Virginia Tech ❖ Bradley Department of Electrical and Computer Engineering

ECE 4984 / 5984 Linux Kernel Programming
Fall 2017

Large Project: Stackable File System

1 Introduction

In this project, we will develop an *eXtremely simple enCryption File System (XCFS)*, which is a stackable file system running on top of an existing file system (e.g., ext4) and provides encryption/description of file contents. For a file created at XCFS, an user can see decrypted file contents only through XCFS; if an user directly accesses the file without using XCFS, he or she will see encrypted file contents.

This project is composed of a basic part and advanced part. The basic part takes 100% of score and all students should implement the basic part. In the advanced part, we will improve security by encrypting file names. By implementing the advanced part, you will get up to 10% bonus score.

The following concepts from the course will be put in practice in this project:

- Virtual file system
- Address space
- Memory management

2 Project description

XCFS should run in kernel space and should be written as a kernel module without modifying Linux kernel source code. All source code should be compiled with Linux Kernel v4.12. Following is the more detail description of the basic part and advanced part.

2.1 The basic part

Restriction : Do not modify existing kernel source code at all and write XCFS as a kernel module.

Encryption : Encryption is adding one for each bytes and decryption is subtracting one for each bytes.

File contents : All contents of a file should be properly encrypted and decrypted for buffered I/O and `mmap`-ed I/O.

2.2 The advanced part

File name : Encrypt and descrpt file names.

3 Additional information

WrapFS : `http://wrapfs.filesystems.org/`

eCryptFS : `https://github.com/torvalds/linux/tree/master/fs/ecryptfs`

SDCardFS : `https://android.googlesource.com/kernel/common/+/android-3.10/fs/sdcardfs`

4 Results to be handed

The deadline is **12/06 11:59 PM EDT**. Following is expected to be submitted:

- Source code. It is okay to copy and modify existing kernel code. However, you should comment in the source code to show that you understand it.
- Report in PDF, which briefly describes your design and includes screenshots to write, compile, and run a hello world C program.

All of this should be contained in a tarball should, with the following format: `<group id>.project4.tar.gz` (e.g., `group1.project4.tar.gz`)

5 Project TA office hours

- *TA*: Mincheol Sung
- *Date and time*: Monday:3-5pm, Wednesday:3-5pm
- *Email*: `mincheol@vt.edu`
- *Location:* 460 Durham