

# Testing services through Cloud

---

WHITE PAPER

---

## Table of Contents:

1. Abstract
2. Introduction
3. What is Cloud computing?
4. Why is Cloud computing Important?
5. What has been attempted in space of software testing:
6. What is Cloud testing
7. Different types of cloud testing
8. Taas ( Testing as a service)
9. Testing in Cloud :
10. What is different about testing cloud solutions:
11. Testing services offering via cloud
12. Cloud computing: innovating the business of health care
13. Uses of Cloud in Health Care
14. Conclusion
15. Bibliography

## Abstract:

Market adaption of cloud based testing services (Functional, performance, security) is still in very really adaption stage however it is observed that enterprises are increasingly viewing testing as a service (TaaS) as not only a **compliment** but a **potetinal substitute for some** traditional testing services.The results of these offerings help in lower

operating cost, and shift spending from capital expenditure to operational expenditure and get more value out of virtual test environment

## Introduction:

### What is Cloud computing?

Cloud computing is a computing model in which shared resources are allocated dynamically to create a highly flexible and scalable computing environment. By providing hardware and software on-demand, the cloud approach allows organizations to treat computing like a service.

The cloud model can be used to run software, handle testing, expand storage, facilitate collaboration and more. In short, cloud enables infrastructure to be treated as a service. All of these services offer improved agility and scalability, making users feel as if they have a virtual data center at their disposal. As this new model continues to mature and as application vendors wrestle with the changing demands of their clients, consumers stand to regain control over their IT capital expenditures.

There are several computing models emerging in the market today. It is important to select the model or combination of models that works for you. The factors that typically drive the decision of which model to utilize include:

- 1) Suitability of the application to a cloud-based infrastructure;
- 2) Compliance requirements; and
- 3) The strategic value of the data generated.

**Public cloud computing** makes use of the public Internet and shared computing resources as the medium through which to deliver services and capacity on-demand. Computing resources are hosted offsite by a third-party provider, and users gain access to the resources via web-based applications. From the customer's perspective, the arrangement is similar to outsourcing, except the scalability is greater and the billing model more closely resembles a utility. Healthcare providers might consider workloads like email, collaboration and test/development for public clouds.

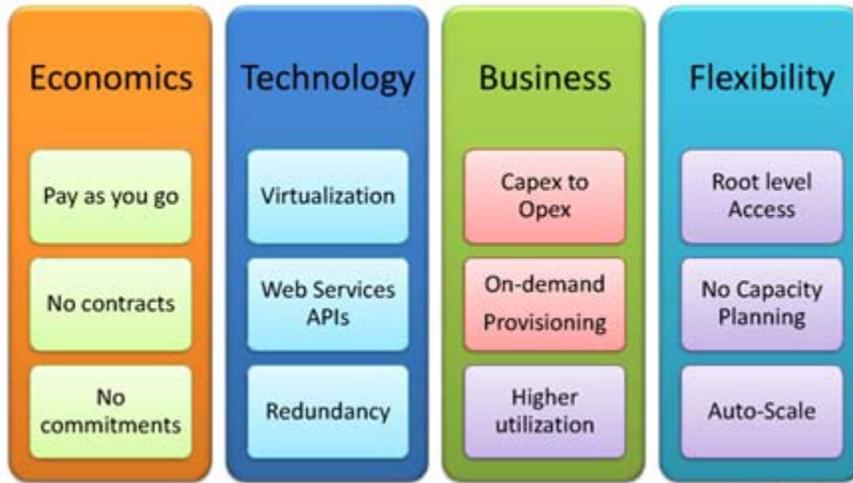
**Private cloud computing** offers the benefits of on-demand infrastructure but with dedicated resources to one organization. The computing resources are shared, but they are shared across applications and business units of the same organization. Another variable to private clouds is whether you put these resources on-premise or off-premise. This decision is based on perceived risk, latency considerations and the decision to own the real-estate required to house the infrastructure. Healthcare providers should consider private clouds for enterprise resource planning systems.

