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Integrating Blockchain into AgricultureSupply Chain

Pranav Prakash Kamble[1], Pratik Pramod Shetane[2], Baliram Shankar Waghmare[3], Chaitanya Jalindar Kate[4], Dr. Dinesh Bhagwan Hanchate[5]

[1-4]BE (Comp), VPKBIET, Baramati Pune, India

Dean, IIIC VPKBIET, Baramati Pune, India

Abstract: Problems in agriculture supply chain like broken supply chain, deceptive traders, a good considerable price for the commodity have become more severe. This has lead to current situation like increase in death rate of farmers, high margins for successive chain members this also bought high inflation in rates of the commodities which has badly affected the consumers. So we have come up with a solution using block-chain technologyto make this efficient. The fundamental structure of block-chain makes it highly secure and systematic way to store the data.Block-chain uses different algorithms like hashing, cryptography, consensus, digital signatures, digital certificate, smart contracts etc. Different organizations are working to overcome such problems in supply chain. Block-chain is prime solution to create communities and ownership in an virtual system.

Index Terms: Hashing, Cryptography, Con- census, Smart Contract, Digital Signature, Digital Certificate,Blockchain.

INTRODUCTION

In recent years, Blockchain technology become most fascinating technology. As it is a digitally distributed decentralized system. Where nodes in system has an ledger(transaction database) and same copy is present with each node present in system. So to make the ledger consistent algorithms like consensus, hashing etc. are used. This technology has wide application in field of finance, agriculture, medical, government- sectors etc. This is gaining interest after the Bit coin, as weare able to create private Blockchain. A Blockchain systemis a distributed system across a node. The network keeps a ledger copy, so after a new block is added to the Blockchain, the logger also new to all nodes. Blockchain enhances the efficiency and clarity of supply chains. The most important factor required for reliability and trustworthiness in the supplychain provided by the Blockchain. Hence by using Blockchain technology in supply chain we have eliminated traders' competition, gives high profit margin for farmers etc. As seen in fig. it shows the structure of block or transaction in Blockchain.
A new block is added to the end of chain and this is how Blockchain is created.

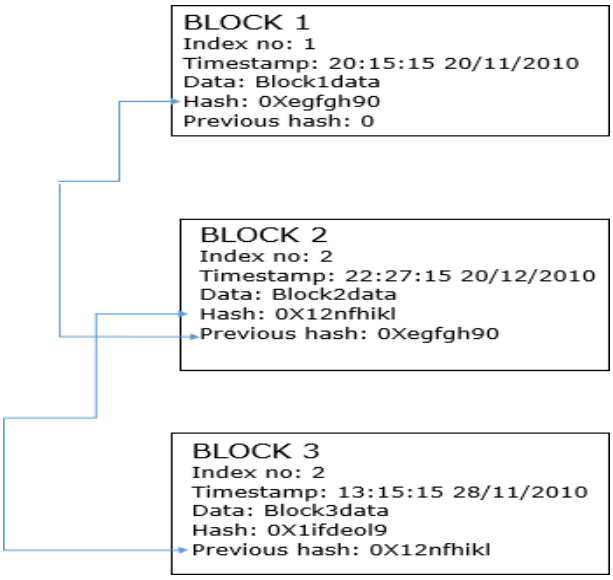

Fig. 1. Structure of Blockchain

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The block consist of such parameters:
- Timestamp: Current Time
- Previous Hash: Hash of Previous block
- Hash: Hash of current block
- Data: Original Data

Most interesting application of Blockchain are:-
1. Cryptocurrency (Bitcoin, Ethereum etc.)
2. NFT's (Non-fungible Token)

A. Cryptocurrency

The main motive for the invention of Blockchain-technologywas cryptocurrencies (decentralized digital money transfer system). The cryptocurrency are the digital assets that can be efficiently transfer from one person to another person without interference of any organizations/third party.

B. NFT's

NFT(Non-fungible Token) is used to transforming your digital assets (ex. digital art) by creating unique digital signature, which defines ownership of your assets and theycan be brought and sold for money. Non fungible means they are not interchangeable and each of them represents unique asset owned by specific person. Even the digital asset can be copied but it will not be authenticated. Each NFT contains distinguishable information like who owns this digital asset and who sold it making it distinct and easily verifiable.

I. ALGORITHM USED

A. SHA-256

Secured Hashing Algorithm is a cryptography hashfunction that is used to generate specific bit output. The output of this function is an unreadable format and n-bits of input can be converted to 256 bits. In SHA-256, the outputof this algorithm is 256 bits. IN our applications we haveused all attributes like farmers' mail, trader mail, max- price, min-price etc. and we have used string value of all to compute hash and finally we are storing it in database (BlockHash).

