Introduction to Cloud Computing: A Review

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Abstract: Cloud Computing is an emerging field where Infrastructure, Platform and Software can be accessed as a service. The clients accessing the service pay for what they use. This paper presents the basic idea of cloud computing, various models, and benefits of cloud computing technology to the end user. Also highlighting some of the challenges faced by the cloud computing.

Keywords: cloud computing, models, benefits etc.

I.   INTRODUCTION

Cloud Computing is defined as a model for enabling convenient, on-demand network access to a shared pool of configured computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. The cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models."
Various definitions have been composed by many scientists. Some of definitions are:-

- 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 resources based on service-level agreement established through negotiation between the service provider and consumers.

- Cloud computing refers to the bigger picture basically the broad concept of using the internet to allow people to access the technology enabled services.

- Cloud computing is broad array of web based services aimed to allowing users to obtain a wide range of functional capabilities on a 'pay-as-you-go' basis that previously required tremendous hardware/software investments and professional skills to acquire. It is the realization of the earlier ideals of utility computing without the technical complexities or complicated deployment worries.

II.   BASIC IDEA OF CLOUD COMPUTING

Let say Google has its main server at China. But Google server provides services all over the world, say in India, Japan, UK etc. so if the main server is at China people accessing Google services from India will have large response time as compare to people accessing services from China. To overcome from this large response time, a new technique is used where replicated servers of Google server are placed to all such countries. So, thus people in India will access Google services from replicated Google server placed in India in place of Google server at china. And within India, there could be many replicated servers, say in Delhi, Mumbai so on. Thus response tine will be much smaller. This whole mechanism is named as cloud. Google has made this cloud like structure so as to provide services or to fulfill all end user requirements anywhere. That is why clouds are named as some mechanism which provides "Anything as a Service Anywhere".
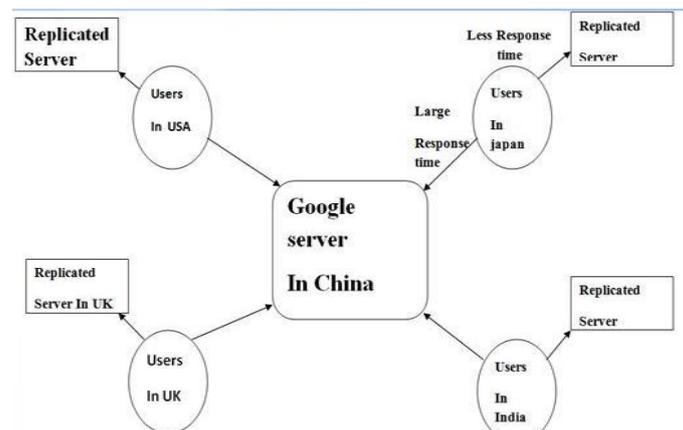

Fig .1 Basic idea about cloud computing

III.   SERVICE MODEL

- *Infrastructure as a Service (IaaS):* Provides the consumer with the capability to provision processing, storage, networks, and other fundamental computing resources, and allow the consumer to deploy and run arbitrary software, which can include operating systems and applications. The consumer has control over operating systems, storage, deployed applications, and possibly limited control of select networking components.
- *Platform as a Service (Pass):* Provides the consumer with the capability to deploy onto the cloud infrastructure, consumer created or acquired application, produced using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems and storage, but has control over the deployed applications and possibly application hosting environment configurations.
- *Software as a Service (SaaS):* Provides the consumer with the capability to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface, such as a web browser (e.g web-based e-mail). The consumer does not manage or control the underlying cloud infrastructure, including network, server, operating systems, storage, or even individual application capabilities, with the possible exception of limited user specific application configuration settings.

IV.   DEPLOYEMENT MODELS

- *Private Cloud*: The cloud infrastructure is operated for a private organization. It may be managed by the organization or a third party, and may exist on premise or off premise.
- *Community Cloud*: The cloud infrastructure is shared by several organizations and supports a specific community that has communal concerns (e.g. mission, security requirements, policy and compliance considerations). It may be managed by the organization or a third party, and may exist on premise or off premise.
- *Public Cloud:* The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.
- *Hybrid Cloud*: The cloud infrastructure is composition of two or more clouds that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g. cloud bursting for load balancing between clouds).

