



White Paper

Cloud Performance Testing

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Because of the versatile demands of the current market, its complexity and the dynamic nature of applications, performance testing has become a challenging task.

Introduction and Background Information

Performance testing measures system throughput and latency with a variety of concurrent users over long periods of time. Performance testing is normally a time consuming and expensive activity, but it helps mitigate risks of going into production. Performance engineers all over the globe are harnessing the infinite potential of the cloud to test the performance of their applications. The cloud oriented performance testing helps to overcome the challenges of a test strategy that relies entirely on traditional performance testing methods.

This white paper discusses cloud computing capabilities and why organizations need to consider the cloud model for performance testing.

Challenges and Limitations of On-Premise Model

The testing model involves various components such as the performance testing tools and the system under test that are deployed 'on premise,' within a local environment. In most cases, performance testing is done in a lab environment. This lab is normally a subset of production environment. The lab requires a copy of infrastructure, servers, hardware and software from the production to host the system under test, and the performance testing tools. Setting up such a lab requires considerable investment and effort, and the management of overheads such as maintenance costs. An organization setting up such a lab will need to hire administrators to maintain and support the lab. This may further involve additional training costs for the resources.

The other important aspect we need to consider is that the on-premise approach does not measure up to the actual replica of the geographical distribution of users and their behavior. It can answer the queries regarding performance or capacity with a good degree of accuracy and highlight the main performance bottlenecks. However we may actually ignore certain aspects such as network latency and behavior of network infrastructure. So

we might not be testing the actual user experience. Because of the versatile demands of the current market, its complexity and the dynamic nature of applications, performance testing has become a challenging task.

These are some of the issues with traditional on-premise model. Cloud enabled performance testing can address the above issues as explained in the subsequent sections.

Cloud Scope and Service Models

A public cloud is managed by a third party service provider and its access is by subscription. A public cloud provides a bunch of business processes and infrastructure services on adaptable price-per-use basis.

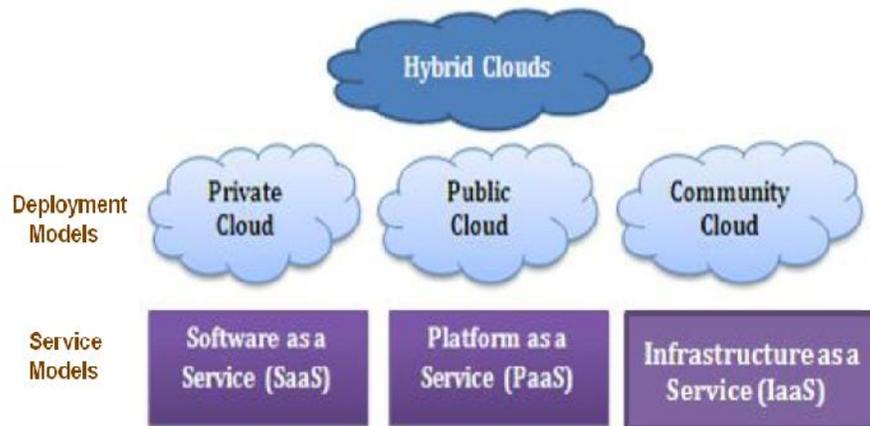
Private clouds are used by a single organization. They offer most of the benefits as public clouds, and they give greater flexibility to the organization. A private cloud can retain and customize the ability to standardize the best practices of an organization. Service Level Agreements (SLAs) are negotiated between the provider and consumer. Performance testing and capacity management can be customized according to the needs of the consumer.

Many enterprises cling to both public and private cloud models by integrating the two approaches into hybrid clouds. Certain business and technical factors usually drive the decision on which cloud deployment model to use and each model can have considerable implication for performance.

The service stack provided by the cloud can vary. Here are the layers, starting at the bottom:

Infrastructure as a Service (IaaS): In this model an enterprise can outsource the equipment used to support processes and networking components. The equipment is owned by the service provider. The provider is solely responsible for its maintenance. Here the client can pay on a per-use basis.

The downtime of an application and the latency of few seconds can result in revenue losses and customer dissatisfaction – So application performance matters a lot.



Platform as a Service (PaaS): This model facilitates consumers to deploy applications that are created using programming languages and libraries onto the cloud infrastructure. Here the consumer need not manage the cloud infrastructure, but has complete control over the deployed applications and certain settings for the hosting environment.

Software as a Service (SaaS) is the facility offered to consumers to use the provider's application running on cloud infrastructure. A variety of client devices can access the applications through a thin client or program interface and the consumer need not manage the underlying cloud infrastructure.

Why Cloud for Performance Testing?

