International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 07 | July - 2022 Impact Factor: 7.185 ISSN: 2582-3930

A block chain based approach for drug traceability in healthcare supply chain

S A Madival , Computer science and engineering & Sharnbasva University
Shivani Bilgundi , Computer science and engineering & Sharnbasva University

---

Abstract - Healthcare supply chains are intricate networks that go across numerous organisational and geographic boundaries and serve as the structural backbone for many services that are essential to daily living. Such systems' intrinsic complexity makes it possible to add impurities like erroneous data, a lack of transparency, and a weak data provenance. One result of these restrictions within the current supply chains is the production of counterfeit medications, which not only has a substantial negative impact on people's health but also costs the healthcare sector a great deal of money. Thus, current research has highlighted the requirement for a strong, end-to-end track and trace system for pharmaceutical supply chains.To ensure product safety and get rid of fakes, the pharmaceutical supply chain needs a comprehensive product tracking system. The majority of track and trace systems currently in use are centralised, which causes problems with data privacy, transparency, and authenticity in healthcare supply chains. In this paper, we describe an Ethereumblockchain-based strategy for effective product traceability in the healthcare supply chain that makes use of smart contracts and decentralised off-chain storage. The smart contract gives a secure, immutable history of transactions to all stakeholders and ensures data provenance. It also does away with the need for middlemen. We outline the system architecture and comprehensive algorithms that underpin the fundamental operations of our suggested solution. We test and validate the system, offer a cost and security analysis, and assess its efficiency in enhancing traceability.within the networks that sell drugs.

Key Words:Block chain, Security, block size, hash code

1.INTRODUCTION

The healthcare supply chain is a complicated web of numerous independent businesses, including pharmacies, hospitals, manufacturers, distributors, and raw material suppliers. Due to a number of issues, including a lack of information, centralised control, and rivalry among stakeholders, tracking goods across this network is challenging. Such complexity not only leads to inefficiencies like those shown by the COVID-19 epidemic, but it can also make it more difficult to combat the spread of counterfeit medications into the healthcare supply chain.Drugs that have been purposefully created fraudulently or with incorrect labels on their identity or source to pass for real ones are known as counterfeits. These pills may be ones that don't have any active pharmaceutical ingredients (API), have the wrong amount of API, the wrong API, are of poor quality, include contaminants, or have been repackaged from expired goods. Even some fake pharmaceuticals may be prepared in subpar circumstances and with inaccurate formulations.

Up to 30% of the medicines sold in underdeveloped nations are fake, according to the Health Research Funding Organization. Furthermore, a recent World Health Organization (WHO) study found that using fake medications is one of the leading causes of fatalities in underdeveloped nations, with youngsters making up the majority of the casualties. In addition to having a negative impact on human lives, the pharmaceutical sector suffers a large financial loss as a result of the sale of counterfeit pharmaceuticals. In this regard, it is estimated that the US pharmaceutical sector loses $200 billion annually as a result of the sale of fake medications.

2. Literature survey:

1)A Peer-to-Peer Electronic Cash System

AUTHORS: Satoshi Nakamoto

Online payments could be made directly from one party to another without going through a banking institution with a peer-to-peer version of electronic cash. Digital signatures contribute to the solution in some ways, but the primary advantages are lost if a reliable third party is still necessary to stop double spending. We offer a peer-to-peer network as a solution to the double-spending issue. Transactions are timestamped by the network by being hashed into a continuous chain of hash-based proof-of-work, creating a record that cannot be modified without performing new proof-of-work.. The longest chain provides evidence for both the order of events seen and the source of the greatest amount of CPU power. The nodes that are not working together to attack the network will produce the longest chain and outperform attackers as long as they control the bulk of the CPU power. There isn't much structure needed for the network itself. Nodes can leave and rejoin the network at any time, accepting the longest proof-of-work chain as evidence of what transpired while they were away. Messages are broadcast on a best effort basis.

