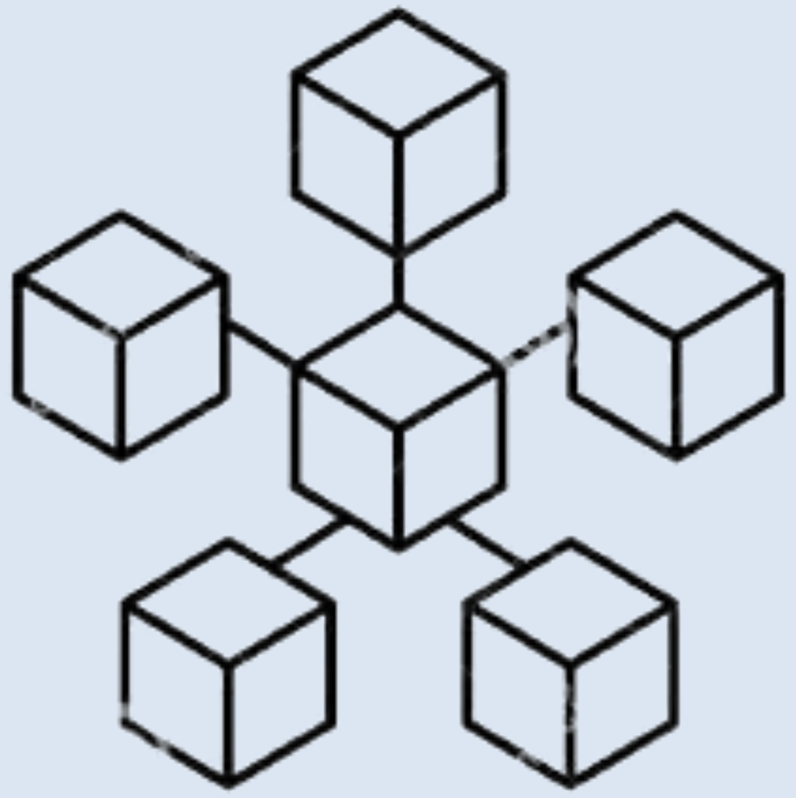
BLOCKCHAIN BASED LAND REGISTRY SYSTEM WITH BIOMETRIC AUTHENTICATION



Domain: Blockchain Technology

Guide:
P.N.RAMYA

Team Members:

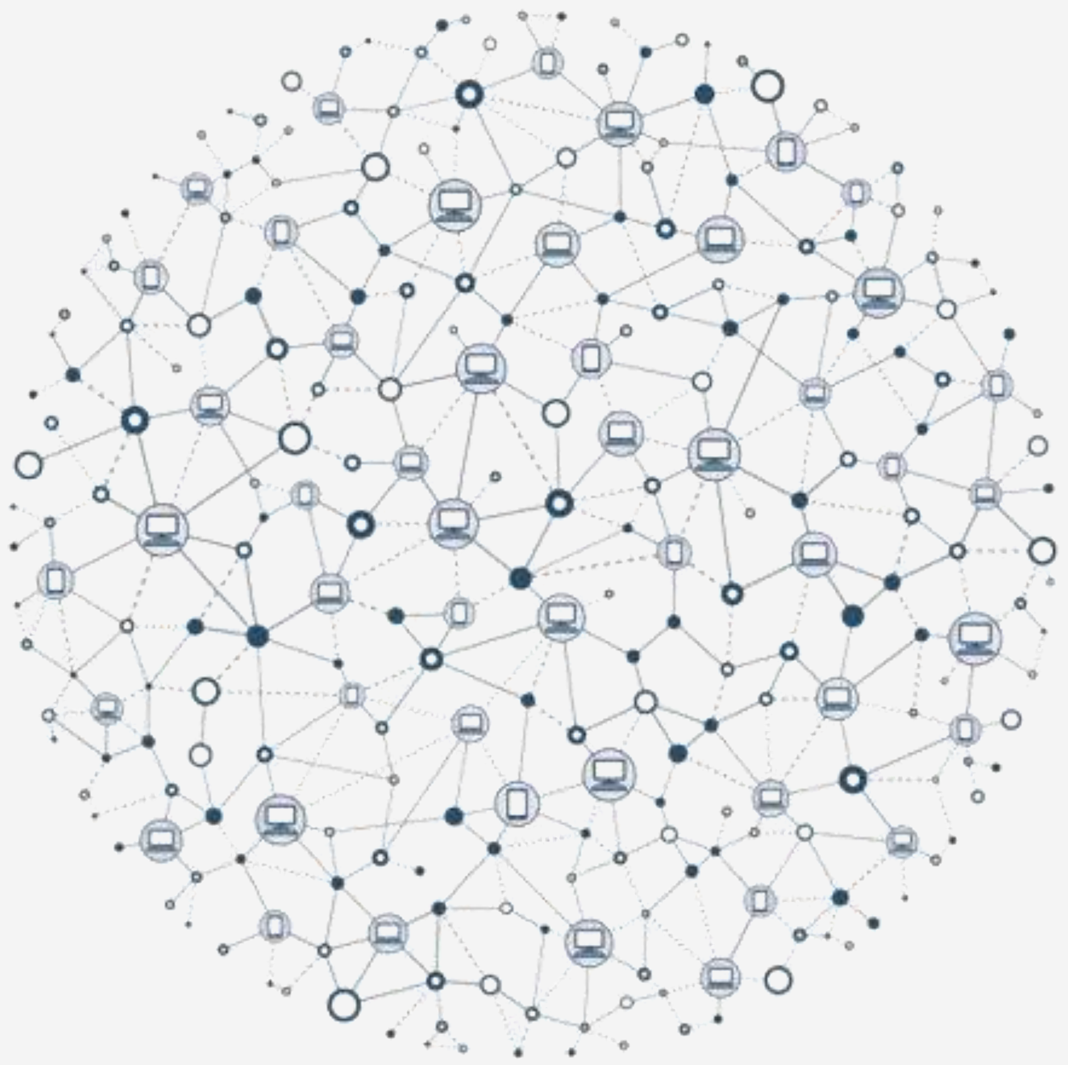
Achintya. P (19251A1261)

Ayushi Verma (19251A1264)

Geetha Krishna (19251A1272)

Priyanka. M (19251A1292)

Overview



Introduction

Land is one of India's most contentious topics. It lacks a correct scheme for maintaining property documents and providing the outcomes of rare and long drawn legal conflict to an individual with conclusive titles. Today in India land title does not ensure its full rights to an owner. In addition, property transactions are carried out on paper and not very frequently updated, resulting in countless conflicts over property.

Problem Statement

In India, property transactions are carried out on paper and not very frequently updated, resulting in countless conflicts over property. Land documents are centralized and preserved in the sub-registrar's office in India. It is also possible that the record may be altered or manipulated.

It is a tedious process and most often people are not aware of the entire rules to be followed during registration process. Also, more documents need to be verified and thus it takes delay in completing registration. In addition to this, the middlemen collect bribes to complete this process. Mistakes also may occur while processing land records.

Why Blockchain?

DISTRIBUTED LEDGER

- Blockchain technology enables the maintenance of a distributed ledger among all nodes of the system
- Every new transaction is cryptographically secured and added to the chain as part of a new block
- As other blocks are added to the chain the veracity of the transaction become unassailable.

TIME-STAMP

- The blockchain is effectively timestamped and transactions once added cannot be re-arranged in chronological sequence
- This allows everyone to access the entire history of all the transfers of a given property

SMART CONTRACTS

- Blockchain technology allows the creation of smart contracts that eliminates opportunities for regulatory discretion
- These smart contracts can be self-executing if combined with digital payment technologies or crypto-currencies
- Reduce the need for manual intervention as they are automated

SECURITY AND FAULT TOLERANCE

- Since there is no single point of failure it is very expensive to bring the entire system down.
- If any one node is brought down for any reason, all the others are still accessible

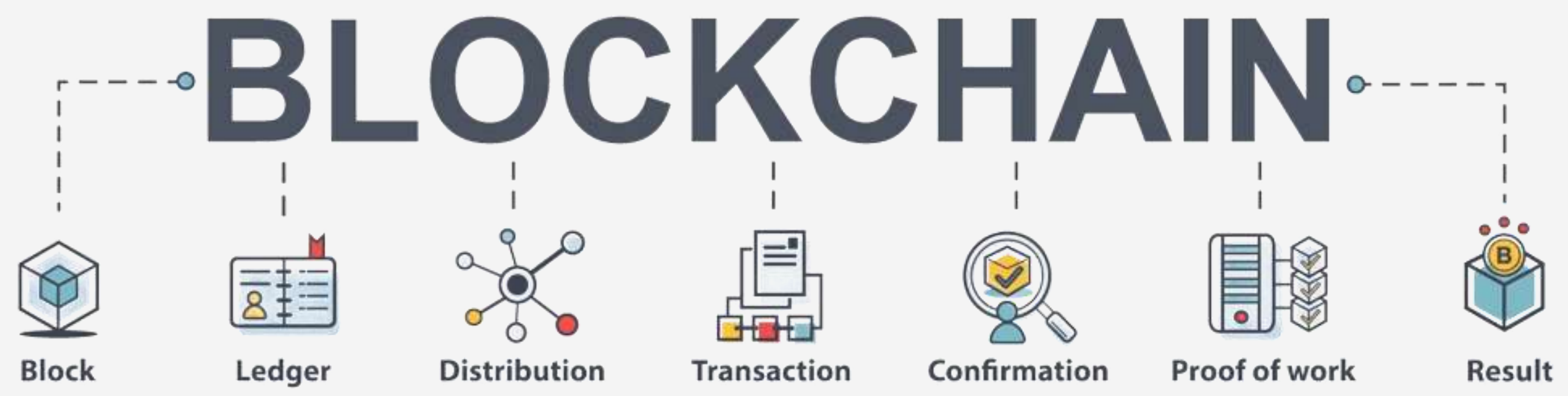
TRANSPARENCY

- Since the entire blockchain is accessible at all times, there is complete transparency about all transactions
- This allows for public audit as well as private title due diligence

CONSISTENCY

- The blockchain can only be added to and changed in the manner prescribed by the software
- This ensures consistency of data across all transaction records

Objectives



- To implement the land registry process using blockchain technology for enhanced security
- To create DAPP which will be a one stop platform for buying, selling and registering land
- To make a decentralized system which is immutable and tamper proof
- To add biometric authentication for personal security and unauthorized access
- To accelerate the process of removing the middle men that hold the information
- Bring transparency in the system as buyers and sellers can directly communicate with each other and also users can access their records very easily
- To maintain a fool-proof record of transactions between the buyers and sellers

Literature Survey

Existing Systems

(Limitations w.r.t each paper)

Suganthe, R. C., N. Shanthi, R. S. Latha, K. Gowtham, S. Deepakkumar, and R. Elango. "**Blockchain enabled Digitization of Land Registration**" In *2021 International Conference on Computer Communication and Informatics (ICCCI)*, pp. 1-5. IEEE, 2021

- The system just stores the land details on blockchain but doesn’t support the purchase of land and the transfer of ownership.

Literature Survey

Existing Systems

(Limitations w.r.t each paper)

Mohammed Moazzam Zahuruddin, Dr. Sangeeta Gupta, Shaik Waseem Akram, "**Land Registration using Blockchain Technology**", *International Journal of Emerging Technologies and Innovative Research*, ISSN:2349-5162, Vol.8, Issue 6, page no.b657-b667, June-2021

- The system has been implemented and tested only on an IDE and is not integrated with a frontend for the users to access it.
- The details of the land owner are not verified hence could be fraudulent.