**Hybrid cloud computing** involves a combination of public and private clouds. This is common among large organizations that use cloud computing for multiple initiatives. When data and services cannot be shared between the public and private components of the two clouds, the architecture is considered static. Soon it may also be common to create more dynamic hybrid architectures, so that data and services are interchangeable as though they are located in the same virtual operating system. Supplier relationship management is a good example of an application that fits well with a hybrid model

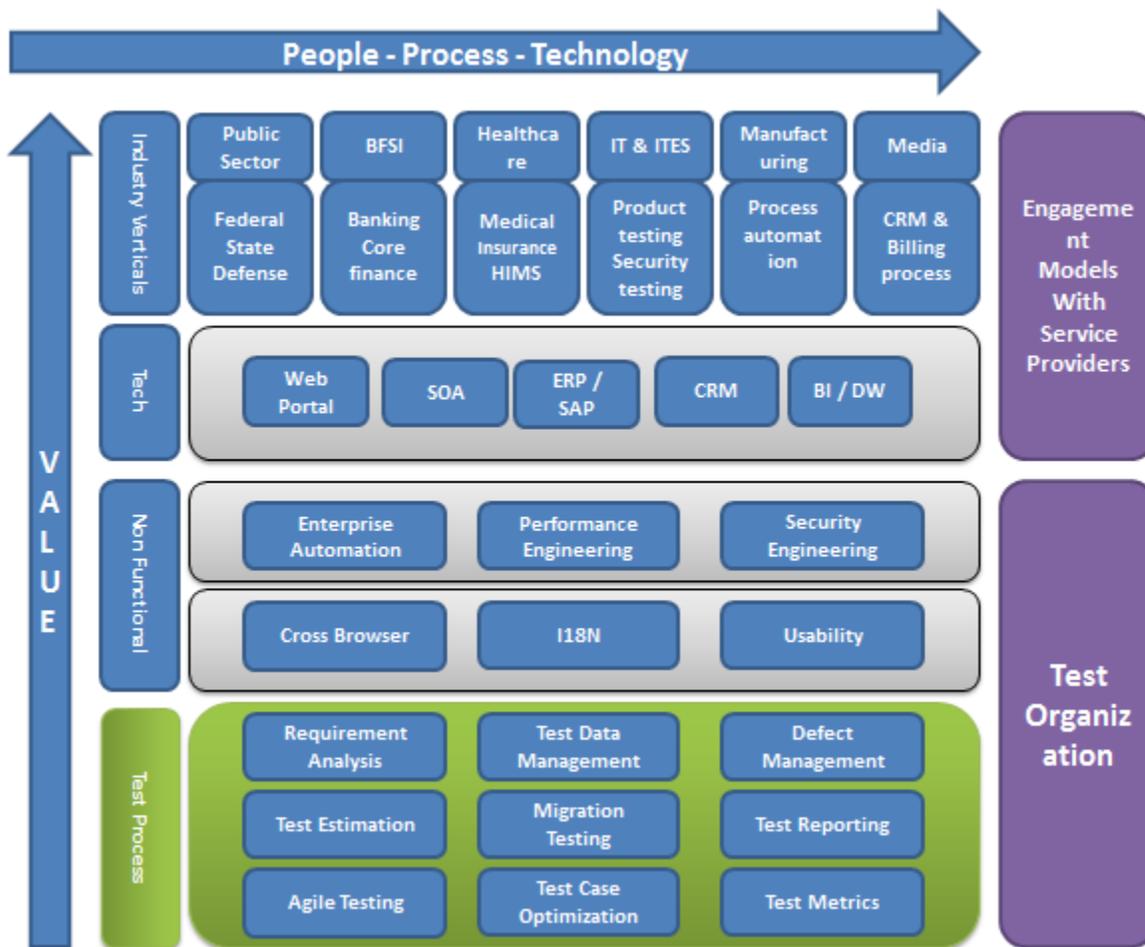
Community Cloud computing involves for building particular market segments, such as healthcare, Banking etc that require a special set of characteristics (e.g., compliance and security measures).

**Why is Cloud computing Important?**

The basic value proposition of cloud computing is: buy only the resources you need to consume when you need them, and pay accordingly. For example, organizations can run applications in the cloud and pay for only what they use based on the number of virtual CPU's, available memory, storage and network utilization.



**What has been attempted in space of software testing:**



### What are few classic problems in field of test engineering?

Test Engineering has started evolving and currently is at maturity stage where entire world is looking to standardize processes in testing services. Along with evolution test engineering also have come up with its own classic problems over a period of time in multiple testing practices. Few of them are...

