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# The Cloud: Promises and Realities

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## Executive Summary

While it's true that cloud computing offers new levels of capability across the business spectrum, the ideal characteristics that users hope the cloud will deliver are a constant work-in-progress. Current economic circumstances continue to drive the demand for a more effective model of delivering applications and computing services. Yet while the technology evolves, users are encountering a range of cloud experiences, both positive and negative. As a result, a number of users and organizations still question the reality of what the cloud can deliver.

Today's cost- and resources-constrained business world requires executives and IT managers to constantly find new ways to innovate, and the potential that cloud services offer continues to be attractive. A recent study from the research firm IDC predicts that of the projected \$27 billion in net new IT revenue in 2013, 27% will come from IT cloud services. That percentage is likely to grow in subsequent years, and companies that don't position themselves as IT cloud services leaders will forfeit increasingly large portions of the highest-growth markets. In addition, some of the predictions maintain that many enterprise portfolios will eventually consist of hybrid collections of legacy, on-premise systems, hosted, and cloud-sourced offerings. The path toward this blend of services will require substantial development of cloud technology to truly live up to industry-wide promises.

This white paper explores some of the early drivers of cloud services and how they have influenced current expectations. We'll look at how different technologies have helped create those promises—some that have been realized, and others that haven't. Finally, we'll learn about the current realities of cloud computing as they relate to data control, performance, security, and ROI.

## What Is the Cloud?

The cloud can be defined as a computing paradigm in which scalable and elastic IT-enabled capabilities are provided as a service to consumers using the Internet. Cloud computing is a result of the development and convergence of a number of technologies, such as grid computing, virtualization, hosting services, service-oriented architecture (SOA), software as a service (SaaS), and utility computing. Each of these has played a role in the global advancement of the cloud among consumers and organizations. Cloud-based offerings feature a number of different attributes and include the following:

- Scaled infrastructures
- Internet-accessibility
- Consumption-driven
- Easily purchased and billable services

- Multi-tenant framework for diverse clientele
- Dynamic, configurable resources

As the complexity of computing evolves on a global scale, the delivery of applications and services requires an agile and flexible service-oriented system. Today's increased focus on outcomes and consumption models means that public cloud providers must employ every available approach to streamline efficiency and deliver cost-effective products. These approaches consist of specific design models, architectures, technologies, and best practices to ensure their service succeeds. While this is especially good news for consumers and organizations, it also bodes well for the ongoing development and growth of the cloud.

As specific approaches are shown to lower costs and provide greater flexibility, they can be applied to a company's internal system in the form of a private cloud. Like public clouds, a private cloud exists within the boundaries of an organization, and access is limited to internal users. In the case of hybrid cloud computing, public cloud services are combined with private cloud features and serviced by an internal IT department or provider.

The future promises further variations on these cloud combinations. For example, large cloud providers can partner with infrastructure providers to create private cloud appliances of their public cloud offerings, and then make them commercially available.

According to recent cloud research from IDC, public cloud services adoption will grow at over five times the rate of the IT industry to \$29B in 2011. This is an increase of 30 percent from 2010, and the figure is expected to reach \$55B by 2014. As the cloud phenomenon continues to evolve, a number of questions have yet to be answered. Some of these include:

- How will cloud computing evolve as global connectivity expands?
- What will full-scale adoption mean for individual companies?
- Can cloud computing meet the increasing complexity of the business-service model?
- How will cloud computing transform markets and industries as it develops?

The cloud is a revolutionary concept, still at the beginning of its evolutionary path. For example, processing facilities now provide computational services that save customers the expense of buying more computers. Cloud storage services offer the means for storage provisioning that no longer require users to purchase farms of storage networks and servers. Applications can be provided through SaaS providers, alleviating the need for software and license purchases. Fundamentally, this reflects a significant change in how individual users and companies use technology and interact with each other, now and in the future.

