

## Cloud System for Software Testing

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**Abstract:**

Software testing is a process of implementation programs and applications to find errors in software. Testing of a large number of software at the same time may take a long time and cost a lot. This paper describes a distributed system for software testing depends on cloud computing principles. Virtualization is used to provide possibilities in network creation and it's parts. Capturing the network traffic shows that when the file size is increased, the time taken to test is increased too. When one tester is used and two users, the test process took longer time, so it's needed to increase testers.

**Introduction:**

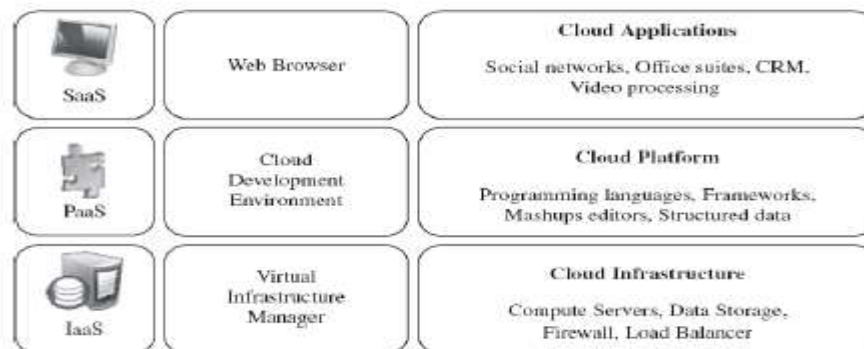
Its easy to write any Java code but the problem if this code is right and gives the result wanted from it, So that tee software codes must be test.

Testing still the largest challenge in software development. Software testing is a process of searching and finding the errors during program execution, so we get a program without errors and aim to evaluate ability or usability of software. Software testing is the important way to reach software quality[1].

Software testing had become a basic business for a number of IT services[2].

Based on the fact software testing has an importance in software phases and this increase nowadays. Cloud computing is a shared resource such as devices, programs and network. There are main services Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) and Storage as a Service see figure1[3].

Cloud computing had become a computer model. Where can provide a virtual devices and hardware which has hosted remotely and provide usability service model when needed. Cloud computing describe the ability to access the shared resources and shared search structure which provide services when need. Across network to other operations which meet changing needs.it provide facilities for users to implement, deploy and manage their applications ‘on the cloud’ which entails virtualization of resources that preserves and accomplishes itself[4].



**Figure 1: Cloud computing service model [1]**

Software testing has been one of the best practice areas for migrating to cloud environment. Testing new software requires costly server, storage and network devices only for a limited time. These computing resources are not used after testing, thus incurring extra cost on budget. To ensure a reliable service, providers have to test their services on all platforms. Test automation topic is frequently visited when software testing is considered over the cloud. One of the major drivers of cloud computing adoption is economies of scale. It provides a pay-per-use type of service, thus eliminating the upfront investment in many cases. Cloud services might be allowed to dynamically adapt and update which requires that certain changes be validated at runtime.

Software testing in the cloud can reduce the need for hardware and software resources and offer a flexible and efficient alternative to the traditional software testing process[5].

In this paper, virtualization concept is used to provide possibilities in network creation and its parts.

Virtualization is a technique for hiding the physical characteristics of computing resources from the way in which other systems, applications, or end users interact with those resources.

Virtualization “ a technology to divide or to combine the resources of computer system between multiple operating systems or applications, to make illusion that each one access the real resources”[6].

Windows Server 2008 Hyper-V, which was released in June 2008 . Based on a 64-bit microkernel hypervisor, the Windows Hypervisor . The Windows Hypervisor runs directly above the hardware, enables multiple operating systems to run concurrently within partitions, and ensures strong isolation between the partitions by enforcing access policies for critical system resources such as memory and processors[7] .

#### **Objectives of this paper:**

The aim of this paper is to build a cloud system to test codes written by Java language. This system has the following specifications.

1. The system is Software As a Service cloud type (SaaS).
2. Service that this system introduce is testing programs and applications which are written using Java language in terms of correctness of unit's writing which is (package, class, object, function, etc....) and the result will be as a message includes units' success or failure.
3. The system has one server and one/or multiple testers.
4. Server divides the work into testers, but it's hidden to the user.
5. The user communicates with the server throughout user application's icon, which in its turn, connects him to the server.
6. Multiple users can use the system at the same time.

