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Various challenges and Trust issues in cloud computing for improvement the quality and services

Vaishali Pandey[1] and Mohit Giri Goswami[2]

[1]M. Tech Scholar, Department of Computer Science,
Graphic Era hill University Bhimtal(U.K.), INDIA
[2]Astt. Professor, Department of Computer Science,
Amrapali Institute of Technology and Science, (U.K.), INDIA

ABSTRACT: Cloud computing is a new computing with flexible and powerful computational capabilities. Cloud computing is a cost effective and proved delivery platform for providing services. Quality of service provided by cloud service provider is an important factor as no one wants to compromise with the quality. One of the main factors slowing down the improvement and development of cloud computing is the need to guarantee a minimum level of trust between two interacting nodes. There are various trust issues from both sides (user as well as service provider). Not only issues but also there are some challenges of trust in CC.). In this we are focusing on the challenges faced by the user while using cloud computing. It also includes reliability with its parameters.

Keywords: Cloud computing, services, models, quality, trust, reliability.

I. INTRODUCTION

*Cloud***-** refers to the combination of applications and services on remote area.

Computing- computing here refers how to access the different services and applications from remote areas.

Cloud Computing-

- Collectively refers to the applications and services that run on distributed network using virtualized resources and accessed by common internet protocols and networking standards.
- Cloud computing gets its name as metaphor for "the internet".

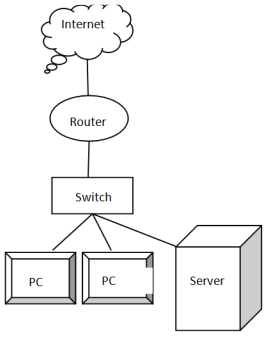


Fig. 1. Basic model of cloud computing [2]

- Cloud computing makes it possible to compute with infinity scalable and universally available system.[1]

Principle of cloud computing-the basic principle of cloud computing is to make the computing be assigned in a great number of distributed computers rather than local computer or remoter server. It is an extent of grid computing, distributed computing and parallel computing. Cloud computing is by no means different from grid computing .The later tries to create a virtual processor by join together a cluster of computers. The aim of grid computing is to solve large task by using the advantage of concurrency and parallelism, while the cloud is focus on collaboration. Cloud computing takes the technology, services and applications that are similar to those on the internet and turn them into a self service utility. In order to become the part of cloud there is no need to download or install a specific software, only the interconnection is required.

Two essential concepts-

1) Abstraction-cloud computing abstracts the detailed implementation of system from its users and developers. Reduces the complexity of system.

*2) Virtualization***-**cloud computing virtualizes system by pooling and sharing resources. [1]

"Cloud computing is an abstraction based on the notion of pooling physical resources and presenting them as a virtual resource"**.**

*Changing nature of cloud computing***-**explain it with the help of example.

A) Google-One of the biggest promoter of cloud computing. Google can be accessed by Google apps. Google apps cover: g mail, calendar, Google talk. Google has built a worldwide network of datacenter to service its search engine. By doing so, Google has captured substantial portion of world's advertising revenue which enabled Google to offer free software to users.

B) Azure platform-Microsoft is creating the Azure platform. It enables do.net framework application to run over the internet as an alternate platform for Microsoft developer software running on desktop.

C) Amazon web service-One of the most successful cloud based business is Amazon web service which is an infrastructure as a service offering that lets you rent virtual computers on Amazon's own infrastructure. [1]

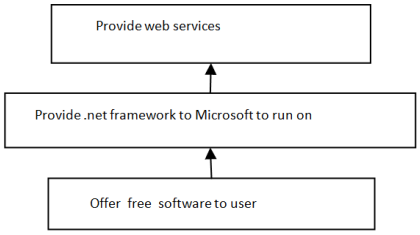


Fig. 2. Changing nature of cloud [1].

Cloud components-cloud computing solution is made up of several elements.

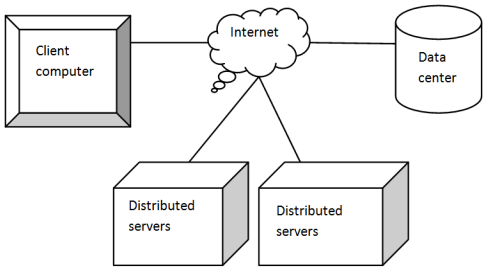


Fig. 3. Components of cloud computing [2].