Literature Survey

Existing Systems

(Limitations w.r.t each paper)

Rakesh Kumar K V, Rithick Gokul A, V. Nirmal Kumar "**Blockchain and Smart Contract for Land Registration using Ethereum Network**" In *International Journal of Engineering Research & Technology (IJERT),* paper ID - IJERTCONV10IS08005, (Volume 10 – Issue 08), July, 2022

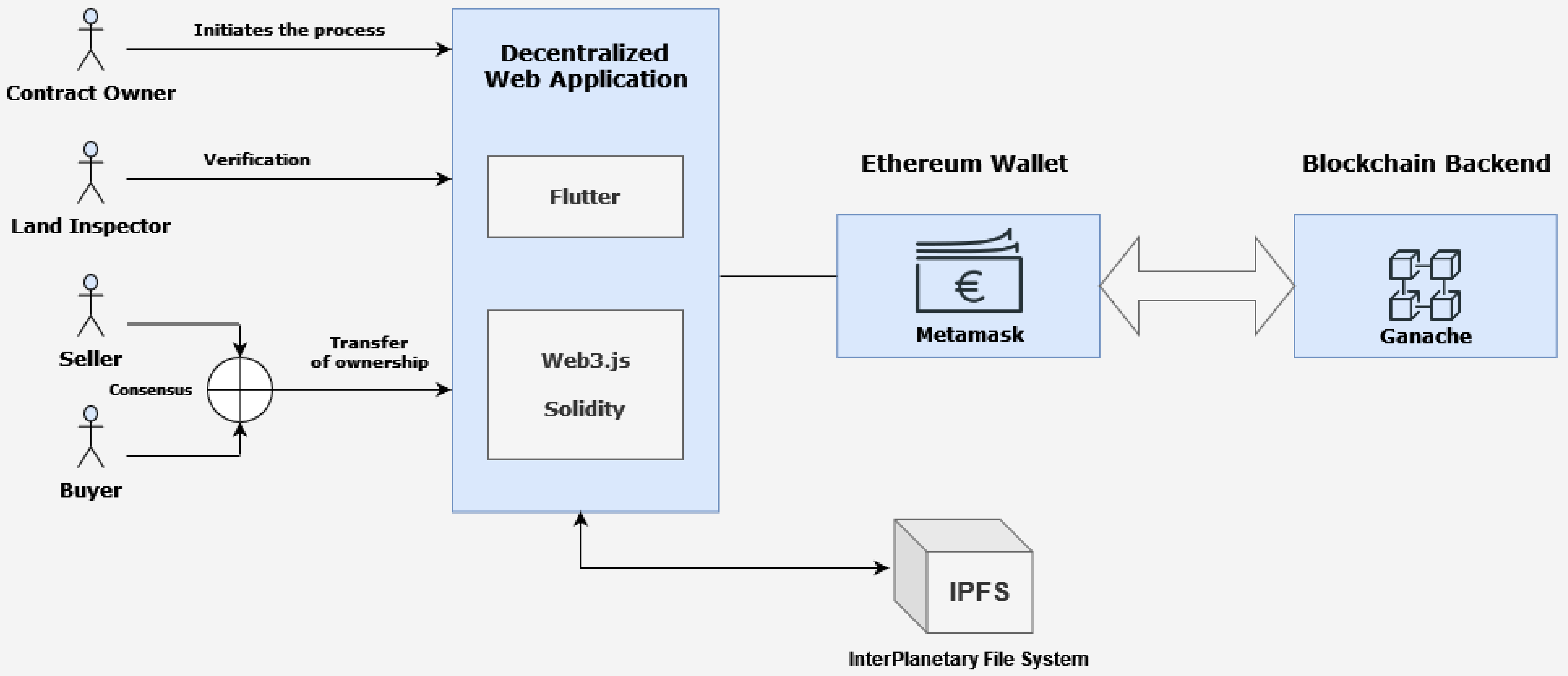
- The system simply secures the documents stored on IPFS and doesn’t provide any provision for communication between the land buyers and sellers

Literature Survey

Proposed System

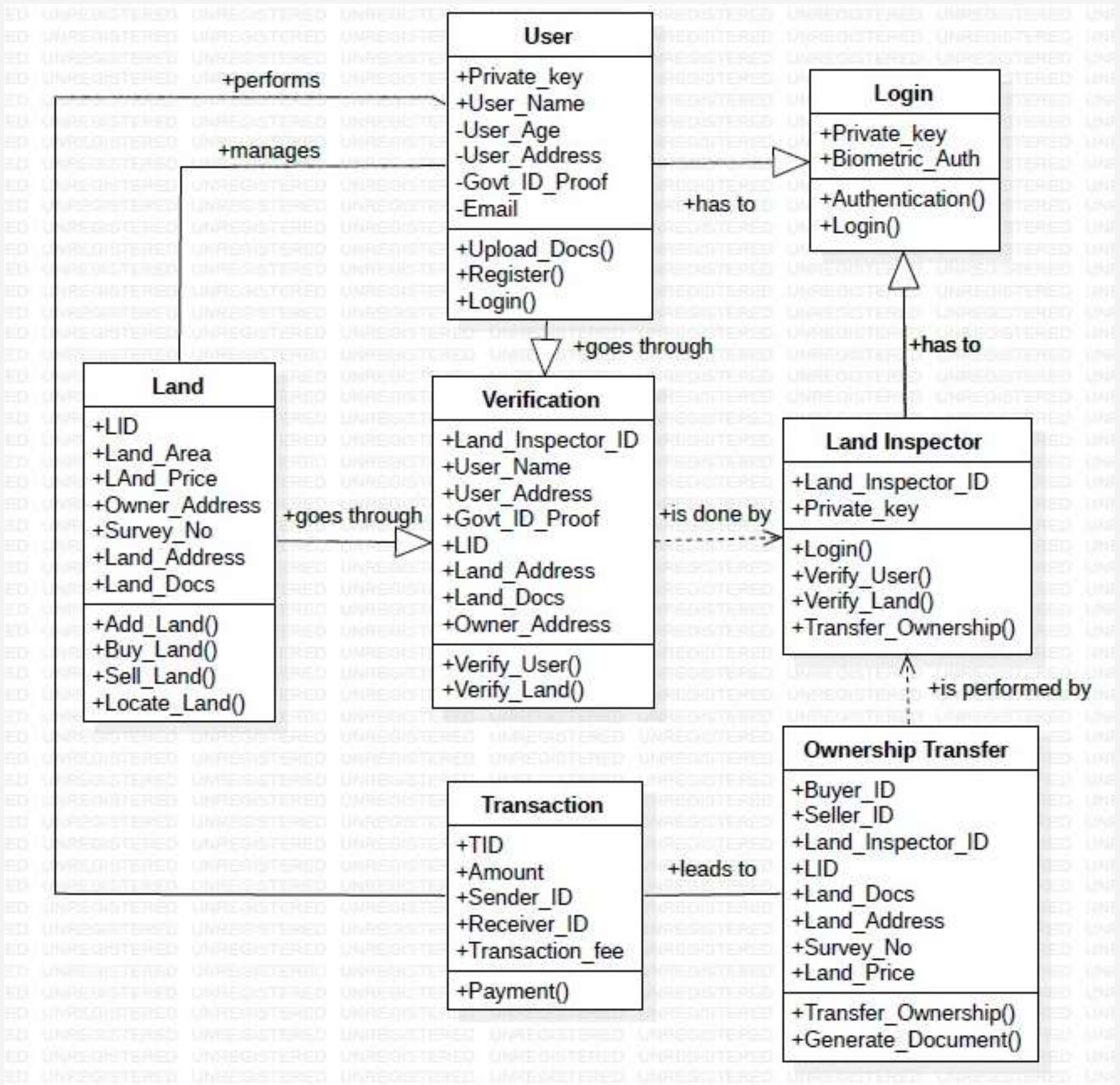
- The system provides a user friendly interface for direct communication between the buyers and sellers without any middle man
- The system verifies the user’s (buyer/seller) identity with biometric authentication and an identity document that is produced at the time of registration
- Once the user is authenticated, the option to add lands is enabled
- The land inspector verifies the land documents before approving the addition of land to the user’s profile
- Once the land is verified, it gets added to the land gallery of all the users
- The user can make it available for sale or can buy an already available land
- If the seller accepts the request, payment is made and transaction begins
- The land inspector verifies the transaction and transfers the ownership of the land in the presence of a witness
- A transfer of ownership document is generated which gets stored in IPFS

