

Research on MQTT protocol in the Internet of Things network and building an experimental application

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Abstract: This study investigates the MQTT (Message Queuing Telemetry Transport) protocol within the Internet of Things (IoT) ecosystem and develops a practical experimental application to validate its performance. As a lightweight publish-subscribe messaging protocol, MQTT is particularly suited for constrained environments characterized by limited bandwidth, high latency, and unreliable networks. The research systematically analyzes MQTT's architecture, including its Quality of Service (QoS) levels, topic-based filtering, and session management mechanisms. An experimental IoT system was designed and implemented, integrating sensor nodes, an MQTT broker, and client applications to simulate real-world data transmission scenarios. Performance metrics such as latency, throughput, and packet loss were evaluated under varying network conditions and QoS configurations. The results demonstrate that MQTT maintains reliable communication with minimal overhead, making it highly effective for low-power, resource-constrained IoT devices. The findings provide practical insights into protocol optimization and deployment strategies, confirming MQTT's suitability for scalable and efficient IoT solutions. This work contributes to the advancement of robust communication frameworks in the rapidly expanding IoT landscape.

Keywords: MQTT, Internet of Things, communication protocol, experimental application