What CIOs Need to Know and Do to Exploit Cloud Computing

FOUNDATIONAL **Refreshed:** 27 June 2017 | **Published:** 07 July 2016 **ID:** G00310075

Analyst(s): *Donna Scott*

Summary

After 10 years, confusion still exists regarding cloud computing. This guide will help CIOs understand why and how cloud as a style of computing should be exploited and why they need a cloud strategy.

FOUNDATIONAL DOCUMENT

This research is reviewed periodically for accuracy. Last reviewed on **27 June 2017**.

Overview

Key Challenges

After 10 years, cloud computing is still perplexing to many CIOs; thus, it is not being exploited for its maximum benefit.

While cloud computing is a foundation for digital business, we estimate less than one-third of enterprises have a documented cloud strategy.

Pursuing cloud computing as a style of computing without optimizing application design, management and governance can result in sprawl and cost overruns.

Many CIOs lack a decision framework to prioritize legacy applications movement to an optimized cloud style of computing.

No standards address migration between cloud computing suppliers; CIOs that desire reduced lock-in to cloud service providers must explicitly include it as part of the cloud strategy and execution.

Recommendations

Leverage your digital business strategy to justify your cloud strategy and investments.

Exploit and optimize a cloud style of computing for new applications, and identify which legacy applications should move to an optimized cloud style of computing.

Invest in architecture/standards and cloud infrastructure/platform product management roles/skills to succeed with cloud computing and achieve your agility, speed, innovation and cost goals.

Productize application and infrastructure functionality to enable internal consumers of cloud services to help themselves to IT (through self-service), while reducing associated risks through application of standards, policies and embedded management/security.

Develop a cloud strategy so that decisions do not have to be re-evaluated and analyzed with every new project/product, thus increasing enterprise agility and productivity.

Introduction

Even 10 years after the introduction of public cloud computing services, and five-plus years of private cloud services, confusion remains over where and how to exploit these services. This document provides guidance to CIOs on the development of a cloud strategy and how to maximize the benefits of cloud computing for your enterprise.

The Multiple Faces of Cloud Computing

CIOs should recognize that we are in a period of slow migration of value from on-premises data centers to the public cloud. While public cloud spending today is a relatively small 5% as a proportion of total IT spend (see "Forecast: Public Cloud Services, Worldwide, 2014-2020, 1Q16 Update" (https://www.gartner.com/document/code/302290?ref=grbody&refval=3369117) and "Forecast Analysis: IT Spending,

Worldwide, 1Q16 Update" (https://www.gartner.com/document/code/296931?ref=grbody&refval=3369117)), it will grow at an average compound annual growth rate (CAGR) of 15.8% through 2020, which is much higher than IT budget growth. Public cloud growth is due to new initiatives as well as migration of existing legacy systems.

A key benefit of public cloud infrastructure as a service (IaaS) and platform as a service (PaaS) is to place applications closer to customers to enable better user experience. This is particularly important for enterprises with worldwide customers that have consolidated their data centers in a few locations to save money. As a result, much of the new customer-facing cloud-style applications being built are for the public cloud. Enterprises with a high need for private cloud computing are making greater use of colocation facilities for the same reasons.

Additional reasons for the rise in public cloud computing are:

- Offloading existing highly customized and expensive-to-operate applications to SaaS can concentrate limited or constrained IT skills on more differentiated services and capabilities.

- Public cloud providers are increasingly abstracting and making it easier and faster to build new application functionality, which makes public cloud providers attractive to leverage for digital business opportunities. At the same time, it is more difficult to build the same type of capability internally with the same level of innovation.

- New application development, especially if it's experimental or has unspecified demand or an unknown knowledge of success, will often be performed in the public cloud. This is due to lack of desire to invest capital in an unpredictable project. Once the endeavor becomes predictable and productized, decisions on public versus private cloud can be re-evaluated.

- Some IT organizations seek to replatform as much as possible to the public cloud in their effort to divest something they see as commodity: data centers, racking/stacking/cabling infrastructure, etc. This enables the limited or constrained IT skills to focus on higher-order delivery closer to business value.

Private cloud computing is also being exploited, especially where intellectual property (and the desire not to share infrastructure), control, regulatory or compliance concerns, security, performance, and cost of service delivery are differentiated. In those cases, private clouds that run on-premises, in colocation facilities or at provider facilities can offer some of the same benefits as public cloud computing. It should be noted that enterprises with successful self-built private cloud computing are highly skilled and tend to be Type A enterprises. In addition, distinctions about public versus private cloud are increasingly becoming blurred as public cloud providers have added a portfolio of virtual private cloud options with more isolation and dedicated resources at higher costs.

> Private to public cloud is a gray spectrum of choices, with a range of isolation options for internal or external delivery. Ultimately, value will be derived from selecting the appropriate style of cloud computing that works for each given organization.

