CLOUD COMPUTING - EVERY USER IS A STAKE HOLDER

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ABSTRACT

An emerging IT development, deployment, and delivery model that enables real-time delivery of a broad range of IT products, services and solutions over the internet is known as 'Cloud Computing'. The concept and service is rising fast, with its data centres growing at an unprecedented rate. Cloud computing comes into focus only when we 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. The key benefits of cloud computing are: Flexibility, Scalability, Economics, Inherited Resiliency,. Highly Automated, Reduced Cost, Increased Storage. The move to cloud computing is a business decision in which the business case should consider the relevant factors, among others the security and privacy requirements. The cloud service users need to be vigilant in understanding the risks of data breaches in this new environment.

KEY WORDS: Grid Computing, Virtualization, Distributed Computing, SaaS, HaaS, Pay-per-Use, PaaS, Scalability

1.0 INTRODUCTION

The current world is technology driven. The ever fast changing ICT is appearing with its newer blessings almost in every year. A new reality is emerging for organizations of every size from every part of the planet. It's called the cloud-a profound evolution of IT with revolutionary implications for business and society, creating new possibilities and enabling more efficient, flexible and collaborative computing models. A paradigm shift to cloud computing will affect many different sub-categories in computer industry such as software companies, internet service providers (ISPs) and hardware manufacturers. While it is relatively easy to see how the main software and internet companies will be affected by such a shift, it is more difficult to predict how companies in the internet and hardware sectors will be affected. Cloud computing allows computer users to conveniently rent access to fully featured applications, to software development and deployment environments, and to computing infrastructure assets such as network-accessible data storage and processing .

2.0 CLOUD COMPUTING - WHAT IT IS.

Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the internet). Cloud computing is a technology that uses the internet and central remote servers to maintain data and applications. It allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access. This technology allows for much more efficient computing by centralizing storage, memory, processing and bandwidth.

Cloud computing is broken down into three segments: "application", "storage" and "connectivity". Each segment serves a different purpose and offers different products for businesses and individuals around the world. In June 2011, a study conducted by Version One found that 91% of senior IT professionals actually don't know what cloud computing is and two-thirds of senior finance professionals are clear by the concept, highlighting the young nature of the technology [1].

Cloud computing has become the new buzz word driven largely by marketing and service offerings from big corporate players like Google, IBM and Amazon. A simple example of cloud computing is Yahoo email, Gmail, or Hotmail etc. One doesn't need software or a server to use them. All a consumer would need is just an internet connection

and he/she can start sending emails. The server and email management software is all on the cloud (internet) and is totally managed by the cloud service provider Yahoo, Google etc. The consumer gets to use the software alone and enjoy the benefits. The analogy is, ***'If I need milk, would I buy a cow?'*** All the users or consumers need is to get the benefits of using the software or hardware of the computer like sending emails etc. Just to get this benefit (milk) why should a consumer buy a (cow) software/hardware? The concept is explained through a simple diagram [5] :

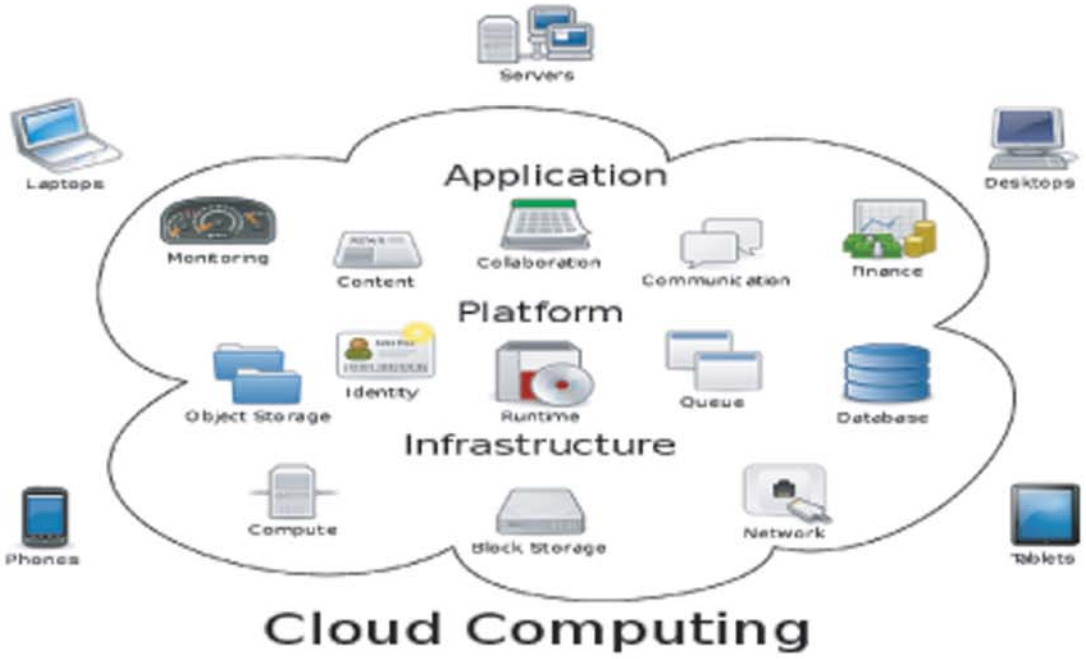

Figure 1: Concept of Cloud Computing (Source : www.wikipedia.org).

