



Securing Medical Records Using Blockchain

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Abstract :-

Last year, more than 40 million people's medical records in the United States were exposed to data breaches. Therefore, increasing data breaches raise concerns about the security of medical records. There are some other factors also for an increase of these breaches which are, centralized systems, not good laws made by the government to punish the person or companies who breaches the data.

To overcome all of these, we need a blockchain-based medical record system because in a blockchain-based system we can not manipulate data without all person's permission present in that network. So in this, we are using Blockchain to record medical records , we are also using IPFS technology to store and share the file. In this, we mainly focus on how Medical Records can be managed by Blockchain, and how it can create a more efficient and interoperable infrastructure to manage records that leads to improved healthcare outcomes, while maintaining patient data and without compromising his/her privacy or security of sensitive data.

2. Introduction :-

(a) What is Blockchain :- In simple terms it is a distributed database that anyone can get a copy of and anyone who has a copy can add new records to this database(after verifying by others), but cannot modify the records till he/she do not get permission from all (but the condition is, that all (anyone) should be connected to that network). This is a type of digital ledger of transactions that is duplicated or copied and distributed across every person on that network on the blockchain.

Or , in technical terms, the blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets on any network.

(b) Data Breaches cases [1] :-In today's world, data breaches are on the rise every day. There are many examples of data breaches in this world, and the rate of which is increasing day by day. In countries like India, there are no laws that punish individuals or groups who are used to sell this data to others or manipulate it for their own benefit.

Over the past year (2021), medical records of more than 40 million people in the United States have been subject to data breaches. There are some other examples also, like, from 2005 to 2019, the total number of people affected by medical record data breaches or violations was 249,09 million (worldwide). The average cost of a data breach in 2019 was \$ 3.92 million (According to an IBM report), but the breach typically costs the healthcare industry \$ 6.45 million. These costs were the highest in the United States compared to other countries. The average cost of a data breach increased by 12% between 2014 and 2019, and the average cost of a breached record increased by 3.4% over the same period.

Now We can talk about India's biggest medical record breach or violation that was done or committed by Multi Specialty Private Hospital in Kerala. In this case, the complete patient records from the last five years, which contains hundreds thousands of test results, scans, prescriptions and more leaked on the internet. No one knew for how many months or years it remained on the internet, which was leaked on the internet. These all are searchable with a unique patient ID on the internet, which is in the public domain.

Laboratory is approved for COVID - 19 test by Indian Council of Medical Research, Govt of India through Department of Health and Family Welfare, Government of Kerala

COVID-19 TEST REPORT						
Date and time of reporting:		25-11-2020 02:11 PM				
Address of the referring facility:		[REDACTED]				
Specimen Details						
Date and time of sample collection:		21-11-2020				
Date and time of receipt of specimen at the lab:		21-11-2020				
Condition of the specimen received/quality on arrival:		Good				
Reporting Details						
SRF ID:		[REDACTED]				
Sl.no	Patient ID	Patient name & Address	Age	Gender	Type of Test	COVID-19 Result
1	[REDACTED]	[REDACTED] [REDACTED] NGANNADI ROAD, [REDACTED] EDATHALA NORTH	85	MALE	ANTIGEN	Negative

Figure [1]

2. Related Work :-

Factom [3]

Helps keep digital records accessible only to hospitals and medical managers. The physical paper is equipped with a special Factom security chip that contains patient data.

Guardtime [4]

It uses blockchain for cybersecurity applications. It fills the gap between the Patient and doctors. It helps healthcare companies and governments implement blockchain in their healthcare systems.

It provides a single truth version of the health record.

Akiri [5]

It helps protect patients with in-transport health data. This system does not store data, but it acts as both a network and a protocol. This is set in the big data industry. It works on the basis of the network as a service optimized for the healthcare industry

BurstIQ [6]

A software and cybersecurity Industries. This helps medical companies manage large amounts of patient data. It allows you to securely store, sell, share, and license your data while maintaining strict compliance with HIPAA rules.

Data sharing and privacy for patient iot devices using blockchain

The main goal of the common is to use blockchain to improve the way medical data is shared. It also includes complete and up-to-date information on the patient's health and health activities. It also helps eradicate the abuse of opioids and other prescription drugs.

