A Brief Introduction to Cloud Computing

(Terminology, Features, Types of Services, Deployment, Challenges and Security Issues)

Nilesh Kunhare
Computer Science and Engineering Department
Sanghvi Innovative Academy
Indore, India
nilesh954@gmail.com

Sunil Nimawat
Computer Science and Engineering Department
Sanghvi Innovative Academy
Indore, India
sunilnimawat@gmail.com

Abstract— **Cloud computing is receiving a great deal of attention among users ranging from individuals at home to the technology professionals. Cloud computing is everywhere and is picked up by most of the blogs, websites and tech magazines. This paper introduces the terminology, exploring the features, service models, deployment strategies use today, performance and security issues associated with cloud computing.**

Key Terms—**Cloud Computing; Infrastructure; Service Providers; Deployment; Security.**

I. BACKGROUND

During the last several decades striking advances in computing power, storage and networking technology have allowed the human to generate, share and process sprouting amounts of information hysterically in various innovative ways. These computing technologies are introduced and developed in such a new ways that their designers never envisioned the usage of their applications, which in turn lead to demand for more powerful computing infrastructure.

In order to meet computer infrastructure requirements, the system designers constantly looking for new algorithms and system architectures to process larger collections of data more quickly than is expedient with today's systems. Hence computers nowadays have become smaller and less expensive by assembling very large, powerful systems consisting of many small, inexpensive commodity components. Networks speed becomes faster and disk drive capacity continues to increase. These systems tend to be much less costly than a single, faster machine with comparable capabilities.

However, developing systems from large number of commodity components leads to some momentous challenges. As many important issues must take into consideration during system design such as electrical power consumption, equipment weight, air conditioning capacity. Software challenges also rise as writing software that can take full benefits of the aggregate computing power of many machines is far difficult than writing a software for a single faster machine, including the deployment challenges.

In recent trend, a number of commercial and academic organizations have taken a variety of different approaches to abide the challenges discussed above. They have built large systems from commodity computers, networks, disks, and developed software to make this hardware easier to program and manage. These organizations are using their software and hardware to provide computations, storage, and data base management services to their internal users and also provide services to external customer for fee. This type of service based environment is referred to as cloud computing.

II. INTRODUCTION

The Cloud computing refers to the delivery of computing services over the internet. It is a computing model in which the customers plug into the cloud to access the resources which are priced and provided on demand. Cloud services include webmail, online file storage, social networking sites, blogs, and online business applications and many more specialized corporate and user applications which allow individuals and businesses to use hardware and software that are managed by third parties at remote locations.

Cloud Computing
Having secure access to all your applications and data from any network device

Figure1. A Cloud is used in network diagram to depict the Internet.

III. BENEFITS OF CLOUD COMPUTING

Cloud computing offers various benefits including:

- *Network Access:* network can be accessed using standard APIs (such as HTTP) through the broad range of devices including PCs, mobiles, and smartphones.
- *Shared Infrastructure:* The cloud computing seeks to make the most of the available infrastructure across a number of users by enabling the sharing of physical devices, networking capabilities and storage via virtualized software model.
- *Reduced cost:* sharing infrastructure and resources results in reduced cost than traditional computing.
- *Managed metering:* the services are optimized by providing the reports and billing information. Hence the customers are billed according to how much they used the services during billing period.
- *Dynamic provision:* this allows for the provision of services based on current demand requirements. This

dynamic progression needs to be done while maintaining extreme levels of reliability and security.

- *Maintenance:* The accessing is through API which does not require application installation onto PCs as result reducing maintenance requirements.

IV. SERVICE PROVIDER ON CLOUD

The selection of service providers relies on the type of service requirement, specific functions, giving user more or less control. The consumers' cloud need depend upon how he is intended to use the space and resources associated with the cloud. The cloud provider will be pay-as you-go, meaning that you can purchase more storage space from your cloud provider as per your technological need changes. The cloud providers offer following services that can be grouped into following categories.

Software as a Service (SaaS): The SaaS provider gives subscribers access to both applications and resources. In this model the customers access the application hosted as a services via internet. I makes superfluous for the customers to have a physical copy of software to install on their devices. It is the most widely known and used form of cloud computing. It provides all the functions of an application through web browser to many customers. It omits the customer worries about storage, application servers and development concerns. Examples include Salesforce.com, VoIP from Skype and Vonage, Google's Gmail and Apps, instant messaging from Yahoo and AOL.