1) Clients-It may be LAN. Clients are the computers that sit on our disk (laptops, tablet computer, mobile phones or PDA's).

2) Data Center- is a collection of servers where the application to which we subscribe is placed .It could be a room or room full of servers on the other hand world that we are access via internet. A growing trend in IT world is virtualizing servers.

3) Distributed Servers-Servers are in geographically desperate locations. But for the cloud subscriber, these servers acts as if they are humming away right next to each other. [2]

Clients Categories-

A) Mobile-PDA's, smart phones like blackberry, i-phone etc.

B) Thin-Clients are the computer that do not have internal hard drives, but rather they server do all work and display information.

C) Thick-Regular computer using web browser (IE, Firefox etc).

Thin client are becoming an increasingly popular solution, because of their prize and effects on environment

Benefits-

1) Lower Hardware cost-Thin clients are cheaper than thick because they do not contain as much hardware.

2) Lower IT cost-Thin clients are managed at the server and there are fewer points of failure.

3) Security-As processing takes place on the server and there is no need of hard drive, there is less chance of malware invading device.

4) Data security-As the data is stored on server, there is less chance for data to be lost if the client computer is crashes or is stolen.

5) Less Power Consumption-Pay less to power them. Thin client consumes less power than thick clients.

6) Ease Of Repair and Replacement-If a thin client dies, it is easy to replace.

7) Less Noise-Less heat is generated and quieter fans can be used on the client.

NIST model - support virtualization and multi tenancy (sharing of resources among two or more clients).

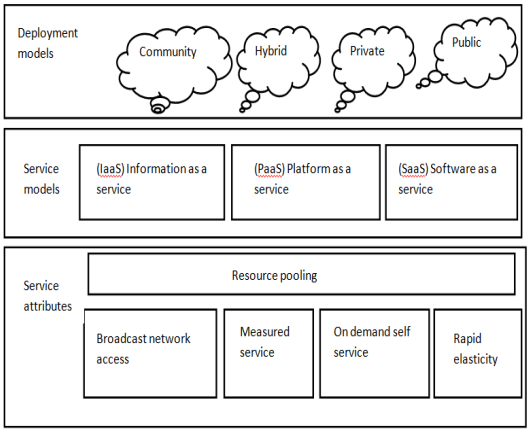


Fig. 4. NIST Cloud Model [1].

The Deployment models-

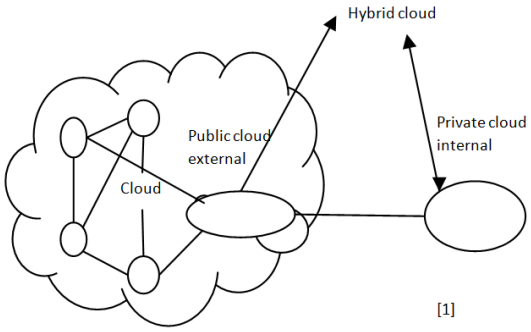
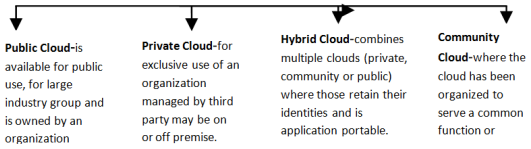


Fig. 5. Deployment models of cloud [1].



Service models-
1-Software as a Service (SaaS)
2-Platform as a Service (PaaS)
3-Information as a Service (IaaS)

Cloud computing –a five layer model-

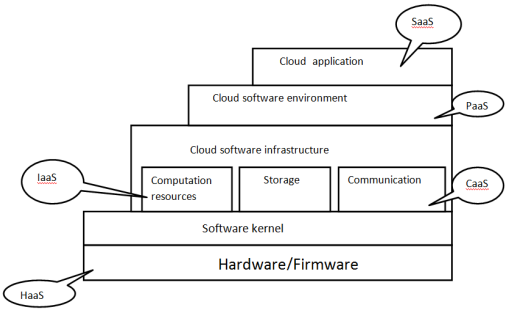


Fig. 6. Five layer model of cloud [12].

