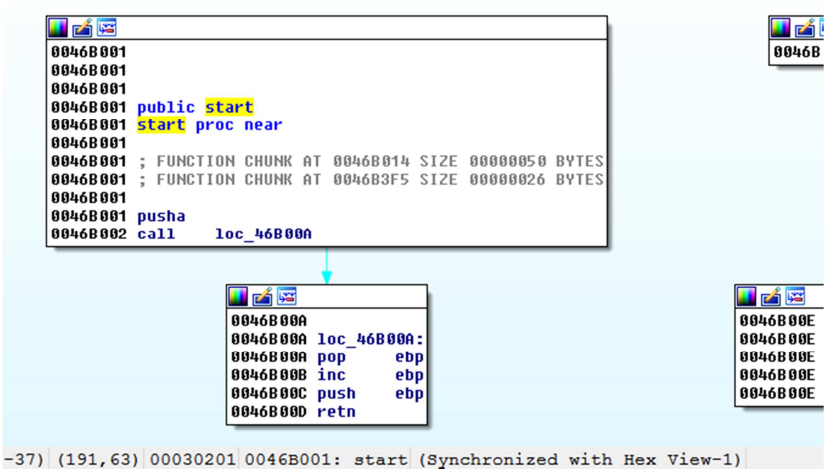
REVERSING WITH IDA PRO FROM SCRATCH
PART 16

Before continuing with more reversing, we'll do one more unpacking exercise with another target. In this case, UnPackMe_ASPack 2.2.

It belongs to the easy category. More ahead in the course, we'll continue with advanced unpacking after studying other topics.



There, we see the packed file EntryPoint. It starts with the PUSHAD instruction that we hadn't seen among the most used, but it just pushes every register into the stack. PUSHAD = To Push or save all registers into the stack in the following order.

60	PUSHAD	Push EAX, ECX, EDX, EBX, original ESP, EBP, ESI, and EDI

POPAD is the inverse operation. It pops the stack content saving it in the registers in the following order. (Except ESP that is not modified by it)

61	POPAD	Pop EDI, ESI, EBP, EBX, EDX, ECX, and EAX

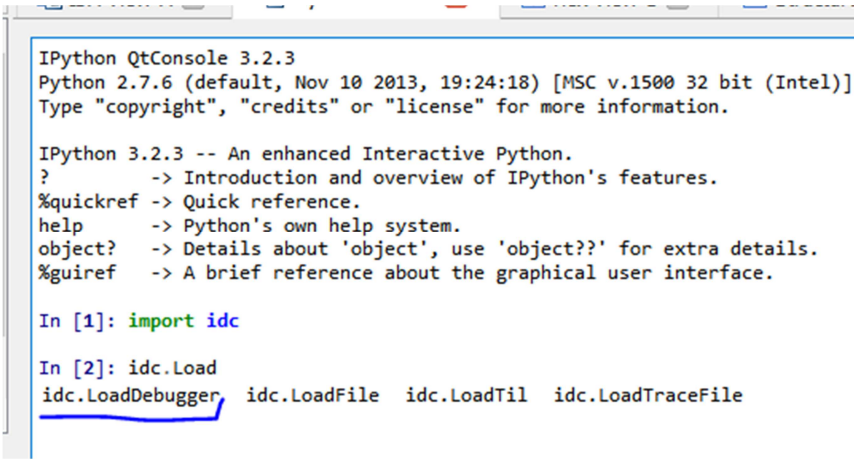
In the easy packers, most of them used PUSHAD to save the original state of the registers and POPAD to restore them before jumping to the OEP to execute the program unpacked in memory.

Thanks to this, we could get the OEP easily using the PUSHAD-POPAD method. Obviously, in modern packers, the creators knew about this and avoid using these instructions.

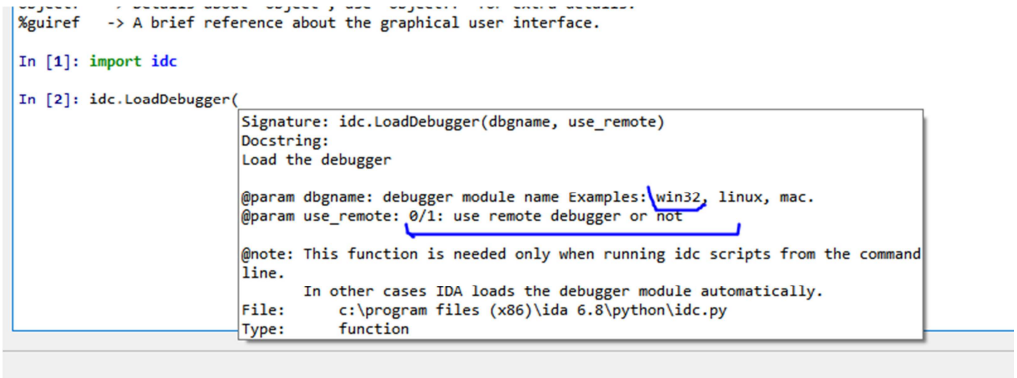
What is the PUSHAD-POPAD method?

