



Smart Hospital and Healthcare System Using Blockchain

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ABSTRACT

Our project Smart Hospital and Healthcare System Using Blockchain includes registration of patients, storing their details into the system. Our software has the facility to give a unique id for every patient and stores the details of every patient and the staff automatically. User can search availability of a doctor and the details of a patient using the id. The Hospital Management System can be entered using a username and password. It is accessible either by an administrator or receptionist. Only they can add data into the database. The data can be retrieved easily. The interface is very user-friendly. The data are well protected for personal use and makes the data processing very fast. It is having mainly two modules. One is at Administration Level and other one is of user I.e., of patients and doctors. The Application maintains authentication in order to access the application. Administrator task includes managing doctors' information, patient's information. To achieve this, aim a database was designed one for the patient and other for the doctors which the admin can access. The complaints which are given by user will be referred by authorities.

Keywords: Health records, Block chain, Encryption of data

1. Introduction

Recently, blockchain has been suggested to be a promising solution for EHR data management. The inherent secure-by-design feature of a blockchain-based infrastructure has the potential to provide a tamper-proof log for all the access events of EHR. In particular, all the access events can be verified and recorded through a consensus mechanism before being added to the blockchain. However, from the perspective of EHR management, the traditional blockchain-based solutions suffer from two significant drawbacks. First, although blockchain can ensure data integrity, it lacks proper access control mechanisms to contain operations performed by different participants. Second, the size of blocks in a blockchain is too limited to accommodate EHR data containing images (e.g., X-ray, CT scan, and MRI).

To validate our design, we prototype the hybrid architecture by using the Hyperledger Composer Fabric platform. In addition, we conduct multiple experiments to validate both smart contracts and access control policies which show that the proposed system can maintain a traceable access events and transaction records for EHR data management. We evaluate the system performance, via multiple experiments, of the transaction processing time and the average response time against unauthorized EHR data request under different settings.

The rise of new technologies, such as Internet of things and big data, has promoted the development and innovation of healthcare around the world and improved the construction of the smart healthcare system. Smart healthcare is a medical system with medical cloud data as the core, which combines electronic medical record, electronic health archive, and medical Internet of things by using Internet of things, data transmission, and exchange technologies to build medical and health services and optimal management. At present, the smart healthcare industry has made rapid progress, but there are still problems of information security and system security. As the key technology of the fourth industrial revolution. Blockchain has the characteristics of decentralization, anonymity, tamper proof, and auditability. The combination of blockchain and smart healthcare can alleviate the pain points of traditional smart healthcare in information sharing, data security, and privacy maintenance, optimize the user-centered smart healthcare systems, and establish a multiparty medical alliance chain involving government, enterprises, and individuals to promote the industrial upgrading of smart healthcare. A blockchain is a decentralized network that uses peer-to-peer (p2p) technology to track all transactions. It lacks a centralized authority or a single point of contact. Rather, it is a group of nodes that keep the system functioning. Each transaction is extremely safe because of the network's nodes. Encryption provides an additional level of security to the connection.

Decentralization, security, privacy, and resilience through cryptographic algorithms are all elements of blockchain that have the potential to tackle the present difficulties in the healthcare industry. The digital healthcare service plays a critical role in keeping and storing data. However, it has a big issue with patient information leaking out. The existing healthcare system is insecure among several medical services because of data availability delays and

the danger of data theft. Hospital records can be archived without the patient's knowledge. Due to several challenges, such as security and accessibility of data, there has been no exploration or experimentation in the healthcare industry.

In today's healthcare sector, securely accessing data within the network is a top focus of the proposed system. The blockchain-based system can generate excellent outcomes in many ways if used appropriately. It is an efficient and effective way to secure authentic information. The information is maintained as a ledger feature in blockchain technology with the smart contract, controlling the patient's access to medical records. It guarantees security, ease of access, and other manufacturing aspects of administration, as well as privacy, validity, and authentication for this system.

The objective of this study is to develop a blockchain based system that helps in the security and management of patient data. This system uses blockchain technology with smart contracts to establish an iterative, secure, accessible, and decentralized healthcare ecosystem. People will be able to freely and securely share their medical records with doctors, hospitals, research institutions, and other groups while having complete control over their medical data privacy. Besides, this research looks towards the use of blockchain technology in a variety of uses that are growing rapidly.

2. Literature Survey

Smart healthcare realizes the interaction between patients and medical staff, medical institutions, and medical devices by building a health archives regional medical information platform and using the most advanced Internet of Things technology, so that the medical industry gradually achieves information. Sharing medical data is an important step to make the medical system more intelligent and improve the quality of medical service. However, the sharing of patient data among institutions is not yet fully realized, and the blockchain is a great way to solve this problem right now. Blockchain is distributed data systems involving multiple independent nodes, which is an emerging technology for decentralized and transactional data sharing among large networks of untrusted participants. It features decentralization, timestamps, collective maintenance, programmability, and tamper-proofing. Blockchain has relatively few applications in medical treatment, and the existing research mainly focuses on combining blockchain with a certain information technology to build a single application platform, such as using blockchain technology to build a medical transaction sheet verification system.

