters, and public cloud services. The reality for most enterprises is that this diverse and complex environment will dominate most IT footprints for a number of years.

Survey participants are experienced and pragmatic and understand that IT operations must evolve and mature while taking full advantage of open source, AI/ML, and software-defined automation and platforms for consistent cross-cloud infrastructure configuration, access, observability, management, and control. Almost half (46%) believe it will be mission critical or very important to have one common shared control plane across VMs, containers, public clouds, and on-premises infrastructure in the future (see Figure 14).

FIGURE 14

Importance of a Common Control Plane in the Future

Q. How important will it be to have one common shared control plane across VMs, containers, public clouds, and on-premises infrastructure in the future?



n = 901

Source: IDC, 2020

Over the next two years, IT decision makers are most concerned about possible infrastructure security failures, cost overruns, and their inability to cope with industry and global economic risks outside their control (see Figure 15). Enterprises are investing aggressively in cloud infrastructure, AI/ML analytics,

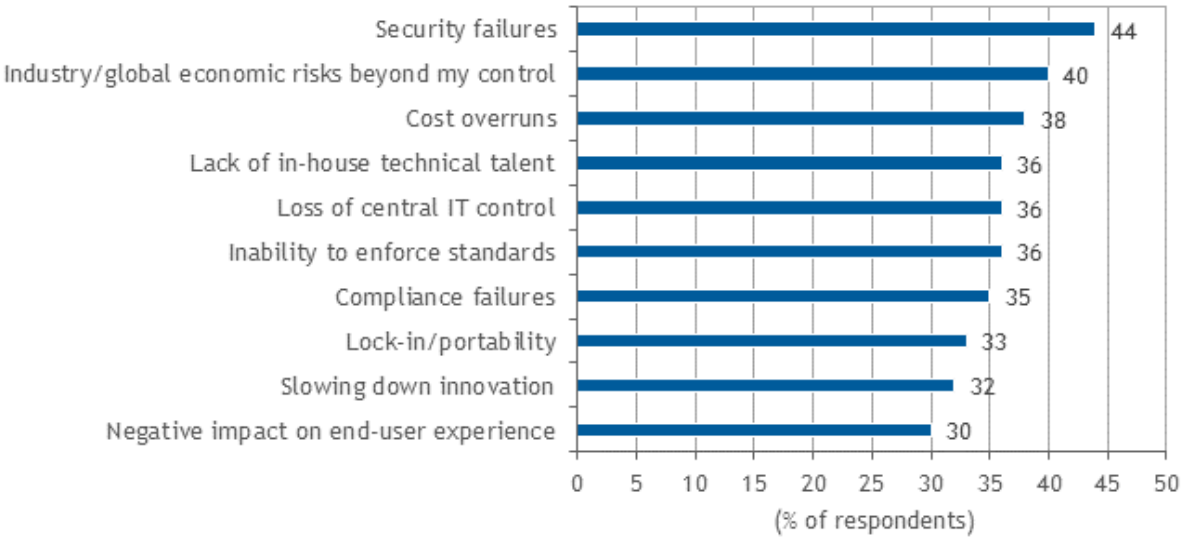
cloud-native DevOps agility, and cross-cloud VM and container management control planes to provide their businesses with greater flexibility, security, and agility. As business becomes more and more digitalized, the need for effective, secure, and autonomous digital infrastructure has never been more important.

Enterprise IT decision makers who are planning to deploy containers and DevOps development strategies at scale need to ensure that the infrastructure that will be used to host and scale these critical applications is up to the task.

FIGURE 15

Top Infrastructure Transformation Risks Over the Next Two Years

Q. What risks related to the planned transformation of your organization's infrastructure have you most concerned over the next two years?



n = 901

Note: Multiple responses were allowed.

Source: IDC, 2020

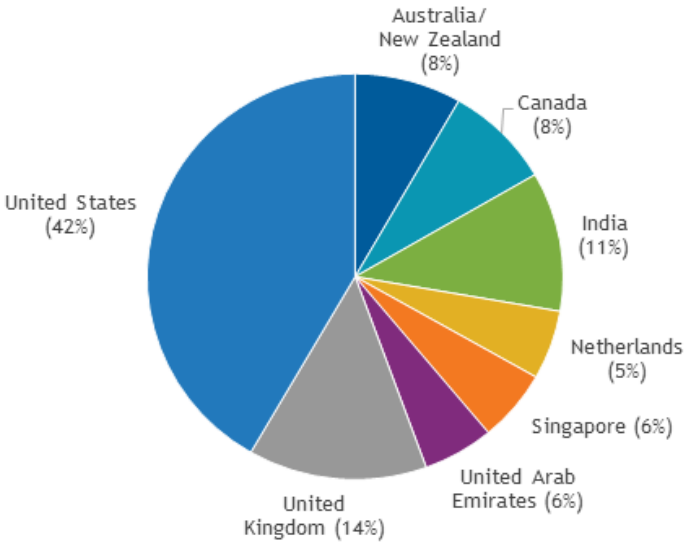
METHODOLOGY

IDC's worldwide survey of senior IT operations decision makers was conducted via a web survey during October 2020. Participants represented 901 decision makers across the Americas, Europe, and Asia (see Figure 16). Over 80% of the participants represented organizations with more than 5,000 employees (see Figure 17). The survey was evenly distributed across a range of industries: education, finance, government, healthcare, large retail, pharma, technology, transportation, and other, with 11% of the sample allocated to each industry.

Note: All numbers in this document may not be exact due to rounding.

FIGURE 16

Participant Countries

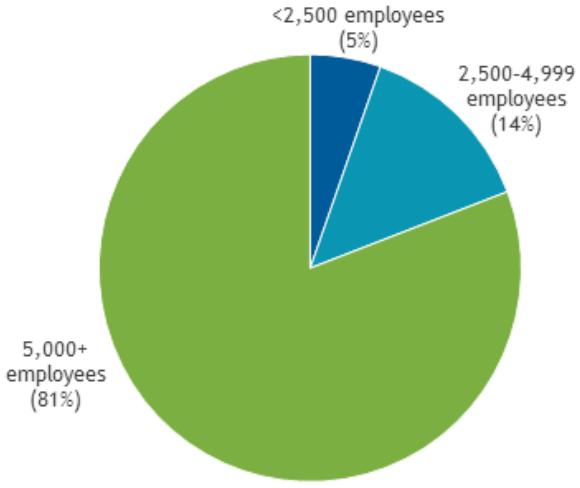


n = 901

Source: IDC, 2020

FIGURE 17

Participant Company Size



n = 901

Source: IDC, 2020

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

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