Practical Reversing (I)

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Reversing & Malware Analysis Training

This presentation is part of our **Reverse Engineering & Malware Analysis** Training program. Currently it is delivered only during our local meet for FREE of cost.

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

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Outline

- Break Point
- Debug Registers
- Flags
- API Help

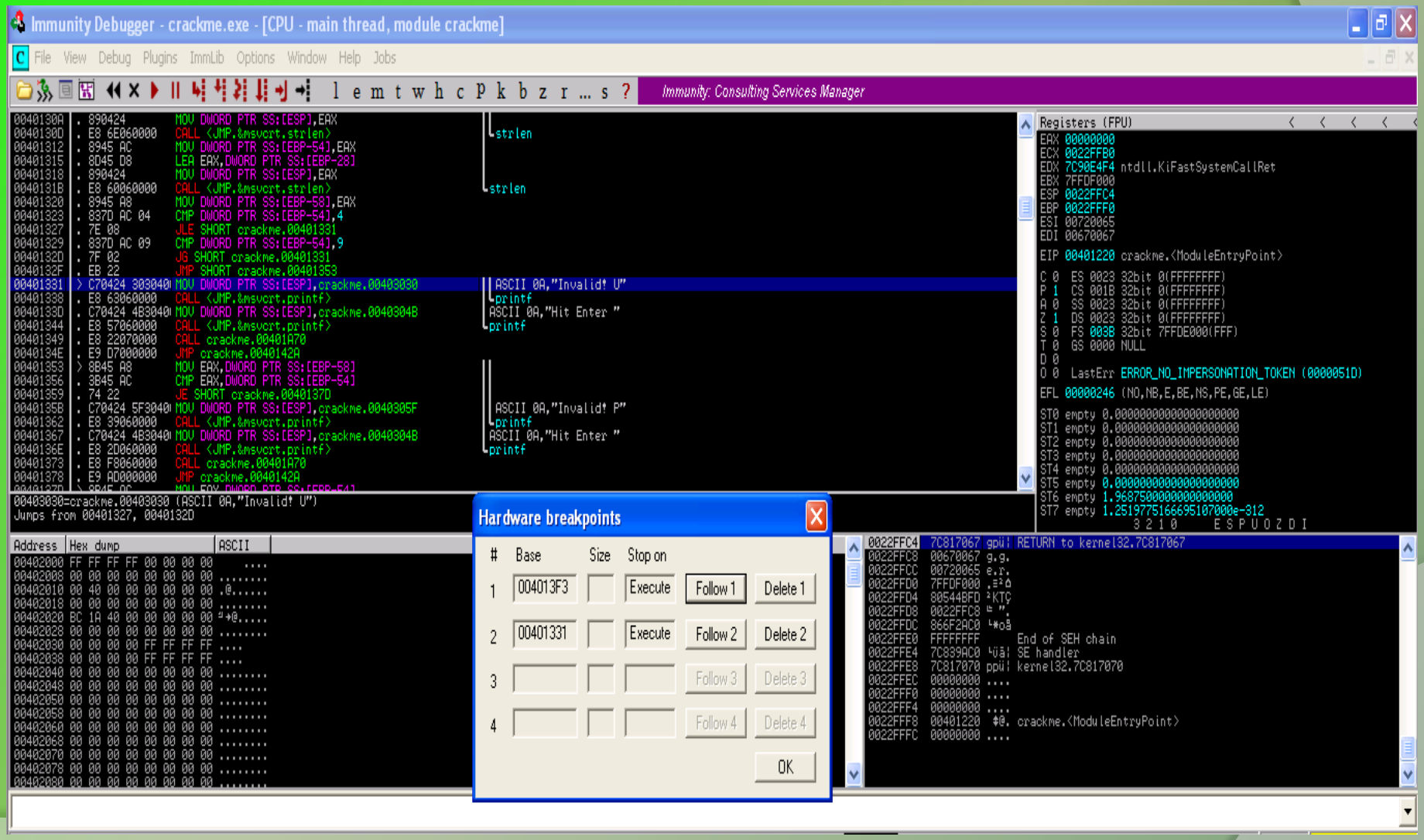
Types of Breakpoints

- Software
- Hardware
- Memory

Breakpoint

- Software breakpoints are set by replacing the instruction at the target address with 0xCC (INT3/ Breakpoint interrupt)
- Hardware breakpoints are set via debug registers. Only 4 hardware breakpoints can be set
- Debug registers:
  - 8 debug registers present
  - DR0 – DR3 : Address of breakpoint
  - DR6 : Debug Status – To determine which breakpoint is active
  - DR7 : Debug Control – Flags to control the breakpoints such as break on read or on-write
- Debug registers are not accessible in Ring 3

Hardware Breakpoints



Memory

- To access memory, need of permissions
- Lots of permissions
  - PAGE_GUARD
  - PAGE_READWRITE
  - PAGE_EXECUTE
  - PAGE_EXECUTE_READ
- To set memory breakpoint,
  - the permissions of that memory region is set to PAGE_GUARD
  - whenever an access is made to that memory STATUS_GUARD_PAGE_VIOLATION exception is raised
  - On getting the exception the debugger changes the permission back to the original
  - Notifies the user of the breakpoint

Breakpoints

DEMO

Flags (Eflags Register)

- 1 register – 32 bits
- Each bit signifies a flag
- Few important ones are:

Bit #	Abbreviation	Description
0	CF	Carry flag
2	PF	Parity flag
4	AF	Adjust flag
6	ZF	Zero flag
7	SF	Sign flag
8	TF	Trap flag (single step)
9	IF	Interrupt enable flag
11	OF	Overflow flag

