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INNOVATIVE COMPUTING USING CLOUD

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***Abstract*— Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation.Cloud computing is basically an Internet-based network made up of large numbers of servers - mostly based on open standards, modular and inexpensive. Clouds contain vast amounts of information and provide a variety of services to large numbers of people.**

I. INTRODUCTION

Imagine yourself in the world where the users of the computer of today's internet world don't have to run, install or store their application or data on their own computers, imagine the world where every piece of your information or data would reside on the Cloud (Internet).As a metaphor for the Internet, "the cloud" is a familiar cliché, but when combined with "computing", the meaning gets bigger and fuzzier. Some analysts and vendors define cloud computing narrowly as an updated version of utility computing: basically virtual servers available over the Internet. Others go very broad, arguing anything you consume outside the firewall is "in the cloud", including conventional outsourcing. Cloud computing comes into focus only when you think about what we always need: 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 ICT's existing capabilities. Cloud computing is at an early stage, with a motley crew of providers large and small delivering a slew of cloud-based services, from full-blown applications to storage services to spam filtering. Yes, utility-style infrastructure providers are part of the mix, but so are SaaS (software as a service) providers such as Salesforce.com. Today, for the most part, IT must plug into cloud-based services individually, but cloud computing aggregators and integrators are already emerging.

II. CLOUD COMPUTING - THE CONCEPT

Cloud computing is Internet ("cloud") based development and use of computer technology ("computing"). It is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet. Users need not have knowledge of, expertise in, or control over the technology infrastructure "in the cloud" that supports them.The concept incorporates infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS) as well as Web 2.0 and other recent technology trends which have the common theme of reliance on the Internet for satisfying the computing needs of the users. Examples of SaaS vendors include Salesforce.com and Google Apps which provide common business applications online that are accessed from a web browser, while the software and data are stored on the servers.The term *cloud* is used as a metaphor for the Internet, based on how the Internet is depicted in computer network diagrams, and is an abstraction for the complex infrastructure it conceals.

III. HISTORY

The Cloud is a term with a long history in telephony, which has in the past decade, been adopted as a metaphor for internet based services, with a common depiction in network diagrams as a cloud outline.

The underlying concept dates back to 1960 when John McCarthy opined that "computation may someday be organized as a public utility"; indeed it shares characteristics with service bureaus which date back to the 1960s. The term *cloud* had already come into commercial use in the early 1990s to refer to large ATM networks. By the turn of the 21st century, the term "cloud computing" had started to appear,

although most of the focus at this time was on Software as a service (SaaS).

In 1999, Salesforce.com was established by Marc Benioff, Parker Harris, and his fellows. They applied many technologies of consumer web sites like Google and Yahoo! to business applications. They also provided the concept of "On demand" and "SaaS" with their real business and successful customers. The key for SaaS is being customizable by customer alone or with a small amount of help. Flexibility and speed for application development have been drastically welcomed and accepted by business users.

IBM extended these concepts in 2001, as detailed in the Autonomic Computing Manifesto -- which described advanced automation techniques such as self-monitoring, self-healing, self-configuring, and self-optimizing in the management of complex IT systems with heterogeneous storage, servers, applications, networks, security mechanisms, and other system elements that can be virtualized across an enterprise.

Amazon.com played a key role in the development of cloud computing by modernizing their data centers after the dot-com bubble and, having found that the new cloud architecture resulted in significant internal efficiency improvements, providing access to their systems by way of Amazon Web Services in 2005 on a utility computing basis.

2007 saw increased activity, with Google, IBM, and a number of universities embarking on a large scale *cloud computing* research project, around the time the term started gaining popularity in the mainstream press. It was a hot topic by mid-2008 and numerous cloud computing events had been scheduled.

In August 2008, Gartner Research observed that "organizations are switching from company-owned hardware and software assets to per-use service-based models" and that the "projected shift to cloud computing will result in dramatic growth in IT products in some areas and in significant reductions in other areas."

