LAND REGISTRATION SYSTEM USING BLOCKCHAIN(ETHEREUM)

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Introduction

Blockchain is a way of passing data (such as records, events, or transactions) from one party to another in a very secure way. It is an electronic record of information that requires digital security. All data stored in the blockchain is immutable; once a piece of data enters into a blockchain, it is practically impossible to alter its value (**because it supports append only Feature**).

The Blockchain in the land registry is used for secure transfer of land property. The transparent nature of Blockchain enables to track the changes made in land documents. Advent of Blockchain technology in the land registry is playing a very beneficial role in this developing era. It is helping in uplifting the poor, and marginalized section of the society in fighting illegal authorization of land. **The current system for land registration is full of duplicity and inefficiencies, due to which the land records are not protected, and citizens are the one those have to bear the most of it**.

Land Registry Records term can be express as it is the legal records maintained and controlled by the govt. authorities, containing all the relevant information about the property, and one of the essential data is the current legal owner of the asset or the property. It helps to get details back-dated history of ownership of that land with all the information about the past owners of the property. The Legal Rights of property gets changed from one hand to another hand**. The information stored as the legal records that can always get tampered.**

It becomes challenging to understand who the legal owner of the asset or the property is. The land dispute between the legal owner and the claiming owner; the claiming owner can file a case against the legal owner to win the ownership of that property. In that case, the judiciary declared the property as disputed land or disputed property. That cannot be bought or sold by anyone who claims to be an actual owner. In this case, the judiciary takes a hold on the property and decide who is the legal owner of the property which makes the inter-process difficult. Almost **66% court cases** in the country are **related to land disputes** costing a whopping **Rs.58,000 crore in** litigation,

Drawbacks of Existing System.

The **drawbacks** of the existing way of transferring the ownership of land records:

1. The Existing Process is very **time-consuming**.
2. This process is **less secure** as compared to the blockchain technology of land registration.
3. It has **no transparency**.
4. The process is **less synchronized**.
5. The traditional way has very little **data integrity.**

These Drawback are reduced by using Blockchain and it provide these features:

1. The land registry in Blockchain, the property owner, can automatically check their own and whether they are eligible to transfer the legal ownership to others or to sell the property.

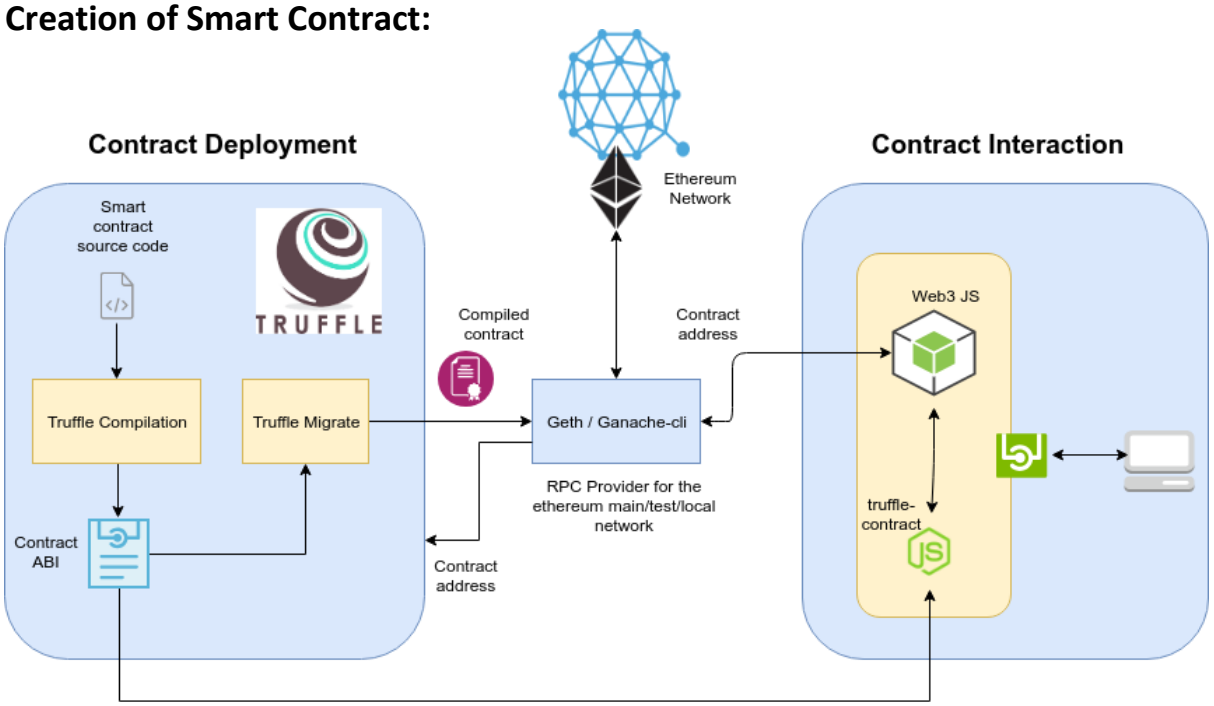
2. The Buyer and the Seller, both parties, are the user in the blockchain channel and can get easy access to each other, as it connects users over the single platform.

