International Journal of Humanities and Social Science Invention (IJHSSI)
ISSN (Online): 2319 – 7722, ISSN (Print): 2319 – 7714
www.ijhssi.org ||Volume 8 Issue 05 Ser. I || May 2019 || PP 74-78

Speed Perspective for analysing Website Performance of Haryana State Universities

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Abstract: *Speed is one of the key factors in determining webpage performance. More than 50% of the website visitors tend to abandon the site after an average minimum wait. The webpage must respond to the user before this average minimum wait so as to make them stay on the page so factors like first byte, start rendering and visually complete play important role in determining the performance of webpage and hence the site. This paper compares the speed performance of official websites of the state universities of Haryana for these performance factors.*

Keywords: *Website Monitoring , Web Analytics, Website Performance Metrics, Speed Analysis, Webpage Speed.*

I. INTRODUCTION:

Identification of errors and bottlenecks in website performance is required so that a faster experience can be delivered to the users. Several studies have been carried out to thoroughly investigation about the performance of the website from various perspectives like, web traffic, speed and so on, based on which efforts are being made to improve the web usage experience and provide users the satisfaction they seek. There is a fair scope of performance limitations even when the website itself is quite fast. Many technical metrics exit that are not much related to user experience such as page load, DOM content loaded etc. But now there is also focus on metrics which affect the users' web browsing experience such as Speed Index, First Paint etc. Studies show that more than 50% of the website visitors tend to abandon the website after an average wait of 3 seconds.[10]

The speed index metric takes into account the visual progress of the visible page loading and calculates an overall score for how quickly the content was painted. In order to do this, it must to be able to compute how "complete" the page is at several instances of time while the page is being loaded. In WebPagetest[8] this is achieved by capturing a video of the webpage loading in the browser and examining each video frame (10 frames per second in the current implementation and it only works if video capture is enabled). The algorithm used for calculating the completeness of each frame can be found at [9] that further assume that each video frame can be assigned a % complete.

First Interactive is the measurement of time when the main content has been delivered and is expected to be responsive to the user's input. A webpage may be responsive or not responsive at times. Not being responsive is any duration for which the main thread is blocked for around more than 50ms. Technically, such measurements are difficult.

The work explains further work added to previous attempts by authors, which included analytical reviews for state universities[12] and private universities[13] of Haryana in particular. This work has added perspective of speed for web analysis.

Experimental Setup and Tools Used: Belonging to science and technology domain, seven of the state universities of Haryana have been chosen for this experiment as listed below. A comparative study of the official websites of mentioned universities has been done. Based on their speed/time taken, several metrics have been recorded for analysing the performance of their official websites. webpagetest.org[8], a freeware online Web Analytical Tool[11], has been used for data collection done during the month of December 2018.
The website used for carrying out work are:

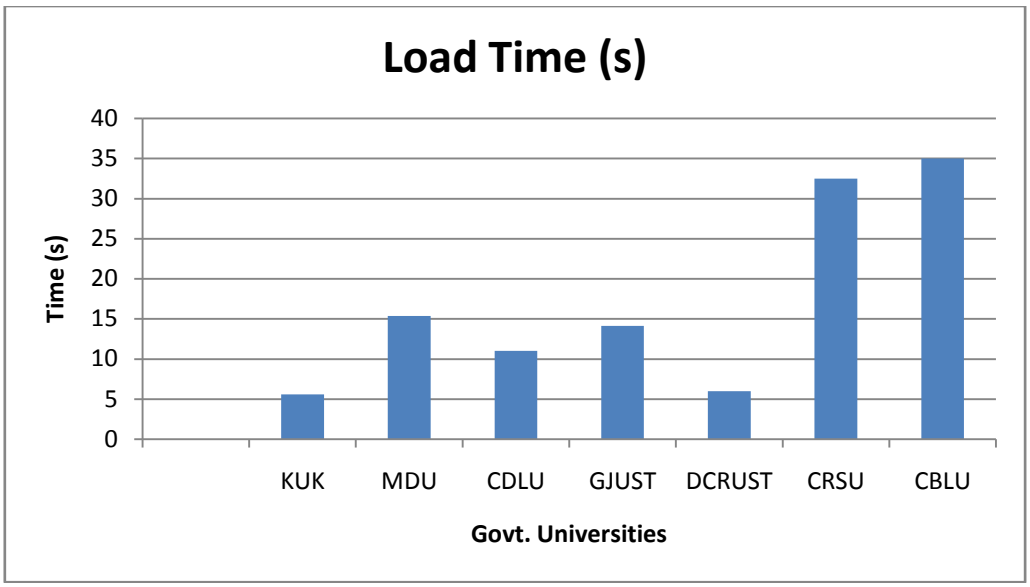
1. www.kuk.ac.in - representing Kuurkshetra University as educational hub
2. www.mdurohtak.ac.in - representing Maharshi Dayanand University
3. www.cdlu.ac.in - representing Chaudhary Devi Lal University
4. www.gjust.ac.in - representing Guru Jambheshwar University of Science and Technology
5. www.dcrustm.ac.in - representing Deenbandhu Chhotu Ram University of Science and Technology
6. www.crsu.ac.in - representing Chaudhary Ranbir Singh University
7. www.cblu.ac.in – representing Chaudhary Bansi Lal University

The data has been recorded from the mentioned tool and the results have been reported in the form of charts with the help of Microsoft Excel, for a better presentation.

