

PseudoManuscript Being Distributed in the Same Method as Cryptbot - ASEC BLOG

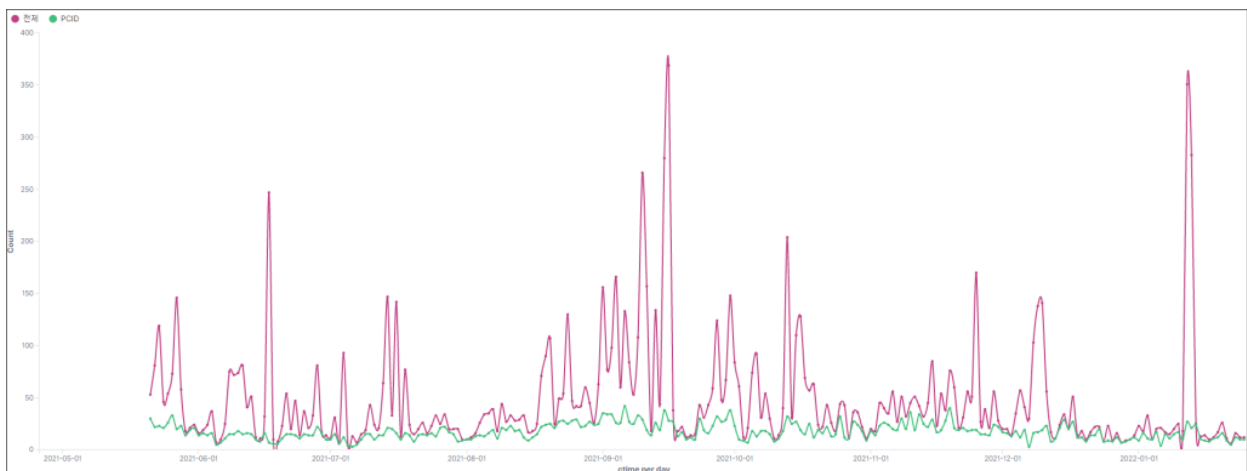
: 2/18/2022

The ASEC analysis team has discovered that PseudoManuscript malware was being distributed in Korea since May 2021. Introduced in the previous ASEC blog, PseudoManuscript is disguised as an installer that is similar to a form of Cryptbot, and is being distributed. Not only is its file form similar to Cryptbot, but it is also distributed via malicious sites exposed on the top search page when users search commercial software-related illegal programs such as Crack and Keygen.

The team has confirmed the executable file path below in the logs collected by AhnLab's ASD (AhnLab Smart Defense) infrastructure, and it appears that the user was trying to download a Windows validation program from a malicious site.

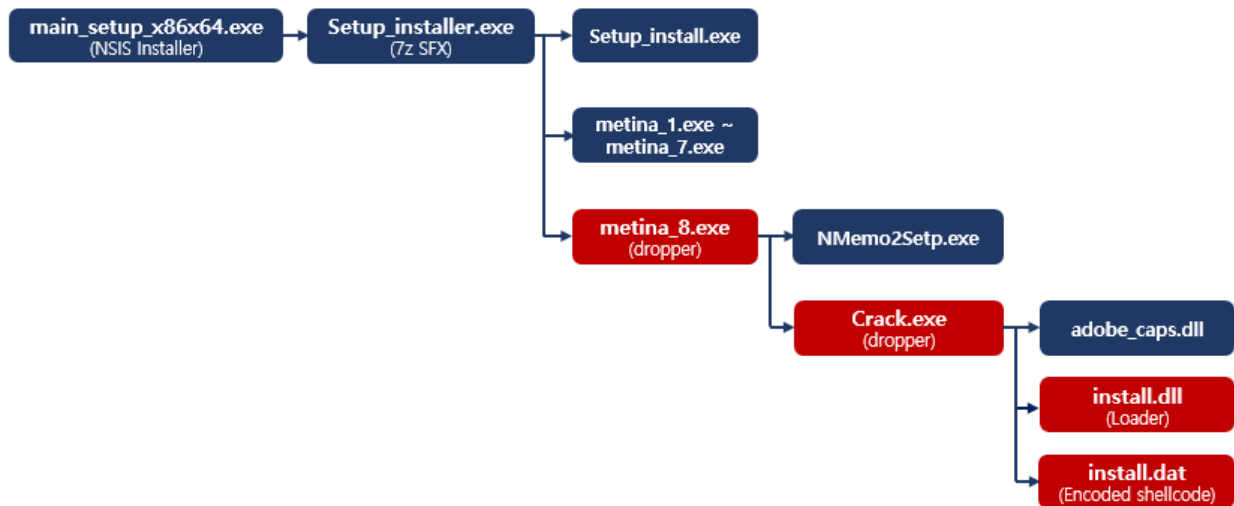
- **Executable File Path**

```
...\downloads\60b63e_kmsauto-net-201\kmsauto-net-2016-v154-windows-10-activator-portable\60b63e21e82a660b63e21e_setup_v18.2.9\main_setup_x86x64.exe
```



