Ethereum based Land Registry Maintenance - Whitepaper

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Contents

1   Introduction

1.1   Brief History of Blockchain

Blockchain was first introduced in 2008 by Satoshi Nakamoto where he proposed a new methodology for storing and distributing data among a group of nodes that do not trust one another. Bitcon is the first application of blockchain technology. Bitcoin is a digital currency which unlike regular currency doesn't require a trusted third party who can guarantee the value of the currency.

1.2   What is Ethereum??

Ethereum is a decentralized application platform which show cases a wide array of functionalities, among them Ether and Smart contracts are it's core features.Ether is native cryptocurrency of Ethereum, it helps facilitate the economic incentive for computation. Smart Contracts are programs uploaded into EVM storage and coupled with the immutable property of Blockchain this provides an executable environment with integrity across all the nodes on the network.

1.3   Terms related to Land Registration

1.3.1   Survey Number

A unique number allocated to a specific piece of land by the Survey Department to keep records. This record contains information such as location, size, shape and ownership of the land.

1.3.2   Sub Division Number

We can uniquely identify a land with help of Survey Number, but if the land is further divided into plots then Sub Division Number is allotted to distinguish between the plots.

1.3.3   Sub Registrar Office

Sub Registrar Office acts as middle man in the transaction, its primary function is to register documents relating to property transactions and collect proper stamp duty and registration fee.

2   Application

2.1   ELRM

Ethereum based Land Registry Maintenance (lets call it ELRM for short), is a Smart Contract which maintains the land records and updates them whenever a new transaction is made.

2.2   Motivation

2.2.1   Drawbacks of current system

- It is a fairly complicated process

- Not many people are aware of the process involved

- Cases where people falsify the documents

- Need for a middle man (Sub Registrar Office) to facilitate the transaction

All the above drawbacks can be resolved by blockchain. The transaction would be straight forward and there is no need for middle man. But main advantage of using blockchain is that, the immutable property of blockchain makes sure there is no falsification of documents.

2.3   Why ELRM??

To completely navigate the Land Registration process to blockchain, all the Land Records should be made online. If the Land Records are not online, even though the transaction can be made online we would again need another transaction offline

to collect the records. This would make our effort obsolete, so we need to do the next best thing. With help of ELRM all the transactions made would be recorded and any case of falsification can be cross verified with the ELRM.

2.4   Functionality

2.4.1   Complete Transfer

As the name suggests, Complete Transfer implies when a land is transferred from one entity to other without any splitting.

2.4.2   Partial Transfer

Partial Transfer is a wider domain. Let's see some of the examples of partial transfer.

1. Person A splits his land into 2 parts, sells one part and holds on to the other one.

2. Suppose Person A, B, C are required to share a piece of land acquired through inheritance

The first example is supported in ELRM, whereas in case of second example the splitting should be done in steps and cannot be completed in a single transaction

