A Permissioned Blockchain Approach for Real-Time Embedded Control Systems

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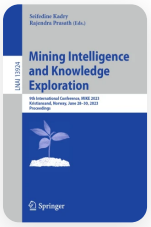

Mining Intelligence and Knowledge Exploration

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Abstract

In real-time embedded control (RTEC) systems, sensors collect data which is processed and sent to different control nodes. RTEC deployments have numerous applications in diverse verticals like industrial control, healthcare, and vehicular networks. In such cases,

a trusted and verifiable control is required, particularly when the data is kept in a distributed manner, and is exchanged over open wireless channels. Thus, blockchain (BC) is a viable option to store the sensor data between RTEC systems, which maintains a trusted ledger of associated operations. Existing works have not focused on the integration of BC in RTEC systems. Motivated by the gap, the paper presents a systematic approach to integrating BC in RTEC ecosystems. We present a reference architecture and discuss the device registration, the hyperledger fabric set up, and the task offloading strategy between edge gateways and cloud nodes, and present the performance analysis of the architecture. The discussion of open issues and challenges also highlights the practical implications of the approach, emphasizing its importance for future deployments of real-time embedded control systems.

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