# A Perspective Review on Hyperledger Fabric Access Control System

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### Abstract

Blockchain technology has enormous potential and is currently seen as a new technical trend with a quickening growth rate. Supply chain, health care, and finances are just a few of the application areas wherein blockchain-based systems are gaining interest. Whenever it comes to public and private management, data integrity is crucial and becoming more essential. Data integrity can be achieved in an access control system which is built on the blockchain. By using encryption protocols, access controls, and cryptography techniques, the Hyper ledger Fabric is created to be safe against unauthorised access and use. Systems for access control exist to safeguard resources against unwanted access. Platforms for blockchain systems, such as Hyperledger Fabric, are built with data integrity, complete transparency, and confidentiality. This article provides an in-depth analysis of a Hyperledger enterprise blockchain technology.

**Keywords:** Blockchain, public and private management, data integrity, Hyperledger Fabric.

## 1. Introduction

Blockchain is a distributed community of network nodes that maintains an irreversible transaction ledger. By applying operations that have been verified by a consensus procedure and arranged into blocks with a hash that links each block to the one before it, each of these nodes keep a copy of the ledger. In the assets trading and information exchange sectors, the introduction of blockchain technology is a competitive technology that has the potential to transform a wide variety of industries, professions, companies, industries, and even aspects of


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life [1]. With several significant advantages over other preferred blockchain platforms, Hyperledger Fabric is an open-sourced shared Distributed Ledger technology system built for usage in business contexts [2].

Fabric's extremely modular and adaptable design enables innovation, adaptability, and optimization for a variety of industrial use cases like finance, banking, healthcare, human resource management, supply chain, and even the delivery of digital music [3]. This paper's aim is to give a thorough analysis of the literature on blockchain for a variety of applications using Hyperledger Fabric [1].

### 1.1 Blockchain –An overview:

It's important to first realize the fundamentals, classifications, types, and the advantages of blockchain in order to comprehend blockchain technologies and how they benefit applications.

The technology behind a variety of digital crypto currencies is called blockchain. Blockchain is a network of decentralised, distributed blocks used to store the information with digital signatures [4]. Transactions are more secure and tamper-proof thanks to the characteristics of blockchain, including decentralisation, immutability, transparency, and auditability. Blockchain technology has applications outside of cryptocurrencies, including managing risk, healthcare facilities, and financial and social services [5].

### 1.2 Permissioned and Permission-less blockchain:

Permissioned blockchains execute a blockchain among a group of known, identifiable, and frequently validated participants using a governance architecture that produces a certain level of trust. A permissioned blockchain offers a means of securing communications between a collection of entities who have a common objective but may not fully trust one another. A blockchain network can employ more established crash fault tolerance or byzantine faults tolerance consensus methods without the need for expensive mining by depending on the identification of the participants.

Permission-less public blockchain network systems are frequently used to describe blockchain. Each participant in this type of blockchain technology is able to contribute a new block to the ledger while maintaining their pseudonymous real-world identities [7].

### 1.3 Subtypes of block chain:

Public, private, consortium, and hybrid blockchain networks are the four basic subtypes of blockchain networks [6].

### 1.4 Hyperledger Fabric:

Hyperledger Fabric (HLF) is an open-sourced project from the Linux Foundation for blockchain platform. An enterprise-level permissions blockchain network is called Hyperledger Fabric. It is composed of numerous distinctive groups or individuals that collaborate with one another to achieve a common goal. Using fabric certificate authority, each fabric member can configure one or more authorised peers to use the network, and all peers are appropriately allowed.

The channel-creation feature of Hyperledger Fabric enables a collection of users to construct their own transaction ledger. This is a crucial choice for networks because some users can be rivals and every action they make need not be known to all users — like a special price provided to some users but not others. If two players combine to construct a channel, only those two have duplicates of the record for that channel [16-18].

### 1.5 Transaction flow of Hyperledger Fabric:

Each transaction in HLF goes through discussion to reach the process of execution, order and validation phase [8]. The transaction is started by the client. A request proposition is initially made to call a chain code function. The client then signs the proposal and submits it to the channel where the chain code is being used. The client anticipates receiving several endorsements in accordance with the chain code endorsement policy.

