Fundamentals of Cloud Computing

What is cloud computing?

- Cloud computing is a technology that uses the internet for storing and managing data on remote servers and then access data via the internet.
- This type of system allows users to work on the remote.
- Cloud computing customers do not own the physical infrastructure; they rent the usage from a third-party provider.
- Cloud Computing and the Essential characteristics of cloud services are On-demand self- service, Broad network access, Resource pooling, rapid elasticity.
- Cloud computing is so successful because of its simplicity in its usage. They are a cost-effective solution for enterprises.
- The various features are Optimal Server Utilization, On-demand cloud services (satisfying client), Dynamic Scalability, Virtualization techniques.
- One such example is Google cloud – It is a suite of public cloud services offered by Google.
- All the application development run on Google hardware. They include Google Compute Engine, App engine, google cloud storage, Google container engine.

National Institute of Standards and Technology (NIST) stated that cloud computing offers worldwide, and on-demand access to computing resources that can be configured based on the customer's demand.

NSIT has also introduced the 5-4-3 principle of cloud computing which include five characteristic feature of cloud computing, four deployment model and three service models.

Principle of Cloud Computing

Five Essential Characteristics

Four Cloud Deployment Model

Three Cloud Service Model

Principles to Scale Up Cloud Computing

Five Essential Characteristics Features

The essential characteristics of cloud computing define the features that are important for successful cloud computing.

If any feature among the defined one is missing, then fortunately it is not a cloud computing. Let us now discuss what these essential features are?

1. On-Demand Service

The customer can self-provision the computing resources such as server time, storage, network, application according to his demands without any human intervention i.e. the cloud service provider.

2. Broad Network Access

The computing resources are available over the network and they can be accessed using heterogeneous client platforms such as mobile, laptop, desktop, PDAs etc.

3. Resource Pooling

The computing resources such as storage, processing, network, etc. are pooled in order to serve multiple customers.

For this, cloud computing adopts the multitenant model where the computing resources of the service providers are dynamically assigned to the customer on their demand.

The customer is not even aware of the physical location of these resources. However, at a higher level of abstraction, the location of the resources can be specified.

4. Rapid Elasticity

For cloud customer the computing resources often appear to be unlimited this is because the cloud resources can be rapidly and elastically provisioned on to meet customer's demand and the resource can be rapidly released to scale in.

Depending on the customers demand the computing resources can be purchased at any time and in any quantity.

5. Measured Service

The computing resources used by the customers can be monitored and controlled by implementing the meter at some level of abstraction depending on the type of service.

With metering capability, the utilized resources can be reported thereby providing the transparency between the provider and customer.

Cloud Deployment Model

As the name suggests the cloud deployment model exhibits the method in which the computing resources are acquired at the location and provisioned to the customers.

Deploying cloud computing can be categorized into four different forms as below:

1. Private Cloud

The cloud environment deployed for the exclusive use of a single organization is the private cloud.

The organization may have multiple cloud users belonging to the different business unit of the same organization.

The organization may unilaterally own and manage the private cloud or it may give this responsibility to a third party i.e. cloud providers or it may be the combination of both. The private cloud infrastructure can either be on or off organization premise.

2. Public Cloud

The cloud infrastructure deployed for the use of the general public is the public cloud.

This public cloud model is deployed by cloud vendors, gov. organization or combination of both of them.

The public cloud is specifically deployed at the cloud vendor's premises.

3. Community Cloud

A cloud infrastructure that is shared by several organizations that together form a community and shares the same interest is a community cloud.

The community cloud is owned, managed and operated by the organizations or cloud vendor's i.e. third party.

The communication cloud can be on the community organizations premises or on the cloud provider's premises.

4.Hybrid Cloud

The cloud infrastructure comprised of two or more distinct cloud models such as private, public and community then that cloud infrastructure is hybrid cloud.

Though these distinct clouds structures remain as a unique entity they can be confined together by exclusive technology which enables data and application portability.

Services Offering Models

Cloud computing offers three kinds of services to its end users which we will be discussing in this section

1. SaaS

Software as a Service (SaaS), here the cloud service provider offers his customer to use application running on cloud infrastructure over the internet on a subscription basis.

With this capability, the service providers offer servers, storage, network, virtualization, operating system, running environment and software.

The user can access cloud applications on or off-premises. The customer does not have to worry about the maintenance and updates as it is the responsibility of the service provider. The customer can scale up or scale in the offered services depending upon his demands.

The most popular examples of SaaS are Google Dropbox, Microsoft OneDrive, and Slack.

2. PaaS

Platform as a Service (PaaS), here the cloud service providers along with the infrastructure offer runtime environment to its consumer which leverage the web-based development and deployment of the software or application.

The PaaS customer does not have to manage or control the cloud infrastructure though they have full control over the deployed software. The most popular PaaS services are Google App Engine, Windows Azure and Heroku.

3. IaaS

Infrastructure as a Service (IaaS), here the cloud service provider offers server, storage, network services through virtualization to its end users. The consumer can access these virtualized computing resources over the internet.

The IaaS customer does not have to manage or control the cloud infrastructure though the customer has control over the run time environment, middleware, operating system and deployed applications.

The most popular IaaS services are Google Compute Engine, Rackspace, and Amazon Web Services (AWS).

Principles to Scale Up Cloud Computing

In this section, we will discuss the principles that leverage the internet to scale up cloud computing services.

1. Federation

To the customers, cloud resources are always unlimited but every cloud has a finite capacity.

If the customer demand grows continuously the cloud has to grow beyond its capacity for that the service provider's forms federation to enable collaboration and sharing of resources.

The federated cloud must allow the virtual application to be deployed across federated sites. The virtual application must not be location-dependent and should be able to easily migrate between the sites.

The federated members must be independent as it would ease the competitive service providers to federate.

2. Independence

The cloud computing services must offer full independence to the end-users which allow the user to use the cloud services without relying on any specific cloud provider.

Even the cloud provider must be able to manage and control there computing service without sharing internal details with the customers or partners.

3. Isolation

We all are aware of the fact that a cloud service provider offers his computing resources to multiple end-users.

The end-user must be assured before he moves his computing cloud that his data or information would be isolated in the cloud and it cannot be accessed by the other members sharing the cloud.

4. Elasticity

The cloud computing resource should be elastic that means the user must be free to engage and release the computing resources on his demand.

5. Business Orientation

Before moving the mission-critical application to cloud the companies must ensure the quality of service offered by the cloud providers.

The cloud service provider must also develop a mechanism to understand the exact business requirement of the customer and customize the service parameter according to the customer requirement.

6. Trust

Trust is the most important factor that leverages any customer to move their computing over the cloud.

For the success of the cloud, the trust must be maintained the cloud customer and cloud vendor and also among the different cloud providers to form the federation.

So these are the principles of cloud computing that leverages the internet to scale up cloud computing.

The cloud provider considers these principles before deploying cloud services to the end-users.