

ABSTRACT

Efficient data querying in Hyperledger Fabric-based systems remains a significant challenge due to the decentralized architecture and limited query flexibility. Even though the Hyperledger Fabric offers mechanisms such as Mango Query and composite keys, those mechanisms have their own limitations, in which Mango Query lacks performance on multicondition searches, while composite keys are rigid and context-dependent. Moreover, the reliance on historical or off-chain data poses consistency and trust issues in real-time applications. To overcome these limitations, this paper proposes a query strategy that dynamically chooses between Mango-based indexing and composite key access, depending on the number of query conditions, while operating entirely on a world-state database. Implemented in a simulated supply chain environment with 10,000 and 50,000 records, the proposed method achieves substantial latency improvements of over 90% in multicondition scenarios, while also supporting flexible query patterns including warehouse, timestamp, and responsible person. Compared to basic queries without indexing, this approach offers a scalable and efficient solution for permissioned blockchain environments, especially in supply chain systems where fast and accurate data retrieval is critical.

Keywords: Hyperledger Fabric, Data Retrieval, Supply chain, Composite Key, Mango Query.