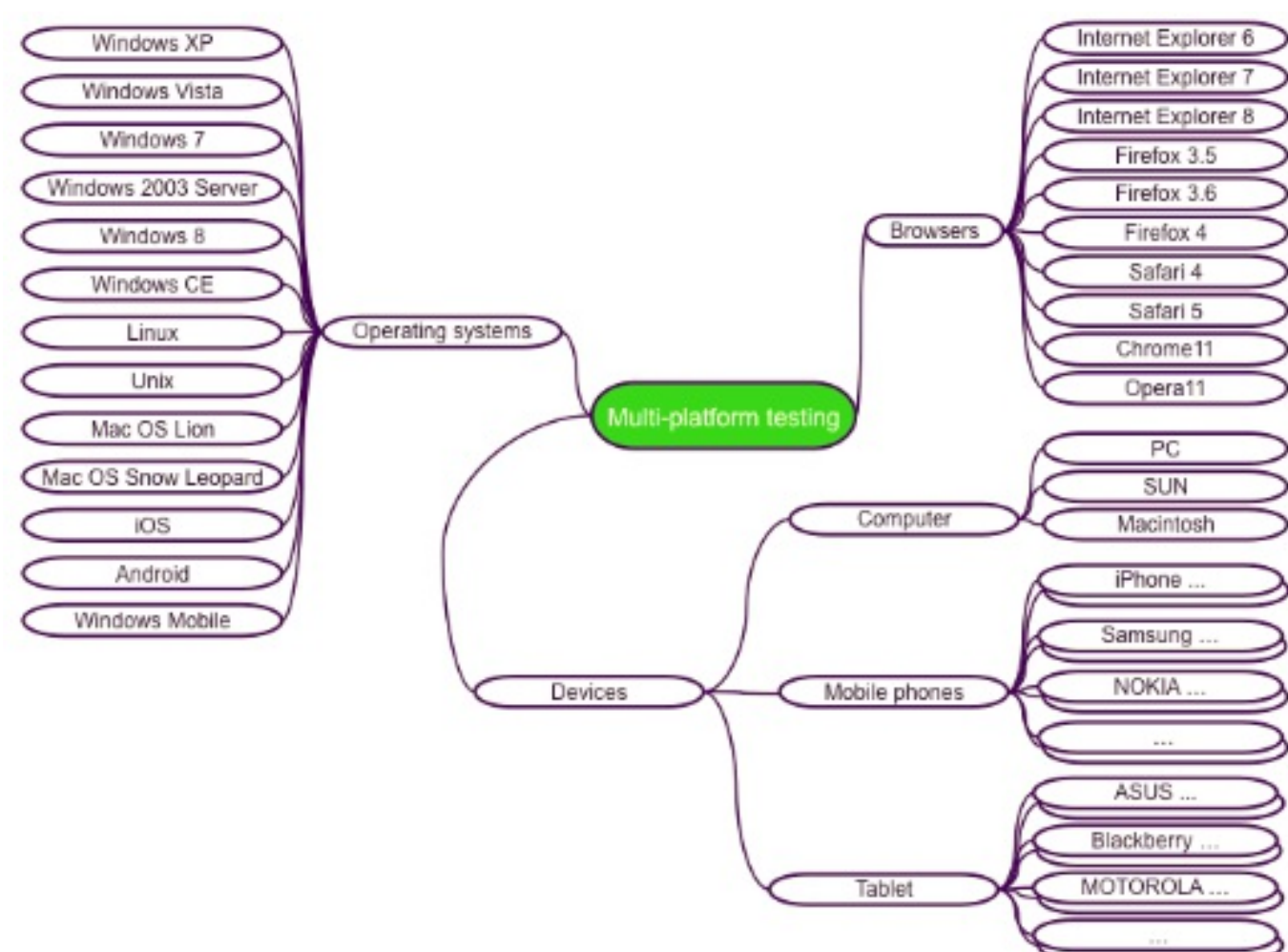


INTRODUCTION

A number of variables, such as multiple platforms, browser versions, operating systems and hardware increase the complexity of cloud testing in comparison with traditional methods.

Automated cross-browser testing requires high investments in servers, memory and processing infrastructure for testing.

