

REAL ESTATE SYSTEM USING SMART CONTRACTS¹

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Received: 10 February 2019; Accepted: 27 March 2019; Published: 08 April 2019

ABSTRACT

The Blockchain technology is becoming a key technology in share economy. Recent studies proved that blockchain could be used not only for the economy but for other fields like health management, real estate and many more. Blockchain got considerable attention from many researchers and government. This paper present idea about how blockchain can be used in smart contracts in a specific domain of real estate system. The design and structure of the smart contract is presented in this paper.

INTRODUCTION

Blockchain technology is based on cryptography. This is the key technology that runs the bitcoin system. In 2008, (anonymous person or group of people named as) Satoshi Nakamoto proposed a paper that gives an idea about how the blockchain technology can be used for digital currency (bitcoin)[1][2]. Later many researchers found that this technology can be used in various sectors like finance, real estate, governance. Blockchain technology can play a vital role in the smart cities and real estate system. The main key features of blockchain are security, anonymity, and elimination of middleman which makes it more useful for the real estate system[3].

Real estate system is changing very quickly in smart cities. Evolution in technology not only improves life but it makes the system more transparent and reliable. Real estate system is transforming rapidly towards digitalization. This may lead to several problems like it can be hacked by anyone or can be used for frauds.

Blockchain technology is a distributed ledger system that removes the need for trust in two parties and eliminate administrator. Blockchain gives control to the distributed nodes by using peer-to-peer (P2P) network. The double spending problem can be removed in blockchain by combining public/private key cryptography.

The blockchain is defined as “distributed database contains records of transaction and those are stored in participating parties” by Zhao [2][3]. Blockchain can also be defined as another way of storing data into a distributed database that is present in all participating parties.

As per the name, Blockchain consists of a chain of blocks that has information related to transaction, timestamp and specific symbol by which the block is published in the network. The block contains information related to the transaction as well as the timestamp and the hash value of the previous block.

The hash value is the unique alphanumeric string obtained by giving the block to hash function. In the case of bitcoin the hash function used is SHA-256 which generates a 256-bit hash value. With this, the block contains a 4-bit number known

¹ How to cite the article: Mahant M., Kalyanshetti Y., Mahajan M., Muttin K., Wadi B., Real Estate System Using Smart Contracts; International Journal of Research in Science and Technology, Apr-Jun 2019, Vol 9, Issue 2, 9-13

as a nonce (unique value given to the block). The first block in the chain is a genesis block. This makes the system more secure, and no one can change the transactions.

Many researchers believed that blockchain is evolved in three generations named as blockchain 1.0, blockchain 2.0 and blockchain 3.0. The blockchain 1.0 is used for cryptocurrency and decentralized transactions, blockchain 2.0 is used for smart contracts and assets, and the blockchain 3.0 is used for digital society and building applications for government, IOT, and health care system.

In the case of Bitcoin the working of blockchain is as shown in figure.

