

Research evaluating data collection protocols for smart water meter networks

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Abstract: This study evaluates data collection protocols for smart water meter networks, focusing on performance metrics critical to large-scale deployment. Given the constraints of limited bandwidth, energy efficiency, and data reliability in urban water infrastructure, we systematically compare several communication protocols, including LoRaWAN, NB-IoT, and MQTT. Through a combination of simulation and real-world testing in a pilot network, we assess key parameters such as packet delivery ratio, latency, power consumption, and scalability. The results indicate that while LoRaWAN offers superior energy efficiency for sparse, low-frequency reporting, NB-IoT provides higher reliability and lower latency for dense urban environments requiring near-real-time data. MQTT, when paired with appropriate physical layers, demonstrates flexibility in data management but introduces higher overhead. The findings provide a comparative framework for selecting optimal protocols based on specific network density and reporting requirements, contributing to the development of more robust and efficient smart metering infrastructures.

Keywords: data collection protocol, smart water meter network, performance evaluation, IoT