VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JNANA SANGAMA", BELAGAVI - 590 018

MINI PROJECT REPORT

on

"Patient Record Management with Scan Card Integration"

Submitted by

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In partial fulfillment of the requirements for the V semester

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE & ENGINEERING

Under the Guidance of

Dr. Mustafa Basthikodi

Professor & Head, Department of CSE

at

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MANGALURU

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CERTIFICATE

This is to certify that the mini project work entitled **"Patient Record Management with Scan Card Integration"** has been carried out by **A P Aishwarya (4SF21CS001), Deeya Das (4SF21CS039), Jampala Poojitha (4SF21CS062) and Vinola Quadras(4SF21CS187)**, the bonafide students of Sahyadri College of Engineering and Management in partial fulfillment of the requirements for the V semester of Bachelor of Engineering in Computer Science and Engineering of Visvesvaraya Technological University, Belagavi during the year 2023 - 24. It is certified that all suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the said degree.

Project Guide	**Project Coordinator**	**HOD**
Dr. Mustafa Basthikodi	**Dr. Adarsh Rag S**	**Dr. Mustafa Basthikodi**
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DECLARATION

We hereby declare that the entire work embodied in this Mini Proejct Report titled **"Patient Record Management with Scan Card Integration"** has been carried out by us at Sahyadri College of Engineering and Management, Mangaluru under the supervision of **Dr. Mustafa Basthikodi.,** in partial fulfillment of the requirements for the V semester of **Bachelor of Engineering** in **Computer Science and Engineering**. This report has not been submitted to this or any other University for the award of any other degree.

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Abstract

This proposed card-integrated patient record system aims to enhance the security, transparency, and accessibility of medical information. Leveraging decentralized and tamper-resistant technology, the system addresses challenges in traditional patient record management. It ensures data integrity, transparent access for authorized stakeholders, and mitigates risks of centralized storage. ScanCard integration in SecureHealth enhances patient record accessibility. Users can retrieve and update medical information effortlessly through a simple card scan, improving user experience, data accuracy, and system efficiency and security.

Acknowledgement

It is with great satisfaction and euphoria that we are submitting the mini project report on **"Patient Record Management with Scan Card Integration"**. We have completed it as a part of the curriculum of Visvesvaraya Technological University, Belagavi in partial fulfillment of the requirements for the V semester of Bachelor of Engineering in Computer Science and Engineering.

We are profoundly indebted to our guide, **Dr. Mustafa Basthikodi**, Professor and Head, Department of Computer Science and Engineering for innumerable acts of timely advice, encouragement and we sincerely express our gratitude.

We also thank **Dr. Suhas A Bhyratae**, **Dr. Adarsh Rag S** and **Mr. Raghavendra Sooda**, Project Coordinators, Department of Computer Science and Engineering for their constant encouragement and support extended throughout.

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We sincerely thank **Dr. S. S. Injaganeri**, Principal, Sahyadri College of Engineering and Management and **Dr. D. L. Prabhakara**, Director, Sahyadri Educational Institutions,who have always been a great source of inspiration.

Finally, yet importantly, we express our heartfelt thanks to our family and friends for their wishes and encouragement throughout the work.

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Chapter 1

Introduction

The traditional process of managing patient records, characterized by the physical accumulation of medical reports and documents, poses significant challenges for both patients and healthcare professionals. Patients often find themselves burdened with the task of organizing and carrying numerous sheets of paper containing their medical history, which can be particularly daunting for individuals with complex health conditions. The potential consequences of this cumbersome process are magnified in critical situations, such as emergencies or serious accidents, where the lack of immediate access to comprehensive medical records can impede timely and accurate treatment. Moreover, the reliance on manual record-keeping not only leads to inefficiencies and inaccuracies but also exacerbates concerns regarding data security and privacy. Healthcare providers face the arduous task of deciphering and piecing together fragmented medical information, which can compromise the quality of care delivered. This outdated approach results in a significant consumption of time and resources, as well as unnecessary paper wastage, further highlighting the urgent need for a more efficient and secure solution.

The proposed blockchain-based patient record system offers a transformative alternative to traditional record management practices by introducing a decentralized and transparent framework for storing and accessing medical data. By leveraging the inherent security and immutability of blockchain technology, the system ensures the integrity and confidentiality of patient records while facilitating seamless access for authorized stakeholders. Patients benefit from the convenience of digitally accessing their comprehensive medical history, eliminating the need for cumbersome paper-based documentation. Healthcare professionals gain timely and secure access to accurate patient records, empowering them to make informed decisions and deliver personalized care. Furthermore, the transparent

nature of blockchain transactions fosters trust and accountability in the management of sensitive medical information, mitigating concerns regarding data security and privacy. Overall, the adoption of a blockchain-based patient record system holds the potential to revolutionize medical data management, enhancing efficiency, security, and accessibility while improving patient outcomes and fostering collaboration within the healthcare ecosystem.

Chapter 2

Literature Survey

A personal health record (PHR) including healthcare history, medical records, allergy history, and genetic diseases is an important property of each patient [1]. Patients own their PHRs, and they do not have to disclose all their records to doctors whenever they seek medical treatment, unless in the case of major diseases. Meanwhile, doctors should also be allowed to check their patients' PHRs, even in emergency situations, when the patients may be unconscious and their lives are in danger [2].

Many systems have been designed to manage and access patients' personal health records based on traditional centralized databases [3][4] or blockchain [5]. When a patient seeks treatment from a doctor, the doctor can view the patient's personal health information under the patient's permission. However, these systems still have several challenging problems, especially in an emergency situation. Firstly, its storage is costly for a healthcare service institute or hospital in recording and maintaining the fast-growing volume of personal information. In order to overcome the storage cost, the health recording service may only promise to maintain the records happening in the recent 3 years or 5 years and discard the older records. Secondly, the health records are stored in a centralized server and the data is at risk to be leaked when the data is transmitted or accessed by doctors. Since health records contain highly private and sensitive information, data leakage can result in exposure to privacy. Thirdly, the traditional access control methods bear relatively long time delay without considering the emergency requirements; meanwhile, the quick access mechanism is credential for patients.

