

5th Annual Nutanix

Enterprise Cloud Index

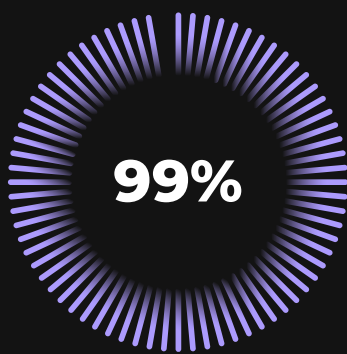
The Explosion of
Data Across Clouds

Background and Research Goals

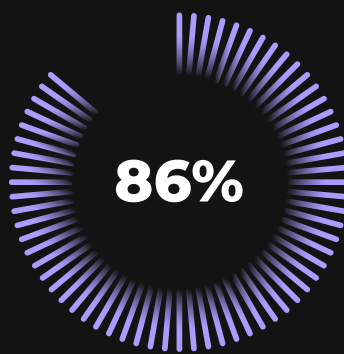
For the fifth consecutive year, Nutanix commissioned a global research study to learn about the state of global enterprise cloud deployments and what their biggest IT infrastructure and cloud-related data management challenges are. In December 2022 and January 2023, U.K. researcher Vanson Bourne surveyed **1,450** IT decision-makers around the world. The respondent base spanned multiple industries, business sizes, and geographies, including North and South America; Europe, the Middle East, and Africa (EMEA); and the Asia-Pacific-Japan (APJ) region.

The findings of the 5th Annual Enterprise Cloud Index (ECI) reveal a notable increase in the use of mixed infrastructure, which spans private IT infrastructure (both on-premises and hosted), public clouds, and edge locations. The increased diversity is driving IT pros to seek a unified place to manage and secure their applications and data.

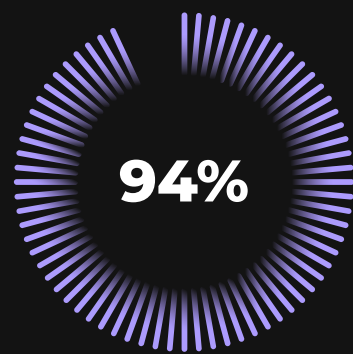
Top Cloud Trends



of organizations have moved one or more applications to a different IT infrastructure in the past year



of organizations agree that moving applications can be complex and costly



of organizations would benefit from having a single, unified place to manage applications and data across clouds

“ December 2022 and January 2023, U.K. researcher Vanson Bourne surveyed **1,450** IT decision-makers around the world. ”



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Key findings

01 **Most organizations use more than one type of IT infrastructure, and nearly all agree that having a single platform to manage them all would be ideal.**

The majority (60%) of IT teams leverage more than one IT infrastructure, whether it is a mix of private and public clouds, multiple public clouds, or an on-premises datacenter along with a hosted datacenter. That number is expected to grow to nearly three quarters (74%) in the near future. However, mixed infrastructures create new management challenges, and 94% of respondents say they'd benefit from having a single, unified place to manage applications and data across their diverse environments.

02 **Data security and management considerations drive IT infrastructure choices.**

Data is driving infrastructure decisions for enterprises, with data security, protection and recovery, and sovereignty topping the list of infrastructure deployment criteria. However, data visibility is a growing challenge. While 94% of respondents agree that having full visibility is important, only 40% of ECI respondents report having complete visibility into where their data resides.

03 **Cloud cost control ranks as a top IT management challenge.**

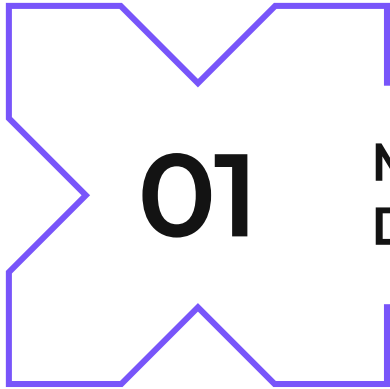
Managing cloud cost is a difficulty when using current IT infrastructures, according to 85% of respondents, and more than a third (34%) rank it a "significant" challenge. Additionally, nearly half of respondents (46%) plan to repatriate some applications to on-premises datacenters to mitigate cloud costs in the year ahead.

04 **Nearly all respondents (97%) have begun using open-source Kubernetes orchestration.**

But they cite designing and configuring the underlying infrastructure, storage, and database services as among the top challenges they continue to face with their Kubernetes deployments.

05 **Sustainability is now an IT priority.**

Nearly all (92%) respondents agree that sustainability is more important to their organization than it was a year ago. This shift in priorities is primarily driven by corporate Environment, Social and Governance (ESG) initiatives (63%), and supply chain disruptions or long hardware procurement cycles (48%).



Mixed Infrastructure Dominates

It is no surprise that today the majority of IT teams surveyed (**60%**) leverage more than one IT infrastructure, but that trend is only going to intensify. Whether it's a mix of private and public clouds, multiple public clouds, or leveraging an on-premises datacenter along with a hosted datacenter, a single-environment approach to IT is no longer supporting the needs of modern businesses (*Figure 1*).

Use of Multiple IT Environments



Figure 1: Use of Multiple IT Environments

Nearly a quarter of enterprises surveyed currently rely primarily on an on-premises datacenter (24%). This is closely followed by a mix of on-premises and hosted datacenters (23%), and hybrid cloud (21%). And while hybrid multicloud, or the use of private cloud along with multiple public clouds, is used by 12% of respondents today, the number is expected to more than triple to 38% in as little as one year. Looking a few years down the road, hybrid multicloud is expected to be the dominant mode, followed by hybrid cloud (*Figure 2*).

