Web Testing: A Review on Tool, Challenges and Techniques

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Abstract: *Web testing is the name given to software testing that focuses on web applications. Issues such as the safety of the web application, the basic functionality of the site, its accessibility to handicapped users and fully able users, as well as handiness for expected traffic and number of users and the ability to sustain a massive spike in user traffic, both of which are related to load testing. In this paper web testing based on Methods, tool and Techniques. Methods have been discussed which will help in handling some challenges during the website development.*

Keywords: E-commerce, Tool,Web application, Web Testing.

1. Introduction

Testers are still studying how to best test e-commerce Web applications, as most of these applications are business critical, and it is still a massive and growing marketplace. Millions of dollars have been spent on websites, and the investors look forward for success. Unfortunately, e-commerce history is filled with high priced downfall. Some of which could have been avoided by high quality testing before the site was unlocked to the general public [1]. The impact of having a poorly operating website are shocking, and even affect the stores that the websites are authorizing online. A analysis based on recent study showed that when a mistake found on an e-commerce website, 28% of the people stopped shopping at the site, 23% stopped buying from the site, and 6% of the people were so disturbed, that they stopped buying at store that the site is based on [2]. One can only have an assumption that the customers feel that if the company cannot sustain a quality website, then they may not be able to sell a quality product from their stores. Tons of user reviews can help in building this fact. Additional aspects that are very considerable regarding web applications are security, reliability and recoverability. Formar requirements for web applications are far more rigorous than shrink-wrap software. People want that websites which we are accessing should be secure, and should be available twenty-four hours a day, seven days per week. When they are not, the business suffers [3]. The gesture of the paper is organized as follows: Section 2. Illustrate Web application performance tool, Section 3. Illustrate the challenges during web testing, Section 4. Focuses on various web testing methods and finally some conclusions are provided in the Section 5.

2. Web Application Performance Tool (WAPT)

A Web Application Performance Tool (WAPT) WAPT is a load and stress testing tool that provides an easy-to-use and cost-effective way to test any web site, including business applications, mobile sites, web portals, etc. With WAPT you can create load tests in a matter of minutes. A few clicks are required to make thousands virtual users execute concurrent sessions against your web site. WAPT tends to simulate virtual users which will repeat either recorded URLs or specified URL and allows the users to specify number of times or iterations that the virtual users will have to repeat the recorded URLs .By doing so, the tool is useful to check for blockage and performance leakage in the web application being tested. WAPT is a web load and stress testing tool from softlogica [5] having following specifications:
(a) Handles dynamic content and HTTPS/SSL;
(b) Easy to use;
(c) Support for redirects and all types of proxies;
(d) Clear reports and graphs.

3. Challenges during Web Testing

A WAPT faces distinct challenges during testing and should be able to run tests for:
(a) Browser compatibility
(b) Operating System compatibility
(c) Windows application compatibility where required (particularly for backend testing)

WAPT allows a user to enumerate how virtual users are busy in the various types of testing environment i.e. either expanding the users or consistent users or fluctuating users load.

(a) Expanding the user load, step by step is called Ramp [6] where virtual users are increased from 0 to hundreds, where, Ramp test is the test which uses extending numbers of users over a given period of time frame to actuate the maximal number of users the web server can hold before generating error messages.
(b) Consistent user load manage stated user load at all time.
(c) Fluctuating user load likely to increase and decrease the user load from time to time.

Websites offer fresh challenges to developers and testers. Compatibility and performance are two important factors that are representative in the e-commerce and web applications. Nevertheless, when new technology is used to create web applications perform well and compatible, new testing methods have to be created along with those technologies. Performance is analytical, and based on a analysis from the Newport Group, more than half the currently displayed transaction-based web applications did

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not meet expectations for how many concurrent users their applications could handle [4].

4. Web Testing Techniques

4.1 Functional Testing

Test for each and every link in web pages, database connection, forms basically used in the web pages for submitting or getting database from user. This database consist of personal information of the user.
(a) Test the outgoing links from all the pages from specific domain under test.
(b) Test all internal links.
(c) Test links jumping on the same pages.
(d) Test links used to send the email to admin or other users from web pages.
(e) Test to check if there are any orphan pages.
(f) Lastly in link checking, check for broken links in all above-mentioned links.

