SmartProp : Blockchain-based Smart Property Ownership Management System on IPFS

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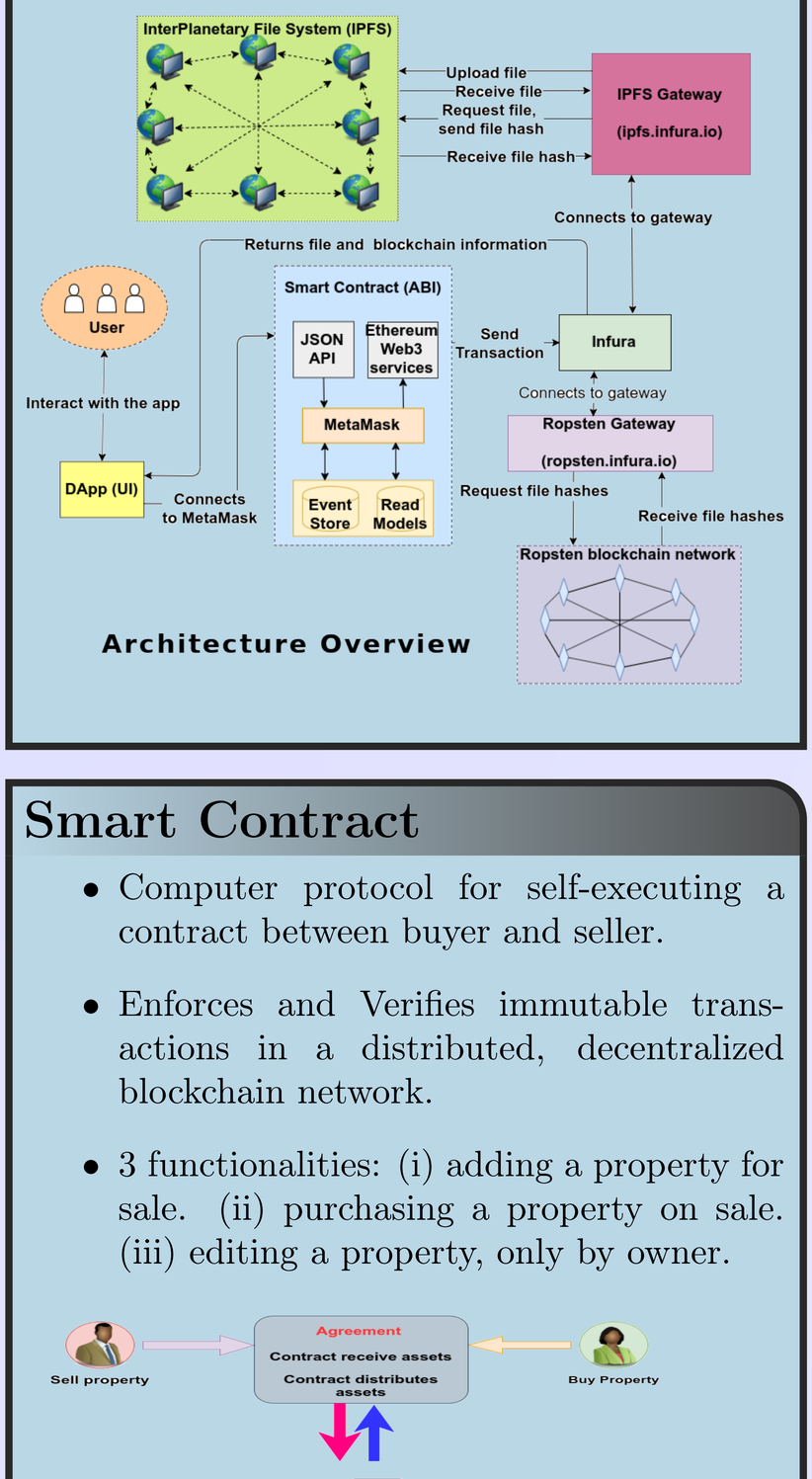
Problem

Forgery in property ledgers and contracts has serious implications in the estate market.
e.g. It triggered the 2008 Financial Crisis. Present centralised verification of property contracts has a lot of disadvantages such as tampering of documents, destruction of ledgers from unavoidable calamities and corruption.

