Analysis of effects of Caches on Page Load Times for Desktops/Mobile Devices using WProf

Shreya Bhatia
Stony Brook University
shbhatia@cs.stonybrook.edu

Arpita Sheth
Stony Brook University
arsheth@cs.stonybrook.edu

ABSTRACT

Page load times are known to directly impact user satisfaction and measuring PLT has become a key performance metric.This necessitates evaluation of Local cache, Proxy cache, DNS cache effects on the critical rendering path and PLT. In this project we measure and analyse the effects of Local caches, Proxy Caches, DNS caches on Page Load Times for Desktop as well as Mobile Devices. We use Wprof scripts for logging and analysing time taken for various operations in rendering.

Keywords

Page Load Time, WProf, Critical Rendering, DNS Cache, Local Cache, Proxy Cache

1. INTRODUCTION

As the number of users continues to increase steadily, end user experience has become a critical issue and it is important to evaluate how Local cache, Proxy cache, DNS cache affects the critical rendering path and page load time of webpages to enhance the user experience.[1] The aim of this project is to perform web analysis over HTTP and analyze the effects of different caches on the Critical Rendering and Page Load Times. We focus on Mobile as well as Desktop sites for this experiment. We are using WProf scripts to calculate the impact of cache on Page Rendering.The top 200 sites from Alexa are used to evaluate this methodology. The paper aims at presenting an in depth discussion about the effects of various caches on PLTs and Web Rendering.

2. PROBLEM DESCRIPTION

As previously established, PLT plays a critical role in end user experience and minimizing PLT is crucial to enhancing this experience. Given its importance, myriad of techniques have been developed to minimize PLT. [2] In this quest, caching has been adopted as a key metric. While majority of the literature deals with analyzing the impact of caches on overall PLT of a Webpage, it is crucial to study cache effects on Critical rendering path of a webpage. Critical rendering path is the sequence of steps the browser goes through to turn the code and resources required to render the initial view of a web page into actual pixels on the screen. In this paper, we are analysing effects of different caches mainly Local, Proxy and DNS on critical rendering path as well as the overall PLT of a Webpage.

3. SOLUTION METHODOLOGY

The following section aims at describing approaches for both mobile and desktop devices. For Mobile Devices, we are using ADB tool combined with Wprof scripts to log the different metrics involved in loading a site on a mobile device browser. Initially, we evaluate by disabling the caches and later on measure the improvement gained by enabling the caches. For Desktop devices, we will calculate the PLT and Critical Path Rendering time for Alexa's top 200 sites by disabling caches and later enabling local, DNS and Browser caches. We propose to use the data logged using the Wprof Scripts to analyze the performance impact of each type of cache on different types of objects in a Webpage.

4. EXPERIMENTAL SETUP

We are using Samsung Galaxy Note 4 as a test mobile device. We installed the Chromium shell APK on the device to help log the rendering times and critical rendering paths for each Website. For Desktop devices,we are using Chromium Web Browser on Ubuntu 12.04. We are using Wprof for extracting dependencies of activities during a page load.

5. EVALUATION METHODOLGY AND RESULTS

For experimental purposes, we consider five sites from Alexa's Top 200 sites without loss of generality and load them on the mobile device. We analyse the Download time, Computation time as well as time for downloading seperate objects such as html, css, jpg, img etc for each site. Figure 1 illustrates the different times required for each site.

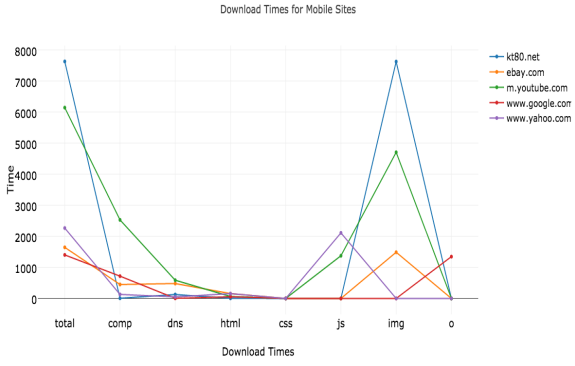

Figure 1: Comparison of PLTs across sites

As it can be seen from the figure, Youtube takes much lesser time as compared to a very simpler site kt80 which has only one image, contrary to the expected. This happens because the topmost sites from Alexa are over-optimized, thus nullifying the effects of cache.

Next, we calculated Page Load Times for different websites with and without the browser cache enabled. We first log the values on mobile devices without enabling the cache. Next we log the values for same sites by bringing the Browser Cache in picture. Figure 2 illustrates the results of this experiment. X axis contains number of times ebay site was loaded and Y axis is the loading time for different objects.

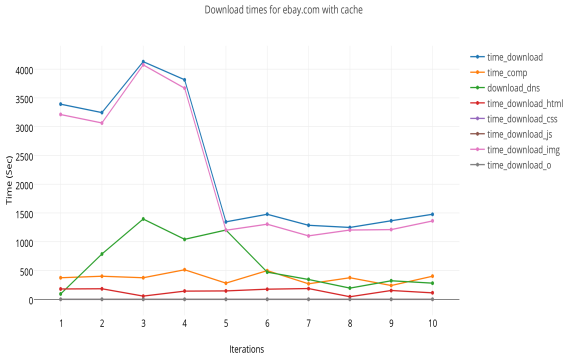

Figure 2: Comparison of PLTs with cache enabled

6. FUTURE WORK

We have currently only focused on PLT analysis over Mobile browser. We plan to broaden this analysis by analysing over Alexa's top 50 sites. At the moment, we are only considering the effects of Browser Cache on the Page Load Times and Critical Rendering. We aim at analysing the effects of DNS Cache as well as Proxy Cache. For future reference, we also aim at analysing PLTs with all the above mentioned setup for Desktop sites.

7. REFERENCES

[1] Ma Yun, Liu Xuanzhe, Z. S. X. R. Measurement and analysis of mobile web cache performance. *ACM*, 3 (2015).

[2] Xiao Sophia Wang, Aruna Balasubramanian, A. K., and Wetherall, D. Demystifying page load performance with wprof. *USENIX*, 1 (2013).