

Design and Implementation of Healthcare System Using Blockchain

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Abstract - Medical data privacy and data protection are crucial issues during medical services. The bulk of the populace is always concerned about data security or secure storage of medical data. An effective and efficient healthcare system requires a technology platform to communicate securely and seamlessly. For a few years now, blockchain has been a developing technology. Most developers are drawn to blockchain because of its immutability, decentralization, transparency, and distributed ledger. As a result, the use of Blockchain in health-care systems will have a significant impact because it can be used to securely store personal medical data. This study proposes a HealthCare system that securely manages personal medical data and facilitates communication among doctors, patients, and administrative staff. The study also includes a comparison between a traditional system and the suggested system, as well as a description of the system's breadth and possibilities for future research.

Index Terms—Blockchain, Healthcare, IPFS, Smart Contract.

I. INTRODUCTION

The recent advent in technology is affecting all parts of human life and is changing the way we use and perceive things previously. Just like the changes technology has offered in various other sectors of life, it is also finding new ways for improvement in the healthcare sector. The main benefits that advancement in technology is offering are to improve security, user experience and other aspects of the healthcare sector. Electronic Health Record (EHR) and Electronic Medical Record (EMR) systems provided these advantages. They do, however, have certain concerns about the security of medical records, user ownership of data, data integrity, and so on. The implementation of a revolutionary technology, such as Blockchain, could be the answer to these problems. This technology offers a secure, tamper-proof platform for storing medical records and other healthcare related information. Prior to the invention of modern technology, the healthcare industry relied on a paper-based system to store medical records, i.e., a handwritten system. This paper-based medical record system was inefficient, insecure, disorganized, and unforgiving. It also had to deal with data duplication and redundancy because all of the institutions where the patient went had multiple copies of the patient's medical records.

EHR systems, which were designed to combine paper-based and electronic medical records, became popular in the healthcare industry (EMR). Clinical notes and laboratory results were stored in these systems' various components [1]. They were proposed to improve patient safety by preventing errors and increasing access to information [2]. The purpose of EHR systems was to help individuals with their problems. EHR systems have been used in a number of hospitals throughout the world because to the benefits they give, including better security and cost-effectiveness. They are regarded as an important aspect of the healthcare business because they give the industry a lot of functionality.

II. Healthcare Management System

A. Why HMS and How is it useful for Hospitals?

Doctors and nurses are no longer the sole providers of healthcare. The healthcare sector includes hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance, and medical equipment. A well-oiled hospital management process requires a plethora of key decisions to be made as fast and efficiently as feasible. Without a distinct hospital administration system, it is difficult to deploy currently. As a result of these changes in the healthcare business, the usage of a healthcare management system has become necessary. So, what exactly is the HMS (Hospital Management System)? The Hospital Management System (HMS) is a piece of software that manages various aspects of clinic workflow. It controls administrative, medical, legal, and financial aspects of healthcare performance. That is a necessary component of the healthcare facility's successful operation.

B. FEATURES OF HOSPITAL MANAGEMENT SOFTWARE:

1. Speed: Because it automates the majority of healthcare processes, the system should never slow down. All duties, including communication between departments, reporting of tests, and so on, are sped up with the help of a hospital management system. As a result, an HMS's speed is considered crucial.

2. Error-free: Another important characteristic of a hospital management system is that it must be error-free. In other words, it should be able to complete all tasks with the highest level of accuracy and with the least amount of human intervention. The implementation of such a system also ensures that employees make fewer mistakes. Not only that, but it can also cut down on the number of workers needed to complete the task.

3. Easy access of data: You can easily access all of the necessary data with the help of a hospital management system. A hospital generates a large amount of data on a daily basis, which must be safely stored. This is something that the software is capable of. Doctors, for example, can access patient data whenever they want, without having to wait.

4. Cost-effective: For hospitals, the system also proves to be very cost-effective. Using a hospital management system means less time spent stationary, less storage space needed, and a smaller workforce. All of this helps to reduce the total cost of operations.



figure 1: hms

III. TECHNOLOGIES

A. Blockchain in Healthcare:

Blockchain is a cryptographically linked decentralized list of digital records. Each record is referred to as a 'block.' Every block has a cryptographic hash of the previous block, which is a mathematical algorithm, as well as a timestamp and transaction data. Blockchain was created as a secure open ledger for recording digital transactions that is managed by a peer-to-peer network.

ALL about removing the middleman. It's about increasing the security of various transactional activities in the healthcare space, while eliminating bureaucracy and manual inefficiencies, improving quality of care and democratizing patient data.

