Cloud Computing: Business Edge

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Abstract
Cloud computing comes into focus only when you think about what IT always needs: a way to increase capacity or add capabilities on the fly without investing in new infrastructure, training new personnel, or licensing new software. Cloud computing encompasses any subscription- based or pay per use service that, in real time over the internet, extends IT's existing capabilities. It is a style of computing which is having dynamically scalable virtualized resources provided as a service over the Internet. It reduces the time required to procure heavy resources and boot new server instances in minutes, allowing one to quickly scale capacity, both up and down, as ones requirement changes. In this article we try to cover the issues that a company needs to consider when evaluating a cloud service and also identifies some issues and risks involved in controlling cloud computing services and provides recommendations on their appropriate use. We have also discussed about the predictions and future of cloud computing, it is imperative for these enterprises to critically evaluate the feasibility of this technology for their specific businesses. Cloud Computing has many antecedents and equally as many attempts to define it. Cloud Computing offers flexibility whilst simultaneously reducing costs – with the positive side effect of sustainability.

Keywords
Services, Future of cloud computing, Predictions

I. Introduction

A Cloud is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource(s) based on service-level agreements established through negotiation between the service provider and consumers. 'Existing technology such as grid computing, utility computing or adaptive computing mark the infrastructure path leading to Cloud Computing; application service providing and Software-as-a-Service signify the growth towards the provision of programmes. Cloud computing technology is enabling IT to do more with the infrastructure that already exists, as well as adding new ways to expand capacity quickly and economically by using external cloud computing resources. This technology is enabling IT managers to treat infrastructure as a common substrate on which they can provision services to users faster in a much more flexible and cost-effective way –without having to re-design or add to the underlying infrastructure. Given the benefits of cloud computing, its broad appeal is not surprising. However, this new approach does raise some concerns. Chief among them is securing data in the cloud. Cloud Computing it's simply means computing over the Internet. The Internet is usually visualized as Clouds; hence the term CC for computing has been done through internet. With CC end users can access datacenter and computing resources via the Internet from anywhere, for as long as they need, without disturbing about the maintenance or management of actual resources.

Cloud Computing is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the internet. It includes Software as a service, Platform as a Service and Infrastructure as a service. Cloud computing enables users and developers to utilize services without knowledge of, expertise with, nor control over the technology infrastructure that supports them. Cloud computing represents an externalization of information technology applications and infrastructure beyond an organization's data center values. By making data available in the cloud, it can be more easily and ubiquitously accessed, often at much lower cost, increasing its value by enabling opportunities for integration and analysis on a shared common platform. Organizations explore cloud computing as a way to reduce costs, improve service and free internal resources to focus on differentiating mission critical activities. Cloud computing shifts the responsibility of configuring, deploying and maintaining computing infrastructure from clients to Cloud providers.

From a hardware point of view, three aspects are new in Cloud Computing.

- The illusion of infinite computing resources available on demand, thereby eliminating the need for Cloud Computing users to plan far ahead for provisioning.
- The elimination of an up-front commitment by Cloud users, thereby allowing companies to start small and increase hardware resources only when there is an increase in their needs.
- The ability to pay for use of computing resources on a short-term basis as needed (e.g., processors by the hour and storage by the day) and release them as needed, thereby rewarding conservation by letting machines and storage go when they are no longer useful.