Test forms in all pages: Forms are the necessary component of any web site. Forms are used to grab data from users and to maintain communication with them Following are the check list on forms:
(a) First check all the validations on each field.
(b) Check for the fault values of fields.
(c) Incorrect inputs to the fields in the forms.
(d) Alternatives to design forms if any, form delete, view or modify the forms
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Cookies testing: A 'cookie' is a small file containing a string of characters that is sent to your computer when you visit a website Cookies are files stored on user machine. These are basically used to keep up login sessions. Test the application by enabling or disabling the cookies in your browser options. Test if the cookies are encrypted earlier writing to user machine. If you are testing the session cookies (i.e. cookies expire after the session's ends) check for login sessions and user starts after session end. Check effect on application security by deleting the cookies.

Database testing: Data flexibility is very considerable in web application. Check for data probity and fallacy while you edit, delete, modify the forms or do any other database related functionality. Check if all the database queries are executing in right manner, data is released correctly and also refreshed correctly.

4.2 Usability Testing

Test for navigation: Navigation means user can move around the application in the manner intended, how the user surfs the web pages, various controls are there on the web pages like buttons, boxes or how user using the links on the pages to surf different pages. It includes content checking and other user information for user help.

Content checking: Content should be reasonable and easy to understand. Check for spelling errors. You can use some rules that are used for web page and content building. Content should be clear and concise. All the anchor text links should be working accurately. Images should be placed

accordingly with proper sizes. Other user information for user help: Like search option, sitemap, help files etc. Sitemap should be present with all the links in web sites with proper tree view of navigation. Check for all links on the sitemap. "Search in the site" option will help users to find content pages they are looking for easily and quickly. These are all arbitrary items and if present should be validated.

For usability, the tests can be biased, but there are rules and standard procedures that have been settled from one end to other and it would be easy for a project team to blindly follow them, and feel that the site will be acceptable since the standards are followed.

A proactive suggestion is that while establishing the design guidelines, to define requirements that can be positively identified and measured [11]. A way to do this is to capture and quantify the meaning of learnability, understandability, and operability in a testable form. These concepts need to be formulated into testable requirements by describing how these concepts will be accomplished [3].

4.3 Interface Testing

The main interfaces are Web server and application server interface, Application server and Database server interface.
(a) Examine if all the communication between these servers are carried out properly. Fallacy are handled correctly. If web server returns any error message for any query by application server then application server should latch and show these error messages relevently to users.
(b) Check what happens if user interfere any transaction in-between?
(c) Check what happens if connection to web server is reset in between?

4.4 Compatibility Testing

Compatibility of your web site is very important testing feature. It includes:
(a) Browser compatibility
(b) Operating system compatibility
(c) Mobile browsing
(d) Printing options

Browser compatibility: Part of applications are totally vulnerable on browsers. Different browsers have different configurations and framework that your web page should be compatible with. Your web site coding should be cross browser platform compatible. If you are using java scripts for User Interface functionality, carrying out security checks or authentication then give more stress on browser compatibility testing of your web application. Test web application on various browsers like Internet explorer, Firefox, Netscape navigator, AOL, Safari, Opera browsers with different versions.

OS compatibility: Part of functionalities of your web application may not be compatible with all operating systems. All new technologies used in web development like graphics designs, interface calls like different API's may not be available in all Operating Systems. Test your web

application on different operating systems like Windows, Unix, MAC, Linux, Solaris with different OS flavors.

Mobile browsing*:* **This** is brand new technology. Now a days Mobile browsing is rocking. Test your web pages on mobile browsers. Some compatibility issues may be there on mobile.

Printing options*:* If you are giving page-printing options then make sure fonts, page alignment, page graphics getting printed properly. Pages should be fit to paper size or as per the size mentioned in printing option.

4.5 Performance Testing

Web application should be maintained on heavy load. Web performance testing includes Web Load Testing and Web Stress Testing.

Load testing*:* The focus of this is to test if many users are accessing or approaching the same page at a same time. Site should handle many simultaneous user requests, large input data from users, Simultaneous connection to database, heavy load on particular pages etc.

Stress testing*:* Generally stress means stretching or beating the system beyond its specification limits. Web stress testing is carried out to break the site by giving stress and inspect how system reacts to stress and how system recovers from crashes. Stress is commonly given on input fields, login and sign up areas. In web performance testing web site functionality on different operating systems, different hardware platforms are checked for software, hardware memory leakage errors.

