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PATHFINDER REPORT

Unified Hybrid Cloud Will Be Key to Successful Digital Transformation

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About this paper

A Pathfinder paper navigates decision-makers through the issues surrounding a specific technology or business case, explores the business value of adoption, and recommends the range of considerations and concrete next steps in the decision-making process.

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Executive Summary

Organizations of all types are committed to the potential of cloud to transform how they do business, with adoption of external cloud services nearly ubiquitous at this point. However, the realities and challenges of cloud execution see most businesses choosing not to go 'all in' on public cloud and instead turning to hybrid cloud strategies to get the most from their IT operations. The requirements of the specific applications define the value they receive from both on-premises and off-premises environments.

For hybrid cloud deployments to successfully support both next-generation and more traditional application architectures, they must be built to provide consistency across APIs, management, orchestration, a common data layer and other components, both on- and off-premises. Meeting the architectural challenges for successful 'unified' hybrid cloud is the next big cloud challenge facing businesses.

Methodology

A Pathfinder paper helps decision-makers navigate the issues surrounding a specific technology or business case, explores the business value of technology adoption, and recommends the range of considerations and concrete next steps in the decision-making process. Throughout this paper, we cite data from 451 Research's Voice of the Enterprise service, which combines industry-leading analysis with insights from an extensive community of IT and line-of-business professionals, drawing on surveys of IT decision-makers with specific knowledge of their organization's cloud strategies.

Key Findings

- Businesses expect a continued shift to cloud execution, with the portion of workloads being primarily executed in off-premises environments (including SaaS, public cloud IaaS, hosted private cloud, and hosted non-cloud infrastructure) expected to rise from 48% to 69% during the next two years.
- Most businesses nevertheless see a persistent role for on-premises infrastructure environments, with 58% of those surveyed indicating their IT strategy will include the hybrid use of on- and off-premises infrastructure to enable workload portability or seamless execution of functions.
- The drivers of hybrid cloud adoption are very similar to those for cloud overall, suggesting that businesses ultimately regard hybrid cloud architectures as the IT approach best equipped to deliver the benefits around cost, performance, agility and security that are the key objectives for cloud transformation.
- Nearly half of surveyed businesses (44%) plan to deal with mission-critical legacy apps by modernizing 'in place' – which may include redesigning, integration with new tools, or re-architecting to take advantage of containers, microservices and other modern platform features – representing the largest portion of respondents by 30 percentage points.

- The data layer is critical to modern, cloud-driven application initiatives, with large numbers of businesses already using the relational database (45%) and data analytics (42%) functions of public cloud, and another large portion (27%) planning to implement machine-learning functions in the next 12 months.
- Businesses are beginning to seek out storage tools that can apply consistent data services across cloud environments – 26% of surveyed organizations plan to be running hybrid cloud storage gateways in the next two years.

The Path to Cloud Transformation is Hybrid

Digital transformation is a major objective for organizations of every type. The transformation path includes the modernization of applications using next-generation architectures and of infrastructure using modern cloud platforms, both off-premises and internally, with intended outcomes including improvements to organizational efficiency and agility.

As businesses work to move beyond implementing cloud infrastructure, both on- and off-premises, and toward making these platforms fundamental to how IT is executed, most are realizing that the best opportunity to achieve benefits in cost, performance, security and agility comes from a hybrid combination of internal and external cloud environments, with relatively few organizations expecting to run entirely off-premises.

The value presented by either on-premises or off-premises cloud infrastructure is relative and depends on the requirements of the application in question, with workloads that benefit most from elasticity being the best fit for public cloud, and those that have a more consistent load and a demand for isolation fitting better with on-premises infrastructure.

Modern hybrid application designs allow applications to take advantage of the benefits of both environments, without requiring the business to choose one or the other. But supporting a hybrid application requires a hybrid cloud architecture that consistently applies APIs, orchestration and a shared data layer across both on-premises and external clouds. Building a unified hybrid cloud architecture that effectively supports the hybrid execution of applications across environments will present engineering challenges for organizations during the next several years, and should be a key consideration in overall IT decision-making as businesses seek to transform.

Businesses See Opportunity in Implementing Public Cloud

Enterprise adoption of cloud is mainstream, with cloud platforms and services (including SaaS, IaaS and hosted private cloud) now part of the IT playbooks at more than 90% of businesses surveyed in 451 Research's Voice of the Enterprise: Cloud Hosting and Managed Services practice. Most businesses are pursuing some combination of the same benefits from their use of cloud – agility, cost improvement, security and the ability to deploy functions faster.

