Design Document (HLD/LLD)

BLOCKCHAIN-BASED REAL ESTATE TOKENISATION

DIVYANSHU JANGID (B2020020)

NAMAN KUMAWAT (B2020029)

PRATIK AGARWAL (B2020039)

ROHAN KAPOOR (B2020042)

SHIVEN GOYAL (B2020051)

Table of Contents

Abstract

- As blockchain and cryptocurrency regulations in the region begin to grow, numerous start-ups are showing interest, along with major financial institutions seeking to develop this innovation across the region. The concept of tokenisation of real estate assets involves creating a virtual token that represents ownership of a particular type of asset.

- With traditional real estate investments, there are the challenges of a lack of liquidity, a lack of transparency, intermediaries, high processing fees, and an absence of fractional ownership. A solution to this problem has emerged through tokenisation.

- Tokens can represent real estate related ownership in several ways due to their enhanced flexibility in use. A token becomes a record that has legal meaning and hence an economic value. In addition to representing ownership of an asset, tokens can also represent an equity interest in a legal entity that controls the asset, an interest in a debt secured by the asset, a right to share in the revenue or profits generated by the asset, or any other variation as determined by the issuer of the tokens.

- Basically to gevren the entire real estate market which can bring up new opprotunities related to the transactional data , minimizing the documentation control and dependence can achieve new heights to regulate the same in which middle men have much lesser influence , thereby creating a brighter opportunity for everyone to have some ownership which eventually will lead to pool of investements making them much secure and profitable in the future .

1. Introduction

1.1 Why this Design Document?

This Design Document contains both the components

- High-Level Design (HLD)
- Low-Level Design (LLD)

The goal of the High-Level Design Document (HLD) is to supplement the current project description with the essential details and to serve as a reference manual for how modules interact at a high level. We hope to provide a bird' eye view of the architecture and design of the solution we're giving for e-voting system traceability difficulties in this document.

The HLD will:

- Describe the project's constraints and assumptions
- Present all design aspects and characterize them in depth
- Describe the asset tracker's reusability

The purpose of the Low-Level Design Document (LLD) is to provide the internal logical design of the actual program code for the Real Estate Tokenisation system . LLD describes class diagrams, including methods and relationships between classes, as well as program specifications

2. General Description

2.1 Product Perspective

- Blockchain technology has recently been adopted and adapted for use by the commercial real estate (CRE) industry. CRE executives are finding that blockchain-based smart contracts can play a much larger role in their industry. Blockchain technology can potentially transform core CRE operations such as property transactions like purchase, sale, financing, leasing, and management transactions.
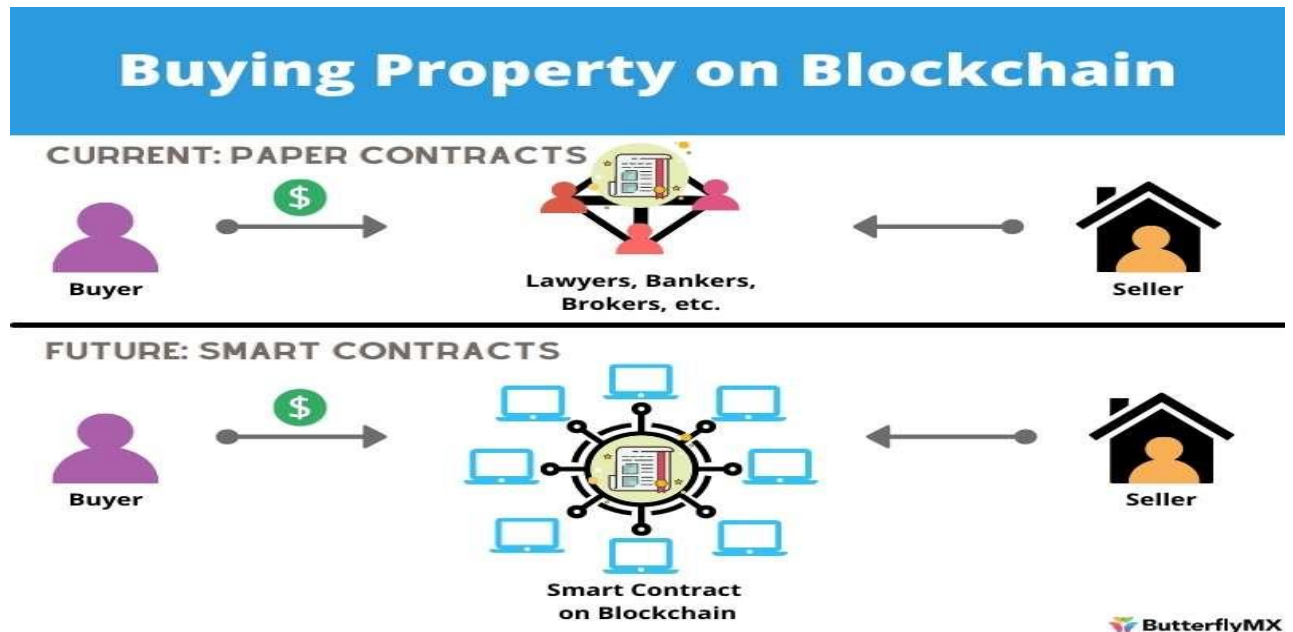
Given blockchain's disruption of financial services and subsequent widespread application across industries, it's hard to find a segment that has not been influenced by the technology.

