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Cloud Computing Challenges and its Implications

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Abstract:
Cloud computing refers the accessing and configuring the network of computing resources over internet. This network may be public or private. Cloud computing is emerging technology although it is started from 1990s but many areas are yet to be explore. The procedure of cloud computing is performed in such a way so that it gives benefit to everyone such as consumer as well as provider. This benefit related in terms of resource availability, reduce cost resources, promote self service, increase flexibility and reliability, application utility, online configuration apps and online development & deployment of application. The study of this paper is to transfer the essential knowledge of cloud computing to the beginners who are going to start the research in this field. This paper not is not only give the knowledge as well as research challenges are also discussed which helps in deciding the path of direction for further research.

Keywords- *Cloud Computing, SaaS, PaaS, IaaS, Cloud Architecture.*

I. INTRODUCTION

As the society is moving towards the digital human era, new technologies are emerging that are serving special tasks and shaping the lifestyle of people in a better mode [1]. Cloud computing is a new emerging drift in information technology [2] that make easier for sharing of resources or data of computer to the devices such as computer and mobile whenever required [3]. Cloud computing is not only for the storage [4], it is a lot more than storing the data as it provides various online services, applications and a lot more. The perception of cloud computing has generated ease for the organization's and many other users using it but is still an evolving technology of Information Science which maximizes the success of the utilization of shared resources. The term "cloud" of cloud computing is basically proposed from the real cloud properties as the cloud is made up of thousands and lakhs of vapors, then formed same as the cloud computing can be considered as a network in which unlimited users are involved. "Cloud is for everyone, cloud is a democracy".

II. HISTORY CLOUD COMPUTING

A. History

The cloud technology is being used for ages but the fact is we still don't understand it clearly. Earlier everything was okay till our computer's or mobile phone's [5] storage was not filled but when they got filled it created a lot of disturbance what to store and what not, since we didn't had option to store everything which we want then the concept of cloud came into existence which contributed in the more simpler and easier living of the human being.

1) Early 1990s.

In early 1990, data circuits of point to point were used for the users. After that it was detailed to services for virtual private network (VPN). The basic objective behind it is to supply good quality with low cost and consumption of resources using optimization for improvement in competency of bandwidth.

2) Late 1990s.

In late 1990, the first step was taken by the Salesforce in the era of cloud computing. The applications of enterprise level were provided to the user by the Salesforce. These services were purchased by many companies at low cost [6] with claim service.

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3) Early 2000s.

In early 2000, e-commerce retail sales and retail marketing were introduced by Amazon using dot com services. It also introduced the concept of data centers [6].

4) Late 2000s.

In late 2000, the new service i.e. Google Docs was introduced and act as revolutionary power of sharing in the digital world. Google Docs with cloud computing, any document can be shared to the users anywhere in all over the world.

B. Characteristics

1) On-Demand Self Service.

Cloud computing offers services to businesses like storage, applications, infrastructure etc. whenever an organization requires. It is termed as an on-demand service because any amount of service offered by it can be buy by paying some amount of money at any time [7, 8].

2) Location Independent.

The services can be accessed from anywhere. This means that the services supplied by the cloud computing does not depend upon the location or the place form where these are accessed.

3) Time and Cost Saving

A number of organizations depend upon cloud, as they do not posses to store the data physically due to over budget problem or purchasing various software licenses etc. that's why they simply hire the cloud services which can take care of all that data at a very low price. Also it does not require giving a lot amount of time to utilize its services rather it gives the result in just some clicks [7, 8].

4) No Additional Spending on Data Centers.

The main focus of cloud computing is on the users instead of on the weighty servers that need a lot of maintenance which will need a hefty amount of money as well [3].

5) Flexibility.

Cloud offers a flexible nature to its users as the users will pay only for what they are holding and can also increase or decrease the demand of the services as per the fluctuation in the workloads of the organization [7, 9] .This is a very unique feature of the cloud computing which makes it more convenient to use [3].

6) Data Security.

This is also another special feature due to which security of data of customers is not required at customer's end. Since data & information are like part and parcels of our life so any disturbance in the data may lead to disastrous situations. So, people want a service which can hold their data without any damage which can be achieved by using cloud computing [10].

C. Limitations

1) Downtime

This is the one of the most terrible drawbacks of cloud because providers of cloud do not ever provide claim whenever their service outrages, not even the very best. Working cloud system totally depends on the net connection. In other words if there is no internet connection there is nothing like cloud computing. Complete cloud system does not work.

