

Implementing and Analyzing Web Performance Testing for Universitas Terbuka's Website with GTMetrix and Pingdom

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Abstract

A higher education institution's website allows lecturers and students to search for necessary information online. Good web performance is essential to provide better service to users. This research focuses on analyzing and testing the performance of a university website to maximize its efficiency. Performance testing measures a website's effectiveness. In this study, we analyze the website of Universitas Terbuka (UT), known for its distance learning system. The goal is to assess the website's performance using testing tools like GTMetrix and Pingdom, which automatically analyze web performance. These tools provide data on the website's performance, which is then processed into information about strengths, weaknesses, and potential solutions. The outcome includes a comparison of performance metrics from GTMetrix and Pingdom. This research contributes to evaluating UT's website performance and offers insights to help developers enhance and optimize the application to the desired level.

Keywords: Performance testing; universities; GTMetrix and Pingdom Tools.

1 Introduction

A website is a source of information which allows the search for data and information via the internet. It is used by the general public, including employees and students. The performance and loading time of a website determine its quality (Huda, 2021) as these two factors play a critical role in ensuring that users find information more quickly and efficiently. Poor system performance, as identified by delayed responses due to increasing numbers of active users or system crashes, can pose fatal issues when accessing the system because data are generally sensitive (Sarojadevi, 2011).

Universitas Terbuka (UT) implements distance learning as a method to stimulate guided independent learning for all students. Commonly, universities with distance learning must ensure that their system is highly reliable to handle an abundance of users visiting the website. This requires hardware that satisfies the demand of website visitors to ensure a satisfactory browsing experience. Misjudging system capacity can result in either wasted resources or insufficient resources, which may lead to system damage, overload, or other incidents. Decreased system capabilities,

such as delayed responses due to increasing numbers of active leading to server outages, or system crashes, can pose fatal issues.

To address these challenges, website performance testing is needed to improve the services provided to visitors and to facilitate analysis as the initial measure for improving website performance. One way to test website performance is by using GTMetrix (Hidayati, 2022). This tool aids the analysis to improve website performance while reducing loading time. This results in a satisfying experience of navigating the website.

Pingdom is a web performance monitoring tool that analyzes website speed and performance. It provides insights into various aspects of a website's functionality, including load times, server response times, and potential bottlenecks (Yason et al., 2022). Pingdom's reports help identify performance issues and areas for improvement, aiding in optimizing the overall user experience.

Previous research discussed the performance problems of websites associated with Brawijaya University (UB) and Malang State Polytechnic (Polinema) using Jmeter as a tool to assess the two



websites during student registration. The research made explicit the website performance upon the registration for entrance examination and underscored several recommendations for website improvements (Putri et al, 2017). System performance testing was also carried out at universities in Makassar using GTMetrix, marking a performance grade of F with a performance score of 31%, and a structure of 45%. (Mongkau., 2023). In this study, the researchers aim to apply GTMetrix and Pingdom to evaluate the website's performance. Each stage of performance testing requires meticulous analysis.

2 Research Method

This research involved retrieving and studying literature related to performance testing on websites. Data were also collected and analyzed to support the performance test. GTMetrix was deployed to aid in analyzing the results of performance testing and drawing conclusions. The research followed the following steps and designs, as shown in Figure 1.

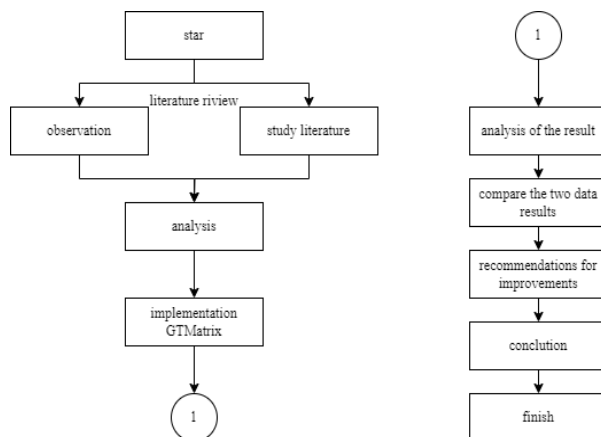


Figure 1. Research Procedure

2.1 Performance testing

Software testing is an important phase of the software development life cycle. It is an important way to evaluate software to test quality (Putri, 2017). One type of testing is Performance Testing which is the process of determining the speed or effectiveness of a computer program network, software or device (Haryanto, 2021). The main goal is testing scalability, availability, and performance to ensure it satisfies the required standard and handle expected loads efficiently.

