



## **Cloud Optimization – Expanding Capabilities, while Aligning Computing and Business Needs**

*A framework for making business decisions about cloud computing.*

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## Introduction

*Cloud computing provides improved resource optimization and enhanced capabilities for the enterprise.*

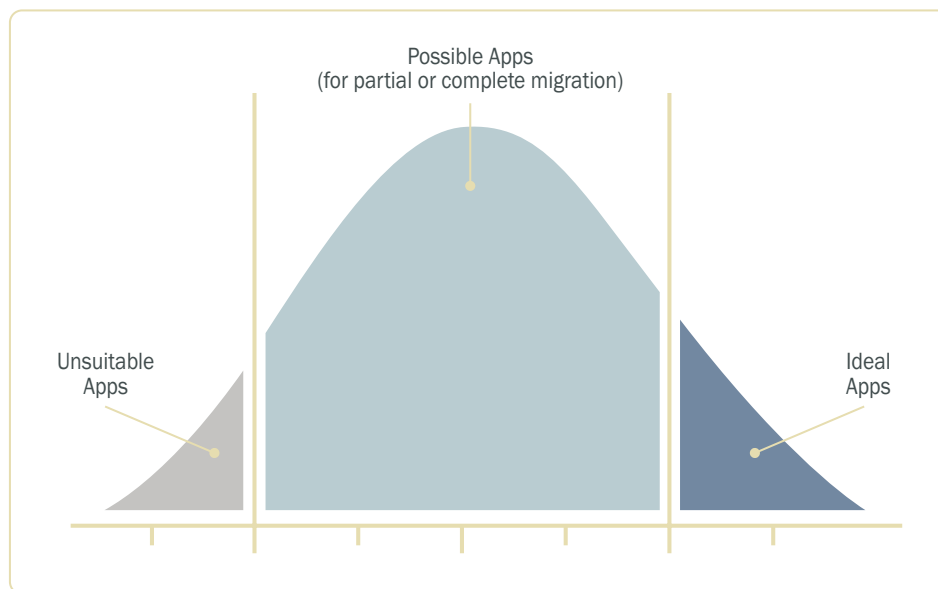
Successful enterprises fully use the resources they have to deliver superior products and customer experiences. In the past, many enterprise organizations gained economies of scale and computing efficiency through concentrating hardware resources—primarily servers in data centers—and leveraged virtualization to further improve efficiency. Containing costs and maximizing uptime often overshadowed everything else. The result? A constrained organization and an IT department and business on very different paths with very different goals.

Cloud computing now provides organizations with new ways to deploy and maintain enterprise applications—allowing for greater flexibility and reduced complexity.

Fully understanding the range of potential cloud computing benefits requires a broad perspective that recognizes that real computing resource optimization aligns computing capabilities with business needs. So, in addition to uptime, organizations can now achieve agility, integration, scalability, accelerated deployment, better utilization, and transparent cost accounting.

The key to making the most of cloud computing opportunities is determining which applications are best suited to the cloud versus an on-premises data center. Not all applications are appropriate for the cloud, and not all applications should be moved to the cloud.

### Enterprise Applications – Potential Candidates for Cloud Computing



*Figure 1 – Representative enterprise application distribution in terms of suitability for the cloud, derived from client portfolio assessments.*

For many applications, the cloud is an ideal solution, and for others, there is the option of moving parts of an application's architecture to the cloud to take best advantage of specific capabilities and services—while leaving other parts on premises. To determine which applications are likely to derive the greatest benefit from cloud computing, organizations will want to explore a number of considerations to help

guide decisions regarding deploying or migrating applications to the cloud. To make these strategic decisions, it is important to have a comprehensive understanding of the new cloud computing platform and services capabilities, which will provide organizations with opportunities to become more agile and responsive, while controlling costs and reducing complexity.

## Financial and Business Considerations

*Cloud computing offers organizations compelling financial opportunities.*

Informed decisions are effective decisions. Before making investments, enterprises need to understand the value their investments bring to the organization. Traditionally, understanding the value of capital investments for on-premises computing has been difficult. In an enterprise-owned and managed data center, it is possible to arrive at a gross Total Cost of Ownership (TCO) by adding up all related expenses, but it is typically very challenging to analyze those numbers to produce a real cost estimate per application. Without insight into what an application costs to deploy and maintain, it is impossible to understand the value of that application with respect to its cost.

The consequence of not being able to arrive at accurate Return on Investment (ROI) figures for on-premises computing consigns businesses to operate in a world of unknowns, which means that many businesses and their IT organizations lack the information they need to make strategic and well aligned decisions with respect to one another.

While cloud computing is not the solution for every application, it does provide crisp, detailed, and transparent cost and usage information for those

applications that are well suited to the cloud. Exact and granular application costs can be tracked; usage fluctuations can be understood, and the computing resource needs for any one application are not lost within the complexity of the data center as a whole. This detailed level of cost and usage data for enterprise applications provides businesses with the ROI data they need to support strategic business decisions.