Gartner defines hybrid cloud computing as the coordinated use of cloud services across provider boundaries among public, private and community cloud service providers. Hybrid cloud computing implies significant integration between the internal and external (or two or more external) environments at the data, process, management or security layers. *Nearly all enterprises will exploit public, private and hybrid cloud computing, especially for their digital business needs.* As they expand cloud usage, many will engage in the use of managed service providers/cloud service brokers that will help them to aggregate, integrate and customize cloud services, and serve as an intermediary between cloud providers (see "A CIO Primer on Cloud Services Brokerage" (https://www.gartner.com/document/code/245329?ref=grbody&refval=3369117)).

Analysis

Justify Your Cloud Strategy and Investments Based on Your Digital Business Strategy

Digital business requires speed and agility, both to trial and advance new ideas, but also to continually enhance digital business products and services. A cloud style of computing provides speed and agility through the use of cloud services — which become available to a broader set of users (also called cloud consumers) through a self-service interface. As users "help themselves" to these cloud services, it has the effect of democratizing IT, which in turn spurs creativity and innovation. Examples of cloud services that can be self-requested include applications (SaaS), platforms (PaaS) and infrastructure (IaaS).

Before cloud computing became available as a style of service, most users were required to make specific requests to the IT organization to access computing resources (applications, platforms and infrastructure). This often took days to months, depending on the complexity of the request and the number of handoffs required to complete the request. With cloud services, however, users can have access and get resources immediately.

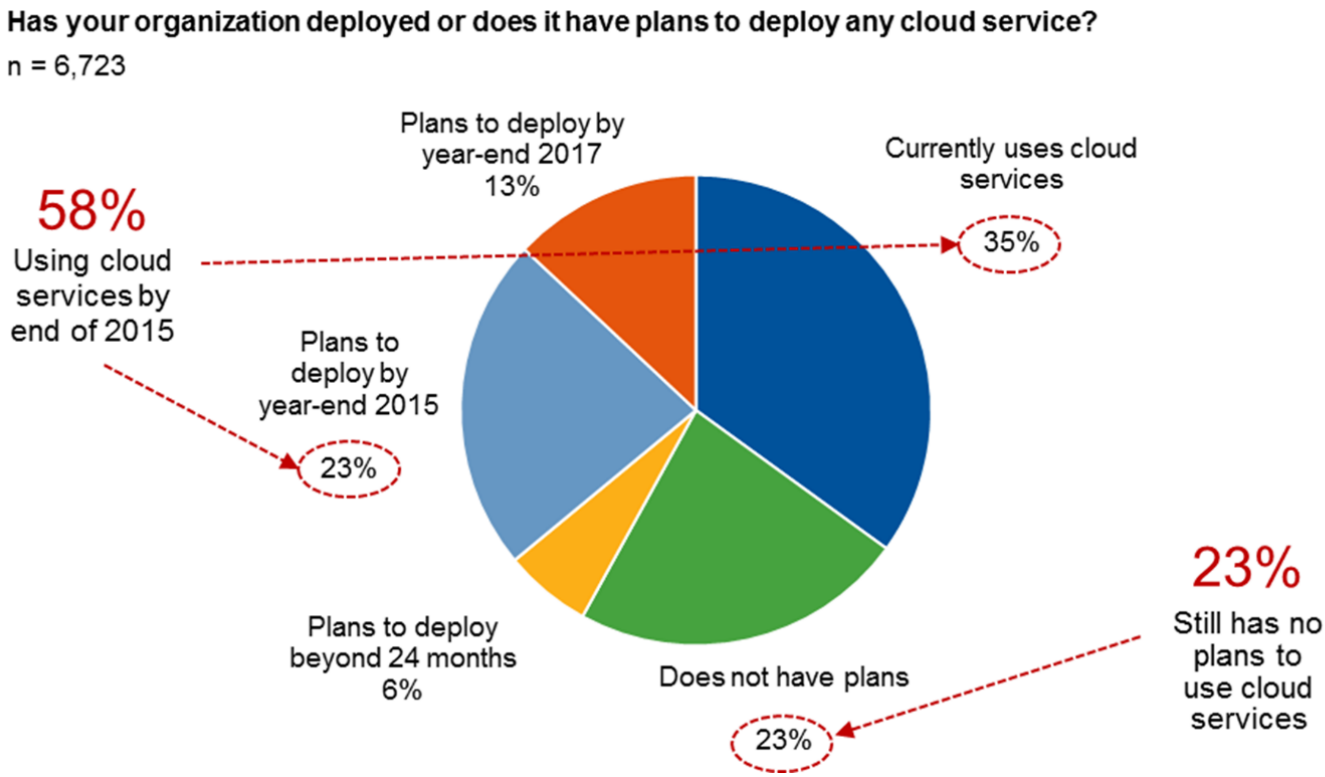
Cloud computing further increases the speed of development and time to market because cloud services are available through APIs, which enable developers to programmatically access cloud services for even faster and more repetitive access. Moreover, these APIs support continuous integration and delivery, the foundation of agile methodology and DevOps methods commonly used for digital business and

most new software development. Even if you use packaged applications, your vendors (of both SaaS and on-premises software) have or are enabling API access so your developers can more easily integrate functionality and data through APIs.

