White Paper

Multicloud Architectures Empower Agile Business Strategies

Sponsored by: Nutanix
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IDC OPINION

Digital innovation harnesses emerging technologies that include modern development languages, DevOps collaboration, containers, open source, big data, online social engagement, and dynamic software-defined multicloud infrastructure platforms. Although large organizations invest aggressively in developing new applications, they continue to rely on established databases, middleware, and applications built for more reliable, tightly coupled architectures. Together, modern and traditional applications, databases, and infrastructure technologies must be well integrated to deliver mission-critical business services.

IDC’s research shows that over the next five years, the majority of IT organizations expect to rely on multiple private and public cloud infrastructure options, combined with traditional physical and virtual IT resources, to meet the needs of their businesses. Workload-specific requirements are driving deployments using multiple different clouds as IT decision makers seek to optimize performance, cost, and security while taking advantage of automation and emerging technologies. Specifically, IDC’s research shows that:

- While each organization will make its own unique choices over the next three years, IDC estimates that the typical enterprise will run 70-85% of workloads on dedicated on-premise or hosted infrastructure.
- Critical applications that require highly resilient infrastructure and high levels of security and data protection are most frequently assigned to on-premise, dedicated infrastructure including private cloud and software-defined infrastructure (SDI). These types of workloads include many mission-critical applications such as SAP, Oracle, and SQL Server.
- Dev/test workloads and production applications designed for dynamic horizontal scaling and a tolerance for less resilient infrastructure are more often deployed onto public cloud service providers’ IaaS and PaaS platforms. Cloud-based backup and disaster recovery services are also gaining interest.
- Business concerns about security, data protection, and performance are often more important than cost when it comes to determining where specific applications are deployed.
- Controlling costs and maintaining operational efficiency are top priorities driving the use of consistent management and automation across all infrastructure platforms.
SITUATION OVERVIEW: WORKLOAD REQUIREMENTS DRIVE IT INFRASTRUCTURE CHOICES

Increasing numbers of enterprise IT teams are juggling the need to promote business optimization based on digital innovation, big data, DevOps, and social analytics while introducing automated private clouds, modernizing on-premise and dedicated hosted physical and virtual infrastructure, and leveraging public cloud services. As the diversity of applications increases, more and more organizations are recognizing that individual workloads and applications can have very different infrastructure requirements. However, IT teams need to be able to manage, automate, and optimize workload performance consistently across all of these platforms.

As shown in Figure 1, applications that have a high degree of elasticity, as well as requirements for variable scalability and global reach, are frequently deployed onto a range of shared public cloud services. These public cloud services might be provided by very large IaaS providers such as AWS, Google, and Microsoft Azure but also include public PaaS services and public cloud infrastructure services offered by telcos, MSPs, and hosters. Workloads with stringent security, data protection, and compliance requirements, as well as those that are resource intensive, latency sensitive, or dependent on legacy platforms, are most frequently run on-premise or in a dedicated managed service and hosted or collocated datacenters. Workloads that need security and control or are resource intensive but can tolerate shared infrastructure and benefit from self-service automation are increasingly deployed into private clouds.

FIGURE 1

Workload Requirements Driving Infrastructure Strategies

Dedicated workload characteristics
- Highly predictable capacity requirements
- Support strategic business-critical processes and information
- Stringent security, data protection, and compliance needs
- Storage and compute intensive
- Availability and latency sensitive

Private cloud workload characteristics
- Stringent security, data protection, and compliance needs
- Support strategic business-critical processes and information
- Resource requirements vary over time, and resource sharing improves economics
- Require developer and end-user agility and self-service automation

Public shared service cloud workload characteristics
- Elastic capacity
- Frequent application changes and updates
- Mobile, web, or IoT apps with global reach required
- Business agility via self-service

Source: IDC, 2016
A recent IDC survey of North American IT decision makers shows that 82% of enterprises expect to use three or more clouds by 2020. These cloud options include a broad mix of dedicated on-premise private clouds, hosted or outsourced dedicated private clouds, virtual private clouds, and shared public cloud services from a wide range of service providers.

