WannaHusky Malware Analysis w/ YARA + TTPs

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Hello! I have recently gained a new interest in threat intelligence, malware research and analysis. In response, I have been taking courses to learn the tools and methodologies of malware analysis and reverse engineering. This blog is a result of my new-found interest.

My first blog post follows my observations on a malware sample provided by **HuskyHacks** as a part of his course, **Practical Malware Analysis & Triage**. The formatting of this post is more report-style, highlighting my findings in my initial triage. I've included a full set of YARA rules, as well as the TTPs of the sample at the end.

Please feel free to give feedback, as I would like to further improve my malware analysis skills and perform deeper and more thorough analysis in the future.

Executive Summary

Ransomware.WannaHusky is a Nim-compiled ransomware malware sample, provided as part of the Practical Malware Analysis & Triage course. It is an 32-bit executable.

Ransomware.Wannahusky consists of multiple steps: The sample first returns the current directory of the user and then returns the home directory of the user. If *cosmo.jpeg* is on the Desktop of the infected host, the sample executes a PowerShell script (*ps1.ps1*). Next, the sample will encrypt *cosmo.jpeg*, adding the *.WANNAHUSKY* extension and write the *WANNAHUSKY.png* to the Desktop. The sample will then change the Desktop wallpaper to the *WANNAHUSKY.png* file. Lastly, it runs the `tree C:\` command.

Indicators of compromise include *ps1.ps1*, the encryption of *cosmo.jpeg* (with the file becoming *cosmo.WANNAHUSKY*), a ransomware note saved as *WANNAHUSKY.png*, the Desktop wallpaper changing to the contents of *WANNAHUSKY.png* and the `tree C:\` command being run.

```
SHA256 Hash: 3D35CEBCF40705C23124FDC4656A7F400A316B8E96F1F9E0C187E82A9D17DCA3
```

Observations

Malware Composition:

The sample provided consists of two components:

```
File Name: Ransomware.WannaHusky.exe
SHA256 Hash: 3D35CEBCF40705C23124FDC4656A7F400A316B8E96F1F9E0C187E82A9D17DCA3File Name: ps1.ps1
SHA256 Hash: D6317F374F879CD4E67FB4E9DDC0D283926489F4C0D6CF07D912A247E5CFDE99
```

Static Analysis:

CAPA:

CAPA is a tool that detects capabilities in executable files. After running the binary against the CAPA tool, the following information was extracted:

- Hashes: SHA1, SHA256 and MD5
- Language: The binary is compiled with Nim
- Encryption: The binary uses HC-128 to encrypt data
- Encoding: The binary uses Base64 to encode data
- There are detected capabilities of reading and writing files to the file system
- There are detected capabilities of creating and terminating processes