### Rapid Deployment, Accurate ROI, and Business Value

*When a business group decides to design a prototype for a new application, the traditional deployment options have included either preparing a business case and requesting the capital expenditure, or trying to purchase servers using the group's own line-of-business budget and deploying a shadow app. Neither option has been satisfactory: The first typically involves a very long business approval, procurement, and deployment cycle; and in many cases, the length of time to deployment can exceed 12 months—leaving the business group to turn elsewhere to meet its commitments.*

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### Procurement and Deployment Cycle

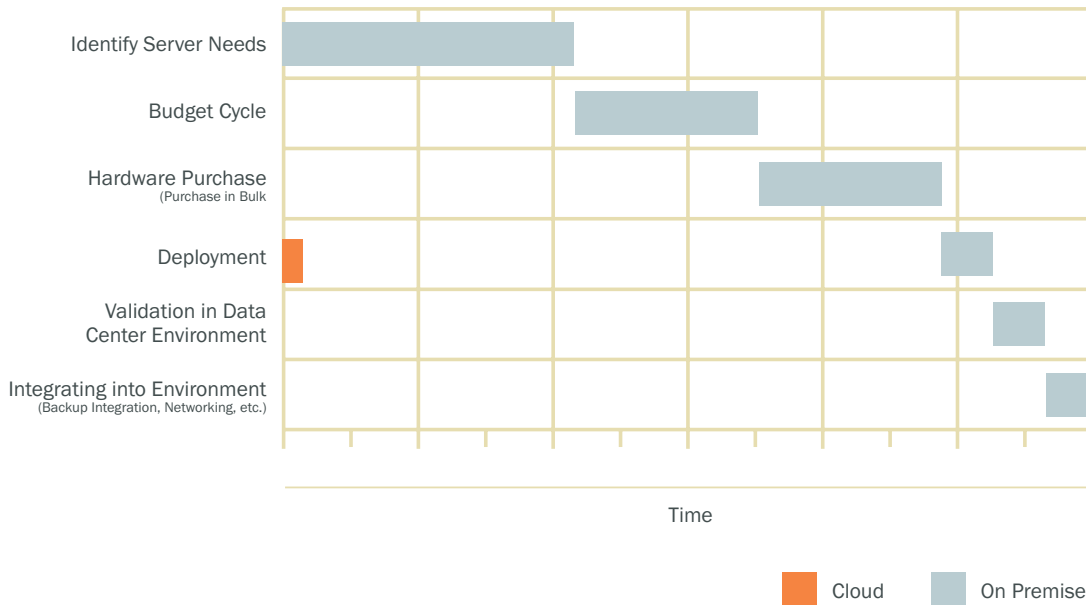


Figure 2 – Typical enterprise procurement and deployment cycle vs. cloud deployment, derived from client assessments.

The second option often allows the business group to deploy their application sooner, but the business group may lack the technical expertise to keep their own servers up and running, and they have no formal support structure to rely on when things go wrong.

Cloud computing offers options that allow business groups to deploy prototype or proof-of-concept (POC) applications rapidly, analyze and establish their business value, and use precise cost accounting to determine the new application’s ROI. Take, for example, a project that requires a robust web front end, a database server, and a file server. Purchasing hardware for this project would likely involve an up-front capital expenditure of approximately \$40K, which doesn’t include any ongoing maintenance, support, or infrastructure costs. To deploy an application with the same needs in the cloud would likely cost about \$400 per month—with no upfront capital expense. Additionally, the cloud application could be supported with an uptime Service Level Agreement (SLA) of 99.9% plus, and the application could be scaled easily.

When a business group deploys a POC application to the cloud, the group can set certain performance benchmarks to be measured over a set time period. At the end of the trial phase, the usage costs (~\$400/month) can be easily analyzed against the demonstrated value of the application to provide a clear ROI. The granular cost accounting data can also be used to easily project future costs.

### Sample Proof of Concept Application Deployment Scenario

Traditional On-Premise Costs	
5 Servers.....	\$40,000
Cloud Computing Costs	
Web Application Instance, Database, Data Storage, etc.....	\$400/mo.

Figure 3 – Figures based on an actual rapid deployment scenario.



*Cloud computing provides opportunities for IT to assume a greater role within the enterprise.*

The demands of building out, provisioning, and maintaining on-premises data centers to support new development, legacy applications, and backup and storage activities, requires organizations—regardless of their area of expertise—to become IT hardware specialists. Enterprise IT departments have traditionally been asked to support applications and maximize uptime while containing capital expenditures as much as possible. Striving to meet these perceived needs, organizations have prioritized uptime and adopted long procurement cycles. In some cases, this puts IT organizations out of step with the needs of the business.

