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Effective Trusted Agri Blockchain System using Raft Algorithm

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Abstract: In the Existing System, Relating to Traditional traceability system(TTS) which has certain problems of centralized management, not able to be seen through and difficult or Impossible to understand information, unable to be trust the data, and easy generation of fact or knowledge that are provided or learned information islands. So, To solve the above given TTS problems, In this paper we have designed and developed a traceability system which is based on the blockchain technology for the purpose of storage and query of product information in the supplychain of agricultural products. The power of influence of the characteristics of blockchain are used here because it is decentralization, Interfere with something without permission or so as to cause damage(tamper-proof) and traceability of blockchain technology, the transparency and Able to be believed, convincing of traceability information are increased. Here, We have used a dual storage structure of ''database + blockchain'' , on-chain and off-chain traceability information is constructed to reduce load pressure of the chain and realize efficient information query. The proposed algorithm is Raft Algorithm, which used to generate the digital signature, this signature is used in the blockchain generation process. Blockchain technology combined with Raft algorithm is proposed to realize the safe sharing of private information in the blockchain network. Here, We know that the Blockchain technology which is combined with cryptography is proposed to realize the safe sharing of private information in the blockchain network. In addition, we have design a Reputation-based smart contract to encourage network nodes to upload traceability data.

Keywords: Blockchain, component, formatting, style, styling, insert

I. INTRODUCTION

In this paper, We gonna see about all the Fruits and vegetables of agricultural products[FVAPs] which have excellent production advantages in China, and which is a large agricultural country with greater in quality, quantity or merit 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). FVAPs have the characteristics of raising of crops and livestock, green, healthy and high nutritional value, which are deeply loved by people. However, the short storage time and the low storage temperature of storage requirements for FVAPs, leading to food safety incidents are extremely likely to do to occur. In recent years, domestic and international safety incidents of FVAPs have occurred frequently. Such as "poisonous ginger'' "Ginger toxicity"- It can cause mild side effects including **heartburn, diarrhea, burping, and general stomach discomfort**. When applied to the skin: Ginger is possibly safe when used short-term. It might cause skin irritation for some people incident which in China, Hami melon make radioactive by listeria in United States, and the outbreak of E.coliin Germany, which have greatly harmed and evil effect [3] on the health of the majority of people. As a result, the state attaches great importance to the traceability of food supply chain, and countries strengthen management of traceability by issuing relevant laws and food regulations [6]. The General Food Law expose to public view by the European Union in 2002 specify as a condition of an agreement that a comprehensive traceability system must be established in the food industry in order to recall targets in a timely and accurate manner and transmit information to consumers. The Food Safety Law implemented by China in 2009, which provides that food producers and operators should establish a food safety traceability system to ensure food traceability. Now a days,''Traceable System'' has become a most challenging for all solid nourishment foods and food-related companies and also the traceability system has become an efficient means of quality management in the agricultural product supply chain [7]-[8]. The traceability of FVAPs involves many under the rule of a monarch or government subjects. In according to the business relationship, it can be divided into two entities such as, internal and external entities of the supply chain. The internal entities include enterprises like farmer production, processing, cold chain wholesaler enterprises, retailer enterprises, etc., and the external entities embrace consumers and food safety, quality regulatory agencies, etc.. The entire supply chain has the characteristics of many production points and sales points, long production chains, and wide production areas, which

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makes supervision and tracing of food safety particularly difficult in practice [9]. In practical applications, data in traditional traceability systems is centralized, and authoritative agencies manage the central database of the traceability system [10]-[11]. Since the traceability data of each supplychain node are managed by enterprise, the data are easy to tamper with. Therefore, the reliability of information transmission among different roles in the agricultural supply chain needs to be increased. Blockchain is a kind of distributed database which is decentralized, tamper-proof, traceability, and maintained by multiple parties. It uses a cryptographic algorithm to form a chain structure composed of data blocks in chronological order. Any party must receive the consent of all other parties in advance according to agreed rules in order to realize information sharing and information supervision among different parties. Moreover, blockchain integrates many technologies, such as Peer to Peer (P2P) networks, cryptographic technologies, smart contract, consensus mechanisms, timestamps, blockchain structure, etc. Thus, it can achieve the self-verification and management of data without relying on a third party. The use of blockchain technology for the tracing of agricultural products can solve the problems with the current traditional traceability system. Blockchain are mainly divided into three categories: Public chains, Consortium chains and Private chains. Consortium chains refer to the blockchain which several organizations participate in and manage together. In terms of privacy, Consortium chains is intermediate between Public chains and Private chains, with its data only being accessible by members of the alliance. Additionally, Consortium chains transaction efficiency is higher than Public chains. In a traceability system, the main responsibility bodies of the supply chain of agricultural products are related to the cooperative relationship between participants in supplychain. However, these responsibility bodies cannot be fully trusted. In reality, the main responsibility bodies of the supply chain are originally related to each other by horizontal interaction or a vertical transaction relationship.