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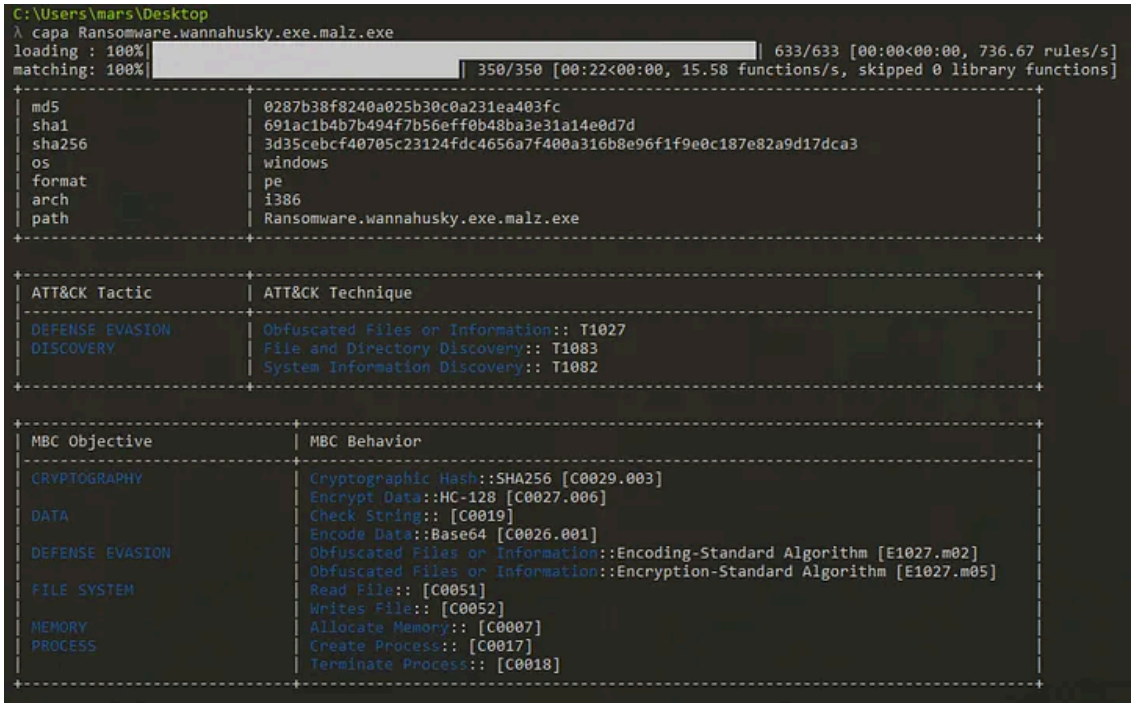

Figure 1.1: CAPA output — Tactics & Techniques, Behaviours

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```
+-----------------------------------------------------+-----------------------------------------------------+
| CAPABILITY                                          | NAMESPACE                                           |
|-----------------------------------------------------+-----------------------------------------------------|
| compiled with Nim                                   | compiler/nim                                        |
| encode data using Base64                            | data-manipulation/encoding/base64                   |
| reference Base64 string                             | data-manipulation/encoding/base64                   |
| encrypt data using HC-128                           | data-manipulation/encryption/hc-128                 |
| hash data using SHA256                              | data-manipulation/hashing/sha256                    |
| contain a thread local storage (.tls) section       | executable/pe/section/tls                           |
| query environment variable                          | host-interaction/environment-variable               |
| check if file exists                                | host-interaction/file-system/exists                 |
| read file on Windows (2 matches)                    | host-interaction/file-system/read                   |
| write file on Windows (5 matches)                   | host-interaction/file-system/write                  |
| get thread local storage value                      | host-interaction/process                            |
| execute command (2 matches)                         | host-interaction/process/create                     |
| allocate RWX memory                                 | host-interaction/process/inject                     |
| terminate process                                   | host-interaction/process/terminate                  |
+-----------------------------------------------------+-----------------------------------------------------+
```

Figure 1.2: CAPA output — Capabilities

PE Studio:

After analyzing the Strings in PE Studio, some strings of interest are listed below:

- `tree C:\` command is run
- The *ps1.ps1* script is written to the Desktop, and then executed
- The contents of the PowerShell script:

> The script imports the user32.dll. It then sets the `$currDir` variable to the contents of the `Get-Location` cmdlet, sets the `$wallpaper` variable to the WANNAHUSKY.png file, and sets the `$fullPath` variable to the joined paths of the current directory and WANNAHUSKY.png (ex. `Desktop\WANNAHUSKY.png`). It then invokes the `SetWallpaper` function to change the user's Desktop wallpaper to the ransom note (WANNAHUSKY.png).

- *WANNAHUSKY.png* is written on the Desktop

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Figure 2: PE Studio — Strings

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```
$code = @'
using System.Runtime.InteropServices;

namespace Win32{

    public class Wallpaper{

      [DllImport("user32.dll", CharSet=CharSet.Auto)]
      static  extern int SystemParametersInfo (int uAction , int uParam , string lpvParam , int fuWinIni) ;

      public static void SetWallpaper(string thePath){
         SystemParametersInfo(20,0,thePath,3);
      }
    }
}
'@
add-type $code

$currDir = Get-Location
$wallpaper = ".\WANNAHUSKY.PNG"
$fullpath = Join-Path -path $currDir -ChildPath $wallpaper

[Win32.Wallpaper]::SetWallpaper($fullpath)
```

Figure 3: Contents of ps1.ps1

Dynamic Analysis:

Initial Detonation:

When the binary is run, *cosmo.jpeg* is encrypted and deleted. Two new files named *cosmo.WANNAHUSKY* and *WANNAHUSKY.png* are written to the Desktop. The wallpaper is changed to the contents of *WANNAHUSKY.png*.