First of all, we have to choose the debugger and run it. We already know how to do that in DEBUGGER - SELECT DEBUGGER and we select LOCAL WIN32 DEBUGGER.

Now, to practice, we run it through Python. You can type the instructions one at a time in the Python bar or use the IpyIDA plugin we installed and that is more comfortable. I'll do it like this.



When typing idc.Load and pressing TAB, it tells me that idc.Load exists.



In our case, we have to select win32 and 0 for local (1 is for remote debugger)

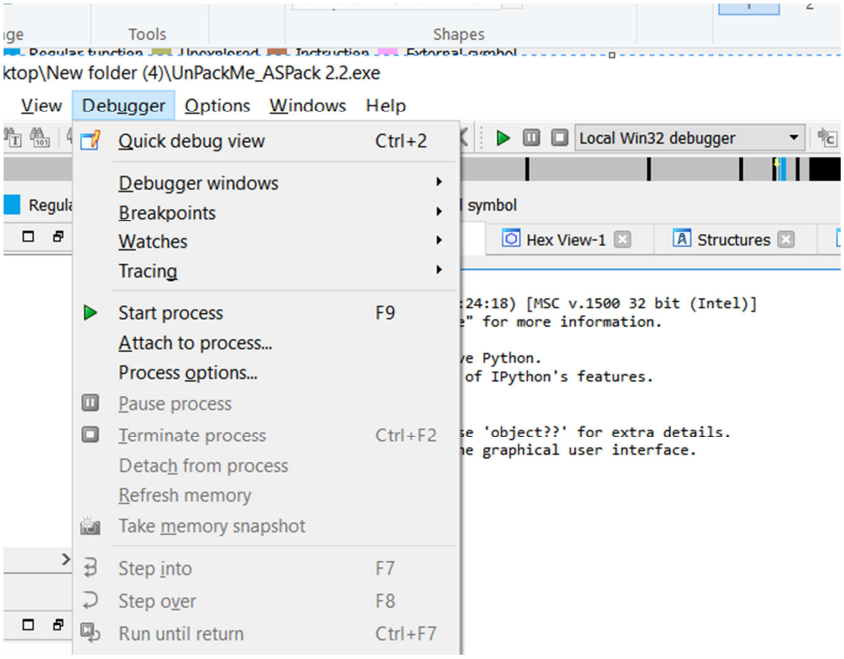
Let’s try it.

```
In [1]: import idc

In [2]: idc.LoadDebugger("win32",0)
Out[2]: True

In [3]:
```

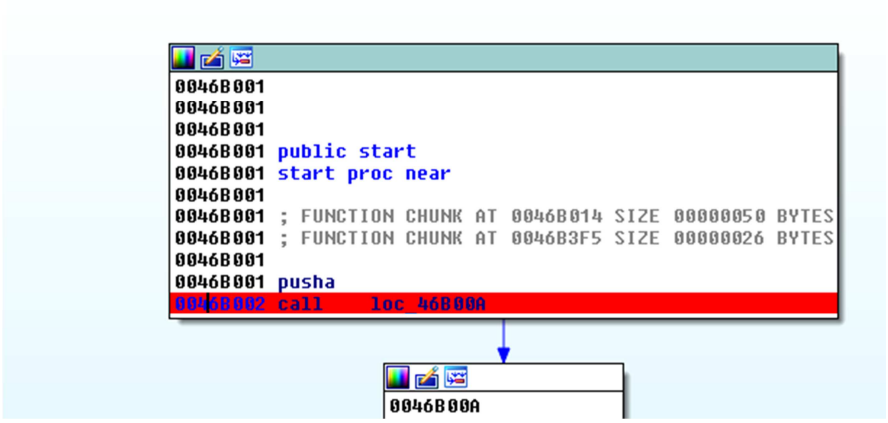
It seems it liked it. It returned TRUE.



It is already selected. If we repeat that command, it returns FALSE because is already running.

The PUSHAD method is based on executing the PUSHAD and in the next instruction, we find the registers it saved in the stack and set a breakpoint to stop the execution when it tries to recover them with POPAD just before jumping to the OEP after unpacking the original code.

Setting a breakpoint with F2 after the PUSHAD, we should stop after executing it. (PUSHA is similar to PUSHAD).



