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SECURING HEALTHCARE: A BLOCKCHAIN REVOLUTIONBASED FOR DRUG TRACEABILITY

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ABSTRACT:
The blockchain is generally defined as a decentralized system in which transactional or historical records are recorded, stored and maintained across a peer-to-peer network of personal computers called nodes. In other words, it's an immutable, public digital ledger which is a much akin to a database. The blockchain is indeed a powerful and disruptive technology that can cause a seismic shift in just about any industry.
A huge amount of data, generated by different applications in computer network, is growing up exponentially based on nonstop operational states. Such applications are generating an avalanche of information that is disruptive for predictable data processing and analytics functionality, which is perfectly handled by the cloud before explosion growth of Big Data. Blockchain technology alleviates the reliance on a centralized authority to certify information integrity and ownership, as well as mediate transactions and exchange of digital assets, while enabling secure and pseudo-anonymous transactions along with agreements directly between interacting parties. It possesses key properties, such as immutability, decentralization, and transparency that potentially address pressing issues in health-care, such as incomplete records at point of care and difficult access to patient's own health information. An efficient and effective healthcare system requires interoperability, which allows software apps and technology Platforms to communicate securely and seamlessly, exchange data, and use the exchanged data across health organizations and app vendors. Unfortunately, healthcare today suffers from fragmented data, delayed communications, and disparate workflow tools caused by the lack of interoperability. Blockchain offers the opportunity to enable access to longitudinal, complete, and tamper-aware medical records that are stored in fragmented systems in a secure and pseudo-anonymous fashion. The proposed work carried out blockchain implementation in distributed computing environment and it also provides the automatic recovery of invalid chain. Finally we focus our contribution part that is emergency medicine tracking system and give to valid patients. This also determines the impact of those security issues and possible solutions, providing future security-relevant directions to those responsible for designing, developing, and maintaining distributed systems.

Keywords:-
Blockchain Technology, Decentralization/ Decentralized System, Distributed Computing, Peer-to-Peer Network, Healthcare, etc.

INTRODUCTION

A blockchain system can be considered as a virtually incorruptible cryptographic database where critical medical information could be recorded. The system is maintained by a network of computers that is accessible to anyone running the software. Blockchain operates as a pseudo-anonymous system that has still privacy issue since all transactions are exposed to the public, even though it is tamper-proof in the sense of data-integrity. The access control of heterogeneous patient's healthcare records across multiple health institutions and devices needed to be carefully designed. Blockchain itself is not designed as the large-scale storage system. In the context healthcare, a decentralized storage solution would greatly complement the weakness of blockchain in the perspective.

The blockchain network as a decentralized system is more resilient in that there is no single-point attack or failure compare to centralized systems. However, since all the Bitcoin transactions are public and everybody has access, there already exist analytics tools that identify the participants in the network based on the transaction history. With popularity analytics, similarity or closeness among topics within large volume of data can be detected. Groups of items or topics can be system generated using closeness relationship formulation. As information flows among different nodes in Bitcoin network, Bitcoin transaction is slow due to the fact that information needs to be propagated across the network to synchronize the ledger replicas. The slow dissemination of information exposes a potential security hole for the malicious attacks. Some measures have been implemented to mitigate the number of the blockchain forks in the network by 50%. However, a long-term solution is still needed. Like any other networks, Bitcoin network is no exception when it comes to malicious attacks. One of the notable forms of attack against Bitcoin network topology is eclipsing attack by using information propagation knowledge. Bitcoin peer-to-peer network topology can be inferred and utilized by malicious attackers to perform precise attacks such as eclipsing attack. By observing the flooding process of the information flow, a flooding networks topology can be inferred. A network topology inference method has been proposed along with a proof of concept in real network. The critical players of Bitcoin transactions can be identified use various network centrality metrics.

Blockchain might re- place conventional methods of keeping track of valuable information such as con- tracts, intellectual-property rights, and corporate accountings. Personal healthcare records need to be protected with the highest standard. With the increasing number of data breach incidents in the past several years, the awareness of the general public about the personal data privacy will continue to increasing. The necessity for data privacy will grow stronger with an increasing number of services and device collecting our personal data associated with our personal identity. There are techniques that obfuscate the linking of pseudonymous address and the real person such as Coin Join.

PROBLEM DEFINITION

In the proposed research work to design and implement a system for health care data, where user can store all information in single blockchain without any Trusted Third Party (TTP) in fog computing environment. The system also carried out data integrity, confidentiality as well as eliminates the inconsistency for end user. Alsowe focus our contribution part that is emergency medicine tracking system and give to valid patients.

