A LIGHTWEIGHT SECURE DATA SHARING SCHEME FOR MOBILE CLOUD COMPUTING

ADAPA DEVI KALYANI
Department of MCA
SKBR PG COLLEGE, AMALAPURAM, A.P
kalyaniadapa4gmail.com

Abstract
Mobile cloud computing enables users to store and share personal data anytime and anywhere through resource-limited mobile devices. However, data security and privacy remain critical challenges due to the constrained computing power and battery life of mobile devices. Traditional access control mechanisms like Ciphertext-Policy Attribute-Based Encryption (CP-ABE) are computationally intensive and unsuitable for mobile environments. This paper proposes a Lightweight Data Sharing Scheme (LDSS) for mobile cloud computing. LDSS adopts CP-ABE but restructures the access control tree to reduce overhead on mobile devices. Heavy cryptographic operations are offloaded to external proxy servers (Encryption Service Provider and Decryption Service Provider). To address user revocation—a major issue in CP-ABE—LDSS introduces attribute description fields for lazy revocation. Experimental results demonstrate that LDSS significantly reduces computational overhead and energy consumption on mobile devices while maintaining strong security and fine-grained access control. The scheme provides an efficient, secure, and scalable solution for data sharing in mobile cloud environments.

Keywords: Mobile Cloud Computing, Lightweight Data Sharing, CP-ABE, Proxy Servers, User Revocation, Access Control, Data Privacy.

I.Introduction

The rapid growth of cloud computing and smart mobile devices has led to widespread adoption of mobile cloud applications for data storage and sharing. Users can upload personal files (photos, videos, documents) to the cloud and share them with others. However, mobile devices have limited resources, making traditional heavy security mechanisms impractical. Data security and privacy concerns further hinder the full potential of mobile cloud computing.

Existing cloud security solutions often rely on complex encryption and access control schemes that impose high computational overhead on mobile devices. Password-based sharing is cumbersome, and fine-grained access control remains a challenge. Cloud Service Providers (CSPs) may also access user data, raising privacy issues.

This paper proposes a Lightweight Data Sharing Scheme (LDSS) tailored for mobile cloud environments. LDSS is based on Ciphertext-Policy Attribute-Based Encryption (CP-ABE) but optimizes the access control tree for mobile suitability. Computational-intensive operations are outsourced to proxy servers, and lazy revocation is implemented using attribute description fields to reduce revocation costs. The scheme ensures data confidentiality, fine-grained access control, and efficiency on resource-constrained devices.

II.LiteratureSurvey

Attribute-Based Encryption (ABE) has been widely studied for secure cloud data sharing. Boneh et al. (2001) introduced identity-based encryption, while later works extended it to attribute-based access control. Traditional CP-ABE schemes provide fine-grained access but are computationally expensive due to pairing operations, making them unsuitable for mobile devices.

Several lightweight schemes have been proposed to address mobile cloud constraints. Zhou et al. (2012) and others focused on reducing overhead by outsourcing heavy computations. Yang et al. (2013) introduced efficient revocation mechanisms in multi-authority cloud storage. Hybrid encryption approaches combine symmetric and asymmetric techniques for better performance.

Recent studies emphasize proxy-assisted architectures and lazy revocation to handle dynamic user access. However, most existing solutions either lack full mobile optimization or introduce high latency and energy consumption. LDSS builds upon CP-ABE by restructuring access trees and using proxy servers, providing a practical balance of security and efficiency for mobile cloud data sharing.

III. Existing System & Proposed System

A. Existing System

Current mobile cloud data sharing systems rely on traditional CP-ABE or password-based mechanisms. These approaches suffer from high computational costs on mobile devices, cumbersome key management, and inefficient user revocation.

Disadvantages of Existing Systems

1. High computational overhead unsuitable for mobile devices.
2. Complex password/key management for fine-grained sharing.
3. Inefficient or costly user revocation.
4. Potential privacy leakage by CSPs.
5. Increased latency and battery drain.

