VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JNANA SANGAMA", BELAGAVI-590018.

An Internship Report On

"JAVA FULLSTACK DEVELOPER"

Submitted in partial fulfilment of the requirement for the award of degree of

Bachelor of Engineering Information Science & Engineering

Submitted by

SUJAN DAHAL

[1RI19IS045]

Carried out at Pantech E Learning
No 11/A, Thanjaur Road, T.Nagar
Chennai TN 600017

Internal Guide

Mrs. Nishchitha T S
Assistant Professor
Dept. of ISE

External Guide

Mr. Malaiyappan M
Director
Pantech E Learning, Chennai

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

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DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

INTERNSHIP CERTIFICATE

This is to certify that the Internship entitled **"JAVA FULLSTACK DEVELOPER"** has been successfully carried out at **"Pantech E Learning",** by **SUJAN DAHAL** bearing the **USN: 1RI19IS045,** a bonafide student of **R R INSTITUTE OF TECHNOLOGY** in partial fulfilment for the award of degree of **Bachelor of Engineering in INFORMATION SCIENCE & ENGINEERING** of **Visvesvaraya Technological University, Belagavi** during the academic year 2022-2023. It is certified that all corrections/suggestion indicated for internal assessment have been incorporated in the report. The internship report has been approved as it satisfies the academic requirementswith respect to the internship work for the said degree.

Mrs. Nishchitha T S **Assistant** **Professor** **Dept. of ISE**	**Dr. Erappa G** **Professor & HOD** **Dept. of ISE**	**Dr. Mahendra K V** **Principal**

External Viva

Name of the Examiners   Signature with date

1. _____   _____

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OFFER LETTER

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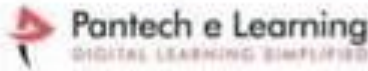
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05.09.2022

Sujan Dahal

RR Institute of Technology

INTERNSHIP CONFIRMATION LETTER

Dear **Sujan Dahal**

Greetings from **Pantech Group of Companies**

Pantech Group is focused on being a leader in the area of Products & Research Initiatives. We have developed and established a comprehensive set of sustainable initiatives that facilitate our bottom-line approach to interns. We believe in guiding the Intern by an inquisitive learning process, by placing them on their own path of learning – BY DOING!

We are in receipt of your enrolment for the **Pantech APSSDC – JAVA FULL STACK INTERNSHIP PROGRAM – SEPTEMBER 2022** and accord our acceptance for the same. Your internship will commence on **1ST September 2022** and will be for **1 Month Duration**.

Details as provided by you for INTERNSHIP CERTIFICATION:

Name : Sujan Dahal

College Name : RR Institute of Technology

Email id : dl.sujan643@gmail.com

In case of any changes to be done from the above, mail us at training@pantechelearning.com.

You can download the Project Assignments and Codes and pass it on for validation.

It is anticipated that during your internship with us you will gain invaluable hands-on experience and knowledge in the domain and make it beneficial for your career advancements & Institutional Credits.

Associate Partner : Andhra Pradesh State Skill Development Corporation

Malaiyappan M

Head – STTIP Program

CERTIFICATE

CERTIFICATE NO: PEL-INT-JFSMC-269

CERTIFICATE

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NAME _Sujan Dahal_

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has successfully completed

30 DAYS JAVA FULL STACK MASTER CLASS

at Pantech E Learning Pvt Ltd, Chennai

FROM _01.09.2022_ TO _30.09.2022_

M.Malaiyappan
Director
Pantech e Learning

Dr.Ravi Gujjala
Chief General Manager (Technical)
APSSDC

DECLARATION

I ,**SUJAN DAHAL** bearing the **USN: 1RI19IS045**, student of Bachelor of Engineering, Information Science & Engineering ,R R INSTITUTE OF TECHNOLOGY, Bengaluru, hereby declare that the internship training titled "**JAVA FULLSTACK DEVELOPER**" has been independently carried out by me under the supervision and guidance of **Mr. Malaiyappan M, Director of Pantech E Learning**, Chennai, and **Mrs. Nishchitha T S,** Assistant Professor, Dept. of Information Science & Engineering, R R INSTITUTIONS Bengaluru, submitted by me as a partial fulfilment of the requirements for the award of degree in **Bachelor of Engineering** degree in **Information Science & Engineering** from **Visvesvaraya Technological University**, **Belagavi** during the academic year **2022-23**. I also declare that the internship has not been submitted previously for the award of any degree or diploma, by me to any institution.

SUJAN DAHAL

[1RI19IS045]

ACKNOWLEDGEMENT

I would like to express my gratitude to **Dr. Mahendra K V**, principal, R.R INSTITUTE OF TECHNOLOGY, for providing me excellent facilities and academic ambience which has helped me in completion of this Bachelor Degree.

I express my truthful thanks to **Dr. Erappa G,** Head of Department, Dept. of ISE, for his valuable support.

I extend my sincere thanks and heartfelt gratitude to internship coordinator, **Mrs. Sowmya J,** Assistant Professor, Dept. of ISE, for providing me an invaluable support

I extend my sincere thanks and heartfelt gratitude to my Internal guide, **Mrs. Nishchitha T S** , Assistant Professor, dept. of ISE for providing me invaluable support throughout the period of my internship training.

I wish to express my heartfelt gratitude to my external guide **Mr. Malaiyappan M**, Director, Pantech E Learning, Chennai for his valuable guidance, suggestions and cheerful encouragement during the entire period of my Internship Training.

I would like to sincerely thank all the people at Pantech E Learning for spending their valuable time in ensuring that I understand the working of the company and helping me in preparation of this report.

Finally, I would like to express my gratitude towards my parents, teaching and non-teaching staff of the department, the library staff and all my friends, who have directly or indirectly supported me during the period of my internship program.

SUJAN DAHAL

[1RI19IS045]

ABSTRACT

I as offered an internship at Pantech E Learning after a successful round of interview. The internship was for 1 months from 1st September 2022 to 30th September 2022. The role I was assigned was that of Java Full Stack Developer.

The study aimed to design, to develop, and to implement java full stack project- Erasure Coding. Erasure coding is a technique used in data storage and transmission to protect against data loss due to errors or failures. This method involves dividing the data into small pieces and generating additional pieces, called parity or redundancy, that are distributed across multiple storage devices. In case of a failure, the lost data can be reconstructed using the remaining pieces and the redundant ones. Erasure coding offers higher data protection and reliability than traditional replication methods while reducing storage and bandwidth requirements. This technique is used in various applications, including cloud storage, distributed computing, and communication systems. However, erasure coding also involves higher computational complexity and overhead, which can affect performance and efficiency. Thus, erasure coding is a trade-off between data protection and resource utilization, and its design and implementation depend on specific requirements and constraints.

