WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Product Authentication System

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ABSTRACT

The customer thinks a thousand times before purchasing the product. He has questions in his mind whether the product that he is purchasing is authentic or not. In order to solve this problem, it is important to be transparent with these customers.

Blockchain technology explored itself very rapidly in the financial industry. Blockchain does not have any trusted intermediary. It is known for faster transactions and adding more transparency. It is used in financial transactional records. Therefore, the contents of its data are tamper-proof before it is used in blockchain.

In this paper, we create a system that helps the customers for themselvesto scan and identify that the product is authentic. For the creation and packaging of the right items each of these items needs to be provided with a digital QR code of its own. This research paper proposes a form of identification of each manufactured product using blockchain technology. Discusses the software implementation process where the product code is scanned using this application and confirms whether the given product is authentic or not.

It also provides a digital identity along with proof of ownership for each product which is recorded on an immutable ledger. The customer can add his name and number to their purchased product, sealing his/her ownership over the product.

This project proposes a form of identification of products using blockchain technology. Our project is composed of the following modules:

1. Web Application - utilized by the manufacturer and the admin.

2. Blockchain - hosted via Ganache storing all the logs in an immutable format.

3. IPFS - stores the product information

4. Mobile Application - residing on the customer's mobile phone via which he/she can scan the QR to affirm the validity of the product.

Keywords— Blockchain, Transparency, Tamper-Proof, QR

Introduction

In the past few years, the global development of products has come with a big problem of counterfeit products being sold without any regulation. Counterfeit products affect the company name, reputation, and revenue and companies have to face major losses due to these activities. These copies are so similar to the original product that it becomes too difficult to separate the real from the fake.
Our project utilizes blockchain technology to give a digital identity to each product. Blockchain is a set of recording details that makes it difficult to modify, hack, or deceive the framework. The blockchain is a duplicated list of computerized transactions that is distributed on the blockchain network across each node or participant. Each record is stored in the form blocks in blockchain and each block in the series has a number of activities and each time a new transaction occurs on a blockchain. Depending on the distributed algorithm, smart contracts and encrypted algorithms areutilized in blockchain.

In this paper we design a system that is able to share data about products from manufacturer to the customers when they scan the QR code generated through our system.

Objectives of the Project

The main objectives of this system are:

i. To Design an Anti-Counterfeit System with a Blockchain backend.
ii. To secure product details by creating a record that can't be manipulated and is encrypted end-to-end.
iii. Maintain a traceable digital identity for each product.
iv. High efficiency and speed.
v. Automating processes that would generally require human interaction, hence speeding up the process.

Proposed System

In this project, *weauthenticate each* product by using blockchain technology. The first step is to bring all the manufacturers to the blockchain network and collect their major product information. Product verification is done by registering and providing them with the correct id and password. The manufacturer will be the main owner of the item. The manufacturer will ask the manager to add the product to the network while the QR code will be assigned to that product. The regulator will register the product and the manufacturer on the network if the applicant is the actual manufacturer. Once the product is recorded on the network it will create a smart contract with the unique QR code of the product where the product details are stated in the encrypted text form.
To protect the QR code from being replicated there is a Copy Sensitive digital image in the QR code.
In the next step the manufacturer will send the product details to the administrator and the status is set as shipping; it will not change the ownership of the product until a request from both parties for the purchase and sale of the product is approved.
As soon as both parties agree to a joint venture, its ownership in the blockchain network will be transferred in the form of a smart contract automatically after payment has been made. At this stage clients will be provided with the Android app and consumers can scan the QR code assigned to the object using the Android app. The scanner scans the product and removes the encrypted text in the algorithm provided and receives information about the current manufacturer and owner of the product and can decide whether to purchase the item or not.
The customer at the time of checkout, also has the ability to append his/her name and number to the digital identity of the product. During the first scan via mobile, a prompt appears for the customer to add these fields onto a text field. Once the user has filled these details, the mobile app sends a request to the server which in turn sends a request to the IPFS network storing the product details. The QR is then updated as the user's information is added. On second scan, the user can now see his/her details appended to the digital identity of the product. This can be used as a proof of ownership over the product.

Technology Used

Hardware:

1. Processor: Intel Core i3 or more.
2. RAM: 4GB or more.
3. Hard disk: 250 GB or more.

Software:

1. Operating System : Windows 10, 7, 8.
2. Python
3. Anaconda
4. IPFS
5. Spyder, Jupyter notebook, Flask.
6. Android studio, Java Kotlin
7. Ganache
8. Remix IDE
9. JavaScript

Advantages of Proposed System

- The information used for this proposed system is obtained by distributed computers throughout the world. All distributed computers show their computational power to make information secure and immutable.
- Using functions and power allocations, the entire blockchain system uses authentication, delivery, and data management on the local side. Blockchain technology is not dependent on additional external controls, has no internal controls, and is independent.
- The move to the blockchain is completely transferable and straightforward. Anyone can come to them from anywhere in the world.
- We use cryptography algorithms to add a special identifier of the individual information in the blockchain and we implant such identifiers in the Blockchains.
- It is not possible to reproduce the substance from any identifier since we utilize single-direction cryptographic functions(hashes).
- Blockchain facilitates faster transactions by allowing P2P cross-border transfers with digital currency.