IT Models in Use and Planned*

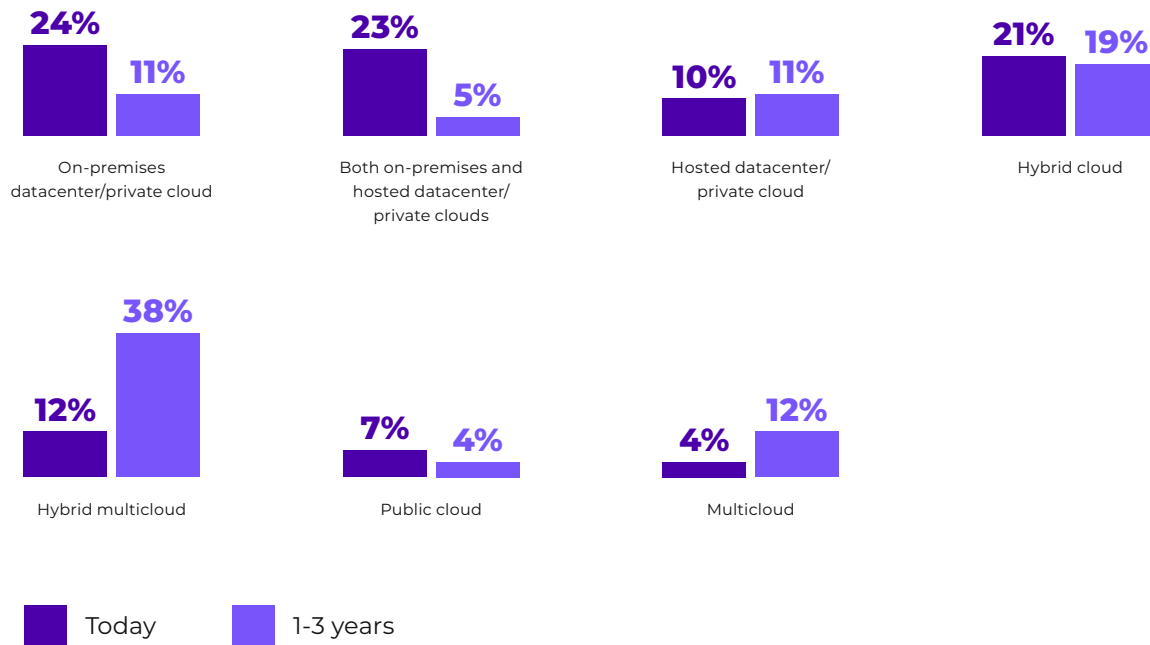


Figure 2: IT Models in Use and Planned*

*Exclusively in use/planned totals may not equal 100% due to rounding.

Deployment Criteria

When determining which IT infrastructure(s) to deploy, enterprises report prioritizing cybersecurity, data recovery, and data sovereignty as their chief criteria. Being able to easily move applications to the public cloud, however, played a moderately larger role in decision-making than application requirements and cost when respondents were asked to rank their top three infrastructure criteria (*Figure 3*). When pressed to select a single overriding decision criterion, however, the ability to easily move existing applications to the public cloud tied for third most important. Interestingly, while application requirements fell at the bottom of the infrastructure criteria list, the vast majority of respondents (**86%**) nonetheless identified running high performance workloads, including data analytics, AI, and ML, as a challenge with their current IT infrastructure.

An additional consideration for many enterprises is the edge, with nearly all respondents (**93%**) agreeing that developing or strengthening their edge strategies will be more important to their organizations in the year ahead.

Infrastructure Decision Drivers, Top 3

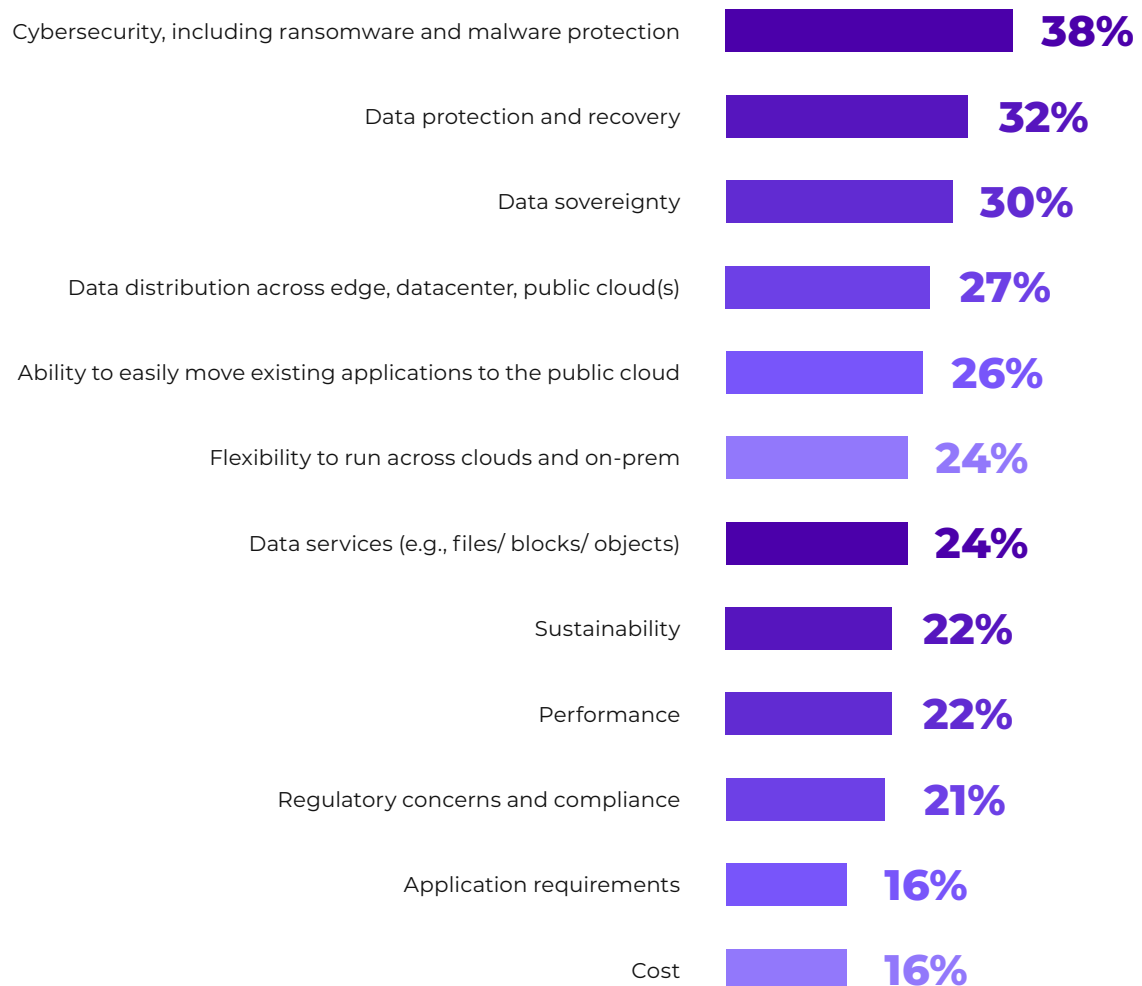


Figure 3: Infrastructure Decision Drivers, Top 3

Demand for Unification and Interoperability

As the IT infrastructure mix continues to grow increasingly diverse, say respondents, comprehensive tools that allow them to provision, move, manage, monitor, and secure applications and data from a single console in a uniform manner is a growing priority. Nearly all (94%) of ECI respondents agree with the statement that “one place to run and manage all applications and data across clouds is ideal for my organization.”

Emerging unified management solutions enable seamless workflows and management of data. These solutions will also help enterprises optimize their management of applications and data wherever those resources may reside. In addition, most organizations recognize the need for interoperability among their IT environments, including private and public clouds. Encouragingly, they report slightly higher full-interoperability levels than last year. Just **8%** report very limited interoperability among their current IT environments (*Figure 4*). This will in turn make it easier to move applications across clouds if necessary, which is currently a pain point for organizations. In fact, **86%** of *ECI* respondents agree that moving applications among environments can be complex and costly.

