Research on Real Estate Transaction Platform Based on Blockchain Technology

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Abstract: This paper analyzes the current status of real estate transactions in China and puts forward some shortcomings. In response to these shortcomings, a real estate transaction platform based on blockchain technology is proposed. This platform uses the Hyperledger Fabric platform to effectively connect purchasers, sellers, financial institutions and government departments. Firstly, the whole transaction process of the platform is proposed. Then, the design framework of the system is proposed and the implementable scheme is given. At last, this work summarizes some points of the program, and points out the shortcomings and difficulties in the future work.

1. Introduction

In recent years, with the continuous rise of nationwide house price, the house has been the top priority of each family and the focus of the society. In 2013, the executive meeting of the State Council decided to integrate the real estate registration responsibilities, established a unified registration system for real estate. In 2014, the State Council promulgated The Interim Regulations on real estate registration. All of these made real estate become a hot topic in the whole country. The real estate transaction is usually divided into the first-hand house transaction and the second-hand house transaction. There are many transaction steps of second-hand house. When the real estate registration is implemented, the general transaction steps of second-hand housing are signing the second-hand housing sales contract, paying taxes, applying for real estate transfer registration. If there is a loan demand, the second-hand house can be used for the second-hand house transaction. The contract of house sale or the certificate of the non-moving property right should be processed by the bank or other financial institution. And the mortgage formalities is deal with the real estate registration department. Before that, most of the purchasers and sellers have to find each other through intermediary agencies. After the series of discussions, they can finally sign a contract in the transaction department. The number of links and time has decreased with the reform to streamline administration, delegate powers, and improve regulation and services. However, there are still many risks for both parties. First of all, the transaction between the two parties is transaction through intermediary. The intermediary service agencies in the market are uneven. The information between the purchaser and the seller is extremely asymmetric. The intermediary may earn the difference in the middle. Secondly, it is difficult for the seller to prevent the information which provided by the house from being genuine. Also, there may be a situation in which one house is sold more. At the same time, the general purchaser is rarely paid in full, which makes it possible for the seller to refuse the balance after the completion of the real estate transfer. In addition, it is difficult for the purchaser to know whether the real estate has restrictions unless inquiring to the real estate registration agency, such as seizure, mortgage. Of course, there may
be risk in subsequent loans from banks to other financial institutions. But this is not the key problem to be solved in this paper, which will not be described in detail. Thus, in order to develop the real estate industry more benign, we need a decentralized, traceable and transparent data transaction platform [1].

Blockchain, as a non-tamperable distributed decentralized ledger, its centralization and consensus mechanism can effectively solve the shortcomings of traditional real estate transactions [2]. At present, there are three main directions for the research of blockchain in the field of real estate at home and abroad: (1) Building a platform for information sharing of real estate blockchain, breaking the data barrier between administrative departments, allowing data to run instead of applicants. At present, most domestic E-government information platforms, such as the blockchain information sharing platform for real estate in Loudi City, Hunan [3], the inclusive financial platform of Nanjing. (2) Put real estate on the blockchain platform, and use property rights for real estate. Smart contracts are distributed to different people, reduce the investment threshold and disperse the investment risk. But the application is controversial in various aspects, such as the I-House Token in US [4], domestic Kaka house buying network.; (3) Building a real estate rental and sales platform based on blockchain, such as the prototype blockchain title registry system in Davidson County [5], Ioannis Karamitsos and others, using the blockchain to lease residential and commercial buildings [6].

In view of the problems existing in traditional real estate transactions, this paper proposes to build a real estate transaction platform based on blockchain. It can use the smart contract of the blockchain to carry out real estate transaction, store the transaction data, and provide traceable transaction record query. The specific innovations are as follows: (1) The platform is operated by the real estate transaction department, which helps to fundamentally solve the unrealistic situation of real estate information on other real estate transaction platforms. And it ensures the authenticity and validity of the real estate data on the platform; (2) Sharing information with the database of the real estate department, interacting the real-time information of the real estate, ensuring the real-time and validity of the transaction; (3) The whole real estate purchase and sale process is completely communicated by the purchaser and the seller, avoiding the participation of the intermediary agencies, and through the intelligent contract. The signed contract is safe and irreversible.

2. Methodology

2.1 Blockchain technology
The blockchain technology was first proposed by Satoshi Nakamoto when introducing Bitcoin in 2008 [7]. Later, it has gradually attracted the attention of governments and many large enterprises. As a result, blockchain technology has been rapidly developed and applied in various industries. The blockchain is essentially a distributed database of records, or public ledger of all transactions or digital events that have been executed and shared among participating parties [8].

2.2 Hyperledger Fabric
Hyperledger Fabric is a project initiated by the Linux foundation, which can be used as the underlying blockchain platform. It is open-source and based on standards, which runs user-defined smart contracts, supports strong security and identity features, and uses a modular architecture with pluggable consensus protocols [9].

