CLOUD COMPUTING: A REVIEW

Present & Future of Cloud Computing

Leena Rajendra Teli

Student

B.Sc of Information Technology leenxteli@gmail.com

Chikitsak Samuhas Sir Sitaram And Lady Shantabai Patkar College Of Arts And Science And V R Varde College, Mumbai, India.

Kshitija Nilesh Saitavdekar

Student

B.Sc of Information Technology kshitijasaitavdekar09@gmail.com

Chikitsak Samuhas Sir Sitaram And Lady Shantabai Patkar College Of Arts And Science And V R Varde College, Mumbai, India.

Abstract: Nowadays Cloud Computing is preferred by many successful business and IT techs for its versatility. This review paper focuses on 'Why', 'How', 'What' of Cloud Computing. It is a service provided over internet for delivering and hosting various software applications and networked hardware. The fundamental features of cloud computing are its architecture, classification, Services provided, advantages and disadvantages. Architecture of cloud computing is bifurcated into two parts, Front end and back end. Front end is referred as the client side of cloud computing, Back end refers to the cloud services which is used by the company itself. As the cloud computing is evolving, use of hardware has decreased significantly because it provides 'pay-as-you-go' service so most of the work is done by cloud services which saves the setup cost of software and hardware. There are many applications of cloud computing which are introduced in the market for the advancement of the society, like using Google G suit for backing up data which includes Google docs, Calendar and many more features. The main objective of this paper is to provide perception about the new domains of cloud computing.

Keywords: **Cloud, Front End, Back End, Architecture, SaaS, PaaS, IaaS.**

I. Introduction:

Cloud Computing is a service provided over internet to allow business to scale up as change occurs. Services provided include- storage, databases, operating systems, software, intelligence, networking, servers and hardware on which these services can be implemented. Cloud computing is a per-paid service where requirements are put forth beforehand and the payment is based on for how much time the service are used. This serves as a major advantage when switching to cloud computing. Once the business is on cloud the data can be accessed from anywhere until and unless it has internet connection. Now that all the data is on virtual data center workload is reduced on the local computers which use heavy applications. Some of the companies who have cloud computing services are Google, Microsoft, Amazon, IBM, etc.

II.   **Architecture**

Cloud Computing Architecture comprises many components and sub components which are essential and loosely coupled which make cloud work. It is a technology which is used by both small organizations and large organizations to store information in cloud and access it from anywhere at anytime via internet connection.
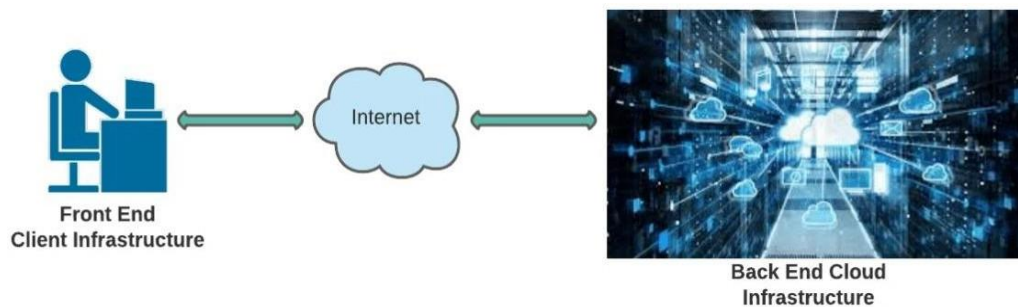

Figure 1:Architecture Of Cloud Computing

The Cloud Computing Architecture is branched into two parts:
   i.   Front End
   ii.   Back End
The branches of cloud computing architecture communicate via network, generally Internet

Front End:
Front End is a visible interface and it refers to the client part of cloud computing system. In cloud computing systems for accessing, its platform users are provided with client-side interface and application. The client- side applications provide web servers such as google chrome, fire fox and internet explorer. The only component of Front end is a Cloud infrastructure which consists of hardware and software components such as data storage, server, virtualization software. It provides GUI (Graphical User Interface) to the end-users to interact with the cloud.

