Efficient Approach for Land Registration using BlockchainTechnology

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***Abstract*—**Blockchain is a comprehensive solution to shield the vulnerabilities in many sectors which are prone to corruption and human error. The Land Registry is one of the cases where there can be a lot of human interventions which can cause errors intentionally or unintentionally. Apart from that there are many cases of fraud, falsified identities and forged documents and even a complete record loss within paperwork. When there are thousands of records to be maintained and tracked it is obvious that integrity and safety is tampered in one way or other. There is no proper solution to this. The transparent nature of the blockchain will make this possible by not involving any middleman other than the land Inspector while an ownership of a land is transferred. The immutability and traceability provided by the Blockchain helps in implementing decentralized technology within the process of land registration.

Keywords—Decentralized, Integrity, Immutability, Traceability, Transparent.

I. INTRODUCTION:

Current Land Registration system is tedious since it involves writing of documents by hand and maintaining those large volumes of documents. But as the time passed, technology has been modernized and facilitated us with many amusing things, one such technology is Blockchain. Main issue in maintaining hard copies of the documents of every land is that it becomes very difficult to maintain and track them ultimately involving too much labour. This results in both time and cost consuming. Also, transparency is one other issue where there are many cases of corruption, selling a land more than once due to this. Blockchain is one of the most desirable solutions available to deal with the current problems.

1) Blockchain :

Blockchain is a decentralized electronic ledger built with a peer-to-peer mechanism that keeps all the historical transactions that have taken place in the network. Transactions are stored in a block and each time stamped and connected to the previous block to create an immutable transaction record. The transactions are stored in a mem-pool until they are placed in a block and mined to add it to the existing chain of blocks called network.

Blockchain is a technology of Write-once, attach-many, no-modify making each transaction verifiable, auditable and immutable.

A distributed database is provided by theblockchain to allow everyone to record and access information with no centralized authority being involved. In current scenario If the ownership of a land is to be transferred, then one should sign it, take notaries for rubber stamping and hand the documents to the State fill out blanks in the deed.

The method is very old and inefficient. However, it can enhance the method by generating a digital title with the Land recording network blockchain.

Blockchain possesses authenticity and enables homeowners legitimately to transfer the land to the buyer with not much hassle and only one intermediate involved and that is the land Inspector.

2) Decentralized Applications:

A decentralized application is a type of distributed open source software application that runs on a peer-to-peer blockchain network rather than on a single computer. They are free from the control and interference of a single authority. Benefits of dApps include the safeguarding of user privacy, the lack of censorship, and the flexibility of development.

3) Proof of Work (PoW):

Decentralization of the events in the blockchain is done by the Proof of Work. Whenever a new transaction is occurred in the network, it is broadcasted to every node in the network. PoW is then calculated by each node and one who calculates the PoW first will acknowledge all the other nodes in the network and will add the transaction to the block. This helps in securing the transaction from any attackers from manipulating the blocks.

4) Reducing Fraudulent Activities:

Another main concern of land registry is the fraudulent activities being done. Blockchain can help in reducing them which makes the system more secure. We know it is nearly impossible for someone to make a change in the blockchain as there are many servers involved this can ultimately reduce the illegal activities involved in land transactions. It becomes easy for anyone to track the details of a particular land as this process adopts a decentralized method.

5) Reducing Corruption:

No matter how much advanced the system gets, there is always a problem of corruption. Common people suffer a lot with this issue. There are many intermediaries involved while selling a land and they obtain bribes in order to do the work. This issue can be resolved as the Land Inspector of the district is the only one who is involved.

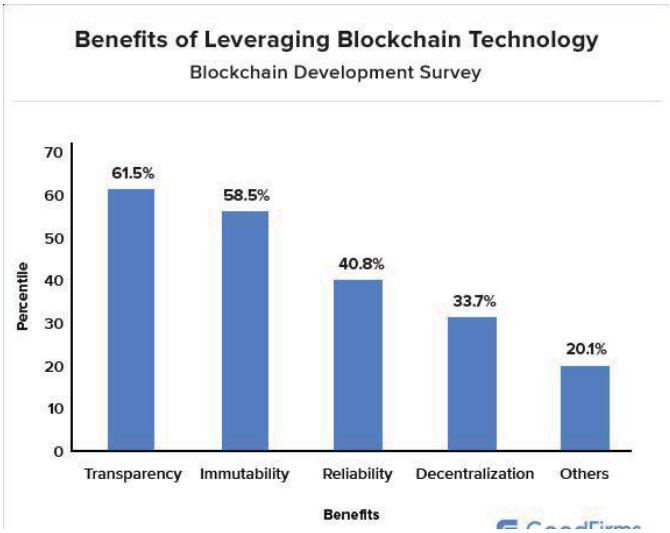
6) Role of Smart Contract:

Smart contract is a program or a transaction that is stored in the blockchain which is automatically executed when predetermined conditions are met.