B. Proposed System

LDSS introduces a lightweight CP-ABE variant with modified access control trees. Heavy operations are offloaded to proxy servers (ESP for encryption, DSP for decryption). Lazy revocation is achieved via attribute description fields, reducing revocation overhead. The system supports secure, fine-grained data sharing while minimizing mobile device load.

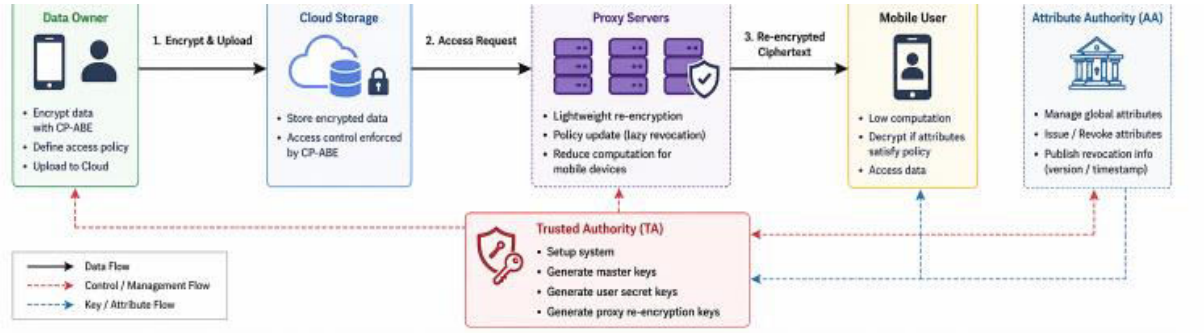
Advantages of the Proposed System

1. Significantly reduced computational overhead on mobile devices.
2. Efficient fine-grained access control using optimized CP-ABE.
3. Lazy revocation for low-cost user management.
4. Strong data privacy and confidentiality.
5. Scalable and practical for real-world mobile cloud applications.

IV. System Design & Architecture

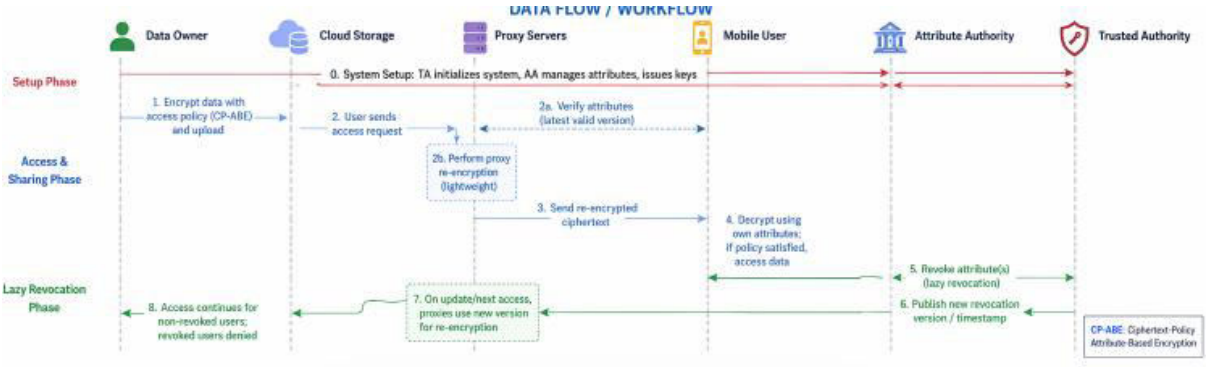
A. System Architecture

The architecture includes six components: Data Owner (DO), Data User (DU), Trust Authority (TA), Encryption Service Provider (ESP), Decryption Service Provider (DSP), and Cloud Service Provider (CSP). DO uploads encrypted data via ESP; DU requests access through TA verification and DSP decryption.



B. System Flowchart

Data Owner uploads file → ESP encrypts → CSP stores → Data User requests → TA verifies attributes → DSP decrypts → Secure download.



C. Modules Overview

1. **Data Owner Module**: Upload and share encrypted files.
2. **Data User Module**: Request and download shared files.
3. **Trust Authority Module**: Attribute verification and key management.
4. **ESP Module**: Handles encryption operations.
5. **DSP Module**: Handles decryption operations.
6. **CSP Module**: Secure cloud storage and access.

