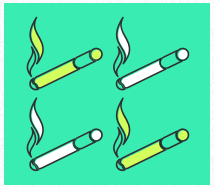
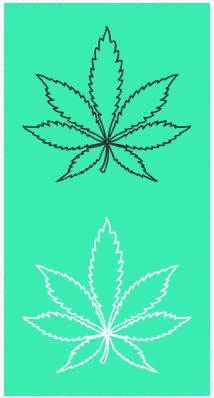


TRACE LINK

Decentralised Permissioned Blockchain Platform



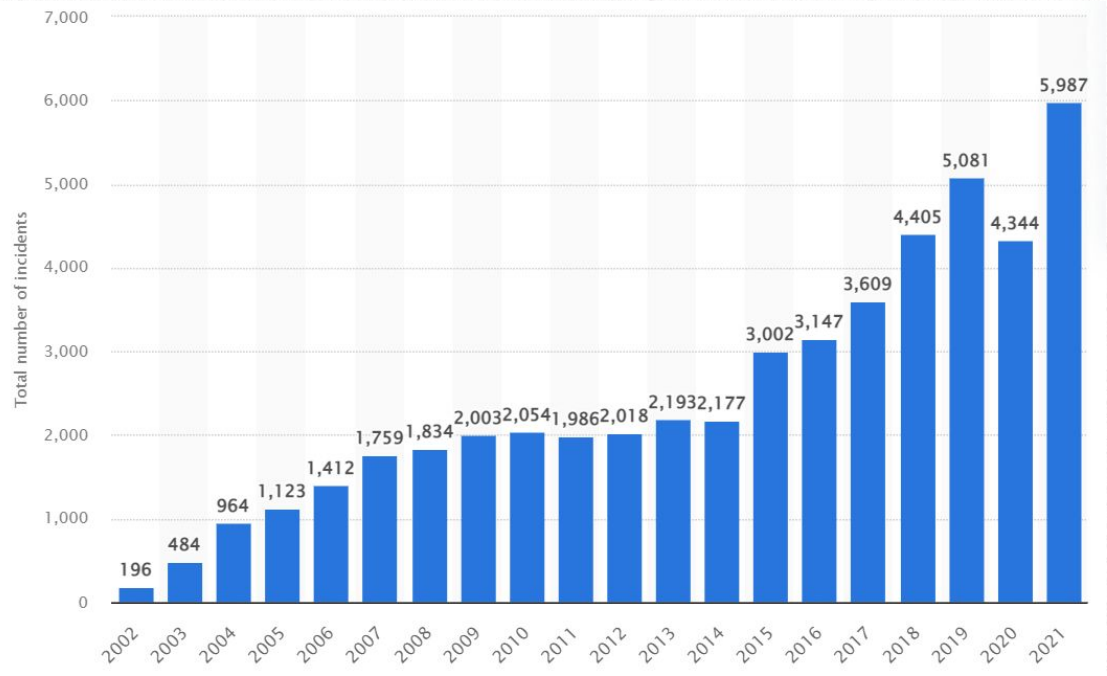
PURPOSE

In the pharmaceutical industry there has been a lot of counterfeiting drugs that has increased the amount of medicine trafficking. The World Health has shown that 11% of medications sold in developing countries have been counterfeit, resulting in 144,000 annual deaths(White, 2022). Drug counterfeiting is a $200-billion business which is financially damaging to the authentic manufacturers and is life threatening to patients(Miller & Duggan, n.d.). One of the most commonly counterfeit drugs are weight loss drugs such as Lipitor(Haiken, n.d.).

Therefore to prevent counterfeit drugs, the pharmaceutical industry need an efficient supply chain management system to protect the consumers of the medicine. This would avoid counterfeit medical drugs from entering the global market. The traditional supply chain management system is prone to hackers and makes it hard to track transactions. As a result products would be easily counterfeit. By introducing the use case of blockchain technology we can manage this trustless system as it allows us to easily trace the drug to the manufacturer and therefore it cannot be counterfeit.

Statistics

Total number of counterfeit crimes concerning pharmaceuticals worldwide 2002-2021(Mikulic, 2021).



What is Trace Link?

This Blockchain based decentralised system allows for immutability, traceability, and transparency so every stakeholder involved in the supply chain has information of the source and the trading history of the drugs. This helps every stakeholder to distinguish between the safe reliable drugs from the counterfeit dangerous drugs and allows them to see the source of those counterfeit drugs.

