SAVITRIBAI PHULE PUNE

UNIVERSITY A PROJECT REPORT ON

Digital Locker for Institutional Level

SUBMITTED TOWARDS THE
PARTIAL FULFILLMENT OF THE REQUIREMENTS OF

BACHELOR OF ENGINEERING (Computer Engineering) BY

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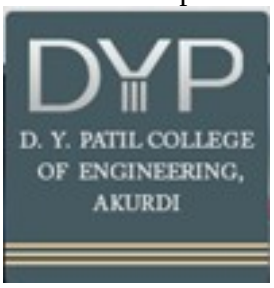
Under The Guidance of

Prof. Mrs. Deepali Rane



DEPARTMENT OF COMPUTER ENGINEERING
D. Y. Patil College of Engineering,
Akurdi.

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DEPARTMENT OF COMPUTER ENGINEERING

CERTIFICATE

This is to certify that the Project Entitled

Digi Locker for Institutional Level

Submitted by

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is a bonafide work carried out by Students under the supervision of Prof. Mrs. Deepali Rane and it is submitted towards the partial fulfillment of the requirement of Bachelor of Engineering (Computer Engineering).

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PROJECT APPROVAL SHEET

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at

DEPARTMENT OF COMPUTER ENGINEERING

(D. Y. Patil College of Engineering, Akurdi.)

SAVITRIBAI PHULE PUNE

UNIVERSITY,PUNE ACADEMIC YEAR 2021-

2022

Mrs. Deepali Rane	Dr.Mrs.M.A.Potey
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Abstract

This project consists of a web based digital locker for storage of documents and certificates of the university and college purposes. This project is inspired from the idea of digilocker app from the government of India. In which we can store our government related documents .

In digi locker for institutional level we plan to implement the digital locker for storage and verification of documents from the college so that documents can be easily accessible as well as verified. So students need not carry hard copies of those documents everywhere.

Our project also helps to ease out the verification process from college and time required for it . Now any student can verify any documents in minutes from college officials.

Implementing this can ease out the process of document storage and verification of any document and can help the system to run efficiently and smoothly.

Acknowledgments

It gives us great pleasure in presenting the preliminary project report on ***'Digi Locker for Institutional Level'****.*

I would like to take this opportunity to thank my internal guide ***Prof. Mrs. D. D. Rane*** *for giving me all the help and guidance I needed. I am really grateful to them for their kind support. Their valuable suggestions were very helpful.*

I am also grateful to Dr.Mrs.M.A.Potey, *Head of Computer Engineering Department, DYPCOE for her indispensable support, suggestions.*

In the end our special thanks to ***HefShine Softwares*** *for providing various resources such as laboratories with all needed software platforms, continuous Internet connection, for Our Project.*

Mohit Khedkar
Rutuja Kondhare
Ankan Biswas
Shreya Parmane
(B.E. Computer Engg.)

Contents

Synopsis

2.1 Project Title

Digi locker for Institutional level

2.2 Project Option

Internal Project

2.3 Internal Guide

Prof. Mrs. Deepali D. Rane

2.4 Sponsorship and External Guide

Sponsorship is provided by HefShine Softwares Pvt Ltd Pune and Mr. Akshay Paramane has been a guide at every step.

2.5 Technical Keywords (As per ACM Keywords)

1. Digital Locker
2. Advanced Encryption Standard(AES)
3. Bcrypt
4. JWT Token
5. Spring Boot
6. Spring Security

2.6 Problem Statement

Creating a Digi-Locker or digital locker which provides access to authentic virtual documents. It is a digital document wallet where students can store documents such as SSC, HSC, Degree Marksheets, Online course completion certificates etc.

2.7 Abstract

- This web based digital locker for institutional level helps to store and verify documents.
- It provides safe storage for documents like X,XII, and other marksheets and other documents so it can be used when required as well as it can be verified by the concerned authority when required.

2.8 Goals and Objectives

- Objectives:
    1. Create a digital locker to store the documents of students
    2. Create a verification process to verify any stored document with the concern authority
    3. To ease the process of carrying the official documents.
- Goals:
    1. To create a seamless digital storage system which can be accessible as well as secure to hold important documents.
    2. To ensure the safety and authenticity of the documents

2.9 Relevant mathematics associated with the Project

System Description:

- Input: Educational Documents
- Output: Verified documents
- Functions : Upload the document, get it verified by staff, change role from student to staff.
- Mathematical formulation if possible
- Success Conditions: Documents can be shared easily to the 3rd party

- Failure Conditions: Virus may be uploaded instead of documents corrupting the system

2.10 Names of Conferences / Journals where papers can be published

- International Journal of Engineering Research and Technology (IJERT)
- Indian Journal of Computer Science and Engineering (IJCSE)
- Association for Computing Machinery

2.11 Review of Conference/Journal Papers supporting Project idea

- S. Wang, R. Pei and Y. Zhang, "EIDM: A Ethereum-Based Cloud User Identity Management Protocol," in IEEE Access, vol. 7, pp. 115281-115291, 2019, doi: 10.1109/ACCESS.2019.2933989.

