LAND REGISTRATION USING BLOCKCHAIN TECHNOLOGY

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ABSTRACT

The present Land Registration System is a time consuming process for the transfer of property ownership related to a land transaction. The data of the land is stored in a single place leading to security issues also. In some cases the incomplete/improper registration leads to dispute of ownership and litigations of the land. In this work, a land registration system using block chain is proposed to overcome the above mentioned limitations of the land registration system. The decentralised storage of data in block chain provides security and land owner data can be stored safely to avoid conflicts of land ownership. Land being an important asset, the use of bock chain technology can help improve this sector in its work implementation as well as its characteristics significantly for a seamless and hassle free work flow to achieve a reliable system.

Keywords : Land registration, blockchain, ethereum, smart contract, sellers, buyers

1. INTRODUCTION

The prevalence of CoViD-19 (Corona Virus Disease) pandemic created great havoc to not only to human lives but also to every essential sector ranging from private to government. People are instructed to stay safe at their homes rather than moving out unless and until required, following all the essential norms to protect themselves from the threatening pandemic. In such scenario, if property is to be purchased, then it will be a risk-filled necessity for the people to walk to the registration office for fulfillment of all the manual formalities to get the ownership. In the proposed land registration system, all phases from buying to selling of a land take place through the blockchain environment through their own smart devices, thereby overcoming the need to move around [1]. Also, during the CoViD (Corona Virus) Pandemic, there is a need to adopt the emerging technologies to offer a wide set of services to the users online rather than offline approaches. This may incur payments made by the users to acquire services in terms of goods or groceries ordered online to prevent the offline transmission of the disease. However, if the gateway is not a secure one, then the transfers made by the users may fall into wrong accounts and this creates a panic amongst the community to prefer online over offline options. If blockchain environment is used to serve the aforementioned purpose, then every entity across the network can access the ledger data and hence it gets easy to track the malicious nodes [2].Also, another aspect to be focused on is the adherence to regulations that is lagging in different blockchain variants.

Land Registration process requires a lot of paper work. The paper work takes a lot of time to complete the transaction of Land Owner updating. i.e. the land has already been sold by previous owner but the data in the server is yet to be updated. In some cases due to incomplete registration the land ownership is left uncertain. Documents might be forged through illegal processes to claim land ownership. other challenges faced in Land Registration:

i. Middlemen/Brokers:

Brokers/middlemen charge differently for their services based upon the land to be sold or bought, documents work required for the registration etc.

ii. Fraudulent Cases:

People not having enough knowledge about registration process and documents validity are often prone to fraud cases.

The above mentioned limitations of the land registration system can be overcome using block chain to maintain land owner data. Blockchain provides a solution to store data in a decentralized manner which provides better security to the data. It provides a fast and reliable system with respect to process execution [8]. Smart Contracts are the tools used to carry out these procedures automatically and reliably upon the block chain eliminating the need of any third person intervention. They can be deployed using Decentralized applications for client side UI.

Smart Contracts can automatically execute a land transaction under given conditions from the seller and buyers that can be deployed on the block chain. This enables a fast and reliable land registration system to increase the speed of the original process. A safe and secure way to store and maintain data is required. The land owner updating can be done very fast. Document forgery for the claiming of land can be kept in check with the block chain data. Due to faster land transaction execution, incomplete registrations can be eliminated. There is a significant scope for the improvement of this work, which can be under taken by government for implementation based upon their needs.

The rest of the paper is organized in a way where section 2 gives a glimpse about the use of blockchain to deal with various aspects of distributed environment in a secure way. Section 3 proposes the work developed for land registration process to ease the existing one and overcome its difficulties. Section 4 shows the implementation and the results derived on the ethereum solidity platform for various scenarios quoting a successful execution of the records from seller to buyer in a secure way and finally the work is concluded with a light on future enhancements.

2. Literature Survey

Many organizations learn to tie up with other firms bearing similar interests to develop and work in coordination on a secure application development to yield profitable outcomes. This in contrast to the Crowd funding platforms ensure secure access to the data binding to the access control mechanisms as set up by the firms, which if violated will result in imposing fines and lead to legal filings against the culprits. In addition, if multiple firms are taking part, then each one can follow its own security algorithms and access policies to strengthen the privacy distribution across the network[3]. Towards resolution of any conflict in this direction, involvement of intermediaries is permitted though not completely bypassed. The benefits of such a challenging technology can be well gained if it is integrated with other prominent technologies such as cloud to promote heavy data stores, IoT to promote high data capturing abilities etc.

Repeated execution of a set of statements on satisfaction of a condition is not supported in traditional blockchain based smart contract developments. This is however important when multiple statements have to be inferred to derive towards a decision orientation system. Also, if the nature of the data is dynamic rather than fixed state one and if there is an availability of firmware to analyze the data, then the traditional approaches to perform experiments fail [4]. Hence, there is a need to set up the code in a manner that complies well with the aforementioned issues to provoke a smoother execution across the nodes. In addition to this, a compatible software testing framework is to be worked on to derive better outcomes. The implementation if in place will serve to be beneficial for multiple smart home based secure data across via blockchain network.