## Promises of Cloud Computing

### Cost Savings

The cost savings that cloud offers to companies can take a number of forms. However, some of the key ways that cloud can increase financial benefits for an enterprise are:

- Reduce operational costs by increasing data center automation

- Forgo capital investment for IT projects/provider performs datacenter management
- Decrease in costs for application deployment
- Shift resource allocation according to market fluctuations
- Increase investments in business initiatives over data center management

## Software Development

Software development represents an important way that cloud can help companies achieve a true competitive advantage. For example, in terms of adding SaaS capability, it can be as easy as getting an account on a supplier's host. Cloud computing services speed up new application development by delivering software in terms of minutes and hours, as opposed to days and months. The massive scale on which cloud providers operate also means that large-scale applications can be swiftly developed. One example is that users who purchase infrastructure as a service (IaaS) capacity can quickly configure virtual machines (VMs) to supply the computing power on a scale that would formerly have been impossible to achieve. Software development represents an area where cloud easily meets, if not exceeds, expectations.

## Computing Power

Many companies will eventually find themselves confronting the question: Which services should be moved to the cloud and when? Ultimately, the answer needs to balance both the risks and rewards. The cloud's elastic scalability allows businesses to:

- Serve larger audiences
- Solve bigger, more challenging problems
- Provide on-demand computing capacity
- Ramp-up and grow new projects as needed

The cloud's computational power provides companies with an exponential increase in the number of applications offered and users served. This not only adds broad efficiency to a company's business processes, it can also profoundly alter internal relationships. For example, cloud services such as automation can allow IT to focus more on business and less on technical maintenance.

## Automation

Previously, when it came to software updates, back-ups, and storage distribution, hands-on IT maintenance was an integral part. Now, cloud automation of maintenance tasks is extensive. Thus, there's less need to add skills or technologies; you can leverage those you already have in place. Cloud vendors provide access to automate across all your systems, to initiate processes from anywhere, and easily evaluate output and benchmarks.

For example, during moments of high demand, a company can expand its data infrastructure into the cloud, (i.e., cloudbursting) to handle the increased volume. Normally, the number of internal and external toolsets necessary to manually execute and document the process would be nearly impossible for IT to manage. Cloud automation provides a way to handle the negotiation of each tool's execution and security system.

## Infrastructure Simplification/IT Freedom

Cloud computing shifts the emphasis from static, stand-alone application silos in an enterprise to dynamic, shared environments. It offers an innovative model for delivering IT infrastructure, applications, and data, allocated among various tasks and accessed through the network. The virtual datacenter in a public cloud environment can significantly transform an enterprise infrastructure. Some of the ways include:

- Increased access to CPU cycles/decreased need to purchase more computers
- More data storage without adding onsite servers or extra physical storage
- Automation capability frees up IT
- Agile response to market fluctuations, reduced time-to-market
- Lower-cost application deployment

## Multi-tenancy

As mentioned previously, cloud offers the ability to consolidate IT resources, enables access for multiple users, and provides a common infrastructure for numerous applications. In this regard, multi-tenancy is a key attribute of both public and private clouds. It applies to all three layers of a cloud: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). Multi-tenancy enables providers to make a single instance of a software application available to multiple customers, or “tenants.” In contrast to a single-use server that runs one application per user, (i.e., single-tenancy), multi-tenancy disallows any changes to be made to software code by users. Providers can easily perform single updates to affect all instances of the software, passing on the cost benefits to companies.

## Realities of Cloud Computing

Today, cloud computing is a reality for many Web users, whether they recognize it or not. Amazon, Google, and a host of other providers offer 24/7 services that many general Internet users access without serious security considerations. For companies, from start-ups and small-to-mid-sized businesses (SMBs) to large enterprises, the case for moving business activities to the cloud is more complex. For example, there are certain applications that corporations would rather run on their own servers due to concerns about application and data control. While these companies would like to capitalize on the flexibility and potential cost savings the cloud offers, many remain noncommittal, awaiting improvements and further developments as cloud processes mature. Although the cloud is beyond the point of experimentation, organizations are just beginning to realize the true benefits.

## Security

Since its development, unanswered questions remain in regards to how the cloud model will work with complex business-critical services, especially around issues of security. The degree of concern is related to the kind of cloud environment a company chooses: public or private. In terms of public clouds, the shared computing environment is unrestricted, allowing access to all individuals, companies, or other kinds of organizations. Fears in regards to adequate data security are compounded by issues related to compliance, governance, and reliability. For example, the flipside to multi-tenancy is that a company’s data could reside on the same resources as a competitor’s applications and data. This omits the isolation and safeguards that a dedicated server provides.