EXISTING SYSTEM:

In the existing system, The traceability of fruit and vegetable of an agricultural products involves many under the rule of a monarch or government subjects. In according to the business relationship, it can be classified into two entities, such as internal and external entities of the supply chain. The internal entities which as a set of parts include enterprises like farmers, processors, cold chain distributor, retailer and consumption enterprises, etc., these are the internal traceability system. The external entities is a act of embracing consumers and safety and quality regulatory agencies, etc. The entire supply chain has the characteristics of many farm production points and distributor points, long production chains, and wide production areas, which makes supervision and tracing of food safety particularly requiring effort in practice.

PROBLEM STATEMENT:

Standardization of problem lists in the safety concerns.

- Now a days ‘‘Traceable’’ has become a most challenging system for all the foods and food-related companies.
- In practical applications, data in traditional traceability systems is centralized, and authoritative agencies manage the central database of the traceability system.
- Since the traceability data of each supply chain node are managed by enterprise, the data are easy to tamper with.
- Therefore, the reliability of information transmission among different roles in the agricultural supply chain needs to be increased.

PROPOSED SYSTEM:

1) The main purpose of the current paper is to explain how to apply blockchain technology to the traceability of agricultural products.

2) Using the features of distributed storage, hash encryption, and programmable smart contract of blockchain technology, we have designed and implemented a traceability system for fruits and vegetables agricultural products based on a trusted blockchain.

3) We apply blockchain technology to the traceability of agricultural products, and propose solutions to the problems of heavy load, slow query speed and privacy data protection on the existing blockchain technology.

4) We build blockchain environment based on Hyperledger method, and use the Java language to develop and implement traceability system to realize the process of storing and querying agricultural product traceability information.

Advantage of Proposed System:

- Using a traceability system, detailed information about agricultural products can be displayed to consumers, and the trust of consumers regarding the safety of agricultural products can thereby be enhanced.
- When quality and safety accidents occur with agricultural products, law enforcement agencies can trace back to the problem link and determine where the main responsibility for the accident lies.
- Blockchain traceability refers to the use of blockchain technology in traceability systems; such traceability is achieved using blockchain characteristics of decentralization, non-tampering, and traceability to ensure the authenticity

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and transparency of traceability information in agricultural products traceability systems, and achieves effective and reliable traceability

II. SYSTEM REQUIREMENT

A. SOFTWARE REQUIEMENTS SPECIFICATION:

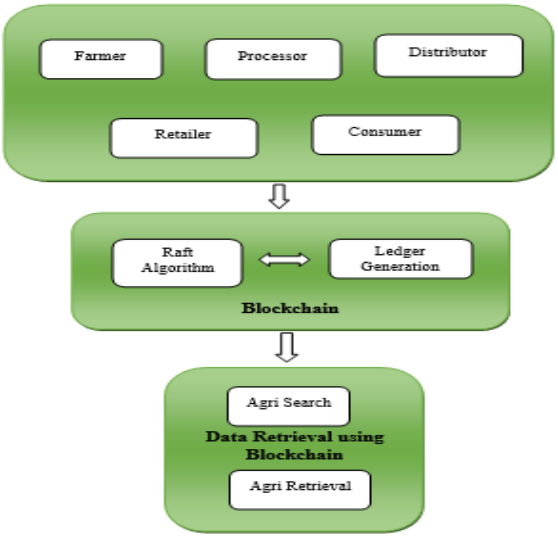
Operating System	:	Windows 7 / 8 / 10
Language	:	Java
Database	:	MySql Server
IDE	:	Netbeans 8.1
Front End	:	JSP
Back End	:	Java Servlet

B. HARDWARE REQUIEMENTS SPECIFICATION:

Processor	:	i3 or above
Ram	:	2 GB or above

III. SYSTEM ARCHITECHURE

System Architecture design-identifies the overall hypermedia structure for the WebApp. Architecture design is tied to the goals establish for a WebApp, the content to be presented, the users who will visit, and the navigation philosophy that has been established. Content of the architecture, which is focuses on the manner in which content of the objects and structured for the presentation and the navigation. WebApp architecture, addresses the manner in which the application is structure to manage user interaction, handle internal processing tasks, effect navigation, and present content. WebApp architecture is defined within the context of the development environment in which the application is to be implemented.