Architecture Diagram

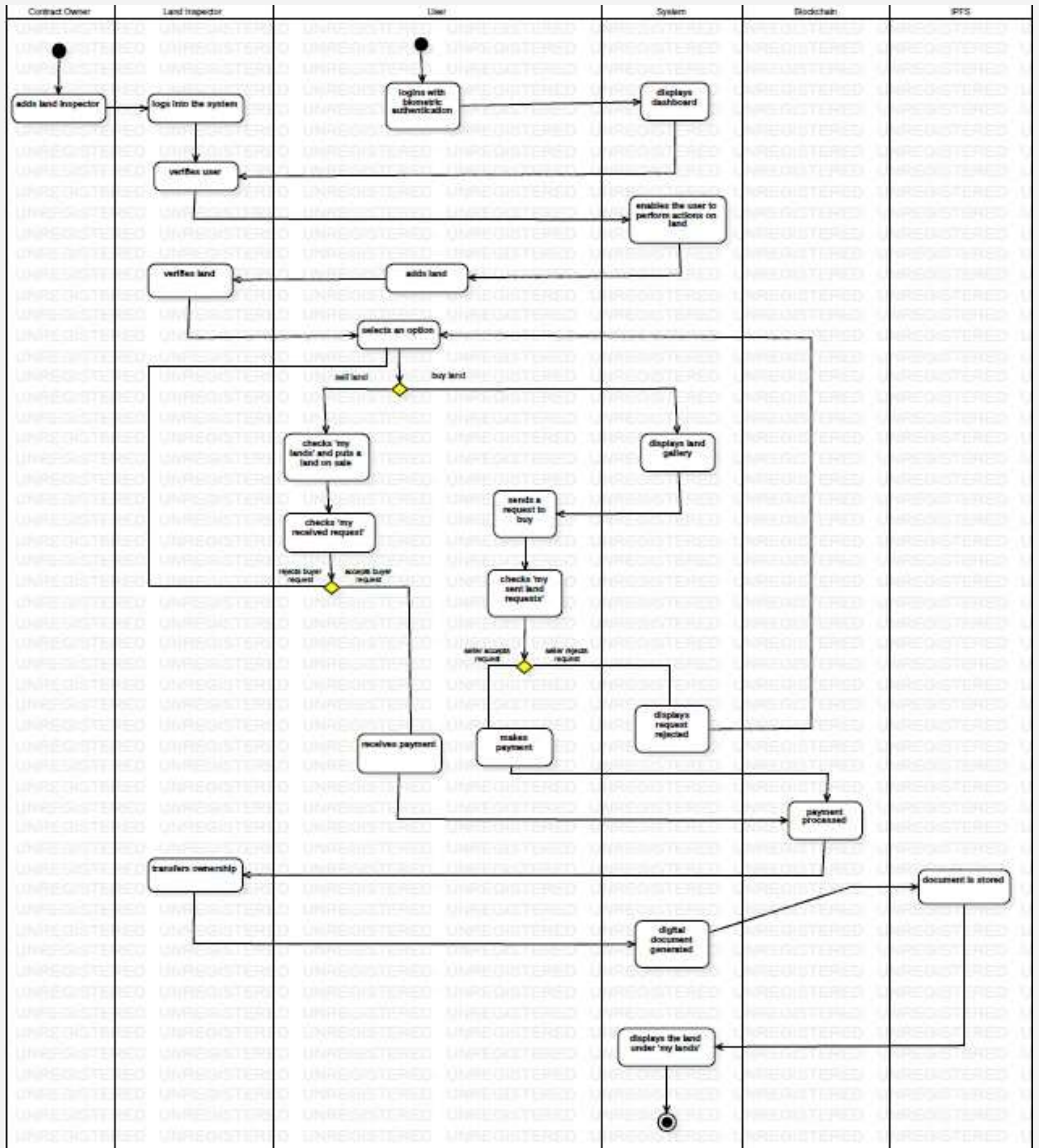


Design Specification

Class Diagram

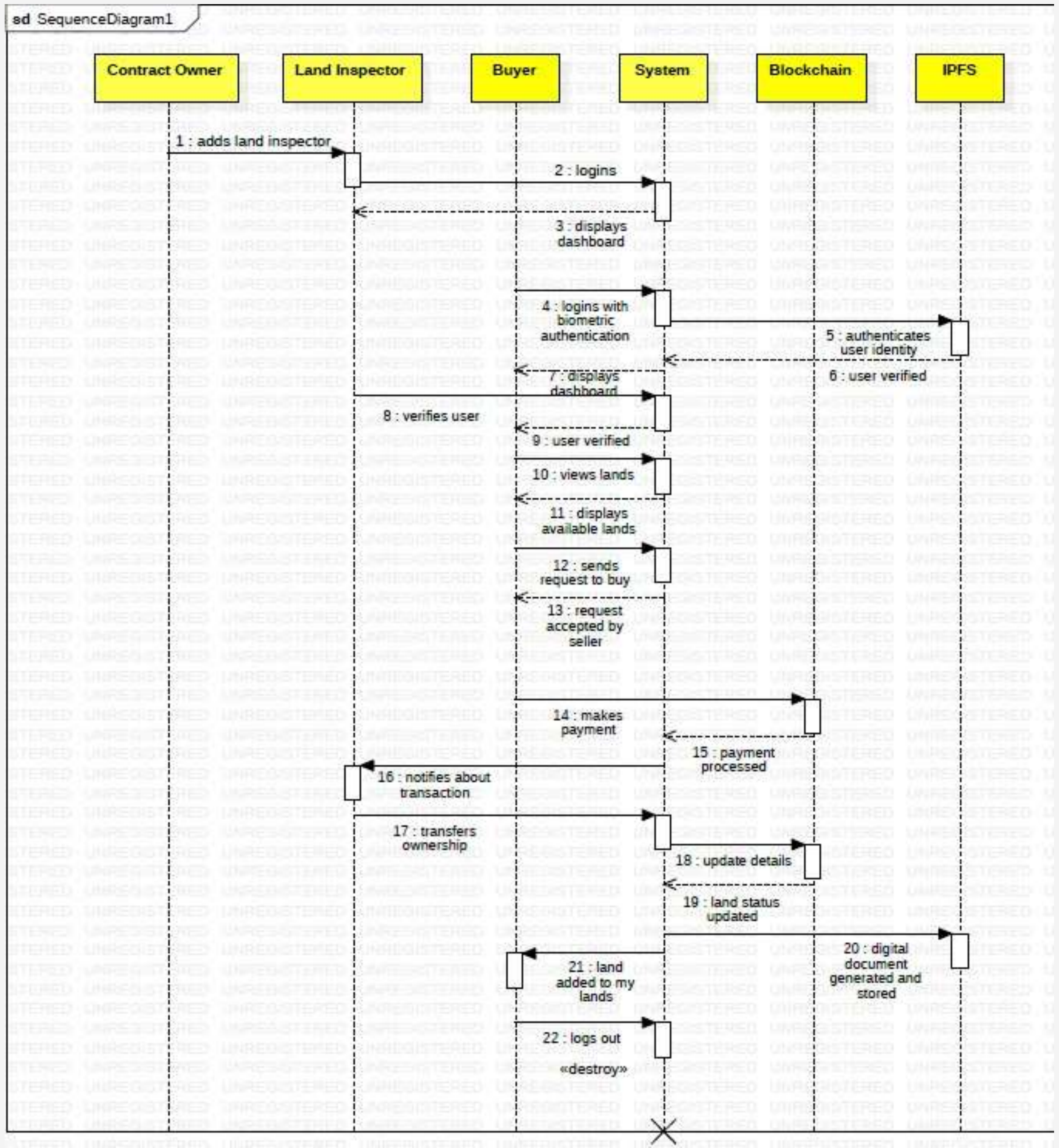


Activity Diagram



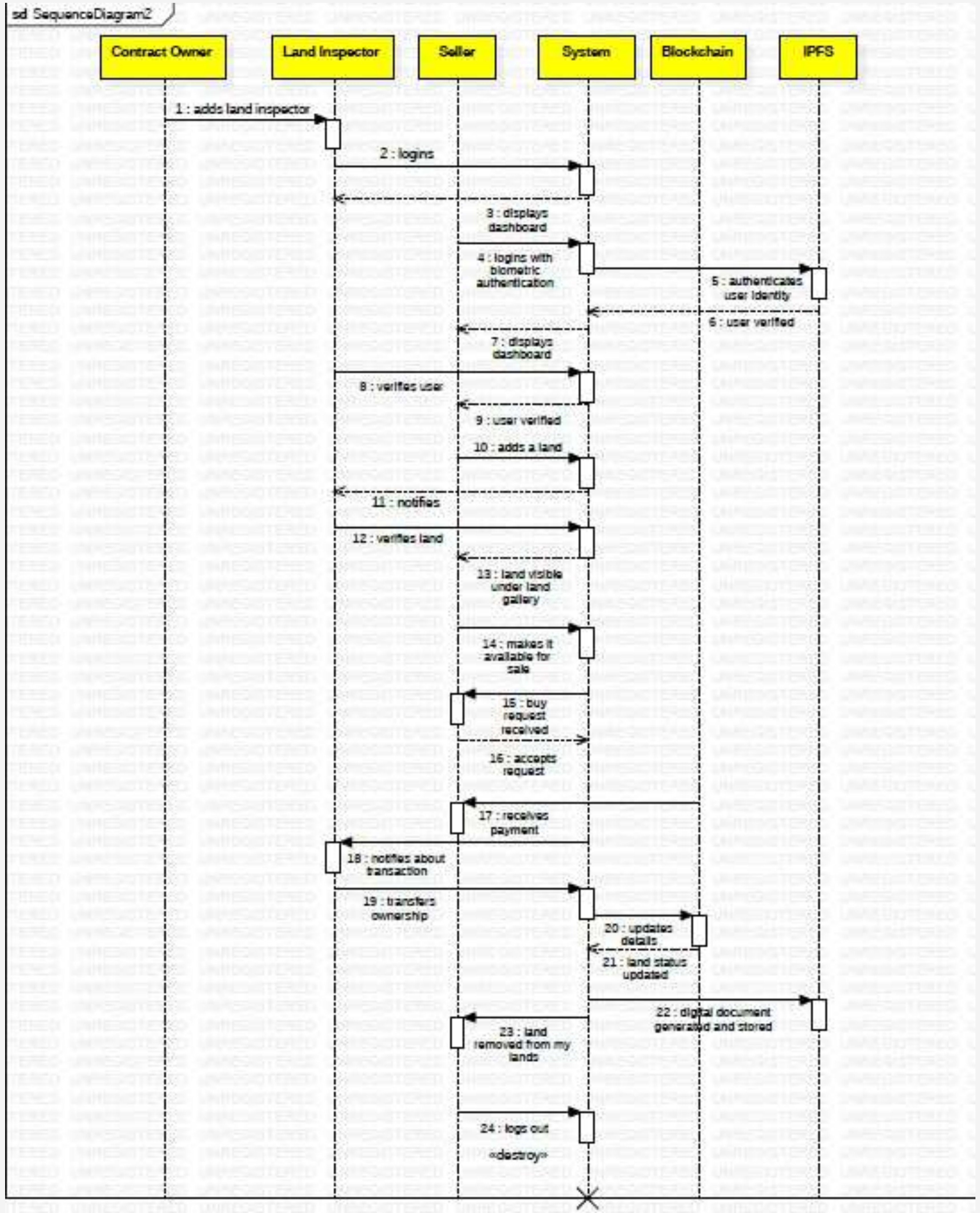
Sequence Diagram 1

(Buyer)

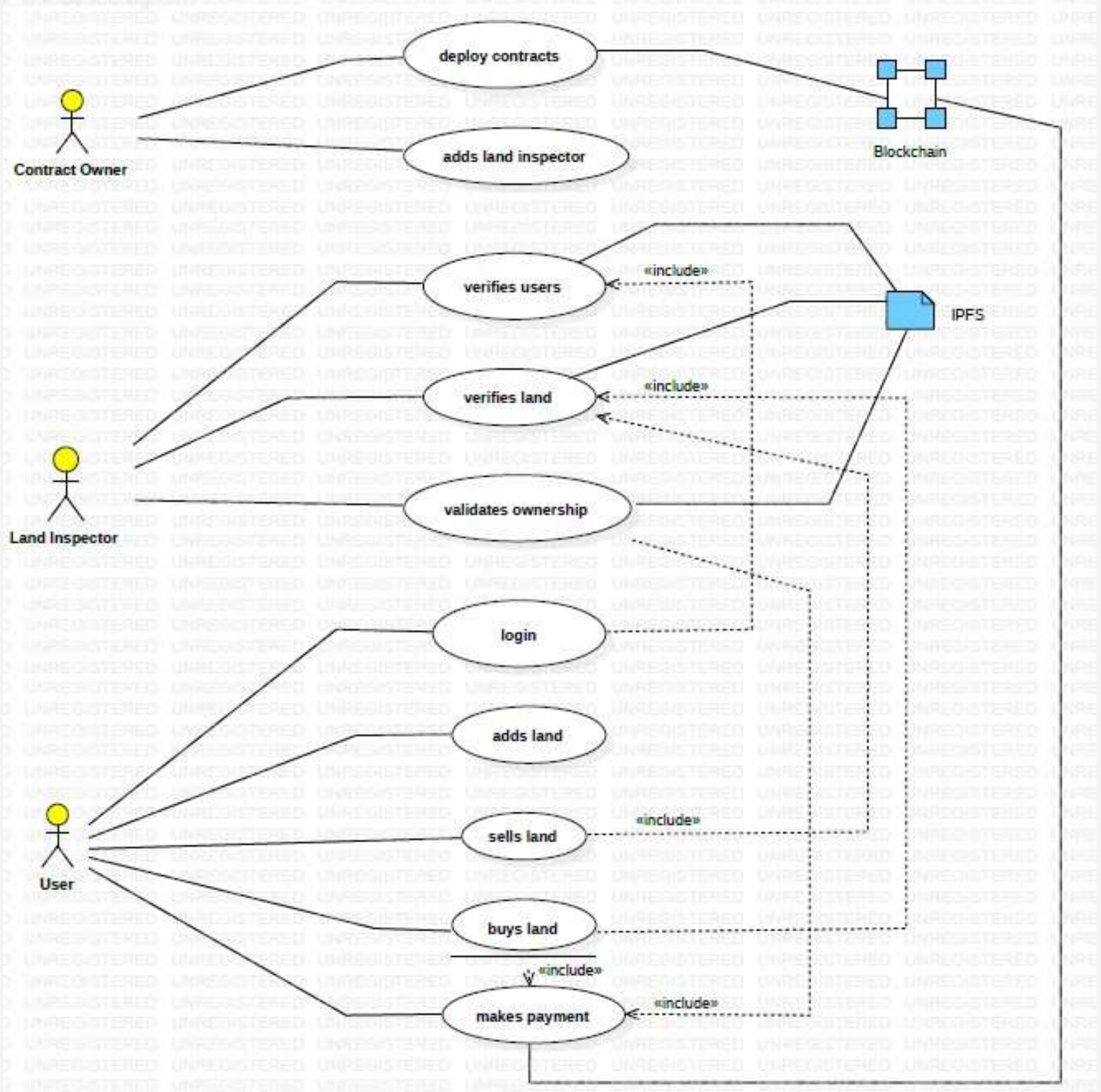


Sequence Diagram 2

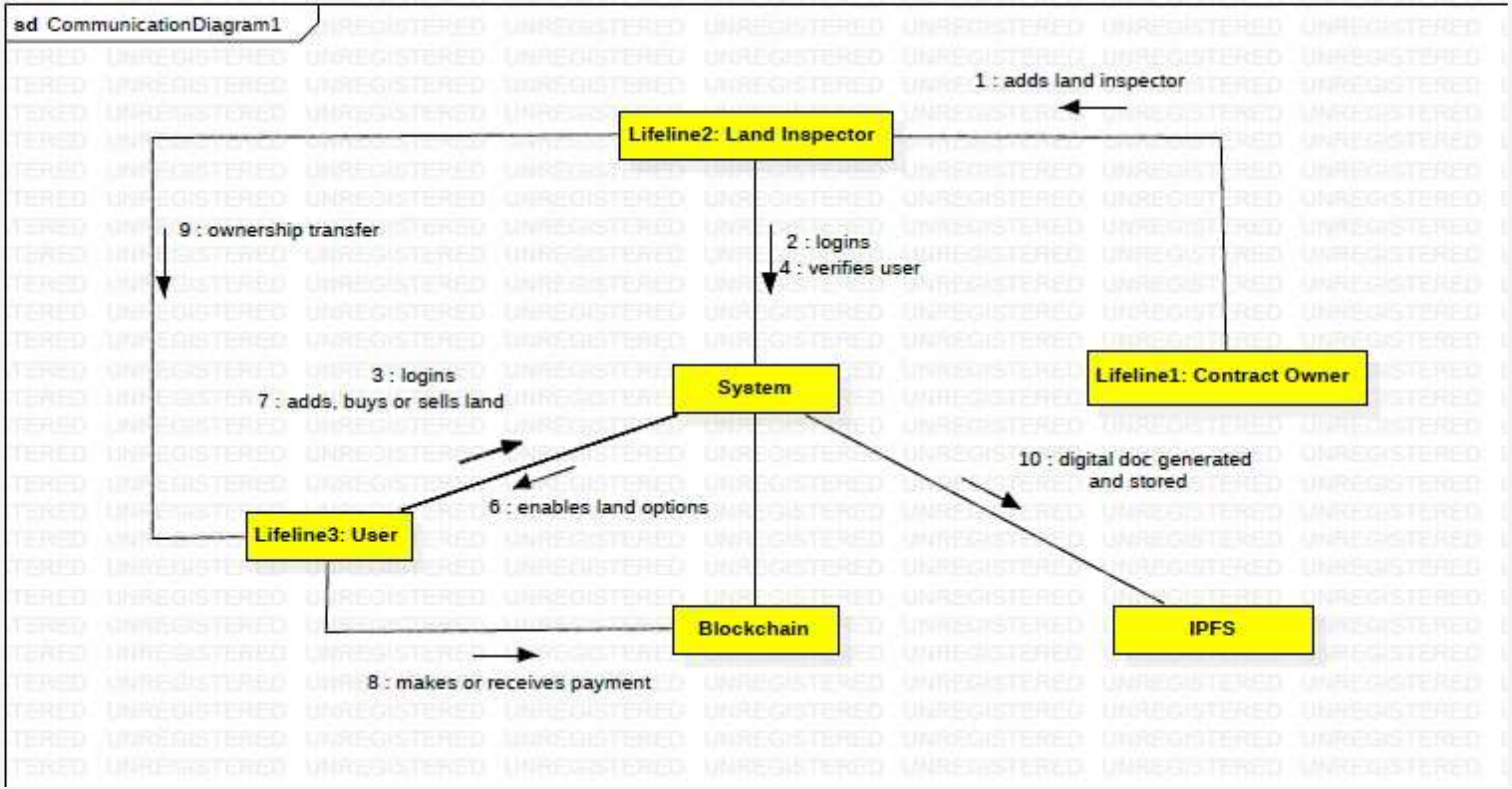
(Seller)



