**Harvard
Business
Review**

HOW TO PLAN FOR A
MULTI-CLOUD WORLD

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When cloud computing first emerged, the question on many CIOs' minds was whether to adopt it at all. Eventually, the question became not whether, but when. Now it's which cloud tools and platforms to use—and how to ensure they work together seamlessly and securely.

One of the great opportunities of cloud technology is the ability to combine and integrate different tools, services, and platforms. We are entering a future marked by openness and interoperability: According to recent research, 82 percent of enterprises have a hybrid cloud strategy, running applications in an average of 1.5 public clouds and 1.7 private clouds; and IDC predicts increasing adoption of hybrid cloud architectures.

That's good news for businesses. Open architectures protect companies from vendor lock-in, add critical redundancies, and enable IT leaders to tap the best solutions to meet their unique business needs without arbitrary constraints that impede progress.

Google Cloud was built to help companies succeed in this open, multi-cloud world. Our commitment to openness ensures seamless user experiences across multiple environments and empowers our customers to choose the right tools and platforms to meet their business needs.

Openness enables businesses to tap innovation without restriction, and it's been part of Google's DNA since the beginning. We've released more than 20 million lines of code in more than 900 projects—including Chromium (the project behind the Chrome browser and operating system), TensorFlow (our open-source machine-learning library), and our popular container management system Kubernetes. We have a track record of incubating today's most compelling innovations—from MapReduce (which directly inspired Hadoop) to our early efforts that enabled today's revolution in containers. With each breakthrough, we've contributed these innovations right back to the community into open source. At Google Cloud, we're firm believers in an open cloud future where vendor lock-in is a practice of the past and customers' data belong to them. Because at the end of the day, cloud is about connecting people to the information they need in order to be successful.

Here's to your future.

Brian Stevens
VP Cloud Platforms
Google Cloud

HOW TO PLAN FOR A MULTI-CLOUD WORLD

An open-source strategy and consistent governance will help companies use multi-clouds to compete in the digital world.

Cloud platforms are rewriting the way that companies work, serving as a vital foundation for digital transformation. By improving business speed and flexibility, cloud helps organizations go to market faster with better products and services. "Cloud's value lies in how fast you can serve customers and deliver new functionality to them," says Jeff Kaplan, managing director at THINKstrategies, Inc.
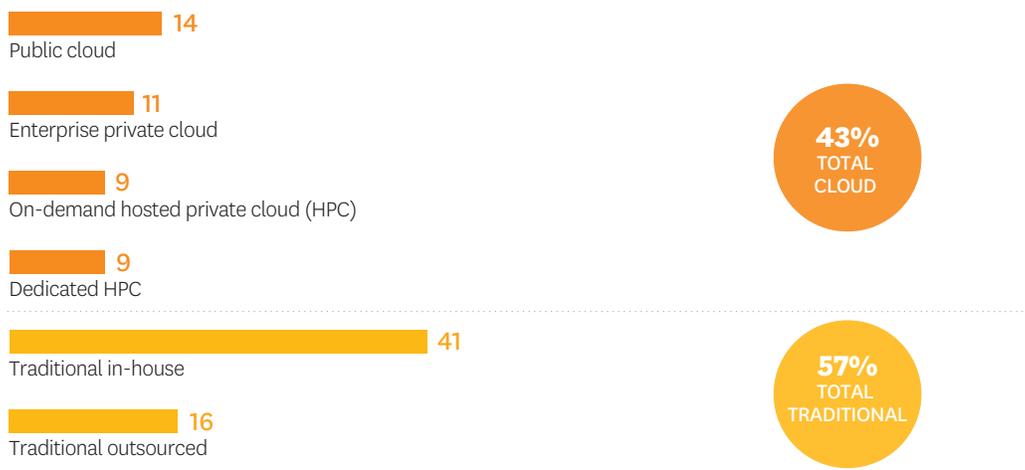
With Forrester predicting that the public cloud market will hit $191 billion by 2020, the cloud is in hypergrowth mode. Indeed, many large organizations already depend on mixed networks composed of multiple cloud service providers, third-party cloud platform vendors, and on-premises systems. As IDC sees it, cloud purchases across several categories will command 43 percent of the total IT budget by 2018. figure 1

FIGURE 1

I.T. MARKET IN TWO YEARS: GROWTH IN ALL TYPES OF CLOUD

On average, 43 percent of total annual IT budgets will be allocated to cloud-based procurement/management models by 2018.