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Chapter1: INTERNSHIP OVERVIEW

1.1 Introduction to Internship

An internship is a structured work experience related to a student's major and/or career goal.It is an experience that should enhance a student's academic, career, and personal development. It is an involvement, closely aligned with the student's major and arranged withan employer who believes it is desirable to aid in the training and education of the student. Itis of a short duration, typically four weeks, through direct personal contact hours or through a training program, and to aid the intern in developing a summary report of his/her experience. This internship program is designed by Pantech E Learning labs for the partial fulfilment of the degree of Bachelor of Engineering. The intern is honored by the internship program under this curriculum. This program has enhanced the skill and enthusiasms of the students as they get knowledge of the company environments and to learn different aspects of working mechanism that prevail in the organizations.

1.2 Internship Program Objective

The major objectives of internship are:

- ❖ To expose students to a particular job and a profession or industry.
- ❖ To provide students with opportunity to develop skills in the field of interest.
- ❖ To assist students in gaining vital work-related experience and building strong resume for bright career.
- ❖ To help students in developing business contacts i.e. creating network contacts.
- ❖ To help students potentially land permanent or contractual jobs from host company.

1.3 About Pantech E Learning

Pantech E Learning is a subsidiary of the Pantech Group. Pantech is a Think Tank with a keen interest in sharing technical knowledge expertise to the student and staff community viz a viz On Campus Courses, In-House Courses, Faculty Development Programs, Hands on Sessions, Workshops and Seminars. Pantech E Learning Visions for promoting technical excellence & offering fantastic opportunities to the students and faculty of educational institutes & corporates , enabling them to pursue insight into transformative technical trends with a view to empower & build a knowledge society. They are focused on providing quality education on latest technologies and develop products which are of great need to the society. They also involve in distribution and sales of latest microprocessor and microcontroller products developed all over the globe to their customers. They run a project consultancy where they undertake various projects from wide range of companies and assist them technically and build products and provide services to them. They are continuously involved in research about futuristic technologies and finding ways tosimplify them for their clients.

1.4 Vision
To be a world-class research and development organization committed to enhancingstakeholder's value

1.5 Mission
To Tap and train best brainpower to give solutions for real challenges of the world.

1.6 Values
- ❖ Zeal to excel and zest for change.
- ❖ Integrity and fairness in all matters.
- ❖ Respect for dignity and potential of individuals.
- ❖ Ensure speed of response.
- ❖ Faster learning, creativity and team-work.
- ❖ Loyalty and pride in the company

Chapter2: PROJECT OVERVIEW

2.1 Introduction to Erasure Coding

Erasure coding is a method of data protection in which data is broken down into smaller fragments and then expanded with additional redundant information. This redundant information can be used to recover lost data in the event of partial data loss, such as due to a hardware failure or network disruption.

In erasure coding, the original data is divided into several data fragments, and additional fragments called parity fragments are generated from the original data fragments. These parity fragments contain redundant information, which is calculated using mathematical algorithms, and can be used to reconstruct the original data if some of the data fragments are lost.

Erasure coding is used in many storage systems, including distributed storage systems like Hadoop and cloud storage systems like Amazon S3. It offers higher reliability than traditional methods like replication, which simply make copies of data, by using fewer resources.

One popular type of erasure coding is Reed-Solomon coding, which is used in many applications, including CD-ROMs, DVDs, and RAID systems. Reed-Solomon coding works by generating a set of parity fragments that can be used to recover any subset of the original data fragments. Other types of erasure coding include Cauchy-Reed-Solomon coding, Fountain coding, and Tornado coding.

2.2 Objective:

✓ The propose an uprightness check plan for their framework to upgrade information strength against capacity server defilement, which returns altered cipher texts.

✓ More flexible adjustment between the number of storage servers and robustness.

✓ Their system supports a repair mechanism in which a new storage server can compute a new cipher text from the cipher texts obtained from the remaining storage servers.

✓ New integrity tags can be computed from different storage servers without involvement

of the user's secret key or backup servers.

✓ There have been some integrity check schemes for erasure code.

2.3 Existing System

In Existing System we use a straightforward integration method. The following steps shows that how straightforward method was used for integrating erasure coding into an existing system:

- **Identify the data to be protected:** Identify the data that needs to be protected using erasure coding. This could include data stored in databases, file systems, or distributed storage systems.

- **Determine the erasure coding requirements**: Based on the data to be protected, determine the erasure coding requirements. This should include the number of data fragments and parity fragments needed to achieve the desired level of redundancy and reliability.

- **Choose an erasure coding algorithm:** Choose an erasure coding algorithm that best fits the needs of the project. This could include Reed-Solomon coding, Cauchy-Reed-Solomon coding, Fountain coding, or Tornado coding.

- **Implement erasure coding:** Develop and implement the erasure coding solution based on the chosen algorithm. This could involve developing custom code, using third-party libraries, or leveraging APIs provided by the erasure coding software.

- **Test and validate erasure coding:** Test the erasure coding solution thoroughly to ensure that it meets the requirements and performs as expected. This should include functional testing, performance testing, and security testing.

- **Integrate erasure coding into the existing system:** Integrate the erasure coding solution into the existing system. This could involve modifying the data storage system or using an erasure coding plugin or API provided by the storage system.

2.4 Proposed System:

Here's a proposed system for erasure coding that incorporates distributed storage, threshold proxy re-encryption, and AES technology:

- ❖ **Distributed storage:** The system uses a distributed storage architecture where data is stored across multiple servers. This provides redundancy and fault tolerance, as well as the ability to scale storage capacity as needed. The distributed storage system could be implemented using technologies such as Hadoop Distributed File System (HDFS) or Ceph.

- ❖ **Key servers:** The system includes key servers that are responsible for managing cryptographic keys used for encryption and decryption. The key servers could be implemented using technologies such as Hashicorp Vault or Amazon Web Services Key Management Service (KMS).

❖ **Threshold proxy re-encryption:** To provide secure access to data stored in the distributed storage system, the system uses threshold proxy re-encryption. This is a cryptographic technique that allows a third party to transform encrypted data from one key to another without being able to see the underlying plaintext. Threshold proxy re-encryption provides the ability to share data securely with multiple parties while maintaining control over access to the data.

❖ **AES technology:** To provide strong encryption for data stored in the distributed storage system, the system uses Advanced Encryption Standard (AES) technology. AES is a widely used and highly secure encryption algorithm that is recommended by the National Institute of Standards and Technology (NIST). The system could use AES in various modes, such as Cipher Block Chaining (CBC) or Galois/Counter Mode (GCM).

❖ **Implementation:** The proposed system could be implemented using a combination of custom software development and third-party tools and services. For example, the distributed storage system could be implemented using HDFS, the key servers could be implemented using Hashicorp Vault, and the threshold proxy re-encryption could be implemented using a library such as NuCypher.

