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Websites Performance Characteristics For Jordanian Public Universities

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Abstract: Eight different governmental universities in Jordan were tested for their homepage performances. The factors that were tested are HTML size, download time, number of images, image size, connection establishment time, DNS, first byte, end of packet and homepage size. The result showed that Mutah university has the highest number of objects and the download time among the other universities with a values of 9 and 7.92 sec, respectively, while Jordan university has the highest object size with down load time of 0.62 sec. These results were affected by the location of each university from the National Information Center (as Central hub for governmental sector), as well as, the managed build up pages.

Key words: Website, performance, DNS, download time

INTRODUCTION

The dramatic growth of Information Technology (IT) resulted in a vital change in all aspects of human life worldwide. These aspects include the major development of banking, shopping, teaching and communication. Consequently, all countries have paid an attention to move up such development and to elaborate for crossing their geographical borders. Jordan, for example, has initiative steps among its neighboring countries toward such development. One of the interested sectors in Jordan is the educational organizations. These organizations include the governmental and private universities and community colleges, as well. These institutions offer different common major programs, which are distributed across the country. While there are limited numbers of involved professors in each program, there is a need to link all common programs using the long distance teaching via IT. Therefore, the Jordanian government has paid an attention to develop educational websites and e-learning strategies^[1,2].

Several researchers have tackled to study websites characteristics behavior. Arlitt and Williamson^[3] studied on measuring websites performance such as transferring size and locality reference in Uniform Resource Locators (URLs)^[4]. Gaurav and Peter^[4] examined websites traffic and web servers' load using real workload for efficiency evaluation of web servers processes. Ritter *et al.*^[5] checked websites locality richness and task supported programs such as admission information, campus information, faculty listing and introduction to a given program^[6]. Zhi^[6] explored the relationship between web page downloading time and web page design factors. His work dealt with investigating the web page response time

components such as DNS lookup, TCP connection, redirection and first packet, base page, content download Zhang *et al.*^[7] investigated the most important features that affect the performance evaluation of website. They showed that educational domains require information reliability according to navigation, comprehensiveness of information and information updating. Muntean *et al.*^[8] showed the effect of existing of images on downloading time which they concluded that the large number of images can seriously influence websites performance.

This study focuses on the studying different possibilities of websites performance among the Jordanian governmental universities.

MATERIALS AND METHODS

In order to investigate the performance of web site characteristics in Jordan, several governmental universities were selected. These universities are classified as the best institutions that can utilize IT. These universities include Mutah University (MU), University of Jordan (JU), Jordan University for Science and Technology (JUST), Yarmouk University (YU), AlBalqa Applied University (BAU), The Hashemite University (HU), Al Al-Bayt University (AABU) and Al-Hussein Bin Talal University (AHU) which they are distributed across the country. The study was performed on examining the website of each university from different disciplines. These disciplines include: the index page size of each web site, java script, images, flash and embedded objects. Moreover the size distribution among dynamic reference add Banners, as well as, down loaded time and link popularity were also taken into considerations in this study.

In order to obtain a comparable output during navigation, all tests were browsed out of rush hour time. The obtained results were analyzed using.
<http://watson.addy.com/nph-watson5.cgi>
<http://www.websiteoptimization.com/services/analyze/wso.php>
<http://www.webperf.org/breakdown.html>

RESULTS AND DISCUSSION

A comprehensive HTTP client/server test site application (<http://watson.addy.com>) was used with different features that are designed to pin-point critical issues in sites web server. The reason beyond this study was to investigate the factors that preventing optimal performances for each site. By simulating the HTTP request that generated by Watson’s website, as a popular on-line performance tester, the following factors such as object type, number of objects, size of objects and estimated download time were taken into consideration.

Figure 1 shown that AABU and JU universities have the largest size of HTML size in which both Universities have 22107, 116202 byte, respectively. On the other hand JUST showed the lowest HTML size, with a value of 766 byte. MU has an average size of 9877 byte. The rest of the Universities have an HTML size less than 3624.

It is clear that as the size of HTML decrease, the average time that allowed by the user to display the content of the page will be less than 8 sec, however at higher HTML size greater than 20 k the required allowed time will be as high as 8.6 sec. This is the fact that the HTML site for these universities are not optimized and contained unnecessary features.

Figure 2 showed the download time required to view the pages for investigated universities sites. It is obvious that MU and HU home pages having as high as 7.92 and 7.34 sec, respectively. In comparison with JUST, which has a zero download time, MU, for example, has link to external object and having large number of objects within its home page.

