A Project report on

SECURING THE HEALTH RECORDS USING ATTRIBUTE BASED ENCRYPTION

Submitted in partial fulfillment for the award of the degree of

M.Tech (Software Engineering)

by

KAMIREDDY SAI GOUTHAM (19MIS0354)

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS

November, 2023

SECURING THE HEALTH RECORDS USING ATTRIBUTE BASED ENCRYPTION

Submitted in partial fulfillment for the award of the degree of

M.Tech (Software Engineering)

by

KAMIREDDY SAI GOUTHAM (19MIS0354)

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS

November, 2023

DECLARATION

I here by declare that the thesis entitled "SECURING HEALTH RECORDS USING ATTRIBUTE BASED ENCRYPTION" submitted by me, for the award of the degree of M.Tech (Software Engineering) is a record of bonafide work carried out by me under the supervision of CHANDRASEGAR.T.

I further declare that the work reported in this thesis has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Place: Vellore
Date:

Signature of the Candidate

CERTIFICATE

This is to certify that the thesis entitled “SECURING HEALTH RECORDS USING ATTRIBUTE BASED ENCRYPTION” submitted by KAMIREDDY SAI GOUTHAM 19MIS0354, School of Computer Science Engineering And Information Systems, Vellore Institute of Technology, Vellore for the award of the degree M.Tech (Software Engineering) is a record of bonafide work carried out by him/her under my supervision.

The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university. The Project report fulfils the requirements and regulations of VELLORE INSTITUTE OF TECHNOLOGY, VELLORE and in my opinion meets the necessary standards for submission.

Signature of the Guide **Signature of the HoD**

Internal Examiner **External Examiner**

ABSTRACT

One of the well-known cryptographic cores that uses symmetric keys and provides superior security is the Advanced Encryption Standard (AES). To protect it and to provide access to the data in the future as needed, appropriate security practices must be followed. The doctor receives a copy of the encryption key that was created. Deduplicating encrypted data using a deduplication algorithm is a difficult undertaking in the public health sector. The main goal of this effort is to avoid deduplication while automatically storing the data and making it accessible via a continual data authentication procedure. But applying search operation on encrypted data and at the same occasion retrieve specific data from a hugeamount of encrypted data as well as secure data sharing within a group of entities is the most challenging task. So that secure keyword search and data sharing operations.

ACKNOWLEDGEMENTS

It is my pleasure to express with deep sense of gratitude to PROF. CHANDRASEGAR T, Assistant Professor Sr. Grade 2, School of Computer Science Engineering and Information Systems, Vellore Institute of Technology, for his/her constant guidance, continual encouragement, understanding; more than all, he taught me patience in my endeavour. My association with him / her is not confined to academics only, but it is a great opportunity on my part of work with an intellectual and expert in the field of Information Security.

I would like to express my gratitude to DR.G.VISWANATHAN, Chancellor VELLORE INSTITUTE OF TECHNOLOGY, VELLORE, MR. SANKAR VISWANATHAN, DR. SEKAR VISWANATHAN, MR.G V SELVAM, Vice – Presidents VELLORE INSTITUTE OF TECHNOLOGY, VELLORE, Dr. V. S. Kanchana Bhaaskaran, Vice – Chancellor, DR. Partha Sharathi Mallick, Pro-Vice Chancellor and Dr. S. Sumathy, Dean, School of Computer Science Engineering And Information Systems,, for providing with an environment to work in and for his inspiration during the tenure of the course.

In jubilant mood I express ingeniously my whole-hearted thanks to Dr. Neelu Khare, HoD/Professor, all teaching staff and members working as limbs of our university for their not-self-centered enthusiasm coupled with timely encouragements showered on me with zeal, which prompted the acquirement of the requisite knowledge to finalize my course study successfully. I would like to thank my parents for their support.

It is indeed a pleasure to thank my friends who persuaded and encouraged me to take up and complete this task. At last but not least, I express my gratitude and appreciation to all those who have helped me directly or indirectly toward the successful completion of this project.

Place: Vellore

Date: Name of the student

KAMIREDDY SAI GOUTHAM

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

DB	Data Base
JVM	Java Virtual Machine
JSP	Java Server Page
JRE	Java Runtime Environment
SSD	Sparse Social Dimension
ABE	Attribute Based Encryption

Chapter -1

INTRODUCTION

1.1 BACKGROUND

Securing health records using Attribute-Based Encryption (ABE) addresses the critical need for safeguarding sensitive patient information. Health records contain highly personal data, demanding robust protection against unauthorized access. ABE offers a solution by enabling access control based on specific attributes, allowing for fine-grained access management. Traditional encryption methods often lack the granularity needed for comprehensive access control, using a single key or password to protect entire datasets. In contrast, ABE allows access based on attributes such as role, clearance level, or department, ensuring that only authorized individuals with the relevant attributes can access specific parts of the records. For instance, doctors may access patient diagnoses, while pharmacists can access medication details, streamlining information dissemination while maintaining confidentiality. Challenges in key management and system complexity need careful consideration, yet ongoing advancements in encryption techniques and access control mechanisms hold promise for further fortifying the security and privacy of health data in the future. As technology continues to evolve, refining ABE in health record security will likely play a pivotal role in safeguarding sensitive information and meeting the dynamic demands of the healthcare landscape.

1.2 MOTIVATION

The motivation behind employing Attribute-Based Encryption (ABE) for securing health records systems from the critical need to protect sensitive patient information in a highly dynamic and technologically evolving healthcare landscape. Traditional encryption methods often fall short in providing the necessary granularity for access control, using one key or password to protect entire datasets. Health records, containing highly confidential medical histories, diagnoses, and treatment plans, require a more nuanced approach to ensure only authorized individuals can access specific information while adhering to stringent regulatory standards such as HIPAA. ABE addresses this challenge by offering a more flexible and fine-grained access control system, allowing access based on attributes like role, clearance level, or

department. This method aligns with the necessity for healthcare professionals to access only the information relevant to their responsibilities, safeguarding patient privacy while enabling efficient data sharing. The implementation of ABE in health records not only enhances security and confidentiality but also streamlines data accessibility, making it a compelling solution to balance the intricacies of privacy protection and the legitimate need for information exchange in the healthcare domain. Overall, the motivation for employing ABE in health records is driven by the need for a robust, adaptive, and regulatory-compliant method to safeguard sensitive patient data in an increasingly digital healthcare environment.

1.3 PROJECT STATEMENT:

The healthcare industry is facing an increasing challenge when it comes to securing and authenticating health records. With the rise of electronic health records (EHRs) and other digital health technologies, there is a growing need to ensure that sensitive patient information is protected from unauthorized access and cyber threats. One of the major challenges associated with securing and authenticating health records is the complexity of the healthcare ecosystem. Health records are often shared among multiple providers, payers, and other stakeholders, each with their own unique systems and processes. This fragmentation can make it difficult to establish a consistent, standardized approach to data security and authentication, leaving patient information vulnerable to breaches and other forms of cyberattacks.

1.3 OBJECTIVES

The objectives of using attribute-based access control to secure and authenticate health records are two-fold. Firstly, it enables more granular control over access to sensitive information. This means that only authorized individuals with the necessary attributes can view or modify specific data. Secondly, it enhances security by reducing the risk of unauthorized access or data breaches. By implementing attribute-based access control, healthcare organizations can ensure that patient data is protected at all times, while also ensuring that the right people have access to the right information when they need it.

1.4 SCOPE OF THE PROJECT

The scope of this project is to introduce the importance of securing and authenticating health records, define the challenges associated with it, outline the objectives of using attribute-based access control, explain what attribute-based access control is and how it can be used to secure and authenticate health records, discuss the benefits of using attribute-based access control, outline the steps involved in implementing attribute-based access control for health records, and finally, discuss the challenges and limitations associated with implementing attribute-based access control for health records.

Chapter-2

LITERATURE SURVEY

2.1 SUMMARY OF THE EXISTING WORKS

S.NO	Title	Merits	De-merits
1	Exploring Data Security Issues and Solutions in Cloud Computing.	• It provides a comprehensive overview of the data security issues in cloud computing. • It discusses a number of solutions to these security issues. • It is well-written and easy to understand and based on a solid theoretical foundation.	• It is somewhat dated and does not address some of the newer security threats. • It focuses on the security of data stored in the cloud, but it does not address the security of data in transit between the cloud and the user.
2	A comprehensive study of the trust evaluation mechanisms in the cloud computing.	• It provides a comprehensive overview of the trust evaluation mechanisms in cloud computing. • It discusses the different trust characteristics that can be used to evaluate cloud entities. • It identifies the challenges and open research issues in trust evaluation in cloud computing.	• It is somewhat dated and does not address some of the newer trust evaluation mechanisms that have been proposed in recent years. • It does not provide specific implementation guidance for trust evaluation mechanisms.

3	Survey on secure search over encrypted data on the cloud.	• The paper provides a comprehensive overview of the different secure search techniques that have been proposed in the literature. • It discusses the different security and performance trade-offs of these techniques. • The paper is well-written and easy to understand.	• The paper is somewhat dated and does not address some of the newer secure search techniques that have been proposed in recent years. • It does not provide specific implementation guidance for secure search techniques.
4	Efficient and secure identity-based encryption scheme with equality test in cloud computing.	• The paper proposes a new identity-based encryption (IBE) scheme with equality test (EET) that is efficient and secure. • The scheme is based on bilinear pairings and achieves one-way security against chosen identity and chosen ciphertext attacks (OW-ID-CCA) in the random oracle model (ROM). • The scheme is efficient in terms of both computation and communication costs.	• The scheme is somewhat complex and may be difficult to implement. • The security of the scheme relies on the hardness of the bilinear pairing problem.

5	Identity-based encryption with keyword search from lattice assumption.	• The paper proposes a new identity-based encryption (IBE) scheme with keyword search (KWS) that is secure under the lattice assumption. • The scheme is efficient in terms of both computation and communication costs. • The scheme is provably secure against chosen keyword attacks (CKA).	• The scheme is somewhat complex and may be difficult to implement. • The security of the scheme relies on the hardness of the lattice problem.
6	Privacy-preserving personal health record using multi-authority attribute-based encryption with revocation	• The paper proposes a new privacy-preserving personal health record (PHR) system that uses multi-authority attribute-based encryption (MA-ABE) with revocation. • The system allows patients to encrypt their PHRs and store them in the cloud, while ensuring that only authorized users can decrypt them. • The system is secure and can resist various attacks, such as collusion attacks and impersonation attacks.	• The security of the system relies on the hardness of the bilinear pairing problem.