Blockchain can be used in integration with various other domains such as machine learning, IoT, data analytics etc to solve the issues relevant to security, confidentiality and authentication. Different implementations of blockchain deal with different real-time scenarios based on the nature of emerging data. For example, ethereum is found to be efficient to prove security and decentralization properties, but scalability is still a challenging aspect to be proved. If there are users who want to attain better returns in the long run, then a compromise on decentralization is not possible [5]. At the other end, if there are users looking for short term returns, then the prime focus will not be on distributed flow, but will be on other aspects pertaining to scalability, security, transparency etc. Also, an amalgamation of both public and private blockchains can be used to utilize the benefits of transparency and secure accessibility. However, a mechanism for the server to generate multiple unique addresses for each user performing an operation on the blockchain is essential to achieve better outcomes [6].

The ability to ensure trust across various nodes through consensus in coordination with authentic and secure access to the data stored is a challenging and desirable property. Particularly in Land registration system, the identity of the users is hidden and only the eligible and thoroughly verified land is put to sale. Also, the entire system is under the single controller in the current system. The scalability aspect is unproved which has wide impact on the overall performance of the entire distributed blockchain network [7].

3. Proposed System

3.1 A secured land registration framework on Blockchain

Smart Contract Definition for Land Registry in Blockchain

In this system, Bock chain has been used for faster execution of land transactions. This system typically considers a land sale transaction and the process is carried in the below 5 steps:

Step 1: The users have to register on a client side application

Step 2**:** The seller has to upload land documents in order to initiate a sell transaction

Step 3:The buyer requests the land owner to view the land details.

Step 4: The land inspector verifies the seller and buyer along with sale deed.

Step 5: The hash value of the document upload by the owner is same to the hash value to the time of buying the property (signing) then the documents is 100 percent authenticated.

Limitations of above system:

The land inspector has to verify the land in every transaction.

The land verification may take time depending upon the circumstances[9].

In the proposed system, the user's data is obtained from a central citizenship data that is maintained by the government. The land owner has to initiate the transaction which is completed by the buyer, this is called as dual consensus regarding a transaction. This system handles the case where the owner of land is absent and thus allocating its owner as the government.

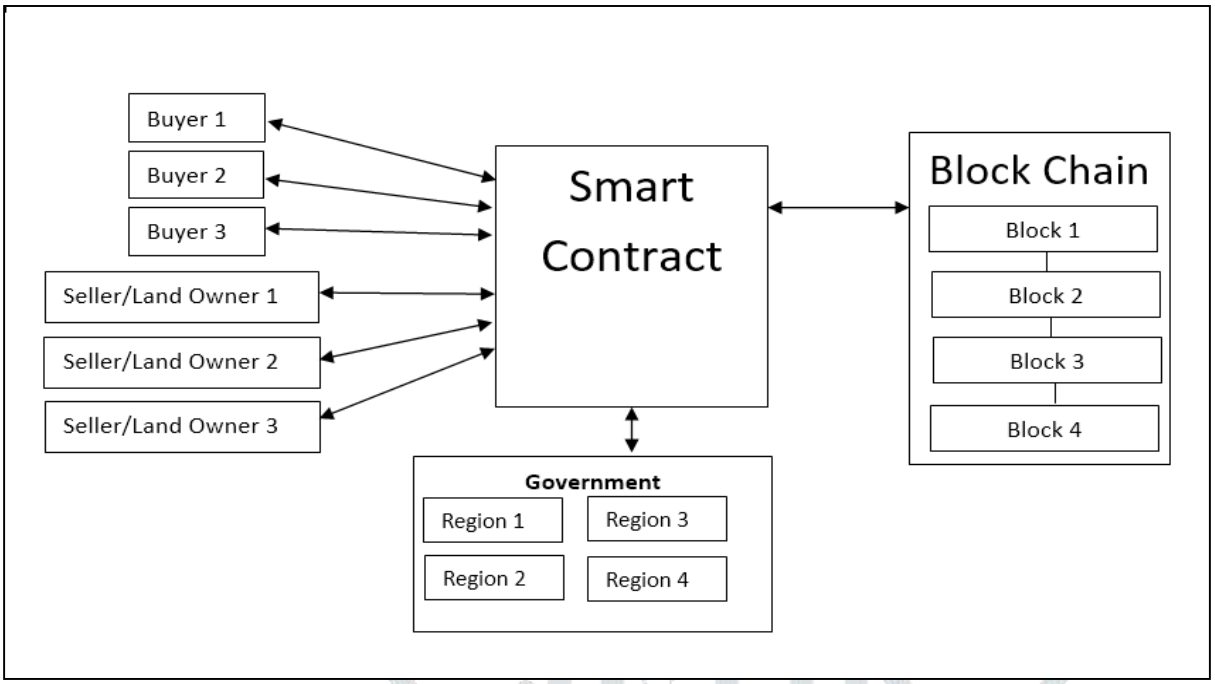

Fig 1. Block Diagram of Proposed Solution

There are three modules designed for the overall functionality demonstration. One is Seller, the other is Buyer and third one is the Node in blockchain based on which the sellers sell the property. Buyer who wants to buy a property by going through the information available to them which contains all the details of property like name of the owner, location, measurement etc. Seller and buyer are able to access all the information available publicly to them. For each transaction, node will verify and copy it onto the ledger.

