IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Smart Healthcare System Using Blockchain

Chalak Roshani Devanand
Department of Computer Engineering
Pune, Maharashtra

Kokate Vishal Dnyanoba
Department of Computer Engineering
Pune, Maharashtra

Tamboli Nikita Balasaheb
Department of Computer Engineering
Pune, Maharashtra

Dr. Shubhangi Gunjal
Assistant Professor
Department of Computer Engineering
Pune, Maharashtra

Abstract: An electronic health record is a collection of a patient's medical records that can be accessed at any time and from any location by authorized personnel. The use of e-healthcare has led to improved social and health outcomes, as well as a reduction in medical errors. However, a major obstacle to the advancement of e-healthcare is the security issues related to patient data storage in IT frameworks. Blockchain technology has emerged as a potential solution to this issue and may revolutionize the healthcare industry. Sharing medical records can be time-consuming because the same person's records may be kept in several locations, increasing the likelihood of duplication in the system. Usually, producing fake reports requires altering or hacking the data. The primary cause of this is that patients are not allowed to view their data. This work establishes the groundwork for a blockchain-based strategy that includes smart contracts, context based access control, a public ledger, and a private ledger to securely manage patient data. The suggested architecture ensures reliable access to patient data, safe storage, and interoperability. Additionally, the proposed blockchain-based framework provides an efficient and trustworthy means of managing complex medical procedures. The study also outlines potential uses for blockchain technology in the healthcare industry, such as facilitating secure and anonymous sharing of health data for research purposes.

Keywords – Electronic Health Records, Blockchain Technology, Healthcare system, Security, Smart Contracts

I. INTRODUCTION

A blockchain-based healthcare system focused on medical data exchange and consent management can revolutionize the way patient records are shared and controlled. The system would provide patients with full ownership and control over their medical data, allowing them to securely share specific records with healthcare providers or insurance companies through smart contracts. Blockchain's transparency ensures that every access to the patient's records is logged immutably, providing a complete audit trail. By utilizing decentralized storage and identity verification, patients can maintain privacy while ensuring that only authorized individuals access

their data. The platform would also streamline data exchange between healthcare providers, enabling better interoperability and reducing the need for repeated tests or treatments, which in turn improves patient outcomes and lowers costs. Additionally, smart contracts can automate the insurance claims process, reducing paperwork and speeding up reimbursements. This blockchain solution not only enhances data privacy and security, but it also detecting fraud by preventing unauthorized access or manipulation of patient medical records.

II. OBJECTIVES

A. **Enhance data security:** Blockchain's distributed ledger ensures that any changes to the data are recorded and verifiable, making it difficult for unauthorized individuals to alter patient records.

B. **Maintaining data authenticity:** The cryptographic hash function used in blockchain creates a unique digital fingerprint for each data block, ensuring that data remains authentic and unaltered.

C. **Enhanced Data Privacy:** using access control blockchain can enable granular control over who can access and share patient data, preventing unauthorized disclosure.

D. **Improved Data Sharing and Interoperability:** Secure data exchange using blockchain can facilitate secure and efficient data sharing between healthcare providers, researchers, and patients.

III. MOTIVATION

A. **Improving Data Security and Privacy:** Healthcare organizations often deal with sensitive patient data, making them prime targets for cyberattacks. Blockchain's decentralized and immutable nature can help prevent data breaches and unauthorized access.

B. **Enhancing Data Interoperability:** Healthcare data is often difficult to share and analyze across different systems. Blockchain can create a standardized framework for data exchange, improving interoperability and enabling better care coordination.

C. **Empowering Patients with Control over their data:** Blockchain can give patients greater control over their own health data, allowing them to share information with authorized parties as needed.

D. **Building Trust Among Stakeholders:** Blockchain can establish trust among healthcare stakeholders by providing a transparent and verifiable record of data transactions.

