A Trusted Blockchain-Based Traceability System for Fruit and Vegetable Agricultural Products

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ABSTRACT

Traditional traceability system has problems of centralized management opaque information, untrustworthy data, and easy generation of information islands. To solve the above problems, this paper designs a traceability system based on blockchain technology for storage and query of product information in supply chain of agricultural products. Leveraging the characteristics of decentralization, tamper-proof and traceability of blockchain technology, the transparency and credibility of traceability information increased. A dual storage structure of “database C blockchain" on-chain and off-chain traceability information is constructed to reduce load pressure of the chain and realize efficient information query. Blockchain technology combined with cryptography is proposed to realize the safe sharing of private information in the blockchain network.

1. INTRODUCTION

Fruit and vegetable agricultural products have excellent production advantages in China, which is a large agricultural country with superior climate conditions and abundant species resources. According to data from the National Bureau of Statistics of China , the total output of fruit and vegetable agricultural products in 2019 was 995.03 million tons, accounting for 54.48% of all agricultural products (1826.55 million tons). Fruit and vegetable agricultural products have the characteristics of green, healthy and high nutritional value, which are deeply loved by people. How- ever, the short storage time and the low storage temperature of storage requirements for fruit and vegetable agricultural products, leading to food safety incidents are extremely prone to occur.

In recent years, domestic and international safety incidents of fruit and vegetable agricultural products have occurred frequently. Such as ``poisonous ginger'' incident in China , Hami melon contamination by listeria in

the health United State , and the outbreak of E. coli in Germany, which have greatly harmed the health of the majority of people.

1.1 . OBJECTIVE OF THE PROJECT : In this context, the primary contributions of this objective of the project can be summarized as follows **:**

- We elaborated on the main shortcomings of current agricultural product traceability and proposed solutions. We apply blockchain technology to the traceability of agricultural products, and propose solutions to the problems of heavy load, low query speed and privacy data protection on the existing blockchain technology. The detailed design of the on-chain and off-chain storage structure and privacy data protection is a key part of the research.

1.2. SCOPE OF THE PROJECT : This project is designing a traceability system based on blockchain technology for storage and query of product information in supply chain of agricultural products

2.LITERATURE SURVEY

2.2 RELATED WORK :

- **Traceability system using public and private blockchain :**Traditional traceability system has problems of centralized management, Opaque information, untrustworthy data, and easy generation of information islands
- **Food safety tracing technology based on block chain :** This paper proposes a food safety traceability system based on blockchain and EPC Information Services (EPCIS), and develops a prototype system.
- **Blockchain based secured information sharing protocol in supply chain management system with key distribution mechanism:** This paper describes how the blockchain mechanism combines with the traditional pharmaceutical supply chain system and to achieve a better SCM system, we present a blockchain-based scheme for information sharing securely in the pharmaceutical supply chain system with smart contracts and consensus mechanism
- **Food safety traceability system based on blockchain and EPCIS :**This paper proposes a food safety traceability system based on the blockchain and the EPC Information Services and develops a prototype system. The management architecture of on-chain & off-chain data is proposed as well, through which the traceability system can alleviate the data explosion issue of the blockchain for the Internet of Things.
- **Drug ledger A practical blockchain system for drug traceability and regulation:** Drug traceability system is essentially important for public drug security and business of pharmaceutical companies, which aims to track or trace where the drug has been and where it has gone along the drug supply chain.

2.2 EXISTING SYSTEM :

Existing application of blockchain technology to the database layer and communication layer of the blockchain food safety traceability system through analysis of the technical architecture level, and demonstrated the design through the case of ham sausage effectiveness of the program.

Disadvantages : The system is less secured since it is not implemented traceability information privacy protection process.The system is not secured since it does not implements traceability anti-counterfeiting process.

2.3 PROPOSED SYSTEM :

The proposed system has designed and implemented a traceability system for fruits and vegetables agricultural products based on a trusted blockchain.

Advantages : The system traceability is achieved using blockchain characteristics of decentralization, nontampering, and traceability to ensure the authenticity and transparency of traceability information in agricultural products traceability systems, and achieves effective and reliable traceability.The system is more effective since it develops on-chain and off-chain data storage technology.

3. SYSTEM REQUIREMENTS SPECIFICATION

3.1 FUNCTIONAL REQUIREMENTS:

- **INPUT DESIGN :**

Input Design plays a vital role in the life cycle of software development, it requires very careful attention of developers. The input design is to feed data to the application as accurate as possible. So inputs are supposed to be designed effectively so that the errors occurring while feeding are minimized.