If you want to do it using Python, you can type:

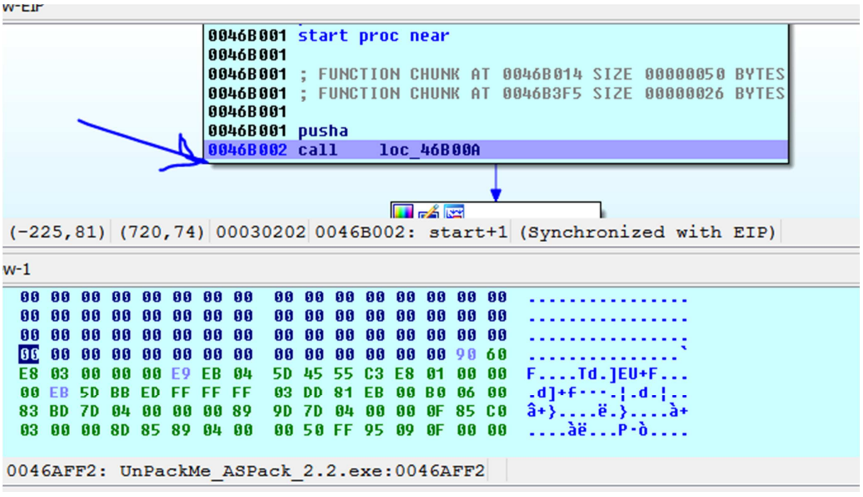
idaapi.add_bpt(0x46b002, 0, BPT_SOFT)

With that, you set a breakpoint from Python. The first argument is the address, the second one is the breakpoint size and the third one is the type. In this case, the normal breakpoint by software BPT_SOFT or 0.

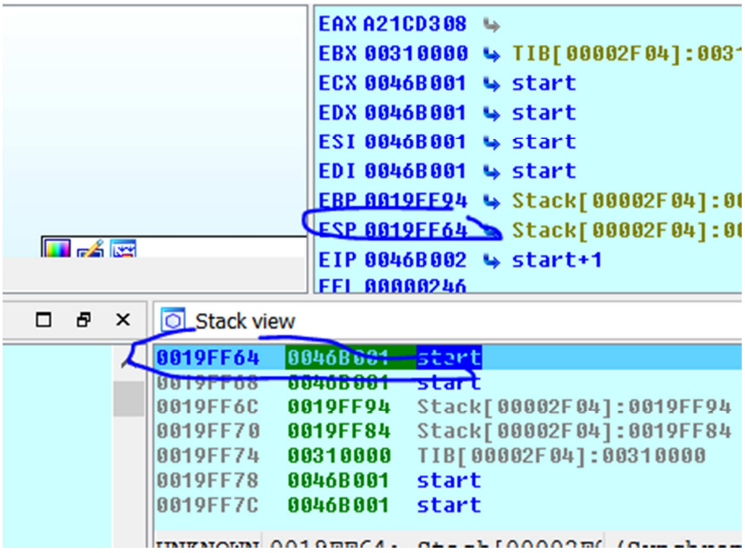
We already selected the debugger. We set the first breakpoint. Now, we have to run the debugger to stop at the breakpoint. That is easy. With F9 or from Python.

StartDebugger("","","");

With that command, the selected debugger will run if everything is OK and in this case, it will stop at the breakpoint we set at 0x46B002.

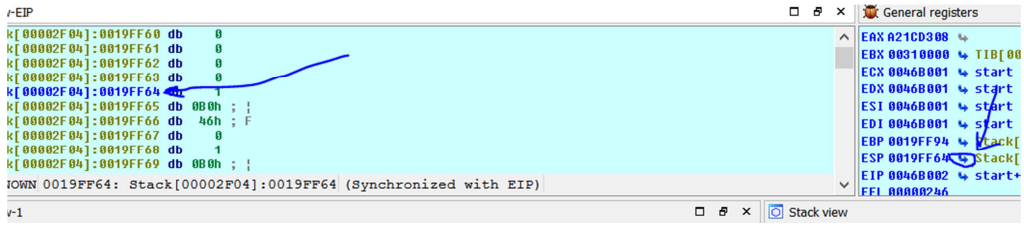


We have to see the stack here and set a breakpoint at the first line to stop there because it is the place where the register values saved by a PUSHAD are and they are recovered later with a POPAD.



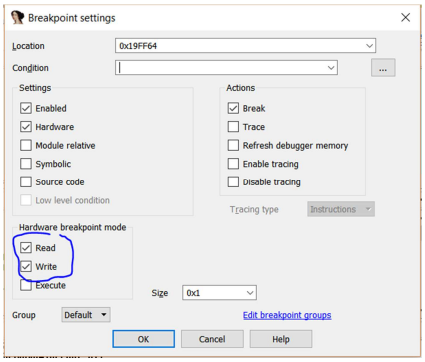
We can set a breakpoint at 0x19FF64 in my case, in yours, it it is your first stack address pointed by ESP.

Now, I place the cursor on the disassembly list and press the little arrow next to ESP.