- D. Augot, H. Chabanne, T. Chenevier, W. George and L. Lambert, "A user-centric system for verified identities on the bitcoin blockchain" in Data Privacy Management Cryptocurrencies and Blockchain Technology, Cham, Switzerland:Springer, pp. 390-407, 2017.

- S. Ahmed and Q. Mahmood, "An authentication based scheme for applications using JSON web token," 2019 22nd International Multitopic Conference (INMIC), 2019, pp. 1-6, doi: 10.1109/INMIC48123.2019.9022766.

- P. Kumar, A. Gurtov, J. Iinatti, M. Ylianttila and M. Sain, "Lightweight and Secure Session-Key Establishment Scheme in Smart Home Environments", *IEEE Sensors Journal*, vol. 16, no. 1, pp. 254-264, Jan. 2016.

- K. Gutzmann, "Access control and session management in the HTTP environment", *IEEE Internet Computing*, vol. 5, no. 1, pp. 26-35, Jan.-Feb. 2001.

- Thanh-Cong Le, Quoc-Vuong Nguyen, Minh-Triet Tran, *Future Data and Security Engineering*, vol. 12466, pp. 304, 2020.

- Gaofeng He, Yongrui Si, Xiancai Xiao, Qianfeng Wei, Haiting Zhu, Bingfeng Xu, "Preventing IoT DDoS Attacks using Blockchain and IP Address Obfuscation", *Wireless Communications and Signal Processing (WCSP) 2021 13th International Conference on*, pp. 1-5, 2021.

- Z. Liu and B. Gupta, "Study of Secured Full-Stack Web Development", *Proceedings of 34th International Conference on Computers and Their Applications*, vol. 58, pp. 317-324, 2019.

- O. Ethelbert, F. F. Moghaddam, P. Wieder and R. Yahyapour, "A JSON Token-Based

Authentication and Access Management Schema for Cloud SaaS Applications", *2017 IEEE 5th International Conference on Future Internet of Things and Cloud (FiCloud)*, pp. 47-53, 2017.

- N. Hong, M. Kim, M. Jun and J. Kang, "A Study on a JWT-Based User Authentication and API Assessment Scheme Using IMEI in a Smart Home Environment", *jornal of sustainability*, vol. 9, no. 7, June 2017.

- M. Jones, J. Bradley and N. Sakimura, *JSON Web Token (JWT) RFC 7519*, 2015, [online] Available: http://www.rfc-editor.org/rfc/rfc7519.txt.

2.12 Plan of Project Execution

Web Based Execution.

Technical Keywords

3.1 Area of Project

A personal digital locker for the students with the support of verification of documents for the authenticity purposes to help with college and placement related activities.

3.2 Technical Keywords

- Digital Locker – A web/cloud based storage system for some important documents which are stored on the server with some sort of encryption/decryption technology.

- Advanced Encryption Standard(AES) for files encryption

- Bcrypt – Bcrypt is the hashing algorithm in which any string can be hashed into any number of rounds(we are doing it for 12 rounds) and it cannot be decrypted as different keys are used for every round. We can only compare and check it .

- JWT Token - JSON Web Token *(JWT) is* a compact URL-safe means of representing claims to be transferred between two parties.

- Spring Boot - Spring Boot helps developers create applications that just run. Specifically, it lets you create standalone applications that run on their own, without relying on an external web server, by embedding a web server such as Tomcat . It has embedded tomcat in the application. We are using it with java

- Spring Security - Spring Security is really just a bunch of servlet filters that help you add authentication and authorization to your web application. It also integrates well with frameworks like Spring Web MVC (or Spring Boot), as well as with standards like OAuth2.
  We are using it along with jwt

Introduction

4.1 Project Idea

- A Web Based Digital locker on institutional level for secure storage and verification of the documents.

4.2 Motivation of the Project

- A digital-locker app from the government of India which is used to store important documents like aadhar card, pan card, election card and likewise.

4.3 Literature Survey

Authors	Name of Paper	Advantages	Disadvantages
S. Wang, R. Pei and Y. Zhang	EIDM: A Ethereum-Based Cloud User Identity Management Protocol	A Ethereum based identity management protocol will be established for the users	Authorization token must be generated for each and every user
D. Augot, H. Chabanne, T. Chenevier, W. George and L. Lambert	A user-centric system for verified identities on the bitcoin blockchain	Authentication of the tokens generated by the users with the actual token.	Failed tokens can't be retrieved.
S. Ahmed and Q. Mahmood	An authentication based scheme for applications using JSON web token	JSON web based token for easy login for the user for each session	load should be manage to if the user load is huge, the authentication system will be slowed down.
N. Hong, M. Kim, M. Jun and J. Kang	A Study on a JWT-Based User Authentication and API Assessment Scheme Using IMEI in a Smart Home Environment	This helps us to authenticate and verify the system and the documents in the servers.	token based authentication should be done and active on each session
O. Ethelbert, F. F. Moghaddam, P. Wieder and R. Yahyapour	A JSON Token-Based Authentication and Access Management Schema for Cloud SaaS Applications	This helps to create tokens for SaaS Applications on Cloud	Proper Setup should be done for the system to be in place.

