



## Software Testing In Cloud Computing Environment

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**Abstract**— *Software Testing based on Cloud Computing Environment is known as Cloud Testing. In this paper, the definition of cloud testing was derived from the concept of cloud computing. It analyzed the questions of which software testing projects can do the cloud testing & why one proceed to do cloud testing, how to do cloud testing. This paper was a research for the future work In Cloud Testing Environment.*

**Keywords**— *Cloud Environment, Cloud Testing, Software Testing*

### I. INTRODUCTION

Cloud Computing is the next stage in the Internet's evolution, where — from computing power to computing infrastructure, applications, business processes to personal collaboration — can be delivered to end user as a service wherever and whenever you need. It is bonded with Distributed computing; Parallel computing, Network storage technologies.

In Typical Cloud computing Application System there are about six layers each layer consist of a components-Client, Service, Application, Platform, Storage & Infrastructure.

Cloud Computing Involves delivering hosted services over Internet without Deploying or Installing the Application on user's local computers. Cloud Environment facilitates deployment of application without the cost and complexity of managing the underlying Software & Hardware Layers. In Cloud Computing main idea is to provide hosted services these hosted services are defined in three categories: Software as Service (SaaS), Platform as Service (PaaS), and Infrastructure as Service (IaaS). Infrastructure as Service provides virtual threads with unique IP addresses. Customers use the Application Programming Interface (API) to Access, Start & Stop their Virtual servers. Fig 1 showing different hosted layers in cloud.

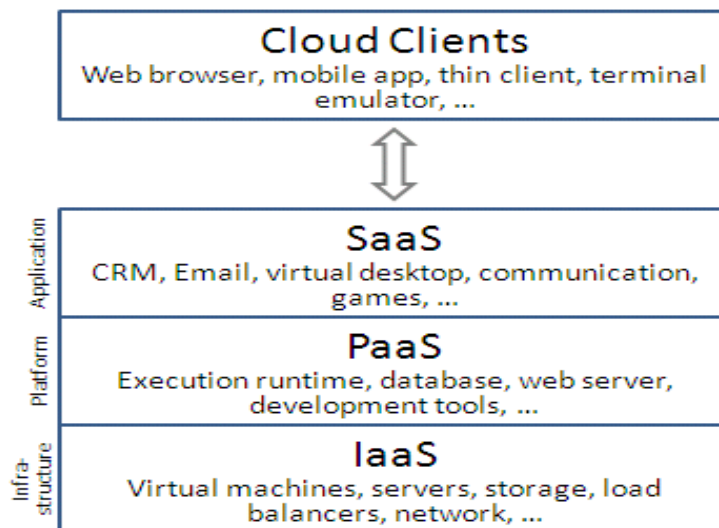


Fig. 1 Hosted Services On Cloud

#### (A) Hosted service on Cloud

Cloud Computing also known as Utility Computing. A company using cloud computing has to pay for the resources they consume. Also known as Pay-what-you-use-model. Platform in Cloud is a set of Software and development Tools hosted on providers infrastructure. Developers create Applications on platform and (PaaS) Platform as Service. Providers use gateway software installed on end user computer. In Software as a Service provider (SaaS) model, the vendor supplies Hardware Infrastructure. From a Market point of view (SaaS) is a Broad level Market. Here Services from SaaS platform can be Database Management, Inventory Control. Because the service provider hosts both Application and the Data, Here end user is free to utilize Service. Cloud Computing enables end user in sharing resources based on three models.

Public Cloud, Private Cloud, Hybrid Cloud are three different models for sharing Resources.

Public Cloud Owned and operated by Third party Cloud is larger in scale which provides client seamless, On demand scalability. Private cloud built on individual enterprise provide hosted services to limited number of users. When a service provider uses public cloud resources to develop private cloud that is known as Virtual private cloud. A Typical Cloud Computing Fig.2 shows conceptual Diagram.