IT Infrastructure Interoperability Levels

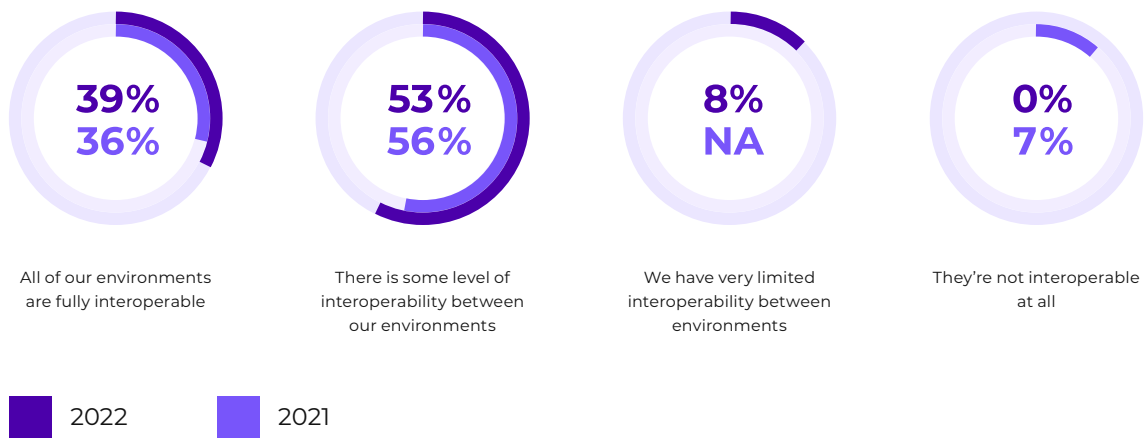
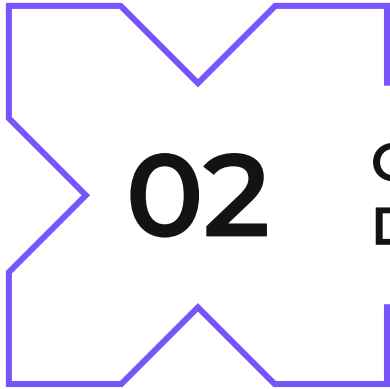


Figure 4: IT Infrastructure Interoperability Levels

Hyperconverged infrastructure (HCI) is also easing management burdens in respondent IT organizations. More than half (**53%**) say they have deployed HCI or are in the process of doing so, and nearly all (**93%**) say they will have deployed it two years from now. By virtualizing compute, storage, and networking functions, which can be provisioned and modified in software, HCI enables federated management of all resources in the infrastructure, which can span both on-premises and cloud deployment making it the ideal foundation for a hybrid environment.



Quest for Integrated Data Management

Hundreds of millions of new applications will be created in the next few years and will generate unprecedented volumes of data. This is leading many enterprises to realize they need to optimize not only where they host applications but also where they store their data. This starts with visibility of where the data resides. In fact, **94%** agree that having full visibility is important. However, only **40%** of 5th Annual ECI respondents report having complete visibility into where their data resides, meaning **60%** are still falling short.

Given the above, it's not surprising that data is also driving infrastructure decisions for enterprises, with data security (**38%**), protection and recovery (**32%**), sovereignty (**30%**), and distribution across environments (**27%**) topping the list of key drivers. And while the need for multiple IT infrastructure choices is clear, a number of issues, both organizational and technical, continue to make universal visibility and control of data stored across different environments a significant challenge for most organizations.

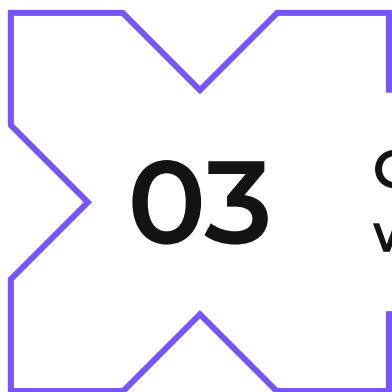
For example, data security, privacy, and compliance together are identified most often (**88%**) as a challenge with organizations' current IT infrastructures. Additionally, protecting against ransomware and other types of malware (**87%**), and running high-performance workloads—including data analytics, artificial intelligence and machine learning (**85%**)—top the list as the challenges most often mentioned by respondents with their current IT infrastructures.

The growing level of diversity in cloud deployments creates enormous complexity in managing data in heterogeneous cloud environments at a time when IT skills are in short supply. *Figure 5* shows the percentage of respondents that saw each issue listed as one of the “biggest challenges” they face managing data across a mix of private and public cloud infrastructures.

Mixed-Environment Data Management Challenges



Figure 5: Mixed-Environment Data Management Challenges



Cloud Native Strategies with Kubernetes

Enterprises increasingly deploy microservices-based, cloud native applications when developing new applications. Microservices address issues with application scalability, failure resistance, development speed, and build times for the dynamic cloud environment by breaking applications up into multiple smaller, discrete services, each concerned with a specific business function. Packaging microservices into containers is a growing strategy to decouple applications from proprietary infrastructure so that an error in one doesn't impact other containers or an entire host computer. Containers allow applications to run on any cloud platform, which eases application mobility across cloud environments.

As more and more enterprises adopt containers, Kubernetes has become the de facto container orchestration system. It abstracts away the complexity of container deployment operations and automates containerized application deployment, scaling, and management. For this reason nearly all (94%) of 5th Annual ECI respondents reported having deployed Kubernetes.

Because applications designed using microservices architectures involve many moving parts, underlying compute and storage infrastructure must be adequate to support replicating services across infrastructures and scalability to meet dynamic resource demand and utilization. This can be a challenge for many enterprises, especially when implementing at scale. Because of this, it's not surprising that storage (42%) and underlying infrastructure design (42%) were cited among the most pressing challenges respondents faced with deploying and managing their Kubernetes environments (Figure 6).

Similarly, migrating legacy applications to Kubernetes (40%) was understandably a significant issue, as it entails the core decision and investment mentioned earlier of rearchitecting primarily monolithic applications designed for three-tier data centers using an entirely different, microservices-based, development architecture.

