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Digital Forensics Project

“Windows malware analysis”

1. Introduction:

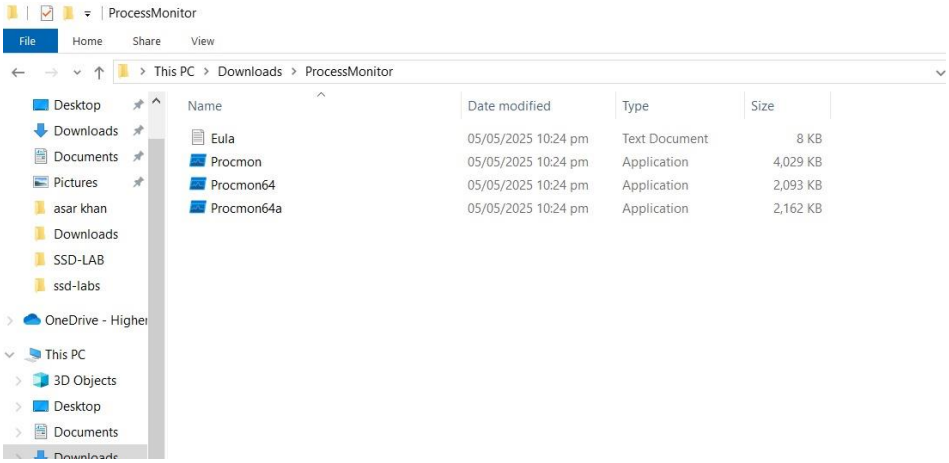
This project demonstrates step-by-step malware analysis conducted on a Windows system. Malware analysis is a crucial part of digital forensics to understand malicious behavior, detect indicators of compromise (IOCs), and strengthen system defenses.

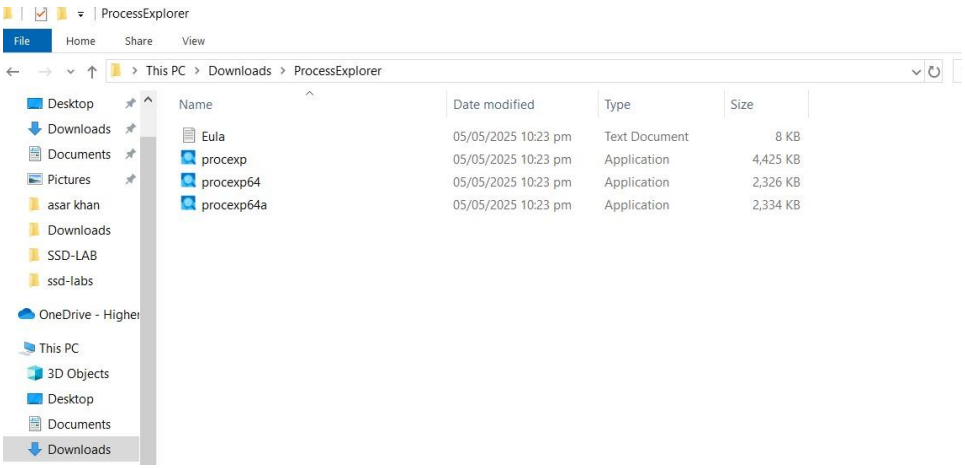
2. Tools Used:

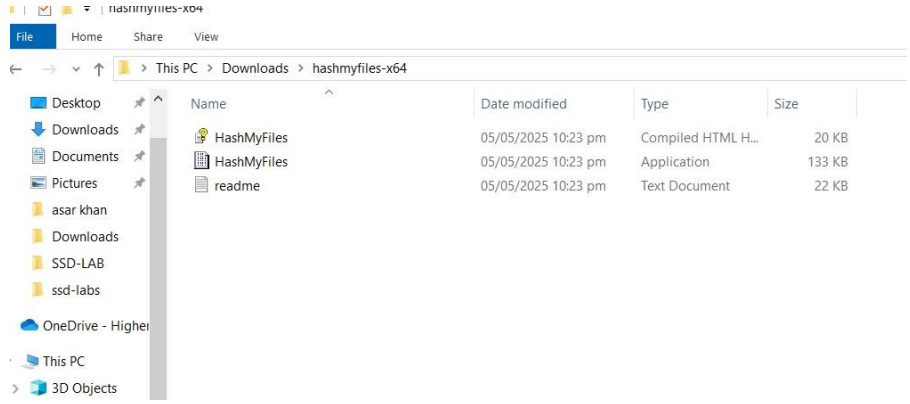
- Process Explorer (Microsoft Sysinternals)
- Process Monitor (Microsoft Sysinternals)
- PEStudio (Winitor)
- Wireshark (Network Protocol Analyzer)
- HashMyFiles (NirSoft)

