Optimizing Communication Protocols in Industrial IoT Edge Networks: A Review of State-of-the-Art Techniques

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Abstract: *The IIoT is revolutionizing contemporary industry by facilitating intelligent decision-making and real-time data sharing through networked systems and devices. An in-depth examination of the communication protocols and edge computing architectures vital to IIoT applications is provided in this study. Based on delay, it assesses MQTT, CoAP, HTTP, DDS, and AMQP, which are important protocols, bandwidth efficiency, reliability, and security to determine their suitability for diverse industrial scenarios. Additionally, it examines the integration of edge computing to offload processing from centralized cloud systems, thereby reducing latency and improving scalability. The study also explores enablers such as Automated Guided Vehicles (AGVs), Rule-Based Path Allocation (RBPA), and RFID, along with critical aspects including routing, task scheduling, data storage, and cybersecurity in edge-enabled IIoT networks. Their findings underscore the importance of protocol selection and edge orchestration in building resilient, interoperable, and efficient IIoT infrastructures. This study concludes with discussions on open challenges and future directions for standardization and intelligent protocol adaptation in edge-centric IIoT ecosystems.*

Keywords: Industrial Internet of Things, Message Queuing Telemetry Transport, Automated Guided Vehicle, Robot-Based Process Automation, Communication Protocols, MQTT, CoAP, DDS, AMQP, AGV, Task Scheduling.

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503

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