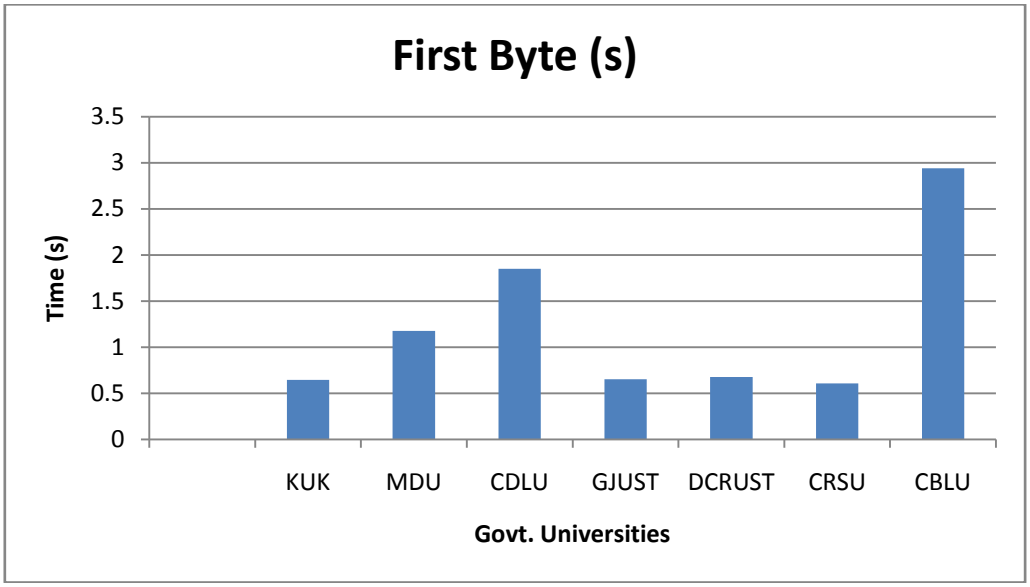
II. FACTS AND FINDINGS:

The data collected for the following attributes has been represented in the form of graphs to show the comparison results.

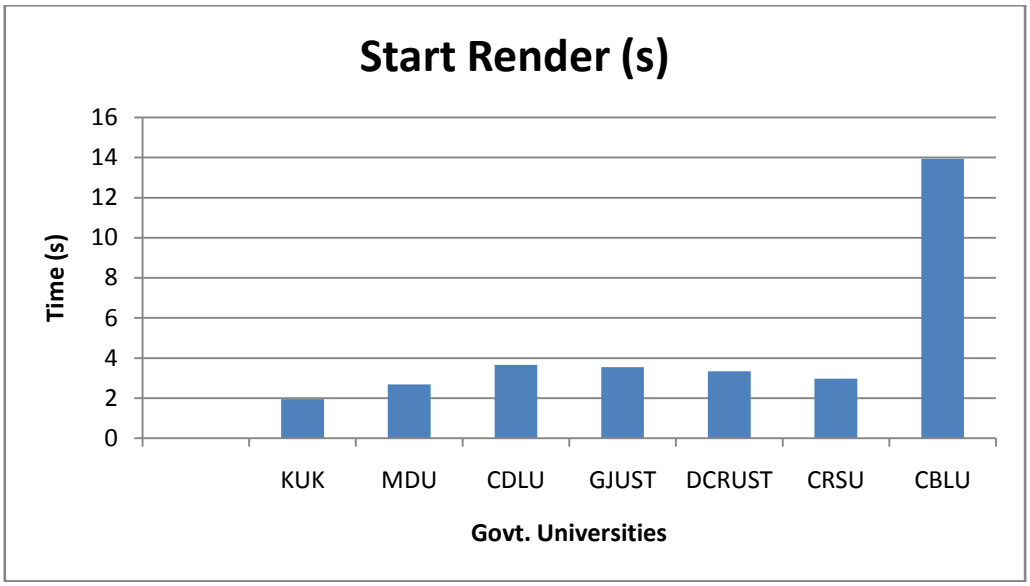
Load Time: It is the time from when user started browsing the webpage until the Document Complete event i.e. when the complete content of the webpage has loaded. The more the load time, the slower is the website. CBLU is found to have the highest load time while KUK the lowest.