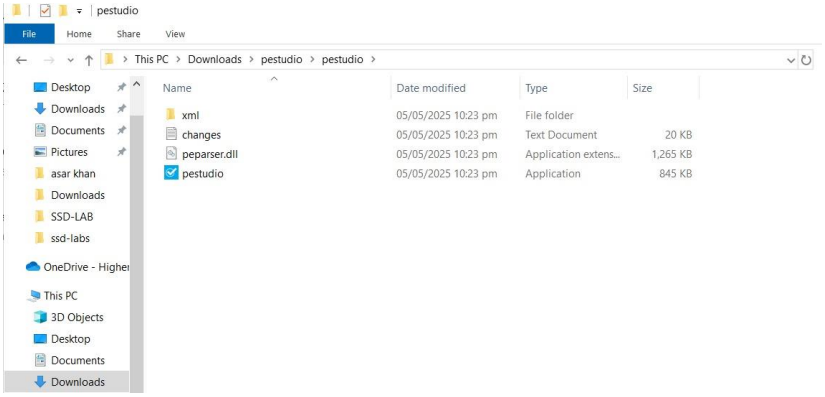
3. Step 1: Setup Environment

- A separate Windows PC was used with no internet connection.
- Installed all analysis tools listed above.



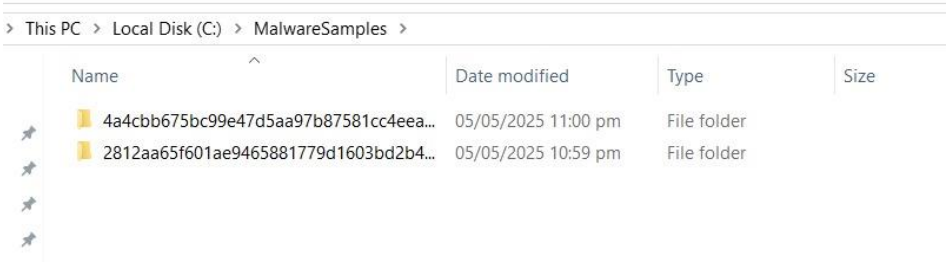






4. Step 2: Getting the Malware Sample

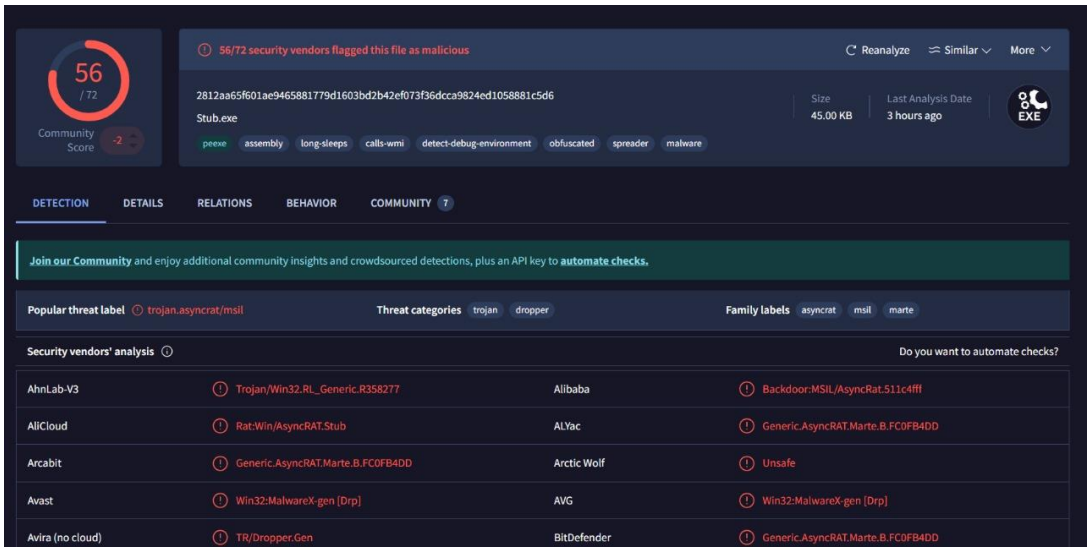
- A test malware sample was downloaded from a safe repository.
- Stored safely in a folder named "MalwareSamples."