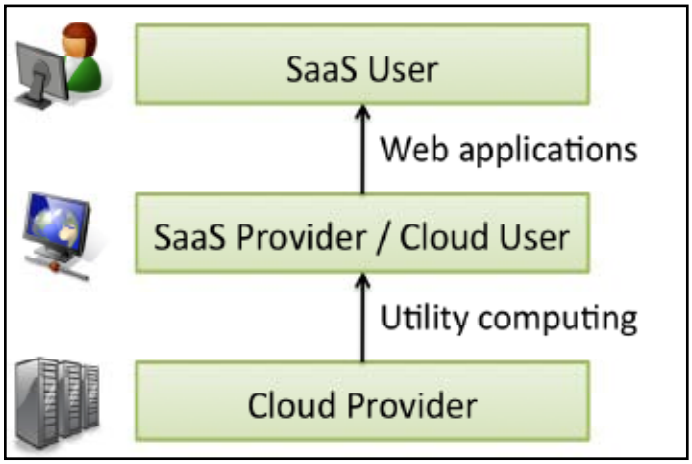

Fig. 1: Users and Providers of Cloud Computing

The benefits of SaaS to both SaaS users and SaaS providers are well documented, so we focus on Cloud Computing effects on Cloud Providers and SaaS Providers/Cloud users. The top level can be recursive, in that SaaS providers can also be SaaS users.

II. Services

A. Infrastructure as a Service

A Cloud is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource (s) based on service-level agreements established through negotiation between the service provider and

consumers. Like Amazon Web Services provides virtual servers with unique IP addresses and blocks of storage on demand. Customers benefit from an API from which they can control their servers. Because customers can pay for exactly the amount of service they use, like for electricity or water, this service is called utility computing. Servers, storage systems, networking equipment, data centre space etc. are pooled and made available to handle workloads. The customer would typically deploy his own software on the infrastructure. Some common examples are Amazon, Go Grid, 3 Tera, etc.

B. Platform as a Service

Platform as a Service provides a development platform for developers. The traditional programmers write their own programming and upload that file into the datacenter of the cloud and present it on the internet. Platform as a service is a set of software and development tools hosted on the provider's servers. Developers can create applications using the provider's APIs. Google Apps is one of the most famous Platform as a Service Providers. This phase also provides the environment to build the application to the traditional programmers. Thus the work of Platform as a Service is to provide the services as a platform, to develop the softwares or specific applications to work over the cloud. Clients have control over the deployed applications and environment-related settings. As with SaaS, the management of the underlying infrastructure lies within the responsibility of the provider.

There are mainly four types of solutions of Platform as a Service:

- Social application platforms
- Raw compute platforms
- Business application platforms
- Web application platforms

C. Software as a Service

SaaS clients rent usage of applications running within the Clouds provider infrastructure, for example SalesForce. The applications are typically offered to the clients via the Internet and are managed completely by the Cloud provider Software as a Service is the broadest market. SaaS allows the customer only to use its applications. . A single instance of the service runs on the cloud & multiple end users are serviced. On the customers side, there is no need for upfront investment in servers or software licenses, while for the provider, the costs are lowered, since only a single application needs to be hosted & maintained. One big benefit of SaaS is that all clients are running the same software version and new functionality can be easily integrated by the provider and is therefore available to all clients.

III. Cloud Computing Concerns

Security of the valuable data of the end-users is now become very important issue as it may lead to big problem if any unauthorized user can access it. Whenever he got access to that data he can misuse it, therefore CC has to be aware to their valuable data. There is some availability in the architecture of CC, hence at some places the network utilizes the outer computing resources or they might not be fully protected; hence, there is essential requirement for implementing appropriate regulatory compliance policies

IV. Benefits of Cloud Computing

A. Faster Implementation

Compared with the amount of time required to set up a new solution internally within many organizations, a cloud based implementation can be achieved relatively quickly. Cloud reduces the overall administrative overhead, therefore further speeding up the process.

B. Security

Cloud computing minimizes infrastructure risk is by enabling surge computing, where an enterprise data center (perhaps one that implements a private cloud) augments its ability to handle workload spikes by a design that allows it to send overflow work to a public cloud. For many small and medium sized organizations that do not necessarily possess dedicated security resources or know how; a move to the cloud can result in improved security.

C. Lower Cost of Entry

Cloud Computing can be less expensive than hosting systems and services internally. Applications are developed more by assembly than programming. This rapid application development is the norm, helping to reduce the time to market, potentially giving organizations deploying applications in a cloud environment a head start against the competition.

D. A Mobile Profile

Since all is accessible through internet, it will be accessible globally. It will be too much beneficial for a small and medium sized enterprise that is not willing to invest a lot in network setup and wish to free from maintenance.