#### **Literature Review**

In (2010), T.Vengattarman, etc, write a paper that present a model of cloud computing environment[8].

In (2010), Takayuki Banza, etc, supposed in the paper a system to test software in D-cloud environment[9].

In (2011), Philip, Carmelo Ragusa present in their paper software testing topic with cloud computing more Inclusive and the computing environment for that[10].

In (2012), Hung Youlan Pen Zhenlong, they write a paper focus on discuss the operations and procedures to test software and cloud computing[11].

In (2012), Nassima Aleb Samir present a new style to test software automatically as a service over the cloud computing[12].

In (2012), Neha Joha and Amit Srivastava describe how to use a cloud computing approach and its services to decrease testing cost and install testing effort[13].

In (2014), Devesh Kumar, Shivam Jain present in their paper a deep studying on testing as a service in cloud[14].

In (2014), V.Priyadharshini,A. Malathi, present a paper that provides an overview regarding trends, opportunities, challenges, issues and needs in cloud testing & cloud-based application[15.]

In (2015), Sarah Hosseini, etc, introduce a new framework for cloud testing that is based on the ISTQB standard framework and according to the requirements and cloud testing steps[16].

in(2015), J.Jayashree,etc, write a paper gives an account of an efficient review of distributed papers. They give a diagram with respect to fundamental commitments, patterns, crevices, opportunities, difficulties and conceivable Research headings. they give an audit of programming testing over the cloud writing and sort the assortment of work in the field[17].

In(2015), Khushwant Viridi,etc, write a paper deals with providing the testing of software as a service via clouds[18].

in(2016), Akanksha Singh,etc, Present a paper discuss majorly about Cloud computing how it is being used for testing software. It is also giving a brief introduction of various risk introduced in cloud testing[19].

#### Cloud system for software testing (CSST)

CSST system is a networked-distributed system consisted of three applications which communicate with each other by a network (server app, user app, tester app), Figure 2 show CSST system.

User app works on user computer which considered as entrance of the user to the system where the user is dealing with application interface. Server app works on central computer of the system and it manages the whole system. Tester app works on the tester computer and it tests codes, the server might deal with more than one user and may contain unlimited number of testers doing testing at the same time.

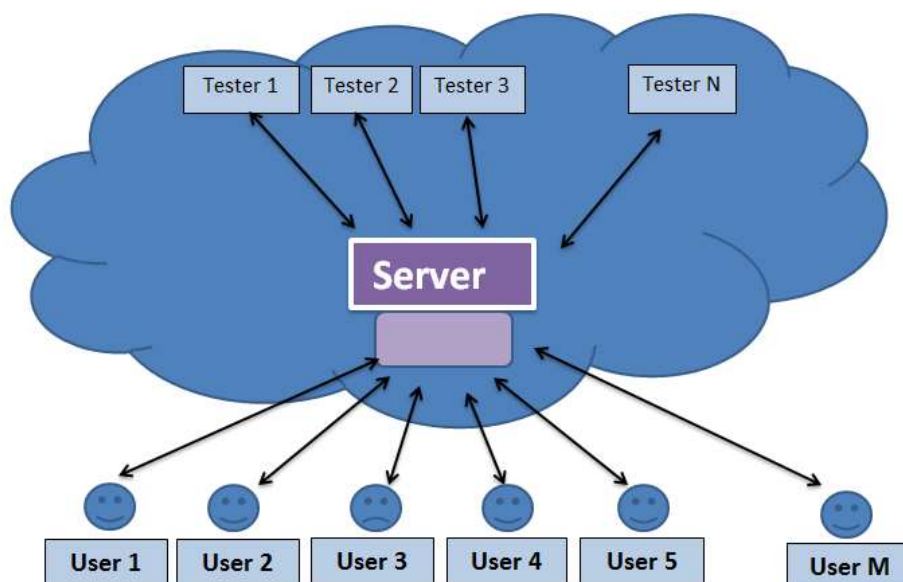


Figure 2: CSST System

Proposed system applications interfaces components:

1. User app interface: User app interface implemented by the double click on its icon.
2. Server app interface: server app has been installed on the central computer of the system.
3. Tester app interface: tester app works on tester computer and directly communicates with server and the system might have unlimited number of tester computers and each one has its own tester app.

