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Medical Data Storage Using Blockchain

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Abstract : **Block chain in healthcare, though early in its adoption, is already showing some promise. In fact, early block chain solutions have shown the potential to reduce healthcare costs, improve access to information across stakeholders. It simplifies and streamlines the influx of information necessary to properly manage and provide care for those who need it most. A patient's medical history, records, current providers and mostly everything else a medical doctor would need to know is constantly and securely accessible and allows for any medical professional to quickly and safely diagnose patients based on a clearer medical record. This platform also brings care plan information, medication protocols and high-quality resources into an easily distillable platform that allows individuals, support systems and multi-care facilities to better understand how to provide nuanced care.**

Keywords —Blockchain, Ethereum, Ganache, Metamask, Truffle, Medical Storage, Data Sharing, Data Security.

I. INTRODUCTION

A blockchain is a database. The term "blockchain" refers to a collection of immutable records, or a chain of transactions, each of which consists of one block kept together by cryptographic keys. By putting patients at the center of the healthcare ecosystem and increasing health data security, privacy, and interoperability, blockchain technology has the potential to transform health care. By making electronic medical records more efficient, disintermediated, and secure, this technology has the potential to build a new paradigm. We anticipate that by using this technique, we will be able to give a doctor with a patient's comprehensive medical history.By deflating the current expenditure bubble, preserving patient data, and enhancing overall experience, blockchain in healthcare might help alleviate the agony. Everything from encrypting medical data to limiting disease outbreaks is currently possible with this technology. Security is a major problem in the healthcare business. Between 2009 and 2017, about 176 million patient records were compromised as a result of data breaches. Blockchain is suitable for security applications because it can maintain an incorruptible, decentralized, and transparent log of all patient data. Furthermore, while blockchain is public, it is also private, concealing any individual's identity behind complex and secure algorithms that can protect medical data sensitivity. Because of the technology's decentralized nature, patients, physicians, and healthcare professionals may all exchange the same information quickly and safely.

The objectives of this system are:

Our aim is to provide a digital solution to this problem so that, next time when you visit your doctor, you don't need to carry your medical file. We have developed a Web portal to allow the doctor to view the past records on any patient with the patient's consent. We are using Blockchain technology to store the patient records. This will ensure that the information or any data remains secure while being decentralized across different peers.

II. LITERATURE SURVEY

The Blockchain architecture that is used in Blockchain Technology for EHR and for safe storage of electronic health data with granular access controls for users. This approach also addresses the scalability issue that blockchain technology has in general by utilizing off-chain record storing. This framework gives the EHR system the advantages of a blockchain-based solution that is scalable, secure, and integrated. [1]

For an e-health system on a mobile cloud platform, they have suggested an unique EHRs sharing architecture based on blockchain and decentralized storage interplanetary file system (IPFS). To strengthen the security of EHR sharing, they have used smart contracts to provide a reliable access control system. A data sharing protocol is also in place to control user access to our EHR system.Using usability testing on a mobile Android application and Amazon Web Services cloud computing,the authors assess the performance of the proposed EHRs sharing paradigm (AWS). The results of the study show that the suggested strategy may be used for a variety of e-health scenarios. They have presented a security analysis as well as a thorough review of several performance indicators to demonstrate the benefits of the proposed framework over the current EHRs sharing solutions. [2]

Blockchain architecture was introduced for electronic health record management . Blockchain enables a decentralized approach to peer-to-peer services across a variety of patient data. Distributed database access can be used to achieve data transparency. The model has certain features for keeping patient logs and may be used to store patient records from hospital databases. Data, preceding hash code, and block hash value are all contained within a block. The cryptographic technique was used to produce each hash code. Graphical user interface layer, Network layer, and Smart contract layer are the three components that make up the model. Each layer conducts a variety of methods in

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response to the demands of the user. Some tasks, such as add, update, and read, are primarily concerned with patient records. [3]

It is a blockchain-based framework allowing patients, providers, and third parties to have safe, interoperable, and efficient access to medical data while maintaining the privacy of patients' sensitive information. Ancile is a system that uses smart contracts on an Ethereum-based blockchain to provide heightened access control and data obfuscation, as well as advanced cryptographic methods for added security. The purpose of this is to look at how Ancile will interact with the various demands of patients, providers, and third parties, as well as to see how the framework may solve long-standing privacy and security problems in the healthcare business. [4]

III. PROPOSED SYSTEM

A. PROBLEM DEFINITION

Over decades, medical facilities have evolved elegantly. Still most of us are the witness of the fact that whenever we see a doctor, we need to put our medical file in front of him/her. Our file contains our previous prescriptions, medical reports,etc. It is a tedious task to keep a record of all these.

