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Blockchain for Health Data Management

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Abstract

Medical reports are a vital component of hospital operations and are frequently involved in operations. These days, hospitals have boosted their revenue by integrating pathology and other test labs within the facility for effective and quick reports in addition to more revenue.

Operations in hospitals cover a wide range of activities, including patient admission, management, and hospital expense management. This makes operations more complicated and challenging to track, especially when combined with additional services like pathology and pharmacy management.

Therefore, with the Hyper ledger concept, we leverage block chain technology to track every transaction with 100% authenticity. We demonstrate how this results in safe, efficient, and secure management of the entire system by using block chain technology to manage the medical records of all patients along with transaction information. Instead than using a centralized server, all transactions are encrypted and saved as blocks to ensure their authenticity.

Additionally, we employ the hyper ledger idea to date stamp-associate and store each transaction's accompanying medical documents. This makes it possible to confirm the accuracy of each report, and any tampering will be obvious. As a result, we provide a block chain-based system for managing medical reports that is secure, reliable, effective, and legitimate.

Keywords: Health Data Management, Electronic Medical Record (EMR), Electronic Health Record (EHR).

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Introduction

Technology's recent advancement is changing how we use and perceive things, which has an impact on every aspect of human life. Similar to the changes technology has brought about in numerous other spheres of life, the healthcare industry is likewise finding new opportunities for advancement. The key advantages that technology advancements are bringing to the healthcare industry include an improvement in security, user experience, and other areas. Electronic Medical Record (EMR) and Electronic Health Record (EHR) systems provided these advantages. They continue to have certain problems with data integrity, user ownership of data, and the security of medical information, nevertheless. The application of a cutting-edge technology, such as Block chain, may be the answer to these problems. With the help of this technology, medical records and other information connected to healthcare might be stored on a safe, tamper-proof platform.

Prior to the development of contemporary technology, the healthcare industry employed a paper-based system, or a handwritten mechanism, to maintain medical records. This paper-based system for keeping medical records was ineffective, unsafe, disorganized, and not temper-proof. Due to the fact that the patient's medical records were duplicated and redundant throughout all of the institutions the patient attended, this problem also existed.

A trend towards EHR systems, which integrate paper-based and electronic medical records, was present in the healthcare industry (EMR). Clinical notes and lab results were stored in these systems' numerous components. By reducing errors and enhancing information access, they were suggested to improve the safety of the patients. The purpose of HER systems was to develop an effective system that would change the condition of the healthcare industry and to address the issues with paper-based medical records.

Related Work

In the current system, all medically relevant data are digitalized and kept on the hospital server. When a patient returns to the hospital, he or she can search past information, including the patient's and doctor's names, the date, the diagnosis, and other details. EHRs have received a lot of attention since they have a significant applicability in the medical industry. For EHRs, numerous standards have been put forth. Numerous publications also looked at the security and privacy concerns with EHR systems. However, conventional EHRs have a lot of issues. First off, since each hospital or research facility has its own unique database, medically related data are typically held independently in various hospitals or research facilities.

Therefore, a patient must have another medical check when moving from one hospital to another. This would inevitably result in the wastage of medical information resources and raise the physical and financial constraints placed on patients. Second, only the authorities, such hospitals, have access to the data in EHR systems. As a result, if there is a disagreement between a hospital and a patient, the hospital will always prevail because it has the power to alter or even destroy the patient's medical records. For the sufferers, it is unfair.

Proposed System

The Proposed System employs a technique for creating a realistic and privacy-preserving e-medical system that permits allowed encrypted searches for databases from several medical authorities. We first present the RSA protocol and the "hash keyword to prime" function before focusing on interactive features.

In order to provide fine-grained access control in a dynamic searchable encryption system, we integrate a multi-authority attribute-based encryption technique. We next show the multi-authority searchable encryption model. Third, we demonstrate how to implement a searchable encryption system with forward security for a database of encrypted medical records.

Block Chain

A block chain is a chain of blocks, often called a distributed ledger, without any ownership. The idea was presented initially by Satoshi Nakamoto in the creation of a cryptocurrency. A blockchain appears as a distributed ledger and has no sovereignty; that is, no individual or organization can dictate the interchange and access of information. The term “distributed ledger” means that data is stored at multiple locations, and is not maintained or owned by a single entity.

Thus, any change in the network is replicated on every node in the system, as if everynode has the original document. The same ledger is distributed to all nodes, so it is almost impossible to make malicious changes. The ledger stores

information in the form of blocks, each of which has header and data sections. The data section stores the transactions, whereas the header sections contain the block metadata. Every header contains hashes of the current and previous blocks.

