Fake Product Detection System
(Using Blockchain)

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***Abstract*— In response to the pervasive issue of product counterfeiting in the retail market, this project introduces a novel approach leveraging blockchain technology to enhance detection and prevent the circulation of fake products. Traditional methods like RFID tags,** modify the data in the blockchain which leads to the security and protection of data. Blockchain helps to solve the problem of counterfeiting products.

artificial intelligence, and QR code-based systems have limitations, such as vulnerability to copying and high computational power requirements.

The proposed solution involves the integration of blockchain into the product supply chain. Each stage of a product transaction is recorded in a decentralized blockchain system using QR codes. Blockchain's inherent security and immutability ensure that the recorded supply chain data remains tamper-proof, providing a robust defense against fraudulent activities. This innovative approach aims to establish a secure and transparent product traceability system, addressing the persistent challenges associated with counterfeit products in today's retail market.

INTRODUCTION

Whenever a product is developed, it always has some risk factors such as counterfeiting and duplication which leads to affecting the company name, reputation, revenue, and customer satisfaction. The trading and marketing of counterfeit products are growing very fast. To ensure the identification and tracking of false goods or products and to combat this phenomenon, a fully functional blockchain system is proposed. Companies only need to pay very little effort and they no longer need to worry about counterfeit products. Due to the counterfeit products, manufacturers face a huge loss in the reputation of the company name and brand value because customersthought it is a genuine product by the company so they review the product on a counterfeit product basis. To overcome this problem a blockchain-based system can be adopted. Blockchain is a distributed decentralized-based technology that stores data in blocks in the database and is connected with chains. Whenever new data is going to add to databases it will add to existing data by connecting a chain of it to the existing block. Blockchain does not allow

any user to update the existing data each time blockchain will add data as a new block to existing data. So it is impossible to delete or

BLOCKCHAIN BACKGROUND

A blockchain is a decentralized-based technology that is distributed among the computers in a computer network. As a database, a blockchain stores information in the form of blocks and chains. One of the biggest successful real-world applications of blockchain is cryptocurrency currency like bitcoin. Blockchain uses a more secure and protected mechanism to keep records of transactions. Blockchainprovidesa guarantee of security to our data.

Blockchain databases and typical databases are nearly the same. As both are used to store data, the only difference is howthe datais structured in databases. Typical database stores dataas it is provided by the user but in blockchain data is stored in blocks and blocks are linked to each other with the help of a chain. The technology behind block and chains is hashing. Each block has its own capacities and has information when it is completely filled a new block is linked to it and the new information is stored in a new block and the process continues as new data continue to come.

One of the main advantages of blockchain is it provides us witha distributed, decentralized database but noneditable. So even ifwe want to change our existing data, the blockchain does not provide us that functionality.

HOW DOES BLOCKCHAINWORK?

1. When a user/client is going to input the transaction blockchain must do the authentication of the user.
2. When the authentication is done, a new block is created with transaction information stored.
3. The newly created block is distributed across everynode of the computer network.
4. The authorized nodes do their steps of verifying the transaction and after verifying transaction informationare added to existing blocks with the help of chaining mechanisms.
5. Again, updates are distributed across the network.

Thus above finalize that the transaction history is stored in blockchain databases. The same steps are also shown in the below image.

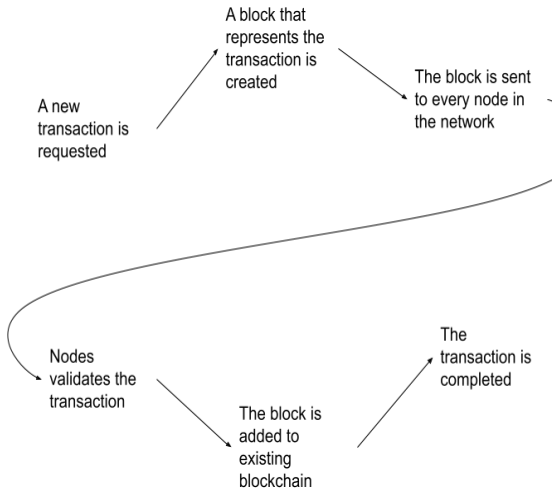

Figure 1: Working of Blockchain

BENEFITS OF BLOCKCHAIN

1. Accuracy: As we know that blockchain is distributed system so the database of the blockchain is distributed among the different nodes in the computer networks. This means that th user never comes to know from where the database of blockchain is coming.This result in the least involvement of humans in this technology which leads to less human error thus resulting in less computational error by blockchain technology which leads to great accuracy.