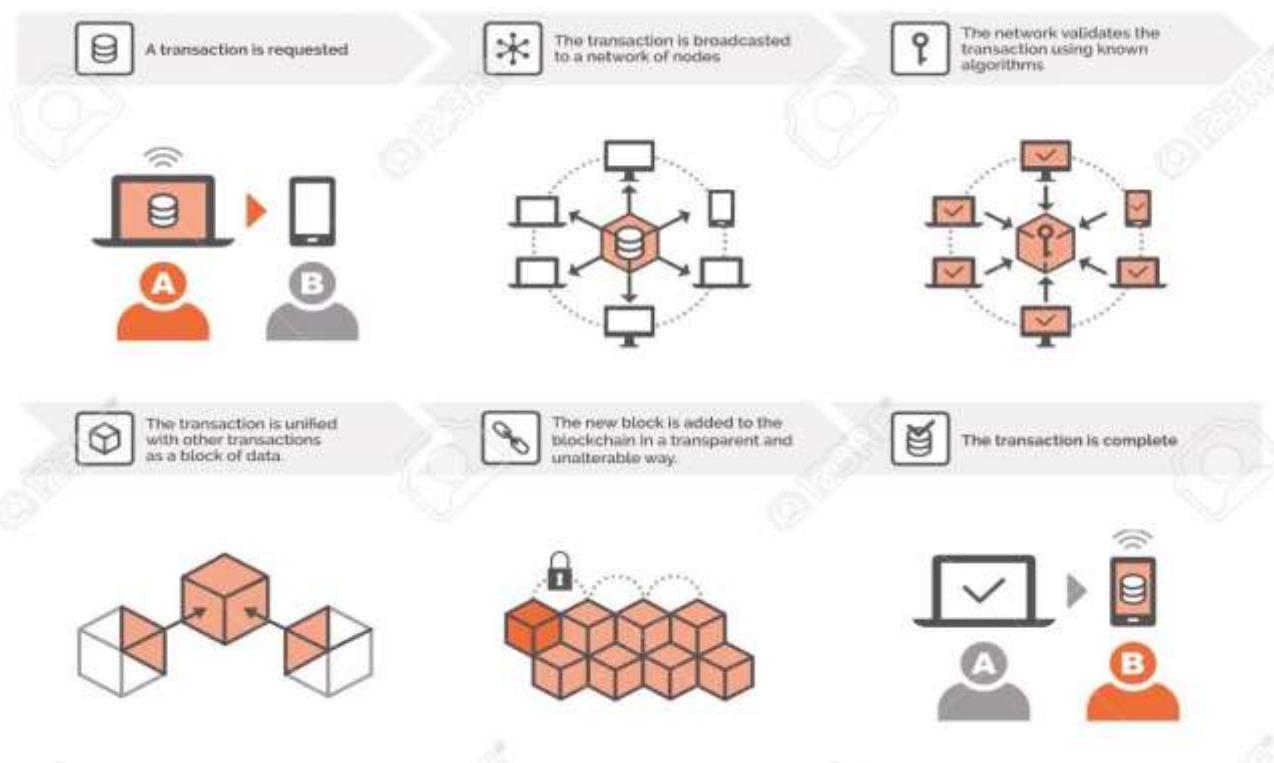


Fig. Blockchain working in bitcoin

This paper describes the application of blockchain technology in the real estate system. The paper is organized as follows. In section 2, we discuss the background, and related work and the blockchain for IOT is described in section 3. Section 4 comprises smart contract structure.

Development, use cases, and conclusion are described in sections 5, 6 and 7 respectively.

Background and Related work:

Blockchain technology primarily used for processing the transactions but later researchers found that it can ensure transaction complies with the programmable rules in the form of smart contracts[5].

These smart contracts can be used in a system where the data has to be kept immutable and secured. All banks are currently developing applications based on this, and they are trying to understand what this technology can do in their business. In generic form, blockchain technology is the distributed cryptographically system that stores transactions in immutable form and these are consistent. This data is stored in the participating systems in the network. By this blockchain ensures transparency and consensus on the validity of data.

Researchers found that the proof-of-work approach requires a high level of energy, but it guarantees high-level protection from forging and a high level of consistency. The energy needed for the bitcoin network is approximately 100MW [6]. This is the major issue in case of proof of work.

Other alternatives require part of trust in blockchain network; minors have to put their resources at risk in case of proof-of-Stake and in case of the proof-of-elapsed-time special type of hardware is required to calculate elapsed time.

For designing and deploying blockchain, we have to consider some parameters. The parameters are as listed below[8][9]:

1. Programming language (we can use different types of language depending upon crypto-currency)
2. Consensus protocol used for validation of data in the blockchain.
3. Participants in the network of the blockchain.
4. Type of crypto-currency that is used for mining.

For designing and developing, we can use various languages depending upon the crypto-currency that is used for mining. Various languages are present to design a blockchain based system.

Consensus algorithms are used to validate transactions. Several studies investigate blockchain technology as the business model that allows financial transactions with trust fewer partners without any additional security.

Blockchain technology platforms can be programmed in two ways public and private. In public type, any node participating in the network can read and write data, and it does not require any permission to do this. In the case of private, to perform different operations requires different permissions. The examples of private blockchain network are ethereum and hyperledger. Ethereum and bitcoin are examples of public blockchain network. In the case of the public blockchain, the minors get the reward after the creation of every block in terms of crypto-currency. On the other hand in case of the private blockchain, the permission of mining is given to some authorized parties in the network.

3. Phases of blockchain application:

Development of blockchain application is divided into analysis, design and implementation phases. In the analysis phase we analyze the requirements. Depending on requirements those are collected we define what type of blockchain platform (public or private) is suitable. In the design phase we design what kind of functions are needed to fulfill the need of the customer. In the implementation phase we create the smart contract that uses the functions that are defined in the 2nd phase.

In analysis phase, we define the key characters in the system as who is going to be minors. In design phase, we create smart contract, and in implementation phase we deploy the smart contracts on blockchain platform like etherum and this can be used for testing purpose.

