

# Blockchain Real-Estate Property using Smart Contracts

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**Abstract-** *In the areas of housing rental markets, many landlords charge false rental information and it becomes very difficult for the government to keep track of the housing rental situations. In this paper, a block chain based solution is proposed to overcome the problems faced in housing rental systems. This solution uses smart contracts. Smart contracts are agreements that are executed when certain conditions are met. These will manage all the information listed in IPFS (Inter Planetary File System). The integrity in block chain technology used here, makes the approach very reliable and secure. This will help to avoid third parties, brokerage services etc.*

**Indexed Terms-** *Smart Contracts, Ethereum, Inter Planetary File System (IPFS), Block Chain, Secure Hashing Algorithm (SHA)-256, Encryption, Lease/Rental Agreements, Rental System.*

## I. INTRODUCTION

Block chain technology is a connection of blocks which consist of information regarding the transactions. It is a distributed peer-to-peer ledger in which control is distributed among individual nodes in P2P network. Block chain is a very different technology as compared to the other technologies. It increases the trust and transparency of the data that is shared across the network.

Block chain plays a very crucial role in the real estate field by leasing properties, lands etc. This also eliminates the need of trust between the users, central authority and the governance. It provides a very simple flow of using smart lease contracts. These smart contracts make it very easy to reach online agreements and implement them. This saves a lot of time and effort.

One of the major usage of block chain in this proposed approach is that, it prevents the disputes that occur between the landlord and tenants while buying or renting the properties. It makes the process very convenient.

This paper focuses on the core operation mechanism of block chain technology in housing rental systems and the functions of the smart contract module.

## II. PREVIOUS WORK

In Housing Rental System based on Block Chain Technology<sup>[1]</sup> the importance of the block chain technology has been discussed in detail. The author has discussed the technical background of the entire work in detail which involves the block chain structure, the smart contract and the alliance chain.

Each block in the block chain is connected to one another through hash operation. They contain information regarding the transactions, block head, nonce, hash data, time stamp and first hash.

The smart contract is like a real contract which is executed by writing script language code. When a certain condition is met, state of the machine changes and the contract gets executed.

Alliance Chain is the structure of weakly centralized organisation.

This work also includes the overall structure of the leasing system along with how the client application system and alliance chain network functions.

In the leasing system, there is client application system, alliance chain network and the block chain repository. In the client application system, the

landlords can log in and specify the required rental information. When the tenants find the resources according to their needs, they send a request to the alliance chain network. The alliance chain network, records the information, takes part in authentication etc. The block chain repository takes part is responsible to settle the disputes related to housing lease as it is tamper proof and traceable.

The work proposed in Smart Contracts for Lease Agreements using Block Chain<sup>[2]</sup> involves the implementation of smart contracts. Using a single smart contract, lease can be given to the properties to any of the landlords or tenants with the help of block chain technology. The solidity smart contract is used to provide the solution which will help to overcome the brokerage charges and avoid middlemen.

Block chain technology has a P2P transfer network and it enhances the trust as it is secure, transparent, distributed and very flexible.

Cryptocurrencies are the digital currencies. One of the most popular crypto currencies is Bitcoin. Bitcoin is used as a electronic payment between the two parties in a secure manner. Other type of blockchain is the Ethereum block chain. This allows to build complex Distributed Applications (DApp). All the transactions in a blockchain are stored in an immutable distributed database.

The smart contracts are preferred as they:

- reduce manual error
- do not involve any middlemen
- reduce costs
- do not require trust in the execution process
- have autonomous execution

The following are the phases involved in the design and implementation of block chain applications:

- Planning - describes the scope of the project.
- Define requirements - requirements are decided which will make the application support the day-to-day era.

- Design and Prototyping - smart contract is implemented using high level programming language such as solidity.
- Software Development - to reach the required goals, access controls and software management applications can be used.
- Testing - in this phase the Mocha Testing Framework is used.
- Deploying - DApps are linked with public or private block chain networks.

Decentralised Applications (DApps) are cryptocurrency applications that run on Ethereum permission less networks. Truffle is used to develop DApps. It has the following 3 components:

- Truffle
- Ganache
- MetaMask

The work also includes the implementation of simple smart lease contract.

In A block Chain based Housing Rental System<sup>[3]</sup>, solution proposed is based on Ethereum Smart Contract, IPFS and Oraclize services. Since block chain is a very expensive data storage medium, it is not suitable to store informations having multiple images in it. Therefore, Ethereum smart contract and IPFS cooperate with each other. IPFS is used to store all the informations and its hashes are stored in smart contracts. This helps to provide authenticity to the hashes.

Oraclize is used as a trigger tool for each bill lease creation. The proposed work in this paper also includes System Core operating mechanisms of Ethereum smart contract, IPFS and oraclize services and shows the interaction between the smart contracts and participants.

Landlord sends the information to IPFS in JSON format. The hash of listings information is sent to listings information contract. From here, tenants access the hash value. If the landlords agree, they create a smart lease contract.