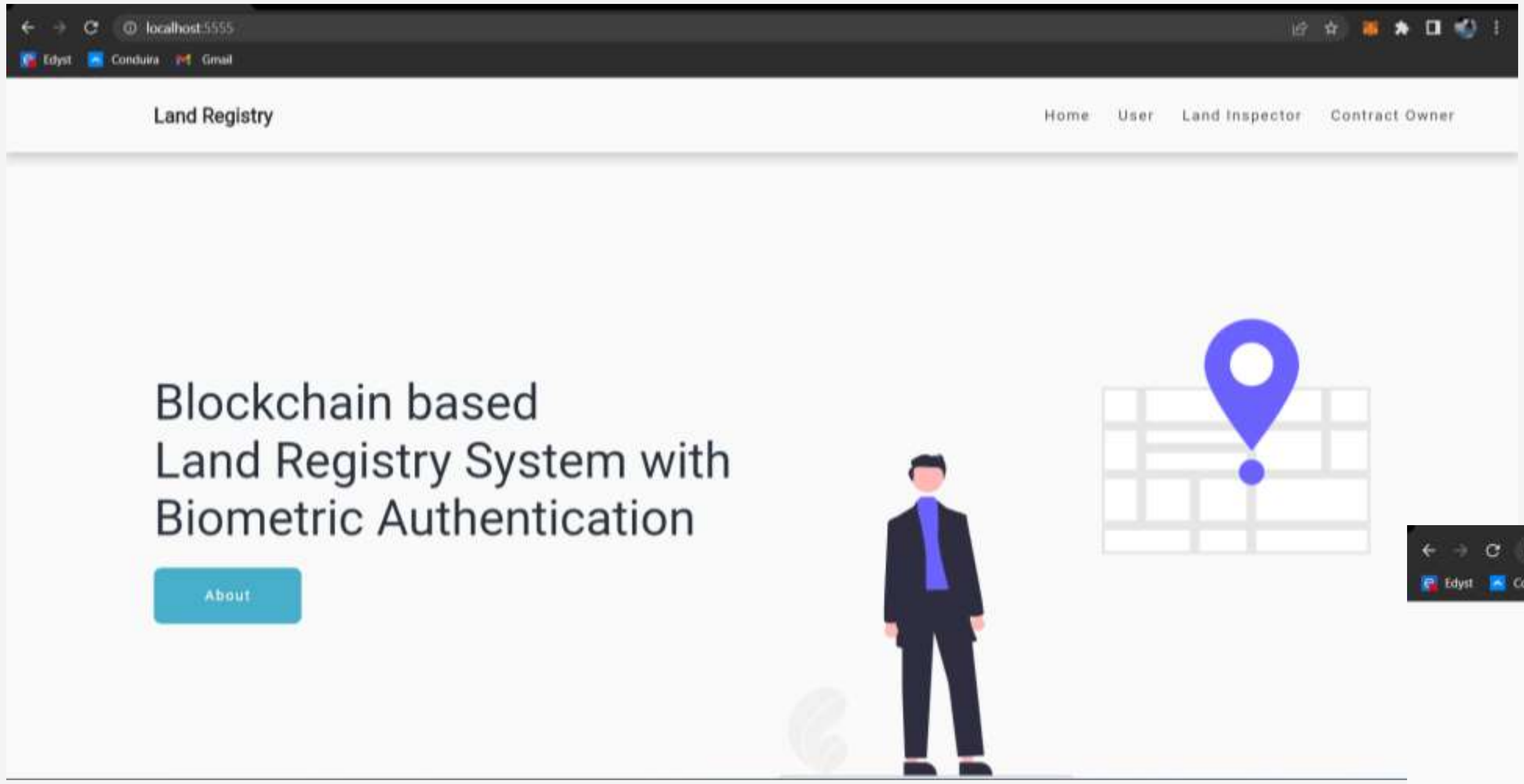
Use-Case Diagram



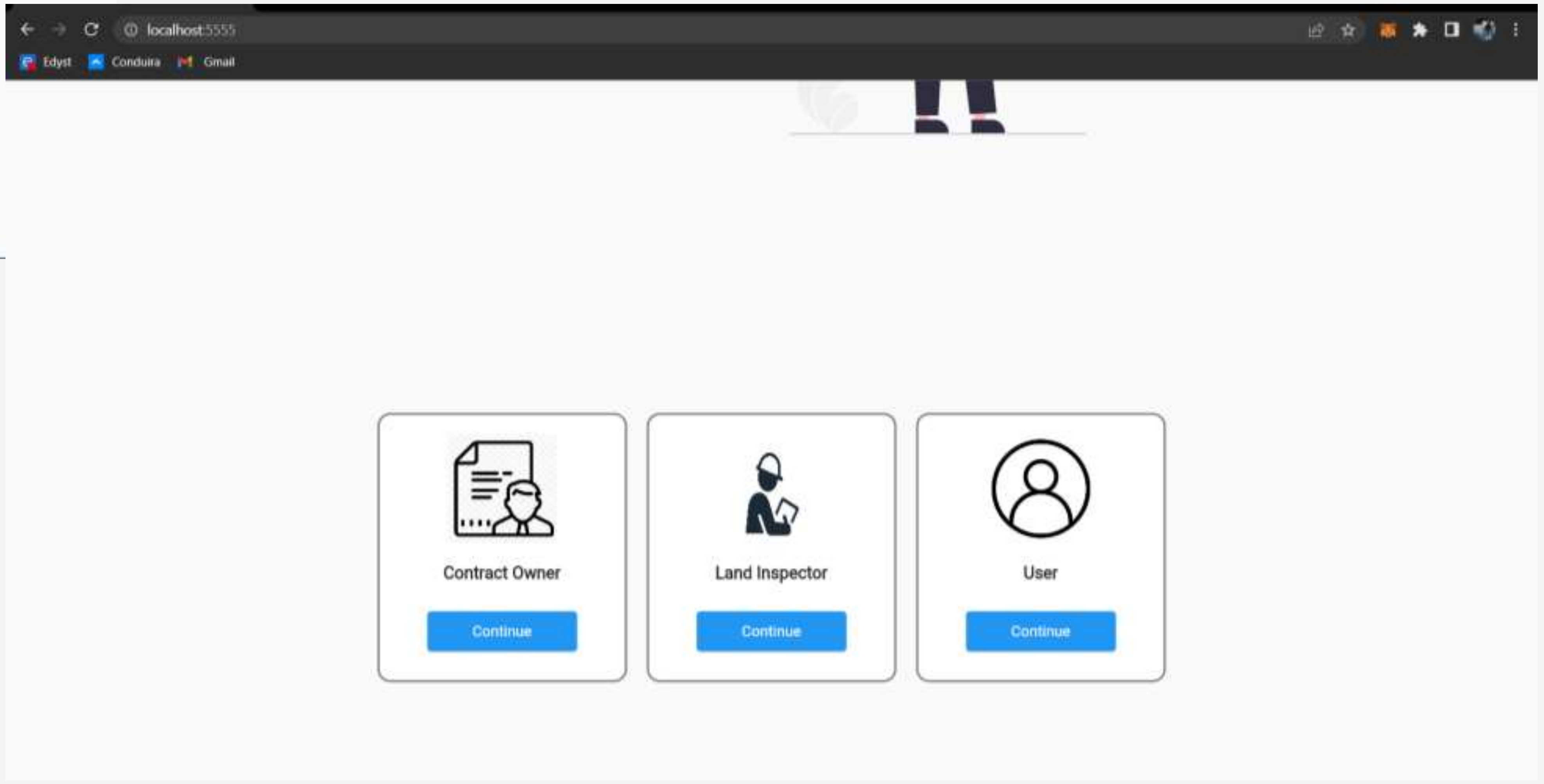
Collaboration Diagram



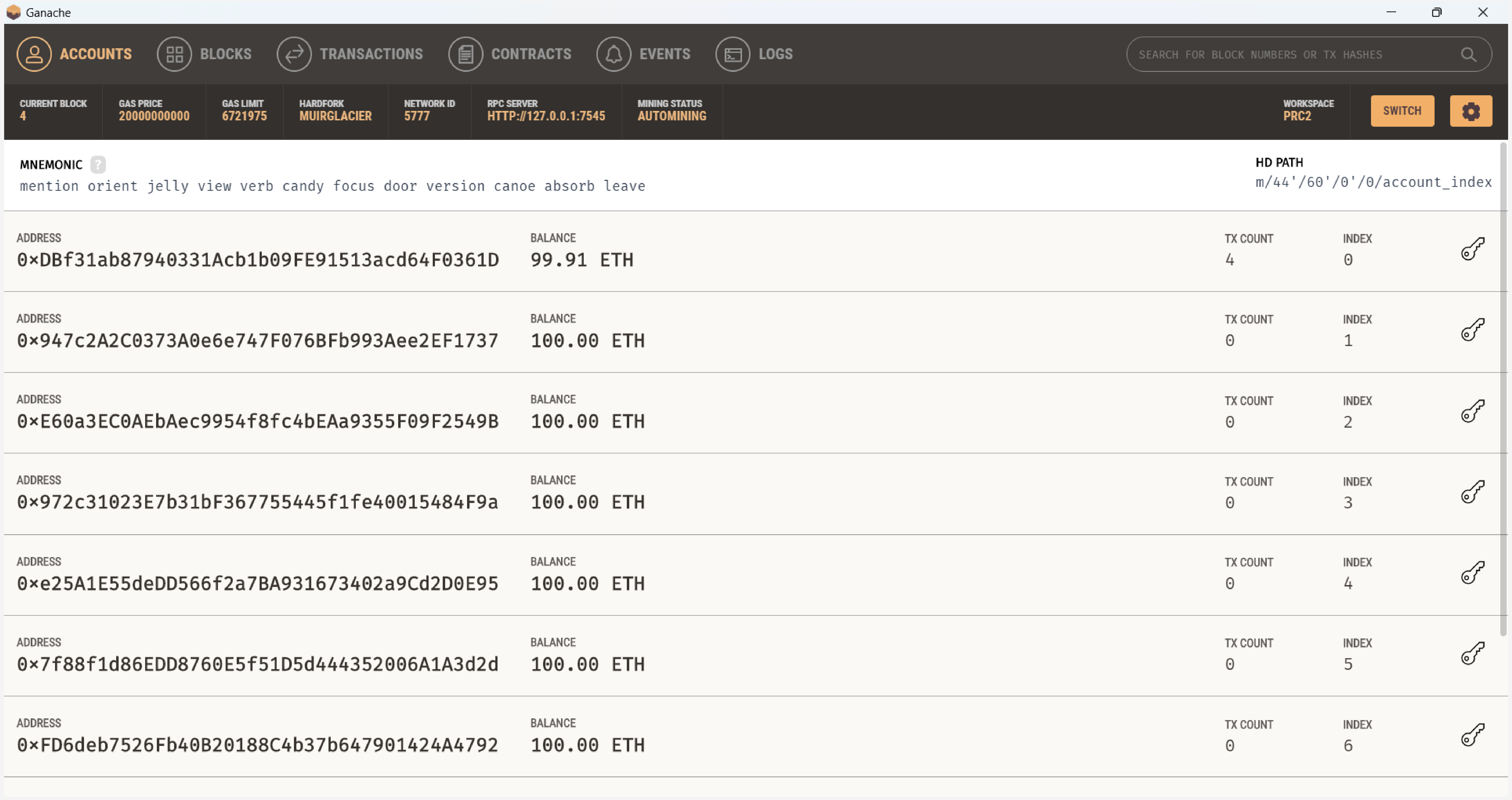
Code Implementation



Blockchain based
Land Registry System with
Biometric Authentication



Code Implementation



Ganache

ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	MINING STATUS	WORKSPACE
4	20000000000	6721975	MUIRGLACIER	5777	HTTP://127.0.0.1:7545	AUTOMINING	PRC2

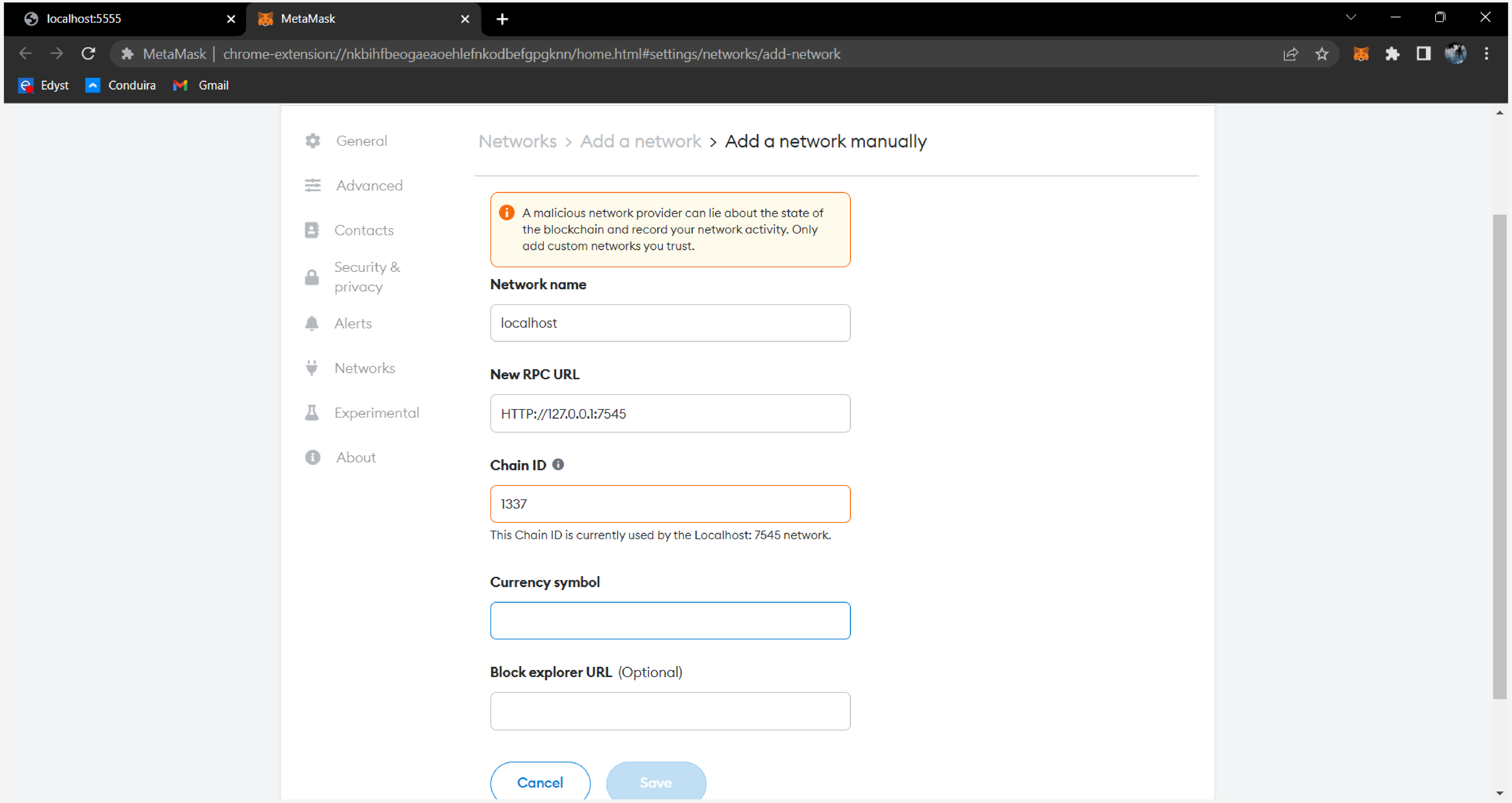
SWITCH

MNEMONIC
mention orient jelly view verb candy focus door version canoe absorb leave