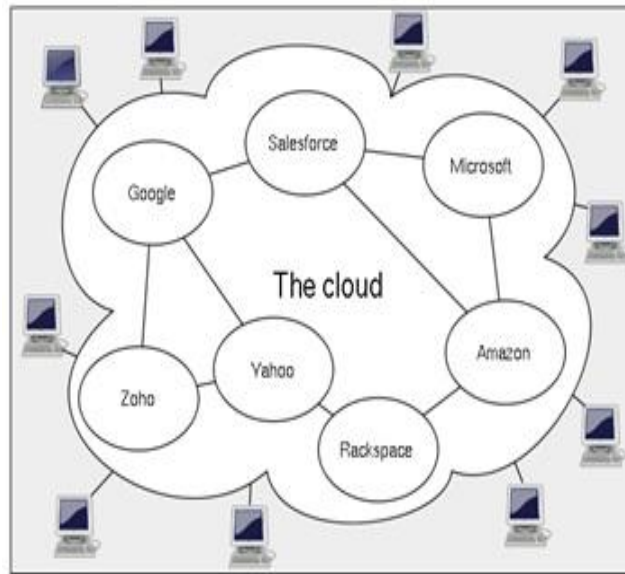


Fig. 2 Cloud Computing

## II. CLOUD TESTING

Cloud Testing involves monitoring and reporting on user traffic conditions and also maintaining load balance and stress testing for wide range simulated condition Fig 3 showing phases of cloud life cycle.

In Cloud Testing user has unlimited resources for disposal paying for what-you-consume. While doing Cloud Testing Different Steps performed are:

B) Reasons for using Cloud Computing For Testing:

1) Improves Testing Efficiency: Cloud Computing reduce time to built Test environment like Operating System Installation, Software Installation Of various Tools.

2) Cost Savings: Cloud Testing reduce overall testing cost of tools and testing machines. Every enterprise has key goal to maximize profit reduce cost. Software testing as part of R&D process also needs to reduce cost that is minimum infrastructure and testing tools to complete Software Testing. Cloud testing also reduces maintenance, upgrading machines and testing tools time.

3) Realistic Performance Testing: Performance testing in cloud Testing is external net application rather than inter-enterprise internet simulation.

4) Changes in External Environment: In Cloud computing Enterprises provide software products and services through network cloud user can rent services rather than purchasing.

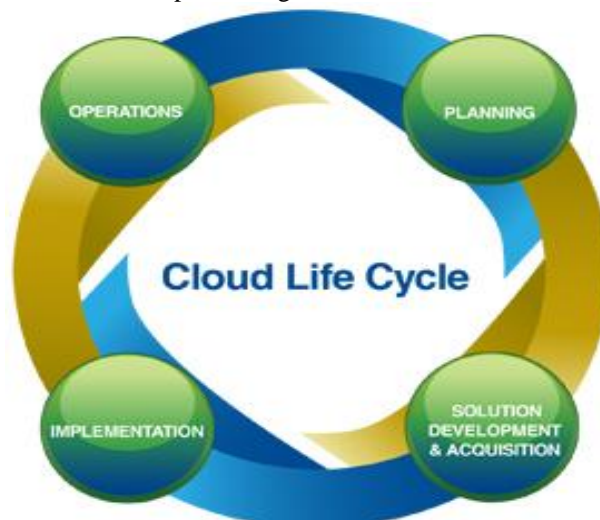


Fig. 3 Cloud Life Cycle

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(C) Environment for cloud Testing:

Hardware Environment: Test Software requirement of Hardware and environment for different application Platforms.

Software Environment: Test compatibility of software on other Operating system, Database, Operating System.

Adaptive/Security Software: Firewall, Antivirus.

Performance Testing: Execute performance and load testing.

With Development of Cloud Computing Technology more testing services for software application developed.

(D) Problems with Cloud Testing:

1) Expensive: Migrating Testing To cloud is expensive process. Test cases format has to be changed for cloud testing.

2) Security: Enterprise information & network security is key concern. When using cloud testing for load or performance testing Logical information about enterprise software will shown in Test scenario meanwhile the weakness and performance condition will reflect those information leaked to competitor Enterprises .

