

# PRE-PROD ON THE CLOUD CSC CLOUD OFFERING FOR PRE-PRODUCTION SOFTWARE DEVELOPMENT TASKS

The CSC logo consists of the letters 'CSC' in white, bold, sans-serif font, centered within a red, rounded rectangular shape.

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## ABSTRACT

The evolution of cloud computing, with its promise of lower operational costs and the flexible provisioning model of “pay as you go,” is propelling the need for commoditization of services related to cloud computing and virtualization. This phenomenon is pushing many companies to re-invent themselves with the goal of better positioning themselves within the new cloud computing paradigm. At the same time, new Independent Software Vendors (ISV) are building smart solutions as services that can be provisioned on cloud platforms.

This paper evaluates cloud-based solutions targeting various pre-production activities in a software project’s development life cycle, and proposes to leverage such a solution from Skytap. A fundamental restructuring of the economy is leading to reduced spending by many CEOs and CFOs. With a shrinking economy, many enterprises, small and medium businesses (SMBs) are looking towards their IT departments for cost savings.

Under enormous pressure to reduce IT costs, CIOs and CTOs have to make tough decisions: Moving toward cloud computing platforms offers compelling cost benefits; but lack of standards, data security concerns and the risk of vendor lock-in provide significant challenges for deploying production systems in cloud-based environments. Given the current scenario with ISVs offering cloud-based products on one hand and potential risks faced by enterprises and SMBs on the other, CSC proposes low-risk, high-impact cloud service offerings for enterprises and SMBs, for early adoption and lower capital expenditure costs.

## 1. OVERVIEW

Cloud computing is enabling companies to dramatically reduce their IT capital expenditure by sourcing their IT infrastructures to Cloud service providers. This has prompted several big players in the industry to jump onto the Cloud band-wagon and now they are busy building Cloud infrastructure platforms. While the big players are building the infrastructure layer of the Cloud, smaller players and start-ups are focusing their energies in building applications that run as services, which are compatible with the Cloud platforms built by the big players.

While it is lucrative for companies to take advantage of such Cloud-based service offerings, the following factors are making the decision of moving enterprise production infrastructure and business applications to a vendor specific Cloud, a very difficult choice.

- Data confidentiality, data location, privileged access and regulatory compliance with respect to the information / data
- Investigative support, service availability, software licensing, long-term viability and vendor Lock-in with respect to the operational aspects of business applications

While the industry's standards organizations are working towards establishing core standards for Cloud interoperability, security in multi-tenant Cloud platforms and regulatory compliance, it may at least take a couple more years for the dust to settle down on the Cloud-based platform standards, which then can make Cloud platforms a viable choice for moving production infrastructures and business applications. But the promise of Cloud computing can still be leveraged for various low risk activities such as software architecture proof of concepts, application development, quality assurance, demos and training. The following sections will detail out the various aspects of SDLC, challenges/pain points at each phase and evaluate potential Cloud service offerings that can fit the purpose and can save capital expenditure.

## 2. SOFTWARE DEVELOPMENT LIFE CYCLE LANDSCAPE

### 2.1 PROOF OF CONCEPT ACTIVITIES

A typical enterprise software program consists of several phases in the SDLC. Many programs start out with an architectural proof of concept to mitigate the risk of feasibility of the program itself. A typical proof of concept would aim at realizing the most complex aspect of the architecture by building the core components prescribed by the architecture. A small team of developers, architects come together to build these core components. Usually, program management procures the necessary infrastructure, software packages and the software licenses that are required to build the proof of concept independent of the results of the POC whether the solution is feasible to build or not. This is certainly a capital expense that both business and the IT management would love to avoid.

Some POCs are often required prove the scalability of the core components before investing huge amounts of money on the actual project development. These types of POCs would also need performance testing the core components by simulating the user load. In these scenarios, in addition to the infrastructure, software and licensing costs, the project management team would also need to budget for testing and load simulation software tools which are usually very expensive and often require highly paid testing personnel with specific skills to script and execute the test scenarios. To add to the mix, some of these software tools have limitations on number of virtual users that they can simulate pushing management to take risk of extrapolating the actual results for high user loads instead of actually testing with the desired load. In some cases, the management would have to hire a testing lab from big players like SUN or IBM for carrying out the load tests on proof of concepts which prove out to be highly expensive.

A typical POC would only last for as long as 4 to 6 weeks, causing the infrastructure and software packages either to be re-purposed or kept on shelf depending on the POC results, causing a *huge capital expenditure* and even a *dead investment*. These are some of the scenarios that could leverage the Cloud platform service offerings to gain on IT infrastructure efficiencies and improve business responsiveness.