Block Chain Working

The scenario depicted in Figure 1.1, in which a network node wishes to add a record to the blockchain network, can be used to understand how a blockchain operates. This request is broadcast to the network, verified by a network-defined method, and added to the network indefinitely. Upon block verification, this new record becomes impervious to modification.



Fundamentals of Block Chain Technology at the Basis Block chain is a peer-to-peer (P2P) distributed ledger technology that fosters trust and transparency in a transitive logical chaining process for a new generation of transactional applications. Although it is regarded as the basic building block of crypto currencies like Bitcoin, the underlying structure of the block chain's components, including distributed.

In any transactional process, a network, shared ledger, and digital transactions should be used. Following are brief summaries of each of the components.

Distributed Networks

Blockchain relies on a decentralised network with equal benefits for each node. No particular node should be given any importance or weight. This should be viewed as a design for an expanded peer-to-peer network. Every node in the network maintains an up-to-date copy of the block chain and contributes to the network's overall technique of cumulatively authenticating and confirming digital transactions.

1. Shared Ledger

A common ledger of transactions is kept up to date by each node in the network. This procedure establishes block chaining as a trusted and open implementation strategy. The nodes execute algorithms to assess the legitimacy of a transaction that has been launched on a digital record and confirm the planned dealing. The new transaction of digital data is added to the block chain, registered in the ledger, and disseminated in the network for updating if the majority of nodes inside the network concur that it is genuine. The integrity of the shared ledger is ultimately provided by the openness of the process because each node cannot alter the record or ledger data at any time because the update choice is a group decision.

2. Digital Transaction

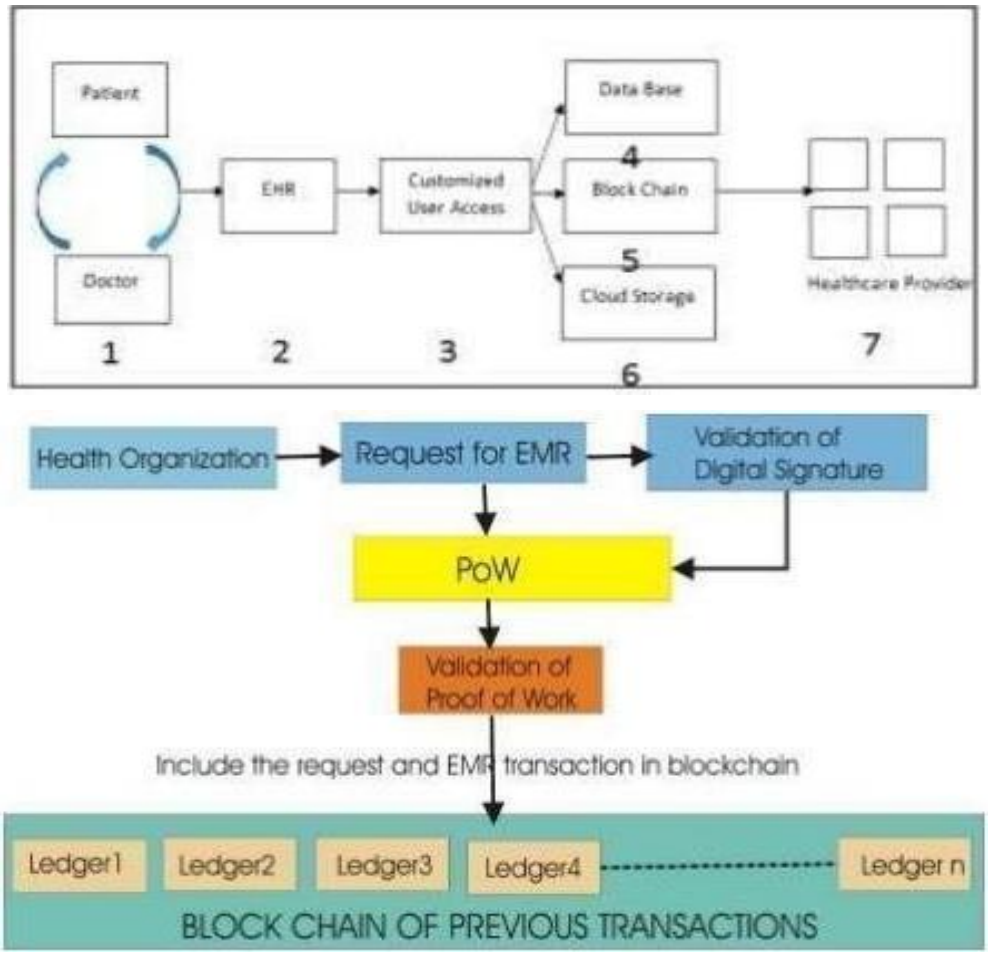
A blockchain can store any sort of data or digital quality, thus the network that uses the block chain determines what kind of data is contained in the collective activity. To guarantee authenticity and accuracy, data is digitally signed and encrypted. Blocks are used to organise transactions, and each block in a block chain has a cryptologic hash to the block before it. During a linear, written account order, blocks are alternated.

