



State of Linux in the public cloud

Annual review

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State of Linux in the Public Cloud

Executive summary

More and more workloads are moving to public cloud environments. In the 2021 Linux® market study by [Management Insight Technologies](#), an internal market survey conducted on behalf of Red Hat, more than half of respondents said that they expected to move a workload from the datacenter to a cloud environment in the next year. Further, more than half of respondents are taking a hybrid strategy—a combination of on-premise and cloud environments with workloads and data migrating between them.

This hybrid model gives organizations the flexibility they need to evolve, adapt, and make purposeful IT decisions based on their organizational objectives instead of infrastructure requirements.

When it comes to hybrid cloud success, consistency is key. That consistency starts with Linux. When an operating environment is flexible, consistent, resilient, and security-focused, the overall application and user environments inherit that consistency. When an organization moves to a public cloud environment, that consistency empowers it to retain skills, standards, business processes and best practices.

Respondents in the Linux market study emphasized a need for consistency. When asked which actions their organizations take to make moving workloads across the datacenter and public clouds less difficult, respondents ranked “standardizing on a Linux OS” as the top action they are taking.

Standardization does not mean that every environment needs to be the same. It means using a common language and a common approach to building IT environments. The 2021 Linux market study shows that as workloads continue to move to cloud environments, organizations choose Linux to take advantage of its consistency as a platform and to help migrate and manage those workloads.

Organizations are continuing to use tested and trusted enterprise-grade software to build efficiency and security into their hybrid cloud strategies, and reduce their overall costs. They are looking for benefits such as support, smart management, and standardized security from their platform, which are not available using a do-it-yourself approach.

Chapter 1:

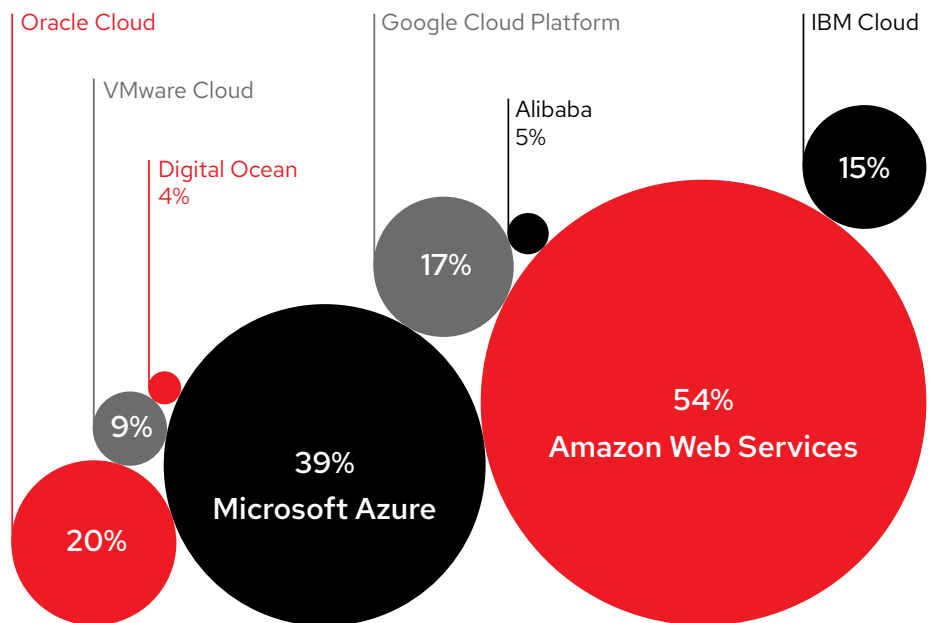
Linux distributions continue to move to cloud environments



The 2021 Linux market study: Methodology and firmographics showed that Linux distributions continue to cross all types of environments. But almost all organizations using Linux are moving toward a greater proportion of their workload being on a public cloud.

Respondents described using typical distributions of cloud and on-premise environments that are in use across the industry. Respondents' top cloud providers are Amazon Web Services (AWS) (used by 54% of respondents), Microsoft Azure, and Oracle Cloud, with an average of 1.63 public clouds per organization.

