

MALWARE ANALYSIS USING METHOD IDENTIFIERS

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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LIST OF ABBREVIATIONS

- **URL**- Uniform Resource Locator
- **DLL**- Dynamic Link Library
- **DNS**- Domain Name System
- **PE**- Portable Executor
- **ASCII**- American Standard Code for Information Interchange
- **SHA**- Secure Hash Algorithm
- **IOC**- Indicators of Compromise
- **APT**- Advance Persistent Threat
- **Exe**- Executable

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ABSTRACT

Malware is any malicious software that is harmful created by cybercriminals to steal data, harm, or destroy computers and computer systems.

The proposed name of the project is “Malware Analysis”. The word "malware" is made up of the words "malicious" and "software." Any sort of software or code that is specifically created with the goal to hurt, damage, or allow unauthorized access to computer systems, networks, or user data is referred to as malicious software.

This study focuses on the critical field of malware analysis, aiming to explore techniques and methodologies to understand different behaviors and characteristics of malicious software.

To conceal their malicious code and avoid being detected by security tools, malware authors frequently employ a variety of approaches. One typical tactic is to obscure their code by employing various identifiers and approaches.

Our study demonstrates how malware has developed from simple viruses to more complex varieties like ransomware. We dig into the significance of threat intelligence, code analysis, and behavioral analysis in defending against these dangers. We also stress the importance of cybersecurity experts working together to remain on top of changing malware threats. Method Identifiers are being used in the project for malware analysis.

Comments:

- The proposed name of the topic is clear.
- The objective is relevant.
- Includes research findings on the topic.

CHAPTER 1

PROJECT DESCRIPTION AND OUTLINE

1.1 Introduction

Malware is an abbreviated form of “malicious software.” It is developed as harmful software that invades or corrupts one’s computer network. The goal of malware is to cause havoc and steal information or resources for monetary gain or sheer sabotage intent. It is specifically designed to gain access to or damage a computer, usually without the knowledge of the owner. The term "malware" was reportedly first coined by Yisrael Radai in 1990. Yisrael Radai is an Israeli security expert who used the term in a Usenet newsgroup discussion. Since then, "malware" has become a widely accepted and commonly used term in the field of cybersecurity to refer to all types of malicious software. Now, over 25 million new types of malwares registered since the beginning of 2022 alone.

Classifying malware into distinct types or categories based on its characteristics, behavior, and intended purpose helps cybersecurity professionals, researchers, and antivirus software developers better understand, analyse, and respond to different types of malwares.

1.2 MOTIVATION FOR THE WORK

The motivation behind this project of ours is that there has always been a problem related to malicious software known as malware. So, it is important to note that while studying malware is essential for cybersecurity, it should always be done responsibly and within legal boundaries. Malware analysis is required to gain insights into how specific malware strains work, their methods and behaviours. The need to safeguard critical infrastructure has led to creating this project. So, let us quickly know more about the project in detail.

1.3 Problem Statement

As stated earlier in the introduction, method identifiers in malware analysis play an important role in understanding and analysing malicious software. These identifiers are essentially the techniques, patterns, or characteristics that can be used to identify and categorize malware.

So our project's aim is to perform analysis of the malware using method identifiers. The problem which we are facing is the ongoing threat of malware which is harmful for computers and networks. According to the recent article which tells how pervasive and serious danger has malware become in today's digital age.

Identifiers categorize and classify different types of malware behaviours. This classification allows security professionals to quickly understand the nature of a particular behaviour and its implications. Security teams can use identifiers to develop response strategies and mitigation techniques tailored to specific behaviours. This helps organizations proactively defend against known malware activities.

1.4 Objective

The objectives of the project are to:

- To obtain a dataset of malicious and non-malicious samples.
- To extract the features from the respective samples.
- To create a catalogue of known malicious behaviours.

- To analyse the extracted features and compare them with the catalogue of known malicious behaviours.

1.5 Scope

The scopes involved in the project are threat classification, malware behavioural analysis, vulnerability exploitation.

Basically, the overall process of this project can be viewed as below:

1. Collect the data
2. Extract features from the samples
3. Build a Malware Behavior Catalogue
4. Analyse the behavior of the extracted features
5. Test and evaluate
6. Alert and reporting

1.6 Report Organization

This thesis consists of five (5) chapters. Chapter 1 will discuss the introduction to the system which will explain the introduction, problem statement, objective, and scope. For Chapter 2, it will discuss the literature review, definition, and types of malwares. For Chapter 3, it will discuss the methodology and requirements of the project. For Chapter 4, it will discuss the design and implementation of the project. Chapter 5, it will show the results and discussion.

SUMMARY

Our project focuses on malware analysis using method identifiers using static and synamic analysis. Now a day, internet becomes an essential part of the daily life of many people where as malware is designed to damage a computer system without user's informed consent.

CHAPTER 2: RELATED WORK INVESTIGATION

2.1 Introduction

In this chapter, we are going to focus on discussing the results or findings based on the article, journals, or any other related reference material. Some original words from the reference material may be cited to enhance the review. The purpose of this chapter is to explain about the selected project. We focus on malware detection using a combination of static and dynamic analysis as well as signature-based approaches. Through our project, we aim to reveal the inner workings of malware using this verification process. By using signature as a guide, we seek to contribute to ongoing efforts to improve cybersecurity, share our knowledge and protect our digital environment from malware threats.

Basically, it is divided into a few sub-sections as well. Those sub-section include some little explanation of basic concepts of the selected project, research of some already existing similar problem or solution done by others and the hardware, technique or method which will be applied or used in the selected project.

This chapter explains in detail the techniques or technologies which are suitable to be adapted into the project. This chapter contains information about the study of the project in general.

LINKS:

- <https://blough.ece.gatech.edu/research/papers/ccs21.pdf>
- https://www.researchgate.net/publication/267777154_Malware_Analysis

2.2 What is Malware Classification?

Malware classification is the process of categorizing malicious software (malware) into distinct types or categories based on its characteristics, behavior, and intended purpose. This classification helps cybersecurity professionals, researchers, and antivirus software developers better understand, analyze, and respond to different types of malware.