IV. SYSTEM IMPLEMENTATION

1. System Framework Development
2. Chain Generation
3. Encryption and Traceability
4. Smart Contract for System
5. Traceablility Verification

4.1 System Framework Development:

In this project the traceability system is divided based on the agriculture products into the links such as Framer, Processor, Distributor, Retailer and final to the Customer. Here each link includes its own features. The framer link include as area of land for growing crops and water rearing alivestock , specified plants and all the cultivate word

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information send at process. The Processor link include handle of preparation by a special method of manufacture packages and pasting 2D code etc,. The Distributor link and Retailer link include wholesaler who distributes goods to retailers in a specific area records production process. Finally all the regarding above given information details are visible to the customers using the traceability during the process of the links about the quality and safety of an agriculture product if any a mishap event happening by chance. The FVAPs are the sturcture of agri product in blockchain using traceability system was mainly classified as four layers are used for each encryted ciphertest, smart contract data analysis, storage of data and query responds request, and business functions enterprises in link.

4.2 Chain Generation

So by using this tracebility sustem it records all the storage traceability information of agri product into blackchain by the time the agri product and transaction data is store in number of block are increases consequently. Due to such chain type structure of blockchain with efficiency is low by query.And to avoid us prombles here we includes double storage "database+block". The encrypted ciphertext and hash value of information is uploaded in to the blockchain.the issue of storage space, the SHA256 algorithm with higher security is used in the encryption of public information. For the input of any length string, the SHA256 algorithm will generate a 64-bit hexadecimal value. The application layer provides business functions corresponding to different users of the system platform, such as uploading data from enterprises in various links, querying traceability information by consumers, and supervision by government departments.

4.3 Encryption and Traceability

The information of a traceability is a data privacy protection is an important issue for enterprises the information of data privacy is encrypted by blockchain and smart contract simultaneously with hash value. The Private information such astransaction data is encrypted by the CipherBlockChaining(CBC) mode of the AESencryption algorithm. The required Key1is randomly selected by the smart contract generate and upload encrypted ciphertext to the blockchain. In order to ensure the security of the Key1, this paper used the Elliptic Curves Cryptography (ECC) to encrypt the Key1.

4.4 Smart Contract for System

The Smart Contract are vitally important for time driven, dignified C program resources into a position ready for immediate action shared distributed database. It can be operating mechnically by itself executed when action that sets off a course of events conditions are met, blocks can be transmitted and verified in informationized. In Hyper ledger fabric the smart contract is also called as chain code, so in blockchain the degree of manual involved is reduced and make certain safe and protect decentralization .Here the FVAPs from Framer, Processor, Distributor, Retailer traceability data records are all recorded in the agriculture products traceability system based on blockchain. In order to inspire with confidence formal relationalship between countries or groups for a shared purpose member to upload traceability data. The contract logic will be operating mechnically by itself to increase the reputation value of block.

4.5 Raft Algorithm

Raft is a consensus algorithm that is designed to be easy to understand. It's equivalent to Paxos in fault-tolerance and performance. The difference is that it's decomposed into relatively independent subproblems, and it cleanly addresses all major pieces needed for practical systems. To maintain these server status(es), the Raft algorithm divides time into small terms of arbitrary length. Each term is identified by a monotonically increasing number, called **term number.** Candidate or Leader demotes to the Follower state if their term number is out of date(less than others). If at any point of time, any other server has a higher term number, it can become the Leader immediately.

