CSC 471 Spring 2022 Lab 2

Dr. Si Chen

Build a heuristic malware detection system

The goals of this lab:

- Understanding the concepts of IAT/EAT
- Know how to use static analysis to detect malware

Objectives and Targets

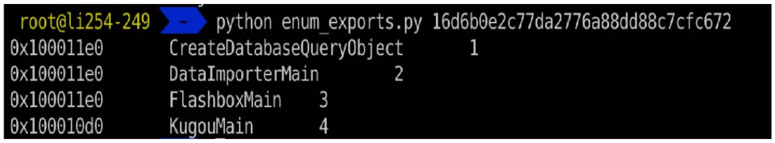
Please download **malware_lab_2.zip** from our class website, unzip it. It should release the following malware samples:

- 16d6b0e2c77da2776a88dd88c7cfc672
- 0fd6e3fb1cd5ec397ff3cdbaac39d80c
- 6a764e4e6db461781d080034aab85aff
- cc3c6c77e118a83ca0513c25c208832c
- e0bed0b33e7b6183f654f0944b607618
- 1c1131112db91382b9d8b46115045097

Please **create a runnable program** (recommend using Python).

This program should be able to scan a folder, and analysis the PE structure of each malware sample.

Then, implement the following heuristic rules:

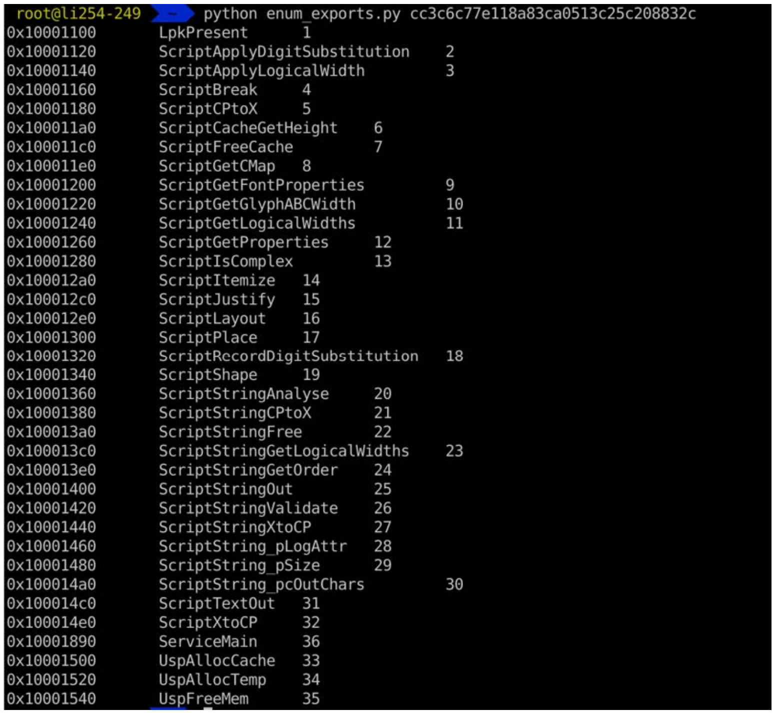


```
 root@li254-249  ~  python enum_exports.py 16d6b0e2c77da2776a88dd88c7cfc672
0x100011e0      CreateDatabaseQueryObject       1
0x100011e0      DataImporterMain        2
0x100011e0      FlashboxMain    3
0x100010d0      KugouMain       4
```

Figure 1: Malware Sample 1 Export Functions Information

1. If three or more export functions have the same memory address, it's a malware.

E.g. In Figure.1, all three export function have the same memory address 0x100011e0 (*CreateDatabaseQueryObject, DataImporterMain, FlashboxMain*), so it's a malware.



```
root@li254-249  ~  python enum_exports.py cc3c6c77e118a83ca0513c25c208832c
0x10001100      LpkPresent      1
0x10001120      ScriptApplyDigitSubstitution    2
0x10001140      ScriptApplyLogicalWidth         3
0x10001160      ScriptBreak     4
0x10001180      ScriptCPtoX     5
0x100011a0      ScriptCacheGetHeight    6
0x100011c0      ScriptFreeCache         7
0x100011e0      ScriptGetCMap   8
0x10001200      ScriptGetFontProperties         9
0x10001220      ScriptGetGlyphABCWidth          10
0x10001240      ScriptGetLogicalWidths          11
0x10001260      ScriptGetProperties     12
0x10001280      ScriptIsComplex         13
0x100012a0      ScriptItemize   14
0x100012c0      ScriptJustify   15
0x100012e0      ScriptLayout    16
0x10001300      ScriptPlace     17
0x10001320      ScriptRecordDigitSubstitution   18
0x10001340      ScriptShape     19
0x10001360      ScriptStringAnalyse     20
0x10001380      ScriptStringCPtoX       21
0x100013a0      ScriptStringFree        22
0x100013c0      ScriptStringGetLogicalWidths    23
0x100013e0      ScriptStringGetOrder    24
0x10001400      ScriptStringOut         25
0x10001420      ScriptStringValidate    26
0x10001440      ScriptStringXtoCP       27
0x10001460      ScriptString_pLogAttr   28
0x10001480      ScriptString_pSize      29
0x100014a0      ScriptString_pcOutChars         30
0x100014c0      ScriptTextOut   31
0x100014e0      ScriptXtoCP     32
0x10001890      ServiceMain     36
0x10001500      UspAllocCache   33
0x10001520      UspAllocTemp    34
0x10001540      UspFreeMem      35
```

Figure 2: Malware Sample 2 Export Functions Information

2. If three or more export functions have the same memory offset (the difference between two export functions are the same), it's a malware.

E.g. In Figure.2, the memory offset (difference) between each export functions is always 0x20, so it's a malware.

When running your program,**it should be able to scan through all malware samples, and output which rules that malware sample violate**.

Experiment Setup

1. Check the tutorial on website to create an account and log in Badger CTF system (via SSH)
2. Watch the following lecture video (Real-world Case Study). Try to use Badger CTF to repeat all Linux commands that I typed and get familiar with the system.

   http://moozlab.com/csc471/iat.html

3. Download the malware_lab_2.zip (password: infected) from our course website

   wget https://www.cs.wcupa.edu/schen/malware2022/lab1/malware_lab_2.zip

4. Download Python script: enum_export.py and start from there. You can re-use this script in your project. P.S. You can type the following command inside Badger CTF to download the script.

```
wget https://www.cs.wcupa.edu/schen/malware2022/download/enum_export.py
```

5. Unzip the malware_lab_2.zip and make sure the malware sample and the Python script enum_export.py are in the same folder.

```
unzip malware_lab_2.zip
```

6. Type the following command in your terminal, and hit enter key, it should output the export functions and addresses.

```
python3 enum_export.py 16d6b0e2c77da2776a88dd88c7cfc672
```

7. Now tweak the Python script (enum_export.py), read the code and figure out its meaning.

8. Write Python code (You can use Vim editor) to implement all the functionalities. You can use Google and post your question on our Discord Channel.

9. You can check the online documentation of the *pefile* library for more details

```
https://github.com/erocarrera/pefile/blob/wiki/UsageExamples.md#introduction
```

Submission

- The lab due date is available on our course website. Late submission will not be accepted;
- The assignment should be submitted to D2L directly.
- Your submission should include: A **detailed project report in PDF format** to describe what you have done, including screenshots of the final result
- **No copy or cheating is tolerated**. If your work is based on others', please give clear attribution. Otherwise, you **WILL FAIL** this course.