

# Ethereum based Real Estate Management

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**Abstract:** - The use of blockchain technology to facilitate the automatic transfer of real estate assets like Industrial estates, Commercial Estates, Residential Flats, etc. after a specified amount of time or to handle claim requests from designated parties is explored in this research paper. The current real estate transfer procedure can take a long time and is prone to mistakes, which can result in disputes and inefficiencies. A safe and open mechanism for controlling these transfers can be made by utilising blockchain technology. Blockchain is a mechanism that the proposed system employs to automate asset transfers based on established rules or nominee claims and to retain digital records. The technology makes sure that every transaction is verified and added to the blockchain, giving a complete and verifiable record of ownership transfers.

**Key Words:** - Real Estate, Blockchain, Smart Contracts, Automatic Transfer, Nominees.

## I. INTRODUCTION

### 1.1 Motivation

Property owners, developers, and governmental organisations from all over the world have faced significant difficulties with real estate management. The present real estate management system is primarily dependent on centralized databases, which are prone to fraud, corruption, and data breaches. This compromises the credibility of the entire system and creates a serious risk to the stakeholders. Blockchain technology provides a decentralized, tamper-proof system that can securely handle real estate records, which is a solution to this issue.

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Transparency, security, and efficiency in the real estate sector can all be dramatically increased with blockchain-based property management. Con-trary to conventional systems, blockchain-based solutions can keep a precise and unchangeable record of every transaction, preventing the occurrence of fraudulent acts. When an asset owner dies, the process of transferring the assets is quite tedious. We aim to make this process more seamless through our application.

### 1.2 Problem Definition

To develop an application to facilitate management of Real Estate Assets and provide automation of asset transfer to designated nominees.

### 1.3 Project Scope

The scope of the project is limited to securely transferring Real Estate assets to designated nominees either automatically or when nominees claim the asset using valid proof of death of asset owner and identity certificate.

### 1.4 User Classes and Characteristics

The user classes involve Buyer, Seller, Nominee, Land Official and Contract Owner which is Government in the view of this project. The buyer, seller and nominee all have public

address of their account where their assets are stored. All the transactions will be held between these accounts. The land official will verify the transactions and the users. The contract owner will appoint the land official.

## II. BACKGROUND

In the current system, the buyer first pays the seller with cash before paying the government's stamp duty fees, which can be done online. The next step is to make an appointment with the local registrar office, where they must appear with all the required paperwork and evidence of payment. It takes a long time to verify their paperwork, and there are openings that thieves could exploit. Following this procedure, the buyer must manually update owner information in the local government records. Additionally, there are owner details on the water and electric boards that need to be manually changed. Due to the lack of real data records being made available to property buyers, there are an increasing number of fraud instances, which indicates a lack of transparency in the system. All of this is due to the fact that the information is not in the public domain and that since the records are dispersed, it is impossible to determine how many properties each individual owns. The government has addressed this issue in the recent past, but there is still a need to address the issue of authentic data not being accessible in the public domain.

It takes a long time, and there are many middlemen involved who occasionally demand extortionate fees for their services. In our world where things move quickly, this process should be completed in a matter of days rather than weeks. The government has pushed towards digitization and maintaining digital records in a centralised database, but there are also problems with the database, some of which are data security and fraudulent data alterations, which is a problem that needs to be addressed immediately. Another problem is the loss of records in any disaster scenario, whether they are kept in conventional offices or in a centralised system.

Additionally, this system is very expensive and involves a large number of people who are not necessary in the modern digital age, where technology can automate the majority of work.

There is still another issue with the transfer of property by will or heredity in addition to all of these issues. This situation. One must visit the.

## III. FUNCTIONAL REQUIREMENTS

### 3.1 Store and maintain Real Estate Asset Records

The system must be able to safely maintain real estate asset records for things like residential apartments, commercial properties, and industrial estate. All information must be kept secure and must be properly verified.

### 3.2 Transfer Real Estate Assets

The system must facilitate the buying and selling of land efficiently without much overhead. The system must have functionality of verifying the authenticity of the land as well as the buyer or seller.

### 3.3 Automatically Transfer Real Estate Assets

The system must have the functionality to add nominees to the accounts of the users. If any emergency occurs or if the user has instigated a will, then it must be executed accordingly. For Real Estate assets the user must be regularly sent a reminder to check the wallet and confirm their presence. If presence is not detected, then assets are automatically transferred to the nominees.

## IV. NON-FUNCTIONAL REQUIREMENTS

### 4.1 Performance Requirement

The reliability of the transactions is the main priority rather than their speed. The speed of transactions can be compromised as we are not trading lands within milliseconds and users can wait until the transaction is completed. So the project focuses on the reliability of the transaction.

