Most technology leaders at large enterprises have answered the question, “Should I move to the cloud?” with a resounding “Yes.” The result is a $100 billion market that is growing at a rate of more than 25% per year. Cloud architecture is at the center of most companies’ innovation and digital agendas.

But the question of moving to the cloud is only the first of many, and further questions get complicated fast. Today’s heterogeneous infrastructure environments demand that CIOs decide on which capabilities to move now, which to move down the road (and why and when), which to keep on premises, and which cloud (or more often, clouds) to use.
All these decisions must be made while ensuring that multiple cloud and legacy environments work together in a seamless manner. (See “Cloud Definitions.”)

### CLOUD DEFINITIONS

Cloud terminology sometimes means different things to different people. We use the terms below in the following ways.

**Traditional or On-Premise Infrastructure.** Distributed computing and storage for an enterprise through traditional on-premise servers; storage hosted in enterprise-owned or enterprise-managed data centers, with a variety of hardware and virtualization options.

**Private Cloud.** Shared and somewhat elastic on-premise infrastructure with a higher degree of automation and orchestration that enables self-service functionality beyond traditional IT capabilities (rapid provisioning, for example) and a higher level of security and auditability.

**Public Cloud.** Highly scalable, effectively “infinitely elastic” shared infrastructure services (computing, storage, network, etc.) or software services procured from external providers with usage-based pricing. Includes infrastructure as a service (IaaS) options, such as AWS EC2; platform as a service (PaaS), such as Azure Cognitive Search and AWS Elastic Beanstalk; and software as a service (SaaS), such as Salesforce.com or Office365.

**Hybrid Cloud.** Application and infrastructure deployments leveraging some combination of traditional or on-premise infrastructure, private cloud environments, and at least one public cloud environment.

**Multicloud.** A combination of two or more public cloud environments, specifically focusing on IaaS or PaaS (does not include SaaS).
In this fast-growing market, clarity on what constitutes an efficient and effective multicloud approach is hard to come by. One reason is that companies have followed multiple paths to mainstream adoption. Some intentionally embrace multicloud as a strategic C-suite decision. Others land there through M&A or were guided by developers, software vendors, and disparate decision makers from business units, skunkworks teams, and central IT. Regardless of route, most are now calling it a strategy—even as they struggle to make the best of what is often a multicloud muddle.

This article presents a framework to help companies navigate a complex multicloud landscape effectively. We examine key questions on how they can bring a true strategic lens to decision making and offer ideas on how to thrive on the multicloud frontier.

A CLOUD-FILLED FORECAST

While experts often talk about a migration to the cloud, in reality, we are in the midst of a stampede. Based on recent interviews with more than 250 CIOs, CTOs, lead cloud engineers, and other key cloud decision makers, it appears that almost 95% of enterprises are already in hybrid environments, with about two-thirds of large businesses using multiple public cloud providers. (See Exhibit 1.)
All categories of workloads—core business apps, transaction systems, customer-facing apps, and data and analytics capabilities—are becoming enabled by the cloud. Enterprise spending on public and private cloud computing is expected to double in the next two to three years, with the fastest growth taking place on public clouds. This is due, in part, to the fact that most companies are deliberately diversifying their cloud providers. It is common for larger companies to use up to four cloud platforms, both public and private, for different functions and applications.

This kind of multicloud approach delivers multiple benefits, including increased agility, flexibility, innovation rates, and the ability to deploy cutting-edge technology and platform strengths. It also surfaces new types of concern. Global companies need to think through how using a cloud platform in one country or region could affect operations or sales in another. Selecting best-in-class offerings for each workload is a clear priority, and so is avoiding vendor lock-in. As one executive said, “We just won’t put all our eggs in one basket. There is a high probability that many providers will be in the mix in three to five years.” More regulators are looking for companies to apply a multicloud strategy. Costs, of
course, are a big factor, and having a multicloud strategy increases negotiating leverage. One CIO put it this way: “My goal is to get everything to the cloud and save a lot of money doing it.”

“This kind of multicloud approach delivers multiple benefits, including increased agility, flexibility, innovation rates, and the ability to deploy cutting-edge technology and platform strengths.

LOST IN THE CLOUD?

As a result of increased multicloud usage, both heterogeneity and interdependencies are rising rapidly. Complexity is exploding. Across industries, enterprise CIOs are encountering new, unanticipated pain points, including:

- **Establishing the Multicloud Operating Model.** Multicloud environments add a layer of complexity that challenges existing operating models. Most companies lack a standard integrated management layer that provides consistent visibility and control in all environments. Further, there are challenges standardizing IT processes, security, and business-need alignment across clouds. “Our number one challenge is visibility into multiple systems—we need a single focus,” said an IT executive.

- **Connecting Securely to the Cloud.** Companies are often unable to connect workloads simultaneously across environments. A retail executive told us, “We need to have accurate, real-time store availability and shipping-time information for all of our online products. If something goes down, we need instant visibility because every minute down we are losing revenue.”