Biggest Challenges with Deploying and Managing Kubernetes

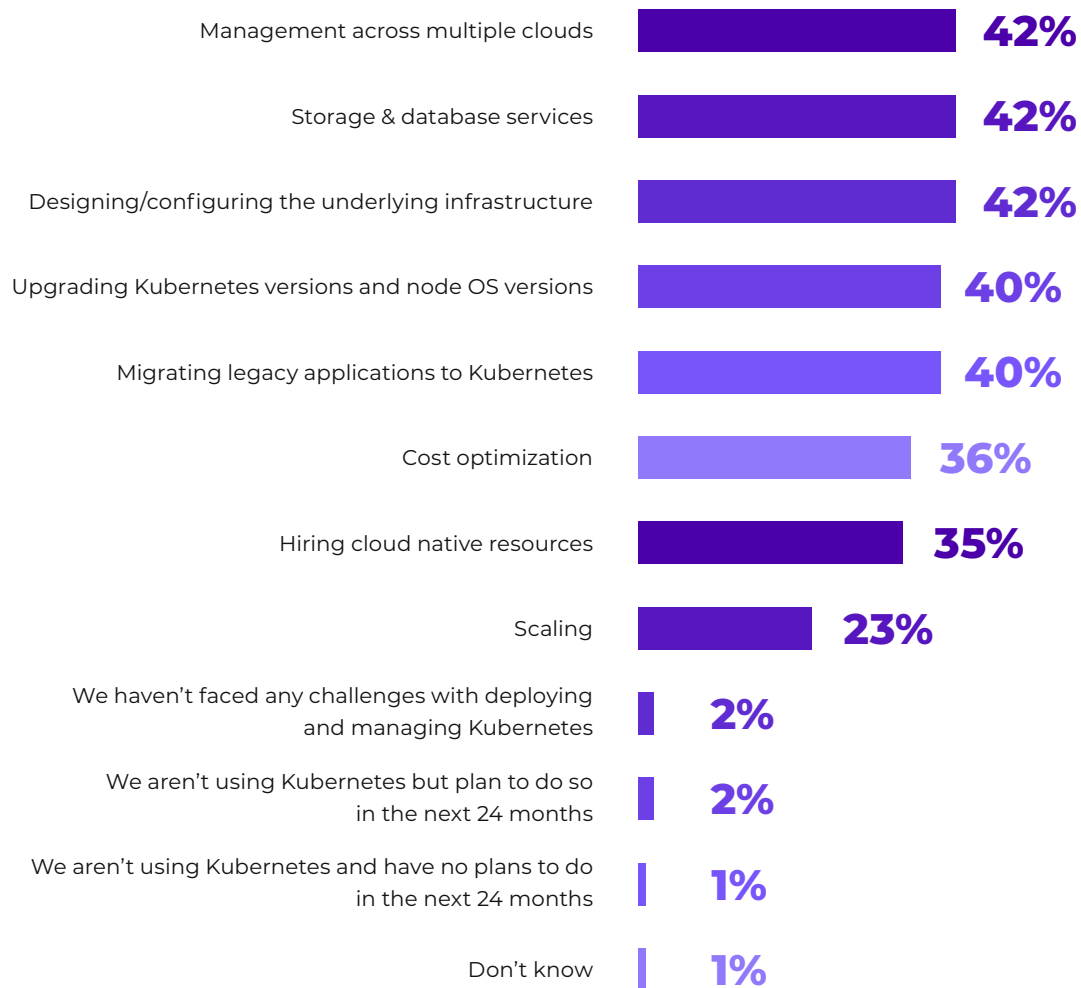


Figure 6: Biggest Challenges with Deploying and Managing Kubernetes

85% of organizations are concerned with managing cloud cost



04 Controlling Cloud Costs

Due in part to the reliance on public cloud resources to scale fast during the pandemic, more and more enterprises are reporting cloud cost as an increased area of concern in IT. Cloud cost control is considered a challenge by **85%** of organizations. In addition, **30%** say they are “very concerned” about cloud costs in relation to their IT budgets in the coming year, while another **46%** say they are “somewhat concerned.”

An ECI respondent at the IT director/VP level in a manufacturing company in Germany, for example, stated: “Adopting cloud services is becoming more and more expensive, and this will probably be one of the biggest obstacles my business will face in the next generation of technology.”

To manage costs, respondents say they plan to optimize where applications and data are hosted by using tools to gain greater visibility into cloud consumption and minimize waste. They’ll also move some applications to a different public cloud provider, as *Figure 7* reflects.

Strategies for Managing Cloud Costs in the Coming Year

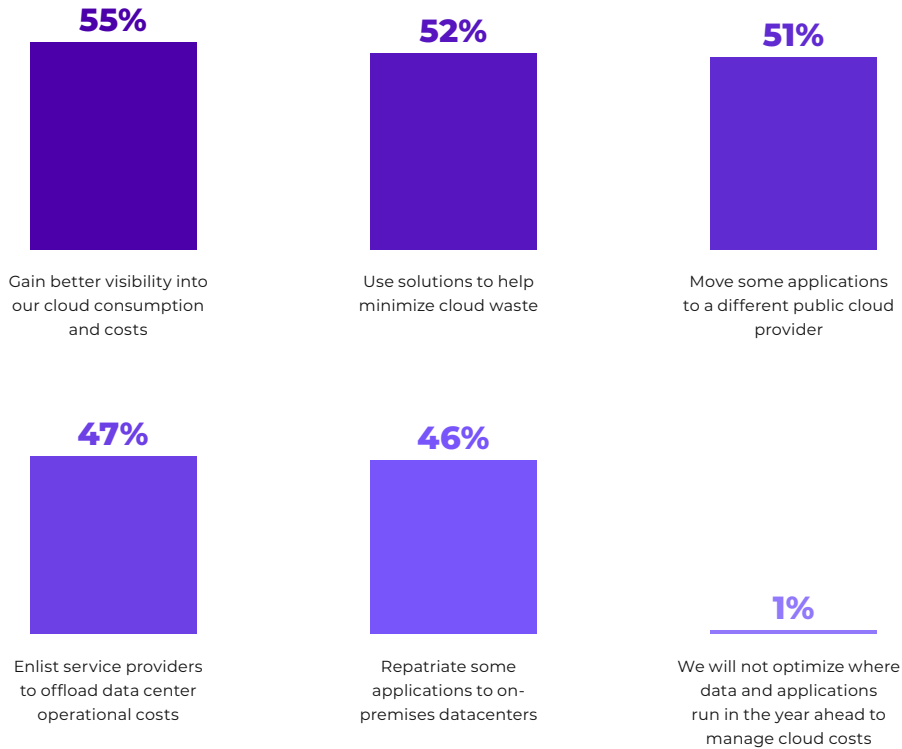


Figure 7: Strategies for Managing Cloud Costs in the Coming Year

One reason has to do with the recruitment and retention of cloud talent: **80%** of respondents identify IT and cloud talent recruitment and retention a concern for their budgets in the coming year. When asked in which areas they expect their organization to need additional talent in the next two years, respondents identified IT specialists (**59%**), cloud engineers or architects (**48%**), and cloud native developers (**46%**) as their priorities (*Figure 8*). Maybe not surprisingly, all respondents indicated plans to hire additional IT talent in the next two years.

Additional Talent Needed in the Next 24 Months



Figure 8: Additional Talent Needed in the Next 24 Months

According to one ECI respondent at the Chief Technology Officer level at an organization in the energy, oil/gas and utilities industry in the United States, "the biggest concern[s] are Fierce competition for talent, powering through the turbulence and cost containment."