2) E-Voting with Blockchain: An E-Voting Protocol with Decentralisation and Voter Privacy

AUTHORS: **Freya Sheer Hardwick, Apostolos Gioulis, Raja Naeem Akram, and Konstantinos Markantonakis**

Numerous facets of our social lives have been positively impacted by technology. The creation of a constantly connected global infrastructure makes it simple to access a wide range of resources and services. Furthermore,technology like the Innovation and creativity have flourished on the internet. Blockchain, the foundation of cryptocurrencies, is one such disruptive invention. Many existing and developing technologies/services are positioned as game changers by the blockchain technology. It is taking centre stage in many services as an equalising element to the current parity between consumers and major corporations/governments thanks to its immutability property and decentralised architecture. E-voting platforms could use blockchain technology, for example. The purpose of such a plan would be to offer a decentralised architecture to operate and maintain an open, equitable, and transparent voting system. together with independent verification. In this work, we suggest a potential new electronic voting protocol that makes use of the blockchain as an open voting system. The protocol was created to maintain key aspects of electronic voting while also providing some degree of decentralisation and allowing voters to modify their votes (within the permissible voting period). From a practical standpoint, this article outlines the benefits and drawbacks of implementing blockchain for such a proposal in both the development/deployment and usage contexts. The study concludes with a hypothetical roadmap for blockchain technology development in order to accommodate sophisticated applications.

3) How blockchain-timestamped protocols could improve the trustworthiness of medical science

AUTHORS: Kan Yang, Xiaohua Jia, Kui Ren, Bo Zhang, Ruitao Xie

There is less trust in scientific research when there is proof of data manipulation. Some of the issues that compromise the reliability of published research include outcome switching, data dredging, and selective publication. Carlisle was the first to report on techniques

for leveraging blockchain to show that pre-determined endpoints in clinical trial procedures have been met. Using a clinical trial procedure where outcome switching has already been documented, we intended to empirically test such a strategy. Here, we demonstrate how blockchain technology may be used to audit and validate the validity of scientific investigations in a way that is both affordable and independently verifiable.

4) Best Treatment Identification for Disease Using Machine Learning Approach in Relation to Short Text

AUTHORS: Bharti E. Nerkar, Sanjay S. Gharde

Building a computer system that can adapt and learn from experience is the aim of machine learning. In order to get the best and most accurate results for the system, machine learning is used to integrate computer-based systems into the healthcare industry. Here, the system works with automatically identifying instructive sentences from medical journal articles. Our main goal is to incorporate machine learning into the medical profession and create a programme that can automatically recognise and distribute information about diseases and therapies. The programme will also be able to recognise semantic relationships between diseases and treatments. In the proposed work, the user will utilise the search engine to enter symptoms in order to get the disease summary (information on the disease and its related treatments). When a pdf file is first downloaded and saved in the system, the data in the document is first processed, and the relevant data that is extracted is then put in the database. To make the process of finding the semantic term that aids in swiftly and readily identifying the ailment easier, the user's symptoms are further classified using an SVM classifier. The exact ailment associated with the detected semantic keyword is then determined by matching it with the database of stored medical input. Once the disease connected to the symptom has been determined, a medical database is consulted to extract any relevant publications. Tokenization, stop word elimination, and stemming are all parts of the preprocessing process. The algorithm for keyword searching is then used to retrieve pertinent information. In order to detect the semantic relationships between diseases and therapies in biomedical language, BOW, NLP, and biological concepts are combined. For the extraction of cure and prevent relations, OanaFrunza's 98.51 percent F-measure is the best result to date. SVM classifiers are employed in our implementation of the suggested method, and they provide better results. The current system's stated flaw was that it failed to pinpoint the most effective method of treating a condition. In order to solve the problem and choose the best treatment for the sickness among those suggested by the system, the proposed method employed data mining ideas and a voting algorithm.

3. OBJECTIVE:

In this regard, the main contributions of the purpose of this project can be summarized as follows.