3.0 EVOLUTION OF CLOUD COMPUTING

The following diagram explains how the cloud computing is emerging as a new concept of service [5] :

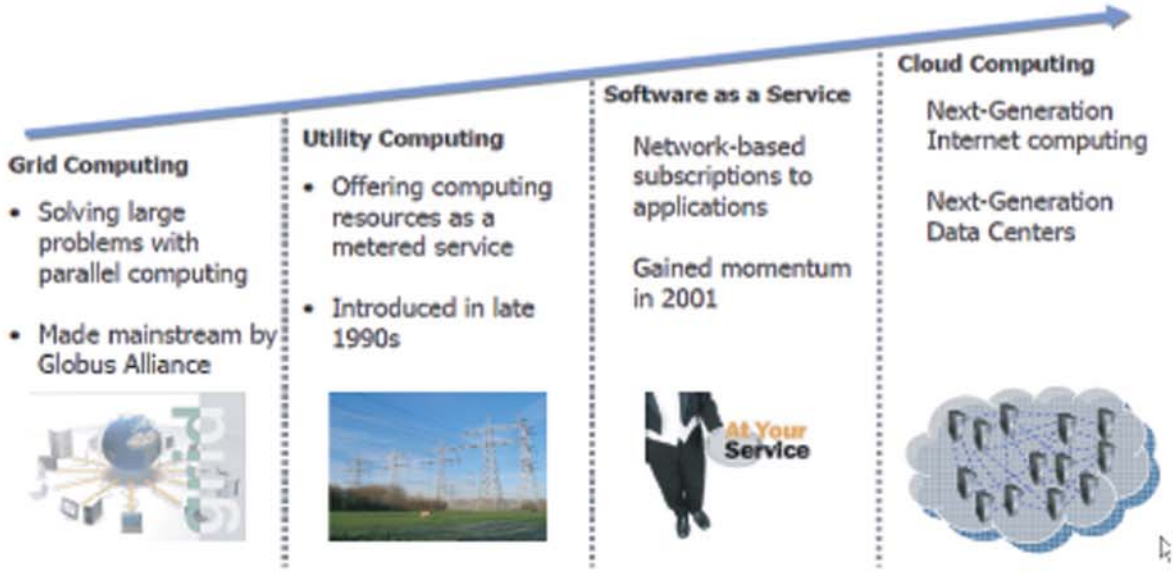

Figure 2: Evolution of Cloud Computing Deployment Models

3.1 Public Cloud. Public Cloud describes cloud computing in the traditional mainstream sense, whereby a service provider makes resources, such as applications and storage, available to the general public over the internet. Public cloud services may be free or offered on a pay-per-usage model from an off-site third-party provider who bills on a fine-grained utility computing basis. Examples of public clouds include Amazon Elastic Compute Cloud (EC2), IBM's Blue Cloud, Sun Cloud, Google AppEngine and Windows Azure Services Platform[2].

3.2 Private Cloud. Private Cloud (also called internal cloud or corporate cloud) is a marketing term for a proprietary computing architecture that provides hosted services to a limited number of people behind a firewall. Advances in virtualization and distributed computing have allowed corporate network and datacenter administrators to effectively become service providers that meet the needs of their "customers" within the corporation.

3.3 Community Cloud. Community cloud shares infrastructure between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party and hosted internally or externally. A community cloud may be established where several organizations have similar requirements and seek to share infrastructure so as to realize some of the benefits of cloud computing.

4.0 CLOUD COMPUTING LAYERS

Once an internet protocol connection is established among several computers, it is possible to share services within any one of the following layers.

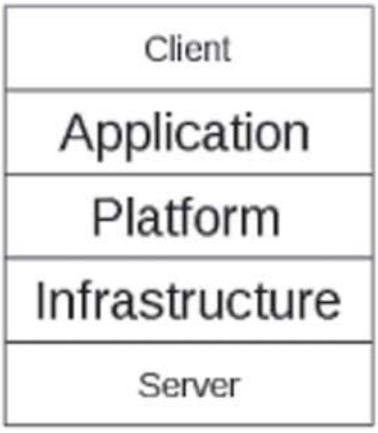

Figure 3: Cloud Computing Layers

4.1 Client

A cloud client consists of computer hardware and/or computer software that relies on cloud computing for application delivery and that is in essence useless without it. Examples include some computers (example: Chromebooks), phones (example: Google Nexus series) and other devices, operating systems (example: Google Chrome OS), and browsers.