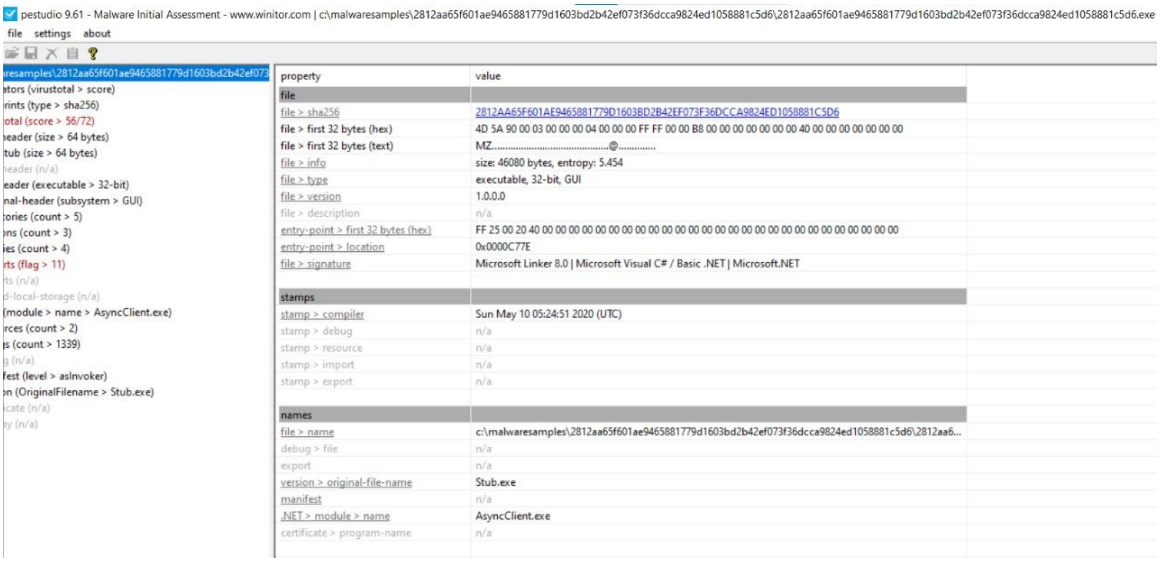
5. Step 3: Static Analysis

- Hashes were calculated using HashMyFiles.
  - MD5: 13db9e0f18443b2d6059c334d32a5cc7
  - SHA1: 7f40eae29cc7b26538705a78c29dd311bed54253
  - SHA256: 2812aa65f601ae9465881779d1603bd2b42ef073f36dcca9824ed1058881c5d6

