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BASICS OF CLOUD COMPUTING

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Abstract - *Cloud computing is on demand as it offers dynamic flexible resource allocation for trustworthy and definite services in pay-as-you-use manner, to Cloud service users. For hosting and delivering services over internet it has emerged as new paradigm. Cloud computing attracts business owners as it benefits enterprises when there is rise in service demand and eliminates the need of provisioning plan of owners. Cloud computing provides huge opportunities to IT industry. This paper is used to review the cloud computing concept, their characteristics, architecture, service models, deployment models and challenges.*

Key Words: **cloud computing, cloud services, virtualization, scalability, data centers.**

1. INTRODUCTION

Cloud Computing has recently gained considerable attraction as it became one of the most talked about future computing and service paradigm. This new paradigm has led to increase in demand for increased performance computing infrastructures. Hence, it resulted in construction of huge computing cloud data centers. The cloud data centers are capable of hosting many thousands of servers and tens of thousands of web-based application services simultaneously [1]. It has been estimated that the Cloud Computing offers cost advantages which in comparison to earlier approaches has three to five times reduced for business applications and more than five times it has led to reduction in cost for consumer applications [2].

1.1 CLOUD DEFINITION

Cloud computing is a service leaning paradigm that tender "everything as a service" over internet. It facilitates sharing of infrastructure (server space), platform and services [1]. It is a term used to exemplify both a platform and the type of application. Cloud Computing [2] illustrates applications that can be extended to be made accessible via internet. For this purpose, huge data centers consisting of powerful servers are being used for hosting web applications and the assorted web services. On the other hand, as a platform it provisions, configures and reconfigures servers that can be physical or virtual machines.

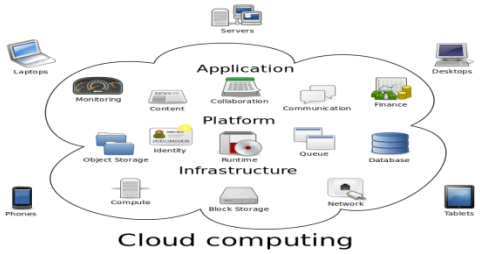

Figure-1: Cloud computing

1.2 CLOUD COMPUTING ARCHITECTURE

NIST, a well accepted institution around the world is known for their quality work in the domain of Information Technology and is widely accepted. The architecture of Cloud Computing as presented by NIST includes five crucial characteristics, four cloud deployment models and three cloud services [3]. The layered architecture by NIST is shown in figure 1.

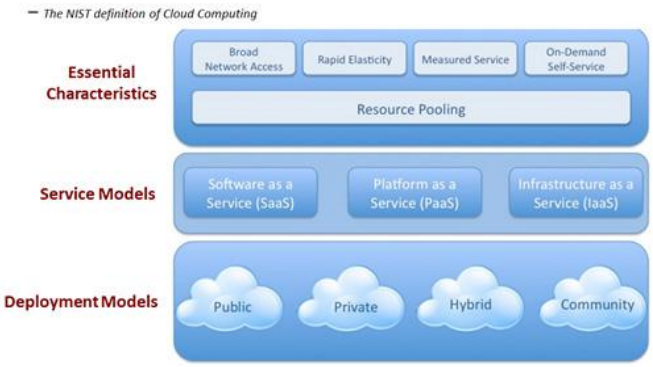

Figure-2: Model of NIST working definition of Cloud computing [4]

1.3 CHARACTERISTICS OF CLOUD COMPUTING

The essential characteristics of Cloud computing as explained in [3] are presented below:-

- On-demand-self-service: The services can be provisioned or acquired back as per user requirement without his interaction with the service provider.

- Broad Network Access: A standard mechanism is adopted in a heterogeneous environment to have access over the network and is implemented using thin or thick clients.
- Resource Pooling: The provider pools the computing resources in an efficient way in order to serve needs of distinct consumers who follows a multi-tenant model via assigning the required virtual and physical resources dynamically on the basis of consumer demand.
- Measured Service: Cloud computing systems are designed in a way that they can automatically control and can optimize resource usage. This can be achieved by provisioning a metering ability to varied type of services offered by Cloud.

1.4 CLOUD SERVICE MODELS

The three fundamental classifications of Cloud systems, generally refereed as "SPI model" as explained in [3] are presented in this section.SPI is a term which can be bifurcated as "Software as a Service", "Platform as a Service" and "Infrastructure as a Service" and a brief illustration is explained below:

- Software as a Service: SaaS constitutes an easy software delivery model which depicts accessing of applications over Internet is made possible via an easy interface such as a web browser. The users remain unaware about the underlying cloud infrastructure that is being used in backend. Such infrastructure includes network resources, servers, operating systems, types of storage devices deployed, platform, etc. The model eradicates the need to install, deploy and run the developed application on local computers [3]. As the application runs on the service provider's system, hence the provider is responsible for managing the access and performance of the application.

- Platform as a Service: With PaaS, the applications created by consumer using provider tools or programming languages can be deployed on cloud infrastructure. PaaS as a service paradigm offers an elevated and integrated environment that provisions the user to build, test, deploy and host the applications [3] [4]. In comparison to SaaS, the consumers maintain an abstraction from the infrastructural details and only controls the applications developed and deployed by them. Besides, users can manage the hosting environment configurations for their applications. Thus, PaaS contributions relate to facilitation of application development and related maintenance issues. Some providers intend to provide only development environment, and some offers hosting-level services which includes security and on-demand scalability concerns. Typical examples of PaaS are Google App Engine, Windows Azure, Engine Yard, Force.com, Heroku, MTurk.