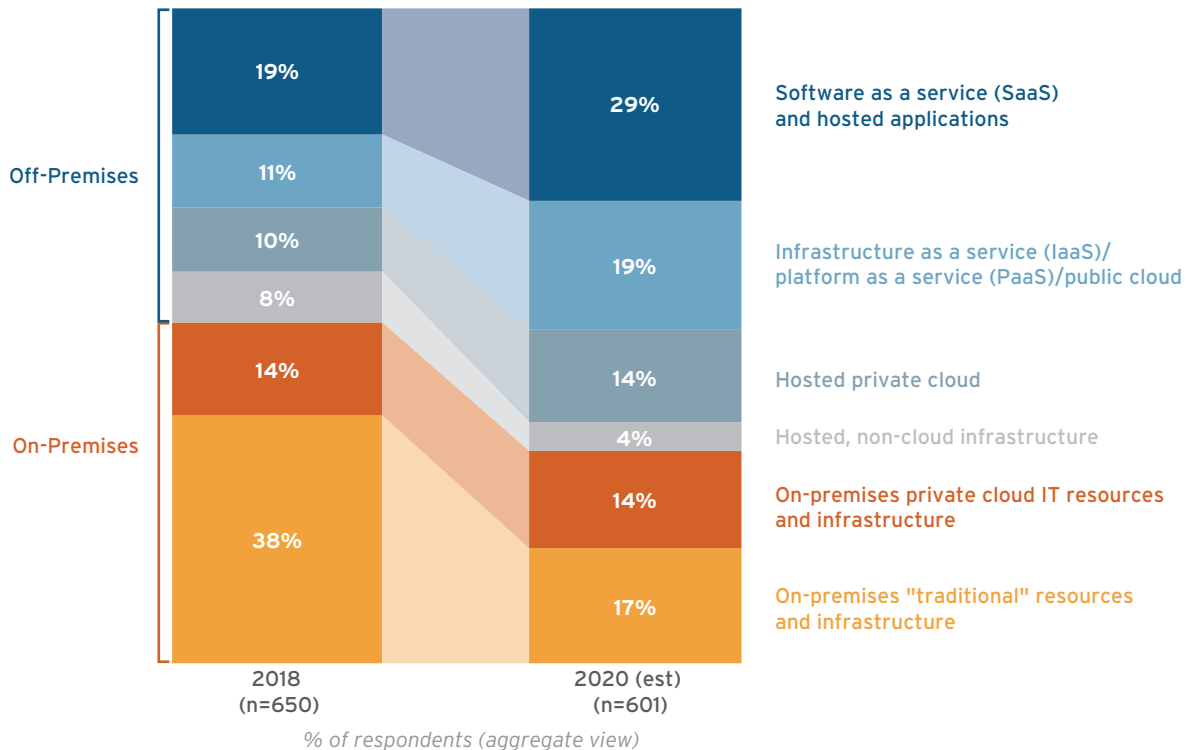
Although most businesses have adopted public cloud technologies, most of them remain in the early stages of implementing those technologies across their IT organizations. Only about 25% of businesses say they have broadly implemented public cloud infrastructure as a service for production applications. However, survey respondents indicate that they expect to make a significant shift to cloud environments as the primary venues for executing workloads during the next two years, with significant increases in SaaS (from 19% of workloads to 29%), IaaS (11% to 19%), and hosted private cloud (10% to 14%) coinciding with a decrease in the role of traditional on-premises IT as a primary execution venue (see Figure 1).

Figure 1: Primary Venue for Workload Execution, Today and in Two Years

Source: 451 Research, Voice of the Enterprise: Cloud, Hosting and Managed Services, Workloads and Key Projects, 2018

Q: Which of the following is the primary environment used to operate your organization's (workload) today?

Q: Which is the primary environment in which (workload) will be operated two years from now?



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Methods for doing business are being rewritten across industries by agile, cloud-native entrants. Existing competitors that succeed in modernizing via cloud during the next several years will be positioned to become leaders in their respective markets. But making this transformation will require navigating the complexity of cloud platforms and the challenges of modernizing existing systems.

Modernization of applications can include several approaches in the context of IT transformation, including redesign, integration with additional systems and tools, or re-platforming to gain the advantages of cloud-native architectural approaches (whether on-premises or in public cloud) such as containers, microservices or PaaS.

Most businesses expect to rely on hybrid cloud strategies to navigate cloud adoption, viewing the hybrid approach as a solution for some of the inherent complexities of cloud – but hybrid cloud presents businesses with engineering challenges of its own.