With massive increase in Internet traffic, in terms of number of users as well as the size of data, an application may get hits from all corners of the world. Cisco reports that total data center traffic will grow from 39% in 2011 to 64% in 2016. In order to tackle all the users, the performance of the application needs to be measured in peak traffic. So it is essential to test immediately to higher concurrency levels.



Cloud model amplifies elasticity in the application platform. This implies that the actual resources used by the application may grow or shrink based on the application load.

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Performance testing in cloud infrastructure can help test engineers to take the right step in evaluating more effective, large scale and realistic tests.

Main reasons to consider cloud model

Performance testing demands extensive capital investments in hardware. Cloud is the good choice for organizations that do not want to have a full dedicated investment in testing infrastructure, as it fulfills all test environment needs and requirements.

If Cloud computing is utilized effectively, it can help in achieving enough test coverage while minimizing the investment and configuration costs for any company. The usage of right environment for testing will also help in controlling the costs by enabling defect detection earlier in the life cycle.

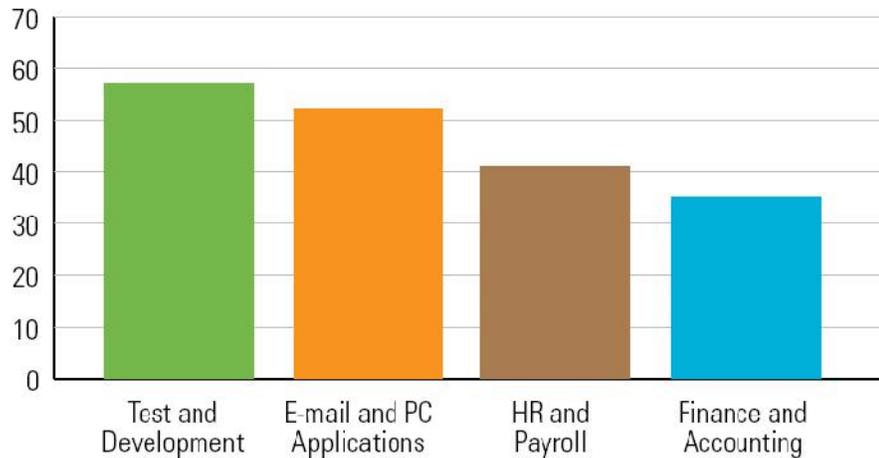
According to various research reports, 30 percent of the bugs in production are due to the incorrect test environment configurations. The study also indicates that the efforts involved in fixing these defect leakages are huge. With the Cloud-based rental and pay-as-you-go model, the testing team is provided with a test lab for the required timeframe. Organizations can shorten the provisioning time as cloud enables provisioning of test servers on an on-demand basis.

Cloud model amplifies elasticity in the application platform. This implies that the actual resources used by the application may grow or shrink based on the application load. The Cloud makes it possible to test during the up-scaling and down-scaling of applications.

The Cloud also gives organizations an opportunity to collaborate beyond boundaries. Distributed teams can share the same environment and use it for testing initiatives, round the clock.

Cloud environments could be shared with the development team for debugging purposes. With the Cloud, testing team can say -- We have tested this software in a real environment in the Cloud. Here is the defect and here is a link to the environment that was used for testing. Now developers can access that URL, to see the defects and fix them.

Major Applications in Cloud



IDC reports that enterprise cloud application revenues reached \$22.9B in 2011 and is projected to reach \$67.3B by 2016. Cloud-based business application services will grow from \$13.4 billion in 2011 to \$32.2 billion in 2016. So it is very clear that the cloud model will supplement mainframe and client/server installations in the years to come.

Benefits of Performance Testing in the Cloud

Small and medium-sized enterprises (SMEs) that cannot afford huge capital expenditures also find cloud enabled performance testing an ideal approach.

All levels of testing could be performed in cloud infrastructure, but performance testing benefits greatly from cloud environments.

Flexibility

Different levels of tests can be executed on discrete environments at the convenience of an enterprise. Performance testers no longer have to wait until the end of the testing phase in order to move to a production-like environment for their performance and stress tests. Instead such an environment can be brought into action at will.

Simplicity

The cloud model provides a new level of simplicity in the form of bug fixing environments that can be launched as quickly as the configuration can be put in place.

The Cloud computing Model gives organizations an opportunity to collaborate beyond boundaries.

Distributed teams can share the same environment and use it for testing initiatives, round the clock.

