Practical Reversing V – Exploit Development Basics

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Reversing & Malware Analysis Training

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For complete details of this course, visit our Security Training page.

Who am I #1

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Contents

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- Classification of exploits
- Exploitation Techniques
  - Direct EIP overwrite
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Vulnerability

- In computer security, a vulnerability is a weakness which allows an attacker to reduce a system's information assurance.
- Vulnerability is the intersection of three elements: a system susceptibility or flaw, attacker access to the flaw, and attacker capability to exploit the flaw.

- Source: Wikipedia

Exploit

- Piece of software/code that takes advantage of a vulnerability in order to cause unintended or unanticipated behaviour to occur on computer software, hardware [Wiki]
- This frequently includes
  - gaining control of a computer system or
  - privilege escalation or
  - a denial-of-service attack.

Exploit (contd)

- Exploits can be in any form based on the software it exploits:
- Software : exploit
  - Adobe reader : pdf file
  - Microsoft word : doc file
  - Microsoft excel : xls file
  - Internet Explorer : Attacker hosted website or html file
  - and so on..

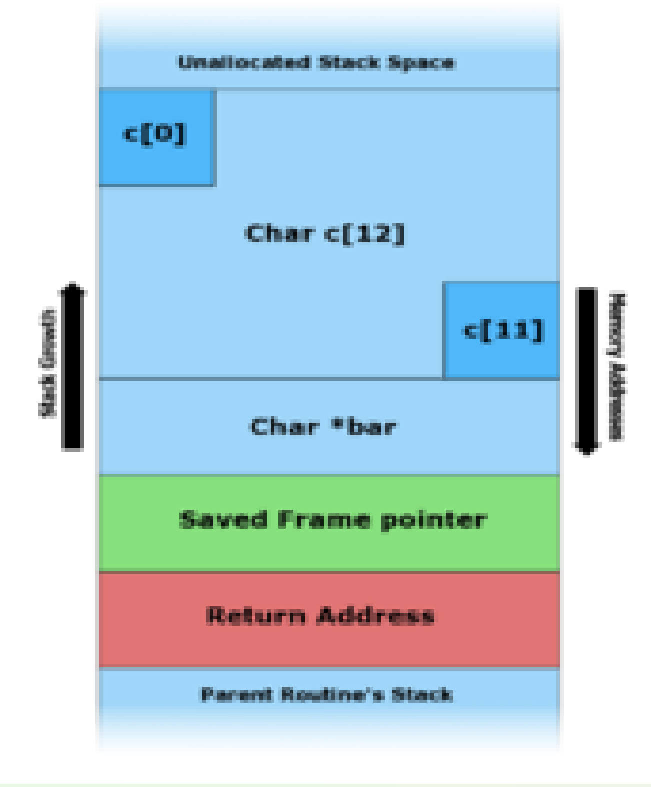
Classification

- Based on the vulnerability they exploit
  - Buffer Overflow, Memory Corruption, Use-After-Free
- Local or Remote
  - Local Privilege Escalation, Remote code execution
- Result of running the exploit
  - DoS, EoP etc

