

Electronic Health Records Using Blockchain Technology

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ABSTRACT

Due to the rapid growth of HealthCare management, it is crucial to maintain the Electronic Health Records of patients. Electronic Health Record systems face problems in terms of security, integrity, and management since a large volume of patient's sensitive data is shared between anonymous bodies. To overcome these issues, this project aims to explain how Blockchain technology can be a solution for EHRs systems. We proposed a system to implement blockchain technology for EHR and to provide secure storage of electronic records by defining granular access to the users by interpreting an EHR web application. This project also aims to put the patient in control of their medical data.

KEYWORDS: Blockchain, Web Application, Security, Immutable records, Patient control.

I. INTRODUCTION

It is very clearly known that the prescription i.e notes/letters given by the doctors are not patient-friendly. It is difficult to read and understand the document and track the transaction. Also, an enormous volume of sensitive data is being shared every day and stored in local medical record systems where unauthorized people may access it. Therefore, there is a clear need for users i.e patients to provide documents and transactions in an understandable way and avoid the threats of confidentiality, bottlenecks due to the poor design of the existing system.

EHRs contribute to better health care by providing accurate, up-to-date, and complete information about patients allowing quick access to patient records for more coordinated, efficient care. EHR helps in improving the privacy and security of patient's data, thereby diminishing costs through lessened paperwork and reduced duplication of testing. Hence the requirements of EHR include sensitivity, privacy, immutable, access among multiple people. These requirements can match with the properties of blockchain technology.

The blockchain contains a chain of blocks that are connected and these blocks continuously extend based on storing information on the blocks. A blockchain has many benefits like security, anonymity without any interference, distributed data sharing architecture. This technology could provide security of data and make electronic health records more efficient. In this study, we explore the applications of blockchain to health care in electronic health records storage and access management.

II. PRE - REQUISITES REQUIRED

Software Requirements:

- Python 3.8.2
- Python Django
- Bootstrap
- HTML 5
- CSS3
- MySQL
- Json sinks
- Visual studio code

Data Information such as Administrative and billing data, Patient geographics, process data notes, Medical history, medication, Diagnosis, Immunization dates, lab, and test results can be stored in a web application using a blockchain network providing decentralized autonomous secured data sharing.

III. BLOCKCHAIN

To create a private blockchain, the proof of work must be defined after creating a block class with the required attributes. Each block must be unique to ensure no duplicates. Create a new class for blockchain and the hash of the previous block is attached to the present block thereby creating a link to form the chain. This helps to keep track of each block. Proof of work system must be defined to make it slightly difficult to create a new block. Each block to be added to the chain must be valid that it satisfies the difficulty criteria and mining is done. The Hashing algorithm used is SHA256(Secure hash algorithm 256).

Python 3.8.2 language is used to build the blockchain. Python Django is an open-source python framework used for the development of blockchain. Bootstrap is a front-end framework, it includes HTML and CSS-based design for forms, tables. The purpose of adding it to this project is to put in colour, size, font, and layout to the project. MYSQL is a database management system based on SQL(structured query language). The application categorises scripts/data into one structure in the format of a table. JSON stands for javascript object notation. JSON format is used for data interchanging purposes and it is used by any programming language. Visual Studio is an integrated development environment(IDE). With the assistance of IDE, we can write code, then develop web applications, web services, web apps, mobile apps. In this project, we used a visual studio for web application and blockchain interfacing. It contains a code editor, output window, which are used for writing code, checking output.

IV. WEB APPLICATION

The EHR web application designed for our project has three access logins. It was built upon Blockchain-based architecture. Data can be shared in a peer-to-peer approach which is either by a doctor to patient or patient to doctor. Users are Doctors, Patients, and Admins.

Doctor <=> Patient (Transaction of medical data)

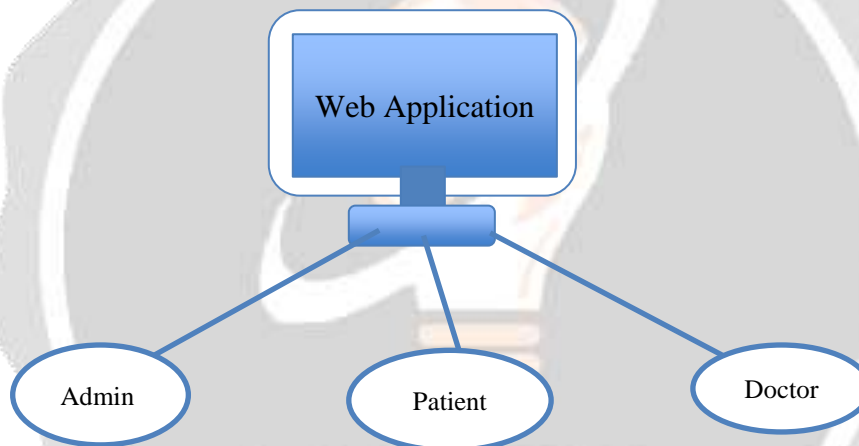


Fig: Web application structure

Admin :

- Admin can log in and signup based on the hospital he is working in.
- Admin can create patient accounts.
- Admin can create doctors' accounts who are working in the hospital under different specialities.