In order to better store and share the patient's personal health records,researchers introduced the semitrusted server to implement data storage and proxy reencryption. Liet al. [17] proposed a framework for access control to PHR stored in a semitrusted server, using

attribute-based encryption (ABE) technology to encrypt the PHR file of each patient. Users in the PHR system are divided into multiple security domains, which reduces the complexity of keymanagement for users and ensures a high degree of privacy for patients. Bhatia et al. [18] proposed a lightweight certificateless proxy reencryption scheme to make the PHR system capable of low-power mobile devices, which uses the semitrusted proxy server to perform the reencryption process. Reference [14] proposed a revocable and unpaired ciphertext policy attribute-based encryption for the management of personal health records and added a proxy decryption server to decrypt the partial ciphertext at the decryption end, which can effectively reduce the computational overhead of the decryption end. Although the above models protect the privacy of the PHR system and consider efficiency issues, their designs all rely on the semitrusted server. e server is extremely vulnerable to single-point attacks, which cannot guarantee the security of data.

The emergency situation is not considered, such a show to handle data requests from doctors while the patient is unconscious.In dealing with emergency access, Huda et al. [12] introduced a new privacy-aware protocol for handling healthcare professionals' access to patient-controlled PHR in emergency situations. It uses an IC card embedded with a patient's emergency access report for strong authentication.The method of storing data on the IC card is risky. If the IC card is lost, it will cause irreparable losses.The emergency access policy designed in [15] is to preset a timeout period. If the patient rejects the emergency request, the patient is conscious and the doctor needs to be authorized to access normally. If the patient does not operate over time, the system will approve an urgent request.The setting of the timeout period here is a problem. Reference [21] proposed three verification methods for the PHR system in emergency situations.The first is that the telecommunication provider determines whether the patient's telecommunication equipment is within a reasonable distance of the hospital location. If reasonable, the telecommunication provider provides the patient's key sharing.The second is to send a shared key request to emergency contacts if the patient does not respond within a reasonable time.

Chapter 3

Problem Statement

Designing a blockchain-based patient record system to enhance the security, transparency, and accessibility of medical information with Scan Card Integration. Current patient record systems suffer from security vulnerabilities, lack of transparency, and limited accessibility. The centralized nature of these systems makes them susceptible to data breaches and unauthorized access. The proposed system addresses these issues through the implementation of blockchain technology. Security Vulnerabilities: Centralized databases storing patient records are susceptible to cyber threats and data breaches. Unauthorized access to sensitive medical information poses a significant risk to patient privacy and confidentiality. Lack of Transparency: Current systems often lack transparency in terms of who accesses patient records and for what purposes. Patients may be unaware of who has viewed their medical information, leading to a lack of trust in the system. Limited Accessibility: Patient records are often scattered across various healthcare providers and systems, hindering seamless access for authorized personnel. In emergency situations, quick and comprehensive access to a patient's medical history may be challenging. Data Integrity and Tampering: The centralized nature of data storage raises concerns about the integrity of patient records.Tampering or unauthorized alterations to medical records can have severe consequences for patient care and legal matters.

3.1 Objectives

- Conduct an extensive literature review to understand existing patient record management systems and blockchain technology's potential in healthcare.
- Identify challenges and limitations in traditional patient record management, fo-

cusing on inefficiencies, security concerns, and accessibility issues.

- Develop a scan card solution for patients to effortlessly access and update their medical records.
- Conduct usability testing to evaluate the effectiveness and user-friendliness of the scan card solution and the overall system.
- Analyze the results of the evaluation process and compare them against predefined metrics and benchmarks.

Chapter 4

Software Requirements Specification

The utilization of the MERN (MongoDB, Express.js, React.js, Node.js) stack as the software requirement for the implementation of the proposed patient record system offers numerous advantages in terms of flexibility, scalability, and developer productivity.

1. MongoDB: MongoDB serves as the database component of the MERN stack, providing a flexible and scalable solution for storing patient records. Its document-based data model allows for easy storage and retrieval of complex medical data, while its scalability features ensure that the system can handle increasing volumes of patient information as the user base grows.

2. Express.js: Express.js is used as the web application framework for Node.js, providing a robust and efficient platform for building the backend services of the patient record system. Its minimalist design and middleware support enable developers to create RESTful APIs for managing patient records, authentication, and other essential functionalities with ease.

3. React.js: React.js serves as the frontend library for building the user interface of the patient record system. Its component-based architecture and virtual DOM abstraction facilitate the development of interactive and dynamic user interfaces, enhancing the user experience for both patients and healthcare providers. Additionally, React's reusability and modular approach streamline the development process and promote code maintainability.

4. Node.js: Node.js acts as the runtime environment for executing server-side JavaScript code in the MERN stack. Its event-driven, non-blocking I/O model makes it well-suited for handling concurrent requests and real-time interactions, ensuring optimal performance and responsiveness for the patient record system. Moreover, Node.js's extensive package ecosystem enables developers to leverage a wide range of libraries and tools to enhance

the functionality and scalability of the system.

By leveraging the MERN stack, the patient record system benefits from a cohesive and modern technology stack that streamlines development, promotes code reusability, and facilitates the creation of scalable and responsive applications. Additionally, the use of JavaScript across the entire stack enables developers to work seamlessly across frontend and backend components, fostering collaboration and productivity throughout the development lifecycle.