IV. KEY CHARACTERISTICS

- ***Cost*** is greatly reduced and capital expenditure is converted to operational expenditure. This lowers barriers to entry, as infrastructure is typically provided by a third-party and does not need to be purchased for one-time or infrequent intensive computing tasks. Pricing on a utility computing basis is fine-grained with usage-based options and minimal or no IT skills are required for implementation.

- ***Device and location independence:*** enable users to access systems using a web browser regardless of their location or what device they are using, e.g., PC, mobile. As infrastructure is off-site (typically provided by a third-party) and accessed via the Internet the users can connect from anywhere.

- ***Multi-tenancy:*** enables sharing of resources and costs among a large pool of users, allowing for:

    - **Centralization** of infrastructure in areas with lower costs (such as real estate, electricity, etc.)

    - **Peak-load capacity** increases (users need not engineer for highest possible load-levels)

    - **Utilization and efficiency** improvements for systems that are often only 10-20% utilized.

- **Reliability** improves through the use of multiple redundant sites, which makes it suitable for business continuity and disaster recovery. Nonetheless, most major cloud computing services have suffered outages and IT and business managers are able to do little when they are affected.

- **Scalability** via dynamic ("on-demand") provisioning of resources on a fine-grained, self-service basis near real-time, without users having to engineer for peak loads. Performance is monitored and consistent and loosely-coupled architectures are constructed using web services as the system interface.

- **Security** typically improves due to centralization of data, increased security-focused resources, etc., but raises concerns about loss of control over certain sensitive data. Security is often as good as or better than traditional systems, in part because providers are able to devote resources to solving security issues that many customers cannot afford. Providers typically log accesses, but accessing the audit logs themselves can be difficult or impossible.

- **Sustainability** comes about through improved resource utilization, more efficient systems, and carbon neutrality. Nonetheless, computers and associated infrastructure are major consumers of energy.

V. ARCHITECTURE

Cloud architecture, the systems architecture of the software systems involved in the delivery of *cloud computing*, comprises hardware and software designed by a *cloud architect* who typically works for a *cloud integrator*. It typically involves multiple *cloud components* communicating with each other over application programming interfaces, usually web services.

This closely resembles the UNIX philosophy of having multiple programs doing one thing well and working together over universal interfaces. Complexity is controlled and the resulting systems are more manageable than their monolithic counterparts.

Cloud architecture extends to the client, where web browsers and/or software applications access *cloud applications*.

Cloud storage architecture is loosely coupled, where metadata operations are centralized enabling the data nodes to scale into the hundreds, each independently delivering data to applications or user.

VI. TYPES

- **Public cloud**

  Public cloud or external cloud describes cloud computing in the traditional mainstream sense, whereby resources are dynamically provisioned on a fine-grained, self-service basis over the Internet, via web applications/web services, from an off-site third-party provider who shares resources and bills on a fine-grained utility computing basis.

- **Private cloud**

  Private cloud and internal cloud are neologisms that some vendors have recently used to describe offerings that emulate cloud computing on private networks. These products claim to "deliver some benefits of cloud computing without the pitfalls", capitalizing on data security, corporate governance, and reliability concerns.

  While an analyst predicted in 2008 that private cloud networks would be the future of corporate IT, there is some uncertainty whether they are a reality even within the same firm. Analysts also claim that within five years a "huge percentage" of small and medium enterprises will get most of their computing resources from external cloud computing providers as they "will not have economies of scale to make it worth staying in the IT business" or be able to afford private clouds.

  The term has also been used in the logical rather than physical sense, for example in reference to platform as service offerings, though such offerings including Microsoft's Azure Services Platform are not available for on-premises deployment.

- **Hybrid cloud**

  A hybrid cloud environment consisting of multiple internal and/or external providers "will be typical for most enterprises".

