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Drug Traceability in Healthcare Supply Chain Using Blockchain: A Review

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ABSTRACT: Drug traceability system is essentially important for public drug security and business of pharmaceutical companies, which aims to track or trace where the drug has been and where it has gone along the drug supply chain. Traditional centralized server-client technical solutions have been far from satisfying for their bad performances in data authenticity, privacy, system resilience and flexibility. We have proposed an entirely new blockchain system for drug traceability. This system is more secure and scalable than other alternatives on the market today. In addition, the proposed system is able to effectively prune its storage, resulting in a finally stable and usable blockchain storage solution.

KEYWORDS: Blockchain, drug counterfeiting, traceability, healthcare, supply chain, trust, security

I. INTRODUCTION

Drug traceability is essentially important for patients' health, business operation, and government regulation. With a reliable drug traceability system, patients and stakeholders of the drug supply chain could conveniently know where the drug has gone or has been. Indeed, the drug traceability has also become more and more a compulsory mandate by governments around the world. For example, the U.S. Drug Supply Chain Security Act (DSCSA) [39], which was signed into law on November 27, 2013, requires that an electronic, interoperable system should be built to identify and trace prescription drugs as they are distributed in the United States. In China, for approximately 8 years, stakeholders above had been required to upload the drug information of individual pharmaceutical products to the official designated IT system whenever there are drugs in or out of their warehouses.

Generally, a drug traceability system should be able to keep track or trace of the drug transaction flow through different stakeholders along the drug supply chain. It should provide reliable information about the flow for stakeholders and patients, especially that of drug production origin for anticounterfeit purpose. Or, at least it could be used to bind the responsibility of drug security to the relevant stakeholders for government regulation. Furthermore, the privacy of traceability data in the system is required to be protected as much as possible, especially that of statistical information (e.g. productivity, quantity of sale, etc.) of drugs that has been past the stakeholder.

This paper presents Drug Traceability System, a fully scenario-oriented blockchain system for drug traceability and regulation. It reconstructs the whole service architecture, ensures the both authenticity and privacy of traceability data, and meanwhile achieves a finally stable blockchain storage with time going by. Algorithms reflecting the practical workflow of drug supply chain have also been presented.

II. RELATED WORK

Literature survey is the most important step in any kind of research. Before start developing we need to study the previous papers of our domain which we are working and on the basis of study we can predict or generate the drawback and start working with the reference of previous papers.

In this section, we briefly review the related work on Block chain technology.

R.Alvaro-Hermana, J. Fraile-Ardanuy, P. J. Zufiria, L. Knapen, and D. Janssens present the concept between two arrangements of electric vehicles, which fundamentally diminish the effect of the charging procedure on the power framework amid business hours. This trading approach is also economically beneficial for all the users involved in the

trading process. An activity-based approach is used to predict the daily agenda and trips of a synthetic population for Flanders (Belgium) [1].

Y. Xiao, D. Niyato, P. Wang, and Z. Han provide a study of the possible flow and functional factors that enable DET in communication networks. Various design issues on how to implement DET in practice are discussed. An ideal approach is created for delay-tolerant remote controlled correspondence organizes in which every remote powered device can masterminded its information transmission and energy exchanging activities as indicated by present and future vitality accessibility [2].

J. Kang, R. Yu, X. Huang, S. Maharjan, Y. Zhang, and E. Hossain presents a work to accomplishes request reaction by giving motivating forces to releasing PHEVs to adjust nearby power request out of their own self-interests. Be that as it may, since exchange security and security insurance issues show genuine difficulties, they investigate a promising consortium block-chain innovation to enhance exchange security without dependence on a confided in outsider. A restricted P2P Electricity Trading framework with Consortium block- chain (PETCON) strategy is proposed to represent detailed activities of limited P2P power exchanging [3].

N. Z. Aitzhan and D. Svetinovic presents a work that address the issue of providing transaction security in decentralized smart grid energy trading without confidence on trusted third parties. We have developed a proof-of-concept for decentralized energy trading system using blockchain technology, multi-signatures, and anonymous encrypted messaging flows, enabling peers to anonymously negotiate energy prices and securely perform trading transactions [4].

