

Understanding Cloud Computing

A white paper for executives making decisions on computing resources

Executive Summary

Cloud computing offers companies the option of transferring their IT operations into an on-demand environment, where they can develop, deploy, and manage applications, and pay only for the time and capacity that they need. Many of the top hosting providers now offer cloud services.

Any type of company that requires application hosting could potentially benefit from the provisioning of computing infrastructure resources as a service. In addition to the economic advantages of an on-demand computing environment, companies also enjoy the flexibility of being able to scale their services up or down to accommodate changing needs or business requirements, without having to invest in new equipment.

The three primary factors to be considered when deciding whether to leverage cloud computing and which provider to choose are:

- Reliability
- Availability
- Scalability

Due diligence is necessary to determine which provider can meet a company's service, support and scalability needs. A consultant with experience in cloud computing can provide important information on cloud-based services, from application hosting to storage services to infrastructure redundancy, as well as help transition a company's IT infrastructure into an elastic cloud environment.

Intended Audience

This document is intended for IT executives and senior managers responsible for computing resources. This document assumes a basic level of technical competency, and is intended to help you decide whether cloud computing is the best option for your needs.

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This white paper is sponsored and presented by PhD Computing, a full-service web development company with more than a decade of experience providing web development, web design, search engine optimization (SEO), technology analysis and scoping, and webmaster services. PhD is an experienced cloud computing provider, and offers a no obligation consultation to help companies determine whether cloud computing is right for them.

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The concept of cloud computing, in which a business transfers computing requirements to a cloud computing provider, has evolved from a niche operations model into the mainstream.

Several major tech companies now offer their services as cloud computing vendors, alongside dozens of smaller providers. The research firm IDC predicts the global market for cloud services will reach \$42 billion by 2012. According to the same report, spending on cloud computing will accelerate throughout the forecast period, capturing 25% of IT spending growth in 2012 and nearly a third of growth the following year. An ABI Research study predicts that cloud computing will also change the face of the mobile application world by 2014, generating a projected \$20 billion in revenue.

Every type of company, regardless of its application hosting needs, is a candidate for cloud computing. For smaller companies, it provides a low upfront cost into hosting with the ability to scale up as needed. A medium-sized company would benefit from immediate access to computing resources that would typically require significant upfront capital and staff to support, as well as a global reach and redundancy that economically may not be otherwise attainable. For large companies, cloud computing also provides important redundancy and solution scalability, but when a custom environment becomes necessary it may be time to transfer from a public cloud solution to either a dedicated hosting environment or a private cloud:

Public Cloud: A hosted cloud computing environment that does not rely on hardware or datacenter infrastructure that is owned by the company. The company typically pays a monthly fee to a third party provider based on resource usage. This is the most familiar type of cloud computing. Public cloud offerings are available from companies such as Rackspace, Amazon EC2, and Google Apps.

Private Cloud: With this approach, the concept of cloud computing is internalized within a company. The underlying technology that allows IT systems to obtain and use resources on demand is still in place, but the company is typically the only user of the resources and it is hosted in the company's own datacenter, or a dedicated area in a shared datacenter.

One analogy describes cloud computing as taking a taxi rather than buying a car. You still get where you need to go, but without the upfront investment. However, some taxi drivers, like some cloud computing providers, are more experienced than others, and while letting someone else take the wheel may alleviate some of your responsibilities for the drive, it doesn't eliminate the possibility of a costly accident. Before launching your data into the cloud, it is wise to research potential vendors on such key issues as reliability, control and support.

What is Cloud Computing?

Cloud computing offers such physical resources as processors and storage as online resources that can be accessed much like a utility (the electric company for example). Cloud solutions typically utilize some form of computer clustering to achieve this provision of resources, which can be granularly assigned to customers on demand.

There may be a temptation to equate cloud computing with computing in a virtual environment, but there are key differences between the two approaches. At its core, virtualization is designed to take one physical server and partition it to act as multiple "virtual" servers. Cloud computing is architected in such a way that one physical server is added to a cluster (a group of servers) that can be used as one large logical resource. Some providers have used virtualized to achieve their cluster and called it cloud computing, but cloud is elastic and charges only for usage. Virtualization still requires the purchase of a fixed partition or resource.

By hosting applications in a cloud environment, a company's computing infrastructure is treated as a utility service. Since there is no need to purchase hardware, such concerns as computing capacity, bandwidth and storage are no longer issues.

For example, if a company purchases a physical server for its computer needs, it is limited to the capacity of that server, and must pay for its continual usage, even during off-hours and evenings when it may not be necessary. With cloud computing, a company severs the tie to physical hardware, receives access to massive computing and storage resources from a cloud vendor, and pays only for the services and usage they need.

By migrating computing and storage outside an enterprise and into a public cloud environment, a company defines its resource requirements, lets someone else worry about the hardware and software, and pays only for what they use.

