

# Contemporary Study of Cloud Computing Environment

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## ABSTRACT

Cloud computing is an emerging model of business computing. It is basically a model that helps to provide on-demand network access from a shared pool that consists of client computers, distributed servers, cloud storage, applications and cloud services to the consumers. Cloud computing is definitely more than the internet. It is touching the new heights in the modern era. Cloud computing is making the computer industry more fashionable than the women's fashion. This paper basically tells about cloud components, cloud services and discusses about pros & cons of cloud computing.

## Categories and Subject Descriptors

C.4 [Performance of Systems]: Reliability, availability, and serviceability

## General Terms

Performance, Security

## Keywords

Cloud Computing; SaaS; PaaS; Haas; DaaS; SLA's.

## 1. INTRODUCTION

Well, what is the actual meaning of cloud computing? Now, cloud computing is everywhere. Everyone who is in the IT world is talking about it. Basically, "Cloud computing has been evolved from grid computing and is providing the on-demand resources to the consumers which are helping to cut operational and hardware costs" [8]. With the creativity of the cloud computing concept, other organizations can host your applications[1]. But for the successful implementation of the cloud computing in today's world, standard inter-connect protocols and collaboration of various data center technologies play an important role. Cloud computing will require persons who are experienced in different fields and backgrounds. As this will make Cloud Computing is a expensive venture. But even with huge initial investment in this provides far more advantages to the organization [3].

## 2. BASIC COMPONENTS

Some organization would go to a cloud computing vendor because of lack of resources and some would made their own cloud computing applications, infrastructure and platforms [3]. So, some basic components of cloud computing are to be explained in this section.

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### 2.1 Clients

Clients are the computers, laptops or tablet PC's that just sit on your desk table. Clients are the devices that are used by end users to manage their information on the cloud [1]. Clients are categorized as:-

#### a) Thin Clients:-

These clients do not have any hard disk. They are just used to display the information and data.

#### b) Thick Clients:-

They are the regular computers and you can use internet explorer to connect to the cloud [1].

### 2.2 Data Center

Data center is basically the collection of servers where the application you subscribe is stored. It could be a large room or a room full of servers [1].

### 2.3 Infrastructure

The Cloud Computing infrastructure consists of computer hardware and the buildings that contain hardware [7]. The infrastructure will depend upon the application you want to use and how the provider has chosen to build the solution. Suppose you requirement consists of large number of servers and your budget is going very high then cloud computing can be very advantageous to you because you do not have to buy dedicated servers for your job, just go for cloud computing and "Pay As Much You Use" [1].

#### • Full Virtualization:-

Full Virtualization is a technique in which the client is able to completely simulate the hardware that is running on the server machine. The result is that all the software running on server machine can be displayed on the client machine. Examples of full virtualization organization are Go Grid and Skytap [7].

Full Virtualization can work because:-

- A computer system can be shared among many users.
- The hardware resources can be emulated on the other machine [1].

Full Virtualization can't work because:-

- Some functions can run only on dedicated hardware.
- Sometimes your performance of the application can suffer.

#### • Grid Computing:-

Grid computing combines the number of resources of a network to solve a problem at the same time. Grid computing is used for heavy tasks like scientific problem and heavy processing power. It can also be implemented from distributed locations. Example of grid computing is Sun Microsystems[7].

Grid Computing can work because:-

- It is used for problems which requires a huge amount of computing power [1].
- The resources can be shared among computers, without one computer managing the other computer [1].
- It is a cost-effective method for solving a problem.

- **Para Virtualization:-**

It allows multiple operating systems to run on a single machine at the same time. In contrast to full virtualization, whole system should be emulated but in this it is not necessary, that's why it is better than full virtualization [1].

Para Virtualization can work because:-

- It helps in reducing guest execution time to perform the operations.
- Transfer to a new system can be done easily because the guest instances can be removed from the underlying hardware [1].

Para Virtualization can't work because:-

- It needs the guest instances operating system to be modified so that they can interact with Para virtualization interfaces. This can only be possible if you can access the source code of the operating system unless you can't use Para virtualization [1].