7	Secure attribute-based data sharing for resource-limited users in cloud computing.	• The paper proposes a new ABE scheme that is based on the chameleon hash function. This is a promising cryptographic primitive that is resistant to chosen ciphertext attacks. • The scheme is efficient in terms of both computation and communication costs. This makes it suitable for deployment in resource-limited devices, such as mobile phones.	• The scheme is somewhat complex and may be difficult to implement. • The security of the scheme relies on the hardness of the chameleon hash function.
8	A Cipher text-Policy Attribute-Based Encryption Scheme Supporting Keyword Search Function.	• The paper proposes a new ciphertext-policy attribute-based encryption (CP-ABE) scheme that supports keyword search. • The scheme is efficient in terms of both computation and communication costs. • The scheme can be used to support a variety of keyword search applications, such as medical records, e-commerce, and social networks.	• The scheme is somewhat complex and may be difficult to implement. • The security of the scheme relies on the hardness of the bilinear pairing problem.

9	Heterogeneous data storage management with deduplication in cloud computing.	• The paper proposes a new approach to heterogeneous data storage management in cloud computing that uses deduplication. • The approach is efficient in terms of both storage and bandwidth costs. • The approach is scalable to large-scale data sets. • The approach is secure and can protect the privacy of user data.	• The approach relies on the availability of a central deduplication server, which could be a single point of failure.
10	Encrypted data management with deduplication in cloud computing	• The paper proposes a new approach to encrypted data management with deduplication in cloud computing. • The approach is scalable to large-scale data sets and secure and can protect the privacy of user data.	• The approach is somewhat complex and may be difficult to implement. • The approach relies on the availability of a central deduplication server, which could be a single point of failure.

2.2 CHALLENGES PRESENT IN EXISTING SYSTEM

Securing health records using Attribute-Based Encryption (ABE) presents a promising approach but also faces various challenges within the existing system. some of the challenges:

Complex Implementation: ABE involves a complex cryptographic setup and requires a comprehensive key management system. Implementing and managing this complex infrastructure can be challenging for organizations, particularly smaller healthcare providers with limited resources.

Scalability: Healthcare systems deal with a vast amount of sensitive data. ABE must scale efficiently to handle the growing volume of health records without compromising performance. Ensuring scalability while maintaining security is a significant challenge.

Interoperability: The existing healthcare ecosystem comprises various systems, databases, and platforms. Integrating ABE across these diverse systems to ensure interoperability and smooth data sharing while maintaining security is a complex task.

Performance Overhead: Implementing ABE can introduce computational overhead and latency due to the complex encryption and decryption processes. Balancing security with system performance is a critical challenge, especially in real-time healthcare settings.

User Acceptance and Usability: The complexity of ABE may lead to usability issues. Balancing strong security measures with user-friendly access to health records is crucial. Users, including healthcare professionals and patients, need an intuitive system that does not hinder their workflow or access to essential information.

Data Ownership and Trust: ABE raises concerns about data ownership and trust. Ensuring that the healthcare provider or the individual retains control and ownership of their health data while securely sharing it based on attributes is a significant challenge.

Chapter- 3

REQUIREMENTS

3.1 HARDWARE REQUIREMENTS

The hardware requirements may serve as the basis for a contract for the implementation of the system and should therefore be a complete and consistent specification of the whole system. They are used by software engineers as the starting point for the system design. It shows what the system does and not how it should be implemented.

PROCESSOR	:	DUAL CORE 2 DUOS
RAM	:	4GB RAM
MONITOR	:	15” COLOR
HARD DISK	:	250 GB

3.2 SOFTWARE REQUIREMENTS

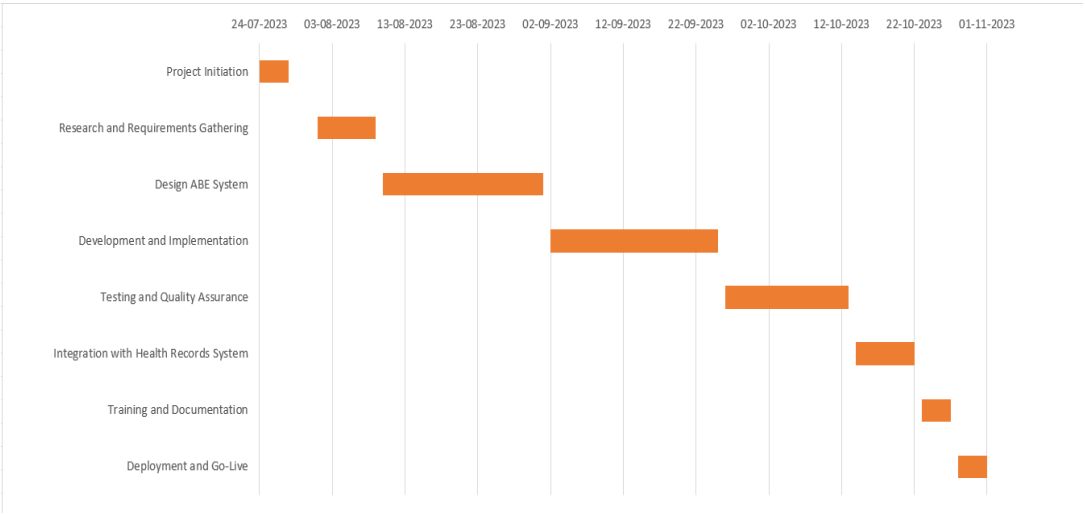
The software requirements document is the specification of the system. It shouldinclude both a definition and a specification of requirements. It is a set of what the system should do rather than how it should do it. The software requirements provide abasis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the team’s and tracking the team’s progress throughout the development activity.

FRONT END	:	HTML, CSS, JS
BACK END	:	J2EE (JSP, SERVLETS)
DATABASE	:	MY SQL 5.5
IDE	:	ECLIPSE

3.3BUDGET

Procured Items/Components for the Project work	Total Cost
LAPTOP	72000
PRINTER	6000
INTERNET BILL	2500
Total Budget (INR)	80500

3.4 GANTT CHART



Activity	Description of the Activity	Guide Remarks
1	Define project scope, objectives	
2	Research ABE implementation, gather requirements for securing health records	
3	Develop the architecture for implementing ABE	
4	Code and implement the ABE system for health records.	
5	Test the ABE system, identify and fix issues for a secure implementation.	
6	Integrate the ABE system with the existing health records system.	
7	Prepare user training materials and documentation for the ABE system.	
8	Deploy the secured health records system using ABE.	

Chapter 4

ANALYSIS & DESIGN

4.1 PROPOSED METHODOLOGY

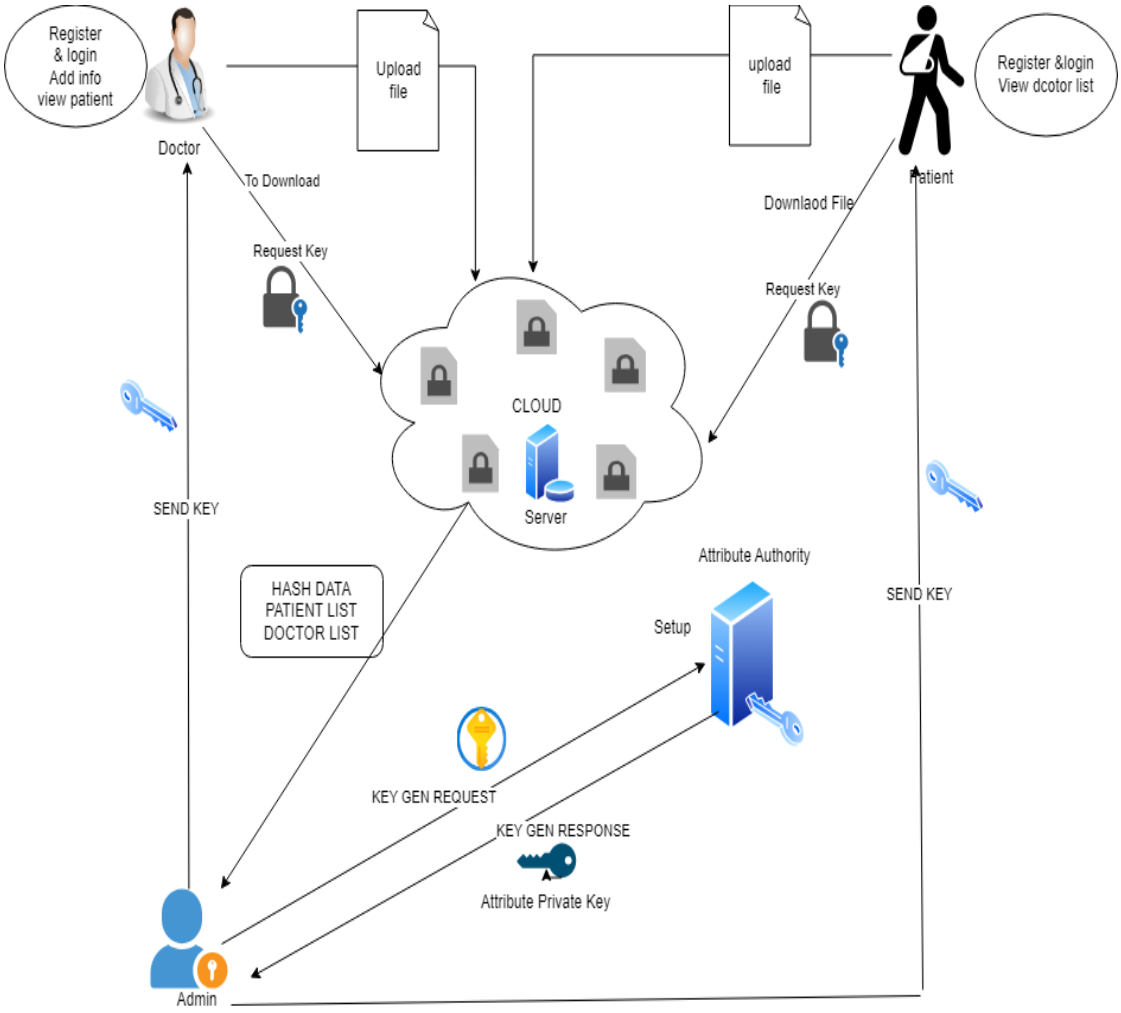
This project provides a brief overview of earlier research on several cloud-based methods for safe keyword-based searching and data exchange.

The fundamental method for keeping sensitive data secret is encryption. However, there are still some crucial difficulties, such as transferring data across encrypted channels and performing safe searches of data. Many encryption methods and their corresponding application schemes are available that facilitate sharing or searching; some of them even safely carry out both functions.