Gartner has written about the economics of connections that will increasingly define new business models that are more ecosystem- and platform-based (see "Unlock Digital Business Value Through the Economics of Connections" (https://www.gartner.com/document/code/293686?ref=grbody&refval=3369117) and "Building a Digital Business Technology Platform" (https://www.gartner.com/document/code/297286?ref=grbody&refval=3369117)). Exploiting these new business models requires the ability to reuse not just your own application and data assets but those of others in your ecosystem. Marketplaces will be established to sell and source various assets (such as data, analytics, functionality and events). Sourcing these assets offers connection to them via APIs that have defined functionality and SLAs, and have been written in the cloud style of computing so the APIs accessing the functionality can scale with increasing demand (see "The API Economy: Turning Your Business Into a Platform (or Your Platform Into a Business)" (https://www.gartner.com/document/code/280448?ref=grbody&refval=3369117)).

As a result of these benefits, cloud computing is the foundation of digital business initiatives. Yet in our most recent 3Q15 cloud survey, 42% of the more than 6,700 responses indicated their organizations hadn't used or planned to use any form of cloud services by year-end 2015 (see Figure 1 and Note 1).

Figure 1. Cloud Survey Results: 58% Use or Planned to Use Cloud Services by Year-End 2015



Source: Gartner (July 2016)

Recommendations:

Educate your CEO and board of directors about the need to invest in cloud computing as a style of computing that drives greater speed, agility and innovation through the democratization of IT. It's not a "keep the lights on" play.

Use your digital business strategy to justify the investments needed for cloud computing. In our latest CEO survey, CEOs expected 46% of their revenue to come from digital business by 2019 (see "2016 CEO Survey: The Year of Digital Tenacity" (https://www.gartner.com/document/code/296113?ref=grbody&refval=3369117)).

If you are not using cloud computing (as 42% were not in our latest cloud survey — see Note 1) you'll need to experiment with public, private and hybrid cloud services. Experimentation is required so that you get a better understanding of the value cloud computing can provide to your organization, which is an important aspect of the future development of your cloud strategy. Engaging managed service providers/cloud service brokers can extend your skills and reach, and reduce the time to take advantage of cloud services.

Even if your organization is not pursuing a digital business strategy, cloud computing should be evaluated for its business benefits to drive speed, agility and innovation, while potentially cutting costs at the same time.

Using Cloud Services Is Not Enough: You Must Optimize Your Application Design

Cloud services drive speed and innovation through broad and easy accessibility. Offering cloud services make your developers more productive and can improve time to market. *But the way you use cloud services matters* : Developing your applications in a "Wild West" style where "anything goes" can result in costly sprawl, lack of leverage and high cost maintenance, resulting in significant technical and architectural debt. This is true for all types of cloud services in use. In other words, cloud services can enable agility, but you don't get it unless you optimize your applications for cloud computing with the explicit purpose of getting the most value (speed, agility) at the lowest effective cost. What does this mean?

Optimized Cloud-Based Applications Leverage "Service-Oriented Architecture (SOA) on Steroids": Most new applications are being built with cloud as a style of computing through the use of IaaS and/or PaaS, such that they share computing resources, and have the opportunity to be scalable and elastic. But there is something more. First, to reach the level of agility desired by product teams, as much functionality as possible needs to be reused. Of course we have been talking about and implementing SOA for years, but a cloud style of computing is "SOA on steroids." Cloud computing makes development of new applications more composable, from existing components/functions. As a result, they can be more quickly prototyped and developed, usually at a lower cost, and the teams can be more productive by focusing on new functionality and leveraging existing functionality. This encourages reuse.

> Without reuse, cloud-style applications would be just one more method to generate architectural and technical debt, thus reducing productivity, increasing costs and slowing innovation and releases.

Cloud-Based Application Composability Requires Standards: To get the maximum reuse with optimized service delivery costs requires standard configurations of software infrastructure components. Without such standards, your cloud-based applications would end up in a similar situation to that of most legacy applications — hundreds or thousands of applications each with different nonstandard components resulting in high costs and low reuse — ultimately reducing, not increasing agility. To get the agility promised by cloud services requires a focus on enterprise architecture and standards (see "Using Enterprise Architecture to Maximize Cloud Strategy Business Outcomes" (https://www.gartner.com/document/code/272767?ref=grbody&refval=3369117)).

Cloud-Based Application Design Is Different:

Cloud-style applications are stateless, meaning they can fail and restart easily, and they can scale dynamically based on increasing or decreasing demand (often called elasticity), thus automatically achieving service levels at reduced cost of operation. (For more information, see Note 2.)

The cloud style of applications requires the solution architects to design the application to accommodate and respond to failing infrastructure. Resiliency must be explicitly designed by the solution/product teams or embedded in infrastructure policies, which are abstracted from the developers/engineers and applied automatically, driving greater productivity for the product teams.