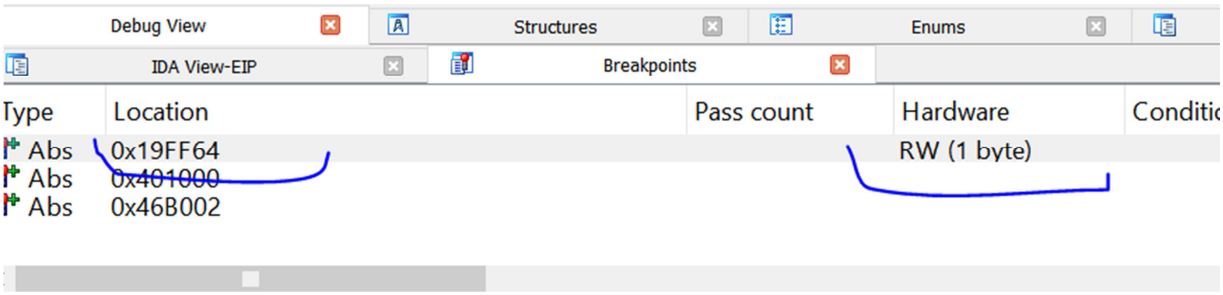


Pressing the arrow next to a register, it will try to show that address (on that window) if it exists. So we can set a breakpoint there with F2, but we have to edit it to be On Read and Write not On execution because it will stop when it recovers or reads. It won't execute any code there.

When pressing F2 it knows that and opens the breakpoint settings window.



If it doesn't appear, we should go to DEBUGGER-BREAKPOINTS-BREAKPOINT LIST.



And let's right click-EDIT to change the settings we want.

Can we set a breakpoint with Python?

```
  bpttype_t type;         // type of the breakpoint:
// Taken from the bpttype_t const definition in idd.hpp:
// BPT_EXEC   =  0,             // Execute instruction
// BPT_WRITE  =  1,             // Write access
// BPT_RDWR   =  3,             // Read/write access
// BPT_SOFT   =  4;             // Software breakpoint
  // modifiable characteristics (use update_bpt() to modify):
  int pass_count;         // how many times does the execution reach
```

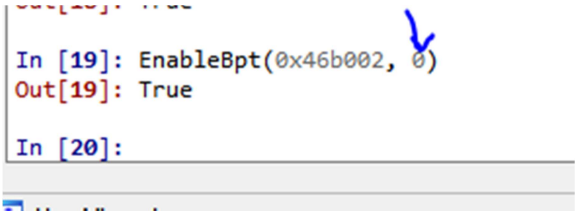
idaapi.add_bpt(0x019FF64, 1, 3)

The 1 argument is the breakpoint size and 3 is the type, in this case, READ-WRITE ACCESS as we see in the table. If I type it, the same breakpoint appears we set manually.

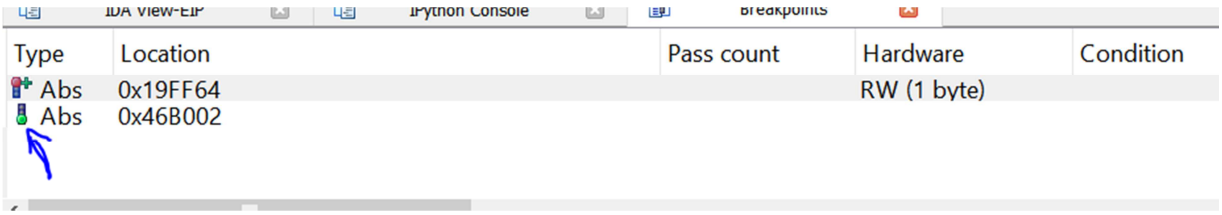
Let's disable the previous BP in the BP list with right click-DISABLE or with Python.

EnableBpt(0x46b002, 0)

With the second argument = 1 you enable it and with 0, you disable it.

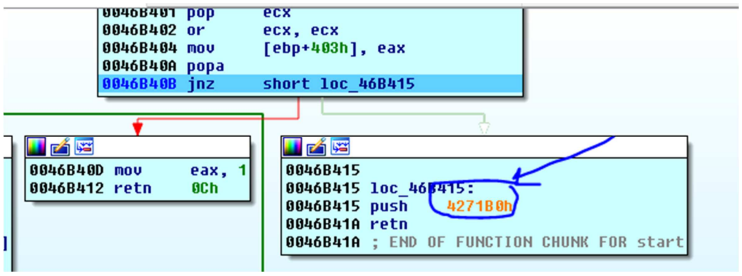


There, it is in green or disable and, of course, the one belonging to the stack is in red.

