Non-Functional Testing On Cloud Computing – A Pilot Survey

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Abstract: Non functional requirement have great impact on the application. If it goes wrong it will lead to costly rework. In small organizations, there will be limited (and non-scalable) infrastructure to implement all the non-functional requirement testing. Cloud testing allows test software and hardware without the usual constraints of a limited budget, multiple test cases, geographical issues and many more. With a range of applications in the cloud, it is now becoming essential to develop the Cloud Testing strategy.

IndexTerms - Cloud Computing, Cloud based testing.

I. INTRODUCTION

The quality attribute of a software system is specified in Non-functional requirement. Non-functional requirement will have a great impact on the functionality and reusability of the application. If Non functional requirements get wrong, it will lead to more costly rework. If functional requirements are missed, it can be added later, but non-functional requirement will lead to rework or even cancel the project.

In small organizations, there will be limited (and non-scalable) infrastructure to implement all the non-functional requirement testing. It will lead to test a product to be tested on limited resource which may lead to fail. To assess the scalability, performance, security and reliability of a web application cloud-based testing is used. Cloud computing is an internet based platform that combines various computing services such as software, hardware or other computer related services virtually. The testing is performed on a third-party cloud computing environment. This will enable faster availability with scalability to save cost and time for software testing. Cloud testing allows test software and hardware without the usual constraints of a limited budget, multiple test cases, geographical issues and many more. With a range of applications in the cloud, it is now becoming essential to develop the Cloud Testing strategy.
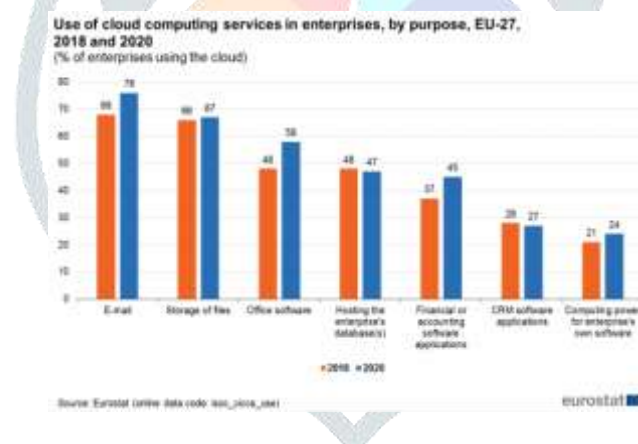

Fig1: Use of Cloud computing services in enterprises, 2018-2020

Literature Survey

The engineering of cloud applications must take into account of Non-Functional Requirements (NFRs), such as end-user, software and cloud infrastructure requirements for low-power computing, performance, availability, elasticity, operational cost and similar. Such requirements should be identified and considered early in the software engineering process and decisions must be taken on their trade-offs, e.g. greater service availability while balancing operational costs [1].

A framework for processing of non-functional testing where the non-functional requirements should be considered for mobile application tests, test case scenarios (TCS) and tools to test and execute these TCS. In addition, a cost-benefit analysis will be presented, according to the types of test execution; considering cloud and local tools [2].

Performance tests writing skills for IaaS clouds using the Web-based benchmarking tool Cloud Workbench (CWB). Introducing benchmarking of IaaS cloud in general, demonstrate the execution of a simple benchmark in a public cloud environment,

summarize the CWB tool architecture, and interactively develop and deploy a more advanced benchmark together with the participants [3].

Analyzing the inflection point characteristics and user behavior characteristics in the performance testing, and puts forward a set of performance test indicators, and builds a performance test model UBPTM (User Behavior Performance Test Model) which is suitable for the cloud environment [4].

The systems must comply with non-functional requirements as they evolve. Certain traditional techniques are employed to verify the non-functional properties of critical systems at design time. In this paper, a new framework has been discussed that supports the process of deploying applications on cloud providers, using a comparison of high level requirements predominantly non-functional requirements (NFR) [5].

In this paper, the design and implementation of an Infrastructure as a Service cloud manager such that non-functional requirements determined during the requirements analysis phase will be mapped to properties; for a group of Virtual Appliances running the application. This management system ensures that expected Quality of Service is maintained during execution and will be considered during different development phases [6].

This paper discuses about the efficiency of the Dynamic Random Testing (DRT) will be improved by combining it with cloud computing. What are the key challenges faced as the cloud testing select the test cases sequentially. This paper presents a strategy to adapt DRT in cloud computing, by which both resource allocation and test case prioritization are considered [7].

This paper focus on the user behavior and inflection point characteristics in the performance testing, and standard set of rules for performance test indicators and build a test model which will be better suited for cloud environment [8].

This paper proposes a methodology to test the application on cloud which deals with cloud security user acceptance, business requirement and performance. Cloud testing tools are selected on the basis of certain characteristics of the testing tool like platform compatibility, available support and service cost [9].

