

Cloud Testing Exploration, Benefits and Need of Future Enhancements

Mrs. Aparna Sachin Nisal
*University of Pune,
Institute of Business Management & Rural Development (IBMRD),
Ahmednagar, Maharashtra, India*

Abstract:-

Cloud computing is opening up new vistas of opportunity for testing. Cloud Testing uses cloud infrastructure for software testing. In case of applications where rate of increase in number of users is unpredictable or there is variation in deployment environment depending on client requirements, cloud testing is more effective.. Organizations pursuing testing in general and load, performance testing and production service monitoring in particular are challenged by several problems like limited test budget, meeting deadlines. High costs per test, large number of test cases Cloud-based testing has the potential to offer a compelling combination of lower costs, pay-per-use and elimination of upfront capital expenditures. At same time cloud-based testing introduces a new set of challenges, such as data security and a lack of standards. Cloud computing leads an opportunity in offering testing as a service (TaaS) for SaaS and clouds. This paper focuses on benefits and problems of cloud testing. Furthermore it gives the idea about various types of testing involves in the same and answers to the questions of different levels of users.

Keywords - cloud testing, cloud-based software testing, TaaS, performance testing and evaluation

I. Introduction:-

Cloud computing promises to cut the operational and more importantly the way of providing and managing computing resources, such as CPUs, databases, and storage systems. More currently though, cloud computing refers to the many different types of services and applications being delivered in the internet cloud, and the fact that, in many cases, the devices used to access these services and applications do not require any special applications. Testing has traditionally been viewed as a necessary evil because it required a huge, dedicated infrastructure and resources that were used sporadically.

II. Use of Virtualization:-

In broad strokes, technological virtualization has met base-level operational and financial objectives by eliminating the need for intensive capital investments.

Virtualization is the single most effective way to reduce IT expenses while boosting efficiency and agility—not just for large enterprises, but for small and midsize businesses too. Virtualization is helpful with some of following ways,

- Run multiple operating systems and applications on a single computer.
- Consolidate hardware to get vastly higher productivity from fewer servers.
- Save 50 percent or more on overall IT costs.
- Speed up and simplify IT management, maintenance, and the deployment of new applications.

The concept of virtualization is the basic and important part of cloud.

Many companies are delivering services from the cloud. Some notable examples as of 2010 include the following: Google, Microsoft, Salesforce.com, GoGrid, Joyent Inc, Mosso etc.

In 2010, Garner estimated that “the cloud service market will reach \$150.1 billion in 2013”. Etc.

Software testing is an integral part of the software development life cycle .Challenges in software testing is deploying and maintaining a real-world test platform at the outset of a project. Virtualization technology has been utilized in testing various software since its inception in 1960’s. IBM’s CP-40 project might be considered as the pioneer of virtualization technology. The concepts that affect software testing as an on-line service are domain knowledge, infrastructure, security, pricing, communication and skills. On-line testing reduces costs related to installing and maintaining testing environment. It also introduces a new market where the providers and consumers can reach skilled test engineers on-demand.

What is Cloud testing?

As per Wikipedia Cloud testing is a form of software testing in which web applications use cloud computing environments to simulate real-world user traffic .

“Cloud testing basically aligns with the concept of cloud and SaaS. It provides the ability to test by leveraging the cloud, thereby bringing the same benefits that the cloud brings to customers....” (by Vinita Ananth, Director - APJ Region, HP Software-as-a-Service).

“Testing in the cloud leverages cloud computing environments and seeks to simulate real-world user traffic as a means of load or stress testing Web sites. (By Nivedan Prakash)

“Cloud testing is the answer to the less-than realistic performance test that originates within the infrastructure of one of our clients. When we use cloud testing, we take advantage of hardware and bandwidth that more closely mimics our observed, real world conditions. Essentially, we execute the test in cloud-based infrastructure and bandwidth.” (R V Ramanan, President – Global Delivery and Chief Software Architect, Hexaware Technologies)

Cloud testing is also defined as Testing as Service (TAAS). IT organizations that deal with testing product and services are making use of cloud based licensing model for their end clients with functional and non-functional requirements.

Two types of cloud testing services are,

On-Premise:

Cloud testing can be used for these services for validation and verification of various products owned by organizations or individuals.

On Demand:-

Testing on demand is used to test on demand software as well. Its is becoming increasingly popular to use testing as a service to simulate production such as cloud environments instead of traditional on-premise testing products.

