



BLOCKCHAIN FOR GIVING PATIENTS CONTROL OVER THEIR HEALTHCARE RECORDS

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Abstract: The research project explores the potential of Blockchain in the healthcare industry. The current solution to the health care storage and sharing of medical records is the most sensitive Electronic Health Record (EHR). Electronic health records (EHRs) are not digital patient information stored on a network. Various opportunities to improve patient care, performance measurements in clinical practice and to contribute to future clinical research are provided by EHRs. The schemes used to maintain EHRs were not yet very secure in the current era of smart cities and homes. Data can be easily broken by unauthorized hackers and outsiders. Also, the data is not accessible to patients and caregivers. These applications cannot create a balance between data security and data access. But block chain can solve these problems. Most EHR data sharing is still done by post due to the lack of a reliable and reliable health data sharing system. This leads to significant delays in patient treatment. Blockchain has the potential to improve health care by placing the patient in a centralized system and improving health data protection and collaboration. Blockchain is a spatial division that provides cryptographic assurance of data integrity, security, privacy and access to data. Patients fully control their medical knowledge and authorize physicians who can review medical information through grant funding and withdraw access methods and outline the challenges they face, and the problems that need to be addressed.

Keywords - (EHR) Electronic Health Record, (EMR) Electronic Medical Record, (HL7) Health Level 7, (FHIR) Fast Healthcare Interoperability Resources, (PoW) Proof of Work, (PoS) Proof of Stake, (RSM) Replicated state machine, (Tps) Transactions Per Second, (SDK) Software Development Kit

I. INTRODUCTION

The traditional system of keeping medical records in particular based on manuscripts they have many problems such as random Sequence of events, information, insufficient data, broken record, data repetition, inconsistency with handwriting also Sometimes it does not work well. In modern times, victory this shortcoming the healthcare industry is changing about the Electronic system based on the electronic and currently known better known as Electrical Health Records (EHR).

Major projects in the health care sector can be considered with an EHR program that starts in a patient medical record, Doctor appointments and appointments, clinical and laboratory tests report, doctor's note, payment and accounts and future Patient follow-up. The main purpose of the EHR is to provide order, sufficient without restriction, not required medical,

Consistent and effective medical record participants. The advantage of the system is that it is better efficiency, accuracy, security

And low cost. Blockchain technology has greatly improved upgrade to the digital age. Technology in particular based on the Built-in appendix data structure and is composed of a set of notes in which members of the peers do not trust all other Participants. Notes can be found on chain be order set of blocks contain a number of tasks and as a result blockchain is Considered a chronological text order process. Key features of the blockchain technology are as follows:

- Corrected: job records when updated it cannot be changed and the data is stored permanently
- Separation: a copy of the data is kept on all nodes in a network that separates data.
- Consistency: each block is verified by the miner network member.
- Delete: all network members have access or view data.
- Specialist in patient health care and mobility services.
- A patient's health history can help health care providers make accurate diagnoses and treatments.
- Ensuring data integrity, confidentiality and confidentiality of patients while sharing clinical information

II. MOTIVATION

Blockchain-based systems are a decentralized technology that is used in several industries such as logistics, supply chain management, finance applications and Internet of Things (IoT). Blockchain provides a secure distributed database and queries to the database can be made without any intervention of unauthorized identities. It is highly efficient in the case when various participants want to access the same database. Thus, Blockchain can minimize a lot of resources and costs to access the same database securely. The critical issue in the electronic health/medical records (EHR/EMR) is maintaining the interoperability among various involved identities. This issue may cause obstacles in the data transaction among each other. There is a lack of data management and sharing mechanism among the identities which leads to fragmentation of the healthcare information. Apart from interoperability, data security and privacy are also challenges in the current ways of data storing and sharing data through EHR/EMR systems. Sharing and storing patient's data has a lot of liabilities due to data leakage and potential shortcoming in security mechanisms. Blockchain for healthcare can ensure the security of the personal and medical information of the patients and can make sure that only authorized identities can access/edit the data using features which enables specific features among various identities in the system. Therefore, there is a clear need for a distributed way of sharing and store data where patients are more sure about their data security and privacy and in addition, all the involved identities can see the holistic view of overall transaction and interactions.

III. PROBLEM STATEMENT

The lack of a Patient database system which promotes patient's data security and flexibility to share their medical records whenever required.

IV. 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 improves 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 entrusted 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; using etheric blockchain to build a medical information sharing platform MedRec which combines blockchain with big data; and using Blockchain technology. However, the application of blockchain technology in the whole intelligent medical industry lacks systematic research. Based on this, the study will build a customer-centred Blockchain smart healthcare application system based on stakeholder theory to explore its development path. After sorting out and analyzing all the stakeholders of the system, we get the application system based on ten aspects including 22 criteria.