2. Cost Reductions: Blockchain is very beneficial for cost reductions in transactions because blockchain eliminates

As we come to know from the above discussion, the primary goal of blockchain is to make recorded data noneditable. Blockchain working can be explained in nearly five steps which are as follows:

The involvement of third-party such as banks. For example, every time business owners accept payments using credit cards there will be a small cut in payment from the bank for providing the services. Still, block chain does not have central authority so there will be no or minimal transaction fees.

3.Decentralization: As we know from the above definition of blockchain that blockchain is a decentralized distributed system . so the blockchain database has many copies and is spread across the different computers in computer networks. Thus if we have to add a new block to the database then every computer has to add it to its blockchain to reflect the change. Thus, blockchain becomes more difficult to tamper with. Even if a hacker tried to make a change to the blockchain then only that copy is affected other remains the same. Thus decentralization property of blockchain helps in the security of data.

Efficient Transactions: Blockchain transaction is decentralized and it is not conducted by some authority. As we know that authorities operate their transaction during working hours and if we start a transaction on Friday then it takes three days to complete the transaction which means till Monday but the blockchain run 24/7. And also blockchain completes the transaction in less than 10 minutes. Blockchain also takes almost the same time to complete cross-border trades which if it is done by other authorities take longer time due to difference in time zones issue and many more reasons. Thus Blockchain provides an efficient mechanism for transactions.

.Transparency: Blockchain provides transparency as most of the blockchains are open-source software. So it will give us the functionality of reviewing the code, and gives suggestions to improve blockchain technology. thus blockchain is completely transparent to the user. The Suggestions are going to implement only if the majority of network users agree.

LITERATURE REVIEW

COMPARISONS OF DIFFERENT ANTI-COUNTERFEITING TECHNOLOGIES.

The following table[1] shows different anti-counterfeiting technologies and comparisons between the

Index	Technology	Product Type	Advantage	Limitation	Blockchain
1.	RFID	Any	1. Reliable track and trace through any environment.	1. Reader collision. 2. Unable to transmit through metal objects.	No
2.	Magnetic strips	Hotel key cards	1. More secure than barcodes. 2. Easy and fast to use.	1. Can be damaged even from small scratches 2. Does not work from a distance.	No
3.	Security Hologram	Currency	1. If tried to remove it leaves residue behind.	1. Production is expensive and time-consuming 2. Easy to clone.	No
4.	Barcodes	Daily use products	1. Simple implementation. 2. Scalable	1. Easy to replicate. 2. Editable.	No
5.	DNA coding	Medicines	1. Very difficult to replicate. 2. Easy to encrypt data.	1. Unstable and sensitive to harsh environments	No
6.	Laser Engraving	Metal products	1. Permanency 2. Fast development speed	1. Expensive 2. Can be replicated.	No
7.	Digital Watermark	Digital Documents	1. Easy to implement. 2. Hard to remove.	1. Limited to the digital world only.	No
8.	Hashing Algorithm (SHA-1/SHA-2)	Digital biodata	1. Hard to replicate.	1. Easy to encrypt and decrypt.	No
9.	Fingerprinting	Digital Content	1. High security. 2. Non transferable	1. System failures. 2. High cost.	No
10.	Blockchain	Any	1. Can be applied at the time of manufacturing 2. Data once stored cannot be modified.	1. Demands high memory. 2. Expensive to implement.	Yes

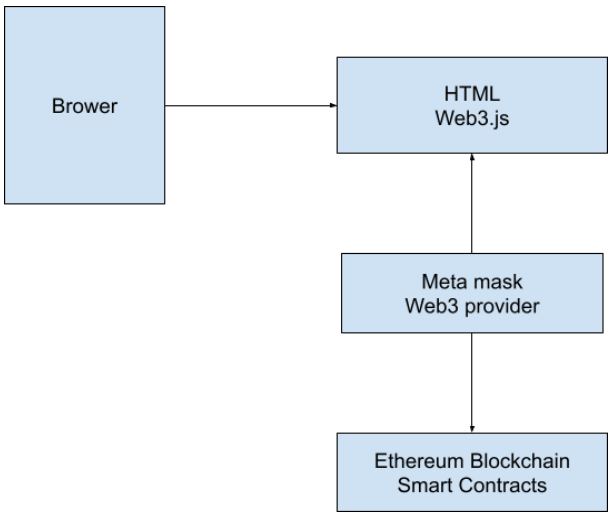

Figure 2: System Model of Proposed System

METHODOLOGY

1. PROPOSED SYSTEM

As counterfeiting products are increasing widely in the world, we need to develop a full-fledged application system that will help us to identify these counterfeiting products. In this paper, the proposed system is that it will store the supply chain of the product and keep the history of ownership of the products. So that when the customersbuy this product they will see the complete information about the product and decide whether the product is authenticated or not. We will use QR codes to verify the products and add information about the product. And for storing the data of the product we need to use asystem that does not allow anyone to change the existing data, this can be achieved by blockchain technology. So in this proposed system, we are using blockchain, and QR codes to detect fake products.