Optimized cloud-based application design embeds manageability and security in the application itself rather than performing most of it on the outside and after the fact — as most traditionally built applications do. There is a greater attempt to monitor, analyze, test and forecast potential missed SLAs with dynamic actions taken for correction. For example, monitoring is embedded and linked directly with autoscaling (to scale up or down the resources to meet SLAs). Replication and backups are also embedded, and typically based on policy determined by the type of application, criticality and regulations. Even patching is often done differently, based on an update of the image or configuration, and the orchestrated removal/replacement of the nodes (because they are stateless), rather than applying patch changes online.

The net effect of these design changes, if well-executed, is that cloud computing brings more than agility: It can also lower the cost of building and operating cloud-based applications, assuming the proper operations principles are applied. If you lack optimized cloud service operational and security management skills, managed service providers/cloud service brokers can help to fill the void and encourage good tenant practices, such as turning off cloud instances when they are not in use to reduce undue cost and waste.

> Reuse of standard functionality and infrastructure, embedding manageability and security, and applying greater automation of the build and run processes, offers both agility and cost optimization benefits.

Recommendations:

Establish a cloud strategy and architecture group with a multidisciplinary focus, including lines of business, enterprise architecture, cloud subject matter experts, sourcing, and infrastructure and operations (I&O), to develop cloud-optimized application design principles and standards (see "What CIOs Need to Know About Cloud Computing Roles and Competencies" (https://www.gartner.com/document/code/310409?ref=grbody&refval=3369117)).

Productize application and infrastructure functionality, easily enabling cloud consumers to help themselves to IT (through self-service) and simultaneously encourage reuse, but reducing associated risks through application of standards, policies and embedded management/security. This will require new roles/skills in cloud product management for the various components that will be offered as productized cloud services.

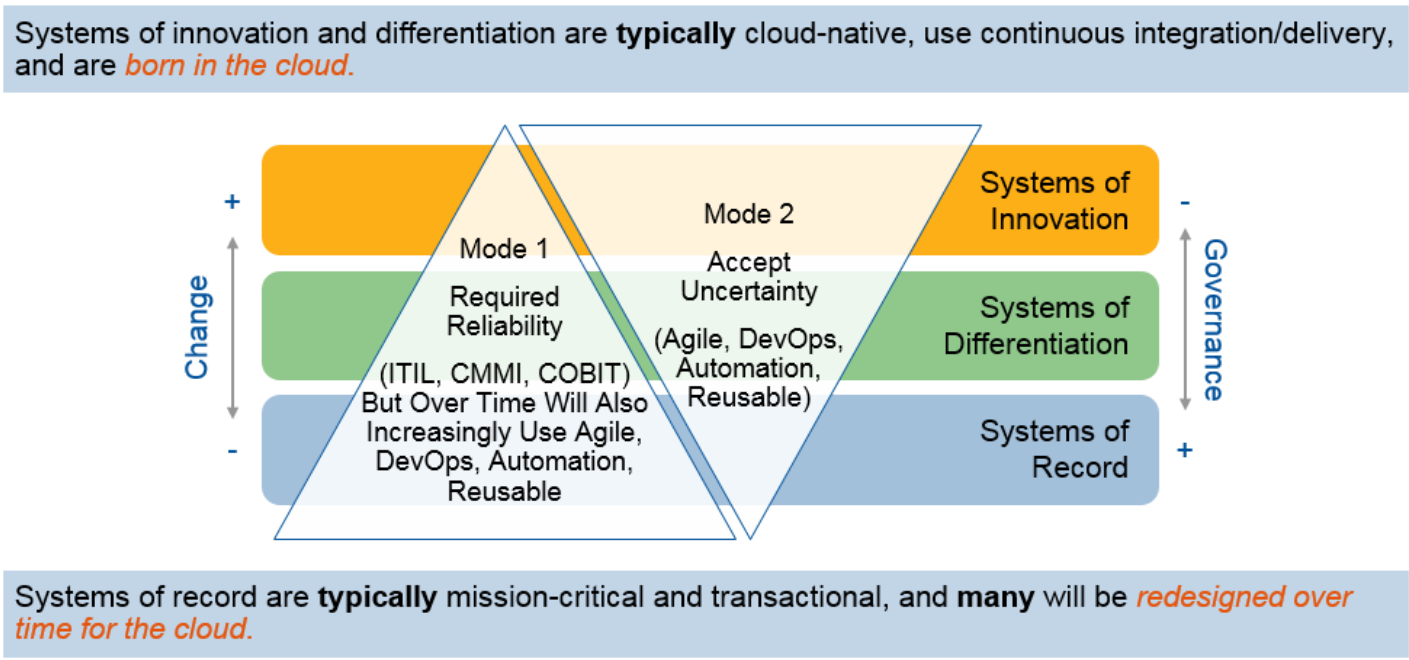
When establishing architecture standards for cloud-based applications, be sure to establish management and security standards that can be included in every initiative, which will have the effect of reducing risk and increasing product development productivity.

