

STUDY OF TESTING AS A SERVICE (TAAS) – COST EFFECTIVE FRAMEWORK FOR TAAS IN CLOUD ENVIRONMENT

Abhaysinh Sathe ¹, Dr. Raj Kulkarni ²

^{1&2}Walchand Institute Of Technology, Solapur

ABSTRACT

With application performance catalysing business growth, software testing assumes a very significant role in the growth of an enterprise. Over time, the software testing function has become a challenging activity for enterprises due to increasing technological complexities, software sourcing challenges, rising costs and security issues among others. Typically, software testing is done either internally using the infrastructure that exists within the organization, or then is outsourced to software services providers. At the IT service provider's side, software testing underwent a long drawn evolution cycle. From ad-hoc practices within different business units, it gradually evolved to a centralized Managed Test Center approach, and finally towards institutionalising a Testing Center of Excellence (TCoE) within the organisation.

This offered customers a dynamically scalable and economical framework which enabled them to outsource their testing requirements and avoid complex contracts, long start-up times, and high levels on investment. The final stage of the evolution cycle of testing has manifested in the form of Testing-as-a-Service (TaaS). Today, Testing-as-a-Service is being increasingly considered a viable testing model by many organizations to achieve reduced costs and improved service for their IT test requirements. To address this importance, We have designed a service offering - 'Testing as a Service', using Cloud computing. This paper focuses on how organizations can optimize their IT budget through a strategic initiative in the form of 'On Demand' testing.

Keywords— *Testing as a Service(TaaS), Software as a service(SaaS), Cloud computing, cloud testing*

Introduction

Software testing is an activity conducted for finding error in software. It also verifies and validate whether the program is working correctly or not .Software testing is not only finds the bugs but also confirms that either the software is working according to requirement specification or not.

Software testing plays very significant role in growth of an enterprise. Over time the software testing function has become challenging activity for enterprises due to increasing technology complexities ,software sourcing challenges.

Typically software testing is done either internally within the organization .Testing follows its own evolution cycle. This offered customer the dynamically scalable and economics framework which unable them to outsource their testing requirements. The final stage of the evolution cycle of testing has manifested in the form of Testing as a service (TaaS).Today testing as a service is being increasingly considered a viable testing model by many organizations to achieve reduced costs and improved service for their IT test requirements .

The recent sharp downturn in the economy is forcing organizations to reconsider their approach towards IT investments. In a world, where companies are more focused towards improving efficiencies and return of capital employed, CIOs/CTOs need to re-consider how they can reduce their technology investments, or get higher return on the same or incremental investments. Testing is crucial to enhance user satisfaction and reduce support cost. However, testing requires organizations to invest in people, tools and environments and can take up a significant percentage of the available budget. But quality can never be compromised. New ways of development and testing are enabling organizations to ensure higher quality but with significantly lower investments. Though the entire domain of outsourced testing can be the potential for managed testing, as per Industry reports, the worldwide market for software and systems testing services will reach over \$56 billion in 2013-14 (about 20% of end-user spending). Out of this the potential for managed test services may account for nearly USD 30 billion (~53%). Considering the potential, it is utmost necessary to evaluate innovative and more efficient models focusing on outcomes than the effort.

I . Requirements for a Test Lab

Testing is a vital phase in any software development and maintenance initiative. Frequently changing requirements coupled with a reduced development life cycle has increased the pressure on testing teams to do more with less. A dedicated test lab is one of the solutions to handle this challenge. Traditionally, to support a test lab initiative, an organization would need to put the following infrastructure/resources in place:

- Target testing environment, similar to production environment
- Multiple target software platform for compatibility testing
- Skilled professionals to design, develop, and execute test scripts; and analyze the results of the tests
- A good test automation software with multiple virtual user is also verified that licenses
- Sufficient bandwidth for simulating real life scenarios
- Any other equipment required (firewall, switches, etc.) to simulate realistic environment

II Benefits of TaaS on Cloud

Testing-as-a-Service has demonstrated significant improvements over traditional testing environments. A major advantage of using the Testing as a service, especially a Public Cloud is that it is a highly scalable model; a major improvement as compared to an internally managed model. Enterprises need space, servers etc. to handle any on-demand computing needs and a public cloud model ensures that the capacity needs can be immediately fulfilled. Also, when deploying testing configurations, the environment is created using certain specific tools. These testing tools can be easily deployed on a public cloud at a faster rate than in the enterprise's own environment as it requires customized testing. A public cloud deployment is also much quicker compared to testing in an internal environment as it has a standardized hardware and computing power.