### 4.2 Safety and Security Requirements

The system needs to be very secure since it consists the transfer of assets of the user. As well as it involves government agencies so the government data must not be compromised.

### 4.3 Software Quality Attributes

#### 4.3.1 Correctness

The compliance of programme code with specifications and the independence of the software system's actual application are both indicators of a software system's correctness.

#### 4.3.2 Reliability

The reliability of a software system is defined as the likelihood that it will perform a function (given by certain requirements) for a specified number of input trials under a specified number

of input conditions in a specified time period (assuming that hardware and input are free of errors).

#### 4.3.3 Learnability

The user interface design and the readability and simplicity of the user instructions (tutorial or user manual) are both factors that affect how easy it is to learn a software.

#### 4.3.4 Robustness

The impact of operational mistakes, incorrect input data, and hardware failures is reduced by robustness.

## V. SYSTEM REQUIREMENTS

### 5.1 Database Requirements

MongoDB will be used to store the user records, land official records and contract owner details. It is NoSQL database best used to handle data non-relational in nature and best suited for scaling applications. Since our data will contain massive user records, MongoDB is best suited for the project. Also it will provide fast and efficient querying of user records. For storing land records, we use the Ethereum blockchain will maintain the ownership of the land and provide a secure means of storing the land records. Also for deploying Smart Contracts, blockchain will be used.

### 5.2 Software Requirements

- ReactJS – For Developing the UI of the application
- NodeJS – For Developing the server side of the application
- Solidity – For Developing Smart Contracts
- Truffle – For setting up local Ethereum
- Metamask – For storing Ethereum Accounts
- Remix IDE – To test Solidity code without having it locally
- Visual Studio (VS) Code – To write and maintain project codebase
- Web3JS – Library to connect NodeJS server to Ethereum Blockchain

### 5.3 Analysis Model

There are multiple models to choose from, such as waterfall model, iterative model, spiral model etc. But agile model is one of the best models among them. As our project has multiple modules involves and each module is dependent on each other, it is better to use agile methodology while developing the software. In this methodology we deliver the project in parts, and we can also change the project as per user requirement at any given time of SDLC cycle.

The Agile Software Development Lifecycle (SDLC) model combines incremental and iterative process models with a focus on process adaptability and customer satisfaction through quick delivery of functional software. Agile techniques splinter the product into ever smaller builds. Iterations of these builds are supplied. Typically, an iteration lasts between one and three weeks. Every iteration involves cross functional teams working simultaneously on various areas like

- Planning
- Requirement Analysis
- Design
- Coding

## VI. PROPOSED SYSTEM

In this we proposed the asset management system based on the ethereum and IPFS using Blockchain technology. In this we stored the users data securely on the IPFS. In this we have created system where user can register in the system using their personal details. User can add different type of digital assets in their account. Different digital assets like crypto, land digital art forms like NFT etc assets can be added in the user account. In our system user have facility to add nominee to their asset. The user can add anyone as nominee to the assets. The nominee is informed about the person who added him/her as nominee and all other related information via mail.

After creation of person or if person forgot their password of crypto wallets their cryptocurrency goes unused or wasted. So, to avoid this we have added nominee facility. Using this facility user can add nominee to their asset and the time period or certain condition after completing that time period or after fulfillment of certain condition assets are automatically transferred to the nominee. In some cases nominee need to claim the assets then assets are transferred to the nominee account.

In case of the land assets, there is lots of paper work is needed in order to buy or sell land. And in case of this land transfer

transaction both buyer and seller must need to be present in front of the land officer during the land transactions. So, for the person living far away, it's very hectic to do land transactions. And also land records might be tampered by government entity or other entity. In our system while registering user need to add land records in the system. These added records are stored on the blockchain, which are can't be tampered. And added records in the system are verified by the Government officer. The user is able to sell their land on our system and other can buy this land. All the land related transaction are verified and carried out by the government officer. Our system provides platform where user can buy and sell any land online from anywhere in the world.

### 6.1 Module Description

- **Web Platform:** Asset management web platform where user can login in the system and add the different assets in the account. Different digital assets like crypto, land, NFT etc can be added in the user account. User can also sell and buy land assets on this platform.
- **Assets Details:** On web portal of Assets management user can login using credentials and user will list out different digital assets. Also user can add nominee to their assets.
- **Deployment:** Executing user actions like send and retrieve hash functions, deploying it using smart contracts, and storing hash values in the ethereum block chain.
- **Validation:** To verify the validity of the documents, the IPFS hash and the transaction hash from Ethereum are compared.

