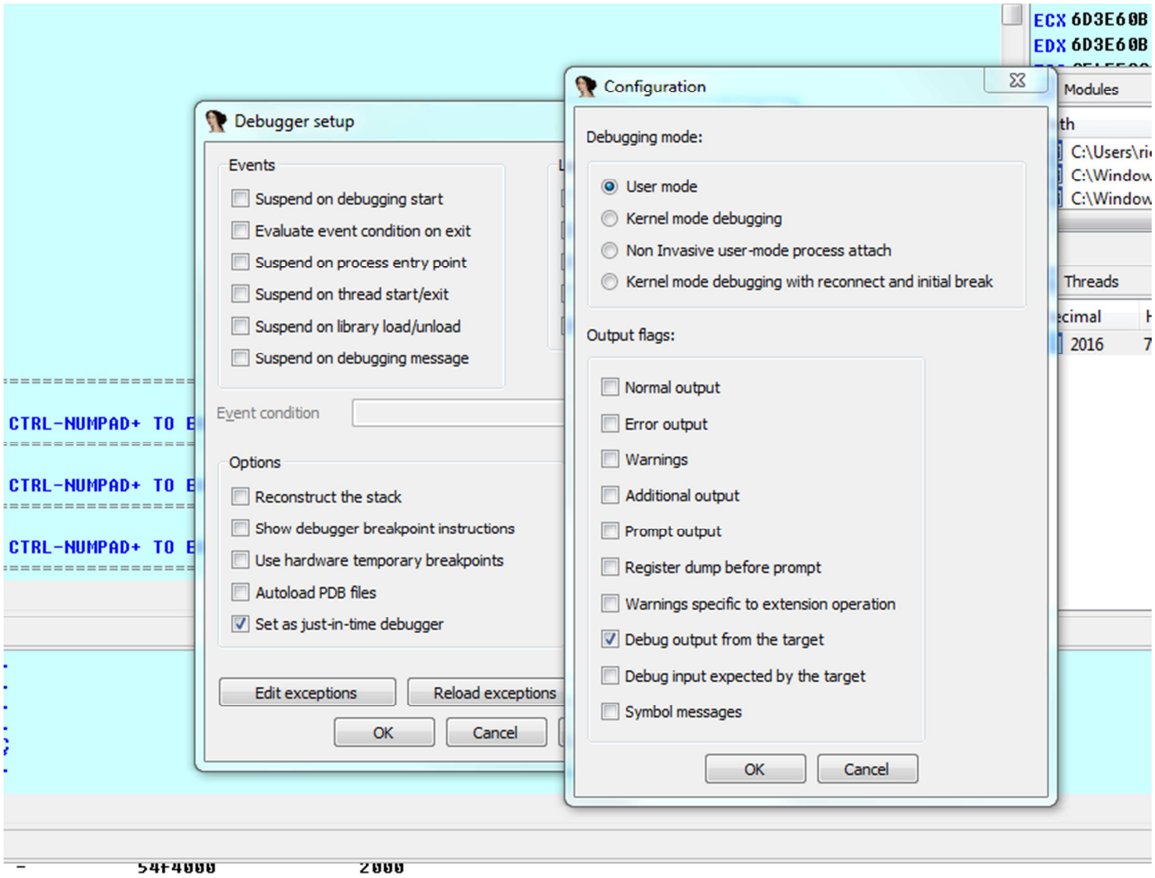
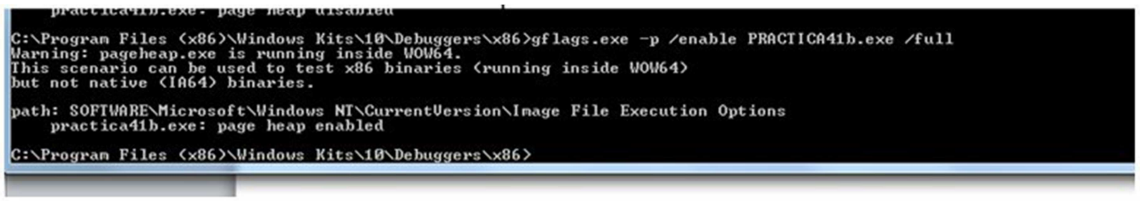
PART 44

We have the exercise PRACTICA_44 to solve it, but we will do it in the next parts. Now, we will see some more info that we can get using Windbg inside IDA. We'll use the previous case of PRACTICA 41 b that we know it was a heap overflow.

We'll change from IDA debugger to Windbg and check that it is in USER mode in DEBUGGER OPTIONS.



Change the gflags to have the PAGE HEAP enabled in the process in Full Mode.



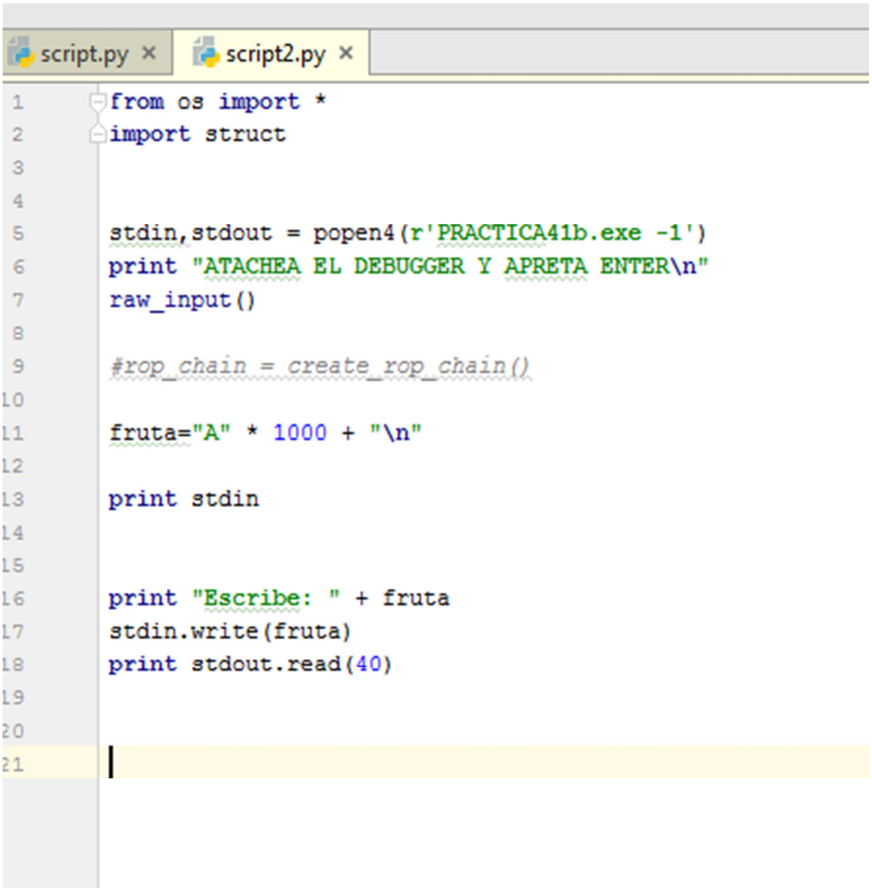
Voy hasta el path donde está el gflags.exe en la misma carpeta que esta el windbg.exe y cambio a que este habilitado el PAGE HEAP en modo FULL con.

gflags.exe -p /enable PRACTICA41b.exe /full

I go to gflags.exe path in the same windbg.exe folder and change it to enable the PAGE HEAP in FULL mode with:

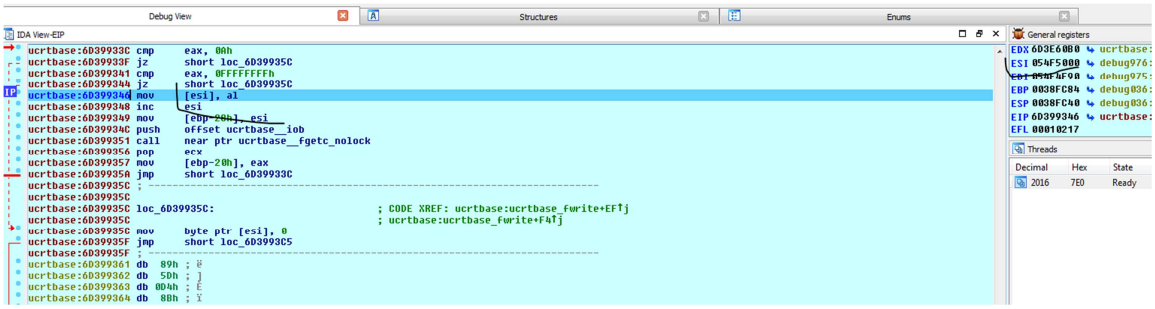
gflags.exe -p /enable PRACTICA41b.exe /full

Run script2.