## 2.2 DEVELOPMENT

### 2.2.1 ENVIRONMENT USAGE PATTERNS

During the development phase of the SDLC, most of the development activities take place on the developer workstations with supported IDEs installed on the developer workstation for any technology platform stack, be it Java or .Net or any Open Source stack. An integrated environment with all software components would only be required for ensuring all project related software artifacts work together. Project management has to procure the required infrastructure, software products and licenses for standing up the technology platform stack on the development as well as test environments in addition to the actual production environment. These environments have become a standard for any development project though their usage is limited to only about 20-30% depending on the size of the development team.

Typically, project teams would have a scheduled build process that pushes project software components into the development environment upon which the development teams would verify whether their individual components can work together with other components. Though this process has to occur regularly, it only constitutes 20-25% of the effort per week leaving the environment idle for the rest of 75-80% of time. This is simply waste of resources that adds up to the total cost of delivering the project. This is certainly an important area to leverage Cloud computing features like provisioning, pay as you go and multi-tenancy.

### 2.2.2 SOFTWARE LICENSING

With respect to software licensing, an ideal situation would be a small pool of software licenses of a specific technology stack that can be shared by multiple project teams and released back to the license pool after use. In a Cloud based environment, each time environment resources are re-purposed, the licenses should be released back to the license pool for other teams to use. Cloud service providers have to work towards conceptualizing this idea to promote faster Cloud adoption rate by sharing the licensing costs. The incentive for the software tool providers would be bulk/volume sales when sold to Cloud providers vs. unit sales at organization level. This can be analogous to video rentals like Netflix renting videos to customers for a low rate of about a dollar per day where the advantages for video makers is the bulk/volume sales of videos to Netflix and get paid upfront.

## 2.3 QUALITY ASSURANCE

Quality Assurance is a planned and systematic process that provides confidence in a software product's suitability for its intended purpose. IT Quality Assurance is a risk mitigation strategy applied to reduce undetected software problems that could negatively impact the end user satisfaction. Over several years, the complexity of quality assurance processes has increased with the increased complexity of software applications. Especially web enabled software applications needed significant improvements in the quality assurance processes as well as new types of testing methodologies.

Software Quality Assurance on any application is largely divided into two major areas. Testing teams should first create test environment with the required software and hardware that the application is built-on to deploy the application and secondly, the testing tools that automate several aspects of testing including functional, regression, performance and load testing.

### 2.3.1 ENVIRONMENT CHALLENGES

In today's IT practices, building the dev and test environments for a typical distributed web application involves a significant amount of time and resources. This is due to complexity of the n-tier web application architectures that require all tiers to be built separately and integrated as an environment for development and as well as testing. A

typical web application would require a database server, an application server and a web server plus any reporting software, messaging software for asynchronous processing and so on. In addition to setting up these infrastructure components, the application deployment and configuration also adds complexity to the mix.

With IT budgets shrinking, procuring physical hardware, storage and network devices may often become hard to justify. Applications that require to be tested on multiple platforms, browsers and languages have to compromise on test coverage, thus pushing the risk to IT management that may sometimes become unacceptable. As a mitigation strategy, several IT managers are pushing their teams to re-purpose existing infrastructure components to build and re-build test environments for varying dynamics to achieve acceptable test coverage and thereby lower the risk. This would require development teams to constantly teardown and build test environments for various test scenarios that need to be tested on multiple platforms causing productivity bottlenecks and reducing the time spent on actual testing.

With the objective of reducing time-to-market, IT development processes are moving towards agile methodologies causing testing teams to adopt iterative development and testing thus limiting the testing cycles. Another important factor compounding the problem is the growing trend to outsource testing process to offshore teams, causing test environments to be shared consistently across global teams to facilitate team collaboration. This setup increases the time spent to reproduce a reported bug since the teams have to effectively communicate with each other to reproduce the scenario that caused the bug. These environments if can be provisioned and configured quickly using a Cloud platform, the IT management could save thousands of dollars and avoid pursuing short cuts and risks explained above.

### 2.3.2 PRODUCT CHALLENGES

While IT management has to handle environment challenges to mitigate several risks outlined above, at the same time, the management also has to look for solutions that automate various testing aspects to lower staffing costs for executing repeatable test scenarios. There are various software testing tools that fit into this context but these testing tools are often too expensive to procure and maintain. There is no need for these testing tools throughout the year. Also, organizations need to employ highly skilled staff that have in depth knowledge of these tools to script the test scenarios which may become very expensive for some organizations.

Organizations that do not have a need for these tools on an on-going basis are following the traditional approach of employing a low-cost offshore team for manually testing the application software. This may appear to be cheaper for making an application production ready but, as the application goes into enhancement / maintenance mode, for every change, organizations have to again employ testing staff who may not have had the knowledge of the application before causing the organizations to spend money and time for the learning curve of the new staff.