When applications move to the cloud, hardware procurement and maintenance tasks are offloaded—freeing up IT resources to work on higher value, more strategic activities. Because new hardware resources don't have to be acquired to launch a new application, cloud computing enables IT departments to become more agile and more responsive to changing business demands. The capacity for rapid prototyping and proving concepts without up-front capital expenditures enables IT to say yes to many more requests.

While long procurement cycles and bulk ordering have traditionally helped IT departments keep hardware costs in check, these activities have taken IT's focus away from the primary direction of the enterprise. But, when IT can shift direction and is empowered to partner with the organization—instead of just serving it—IT gains value, currency, and relevance. Where the traditional model often produces friction between IT and other parts of the organization, cloud computing allows IT to move along the same path and brings formerly disparate objectives into alignment—making IT a true partner in achieving organizational goals.

#### IT as Business Partner

*For enterprise organizations, data center capabilities have been key because mission-critical applications must perform dependably and without interruption. But, when an enterprise data center is built to support flagship applications and support them with sufficient redundancy to provide five-nine (99.999%) uptime, how can that same enterprise IT department handle requests for smaller, line-of-business application development? And how can that IT department support rapid innovation and testing of new technologies? And what about supporting new web hosting, database development, and business intelligence applications?*

*The real problem is that the enterprise data center supports an organization's biggest, most costly, and most critical applications—but does so at significant expense. If an organization would fail without a key application, that expense can be justified. But, bringing many other line-of-business applications into the enterprise data center increases the deployment and maintenance costs of those applications beyond the point of justification.*

*When this happens, IT departments are faced with an unfair choice: Say no to otherwise reasonable business requests, or deal with a cost structure that is unreasonable for the value an application provides. What if IT organizations could remove the aspects of data center management that provide the least value to their organizations and at the same time increase the value of the activities they do perform?*

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And, if in doing so, they reduced their costs and their capital expenditure needs, it would allow IT organizations to become better aligned with the goals of the enterprise.

Cloud computing capabilities present IT departments with a far better choice: The decision no longer has to be between saying no and deploying an application that is not cost effective. Now the question is, "Where does an application best reside?" For some applications the question is actually, "Where does each part of an application's architecture reside?"

Fully exploiting cloud capabilities will provide higher value at lower costs—and will transition IT from simply supporting the enterprise in a reactive manner to leading it in a proactive manner. When IT takes its appropriate seat at the table to help guide the enterprise, the organization becomes unconstrained—no longer having to defer projects and delay innovation. This capacity for a true IT/business partnership will constitute a material advantage—positioning cloud-optimized enterprises to become industry leaders.

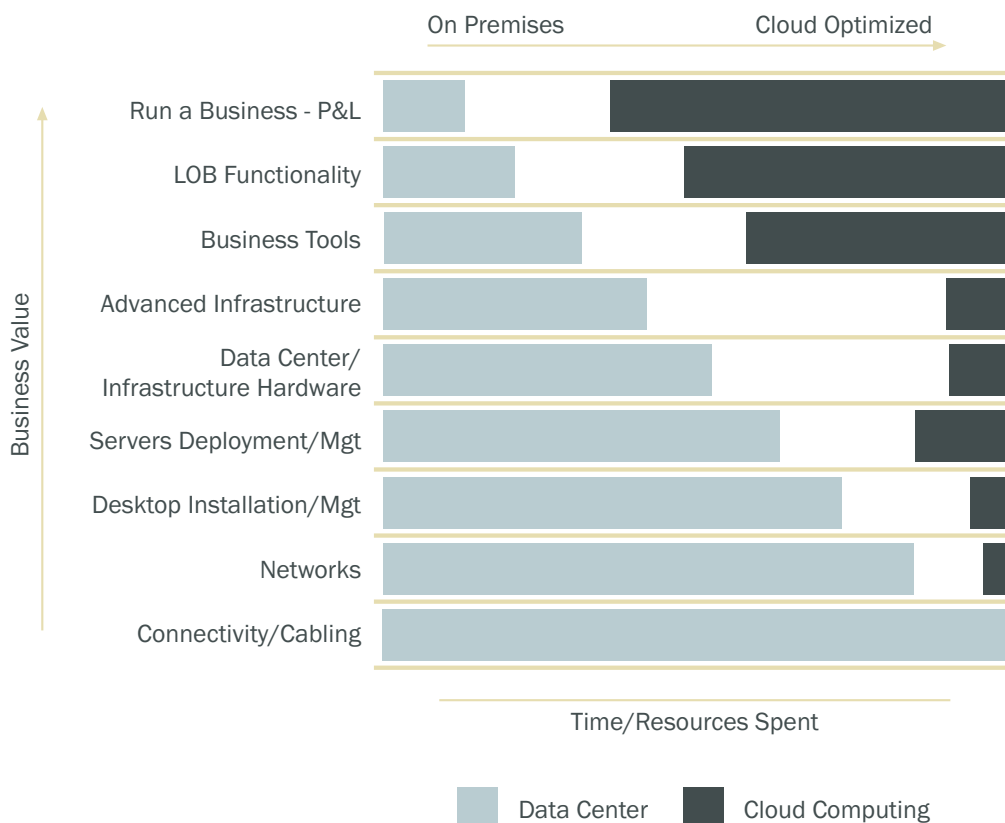


Figure 4 – Suggested change in IT activities when moving from an on-premises model to a cloud-optimized model; analysis based on conversations with industry professionals.