Similarly HU has larger size of page. The other universities have small download time. This is supported by the results obtained by Fig. 3 and 4 were MU in specific has 8 number of images, while JUST, YU, HU and AABU do not have images in their index home pages. Nevertheless, JUST has large number of embedded objects.

Figure 5 shows the connection established for universities home pages under consideration. It is cleared that YU, HU and AABU have minimal connection establishment, while the rest of the universities have as

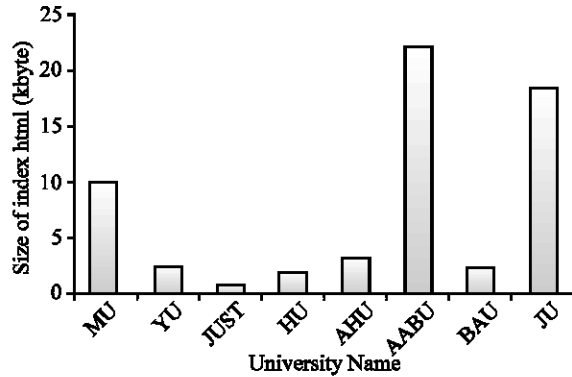


Fig. 1: HTML size for Jordanian Pubic Universities Homepages

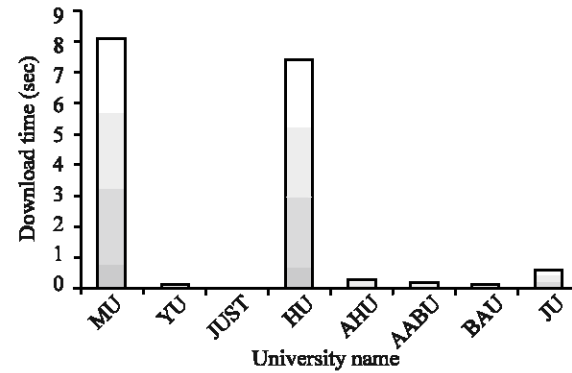


Fig. 2: Download time for Jordanian Pubic Universities Homepages

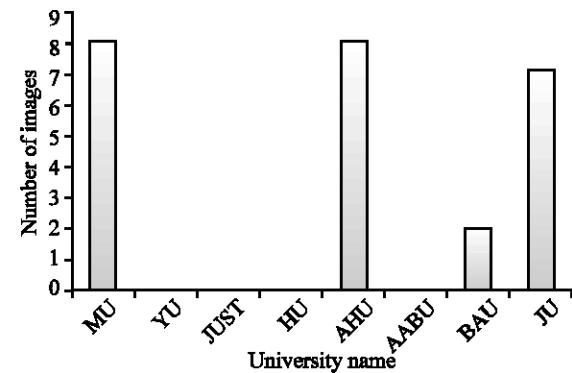


Fig. 3: Number of Images contained in the Jordanian Pubic Universities Homepages

high as 3 sec to be approved. Unfortunately, MU showed the maximum establishment time. This is because lack of management on its web servers that having large functions such as proxy, firewalling, email browsing and home pages. This fact is cleared by Fig. 6, where DNS for MU is the highest among the other ones due to lack of popularity and services to the other clients.