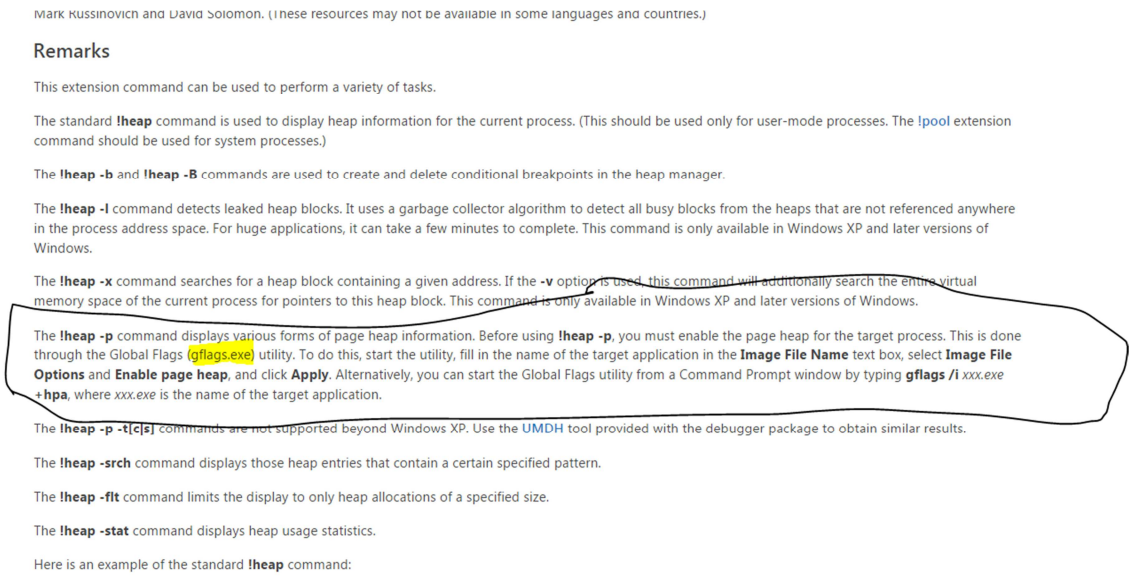


But, this time, when it stops, I attach IDA with the PRACTICA41b analysis loaded in the LOADER and, of course, in Debugger Mode Windbg user.

Logically, it will crash like before when it tries to write outside the allocated block and it overflows.



For this, you have to set Windbg well inside IDA. Anyways, if you had problems to install Windbg and IDA doesn't recognize it, you can attach Windbg outside IDA and type the commands there. You won't have the IDA interface, but you'll have the same info.



Mark Russinovich and David Solomon. (These resources may not be available in some languages and countries.)

Remarks

This extension command can be used to perform a variety of tasks.

The standard **!heap** command is used to display heap information for the current process. (This should be used only for user-mode processes. The !pool extension command should be used for system processes.)

The **!heap -b** and **!heap -B** commands are used to create and delete conditional breakpoints in the heap manager.

The **!heap -l** command detects leaked heap blocks. It uses a garbage collector algorithm to detect all busy blocks from the heaps that are not referenced anywhere in the process address space. For huge applications, it can take a few minutes to complete. This command is only available in Windows XP and later versions of Windows.

The **!heap -x** command searches for a heap block containing a given address. If the **-v** option is used, this command will additionally search the entire virtual memory space of the current process for pointers to this heap block. This command is only available in Windows XP and later versions of Windows.

The **!heap -p** command displays various forms of page heap information. Before using **!heap -p**, you must enable the page heap for the target process. This is done through the Global Flags (gflags.exe) utility. To do this, start the utility, fill in the name of the target application in the **Image File Name** text box, select **Image File Options** and **Enable page heap**, and click **Apply**. Alternatively, you can start the Global Flags utility from a Command Prompt window by typing **gflags /i** *xxx.exe* **+hpa**, where *xxx.exe* is the name of the target application.

The **!heap -p -t[c|s]** commands are not supported beyond Windows XP. Use the UMDH tool provided with the debugger package to obtain similar results.

The **!heap -srch** command displays those heap entries that contain a certain specified pattern.

The **!heap -flt** command limits the display to only heap allocations of a specified size.

The **!heap -stat** command displays heap usage statistics.

Here is an example of the standard **!heap** command:

Windbg has a lot of uselful heap commands. I think that to work with heaps it is the most complete.

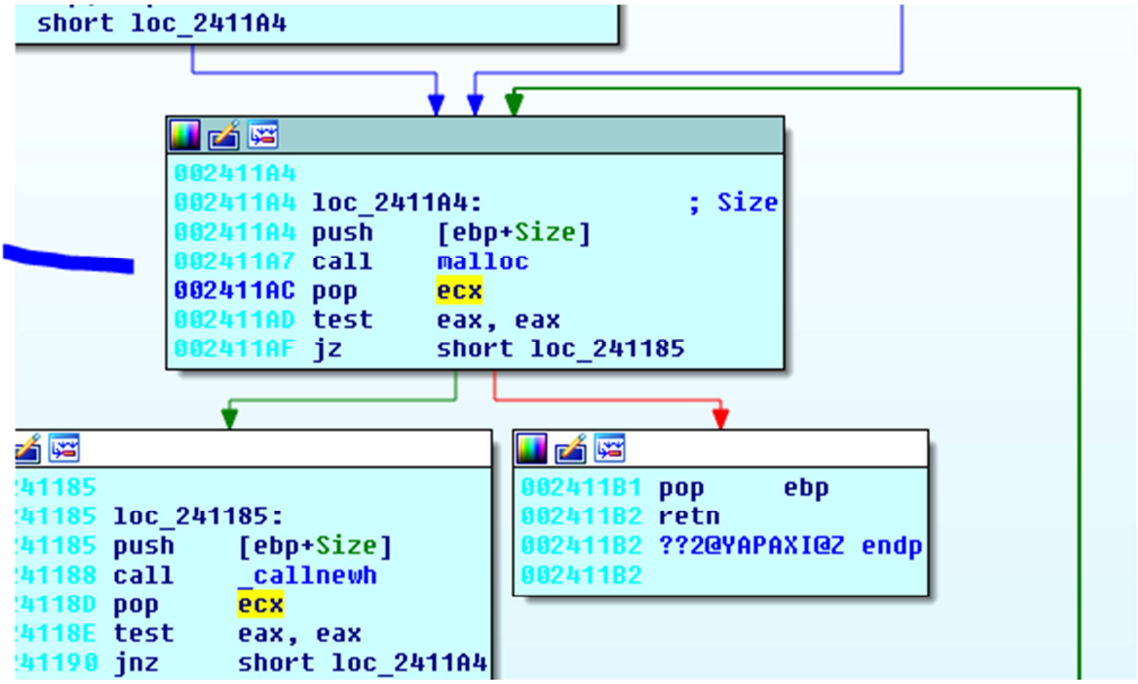
```
WINDBG>!heap -p -a esi
    address 054f5000 found in
    _DPH_HEAP_ROOT @ 3ce1000
    in busy allocation (  DPH_HEAP_BLOCK:         UserAddr         UserSize -         VirtAddr         VirtSize)
                                 54d16b4:          54f4f90               6c -          54f4000             2000
    59e58e89 verifier!AVrfDebugPageHeapAllocate+0x00000229
    77631d4e ntdll!RtlDebugAllocateHeap+0x00000030
    775eb586 ntdll!RtlpAllocateHeap+0x000000c4
    77593541 ntdll!RtlAllocateHeap+0x0000023a
    6d345e7b ucrtbase!malloc+0x0000002b
    002411ac PRACTICA41b+0x000011ac
    0024109d PRACTICA41b+0x0000109d
    0024136a PRACTICA41b+0x0000136a
    75a2338a kernel32!BaseThreadInitThunk+0x0000000e
    77599a02 ntdll!__RtlUserThreadStart+0x00000070
    775999d5 ntdll!_RtlUserThreadStart+0x0000001b
```

That command is very useful. It just works completely with the page heap full enabled. We see it tells me the allocated block size that it is used or busy (not free) and tells me the place history where it passed when that block was allocated.