This paper explains about the threat, risks and vulnerabilities that are associated with the cloud. Organization needs to expose every detail to the clouds, cloud service providers may hide the risks, threats or vulnerability without informing fully to the users [10].

Benefits of Cloud Testing

The need for cloud testing is visible with the many benefits that are derived from it.

Dynamic availability of testing environment: The most common method of testing in any organization is to invest in the hardware/software infrastructure required for testing. Many will agree that the environment provided to the test teams is due to the rapidly changing demands of the customer environment, which is why it is very difficult for companies to maintain this. The cloud is the only answer to this problem, which enables users to easily replicate the customer environment and detect failures in the cycle.

Low cost: When companies invest in the infrastructure, the usual cause of it is many of their servers are not utilized all the time. They require additional expense on license renewal or maintenance. Cloud helps in these situations, as and when they want user can use it as service, thereby saving huge cost for an organization.

Easily customizable: It is easy task for organization to emulate and end-user centric environment by customizing it as per the usage. The test team can easily handle load and performance test scenarios in various permutations and combinations such as browser, configuration.

Scalability: When business requirement keeps altering frequently scalability place a very important role. In this feature resources can be increased or decreased as the requirement demands.

Types of Non functional testing Performed in the Cloud

Availability Testing: The cloud provider must make sure the cloud is available all the time for use. The administrator has to make sure the cloud will be available as there may be carrying out mission critical activities. That should not affect the user.

Multi-Tenancy Testing: Many users will be using the cloud services at a time. Testing must be carried out to ensure that access control and security of the data are secured.

Performance Testing: Many users will be using the cloud platform at a time; every user needs to get the response back with a good response time. To evaluate performance network latency is a critical factor. There might be sudden deceasing and increase in the load by decommissioning resources. Thus load and stress testing are carried out to make sure application performing optimally with sudden difference in load and stress.

Security Testing: The resources and data will be available in the cloud, hence it is essential to make sure all the sensitive data belongs to user cannot be accessed illegally. The privacy of the user needs to be maintained. User data integrity must verify when an application is maintained on cloud.

Disaster Recovery Testing: The main feature of cloud is availability; the cloud is available at all the times. If there is a network failure or breakdown of an application due to extreme load or system failure how fast it can be identified and can be solved as well as if any data loss occurs during this time.
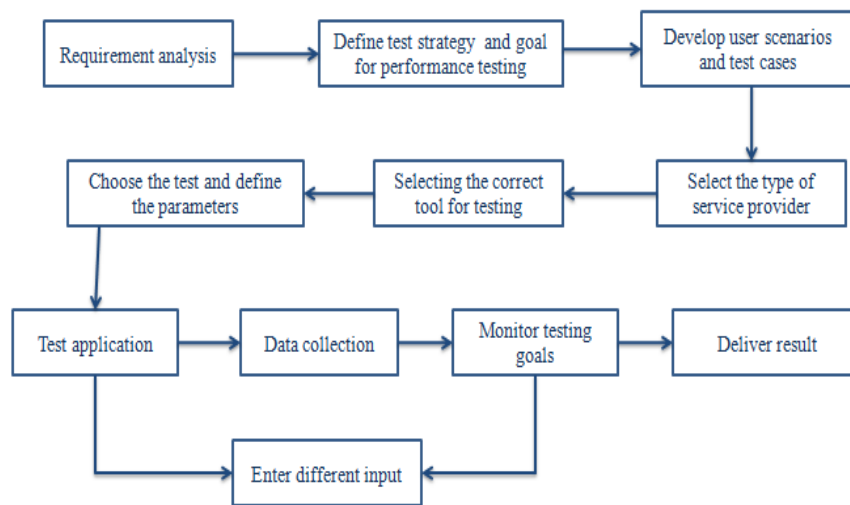

Fig 2: Cloud testing procedure

Challenges faced during cloud testing

The main risk involved in cloud computing is data theft. The cloud provider needs to assure the client about the safety of the sensitive data. The primary issue that are needed to be addressed on the cloud are User privacy protection, security standards on the cloud, the security of applications running in the cloud, Security Testing techniques.

For testing purpose, they may require certain configuration with respect to storage, networking or servers which is not provided by cloud providers. Emulating the customer environment is difficult in the cloud testing.

Performing integration testing on cloud is quite challenging. The tester needs to test network, servers, database etc. But tester will not have control over the underlying environment. One more challenge is tester will have to anticipate that servers may go down, network break down, risk of crashes.

Conclusion

The cloud computing environments have a lot of huddles that an organization needs to handle. To identify issues, cloud entails testing applications across various models and environment. Consideration of non-functional requirements does not go away in the world of cloud. Cloud providers have very different capabilities. To operate an application seamlessly and securely, the challenges needs to be understood and necessary actions are to be undertaken. Using the cloud for testing is immensely helping organizations to acquire the required tools, software licenses, infrastructures at a very low cost without having to set it up them and later worry about its maximum utilization.

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