LITERATURE SURVEY

DR. A MANJULA, ASSOCIATE PROFESSOR [1], Healthcare supply chains are critical backbone to services and vital for everyday life. The inherent complexity of such systems can introduce impurities including inaccurate information, lack of transparency and limited data provenance. A counterfeit drug is one consequence of such limitations within existing supply chains which not only has serious adverse impact on human health but also causes severe economic loss to the healthcare industry. Therein, an end-to-end product tracking system across the pharmaceutical supply chain is established to ensure product safety and eliminating counterfeits. Most existing track and trace systems are centralized leading to data privacy, transparency and authenticity issues in healthcare supply chains. In this paper, we present an Ethereum block chain-based approach associated with smart contracts and decentralized off-chain storage for efficient product traceability in the healthcare supply chain. The smart contract guarantees data provenance, eliminates the need for intermediaries and provides a secure, immutable history of transactions to all stakeholders.

SHAIK. AYESHA BEGUM [2], The goal of a drug traceability system is to track or trace where a drug has been and where it has gone along the drug supply chain, which is critical for public drug security and pharmaceutical company business. Traditional centralized server client technical solutions have failed to meet expectations in terms of data integrity, privacy, system resilience, and adaptability. For drug traceability, we've proposed a totally new blockchain system. This solution is

more secure and scalable than other options currently available. Furthermore, the suggested system can prune its storage effectively, resulting in a robust and usable blockchain storage solution.

SARMISTHA SARNA GOMASTAA, ADITI DHALIA [3], Over the last decade, pharmaceutical businesses have battled to standardize product traceability across the supply chain process, enabling counterfeiters to enter the market with counterfeit pharmaceuticals. As a result, an end-to-end product tracking system is crucial for ensuring product safety and eliminating counterfeit products across the pharmaceutical supply chain. In this paper, we introduce PharmaChain, a decentralized hyperledger fabric framework that leverages confidentiality, accountability, and interoperability. This system enables on-chain and off-chain storage for secured, rapid transactions, along with smart contracts establishing data provenance. To demonstrate security, we have provided double signing through the elliptic curve digital signature algorithm, hash data encryption, and 33% node attack. The purpose of this suggested framework is to engage particular governance disciplines to assess its effectiveness in improving drug traceability across the pharmaceutical supply chain to preserve public health by preventing counterfeit pharmaceuticals.

JAYENDRA S. JADHAV , JYOTI DESHMUKH [4], Technological acclimatization in today's healthcare industry is a subject of new inventions. The worldwide Covid-19 epidemic has led to increase in the use of technology for healthcare supply chain, patient data man agement, and claims settlement. Data management in healthcare industry is a complex structure where multiple organizations provide proper supply chain services in day to day life. Improper data management disrupts the supply chain, which has a long-term impact on the healthcare sector. Various issues in the present supply chain must be addressed. Blockchain-based crypto-currencies are well-known nowadays for their ability to create safe and traceable solutions. With the growing use of crypto-currencies, it also governs new range of applications and opportunities, including healthcare applications. Blockchain-based solutions are effective in the health sector for secure data retrieval and storage, resulting in more effectual product creation and tracking. Such system can provide data provenance, promotes genuine healthcare sector demands, and ensures the immutability of multi-direction transactions. In this study, we contribute a thorough overview of the literature on how Blockchain technology is changing the way healthcare supply chains operate. We looked at 61 papers from 2019 to 2021 that highlighted various difficulties with the traditional healthcare supply chain. We scrutinized different barriers and opportunity of Blockchain-based healthcare supply chain at the end of the research.

YASSINE ZNAKI, WAFAA ENNEFFAH [5], The pharmaceutical supply chain management is facing numerous challenges that had led in the past and still today to issues in the distribution of drugs and their availability in the market. When interviewed, stakeholders affirm the issue does not involve the scarcity or lack of production, but indeed inventory allocation. The complexity of the drug supply chain fabric and the critical nature of these synergies' request for a holistic solution that should be able to assure both the validity of the data and the durability of the records. Blockchain appeals to be the right solution for this problem. In this paper, we will be conducting a quantitative survey on the use of blockchain technology in the proper management of pharmaceutical supply chain. We will be pointing out the main current challenges such approaches face, and finally, we will be projecting the on the feasibility and underlining the applicability to the case of a pharmaceutical supply chain in Morocco.