V. Features of Cloud Computing

Cloud computing brings various benefits among the three categories:

- Economic: It helps in reducing the IT costs
- Architectural: Improves the Experience of the end users
- Strategic: helps that the companies focus on the core competencies between various companies.
- Cloud Service Level Agreements (SLAs)

Most subscribers of a cloud service may feel as though they are getting into an arrangement where it appears as though vendors create the SLA's for their own protection against litigation, with minimal assurances to a tenant. IT managers can focus on the following SLA tips with a vendor.

A. Data Protection

where there is a clear definition as to who will have access to the data and the levels of protection in effect for their data some questions are:

- How will data be encrypted?
- How will compliance be addressed?
- What are the levels of access control?
- How is data center secured?
- What happens to the data if the service providers are switched?
- How often are audits done and what type of auditing tools are in place?
- How is data detection handled?

B. Continuity

One has to consider what happens in the event of an outage or another related event that causes data to become unavailable. Some questions to consider here are

- How will the vendor define a services outage?
- Will there be scheduled vendor downtime for maintenance etc?

Costs: on cost to consider are:

- Will there be or are there current licensing fees above and beyond sated vendor service fees?
- Does the vendor offer price protection?

VI. Predictions

Appirio's predictions reveal that in spite of our current economy, cloud computing will continue to see strong growth and investment over the next year – a prediction that industry analysts agree with as well.

The "cloud of clouds" expands but sees traction revolve around open platforms. We will see Microsoft and other traditional software players invest even more in new but closed cloud platforms. At the same time, proponents of a more open approach, like Amazon, Facebook, Google and Salesforce, will push more and deeper "cloud connections".

At the best, Microsoft Azure will be better platform for exchange. Microsoft will continue to shower attention on Azure but will see relatively limited adoption from ISVs and customers. While it will likely disappoint users and remain well behind established cloud players for the first few years.

Google doubles down on the enterprise, enterprises return the favor by racing to Google Apps. Google has already shown they're serious about winning over enterprises with acquisitions.

VII. Research Issues

The general cloud computing approach discussed so far, as well as the specific VCL implementation of a cloud continues a number of research directions, and opens some new ones of resources and complex control images for those resources, including workflow-oriented images. Temporal and spatial feedback large scale workflows may present is a valid research issue. Underlying that is a considerable amount of meta- data, some permanently attached to an image, and some kept in the cloud management databases. Cloud provenance data, and in general metadata management, is an open issue.

Open challenges include: How to collect provenance information in a standardized and seamless way and with minimal overhead – modularized design and integrated provenance recording; How to store this information in a permanent way so that one can come back to it at anytime, - standardized schema; and How to present this information to the user in a logical manner- an intuitive user web interface.

VIII. Future of Cloud Computing

As new offerings like Amazon's Cloud Front, Microsoft's Azure, Hosting.com's CloudNine and VMware's Cloud are rolled out week in, week out, the worldwide Cloud computing momentum continues to grow.

A. Peter Coffee

Director, Platform Research – Salesforce.com

Developer communities and system integrators will defect, in growing numbers, from established enterprise software vendors that have failed to deliver real innovation and value during the past several years.

Software market cycles will rapidly accelerate to web speed, with multiple release per year, rather than the glacial pace of multi year upgrade cycles that currently results in most IT sites running legacy versions of cumbersome bloatware.

B. Geva Perry

GM of Cloud Computing, Giga Spaces

Trend of Large Vendors Entering Cloud Computing will Accelerate with more coming from these vendors as well as VMW are, Citrix, Sun, HP, Cisco, Intuit, Symantes, Yahoo and others.

Platform-as-a-Service will take its first steps into the Mainstream such as Heroku, aimed at Ruby-on-Rails, will be in a particularly strong position to take advantage of this trend.

C. Markus Klems

Research Assistant, FZI Research Center for information Technology

- Cloud computing will certainly fuel the Saas business. More and more Desktop applications will turn into services or at least hybrid online / offline apps that live in the Cloud.
- Scalable, on-demand middleware is an appealing vision for large enterprises: avoiod bottlenecks by outsourcing parts of the middleware infrastructure into a SOA- Cloud.
- Amazons' new Web Service CloudFront points at the promising future for DIY Content Distribution and Media Hosting.