If we had run the same command in a block that was freed or **free**, it would tell us the history of those places where it was freed.

The allocation comes from:

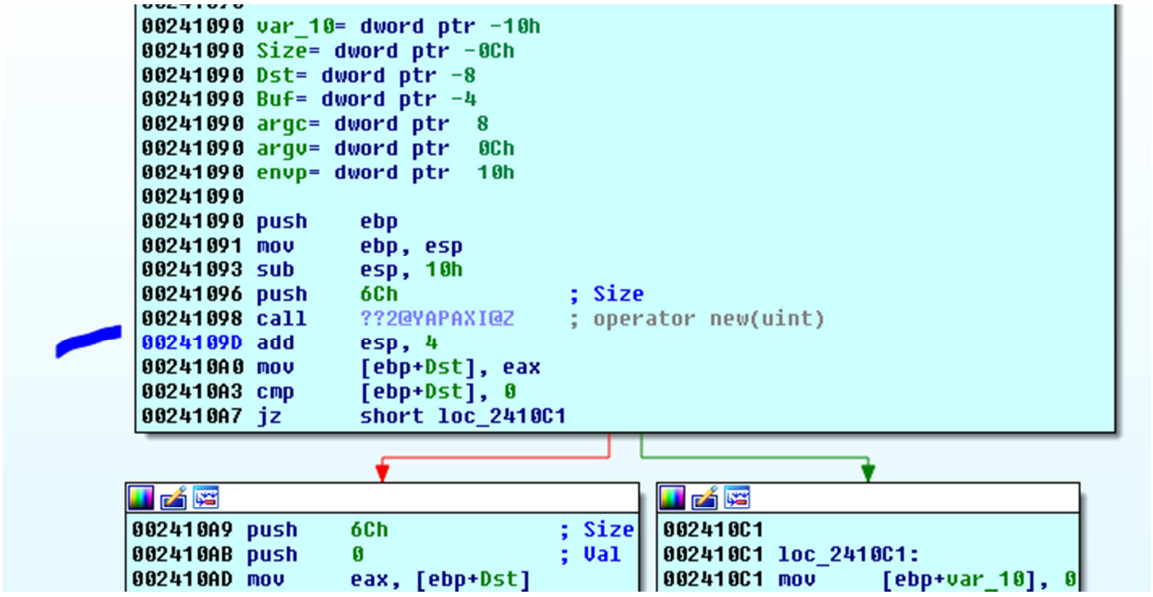
002411ac PRACTICA41b+0x000011ac



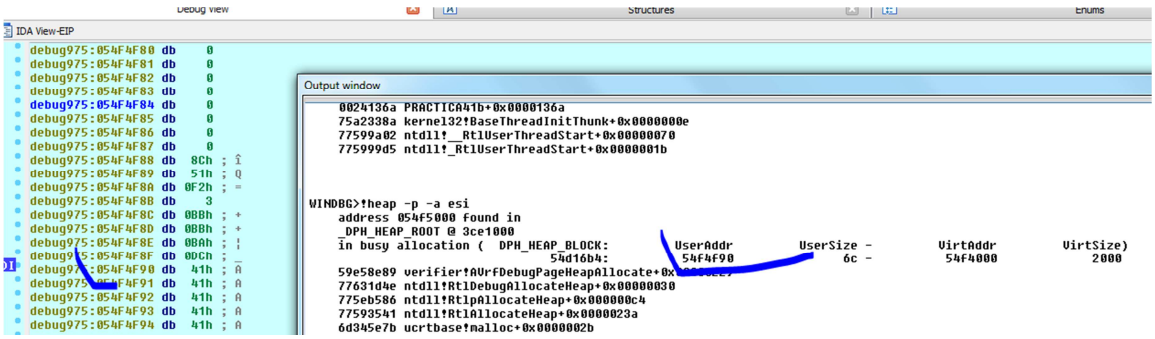
And above in the history list, we see how it calls malloc. Then, it internally calls RtlAllocateHeap, etc.

Downwards in the history list, we have:

0024109d PRACTICA41b+0x0000109d

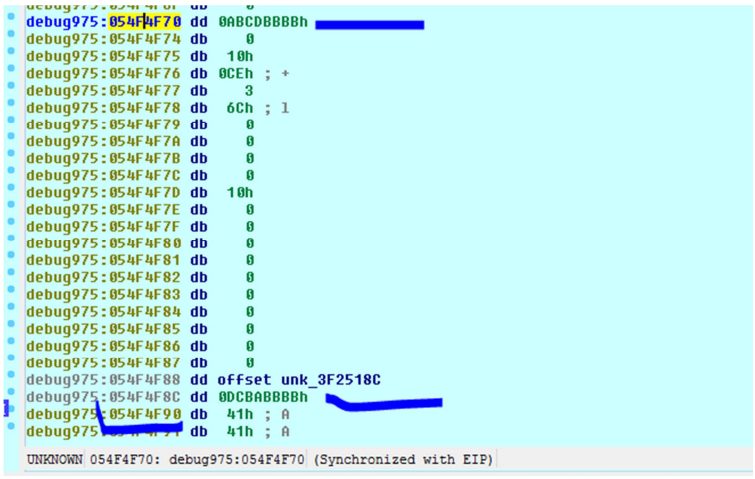


We see it marks the calls return address where it entered to allocate.



It shows the user address that is the block start for the user where it can be written. The block header is before.

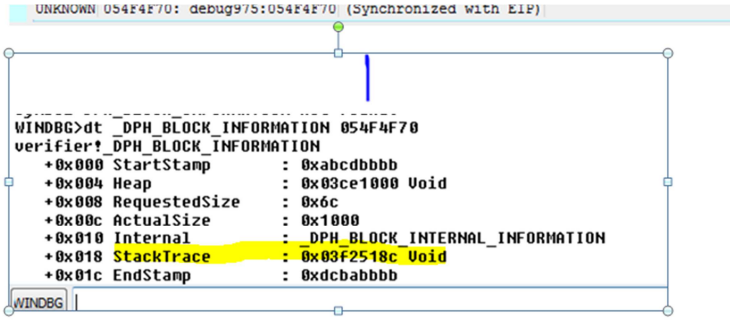
In Microsoft WEB, we see the header info, in this case, for the heap in Full Page Mode. It starts with ABCDBBBB and ends with DCABBBBB, Let's check if we see it just before the start where we wrote.

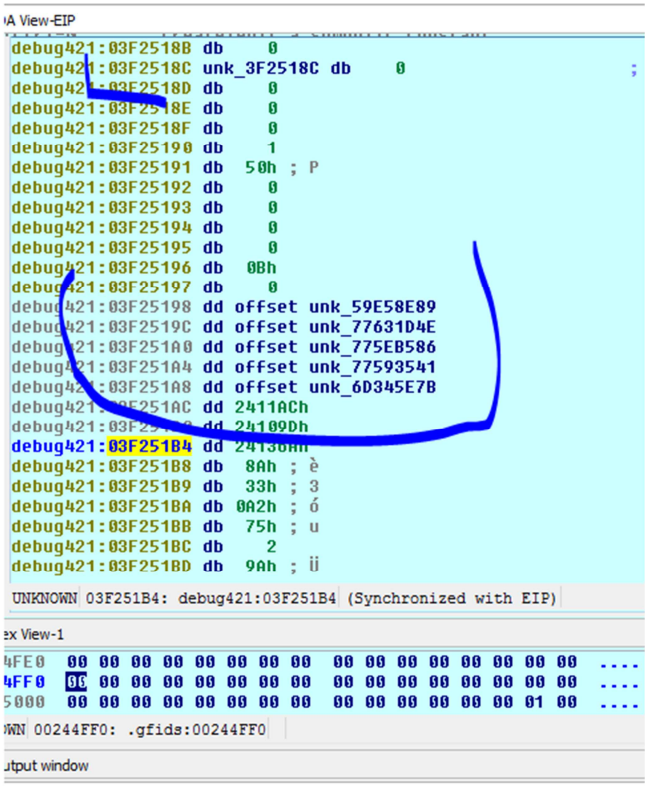


With the Windbg dt command followed by _DPH_BLOCK_INFORMATION it will give info about the header fields.

