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## Blockchain Message Broker: Secure Data Transfer with a Two-Layer Hyperledger Fabric Platform

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Nowadays, Secure Data Transfer (SDT) is a crucial part of data exchange processes, especially in cross-organizational environments. Such data exchanges often rely on untrusted public networks, which are known to suffer from data loss, corruption, and even unauthorized data access.

To address these challenges, we propose the use of a blockchain-based system with a message broker-like architecture. This architecture offers a convenient message delivery interface while relaxing data size limitations through the use of off-chain storages.

In this article, we present a prototype of a system based on the architecture mentioned above, built on the Hyperledger Fabric platform. The prototype follows a two-layer model, implemented using the support for multi-channel networks provided natively by the underlying blockchain platform. The first layer consists of multiple small PBFT clusters (referred to as partitions), which are used directly for message delivery. The second layer organizes these partitions into larger RAFT-managed clusters (referred to as topics), which handle system management and asynchronous data replication.

In addition to the blockchain core, the prototype includes connector applications that allow counterparties to interact with the blockchain, and off-chain storage systems used to store the actual data being transferred. The connector applications are implemented as Java-based microservices. PostgreSQL databases and MinIO object storage are used as the off-chain storage components.

All data transfer logic is implemented via Java-based chaincodes, which are responsible for orchestrating the data transfer process and manipulating blockchain ledgers. These ledgers serve as immutable logs of all data transfer processes between counterparties and can be used for auditing purposes.

As a result, the presented prototype offers enhanced fault tolerance and scalability compared to existing blockchain approaches and traditional message brokers.

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