Figure 4: WANNAHUSKY.png

A *cmd.exe* window also appears on the screen, running the tree command. It appears that the *cmd.exe* window is not being run discreetly in the background and shows the output of the command before exiting.

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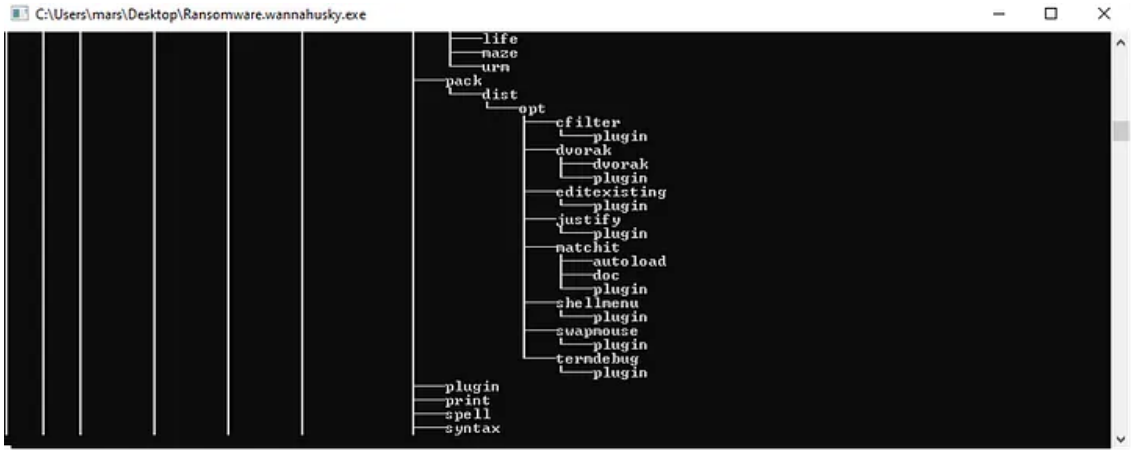

Figure 5: Capture of the tree command output

After monitoring for network traffic in Wireshark, there was no detection of the binary attempting to call out to hosts or domains.

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Additionally, in order for the binary to execute successfully, *cosmo.jpeg* needs to be on the Desktop. If the binary cannot locate *cosmo.jpeg*, it returns an error (shown below).

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Figure 6: Failed execution of Ransomware.Wannahusky.exe

A Deeper Dive

Disassembling:

There are 3 important functions in `NimMainModule@0:`

- `wannaHusky__4JhDTDCSrwYIQ19bJbLaL2w@0:` This function is responsible for the encryption and deletion of *cosmo.jpeg* and writing *cosmo.WANNAHUSKY* to the Desktop
- `changeBackground__4JhDTDCSrwYIQ19bJbLaL2w_2@0:` This function is responsible for changing the Desktop wallpaper. This occurs by writing the *WANNAHUSKY.png* file to the Desktop and executing the *ps1.ps1* script, which changes the Desktop wallpaper.
- `nosexecShellCmd@4:` This function is responsible for spawning *cmd.exe* and running the tree command on the C:\ directory → `C:\Windows\system32\cmd.exe /c tree C:\`