Most Businesses Favor Hybrid Cloud Strategies

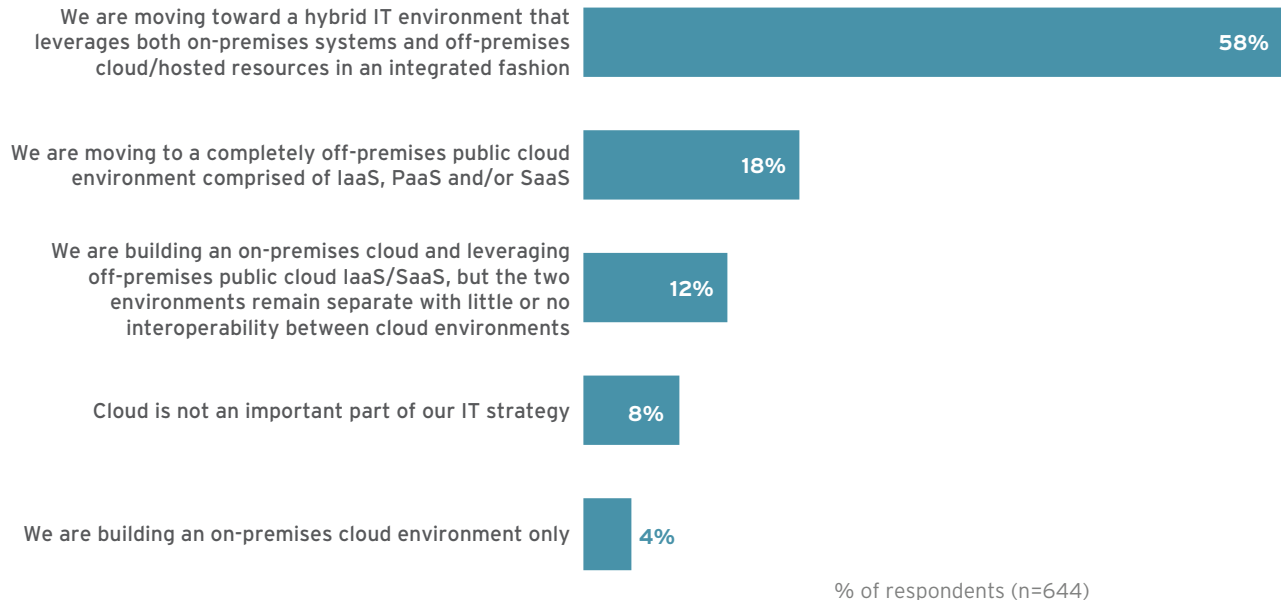
Businesses demonstrate a clear intent to increase usage of public cloud platforms, including IaaS. However, the shift toward off-premises cloud platforms is not absolute. Survey respondents indicate a persistent plan for using on-premises resources. Most businesses (58%) indicate that their IT strategy will include a unified hybrid approach, using on-premises cloud resources alongside public cloud infrastructure (see Figure 2) in an architecture that supports workload portability, as well as the seamless delivery of functions across environments.

Only a relatively small portion of respondents (18%) indicate plans to operate entirely on public cloud environments (including IaaS, PaaS and SaaS), a posture that is understandably more common among smaller businesses, newer businesses and other types of organizations that don't have large existing investments in technology residing on-premises.

Figure 2: Approach to IT Strategy, On- and Off-Premises Infrastructure

Source: 451 Research, Voice of the Enterprise: Cloud, Hosting and Managed Services, Budgets and Outlook, 2017

Q: Which of the following best describes your organization's overall IT approach and strategy?



% of respondents (n=644)

Whether they consider hybrid cloud to be a permanent IT posture or an interim step toward an all-encompassing engagement with public cloud platforms, many businesses regard a hybrid strategy as means of reconciling cloud-native application development with legacy systems that demand significant refactoring before they can benefit from the advanced functions of cloud platforms both on-premises and off-premises.

Hybrid architectures may also ultimately provide these businesses with a vehicle for moving workloads off-premises when desired, or in some cases from public cloud to on-premises environments, in pursuit of cost or performance benefits. In responses to 451 Research's Voice of the Enterprise: Cloud, Hosting and Managed Services studies, 22% of businesses indicate they have moved workloads or data from a public cloud into another environment (including hosted private cloud and on-premises private cloud), citing performance, cost and security as the top drivers for doing so. Additional deployments of unified hybrid cloud environments designed to enable a more fluid approach to workload placement could lead to a larger number of companies moving workloads in and out of public cloud environments as dictated by application or business requirements.