2.2 Problem Statement

Real estate technology has traditionally been primarily concerned with listings and with connecting buyers and sellers. To introduce a new way of trading real estate , blockchain can enable trading platforms and online marketplaces to support real estate transactions more comprehensively. In order to allow sellers to tokenize assets and liquidating that asset through a token sale , we can implement blockchain in real estate.Collected tokens can be exchanged for fiat currency, with buyers owning a percentage stake of the property.

Here are some areas where implementing blockchain can change the game.

- Liquidty
- Fractional Ownership
- Decentralized system
- Cost Transparency
- New Platform and Marketplaces

2.3 Proposed Solution

The blockchain is a digital, decentralized, encrypted, transparent ledger that can withstand manipulation and fraud. Because of the distributed structure of the blockchain, a Ethereum real estate trading system reduces the risks involved with fraud and allows for a tamper-proof for transactions. A blockchain-based real estate tokenisation system requires a wholly distributed real estate trading infrastructure. With the help of blockchain technology, we can have a distributed ownership of the property along with fast liquidation of assets.

Ethereum blockchain can revolutanize the data coordination , with peer to peer transactions by building a platform for creating and building smart contracts, which will allow users to exchange just about anything of value shares, money , real estate. By using smart contracts the **cost** of issuing and administering securities can be reduced, streamlining transactions and increasing **speed** of execution. The element of automation introduced in the process can reduce costs throughout the whole process and the lifetime of securities.

2.4 Future Improvements

Blockchain technology achieves significant success in the detection of malleable change in a transaction however successful demonstration of such events has been achieved which motivates us to investigate it further.Over time, **research** has highlighted specific problems, such as the need for further work on blockchain-based real estate tokenisation with significant technical challenges.

- Scalability and Processing Overheads
- User Identity
- Transactional Privacy
- Energy Efficiency

2.5 Technical Requirements
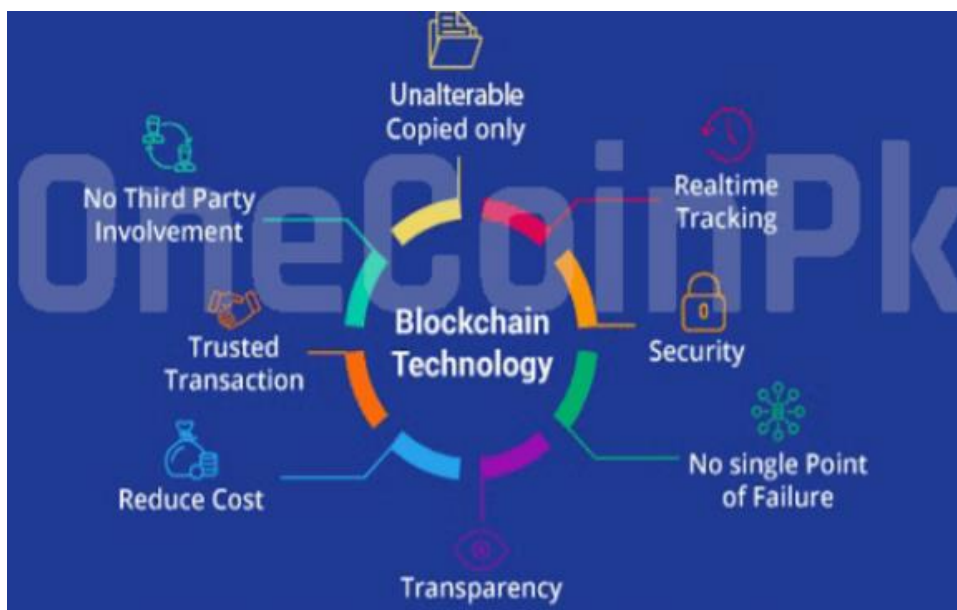
2.6 Data Requirements

The blockchain based real estate platform uses data about the seller recorded by the platform along with its location details. Other seller data requirements are property area ,amenities available, identity verified ,share control, of the property.