❖ **Testing and validation:** The system should be thoroughly tested and validated to ensure that it meets the requirements and performs as expected. This should include functional testing, performance testing, and security testing.

❖ **Deployment and maintenance:** The system should be deployed into a production environment and monitored for performance and reliability. Ongoing maintenance and support should be provided to ensure that the system continues to meet the needs of the organization.

2.5 Advantages:
Following are the major advantages of Erasure Coding:
❖ Data Robustness.
❖ Data confidentiality.
❖ Data forwarding.
❖ The storage servers independently perform encoding and re-encryption.
❖ More flexible adjustment between the number of storage sever and robustness.

2.6 Disadvantages:
Following are the major advantages of Erasure Coding:
❖ The user can perform more computation and communication traffic between the user and storage servers is high.
❖ The user has to manage his cryptographic keys otherwise the security has to be broken.

❖ The data storing and retrieving, it is hard for storage servers to directly support the other functions.

Chapter3: SYSTEM REQUIREMENTS AND SYSTEM ANALYSIS

3.1 System Requirements:

3.1.1 Functional Requirements:

Here are some functional requirements for erasure coding:
- ➢ **Data fragmentation:** Erasure coding should be able to break data into multiple fragments, including both data and parity fragments, as per the chosen coding algorithm.

- ➢ **Redundancy:** Erasure coding should provide redundancy by generating and distributing parity fragments across the storage nodes to protect against data loss.

- ➢ **Recovery:** Erasure coding should enable recovery of the original data in case of data loss by using the available fragments, including the parity fragments.

- ➢ **Scalability:** Erasure coding should be scalable and able to handle large volumes of data without significant impact on performance.

- ➢ **Performance:** Erasure coding should not have a significant impact on system performance, such as slow read and write times, while providing data redundancy.

- ➢ **Security:** Erasure coding should provide data security through the use of encryption and access control mechanisms, ensuring that only authorized users can access the data.

- ➢ **Error detection and correction:** Erasure coding should have the capability to detect and correct errors in the stored data fragments, ensuring data integrity.

- ➢ **Integration:** Erasure coding should be integrated into the existing storage and retrieval systems, ensuring compatibility with the storage system.

- ➢ **Configurability:** Erasure coding should allow for the configuration of parameters such as the number of data and parity fragments, block sizes, and coding algorithms.

- ➢ **Monitoring and maintenance:** Erasure coding should be monitored and maintained to ensure optimal performance and integrity of the stored data. This includes monitoring for failures or errors in storage nodes and data fragments, as well as regular backups of the stored data.

3.1.2 Non-Functional Requirements:

Here are some non-functional requirements for erasure coding:

- ❖ **Reliability:** Erasure coding should be highly reliable, providing data protection and

recovery even in the event of multiple failures or data losses.

❖ **Availability:** Erasure coding should be available at all times, ensuring that data can be accessed and recovered when needed.

❖ **Performance:** Erasure coding should provide high performance, including fast read and write times, and minimal latency, ensuring that users can access and manipulate data quickly and efficiently.

❖ **Scalability:** Erasure coding should be highly scalable, enabling the storage and retrieval of large volumes of data, and allowing for the addition of new storage nodes as needed.

❖ **Security:** Erasure coding should be highly secure, protecting against unauthorized access, data breaches, and data theft.

❖ **Compliance:** Erasure coding should comply with applicable laws, regulations, and industry standards, including data privacy laws and data retention policies.

❖ **Usability:** Erasure coding should be easy to use and configure, ensuring that users can manage and access data without requiring specialized technical expertise.

❖ **Interoperability:** Erasure coding should be interoperable with other storage and retrieval systems, ensuring compatibility with existing systems and applications.

❖ **Maintainability:** Erasure coding should be easy to maintain, including the ability to upgrade, patch, and replace components without significant disruption to the system.

❖ **Cost-effectiveness:** Erasure coding should be cost-effective, providing data protection and recovery without requiring significant investment in hardware or software.
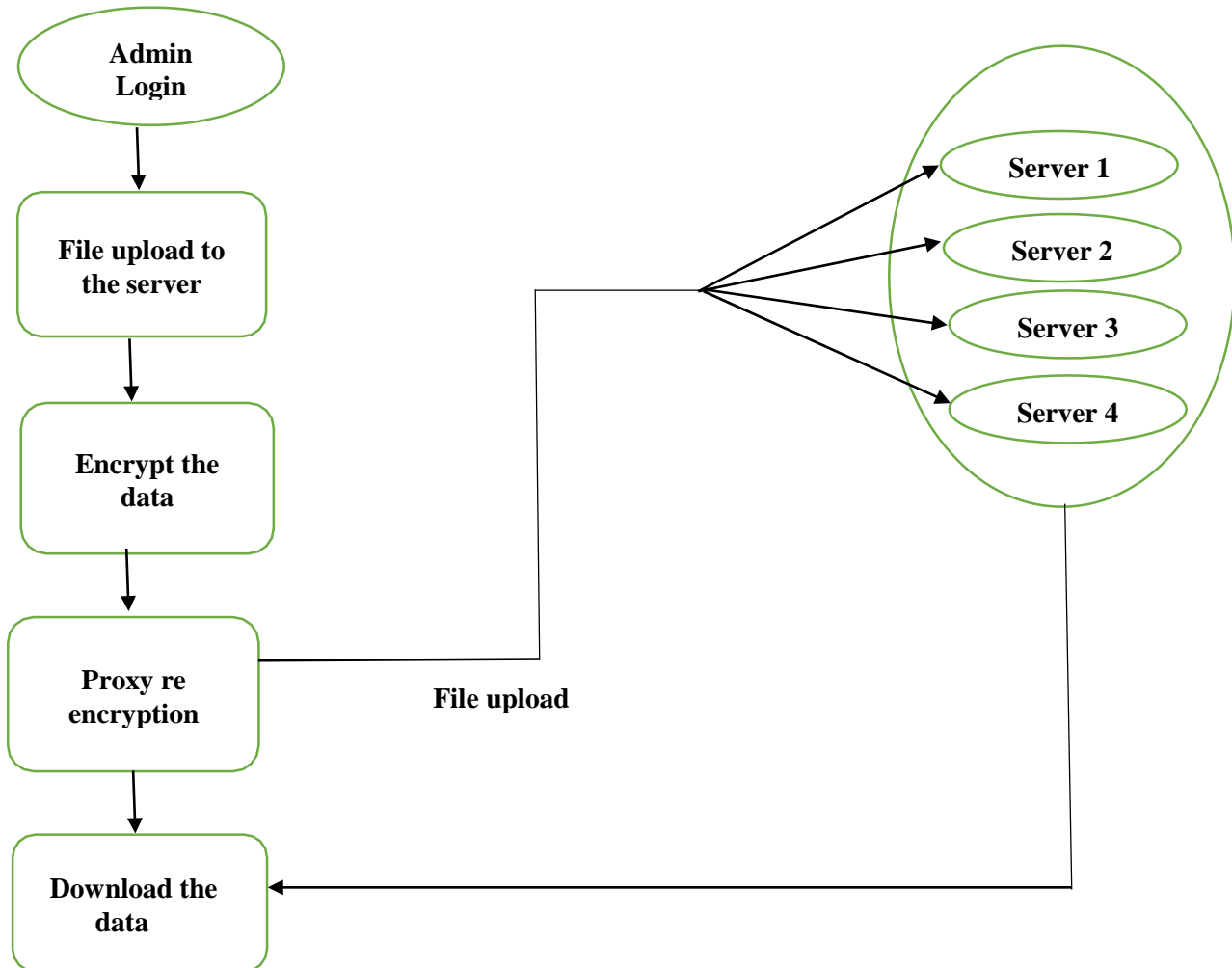
3.1.3   Hardware Requirements:
   ❖ Main Processor → 2GHz
   ❖ RAM → 512MB (min)
   ❖ Hard Disk → 80GB