85% of organizations report that meeting corporate sustainability goals is a challenge



05 Sustainability Grows in Importance

Increasingly, enterprises are charged with meeting business sustainability goals while managing increasingly diverse and complex environments. Delivering on sustainability business strategies that, in part, include IT operations is bubbling up the lists of ECI respondent challenges.

Nearly all (**92%**) respondents agree with the statement that “sustainability is more important to my organization than it was a year ago.” However, **85%** acknowledge that meeting corporate sustainability goals is a challenge, with more than a third (**36%**) describing it as a “significant” one. Sustainability objectives range from reducing energy consumption, both in IT and elsewhere throughout organizations (Figure 9), to strategies to help ensure business viability in uncertain economic times.

An ECI respondent at the managing director level at a financial services organization in Australia, for example, shared “IT leaders this year face hybrid work inflation and the prospect for sustainability regulation while they deal with perennial issue[s] such as staff retention and cybersecurity.”

Reasons for the increased focus on sustainability are varied with corporate environment, social and governance (ESG) initiatives (63%) and supply chain disruptions or long hardware procurement cycles (59%) topping the list as the main drivers.

IT Sustainability Drivers

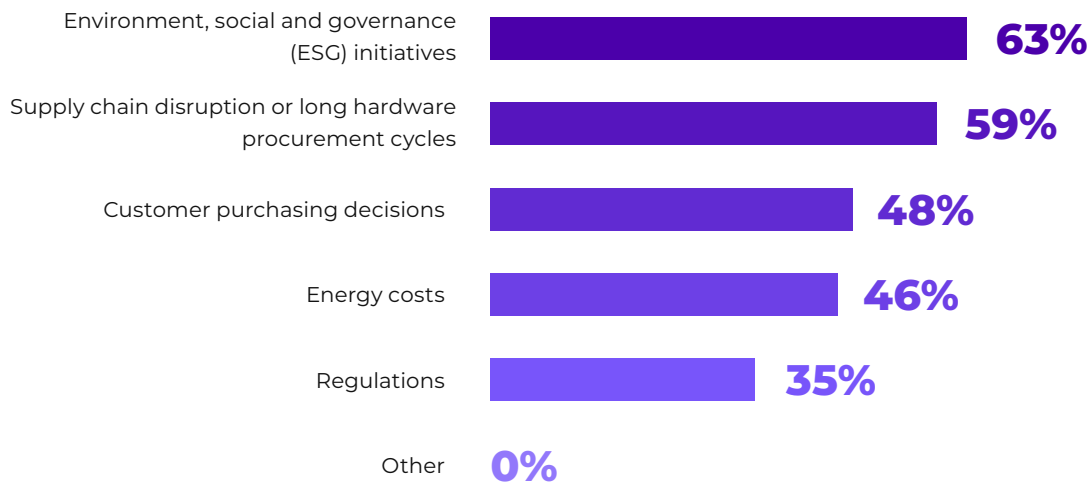
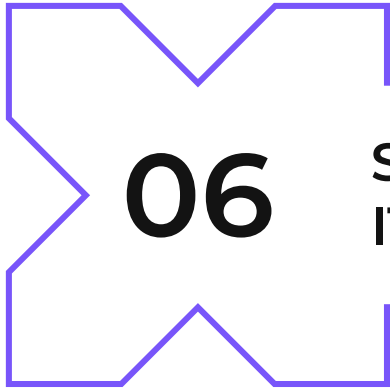


Figure 9: IT Sustainability Drivers



06

Security Drives IT Strategies

Respondents, on average, cite cybersecurity as the top criterion they use to decide which IT infrastructure(s) to deploy. Notably, nearly all respondents (99%) report having moved one or more applications from one IT infrastructure to another in the past year, and the biggest driver behind the relocation, mentioned by 46% of respondents, was related to improving their organization's security posture.

There are a few primary ways that organizations are bolstering their defenses against ransomware and malware attacks, including updating security measures, introducing specific employee training, and increasing security testing protocols (Figure 10).

How has your organization prepared for ransomware or malware attacks?



Figure 10: How has your organization prepared for ransomware or malware attacks?



A system is needed to isolate the work environment of enterprise users from their personal environment, while protecting the user's work environment.... [Enabling the environments to] seamlessly co-operate and securing these hybrid systems will be a difficult task.



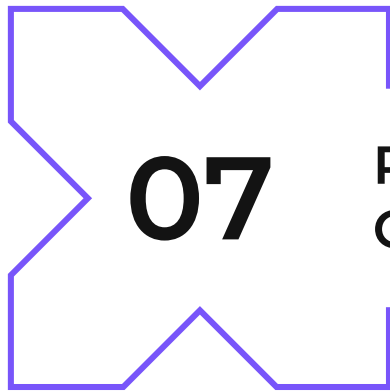
But are these steps enough? **93%** of respondents report that their organization needs to be better prepared against ransomware and malware, signifying gaps in respondent security strategies to stay a step ahead of the threat landscape.

Data security and related backup, compliance, governance, and sovereignty functions have been among the top IT infrastructure investment drivers and greatest IT management challenges for the five years that *ECI* research has been conducted. The reasons are understandable:

Changing attack surface. The world's digital attack surface expands and changes daily, as bad actors find new vulnerabilities to exploit and devise ways to circumvent the latest protections IT departments have taken care to deploy. The situation has created a chicken-and-egg scenario in which enterprises are never "done" with cybersecurity strategies and protection deployments; rather, data security becomes an ongoing, evolving discipline requiring continual evaluation and refinement. This is likely why cybersecurity ranked first among primary drivers behind infrastructure decisions with **38%** of respondents selecting it.

Attesting to the ever-present cybersecurity struggle, an ECI respondent at the IT director/VP level in a technology company in Switzerland noted: "A system is needed to isolate the work environment of enterprise users from their personal environment, while protecting the user's work environment.... [Enabling the environments to] seamlessly co-operate and securing these hybrid systems will be a difficult task."

Evolving compliance mandates. Moreover, industry and government compliance regulations are perennially in transition as privacy issues continue to move front and center in an economy that grows increasingly digital by the day. For example, some industry and government regulations mandate on-site data storage or that personally identifiable information (PII) about customers remain stored in the local region where the business is headquartered. In the latter case, enterprises using public cloud services must verify with their providers—which run distributed architectures for optimized efficiency and data backup—that their customer data won't spill into another region served by that provider.



Regional Comparisons

IT pros across North and South America, EMEA, and the APJ region follow many of the same basic cloud deployment trends and face similar management issues. However, there were a few notable outliers, which are described below.

