LOAD TESTING FOR JQUERY BASED MOBILE WEBSITES USING BORLAND SILK PERFORMER™

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ABSTRACT
The growing embrace of smartphones, tablets and other mobile devices has fuelled the escalation of mobile websites in recent years. Mobile devices have become the principal standard of communication for consumers as well as business worldwide. Strategy Analytics’ WSS (Smartphones) research service predicts, by the end of 2015, the number of smartphone users will have grown to 2.5 billion, or 35% of the world’s population. At the same time the expectations for performance are increasing and the applications they are accessing are becoming ever more critical to the business. It is now mandatory for businesses to ensure the performance of applications in their mobile environments. Load Test is the simplest form of performance testing. A load test is usually conducted to understand the behavior of the application under a specific expected load. This load can be the expected concurrent number of users on the application performing a specific number of transactions within the set duration. This test will give out the response times of all the important business critical transactions. If the database, application server, etc are also monitored, then this simple test can itself point towards the bottleneck in the application. Mobile websites are typically simplified versions of a standard website that provide a better mobile user experience through improved usability, faster page loads and sometimes reorganization of content to bring mobile-specific features to the forefront of the experience. Mobile load testing allows us to simulate load and stress on our mobile Web sites in anticipation of both expected and unexpected performance spikes. Silk Performer® is a proven, powerful and easy-to-use load and stress testing solution for optimizing the performance of business applications. jQuery is an open source JavaScript library that simplifies the interactions between an
HTML document, or more precisely the Document Object Model and JavaScript. jQuery is used to construct faster loading e-commerce/m-commerce websites. This paper discusses about the importance of jQuery based mobile websites and need of load testing for mobile websites.

Key words: Jquery, Load Testing, M-Commerce, Response Time, Virtual Users.

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1. INTRODUCTION

More and more users are moving to smartphones and tablets to access business applications. Mobile users have high performance expectations, whether using a mobile application or accessing a mobile website. According to Equation research, 58% of mobile users expect sites to load as quickly on their mobile phones and on Personal Computers. According to Strangeloop, 57% of online consumers will abandon a site after waiting 3 seconds. 80% of these people will not return. Global e-commerce sales via mobile devices are likely to hit $638 billion by 2018, said a study by the Associated Chambers of Commerce of India (Assocham)-Deloitte. “E-tailers like Flipkart, Amazon and Jabong now get 50% of their revenues from consumers shopping on their mobile phones. Mobile devices typically have slower CPUs, smaller screens, and less memory than the typical desktop PC. To provide a good experience to their users, most companies need to modify their applications and rework their interfaces to tailor them to the limitations of mobile devices. Many companies find they need to create a mobile site that serves Web pages appropriate for the small display areas of mobile devices. A mobile website is designed specifically for the smaller screens and touch-screen capabilities of smartphones and tablets. It can be accessed using any mobile device’s Web browser. Mobile browser usage is increasing every day. Even with smart techniques like mobile-first responsive design, testing a site before delivery is critical due to the overwhelming variety of mobile devices that are available to consumers. Testing organizations need to take into account various display sizes, and hence browser sizes, etc., to validate how content will get displayed on the browser.

2. MOBILE WEBSITES

Mobile commerce is growing rapidly, and will eventually become the preferred way to shop online. Mobile commerce is a type of e-commerce conducted through mobile devices such as mobile phones, personal digital assistants and other mobile devices with a wireless connection - including smartphones, tablets and netbooks. In other words, it’s a complete online shopping experience, but with all the convenience of being on a cell phone or tablet. Mobile commerce is growing so quickly and it will account for half of all E-commerce by 2018. Goldman Sachs believes that up to $626 billion will be spent shopping on smartphone and tablet devices. The primary benefit of a mobile website is that it makes regular websites more accessible for mobile users. It can have all the same elements as the regular version of the website such as its look and feel, pages, images and other content but it features a mobile-friendly layout that offers improved readability and functionality when viewed on a smartphone or tablet. It is necessary to conform how a mobile website will perform in the real world,

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ensuring that our infrastructure delivers the performance that the mobile users expect, even during peak load. According to statcounter, phone and tablet usage accounts for about 44% of web traffic. This means that consumer expectations for mobile websites are higher than ever. On April 21st, 2015 Google released a new algorithm for mobile website rankings. Mobile friendly websites will get higher rankings in google mobile search results. Now, mobile friendly web designs are critically important. Test the website on different types of smartphones and mobile operating systems.

3. LOAD TESTING

Why Performance testing is essential?