Traditional physical and virtualized infrastructure is also expected to play a vital role in most enterprises over the next several years. As shown in Figure 2, over the next three to four years, enterprise IT decision makers generally believe that over 70% of workloads will run on some type of dedicated infrastructure (either on-premise or in a hosted/collocated or an outsourced setting). Highly scalable and externally facing workloads such as big data analytics or interactive social and mobile workloads, which often have a great deal of variability in terms of resource requirements, are most likely to be deployed on public clouds, but even the majority of these applications are expected to be supported by on-premise or dedicated hosted infrastructure. ERP and content management/backup workloads are most likely to be deployed into private clouds, and technical computing, image processing, and internal IT and security operations workloads are most likely to remain deployed on physical and virtual noncloud infrastructure.

**FIGURE 2**

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**Multicloud Workload Preferences**

*For each workload type, please indicate which infrastructure platform you expect will provide primary computing support for the workload by 2020.*

<table>
<thead>
<tr>
<th>Workload Type</th>
<th>Traditional on-premise IT</th>
<th>Traditional hosted/outsourced IT</th>
<th>Private cloud on-premise</th>
<th>Private cloud hosted/virtual</th>
<th>Public cloud IaaS/PaaS</th>
<th>Public cloud SaaS</th>
<th>Unsure/other/not applicable</th>
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<td>Content management/backup/data recovery</td>
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n = 200

FUTURE OUTLOOK: MULTICLOUD ARCHITECTURES WILL DOMINATE FOR MANY YEARS

IDC interviews with a wide range of enterprise IT architects and executives underscore the fact that most organizations will continue to depend on multicloud architectures for a number of years. These organizations consistently cite the need to improve operational efficiency and manage constant change via automation as important challenges. Whether the company is a global financial services organization or a regional manufacturer, IDC finds similar trends:

- Business and application development leaders demand speed and efficiency.
- IT operations teams are increasingly seen as business partners responsible for sourcing IT resources and services from the best possible mix of infrastructure and services available.
- Security, data confidentiality, and compliance are top of mind with all stakeholders and have a significant impact on cloud deployment and sourcing decisions.
- Automation and software-defined infrastructure, including hyperconverged systems, are viewed as important enabling technologies that will allow IT teams to more efficiently manage across multiple clouds while making more efficient use of IT infrastructure resources.
- The transition to a well-managed multicloud architecture takes time and is typically viewed as a multiyear journey.

Most organizations indicate that they expect to rely on software-defined infrastructure and automation to help manage and optimize emerging multicloud architectures. Many organizations are currently exploring a range of options including converged and hyperconverged software-controlled systems running on commodity hardware. Cloud-style self-service provisioning, Docker-style containers, and orchestration are being introduced into many environments to improve workload portability and utilization of virtual machines (VMs) and computing infrastructure.

As shown in Figure 3, these decision makers expect that software-defined infrastructure will improve business scalability and agility, improve business continuity, and allow faster application provisioning and business reaction to market changes.
The sections that follow provide details of conversations with a range of customers across a variety of regions, which underscore the fact that adoption of multicloud strategies is an evolutionary journey that is unique to each organization.

**Financial Services Leader Depends on Private Cloud for 95% of Strategic Workloads**

A global financial services company knows that online business performance, data protection, and confidentiality are key to maintaining customer and partner loyalty. With 11,000 employees, the company relies on a multicloud environment anchored by on-premise private cloud infrastructure supplemented by Amazon EC2 and Microsoft Azure public cloud services to support selected development and test workloads as well as approximately 5% of the organization's total production applications. Overall, 95% of the organization's production workloads and the majority of development and test usage runs on dedicated on-premise IT infrastructure.
that is rapidly evolving from traditional physical and virtualized platforms to software-defined infrastructure and private cloud to improve business agility and flexibility.

The company expects to use a hybrid or multicloud strategy to support the majority of applications for the foreseeable future, with private cloud supporting the bulk of mission-critical applications. Internal ROI analysis, combined with concerns about data protection and regulatory requirements, has convinced the company that on-premise software-defined infrastructure and private cloud are the most cost-effective strategies available for its needs. Specifically, an analysis of the cost to build and maintain infrastructure with sufficient security and SLAs versus purchasing it from third-party cloud service providers found that internally run resources would be less expensive to build and operate and easier to troubleshoot and audit.