B. PROPOSED SYSTEM

As we know how it is difficult to maintain medical records and it becomes tedious for the doctors as well as while referring to the records. And due to this many times whole procedures for testing and consulting has to be redone which is time consuming and not affordable for the patients. So we have come up with an idea of making such a system which would help us to overcome this problem. The system contains a provision for the patients to upload their medical records securely as well as a right to share their medical records with the doctors. Keeping in mind the privacy and security that a patient requires for their medical records we have implemented this system using Blockchain which is very secure and we have used Etherum and Solidity. It is a public Blockchain wherein for patients to connect and upload data in the chain they need to use its private key. Patients have a right to share access with the registered doctor on the chain. And the shared private key of the patient would be visible on the doctor's dashboard. Doctors can view as well as download the documents of the patients and start with the treatment.

IV. METHODOLOGY

For developing this project we have used the smart contract which are written in solidity language which is a statically typed ,curly braces programming language that is designed for the development of smart contracts that run on the Ethereum blockchain.The smart contracts was written and deploy on Remix IDE.Remix is a online IDE that is used for develop and test smart contracts.In total 8 smart contract has be written for our project.The smart contracts are compiled and deployed on ganache network. Ganache is a blockchain simulation that runs locally on a desktop. The compilation and deployment of the smart contracts is done using truffle.js. On compilation ABI (Application Binary Interface) is generated by truffle.js which is required for integrating the front-end with the system. The smart contracts are deployed on different addresses, which are used for interacting with themselves and by metamask to send transactions. Our website is developed using ReactJS which acts as the front-end of the system.This website is integrated with the smart contracts with use of the web3.js module.The metamask wallet browser extension is required for the operation of the system. Metamask wallets allow the user to pay the gas fee required for adding data to the blockchain.

V. RESULTS

The current implementation stage of the system is able to store the medical report of the patients ,along with functionality where the doctor can view the medical report of the patient until he /she gives access to the doctor for viewing the report.We have created a basic ReactJS website as a front-end for taking inputs and displaying data. Some of the screenshots of the system so far implemented is shown below:

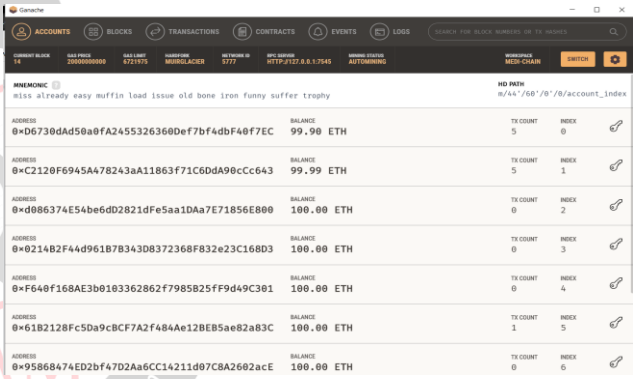

Fig 5. 1 Ganache from where the doctor and Patient has to take a private key.

Ganache is a software in which blockchain simulation can be run locally on a Desktop. It also deploys the smart contracts written for the project. Even it provides private key to the actor .

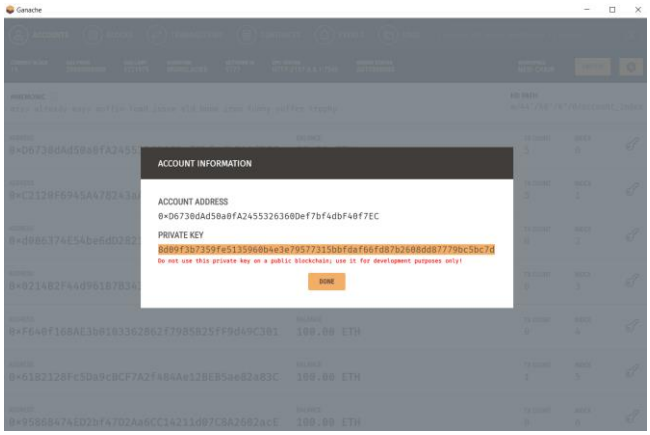

Fig 5.2 Private key available for Doctor and Patient

By using the private key Doctor and Patient can make an

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account in metamask.Once the account is made ,Doctor and patient can use the feature available in the web portal.

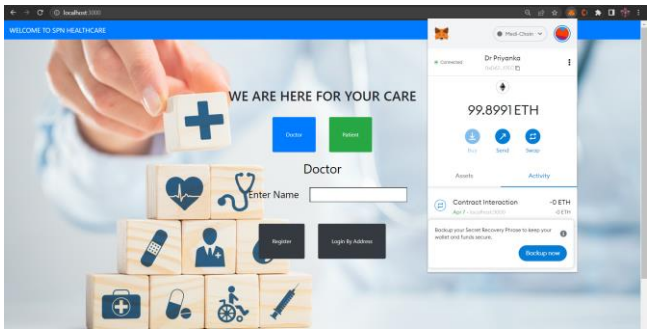

Fig 5.3 :Registering a Doctor to the system

First the actors need to register themselves to the network. As Fig 5.3 shows the example of a Doctor registering themselves to the blockchain and the Metamask wallet confirmation for that transaction.Once the metamask allows the transaction for the Doctor ,then the account is made for the doctor in the metamask.From that Doctor can login to his/her page in web portal application.