Chapter 5

System Design

5.1 Architecture Diagram

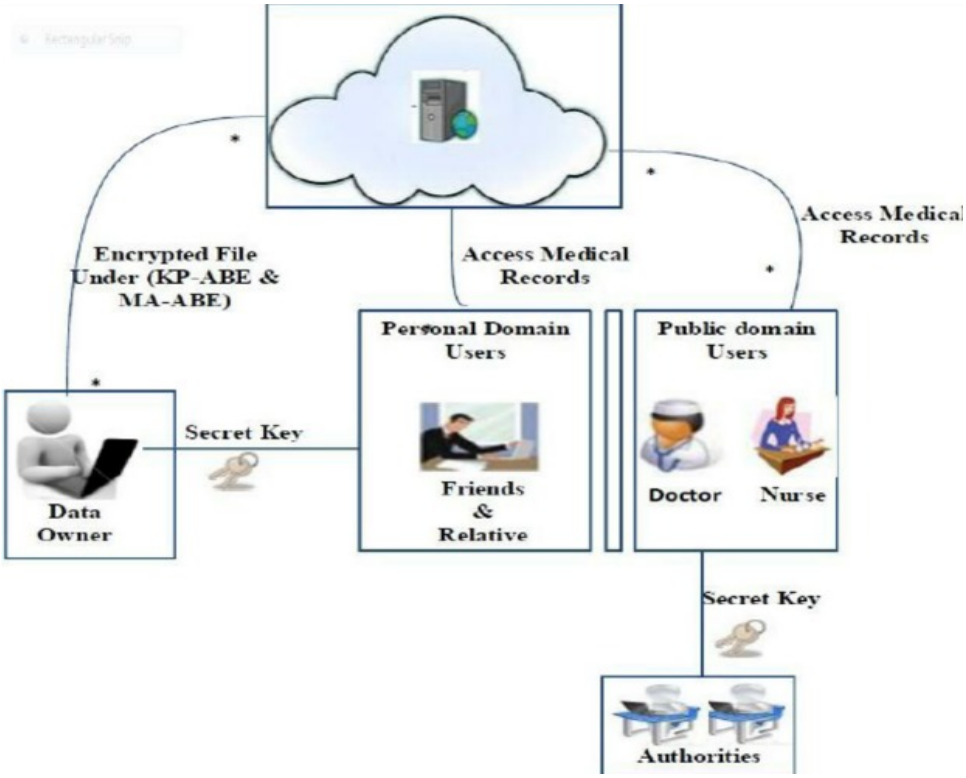

Figure 5.1: Representation of entities in the system

5.2 Use-Case Diagram

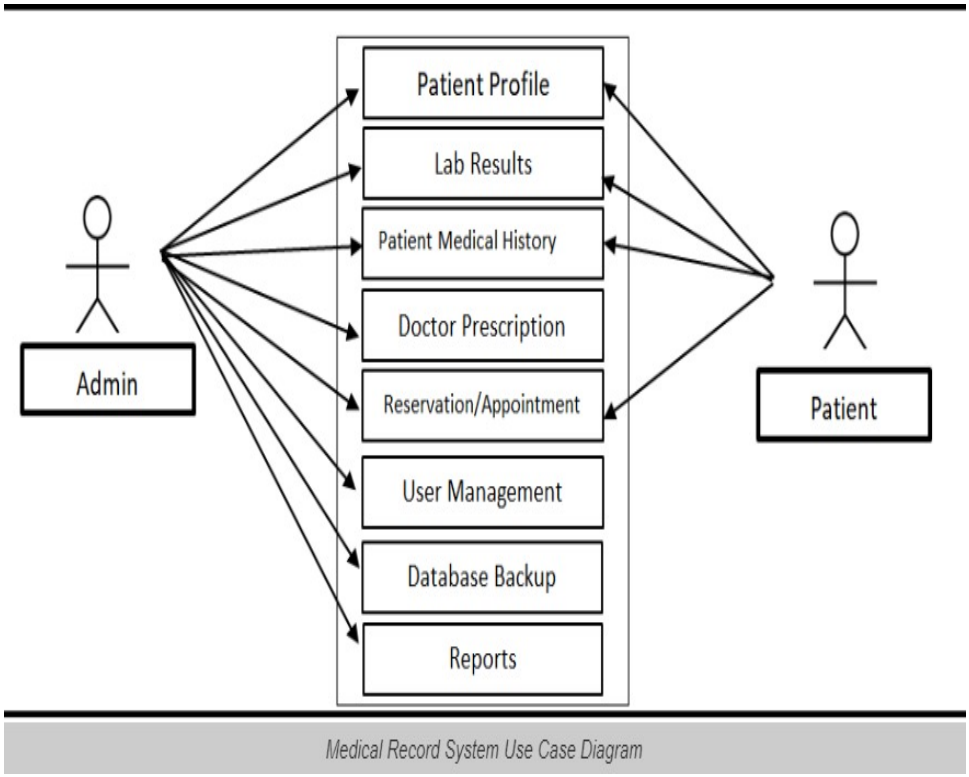

Figure 5.2: Scope of the project

5.3 Data Flow Diagram

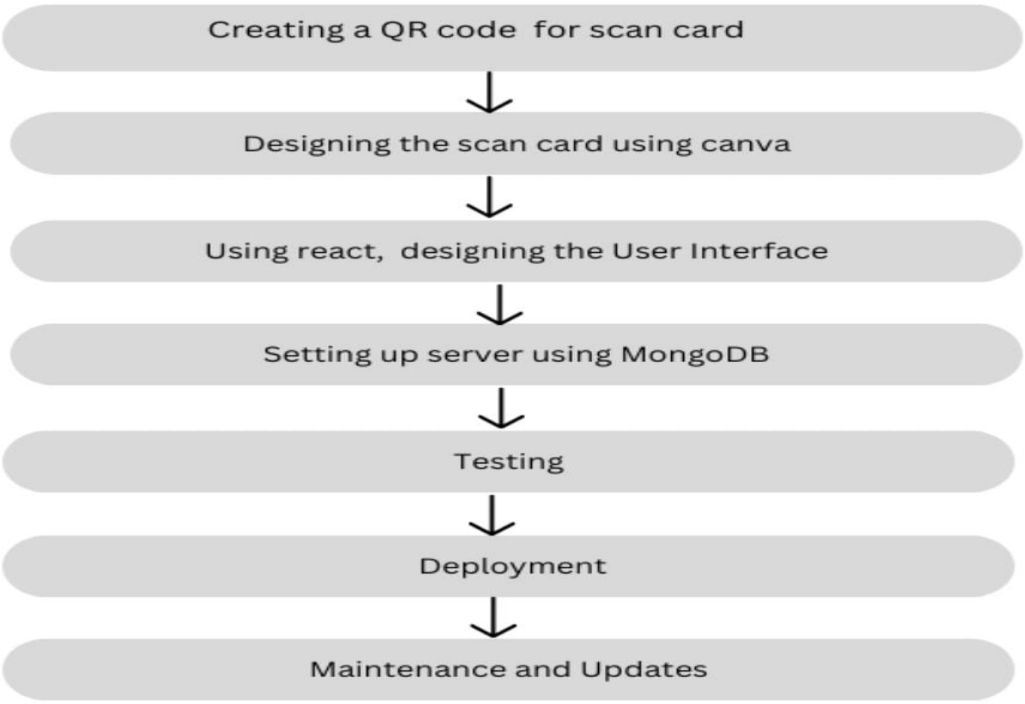

Figure 5.3: Flowchart of the proposed system

5.4 Class Diagram

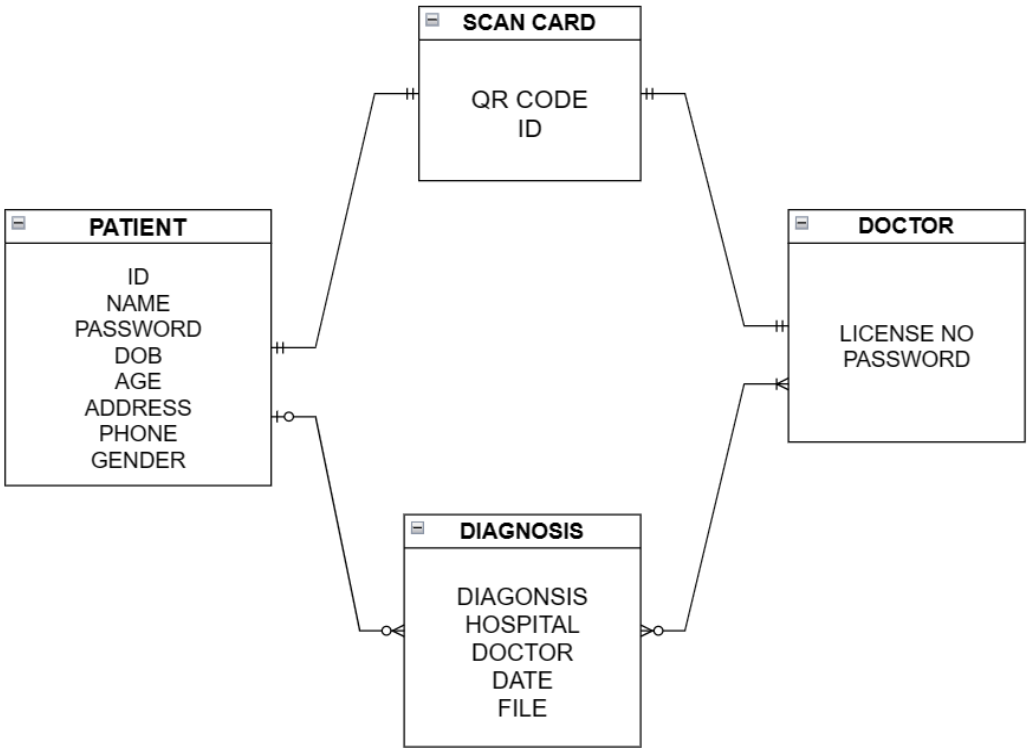

Figure 5.4: Blueprint of the system

5.5 Sequence Diagram

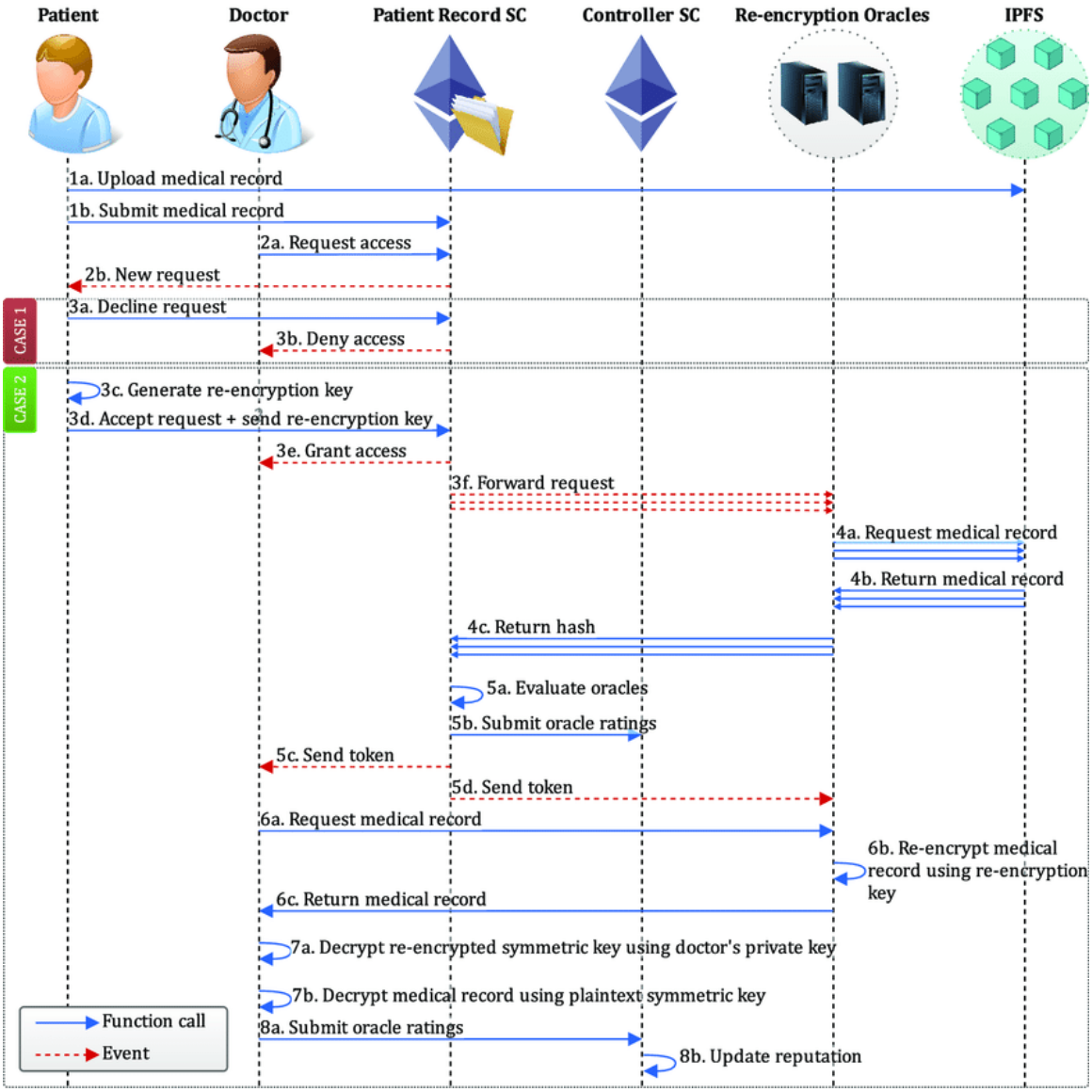

Figure 5.5: Sequence of messages exchanged

Chapter 6

Results and Discussion

The healthcare industry is undergoing a digital transformation, and one of the most critical areas of focus is patient data management. Traditional methods of storing and accessing medical records are often siloed, insecure, and inefficient. This not only creates challenges for patients and healthcare providers but also poses significant security risks. Blockchain technology, with its inherent immutability and transparency, offers a promising solution to these problems. This paper explores the development and implementation of a patient record system (PRS) leveraging the MERN stack (MongoDB, Express.js, React.js, Node.js) for development and data storage with ScanCard integration for enhanced security and user experience. PRS fosters trust and transparency by empowering patients with greater control over their healthcare data. Patients can access their medical records securely and track who has accessed them through detailed access logs. This level of transparency allows patients to actively participate in their healthcare decisions by providing a complete view of their medical history to authorized providers. Furthermore, patients can grant or revoke access to their records at any time, ensuring that only relevant healthcare professionals have access to the information they need. This shift in control empowers patients and fosters a collaborative environment in healthcare delivery. The optional integration of ScanCard technology offers a convenient and potentially more secure method for patient authentication. By utilizing a physical ScanCard, patients can log in to the PRS system quickly and securely, eliminating the need for remembering complex passwords. This can be particularly beneficial for patients who may struggle with traditional login methods. Additionally, ScanCards add a layer of security compared to password-based authentication, reducing the risk of unauthorized access through stolen credentials.