- 'I cannot reproduce the bug' (environment mismatch)
- It just takes too much time to configure the tool
- Site works fine in US, but does not work from EU
- It's too expensive to setup, maintain and update a test lab
- It takes too much time and effort to setup a test lab
- Test phases last for only 2 months: Underutilized Test Boxes
- I doesn't have a snap shot of test environment in case it crashes (No black box)

## Evolution of Software Testing:

<u>Generation</u>	<u>Role of Vendors</u>
(1 <sup>st</sup> ) Insourcing	Provide tools
(2 <sup>nd</sup> ) Outsourcing	Provide testing (which subsumes the tools)
(3 <sup>rd</sup> ) Crowdsourcing (TaaS)	Provide testers (which subsumes the testing and tools)
(4 <sup>th</sup> ) Test sourcing	Provide test artifacts (which subsumes the testers, testing and tools)

### Insourcing:

(Decentralized, Project Based, Centralized, Test CoE)

Testing was performed by *insourcers*, people employed within the same organization that wrote the software. Developers and testers (often the same people performing both tasks) worked side by side to get the software written, tested and out the door.

### Outsourcing:

(Staff Augmentation, Cosourcing, Project based, Managed Services)

Vendors' role soon changed as demand for more than just tools surfaced. Instead of just providing tools to insourcers, vendors emerged that provided *testing* itself. We call this *outsourcing* and it is still the basic model for the way many development shops approach testing: hire it out.

### Crowd Sourcing:

(Provide testers, which subsumes the testing and tools)

All the Testing Jobs are Crowd sourced to allow anyone who wants to attempt to test something to try and typically, to be rewarded based on defects found.

### Test Sourcing:

(Provide test artifacts, which subsumes the testers, testing and tools)

Test Sourcing = Outsourcing + Crowd Sourcing

Test Sourcing is essentially outsourcing people part of testing coupled with virtualization to external entity (cloud based testing service providers).

## How virtualization addresses classic problems in test engineering:

With the advent of virtualization things and delivery models are changing into new dimension. Virtualization technology, inherent by nature, answers classic problems in test engineering. Let's see how virtualization addressed these problems.

- **'I cannot reproduce the bug' (environment mismatch)** – when multiple VM's of same image is made available for both Dev and Test environments

- **It just takes too much time to configure the tool** – ready made images with required prebuilt configurations available for deployment on the fly
- **Site works fine in US, but does not work from EU** – VM's (severs) maintained in multiple geographic regions of choice by vendors
- **It's too expensive to setup, maintain and update a test lab** – Cloud service vendor's model for multiple clients coupled with experienced professional makes it a win-win situation.
- **It takes too much time and effort to setup a test lab** - Vendors do it for you who maintain skilled professionals to get things done for us.
- **Test phases last for only 2 months: Underutilized Test Boxes** – Pay only for what you use
- **I don't have a snap shot of test environment in case it crashes (No black box)** – Virtualization always provides a snapshot of crashed environment.

### Impact of Virtualization on Software Service Definition:

Virtualization is changing outlook of classic software service definition from defined to **pre-defined**.

#### Before Virtualization

Defined entry criteria  
 Defined exit criteria  
 Define activities  
 Defined deliverables  
 Defined commercials  
 Defined R&R  
 Defined scope and dependencies

#### with Virtualization

Pre-defined entry criteria  
 Pre-defined exit criteria  
 Pre-define activities  
 Pre-defined deliverables  
 Pre-defined commercials  
 Pre-defined R&R  
 Pre-defined scope and dependencies

## What is Cloud Testing?

Cloud Testing is a means of testing cloud-based applications that use resources found in the cloud. By resources, we mean any element (hardware, software and infrastructure) necessary to carry out the tests. Cloud testing provides an end-to-end solution that transforms the way testing is done and can help an organization boost its competitiveness by reducing the cost of testing without negatively impacting mission critical production applications. By leveraging a cloud computing solution for testing, organizations can shorten provisioning time because the cloud enables provisioning of test servers on demand. This helps ensure unused servers are not sitting idle.

**Few features of Clout Test Service Offerings:**



Cloud Testing offers a suite of services that allow developers, testers and website managers to automate and speed up the testing and archiving of their websites using real browsers from the cloud. Cloud Testing operate a SaaS (Software as a Service) model, so there is no need to invest in any hardware, software or consultancy; our services provide all you need, leaving you to you concentrate on what you do best -developing, testing and running websites.