As far as e-commerce websites are concerned, performance testing, though expensive, is an unavoidable parameter to analyze bottlenecks and solve them before launch of the site. There are six major types of software performance testing which include load, stress, soak, spike, configuration, and isolation tests. Load testing is a kind of performance testing which determines a system's performance under real-life load conditions. This testing helps determine how the application behaves when multiple users access it simultaneously. Load testing should not be forgotten for mobile sites and application either. This testing usually identifies: (i) Response time for each transaction (ii) Performance of System components under various loads (iii) Performance of Database components under different loads (iv) Network delay between the client and the server (v) Software design issues (vi) Server configuration issues like Web server, application server, database server etc. (vii) Hardware limitation issues like CPU maximization, memory limitations, network bottleneck, etc. Load testing will determine whether system needs to be fine-tuned or modification of hardware and software is required to improve the performance.

A Virtual user is a program that acts just like a real user would, when making requests to a web application. During a load test, a considerable number of virtual users can be run on one computer, in this context called a driver machine. A testing environment usually consists of multiple driver machines, allowing a very large number of virtual users to come into play. We can find the Number of virtual users using Little's Law: \( N = Z \times (R + T) \) where \( N \) – number of Virtual Users, \( Z \) — Transactions per Second (TPS), \( R \) — Response Time in seconds, \( T \) — Think Time in seconds.

Since, mobile devices are available in an exorbitant of different screen sizes featuring different mobile OS including, Android, iOS, Blackberry, Windows, etc., the mobile testing task appears a bit cumbersome. However, deploying an effective testing tool can help to accomplish the task with greater efficiency and precision. There are a plenty of testing tools available in the market. Here is a list of a some adept tools for testing mobile websites. (i) iPhoney (ii) Device Anywhere (iii) mobi Ready (iv) Responsive test (v) Multi-Browser Viewer (vi) Google Mobilizer (vii) Modify Headers (viii) Gomez (ix) Screenfly (x) BORLAND SILK PERFORMER™ etc.

BORLAND SILK PERFORMER™: Silk Performer® is a proven, powerful and easy-to- use load and stress testing solution for optimizing the performance of business applications. Accurate, realistic tests are easy to create, providing the ability to simulate tens or even tens of thousands of IT system users in a wide range of enterprise environments and platforms. The tests isolate issues and bottlenecks that
could impact reliability, performance and scalability. Intuitive diagnostic and analysis capabilities help to resolve any issues quickly, which reduces test and fix cycles, accelerates time-to-market, and supports critical release decisions relating to application performance.

4. TOOL RESULTS AND DISCUSSION
A leading jQuery based mobile website (https://m.ebay.in/) have been tested using BORLAND SILK PERFORMER™. The results have been analyzed and also a detailed explanation for the various graphs have been presented. We have tried many load testing tools. Every testing tool has its own merits and demerits.

**Benchmark Description Language:** Silk Performer test scripts are written in the program's proprietary scripting language (BDL).

**Program Structure of Load Testing Scripts**
A Silk Performer load testing script consists of the following sections:
- Symbols
  - (I)External functions (II) Include files (III) Constants (IV) Parameters (V) Variables (VI) Random variables (VII) Functions (VIII) Event handlers.
- Workload
- Transactions
- Web forms (Silk Performer Web Testing Only)
- SQL (Silk Performer Database Testing Only)

Silk Performer permits the use of multiple sections for external functions, global variables, constants, random variables, and functions, in any order.

**Syntax of Load Testing Scripts**
The various sections of a Silk Performer load testing script must be declared using the following syntax: (i) External functions contained in a dynamic link library that are called from a script must be declared using the keyword dll. (ii) Include statements in a script include one or more files during the compilation of a script. Declare include files with the keyword use. (iii) Constants are defined using the keyword const. There is no need to specify the data type when declaring a constant. (iv) Variables are defined using the keyword var. Global variables have global scope and therefore can be used in every transaction and as bind or INTO variables in every SQL command. We can also define variables with local scope for any transaction (v) Parameters are variables, which are re-used by the visual script customization wizards. Parameters are (automatically) defined using the keyword dclparam. (vi) Random variables are defined using the keyword dclrand. (vii) Functions used in a script are defined using the keyword dclfunc. (viii) Users to be simulated are defined using the keyword dcluser. (ix) Transactions executed by the users specified in the workload section of a script are defined using the keyword dcltrans. (x) Web forms used in transactions in a script are defined using the keyword dclform. (xi) SQL commands that are called by transactions in a script are defined using the keyword dclsql. (xii) Handler functions are defined using the keyword dclevent. (xiii) The code page with which a script was recorded is defined by the @codepage keyword.

