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Asset Security and Transfer using Blockchain

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Abstract—

Rigid assets like land are very tough to maintain. Humongous amount of paperwork goes into maintenance and registry of such assets. Due to these loopholes fraudsters find different ways to exploit these loopholes. Also if the owner of such assets dies suddenly dies, the asset may remain stagnant and no one can claim it in case there is no heir. Same is the case with crypto assets. Still no clear government regulation is available for crypto assets. Therefore no mechanism is available for will transfer of crypto assets. Blockchain is a distributed and decentralized ledger which is immutable in nature. So our proposed system intends to solve these problems by building an application that provides land registration, it's efficient transfer and automatic transfer of assets, i.e. execution of will of a person.

Index Terms—Blockchain, Will Transfer, Crypto, Smart Con-tract, Land Registry, Assets Security

I. INTRODUCTION

A. Motivation

Fraud cases involving cryptocurrency, real estate, and other asset types occur daily. Smart contracts can be used with blockchain to address these issues. Blockchain cannot be altered because it is an immutable ledger. Assets like real estate and insurance can be placed on the blockchain. In certain sad circumstances, such as untimely death, illness, or for legal purposes

Using smart contracts, it is possible to transfer assets to the designated beneficiary quickly, safely, and without incident. The lengthy days and paperwork involved with the will transfer procedure might be eliminated by automating it. Many farmers must pledge their land as security against bank loans. However, a large number of them lack the necessary documentation, and they

B. Problem Definition

To develop a decentralized application (dApp) to ensure security and transfer (primarily will transfer) of assets, like crypto, land using Blockchain.

C. Project Scope

The scope of the project is limited to securely storing land records, crypto assets and facilitating efficient transfer of such assets. Future scope of the project includes the will transfer can be fully automated by automatically transferring assets after cremation as opposed to current system of claiming by nominees.

D. 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.

E. What is Blockchain?

Blockchain is essentially an online database, similar to a spreadsheet you could use at home or at work. But this repository (or ”ledger,” in blockchain lingo) is distributed and decentralised: A network of unrelated computers known as ”nodes” each maintain their own copy of the ledger instead of the data being kept in one location on a computer or on a server cared for by one person or business. The fact that copies are not centralised helps to safeguard the data's dependability because it would take multiple corrupted copies of a ledger to trick the network. Theoretically, blockchain systems are safe because a hacker would need to exert more computing power than the majority of the network (which is very challenging to do), risk losing some of their cryptocurrency holdings by approving fake transactions, or control at least 51% of the nodes to force all nodes to update the overall blockchain with the faked data.

A well-established blockchain system with numerous nodes would be extremely unlikely to be compromised in one of those methods, while newer systems with fewer nodes may be more susceptible to attacks. However, the infrastructure of blockchain makes it much more difficult—and perhaps expensive.

F. What is Ethereum?

Ethereum (ETH), one of the most ambitious blockchain projects, aims to use cryptocurrencies to decentralise goods and services in a variety of use cases outside of money.

While Ethereum has chosen a different tack from Bitcoin, generalising such that its users can develop any number of unique assets and programmes governing their operation, Bitcoin aspires to serve as a digital gold standard.

This has led to (possibly inaccurate) comparisons between Ethereum and the web browser, while Bitcoin is more like email (a very powerful, special-use tool).

G. What are Smart Contracts?

A smart contract is a piece of self-executing computer code that is guaranteed to run predictably, is publicly available, and cannot be altered.

A entirely new method of approaching contracts is rep-resented by smart contracts. Smart contracts use blockchain technology to assure compliance rather than having two parties sign identical copies of a paper agreement and threaten one another with legal action if the other side doesn't comply.

To put it another way, once you "sign" a smart contract, you cannot change your mind. The result is a new way for public and private agreements to be made between individuals, organizations, and even governments because the computer code that implements the contract will always operate in the manner in which it is programmed.

II. FUNCTIONAL REQUIREMENTS

A. Store Land Records

The system must be able to store land records securely. They must be properly verified, and all information must remain secure.

B. Transfer Land

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.

C. Automatically Transfer 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 crypto 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.

III. NON FUNCTIONAL REQUIREMENTS

A. 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.

B. 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.

C. Software Quality Attributes

- 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.

- 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).

- Learnability

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

- Robustness

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

IV. SYSTEM REQUIREMENTS

A. 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 fo 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 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.

B. Software Requirements

- ReactJS – For Developing the UI of the application
- NodeJS – For Developing the server side of the applica-tion
- 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

C. 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 Devlopment Lifecycle (SDLC) model combines incremental and iterative process models with a fo-cus 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
- Unit Testing
- Acceptance Testing

The existing procedures should be customised to best meet the project requirements, according to the agile paradigm, which holds that every project needs to be handled differently. To deliver specific features for a release, tasks in an Agile project are separated into time boxes (short time frames).