This figure represents the interdependencies between the different layers in cloud.
They define 5 layers as follows-
Cloud application layer-The most visible layer to the users of cloud .Normally the users' access the services provided by this layer through web portals and are sometimes required to pay fees for them.
Cloud software environment layer-The users of this layer are cloud application developers, implementing their application for and deploying them on the cloud.
Cloud software infrastructure layer-It provides fundamental resources to other higher level layers. Cloud services offered in this layer can be categorized into computational resources, data storage, and communication.
Software kernel-This layer provides the basic software management for the physical servers that compose the cloud. Software kernel at this level can be implemented as an OS kernel, hypervisor and virtual machine monitor or clustering middleware.
Hardware and firmware-The bottom layer of the cloud stack is actually a physical hardware and switches that form the backbone of the cloud. In this regard, users of this layer of the cloud are normally big enterprises with huge IT requirements in need of the sub leasing. [12].

Benefits of Cloud Computing-

- On demand self service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service
- Lower cost
- Ease of utilization
- Quality of service
- Reliability
- Outsourced IT management
- Simplified maintenance and upgrade
- Low Barrier to entry.[1]

Disadvantage of Cloud Computing-

1) Cloud computing may not best model for large amount of data transfer.
2) Cloud computing is a stateless system.
3) Cloud computing is unidirectional in nature.
4) Communication takes place and provider. There is an architectural disconnect between two.
5) Due to stateless message travel over different routes and for data to arrive out of sequence.
6) For single area, it has privacy and security .But globally we have increased risk due to interception and malfeasance of another.

Security and Privacy Issue-
The "IT security" can be split into three subcategories- confidentiality, integrity and availability. Cloud computing poses specific threat to each of them. *Confidentiality*-is achieved by encryption. However when a company's data is stored in a cloud environment, one has to consider the problem of long term confidentiality. *Integrity*-can be achieved by no modification made by third party. *Availability*-is achieved by ensuring reliable timely access to and use of information.
There are numerous security issues for cloud computing as it compasses meant technology including networks ,databases, operating systems, virtualization, resources scheduling, transaction management etc. Therefore security issues for these systems and technology are applicable to cloud computing. For example-the network that interconnects the system in cloud should be secure, virtualization paradigm in cloud computing leads to several security concerns,

mapping the virtual machine to the physical machine has to be carried out securely [13].

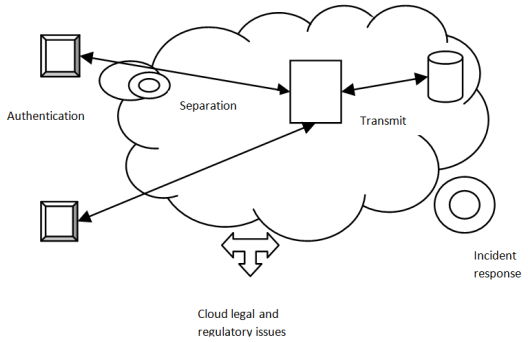


Fig. 7. Security and privacy issue in cloud computing [13].

Encryption is best option for securing data in transit as well. Authentication and integrity protection mechanism ensures that data only goes where the customer wants it to go and is not modified in transit. Strong authentication is a mandatory requirement for any cloud deployment. User authentication is a primary basis for access control. In a cloud environment, authentication and access control are more important than ever since the cloud and all of its data are accessible to anyone over the internet.

Privacy-is an important concern in cloud computing from the perspective of cloud consumers, regarding legal compliance and consumer's trust. Privacy is a core issue in many challenges in cloud computing including the need to protect identity information, policy components during integration and transaction histories. Many organizations are not comfortable in storing the data and applications on the system that reside outside their on premise data centers. By migrating their workloads to a shared infrastructure, customers' private information faces increased risk of potential unauthorized access and exposure. Cloud service providers must assure their customers and provide a high degree of transparency into their operation and privacy assurance. Privacy protection mechanism must be embedded in all cloud security solutions.

Trust- is one of the major aspect of quality. Here we are talking about quality that's why it is compulsory to about trust. In layman language, trust is complete confidence in a person, plan or in any service (here services of cloud).Trust is confidence or faith in services provided by cloud service provider. Trust allows us to use any service in cloud without any fear.

Need of trust -Trust is important in building healthy relationships in any field including cloud computing .If there is no trust exist in between cloud service provider and cloud user then there is no use of cloud computing . Trust plays an important role in commercial cloud environment. Trust enables user to select the best resources in a heterogeneous cloud infrastructure.