Roles of Seller And Buyer: Sellers can upload the document to the smart contract, before that document must be digitalised. If document is not digitalised, then the seller must enter the document registration number on textbook. The smart contract will verify it by calling the Encumbrance Certificate API. Buyers must send the money as tokens to smart contracts and no partial transactions will be allowed. If the smart contracts will meet the requirements provided by sellers and buyers, then it executes a transaction.

Role of Ethereum Nodes : Once it the requirement as mentioned for the seller and buyer module are met, transactions will be made. After each transactions, it will be verified by millions of nodes participating in the network based on the hashing program. If all the nodes in the platform accepts the transactions, it will be successful else it will be rejected.

4.Implementation & Results

The proposed work is implemented on ethereum blockchain platform with solidity as a notion to code the contract between various users. The work is initiated onto a personal device as an initial phase with a minimum of 4 GB memory requirement independent of the operating system.

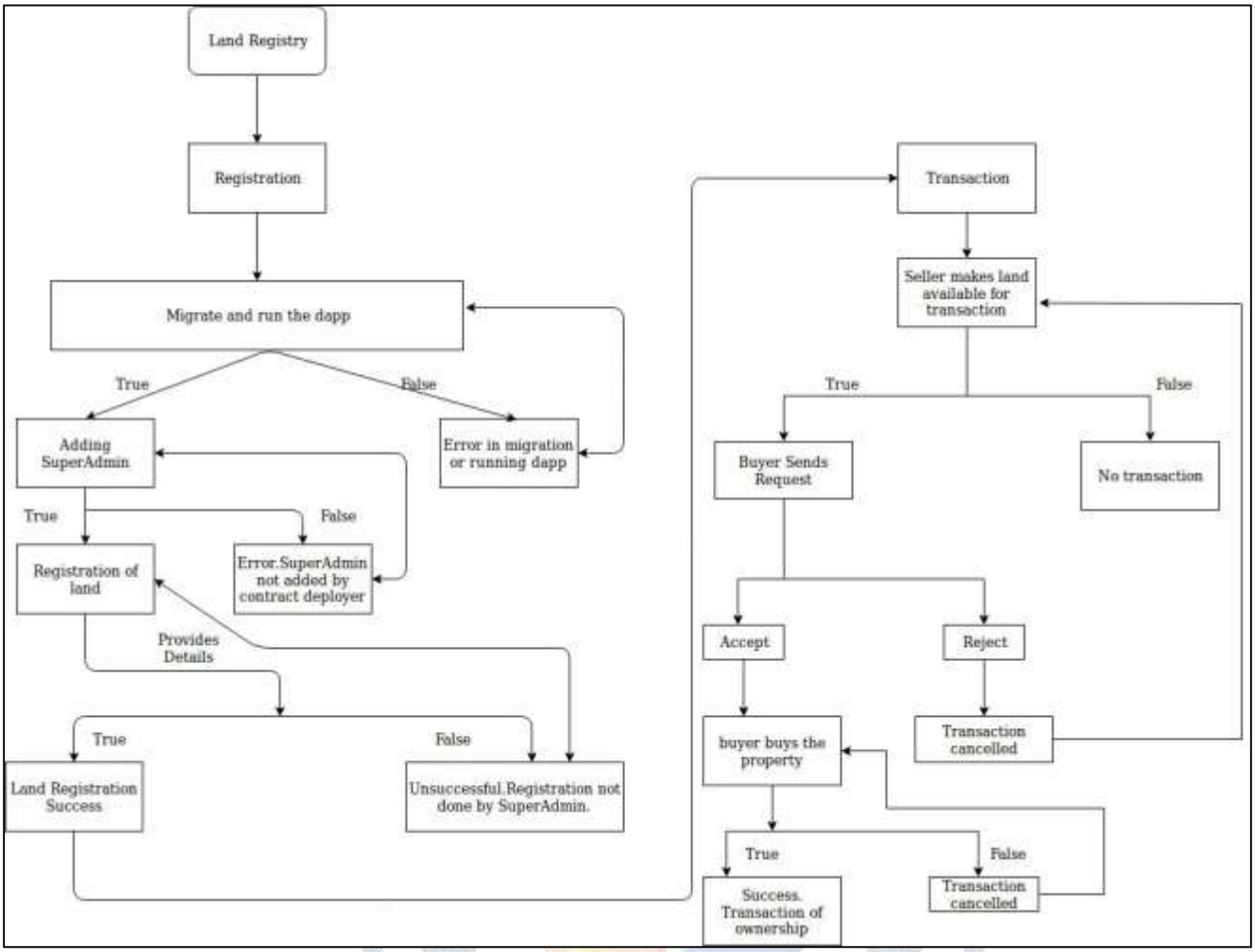

Fig 2. Data flow across various Land Registration Modules

Design and Test Steps

The ethereum solidity contract consists of mainly two functionalities.