2.7 Programming Used

Python Programming is used with the Hashlib module which is used to implement a common interface to message-digest algorithm and different secure hash. SHA 256 cryptographic algorithm is used in this to add blocks we will also need to flesh out methods for the new_block(), add_new_transaction(), and hash() in blockchain for this Blockchain-based Real Estate Tokenisation.

2.8 Constraints

Blockchain technology has enormous potential in creating trustless, decentralized applications. But it is not perfect. Certain barriers make blockchain technology not the right choice and unusable for mainstream applications. We can see the limitations of blockchain technology in the following image.
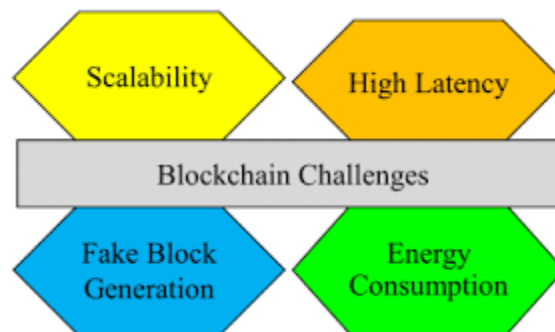
- **Lack of Awareness**
  There is a lot of discussion about blockchain, but people do not know the true value of blockchain and how they could implement it in different situations.

- **Limited availability of technical talent**
  In blockchain technology, there are not so many developers available who have specialized expertise in blockchain technology. Hence, the lack of developers is a hindrance to developing anything on the blockchain.

- **Immutable**
  In immutable, we cannot make any modifications to any of the records. immutability also has a drawback. In this case, when you want to make any revisions or want to go back and make any reversals. For example, you have processed a payment and need to go back and make an amendment to change that payment.

- **Key Management**
  There are different keys, such as public keys and private keys. When you are dealing with a private key, then you are also running the risk that somebody may lose access to your private key. It happens a lot in the early days when bitcoin wasn't worth that much. People would just collect a lot of bitcoin, and then suddenly forget what the key was, and those may be worth millions of dollars today.

- **Scalability**
  Blockchain has consensus mechanisms that require every participating node to verify the transaction. It limits the number of transactions a blockchain network can process.

- **Consensus Mechanism**
  In the blockchain, Depending on the network size and the number of blocks or nodes involved in a blockchain, the back-and-forth communications involved to attain a consensus can consume a considerable amount of time and resources.

3. Design Details

3.1 Accessibility

The process of tokenization is fundamental to improve:

1. **Trading and pricing:** the disintermediation leads to a shift away from the current market makers model, at the same time, it creates an audit trail of ownership and characteristics of the underlying asset, improving the pricing;

2. **Liquidity:** the process provides improved liquidity for near-illiquid assets and potentially eliminates the illiquidity premium, leading to a higher share of value to be captured by investors, it also provides faster and cheaper securities lending allowing for a faster unwinding of collateral and improved collateral liquidity, leading to more efficient use of the balance sheet.

3. **Clearing and settlement:** the process is streamlined and cheaper, by reducing back-office work and the number of resources dedicated. It also reduces the number of intermediaries and as such the overall counterparty risk of the process. The use of blockchain also provides faster data reconciliation.