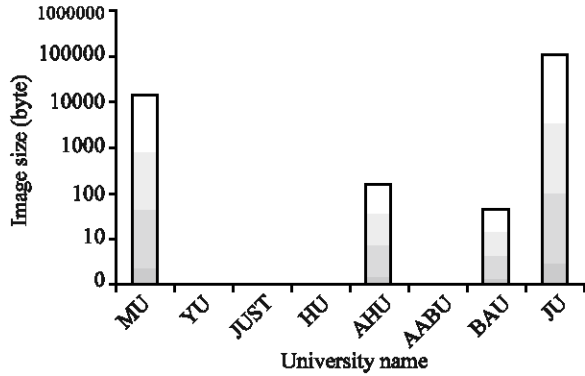


Fig. 4: Image size for Jordanian Pubic Universities Homepages

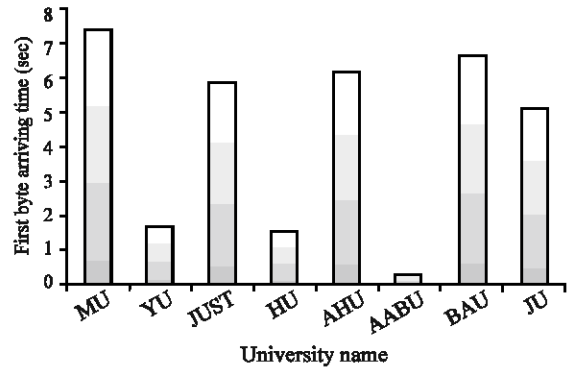


Fig. 7: First Byte arriving time of Jordanian Pubic Universities Homepages

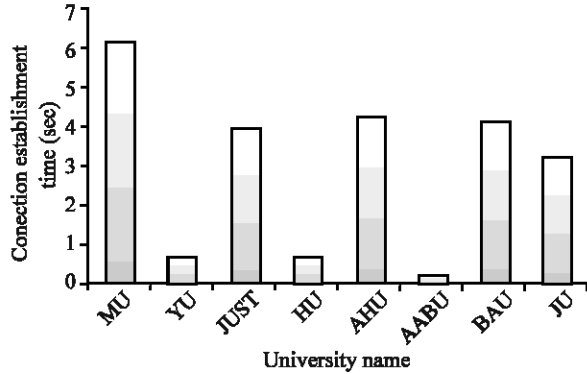


Fig. 5: Connection establishment time for Jordanian Pubic Universities Homepages

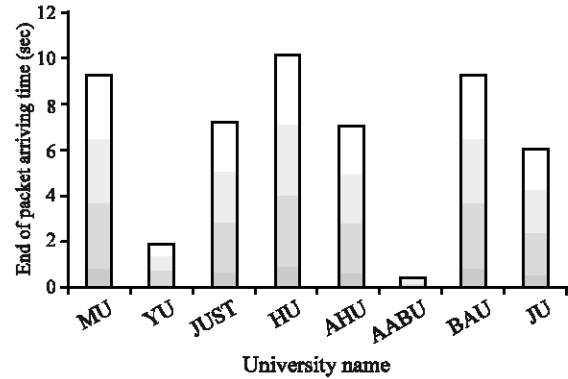


Fig. 8: End of packet arriving Time of Jordanian Pubic Universities Homepages

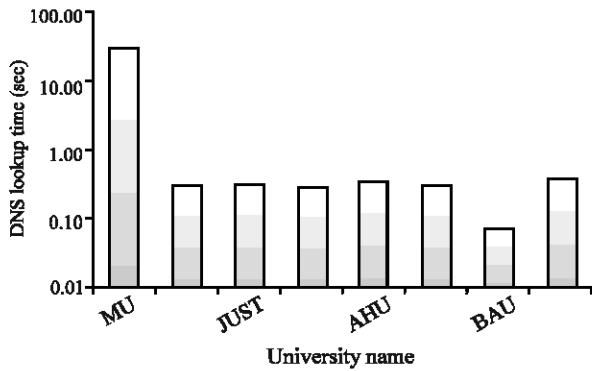


Fig. 6: DNS Jordanian Pubic Universities Homepages

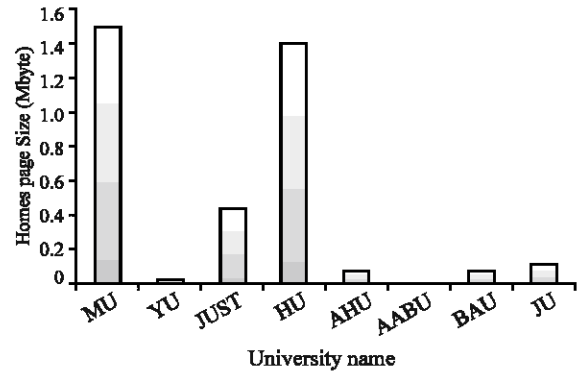


Fig. 9: Homepage size for Jordanian Pubic Universities Sites

Figure 7 shows the first byte download for homepage under consideration. Where MU proved the highest first byte while AABU showed the lowest one. This is because, fairly that, MU is located on southern region of the country which requires long distance connect with ISP, while AABU is supplied directly by Air force network located near the Information Center. In general all universities showing the lowest First Byte are located in the middle of the country while the rest are

distributed across the country. Similar results were shown in Fig. 8 where, AABU has minimal end of packet on the other hand, HU, MU and ABU showed the maximum values end of packet.

Figure 9 show the size packet required by the maximum transmission unit for the home pages. It is cleared that only HU and MU showed the maximum values of 1494713 and 1385343 bytes, respectively. This is

attributed to the fact that the client need more time to browse the total home page of each university once a time related to DNS and their pages contain large HTML size.

CONCLUSIONS

Jordanian Universities home pages were examined for their performance evaluation. MU showed the worst performance while AABU proved the best one. It is recommended that the statistical values of this study should be modeled according to the investigated parameters in order to optimize a general prediction for website performance characteristics.

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