IT deployment models in use. Each region leads in the deployment of different IT deployment models (Figure 11). EMEA, for example, reports the highest exclusive use of both on-premises and hosted datacenters (**26%**), while APJ reports the highest traditional use of on-premises data center/private cloud only (**26%**), the greatest adoption to date of hybrid multicloud (**15%**), and two to three times the rate of the exclusive use of public cloud as IT infrastructure compared to the other regions, with **13%** penetration.

The Americas region reports the greatest uptake of hybrid cloud, pairing private infrastructure with a single public cloud platform, with **26%** penetration. In three years' time, the Americas expect to be running significantly more hybrid cloud but far less hybrid multicloud infrastructure and moderately more private infrastructure than their regional counterparts (*Figure 11*).

IT Deployment Models in Use by Geography

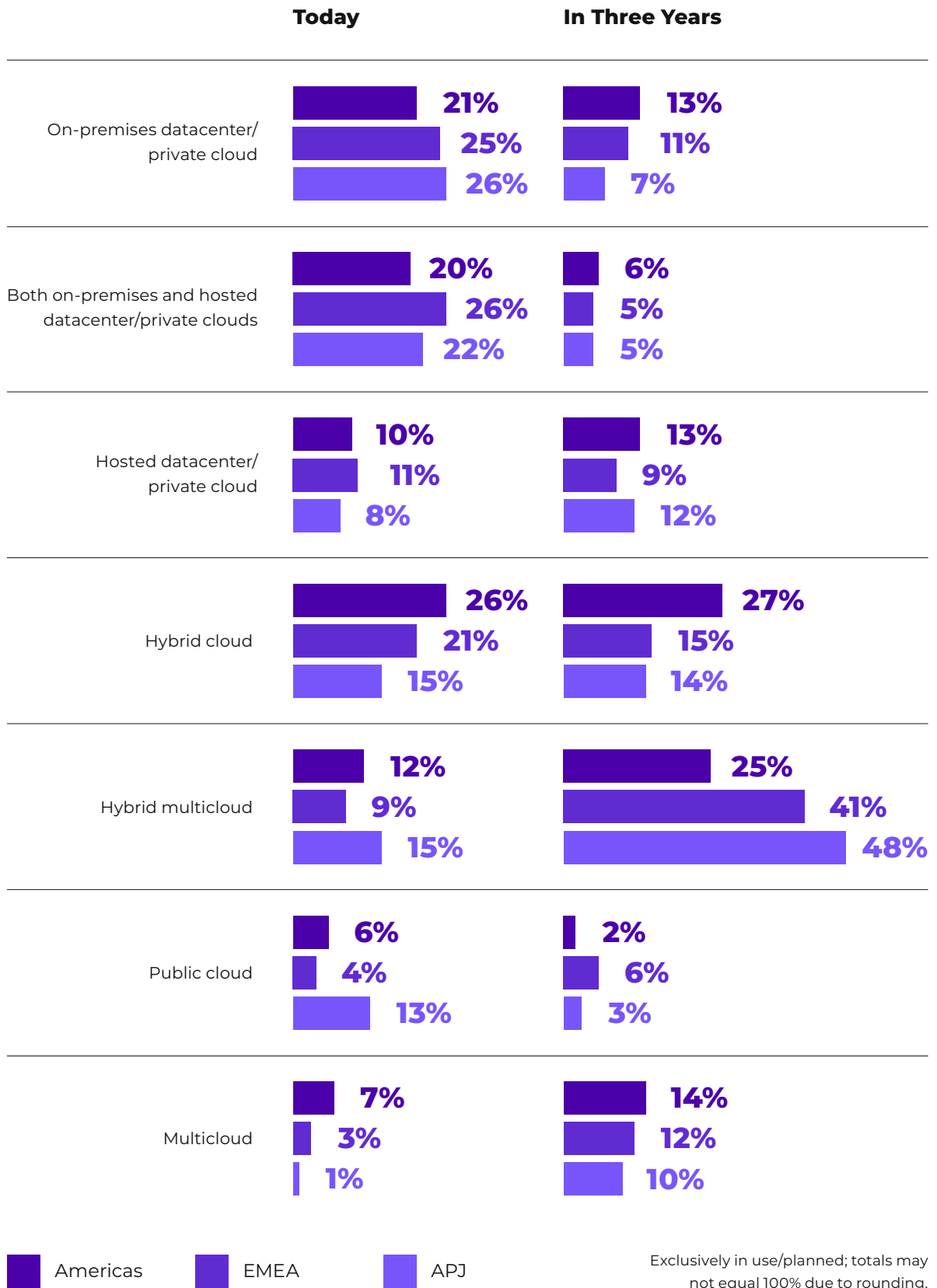


Figure 11: IT Deployment Models in Use by Geography

Data visibility. Respondents in the EMEA region were more bullish about their current level of data visibility across their diverse IT environments, with **44%** of IT pros there reporting that they had “full” visibility into their data. This compared to **40%** of the Americas respondents and **36%** of those from APJ.

Primary management challenges. When asked about their primary challenges in managing data across multiple diverse environments, significantly more respondents from the Americas cited security, outpacing their EMEA and APJ counterparts by 12 and 11 percentage points, respectively. At the same time, APJ outpaced the other regions by virtually the same margin in citing data analytics and orchestration most often. APJ respondents also mentioned having to contend with data silos as a challenge moderately less often than those in the other regions (Figure 12).