VII. ROLES

- **Provider**

  A cloud computing provider or cloud computing service provider owns and operates live cloud computing systems to deliver service to third parties. The barrier to entry is also significantly higher with capital expenditure required and billing and management creates some overhead. Nonetheless, significant operational efficiency and agility advantages can be realized, even by small organizations, and server consolidation and virtualization rollouts are already well underway. Amazon.com was the first such provider, modernizing its data centers which, like most computer networks, were using as little as 10% of its capacity at any one time just to leave room for occasional spikes. This allowed small, fast-moving groups to add new features faster and easier, and they went on to open it up to outsiders as Amazon Web Services in 2002 on a utility computing basis.

- **User**

  A user is a consumer of cloud computing. The privacy of users in cloud computing has become of increasing concern. The rights of users are also an issue, which is being addressed via a community effort to create a bill of rights.

- **Vendor**

  A vendor sells products and services that facilitate the delivery, adoption and use of cloud computing. For example:

- Computer hardware (Dell, HP, IBM, Sun Microsystems)
    - Storage (Sun Microsystems, EMC, IBM)

- Infrastructure (Cisco Systems)

- Computer software (3tera, Hadoop, IBM, RightScale)
  - Operating systems (Solaris, AIX, Linux including Red Hat)
  - Platform virtualization (Citrix, Microsoft, VMware, Sun xVM, IBM)

VIII. PRICING

Amazon charges customers in two primary ways:

- Hourly charge per virtual machine
- Data transfer charge

The hourly virtual machine rate is fixed, based on the capacity and features of the virtual machine. Amazon advertising describes the pricing scheme as "you pay for resources you consume," but defines resources such that an idle virtual machine is consuming resources, as opposed to other pricing schemes where one would pay for basic resources such as CPU time.

Customers can easily start and stop virtual machines to control charges, with Amazon measuring with one hour granularity. Some are thus able to keep each virtual machine running near capacity and effectively pay only for CPU time actually used.

IX. CLOUD (OPERATING SYSTEM)

Cloud is a "browser based Operating system" created by 'Good OS LLC', a Los Angeles-based corporation. The company initially launched a Linux distribution called gOS which is based on Ubuntu, now in its third incarnation

- **Browser and Operating System**

  Cloud is a combination of a simplified operating system that runs just a web browser, providing access to a variety of web-based applications that allow the user to perform many simple tasks without booting a full-scale operating system. Because of its simplicity, Cloud can boot in just a few seconds. The operating system is designed for Netbooks, Mobile Internet Devices, and PCs that are mainly used to browse the Internet. From Cloud the user can quickly boot into the main OS, because Cloud continues booting the main OS in the background.

  Combining a browser with a basic operating system also allows the use of cloud computing, in which applications and data "live and run" on the Internet instead of on the hard drive.

  Cloud can be installed and used together with other operating systems, or can act as a standalone operating system. When used as a standalone operating system, hardware requirements are relatively low.

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- ***Reception***

  Early reviews compared the operating system's user interface to Mac OS X and noted the similarity of its browser to Google Chrome, although it is actually based on a modified Mozilla Firefox browser.

X. PRODUCTS AND SERVICES

1) Customer Relationship Management

Salesforce.com's CRM solution is broken down into several applications: Sales, Service & Support, Partner Relationship Management, Marketing, Content, Ideas and Analytics.

2) Force.com Platform

Salesforce.com's Platform-as-a-Service product is known as the Force.com Platform. The platform allows external developers to create add-on applications that integrate into the main Salesforce application and are hosted on salesforce.com's infrastructure.

These applications are built using Apex (a proprietary Java-like programming language for the Force.com Platform) and Visualforce (an XML-like syntax for building user interfaces in HTML, AJAX or Flex).

3) AppExchange

Launched in 2005, AppExchange is a directory of applications built for Salesforce by third-party developers which users can purchase and add to their Salesforce environment. As of September 2008, there are over 800 applications available from over 450 ISVs.