Problem Definition and scope

5.1 Problem Statement

Creating a DigiLocker or digital locker which provides access to authentic virtual documents. It is a digital document wallet where students can store documents such as SSC, HSC, Degree Marksheets, etc

5.1.1 Goals and objectives

- Objectives:
  Create a digital locker to store the documents of students
  Create a verification process to verify any stored document with the concern authority
  To ease the process of carrying the official documents.
- Goals:
  To create a seamless digital storage system which can be accessible as well as secure to hold important documents.
  To ensure the safety and authenticity of the documents

5.1.2 Statement of scope

- Users can upload documents in the web/cloud based system in which it will be encrypted and stored.
- Users can also send it for verification to the college to get authenticated by the concerned authority.
- Authorities can verify and use the documents when required with the permission of the user who has uploaded the document.

5.2 Major Constraints

- For the College authorities to be able to verify the documents, the concerned authority should have access to that document from the college/ institutional level, if not the verification process can’t be done smoothly.

- Students can upload the document in the system where it can be secure with the help of encryption and decryption-based algorithms. if these algorithms are not implemented properly the documents may be at risk of being misleading in the cyber breach.

- Proper implementation of the verification process should be done in order to solve the authentication problem. if not done properly the authenticity of the document is in the question.

5.3 Methodologies of Problem solving and efficiency issues

- The main problem solved using this system is to eliminate the use of carrying original documents. and the issue of reverifying it again and again physically.

- We will be using the web based system to store the documents uploaded by the students and it will also be secured by the use of encryption and decryption algorithms to ensure the safety of the documents.

5.4 Outcome

- We can access the documents from anywhere with the help of this project.
- the documents uploaded can be verified and the authenticity of the document can be checked.
- physical need to carry any document will be eliminated completely.

5.5 Applications

- Storage systems
- Digital lockers
- Banking Systems
- Educational Institutional
- Medical Fields

5.6 Hardware Resources Required

Sr. No.	Parameter	Minimum Requirement	Justification
1	CPU Speed	2 GHz	To perform the operations in the browsers.
2	RAM	2 GB	To run any browser to access the website

Table 5.1: Hardware Requirements

5.7 Software Resources Required

Platform :

1. Operating System: windows XP,7,10,11, Ubuntu, Kali ,parrotOS

2. IDE: Spring tool suite, Vscode

3. Programming Language- Java, Angular
4. Framework: Spring boot
5. Postman Api

Project Plan

6.1 Project Estimates

Use Agile model and associated streams derived

6.1.1 Reconciled Estimates

6.1.1.1 Cost Estimate - NA

6.1.1.2 Time Estimates - 10 Months

6.1.2 Project Resources

People - 4 People

OS - Windows - 10

Software: VsCode, Spring tool suite

Hardware: - NA

6.2 Risk Management w.r.t. NP Hard analysis

- The main risk is to secure storage of the document in the system as any wrong entry in the system can cause a cyber breach in the system, which can cause the document leak and threat to the system.

6.2.1 Risk Identification

1. Are end-users enthusiastically committed to the project and the system/product to be built?

Answer: YES

2. Are requirements fully understood by the software engineering team and its customers?

Answer: YES

3. Do end-users have realistic expectations?

Answer: YES

Does the software engineering team have the right mix of skills?

Answer: YES

5. Are project requirements stable?

Answer: No

6. Is the number of people on the project team adequate to do the job?

Answer: YES

7. Do all customer/user constituencies agree on the importance of the project and on the requirements for the system/product to be built?

Answer: YES

6.2.2 Risk Analysis

- The login details should be protected by the user and the credential of the college should be separate.
- The document should be encrypted/decrypted otherwise there will be data breach in the system which will not be beneficial for anyone.

6.2.3 Overview of Risk Mitigation, Monitoring, Management:

As we are going to use the resources and data from the users system we should also respect the privacy of the users data. For that we will apply some rules on access and storage of that data and all the resources that are going to be used. All its details and its priority is discussed in the following table of Mitigation and monitoring.

