

CakeFS

ICT3215 Digital Forensics

User Manual

PA G-11

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Introduction

CakeFS is based on a FUSE-based architecture, and provides users unparalleled capabilities for securing their sensitive data, while retaining plausible deniability. Unlike traditional encryption tools that will leave detectable forensic marks, CakeFS uses innovative techniques including dynamic layered encryption, custom file formats and proactive anti forensic mechanisms. These features ensure that sensitive data is protected from forensic analysis and CakeFS is a must have for those seeking advanced privacy and security.

System Requirements

Operating System

- Compatible with Linux.

Python Version

- Python 3.11.0 or later.

Required Python Packages

The following Python packages must be installed:

- Fusepy
- Cryptography

Installation and Usage Instructions

Installation

Install the necessary packages using pip. Run the following commands in a linux terminal:

```
sudo apt update
sudo pip install --break-system-packages fusepy cryptography
```

A temporary mount point is required to work. First, open *another* linux terminal, then access as a superuser and create the temporary mount in order to later access the layers:

```
sudo su
mkdir /tmp/fuse
```

To initialize the file system, run the following command in your first terminal:

```
sudo python3 NP_Password_Fuse.py
```

A password prompt will appear from the script, key in the following without the quotation marks as the password to initialise the filesystem:

```
"c"
```

Layer Access & Navigation

Now the user will be able to interact with the filesystem. In here, the filesystem has implemented obscurity, such that it alters the access to the file system in a way the folders are hidden from traditional list commands such as 'ls', unless a specific layer is accessed.

```
(root@kali)-[~]
└─# cd /tmp/fuse/

(root@kali)-[/tmp/fuse]
└─# ls
ls: cannot open directory '.': No such file or directory
```

There are multiple layers that the user can interact with in the filesystem and each of those layers have their unique passwords. The user can refer to the table below for the respective credentials, and change directory to any desired filesystem with the following command.

```
cd /tmp/fuse/<layer name>
```

Whilst inside the layer, the user can test on 3 main functions: 1. list the contents inside the folder (read), 2. create files (write), and 3. remove files (delete). As soon as the user types something for his next command, the script will return the following prompt for the layer's password:

```
Incorrect password. Attempts remaining: 2
Enter password for echo:
Enter password for drizzle: █
```

For instance, to access the functionalities in the layer "webare", enter the password without quotation marks to access it.

To view all the layers and their passwords, refer to the Appendix B at the end of this document.

```
"withu"
```

Upon entering the correct password, the user can continue to utilise commands include, but are not limited to, the following to test the core functionalities:

Functionalities	Commands
Write	Nano <filename.xxx> Vim <filename.xxx> Echo "contents of the file" > <filename.xxx>
Read/List	ls Cat <filename.xxx>
Delete	Rm <filename.xxx>

Self-Destruct Mechanisms

WARNING: THIS MECHANISM WILL OVERWRITE AND REMOVE FILES RELATED TO THE SCRIPT IN BOTH THE DIRECTORY AND THE FILESYSTEM. HENCE, PLEASE MAKE A BACKUP OF ANY IMPORTANT FILES DONE IN THE AFFECTED AREAS IF ANY!

The self-destruct mechanism serves as a critical security feature to prevent unauthorised access and ensure data confidentiality and is implemented onto 2 key scenarios: 1. Incorrect password 1 time during the master password prompt, or 2. Incorrect password 3 times for the password prompts on the specific layers.

```
systemExit: 0
(kali㉿kali)-[~/Desktop/CakeFS_Demo]
$ sudo python3 NP_Password_Fuse.py
Enter master password to mount filesystem:

(kali㉿kali)-[~/Desktop/CakeFS_Demo]
$
```

```
(kali㉿kali)-[~/Desktop/CakeFS_Demo]
$ sudo python3 NP_Password_Fuse.py
Enter master password to mount filesystem:
Enter password for sunshine:
Enter password for frost:
Incorrect password. Attempts remaining: 2
Enter password for frost:
Incorrect password. Attempts remaining: 1
ergerg
Enter password for frost:
Incorrect password. Attempts remaining: 0
Too many incorrect attempts for frost. Initiating self-destruct sequence.
encrypted_storage.db has been securely deleted.
Self-destruct sequence complete. /home/kali/Desktop/CakeFS_Demo/NP_Password_Fuse.py
has been deleted.
Unmounting FUSE filesystem...
fusermount: failed to unmount /tmp/fuse: Device or resource busy
Self-destruct failed: Command '['fusermount', '-u', '/tmp/fuse']' returned non-zero
exit status 1.
```

To trigger the mechanism, simply input incorrect values that many times for the respective key scenarios. As the mechanism will affect the FUSE mountpoint, refer to the Appendix A to troubleshoot if required.

Appendix

A: Troubleshooting

```
sudo apt purge python3-fusepy # in the event python-3fusepy is installed
sudo pip install --break-system-packages fusepy

which python3
python3 --version # ensure that it is at least 3.11.X
```

In the event there are issues with the FUSE mountpoint, such as in the case of the self destruct event, use the following command to unmount and recreate the directory:

```
sudo fusermount -u /tmp/fuse
sudo mkdir /tmp/fuse
```

B: List of layers and their respective passwords

Layer	Password
skyfall	eaglesoarhigh
sunshine	brighteveryday
moondust	nightsparkling
rivers	flowfreely
mountain	standtall
forest	deepandgreen
clouds	driftingaway

ocean	vastandblue
desert	endless sand
thunder	stormyweather
raindrop	fallsquietly
iceberg	hiddenbeneath
volcano	eruptionfire
galaxy	starsunseen
comet	trailoflight
webare	withu
nebula	cosmiccloud
gravity	pulltogether
quantum	smallestrealm
horizon	farawayline
island	solitudepeace
windmill	turnforever
starlight	guidingpath

GO	homesweethomealabama
heartbeat	lifesrhythm
sandstorm	blindingwind
tornado	spiralforce
snowfall	frostymagic
11223344	fourthreetwoone
aurora	polarcolors
whirlpool	currentspull
meadow	calmserenity
wildfire	untamedflame
rainforest	livelygreen
canyon	deepandvast
tidalwave	shoreimpact
waterfall	naturecascade
skylark	soaringbird
glacier	frozenriver

sequoia	toweringtree
rainbow	colorarch
sunset	goldenhue
dawn	freshstart
twilight	eveningglow
midnight	silenthours
whisper	secretheard
echo	soundreturns
mirage	illusionsight
frost	coldandsharp
ember	burningcoal
dunes	shiftingland
lagoon	hiddenwater
rapids	rushingwater
blizzard	snowstorm
quicksand	sinkslowly

pebble	smallsmoothrock
drizzle	lightshower
typhoon	ragingstorm
harbor	safehaven
geyser	hotwaterise
tidalpool	watercircle