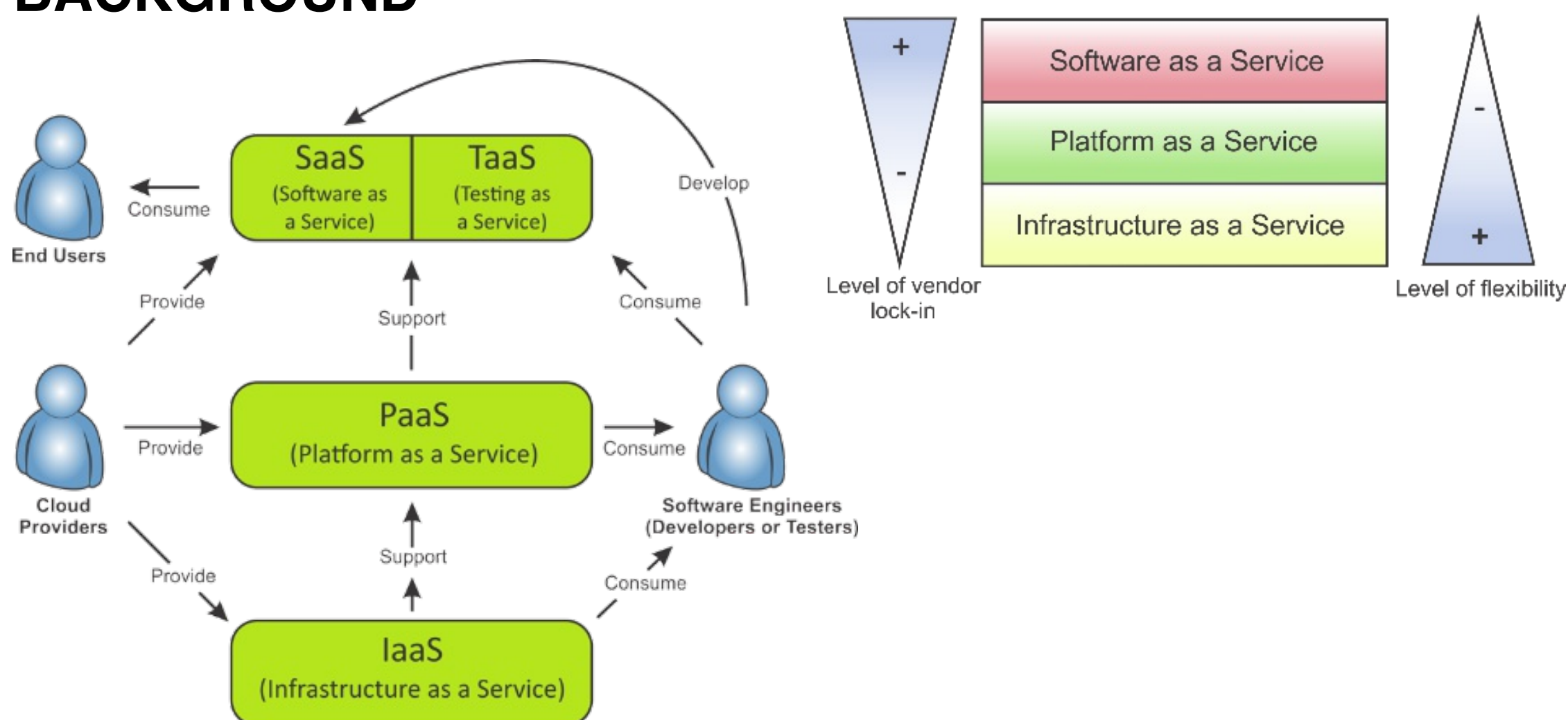
Cloud testing reduces costs, as it optimizes the use of computing resources by offering the on-demand test service and pay-as-you-test model.



OBJECTIVES

- Identification of the **impact of the lock-in problem** on the entire **cloud testing process**;
- Proposal of a solution to the lock-in problem in both writing and execution of tests through a test architecture that abstracts TaaS providers;

BACKGROUND



Vendor Lock-in it results from the lack of portability and interoperability among providers and causes users to strongly depend on a particular vendor due the specific Selenium capabilities and APIs that hamper the migration of tests among TaaS providers.