3. The verification of property and the land records becomes very accessible and very easy to anyone.
4. Once the verification gets complete, the users who are buyers and sellers can quickly move to the next process of registration that is the transaction.
5. The Purchase of land or asset gets executed by using a smart contract.
6. The seller transfers the ownership to the buyer.
7. The payment process automatically gets completed by transferring the amount from Buyer's account to the seller's account.
8. Everyone, buyer, seller, and the bank can verify the status of the contract over the blockchain smart contract platform.

(The Highlighted points are the inspiration of modules in my project)

Architecture of System.

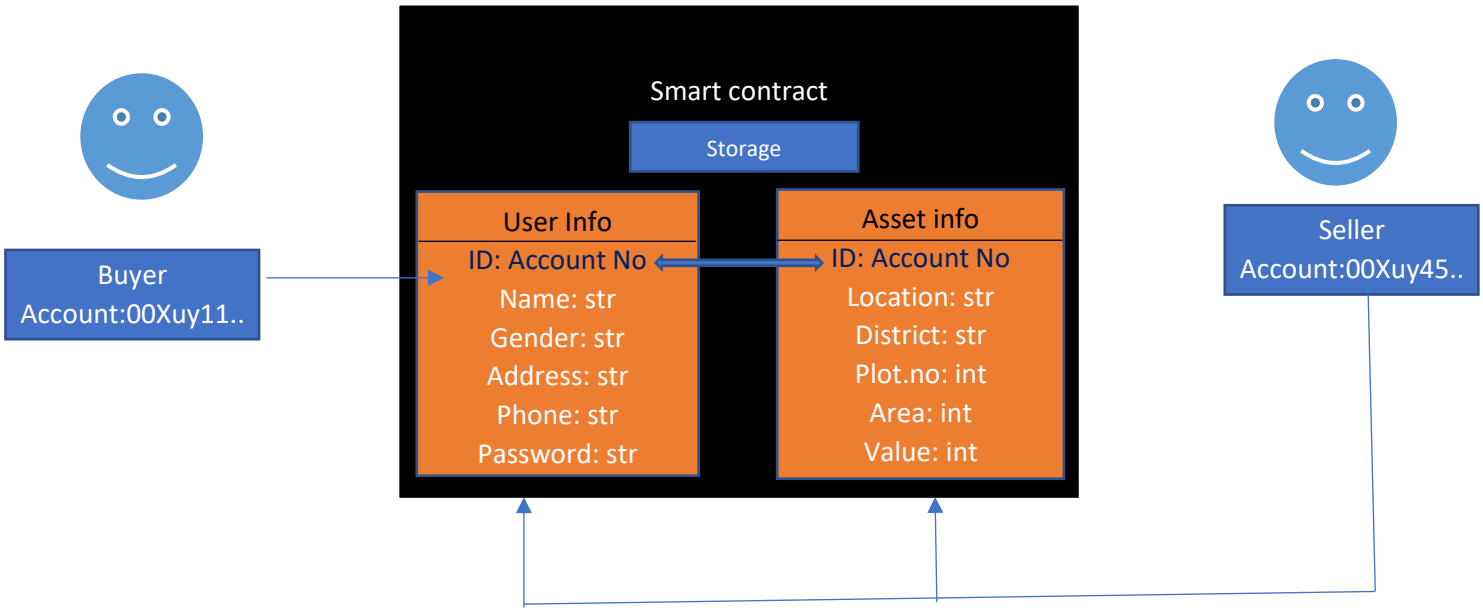
Creation of Smart Contract:



Register Module :

= Provide Account address

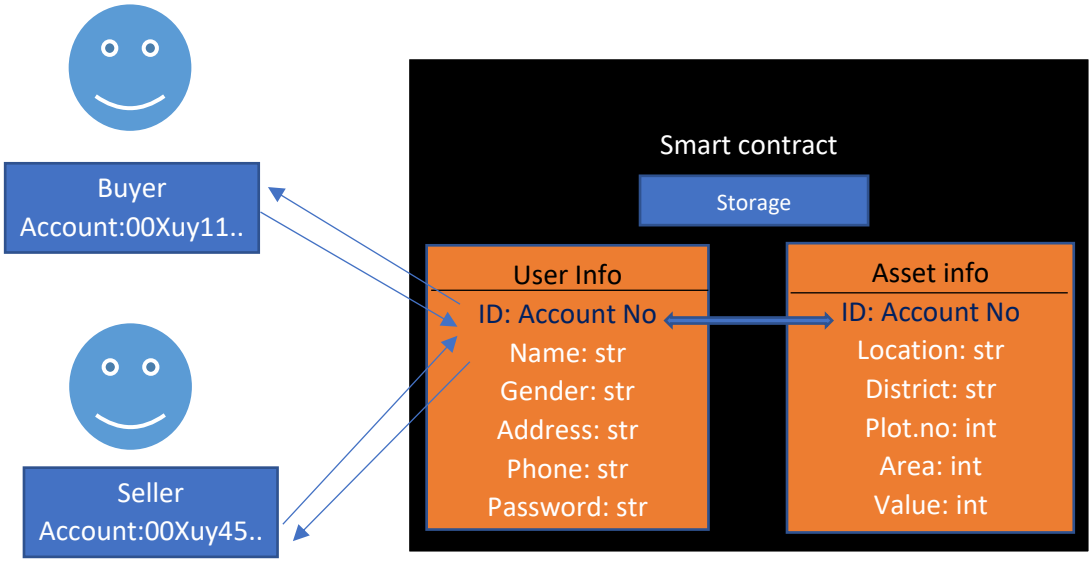
= Retrieving data



- The buyer can only enrols to user enrolment portal.
- The seller have to enrols in both the user and asset enrolment portal.

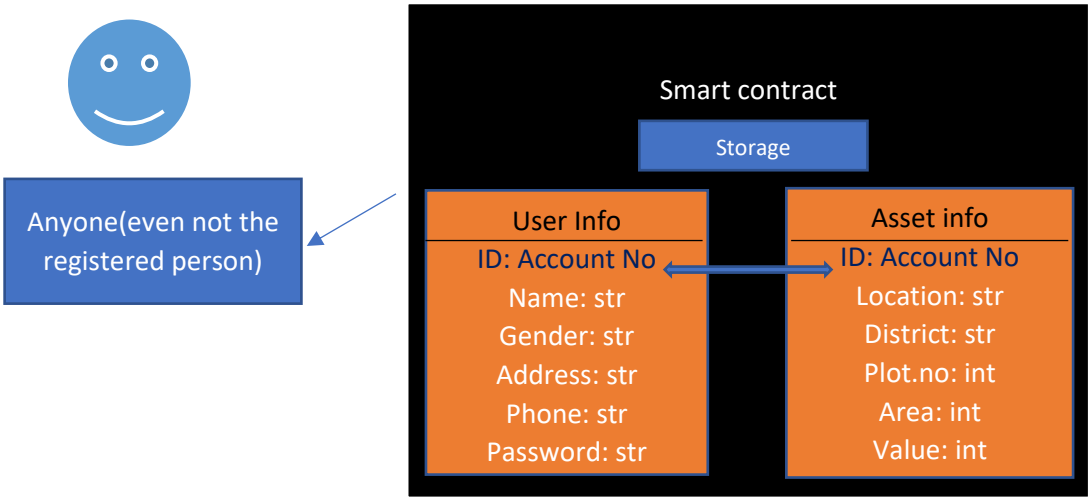
Search Module:

The seller and Buyer can verify their own and each other data in this module. Before any transaction.

