

Medicine Traceability System using Blockchain

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Abstract

International Policy Network gave a report that 700,000 deaths are recorded alone from Fake Malaria and TB drugs. Hence nowadays it is more important to validate the medicines source and supply chain because of many middle acting and supporting agents like supply agency and distributors. It is found that due to high cost of some newly developed drug, many organizations registered under fake names around the globe produce fake medicine under same brand name and packaging. This poses a great hazard to the life of patients. The existing system uses very weak security Databases and it has many loopholes for fake medicines to enter in market. Our Proposed System is based on Blockchain technology uses a permanent ledger so this original information can never be modified plus the origin of medicine can be traced back. With the help of traditional batch number or user friendly QR code printed on the rear of medicines this intrusion in the supply chain can be successfully detected and stopped. In This System we have used Message digest and SHA algorithm to provide encryption to the input file (Which is our block of transactions here).

Keywords: Blockchain, Medicine, Network, Permanent Ledger, QR code, RDBMS, Traceability, Transparency

INTRODUCTION

Increasing problem of counterfeit medicines is being faced by the legal pharmaceutical supply chains worldwide. Numerous cases are registered where end users have consumed counterfeit medicines resulting in permanent injuries and sometimes even death. The main use of supply chain traceability is to help in verification of authenticity for pharmaceutical products and also to prevent counterfeit products to reach end consumers. A blockchain is a growing list of records which are linked to each other using cryptography. In the blockchain network, each block consists of cryptographic hash of the previous block, a timestamp and the transaction data, usually represented as a Merkle tree. The data once stored in the blockchain cannot be altered later. Blockchain is a secure network of storing transactions in a chronological manner. Primary objective of the given study is to contribute in the field

of tracking along with tracing of goods, specifically in the field of medical sector. This can be done by understanding how the block chain technology can be applied in a supply chain. Our second intention is to suggest a tool that can be used for managing transparency in the field of logistics by using blockchain technology.

LITERATURE REVIEW

Supply chain network usually consists of number of parties: suppliers, intermediates, third party logistic (3PL), fourth party logistic (4PL) and end users or consumers (Mehmann&Teuteberg, 2016). Two things must be supported by a traceability system, tracking and tracing. Tracking is used in keeping the record of the product at each stage and tracing is defined as the process which is used to identify the origin of a product. One technology which can offer both tracking and tracing and that has been given much attention during the last few years, is the

blockchain technology (YliHuumo, Ko, Choi, Park, &Smolander, 2016), a technology initially invented in order to support the digital currency of Bitcoin (Nakamoto, 2008). The data once stored in the blockchain cannot be altered or modified further. The data is stored in the chronological order in blockchain.

So far, the research regarding the blockchain technology has revolved around the concept of digital currencies specifically the bitcoin(Yli-Huumo et al., 2016), but still this technology is not fully explored yet(Lemieux, 2016) and it is said to have the future potential when exploring about the concept of storing things.(Hull et al., 2016).

MATHEMATICAL MODEL

Let S is the System

$S = \{I, O, F, DD, NDD, Success, Failure\}$

where,

$I = Input = \{I1, I2, I3, I4, I5, I6, I7\}$

$I1 =$ Company details;

$I2 =$ Distributorship details;

$I3 =$ Dealer details;

$I4 =$ Medical details;

$I5 =$ User details;

$I6 =$ Medicine details;

$I7 =$ QRCode;

$F = Function = \{F1, F2, F3, F4, F5, F6, F7\}$

$F1 =$ Register;

$F2 =$ Login;

$F3 =$ Add companydetails;

$F4 =$ Add distributionshipdetails;

$F5 =$ Add dealershipdetails;

$F6 =$ Add medicaldetails;

$F7 =$ Add medicinedetails;

$F8 =$ Create block;

$F9 =$ Add transaction;

$F10 =$ Attach block;

$O = output = \{O1, O2, O3, O4\}$

$O1 =$ Supply chainhistory; $O2 =$ Transaction block; $O3 =$ Viewsupplychain; $O4 =$ View users;

Success=block-chain created successfully, scan medicines and delivered to end user.

