Software Testing Based on Cloud Computing

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Abstract - **Cloud testing is the method of software testing based on cloud computing technology. 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 do clouds testing, how to do cloud testing. This paper was a research for the future software testing methods.**
Keywords: **cloud computing, software testing, cloud testing**

I. CLOUD COMPUTING OVERVIEW

Cloud Computing is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet. It is fused with grid computing, utility computing, distributed computing, parallel computing, network storage technologies, virtualization, load balance etc.

In a typical application system of cloud computing, there are six layers components - client, service, application, platform, storage and infrastructure. A cloud client consists of computer hardware and software, which relied on cloud computing for application delivery, or which is specifically designed for delivery of cloud services. Cloud service include "products, service and solution that are consumed in real-time" over the network. A cloud application leverages the cloud in software architecture, to eliminate the need to install and the application on the users' local computers. A cloud platform facilitates deployment of application without the cost and complexity of managing the underlying hardware and software layers.

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. These services are broadly divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS).

Infrastructure-as-a-Service provides virtual server instances with unique IP addresses and blocks of storage on demand. Customers use the provider's application program interface (API) to start, stop, access and configure their virtual servers and storage. In the enterprise, cloud computing allows a company to pay for only as much capacity as is needed, and bring more online as soon as required. Because this pay-for-what-you-use model resembles the way electricity, fuel and water are consumed; it's sometimes referred to as utility computing.

Platform-as-a-service in the cloud is defined as a set of software and product development tools hosted on the provider's infrastructure. Developers create applications on the provider's platform over the Internet. PaaS providers may use APIs, website portals or gateway software installed on the customers' computer. Developers need to know that currently, there are not standards for interoperability or data portability in the cloud. Some providers will not allow software created by their customers to be moved off the provider's platform.

In the software-as-a-service cloud model, the vendor supplies the hardware infrastructure, the software product and interacts with the user through a front-end portal. SaaS is a very broad market. Services can be anything from Web-based email to inventory control and database processing. Because the service provider hosts both the application and the data, the end user is free to use the service from anywhere.

A cloud can be private or public. A public cloud sells services to anyone on the Internet. (Currently, Amazon Web Services is the largest public cloud provider.) A private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people. When a service provider uses public cloud resources to create their private cloud, the result is called a virtual private cloud. Private or public, the goal of cloud computing is to provide easy, scalable access to computing resources and IT services.

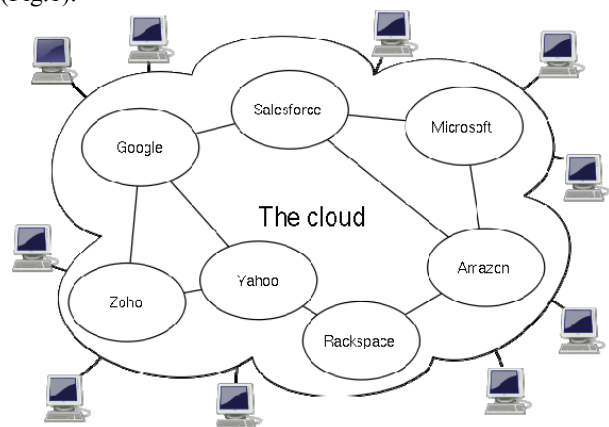Cloud computing conceptual diagram as follow (Fig.1):

Fig.1 Cloud computing conceptual diagram

II. CLOUD TESTING

A. The Definition of Cloud Testing

Cloud testing is a new form of software testing in which web applications that use cloud computing environments seek to simulate real-world user traffic as a means of load testing and stress testing web sites. With cloud-testing you have unlimited resources at your disposal,

paying only for what you consume, only when and if you consume it.

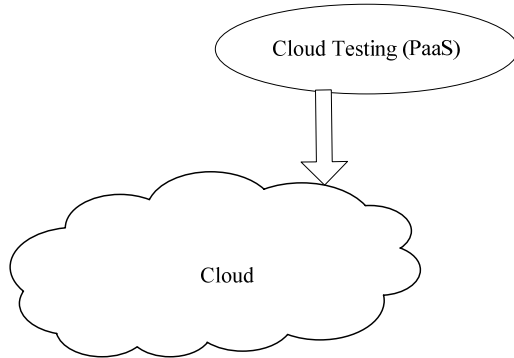The cloud testing conceptual diagram as shown in Fig.2:

Fig.2 Cloud testing conceptual diagram

B. The Reasons for Using Cloud Computing for Testing

1) Cost Savings

Every enterprise in the pursuit of the lowest cost and maximize profits. Software testing as part of R&D process also needs to reduce the cost, that is, with a minimum machine and testing software to complete the software testing. Testing can be achieved by huge savings in the cloud, do not buy or prepare a lot of personal computers, purchase and install various types of testing software, and no longer need to deploy complex networks. Such as purchase of an automated test software to spend at least 9,000 yuan, the test requires only 2 months, but if rent the software testing platform with 800 yuan/per month, it only needs to pay 1,600 yuan. At the same time, as the version of the software and technology development, Dependent testing software or the environment also need to upgrade, upgrade and maintenance costs will be created. The cloud testing environment is not necessary for enterprises to consider these factors, by providing cloud testing services provider can be completed.

2) Improve the Testing Efficiency

Using cloud testing, we can reduce the time to build a test environment greatly, such as machine and network preparation, the operating system installation, software installation of various testing tools.