Con el comando dt del Windbg seguido de _DPH_BLOCK_INFORMATION nos dará la información de los campos del header.

If we go to the address pointed by the stack trace…





We see that a little down, it saves the allocation history. It matches with what the command gave us.

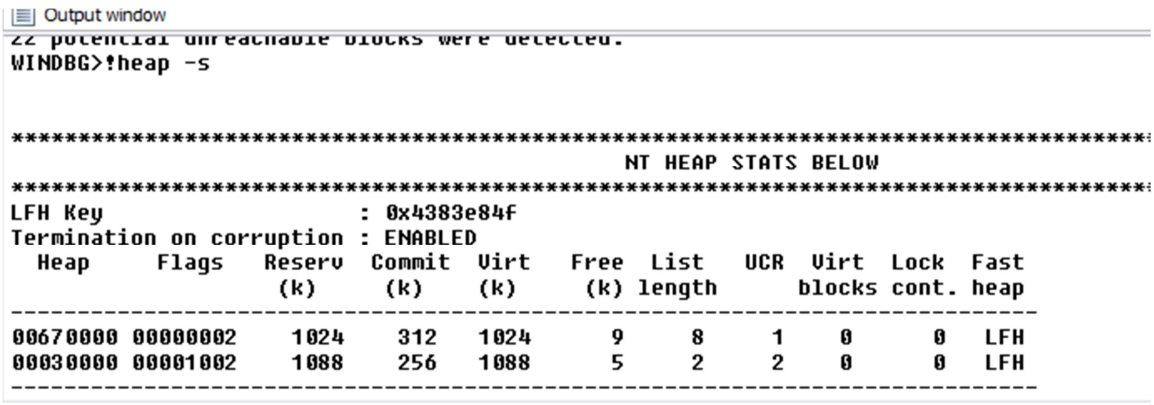
¡heap –p –a xxx

Now, we'll try what info it gives us when we use it with a normal heap. Obviously, it won't be that specific nor have the history of each block.

I disable the Page Guard Full.

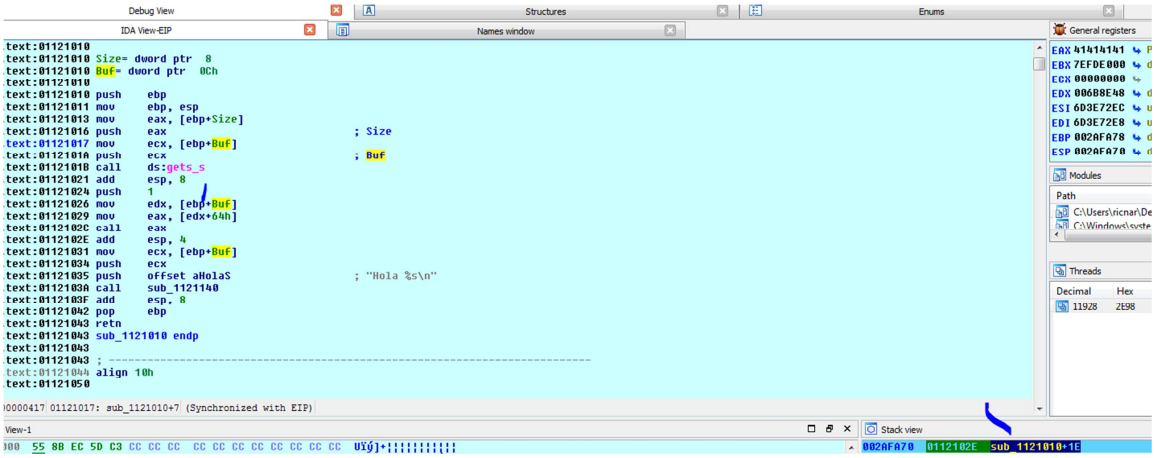
I run the script again and when it stops, I attach IDA again with the analysis and the local Windbg debugger as before.

Logically, we don't have the same info and the program crashed when it jumped to execute. Let's see the heap.

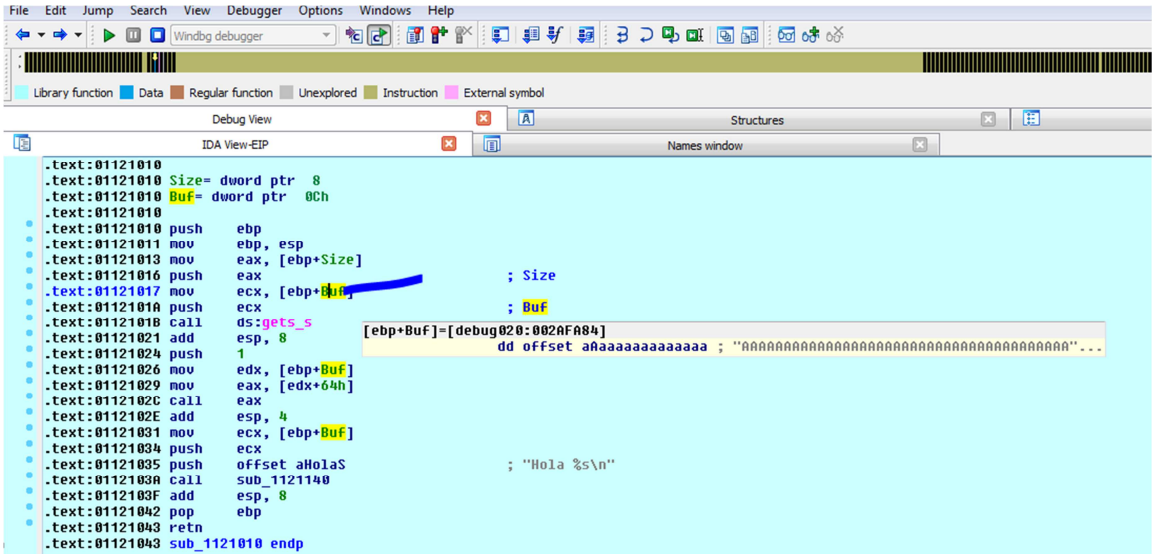


The heap stats.

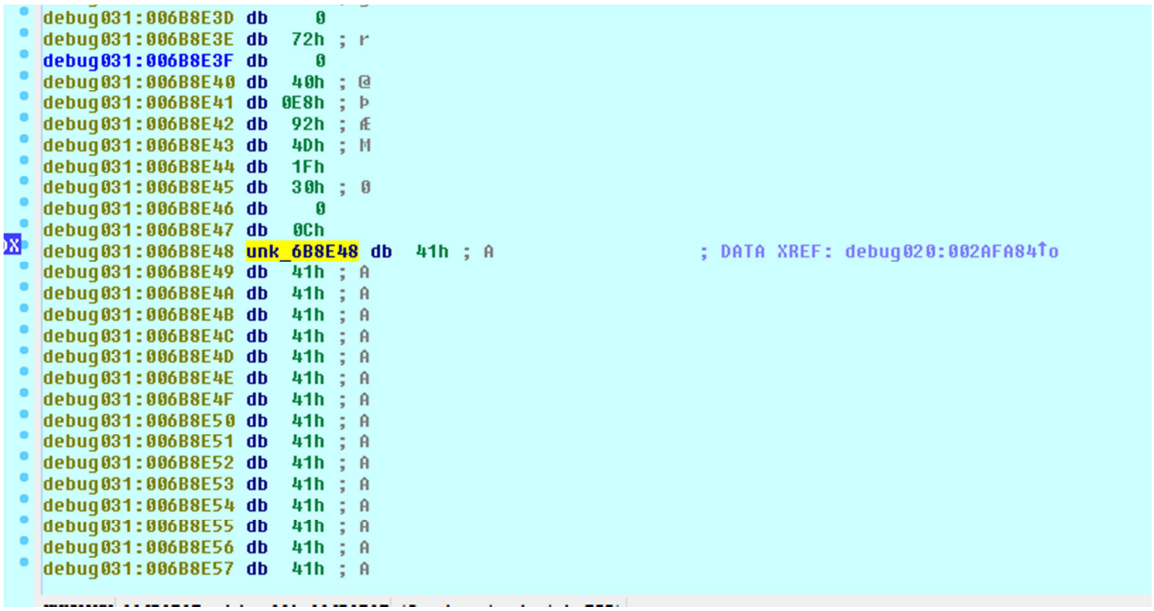
If we go to the zone where it jumped, looking at the stack, we know it comes from there.