Advantages of Proposed System:

- Increased performance
- Improved reliability and flexibility
- Increased security
- Improved privacy

4.2 SYSTEM ARCHITECTURE

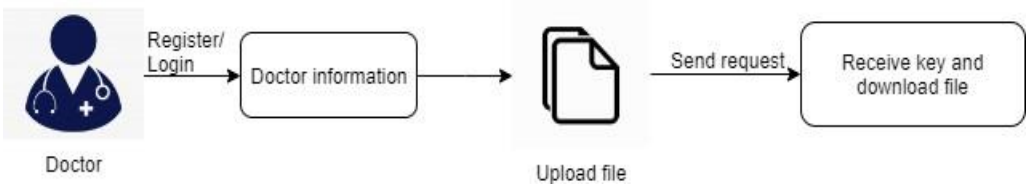


4.3 MODULE DESCRIPTIONS

- Doctor gives prescription
- Patient send message to doctor
- Admin authenticate the requests
- Cloud maintains the details

Doctor Gives Prescription

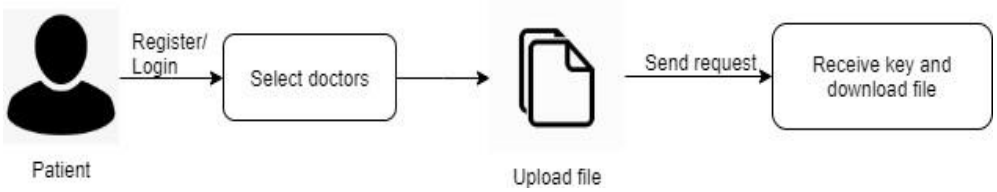
Doctor register and login then enters the details of information then view the file which uploaded by the patient. Doctor sends request the file. Doctor receives the secret key and download the file which patient given and know the message. Doctor reply for the patient queries and upload file.



4.3.1

Patient sends message to doctor

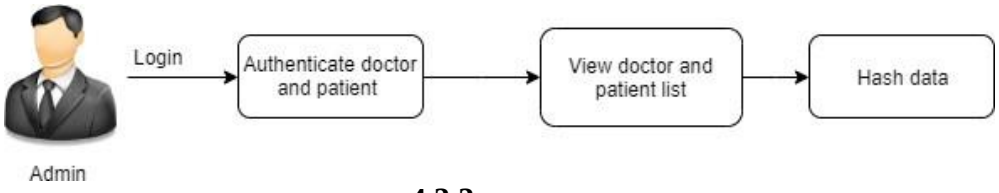
Patient register and login then view the doctor list and select the doctor and sendthe problems in message file format. The file while upload it will be encrypted and stored. Patient can view file and send request. Patient receive the secret key and download the file which doctor given and know the message.



4.3.2

Admin authenticates the requests

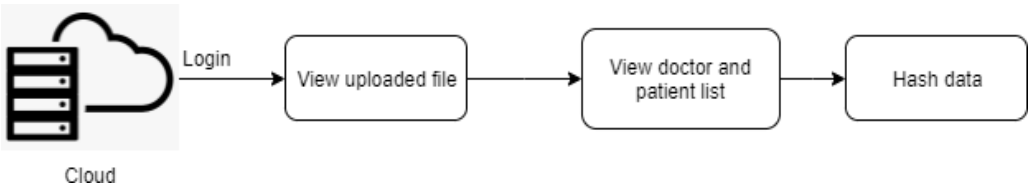
Admin login then authenticate doctor and accept the request given and the details will be converted into blocks of hash data and send key to doctor. Admin authenticate patient and accept the request given and the details will be converted intoblocks of hash data and send key to patient and also has the doctor list and patient list.



4.3.3

Cloud maintains the data

Cloud login then maintains the details of uploaded files, doctor information,doctor list, hash data and patient list.



4.3.4

Chapter 5

IMPLEMENTATION & TESTING

5.1 DATA SET

5.2 SAMPLE CODE:

Data Owner Home .jsp

```
<!DOCTYPEhtml>
<htmllang="en">
<head>
<title>VeriDedup</title>
<!--
-->
<metacharset="UTF-8">
<metahttp-equiv="X-UA-Compatible"content="IE=Edge">
<metaname="description"content="">
<metaname="keywords"content="">
<metaname="author"content="">
<metaname="viewport"content="width=device-width,initial-scale=1,
maximumscale=1">
<linkrel="stylesheet"href="css/bootstrap.min.css">
<linkrel="stylesheet"href="css/font-awesome.min.css">
<linkrel="stylesheet"href="css/aos.css">
<linkrel="stylesheet"href="css/owl.carousel.min.css">
<linkrel="stylesheet"href="css/owl.theme.default.min.css">
<!-- MAIN CSS -->
<linkrel="stylesheet"href="css/templatemo-digital-trend.css">
</head>
<body>
<!-- MENU BAR -->
<navclass="navbar navbar-expand-lg">
<divclass="container">
<aclass="navbar-brand"href="#">
<iclass="fa fa-line-chart"></i>
 VeriDedup
</a>
<buttonclass="navbar-toggler"type="button"data-
```

```
toggle="collapse"datatarget="#navbarNav"aria-controls="navbarNav"aria-
expanded="false"
aria-label="Toggle navigation">
<spanclass="navbar-toggler-icon"></span>
</button>
<divclass="collapse navbar-collapse"id="navbarNav">
<ulclass="navbar-nav ml-auto">
<liclass="nav-item">
<ahref="#about"class="nav-link smoothScroll">Home</a>
</li>
<liclass="nav-item">
<ahref="ViewOTPForUploadFiles.jsp"class="nav-link
smoothScroll">DataHolders</a>
</li>
<liclass="nav-item">
50
<ahref="VerifyOTP_For_UploadFile.jsp"class="nav-link smoothScroll">Upload
Files</a>
</li>
<liclass="nav-item">
<ahref="ViewUploadedFiles.jsp"class="nav-link smoothScroll">View Uploaded
Files</a>
</li>
<liclass="nav-item">
<ahref="blog.html"class="nav-link">DataUser</a>
</li>
<liclass="nav-item">
<ahref="index.jsp"class="nav-link contact">Logout</a>
</li>
</ul>
</div>
</div>
</nav>
```

```
<!-- HERO -->
<sectionclass="hero hero-bg d-flex justify-content-center align-items-center">
<divclass="container">
<divclass="row">
<divclass="col-lg-6 col-md-10 col-12 d-flex flex-column justify-content-center
align-items-center">
<divclass="hero-text">
<h1class="text-white"data-aos="fade-up">A Verifiable Cloud Data Deduplication
Scheme with Integrity and Duplication Proof</h1>
<ahref=""class="custom-btn btn-bg btn mt-3"data-aos="fade-up"data-
aosdelay="100">Let us discuss together!</a>
<strongclass="d-block py-3 pl-5 text-white"data-aos="fade-up"data-
aosdelay="200"><iclass="fa fa-phone mr-2"></i> +99 123456789</strong>
</div>
</div>
<divclass="col-lg-6 col-12">
<divclass="hero-image"data-aos="fade-up"data-aos-delay="300">
<imgsrc="images/working-girl.png"class="img-fluid"alt="working girl">
</div>
</div>
</div>
</div>
</section>
<!-- ABOUT -->
<sectionclass="about section-padding pb-0"id="about">
<divclass="container">
<divclass="row">
<divclass="col-lg-7 mx-auto col-md-10 col-12">
<divclass="about-info">
<h2class="mb-4"data-aos="fade-up">VeriDedup <strong>A Verifiable Cloud Data
Deduplication Scheme</strong> with Integrity and
Duplication Proof</h2>
<pclass="mb-0"data-aos="fade-up">Cloud computing
```

```
is a paradigm that enables huge memory space and massive
computation capacity at a low cost. <ahref="">blog</a> pages,
<ahref="">project</a> page, and <ahref="">contact</a> page.
<br><br>You are <strong>allowed</strong> It allows users to obtain
the intended services across multiple platforms irrespective
of location and time and consequently conveys an exten_sive convenience to the
cloud users.</p>
</div>
<divclass="about-image"data-aos="fade-up"data-aos-delay="200">
<imgsrc="images/office.png"class="img-fluid"alt="office">
</div>
</div>
</div>
</div>
</section>
<!-- PROJECT -->
<sectionclass="project section-padding"id="project">
<divclass="container-fluid">
<divclass="row">
<divclass="col-lg-12 col-12">
<h2class="mb-5 text-center"data-aos="fade-up">
 Please take a look through our
<strong>VeriDedup</strong>
</h2>
<divclass="owl-carousel owl-theme"id="project-slide">
<divclass="item project-wrapper"data-aos="fade-up"data-aos-delay="100">
<imgsrc="images/project/integritybg1.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span>DataOwner</span>
<iclass="fa fa-angle-right project-icon"></i>
```

```
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg2.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span>DataUser</span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integ\itybg3.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small>Branding</small>
<h3>
<ahref="#">
<span>AA</span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg4.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
```

```
<ahref="#">
<span></span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg5.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span></span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
</div>
</div>
</div>
</div>
</section>
<!-- TESTIMONIAL -->
<sectionclass="testimonial section-padding">
<divclass="container">
<divclass="row">
<divclass="col-lg-6 col-md-5 col-12">
<divclass="contact-image"data-aos="fade-up">
<imgsrc="images/female-avatar.png"class="img-fluid"alt="website">
</div>
</div>
```

```
<divclass="col-lg-6 col-md-7 col-12">
<h4class="my-5 pt-3"data-aos="fade-up"data-aos-delay="100">Client
Testimonials</h4>
<divclass="quote"data-aos="fade-up"data-aos-delay="200"></div>
<h2class="mb-4"data-aos="fade-up"data-aos-delay="300">It allows users to obtain
the intended services across multiple platforms irrespective
of location and time and consequently conveys an exten_sive convenience to the
cloud users.</h2>
<pdata-aos="fade-up"data-aos-delay="400">
<strong>Mary Zoe</strong>
<spanclass="mx-1">/</span>
<small>Digital Agency (CEO)</small>
</p>
</div>
</div>
</div>
</section>
<footerclass="site-footer">
<divclass="container">
<divclass="row">
<divclass="col-lg-5 mx-lg-auto col-md-8 col-10">
<h1class="text-white"data-aos="fade-up"data-aos-delay="100">We make creative
<strong>brands</strong> only.</h1>
</div>
<divclass="col-lg-3 col-md-6 col-12"data-aos="fade-up"data-aos-delay="200">
<h4class="my-4">Contact Info</h4>
<pclass="mb-1">
<iclass="fa fa-phone mr-2 footer-icon"></i>
 +99 080 070 4224
</p>
<p>
<ahref="#">
<iclass="fa fa-envelope mr-2 footer-icon"></i>
```

```
 hello@company.com
</a>
</p>
</div>
<divclass="col-lg-3 col-md-6 col-12"data-aos="fade-up"data-aos-delay="300">
<h4class="my-4">Our Studio</h4>
<pclass="mb-1">
<iclass="fa fa-home mr-2 footer-icon"></i>
Av. LÃºcio Costa - BarradaTijuca, RiodeJaneiro - RJ, Brazil
</p>
</div>
<divclass="col-lg-4 mx-lg-auto text-center col-md-8 col-12"data-aos="fade-
up"dataaos-delay="400">
<pclass="copyright-text">Copyright &copy; 2020 Your Company
<br>
</div>
<divclass="col-lg-4 mx-lg-auto col-md-6 col-12"data-aos="fade-up"data-
aosdelay="500">
<ulclass="footer-link">
<li><ahref="#">Stories</a></li>
<li><ahref="#">Work with us</a></li>
<li><ahref="#">Privacy</a></li>
</ul>
</div>
<divclass="col-lg-3 mx-lg-auto col-md-6 col-12"data-aos="fade-up"data-
aosdelay="600">
<ulclass="social-icon">
<li><ahref="#"class="fa fa-instagram"></a></li>
<li><ahref="#"class="fa fa-twitter"></a></li>
<li><ahref="#"class="fa fa-dribbble"></a></li>
<li><ahref="#"class="fa fa-behance"></a></li>
</ul>
</div>
```

```
</div>
</div>
</footer>
<!-- SCRIPTS -->
<scriptsrc="js/jquery.min.js"></script>
<scriptsrc="js/bootstrap.min.js"></script>
<scriptsrc="js/aos.js"></script>
<scriptsrc="js/owl.carousel.min.js"></script>
<scriptsrc="js/smoothscroll.js"></script>
<scriptsrc="js/custom.js"></script>
</body>
</html>
```