4) Customization

Salesforce users can customize their CRM application. In the system, there are tabs such as "Contacts", "Reports", and "Accounts". Each tab contains associated information. For example, "Contacts" has fields like First Name, Last Name, Email, etc.

Customization can be done on each tab, by adding user-defined custom fields.

Customization can also be done at the "platform" level by adding customized applications to a Salesforce.com instance that is adding sets of customized / novel tabs for specific vertical- or function-level (Finance, Human Resources, etc) features.

5) Web Services

In addition to the web interface, Salesforce offers a Web Services API that enables integration with other systems

XI. CONCLUSION

Cloud Computing is a vast topic and the above report does not give a high level introduction to it. It is certainly not possible in the limited space of a report to do justice to these technologies. What is in store for this technology in the near future? Well, Cloud Computing is leading the industry's endeavor to bank on this revolutionary technology.

Cloud Computing Brings Possibilities……..

- Increases business responsiveness
- Accelerates creation of new services via rapid prototyping capabilities
- Reduces acquisition complexity via service oriented approach
- Uses IT resources efficiently via sharing and higher system utilization
- Reduces energy consumption
- Handles new and emerging workloads
- Scales to extreme workloads quickly and easily
- Simplifies IT management
- Platform for collaboration and innovation
- Cultivates skills for next generation workforce

Today, with such cloud-based interconnection seldom in evidence, cloud computing might be more accurately described as "sky computing," with many isolated clouds of

services which IT customers must plug into individually. On the other hand, as virtualization and SOA permeate the enterprise, the idea of loosely coupled services running on an agile, scalable infrastructure should eventually make every enterprise a node in the cloud. It's a long-running trend with a far-out horizon. But among big metatrends, cloud computing is the hardest one to argue with in the long term. Cloud Computing is a technology which took the software and usiness world by storm. The much deserved hype over it will continue for years to come.

ACKNOWLEDGMENT

I take this opportunity to express my profound gratitude and deep regards to my guide **Prof. Dr. S. R. Gupta** for his exemplary guidance, monitoring and constant encouragement throughout the course of this thesis. The blessing, help and guidance given by him time to time shall carry me a long way in the journey of life on which I am about to embark.

REFERENCES

[1] David Linthicum. Cloud Computing
[2] Sosinsky, B., Cloud Computing Bible, Wiley, 2011.
[3] Velte, A., Velte, T., Elsenpeter, R., (2010), Cloud Computing: A Practical Approach, McGraw-Hill Publications.
[4] Reese, G., (2009), Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publications.
[5] Chip Computer Magazine, December 2008 - Feb 2009 Edition.
[6] Lewis, Grace. Cloud Computing: Finding the Silver Lining, Not the Silver Bullet. http://www.sei.cmu.edu/newsitems/cloudcomputing.cfm (2009).
[7] Lewis, Grace. Basics About Cloud Computing.
[8] http://www.sei.cmu.edu/library/abstracts/whitepapers/cloudcomputingbasics.cfm (2010). www.wikipedia.com
[9] www.google.com
[10] www.amazon.com
[11] www.salesforce.com.
[12] www.cloudbook.net
[13] AmazonWebServices. Amazon Elastic Compute Cloud homepage. http://aws.amazon.com/ec2, November 2008.
[14] Chappel D. Microsoft Azure homepage. Introducing the Azure Services Platform [Internet].
[15] "The NIST Definition of Cloud Computing". National Institute of Standards and Technology. Retrieved 24 July 2011.
[16] "Distributed Application Architecture". Sun Microsystem. Retrieved 2009-06-16.
[17] "Cloud computing in Telecommunications". Ericsson. Retrieved 16 December 2012.
[18] "ITU Focus Group on Cloud Computing - Part 1". International Telecommunication Union (ITU) Retrieved 16 December 2012.
[19] www.ibm.com