Table 1 Literature Review

Sr.No.	Name of Paper	Authors	Publication Name	Published On	Approaches
1.	"Using Blockchain for Electronic Health Records."	Ayesha Shahnaz ¹ , Dr. Usman Qamar ² and Dr. Ayesha Khalid.	IEEE	March 27 2021	In this paper, we discuss how the blockchain technology can be used to transform the EHR systems and could be a solution of these issues.
2.	"eHealthChain—a blockchain-based personal health information management system".	Pravin Pawar ¹ · Neeraj Parolia ² · Sameer Shinde ³ · Thierry Oscar Edoh ⁴ · Madhusudan Singh	IEEE	March 5-7, 2021	The Personal Health Information Management System (PHIMS) supports activities such as acquisition, storage, organization, integration, and privacy sensitive retrieval of consumer's health information.
3.	"Research on the Application of Blockchain in Smart Healthcare: Constructing a Hierarchical Framework"	Xiamen Du ¹ , Beibei Chen ² , Ming Ma ² and Yanjiao Zhang ³ .	IEEE	December 31 2020	Constructed a development application system of smart healthcare under the blockchain based on stakeholder theory.
4.	"Application of Blockchain in the Hospital management system"	ZEQI leng.	IEEE	July 3 2020	Compared to existing systems, eHealth Chain provides complete control to the user in terms of personal health data acquisition, sharing, and self-management..

V. PROPOSED SYSTEM

In this project we will create an EHR system using the concept of blockchain. We will be deploying the project using web technologies like html, css, JavaScript and server side technologies like php and sql for database management. To manage the medical records of patients, need to map EHR components to requirements of the systems. All hospitals act as organizations in the network. Patient data has been treated as assets which is stored in the ledger. It is also possible to store the reference of the EHR data in the ledger but since application is not managed by real data and for that it will be necessary to maintain the separate database which will have patient's data. This can be a good solution when it is integrated with production or real hospitals EHR data. For now patient record has few fields like personal and medical details like age, address, allergies, symptoms, treatment, followup, etc. When doctor is medicating to a patient, patient history data will be available which helps doctors to assign appropriate treatment. To improve the privacy of records, it is designed to provide extra steps in application for patients. Patient can decide to have permission to access his/her data from particular doctor. Doctor can view limited fields of assent means patient data like all medical fields along with age and allergies. Whereas patient can view all the fields but edit only personal field.