*Computing efficiency that is aligned with business goals is true efficiency.*

A well-conceived, virtualized on-premises data center provides optimum use of existing resources, but the up-front costs and procurement model make it very difficult to match those resources to business computing needs. At any given time, an enterprise likely has either too few computing assets or too many for the current demand. The traditional model makes it hard to answer tough efficiency questions:

- What percentage of existing computing infrastructure is being underutilized?
- How long does it take to deploy new software development lifecycle (SDLC) instances (dev, test, stage, prod)?
- When the development lifecycle is complete, what happens with the unused hardware?
- If extra hardware is onsite awaiting a business need, how much does it cost when not in use?
- When SDLC instances are no longer needed, what is the cost to continue maintaining the hardware?
- Do the servers have low utilization rates?

Cloud computing offers enterprises unparalleled efficiency because with the cloud model, organizations only pay for what they need. With no need to purchase hardware, new computing resources can be deployed on demand—making it easy to innovate and scale to match business needs. For applications running in the cloud, the maintenance costs for IT departments are low and predictable.

Even for legacy applications not wholly suited to the cloud, it is possible to migrate parts of these applications, and by doing so, IT departments adopt a more granular, transparent, pay-as-you-go model that can scale up—

and even more importantly, scale down—easily and efficiently. While not all applications would be cost effective in the cloud, the potential efficiencies and cost savings for appropriate applications can be stark, and in most cases migration complexity is not prohibitive. ROI gained from better efficiency and agility may well offset most costs associated with relocating applications to the cloud, and when computing costs track with business demand, true efficiency is achieved.

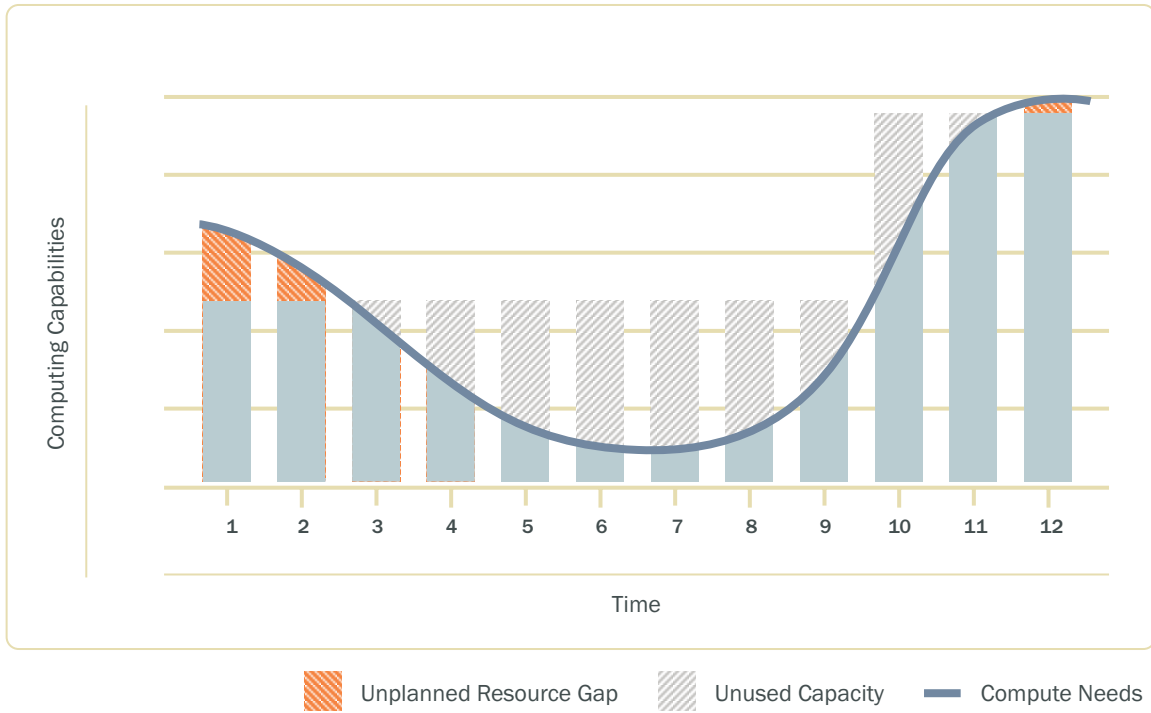
**Uneven Business Demand**

*For some organizations, business (and subsequently computing) demand fluctuates dramatically over time. One example is seen in the printing industry. Companies that print customer-created content such as photo books and calendars often experience dramatic spikes in demand leading up to and throughout the North American and European holiday season. Companies that actually sell the photo books online typically outsource the printing to any number of printing companies depending on the various printing companies' ability to meet turnaround times and other parameters. If the printing companies don't have the computing elasticity to meet the demand as it changes, they lose business. Purchasing the computing hardware required to meet seasonal spikes constitutes a significant capital expenditure, however, and only at the end of the peak demand cycle can the company assess the value of the investment.*

