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BiBi Wiper: analisi malware

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Sommario

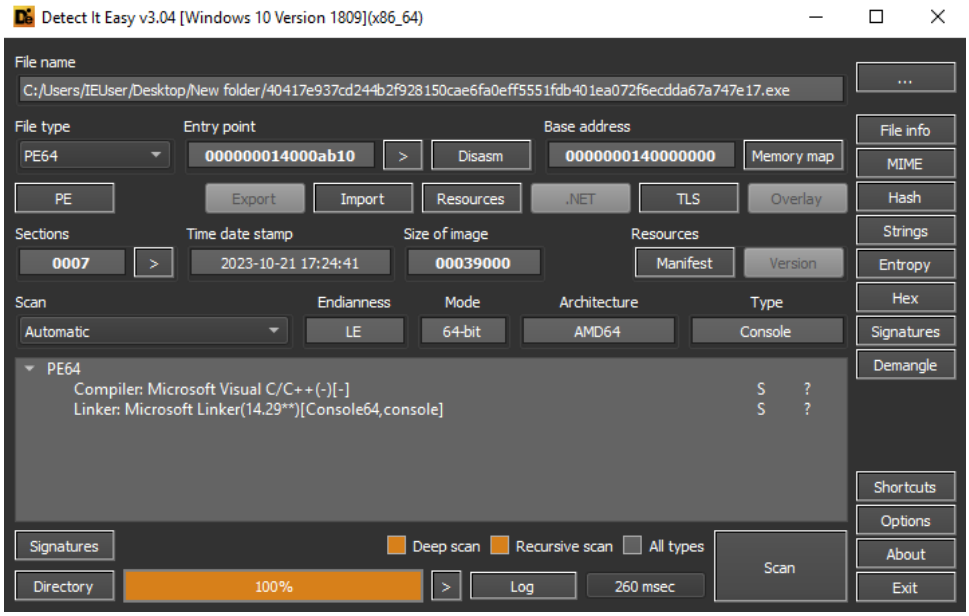
Introduzione

BiBi Wiper è un malware di tipo "distruttivo" utilizzato nel conflitto Israele – Hamas dagli attivisti del gruppo terroristico sunnita. Dal 30 Ottobre 2023 il threat sta infettando anche sistemi operativi Unix, nonostante la variante più utilizzata sia quella Windows, sottoposta ad analisi nel presente articolo.

L'artefatto, similarmente a quanto è avvenuto durante la guerra Russo-Ucraina, è stato utilizzato come strumento di guerra ibrida atto ad effettuare azioni distruttive nei confronti delle infrastrutture critiche di Israele, contribuendo di fatto all'offensiva militare e strategica di Hamas. La minaccia, eseguendo una sovrascrittura ed una fase di "locking" dei files (senza però chiederne alcun riscatto) pone BiBi Wiper in una condizione diversa da una minaccia Ransomware. L'unico obiettivo del Wiper è quello di rendere i dati dei target systems non accessibili e non utilizzabili. [0]

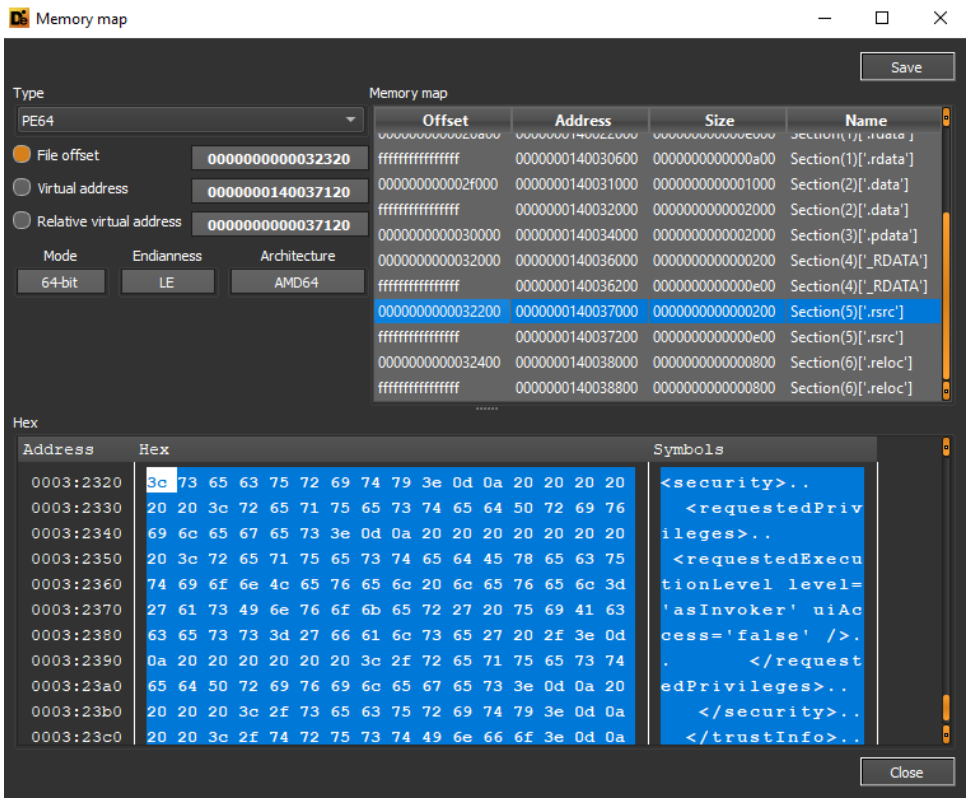
Analisi statica e malware assessment

Il sample analizzato ha come hash **e26bba0304f14ef96beb60376791d32c**, ed è stato sviluppato in C++.

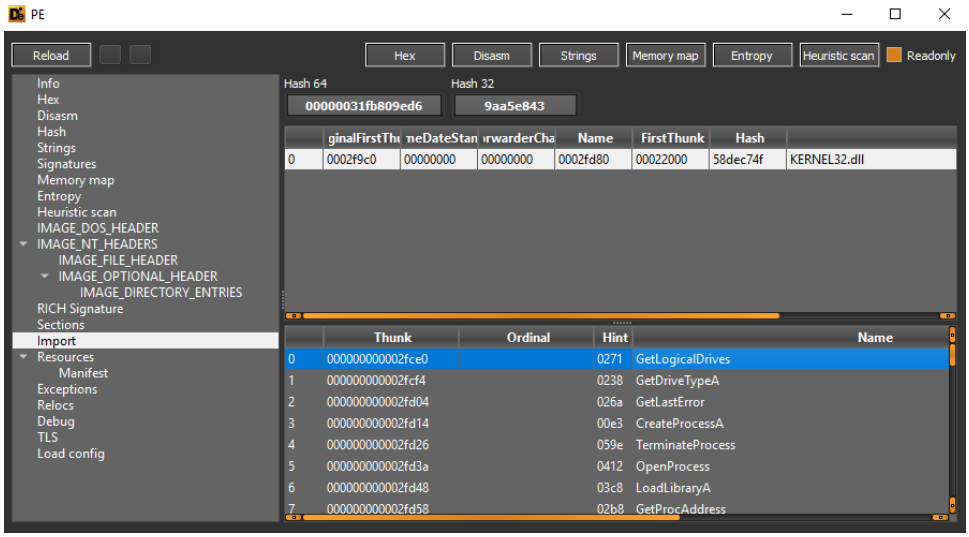


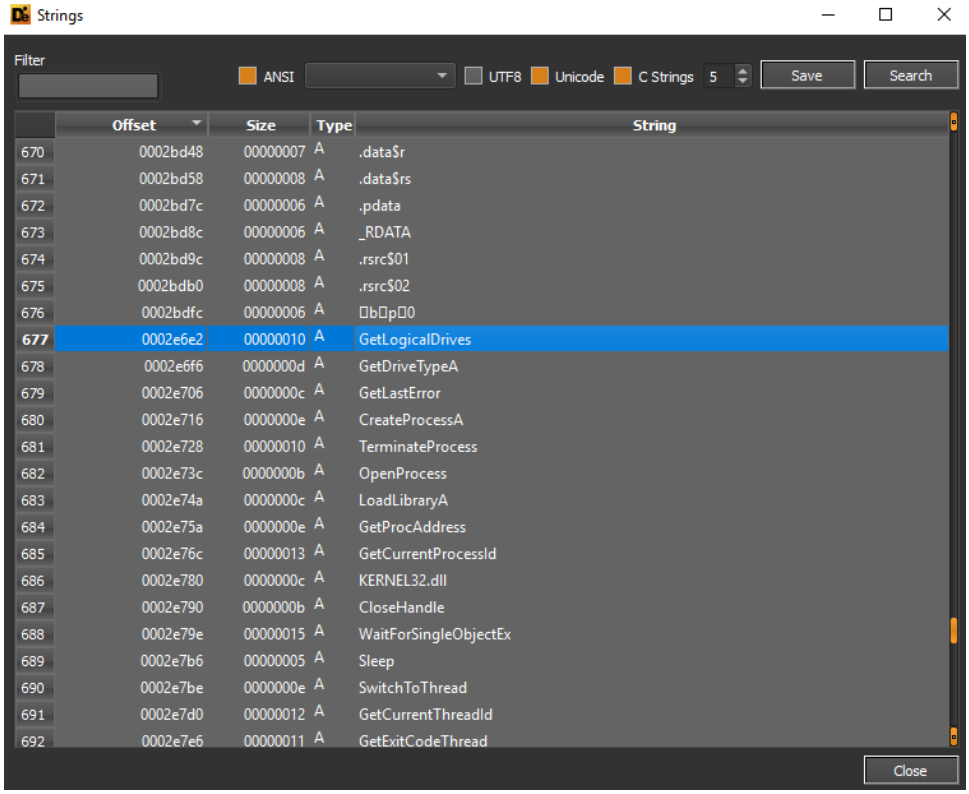
```
File name: C:/Users/IEUser/Desktop/New folder/40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecc
Size: 207872(203.00 kB)
MD5: e26bba0304f14ef96beb60376791d32c
SHA1: 24f6785ca2e82d1d1d61f4cb01d5e753f80445cf
Entropy: 6.19335(not packed)
Operation system: Windows(Vista)
Architecture: AMD64
Mode: 64-bit
Type: Console
Endianess: LE
Entry point(Address): 000000014000ab10
Entry point(Offset): 9f10
Entry point(Relative address): ab10
Entry point(Bytes): 4883ec28e89f0600004883c428e972feffffcccc4883ec284d8b4138488bca498bd1
Entry point(Signature): 4883ec..e8........4883c4..e9........cccc4883ec..4d8b41..488bca498bd1
Entry point(Signature)(Rel): 4883ec..e8$$$$$$$$48895c24..55488bec4883ec..488b05........48bb.......
```

All'interno della sezione *.rsrc* (la quale contiene i dettagli del file di metadati *manifest* ed altre risorse) possiamo evidenziare un'impostazione di execution *"asInvoker"*, pertanto il threat viene lanciato con i medesimi privilegi e permessi di sicurezza del processo parent.

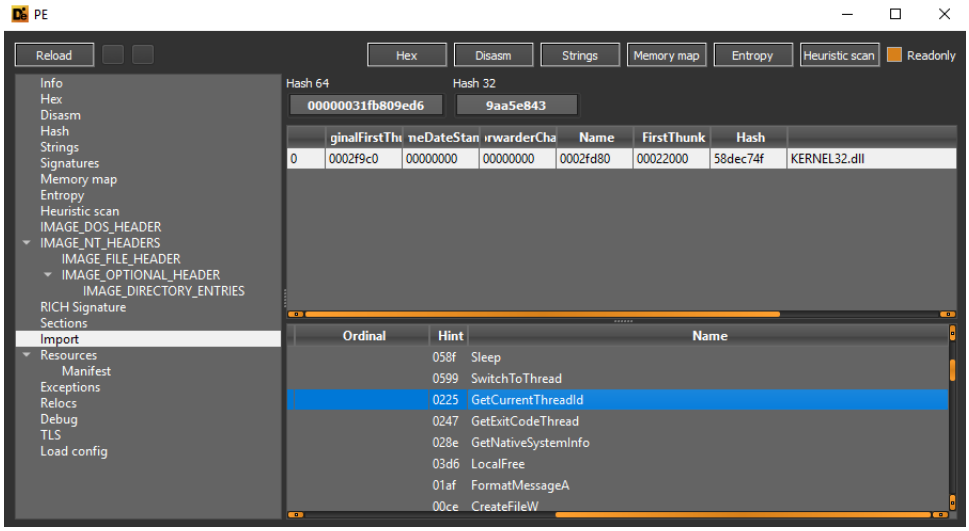


Le funzioni importate mediante la libreria *KERNEL32.dll* fanno riferimento a drives enumeration, creazione ed apertura di processi e richiamo di librerie esterne mediante *LoadLibraryA*:

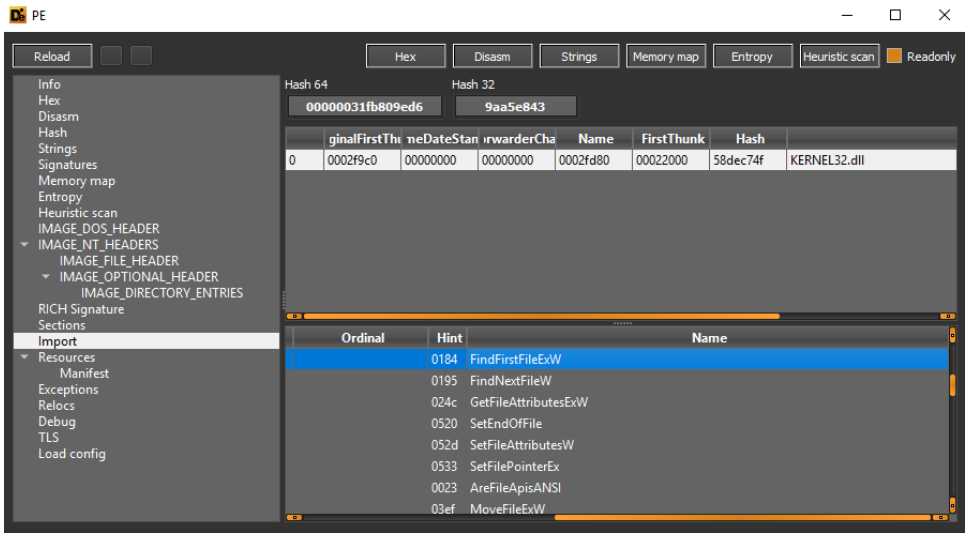




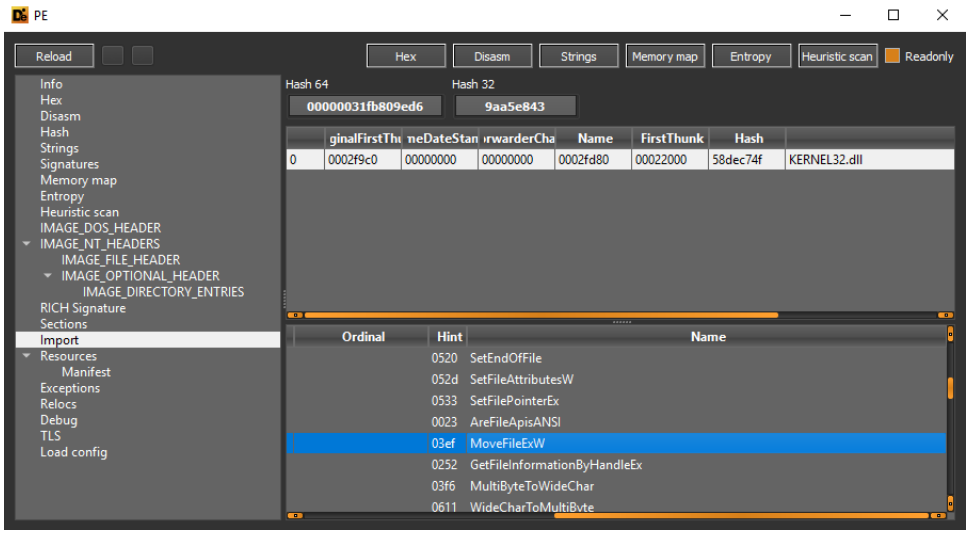
Vengono utilizzate funzioni di threads management per gestire esecuzioni concorrenziali:



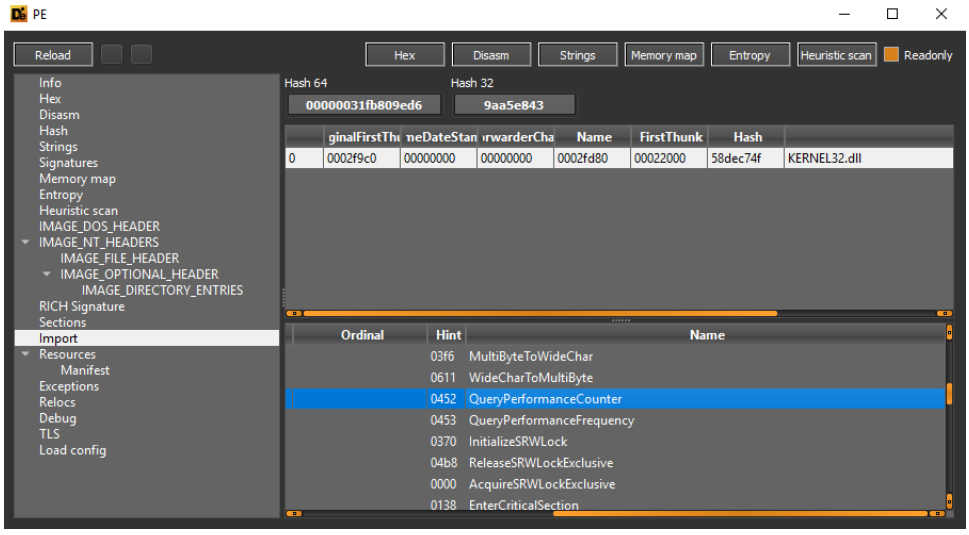
A seguire evidenze di files enumerations loop di ottenimento dei files ed attributi dei medesimi, nonché un puntamento mediante la funzione *SetFilePointerEx*. Quest'ultima è largamente utilizzata da minacce con funzionalità di riferimento a files esterni in quanto permette una gestione più granulare e specifica della location di puntamento.



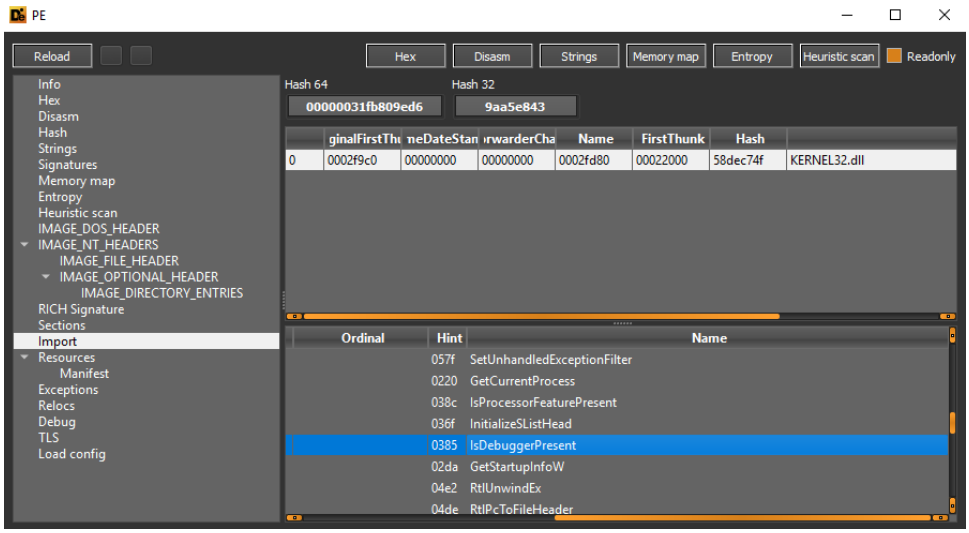
I files vengono rinominati con estensione **.BiBi** dopo che gli stessi sono stati resi inaccessibili attraverso un processo di sovrascrittura:



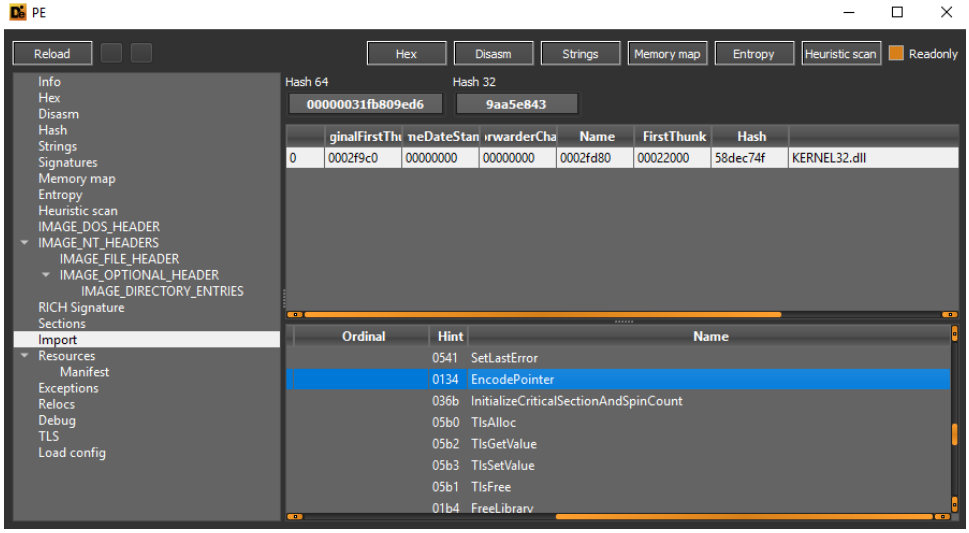
Vengono inoltre ottenuti i dettagli del Performance Counter e della frequenza di esecuzione dei componenti della CPU, tali informazioni possono permettere ad un threat di individuare un eventuale ambiente virtualizzato, come ad esempio macchine virtuali o sandboxes:



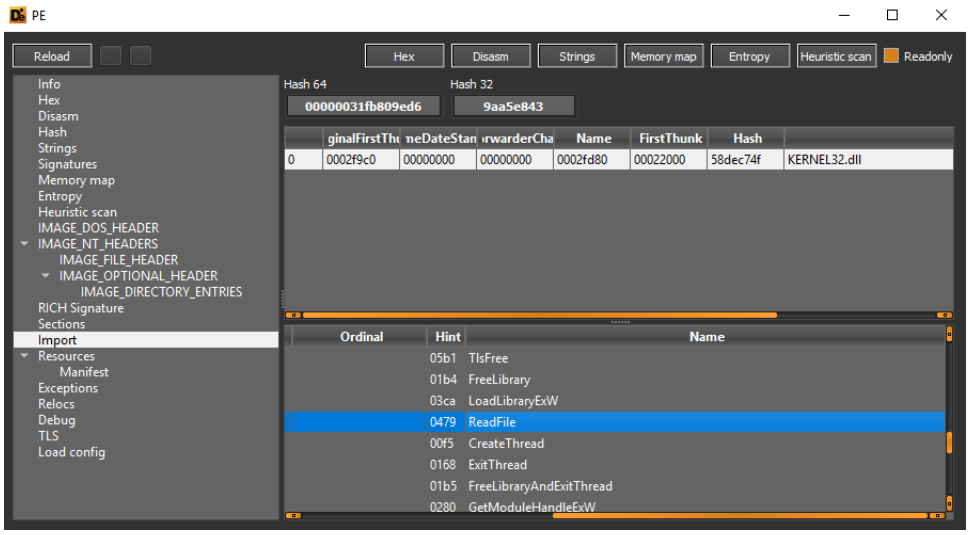
Si noti la funzione di debugger checking *IsDebuggerPresent*, che permette di evitare il monitoraggio e il tracciamento dell'esecuzione del processo stesso attraverso breakpoints e code browsing tools:



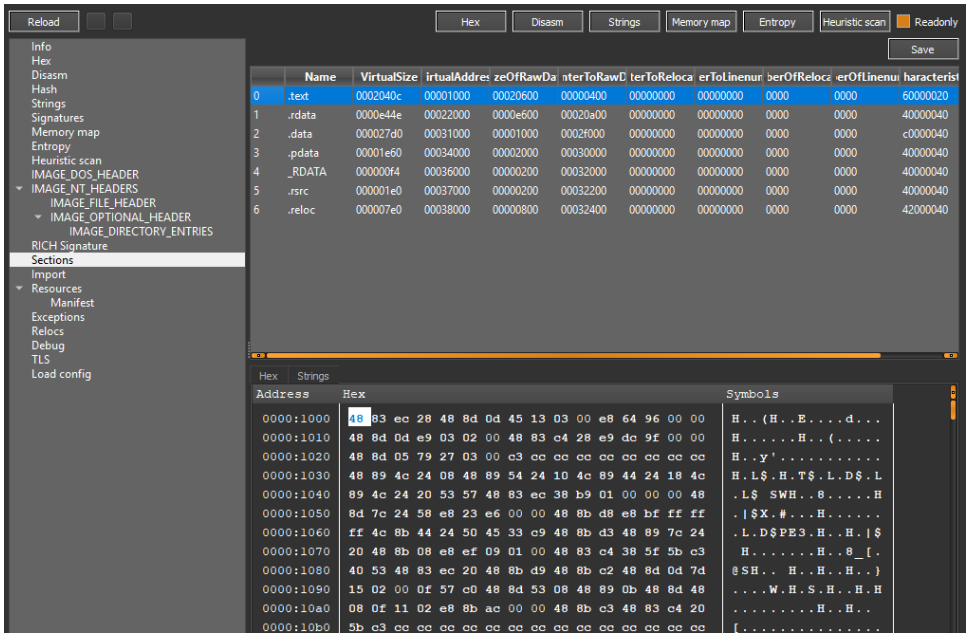
I valori dei puntatori utilizzati vengono codificati mediante il richiamo della funzione *EncodePointer*. I puntatori permettono di far riferimento ad ulteriori variabili ed oggetti all'interno di funzioni eseguite, nel caso specifico non vi è contezza precisa dei valori e attributi riferiti in quanto codificati.