3   Smart Contract

3.1   Control Flow
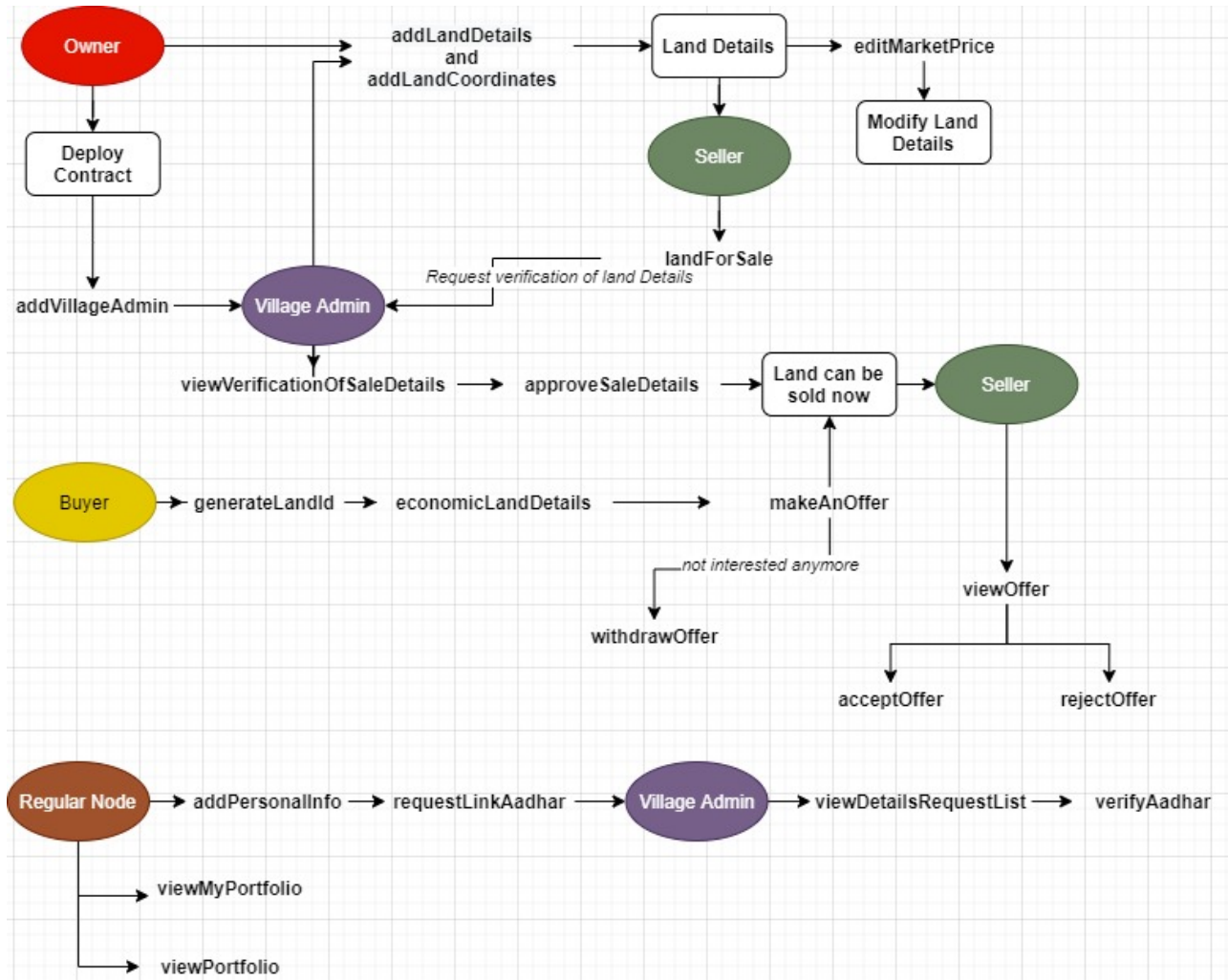
3.2   Functions

3.2.1   addVillageAdmin

Each village is assigned a village admin by the owner of the contract. Village Admin is responsible for adding the land details, verifying sale details and aadhar verification.

3.2.2   generateLandId

The land details of linked to a Land ID. generateLandId takes in the primary details of the land (State, District, Village, Survey Number, Sub Division Number) and generates a unique Land Id using them.

3.2.3   addLandDetails

This can only be called by owner or village admin. addLandDetails is used to fill out the land details. This function contains the following details

- address of the land owner

- State

- District

- Village

- Survey Number

- Sub Division Number

- Owner Aadhar Number

3.2.4   addLandCoordinates

This is same as addLandDetails, but since solidity can only support a few functional arguments we split the details into 2 parts. In this function we add the following details

- Land Coordinates

- Radius of the plot

- Area of the plot

- Market Price

- Type of Land

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3.2.5   requestLinkAadhar

This is a public function which can be called by anyone. This adds your address to the request list, which is seen by admin or owner and they verify and link the Aadhar Number to node address.

3.2.6   addPersonalInfo

The user has to give his personal info which then maps itself to the node address. Personal Info consists of the following

- First Name

- Last Name

- Address Info

- Aadhar Number

- Pan Number

- Phone Number

These details are used for cross verification by owner or village admin when requested for verification

3.2.7   viewDetailsInRequestList

This function is used by owner and admin to view the personal details of the requester in request list and then they can verify them using verifyAadhar

3.2.8   verifyAadhar

After viewing the details in request list, the owner or village admin can then verify aadhar using this function

3.2.9   editMarketPrice

This function is used by owner or village admin when they need to update the market price of a particular piece of land

3.2.10   viewMyPortfolio

This function is used when anyone wants to see the list of their assets. This returns an array of containing land id of the assets

3.2.11   viewPortfolio

This function is used when anyone wants to see the list of assets of some other node. This takes in the address of the node whode assets need to be displayed. This returns an array of containing land id of the assets

3.2.12   ecomomicLandInfo

This is used when the buyer wants to check information related to a piece of land. This function displays the following

- Market Price

- Area of the Land

- Availability Status

- Area for Sale

- Minimum Offer

- Type of Land

- Highest standing offer

3.2.13   landForSale

This is used to make the land available for sale. The seller provides the following

- Area for Sale

- Coordinates

- Market Price

- Minimum Offer

After this function is called, the land id would be added to Request Sale Details list, which will be verified by village admin or the owner

3.2.14   modifyMinOffer

This function is used by the seller to modify the minimum offer required.

3.2.15   removeLandForSale

If the seller is no longer interested to sell the land, he/she can use this function to remove the land from sale

3.2.16   viewVerificationOfSaleDetails

This is used by the village admin or the owner to view sale details from Request Sale Details list.

3.2.17   approveSaleDetails

After viewing the sale details, village admin or the owner can use this to approve the Sale and the details for land after splitting

3.2.18   rejectSaleDetails

In case of any discrepancy in the sale details, village admin or the owner can use this to reject the sale.

3.2.19   makeAnOffer

If the buyer wants to make an offer on any piece of land, they can use this function with the land id and the offer they are willing to make. The offer should be higher than the current highest offer else the function call would return an error

3.2.20   withdrawOffer

If the buyer is no longer interested, they can withdraw their earlier offer using this function

3.2.21   viewOffer

This displays the current highest offer for a given land id

3.2.22   acceptOffer

If the seller has an offer he is satisfied with, he can accept the offer using this and the function updates the details in the records

3.2.23   rejectOffer

If the seller is not satisfied, he can reject the current offer using this function and wait for a better one.

4   Conclusion and Future Scope

Implementing Lang Registration using blockchain would make the process easy and prevent any falsification of documents, but this would require all the documents to be made virtual, Our implementation helps maintain the records and guarantee their authenticity.

The contract is designed in such a way that, when the land records are made virtual we can make the functions payable. By doing this we can use ether as economic compensation for the land instead of money which results in the entire process being on blockchain without any middleman

Integration with Geofencing API would allow it to be more Interactive