- **OUTPUT DESIGN:**

  The Output from the computer is required to mainly create an efficient method of communication within the company primarily among the project leader and his team meambers, in other words, the administrator and the clients.

The Three key considerations involved in the feasibility analysis are

- ♦ ECONOMICAL FEASIBILITY
- ♦ TECHNICAL FEASIBILITY
- ♦ SOCIAL FEASIBILITY

ECONOMICAL FEASIBILITY: This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified.

TECHNICAL FEASIBILITY : This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources.

SOCIAL FEASIBILITY: The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity.

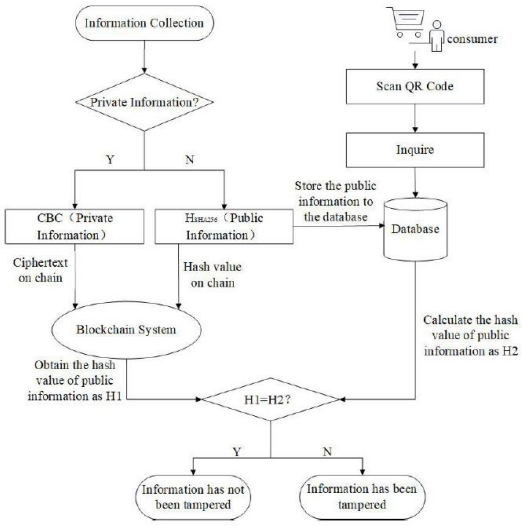
3.3 SOFTWARE REQUIREMENTS

- OPERATING SYSTE: WINDOWS 7 ULTIMATE.
- CODING LANGUAGE: JAVA.
- FRONT-END : ECLIPSE.
- DATA BASE: MYSQL.

3.4 HARDWARE REQUIREMENTS

- SYSTEM:PENTIUM IV 2.4 GHZ.
- HARD DISK:40 GB.
- FLOPPY DRIVE: 1.44 MB.
- MONITOR:14’ COLOUR MONITOR.
- MOUSE : OPTICAL MOUSE.
- RAM : 4 GB.

4. SYSTEM DESIGN IMPLIMENTATION:



4.1 SYSTEM DESIGN AND DEVELOPMENT:

Modules

- **Data**

In this module, the data owner uploads their Products in the server and will do the following operations like My Profile, Add Products, View My Products, View My Products Purchased.

- **Users**

In this module, user logs in by using his/her user name and password. After Login user will Search for products and also do some operations like My Profile, Manage Bank Account, My Purchased Products, Search Products and Purchase. Total Bill On Purchased Products View Admin Launched Products and Purchase.

- **Admin**

The Admin server manages both users and sellers like owners and doing following operations Authorize Users, Authorize Data Owners, Add Categories, View Categories, View All Products with Ranks, View Product Search History, View Purchased

Products List, Trace and View Sales by Blockchain, View All Purchased Products and Users, View Total Bill on All Purchased Products, View Product Rank Results.

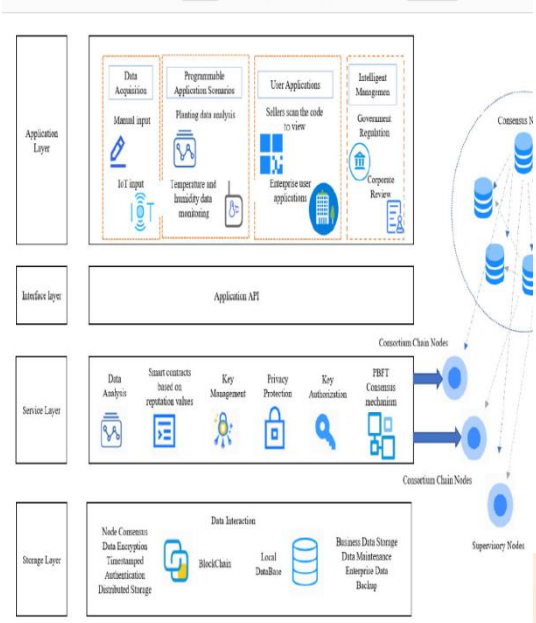


FIGURE 1. Blockchain-based traceability systemarchitecture.

5. CONCLUSION

In this project, we designed and implemented the traceability system of fruits and vegetables agricultural products based on the non-tampering and traceable characteristics of blockchain, and discussed the storage and query design ofthe system. To overcome the problems of high data load pressure and poor private security of the blockchain traceability system as the data grows, an on-chain and off-chain data storage method using ``database C blockchain'' is proposed.

6. REFERENCES

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