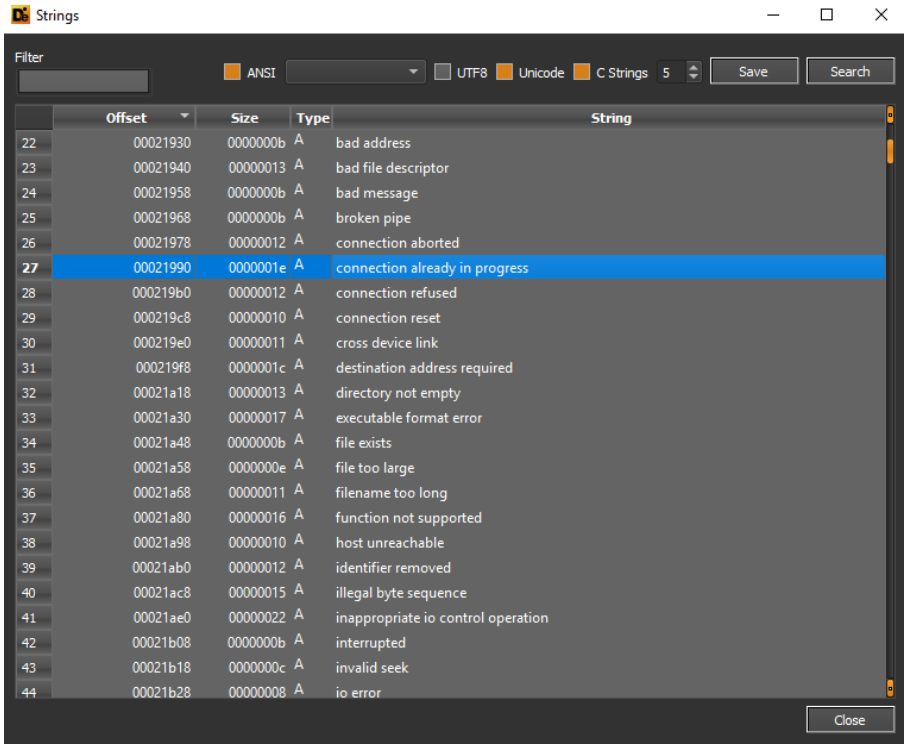


In un contesto concorrenziale vengono letti i files presi in considerazione:

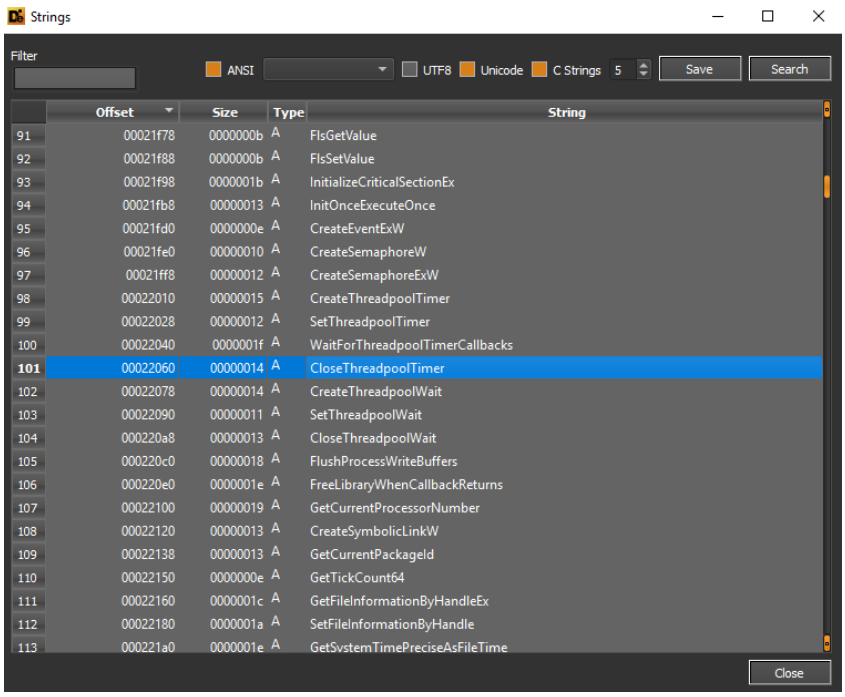


Qui i dettagli delle sezioni del Portable Executable in questione. La sezione principale risulta essere *.text*, la quale contiene le istruzioni direttamente eseguite dalla CPU.

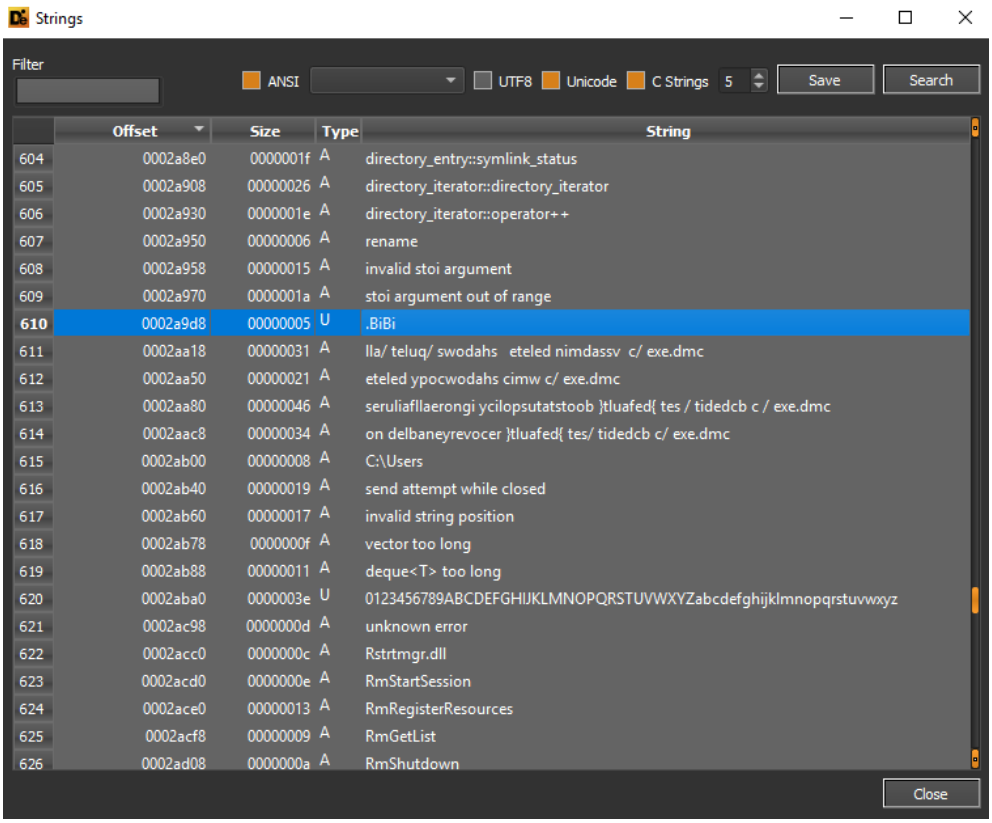




Qui i dettagli di gestione di oggetti concorrenziali e resources management, nello specifico multithreading e *semaphores*. Gli oggetti *semaphores* permettono l'utilizzo di risorse con un accesso esclusivo, evitando pertanto un accesso simultaneo da parte di più processi alla medesima risorsa:



Di seguito evidenze relative alla fase di *directory iterator*, estensione .BiBi appesa ai files resi inaccessibili, l'individuazione dei comandi CMD di booting settings al fine di disabilitare il modulo di Windows Automatic Repair ed il controllo di eventuali failures di OS booting. I comandi CMD in questione sono in forma *reversed* (ovvero scritti al rovescio) all'interno delle stringhe estraibili. Vengono inoltre utilizzate istanze di Restart Manager per gestire lo status e la terminazione del processo e vengono eliminate le copie shadow con lo scopo di non permettere il ripristino dei files in modo semplice:



Tramite un processo di text reversing abbiamo ottenuto i seguenti comandi eseguiti:

Input

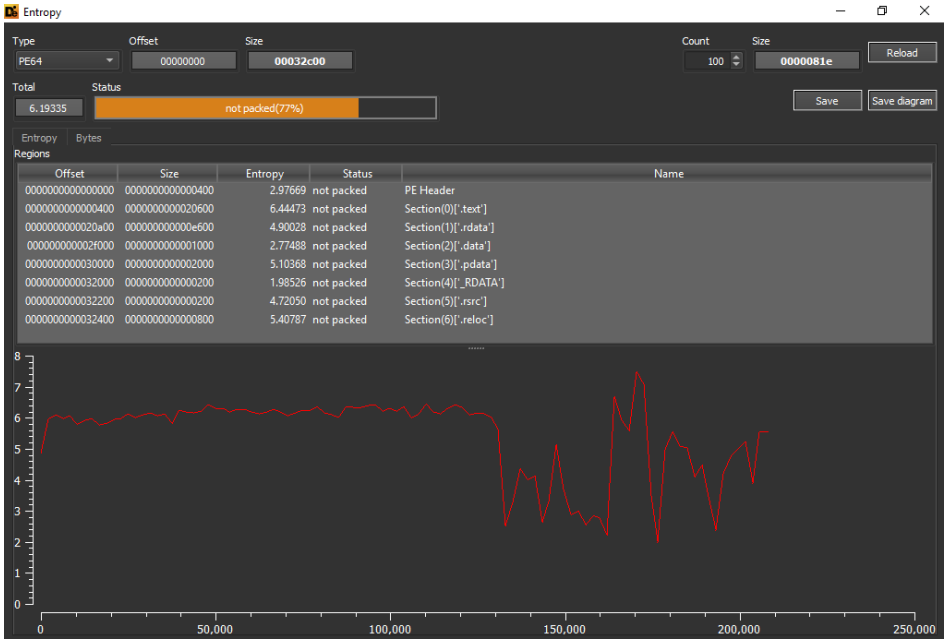
```
lla/ teIuq/ swodahs   eteled nimdassv  c/ exe.dmc
eteled ypocwodahs cimw c/ exe.dmc
seruliafllaerongi ycilopsutatstoob }tluafed{ tes / tidedcb c / exe.dmc
on delbaneyrevocer }tluafed{ tes/ tidedcb c/ exe.dmc
```

ABC 207 4

Output

```
cmd.exe /c bcdedit /set {default} recoveryenabled no
cmd.exe / c bcdedit / set {default} bootstatuspolicy ignoreallfailures
cmd.exe /c wmic shadowcopy delete
cmd.exe /c  vssadmin delete   shadows /quIet /all
```

Le sezioni del malware non risultano possedere peculiarità di packing, pertanto i threat actors non hanno provveduto a disporre un'azione di bytes confusing ai fini di rendere più difficoltosa un'eventuale analisi statica dell'artefatto. Tuttavia, come vedremo più avanti, alcuni attributi specifici di comandi eseguiti sono in stato di "text reversed" o in forma codificata.

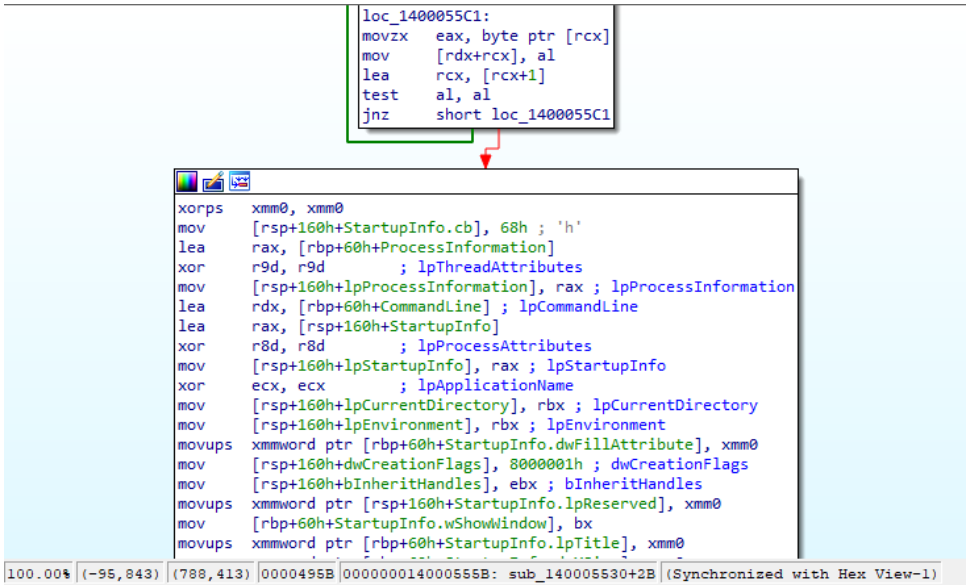


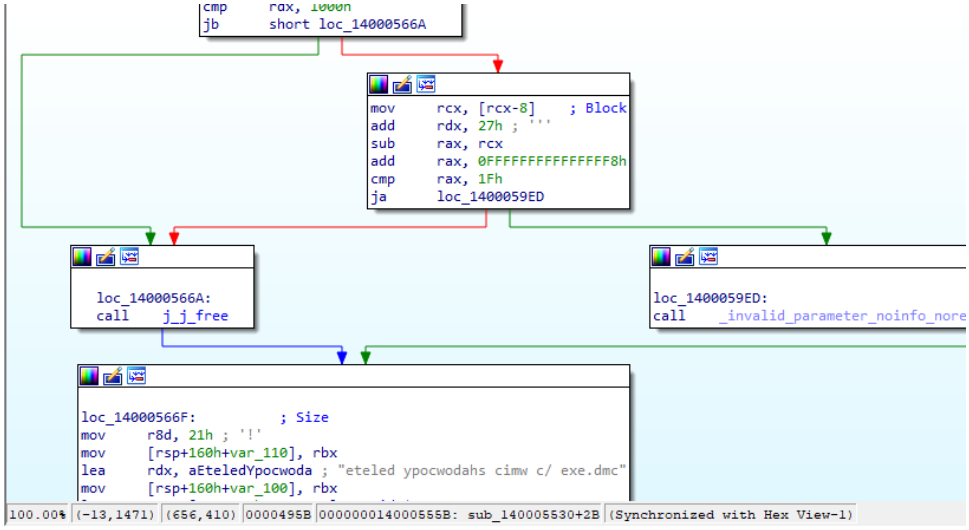
Analisi dinamica e second malware assessment

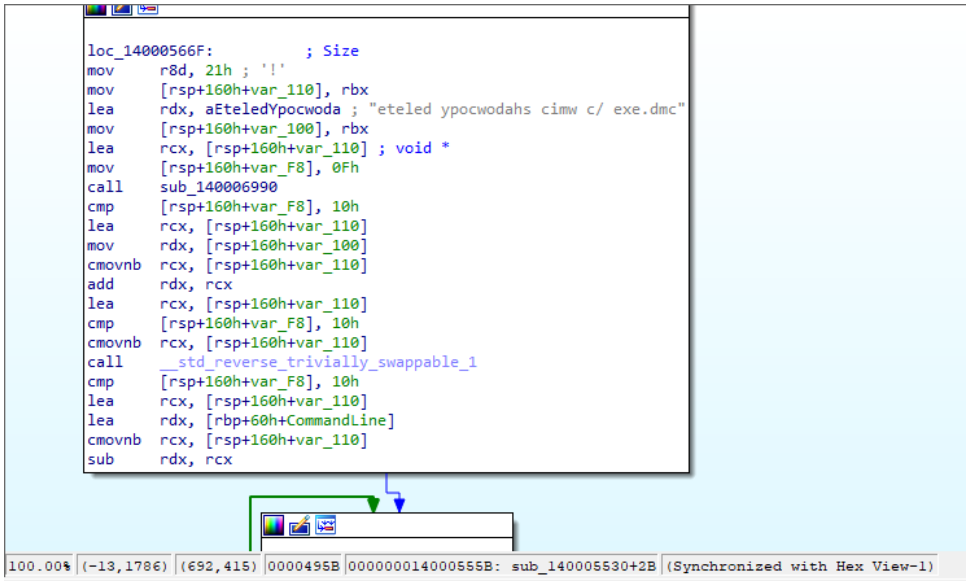
All'interno della funzione ***sub_140005530*** viene creato un nuovo processo avente come parametri i comandi CMD di *booting modification* (in forma text reversed):

```
sub_140005530 proc near

bInheritHandles= dword ptr -140h
dwCreationFlags= dword ptr -138h
lpEnvironment= qword ptr -130h
lpCurrentDirectory= qword ptr -128h
lpStartupInfo= qword ptr -120h
lpProcessInformation= qword ptr -118h
var_110= qword ptr -110h
var_100= qword ptr -100h
var_F8= qword ptr -0F8h
StartupInfo= _STARTUPINFOA ptr -0F0h
ProcessInformation= _PROCESS_INFORMATION ptr -80h
CommandLine= byte ptr -60h
var_10= qword ptr -10h
arg_0= qword ptr  10h

mov     [rsp-8+arg_0], rbx
push    rbp
lea     rbp, [rsp-60h]
sub     rsp, 160h
mov     rax, cs:__security_cookie
xor     rax, rsp
mov     [rbp+60h+var_10], rax
xor     ebx, ebx
mov     [rsp+160h+var_F8], 0Fh
lea     rdx, aLlaTeiuqSwodah ; "lla/ teIuq/ swodahs   eteled nimdassv  "...
mov     [rsp+160h+var_110], rbx
100.00% (-95,78) (744,415) 0000495B 000000014000555B: sub_140005530+2B (Synchronized with Hex View-1)
```

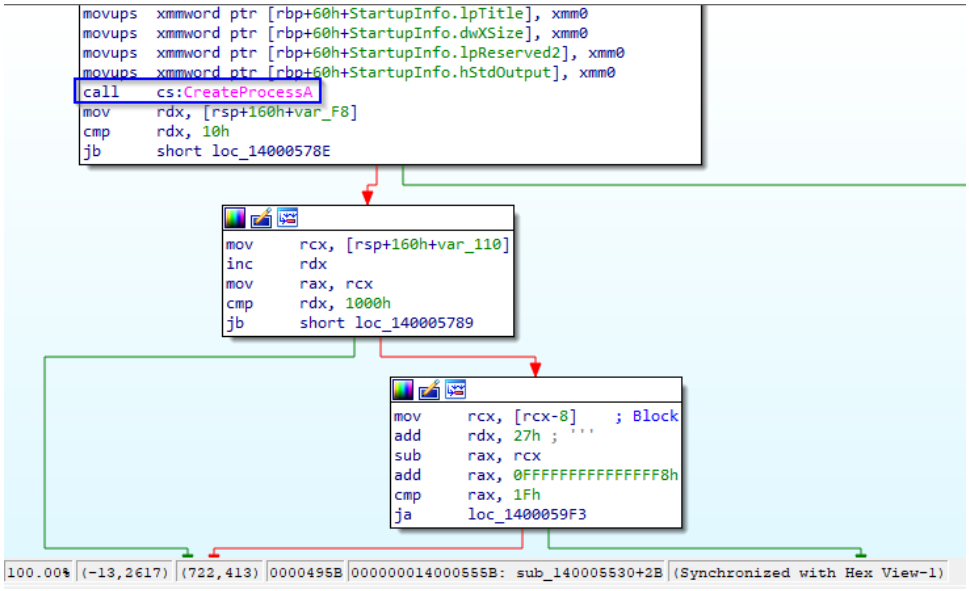
Evidenziamo i dettagli di impostazione dei threads e degli attributi di esecuzione del processo stesso:



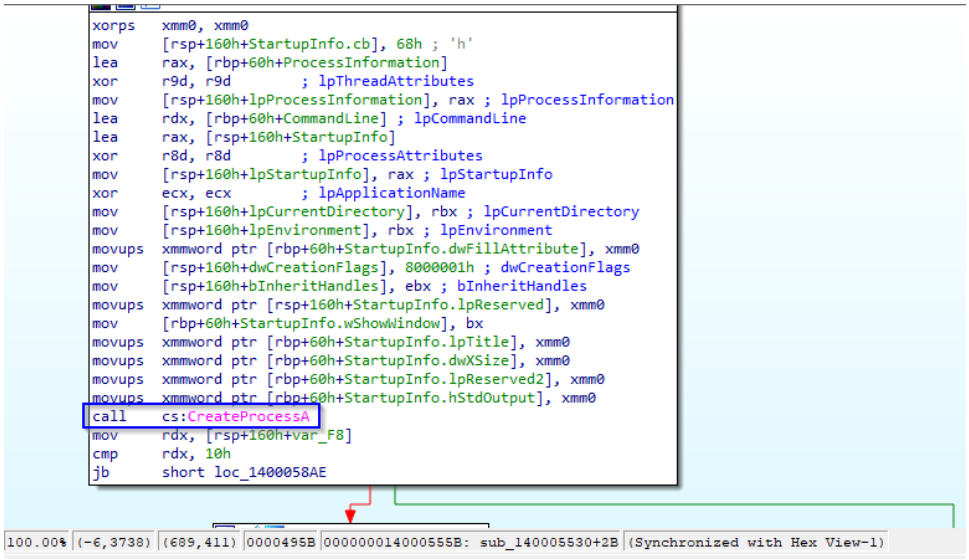


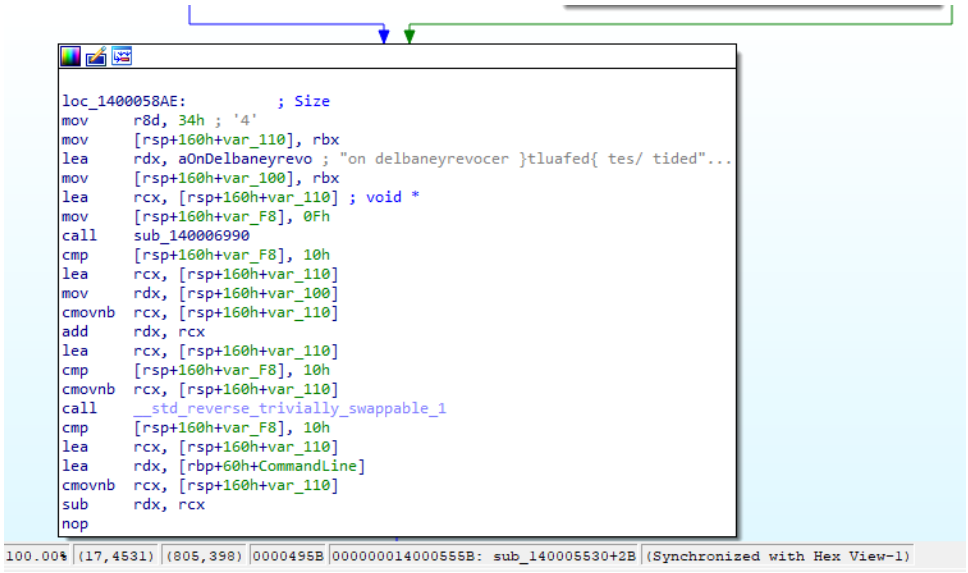


Infine, viene richiamata la funzione *CreateProcessA* per la creazione del processo in questione per l'esecuzione dei comandi su citati:


movups xmmword ptr [rbp+60h+StartupInfo.lpTitle], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.dwXSize], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.lpReserved2], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.hStdOutput], xmm0
call cs:CreateProcessA
mov rdx, [rsp+160h+var_F8]
cmp rdx, 10h
jb short loc_14000578E
mov rcx, [rsp+160h+var_110]
inc rdx
mov rax, rcx
cmp rdx, 1000h
jb short loc_140005789
mov rcx, [rcx-8] ; Block
add rdx, 27h ; '''
sub rax, rcx
add rax, 0FFFFFFFFFFFFFFF8h
cmp rax, 1Fh
ja loc_1400059F3
100.00% (-13,2617) (722,413) 0000495B 000000014000555B: sub_140005530+2B (Synchronized with Hex View-1)

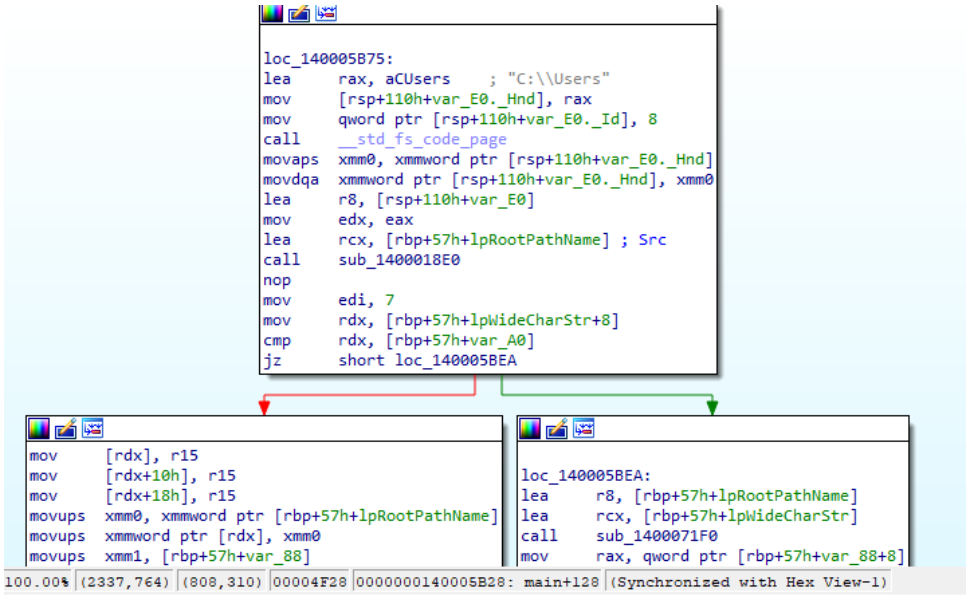

loc_14000578E: ; Size
mov r8d, 46h ; 'F'
mov [rsp+160h+var_110], rbx
lea rdx, aSeruliafllaero ; "seruliafllaerongi ycilopsutatstoob }tlu"...
mov [rsp+160h+var_100], rbx
lea rcx, [rsp+160h+var_110] ; void *
mov [rsp+160h+var_F8], 0Fh
call sub_140006990
cmp [rsp+160h+var_F8], 10h
lea rcx, [rsp+160h+var_110]
mov rdx, [rsp+160h+var_100]
cmovnb rcx, [rsp+160h+var_110]
add rdx, rcx
lea rcx, [rsp+160h+var_110]
cmp [rsp+160h+var_F8], 10h
cmovnb rcx, [rsp+160h+var_110]
call __std_reverse_trivially_swappable_1
cmp [rsp+160h+var_F8], 10h
lea rcx, [rsp+160h+var_110]
lea rdx, [rbp+60h+CommandLine]
cmovnb rcx, [rsp+160h+var_110]
sub rdx, rcx
nop
100.00% (-5,3182) (705,376) 0000495B 000000014000555B: sub_140005530+2B (Synchronized with Hex View-1)

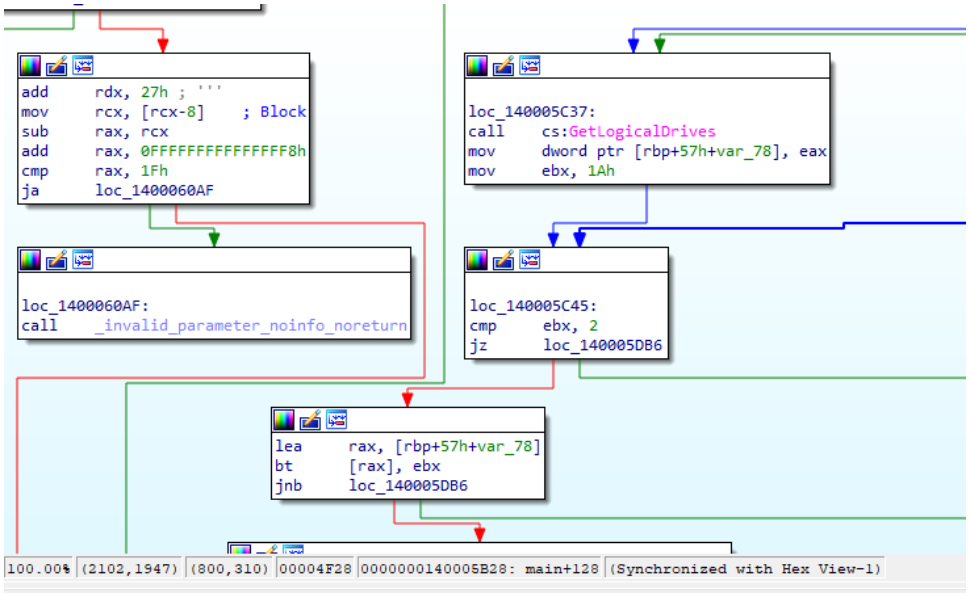

xorps xmm0, xmm0
mov [rsp+160h+StartupInfo.cb], 68h ; 'h'
lea rax, [rbp+60h+ProcessInformation]
xor r9d, r9d ; lpThreadAttributes
mov [rsp+160h+lpProcessInformation], rax ; lpProcessInformation
lea rdx, [rbp+60h+CommandLine] ; lpCommandLine
lea rax, [rsp+160h+StartupInfo]
xor r8d, r8d ; lpProcessAttributes
mov [rsp+160h+lpStartupInfo], rax ; lpStartupInfo
xor ecx, ecx ; lpApplicationName
mov [rsp+160h+lpCurrentDirectory], rbx ; lpCurrentDirectory
mov [rsp+160h+lpEnvironment], rbx ; lpEnvironment
movups xmmword ptr [rbp+60h+StartupInfo.dwFillAttribute], xmm0
mov [rsp+160h+dwCreationFlags], 8000001h ; dwCreationFlags
mov [rsp+160h+bInheritHandles], ebx ; bInheritHandles
movups xmmword ptr [rsp+160h+StartupInfo.lpReserved], xmm0
mov [rbp+60h+StartupInfo.wShowWindow], bx
movups xmmword ptr [rbp+60h+StartupInfo.lpTitle], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.dwXSize], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.lpReserved2], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.hStdOutput], xmm0
call cs:CreateProcessA
mov rdx, [rsp+160h+var_F8]
cmp rdx, 10h
jb short loc_1400058AE
100.00% (-6,3738) (689,411) 0000495B 000000014000555B: sub_140005530+2B (Synchronized with Hex View-1)


loc_1400058AE: ; Size
mov r8d, 34h ; '4'
mov [rsp+160h+var_110], rbx
lea rdx, aOnDelbaneyrevo ; "on delbaneyrevocer }tluafed{ tes/ tided"...
mov [rsp+160h+var_100], rbx
lea rcx, [rsp+160h+var_110] ; void *
mov [rsp+160h+var_F8], 0Fh
call sub_140006990
cmp [rsp+160h+var_F8], 10h
lea rcx, [rsp+160h+var_110]
mov rdx, [rsp+160h+var_100]
cmovnb rcx, [rsp+160h+var_110]
add rdx, rcx
lea rcx, [rsp+160h+var_110]
cmp [rsp+160h+var_F8], 10h
cmovnb rcx, [rsp+160h+var_110]
call __std_reverse_trivially_swappable_1
cmp [rsp+160h+var_F8], 10h
lea rcx, [rsp+160h+var_110]
lea rdx, [rbp+60h+CommandLine]
cmovnb rcx, [rsp+160h+var_110]
sub rdx, rcx
nop
100.00% (17,4531) (805,398) 0000495B 000000014000555B: sub_140005530+2B (Synchronized with Hex View-1)

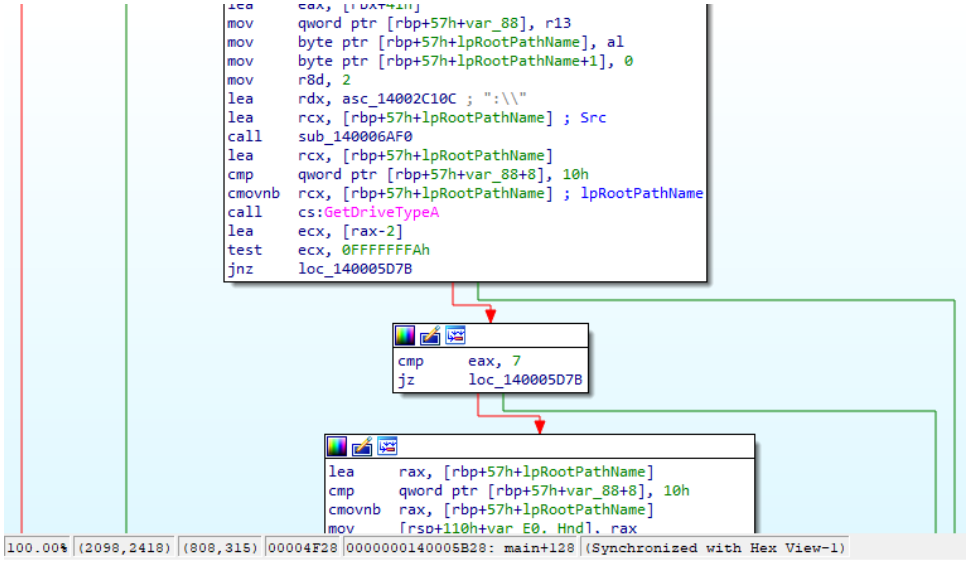

xorps xmm0, xmm0
mov [rsp+160h+StartupInfo.cb], 68h ; 'h'
lea rax, [rbp+60h+ProcessInformation]
xor r9d, r9d ; lpThreadAttributes
mov [rsp+160h+lpProcessInformation], rax ; lpProcessInformation
lea rdx, [rbp+60h+CommandLine] ; lpCommandLine
lea rax, [rsp+160h+StartupInfo]
xor r8d, r8d ; lpProcessAttributes
mov [rsp+160h+lpStartupInfo], rax ; lpStartupInfo
xor ecx, ecx ; lpApplicationName
mov [rsp+160h+lpCurrentDirectory], rbx ; lpCurrentDirectory
mov [rsp+160h+lpEnvironment], rbx ; lpEnvironment
movups xmmword ptr [rbp+60h+StartupInfo.dwFillAttribute], xmm0
mov [rsp+160h+dwCreationFlags], 8000001h ; dwCreationFlags
mov [rsp+160h+bInheritHandles], ebx ; bInheritHandles
movups xmmword ptr [rsp+160h+StartupInfo.lpReserved], xmm0
mov [rbp+60h+StartupInfo.wShowWindow], bx
movups xmmword ptr [rbp+60h+StartupInfo.lpTitle], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.dwXSize], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.lpReserved2], xmm0
movups xmmword ptr [rbp+60h+StartupInfo.hStdOutput], xmm0
call cs:CreateProcessA
mov rdx, [rsp+160h+var_F8]
cmp rdx, 10h
jb short loc_1400059CA
100.00% (16,5151) (734,403) 0000495B 000000014000555B: sub_140005530+2B (Synchronized with Hex View-1)

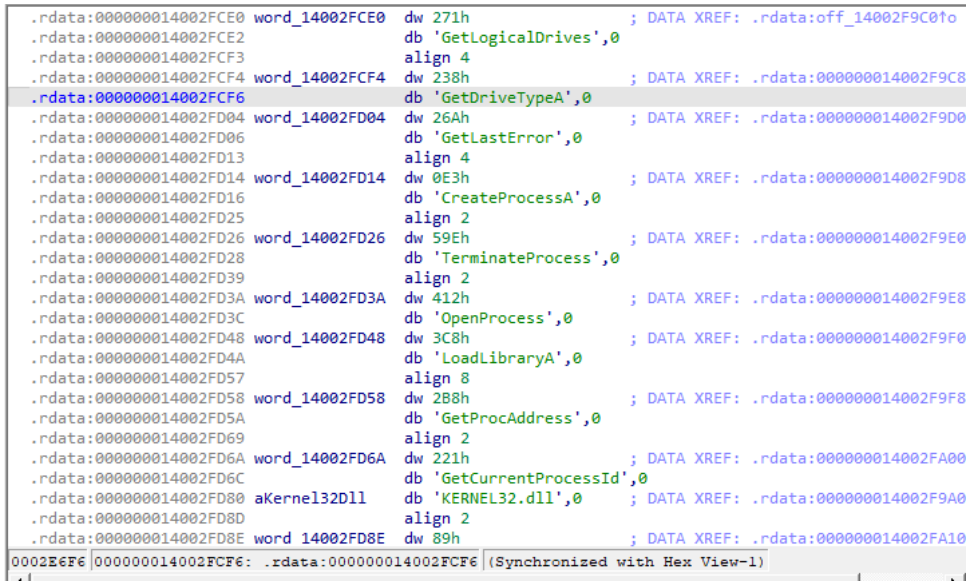
Vengono presi in considerazione i files e dati partendo dalla root folder **C:\\Users**



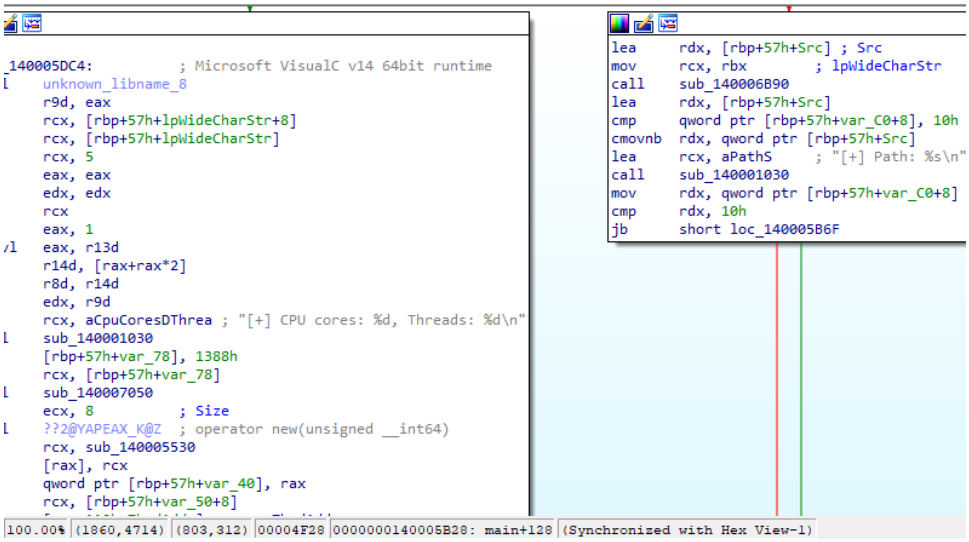


Successivamente vengono enumerate e classificate le varie tipologie di dischi di sistema:



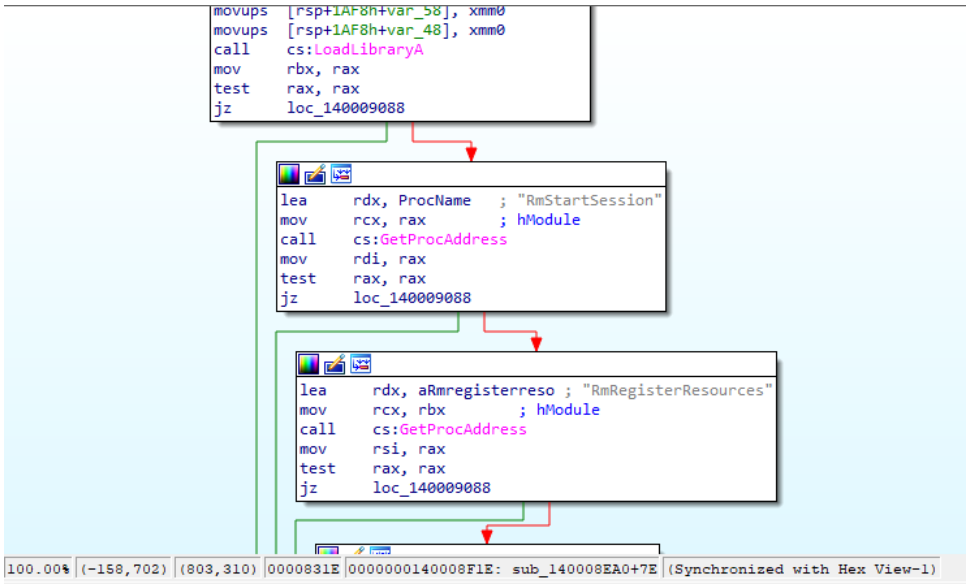


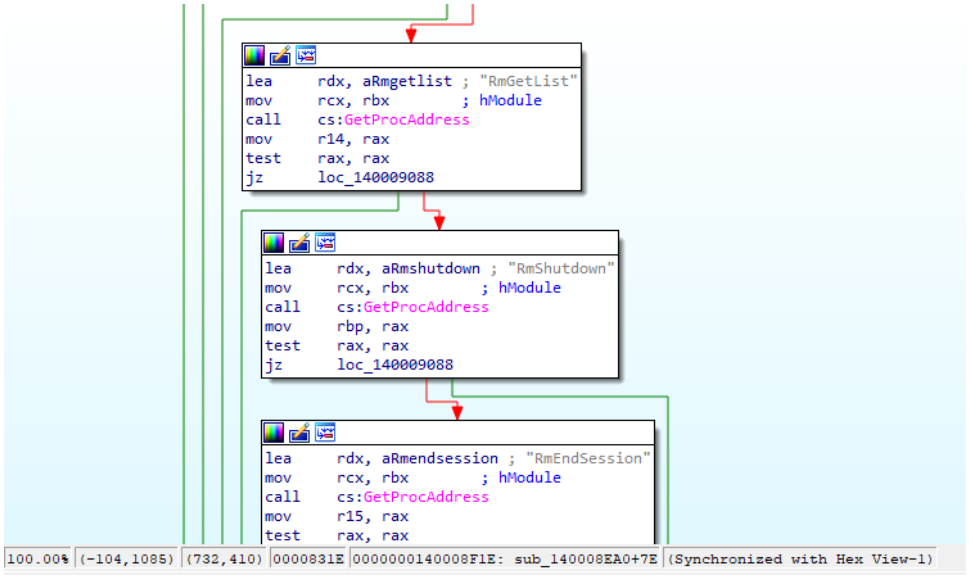
Vengono raccolti gli attributi e parametri per procedere con la fase di infection chain, quali il numero di threads, cores CPU, path ed elementi statistici di esecuzione:

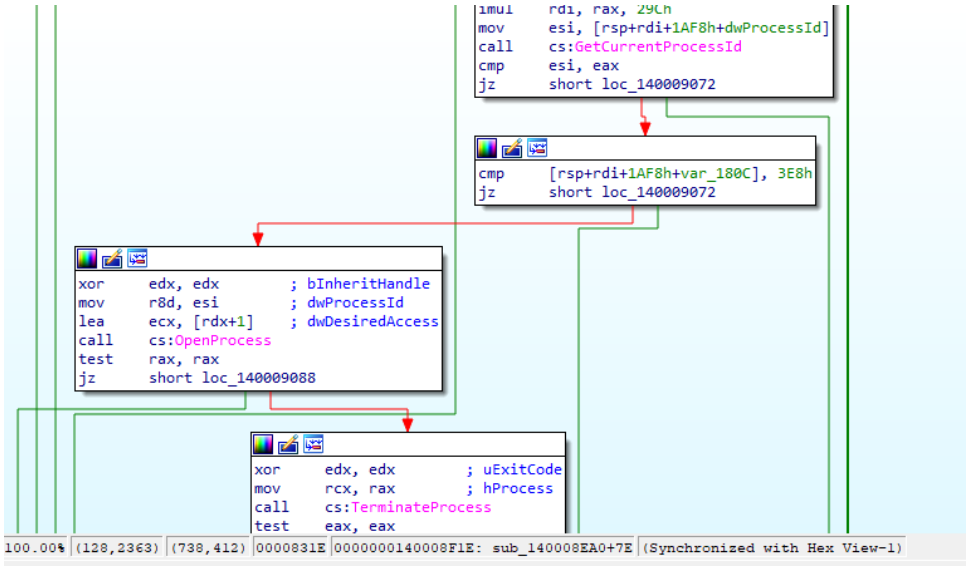


format-string	[+] Stats: %d | %d
format-string	[+] Path: %s
format-string	[+] CPU cores: %d, Threads: %d

Abbiamo evidenza della gestione delle sessioni di *Restart Management* con gli attributi di CurrentProcessID:







Ai seguenti indirizzi della sezione *.rdata* individuabili da *000000014002FE48*, sono evidenziabili le funzioni di files looping getting, ad esempio, *FindNextFileW, FindFirstFileExW* e *GetFileInformationByHandleEx*. Quest'ultima permette di ottenere dettagli di files specifici all'interno di una fase iterativa:

```
.rdata:000000014002FE2E                 db 'CreateFileW',0
.rdata:000000014002FE3A word_14002FE3A  dw 17Eh                 ; DATA XREF: .rdata:000000014002FA60
.rdata:000000014002FE3C                 db 'FindClose',0
.rdata:000000014002FE46 word_14002FE46  dw 184h                 ; DATA XREF: .rdata:000000014002FA68
.rdata:000000014002FE48                 db 'FindFirstFileExW',0
.rdata:000000014002FE59                 align 2
.rdata:000000014002FE5A word_14002FE5A  dw 195h                 ; DATA XREF: .rdata:000000014002FA70
.rdata:000000014002FE5C                 db 'FindNextFileW',0
.rdata:000000014002FE6A word_14002FE6A  dw 24Ch                 ; DATA XREF: .rdata:000000014002FA78
.rdata:000000014002FE6C                 db 'GetFileAttributesExW',0
.rdata:000000014002FE81                 align 2
.rdata:000000014002FE82 word_14002FE82  dw 520h                 ; DATA XREF: .rdata:000000014002FA80
.rdata:000000014002FE84                 db 'SetEndOfFile',0
.rdata:000000014002FE91                 align 2
.rdata:000000014002FE92 word_14002FE92  dw 52Dh                 ; DATA XREF: .rdata:000000014002FA88
.rdata:000000014002FE94                 db 'SetFileAttributesW',0
.rdata:000000014002FEA7                 align 8
.rdata:000000014002FEA8 word_14002FEA8  dw 533h                 ; DATA XREF: .rdata:000000014002FA90
.rdata:000000014002FEAA                 db 'SetFilePointerEx',0
.rdata:000000014002FEBB                 align 4
.rdata:000000014002FEBC word_14002FEBC  dw 23h                  ; DATA XREF: .rdata:000000014002FA98
.rdata:000000014002FEBE                 db 'AreFileApisANSI',0
.rdata:000000014002FECE word_14002FECE  dw 3EFh                 ; DATA XREF: .rdata:000000014002FAA0
.rdata:000000014002FED0                 db 'MoveFileExW',0
.rdata:000000014002FEDC word_14002FEDC  dw 252h                 ; DATA XREF: .rdata:000000014002FAA8
.rdata:000000014002FEDE                 db 'GetFileInformationByHandleEx',0
.rdata:000000014002FEFB                 align 4
0002E85C 000000014002FE5C: .rdata:000000014002FE5C (Synchronized with Hex View-1)
```

Di seguito ulteriori dettagli presenti all'interno della sezione .rdata inerenti alle funzioni di performance counter querying, ottenimento del timestamp locale per environment execution awareness (individuazione e classificazione dell'ambiente d'esecuzione).

```
.rdata:000000014002FEFE                 db 'MultiByteToWideChar',0
.rdata:000000014002FF12 word_14002FF12  dw 611h                 ; DATA XREF: .rdata:000000014002FAB8
.rdata:000000014002FF14                 db 'WideCharToMultiByte',0
.rdata:000000014002FF28 word_14002FF28  dw 452h                 ; DATA XREF: .rdata:000000014002FAC0
.rdata:000000014002FF2A                 db 'QueryPerformanceCounter',0
.rdata:000000014002FF42 word_14002FF42  dw 453h                 ; DATA XREF: .rdata:000000014002FAC8
.rdata:000000014002FF44                 db 'QueryPerformanceFrequency',0
.rdata:000000014002FF5E word_14002FF5E  dw 370h                 ; DATA XREF: .rdata:000000014002FAD0
.rdata:000000014002FF60                 db 'InitializeSRWLock',0
.rdata:000000014002FF72 word_14002FF72  dw 4B8h                 ; DATA XREF: .rdata:000000014002FAD8
.rdata:000000014002FF74                 db 'ReleaseSRWLockExclusive',0
.rdata:000000014002FF8C word_14002FF8C  dw 0                    ; DATA XREF: .rdata:000000014002FAE0
.rdata:000000014002FF8E                 db 'AcquireSRWLockExclusive',0
.rdata:000000014002FFA6 word_14002FFA6  dw 138h                 ; DATA XREF: .rdata:000000014002FAE8
.rdata:000000014002FFA8                 db 'EnterCriticalSection',0
.rdata:000000014002FFBD                 align 2
.rdata:000000014002FFBE word_14002FFBE  dw 3C4h                 ; DATA XREF: .rdata:000000014002FAF0
.rdata:000000014002FFC0                 db 'LeaveCriticalSection',0
.rdata:000000014002FFD5                 align 2
.rdata:000000014002FFD6 word_14002FFD6  dw 36Ch                 ; DATA XREF: .rdata:000000014002FAF8
.rdata:000000014002FFD8                 db 'InitializeCriticalSectionEx',0
.rdata:000000014002FFF4 word_14002FFF4  dw 5B9h                 ; DATA XREF: .rdata:000000014002FB00
.rdata:000000014002FFF6                 db 'TryEnterCriticalSection',0
.rdata:000000014003000E word_14003000E  dw 114h                 ; DATA XREF: .rdata:000000014002FB08
.rdata:0000000140030010                 db 'DeleteCriticalSection',0
.rdata:0000000140030026 word_140030026  dw 2F3h                 ; DATA XREF: .rdata:000000014002FB10
.rdata:0000000140030028                 db 'GetSystemTimeAsFileTime',0
0002E92A 000000014002FF2A: .rdata:000000014002FF2A (Synchronized with Hex View-1)
```

```
.rdata:000000014002FFD5                 align 2
.rdata:000000014002FFD6 word_14002FFD6  dw 36Ch                 ; DATA XREF: .rdata:000000014002FAF8
.rdata:000000014002FFD8                 db 'InitializeCriticalSectionEx',0
.rdata:000000014002FFF4 word_14002FFF4  dw 5B9h                 ; DATA XREF: .rdata:000000014002FB00
.rdata:000000014002FFF6                 db 'TryEnterCriticalSection',0
.rdata:000000014003000E word_14003000E  dw 114h                 ; DATA XREF: .rdata:000000014002FB08
.rdata:0000000140030010                 db 'DeleteCriticalSection',0
.rdata:0000000140030026 word_140030026  dw 2F3h                 ; DATA XREF: .rdata:000000014002FB10
.rdata:0000000140030028                 db 'GetSystemTimeAsFileTime',0
.rdata:0000000140030040 word_140030040  dw 281h                 ; DATA XREF: .rdata:000000014002FB18
.rdata:0000000140030042                 db 'GetModuleHandleW',0
.rdata:0000000140030053                 align 4
.rdata:0000000140030054 word_140030054  dw 4D5h                 ; DATA XREF: .rdata:000000014002FB20
.rdata:0000000140030056                 db 'RtlCaptureContext',0
.rdata:0000000140030068 word_140030068  dw 4DCh                 ; DATA XREF: .rdata:000000014002FB28
.rdata:000000014003006A                 db 'RtlLookupFunctionEntry',0
.rdata:0000000140030081                 align 2
.rdata:0000000140030082 word_140030082  dw 4E3h                 ; DATA XREF: .rdata:000000014002FB30
.rdata:0000000140030084                 db 'RtlVirtualUnwind',0
.rdata:0000000140030095                 align 2
.rdata:0000000140030096 word_140030096  dw 5C0h                 ; DATA XREF: .rdata:000000014002FB38
.rdata:0000000140030098                 db 'UnhandledExceptionFilter',0
.rdata:00000001400300B1                 align 2
.rdata:00000001400300B2 word_1400300B2  dw 57Fh                 ; DATA XREF: .rdata:000000014002FB40
.rdata:00000001400300B4                 db 'SetUnhandledExceptionFilter',0
.rdata:00000001400300D0 word_1400300D0  dw 220h                 ; DATA XREF: .rdata:000000014002FB48
.rdata:00000001400300D2                 db 'GetCurrentProcess',0
0002E9F6 000000014002FFF6: .rdata:000000014002FFF6 (Synchronized with Hex View-1)
```

Qui ulteriori riferimenti alle funzioni *IsDebuggerPresent* ed *EncodePointer*:

```
.rdata:0000000140030098                 db 'UnhandledExceptionFilter',0
.rdata:00000001400300B1                 align 2
.rdata:00000001400300B2 word_1400300B2  dw 57Fh                 ; DATA XREF: .rdata:000000014002
.rdata:00000001400300B4                 db 'SetUnhandledExceptionFilter',0
.rdata:00000001400300D0 word_1400300D0  dw 220h                 ; DATA XREF: .rdata:000000014002
.rdata:00000001400300D2                 db 'GetCurrentProcess',0
.rdata:00000001400300E4 word_1400300E4  dw 38Ch                 ; DATA XREF: .rdata:000000014002
.rdata:00000001400300E6                 db 'IsProcessorFeaturePresent',0
.rdata:0000000140030100 word_140030100  dw 36Fh                 ; DATA XREF: .rdata:000000014002
.rdata:0000000140030102                 db 'InitializeSListHead',0
.rdata:0000000140030116 word_140030116  dw 385h                 ; DATA XREF: .rdata:000000014002
.rdata:0000000140030118                 db 'IsDebuggerPresent',0
.rdata:000000014003012A word_14003012A  dw 2DAh                 ; DATA XREF: .rdata:000000014002
.rdata:000000014003012C                 db 'GetStartupInfoW',0
.rdata:000000014003013C word_14003013C  dw 4E2h                 ; DATA XREF: .rdata:000000014002
.rdata:000000014003013E                 db 'RtlUnwindEx',0
.rdata:000000014003014A word_14003014A  dw 4DEh                 ; DATA XREF: .rdata:000000014002
.rdata:000000014003014C                 db 'RtlPcToFileHeader',0
.rdata:000000014003015E word_14003015E  dw 468h                 ; DATA XREF: .rdata:000000014002
.rdata:0000000140030160                 db 'RaiseException',0
.rdata:000000014003016F                 align 10h
.rdata:0000000140030170 word_140030170  dw 541h                 ; DATA XREF: .rdata:000000014002
.rdata:0000000140030172                 db 'SetLastError',0
.rdata:000000014003017F                 align 20h
.rdata:0000000140030180 word_140030180  dw 134h                 ; DATA XREF: .rdata:000000014002
.rdata:0000000140030182                 db 'EncodePointer',0
.rdata:0000000140030190 word_140030190  dw 36Bh                 ; DATA XREF: .rdata:000000014002
0002EAD0 00000001400300D0: .rdata:word_1400300D0 (Synchronized with Hex View-1)
```

L'eseguibile è stato compilato il **21 Ottobre 2023:**

property	value
md5	E26BBA0304F14EF96BEB60376791D32C
sha1	24F6785CA2E82D1D1D61F4CB01D5E753F80445CF
sha256	40417E937CD244B2F928150CAE6FA0EFF5551FDB401EA072F6ECDDA67A747E17
first-bytes-hex	4D 5A 90 00 03 00 00 00 04 00 00 00 FF FF 00 00 B8 00 00 00 00 00 00 00 40 00 00 00 00 00 00 00
first-bytes-text	M Z . . . . . @ . . . . .
file-size	207872 (bytes)
entropy	6.193
imphash	7339438F1FA3FBACA1E35B75D7395E40
signature	n/a
entry-point	48 83 EC 28 E8 9F 06 00 00 48 83 C4 28 E9 72 FE FF FF CC CC 48 83 EC 28 4D 8B 41 38 48 8B CA 49 8B
file-version	n/a
description	n/a
file-type	**executable**
cpu	**64-bit**
subsystem	console
compiler-stamp	0x65346BC9 (Sat Oct 21 17:24:41 2023)
debugger-stamp	0x65346BC9 (Sat Oct 21 17:24:41 2023)
resources-stamp	0x00000000 (empty)
import-stamp	0x00000000 (empty)
exports-stamp	n/a
version-stamp	n/a
certificate-stamp	n/a

Gli indicatori di maggior interesse inerenti al sample fanno riferimento perlopiù a caratteristiche di files management, environment ed hardware information discovery, services management ed execution ed external function calling:

indicator (37)	detail	level
The file references string(s)	type: blacklist, count: 36	1
The count of libraries is suspicious	count: 1	1
The file imports symbol(s)	type: blacklist, count: 21	1
The file contains a blacklist section	section: _RDATA	1
The time-stamp of the compiler is suspicious	year: 2023	2
The time-stamp of a directory is suspicious	directory: debug, stamp: Sat Oct 21 17:24:41 2023	2
The file checksum is invalid	checksum: 0x00000000	3
The file references a group of API	type: synchronization, count: 38	3
The file references a group of API	type: execution, count: 68	3
The file references a group of API	type: file, count: 38	3
The file references a group of API	type: reckoning, count: 14	3
The file references a group of API	type: services, count: 13	3
The file references a group of API	type: storage, count: 4	3
The file references a group of API	type: diagnostic, count: 10	3
The file references a group of API	type: dynamic-library, count: 16	3
The file references a group of API	type: memory, count: 16	3
The file references a group of API	type: exception, count: 8	3
The file references a group of API	type: console, count: 12	3
The file references a group of hint	type: file, count: 8	3
The file references a group of hint	type: format-string, count: 3	3
The file references a group of hint	type: utility, count: 1	3
The file references a group of hint	type: rtti, count: 22	3
The file references a group of hint	type: function, count: 1	3

Qui si elencano ulteriori attributi in merito al Portable Executable, inclusa la file signature:

property	value	detail
compiler-stamp	0x65346BC9	Sat Oct 21 17:24:41 2023
size-of-optional-header	0x00F0	240 bytes
signature	0x00004550	PE00
machine	0x8664	**Amd64**
sections	0x0007	7
pointer-symbol-table	0x00000000	0x00000000
number-of-symbols	0x00000000	0x00000000
processor-32bit	0x00000000	false
system-image	0x00000000	false
executable	0x00000002	**true**
dynamic-link-library	0x00000000	false
debug-stripped	0x00000000	false
line-stripped-from-file	0x00000000	false
local-symbols-stripped-from-file	0x00000000	false
relocation-stripped	0x00000000	false
large-address-aware	0x00000020	**true**
uniprocessor	0x00000000	false
bytes-of-machine-words-reversed-Low	0x00000000	false
bytes-of-machine-words-reversed-Hi	0x00000000	false
media-run-from-swap	0x00000000	false
network-run-from-swap	0x00000000	false

Nelle sezioni dell'artefatto si evincono i valori legati ai coefficienti d'entropia e l'entrypoint (ovvero l'indirizzo iniziale d'esecuzione) della sezione *.text* (istruzioni CPU) all'indirizzo *0x0000AB10:*

property	value	value	value
name	.text	.rdata	.data
md5	47086F913C767FB79FF63FEA...	FC9155991D99E81FAA884AE...	F4D28948DD21F61F2911F50...
entropy	6.445	4.900	2.775
file-ratio (99.51%)	63.79 %	28.33 %	1.97 %
raw-address	0x00000400	0x00020A00	0x0002F000
raw-size (206848 bytes)	0x00020600 (132608 bytes)	0x0000E600 (58880 bytes)	0x00001000 (4096 bytes)
virtual-address	0x0000000040001000	0x0000000040022000	0x0000000040031000
virtual-size (211262 bytes)	0x0002040C (132108 bytes)	0x0000E44E (58446 bytes)	0x000027D0 (10192 bytes)
entry-point	**0x0000AB10**	-	-
characteristics	0x60000020	0x40000040	0xC0000040
writable	-	-	**x**
executable	**x**	-	-
shareable	-	-	-
discardable	-	-	-
initialized-data	-	x	x
uninitialized-data	-	-	-
unreadable	-	-	-
self-modifying	-	-	-
virtualized	-	-	-
file	n/a	n/a	n/a

value	value	value	value
.pdata	_RDATA	.rsrc	.reloc
E969B76C781BFBAFF75A595...	91DDDA35C6D0A6CCD1D39...	2D5EB1E7989B77F5C38C725...	CC5B904DECA074980130772...
5.104	1.982	4.718	5.407
3.94 %	0.25 %	0.25 %	0.99 %
0x00030000	0x00032000	0x00032200	0x00032400
0x00002000 (8192 bytes)	0x00000200 (512 bytes)	0x00000200 (512 bytes)	0x00000800 (2048 bytes)
0x0000000040034000	0x0000000040036000	0x0000000040037000	0x0000000040038000
0x00001E60 (7776 bytes)	0x000000F4 (244 bytes)	0x000001E0 (480 bytes)	0x000007E0 (2016 bytes)
-	-	-	-
0x40000040	0x40000040	0x40000040	0x42000040
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	x
x	x	x	x
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
n/a	n/a	n/a	n/a

Sono presenti diverse funzioni classificabili come meritevoli di attenzione: *CreateProcessA*, *OpenProcess*, *SwitchToThread*, *GetCurrentThreadId*, *GetNativeSystemInfo*, *FindFirstFileExW*, *FindNextFileW*, *MoveFileExW* e *SetFileAttributesW*.

functions (99)	blacklist (21)	type (1)	ordinal (0)	library (1)
CreateProcessA	x	implicit	-	kernel32.dll
TerminateProcess	x	implicit	-	kernel32.dll
OpenProcess	x	implicit	-	kernel32.dll
GetCurrentProcessId	x	implicit	-	kernel32.dll
SwitchToThread	x	implicit	-	kernel32.dll
GetCurrentThreadId	x	implicit	-	kernel32.dll
GetNativeSystemInfo	x	implicit	-	kernel32.dll
FindFirstFileExW	x	implicit	-	kernel32.dll
FindNextFileW	x	implicit	-	kernel32.dll
SetFileAttributesW	x	implicit	-	kernel32.dll
MoveFileExW	x	implicit	-	kernel32.dll
GetFileInformationByHandleEx	x	implicit	-	kernel32.dll
QueryPerformanceFrequency	x	implicit	-	kernel32.dll
RtlLookupFunctionEntry	x	implicit	-	kernel32.dll
RtlPcToFileHeader	x	implicit	-	kernel32.dll
RaiseException	x	implicit	-	kernel32.dll
FreeLibraryAndExitThread	x	implicit	-	kernel32.dll
GetModuleHandleExW	x	implicit	-	kernel32.dll
WriteFile	x	implicit	-	kernel32.dll
GetEnvironmentStringsW	x	implicit	-	kernel32.dll
SetEnvironmentVariableW	x	implicit	-	kernel32.dll

Qui alcune stringhe di information ed attributes gathering, nonché l'estensione appesa ai files .BiBi.

