2021

# Land-On-Block – Project Document

dApp II – Capstone Project

Pratik Patel (101339642)
Professor: Dave Mckay & Dhruvin Parikh
4/23/2021

GEORGE BROWN COLLEGE

# Contents

## Introduction

Blockchain is one of the most talked about technologies in recent years, especially within the IT community and the financial services industry. Not to mention, it has taken a space into various other domains such as Supply chain, Real estate, Digital identity and lot more. Real estate with blockchain is an unprecedented area where lot many startups have started to work on it. For countries without a trustworthy real estate ownership record and land registry, a similar project is very essential, cost efficient and fastest way to create transparent and trustable land records. It will serve as a foundation for better investments in land, enable the development of a mortgage market and a credit market in general, and become an institution for trust in one of the most fundamental parts of an economy which are land and real estate, undoubtedly.

## Requirement

The land registry and transfer transactions are one of the areas where security and transparency are important and where there is a high level of value, but where the required transaction speed and the number of transactions is significantly lower. Despite the importance of real estate for both society and individuals, there are many parts of the real estate transactions and the information about those transactions that take a long time to update. Especially, when we talk about developing countries such as India, Vietnam, and other Asian countries where usage of technology is not up to the mark in government backed services, it becomes utmost important to use technology which provides trust, transparency and easy accessibility.

Main bottlenecks based on traditional methods used for land registry and transfer are mentioned below.

- **Missing land records**

  Government of India has employed thousands of employees in public sector to keep the land registry and transfer transactions intact. Still there are high number of cases where land records are missing. Inefficient and paper-based system proven to be detrimental to economy of any country, and it is applicable to India. Improper handling of such paper records and intentional fire cases destroys the evidences which paves the way to missing land records.

- **Fraudulent land records**

  Bribe and corruption cannot be eliminated unless it has secure system which catches every instance of update, and it applies to Land registry system of India. Politics and common man bribe to some corrupted officials leads to changes in land records and makes the entire system vulnerable. Fraudulent land records are not rare cases anymore in India and other countries as well. As per the survey, research indicates that 1/3rd of the legal disputes in law of court in India are owing to land claims

- **Lack of Transparency and accessibility**

  Till recent past, to check the records and validate the same, individual has to go to government office and get the land deed. Sometimes, it takes weeks of time as documents are not in place in government office. Hence, citizens are left hopeless to get their documents on time. Accessibility of land record is big pain for all citizens. On top of that, how internal system works has not mentioned or available to citizens. This leads to opaque system where land record validation and transparency becomes a big question to citizens.

## Why blockchain required?

Blockchain is one of the most talked about technologies in recent years, especially within the IT community and the financial services industry. However, it's inherent nature of creating trust has attracted other industries as well and real estate is one of them. For countries without a trustworthy real estate ownership record and land registry, a similar project is very essential, cost efficient and fastest way to create transparent and trustable land records. The functionality of Blockchain can be described as a digital ledger. It mainly serves the same functionalities as a sound Land Registry system because it knows who owns what at a certain time. It ensures single-ownership and it captures when a certain transaction took place. It is possible to 'trace back' and therefore it should be possible to guarantee title.

## What blockchain to use?

In this use case I have decided to use Ethereum blockchain. Considering the choice of platform, the public permissioned blockchain based on Ethereum seems to be a reasonable solution since it supports smart contracts and provides development tools and libraries. Since user can access their land records easily on public blockchain and smart contracts logics are efficient to develop the logic for land transfer, Ethereum becomes a good choice for this application. In other words, with smart contracts enabling self-execution when certain conditions are met transactions could be completed faster. However, it can be extended to Hyperledger Fabric as well when limited authorization required to be given to some participating nodes such as Buyer, Seller, Broker and more power to be given to specific nodes such as Government land registry department, Judicial system and others.

## Scope of the project

This capstone project has limited scope limited to the overall design of the application and fundamental architecture of the same. It covers the bottlenecks, benefits as well. It is in early developments phase where idea has been coined to create this solution based on foundation knowledge of Blockchain. However, in order to make it more scalable and flexible, where various scenarios and complexity can be accommodated with the contribution from blockchain expert community.