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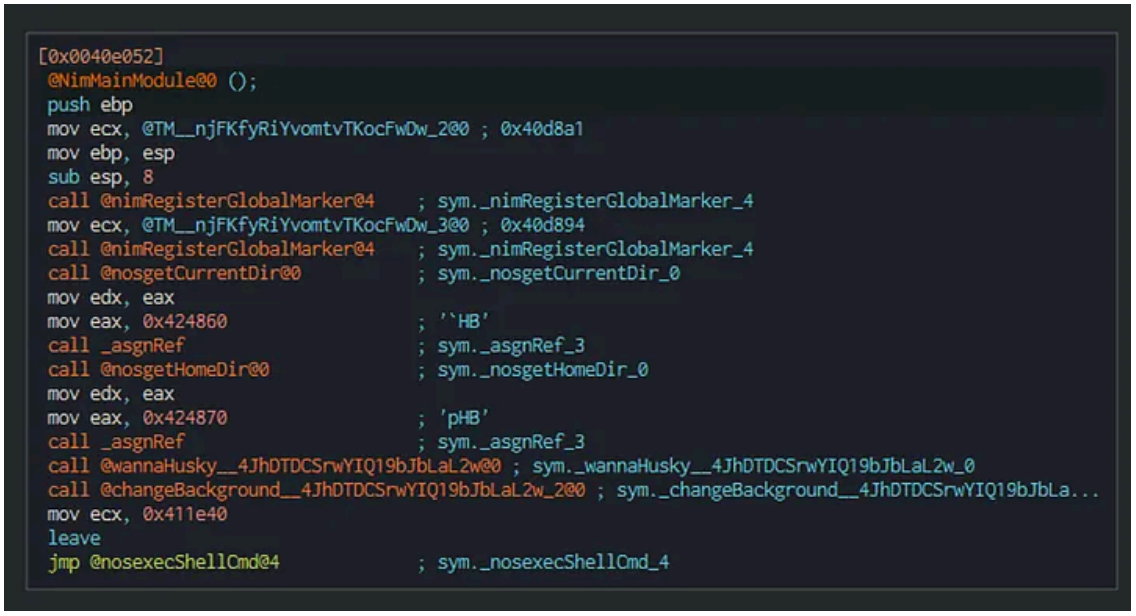

Figure 7: NimMainModule in Cutter

Within the `wannaHusky__4JhDTDCSrwYIQ19bJbLaL2w@0` function, the encryption and encoding function calls are located. The target file (*cosmo.jpeg*) appears to get encrypted and encoded.

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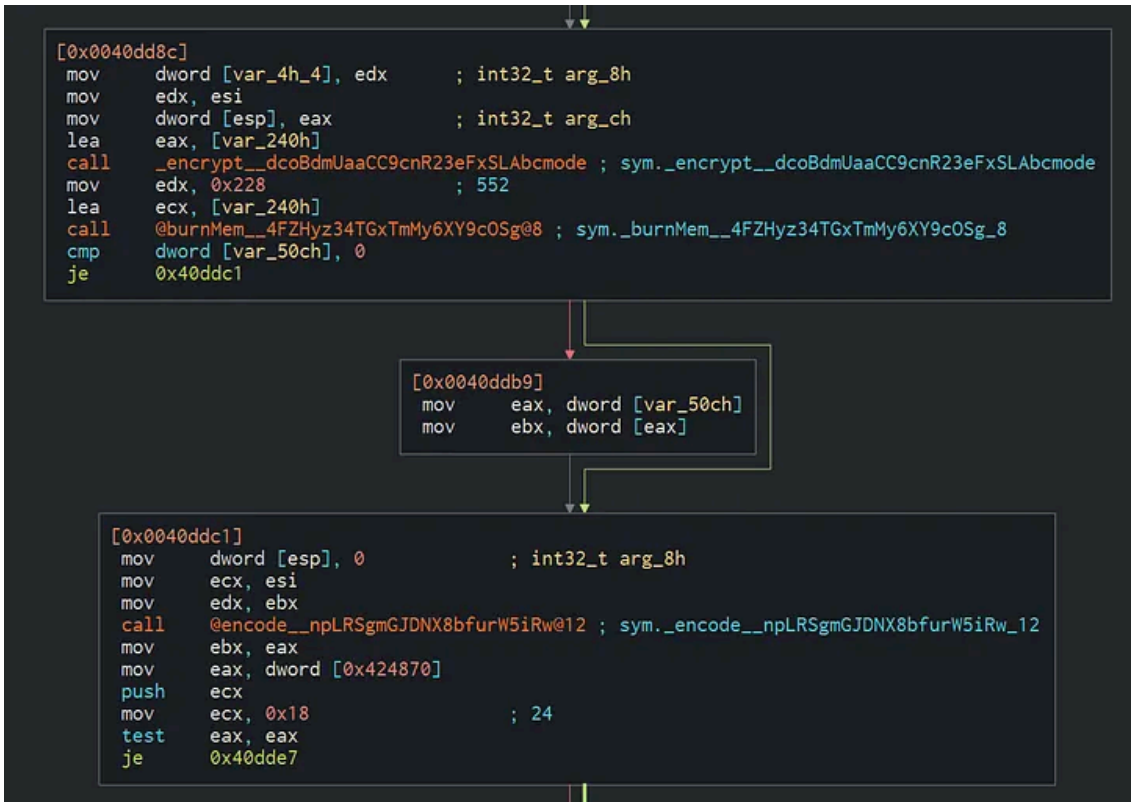

