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Agriculture Product Supply Chain Using Blockchain

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ABSTRACT: Globalized delivery of manufacturing and agricultural production offers renewed attention to the health, efficiency, and validation of many vital criteria in the food and agricultural supply chain. That numbers of food safety and corruption hazards have generated an enormous need of an efficient traceability solutions which acts as an essential quality managements tools ensuring to enough product's safety within the agriculture supply chain. This paper proposes a strategy that levitates the block chain and conducts business operations effectively across the agricultural supply chain for tracking crop prices and traceability. The proposed framework solution discards the need for trusted centralized authority, intermediaries and offers records of the transactions, improving efficient science and safety with high integrity and reliability. All transactions are registered and then stored in block chain's unchangeable ledger with linkages to a decentralized le network, thereby ensuring vary high degree of traceability and transparency in the supply chain ecosystem a stable, reliable and in efficient manner.

KEYWORDS: Code Editor (Visual Studio Code), Node.js, Ganache, Truffle Suite, Solidity, Web3.js, React.js, JavaScript, HTML/CSS, MetaMask Integration

I. INTRODUCTION

A blockchain is a distributed database or ledger shared among a computer network's nodes. They are best known for their crucial role in crypto currency systems for maintaining a secure and decentralized record of transactions, but they are not limited to cryptocurrency uses. Blockchains can be used to make data in any industry immutable—the term used to describe the inability to be altered.

Because there is no way to change a block, the only trust needed is at the point where a user or program enters data. This aspect reduces the need for trusted third parties, which are usually auditors or other humans that add costs and make mistakes.

Since Bitcoin's introduction in 2009, blockchain uses have exploded via the creation of various cryptocurrencies, decentralized finance (DeFi) applications, non-fungible tokens (NFTs), and smart contracts.

Decentralized blockchains are immutable, which means that the data entered is irreversible. For Bitcoin, transactions are permanently recorded and viewable to anyone.

II RELATED WORKS

The article titled "Smart contract-based agricultural food supply chain traceability" proposes the utilization of Hyperledger Fabric and implement smart contracts (Chain code) for tracking and executing transactions within the agricultural food supply chain. The agricultural food supply chain process, from farm to fork, involves the following entities:

Agricultural Bureau: This entity maintains records of farmers, seed information, plot details, and yield data to ensure the accuracy of source data. The blockchain stores the hash value of this information

Farmer: Responsible for planting crops, utilizing sensors to monitor and record crop growth parameters such as water, air, sunlight, and soil quality. Additionally, farmers generate smart contracts and store IPFS data hashes.

Processor: Upon harvesting, the farmer sells the crops to the processor, who transforms raw crops into final products for customers. The processor records batch information, quantity, and other relevant details. The data hash is stored in the blockchain.

Quality Supervision Bureau: Tasked with overseeing product quality and conducting mandatory inspections of manufacturing processes to ensure compliance with regulations on standardization and quality. Penalties are enforced for violations.

Distributor: Acts as an intermediary in the supply chain, storing and selling processed agricultural products to retailers in batches. The hash value is stored in the blockchain to ensure the integrity of subsequent data.

Retailer: Purchases products from distributors and sells them to consumers in smaller quantities. Records the time of sale, quantity sold, and hash value for traceability.

Consumers: Individuals who purchase and consume agricultural food products. They can access complete supply chain information by scanning the barcode or QR code on the product package, facilitating food tracking.

The following research, titled "Blockchain and smart contract for IoT-enabled smart agriculture," outlines the interaction method between actors and the system through various components. The roles of each actor are elaborated below:

Contract Owner: Holds significant control over the system, responsible for entering contracts and ensuring rule implementation.

Supply Shops: Collect and distribute seeds, fertilizers, and other agricultural materials to growers.

Producers: Farmers responsible for all tasks related to planting and harvesting crops.

Distributors: Transport crops safely between locations.

Wholesalers: Purchase crops and agricultural products in bulk from producers and resell them to retailers.

Retailers: Purchase goods from wholesalers and sell them to consumers on a smaller scale.

Consumers: Form a large group relying on agricultural products, driving demand within the system.