Smart Contracts are just "if/when…then…" statements written as code into a blockchain(Market Intelligence Blogs, 2022). Agreements between all stakeholders are stored via the smart contract. Smart Contracts are implemented into TraceLinks blockchain to enforce agreement between each stakeholder in the supply chain. The smart contract will contain conditions such as the legality and reliability of the source of the drug and its components. If the conditions are met the drug proceeds through the supply chain. Pharmacists will be able to avoid untrustworthy sources. eg. India/China.

STAKEHOLDERS

Manufacturer

Manufacturers provide a unique QR code to each drug that they produce. Manufacturer will send the product to the Wholesaler with a smart contract. Wholesalers will scan the QR code and the smart contract will validate the product to check the authenticity of the drugs. This reduces the risk of counterfeit drugs travelling further down the supply chain. Blockchain enforces authenticity due to its immutable nature.

Wholesaler

Wholesaler will send the product to the Pharmacists with a smart contract which will validate the product and authenticity. When the pharmacist scans the QR code the Information about the product is displayed as they have the right to know all this information in order to determine all the drugs a patient needs and which ones to prescribe so that they won't interact with one another.

Pharmacist

The pharmacist will prescribe the appropriate drug to the patient. Data on the patients experience with the drug is recorded in the blockchain so that future prescriptions can be made by the pharmacist while keeping the privacy of the patient. Every block in the blockchain network will carry data on the trading history of the drug, this can include trading time, the buyer, the seller, and location of manufacture. The timestamp of the trade helps pharmacists to determine how long the medicine was not effective and prescribe accordingly.