*But companies using cloud computing for computing elasticity are able to meet seasonal fluctuations like these without making capital expenditures. Perhaps even more importantly, when seasonal or other uneven business demand falls, a company taking full advantage of cloud computing sees their related expenses fall at exactly the same time. This flexibility is one of the compelling aspects of cloud computing.*



Seasonal Printing Demand Scenario - On Premises Computing



Seasonal Printing Demand Scenario - Cloud Computing

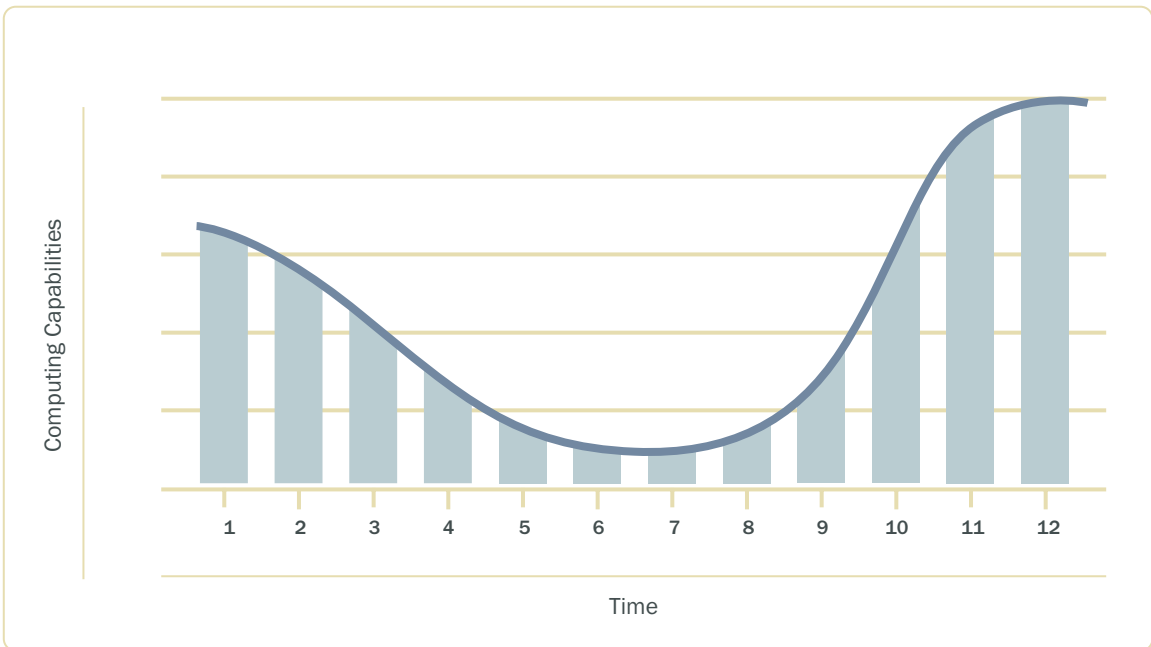


Figure 5 – Analysis based on assessment of compute demands for an industry leader in automated, mass-customized fulfillment for the consumer print-on-demand market.

— Compute Needs

## Service Level Agreements (SLAs)

*Enterprise data centers typically employ a “one-size-fits-all” approach to Service Level Agreements or SLAs, which for some applications may be a very high cost, low return answer.*

Many enterprise data centers are built with enough redundant equipment to support uptime of 99.999%—or five nines. For certain mission critical applications, this may be the only approach; however, many enterprises also support numerous line-of-business (LOB) applications that support business activities for small groups of employees. Some of these applications provide data management and automated workflow capabilities, which are very important to each group’s productivity, yet some of these groups may work in only one time zone and during standard business hours. For applications such as these, five-nine uptime may be very costly and unnecessary, and even for those applications with very high uptime requirements, the cloud allows for uptime that tracks with usage. A single instance can be guaranteed an uptime of 99.9%, and applications running redundant instances distributed across fault and upgrade domains can be guaranteed at 99.95%.

When applications are migrated to the cloud, they can be supported by a level of 99.9% plus—or three-nine or better uptime<sup>1</sup> at no additional cost, while there is a significant cost to achieving three-nine uptime in an on-premises data center, and the costs grow exponentially to achieve four and five nines. As part of an application portfolio review, organizations should question whether it makes sense for all of

their applications to be covered by the same SLA—and determine if applications with less stringent uptime requirements would cost less and work more efficiently in the cloud. By moving whole applications, or parts of those applications, and using SLA options based on application usage, cloud capabilities could help realize significant cost savings. Additionally, if such applications are migrated to the cloud, it may be possible to reallocate on-premises resources for more valuable purposes.