Public cloud providers used for Linux workloads



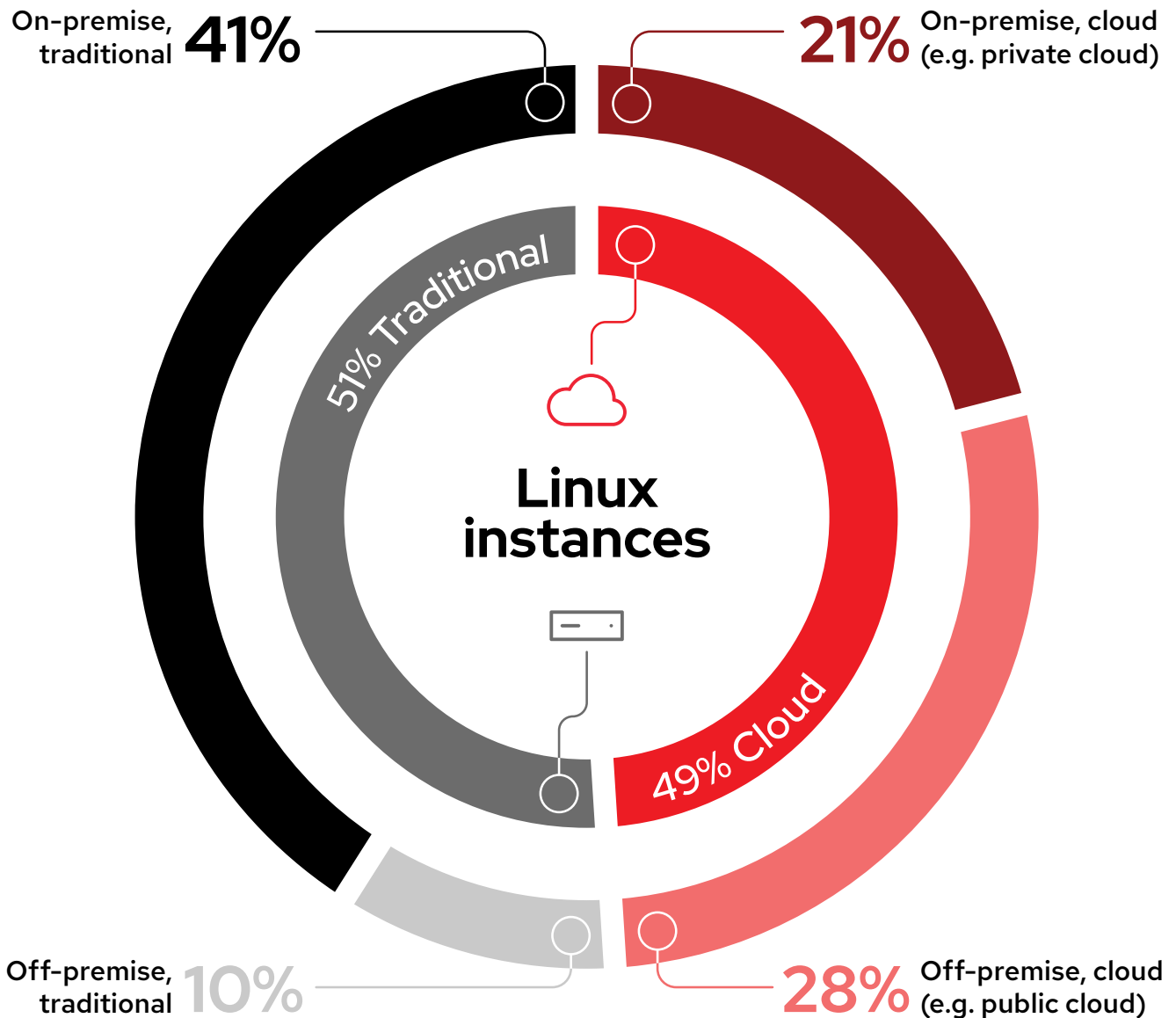
Red Hat Enterprise Linux is available directly through certified cloud provider marketplaces including AWS and Microsoft Azure.

[Learn more about AWS integrations](#)

[Learn more about Azure integrations](#)

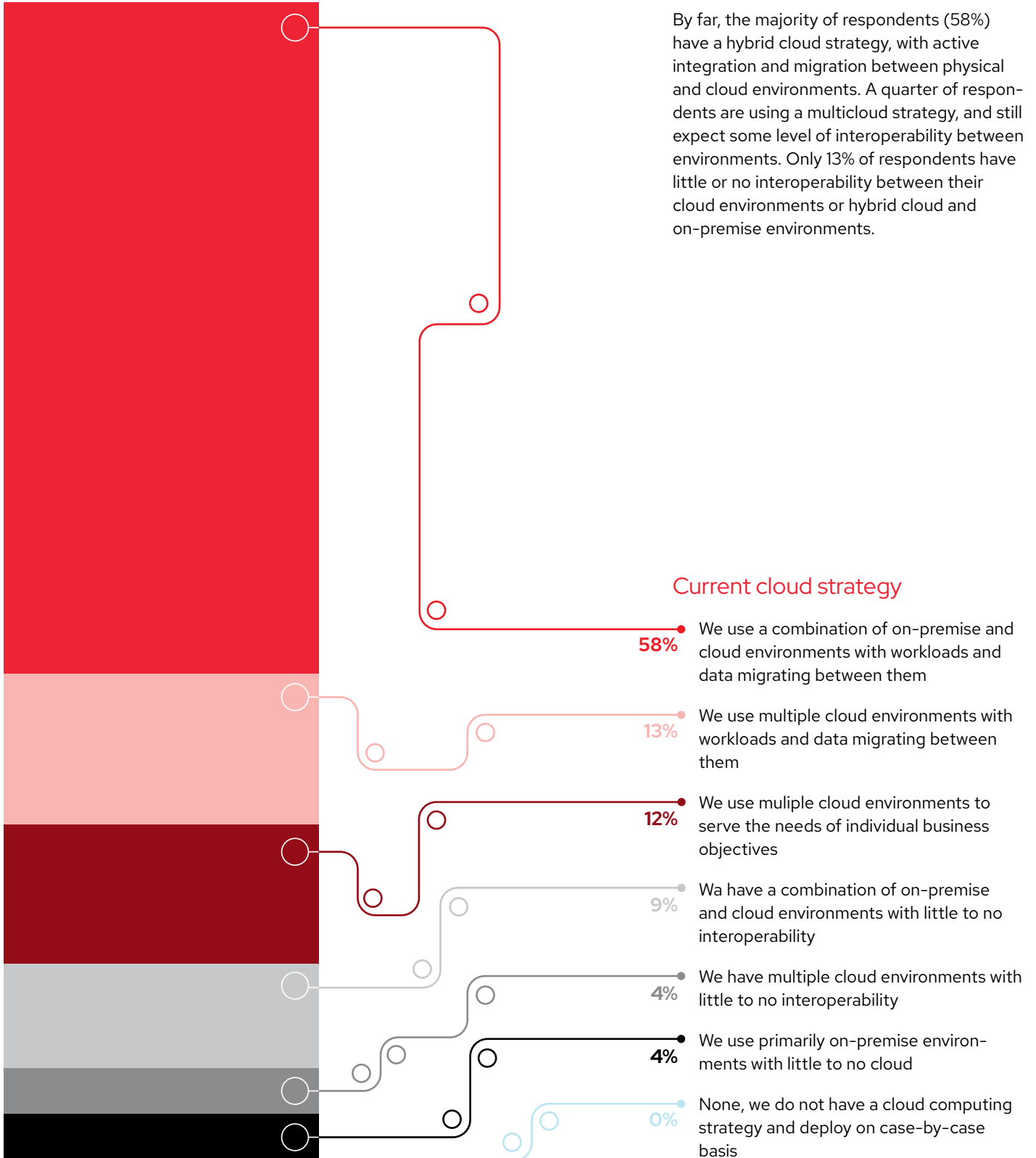
Linux systems are deployed across on-premise and hosted physical systems (51% combined), with another 21% deployed on on-premise private cloud. Only 28% of Linux workloads, for respondents in this study, were deployed on a public cloud.