Log Detection Graph

Such a distribution method targets random users, and it has been confirmed that numerous PCs in Korea were infected. The figure above is a graph of the number of logs that were detected since the start of distribution (May 2021) up till now. The green graph shows the number of infected PCs, and the red graph shows the number of detected files. You can see that on average, around 30 PCs were consistently being infected every day.

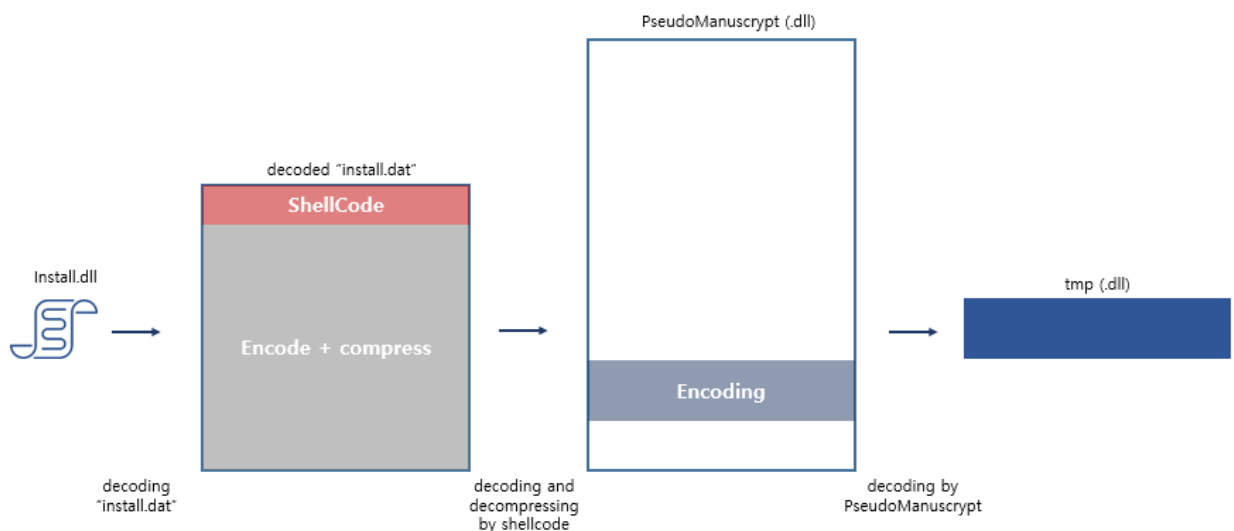


PseudoManuscript operation flow

The top-level file disguised as an illegal program is in the form of NSIS (Nullsoft Scriptable Install System) Installer, and it creates the “setup_installer.exe” file to execute it. “Setup_installer.exe” is in the form of 7z SFX, and it creates a Loader file, various malware, and numerous dll files. The dll files are all normal files, and they are libraries needed to execute the Loader file. Loader executes the various malware that was created together, and this process is the same as the execution process of Cryptbot. Other than PseudoManuscript, malware executed by Loader includes SmokeLoader, Glupteba, etc., and PseudoManuscript is in the form of 7z SFX. Finally, PseudoManuscript creates install.dll (Loader that performs decoding) and install.dat (Encoded shellcode) in the %TEMP% path. It then creates and executes a shortcut file called “install.dll.lnk” to operate a certain function inside the install.dll file.

- **Property of install.dll.lnk**

C:\Windows\system32\rundll32.exe "%TEMP%\install.dll",install



PseudoManuscript execution flow (2)

The install.dll file decodes the install.dat file to execute it in the memory. The install.dat file contains a shellcode and pe data that is encoded and compressed, and the shellcode decodes the encoded and compressed pe data and executes it. The pe data then performs the actual malicious behavior and decodes additional data inside to create it with the tmp extension, which is then registered to service. Details about pe data are explained below.

```
v0 = GetCommandLine();
GetModuleFileNameW(0, &Filename, 0x104u);
v1 = wcsrchr(&Filename, 0x5Cu);
if ( lstrcmplw(v1 + 1, L"svchost.exe") )
{
    if ( sub_669580() )
    {
        result = (PWSTR)sub_66A700(v0);
    }
    else
    {
        v8 = CreateThread(0, 0, sub_669C40, 0, 0, &ThreadId);
        WaitForSingleObject(v8, 0xFFFFFFFF);
        result = (PWSTR)CloseHandle(v8);
    }
}
else if ( StrStrIW(v0, L"netsvcs") )
{
    v2 = CreateThread(0, 0, sub_6694C0, 0, 0, 0);
    CloseHandle(v2);
    v3 = CreateThread(0, 0, sub_6689C0, 0, 0, &ThreadId);