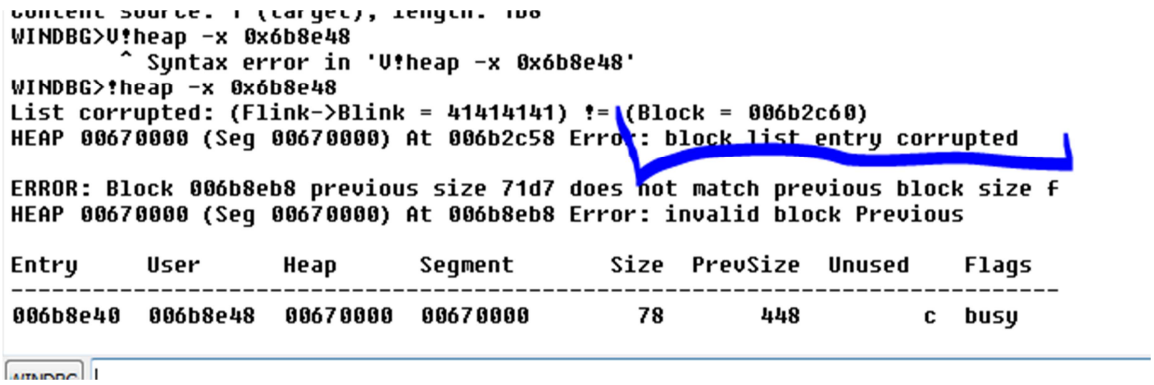


And we see that EBP didn't change and as we know the program, we'll cheat looking at the buffer value to which we passed a **gets_s** that is the allocated block start. Now, it copies there. It is passed as an argument (obviously, we can do this because it is a simple program and to learn, if not, we have to enable the **Page Guard** and do what we saw before)



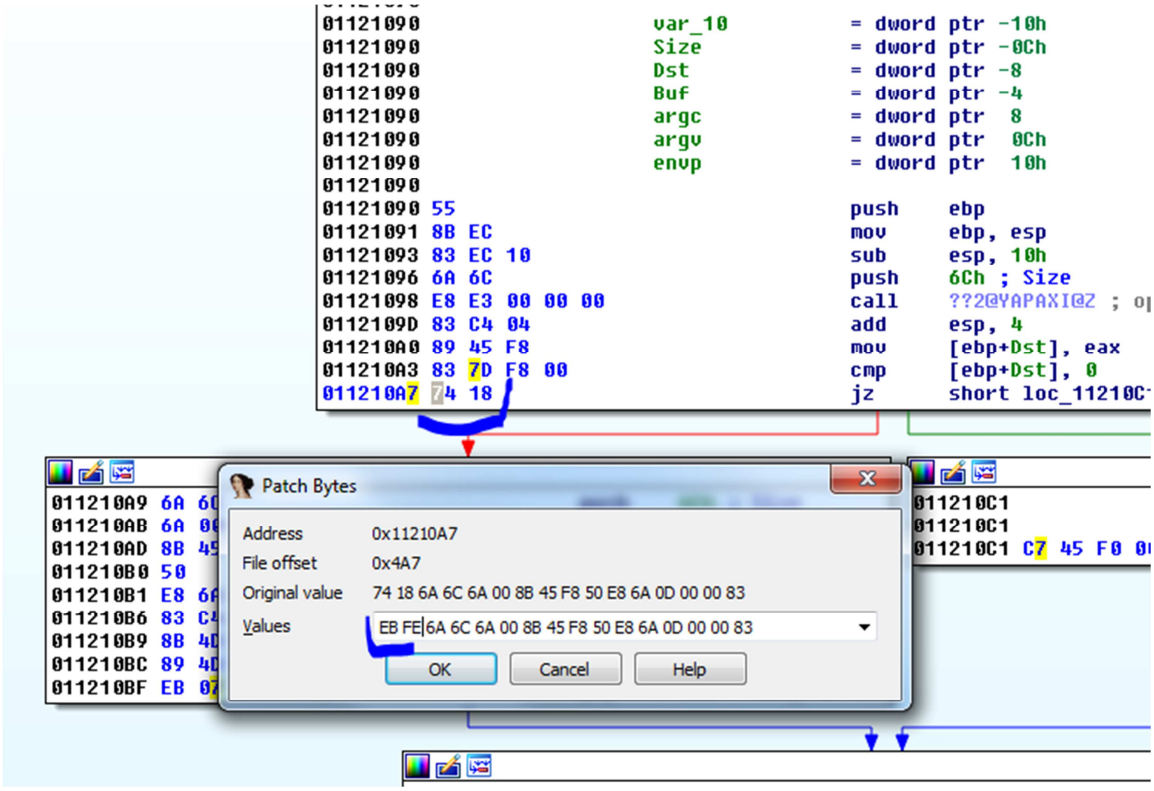
The Buf variable continues pointing to the heap block start. So, we can go there.





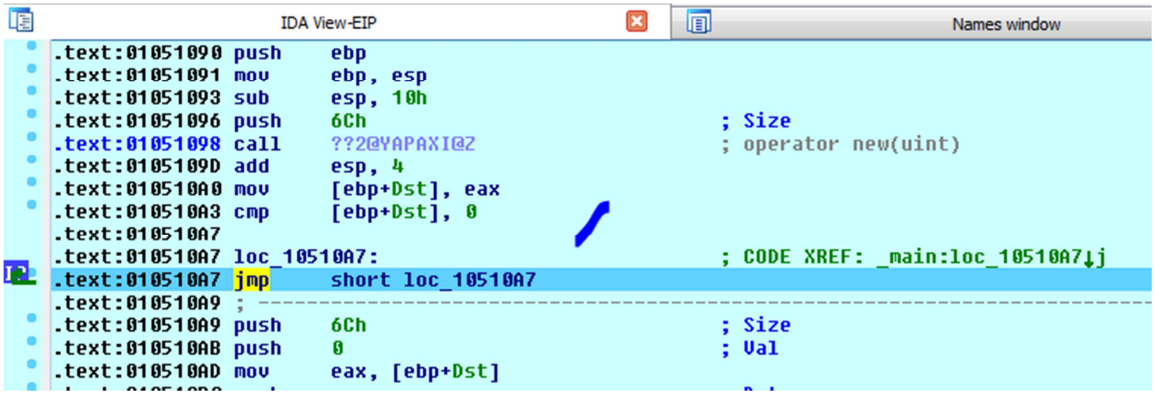
It is corrupted. We know that.

Obviously, as all is broken, we'll try to attach it before it breaks the heap to see a block info. I can't run it directly in IDA because it runs that in debug mode to the heap. So, I we assemble an EB FE at the start to leave it looping and when I run it, I will attach it.

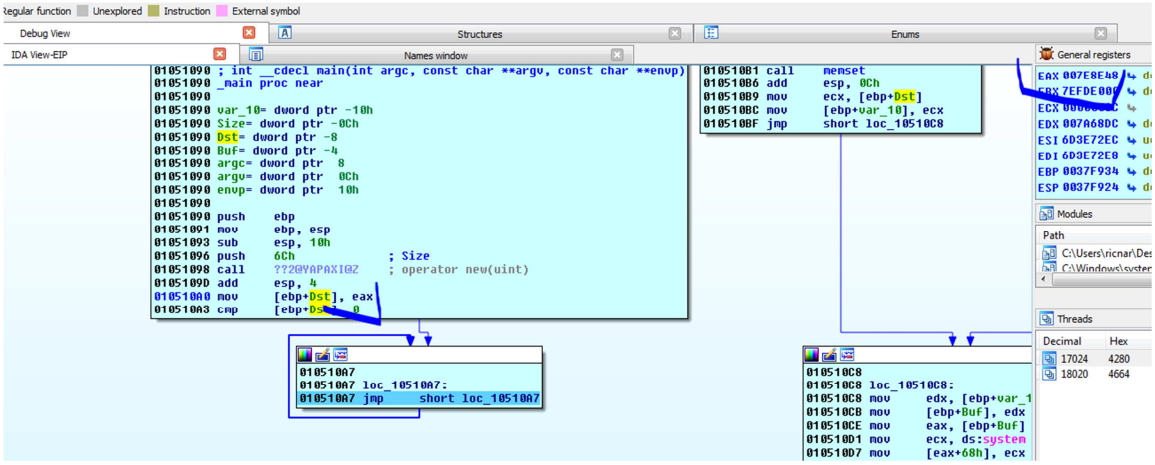


I'll change the **74 18** of the conditional jump to **EB FE**. Then, **EDIT-PATCH PROGRAM- APPLY PATCH TO INPUT FILE.**

Now, I run the script. When it is looping, I stop there. As it already passed through the malloc, I can see the heap.