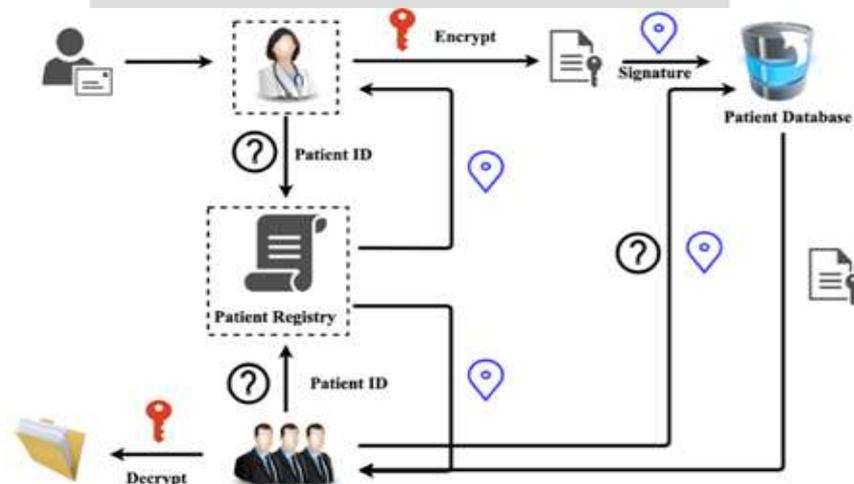


figure 2: Structure of Healthcare

B. Smart Contracts:

Blockchain is a platform on which smart contracts can be executed and hosted. Smart contracts are basically computer programs that run in a blockchain. They are used as triggers, conditions and also business logic so as those programmable transactions are enabled. In general, they contain attributes – value and state. Therefore, they are used to verify and validate the contracts made between two or more parties that are a part of the blockchain.

C. IPFS (Inter Planetary File System):

The relationship between IPFS and blockchain: The joining of IPFS It's a natural fit, and blockchain is a natural fit. As a result, a robust distributed permanent digital ledger with access from multiple systems has been created.

The InterPlanetary File System (IPFS) is a peer-to-peer distributed system that forms a Merkle-DAG by connecting networks utilizing the same file system. The DAG structure is made up of linked objects that are usually connected by their hash.

IPFS combines distributed peer-to-peer file system storage with Merkle data structures that allow versioned file systems to communicate to create the permanent web.

It is not necessary for peers (or nodes) to trust one another.

D. Postman:

Postman is a stand-alone API (Application Programming Interface) testing platform for creating, testing, designing, modifying, and documenting APIs. It's a straightforward GUI for sending and viewing HTTP requests and answers.

You don't need to develop any HTTP client network code while using Postman for testing. Instead, we create groups of tests and let Postman interact with the API. Almost any functionality that a developer would require is integrated in this programme. This tool can make a variety of HTTP queries, including GET, POST, PUT, and PATCH, as well as convert the API to code in languages like JavaScript and Python

E. SQL:

Medical care associations normally use SQL to import/trade records from specific clinical hardware or patient outline data sets into their application programming connection points (APIs) or medical care data the executives frameworks (HIMS) without requiring IT staff to include the data physically.

IV. IMPLEMENTATION:

Our website assists users in efficiently organizing their reports. After entering our Aadhar number on the Home page, we can view our medical reports, which doctors may quickly review for future action. Patients also have the option of scheduling an appointment with a doctor of their preference. A message will be sent to the patient after a successful appointment booking.

Doctors can examine all of their patients' information when they log in.

The hospital's admin has the right to add, delete, and update patient data and reports.

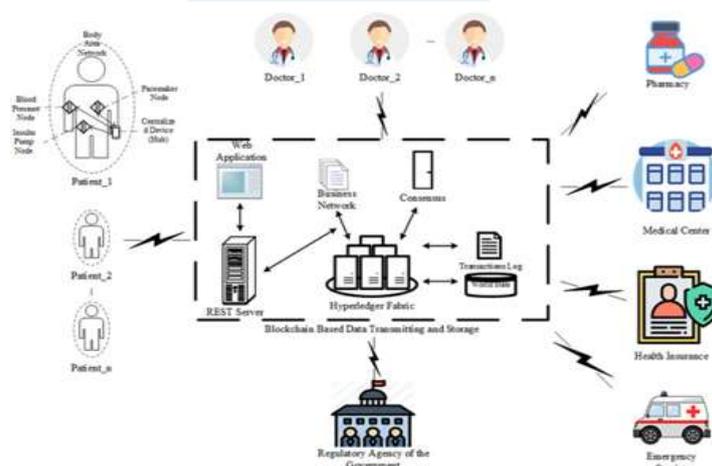


figure 3: HMS Blockchain



figure 4: Home Page

The initial page of the website will be the home page. By providing their Aadhar number, patients can get their reports. On this Home page, patients can also make appointments and change the language of the website. Patients can also see a list of the doctors who work at the hospital, as well as the services that the institution offers.