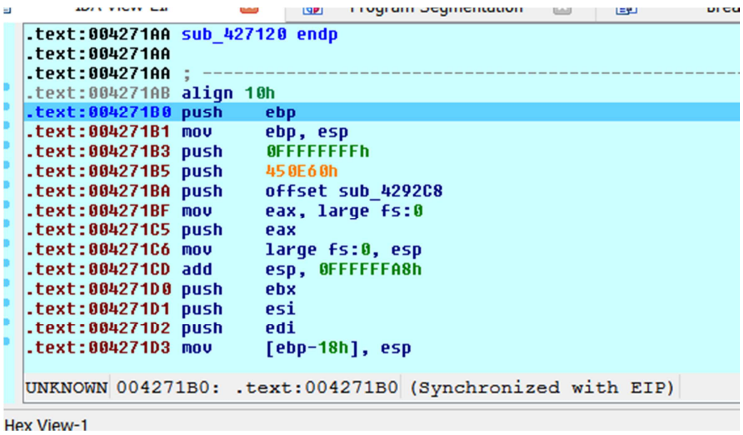


Let's continue with F9 or type in Python.

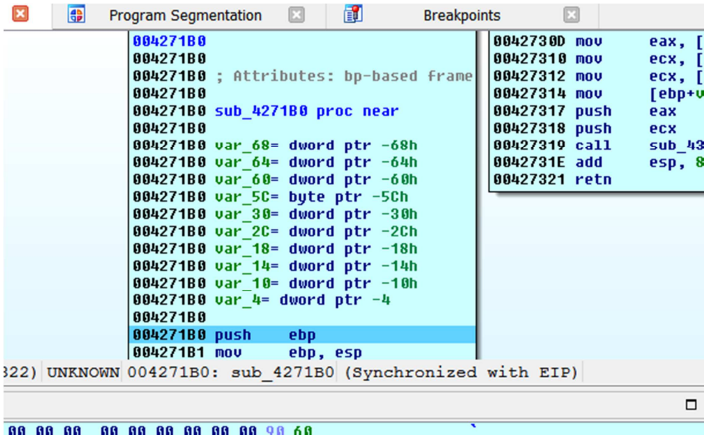
idaapi.continue_process()



It stopped just after the POPAD when it recovers the registers and from the stub, it is going to jump to the OEP at 0x4271B0 because a PUSH RET is similar to a JMP. So, let's trace a little until getting the OEP.

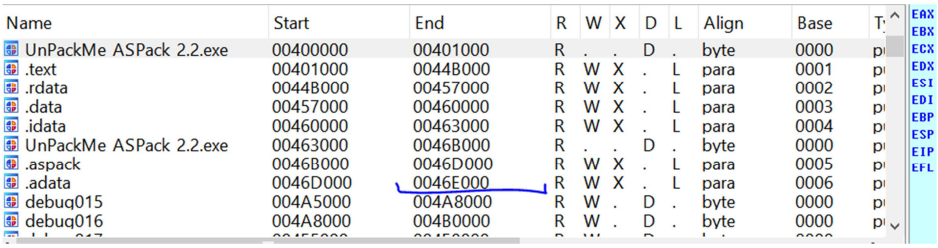


Now, let's reanalyze the executable, as we did in the previous case and we created the function. If we wanted just to do a snapshot of the memory to a database to study it, this would be the time, we won't repeat it here.



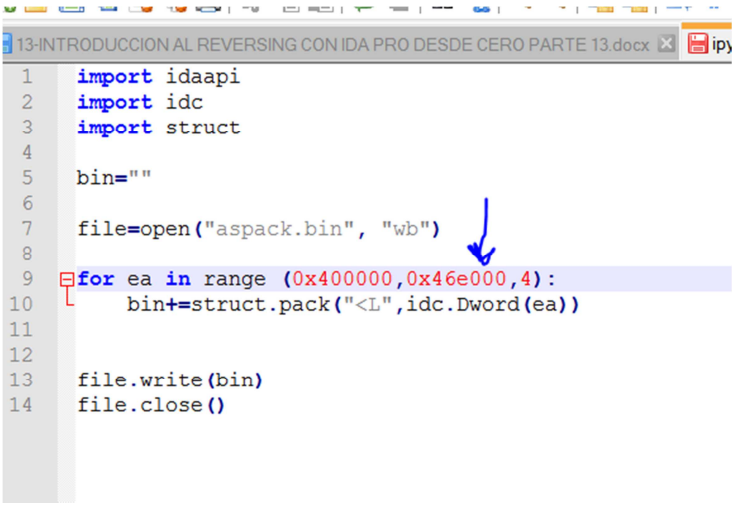
The next step is dumping. So, we need to find the ImageBase and the final address in the last executable segment.

In SEGMENTS, we see that the ImageBase is 0x400000 and it ends at 0x46E000.