3) Performance Testing is More Realistic

Performance test on the cloud testing platform, you can open more clients, and the test itself is the external net application rather than the inter-enterprise internet simulation which covers more realistic scenario. If you can find and deal with the unexpected traffic peaks, it will make the test software get great function improvement.

4) Changes in the external environment

With the progress of cloud computing technology, the companies will provide software products and services through the network (cloud), we can only "rent" rather than "buy" to use these testing software, that is, only cloud testing.

C. The Suitable Environment for Cloud Testing

By the definition of cloud testing, we see that: In software testing those who need to use the software tools and environments are available for cloud testing. In the current, the project suitable for cloud testing is about:

Hardware environment: test the software requirements of hardware and environment in different application scenarios,

Software environment: Operating system, database, browser, etc. Test the adaptability of software on different operating platforms;

Adaptive software: Test different firewall and install anti-virus software, software reliability;

Functional automation testing: execute software automation testing;

Performance Testing：execute software performance and stress testing.

With the development of cloud computing technology, testing services for software applications will be developed. Suitable for cloud test projects will also be increasing.

D. Problems of Cloud Testing

1) Security: Including the enterprise information security and network security

When using cloud test platform for functionality or performances, the way about enterprise software how to realize its logical information and technical means will be shown in the test scenario, meanwhile, the weakness, leak and the performance condition will be reflected in the diary. If those information is leaked to the competitors, it will do harm to the enterprise. Meanwhile, the cloud test is based on the internet, so it may come up to the situation about the internet suspending, slow internet speed, virus attack and so on.

As for the weakness and risks mentioned above, we can learn from the knowledge and the attitude of banks how to overcome habitual conservative ideas: in the present highly developed financial service age, we are not worried about the loss of the deposit and the phenomenon that can not draw money due to the interruption of the internet in the process of withdrawing. Although minimum rate affairs may happen, for example, the decrease of the deposit ,the leak of private information or wait for drawing in a long queue. However, it is much safer than putting money at home and take money with yourself. We also enjoy the convenience of union pay and eBay. So it is unnecessary to worry about the security and the stableness of the internet. We should sign a contract from the cloud test service about the company technical information and data and the internet security which is just like when you firstly open your bank account, the bank has the obligation of confidentiality and guarantee about your private information.

2) Restrictions of the Suitable Range for Cloud Testing

B/S application software (such as website) using the cloud testing is most appropriate, and the C/S structure software adaptability is poor, it still need to install the cloud testing software in the test platform, the cloud testing is more complex.

As for some software research and development companies which prohibit putting in external internet because of the confidentiality, the cloud test is not available. They can only be examined by the original test means or build a private cloud environment in the company to test their software.

III. CLOUD TESTING REALIZATION

In the current, the way to provide cloud testing services about the following two:

A. Using Web Access to Cloud Testing Services：

Access to the page provided by the cloud testing services, the enterprise does the functional testing and performance testing. It is easy to achieve for the WEB-based application software products of B/S structure.

B. Using Virtual Machine Technology:

Cloud testing service providers provide the IP of the virtual machine; clients connect the virtual machine through remote desktop and other ways. But the way of non-WEB application software, still needs to be installed on the virtual machine and then it can be tested. Diagram is as follow (Fig.3):
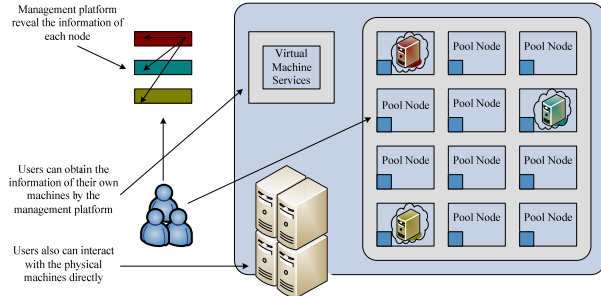

Fig.3 IaaS platform architecture 一 Virtualization technology

The main process of cloud testing as follows:

1) Users login cloud testing provider's website and register user information;

2) Users apply for the test platform resources, applications need to describe the configuration requirements of virtual machine environment, Such as operating system version, browser version, memory size, hard disk size, hard disk speed, network bandwidth, firewall, etc.;

3) The service provider of cloud testing review the application and configure the test platform;

4) Under the rental agreement, the user (online) pre-paid service fee;

5) Users login the cloud testing platform, until the end of the testing;

6) According to the flow or time to pay the actual costs, the lease ends.

IV. BUILD THE PRIVATE CLOUD TESTING PLATFORM OF ENTERPRISE

Reference cloud testing ideas, enterprises can build their own internal cloud testing environment to enjoy its advantages. Confidentiality and other reasons for the external network can not access the software R&D enterprise cloud test method can also click here.

Automated cloud testing environment: choose a better performance machine or server to install automated testing software, for example Loadruner, Robot and other tools. Testing groups log in this machine to do their own functional testing and automated testing, and do not need to install the independent automated testing environment in the local machines.

Multi-machine environment to build: using virtual machine technology to copy and start a number of virtual machines on the server quickly, the test terminals access to their own virtual machines to upgrade customer data, execute the environment testing, stress testing, performance testing, and other software testing by remote desktop or VPN.

V. CONCLUSION

This paper described our research in the area of cloud testing. We introduced the definition of cloud computing and the definition of cloud testing. And then, we analyzed the questions of which software testing projects can do the cloud testing, why do clouds testing, how to do cloud testing. There are already several products available that focus on this activity. Our work is aimed at doing a research for the future software testing methods.

ACKNOWLEDGMENT

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