#### **TaaS : Testing as a service:**

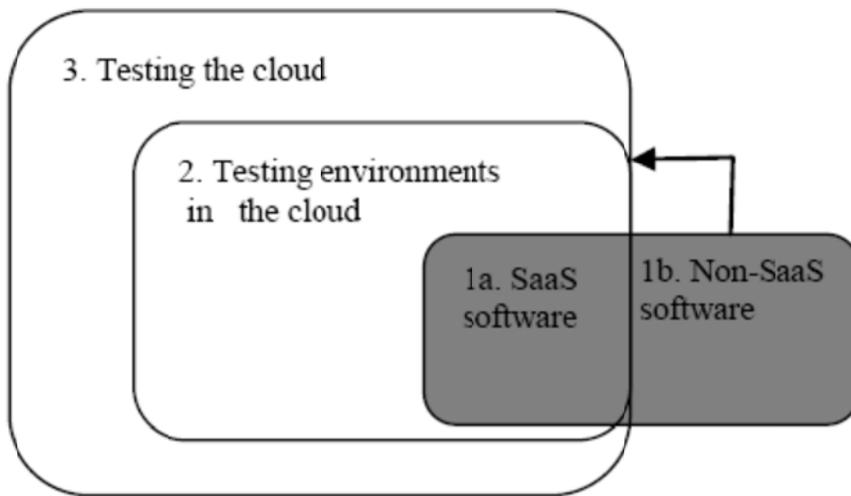
Testing Platform on Cloud aims in providing the customer on demand, Cloud based and cost effective testing with reduced overheads especially targeting small and medium scale clients.

**Testing-as-a-Service delivers application testing services in a highly available, consumable, pay-as-you-go model that provides flexibility in service and pricing.** It also lowers the cost of entry to full service testing options and helps you implement best practice quality management processes. And it helps Leverage the existing investments by incorporating them into the center of excellence.

### **Testing Services in Cloud Conceptual Framework:**

Testing in the cloud or cloud testing can have three facets

- (1) The system or application under test is accessible online.This might be SaaS software or non-SaaS Software. In addition,this includes testing at different test levels e.g. performance testing;
- (2) Testing infrastructure and platforms are hosted across different deployment models of the cloud i.e. Public, community, private or hybrid clouds;
- (3) Testing of the cloud itself. Cloud environments should be tested and measured for their performance, availability, security and scalability in order to support efficient delivery of service



Cloud Testing is practiced in the industry in two ways:

- One is Testing applications which have migrated or are to be migrated to the cloud so as to ensure that their performance, security and reliability matches or exceeds expectations in view of the changing delivery methods (Testing Cloud).
- The other is leveraging the cloud-based hardware infrastructure and computing resources to perform traditional Testing like performance, load, stress, security and compatibility testing for regular, on-premise applications (Testing using Cloud).

Both the approaches enjoy widespread popularity, and there are numerous vendors and service providers who provide these types of platforms and services to both consumers and organizations.

### Different models of cloud testing:

Shift of SLA's from defined to pre-defined state 			
	Crowd Sourcing	Out Sourcing	Test Sourcing
<b>Commercial Models:</b>	Pay per defect	Based on test points	Fixed price per product
<b>Service Catalog:</b>	Limited to consumer market applications	Mix of standardized and non-standardized services	Move towards standardised services
<b>SLA's:</b>	Best Effort	Defined per project	Predefined
<b>Service Packages:</b>		Activities and deliverables defined per project	Activities and deliverables Predefined
<b>TaaS Engine:</b>	Online Collaboration	Global delivery model	Global delivery model
<b>Test Assets:</b>	Owned by testers	Owned by service provider. Continuous Improvement	Owned by service provider
<b>Tools, Tech &amp; Process:</b>	Provided/Owned by tester	Owned by service provider. Limited sharing of resources	Owned by service provider. High sharing of resources
<b>Suitable Candidates:</b>	Consumer market Applications Exploratory Testing at least cost Application has to be reasonably stable (tested) before offering for crowdsourcing.	Scope - Any kind of testing including progression testing. Can Include test asset, tools, any cloud based assets. Can accommodate high level of requirement volatility but passes the commercial risk to client. Predictable outcomes at variable cost.	Scope - Any testing which has large standardized components, e.g. test automation, SAP Testing. Can Include test asset, tools, any cloud based assets. Can accommodate low level of requirement volatility and DONOT pass the commercial risk. Predictable outcomes at fixed predictable cost.