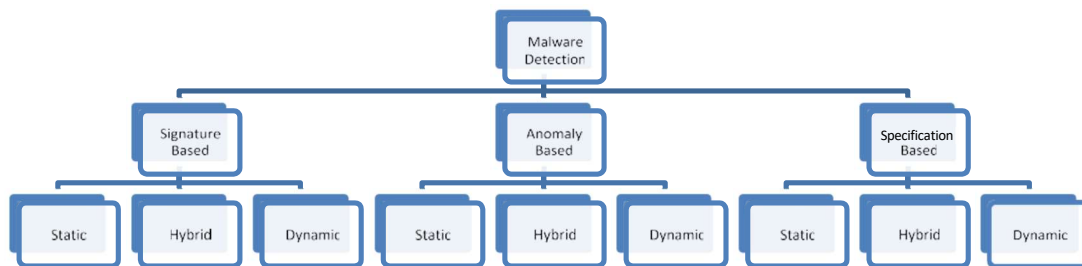


Fig 1: Malware Detection Flowchart

Here are some common categories of malware:

- Worms: Worms are self-replicating malware that can spread across networks or the internet without the need for user interaction. They often exploit vulnerabilities to propagate.
- Viruses: Viruses are malicious programs that attach themselves to legitimate files or software. They can replicate and spread to other files or systems when the infected file is executed.
- Trojans: Trojans disguise themselves as legitimate software but have malicious functionality hidden within. They can perform a variety of harmful actions, such as data theft, remote control, or system damage.

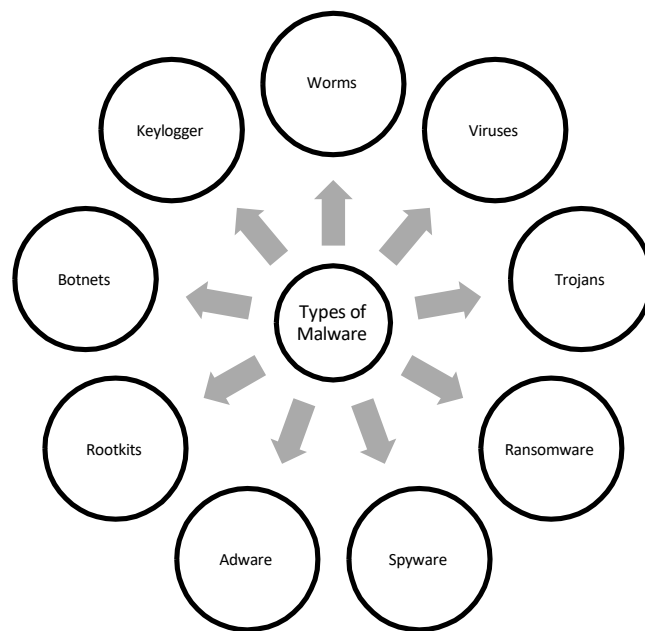


Fig 2: Malware Classification

- Ransomware: Ransomware encrypts a victim's files or locks them out of their system, demanding a ransom payment in exchange for the decryption key. It's known for its extortion tactics.
- Spyware: Spyware is designed to secretly monitor and gather information about a user's activities, often without their consent. It can record keystrokes, capture screenshots, and more.
- Other: Adware, Rootkits, Botnets, Keyloggers, etc.

CHAPTER: 3

REQUIREMENT ARTIFACTS

3.1 Introduction

A system architecture is a conceptual model that defines the structure, behavior, and interactions of a system. It tells us about various components of a system and how they interact with each other. It is a blueprint for how the system will be built and deployed. The system architecture should be designed to meet the specific needs of the system and its users.

The system architecture is typically defined using a variety of diagrams and models. These diagrams and models show the different components of the system, how they are connected, and how they interact with each other. The system architecture may also include descriptions of the system's data flows, control flows, and performance characteristics.

The system architecture is important because it helps to ensure that the system is well-designed and that it will meet the needs of its users. It also helps to identify any potential problems with the system early on, before they become too difficult to fix.

3.2 Tools and Environments used

For malware analysis various tools, environments have been used as specified below:

1. ORACLE Virtual Box: VM Virtual Box is cross-platform virtualization software. It allows users to extend their existing computer to run multiple operating systems including Microsoft Windows, Mac OS X, Linux, and Oracle Solaris, at the same time. Designed for IT professionals and developers, Oracle VM Virtual Box is ideal for testing, developing, demonstrating,

And deploying solutions across multiple platforms from one machine.

2. Operating System: Windows 10 is a computer operating system by Microsoft. It is part

of the Microsoft Windows family of operating systems. It was called Threshold when it was being developed (made/coded). Windows 10 is a Microsoft operating system for personal computers, tablets, embedded devices and internet of things devices.