Motivation- With the growing need of cloud computing and as it is used in every field now a days dependency on cloud is also increasing. But at the same time users suffer from many challenges of trust in cloud computing. That's why there is a need to develop a trust framework in order to select best cloud service provider.

Challenges in cloud computing-
1-Diminishing Control
2-Lack of Transparency

Trust Issues-There are some trust issues from client as well as from server side also.

Table 1: To show various trust issues.

Server side trust issues	Client side trust issues
1-Network failure	1-Lack of transparency
2-Server (Hard-disk) failure	2-Diminishing control
3-Database failure	3-With the growing number of cloud service provider, the customer are facing a challenge to select the best and most appropriate one.
4-Software management failure	

Reliability- reliability is an important component of trust[8].It is also called success rate.

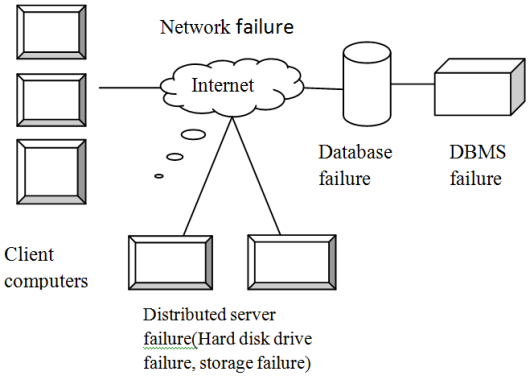


Fig. 8.

Reliability is the ability of the system or component to perform its required functions under stated conditions for a specified period of time[9].Reliability is a probability of failure free operation for a specified time in a specified environment for a specified purpose.

Reliability measurement is based on-

Failure rate-is the frequency with which an engineered system or component fails, expressed in failures per unit of time. It is denoted by λ. Failure Rate of a system usually depends on time with the rate varying over the life cycle of the system.

Calculating Failure Rate-

$$\lambda = items\ failed \div total\ operating\ time$$

The probability of a product surviving until time (t) is given by following function:-

$$\boldsymbol{reliability\ at\ time\ y = e^{-\lambda t}}$$

Data set for failure rate-The software that runs the backblaze data center takes a snapshot of the state of every drive in the data center , including the drive's serial number, and all of its smart data. The SMART data includes the number of hours the drive has been running ,the temperature of the drive. Each day, all of the drive "snapshots" are processed and written to a new daily stats file. Each daily stats file has one row for every drive operational in the data center that day. For example, there are 365 daily stats files in the data package with each file containing a "snapshot" for each drive operational on any given day.

Each daily stats file is in CSV (common separated value) format. The first line lists the names of the columns and then each following line has all the values for those columns. Here are the columns:

Data- the data of the file in yyyy-mm-dd format.

Serial number-The manufacturer assigned serial number of the drive.

Model-The manufacturer assigned model number of the drive.

Capacity-The drive capacity in bytes.

Failure-contains a "0" if the drive is OK. Contains "1" if this is the last day the drive was operational before failing.

Computation of failure rate-

"It is all about counting". And that's certainly true in this case. A failure rate says what fraction of drives have failed over a given time span. Let's start by calculating a daily failure rate , which will tell us what fraction of drives fail each day .We will start by counting "drive days" and "failures". To count drive days ,we will take a look every day and see how, many drives are running. Here's a week in the life of a small data center-

Sun day	Mon day	Tues day	Wedne sday	Thurs day	Frid ay	Satur day
15	15	14	14	14	14	14

On Sunday and Monday ,there are 15 drives running from Tuesday through Saturday there are 14 drives each day. Adding them up we get-15+15+14+14+14+14+14=100 i.e 100 drives days.

Now, Let's look at drive failures. One drive failed on Monday and was not replaced .Then one died on Wednesday and was promptly replaced.