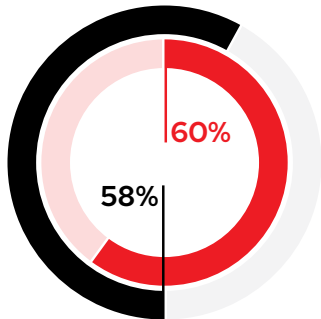
Linux systems by infrastructure environment



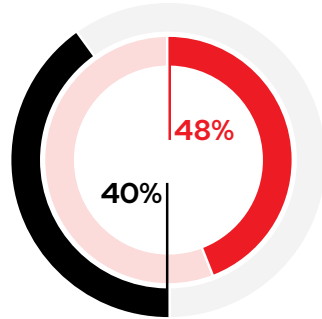
By far, the majority of respondents (58%) have a hybrid cloud strategy, with active integration and migration between physical and cloud environments. A quarter of respondents are using a multicloud strategy, and still expect some level of interoperability between environments. Only 13% of respondents have little or no interoperability between their cloud environments or hybrid cloud and on-premise environments.

Current cloud strategy

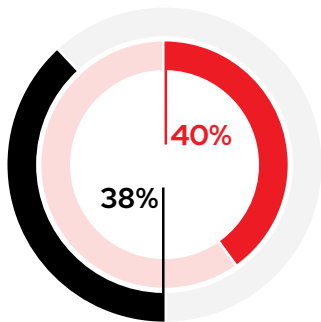




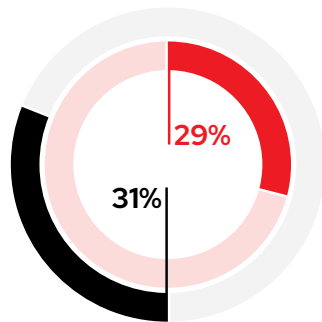
Move workload from datacenter to public cloud