    result = (PWSTR)CloseHandle(v3);
}
else if ( StrStrIW(v0, L"SystemNetworkService") )
{
    v5 = CreateThread(0, 0, sub_669C40, 0, 0, &ThreadId);
    WaitForSingleObject(v5, 0xFFFFFFFF);
    result = (PWSTR)CloseHandle(v5);
}
else
{
    result = StrStrIW(v0, L"AppService");
}
```

Command line scan

The called pe data first checks if the name of the currently running process is svchost.exe. In this case, the current process was run as rundll32.exe by the shortcut file.

MachineGuid value

When it is not a svchost.exe process, it creates a certain registry key and saves malicious data. For the name of the created registry, it uses the MachineGuid value that exists in the HKLM\SOFTWARE\Microsoft\Cryptography registry. MachineGuid is a HardwareID value, where each PC has a unique value. It uses this characteristic to create the registry key name.

MachineGuid value is encoded via the "Global" string, and the encoded MachineGuid value is used to create a registry key in the path below. The encoded "install.dat" data is then saved to the registry key.

– HKLM\SOFTWARE\Classes\CLSID\MachineGuid("Global"):1 – Encoded "install.dat"

```
if ( EnumServicesStatusExW(
    hSCObject,
    SC_ENUM_PROCESS_INFO,
    0x30u,
    1u,
    (LPBYTE)v5,
    v18,
    &pcbBytesNeeded,
    &ServicesReturned,
    &ResumeHandle,
    0) )
{
    v7 = (void (__stdcall *) (SC_HANDLE)) CloseServiceHandle;
    v8 = (SC_HANDLE) LocalAlloc(0x40u, 0x2000u);
    v9 = 0;
    hSCObject = v8;
    v22 = 0;
    v25 = 0;
    if ( ServicesReturned )
    {
        v10 = (DWORD *) ((char *) hMem + 36); // process id
        do
        {
            if ( *(v10 - 6) == 4 ) // 실행 중인 서비스인지
            {
                v11 = OpenServiceW(v6, (LPCWSTR)*(v10 - 9), 1u); // v10-9 : service name
                if ( v11 )
                {
                    if ( QueryServiceConfigW(v11, (LPQUERY_SERVICE_CONFIG)hSCObject, 0x2000u, &v22) )
                    {
                        v12 = (const WCHAR *) *((_DWORD *) hSCObject + 3); // path
                        if ( v12 )
                        {
                            if ( StrStrIW(v12, L"-k netsvcs" ) )
                            {
                                v13 = *v10;
                                for ( i = 0; i < 0x64; ++i )
                                {
                                    v15 = dwProcessId[i];
                                }
                            }
                        }
                    }
                }
            }
        } while ( v10++ );
    }
}
```

