Proceedings of the Sixth International Conference on Intelligent Computing and Control Systems (ICICCS 2022)
IEEE Xplore Part Number: CFP22K74-ART; ISBN: 978-1-6654-1035-9

2022 6th International Conference on Intelligent Computing and Control Systems (ICICCS) | 978-1-6654-1035-9/22/$31.00 ©2022 IEEE | DOI: 10.1109/ICICCS53718.2022.9788449

An Ethereum based Fake Product Identification System using Smart Contract

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Abstract*— In recent years, counterfeit products have played an important role in the product making industry. It has also affected the company's brand, sales, and profits. Blockchain technology is now being used to identify authentic products and detect counterfeits. Blockchain is a distributed, expanded, digital book that stores business data as blocks in multiple archives linked by chains. No block can be changed or modified because blockchain technology is secure. Customers or users who use the blockchain technology does not have to be depend on mediator to ensure product security of the system. Counterfeit products can be effectively combated using serial numbers which is assigned to the product uniquely. With emerging Blockchain technology trends in this project. As a result, this system can be used to store product information as well as generate distinct product codes for items such as blocks. It generates a unique code for the user and matches it to the Blockchain network. If the input matches, the customer will be notified; if the input does not match, the customer will be notified that the product is counterfeit.

Keywords: Blockchain, Ethereum, Authentication, Counterfeit, Serial number, Solidity

I. INTRODUCTION

In the global development, the technology is frequently accompanied by risk factors such as fraud and duplication, which can have a great impact on the company's reputation and the revenue. There are so many products available in the supply chain management system. Ascertaining whether the product is genuine or fake. Because of the manufacturers of counterfeit or stolen goods, who are facing a major problem and massive losses. We can use blockchain technology to ensure product integrity. Blockchain is an information storing ledger system that makes it difficult to change or to modify or hacked. A blockchain is a computerized transaction record that is repeated and distributed across the blockchain network of programs. Each block in the series contains multiple transactions details, and whenever a new activity happens in a blockchain, a data of that purchase is added to the record of each product. Blockchain is the type of DLT in which the transactions are added by using a fixed cryptographic value known as a hash.

The use of blockchain technology aids in the resolution of the counterfeiting problem. Blockchain is extremely safe. If the product is stored with the unique hash code of the network produced on that product and it is possible to keep all of the product's production records in a chain, a block will be created for that product. All the records of activity will be stored in blockchain blocks. In our proposed system, it assigns a specific product code, and the end user can obtain all of the product's information. We can tell if a product is genuine.

II. LITERATURE REVIEW

A Blockchain based application system proposed using a nationally distributed blockchain help to ensure that consumers do not have to depend solely on the retailers to determine the authenticity of products. We will describe a Blockchain system that incorporates anti-fraud products., so that manufacturers can use it to deliver real-time products without having to deal with directly operating stores and other quality assurance costs. [1] The traditional cloud storage model was centralized, and if the single point of failure could cause the system failure. The IPFS decentralized system, Ethereum, and attribute-based encryption technology have all been combined in the system. The decentralized system, which is based on the Ethereum, which has a keyword search function on the cypher text, which solves

all the problems that cloud servers return wrong output in traditional systems. [2] A system for providing a realistic and authentic solution to digital content that is published and posted online and other forms of media. The project employs the advances technology such as Polygon chain and Ethereum chain. Although the solution focuses on the authenticity of the online books, architecture design, and smart contract solidity code are all generic enough to be easily expanded and applied to any other digital assets to ensure authenticity, authenticity, and integrity. [3]

The concept of blockchain in a food supply chain system and information security and compares it to the existing supply chain systems. The proposed system focuses on the disadvantages, promoting blockchain in food supply chain tracking, monitoring, and auditing the manufacturers in recording transactions to ensure authenticity. The proposed system has not been tested in the field; rather, it is a theoretical concept. [4]

A food supply chain system traceability system based on HACCP demonstrates how blockchain can be used in conjunction with HACCP in the food supply chain system. The system proposed a new decentralized system based on IoT and blockchain technology, as well as an investigation into the challenges associated with scaling block-chains in general. [5] Authentication in Social Network Calculation Using a Block-Chain Algorithm and a Text Encryption Protocol: It proposes a privacy-preserving algorithm that is efficient in preserving information privacy in social networks. To begin, it will verify their identities after they send the request during the community expansion based on mining seed to protect others from malicious users. Using the block chain's recognition, it stores the user's public key and bind it to the block address, which is then used for authentication of product. [6]

Blockchain technology has demonstrated the remarkable adaptability as a variety of market sectors in different ways to incorporate its capabilities into their operations. While a financial services industry had also received the majority of the attention thus far, a project in other service-related fields, such as health care, demonstrate that it is changing. [7] The researchers are looking into how the blockchain technology can also be used to secure healthcare and medical data hosted over the cloud. It also discusses the new challenges of such a proposal, as well as the additional research that is required. [8] This paper proposed a blockchain-based product traceability system in that all product transmitting histories are continuously recorded in a distributed network using smart contracts, forming a chain that can be traced back to the product origin. [9]