Data User Home .jsp

```
<!DOCTYPEhtml>
<htmllang="en">
<head>
<title>VeriDedup</title>
<!--
-->
<metacharset="UTF-8">
<metahttp-equiv="X-UA-Compatible"content="IE=Edge">
<metaname="description"content="">
<metaname="keywords"content="">
<metaname="author"content="">
<metaname="viewport"content="width=device-width, initial-scale=1,
maximumscale=1">
<linkrel="stylesheet"href="css/bootstrap.min.css">
<linkrel="stylesheet"href="css/font-awesome.min.css">
<linkrel="stylesheet"href="css/aos.css">
<linkrel="stylesheet"href="css/owl.carousel.min.css">
<linkrel="stylesheet"href="css/owl.theme.default.min.css">
```

```
<!-- MAIN CSS -->
<linkrel="stylesheet"href="css/templatemo-digital-trend.css">
</head>
<body>
<%
String dataUser = session.getAttribute("DataUser").toString();
session.setAttribute(dataUser, "DataUser");
%>
<!-- MENU BAR -->
<navclass="navbar navbar-expand-lg">
<divclass="container">
<aclass="navbar-brand"href="#">
<iclass="fa fa-line-chart"></i>
 VeriDedup
</a>
<buttonclass="navbar-toggler"type="button"data-
toggle="collapse"datatarget="#navbarNav"aria-controls="navbarNav"aria-
expanded="false"
aria-label="Toggle navigation">
<spanclass="navbar-toggler-icon"></span>
</button>
<divclass="collapse navbar-collapse"id="navbarNav">
<ulclass="navbar-nav ml-auto">
<liclass="nav-item">
<ahref="#about"class="nav-link smoothScroll"><%=dataUser%></a>
</li>
<liclass="nav-item">
<ahref="ViewUploadFilesByDataUser.jsp"class="nav-link     smoothScroll">View
Uploaded
Files</a>
</li>
<liclass="nav-item">
<ahref="SendRequest.jsp"class="nav-link smoothScroll">Send Request</a>
```

```
</li>
<liclass="nav-item">
<ahref="Downloads.jsp"class="nav-link">Download</a>
</li>
<liclass="nav-item">
<ahref="index.jsp"class="nav-link contact">Logout</a>
</li>
</ul>
</div>
</div>
</nav>
<!-- HERO -->
<sectionclass="hero hero-bg d-flex justify-content-center align-items-center">
<divclass="container">
<divclass="row">
<divclass="col-lg-6 col-md-10 col-12 d-flex flex-column justify-content-center
align-items-center">
<divclass="hero-text">
<h1class="text-white"data-aos="fade-up">A Verifiable Cloud Data Deduplication
Scheme with Integrity and Duplication Proof</h1>
<ahref=""class="custom-btn btn-bg btn mt-3"data-aos="fade-up"data-
aosdelay="100">Let us discuss together!</a>
<strongclass="d-block py-3 pl-5 text-white"data-aos="fade-up"data-
aosdelay="200"><iclass="fa fa-phone mr-2"></i> +99 123456789</strong>
</div>
</div>
<divclass="col-lg-6 col-12">
<divclass="hero-image"data-aos="fade-up"data-aos-delay="300">
<imgsrc="images/working-girl.png"class="img-fluid"alt="working girl">
</div>
</div>
</div>
</div>
```

```
</section>
<!-- ABOUT -->
<sectionclass="about section-padding pb-0"id="about">
<divclass="container">
<divclass="row">
<divclass="col-lg-7 mx-auto col-md-10 col-12">
<divclass="about-info">
<h2class="mb-4"data-aos="fade-up">VeriDedup <strong>A Verifiable Cloud Data
Deduplication Scheme</strong> with Integrity and
Duplication Proof</h2>
<pclass="mb-0"data-aos="fade-up">Cloud computing
is a paradigm that enables huge memory space and massive
computation capacity at a low cost. <ahref="">blog</a> pages,
<ahref="">project</a> page, and <ahref="">contact</a> page.
<br><br>You are <strong>allowed</strong> It allows users to obtain
the intended services across multiple platforms irrespective
of location and time and consequently conveys an exten_sive convenience to the
cloud users.</p>
</div>
<divclass="about-image"data-aos="fade-up"data-aos-delay="200">
<imgsrc="images/office.png"class="img-fluid"alt="office">
</div>
</div>
</div>
</div>
</section>
<!-- PROJECT -->
<sectionclass="project section-padding"id="project">
<divclass="container-fluid">
<divclass="row">
<divclass="col-lg-12 col-12">
<h2class="mb-5 text-center"data-aos="fade-up">
 Please take a look through our
```

```
<strong>VeriDedup</strong>
</h2>
<divclass="owl-carousel owl-theme"id="project-slide">
<divclass="item project-wrapper"data-aos="fade-up"data-aos-delay="100">
<imgsrc="images/project/integritybg1.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span>DataOwner</span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg2.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span>DataUser</span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integ\itybg3.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small>Branding</small>
<h3>
<ahref="#">
```

```
<span>AA</span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg4.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span></span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg5.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span></span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
</div>
</div>
</div>
```

```
</div>
</section>
<!-- TESTIMONIAL -->
<sectionclass="testimonial section-padding">
<divclass="container">
<divclass="row">
<divclass="col-lg-6 col-md-5 col-12">
<divclass="contact-image"data-aos="fade-up">
<imgsrc="images/female-avatar.png"class="img-fluid"alt="website">
</div>
</div>
<divclass="col-lg-6 col-md-7 col-12">
<h4class="my-5 pt-3"data-aos="fade-up"data-aos-delay="100">Client
Testimonials</h4>
<divclass="quote"data-aos="fade-up"data-aos-delay="200"></div>
<h2class="mb-4"data-aos="fade-up"data-aos-delay="300">It allows users to obtain
the intended services across multiple platforms irrespective
of location and time and consequently conveys an exten_sive convenience to the
cloud users.</h2>
<pdata-aos="fade-up"data-aos-delay="400">
<strong>Mary Zoe</strong>
<spanclass="mx-1">/</span>
<small>Digital Agency (CEO)</small>
</p>
</div>
</div>
</div>
</section>
<footerclass="site-footer">
<divclass="container">
<divclass="row">
<divclass="col-lg-5 mx-lg-auto col-md-8 col-10">
<h1class="text-white"data-aos="fade-up"data-aos-delay="100">We make creative
```

brands only.</h1>

<divclass="col-lg-3 col-md-6 col-12"data-aos="fade-up"data-aos-delay="200">
<h4class="my-4">Contact Info</h4>
<pclass="mb-1">
<iclass="fa fa-phone mr-2 footer-icon"></i>
+99 080 070 4224

<ahref="#">
<iclass="fa fa-envelope mr-2 footer-icon"></i>
60
hello@company.com

<divclass="col-lg-3 col-md-6 col-12"data-aos="fade-up"data-aos-delay="300">
<h4class="my-4">Our Studio</h4>
<pclass="mb-1">
<iclass="fa fa-home mr-2 footer-icon"></i>
Av. LÃºcio Costa - BarradaTijuca, RiodeJaneiro - RJ, Brazil

<divclass="col-lg-4 mx-lg-auto text-center col-md-8 col-12"data-aos="fade-up"dataaos-delay="400">
<pclass="copyright-text">Copyright © 2020 Your Company

<divclass="col-lg-4 mx-lg-auto col-md-6 col-12"data-aos="fade-up"data-aosdelay="500">
<ulclass="footer-link">
<ahref="#">Stories
<ahref="#">Work with us

```
<li><ahref="#">Privacy</a></li>
</ul>
</div>
<divclass="col-lg-3 mx-lg-auto col-md-6 col-12"data-aos="fade-up"data-aosdelay="600">
<ulclass="social-icon">
<li><ahref="#"class="fa fa-instagram"></a></li>
<li><ahref="#"class="fa fa-twitter"></a></li>
<li><ahref="#"class="fa fa-dribbble"></a></li>
<li><ahref="#"class="fa fa-behance"></a></li>
</ul>
</div>
</div>
</div>
</footer>
<!-- SCRIPTS -->
<scriptsrc="js/jquery.min.js"></script>
<scriptsrc="js/bootstrap.min.js"></script>
<scriptsrc="js/aos.js"></script>
<scriptsrc="js/owl.carousel.min.js"></script>
<scriptsrc="js/smoothscroll.js"></script>
<scriptsrc="js/custom.js"></script>
</body>
</html>
```