M. Mihaylov, S. Jurado, N. Avellana, K. Van Moffaert, I. M. de Abril, and A. Now presents a work that shows decentralized computerized cash, called NRG-coin. Prosumers in the smart grid framework exchange privately made sustainable power source utilizing NRG-coins, the estimation of which is indented on an open cash trade advertise. Like Bit-coins, this money proposes various favorable circumstances over fiat cash, however not at all like Bit-coins it is made by infusing vitality into the matrix, as opposed to giving vitality on computational influence. Likewise, they make a novel exchanging worldview for purchasing and offering environmentally friendly power vitality in the smart grid network [5].

S. Barber *et al* presents a work that Bit-coin is isolated computerized cash which has pulled in a significant number of clients. They play out a top to bottom examination to comprehend what made Bit-coin so effective, while many years of research on cryptographic e-money have not prompt a vast scale appropriation. They ask additionally how Bit-coin could turn into a decent contender for seemingly perpetual stable money [6].

I. Alqassem *et al* presents a work that Bit-coin is constantly improved by an open source network, and different Bit-coin libraries, APIs, and elective usage are being created. All things considered, there is no up and coming convention contrast or design portrayal since the authority whitepaper was distributed. The work demonstrates an a la mode convention detail and design investigation of the Bit-coin framework. We play out this examination as the initial move towards determination of the cryptographic currency reference design [7].

K. Croman *et al* presents a work that the expanding fame of block-chain-based digital forms of money has made versatility an essential and earnest obligation. The work ponders how essential and incidental bottlenecks in Bit-coin restrict the ability of its present distributed overlay system to help generously higher throughputs and lower latencies. These outcomes propose that re-parameterization of square size and interruption ought to be seen just as a first augmentation toward accomplishing people to come, high-stack block-chain conventions, and real advances will moreover require a fundamental reevaluating of specialized ways [8].

G. W. Peters and E. Panayipresents a work which give a diagram of the idea of block-chain innovation and its capacity to disturb the universe of managing an account through encouraging worldwide cash settlement, shrewd contracts, mechanized keeping money records and advanced resources. In such manner, they first give a concise outline of the center parts of this innovation, and in addition the second-age contract-based improvements [9].

L. Luu *et al* presents a work which gives another circulated understanding convention for authorization less block-chains called ELASTICO. ELASTICO scales exchange rates straightly with accessible estimation for mining: the more

the calculation control in the system, the higher the quantity of exchange squares chosen per unit time. ELASTICO is productive in its system messages and permit complex foes of up to one-fourth of the aggregate computational power [10].

III. OPEN ISSUES

- Healthcare supply chains are complex networks that span numerous organisational and geographic boundaries, providing a fundamental backbone to everyday activities.
- Impurities such as erroneous information, a lack of transparency, and restricted data provenance can be introduced by the intrinsic complexity of such systems.
- Counterfeit medications are one of the consequences of such constraints in existing supply chains, which not only has a negative impact on human health but also costs the healthcare business a lot of money.
- As a result, previous research has underlined the importance of a reliable, end-to-end track and trace system for pharmaceutical supply chains.
- In order to ensure product safety and eliminate counterfeits, an end-to-end product tracking system across the pharmaceutical supply chain is essential.
- In healthcare supply chains, most contemporary track and trace systems are centralised, resulting in data privacy, transparency, and authenticity challenges.

IV. CONCLUSION

In this system, we have investigated the challenge of drug traceability within pharmaceutical supply chains highlighting its significance especially to protect against counterfeit drugs. We have developed and evaluated a blockchain-based solution for the pharmaceutical supply chain to track and trace drugs in a decentralized manner. Specifically, our proposed solution leverages cryptographic fundamentals underlying blockchain technology to achieve tamper-proof logs of events within the supply chain and utilizes smart contracts within Ethereum blockchain to achieve automated recording of events that are accessible to all participating stakeholders.

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