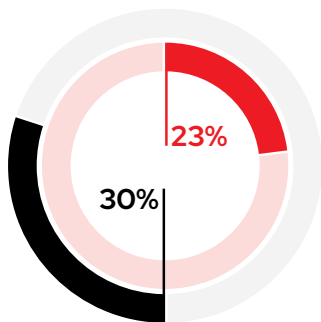
Deploy net new for the public cloud



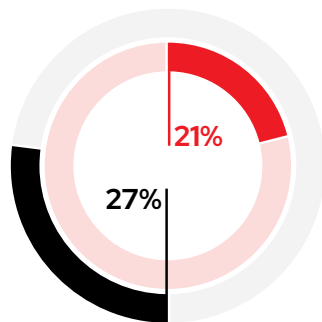
Deploy across hybrid deployment



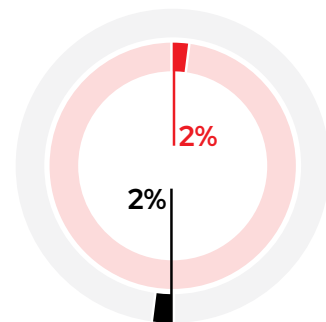
Move from one public cloud to another



Move workload originating in public cloud to datacenter



Repatriate workload from public cloud back to datacenter




None

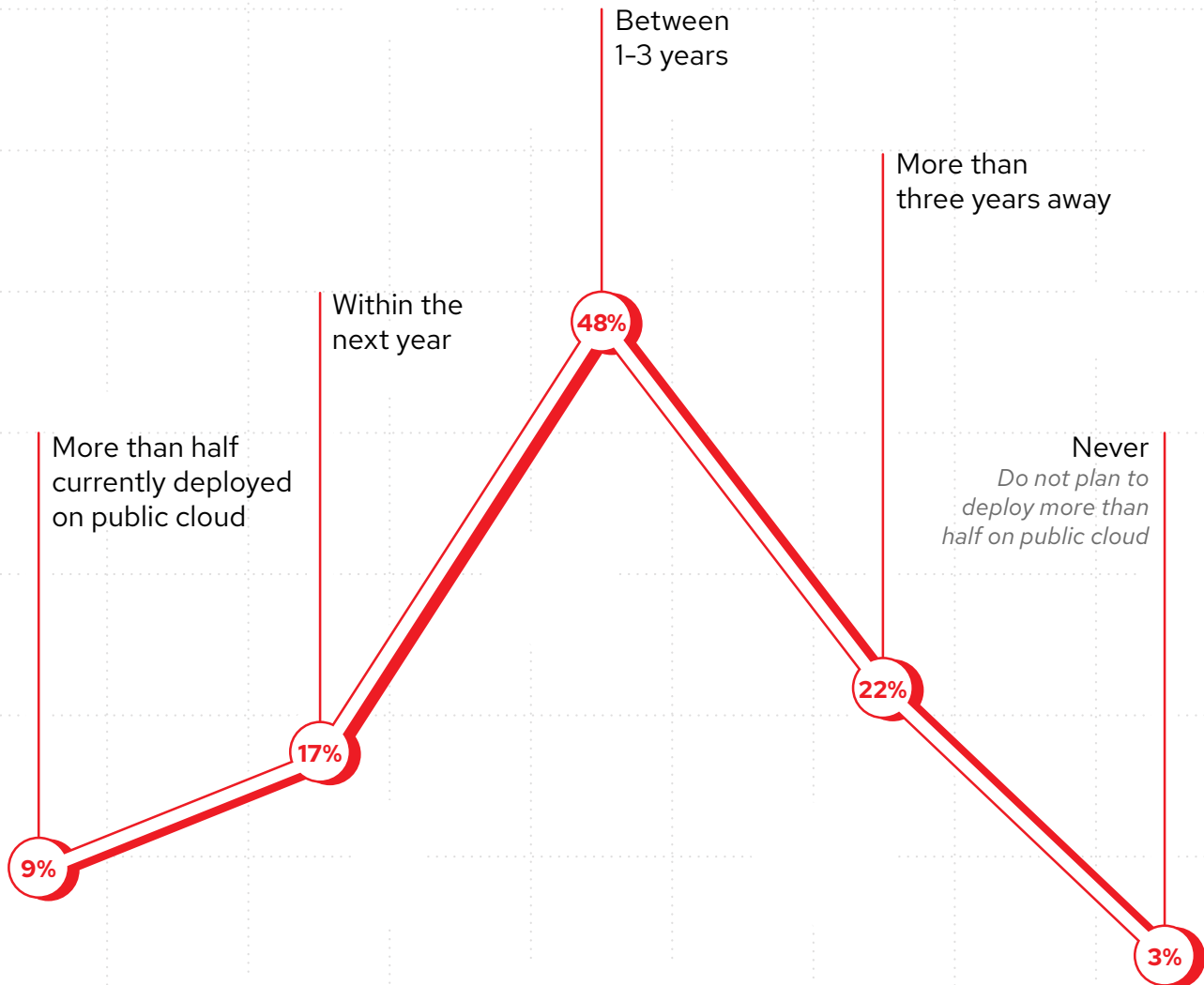
Organizations often move workloads, most frequently from a datacenter to a cloud environment (58%), but also moving between clouds (31%). Only 2% of respondents hadn't either moved a workload between environments or deployed a new workload. Interoperability and portability are therefore critical considerations for cloud environments.

Organizations expect a similar pattern for migrations and new deployments over the next two years. However, they anticipate some differences. First, they foresee an increase in new cloud deployments (from 40% to 48%); second, a decrease in migrations of cloud-native workloads into datacenters (from 30% to 23%); and third, a decrease in repatriating workloads (from 27% to 21%).

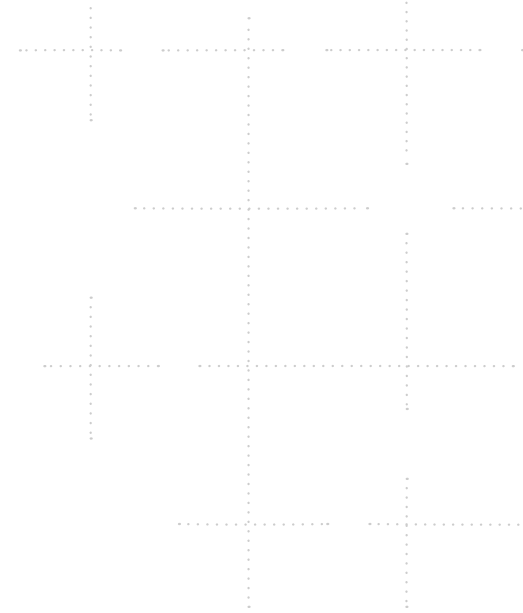
 Actions expected in two years

 Actions taken past 12 months

Organizations are actively moving their workloads to the cloud, although that movement will take time. Only 9% already have more than half of their workloads in a public cloud. In three years 74% of the respondents expect to have at least half their Linux workloads deployed in a public cloud. However, very few – only 3% of respondents—do not plan to deploy at least half of their workloads to a public cloud.