In the current economy, businesses are challenged to maintain their web sites up & running and to be reliable and highly performing. Reliability and performance have become key factors for running a successful business online. Businesses have to rely on performance testing tools to ensure their web sites do not leave any customer unsatisfied. Again, there are several vendors that promote performance and load testing tools but have limitations on the number of virtual users that the tools can scale up to, in addition to the challenge while procuring expensive automated testing tools.

With Cloud computing, such expensive testing tools can be provisioned on demand for shorter durations and the enterprises can use Cloud solutions to reap cost benefits and avoid capital expenditure for procuring such testing tools.

## 2.4 TRAINING AND DEMO

Yet another use case for adopting a Cloud based IT environment is to leverage it for training and demo purposes. Since the typical use of IT environment for such activities is limited to short durations, a Cloud based demo/training lab can provide immense cost efficiencies while enabling very rapid setup of multiple training workstations.

### 3. CLOUD-BASED PRE-PRODUCTION ENVIRONMENT

With hardware virtualization and the ability to run multiple instances of operating systems and software applications, has several implications for distributed systems. Based on the business need, resources can be pooled and shared dynamically among several applications. Cloud computing brings the opportunity to efficiently utilize and manage computing resources by its elastic nature to expand resources on demand and release them when not needed. Cloud also offers provisioning for setting up different environments to develop and test business scenarios in multiple OS platforms or multiple browsers.

On the other hand, Cloud enabling the development tools, IDEs and automated testing tools reduces the total cost of ownership for businesses and the “Pay as you Go” model makes it affordable for businesses to ensure the reliability and performance aspects of their web sites. Even small businesses also can leverage these development and testing tools on need basis which otherwise may not have been affordable. Cloud enabling automated testing tools also lowers the limitation of scaling virtual user capacity for performance and load testing scenarios by leveraging the power of Cloud.

One of CSC's key partners, Skytap, provides some excellent choices for a Cloud-based pre-production environment. Skytap's offerings coupled with CSC's extensive experience in application development ensure a comprehensive and end-to-end solution for Cloud based application lifecycle management for enterprises.

#### 3.1 ABOUT SKYTAP

Skytap is the provider of Cloud-based virtual labs that deliver self-service provisioning of complex IT environment. Skytap's goal is to make serving up virtual machines over the internet as ubiquitous as delivering html to a browser.