With the help of Listings Contract (LC), Lease Agreement Producer Contract (LAPC), Smart Lease Contract (SLC), the smart contract modules have been explained.

Six statuses of smart lease contract are as follows:

- activate contract status
- sign contract status
- pay the deposit status
- rental process status
- return deposit status
- completion status

A case study analysis has also been done based on block chain based housing rental platforms.

In A Model-Driven Approach to Smart Contract Development<sup>[4]</sup> the research involves a holistic definition of block chain and smart contract.

### III. METHODOLOGY

In the proposed approach, there are 5 major entities. These are:

**Admin:** Admin has access to the entire database and has all the information concerning the entities. The work of an admin is to add the stakeholder in the database. If there is any suspicious activity, the admin has the right to ban the stakeholders and seize their property.

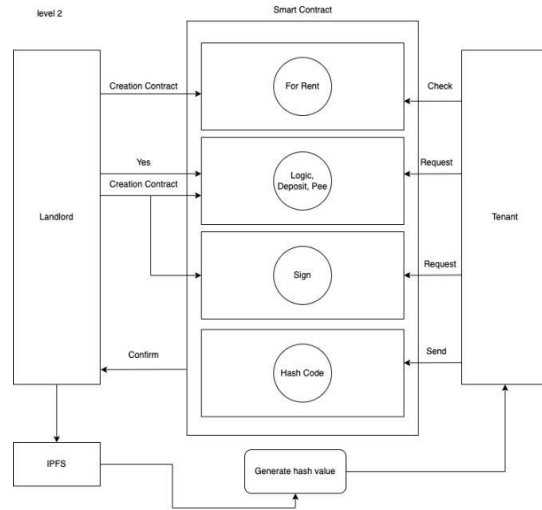


Fig. 1. Flow Diagram

When the funds are accumulated the admin is responsible for distributing them among all the shareholders. Setting the tax for the land acquired is also the job of an admin.

- **Landlord:** The landlords upload all the required information concerning their properties, on the platform. They have the right to decide who among the customers can become a tenant. They set the prices of their properties per 30 days and can limit the amount that can be paid in advance.
- **Tenant:** These are the people who have rented some property from the landlord and pay rent. They can send notifications to the landlords to rent some property.
- **Customer:** These are the people who search for the property and has not rented one yet. When the customers rent some property from the landlords, they become tenants.
- **Shareholder:** The shareholders offer and buy shares. They own a percentage of the shares. If any shareholder owns 51% or more of the share, they can claim the ownership of the land from the rest of the shareholders.

The landlord uploads all the information of their properties

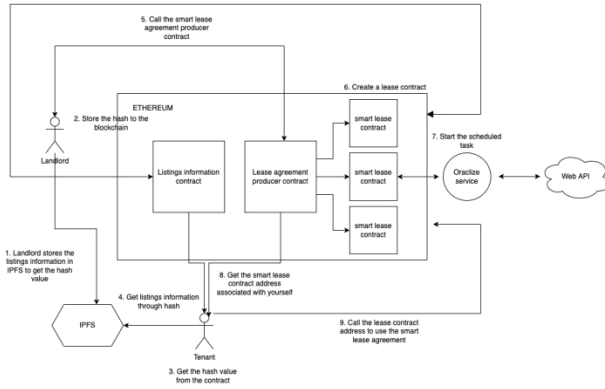


Fig. 2. Methodology

which gets stored in IPFS (Inter-Planetary File System). IPFS is a file system which can be tracked easily on a distributed network. This system allows interaction over P2P network. IPFS information can be accessed from any computer. If someone stores file on IPFS network, then it can be accessed by anyone with the IPFS software.

When a file is added to IPFS, it gets a unique address which is taken from file contents's hash. This unique address is called Content Identifier (CID). IPFS uses SHA-256 algorithm which gives a 256 bit string.

IPFS is basically a Distributed Hash Table. It maps the CIDs to the people who access the content. For any new content, the entry is added to the DHT. If anyone wants to access the data, they can do so by looking up the CID in DHT.

The customers access the portal, if they want to rent some property, they contact the landlord. The landlord and customer reach an agreement and the smart contract is signed.

The smart contract works in the following 6 stages:

- activate contract status
- sign contract status
- pay deposit status
- rental process status
- return deposit status
- completion status

#### IV. CONCLUSION AND FUTURE SCOPE

Block chain has tremendous growth with respect to its applications. Block chain based rental systems is an important application of block chain technology. This system shares the listings information using this technology. This helps the large companies to have less number of users.

The traditional leasing method is converted into coding through Ethereum Smart Contract. All the listings information is preserved during the leasing process. Hence, legal protection is provided to both lessee and the landlords.

In the future, the feature to facilitate chat between the tenants and owners. This will make the communication easy and efficient.

Maintenance of the records can be made easier by bringing the various government organisations together.

#### V. ACKNOWLEDGMENT

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