Since cloud computing offers so many choices, in cases where compute and storage SLAs don’t need to be the same, it is possible to choose the SLA that fits an organization’s need. And while planning to mitigate issues with uptime, external connectivity, data corruption, and failover are central for any organization, the methodology for achieving high SLAs may be different in the cloud than on premises—meaning the appropriate level of application support can frequently be achieved—but through different means.

As with all cloud-computing-related business considerations, the cloud simply offers new options to allow computing resource decisions to be made based on the requirements of each individual application and on the needs of the business.

<sup>1</sup> Depending on cloud provider.

## Data Considerations (Sensitivity and Regulatory)

*While effective data policy and management is critical on premises and off, data attributes will help guide cloud deployment and migration decisions.*

An organization's approach to sensitive and/or regulated data is critical both on premises and off because while the risks and exposure may be different, risk and compliance responsibilities exist with both models. Additionally, industry analysts agree that organizations should be working on policies and practices that protect their sensitive and proprietary data—even internally—whether that data is at rest, in motion, or in use:

*"The truth is that every business, regardless of industry, has some sort of intellectual property that has value. IDC believes intellectual property needs to be protected whether at rest, in motion, or in use." IDC<sup>2</sup>*

In some cases, internal applications will already contain encrypted or masked data that can be referenced by other parts of the application, and applications that already have sophisticated data security architecture may be good candidates for cloud computing—in whole or in part.

Some portion of an organization's most sensitive data, either for business or regulatory reasons, will need to remain on premises. And while every organization will need to fully understand its own data, the following is a partial list of data categories that may make specific tables less appropriate for migration to the cloud.

- Internal IP
- PCI DSS
- PII
- SOX and GLBA
- HIPAA

However, even though certain restricted data shouldn't go into the cloud, that doesn't mean that other parts of an application's architecture can't be moved. Partitioning

(or moving parts of) applications allows organizations to benefit from pushing certain compute cycles and other computing processes to the cloud—even while keeping specific data assets local.

As organizations confront the ongoing challenges of securing sensitive data wherever it resides, they will also have to be increasingly attentive to the costs associated with collecting, managing, and securing that data. For appropriate data, cloud computing changes the way organizations are charged for storing data—making costs transparent, more granular, and easier to track and analyze.

Even when data assets must remain on premises, applications with high compute needs that spike at particular times may be excellent candidates for partitioning to take advantage of cloud capabilities. Monthly payroll and specific financial applications are good examples: These applications may have high compute needs that spike weekly, monthly, or at quarter and year end periods. There is huge expense in amassing the appropriate compute capacity, and yet that capacity is likely idle much of the time.

Finally, when organizations think about moving their data to the cloud, they have to think about the origins of that data. When everything is on premises, it isn't necessary to think too deeply about how to connect to that data; however, in the cloud, it is important to know where data originates, where it is stored, and how it is accessed. Questions about authentication and encryption of data transactions will need to be addressed.

<sup>2</sup> International Data Corporation (IDC), Insider Risk Management: A Framework Approach to Internal Security, Sponsored by: RSA, The Security Division of EMC, Brian E. Burke Christian A. Christiansen, August 2009

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## Geopolitical (Restrictions and Requirements)

*Geopolitical considerations impact organizations whether their computing is on premises or in the cloud; however, specific geopolitical factors will guide cloud deployment and migration decision making.*

Geopolitical restrictions and requirements exist and impact all businesses and organizations that operate in multiple regions, and while there are many geopolitical considerations to explore when thinking about how to best structure an organization's computing model, the following is a partial list of key concerns:

- Legal Restrictions on Data Storage - Various countries and regions dictate by law where certain data must (or must not) be stored. For all organizations, it is important to review and understand the legal restrictions for all pertinent areas. When exploring cloud computing, the solution to such restrictions may be as simple as selecting a specific data center; however, in some cases, organizations will be limited and restricted in their ability to use cloud resources.
- Geo-Routing – Geo-routing is a very specific and very restrictive condition that impacts certain businesses, government entities, and non-governmental organizations (NGOs) operating in geographies with legal restrictions on where data can and cannot be transmitted. In most cases, entities impacted by geo-routing are well aware of the limitations, and because these restrictions require secure networks to prevent data from traveling through geo-restricted areas, entities subject to geo-routing provisions may not be able to use cloud capabilities—as geo-routing is not currently supported.
- Legal Tax Restrictions – There are tax restrictions and implications that dictate how organizations—and their customers and affiliates—are charged taxes. Many of these laws are currently in flux, which can make it difficult for organizations to make appropriate business decisions; however, it is important for organizations to investigate all applicable tax implications to understand how they will be impacted—whether computing on premises or in the cloud.