V. SYSTEM DESIGN

A. Architecture Diagram

Following is the architecture of our proposed system. It maps out the system components to the physical implementa-tion. It displays the general structure of our software system and the associations, boundaries and limitations between each element.

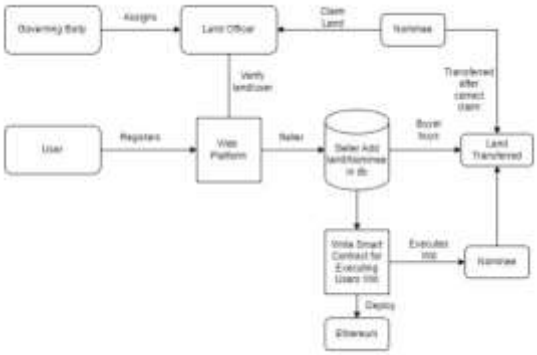

Fig. 1. [7] Architecture Diagram 1.

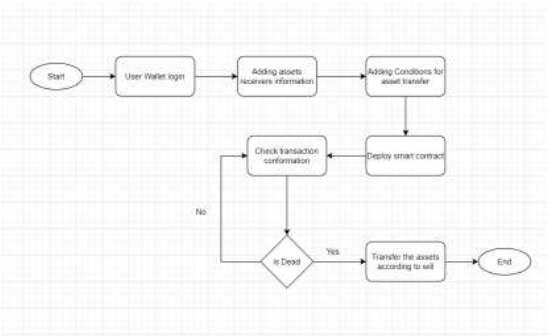

Fig. 2. [7] Architecture Diagram 2.

B. Use Case Diagram

Following is the use case diagram of our proposed system. It summarizes the details of all our system users, i.e. actors and how they interact with the system.

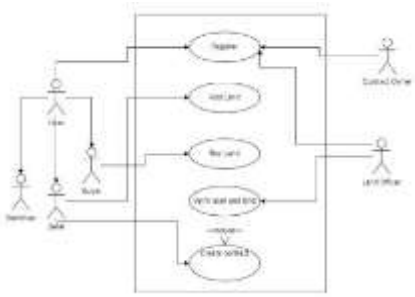

Fig. 3. [7] Use Case Diagram.

C. Class Diagram

Following is the class diagram of our proposed system. It represents the overall static view of our system. It visualizes, documents and describes the overall system and helps in constructing the code for the software structure.

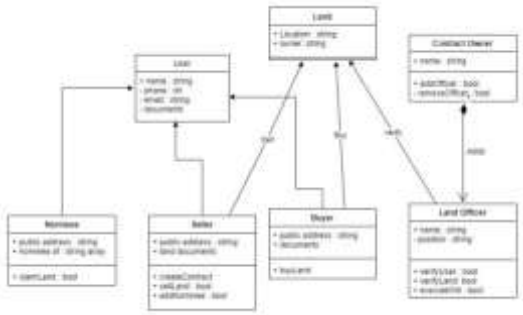

Fig. 4. [7] Class Diagram.

D. Deployment Diagram

Following is the deployment diagram of our proposed system. It models the physical architecture of our proposed system. It emphasizes on the relationships between the soft- ware and hardware components of our software system.

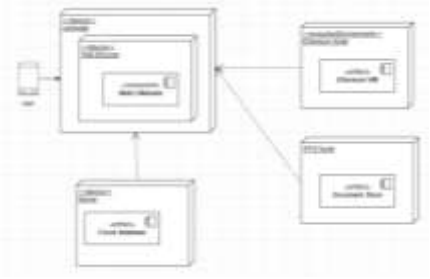

Fig. 5. [7] Deployment Diagram.

E. ER Diagram

Following is the ER diagram of our proposed system. ER diagram is abbreviation for Entity Relationship diagram. It portrays the different entities in our system and their relation-ship among themselves. It helps to build the logical structure of our system. Rectangles are used to represent entities in ER Diagrams, ovals are used to define attributes, and diamond shapes are used to represent relationships.

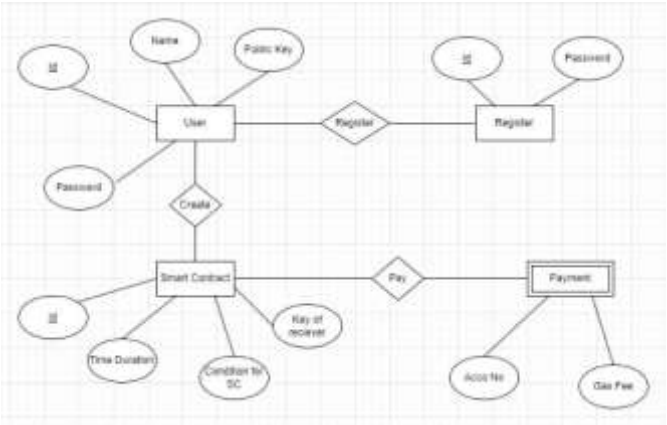

Fig. 6. [7] ER Diagram.

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