Blockchain Based Product Ownership Management for the supply chain using QR code: A Survey

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Abstract –**In today's world the genuineness of the QR code cannot be assured in the supply chain since these can be easily duplicated in the public space. We propose amodern based POMS (Product Ownership Management System) of quick response (QR) Code attached products for anti-counterfeits. In the traditional supply chain management (SCM), the prevalence of inaccurate records, billing disputes and outright fraud means that the whole supply chain needs to be properly audited by impartial third parties. The proposed system will help to overcome the problems associated with the current SCM system such as the excessive amount of time spent on paperwork and authorization resulting in delay of the delivery of products.**

***Keywords*--Blockchain Technology, QR Code, Supply Chain Management, POMS, Anti-counterfeits.**

I. INTRODUCTION

A decentralized, distributed system in which transactions are recorded in consecutive blocks forming an immutable ledger is referred to as "blockchain". A cryptocurrency network where anyone in the network can check the proof of possession of the balance or tokens is previously used in the blockchain. In our system, the concept of "proof of possession of balance" is replaced with an equivalent concept referred to as "proof of possession of products" within a supply chain. It is essential to propose a rigorous and transparent protocol for blockchain-based POMS.Product ownership management system (POMS) can supervise and handle the possession of products starting from the manufacturer to the current owner. With the idea of this proposed system, counterfeitsmay be detected if a party cannot prove the possession of claimed products with the help of quick response (QR) code. Fig. 1 gives the sample QR code.

Fig. 1A Sample structure of a quick response (QR) code.

Ownership change is recorded in a block which is then attached to the blockchain which is then distributed throughout all members of the supply chain participating in the blockchain network. Following figure illustrates an example of a blockchain. The initial block of a blockchain is called genesis block, which has no parent block. Every block in the chainbarring the genesis block maintains a previous hash with which the chain can be traversed back to the genesis block. Each block has a hash, which is generated using the data contained in the block. We give the internals of blockchain in details in Fig. 2.

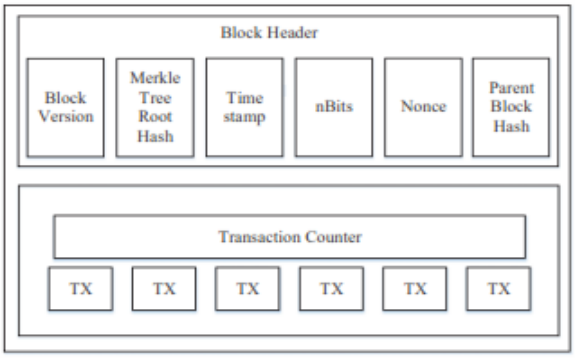

Fig. 2 Block Diagram of a blockchain.

II. LITERATURE REVIEW

Si Chen [1] in his paper, discussed how to improve the supply chain quality management by adopting the block chain technology and proposed a framework for block chain-based supply chain quality management. This framework provides a theoretical groundwork to the quality management of supply chain.
We are using this framework as basis for our supply chain management system.

Christian Esposito [2] focuses on the various opportunities of block chain for usage in the health-care sector. This paper proposes an Ethereum block chain technology for decentralized healthcare database.
From this paper, we get the general idea of how a decentralized network can be brought into effect for Product Ownership Management System. This concept can be used to exchange data between various stakeholders in a supply chain.
Feng Tian [8] demonstrates how block chain works in the food supply chain with HACCP. In his paper,he proposes a system regarding a new decentralized traceability framework based on the Internet of things and block chain technology. This method can be used to convey instantaneous information to every supply chain member on the status of products. Also, using this concept, a system can significantly improve the efficiency and transparency of any supply chain, which will enhance the safety of the product.

Daniel Tse [9] introduces the concept of Block chain technology in information security of the food supply chain and compares it with the traditional supply chain management system. This paper sparks an idea about how

we can trace the origin of any product throughout the supply chain.

III. PROPOSED SYSTEM

1) *Manufacturer Enrolment:*
The manufacturer will enroll the valid information about the product on the blockchain with company name and other details.

2) *Assign QR Code to product:*
The manufacturer will manufacture products and assigns a unique ID to each product with QR code.

3) *Claim initial ownership of the product:*
With the product, unique ID admin can add a new transaction in blockchain to claim the initial ownership of the products. The detail information of the product can fetch through the assigned QR code.

4) *Shipping Product:*
The manufacturer ships products to the Distributor where a distributor can check the manufacturer details and ownership of the products, etc. Distributor verifies the genuineness of the product using assigned QR code and issues a transaction.
Ownership of the product will be transfer from the manufacturer to the distributor. Similarly, when any party receives products, a recipient follows the same procedure as above. At every time the product ownership transfer details is updated against the product unique id through the QR code.

