"Decentralized Supply Chain using the Ethereum Blockchain"

ONKAR DIGHE [1], ADITYA CHAUBEY[2], ARCHIT BORADE [3], GAURAV MORE [4]

MET's Institute of Engineering,
Adgaon, Nashik-422003,
SAVITRIBAI PHULE UNIVERSITY, PUNE

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Abstract -

Majority of air pollution is generated by the combustion of fossil fuel (coal, diesel fuel, gasoline, oil, and natural gas) and they are a major contributor to health-harming air pollution. Union Minister Nitin Gadkari stressed the need to enhance the production of biofuel in the country by using the stubble of certain crops to reduce the dependence on the import of crude oil and fuel gasses. Since the production of biofuels is abundant in India and it requires minimal infrastructure changes for large scale adoption, it can serve as a much easier solution to the issue. But the creation of a supply chain for regular use of Biofuels is still in its nascent stage.

Providing a solution for this problem by creating Supply Chain of the entire set of Production, Distribution and Marketing processes by which a consumer is supplied with a desired product and producer can get their desired market with better security, this system

Key Words: Blockchain, Supply chain management, platform construction.

INTRODUCTION

The term 'Blockchain' is used as a broad catch-all term for the implementation of a distributed ledger based on cryptographic hash functions. The blockchain consists of a set of protected information blocks chained sequentially to one-another. Together they form an immutable ledger, distributed over the participating nodes. The purpose of the blockchain is to share information amongst all parties that access it via an application

Smart contracts are simply programs stored on a blockchain that run when predetermined conditions are met. They typically are used to automate the execution of an agreement so that all participants can be immediately certain of the outcome, without any intermediary's involvement or time loss. The blockchain is then updated when the transaction is completed. That means the transaction cannot be changed, and only parties who have been granted permission can see the results.

The biofuel supply chain involves producing biomass feedstock; harvesting, collecting, storing, and transporting the feedstock to the biorefinery, converting the biomass to fuel at the biorefinery, distributing biofuels to end users, and, finally, using the fuel. Currently, this whole process of supply chain of biofuels is done without there being a proper system for every possible party to partake in. Suppliers and Buyers and Fuel Companies do not take part in any type of central auction process, rather the fuel companies contact the suppliers and make contracts on a first come first serve basis.

This system will make use of the blockchain technology and hence will make a public decentralized network where each participating party (suppliers, buyers, transporters, insurers, etc) can take part in the process of the supply chain. This System will allow the suppliers of biofuels to select an offer from the bids of the sellers (the fuel companies). Then the transportation and insurance parties can also be selected through the same bidding process. Each part of the supply chain is secure and traceable as each and every process will be added to the blockchain ledger which is immutable and distributed. As a result, the proposed system overcomes the drawbacks of the existing system.

LITERATURE SURVEY

"Agriculture Supply Chain Management: A Scenario in India", Somashekhar I C, Dr.J.K . Raju, Dr.HemaPatil. This paper explained that, Information is crucial to efficient agricultural markets. The availability of accurate price and other market information helps to reduce risks and transaction costs and enables market participants to plan and coordinate more effectively their production and trading activities. Although market information has public good elements, most of the efforts to develop public sector market information systems have failed, as most systems have lacked commercial utility and have been unsustainable. From the review of literature it can be concluded that, strengthening the following aspects develops a better model of agriculture supply chain management which helps in solving the food problem of the country and indeed the world. From the review of literature it can be concluded that, strengthening the following aspects develops a better model of agriculture supply chain management which helps in solving the food problem of the country and indeed the world[1].

"Application of Blockchain Technology in Energy Trading: A Review", Hongbiao Li, Fan Xiao, Lixin Yin and Fengtong Wu. This paper presents that, As an emerging and powerful technology, energy trading based on blockchain has attracted a growing attention of many scholars. After studying the existing literature, this paper summarizes the key issues into the following four points: (1) construction of trading platform; (2) economy, privacy, and security of transaction mechanism; (3) redundancy and scalability of trading platform; (4) implementation of the specific technology of trading platform. Since most studies are in the primary stage, the construction of an energy trading platform and efficient algorithm implementation will be important research directions in the future. Another interesting topic is to apply machine learning to blockchain-based applications[2].

