BLOCKCHAIN BASED PATIENT'S RECORD MANAGEMENT SYSTEM

[1]Dr.K.Rohith Kumar,[2]A.Yuktha Reddy,[3]B.Nikhitha,[4]A.Himanth Sai Kumar,[5]P.Aneesh Reddy
[1]Associate Professor,Sreyas Institute Of Engineering And Technology ,Department Of Computer Science And Engineering.
[2,3,4,5]Students,Sreyas Institute Of Engineering And Technology ,Department Of Computer Science And Engineering.

ABSTRACT

The Blockchain Based Patient Medical Record Management System represents an innovative approach to addressing the critical challenges faced by traditional Electronic Health Records (EHRs), such as poor interoperability and unresolved privacy issues. By leveraging blockchain technology's decentralized structure and robust encryption mechanisms, this system aims to enhance the efficiency, security, and overall management of patient medical records. Key benefits include decentralization, where data is distributed throughout the network rather than stored in a central location, and enhanced data transparency and security through encryption methods like the SHA-256 algorithm. This project underscores the transformative potential of blockchain technology in revolutionizing patient medical record management. By integrating blockchain with EHR systems, we can achieve a more secure, efficient, and patient centred approach to healthcare data management, ultimately improving the quality of care and patient outcomes.

KEYWORDS: *EHR, Interoperability, Decentralized, SHA-256, Encryption, Robust.*

I.INTRODUCTION

The advances in AI, especially in the field of machinelearning and deep learning opened into several outstanding innovations in the field of healthcare especially in the field of Radiology. Due to Covid-19 pandemic, lot of use cases using AI model has been developed and provided promising result. Radiological images such as X-ray images, Computed Tomography (CT) images were used for detection of various inflammatory lung diseases. The block-chain based model gives the healthcare market a new dimension by considering safety aspects for data integrity and developed standardized and formalized contracts for accessing the data. Especially when we work with the electronic health record (HER), which stores data with different workflow it is difficult to know the identity of the person who does what and when the work has been

performed. Block chain- based model puts a time stamp on every workflow and also putan identity to it and the copies are distributed to each participated node in the network. So, if there is modification orupdate happened in any node, it is equally distributed to all the node and can be visible to everybody who is accessing it anywhere in the world. The model ensures that the data integrity is maintained between the end points without any human intervention. Federated Learning (FL) is a technique based on machine learning which trains the algorithm across the edge devices in adecentralized way without leaking the privacy. The AI model developed trained inside the device based the user input data and then the data sent to the central server for aggregation of allthe data and inside the central server the AI model get Updated and the improved model again sent back to the device. In FL, training of the algorithm has been done collaboratively without sharing the private information. In the beginning this method was used for the use cases related to edge devices and mobile devices. Recently FL has gained a lot of traction in the field of healthcare. It was found that the accuracy of the model trained with FL performed better compared to the modeldeveloped at the isolated atmospheres.

II.EXISTING SYSTEM

The artificial intelligence-based technique already providing promising result in detecting various critical disease using medical images. Mainly the role of the AI based technique in diagnosis of various diseases using medical ima ges is to act as a decision support system for the doctors so that the decision taking process will be faster and at the same time maintaining the precision and accuracy. One of the best techniques is deep learning that has been successful in detecting various diseases using medical images. Sekeroglu and Ozsahin proposed an approach that can detect Covid-19 based on chest X-ray using Convolutional Neural Network.

III.PROPOSED SYSTEM

The blockchain service allows the users (researchers, clinicians, institutions, etc) to access the data by providing a small transaction fee. The non-repudiation and patient's private data are guaranteed. By using the blockchain system, we can know who is accessing the data, when the data was requested, for what reasons. The data access mechanism is described as follow:

1) The user creates a user account on the platform

2) The user requests access to a certain resource/asset

3) The smart contract checks if the resource is available in the ledger.

If the requested data is available, the smart contract reserves it and notifies the user. The user checks the requirements to access the data and signs the contract. Once the validation is done the user will be charged according to the smart contract'srules. Accordingly, a usage token is issued to the user.

The steps of the token usage flow are as follows:

1) The buyer or user logs in theplatform using their credentials.

2) The buyer requests the data using their provided token.

3)The ML engine requests the usagerights to the ledger before proceeding.

4) If the buyeracknowledged by the system, the blockchain replies with the hash of the requested data.

IV.LITERATURE SURVEY

1. Blockchain for Secure and Scalable Electronic Health Records , Xia, Q., Sifah, E. B., Asamoah, D. A., Gao, J., Du, X., & Guizani, M. IEEE Transactions on Information Forensics and Security, 2017. This paper explores the integration of blockchain technology into electronic health record (EHR) systems to enhance security and scalability. The authors propose a decentralized architecture that ensures tamper-resistant data storage while enabling efficient data sharing among healthcare providers. The study highlights privacy-preserving mechanisms and discusses the trade-offs between scalability and security when adopting blockchain in medical applications.