Registration : Here the user provides the land details to the government authority who is registered as the super admin. The land which is going to be registered should be in the same area as the super admin who is going to register the land. The super admin verifies the details with the existing records and enters into the dApp as shown in figure 3.

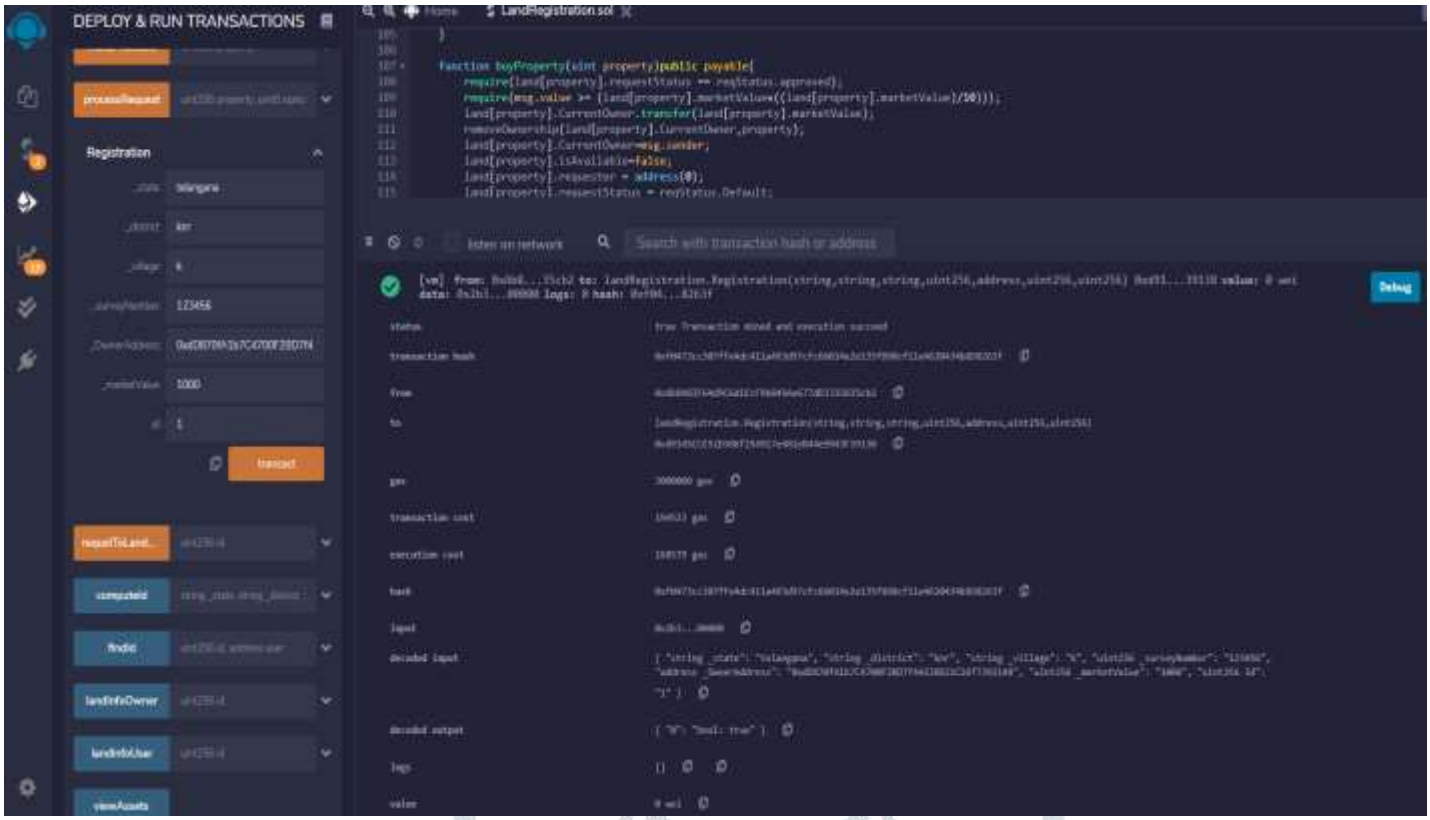

Fig 3. Land Registration

The details that are enrolled into the dApp are : state, district (village), survey number, owner address, market value.

