AgentTesla dropped via NSIS installer

l1v1ngc0d3.wordpress.com/2021/11/12/agenttesla-dropped-via-nsis-installer/

dominik 12 Nov 2021

Lately one of our customers received a suspicious file which was blocked by our sandbox solution but it was unclear if this was malicious and if so what malware it was so I did an analysis and want to share my results with you. The main goal of this article is to show how to extract the final payload.

The sample is now available on VT:
ce8a9bf908ce35bf0c034c61416109a44f015eabf058b12485450cd40af95fc3

NSIS installer

If we do some static analysis via DiE (Detect it Easy) we see that the file is of type NSIS installer. One easy way to obtain the files is to just simply extract the files with 7-ZIP. Unfortunately I'm not aware of any way to reverse the NSIS script (any hint welcome ;-)).

installer	Nullsoft Scriptable Install System(2.40)[zlib,solid]	S	?
linker	Microsoft Linker(6.0*)[EXE32]	S	?
overlay	NSIS data(-)[-]	S	

After extracting the file we find a folder $PLUGINDIR as expected and another file with a random name and some bytes in it.

$PLUGINSDIR	11/11/2021 3:35 AM	File folder	
1bcfef39f3a713c08f90e93311ca5b5a.ec73...	11/10/2021 12:55 ...	FILE_3D72404B706...	308 KB
w66zlsqpnyue6	11/9/2021 11:34 PM	File	286 KB

First dll – swfmwfkkeh.dll

Inside of the $PLUGINSDIR directory we find one file named swfmwfkkeh.dll (SHA1: 56f3d68f10bde42216634f987b421feee696506e). Once again we open it up in DiE and find out that its written in C/C++ and some exports which look a little strange.

compiler	Microsoft Visual C/C++(2015 v.14.0)[msvcrt]	S	
linker	unknown(14.0)[32]	S	

rdin	RVA	Name	
0000	00000000	00000000	
0001	00001310	00007c2e	zznqqqjqi

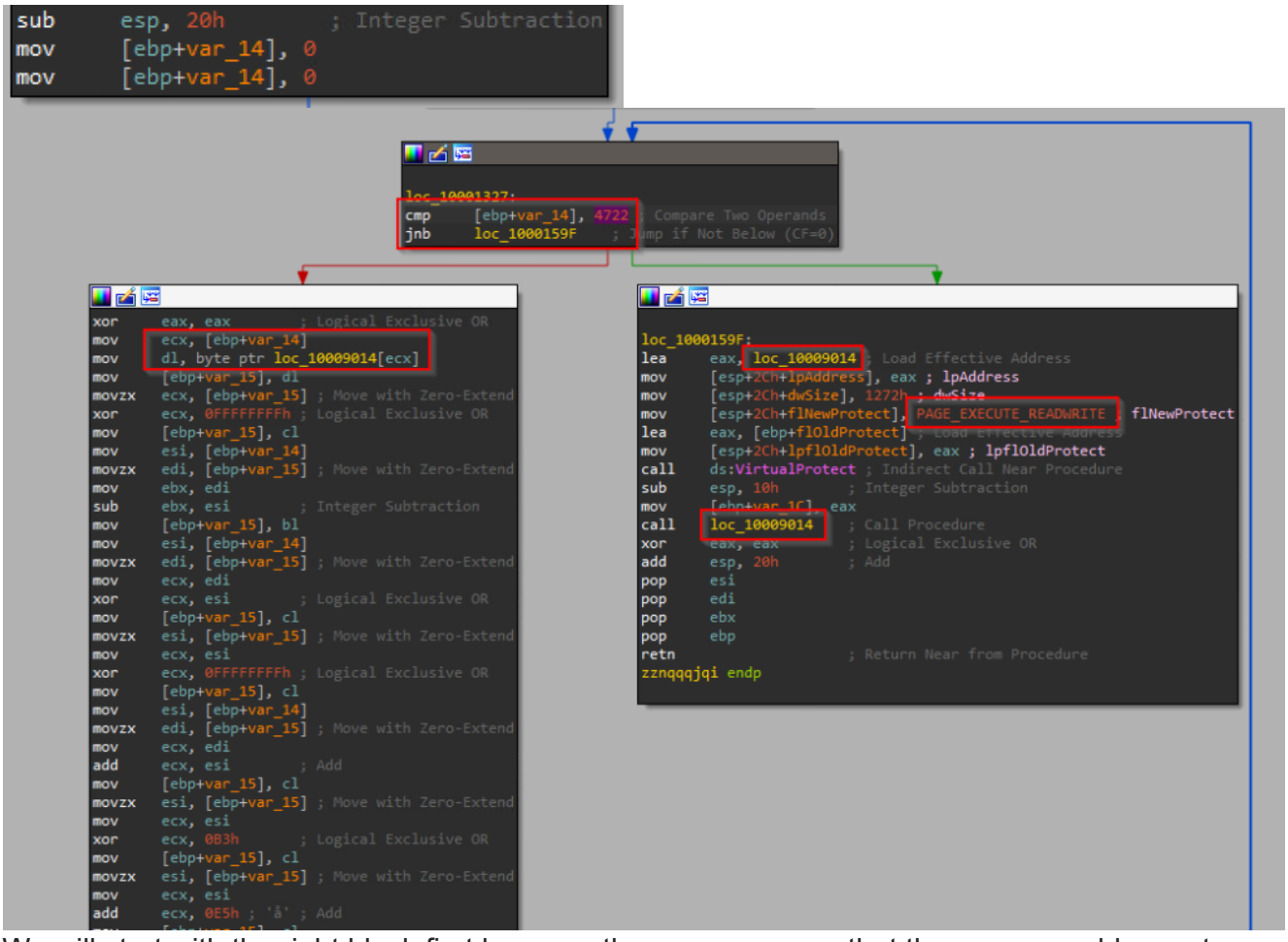
In the imports there are some false flags but the VirtualProtect seems to be reasonable

3	00008232		03f3	MultiByteToWideChar
4	00008248		05d0	VirtualProtect
5	0000825a		0602	WideCharToMultiByte
6	00008270		0630	lstrcatA
7	0000827c		0639	lstrcpyA
8	00008288		063c	lstrcpynA
9	00008294		063f	lstrlenA

Now we open up the file in IDA Pro and take a look at the export functions

Name	Address	Ordinal
zznqqqjqi	10001310	1
DriverEntry	**100067A6**	**[main entry]**

We assume that the NSIS installer will start the DLL and call the exported function „zznqqqjqi“ so we start our analysis there. After setting up the stack the function intiliazes „var_14“ which then is compared if its above 4722 (in fact the function does a „jump not below“ with the main functionality in the false tree).



We will start with the right block first because there you can see that the memory address at 10009014 will receive RWX permissions and after that will be called. So we can assume that at this location there must be some assembly code. Now lets take a look what happens in the left block because this is where we land after the first comparison. At this point „var_14“ is still below 4722. As you can see the variable (now in ecx) is used as a pointer in the marked area by utilizing „byte ptr loc_10009014[ecx]“. So it grabs the first bytes of what ever is at this address. If

we take a look what is there we see some „strange“ assembly code – this doesn't look as valid assembly code at all. If we look further down in the left block we see some xor, sub, add and mov operations so we can assume that this code will be modified.

```
loc_10009014:                           ; CODE XREF: zznqqqjqi+2BB↑p
                                        ; DATA XREF: zznqqqjqi+29↑r ...
                stosd                   ; Store String
                push    edx
                leave                   ; High Level Procedure Exit
                mov     word ptr [esi-5Ch], ds
                cmc                     ; Complement Carry Flag
                idiv    ebp             ; Signed Divide
                mov     edx, gs
                cmp     al, 0AAh ; '²'  ; Compare Two Operands
                or      esp, [eax+edi]  ; Logical Inclusive OR
                sub     [edx], esi      ; Integer Subtraction
                rcl     edx, 30h        ; Rotate Through Carry Left
                jnz     short near ptr loc_1000905A+1 ; Jump if Not Zero (ZF=0)
                push    ds
                or      byte ptr [ebp-34h], 25h ; Logical Inclusive OR
                imul    ecx, esi, 3Fh ; '?' ; Signed Multiply
                scasd                   ; Compare String
                sub     eax, 18223C8Ah  ; Integer Subtraction
                or      [eax-41323851h], esp ; Logical Inclusive OR
                pop     edx
                popf                    ; Pop Stack into Flags Register
                pop     eax
                cld                     ; Clear Direction Flag
                push    esp
                dec     ecx             ; Decrement by 1
                xor     ch, [edx]       ; Logical Exclusive OR
                add     ah, [esi+edx*8] ; Add
                fmul    st(3), st       ; Multiply Real
                dec     esi             ; Decrement by 1
                cmp     dword ptr [eax-20751D43h], 0FFFFFFCFh ; Compare Two Operands
                cmp     ebx, [ebp+2C8763A5h] ; Compare Two Operands
```