- VirusTotal lookup result:
  - Detection rate:56/72

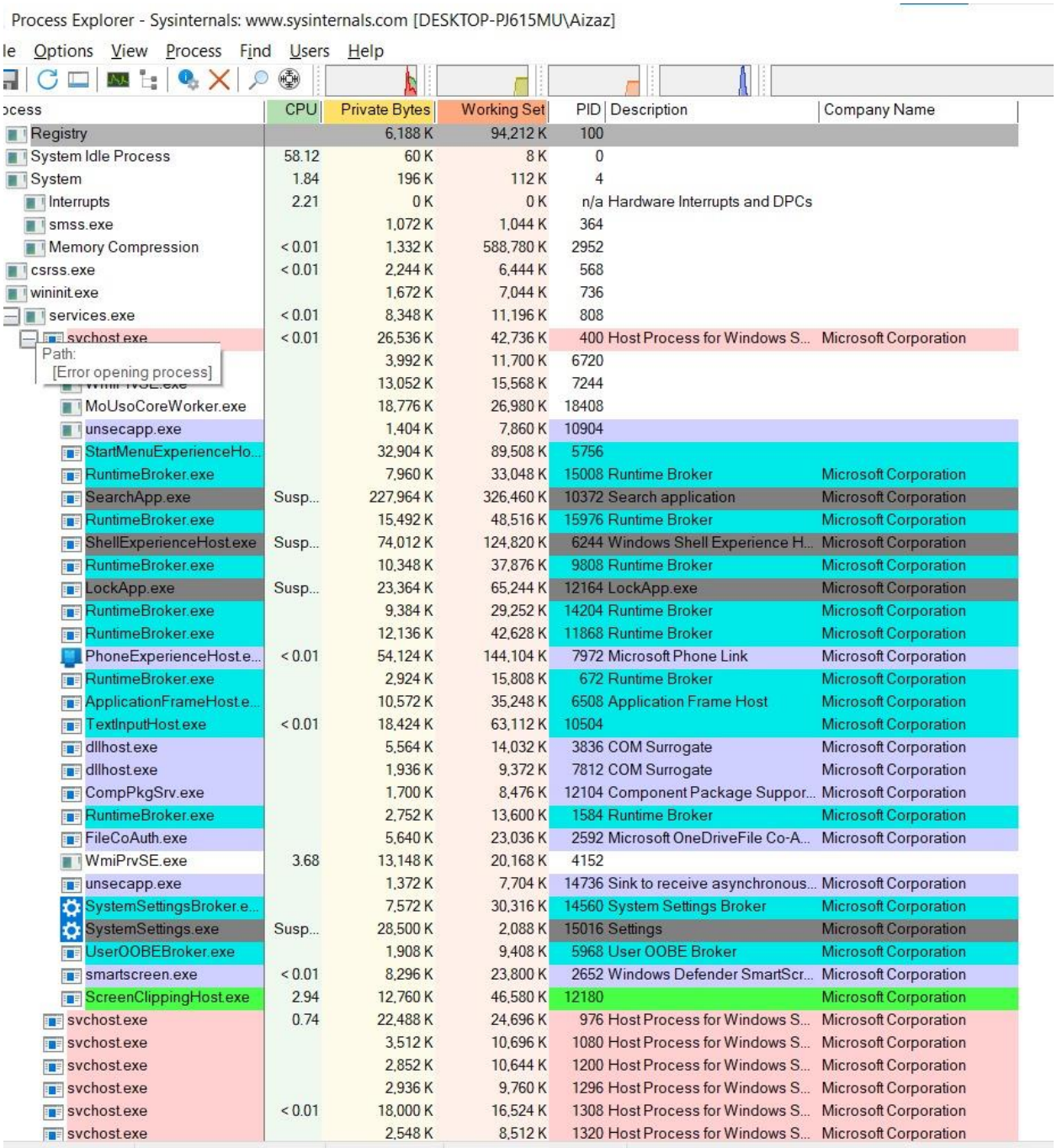


- PEStudio Analysis:

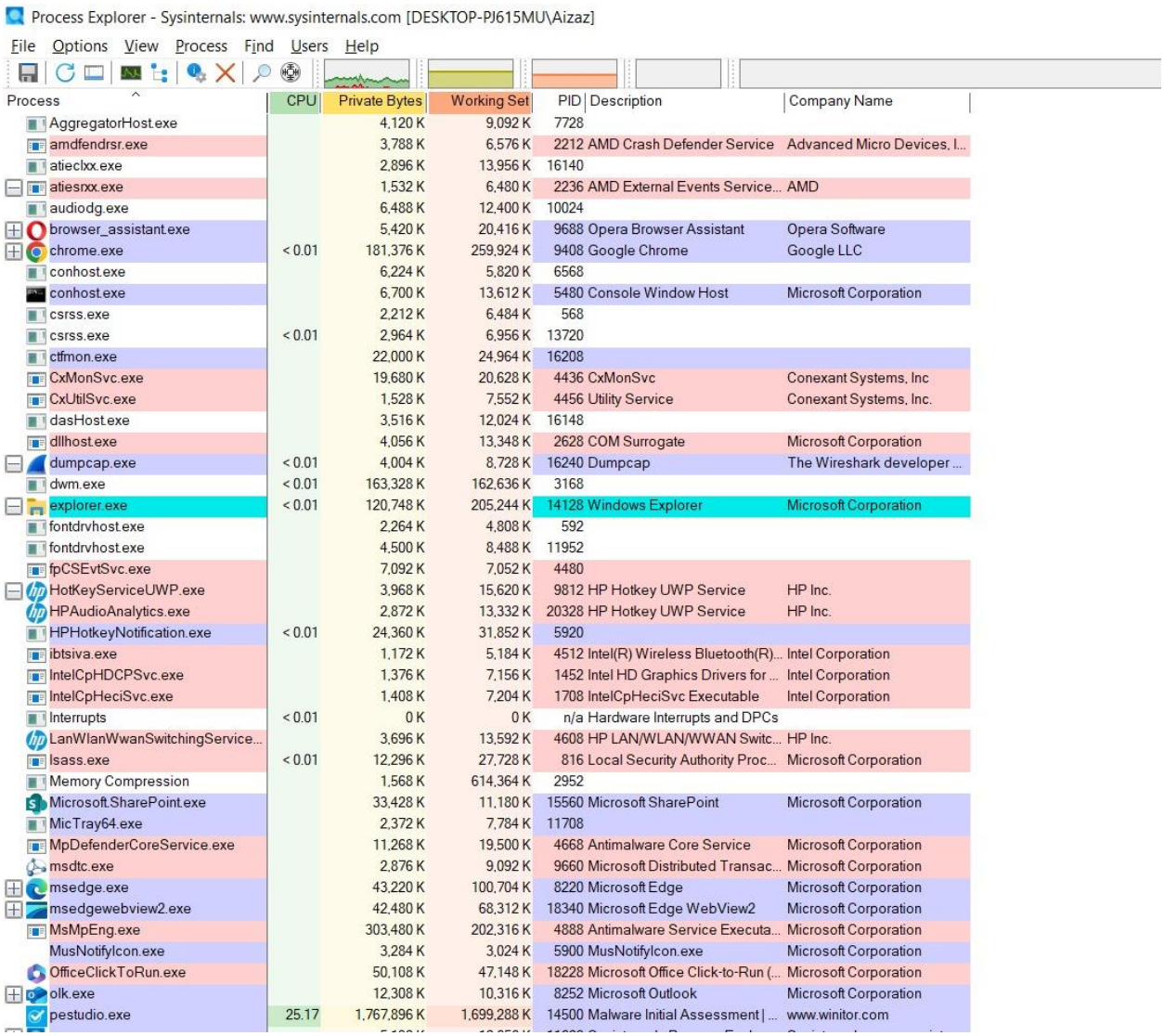


6. Step 4: Dynamic Analysis

- Process Explorer observed new processes created by the malware.
- Before execution:



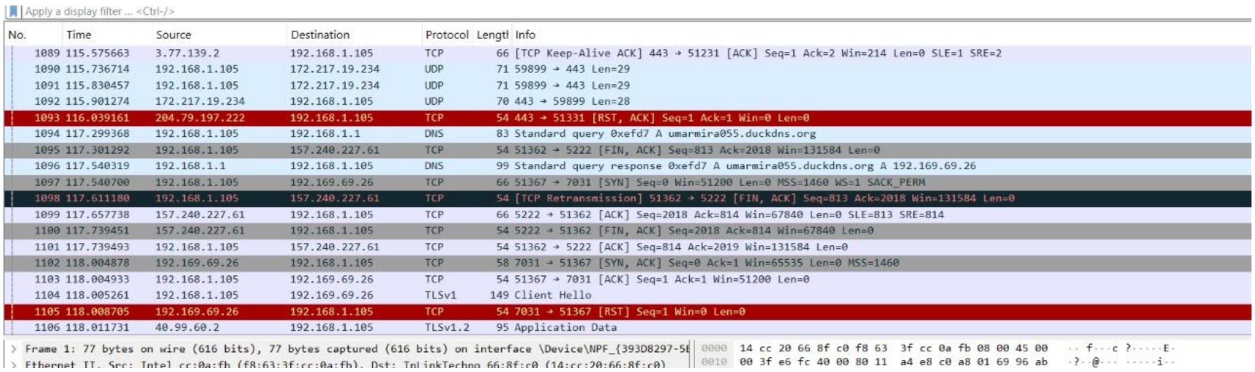
- After execution:



Process	CPU	Private Bytes	Working Set	PID	Description	Company Name
AggregatorHost.exe		4,120 K	9,092 K	7728		
amdfendrsr.exe		3,788 K	6,576 K	2212	AMD Crash Defender Service	Advanced Micro Devices, I...
atieclxx.exe		2,896 K	13,956 K	16140		
atiesrxx.exe		1,532 K	6,480 K	2236	AMD External Events Service...	AMD
audiodg.exe		6,488 K	12,400 K	10024		
browser_assistant.exe		5,420 K	20,416 K	9688	Opera Browser Assistant	Opera Software
chrome.exe	< 0.01	181,376 K	259,924 K	9408	Google Chrome	Google LLC
conhost.exe		6,224 K	5,820 K	6568		
conhost.exe		6,700 K	13,612 K	5480	Console Window Host	Microsoft Corporation
csrss.exe		2,212 K	6,484 K	568		
csrss.exe	< 0.01	2,964 K	6,956 K	13720		
ctfmon.exe		22,000 K	24,964 K	16208		
CxMonSvc.exe		19,680 K	20,628 K	4436	CxMonSvc	Conexant Systems, Inc
CxUtilSvc.exe		1,528 K	7,552 K	4456	Utility Service	Conexant Systems, Inc.
dasHost.exe		3,516 K	12,024 K	16148		
dllhost.exe		4,056 K	13,348 K	2628	COM Surrogate	Microsoft Corporation
dumpcap.exe	< 0.01	4,004 K	8,728 K	16240	Dumpcap	The Wireshark developer ...
dwm.exe	< 0.01	163,328 K	162,636 K	3168		
explorer.exe	< 0.01	120,748 K	205,244 K	14128	Windows Explorer	Microsoft Corporation
fontdrvhost.exe		2,264 K	4,808 K	592		
fontdrvhost.exe		4,500 K	8,488 K	11952		
fpCSEvtSvc.exe		7,092 K	7,052 K	4480		
HotKeyServiceUWP.exe		3,968 K	15,620 K	9812	HP Hotkey UWP Service	HP Inc.
HPAudioAnalytics.exe		2,872 K	13,332 K	20328	HP Hotkey UWP Service	HP Inc.
HPHotkeyNotification.exe	< 0.01	24,360 K	31,852 K	5920		
ibtsiva.exe		1,172 K	5,184 K	4512	Intel(R) Wireless Bluetooth(R)...	Intel Corporation
IntelCpHDCPSvc.exe		1,376 K	7,156 K	1452	Intel HD Graphics Drivers for ...	Intel Corporation
IntelCpHeciSvc.exe		1,408 K	7,204 K	1708	IntelCpHeciSvc Executable	Intel Corporation
Interrupts	< 0.01	0 K	0 K	n/a	Hardware Interrupts and DPCs	
LanWlanWwanSwitchingService...		3,696 K	13,592 K	4608	HP LAN/WLAN/WWAN Switc...	HP Inc.
lsass.exe	< 0.01	12,296 K	27,728 K	816	Local Security Authority Proc...	Microsoft Corporation
Memory Compression		1,568 K	614,364 K	2952		
Microsoft.SharePoint.exe		33,428 K	11,180 K	15560	Microsoft SharePoint	Microsoft Corporation
MicTray64.exe		2,372 K	7,784 K	11708		
MpDefenderCoreService.exe		11,268 K	19,500 K	4668	Antimalware Core Service	Microsoft Corporation
msdtc.exe		2,876 K	9,092 K	9660	Microsoft Distributed Transac...	Microsoft Corporation
msedge.exe		43,220 K	100,704 K	8220	Microsoft Edge	Microsoft Corporation
msedgewebview2.exe		42,480 K	68,312 K	18340	Microsoft Edge WebView2	Microsoft Corporation
MsMpEng.exe		303,480 K	202,316 K	4888	Antimalware Service Executa...	Microsoft Corporation
MusNotifyIcon.exe		3,284 K	3,024 K	5900	MusNotifyIcon.exe	Microsoft Corporation
OfficeClickToRun.exe		50,108 K	47,148 K	18228	Microsoft Office Click-to-Run (...	Microsoft Corporation
olk.exe		12,308 K	10,316 K	8252	Microsoft Outlook	Microsoft Corporation
pestudio.exe	25.17	1,767,896 K	1,699,288 K	14500	Malware Initial Assessment [...	www.winitor.com

Wireshark captured the following suspicious network traffic:

- IPs contacted: 150.171.22.12
- Domains contacted: akami cdn
-
- IPs contacted: 119.152.63.0/24
- Domains contacted: tencent cloud
-