IX. Cloud Computing Service Provider

Cloud Computing has emerged as one such concept that allows an entrepreneur to avoid capital expenditure (CapEx) on hardware, software and services, and pay provider only for what they use. These are Amazon web services, 3Tera, Force.com., Appistry-Cloud computing middleware, Microsoft Live Mesh, AppNexus, Flexiscale, GoogleApp Engine, GoGrid, Terremark Enterprise Cloud.

A. High – level challenges

1. Cloud Service Immaturity

The cloud computing space is still in a state of relative immaturity. Vendor fluctuations and various service approaches are likely to make this a volatile segment in the short term.

2. Vendor lock-in/ Dependency

Given this immaturity and volatity, vendor dependency or vendor changes must be considered, including the ability to continue business operations.

3. Risk Assessment and Management Difficulty

Risk assessment and management are difficult in many cases due to poor vendor transparency, inflexible terms of service, lack of a negotiated contract with the vendor (as opposed to a "click through" terms of service imposed on all users), and lack of right to audit.

4. Cost / Benefit Profile Uncertainty

Recent surveys suggest that the cost / benefit of cloud services is difficult to assess. A significant proportion of institutions that have and used cloud services indicate the cost/savings realized by using cloud services was estimated incorrectly, and that they have been unable to effectively monitor cost / savings or have

only been able to do so with great difficulty.

X. Risks

Once the high level challenges are understood, the next step is to consider the risks and determine whether / how to appropriately mitigate those risks in the context of the proposed information and / or service.

A. Vendor Trustworthiness

How do we establish an adequate level of trust in a cloud service provider? How do we ensure our trust boundaries do not extend farther than intended when using a cloud service vendor?

B. Integration

How will we manage the integration so such cloud services with current information and / or information services.

C. Data and Intellectual Property Issues

What are the potential for and the consequences of information loss, leakage or services? What are the risks to involved intellectual property? What response plan will be followed if a data breach occurs? How is the data owner notified?

D. Recorded Preservation, Access and Management

How would we manage preservation, access, retention and disposal of information? How would we ensure that university information is securely removed form the vendor's equipment if necessary?

E. Responsibility / Liability

What is the relative liability for lost data / revene accepted by the vendor and retained by the university? How will liabilities related to lost or altered data be shared between the vendor and the university?

F. Vendor Location

What are the implications of the vendor's location on compliance, cultural, timeliness and support level issues?

G. Human Resources Safeguards

How does the vendor select, vet, and train its employees to minimize risks to the privacy, security and integrity of client data.

H. Operational Flexibility

What is the effect of the potential loss of flexibility or life cycle control over the service? How would we be alerted to vendor service changes that could impact our operations?

I. Security / Safeguards

How do we satisfy ourselves that the vendor will employ and maintain adequate safeguards based on the sensitivity and criticality of the information or / services involved.

J. Confidentiality / Privacy

What are the privacy risks and / or open records consequences of the information and / or service involved? Can we control how our information may be used by the vendor? Does vendor use or intended use of information conflict with nondisclosure agreements the university has entered into regarding such information?

K. Legal/Regulatory Consequences

How does the use of a cloud service impact our ability to comply with various legal requirements (e.g., HIPAA, FERA, PCI-DSS, E-discovery, state data protection laws, export control laws)? Do laws where the vendor is incorporated or locates its servers (which may include foreign laws) potentially apply.

1. Recommendations and Strategies

The following recommendations and strategies are intended to assist units in their approach to evaluating the prudence and feasibility of leveraging cloud services.

(i). Risk / Benefit Analysis

units considering university services that may be delivered using cloud technology or new services provided by cloud technology must indentify and understand the risks and benefits of the service. Consider the security and privacy objectives of confidentiality, integrity, availability, use control and availability and determine what would happen if these objectives were not met.

(ii). Consultation

Consult with appropriate data stewards, process owners, stakeholders and subject matter experts during the evaluation process.