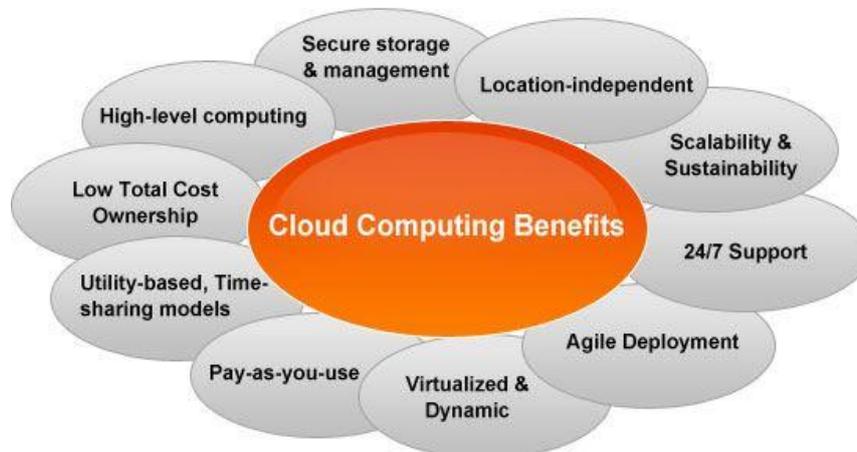### V.   CHARACTERISTICS AND ADVANTAGE OF CLOUD COMPUTING

Fig. 2 Benefits of Cloud computing

- *Multi-tenancy*: Public cloud service providers often host the cloud services for multiple users within the same infrastructure.
- *Elasticity and Scalability*: Ability to expand and reduce resources according to your specific service requirement. e.g. you may need a large number of server resources for the duration of a specific task. You can release these server resources after you complete your task.
- *Pay-per-use*: Pay for cloud services only when you use them, either for the short time (for CPU time) or for a long duration (for cloud based storage).
- *On demand*: One can invoke cloud services on need basis, need not to be a part of IT infrastructure.
- *Resiliency*: Cloud can completely isolate the failure of server and storage resources from cloud users. Work can be migrated to a different physical resource in the cloud with or without user awareness.
- *Less cost*: It is less expensive to run a workload in a data center in another area based on time of day or power requirements.
- *Quality of service*: A well designed cloud can project a much higher QoS than possible. This is due to the lack of dependence on specific hardware, so any physical machine failures can be migrated without the usersknowledge.

- *Specialized Environment*: Within a cloud the user can utilize custom tools and services to meet their needs. This can be the use of latest library, toolkit, or to support legacy code within new infrastructure.
- *Simplified Interface*: Whether using a specific application, a set of tools or web services, cloud provides access to potentially vast amount of computing resources in an easy and user centric way.

VI. DISADVANTAGE OF CLOUD COMPUTING

- Requires high speed network and connectivity constantly
- Privacy and security is not good. The data and application on a public cloud might not be very secure.
- Users have external dependency for mission critical applications.
- Requires constantly monitoring and enforcement of service level agreements.
- Disastrous situation are unavoidable and recovery is not possible. If the cloud losses data, the user and the service provider both gets serious problems.

VII. CLOUD COMPUTING ISSUES

The issues can be organized into several different categories varying from security, protection, identity management, resource management, power and energy management, data isolation, availability of resources, heterogeneity of resources. The following could be treated as of prime concern.
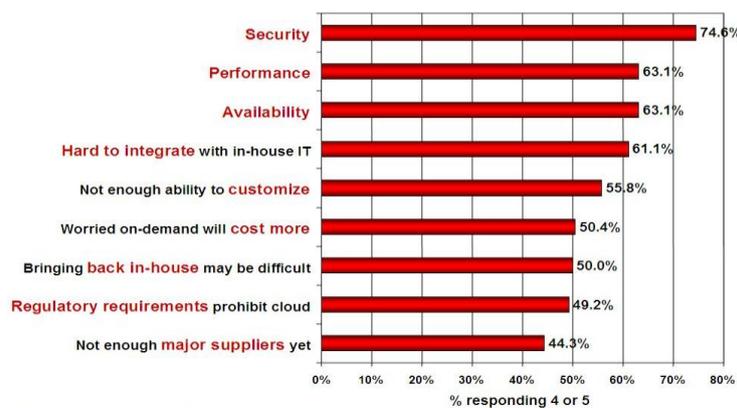
Fig. 3 Challenges in cloud computing

- *Security*: The main challenge to cloud computing is how it addresses the security and privacy concerns of businesses thinking of adopting it. The fact that the valuable enterprise data will reside outside the corporate firewall raises the serious concern. Hacking and various attacks to cloud infrastructure would affect multiple clients even if only one site is attacked. These risks can be mitigated by using security applications, encrypted file systems, data loss software etc.
- *Service Delivery and Billing*: It is difficult to assess the costs involved due to the on-demand nature of the services. Budgeting and assessment of the cost will be very difficult unless the provider has some good and comparable benchmarks to offer. The service level agreements of the provider are not adequate to guarantee the availabilityand scalability.
- *Performance*: The cloud must provide better performance when a user moves to the cloud infrastructure. Performance can be measured by the capabilities of the applications running on the cloud. Poor performance is due to lack of proper resources, disk space, limited bandwidth, low CPU speed etc. poor performance can lead to end of service delivery, loss of customers.
- *Resource Management*: It includes the management of memory, disk space, CPU's, I/O devices etc. Resource provisioning can be defined as allocation and management of resources to provide desired level of services. The major issues of job scheduling on cloud systems are partitioning of jobs into parallel task, inter connection network betweenclouds or processors, priority to jobs, job flexibility, resource allocation etc. The job scheduling is the critical process that must be decided very carefully and wrong selection of scheduling strategy can lead to devastating effect on performance and wastage of resources while failing to meet quality of service.
- *Virtualization*: It is the creation of virtual version of storage device, an operating system, a server or network resources. It divides the resource into multiple executions environment and hides the physical characteristics of computing resources to simplify the wayin which other systems, applications or end users interact with those resources. Virtualization makes infrastructure management more complex and massive automation is required in order to support the key aspects such as automation, on-demand and elasticity requirements.
- *Energy consumption*: Cloud data centers house thousands of servers and set up the cooling infrastructure to remove heat generated by the servers. The servers and cooling infrastructure consume a large amount of energy and produces green house gases. We require designing such hardware, software, scheduling policies and other protocols that consume energy in eco friendly and optimist manner.

VIII. CONCLUSION

Cloud computing is an integral component of almost all businesses in near future and is expected to change the IT industry. It is based on the model of delivering services on the internet with pay as you go model with various advantages. Cloud computing has certain challenging issues like security, performance, virtualization, energy consumption etc that needs to be addressed carefully. This paper has discussed the concept of cloud computing, its models and highlighted the advantages, disadvantages and challenges.

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