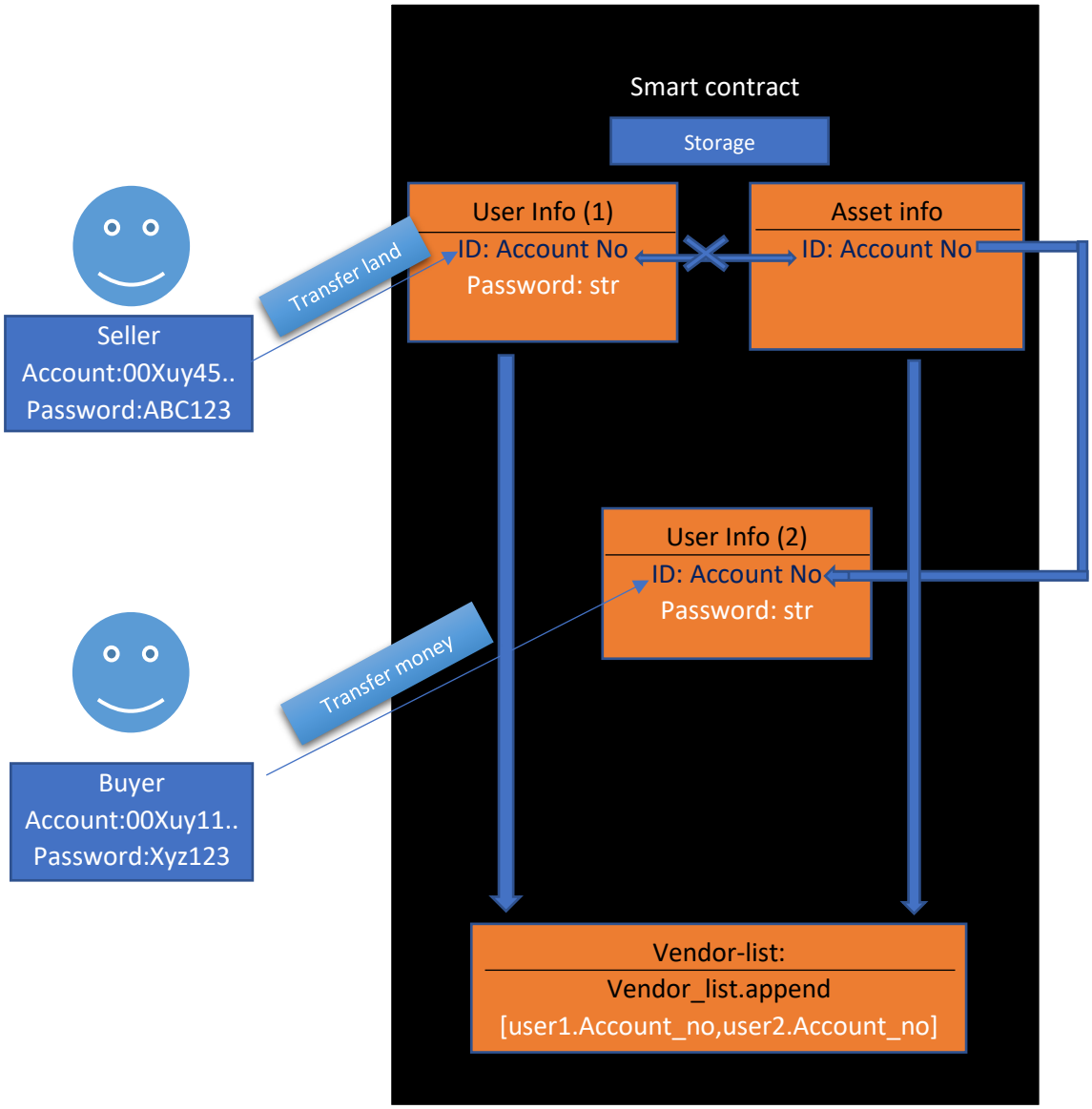


Record Module:

Anyone can see and check the data available for selling and person who are willing to buy land to give proposals this is only a View.



Mutation Module:



In seller's side:

The seller only wants to know the buyer's address.

He enters his account address and password and buyer's account address to initiate the transfer of land power of attorney.(since it is open to all so anyone can enter the address but the password is not known to anyone that is confidential that's why only authorised person can register the land to the buyer).

