CLOUD COMPUTING; NEW AGE OF TECHNOLOGY INNOVATION: A COMPREHENSIVE STUDY

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Abstract

Cloud computing is the development of parallel computing, distributed computing, grid computing and virtualization technologies that define the shape of a new era. Cloud computing is an emerging model of business computing. Cloud computing has formed the conceptual and infrastructural basis for tomorrow is computing. The global computing infrastructure is rapidly moving towards cloud-based architecture. While it is important to take advantages of could based computing by means of deploying it in diversified sectors, the security aspects in a cloud based computing environment remains at the core of interest. Cloud based services and service providers are being evolved which has resulted in a new business trend based on cloud technology. With the introduction of numerous clouds based services and geographically dispersed cloud service providers, sensitive information of different entities are normally stored in remote servers and locations with the possibilities of being exposed to unwanted parties in situations where the cloud servers storing those information are compromised. If security is not robust and consistent, the flexibility and advantages that cloud computing has to offer will have little credibility. Technology innovation and its adoption are two critical successful factors for any business/organization. Cloud computing is a recent technology paradigm that enables organizations or individuals to share various services in a seamless and cost-effective manner. This paper describes cloud computing, a computing platform for the next generation of the Internet. The paper defines clouds, types of cloud Provides, Comparison of Cloud Computing with Grid Computing, applications and concerns of Cloud Computing , Concept of Virtualization in Cloud Computing.

Keywords: Cloud Computing, New Age, Technology Innovation, and Comprehensive Study

Introduction:

Cloud computing is a term used to describe both a platform and type of application. A cloud-computing platform dynamically provisions, configures, reconfigures, and depravations servers as needed. Servers in the cloud can be physical machines or virtual machines. Advanced clouds typically include other computing resources such as storage area networks (SANs), network equipment, firewall and other security devices. Cloud computing also describes applications that are extended to be accessible through the Internet. These cloud applications use large data centres and powerful servers that host Web applications and

Web services. Anyone with a suitable Internet connection and a standard browser can access a cloud application.

Recent developments in the field of could computing have immensely changed the way of computing as well as the concept of computing resources. In a cloud based computing infrastructure, the resources are normally in someone else's premise or network and accessed remotely by the cloud users. Processing is done remotely implying the fact that the data and other elements from a person need to be transmitted to the cloud infrastructure or server for processing; and the output is returned upon completion of required processing. In some cases, it might be required or at least possible for a person to store data on remote cloud servers. These gives the following three sensitive states or scenarios that are of particular concern within the operational context of cloud computing:

➢ The transmission of personal sensitive data to the cloud server,

➢ The transmission of data from the cloud server to clients' computers and

➢ The storage of clients' personal data in cloud servers which are remote server not owned by the clients.

Cloud Computing vs. Grid Computing:

Cloud computing environments support grid computing by quickly providing physical and virtual servers on which the grid applications can run.

Cloud computing should not be confused with grid computing. Grid computing involves dividing a large task into many smaller tasks that run in parallel on separate servers. Grids require many computers, typically in the thousands, and commonly use servers, desktops, and laptops. Clouds also support non-grid environments, such as a three-tier Web architecture-running standard or Web 2.0 applications. A cloud is more than a collection of computer resources because a Cloud provides a mechanism to manage those resources. Management includes provisioning, change requests, reimaging, workload rebalancing, deprovisioning, and monitoring.

Types of Cloud Providers:

1. **Software as a Service (SaaS)**
2. **Platform as a Service (PaaS)**
3. **Infrastructure as a Service (IaaS)**
4. **Storage as a service**
5. **Security as a service**

6. **Data as a service**

7. **Test environment as a service**

8. **Backend as a service**

Cloud Computing Applications:

The applications of cloud computing are practically limitless. With the right middleware, a cloud computing system could execute all the programs a normal computer could run. Potentially, everything from generic word processing software to customized computer programs designed for a specific company could work on a cloud computing system. Why would anyone want to rely on another computer system to run programs and store data? Here are just a few reasons:

➢ Clients would be able to access their applications and data from anywhere at any time. They could access the cloud computing system using any computer linked to the Internet. Data would not be confined to a hard drive on one user's computer or even a corporation's internal network.

➢ It could bring hardware costs down. Cloud computing systems would reduce the need for advanced hardware on the client side. You wouldn't need to buy the fastest computer with the most memory, because the cloud system would take care of those needs for you. Instead, you could buy an inexpensive computer terminal. The terminal could include a monitor, input devices like a keyboard and mouse and just enough processing power to run the middleware necessary to connect to the cloud system. You would not need a large hard drive because you'd store all your information on a remote computer.