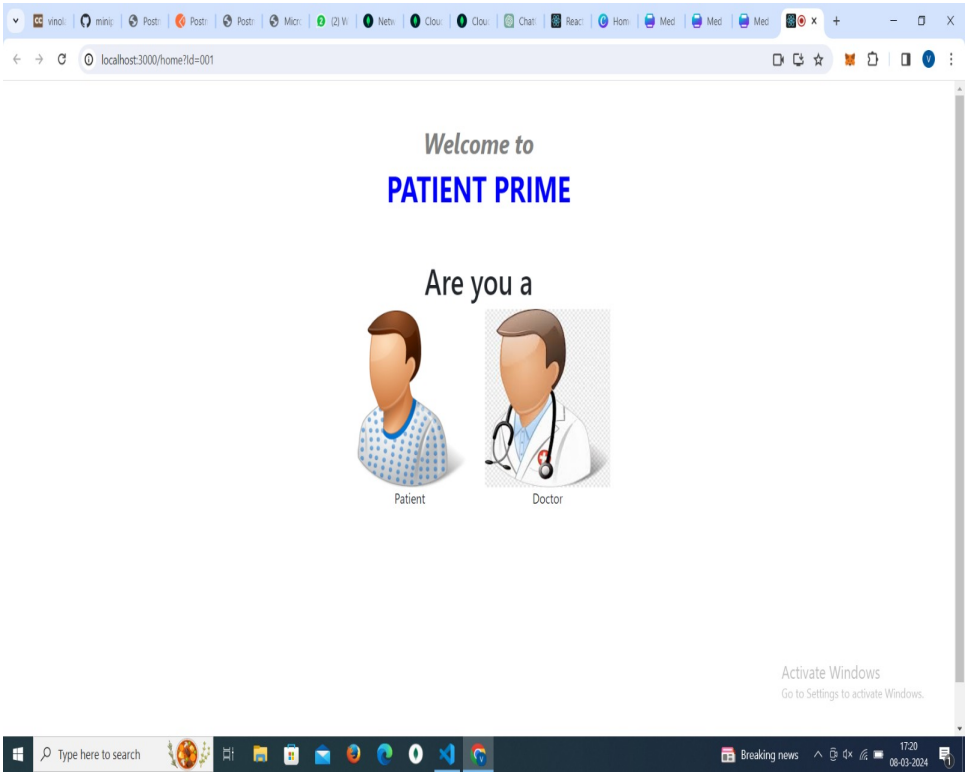

Figure 6.1: Home page

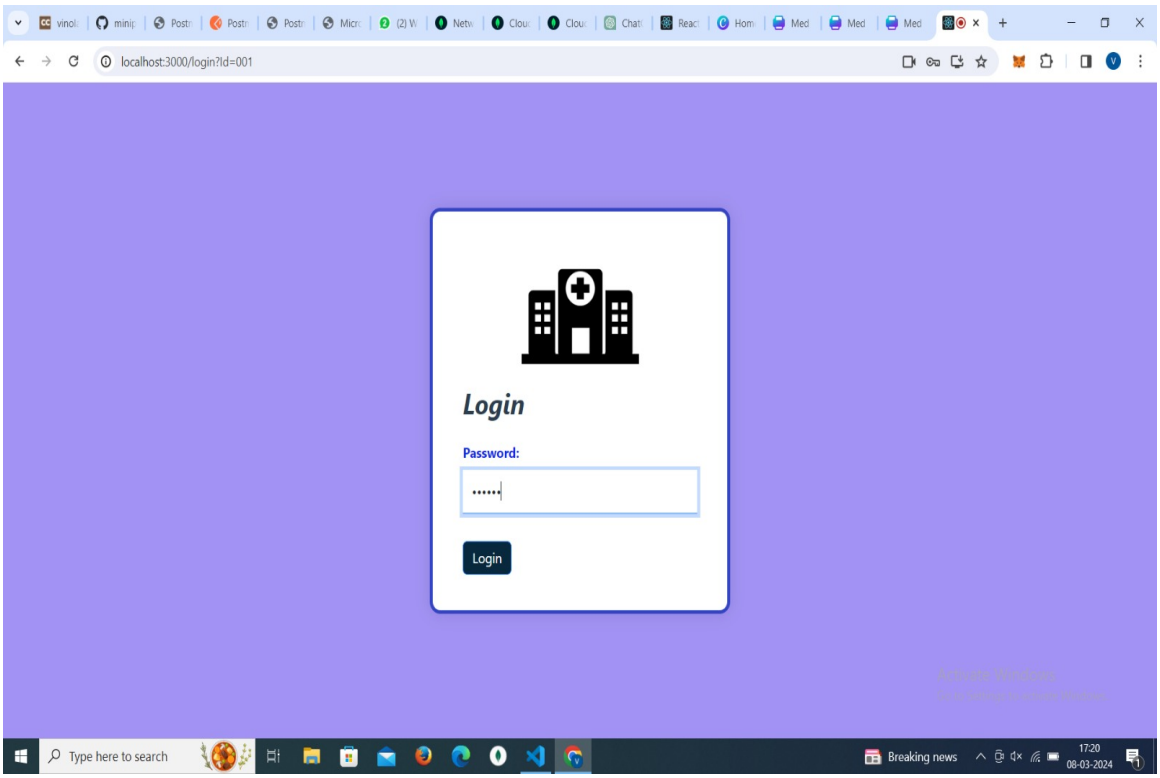

Figure 6.2: Patient Login

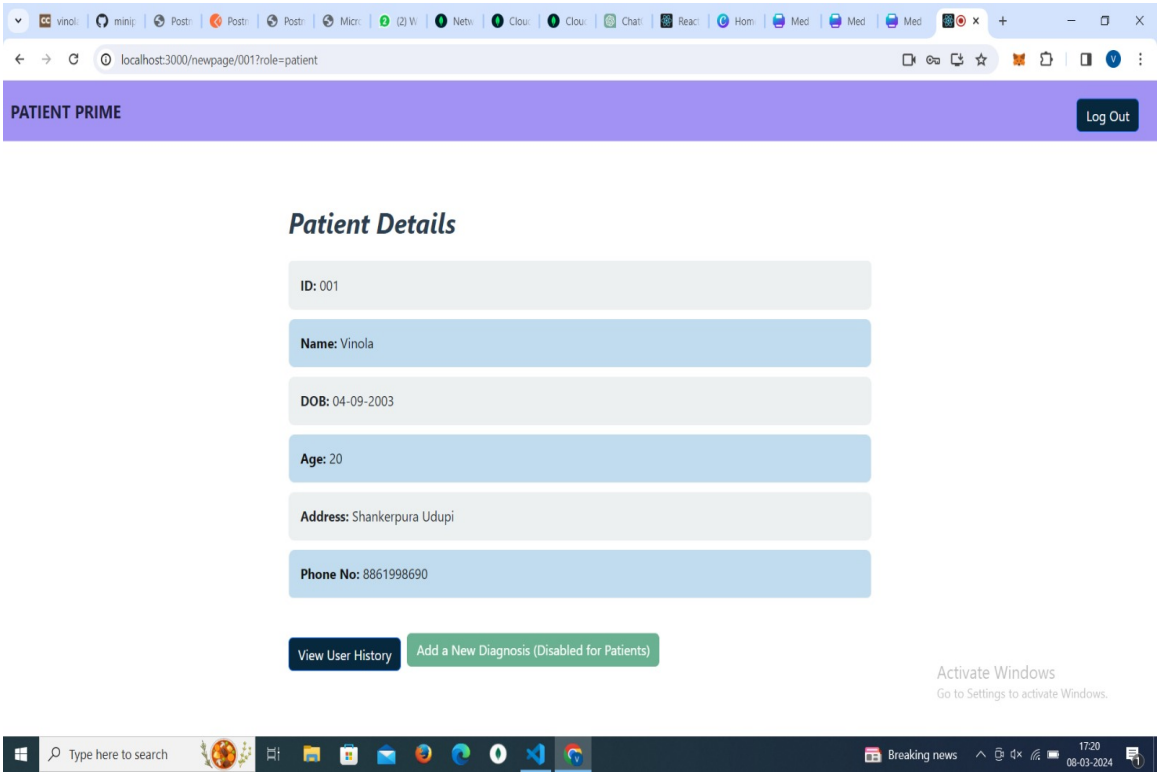

Figure 6.3: Patient Details

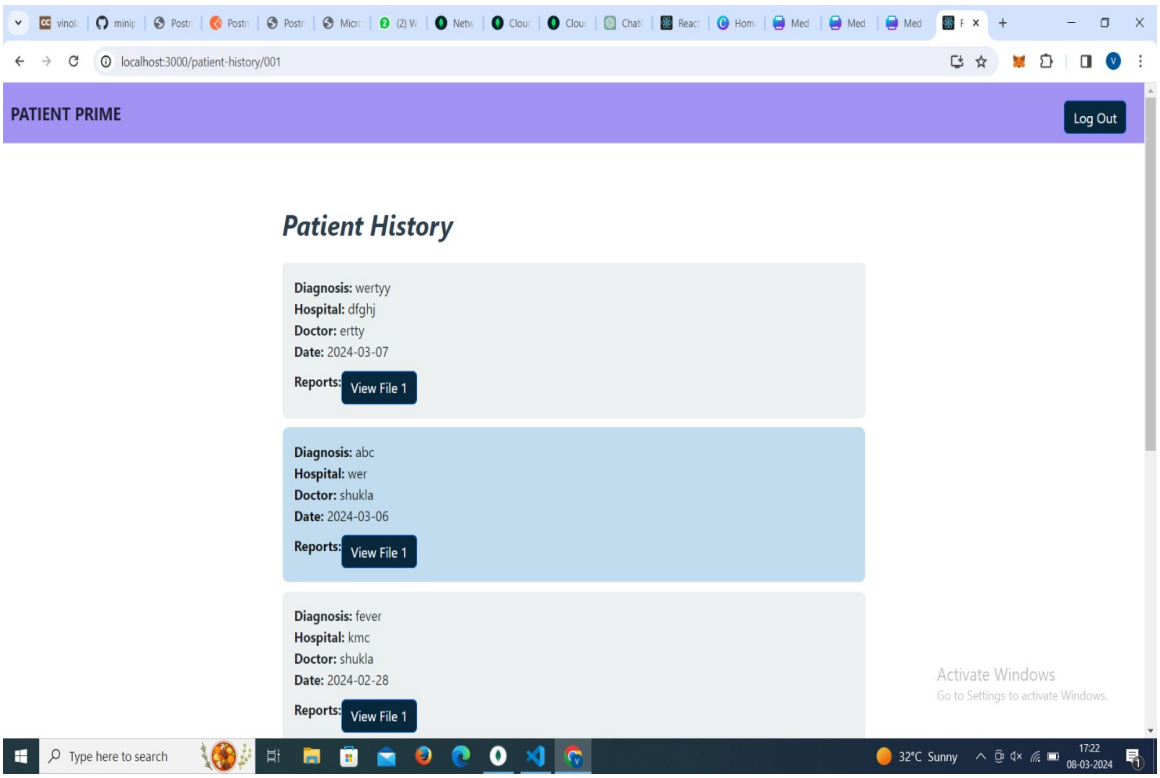

Figure 6.4: Patient History

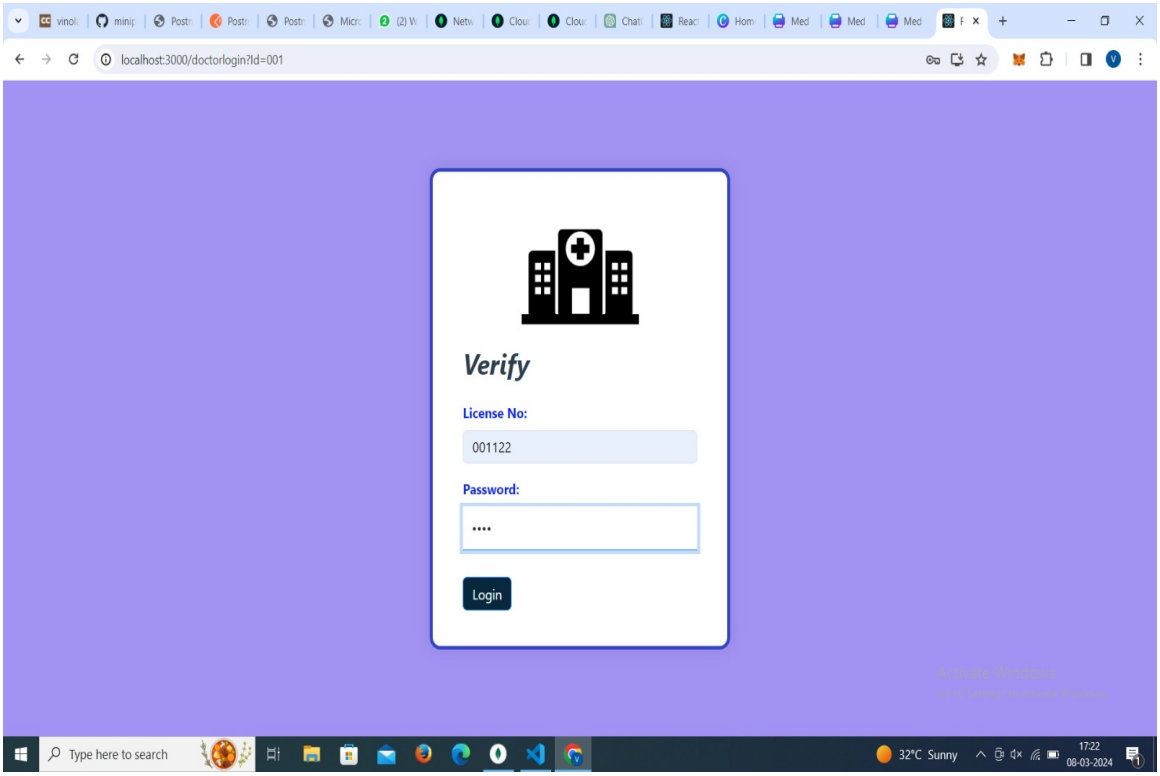

Figure 6.5: Doctor's Login

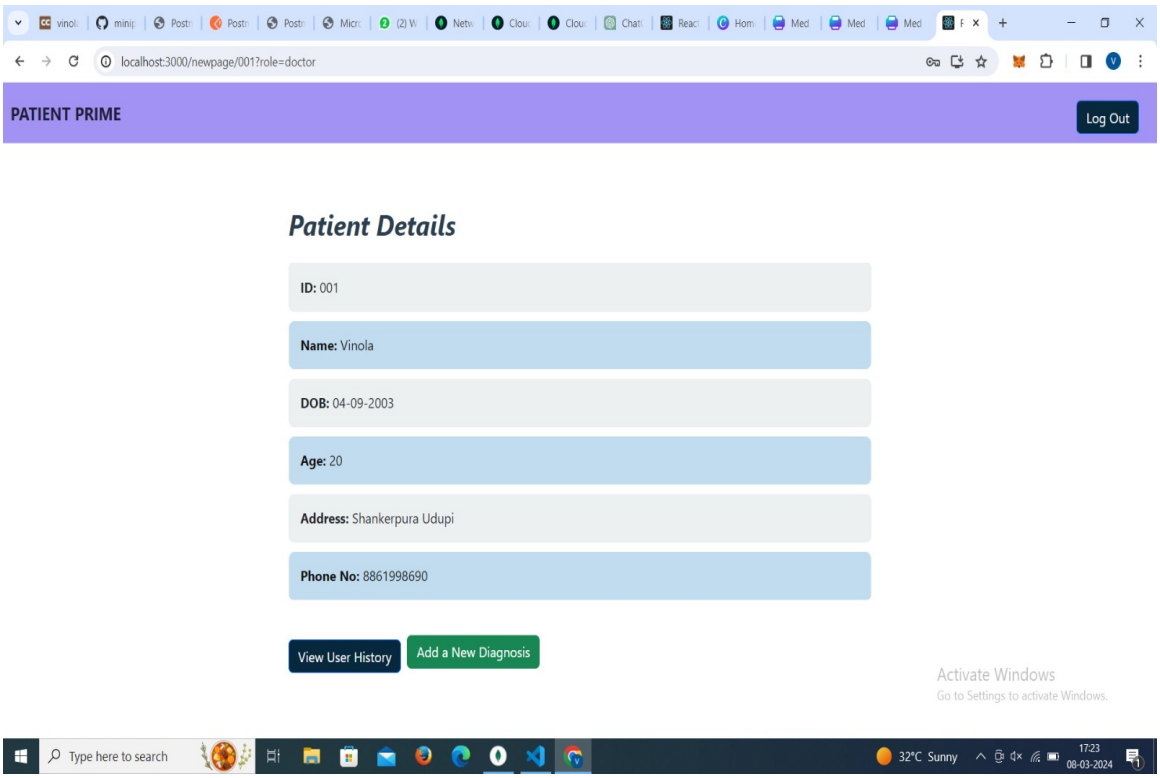

Figure 6.6: Patient Details

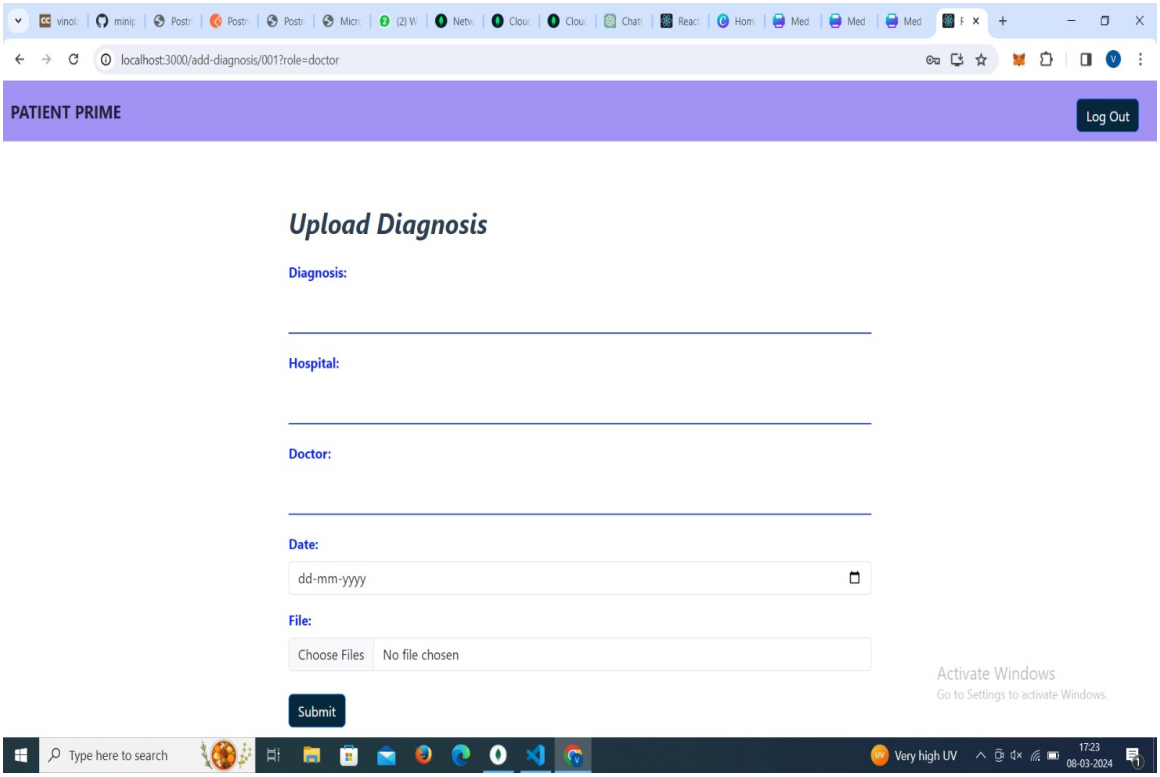

Figure 6.7: Upload Diagnosis Page

Figure 6.8: Scan card with QR card

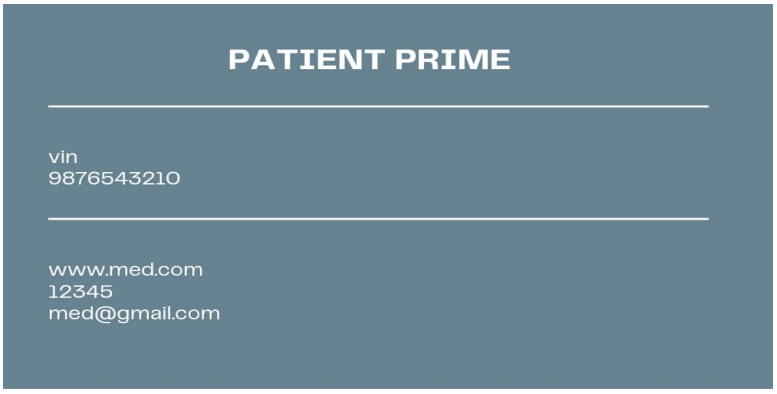

Figure 6.9: Scan card with patient details

Chapter 7

Project Plan

The objectives of this project are multifaceted, beginning with the meticulous collection and organization of patient datasets through an extensive literature survey. Moving forward, the project aims to