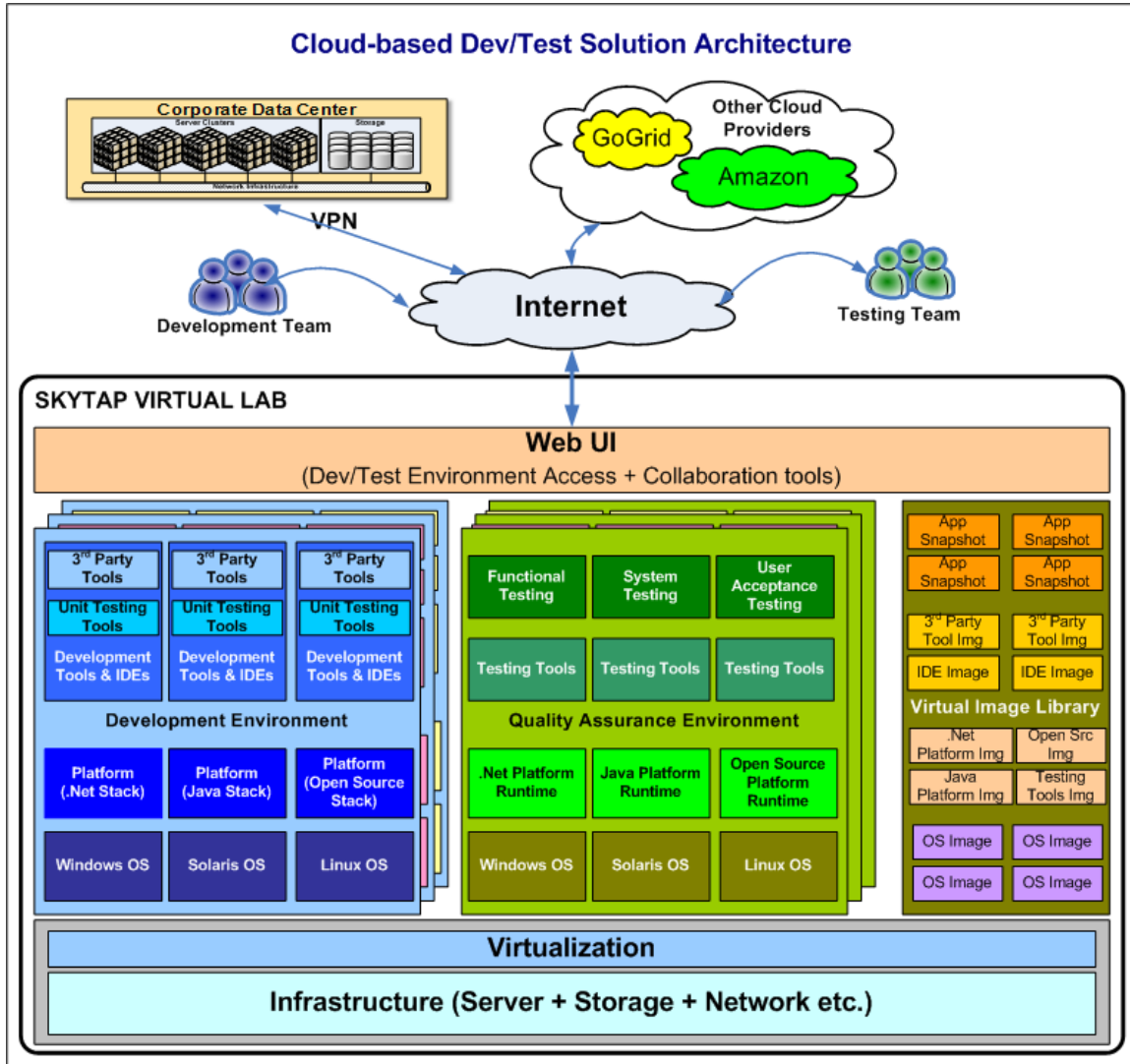
##### 3.1.1 VIRTUAL LAB AUTOMATION

Wikipedia refers Virtual Lab Automation as software solutions to automate IT labs using virtualization technology. Currently these solutions are available as on-premise packaged software or as an on-demand Cloud based service. Skytap offers several features as part of its virtual lab automation solution. Some of the key features include

1. Creating multi-machine configurations by combining different machines using web UI allowing a whole IT system to defined and isolated in a test environment. With virtual networking, copies of the same environment can be run in parallel to emulate production environment.
2. A Configuration library where the multi-machine configurations can be stored and made available to development and test teams for saving time on environment setup and configuration.
3. Ability to suspend a complete state of a multi-machine configuration and make a snapshot (a copy at a point in time). This is especially useful for application development teams for quickly reproducing a bug which can save lot of time.
4. A web service based automation API that enables teams to automatically create test environments as part of the build process and initiate automated test runs after deployment.
5. Monitoring module that enables system health checks including CPU utilization, storage, performance and network usage.
6. Security feature with role based authorization
7. Remote access and virtual dashboard to the lab environment.
8. Administration features include user and quota management and project creation.

#### 4. SOLUTION ARCHITECTURE

Using the Skytap offerings described above, enterprises can setup their pre-production environment quickly and economically. The diagram below shows a hypothetical scenario where the development and test environments are setup entirely on a Cloud based infrastructure and are accessible thru the Internet. The conceptual model below draws heavily on the product offerings from Skytap and potential integration for customers by CSC.



- As illustrated above, a Cloud infrastructure provides virtualized server resources. A set of virtual resources can be designated as the Development Environment and managed via the Cloud infrastructure tools.
- Enterprises can deploy their approved development stack (consisting of Operating System, app development platform (J2EE, .NET, Open Source etc.) on the designated Development Environment (virtualized).
- Traditional development tools like IDEs, third-party software, application frameworks can then be easily installed.
- This stack which is created for the Development Environment can then be stored a Virtual Image in the "Virtual Image Library"; thus making them available on demand for rapid provisioning and setup.

- On the same lines, a virtualized Testing Environment can also be setup which will provide the runtime environment for an application.
- In other words, unit-tested application source code can be deployed onto the Testing environment as runtime components on the appropriate platform and operating system.
- The Testing environment may also host various Testing tools, system monitoring tools and third-party products. Such testing virtual images can also be stored in the Virtual Image library.
- Test tools can be easily reused across multiple applications, without having to build the virtual test bed all over again.
- Additional server instances can be easily provisioned using the Cloud infrastructure management tools.
- A highly rich and intuitive Web based User Interface enables users to interact and work with the development and testing tools setup in the virtual environment.
- The virtualized development and test environment can communicate with an application on an external Cloud (e.g. Amazon EC2, GoGrid etc.). It can also be setup to connect with corporate data centers using VPN.
- Special features from Skytap also allow developers to capture a snapshot of the entire system at runtime to support testing and debugging activities.

## 5. CONCLUSION

Cloud opens new avenues and vistas for enterprises to setup and operate development and test environments quickly and economically. Technology from companies like Skytap are spearheading this phenomenon and system integrators such as CSC can play a pivotal role in enabling and customizing such technologies for our customers. As responsible vendors, it is part of our responsibility to educate our customers about the tangible and non-tangible benefits of leveraging and benefitting from such technological advancements without compromising on security or regulatory constraints.

## 6. REFERENCES

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