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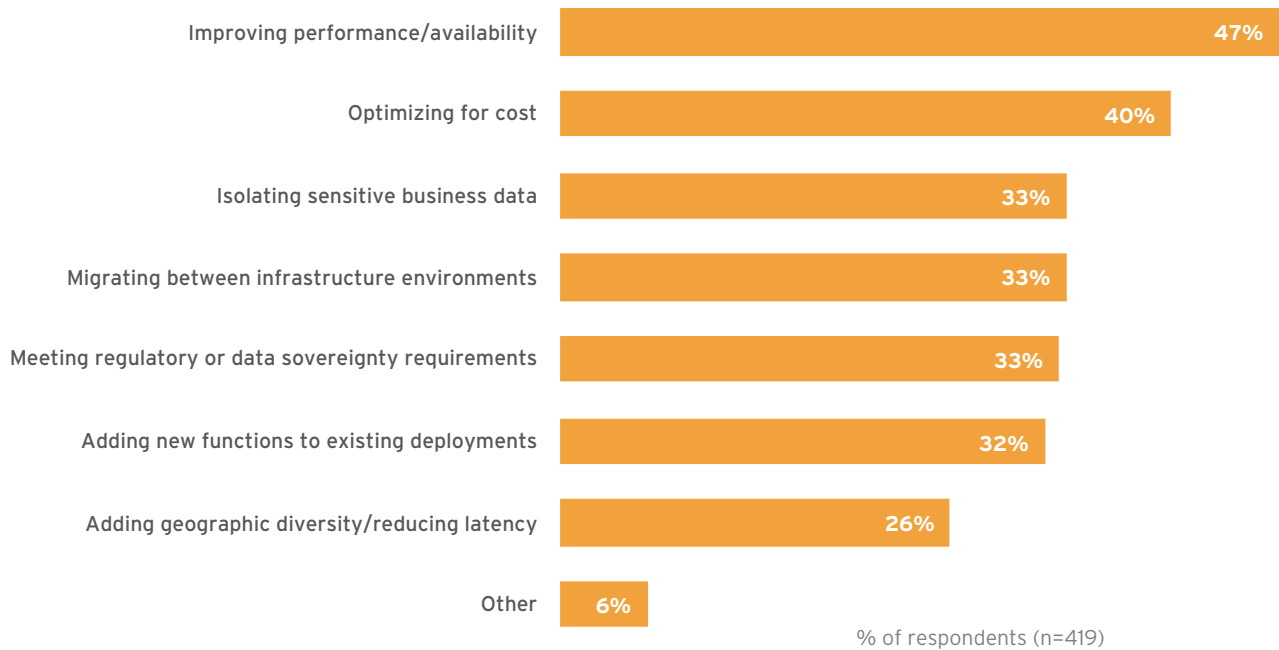
Hybrid Architectures Address IT Transformation Objectives

Businesses most frequently identify performance and availability (47% of survey respondents), optimizing for cost (40%) and isolating sensitive business data (33%) as the reasons for deploying a workload across multiple infrastructure environments (see Figure 3). These drivers of hybrid deployment are nearly identical to the top drivers indicated for cloud adoption overall.

Cost, performance, security and agility are bigger-picture business drivers, and measures of the success of any modern IT project, cloud or otherwise. The widespread intent to operate in a hybrid cloud model, specifically for the sake of performance, cost and security, highlights the fact that for many businesses, on-premises infrastructure can deliver these benefits (high performance, isolation of data) by default.

Figure 3: Reasons for Using Multiple Infrastructure Environments

Source: 451 Research, *Voice of the Enterprise: Cloud, Hosting and Managed Services, Workloads and Key Projects, 2018*
Q: Which best describe your reasons for using multiple infrastructure environments to operate (Workload)?



A hybrid strategy often reflects the fact that a business does not believe public cloud can satisfy the entirety of its IT requirements, and that benefits such as agility can be achieved via the application of cloud-related architectures (using containers, for instance) or storage services to on-premises infrastructure design. In other cases, applications may benefit from specific traits of on-premises infrastructure. Workloads that do not explicitly benefit from the elasticity of public cloud, for instance, may be operated more cost-effectively in a static environment, while workloads with strict

regulatory or company-imposed data-protection requirements might be best served in single-tenant environments. Ultimately, the requirements of the application determine the benefits derived from both on-premises and external cloud environments, where agility may be best served by public cloud and stability best delivered by internal infrastructure.