- **Moving Workloads Among Clouds.** Companies have difficulty moving workloads between environments, either continuously or for one-time migrations. The cost of
Most enterprises say they are not well-prepared for these challenges, with more than half of the executives we interviewed pointing to new risks, complexity, and uncertainty as major issues. Yet, the march toward a multicloud approach continues unabated. “All global companies are going to need to be multicloud,” a telecom executive told us. “It’s an absolute necessity going forward.” A media company executive said, “No one cloud is best at everything. If you’re not multicloud, you're not getting the most out of your technology.”

The question for enterprises is how to effectively and efficiently navigate a multicloud approach.

**FINDING AN EFFICIENT MULTICLOUD MODEL**

The choice of a multicloud model is often based on the tradeoff between two competing needs: maximizing use case flexibility and controlling chaos through architectural constraints.

**Use Case Flexibility.** The ability to solve complex or multiple use cases by leveraging the strengths of different clouds is a critical determinant of multicloud strategy because companies want a best-in-class environment in each context. For example, a movie theater operator chose to run its high data-volume media analytics on Google’s BigQuery, ticket processing on IBM’s Z Cloud, and customer-facing applications on AWS. The company could have simplified its technology landscape by accepting lower performance in some of these areas but only at the cost of weaker insights, longer lines, or higher expenses. Other companies with narrowly focused use cases or clear priorities for best-in-class solutions may choose to adopt a single cloud for their priority use case and accept lower performance in other parts of the business.
Architectural Constraints and Standardization. When building applications across multiple clouds, technology teams need standardization to scale engineering and development processes as well as to control risk. In addition, these teams often face architectural constraints imposed internally (by a leadership team that prioritizes risk reduction and control, for example) or by regulators—and more often, the latter. For example, a global retailer might be required to have data centers in multiple regions because of GDPR and data-sovereignty requirements, or a financial institution may be required to run pricing-related workloads in a private cloud environment due to government security requirements (such as multistep authentication and multiple firewalls).

A View of the Frontier. A spectrum of cloud adoption models emerges based on these competing dimensions. (See Exhibit 2.)
Of course, every company has its own situation and needs, but the “efficient multicloud frontier” comprises three approaches. These approaches balance flexibility, innovation, and the ability to satisfy multiple complex and dynamic use cases against transparency, control, and value maximization across various environments. (See Exhibit 3.) The problem is that executives at many different types of enterprises indicate that they—and very likely their peers—remain outside (usually below, but occasionally above) the efficient frontier in terms of the cloud model they have adopted.
Understanding where your organization sits today in relation to this frontier, and how to move closer to an efficient solution, is key to developing an effective multicloud strategy. In our experience, however, while the first three positions can all be efficient depending on a company’s profile, companies successfully occupying positions one and three are rare. For position one, the company must strategically determine that the rate of innovation is more important than the value gained from integration and that the risks of unconstrained development do not pose a business threat to the organization. For position three, priority use cases must be narrowly circumscribed, with innovation taking a back seat to management simplicity and control. Our interviews suggest that a significant majority of enterprises will ideally operate in the “balanced” multicloud model (position two), which balances the delivery of a variety of use cases against some level of architectural constraints. (See “Kroger’s Multicloud Journey.”)
With more than $120 billion in annual revenues, Kroger is one of the largest retailers and employers in the world. The company has an ambitious digital agenda (it is a major player in e-commerce and online grocery shopping) and a substantial IT footprint that includes multiple data centers, application teams, and a significant investment in next-generation capabilities. Its 84.51° subsidiary uses artificial intelligence and advanced analytics to manage data and generate valuable consumer insights.

Like many other enterprises, Kroger made a strategic decision to use multiple clouds so that teams could innovate more quickly and leverage the best capabilities that various vendors had to offer. This inevitably led to fragmentation in the company’s software and operational stacks—and complexity in its technology operating model. Kroger needed a more systemic approach, one that would enable it to look to a future of increasing change, particularly in the use of AI and advanced analytics, and provide the very latest innovation and customer experiences in a fast-evolving industry. In early 2020, leadership determined to develop a multicloud strategy that could better support its longer-term business and technology goals and address its operating model complexity.

Surveying the multicloud frontier, the company chose to move toward a balanced approach that would allow it to match use cases with cloud vendors while imposing some high-level constraints to help control costs and complexity. Kroger made a key decision to build a common platform to implement this approach. It chose Kubernetes for multiple reasons. One, Kubernetes supported a common runtime across multiple cloud providers and edge computing. Two, it gave different development teams the flexibility to build and evolve their respective technology stacks independently. Three, it is becoming the de facto standard across the industry, with multiple major players, including Google, IBM, and Microsoft, throwing their weight behind it.

Kroger is now a year into its implementation journey, and the balanced approach is providing leadership a way to consistently scale the operating model while
enabling teams to innovate. Newfound consistency in the platform and tools is delivering a better developer and customer experience, which is expected to translate into a faster speed to market.

