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Land Ledger: A Blockchain- Based System for Secure and Transparent Land Record Management

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Abstract - Land registration systems are crucial for tracking legal ownership details, but often face problems such as fraud, data manipulation, a lack of transparency, and delay. The following paper proposes an innovative Blockchain-Based Land Registration System, which utilises blockchain technology for secure and incorruptible handling of land registration information. Smart contracts will be employed to handle property registration and transfer automatically, eliminating unnecessary manual procedures and accelerating the process. Data will be stored using cryptographic tools, which will prevent data manipulation and verify their authenticity. Stakeholders will have access to the data instantly, thus improving transparency.

Index Terms - Blockchain, Land Registration System, Smart Contracts, Decentralised Ledger, Data Security, Transparency, Property Management, Fraud Prevention.

I. INTRODUCTION

The Land Registry is essential in tracking land ownership and ensuring transactions. The current land registries are centralised in nature and face challenges of transparency, fraudulent activity, alterations, and delayed transactions. Land registry systems that are manual and have not been adequately digitised have a higher likelihood of mistakes, errors, and corruption.

Blockchain technology presents a viable solution to the above problems. Blockchain refers to a distributed digital ledger that uses cryptography to link blocks of transactions. Once information has been recorded in blocks, the information cannot be modified; hence, data security and integrity are guaranteed. In the implementation of blockchain in a land registry system, all the details of the property ownership, the history of transfers, and other relevant information will be recorded in a public ledger available to all authorised parties.

The blockchain technology does not require any third party since all information is publicly available and can be verified at any time. Smart contracts will also be used to facilitate transactions, thereby reducing the chances of human error and fraud.

II. RELATED WORK

Blockchains have been extensively researched due to their potential to offer secure, distributed, and immutable storage. The existing land record-keeping systems are based on centralised storage systems that face risks such as fraud and manipulation.

Various scholarly articles suggest the implementation of blockchains as a means to record data regarding properties in an immutable manner. By utilising smart contracts, one can perform registration and transfers automatically, thereby minimising efforts and delays.

Pilot projects across various nations have highlighted benefits such as higher transaction speed and improved trust among participants.

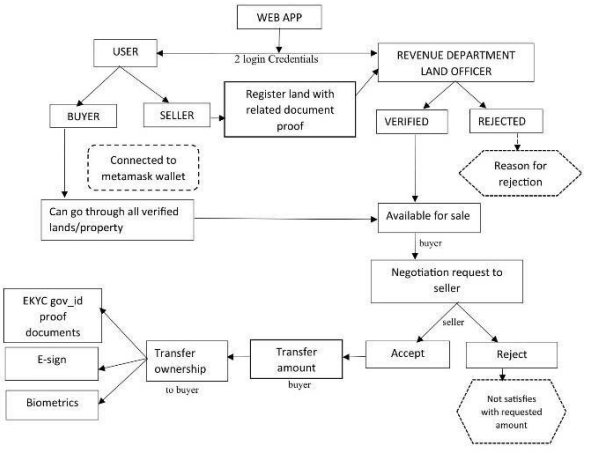

Fig 1. Workflow of the Land Registration System

III. SYSTEM OVERVIEW

The proposed Blockchain-Based Land Registration System establishes a secure and decentralised platform for managing land-related records. All property information is verified by authorised government entities before being stored on a blockchain ledger, ensuring transparency and immutability. Smart contracts are utilised to automate the registration process and handle ownership updates efficiently, thereby reducing dependence on manual procedures.

IV. METHODOLOGY

The proposed blockchain-based land registry system is developed using a structured approach that integrates frontend, backend, and blockchain technologies. Initially, system requirements are analysed by identifying key stakeholders such as administrators, buyers, and sellers, along with core functionalities including land registration, ownership transfer, and record verification. A decentralised system architecture is then designed, where the blockchain serves as a secure and immutable database. A local Ethereum network is set up using Ganache, and smart contracts are developed in Solidity to define and automate land-related transactions. The frontend interface is built using web technologies such as HTML, CSS, and JavaScript, while the backend is implemented using Node.js or Python to facilitate communication between the user interface and the blockchain via Web3 libraries. All components are integrated to ensure seamless interaction, where user actions trigger smart contract execution. The system is thoroughly tested for security, accuracy, and performance, and finally deployed on a test network, demonstrating a reliable and transparent solution for managing land records.

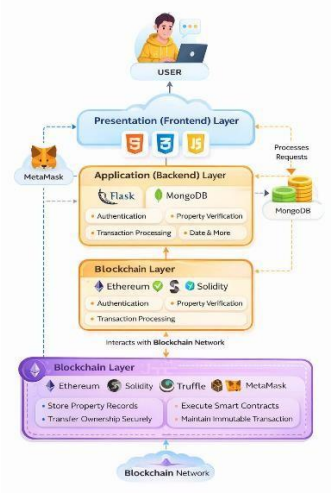

Fig 2. System Architecture for Blockchain-Based Land Registration

V. RESULTS

The proposed system improves the security, transparency, and efficiency of land transactions by storing property records on a blockchain network. The integration of smart contracts accelerates the execution of agreements and transaction processes. As a result, the system significantly reduces the likelihood of fraud and disputes while ensuring reliable record management.

VI. FUTURE WORK

The system can be enhanced by integrating Geographic Information Systems (GIS) for more accurate land mapping and visualisation. Incorporating artificial intelligence into the verification process can further help in identifying fraudulent claims. Additionally, collaboration between government authorities and the digital platform can expand the system's adoption and effectiveness. The development of a mobile application could also improve accessibility and user convenience.

VII. CONCLUSION

The introduction of the Blockchain-Based Land Registration System is a practical and reliable solution to managing land record management. The implementation of blockchain technology ensures that the data cannot be altered and guarantees data accuracy and security from any fraudulent actions.

By implementing smart contracts in the system, property registration and transfer become automated processes, minimising the need for human intervention.

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