**What things are the same about testing cloud solutions?**

Although entire testing service offerings are made available via cloud, few of core elements of software test engineering which cannot be changed. They are

- Requirements coverage based testing
- Risk-based structured test approach
- Test Plan / Test Phases
- Test Cases / Test Data / Test Automation
- Defect Management / Functional Test
- Use of off-shore resources / Virtualization
- Politics {Quality / Schedule / Resources}

**What is different about testing cloud solutions?**

Needless to say by very nature of cloud there are multiple things that change, such as

- Shared multi-tenant test environments
- Security (Test User IDs / SSO)
- Integration of on/off premise systems
- Performance / volume test
- Defect isolation
- Documentation of “Out Of the Box” requirements
- Release Management

## Operational Challenges for Testing in the Cloud

Cloud-based testing poses different challenges than in-house testing.

First, there are **currently no universal or standard solutions** to **integrate public cloud resources** with users' internal data centers. Each cloud provider has their own architecture, operating model and pricing mechanisms and offer very little interoperability. This poses a challenge if companies need to switch vendors.

**Security is another major concern**, mostly because data and code may be stored in a remote location beyond an organization's legal and regulatory jurisdiction. Yet another challenge is that some cloud providers offer only limited types of configurations, technology, servers and storage, networking and bandwidth, making it difficult to create real-time test environments.

**Improper choice of cloud-based use and pricing options is another risk.** While some vendors offer pay-as-you-go services, they are only cost-effective when the right plan and service provider are chosen for the anticipated needs (e.g. space vs. RAM vs. bandwidth). Costs can quickly spin out of control if resource estimates differ wildly from actual usage.

Also be aware of associated expenses, such as the cost of encrypting data to assure its security in the cloud. And remember that cloud disaster recovery isn't necessarily built in just because the test infrastructure is in the cloud. Test teams should also rigorously plan their test environments, test infrastructure and arm themselves with security and greater control over data.

To gain confidence, create a proof of concept. Ask yourself what cultural and process changes are required to move to cloud-based testing, who owns service management, and what changes in organizational/financial process alignment must be made to manage/provide for a new service.

Start small and gain confidence in the benefits of cloud-based testing. Cost of operation and ownership will fall over time in companies that intelligently embrace pay-as-you-go or on-demand services. Use an experienced partner that can ensure cost reductions and faster time-to-market. Companies that start early and push forward will reap first-mover advantages that far outweigh the pioneering risks.

## Uses of Cloud in Health Care

- Cloud offers innovative ways to capture, manage, store, and share information with potential cost savings in IT infrastructure and staff. Some of its applications are similar to IT optimization in any business enterprise, and others address the current, unique needs of health care. Healthcare finance executives can use cloud computing to help innovate their organizations in several ways

**Revolutionizing the revenue cycle.** Currently, most (if not virtually all) revenue cycle systems are largely claims-based and processed in traditional IT environments. Several likely changes in this model point toward a cloud application:

- > The transition to mobile devices at the virtual bedside creates new challenges for connectivity and interoperability.
- > The requirements for conversion to ICD-10 and other infrastructure innovations are expected to move individual applications to broader "clinical data" streams.
- > The "do better with less" mandate suggests rethinking the traditional patient financial services system investment and its ROI.

### **Planning for a more integrated healthcare "ecosystem":**

Health systems and hospitals should be anticipating greater linkage to state governments to manage more health information, including health insurance exchanges. They should be anticipating greater integration with payers and new relationships with drug companies and other suppliers. In this converging ecosystem, finance leaders should be considering how to achieve uniformity of reporting, interoperability, and better return on IT investments. The cloud environment is clearly an option.

When operating as small businesses, physician groups can use cloud-based computing to help avoid building significant internal IT infrastructure.

***Accelerating effective connections between primary care providers and home care.***

Wireless devices can provide real-time data to cloud, where they are captured, and can be used for individual care management and consolidated into a broader database for the practice of evidence-based medicine across the broader population.