Index .jsp

```
<!DOCTYPEhtml>
<htmllang="en">
<head>
<title>VeriDedup</title>
<!--
-->
<metacharset="UTF-8">
```

```
<metahttp-equiv="X-UA-Compatible"content="IE=Edge">
<metaname="description"content="">
<metaname="keywords"content="">
<metaname="author"content="">
<metaname="viewport"content="width=device-width, initial-scale=1,
maximumscale=1">
<linkrel="stylesheet"href="css/bootstrap.min.css">
<linkrel="stylesheet"href="css/font-awesome.min.css">
<linkrel="stylesheet"href="css/aos.css">
<linkrel="stylesheet"href="css/owl.carousel.min.css">
<linkrel="stylesheet"href="css/owl.theme.default.min.css">
<!-- MAIN CSS -->
<linkrel="stylesheet"href="css/templatemo-digital-trend.css">
</head>
<body>
<!-- MENU BAR -->
<navclass="navbar navbar-expand-lg">
<divclass="container">
<aclass="navbar-brand"href="index.html">
<iclass="fa fa-line-chart"></i>
 VeriDedup
</a>
<buttonclass="navbar-toggler"type="button"data-
toggle="collapse"datatarget="#navbarNav"aria-controls="navbarNav"aria-
expanded="false"
aria-label="Toggle navigation">
<spanclass="navbar-toggler-icon"></span>
</button>
<divclass="collapse navbar-collapse"id="navbarNav">
<ulclass="navbar-nav ml-auto">
<liclass="nav-item">
<ahref="#about"class="nav-link smoothScroll">Home</a>
</li>
```

```
<liclass="nav-item">
<ahref="DataOwnerRegister.jsp"class="nav-link smoothScroll">DataOwner</a>
</li>
<liclass="nav-item">
<ahref="DataUserRegister.jsp"class="nav-link">DataUser</a>
</li>
<liclass="nav-item">
<ahref="AALogin.jsp"class="nav-link contact">AA</a>
</li>
<liclass="nav-item">
<ahref="CSPLogin.jsp"class="nav-link contact">CSP</a>
</li>
</ul>
</div>
</div>
</nav>
<!-- HERO -->
<sectionclass="hero hero-bg d-flex justify-content-center align-items-center">
<divclass="container">
<divclass="row">
<divclass="col-lg-6 col-md-10 col-12 d-flex flex-column justify-content-center
align-items-center">
<divclass="hero-text">
<h1class="text-white"data-aos="fade-up">A Verifiable Cloud Data Deduplication
Scheme with Integrity and Duplication Proof</h1>
<ahref="contact.html"class="custom-btn btn-bg btn mt-3"data-aos="fade-up"data-
aosdelay="100">Let us discuss together!</a>
<strongclass="d-block py-3 pl-5 text-white"data-aos="fade-up"data-
aosdelay="200"><iclass="fa fa-phone mr-2"></i> +99 080 070 4224</strong>
</div>
</div>
<divclass="col-lg-6 col-12">
<divclass="hero-image"data-aos="fade-up"data-aos-delay="300">
```

```
<imgsrc="images/working-girl.png"class="img-fluid"alt="working girl">
</div>
</div>
</div>
</div>
</section>
<!-- ABOUT -->
<sectionclass="about section-padding pb-0"id="about">
<divclass="container">
<divclass="row">
<divclass="col-lg-7 mx-auto col-md-10 col-12">
<divclass="about-info">
<h2class="mb-4"data-aos="fade-up">VeriDedup <strong>A Verifiable Cloud Data
Deduplication</strong> Scheme with Integrity and
Duplication Proof</h2>
<pclass="mb-0"data-aos="fade-up">Cloud computing
is a paradigm that enables huge memory space and massive
computation capacity at a low cost. <ahref="">blog</a> pages,
<ahref="">project</a> page, and <ahref="">contact</a> page.
<br><br>You are <strong>allowed</strong> It allows users to obtain
the intended services across multiple platforms irrespective
of location and time and consequently conveys an exten_sive convenience to the
cloud users.</p>
</div>
<divclass="about-image"data-aos="fade-up"data-aos-delay="200">
<imgsrc="images/office.png"class="img-fluid"alt="office">
</div>
</div>
</div>
</div>
</section>
<!-- PROJECT -->
<sectionclass="project section-padding"id="project">
```

```
<divclass="container-fluid">
<divclass="row">
<divclass="col-lg-12 col-12">
<h2class="mb-5 text-center"data-aos="fade-up">
 Please take a look through our
<strong>VeriDedup</strong>
</h2>
<divclass="owl-carousel owl-theme"id="project-slide">
<divclass="item project-wrapper"data-aos="fade-up"data-aos-delay="100">
<imgsrc="images/project/integritybg1.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span>DataOwner</span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg2.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span>DataUser</span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
```

```
<imgsrc="images/project/integritybg3.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small>Branding</small>
<h3>
<ahref="#">
<span>Au</span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg4.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span></span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
</div>
</div>
<divclass="item project-wrapper"data-aos="fade-up">
<imgsrc="images/project/integritybg5.jpg"class="img-fluid"alt="project image">
<divclass="project-info">
<small></small>
<h3>
<ahref="#">
<span></span>
<iclass="fa fa-angle-right project-icon"></i>
</a>
</h3>
```

```
</div>
</div>
</div>
</div>
</div>
</div>
</section>
<!-- TESTIMONIAL -->
<sectionclass="testimonial section-padding">
<divclass="container">
<divclass="row">
<divclass="col-lg-6 col-md-5 col-12">
<divclass="contact-image"data-aos="fade-up">
<imgsrc="images/female-avatar.png"class="img-fluid"alt="website">
</div>
</div>
<divclass="col-lg-6 col-md-7 col-12">
<h4class="my-5 pt-3"data-aos="fade-up"data-aos-delay="100">Client
Testimonials</h4>
<divclass="quote"data-aos="fade-up"data-aos-delay="200"></div>
<h2class="mb-4"data-aos="fade-up"data-aos-delay="300">It allows users to obtain
the intended services across multiple platforms irrespective
of location and time and consequently conveys an exten_sive convenience to the
cloud users.</h2>
<pdata-aos="fade-up"data-aos-delay="400">
<strong>Mary Zoe</strong>
<spanclass="mx-1">/</span>
<small>Digital Agency (CEO)</small>
</p>
</div>
</div>
</div>
</section>
```

```
<footerclass="site-footer">
<divclass="container">
<divclass="row">
<divclass="col-lg-5 mx-lg-auto col-md-8 col-10">
<h1class="text-white"data-aos="fade-up"data-aos-delay="100">We make creative
<strong>brands</strong> only.</h1>
</div>
<divclass="col-lg-3 col-md-6 col-12"data-aos="fade-up"data-aos-delay="200">
<h4class="my-4">Contact Info</h4>
<pclass="mb-1">
<iclass="fa fa-phone mr-2 footer-icon"></i>
 +99 080 070 4224
</p>
<p>
<ahref="#">
<iclass="fa fa-envelope mr-2 footer-icon"></i>
 hello@company.com
</a>
</p>
</div>
<divclass="col-lg-3 col-md-6 col-12"data-aos="fade-up"data-aos-delay="300">
<h4class="my-4">Our Studio</h4>
<pclass="mb-1">
66
<iclass="fa fa-home mr-2 footer-icon"></i>
Av. LÃºcio Costa - BarradaTijuca, RiodeJaneiro - RJ, Brazil
</p>
</div>
<divclass="col-lg-4 mx-lg-auto text-center col-md-8 col-12"data-aos="fade-
up"dataaos-delay="400">
<pclass="copyright-text">Copyright &copy; 2020 Your Company
<br>
</div>
```

```
<divclass="col-lg-4 mx-lg-auto col-md-6 col-12"data-aos="fade-up"data-aosdelay="500">
<ulclass="footer-link">
<li><ahref="#">Stories</a></li>
<li><ahref="#">Work with us</a></li>
<li><ahref="#">Privacy</a></li>
</ul>
</div>
<divclass="col-lg-3 mx-lg-auto col-md-6 col-12"data-aos="fade-up"data-aosdelay="600">
<ulclass="social-icon">
<li><ahref="#"class="fa fa-instagram"></a></li>
<li><ahref="#"class="fa fa-twitter"></a></li>
<li><ahref="#"class="fa fa-dribbble"></a></li>
<li><ahref="#"class="fa fa-behance"></a></li>
</ul>
</div>
</div>
</div>
</footer>
<!-- SCRIPTS -->
<scriptsrc="js/jquery.min.js"></script>
<scriptsrc="js/bootstrap.min.js"></script>
<scriptsrc="js/aos.js"></script>
<scriptsrc="js/owl.carousel.min.js"></script>
<scriptsrc="js/smoothscroll.js"></script>
<scriptsrc="js/custom.js"></script>
</body>
</html>
```

DataOwnerRegisterServlet.java

```
package com.Veri.Servlet;
import java.io.IOException;
import javax.servlet.ServletException;
import javax.servlet.annotation.WebServlet;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import com.Veri.Implementation.Implementation;
import com.Veri.Interface.Interface;
import com.Veri.bean.Users;
/**
* Servlet implementation class DataOwnerRegister
*/
@WebServlet("/DataOwnerRegisterServlet")
public class DataOwnerRegisterServlet extends HttpServlet {
private static final long serialVersionUID = 1L;
 /**
 * @see HttpServlet#HttpServlet()
 */
 public DataOwnerRegisterServlet() {
 super();
 // TODO Auto-generated constructor stub
 }
68
/**
* @see HttpServlet#doGet(HttpServletRequest request, HttpServletResponse
response)
*/
protected void doGet(HttpServletRequest request, HttpServletResponse response)
throws ServletException, IOException {
// TODO Auto-generated method stub
response.getWriter().append("Served at: ").append(request.getContextPath());
```

```
}
/**
* @see HttpServlet#doPost(HttpServletRequest request, HttpServletResponse
response)
*/
protected void doPost(HttpServletRequest request, HttpServletResponse response)
throws ServletException, IOException {
// TODO Auto-generated method stub
doGet(request, response);
String name = request.getParameter("name");
String email = request.getParameter("email");
String password = request.getParameter("password");
String confirmPassword = request.getParameter("confirmPassword");
if(password.equals(confirmPassword))
69
{
Users dataOwnerReg = new Users();
dataOwnerReg.setName(name);
dataOwnerReg.setEmail(email);
dataOwnerReg.setPassword(password);
Interface inter = new Implementation();
int t = inter.DataOwnerRegister(dataOwnerReg);
if(t != 0)
{
response.sendRedirect("DataOwnerRegister.jsp");
}
else
{
response.sendRedirect("error.jsp");
}
}
}
}
```