Sun day	Mon day	Tues day	Wedne sday	Thurs day	Frid ay	Satur day
15	14	14	13	14	14	14

So we have 2 drive failures in 100 drive days of operations. To get the daily failure rate we simply divide .2 divided by 100 is .02 or 2%. The daily failure rate is 2%. The annual failure rate is the daily failure rate multiplied by 365. If we had a full year made of weeks , the annual rate failure rate would be 730%. Annual failure rates can be higher than 100%. We keep 100 drives running in data center at all times, replacing drives immediately when they fail. At a daily failure rate of 2% ,that means 2 drives fail each day and after a year 730 drives will have died. We can have an annual failure rate above 100% if drives last less than a year on average.[9]

Bath Tub Curve- It is widely used in reliability engineering .It describes a particular form of the hazard functions which comprises three parts –*First part* is a (infant mortality) decreasing failure rate, known as early failures. *Second part* is a constant failure rate , known as random failures. *Third part* is an increasing failure rate, known as wear out failures.

The bathtub curve is generated by mapping the rate of early failures when first introduced, the rate of random failures with constant failure rate during its "useful life" and finally rate of "wear out" failures as the product exceeds its design lifetime.

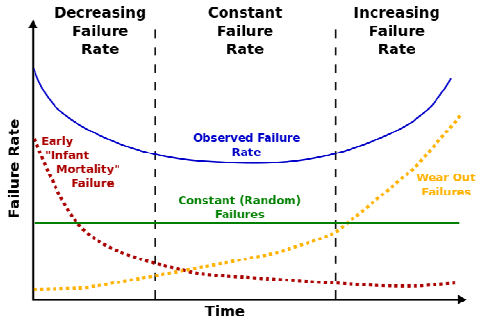


Fig. 9. Bath tub Curve.

Result-Constant value of λ and t is variable.

```
t =(0:0.01:.2);
y =exp(-25*t);
figure
plot(t, y)
title('y = \ite^{\lambda t}','Color','b')
```

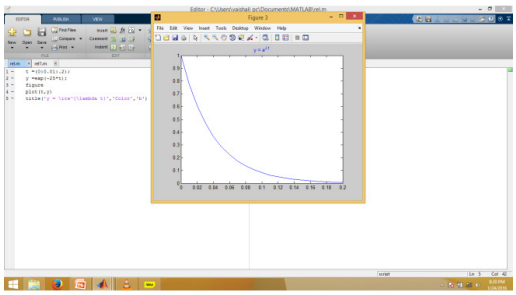


Fig. 10.

Explanation-As we know that here the value of lambda(λ) i.e. failure rate is positive and the value of time cannot be negative. That's why this graph is as follows. As we know that the value of failure rate and time cannot be negative due to which this graph cannot move upward (to the positive value).

Zero value of λ and t is variable.

```
t =(0:0.01:.2);
y =exp(-0*t);
figure
plot(t, y)
title('y = \it e^{\lambda t}','Color', 'b')
```

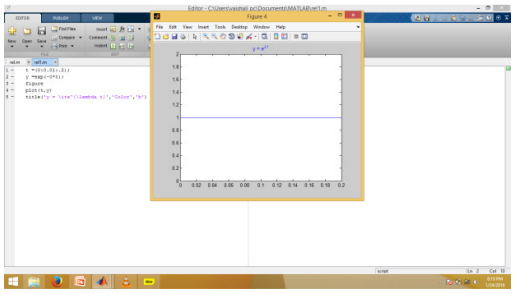


Fig. 11.

Explanation-Here in this graph the value of lambda (λ) is zero i.e. failure rate is zero and the value of time is variable. That's why the graph contains straight line.

Reliability parameters-

MTBF(Mean time between failures)- is the average time between failure of system ar any hardware module. MTBF is typically part of a model that assumes the failed system is immediately repaired (,mean time to repair) as a part of renewal process. It describes the expected time between two failures for a repairable system.

FITS(Failure in times)- FITS is a way of representing MTBF. It is nothing but the total number of failures of the module in a billion hours.

MTTR(Mean time to repair)- is a basic measure of the maintainability of repairable items. It represents the average time required to repair a failed component or device. In operational system, repair generally means replacing failed hardware part. Thus , hardware MTTR could be viewed as mean time to replace failed hardware module.

*MTTF(Mean time to failure)-*is the measure of reliability for non repairable system . MTTF which measures average time to Failures with modeling assumptions that failed system is not repair(infinite repair time). It denotes the expected time to failure for non repairable system. It is statistical value and is meant to be the mean over a long period of time and a large number of unit.

CONCLUSION

This paper explains the basics of cloud computing, it's various models (service and deployment), Quality of cloud computing, cons and pros of cloud computing. This paper presents various issues and challenges in cloud computing.

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