Along with these, an ID generated from the first four details of the land is also passed in. This ID is generated in the function "computeId()" using SHA256. The values entered in the registration form of the UI is passed in to the function "Registration()" and the details are mapped using the ID generated from above as shown in figure 4. Later on this mapping allows searching for a land easier.

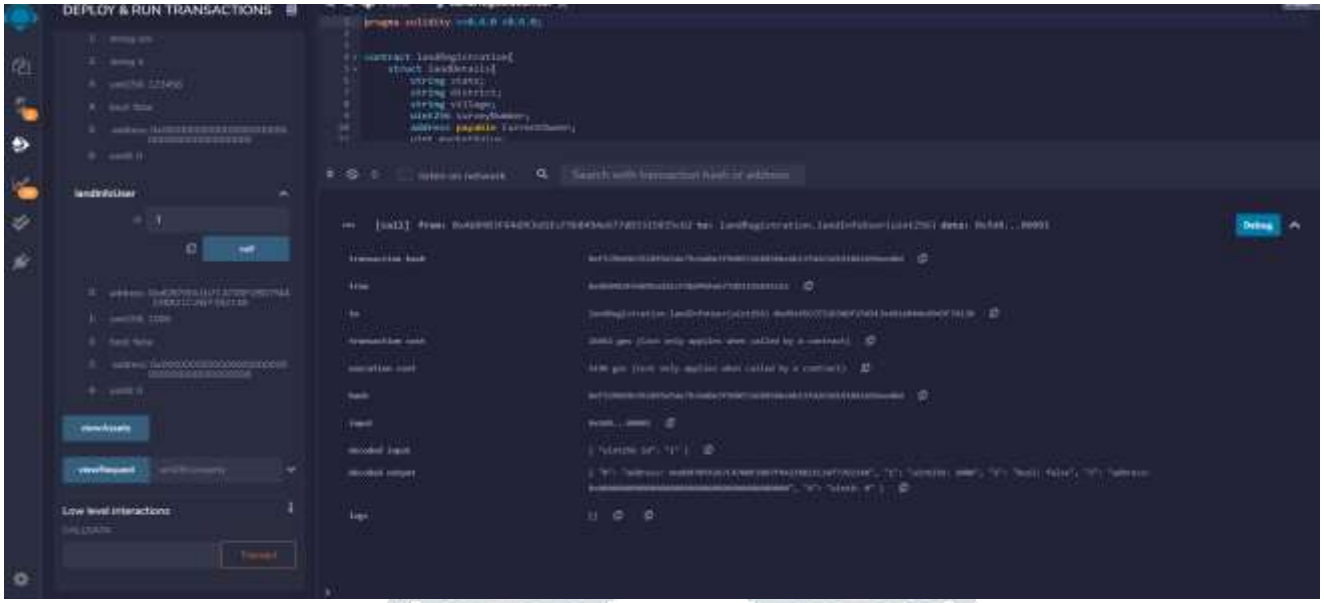

Fig 4: Land Info User Before Purchase

There is another field in the registration page, which is, adding the super admin. There the address of the superuser and the village in which he/she is working is provided. The village is mapped in to the address so that it becomes easier to check that only the super admin assigned to a village is able to register the details of a land in that village.

Transaction: The transaction of a property has several stages involved. The algorithm is designed in such a way that there is no need for any central authority to verify the transaction process. It is important to note that the owner of a property can sell the land as a whole, i.e, there is no partial transaction of the property. This is just to simplify the problem in hand. Later on, while improving the dApp, more of these functionalities can be added. The following are the steps involved :

i. Making the land available : Once the buyer and seller agrees to make the transaction, the seller should make the land available to buy. The land owner passes the property ID to the function “makeAvailable()” and the function verifies the account of owner and changes the value of “isAvailable” to true which implies that the land is open to buy as shown in figure 5.

ii. Sending request to land owner : When the land is available to buy, the buyer sends a request to the land owner to buy the property. The ID of the land is fed into the function “requestToLandOwner()”.The function verifies whether
the land is available to buy by checking the value of “isAvailable”. If the value is true, the buyer’s address is stored inside “requester” which was initially 0 address. The value of “isAvailable” is then set to false so that no more request can be sent and request status is changed from “default” to “pending”.

The above two functions are important in the transaction process because if there is no “makeAvailable” function then any one can send request to the land owner which will overwrite the request of the original buyer. If there is no request function then anyone who sent the exact amount to buy the property can actually get the property.

