Assembler 101

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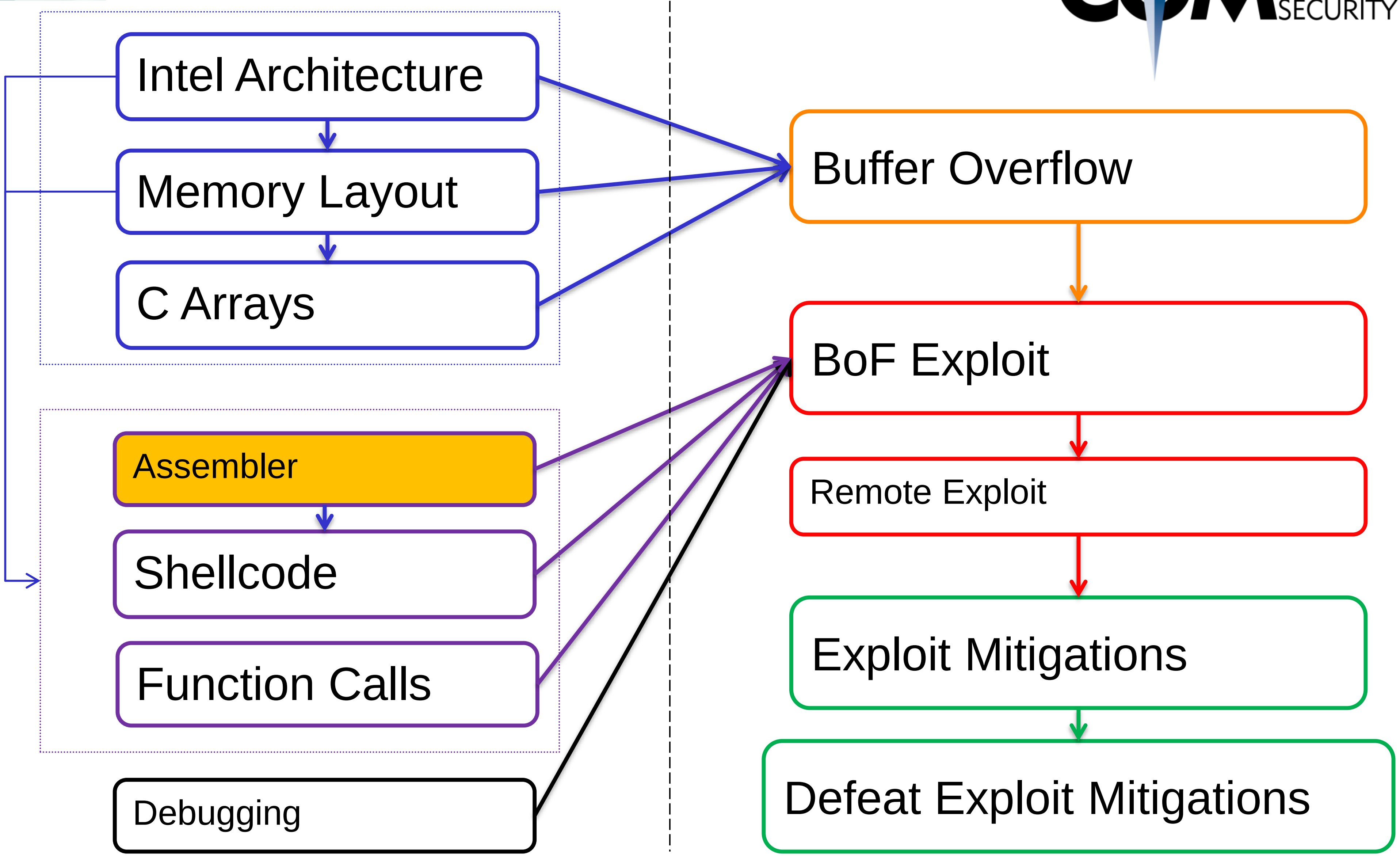
Content



Intel Architecture

Memory Layout

C Arrays

Assembler

Shellcode

Function Calls

Debugging

Buffer Overflow

BoF Exploit

Remote Exploit

Exploit Mitigations

Defeat Exploit Mitigations

Short Assembler Intro

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Assembler Intro

Initialize a variable

```
int number;

number += 1
```

```
number dw 0

mov number, eax

inc eax

mov eax, number
```

Assembler Intro

Array on the stack

```
char test[5];

test[0] = 1;

test[3] = 9;
```

```
sub     $0x10,%esp

movb    $0x1,-0x5(%ebp)

movb    $0x9,-0x2(%ebp)
```

Assembler Intro

Array on the heap

```
char *test = malloc(5);





test[3] = 9;
```

```
sub     $0x28, %esp
movl    $0x5, (%esp)
call    8048300 <malloc@plt>
mov     %eax, -0xc(%ebp)
mov     -0xc(%ebp), %eax
add     $0x3, %eax
movb    $0x9, (%eax)
```

Conditional statement

```
if (number < 0) {
   <yes>
}
<no>
```

```
number dw 0
mov number, eax
cmp eax, 0
jge label     # jump greater equal
<yes>
label:
<no>
```

Assembler Intro

Loop

```
int n;

for(n=0; n<12; n++)

{

  printf(“A”);

}
```

```
03    sub     $0x28,%esp

06    movl    $0x0,-0xc(%ebp)

13    jmp     0x8048403 <bla+31>

15    movl    $0x41,(%esp)

22    call    0x8048320 <putchar>

27    addl    $0x1,-0xc(%ebp)

31    cmpl    $0xb,-0xc(%ebp)

35    jle     0x80483f3 <bla+15>
```

Online Assemblers

Compile Online with NASM

- https://www.jdoodle.com/compile-assembler-nasm-online
- https://www.tutorialspoint.com/compile_assembly_online.php

Decompile C source Code:

- https://godbolt.org/
- https://retdec.com/decompilation-run/