Mixed-Environment Data Management Challenges by Region

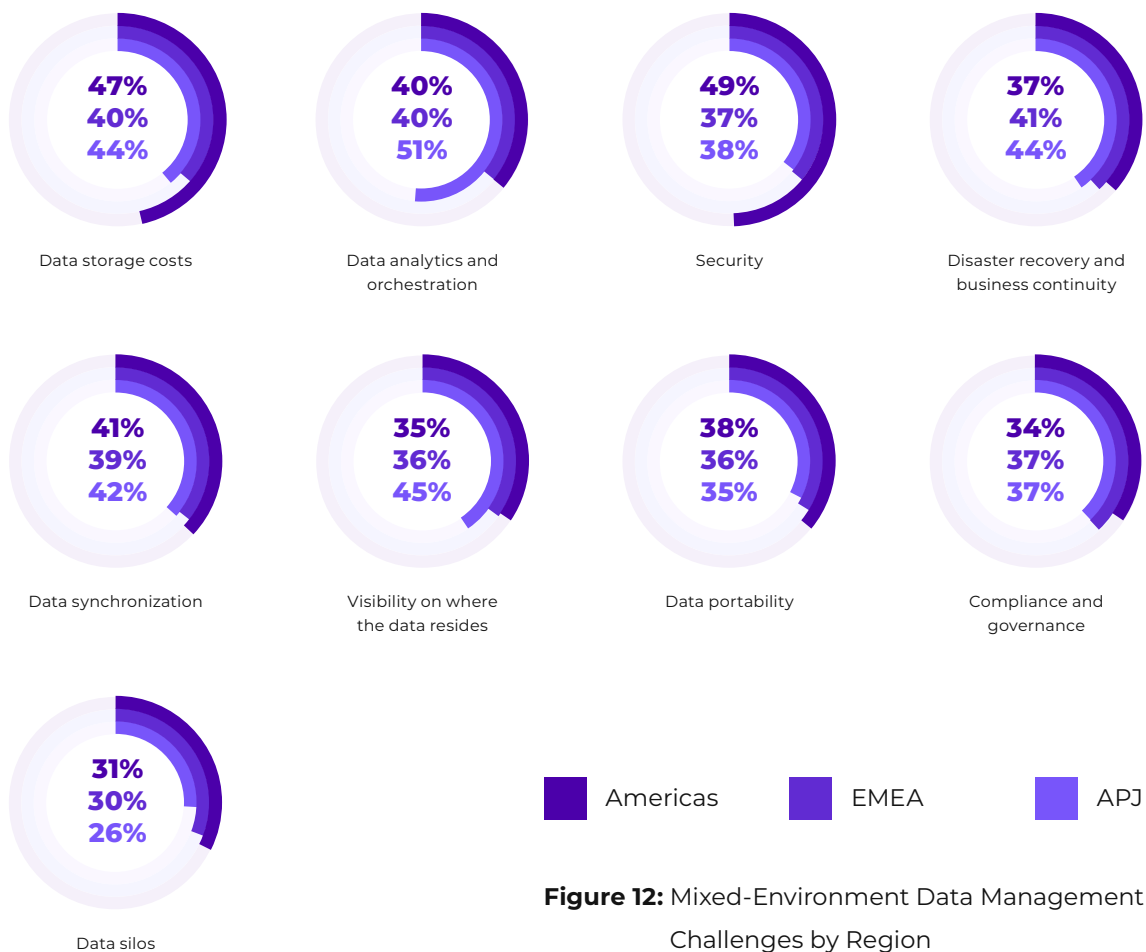


Figure 12: Mixed-Environment Data Management Challenges by Region

Application relocation drivers. While the same basic trends drove respondents in the three geographical regions to move one or more applications to a different infrastructure in the past year, APJ respondents outpaced their counterparts in a few areas. Most notably, gaining better control of the application (47%) and meeting sustainability goals (44%) were mentioned significantly more often there (by up to 10 percentage points) than the other regions. In a similar spirit, the Americas region notably outpaced EMEA and APJ in outsourcing IT management (38%) as a relocation driver. In addition, the Americas were the only region with any respondents reporting that they hadn't relocated any applications (2%) in the prior year (Figure 13).

Reasons for Relocating Applications in the Past 12 Months

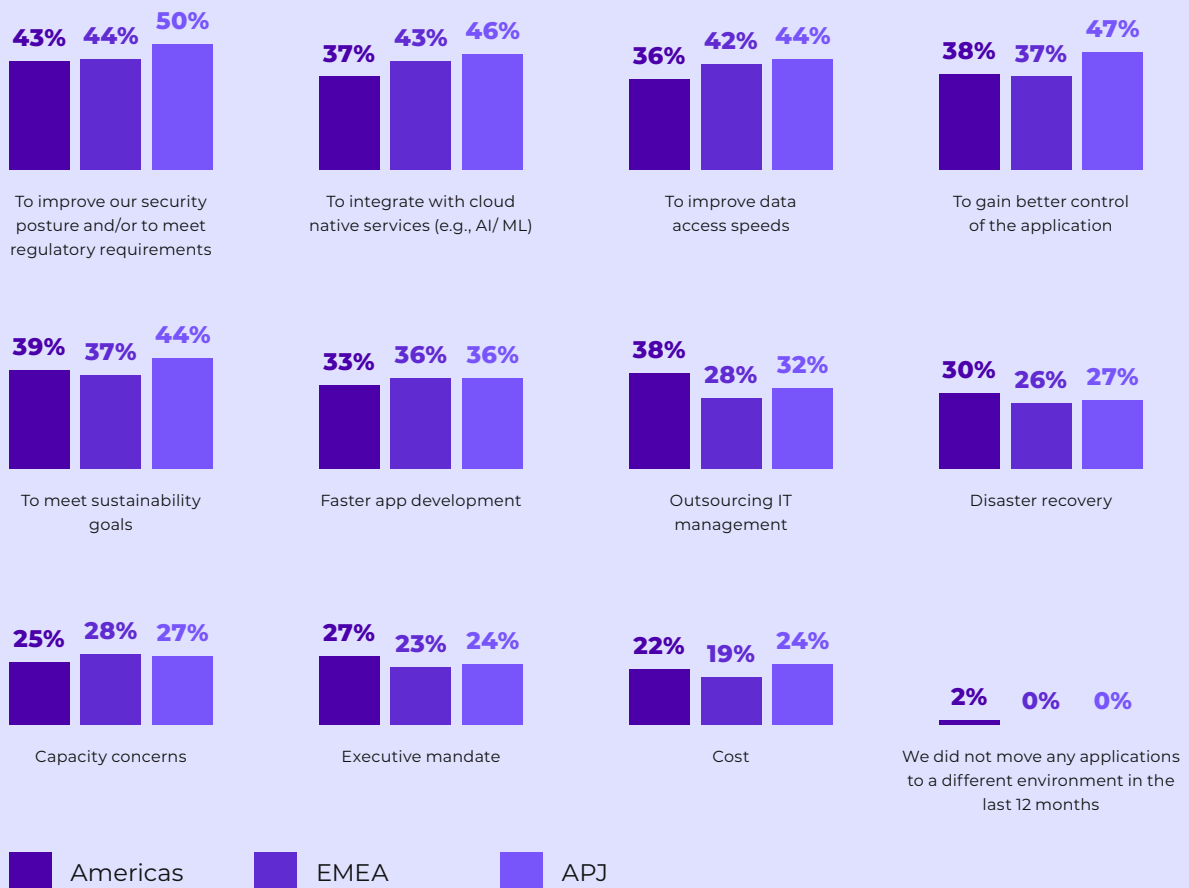
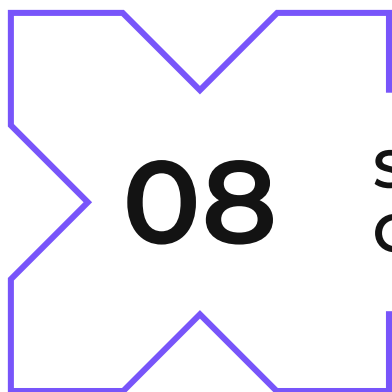


Figure 13: Reasons for Relocating Applications in the Past 12 Months



08

Summary and Conclusions

IT infrastructures are growing increasingly diverse. More than half of *5th Annual ECI* respondents (**60%**) are running multiple environments, and they generally plan to continue doing so or further diversify their IT environments. Adoption of the hybrid multicloud model, which constitutes a private cloud on-premises or at the edge plus multiple public cloud platforms, is expected to more than triple in the coming three years, while the growth of most other models will remain flat or decline. At the same time, data is becoming a bigger driver behind IT decisions.