Design & Implementation

System components of Product Authentication System: -

•Web Application:

The web application is meant to be utilized for manufacturers who want their product authenticated via our system.

Our web application consists of the interactive HTML pages. Actions on this web application result in transactions queued onto the blockchain and IPFS depending on the type of request.

•Server:

Our main flask-based server, currently running locally on the the PC which is the center of all actions in our system. All communication occurs through the server. It connects the user facing interactive components with the IPFS and blockchain networks.

•Metamask:

Metamask functions as a digital wallet that enables users to store, send, and receive Ethereum and other ERC-20 tokens. It also provides a secure way for users to manage their private keys, which are necessary for making transactions on the Ethereum blockchain.One of the main features of Metamask is its ability to interact with our system on the Ethereum blockchain. Our system is a decentralized application that runs on the Ethereum blockchain and provides various services and functionalities to users. Metamask allows users to connect to our system directly from their browser, without the need for a centralized server or third-party intermediary.

When a user connects to our system using Metamask, our system can access the user's Ethereum address and balance, and can perform various actions on the user's behalf, such as sending and receiving tokens or executing smart contracts.

Overall, Metamask provides a user-friendly and secure way for users to manage their cryptocurrency assets and interact with our system on the Ethereum blockchain. Its popularity has made it one of the most widely used tools in the Ethereum ecosystem.

•Local Blockchain Network:

Stores the logs of all the transactions occurring in the web server along with the product data. This allows for accountability, verifiability and lowest possible chances of data manipulation.

It builds a decentralized, immutable, and transparent ledger of transactions that is visible to all participants in the network. This creates a system of trust and accountability that is based on cryptography and consensus, rather than on trust in a central authority.

•IPFS:

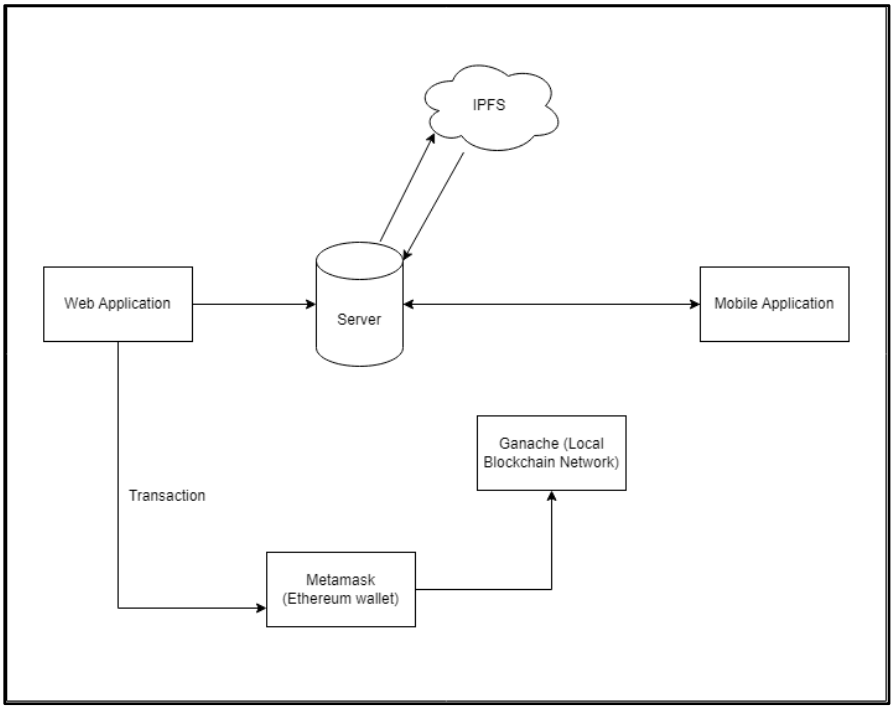
IPFS provides a decentralized storage system that allows for the storage and distribution of data without relying on a centralized server. This means that product authentication data can be stored on a network of nodes, rather than on a single server. This makes the system more resilient to downtime, cyber-attacks, and other potential issues.IPFS uses content-addressed storage, which means that data is identified and accessed based on its content, rather than its location. This ensures that the data is immutable and cannot be altered or tampered with once it is stored on the network.IPFS allows for fast retrieval of data, as it uses a distributed hash table (DHT) to index and retrieve data. This means that product data can be quickly and easily retrieved from the network, regardless of where it is stored.

IPFS provides a transparent system for data storage and retrieval. This means that all transactions are recorded on the network, and can be easily audited and verified.