A new decentralized supply chain that uses blockchain and NFC technologies to detect counterfeiting attacks. The supply chain design replaces the centralized supply chain system design and, unlike existing protocols, employs a newly proposed consensus protocol which is fully decentralized and balances the efficiency and security. [10]

IoT devices monitor every stage of a supply chain. Blockchain technology, by the use of smart contracts, aids in the efficient administration of product delivery and supplier payment. These technologies are used to create a trust-based supply chain management system. [11] Blockchain has emerged as a potential method to tackle safety and security issues in Internet of Things devices because to its special qualities, which include permanence, review capacity, and decentralization. [12] BPCM is a blockchain-based Producer-Consumer Model that allows producers to sell directly to customers while preventing interagents from profiting from farmers using smart contracts. [13] Only cars with an accurate and verifiable record will be allowed to exchange messages on the blockchain network, assuring true and legitimate communication. [14] A wireless blockchain-based network is presented for sustainable smart agriculture with greater signal to interference or signal to noise ratio (SIR/SNR) for relay selection. [15]

III. PROPOSED SYSTEM

For product delivery, the existing system has relied on the current tracking system. On that the admin can take all the control, so they can modify the data and also, we need go for the third party for trust and making a security. It has a lot possibility to change the real product when it is going to customer. It was based on centralized system and Third party/ unknown user can change the data.

Based on current existing problems we proposed the emerging technology that is Blockchain Technology. In our system we enable the communication between the customer and all the other components. We generate the script using smart contract using solidity blockchain and also introduced the Decentralized application for making user friendly GUI for the customer to see their details. In our system the user can scan the serial number to check the validity and authenticity of the product.

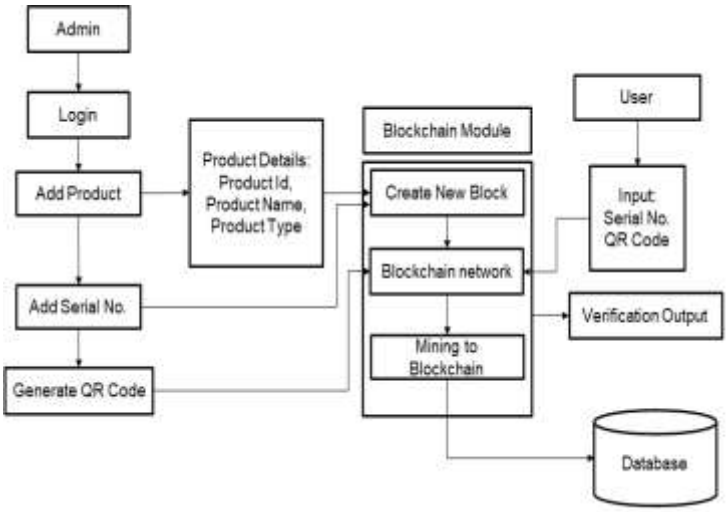

Fig.1. System Architecture Diagram

In fig(i), the admin can login into the website and able to add product and their details and also can add serial number of products for authentication purposes. After that data is entered to the new generated block and then added to the blockchain network and then all the data is stored in the database.

From user side they can go to website and enter the serial number if the product authentication is approved, they get message that product is fake or genuine. Admin is also able to provide the access to the manufacturer to add their product into the website by direct login to the system.

In the backend of our project the different functionality works like when the user enters the serial number as an input it goes into the blockchain network and start compare it to the blocks as soon as it matches the data is retrieved from the database about the product details. Apart from that Solidity the smart contact comes in action to check the authenticity of product and the output will be shown to the user.

We have also used SHA256 blockchain algorithm which is already included in our code. Blockchain is already protected by SHA256 algorithm (Secure Hash Algorithm).

A. Customer UI Authorization

The Customer User Interface an6d authorization module is a web interface that displays two panels on the website. The first is admin, which is used by admin, and the second is user panel, which allows the user to enter the serial number for product identification and verification. By logging into the system and using the admin authorization, the admin can control and access all of the operations. It can also store product information such as product id, name, kind, and serial number. If the manufacturer wants to add new products, the admin can grant access to the user.

B. Authentication Module

Algorithm: Smart Contract

Pre-Condition: Product details
Post Condition: Validate product
/* Pn → Number of Products
P → Product
Admin: Add () → To add the product in block chain*/
Admin: Add ()
{
Check(P);
Validate(P);
P → Blockchain;
}
P $\sum_{i=1}^{Pn} Pi$
If (P $\notin$ Pi)
{
P invalid;
Request accepts → Admin: add(P);
}
else
{
P Valid;
}

This module is used to enable the addition of new products and items in a new block. Every time a code is scanned or a serial number is entered, the new data is saved in the database, triggering the creation of a new transaction in Blockchain. Following that, it will perform a mining operation on the Blockchain in order to prepare for a transaction. The output will be generated based on the smart contract and database.

