Overview of Cloud Computing

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Abstract
In this paper, the concept of cloud computing has been studied. In the first part brief introduction to the cloud computing has been given. It includes definition of cloud computing given by NIST and other scholars. In the next section the architecture and various service models as well as deployment models provided by cloud computing has been discussed. This is followed by the working of the cloud which includes the concept of virtualization. Then the light has been put on its major application areas. In the next part its advantages and disadvantages have been highlighted.

Keywords
Cloud, Private Cloud, Hybrid Clous, Saas, Paas, Iaas

I. Introduction

A few years back, people used to run applications and programs by downloading software on a physical computer and the user himself was responsible for all the necessary updates such as security updates. Users had to send files as email attachments to be worked on by one user at a time and this generally led to a mess of conflicting file content and other data. Cloud computing is a new trend and companies have started using the concept of cloud computing. Even large database was not sufficient to meet the demand of storing increasing amount of data. So, companies decided to move all the data to the cloud where all the files are stored centrally.Cloud is basically a common virtual database [1] which not only store files or other data but also contain a shared pool of resources. The resource can be software or any kind of application or some data. Moving to the cloud gives access to everyone. So, with this new trend the users are no longer responsible for installing software or any kind of application on to their physical devices instead that software or that application can be directly accessed whenever required. Hence, it has been given the name "On-demandComputing" [1]. The beauty of cloud computing lies within the fact that a consumer need not buy a software or an application because the consumer can use it by directly logging on to a particular website and need to pay only for that particular time for which the resources have been being used by the consumer. Service providers take care of regular software updates so the consumer need not worry about wasting time in maintaining the software. This makes the consumer free and allows him to focus on the things that matter.

Hence, cloud computing is purely a business activity because the consumer simply pay for the requested subscription [2]. So cloud computing cuts out the high costs of hardware. The only thing that is required by a consumer on physical device is the internet connectivity. Once there is an internet connection then the consumer can do work from anywhere. The most popular social networking sites like face-book are also an example of cloud computing implementation because when a user is updating a status, cloud technology is being used at that time. Checking bank balance on a phone? The user is in the cloud again.

II. Definition

Different scholars have given different definitions of cloud computing. Definition given by Vangie Beal is" Cloud computing is a type of computing that relies on sharing computing resources rather than having local servers or personal devices to handle applications" [1]. Cisco defines cloud computing as" IT resources and services that are abstracted from the underlying infrastructure and provided on demand and at scale in a multitenant environment"[3]. In Cloud Computing, the word cloud is used to describe the "internet"[3]. So, the term cloud computing can be defined as a type of internet based computing, where different services such as servers, storage and applications are delivered to the computers and other physical devices of an organization through the internet[4]Amazon EC2(Elastic Computer cloud) is an example of a commercial web service that provide computing resources on lease to the customers[5]. NIST(National Institute of Standards And Technology) issued a different definition in September, 2011. NIST defined Cloud Computing as "a model for enabling ubiquitous, convenient ,on demand network access to a shared pool of configurable computing resources(example network ,servers, storage, applications and services)that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of three service models and four deployment models [6]. Hence, by concluding cloud computing can be defined as the use of computing resources which are placed in a data center and are accessed via internet from any location.

III. Architecture

The architecture of cloud computing includes all those components, subcomponents and elements that are used for computing [7]. The architecture of cloud computing includes three types of service models. These are named as SaaS , PaaS and IaaS. The below figure represent these models:

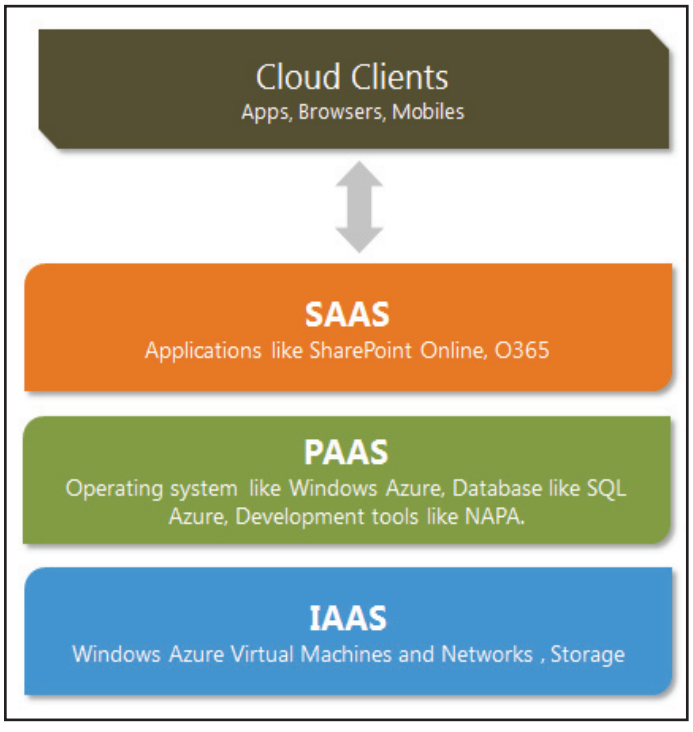

Fig. 1: Cloud Computing Service Model

A. Software as a Service (SaaS)

This service model allows a consumer to use commercialsoftware [8] or a pre developed software on pay per use basis. It means more usage more cost and less usage less cost. So, there is no need to download the software on the physical machine. Hence this service model allows multiple consumers to use the same software at the same time[8].The consumer is free from doing all kind of settings or configurations[8].The cloud provider will do all the settings and the desired configuration on the behalf of the consumer. Example-Gmail.

B. Platform as a service (PaaS)

This service model allows the consumer to develop their own program or application by using any programming language or tools provide by the cloud provider. In this the consumer has control over the application and the configuration settings of the application that is being developed by the consumer.

C. Infrastructure as a service (IaaS)

In this service model administrators provide infrastructure to the consumers or developers so as to support their development operations. It means one can outsource the elements of infrastructure like storage, servers, networks etc to a cloud provider like Microsoft [9]. Here Microsoft acts as an administrator. For example, using Microsoft Windows Azure one can set up new windows server and Linux virtual machines and can adjust the usage as per the requirement [9].

Apart from these service models the architecture of cloud computing also includes the deployment models which further include four types of cloud namely public cloud, private cloud, community cloud and hybrid cloud.

D. Public Cloud

It is that type of cloud in which all the computing resources are made available to everyone over a public network by the cloud service provider. Since it is made available to all the groups of general public at a very low cost so it is less secure as compared to private cloud.

E. Private Cloud

In case of private cloud all the computing resources are made available to a particular organization. It means that only the employees of that organization can have access to those computing resources. All other public is not allowed to gain access to those computing resources which are owned by that organization. Hence this type of cloud offers greater security but at high cost.

F. Community Cloud

It is that type of cloud in which the computing resources are made available to a group of people with the same objective, the can either is concerned with the security, privacy or performance related issues. It is different to the private cloud in the sense that it includes multiple organizations participating while in case of private cloud there is only a single organization that owns a particular cloud.

G. Hybrid Cloud

A hybrid cloud is made by the combination of two or more other types of clouds. For example the more critical data can be moved to the private cloud while the less critical data can be placed at the public cloud.

How Does a Cloud Work?

After getting a basic idea of architecture of cloud computing the next thing that come into the picture is that how does it work? As we have internet provider, inthe same way we also have cloud provider companies such as Google, Microsoft etc.These cloud provider companies make all the resources (such as a software ,hardware,servers,storage space etc)available to individuals or any organization at the same time. It means that all the persons or business groups are sharing those resources at the same time. Companies have moved their data on the cloud so that different employees can access the same resource at the same time. The cloud is basically a data centre including large number of servers and other computing resources that resides on the internet [10]. So, internet connection is the only thing that is required to access the computing resources residing on the cloud.

Because multiple organizations can access the same resource at the same time so the cost of buying software is reduced. Other thing that is associated with the cloud is that there is no restriction on the number of users using the cloud services.

IV. Virtualization in Cloud Computing

Virtualization is the key concept behind cloud computing. Virtualization creates an illusion of the resources. It means that virtualization is the use of hardware and software to create perception one or more entities exist although they are not physically present in reality[11]. Virtualization increase the hardware utilization as it becomes very easy to share resources among multiple users without letting the users to know that the resources they are using are just an illusion of the physical resources[12].The figure below represents the process of virtualization in cloud computing.

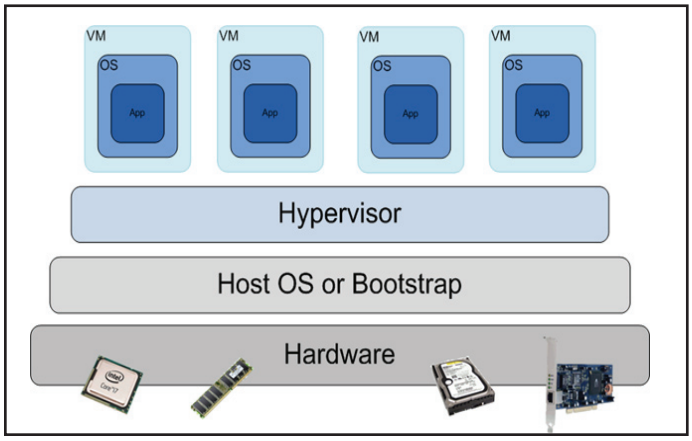

Fig. 2: Virtualization Process in Cloud Computing

The technology behind virtualization is known as virtual machine monitor (VMM) or virtual manager or hypervisor, which separates compute environment from the actual physical environment [13]. The hypervisor is responsible running multiple virtual machines and the machine on which virtual machines run is called host machine and the virtual machine itself is called as guest machine [11].