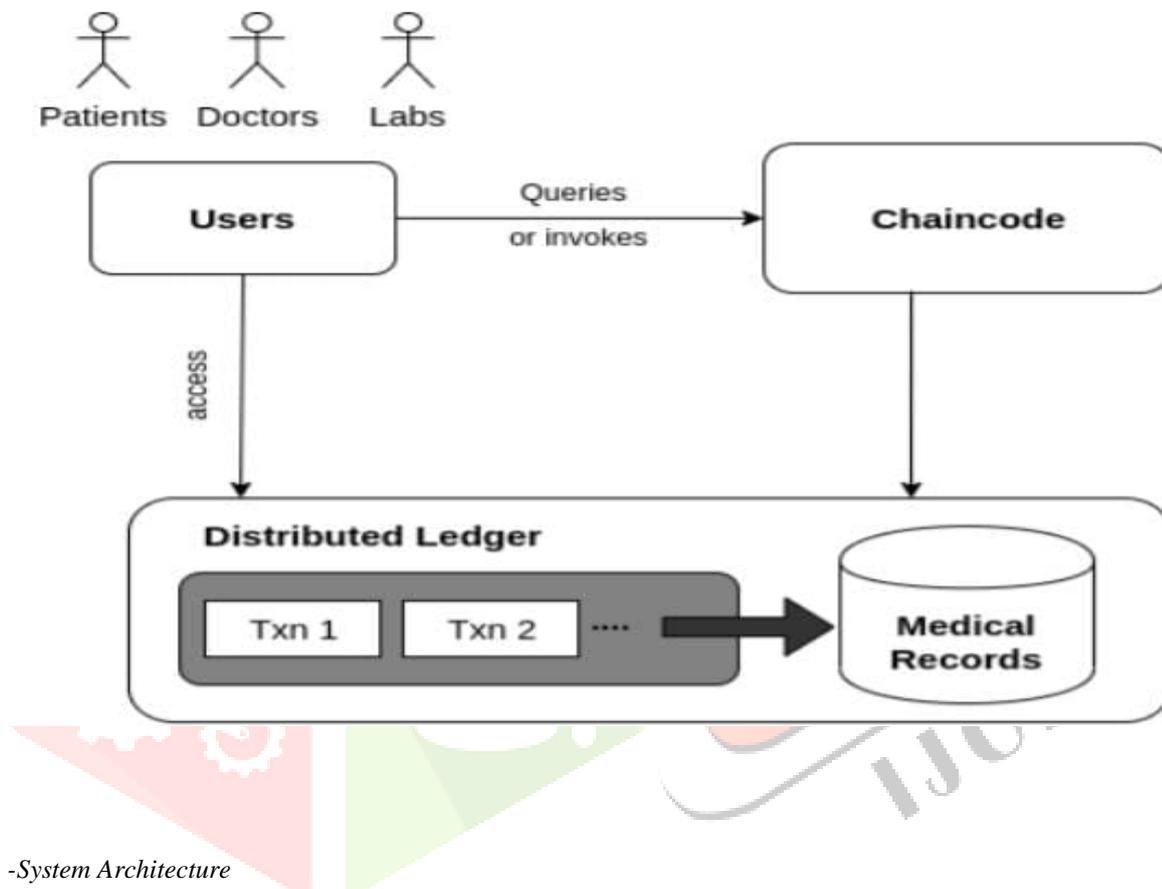


Figure -System Architecture

VI. ALGORITHM

3.1 Consensus Algorithm

A consensus algorithm is a protocol through which all the parties of the blockchain network come to a common agreement (consensus) on the present data state of the ledger and be able to trust unknown peers in a distributed computing environment. Each block that is added on the chain would need to follow some consensus rules for it to be added on the blockchain. For this purpose blockchain technology uses consensus algorithms. The most common consensus algorithm used is Proof of Work (PoW) algorithm and it was used by Nakamoto, in bitcoin network. The basic working of this algorithm is that there are number of nodes or participants on a Blockchain network so when a transaction is requested to be added on the network by any participating node it needs to be calculated. This process is called mining and the nodes that are performing these calculations are miners. We know that Blockchain is a distributed decentralized network that provides immutability, privacy, security, and transparency. There is no central authority present to validate and verify the transactions, yet every transaction in the Blockchain is considered to be completely secured and verified. This is possible only because of the presence of the consensus protocol which is a core part of any Blockchain network. The Blockchain consensus protocol consists of some specific objectives such as coming to an agreement, collaboration, co-operation, equal rights to every node, and mandatory participation of each node in the consensus process. Thus, a consensus algorithm aims at finding a common agreement that is a win for the entire network.

3.2PBFT Algorithm

The PBFT algorithm is used as the consensus algorithm in the medical blockchain because the PBFT algorithm is a consensus algorithm suitable for the alliance chain. Its advantages and advantages are:

1. The PBFT algorithm does not need to rely on a large amount of computing power to avoid the 51 percent attack” like the POW algorithm, nor does it need to rely on tokens as a standard to measure voting rights like the POS algorithm or DPOS algorithm. In the case of $(n-1)/3$ nodes error (data loss, nonoperation, etc).
2. As a kind of Byzantine fault tolerance (BFT) algorithm, PBFT algorithm can guarantee the normal execution of a distributed consensus process when there are less than or equal to $(n-1)/3$ faults or malicious nodes in the system, This requires that the nodes in the network using the PBFT algorithm have at least $(2n+1)/3$ normal nodes in each consensus process, so the environment in which these nodes operate must be relatively safe and stable.