HD PATH
m/44'/60'/0'/0/account_index

ADDRESS	BALANCE	TX COUNT	INDEX
0×DBf31ab87940331Acb1b09FE91513acd64F0361D	99.91 ETH	4	0
0×947c2A2C0373A0e6e747F076BFb993Aee2EF1737	100.00 ETH	0	1
0×E60a3EC0AEbAec9954f8fc4bEAa9355F09F2549B	100.00 ETH	0	2
0×972c31023E7b31bF367755445f1fe40015484F9a	100.00 ETH	0	3
0×e25A1E55deDD566f2a7BA931673402a9Cd2D0E95	100.00 ETH	0	4
0×7f88f1d86EDD8760E5f51D5d444352006A1A3d2d	100.00 ETH	0	5
0×FD6deb7526Fb40B20188C4b37b647901424A4792	100.00 ETH	0	6

Code Implementation


localhost:5555
MetaMask
MetaMask | chrome-extension://nkbihfbeogaeaoehlefnkodbefgpgknn/home.html#settings/networks/add-network
Edyst
Conduira
Gmail
General
Advanced
Contacts
Security & privacy
Alerts
Networks
Experimental
About
Networks > Add a network > Add a network manually
Cancel
Save

A malicious network provider can lie about the state of the blockchain and record your network activity. Only add custom networks you trust.

Network name: localhost

New RPC URL: HTTP://127.0.0.1:7545

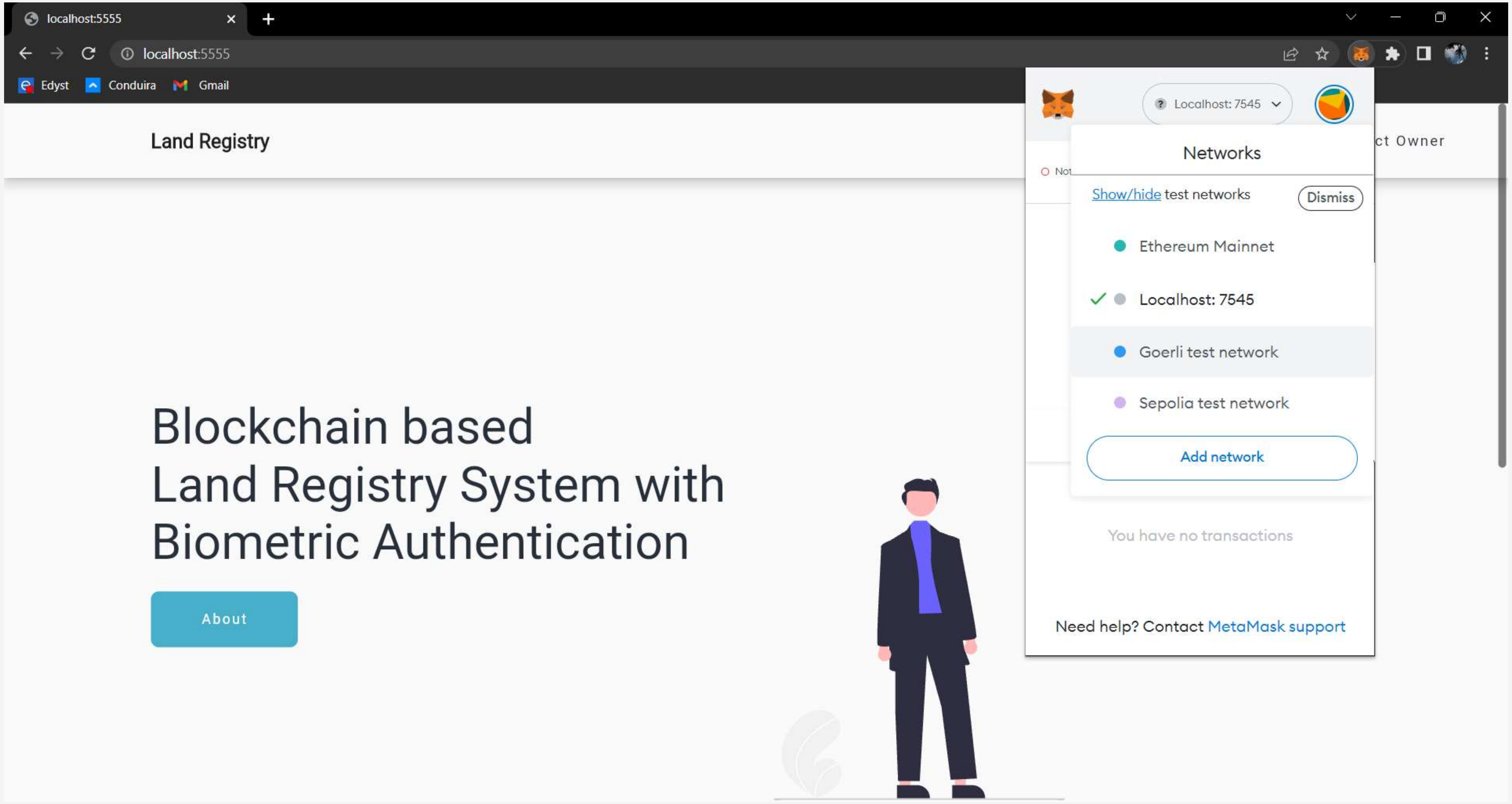
Chain ID: 1337

This Chain ID is currently used by the Localhost: 7545 network.

Currency symbol:

Block explorer URL (Optional):

Code Implementation



localhost:5555

Edyst Conduira Gmail

Land Registry

ct Owner

Blockchain based
Land Registry System with
Biometric Authentication

About

Localhost: 7545

Networks

Show/hide test networks

Dismiss

Ethereum Mainnet

✓ Localhost: 7545

Goerli test network

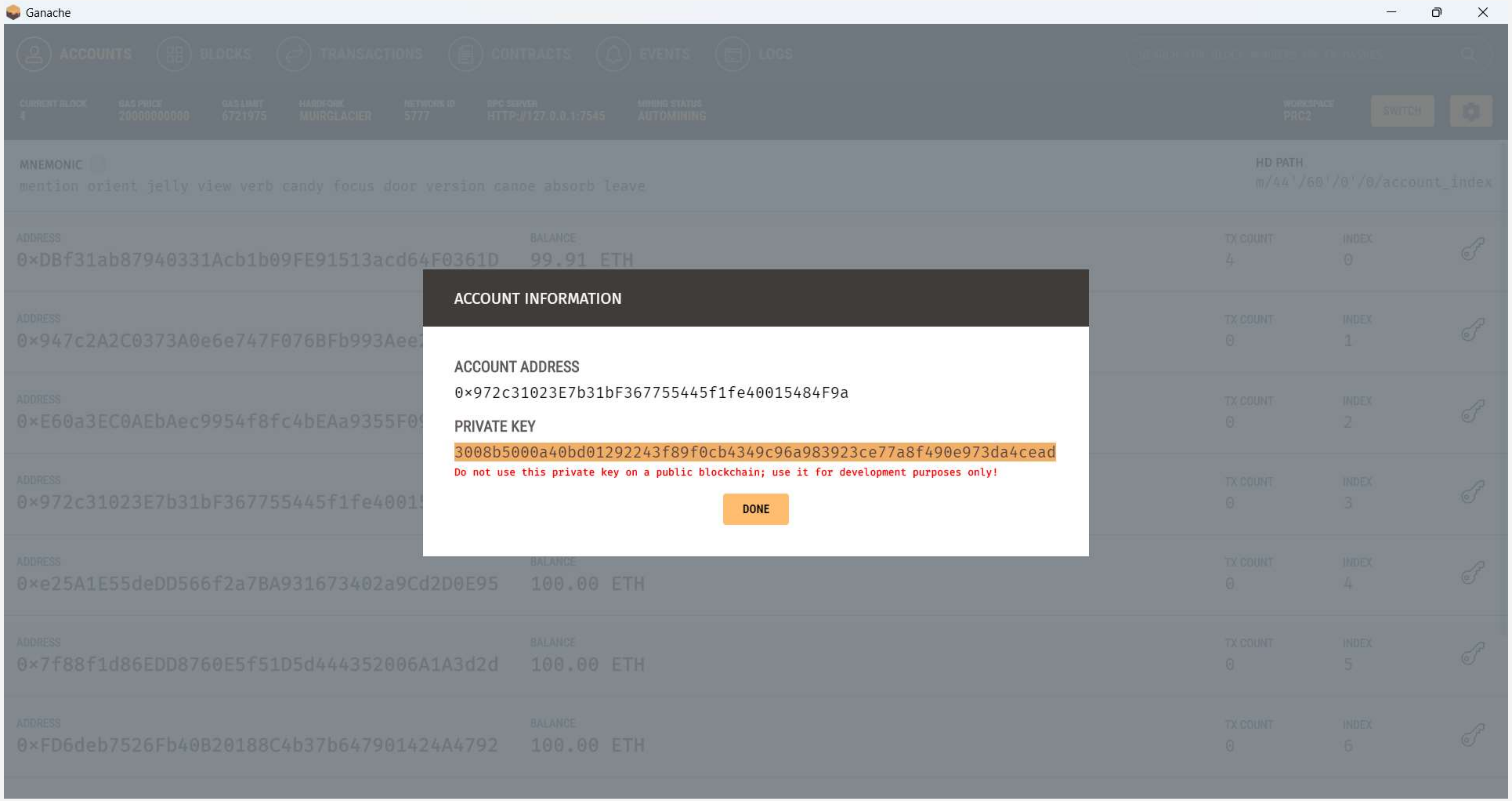
Sepolia test network

Add network

You have no transactions

Need help? Contact MetaMask support

Code Implementation


Ganache

CURRENT BLOCK 4 | GAS PRICE 20000000000 | GAS LIMIT 6721975 | HARDFORK MUIRGLACIER | NETWORK ID 5777 | RPC SERVER HTTP://127.0.0.1:7545 | MINING STATUS AUTOMINING | WORKSPACE PRC2

MNEMONIC
mention orient jelly view verb candy focus door version canoe absorb leave

HD PATH
m/44'/60'/0'/0/account_index

ADDRESS	BALANCE	TX COUNT	INDEX
0x DBf31ab87940331Acb1b09FE91513acd64F0361D	99.91 ETH	4	0
0x947c2A2C0373A0e6e747F076BFb993Aee		0	1
0xE60a3EC0AEbAec9954f8fc4bEAa9355F0		0	2
0x972c31023E7b31bF367755445f1fe4001		0	3
0xe25A1E55deDD566f2a7BA931673402a9Cd2D0E95	100.00 ETH	0	4
0x7f88f1d86EDD8760E5f51D5d444352006A1A3d2d	100.00 ETH	0	5
0xFD6deb7526Fb40B20188C4b37b647901424A4792	100.00 ETH	0	6