Cloud-based software testing refers to testing and measurement activities on a cloud-based environment and infrastructure by leveraging cloud technologies and solutions. It has four major objectives.

- To assure the quality of cloud-based applications deployed in a cloud, including their functional services, business processes, and system performance as well as scalability based on a set of application-based system requirements in a cloud.
- To validate software as a service (SaaS) in a cloud environment, including software performance, scalability, security and measurement based on certain economic scales and pre-defined SLAs.
- To check the provided automatic cloud-based functional services, for example auto-provisioned functions.
- To test cloud compatibility and inter-operation capability between SaaS and applications in a cloud infrastructure, for example, checking the APIs of SaaS and their cloud connectivity to others.

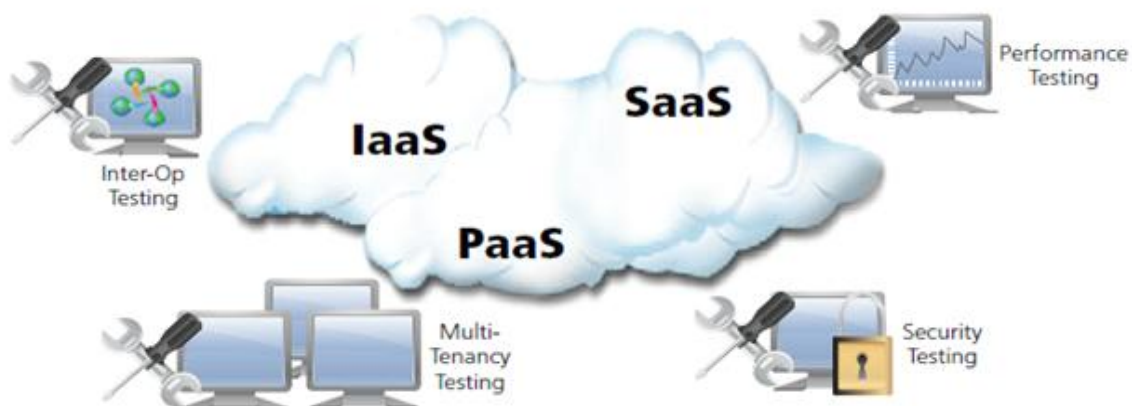


Figure 1:- Testing a cloud offering

Testing a cloud refers to the verification and validation activities for applications, environment and infrastructure that available on demand.

Every cloud offerings requires traditional and contemporary verification strategies. Conventional testing methodologies are ideal for on-premise applications and environments. Any product offered on cloud should meet its functional and non-functional requirements.

Various types of testing it requires to carry are,

Performance testing:-

Performance measurement for a cloud offering is different. The cloud should be elastic that enables enterprises to use limited resources from cloud applications and increase the usage as required. So, the cloud offerings should be tested for fluctuating resources. Testing should also ensure that automatic deprovisioning should happen when the load decreases. The performance testing is carried out with the approaches, Load and Stress testing.

Security Testing:-

Unauthorized access should be avoided. Shared data integrity should be maintained and secured.

Availability Testing:-

Cloud offering should be available all the times, and cloud vendor should not have any abrupt downtime.

Interoperability Testing:-

The cloud application should have capability to be executed across various cloud platforms. The application must work in multiple environments and platforms.

Disaster recovery testing:-

The disaster recovery time must be low for any failure. Many other such testing services are required.

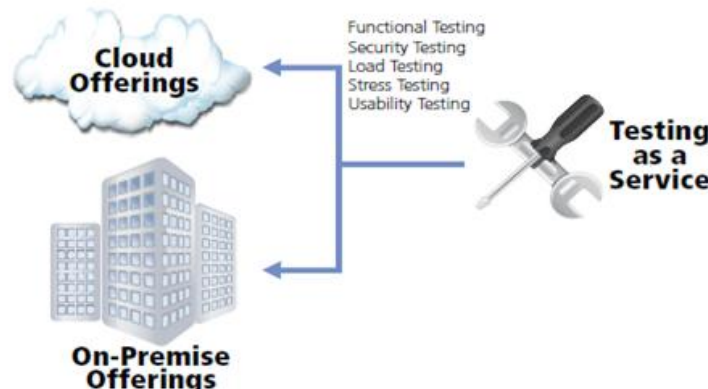


Figure 2:- Testing As a Service (TaaS)

These products are available in all 3 delivery models with all above testing approaches are ,

SaaS:- Testing products and services are recognized as on demand testing applications with Black box testing models.