3.1.4   Software Requirements:
   ❖ Language → Java
   ❖ Web Server → Glassfish 4.
   ❖ Operating System →Windows 8

Chapter4: SYSTEM DESIGN

4.1 Block Diagram:

4.2 Modules:

- ❖ **Registration:** For the registration of user with identity ID the group manager randomly selects a number. Then the group manager adds into the group user list which will be used in the traceability phase. After the registration, user obtains a private key which will be used for group signature generation and file decryption.

- ❖ **Sharing Data**: The canonical application is data sharing. The public Auditing property is especially useful when we expect the delegation to be efficient and flexible. The schemes enable a content provider to share her data in a confidential and selective way, with a fixed and a cipher text expansion, by distributing to each authorized user a single and small aggregate key.

- ❖ **Secure Cloud Storage:** Data robustness is a major requirement for storage systems. There have been many proposals of storing data over storage servers. One way to provide data robustness is to replicate a message such that each storage server stores a copy of the message. A decentralized erasure code is suitable for use in a distributed storage system.

- ❖ **Proxy Re-Encryption:** Proxy re-encryption schemes are crypto systems which allow third parties (proxies) to alter a cipher text which has been encrypted for one user, so that it may be decrypted by another user. By using proxy re encryption technique the encrypted data (cipher text) in the cloud is again altered by the user. It provides highly secured information stored in the cloud.

- ❖ **Data Retrieval:** Reports and data are the two primary forms of the retrieved data from servers. There are some overlaps between them, but queries generally select a relatively small portion of the server, while reports show larger amounts of data. Queries also present the data in a standard format and usually display it on the monitor; whereas reports allow formatting of the output.
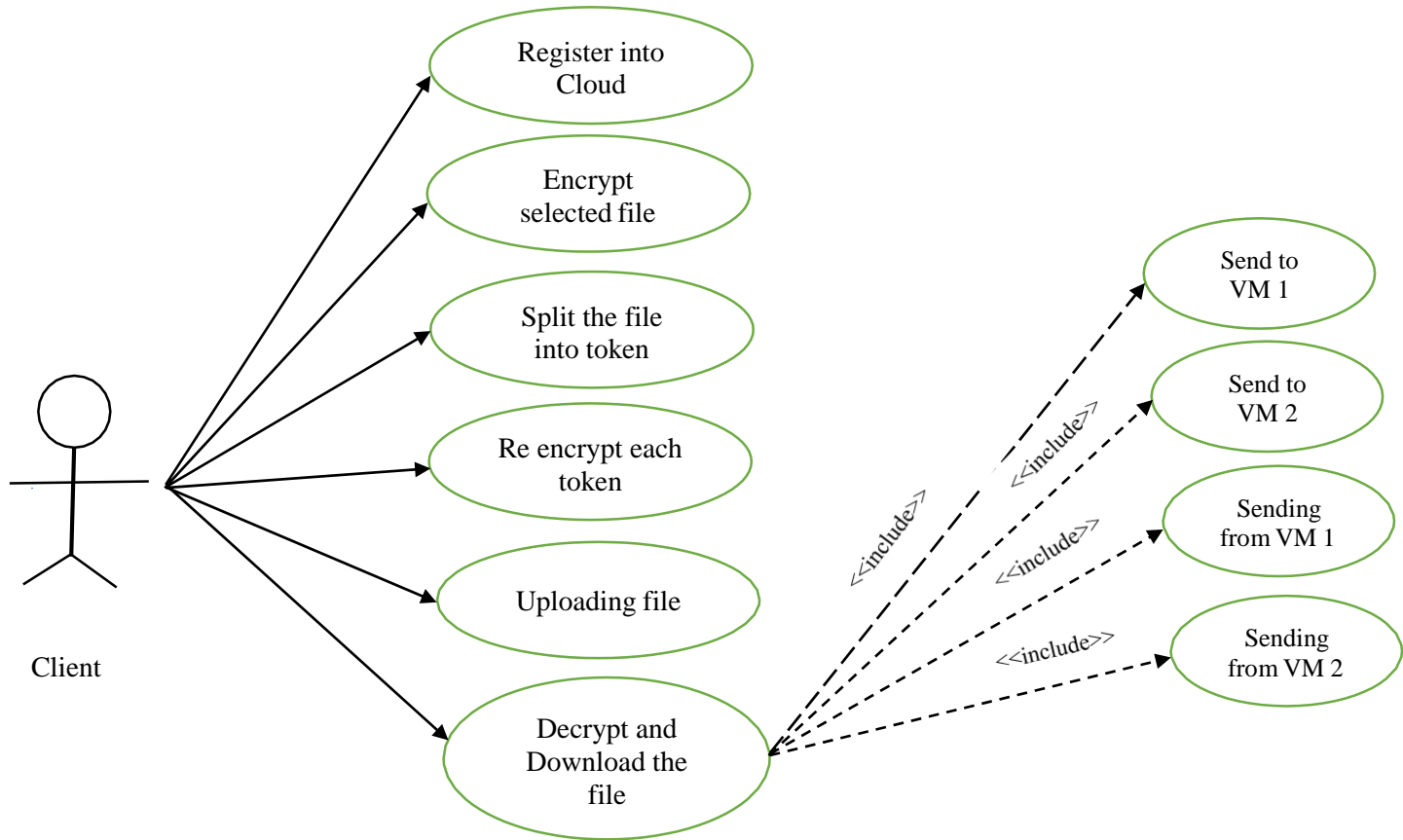
4.3 UML Diagram:

UML stands for Unified Modeling Language, which is a graphical language used to visualize, specify, design, and document software systems. UML diagrams are used to represent various aspects of a software system, including its structure, behavior, and interactions between components.