**1.5.1 Execution Phase:** This phase's primary goal is to approve the transactions. The application client initiates this step by sending a transaction proposal to the peer endorsing parties. The signature is verified by the endorsing peer. To accomplish this, all endorsing peer perform the necessary validity checks on the client's permission, authenticity, well-formed, and replay protection. If every check is successful, the peers execute the transaction towards their own key-value storage, and they then create an acknowledgment comprising the read-write sets that were generated as a result of the code function execution. All of these values

are then signed by their peers and delivered back to the customer as a confirmation of the recommendation or proposal. At this time, there are no changes made to the ledger.

**1.5.2 Order Phase**: Following receipt of all endorsement, a client reviews, compares, and confirms that all conditions as outlined in the endorsements and policies of the chain code have been met. The client does not make an ordering request for a read operation. The endorsements are combined into transactions and sent to the delivery company by the peers if the order is for a code invocation, or a write. The transactions are then confirmed and ordered in accordance with the channel.

**1.5.3 Validation Phase:** All the ordered transactions included within the block are sent to all peers in the channel after validating each transaction and committing it. In accordance with the endorsing policy, the peers verify the transaction, and if all checks are successful, the peers include the matching blocks to the ledger. Each peer must formally commit the action. Only a specific subgroup of peers inside the channels are allowed to do the endorsement; these peers are referred to as endorsing peers [8].

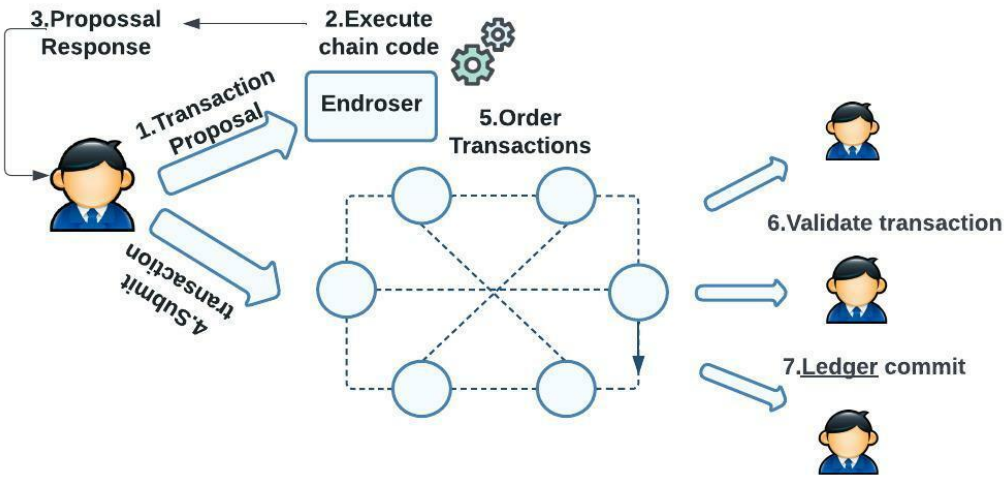


**Figure 1.** Process flow on Hyperledger fabric access control system

## 2. Related Works

Article [9] suggested a blockchain-based access management system for the Internet of Things called fabric-IoT that was built on the Hyperledger Fabric blockchain platform. The system included three different types of smart contracts such as, Device Contracts, Policy

Contracts, and Access Contracts. Device Contracts offer both ways; a way to query the URL of source data created by devices as well as a way to store it.

Paper [10] suggested a permissioned blockchain-based hyperledger fabric and composer-based emergency access control management system. The emergency conditions and time period for such quick access Personal Health Records (PHR) data objects were described in the system using smart contracts, and patients could set some restrictions for managing PHR rights. Using the hyperledger composer, the framework's performance was evaluated in terms of response time, confidentiality, security, and accessibility.

Article [11] focused on the federated data sharing system with role-based access control and multidimensional user authorization based on blockchain. The coloured currency was used to define the user's authority in multiple dimensions, and decentralised access control decisions were made through into the automated execution of smart contracts. This effectively increased the mechanism's robustness and enhanced the performance of security decisions. The Hyper Ledger Fabric platform serves as the foundation for the system.

Regular protection of student records is required for access safety and security management. The blockchain system can enable services for access control, security, confidentiality, and exchangeability. Although the Hyperledger Fabric blockchain has a scalable modular architecture, many configuration factors have an impact on how quickly transactions can be accessed [12].

