

Healthcare Management System using Blockchain Technology

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Abstract:- Blockchain technology has many application now the time. Different ideas are rising of how to use the blockchain technology in different fields and domains. It provided benefits in several fields like healthcare sector, cryptocurrency, etc. Due to its features of data tampering proof, difficult to modify it, it is used to prevent the data breaches and unwanted data modifications in every fields. Electronic Health Record (EHR) system now the time use in many hospital but even then there is observed that data breaches is happening in the patient data and it is not good for the reputation of the hospital. So, we are trying to make the system using blockchain technology for hospitals so that they can manage the data of patients efficiently with responsibility. It brings security and consistency in the data.

Keywords:- Blockchain Technology, healthcare sector, Electronic Health Record, security, consistency;

I. INTRODUCTION

Now the time technology are advancing with high rate, and it is used in every field. With every new technology, new ideas and designs are rise for better life and better health. Electronic Health Record is such a system which is used to bring ease in managing records and maintaining records in hospital. But due to less security, it becomes vulnerable. Data and information related to doctor, patients and hospital can be changed and modified. So, the system is appear to be unsuccessful. But with the rise of blockchain technology, it brings revolution and strong security service. So it is used in many fields. With the help of Blockchain technology, EHR system has become secure and tamper proof.

Before the rise of these technologies, Healthcare sector used paper based system to store the medical records but that type of system was inefficient, insecure and unreliable because many patients just don't care about their report and lost the report. Whenever patient needs to meet doctor, he/she needs to bring files which contain medical reports, prescriptions, x-ray report, etc. So, paper work is proved to be tedious task.

The EHR system also faces some other problems which are as follows:

Interoperability: It is the way of exchanging information in different system. The exchange of information should be improved for further use of information in efficient manner. An important aspect of EHR systems is its Health Information Exchange (HIE) or in general data sharing aspect. With the increasing number of EHR systems, various terminologies are used for same things. So, it may create confusion because it is not standard way. The terminologies used in the system should be understandable to all.

Data Breaches: In last few years, data breaches in healthcare sector became too much common. A study was done on data breaches and it is found that it happened in large scale. Another study explains that hospitals have become an easy target of cyber attacks. So, there is a need of secured system which can be possible with the use of blockchain technology.

Moreover, many EHR systems are designed for hospitals to fulfill the needs and requirements of the management of data and help in other task. But due to poor security and unreliable system, EHR system and other such system for hospital failed to fulfill its duty. These problems led it to find a platform that may proved to be helpful in transforming healthcare sector to be more secured and that technology is Blockchain. A platform which is secure, transparent and it also provides data integrity to the medical records of the patients. This paper proposes a framework that creates such a platform that would store patient's medical records and also help in other task in hospital to be done such as appointment, consultation, uploading reports, etc. We also intend to solve the scalability problem of blockchain, as it is not in the design of blockchain to store huge volumes of data on it. So, we would use Inter Planetary File System to store the file. Moreover, our proposed work is intending to solve the above mentioned interoperability and data breaches problem faced by the EHR system.

II. LITERATURE SURVEY

[A] In the paper entitled “Towards Using Blockchain Technology for eHealth Data Access Management” the authors have given the idea of using blockchain only for storing address or pointer of data. And IPFS should be used for storing the data.

[B] In the paper entitled “Health Record Management through Blockchain Technology” the authors have suggested to use smart contract in the blockchain for transaction for solving the problem of trust issue.

[C] In the paper entitled “Health Information Exchange using Blockchain Technology” the authors have proposed a Health Information Exchange System which contains effective and usable project modules with entities like doctor, patient, hospital, pharmacist, insurance company.

[D] In the paper entitled, “Blockchain Technology in Healthcare: A systematic Review” the authors suggested many aspects like EMR, drug supply chain management, health insurance claims and health data analytics.