- We propose blockchain-based solutions for the pharmaceutical supply chain that provide security, traceability, immutability, and accessibility for pharmaceutical data lines.
- We are designing smart contracts that can handle various transactions between participants in the pharmaceutical supply chain.
- Present, implement, and test smart contracts that define the working principles of the proposed solution.

Perform a security and cost analysis to evaluate the performance of the proposed blockchain-based solution.

4. SYSTEM ANALYSIS:

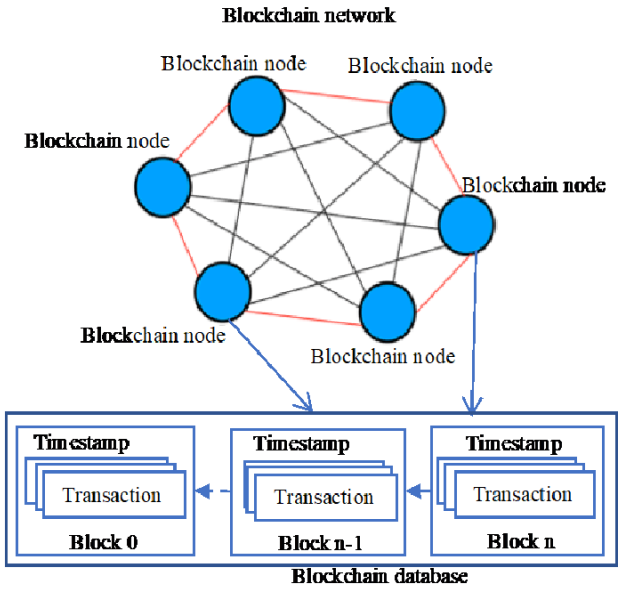
Existing System:

Existing Systems In today's world, the healthcare industry relies on a broad supply chain that transcends organizational and geographical boundaries. Impurities such as false information, lack of transparency, and limited sources of data can be brought about by the intrinsic complexity of such systems. Counterfeit medicines are one of the consequences of such restrictions in existing supply chains, not only adversely affecting human health, but also costing the healthcare industry a great deal. Therefore, reliable end-to-end tracking and tracking systems in the pharmaceutical supply chain have been highlighted in previous studies. An end-to-end traceability system in the pharmaceutical supply chain is essential to ensure product safety and eradicate counterfeiting. The latest tracking systems in the healthcare supply chain are centralized, leading to privacy, transparency and reliability issues.

Proposed System

We are developing a drug traceability system based on blockchain technology to track drugs throughout the healthcare supply chain. The healthcare supply chain has a large number of stakeholders, including manufacturers, suppliers, distributors, pharmacies, and hospitals. When a drug is delivered from the manufacturer to the customer or patient, one of the parties may mislabel or forge the drug. To avoid this, we propose a solution. Another aspect to consider when investigating the shortcomings of the healthcare supply chain is the possibility that one of the parties has long-term storage of the drug. We are waiting for demand to increase before we sell our medicines. The stockpile of this medicine affects the treatment of patients in an emergency. To avoid this, collect information about the number of medicines each stakeholder has and when to deliver them to other stakeholders. To achieve all of this, we useblockchain technology. This is a distributed ledger used to store transactions between parties in the form of blocks.

4. ARCHITECTURE



5. MODULES:

Pharmacy Seller

The seller must login to this module using a valid user name and password. After successfully logging in, he can perform several actions like View & Authorize Users, Adding categories, adding drugs View all medications, View all purchased medications, Find the total cost of your drug purchases, List all medications via chain tree, list all medication reviews, List All History of Search and View Details, View All Drug

Searches Per User, View the charts for Drug Ranking and Search Ratio.

View and Authorize Users

The list of people who have registered can be seen by the seller in this module. The admin can examine the user's information in this, including user name, email address, and address, and admin can also authorise users.