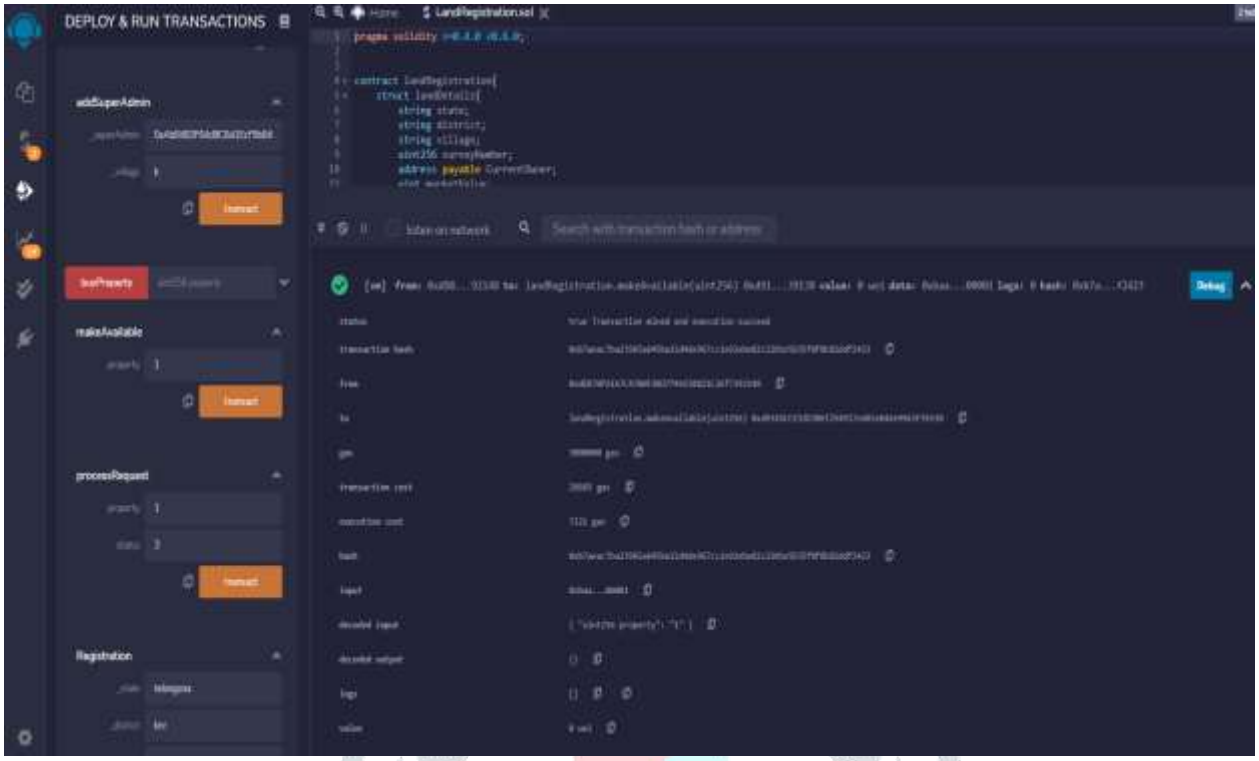

Fig 5. Make Land Details Available

iii. Viewing the request : The function “viewRequest” takes the property ID as the input and returns the address of the requester. The function is for checking the address of the buyer as shown in figure 6.