3) Integration Testing in Cloud: There is lack of well defined validation and Quality Assurance Standards to address the connectivity Protocols, Interaction Interfaces and service API's provided by SaaS and Clouds API's. To address software integration issues in cloud testing Engineers need adequate Test Models and criteria for addressing three types of integration in cloud testing.

4) Innovative test methods and solutions: Cloud Testing requires large scale real time test load in scalable web based distributed environment. One of them is powerful test simulator which provide large scale web based data integration and data simulation in cloud using virtual and physical computing resources. An Innovative end to end programme tracking solution is needed to support Software testing, Bug Fixing of cloud based programs at different levels.

5) On-demand test environment construction

To set up a testing environment systematically (or automatically) for on-demand testing services in a cloud? Although the current cloud technologies support automatic provision of required computing resources for each SaaS (or application) in a cloud, there are no supporting solutions to assist engineers to set up a required test environment in a cloud using a cost-effective way. It is necessary to provide an on-demand test environment for TaaS customers. To do this, TaaS vendors need to provide a systematic solution to establish a required test environment based on the user's selection.

### **III. CLOUD TESTING SERVICES**

A) Web Access To Cloud Testing Services:

Access to page provided by Cloud Testing Services the Enterprise do performance and Functional Testing.

B) Using Virtual Machine Technology:

Service providers for Cloud Testing Provide IP of Virtual Machine Client connect to virtual machine through Remote Desktop but to provide access to non web based application still needs Software to be installed on Virtual Machine and then it can be tested.

Main Steps of Cloud Testing Are as Follows:

1) User login to cloud testing provider's website and register useful information.

2) User apply for Platform, Application, Resources that describe configuration requirement of virtual machine like Operating System Version , Hard disk Size , Hard disk Speed , Network Bandwidth , Firewall.

3) Service provider review all requirements and also check Comp ability.

4) User login Cloud Testing Platform until Testing Completes.

C) Building Private Cloud Testing Environment:

Referring Cloud Testing ideas Enterprise can built own Internal Cloud Testing Environment Confidentiality can maintained is in this case.

Automated Cloud Testing Environment chooses better performance machine or server to install testing software, Testing Groups Login to Automated machine and perform Testing.

Using Virtual Machine Technology user can start number of machines on server quickly

D) Why Cloud Testing is Important?

Comparing with Software Testing Cloud Testing Has Several Advantages:

Reduce cost by leveraging with computing hardware and software and hardware resource. This refers to effectively using virtualized resources and shared cloud infrastructure to eliminate required computer resources and licensed software cost in Test Laboratory.

Conduct large scale and effective real-time online validation for Internet based software Clouds.

Easily Leverage scalable Cloud testing system infrastructure to test performance and scalability.

While implementing cloud testing in small division where flexible and cost efficient cloud based testing implemented and this demonstrate following major benefits:

Virtualized resources reduce its Capital and licensing expenses as 50% to 70%.

Reduce operating & Labour cost by 30% to 50%.

Shorten its Development and testing time from weeks to minutes.

Detected Defects get resolved by 15% to 30%.

#### E) Forms of Cloud based Software Testing

There are Four different forms of Cloud based Software Testing. Each one focuses on different objective:

Testing inside a Cloud: It checks quality of cloud on based infrastructure of Cloud and specified Cloud capabilities. Only Cloud vendors can perform this testing as they have accesses to internal infrastructure and connection between its internal SaaS and security, management and monitor.

Testing Of Cloud: It validated quality of Cloud from from an External view based on provided Cloud Capabilities. Especially Vendors are interested in this type of Testing.

Testing over Cloud: It test Cloud Based services application over cloud including Public, Private and Hybrid Cloud based on System level Application and specification.

#### F) Different Test Environment in Cloud

1) Cloud SaaS oriented Testing: This types of Testing Activities Performed inside Cloud By Engineer of Cloud. The primary objective is to assure the quality of provided service functions offered in a cloud. These engineers must go through unit testing, integration, system function validation and regression testing, as well as performance and scalability evaluation. Since clouds and SaaS usually provide certain service APIs and connectivity interfaces to their customers, it is required task for engineers to validate these APIs and connectivity in a cloud environment. Furthermore, performance testing and scalability evaluation in a cloud is very important and critical to cloud/SaaS vendors because this assures the quality of cloud elasticity to support SaaS and cloud services inside a cloud.