First Byte: It is the time interval from when the user started browsing the webpage to the time when first bit of the response from server is arrived. It is commonly known as TTFB (Time To First Byte). All this time is often termed as the *back-end time* and is the amount of time taken by the server while building the page for the user. CBLU is showing highest TTFB while CRSU the lowest.

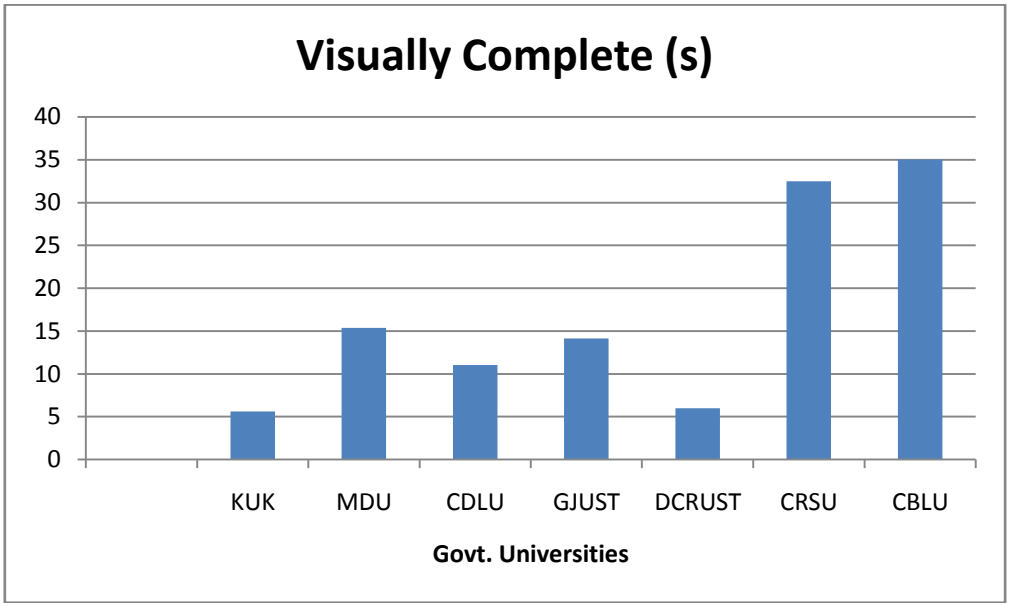


Start Render: The Start Render time is that instant of time when something was displayed first to the browser screen. It is the moment when a blank page first shows something from the sought webpage. It could be the page content, a logo, search box or could be something as simple as a background color but it is the first sign of something appearing on the page for the user. CBLU is found to have the highest start render time while KUK the lowest.



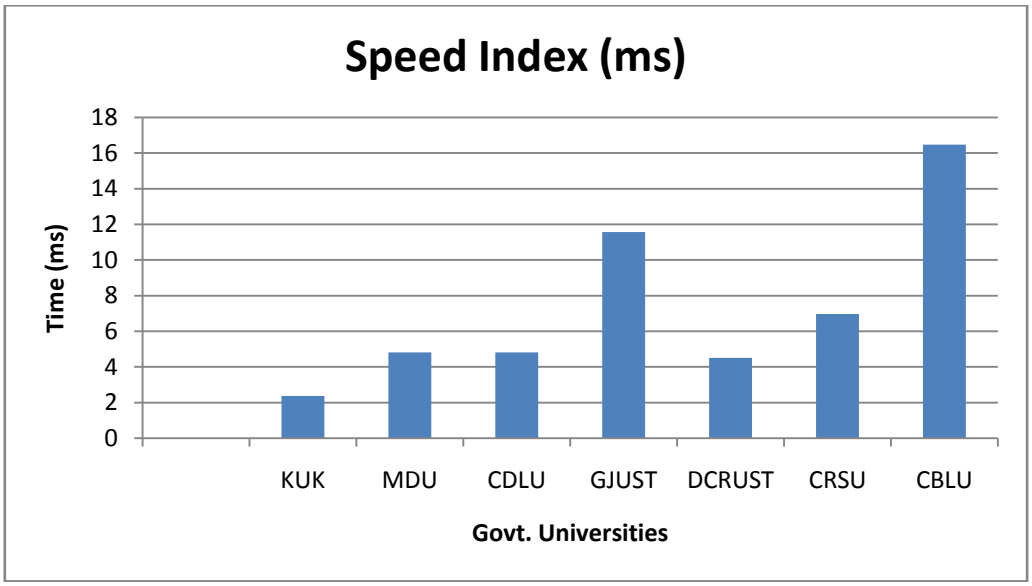
Visually Complete: It is a point-in-time metric that measures the time when the user perceives that the webpage has completely loaded. To user the visual area of the web page has finished loading. It is not same as the actual page load time but shorter since users perceive complete page load before the actual time taken for page to load fully.