Comprehensive Testing

End-to-end tests for more generic processes can be performed in the cloud. All the necessary components can be published in the cloud to create the complete chain of systems. In this manner the overall business process can be tested;

Cost Reduction

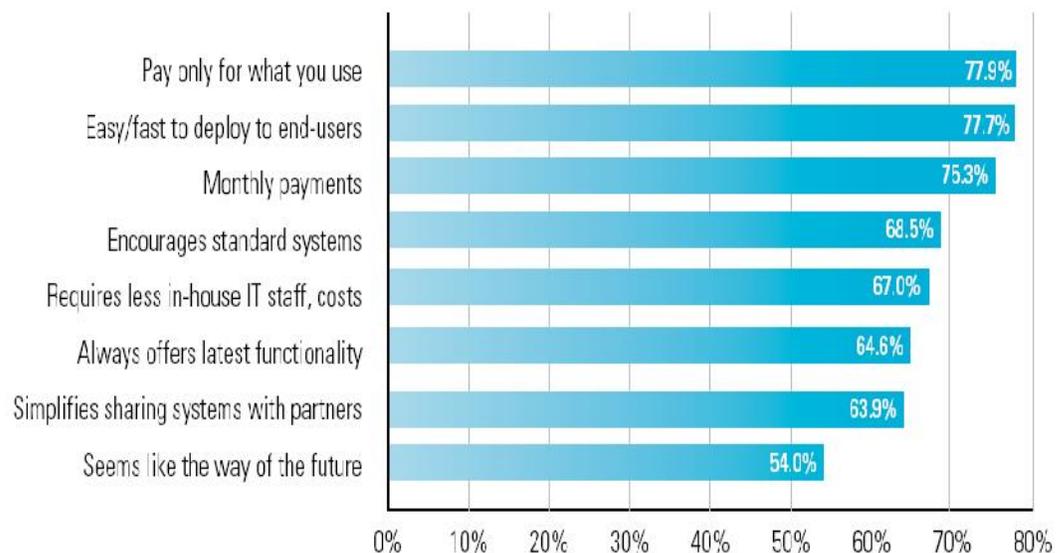
Cloud environments could be enabled and disabled at will, reducing the cost of environmental management. Cost reduction is the major factor influencing companies to choose Cloud. As per IDC survey reports, economic benefits are the key drivers of cloud adoption.

Cloud Testing leverages the cloud infrastructure, minimizing the unit cost of computing and increasing the efficiency of performance testing. The report on cloud enabled testing service providers reveals that the cost savings usually range from 40% to 70%.

Small and medium-sized enterprises (SMEs) that cannot afford huge capital expenditures also find cloud enabled performance testing an ideal approach. As there is no need to make upfront payments in infrastructure, Public cloud allows enterprises to shift to a flexible operating expenditure model.

In case of Private cloud, infrastructure can be deactivated once the testing process is complete. This frees enterprises from incurring expensive operational costs.

Benefits of Cloud Based Performance Testing



Cleaner and Greener Testing

It is apparently true that cloud computing capabilities make it significantly greener than traditional models and this is true for testing process. By just sharing cloud resources for their test infrastructure, enterprises can use IT resources on demand and eliminate waste. Consumers using cloud infrastructures can minimize energy use and deliver environmental savings in carbon dioxide of around 55%.

Greater Control

Cloud-based environments can provide greater control on test execution, analyze application performance and find bottlenecks while the tests are running. Cloud model allows test engineers to ascend from a few thousands to millions of concurrent users to evaluate breaking points. This gives testers a perfect picture of all possible runtime errors and adapts enterprises for peak demand times.

Internal Lab Testing vs. Cloud Testing

So what is the best choice?

- Setup an internal copy of production as a test environment and use several computers to generate load internally
- Setup an internal copy of production as a test environment and use load injectors on the cloud to generate load distributed geographically
- Setup a copy of production on the cloud as a test environment and use load injectors on the cloud to generate load distributed geographically

We saw that performance testing from the cloud gives you a complete understanding of the final user experience and reduce drastically investment and configuration costs. However, it adds complexity in the testing process and in the analysis of performance bottlenecks. These choices depend on the type of application to be tested and company culture and processes. Moreover, it adds complexity

A first performance testing run in a simpler lab with smaller loads is still valuable as it gives an overview of early performance issues. An application

which does not pass the lab test, needs to be tuned before going to larger scale testing over the Internet!

A load testing tool which supports both lab and cloud testing with the same use of script across both types of tests is definitely a winning choice as it gives you flexibility and scalability across your project.

Conclusion

Hence, moving testing to the cloud must be considered as a strategic initiative. A feasibility study is often advised to identify the sequence of events in which moving to the cloud computing model can benefit your enterprise. Test engineers can start by evaluating the cost of on-premise model to that of the cloud infrastructure.

You need to analyze the benefits and proceed further only if your plan of action resolves a clear business need. You can start small and gain confidence with the advantages of cloud enabled performance testing.