UML diagrams can be broadly categorized into two types: structural diagrams and behavioral diagrams. Structural diagrams include class diagrams, object diagrams, component diagrams, and deployment diagrams. These diagrams represent the static structure of a system, including its classes, objects, components, and their relationships.

Behavioral diagrams, on the other hand, include use case diagrams, activity diagrams, state machine diagrams, and sequence diagrams. These diagrams represent the dynamic behavior of a system, including how its components interact with each other over time.

UML diagrams provide a standard way to communicate and document software systems, making it easier for developers, designers, and stakeholders to understand and collaborate on complex software projects.

Register into
Cloud

Encrypt
selected file

Split the file
into token

Re encrypt each
token

Uploading file

Client

Decrypt and
Download the
file

Send to
VM 1

Send to
VM 2

Sending
from VM 1

Sending
from VM 2

<<include>>

<<include>>

<<include>>

<<include>>

Fig: UML Diagram

4.4 Sequence Diagram:

A sequence diagram is a type of UML diagram that shows the interactions between objects or components in a system in a chronological order. It represents the dynamic behavior of a system, illustrating the flow of messages and the order of method calls between objects or components during a specific scenario.

Sequence diagrams are commonly used to model and analyze the behavior of a system from the perspective of a specific use case or scenario. They can help developers to understand and visualize the flow of control, the relationships between objects, and the sequence of operations that occur during a given scenario.

The basic components of a sequence diagram include objects, lifelines, messages, and activation

bars. Objects represent the instances of classes in the system, while lifelines represent the timeline of an object's existence. Messages represent the communication between objects, and activation bars represent the duration of an object's method call.

Sequence diagrams are a useful tool for designing, debugging, and documenting complex systems. They can be used throughout the software development lifecycle, from requirements gathering and analysis to testing and maintenance.
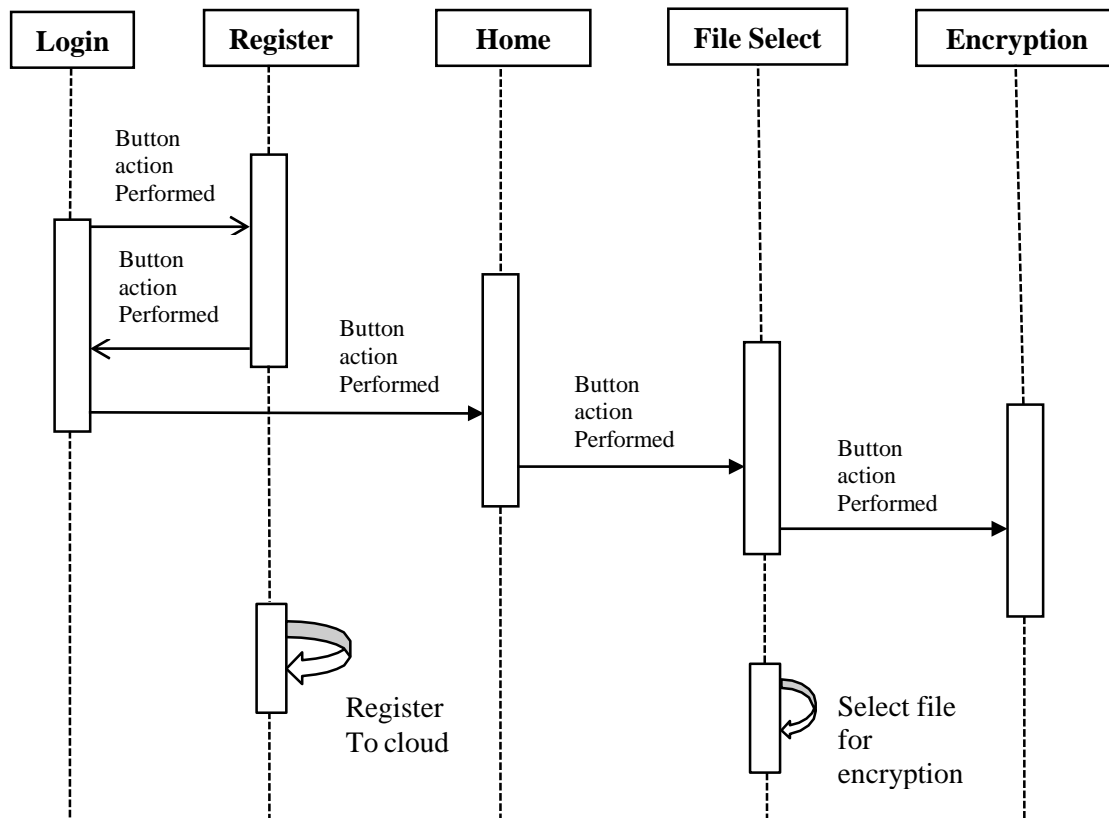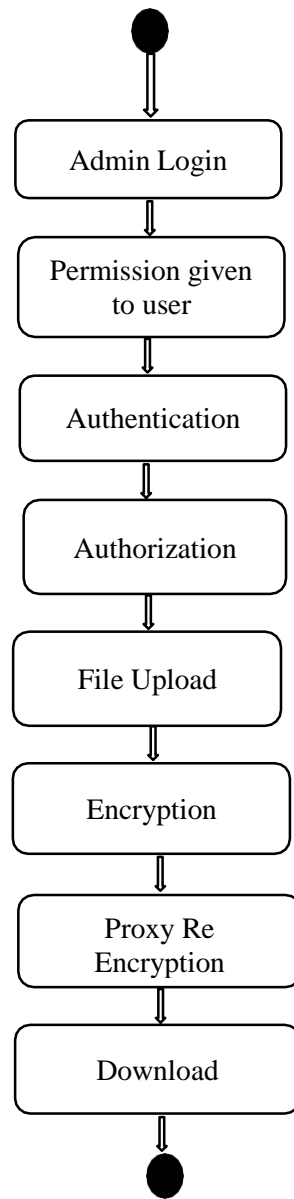

Fig: Sequence Diagram

4.5 Activity Diagram:

An activity diagram is a type of UML (Unified Modeling Language) diagram that visualizes the flow of activities or actions in a system, process, or workflow. It is used to model and represent the behavior of a system, such as business processes, software algorithms, or complex workflows.

Admin Login

Permission given to user

Authentication

Authorization

File Upload

Encryption

Proxy Re Encryption

Download

4.6 Class Diagram:

A class diagram is a type of UML (Unified Modeling Language) diagram that represents the static structure of a system or software application. It depicts the classes, interfaces, associations, and other relationships between objects in the system.