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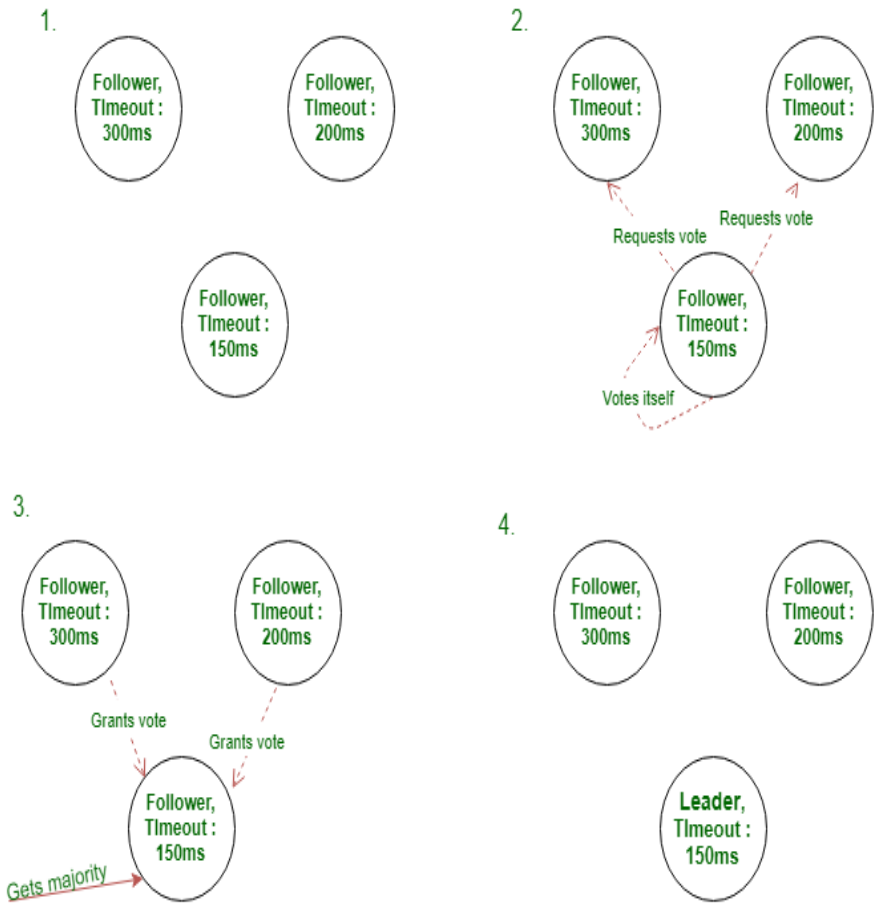

The following excerpt from the Raft paper(linked in the references below) explains a significant aspect of server timeouts.

Raft uses randomized election timeouts to ensure that split votes are rare and that they are resolved quickly. To prevent split votes in the first place, election timeouts are chosen randomly from a fixed interval (e.g., 150–300ms). This spreads out the servers so that in most cases only a single server will time out; it wins the election and sends heartbeats before any other servers time out. The same mechanism is used to handle split votes. Each candidate restarts its randomized election timeout at the start of an election, and it waits for that timeout to elapse before starting the next election; this reduces the likelihood of another split vote in the new election.

Rules for Safety in the Raft protocol

The Raft protocol guarantees the following safety against consensus malfunction by virtue of its design : **Leader election safety** – At most one leader per term)

- **Log Matching safety**(If multiple logs have an entry with the same index and term, then those logs are guaranteed to be identical in all entries up through to the given index.
- **Leader completeness** – The log entries committed in a given term will always appear in the logs of the leaders following the said term)
- **State Machine safety** – If a server has applied a particular log entry to its state machine, then no other server in the server cluster can apply a different command for the same log.
- **Leader is Append-only** – A leader node(server) can only append(no other operations like overwrite, delete, update are permitted) new commands to its log
- **Follower node crash** – When the follower node crashes, all the requests sent to the crashed node are ignored. Further, the crashed node can't take part in the leader election for obvious reasons. When the node restarts, it syncs up its log with the leader node

4.6 Traceablility Verification

The traceability information is gather together to fetch calm and controlled by Internet of Things device or manually entered. User will upload the traceability information of Framer, Processor, Distributor, Retailer traceability data to the system, the traceability information classified into 'private information' is to blockchain after CBE encrypted

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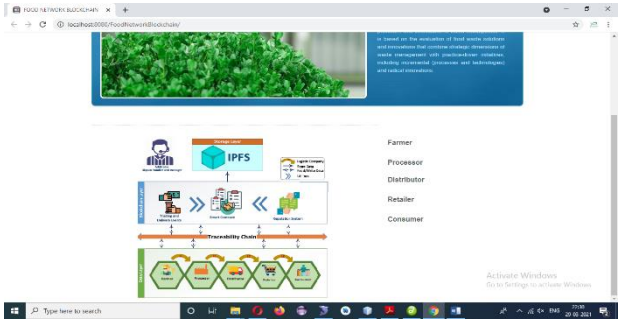
and 'public information' is in the local DB. The SHA256 algorithm is used to hash the public information. By using this hash key value in this blockchain its obtained to store and returns the block(node) numbers this number is record to the DB which is updated to the public information. when ever the modification is done to the agri products ,that same the public information's hash value needed to be rewritten in the updated block no in the blockchain. And then the customer will finds the public information and block no's through DB these are done by scanning the QR code, gets all information of the block(node) number, hash values of public information on the blockchain to determining tamper with the FVA product traceability informations.