For many businesses, a unified hybrid cloud model represents the best approach for addressing the full breadth of workload and business requirements, especially where hybrid applications are configured to take advantage of both on-premises and off-premises environments simultaneously.

Hybrid Applications - Going From 'or' to 'and'

Multi-cloud architectures that incorporate a variety of cloud infrastructure environments above all provide businesses with choice in terms of overall workload deployment, enabling them to identify and use the best execution venue for a given workload. A unified hybrid cloud environment stitches together both on- and off-premises cloud resources in a manner that allows a workload to benefit from both simultaneously, as dictated by the needs of the application in question.

Gaining the full benefit of a hybrid infrastructure environment requires a hybrid approach to application architecture. A hybrid application does not reside in one infrastructure environment or another, but is deployed across a hybrid infrastructure.

Creating an environment capable of supporting a hybrid application requires unifying infrastructure design across orchestration tools, storage architecture, APIs and other key layers. This allows a business to go from the 'or' model of workload placement to an 'and' model, deploying workloads in ways that take advantage of multiple infrastructure environments – for example, an application that gathers data in a public cloud environment and then replicates that to an on-premises environment for analysis, or vice versa.

Hybrid cloud also enables developers to build an application once and run it on any component of the IT infrastructure, and to revise the placement of application components over time to optimize for performance, cost and other benefits. The notion of the hybrid application, and of continuous optimization across environments, is not only relevant to businesses dealing with legacy systems. In some cases, businesses born in public cloud environments are also finding advantages in distributing workloads across hybrid clouds.

Hybrid Application Architecture and Modernization

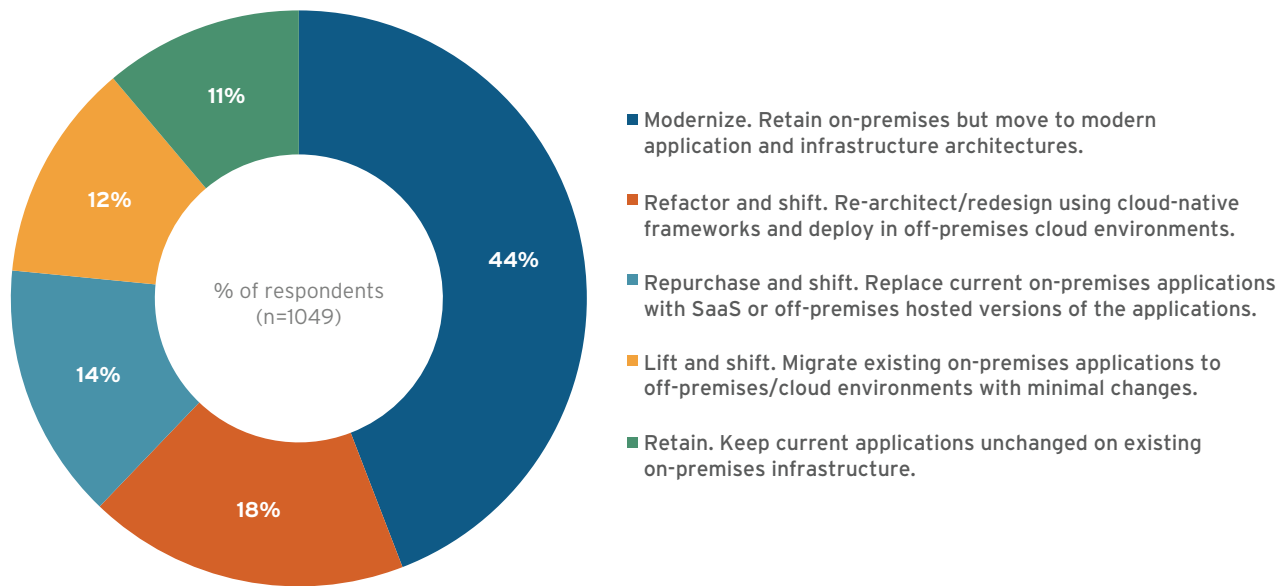
In addition to supporting the development and execution of cloud-native applications on a greater breadth of infrastructure environments, the hybrid cloud also supports several other key enterprise use cases. It supports the modernization of legacy applications (including re-architecting using containers and microservices) with the objective of migrating them to public cloud, and second, it supports the modernization of legacy applications in place, with the objective of achieving cloud-like agility and efficiency benefits while remaining on-premises.