3. Functioning of system (medical record using blockchain) :-

blockchain healthcare use cases :-

Administration

Doctor

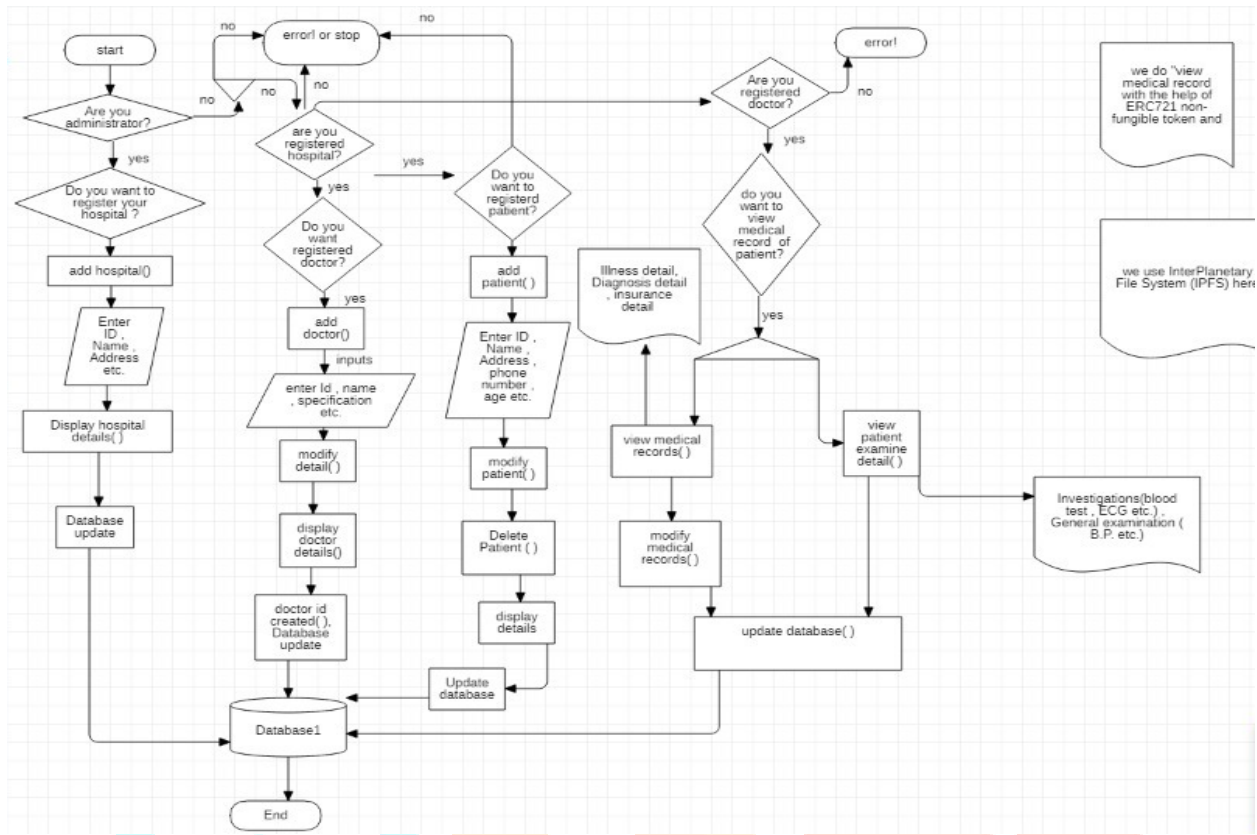
Hospital

Patient

Firstly we should have to talk about the workflow diagram that is given below. In this system firstly we ask if you are an administrator or not. If yes then only the person or organization can register the hospital by giving appropriate details to them. After that if it say no then we ask about that it is an register hospital or not if yes then this hospital has right to add doctor or patient details or we can say that it can register both patient or doctor , If he/she say no then we ask about that he or she is a registerd doctor or not . After That if he / she says yes then in case the doctor has the right to see all types of patients medical records.

At each step we are updating our database. For example, after registering a hospital we update the database.