The services provided by cloud computing can be categorized as follows:

- Infrastructure as a service (IaaS)
- Platform as a service (PaaS)
- Data storage as a service (dSaaS)

Infrastructure

Customers use the provider's control panel and/or application program interface (API) to start, stop, access and configure their virtual servers and storage. With cloud-based hosting, a company receives guaranteed processing power, as well as scalable bandwidth for storage and Internet access.

Platform

Platform services include operating systems and required services that focus on a specific application, as well as access to necessary services and specialized local resources. Developers create these applications on the provider's platform over the Internet, typically through APIs, website portals or gateway software.

Data Storage

The user pays only for the storage capacity they need, and the bandwidth required for that storage. The scalability of this service allows companies to add capacity as needed, on demand.

Advantages of Cloud Computing

A primary goal of cloud computing is to reduce the cost of computing resources, while increasing system flexibility and scaling.

Should a company need short-term server access, cloud computing offers a means to acquire it without signing a long-term agreement, and you can power it off when you are done and pay only for your usage. Those with consistent and ongoing requirements can still avoid investment in expensive servers, or the need to hire multiple systems administrators to keep their IT efforts running at optimum efficiency.

Since all data and applications are collected and stored “in the cloud,” access to this information may be obtained from any computer with Internet access, not just the one in the office. Thus, cloud computing can make services more accessible, such as sending emails or invoices, reviewing photos or documents or setting up appointments from home, the office or on the road. Files on computers and mobile resources can automatically be synchronized.

For mission critical data, companies are advised against having all of their data housed in one physical location. However, the creation of geographical redundancy through a replica environment can be costly. Cloud computing automatically disperses hardware in multiple locations and often on international servers, so there is never a question of redundancy if one breaks down. If a server becomes overloaded, the clustering technology used in most cloud computing environments permits online migration, through the aggregation of multiple operating systems on a single computer.

There are environmental benefits to cloud computing as well. Information can be stored in a climate that minimizes energy usage. And because servers can be shared in a virtual environment, the result is fewer servers and a reduction in the power required to operate and cool them. This helps to minimize a company’s carbon footprint.

Choosing a Provider

There are three main factors that should be considered when deciding whether to go with cloud computing and which provider to choose:

- Reliability
- Availability
- Scalability

Reliability

The cloud computing market is evolving, so a company must consider the risk in trusting its data with one provider. Are they committed to a true cloud environment for the long term or are they simply re-branding an existing infrastructure to capitalize on the industry excitement around cloud computing? Is the provider capable of adapting to the challenges of cloud computing as it evolves? It is important to research the provider that will host your company’s infrastructure and understand their current and long term strategy for

their cloud offerings. As with any outsourced relationship, if they have issues, you'll have issues.

Availability

What kind of network will your information be sitting on? Are the specific platforms and technologies you require available to you through your cloud provider? How far can you scale up? What are their hardware SLAs? How will they support your company from a customer standpoint? Will you still need to have some IT experts on staff, or will the company provide a completely managed solution? Assess the availability of the network, and how the provider deals with crisis situations if the unexpected occurs.

Scalability

Many companies are taking a second look at operational overhead in this current economy. It is important to find a cloud computing provider that recognizes your needs and can accommodate your scalability requirements. Cloud computing is unique in that it allows you to scale up or down, on demand. Your provider should meet your core business objectives, without requiring you to pay for capacity you cannot monetize right now. For companies that only require minimal resources, there are entry-level solutions that bill only for your actual usage with no minimum fees. Then, as business increases, it is possible to increase capacity accordingly, without making any technical changes.

Issues and Challenges

Privacy and security are two key considerations when deciding whether to leverage a cloud computing environment. Existing encryption standards help to satisfy some privacy concerns and help protect cloud computing data. However, cloud is inherently a shared environment. Segregation of data is achieved through various methods but often relies on a software layer such as a virtualization hyper-visor. While not a prominent industry concern to date, software segregation does have the potential for vulnerabilities that could lead to compromise of data privacy.

No system is infallible. In March of 2009, Google Docs inadvertently opened a small number of private documents to unauthorized parties. According to Google, just 0.05 % of accounts were affected, which translates to 2,200 users out of a total of more than 4.5 million.

Since security and availability incidents are a reality of any computing environment, it is wise for a company to take a few basic precautions, such as maintaining geographically disperse data backups, and creating a contingency plan for any downtime that may result from a system failure.

Another potential issue is the technical migration into the cloud environment, which may require additional programming, provisioning, set-up and changes in your applications, depending on the provider. These services will require the expertise of an IT professional.

Conclusion

Given the significant investment being made in cloud computing by many of the world's leading companies, it is possible that the movement to shift data and applications from individual systems to the cloud environment is just getting started. New technologies and capabilities may result in a further evolution of the cloud computing model. Companies presently considering such a move must weigh the advantages against the potential drawbacks, and decide if they are ready to launch their data into the cloud. Before doing so, a consultation with an experienced cloud computing provider is the best way to determine an effective course of action.