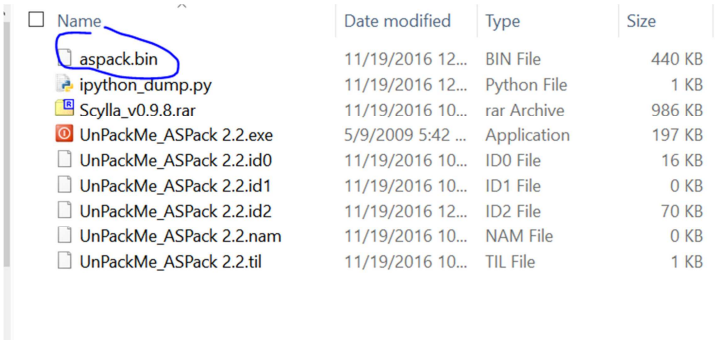
Name	Start	End	R	W	X	D	L	Align	Base
UnPackMe ASPack 2.2.exe	00400000	00401000	R	.	.	D	.	byte	0000
.text	00401000	0044B000	R	W	X	.	L	para	0001
.rdata	0044B000	00457000	R	W	X	.	L	para	0002
.data	00457000	00460000	R	W	X	.	L	para	0003
.idata	00460000	00463000	R	W	X	.	L	para	0004
UnPackMe ASPack 2.2.exe	00463000	0046B000	R	.	.	D	.	byte	0000
.aspack	0046B000	0046D000	R	W	X	.	L	para	0005
.adata	0046D000	0046E000	R	W	X	.	L	para	0006
debug015	004A5000	004A8000	R	W	.	D	.	byte	0000
debug016	004A8000	004B0000	R	W	.	D	.	byte	0000

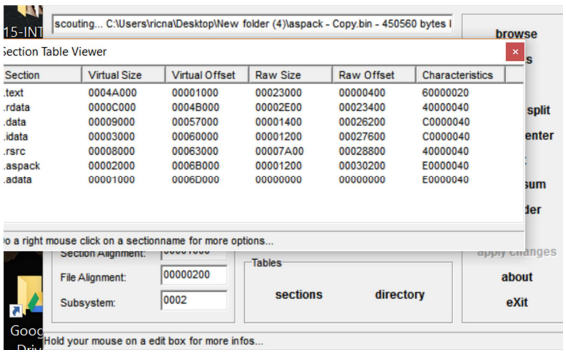
Instead of using the script we used in the 15th part, we will use the version of itself in Python.



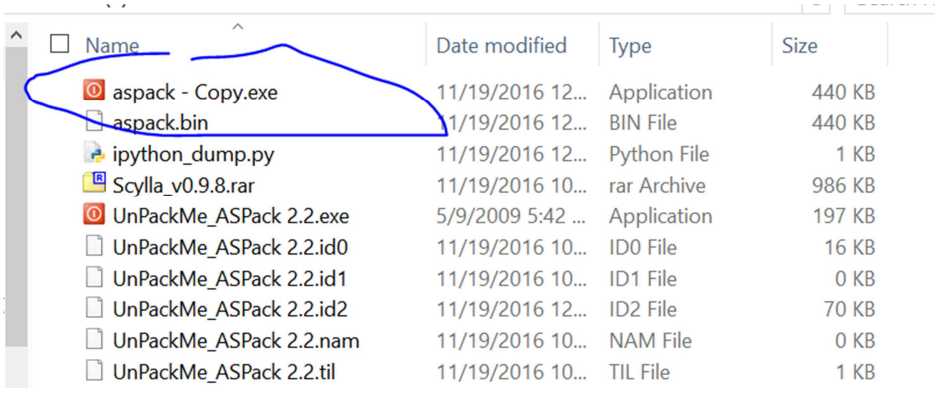
As this has many lines, I do it in a text editor and save it as **ipython_dump.py** that is included in this tutorial.

Now, with the menu FILE-SCRIPT FILE, I open it. It executes itself and creates an **aspack.bin** file. It doesn't have any icon, so I use PEEDITOR.



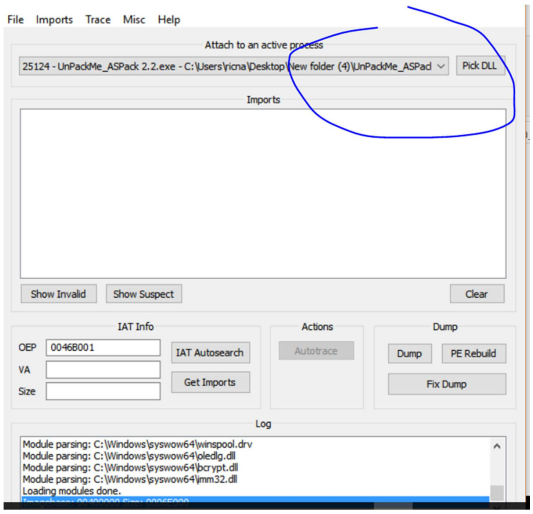


Right Click - DUMP FIXER.



When we rename it, its icon appears.

Let's open Scylla 0.98. In this part, I attached a newer version. I will find the process stopped at the OEP.