EXISTING SYSTEM

In today's world, the healthcare industry relies on extensive supply chains that cross organizational and geographic boundaries. 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. A dependable end-to-end track and trace system for pharmaceutical supply chains has thus been emphasized in prior study. An end-to-end pharmaceutical supply chain tracking system is vital to

assure product safety and eradicate counterfeits. Most modern track and trace systems in healthcare supply chains are centralized, posing privacy, transparency, and authenticity issues.

PROPOSED SYSTEM

We are developing a Drug Traceability System based on Blockchain Technology that will be used to track drugs throughout the healthcare supply chain. There are numerous stakeholders in the healthcare supply chain, including manufacturers, suppliers, distributors, pharmacies, hospitals, and so on. While supplying the drug from the manufacturer to the customer or patient, there is a possibility that one of the stakeholders will mislabel or counterfeit the drug. To avoid this, we propose our solution. Another aspect to consider when examining flaws in the healthcare supply-chain is the possibility that one of the stakeholders stocks the drugs for an extended period of time. Waiting for demand to rise before selling the drugs. This drug stockpiling has an impact on the treatment of patients in an emergency. To avoid this, we are gathering information on how many drugs each stakeholder has and when he is supposed to supply the other stakeholder. To achieve all of the above, we will use the blockchain technology which is a distributed ledger used to store transactions between the parties in the form of blocks.

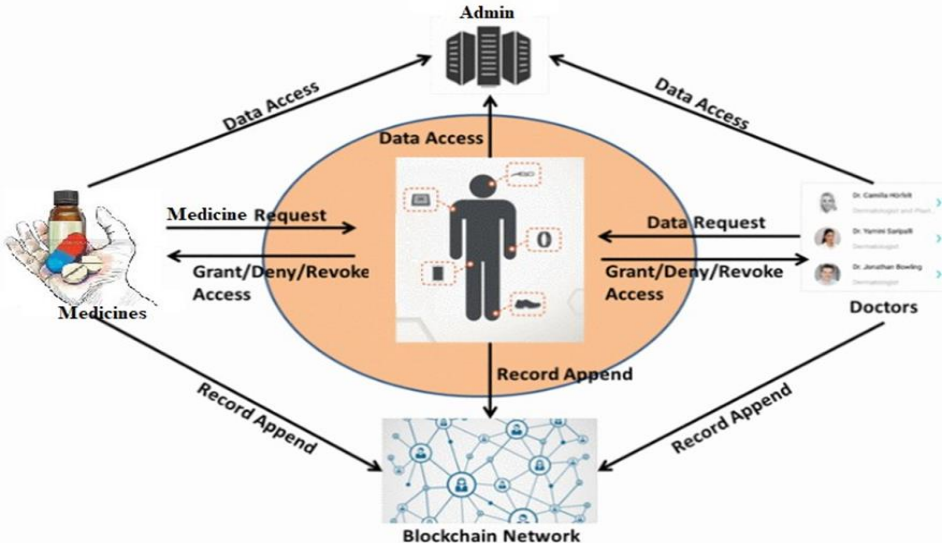

Figure1:SystemArchitecture

ALGORITHM

Algorithm 1 : Hash Generation

- Input : Genesis block, Previous hash, data d,
- Output : Generated hash H according to given data
- Step 1 : Input data as d
- Step 2 : Apply SHA 256 from SHA family
- Step 3 : CurrentHash= SHA256(d)
- Step 4 : Retrun CurrentHash

Algorithm 2: Protocol for Peer Verification

- Input : User Transaction query, Current Node Chain CNode[chain],Other Remaining Nodes blockchain NodesChain[Nodeid] [chain],
- Output : Recover if any chain is invalid else execute current query
- Step 1 : User generate the any transaction DDL, DML or DCL query
- Step 2 : Get current server blockchainCchain ⇓Cnode[Chain]
- Step 3 : For each