Consider contracting for managed services/cloud service brokerage capabilities to enable skills transfer and shorten time to value for optimized application design for cloud computing.

Use a Pace-Layered Application Strategy as Input to Your Cloud Strategy

CIOs need to determine where and how to leverage cloud computing for business benefit. A different cloud strategy is often made for existing (legacy) applications versus newly developed applications. Gartner's Pace-Layered Application Strategy and bimodal research can be used to help guide your cloud strategy (see "Pace-Layered Application Strategy and IT Organizational Design: How to Structure the Application Team for Success" (https://www.gartner.com/document/code/307928?ref=grbody&refval=3369117) and Figure 2).

Figure 2. Use Pace-Layered Application Strategy to Assist With Cloud Strategy



CMMI = Capability Maturity Model Integration

Source: Gartner (July 2016)

Driving innovation associated with digital business is a key requirement for today's CIOs. Much of these innovation initiatives will require shorter cycle times to develop many prototypes for testing, but with fewer resulting developed capabilities (because many prototypes will fail to meet business needs). Most innovation initiatives and their associated software development are exploratory in nature and require a different work style, and a differentiated approach to governance that reflects a different set of risks and a need to manage higher uncertainty but with faster speed. We call this work style and associated governance Mode 2 (see "Deliver on the Promise of Bimodal" (https://www.gartner.com/document/code/299685?ref=grbody&refval=3369117)). As a rule of thumb, the applications associated with innovation initiatives will be developed with an optimized cloud style of computing as the new architecture (see Figure 2). Often, these "greenfield" applications are being developed in the public cloud (for reasons cited earlier in the introduction).

Where justified, existing systems of record applications (for example, longer-lived transactional applications) are also getting partially or fully refactored or replaced for an optimized cloud style of computing to support the digital business strategy (see " Renovate the IT Core: Laying the Foundation for Digital Business" (https://www.gartner.com/document/code/270828?ref=grbody&refval=3369117)). Doing your own refactoring (versus replacing the applications with SaaS or an optimized release from your packaged application vendor) can take a considerable amount of time and money, especially for complex and monolithic applications. Assessing what to do with systems of record such that they have the flexibility needed to collaborate on digital business initiatives is a core requirement for CIOs and enterprise architects to address.

For most organizations, only a portion of legacy will be refactored. Existing applications that are not moving to SaaS often get onboarded to the private cloud because of their intense integration with other applications (see "When IT Leaders Should Select Private Cloud Over Public Cloud Services" (https://www.gartner.com/document/code/273092?ref=grbody&refval=3369117)).

With systems of innovation often in the public cloud and systems of record often in the private cloud, most enterprises will pursue hybrid application integration strategies.

Replace and Refactor Systems of Record to Ready Your Digital Business Platform

It will make sense for some existing applications to be replaced, through SaaS or the acquisition of packaged software capabilities to modernize the applications and lay the foundation for the digital business platform. However, not all applications can or will be acquired on the open market; some custom applications will need to be refactored for the cloud style of computing to enable them to participate in the digital business platform. Prime candidates are those that require increased change frequency or the need to integrate with new systems of innovation and differentiation to drive digital business initiatives. Another consideration is their variability in demand. If the variability is great, then it makes sense to refactor the application so that it can use the resources it requires to meet the SLA, rather than require extra resources applied round the clock whether needed or not. Refactoring an application with high variability in demand will have the effect of reducing the cost.

In the public cloud, refactoring such applications enables elasticity, applying just the right amount of infrastructure resources to meet the demand, which reduces direct operational costs because you pay for what you use. If you move your monolithic applications "as is," you will have to size them for peak demand in the public cloud and therefore incur significantly higher costs. That said, sometimes migration to the public cloud is justified as a form of consolidation, after which the refactoring can be accomplished. Depending on your cloud strategy, you may continue to operate the new cloud optimized application at the chosen public cloud provider, or migrate to a different provider or to private cloud providers.

In the private cloud, refactoring such applications in combination with the use of dynamic optimization technologies (see "Innovation Insight for Dynamic Optimization Technology for Infrastructure Resources and Cloud Services" (https://www.gartner.com/document/code/294812?ref=grbody&refval=3369117)) results in increased asset utilization (thus delaying capital cost outlays). Dynamic optimization technology is a capability that uses telemetry, algorithms, service and resource analytics, and policies to drive real-time automated actions that reduce waste, cost and risk exposure, while simultaneously improving service levels. These technologies help reduce cloud service and virtual infrastructure sprawl and cost, while improving governance and compliance.