Running service scan

After it creates the registry key, it checks the process id of services that include "-k netsvcs" in their arguments, then injects the decoded "install.dat" in the process. It then deletes the "install.dat" file that exists in the %TEMP% path, and the injected process references the encoded "install.dat" data that was saved to the registry key.

The injected svchost.exe goes through the same process and scans the command line. It checks if the name of the current process is svchost.exe and if netsvcs is included in the argument, it executes two threads.

The thread that is first executed performs the feature of registering a certain file to service when the process is terminated. It first brings down the priority of process termination to the lowest and configures the control handler.

```

BOOL __stdcall HandlerRoutine(DWORD CtrlType)
{
    if ( CtrlType == 5 )
    {
        SetProcessShutdownParameters(0, 0);
        SetConsoleCtrlHandler(HandlerRoutine, 1);
    }
    else if ( CtrlType == 6 )
    {
        sub_669410();
        return 0;
    }
    return 0;
}

```

Control handler function

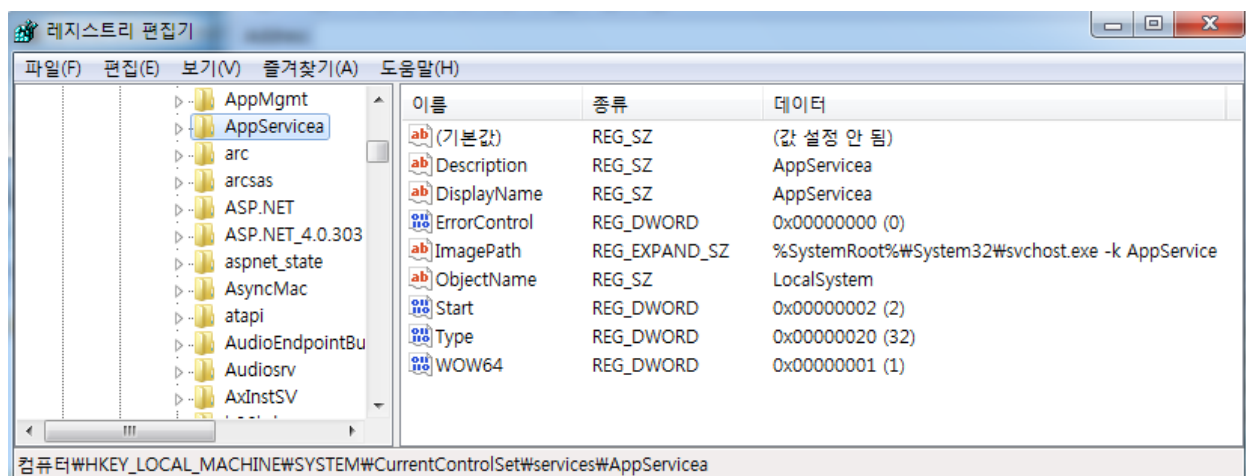
The function that is added to the control handler is as shown above, and it checks the received control signals. The function scans for the following control signal values: 5 and 6. If the signal value is 5 (When the user logs off), it reconfigures the priority of process termination and the control handler, and if the signal value is 6 (When the system shuts down), it executes a function that creates a malicious service. The malicious service is created via the process below.