The modernization of legacy applications in place represents a significant portion of many businesses' current IT strategies. Among respondents to 451 Research's Voice of the Enterprise: Digital Pulse study, 44% of businesses said their main strategy for dealing with mission-critical legacy applications was to modernize them with cloud-like capabilities while retaining them on-premises, the largest portion of respondents by a significant margin (see Figure 4).

Figure 4: Approach to Dealing With Legacy Applications

Source: 451 Research, Voice of the Enterprise: Digital Pulse, Workloads and Key Projects 2018

Q: Which of the following best describes your organization's overall IT infrastructure approach to mission-critical legacy applications and workloads going forward?



By incorporating an on-premises cloud environment that shares an architecture with the public cloud environment, a hybrid cloud can provide the basis for this modernization of legacy applications in a way that emphasizes the benefits of both on-premises cloud and public cloud and allows businesses to approach application modernization from the perspective of business objectives rather than workload placement.

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The Data Layer Is Critical to Innovation in the Cloud

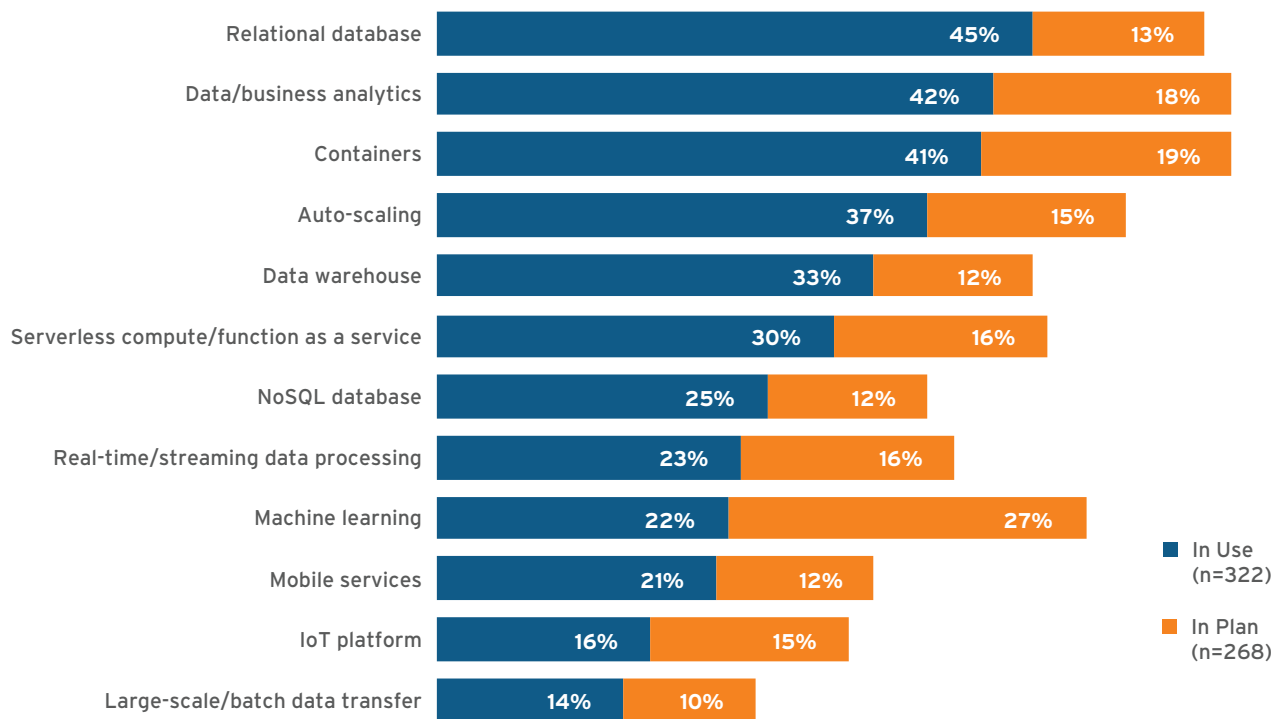
Cloud infrastructure offers businesses a means of lowering the cost and complexity of operations via the modernization of existing applications and systems. However, the greater opportunity offered by cloud is for organizations to create new insight (and potentially sources of revenue) by making use of existing sources of business data to identify strategic opportunities, train AI or make user data more accessible.