In terms of costs, the TaaS model is beneficial since enterprises pay for the actual time utilised for testing a leading to controlled costs. Compare this to a situation where an enterprise manages its own infrastructure and has to incur capital expenditure and yearly depreciation costs on testing environments. The TAAS model also offers licensing benefits since test tools, hardware, application licensing or even operating platform (unix, linux etc) are managed by the cloud. Additionally, using standardized testing processing and tools can yield a 10%-20% cost reduction due to increased quality and Test Automation from cloud deployments show a 5%-10% revenue enhancement. Enterprises also witness productivity gains of 5%-10% year-over-year due to test method improvements. Leveraging a global talent pool through an extended cloud ecosystem can lead to a 10%-20% savings in personnel costs. By switching to TaaS, customers get access to a centralized test environment, with standardized software library and test suites. It also has a self service portal, which cuts down time required to provision test environments. A Role based access control (RBAC) provides access to different functionalities of TaaS, based on user roles.

III Challenges Faced

Setting up a dedicated, in-house test lab comes with its own set of challenges. Some of the major challenges faced are:

- **Infrastructure:**

hardware & software resources, establishment of proper tools & processes, and other resources like bandwidth. This creates a strain on the overall budget.

- **Scalability:**

To ensure that software works in a real life situation, it needs to be tested in a real life environment. It is not easy for an organization to create a scalable infrastructure that simulates the production environment.

- **Cost:**

There is a major capital investment required to own a proper test lab. Since most of the cost is a fixed cost (hardware, software, tool licenses) it also creates a challenge to allocate budgets for this kind of investment and justify the ROI.

- **Availability of skilled engineers:**

Skilled test engineers, especially automation engineers, are not available easily and are very expensive. Cost, along with other challenges of such an initiative causes decision-makers to compromise on critical aspects such as regression coverage, and release software without completely validating load, performance, and scalability testing.

IV Cloud Testing – New Paradigm

Cloud Computing, one of the most highly publicized IT technology trends, is a new approach to deploy/test applications "over the Internet". Cloud Testing utilizes the same computing concept to extend current testing paradigms using shared, scalable, 'on-demand' testing infrastructure that is allocated on a "pay as you go" basis. This model provides an unparalleled flexibility of ramping up and tearing down a testing environment in short notice. A new test harness can be launched in the cloud with all the necessary configuration work completed, including operating system, software, etc. in almost no time. Organizations need not procure any server, tools or licenses– they need to hook up, deploy the software, test, and start paying for just the resource usage. Same efficiency applies to shutting off a cloud environment – just cancel what you don't need. The Cloud Testing model's flexibility reduces much of the capital cost, risk and effort associated with establishing an appropriate testing environment for the enterprise. More importantly, organizations can focus on their core capabilities.

V Using Cloud for Test Environment

As software applications become more critical for business changes, the software development process is becoming more agile, distributed and non cohesive. This, along with the emergence of a global delivery model, has resulted in smaller distributed teams operating independently for development, testing, and integration. To support this kind of development processes and the need for continuous testing, organizations spend a major part of their budgets in setting up test environments and automated tool licenses.

Cloud Computing cost by providing a test environment and easier provisioning. Scaling up and tearing down of a test environment is possible within a very short time, sometimes within minutes. This, along with 'on demand' testing services by testing service providers, also helps organizations to reduce capex as well as opex.