After creating the SYSTEM\\CurrentControlSet\\Services\\AppService[a-z] registry, it configures this service registry as shown below.

- Start : 0x02 (Starts automatically when the system starts)
- imagepath : %SystemRoot%\System32\svchost.exe -k AppService

The name of the created service and the file that is executed via the service are configured as follows:

- SYSTEM\\CurrentControlSet\\ServicesAppService[a-z]\\Parameters:serviceDll = %System%\Encoded string.tmp
- SOFTWARE\\Microsoft\\Windows NT\\CurrentVersion\\Svchost:AppService =AppService[a-z]



Created service

The file that is to be registered to the service decodes the data that exists in a certain location and creates it with the tmp extension in the System path. The created tmp file acts as a Loader that decodes and executes the encoded "install.dat" data existing in a certain registry key. It appears that this process serves the purpose of performing continuous malicious behaviors even when the user PC is shut down and restarted.

```

0273938C 6A 04 PUSH 4
0273938E 8D85 2CFBFFFF LEA EAX,[EBP-AD4]
02739394 50 PUSH EAX
02739395 6A 04 PUSH 4
02739397 6A 00 PUSH 0
02739399 50 PUSH EAX
0273939A FE85 1BF7FFFF PUSH DWORD PTR SS:[EBP-8E8]
027393A0 FFD7 CALL EDI
EDI=756214D6 (ADUAP132.RegSetValueEx)
ADUAP132.RegSetValueEx

Address Hex dump ASCII
054AF708 A3 00 3A 00 5C 00 57 00 69 00 6E 00 64 00 6F 00 C:\Windows\system32\
054AF70B 77 00 73 00 5C 00 73 00 79 00 73 00 74 00 65 00 \System32\
054AF70E 60 00 33 00 32 00 5C 00 00 00 32 00 50 00 56 00 n32\
054AF711 44 00 40 00 4A 00 49 00 4A 00 2E 00 74 00 00 00 D\I
054AF714 00 00 78 00 00 00 00 00 00 00 00 00 00 00 00 00

054AF388 00000080 ((
054AF38C 054AF708 ((
054AF390 00000000 ((
054AF394 00000000 ((
054AF398 054AF708 (-> Data = 054AF708 -> A3
054AF39C 00000004 ((
DataSize = 4

EIP 027393A0
C 0 ES 0023 32bit 0(FFFFFFFF)
P 1 CS 001B 32bit 0(FFFFFFFF)
A 0 SS 0023 32bit 0(FFFFFFFF)
Z 1 DS 0023 32bit 0(FFFFFFFF)
S 0 FS 003B 32bit 7FFB4000(FFF)
T 0 GS 0000 NULL
D 0
D 0
D 0 LastErr: 00000000 ERROR_SUCCESS
EFL 00000246 (NO,NB,OE,NS,PE,C)