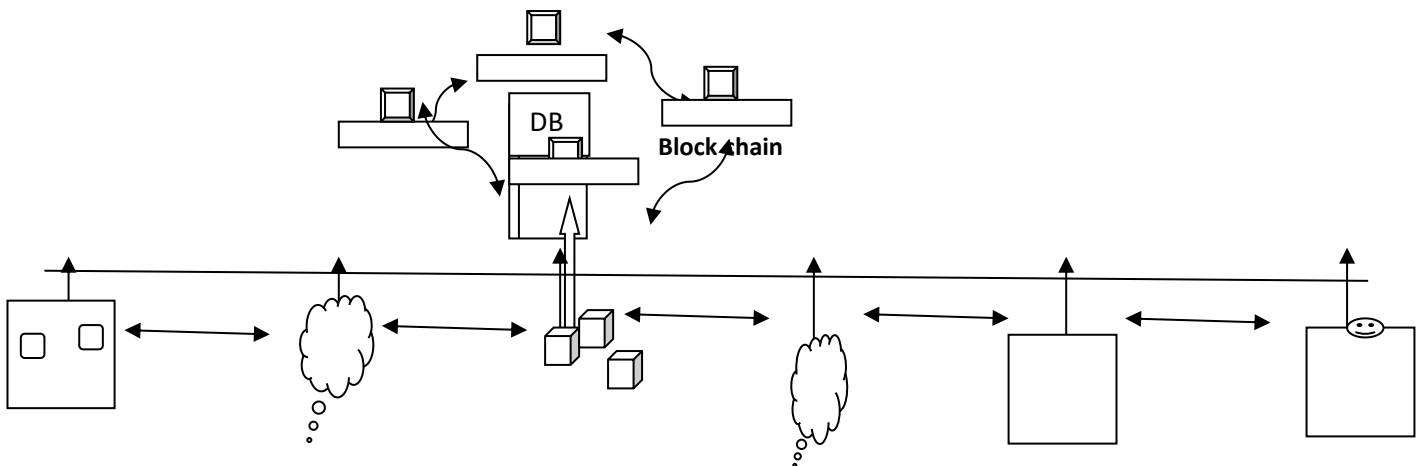
III. METHODOLOGY

DATA PROCESSING

Data preprocessing for an agriculture product supply chain project using blockchain involves several steps to ensure the data is clean, organized, and suitable for analysis or use within a blockchain network. Here's a general outline of the preprocessing steps:

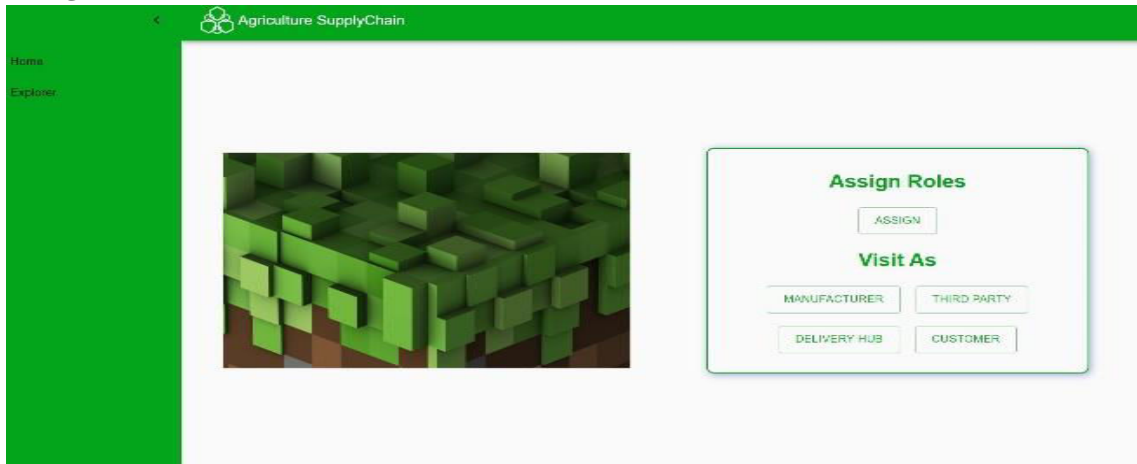
- Data Collection
- Data Integration
- Data Transformation
- Data Validation
- Data Security and Privacy
- Blockchain Integration
- Data Storage
- Testing and Validation