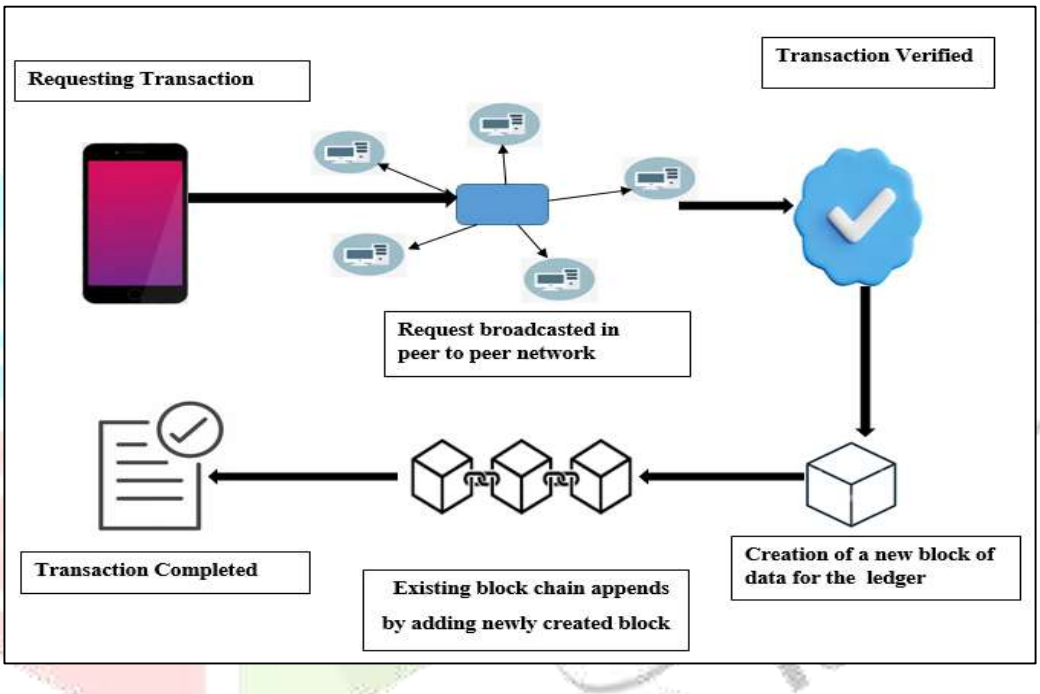
IV. ARCHITECTURE

The architecture of a blockchain-based smart healthcare system is designed to provide a secure, decentralized, and interoperable environment for managing patient data. By leveraging the benefits of blockchain technology and integrating it with other healthcare systems, such as electronic health records, these systems can improve the quality and efficiency of healthcare delivery.

To understand the blockchain architecture let us use the below figure that explains the whole process of a transaction being send from a user on the blockchain network. The diagram represent the process of a blockchain transaction:

1) **Requesting Transaction:** The process begins when a user requests a transaction. This can be any form of data exchange, such as a cryptocurrency payment or a smart contract execution.

2) **Request Broadcasted in Peer-to-Peer Network:** The transaction request is sent to a peer-to-peer network, composed of multiple nodes. Each node in the network receives the transaction request. This decentralized network of nodes helps ensure the integrity of the process, as no single entity controls it.



3) **Transaction Verification:** The nodes in the network verify the transaction. Verification involves checking the validity of the transaction, such as confirming that the user has sufficient funds or that the data is correct and complies with network rules. This is typically done through a consensus mechanism like Proof of Work (PoW) or Proof of Stake (PoS), depending on the blockchain protocol.

4) **Creation of a New Block of Data for the Ledger:** Once the transaction is verified, it is grouped with other verified transactions to form a "block". This new block is created and is ready to be added to the blockchain.

5) **Existing Blockchain Appends the New Block:** The newly created block is then appended to the existing blockchain. This chain of blocks is immutable and serves as a permanent ledger of all transactions on the network.

6) **Transaction Completed:** After the block has been added to the blockchain, the transaction is considered complete. The decentralized ledger is updated, and the status of the transaction can be verified by anyone on the network. In summary, this diagram outlines how a transaction request is broadcasted, verified, added to the blockchain, and then confirmed as completed in a peer-to-peer blockchain network.

V. PROBLEM STATEMENT

The modern healthcare system faces significant challenges in data security, interoperability and transparency. Patient medical records are often fragmented across different providers, leading to inefficiencies, duplication of tests, delayed diagnoses and compromised care.

VI. EXISTING SYSTEM

In the existing system, companies most prevalent concerns about the information carried from one organization to another are maintaining trust and security. There is a significant possibility that a lack of trust will develop because information may be inputted at any point along the chain of communication. This possibility is of almost significance in medicine because of the sensitive nature of the information involved concerns could be warranted when several providers have different copies of the same health information that has not been verified. This might happen when the information has not been checked for accuracy.

VII. PROPOSED SYSTEM

The proposed system stores medical data like prescriptions, patient medical reports and emergency data which could encompass data regarding medical history of the patients, the medicine details in database for future use. This data could be made available whenever needed by the patient & doctor through their login. In this system blockchain based cryptographic algorithm methods and consensus algorithms are used for securing the stored data from unauthorized access.