Sr. No	Title	Key Action	Priority
1	Securing Data collected while performing tasks.	Store these data only at Local storage. Uploading this data at third party server will cause breach of user security and privacy.	High
2	Login details of the users system	Don’t store these details at any cost.	High
3.	Access to the Users file from Servers	Access to these file should be in the form of read-only.	Moderate

Table 6.1 Overview of risk mitigation

6.3 Project Schedule

6.3.1 Project task set

Major Tasks in the Project stages are:

- Use AES(Advanced Encryption Standard for encrypting documents on the server side)
- Bcrypt for password encryption
- Spring security and JWT
- Encryption/Decryption algorithm for hashing the key used in AES

Impact	Value	Description
Very high	> 10%	Schedule impact or Unacceptable quality
High	5 – 10%	Schedule impact or Some parts of the project have low quality
Medium	< 5%	Schedule impact or Barely noticeable degradation in quality Low Impact on schedule or Quality can be incorporated

Table 6.3: Risk Impact definitions [**?**]

6.3.2 Task network

Project tasks and their dependencies are noted in this diagrammatic form.

6.3.3 Timeline Chart

A project timeline chart is presented. This may include a timeline for the entire project. Above points should be covered in Project Planner as Annex C and you can mention here Please refer Annex C for the planner

6.4 Team Organization

The manner in which staff is organized and the mechanisms for reporting are noted.

6.4.1 Team structure

The team structure for the project is identified. Roles are defined.

6.4.2 Management reporting and communication

- The project work is organized based on the actual task for the designing, implementation, test and optimization. As it has been primarily planned, each of the developers worked 5 days a week; 3 days for implementation, and 2 days for testing and summarizing the work. Totally it is 10 months' work.
- Apart from the designing, implementation and testing, developers also define the work plan every time before the implementation and improve the project after the accomplishment of each individual section.
- Developers communicate through the Google meet, WhatsApp and Skype for sharing the ideas and discussing the project.
- Data statistics and relative materials are collected and shared through Drive.

Software requirement specification

7.1 Introduction

A software requirements specification (SRS) is a document that describes what the software will do and how it will be expected to perform. It describes the purpose and functionality of the product.

7.1.1 Purpose and Scope of Document

Purpose:

Purpose of digital locker is to securely store the important documents and to be able to view, verify and store the document in the secure server. The verification is important to find out the authenticity of the document. The verification will be done through the college concerned authority which will verify the document with the origin of the document. like the marksheet uploaded by the student will be verified across the marksheet issued by the college. if the numbers and marksheet match the verification will be offered.

Scope:

This will enable us to access any document through ease along with verifying it from the college concerned authority which in turn saves time for verification of the documents.

7.1.2 Overview of responsibilities of Developer

- Perform project design and development activities according to project requirements.
- Coordinate with team mates in preparing project proposals and contractual documents.
- Track project progress regularly and develop status reports to management.
- Ensure that the project is completed within allotted timelines.
- Research and recommend new technologies to carry out project development tasks.
- Provide assistance to other Developers, perform peer reviews and provide feedback for improvements.
- Develop time reduction initiatives while maintaining quality and productivity.

7.2 Usage Scenario

This will be used in day to day scenario by the students and college to store, use and verify the documents

7.2.1 User profiles

Student - A student profile for each student for uploading and accessing the documents

College - A college authorizes a person for the verification of the documents from the college side.

7.2.2 Use-cases

All use-cases for the software are presented. Description of all main Use cases using use case template is to be provided.

able 7.1: Use Cases

Figure 7.1: Use case diagram

7.2.3 Use Case View

7.3 Data Model and Description

7.3.1 Data Description

Data objects that will be managed/manipulated by the software are described in this section. The database entities or files or data structures required to be described. For data objects details can be given as below

7.3.2 Data objects and Relationships

Data objects and their major attributes and relationships among data objects are described using an ERD- like form.

7.4 Functional Model and Description

A description of each major software function, along with data flow (structured analysis) or class hierarchy (Analysis Class diagram with class description for object oriented system) is presented.