Back End:
The Back End refers to the cloud itself which is used by the service provider. It the responsibility of back end for monitoring all the programs that run the application on the front-end. Also, it comprises all the resources required to provide cloud computing services. It consists a huge amount of data storage, security mechanism, virtual machines, deploying models, servers, traffic control mechanisms, etc. Back End is an important part of the cloud computing architecture.
○ The components of the back-end cloud architecture are:

• Application:
The application may be any software or platform. Relying upon the client requirement, the application provides the result to the end-user in the back end.

• Service:
Service is one of the most important components of cloud computing architecture. The responsibility of services is to provide utility in the architecture. It manages which type of service you access according to the client's requirement.
Cloud computing consists of three types of services:
1.Software as a Service (SaaS)
2.Platform as a Service (PaaS)
3.Infrastructure as a Service (IaaS)

• Storage:
Storage is one of the most essential components of cloud computing. It provides a huge amount of storage capacity and maintains data like files, videos, documents, etc. over the internet.

- Infrastructure:

An Infrastructure is a component which provides services on the host level, application level, and network level. It includes hardware and software components which are needed to support the cloud computing model.

- Management:

Management is a component which is used to manage components such as application, storage, infrastructure and other security issues in the back end and build coordination between them.

- Security:

Security is an in-built part of back-end cloud infrastructure. It implements a security management to the end user in the back end which results in preventing data loss.

III.   Classification Of Cloud Computing

➢ Types of Cloud:

i.   Public cloud:

The 'Public Cloud' is the cloud which is available to general public on a pay-per-use basis. It offers a public cloud environment through the internet. Customers do not have any visibility over the actual infrastructure of the company providing cloud computing services.

It is the IT infrastructure which is used by many companies at the same time. It is the best economical option for users in which the service provider bears the expenses of bandwidth and infrastructure because the cost is determined by usage capacity. The Google Cloud Platform public cloud infrastructure which is a part of google cloud storage public services and the examples of them are Gmail, Google Drive.

Let's take an example of an email account which is secured by its password, and the hardware over which it is stored is shared by millions of people.

Service providers of public cloud are as follows:

- Microsoft Azure ExpressRoute
- Google Cloud Interconnect
- AWS Direct Connect
- Blue cloud by IBM

ii.   Private cloud:

Private cloud is also known as corporate cloud or internal cloud. The private cloud is a cloud which is used by large enterprises to develop and manage their own data centers, these internal datacenters of business organizations which are not made available to the general public are known as a private cloud. A secure IT infrastructure is provided and it is controlled and operated for the benefit of a single organization. Comparatively, Private clouds are more secure than a public cloud. The organization can control its own private cloud or outsource this task from a third party and the infrastructure can be placed either on the premises of the customer or in a data center. Eventually, the private cloud is the cloud that is deployed on the organization premises, served, and controlled by its employees.

Service providers of Private Cloud are:

- VMware
- Microsoft

iii.   Hybrid Cloud:

Hybrid clouds are two completely different clouds that are public cloud and private cloud which are joined together rather than considering only a particular aspect. A hybrid cloud is the combination of a private and public cloud, it provides more flexibilty to the businesses at the same time it controls over critical operations and assets. When there is heavy network traffic or high data load cloud is preferred over the organization's own infrastructure which is used for daily and basic usage.

For example, Local governments of small country's don't have massive budgets which leads problem and makes it difficult to manage the growing expectations of its citizens. So, when its current infrastructure starts aging and data center nearing its capacity they prefer to invest in the hybrid cloud architecture.

Service providers of Hybrid Cloud:
- Microsoft
- Amazon
- Google
- VMware

iv. Community cloud:

A community cloud is a cloud which is shared between organizations with a common goal. It can be owned, operated and run by one or more of the communal organizations. Community clouds can be controlledand managed on both on and off the premises.

