A Survey on Application of Blockchain Technology in Drug Supply Chain Management

Abstract:

The drug supply chain is a critical component of the pharmaceutical industry, encompassing the complex process of manufacturing, distribution, and delivery of medications to patients. Ensuring the integrity, transparency, and security of this supply chain is essential to prevent counterfeit drugs, improve traceability, and enhance patient safety. Blockchain technology, with its inherent features of transparency, immutability, and decentralized consensus, has gained attention as a potential solution for addressing challenges in drug supply chain management.

This survey paper provides a comprehensive overview of the application of blockchain technology in drug supply chain management. We begin by introducing the key concepts of blockchain technology, highlighting its attributes that align with the requirements of the pharmaceutical supply chain. Subsequently, we explore various use cases and applications of blockchain in this domain.

Blockchain's ability to create an auditable and tamper-resistant record of each step in the drug supply chain helps combat counterfeiting by ensuring the authenticity of pharmaceutical products. The use of unique identifiers for each drug unit, recorded on a blockchain, enables real-time tracking and tracing of medications, thereby enhancing transparency and accountability. Smart contracts, self-executing code on the blockchain, can automate compliance checks, verification processes, and contractual agreements between different stakeholders in the supply chain.

**Existing System:**  
The pharmaceutical industry faces challenges in ensuring the integrity, traceability, and security of drugs throughout the supply chain. In response to these challenges, this study proposes the implementation of a Blockchain-based Drug Supply Chain Management System utilizing the SHA-256 hashing algorithm. This system aims to enhance transparency, reduce the risk of counterfeit drugs, and improve overall efficiency in the pharmaceutical supply chain.

The existing system leverages a decentralized blockchain architecture, incorporating smart contracts to automate and enforce agreements between stakeholders. Each transaction in the supply chain is recorded in blocks, and the SHA-256 hashing algorithm is applied to ensure the integrity and uniqueness of the data. Unique identifiers, such as serial numbers or barcodes, are assigned to drug batches, facilitating traceability and authentication.

Disadvantage:

Blockchain networks, especially public ones, may face scalability challenges as the number of transactions increases. This can lead to slower transaction processing times and increased costs. The scalability of the network must be carefully considered, especially in the context of a large and complex pharmaceutical supply chain.

Energy Consumption:

Blockchain networks that use Proof of Work (PoW), the consensus mechanism associated with SHA-256, can be energy-intensive. This may raise concerns about the environmental impact, particularly if the system scales significantly.

Complexity and Technical Expertise:

Implementing and maintaining a blockchain system, especially one utilizing a hashing algorithm like SHA-256, can be complex. Organizations may need to invest in technical expertise and resources to ensure the proper development, integration, and maintenance of the system.

Integration Challenges:

Integrating blockchain with existing systems and technologies within the pharmaceutical supply chain can be challenging. Legacy systems may not easily adapt to blockchain, requiring additional effort and resources for seamless integration.

**Proposed System:**

we have developed a web-based SCM platform for pharmaceutical organizations. It uses the Ethereum Blockchain technology. As removing the counterfeiting of drugs is a prior concern nowadays, we are primarily focused on them only. Because it affects the health of humans deadly. Firstly an administrator is authorized to assign different roles such as designer, regulator, manufacturer, distributor, and retailer. They are considered an integral part of the SCM and perform transactions privately. At each transaction data is stored in the Blockchain Ethereum network. The user, which is the consumer can trace the whole path of the medicine through its Id.This Process makes the tracing of the product easier thereby ensuring no counterfeit medicines in the pharmaceutical SCM. Since data is stored in a decentralized network of Blockchain, security is also achieved