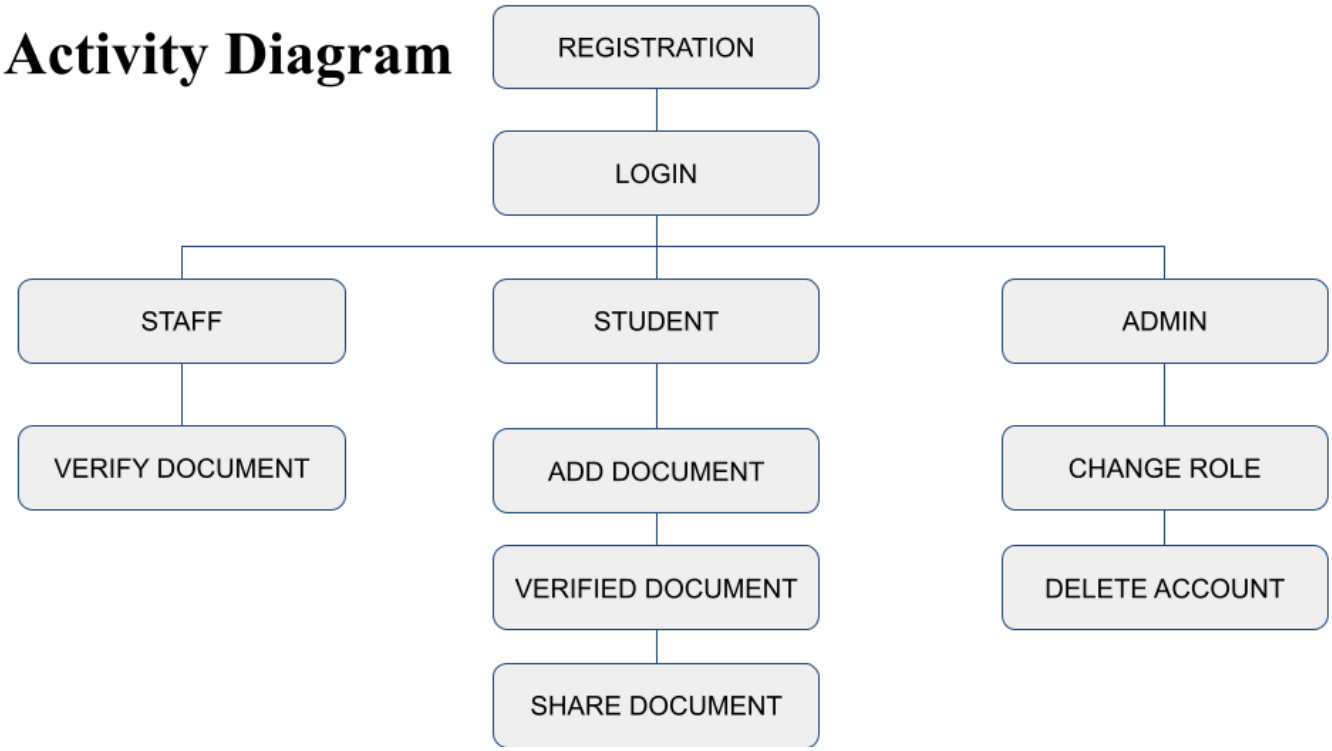
7.4.1 Data Flow Diagram

7.4.1.1 Level 0 Data Flow Diagram

7.4.1.2 Level 1 Data Flow Diagram

7.4.2 Activity Diagram:

- The Activity diagram represents the steps taken.



7.4.3 Non Functional Requirements:

- Interface Requirements
- Performance Requirements
- Software quality attributes such as availability [related to Reliability], modifiability [includes portability, reusability, scalability] , performance, security, testability and usability[includes self adaptability and user adaptability]

7.4.4 State Diagram:

State Transition Diagram

Fig.7.2 example shows the state transition diagram of Cloud SDK. The states are represented in ovals and the state of the system gets changed when certain events occur. The transitions from one state to the other are represented by arrows. The Figure shows important states and events that occur while creating new project.

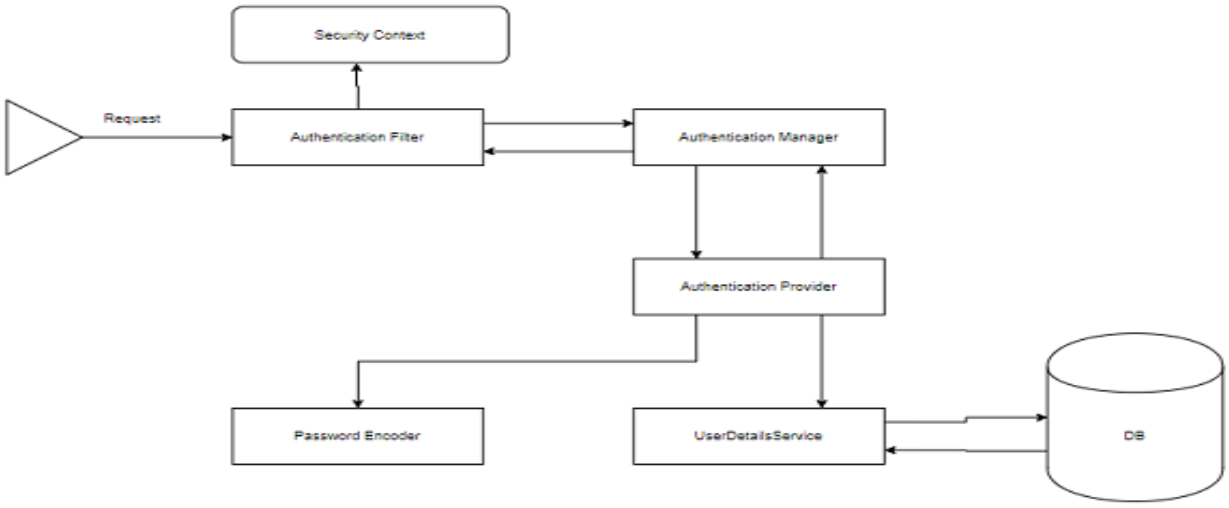


Figure 7.2: State transition diagram

7.4.5 Design Constraints

Any design constraints that will impact the subsystem are noted.