View Chart Results

The seller can access all charts in this, including those for viewing search ratios and drug rankings.

User

There are n numbers of users present in this module. Before doing any operations, the user should register. Once a user registers, the database will record their information. After successfully registering, he must log in using an authorised user name and password. Once logged in, the user can perform several actions, such as accessing My Profile, managing their accounts, Drug search and purchase My Search History, Drugs by Chain Tree, Other Patients' Drug Reactions View Top K Query Details, View Top K Drugs Purchase.

6. Results and Analysis:

Conclusion:

In this project, we looked at the issue of drug traceability within pharmaceutical supply chains and highlighted its importance, particularly to guard against fake medications. We have created and tested a blockchain-based pharmaceutical supply chain solution that enables decentralised drug tracking and tracing. Our suggested method, in particular, makes use of smart contracts within the Ethereum block chain to accomplish automated recording of events that are accessible to all participating stakeholders. This enables tamper-proof recordings of occurrences within the supply chain.

In terms of the quantity of gas used to carry out the various operations that are triggered within the smart contract, we have shown that our suggested method is economical. Additionally, the results of the security analysis conducted have demonstrated that our suggested solution achieves protection against malicious attempts targeting the integrity, availability, and nonrepudiation of transaction data, all of which are crucial in a complex multi-party setting like the pharmaceutical supply chain.

In order to achieve end-to-end transparency and verifiability of drug use, we intend to extend the suggested system as part of our ongoing efforts to improve the efficiency of pharmaceutical supply chains.

ACKNOWLEDGEMENT

The heading should be treated as a 3rd level heading and should not be assigned a number.

REFERENCES

[1]. "Shortage of individual defensive gear imperiling wellbeing laborer around the world" https://tinyurl.com/v5qauvp. [Accessed on: 3-June-2020]

[2]. Chambliss W, Carroll W, Yelvigi M, el al. "Job of the drug specialist in forestalling appropriation of fake prescriptions". J Am pharm Assoc. 2012;52(2): 195-199.

[3]. Ziance RJ. "Jobs for drug store in battling fake medications". J Am pharm Assoc. 2008;48: e71-e88.

[4]. Toscan P. "The perilous universe of fake professionally prescribed drugs". Accessible: http://usatoday30.usatoday.com/cash/ventures/wellbeing /drugs/story/2011-10-09/cnbc-drugs/50690880/1.[Accessed on: 3-June-2020]

[5]. T.Adhanom, "Wellbeing is a crucial human right",2017. Available:https://www.who.int/mediacentre/news/proclamations/major basic liberty/en/. [Accessed: 26-May-2020].

[6]. World Health Organization, "Developing danger from fake prescriptions", 2010.

[7]. Daniela Bagozzi, C.L. "1 out of 10 Medical Products in Developing Countries Is Substandard or Falsified". 2017. Accessible: https://www. who.int/news-room/detail/28-11-2017-1-in-10-clinical items indeveloping-nations is-unacceptable or-falsified.[Accessed: 3-June-2020].

[8]. The Guardian. "10% of Drugs in Poor Countries Are Fake, Says WHO". 2017. Accessible: https://www.theguardian.com/globaldevelopment/2017/ nov/28/10-of-drugs-in-poor-nations are-fakesay who.[Accessed: 3-June-2020].

[9]. Funding, H.R. "20 Shocking Counterfeit Drugs Statistics". 2017. Accessible: https://healthresearchfunding.org/20-stunning fake drugsstatistics. [Accessed: 3-June-2020].

[10]. Blackstone, E.A.; Fuhr, J.P., Jr.; Pociask, S. "The wellbeing and monetary impacts of fake medications". Am. Wellbeing Drug Benefits 2014, 7, 216-224

[11]. U.S. Food and Drug Administration, "A medication store network model". Accessible: https://www.fda.gov/drugs/drug-deficiencies/graphicdrugsupply-chain example}.Accessed: 3-June-2020].