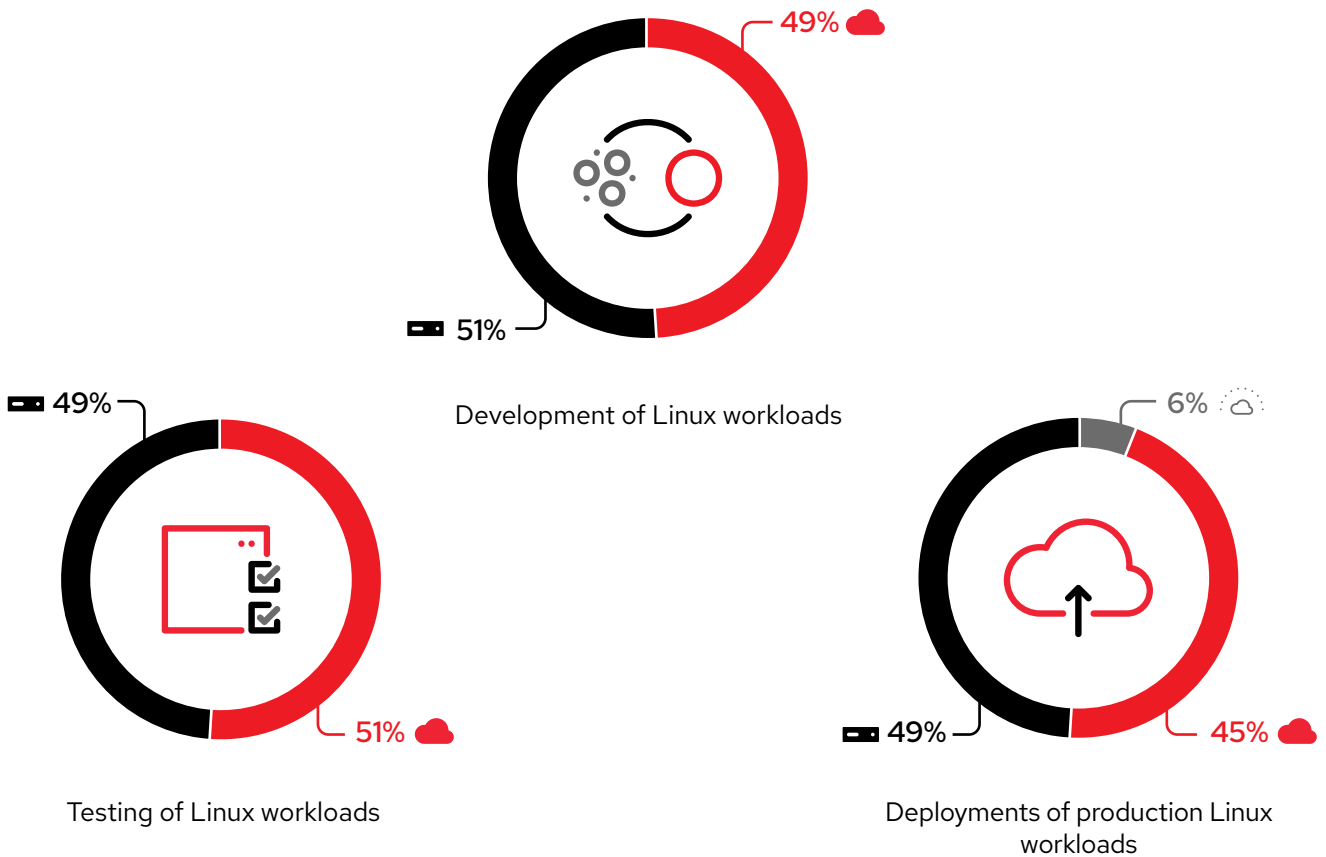
Timeline to deploy 50% of Linux workloads to a public cloud



Despite the fact that workloads are frequently moving between environments and new workloads are being deployed, the overall allotment of workloads between datacenters and cloud environments stays consistent (close to an even split) across workload life cycle stages. The only slight difference is production environments, where 6% of workloads are on the network edge.

Linux workloads by production life cycle stage

On the edge
 On the public cloud
 On-premise



The Red Hat perspective

As organizations move to a hybrid cloud model, it is becoming increasingly important to build products designed for that environment. Retrofitting legacy applications and working within the limitations of on-premise solutions will continue to give way to a development philosophy that takes advantage of the hybrid cloud model. As organizations continue to migrate workloads to public clouds, this “hybrid cloud first” philosophy will become the primary approach to software development and modernization.

Chapter 2:

Organizations seek consistency to address challenges in their IT environment

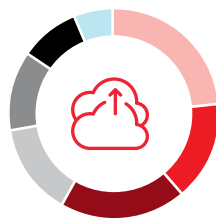
Consistency comes from a trusted foundation that reduces complexity and increases availability across environments so your teams can innovate at will. It's key for modern enterprises, which might manage thousands or tens of thousands of servers and workstations. Red Hat Enterprise Linux allows organizations to deploy their systems without the expense and risks of manual or semi-manual management. Red Hat Enterprise Linux frees businesses to focus on their own priorities, while knowing they have stability and consistency on any cloud they use.

Read the e-book, [Why the operating system matters](#).

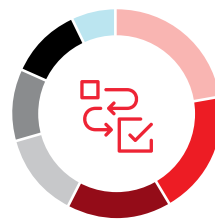
As organizations increasingly move to hybrid environments, they are seeking tools that will help to address the difficulty, cost, and administration of migrating and managing their deployments. A consistent environment emerges as a key need to address these challenges.

The way organizations interact with software vendors and where they want to obtain their software and tools are changing as they move to cloud environments. Respondents were almost evenly split between using a Linux vendor, cloud provider, third party, or in-house development for key software assets like security, management, containers, and support. Respondents are using an average of over 1.5 different service providers for each area.

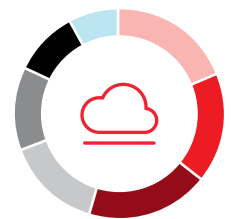
Where organizations are obtaining tools and services for Linux administration



Tools for deploying Linux on cloud

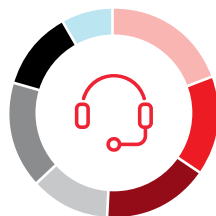


Maintaining performance and availability



Infrastructure management

- LinuxOS vendor and cloud provider
- LinuxOS vendor only
- Cloud provider only
- In-house only
- LinuxOS vendor and in-house
- Cloud provider and in-house
- LinuxOS vendor, in-house and cloud provider
- Other combination