7.4.6 Software Interface Description

The software interface(s)to the outside world is(are) described. The requirements for interfaces to other devices/systems/networks/humans are stated.

Detailed Design Document using Appendix A and B

8.1 Introduction

This document specifies the design that is used to solve the problem of Product.

8.2 Architectural Design

A description of the program architecture is presented. Subsystem design or Block dia- gram, Package Diagram, Deployment diagram with description is to be presented.

8.3 Data design (using Appendices A and B)

A description of all data structures including internal, global, and temporary data structures, database design (tables), file formats.

8.3.1 Internal software data structure

Data structures that are passed among components of the software are described.

8.3.2 Global data structure

Data structures that are available to major portions of the architecture are described.

8.3.3 Temporary data structure

Files created for interim use are described.

Figure 8.1: Architecture diagram

8.3.4 Database description

In Digital Locker for Intuitional Level MySQL Database is used .

8.4 Component Design

Class diagrams, Interaction Diagrams, Algorithms. Description of each component description required.

Project Implementation

9.1 Introduction

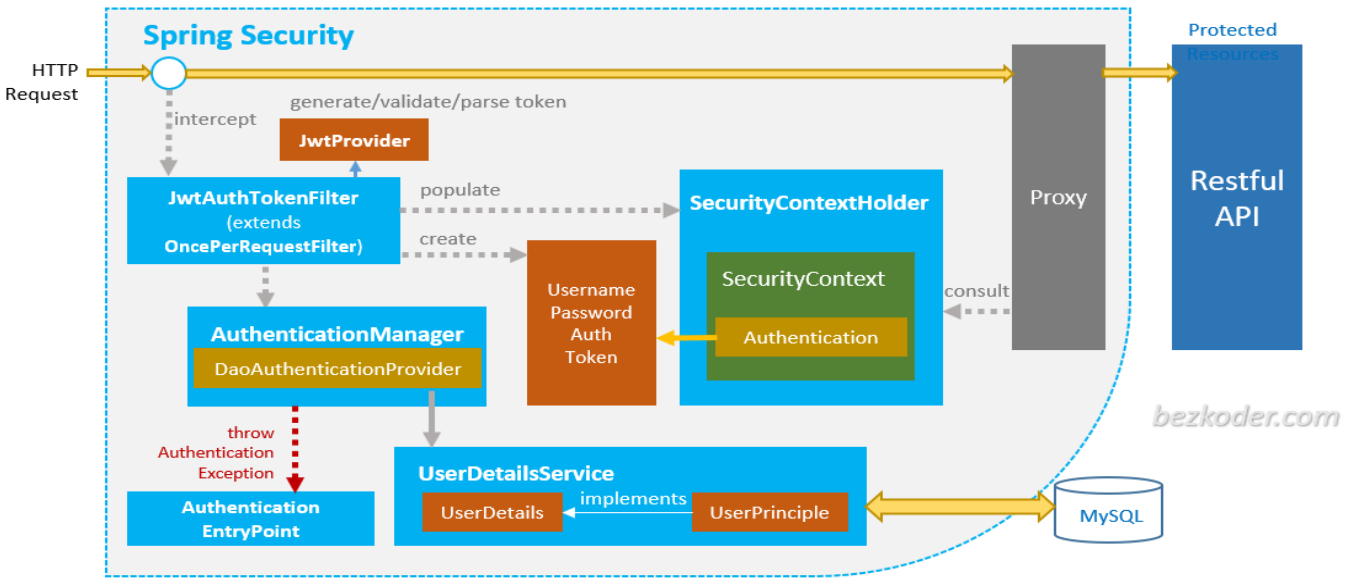
Creating a Digital Locker or digital locker which provides access to authentic virtual documents. It is a digital document wallet where students can store documents such as SSC, HSC, Degree Marksheets, etc