Blockchain-based medical health record sharing application in which user represents the end-user of the application, likely a patient or healthcare provider. Each user is associated with a public key, which is used to verify their identity and authorize access to their health records. This is a secret key known only to the user and is used to sign transactions and prove ownership of their health records. The system represents the core of the application, responsible for managing user interactions, accessing and updating health records, and interacting with the blockchain. This entity is responsible for assigning roles to system users and managing the overall system. This contains information about different roles within the system, such as patient, doctor, and administrator. These are the various operations that can be performed within the system, such as viewing health records, requesting access, and performing transactions. The system can deny access to a user if they

do not have the appropriate permissions or if their request is invalid. Blockchain is the underlying technology that provides security, transparency, and immutability to the system. A transaction represents an action performed on the blockchain, such as creating, updating, or deleting a health record. The system interacts with the blockchain to perform these transactions. The blockchain network verifies and confirms the transaction, ensuring its validity and adding it to the permanent record.

VIII. RESULTS

A blockchain-based smart healthcare system could revolutionize the medical field by offering a decentralized, safe, secure and compatible environment for patient medical data management. These technologies can greatly raise the standard and efficiency of healthcare delivery by strengthening patient control, encouraging data interoperability, boosting data security, expediting clinical trials, and improving healthcare outcomes.

IX. CONCLUSION

The proposed blockchain-based healthcare system architecture offers a secure, decentralized, and transparent solution for managing medical health records, enabling secure data sharing, and improving healthcare outcomes.

X. ACKNOWLEDGMENT

We would like to convey our heartfelt gratitude towards the Department of Computer Engineering at Jaihind College of Engineering, Kuran for providing us with every tool and resource possible, assistance, and guidance necessary to complete this research.

XI. REFERENCES

[1] Anggraini, I. D., Pratama, M. F., Abdullah, A. G. (2019). Smart healthcare using blockchain: A systematic literature review.

Journal of Physics: Conference Series, 1231(1),012064

[2] M. Jain, D. Pandey, and K. K. Sharma, “A Granular Approach to Secure the Privacy of electronic Health Records Through

Blockchain Technology,” Int. J. Distrib. Syst. Technol., vol. 13, no.8, 2022, doi: 10.4018/IJDST.307899.

[3] Blockchain and Health IT: Algorithms, Privacy, and Data. Prepared by: Allison Ackerman Shrier, Anne Chang, Nadia Diakun-

thibault, Luca Forni, Fernando Landa, Jerry Mayo, Raul van Riezen.

[4] M. Jain, D. Pandey, and K. K. Sharma, “A Granular Access-Based Blockchain System to Prevent Fraudulent Activities in

Medical Health Records," Lect. Notes Data Eng. Commun. Technol., vol. 106, pp. 635–645, 2022, doi: 10.1007/978-981-16-

8403-658.

[5] Nguyen, D.C. Pathirana, P. N. Ding, M. Seneviratne, 2019. Blockchain for secure ehr sharing of mobile cloud based e health

systems. IEEE Access.

[6] Zheng, X. Mukkamala, R.R. , Vatrapu, R. , Ordieres Mere, J. , 2018. Blockchain-based personal health data sharing system using cloud storage. In: 2018 IEEE 20th International Conference on e-Health Networking, Applications and Services (Healthcom). IEEE, pp. 1–6.

[7] D. Spatar, O. Kok, N. Basoglu, and T. Daim, "Adoption factors of electronic health record systems," Technol. Soc., vol. 58, no. February, p. 101144, 2019.

[8] W. W. Koczkodaj, M. Mazurek, D. Strzałka, A. Wolny-Dominiak, and M. Woodbury Smith, "Electronic Health Record Breaches as Social Indicators," Soc. Indic. Res., vol. 141, no. 2, pp. 861–871, 2019.

[9] G. Jetley and H. Zhang, "Electronic health records in IS research: Quality issues, essential thresholds and remedial actions," Decis. Support Syst., pp. 113–137, 2019.

[10] M. Reisman, "EHRs: The Challenge of Making Electronic Data Usable and Interoperable.," P T, vol. 42, no. 9, pp. 572– 575, 2017.

[11] Vidhya Ramani, Tanesh Kumar, An Braeken, Madhusanka Liyanage, Mika Ylianttila, "Secure and Efficient Data Accessibility in Blockchain based Healthcare Systems", December 2018 DOI: 10.1109/GLOCOM.2018.8647221.

[12] Jingwei Liu_, Xiaolu Li_, Lin Yey, Hongli Zhangy, Xiaojiang Duz, and Mohsen Guizanix, "BPDS: A Blockchain based Privacy-Preserving Data Sharing for Electronic Medical Records", 978-1-5386-4727-1/18/$31.00 ©2018 IEEE.

[13] HYUNIL KIM, SEUNG-HYUN KIM, JUNG YEON HWANG, AND CHANGHO SEO." Efficient Privacy-Preserving Machine Learning for Blockchain Network." IEEE Access, vol. 7, pp. 136481–136495, 2019.