Flags Demystified

- **Carry flag** is used to indicate when an arithmetic carry or borrow has been generated out of the most significant ALU bit position
- **Parity flag** indicates if the number of set bits is odd or even in the binary representation of the result of the last operation
- **Adjust flag** is used to indicate when an arithmetic carry or borrow has been generated out of the 4 least significant bits
- **Zero Flag** is used to check the result of an arithmetic operation, including bitwise logical instructions. It is set if an arithmetic result is zero, and reset otherwise
- **Sign flag** is used to indicate whether the result of last mathematic operation resulted in a value whose most significant bit was set
- A **trap flag** permits operation of a processor in single-step mode
- **Overflow flag** is used to indicate when an arithmetic overflow has occurred in an operation, indicating that the signed two's-complement result would not fit in the number of bits used for the operation

Basic Reversing Techniques

- Check for readable strings
- Import table (IAT) for imported Windows API
- Setting breakpoint on interesting API
- Single stepping

Variables

- Found under **Names** tab
  - L - library function
  - F - regular function
  - C - instruction
  - A - ascii string
  - D - data
  - I - imported name

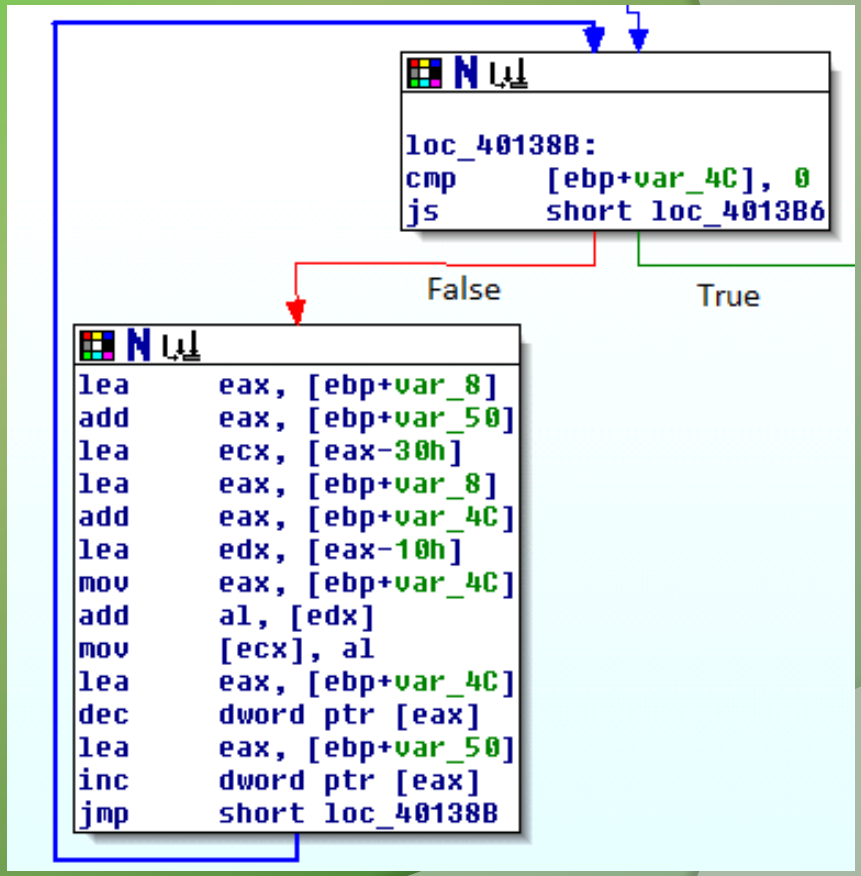
Contd..

```
shr     eax, 4
shl     eax, 4
mov     [ebp+var_6C], eax
mov     eax, [ebp+var_6C]
call    ___chkstk
call    ___main
add     dword_402000, 5
mov     dword ptr [esp], offset aCrackme ; "#Crackme\n\n"
call    printf
```

- Global variables are generally dword_<address>
  - dword_402000 – as shown in image
- Local variables are of the form var_<offset>
  - var_6C – as shown in image

Loop in IDA

- Red Line
  - If condition is false
  - (zero flag = 0)
- Green Line
  - If condition is true
  - (zero flag = 1)



Reversing a Simple Crackme

DEMO

Crackme Code

```
#include <stdio.h>
#include <string.h>
#include <stdlib.h>

int main()
{
   char a[10],b[10],c[10],d[10];
   int i,j,k,l,r,s;
   printf("#Crackme\n\n");
   printf("enter username: ");
   scanf("%s",a);
   printf("enter password: ");
   scanf("%s",b);
   k = strlen(a);
   l = strlen(b);
   if (k <5 || k >=10){
       printf("\nInvalid! Username Length\n");
       printf("\nHit Enter to Exit\n");
       getchar();
   } else {
   if (l != k){
       printf("\nInvalid! Password Length\n");
       printf("\nHit Enter to Exit\n");
      getchar();
   } else {
      i = k-1;
      j = 0;
      while (i >= 0){
           c[j] = a[i]+i;
           i--;
           j++;
      }
      c[j] = 0;
      r = strlen(c);
      if (r == l){
           i = strcmp(c,b);
           if (i == 0){
             printf("\nCongratulations! You did it..\n");
             printf("\nHit Enter to Exit\n");
           } else {
             printf("\nAccess Denied! Wrong Password\n");
```

References

- Complete Reference Guide for Reversing & Malware Analysis Training

Thank You !

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