In the login page, the user can login into his own page either as a doctor,admin according to the credentials given.

In the signup page, the user can make his account into his own page either as a doctor,admin or as a patient according to the credentials given.

This allows the user to enter the personal details such as Name, Aadhar number, Date of Birth, Blood Group, Address and various more essential details in order to systematically maintain the records

figure 5: Signup Successful

After successfully registering, the user will get this popup message.

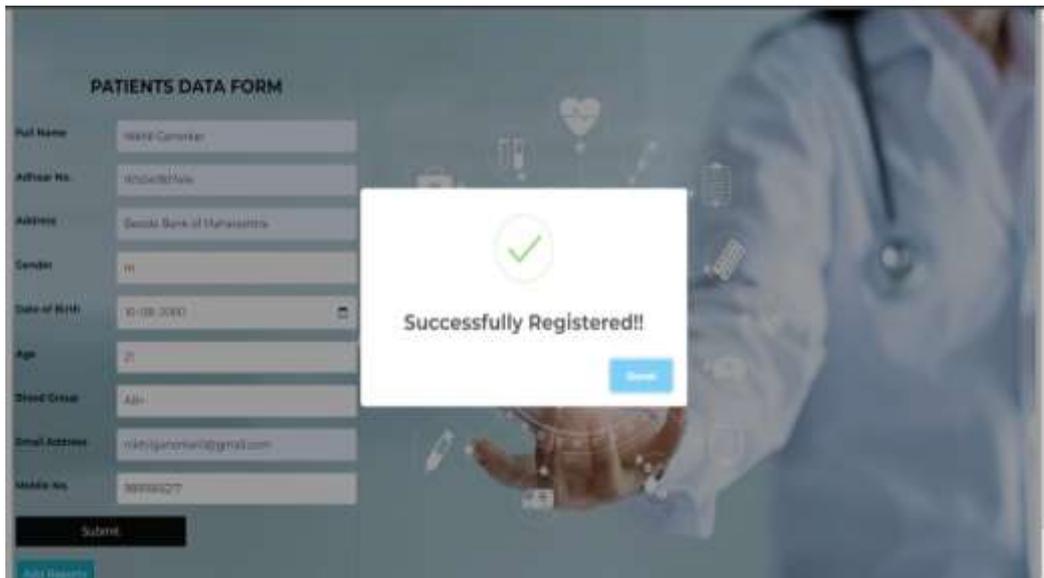


figure 6: Patient details are added successfully

After entering the patient's Aadhar number, this page is forwarded from the Home page. The patient's reports can be found here. From this page, the hospital's admin can make changes to the patient's record.



figure 7: Doctors Available

Patients can browse a list of doctors working in the hospital, as well as their degrees and the faculty in which they work.

figure 8: Book Appointment Form

Patients can use this form to schedule an appointment with the doctor of their choice. Patients will receive a message on the mobile number entered in this form after an appointment has been successfully booked.



figure 9: Facilities Provided

In the facilities we provide 1]ambulance,2]emergency services,3] rooms,4] canteen these are all four services available 24/7 . If we open this web page through our mobile phone, we can make a direct call on the contact numbers provided.

V. FUTURE SCOPE

When it comes to healthcare facilities, Blockchain technology has a favourable impact on doctors' ability to acquire and use patient data, as well as how patients communicate with doctors. Blockchain development services are not a new concept in the business; it is a rapidly evolving technology with a bright future ahead of it.

VII. CONCLUSION

Our research reveals that blockchain can be used in a variety of healthcare applications, including electronic medical record administration, drug and pharmaceutical supply chain management, biomedical research and teaching, remote patient monitoring, and health data analytics. A variety of blockchain-based healthcare prototypes have been created using developing blockchain concepts including smart contracts, permissioned blockchain, and off-chain storage, among others. More research is needed, however, to better comprehend, characterize, and evaluate blockchain technology's relevance in healthcare. In order to overcome the difficulties of scalability, latency, interoperability, security, and privacy in connection to the application of blockchain technology in healthcare, more study is required.

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