CSST system is a networked-distributed system as it's mentioned previously, for this reason, there are many factors affect its work, Some of these factors related to the network, such as network congestions and some other related to system hardware

(Server specifications, tester computer specifications) and some other factors related to the user himself and all these factors affect both, files testing speed and result returning to user.

CSST system is applied in virtualized networks that configured by Hyper-V manager which consists of three virtual computers that works on the mother computer (depending on mother computer specifications available) it connects them by virtual network, the server app works on the mother computer and make the three other virtual computers as testing computers and/or user computers. Depending on the possibilities that the network provides, it adopted three cases:

1. One user- one tester- server.
2. One user- two tester- server.
3. Two user- one tester- server.

Network traffic is captured using wire shark program [20], by observing the network the following points are noticed:

There is a positive relationship between file size and testing time. In the first case (One user- one tester- server) when file size is 1KB, the required time was 0.025 second, when a file of size 2KB was sent. The required time to send, test and receive the result was 0.89 second, and when the file size was 3KB, the time was 3.89 second. Here we notice the positive relationship in testing time for the whole connection and we clearly notice that when we sent a file, its size 1 MB the connection took 4.289 second.

This time affected by connection status, network specifications and users system's utilization.

In case of (one user and two testing computers) at the same time, testing time was observed increase because the server takes some time to choose between one of the testing computers. When sending file its size 1 KB, the testing took 0.93 second, this time is more than the time that was taken in that certain case of sending file with the same size but in (one user and one tester) case.

When a file of 2KB size is sent, the required time was 2.442 second and it's more than the time needed to test a file with the same size but in (one user and one tester) case, when sending file, its size is 3 KB, the time it took 4.539 second.

In sending file with size 1 MB, the required time is 5.294 second. This time is longer than the time we need in case of file its size 1 MB in (one user and one tester). There is a positive relationship between the time and the increasing in file size.

In this case there are also other factors affect time as we mentioned earlier.

Table1 show a comparison of the Time required to test between (one user + one tester, one user+ two testers ):

Table1: Comparison of the Time required to test between (one user + one tester, one user+ two testers )

File Size	One user+ one tester	One user+ two testers
1KB	0.025 second	0.938 second
2KB	0.89 second	2.442 second
3KB	3.089 second	4.539 second
1MB	4.289 second	5.294 second

In case of (two users at the same time and only one tester), it appeared that network congestions and server scheduling affect the required time for testing. When a file of size 1 KB is sent by two users at the same time, the time was 3.235 second. This time is longer than the two previous cases, because the tester computer tests the first user file then does the second, depending on arriving precedence to the waiting queue and resend the result to users, While when a file of size 2 KB is sent, it took 4.649 second. As well sending file of size 3 KB the required time was 5.058 second. So is the case of sending file of size 1 MB by the (two users at the same time), the testing took 9.254 second that is longer than the case of (one user and one tester) and the case of (one user and two testers). Also, this case affected by the factors that mentioned before. Table2 show a Comparison of the Time required to test among (one user + one tester, one user+ two testers , two users + one tester).

Table2: Comparison of the Time required to test among (one user + one tester, one user+ two testers , two users + one tester)

File Size	One user+ one tester	One user + two testers	Two users + one tester
1KB	0.025second	0.938second	3.235 second
2KB	0.89 second	2.442 second	4.649 second
3KB	3.089 second	4.539 second	5.058 second
1MB	4.289 second	5.294 second	7.456 second

### Conclusion and future work

As shown in the table 2, there is a positive relationship between increasing in file size and the required time to test these files, but this time is less than the time required to test file of each user on his computer individually. This mean that using CSST system will decrease the time required to test files of multiple users at the same time, In the future works we recommended to deploy CSST system over the internet and to benefit from Java language which has been developed to programming CSST system by android to play on smart phones.

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