## **2.4 Distributed Servers**

All the servers may not be at one location. They are residing at different geographical locations. This provides more flexibility and security. Flexibility can occur if you are running out of hardware at one site then you can provide the hardware to the client by linking to the other site.

Security can occur if something has happened at one site then still the client can access its services through the other server sites [1].

## **2.5 Services**

Cloud services break down into software services, platform as a service and hardware as a service. The characteristics of services are:-

- 1) It allows end users to share resources.
- 2) It allows the users to access the systems on different hardware.
- 3) It helps in larger scalability [1].

### **2.5.1 Software As A Service**

Software as a Service (SaaS) is a model that makes the software available to the customer through the web browser. In this, customer does not care about where the software is hosted and which operating system they are using i.e. customer does not have to maintain it. It is also known as "on demand software" [9]. Example of a organization which is working on SaaS is Salesforce.com.

Advantages of SaaS [1] are:-

- 1) More number of customers are supported on fewer hardware components
- 2) SaaS applications are easy to customize as they help the customer what they need.
- 3) Quicker access to new functionality for customers.
- 4) Security is more because SSL (Secure Sockets Layer) is used instead of complex back-end configurations.

Disadvantages of SaaS are:-

- 1) The organization with unique needs can not get its all components on the SaaS so they have to buy their software's.
- 2) Here, data is stored on vendor's servers, so security can be a serious issue.
- 3) In SaaS, applications can be stored on distributed servers. So, SaaS is not suitable when sub-seconds are required to access the application.
- 4) In SaaS, pay as much you use. There is a "lock-in" with the vendors. Once you pay for an application to a vendor then you can not shift to a new vendor unless you have to pay a huge price for a new vendor.

### **2.5.2 Platform as a Service**

It is delivery of all the resources required to build an applications and services from the internet without installing the software on your machine. PaaS includes utility grade instrumentation, application design, development, testing and hosting an application [1]. It also helps to the user interfaces which are web based.

Example of PaaS is Google App Engine [5].

### **2.5.3 Hardware as a Service**

Well, SaaS and PaaS are providing applications to the customers but Hardware as a service (HaaS) does not provide applications to the customers. It offers the hardware to the customers. It means organization or vendors rent their hardware resources to the customers [1].

HaaS allows you to rent some of the following:-

- a) Memory Storage
- b) CPU cycles
- c) Network equipments like ( Computers, printers , I/O devices, routers)

HaaS benefits:-

- a) Customers can share resources which helps in cost reduction.
- b) Customers do not have to buy each hardware resource if they want to use with the help of cloud computing concept and pay as much they use.

### **2.5.4 Database as a Service**

This is also one of the features of cloud computing which is emerging to a great extent. It is also known as DaaS. Some of the offerings are explained in this section [1].

DaaS offerings:-

- 1) It helps the customers in not managing the huge databases which are required for your application.
- 2) It helps in not buying the hardware which are required to manage the databases.
- 3) DaaS service provider has the responsibility to provide security to your databases and you do not have to buy softwares which are required for database security.
- 4) Database custom validations are there in DaaS services which helps to get accurate information.

## **2.6 Applications**

The end user spends a lot of time in using the application which are hosted on distributed servers [7]. Basically, make the license agreement with the vendors and pay as much as you are using the application. Mostly the applications are run with the help of web browsers.

## **2.7 Storage**

Storage is one of the main component of cloud computing. The customers can take storage space on rent from vendors. The customers do not have to buy equipments and do not have to maintain them. In this security of data is also done by vendors.

## **2.8 Processing Power**

This is not the direct component of cloud computing but it is an indirect component of cloud computing. Well, most corporate servers are left unused during off- peak hours and they are idle nearly about fifty percent of the time. So, there is a lot of wastage of energy and money resources. So, corporate companies have to take time to fully research the drawbacks and benefits of shared resources instead of wasting money on power resources that they cannot fully utilize [7]. If companies

are using cloud computing concept, they do not have to bother for more hardware resources and more processing power. They are available to them in a fly.

