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Land Registration System Using Ethereum Blockchain

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***Abstract*—In today's scenario, many news related to counterfeit land titles, fraud land registry, delay in ownership transfer, the involvement of government officers in fraudulent activities is frequently being heard. However, this depicts that the existing land registry system is not efficient to provide security and timely settlement of transactions between the seller and buyer. To solve this problem, we proposed a blockchain-based land registry system in this article. The specialty and popularity of blockchain technology is its transparency and security. Blockchain is being inculcated with the trait of persistence, immutability, decentralization. Its ascent to new opportunity of efficiency and cost saving. It can provide right framing for digital asset, online payment, and transfer of remittance. Additional to this it can check upon black money laundering. Consumers will trust businesses that use blockchain technology. We proposed a decentralized application in this paper. We used the Ethereum network in particular to create and deploy the smart contract. Frontend web pages are used to communicate with the deployed contracts. React is a framework for creating web pages. Next.js is used for server and routing purposes. Finally, the findings and analysis demonstrate that our proposed approach is effective and feasible.**

I. INTRODUCTION

Land registration entails gathering information such as ownership and property size. Currently, the entire process of land registry maintenance is extremely time-consuming because it requires the storage of vast quantities of written records. The main problem with the above-mentioned method of land register upkeep is that every future reference that must be made from these hard copies will take too much time. This is a lengthy procedure. The current method is insecure since the majority of the procedure is opaque, the system is inefficient, and property sales must be recorded precisely many times. Several attempts have been made to automate land register data maintenance by removing the need for hardcopy records. Initially, this is accomplished by storing data in massive databases. However, this strategy is ineffective in terms of data security because the data contents are easily hacked, and data manipulation can occur in poorly managed databases. Blockchain is a distributed ledger system that maintains a historical record of all transactions over a peer-to-peer network.Land registry implementation using blockchain helps to prevent fraudulent actions, making the system more secure. Because it is difficult to copy the blockchain, utilizing this technology to construct a land register helps to avoid any illicit land transactions.Contracts and ownership details are maintained in a decentralized method. Because the block chain implementation eliminates the need for physical interaction, it is easier to track data transactions and thus increases overall security for system users. Blockchain presents an opportunity to build a strong digital identity system. Using blockchain, each block in the network represents the data involved in a land transaction which includes details like property id, property number, owner details, transaction amount, mode of payment and last transaction details such as amount that has been paid for that transaction. We can ensure data security and methodical data organization by employing encryption approaches such as the SHA256 algorithm.

Implementation of applications using blockchain guarantees the quality of digital data that is being used. Privacy issues like data security breach and identity theft in digital domain are well addressed. Present day technology uses password-based approach for accessing confidential information. Method of storage of data in insecure systems is also not reliable. Stringent identity verification based on public key cryptography is used in blockchain-based apps' authentication mechanisms. The cryptographic hashing method in blockchain verifies whether the transaction in question is linked to the private key involved. The databases of existing computerized land registries are accessible to both business entities and the general public, ensuring greater documentation of transaction details. The local terrestrial maps and images of the areas under transaction are also

maintained under these databases to ensure better surveillance of areas under sale. The signature for each block is created using an elliptic cryptographic curve algorithm, resulting in a pair of public and private keys. The hash of the transaction is signed using the private key, making the transaction more secure.PoW algorithm used in the blockchain helps in decentralizing the events.

What the poof of work algorithm does is that when a new transaction occurs, it will first broadcast the transaction to every node in the network. Each node will calculate the PoW. One who found the PoW announces to other nodes in the network and will add that transaction to the block. The difficulty factor is a PoW parameter that helps to minimize the time it takes to construct a new block, ensuring that an attacker cannot create or replicate a block within that time. The authentic chain is always the longest expanding chain. Each block on the blockchain has its own unique identification number, and no human editing or data tampering is possible within the block. Once a transaction is completed, it is added to the chain of blocks and if two owners have the same property it is managed with the block chain in a good and secure manner. Blockchain based land registration has the potential to increase liquidity, mitigate risk, and reduce costs, all of which would make property investment an even more attractive prospect.

Currently, registration officials and other third parties that are involved in a land transaction deal frequently benefit financially from clients who want to sell the property.

The offline method of initiating a land transaction often leads to issues like double spending. Blockchain helps mitigate the interference from third parties by offering a secure platform by means of transaction timestamp, stored within the block. By implementing land registry using block chain we are addressing some of the challenges involved in data collection and storage, data confidentiality, authenticity of ownership details regarding source of money. It also contains information about the funds provided by financial institutions and the customers participating in land transactions, such as banker and insurance information. The block chain contains information about the amount of land purchased by an individual or business. It also offers specifics on how to represent past attributes, information about financial institutions, data protection, fault tolerance without data loss, and representation of previous transaction details. Maintaining land registry records is a tedious task. The process of referring back to all the transactions made from a land registry ledger is again a time consuming process. The integrity of data kept in the blockchain network is called into doubt by the prevalent illicit actions in our society. These concerns have served as a catalyst for land record maintenance innovation.