SmartProp: Our Solution

To counter forgery in real-estate industry by:

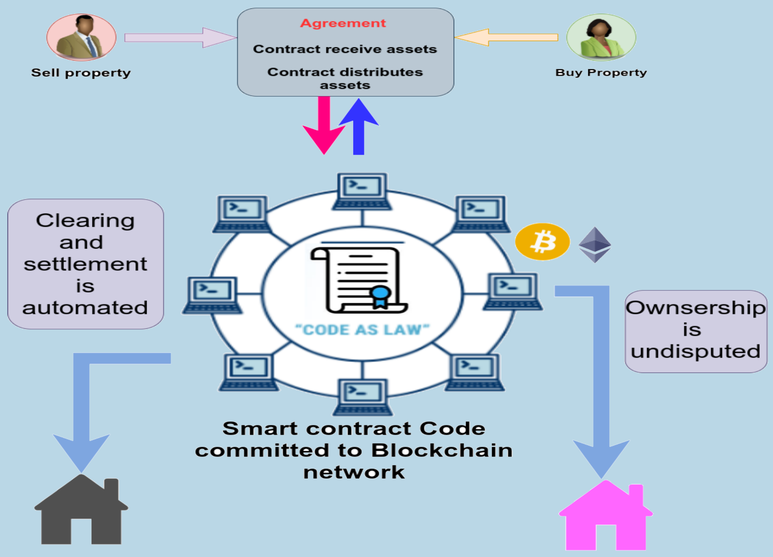
- Implementing an immutable fault-tolerant asset management system, SmartProp.
- Adapting the work in [1] to build SmartProp as a decentralised peer-to-peer application on the Blockchain.
- Combining IPFS with Blockchain to store images and other large files. IPFS solves Blockchain's storage capacity problem of storing maximum 1 megabyte data only.
- Implementing an Ethereum-based smart contract as the 'backbone' of SmartProp's end-to-end decentralised system.



Architecture Overview

Smart Contract

- Computer protocol for self-executing a contract between buyer and seller.
- Enforces and Verifies immutable transactions in a distributed, decentralized blockchain network.
- 3 functionalities: (i) adding a property for sale. (ii) purchasing a property on sale. (iii) editing a property, only by owner.