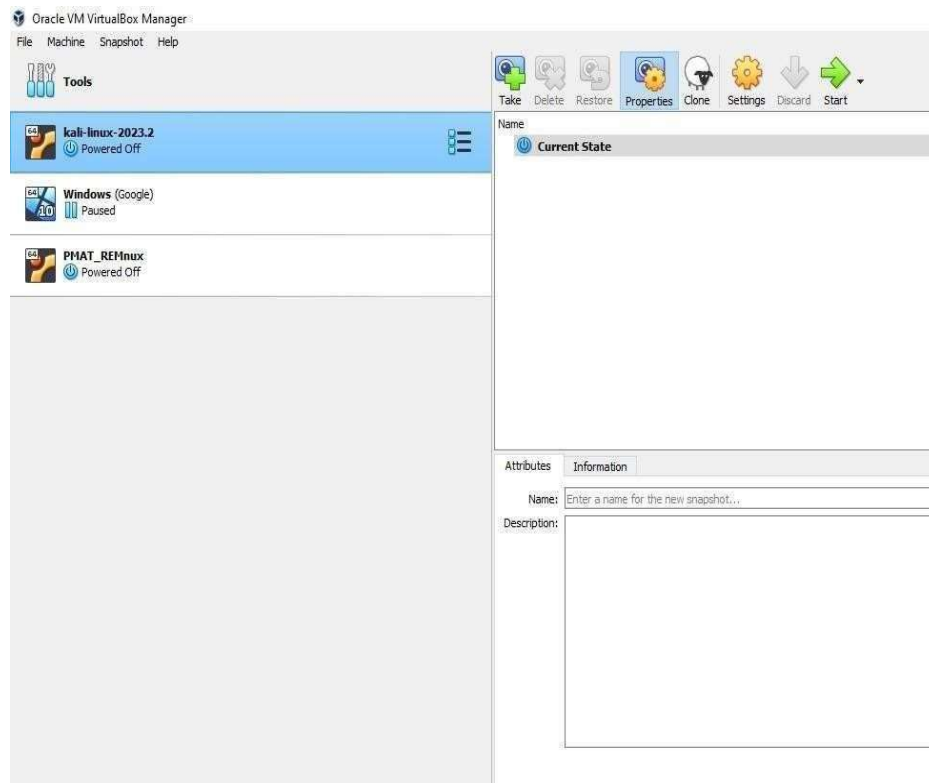


Fig 3: Installing Oracle VM and setting up Windows 10 through ISO file

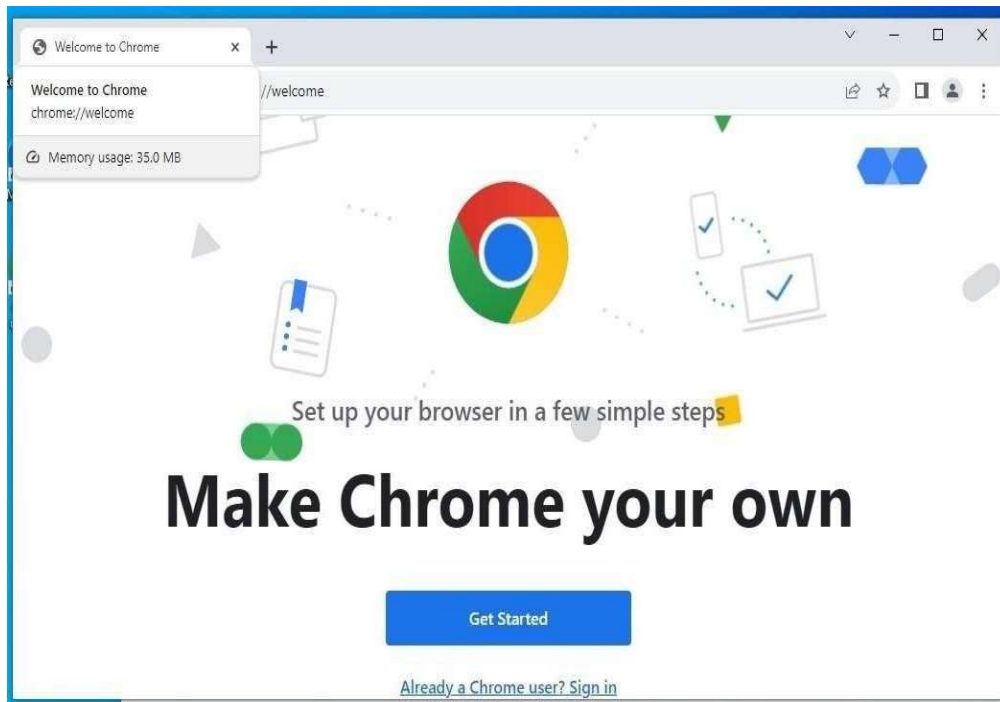


Fig : Setting up Chrome in Windows 10

3. Flare VM: FLARE VM - a collection of software installations scripts for Windows systems that allows you to easily setup and maintain a reverse engineering environment on a virtual machine (VM). FLARE VM was designed to solve the problem of reverse engineering tool curation and relies on two main technologies: Chocolatey and Boxstarter. Chocolatey is a Windows-based Nuget package management system, where a "package" is essentially a ZIP file containing PowerShell installation scripts that download and configure a specific tool. Boxstarter leverages Chocolatey packages to automate the installation of software and create repeatable, scripted Windows environments.