The company expects that it will continue to migrate selected noncritical applications to SaaS-based options over time and use public IaaS services on a selected basis. Emerging mobile applications, many of which support consumers, tend to be more elastic and less predictable, with a need to scale horizontally on demand. These applications are seen as being well suited for cloud architectures, but the company expects that many applications will rely on private cloud given confidentiality and security concerns.

Data security, access control, and performance reliability are shaping the organization's strategy to maintain on-premise infrastructure to support 95% of important production workloads – such as ERP and transaction processing – for the foreseeable future. Because of the fact that the company handles highly confidential customer information and financial transactions, it expects that regulatory and compliance requirements will also continue to demand on-premise data storage and analytics.

As the company's chief enterprise architect explains, "Our primary asset is our brand, and it depends on our technology and network. Data protection and confidentiality are the overriding factors. The first thing that we always ask is, 'What's the risk to the brand?'" — Chief enterprise architect, global financial services company

**Business Agility Requirements Drive Global Information Publisher’s Multicloud Strategy**

A global information publishing leader with 55,000 employees has crafted a multicloud strategy that maps workloads across private and public cloud platforms depending on the workload's performance and security characteristics. In three years, the company expects to have allocated 25-30% of workloads to public cloud infrastructure provided by AWS and Microsoft Azure. Workloads targeted for public cloud are described as highly flexible, and workloads that have been developed on cloud platforms are taking advantage of specific PaaS services provided by public cloud providers.

"Data protection and confidentiality are the overriding factors. The first thing that we always ask is, 'What's the risk to the brand?'" — Chief enterprise architect, global financial services company
On-premise IT will continue to support a mix of traditional applications as well as applications deemed best suited for private cloud and highly virtualized, automated software-defined environments including big data, financial applications, and ERP. The company's analysis of the cost to support large-scale, predictable real-time applications and data-intensive workloads showed that it was much more cost effective to do so using on-premise infrastructure rather than public cloud. "The cost of supporting applications that require large-scale data transfers and storage is dramatically cheaper on-premise ... . Real-time applications need the predictability of dedicated infrastructure," explained the company's principal architect.

To maintain end-to-end performance and operational efficiency, the company is committed to the use of consistent operational processes and standards across internal and external infrastructure. The company plans to deploy the same Linux images on-premise as on public clouds and rely on the same Active Directory schema across multiple clouds. The organization recognizes that multicloud operational efficiency relies on architectural consistency and extensive use of automation.

For end users, early experiments with private cloud showed that automated self-service provisioning of VMs, which cut delivery time from weeks to hours, provided significant benefits in terms of productivity and time to market. As a result, policy-based, automated software-defined infrastructure is expected to be an important component of the on-premise architecture going forward. The company plans to create a comprehensive multicloud service catalog to allow end users to browse the full range of SaaS, PaaS, IaaS, and on-premise services and order them directly. Chargeback and billing will be provided automatically as part of the catalog. The company's goal is to provide internal users with resources within minutes and allow them to flex resource consumption as needed based on the needs of the applications and the business.

**Bank's Multicloud Strategy Focuses on Time to Market and Compliance**

A nationally known bank with 280,000 employees is aggressively refactoring over 4,000 applications to make them cloud ready. The six-year program, announced in 2014, is designed to improve business agility and time to market while consolidating the on-premise datacenter footprint by more than half by dramatically increasing the density of virtualization, aggressively leveraging automation, and making strategic use of public cloud services. An equally important goal is to enable a modular business structure that will make it easier to support integration of acquisitions and the spinout of businesses that might be sold off over time.

