

CS 250 Software Security

Binary Code Comprehension

Some Background



- › Executable and Linkable Format
 - › <https://linux-audit.com/elf-binaries-on-linux-understanding-and-analysis/>
 - › Text, data, rodata, bss
- › Calling Conventions
 - › https://en.wikipedia.org/wiki/Calling_convention
- › Stack Layout
 - › <https://eli.thegreenplace.net/2011/02/04/where-the-top-of-the-stack-is-on-x86/>
- › Relocation and Position-Independent Code
 - › [https://en.wikipedia.org/wiki/Relocation_\(computing\)](https://en.wikipedia.org/wiki/Relocation_(computing))
 - › https://en.wikipedia.org/wiki/Position-independent_code

Constructing Simple Buffer Overflow Exploit

```
1. int IsPasswordOkay(void) {
2.     char Password[12];
3.     gets(Password);
4.     if (!strcmp(Password, "goodpass"))
5.         return(true);
6.     else return(false);
7. }

8. void main(void) {
9.     int PwStatus;
10.    puts("Enter password:");
11.    PwStatus = IsPasswordOkay();
12.    if (PwStatus == false) {
13.        puts("Access denied");
14.        exit(-1);
15.    }
16.    else puts("Access granted");
17. }
```

Preparation



- › `echo 0 > proc/sys/kernel/randomize_va_space`
- › `gcc -fno-stack-protector example01.c -o example-01`

Problem 1

- Craft a malicious input to bypass the authentication:
 - Print “access granted” instead of “access denied”

Problem 2



- ▶ Inject arbitrary code to execute
 - ▶ A shell code template is given
 - ▶ Make a working exploit that runs “ps”

Problem 3



- › Return into an existing function in libc
 - › Make a working exploit that runs “ps”