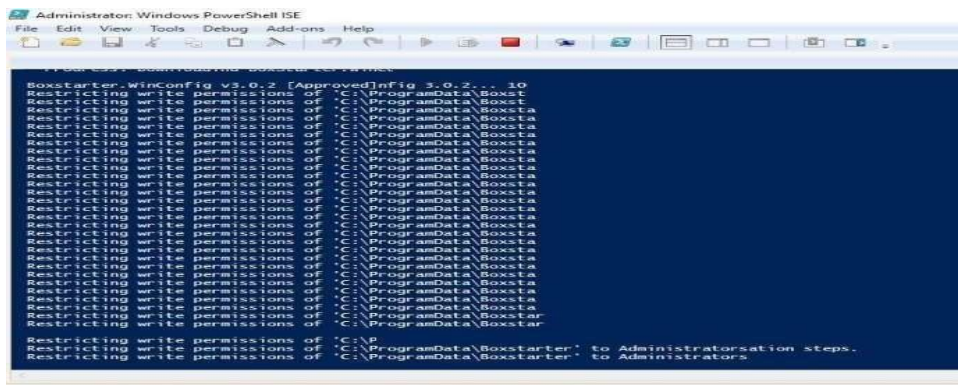


Fig 4: Installation of Flare VM on virtual Windows 10

REMnux : REMnux is a lightweight, Ubuntu-based Linux distribution for assisting malware analysts with reverse-engineering malicious software. It incorporates a number of tools for analysing malicious executables that run on Microsoft Windows, as well as browser-based malware, such as Flash programs and obfuscated JavaScript. The toolkit also include programs for analysing malicious documents, such PDF files, and utilities for reverse- engineering malware through memory forensics.

```

Activities  Terminal  Oct 8 10:07
root@remnux: /media/cdrom

remnux@remnux:~$
remnux@remnux:~$ sudo mkdir /media/cdrom
mkdir: cannot create directory '/media/cdrom': File exists
remnux@remnux:~$ sudo mount /dev/cdrom /media/cdrom
mount: /media/cdrom: WARNING: device write-protected, mounted read-only.
remnux@remnux:~$ cd /media/cdrom
remnux@remnux:/media/cdrom$ ls
AUTORUN.INF          VBoxDarwinAdditionsUninstall.tool
autorun.sh           VBoxLinuxAdditions.run
cert                 VBoxSolarisAdditions.pkg
NT3x                 VBoxWindowsAdditions-amd64.exe
OS2                  VBoxWindowsAdditions.exe
runasroot.sh         VBoxWindowsAdditions-x86.exe
TRANS.TBL            windows11-bypass.reg
VBoxDarwinAdditions.pkg
remnux@remnux:/media/cdrom$
remnux@remnux:/media/cdrom$ sudo -s
root@remnux:/media/cdrom# ./autorun.sh
# Option "-x" is deprecated and might be removed in a later version of gnome-terminal.
# Use "--" to terminate the options and put the command line to execute after it.
root@remnux:/media/cdrom#

```

Fig 5: Setting up Renmux through ISO file

4. INetSim: INetSim is a free, Linux-based software suite that simulates common internet services. It's useful for analyzing the network behaviour of malware samples without connecting them to the Internet.

INetSim simulates services like: HTTP, DNS, SMTP.

INetSim also has additional features, including:

- Faketime
- Connection redirection
- IP-based redirection of arbitrary connections (tcp, udp and icmp)

5. Static Analysis: Static Analysis is the automated analysis of source code without executing the application.

6. Dynamic Analysis: When the analysis is performed during program execution then it is known as Dynamic Analysis

CHAPTER 4 :

DESIGN METHODOLOGY AND ITS NOVELTY

4.1 Introduction

This chapter contains section 3.2 depicting the overall flowchart of the program which is the step-by-step analysis of the malware. Section 3.2 contains hardware and software requirements for “Malware Analysis”.

This chapter contains the flow chart of the whole application. This chapter will explain every step involved in the formation of the application.

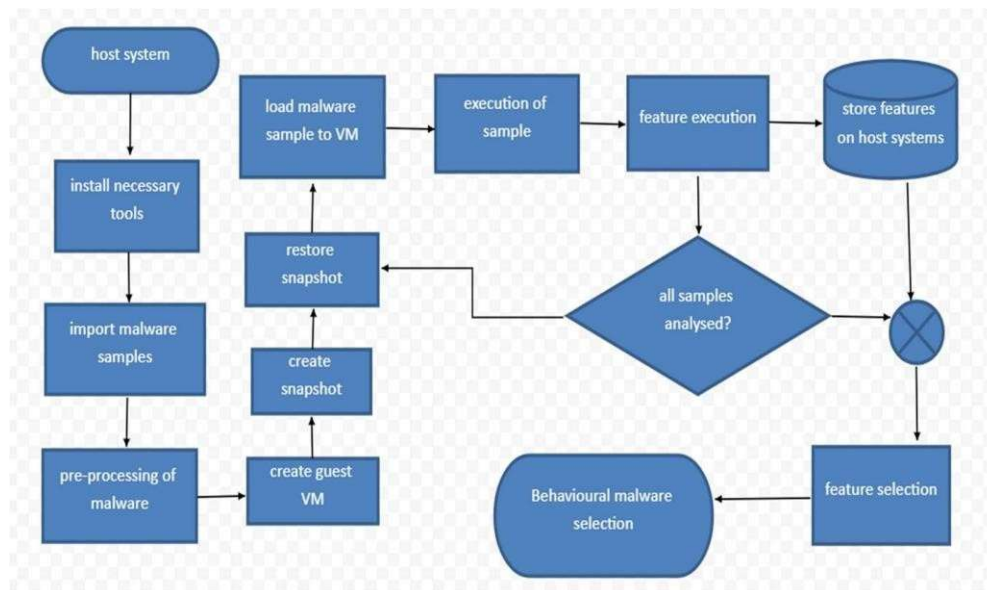


Fig. 6: FLOWCHART FOR MALWARE ANALYSIS USING METHOD IDENTIFIERS

4.2 Requirements

- **Setting up Windows 10 and Renmux on Oracle VirtualBox through iso file**
- **Setting on Renmux**
- **Installation of Flare-VM on virtual Windows 10**
- **Setting up Flare-VM**
- **Setting up INetSim**
- **Static Analysis**
- **Dynamic Analysis**

CHAPTER-5

TECHNICAL IMPLEMENTATION AND ANALYSIS

STATIC ANALYSIS

5.1 Introduction

A software testing technique named static analysis, commonly referred to as static code analysis or static program analysis, includes looking at a program's source code or compiled code without running it. Static analysis looks for grammatical errors, faults with the code's structure, security flaws, and compliance with coding standards to find potential problems and defects in the code.

Static analysis, often known as static code analysis, is a technique for troubleshooting computer programs that involves looking at the code without actually running the program. The procedure gives insight into the organization of the code and can help guarantee that it complies with best practices. Teams working on software development and quality assurance use static analysis in this field.

Programmers and developers can benefit from the use of automated tools when performing static analysis.

While validating the code, the software will scan the entire project for vulnerabilities.

As long as it's automated, the static analysis process is quite straightforward. Static analysis typically comes before software testing in the early stages of development. It happens during the creation phases in the DevOps development process.

After the code has been written, a static code analyzer should be used to review it. It will compare the code to predefined specified rules or defined coding rules from standards. The static code analyzer will have determined whether or not the code complies with the predetermined rules after it has run the code. It is crucial to go through and eliminate any false positives because the software may occasionally identify them. Once false positives are disregarded, developers can start to correct any obvious errors.

5.2 Limitations of Static Malware Analysis

Generally, the source code of the malware samples is not easily available. It therefore reduces the applicable static analysis techniques for malware analysis to those who retrieve the information from the binary representation of the malware.

5.3 Advantages and Disadvantages of static analysis

Static analysis has several advantages, including:

- It can assess every piece of code in an application, improving the quality of the code.
- Compared to manual code review, utilizing automated tools is faster.
- Static testing allows for more depth in code debugging when used with conventional testing techniques.
- Human error is less likely to occur with automated tools.
- This will improve online or application security by raising the possibility that flaws in the code will be discovered.
- In an offline development environment, it is possible.