When refactoring these applications, it is critical that they be done with the new architectural standards so they too receive the benefits of increased speed (of change, composability, and so on) and lower cost of operation as well. (see "Innovation Insight for Microservices" (https://www.gartner.com/document/code/275279?ref=grbody&refval=3369117)). Refactoring legacy applies to networking as well. Enterprises that use a significant amount of public cloud computing will need to rethink their network architectures to drive the speed and agility they seek, but this cannot be delivered with point-to-point networks to all providers (see "Colocation Networking: Connectivity Options to Drive Transformation and Enable Digital Business" (https://www.gartner.com/document/code/292934?ref=grbody&refval=3369117)).

From a customer perspective, the most aggressive stance we've seen is a plan to refactor all existing legacy applications over a five-year period for an optimized cloud style of computing. This decision was driven by the need for innovation (for example, legacy was holding the enterprise back from the speed needed to drive digital business initiatives), as well as the desire for a serious reduction in cost of application operations. In this particular example, monolithic legacy architectures were holding back innovation because of their difficulty and elapsed time to change them due to the considerable risk management required. This company's digital business initiatives depended not only on new development (in an optimized cloud style of computing), but also on the ability to integrate with systems of record applications and to enhance them more frequently. This company's refactoring strategy included moving to a cloud style of computing and to more of a web-scale infrastructure. Those moves, combined with embedded manageability and security, drove the company's cost of service delivery to 50% of the legacy cost of operation.

Recommendations:

For packaged applications, rely on your vendors to migrate to a cloud style of computing or move to a SaaS offering, replacing your on-premises implementation.

Determine and prioritize which existing applications get moved to SaaS or an on-premises optimized cloud style over a specified time period.

Determine and prioritize which existing applications are funding for refactoring over a specified time period.

Prioritize legacy rearchitecture for the cloud based on the need for increased change frequency, the need to integrate with systems of innovation/differentiation, and costly variability in demand, which could be lessened through elasticity.

For legacy applications that need integration to systems of innovation/differentiation but will not require frequent changes, enable their functionality and data via APIs.

Don't forget to apply refactoring to infrastructure initiatives — particularly networking — to enable you to achieve your hybrid cloud architectures speed/latency requirements in a cost-efficient way.

CIOs: Beware of Lock-In to Cloud Service Providers/Services

CIOs and CTOs/architects must determine strategically what degree of vendor/technology lock-in is acceptable to public cloud service providers, especially since there are no public cloud standards. Cloud services can come with a significant degree of lock-in due to the lack of standardized IaaS APIs, data structures for SaaS data, and tools/languages for PaaS. This can become a problem if the selected provider exits the market or when a relationship must end for other reasons — like lack of innovation, price increases, or inability to deliver on SLAs. However, while fear of lock-in is often mentioned as a concern, we find that migration across different cloud provider services for the same capabilities is rare. The focus should be on value derived from the services. This will either validate or eliminate a provider from contention for a given solution. Further, since cloud computing is not a "stack" of service (for example, SaaS is not always built on PaaS, which is not always built on IaaS), one must consider the value of a service at each level.

Considerations when lock-in is a concern:

Choose IaaS and make use of API abstraction layers that allow you to manage and operate many public clouds as if they are one (see "Market Guide for Cloud Management Platforms: Large, Emerging and Open-Source Software Vendors" (https://www.gartner.com/document/code/278177?ref=grbody&refval=3369117)).

Engage cloud service brokers/managed service providers that have the potential to minimize the impact of lock-in through their partnerships with multiple cloud service providers.

Increased use of container models and microservices has the potential to provide greater choice in how, where and when to deploy application functionality (see the A Look Into the Future of Technology section below).

Some providers of technology components such as networks, security and PaaS software offer cloud-agnostic capabilities, meaning they can operate either in the public cloud or the private cloud in the same way. When operating in the public cloud, they replace the public cloud provider's functionality with their own. This has the effect of reducing lock-in with the public cloud provider but moves the lock-in to the technology provider and limits the use of public cloud services that are being frequently enhanced.

> The right strategy is the one that is right for your enterprise based on the value you seek to derive from cloud services.

A Look Into the Future of Technology

> One promising technology development is the emergence of containers and container orchestration as the foundation of new application architectures and software development life cycles. Containers and container orchestration allow for packaging of application logic and data to make it easy to develop, deploy, scale and change functions. From a cloud computing perspective, this technology offers the promise to be able to move applications between cloud providers, assuming the cloud providers implement the container strategy in the same way. CIOs should keep apprised of this technology through CTO/architecture groups, and determine whether and when it can and should be exploited by their enterprise. (For more information, see "Orchestrating Docker Container-Based Cloud and Microservices Applications" (https://www.gartner.com/document/code/306131?ref=grbody&refval=3369117&latest=true) and "How to Navigate the Container Orchestration Market." (https://www.gartner.com/document/code/293450?ref=grbody&refval=3369117))

Recommendations:

Lock-in is inevitable in your software and service architecture, and your strategy must articulate when the value of lock-in is greater than the drawbacks.

For all lock-in, assess your vendor exit strategy upfront so that you are aware of costs, risks and options if needed.