PERCENTAGE OF I.T. BUDGET ALLOCATED

14
Public cloud

11
Enterprise private cloud

9
On-demand hosted private cloud (HPC)

9
Dedicated HPC

43%
TOTAL
CLOUD

41
Traditional in-house

16
Traditional outsourced

57%
TOTAL
TRADITIONAL

SOURCE IDC CLOUDVIEW 2016, FEBRUARY 22, 2016

The increase in cloud service consumption manifests itself in several usage models. Today, many organizations are implementing hybrid cloud, which uses a mix of private clouds, public clouds, and legacy data centers. For example, a majority (56 percent) of large enterprises currently use two or three application development platforms in cloud. figure 2

"The biggest trend we're seeing is the combination of cloud and non-cloud IT assets," says Cassandra Moshian, an analyst at TBRI Research. "Enterprises do not necessarily want their existing investments to fall away because of cloud. Rather, they want to utilize cloud to augment and improve what they already have."

According to RightScale's 2016 State of the Cloud report, a commanding 82 percent of enterprises have a hybrid-cloud strategy, running applications in an average of 1.5 public clouds and 1.7 private clouds. This model reflects today's rapidly changing business world, which has one foot in the digital future, while still depending on legacy systems.

Ultimately, however, hybrid cloud helps companies build a foundation for the next generation of cloud consumption, known as multi-cloud usage. Already in use at more bleeding-edge companies, the multi-cloud model allows companies to consume multiple cloud services from multiple vendors in response to targeted business needs. By mixing and matching specific features from different vendors, companies can swiftly respond to customers, partners, suppliers, and employees as their needs change—and significantly scale back, if not ultimately replace, their on-premises systems.

Multi-cloud environments are growing as organizations see the value of expanding their cloud platform portfolio as the fastest way to better serve customers, partners, suppliers, and employees. Price flexibility is perceived as another major benefit. "Companies are realizing that once they get comfortable with one cloud, it often makes sense to look at the specific capabilities of others in certain circumstances," says Joey Jablonski, vice president and principal architect at cloud consultancy Cloud Technology Partners.

FIGURE 2

CLOUD APPLICATION DEVELOPMENT PLATFORMS UTILIZED

Adoption of multiple cloud platforms becoming more common at many enterprise-size companies.

PERCENTAGE INDICATING THE NUMBER OF APPLICATION PLATFORMS IN USE

ONE	TWO	THREE	FOUR	FIVE OR MORE
28	37	19	5	10
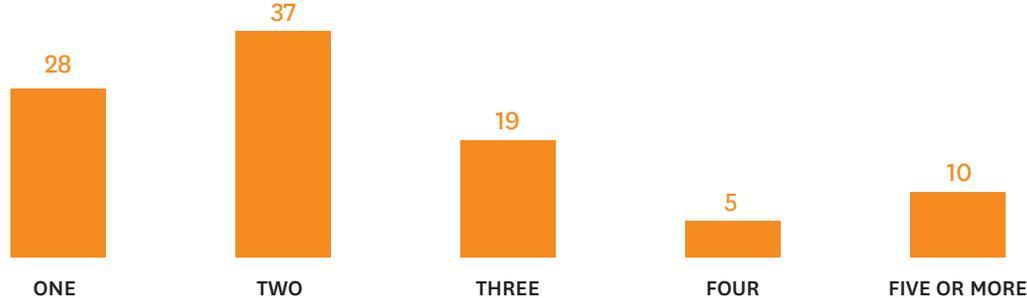
SOURCE "CLOUD DEVELOPER & PLATFORM RESEARCH," TBRI RESEARCH, 2016

> Multi-cloud environments are growing as organizations see the value of expanding their cloud platform portfolio as the fastest way to better serve customers, partners, suppliers, and employees.