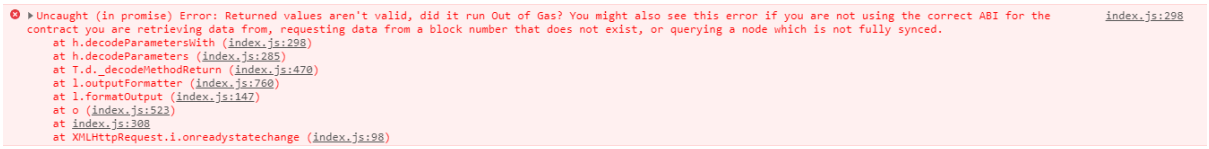
In Buyer's side:

The Buyer only wants to know the seller 's address.

He enters his account address and password and seller's account address to initiate the transfer of money. Here also same security is maintained as mentioned in above.

Problem That I Faced during implementation.

1. **The unwanted wastage of Gas price:**
   The cost of a operation is directly proportional to the bytes which is generated in the transactions thus the gas price also get increased. Form this what I conclude that inserting data as whole has no problem but updating of data during mutation and deletion of data will results in large amount of gas price. Sometime the query also make run out of gas situation.



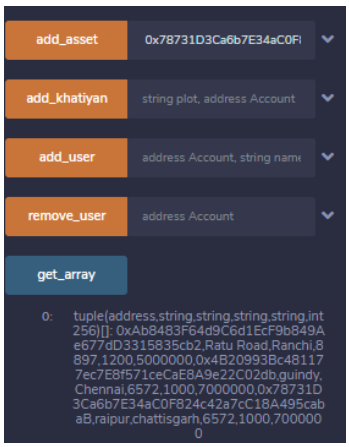
   Solution:
   In order to solve this I separate the user data and asset data in two different Block. Now whenever I have to update any data that is done in mutation. I simply exchange the address id of the seller with the buyer. This will save the gas price up to 70%.

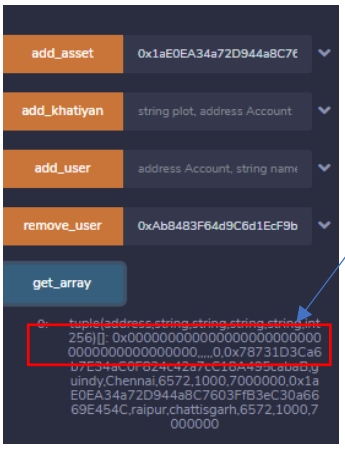
   This is the reason that's why I have to make enrolment in two different Blocks during registration.

2. **Deletion of data create unwanted space after deleting items:**
   when the seller sells the land then in assets section when we remove the data of from the current seller's Account it will create 0.0000000,0.00000000,0…… type of data in that location. This will **consume memory** as well as **increase the time complexity** of traversing the data.

   Solution:
   The **Brute Force** Solution is that remove the data from the i'th location and shift all the afterward data to i-1'th index. This solve the problem of space but still I am struggling with the time complexity cause for doing this I have to shift all the data that is present after the i'th node.

   Optimised Approach:
   I simply traversed to the i'th node and **swap the data of i'th node with the last one**. After doing this I simply **remove the last node**.





Unoptimized code:

```
function remove_user(address Account)
public {
  uint i;
  for (i = 0; i < ast.length; i++) {
    asset memory a = ast[i];

    if (a.Account == Account) {
      delete ast[i];
    }
  }
}
```

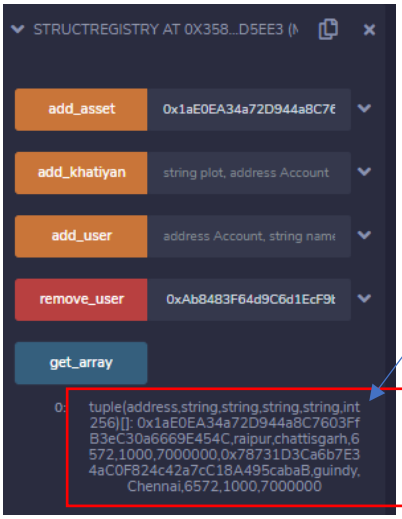
Optimized code:

```
function remove_user(address Account)
payable public {
  uint i;
  for (i = 0; i < ast.length; i++) {
    asset memory a = ast[i];

    if (a.Account == Account) {
      // delete ast[i];
      break;

    }
  }
  asset memory tem;
  tem=ast[i];
  ast[i]=ast[ast.length-1];
  ast[ast.length-1]=tem;
  delete ast[ast.length-1];
  ast.pop();
}
```

Result after Optimization



No unwanted space is created