A class is a blueprint or template for creating objects that share common properties and behavior. Class diagrams depict the classes in a system, along with their attributes and operations (methods).

Attributes are the data members of a class, representing the characteristics or properties of the objects. Operations are the methods or functions that can be performed on the objects, such as modifying their attributes or performing actions.

Associations are the relationships between classes, indicating how objects of one class are related to objects of another class. Associations can be simple or complex, such as one-to-one, one-to-many, many-to-many, or recursive relationships.

Class diagrams can also include other elements such as interfaces, abstract classes, inheritance, and dependencies between classes. Interfaces define a set of operations that a class must implement, while abstract classes provide a common base for a group of related classes.
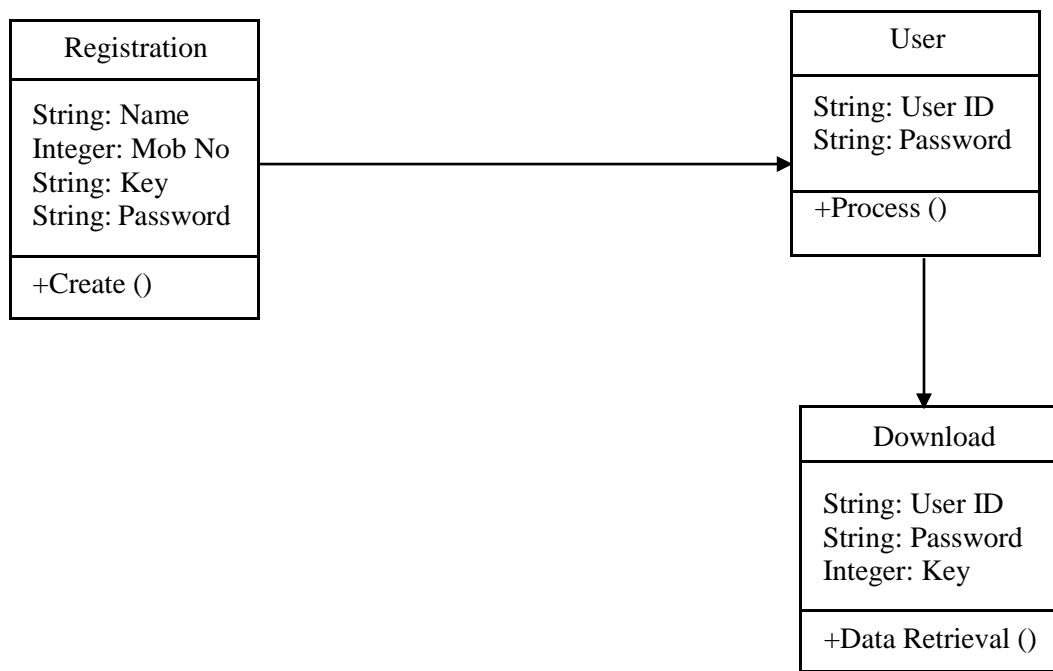

Fig: Class Diagram

Chapter5: IMPLEMENTATION

5.1 Implementation Tools

Implementation is an activity that is contained throughout the development phase. It is the process of bringing designed system into operational use. The system is tested first and then turned into working system. Every task identified in the design specification is carried out in this phase.

5.1.1   Front End Tools: HTML and CSS

HTML known as Hyper Text Mark-up Language; the authoring language used to create documents on the World Wide Web. HTML defines the structure and layout of a Web document by using a variety of tags and attributes. Theme or plugin does exactly what you need it to do, and looks almost exactly how you need it to look. But still, you wish it would look slightly different. For this reason, HTML was used. HTML tags were used in posts, pages, sidebar text widgets to code a hyperlink by hand, or adjust the header sizes.

CSS stands for Cascading Style Sheets. It describes how HTML elements are to be displayed on screen or in other media. In this project, additional CSS was used when further customization on the site was required. Sometimes, the theme does not work as per the requirement of the user so to meet the requirement of the user additional CSS was used. To add in the icons, to scale the logo properly, change the font size of the specified content, to add a specific callout box, or style just a section of a post differently CSS was used. The theme option does provide certain features but to add the features according to the client's requirement additional CSS was applied.

5.1.2   Backend Tools: JAVA

Java is a powerful and versatile programming language that is widely used in backend development. Its robustness, scalability, and security make it an ideal choice for building complex and high-performance backend systems. Java's performance is optimized through its JIT compilation and garbage collection features, which allow for efficient code execution and memory management. Its "write once, run anywhere" philosophy makes it highly portable, allowing developers to deploy applications across different platforms. Java also offers a range of tools and frameworks for building scalable backend systems, such as Spring, Hibernate, and Apache Struts. With its strong security model, including built-in features like the Security Manager and sandboxing, Java is a trusted choice for building secure backend systems. Furthermore, the large and active Java community provides a wealth of resources, including libraries, frameworks, and tools, making it easier for developers to create high-quality backend applications.

5.1.3   Database: MYSQL

MySQL is a popular open-source relational database management system (RDBMS) that is used for storing, organizing, and managing data in a wide range of applications. It is a flexible, scalable, and easy-to-use database system that offers a range of features and benefits.

MySQL organizes data in tables, with each table consisting of rows and columns. It uses SQL (Structured Query Language) for managing relational databases, which makes it easy for developers to work with the database. MySQL offers a range of features, such as indexing, caching, and replication, which help to improve the performance and scalability of the database.