#### 2) Online-based application testing on a cloud -

This type of testing activities usually is performed For checking online application systems on a cloud by using with cloud-based large-scale heavy traffic and user privileges. This is a common usage of cloud technology to help current online application. Testing and performance evaluation on a cloud by taking the advantage of cloud environment so that diverse and scalable computing resources in a cloud can be used without using any in house test laboratory. When applications are connected with legacy systems, the quality of the connectivity between the legacy systems and the under-test application deployed on a cloud must be validated..

#### 3) Cloud-based application testing over clouds

This type of testing refers to the engineering activities performed to assure the quality of a cloud-based application crossing different clouds. When applications are developed to be deployed and executed over different clouds, new testing tasks are needed to assure its quality. Unlike the previous two types, the primary testing objective here is to assure the quality of the end-to-end application over clouds. This suggests that the system-level integration, function validation, performance evaluation, and scalability measurement must cope with different cloud technologies. This definitely complicates the tasks for checking system compatibility, interoperability, and connectivity between different clouds.

### IV. PERFORMANCE TESTING IN CLOUD

Cloud computing continues to mature; one is hard to identify a class of enterprise software that is not delivered and consumed as a service. Performance and Load based testing can be counted among these cloud offerings. Moving these functions to the cloud offers typical cloud benefits, most notably lowered capital and operational costs, and support for distributed development teams. But testing based on cloud also changes the way the tests themselves are performed. These changes come at a time when more and more organizations are looking at software as their competitive differentiator.

#### 1) Testing at scale

Cloud based testing providers provide a cost-effective means of testing applications at scale – as opposed to a lab environment that simulates a small subset of the production environment. This means that instead of testing an application against a portion of users and extrapolating that data to scale with a production environment, the cloud-testing provider can test your application against the actual number of expected users. SOASTA, for example, offers Cloud Test, a functional and performance testing service for Web and mobile applications. In the case of performance testing, SOASTA uses cloud servers to simulate traffic that would come from users visiting a website.

## 2) Testing globally

Cloud based testing tools enable testing on a global scale, thereby reflecting the regions from which users are accessing the application. This is often done through partnerships with other cloud providers, such as Amazon and Rack space. For example, Blitz allows customers to run load tests constituting millions of concurrent users coming from multiple continents.

## 3) Advice for using Tools

Tools like SOASTA, Blitz offers several recommendations. “When using a test tool in the cloud, make sure you understand how licensing is working. How are you going to pay that vendor for using that tool in the cloud? Understand what you’re paying that tool vendor for and how your costs are going to be affected as you attempt to test for more users. Advises organizations to understand the software vendor’s roadmap, including how they plan to put out different communications for the development lifecycle and how tests are reported. Understand how to interpret, read and act on the advice from the tool . Determine the two or three tools that you think you might want to adopt and do a proof of concept on each one, looking at integration with other tools in use, how the tool works with your different platforms and, again, understanding the costs and how you’ll be paying for them.

Cloud based Software Testing is Good but unnecessary

Cloud based Testing of Software Application brings cost benefits but this alone does not make it a top priority for most companies as they still have to contend with issues such as data security and interoperability of cloud systems. The most obvious advantage of cloud-based testing tools is that these bring cost effectiveness as there is better utilization of existing infrastructure. Time saving in setting up and Tearing down of Physical Test Laboratories. Performance testing is particularly well-suited for the cloud, as load simulation can be done easily in the cloud. Data security and integrity in the cloud remain contentious issues to date. While vendors are making strides to address this, it is essential for organizations to keep control of their data and administer the structure of that data in accordance with their quality processes.

## V. CONCLUSION

This Paper described our Research in area of Cloud Computing and Definition of Cloud Testing. And then different types of Cloud Testing, Its need, Issues in handling Cloud Testing , Environment for Cloud Testing. Here work is aimed for doing Research for Future Software Testing Methods.

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