Static analysis has significant limitations, though. Organizations should be mindful of the following, for instance:

- It is possible to find false positives.
- If there is a code defect, a tool might not be able to identify it.

5.4 Hashes Analysis:

Right click on the malware file and select HashMyFiles option and analyze the hash.

Copy the MD5 hash and run it on VirusTotal to know whether it has already been seen somewhere before.

Important:

- SHA-256
- MD5

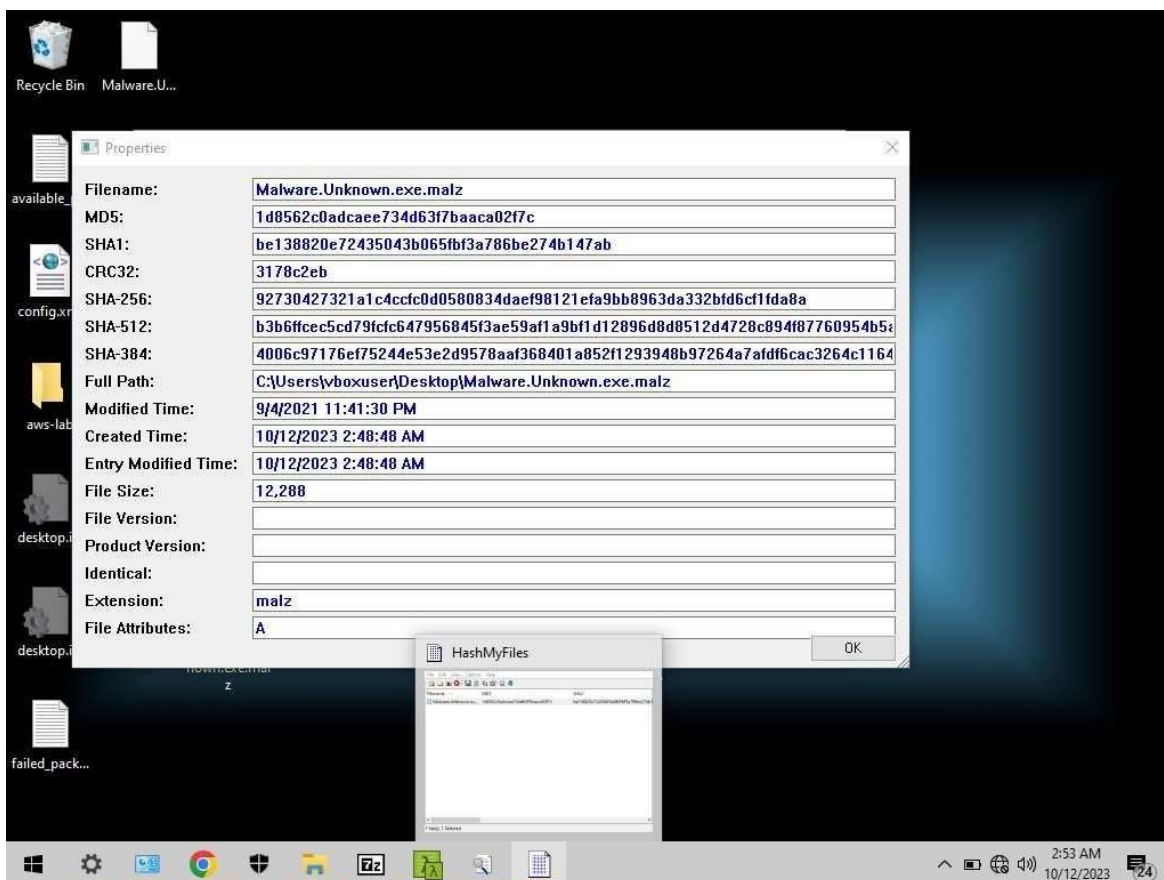


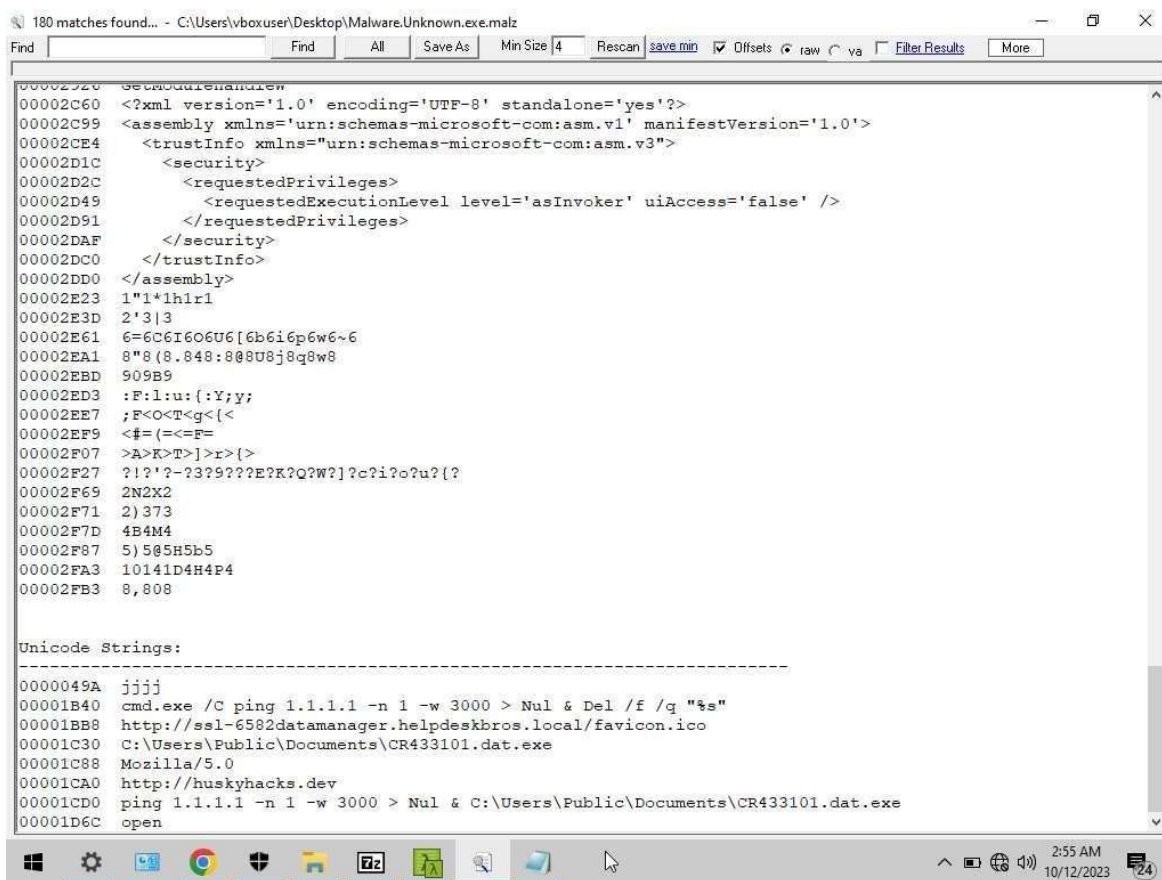
Fig 7: Hashes Analysis

5.5 String Analysis:

In simple language, a string is an array of characters.

Right click on the file and select strings. The list of strings will be visible look for evident strings that could help in analysis.

At the end, we get static unicode strings these are sometimes some of the most telling strings out of all.

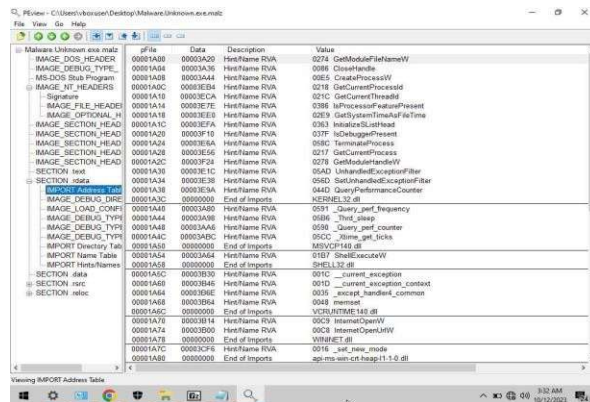
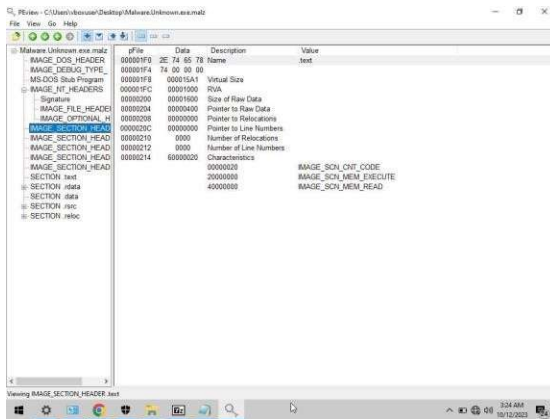


```
180 matches found... - C:\Users\vboxuser\Desktop\Malware.Unknown.exe.malz
Find Find All Save As Min Size 4 Rescan save min Offsets raw va Filter Results More

00002220 GetModuleHandleW
00002C60 <?xml version='1.0' encoding='UTF-8' standalone='yes'?>