- Infrastructure as a Service: IaaS, is a provision model of cloud which outsources the computing and utility resources such as processing, storage, network components, to its users. IaaS providers own these resources and are responsible for the maintenance and housing of all equipments. Users or consumers of such a service are offered with the advantage of pay-as-use model. The infrastructure can scale up and down dynamically and accepts users program and the related data [3]. The infrastructure is flexible and virtualized to meet user requirements. Typical examples of IaaS are: Amazon EC2, IBM Blue Cloud, VPC, Eucalyptus, Joyent, FlexiScale, Rackspace Cloud, etc.

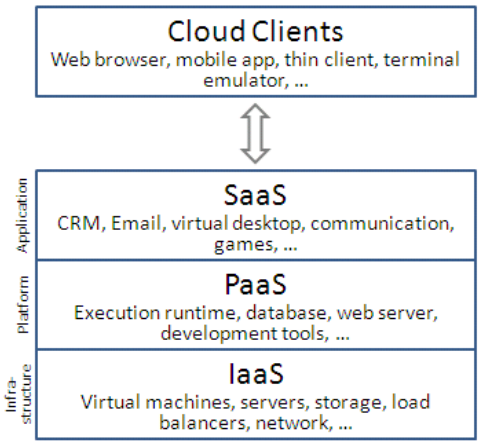

Figure-3: Cloud Service models

1.5 CLOUD DEPLOYMENT MODELS

The cloud deployment models as elaborated in [3] are presented below:-

- Public Cloud: The Public Cloud infrastructure is available all over the world and can be accessed by anybody sitting at any geographical location. The computing resources of Public Cloud environments are dynamically provisioned via Web applications or Web services over the Internet via from any off-site third-party provider. Such clouds are operated by third parties, and applications submitted from varied customers get blended together on the cloud's servers, network components and storage system resources. Examples of such clouds are Amazon clouds, Google clouds.

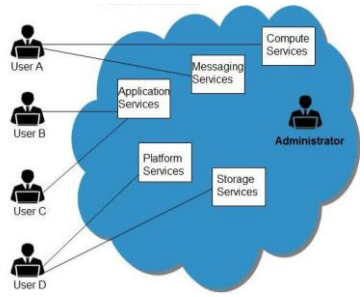

Figure-4: Public cloud

- Private Cloud: Private clouds are the clouds that are available exclusively to a single organization. Such clouds intentionally impose limits access of its resources to the people belonging same organization which owns the cloud. These clouds can be accessed within the organization's premises by means of authentication of each user. The infrastructure of these clouds is managed and operated by a specific organization only.

Figure-5: Private cloud

- Community Cloud: The infrastructure of the Community Cloud deployment model gets shared by many multi-faceted organizations. Such models support a specific community taking into consideration shared concerns. Service providers of these models maintain data of various organizations rather than the user. The major concern area for such models is data security and integrity.

- Hybrid Cloud: These are combination of multiple clouds (private, community, or public) that act as unique entities but are bounded together for offering advantages of numerous deployment models. It is also called as a multiple cloud system that gets coupled to allow data and programs to be moved easily between various deployment systems. Besides, a hybrid cloud can be offered in various ways. One way employs a partnership between vendors having a private cloud with a public cloud provider.

Figure-6: Hybrid cloud

1.6 CHALLANGES OF CLOUD COMPUTING

The challenges faced by cloud computing environment are presented below[6]:

- Security and Privacy: It addresses the issues relating to securing the stored data and monitoring of usage of cloud by the service providers. This issue can be resolved by storing the data into the company or organization itself and allowing its usage on the cloud.
- Service Delivery and Billing: The service level agreements (SLAs) offered by providers are not adequate enough to guarantee the availability and scalability.
- Interoperability and Portability: As the cloud environment is highly dynamic in nature and due to the virtualization technology, the leverage of migrations of the resources should be permissible.
- Automated service provisioning: Cloud computing environment is very elastic as automatically the resources can be allocated or released. So, to make it possible a mechanism needs to be developed and deployed that uses or releases the resources without compromising on the performance aspects.
- Performance and Bandwidth Cost: By limiting the hardware resources, the cost consumed by organizations on cloud cannot be saved as more amount has to be spend on bandwidth.
- Virtual Machines Migration: A strategy needs to be formulated to dynamically distribute the load when moving between the virtual machines in a virtualized data centre. Virtualization technique slices a single physical machine into set of virtual machines each having its own computing and storage requirements and resources.
- Energy Cost: Enormous amount of electrical energy is consumed by cloud data centres which results in high operational costs and emission of huge amount of carbon dioxide.

2. CONCLUSIONS

Cloud computing is a new emerged paradigm over internet for managing and delivering services. Cloud computing turns the promise of long held utility into reality by changing the landscape of information technology. Though there are significant benefits of cloud computing but the current technology cannot realize its full potential as they are not mature enough. Many challenges are there which starts receiving attention from research family.

In this paper we have surveyed about the basics of cloud computing which is a new emerging trend. Cloud computing increases the performance of computing infrastructure. As it facilitates sharing platform which in turns provides cost cut advantages. As cloud computing technology is still developing at its early stage, we hope our work will provide a better understanding of cloud computing, and help the researchers for further research in this area.

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