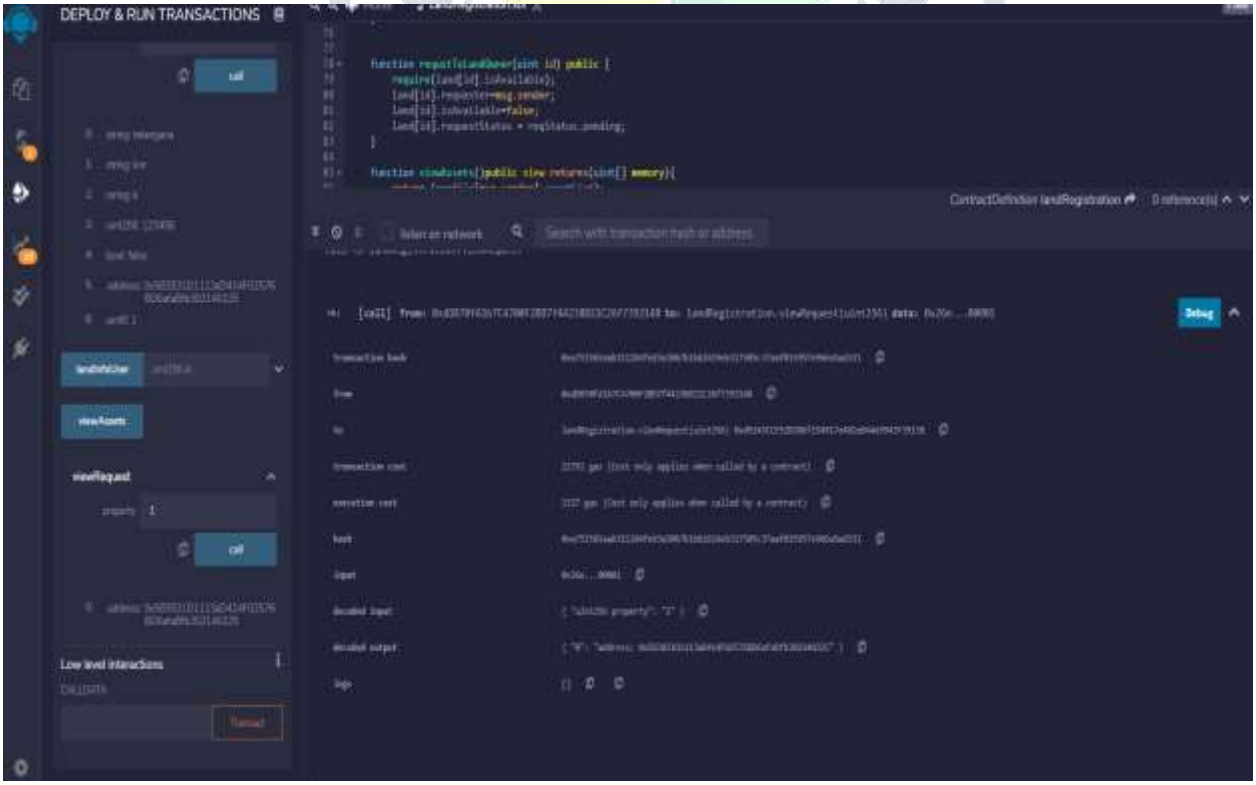

Fig 6. View Land Request

iv. Processing the request : Once the seller views the requester address and if it is the right one, then the seller can process the request by inputting property ID, request status to the function “processRequest”. The function, as usual ,verifies whether the input is done by the owner of the land and process the request as shown in figure 7. If the requester address is not of the original buyer then the seller can reject the request and the function changes the value inside requester to 0 address and request status as default. This is for reverting the states to the original and starting the transaction process from zero.

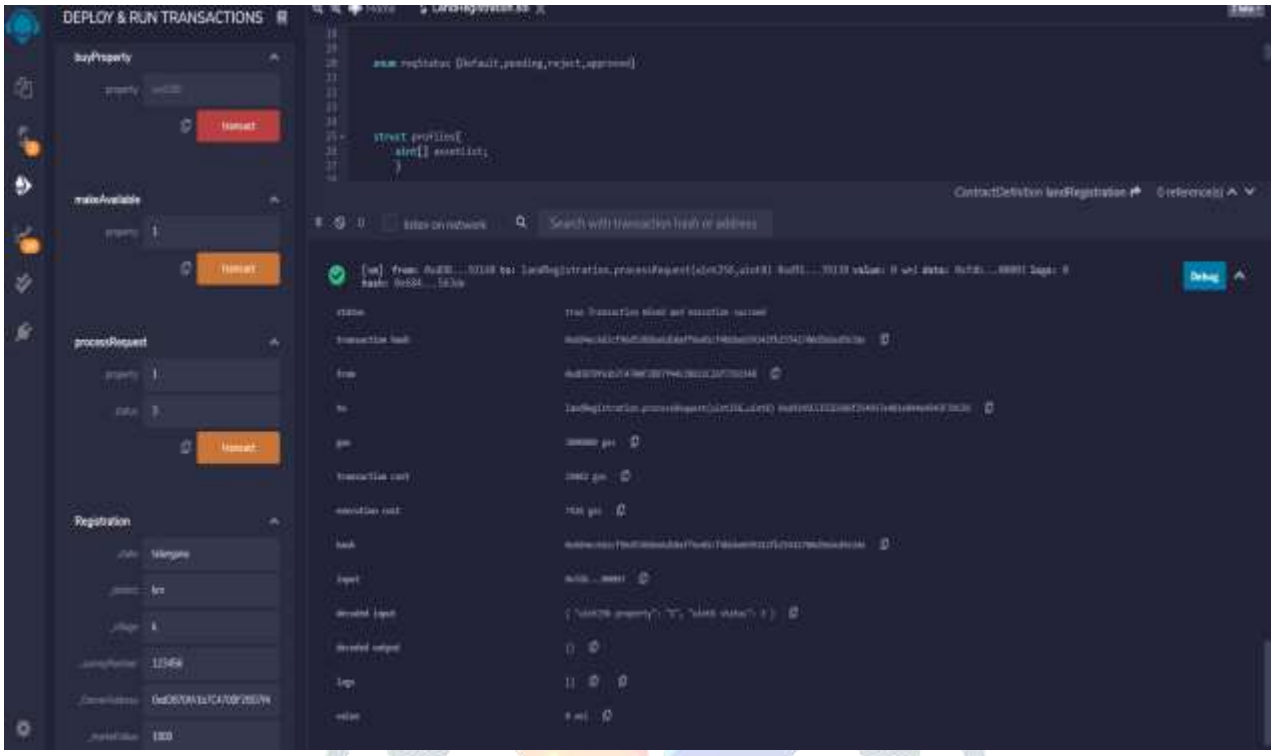

Fig 7. Process Land Request

v. Buying the property : Once the request is approved the buyer can buy the property. The buyer enters the land ID to the function “buyProperty”. The function check whether the request status is approved or not and if it is approved, then it checks if the amount given is greater than the sum of market value and 10% of market value which goes as the land tax. If the conditions are satisfied then the amount is transferred to the land owner’s account. The functions then changes the ownership of the land to the buyer. Removing the ownership of the previous owner is done by calling another function “removeOwnership” as shown in figure 8. This function is called after the transfer of amount is complete. “removeOwnership” removes the property from the last owner’s asset list.