The main point about geopolitical issues is that all organizations need to understand the restrictions and regulations that apply to them. Whether computing on premises or in the cloud, these factors need to be understood and addressed. In some cases, the solutions will be simple—such as selecting the appropriate cloud-based data center; while in other cases, there may be no easy solution; and in some situations, a hybrid solution that utilizes both cloud and on premises resources may constitute an advantage. Either way, understanding geopolitical factors is the key to structuring either on-premises or cloud computing resources appropriately.

## Latency

*Latency is a consideration for all distributed computing, but with appropriate planning, organizations can use cloud computing to achieve both the benefits of a distributed model and appropriate application performance.*

Latency is a potential issue that pertains to all distributed computing models—regardless of whether or not the model includes the cloud or not. Since latency is simply the amount of time it takes for a computer to receive an answer back from another computer, latency is not typically an issue for computing resources that are in close physical proximity and where firewalls do not have to be crossed for the computing resources to communicate back and forth. However, there are many important business reasons why organizations would want to employ a distributed computing model:

- Ability to integrate computing systems with suppliers, partners, and clients.
- Capacity to deploy electronic ordering and invoicing with suppliers, partners, and clients.
- Ability to deploy mobile applications, which are typically worst-case latency scenarios.

To take advantage of these opportunities presented by distributed computing models, it is important to identify potential latency issues—but it is equally important to recognize that in most cases, application modifications can mitigate latency concerns. For many applications, latency differences between on premises and off are actually imperceptible to users, and in other cases, there is even the potential to use the distributed cloud computing model to one's advantage by selecting a particular cloud data center. Cloud computing capabilities can also be used as an advantage in the delivery of static content. Content Delivery Networks (CDNs) will cache files as close

as possible geographically to the end-user, thereby making it easier and faster for users to retrieve files. While latency must be a consideration when deploying any distributed computing resources, it should not be seen as a barrier—just as a factor in any optimized application architecture.

### Data and International Considerations

*In addition to ordinary data security concerns, some organizations have had uncertainties about storing data outside of their own country or within a cloud computing data center owned by a U.S.-based company due to fears about perceived vulnerabilities posed by laws such as the Patriot Act. The reality is that most countries have very similar legal provisions to those contained in the Patriot Act—or they have exemptions from certain protections for the purpose of national security, as the UK does with the Data Protection Act.*

*In most cases, governments, corporations, and non-governmental organizations (NGOs) work together cooperatively as part of a collective effort to support both security and a fair and effective business environment. Legal protections remain in place for businesses in the US, Europe, and elsewhere, and procedural safeguards tend to be respected by the vast majority of countries. In the end, of course, the decision about where particularly sensitive data sets should reside remains a question for each individual organization; though it is important to note that the opportunity to take advantage of application architecture that enables robust cloud computing activities still exists—even when certain data remains on site.*

## Deployment Speed

*Cloud computing allows organizations to deploy new applications faster than ever before, which presents significant opportunities both for innovation—and for implementing common sense guidelines to govern development activities.*

The traditional on-premises data center model has frequently dictated the pace at which enterprise development activities move. The nature of procuring hardware, hiring resources, and building and scaling out the necessary infrastructure to accommodate business applications has often been a natural limitation—keeping business growth in check because most development couldn't happen without significant investment. Solid business cases had to be made and approved before the resource acquisition process could begin. However, relying on this model to moderate business development and innovation has frequently had unintended consequences:

- When the IT response to a business request takes months to years, business needs often evolve before the procurement and development cycle is complete—potentially leading to solutions that no longer fit the business.
- Fairly or unfairly, business groups have often perceived IT as being slow to deliver business solutions.
- When business groups (marketing, finance, sales, etc.) have been unable to meet their commitments by working with IT, those groups have sometimes used line-of-business (LOB) budget to outsource development or deploy shadow applications.

- Organizations can become constrained by previous decisions, leaving hardware acquisitions underutilized or inappropriate for future needs.

Cloud computing capabilities enable unconstrained development, and when used appropriately, the new speed with which applications can be developed and deployed can become a critical competitive advantage. With this new freedom comes the opportunity to employ effective management policy to direct development activities and deployment to make sure that business groups remain aligned with organizational goals.