Whenever land owner wants to sell a land and someone is interested in buying that land, the buyer can make a request to the land owner about the land and if the land owner approves the request then the buyer can buy the property by making a transaction by sending the market value to the owner.

Here comes the role of a smart contract the money sent by the buyer is not sent directly to the land owner there is someone called as a land Inspector who should approve the transaction. Land Inspector neither has the access to the money sent buy the buyer nor to the land. The money sent by the buyer is stored in the smart contract safely and no one has the access to withdraw that money.

When the land Inspector verifies the transaction and approves the Ownership transfer request the market value is transferred to the seller and buyer gets the land on his name. This way security and decentralization is maintained.



II. OBJECTIVE :

As an alternative to the old methodologies where intermediaries play a major role, a new efficient and secure service should be built. Keeping this in mind Blockchain technology can be vowed as a viable technology that can be used in this scenario.

Since the data of every transaction is available to everyone the Blockchain technology is considered secure.

Tools Required:

VS Code: An editor to write and organize our code.

Node Js: Node Js is an open-source and cross-platform JavaScript runtime environment.

It is a JavaScript runtime built upon Chrome's V8 JavaScript engine. Scalable network applications can be built.

Metamask Chrome Extension: It is a cryptocurrency wallet used to interact with the Ethereum blockchain. Users can access their Ethereum wallet through browser by using this.

III. RELATED WORKS:

Digitalization of Land Records using Blockchain Technology:

This paper describes the important role that blockchain could play in Land Registration. It describes the problems that the current Land Registration system is prone to and how these problems can be resolved by using blockchain. Problems like tracking the pieces of properties from thousands of land records , also falsified identities, forged materials and complete record loss inside the paperwork are even bigger issues.

Securing Land Registration using Blockchain:

This paper mainly focuses on the security the blockchain could give by using it in the Land Registration. It explains abouts the linkage between each block to its previous block using a secure algorithm like SHA256 along with this it also describes about the Proof of Work concept which is responsible for the time taken while mining a block.

IV. PROPOSED METHODOLOGY:

Summary:

By using these two papers a decentralized application is developed which implements all the key aspects mentioned in them. All the users can act as buyers and sellers according to their needs. There will be land Inspector for every district and whenever a transaction is to be occurred he/she needs to approve the transaction and then it will be done securely in the blockchain without any hassles thereby eliminating all the problems that are previously mentioned.