All businesses in the supply chain have an impact on data reliability tracing for transactions involving agricultural products. Transaction data management is non-transparent and unreliable in traditional centralised product transaction management since data are only stored in one entity in the supply chain. Blockchain, which uses a hash function to join transfer protocol blocks into a distributed, tamper-proof chain ledger, may be able to help with the issue. However, there is still room for improvement in blockchain’s data access performance. The decentralised tracking system for agricultural goods used Hyperledger Fabric as its foundational technology, and its efficiency was improved by using a Radis-based data structuring approach [13].

In the Internet of Things, paper [14] introduced the IoT-chain security authentication system, which offers attribute-based secure preparatory stage on the Hyperledger blockchain

platform. There are three different types of chain codes in the system: access codes, device codes, and policy codes.

Article [15] introduced the popular permission Blockchain Fabric towards the usage with smart home services. Smart home gadgets are becoming much more prevalent along with the demand for smart home services. While this is happening, security issues with services and applications are becoming more significant. A smart home security management system based on fabric has been created. The smart house may govern access to and the security of smart home gadgets based on this system. The experimental results demonstrated that the system performs at its peak when there are less than 6000 smart home devices registered concurrently.

## 3. Benefit of Hyperledger Fabric Access Control System

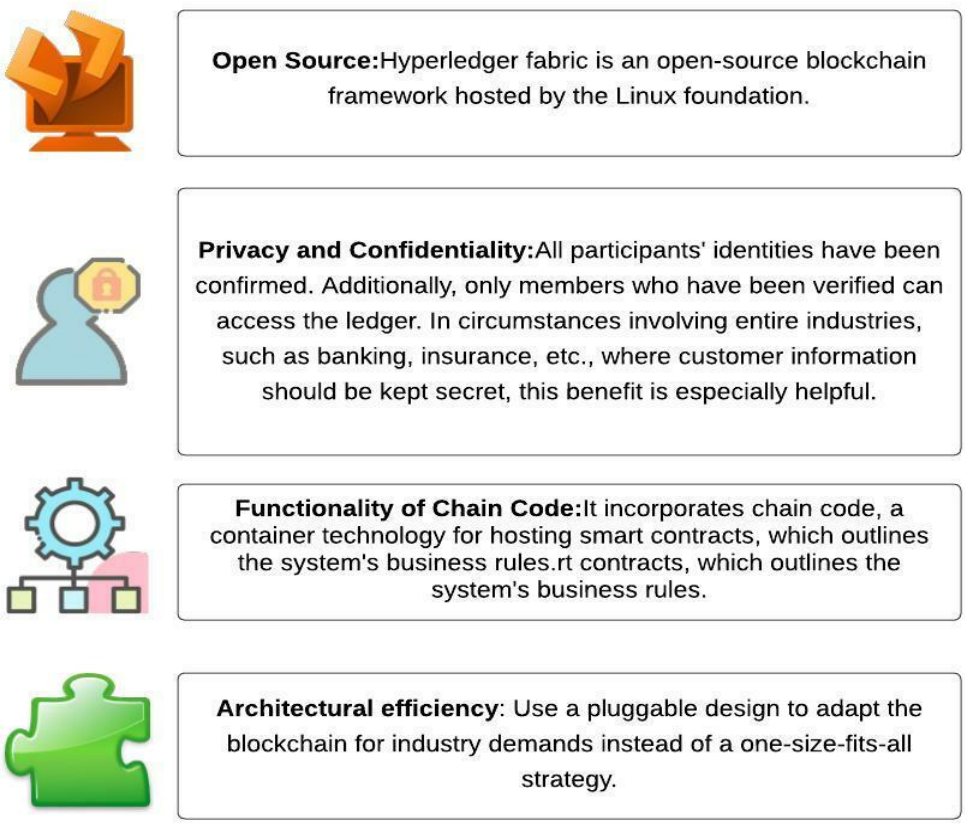


**Figure 2.** Benefits of Hyperledger Fabric System

## 4. Conclusion

On managing blockchains, Hyperledger Fabric is a distributed operating system that is extensible and modular. The application of blockchain technology to the supply chain,

healthcare, cyber security, agriculture products, and other sectors is not a novel concept and is actually one of the most promising areas of current research. To develop more useful and effective systems that can fully utilise the capabilities of blockchain and achieve desired goals, more study and analysis are still needed in the area of Hyperledger fabrics blockchain.

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