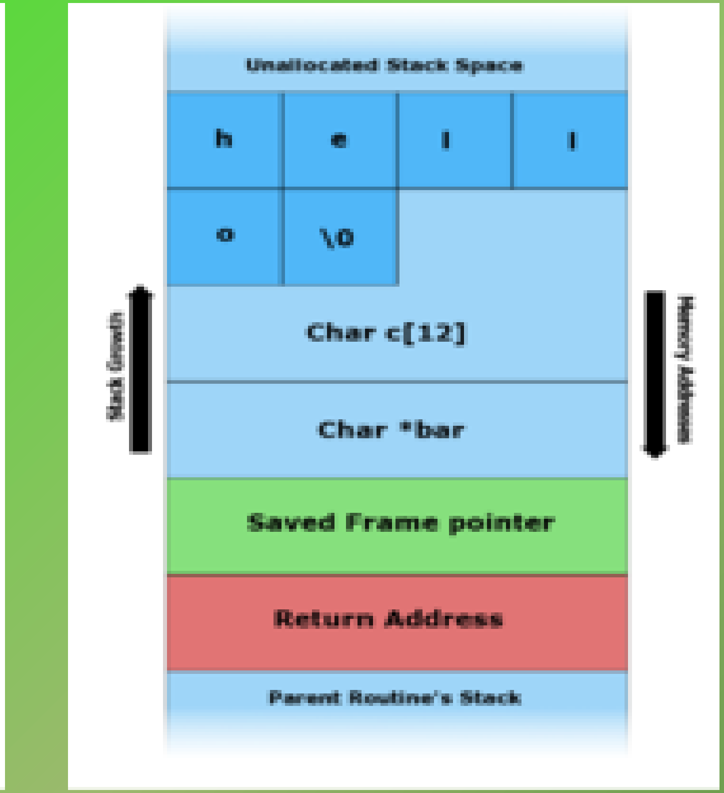
Stack Buffer Overflow

- Occurs when a program writes to memory addresses on the stack outside of the allocated buffer
- For exploiting a stack based buffer overflow is to overwrite the function return address with a pointer to attacker-controlled data (usually on the stack itself)

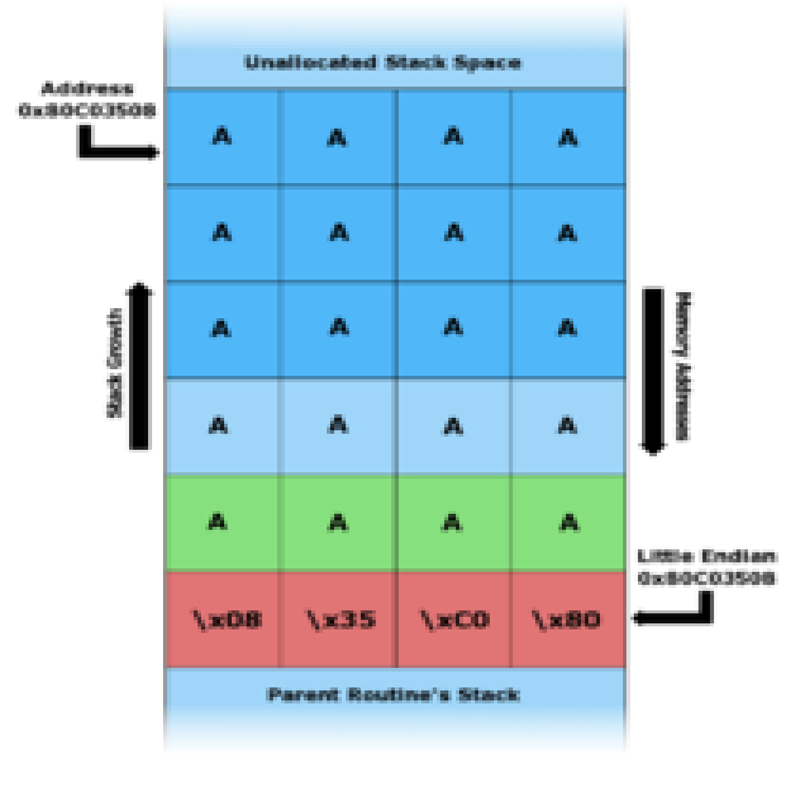
Stack Buffer Overflow in Action



A - Before data is copied.



B - "hello" is the first command line argument.



C - AAAAAAAAAAAAAAAAAAAA\x08\x35\xC0\x80" is the first command line argument.

Direct EIP overwrite (saved ret)

- Every Windows uses process memory that contains 3 major components :
  - code segment (executable instructions). The EIP keeps track of the next instruction
  - data segment (variables, dynamic buffers)
  - stack segment (used to pass data/arguments to functions, and is used as space for variables)
    - The stack starts (= the bottom of the stack) from the very end of the virtual memory of a page and grows upwards (to a lower address).
    - PUSH adds something to the top of the stack,
    - POP will remove one item (4 bytes) from the stack and puts it in a register.