Input: Attributes in Block Data
Output: Hash Value

Steps For Generating Hash:
Step 1: Input value data
Step 2: Perform SHA suitable algorithm**Step 3**: Hash-value= SHA-256(data) **Step 4**: Return Hash-value

B. Consensus

- This algorithm is used to maintain consistency and addingnew block after validating the chain.
- Advantage of this is chain gets validated before addition of new block. So we can came to know whether chain is been hacked by unknown user/hacker.
- If nodes gets disconnected/down, we can discover the data.

Steps for algorithm:
Input: No-of-nodes,total-no-nodes **Output:** Blockchain is valid/invalid.

Step 1: for each(i into No-of-nodes)
Step 2: for each(j into total-no-nodes)
if(previous-Hash[j]==Hash-of-block[j-1])fig=1
else fig=0break

Step 3: end for,

Step 4: if(fig==1) Blockchain is valid Blockchain is invalid

Step 5: end for

C. Smart Contract

- It defines the rules and regulation to regulate the trans- action in Blockchain.
- Smart contracts is created by one party to make transac- tion and the other party must accept the contracts

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terms and conditions.

Steps for algorithm:
Input: Min-Price,Max-Price
Output: Transaction has happen successfully

Step 1: Farmer has given the min-Price and max-Pricefor given commodity.
Step 2: Trader search the product in given range(Min-Price,Max-Price)
Step 3: Trader places the order for given commodity.
Step 4: The Farmer will accept the order if he wants.
Step 5: The best-price for commodity is selected as:(Calculate the best-Price)
Best-Price=Min-Price + Random.value(Max-Price - Min-Price)
Step 6: The transaction is initiated.

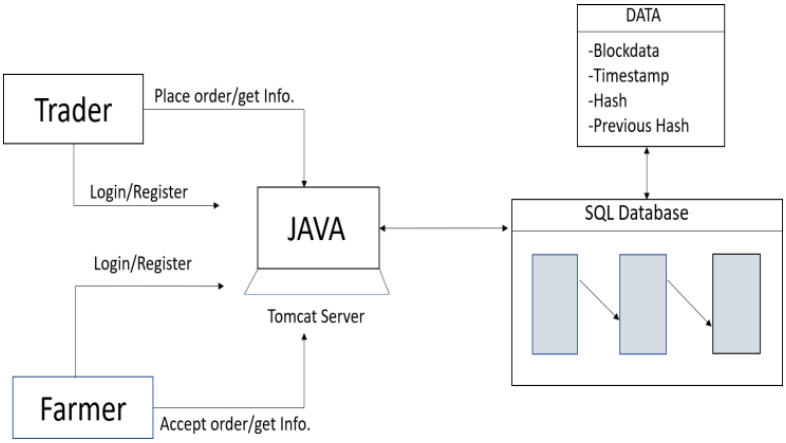

Fig. 2. Architecture Diagram

II. SOFTWARE USED

A. Tomcat Server with JSP front end:

Tomcat server can be used to host the application, so developer can easily perform different testing. Tomcat server isa high speed server this helps to connects users to Blockchain. This can handle high-traffic. JSP (Java Servlet Page) is used tocreate these web application as it supports dynamic web con- tent. JSP tags can be used to add Java code into HTML Pages. At front end side, users can select their role as farmer/trader can easily register with necessary information. Users can easily login with their credentials, as per their role they can buy or sell the products the transaction is stored in Blockchain.

B. SQL Databases:

This transaction data is stored in Blockchain structure into MYSQL Database. Before adding data to the chain, the whole chain is validated by verifying the previous hash value of blockprevious blocks hash value. Here we have 4 data nodes which acts like decentralize system which keep copies of database to remain consistent this is how we keep record of ownershipof products.

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III. WORKING OF APPLICATION

Farmer will add products description with different at- tributes like min-price, max-price, quantity, name, etc. Trader will search product by entering product name his MIN-PRICEMAX-PRICE. He will see the products if his prices are in range of product's price. He wishes to buy the product hewill enter the quantity places the order this creates the smart-contract. Now farmer can see the order details, nowhe can accept or reject the order. If he accepts the order,smart contract plays a vital role to select the best price. Now transaction is successfully done, this data is added to Blockchain.

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IV. CONCLUSION

We have created a web application that cannot be a complete solution to the supply chain but it is capable of resolving many problems in chain management. There are many existing applications that helps in managing supply chain but working with third parties, which uses this information for different purpose which makes these app an unreliable platform. This web application can also be used in different supply chain like medical, design, manufacturing, transport etc.

V. REFERENCE

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