Patient:

- A patient can log in and sign up by providing their credentials.
- Patients can book an appointment with the doctor by filling out a form about the symptoms.
- A patient can see their diagnosis results given by the doctor.

Doctor:

- Doctors can log in and sign up by providing their credentials.
- A doctor can see his/her booking appointments on the Dashboard.
- A doctor can see the patient's details and based on the information provided by the patient, he/she can prescribe medications.

V. RESULT AND DISCUSSION

- The following Snippets shows the access of the web application for different users. (Admins, Patients, Doctors)



Fig 1: Home page

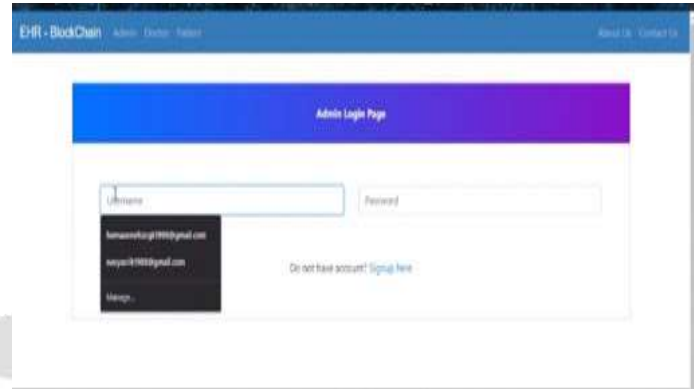


Fig 2: Admin Login Page

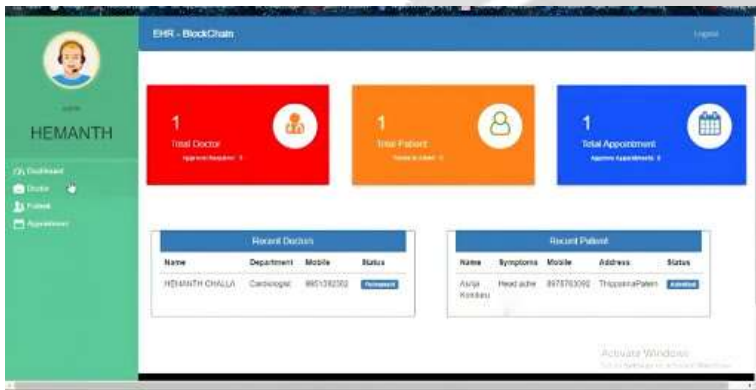


Fig 3: Admin Dashboard

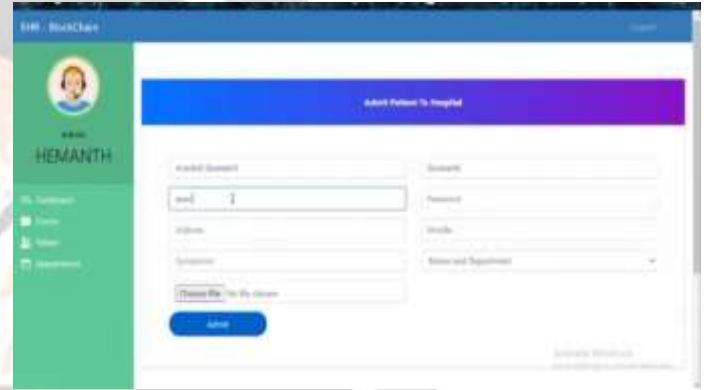


Fig 4: Creation of Patient/Doctor ID



Fig 5: List of Patients

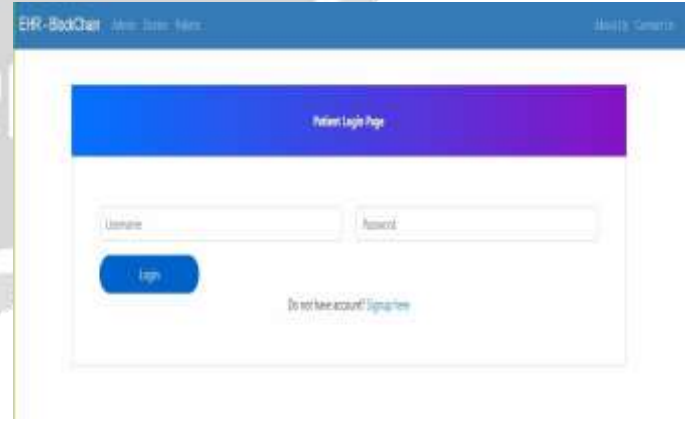


Fig 6: Patient Login Page