2.2 GTMetrix

Gtmatrix enabled the testing and evaluation of websites by generating performance scores including scores for page speed, Yslow, and page detail. One of the quality analysis metrics that can be measured by using GTMetrix tool is the optimization of CSS and JavaScript. This measurement aids in improving website performance by optimizing its format, such as removing unused characters and other bugs. GTMetrix has four indicators for assessing website quality. GTMetrix classifies the website performance into grades A, B, C, D, E, and F. Grade A indicates very good performance, while F indicates very poor performance. The present study applies the following rubric for interpreting the scores generated by GT.

Table 1. Score Interpretation in GTMetrix

Colours	Score range	Description
Light green	61%-100%	Good
Red	0%-60%	Poor

In addition, the following score description was also operative in drawing the conclusion of website performance.

Table 2. Score Description in GTMetrix

Aspects	Description
Overall Score	The overall score of website performance is classified into grades A, B, C, D, and so on. Grade A indicates the best performance, while the latter grades demonstrate lower performance.
Performance	The website performance demonstrates the response rate of a website when accessed by a visitor. This is quantified as a percentage in which a higher percentage corresponds to a higher response rate.
Structure	The structure of the website indicates the website design and how well it facilitates the achievement of the desired level of performance. Similar to the website performance, structure is also quantified as percentage.

2.3 Pingdom Tools

Pingdom Tools is a website performance analysis tool that allows users to measure page load times and evaluate various aspects of a website's performance (Wijaya, 2022). By conducting tests from different geographical locations, Pingdom provides in-depth insights into load times and the size of each page element, as well as server response times. The tool delivers detailed reports and recommendations for optimization, such as reducing file sizes and improving caching, which help users enhance the overall user experience and site performance. Although its primary focus is on speed performance, Pingdom Tools also offers an intuitive interface and routine monitoring to track performance changes over time (Suliman, 2020).

2.4 University Website

A university website is an online platform managed by a higher education institution to provide various information related to the university, academic programs, campus activities, news, resources, and services to students, prospective students, staff, and the general public. This study involved two case studies on the UT websites. The description of the Website of Universitas Terbuka is a State University in Indonesia that implements an open and distance learning system. The URL to access UT's website is <https://www.ut.ac.id/>. It contains various information about university information, student registration, study program information and so on.

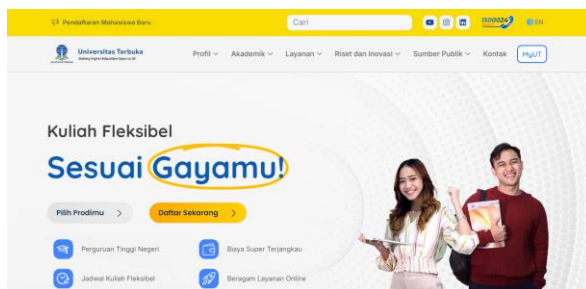


Figure 2. Website UT

3 Results and Discussion

3.1 Performance Testing Using GTMetrix

Performance testing was conducted on the websites of UT using the GTMetrix tool. Performance testing was conducted on August 30, 2024, at 7 PM. The researchers visited both websites, <https://www.ut.ac.id/> respectively. The analysis focused on speed visualization,

performance, browser timing, and history. The results of the comparison of the two websites are presented below.

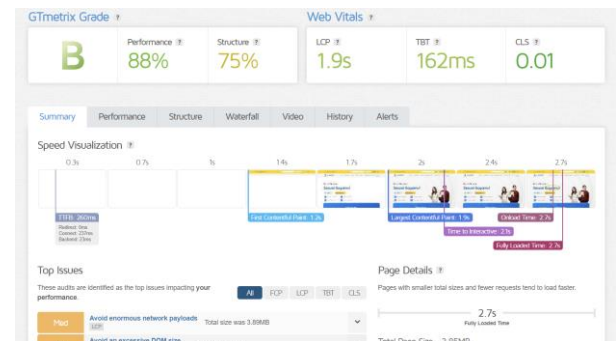


Figure 3. The Results of Performance Testing using GTMetrix

3.2 Performance Testing Using Pingdom

Performance testing using pingdom was conducted on August 30, 2024, at 7 PM. Performance testing using Pingdom resulted in a score of 68%, indicating that there are areas where the website's efficiency could be improved. This score reflects various factors, including page load times, server response times, and the size of page elements. A score of 68% suggests that while the website functions adequately, there are opportunities for optimization, such as reducing file sizes, enhancing caching strategies, and improving server response times. Implementing these improvements could lead to a better user experience and more efficient website performance overall.