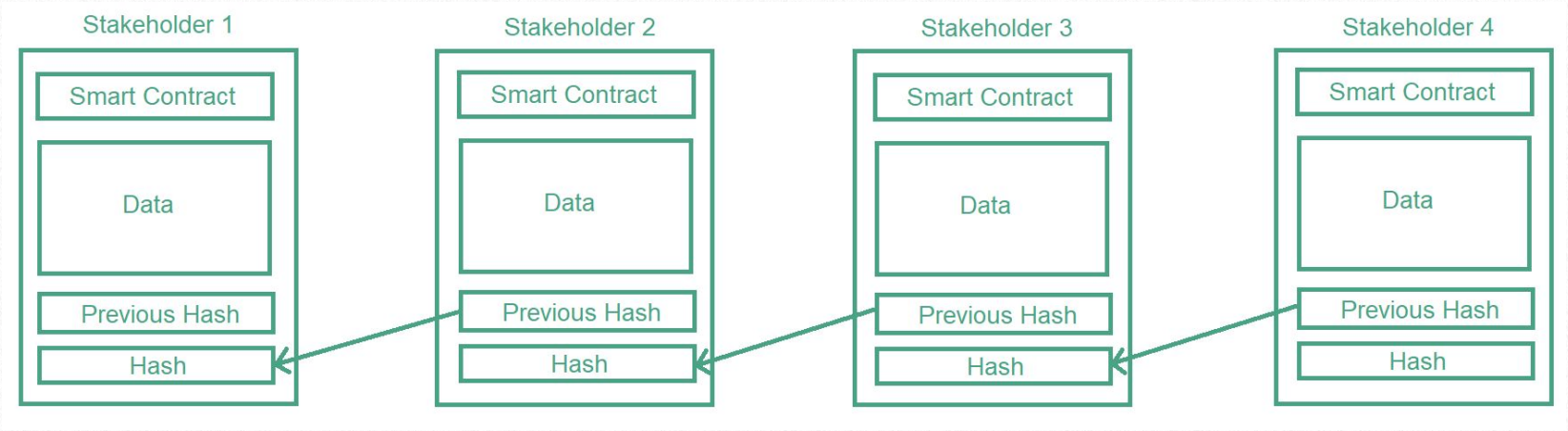
Patient

Operation Principle

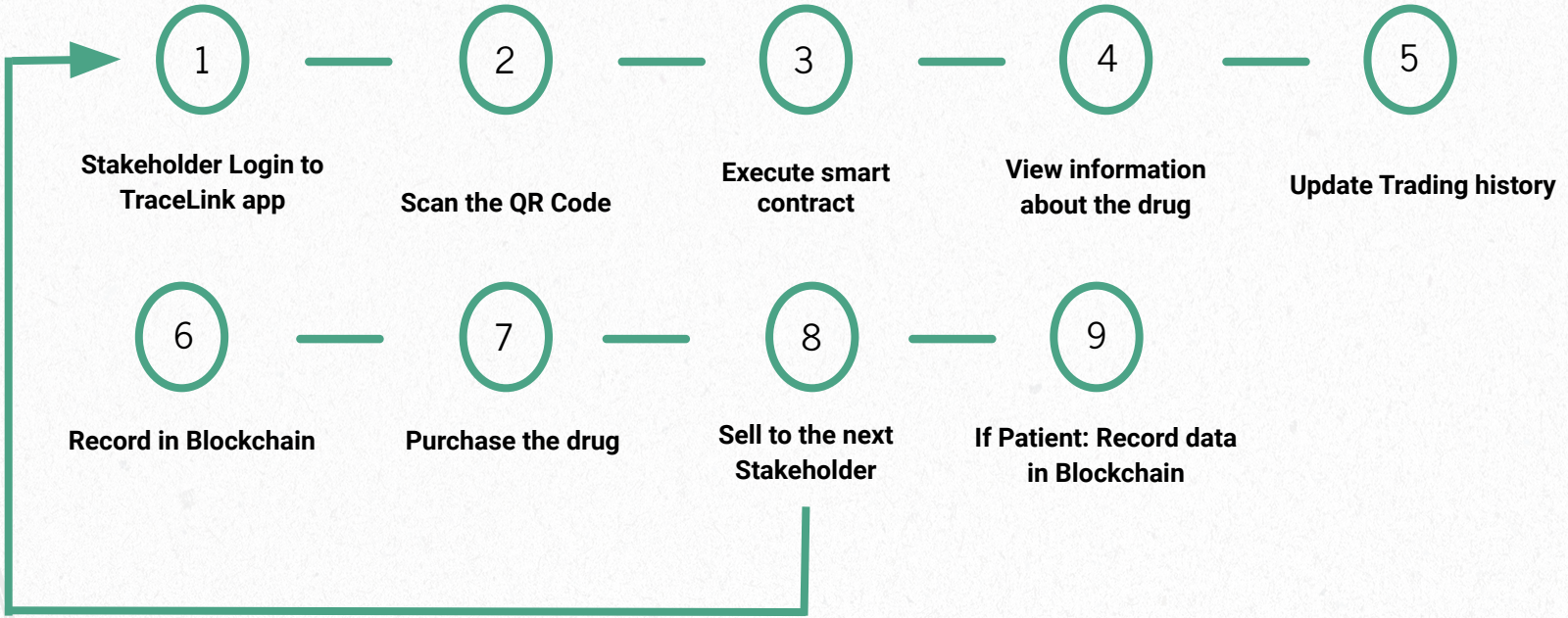
Blockchain networks are able to hold history of immutable transactions between each block added to the blockchain consist of 3 things that allow for this mechanism: Data, Hash, Previous Hash. If a block were tampered with, the blocks following that would be invalid since the hash of the block is generated using the data. If the Hacker wants the blockchain network to be valid again they must tamper with all the blocks in the network which is computationally impossible.

The Manufacturer of the drugs will provide a unique QR code which is the public key for every pharmaceutical product they produce as that will be the identity of this digital asset. The private key of each stakeholder is stored off-chain. The next stakeholder will scan that QR code to view the information about that product and to execute the smart contract to ensure its authenticity so it can be purchased safely, at the same time it will update the trading history of that particular product. Each stakeholder will be able to know that their product was safely received by the client.

Operation Principle



TraceLink Workflow



Competitive Advantage

Advantage:

1. Easy to trace trading history to identify source of counterfeit.
2. Data in network is immutable so information about the drug cannot be tampered with.
3. Distributed decentralised system so peers in a network cannot force contracts.
4. Less cost and human error since there is no middle man used for verification

Disadvantage

1. Hard to trace trading history.
2. Information can be tampered with.
3. Centralised system.
4. Middle man needs to be paid.

Challenges

The cost of maintaining and running blockchain nodes is expensive(Rawat, 2021).

Distributed systems are public and some pharmaceutical companies value their privacy for competition reasons(Rawat, 2021).

The blockchain technology becomes useless if the components of the drug were tampered with before reaching the manufacturer(Rawat, 2021).

Cultural Considerations

With the ability to trace transaction along the supply chain, stakeholders can work towards reducing carbon footprints and time spent in transit(Rawat, 2021).

No money is spent on the middle man for transactions so individuals working in the supply chains can potentially face unemployment.

With easy traceability, COVID19 tracing becomes a lot easier when finding out the transaction where infection occurred in the supply chain.

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