"A Design of Blockchain Based Smart Contract for Tendering", Simon Maina Karume, Denies Kiyeng and Nelson Masese. For parties to be involved in monitoring the organization activities, they need efficient tools and intuitive assessment that gives clear results. To build such an environment, blockchain and smart contracts show great potential. In this study, the tendering process will be implemented in the blockchain environment to provide an open and fair tendering scheme[3].

"The Current State of Blockchain Applications in Supply Chain Management", Tan Gurpinar, Gilberto Guadiana, Philipp Asterios Ioannidis, Natalia Straub, Michael Henke. This paper states that, we present a systematic literature mapping on blockchain based solutions in the field of supply chain management. In addition to the solutions' associated industry sector, use cases and addressed challenges were identified. Also, the solutions were mapped based on their data collection methods, data integrity mechanisms, degree of technical implementation, and supported SCM processes. Thereby, the paper is subject to the following limitations. The use of the search term "smart contract" may have biased results towards solutions that use Ethereum. Also, it was often not possible to understand the proposed blockchain consensus mechanisms as well as the potential network administrators that would operate the blockchain system due to the solutions being at an early developmental stage. Therefore, it was sometimes challenging to differentiate between a consortium and private blockchain [4].

AIM & OBJECTIVES

- To develop a system which is more secure.
- To develop a system which takes less time.
- The system should be completely digital so no paperwork required.
- To develop a system is to provide a direct role for the higher officials.

MOTIVATION

- To develop a system which is more transparent.
- To develop a system which takes less time.

The system should be more digital so less paperwork is required.

To develop a system is to provide a direct role for the higher officials.
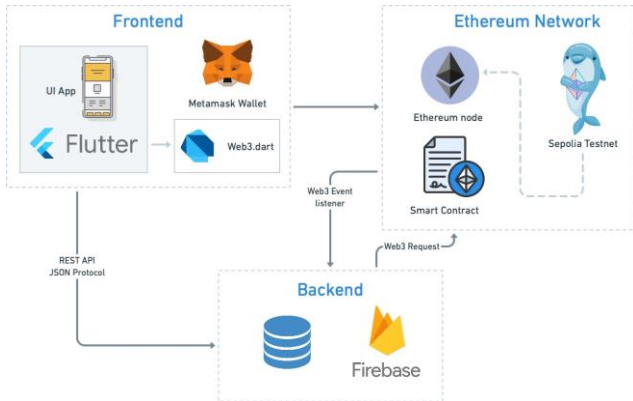
SYSTEM ARCHITECTURE

Fig -1: System Architecture Diagram

APPLICATION:

• A network for biofuel suppliers to sell biofuels.

• A network for fuel companies to pick from and buy biofuels directly from the biofuel suppliers.

FUNCTIONAL & NON-FUNCTIONAL REQUIREMENTS

Functional requirements

1. Registration
2. User Login
3. Creation of database: Users Mandatory Information

Design Constraints:

1. Database
2. Operating System
3. Web-Based Non-functional Requirements

Security:

1. User Identification
2. Login ID
3. Immutability

Performance Requirement:

1. Response Time
2. Capacity
3. User Interface
4. Maintainability
5. Availability

SYSTEM REQUIREMENTS

Software Used: VS Code, Ganache, Metamask Wallet, solidity Compiler, Web Browser, Android Studio, Flutter.

Hardware Used:

● Intel I3/Amd Ryzen 3 processor or above

● 150 GB Hard Disk or above

● 4 GB RAM or above

& other required standard computer peripherals

CONCLUSION

Blockchain can greatly improve supply chains by enabling faster and more cost efficient delivery of products, enhancing products' traceability, improving coordination between partners, and aiding access to financing. We analyzed the need of the Blockchain Framework in the supply chain management of BioFuels and conducted rigorous studies and researches. We understood the requirements of the supply chain of Biofuels and created a user friendly, easy to digest application which all the members can access from the ease of their palms. We have developed the application using Flutter which can run on all types of operating systems for eg: Android , iOS, web, etc.

We transformed the whole process of the supply chain of biofuels into a blockchain network. Everything from the supply of the fuel, transportation of the fuel, buying of the fuel and the insurance required during the transportation stages of the fuel is done in the blockchain network. We also added a bidding system so that different competitors can enter different bids at all the stages of the process.

Overall, the implementation of this system in the real world has the potential to revolutionize the Supply Chains in Biofuels with improved security.

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