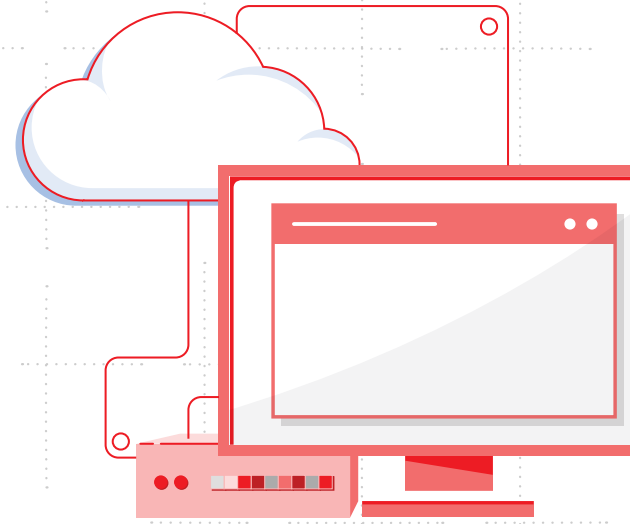
Technical support



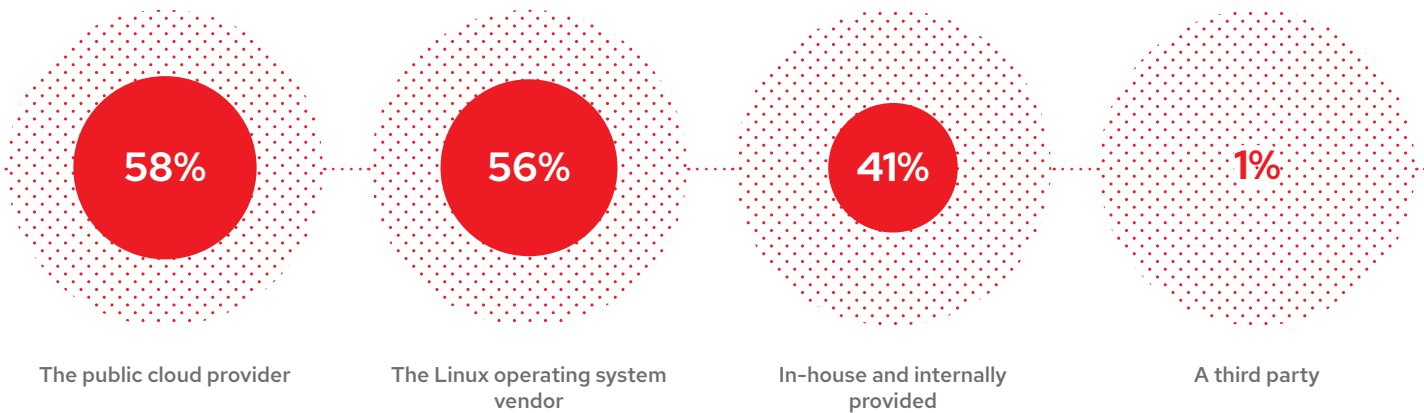
Container management



Maintaining infrastructure security

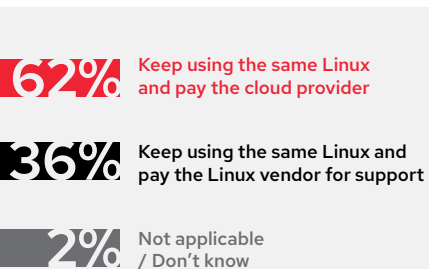


Where organizations obtain key services or tools (simplified)



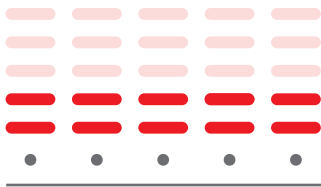
Because workloads are constantly moving between environments, part of managing applications is defining a consistent approach to portability. Interestingly, respondents had slightly different approaches overall depending on whether the migration was from on-premise to a cloud or between clouds. For both types of migrations, the number one preferred strategy is using a consistent operating system, with some nuances in their approaches in each environment.

Preferred way to purchase support for cloud-based Linux deployments

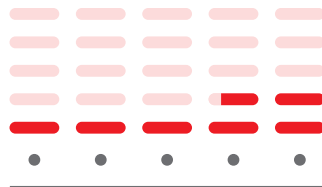


Standardizing on an operating system is the top preferred approach to migrate workloads, selected by 40% of respondents. The most popular action respondents took to ensure a smoother migration to cloud was to standardize on Linux for both on-premise and cloud deployments. While the least popular action was to adopt self-managed and supported Kubernetes.

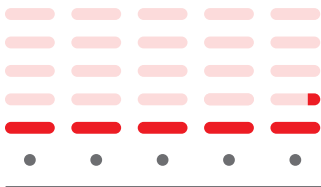
Actions to make data center to cloud migrations easier



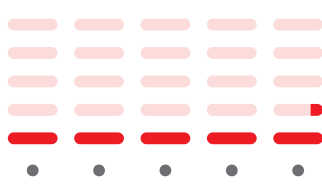
Standardize on the Linux OS (i.e., Red Hat Enterprise Linux, Ubuntu)



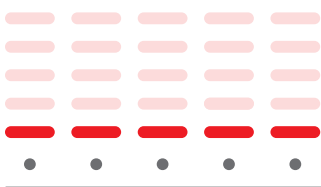
Use public cloud provider's on-premise offering (i.e., Anthos, AWS Outposts, Azure Stack)



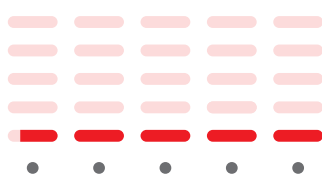
Use a cloud agnostic provisioning tool (i.e., Terraforms, vRA)



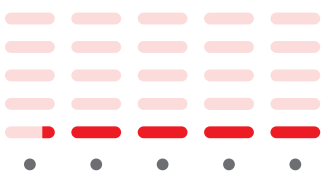
Use a vendor supported Kubernetes platform that works across clouds (i.e., OpenShift®)



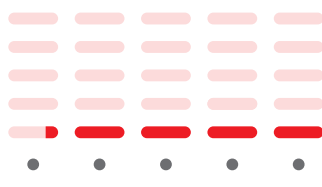
Use life cycle automation software (i.e., Puppet Enterprise, Red Hat Ansible®)



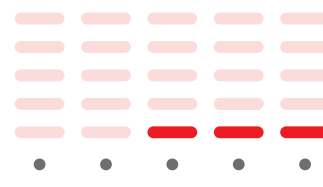
Use a cloud provider's managed and supported Kubernetes service (i.e., EKS, GKE)