### 3. KEY BENEFITS OF CLOUD COMPUTING

#### a) Resource Coupling

In cloud computing, the resources available are loosely coupled i.e. resources are less dependent upon each other [2].

#### b) Scalability

It means, if you require more capacity and more resources then service provider will provide you these without buying and installing software and equipments. You can stop using them further if you do not need them. It means pay according to the usage [1].

#### c) Reduced Costs

Consumers can run its application on less costs because they do not have to buy resources and equipments for running that application. And customers do not have to spend money on security also because this is provided by vendors [10].

#### d) Pay-Per-Use

The utility computing is based on pay per use. In cloud computing, the users are paying according to their usage and no upfront costs have to be paid by consumers [10].

#### e) Strong Fault Tolerance

The vendors provide security to the data of the customers by applying various encryption algorithms on data. So, big companies provide reliable and secure data on the network. Fault tolerance can be provided to provider-inner, provider-user, provider-across and user-across [2].

#### f) Virtualization

Virtualization is a technique in which the client is able to completely simulate the hardware that is running on the server machine. The hardware resources can be emulated on the other machine [1]. It helps in reducing cost for the hardware resources.

#### g) Service Oriented

Cloud computing is service oriented i.e. it provides services to the consumers in the form of Software as a service (SaaS), Platform as a Service (PaaS), Hardware as a Service (HaaS) and Database as a Service (DaaS) [6].

#### h) More Work Optimization Tasks

When your organization stores your non-critical data on the service provider database then your organization is free to work on work related tasks rather than concerning about maintaining and hiring more manpower to manage the data [1].

#### i) User Friendliness

Cloud computing is a technique which is very user friendly because users are storing their data on the service provider databases without taking headache, where to store the data and how it will be safe and how it will be managed.

#### j) Automatically Updates

Consumer does not have to download the updates in the application. These updates are automatically done by vendors to provide more functionality to the consumers [11].

#### k) More Mobility

Users can access their data from anywhere in cloud computing

paradigm because they need not to be on their desks but they should have an internet access and a computer access [4].

### 4. CONS AND RISKS OF CLOUD COMPUTING

#### a) Critical Data

If users want to store their critical or sensitive data on the cloud computing then this is not safe to store the sensitive data on the cloud networks because data is stored on different locations e.g. if Indian security agencies store their data on cloud computing and if this data is leaked out then there are plenty's and even prison is there if sensitive data is not properly stored.

#### b) Political Factors

If Users want to store data on the cloud and users belong to India and they want to store their data on the American cloud, it may be illegal because if IT policies of America are not friendly with India then you are out of luck and users data then can not be private [1].

#### c) Complete Control

If user is running an application and that application demands complete control of memory, CPU and hard drives then cloud computing is not for the user [1].

#### d) Time Consuming

In cloud computing concept, data is stored on the distributed servers and user requires the data instantly then cloud computing is not a good option for users.

#### e) Weak Service Level agreements

Standard service level agreements are not present in cloud computing. Because there are vendors lock-in, insufficient security measures, instantly data unavailability. Basically, SLA's are made for vendors. They are not made for users [10].

#### f) The More Costs with More Throughputs

Well, cloud computing follows the rule "Pay as much as you use". But when user is using high-definition videos then the costs of the application are rising sharply [1].

#### g) Hardware Dependencies

If user application requires specific hardware, drivers then cloud computing solution is not fit for this application.

### 5. CONCLUSIONS AND FUTURE WORK

In this paper, we have portrayed the basic components of cloud computing and how they are helpful in the cloud solution of an application. We have also discussed about various pros of cloud computing and how cloud computing solution is more scalable, flexible and cost efficient for a user application. Cloud computing has a major drawback in terms of security, so more encryption algorithms can be made to make sensitive data more secure. In future we can also work on throughput factors which raise the costs of application sharply. And we can also work more on the SLA's agreement which helps to users in cost savings and to avoid vendors lock-in. One of the most important point is that more accurate tools should be made that tells user, "they are paying that what they are using" and also tells that how slow the system is and how much deployment latency is there?

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