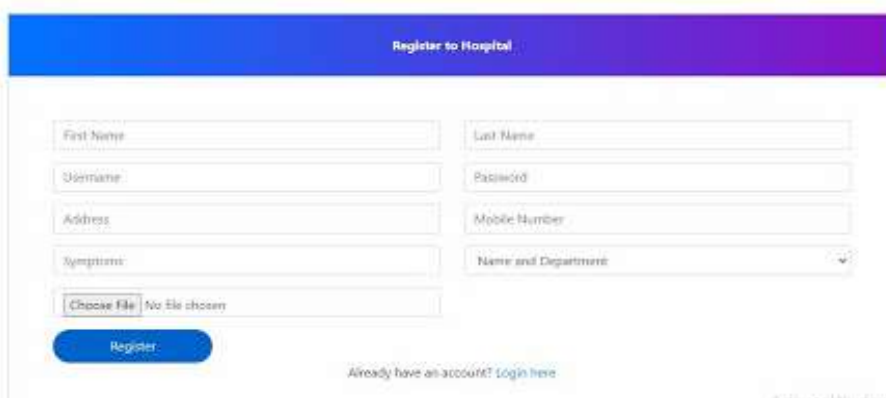




Fig 7: Patient Sign Up



Fig 8: Patient Dashboard



Fig 9: Grant access to doctor

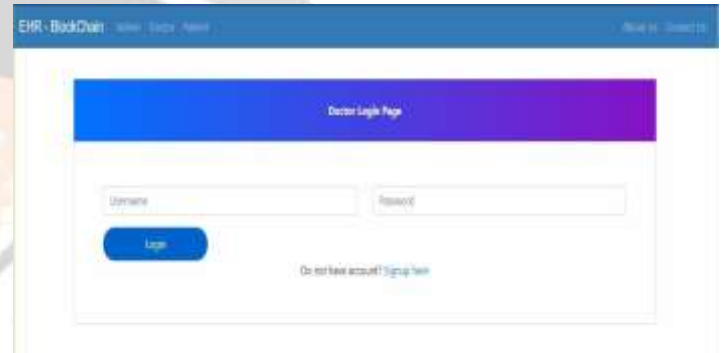


Fig 10: Doctor Login Page

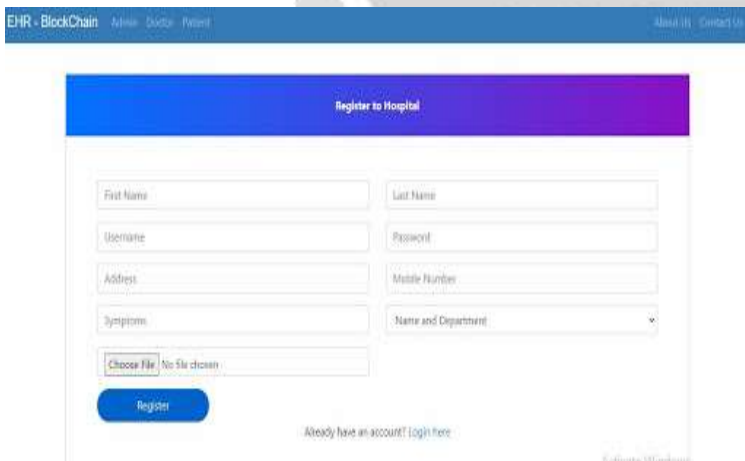


Fig 11: Doctor Sign Up



Fig 12: Appointments in doctor dashboard

VI. CONCLUSION AND FUTURE SCOPE

An electronic health record system using blockchain technology is designed, implemented, and observed. It explains how blockchain can be used for healthcare and also for the advancement of EHR systems by solving the issues of previous EHR systems. This system provides role-based access, as the records are only available between trusted and related individuals. This project can be extended to a high-end application by using the advanced architecture of blockchain- like Hyperledger, Ethereum. Features like payment module, file transfer, interactions between peers can be included for future purposes.

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