Embrace higher-productivity PaaS development options that will allow multicloud deployment through multiple platforms. This will provide an exit strategy and choice for developers.

Choose IaaS as lowest common denominator if your strategy is to enable switching between multiple public cloud IaaS providers.

When evaluating options that offer similar capabilities both on public cloud and private cloud, make sure to evaluate whether there is equal strategic investment and mind share in each solution, or whether there are hidden agendas. Remember that lock-in would then move to that provider, but it would enable multicloud functionality. As such, the longevity of the solution is an equally important evaluation criterion.

Keep apprised of container and container orchestration developments as a new means of application development and packaging, with the potential to enable fluidity between providers and reduce lock-in.

CIOs: Develop a Cloud Strategy

As a result of these benefits (speed, agility, composability, likely reduced cost if well-designed and executed), cloud computing is the new optimized design strategy for new applications, just like the internet replaced many client/server-based applications and client/server replaced mainframe-based applications. Cloud computing will become the dominant design style for new applications and for refactoring a large number of existing applications over the next 10-plus years. Therefore, cloud as an optimized style of computing is strategic to IT and is the underpinning of delivering on new digital business innovations. The bottom line is that cloud computing as a style of computing is strategic for your enterprise, and CIOs need to focus on it from top-down (business benefits and exploitation) and bottom-up (how to achieve it) perspectives.

A cloud strategy clearly defines the business outcomes you seek, and how you are going to get there. It specifies:

The scope of the cloud initiative

Expected business outcomes

Where and why you will exploit SaaS

A decision framework for using public cloud versus private cloud services for new applications

A decision framework for existing legacy applications and which ones will be migrated to an optimized cloud style of service, and guidance on public versus private cloud

Management, security and governance aspects of exploiting cloud services

External provider evaluation strategy

Investments required and time frames/milestones for execution of strategy

Architectural standards and considerations to drive reuse and agility, and, if desired, cross-cloud provider migration

Having a cloud strategy will enable you to apply its tenets quickly with fewer delays, thus speeding the arrival of your ultimate business outcomes. For example, it will allow you to establish a decision framework that can be used to automatically define whether new applications will be developed and/or operated in the public cloud or private cloud rather than requiring a separate intake process with every new project or product initiative. This will enable IT to deliver services faster without interruptions or delays. Where there are gray areas (for example in terms of regulatory issues), the intake workflow process could always include meetings to make the final decision, but you certainly don't want to do that for everything. (For more information on developing a cloud strategy, see "Cloud Strategy Cookbook" (https://www.gartner.com/document/code/292591?ref=grbody&refval=3369117) and Note 3.)

Recommendations:

As part of your cloud strategy, identify the key benefits you seek in using cloud computing. This should include proximity to customers and enabling employees to focus on a higher level of value.

As input to your cloud strategy, make sure you experiment thoroughly with public, private and hybrid cloud computing to understand where you can achieve value for different types of workloads.

Develop a cloud strategy that identifies where and how you will exploit cloud computing for new applications and for existing legacy applications (which may migrate to SaaS or need to be refactored or replaced).

Use your cloud strategy to develop policies on public, private and hybrid cloud services that can then be automated and abstracted away from the consumer of cloud services. This will reduce or eliminate the intake process for every new application development initiative.

Gartner Recommended Reading

"What CIOs Need to Know About Cloud Computing Roles and Competencies" (https://www.gartner.com/document/code/310409?ref=ggrec&refval=3369117)

"How to Establish a Service-Optimized Organizational Structure" (https://www.gartner.com/document/code/301661?ref=ggrec&refval=3369117)

"Moving From Project to Products Requires a Product Manager" (https://www.gartner.com/document/code/289817?ref=ggrec&refval=3369117)

"Clarifying the IT Service Manager's Role" (https://www.gartner.com/document/code/307978?ref=ggrec&refval=3369117)

"2016 Strategic Roadmap for Data Center Infrastructure" (https://www.gartner.com/document/code/308122?ref=ggrec&refval=3369117)

"Key Benefits of Continuous Integration and Delivery Combined With Cloud Computing" (https://www.gartner.com/document/code/291610?ref=ggrec&refval=3369117)

"Seven Leverage Factors That Will Deliver Higher Value and Lower the Risk of Your SaaS Contract Negotiations" (https://www.gartner.com/document/code/308773?ref=ggrec&refval=3369117)

"When IT Leaders Should Select Private Over Public Cloud Services" (https://www.gartner.com/document/code/273092?ref=ggrec&refval=3369117)

"Devise an Effective Cloud Computing Strategy by Answering Five Key Questions" (https://www.gartner.com/document/code/270415?ref=ggrec&refval=3369117)

"Evaluating and Negotiating Software License Agreements and Cloud Contracts Primer for 2016" (https://www.gartner.com/document/code/292951?ref=ggrec&refval=3369117)

Additional Gartner Recommended Reading Outside Your Current Subscriptions

"Gartner ITScore Transformation Roadmap: Achieving Enterprise IT Maturity Level 3" (https://www.gartner.com/document/code/308448?ref=ggrec&refval=3369117)

Note 1

About the Gartner Cloud Survey

The Gartner cloud adoption survey was conducted in 3Q15 using 6,723 responses from organizations with more than 100 employees in 10 countries: Australia, Brazil, Canada, China, France, Germany, India, Mexico, the U.K. and the U.S. Fifty-eight percent of the respondents indicated they were using or planning to use cloud services by YE15.