design and develop a blockchain-powered framework for patient record management, seamlessly integrating creative graphical user interface (GUI) and backend functionalities. A significant aspect of this endeavor involves designing a scan card solution, which, when integrated with the developed framework, enables efficient access to patient records. This innovative approach caters to healthcare institutions, practitioners, and patients alike, ensuring secure storage, easy accessibility, and resistance to tampering of patient records. The project further extends its reach by evaluating the outcome of the framework and analyzing results for publication in a reputable conference or journal. Within the frontend development phase, users are prompted to select their role as either a patient or a doctor to access the files. Once authenticated, users can seamlessly insert medical records into the system. Additionally, the project introduces a unique card featuring a QR code, facilitating quick access to patient records in emergency situations where immediate medical history retrieval is crucial for informed decision-making. This strategic integration of technology addresses the critical need for efficient and secure patient record management, especially in high-stakes scenarios such as emergency medical procedures.

Chapter 8

Conclusion

In conclusion to this, The proposed patient record system offers a robust solution to the challenges plaguing traditional healthcare data management. By embracing decentralization and transparency, the system ensures the security and accessibility of patient records, paving the way for a more trustworthy healthcare ecosystem. In critical emergency situations, where time is of the essence and medical decisions need to be made swiftly, the system proves invaluable. Imagine a scenario where a doctor is in the midst of a surgical procedure and encounters unexpected side effects due to previous health issues of the patient. In such a high-pressure environment, access to comprehensive patient records becomes paramount. With the system's innovative scan card solution, equipped with a QR code, doctors can quickly retrieve essential medical history, enabling them to make informed decisions and provide optimal care without delay. This seamless integration of technology not only enhances patient safety but also underscores the transformative potential of blockchain technology in revolutionizing healthcare data management.

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