Operating System Project Proposal

CS Dept , FCAI , Air University E-9 , Islamabad

Submitted By:

M.Waqas Siddique (232441)

Sardar Muhammad Ali Khan (232967)

Hassan Ali (232390)

Submitted To:

Sir Mohabbat Ali

1. Introduction

Data security is important in every system today. People store personal and sensitive files on their computers, so protecting this data from unauthorized access is necessary. A normal file system saves data in plain text, which means anyone can open and read it. To solve this problem, we decided to create an Encrypted Virtual File System that keeps all files safe by encrypting them automatically.

We are using FUSE. It allows us to build our own file system in user space without changing the operating system kernel. This makes development easier and safer. Our goal is to create a simple and secure file system that shows how file operations, encryption, and OS concepts work together.

2. Objectives of the Project

The main objectives of our project are as follows:

- To design an encrypted file system that stores all data securely.
- To learn how a FUSE based file system works in user space.
- To understand how operating systems handle file operations.
- To connect encryption with file storage in a practical way.
- To strengthen our knowledge of OS concepts such as blocks, metadata, and user to kernel interactions.

3. Abstract View (How the Project Works)

Our project creates a virtual file system that can be mounted on any empty folder. After mounting, the user can create files, read data, and write content just like a normal directory. Behind the scenes, the FUSE program handles all file operations. Whenever the user writes something, the system encrypts the data before saving it. When the user reads the file, the system decrypts it and shows the original content.

The idea is to make everything work automatically. The user sees normal files, but the actual stored data is encrypted. We also keep a small structure for file information and store the encrypted data inside a backing storage file. In this way, the system behaves like a normal file system but adds security through encryption.

4. Key Responsibilities (3-Member Team)

Waqas Siddique – Member 1

- Sets up the basic FUSE filesystem framework in C
- Implements mounting and unmounting logic
- Handles file system operations like getattr, readdir, and path handling
- Manages internal metadata structures for files and directories

Sardar Muhammad Ali Khan – Member 2

- Implements core file operations such as create, read, write, and delete
- Manages how data is stored in the backing storage file
- Handles file size updates, writing offsets, and data retrieval
- Ensures the correct mapping between virtual files and stored data

Hassan Ali – Member 3

- Implements encryption and decryption functions (AES or simple XOR)
- Integrates encryption with the write operation before data is stored
- Integrates decryption with the read operation before data is shown
- Tests encrypted storage to ensure data cannot be read without filesystem

5. Conclusion

This project will help us understand how file systems and OS concepts work in real life. By building an encrypted virtual file system with FUSE, we will learn about secure storage, data handling, and user space file management. The final result will be a simple and secure system that protects user data while working just like a normal folder. This project improves our programming, design, and problem-solving skills.

6. References

[1]. https://www.geeksforgeeks.org (Operating System File System Concepts)
[2]. https://www.openssl.org (AES Encryption Documentation)
[3]. https://www.tutorialspoint.com (C Programming & File Handling Concepts)