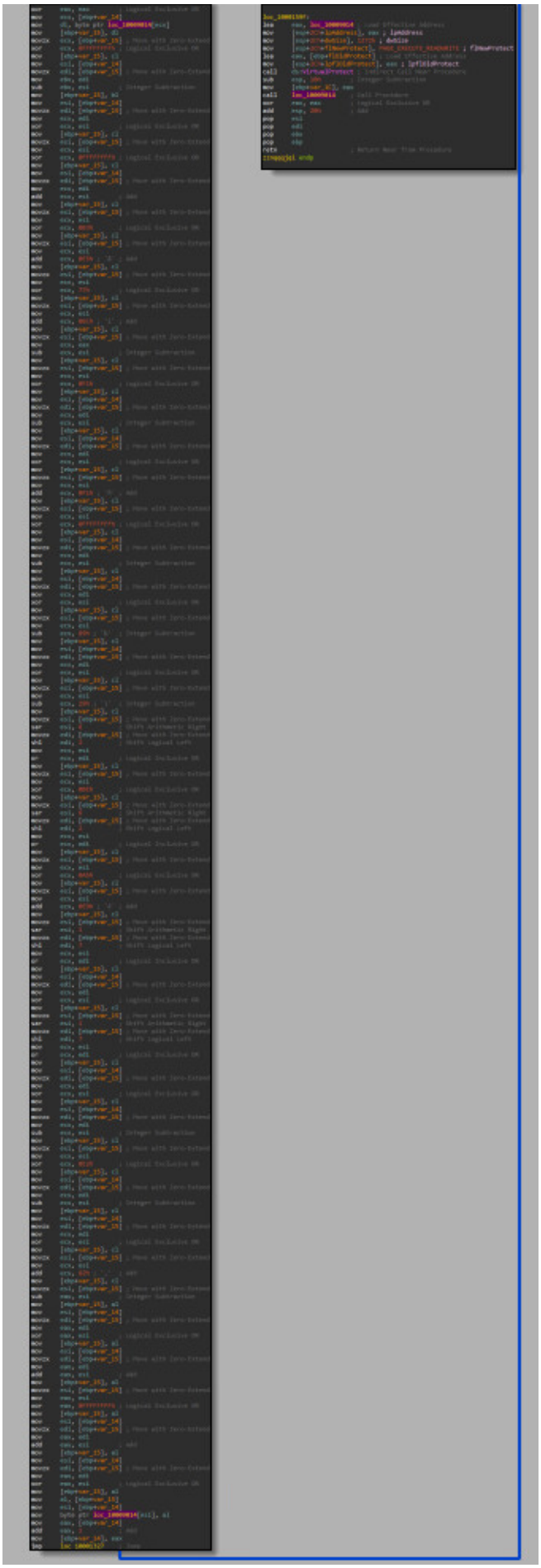
After all the byte manipulations are done the byte is written back to the address 10009014. This time esi receives the pointer (mov esi, [ebp+var_14]).

```
mov     [ebp+var_15], al
mov     al, [ebp+var_15]
mov     esi, [ebp+var_14]
mov     byte ptr loc_10009014[esi], al
mov     eax, [ebp+var_14]
add     eax, 1          ; Add
mov     [ebp+var_14], eax
jmp     loc_10001327    ; Jump
```

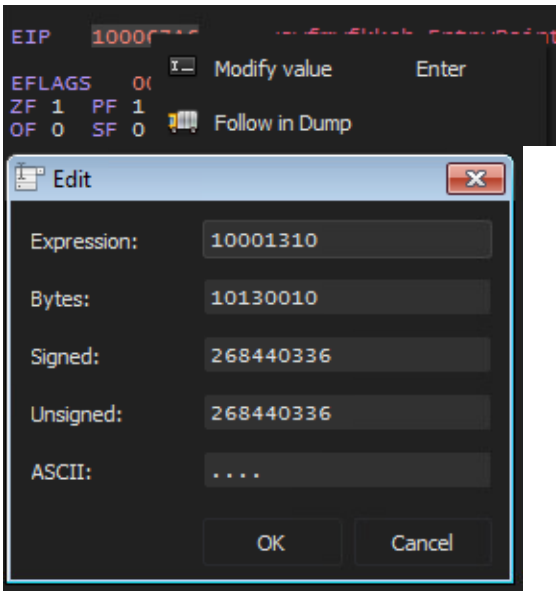
Then we jump back to the comparison if var_14 is already above 4722. If this is the case we change the page permissions to RWX and execute the now modified code.

Let's debug some code

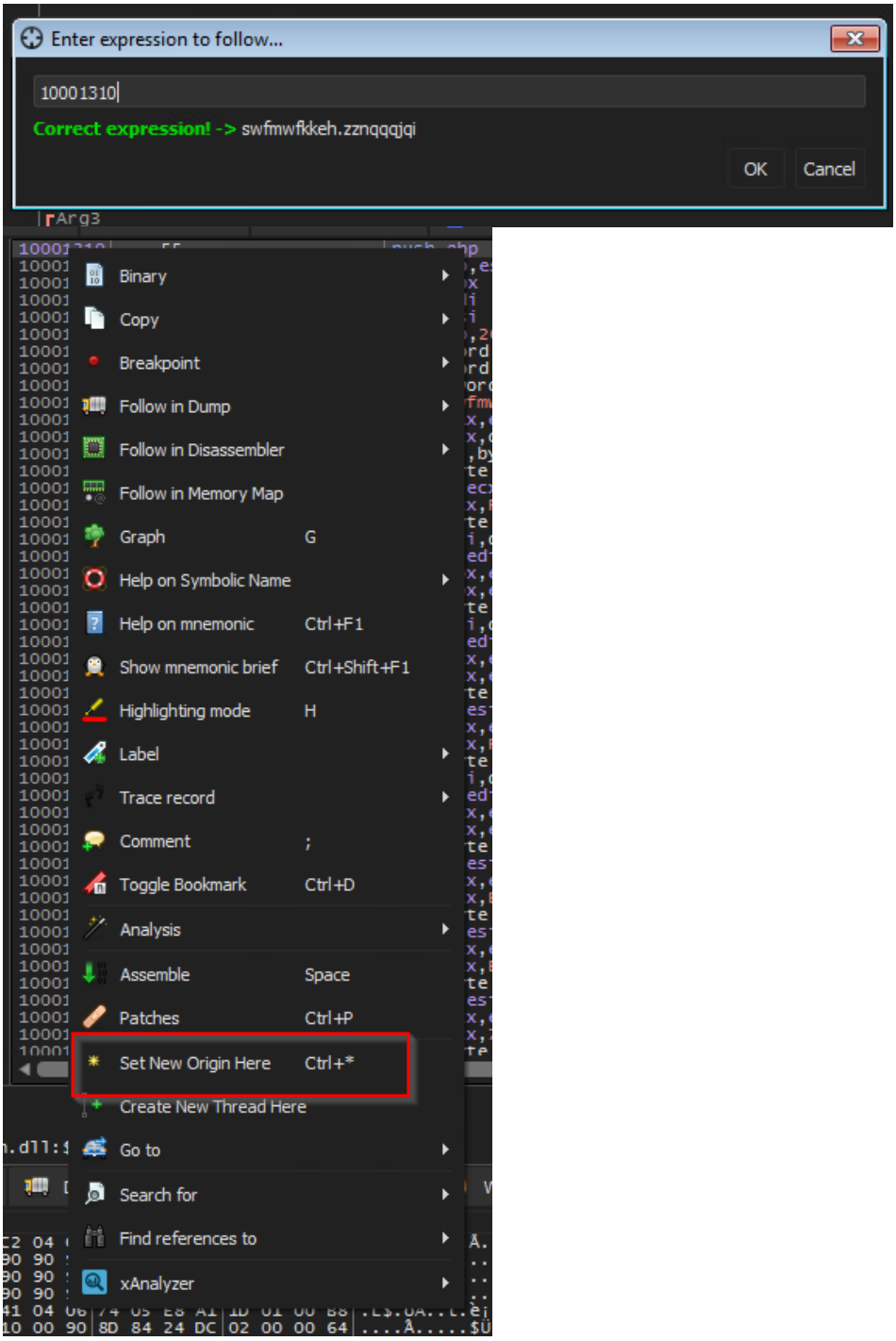
The decryption routine is very very long and we don't want to go into reversing this algorithm. Below is a screenshot of the algorithm – hell no!



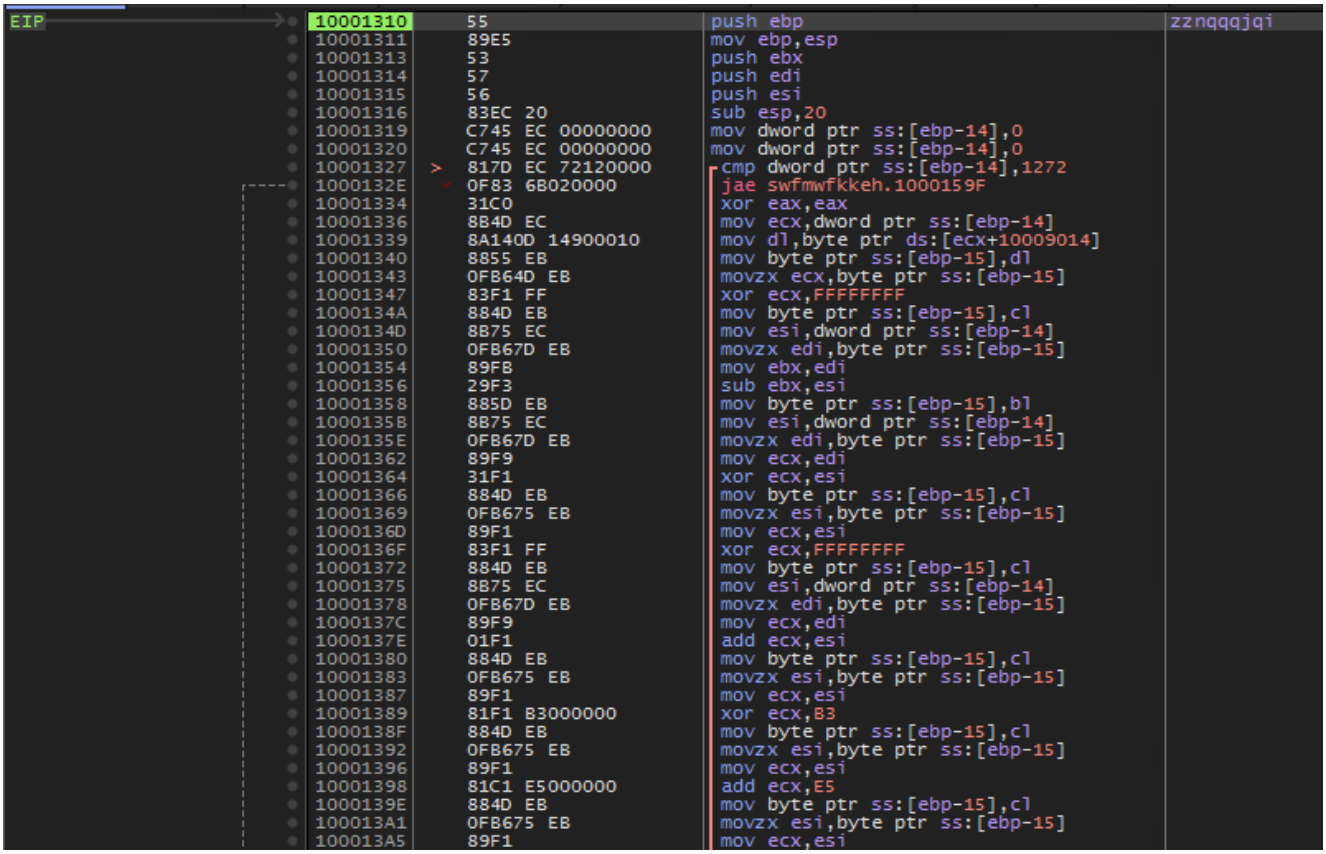
So lets open the file up in x64dbg and jump to user code but stop there. We want to start at the function „zznqqqjqi“. If we switch to text mode in IDA we can see the address. We have two options to change the instruction pointer (EIP) to continue from this address. First we can right-click on the EIP register and modify the value.