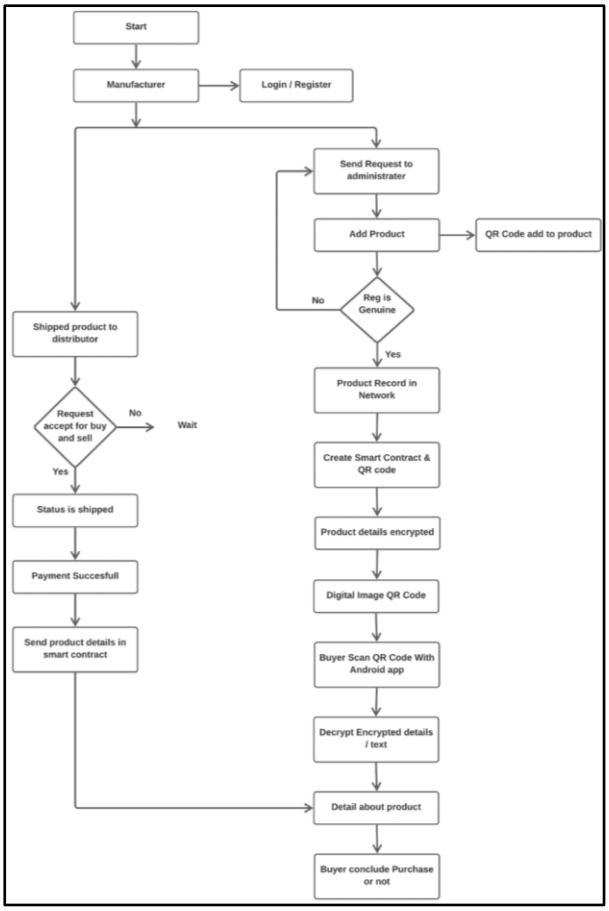
IPFS can be used in conjunction with smart contracts to create a self-executing authentication system. Smart contracts can be used to automatically verify the authenticity of a product based on the data stored on the IPFS network, without the need for human intervention.

•Mobile Application

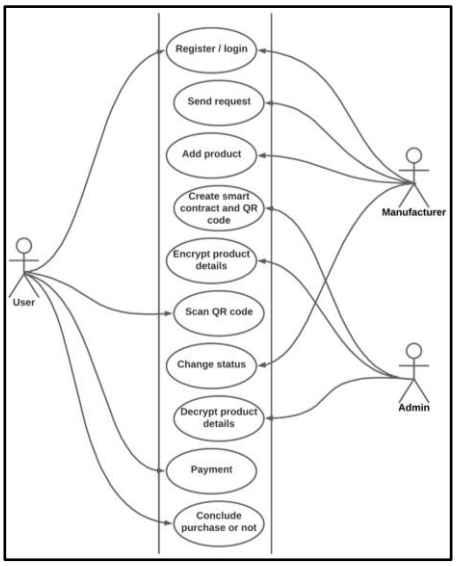
Installed on the user end. Allows for the main functionality of the system which is the scanning of the QR code for a specific model of a specific product type. The digital identity stored for each product is retrieved and displayed on a successful scan.



Blockdiagram



Flowchart



Use Case Diagram

Future Scope

Blockchain technology is still not developed as much so further investigation is required. The future function of this framework can be proof that the code is simple. The client may not believe that the program is valid due to a simple code, and no excess code will have additional uses. Assigning a blockchain that resists fraud and traction, then platform development is guaranteed in terms of real products. This will enhance the customer experience by introducing the entire resource framework open and transparent.

Self-service based QR allotment without the need of admin to validate whether request for the product is authentic or not. This could be done using camera based authentication.

Allowing user to add his/her name to product details which will be stored on the IPFSalong with other product details. On second scan the product should also show the name of the customer who owns it.

Tracking the product from the beginning of the supply-chain to increase industrial use-case of this project. This would also provide increased transparency to the customers about the product manufacturing details.

Conclusion

This paper is a great Blockchain framework that proposes a fully functional anti-counterfeit framework. Without paying any transaction fees, clients of our framework at this point should not worry about the opportunity to get something counterfeit. Similarly, the proposed framework is important for end-to-end customers to identify counterfeit items in the inventory network. The client ends up viewing the QR code assigned to an object and can retrieve all data such as an exchange history, the current owner depending on which client can check whether the item is authentic or not. The client is also provided with the ability to append his/her name and number to the Blockchain system in case it

Acknowledgments

We express our deep gratitude to our project guide Mr. Allan Lopesfor providing timely assistance to our queries and guidance us throughout the year. We extend our sincerity appreciation to our entire staff from Universal College of Engineering for their valuable insight and tips during the designing of the project. Their contributions have been valuable in so many ways. We are also grateful to our HOD Mrs. Yogita Mane for extending her help directly and indirectly through various channels in our project work.
We are also grateful to the campus Director, Dr. Jitendra Patil for providing us with all the facilities required for the successful completion of this project.

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