V. PROBLEM ARCHITECTURE:

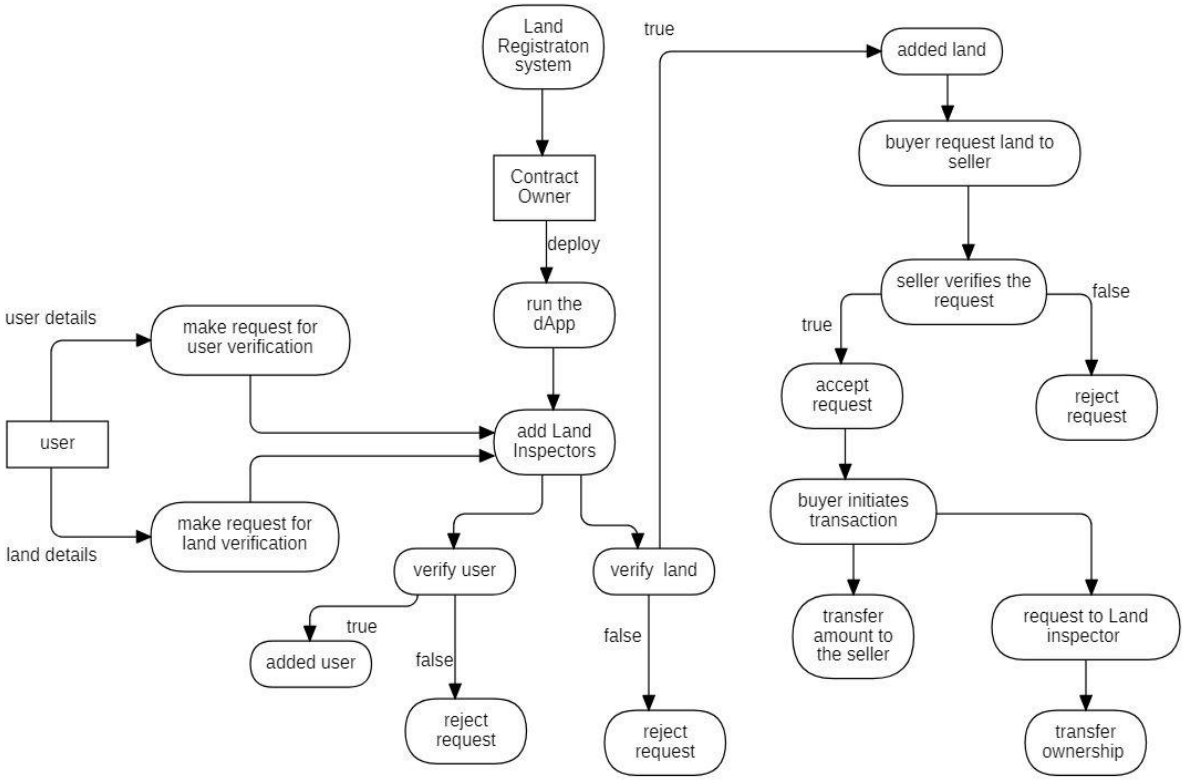


Fig. 1 : Work Flow Diagram

The contract is deployed by the higher authorities who then add Land Inspectors for every district. Users then fill up their details and send a verification request for respective Land Inspectors. Land Inspectors are now supposed to verify those requests using other legal documents and allow them to be participants of this system. If those details are not correct then the Land Inspector can reject their request.

After successful verification users can now register their lands by sending land details for Land Inspectors for verification. If all the details given came out to be valid during the verification process by Land Inspectors then those land registration requests are accepted there by allowing users to view those lands and make sell, buy requests. Throughout the process the details of Land Inspectors remain anonymous to the users.

VI. RESULTS & DISCUSSION:

As Blockchain is a decentralized and scalable technology using it in Land Registry will definitely aid the problems faced and makes it possible for the buyers and sellers to get rid of any additional intermediaries other than the Land Inspector.

To display their properties and make any sell or buy request for any other land the users can register and use the platform. Users need to give various details of them to get registered on the application.

Any User can make any of their land available for sale by just clicking a button. Whenever someone is interested in purchasing that land one can request to the land owner acting as a buyer and if the owner accepts the request the buyer can now pay the market value and the amount of ether is transferred to the contract and stored in it until the Land Inspector verifies the ownership transfer request and once the request is approved by the Land Inspector the market value is transferred to the seller and the land is registered on to the buyer as the current owner of the Land. This makes the transaction secure without any chance of corruption and also manipulation of any block is almost impossible as one should successfully attack 51% of the servers in order to make a change valid on the network.

This makes Blockchain as the most viable technology that can be used in this sector.

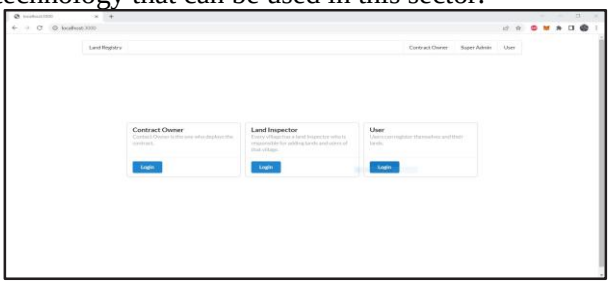


Fig. 2: Home page

The home page of the applications includes different sections like Contract Owner, Land Inspector and Users. Every person that tries to interact with this application is first directed to this home page. From here on they can navigate to their respective sections.

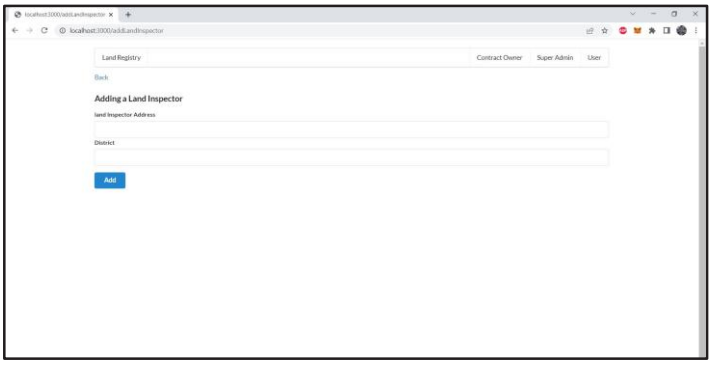


Fig. 3 : Adding Land Inspector page for Contract Owner

Contract owner is supposed to add Land Inspectors for every district for which he can login to the Contract Owner section from the home page. He is then directed to the below page where he can add Land Inspector by submitting a few details.