4. Smart Contract:

The smart contract is code program identified by a blockchain network. The components of a smart contract are executable functions and variables that are present. The smart contract is written in high-level languages like python, solidity and go. The language used for the ethereum platform is python or solidity. The smart contracts are compiled using solidity compiler. There are many solidity compilers are present. The contract is once compiled successfully then it is uploaded to blockchain network, and it gets an address in the blockchain. These are used to validate the block.

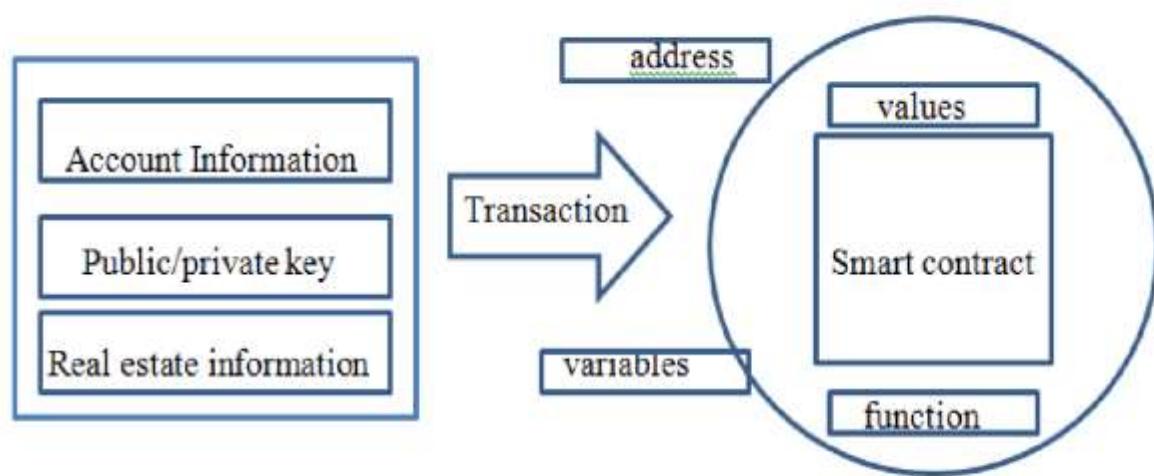


Figure: smart contract:

The ethereum platform is preferred more to design distributed applications. Ethereum uses a high-level language known as solidity is used to write smart contracts. The code written in solidity is compiled, and it is uploaded to ethereum virtual machine as software. Smart contracts contain executable functions and state variables.

5. Use Case:

1. Real estate System: The blockchain technology can be used in real estate system to make system tamper proof as well as more secured. This ensures peer to peer transaction.
2. Health care System: The Healthcare system can be made more secured using blockchain. This can be used to store the data in the form of blocks and that data can be used in various ways.
3. Banking System: in banking system, we need intermediate third party to transact. Blockchain can eliminate this third party and makes peer to peer transaction.
4. Transport systems: Blockchain can be used to track the shippings in transportation system.
5. Governance: In government sector we can use this technology for remote voting and for other services. We can use this to track funds obtained by different organisations.

6. Benefits:

Perhaps Blockchain technology did not cover the whole process in their organization; however, the cost/benefits analysis should be prepared once the smart cities owner identifies a process that is ready for Blockchain technology. The benefits of using smart contract and blockchain technology for real estate are as follows:

Different parties can modify database: In the real estate ecosystem, multiple parties such as owners, tenants, and financial management (FM) operators involve the management of real estate properties. They have access to modify a variety of information with the Blockchain. This eliminates the modification between the parties.

Advantage of Disintermediation: With the Blockchain, trusted intermediaries such as notary and brokers are not required since the transactions can be independently verified and automatically validated.

Transactions advantage: In real estate companies, different transactions related to different parties (such as landlords, tenants and FM services) are part of the same database. The real estate companies face difficulties to separate the number of invoices. With the Blockchain technology, we can separate transactions between the parties seeking to improve the efficiency of the invoicing process. As an example, in the net rent lease structure, the tenant pays the facility services (such as cooling and maintenance services) directly to the FM companies and the base rent amount directly to the landlord. A state finite function and process work is presented in details. Future work needs to assess the impact of the different platform such as Hyperledger Fabric for the specific use case presented in this paper.

7. Conclusion:

This paper has presented an overview of the Blockchain technology as a disruptive technology for the use case of real estate industry. This study was designed to see the effect of smart contract with the various components for the implementation.

Financial Support and Sponsorship: Nil

Conflict of interest: None

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