ACEIOT/KEEP Seminar

Date: 16th September 2022

Time: 10h30 AM -Kigali, Rwanda Time / 08h30 AM Accra, Ghana Time

Mode: Virtual

Containerized Architecture Performance Analysis for IoT Framework Based on Enhanced Fire Prevention Case Study: Rwanda

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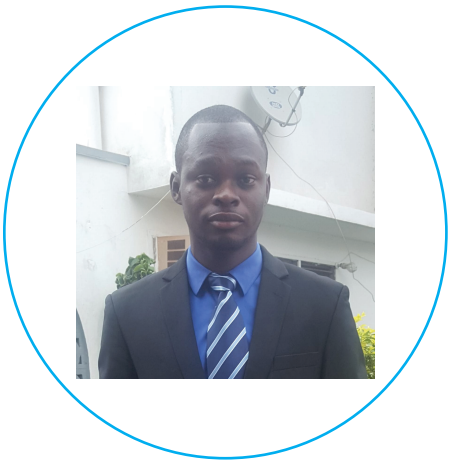
Nowadays, building infrastructures are pushed to become smarter in response to desires for the environmental comforts of living. Enhanced safety upgrades have begun taking advantage of new, evolving technologies. Normally, buildings are configured to respond to the safety concerns of the occupants. However, advanced Internet of Things (IoT) techniques, in combination with edge computing with lightweight virtualization technology, are being used to improve users' comfort in their homes. It improves resource management and service isolation without affecting the deployment of heterogeneous hardware. In this research, a containerized architectural framework for support of multiple concurrent deployed IoT applications for smart buildings was proposed. The prototype developed used sensor networks as well as containerized microservices, centrally featuring the DevOps paradigm. The research proposed an occupant counting algorithm used to check occupants in and out. The proposed framework was tested in different academic buildings for data acquisition over three months. Different deployment architectures were tested to ensure the best cases based on efficiency and resource utilization. The acquired data were used for prediction purposes to aid occupant prediction for safety measures as considered by policymakers.

Adaptive Storage Optimization Scheme for Blockchain-IIoT Applications using Deep Reinforcement Learning



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Blockchain-IIoT integration into industrial processes promises greater security, transparency, and traceability, particularly in collaborative production systems such as food supply chains. However, this advancement faces significant storage and scalability issues with the existing blockchain technology. The use of cloud resources to alleviate this problem has been extensively studied in recent years. Nonetheless, block selection remains a substantial challenge associated with cloud resources and blockchain integration. This paper proposes a deep reinforcement learning (DRL) approach as an alternative to solving the block selection problem, which involves identifying the blocks to be transferred to the cloud. We propose a DRL approach to solve our problem by converting the multi-objective optimization of block selection into a Markov decision process (MDP). We design a simulated blockchain environment for training and testing our proposed DRL approach. We utilize two DRL algorithms, Advantage Actor-Critic (A2C), and Proximal Policy Optimization (PPO), to solve the block selection problem and analyse their performance gains. PPO and A2C achieve 47.8% and 42.9% storage reduction on the blockchain peer, respectively. In addition, the performance of our proposed approach is compared to that of the Advanced Time-variant Multi-objective Particle Swarm Optimization (AT-MOPSO). The slowest DRL algorithm, A2C, achieves a run-time 7.2 times shorter than the AT-MOPSO, which validates the gains introduced by the DRL algorithms. The simulation results further show that our DRL algorithms provide an adaptive and dynamic solution to the time-sensitive blockchain-IIoT environment.