```

Adding an exclusion to Windows Defender

After the service is created, the System folder is excluded from Windows Defender scans, and the first thread is terminated.

```

02738882 50 PUSH EAX
02738883 8D4424 5C LEA EAX,[ESP+5C]
02738887 50 PUSH EAX
02738888 6A 00 PUSH 0
0273888A 6A 00 PUSH 0
0273888C FF7424 38 PUSH DWORD PTR SS:[ESP+38]
02738890 8D8424 A4060000 LEA EAX,[ESP+6A4]
02738897 6A 00 PUSH 0
02738899 6A 00 PUSH 0
0273889B 6A 00 PUSH 0
0273889D 50 PUSH EAX
0273889E 6A 00 PUSH 0
027388A0 FF15 F421F602 CALL DWORD PTR DS:[27621F4]
027388A6 8BF8 MOV EDI,EAX
027388A8 8B7424 18 MOV ESI,DWORD PTR SS:[ESP+18]
027388AC 85F6 TEST ESI,ESI
027388AE 74 29 JE SHORT 027388D9
[027621F4]-7696204D (kernel32.CreateProcessW)

Address Hex dump ASCII
027CF548 00000000 ((
027CF54C 027CF500 (|) ApplicationName = NULL
027CF550 00000000 (( pProcessSecurity = NULL
027CF554 00000000 (( pThreadSecurity = NULL
027CF558 00000000 (( InheritHandles = FALSE
027CF55C 0000000C (( CreationFlags = CREATE_SUSPENDED|DETACHED_PROCESS|00000
027CF560 00000000 (( pEnvironment = NULL
027CF564 00000000 (( CurrentDirectory = NULL
027CF568 027CF5C8 (|) pStartupInfo = 027CF5C8 -> STARTUPINFO {Size=72., Reserved1=NULL, Desk
027CF56C 027CF5A0 (|) pProcessInformation = 027CF5A0 -> PROCESS_INFORMATION {nProcess=NULL, h

EBP 027CFE10
ESI 00000001
EDI 00000000
EIP 027388A0
C 0 ES 0023 32bit 0(FFFFFFFF)
P 0 CS 001B 32bit 0(FFFFFFFF)
A 0 SS 0023 32bit 0(FFFFFFFF)
Z 1 DS 0023 32bit 0(FFFFFFFF)
S 0 FS 003B 32bit 7FFB4000(FFF)
T 0 GS 0000 NULL
D 0
D 0 LastErr: 0000007A
EFL 00000242 (NO,NB,OE,NS,PE,C)
ST0 empty 0.0
ST1 empty 0.0
ST2 empty 0.0
ST3 empty 0.0
ST4 empty 0.0
ST5 empty 0.0

```

Creating process

The second thread that is executed is the %System%\svchost.exe -k SystemNetworkService command, which performs the function of creating a process and injecting the decoded “install.dat” data.

The injected svchost.exe goes through the same process to scan the command line, and if it’s svchost.exe run by the SystemNetworkService argument, it performs the actual malicious behavior. It steals various user credentials including the data below via this process and sends them to the attacker’s server.

- VPN connection information
- Clipboard data
- Audio data
- List of shared network folders
- Information of processes that accept TCP and UDP ports
- File version information of the running process
- C2 : email.yg9[.]me

In addition to the malicious features above, it can also access the C2 server under the attacker’s command and perform various malicious behaviors such as file download, screen capture, and execution of keylogger and cmd commands.

As this malware is disguised as an illegal software installer and is distributed to random individuals via malicious sites, users must be careful not to download relevant programs. As malicious files can also be registered to service and perform continuous malicious behaviors without the user knowing, periodic PC maintenance is necessary.

[File Detection]

- Trojan/Win.Generic.R420870 (2021.05.16.01)
- Malware/Win.Generic.R421780 (2021.05.21.03)
- Trojan/Win.Generic.C4512227 (2021.06.04.01)
- Trojan/Win.Generic.C4512246 (2021.06.04.01)
- Trojan/Win.Generic.R421722 (2021.08.17.03)
- Trojan/Win.Generic.R436809 (2021.08.17.03)
- Trojan/Win.Generic.R436811 (2021.08.17.03)
- Trojan/Bin.Encoded (2022.01.28.02)

[IOC Info]

- 1fecb6eb98e8ee72bb5f006dd79c6f2f
- 5de2818ced29a1fedb9b24c1044ebd45
- 58efaf6fa04a8d7201ab19170785ce85
- 839e9e4d6289eba53e40916283f73ca6
- 89c8e5a1e24f05ede53b1cab721c53d8
- 5e6df381ce1c9102799350b7033e41df
- a29e7bbe6dee4eea95afa3f2e3a1705a
- 8ae40c8418b2c36b58d2a43153544ddd
- email.yg9[.]me

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