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A Case Study Using Testing Technique for Software as a Service (SaaS)

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***Abstract* — In the second semester of 2013, during thedevelopment of the Customer Relationship Management (CRM) System at Brazilian global company, there was the necessity to execute software testing. However, it was done using techniques, such as Script-based Testing, Integration Testing and User Acceptance Testing. These techniques were inadequate to the cloud environment. Thus, the pairwise technique was chosen for the software cloud testing. Comparing the results from the traditional techniques to the pairwise testing it was noticed that the number of test cases was reduced and testing time was cut by one-sixth. So, it was concluded that pairwise testing is effective as an initial testing technique in the cloud, in conditions in which it is applicable.**

***Keywords: Cloud Computing – SaaS – Software Testing – Pairwise Testing - Salesforce***

1. INTRODUCTION

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*B. Software as a Service*

According Kavis, M. J. [1], there are three types of cloud services, being they the Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and the Software as a Service (SaaS). Each one has specific properties and working procedure. However, despite meet different expectations, a model complements the other, they compose the level of abstraction. The applications developed and installed in a SaaS environment are the ones that need to be continuous changing and are not the core business of the corporation.

Due to the necessity of web access, scalability, and fast system configuration to meet the continuous business changing, most of the customers and hirers expects to solve their need through a software by demand (SaaS).

Even though, the similarity between cloud and a traditional software development, it needs a different testing patterns due to the flexibility, agility, and development velocity [1]. Therewith, this paper was developed to analyze and identify an adequate technique to test software as a service (SaaS), proposing a simple, but an efficient test method.

In this case, an application, to register product failures occurrences on case object was hosted and developed at Salesforce.com platform. As this object is a standard, the development is based on configuration instead of coding. Due to this, the deliverables are shorter and faster.

*A. Definition*

According Kavis, M. J. [1], cloud computing can be defined as a result set of computer evolution, in both categories hardware and software. The advantages of cloud computing are the velocity, low development cost and return of investments for the business. Usually, it is built and implemented faster, at a low cost and with effective functions to the users [1].

An interesting category nowadays is the SaaS. These cloud systems are even more in the spotlight and are becoming leaders in business management.



*C. Salesforce.com*

Salesforce.com is a cloud based CRM that is commercialized as a SaaS. As a cloud company, it offers the three types of licenses. This SaaS module provides a configuration development and in consequence agility, fast implementation, and flexibility [2].

* 1. SOFTWARE TESTING IN SAAS

1. *Technique choice*

Due to the SaaS characteristics the traditional software testing cannot be applied, the test has to be fast, reducing the number of test cases and need to have the capacity to analyze the results against the data input without the knowledge of what are being done by the code.

With this entire scenario in mind, it was identified that the best type of test was the black box testing and the best method to do it was pairwise [3].

Black box testing is based on the requirements and specifications. It requires no knowledge of structure, the internal paths or the implementation of the software under test. There are nine techniques on black box testing



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strategy, however the pairwise was the best technique identified to be used at first for SaaS [3] [4].

Pairwise testing, as others black box testing, can reduce the number of test cases and it is applicable at the unit, integration, system, and acceptance test levels. However, this kind of testing do not guarantee that is benefic for the application, there is only one-way to know, trying. That is why a proof of concept (PoC) was done [3].

*B. Proof of concept*

The purpose of the PoC was to verify if the pairwise testing is the fastest way to execute tests on SaaS and if the use of this technique at first is adequate. It was possible, by analyzing and selecting the technique, to select which is better to fit an agile platform, as done in the item III. Later, the PoC compared the scripting test used and the technique chosen.

The main objective was to collect the measures such as the number of test cases, number of detected defects, and the time spent to execute the test. Based on the results, the proposed technique could be acceptable or not.

1. RESULTS

Traditional test and pairwise testing had been done to accomplish the PoC objective. The first kind of test covered one hundred fifty nine test cases. The execution time of the test cases was six hours, for two different teams. During the test execution, the numbers of defects found were three.

IV. CONCLUSION

Due to the necessity of another testing technique for SaaS systems, that is not the same as the traditional environments, this paper provided some tests and an analysis of the applicability of pairwise test on the Salesforce.com platform.

The main objective was to proof that pairwise testing is a recommended technique to be used at first for software based on cloud computing. Applying this technique at Salesforce instance, it was possible to compare the traditional technique and the pairwise testing.

Analyzing the evidences and measures, it can be concluded from this research that there is a great difference between the use of these techniques, as can be seem at section III. The pairwise testing has reduced the time spent for the execution of test as much as it has reduced the number of test cases, finding the same quantity of faults as the traditional testing. So, the application of a black box testing, such as pairwise may increase the velocity of the development phase and reduce the necessary time for SaaS testing, what makes the use of this technique pretty recommendable.

Due to the complexity of cloud system testing, the authors recommend the execution of other black box testing in this type of environments, it may result in more gain of time if specific types of testing scenarios are covered. That may be an innovation regarding SaaS. This research is an initial step and can be used as a reference for future researches.

Applying the All-pairs algorithm [5], seventeen test cases composed the second one. The number of defects has been equal to the traditional techniques, but the time spent was one-sixth. The data for pairwise test cases were structured in:

* 3 Inputs; 2 Record Types; 3 SLAs; 5 Phases;

3 Objects; and 1 Output.

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| Table I presents the compilation of the results and a | VI. REFERENCES |
| comparison between the two techniques. |  |

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| --- | --- | --- | --- |
| **Technique** | **Test Cases** | **Time Spent** | **Defects** |
|  |  |  | **Found** |
| Traditional | 159 | 6 hours | 3 |
|  |  |  |  |
| Pairwise | 17 | 1 hour | 3 |
|  |  |  |  |

Table I – Comparison between Traditional and Pairwise Testing.

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