Analyzing, sharing and drawing insights from business data is the premise for much cloud-based innovation, and businesses using IaaS reinforce this by rating database (45%) and data analytics (42%) functions the advanced IaaS features most widely in use (see Figure 5). Further highlighting the effort to extract value from data, AI and machine learning functions are in plan for a remarkable 27% of IaaS users.

Figure 5: Advanced IaaS Features in Use and in Plan

Source: 451 Research, *Voice of the Enterprise: Storage, Organizational Dynamics 2018*

Q: Which of the following IaaS features are you using in connection with your IaaS/public cloud deployment?



Data is a critical business resource, and application data will be a defining factor in how hybrid-capable application architectures will be. The ability to make effective use of a hybrid cloud, whether by migrating between on- and off-premises environments, by building in one environment and running

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anywhere, or tying pieces from different environments into ongoing operations, requires a hybrid application architecture, which in turn demands a common data architecture. The ability to apply a common data architecture across cloud environments will be a key factor in the effectiveness of hybrid application design and, therefore, of hybrid cloud implementation.

The Cloud Divide - Hybrid Cloud Design Hurdles

Although some businesses regard hybrid cloud architectures as part of the solution to some of the engineering challenges presented by cloud transformation overall, hybrid cloud presents engineering challenges of its own that must be overcome to realize a truly unified environment.

There is a divide between public cloud and on-premises infrastructure (even private cloud) that is based on fundamental differences in how these platforms operate at the application, management and storage layers. Cloud platforms are consumed on demand and managed via APIs, whereas on-premises environments are built on dedicated hardware and often managed manually. Cloud-based applications are frequently designed using web-scale architectures and may take advantage of containers and PaaS features, while on-premises application architectures tend to be more siloed and are often deployed on specific virtual machines. Cloud storage tends to feature shared, highly scalable but simple systems, while on-premises storage systems are dedicated systems focused on delivering enterprise-class features and service levels.

Building applications to function seamlessly across this divide is extremely difficult. Solving the inconsistencies across these environments should take place at the hybrid cloud architecture and management layer to simplify the task of building hybrid applications.

Strides have been made in bridging these gaps at the management layer via orchestration tools and container management functions that can contribute to application mobility and deliver consistency and compatibility at the orchestration layer. However, the divide is less effectively solved at the storage layer, where the important data resides, and where unity and compatibility are essential to an effective hybrid posture.

Bridging the cloud divide will require businesses to implement tools for reconciling the differences between public cloud and on-premises systems at the storage layer, either applying more cloud-like functions on-premises, or by bringing on-premises data systems to cloud environments.

Hybrid Strategy and Design at the Storage Layer

Enabling hybrid cloud demands applying a consistent storage architecture in multiple infrastructure environments and types, a challenge that more businesses are attempting to solve by applying consistent data services in both on-premises and cloud environments. Responses to the Voice of the Enterprise: Storage survey highlight the efforts underway at many businesses to bridge this gap between storage architectures in the public cloud and on-premises, in some cases with tools designed expressly for enabling hybrid cloud.