Failure=Internet connection required, QR code scanner device required.

PROPOSED SYSTEM

The pharmaceutical supply chain in the current scenario consists of numerous entities like raw materials supplier, company, distributor, hospital, patient or end user. The flow of this supply chain is as follows

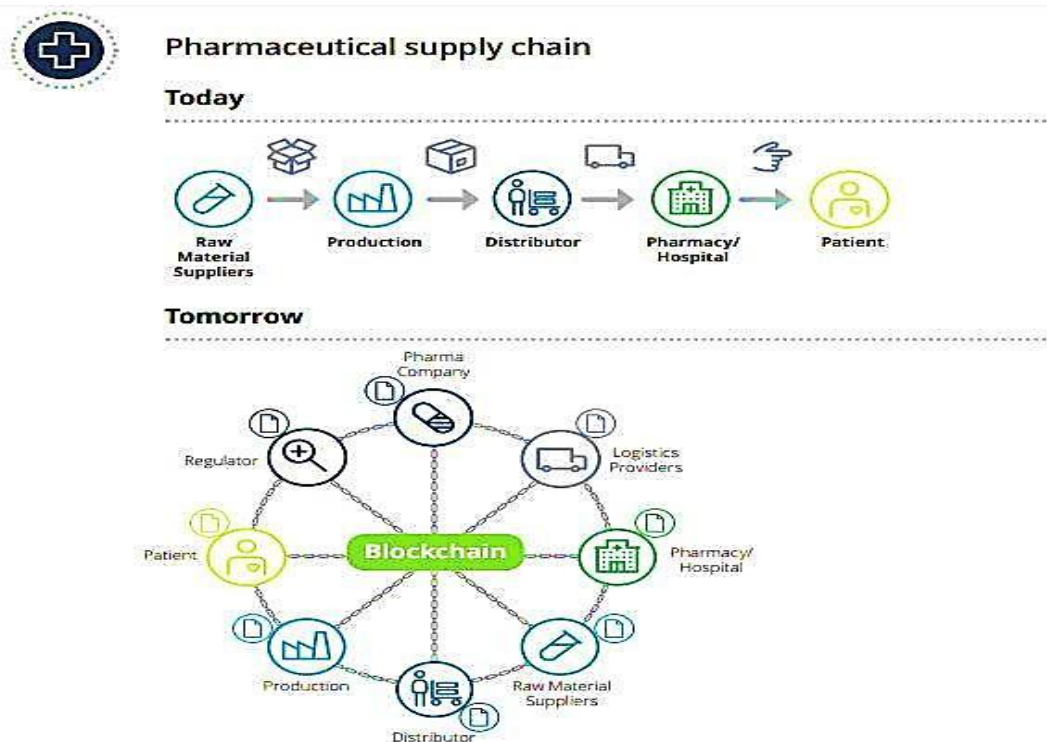


Figure 1: Proposed system.

Firstly, the raw materials are supplied to the company for production of the medicines. After production, the medicines are supplied to the distributors, from there they are distributed to the hospitals or the dealers and ultimately the medicine reaches to the end users or the patients.

In our proposed system we are connecting all these entities with the blockchain technology where the record of each medicine will be kept in the form of blocks created in the blockchain. By using an android app for scanning the QR code attached with each medicine and storing the information like the batch number linked with the medicine, name of the medicine on the blockchain network once a QR code has been scanned. Using this information, digital footprints of each transaction can be created which can be further used for the purpose of traceability and verifying the authenticity of a medicine.

CONCLUSION

Forgery of vital medicines is still one of the biggest Malpractices in India and across the globe .To stop this forgery is a very humongous task as nowadays various diseases can be diagnosed at very early stages of their occurrence but their cure which includes medicines on large should be available in legitimate form only.Any tampering with this items for the purpose earning profit or to intentional harm to them can have direct effect on their effect and health of patients,many a times due to not getting suitable medicines during curing period patients lose their lives. Our blockchain based system will prove to be instrumental in overcoming these loopholes by the permanent and immutable record keeping if implementations of this system is meant mandatory for medicinal supply chain then problem of medicine forgery will be surely solved.

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