2. A Decentralized Blockchain-Based Access Control Framework for EHR Systems ,Yue, X., Wang, H., Jin, D., Li, M., & Jiang, W. IEEE Journal of Biomedical and Health Informatics, 2018. The paper presents an access control model leveraging blockchain for EHR management. It introduces smart contracts to regulate access permissions dynamically while ensuring data integrity. The proposed framework enhances patient control over their medical records, allowing fine-grained access policies. The study also examines computational overhead and practical implementation challenges.

3. MedRec: Using Blockchain for Medical Data Management and Exchange ,Azaria, A., Ekblaw, A., Vieira, T., & Lippman, A. IEEE Open & Big Data Conference, 2016. MedRec is

a pioneering blockchain-based system designed for medical record management. It utilizes Ethereum smart contracts to facilitate secure and efficient data sharing between healthcare providers and patients. The study evaluates MedRec's potential for improving interoperability in health information systems while maintaining patient data privacy.

4. Privacy-Preserving Health Data Sharing Using Blockchain and Federated Learning, Shrestha, R., Vassilev, A., & Williams, M. Future Generation Computer Systems, 2020. This research integrates blockchain with federated learning to create a decentralized and privacy-preserving framework for health data sharing. It addresses concerns related to data ownership, security, and regulatory compliance. The paper highlights how blockchain's immutable ledger can be used to maintain audit trails for medical data while ensuring compliance with HIPAA and GDPR regulations.

5. Blockchain and AI for Healthcare: A Systematic Review, Tanwar, S., Parekh, K., & Evans, R. Journal of Healthcare Informatics Research, 2021. This review article explores the intersection of blockchain and artificial intelligence (AI) in healthcare applications, particularly in patient record management. It discusses AIdriven blockchain frameworks for anomaly detection, predictive analytics, and fraud prevention in healthcare systems. The study provides a comparative analysis of various blockchain platforms and their suitability for medical applications.

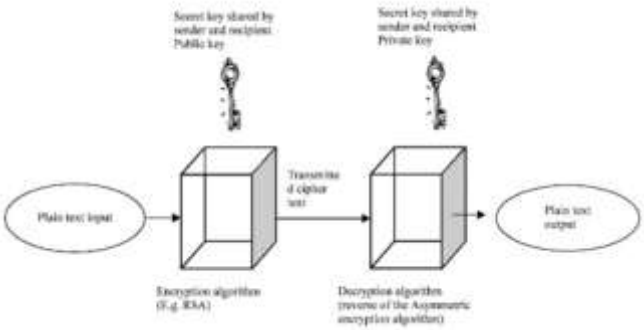


Fig1: system architecture

A system architecture or systems architecture is a conceptual model that defines the structure, behaviour, and various views of a system. An architecture description serves as a formal representation of a system, organized to support reasoning about its structures and behaviours.

3-Tier Architecture:

The three-tier software architecture, which emerged in the 1990s, was developed to address the limitations of the two-tier architecture. In this model, the third tier, known as the middle tier server, sits between the user interface (client) and the data management (server) components. This middle tier is crucial for process management, where business logic and rules are executed. It allows

for accommodating hundreds of users, as opposed to the two-tier architecture, which typically supports only around 100 users. The middle tier provides essential functions such as queuing, application execution, and database staging. The three-tier architecture is particularly useful when an effective distributed client/server design is required. Compared to the two-tier architecture, it offers increased performance, flexibility, maintainability, reusability, and scalability. Additionally, it hides the complexities of distributed processing from users, making it a popular choice for Internet applications and net-centric information systems.

V.IMPLEMENTATION

Logical Design

The logical design of a system pertains to an abstract representation of the data flows, inputs and outputs of the system. This is often conducted via modeling, using an over abstract (and sometimes graphical) model of the actual system. In the context of systems design are included. Logical design includes ER Diagrams i.e. Entity Relationship Diagrams

Physical Design

The physical design relates to the actual input and output processes of the system. This is laid down in terms of how data is input into a system, how it is verified / authenticated, how it is processed, and how it is displayed as output. In Physical design, following requirements about the system are decided.

1. Input requirement
2. Output requirements
3. Storage requirements
4. Processing requirements
5. System control and backup recovery

Put another way, the physical portion of systems design can generally be broken down into three sub-tasks:

1. User Interface Design
2. Data Design
3. Process Design

User Interface Design is concerned with how users add information to the system and with how the system presents information back to them. Data Design is concerned with how the data is represented and stored within the system. Finally, Process Design is concerned with how data moves through the system, and with how and where it is validated, secured and/or transformed as it flows into, through and out of the system. At the end of the systems design phase, documentation describing the three sub-tasks is produced and made available for use in the next phase. Physical design, in this context, does not refer to the tangible physical design of an

information system. To use an analogy, a personal computer's physical design involves input via a keyboard, processing within the CPU, and output via a monitor, printer, etc. It would not concern the actual layout of the tangible hardware, which for a PC would be a monitor, CPU, motherboard, hard drive, modems, video/graphics cards, USB slots, etc. It involves a detailed design of a user and a product database structure processor and a control processor. The H/S personal specification is developed for the proposed system.

Input Design

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

• What data should be given as input?

• How the data should be arranged or coded?

