Evaluation of Software Testing Techniques on Cloud Platforms

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Abstract

Software testing is assessing the functionality and correctness of a program through execution and/or analysis. Testing is a challenging activity for many software engineering especially for large-scale systems. Because testing can be such a difficult, expensive, and labour-intensive process, there is always high demand for better testing support

In Recent years, Cloud Computing is considered as a potential technology in software industry as a resource base. Cloud Computing provides many advantages for organizations and companies to increase their profit in many fields and perspectives. One of these fields is Software Testing. Cloud computing can help to provide test environments, resources, software licenses, tools and infrastructure at an affordable budget without the need to build another on-premises infrastructure for testing purpose.

Introduction & Paper Summaries

Cloud computing brings new business opportunities, and causes some major impacts on software testing.Testing as a Service (TaaS), is the most important services offered in the cloud testing. TaaS is considered as a new business and service model, in which a provider undertakes software testing activities in a cloud for users as a service based on their demands. Cloud testing is still new subject in software testing community.

What is Cloud Testing?

There are some definitions about cloud testing, As follows:

- According to https://sw.thecsiac.com Cloud Testing or more formally, Cloud Computing Testing, is a form of software testing in which web applications use cloud computing environments to facilitate the tests.

- Concepts of cloud testing, cloud and SaaS are aligned, thereby cloud testing bringing the same advantages that the cloud brings to users, by providing the ability to test with leveraging the cloud.

According to Wikipedia , Cloud testing is a form of software testing in which software and web applications use cloud computing environments (a "cloud") to simulate real-world user traffic and the types of testing that can support include: stress testing, performance testing, load testing, functional testing, compatibility testing, browser performance testing, latency testing.

Paper 1 – A Survey of Software Testing in Cloud - Koray Incki, Ismail Ari, Hasan Sozer

2012 IEEE Sixth International Conference on Software Security and Reliability Campanion

Summary -

The paper discuses conventional software testing and software testing using virtulization. Virtualization technology has been utilized in testing various software since its inception in 1960's. IBM's CP-40 project is considered as the pioneer of virtualization technology. Among other goals of the project, CP-40 was mainly used by researchers as a tool to evaluate and test the performance of operating systems.

Paper 2 – Cloud Testing- Issues, Challenges, Needs and Practice - Jerry Gao, Xiaoying Bai, Wei-Tek Tsai

Software Engineering : An International Journal (SEIJ), Vol. 1, No. 1, SEPTEMBER 2011

Summary -

The paper focuses on Testing as a Service(TaaS). This is an innovative concept, and it refers to providing static/ dynamic on-demand testing services in/on/over clouds for the third-parties at any time and all time. One of the primary objectives is to reduce the IT budget of businesses to focus their core businesses by outsource software testing tasks to a third party using TaaS service model.

The execution can be performed either on client site or remotely from the outsourced providers test lab/facilities. TaaS was initially introduced as a concept by Tieto in Denmark in 2009, and its solution of TaaS was nominated by IBM for the Software Innovation Award 2009. Now TaaS has received wide attention due to its advantage in its scalable testing environment, cost reduction, utility-based service models, and on-demand testing services.

Paper 3 – Cloud Computing Testing Evaluation - Ali Mohsenzadeh

IJCEM International Journal of Computational Engineering & Management, Vol. 16 Issue 6, Nov -2013

Summary -

The paper discuses different tyes of software testing over clouds. It mainly covers topics such as different facts of cloud-based software testing. Each of them has different objectives and focuses.

It analyzes the questions of which software projects can be done by the cloud testing. Also this paper offers a comprehensive review on cloud computing testing by discussing the related concepts, advantages and challenges. The main contributions of this paper include discussion about cloud computing testing and the comparison with conventional testing as well as the comparison between commercial testing tools.

Cross Comparision

Virtualization –

Virtualization allows abstraction and isolation of lower level functionalities and hardware, which enables portability of higher level functions and sharing and/or aggregation of the physical resources. CP-40 was part of IBM's then revolutionary CMS – a virtual machine/virtual memory time-sharing operating system. CP-40 ran multiple instances of client operating systems.

Pro's – Efficient Resource Utilization, Reduced overall costs

Con's – Upfront costs are hefty

Limitations - Not all hardware and software could be virtualized

TaaS (Testing as a Service) –

TaaS cloud infrastructures is considered as a new business and service model, in which a provider undertakes software testing activities of a given application system in a cloud infrastructure for customers as a service based on their demands. TaaS involves the on-demand test execution of well-defined suites of test material. The execution can be performed on client site or remotely from the outsourced providers test lab.

Pro's – TaaS and Cloud testing service costs (pay-as-you-test), An open public test environment with diverse computing resources, On-demand test execution by third-parties

Con's – Construction of on-demand test environment is time consuming, There is a lack of welldefined TaaS processes and QoS standards for on-demand testing services

Limitations - How can we assure the security of cloudbased application processes and business data inside a third-party cloud infrastructure and Approaches to coing with failures are not defined

Testing inside a cloud –

It checks the quality of a Aplication from an internal view based on the internal infrastructures of a cloud and specified cloud capabilities. Only cloud vendors can perform this type of testing since they have accesses to internal infrastructures and connections. The primarytesting objective here is to assure the quality of the end-to-end application over clouds. This suggests that the system-level integration, performance evaluation, and scalability measurement

Pro's - Large-scale cloud-based data and traffic simulation to evaluate system performance and scalability

Con's - Doesnt necessarily test the funtionality, Extra cost compared to using Testing as a service

Limitations- lack of cost-effective integration solutions and framework to facilitate software application integration**,** lack of well-defined validation methods and quality assurance standards to address the connectivity protocols, interaction interfaces

Suggestions

All the 3 techniques implemented in cloud have different usecases an they contribute at different levels of software Testing. Furthermore, an innovative end-to-end program tracking solution is needed to support software testing, bug-fixing, and maintenance of cloud-based programs at different levels. This solution enables engineers to understand, test, and monitor end-toen application processes, transactions, service functions, and interactions between TaaS and clouds. Therefore, more research work must be done to address the challenges and open issues in cloud testing and TaaS.

Accetance testing is another region which has lot of scope of research in Clouds. If SQA and Qos are well defined for Clouds. Then this will pave a way for next Gerenration implementation of Quality Assurance

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