For example, one of Jablonski's clients—a large consumer electronics company—recently moved its supply chain and analytics applications from one cloud platform to another to leverage specific data visualization features offered by the second vendor. Adding cloud platforms not only helps organizations avoid vendor lock-in with cloud providers but also provides valuable redundancy.

MULTI-CLOUD PLATFORM MANAGEMENT

While spreading applications and workloads across multiple cloud platforms offers undoubted benefits, the practice can also give rise to new integration and management challenges. For example, Kaplan says it's easy to underestimate the work needed to provide a consistent user interface for developers and business users alike across multiple cloud and on-premises platforms. Moreover, ungoverned expansion onto multiple cloud services and platforms can result in integration and management headaches that unnecessarily drive up costs. "The digitization of the world is well underway, and companies always grapple with change when they face such large transitions," as Kaplan puts it.

According to a recent Harvard Business Review Analytic Services study of business managers in large organizations, integration issues involving multiple systems and clouds are perceived to be among the top barriers to employing more cloud platforms today. figure 3 In many cases, companies run into integration problems as they try to migrate workloads from one cloud to another, just as can happen when migrating on-premises applications between platforms. This is especially true when systems use proprietary standards not designed for multi-vendor integration in the first place.

FIGURE 3

TOP BARRIERS PREVENTING ORGANIZATIONS FROM EMPLOYING MORE CLOUDS

Security
35

Integration with other systems
32

Integrating multiple clouds
25
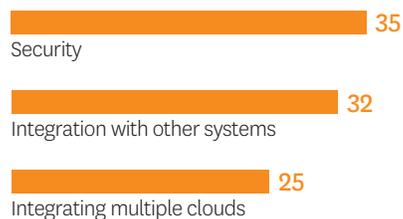
SOURCE "HYBRID IT TAKES CENTER STAGE," HARVARD BUSINESS REVIEW ANALYTIC SERVICES, NOVEMBER 2015, N=310

While major cloud providers offer capable management platforms, some focus primarily on their own applications. This forces IT to deploy and maintain multiple management interfaces across the environment. "If companies cannot connect and consolidate management tasks, it can add another layer of complexity," says Kaplan of THINKstrategies.

Data security and regulatory compliance requirements also highlight the need for a cohesive multi-cloud management strategy for data residing on multiple platforms using different security standards. According to Carl Brooks, an analyst at 451 Research, more than 80 percent of the companies he works with cite compliance across multiple systems and platforms as a primary concern when evaluating hybrid- and multi-cloud models. That's when "the conversation gets much more complicated than just better, faster, and cheaper," he says.

BEST PRACTICES FOR BUSINESS IN A MULTI-CLOUD WORLD

As companies move to hybrid- and multi-cloud computing, many leading enterprises are curbing unmanaged cloud expansion by choosing to work with a limited set of platforms that best support specific business goals. "A multi-cloud environment is not only an IT alternative, it's becoming a business imperative—and corporate leaders are getting more involved in such strategies," Kaplan says. To effectively support digital growth and transformation, those platforms must be able to work seamlessly with other platforms, making an open-source approach increasingly important.
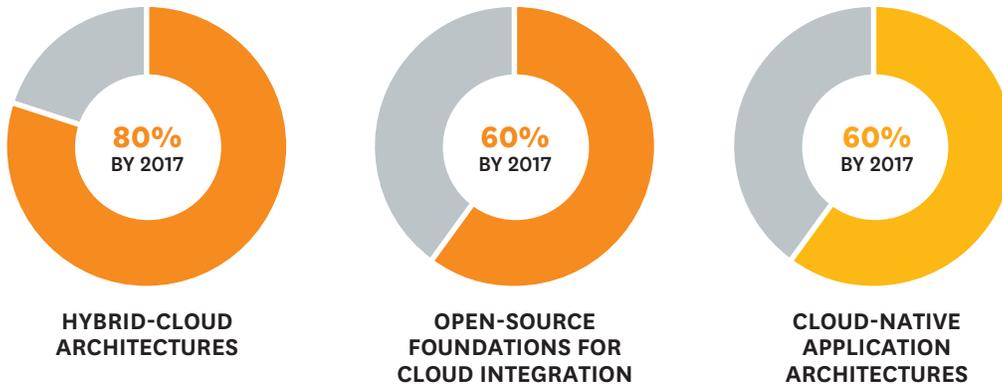
The open-source community is largely driving cloud computing standards in response to strong business demand for cloud adoption. According to a 2016 cloud platforms and standards report from Forrester, 59 percent of decision makers from companies in North America and Europe that consider cloud a high priority said they plan to increase their use of open-source technology over the next 12 months. Indeed, the report notes that OpenStack, the de facto standard for private clouds, is used by 50 percent of Fortune 100 companies.