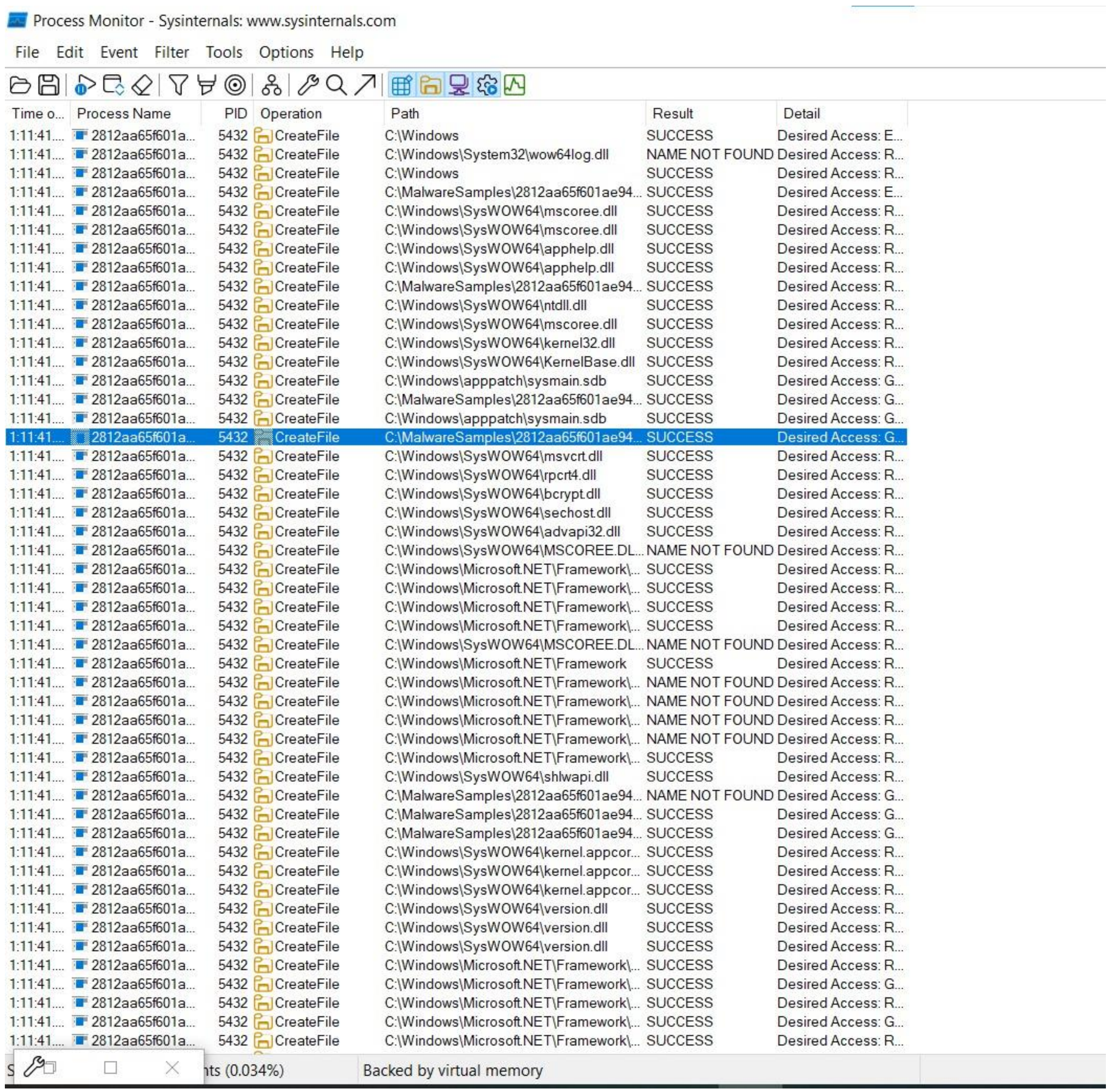
Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
1089	115.575663	3.77.139.2	192.168.1.105	TCP	66	[TCP Keep-Alive ACK] 443 → 51231 [ACK] Seq=1 Ack=2 Win=214 Len=0 SLE=1 SRE=2
1090	115.736714	192.168.1.105	172.217.19.234	UDP	71	59899 → 443 Len=29
1091	115.830457	192.168.1.105	172.217.19.234	UDP	71	59899 → 443 Len=29
1092	115.901274	172.217.19.234	192.168.1.105	UDP	70	443 → 59899 Len=28
1093	116.039161	204.79.197.222	192.168.1.105	TCP	54	443 → 51331 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
1094	117.299368	192.168.1.105	192.168.1.1	DNS	83	Standard query 0xefd7 A umarmira055.duckdns.org
1095	117.301292	192.168.1.105	157.240.227.61	TCP	54	51362 → 5222 [FIN, ACK] Seq=813 Ack=2018 Win=131584 Len=0
1096	117.540319	192.168.1.1	192.168.1.105	DNS	99	Standard query response 0xefd7 A umarmira055.duckdns.org A 192.169.69.26
1097	117.540700	192.168.1.105	192.169.69.26	TCP	66	51367 → 7031 [SYN] Seq=0 Win=51200 Len=0 MSS=1460 WS=1 SACK_PERM
1098	117.611180	192.168.1.105	157.240.227.61	TCP	54	[TCP Retransmission] 51362 → 5222 [FIN, ACK] Seq=813 Ack=2018 Win=131584 Len=0
1099	117.657738	157.240.227.61	192.168.1.105	TCP	66	5222 → 51362 [ACK] Seq=2018 Ack=814 Win=67840 Len=0 SLE=813 SRE=814
1100	117.739451	157.240.227.61	192.168.1.105	TCP	54	5222 → 51362 [FIN, ACK] Seq=2018 Ack=814 Win=67840 Len=0
1101	117.739493	192.168.1.105	157.240.227.61	TCP	54	51362 → 5222 [ACK] Seq=814 Ack=2019 Win=131584 Len=0
1102	118.004878	192.169.69.26	192.168.1.105	TCP	58	7031 → 51367 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1460
1103	118.004933	192.168.1.105	192.169.69.26	TCP	54	51367 → 7031 [ACK] Seq=1 Ack=1 Win=51200 Len=0
1104	118.005261	192.168.1.105	192.169.69.26	TLSv1	149	Client Hello
1105	118.008705	192.169.69.26	192.168.1.105	TCP	54	7031 → 51367 [RST] Seq=1 Win=0 Len=0
1106	118.011731	40.99.60.2	192.168.1.105	TLSv1.2	95	Application Data