The company has surfaced several lessons. From a management point of view, bringing multiple stakeholders to the table early in the process was critical to achieving high-level alignment on strategy and direction. Building in architectural constraints helped teams focus on the business and has accelerated innovation. Perhaps counterintuitively, the constraints led to more flexibility for users rather than less. Most important, the company learned that in orchestrating the transformation, focusing on the technology alone was not enough. To extract value, Kroger needed to devote significant time, management attention, and resources to the issues of organization and talent, as well as to changes in its broader operating model related to cybersecurity, funding, and budgeting.

IMPLEMENTING THE RIGHT MULTICLOUD MODEL

Multicloud is not the answer for everyone. Companies should let their strategies and use cases guide their technology decisions and cloud approach. Striking the right balance between control and innovation can be tough for multicloud users. In our experience, there are five key elements to getting the balance right. (See Exhibit 4.)
The choice of partners to help with the journey is also critical. Enterprises need to be pragmatic and unreserved about putting out requests for information and systematically engaging different partners along the cloud journey, from strategizing to piloting to scaling. This is not only important for shaping greenfield cloud migrations but also for rebooting existing migrations and cloud transformations that are failing to achieve intended results.

Advisory firms can help frame the right strategy and business case. They are instrumental to planning and reprioritization. Reengaging cloud vendors and infrastructure software vendors—and understanding their go-forward roadmaps—can help shape the decision to

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**Exhibit 4 - Striking the Right Multicloud Balance**

<table>
<thead>
<tr>
<th>Key Element</th>
<th>What It Entails</th>
<th>Actions Enterprises Must Take</th>
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| Technology and platform strategy | • Middleware and data platforms  
• Application runtimes and environments  
• Container orchestration  
• Hybrid and multipremise network connectivity  
• Storage, including backup and virtualization | • Standardize a best-in-class software stack spanning data, orchestration, and runtimes to meet hybrid and multicloud application-development needs  
• Rethink the strategic importance of open source in building the technology stack  
• Evaluate and choose vendors that support multicloud and hybrid posture  
• Reevaluate storage and the backup stack to support virtualization, replication, and cloud backup use cases |
| Operations strategy and stack    | • Continuous integration/continuous deployment (CI/CD)  
• Integrated monitoring and observability  
• Automation and infrastructure as code | • Invest in building new capabilities, such as DevSecOps, chaos engineering, and site reliability engineering (SRE) to fully realize the cloud value proposition |
| Security                         | • Application security shift-left testing  
• Next-generation cloud security stack  
• Cloud-first identity and access management, zero-trust architecture  
• SecOps, including distributed security information and event management (SIEM) | • Redesign hybrid and multipremise network architecture to drive the right performance and price by application  
• Design and enforce a multicloud security model and architecture from day one across the network, applications, and endpoints  
• Leverage and integrate identity governance and access to define a common access-control model across clouds |
| Organization                     | • Centers of excellence  
• Training and upskilling  
• Operating model, including new roles and capabilities | • Rethink roles and the organization model across development, infrastructure, network, and security teams  
• Invest aggressively to retrain teams on selected architecture; leverage partners as a stopgap to scale effectively  
• Build centers of excellence and architecture review boards (ARBs) to cross-pollinate best practices among teams |
| Governance                        | • FinOps: budgeting, planning, and cost optimization  
• Procurement  
• Governance risk and compliance (GRC) controls and tooling | • Rethink budget planning and finance controls as the cloud scales; invest in cross-cloud cost management, visibility, and optimization tooling  
• Redesign security and compliance controls for the multicloud; invest to automate compliance testing and reporting |

Source: BCG analysis.
build versus buy. The overriding importance and fluid nature of security means companies need the latest capabilities. Infrastructure software vendors specialize in a number of services, including those related to security (such as access, identity governance, and intelligence and operations); multicloud DevSecOps (especially monitoring, log aggregation, and orchestration); and governance, risk management, and compliance.

System integrators—which offer a range of services related to technology, gap analysis, and security—are critical in helping bridge the talent gap and can reduce the risk inherent in migration and scaling. Integrators also offer managed services, particularly for security and networking, as well as assistance with training and organizational enablement.

For their part, cloud service providers can invest in becoming the top choice for individual workloads, expand their capabilities by workload, and augment current offerings to address major pain points, including legacy software modernization and interoperability with cloud-native services. They can also look for ways to position current middleware and platform offerings to address multicloud use cases while supporting the modernization of legacy applications.

While a multicloud strategy has become an enterprise norm, it is far from a one-size-fits-all solution. Many companies thrive with it, but for others, single-cloud architecture is still the most logical approach. The choice of architecture needs to be driven by priorities and start from the point of view that less is often more.

“While a multicloud strategy has become an enterprise norm, it is far from a one-size-fits-all solution

For companies that choose to go the multicloud route, scaling the operating model becomes critical, and they must often systematically invest in multiple capabilities—in
addition to technology—to ensure success. The two questions most CIOs should ask today: “Is my digital transformation agenda supported by the right cloud architecture? Can pragmatic process and platform choices lead to a better position on the efficient multicloud frontier?”

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