Other key security issues relate to:

- **Data location:** processing and data storage can take place anywhere around the globe with legal jurisdiction implications
- **Data segregation:** content resides in shared environments where encryption methods and data protection can be ineffective
- **Recovery:** concerns exist in regards to data and application infrastructure replication and recovery
- **Investigation:** ever-changing hosts and data centers make data-breach inquiries difficult
- **Long-term data viability:** assurance that providers will maintain continued solvency and independence

### Fail-safe Reliability

As the April 2011, disruption of Amazon's Web Services, and other outages and security breaches have indicated the public cloud's reliability can be problematic and inefficient. This means that companies still face uncertain data stability when deciding to move operations to the cloud. Another area is related to compatibility issues. For example, synchronization between cloud-based implementations and proprietary software versions, such as e-mail and calendar services, can be problematic. Moreover, uptime Service Level Agreements (SLAs) that guarantee performance standards may also be ineffective. They can end up offering little in defining how to validate the SLA, unless procedures are clearly defined at the outset of the agreement.

The rapid rise of the use of cloud providers and the fact that many providers are still refining and testing their platforms means that outages will continue to occur, some having more impact than others. While high availability within a cloud infrastructure is desired, it may ultimately require customized back-end architectural modifications by customers to achieve.

### Integration Factors

Companies see the cloud as an extension of existing IT resources and as a means of broadening business strategies. However, business applications typically operate in silos, disconnected from each other. Therefore, integrating them with cloud-based services to achieve an end-to-end business process can be a costly and time-consuming task. Moreover, integration between on-premise and cloud applications is becoming increasingly complex as well as imperative.

Some organizations are using hybrid combinations of SaaS-based applications, hosted cloud platforms, and their own private cloud. As a result, batch uploads, read-only integration, and cloud silos are no longer adequate for gaining sufficient parity between the separate hosts. Organizations will face an increased need to mediate and monitor information flows between their internal infrastructure and external cloud services using simpler methodologies.

### First Adopter Costs

Much of what we've come to understand about the cloud's business-related effectiveness has come from the experiences of first adopters. For this sector, in some respects, the cloud is a commodity. It requires upfront capital and the capacity to weather a multitude of possible complications. For many of these companies, while throughput, availability, and reliability are the goal, they must be willing to take risks.

The upside and the downside for these companies mean that the public cloud offers the potential for achieving early competitive advantage while also risking insolvency. Some of the challenges early adopters face:

- Manageability/reducing SaaS silos
- Lack of cloud security standards
- Creating a unified platform/cloud-to-cloud integration
- Confirming SLA guarantees
- Avoiding provider lock-in/flexible transitioning between providers

## Conclusion

At the most fundamental level, cloud adoption requires that organizations and users learn to trust the cloud with their data. Cloud providers must continue to innovate and improve their data processing capabilities, and users need to accept the challenges and rewards that are part of any new technology adoption. Our current state of cloud computing has its basis in this process of evolution. Consequently, the cloud industry has emerged as an aggregator industry with enormous promise and equally large unseen risks.

In terms of the cloud, each company's unique make-up will dictate an equally exceptional solution. Variations on the hybrid cloud model, for example, provide companies with a host of processing alternatives. For instance, a customer can keep its large database servers with regulated data on dedicated internal machines and move parts of less sensitive applications to the public cloud. This scenario is just one example among innumerable solutions that cloud computing makes available. However, managing "big data" within the cloud has become big business, and effectively managing "big data risks" is a new area of focus.

The emergence of cloud computing offers a new opportunity to shape the relationship between those who use IT services and those who sell them. As the cloud matures and gains an increasing number of adherents, from SMBs and start-ups to enterprises, it requires increased levels of data protection and insurance from a range of threats. As with any evolving technology, today's businesses must understand how best to leverage the advantages that the cloud offers and guard against its deficiencies.

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## About the Author

Kerry Doyle writes for a diverse group of companies based in technology, business and higher education. As an educator and former editor at PCComputing, reporter for PCWeek Magazine and Associate Editor at ZDNet.

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