

IMPLEMENTING AND SCALING SELENIUM GRID FOR CROSS-BROWSER TESTING IN DOCKER ENVIRONMENTS

Srikanth Srinivas¹ & Dr Rambabu Kalathoti²

¹The University of Texas at Dallas, Richardson, TX 75080, United States

²Department: Computer Science and Engineering, College: Koneru Lakshmaiah Education Foundation

ABSTRACT

Modern web application testing requires robust solutions for validating functionality across multiple browsers and platforms. Implementing and scaling Selenium Grid in Docker environments offers a dynamic and efficient approach to cross-browser testing. This abstract outlines the integration of Selenium Grid with Docker to enable parallel execution of test cases on diverse browser configurations. By containerizing Selenium nodes, organizations can streamline testing processes, reduce infrastructure costs, and improve overall test coverage. The approach leverages Docker's lightweight containers to isolate testing environments, ensuring consistency and repeatability of test results. Furthermore, scaling the Selenium Grid becomes simpler as containers can be rapidly deployed, replicated, and managed across various hosts. This framework addresses challenges such as environment configuration, resource allocation, and the synchronization of test executions. Emphasis is placed on the automation of deployment processes, which reduces manual overhead and minimizes human error. Case studies and experimental results demonstrate that this method not only accelerates testing cycles but also enhances the reliability of test outcomes. By integrating modern containerization technology with Selenium Grid, teams can achieve a more agile testing workflow. Overall, the proposed system supports continuous integration and continuous delivery (CI/CD) pipelines by providing a scalable, cost-effective, and reliable cross-browser testing solution. This paper further discusses best practices, performance metrics, and potential limitations, offering insights for organizations looking to optimize their software testing strategies in a rapidly evolving digital landscape. Future research will expand on these findings and further validate the benefits of containerized testing frameworks in diverse industrial applications, thus ensuring scalability.

KEYWORDS: Selenium Grid, Docker, Cross-Browser Testing, Containerization, Automation, CI/CD, Scalability, Web Testing

Article History

Received: 19 Apr 2025 | Revised: 22 Apr 2025 | Accepted: 26 Apr 2025
