



Testing the Cloud

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Introduction

Cloud Computing presents tangible benefits to businesses. These can be both immediate and vast ranging, from reductions in cost of ownership to location independence. However along with these potential benefits comes a new set of concerns; security, privacy, availability, performance and integrity. Suitable testing must be at the core of any Cloud solution to ensure the delivery of a safe, integrated solution which meets the needs of the business it is to serve.

The purpose of this paper is to understand the benefits and concerns of a Cloud Computing solution and how suitable testing can aid in realizing the full potential of your investment.

Cloud computing is the single largest trend in computing infrastructure today, although commonly misunderstood or incorrectly referred to as Grid Computing, Utility Computing or Autonomic Computing. Although a Cloud solution may make use of these types of backbone, Cloud Computing is a much more generalized term in which little or no centralized infrastructure exists. Sets of loosely coupled data centers work together achieving high utilization levels to perform a common task, presenting GUI interfaces to users through virtualization or thin clients via the 'Cloud'. Indeed Cloud

Computing can be considered to be the next natural step from Grid and Utility computing.

SaaS as a type of Cloud Computing

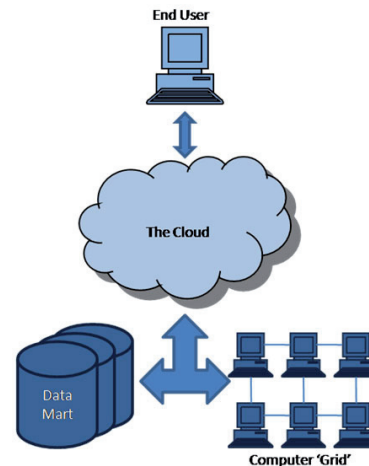
Typically, Software as a Service (SaaS) would be considered to be a type of cloud computing. Software is held centrally, not by local machines. This is presented to the user on an 'on demand' basis usually by means of virtualization. Central control of the application is retained allowing for reduction in licensing, implementation and ongoing maintenance costs. The delivery route in this instance is the 'Cloud' this being the general term for the Internet. The term 'Cloud' is used to describe networks and infrastructure which are not visible to the user, a potentially huge network black box.

PaaS as a type of cloud computing

Another common example of Cloud Computing is Platform as a Service (PaaS). PaaS can be considered as the next step in the SaaS model, where the on demand delivery is not simply the specific item of software required, but the

users' platform, thus allowing centralized control of the usage of each machine on the PaaS network. Again the delivery route in this model is the 'Cloud.'

What does Cloud Computing mean to business?



It's easy to see why Cloud Computing solutions appeal more and more to business' globally.

- ▶ Scalability – The distributed nature of Cloud solutions allow utilization to be spread evenly amongst available servers meaning applications can scale on demand.
- ▶ Location independent access – Using thin clients or virtualization. The only limitation being internet access.
- ▶ Reduced cost of ownership – Using service providers with currently existing Cloud deployments means the need to own hardware to support the Cloud solution can be almost entirely removed.
- ▶ Server efficiency/utilization – The spread of server workload improves server efficiency and increases utilization of otherwise lesser used servers producing greater return on investment.
- ▶ Green IT – The reduced requirement for hardware, implementations and location dependence means business' can reduce the environmental impacts of its IT infrastructure.
- ▶ Instantly deployable environments – Environments can be built and deployed for specific needs such as test or deployment. The use of virtualization using the Cloud means that these environments can be scalable to production size and deployed within far reduced timescales.

- ▶ Reduced maintenance cost – The centralization of all IT components means that maintenance can be carried out centrally on a one time only basis. The maintenance is then mirrored in all end user instances of that Cloud solution.

However, alongside all of these benefits, Cloud Computing presents risks which must be mitigated effectively if Cloud Computing is to be a viable option for business.

- ▶ Lack of control – When IT infrastructure is outsourced to an external third party how does the business maintain control of their data, impact down time, drive technology change or influence decisions which may impact their solution?
- ▶ Security – How can business ensure the potentially sensitive information which traverses the cloud is safe and secure?
- ▶ Privacy concerns – What can business' do to maintain the privacy of their users and information when using the cloud?
- ▶ Data Integrity – When using third party solutions for Cloud Computing what assurances do businesses have their valuable data remains intact?
- ▶ Availability – Cloud Computing solutions rely on the availability of their infrastructure to be able to function. Should a business critical Cloud Solution be unavailable for any time, what is the business impact?
- ▶ Business Acceptability – How sure can a business be that their third party solution is suitable for its intended use?

