EasyChair Preprint

№ 9463

HealthCare Management System Using Blockchain

Arockia A Abins, Praghadiesh Saravanan, Mohamed Rafi and Patrick M Christopher

December 12, 2022

Healthcare Management System using Blockchain

Abstract **- EHR systems allow medical professionals to entry healthcare data quickly on patients who are new, and a digital record is created that is updated on every encounter. In the current scenario, with increased widespread management of patient healthcare data, there is no guarantee of reliable maintenance of patient healthcare data and that the integrity of the records are maintained and there is also a huge risk of data being lost or the data being misused. The blockchain technology came into emergence with smart contracts-based applications which created an afresh decentralized system that is reviewable and also includes data storage that is immutable and easy data access. This latest framework enables and supports the application of patient healthcare information over a lot of systems and stakeholders in a reliable manner and securely. In a typical EHR scenario the database operator is usually responsible for the healthcare data but not the owner of the data.i.e., the patient, hence making the easy access of data and control over the sharing and use of personal data almost impossible for the patients. To overcome these problems, we have proposed an application of healthcare management system using Blockchain Technologies that is implemented with the help of Ethereum based smart contracts and also makes use of decentralized data storage like IPFS (Inter Planetary File System).**

Keywords – Electronic Health Records, Smart Contracts, Ethereum Network, Decentralized Model, Solidity, Block

I. INTRODUCTION

Up until 1960s medical records were stored manually on paper. EHR systems started becoming popular in 2000s and are constantly being improved and optimized as technology advances. Traditional EHR systems that exist today are predominantly stored in local servers or outsourced to a Cloud Service provider. Even if the cloud seems to be the preferable choice, the current systems still have several drawbacks. The majority of hospitals utilize outdated technology that is vulnerable to security attacks. Because best practices aren't being followed, even cloud installations have these issues. We propose a scheme that is both secure and practical named as the Blockchain based Healthcare Management System with Two-side Verifiability (BHMV) which utilizes searchable encryption and incorporates blockchain network for the management of Electronic Health Records (EHR). Our proposed scheme uses Ethereum based smart contracts that is deployed on a blockchain network for the index storage of health records and searching purposes.

II. MOTIVATION

The healthcare management system can be considerably improved by integrating blockchain technologies in healthcare management systems allowing them to function faster and efficiently making the work of hospital staff especially the database operator much easier. We can avoid the systems from being attacked by hackers as blockchain frameworks are practically impenetrable. A robust medium can be provided for the EHR system by using blockchain storage since it possesses the potential to do so. This is mainly due to the fact that the data storage that is used in the blockchain network is unchangeable and any healthcare data that is changed or modified can be certainly traced by the latest block that is created after the alteration occurs.

III. LITERATURE SURVEY

[1] The advantages of blockchain technologies and the cryptography system are combined by the BHMV for creating a safe and practical platform for healthcare data storage and sharing. This paper covers searchable encryption, and the integration of blockchain technologies into healthcare management systems. The secrecy of the outsourced EHR and its index, capabilities to search keywords, verifiability of users, immutable storage, and the ability to dynamically update EHRs are supported by the BHMV.

[2] The existing EHR is combined with a consortium based blockchain to create a distributed solution that utilizes the Hyperledger Fabric. When the data are sent, we employ a proxy re-encryption mechanism to safeguard a patient's privacy. Implement different chain codes to handle business logic that has been agreed upon by network participants. A reliable directory that ensures both access integrity and data integrity for the patient records in healthcare management systems. Offers scalability that encompasses several current EHRs present in regional or core hospitals and also a visible and acknowledged audit trail that is dependent on an immutable entry or admittance log.

[3] The suggested system combines the existing Healthcare management systems with consortium based blockchain to create a distributed solution that utilizes Hyperledger Fabric. The data being sent is employed with a proxy re-encryption mechanism to safeguard patient privacy.

Implement different chain codes to handle business logic that has been agreed upon by network participants. Some characteristics are: DDOS attack issues have been resolved. Data from biofeedback may be incorporated into the patient's medical file thanks to this method and returns the ownership of the data back to the patients.

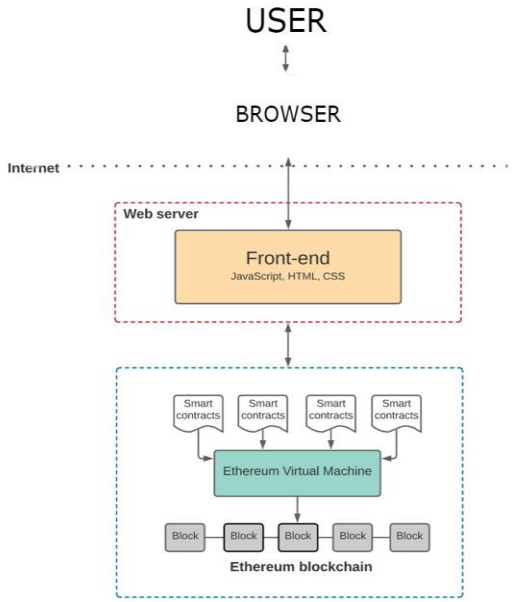
[4] This study suggests a system that implements permissioned blockchain which can be used to preserve electronic health records (EHR), which runs on Ethereum. The characteristics of the proposed system are Managing and distributing electronic medical records effectively (EHR), Ensuring that medical records are being stored securely, are readily available and is reliable.

