Testing Web-Based Applications: the State of the Art and Future Trends

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Abstract

Software testing is a difficult task and testing web-based applications may be even more difficult, due to the peculiarities of such applications. In the last years research has been carried on to address several problems in the field of web based applications testing and several solutions have been proposed. In this talk the main achievements and the challenges to face will be discussed.

1. Introduction

The wide diffusion of Internet has produced a significant growth of the demand of web based applications with more and more strict requirements of reliability, usability, inter-operability and security. Due to market pressure and very short time-to-market, the testing of web based applications is often neglected by developers, as it is considered too time-consuming and lacking a significant payoff. This affects negatively the quality of the applications and, therefore adequate, efficient and cost effective testing approaches are needed for such applications.

Though the testing of web based applications has the same aim of testing of ’traditional’ applications, in most cases, traditional testing theories and methods cannot be used just as they are, because of the peculiarities and complexities of web applications. Indeed, they have to be adapted to the new environment as well as new approaches to testing are needed.

2. Testing web based applications

The main reasons that make testing web based applications more difficult than testing traditional are:

− the heterogeneous nature of their components, due to the different technologies by which components are built (typically different programming languages and models are used), and the mixing of different kind of components (new ones generated by scratch, legacy ones, hypermedia components, COTS, etc.);
− the heterogeneous nature of the running environments, due to fact that the components may be executed on different server platforms as well as different browsers may be used to allow users interactions;
− the extremely wide number of users distributed all around the world and accessing the application services in a concurrent and global way;
− the possibility to generate software components at run time.

All these features have to take in account when any kind of testing is carried out, as well as they affects what has to test and the way to test it. Thus the large number of contemporary users has to be considered for performance and load testing, as well as the large variety of users and of the possible browsers has to be considered in usability testing, accessibility testing, and compatibility testing. The heterogeneity of components, the dynamically generated components, and the consequently complex architecture mainly affects the navigability testing, functionality testing, security and safety testing.

However, as for traditional applications, effective testing of web based applications has to rely on adequate well-defined: (a) test models (representing the components of the application and their inter-connections); (b) test strategies (to create test cases from test models); (c) testing levels (to define the collections of components to be tested); (d) testing processes (establishing the right sequence of testing activities, the resource allocation, the effort estimation, etc.).

Several researches have been carried, and are carrying, out to address testing problems for web applications and to propose effective solutions, but not all of the former aspects have been deeply investigated, and many open questions still need to be addressed. Many research projects have addressed the definition of test models (typically object models and state machine models are used) according to which testing levels (usually the web page is considered as the test unit) and testing strategies (some based on capture/replay techniques of user interactions) have been defined. Still few is in the literature about the definition of testing processes to integrate in the development ones. Analogously, several tools are available to support performance, load, accessibility, compatibility, navigability, security testing, while few tools allows an effective support to functionality testing.

3. Concluding remarks

Appropriate methods, techniques, tools and processes are needed to improve and make cost effective the testing of web based applications. More research should be addressed to functionality testing and to define testing processes to easily integrate in the development process. Finally, the testing of web services is the nowadays challenge.