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Avoiding Fake Products and Implementing Product Verification Using Private Blockchain Network

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Abstract: Counterfeit products have risen with the rising demand and inflating prices and also shortage of supply. According to the latest reports the counterfeit goods industry in the USA is worth more than 600 billion USD. And it is destined to increase at a whopping 4% per year. To prevent the trade of counterfeit products and to help reduce counterfeit goods we have developed a technology with the help of a blockchain network.
Essentially, a blockchain is a digital transaction ledger that is maintained by a network of multiple computers that does not rely on a third party. Individual transaction data files (blocks) are managed by special software that allows the data to be transmitted, processed, stored, and represented in a human-readable form. Each block contains a header with a time-stamp, transaction data, and a link to the previous block in its original configuration. A hash gets generated for every block, based on its contents, and then becomes referred to in the heading of the subsequent block. As a result, any manipulation of a given block would result in a mismatch in the hashes of all subsequent blocks.

I. INTRODUCTION

According to the current supply-chain systems, users or customers are not aware of the manufacturer and the product's authenticity; the availability of genuine products is the biggest issue. The issues are more prominent in supply chains: more organic food is sold than produced, or half of the product labels share fake information about product contents and ingredients. These things happen because the customers have no idea of the manufacturer or where the product comes from. There are many tracking systems, but none is public or accessible by the everyday user. Users have no idea of how genuine the product is. There is also a major issue in the medical sector where fake medicines are available for way cheaper rates and there is no way to identify the authenticity of the medicine. To counter this there has to be a simplified way to trace and track the authenticity of any product.

II. LITERATURE REVIEW

What is blockchain?

Blockchain is a technology to store information in a secure manner, which also emphasises features like decentralisation , immutability , transparency etc. Blockchain is a decentralised digital ledger that assures both data integrity and security through peer-to-peer replication, making it impossible for tampering to occur.

Public vs Private network

Blockchain technology is being widely applied as an open network, or, more precisely, a permissionless network. These blockchain networks can also be termed public blockchains. The majority of the current blockchains (Bitcoin, Ethereum etc.) are public, allowing anyone to read, write, or create smart contracts and deploy nodes anonymously. Therefore, there is no trust other than the state of the blockchain before a certain depth is immutable. Public networks are an ideal choice for organisations involved in crypto-economics. However, a permissioned blockchain (Private blockchain) operates a blockchain among a set of known, identified, and often vetted participants operating under a governance model that can be trusted. Private blockchains provide secure ways of communication between a group of parties, making them ideal for business applications where transactional privacy is a must [1].

Consensus Methodologies

A very important characteristic, not only for blockchain technology but also for any decentralised system, is byzantine fault tolerance. The Byzantine generals' problem was conceived in 1982 as a logical dilemma that illustrates how Generals, who may have communication issues, will attempt to agree on the next move. Different types of consensus algorithms/protocols can be used to create a fault-tolerant byzantine blockchain system.
Consensus algorithms are mechanisms through which a blockchain network reaches consensus.

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A consensus protocol addresses two major challenges:
Protecting the network from attackers and **handling competing chains.**
There are different types of consensus protocols:

1. **Proof of Work (PoW)**
2. **Proof of Stake (PoS)**
3. **Other protocols.**

Proof of work (PoW) works on a mining-based concept where miners solve a complex algorithmic hash and get rewarded. In the end, the soup that every block has is proof of work. This creates a certain level of centralised behaviour. PoS was introduced in 2011 in a Bitcoin talk forum to solve the above problem. PoW and PoS have a notable difference. PoS is more decentralised and secure, as not every user has the authority to mine blocks. Although PoS has these advantages, it also poses additional risks compared to PoW. If a single or a group of miners can gain 51% of the hashing power, they can effectively manipulate the blockchain.[6]

Hyperledger

The Hyperledger Foundation hosts several enterprise-grade blockchain software projects. The developers build and design the projects for vendors, end-users, service providers, start-ups, academics, and others to develop and deploy blockchain networks or commercial solutions. The Hyperledger Foundation started as an initiative by the Linux Foundation providing program management services for open-source projects. Hyperledger enables users to build permissioned distributed ledger technology (DLT) platforms. Its pluggable consensus protocols are among the most important distinguishing features of the platform, which allows it to be tailored to fit specific use cases and trust models. Here channel-based ledgers are created, so channels play a critical role in building a permissioned network.

Type	Blockchain Technology
Public	Bitcoin
Private	Ethereum
Permissioned	Hyperledger

METHODOLOGY

Various branded or reputed companies are working on modern technologies to identify the counterfeited products from the original product in the market and to improve this working, the IT sector can give them positive signals and can help to prevent counterfeit goods. Among these various technologies available in the IT sector, ethereum blockchain is one of the promising technologies which can be used for reducing the counterfeiting of goods.

SYSTEM ARCHITECTURE

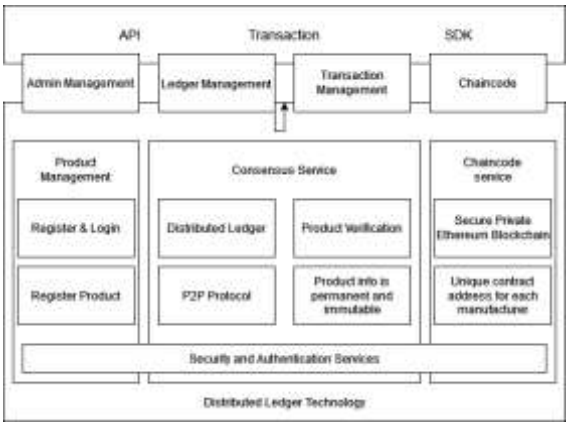

Figure 1

The manufacturer will register on the app and he'll be provided with a unique blockchain address which will be used to store his products and he can add the product info and then push the info to the ethereum blockchain. After publishing

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the product a unique qr code will be generated with the product info which can be placed on packages to get detailed info about the product and manufacturer. While the users can just download the app and scan the qr code to get all the info. Customers don't have to register or login to scan the qr code.

Admin User Flow

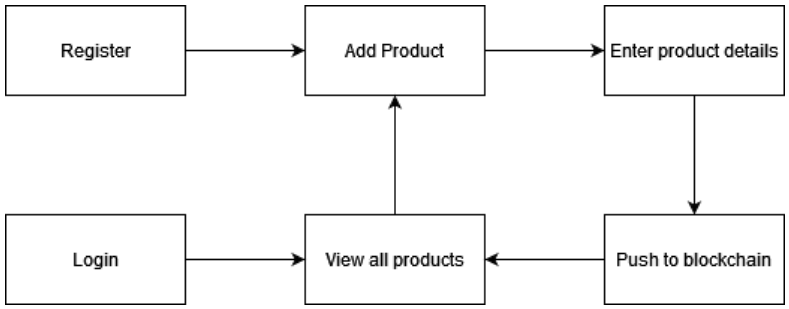

Figure 2

Customer User Flow

Figure 3

Customers can download the app and scan the qr code on the product to verify if the product is genuine or not.

III. CONCLUSION

In our proposed solution, we've primarily focused on targeting the most impactful and cost-effective way to counter duplicate products. The genuinity of products can be validated owing to the fact that the records on blockchain are immutable. Our system can be perfectly thought of to enhance the transparency system in the consumer goods sector based on the non-tampering and traceable characteristics of blockchain. Blockchain could be executed without special requirements. Requirements for implementation of blockchain technology are personal computers that have Hyperledger architecture that is connected to a server.

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