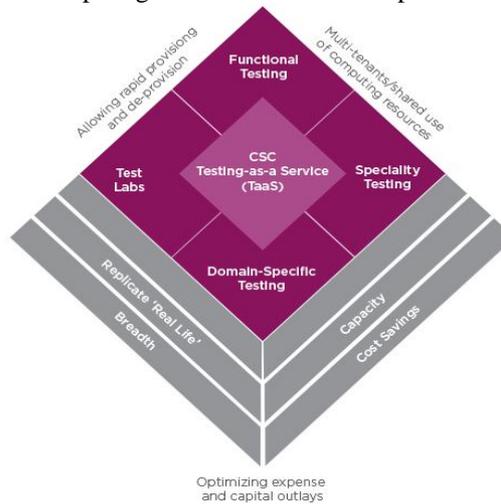


Figure 1

VI Suggested Approach

A GENERIC & SCALABLE APPROACH TO API TESTING TOOL

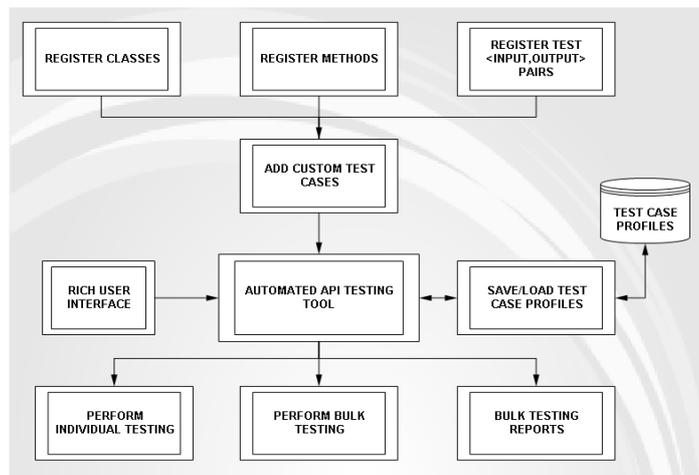


Figure 2

To achieve maximum out of their cloud testing initiative, organizations need to have a cloud based test strategy before initiating the process. Organizations need to come out with a clear plan stating the testing goals, types of tests to be conducted, benchmarks, infrastructure requirements, and last but not the least, a gap analysis of required and available resources.

Define Test Strategy:

For a successful cloud based testing initiative, a test strategy should be defined. It should include the objective of this initiative (cost savings, scalability of the infrastructure , ROI), types of testing to be done on cloud (System testing, load testing, UAT), Insource/outsourced among other normal planning items like timeline, dependencies, and risks.

Identify Infrastructure Requirements:

Based on the test strategy, organizations need to identify resources required. These resources should include Hardware, Software requirements, Test Automation Tools & number of virtual users, Bandwidth, processing power, storage capacity, etc. Organizations also should identify the usage requirements.

Identify Service Providers:

It is absolutely critical to identify a service provider with an established reputation to ensure quality and reliability of services. It is suggested that organizations identify service providers for providing end to end services starting from infrastructure, tool licenses, and provisioning. One important criterion to be evaluated is the time required for provisioning and tearing down the required infrastructure.

Test Execution:

Once a service provider is identified, organizations can start testing as per their plan. Organization should plan to optimize the usage of the infrastructure to minimize their cost.

Monitoring & Measurement:

It is important that the results of the cloud testing initiative are validated continuously on a scheduled or event-driven basis. This will enable organizations to intercept and resolve issues, find cloud usage patterns, and measure success against stated objective. This monitoring & measurement activities are key to demonstrate the ROI of cloud testing.

VII Testing as a Service (TaaS)

Though having a cloud infrastructure solves most of the challenges related to test lab, organizations still find it difficult to find skilled testers who can prepare test strategies and perform test design and test automation. 'On Demand' testing or 'Testing as a Service' offered by leading testing service providers can help organizations in overcoming these challenges. In this model, the service

providers take over the complete Cloud testing initiative. This helps to maximize the ROI as internal resources gets free and can be deployed for other core initiatives. This also helps to convert the fixed cost to variable cost. The flexible scale offered by the service providers also help to shorten the test cycle, resulting in a faster time to market. To deliver end to end Cloud based testing Blue Star Infotech has partnered with a leading Cloud-based Test Infrastructure provider, Platform Lab. Blue Star Infotech leverages Platform Lab's On-Demand infrastructure to provide its clients with a turnkey cloud testing service that reduces their capital expenditure and increase ROI. Availability of all standard hardware, software, test automation tools, and bandwidth ensures that almost all types of applications can be tested for optimal performances and throughput with real life scenarios on pay-per-use basis. Using this service, organizations can save 50-70% of their cost towards testing, including test infrastructure cost.

VIII 'Testing as a Service' Offering

'Testing as a Service' – a.k.a. TaaS can help you lower your cost of quality by testing the software faster and at a lower cost. These services are delivered through processes, frameworks, tools, and a cloud based infrastructure that integrates smoothly with your development process and keeps you constantly apprised of the inherent quality of the solution being developed.

