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Introduction

In our task, we aimed to craft 64-bit x86 Linux shellcode. It's designed to use the execve system function. The job is to transform the existing process into a terminal shell like /bin/sh. We'll dissect the assembly code, go through each line. We'll also talk about the shellcode length.

Shellcode Explanation:

```
.section .text
.globl _start
_start:
        xorl %eax, %eax         # Clear %eax register
        mov $59, %eax           # syscall number for execve (59 in 64-bit)
        lea shell_path(%rip), %rdi # address of "/bin/sh" (using RIP-relative addressing)
        xorl %esi, %esi         # null for command-line arguments
        xorl %edx, %edx         # null for environment variables
        syscall                 # Invoke execve syscall

        xorl %edi, %edi         # Clear %edi register (exit status)
        mov $60, %eax           # syscall number for exit (60 in 64-bit)
        syscall                 # Invoke exit syscall

.section .data
shell_path: .asciz "/bin/sh"
```

This 64-bit x86 Linux assembly shellcode, organized into sections .text and .data, begins with the _start label, the program's entry point. It initializes the %eax register to zero, representing the syscall number. Then, it loads the syscall number for execve (59 in 64-bit) into %eax and the address of the string "/bin/sh" into %rdi using RIP-relative addressing. Following this, it clears %esi and %edx, preparing them for null command-line arguments and environment variables. The syscall instruction invokes the execve syscall, executing /bin/sh. Next, it clears %edi to zero and loads the syscall number for exit (60 in 64-bit) into %eax, followed by another syscall to exit the program. Finally, the .data section defines the shell_path label, pointing to the string "/bin/sh", essential for the execve syscall. This shellcode effectively spawns a shell process and then exits.

Shellcode length

I use python script to find my shellcode bytes, this is the result

My shellcode is 435 bytes long.
Here they are: -- 2E 74 65 78 74 0A 20 20 20 20 2E 67 6C 6F 62 61 6C 20 5F 73 74 61 72 74
0A 5F 73 74 61 72 74 3A 0A 20 20 20 20 78 6F 72 6C 20 25 65 61 78 2C 20 25 65 61 78 0A 20
20 20 20 6D 6F 76 62 20 24 31 31 2C 20 25 61 6C 20 20 20 20 20 20 20 20 20 20 20 23 20 73
79 73 63 61 6C 6C 20 6E 75 6D 62 65 72 20 66 6F 72 20 65 78 65 63 76 65 0A 20 20 20 20 6C
65 61 6C 20 73 68 65 6C 6C 5F 70 61 74 68 2C 20 25 65 62 78 20 20 20 23 20 61 64 64 72 65
73 73 20 6F 66 20 22 2F 62 69 6E 2F 73 68 22 0A 20 20 20 20 78 6F 72 6C 20 25 65 63 78 2C
20 25 65 63 78 20 20 20 20 20 20 20 20 20 23 20 6E 75 6C 6C 20 66 6F 72 20 63 6F 6D 6D 61
6E 64 2D 6C 69 6E 65 20 61 72 67 75 6D 65 6E 74 73 0A 20 20 20 20 78 6F 72 6C 20 25 65
64 78 2C 20 25 65 64 78 20 20 20 20 20 20 20 20 20 23 20 6E 75 6C 6C 20 66 6F 72 20 65 6E
76 69 72 6F 6E 6D 65 6E 74 20 76 61 72 69 61 62 6C 65 73 0A 20 20 20 20 69 6E 74 20 24 30
78 38 30 0A 0A 20 20 20 20 78 6F 72 6C 20 25 65 61 78 2C 20 25 65 61 78 0A 20 20 20 20 69
6E 63 20 25 65 61 78 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 23 20 73 79 73 63 61
6C 6C 20 6E 75 6D 62 65 72 20 66 6F 72 20 65 78 69 74 0A 20 20 20 20 69 6E 74 20 24 30 78
38 30 0A 0A 2E 73 65 63 74 69 6F 6E 20 2E 64 61 74 61 0A 20 20 20 20 73 68 65 6C 6C 5F 70
61 74 68 3A 20 2E 61 73 63 69 7A 20 22 2F 62 69 6E 2F 73 68 22 0A

Conclusion

In conclusion, the assembly code successfully achieves the goal of invoking the execve system call to execute the shell at /bin/sh. The shellcode length was determined, and its ASCII representation was examined using the provided Python script. But my shellcode takes a lot of bytes 435 bytes. I will look into more efficient way in the future