## Solution

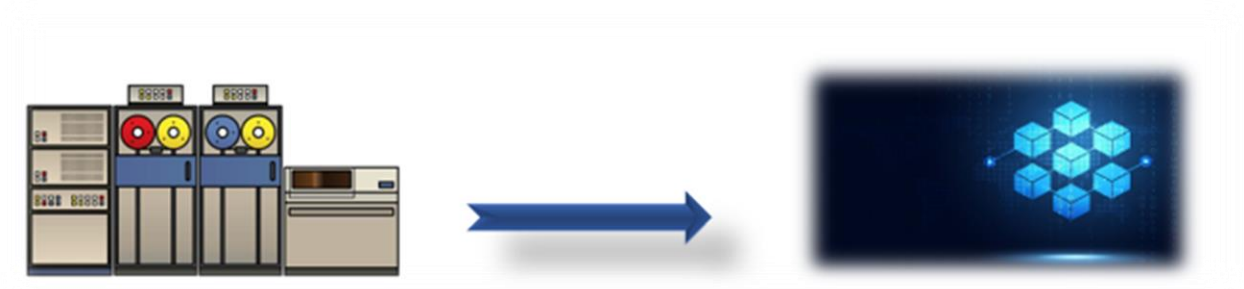
Land-On-Block is blockchain based solution which can help government of India to digitalize their land records and helps to make land transfer convenient. It is a Ethereum based solution where smart contracts will have logic intact which keep the data integrity by automated transaction. In practice, confidence in the original transactions and documents improves when several actors have access to the blockchain's verification records. When the verification records are open and demonstrably difficult to manipulate, there is less reason to question them, and trust and confidence in them grow significantly. The blockchain's ability to create a secure shared history, and in doing so create trust, is why it has been called" The Trust Machine". And this Trust machine is used to develop this solution as we wants to provide transparency to citizens of India.

# Architecture in brief

## Land Registry

In traditional land registry & transfer, the act of buying and transferring ownership of the property remains a tedious and lengthy process. These transfers typically need to be reviewed and confirmed by an array of intermediaries, including agents, lawyers, and governmental bodies.

However, with this solution, for land registry, all land data is digitally signed or hashed and stored to Private distributed nodes on the public blockchain. It would have ledger consisting of all land records of all states of India.