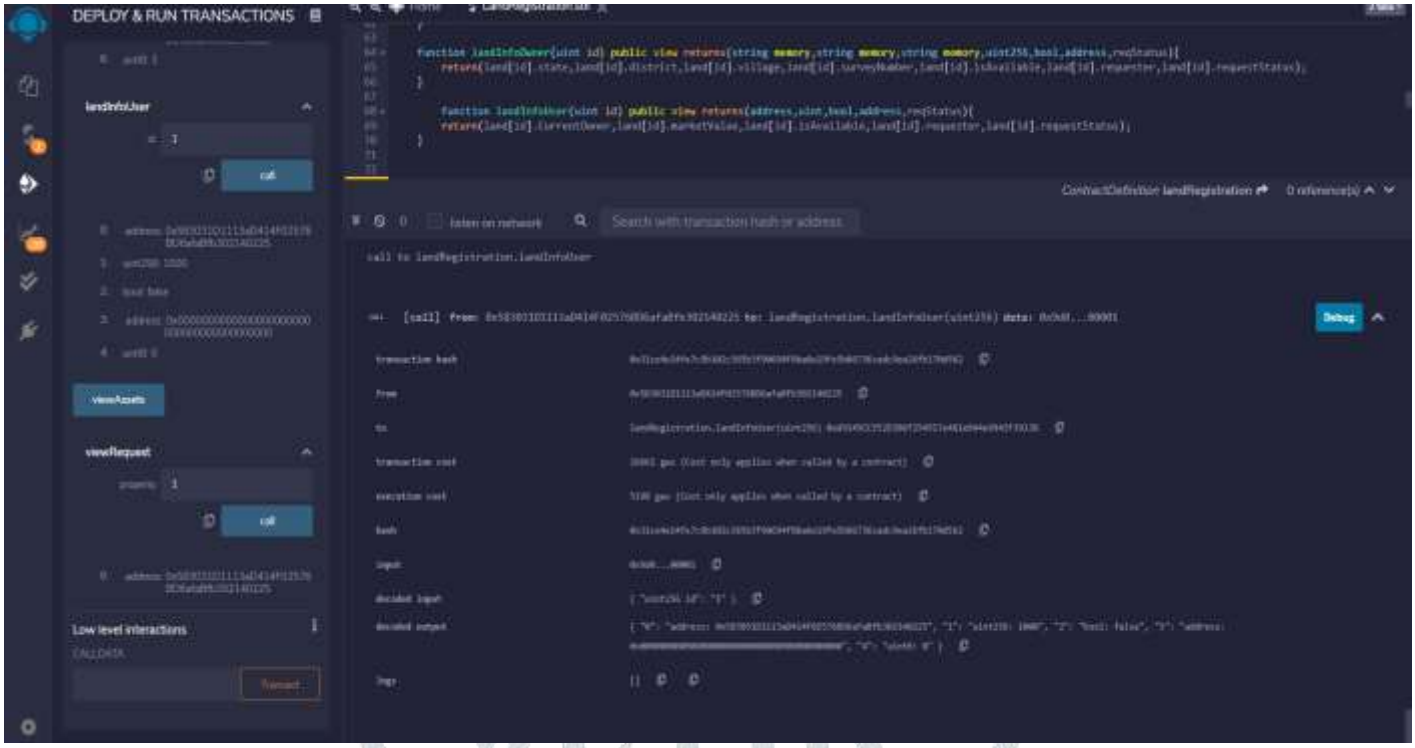

Fig 8. Land Info available to User After completion of the Purchase

5.CONCLUSION

This work dealt with the basic smart contract creation and deployment of the Land Registration process. All the functionalities thought necessary in the land registration process have been implemented and tested on the Remix IDE. There is a significant scope to develop this project further by designing a suitable web application and integrating it with the smart contract and Ethereum Meta Mask application to make it more user friendly and easy to use. The major drawbacks of this project are offline land details verification, no provision for land splitting process. The Land Registration process can be further enhanced by automating the Land Verification Process and Land Updating Process. Further versions could be developed to include Land Splitting Case. Extra functionalities like Land gift and Land Inheritance can be introduced in further versions. Also, this system mainly depends on the citizenship data that is maintained by the government, failure of which might lead to a halt in the process. It also has some assumptions that the land owner details are correct and true, and hence are not verified.

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