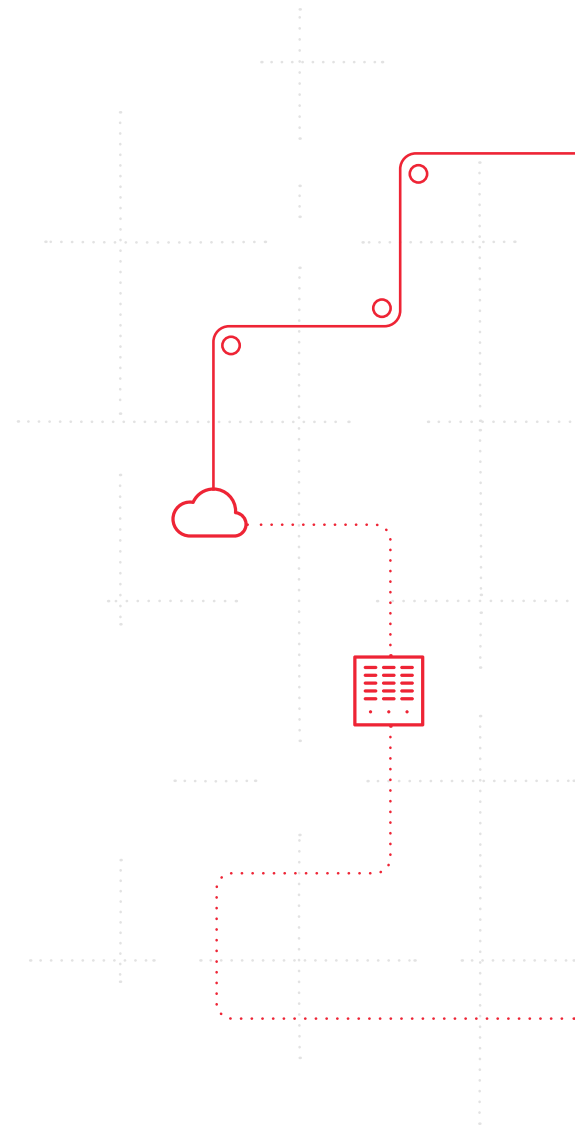
Avoid use of cloud-specific services when possible



Use VMware on public cloud providers (i.e., VMware on AWS, Azure, GCP, and IBM Cloud)



Use only self-managed and self-supported Kubernetes.



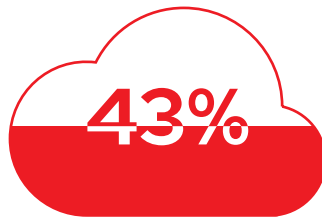


However, for cloud-to-cloud migrations, standardizing on an operating system was preferred by a clear majority of respondents, 52%. Another 43% were committed to maintaining consistent container images across cloud environments. As with on-premise migrations, a significant percentage (41%) were willing to use container management services for deploying workloads, but only 17% would avoid cloud provider-specific tools to maintain portability.

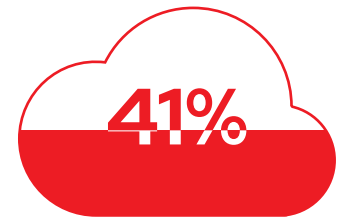
Actions to make cloud-to-cloud migrations easier



Maintain a consistent operating system across clouds



Maintain consistent container images across clouds



Standardize on one container management service



Avoid use of cloud-specific services when possible



Do not use infrastructure provider's Kubernetes (eg. EKS)



None, do not take actions specific to achieving portability

The Red Hat perspective

Consistency is powerful. With the complexity of modern hybrid cloud environments compounded by distributed computing strategies like edge deployments, Internet of Things (IoT), and containerized applications, consistency and standardization have become a key focus. Organizations can automate network management tasks using the consistency offered by a standard operating environment (SOE) approach to increase productivity, efficiency, and visibility for their people and processes.

Learn how to [define an adaptable strategy for your own organization](#)

Linux provides important benefits for cloud deployments

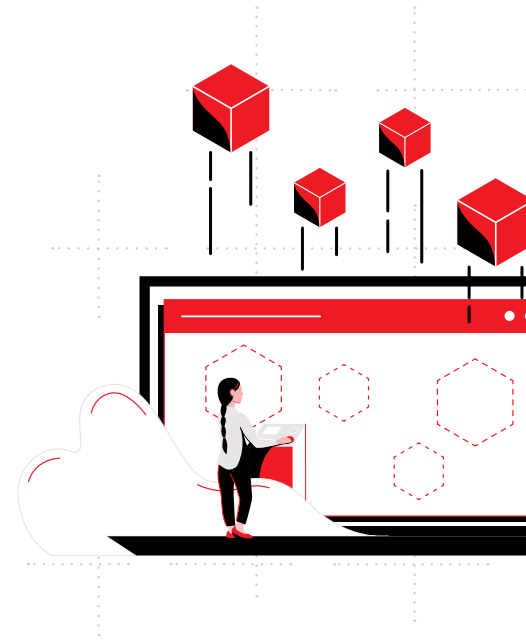
Whether for optimizing security, costs, or portability, organizations find a number of benefits with Linux deployments—so much so that a common migration was from Microsoft Windows on-premise to Linux in a cloud environment.

When deploying Linux in multiple cloud environments, cost, consistent security capabilities, and cloud-specific capabilities were respondents' top priorities.