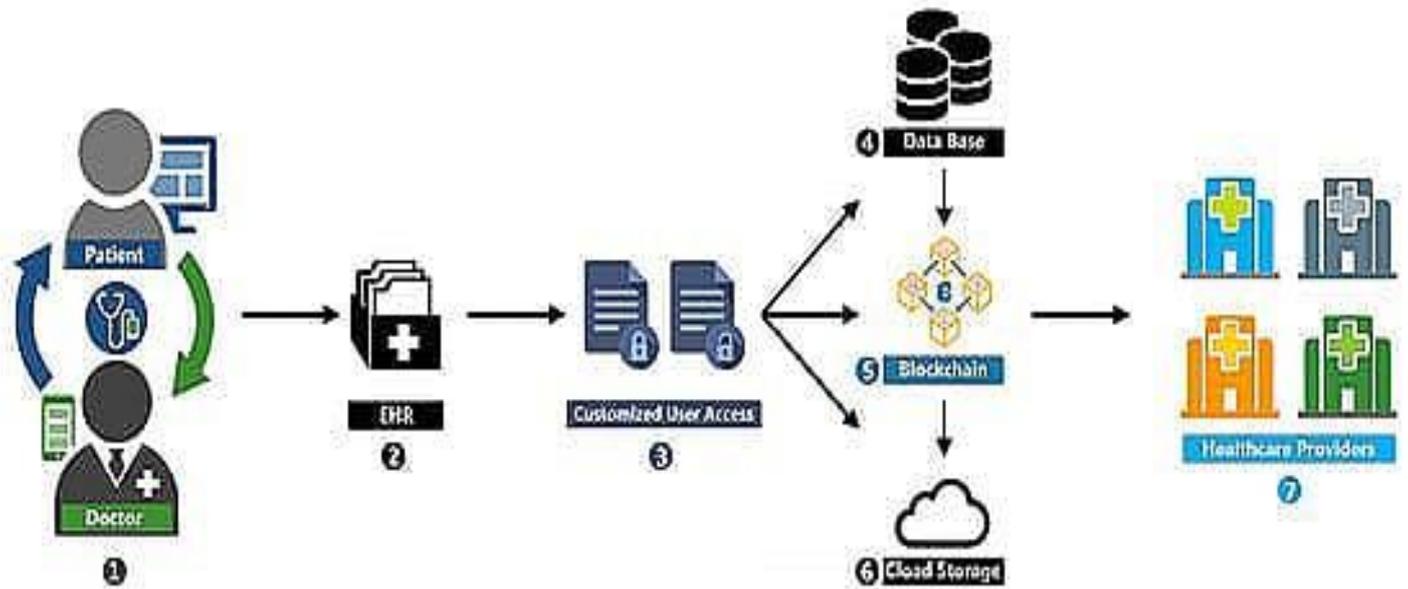


Figure –Deployment diagram



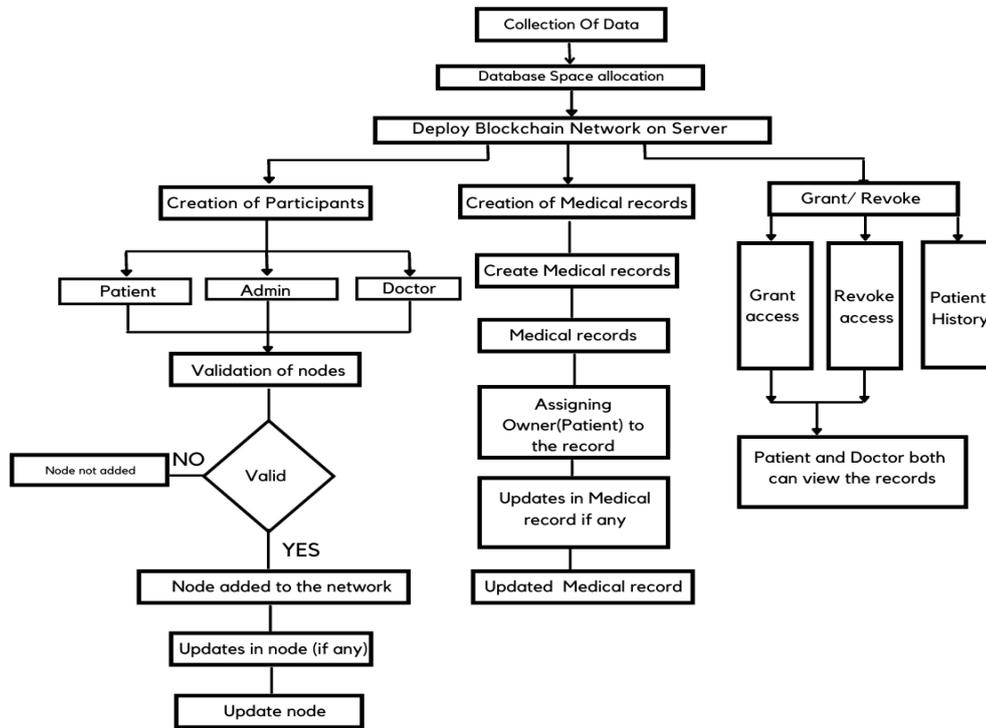


Figure –ER diagram

VII. CONCLUSION

In this paper, we have proposed a blockchain-based approach to give patients control over their medical records in a decentralized, traceable, reliable, trustful, and secure manner. We have created an architecture for the Electronic Health Record using blockchain technology and we have proposed framework for the block chain and create a block to store the patients data in a decentralized healthcare network for secure sharing. We were able to deploy a block chain-based EHR network and implement basic functionalities in the network. We successfully achieved the main objective of this research by using the primary features of blockchain that is hashing and decentralization. We conclude that blockchain technology is an innovative technology for implementing EHRs and also it has the potential to help in the research and progress of healthcare in the near future.

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