[E] In the paper entitled, “Blockchain-based Electronic Health Records Management A Comprehensive Review and Future Research Direction” the authors suggested that technologies like AI, Internet of Medical Things, Edge Computing can be used in EHR with Blockchain Technology.

III. REQUIREMENT ANALYSIS

In this project, website would be designed for Healthcare system management for helping hospital to do its task. Here, website should be secured and data tampered proof which can be achieved with the help of Blockchain Technology. Medical records would be digitalized and the system would become data tampered proof, so that it become secure and system can be used efficiently.

There are some applications are designed for storing medical records digitally, such as medrec is also one of these application used for storing medical data digitally.

Blockchain is a good solution for providing security and preventing data breaches and data tampering. But storing all system data in every node connected in the network would be inefficient and leads to memory wastes. So, IPFS is used which is peer to peer network protocol for storing data in distributed file system. Some platform is needed for testing the blockchain network, and for that Ganache application is used. Html, Sass, typescript are used for designing the front-end of website with effective template. Django framework is used for designing backend as proxy server. As Django is used, so python is used here.

Cryptographic algorithms are required for encryption, decryption and hashing of the data, so secured network can be created in blockchain. HTML and CSS are used for making attractive templates and web pages. Smart contract is used for making the system trustworthy. It can run in blockchain system, so it is used for doing transaction or exchange of data.

IV. PROJECT DESIGN

❖ Proposed System

Existing Medical Health related systems uses a manual system for the management and maintenance of critical information. But currently we have used Blockchain Technology to make the system more secure and tamper proof. For that we have proposed a Healthcare Management System Using Blockchain Technology, which will enable users to securely store, access and share their digital medical records with doctors. This system helps and guides to doctor, specialists, patients how to interact online, make the appointments and exchange information.

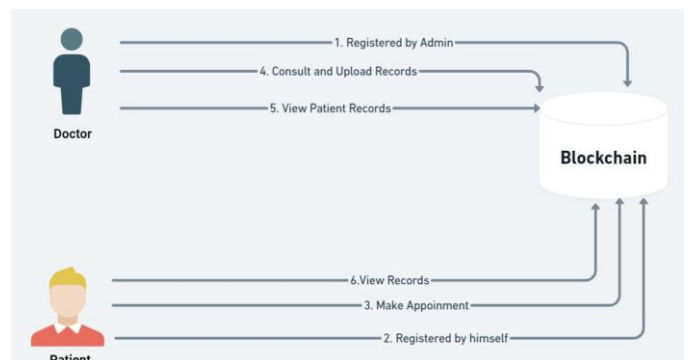


Fig 1:- Usecase Diagram

There are three modules in the system as given.

- A. Patient module: In the patient module, users can registered the new patient, and perform related task to their medical problems. Patients can interact with the specialist doctors for their better prescription and their medical records digitally. This module is further divided as
1. Patient Registration: Patient needs to register in the system.
 2. Patient Login: Registered patient can login in the system.
 3. View Reports: Patient can view and download report uploaded by doctor.
 4. Doctors List: Patient can select any doctor from the doctor list.
 5. Take an Appointment : Patient needs to take appointment.
 6. View Prescription Details: Patient can see the prescribed medicine and dosage on website.

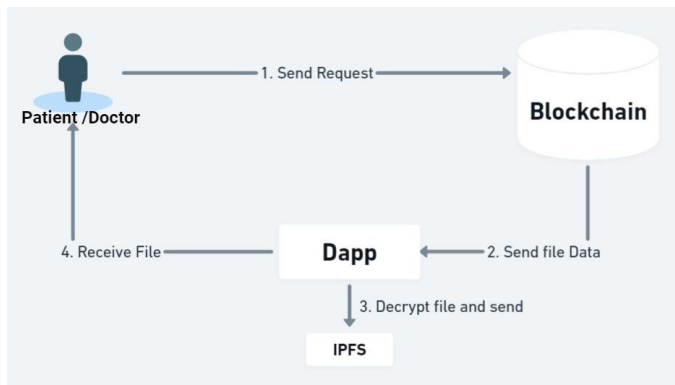


Fig 2:- View record

- B. Doctor module: In this module, doctors have the access to interact with the patients and give medication to the patients. This module is also further divided as
1. Doctor Login: Added doctor can login in the system.
 2. View Patients: Doctor can see the patient’s details who take the appointment.
 3. Upload Reports: After consultation, doctor can upload the report in the system.
 4. Provide Medication for Patients: Doctor can give prescribed medicines with dose information.