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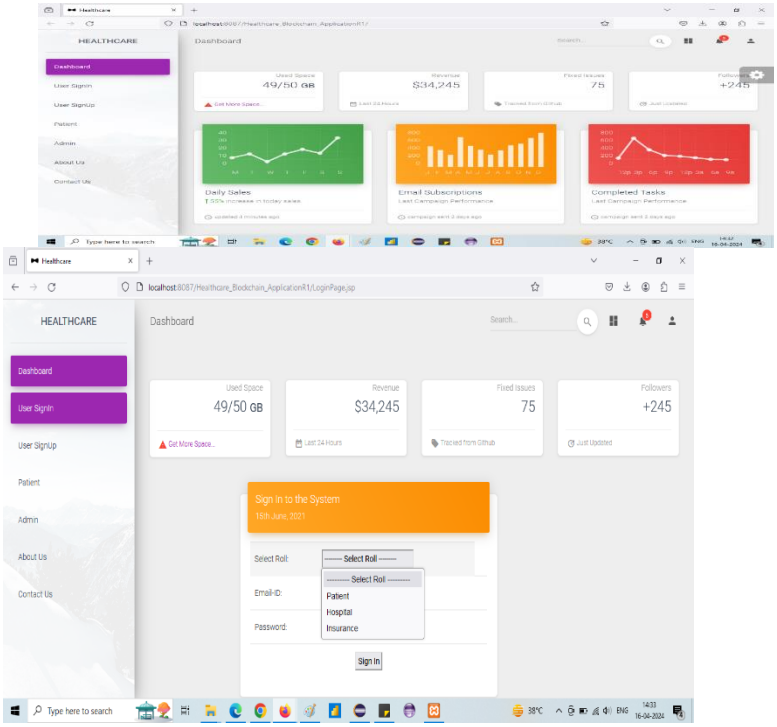
- End for
- Step 4 : Foreach (read I into NodeChain)If (!.equals NodeChain[i] with (Cchain))Flag 1
- Else Continue Commit query
- Step 5 : if (Flag == 1)
- Count = SimilaryNodesBlockchian()
- Step 6 : Caculate the majority of server Recover invalid blockchin from specific node
- Step 7: End ifEnd for
- End for

$$NodesChain\ [Nodeid, Chain] \sum_{i=1}^{n} (GetChain)$$

Mining Algorithm for valid hash creation

- Input : Hash Validation Policy P[], Current Hash Values hash Val
- Output : Valid hash
- Step 1 : System generate the hash Val for ith transaction using Algorithm 1
- Step 2 : if (hash Val.valid with P[])Valid
- hash
- Flag =1Else
- Flag=0
- Mine again randomly
- Step 3 : Return valid hash when flag=1

Implementation Stage
Screenshots Output



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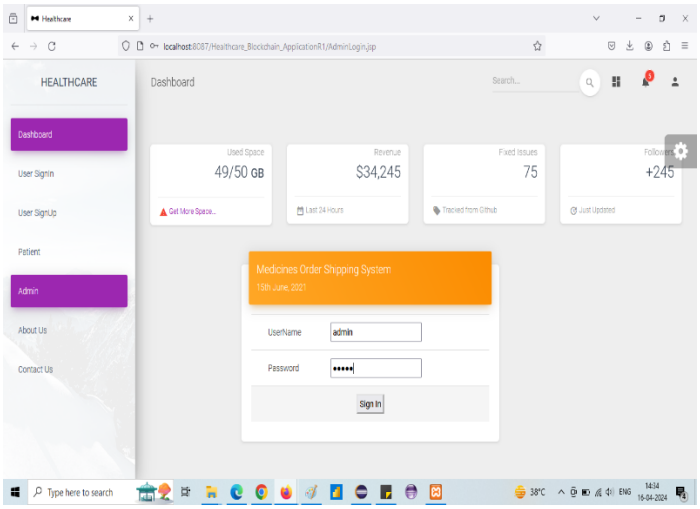