9.2 Tools and Technologies Used

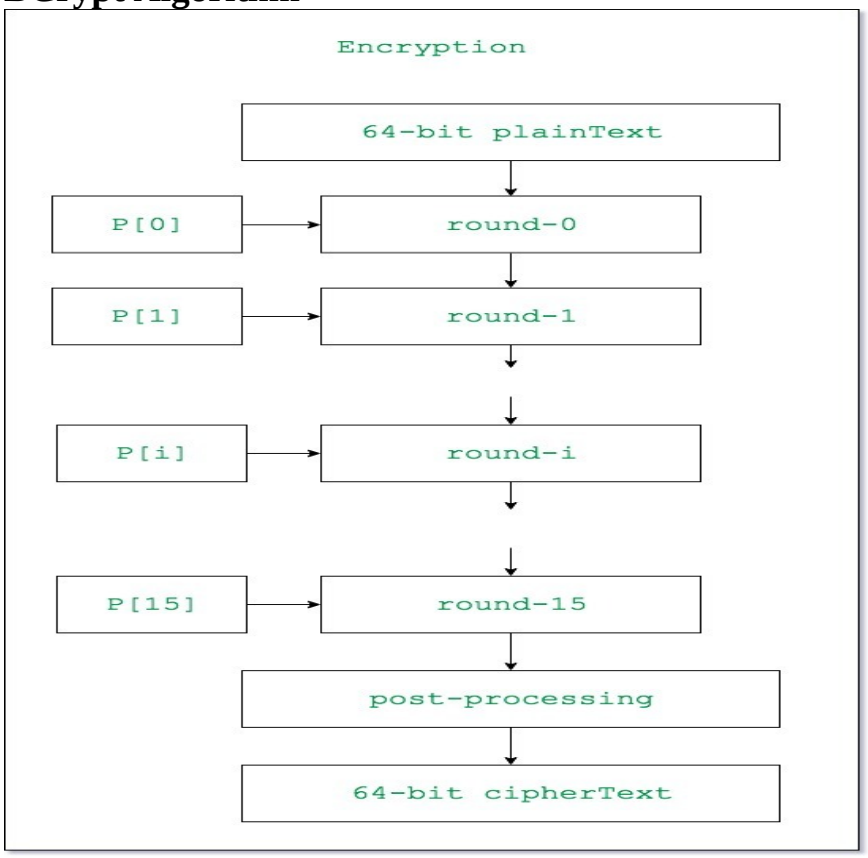
Spring tool suite - Spring boot
Vs-Code - Angular
MySQL - Database

9.3 Methodologies/Algorithm Details

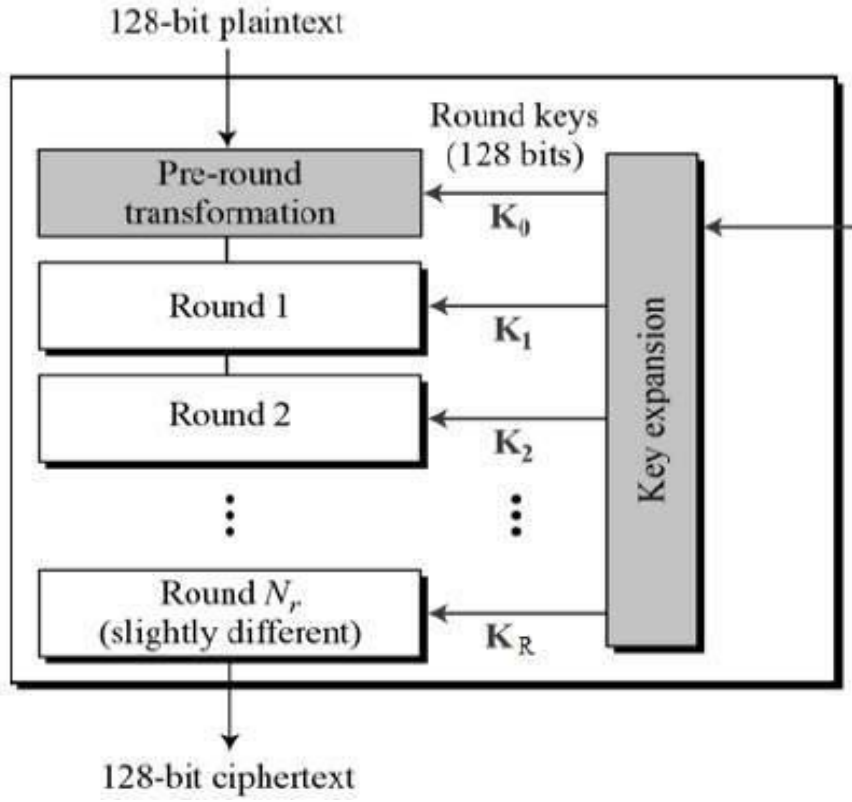
Spring Security



BCrypt Algorithm



AES(Advanced Encryption Standard)



Cipher key
(128, 192, or 256 bits)