2. SYSTEM MODEL

For the proposed system, blockchain is implemented using a personal software called Ganache. Ganache developed a blockchain network that is used for keeping and managing transactions. To use the Ethereum blockchain we need to use a ganache software that helps us to implement blockchain. Metamask is a web browser extension that acts as an interface between the web page and the blockchain. To develop the web page we are using node.js and to develop blockchain smart contracts we are using a solidity programming language.

3. TOOLS REQUIREMENT

Ganache: Ganache is a software suite that is used to set up your personal ethereum blockchain. It is used to deploy your blockchain to the network. It helps to stimulate the ethereum blockchain so that you can interact with your smart contracts in the blockchain.

Metamask: Metamask is a web browser extension and it acts as an interface between the browser and the ethereum blockchain and it helps the user to use their ethereum blockchain wallet.

Truffle Suite: Truffle is a framework that helps us to set up an environment to write smart contracts in blockchain.

Nodejs: Nodejs is a framework that is used to develop the web page of the website.

Solidity: Solidity is a programming language. It is used to write smart contracts in blockchain.

4. FLOW OF PROPOSED SYSTEM

System is maintaining the status of ownership of the product i.e., the manufacturer of the product, the current owner of the product, and history of the ownership, and a QR code.

Stage 1: Product Registration Process: Initially manufacturer will be the first owner of the product. So, the manufacturer will add the product to the database of blockchain and add a QR code to the product for adding new data of the product to its blockchain

Stage 2: Distributor chains: In the next step manufacturer will shipthe product to the distributor. When the distributor receives the product he will scan the QR code and add a new chain about his details on the network, product ownership, time Stamp, and date.

Stage 3: Retailer chains: At this stage, the retailer receives the product from the Distributor and scans the QR code assigned to the product using a QR code scanner, and will add a new chain of his owner details of the product on the network.

Stage 4: End User: At the end of the chain, the customer will take the product, go to the website and upload the QR code over there, and the customer will able to get all detail about the product from the manufacturer to the last retailer. And after getting the details then it was his choice whether to buy the product or not.

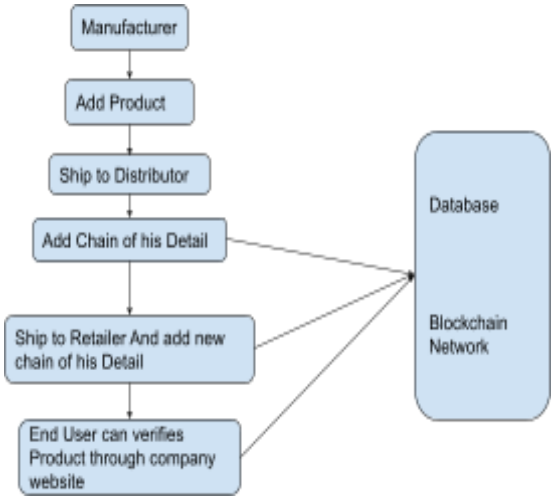

Figure 3: Block Diagram of Proposed System

LIMITATIONS AND FUTURE WORK

The proposed system really helps the retail market, manufacturers, and consumers from counterfeiting products but the system failed when a QR code is taken from a genuineproduct and given to a fake product then the product which issold first become genuine it does not matter it is a genuine product or fake product but another product is treated as a fakeproduct. Also storing the supply chain of every product require a huge amount of memory which is going to make this system expensive.

The future work is to implement this model and try to resolve the limitation such as embedding some material in the product so that when a person tries to take the QR code, the chip or something will send the signal

CONCLUSION

Thus from the above discussion, we can say that developing a completely functional application that can detect whether the product is fake or genuine really helps the retail market to growand provides security to the end user that the product he is buying is really genuine and is branded and also it helps manufacturers to maintain its company reputation and company value. In today's modern technology world, the only emerging technology that provides more security and functionality for stored data is blockchain. Thus blockchain-based application is a lifesavers for all customers and manufacturers.

In this paper, we have proposed a fully functional application that helps users to detect whether the product is fake or real. The manufacturer for the first time stored the detail of the product in the blockchain and generated an embedded QR code to add other details by other parties. At the time of receiving the product, other parties will add their details of ownership of the product. In the end, the customer can scan the QR code and can check the history of the product, and decide whether the product is genuine or not.

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