II. RELATED WORKS

A record keeping system is based upon blockchain, and it removes the vulnerabilities to the sensitive data. It is because of this reason that blockchain uses cryptographic primitives for the process of authentication. That is why blockchain can be used to reduce the trust on the third party by decreasing cost through the process of a programmed transaction recording system. Those applications that are being controlled and managed by the single or central user are called centralized applications. In centralized applications, all the parties reconcile their local databases with a centralized electronic ledger that is maintained and controlled by a trusted central party. Moreover, record keeping has always been a centralized process that always requires trust in the record keepers. Blockchain technology, which has been widely used for the design of decentralized currencies, self-extracting digital contracts and intelligent assets over the Internet, can serve as a replacement for centralized control over records.

Centralized systems are numerous, and today's world is the world of social networking. Social networking platforms like Google and Facebook have created the revolutionary connection in humanitarian society. Also, with these platforms, it also made it great responsibility to manage user privacy and one's data that are very much vital for him. In these social networking systems, there lies a central server where all their data reside. Please see Figure 1 for depiction.

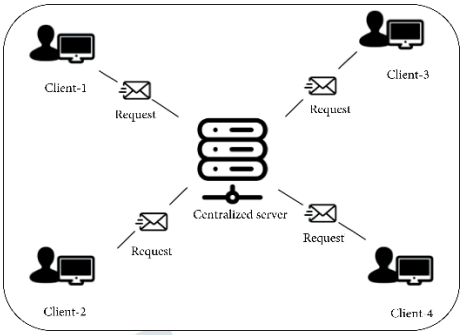

Figure 2.1
Centralized application architecture.

A central or single control regulates all events and coordinates with the entire system in a centralized system. In a decentralized system, on the other hand, each participant/entity is totally self-directed. Each element in this autonomous system is referred to as a peer. In a broader sense, we may say that, rather than a centralized system, the use of a decentralized system is becoming necessary, because everyone wants their system to be secure, traceable, and resilient. And emerging technologies like blockchain can help with this critical role. As time has gone and new trends have emerged in the technology stack, blockchain has become increasingly popular.Now, it is being used in almost every organization of the government and supply chain and in many other numerous areas. Blockchain has smoothed the problematic, time-consuming processes that were at the risk of failure. In simple words, it has made human more powerful towards the implementation of transparency and accountability and in maintaining trust and security. In this decentralized system, there is no intermediary intervention and the system can be evaluated for the required performance. Please see Figure 2 for the elaboration of decentralized systems.

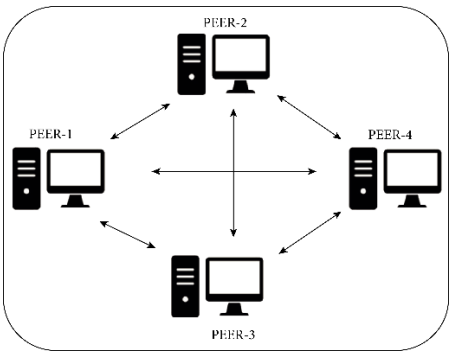

Figure 2.2
Decentralized application architecture.

Every technology has its own set of restrictions and challenges. Despite the fact that decentralized systems have provided great support for managing security, these systems continue to have issues. For example, blockchain (an emerging decentralized technology) usage is increasing, and

the number of transactions is increasing on a daily basis. Because each block's size varies, the time it takes to create a new block becomes a key source of blockchain's slow response. Another rising issue of decentralized systems is the leakage of transaction privacy; this happens because details of the public keys are visible to each participant that is available on the blockchain network. Apart from the advantages of the technologies, there exist few or more cons too; on the one side, blockchain is improving the current state of almost every aspect of data storage and security. It also suffers from few prevailing and alarming problems. In the same way, decentralized systems, i.e., blockchain, are also facing the fork problem. The problem of forks mainly occurs when blockchain is divided into two branches; it can happen due to the change in the consensus algorithm or when there happen some changes to the software. These two problems are directly related to the blockchain's architecture. Normally when there is a change in the consensus algorithm, the soft fork takes place, as at this point the older nodes of the blockchain are unaware about the consensus rule changes. This soft fork can be harmful to the effectiveness and stability of the network. Hard fork condition, on the other hand, arises in decentralized systems when there is a permanent divergence in the blockchain, which occurs when old nodes do not upgrade to the newer version and hence cannot validate transactions.

