TECHNOLOGY SERIES

White Paper

Cloud Computing Promises: Fact or Fiction

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TABLE OF CONTENTS

Introduction

Cloud computing is currently making information technology headlines, and vendors are aggressively promoting the many benefits it can provide organisations. These benefits appear so compelling that on the surface it seems all IT can and should be moved "into the cloud". Upon closer inspection, however, for every benefit cited, questions can also be raised. This White Paper addresses the claims and questions that are often raised in relation to cloud computing and provides a clear view of what the cloud can—and can't—deliver in reality.

Business needs have driven the evolution of IT delivery.

1. Cloud Computing Technology Is Revolutionary

Cloud computing itself is not a technology. It is the combination and integration of a number of technologies, none of which are new. Rather, cloud computing can be considered an evolutionary stage based on the maturity of a number of technologies. Key technologies that have facilitated cloud computing include:

- High-speed networks
- Extremely powerful and low-cost compute power and memory
- Virtualisation technology—processors, memory and networks
- Software that manages large-scale virtualised systems
- Stability and wide acceptance of the Internet, including mobile Internet usage

The progress of the above technologies has coincided with a period where global economic conditions have forced organisations to streamline and maximise cost efficiencies; therefore, business needs have driven the evolution of IT delivery into what is now called cloud computing rather than it being a new revolutionary technology.

Cloud computing delivers scalable software across the Internet.

2. All Software Applications Delivered over the Internet Are Cloud Computing

Software applications have been delivered over the Internet for many years. Vendors using this mode of delivery have, until recently, been known as Application Service Providers (ASP). The financial model for this mode of software delivery is typically the same as on-premises software—annual license fees. Customers of ASP software benefit from a reduced on-premises IT infrastructure and a reduced requirement of administrative support. High-speed Internet connections and low-cost machines running browsers are all that is required. With all the publicity surrounding cloud computing today, many ASPs are marketing themselves as cloud computing providers, even though much of this marketing is only a ploy to increase sales by promising cloud computing while the companies aren't actually changing their mode of service delivery.

Like ASP, cloud computing delivers software across the Internet. The term for this is Software as a Service (SaaS). But is SaaS any different from ASP? The answer most definitely is yes. SaaS has a number of key characteristics that distinguish it from ASP implementations, including:

- SaaS is instantaneously self-provisioned—no setup is required, the software is immediately available
- SaaS is elastically scalable—capacity will automatically adjust in response to varying loads
- SaaS is payment model proportional to usage, although some SaaS is free to use, e.g., Google Apps

Contrast this to many ASP offerings where the following apply:

- Software runs on a fixed-capacity server that can experience overload during periods of high usage
- Provisioning requires dialogue with sales representatives and a commissioning period before software is available
- Payment model is typically an annual license based on a fixed number of users

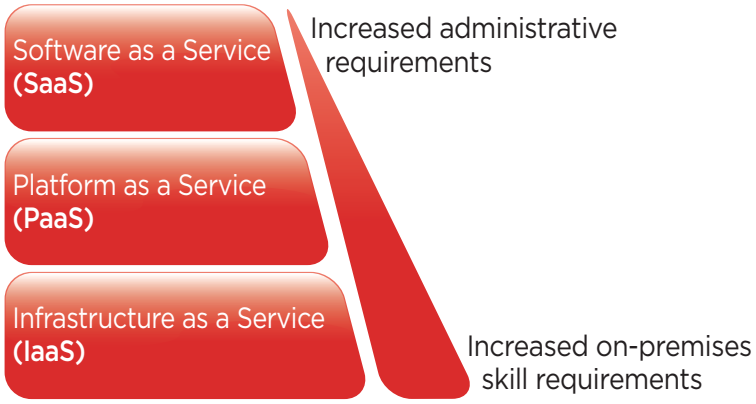
The IT department cannot be completely eliminated.

3. Cloud Computing Removes the Need for an Internal IT Department

One of the major benefits ascribed to cloud computing is reduced costs. In particular, a reduction in IT administration requirements resulting in either smaller IT departments or no IT support at all. To consider this in more detail requires examination of which IT services can be delivered via the cloud. Earlier, we defined SaaS. In addition to SaaS, computing platforms can also be delivered from the cloud. Platforms incorporate the execution environment for applications as well as the tools used to develop the applications. A typical platform may be comprised of an operating system, a database, server software and application software. The delivery model for this type of service is known as Platform as a Service (PaaS), and examples include Microsoft Azure and the Google App Engine.

The cloud can also deliver Infrastructure as a Service (IaaS). With IaaS, servers, networks and load balancers can be instantaneously self-provisioned from the cloud on a pay-per-use basis. An example of this kind of provider is Amazon. IaaS requires on-premises network and development machines, and the administrative tasks are similar to on-premises hosting. The only difference is the physical hardware being administered is off premises.

The diagram below shows the three delivery models of the cloud. The amount of on-premises IT support and skill required by an organisation increases proportionately from top to bottom.