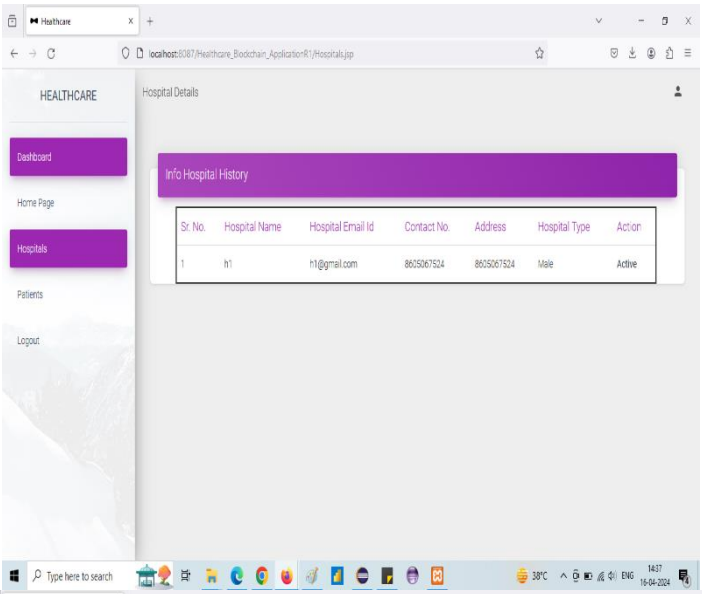

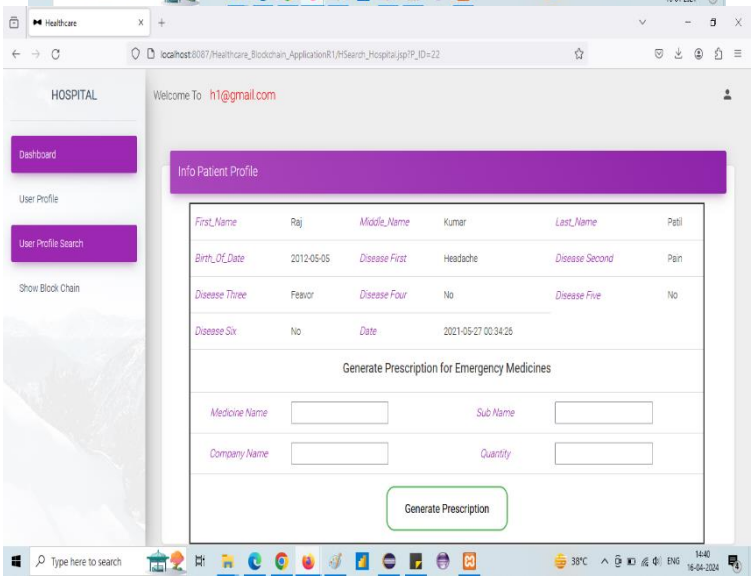

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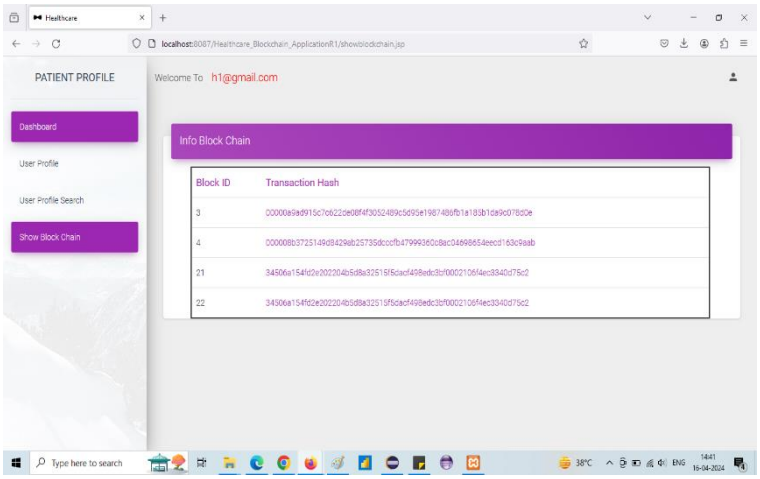

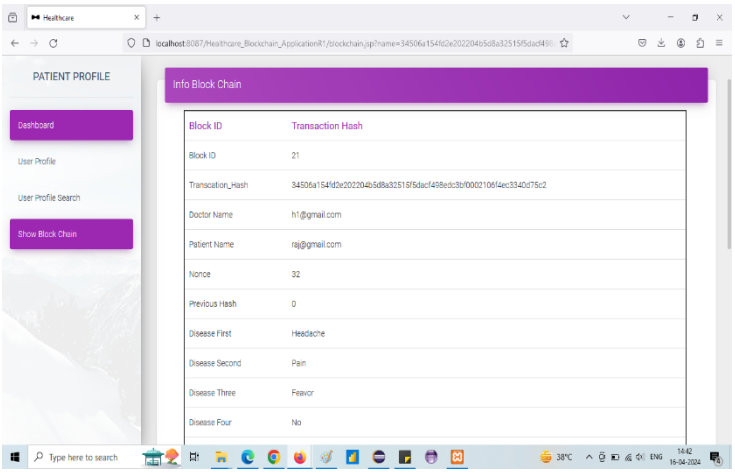

CONCLUSION

In conclusion,integrating blockchain technology into healthcare for drug traceability has the potential to revolutionize the industry.By enhancing transparency,reducing counterfeit drug,improving regulatory compliance ,and steamlining supply chain processes,blockchain can significantly improve patient safety and overall healthcare outcomes.Embracing this innovation could lead to a more efficient and secure healthcare system, benefiting both patients and stakeholders alike**.**

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