C. Blockchain Mining

At first operation it will create a genesis block then initiates a creation of new block and then send the data. In this module we used the data mining to mine into blockchain network and search for the details for the product.

D. Product Information Database

In this module, the product details and information are stored into the database. The meta data about product and details are also stored in the database. Encoded data in the database is pointed to the product for verification. Also, every time the scan operation is performed an immutable entry added to the table.

IV. SOLIDITY: SMART CONTRACT

The programs that created on the blockchain are known as smart contracts. These smart contracts can be accessed by making method calls from outside smart contracts or calls from other smart contracts. When properly written and audited, it can reduce malicious exceptions, fraudulent losses, and the need for a trusted authority.

Solidity is a high-level, object-oriented programming language. It's run smart contracts on various blockchain platforms, the most well-known of which is Ethereum. This contract is transparent, immutable, cheap, and decentralized because it is embedded in the blockchain. A blockchain address is assigned to each smart contract. If the contract has been broadcasted in the network, its address can be used to interact with it.

This algorithm states that the admin can add the product details into the blockchain by checking and validating the product. The Pn number of products will be added to the blockchain. If the Product P is not in the blockchain network It shows the product is invalid and then request the admin to add a product P into blockchain. If the product is in blockchain then it is valid product.

V. RESULT ANALYSIS

The Result Analysis of our project is that user entering the product details in the web UI and it's saved into the Remix IDE fake node for temporary period and then transaction taken palace in Ethereum with using super user wallet (RPC Server) using Ganache.

Fig.2. Product Details

In fig.(ii), the product details are entered by customer and after saving the product details into the system, the next step is to verify the product by providing the serial number and other details and after authentication the project summary is shown.

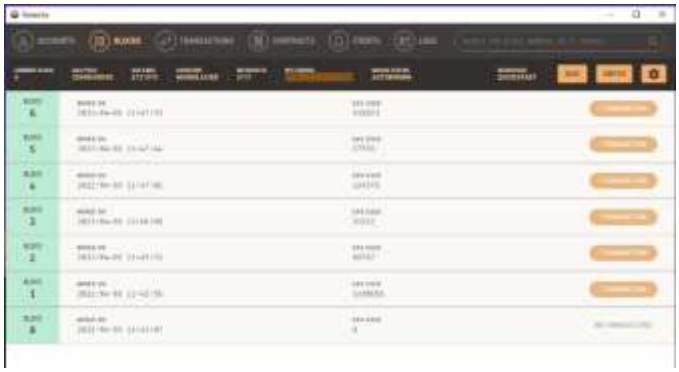

Fig.3. Transaction Details

Once the transaction occurs then the blockchain creates the blocks. The blocks store our product details. All the transaction details are happen using Ganache Server are shown in fig.(iii). Using that we can create a contact and call the block by their hash value. Then using the hash value, we can find out our blocks and verify the products.

Fig.4. Contract Creation

In fig.(iv), when a new block is created in the blockchain then the hash value is assigned to the block in the contract creation. This block hash is again used during the contract call.

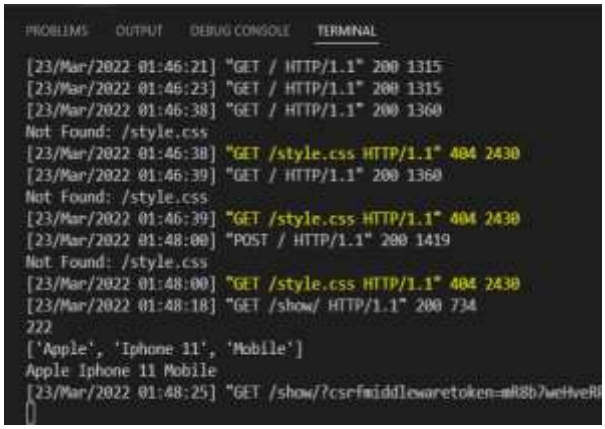

Fig.5. Console output

After entering the serial number in the project summary page, the number will match with blockchain using contract call and then the product details are display in the console as shown in fig(v).

V. CONCLUSION & FUTURE WORK

The availability of fake products on the internet is growing at a high rate. As the result, there is an urgent need to detect fake products, and blockchain technology is being used to do so. In addition, the information is encoded. Customers or users can detect fake products by serial number. Digital information about products can be stored in the form of blocks using blockchain technology.

As a result, the proposed system can help customers detect counterfeit goods in the supply chain. Customers can scan s assigned to products to obtain information, which allows the end-user to determine whether or not the product is genuine.

As for future work, we planned to increase the efficiency and the security of our blockchain network. The customer can easily access the system to check their product details and can verify it. It will have less operational cost and accessible to everyone. Our proposed system will be easy to setup and used.

We will add new features to the system like different parameters of verification for different kind of products rather than only using serial numbers.

Because of the simplicity of the code, the customer can be comfortable in using our application and get better authentication of product.

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