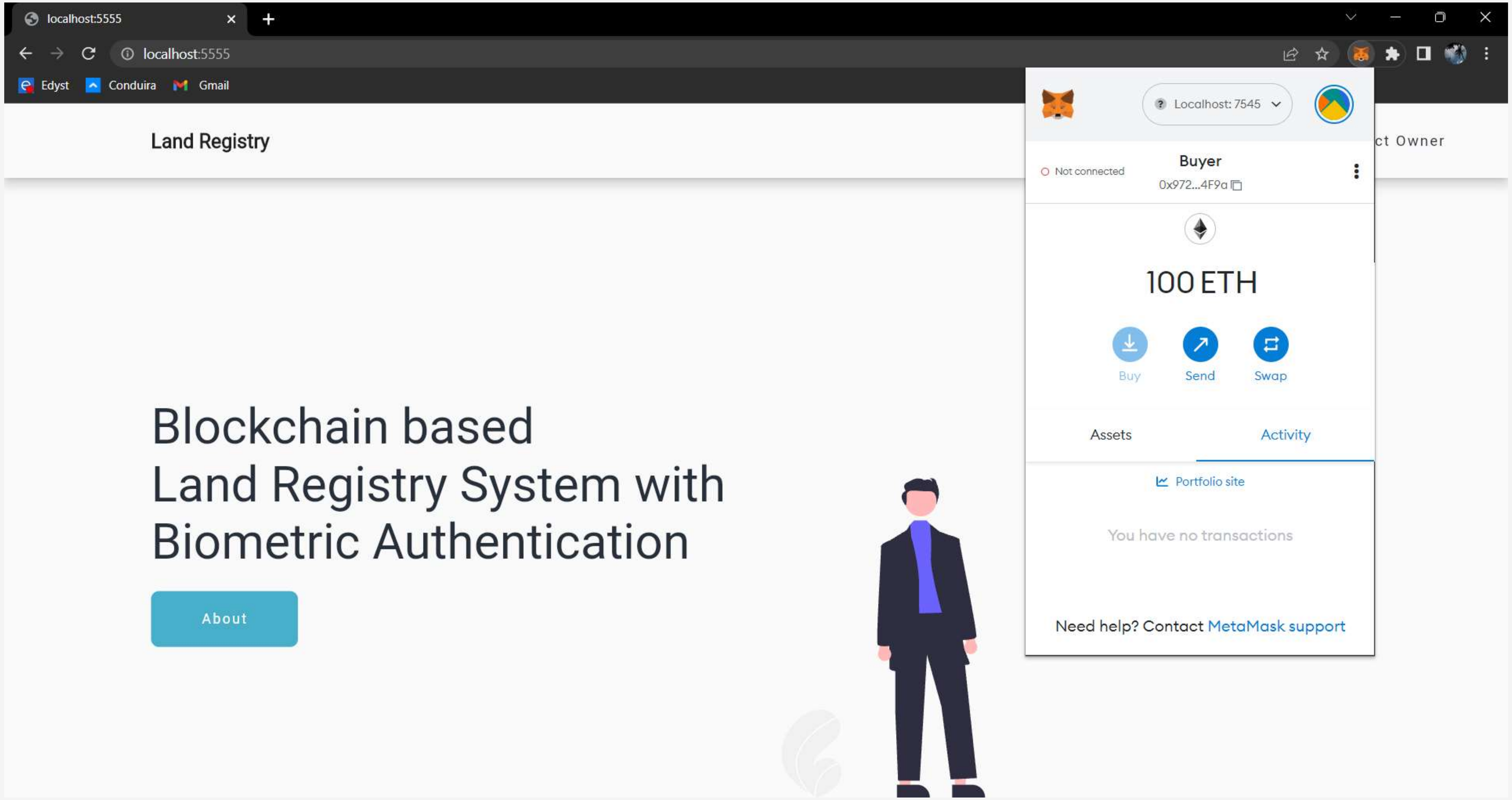
ACCOUNT INFORMATION

ACCOUNT ADDRESS
0x972c31023E7b31bF367755445f1fe40015484F9a

PRIVATE KEY
3008b5000a40bd01292243f89f0cb4349c96a983923ce77a8f490e973da4cead
Do not use this private key on a public blockchain; use it for development purposes only!