(iii). Lower Risk Candidates

When considering university services that may be delivered using cloud technology, ideal candidates will be those that are non-critical to operations involve public information and otherwise would require significant internal infrastructure or investment to deliver or continue delivering internally.

(iv). Higher Risk Candidates

University services that are critical to the operation of the university or involve differentiating or core competencies, and / or involve restricted, or critical information or intellectual property are necessarily higher risk candidates and require careful scrutiny.

(V). Consider "Internal Cloud" Alternatives

Due to the decentralized nature of the university, some duplication of effort is inevitable. "Large enterprises should generally avoid placing sensitive information in public clouds, but concentrate on building internal cloud and hybrid cloud capabilities in the near term,"

XI. A Security Analysis of Cloud Computing

With its ability to provide users dynamically scalable, shared resources over the internet and avoid large upfront fixed cost, cloud computing promises to change the future of computing.

A. Cloud Security Concerns

One of the more notable security incidents occurred in March, 2009 with Google Docs, when a system error allowed the content of private documents to be exposed to everyone for a brief period of time. As a result of this security breakdown, a public interest group, The Electronic Privacy Information Center (EPIC), filed a detailed complaint with the Federal Trade Commission requesting an injunction against Google offering the cloud service until" safeguards are verifiably established" claiming Google's inadequate security is a deceptive business practice.

Situations like this one and other possible security problems have prompted numerous articles (for example The Twitterhack is Cloud Computing's fig. 2.

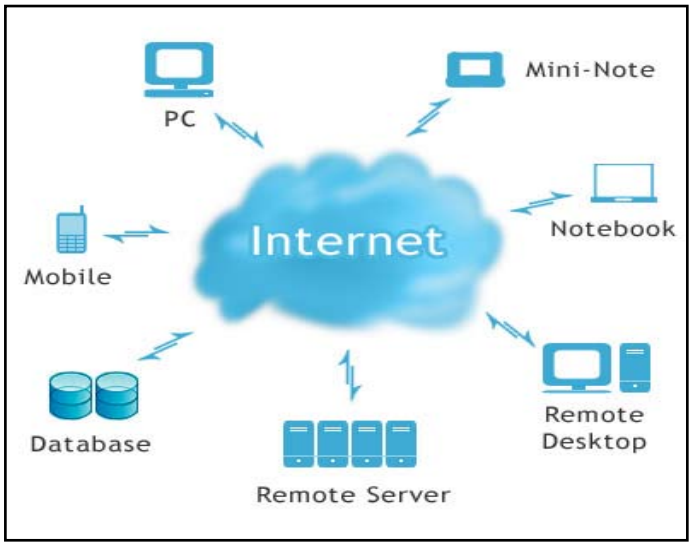

Fig. 2:

Wake – Up Call: Time for Security that works) and white papers on cloud security. The cloud Security Alliance, a non-profit organization comprised of security and technology experts, published an indepth 83-page white paper security Guidance for Critical Areas of Focus in Cloud Computing in April 2009. In addition to articles and white papers, research firm Gartner reports data location and data segregation/ encryption among the top seven security concern in cloud computing. Also, cloud computing security is one of the top ten 2009 trends identified in a survey conducted by Cloud Computing.

To establish a basis for the use of these tools, it is essential to understand one key difference between cloud computing and conventional data centers. Figures shows the rather simple yet significant difference between an enterprise's data center and cloud computing.

XII. Conclusion

Start-up companies, small businesses, mid-size and even large enterprises are interested in cloud computing it also provides for better and easier management of data security, since all the data is located on a central server, so administrators can control who has and doesn't have access to the files. "Cloud" computing builds on decades of research in virtualization, distributed computing, utility computing and more recently, networking, web and software services. It implies a services-oriented architecture, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership, on-demand services and many other things. "Cloud" computing builds on decades of research in virtualization, distributed computing, utility computing, and, more recently, networking, web and software services. It implies a service-oriented architecture, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership, on demand services and many other things. This paper discusses the concept of "cloud" computing, the issues it tries to address, related research topics.

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