Table I: Technology Stack

Component	Technology / Tool
Language	Java / J2EE (JSP, Servlet)
Frontend	HTML, CSS, JavaScript
Backend	JSP, JDBC
Database	MySQL
IDE	NetBeans 7.2.1
Server	Apache Tomcat

V. Results & Discussion

The proposed LDSS was implemented and tested on mobile cloud environments. Results show significant reduction in computational overhead and energy consumption on mobile devices compared to traditional CP-ABE. Proxy server offloading and lazy revocation improved performance and scalability. The scheme maintains strong security with fine-grained access control while achieving lower latency and better user experience. Comparative analysis confirms LDSS outperforms existing schemes in efficiency without compromising privacy.

Table II: Performance / Evaluation Summary

Metric / Component	Traditional CP-ABE	Proposed LDSS	Remarks
Computational Overhead	High	Low	Proxy offloading
Energy Consumption	High	Significantly Reduced	Suitable for mobile devices
User Revocation Cost	High	Low (Lazy)	Attribute description fields
Latency	High	Low	Faster encryption/decryption
Security & Access Control	Strong	Strong & Fine-grained	Maintains CP-ABE benefits

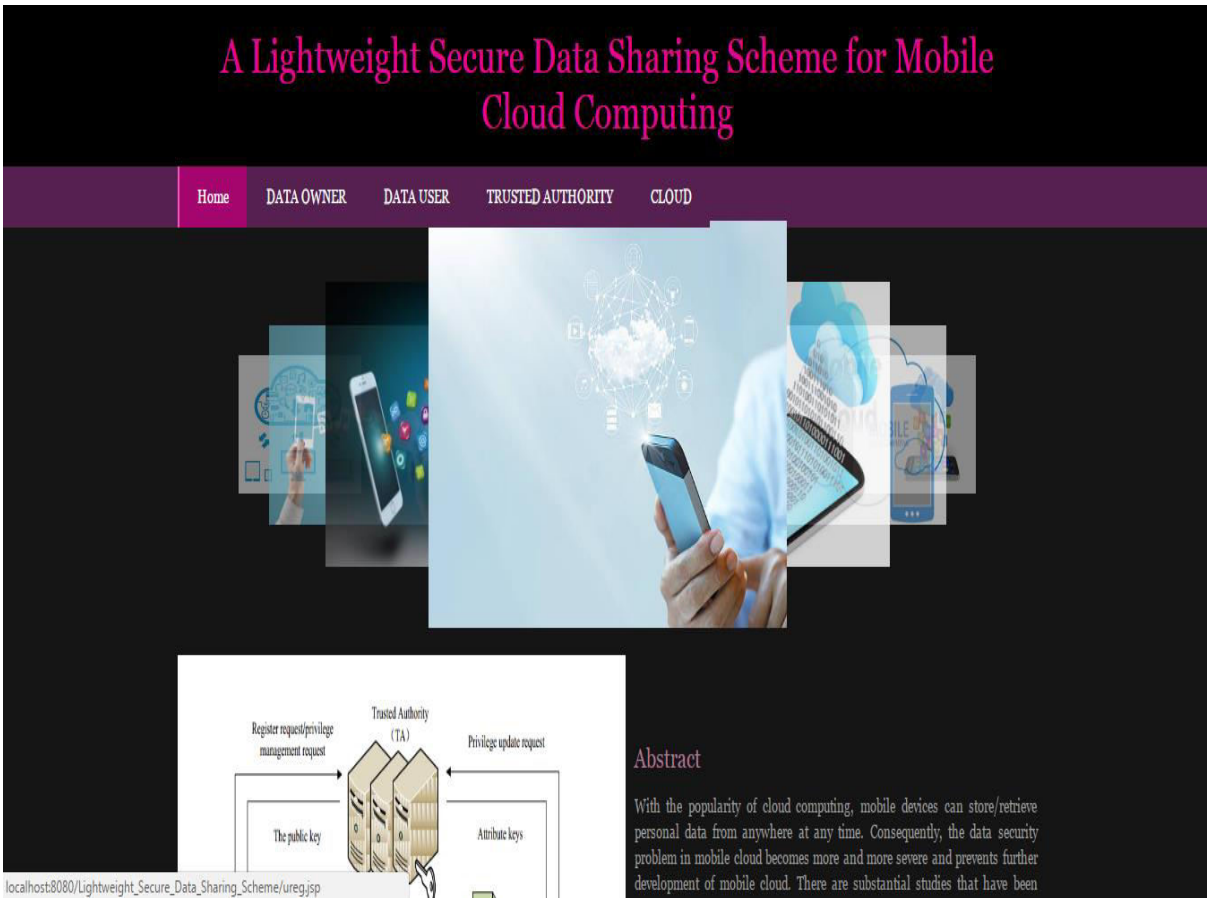


Fig 1:-home page

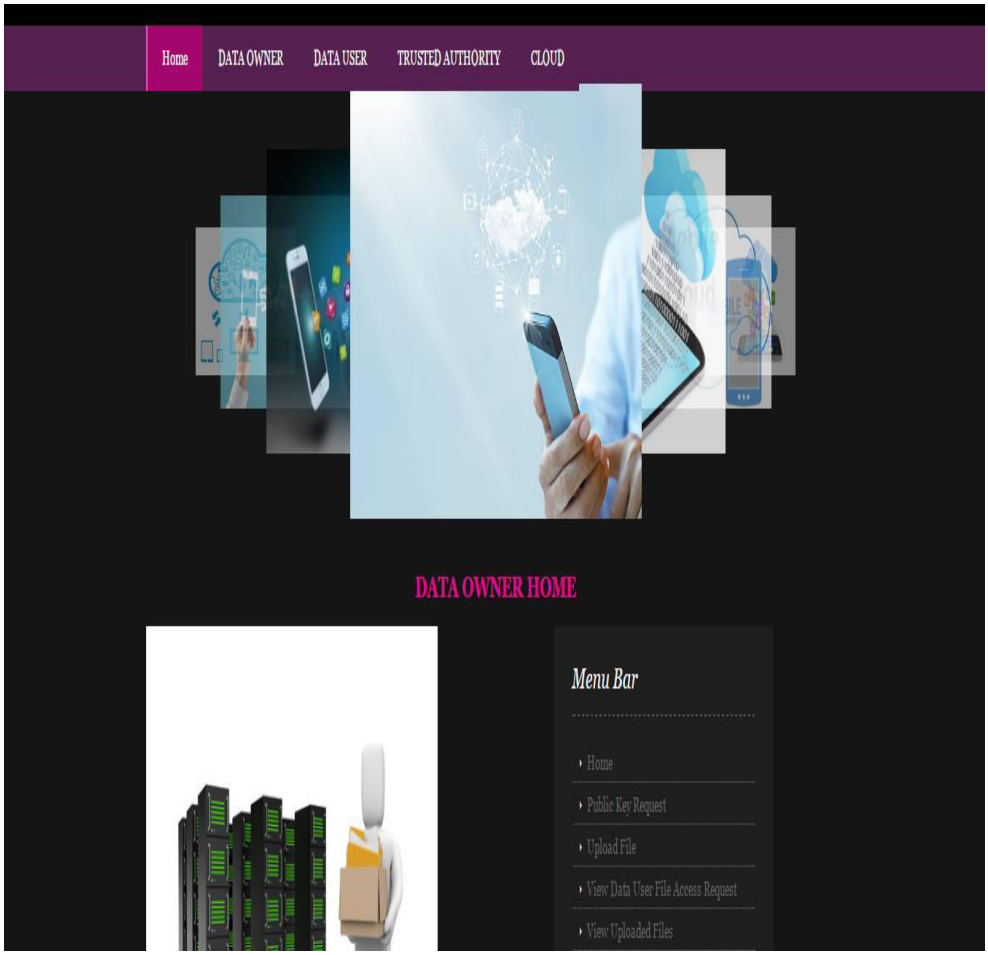


Fig 2:-data owner home page

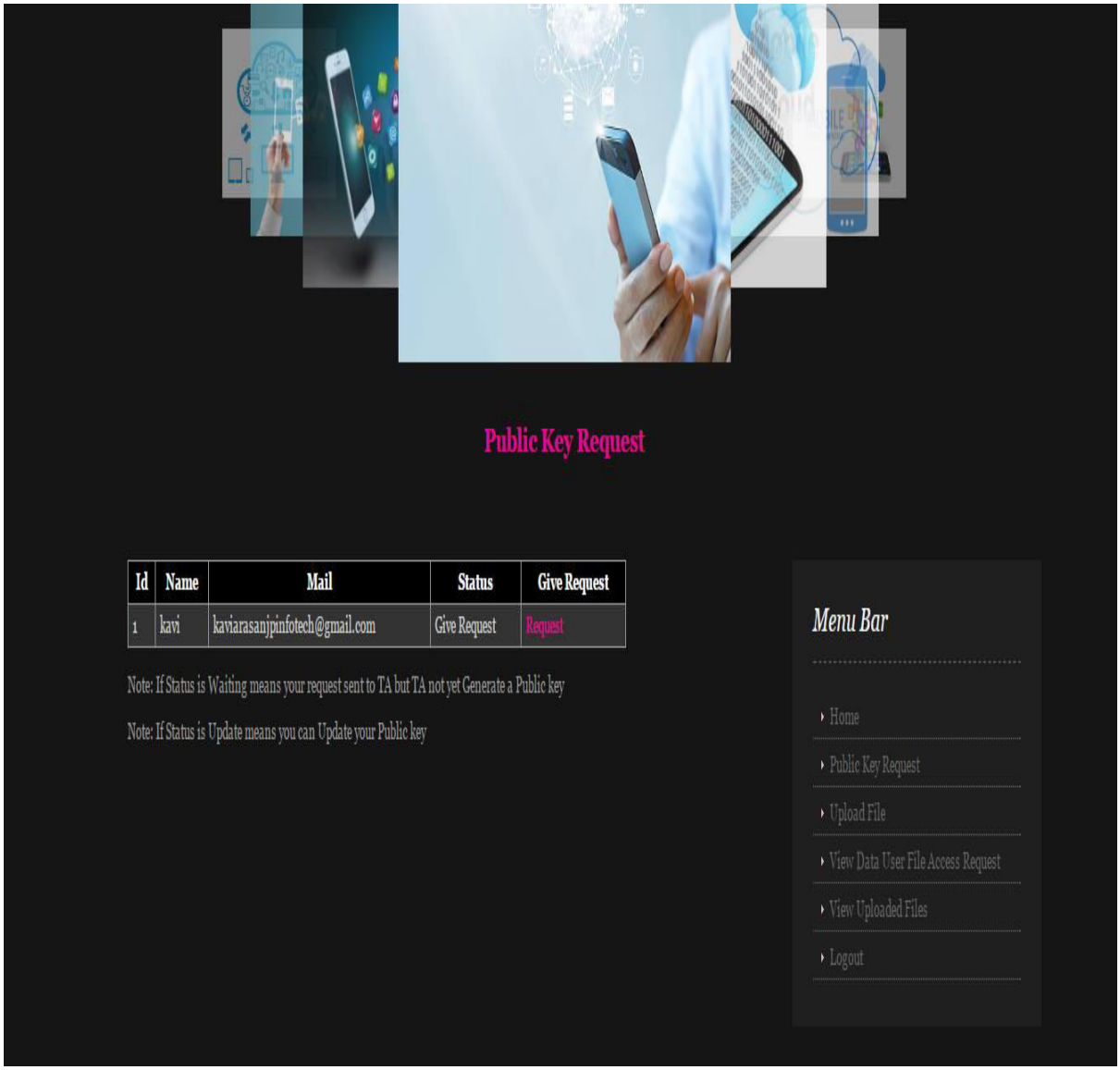


Fig 3:-public key generated

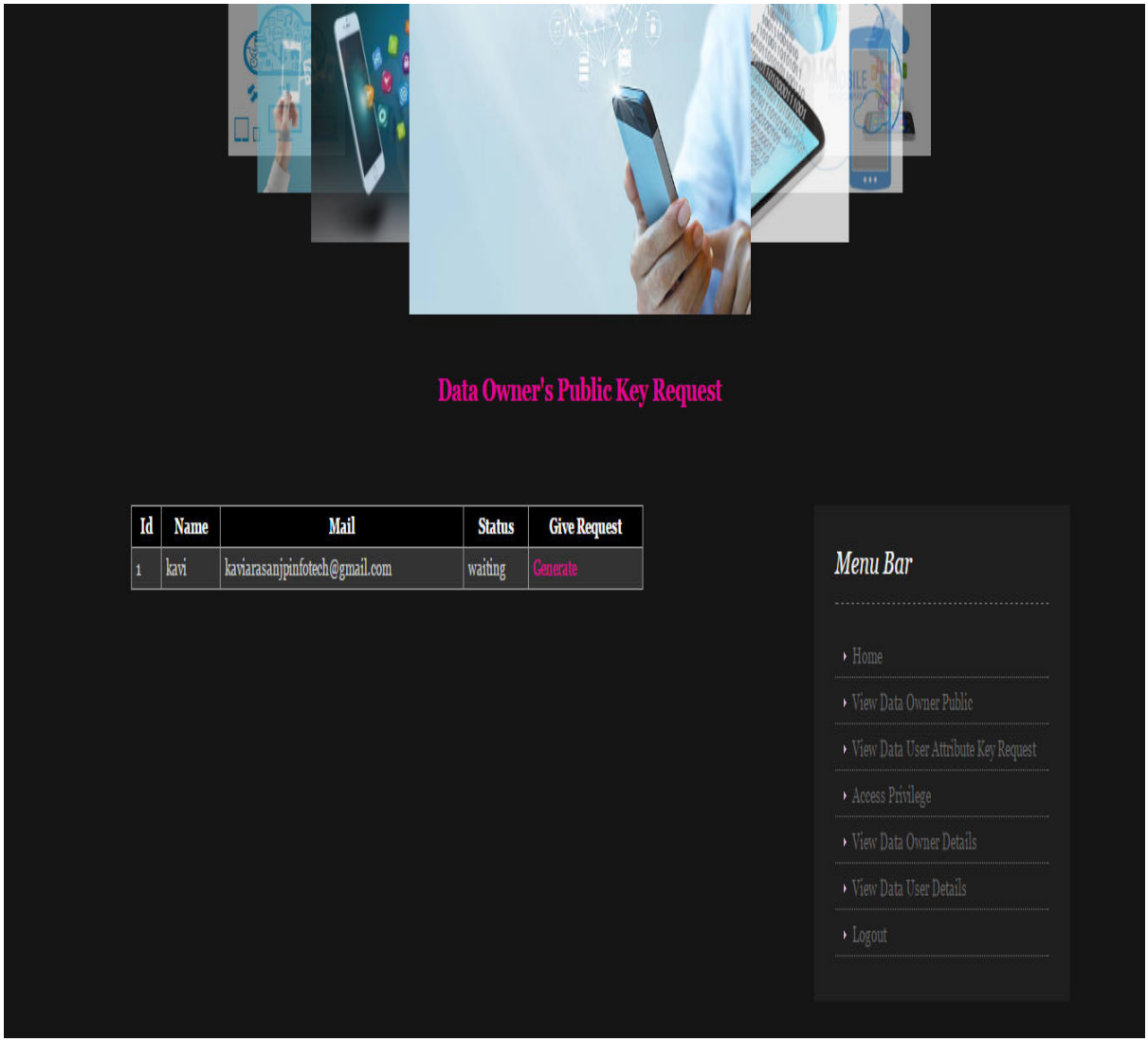


Fig 4:-public key request

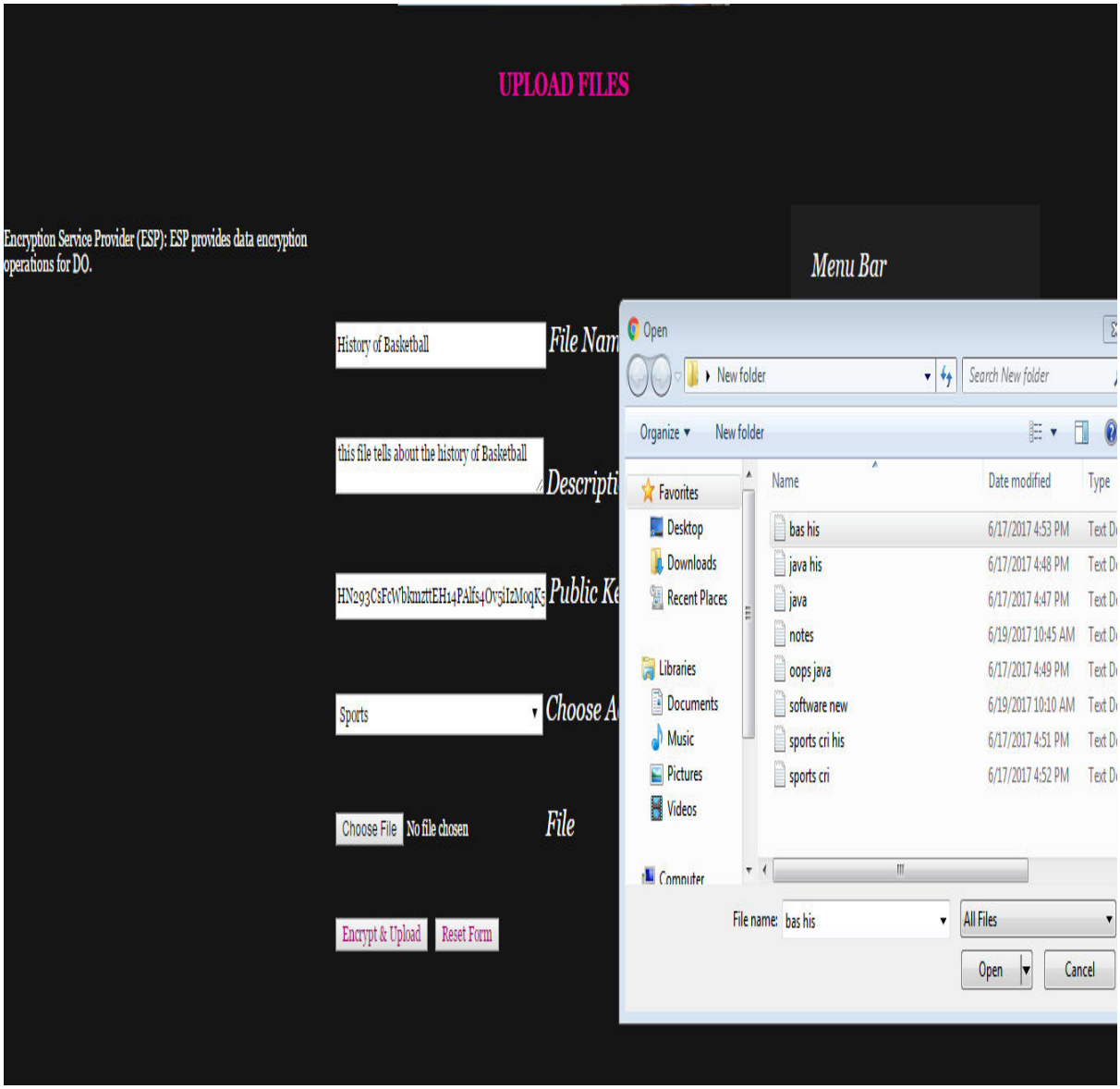


Fig 5:-uploading the files

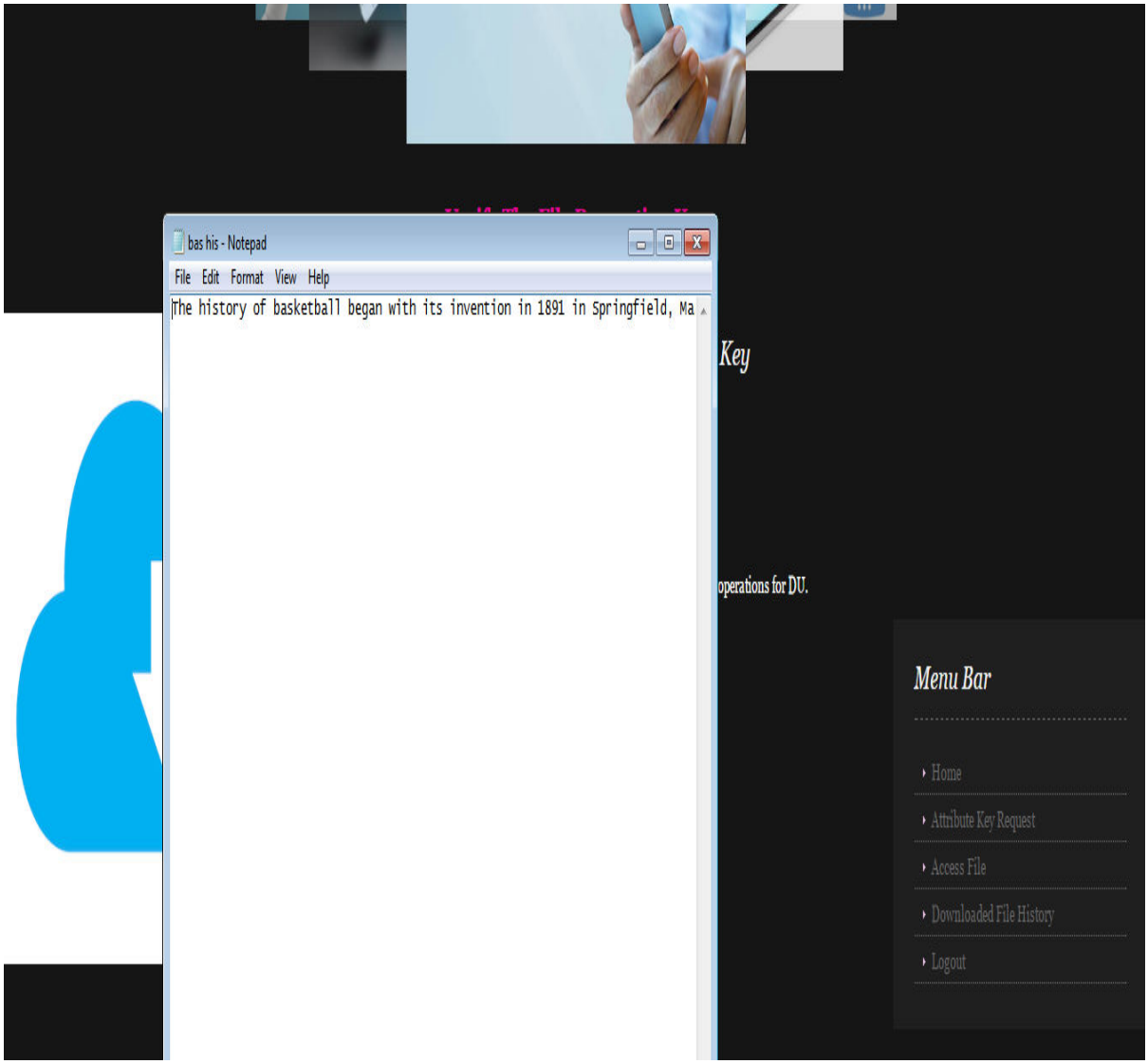


Fig 6:- Downloading the file by the user after verification of keys

VI. Conclusion

This paper presented LDSS, a lightweight secure data sharing scheme for mobile cloud computing. By optimizing CP-ABE with proxy servers and lazy revocation, LDSS effectively reduces computational overhead on mobile devices while preserving strong security and privacy. Experimental results validate its efficiency and practicality for real-world mobile cloud applications. The scheme addresses key challenges in resource-constrained environments and provides a scalable solution for secure data sharing. Future work will focus on enhancing data integrity verification and supporting larger-scale deployments.

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