- Whether or not an organisation can reduce its IT department depends on the level of services being used from the cloud
- SaaS—requires on-premises networks and low-power, low-cost machines
- PaaS—requires on-premises network and development machines, and fewer administrative server tasks

In summary, the requirements placed on the IT department and any associated administrative support depend on the types of services being leveraged from the cloud. One thing that is clear, however, is that the IT department cannot be completely eliminated.

An existing code base may require modification to meet the requirements of a cloud infrastructure.

4. Applications Can Be Moved without Change to the Cloud

A common misconception is that in-house applications can be moved without change to the cloud. This is potentially possible, but it depends on the motivation for the migration. Objectives for transferring an on-premises hosted application to the cloud include:

A. Reducing application-hosting costs
B. Making use of the transparent scalability of the cloud
C. Leveraging the scalable storage of the cloud

All of these can be achieved through appropriate deployment of IaaS or PaaS. Reducing application-hosting costs is achievable without application modification as long as a cloud vendor provides server images that can host the application. As an example, consider a Microsoft .NET Web application using a SQL Server database. This could be moved to Amazon EC2, which provides self-provisioned servers that can execute such applications. In such a case, the application can be moved without modification. This is similar to outsourcing application-hosting to a third-party provider but with the major advantage that the server(s) can be instantaneously provisioned and payment is by CPU hour compared to a provisioning time (typically one or two days) and an annual contract. A cloud environment can also be configured to make use of the elastic scalability of the cloud, with more servers being added and removed automatically to meet variations in application load and satisfying objective B.

Objective C requires modification to the application code base and possibly the underlying architecture. Major vendors including Amazon, Google and Microsoft all provide scalable storage solutions that require using the vendor-specific APIs and only run on the vendor's own cloud.

When exploiting PaaS, an application must be modified or specifically developed for that platform. Microsoft with Azure and Google with the App Engine, for example, have specific requirements detailing how applications must be packaged and what the code can do, so an existing code base may require modification to meet these requirements. For instance, moving a .NET Web application to Microsoft Azure requires the code to be packaged as Web roles, which will then execute in the Azure cloud.

The cloud offers financial savings in more than one way.

5. The Cloud Will Always Save Money on IT

Cost reduction is a primary business motivator for adopting cloud computing, but quantifying cost savings in building a business case is not always easy. Quantifying cost savings is relatively easy for SaaS but becomes increasingly more difficult when it comes to PaaS and IaaS. PaaS and Iaas often have factors that are difficult to measure, such as application modification time, running pilots, and the cost of training a staff in cloud computing skills, amongst many others.

The cloud offers financial savings in more than one way, however. The most obvious is the potential to reduce IT spending on existing requirements. Another is how it allows a business to be more agile and increases revenue by providing low-cost, low-risk self-provisioning IT. This allows organisations to explore new opportunities that may have previously presented too high an investment risk/reward ratio.

In summary, when it comes to saving money on IT, small- and medium-size organisations can generally benefit from leveraging cloud computing. Larger organisations may not benefit financially from cloud computing due to the economies of scale that they can apply to on-premises IT provisioning. However, other advantages such as on-demand provisioning and reduced administration cloud computing may prove beneficial to the business and offset the cost differences.

Moving from one cloud provider to another is not always a seamless process.

6. Cloud Computing Resolves Performance Problems

Elasticity and a seemingly infinite amount of compute and storage capacity are often touted as major benefits of the cloud, but while these are clearly significant benefits, they are not measures of application performance. Poor performance issues are often caused by infrastructure capacity problems rather than poor application implementation. If an application running on a server becomes overloaded and all users are affected, then the users suffer poor response times, plus the application has a performance problem.

Cloud computing can certainly provide solutions to infrastructure capacity problems due to its elastic scalability, but performance will often vary. The Google App Engine will provide an application with all the compute and storage capacity required, but it will not be high performance. PaaS delivery models such as Google App Engine and Microsoft Azure provide satisfactory performance. Only IaaS can provide high performance, and even this isn't always a sure bet.

There are a number of reasons why this is so. Cloud providers may oversell their capacity, causing performance problems that are totally out of the hands of the cloud user. In addition, virtualisation software runs on a multitenant architecture, and what other tenants are undertaking on that infrastructure plays a significant part in performance at any particular moment in time. So while the cloud provides the ability to improve performance problems through increased capacity, only satisfactory or acceptable performance, rather than high performance, should be expected.

Software should be moved to a cloud if it benefits the organisation.

7. All Software Should Be Moved to the Cloud

The attractive benefits of the cloud may encourage organisations to try to move all computing to the cloud. For some organisations, reducing the on-premises IT to an absolute minimum is appropriate. For others, internal IT departments with software development teams are essential as the bespoke software they develop enables the organisation to gain competitive advantage.

In considering what software is suitable for cloud delivery, key features such as self-provisioning, off-the-shelf, pay-per-use, elastically scalable, and access anywhere are all attractive and can help build a business case for cloud adoption. However, arguments against moving to the cloud include custom-built, on-premises software that is accessed only on the premises with little or no variation in load or demand.

Moving from one provider to another is not a seamless process.