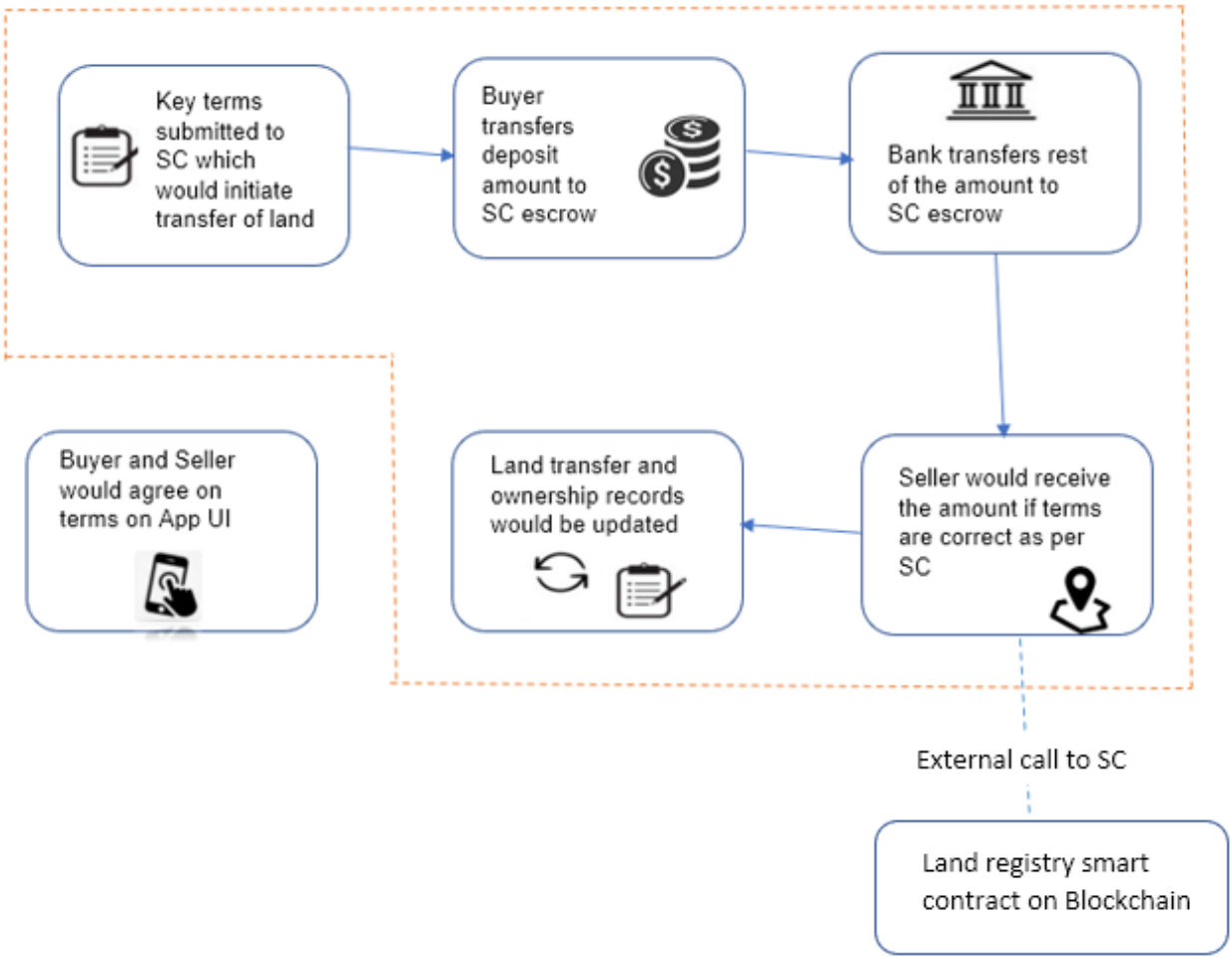


Land records on Legacy system

Trust Registry on Blockchain

## Land transfer

Smart Contracts check the possibility and legitimacy of the transaction. No agreement can be concluded if its terms do not meet the established standards. Transactions can be done in far less time with lower probability of fraud. The seller/landlord includes all details of the property and the buyer/tenant puts all of their necessary information on a 100% encrypted and secure block. Computer protocols check the legitimacy of the transaction and no agreement can be completed until all of the terms are met. Smart contracts execute themselves automatically once the requirements are met.




**Land transfer process flow in the backend**

There are lot many steps involved when land transfer would be developed as full-fledge application. But if we talk about in general, main steps are as below:

1. On application, with interactive and user-friendly user interface, buyer and seller can see the terms they have to agree by checking all the details.
2. Once key terms would be submitted to smart contract, it will initiate land transfer.
3. Buyer will deposit the down payment to the smart contract escrow account
4. Financial institutions such as Bank or NBFC will deposit rest amount to the smart contract escrow account