MySQL is highly customizable, allowing developers to configure and optimize the database to suit their specific needs. It is also highly compatible with different programming languages, frameworks, and operating systems, making it a popular choice for developers building a wide range of applications.
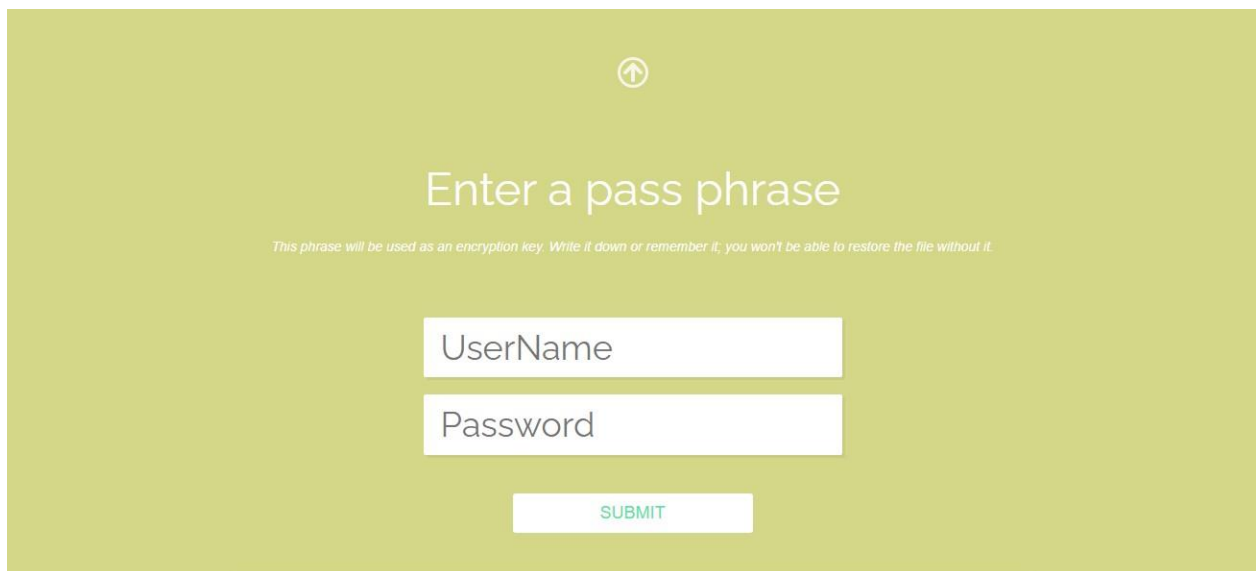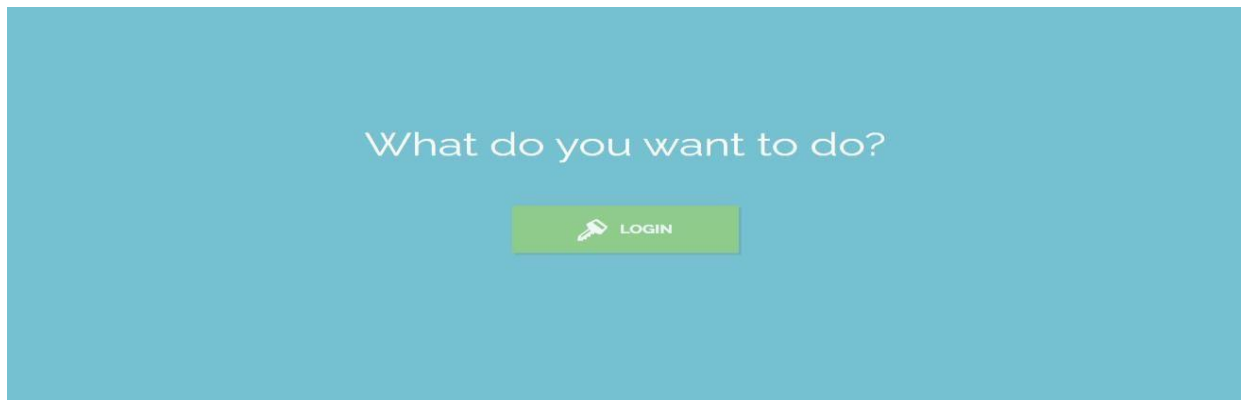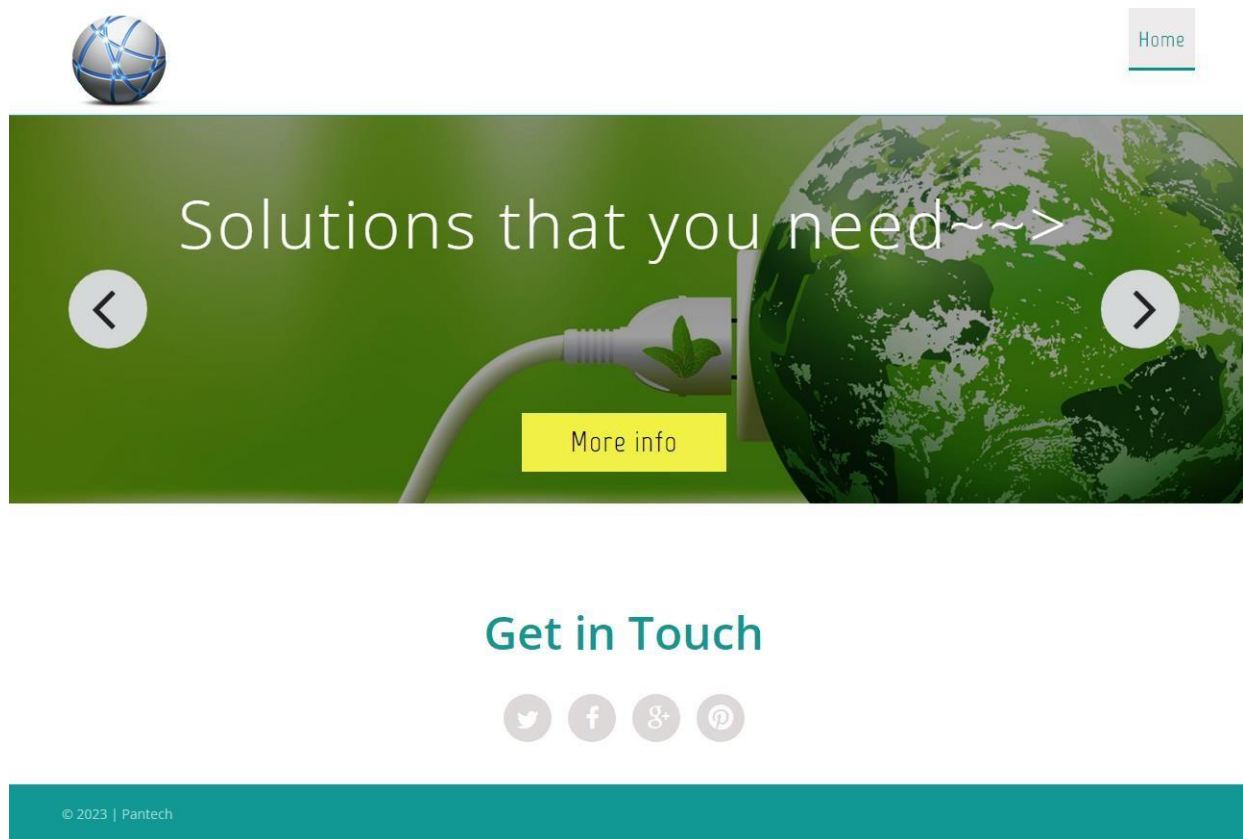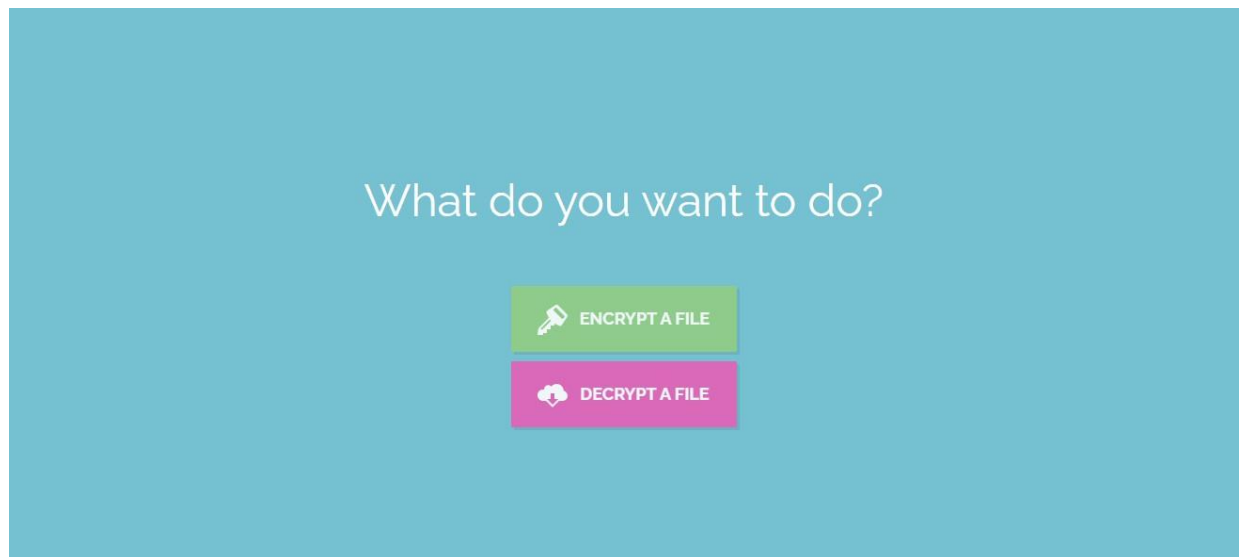
5.1.4   Snapshots:

Figure 1: Home Panel
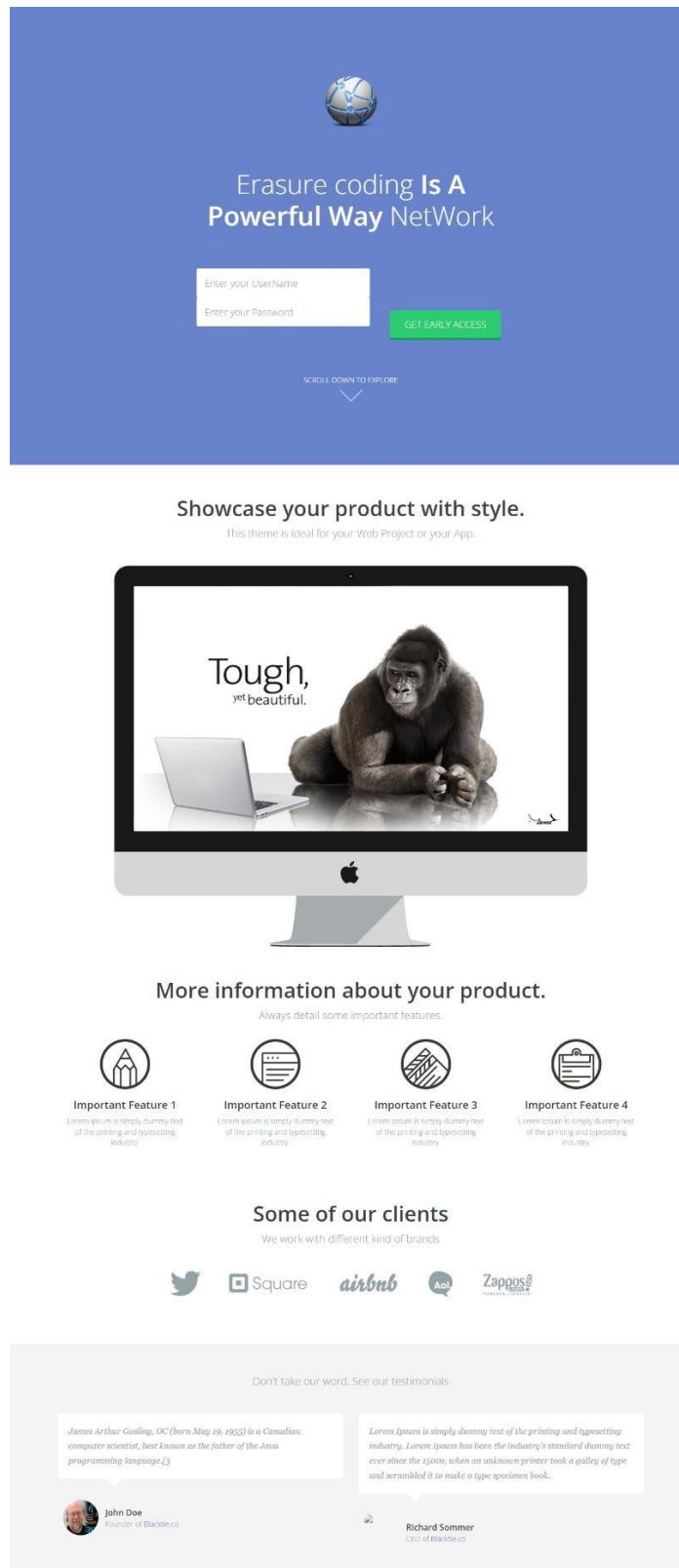
Figure 2: Admin Panel

Figure 3: Upload Panel

Figure 4: Download Panel

Figure 5: Encryption Panel

Chapter6: CONCLUSION

Erasure codes are promising for improving the reliability of the storage system due to its space efficiency compared to the replication methods. Traditional erasure codes split data into equal sized data blocks and encode strips in different data blocks. The disk I/O overhead of data updates is one of the most important bottlenecks in modern storage systems. In this paper, we consider the problem of how to reduce the I/O overhead for multi block updates in erasure coding based storage systems. By analyzing the Update process, we figure out that the l/O overhead of update operations is severely affected by the order of these operations. Accordingly, we propose an efficient algorithm, namely UCODR, to reduce the I/O overhead by scheduling the update sequence. We further evaluate the performance of UCODR in a prototype storage system with real world traces.

6.1 Future Enhancement

As a response, erasure coding as an alternative to backup has emerged as a method of protecting against drive failure. Raid just does not cut it in the age of high-capacity HDDs The larger a disk's capacity, the greater the chance of bit error. And when a disk fails, the Raid Rebuild process begins, during which there no protection against a second (or third) mechanism failure. So not only has the risk of failure during normal operation grown with capacity, it is much higher during Raid Rebuild, too. Also, rebuild times were once measured in minute and hours, but disk transfer rates have not kept pace with the rate of disk capacity extension, so large Raid rebuild can now take days or even longer.

Chapter7: REFERENCES

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