Or we can jump to the address in the disassembly view (Ctrl + G) and then right-click „Set new origin here“.

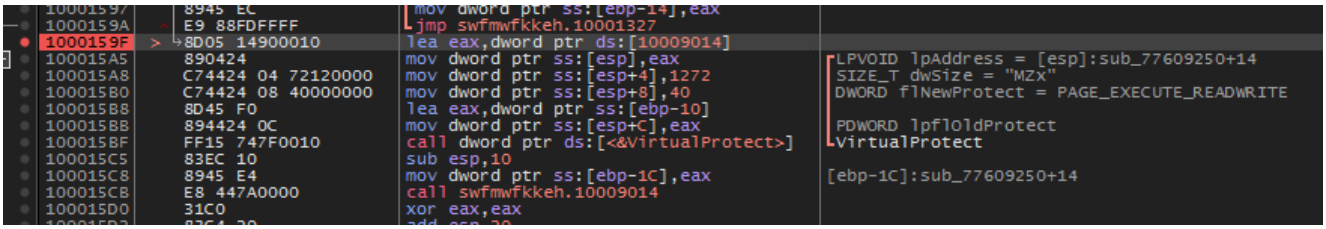


After that we can start debugging.

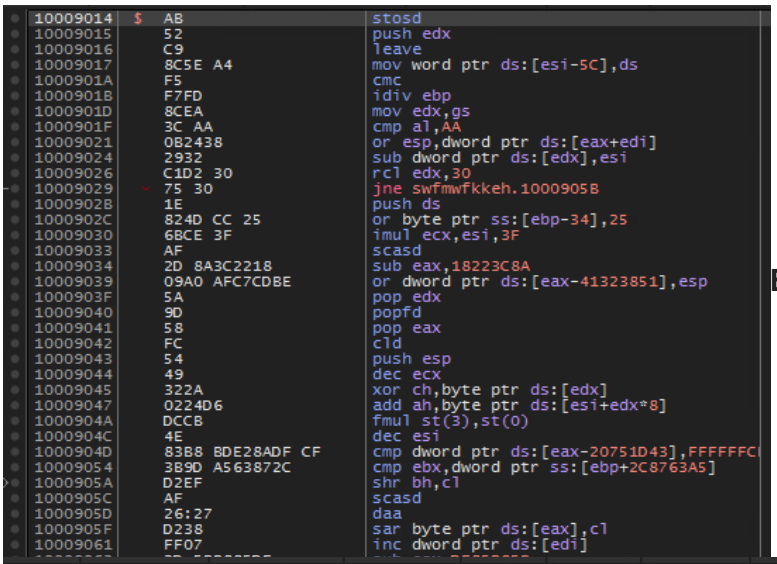


We also see as we did in IDA Pro the initialization of the pointer and the comparision with 1272 (hex) = 4722 (dez). Here is on speciality about assembly. Instead of the jnb operation we saw in IDA Pro we see a jae (jump if above or equal). In fact the operations are interchangeable because both check if the ZERO flag is set.

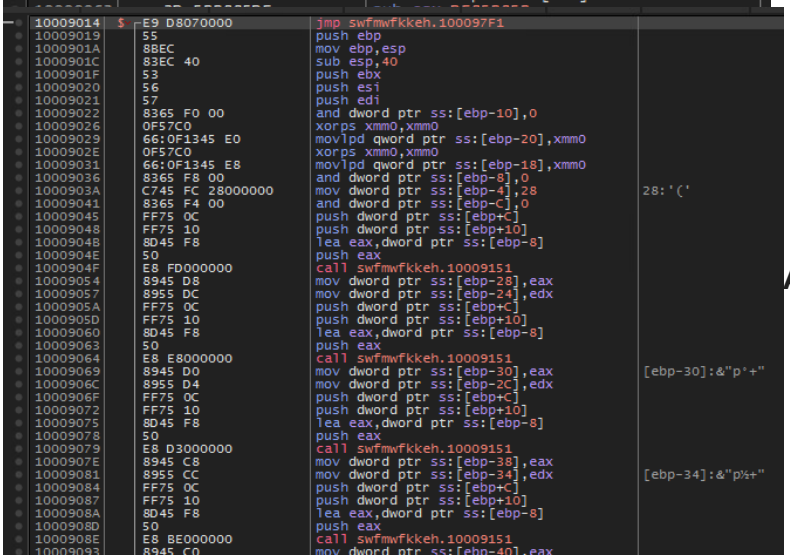
We know from our static analysis that after the decryption loop we change the permission of the page so lets follow the jump and place a breakpoint at this point.



Now we want to obverse how the code changes (without reversing the algorithm). Follow the address 10009014 in disassembler to see the code.



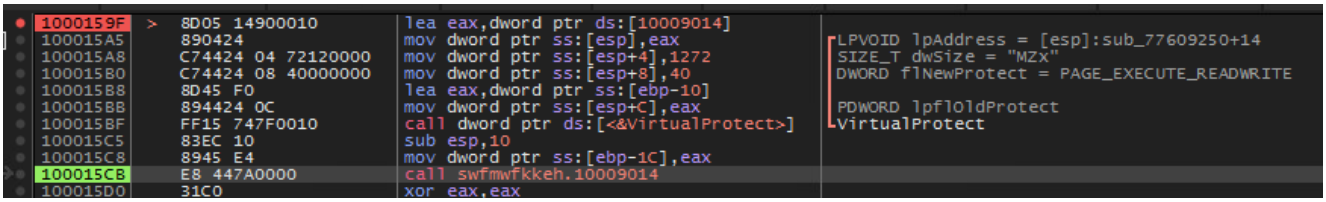
Before decryption



After decryption

As you can see now the code changed fundamentally and it starts with a jmp to another offset in the code. Jump back to the current instruction by double-clicking the EIP register.

Lets single step over the VirtualProtect and then jump into the decrypted code (F7).



We follow the jump and land at this address where we can see values being push/popped and then moved into a local variable (ebp-28). These values are ASCII codes so we can convert them manually or step over until we reach 0x10009849 where the string is terminated by a 0 (xor eax,eax = 0; mov memory,ax).

```
100097F1    55              push ebp
100097F2    8BEC            mov ebp,esp
100097F4    81EC 80040000   sub esp,480
100097FA    6A 53           push 53
100097FC    58              pop eax
100097FD    66:8945 D8      mov word ptr ss:[ebp-28],ax
10009801    6A 68           push 68
10009803    58              pop eax
10009804    66:8945 DA      mov word ptr ss:[ebp-26],ax
10009808    6A 6C           push 6C
1000980A    58              pop eax
1000980B    66:8945 DC      mov word ptr ss:[ebp-24],ax
1000980F    6A 77           push 77
10009811    58              pop eax
10009812    66:8945 DE      mov word ptr ss:[ebp-22],ax
10009816    6A 61           push 61
10009818    58              pop eax
10009819    66:8945 E0      mov word ptr ss:[ebp-20],ax
1000981D    6A 70           push 70
1000981F    58              pop eax
10009820    66:8945 E2      mov word ptr ss:[ebp-1E],ax
10009824    6A 69           push 69
10009826    58              pop eax
10009827    66:8945 E4      mov word ptr ss:[ebp-1C],ax
1000982B    6A 2E           push 2E
1000982D    58              pop eax
1000982E    66:8945 E6      mov word ptr ss:[ebp-1A],ax
10009832    6A 64           push 64
10009834    58              pop eax
10009835    66:8945 E8      mov word ptr ss:[ebp-18],ax
10009839    6A 6C           push 6C
1000983B    58              pop eax
1000983C    66:8945 EA      mov word ptr ss:[ebp-16],ax
10009840    6A 6C           push 6C
10009842    58              pop eax
10009843    66:8945 EC      mov word ptr ss:[ebp-14],ax
10009847    33C0            xor eax,eax
10009849    66:8945 EE      mov word ptr ss:[ebp-12],ax
1000984D    8365 F8 00      and dword ptr ss:[ebp-8],0
```