2) Privacy and Security

Privacy and security are the two major concern in cloud computing. All the data are stored on the cloud, if there is any issue of lacking of privacy and security then all the sensitive data will be leaked out. Weakness in privacy and security can be considered as a threat for everyone who is using cloud systems. So security and privacy issues should be the major focuses area for the cloud service provider because no one will hire a cloud service if their data security breaches.

3) Prone to Attack

Cloud computing can't be possible without the internet connection and everything that is connected via internet is not purely safe and secure even for the toughest security. So, this is also another drawback of cloud systems which needs a lot of attention.

4) Limited Flexibility

The customers of cloud are bounded access and control over their own data & services [8]. There is always a limit for controlling the functions and running own hosting infrastructures.

5) Cost of Cloud Computing

For short term projects, the cost of cloud computing system is high. Although it is very flexible in nature but the overall cost remains high that jumps user expectation because users are not very sure of what will work for them so the cost ends up very high in experimenting and trying to figure out the best for them.

III. Cloud Architecture and Service

A. Cloud Architecture

The cloud architecture includes two parts (refer figure 1):

1) Front Part

The front part generally refers to the users/clients of the cloud. It includes interfaces and applications which are required to right to use the cloud services for example-Web Browser. Basically, the front part is always something which does not involve how things work, how the services are implemented etc. It is made to provide the users a very simple view of the paradigm since the users are not bothered about its internal applications; they just need what is the service.

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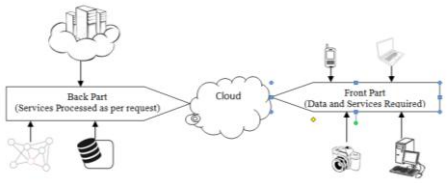

Fig. 1. Cloud Architecture

2) Back Part

The back part is made for the implementers and designers who are actually interested in how the service is being implemented. The back part is considered cloud itself. It includes all the mechanisms required to successfully implement the cloud services, the services themselves, the virtual machines, the huge underlying servers, the storage devices, the deployment models etc. The back part actually acts as a backbone for the front part without which the front part does not possess any meaning.

B. Types of Cloud Computing (refer figure 2)

1) Public Cloud

When users talk about the public cloud, the term itself says that its services are public to everyone and every user can access it depending upon their requirement [9, 12, 13]. The infrastructure of the cloud system is located at the premises of the provider of cloud service itself, so the users remain separate from the location where the infrastructure really exists. These clouds share common resources but are more vulnerable to attacks since the security level is least in the public cloud [7] e.g. Some of the providers of cloud services also provide public cloud like: Google(Google Drive), Microsoft(One Drive) and Amazon AWS etc.

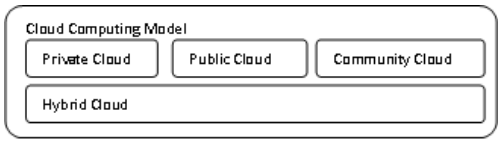

Fig. 2. Types of Cloud Model

2) Private Cloud

Private clouds refer to the cloud in which the assistance is accessible only by its owner or by a group of organization of the same company. This type of cloud is very safe to use and the security level is strictly high because the customer pays for what user holds. In private cloud model, the owner that is basically the customer of the provider of cloud service has all the management over the information and right to change the data and services of the cloud [7, 9, 12, 13].

3) Community Cloud.

Community clouds refer to the cloud in which the assistance and data are shared by a group of people belonging to the same community [8, 9, 12, 13]. The concept of community cloud is used when the data and services are to be shared by the whole community so it provides a lot ease to fulfill this need. The only thing is that the security level is less than the private cloud, but yes it is more than the public cloud. So, overall community cloud is a great concept of cloud computing for example: Community cloud can belong to a government of a single county.

4) Hybrid Cloud.

There is one more cloud that is termed as a hybrid cloud in which the term itself says that it is the mixture of two or more types of clouds [9, 12, 13].

C. Services of Cloud Computing

The services that it provides have made the human life a lot easier. Now we don't have to care about the storage or don't have to worry about where and how to store our data safely without any loss, no need to worry about the maintenance and all. All this has now solved with just one technology that has made many dreams come true. Everything As A Service: it can be broadly marks to all the services provided by the cloud ranging from the storage, application, and infrastructure etc .The user avails the service that suits his purpose. This type of cloud service is a general concept with respect to the services that are mentioned below:

1) Infrastructure Service (IaaS).

The services are provided to the users with reference to the infrastructure, it comes under the infrastructure as a service. Infrastructure as services consist of typically, personal computers in the form of virtual platforms connected to a network [7, 11, 12, 13, 14, 15]. For example: Amazon EC2, GoGrid, Flexiscale [7] etc.

2) Platform Service (PaaS).