"The cost of supporting applications that require large-scale data transfers and storage is dramatically cheaper on-premise ... . Real-time applications need the predictability of dedicated infrastructure."  
— Principal architect, global information publisher

<table>
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<tr>
<th>Banking</th>
<th>United States</th>
<th>280,000 employees</th>
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<tbody>
<tr>
<td>Three-year plan: TBD based on application review in progress</td>
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<tr>
<td>On-premise focus: Systems of record, strategic lending, and transaction processing systems; image processing systems</td>
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As part of the transformation, the organization is building a common software-defined control plane to provide consistent services such as job scheduling, payment engines, performance monitoring, and automated provisioning across all workloads and multicloud infrastructure choices.

In determining the most appropriate platform for each application, the organization looks at the application's specific scale and elasticity requirements. Unpredictable applications that need rapid scaling and elasticity are deemed best for public cloud, unless they have more stringent information management and security requirements that make a private cloud platform preferable. Shorter-term development projects and on-demand applications used by sales are also targeted at public cloud because they have unpredictable requirements that need to be supported instantly.

By comparison, applications that depend on large databases and the use of images as well as those that are latency dependent and need predictable infrastructure and rigorous security are expected to remain on-premise. Applications typically described as systems of record or strategic applications such as lending and transaction processing systems will also remain in-house.

The company's vice president and senior solution architect explained that "cost is not the driver ... faster time to market is a big motive, as is compliance with regulatory requirements and reforms." The company expects that software-defined infrastructure will anchor the in-house IT footprint in the future to take full advantage of state-of-the-art automation and enable greater infrastructure flexibility and control.

**Worldwide Media and Entertainment Company Counts on Automation to Manage Multicloud Architecture**

The corporate IT services division of a worldwide media and entertainment company with 140,000 employees supports over 400 applications, with about 90% of these applications currently deployed on in-house infrastructure. The organization's multicloud strategy blends SaaS, PaaS, and IaaS services with virtualized on-premise and dedicated hosted private cloud and software-defined infrastructure to enable a wide range of applications including ERP and data warehouses as well as a number of compute-, memory-, and data-intensive animation, digital media, and streaming video workloads.

Over the next three years, the organization expects to have shifted about 30% of workloads into public clouds, mostly because of increased availability of SaaS-based versions of applications that are currently hosted on-premise. The remaining 70% of the workloads will be supported by on-premise and dedicated hosted infrastructure.

The organization's senior vice president (VP) for IT explains that running data-intensive applications on public cloud can be three to four times more expensive than running them in-house, so long as the on-premise environment and the staff that manage it are able to take full advantage of automation and open source. The cost of maintaining adequate storage, backup, security, and data compliance on services
running in the public cloud adds to the total cost of operations of public cloud services. By comparison, project-based workloads such as film production, which have a high degree of elasticity, serve a global user footprint, and present unpredictable resource requirements, are seen as better suited for the public cloud.

The evolution of the organization's multicloud sourcing strategy is heavily shaped by the needs of application developers and line-of-business (LOB) planners. The IT infrastructure team is an important partner but does not make decisions on its own. Providing LOB and developer teams with accurate information about cost and performance is crucial to making this partnership work. Understanding the true cost of downtime helps the team determine which applications get value from rapid scaling and paying as they go versus those that benefit most from reliability and in-house control.

"Automation is critical to our strategy," explains the organization's senior VP for IT. "We are trying to position ourselves as trusted advisors who can acquire and integrate technologies." Over time, the organization expects to take advantage of a range of emerging technologies such as containers and software-defined infrastructure to enable a flexible API-driven environment. Dedicated, managed hosted private cloud services will continue to support selected applications as well.

National Real Estate Investment Firm Bets on Multicloud

A national real estate investment firm with 5,000 employees is transitioning from a highly virtualized on-premise architecture to a multicloud strategy that relies on several public cloud IaaS and PaaS providers to provide cloud-based backup and website hosting. Selected SaaS-based applications such as Microsoft Office 365 have recently been implemented. On-premise, the company is implementing a private PaaS environment and investing in software-defined infrastructure to better automate and optimize use on in-house infrastructure.