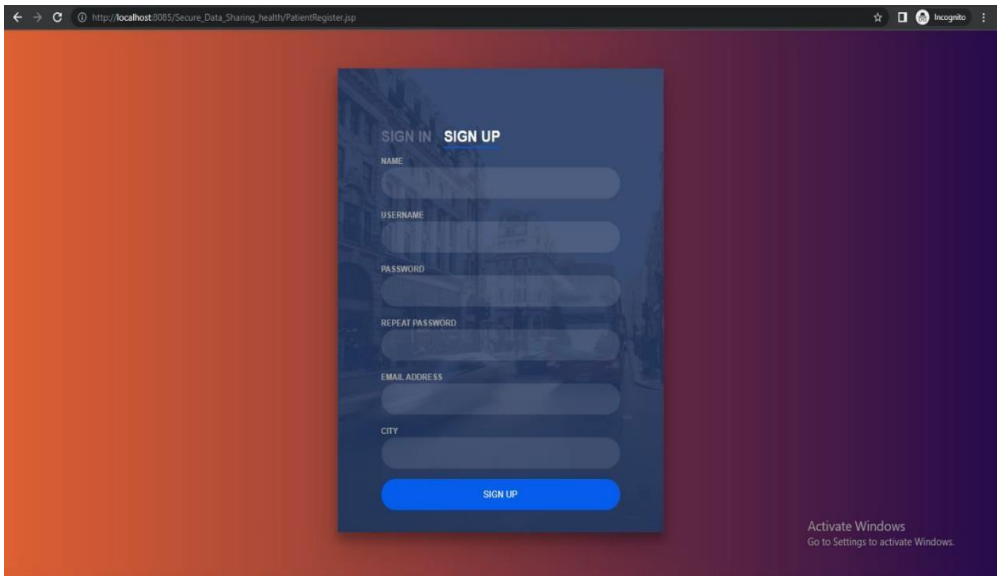
DataUserLoginServlet.java

```
package com.Veri.Servlet;
import java.io.IOException;
import javax.servlet.ServletException;
import javax.servlet.annotation.WebServlet;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import javax.servlet.http.HttpSession;
import com.Veri.Implementation.Implementation;
import com.Veri.Interface.Interface;
/**
* Servlet implementation class DataUserLoginServlet
*/
@WebServlet("/DataUserLoginServlet")
public class DataUserLoginServlet extends HttpServlet {
private static final long serialVersionUID = 1L;
 /**
 * @see HttpServlet#HttpServlet()
 */
 public DataUserLoginServlet() {
 super();
 // TODO Auto-generated constructor stub
71
 }
/**
* @see HttpServlet#doGet(HttpServletRequest request, HttpServletResponse
response)
*/
protected void doGet(HttpServletRequest request, HttpServletResponse response)
throws ServletException, IOException {
// TODO Auto-generated method stub
```

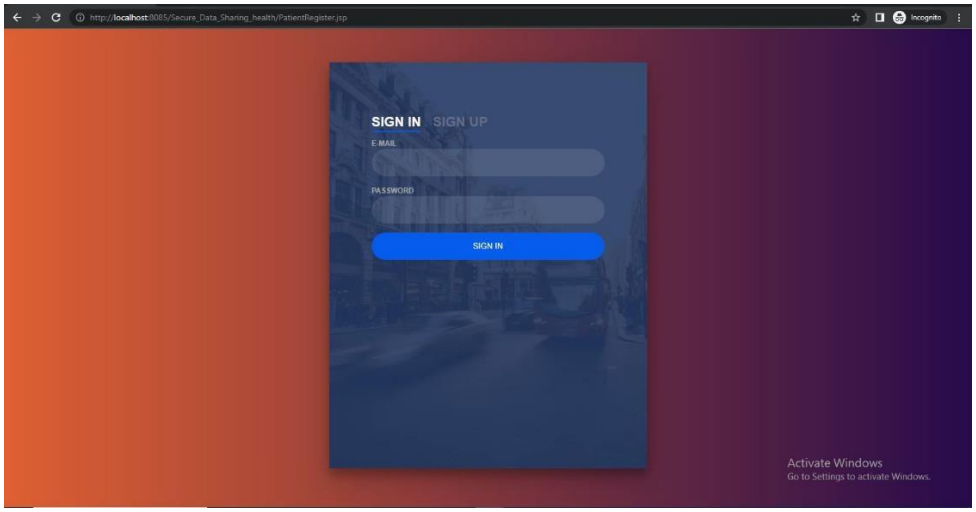
```
response.getWriter().append("Served at: ").append(request.getContextPath());
}
/**
* @see HttpServlet#doPost(HttpServletRequest request, HttpServletResponse
response)
*/
protected void doPost(HttpServletRequest request, HttpServletResponse response)
throws ServletException, IOException {
// TODO Auto-generated method stub
doGet(request, response);
String email = request.getParameter("email");
String password = request.getParameter("password");
try {
Interface inter = new Implementation();
int t = inter.DataUserLogin(email, password);
if(t==1)
{
HttpSession session = request.getSession();
session.setAttribute("DataUser", email);
response.sendRedirect("DataUserHome.jsp");
}
else
{
response.sendRedirect("error.jsp");
}
}
catch (Exception e)
{
e.printStackTrace();
}
}
}
```

5.3 SAMPLE OUTPUT

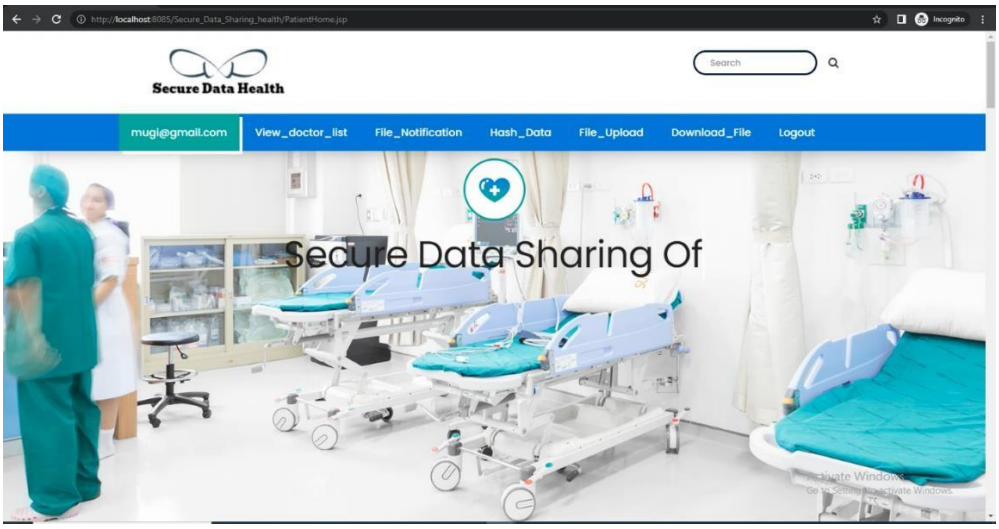
Homepage



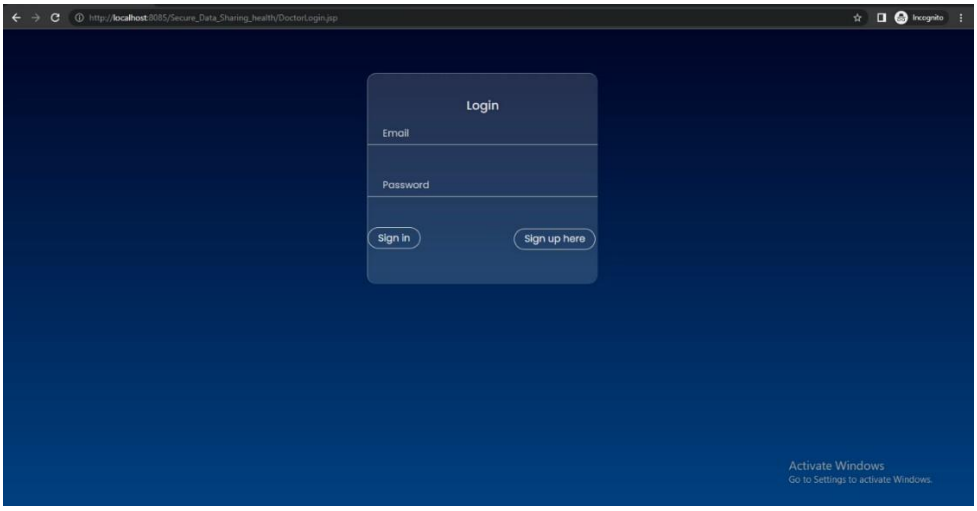
Signup Page



Sign in Page



Patient Page



Patient Login

5.4 TEST PLAN & DATA VERIFICATION

Test Type: Black Box testing Test

To Check validation for all input values before registering the user in application.

Decision table for Login

T – Correct user id/password
F – Wrong user id/password
E – Error message is displayed
S – successful login

Conditions	**Rule 1**	**Rule 2**	**Rule 3**	**Rule 4**
Username	F	T	F	T
Password	F	F	T	T
Output	E	E	E	S

Table 5.4.1 Decision table

Test Case registering the user

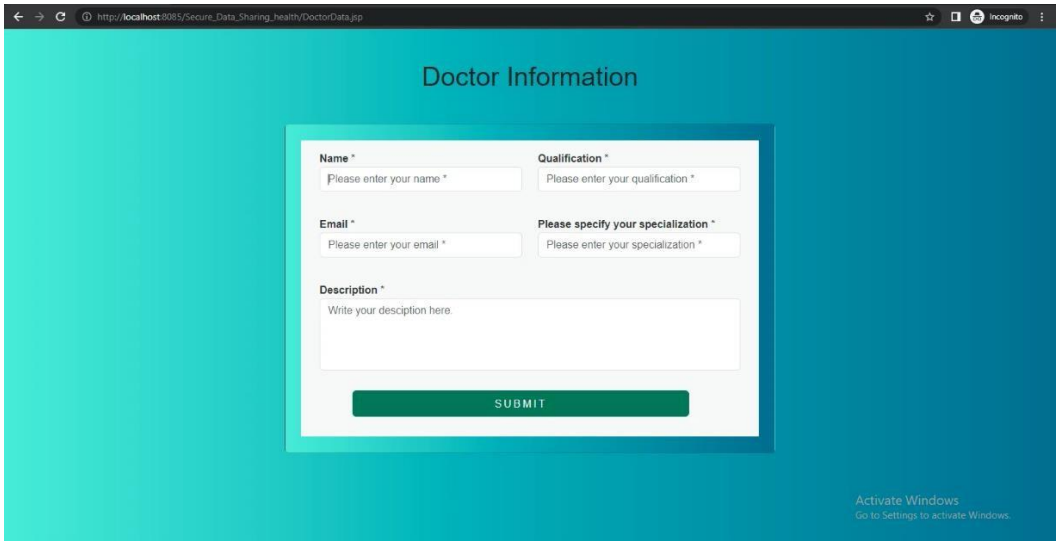
Test case ID	**Test**	**Test case Description**	**Steps**	**Input**	**Actual Results**
TC1	User Interface	Check all the text boxes, links, buttons, etc..	1. Click on input boxes, buttons and links	N/A	UI Should Be Perfect
TC2	Required fields	Check the required fields by not filling any data	1. Do not enter any value in the field. 2. Click on the Register button.	N/A	It Should Show Error Message That Field Should Not Be Empty