To optimize their IT environments and deliver on business goals, increasingly including sustainability and budgetary objectives, enterprises are challenged to simplify and integrate the mixed infrastructures for both their applications and data. Most enterprises are making progress in simplifying management, with most reporting some level of interoperability between their IT environments. However, unified visibility into where all data resides is still lacking. While **94%** agree that having full visibility is important, only **40%** of *5th Annual ECI* respondents report having complete visibility into where their data resides, meaning **60%** are still falling short.

And, of course, this has significant repercussions on enterprises' ability to set and enforce security policies consistently across clouds; not surprisingly, data security and related compliance, governance, and sovereignty issues remained top of mind this year across the respondent base.

In 2020 and 2021, we saw the strategic rise of IT for many enterprises, advancing their digital transformation and technology agendas. Organizations will continue to increase their reliance on technology solutions, such as Kubernetes container orchestration and cloud-agnostic management tools, that abstract the underlying differences among cloud platforms and automate certain functions. This generation of emerging tools cuts down on the complexities of diverse, highly dynamic environments that need to scale while easing enterprises' ability to move applications and data among infrastructures securely and efficiently as IT resource demands and variables change.

A Retrospective: Deployments and Plans, Then and Now

It's no surprise that a lot has changed, especially in IT, in the last few years. What notable changes have taken place in IT shops since 2018 when *ECI* research was first conducted?

Infrastructure changes. In 2018, **19%** of respondents reported using some public cloud infrastructure in addition to private cloud. Today, that figure has risen to **33%** of respondents reporting that they use a mix of private and public clouds (including both hybrid and hybrid multicloud deployments).

The reality of multiple clouds. Attitudes toward the use of multiple IT environments has shifted drastically. Five years ago, well over half of *ECI* respondents (**58%**) said they envisioned running all workloads exclusively in either a private cloud or the public cloud one day. Today, **60%** use more than one environment with plans to expand, and **74%** plan to do so in the coming years. Rather than working to consolidate on a particular infrastructure or IT operating model, as seemed desirable in 2018, most enterprises now see the inevitability, and even benefits, of running workloads in different environments. The goal is now to make this mode more efficient, as **94%** agree that having one place to manage all apps and data across locations is ideal for their organizations. This significant change was likely driven in large part by the seismic shift that impacted IT as a result of the pandemic, as well as the evolution that many companies have gone through after, leading most enterprises to realize that "one cloud doesn't fit all."

Shifting infrastructure criteria. Capabilities related to data security, compliance, and sovereignty continue to occupy the prime spot on IT priority lists when deciding on what infrastructure(s) to deploy. Over the years, however, other factors have changed; the flexibility to run applications and data across clouds and on-premises infrastructure is now a criterion for nearly a quarter of respondents, up from just **6%** five years ago. The performance of applications and data access has also increased in importance, while cost has slipped down the list by a moderate margin (*Figure 14*).

Infrastructure Decision Drivers Then and Now

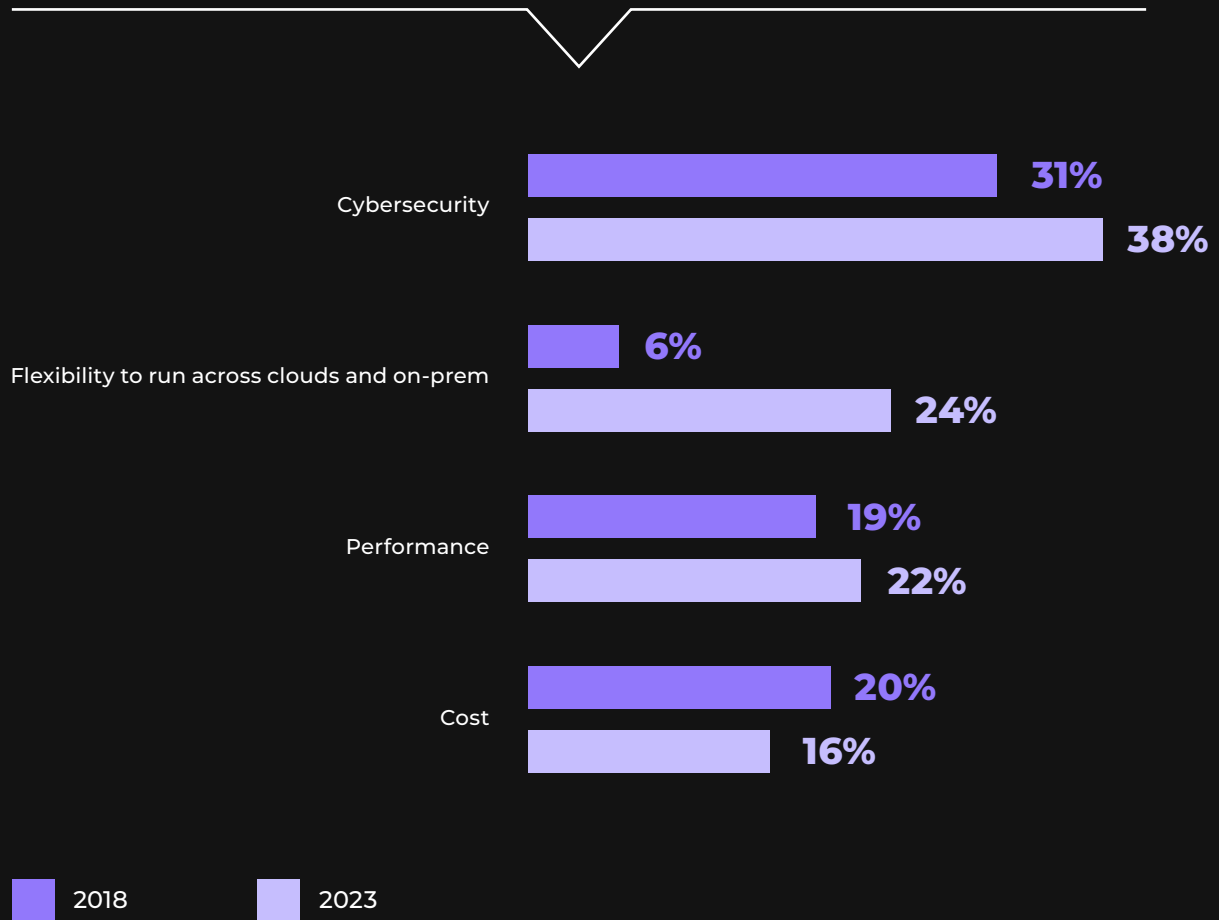


Figure 14: Infrastructure Decision Drivers Then and Now

Questions?

Get in touch with our experts via ask@nutanix.com or by scanning the QR-code on the right.