Workflow Diagram :-



Figure[2]

We do all of that with the help of blockchain and in blockchain with the help of ethereum solidity. We use the ERC721 non-fungible token, we use this most in case of viewing medical records. Here we are also going to use IPFS. Here IPFS means "Inter Planetary File System". It is a distributed peer to peer network based decentralized system which is used to store the files or data or to share data where it can not be changed.

We are also going to use encryption methods to ensure that data is accessed by only authorized persons. That means we use cryptography methods and that is an Asymmetric key method in which every person has two keys: 1st is Public key and 2nd one is Private key. We use it to encrypt the data for ex. :- Suppose there are two person A and B, and they want to send message to each other, so let A send message to B, then A has to encrypt the data using B's public key and when message reach to B, then B can get that data in original form by using his/her private key to decrypt that data.

After that, the encrypted file will be stored on the InterPlanetary File System (IPFS) after that being stored as a block (with the help of ethereum solidity) in a blockchain.

Architecture diagram :-

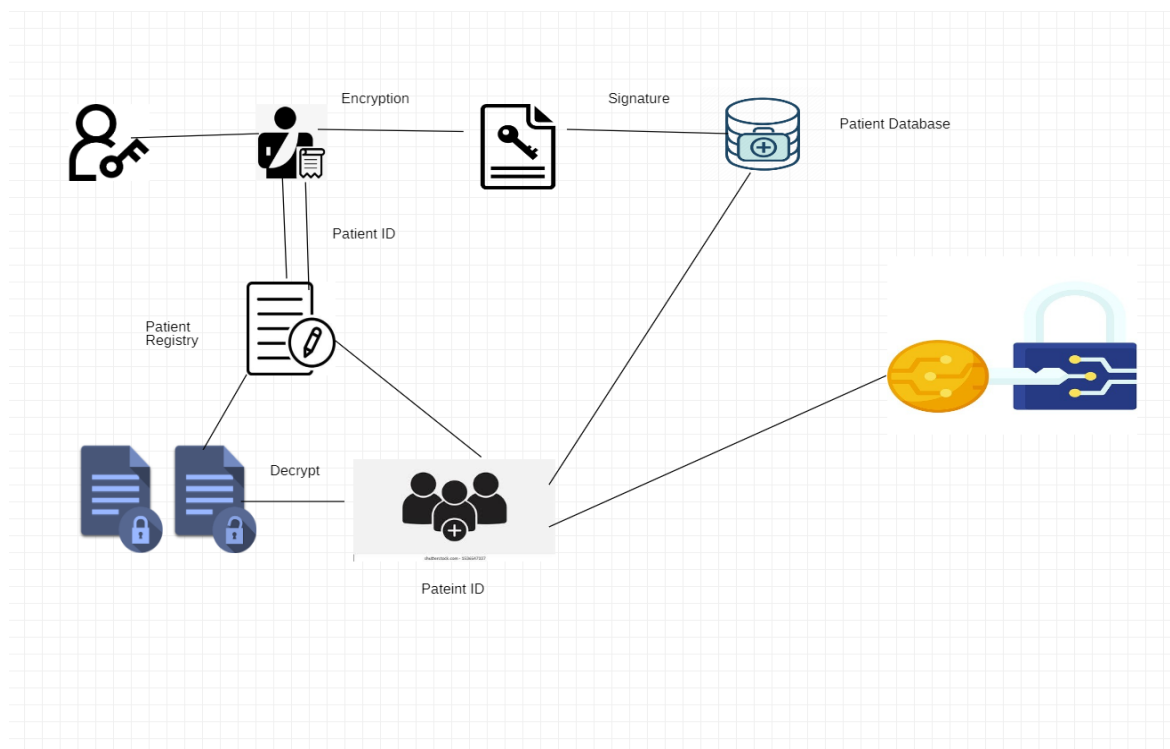
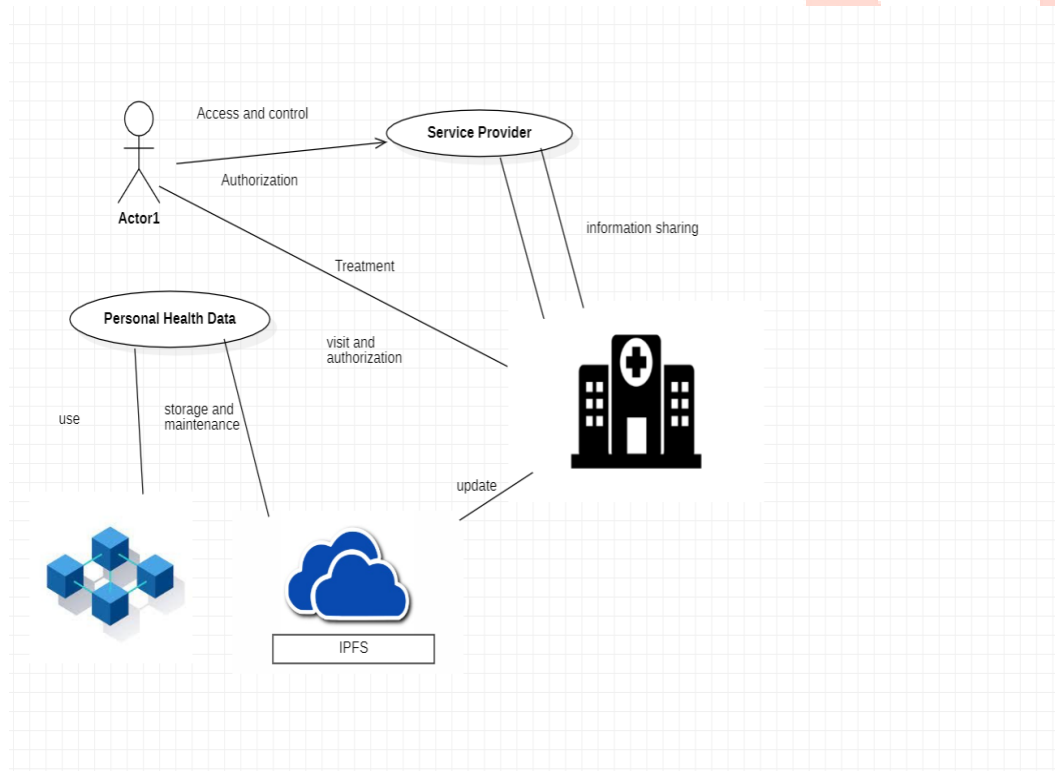