• The dialog to guide the operating personnel in providing input.

• Methods for preparing input validations and steps to follow when error occur.

Objectives

Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities. When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow

Output Design

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

a) Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

b) Select methods for presenting information.

c) Create document, report, or other formats that contain information produced by the system.

VI.CONCLUSION

A solution based on blockchain and AI Federated learning has been proposed to protect and share safely the patient's healthcare data. After analysing the potentials of combining blockchain and AI, we realized that the proposed solution would help to build robust models and share them without being compromised. However, the application wasn't developed and tested, yet this solution is indeed promising. In the future, our proposed framework will be implemented and tested in a real-world environment and its effectiveness will be studied more in detail. A blockchain-based patient record management system has the potential to revolutionize healthcare by ensuring data security, transparency, and patient control. By utilizing blockchain's decentralized and immutable nature, such systems provide a robust framework for managing sensitive healthcare data. This technology addresses key challenges in healthcare, such as fragmented data storage, inefficient record-keeping processes, and the lack of interoperability between healthcare providers. The primary advantage of a blockchain-based system is enhanced data security. Blockchain ensures that patient records are tamper-proof and can only be accessed by authorized individuals, providing a high level of privacy and reducing the risk of data breaches. Additionally, smart contracts

can automate processes like patient consent management and insurance claims, reducing administrative burden and improving efficiency. Another significant benefit is the interoperability between healthcare institutions. A blockchain platform allows secure, seamless data sharing across hospitals, clinics, labs, and insurance providers, breaking down data silos and improving collaboration. With real-time updates, healthcare professionals can access the most up-to-date patient information, leading to better decision-making and outcomes, especially in emergencies.

VI.REFERENCES

[1] Azaria, A., Ekblaw, A., Vieira, T., & Lippman, A. (2016). MedRec: Using blockchain for medical data access and permission management. *2016 2nd International Conference on Open and Big Data (OBD)*, pp. 25-30.

[2] Zhang, P., White, J., Schmidt, D.C., Lenz, G., & Rosenbloom, S.T. (2018). FHIRChain: Applying blockchain to securely and scalably share clinical data. *Computers and Structures*, 10(2), pp. 1-7.

[3] Ivan, D. (2016). Moving toward a blockchain-based method for the secure storage of patient records. *ONC Blockchain Challenge*, pp. 1-7.

[4] Roehrs, A., da Costa, C.A., da Rosa Righi, R., & de Oliveira, K.S.F. (2019). Personal health records: A systematic literature review. *Journal of Medical Systems*, 43(4), pp. 1-14.

[5] Wang, H., & Song, Y. (2018). Secure cloud-based EHR system using attribute-based Crypto system and blockchain. *Journal of Medical Systems*, 42(8), pp. 1-9.

[6] Tandon, A., Dhir, A., Islam, N., & Mäntymäki, M. (2020). Blockchain in healthcare: A systematic literature review, synthesizing framework and future research agenda. *Computers in Industry*, 122, p. 103290.

[7] Yue, X., Wang, H., Jin, D., Li, M., & Jiang, W. (2016). Healthcare data gateways: Found healthcare intelligence on blockchain with novel privacy risk control. *Journal of Medical Systems*, 40(10), pp. 1-8.

[8] Esposito, C., De Santis, A., Tortora, G., Chang, H., & Choo, K.K.R. (2018). Blockchain: A panacea for healthcare cloud-based data security and privacy? *IEEE Cloud Computing*, 5(1), pp. 31-37.[9] Zyskind, G., Nathan, O., & Pentland, A. (2015). Decentralizing privacy: Using blockchain to protect personal data. *2015 IEEE Security and Privacy Workshops (SPW)*, pp. 180-184.

[10] Griggs, K.N., Ossipova, O., Kohlios, C.P., Baccarini, A.N., Howson,

E.A., & Hayajneh, T. (2018). Healthcare blockchain system using smart contracts for secure automated remote patient monitoring. *Journal of Medical Systems*, 42(7), pp. 1-7.

[11] Liang, X., Zhao, J., Shetty, S., Liu, J., & Li, D. (2017). Integrating blockchain for data sharing and collaboration in mobile healthcare applications. *2017 IEEE 28th Annual International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC)*, pp. 1-5.

[12] Dubovitskaya, A., Xu, Z., Ryu, S., Schumacher, M., & Wang, F. (2018). Secure and trustable electronic medical records sharing using blockchain. *AMIA Annual Symposium Proceedings*, pp. 650-659.

[13] Hua, X., Hu, C., Luo, X., & Shi, X. (2019). Blockchain-based patient medical record sharing and protection. *2019 IEEE International Conference on Artificial Intelligence and Computer Applications (ICAICA)*, pp. 135-139.

[14] Chen, Y., Ding, S., Xu, Z., Zheng, H., & Yang, S. (2019). Blockchain-based medical records secure storage and medical service framework. *Journal of Medical Systems*, 43(1), pp. 1-9.

[15] Patel, V. (2019). A framework for secure and decentralized sharing of medical imaging data via blockchain consensus. *Health Information Science and Systems*, 7(1), pp. 1-10.