00002C99 <assembly xmlns='urn:schemas-microsoft-com:asm.v1' manifestVersion='1.0'>
00002CE4 <trustInfo xmlns="urn:schemas-microsoft-com:asm.v3">
00002D1C <security>
00002D2C <requestedPrivileges>
00002D49 <requestedExecutionLevel level='asInvoker' uiAccess='false' />
00002D91 </requestedPrivileges>
00002DAF </security>
00002DC0 </trustInfo>
00002DD0 </assembly>
00002E23 1*1*1h1r1
00002E3D 2*3|3
00002E61 6=6C6I6O6U6[6b6i6p6w6~6
00002EA1 8"8(8.848:808U8j8q8w8
00002EBD 909B9
00002ED3 :F:l:u:{:Y;y;
00002EE7 ;F<O<T<g<(<
00002EF9 <#=(=<F=
00002F07 >A>K>T>]>r>(>
00002F27 ?!?'?-?3?9???E?K?Q?W?] ?c?i?o?u?{?
00002F69 2N2X2
00002F71 2)373
00002F7D 4B4M4
00002F87 5)505H5b5
00002FA3 10141D4H4P4
00002FB3 8,808

Unicode Strings:
-----
0000049A jjjj
00001B40 cmd.exe /C ping 1.1.1.1 -n 1 -w 3000 > Nul & Del /f /q "%s"
00001BB8 http://ssl-6582datamanager.helpdeskbro.local/favicon.ico
00001C30 C:\Users\Public\Documents\CR433101.dat.exe
00001C88 Mozilla/5.0
00001CA0 http://huskyhacks.dev
00001CD0 ping 1.1.1.1 -n 1 -w 3000 > Nul & C:\Users\Public\Documents\CR433101.dat.exe
00001D6C open
```

Fig 8: String Analysis



(c) Comparing raw data and virtual size to identify whether malware is packed or unpacked