For more detailed analysis of the survey, see:

"Survey Analysis: How Cloud Adoption Trends Differ by Geography" (https://www.gartner.com/document/code/294427?ref=grbody&refval=3369117)

"Survey Analysis: How Cloud Adoption Trends Differ by Organization Size" (https://www.gartner.com/document/code/294426?ref=grbody&refval=3369117)

Note 2

Optimizing Application Design for Cloud Computing

Traditional applications were built with rock-solid infrastructure to support the applications and keep them running 24/7. Application developers didn't worry about the infrastructure failing because I&O engineers built an always-on platform. Optimizing application design for the cloud style of computing assumes there will be infrastructure failure, so solution architects and developers must design around it —

meaning they either have many replicated components such that any single loss is negligible, they simply restart the component elsewhere, or both. Enabling this type of restartability generally requires the application components to be stateless — meaning that any work that was being done is lost and must be started over and the infrastructure is immutable. Once provisioned, they stay the same; that is, they are unchangeable. If they fail, you can replace them with identical features. If required to change, they are replaced rather than directly changed. This is counter to stateful designs of traditional applications that are intended to maintain state and never lose a session, transaction, and so on.

The statelessness of the application offers the benefits of scalability and elasticity — meaning application components can scale dynamically to match increasing or decreasing demand. This typically offers the benefit of reduced cost of operation when you pay by use in the public cloud, or through increased asset utilization in the private cloud (thereby avoiding new capital expenditures for increased demand) when combined with dynamic optimization technologies. It also means achieving SLAs in a more dynamic and effective way. This contrasts with traditionally built applications that could not be dynamically changed and had to be overprovisioned to handle increased demand, thereby increasing the cost of operation.

One of the other key attributes of cloud computing is that services are delivered "as a service." This means there are no middlemen (or service tickets) between the requester of the services and the supply of them. The requester chooses services either through a request portal or via APIs, and they are delivered dynamically. The complexities behind service delivery are managed on behalf of the service recipient, who just sees fast, frictionless delivery. We liken this to democratizing IT, in that it arms everyone with the IT capabilities, thus increasing productivity (and potentially innovation) and shortening elapsed cycle times.

Note 3

There Is No One Universal Cloud Strategy

No one single cloud strategy dominates as a style of computing for existing or new applications; nor is there a single rule of thumb as to whether the public or private cloud should be favored. This will depend on many factors such as:

Is data center and infrastructure engineering a critical differentiator? For example, you may decide that your intellectual property should be developed with the cloud style of computing and operated in the private cloud on-premises versus other nondifferentiated areas where it makes more sense to develop and/or operate in the public cloud.

Is application engineering such as for Mode 2 innovation a critical differentiator (or do you primarily leverage packaged applications)? If you invest in application development focused on exploratory innovation, you will likely leverage public cloud computing either directly or through application outsourcing (this is due to both speed and lack of desire to invest in capital for areas where you don't know the result or whether they will succeed). If you mostly leverage packaged applications, you most likely will leverage cloud as a style of computing either as private cloud or as SaaS.

Are there regulatory requirements that may favor private cloud computing such as the requirement for the data to be kept in particular geographical or country boundaries?

Are there application classes that may favor public or private cloud computing other than greenfield or legacy applications? For example, there may be a desire to migrate customer-facing web applications to the public cloud to operate more closely to customers (for example, at more locations) with less latency and better customer experience.

Are there cost or maturity factors that may influence whether to operate in the public or private cloud? Often, bursty or seasonal workloads where there is significant variability in demand are more cost-effective in the public cloud because you don't have to own the infrastructure for occasional use. However, at the other end of the spectrum, often 24/7 production workloads are less expensive to operate internally (if you are fairly mature in your operations). Documenting your types of workload and benchmarking your costs of service delivery as well as by type of application service will help in developing the cloud strategy.

Does your company favor capital expenditure (capex) or operating expenditure (opex) spending? Generally those that favor capex prefer on-premises-owned infrastructure, while those that favor opex will favor nonowned assets such as public cloud computing or managed private cloud computing.

---

that have financial interests in entities covered in Gartner research. Gartner's Board of Directors may include senior managers of these firms or funds. Gartner research is produced independently by its research organization without input or influence from these firms, funds or their managers. For further information on the independence and integrity of Gartner research, see "Guiding Principles on Independence and Objectivity. (https://www.gartner.com/technology/about/ombudsman/omb_guide2.jsp) "