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DIGITAL VAULT SYSTEM.

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Abstract : In today's digital era, the secure storage and transmission of sensitive documents is a significant challenge. Manual record-keeping and traditional password-based systems are prone to threats such as unauthorized access, theft, and data manipulation. To resolve these concerns, this research proposes a secure Digital Locker System that enables users to store, upload, encrypt, and manage personal documents using AES-256 encryption with Fernet implementation and OTP-based authentication through Twilio. The system is developed using the Flask framework and provides a user-friendly interface resembling a physical locker. The Digital Locker ensures confidentiality, integrity, and high security of sensitive documents such as ID proofs, certificates, medical reports, and legal papers. This project demonstrates a scalable, secure, and user-centric digital document vault for individuals and organizations.

Keywords: Digital Locker, Encryption, AES-256, OTP Verification, Flask, Secure Storage, Authentication

I.INTRODUCTION

Today, digital data security has become increasingly crucial as cyber-attacks and identity theft continue to rise. Many government and corporate organizations still depend on manual filing, leading to risks such as data loss, unauthorized access, file damage, and mismanagement. Existing cloud storage systems store documents centrally but may fail to provide user-level encryption and multi-factor authentication.

The Digital Locker System provides a secure platform where users can upload and store their documents and access them only after OTP verification. Files are encrypted using AES-256 symmetric encryption, ensuring that even if database access is compromised, the files remain unreadable. The system can be used by students, employees, government institutions, hospitals, and banks.

This project ensures strong security through:

- Cryptographic protection
- OTP-based identity verification
- Protected file management
- Secure authentication and access controls

II. NEED OF THE STUDY.

Traditional paper-based document handling leads to physical damage, loss, fraud, and accessibility issues. Existing cloud storage platforms focus on storage rather than data encryption and strong authentication. Therefore, there is a need for a secure and encrypted storage solution that ensures privacy and prevents unauthorized access.

Objectives :

1. To develop a secure Digital Locker for encrypted document storage.
2. To implement AES-256 encryption for confidentiality of stored documents.
3. To include OTP-based authentication to prevent unauthorized access.
4. To create a clean and easy-to-use locker-style user interface.
5. To protect sensitive documents against cyber-attacks and data breaches.

III. RESEARCH METHODOLOGY

The research methodology adopted for the development of the Digital Locker system follows a structured and systematic approach consisting of requirement analysis, system design, implementation, testing, and evaluation. Initially, an extensive literature review was conducted to study existing encryption models, secure cloud storage mechanisms, and authentication techniques. Based on the findings, system requirements were identified, emphasizing the need for data confidentiality, integrity, and accessibility through a secured virtual storage platform. During the design phase, a modular architecture was constructed to define the interaction between user interface, encryption engine, backend logic, database, and secure storage components. The methodology incorporates the AES encryption standard for securing files, Flask-based web framework for backend implementation, and SQLite for metadata storage. In the implementation phase, a functional prototype was developed using Python, integrating secure file upload, download, and management features along with access controls and activity logging. The application undergoes iterative testing including unit testing, functional testing, usability testing, and security testing to ensure reliability and resistance against unauthorized access or cryptographic attacks. The evaluation phase includes performance validation, encryption-decryption accuracy monitoring, user experience assessment, and comparison with existing digital storage solutions. This methodological approach ensures that the system achieves its objectives of providing a secure, efficient, and user-centered digital vault environment, analogous to a physical locker but enhanced through modern cybersecurity mechanisms.