After allocating EAX, it remains with the block address.



Let’s see what it says.

```
Expected data back.
WINDBG>!heap -x eax
Entry     User      Heap      Segment       Size  PrevSize  Unused    Flags
-----------------------------------------------------------------------------
007e8e40  007e8e48  007a0000  007a0000        78       448         c  busy
```

As User is always the writable part and Entry is the header start, let’s see.

```
Scanning references from 252 busy blocks (0 MBytes) ...No potential unreachable blocks were detected.
WINDBG> !heap -s

*********************************************************************************************************************
                                        NT HEAP STATS BELOW
*********************************************************************************************************************
LFH Key                   : 0x6f05ba4c
Termination on corruption : ENABLED
  Heap     Flags   Reserv  Commit  Virt   Free  List   UCR  Virt  Lock  Fast
                    (k)     (k)    (k)     (k) length      blocks cont. heap
-------------------------------------------------------------------------------
007a0000 00000002    1024     300   1024      6     6     1    0      0   LFH
-------------------------------------------------------------------------------
```

It shows just one heap and there, it is. Let’s see its content.

WINDBG>!heap -a 007a0000
Index Address Name Debugging options enabled
1: 007a0000
Segment at 007a0000 to 008a0000 (0004b000 bytes committed)
Flags: 00000002
ForceFlags: 00000000
Granularity: 8 bytes
Segment Reserve: 00100000
Segment Commit: 00002000
DeCommit Block Thres: 00000800
DeCommit Total Thres: 00002000
Total Free Size: 0000031b

Max. Allocation Size: 7ffdefff
Lock Variable at: 007a0138
Next TagIndex: 0000
Maximum TagIndex: 0000
Tag Entries: 00000000
PsuedoTag Entries: 00000000
Virtual Alloc List: 007a00a0
Uncommitted ranges: 007a0090
007eb000: 000b5000 (741376 bytes)
FreeList[00] at 007a00c4: 007e8ec0 . 007e4e90
007e4e88: 00028 . 00010 [100] - free
007a6750: 00028 . 00010 [100] - free
007a6158: 00050 . 00010 [100] - free
007e2d30: 00028 . 00018 [100] - free
007e2c58: 00210 . 00018 [100] - free
007e8eb8: 00078 . 01878 [100] - free

Segment00 at 007a0000:
Flags: 00000000
Base: 007a0000
First Entry: 007a0588
Last Entry: 008a0000
Total Pages: 00000100
Total UnCommit: 000000b5
Largest UnCommit:00000000
UnCommitted Ranges: (1)

Heap entries for Segment00 in Heap 007a0000
address: psize . size flags state (requested size)
007a0000: 00000 . 00588 [101] - busy (587)
007a0588: 00588 . 00240 [101] - busy (23f)
007a07c8: 00240 . 00020 [101] - busy (18)
007a07e8: 00020 . 01dd8 [101] - busy (1dce)
007a25c0: 01dd8 . 02d00 [101] - busy (2cf8)
007a52c0: 02d00 . 00048 [101] - busy (3c)
007a5308: 00048 . 00038 [101] - busy (30)
007a5340: 00038 . 00080 [101] - busy (78)
007a53c0: 00080 . 00080 [101] - busy (78)
007a5440: 00080 . 00048 [101] - busy (3c)
007a5488: 00048 . 00228 [101] - busy (220)
007a56b0: 00228 . 00050 [101] - busy (42)
007a5700: 00050 . 00080 [101] - busy (78)

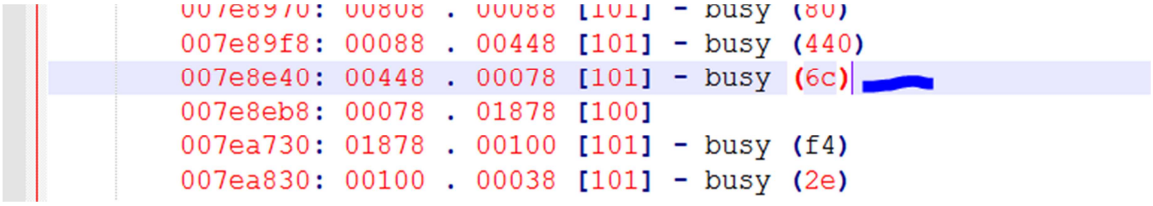
007a5780: 00080 . 00018 [101] - busy (10)
007a5798: 00018 . 00050 [101] - busy (46)
007a57e8: 00050 . 00080 [101] - busy (78)
007a5868: 00080 . 00018 [101] - busy (10)
007a5880: 00018 . 00018 [101] - busy (10)
007a5898: 00018 . 00020 [101] - busy (14)
007a58b8: 00020 . 00070 [101] - busy (64)
007a5928: 00070 . 00208 [101] - busy (200)
007a5b30: 00208 . 00208 [101] - busy (200)
007a5d38: 00208 . 00030 [101] - busy (24)
007a5d68: 00030 . 00030 [101] - busy (24)
007a5d98: 00030 . 00038 [101] - busy (30)
007a5dd0: 00038 . 00028 [101] - busy (20)
007a5df8: 00028 . 00028 [101] - busy (20)
007a5e20: 00028 . 00028 [101] - busy (20)
007a5e48: 00028 . 00028 [101] - busy (20)
007a5e70: 00028 . 00018 [101] - busy (10)
007a5e88: 00018 . 00080 [101] - busy (78)
007a5f08: 00080 . 00080 [101] - busy (78)
007a5f88: 00080 . 00018 [101] - busy (10)
007a5fa0: 00018 . 00020 [101] - busy (14)
007a5fc0: 00020 . 00020 [101] - busy (10)
007a5fe0: 00020 . 00078 [101] - busy (6c)
007a6058: 00078 . 00080 [101] - busy (78)
007a60d8: 00080 . 00018 [101] - busy (10)
007a60f0: 00018 . 00018 [101] - busy (10)
007a6108: 00018 . 00050 [101] - busy (42)
007a6158: 00050 . 00010 [100]
007a6168: 00010 . 00058 [101] - busy (4a)
007a61c0: 00058 . 00080 [101] - busy (78)
007a6240: 00080 . 00020 [101] - busy (10)
007a6260: 00020 . 00018 [101] - busy (10)
007a6278: 00018 . 00080 [101] - busy (78)
007a62f8: 00080 . 00020 [101] - busy (10)
007a6318: 00020 . 00018 [101] - busy (10)
007a6330: 00018 . 00018 [101] - busy (10)
007a6348: 00018 . 00070 [101] - busy (68)
007a63b8: 00070 . 00080 [101] - busy (78)
007a6438: 00080 . 00018 [101] - busy (10)
007a6450: 00018 . 00070 [101] - busy (68)
007a64c0: 00070 . 00078 [101] - busy (70)
007a6538: 00078 . 00080 [101] - busy (78)