Setting up ether wallet for executing smart contracts in Ethereum blockchain network

We will create the account for the Metamask Ethereum wallet. The wallet will start out empty of ethers. Ethers are required to carry out ether transactions. There are test networks like Rinkeby Test Network and Ropsten Test Network for testing purposes. You can obtain free ether for testing purposes by using ether faucets. Many languages can be used to create smart contracts. Solidity language is employed here. Remix IDE, an online compiler for solidity programming, is used to compile and deploy these contracts. During compiling, the option to inject the Web3 environment is chosen in order to produce the

Application Binary Interface (ABI) codes needed to link our web app to the Ethereum network using web3.js.

### 6.2 Creating blocks using smart contracts

Business logic is applied in smart contracts and includes rules and regulations that are provided by the government for compliance during land registrations.

The ether transactions will be carried out by these contracts. When a transaction is successfully completed, a block is successfully formed. Shows the ether wallet's before and after pictures. Here, a portion of the user's ether is taken out of their wallet for the transaction.

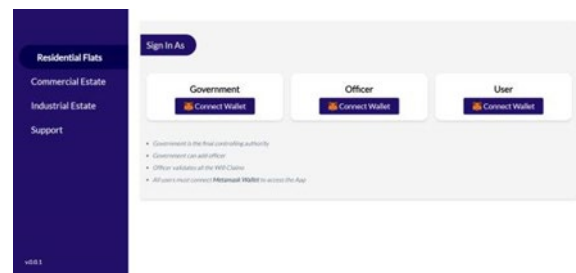


Fig.1. The ether wallet's before and after pictures

### 6.2 STEPS

- Install MetaMask
- Install the browser plugin by visiting <https://metamask.io>.
- Establish a password and launch the wallet. the CREATE ACCOUNT button open a fresh wallet account.
- Unlock Ganache to import the account, select the ether account, click on the private key, copy the address, and paste it into the metamask window.
- Get free test ether from <https://www.infura.io/> to your account. Verify the balance of your Metamask account.
- To create more accounts, repeat steps 3 and 4.
- Deploying contract.
- Upload your contract file (reg.sol) and IPFS file to remix.ethereum.org to deploy the contract.
- Blocks will be created in Ganache and transactions will be completed. A list of transactions will be created in metamask

## VII. RESULTS AND DISCUSSION

In this section we are discussing the results obtained. For various scenarios, Ethereum is a multinational open-source architecture. As a running device, it can implement intelligent.

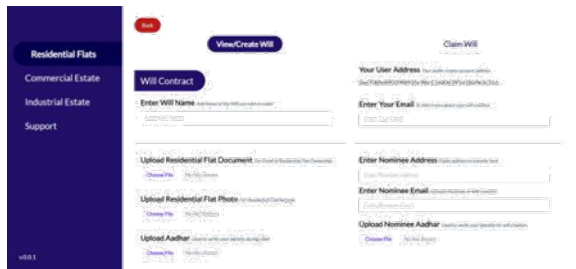


Fig.2. Protocols and enable the development of decentralized applications (DApps).

Ethereum miners are struggling to acquire Ether, the crypto asset used to power the network. These ethers are used to pay for network transactions and quotes. At the heart of Ethereum is the brilliant protocol. The Solidity programming language is used to create smart contracts. As a result, we no longer want to buy. Friends can use the `eth.getBalance` command to check the account balance. The peer node gets the ability to use the `admin.nodeinfo.enode` command. To display advertisements for full nodes, use `min.peers`. [14] We did an overall performance evaluation of on the Ethereum testnet. One is Ropsten, which uses proof-of-work (POW), and the other is Rinkeby, which uses proof-of-authority (POA). , we continue with Ropsten's evaluation, which uses POW for the Ethereum mainnet, as we intend to evaluate the overall performance of in a near-real environment for real-world use cases. To perform an overall performance assessment on the Ethereum testnet, it is important to create a hyperlink between the testnet and the smart contract, creating a testnet account for installing and running the smart contract. We manage this with Infura and MetaMask Infura, Infura provides an API to facilitate access to the 46 Ethereum network. The enterprise created by Infura provides an endpoint that allows to access the Ethereum mainnet and Ethereum testnet using the HTTP method and the web socket method. Infura also offers encryption capabilities, including JSON Web Token (JWT).

## VIII. CONCLUSION

We talked about the planning and implementation of a Blockchain-based asset management system. Assets are added

to the user account, and the smart contract stores their hash. The execution of this smart contract and the automatic transfer of assets to the nominee depend on specific conditions. Land records are saved on the IPFS in the case of real estate assets. IPFS transmits and saves the record's hash in Ethereum. To verify the authenticity of a document, the hashed input from the transaction hash and the hash provided by IPFS are compared.

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