

# Desain dan Implementasi Middleware Layer Untuk Kendali Mobil Listrik Jarak Jauh Dengan Protokol HTTP Dan MQTT

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## ABSTRACT

Research on electric vehicles is currently continuing and there are more and more new discoveries related to technological developments in electric vehicles. Long-distance use of electric vehicles requires a reliable and efficient control system. The middleware layer can be applied as a link between the electric vehicle and the remote control system so that the user and the controlled electric car system are safer and more efficient because it implements an intelligent monitoring and control system based on the HTTP and/or MQTT protocol in the middleware layer. The aim of designing and implementing a middleware layer for remote electric car control with HTTP and MQTT protocols is to create a more secure, reliable and efficient control system. This middleware layer includes monitoring, control, and communication systems, among other components. The HTTP protocol is used for data communication using request and response methods between clients and servers, while MQTT is used to send data in publish and subscribe format.

In general, this research goes through several stages. The first stage, Identification of Research Objectives. This research aims to examine the effectiveness of the design and implementation of a middleware system in remote control of electric vehicles using the HTTP and MQTT protocols. Another goal, to identify the advantages and disadvantages of each protocol and compare their performance. Second stage, Research Design. This research uses a quantitative research design with a case study approach. Testing was carried out by sending several commands from a remote controller to the electric vehicle (in this research using simulation of external modules such as relays and lights) and observing the response given by the vehicle. Third stage, Data Collection. Data collection is carried out by testing the response of the middleware system to commands sent from the remote controller. Fourth stage, Data Analysis. Data were analyzed using descriptive analysis techniques. Data analysis will also be performed to compare the performance of each protocol and determine its advantages and disadvantages. Fifth stage, Interpretation and Reporting of Research Results. The research results will be presented in the form of a research report equipped with tables, graphs and narratives to facilitate understanding. Sixth stage, Evaluation of Research Results. An evaluation will also be carried out to assess the advantages and disadvantages of the research design and methods used so that it can provide input for further research.

Testing and analysis of the performance of using various HTTP and MQTT Protocol servers based on latency data has been carried out. The HTTP server is used by thingspeak and personal websites. The test results of the two http servers show that the Thingspeak server has more varied latency values and tends to have greater latency compared to private web servers. Meanwhile, for studying the MQTT protocol using the MQTT Server HiveMQ, EMQX, and Adafruit, it shows that the three MQTT servers have stability, fast responsiveness, and low latency consistency and are able to provide reliable and efficient communication services.

Kata Kunci: *middleware application, REST, API, ESP32 microcontroller*