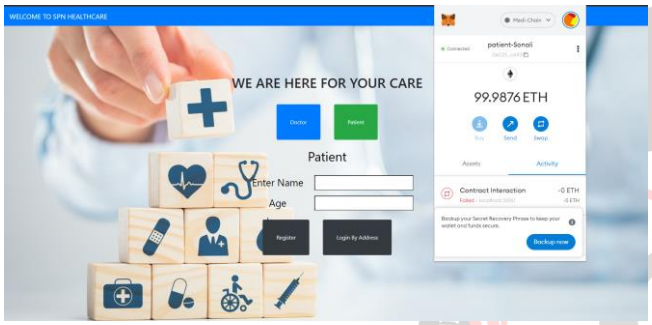

Fig.5. 4 : Registering a Patient to the system

Second, the actor Patient needs to register themselves to the network In Fig 5.4 the patient is registering themselves to the blockchain and the metamask wallet confirms that transaction.Once the transaction is allowed by the metamask,then a patient account is created.

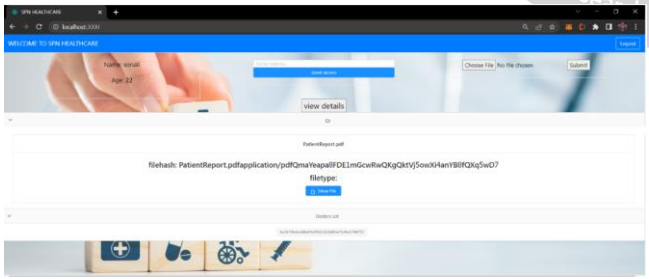

Fig 5.5 Patient can upload the medical report

This is the Patient page ,where the patient can upload his/her medical report .Once the patient has uploaded the medical report .Now the patient can give access to the particular Doctor with whom the patient wants to share his/her medical report. There is a Grant Access button where the patient will take the private key for the Doctor from the ganache and paste it .By clicking on the grant access ,now the Doctor can view the medical report of that patient.Even in the Patient page ,patient can see which whom all doctor he/she has share the medical report.

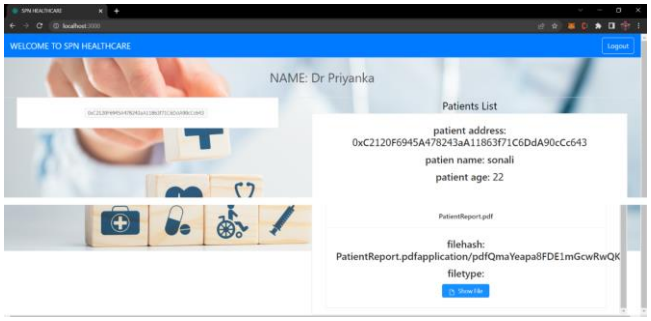

Fig 5.6 Doctor can view the patient medical

This is the Doctor page ,where the doctor can view the medical report of the patients which was shared .It will also show the patient address ,name and age of the patient.

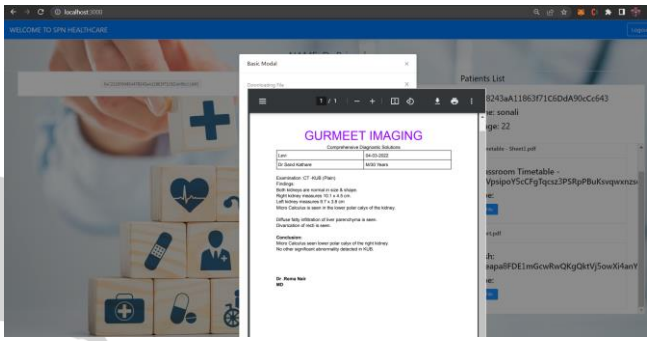

Fig 5.7 Report can be zoom out or in And also it can download and save it

The doctor can view the patient's medical report .Doctor can zoom out or in or can download and save on the desktop.

VI. CONCLUSION

Ethereum is a promising blockchain framework that comes with policies, smart contracts and provision of secure identities.A promising framework for public closed blockchain scenarios to freely join the network. Provide reliable and secure solutions in managing medical field records.

we conclude that Blockchain technology might be a future suitable solution for common problems in the healthcare field, such as EHR interoperability, establishing sharing trust between healthcare providers, auditability, privacy, and granting of health data access control by patients, which would enable them to choose whom they want to trust and with whom to share their medical records.

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