4.2 Application (SaaS)

Cloud application services or "Software as a Service (SaaS)" deliver software as a service over the internet, eliminating the need to install and run the application on the customer's own computers and simplifying maintenance and support.

4.3 Platform (PaaS)

Cloud platform services, also known as platform as a service (PaaS), deliver a computing platform and/or solution stack as a service, often consuming cloud infrastructure and sustaining cloud applications. It facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers. When development teams create applications for the cloud, they must build its own cloud platform.

4.4 Infrastructure (IaaS)

Cloud infrastructure services, also known as "infrastructure as a service" (IaaS), deliver computer infrastructure - typically a platform virtualisation environment - as a service, along with raw (block) storage and networking. Rather than purchasing servers, software, data-center space or network equipment, clients instead buy those resources as a fully outsourced service. Suppliers typically bill such services on a utility computing basis; the amount of resources consumed (and therefore the cost) will typically reflect the level of activity.

4.5 Server (HaaS)

The servers layer consists of computer hardware and/or computer software products that are specifically designed for the delivery of cloud services, including multi-core processors, cloud-specific operating systems and combined offerings.

5.0 WHO USES CLOUD TODAY?

Table - 1: Cloud Users

Personal Use of the Cloud Computing	Startups & Small Businesses	Mid-Size Enterprises	Large Enterprises
Webmail Services - 5% Store Personal Photos - 5% Online Apps - 7% Store Personal Videos - 28% Pay to Store Files - 32% Online Backup - 56%	Can use clouds for everything	Can use clouds for many things	More likely to have hybrid models where they keep some things in house

6.0 SECURITY ISSUES IN CLOUD COMPUTING

In the last few years, cloud computing has grown from being a promising business concept to one of the fastest growing segments of the IT industry. Now, recession-hit companies are increasingly realizing that simply by tapping into the cloud they can gain fast access to best-of-breed business applications or drastically boost their infrastructure resources, all at negligible cost. But as more and more information on individuals and companies are placed in the cloud, concerns are beginning to grow about just how safe an environment it is. Thus it is natural that the cloud service users need to be vigilant in understanding the risks of data breaches in this new environment [6].

"At the heart of cloud infrastructure is this idea of multi-tenancy and decoupling between specific hardware resources and applications," explains Datamonitor senior analyst Vuk Trifković. "In the jungle of multi-tenant data, you need to trust the cloud provider that your information will not be exposed." [6]

For their part, companies need to be vigilant, for instance about how passwords are assigned, protected and changed. Cloud service providers typically work with numbers of third parties, and customers are advised to gain information about those companies which could potentially access their data. An important consideration for cloud service customers, especially those responsible for highly sensitive data, is to find out about the hosting company used by the provider and if possible seek an independent audit of their security status.

7.0 KEY BENEFITS ACHIEVED THROUGH CLOUD COMPUTING

7.1 Flexibility - Cloud computing offers much more flexibility than past computing methods. Cloud computing allows organizations/institutions to expand or contract computing power as required and allows "bursts" of computing power to be utilized on an "on-demand" basis.

7.2 Scalability - Cloud computing enables organizations/institutions to quickly scale up their IT operations as provisioning of new computing resources and software applications can be delivered at a desired pace.

7.3 Economics - Traditional IT has multiple fixed and variable cost elements. In order to fulfill business requirements and sustain day-to-day business operations, organizations/institutions must invest a large fixed amount for initial IT infrastructure establishment and continue to spend variably for software and hardware maintenance. By outsourcing IT functions to the cloud, organizations/institutions can leverage the features of a lean IT structure to reduce the overall IT expenditures involved in software licensing, infrastructure development, on-going support and upgrades.

7.4 Inherited Resiliency - Cloud computing removes single points of failure since the Internet is a highly resilient computing environment. Some competitive service providers also add extra functionalities to enhance resiliency. For example, the "Availability Zones" and "Elastic IP Address" features of Amazon.com EC2 allow multi-location of application software and dynamic IP address re-mapping mechanism in an event of service interruption.

7.5 Highly Automated - Cloud computing services are maintained by dedicated IT professionals of cloud service providers. As a result, organizations/institutions IT staff no longer need to worry about complex details behind the delivered computing services, such as hardware maintenance, constant software update, etc.

7.6 Reduced Cost - Cloud technology is paid incrementally, 'pay-per-use' basis saving organizations money.

7.7 Increased Storage - Organizations can store more data than on private computer systems wherever they are, rather than having to remain at their desks.