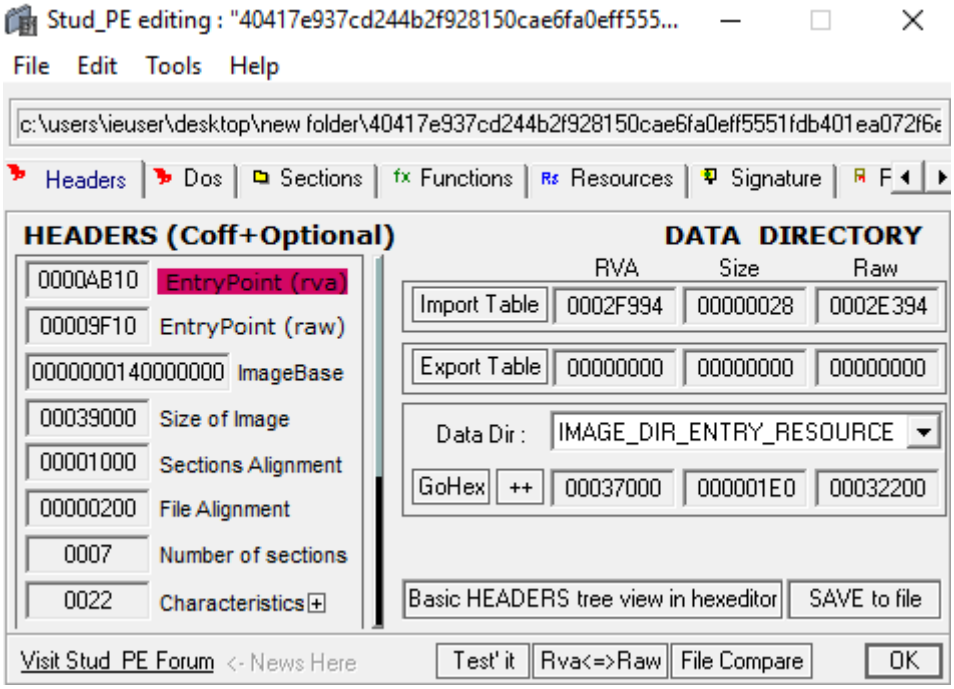
format-string	[+] Stats: %d | %d
format-string	[+] Path: %s
format-string	[+] CPU cores: %d, Threads: %d
file	dl.H
file	Rstrtmgr.dll
file	KERNEL32.dll
file	kernel32.dll
file	mscoree.dll
file	.exe
file	.dll
file	.sys
dos-message	!This program cannot be run in DOS mode.
-	oBYwo
-	oRich

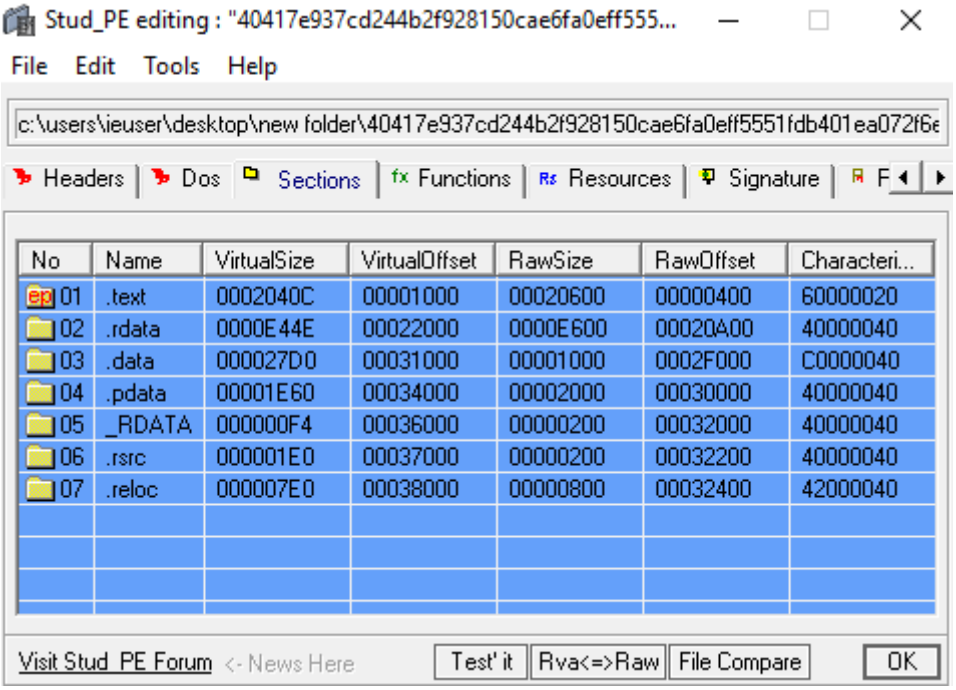
	zu-za
	\r\n
	CONOUT$
	.BiBi
	0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
	\r\n
	\r\n
	\r\n
	\r\n5

Il debugger timestamp risulta essere datato anch'esso il **21 Ottobre 2023:**

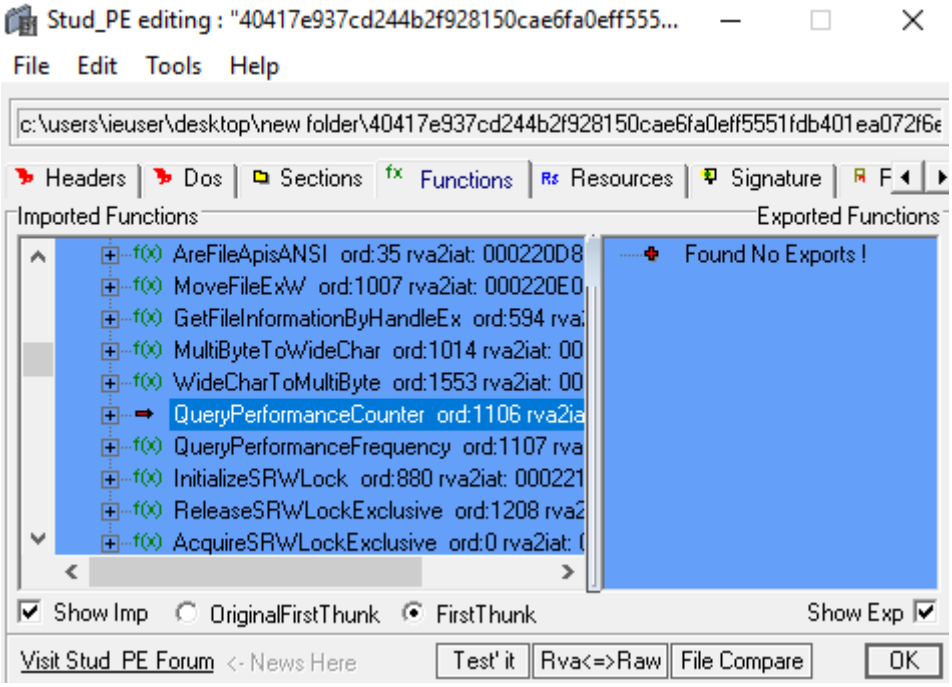
property	value
md5	7AD0B3E52BDC0524CC523484FD471772
sha1	107DE9369E5B8D11496BA77ED21CBC8AD9908FA0
sha256	302217B570AC70A8BD2D75279D478D731FF02BD211514B77A0ED5FB2C7EF644D
size	968 (bytes)
format	PGO
debugger-stamp	0x65346BC9 (Sat Oct 21 17:24:41 2023)
path	n/a

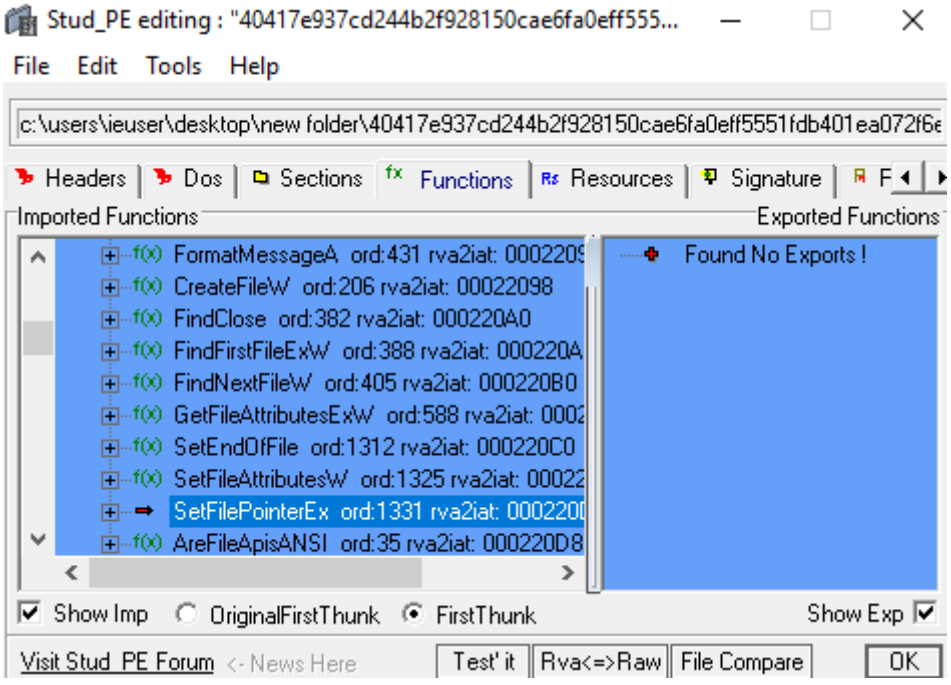
Si notino le seguenti evidenze legate alla fase di PE assessment e delle sezioni incluse, tra cui anche le *VirtualSizes* (le dimensioni delle sezioni nel momento in cui vengono mappate in memoria):

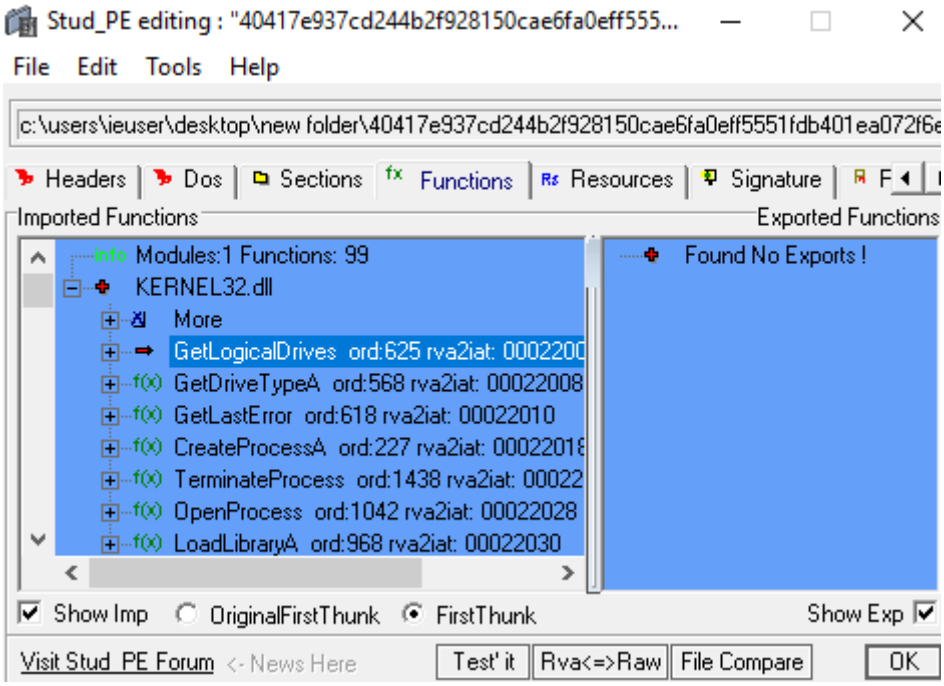




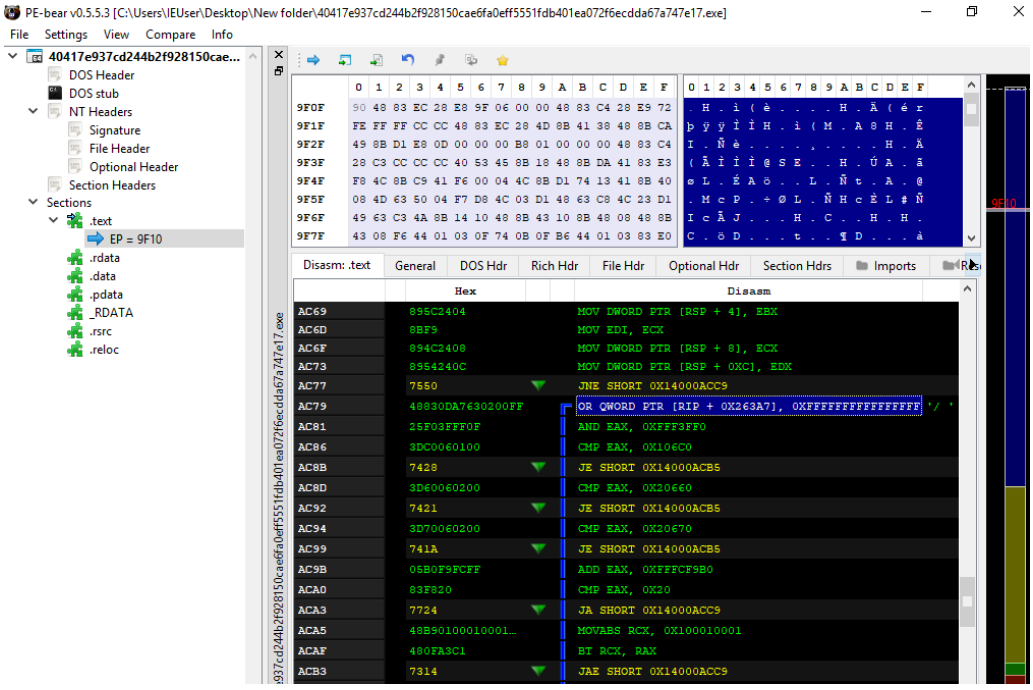
Si evidenziano riferimenti relativi all'importazione di diverse funzioni principali di drives enumeration, performance counter information gathering e puntamento di files:


Stud_PE editing : "40417e937cd244b2f928150cae6fa0eff555...
File Edit Tools Help
c:\users\ieuser\desktop\new folder\40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6e
Headers Dos Sections Functions Resources Signature
Imported Functions
Exported Functions
AreFileApisANSI ord:35 rva2iat: 000220D8
MoveFileExW ord:1007 rva2iat: 000220E0
GetFileInformationByHandleEx ord:594 rva
MultiByteToWideChar ord:1014 rva2iat: 00
WideCharToMultiByte ord:1553 rva2iat: 00
QueryPerformanceCounter ord:1106 rva2ia
QueryPerformanceFrequency ord:1107 rva
InitializeSRWLock ord:880 rva2iat: 000221
ReleaseSRWLockExclusive ord:1208 rva2
AcquireSRWLockExclusive ord:0 rva2iat:
Found No Exports !
Show Imp OriginalFirstThunk FirstThunk Show Exp
Visit Stud_PE Forum <- News Here
Test' it Rva<=>Raw File Compare OK


Stud_PE editing : "40417e937cd244b2f928150cae6fa0eff555...
File Edit Tools Help
c:\users\ieuser\desktop\new folder\40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6e
Headers Dos Sections Functions Resources Signature
Imported Functions
Exported Functions
FormatMessageA ord:431 rva2iat: 0002209
CreateFileW ord:206 rva2iat: 00022098
FindClose ord:382 rva2iat: 000220A0
FindFirstFileExW ord:388 rva2iat: 000220A
FindNextFileW ord:405 rva2iat: 000220B0
GetFileAttributesExW ord:588 rva2iat: 0002
SetEndOfFile ord:1312 rva2iat: 000220C0
SetFileAttributesW ord:1325 rva2iat: 00022
SetFilePointerEx ord:1331 rva2iat: 000220
AreFileApisANSI ord:35 rva2iat: 000220D8
Found No Exports !
Show Imp OriginalFirstThunk FirstThunk Show Exp
Visit Stud_PE Forum <- News Here
Test' it Rva<=>Raw File Compare OK



All'interno della sezione *.text* è riscontrabile l'utilizzo dell'operatore *OR* in merito all'attributo ***QWORD PTR [RIP + 0x263A7].*** L'operazione di *OR* logica viene effettuata con l'elemento esadecimale ***0xFFFFFFFFFFFFFFFF***, il quale rappresenta un errore di **read access violation**.



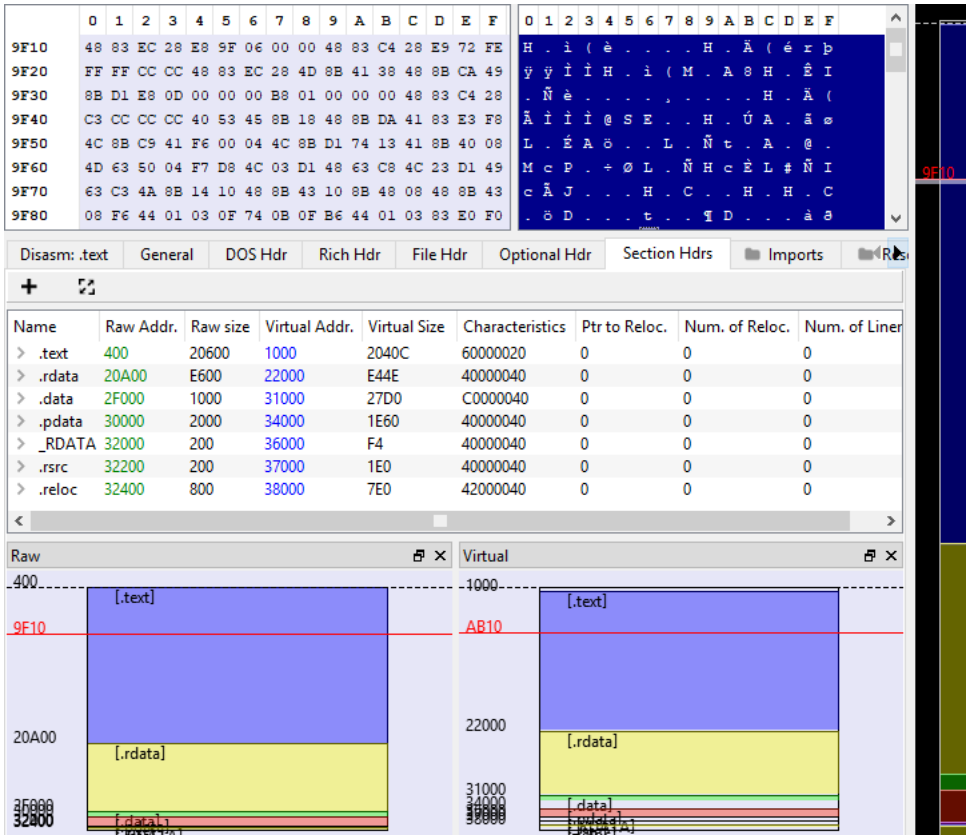
All'interno dell'ultima pagina del PE vi sono 90 bytes:

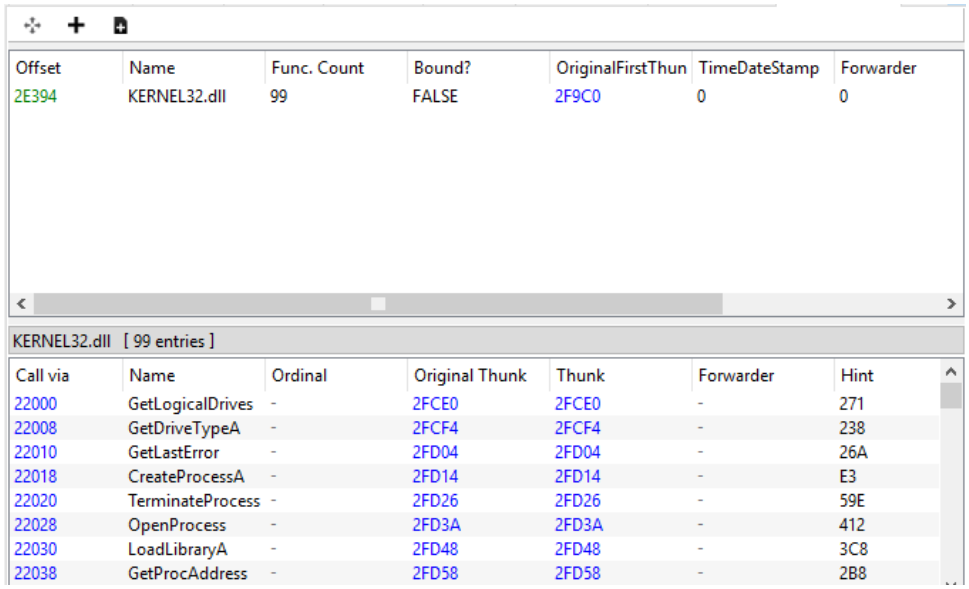
Offset	Name	Value
0	Magic number	5A4D
2	Bytes on last page of file	90
4	Pages in file	3
6	Relocations	0
8	Size of header in paragraphs	4
A	Minimum extra paragraphs needed	0
C	Maximum extra paragraphs needed	FFFF
E	Initial (relative) SS value	0
10	Initial SP value	B8
12	Checksum	0
14	Initial IP value	0
16	Initial (relative) CS value	0
18	File address of relocation table	40
1A	Overlay number	0
1C	Reserved words[4]	0, 0, 0, 0
24	OEM identifier (for OEM information)	0
26	OEM information; OEM identifier specific	0
28	Reserved words[10]	0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3C	File address of new exe header	100

L'*Import Address Table* (elemento che contiene gli indirizzi delle librerie DLL esterne importate) possiede una dimensione che si attesta a **320**:

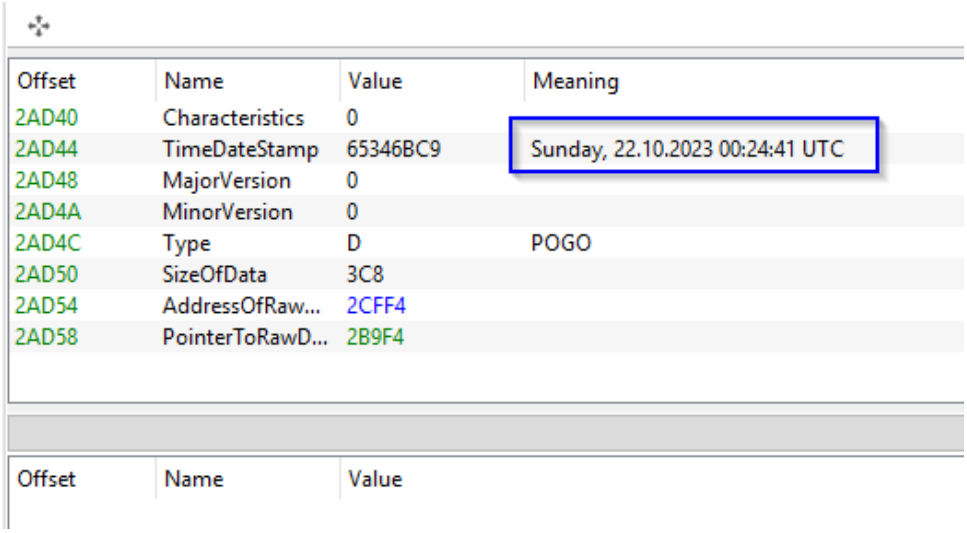
Offset	Name	Value	Value
		8000	TerminalServer aware
160	Size of Stack Reserve	100000	
168	Size of Stack Commit	1000	
170	Size of Heap Reserve	100000	
178	Size of Heap Commit	1000	
180	Loader Flags	0	
184	Number of RVAs and Sizes	10	
	Data Directory	Address	Size
188	Export Directory	0	0
190	Import Directory	2F994	28
198	Resource Directory	37000	1E0
1A0	Exception Directory	34000	1E60
1A8	Security Directory	0	0
1B0	Base Relocation Table	38000	7E0
1B8	Debug Directory	2C340	38
1C0	Architecture Specific Data	0	0
1C8	RVA of GlobalPtr	0	0
1D0	TLS Directory	2C500	28
1D8	Load Configuration Directory	2C380	138
1E0	Bound Import Directory in headers	0	0
1E8	Import Address Table	22000	320
1F0	Delay Load Import Descriptors	0	0
1F8	.NET header	0	0

Qui le dimensioni delle sezioni:





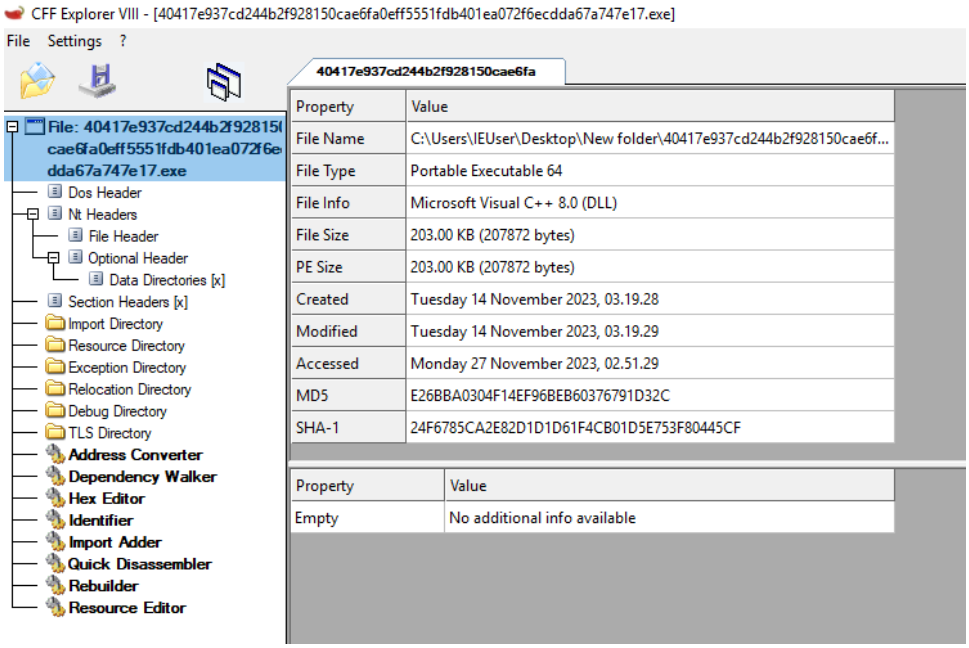
Il timestamp di debugging risale al **22 Ottobre 2023:**



Offset	Name	Value	Meaning
2AD40	Characteristics	0	
2AD44	TimeDateStamp	65346BC9	Sunday, 22.10.2023 00:24:41 UTC
2AD48	MajorVersion	0	
2AD4A	MinorVersion	0	
2AD4C	Type	D	POGO
2AD50	SizeOfData	3C8	
2AD54	AddressOfRaw...	2CFF4	
2AD58	PointerToRawD...	2B9F4	

Offset	Name	Value

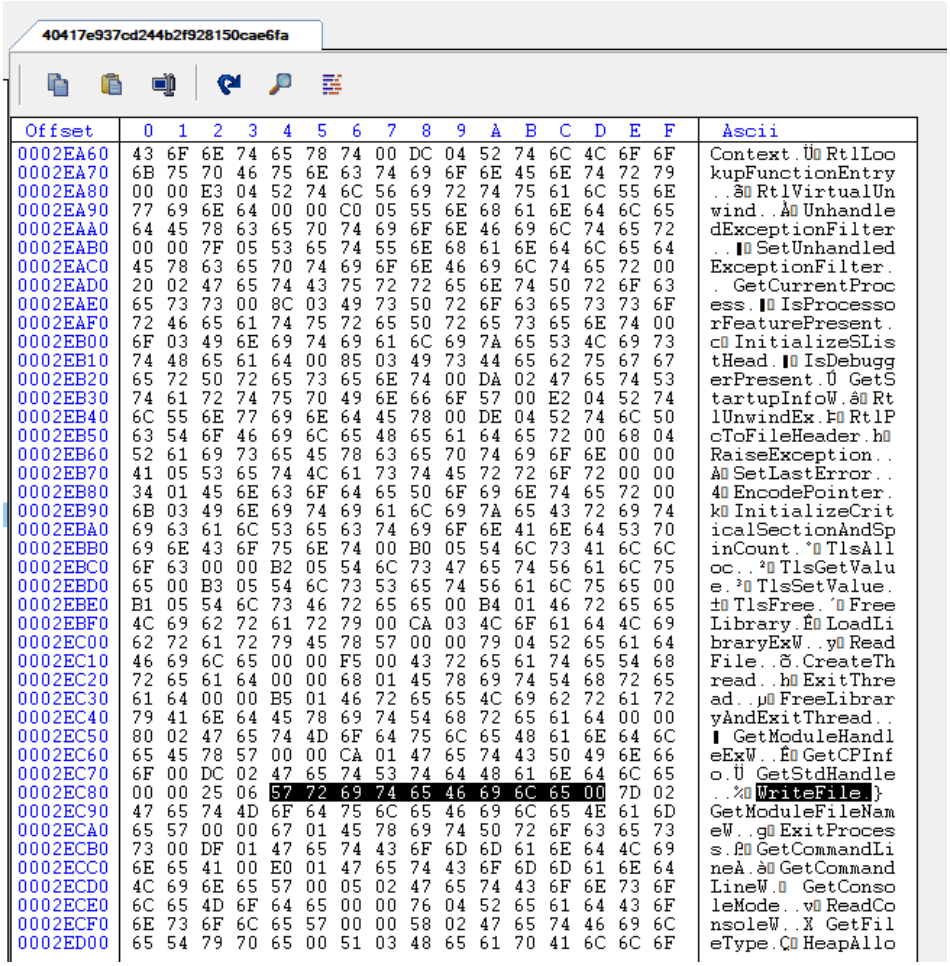
L'eseguibile è stato compilato in ***DllCharacteristics 8160*** (relativo all'applicazione di ASLR e high entropy del PE ai fini della protezione da exploits rendendo di fatto randomici gli indirizzi delle funzioni richiamate e porzioni di memoria fondamentali utilizzate dal processo stesso).



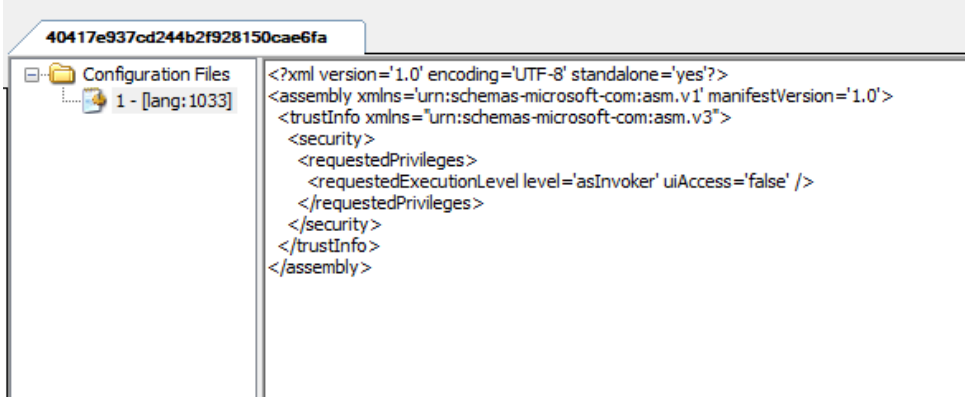
40417e937cd244b2f928150cae6fa

Member	Offset	Size	Value	Meaning
SizeOfInitializedData	00000120	Dword	00013A00	
SizeOfUninitializedData	00000124	Dword	00000000	
AddressOfEntryPoint	00000128	Dword	0000AB10	.text
BaseOfCode	0000012C	Dword	00001000	
ImageBase	00000130	Qword	0000000140000000	
SectionAlignment	00000138	Dword	00001000	
FileAlignment	0000013C	Dword	00000200	
MajorOperatingSystemVers...	00000140	Word	0006	
MinorOperatingSystemVers...	00000142	Word	0000	
MajorImageVersion	00000144	Word	0000	
MinorImageVersion	00000146	Word	0000	
MajorSubsystemVersion	00000148	Word	0006	
MinorSubsystemVersion	0000014A	Word	0000	
Win32VersionValue	0000014C	Dword	00000000	
SizeOfImage	00000150	Dword	00039000	
SizeOfHeaders	00000154	Dword	00000400	
CheckSum	00000158	Dword	00000000	
Subsystem	0000015C	Word	0003	Windows Console
DllCharacteristics	0000015E	Word	8160	Click here
SizeOfStackReserve	00000160	Qword	0000000000100000	
SizeOfStackCommit	00000168	Qword	0000000000001000	
SizeOfHeapReserve	00000170	Qword	0000000000100000	
SizeOfHeapCommit	00000178	Qword	0000000000001000	
LoaderFlags	00000180	Dword	00000000	
NumberOfRvaAndSizes	00000184	Dword	00000010	

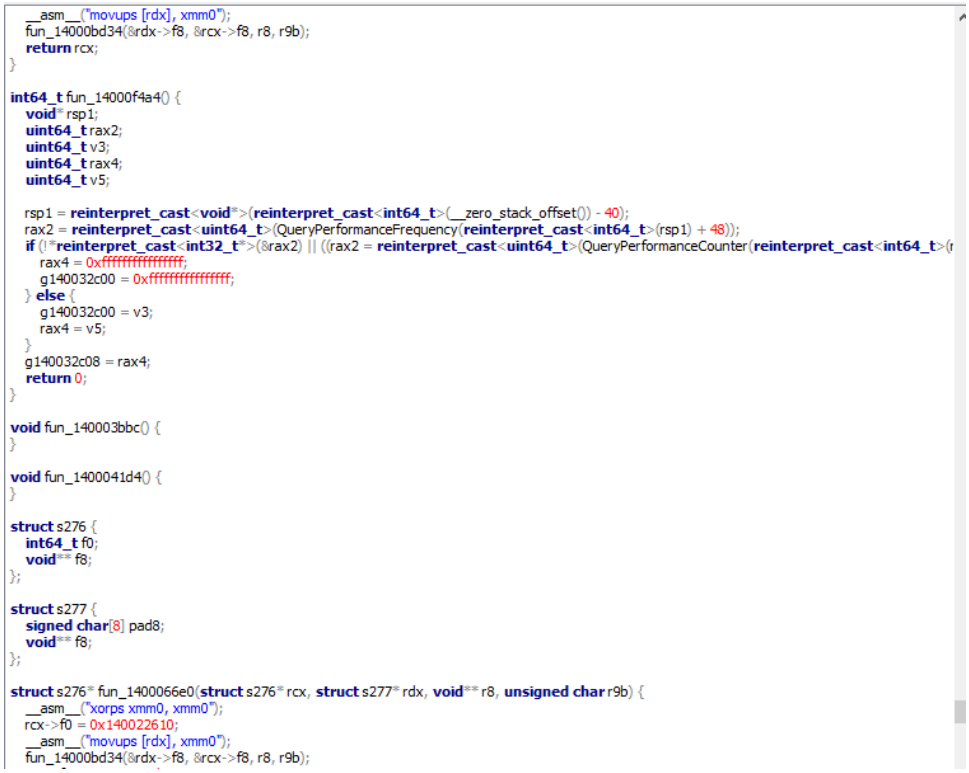
Diverse funzioni di files management ed importazione di librerie esterne sono contenute all'interno del dump esadecimale (*WriteFile, LoadLibraryExW* e *GetFileType*) del Portable Executable:



Qui la risorsa del manifest file, ove si evincono i privilegi d'esecuzione e permessi di sicurezza:



All'interno della funzione ***fun_14000f4a4*** si nota il richiamo di ***QueryPerformanceCounter*** al fine di monitorare l'utilizzo del Performance Counter ed individuare un'eventuale esecuzione all'interno di un ambiente virtualizzato:

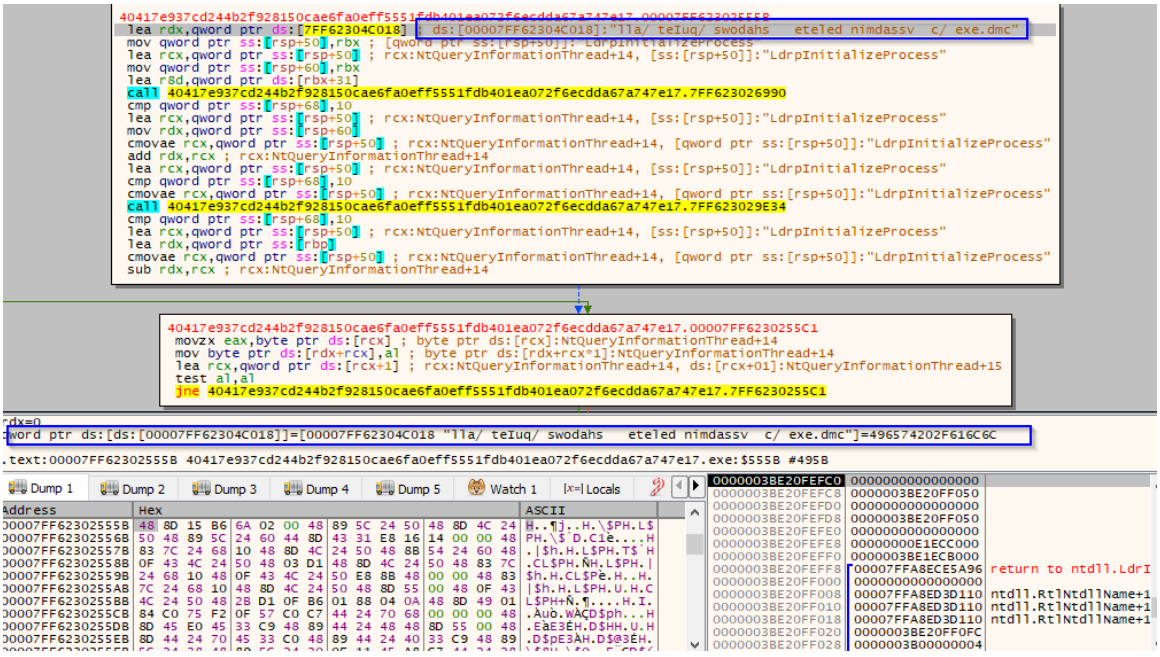


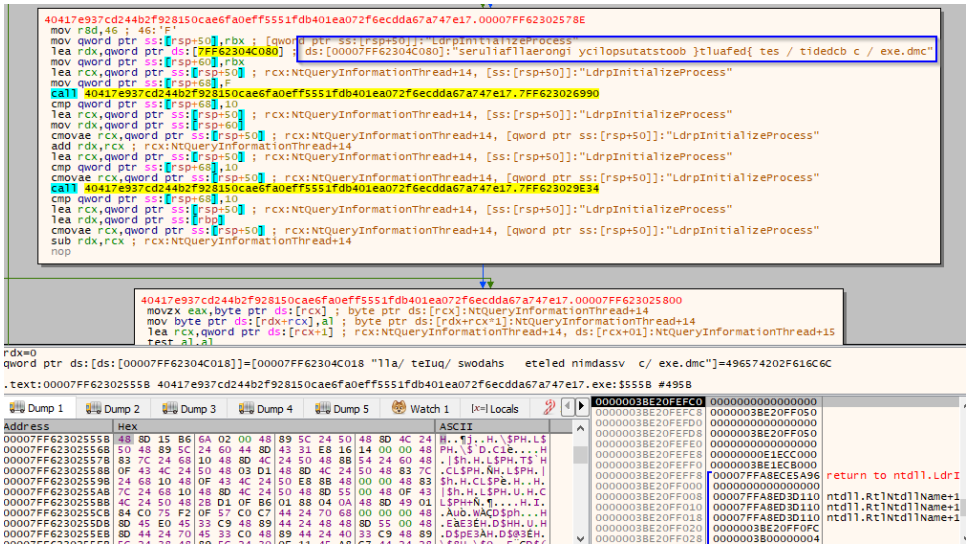
```
    __asm__("movups [rdx], xmm0");
    fun_14000bd34(&rdx->f8, &rcx->f8, r8, r9b);
    return rcx;
}

int64_t fun_14000f4a4() {
    void* rsp1;
    uint64_t rax2;
    uint64_t v3;
    uint64_t rax4;
    uint64_t v5;

    rsp1 = reinterpret_cast<void*>(reinterpret_cast<int64_t>(__zero_stack_offset()) - 40);
    rax2 = reinterpret_cast<uint64_t>(QueryPerformanceFrequency(reinterpret_cast<int64_t>(rsp1) + 48));
    if (!*reinterpret_cast<int32_t*>(&rax2) || ((rax2 = reinterpret_cast<uint64_t>(QueryPerformanceCounter(reinterpret_cast<int64_t>(r
        rax4 = 0xffffffffffffffff;
        g140032c00 = 0xffffffffffffffff;
    } else {
        g140032c00 = v3;
        rax4 = v5;
    }
    g140032c08 = rax4;
    return 0;
}

void fun_140003bbc() {
}

void fun_1400041d4() {
}

struct s276 {
    int64_t f0;
    void** f8;
};

struct s277 {
    signed char[8] pad8;
    void** f8;
};

struct s276* fun_1400066e0(struct s276* rcx, struct s277* rdx, void** r8, unsigned char r9b) {
    __asm__("xorps xmm0, xmm0");
    rcx->f0 = 0x140022610;
    __asm__("movups [rdx], xmm0");
    fun_14000bd34(&rdx->f8, &rcx->f8, r8, r9b);
```

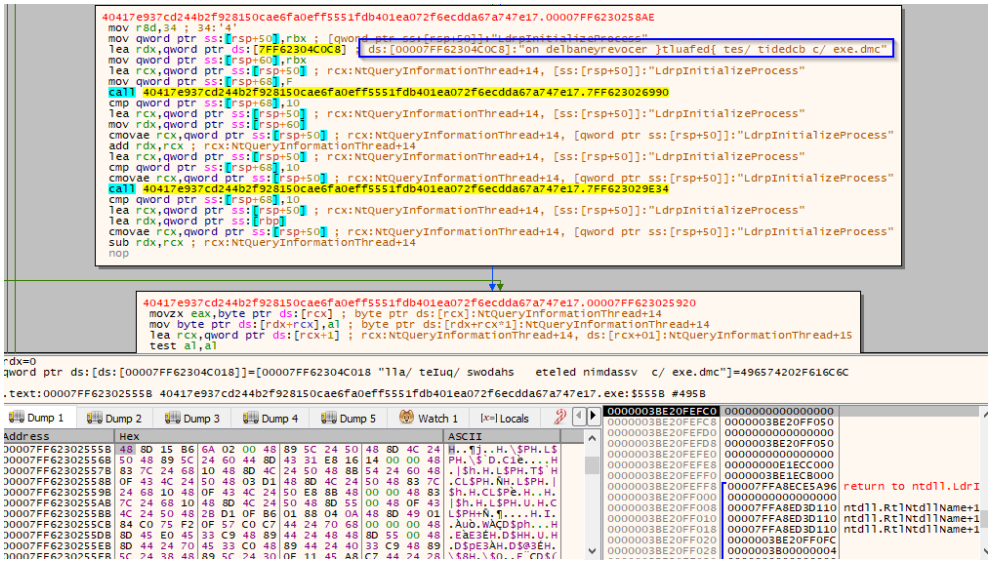
Debugging

Effettuando una sessione di debugging possiamo riscontrare l'estensione .BiBi appesa ai files resi inaccessibili e stringhe di logging delle esecuzioni multithreading e dei comandi di Windows boot setting:

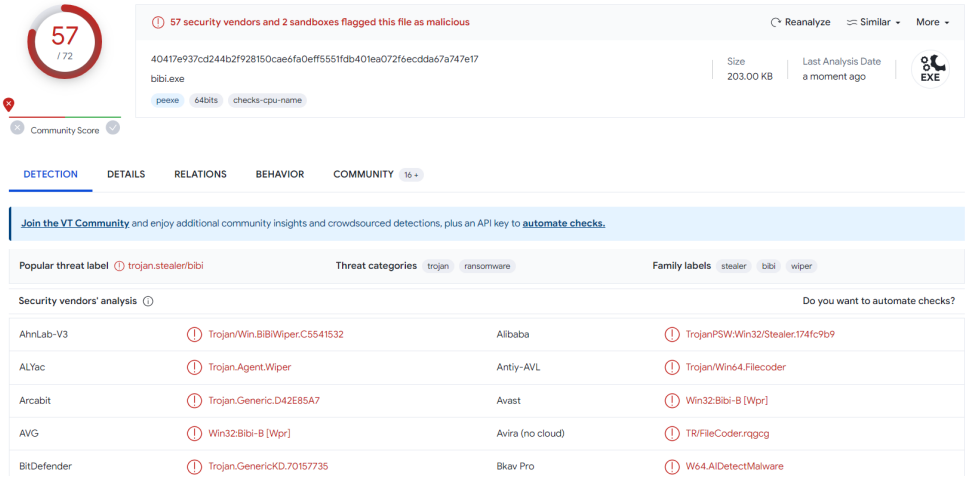
Qui un esempio di istruzione *lea* che copia il valore esadecimale dell'attributo contenente il comando di eliminazione delle copie shadow all'interno del registro *rdx*:


lea rdx,qword ptr ds:[7FF62304C018] ; ds:[00007FF62304C018]:"lla/ teIuq/ swodahs eteled nimdassv c/ exe.dmc"
mov qword ptr ss:[rsp+50],rbx ; [qword ptr ss:[rsp+50]]:"LdrpInitializeProcess"
lea rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [ss:[rsp+50]]:"LdrpInitializeProcess"
mov qword ptr ss:[rsp+60],rbx
lea r8d,qword ptr ds:[rbx+31]
call 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.7FF623026990
cmp qword ptr ss:[rsp+68],10
lea rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [ss:[rsp+50]]:"LdrpInitializeProcess"
mov rdx,qword ptr ss:[rsp+60]
cmovae rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [qword ptr ss:[rsp+50]]:"LdrpInitializeProcess"
add rdx,rcx ; rcx:NtQueryInformationThread+14
lea rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [ss:[rsp+50]]:"LdrpInitializeProcess"
cmp qword ptr ss:[rsp+68],10
cmovae rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [qword ptr ss:[rsp+50]]:"LdrpInitializeProcess"
call 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.7FF623029E34
cmp qword ptr ss:[rsp+68],10
lea rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [ss:[rsp+50]]:"LdrpInitializeProcess"
lea rdx,qword ptr ss:[rbp]
cmovae rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [qword ptr ss:[rsp+50]]:"LdrpInitializeProcess"
sub rdx,rcx ; rcx:NtQueryInformationThread+14
40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.00007FF6230255C1
movzx eax,byte ptr ds:[rcx] ; byte ptr ds:[rcx]:NtQueryInformationThread+14
mov byte ptr ds:[rdx+rcx],al ; byte ptr ds:[rdx+rcx*1]:NtQueryInformationThread+14
lea rcx,qword ptr ds:[rcx+1] ; rcx:NtQueryInformationThread+14, ds:[rcx+01]:NtQueryInformationThread+15
test al,al
jne 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.7FF6230255C1
rdx=0
qword ptr ds:[ds:[00007FF62304C018]]=[00007FF62304C018 "lla/ teIuq/ swodahs eteled nimdassv c/ exe.dmc"]=496574202F616C6C
.text:00007FF62302555B 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.exe:$555B #495B
Dump 1
Dump 2
Dump 3
Dump 4
Dump 5
Watch 1
[x=] Locals
Address
Hex
ASCII
00007FF62302555B 48 8D 15 B6 6A 02 00 48 89 5C 24 50 48 8D 4C 24 H..¶j..H.\$PH.L$
00007FF62302556B 50 48 89 5C 24 60 44 8D 43 31 E8 16 14 00 00 48 PH.\$`D.C1è....H
00007FF62302557B 83 7C 24 68 10 48 8D 4C 24 50 48 8B 54 24 60 48 .|$h.H.L$PH.T$`H
00007FF62302558B 0F 43 4C 24 50 48 03 D1 48 8D 4C 24 50 48 83 7C .CL$PH.Ñ H.L$PH.|
00007FF62302559B 24 68 10 48 0F 43 4C 24 50 E8 8B 48 00 00 48 83 $h.H.CL$Pè..H..H.
00007FF6230255AB 7C 24 68 10 48 8D 4C 24 50 48 8D 55 00 48 0F 43 |$h.H.L$PH.U.H.C
00007FF6230255BB 4C 24 50 48 2B D1 0F B6 01 88 04 0A 48 8D 49 01 L$PH+Ñ.¶....H.I.
00007FF6230255CB 84 C0 75 F2 0F 57 C0 C7 44 24 70 68 00 00 00 48 .Àuò.WÀÇD$ph...H
00007FF6230255DB 8D 45 E0 45 33 C9 48 89 44 24 48 48 8D 55 00 48 .EàE3ÉH.D$HH.U.H
00007FF6230255EB 8D 44 24 70 45 33 C0 48 89 44 24 40 33 C9 48 89 .D$pE3ÀH.D$@3ÉH.
0000003BE20FEFC0 0000000000000000
0000003BE20FEFC8 0000003BE20FF050
0000003BE20FEFD0 0000000000000000
0000003BE20FEFD8 0000003BE20FF050
0000003BE20FEFE0 0000000000000000
0000003BE20FEFE8 00000000E1ECC000
0000003BE20FEFF0 0000003BE1ECB000
0000003BE20FEFF8 00007FFA8ECE5A96 return to ntdll.LdrI
0000003BE20FF000 0000000000000000
0000003BE20FF008 00007FFA8ED3D110 ntdll.RtlNtdllName+1
0000003BE20FF010 00007FFA8ED3D110 ntdll.RtlNtdllName+1
0000003BE20FF018 00007FFA8ED3D110 ntdll.RtlNtdllName+1
0000003BE20FF020 0000003BE20FF0FC
0000003BE20FF028 0000003B00000004
mov r8d,21 ; 21:'!'
mov qword ptr ss:[rsp+50],rbx ; [qword ptr ss:[rsp+50]]:"LdrpInitializeProcess"
lea rdx,qword ptr ds:[7FF62304C050] ; ds:[00007FF62304C050]:"eteled ypocwodahs cimw c/ exe.dmc"
mov qword ptr ss:[rsp+60],rbx
lea rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [ss:[rsp+50]]:"LdrpInitializeProcess"
mov qword ptr ss:[rsp+68],F
call 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.7FF623026990
cmp qword ptr ss:[rsp+68],10
lea rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [ss:[rsp+50]]:"LdrpInitializeProcess"
mov rdx,qword ptr ss:[rsp+60]
cmovae rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [qword ptr ss:[rsp+50]]:"LdrpInitializeProcess"
add rdx,rcx ; rcx:NtQueryInformationThread+14
lea rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [ss:[rsp+50]]:"LdrpInitializeProcess"
cmp qword ptr ss:[rsp+68],10
cmovae rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [qword ptr ss:[rsp+50]]:"LdrpInitializeProcess"
call 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.7FF623029E34
cmp qword ptr ss:[rsp+68],10
lea rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [ss:[rsp+50]]:"LdrpInitializeProcess"
lea rdx,qword ptr ss:[rbp]
cmovae rcx,qword ptr ss:[rsp+50] ; rcx:NtQueryInformationThread+14, [qword ptr ss:[rsp+50]]:"LdrpInitializeProcess"
sub rdx,rcx ; rcx:NtQueryInformationThread+14
40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.00007FF6230256E0
movzx eax,byte ptr ds:[rcx] ; byte ptr ds:[rcx]:NtQueryInformationThread+14
mov byte ptr ds:[rdx+rcx],al ; byte ptr ds:[rdx+rcx*1]:NtQueryInformationThread+14
lea rcx,qword ptr ds:[rcx+1] ; rcx:NtQueryInformationThread+14, ds:[rcx+01]:NtQueryInformationThread+15
test al,al
jne 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.7FF6230256E0
rdx=0
qword ptr ds:[ds:[00007FF62304C018]]=[00007FF62304C018 "lla/ teIuq/ swodahs eteled nimdassv c/ exe.dmc"]=496574202F616C6C
.text:00007FF62302555B 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17.exe:$555B #495B
Dump 1
Dump 2
Dump 3
Dump 4
Dump 5
Watch 1
[x=] Locals
Address
Hex
ASCII
00007FF62302555B 48 8D 15 B6 6A 02 00 48 89 5C 24 50 48 8D 4C 24 H..¶j..H.\$PH.L$
00007FF62302556B 50 48 89 5C 24 60 44 8D 43 31 E8 16 14 00 00 48 PH.\$`D.C1è....H
00007FF62302557B 83 7C 24 68 10 48 8D 4C 24 50 48 8B 54 24 60 48 .|$h.H.L$PH.T$`H
00007FF62302558B 0F 43 4C 24 50 48 03 D1 48 8D 4C 24 50 48 83 7C .CL$PH.Ñ H.L$PH.|
00007FF62302559B 24 68 10 48 0F 43 4C 24 50 E8 8B 48 00 00 48 83 $h.H.CL$Pè..H..H.
00007FF6230255AB 7C 24 68 10 48 8D 4C 24 50 48 8D 55 00 48 0F 43 |$h.H.L$PH.U.H.C
00007FF6230255BB 4C 24 50 48 2B D1 0F B6 01 88 04 0A 48 8D 49 01 L$PH+Ñ.¶....H.I.
00007FF6230255CB 84 C0 75 F2 0F 57 C0 C7 44 24 70 68 00 00 00 48 .Àuò.WÀÇD$ph...H
00007FF6230255DB 8D 45 E0 45 33 C9 48 89 44 24 48 48 8D 55 00 48 .EàE3ÉH.D$HH.U.H
00007FF6230255EB 8D 44 24 70 45 33 C0 48 89 44 24 40 33 C9 48 89 .D$pE3ÀH.D$@3ÉH.
0000003BE20FEFC0 0000000000000000
0000003BE20FEFC8 0000003BE20FF050
0000003BE20FEFD0 0000000000000000
0000003BE20FEFD8 0000003BE20FF050
0000003BE20FEFE0 0000000000000000
0000003BE20FEFE8 00000000E1ECC000
0000003BE20FEFF0 0000003BE1ECB000
0000003BE20FEFF8 00007FFA8ECE5A96 return to ntdll.LdrI
0000003BE20FF000 0000000000000000
0000003BE20FF008 00007FFA8ED3D110 ntdll.RtlNtdllName+1
0000003BE20FF010 00007FFA8ED3D110 ntdll.RtlNtdllName+1
0000003BE20FF018 00007FFA8ED3D110 ntdll.RtlNtdllName+1
0000003BE20FF020 0000003BE20FF0FC
0000003BE20FF028 0000003B00000004

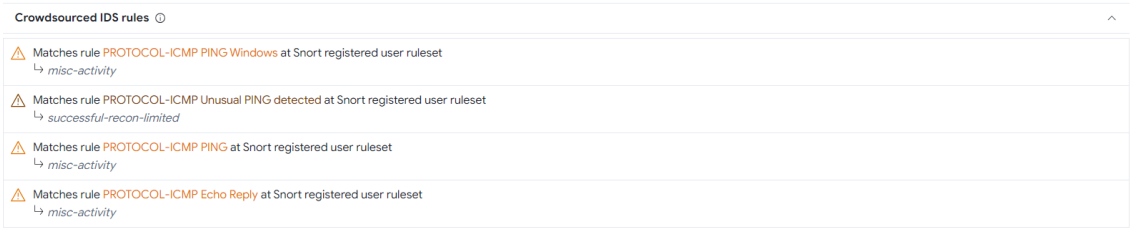




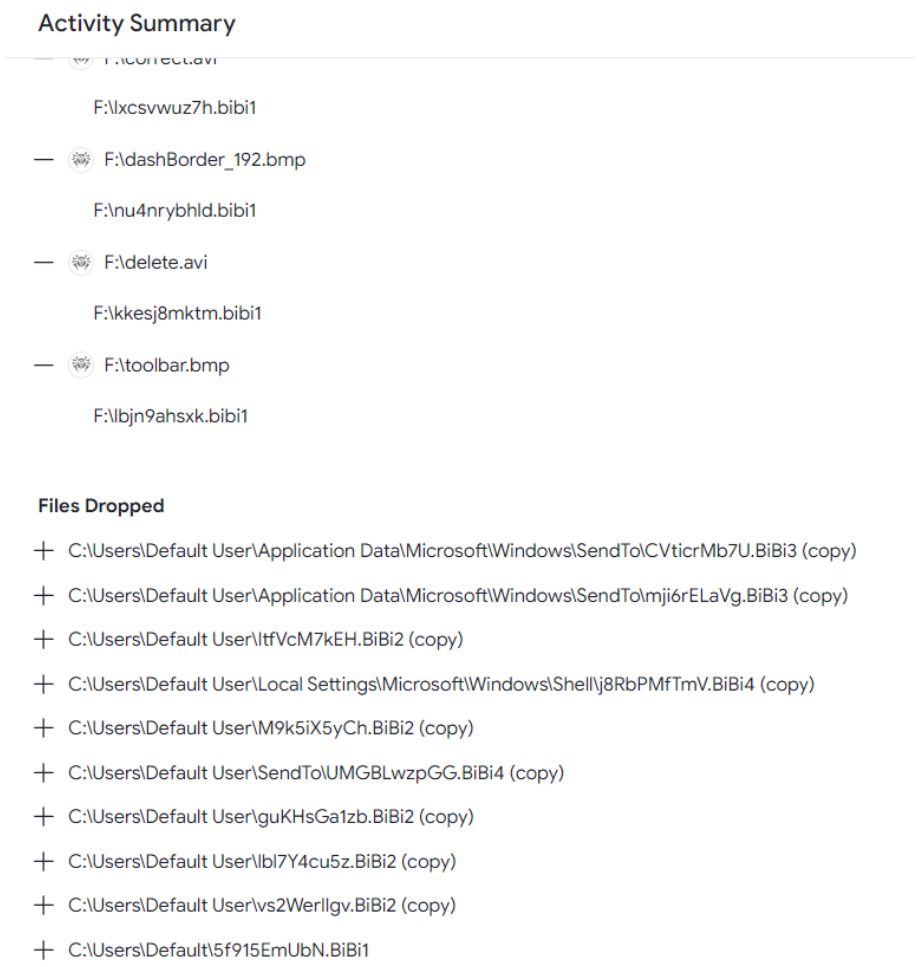
Le classificazioni OSINT dell'artefatto sottoposto a disamina fanno riferimento alla firma **"Trojan/Win.BiBiWiper.C5541532":**



Qui le identificazioni di alcune regole IDS che fanno riferimento ad operazioni ICMP e Ping:



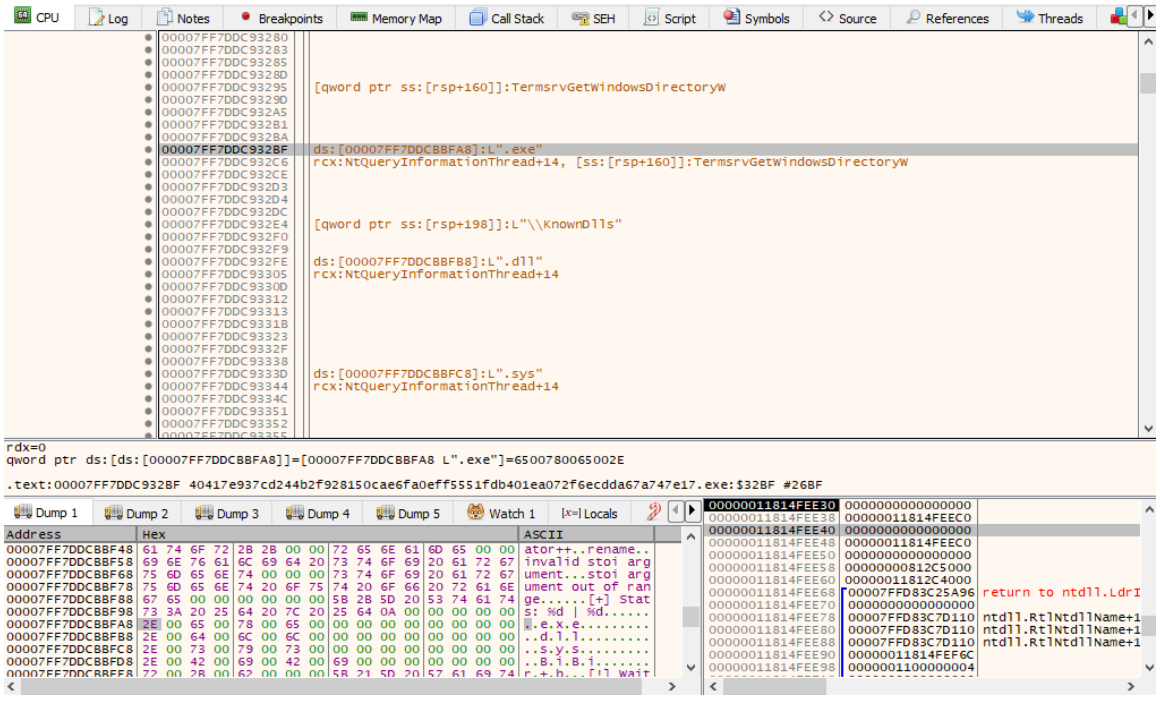
Ecco un esempio di malicious detonation che prende in considerazione i files e li rende in accessibili aggiungendo anche l'estensione finale .bibi ed un attributo numerico di riferimento.



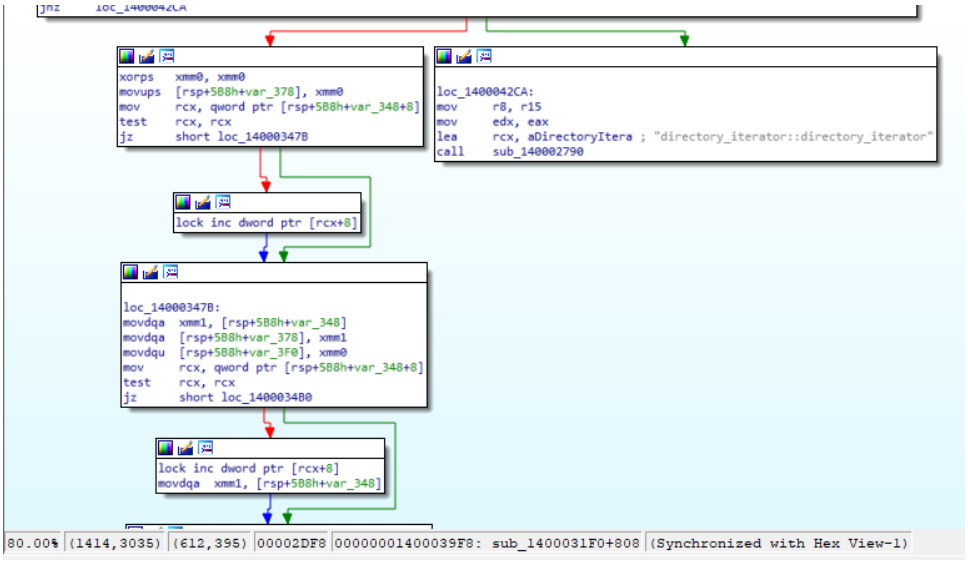
Nello screenshot sottostante la gestione degli attributi di sistema contestualmente all'ottenimento dei files da sottoporre a sovrascrittura rilevati dall'esecuzione di un ciclo ***while***:

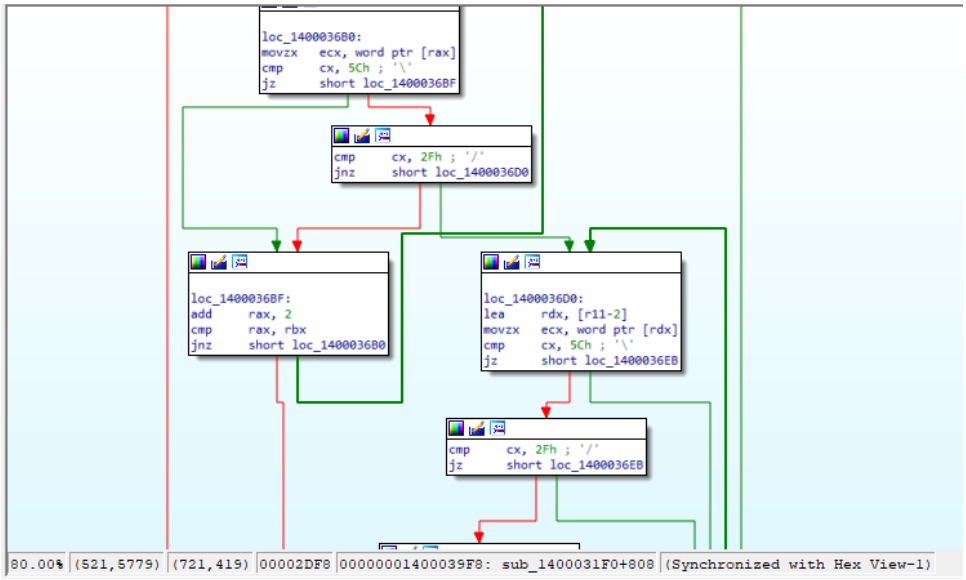
```
    }
  }
  *reinterpret_cast<int32_t*>(&rbx417) = *reinterpret_cast<int32_t*>(&rbx417) - 1;
  *reinterpret_cast<int32_t*>(&rbx417 + 4) = 0;
  if (*reinterpret_cast<int32_t*>(&rbx417) < 0)
    break;
}
addr_140005afd_492:
rbx417 = v428;
rdi429 = v410;
while (rbx417 != rdi429) {
  fun_140006b90(rbx417, reinterpret_cast<uint64_t>(rbp396) + 0xffffffffffffff87, r8_403);
  rdx430 = reinterpret_cast<void**>(reinterpret_cast<uint64_t>(rbp396) + 0xffffffffffffff87);
  if (0) {
    rdx430 = v424;
  }
  rcx404 = reinterpret_cast<void**>("[+] Path: %s\n");
  fun_140001030("[+] Path: %s\n", rdx430, r8_403, 0, "[+] Path: %s\n", rdx430, r8_403, 0);
  rsp413 = reinterpret_cast<void**>(reinterpret_cast<uint64_t>(rsp413) - 8 + 8 - 8 + 8);
  if (!1) {
    rdx425 = reinterpret_cast<void**>(8);
    rcx404 = v424;
    rax431 = rcx404;
    if (1)
      goto addr_140005b6a_498;
    rdx425 = reinterpret_cast<void**>(47);
    rcx404 = *reinterpret_cast<void***>(rcx404 + 0xfffffffffffffff8);
    if (reinterpret_cast<unsigned char>(rax431) - reinterpret_cast<unsigned char>(rcx404) + 0xfffffffffffffff8 > 31)
      goto addr_1400060c7_500;
    addr_140005b6a_498:
    fun_14000a87c(rcx404, rdx425, rcx404, rdx425);
    rsp413 = reinterpret_cast<void**>(reinterpret_cast<uint64_t>(rsp413) - 8 + 8);
  }
  rbx417 = rbx417 + 32;
}
eax432 = fun_1400090b8(rcx404);
*reinterpret_cast<int32_t*>(&r9_433) = eax432;
*reinterpret_cast<int32_t*>(&r9_433 + 4) = 0;
*reinterpret_cast<int32_t*>(&rax434) = eax432;
*reinterpret_cast<int32_t*>(reinterpret_cast<int64_t>(&rax434) + 4) = 0;
rax435 = rax434 / reinterpret_cast<uint64_t>(reinterpret_cast<int64_t>(reinterpret_cast<unsigned char>(v410) - v43
if (*reinterpret_cast<int32_t*>(&rax435) < reinterpret_cast<int32_t>(1)) {
  *reinterpret_cast<uint32_t*>(&rax435) = 1;
  *reinterpret_cast<int32_t*>(reinterpret_cast<int64_t>(&rax435) + 4) = 0;
}
```

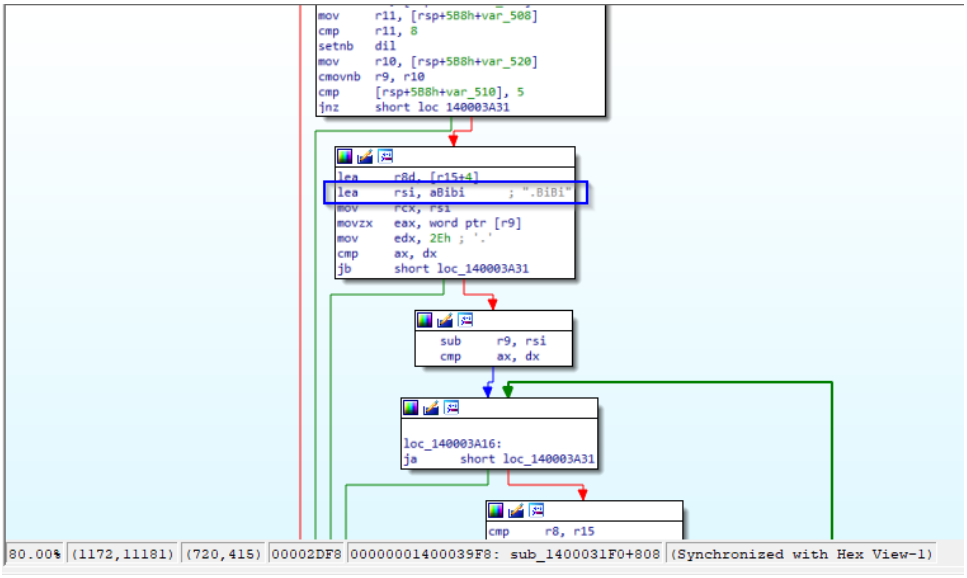
Vengono “saltati” i seguenti tipi di files durante l’esecuzione del malware: **.exe, .dll** e **.sys.**



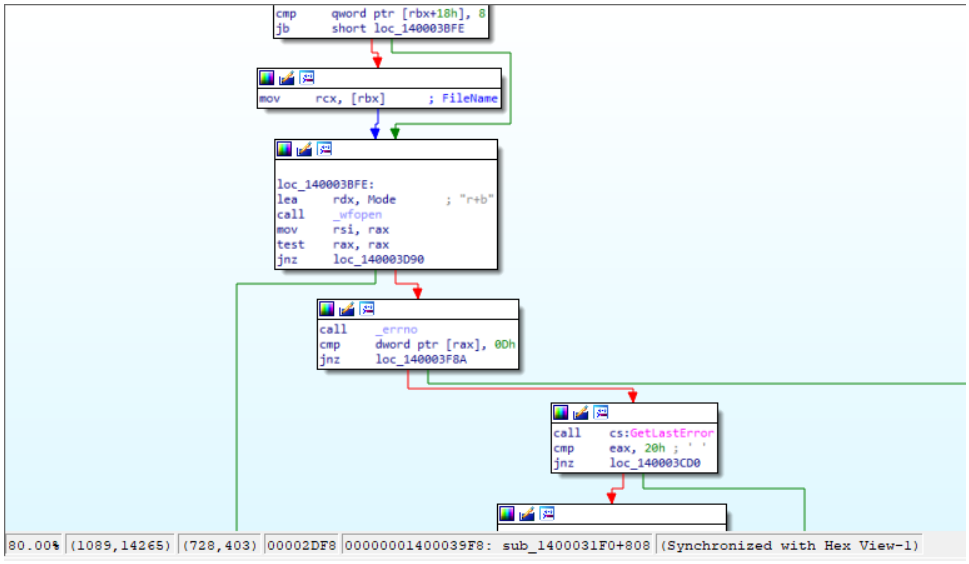
All'interno della funzione ***sub_1400031F0*** viene effettuata l'iterazione delle directories di sistema, una volta identificati i files da rendere inaccessibili essi vengono sovrascritti in parte con un pattern randomico generato ed inserito all'interno della stream evidenziabile nella funzione ***sub_1400048D0***. Dopo aver effettuato l'azione di sovrascrittura, i files presi in considerazione vengono rinominati con l'estensione appesa .**BiBi** ed una cifra specifica.