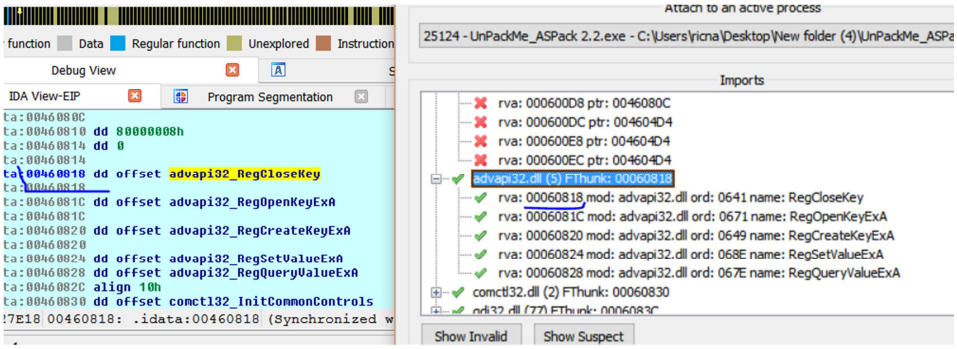


We enter the OEP that is 004271B0, press IAT AUTOSEARCH and GET IMPORTS.

If we press SHOW INVALID and select ADVANCED MODE, we see that there are some bad APIs. Let's try fixing them automatically.

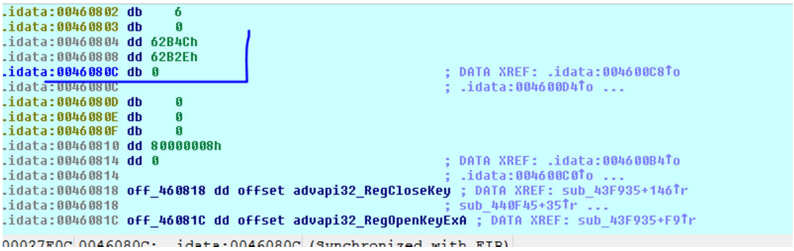
No, it couldn't fix them.

Let's try it manually.

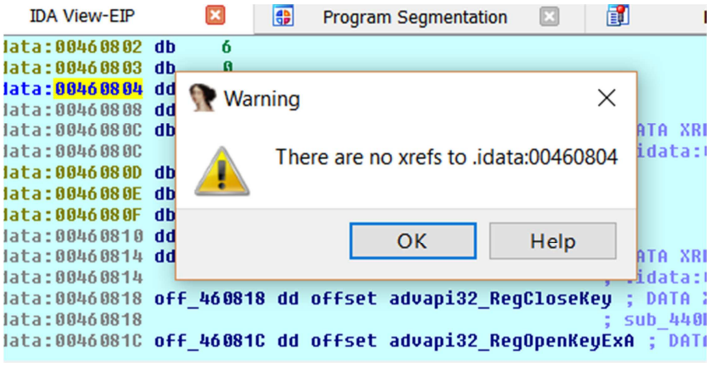


There, we see the first API at 0x460818. That is valid and matches. More above, the invalid APIs start. Let's see what there is in the first invalid API more above at 0x4600EC.

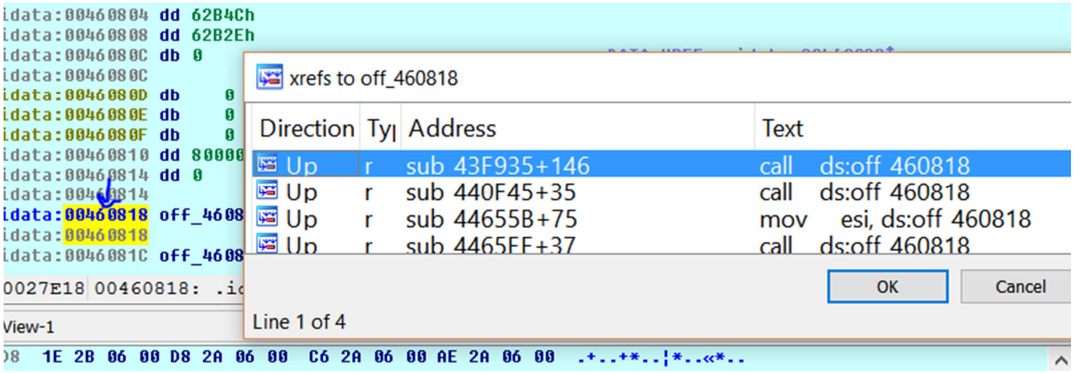
If I reorder then a little with D and then I regroup them.



The content doesn't point to any valid address and if I also press CTRL+X, there are no references.