EIP Overwrite Demo

- A vulnerability in
  - “Shadow Stream Recorder version 3.0.1.7
  - Buffer overflow when reading file (.asx)

Step -1 : Create a PoC to generate a crash in the software to verify the vuln

Step -2 : Find the offset to overwrite EIP

Step -3: Find an address of the “jmp esp” instruction

Step -4: Generate a shellcode and append it to the exploit code

Step -5: Putting it all together

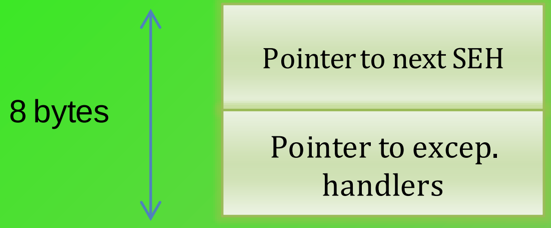
DEMO - EIP

- http://www.youtube.com/watch?v=erl_Aee8oDg

SEH Overwrite

- Exception?
  - An event which disrupts normal execution flow of code and requires execution outside normal flow
  - Software Exception –Generated by program (e.g Invalid file handle)
  - Hardware Exception – Access invalid memory, divide by zero etc
- SEH (structured exception handler)
  - Patented by Borland and licensed to Microsoft
  - Software's method of dispatching and handling exceptions
  - Can handle both software and hardware exceptions
  - For eg try{ } ; except { }; block
  - Whenever an exception happens control is passed on to the OS, which in turn locate and pass the control to the handler chain

SEH Overwrite in Action

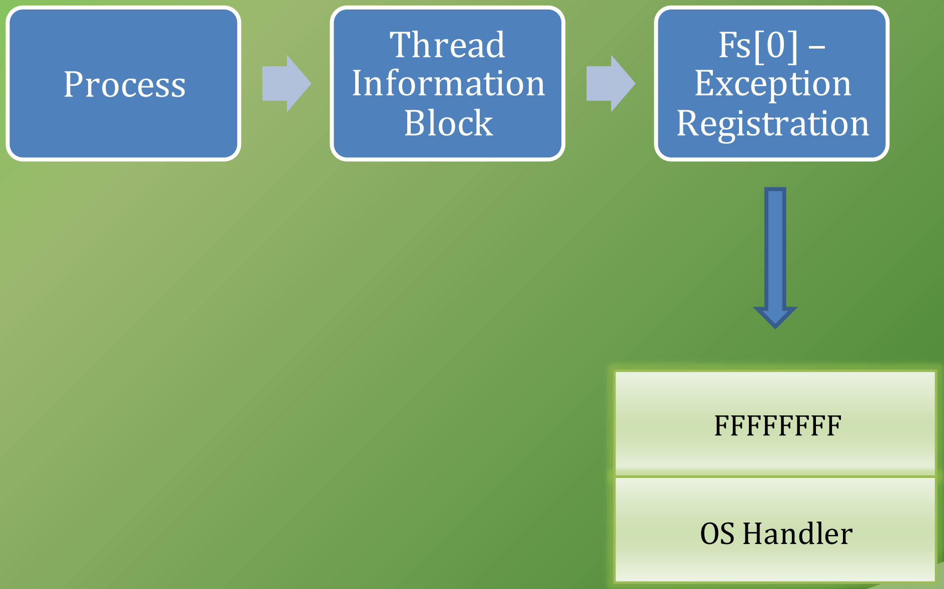


8 bytes

Pointer to next SEH

Pointer to excep. handlers

Exception Registration Record



Process

Thread Information Block

Fs[0] – Exception Registration

FFFFFFFF

OS Handler

Default ERR

SEH Overwrite Demo

- A vulnerability in
  - “MM Player 2.2
  - Buffer overflow when reading file (.ppl)

Step -1 : Create a PoC to generate a crash in the software to verify the vuln

Step -2 : Find the offset to overwrite nSEH + SEHandler

Step -3: Find an address of the command sequence “pop pop ret ”

Step -4: Generate a shellcode and append it to the exploit code

Step -5: Putting it all together

SEH Overwrite Demo

- http://www.youtube.com/watch?v=njQ47H7jO4s&feature=youtu.be

Reference

- Complete Reference Guide for Reversing & Malware Analysis Training

Thank You !

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