Figure 8.1 — Encryption and encoding functions

The new encrypted file is then written to the Desktop (*cosmo.WANNAHUSKY*) and the target file is deleted.

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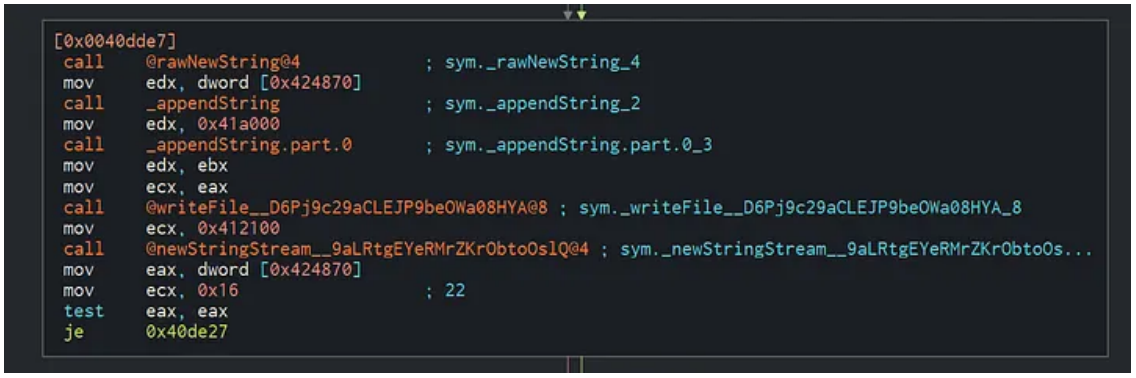

Figure 8.2 — Overwriting target file

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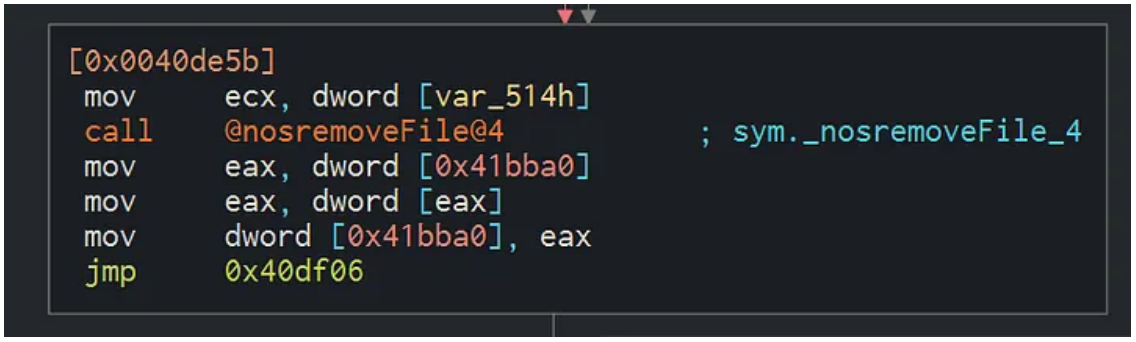

Figure 8.3 — Target file being deleted

Figure 8.4 — Decompiler showing encryption, encoding, writing and deletion of files

Debugging:

When stepping through the sample and simultaneously looking at the process tree in Procmon, there are two *cmd.exe* processes that are run.