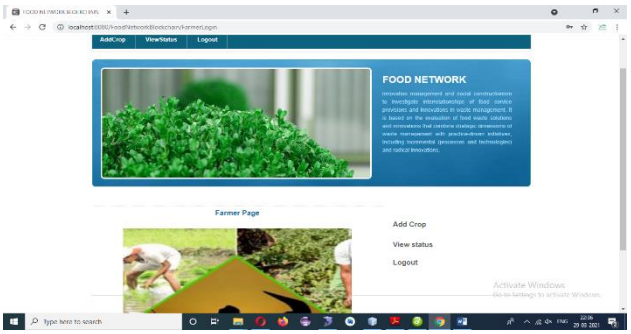
V. RESULT AND ANALYSIS

A result is the final consequence of actions or events expressed qualitatively or quantitatively. Performance analysis is an operational analysis, is a set of basic quantitative relationship between the performance quantities.

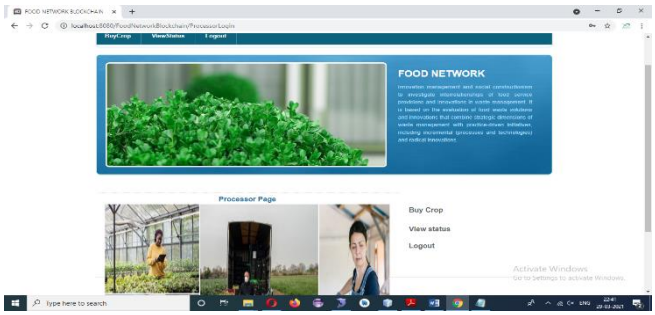
HOME PAGE:



FARMERLOGIN:



PROCESSOR LOGIN:



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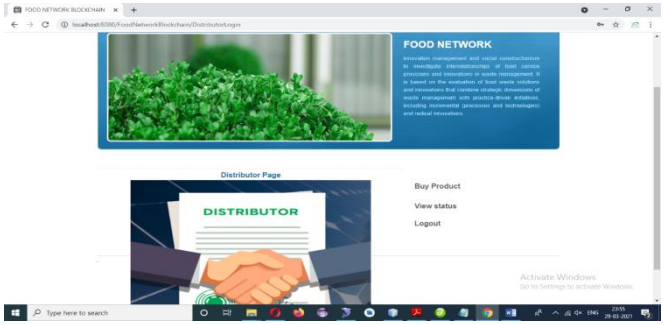
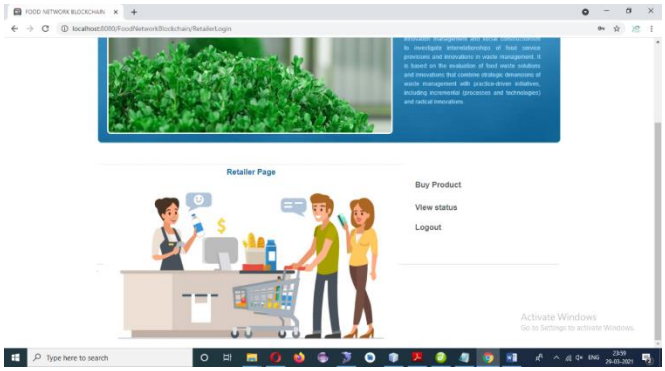
DISTRIBUTOR LOGIN:



RETAILER LOGIN:



CUSTOMER LOGIN:

VI. 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 of the system. The Raft algorithm used in the proposed to give security in the blockchain system. 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 of the 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+blockchain’’ is proposed. The public information displayed to consumers is stored in the supply chain to the local database, whose hash value by Raft algorithm was upload to the blockchain system. The private information encrypted by the AES encryption algorithm is stored into the blockchain for sharing with relevant companies. The storage method proposed in this paper combines the actual situation, taking into account the need for encryption of corporate private information as well as the need for public supervision of supply chain public information, and reduce the pressure of data load on the chain. By storing the block number of the public information on the database, the association between the blockchain and the database is realized. The consumer obtains the public information from the database by quering the data, and the system verifies the information according to the corresponding block number stored in the database to determine whether the product information has been tampered with. With the development of blockchain, in order to meet actual business needs, multi-chain is the future development direction. For future research, we will further explore the cross-chain technology between multiple chains and a new type of consensus mechanism suitable for traceability.

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