DONE

Code Implementation



localhost:5555

localhost:5555

Edyst Conduira Gmail

Land Registry

ct Owner

Blockchain based
Land Registry System with
Biometric Authentication

About

Localhost: 7545

Not connected

Buyer

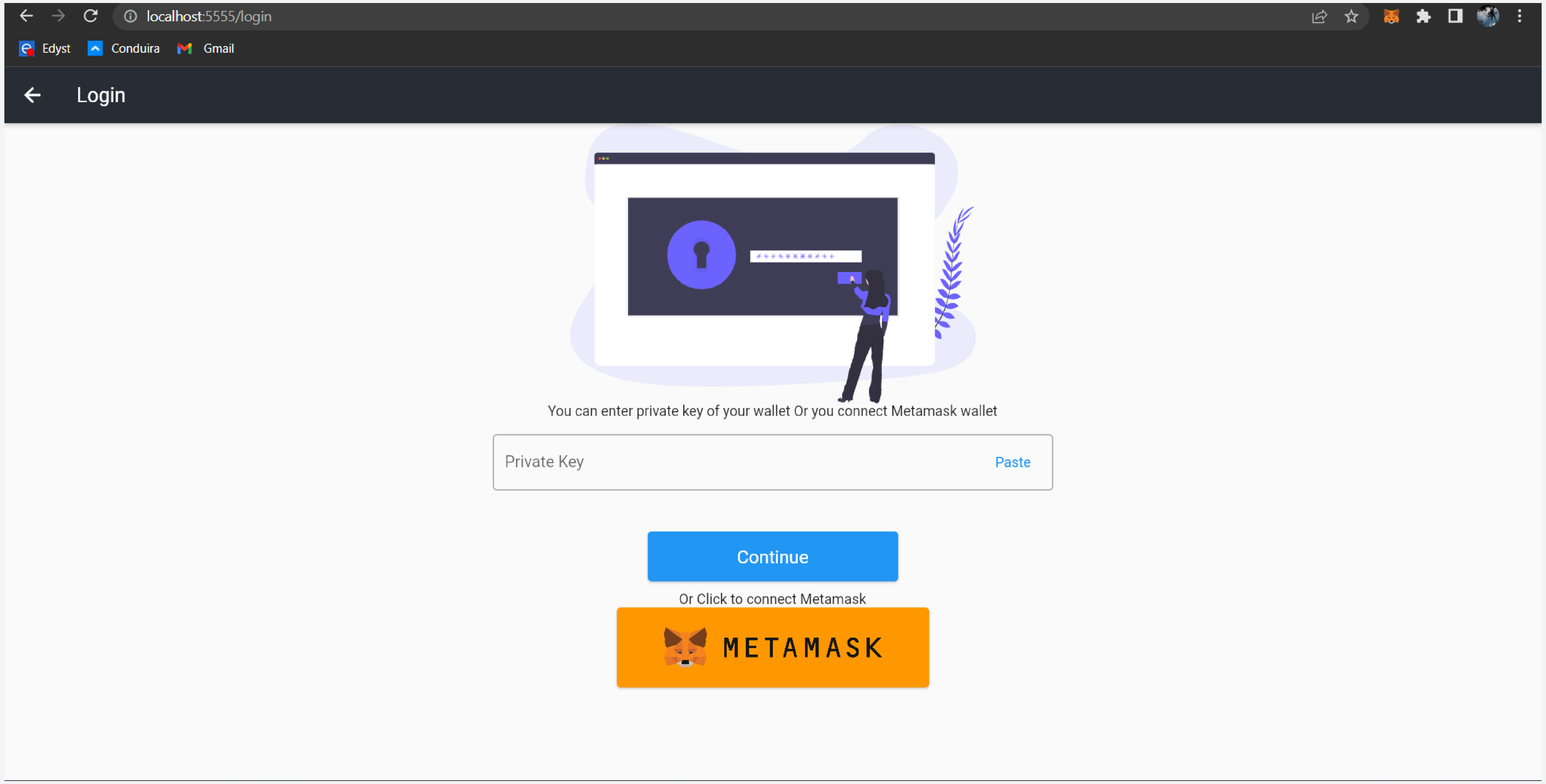
0x972...4F9a

100 ETH

You have no transactions

Need help? Contact MetaMask support

Code Implementation


localhost:5555/login

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Login

You can enter private key of your wallet Or you connect Metamask wallet

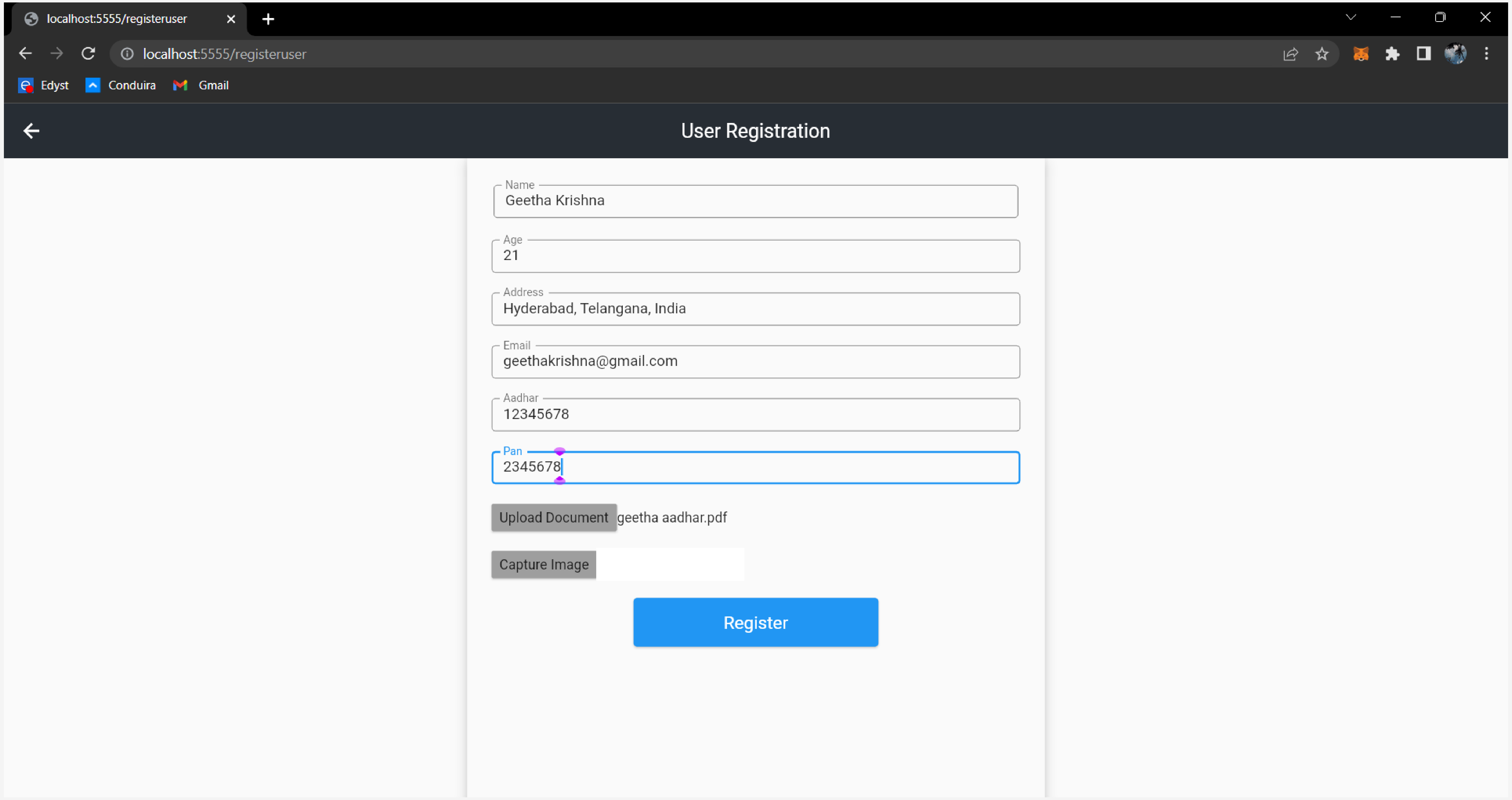
Private Key Paste

Continue

Or Click to connect Metamask

METAMASK

Code Implementation



User Registration

Name: Geetha Krishna

Age: 21

Address: Hyderabad, Telangana, India

Email: geethakrishna@gmail.com

Aadhar: 12345678

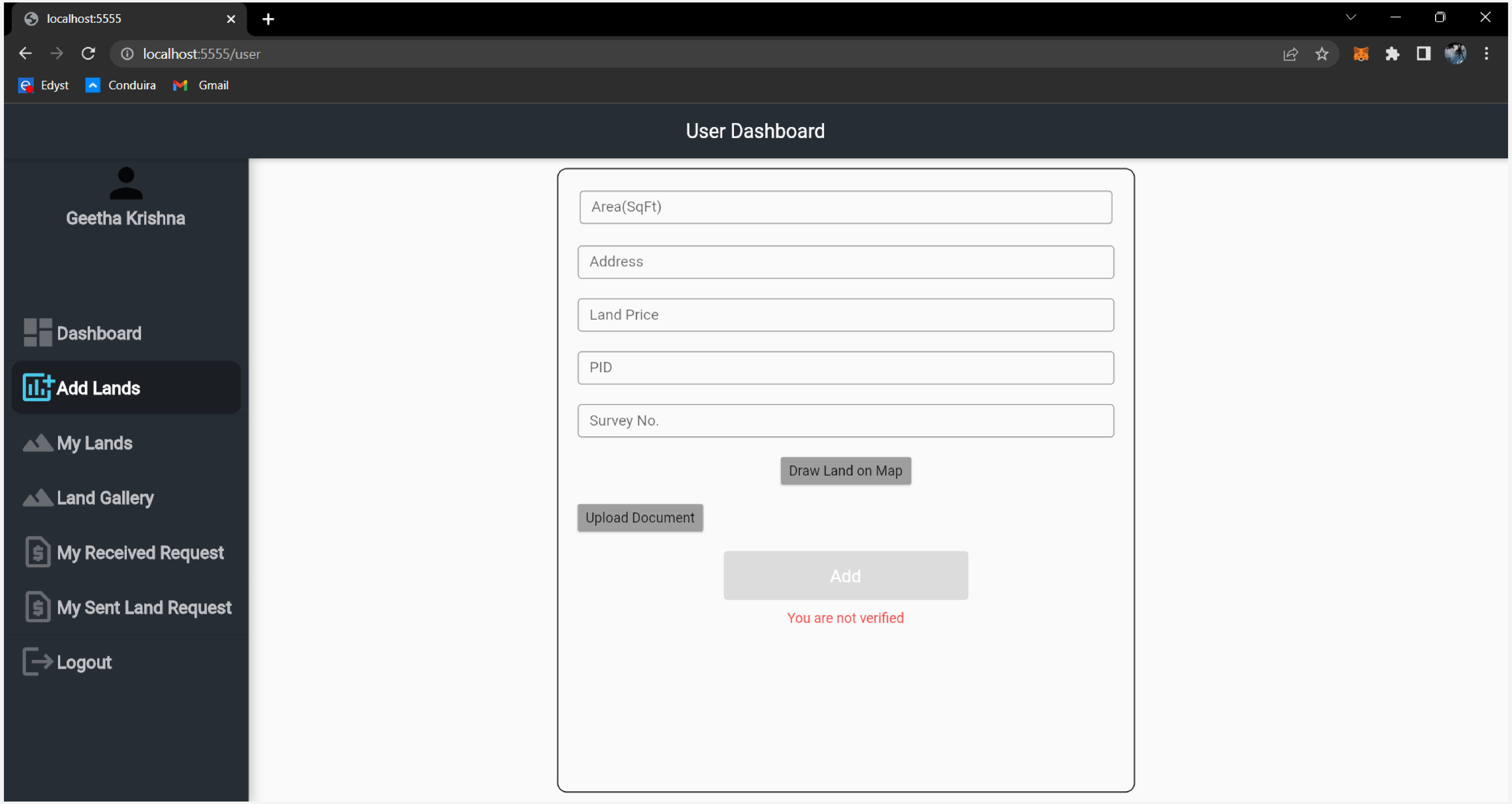
Pan: 2345678

Upload Document geetha aadhar.pdf

Capture Image

Register

Code Implementation



localhost:5555

localhost:5555/user

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User Dashboard

Geetha Krishna

Dashboard

Add Lands

My Lands

Land Gallery

My Received Request

My Sent Land Request

Logout

Area(SqFt)

Address

Land Price

PID

Survey No.

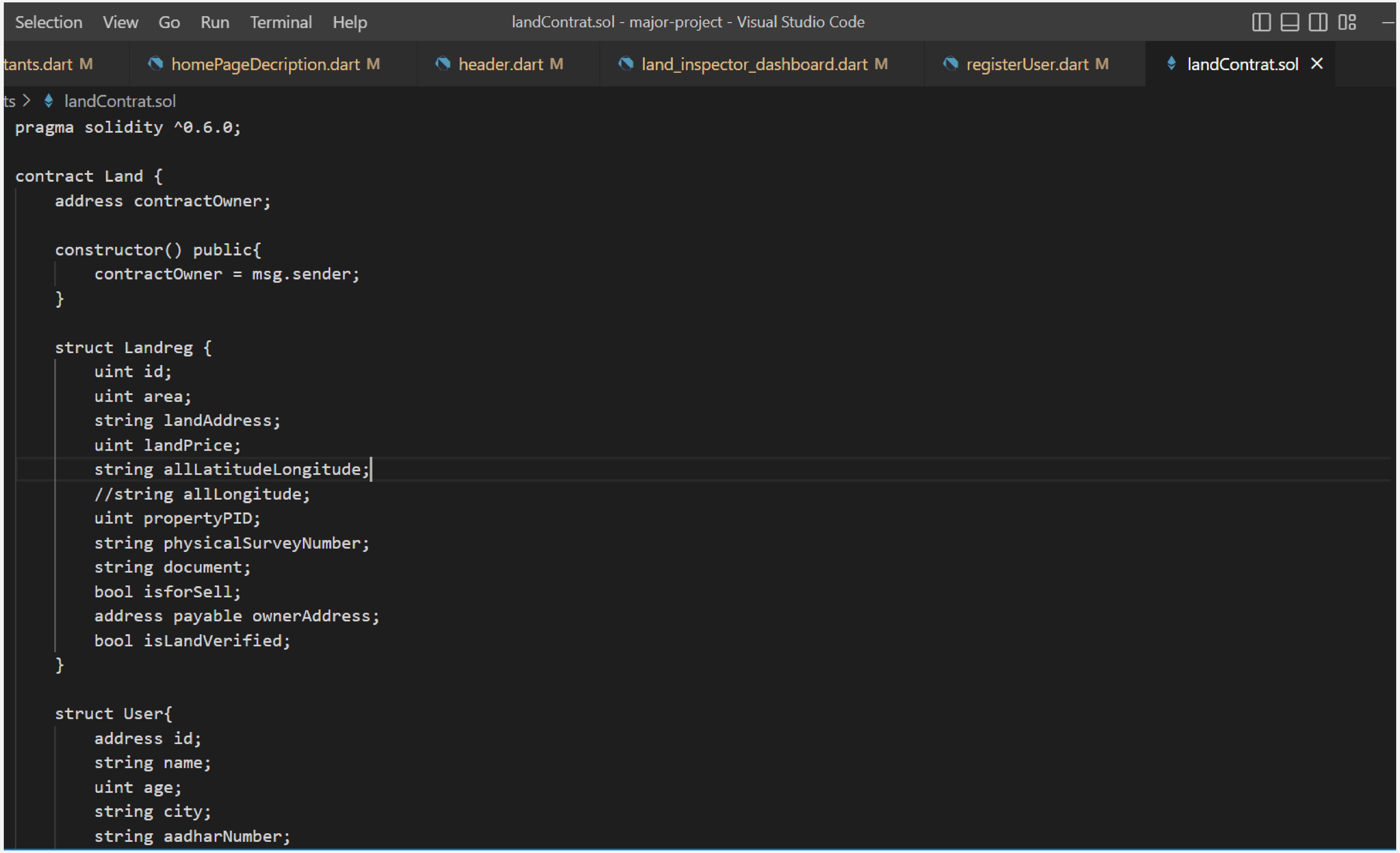
Draw Land on Map

Upload Document

Add

You are not verified

Code Implementation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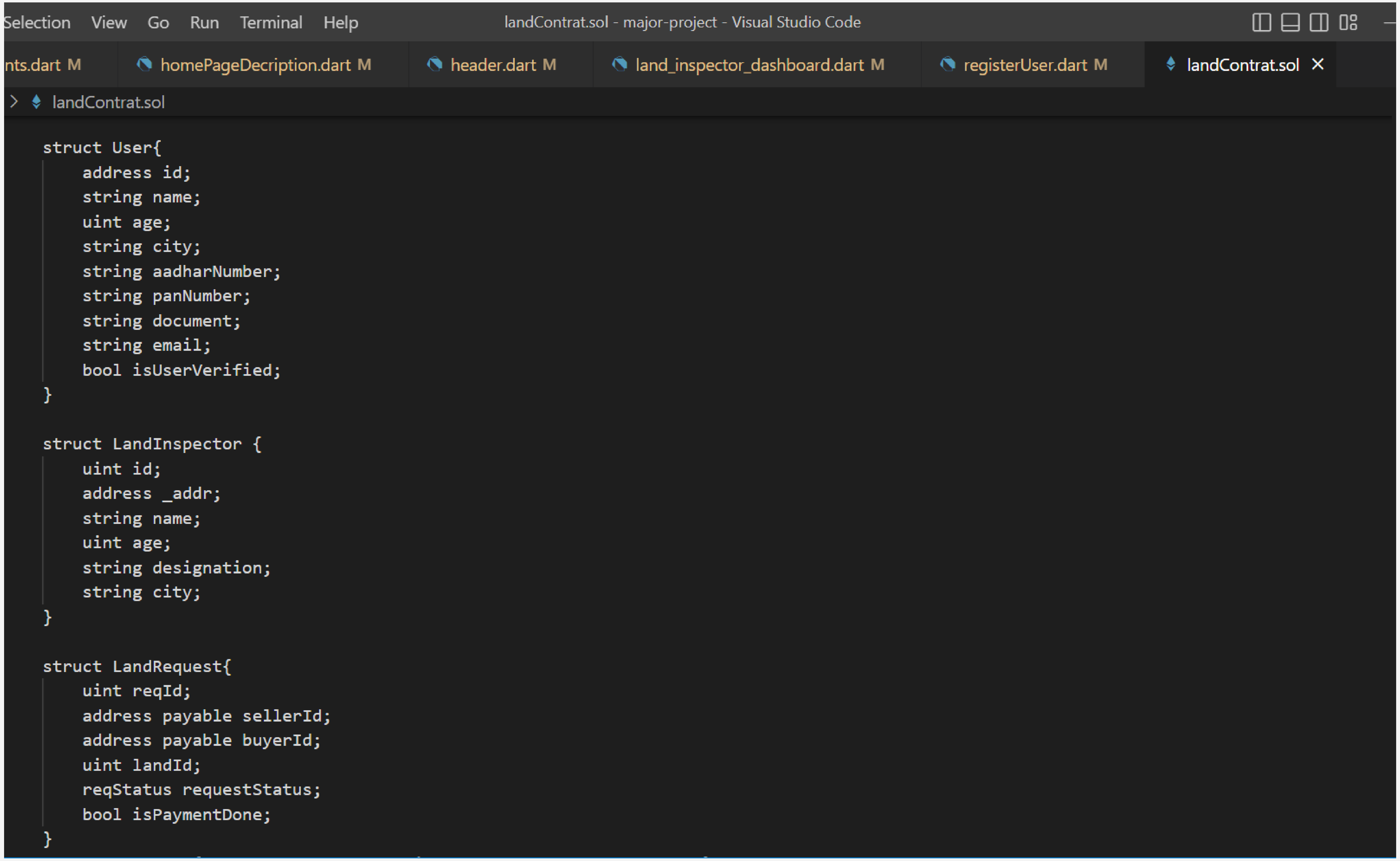
homePageDecription.dart M
header.dart M
land_inspector_dashboard.dart M
registerUser.dart M
landContrat.sol
ts > landContrat.sol

```
pragma solidity ^0.6.0;

contract Land {
    address contractOwner;

    constructor() public{
        contractOwner = msg.sender;
    }

    struct Landreg {
        uint id;
        uint area;
        string landAddress;
        uint landPrice;
        string allLatitudeLongitude;
        //string allLongitude;
        uint propertyPID;
        string physicalSurveyNumber;
        string document;
        bool isforSell;
        address payable ownerAddress;
        bool isLandVerified;
    }

    struct User{
        address id;
        string name;
        uint age;
        string city;
        string aadharNumber;
```