7.8 Allows IT to Shift Focus - No longer having to worry about constant server updates and other computing issues, government organizations will be free to concentrate on innovation.

8.0 BUSINESS IMPLICATIONS OF SHIFT TOWARDS CLOUD COMPUTING

In today's business environment, many managers rely heavily on information technology (IT) to help carry out their duties. Top executives, for one, use IT to perform strategic analyses and generate forecast models in order to better manage their respective organizations. HR managers use IT to facilitate payroll systems and conduct training for employees. And project managers use IT as a medium for communicating and collaborating more effectively with team members.

A paradigm shift to cloud computing will affect many different sub-categories in computer industry such as software companies, internet service providers (ISPs) and hardware manufacturers. While it is relatively easy to see how the main software and internet companies will be affected by such a shift, it is more difficult to predict how companies in the internet and hardware sectors will be affected.

Through 2014 public IT cloud services will grow at more than five times the rate of traditional IT products. Worldwide revenue from public IT cloud services exceeded $16 billion in 2009 and is forecast to reach $55.5 billion in 2014, representing a compound annual growth rate (CAGR) of 27.4%. This rapid growth rate is over five times the projected rate of growth for traditional IT products (5%)[4].

9.0 CLOUD COMPUTING CHALLENGES - CLOUD OF CLOUDS

Cloud Computing is a revolutionary concept that will-more than most other advances-bring us to internet ubiquity where space and bandwidth are delivered like municipal water service or electricity. But we are still a long way from there. It is to be remembered that, in the early days of electricity, local utilities and even individual neighborhoods had vastly different ideas about how electricity should be delivered: different amperage, wattage, etc. This is a pretty good analogy for where Cloud Computing is today. Each Cloud under development is unique and incompatible. Applications and sites will need to be developed for a specific Cloud platform (an important cost-basis to consider). But this will change in the long term.

Just as the Operating System (OS) is being subverted by the advent of browser-based/web-based applications, independent cloud platforms will be subverted by the need for cross-cloud compatibility. Efficiency will demand it if Cloud computing is to ultimately succeed. Therefore, there will eventually be a 'Cloud of Clouds' delivering computing capacity seamlessly and transparently.

10.0 CLOUD COMPUTING - THE FUTURE

The future for cloud computing is bright. Cloud computing holds a lot of promise and we believe that it is likely to be a major influence on hosting and application development. The big names in computers are throwing lots of resources into this. Dell sees a huge market for cloud computing in the future, upwards of $1 billion a year in a few more years. HP, Intel and more are throwing resources into this, and it looks like cloud computing might be the next big thing after UMPCs.

Networks aren't ready for mass roll out yet, and connection speeds aren't yet up to handling this much data. But even Amazon sees a bright future in cloud computing. They have recently released a beta program called Amazon Web Services. The whole idea behind it is resizable computing power. When you need the power, it's there, but when you don't, you can scale back. The bang for the buck with the Amazon program is the highest; it is almost a pay-as-you-go plan for computing cycles.

11.0 CLOUD COMPUTING-SUSTAINABILITY

Although cloud computing is often assumed to be a form of "green computing", there is as of yet no published study to substantiate this assumption. Sighting the servers affects the environmental effects of cloud computing. In areas where climate favors natural cooling and renewable electricity is readily available, the environmental effects will be more moderate. (The same holds true for "traditional" data centers.). Thus countries with favorable conditions, such as Finland, Sweden and Switzerland, are trying to attract cloud computing

data centers. Energy efficiency in cloud computing can result from energy-aware scheduling and server consolidation. However, in the case of distributed clouds over data centers with different source of energies including renewable source of energies, a small compromise on energy consumption reduction could result in high carbon footprint reduction.

12.0 CONCLUSION

In the last few years, cloud computing has grown from being a promising business concept to one of the fastest growing segments of the IT industry. Cloud computing is the next big wave in computing. It has many benefits, such as better hardware management, since all the computers are the same and run the same hardware. 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. Besides, it has other attractive benefits, such as, flexibility, scalability, economics, resiliency , highly automated, reduced cost, increased storage etc.

There are some down sides as well to cloud computing. Peripherals such as printers or scanners might have issues dealing with the fact that there is no hard drive attached to the physical, local machine. If there are machines a user uses at work that aren't their own for any reason, that require access to particular drivers or programs, it is still a struggle to get this application to know that it should be available to the user.

Without a doubt, cloud computing is truly a revolutionary concept for many IT business organizations. Because of the technology's ease of adoption, significantly lower maintenance costs, and greater workflow efficiency, there is no doubt that cloud computing will gain widespread popularity in the days to come. For managers dealing with the growing demand for IT in their respective organizations, cloud computing presents itself as an all-in-one solution, being able to satisfy the growing IT needs while, at the same time, reducing energy usage-all at an affordable price.

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