PaaS:- Build and automation environments are available on demand. Developers can make use of the on demand environments to build and test the automation scripts.

IaaS:- Organizations provide their storage servers or network and other computing infrastructure on demand which are used for verification and validation production environments.

Many of software test professionals dealing with verification activity agree that, it is not so easy to get licensed software for these testing purposes and to maintain performance and security testing by considering cost value.

By considering above information, the IaaS model can significantly reduce the cost involved in purchasing authorized and licensed infrastructure (such as servers/browsers/platforms/OS etc...). Several vendors and managers are now aligning to the idea of using resources on demand when there is need to certify interoperability of the application.

A traditional approach to test software incurs high cost to simulate user activity from different geographic locations. Testing firewalls and load balancers involves expenditure on hardware, software and its maintenance.

Following figure gives us idea about key trends in cloud application and technology adoptions and this is related to the case studies mentioned below.

Key Trends in Cloud Adoptions

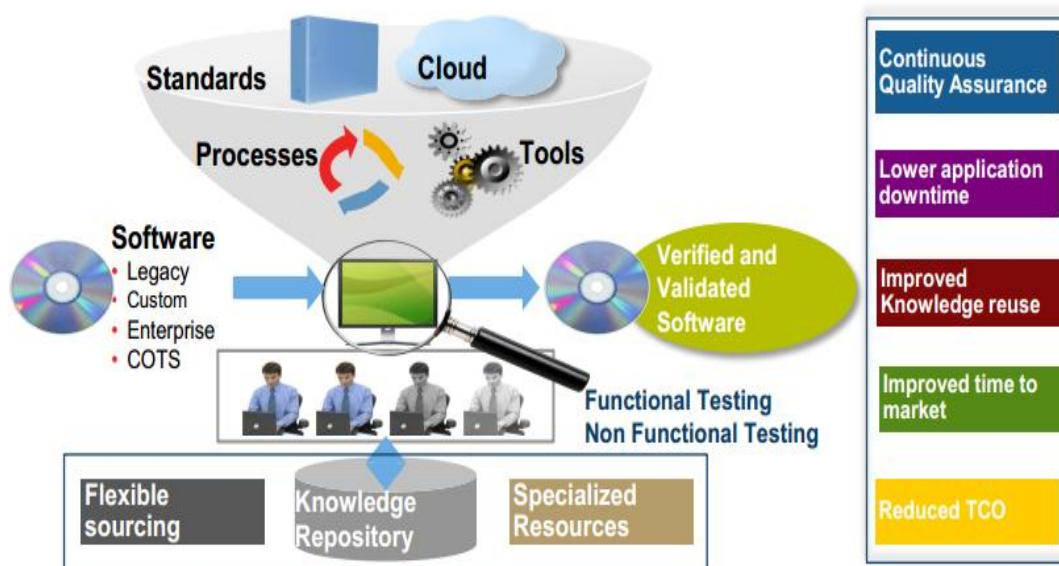


Figure 3:- Cloud Adoptions- Use of technologies

III. Some real life cases- the organizations adopted the cloud testing techniques:

Let we consider one case as, a global company CISCO in California used, NetApp Unified Computing System and Nexus platform to build a shared test environment supporting 23,000 virtual machines. NetApp creates innovative storage and data management solutions. More than 12,000 customers worldwide use more than 87,000 NetApp storage platforms. NetApp engineers conduct stress tests on new NetApp storage hardware and software products, reproducing the conditions in demanding customer environments.

Let consider another case as, Oracle has thousands of developers for its core software products, which include oracle database, middleware, applications etc. Oracle s/w developers regularly run large number of tests and execute programs to meet the business and technical requirement of the product. Previously oracle development team had their own labs for software build, test and execution. Now a day, instead of using small number of local computer resources, each development team accesses a centralized pool of server (with a private cloud) and storage resources in the oracle datacenter and delivered as a service to all oracle developers on demand. Software development teams are able to access the hardware resources through a self service user interface in a fraction of time it formally required by improving productivity. Oracle product development IT finds it much easier to keep each server current with the proper version of operating system, languages, compilers etc.