(d) Analysis of API calls

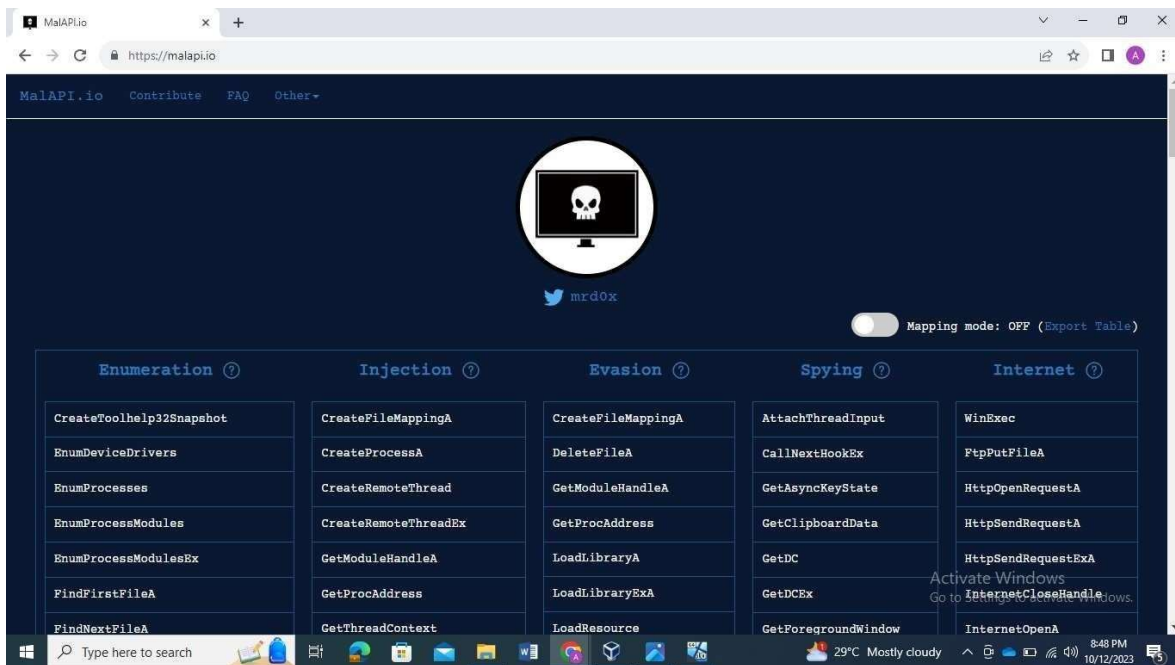


Fig 10: A catalog of API calls that can be used maliciously. Malapi.io.

This catalog could help in analysis

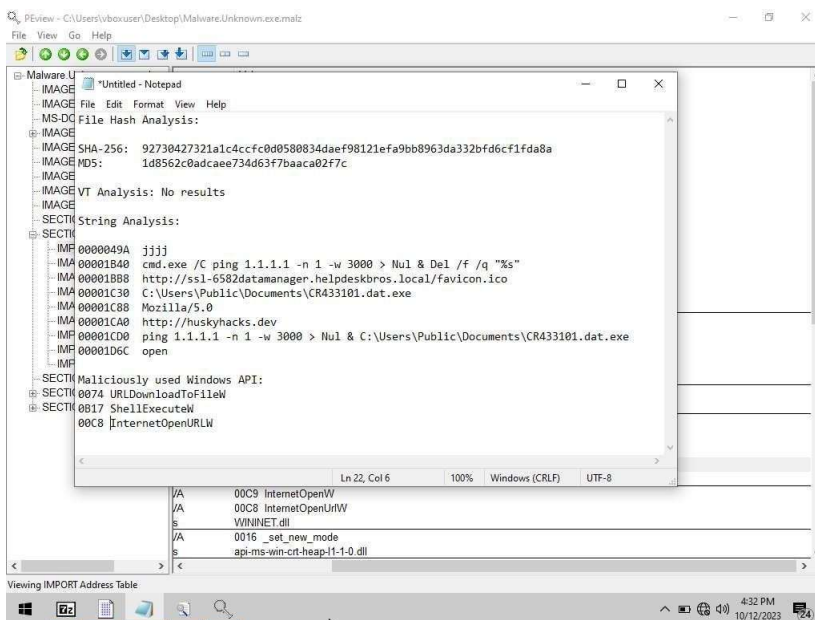


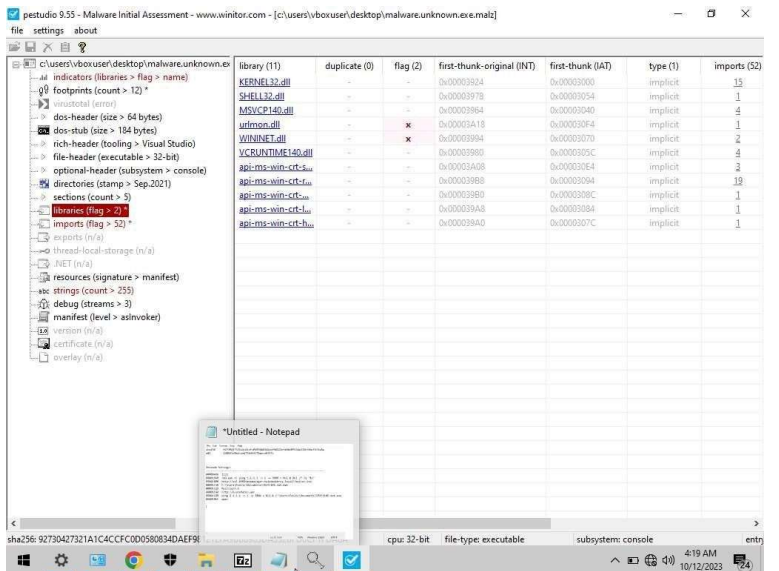
Fig: All-important observation noted.

Analysis through pestudio:

Open pestudio and open the portable executable file.

PEStudio is a specialized software tool that is used for analyzing and auditing Windows executable files, commonly known as PE files and these files include various Windows applications, system files, and dynamic link libraries (DLLs). PEStudio is often used for security and software analysis purposes.