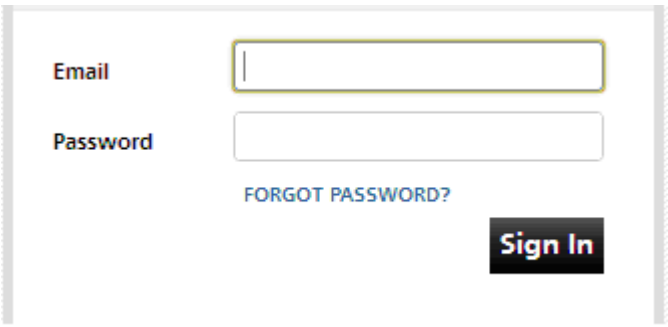
R	Key size
10	128
12	192
14	256

Relationship between number of rounds(R) and cipher key size

Software Testing

10.1 Test Cases

Id	Username	Pswd	Role	Authentication	Otp	Expiry	Email	Status
1	Rey	$2a$10$h9rCnfw9ftgEaMeaPjrbyOB1APQZ736vFRrfU0W.WbaWMFVM1k55e	ROLE_staff	1	825835	2021-12-22 11:05 ;23	shreyaparamne@gmail.com	1
2	Reya	$2a$10$mYS4epM3dNgFBtGDd.q/He5p1fqweDolNJnCKoZOHsPNeWqZSi8PK	ROLE_admin	1	728382	2021-12-19 12:05 ;23	hefshinesoftwares@gmail.com	1
3	Ankan	$2a$10$h9rCnfw9ftgEaMeaPjrbyOB1APQZ736vFRrfU0W.WbaWMFVM1k55e	ROLE_stu	0	019828	2021-12-20 11:05 ;23	ankan.rana@gmail.com	1



Conclusion and future scope

The objective of the Digital Locker for Institutional level is to have digital verified documents at the ease of a login. We can easily Upload, Update, Delete and Verify all college related documents. It will also help in the process of college placement related activities as every companies that comes to college ask for documents from students which needs to be verified by college in-charge in order to validate.

Future Scope

- Decrypted file is stored on the server for few seconds we will try not to store it for even a second so it is secure.

- After adding more functionalities can be used globally as well to share authentic documents of any candidate to other organizations.

Bibliography

[1] D. Adams. *The Hitchhiker's Guide to the Galaxy*. San Val, 1995.

References

(Strictly in ACM Format)

Laboratory assignments on Project Analysis of Algorithmic Design

- To develop the problem under consideration and justify feasibilty using concepts of knowledge canvas and IDEA Matrix.
  Refer [**?**] for IDEA Matrix and Knowledge canvas model. Case studies are given in this book. IDEA Matrix is represented in the following form. Knowledge canvas represents about identification of opportunity for product. Feasibility is represented w.r.t. business perspective.

I	D	E	A
Increase	Drive	Educate	Accelerate
Improve	Deliver	Evaluate	Associate
Ignore	Decrease	Eliminate	Avoid

Table 1: IDEA Matrix

- Project problem statement feasibility assessment using NP-Hard, NP-Complete or satisfy ability issues using modern algebra and/or relevant mathematical models.
- input x,output y, y=f(x)

Laboratory assignments on Project Quality and Reliability Testing of Project Design

It should include assignments such as

- Use of divide and conquer strategies to exploit distributed/parallel/concurrent processing of the above to identify object, morphisms, overloading in functions (if any), and functional relations and any other dependencies (as per requirements). It can include Venn diagram, state diagram, function relations, i/o relations; use this to derive objects, morphism, overloading
- Use of above to draw functional dependency graphs and relevant Software modeling methods, techniques including UML diagrams or other necessities using appropriate tools.
- Testing of project problem statement using generated test data (using mathematical models, GUI, Function testing principles, if any) selection and appropriate use of testing tools, testing of UML diagram's reliability. Write also test cases [Black box testing] for each identified functions. You can use Mathematica or equivalent open source tool for generating test data.
- Additional assignments by the guide. If project type as Entreprenaur, Refer [**?**], [**?**], [**?**], [**?**]

Project Planner

Using planner or alike project management tool.

Reviewers Comments of Paper Submitted

(At-least one technical paper must be submitted in Term-I on the project design in the conferences/workshops in IITs, Central Universities or UoP Conferences or equivalent International Conferences Sponsored by IEEE/ACM)

1. Paper Title:
2. Name of the Conference/Journal where paper submitted :
3. Paper accepted/rejected :
4. Review comments by reviewer :
5. Corrective actions if any :

Plagiarism Report

Plagiarism report

Term-II Project Laboratory Assignments

1. Review of design and necessary corrective actions taking into consideration the feedback report of Term I assessment, and other competitions/conferences participated like IIT, Central Universities, University Conferences or equivalent centers of excellence etc.
2. Project workstation selection, installations along with setup and installation report preparations.
3. Programming of the project functions, interfaces and GUI (if any) as per 1 st Term term-work submission using corrective actions recommended in Term-I assessment of Term-work.
4. Test tool selection and testing of various test cases for the project performed and generate various testing result charts, graphs etc. including reliability testing.
   Additional assignments for the Entrepreneurship Project:
5. Installations and Reliability Testing Reports at the client end.

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