For example, Sometimes A Company needs a particular system or application hosted on cloud services. TheCommunity cloud allows various users to connect to the same environment so this setup removes the need tohave separate servers for each client who has the similar purpose.
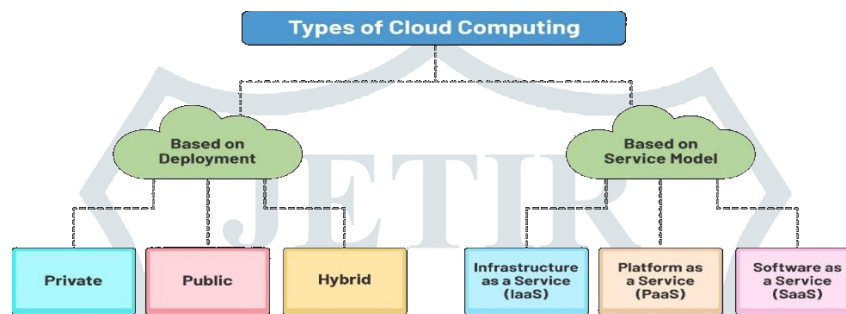

Figure 2: Types of Cloud Computing

IV. Services Provided

Cloud computing is well known for its remote servers which are networked using internet for storage, management and processing of data. These services are provided by cloud service providers and the charges are as per use. There are 5 broad categories of services. They are also called as cloud computing stacks becausethey are setup on one another, making it easy to view the layered architecture.

o Software as a service (SaaS):

When software and applications are provided over internet as a 'pay-as-you-go' service then it is said to be a Software as a Service (SaaS). As its all on the internet there is no need of maintaining a software and a complex hardware to run the applications or software. SaaS applications are operated on internet without any installation process giving it a name- 'Web-based software'. Thus, eliminating any excess hardware andusing the same funds for more appropriate upgradation.

o Platform as a service (PaaS):

This service provides a platform to the users giving them the independence to build applications and execute codes over internet. The service provider arranges hardware and the software as a package in its service, users need not have to worry about the network, servers, operating systems or the storage. PaaS is an advantageous service for developers and coders giving them an upper hand in managing their self-made applications.

o Infrastructure as a service (IaaS):

Infrastructure as a Service (IaaS) is also known as Hardware as a Service (HaaS) provides a large- scale hardware, easily assessable software and secured network to work with. This service is majorly designed for huge businesses and enterprises to provide high-level software, security, networking and other tools required for the user. The charge is also based on, hourly, daily, monthly or on yearly bases.

- o Anything as a service (XaaS)

This Service sums up all the above services and adds up extra features making it different from the other services. This is also known as Everything as a Service (XaaS). It has variety of products, tools and new technologies. This can also be an upgradation of previous service to higher speed of accessing anything over the internet.

- o Function as a Service (FaaS):

Function as a Service (FaaS) is similar to Platform as a Service (PaaS) but this service provides serverless architecture to execute code snippets or run an application. FaaS users write and update their code on fly, which then is executed. As servers are not allotted there is less space consumption and better use of data.

V.   Advantages

- Cost
- Flexibility
- Security
- Replication
- Updates
- Efficiency
- Mobility
- Backup and Restore Data
- Improved collaboration

VI.   Disadvantages

- Downtime
- Security and privacy
- Vulnerable
- Limited control and flexibility
- Vendor lock-in
- Cost concerns

VII.   Future prediction

Future advances are made to overcome the issues faced while using cloud services. One of the issues faced is how secure the data is kept by the service providers. The solution to this is that the cloud service providers should invest more on data security and agreeable contract which can be trusted when handing over users' data. Working over internet has increases its complexity over time, this reduces the required bandwidth for using cloud services. To get the better use of cloud services users could prioritize less relevant software on their computer's memory to get better experience of cloud. With Growing technology, use of hardware has been increased over years. Cloud computing provides 'pay-as-you-go' service so most of the work will be done with the help of cloud service which can save the setup cost of software by dividing it which leads to less use of hardware.

VIII.   Conclusion

Cloud computing is a growing domain in industrial science having a higher probability of usage in the upcoming years. While all analytics articulate of the reputable side, there are many liabilities. This review paper provides the dominant features of cloud computing like it's architecture, classifications and services provided, advantages and disadvantages.

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