**Recording a Test Script:** Silk Performer Recorder, can be used to create scripting and the recording work. To conduct a Silk Performer load test we need to create a test
script that prescribes the actions of the simulated users run during the test. The following is the required **BDL test script**.

```
// Generated 17-09-2015 from 'MA-Ebay-Mobile.spcap'
// by Silk Performer Recorder v16.0.0.6549
// ---------------------------------------------------------------------
// Rule set "ASP.NET ViewState"
// * Rule "Parse and Replace __VIEWSTATE"
// * Rule "Parse and Replace __EVENTVALIDATION"
// *---------------------------------------------------------------------

@codepage(1252)
benchmark SilkPerformerRecorder
use "Kernel.bdh"
dcluser
user
VUser
transactions
TInit : begin;
TMain : 1;
var
dclrand
dcltrans
transaction TInit
begin
end TInit;
transaction TMain
var
begin
MeasureStart("TMainTimer1");
MeasureStop("TMainTimer1");
end TMain;
```
5. RESULT GRAPHS OF BORLAND SILK PERFORMER™

The Load Test summary for the tested mobile website (https://m.ebay.in/) is shown in Fig-1.

![Load Test Summary](image)

**Figure 1 LOAD TEST SUMMARY**

**Detailed chart view of load test results**

**Active users:** This chart shows the overall number of active virtual users. A virtual user is considered as active if the user has started and is currently in one of the following states: executing, wait DB, document downloading, and think time.

**Number of concurrent users:** 10

**Transactions:** The number of Silk Performer transactions per second.

- **Number of transactions:** 36,688,025
- **Average number of transactions/sec:** 174,704.88

![Transactions](image)

**Figure 2 TRANSACTIONS**

**Errors:** This chart shows the number of API errors per second, including Internet, database, and middleware APIs. A problem is considered an error if its severity is defined as "error" or worse, that is, of higher severity. A problem is ignored if its severity is defined as "informational" or "warning". number of errors: 0

**Transactions (busy) ok Response Time:** The response time of successful transactions, excluding the think times within those transactions. A transaction response time is reported in this type of measurement if all API function calls within the transaction succeed.
Minimum[s]: 0.00  
Average[s]: 0.00  
Maximum[s]: 0.18  
Standard deviation[s]: 0.00

**Figure 3** Transactions (busy) ok Response Time:

**User Type**
The user type section provides detailed tabular results about transactions, individual timers and counters, and interface dependent timers and counters for WEB, database, IIOP and Tuxedo on a per user type level. In addition all API errors, and warnings for each user type are listed.

**Figure 4** User Type

**Response time breakdown histograms**

In the above histogram, response times for Web pages are subdivided into server-busy times, document-downloading times, and round-trip times. Response times for Web forms are subdivided into server-busy times and round-trip times. In the example, the histogram illustrates that the server busy time (**medium blue**) makes up 36% (1.21/3.30) of the overall Web page response time. The document downloading-time (**medium blue + light blue**) makes up 84% (2.77/3.30) of the overall response time (**medium blue + light blue + dark blue**).
Percentile Charts
Percentile graphs enable us to analyze the percentages of actions that execute within certain time limits. With the help of percentile graphs we can determine the percentage of transactions, page load times, and custom timers that meet the performance criteria defined for our system. Additionally, by considering the shape of a graph, we can analyze the distribution of execution times. The X-axis represents the percentage of the total number of actions (transaction executions, web-page downloads, or custom timings) that are measured during a load test. The Y-axis represents the time required to perform the actions. In this example, 90 percent of the pages could be downloaded within 6.7 seconds, and 70 percent had a download time below 5.65 seconds. Also, there was no page which could be downloaded below 3.15 seconds. By analyzing the shape of the graph, we could derive that further load on the server will increase download times exponentially.

Lightning-fast page load speed amplifies visitor engagement, retention, and boosts sales. Instantaneous website response leads to maximum conversion rates, and every 1 second delay in page load decreases customer satisfaction by 16 percent, page views by 11 percent and conversion rates by 7 percent according to a recent Aberdeen Group research. There are a lot of technologies behind a mobile website to load. It is not necessary to use the same technology to all the pages of the website, mostly they are different. So the response time is also different. Google strongly suggests webmasters to get their web pages to load in under a second on mobile devices. In our test we observe the following: (i) 75% of the response times are shorter than time bound 1, these response times may be considered fully satisfactory; (ii) 19% of the response times are between time bound 1 and time bound 2, these response times may be considered slightly problematic, but still acceptable; (iii) 6% of the response times are longer than time bound 2, these response times have to be considered seriously problematic.

6. CONCLUSION
Through this paper Load testing for jQuery based mobile web site with SILK PERFORMER™ has been presented. Necessary details about phone and tablet usage statistics, significance of mobile websites and a detailed description about mobile website Load Testing have been discussed. A popular jQuery based mobile website (https://m.ebay.in/) have been tested with BORLAND SILK PERFORMER™. The results have been presented with various graphs and analyzed.

REFERENCES

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https://axelerant.com/