Figure [3]



Figure[3.1]

4. Need of this system [2] :-

Blockchain offers the potential to improve the validation and integrity of such data. It also helps distribute data within the network or facility. These features impact the cost, data quality, and value of medical care in the system. So we can say that to secure our data that is a medical record or to share it with all who are connected to this network. Due to that, anyone can see his / her data and data of particular patients can be shared from one hospital to another hospital. So we can say that with the help of this we can make a system more transparent for all. So, for all of these things, we need this system to overcome all those problems.

5. Conclusion and Future work :-

❖ Future work [7] :-

It is a kind of , decentralized ledger spread through a network. There is no authority in the middle ; it means data can be sent without any damaging of data ,it controls or manipulates it(data). Collection of data is referred to as blockchain in word block. Also it is immutable , it means it is not possible to change data when it is added to the blockchain. There is a link between the block that makes blockchain trustworthy.Its allows doctors, patients, and healthcare providers to gain access to the same information quickly and safely.

So the future works for it to remove or simplify all the problems by improving smart contract etc. Because a smart contract is a kind of proof of work .The main future work is that we want to spread a network more and more .

It means if we write a smart contract it cannot be changed or deleted. We just modify the loop holes that are found out by yourself or by user feedback. And also we can increase or use the best encryption methods to it .

❖ Conclusions [8] :-

It enhances the features related to security issues also used in cyber security for health records system .Improving Electronic Health Information Exchange (HIE) using blockchain to sharing the data across the peer to peer network on blockchain and also contributes to faster data exchange across a wide range of medical applications that are efficient and cost-effective.As a user you will be responsible for providing the access to Doctor, there is not central authority who can see or edit your details without your permission. It allows patients to share specific medical data anonymously for a defined period of time. It is used to record and perform consent-based sharing of patient data and architecture. In short, blockchain provides updated information and allows for access on a need-to-know basis. There is Ledger technology that helps medical secure transfer of patient records.

So for coming generations blockchain plays a very vital important role in health care records.

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