Quashing Concerns

Non-Functional Testing

In the earliest stages of assessing the feasibility of a Cloud Computing solution it is key for the business and Cloud delivery provider to understand the requirement for a Cloud solution within that business' context. The business must carefully document what they require from such a solution clearly and unambiguously. As with the development of any solution, business requirements are the key driver to the success of the solution. As business' look more and more often to third parties to deliver these solutions, the foundations for the delivery must be solid. Business requirements are these foundations. Static Testing on business requirements will ensure that these are concise and complete. Undergoing the process of reviews and workshops to understand what is being asked for in

business requirements will save time and money later in the development lifecycle by removing potential software defects before they are built.

Cloud Computing solutions claim to be scalable on demand. How do business' verify that the solution delivered is capable of coping with the workload which it is required to undertake? Load or Stress testing can be used to prove that the developed solution can scale as required. By using test techniques and tools which are capable of applying huge amounts of load on the solution the Cloud can be accurately measured and its capacity verified.

Using a distributed Cloud Computing solution should mean that the delivery will perform to a high standard. Performance testing techniques allow the systems performance to be measured and verified accurately. Using performance testing and load testing techniques in tandem allows an accurate image of the solutions ability over the cloud to be created. This in turn provides the comfort that the system is constructed so as to be capable of acting as delivery mechanism for the business requirement.

Security testing can provide assurance that business critical data is stored and transported safely. Techniques such as Penetration Testing can prove that the mechanisms, which have been developed to maintain security, will remain intact during potential attempts to compromise the Cloud solution.

Functional Testing

How do business' validate that the system will behave as has been specified within requirements? System testing techniques allow the proving of the systems behaviour within its own entity. Before consideration of any deployment it is critical to prove that the system functions as it has been designed, that the system components work together, inputs and outputs are as expected and the overall resulting system is of a suitable quality to release.

Before any deployment, how do the business verify that the integrated solution will behave as intended to facilitate business continuity? Integration testing allows the business to verify that the Cloud solution will work within the current infrastructure and environments, proving that the implementation of a Cloud solution does not detrimentally impact any existing systems.

Finally, the business requirements must be verified and validated to prove that the end result of the Cloud solution will meet the documented needs of the business. User Acceptance Testing will use business requirements to prove that the delivered Cloud solution meets those needs.

The location independence element of Cloud Computing solutions makes these types of applications the most

versatile in terms of test. There is little need to develop infrastructure which can be utilized offsite and thin client or virtualization are the most common types of interface.

The benefits of offshore testing are well documented and present as an instant option for testing Cloud Computing solutions. Likewise, on-site testing allows immediate control and monitoring of test progress.

Service Enablement via Tools

Major technology vendors including such household names as HP, Intel and Yahoo are presently collaborating to create huge cloud 'test beds' consisting of many thousands of processors working together as centres of excellence in Cloud Computing. These test beds will allow users to test their cloud deployments at internet scale and also understand how their systems and software actually behave within the cloud. With such huge investment by some of the largest technology and Internet Service Providers globally today, indicators are clearly pointing at cloud computing to be a major focus point for the industry in the coming years.

Current test tool offerings by the likes of HP and IBM are ideal for non functional and automated testing in a cloud environment. Already well established software such as HP's Quick Test Pro or IBM's Rational Robot can be used to full effect within a cloud environment to perform automated testing tasks such as regression tests.

Well known tools such as HP's Load Runner or IBM's Rational Performance Tester are familiar to testers the world over and are well suited to testing Cloud type solutions. Already performance test tools which are specifically designed to test cloud applications are appearing on the market such as LoadStorm's or SOASTA's Cloud Test both suites of on demand test tools for cloud applications.

Taking into account the quickly evolving nature of Cloud Computing in today's technology sector it is critical that any tester who is expected to test cloud solutions has a good understanding of what makes a Cloud Computing application and distributed architecture, as well as a good understanding of the tools available and their strengths and weakness for testing different types of cloud applications.

Summary

Whilst Cloud Computing applications for business use are still in their infancy, analysts predict this type of development will form a major new wave in technology infrastructure. The benefits of a Cloud Computing solution appeal to IT managers the world over and cannot be ignored by businesses striving to overcome the constraints of their current IT hardware whilst struggling to justify the cost of investing in major upgrades. All the while understanding the requirement and suitably testing that requirement lies at the core of solid Cloud Computing deliveries.