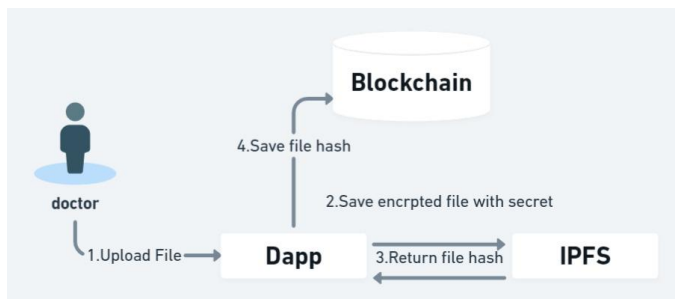


Fig 3:- Upload file

- C. Admin module: Admin can add doctors and patients. Admin also have access to manage the system website. This module also, have different sub-modules.
1. Admin Login: Admin can login in the system.
 2. Add doctor: Only admin can add the doctor in the system.
 3. Manage Website: Admin can manage the website according to their needs.

V. IMPLEMENTATION

In this project, we propose a Health Information System Using Blockchain Technology, which will help hospital to manage and use patient’s data efficiently and securely.

The step wise implementation is given below:

1. Hospital admin add the doctor in the system. Patient can register itself.
2. Patient needs to take appointment first.
3. Then Doctor can view the patient’s record at the time of consultation
4. Doctor can upload medical and x-ray reports in the system. Doctor can give prescription.
5. After that, patient can view and download the report.

Smart Contract: Smart contract is the code that run on the blockchain. This piece of code is executed when transactions are happened. Solidity is used for programming smart contract. And after compiling them it could be executed and deployed on the blockchain. The programming language of JavaScript and Python are encapsulated with the Solidity language provided by Ethereum to write code in smart contracts.

IPFS : IPFS is a protocol that uses peer-to-peer network for data storage. Files stored on IPFS have a unique cryptographic hash. Duplicate files are not present on the IPFS Network. A node on the network stores content and index information of the node.

❖ Platform for Implementation:

1. Ganache: Ganache is a blockchain scalability platform which provides secure, scalable and instant transactions.
2. IPFS: Inter Planetary File System (IPFS) is a file sharing system that can be Leveraged to more efficiently store and share large files. It is a protocol and peer to peer network for storing and sharing data in a Distributed file system.
3. Visual Studio Code: VS Code is a freeware source-code editor made by Microsoft for Windows, Linux and mac OS.
4. Metamask: Metamask is an extension for accessing Ethereum enabled distributed applications.

VI. TECHNOLOGIES USED

- Front-end : Angular cli Framework
- Programming Languages: Html, sass, css
- Back-end : Django Framework
- Programming Language: Python
- Test Blockchain : Ganache
- Metamask used as a wallet.
- Storage: Interplanetary File System(IPFS)
- Software Used :- Microsoft Visual Studio Code
- O.S. Used:- Windows OS 10(64 bit)
- Hardware Used :- Intel Core Processor, 8 GB RAM, Integrated Graphics, LAN