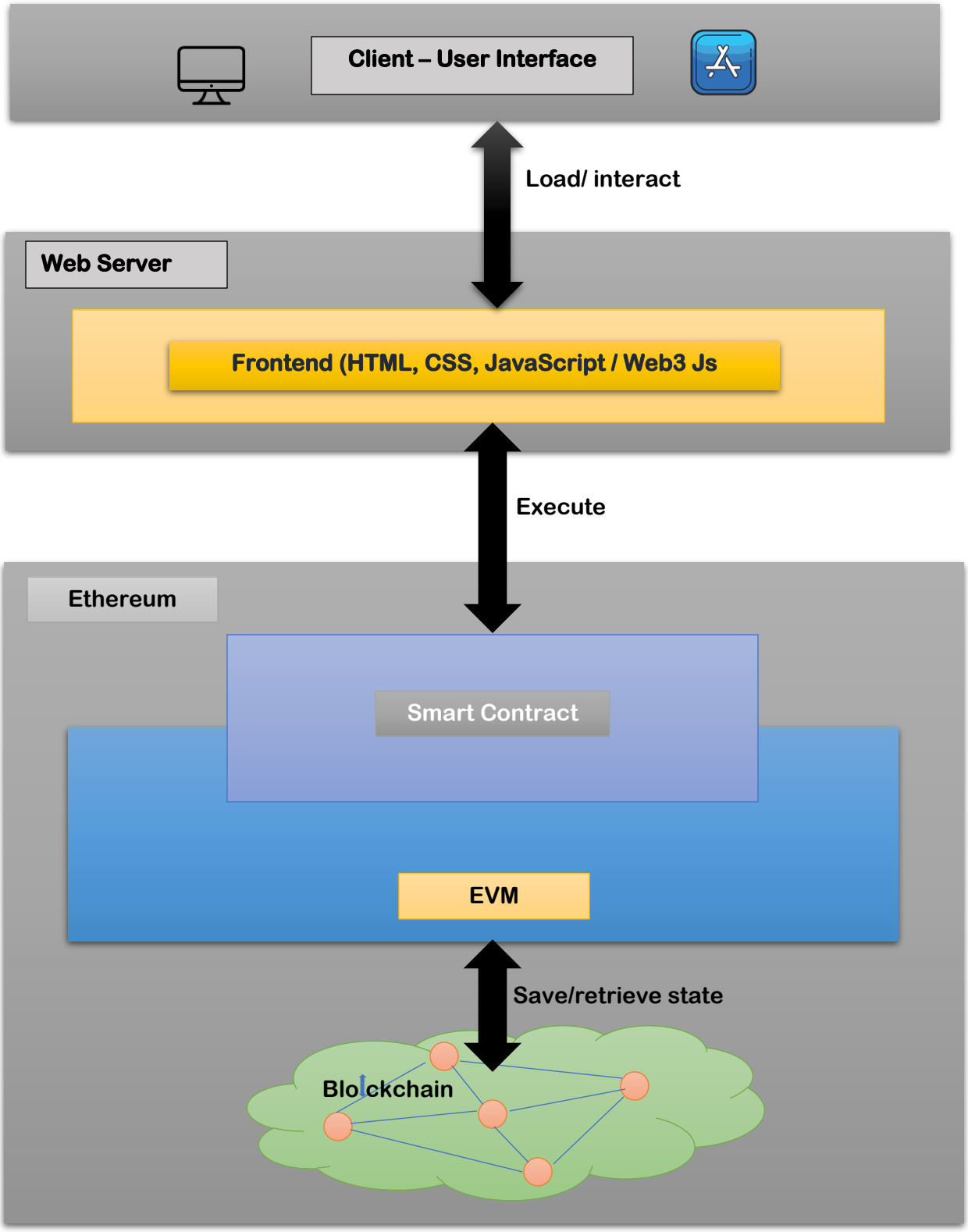
5. Once the seller receives the full amount as per the terms in agreement, smart contract verifies the same
6. As 5th steps gets done, it will give external call to “Land registry” smart contract on blockchain and it will update the ownership records and make the reference of land transfer

## Technology stack and their interaction

As per the current project plan, below technology would be used to make Land-On-Block application.

Technologies needed to develop the entire application:

- Ethereum
- Spring Boot
- Solidity
- Web3j
- MariaDB
- ReactJS, HTML5, CSS3
- Java
- Android Studio & Android Developer Tools
- Android SDK & iOS SDK
- Microservices Architecture
- Truffle
- ActiveMQ
- AWS & AWS S3




**DApp decentralized application**

# Application UI

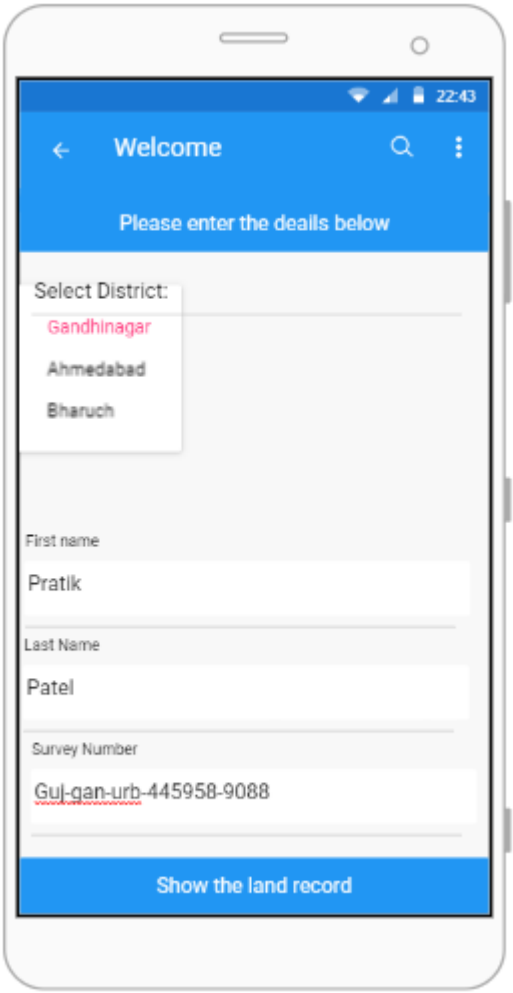
For land registry check I have developed few user interfaces as below. User can download the application from the Google Play store or from Appstore.