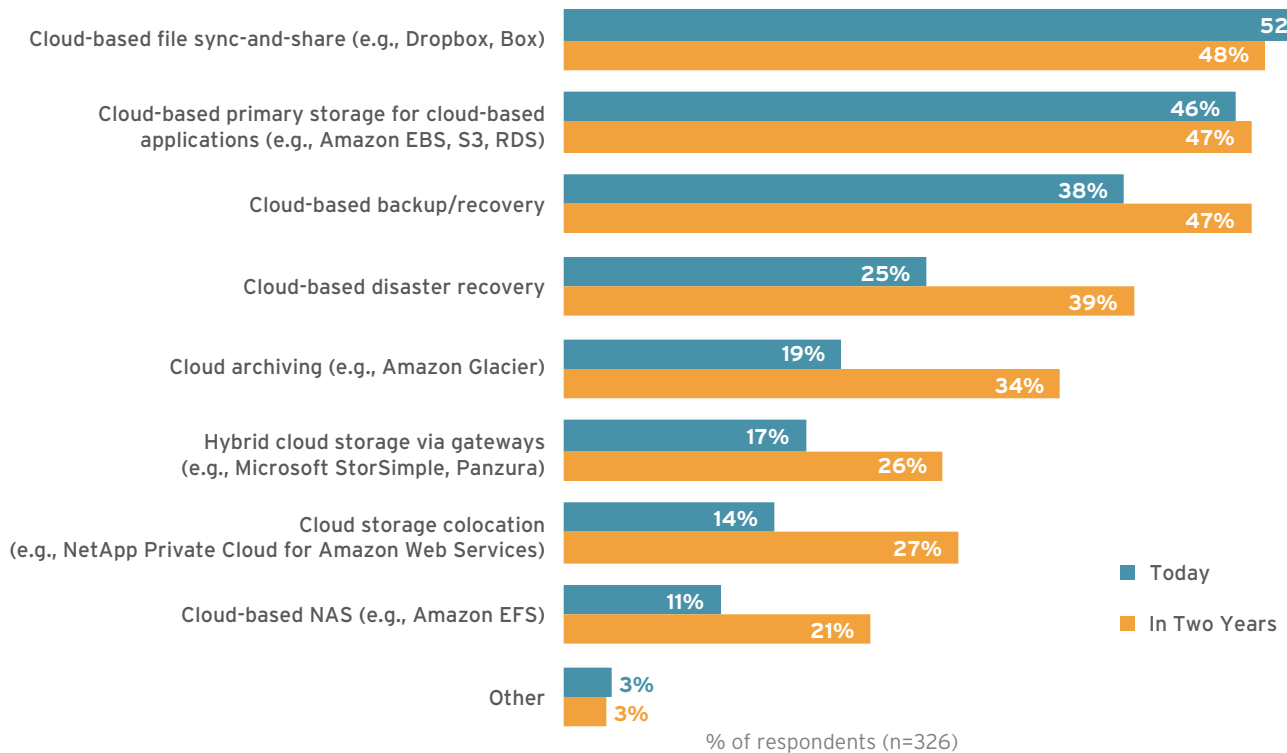
Most of the cloud-based storage functions currently in use are finished products, such as Dropbox-style file sync and share, or the basic storage functions of cloud platforms, such as Amazon S3. However, several of the cloud-based storage functions businesses most expect to engage with over the next two years illustrate the desire to apply formats typical of on-premises architecture in the public cloud (see Figure 6). Examples of this include plans to use hybrid cloud storage gateways (26%), cloud storage colocation (27%) or cloud-based NAS functions (21%).

Figure 6: Cloud Storage Types in Use and in Plan

Source: 451 Research, Voice of the Enterprise: Storage, Organizational Dynamics 2018

Q: Which of the following public cloud storage services and capabilities does your organization utilize today?

Q: Which of the following public cloud storage services and capabilities will your organization utilize in 2 years?



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Applying a hybrid strategy at the data layer means reconciling differences in how availability and replication are handled, how efficiency is measured, and how storage is managed. For many businesses, this will be a matter of finding the right product set, either by turning to existing storage vendors or by seeking out an entirely new tool for an almost entirely new job.

Conclusions and Recommendations

Businesses see a strong opportunity for cloud to have a transformative impact. The use of cloud platforms and services is a given at most organizations today. Businesses expect a continued shift toward off-premises cloud platforms as the primary execution venues for a range of application types, with 62% of workloads expected to run primarily on one of SaaS, IaaS or hosted private cloud in two years, up from 40% today.

Most businesses are pursuing some combination of improvements to cost, agility, performance and security with their adoption of cloud platforms. But while the cloud can deliver on these requirements, it frequently requires a complex engineering effort for which many businesses are not fully equipped.

While the use of public cloud IaaS continues to grow in volume and depth, a majority of businesses said their IT strategy includes a persistent role for on-premises infrastructure environments, with 58% indicating plans to employ a hybrid cloud architecture that supports workload mobility and seamless delivery of function across environments. A clear advantage of a hybrid cloud strategy is that it enables businesses to distribute applications across infrastructure environments in pursuit of those cloud benefits (cost, performance, etc.) without forcing businesses to choose between execution venues.

However, hybrid cloud presents its own engineering challenges. Building an effective hybrid cloud architecture requires bridging a cloud divide that exists at the application, management and storage layers. While significant technological strides have been made toward standardizing at the orchestration layer, the challenge is more persistent at the storage layer, requiring businesses to look harder to find solutions.

Understanding that a hybrid cloud architecture is the likely IT strategy, businesses should start with that goal in mind and allow hybrid requirements to inform the decisions they make about cloud platforms, partners and technologies. In building to achieve the benefits of hybrid cloud, businesses should embrace containers and container management technologies as part of their approach to application architecture. This will contribute to the consistency and compatibility across environments and help to realize the benefits of hybrid cloud. Businesses are beginning to implement new tools designed to facilitate hybrid cloud strategies by applying tools that create consistency across storage environments. Businesses should potentially look beyond their existing storage vendor relationships to find new tools to support new architectures.



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