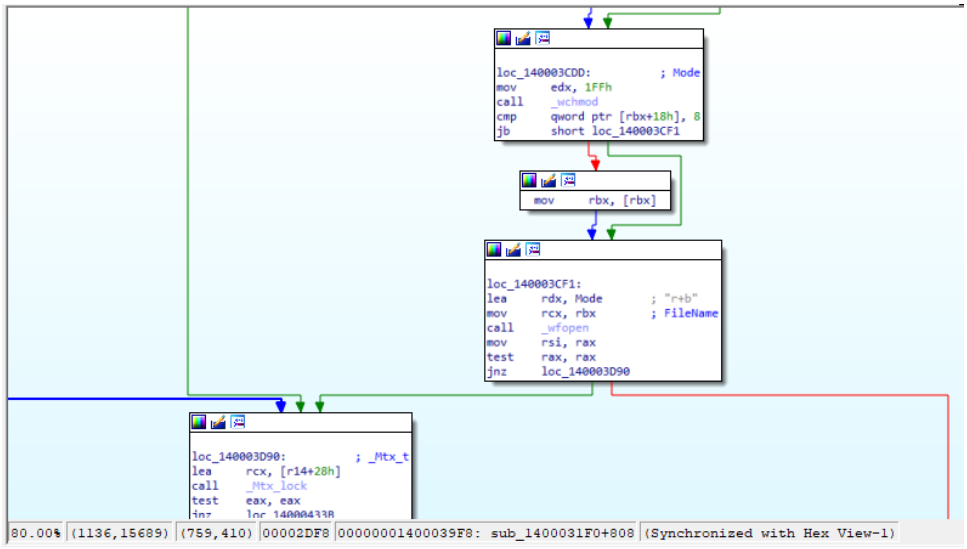


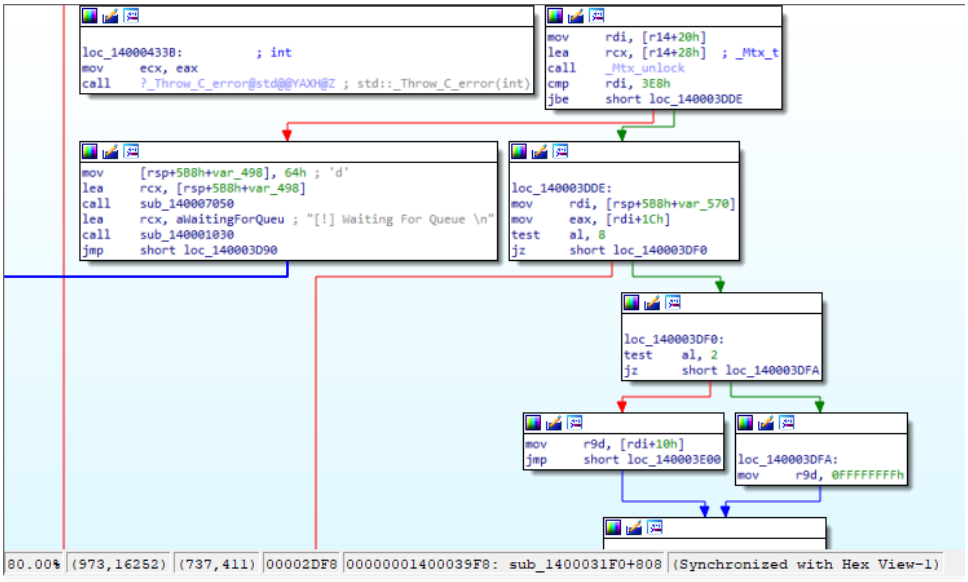


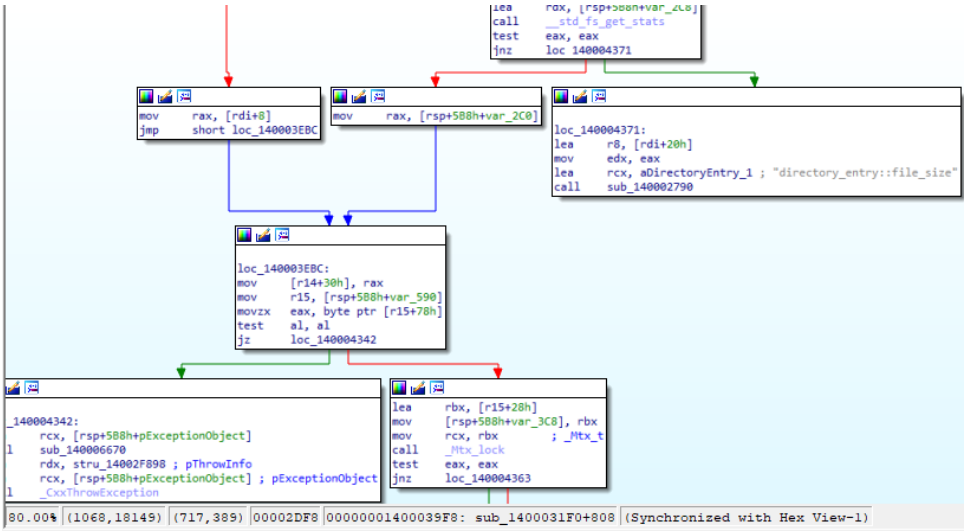
I files vengono aperti con la configurazione ***r+b (read or write mode)***



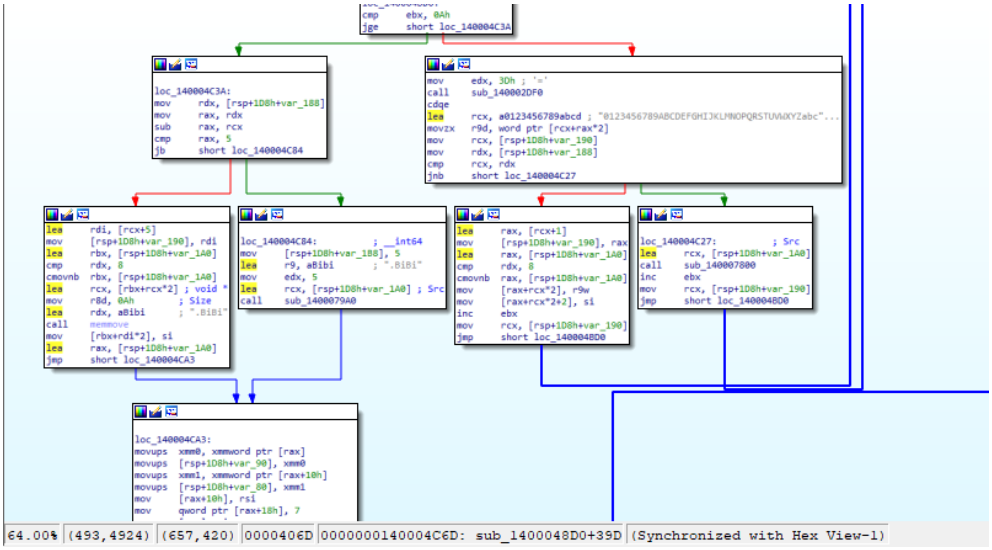
Vengono poi posti in *lock* gli oggetti *mutex* per i files in questione al fine di permettere un accesso esclusivo ad essi, senza interferenze da parte di eventuali processi esterni:

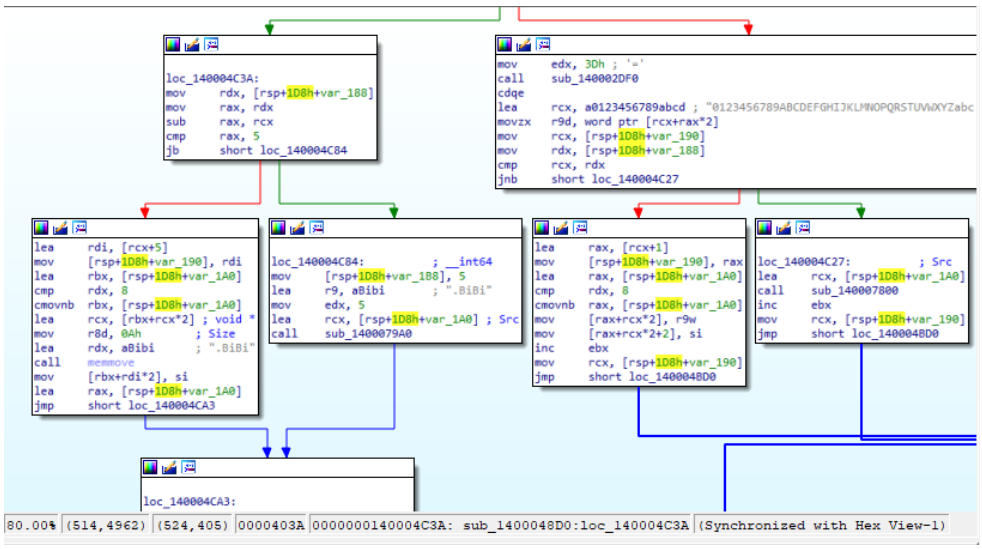

loc_140003CDD: ; Mode
mov edx, 1FFh
call _wchmod
cmp qword ptr [rbx+18h], 8
jb short loc_140003CF1
mov rbx, [rbx]
loc_140003CF1:
lea rdx, Mode ; "r+b"
mov rcx, rbx ; FileName
call _wfopen
mov rsi, rax
test rax, rax
jnz loc_140003D90
loc_140003D90: ; _Mtx_t
lea rcx, [r14+28h]
call _Mtx_lock
test eax, eax
80.00% (1136,15689) (759,410) 00002DF8 00000001400039F8: sub_1400031F0+808 (Synchronized with Hex View-1)

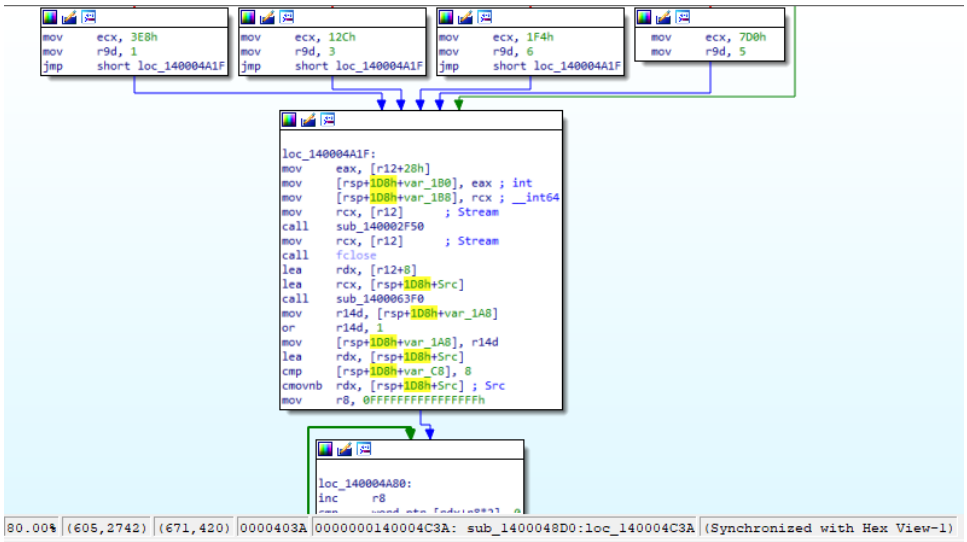

loc_14000433B: ; int
mov ecx, eax
call ?_Throw_C_error@std@@YAXH@Z ; std::_Throw_C_error(int)
mov rdi, [r14+20h]
lea rcx, [r14+28h] ; _Mtx_t
call _Mtx_unlock
cmp rdi, 3E8h
jbe short loc_140003DDE
mov [rsp+588h+var_498], 64h ; 'd'
lea rcx, [rsp+588h+var_498]
call sub_140007050
lea rcx, aWaitingForQueu ; "[!] Waiting For Queue \n"
call sub_140001030
jmp short loc_140003D90
loc_140003DDE:
mov rdi, [rsp+588h+var_570]
mov eax, [rdi+1Ch]
test al, 8
jz short loc_140003DF0
loc_140003DF0:
test al, 2
jz short loc_140003DFA
mov r9d, [rdi+10h]
jmp short loc_140003E00
loc_140003DFA:
mov r9d, 0FFFFFFFFh
80.00% (973,16252) (737,411) 00002DF8 00000001400039F8: sub_1400031F0+808 (Synchronized with Hex View-1)


call __std_fs_get_stats
test eax, eax
jnz loc_140004371
mov rax, [rdi+8]
jmp short loc_140003EBC
mov rax, [rsp+588h+var_2C0]
loc_140004371:
lea r8, [rdi+20h]
mov edx, eax
lea rcx, aDirectoryEntry_1 ; "directory_entry::file_size"
call sub_140002790
loc_140003EBC:
mov [r14+30h], rax
mov r15, [rsp+588h+var_590]
movzx eax, byte ptr [r15+78h]
test al, al
jz loc_140004342
_140004342:
rcx, [rsp+588h+pExceptionObject]
sub_140006670
rdx, stru_14002F898 ; pThrowInfo
rcx, [rsp+588h+pExceptionObject] ; pExceptionObject
_CxxThrowException
lea rbx, [r15+28h]
mov [rsp+588h+var_3C8], rbx
mov rcx, rbx ; _Mtx_t
call _Mtx_lock
test eax, eax
jnz loc_140004363
80.00% (1068,18149) (717,389) 00002DF8 00000001400039F8: sub_1400031F0+808 (Synchronized with Hex View-1)

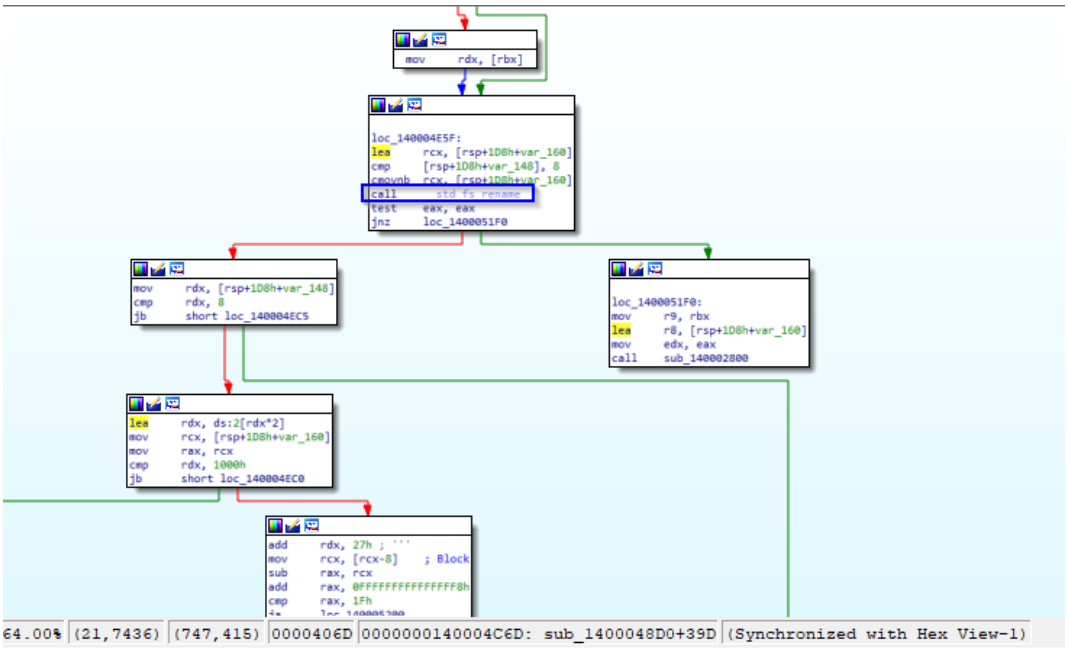
Qui la gestione del pattern randomico contestuale alla sovrascrittura dei files enumerati:

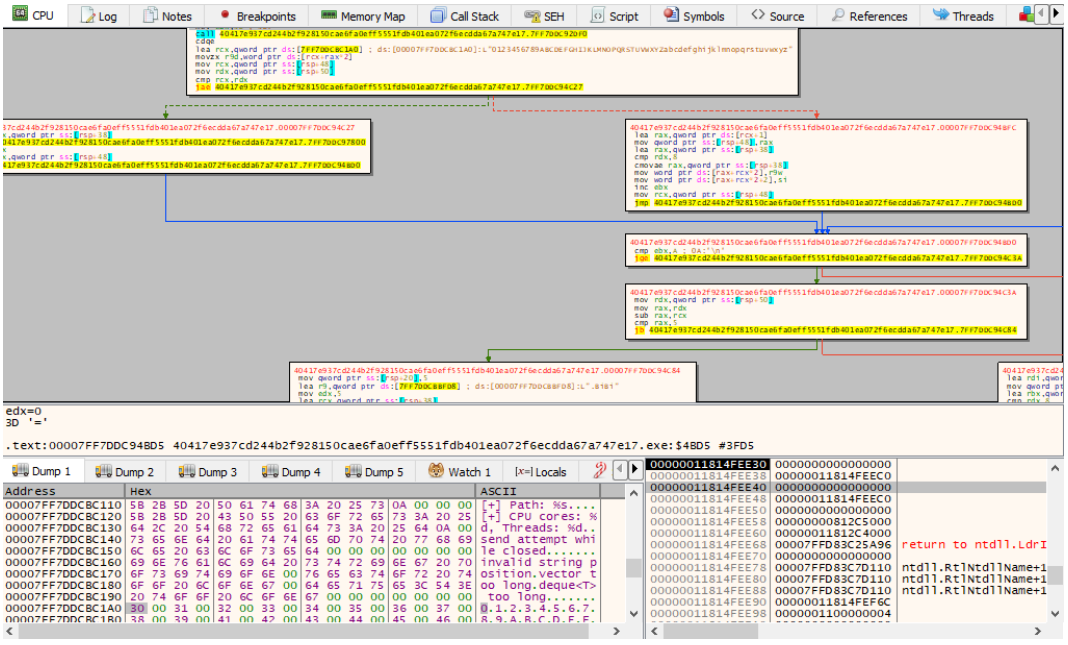






Si noti l'azione di rinomina dei files sovrascritti:





IOCs:

- e26bba0304f14ef96beb60376791d32c
- 24f6785ca2e82d1d1d61f4cb01d5e753f80445cf
- 40417e937cd244b2f928150cae6fa0eff5551fdb401ea072f6ecdda67a747e17
- .BiBi
- 2e 42 69 42 69

Regola YARA

```
rule BiBiRule

{

    strings:

        $strBiBi = ".BiBi"

        $hexBiBi = { 2e 42 69 42 69 }


    condition:

        $strBiBi or $hexBiBi

}
```

CONCLUSIONI:

BiBi Wiper è una minaccia che ripercorre la falsariga dei wipers utilizzati nel contesto del conflitto Russo-Ucraino, come HermeticWiper o IsaacWiper (sviluppati e diffusi immediatamente prima dell'invasione perpetrata dalla Russia, avvenuta de facto il 24 Febbraio 2022).

Nel caso specifico, tuttavia, vi sono alcuni elementi di differenziazione rispetto alle sopra citate minacce: i dati ed i files presi in considerazione nella fase di enumeration vengono resi inaccessibili e sovrascritti mediante un pattern randomico. Tuttavia, il behaviour analizzato non è afferibile ad una classificazione di tipologia Ransomware, in quanto non viene richiesto alcun riscatto per il recupero dei files mediante una ransomnote creata a bordo delle macchine infette. L'unico obiettivo del threat è quello di perpetrare la propria azione distruttiva nei confronti delle principali infrastrutture critiche avversarie ed essa è associabile al sempre più presente concetto di guerra ibrida che abbiamo imparato a conoscere a causa della delicata situazione geopolitica attuale. Una caratteristica fondamentale di tale concetto è rappresentabile dal fatto che, anche senza un'azione di belligeranza militare, si possono comunque ottenere risultati devastanti. Vi è stata inoltre un'attenzione nel gestire anche le risorse ed i files potenzialmente in uso da altri processi esterni e a modificare le impostazioni di avvio di Windows, nonché nell'eliminare le copie shadow al fine di massimizzare l'impatto del threat.

Il crescente e costante rischio di una situazione geopolitica sempre più compromessa e deteriorata, porta ad ipotizzare che lo sviluppo e la distribuzione di tali malware siano destinati ad aumentare. Queste minacce saranno sempre più sofisticate, evasive e distruttive.

Riferimenti:

[0] (introduzione in merito a BiBi Wiper): BiBi Wiper Used in the Israel-Hamas War Now Runs on Windows (blackberry.com)