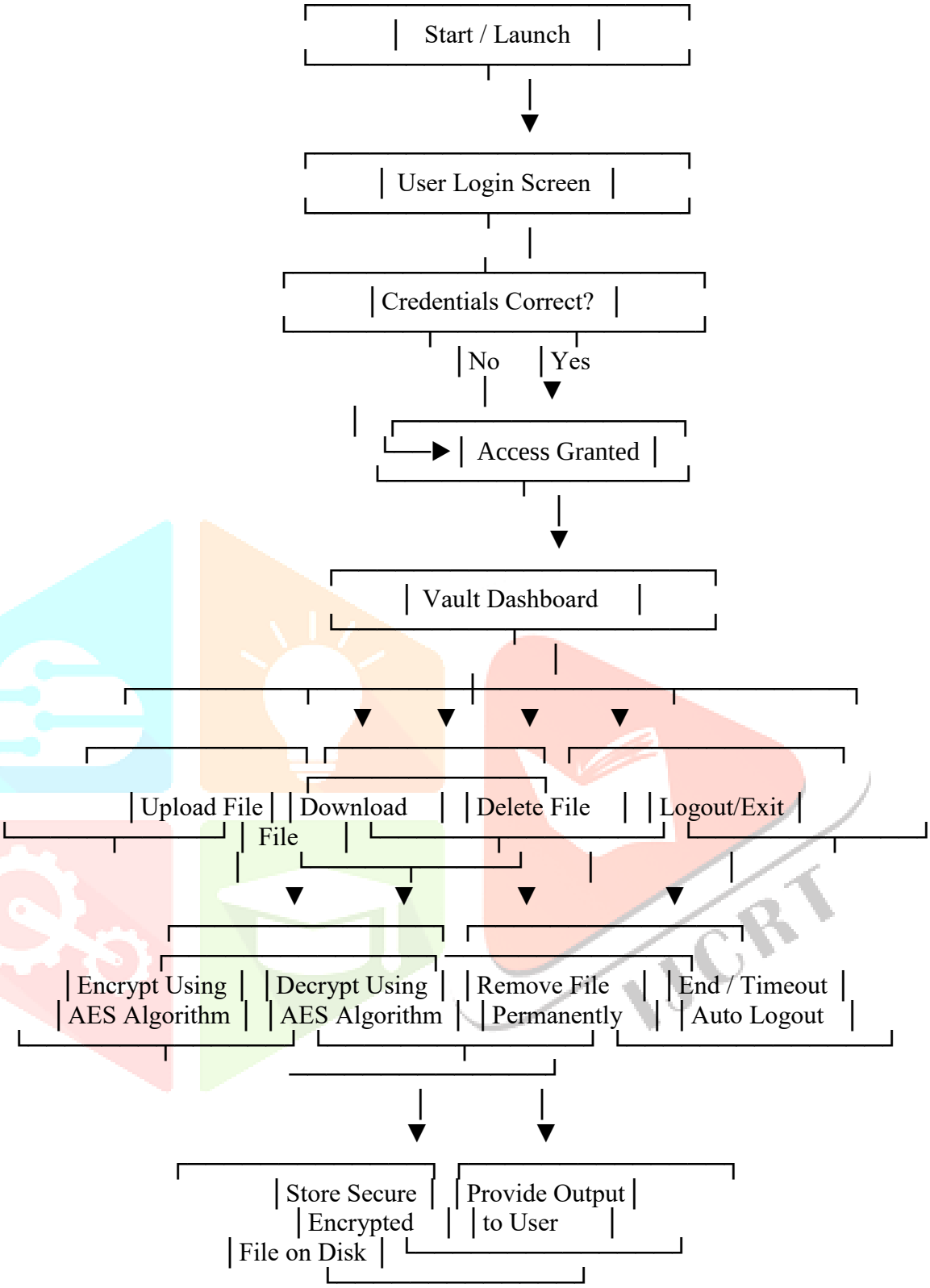

FIG 1. Flowchart

Mathematical Model (CRYPTOSYSTEM)

AES-256 Encryption:

C = Ek(P)
Where:
C = Ciphertext (encrypted output)
Ek = Encryption function with key k (256-bit)
P = Plain text file

Decryption:

P = Dk(C)

Fernet Governing Formula:

Token = base64encode(IV + Ciphertext + HMAC)

IV. RESULTS AND ADVANTAGES

Test Case	Description	Expected Output	Status
TC01	Login with valid credentials	OTP sent successfully	Pass
TC02	Wrong OTP	Access denied	Pass
TC03	Upload encrypted document	Successfully encrypted and stored	Pass
TC04	Download document	Decrypted file returned	Pass

Test Case

ADVANTAGES

- End-to-end encrypted storage
- Eliminates document loss and damage
- Multi-factor authentication increases security
- Cloud & mobile adaptability
- Easy UI resembling physical locker
- Data confidentiality, integrity, and availability ensured

V Future Work & Applications

- Biometric authentication (Face/Fingerprint)
- Blockchain audit trail for file access logs
- Cloud integration and mobile application
- AI-based suspicious login detection
- Offline encrypted backup

APPLICATIONS

- Government Document Management
- Hospitals and Medical Records
- Universities and Examination Records
- Banking and Legal Services
- Corporate HR Departments

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