8. It Is Easy to Switch Cloud Computing Vendors

There are currently no standards in the cloud, so moving from one provider to another is not a seamless process. In selecting a provider, a number of key questions need to be asked.

For SaaS

- How can I retrieve my data from the cloud, and what format will it be in?
- Do other cloud providers support this data format?
- Do any other providers provide equivalent applications?

For PaaS

- Do other vendors support the platform?
- Is the application tied to my current vendor's platform?
- How much work is required to rework my application to make it compatible with another vendor's platform?

For IaaS

- Can another vendor easily recreate my infrastructure?
- Does my application use vendor-specific infrastructure features?
- How much work is required to rework my application to make it compatible with another vendor's infrastructure?

Switching IaaS vendors can usually be achieved with minimal disruption. For example, a Linux infrastructure on Amazon EC2 can easily be replicated on GoGrid's cloud. Similarly, Microsoft Office Live can read SaaS data stored on Google Apps. The tightest coupling of vendors' products, making it the most difficult to switch vendors, is PaaS. For example, an application using Microsoft's Azure is tied to Azure. Similarly, an application developed for Force.com will only run on the Force.com platform. Some PaaS offerings provide looser couplings, such as Google App engine, but some modification to code is still required to move to another provider.

On a case-by-case basis, the cloud offers a computing environment at least as safe as noncloud computing systems.

9. Cloud Computing Is Not Secure

Security is without a doubt the most debated cloud computing topic, and it is not possible to say definitively that cloud computing is or is not secure. Much depends on the type of service utilised, the service provider and the service user.

Here is a sample of the factors related to security that should be considered:

- Loss of governance—Tenants may not have control over certain issues, yet would still be responsible for their outcomes.
- Isolation failure—In a multitenant environment, isolating tenants from each other is the responsibility of the cloud provider.
- Compliance risks—If a cloud customer has to meet regulatory or industry standards, e.g., Payment Card Industry Data Security Standard (PCI DSS), then the failure of the cloud provider to meet the standards compromises the cloud customer.
- Management interface compromise—A third party may gain unauthorised access to applications.
- Data protection—Where is your data stored and how is access to it controlled? What procedures are in place to ensure complete data deletion?
- Malicious insiders—Ultimately, some users have to have access to your cloud account, and the trust they are afforded may be broken.

While cloud computing presents unique security threats, the majority of them are general application and infrastructure concerns, which have proven solutions. The major cloud-related security threats are loss of governance and those that result from multiple tenancy of cloud resources. If these can be resolved on a case-by-case basis, the cloud offers a computing environment at least as safe as noncloud computing systems.

It is very difficult, if not impossible, to directly compare what two providers offer.

10. Moving to Cloud Computing Just Requires a Credit Card—It's Computing as a Utility

Cloud computing is often considered utility computing where only a credit card is required to sign up and start using the services. From there, it is a pay-per-use model, just like a utility at home. While this analogy is somewhat true, it is not the whole story. Consider the process of selecting an electricity provider for your home. Factors that customers consider are price, reputation of the vendor and contract length, among others. But whichever vendor is selected, electricity is delivered to the home and all your appliances work with it. Selecting a cloud provider is not so straightforward. The lack of standards and platforms means it is very difficult, if not impossible, to directly compare what two providers offer. In many cases, alternatives may not be available due to such factors as the programming language an application is developed in, and making a selection often includes a relatively lengthy pilot process to test the vendor's products.

In Conclusion

Many people are still unclear about the advantages and disadvantages of cloud computing. In addition, vendors often promote it as a panacea and absolute necessity for competitive advantage. This White Paper has attempted to clear up some of the confusion surrounding cloud computing by examining the main benefits as well as considering potential drawbacks.

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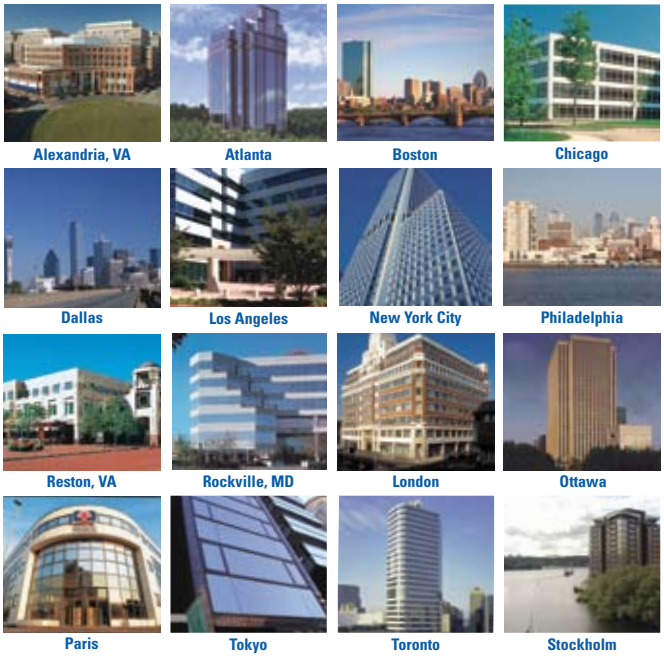

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