The lower value indicates the better performance of the website. Graph shows KUK website takes the lowest time to be visually complete while CBLU the highest. Clearly, the user experience for KUK will be better than that of CBLU.



Along with Speed Index, Visually Complete represents the most accurate picture of the real timing of page load.

Speed Index: This page load performance metric is a calculated metric that represents how quickly the user-visible content is rendered. The Speed Index is the average time at which the visible parts of the webpage are populated on the screen. It depends on the view port size and is expressed in milliseconds. It is helpful in comparing the user-experiences of pages against each other (i.e. before/after optimization, my site vs. competitor, etc) and better when used in combination with the other metrics (such as load time, start render, etc) for a better understanding of site's performance.

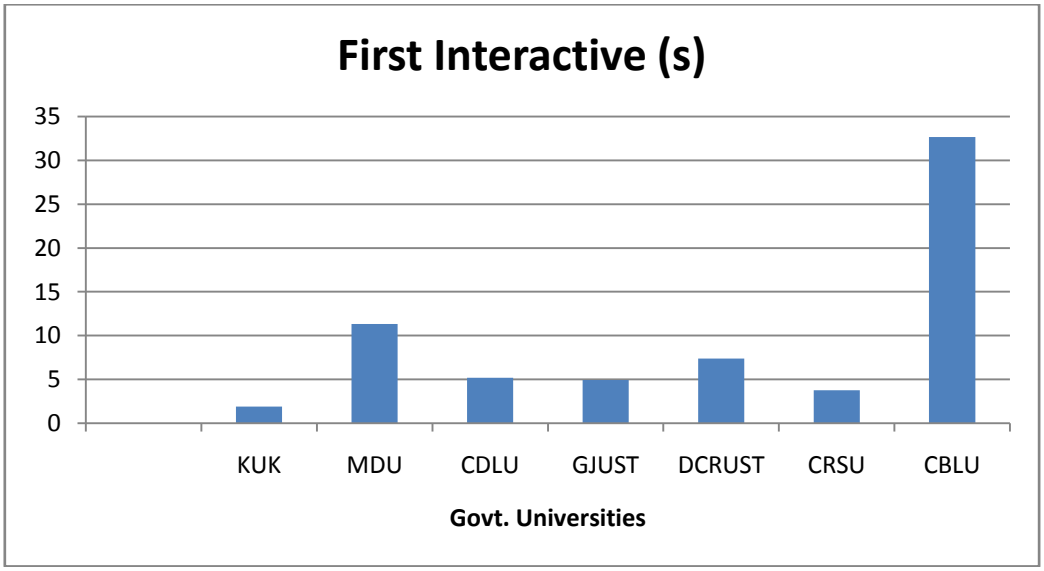


Lower value of speed index results in better user experience, hence performance of the website. It is clear from the graph, KUK is showing lowest speed index while CBLU, the highest.

The *difference* between the Speed Index and Visually Complete time can be well understood with an example. If there is a small icon on a page that takes five seconds to load, but the rest of the page is loaded within two seconds, then *visually complete* will be five seconds since the icon is the last element on the page. But the *speed index* would be near two seconds as the main part of the page loaded within two seconds.

First Interactive: These metric measures the time when the page that is being loaded, will be able to respond to the user's input quickly. There has been a question about whether to consider this metric for monitoring or not as there exists no proper definition of when a page is considered to be *interactive*. Clearly, lower the first interactive time better is the performance of the website.

The first interactive time of CBLU is found to be highest while that of KUK is found to be lowest.



III. CONCLUSION:

Performance metrics from speed perspective have been analysed for the comparative study of seven state universities of Haryana. As per analysis, CBLU is found to have the highest load time while KUK the lowest. CBLU is showing highest TTFB while CRSU the lowest. Again, CBLU is found to have the highest start render time while KUK the lowest. KUK website takes the lowest time to be visually complete while CBLU the highest. KUK shows lowest speed index while CBLU, the highest. Finally, the first interactive time of CBLU is found to be highest while that of KUK is found to be lowest. Further attempts are being made to gain more insight on this analysis for even better comparison.

Future Scope:

Although many speed related key metrics have been considered while carrying out the performance analysis of the aforementioned universities, other metrics falling under the speed perspective may also be explored so as to refine this analysis further. Other universities and organizations may also be considered for performance analysis in future.

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Abha Narwal, et. al. "Speed Perspective for analysing Website Performance of Haryana State Universities". International Journal of Humanities and Social Science Invention(IJHSSI), vol. 8, no. 05, 2019, pp. 74-78.