[1] "Hospital management system using web technology (2020)" –

This paper states that web-based technology offers many online services in almost every field. Every major industry is converting and establishing a digital front for all their major operations to get closer to the booming digital market. In today's world the information flow is very fast and redundant means won't add to the betterment of the individual or the organization that's using them. Online connectivity is now a must for all the well organized and well managed establishments. The paper describes an idea of such a web-based platform that eliminates the need of paper prescriptions in the Hospitals that proscribes EMedical Management which will increase the efficiency of patient management, schedule management of the doctors and give universal access to the patient data anywhere in the hospital.

[2] "Hospital management and control system, Volume 7, 2020" –

This paper informs the Network of Medical records has significant growth for rising patient demands, as well as providing medical professionals and personal with prompt quality precision. Several indicators are essential for measuring efficiency of facilities like healthcare sector, and the effective application usage of patient management system is a key task. Patient information options were equipped upon industries associated with software in most situations will have to be modified and in certain cases HIS needs to be created as specialized software dependent upon unique patient specifications. Research discusses evaluation recognition of core E-HMS elements when their requirements administration differs globally. The main success metrics of E-HMS / HIS are often approached through a bench-marking viewpoint.

[3] "HAMS: An Integrated Hospital Management System to Improve Information Exchange": -

This paper describes that during a situation of emergency, it is important for hospitals to be able to communicate with each other and with emergency care providers about their shortage or availability of resources in terms of bed and staff capacity. With this information, first responders are able to manage at their best the flow of patients and this improves the response time and the health services resilience during emergencies. As a consequence, effective management of emergencies and crisis depends on the knowledge of each healthcare facility of the status of its own resources and on timely information availability, reliability and intelligibility.

[4] "Hospital Management System, 2020"-

This paper sorts the details into the hospital management system. The software has the facility to give a search facility for every patient and the staff automatically. It includes the search facility to know the current status of each sector. It covers a wide range of hospital administration processes. Hospital Management System is a useful to improve the management of hospitals in the area of clinical process analysis and activity-based costing. It enables to develop organization and improve effectiveness and quality of work.

Internal and External Regulation. Internal supervision mainly refers to the real-time supervision of drugs, equipment, and supply chain by medical institutions. External regulation includes three criteria: medical supply chain regulation, medical whole process regulation, and medical waste treatment process regulation, and the executive body is the regulatory body. The application chain is a system that involves the transfer of products or services from suppliers to customers, which is composed of people, organizations, activities, information, and resources. Its purpose is to ensure the quality of sensitive commodities throughout the shipment. Supply chain management is very important in the industry of transporting materials and goods. Also, drug supply

chain management is particularly important for tracking the source of materials used for manufacturing, the process of manufacturing, and the distribution of finished products. Centralized supply chain management systems expose supply chains to corruption, fraud, and tampering. Effective supply chain management is particularly important in the medical field, where a compromised supply chain directly affects patient safety and health outcomes. One potential solution to improve the security, integrity, data sources, and functionality of a healthy supply chain is the blockchain technology. In the supply chain, blockchain technology transactions are secure and transparent and can be permanently monitored and recorded, greatly reducing not only the time required but also the possibility of human error. In addition, through the implementation of blockchain, the security of medical supplies and equipment can be improved. Blockchain technology can be achieved by saving unique device identifiers for each medical device and by tracking and publishing firmware updates using smart contracts. Blockchain-based medical device tracking can also use invariance to prevent device loss, theft, and malicious tampering.

Medical Record Management. Medical record management includes electronic medical record. Electronic medical record provides a convenient health record storage service that facilitates online electronic access to traditional paper medical records, which is highly sensitive information that needs to be shared among peers, to keep up-to-date patient history. Current electronic medical record cannot ensure the security, privacy, and availability of sensitive data, and the patients' diagnosis and treatment data are still in a decentralized state in different medical institution databases. As a result, patients may lose control of available healthcare data, while medical institutions generally maintain primary management. Using blockchain technology to share electronic medical record is customer centered, and patients have the control of their electronic medical record. -e decentralized, self-trusted, and tamper-resistant nature of the blockchain ensures the secure storage and delivery of medical data and greatly reduces the turnaround time for sharing and overall costs. Also, because patients can participate in their own health records, they will focus more on their own healthcare.