## Conclusion:

## Bibliography:

James Whittaker on 'Future of Testing':

[http://blogs.msdn.com/b/james\\_whittaker/archive/2008/08/20/the-future-of-software-testing-part-1.aspx](http://blogs.msdn.com/b/james_whittaker/archive/2008/08/20/the-future-of-software-testing-part-1.aspx)

"Private Cloud for Dummies" - By Judith Hurwitz and Marcia Kaufman

Cognizant:

<http://www.cognizant.com/InsightsWhitepapers/Taking-Testing-to-the-Cloud.pdf>

Infosys:

<http://www.infosys.com/engineering-services/white-papers/Documents/cloud-testing-vs-testing-cloud.pdf>

K. Priyadarsini, V. Balasubramanian, S. Karthik, Assistant Professor, VIT University, Vellore, India

<http://ijaest.iserp.org/archieves/10-My1-15-11/Vol-No.6-Issue-No.2/3.IJAEST-Vol-No-6-Issue-No-2-Cloud-Testing-as-a-Service-173-177.pdf>

Tech\_Target:

[http://docs.media.bitpipe.com/io\\_10x/io\\_105349/item\\_548504/IBM\\_sSSQ\\_IO%23105349\\_E-Guide\\_060112\\_LI548504.pdf](http://docs.media.bitpipe.com/io_10x/io_105349/item_548504/IBM_sSSQ_IO%23105349_E-Guide_060112_LI548504.pdf)

*The Paradigm Shift – Testing 3.0.* Arun Kumar Singh

[http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&sqi=2&ved=0CE8QFjAA&url=http%3A%2F%2Fwww.siliconindia.com%2Fevents%2Fsiliconindia\\_events%2Fsofttec\\_2011\\_ppts%2Farun.ppt&ei=eJH6T\\_A7iu2sB\\_6v-MwG&usg=AFQjCNG7BSImnse3o4hyEnZYffrjUI81pw&sig2=aeCGin6I5\\_AEmfugAqsJ8Q](http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&sqi=2&ved=0CE8QFjAA&url=http%3A%2F%2Fwww.siliconindia.com%2Fevents%2Fsiliconindia_events%2Fsofttec_2011_ppts%2Farun.ppt&ei=eJH6T_A7iu2sB_6v-MwG&usg=AFQjCNG7BSImnse3o4hyEnZYffrjUI81pw&sig2=aeCGin6I5_AEmfugAqsJ8Q)

**Testing on Cloud : Srinivasan Desikan**

[http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=9&ved=0CGsQFjAl&url=http%3A%2F%2Fwww.articlediary.com%2Ffile.php%3Fid%3D69&ei=x5H6T7rdPMfjrAfx593bBg&usg=AFQjCNHnekN2ZpKp9SIPa5xZw8O2RXcZQA&sig2=Dsr\\_F9yPrtDO LXWNVEnElw](http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=9&ved=0CGsQFjAl&url=http%3A%2F%2Fwww.articlediary.com%2Ffile.php%3Fid%3D69&ei=x5H6T7rdPMfjrAfx593bBg&usg=AFQjCNHnekN2ZpKp9SIPa5xZw8O2RXcZQA&sig2=Dsr_F9yPrtDO LXWNVEnElw)

Testing in the Cloud: RedPath

[www.tcqaa.org/documents/Testing%20in%20the%20Cloud.ppt](http://www.tcqaa.org/documents/Testing%20in%20the%20Cloud.ppt)

White paper

Testing services through Cloud

Keerti Kulkarni – MicroFocus

## **Cloud Testing – Guidelines and Approach**

### **Service Innovation in Testing : Deepak Puri, Memphis**

[http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0CE4QFjAD&url=http%3A%2F%2Fwww.tmap.net%2Fsites%2Ftmap.net%2Ffiles%2Fattachments%2FPaper\\_STaaS.pdf&ei=RJP6T9jLKMWHrAeXl6neBg&usg=AFQjCNGXkiKVh4apA74DasB88mdOL3H\\_hw&sig2=KqE\\_RRT7uiEKdI4ChpN5eA](http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0CE4QFjAD&url=http%3A%2F%2Fwww.tmap.net%2Fsites%2Ftmap.net%2Ffiles%2Fattachments%2FPaper_STaaS.pdf&ei=RJP6T9jLKMWHrAeXl6neBg&usg=AFQjCNGXkiKVh4apA74DasB88mdOL3H_hw&sig2=KqE_RRT7uiEKdI4ChpN5eA)

Stress Free Testing in the Cloud: Amazon Web Services; Jinesh Varia

<http://www.slideshare.net/guest2e9c5f40/virtual-stressfree-testing-in-the-cloud>