Development and Analysis of Turnstile Gate Monitoring System Based on Message Queuing Telemetary Transport (MQTT) at PT Bumi Suksesindo
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ABSTRACT

PT Bumi Suksesindo is a gold mining company designated as a National Vital Object, thus requiring an efficient and reliable security system. One of the main challenges is the limitation of turnstile gate devices in displaying user identity information in real-time. To address this need, this study develops a monitoring system based on the Message Queuing Telemetry Transport (MQTT) protocol, which is lightweight and efficient for real-time data communication. This study evaluates MQTT performance at three levels of Quality of Service (QoS 0, 1, and 2) by analyzing five technical parameters: CPU usage, throughput, delay, jitter, and packet loss. The testing scenario involved a 10-minute data transmission over a local network. The results show that QoS 2 offers the best result in data transmission, with a delay of 5.80 ms, jitter of 25.99 ms, and 0% packet loss. Based on TIPHON standards, QoS 2 achieved a network quality index score of 3.67, which is categorized as "Excellent" across all parameters. Additionally, CPU usage under QoS 2 was only 0.85%, indicating very low and efficient resource consumption. The selection of QoS 2 aligns with the needs of the turnstile gate monitoring system, where the protocol mechanism does not tolerate data duplication, thereby ensuring data accuracy and integrity. The monitoring system was developed using the C# programming language and connected to a SQL Server database as the publisher. Meanwhile, the monitoring application was built using Kotlin on Android devices as the subscriber. Both systems were successfully integrated using the MQTT protocol and tested using the blackbox testing method, which showed that all features functioned properly and stably. This study concludes that the developed system is capable of supporting efficient and real-time access authorization requirements within PT Bumi Suksesindo.

***Key words**: Turnstile Gate, Access Security, MQTT, Monitoring System, National Vital Object, Quality of Service (QoS), Push Notification.*