Portability in a TaaS context refers to the ability of software engineers to write a test once and run it in multiple TaaS platforms with no changes in it;

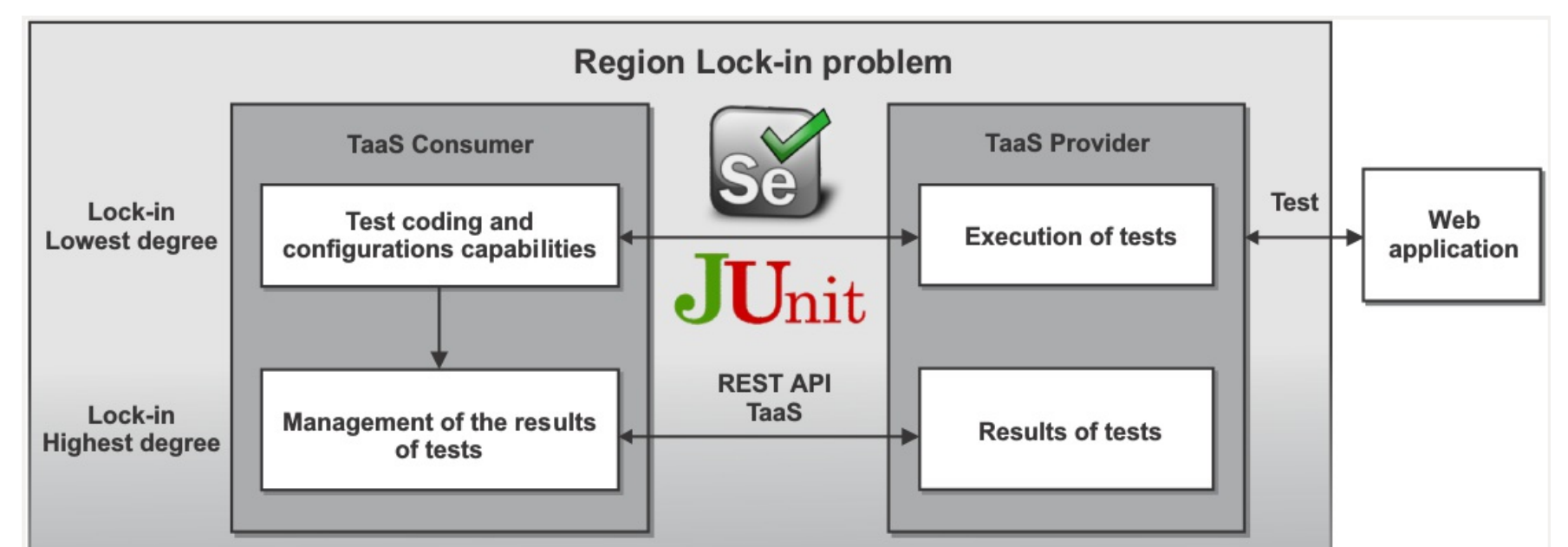
Interoperability in a TaaS context refers to a standard protocol (or an abstraction layer) that enables heterogeneous TaaS providers to collaborate with each other in a transparent way to their clients. This is possible only if their REST APIs follow a common specification.

RELATED WORK

- Petcu listed the main approaches, namely **Open APIs**, **Open protocols**, **Norms or standards**, **Abstraction layers**, **Semantic repositories** and **Domain Specific Languages (DSL)** for the solution of the lock-in problem in cloud computing based on interoperability and portability.
- In general, all studies on lock-in have focused on the cloud environment. In contrast, the **approach adopted** here **focuses specifically** on the application of design patterns in the context of the **TaaS service** model in a cloud environment.