Smart contract Code committed to Blockchain network

Role of Smart Contracts (pre-defined code) in Blockchain

Blockchain Concepts

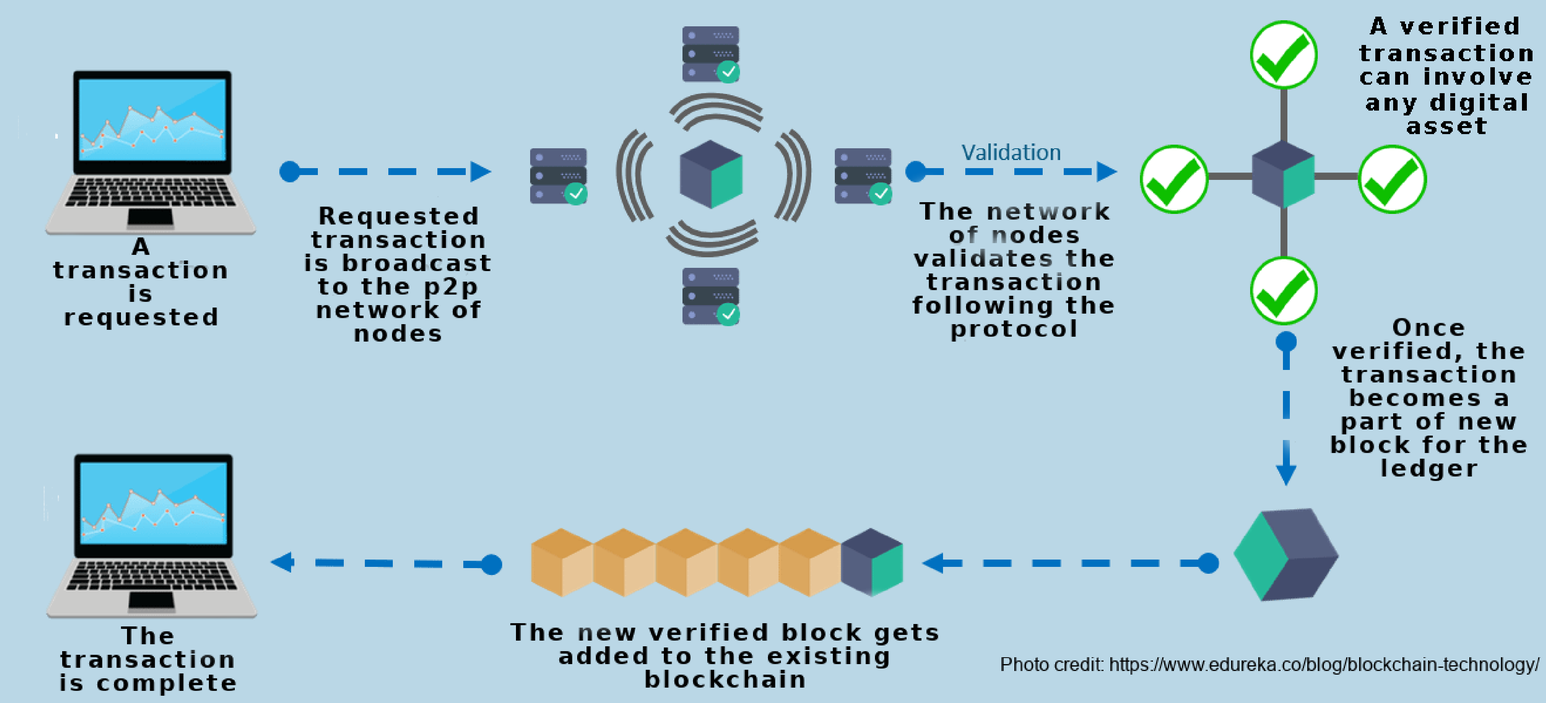
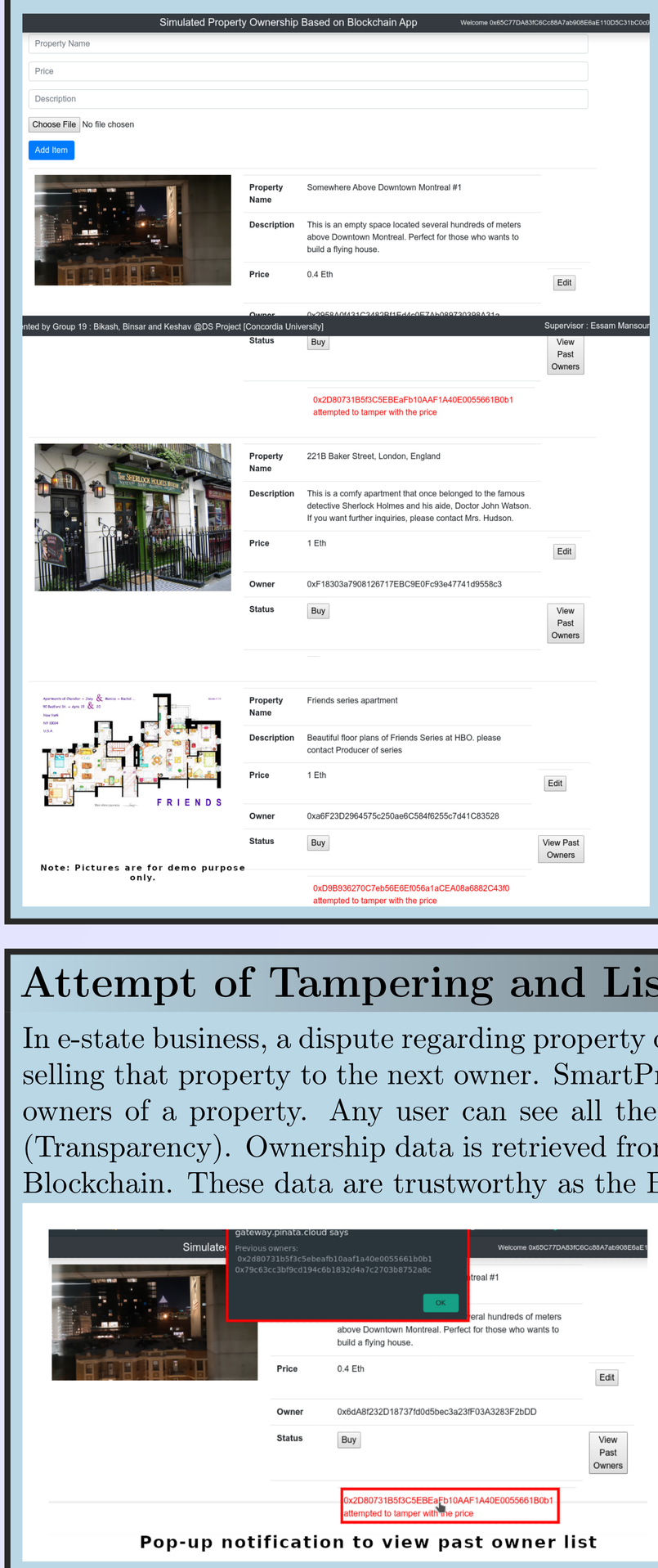


