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PERFORMANCE BENCHMARKING OF HYPERLEDGER FABRIC ON HETEROGENEOUS HARDWARE FOR IOT APPLICATIONS

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Zulkarnain, Muhammad Muaz^a; Ramli, Nabilah^a✉; Nordin, Anis Nurashikin^b

^aDepartment of Mechanical and Aerospace Engineering, Kuliyah of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia

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Abstract

Hyperledger Fabric (HLF), a widely used open-source private blockchain, has garnered attention for its ability to enable blockchain in Internet of Things (IoT) applications. Embedding HLF nodes within IoT devices enables smart contract integration for secure and automated communications, thereby reducing reliance on intermediaries. However, resource-constrained IoT devices often face challenges with complex operations due to their limited processing power. While HLF deployment on single-board computers (SBCs) like Raspberry Pi has been explored, comprehensive performance evaluations across diverse hardware setups in a heterogeneous blockchain network are limited. This study benchmarks HLF performance on a network comprising SBCs with ARM architectures (Cortex-A72 and Cortex-A76) and laptops with Intel Core i7 and Intel Celeron processors. Using Hyperledger Caliper, key performance metrics, including throughput, latency, CPU usage, and memory consumption, were measured. Results show that high-throughput applications are best supported by high-end processors capable of handling multiple clients, achieving up to 1,148.3 TPS. In contrast, SBCs efficiently handle moderate transaction loads from single clients with minimal latency increases. These findings demonstrate the adaptability of HLF across varied hardware configurations, provided a proper network architecture setup, supporting its deployment in diverse IoT environments. Copyright (c) 2025 IIUM Press. This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

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Corresponding author

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Authors (3)

Zulkarnain, Muhammad Muaz^a

Ramli, Nabilah^a✉

Nordin, Anis Nurashikin^b