If we follow the address ebp-28 we can see the string

```
0014F8FE  00 00 7A 00  5F 77 3A F0  93 75 FF FF  FF FF 30 F9  ..z._w:ð.uÿÿÿÿ0ù
0014F90E  14 00 34 F9  14 00 40 00  00 00 53 00  68 00 6C 00  ..4ù..@...S.h.l.
0014F91E  77 00 61 00  70 00 69 00  2E 00 64 00  6C 00 6C 00  w.a.p.i...d.l.l.
0014F92E  00 00 00 90  00 10 00 20  00 00 40 00  00 00 64 F9  ....... ..@...dù
0014F93E  14 00 74 F9  14 00 D0 15  00 10 14 90  00 10 72 12  ..tù..Ð.......r.
```

After that the next call will get us the Magic (4D 5A) of Kernel32.dll

```
100096DB    64:A1 30000000  mov eax,dword ptr fs:[30]
100096E1    8B40 0C         mov eax,dword ptr ds:[eax+C]
100096E4    8B40 0C         mov eax,dword ptr ds:[eax+C]
100096E7    8B00            mov eax,dword ptr ds:[eax]
100096E9    8B00            mov eax,dword ptr ds:[eax]
100096EB    8B40 18         mov eax,dword ptr ds:[eax+18]
100096EE    C3              ret
```

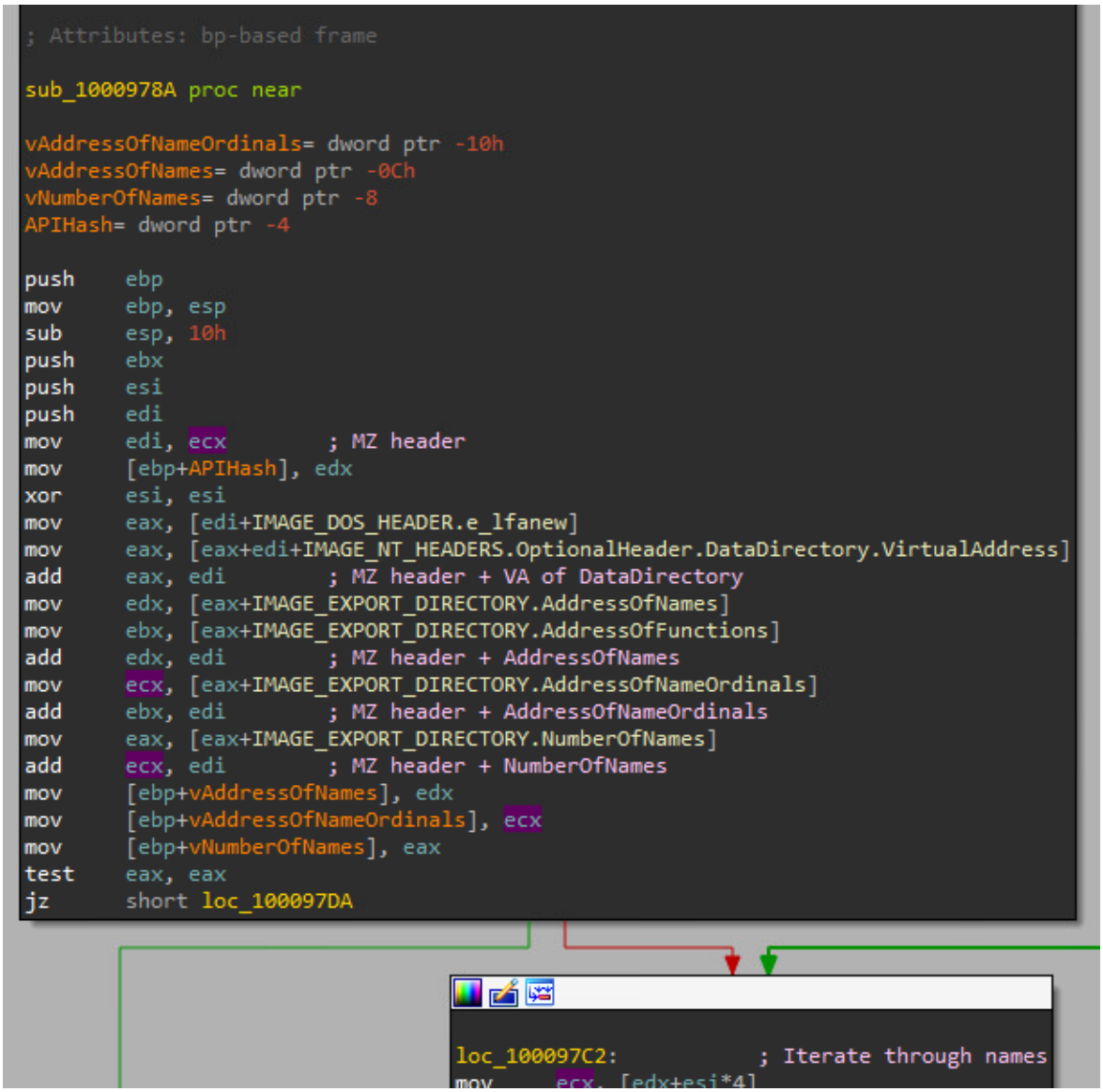
After that we see a lot of calls to the same function and what we suspect to be API hashes. So lets dive into this function and try to figure out what algorithm is used to hash the API function names. For easier analysis I dumped the DLL again with Scylla and opened it up again in IDA Pro.

API Hashing

We will go into the details of the function but what it mainly does is hashing the function names (exports) of the DLL and comparing it with the provided hash. If they match the function is found and a pointer to the function is stored.

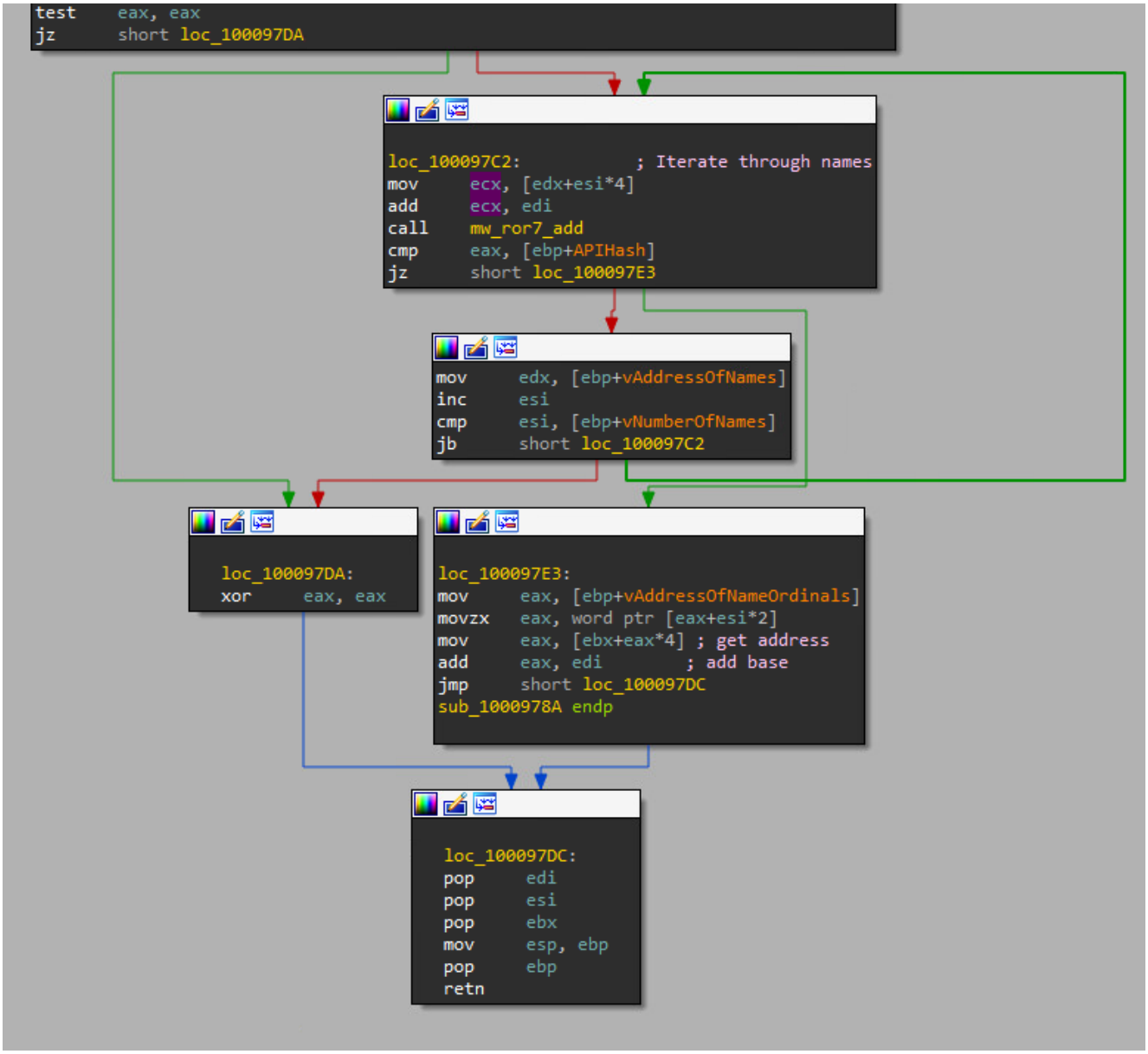
We know that the function receives the address to the module base of kernel32.dll. The address is passed via the ECX register. Additionally the function receives the precomputed hash via the EDX register. The first steps in the program are to store the passed arguments into edi respectively in var_4. Then the function goes over the memory region and reads in the PE

structure looking for the export directory. To better unterstand whats going on here and what offsets are used take a look at this (huge) diagram:
https://raw.githubusercontent.com/corkami/pics/master/binary/pe102/pe102.svg