## Welcome page

This page would be the welcome page of the Land-On-Block land registry check. This interface is limited to check the land for Gujarat state.

## Information Fill-in page

On this page user has to fill in the district such ash Ahmedabad, Gandhinagar and etc. along with their legal first name, last name and survey number of the land which is unique.



## Result page

After filling all required information user would be redirected to result page where application will retrieve information based on survey number hash stored on the blockchain. It will show the details of Land owner, Land use type such as agriculture, commercial, Total assessment of land in Rupees, and piece of land by highlighting.


Some expert on web rightly said, “The blockchain is not a panacea, but it is the best tool we have to fight corruption and inefficiency,”

# References


Frederick Reese, Land Registry: A Big Blockchain Use Case Explored (2017). Retrieved 7th April 2020, from https://www.coindesk.com/blockchain-land-registry-solution-seeking-problem

BLOCKCHAIN-BASED LAND REGISTRATION SYSTEM. Retrieved 7th April 2020, from https://www.qburst.com/resources/case-studies/blockchain-land-registry/

John Dean Markunas, The Impact of Blockchain Technology on the Surveying Industry, Cadastre and Land Registry Systems (2019). Retrieved 7th April 2020, from https://landportal.org/es/blog-post/2021/02/impact-blockchain-technology-surveying-industry-cadastre-and-land-registry-systems

Tpshendra Kumar Sharma, BLOCKCHAIN LAND REGISTERIES ACROSS THE GLOBE (2020). Retrieved 7th April 2020, from https://www.blockchain-council.org/blockchain/blockchain-land-registeries-across-the-globe/

Dr Vidy Potdar, Land Registry Blockchain (2019). Retrieved 7th April 2020, from https://businesslaw.curtin.edu.au/wp-content/uploads/sites/5/2019/10/Land-Registry-Blockchain.pdf

Naveen Joshi, HOW BLOCKCHAIN CAN PREVENT LAND FRAUD AND IMPROVE REGISTRY PROCESS (2020). Retrieved 7th April 2020, from https://www.bbntimes.com/technology/how-blockchain-can-prevent-land-fraud-and-improve-registry-process

Katherine Lang, Land registration and blockchain (2018). Retrieved 7th April 2020, from https://www.taylorwessing.com/download/article-land-registration-blockchain.html

Lauren Tombs, Could blockchain be the future of the property market? (2019). Retrieved 7th April 2020, from https://hmlandregistry.blog.gov.uk/2019/05/24/could-blockchain-be-the-future-of-the-property-market/

J. Michael Graglia, Christopher Mellon, BLOCKCHAIN AND PROPERTY IN 2018: AT THE END OF THE BEGINNING (2018). Retrieved 7th April 2020, from https://d1y8sb8igg2f8e.cloudfront.net/documents/Graglia_Mellon_blockchain.pdf

Using Blockchain in Land Registry (2020). Retrieved 7th April 2020, from https://coreledger.net/wp-content/uploads/2020/12/coreledger_ebook_land_registry_210x297_20191204_FINAL.pdf

Babar Khan Javed, Blockchain for land registry bolsters UAE's digital services initiatives (2019). Retrieved 7th April 2020, from https://www.cio.com/article/3444916/blockchain-for-land-registry-bolsters-uaes-digital-services-initiatives.html

Using Blockchain To Reshape Land Registry And Property Rent (2019). Retrieved 7th April 2020, from https://modex.tech/using-blockchain-to-reshape-land-registry-and-property-rent/