

Comparison Analysis of Performance and Resource Management of Backend Frameworks Golang, Node.js, Python in API Web Services

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ABSTRACT

The increasing number of internet users in Indonesia demands web services that are responsive and well-optimized. One of the key factors influencing web service performance is the backend framework. This study compares the performance of three frameworks: Gin (Golang), Express (Node.js), and Flask (Python) in terms of response speed and CPU and RAM usage using Apache JMeter with load testing methods. The results show that Express is the most stable framework, with an average response time of 2.51 seconds, CPU usage of 3.79%, RAM usage of 3.20%, and a relatively low failed request rate. Gin performs best in GET methods, with the lowest RAM consumption 0.46% and a response time of 4.07 seconds, but experiences performance drops in POST requests. Flask, despite having a response time of 3.13 seconds, has a high failed request rate of 5,445, making it less suitable for applications handling a large number of requests. In conclusion, the choice of backend framework should be based on the specific needs of the application. Express is the best overall choice due to its stability in handling various levels of API complexity. Gin is more suitable for data-centric applications with a large number of users, while Flask is better suited for small-scale applications with limited request traffic.

Keywords: *Web Service, Backend Framework, Load Testing, Golang, Node.js, Python, JMeter*