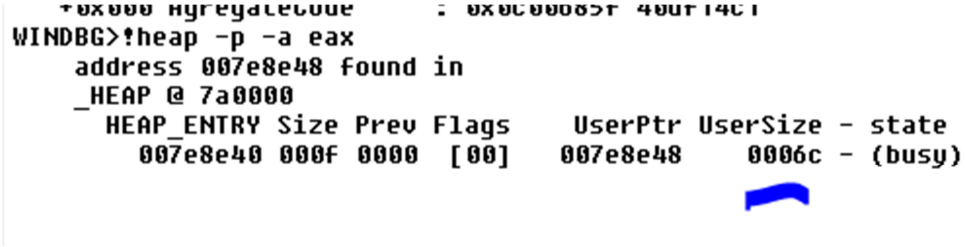
007a65b8: 00080 . 00020 [101] - busy (10)
007a65d8: 00020 . 00018 [101] - busy (10)
007a65f0: 00018 . 00020 [101] - busy (10)
007a6610: 00020 . 00078 [101] - busy (6a)
007a6688: 00078 . 00088 [101] - busy (7c)
007a6710: 00088 . 00018 [101] - busy (10)
007a6728: 00018 . 00028 [101] - busy (20)
007a6750: 00028 . 00010 [100]
007a6760: 00010 . 00080 [101] - busy (78)
007a67e0: 00080 . 00080 [101] - busy (78)
007a6860: 00080 . 03d20 [101] - busy (3d1f)
007aa580: 03d20 . 378b0 [101] - busy (378a8) Internal
007e1e30: 378b0 . 00080 [101] - busy (78)
007e1eb0: 00080 . 00020 [101] - busy (17)
007e1ed0: 00020 . 00400 [101] - busy (3f8) Internal
007e22d0: 00400 . 00400 [101] - busy (3f8) Internal
007e26d0: 00400 . 00080 [101] - busy (78)
007e2750: 00080 . 00080 [101] - busy (78)
007e27d0: 00080 . 00028 [101] - busy (20)
007e27f8: 00028 . 00028 [101] - busy (20)
007e2820: 00028 . 00070 [101] - busy (66)
007e2890: 00070 . 00080 [101] - busy (78)
007e2910: 00080 . 00028 [101] - busy (20)
007e2938: 00028 . 00028 [101] - busy (20)
007e2960: 00028 . 00070 [101] - busy (68)
007e29d0: 00070 . 00078 [101] - busy (6a)
007e2a48: 00078 . 00210 [101] - busy (208)
007e2c58: 00210 . 00018 [100]
007e2c70: 00018 . 00070 [101] - busy (66)
007e2ce0: 00070 . 00028 [101] - busy (20)
007e2d08: 00028 . 00028 [101] - busy (20)
007e2d30: 00028 . 00018 [100]
007e2d48: 00018 . 00078 [101] - busy (6c)
007e2dc0: 00078 . 02000 [101] - busy (1ff8) Internal
007e4dc0: 02000 . 00028 [101] - busy (20)
007e4de8: 00028 . 00028 [101] - busy (20)
007e4e10: 00028 . 00028 [101] - busy (20)
007e4e38: 00028 . 00028 [101] - busy (20)
007e4e60: 00028 . 00028 [101] - busy (20)
007e4e88: 00028 . 00010 [100]
007e4e98: 00010 . 00078 [101] - busy (6a)
007e4f10: 00078 . 00408 [101] - busy (400)

007e5318: 00408 . 00028 [101] - busy (20)
007e5340: 00028 . 00800 [101] - busy (7f8) Internal
007e5b40: 00800 . 006d0 [101] - busy (6c8)
007e6210: 006d0 . 00c08 [101] - busy (c00)
007e6e18: 00c08 . 00800 [101] - busy (7f8) Internal
007e7618: 00800 . 00228 [101] - busy (220)
007e7840: 00228 . 00228 [101] - busy (220)
007e7a68: 00228 . 00490 [101] - busy (483)
007e7ef8: 00490 . 00218 [101] - busy (209)
007e8110: 00218 . 00058 [101] - busy (4a)
007e8168: 00058 . 00808 [101] - busy (800)
007e8970: 00808 . 00088 [101] - busy (80)
007e89f8: 00088 . 00448 [101] - busy (440)
007e8e40: 00448 . 00078 [101] - busy (6c)
007e8eb8: 00078 . 01878 [100]
007ea730: 01878 . 00100 [101] - busy (f4)
007ea830: 00100 . 00038 [101] - busy (2e)
007ea868: 00038 . 00030 [101] - busy (28)
007ea898: 00030 . 00040 [101] - busy (37)
007ea8d8: 00040 . 00048 [101] - busy (3c)
007ea920: 00048 . 00040 [101] - busy (31)
007ea960: 00040 . 00030 [101] - busy (24)
007ea990: 00030 . 00040 [101] - busy (32)
007ea9d0: 00040 . 00038 [101] - busy (2e)
007eaa08: 00038 . 00038 [101] - busy (2c)
007eaa40: 00038 . 00030 [101] - busy (28)
007eaa70: 00030 . 00030 [101] - busy (21)
007eaaa0: 00030 . 00020 [101] - busy (15)
007eaac0: 00020 . 00038 [101] - busy (2b)
007eaaf8: 00038 . 00030 [101] - busy (22)
007eab28: 00030 . 00038 [101] - busy (2e)
007eab60: 00038 . 00048 [101] - busy (39)
007eaba8: 00048 . 00020 [101] - busy (17)
007eabc8: 00020 . 00040 [101] - busy (36)
007eac08: 00040 . 00050 [101] - busy (47)
007eac58: 00050 . 00050 [101] - busy (48)
007eaca8: 00050 . 00020 [101] - busy (12)
007eacc8: 00020 . 00020 [101] - busy (18)
007eace8: 00020 . 00030 [101] - busy (24)
007ead18: 00030 . 00038 [101] - busy (29)
007ead50: 00038 . 00098 [101] - busy (8b)
007eade8: 00098 . 00020 [101] - busy (17)

007eae08: 00020 . 00020 [101] - busy (11)
007eae28: 00020 . 00020 [101] - busy (18)
007eae48: 00020 . 00020 [101] - busy (17)
007eae68: 00020 . 00030 [101] - busy (21)
007eae98: 00030 . 00020 [101] - busy (13)
007eaeb8: 00020 . 00020 [101] - busy (14)
007eaed8: 00020 . 00020 [101] - busy (16)
007eaef8: 00020 . 00030 [101] - busy (28)
007eaf28: 00030 . 00030 [101] - busy (27)
007eaf58: 00030 . 00060 [101] - busy (52)
007eafb8: 00060 . 00028 [101] - busy (12)
007eafe0: 00028 . 00020 [111] - busy (1d)
007eb000: 000b5000 - uncommitted bytes.

If we see in the list, the block is there. If we find it by header address, it tells us the size.





It doesn't show us the history, but the size, the general size is 0xF because to find the total, it multiplies it by 8 giving the following result:

hex(0xf *0x8)

'0x78'

That is the complete size with the header and the end, etc.

In the case of the normal heap, to see the values, we have to use:

```
WINDBG>dt _heap_entry 007e8e40
ntdll!_HEAP_ENTRY
   +0x000 Size             : 0x14c1
   +0x002 Flags            : 0xdf ''
   +0x003 SmallTagIndex    : 0x40 '@'
   +0x000 SubSegmentCode   : 0x40df14c1 Void
   +0x004 PreviousSize     : 0x685f
   +0x006 SegmentOffset    : 0 ''
   +0x006 LFHFlags         : 0 ''
   +0x007 UnusedBytes      : 0xc ''
   +0x000 FunctionIndex    : 0x14c1
   +0x002 ContextValue     : 0x40df
   +0x000 InterceptorValue : 0x40df14c1
   +0x004 UnusedBytesLength : 0x685f
   +0x006 EntryOffset      : 0 ''
   +0x007 ExtendedBlockSignature : 0xc ''
   +0x000 Code1            : 0x40df14c1
   +0x004 Code2            : 0x685f
   +0x006 Code3            : 0 ''
   +0x007 Code4            : 0xc ''
   +0x000 AgregateCode     : 0x0c00685f`40df14c1
```