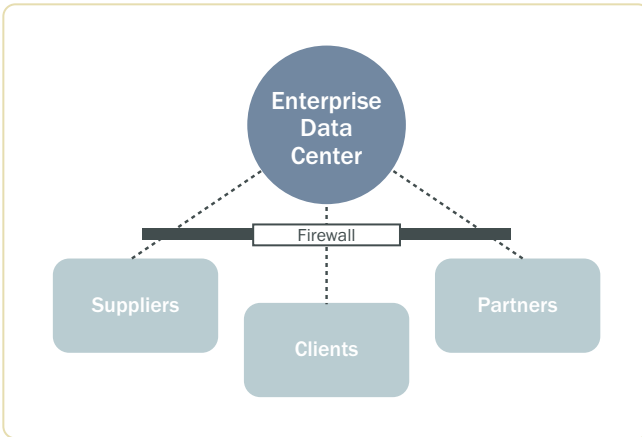
### Opportunity to Move Shadow Apps

*When business groups circumvent IT, purchase their own servers, and deploy their own applications outside the parameters of an organization's standard IT processes and policies, these applications are often referred to as shadow apps; they exist outside the secure data center, frequently without the knowledge or consent of the IT organization. The costs and risks associated with these shadow apps are hard to determine. And though often previously unaware of an application's existence, IT still may get the call when things go wrong, making shadow apps a serious source of frustration for many IT departments.*

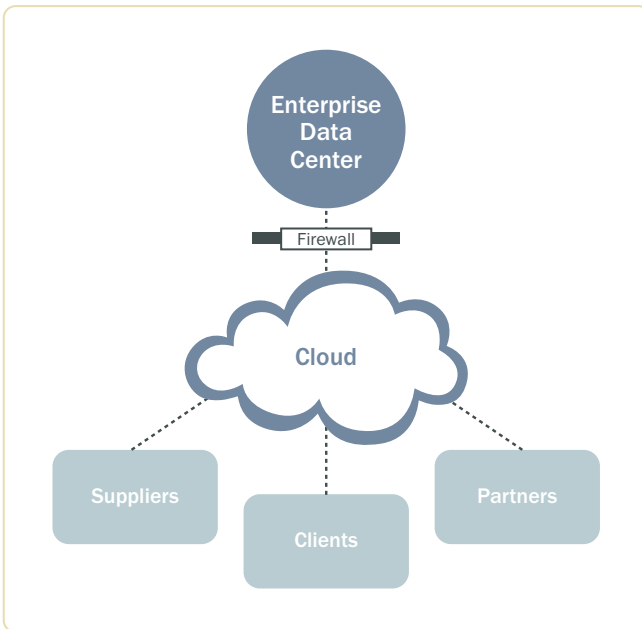
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## Distributed Computing



## Distributed Computing with Cloud



Cloud computing offers organizations an opportunity to eliminate the risks and costs these unsupported applications create. By migrating these shadow applications to the cloud, business groups go from relying on completely unsupported applications to having applications that are supported and secure—and can be governed by an organization’s standard IT policies. Since most shadow applications are relatively simple, migration efforts are typically not prohibitive, and cloud computing costs for this sort of application are often low and predictable. This is just one of the many ways that cloud computing enables IT organizations and business groups to work cooperatively on a better solution to more effectively meet the needs of both parties. Business groups get support, scalability, and peace of mind, while IT departments eliminate risk (potential liabilities related to privacy and data security), headaches, and unknown costs.

Figure 6 – “Secured networking needs are minimized; only the connection between the Data Center and the Cloud needs to be managed.”

- Logic20/20, Inc. Development Architect

## Conclusion

Cloud computing provides enterprise organizations with opportunities to achieve greater agility and far better resource utilization of assets. When organizations capitalize on these opportunities, they become better able to respond to market changes and can better align resources with business needs—all of which means that these organizations can focus their time and talent on core capabilities and organizational goals—not on managing data centers.

Cloud computing also challenges many long-held assumptions about the on-premises data center being the only answer for supporting enterprise applications. By providing scalability and elasticity—as well as strong SLA capabilities—cloud computing demands that organizations evaluate a new range of options. Relying exclusively on a traditional, on-premises data center can no longer be assumed to be the only safe and effective solution.

Organizations need not take an all or nothing approach to cloud computing, but by evaluating their application portfolios, many organizations will be able to use cloud capabilities to better meet business demands and achieve greater success and operational efficiency:

- Bring products to market faster.
- Adapt to market changes quickly.
- Scale up and down easily and efficiently.

- Lower capital expenditures and ongoing maintenance and infrastructure costs.
- Focus on core competencies—not managing a complex infrastructure.

Additionally, cloud computing provides new opportunities for individuals and business leaders to make more meaningful contributions. Cloud capabilities allow individuals and teams to focus on what they do best: develop software, innovate, launch products, and respond to customer needs. When organizations take advantage of these new cloud-enabled opportunities, individuals and teams are no longer bound by traditional limitations and can matter more to their organizations than ever before.

Enterprise organizations unsure about how to explore the potential benefits of cloud computing should empower their top designers, application architects, and IT professionals to test these capabilities now by deploying well-suited new projects and by migrating appropriate existing applications (including shadow apps). Many organizations are already learning how to exploit cloud capabilities to respond more rapidly and intelligently to changing conditions and to achieve a competitive advantage within their industry. By starting small—but starting now—enterprises will quickly begin to discover how they can use cloud capabilities to achieve previously unattainable goals.

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