Factors that influence the Linux selection when deploying in multiple clouds

Cost optimization	25%
Availability of consistent security features	23%
Cloud-specific capabilities	20%
Availability of tools to monitor and remediate performance, availability, and security issues	18%
Consistent Linux image availability across all major public cloud marketplaces	17%
Consistent identity management across all Linux environments	16%
Consistent high availability framework across clouds	16%
Availability of tooling to create identical images	15%
Availability of current staff skills	14%
Developer preference(s)	12%
Support, patching, and updates from my Linux vendor	12%
Consistent operating system pricing	12%

The top benefits that organizations expect to see with deploying Linux in a cloud environment are the benefits of using public cloud: increased scalability and ease of deployment tied for first at 36%. Rounding out the top five benefits are improved performance, security, and cost. Interestingly, cost savings is only the fifth most important benefit for using cloud, but cost optimization is the primary factor in selecting a Linux distribution for multicloud deployments.



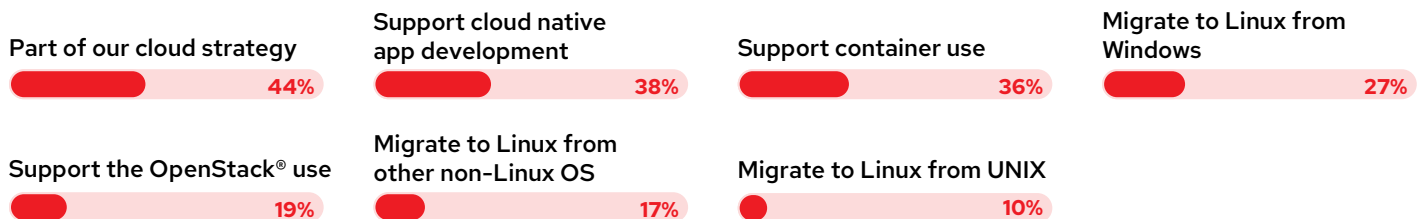
Primary expected benefits of deploying Linux on public cloud.

Scalability	36%
Ease of deployment	36%
Improved performance	35%
Improved security	34%
Cost savings	33%
Improved availability and reliability	31%
Improved speed-to-market	28%
Developer satisfaction	27%
Ease of access for customers, mobile/ remote employees or others	24%
Leverage new development practices (e.g., DevOps, agile, microservices)	24%
Linux lighter-weight than other OS's in public cloud / requires less resources	23%
Containerization / container mobility	23%
Increased ability to customize / address specific use cases	23%
Access to cloud vendor services	22%
Decrease dependency on internal staff	22%
Promotes rearchitecture of workloads	21%
Avoid new infrastructure refresh cycles	20%



The most common action organizations have taken within the last 12 months (or anticipate taking over the next two years) is to migrate existing on-premise applications to a cloud. Most of those migrations are strategic choices, either as part of their cloud infrastructure strategy or their application strategy. Fewer respondents migrated from one operating system to another as part of moving to the cloud; the biggest subset was moving from Microsoft Windows on-premise to Linux in a cloud environment at 27%.

Reasons for most recent on-premise to cloud migration



Red Hat's partner ecosystem provides software solutions that give customers flexibility to deploy applications across any environment, facilitating interoperability between workloads that have migrated to a public cloud environment.

[Learn more about the Red Hat partner ecosystem.](#)

The Red Hat perspective

As organizations adopt the hybrid cloud model, managing migrations from on-premise and private cloud to public cloud is becoming an increasingly important factor. Red Hat has developed specific Red Hat Enterprise Linux capabilities that help organizations accelerate open hybrid cloud strategies by making it less difficult to migrate existing workloads to modern infrastructure in a streamlined, wholesale manner. By running mission-critical applications on Red Hat Enterprise Linux across the open hybrid cloud, IT organizations can experience a smoother, more scalable modernization experience while mitigating potential risks and downtime.

Conclusion

The 2021 Linux market study shows that recent trends are still in place. The hybrid cloud approach is widely used, and more and more workloads are moving to public clouds from on-premise systems. Linux remains central to many organizations' cloud strategies, meeting their needs while remaining flexible and cost-effective. Using a common platform allows organizations to migrate their workloads efficiently, and manage them effectively across their infrastructure.

Red Hat is the leading provider of Linux solutions that help organizations manage, administer, and automate their portfolio of applications on a cloud environment. Red Hat provides expert resources, tools, and services to help your organization innovate and operate more efficiently and effectively.

[Contact Red Hat today](#)

2021 Linux market study: Methods and firmographics

A total of 1,204 IT professionals, across all major industries and from nine countries spanning all major geographic areas, participated in this research survey. Management Insight Technologies selected participants based on technology experience and knowledge, and all respondents had Linux experience.

Management Insight Technologies conducted a series of phone interviews and web-based surveys, where respondents were asked a variety of questions about how their organizations were using Linux in the infrastructure and what considerations were used to select Linux distributions. These surveys were conducted in February and March 2021.

Region		Linux OS status		Industry	
North America	42%	Deployed in production and dev/test	74%	Manufacturing and mining	18%
EMEA	25%	Deployed only for production	16%	Computer hardware, software, and services	16%
APAC	25%	Deployed only for dev/test	6%	Financial services	16%
LATAM	8%	Active pilot or evaluation	3%	Retail, wholesale, and distribution	14%
		Consider for future	1%	Business and professional services	9%
Respondent type		Linux OS status		Healthcare	8%
IT decision makers (e.g., CTO, CIO, director)	40%	Majority in public cloud (50-100% cloud)	7%	Public sector	7%
IT implementer (e.g., architect, IT operations)	40%	Mixed (25-49% cloud)	64%	Telecommunications, ISP, and CSP	4%
Developers	20%	Majority in datacenter (0-24% cloud)	29%	Consumer and personal services	3%
Company size		Cloud-based services	2%	Entertainment, media, and advertising	2%
Small and medium business (500-999)	9%	Other	2%		
Upper mid-market (1,000-4,999)	41%				
Large enterprise (5,000-9,999)	28%				
Very large enterprise (10,000+)	22%				

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