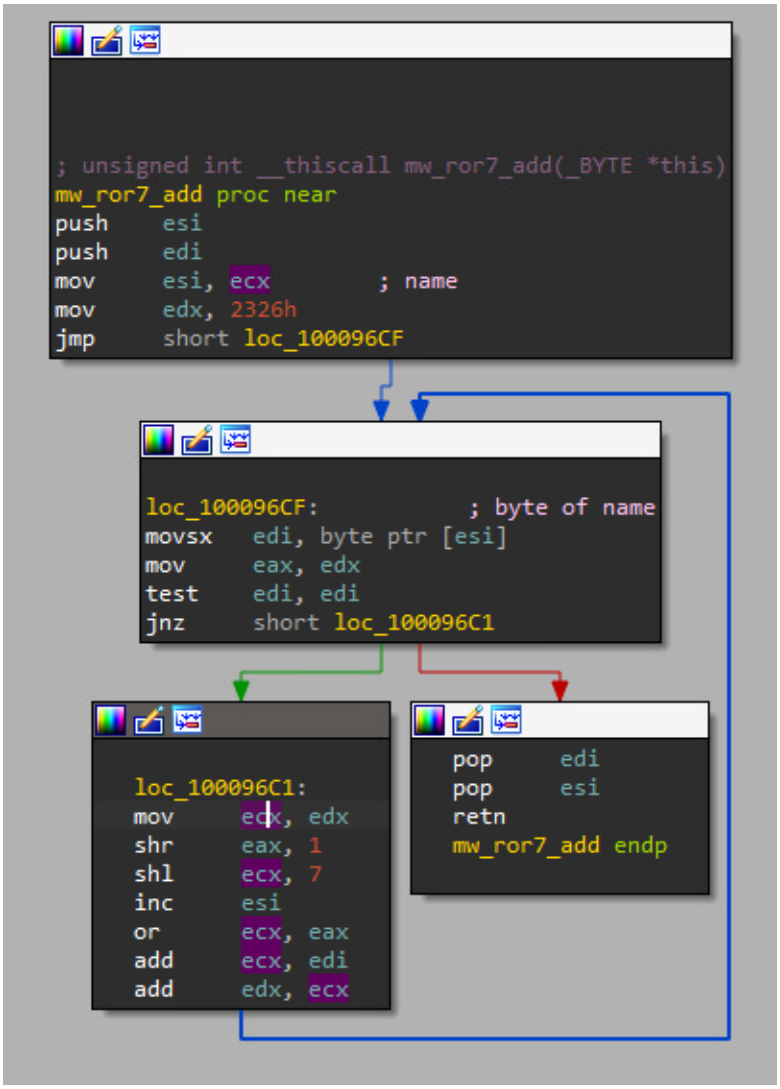


```
; Attributes: bp-based frame

sub_1000978A proc near

vAddressOfNameOrdinals= dword ptr -10h
vAddressOfNames= dword ptr -0Ch
vNumberOfNames= dword ptr -8
APIHash= dword ptr -4

push    ebp
mov     ebp, esp
sub     esp, 10h
push    ebx
push    esi
push    edi
mov     edi, ecx        ; MZ header
mov     [ebp+APIHash], edx
xor     esi, esi
mov     eax, [edi+IMAGE_DOS_HEADER.e_lfanew]
mov     eax, [eax+edi+IMAGE_NT_HEADERS.OptionalHeader.DataDirectory.VirtualAddress]
add     eax, edi        ; MZ header + VA of DataDirectory
mov     edx, [eax+IMAGE_EXPORT_DIRECTORY.AddressOfNames]
mov     ebx, [eax+IMAGE_EXPORT_DIRECTORY.AddressOfFunctions]
add     edx, edi        ; MZ header + AddressOfNames
mov     ecx, [eax+IMAGE_EXPORT_DIRECTORY.AddressOfNameOrdinals]
add     ebx, edi        ; MZ header + AddressOfNameOrdinals
mov     eax, [eax+IMAGE_EXPORT_DIRECTORY.NumberOfNames]
add     ecx, edi        ; MZ header + NumberOfNames
mov     [ebp+vAddressOfNames], edx
mov     [ebp+vAddressOfNameOrdinals], ecx
mov     [ebp+vNumberOfNames], eax
test    eax, eax
jz      short loc_100097DA

loc_100097C2:           ; Iterate through names
mov     ecx, [edx+esi*4]
```

Now the function gets the first name from the export directory (edx+esi*4) and calls the function sub_100096B6. The function name (better: the address of the function name) is passed via the ECX register.



And here we have find the hashing algorithm. First the address of the function name is stored in ESI. Then we move the constant 2326 (hex) into EDX register and jump down to loc_100096CF where we get the first char by utilizing „movsx edi, byte ptr [esi]“. Then the constant 2326h is copied into EAX. With „test edi, edi“ the function checks if there are still characters in the function name left or if the string termination („0“) is reached.



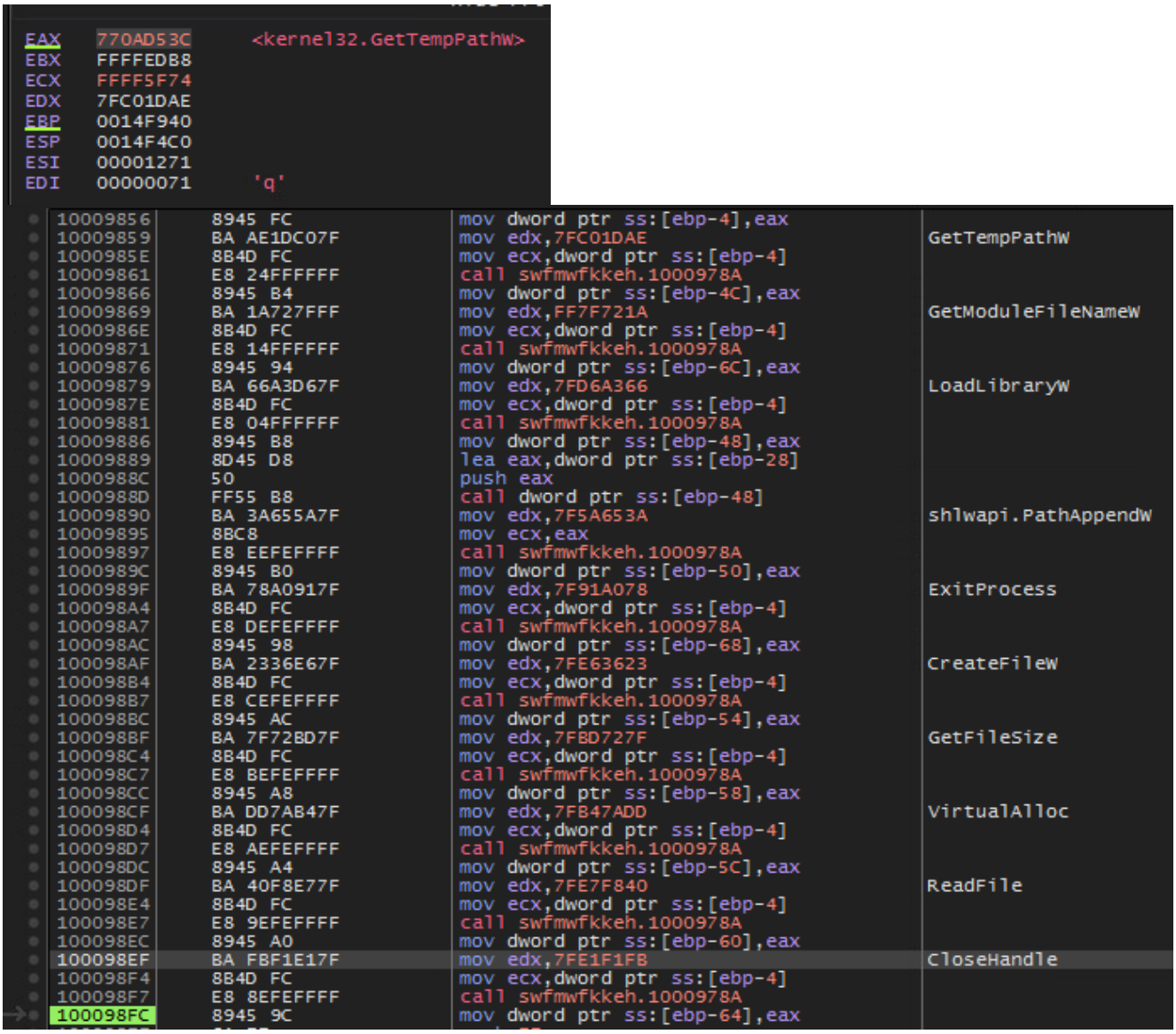
Pseudocode of the hashing algorithm

If we remove some of the optimizations by the compiler and do the shr / shl operations inline (these operations can only be done on registers therefore the compiler had to assemble it this way) then we get a very simple code. Basically its just starting with a constant (I called iv for Initialization Vector) and then shifts right and left and adds the current char. This way we go over all the chars in the string until we reach the end of the string. To simplify things I use a fixed string of „GetTempPathW“. To account for the EDX register (which is 32 bytes long) we have to make sure that we stay inside this range and therefore have to do an AND operation with 0xFFFFFFFF.

```
iv = 0x2326
name = "GetTempPathW"
hash = 0
for i in range(len(name)):
    iv = (iv + (iv >> 1 | iv << 7) + ord(name[i])) & 0xFFFFFFFF
    hash = iv

print(hex(hash))
```

Resolve the called API hashes

If we jump over one of these function calls we see the pointer in the EAX being returned. So we can jump over all the function call and make notes of the resolved API hashes. You could write a IDAPython script if you want but there are not many hashes so I decided to do it manually.