Photo credit: https://www.edureka.co/blog/blockchain-technology/

Implementation

- User Interface implemented using Bootstrap and ReactJS.
- Users perform transactions via smart contracts embedded in Ethereum's Network.



Conclusion and Future Work

SmartProp is a minimal viable product which focuses on property ownership management using blockchain technology.

- It tries to solve the file storage problem in blockchain (maximum 1 megabyte) by using Interplanetary File System (IPFS).
- It overcomes the limitation of traditional property ownership management systems and enhances privacy, security, data integrity as well as reliability.

In the future, We plan to:

- Perform surveys and in-depth analysis to enhance SmartProp (Incentives for users).
- Improve existing functionalities and make it production-ready for the estate market.
- Investigate how developers of SmartProp can benefit from the system without being a part of it (No third parties).

Acknowledgement & Reference

This project is part of the Distributed Design (COMP 6231 Fall'19) course at Concordia University, Montreal.

[1] Victor Zakhary, Mohammad Javad Amiri, Sujaya Maiyya and Divyakant Agrawal, Amr El Abbadi: *Towards Global Asset Management in Blockchain Systems*,arXiv:1905.09359 (2019)

Attempt of Tampering and List of Previous Owner

In e-state business, a dispute regarding property ownership might occur when a previous owner denies selling that property to the next owner. SmartProp has a built-in functionality to show the previous owners of a property. Any user can see all the previous owners and transactions of any property (Transparency). Ownership data is retrieved from Smart Contracts. Transactions are retrieved from Blockchain. These data are trustworthy as the Blockchain is "immutable". (left image).

Pop-up notification to view past owner list

Tampering attempt by malicious client rejected and broadcast to all other clients in the network

Unauthorised attempt to change the price of a property is validated and rejected by the Blockchain network. Every user is notified about the attempt made and about the address of the unauthorised accessor. (right figure) This can be useful for blacklisting potential hackers and other harmful users.