"More and more services are taking an open-source approach, which reduces the time and effort it takes for customers to reconfigure data to match the service provider," Kaplan says. Doing so also helps companies reconcile the different ways data is stored and organized across service tiers within one cloud platform.

"With multi -cloud, it's even more critical to use open source," adds Jablonski. "It allows companies to pick up apps and move them without having to refactor the apps." Indeed, IDC predicts that companies will increasingly turn to open source as a foundational element for cloud integration in 2017. figure 4

FIGURE 4

INCREASED ADOPTION PREDICTED FOR OPEN SOURCE, HYBRID CLOUD

80%
BY 2017

60%
BY 2017

60%
BY 2017

**HYBRID-CLOUD
ARCHITECTURES**

**OPEN-SOURCE
FOUNDATIONS FOR
CLOUD INTEGRATION**

**CLOUD-NATIVE
APPLICATION
ARCHITECTURES**

SOURCE "WORLDWIDE CLOUD 2016, TOP CLOUD TRENDS," IDC FUTURESCAPE

The ability to enforce governance policies across multiple platforms is also key. In addition to certifying each cloud vendor's individual ability to comply with pertinent regulatory environments, enterprises must also find a way to centralize and apply corporate governance, security, and compliance policies across today's hybrid environments. "Policies and controls should not waver across different cloud platforms," says Jablonski. "Security should be uniform from a corporate and governance perspective, including processes for how to respond to incidents and events."

While some leaders may worry that strict governance policies will limit agility and speed, Jablonski considers them the foundation of strategic success. More and more experienced organizations acknowledge the need for centralized governance policies. The IDC 2016 State of the Cloud report found 38 percent of respondents have now established governance policies for cloud, up from 30 percent in 2015.

"I have a client who thinks governance is a bad word," says Jablonksi. "That's unfortunate, because governance is what ensures consistency across the organization." Increasingly, more experienced organizations are implementing a centralized management layer and automated tools to help bake policy compliance into their systems whenever possible.

Finally, leading organizations frequently use third-party support as part of their multi-cloud strategies. For example, many seek help not only selecting cloud providers, but also making sure they get their money's worth. "Navigating service level agreements and the policies and procedures of each provider is just as important as understanding the architecture of those services," Kaplan says. "That's where lots of companies need help."

According to Brooks, nearly 90 percent of the companies he speaks with today use a partner to help manage multiple cloud vendors. "They help companies know where responsibility for things like maintenance and monitoring changes is across the environment," says Brooks. "And that's one of the most important things you need to understand."

> Companies should brace for challenges that will need to be met as they transition from in-house systems to hybrid-cloud, multi-cloud, and public-cloud environments.

SUMMARY AND CONCLUSION

As organizations move further into the digital economy, they will increasingly implement new business processes that rely on flexible and secure interaction among multiple cloud environments as well as legacy systems. While cloud computing and use of cloud applications will continue to grow exponentially, companies should brace for challenges that will need to be met as they transition from in-house systems to hybrid-cloud, multi-cloud, and public-cloud environments. Chief among these are dealing with the business and technical issues of security, system integration, compliance, and complexity.

Fortunately, leading organizations are far enough into their cloud transitions to provide advice to later adopters. Among best practices they recommend:

- Leverage open source for interoperability
- Standardize governance across platforms and tools
- Centralize management
- Rely on third-party support

By evaluating mechanisms such as open source and cloud management in conjunction with new approaches within IT, organizations can build a cohesive strategy for living in a multi-cloud world.