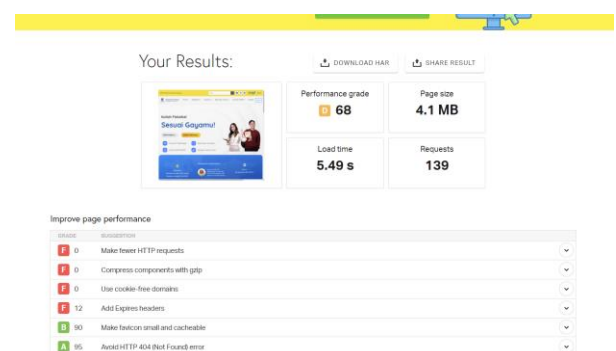


Figure 4. The Results of Performance Testing using Pingdom

3.3 Comparison of Performance Test Results

The performance comparison of the Universitas Terbuka website shows that the performance score using GTMetrix is 88%, while

Pingdom gives a score of 68%. This indicates that although both tools identify areas needing improvement, GTMetrix rates the website's performance slightly higher than Pingdom. The difference in scores may be due to the varying parameters each tool uses for evaluation. However, both scores suggest that there is still room for improvement in the website's performance to achieve greater efficiency.

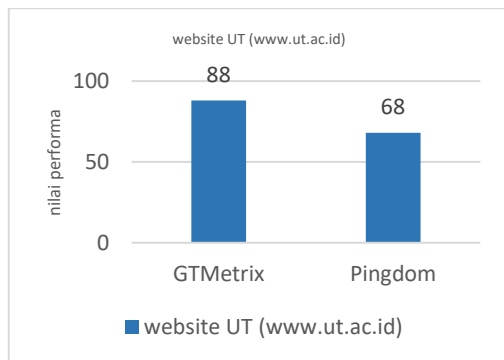


Figure 5. Comparison of Performance Test Results

In website performance testing, Page Load Time measures the total time required for a webpage to fully load until all elements are completely rendered, and it is reported as 2.7 seconds by GTMetrix and 2.11 seconds by Pingdom. Page Size refers to the total size of the webpage, including all its resources like HTML, CSS, JavaScript, images, and media files, with GTMetrix reporting it as 3.85 MB and Pingdom as 4.1 MB. Requests indicate the total number of HTTP requests made to load all resources, with GTMetrix recording 141 and Pingdom 139. Finally, the Performance Score summarizes the overall performance based on factors like load time, responsiveness, and efficiency, with GTMetrix scoring 88 and Pingdom scoring 68. The results can be viewed in the table below.

Table 3. Comparison table of GTMetrix and Pingdom results

No	Testing	GTMetrix	Pingdom
1	Page Load Time	2.7s	2.11 s
2	Page Size	3.85MB	4.1 MB
3	Requests	141	139
4	Performance Score	88	68

In summary, while both tools provide useful insights, GTMetrix and Pingdom show slight differences in their measurements of page load time, page size, and number of requests. However, GTMetrix's higher performance score suggests a better overall assessment of the webpage's performance compared to Pingdom.

3.4 Recommendation for Development

Based on the results of performance testing, the research proposed the following recommendations:

- Avoid the use of excessive scripts or extensions to maintain the stable performance of the websites.
- Improve database & server performance supportive of stable website performance.
- Improve hosting to invite more visitors and use larger resources in managing Virtual Private Server (VPS).
- Reduce the size of images on the website to prevent slow website performance, as characterized by heavy load.

4 Conclusion

The conclusion of this study is that the Universitas Terbuka website's performance requires improvement to achieve optimal efficiency. Testing with GTMetrix and Pingdom revealed different scores, with GTMetrix giving a score of 88% and Pingdom 68%. This discrepancy suggests that each tool identifies different areas needing enhancement, but overall, the results indicate that there is room for performance improvement. By addressing the issues highlighted by both tools, the website's performance can be enhanced, leading to better service delivery and a more optimal user experience.

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