III. How Blockchain Land Registry Platform work?

Stakeholders involved in the Blockchain Land Registry Platform:

Buyer: A person who buys the land and uses the platform to search the property, request access and interact with the seller and get the land title ownership.
Seller: A person who sells the land and uses the platform to manage properties and transfer land title to buyers.
Land inspector: A person who uses the platform to manage property requests, view reports, confirm and initiate the transfer.

Step 1: Users register to the platform

Users who either want to sell or buy properties register to the blockchain land registry platform.
They can create the profile on the platform with details like name, government-issued ID proofs and designation. A hash for the identity information submitted by the users gets stored on the blockchain.

Step 2: Sellers upload the property specifications on the platform

Sellers can use the platform to upload photographs and papers for their properties, as well as pin the land's position on a map.
The blockchain records the transaction matching to the seller's activity of listing the property data.
All users who have joined up as buyers will have access to the property data once they have been uploaded to the platform.

Step 3: Buyers request access to the listed property

A buyer interested in any specific property can send a request to access its specification to the seller.
Property access requests are communicated to the sellers. By looking at the buyer's profile, they can either deny or accept it. Buyers can check the property's past ownership records and submit a purchase request to begin the transfer. Transactions corresponding to the requests made by both sellers and buyers are recorded on the blockchain to ensure authenticity and traceability.

Step 4: Sellers approve the transfer request and land inspector gets the notification

If the seller agrees to the land ownership transfer request, the land inspector is notified and the property transfer can begin.
Smart contracts are triggered to give the land inspector access to land documents.
The land inspector will organize a meeting with the buyer and seller when the paperwork have been verified.
The conference minutes are also stored on the blockchain in case future property conflicts arise.

Step 5: Land Inspector verifies the transaction and initiates the transfer

Land inspector verifies the documents submitted by buyers and sellers and adds the authenticated records to the blockchain land registry platform.
Sellers and buyers sign the property ownership transfer document in front of the land inspector on the land registry platform.
The signed document is kept in the database, and the blockchain transaction associated with it is logged.
The transfer is started, and smart contracts are set in motion to give funds to the seller and transfer title ownership to a new buyer.

Step 6: Land Registry Document Validation and Authenticity

Any authorized party can upload the signed land registry document to the platform to examine its authenticity and validate it in the event of a dispute. If the hash generated after uploading the document matches the hash generated at the moment of signing the document, the document has been authenticated and no changes have been performed.

IV. IMPLEMENTATION SCREENSHOT

Figure 4.1

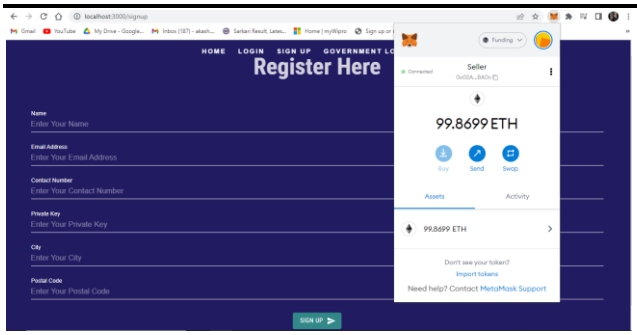

Figure 4.2

V. FUTURE SCOPE

We are now using a private blockchain-based conceptual framework; however, this20 Applied Bionics and Biomechanics method can be modified in the near future to allow the general public to connect directly to the system and acquire information about their assets. Furthermore, we have only been in operation in order to build a conceptual framework. However, in the future, such frameworks could be used to develop a software system. It can surely provide insight into the actual system as a framework.

VI. CONCLUSION

The use of blockchain in the land register has become a need in today's environment. Once the land transfer activity is completed, the information is instantly updated and saved on the blockchain platform, which is the most secure and tamper-proof method of operation. No one can change the legal right of the ownership, and no one can damage the data asset; others cannot make a change in that transaction and ownership. The history of past transfers of ownership uses to help in verifying the current legal owner of the land. There is no need for authority in the Blockchain, which is a huge advantage in today's world. There is no requirement of middleman or authority and is simply called as Decentralized ledger. The term blockchain has been gaining popularity because of success, such as Bitcoin, Ethereum, and Hyperledger fabric. The use and implementation of Blockchain in the land registry and its assistance in maintaining the land records are quite transparent. Blockchain helps to make the process of land registry transparent, straightforward and more accessible. It is very useful in the land registry where this application enables us to know how, when, where, which, etc. about the land title. It also empowers us to know if there had been any activities in a particular land. It shows every record of the land registered. This application will indeed take us towards development and easy accessibility to life not only for us but also for the future generation.

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