TC-003	Required fields	Check user should Register by filling all the required fields	1. Enter valid values in the required fields. 2. Click the Register button.	N/A	User Should Be Registered Successfully and Redirect to Successfully Signed Up
TC-004	User name (i.e firstName and lastName) validation	Check whether the user name contains text having only A- Z and 5-2 if	Enter 5 user name with only alphabets	User	It should not show any name validation error
TC-005	User name (i.e firstName and lastName) validation	Check whether the user name contains text having only A- Z and 5-2 if	Enter 5 user name with numerals and special characters with	User123	It should show validation error message
TC-006	Email validation	Check the Email text field that has an Email address without @ symbol Check the Email text field that has a random string instead of a real email. Check the Email text field that has @ symbol written in words. Check the Email text field that has 5	1. Enter Invalid Emails 2. Click on the Register Button	1.testAtgmail.com 2.test@gmail.com 3.test@gmail 4.@gmail	It should show email validation or pattern error

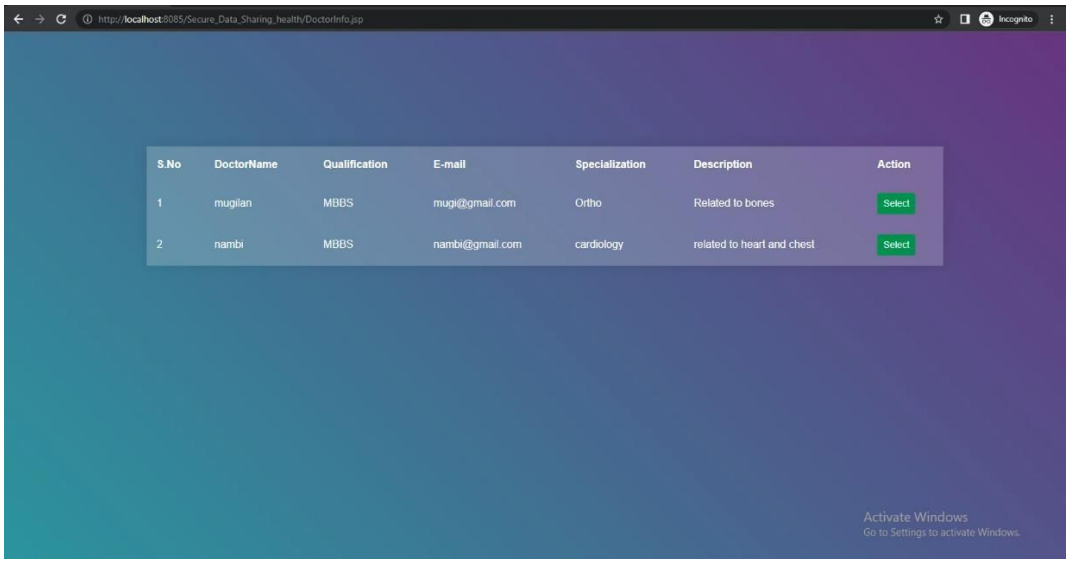
TC-007	Email validation	Check valid emails	1. Enter valid Emails 2. Click on the Register Button	1.test22@gmail .co m 2.test@gmail.c om	It should not show any validation error message
TC-008	Phone Number validation	Check whether the phone number starts with number 6-9 and has only 10-digit numerals no characters allowed	1. Enter ing invalid data in phone field 2. Click on Register button	1.0000000000 2.54612309876	It shows contact number validation error message
TC-009	Phone Number validation	Check valid phone number	Entering valid phone number	7861234231	It should not show any contact validation error
TC-0010	Password validation	Check whether Password contains one special character with numerals and with capital letter	Enter a invalid password without any special character number and Canit al letter	1.sab 2.123 3.sab@ 4sab123	It Shows Password pattern not matched or validation error
TC-011	Password validation	Check with Valid Password	Enter a Valid Password	Pass@123	It should not show any error message
TC-012	Re - Password validation	Check whether the entered password in repassword input box is same as password input	Entering mismatched password	Pass@123 entered password in retype is : pass@123	It Should Show Password Mismatch error

TC-013	Re Password validation	Check with Valid Re-Password	Enter matching valid input	Pass@123	It should not Show any error message
TC-014	Email Exists	Check whether the email id already exist in database	Enter an email which has been already register	test@gmail.com	It should Show Email aldready exists
TC-015	Email Exists	Check with a new email address	Enter a new email id	testtl@gmail.com	It Should not show any error messages