5) *Check Product Ownership Using Blockchain:*
Every product has its own QR code, so through the QR code we get the product history. The product history from manufacturing to shipping details is stored in the blockchain with the unique ID by using blockchain technology. Therefore, after scanning product QR code we get the unique identification number and through it we get the overall product history.

6) *Buying Product:*
Customer should be able to buy products at the shop by validating the product information like manufacturer of the product, Current owner of the product, etc. using their assigned QR code.

After that, the customer can buy and make a new transaction on the blockchain network if the product is valid or deny buying if fake products information found in the product history.

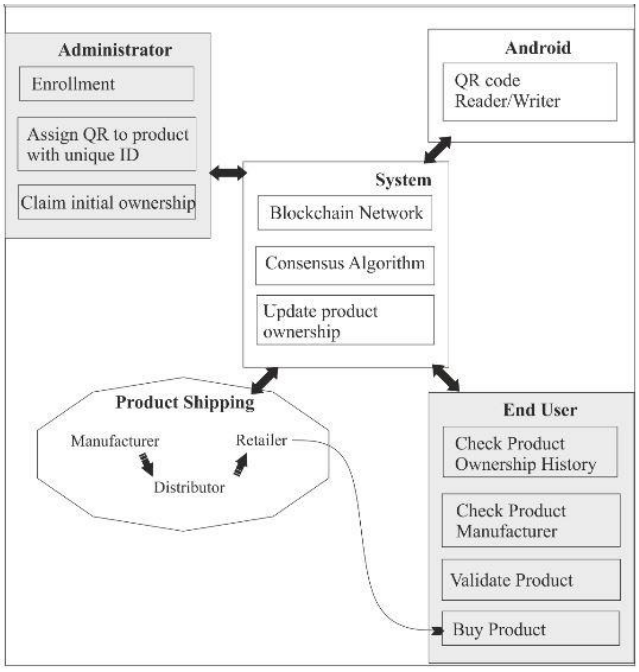

Fig. 3 System architecture of proposed system.

A. Block Structure

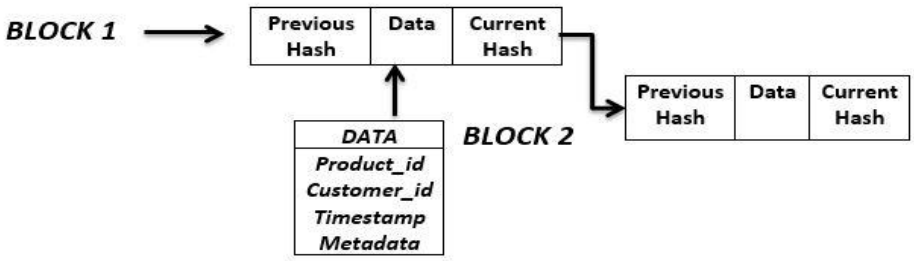

Fig. 4Structure of a block in the blockchain.

The block contains previous hash, the data and the current hash. The data field in the blockchain consists of four fields. The product_id is the unique id given to the product whereas customer_id is the unique id given to stakeholders in our blockchain. The timestamp field is used keep track of the time of transactions.

Each block in the blockchain varies in size considering the amount of metadata needed by the system. A separate block is created for each transaction. These blocks are linked together with hash values generated for each block. A 64 bit hash value for each block is obtained by applying SHA256 [19] algorithm on the contents of the block.

Fig. 4 gives the blockchain and the basic structure for a block

IV. EXPECTED OUTCOME

The user of the system or the customer will be able to get the entire ownership history of a product since the manufacturing stage. It would help decide the genuineness of the product and would provide anti-counterfeits in the supply chain.

Manufacturer will assemble raw material, would build a product, and will claim the initial ownership. The

ownership change will require permission from the manufacturer to transfer the ownership adding a block (of a transaction) in the blockchain. It would require scanning the QR code attached to each product and initiate a transaction. Similarly, other users of the system will get the entire ownership details of the product of interest.

The system will provide a robust platform for maintaining the ownership details. It will also be protected against any unauthorized change as blockchain itself is immutable. The blockchain will be considered invalid if any unauthorized person tries to alter the contents of a block.

V. CONCLUSION

Here we are developing a system which provides security to the product data and facilitates secure authorized flow of product throughout the supply chain with the help of blockchain technology. With the help of the system we can also track the product ownership transaction history from manufacturing stage to end-user stage.

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