VII. RESULTS

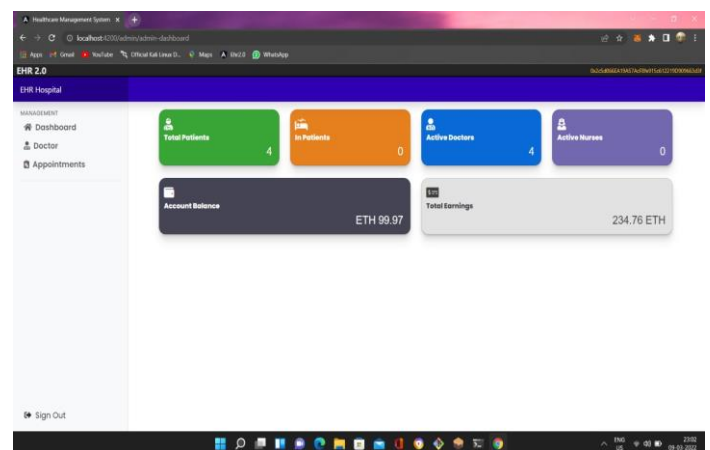


Fig 4:- Dashboard

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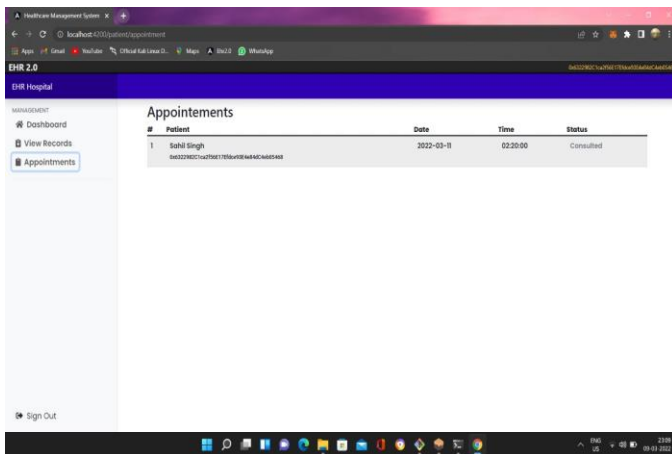


Fig 5:- Appointment detail

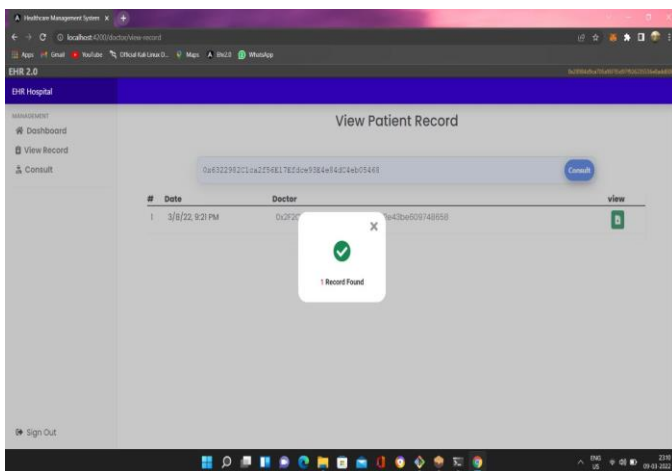


Fig 6:- View Patient Record

VIII. CONCLUSION AND FUTURE SCOPE

In this paper as we discussed above Blockchain technology useful in digital healthcare sector for managing medical records. Blockchain helps in decentralizing the data, it also keep the data confidential and provide integrity. Also, the system proposes measures to ensure the system tackles the problem of data storage as it utilizes the mechanism of IPFS. This system provides patient-driven interoperability where patients provide the on-demand access to their health records and also they can take prescription from the specialist doctors digitally in this system.

For the future, we can also implement Blockchain technology in various sectors such as utility payments, Banking, e-voting etc. In future, we plan to fulfilment the payment option in the present framework. For this we need to have some consideration as how much a patient would pay for consulting services. In future, we will also plan to add supply chain management to the system using which only genuine medicines can reach the patient. Further research can help implementation of blockchain in all domains making lives easier.