Blockchain Model for Health Care

After the Bitcoin blockchain, a distributed blockchain for health records and other documents would serve as storage. In this blockchain, each participant in the distributed network would have a copy of each person's health record. Health information is comprehensive and dynamic, mirroring each member of the network's health records. Health information is comprehensive and dynamic, mirroring each member of the network's health records. Data Lake is nothing more than a data warehouse where all medical data from blockchain would be sorted. The Data Lake can contain a wide range of pictures and documents.

Data lakes are a highly valuable tool for performing various analyses, such as mining for variables that affect results, selecting the best course of action based on genetic markers, and identifying factors that affect preventive maintenance.

Interactive searches, text mining, text analytics, and machine learning are all supported by data lakes. All data saved in the data lake will be encrypted and digitally signed to protect privacy and validity.



Step 1: The process is for a user (a health organisation that needs an EMR) to sign up for the medical blockchaining network by supplying their digital signature and EMR request.

Step 2: The user is given access to a Proof-of-Work (PoW) system when the request has been made and authentication has been established.

Step 3: Proof of work is like a riddle that needs to be solved, like figuring out which two cryptographic hashes are the same or prime factorising a big prime number.

Step 4: Following the completion of the PoW, the requested transaction is verified by all participants in the block chain, and the record is then added to the ledger.

Step 5: Every member of the blockchain network updates their personal ledgers in accordance with the network and broadcasts the change.

Modules Description

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Lake is nothing more than a data warehouse where all medical data from blockchain would be sorted. The Data Lake can contain a wide range of pictures and documents. Data lakes are a highly valuable tool for performing various analyses, such as mining for variables that affect results, selecting the best course of action based on genetic markers, and identifying factors that affect preventive maintenance.

Modules

1. Patient Registration

The patient registration information is mostly used by the admin because they gather all the patient data, provide unique passwords to each user, and can then store the data in a cloud database. Physician registration the doctor registration information is primarily used by administration because it allows us to gather all of the doctor's information before storing it in a database.

2. Doctor Details

The administrative staff keeps track of all the doctors' information so that in the event of an emergency, doctors may easily fix appointments for specific patients.

3. Entry Details

We can ultimately put the information in a database because the admin keeps track of all the patient entering information due to the volume of patients at the hospital.

4. View Form

Since users may access the admin side after a year, they can readily identify the patient report, the view form is primarily used there.

5. Patient Report

Every patient has a unique ID, making it easy to send emails, see reports on patient devices, and finally print out patient reports. This is why admins are primarily responsible for maintaining patient reports.

Conclusion

In this project, we talked about the benefits of block chain technology for the healthcare industry and how it may be applied to electronic health records. Despite the development of the healthcare industry and technological innovation in EHR systems, there were still some problems that this new technology, namely block chain, was able to solve. Our suggested framework combines granular access controls for those records with secure record storage. It develops a system that is simpler for users to operate and comprehend. The framework also suggests steps to ensure that the system addresses the issue of data storage given that it makes use of IPFS's off-chain storage feature. Additionally, the system benefits from role-based access because only related and trustworthy individuals have access to medical records. Additionally, this fixes the EHR system's information asymmetry issue.

We intend to integrate the payment module into the current framework going forward. To do this, we must take into account a number of factors, including how much a patient would be willing to pay for a doctor's consultation through this decentralized block chain system. We would also need to specify a few laws and regulations that adhere to the standards of the healthcare industry.

References

Elias Awath, *"System Analysis and Design",* Tata Mc Graw Hill Publication, Sixth Edition, 2003.
S. Ramachandran," *Computer Aided Design",* Air Walk Publication, Third Edition, 2003.
Richard Fairley, *"Software Engineering Concepts",* Tata Mc Graw Hill Publication, Second Edition, 1997.
Distributed .NET Programming in VB .NET by Tom Barnaby.
Professional VB.NET, 2nd Edition by Fred Barwell, et al.
The .NET Languages: A Quick Translation Guide by Brian Bischof.