In order for the tokenization process to yield the maximum benefits, ideally, the settlement should also happen on-chain.
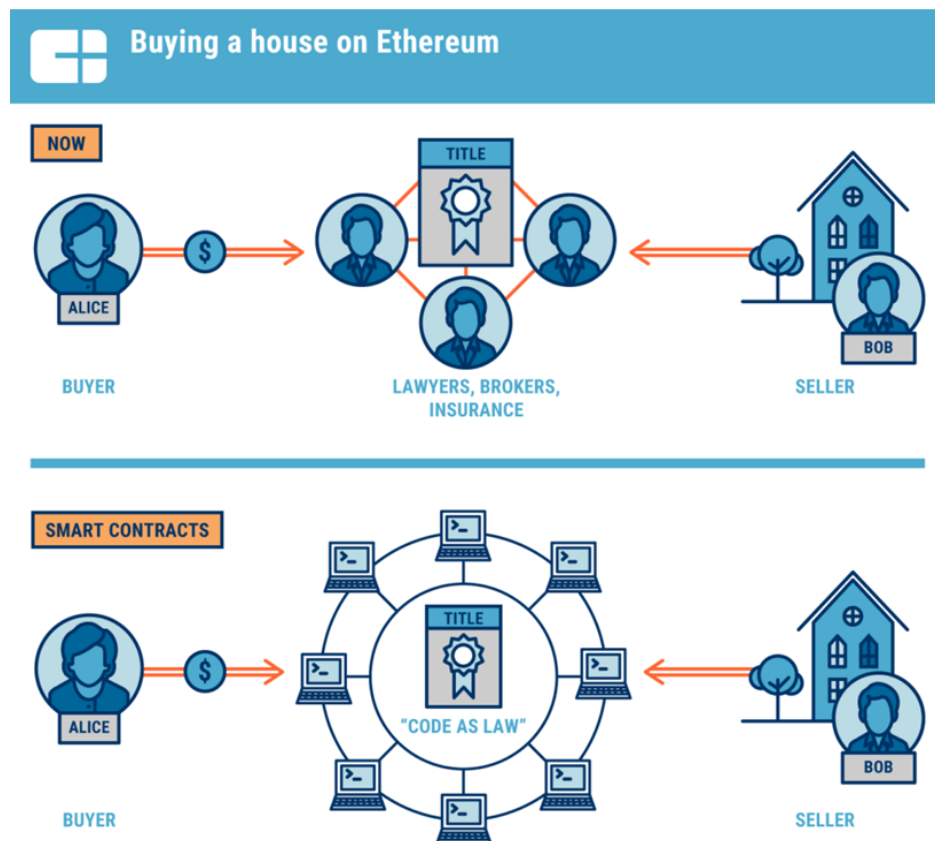
3.2 Error Handling

The different types of errors in blockchain development.

1. Network-based Errors
   One of the easiest methods to avoid this is by ensuring the proper installation and starting of the network. You will have to take all the steps according to the network we have.

2. Database Errors
   During each line of code, data from different databases may be pulled and put to use. If we encounter database errors while coding for blockchain, we should be much alarmed. The first step is to make sure that there are no corruptions in the database set. Next step, you need to ensure the proper connection between the system and the data.

3. HTTP/API Errors
   Depending on the type of error that occurs, certain codes are given for each type. In the world of the world wide web, for instance, HTTP Error 404 means that the page has not been found. Similarly, it is possible to find other types of errors in blockchain development as well.

4. Runtime Errors
   We would also have come across runtime errors while dealing with Hyperledger or other types of blockchain development tech. If we see one of these errors, it means that there is something wrong with the process of runtime.

3.3 Performance

The performance of the system given the real estate tokenisation requirements presented to identify any considerations with regards to its application in a real-world scenario. The experimentation consisted of multiple steps i.e. conducting multiple transactions, verification of transactions, mining transactions into the blockchain, a reflection of the changes made in the public ledger to all the nodes in the network, and the usability of the system. The transaction becomes a part of the public ledger which shows that it has been mined.

3.4 Reusability

The code written and the components used for the project can be reused and with appropriate changes, we can scale up to meet new requirements as well. The code is written can be further scaled up by importing real-time data into the system.

4. Conclusion

•   Since the majority of the implementation takes place at the back end, end users would not notice a significant difference between a blockchain-based real estate trading system and a traditional system. Thus, the audience acceptability of this technology can be assumed to be quite high.

•   Adopting blockchain methods may expose users to unforeseen security risks and flaws, thus a more sophisticated software architecture must be in place which should adequately be complemented with robust managerial expertise.

•   The blockchain network has massive scope in secure real estate transactions as it will help prevent all kinds of frauds globally aas well as small scale because of its property of inherently entire, centralized, open, and consensus-driven technology.

•   With digitization taking over everything, its high time that people start using blockchain for real estate investment and trading even though public awareness for the same is very low. But eventually this new technology can bring in new areas of innovation that can create a significant impact across work-force domains.

• Providing an decentralised platform connected with multiple layers of security gives a bright opportunity in ownership of an asset with no involvements of intermediaries can revolutionize the way of property buying hassel free, which in the traditional culture involves much complex mechanisms .