From what we see we can expect some file operations.

After all necessary APIs are resolved we can see that the malware does the same push/pop trick as before – so we do the same and run to the end and jump to the address in the dump

```
100098FF    6A 77           push 77
10009901    58              pop eax
10009902    66:8945 BC      mov word ptr ss:[ebp-44],ax
10009906    6A 36           push 36
10009908    58              pop eax
10009909    66:8945 BE      mov word ptr ss:[ebp-42],ax
1000990D    6A 36           push 36
1000990F    58              pop eax
10009910    66:8945 C0      mov word ptr ss:[ebp-40],ax
10009914    6A 7A           push 7A
10009916    58              pop eax
10009917    66:8945 C2      mov word ptr ss:[ebp-3E],ax
1000991B    6A 6C           push 6C
1000991D    58              pop eax
1000991E    66:8945 C4      mov word ptr ss:[ebp-3C],ax
10009922    6A 73           push 73
10009924    58              pop eax
10009925    66:8945 C6      mov word ptr ss:[ebp-3A],ax
10009929    6A 71           push 71
1000992B    58              pop eax
1000992C    66:8945 C8      mov word ptr ss:[ebp-38],ax
10009930    6A 70           push 70
10009932    58              pop eax
10009933    66:8945 CA      mov word ptr ss:[ebp-36],ax
10009937    6A 6E           push 6E
10009939    58              pop eax
1000993A    66:8945 CC      mov word ptr ss:[ebp-34],ax
1000993E    6A 79           push 79
10009940    58              pop eax
10009941    66:8945 CE      mov word ptr ss:[ebp-32],ax
10009945    6A 75           push 75
10009947    58              pop eax
10009948    66:8945 D0      mov word ptr ss:[ebp-30],ax
1000994C    6A 65           push 65
1000994E    58              pop eax
1000994F    66:8945 D2      mov word ptr ss:[ebp-2E],ax
10009953    6A 36           push 36
10009955    58              pop eax
10009956    66:8945 D4      mov word ptr ss:[ebp-2C],ax
1000995A    33C0            xor eax,eax
1000995C    66:8945 D6      mov word ptr ss:[ebp-2A],ax
```

There we see a strange string „w66zlsqpnyue6“.

```
0014F8FC  77 00 36 00  36 00 7A 00  6C 00 73 00  71 00 70 00  w.6.6.z.l.s.q.p.
0014F90C  6E 00 79 00  75 00 65 00  36 00 00 00  53 00 68 00  n.y.u.e.6...S.h.
0014F91C  6C 00 77 00  61 00 70 00  69 00 2E 00  64 00 6C 00  l.w.a.p.i...d.l.
```

Reading and decrypting main payload

Lets continue debugging. And find out what this string is used for. Next we have a call to a memory region and as you might have expected its an API call. We call GetTempPathW.

```
EIP  1000996C    FF55 B4         call dword ptr ss:[ebp-4C]
     1000996F    8D45 BC         lea eax,dword ptr ss:[ebp-44]
     10009972    50              push eax
dword ptr ss:[ebp-4C]=[0014F8F4 "<Ô\nw+H\tww"]=<kernel32.GetTempPathW>
```

With the next call we are able to figure out what the previous strange string means. The string is appended to the result of GetTempPathW and therefore it must be a file. If you recall ebp-44 is the string and ebp-480 contains the string of the temp folder.

```
     1000996C    FF55 B4         call dword ptr ss:[ebp-4C]
     1000996F    8D45 BC         lea eax,dword ptr ss:[ebp-44]
     10009972    50              push eax
     10009973    8D85 80FBFFFF   lea eax,dword ptr ss:[ebp-480]
     10009979    50              push eax
EIP  1000997A    FF55 B0         call dword ptr ss:[ebp-50]
     1000997D    6A 00           push 0
dword ptr ss:[ebp-50]=[0014F8F0 <&PathAppendW>]=<shlwapi.PathAppendW>
```

After the call the newly formed string is stored at ebp-480 and we can follow this memory in the dump and see the final result

```
0014F4C0  43 00 3A 00  5C 00 55 00  73 00 65 00  72 00 73 00  C.:.\.U.s.e.r.s.
0014F4D0  5C 00 50 00  65 00 74 00  65 00 72 00  5C 00 41 00  \.P.e.t.e.r.\.A.
0014F4E0  70 00 70 00  44 00 61 00  74 00 61 00  5C 00 4C 00  p.p.D.a.t.a.\.L.
0014F4F0  6F 00 63 00  61 00 6C 00  5C 00 54 00  65 00 6D 00  o.c.a.l.\.T.e.m.
0014F500  70 00 5C 00  77 00 36 00  36 00 7A 00  6C 00 73 00  p.\.w.6.6.z.l.s.
0014F510  71 00 70 00  6E 00 79 00  75 00 65 00  36 00 00 00  q.p.n.y.u.e.6...
```

Next we have a call to CreateFileW. Remember that the parameters are pushed to the stack in reverse order. One interesting fact about this call is the value 80000000 which is a constant for GENERIC_READ which means that the file must already exist or we will get an error. At this point we can assume that the NSIS installer will copy the file over to the temp directory. To proceed with our debugging we have to copy the file ourselves. You can find the file in the „root“ folder.

```
1000997D   6A 00              push 0
1000997F   68 80000000        push 80
10009984   6A 03              push 3
10009986   6A 00              push 0
10009988   6A 07              push 7
1000998A   68 00000080        push 80000000
1000998F   8D85 80FBFFFF      lea eax,dword ptr ss:[ebp-480]
10009995   50                 push eax
EIP 10009996   FF55 AC           call dword ptr ss:[ebp-54]
10009999   8945 F0           mov dword ptr ss:[ebp-10],eax
1000999C   837D F0 FF        cmp dword ptr ss:[ebp-10],FFFFFFFF
100099A0   75 02             jne swfmwfkkeh.100099A4
dword ptr ss:[ebp-54]=[0014F8EC <&CreateFileW>]=<kernel32.CreateFileW>
```

If the call succeeds EAX will contain the handle to the file. The result of the call is storend and checked in the next line.

```
EIP 10009999   8945 F0           mov dword ptr ss:[ebp-10],eax
1000999C   837D F0 FF        cmp dword ptr ss:[ebp-10],FFFFFFFF
100099A0   75 02             jne swfmwfkkeh.100099A4
100099A2   EB 66             jmp swfmwfkkeh.10009A0A
100099A4   6A 00             push 0
100099A6   FF75 F0           push dword ptr ss:[ebp-10]
100099A9   FF55 A8           call dword ptr ss:[ebp-58]
100099AC   8945 F8           mov dword ptr ss:[ebp-8],eax
100099AF   837D F8 FF        cmp dword ptr ss:[ebp-8],FFFFFFFF
100099B3   75 02             jne swfmwfkkeh.100099B7
100099B5   EB 53             jmp swfmwfkkeh.10009A0A
100099B7   6A 04             push 4
100099B9   68 00300000        push 3000
100099BE   FF75 F8           push dword ptr ss:[ebp-8]
100099C1   6A 00             push 0
100099C3   FF55 A4           call dword ptr ss:[ebp-5C]
100099C6   8945 F4           mov dword ptr ss:[ebp-C],eax
100099C9   837D F4 00        cmp dword ptr ss:[ebp-C],0
100099CD   75 02             jne swfmwfkkeh.100099D1
100099CF   EB 39             jmp swfmwfkkeh.10009A0A
```

If this is successful the malware gets the size of the file with a call to GetFileSize

```
EIP 100099A6   FF75 F0           push dword ptr ss:[ebp-10]
100099A9   FF55 A8           call dword ptr ss:[ebp-58]
100099AC   8945 F8           mov dword ptr ss:[ebp-8],eax
100099AF   837D F8 FF        cmp dword ptr ss:[ebp-8],FFFFFFFF
100099B3   75 02             jne swfmwfkkeh.100099B7
100099B5   EB 53             jmp swfmwfkkeh.10009A0A
100099B7   6A 04             push 4
100099B9   68 00300000        push 3000
100099BE   FF75 F8           push dword ptr ss:[ebp-8]
100099C1   6A 00             push 0
100099C3   FF55 A4           call dword ptr ss:[ebp-5C]
100099C6   8945 F4           mov dword ptr ss:[ebp-C],eax
dword ptr ss:[ebp-58]=[0014F8E8 <&GetFileSize>]=<kernel32.GetFileSize>
```

The same logic as above is used to check if the file size is not equal 0. Next we allocate virtual memory with a call to VirtualAlloc and pass the size (stored at ebp-8) to the function. The allocated memory is stored in ebp-C.

```
100099B5    EB 53          jmp swfmwfkkeh.10009A0A
100099B7    6A 04          push 4
100099B9    68 00300000    push 3000
100099BE    FF75 F8        push dword ptr ss:[ebp-8]
100099C1    6A 00          push 0
EIP 100099C3    FF55 A4    call dword ptr ss:[ebp-5C]
100099C6    8945 F4        mov dword ptr ss:[ebp-C],eax
100099C9    837D F4 00     cmp dword ptr ss:[ebp-C],0
100099CD    75 02          jne swfmwfkkeh.100099D1
100099CF    EB 39          jmp swfmwfkkeh.10009A0A
100099D1    6A 00          push 0

dword ptr ss:[ebp-5C]=[0014F8E4 <&VirtualAlloc>]=<kernel32.VirtualAlloc>
```