We have completely take over the testing activities including formulating an appropriate test strategy based on defined objectives, initial planning, tool selection (if appropriate), creating sterile test environments, preparing test plans and test cases, cloud infrastructure provisioning, establishing traceability matrices, test data creation, and running the tests. Organizations can leverage cloud based testing for higher flexibility and lower cost. 'Testing as a Service' provides organizations an option to set up a virtual test lab without any upfront investment in Lab infrastructure, Automation tools licenses, and skilled resources. The Pay-per-usage pricing models are great in controlling IT budget and maximizing profit.

Conclusion:

The complexities of the future are changing. It is becoming demanding, consumer oriented and the number of devices/ user interfaces that the organization has to support is becoming much more versatile. In such an environment, it is imperative to assess and implement the right methodologies to achieve scale, minimize costs and offer improved services. The CIOs and their organization hence should take adequate care and caution in evaluating TaaS offerings and must consider the following:

- New TaaS offerings provide substantial benefits but prudence lies in validating if it can be easily customized and adopted by the internal business organization.
- While potential of Cloud based TaaS is huge, its deployment may vary from one industry to another. Matching the offering with needed compliance and security requirements is something that Vendor Management Organization needs to duly evaluate.
- The service works best where volumes are high and workload can be easily delinked from live operations. This makes outsourcing easier to manage.
- True benefit of TaaS lies in aligning the pricing to successful outcome based models than merely accepting Transaction Pricing. While it is primarily volume driven, combining success rates and variability of transactions is the key to determine right outcome.

References:

- [1.] Lian Yu, Le Zhang, Huiru Xiang, Yu Su, Wei Zhao, Jun Zhu, "A Framework of Testing as a Service", Proceedings of the Conference of Information System Management 2009.
- [2.] Lian Yu, Shuang Su, Jing Zhao, et al, "Performing Unit Testing Based on Testing as a Service (TaaS) Approach", Proceedings of International Conference on Service Science (ICSS) 2008, pp. 127-131.
- [3.] K. Priyadarsini* "cloud testing as service"/ (IJAEST) INTERNATIONAL JOURNAL OF ADVANCED ENGINEERING SCIENCES AND TECHNOLOGIES Vol No. 6, Issue No. 2, 173 - 177
- [4.] J. Geelan, "Twenty one experts define cloud computing," Virtualization, Aug. 2008. Electronic Magazine, Available at <http://virtualization.sys-con.com/node/612375> [Last accessed October 6, 2010].
- [5.] R. Buyya, C. Yeo, S. Venugopal, J. Broberg, and I. Brandic, "Cloud Computing and Emerging IT Platforms: Vision, Hype, and Reality for Delivering Computing as the 5th Utility," Future Generation Computer Systems, Elsevier, 25(6), June 2009, doi:10.1016/j.future.2008.12.001.
- [6.] E. Knorr and G. Gruman, "What cloud computing really means," InfoWorld, April 2008. Electronic Magazine, Available at <http://www.infoworld.com/d/cloudcomputing/whatcloudcomputing- really-means-031> [Last accessed October 6, 2010]
- [7.] Benslimane, Djamel; Schahram Dustdar, and Amit Sheth (2008). "Services Mashups: The New Generation of Web Applications" (http://dsonline.computer.org/portal/site/dsonline/menuitem.9ed3d9924aeb0dcd82ccc6716bbe36ec/index.jsp?&pName=dso_level1&Path=dsonline/2008/09&file=w5gei.xml&xsl=article.xsl). IEEE Internet Computing, vol. 12, no. 5. Institute of Electrical and Electronics Engineers. pp. 13–15. .
- [8.] "Mashup Dashboard" (<http://www.programmableweb.com/mashups>). ProgrammableWeb.com. 2009. .
- [9.] Lian Yu, Wei-Tek Tsai, Xiangji Chen, Linqing Liu, Yan Zhao, Liangjie Tang, Wei Zhao 2010 Fifth IEEE International Symposium on Service Oriented System Engineering
- [10.] http://www.innominds.com/index.php?option=com_content&view=article&id=102&Itemid=124
- [11.] Introduction to software testing available at www.onestoptesting.com/introduction/.