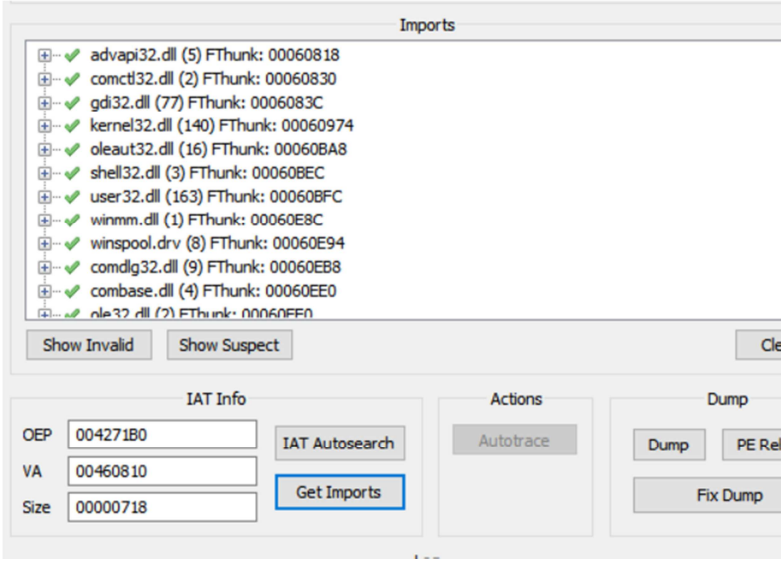


While in a real API, there will be references when the API is used. For example:



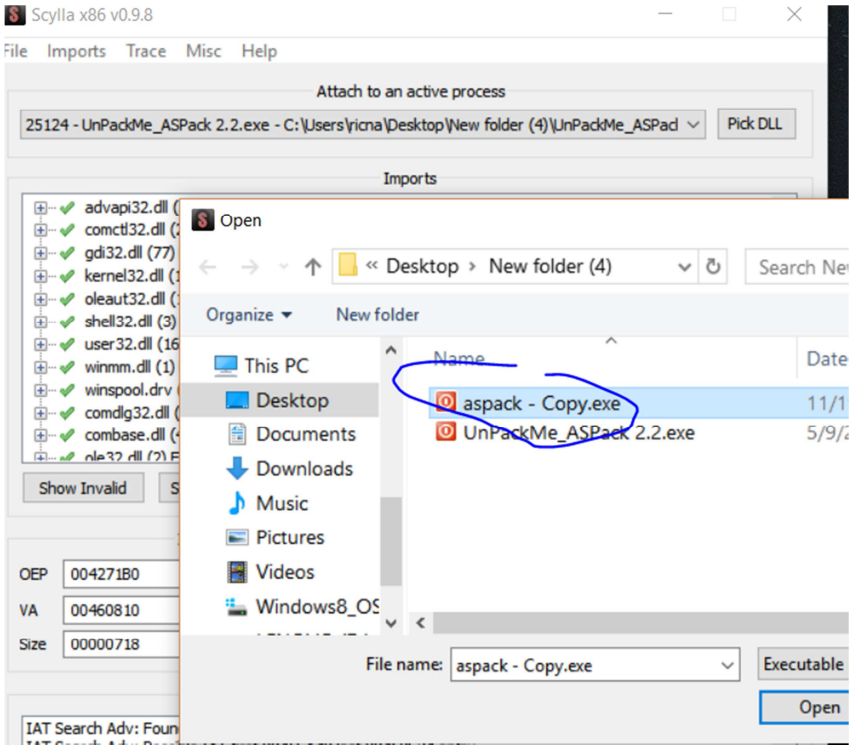
Those are no IAT APIs. We will delete them.

If I press CLEAR and IAT AUTOSEARCH again, but I tell it not to use the advanced mode, it finds them all too.

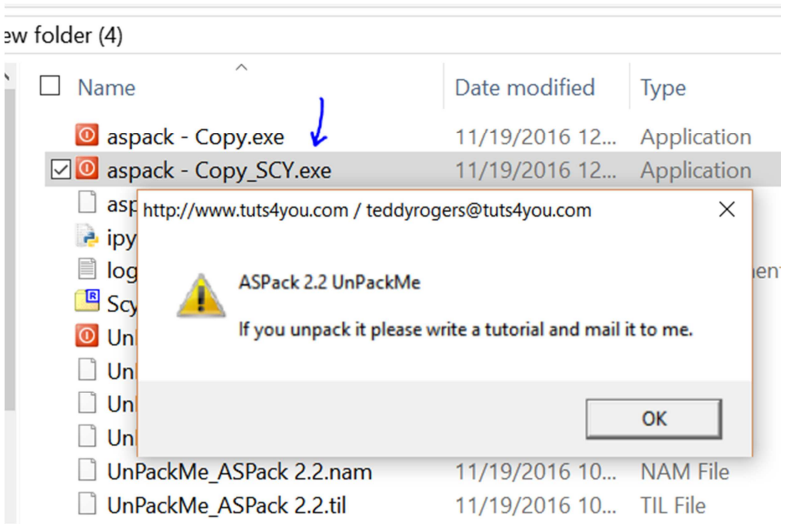


Now, the IAT starts at 0x460810. Clearing the ones that the Advanced Mode had added wrongly.

I can find the dumped file and press FIX DUMP on it.



And I can run the fixed file normally.



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