3. Methodology

1. EHR Records
2. Block Generation.
3. Attribute based encryption.
4. Hashing Signature verification.
5. Remote Records Fetching.
6. Role based access control.

4. Working

Our proposed design has four major components: a user application, a blockchain handshake protocol, a cloud, and a public blockchain network. The system is a virtual representation that serves two purposes. For starters, it provides users with access to application interfaces. Doctors and system administrators are two types of users in our system. Each user has a distinct function. As a result, the user application delivers different user interfaces depending on the user role. Second, based on the data entered by the user, the user application creates an initial transaction. For the purpose of confirmation, the transaction is submitted to the blockchain handshake protocol. Finally, a user interface establishes the relationship between users and the blockchain handshake protocol. The proposed architecture's fundamental component is the blockchain handshake (BH) protocol. This component connects the database server, the blockchain network, and the cloud-based health record system, which acts as a wrapper.

This proposed architecture makes use of the Ethereum blockchain network. A distributed ledger that connects blockchain nodes is known as the public blockchain network. Blockchain nodes are miners who are in charge of updating the blockchain based on the decision method. Alternatively, blockchain nodes accept transactions and use the network's smart contracts to authenticate them. In the proposed design, the cloud provides two services that are similar to those provided by existing cloud-based EHR administration systems. The EHR administration system is hosted as an initial service. Data storage is the next service. All health records can be saved in a database on the cloud. The EHR administration system takes transactions from the blockchain handshake protocol, performs all duties associated with them, and finally stores them in a cloud database. In response to user access requests, the cloud provides the necessary data.

This application's block-diagram has three key entities: an administrator, a patient, and a doctor. Now, inputting profile details, which is a unique feature that grants access to all three organizations, is also included in the list of actions. The patient has access to three out of ten operations, while the doctor has access to three out of ten operations. Only the administrator has access to all ten actions, allowing them to examine and monitor all the information. The only operation that can change block data once it has been retrieved is writing the record of the patient, which can only be done by the doctor.

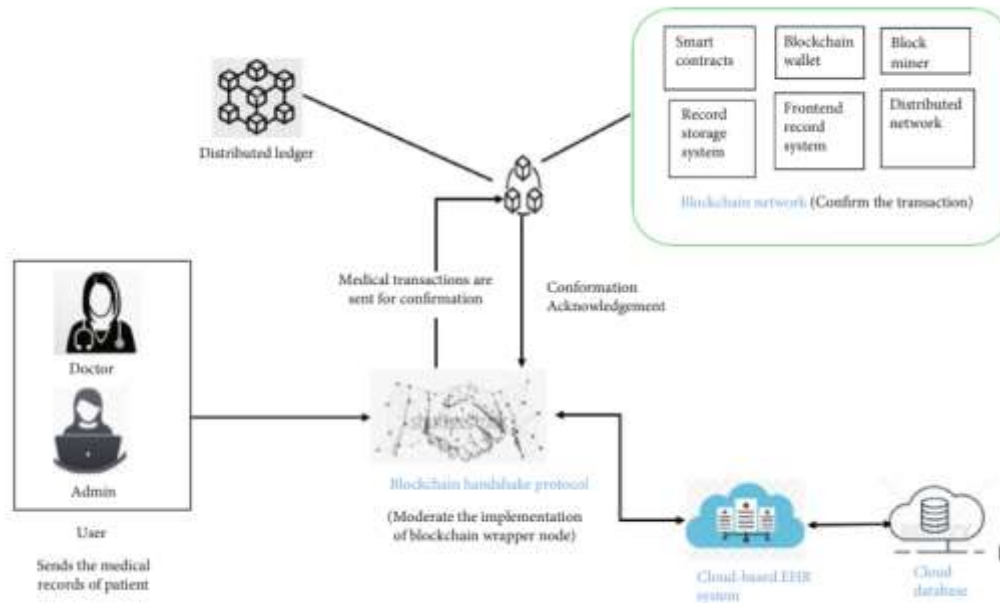


Fig. Block Diagram

5. Conclusion

A health record system based on blockchain technology has the potential to revolutionize the healthcare industry by improving data security, patient control, interoperability, and administrative processes. Traditional health record systems often suffer from fragmentation, where data is scattered across various healthcare providers and systems, making it difficult to share and access comprehensive patient information. By utilizing blockchain, health records can be stored in a standardized format and accessed securely across different healthcare providers, improving care coordination and patient outcomes. We propose a hybrid architecture of using both blockchain and edge nodes to impose attribute-based access control of health record data. Health record management system provide high security for patient information by removing intermediaries from the validation chain. This system enhances revolutionize how hospital use patient record and improve healthcare services also revolutionizes the way hospitals leverage this information, ultimately leading to improve healthcare services and better patient outcomes.

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