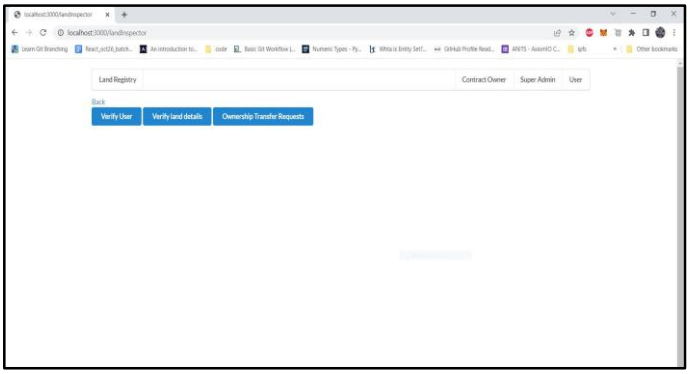


Fig. 4: Land Inspector page

On the Home page there is a section called Land Inspector for Land Inspectors to login, when they do login they get redirected to the below page. This Land Inspector page provides various features for users like Verify User, Verify Land, Ownership Transfer Requests.

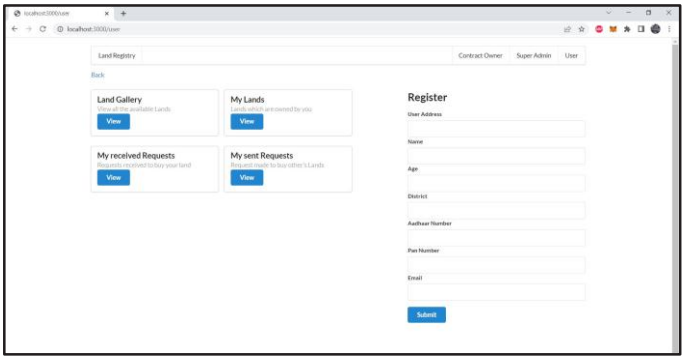


Fig. 5: Users page

On the Home page there is a section called Users for users to login, when they do login they get redirected to Users page providing various features like Land Gallery, My Lands, My Received Requests, My Sent Requests and

User Registration form.

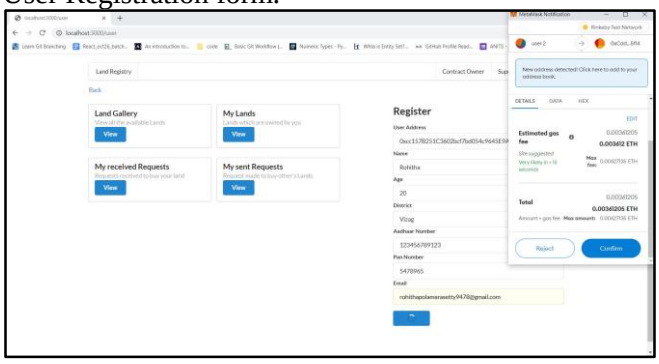


Fig. 6 : User Registration page

Users can fill the registration form and send a user verification request to their respective Land Inspector.

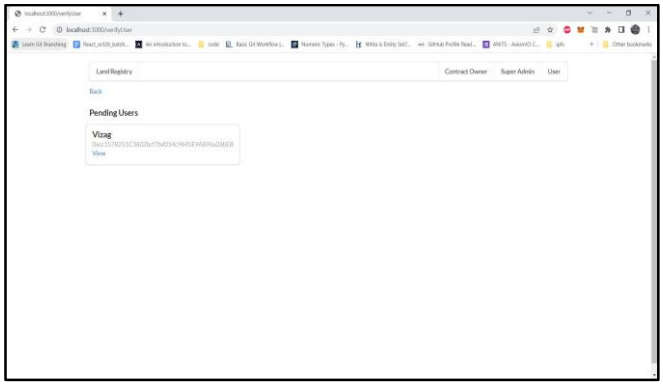


Fig.7 : Pending Users page

These user sent requests for verification are displayed as pending users list for respective Land Inspectors.

VII. CONCLUSION:

First of all we addressed all the problems that exist in the current Land Registration System and we want to somehow find a solution that is capable of eliminating those existing issues.

After a good amount of research we found that one such solution which can tackle all these problems on the go is Blockchain technology. Because Blockchain is decentralized and any causing any manipulation to the existing records is not an easy task in Blockchain. We've built an working demo application that mimics all the features that we discussed.

Main benefits of using Blockchain in Land registry are:

Validation: When a transaction is to be done, it is validated based on its linkage within the network to the other nodes. Record cannot be added if it fails to maintain this.

Encryption: Using cryptographic algorithms like SHA3 and SHA256 information is saved. This means all the assets are encoded properly.

Decentralization: Records are available to everyone and requests can be made without any involvement of third parties other than the Land Inspector who monitors and verifies the transaction.

The application is developed using a smart contract that contains all the methods that are required to carry out a transaction in the backend. Contract is deployed in the Rinkeby test Network so that users can get a real-time experience of how the system works. It also has a interactive UI that the users can use with comfort.

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