BLOCK DIAGRAM

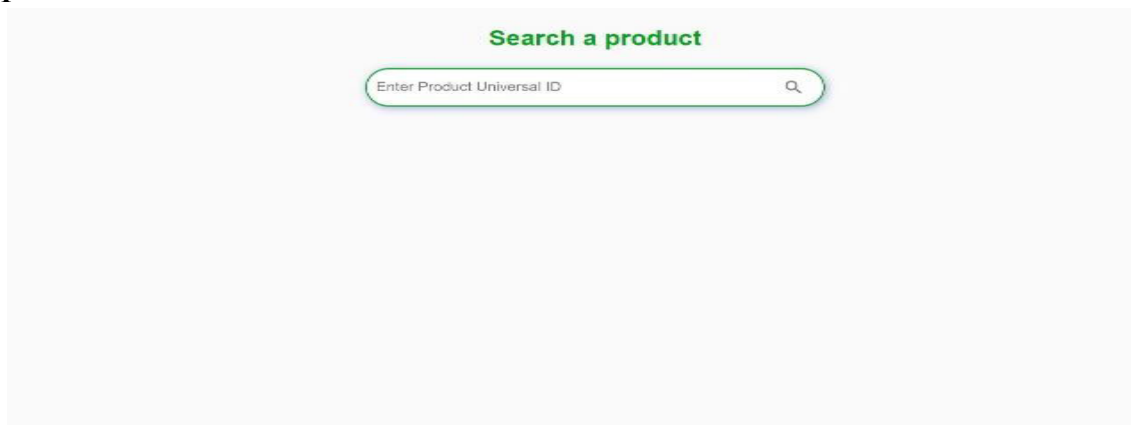




HOME PAGE



INPUT



OUTPUT

Universal ID	Manufacturer	Date	Product Name	Price	Owner	Last Action	Details	Receipt
3	Afsal	Mon Mar 18 2024 14:52:37 GMT+0530 (India Standard Time)	Apple	20	0xcF3D1b139E628...	Manufactured	DETAILS	RECIPT
3	Afsal	Mon Mar 18 2024 14:52:37 GMT+0530 (India Standard Time)	Apple	20	0xcF3D1b139E628...	Bought By Third Party	DETAILS	RECIPT
3	Afsal	Mon Mar 18 2024 14:52:37 GMT+0530 (India Standard Time)	Apple	20	0xcF3D1b139E628...	Shipped From Manufacturer	DETAILS	RECIPT
3	Afsal	Mon Mar 18 2024 14:52:37 GMT+0530 (India Standard Time)	Apple	20	0x669a1B71afAEB...	Received By Third Party	DETAILS	RECIPT
3	Afsal	Mon Mar 18 2024 14:52:37 GMT+0530 (India Standard Time)	Apple	20	0x669a1B71afAEB...	Bought By Customer	DETAILS	RECIPT

IV. RESULT

The blockchain system is capable of storing transaction information for the third recorded data. While this represents the current maximum throughput, the goal is to enhance it further. This can be achieved by updating the programming level of smart contracts, incorporating new methods and functions to reduce execution time and mitigate bottlenecks in the blockchain network.



Timestamps are utilized by the blockchain system to track the number of blocks added and produced within specific time intervals, such as per hour. This metric also sheds light on the speed at which consensus methods are employed. These Analysts must assess large-scale distributed systems to identify obstacles or blockages and predict their behaviour under pressure.

V. CONCLUSION

In conclusion, the integration of blockchain and IoT technologies offers significant potential in establishing a secure, transparent, and innovative ecological agriculture system involving all stakeholders. While the evolution of blockchain and agriculture research studies is still in its early stages, this work presents a promising approach to developing practical blockchain-based applications and revolutionizing the agriculture industry. The proposed model serves as a prototype aimed at mitigating financial losses and agricultural pollution. It delineates the three primary entities in the agriculture domain: data, processes, and stakeholders. Incorporating a cryptocurrency mechanism for facilitating interactions among entities and implementing a system for registering and tracking sellers' land would represent significant advancements for this blockchain system model.

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