Code Implementation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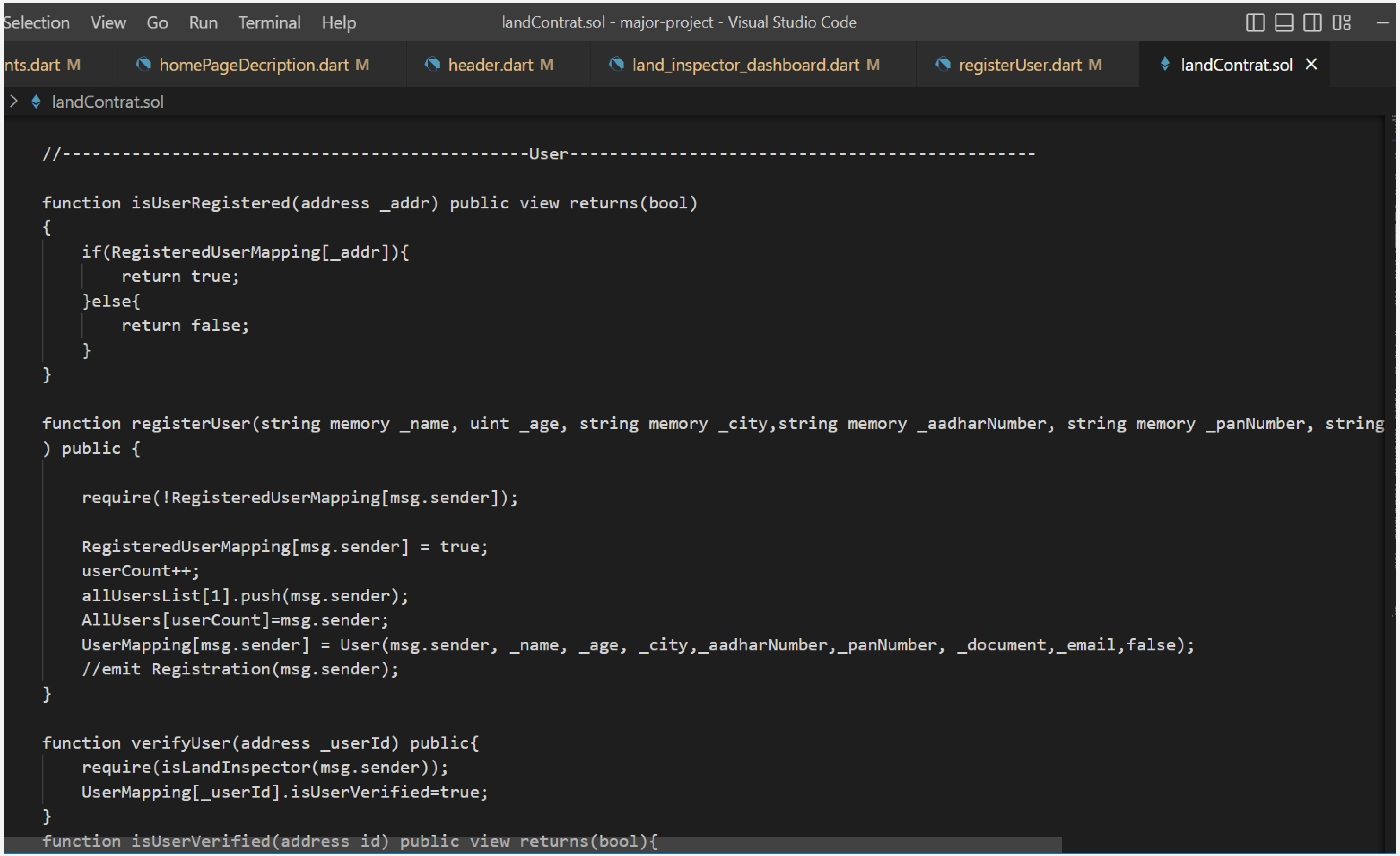
homePageDecription.dart M
header.dart M
land_inspector_dashboard.dart M
registerUser.dart M
landContrat.sol
landContrat.sol

```
struct User{
    address id;
    string name;
    uint age;
    string city;
    string aadharNumber;
    string panNumber;
    string document;
    string email;
    bool isUserVerified;
}

struct LandInspector {
    uint id;
    address _addr;
    string name;
    uint age;
    string designation;
    string city;
}

struct LandRequest{
    uint reqId;
    address payable sellerId;
    address payable buyerId;
    uint landId;
    reqStatus requestStatus;
    bool isPaymentDone;
}
```

Code Implementation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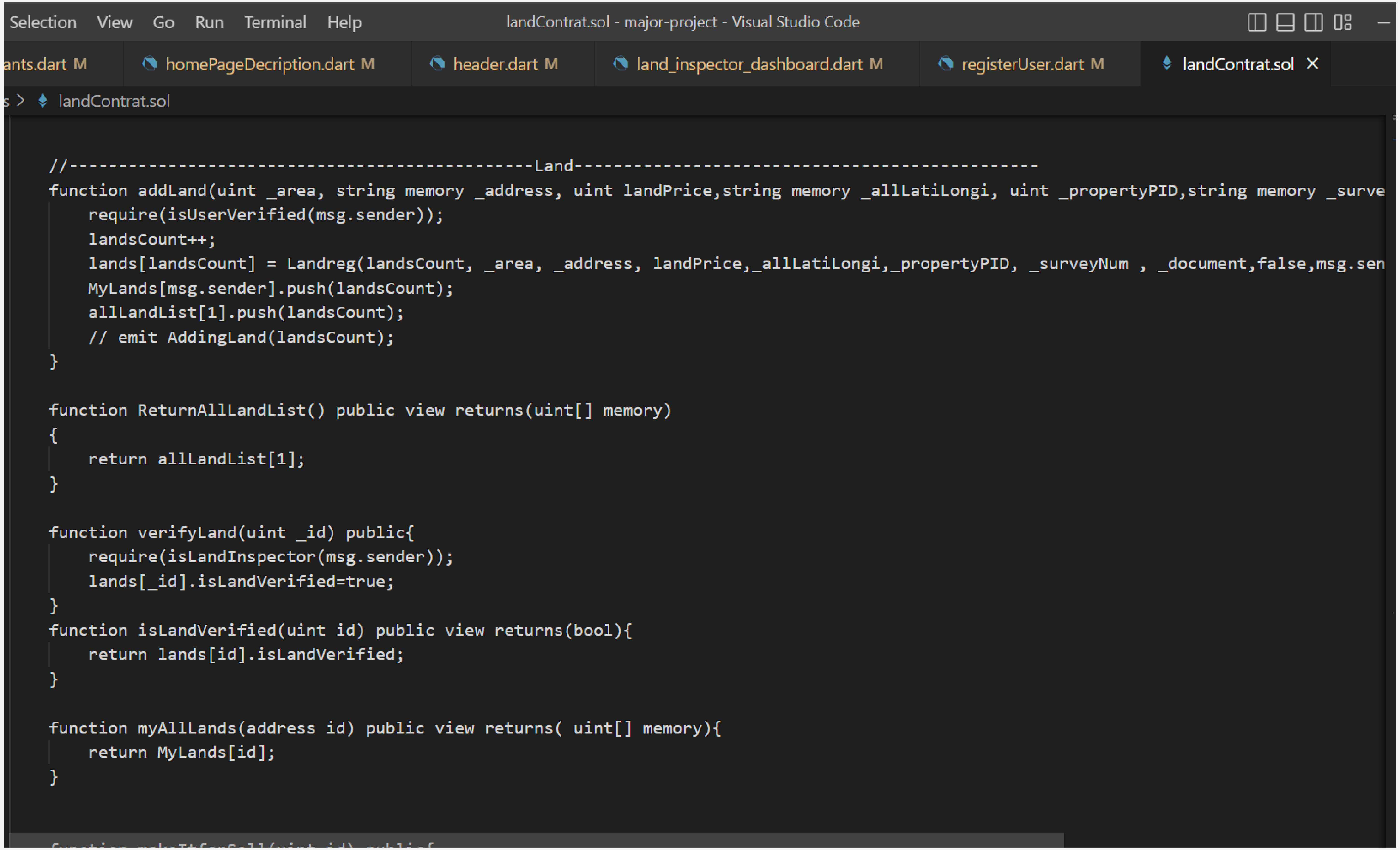
registerUser.dart M
landContrat.sol
landContrat.sol

```
//-----------------------------------------------User-----------------------------------------------

function isUserRegistered(address _addr) public view returns(bool)
{
    if(RegisteredUserMapping[_addr]){
        return true;
    }else{
        return false;
    }
}

function registerUser(string memory _name, uint _age, string memory _city,string memory _aadharNumber, string memory _panNumber, string
) public {

    require(!RegisteredUserMapping[msg.sender]);

    RegisteredUserMapping[msg.sender] = true;
    userCount++;
    allUsersList[1].push(msg.sender);
    AllUsers[userCount]=msg.sender;
    UserMapping[msg.sender] = User(msg.sender, _name, _age, _city,_aadharNumber,_panNumber, _document,_email,false);
    //emit Registration(msg.sender);
}

function verifyUser(address _userId) public{
    require(isLandInspector(msg.sender));
    UserMapping[_userId].isUserVerified=true;
}
function isUserVerified(address id) public view returns(bool){
```

Code Implementation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land_inspector_dashboard.dart M
registerUser.dart M
landContrat.sol
landContrat.sol

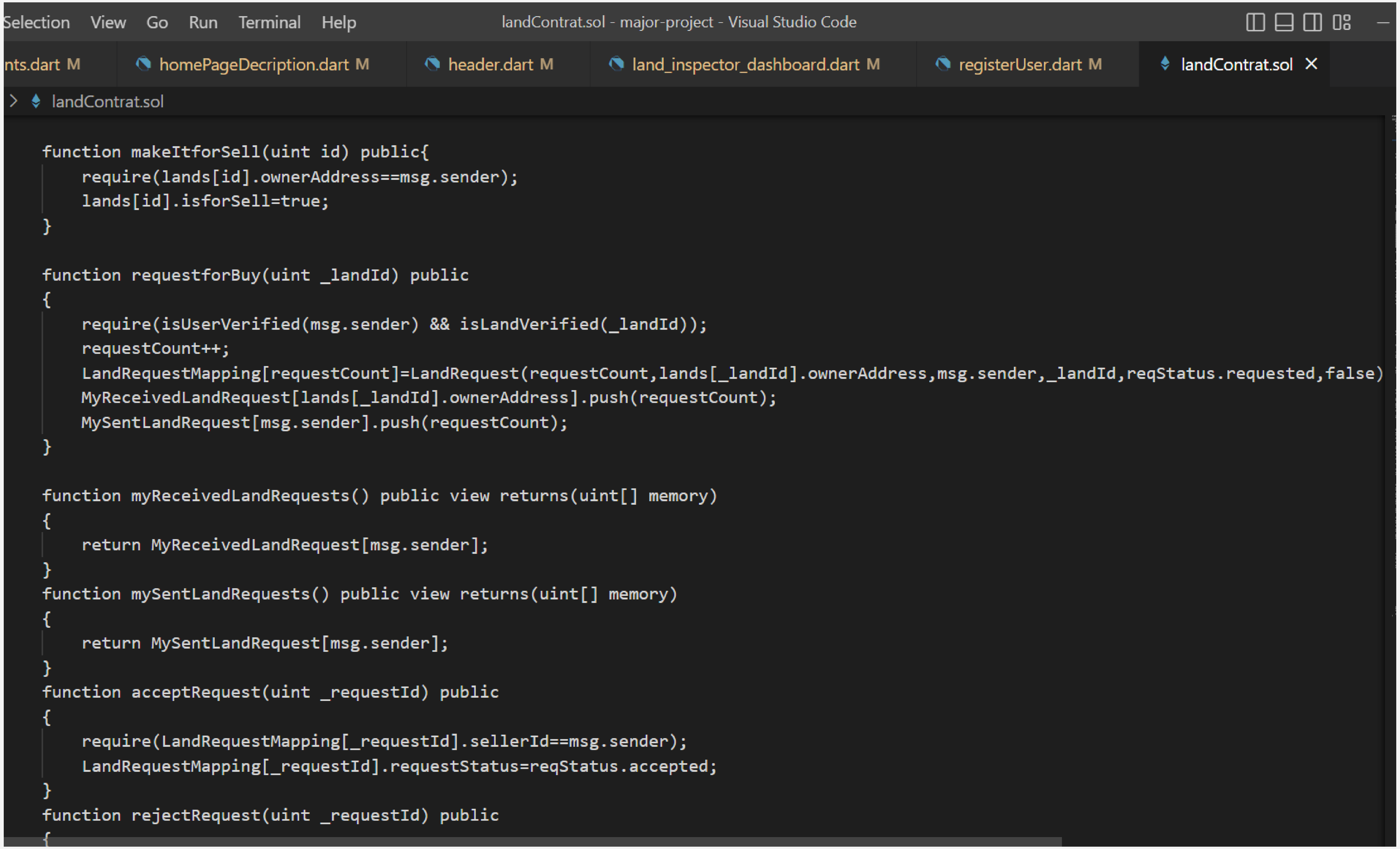
```
//-----------------------------------------------Land-----------------------------------------------
function addLand(uint _area, string memory _address, uint landPrice,string memory _allLatiLongi, uint _propertyPID,string memory _surve
    require(isUserVerified(msg.sender));
    landsCount++;
    lands[landsCount] = Landreg(landsCount, _area, _address, landPrice,_allLatiLongi,_propertyPID, _surveyNum , _document,false,msg.sen
    MyLands[msg.sender].push(landsCount);
    allLandList[1].push(landsCount);
    // emit AddingLand(landsCount);
}

function ReturnAllLandList() public view returns(uint[] memory)
{
    return allLandList[1];
}

function verifyLand(uint _id) public{
    require(isLandInspector(msg.sender));
    lands[_id].isLandVerified=true;
}
function isLandVerified(uint id) public view returns(bool){
    return lands[id].isLandVerified;
}

function myAllLands(address id) public view returns( uint[] memory){
    return MyLands[id];
}
```

Code Implementation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landContrat.sol
landContrat.sol

```
function makeItforSell(uint id) public{
    require(lands[id].ownerAddress==msg.sender);
    lands[id].isforSell=true;
}

function requestforBuy(uint _landId) public
{
    require(isUserVerified(msg.sender) && isLandVerified(_landId));
    requestCount++;
    LandRequestMapping[requestCount]=LandRequest(requestCount,lands[_landId].ownerAddress,msg.sender,_landId,reqStatus.requested,false)
    MyReceivedLandRequest[lands[_landId].ownerAddress].push(requestCount);
    MySentLandRequest[msg.sender].push(requestCount);
}

function myReceivedLandRequests() public view returns(uint[] memory)
{
    return MyReceivedLandRequest[msg.sender];
}
function mySentLandRequests() public view returns(uint[] memory)
{
    return MySentLandRequest[msg.sender];
}
function acceptRequest(uint _requestId) public
{
    require(LandRequestMapping[_requestId].sellerId==msg.sender);
    LandRequestMapping[_requestId].requestStatus=reqStatus.accepted;
}
function rejectRequest(uint _requestId) public
{
```

Conclusion

The following predicaments are addressed and a feasible solution is proposed through our application:

- Vulnerability of centralized systems
- Inconsistent data history
- Double Selling
- Fraudulent and fake documents
- Database attacks