Platform as a Service (PaaS): The PaaS provider gives subscribers to access to the components that they require to develop and operate applications over the internet [2]. The customer installs or develops its own software and applications; the PaaS provider facilitates the required network, operating system and hardware. In a nutshell, PaaS supplies all the resources required to build applications and services completely from internet, without having to install or download the software. Examples include Google's Apps Engine, Force.com, and Microsoft- Windows Live.

Infrastructure as Service (Iaas): As the name states, it primarily deals with computational infrastructure. The IaaS provider gives subscribers the physical storage space and processing capabilities as standardize services over the network. Examples include Amazon Web Services, Wolfram Alpha, IBM- managed hosting ad Amazon.com cloud storage.

Storage as Service (Staas): In this type of cloud service, the users can store their data at remote systems and can access them anytime. These services need high performance system with high volume of storage disk with extreme performance and data consistency, because of the conflicting nature of resource requirements, no one system implements all of them together.

Figure 2. Cloud computing service types with examples

V. DEPLOYMENT OF CLOUD SERVICES

The deployment of the cloud computing services can diverge depending on requirements. There are different types of clouds that customer can subscribe discussed below:

(i) Public Cloud: They are owned and operated by third parties. This type of service can be deployed with very little financial outlay. All customers share the same infrastructure pool with limited configuration, security protections and availability contentions. Examples include e-mail services, online photo storage services or social networking sites.

(ii) Private Cloud: This type of cloud is subscribed for specific organization or group and limits access to associated group.

(iii) Community Cloud: A community cloud is shared among two or more organizations that have similar cloud requirements.

(iv) Hybrid Cloud: This type of cloud contains the mixture of public, private and community clouds. The ability to allow applications and date to move from one cloud to another makes it different from other types of cloud services.

VI. CHALLENGES

Despite the benefits of cloud computing as discussed, there are various issues and challenges on which much more research is to be performed. These challenges include:

a) *Data Protection:* as many users and enterprises stores their own data on cloud drives. In many occasions, the actual storage location is not disclosed, the clause of confidentiality and fear of data lost arises which results a huge security concerns for the service providers. The security measures also include what encryption method does the service providers provide, what methods of protection they have in place for the hardware that your data will be stored on, firewall setup and back up plans in case of data lost.

b) *Data Recovery and Availability:* All types of service providers have an agreement with their consumers that are stringently followed including data replication, system monitoring, maintenance, disaster recovery, and capacity and performance management.

If any of these services is under served by a cloud provider, the damage and impact could be severe.

c) *Regulatory and Compliances Restrictions:* In many of the European countries, government regulations do not allow the customer's personal and other sensitive information to be disclosed outside the state or country. Hence cloud providers need to setup a data center or storage site exclusively within the country to obey with regulations. The deployment of such huge infrastructure is not always feasible and is big challenge for cloud providers.

d) *Management Capabilities:* the management of platform and infrastructure is still in its beginning. The features like Auto-scaling are essential requirement for the enterprisers. Consider a University of Cambridge uses a cloud service and stores data up to 20GB per day. How management provides scaling, efficiency and backups of the storage media is a big issue. Hence, much more research is required for the improvement of load balancing and scalability.

e) *Vulnerability to Attacks:* There is lot of personal information people store on their computers, and this information is now being transferred to the cloud. The treat to malicious attacks is certainly an issue. The capabilities of security system of cloud must be extended to deal with unauthorized access and malicious attempts.
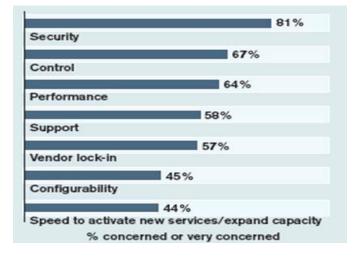

Figure 3: Cloud Security issues

VII. CONCLUSION AND FUTURE WORK

We conclude cloud computing as the ability to use computing resources – storage, applications and processing power over the internet. These resources are managed and hosted by several different types of service providers depends on the customer's requirement. In this paper we have discussed numerous approaches of cloud computing and lighten their strengths and challenges. We have also discussed about incentives and suggestions for future research. Cloud is a big target for malicious individuals and needs much more development work to implement in the area of security for detection and prevention of unauthorized access.

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