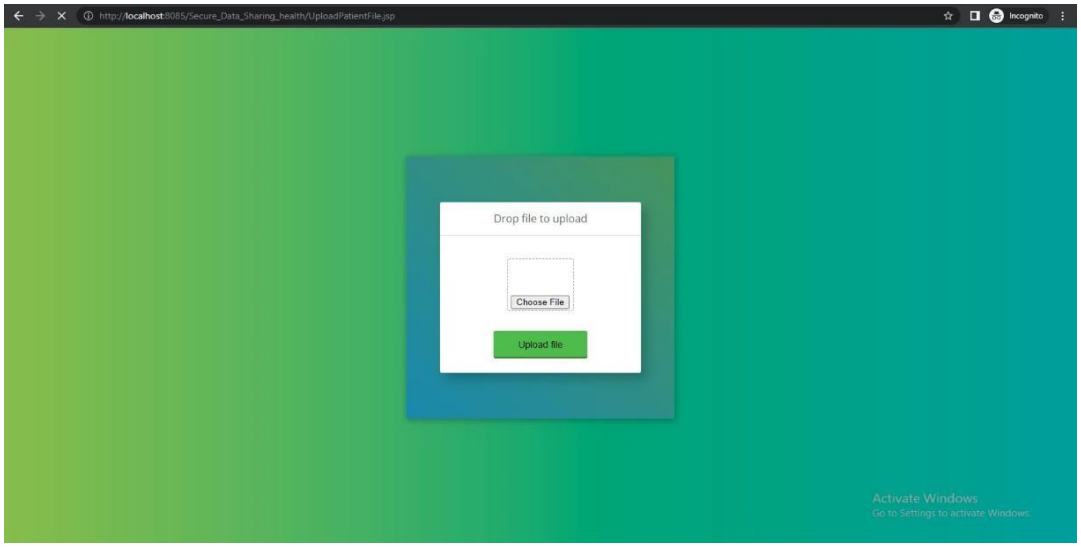
Table 5.4.3 Test case for login



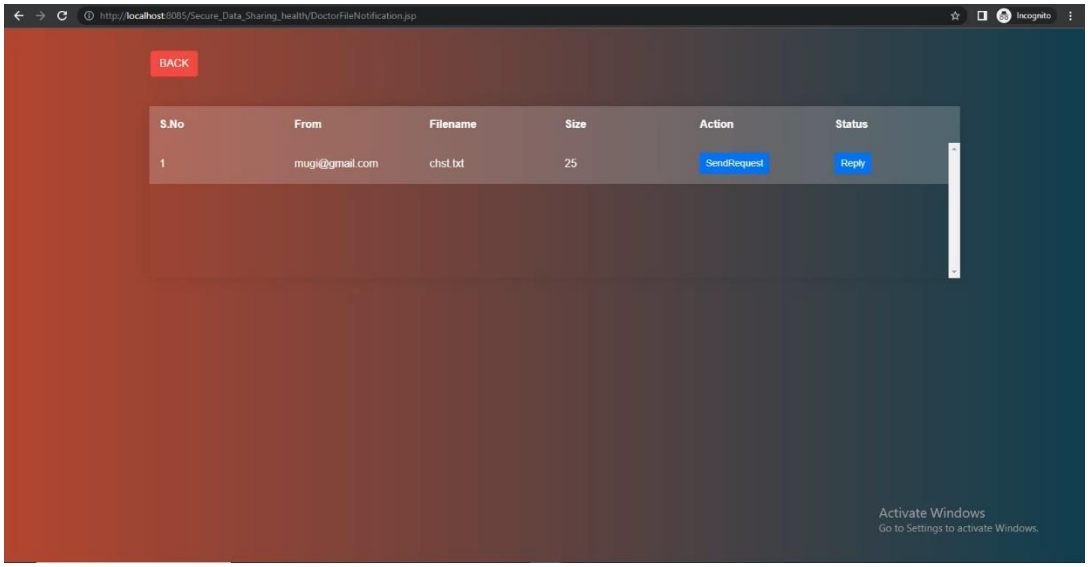
Doctor Info Page



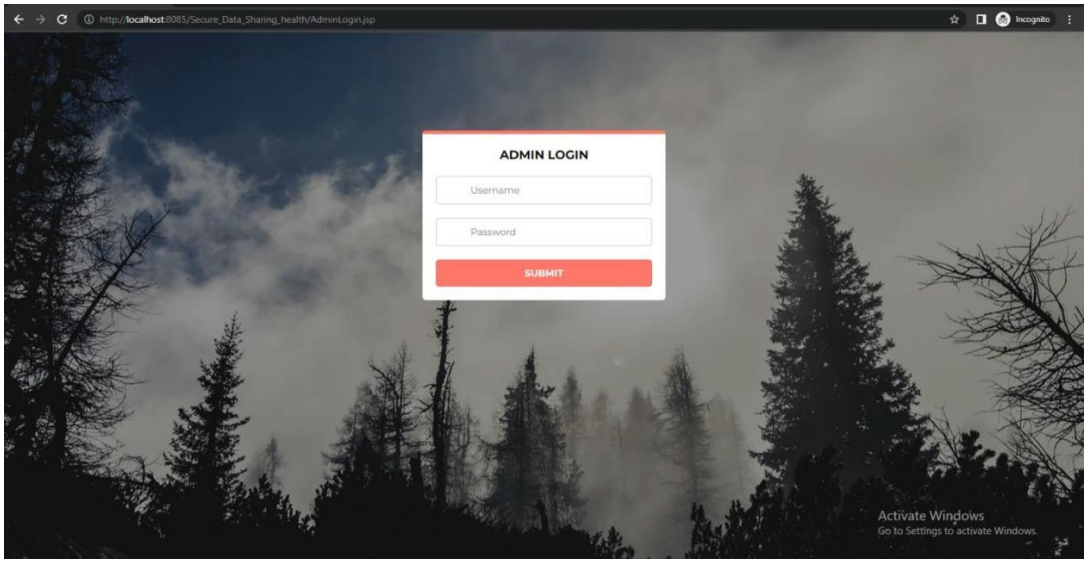
Doctor List Page



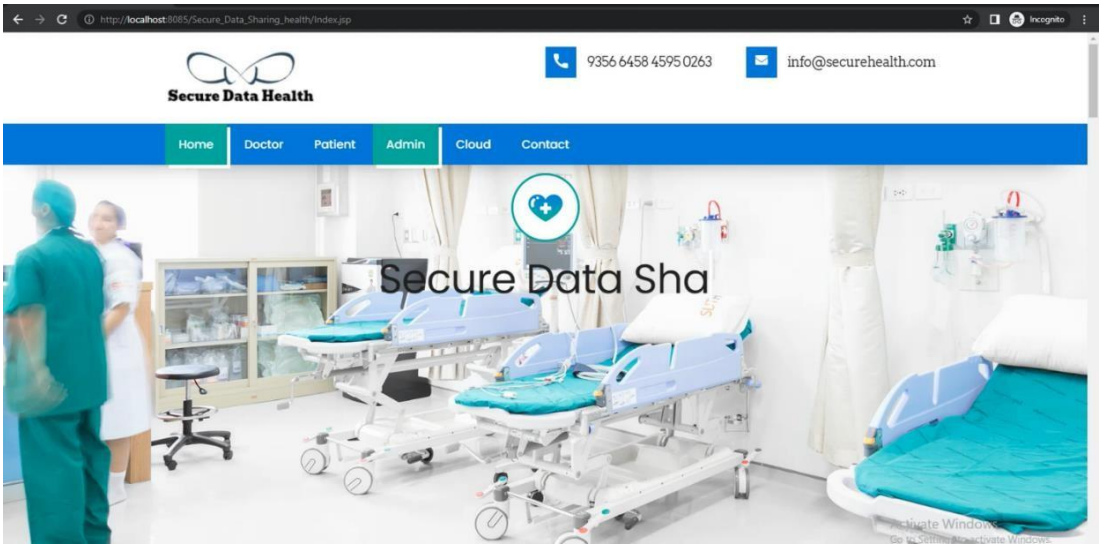
File Upload Page



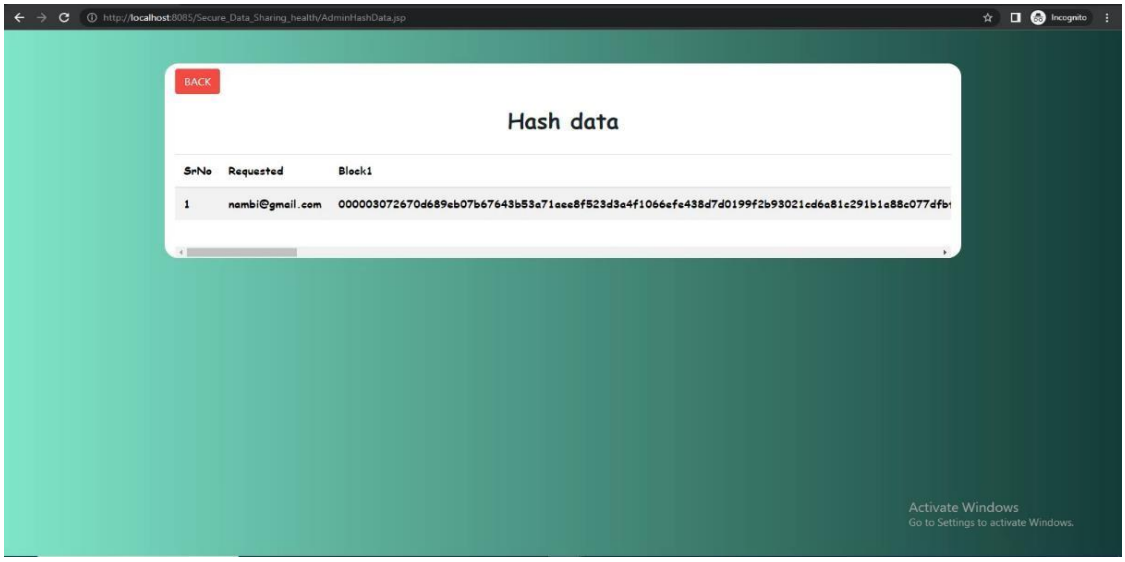
File Notification Page



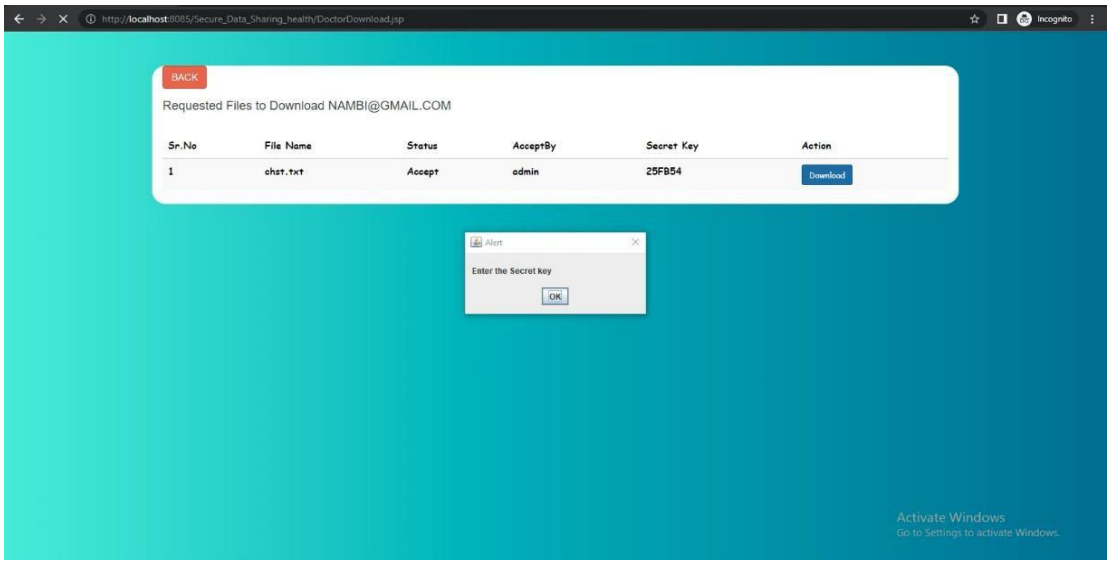
Admin Login Page



Admin Page



Encrypted File data Page



Secret key Page

CONCLUSIONS AND FUTURE WORK

Securing health records using Attribute-Based Encryption (ABE) presents a robust solution for ensuring the confidentiality and controlled access to sensitive patient information. ABE enables fine-grained access control by associating attributes such as roles, clearances, and other characteristics with data encryption. This approach not only aligns with regulatory compliance but also addresses the dynamic access needs within healthcare settings. By segmenting and encrypting health records based on attributes, ABE ensures that only authorized individuals possessing the requisite attributes can access specific data segments. The methodology provides a balance between safeguarding patient privacy and enabling healthcare professionals to access pertinent information for effective care delivery.

Future Work:

In the future, we plan to research on applying the principles of secure health record to implement and enhance future based security. We can also expand the system by adding hospitals and other required data making it more accessible and reliable. Many other functionalities can also be added to the system like online calling, online appointment, video prescribing and etc. The whole system can also be made more interactive and user-friendly by implementing HCI (Human Computer Interaction) rules, principles and theories in to its Frontend. Day to day security checks and other software and security updates are to be introduced from time to time

1. Advanced Attribute Schemes: Explore more sophisticated attribute schemes to accommodate complex access scenarios, ensuring more flexible and granular control over health record access.
2. User-Friendly Implementation: Focus on simplifying the user interface and system integration to ensure ease of use for healthcare professionals while maintaining strong security measures.
3. Interoperability and Standardization: Work towards standardizing ABE implementations to promote interoperability between different healthcare systems and institutions.

REFERENCES

1. Kumar, P. R., Raj, P. H., & Jelciana, P. (2018). Exploring data security issues and solutions in cloud computing. *Procedia Computer Science*, *125*, 691-697.
2. Chiregi, M., & Navimipour, N. J. (2017). A comprehensive study of the trust evaluation mechanisms in the cloud computing. *Journal of Service Science Research*, *9*, 1-30.
3. Pham, H., Woodworth, J., & Amini Salehi, M. (2019). Survey on secure search over encrypted data on the cloud. *Concurrency and Computation: Practice and Experience*, *31*(17), e5284.
4. Wu, L., Zhang, Y., Choo, K. K. R., & He, D. (2017). Efficient and secure identity-based encryption scheme with equality test in cloud computing. *Future Generation Computer Systems*, *73*, 22-31.
5. Zhang, X., Xu, C., Mu, L., & Zhao, J. (2018). Identity-based encryption with keyword search from lattice assumption. *China Communications*, *15*(4), 164-178.
6. Qian, H., Li, J., Zhang, Y., & Han, J. (2015). Privacy-preserving personal health record using multi-authority attribute-based encryption with revocation. *International Journal of Information Security*, *14*, 487-497.
7. Li, J., Zhang, Y., Chen, X., & Xiang, Y. (2018). Secure attribute-based data sharing for resource-limited users in cloud computing. *computers & security*, *72*, 1-12.
8. Wang, C., Li, W., Li, Y., & Xu, X. (2013). A ciphertext-policy attribute-based encryption scheme supporting keyword search function. In *Cyberspace Safety and Security: 5th International Symposium, CSS 2013, Zhangjiajie, China, November 13-15, 2013, Proceedings 5* (pp. 377-386). Springer International Publishing.
9. Yan, Z., Zhang, L., Wenxiu, D. I. N. G., & Zheng, Q. (2017). Heterogeneous data storage management with deduplication in cloud computing. *IEEE Transactions on Big Data*, *5*(3), 393-407.
10. Yan, Z., Wang, M., Li, Y., & Vasilakos, A. V. (2016). Encrypted data management with deduplication in cloud computing. *IEEE Cloud Computing*, *3*(2), 28-35.

APENDICE

Items	Total Cost	In-kind or Match (what you already have)	Requested
Facility Expenses	NA	NA	NA
Utilities	10,000	2,000	8,000
maintenance (cleaning)	3,000	0	3,000
Internet connection	2,500	0	2,500
Total Facility Expenses	15,500	2,000	13,500
Equipment			
laptop	75,000	3,000	72,000
Printer	8,000	2,000	6,000
Other Expenses	5,000	0	5,000
Total Project Costs/Total Request	1,03,000	10,000	93,000