- One cmd.exe window spawns Powershell, which executes the contents of ps1.ps1: `C:\Windows\system32\cmd.exe /c powershell C:\Users\mars\Desktop\ps1.ps1`
- One cmd.exe window executes the tree command: `C:\Windows\system32\cmd.exe /c tree C:\`

While the Powershell script has an intended function, which is changing the user's Desktop wallpaper to *WANNAHUSKY.png*, the tree command does not have a function. After further investigation, it appears that the visible *cmd.exe* window with the tree command executing is a decoy or distraction to the user/malware analyst, as the Powershell script is running in the background discreetly.

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Figure 9.1: Process Tree

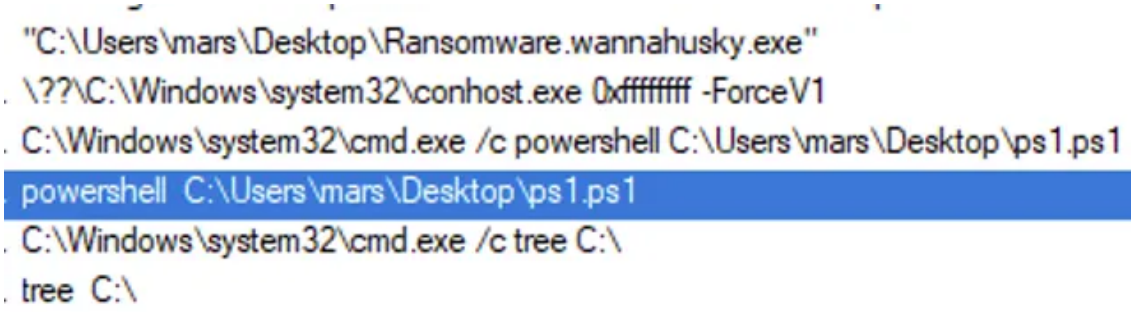

Figure 9.2: Commands as seen in the Process Tree

Indicators of Compromise

Network Indicators

After monitoring for network traffic, there was no detection of the binary attempting to call out to hosts or domains. Therefore, there are no network indicators for this sample.

Host-based Indicators

- *ps1.ps1*
- a ransomware note saved as *WANNAHUSKY.png*
- the Desktop wallpaper changing to the contents of *WANNAHUSKY.png*
- *cmd.exe* window with the `tree C:\` command being executed

Rules & Signatures

A full set of YARA rules can be found below, as well as on my **Github**.

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```
rule ransomware_wannahusky {

    meta:
        author      = "Mars"
        description = "Rule to detect Ransomware.Wannahusky"
        hash        = "3D35CEBCF40705C23124FDC4656A7F400A316B8E96F1F9E0C187E82A9D17DCA3"
        created     = "2022-04-05"

    strings:
        $s1 = "WANNAHUSKY.png" ascii
        $s2 = "cosmo.WANNAHUSKY" ascii
        $s3 = "ps1.ps1" ascii
        $s4 = "nim" ascii

    condition:
        uint16(0) == 0x5A4D and any of them
}
```

Tactics & Techniques

I've highlighted the Tactics and Techniques that I have found in my analysis of the sample below:

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ATT&CK ID	Techniques	Tactics
T1027	Obfuscated Files / Information	Defence Evasion
T1059.001	PowerShell	Execution
T1059.003	Windows Command Shell	Execution
T1082	System Information Discovery	Discovery
T1083	File and Directory Discovery	Discovery
T1491	Defacement	Impact

Source: https://medium.com/@mars0x/wannahusky-malware-analysis-w-yara-ttps-2069fb479909