We do another check if the function succeeded and continue with a call to read file. The destination buffer is the just allocated memory region. In my case its 0x750000.

```
100099D1    6A 00          push 0
100099D3    8D45 90        lea eax,dword ptr ss:[ebp-70]      [ebp-70]:".M"
100099D6    50             push eax                           eax:&".M"
100099D7    FF75 F8        push dword ptr ss:[ebp-8]
100099DA    FF75 F4        push dword ptr ss:[ebp-C]
100099DD    FF75 F0        push dword ptr ss:[ebp-10]
EIP 100099E0    FF55 A0    call dword ptr ss:[ebp-60]
100099E3    85C0           test eax,eax                       eax:&".M"
```

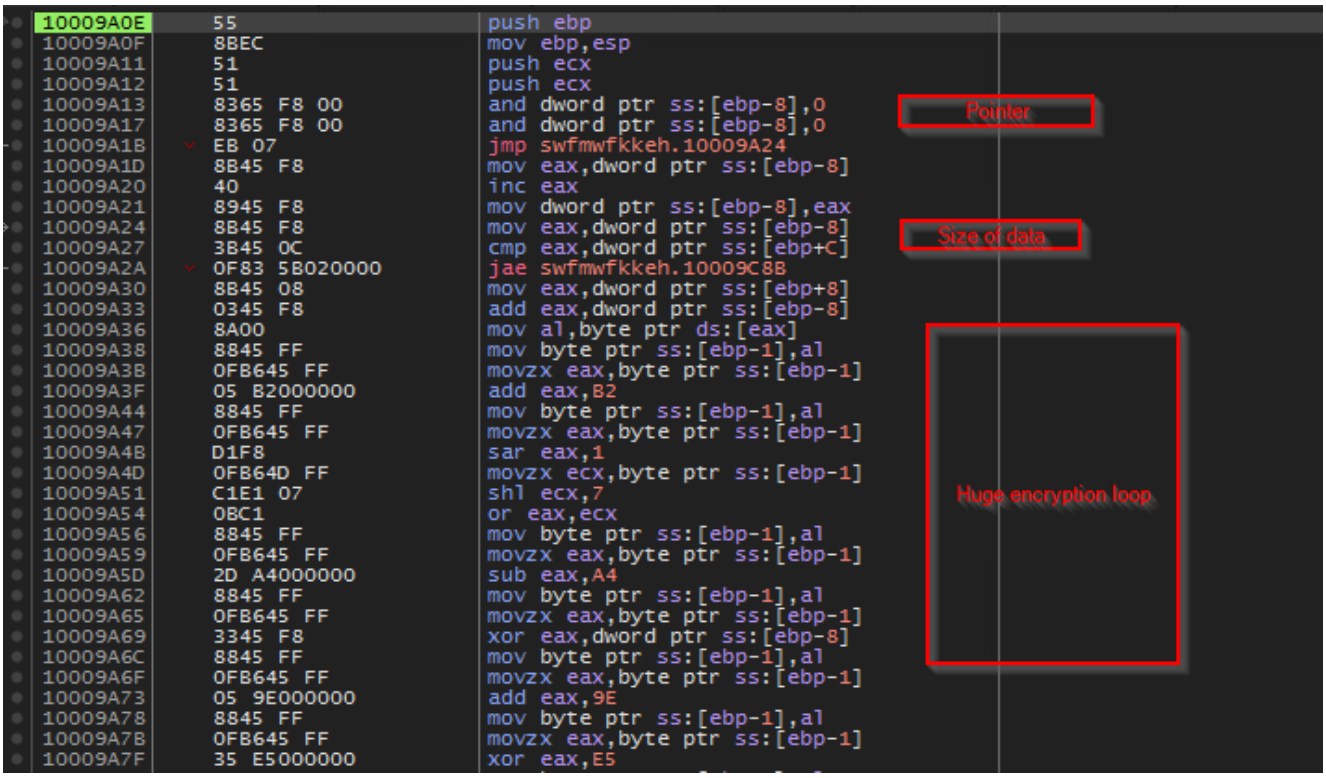
After the file is read we can take a look at the memory region.

```
00750000  87 45 C2 F2 51 3D 46 96 21 14 48 6F 36 2F B5 27  ‡EÂòQ=F–!¶Ho6/µ'
00750010  B3 86 E6 33 23 6C 01 EF 9C 15 7F B8 C8 E3 A6 D2  ³†æ3#l.ï...¸Èã¦Ò
00750020  5B 30 CB 84 14 22 6E B6 E3 90 29 FB C1 D0 72 48  [0Ë„.."n¶ã.)ûÁÐrH
00750030  92 0C C4 1F 53 52 7F 6C BE 4E E5 DA FC 71 9C 3D  ’.Ä.SR.l¾NåÚüq.=
00750040  DA 1E A1 DD 87 80 C7 77 AD 5E 87 51 23 D5 77 AA  Ú.¡Ý‡€Çw.^‡Q#Õwª
00750050  F8 F2 9B 06 B4 48 42 27 E3 F0 7E D1 1F F1 6B 5F  øò›.´HB'ãð~Ñ.ñk_
00750060  C4 25 F0 09 24 04 91 F1 12 07 AD 83 D7 C0 F1 17  Ä%ð.$.‘ñ....×Àñ.
00750070  E5 78 96 F4 0E 90 82 40 3A 8B 47 B4 6C BD B0 F1  åx–ô...‚@:‹G´l½°ñ
00750080  A8 CA CC 6A 0B 1F 55 84 40 D9 5F 1E 4E C9 F8 E8  ¨ÊÌj..U„@Ù_.NÉøè
00750090  C4 1F 98 CC 6C 85 7F 9D 70 EC 9D 5B 03 EC 1B 34  Ä.˜Ìl...pì.[.ì.4
007500A0  8A 98 C5 88 44 41 33 CA 04 8A 1C 31 86 BB 6E 2A  Š˜Å‰DA3Ê.Š.1†»n*
007500B0  97 A8 19 28 0C 09 01 13 55 2D F8 3C 2E 80 63 3F  —¨.(....U-ø<..€c?
007500C0  0A AD A2 5E 75 EF 1C 71 33 BA EA 24 87 B4 F5 45  ..¢^uï.q3ºê$‡´õE
007500D0  AE AB 11 F6 70 8E 8C B8 EE D7 B8 2D 17 F2 20 28  ®«.öp.Œ¸î×¸-.ò (
007500E0  55 08 C3 C1 E3 40 2E F3 40 3F D6 09 63 BF 7A 66  U.ÃÁã@.ó@?Ö.c¿zf
007500F0  93 1A 92 F9 2D 45 4E 0E B2 32 3D 98 82 89 09 E9  “.’ù-EN.²2=˜‚‰.é
00750100  13 23 BB F2 4D 3D 46 96 70 4A 48 6F E9 88 27 27  .#»òM=F–pJHoé‰''
00750110  C2 20 67 2A 23 6C 01 EF 70 15 7F B8 CA E3 76 42  Â g*#l.ip..¸Êãv
```

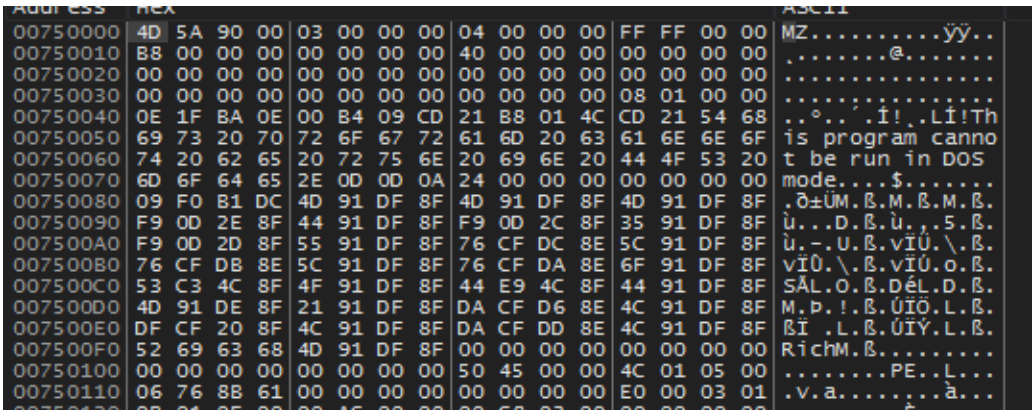
This does look like encrypted data but lets continue our analysis. After reading the file we close the handle to the file and jump into another function at 10009A0E. Notice that the functions receives two parameters. First the file size (ebp-8) and the allocated region of memory (ebp-C).

```
100099E0    FF55 A0        call dword ptr ss:[ebp-60]
100099E3    85C0           test eax,eax
100099E5    75 02          jne swfmwfkkeh.100099E9
100099E7    EB 21          jmp swfmwfkkeh.10009A0A
100099E9    FF75 F0        push dword ptr ss:[ebp-10]
100099EC    FF55 9C        call dword ptr ss:[ebp-64]      Close Handle
100099EF    FF75 F8        push dword ptr ss:[ebp-8]
100099F2    FF75 F4        push dword ptr ss:[ebp-C]
EIP 100099F5    E8 14000000    call swfmwfkkeh.10009A0E
100099FA    8945 F4        mov dword ptr ss:[ebp-C],eax
100099FD    FF75 F4        push dword ptr ss:[ebp-C]
10009A00    E8 8F020000    call swfmwfkkeh.10009C94
10009A05    6A 00          push 0
```

In the function we see a familiar code structure – it has great similarities with the first decryption loop. First there is a pointer initialized with zero stored as local variable at ebp-8. Then the pointer is incremented by one and check against the argument at ebp+C which is the file size. If the pointer value is lower than the size of data (jae) the encryption will continue otherwise we jump to 10009C8B. After the jump is NOT taken we see that the value at ebp+8 (the data itself) is moved into eax and then the pointer (counter) gets added.