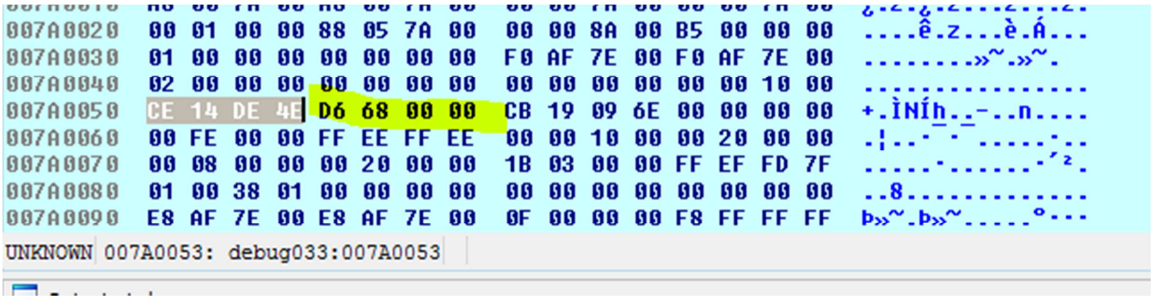
The thing is that they are encoded (xored) with a constant where we can find the constant to unxor them.

```
07E8E70  6C 00 65 00 73 00 28 00  78 00 38 00 36 00 29 00  l.e.s.(.x.8.6.).
07E8E80  3D 00 43 00 3A 00 5C 00  50 00 72 00 6F 00 67 00  =.C.:.\.P.r.o.g.
KNOWN 007E8E48: debug033:off_7E8E48
Output window
INDBG>dt _heap 007a0000
tdll!_HEAP
   +0x000 Entry            : _HEAP_ENTRY
   +0x008 SegmentSignature : 0xffeeffee
   +0x00c SegmentFlags     : 0
   +0x010 SegmentListEntry : _LIST_ENTRY [ 0x7a00a8 - 0x7a00a8 ]
   +0x018 Heap             : 0x007a0000 _HEAP
   +0x01c BaseAddress      : 0x007a0000 Void
   +0x020 NumberOfPages    : 0x100
   +0x024 FirstEntry       : 0x007a0588 _HEAP_ENTRY
   +0x028 LastValidEntry   : 0x008a0000 _HEAP_ENTRY
   +0x02c NumberOfUnCommittedPages : 0xb5
   +0x030 NumberOfUnCommittedRanges : 1
   +0x034 SegmentAllocatorBackTraceIndex : 0
   +0x036 Reserved         : 0
   +0x038 UCRSegmentList   : _LIST_ENTRY [ 0x7eaff0 - 0x7eaff0 ]
   +0x040 Flags            : 2
   +0x044 ForceFlags       : 0
   +0x048 CompatibilityFlags : 0
   +0x04c EncodeFlagMask   : 0x100000
   +0x050 Encoding         : _HEAP_ENTRY
   +0x058 PointerKey       : 0x6e0919cb
   +0x05c Interceptor      : 0
   +0x060 VirtualMemoryThreshold : 0xfe00
   +0x064 Signature        : 0xeeffeeff
   +0x068 SegmentReserve   : 0x100000
   +0x06c SegmentCommit    : 0x2000
```

The Offset 0x50 of the heap structure is called encoding.

WINDBG>dd 007a0000+ 0x50 L2
007a0050 4ede14ce 000068d6

They are those DWORDS which xored the info.



If we do the same in the header dividing it in two DWORDS:

dd 007E8E40 L2

I have the two DWORDS that I have to xor with the two ones of the entry.

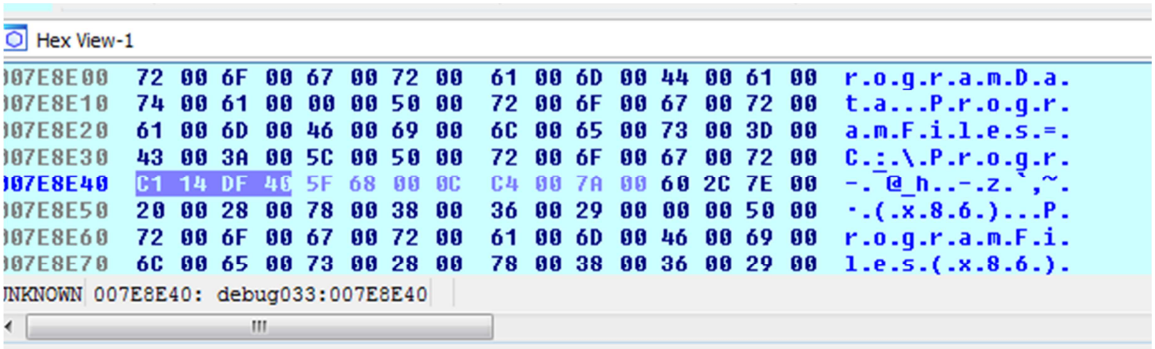
WINDBG>dd 007a0000+ 0x50 L2
007a0050 4ede14ce 000068d6

WINDBG>dd 007E8E40 L2
007e8e40 40df14c1 0c00685f

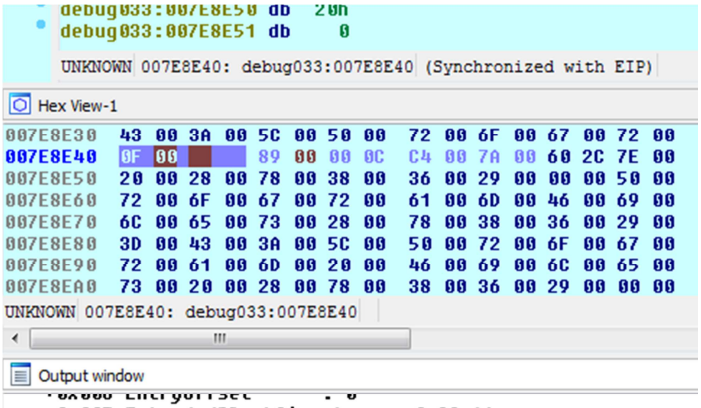
I xor it.

WINDBG>? 4ede14ce ^ 40df14c1
Evaluate expression: 234946575 = **0e01000f**
WINDBG>? 68d6 ^ 0c00685f
Evaluate expression: 201326729 = **0c000089**

We can create the little table. Obviously, we'll break the program and it won't run more, but just to see something.



I replace the values for the xored ones.



Output window

```
   +0x007 ExtendedBlockSignature : 0x89 ''
   +0x000 Code1              : 0xf00010e
   +0x004 Code2              : 0xc
   +0x006 Code3              : 0 ''
   +0x007 Code4              : 0x89 ''
   +0x000 AgregateCode       : 0x8900000c`0f00010e
WINDBG>dt _heap_entry 007e8e40
ntdll!_HEAP_ENTRY
   +0x000 Size               : 0xf
   +0x002 Flags              : 0x1 ''
   +0x003 SmallTagIndex      : 0xe ''
   +0x000 SubSegmentCode     : 0x0e01000f Void
   +0x004 PreviousSize       : 0x89
   +0x006 SegmentOffset      : 0 ''
   +0x006 LFHFlags           : 0 ''
   +0x007 UnusedBytes        : 0xc ''
   +0x000 FunctionIndex      : 0xf
```

```
   +0x006 Code3              : 0 ''
   +0x007 Code4              : 0x89 ''
   +0x000 AgregateCode       : 0x8900000c`0f00010e
WINDBG>dt _heap_entry 007e8e40
ntdll!_HEAP_ENTRY
   +0x000 Size               : 0xf
   +0x002 Flags              : 0x1 ''
   +0x003 SmallTagIndex      : 0xe ''
   +0x000 SubSegmentCode     : 0x0e01000f Void
   +0x004 PreviousSize       : 0x89
   +0x006 SegmentOffset      : 0 ''
   +0x006 LFHFlags           : 0 ''
   +0x007 UnusedBytes        : 0xc ''
   +0x000 FunctionIndex      : 0xf
   +0x002 ContextValue       : 0xe01
   +0x000 InterceptorValue   : 0xe01000f
   +0x004 UnusedBytesLength  : 0x89
   +0x006 EntryOffset        : 0 ''
   +0x007 ExtendedBlockSignature : 0xc ''
   +0x000 Code1              : 0xe01000f
   +0x004 Code2              : 0x89
   +0x006 Code3              : 0 ''
   +0x007 Code4              : 0xc ''
   +0x000 AgregateCode       : 0x0c000089`0e01000f
WINDBG>? 0xf* 8
Evaluate expression: 120 = 00000078
```

As in this case, the size is 0xF, we have to multiply it by 8 to find the total size and it gives 0x78 that is the same it gave at the beginning what includes the header and the end.

We go slowly observing and getting familiar with the heap blocks. In the next part, we'll see what mona tells us about this. If it helps or not. ☺

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Translated by: @IvinsonCLS