V. Application Areas

Some of the major areas in which the cloud computing is used are:

A. Commercial Purpose

The cloud computing is purely a business activity because the companies need not to buy expensive software or hardware as all of them is available on lease.

B. Entertainment
The cloud offers a large storage space so that a user can store all his media pictures and videos on the cloud and can request them when required.

C. Education and Information
Microsoft and other vendors are starting to position their cloud offerings to schools. Microsoft points to help create online classrooms [14].

D. Communication
The Gmail and the face book which are almost the best way to communicate are using the cloud computing technology.

E. Medical
The cost of health-care services can be reduced by ensuring efficient use of resources and standardizing health-care processes. Mobile cloud computing is a promising technology that can provide good solutions to those issues. The use of mobile devices support convenient access to patient-related information and effective communications between medical team members [15].

V. Advantages
The cloud computing offers various benefits in various forms which has made all the business organizations and IT companies to move all their data on the cloud. The advantages offered by cloud computing is as follows:

1. **Pay-per-use:** Because the cloud computing is based on pay-per-use basis so this makes it cost efficient up to some extent as it cuts the need to buy a software.
2. **Shared Resources:** The cloud has a shared pool of different computing resources which allow different consumers to access even the same resource at the same time. It means that the resources are being shared by different organizations simultaneously.
3. **Availability:** The different computing resources are available to everyone at any point of time [9].
4. **No Maintenance:** The consumer is free from doing any kind of updates or maintenance as this is the responsibility of the cloud provider [16].
5. **On Demand Service:** The main benefit of cloud computing is that the resources are made available to the consumers as soon as they demand for them and are released after the successful fulfilment of their demand[6].
6. **Broad Network Access:** The cloud computing provides a broad network access to the resources. It means that the resources can be accessed from almost everywhere in the world [6].
7. **Easy Access:** The method used to access the resources of the cloud is very easy [6].
8. **Measured Service:** The cloud provider will keep track of the services offered to the users. It means that the time period for which a user is allowed gain access to the resources is always being measured by the cloud provider and the resources have to be released after that[6].
9. **Unlimited Storage:** The capacity of the cloud to store information is almost unlimited. In fact the cloud came into existence to cope up with the storage problems that were being faced by the organizations [6].
10. **Backup and Recovery:** If the data gets lost from the physical device then there is no need to worry about the lost data if the same was kept on the cloud also because cloud always keep a backup of the data hence making its recovery easy in case of data lost[6].

VII. Disadvantages
The use of cloud computing is increasing rapidly because of its several advantages. But apart from the above discussed advantages there are some problems too. The main problems that are being faced by organizations using cloud computing are:

1. **Security:** As the companies have to send all their sensitive information to the cloud service provider so their sensitive data is always at a risk [16].
2. **Privacy:** The privacy of the companies can be compromised as all the information is send to the cloud service provider.
3. **Power consumption:** The other issue related with the cloud computing is that it consumes great power of the physical devices such as a Smartphone.
4. **Technical Issues:** Sometimes there can be some technical issues like servers might be down so at that time it becomes difficult to gain access to the resources at anytime and from anywhere e.g. non-availability of services can be due to denial of service attack [17].
5. **Strong Internet Connection:** To use the technique of cloud computing there should always be a strong internet connection without which we would not be to take advantage of the cloud computing.

VIII. Proposed Solution
Although there are many problems with the cloud computing but the main issue is security of the data stored in the cloud. There is large amount of data present on the cloud. All the data need different kind of security levels because different people have different access to the data.So, to provide security to the data we may need intrusion detection system which will help in detecting any unauthorised access to the data present on the cloud.

IX. Conclusion and Scope
According to this study the cloud computing is a type of internet based computing which allow various resources to be shared among different users. Users gain access to the resources for specific period of time on a pay per use basis and this help to reduce the cost of buying the software. A great future of cloud computing is expected as it has transformed the way people used to gain access to the computing resources. Putting all the data on the cloud has changed the trend of the business activities also. Hence it can be conclude that cloud computing has a great potential in increasing the utilization of the computing resources.

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