[5] This is a brief review that speaks about other alternative applications of healthcare management that utilizes blockchain technologies. All the major papers underwent a thorough analysis which were divided into three main categories for the deployment of blockchain in healthcare. The growing significance of storage of healthcare data and the ability to access healthcare data in a secure environment is demonstrated in the study. With regards to effectiveness and economic criteria, hybrid solutions that combines secure blockchain-based access control and conventional data storage is better than a complete blockchain storage mechanism.

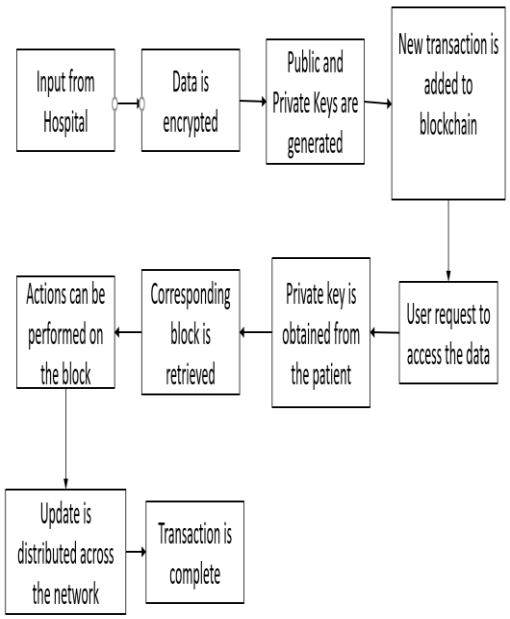
[6] As a part of the scalable permission and blockchain-based system for electronic medical records proposed, the health records of patients are stored in a database in this study. Additionally, a hybrid technique is used, which offers a better level of security by integrating both Attribute Based Access Controls (ABAC) and Role Based Access Controls (RBAC). Integrate fragmented records which enables hospitals interoperability for safe and convenient sharing of patient healthcare data. A hierarchy-based access control system is available for various network users.

S. No.	Title	Approach/ Algorithm used	Achieved Result	Limitations
1.	Blockchain-based healthcare management system with two-side verifiability	A searchable encryption technique based on blockchain technologies on scheme for EHR storage and updates in a decentralised fashion	Functionalities for searching, user verifiability, storage immutability, and dynamic updates of EHR	Uses centralized cloud storage for
2.	Application of Blockchain to Maintaining Patient Records in Electronic Health Record for Enhanced Privacy, Scalability, and Availability	Consortium blockchain system using Hyperledger. Proxy re-encryption scheme for data transfer	Secure data transfer, integrity, tracking records using access log and improved scalability	When a patient chooses to have two pairs of keys, he or she bears a greater burden to keep them secret.
3.	Blockchain-Based	Ethereum-based blockchain	DDOS problem is solved. Biofeedb	Additional resources for
	Medical Record Management with Biofeedback Information	architecture. Uses smart contracts for management framework.	ack data can be integrated.	network nodes are required because of the use of blockchain-based techniques that are used for databases.
4.	The Secure Electronic Medical Records Storage and Sharing Using Blockchain Technology	Permissioned blockchain-based platform called Hyperledger.	System ensures the privacy and security of patient medical records.	All the users must be registered before being given access to the system since it's a permissioned system
5.	Blockchain based Patients detail management System	Scalable permissioned blockchain. Hybrid mechanism which uses RBAC and ABAC	Combines scalability, coordination, access controls and makes the monitoring of patient health easier.	Implementation of access control is a complicated task in blockchain

SYSTEM ARCHITECTURE



FLOW CHART



ENVIRONMENTAL DESCRIPTION

1. Blockchain Networks:

Local Test Network: Ganache

MetaMask Test Network: Georli

Main Network: Ethereum Virtual Machine (EVM)

2. Software Requirements:

Operating System: Windows

Development Tool: Visual Studio Code

3. Hardware Requirements:

Hard disk: minimum 10 GB

RAM: minimum 2 GB

CONCLUSION

In this survey, the current implementations of healthcare management systems using blockchain technologies were explored. 6 white papers including 1 base paper were examined in detail and various features of all these different applications were studied. The importance of storing healthcare data securely and the ability to access patient medical records easily are increasing significantly according to the study. The principles or concepts of blockchain technologies are progressively being correlated with the development of digital solutions for healthcare systems that are reliable and secure.

REFERENCES

1. Tan, Tian Lim, and Madhusudan Singh. "Blockchain based healthcare management system with two-side verifiability." *Plos one* 17, no. 4 (2022): e0266916.
2. Tith, Dara, Hiroyuki Suzuki, W. M. A. B. Wijesundara, Naoko Taira, and Nagaaki Ohyama. "Application of blockchain for maintaining patient records in electronic health record for enhanced privacy, scalability, and availability." *Healthcare informatics research* 26, no. 1 (2020): 3-12.

3. Westphal, Erik. "Digital and decentralized management of patient data in healthcare system using blockchain implementations." *Frontiers in Blockchain* (2021): 36.
4. Abeywardena, Kavinga Yapa, Kabilashan Periyasamy, Sachitha Gunarathna, and Saduni Kudagoda. "Blockchain based Patient detail management System." In *2020 2nd International Conference on Advancements in Computing (ICAC)*, vol. 1, pp. 458-463. IEEE, 2020.
5. Wang, Hui Li, Shao-I. Chu, I-Yueh Fang, Shu Ya Pan, Wei-Cheng Lin et al. "Blockchain based medical record management with biofeedback information." In *Smart Biofeedback-Perspectives and Applications*. IntechOpen, 2020.
6. Usman, Muhammad. "Secure electronic medical records storage and sharing using blockchain technologies." *Procedia Computer Science* 174 (2020): 321-327.