2.3 Real estate transaction platform based on blockchain technology
In this section, we will elaborate on how to build a real estate transaction platform based on blockchain. This platform is designed based on the Hyperledger Fabric platform. The main function of this platform is to realize the real estate transaction information release and transaction. It can also query historical transactions.

2.3.1 System design
Figure 1 shows the process of real estate transaction information release and real estate transaction of
each participant in the process of real estate transaction.

First of all, both the purchaser and the seller need to register to log in to the system. Non real name users can only browse. Any user who wants to buy or sell real estate must have real name authentication. The seller applies for the real estate sale by inputting the real estate ownership certificate number or the real estate location. The system compares whether the applicant is the owner of the real estate through the information of the transfer registration system. Through the comparison, the system publishes the sale information in the system. At the same time, some information of the real estate information such as the real estate location, area, service life and other rights status are published. The seller can choose to publish the information. However, if the real estate right has the status of mortgage and sealing up, it must be announced, and under the status of mortgage and sealing up, the real estate shall not sign a sales contract. The purchaser browses the real estate for sale through the system. After the real estate is selected, the smart contract is signed with the seller. Meanwhile, if there are others also own the property of this real estate, all the co-owners must sign the contract together. After the contract is signed, the data will be stored. Then the transaction information and contract will be pushed to the real estate registration institution. If the loan needs to be handled, the contract will be pushed to the financial institution selected by both parties of the transaction at the same time.

![Figure 1. Flow Diagram of the system](image)

2.3.2 System structure

Recently, DAPP is very popular. But due to the requirements of real estate transaction on information security and privacy, it is not suitable to use Ethereum as a global public chain. For enterprises and users, hyperledger fabric can be applied to the platform with its modular and scalable architecture. On this platform, all users must be authenticated and authorized to join [10], thus to ensure the stability of the system and the security of the information.

The system can be divided into five layers from top to bottom: Web application layer, Smart contract layer, Consensus layer, Network layer, Data layer (as Figure 2).

1. Web application layer: The application layer is user-oriented. It is the interactive interface of the system. It has sign in / sign up module, release message and cancel transaction module, transaction module and read data / push data module. Through the web page, the underlying database can be called to read and store data. Through the gateway, the real estate system data can be called and the
content of the transaction can be pushed back to ensure the real-time data.

(2) Smart contract layer: The smart contract layer provides transaction for data storage query and real estate transactions. When the page applies for data query or storage, the data storage query smart contract is called, which can complete the data query or storage. When the real estate is transacted, the transaction smart contract is called, and the two parties sign the contract to complete the real estate transaction.

(3) Consensus layer: The blockchain is composed of multiple nodes. But there is distrust between the nodes. To ensure the reliability of the whole network, Byzantine Fault Tolerance must be supported. The system adopts Proof of Elapsed Time (PoET) mechanism and PBFT algorithm.

(4) Network layer: The P2P protocol is used as the network transmission protocol for data transmission between nodes. The P2P protocol of Hyperledger Fabric is implemented based on the HTTP/2 protocol.

(5) Data layer: The underlying data layer uses blocks to store data generated by transactions, such as real estate transaction time, purchasers and sellers, real estate related information and other data. So as to facilitate subsequent transaction query historical data.

Figure 2. System structure

3. Conclusions
The specific advantages of this model:

(1) Through the platform, the seller can directly release the information about the real estate sale. The information about the real estate is obtained from the registration department system database, which ensures the accuracy and comprehensiveness of the information viewed by the purchaser through the platform. Because of the decentralization of the blockchain, purchasers and sellers can directly trade, which saves the intermediate links and intermediary costs.

(2) After completing the real name certification, the applicant can directly sign the commercial housing sales contract through the smart contract. Due to the characteristics of the blockchain, traceability and irreversibility of the contract can be guaranteed, which makes it possible to find out the real estate in the future. Every transaction on the platform, and the message is absolutely true, there is no possibility of modification.

(3) The platform database and the real estate registration database can be pushed each other. The real estate transaction office and the registration authority can realize information sharing through the platform, and realize the real-time updating of the data, conform to the requirements of the Internet + government service the tax department interface can be added according to the requirements, so that the sales contracts can be pushed in real time.
(4) The financial department can participate in it, directly query the commercial housing sales contract of the lender through the platform, and handle the loan registration of the second-hand housing on this basis. It ensures the accuracy of the information, which is also conducive to improving the efficiency of the bank’s loan approval.

Difficulties in future work:
(1) Due to the fact that the real estate transaction data is huge and complex, and involves the data exchange among departments, internal and external networks, the security requirements of the system are relatively high.
(2) If the system wants to ensure the accuracy of the data during the early operation period, it is very dependent on the back-end data of the registration department. It is difficult to operate independently. However, for a period of operation, its historical transaction data can directly call the relevant information of real estate. The dependency on background data is weakened.
(3) To fully realize the overall function of a system, it still needs a period of exploration and strong data support from various departments. It may be necessary to initially build a platform to pilot in a certain building or a small area. And then continuously improve and add system functions through specific operation.

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