Performance testing is the agreement that system match performance requirements. This can be as simplified as guarantee that a web page loads in less than eight seconds, or can be as complex as requiring the system to handle 10,000 transactions per 60 seconds, while still being able to load a web page within eight seconds. For example, even the best server cannot make a difference if the firewall machine, and more importantly the number of firewall rules, are not the same [9].

In the execution of performance tests, Weyuker and Vokolos (2000) [10], who provide a detailed case study on performance testing, outline typical steps to create performance test cases. These are:

(a) Identify the software processes that directly influence the overall performance of the system.
(b) For each of the identified processes, identify only the essential input parameters that influence system performance.
(c) Create usage scenarios by determining realistic values for the parameters based on past use. Include both average and heavy workload scenarios.
(d) If there is no historical data to database, use estimates based on requirements, an previous version, or very much alike systems.
(e) If there is a parameter where the approximated values form a range, select values that are likely to bring useful

information about the performance of the system. Each value should be made into a separate test case.

Performance testing can be done through the "window" of the browser, or directly on the server or by "I.P" address of the web application. Performance-testing using the GUI will introduce a time-intensive effort that may or may not impact the project timeline [11].

To assist with load and performance testing, testers should use the test scripts that have been actualize early in the project as a basis for initial load testing. By using the current scripts, this avoids rework and allows to access the scripts to be used at different times by different virtual users when authenticating the system performance [12].

4.6 Security Testing

There are some test cases for website security testing:

(a) Test by pasting internal url directly into browser address bar without login. Internal pages should not open.
(b) If you are logged in by using your username and password and browsing internal pages then try changing url options directly. i.e. if you are checking some publisher site statistics with Publisher site ID = 876, then changing the url site ID parameter directly to different site ID which is not related to logged in user. Access should deny for this user to view others statistics.
(c) Try some invalid inputs in input fields like login username, password, and input text boxes. Make some mistakes intentionally Check the system reaction on all invalid inputs.
(d) Web directories or files should not be approachable directly unless given download option.
(e) Test if SSL is used for security measures. If used proper message should get displayed when user switch from non-secure http:// pages to secure https:// pages and vice versa.
(f) All transactions, error messages, security break effort should get logged in log somewhere on web server.

Security is a critical part of an e-commerce website. The security best practices listed below come from an outstanding article on website security testing by Russ Smith (2001) [8]. Data Collection: Web sites collect data in log files, as well as through forms in which users supply to the website information that is saved on the web server.

(a) The web server should be setup so that users cannot browse directories and obtain file names. For example, www.example.com/data should not list the files in that folder
(b) Data should be secured internally so unauthorized employees do not have the access of data or information.

Get vs. Post: Technically, there are two methods by which information can be collected from a web page when a user submits a web form, one is a GET and another one is POST. A GET shows some information in the Uniform Resource Locator (URL) that could be sensitive, where the POST does not show.

(a) Early in the project, encourage developers to use the POST command wherever possible.
(b) When testing, check URLs to ensure that there are no "information leaks" due to sensitive information being placed in the URL while using a GET command.

Cookies: A cookie is a text file that is placed on a website visitor's system that identifies the user's "identity." The cookie is retrieved when the user revisits the site at a later time. Cookies can expire in a short period of time, such as minutes or hours (session cookie) or can last for months or years (persistent cookie).

(a) Cookies can be controlled by the user, regarding whether they want to allow them or not. If the user does not accept cookies,will the site still work?
(b) Are the cookies necessary? Cookies should be used judiciously so that if users have their browsers at the setting to "provide warning message when cookies are used" and multiple cookies are used, the user will be inundated with multiple warning boxes throughout their visit, perhaps discouraging them from re-visiting the site.
(c) Is sensitive information in the cookie? If multiple people use a workstation, the second person may be able to read the sensitive Information saved from the first person's visit. Information in a cookie should be encoded or encrypted.

5. Conclusions

In this paper, the importance of website testing have been highlighted which is one of the new breed of testing for the past few years. A survey on web testing methods and challenges described some issues and challenges and ways to avoid same issues. Web testing is a challenge exercise and by following the best ways and methods described in this paper, some of the challenges can be overcome.

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