Public cloud services currently support about 15% of the organization's workloads, and the percentage is expected to stabilize at about 30-35% of workloads over the next several years. The remaining majority of workloads, including graphic- and image-heavy applications as well as ERP and data warehouse workloads, are expected to remain on-premise for the long term because of the requirements for predictability, data protection, audit compliance, and strategic differentiation. Many of these workloads have significant requirements for predictability and security.
Over the next several years, the organization expects to build out a private cloud and take advantage of software-defined infrastructure and consistent end-to-end automation. The company expects that the operational efficiencies resulting from greater use of policy-driven automation, self-service, and modern infrastructure will help ensure that critical applications perform as expected. "We hope to see as much as a 25% efficiency improvement from using software-defined infrastructure automation," says the organization's VP of Infrastructure.

**Diversified Manufacturer Turns to Multicloud for Savings and Performance**

A 4,000-person diversified manufacturing firm relies on several generations of infrastructure and workloads to support commercial operations, design, and factory floor applications. Traditional workloads that require predictability and security, such as JD Edwards running on AS/400s, support critical processes, while cutting-edge big data analytics applications that have unpredictable elasticity requirements run on public cloud platforms. SaaS-based services are also slowly displacing selected on-premise packaged software solutions. Few existing applications are being migrated to public cloud infrastructure.

Overall, currently less than 10% of the organization's computing capacity resides on public clouds. The company is very cost sensitive. An ROI analysis consistently showed that on-premise resources are more cost effective and secure than public cloud. Specifically, the firm calculated that shifting all existing workloads to public cloud would be five times more expensive than running them in-house. "Many organizations think that public cloud will wash away the problems they have with older equipment, but these organizations don't really understand the true cost of internal operations versus the high cost of public cloud," explains the company's IT director.

Despite cost concerns, the organization sees a clear role for public cloud for certain types of workloads. Over the next three to five years, the organization expects that the percentage of workloads in the public cloud will increase to about 15% as newer applications that can take advantage of cloud elasticity and global reach are developed and deployed there.
The 85% of workloads expected to remain in-house will become increasingly virtualized as the company increases the density of VMs on physical servers. The organization expects to continue to rely on blended architecture that mixes traditional systems and virtualization and makes greater use of automation over the next several years. The organization expects that it will be able to reduce its physical datacenter footprint and improve operational efficiency as it makes greater use of modern infrastructure. In addition to cost, security continues to be a major priority and remains a significant factor in deciding which workloads are deployed into public clouds.

CONCLUSION: MULTICLOUD STRATEGIES START WITH WORKLOAD REQUIREMENTS

IDC's research shows that organizations that proactively develop and implement multicloud strategies are better able to satisfy business requirements, adhere to compliance and business risk management protocols, and optimize the cost and performance of business applications. Leaving individual groups to create their own strategies often results in the organization spending more money than it needs to and running the risk of compromising important data.

Organizations interviewed by IDC agreed on many of the key steps for achieving multicloud success, including:

- Define and implement workload placement policies specific to different classes of clouds.
- Collaborate with LOB and developer teams to identify current and emerging requirements and SLAs.
- Leverage software-defined infrastructure and automation wherever possible.
- Invest in unified multicloud management solutions including a common service catalog.
- Plan for an evolutionary, multiyear journey that matches the rate at which application architectures and development environments evolve.

Software-defined infrastructure, including the use of automation and orchestration to promote workload portability and control, is frequently identified as an important component of on-premise and dedicated hosted private cloud environments. Overall, 70% of organizations polled by IDC see software-defined infrastructure as a very important enabler of their overall cloud strategy (see Figure 4).
FIGURE 4

Role of Software-Defined Infrastructure in Supporting Enterprise Cloud Strategies

Q. What is the role of SDI in your organization’s cloud strategy?

- Very important enabler (70.0%)
- Helpful but not critical (28.0%)
- We do not have a formal cloud strategy (2.0%)

n = 300

Source: IDC’s Software-Defined Infrastructure Survey, 2015

By using software-defined infrastructure and automation to manage and migrate a variety of workloads as needed across diverse operating systems and cloud platforms, without concern for system-specific dependencies, IT teams will be better able to optimize resource utilization and maintain service levels required by agile business teams. API-based integrations and support for open standards will also be crucial to ensuring workload performance, cost optimization, and consistent delivery of business SLAs across evolving multicloud environments.
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