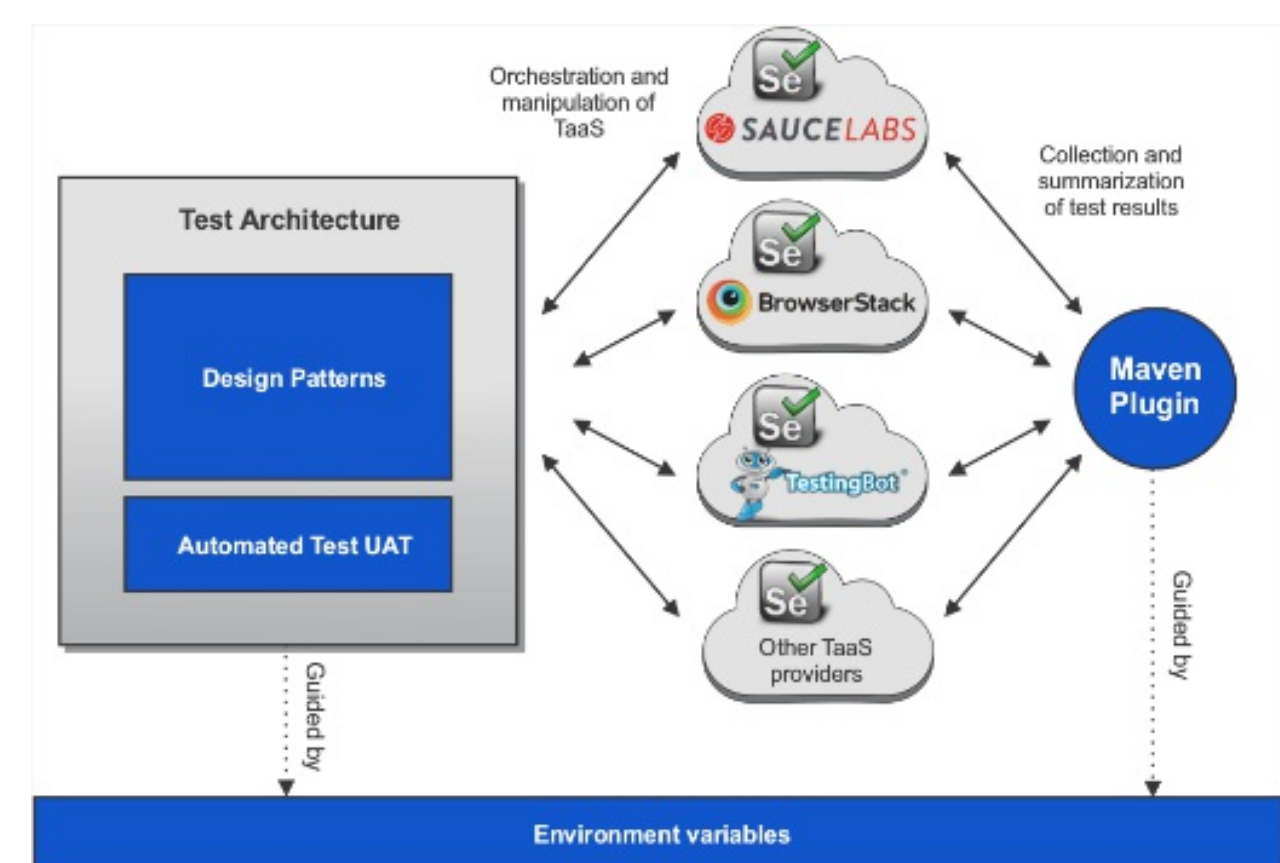
THE LOCK-IN PROBLEM IN TAAS

- The lock-in problem in the context of TaaS is caused by specific Selenium capabilities offered by different TaaS providers;
- The capabilities are configuration parameters formed by a key and value pair directly related to the execution of tests (e.g. browser, browser version, OS, device, OS version, among others);



DEVELOPMENT GUIDELINES AND TEST ARCHITECTURE

- The central idea of our approach lies in the use of a combination of design patterns guided by a set of environment variables through a test architecture;
- We propose a set of guidelines that are independent of vendor technologies for minimizing the impact of vendor lock-in.



- The way capabilities are written is not standardized. Each test set may have different capabilities and a company that uses **hundreds** or **thousands of tests** will incur **exorbitant costs** for test code maintenance if it changes provider.
- The coding and execution of tests become more **practical**, **efficient** and **secure**, as changes in the environment variables do **not impact** on the **remainder of the code**;

CONCLUDING REMARKS

- This study has proposed a solution to the lock-in problem in the **writing** and **execution of tests** for **mitigating the impact of vendor lock-in** on the Testing as a Service (**TaaS**);
- It has also identified the four main stages of the software testing process, namely **writing**, **execution**, **configuration** and **management** that are affected by vendor lock-in in the TaaS context;
- The main contribution of the approach regards the increased **portability** of the **tests** and **interoperability** of **TaaS** through a common interface.

FUTURE WORK

- In order to **validate** our approach, we have conducted **controlled experiments** with students to **measure the efforts** and **time spent** on the **migration** among TaaS providers;

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