> Frame 1: 77 bytes on wire (616 bits), 77 bytes captured (616 bits) on interface \Device\NPF_{393D8297-5E

0000 14 cc 20 66 8f c0 f8 63 3f cc 0a fb 08 00 45 00 ·· f···c ?·····E·
0010 00 3f e6 fc 40 00 80 11 a4 e8 c0 a8 01 69 96 ab ·?··@··· ·····i··

Process Monitor recorded these changes:



Process Monitor - Sysinternals: www.sysinternals.com

File Edit Event Filter Tools Options Help

Time o...	Process Name	PID	Operation	Path	Result	Detail
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows	SUCCESS	Desired Access: E...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\System32\wow64log.dll	NAME NOT FOUND	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\MalwareSamples\2812aa65f601ae94...	SUCCESS	Desired Access: E...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\mscoree.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\mscoree.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\apphelp.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\apphelp.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\MalwareSamples\2812aa65f601ae94...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\ntdll.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\mscoree.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\kernel32.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\KernelBase.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\apppatch\sysmain.sdb	SUCCESS	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\MalwareSamples\2812aa65f601ae94...	SUCCESS	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\apppatch\sysmain.sdb	SUCCESS	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\MalwareSamples\2812aa65f601ae94...	SUCCESS	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\msvcrt.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\rpcrt4.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\bcrypt.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\sechost.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\advapi32.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\MSCOREE.DL...	NAME NOT FOUND	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\MSCOREE.DL...	NAME NOT FOUND	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	NAME NOT FOUND	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	NAME NOT FOUND	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	NAME NOT FOUND	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	NAME NOT FOUND	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\shlwapi.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\MalwareSamples\2812aa65f601ae94...	NAME NOT FOUND	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\MalwareSamples\2812aa65f601ae94...	SUCCESS	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\MalwareSamples\2812aa65f601ae94...	SUCCESS	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\kernel.appcor...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\kernel.appcor...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\kernel.appcor...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\version.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\version.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\SysWOW64\version.dll	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: R...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: G...
1:11:41....	2812aa65f601a...	5432	CreateFile	C:\Windows\Microsoft.NET\Framework\...	SUCCESS	Desired Access: R...

nts (0.034%) Backed by virtual memory

7. Step 5: Findings

- New processes created:

  - C:\Users\Ahmad\AppData\Local\Temp\evilspawn.exe

  - C:\Windows\System32\cmd.exe

- Files/Registry modified: - C:\Users\Ahmad\AppData\Local\Temp\

  - C:\Windows\System32\

- Network traffic to suspicious IPs/domains: 150.171.22.12/ akami cdn

  -119.152.63.0/24/tencent cloud

8. Conclusion:

This malware sample exhibited behaviors such as process injection, file modification, and network beaconing. Static and dynamic analysis provided insight into its techniques and indicators of compromise. The analysis environment was kept isolated to ensure safety during testing.