As we did with the previous encryption loop we don't want to dig into the algorithm and just see whats happening. We know that this code will manipulate the read file so go to address 10009C8B and set a breakpoint. After the decryption is complete we can see a MZ header in the dump.



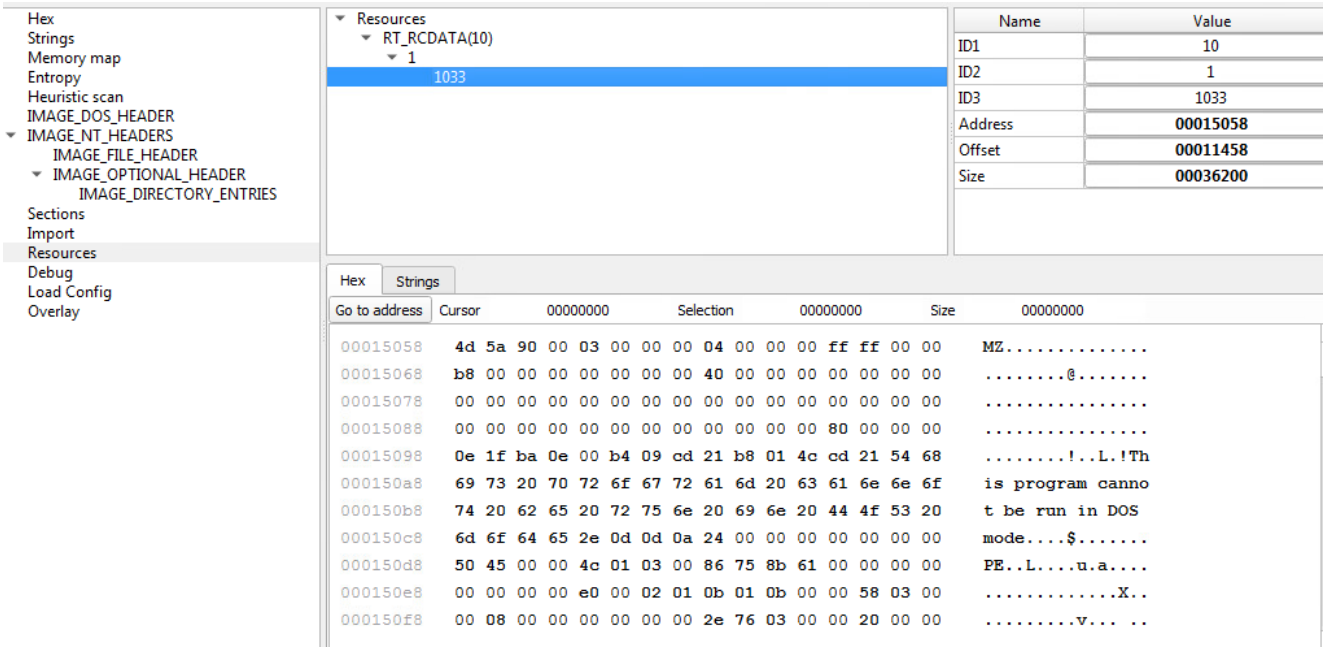
So right-click on the address 750000 and follow in memory map. Then right-click the address again and choose „Dump memory to file". We want to stop our analysis of the initial sample here and continue with the dumped PE.

Analyzing the dumped PE

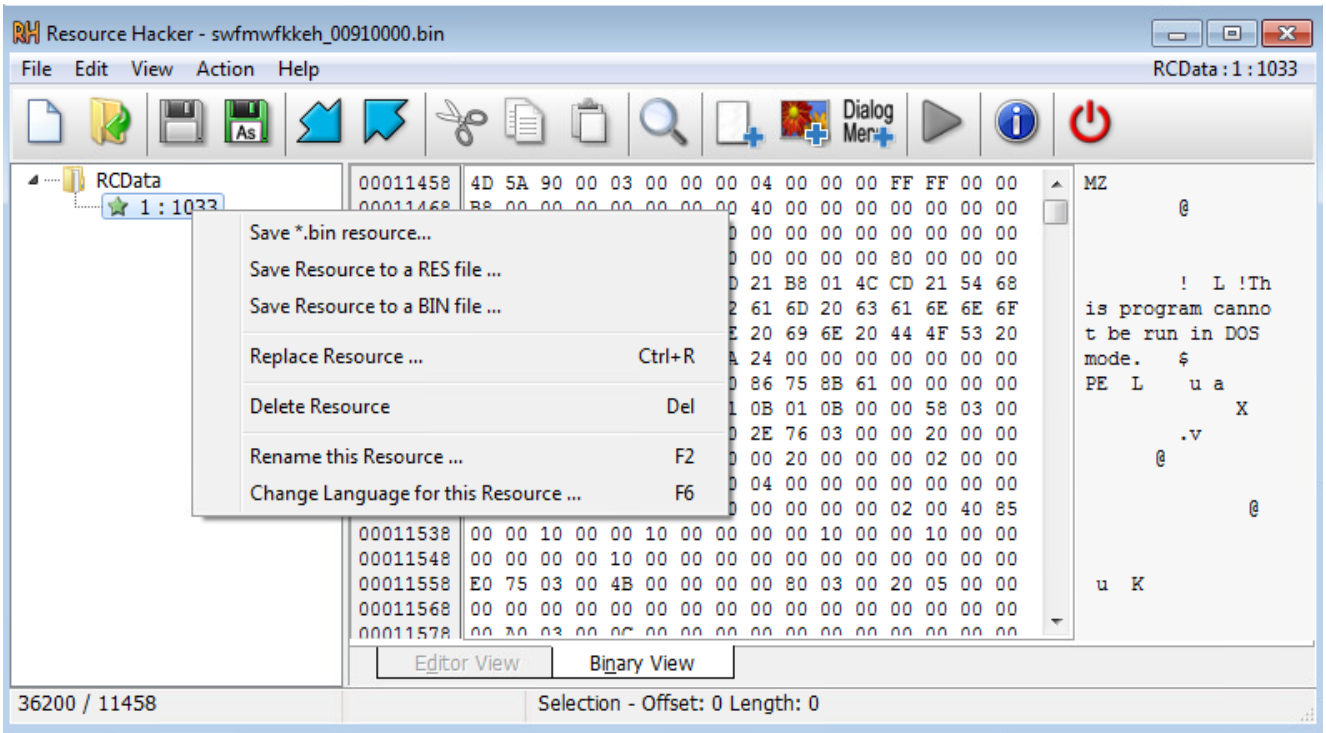
We once again start with some basic static analysis and open the file in DiE.

compiler	Microsoft Visual C/C++(2015 v.14.0)[-]	S	
linker	Microsoft Linker(14.0, Visual Studio 2015 14.0*)[EXE32]	S	?

Immediately we can see that the PE imports APIs to handle resources so lets check if there is something interesting.



And wow … there is an unencrypted PE inside of the resource section. To dump this PE we will utilize Resource Hacker and dump the file via „Save Resource to a BIN file…“

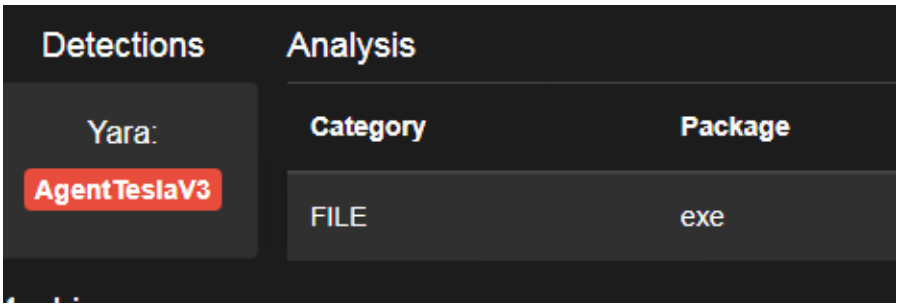


Analyzing the dumped resource

Once again we open the dumped PE in DiE and see that its written in .NET and obfuscated.

protector	Obfuscar(1.0)[-]	S	
library	.NET(v4.0.30319)[-]	S	
compiler	VB.NET(-)[-]	S	
linker	Microsoft Linker(11.0)[EXE32]	S	?

From this point on I just dropped this sample into the CAPE and got a hit on AgentTeslaV3 YARA signatures.



Mission complete!

IoCs

NSIS Installer	ce8a9bf908ce35bf0c034c61416109a44f015eabf058b12485450cd40af95fc3
swfmwfkkeh.dll	6d8bc73c6f2ef4ee700fc8bc4088f73a14dab355a2dd4e3e9aa3ddf52f7e946e
Encrypted resource (inside of NSIS data) w66zlsqpnyue6	c02ff5253bf3930f1ee14e088f50c827bf2209f3a7e9f00ed3994fd417d790b2
Dumped PE	9a72e5859b5564cecff5d5a4a929e81595d68aca1972ea2cf0fcf71c518d2cb9
AgentTesla V3	5459e87eb0a39243a35405866b2dca1d57c2c1ee02d24052635fcc48de5d397c