The service in which the computing platform along with the required operating system and software application and are given to the user. The user can manage and control the platform in his own way. For example: Operating system support, software development frameworks, Microsoft Windows Azure [11], Google App Engine [7] etc.

3) Software Service (SaaS)

This service provides the users with the softwares that are deployed on the remote servers of the providers of the cloud. These softwares can be accessed by the internet connection. The payment is actually done for the actual use of the softwares. For example: Microsoft Office, Gmail, Facebook [8], Salesforce.com [7], Google maps [11] etc.

4) Hardware Service (HaaS).

This is the case in which the user is provided with the bare hardware after the payment has been made and the user can deploy his services and can built his infrastructure in his own way.

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5) Data Service (DaaS).

It refers to the fact that the users of cloud are provided with storage spaces which can be used to store a large amount of information according to their own way.

IV. Cloud Computing Research Challenges

A. Cloud Computing Challenges

1) Increased Security Vulnerabilities

When we move the user's data to the cloud provider that means we share the accountability of the data safety to them [16, 17, 18, 19, 20]. This makes the user's data at the risk as the data may be hacked by the hacker and the data may be misused in several places which cause lack of privacy issues and there are n numbers of vulnerabilities [16] that are harmful for the consumer's data which affects the cloud. As the concern is the trust as the trust is the biggest security factor for any cloud service provider which cannot be easily established by the safety architecture of the providers of cloud service.

2) Reduces Operational Governance Control

Cloud consumers or users that use cloud services are generally selected in a stage of the authority management which is lesser than that over on foundation IT resources [22]. This type of lesser stage of the authority management can causes numerous dangers related with how the cloud service provider operates and provides its cloud, and the external connections that are essential for the communication among provider of cloud service and cloud customer e.g. If a cloud consumer can uses the services of the cloud providers, but the consumer uses this service in Delhi due to its business purpose but the provider of cloud service provider does not have any data centers of cloud in Delhi due to some budget issue so the cloud provides to the consumer which is placed in the south region which is thousands of kilometers far from the consumer's workplace. Due to this scenario, cloud computing requires augmented hops in network. As a result increase in latency and constraints of potential can cause several problems to the cloud customers.

3) Restriction of Portability among Cloud Providers

There is no set standard rules and regulation in cloud computing business, public clouds are generally proprietary to different extents [22, 23, 24]. So there are various challenges that are countered by providers of cloud service as well as the consumer [14] also faces the various issues during portability of IT resources and data. As in portability when a consumer want to port from cloud A to cloud B it may experience various issue like the cloud B cannot support the more security levels as compared to cloud A or it may be possible that cloud B is not supporting as much as data as cloud A. So these are problems faced at the time of portability among clouds.

4) Multi Regional Regulatory and Legal Issues

Third party providers of cloud service frequently used to accumulate their data center in the outer boundary of the regions or convenient geographical locations to make their data centers affordable and within budget [9, 19, 21]. As cloud consumers cannot even know about the actual place of IT resources and data stored in several data centers when uploaded through public clouds. This may cause the serious legal issue for pertaining to administration policies that specifies storage of data and privacy policies e.g. in UK, some rules entail not public data belonging to the citizens of UK must be held within the UK itself.

5) Performance and Bandwidth Cost

This cloud can help in saving money of various businesses by not spending on hardware but they have to keep on spending on bandwidth [9, 19, 21]. This can be low for the low level of data as they didn't want the huge bandwidth, but for huge amount of data, it requires a good amount of bandwidth to transfer demanding and composite data through network easily without much time. So this may be over budget also. So to reduce this problem several industries are waiting for compacted cost before change to cloud.

B. Real Life Example

1) Google Drive.

In early days peoples used to put their essential important documents and official files in their computer hard drives. Now there is no such mess for worrying about the storage space. The Google hard drive lets you to keep your documentaries, photos etc. on their cloud server which can be accessed anytime, anywhere by a just some clicks and means of internet connection.

2) Apple Icloud.

This service is used to synchronize the data of mobile phone with cloud. The main advantage of this service is that in case of loss or change of mobile phone of user, data of user are not lost. Apple icloud helps the apple users for storing their data on the apple icloud that frees the phone memory and can be used for some other purposes. Without using phone or device the icloud can be accessed from anywhere by the users

V. Conclusion & Future Scope

Author discussed the background of the cloud system along with its history and features. Author also discussed the architecture and services of cloud system. This exploration gives the knowledge & power of cloud computing and gives the guidelines for researcher to move forward in same direction. The researcher will narrow down the path in specific direction. For future point of research, the main research area in which author will work is the increase security and also consider the in the direction of

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portability. This portability will benefit the customer to take care among various service providers so that cloud provider will enhance the performance of their service to hold the customer.

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