Oracle's test cloud infrastructure allows the oracle fusion middleware teams to automate essential development and test workload across all oracle fusion middleware releases to improve software development efficiency and quality. Oracle is using a self private Infrastructure as a service (IaaS) cloud for its large development organization.

Thus from above cases we are sure that there are many advantages of the cloud testing, but many operational challenges are also present.

Advantages of Cloud Testing:-

Cost is, of course, a major advantage of moving testing to the cloud. It frees companies from large capital expenditures for creating test environments, and pay-as-you-go models mean they don't pay for idle test environments. But it's important to note that cloud-based testing offers other meaningful benefits.

Operational Challenges for Testing in the Cloud:-

However, cloud-based testing poses different challenges than in-house testing.

- First, there are currently no universal or standard solutions to integrate public cloud resources with users' internal data centers. Each cloud provider has their own architecture, operating model and pricing mechanisms and offer very little interoperability. This poses a challenge if companies need to switch vendors.
- Security is another major concern, mostly because data and code may be stored in a remote location beyond an organization's legal and regulatory jurisdiction. Yet another challenge is that some cloud providers offer only limited types of configurations, technology, servers and storage, networking and bandwidth, making it difficult to create real-time test environments.
- Improper choice of cloud-based use and pricing options is another risk. While some vendors offer pay-as-you-go services, they are only cost-effective when the right plan and service provider are chosen for the anticipated needs (e.g. space vs. RAM vs. bandwidth). Costs can quickly spin out of control if resource estimates differ wildly from actual usage.
- Also be aware of associated expenses, such as the cost of encrypting data to assure its security in the cloud

IV. Conclusion:-

This paper explores about cloud computing, cloud testing and its relation with traditional testing. It gives us idea about different aspects of cloud testing as, testing the cloud and cloud testing with different services such as SaaS, PaaS, IaaS and TaaS, basically use of IaaS in cloud testing. Cloud testing is the evolutionary and developing phase in software testing. We have observed different advantages and challenges in cloud testing. It is the most important research area in the nearest future. The examples discussed in this paper make enlighten the use of cloud computing in the current world for different organizations and its benefits from different aspects.

References:-

- [1] Jerry Gao, Xiaoying Ba, and Wei-Tek Tsa, Cloud Testing- Issues, Challenges, Needs and Practice, Software Engineering: An International Journal (SEIJ), Vol. 1, No. 1, SEPTEMBER 2011, pp(9-23)
- [2] Neha malhotra: Cloud testing vs. testing a cloud (10th annual software testing conference, 2010)
- [3] Storage Manufacturer Builds Highly Scalable Testing Cloud-Customer Case Study-Cisco, 2011
- [4] LEF Grant Briefing H.KOTHANDARAMAN, Testing Applications n Cloud, Computer Sciences Corporation(CSC) ,2011
- [5] An Oracle White Paper, Creating a self service Dev/Test cloud A case study from Oracle product development IT, July 2011

- [6] Cognizant report: Taking Testing to the Cloud, 2011.
- [7] Neha Thakur, White Paper-Performance Testing in Cloud: A pragmatic approach, 2010
- [8] Swapnil H. Chandane and Mahip M. Bartere, New Computing Paradigm: Software Testing in Cloud, Issues, Challenges and Need of Cloud Testing in today's World, *International Journal of Emerging Research in Management & Technology* February 2013, pp(68-75)
- [9] Cloud Computing Basics, http://south.cattелеcom.com/rts0/Technologies/CloudComputing/0071626948_chap01.pdf, [Accessed on 31 Oct 2013]
- [10] Dialogic white paper, 2010, Introduction to cloud computing
- [11] Cloud testing: issues and challenges, <http://qa.siliconindia.com/news/Cloud-Testing-Issues-and-Challenges-nid-137698.html>, [Accessed on 8 Nov 2013]
- [12] Performing Security Testing in the Cloud, <http://www.blacklabssecurity.com/cms/services/cloud-testing-case-study/>, [Accessed on 6 Nov 2013]
- [13] Virtualize for efficiency, Higher Availability and lower costs, <http://www.vmware.com/virtualization/virtualization-basics/what-is-virtualization>, [Accessed on 20 Oct 2013]
- [14] Cloud Testing, http://en.wikipedia.org/wiki/Cloud_testing, [Accessed on 28 Oct 2013]
- [15] Cloud Testing, http://www.webopedia.com/TERM/C/cloud_testing.html, [Accessed on 2 Nov 2013]