➢ Corporations that rely on computers have to make sure they have the right software in place to achieve goals. Cloud computing systems give these organizations company-wide access to computer applications. The companies don't have to buy a set of software or software licenses for every employee. Instead, the company could pay a metered fee to a cloud computing company.

➢ Servers and digital storage devices take up space. Some companies rent physical space to store servers and databases because they don't have it available on site. Cloud computing gives these companies the option of storing data on someone else's hardware, removing the need for physical space on the front end.

> ➢ Corporations might save money on IT support. Streamlined hardware would, in theory, have fewer problems than a network of heterogeneous machines and operating systems.

Cloud Computing Concerns:

Perhaps the biggest concerns about cloud computing are security and privacy. The idea of handing over important data to another company worries some people. Corporate executives might hesitate to take advantage of a cloud computing system because they cannot keep their company's information under lock and key. The counterargument to this position is that the companies offering cloud-computing services live and die by their reputations. It benefits these companies to have reliable security measures in place. Otherwise, the service would lose all its clients. It is in their interest to employ the most advanced techniques to protect their clients' data. Privacy is another matter. If a client can log in from any location to access data and applications, it is possible the client's privacy could be compromised.

Cloud computing companies will need to find ways to protect client privacy. One way is to use authentication techniques such as user names and passwords. Another is to employ an authorization format -- each user can access only the data and applications relevant to his or her job. Some questions regarding cloud computing are more philosophical. Does the user or company subscribing to the cloud computing service own the data? Does the cloud computing system, which provides the actual storage space, own it? Is it possible for a cloud computing company to deny a client access to that client's data? Several companies, law firms and universities are debating these and other questions about the nature of cloud computing. How will cloud computing affect other industries? There is a growing concern in the IT industry about how cloud computing could influence the business of computer maintenance and repair. If companies switch to using streamlined computer systems, they will have fewer IT needs. Some industry experts believe that the need for IT jobs will migrate to the back end of the cloud computing system.

Characteristics of Virtualization in Cloud Computing:

Any discussion of cloud computing typically begins with virtualization. *Virtualization* is using computer resources to imitate other computer resources or whole computers. It separates resources and services from the underlying physical delivery environment.

Characteristics of Virtualization:

Virtualization has three characteristics that make it ideal for cloud computing:

1) Partitioning: In virtualization, many applications and operating systems (OSes) are supported in a single physical system by partitioning (separating) the available resources.

2) Isolation: Each virtual machine is isolated from its host physical system and other virtualized machines. Because of this isolation, if one virtual-instance crashes, it does not affect the other virtual machines. In addition, data is not shared between one virtual container and another.

3) Encapsulation: A virtual machine can be represented (and even stored) as a single file, so you can identify it easily based on the service it provides. In essence, the encapsulated process could be a business service. This encapsulated virtual machine can be presented to an application as a complete entity. Therefore, encapsulation can protect each application so that it does not interfere with another application.

Applications of virtualization

Virtualization can be applied broadly to just about everything that you could imagine:

- ✓ Memory
- ✓ Networks
- ✓ Storage
- ✓ Hardware
- ✓ Operating systems
- ✓ Applications

What makes virtualization so important for the cloud is that it decouples the software from the hardware. Decoupling means that software is put in a separate container so that it is isolated from operating systems.

In recent years, the cloud has evolved in two broad perspectives – to rent the infrastructure in cloud, or to rent any specific service in the cloud. Where the former one deals with the hardware and software usage on the cloud, the later one is confined only with the 'soft' products or services from the cloud service and infrastructure providers. Cloud service models are commonly divided into SaaS, PaaS, and IaaS that exhibited by a given cloud infrastructure. It is helpful to add more structure to the service model stacks: Fig. 1 shows a cloud reference architecture that makes the most important security-relevant cloud components explicit and provides an abstract overview of cloud computing for security issue analysis.
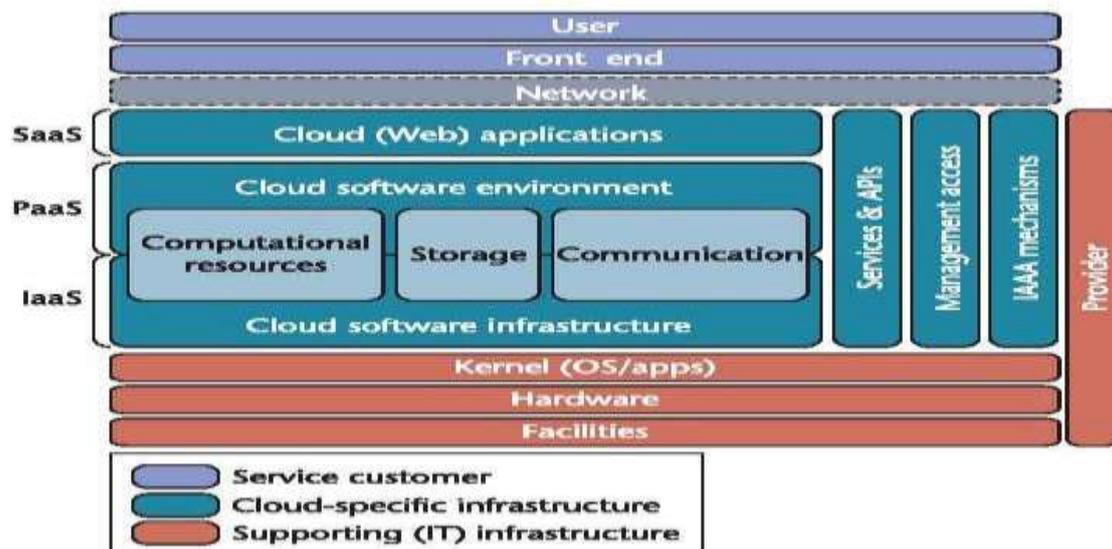
Issues in Cloud Computing:

More and more information on individuals and companies is placed in the cloud; concerns are beginning to grow about just how safe an environment it is? Issues of cloud computing can summarize as follows:

Privacy

Cloud computing utilizes the virtual computing technology, users' personal data may be scattered in various virtual data centres rather than stay in the same physical location, users may leak hidden information when they are accessed cloud computing services. Attackers can analyze the critical task depend on the computing task submitted by the users.

Reliability

The cloud servers also experience downtimes and slowdowns as our local server.

Legal Issues

Worries stick with safety measures and confidentiality of individual all the way through legislative levels.

Compliance

Numerous regulations pertain to the storage, use of data requires regular reporting, and audit trails. In addition to the requirements to which customers are subject, the data centres maintained by cloud providers may also be subject to compliance requirements.

Freedom

Cloud computing does not allow users to physically possess the storage of the data, leaving the data storage and control in the hands of cloud providers.

Long- Term Viability

You should be sure that the data you put into the cloud will never become invalid even your cloud computing provider go broke or get acquired and swallowed up by a larger company.

Table I: The Comparison of Server Cloud Computing Platforms

	Abicloud	**Eucalyptus**	**Nimbus**	**Open Nebula**
Cloud Character	Public/private	Public	Public	Private
Scalability	Scalable	Scalable	Scalable	Scalable, Dynamic
Clouds form	IaaS	IaaS	IaaS	IaaS
Compatibility,	Not support EC2	Support EC2, S3	Support EC2	Open, multi-platform
Deployment	Pack and redeploy	Dynamical deployment	Dynamical deployment	Dynamical deployment
Deployment Manner	Web interface drags	Command line	Command line	Command line
Transplant-ability	Easy	Common	Common	Common
VM support	Virtual Box, Xen, VMware,VM	Xen, VMware, KVM	Xen	Xen, VMware
Web interface	Libvirt	Web service	EC2, WSDL, WSRF	libvirt, OCCI, EC2, API
Structure	Open platform encapsulates core	Module	Lightweight components	Module
Reliability	---------	----------	------------	Rollback host and VM
OS support	Linux	Linux	Linux	Linux
Development language	Ruby, c++, python	Java	Java, python	Java

Conclusion:

Cloud computing has enormous prospects, but the security threats embedded in cloud computing approach are directly proportional to its offered advantages. Cloud computing is a great opportunity and lucrative option both to the businesses and the attackers – either parties can have their own advantages from cloud computing. The vast possibilities of cloud computing cannot be ignored solely for the security issues reason – the ongoing investigation and research for robust, consistent and integrated security models for cloud computing could be the only path of motivation.

In today's global competitive market, companies must innovate and get the most from its resources to succeed. This requires enabling its employees, business partners, and users with the platforms and collaboration tools that promote innovation. Cloud computing infrastructures are next generation platforms that can provide tremendous value to companies of any size. Cloud Computing provides Software, Platform, Infrastructure, Storage, Security,

Data, Test Environment etc. as a service. Clients would be able to access their applications and data from anywhere at any time. Data would not be confined to a hard drive on one user's computer or even a corporation's internal network. It would also bring hardware costs down. You would not need a large hard drive because you would store all your information on a remote computer.

However the biggest concerns about cloud computing are security and privacy. The idea of handling over important data to another company worries some people. Corporate executives might hesitate to take advantage of a cloud computing system because they cannot keep company's information under lock and key. I also discussed the Concept of Virtualization in Cloud Computing as any discussion of cloud computing typically begins with the virtualization. Virtualization is using computer resources to imitate other computer resources or whole computers. I discussed the characteristics, applications and various forms of Virtualization.

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