The red cross in flag section indicate that the following is used or can be used by malware.



pestudio 9.55 - Malware Initial Assessment - www.winitor.com - [c:\users\ybouser\desktop\malware.unknown.exe.malz]

file settings about

c:\users\ybouser\desktop\malware.unknown.exe

indicators (libraries > flag > name)

footprints (count > 12) *

inustotal (error)

dos-header (size > 64 bytes)

dos-stub (size > 184 bytes)

rich-header (tooling > Visual Studio)

file-header (executable > 32-bit)

optional-header (subsystem > console)

directories (stamp > Sep.2021)

sections (count > 5)

libraries (flag > 2) *

imports (flag > 52) *

exports (n/a)

thread-local-storage (n/a)

NET (n/a)

resources (signature > manifest)

strings (count > 255)

debug (streams > 3)

manifest (level > asinvoker)

version (n/a)

certificate (n/a)

overlay (n/a)

imports (52)	flag (9)	first-thunk-original (INT)	first-thunk (IAT)	hint	group (8)
InitializeListHead	-	0x00001EFA	0x00001EFA	867 (0x0363)	synchronization
GetCurrentProcessId	x	0x00001E84	0x00001E84	536 (0x0218)	reconnaissance
IsDebuggerPresent	-	0x00001E7E	0x00001E7E	902 (0x0366)	reconnaissance
QueryPerformanceCounter	-	0x00001E10	0x00001E10	895 (0x0377)	reconnaissance
URLDownloadToFileW	x	0x00001E9A	0x00001E9A	1101 (0x044D)	network
InternetOpenW	x	0x00003ADE	0x00003ADE	116 (0x0074)	network
InternetOpenUrlW	x	0x00003B14	0x00003B14	201 (0x00C9)	network
memset	x	0x00003800	0x00003800	200 (0x00C8)	network
GetSystemTimeAsFileTime	-	0x00003B64	0x00003B64	72 (0x0048)	memory
CreateProcessW	-	0x00003EE0	0x00003EE0	745 (0x02E9)	file
GetCurrentThreadId	x	0x00003A44	0x00003A44	229 (0x00E3)	execution
TerminateProcess	x	0x00003ECA	0x00003ECA	540 (0x021C)	execution
GetCurrentProcess	x	0x00003E6A	0x00003E6A	1420 (0x058C)	execution
ShellExecuteW	x	0x00003E46	0x00003E46	339 (0x0177)	execution
UnhandledExceptionFilter	-	0x00003A64	0x00003A64	439 (0x0187)	exception
SetUnhandledExceptionFilter	-	0x00003E1C	0x00003E1C	1453 (0x05AD)	exception
GetModuleFileNameW	-	0x00003E38	0x00003E38	1389 (0x056D)	exception
GetModuleHandleW	-	0x00003A20	0x00003A20	628 (0x0274)	dynamic-link
CloseHandle	-	0x00003F24	0x00003F24	632 (0x0278)	dynamic-link
QueryPerfFrequency	-	0x00003A36	0x00003A36	134 (0x0086)	-
ThrdSleep	-	0x00003A80	0x00003A80	1425 (0x0591)	-
QueryPerfCounter	-	0x00003A98	0x00003A98	1462 (0x0586)	-
GetCurrentProcess	-	0x00003AA6	0x00003AA6	1424 (0x0590)	-
GetCurrentException	-	0x00003A8C	0x00003A8C	1488 (0x05C0)	-
GetCurrentExceptionContext	-	0x00003B20	0x00003B20	28 (0x001C)	-
GetCurrentExceptionCommon	-	0x00003B46	0x00003B46	29 (0x001D)	-
GetCurrentExceptionCommon	-	0x00003B6E	0x00003B6E	30 (0x001E)	-
GetCurrentExceptionCommon	-	0x00003D06	0x00003D06	1 (0x0001)	-
GetCurrentExceptionCommon	-	0x00003B9A	0x00003B9A	17 (0x0011)	-
GetCurrentExceptionCommon	-	0x00003C74	0x00003C74	84 (0x0054)	-
GetCurrentExceptionCommon	-	0x00003C48	0x00003C48	23 (0x001B)	-

sha256: 92730427321A1C4CCFC0D0580834DAEF98121EFA8B88963DA332BF6CF1FDABA

cpu: 32-bit

file-type: executable

subsystem: console

entry

pestudio 9.55 - Malware Initial Assessment - www.winitor.com - [c:\users\ybouser\desktop\malware.unknown.exe.malz]

file settings about

c:\users\ybouser\desktop\malware.unknown.exe

indicators (libraries > flag > name)

footprints (count > 12) *

inustotal (error)

dos-header (size > 64 bytes)

dos-stub (size > 184 bytes)

rich-header (tooling > Visual Studio)

file-header (executable > 32-bit)

optional-header (subsystem > console)

directories (stamp > Sep.2021)

sections (count > 5)

libraries (flag > 2) *

imports (flag > 52) *

exports (n/a)

thread-local-storage (n/a)

NET (n/a)

resources (signature > manifest)

strings (count > 255)

debug (streams > 3)

manifest (level > asinvoker)

version (n/a)

certificate (n/a)

overlay (n/a)

encoding (2)	size (bytes)	location	flag (5)	label (67)	group (8)	text
ascii	19	.rdata	-	import	synchronization	-
ascii	25	.rdata	-	import	reconnaissance	-
ascii	23	.rdata	-	import	reconnaissance	-
ascii	19	.rdata	x	import	reconnaissance	T10
ascii	17	.rdata	-	import	reconnaissance	T10
ascii	17	.rdata	x	import	network	-
ascii	15	.rdata	x	import	network	-
ascii	12	.rdata	x	import	network	-
ascii	10	.rdata	-	import	network	-
ascii	11	.rdata	-	import	network	-
ascii	6	.rdata	-	import	memory	-
ascii	23	.rdata	-	import	file	T11
ascii	13	.rdata	x	import	execution	T11
ascii	12	.rdata	x	import	execution	T11
ascii	17	.rdata	x	import	execution	T10
ascii	16	.rdata	x	import	execution	-
ascii	18	.rdata	x	import	exception	T10
ascii	24	.rdata	-	import	exception	-
ascii	27	.rdata	-	import	exception	-
ascii	17	.rdata	-	import	dynamic-library	-
ascii	15	.rdata	-	import	dynamic-library	-
unicode	59	.rdata	-	import	utility	T10
unicode	76	.rdata	-	import	utility	T10
unicode	4	.rdata	-	import	utility	-
unicode	11	.rdata	-	import	user-agent	-
unicode	21	.rdata	-	import	url-pattern	-
ascii	11	.rdata	-	import	-	-
ascii	21	.rdata	-	import	-	-
ascii	11	.rdata	-	import	-	-
ascii	19	.rdata	-	import	-	-
ascii	16	.rdata	-	import	-	-

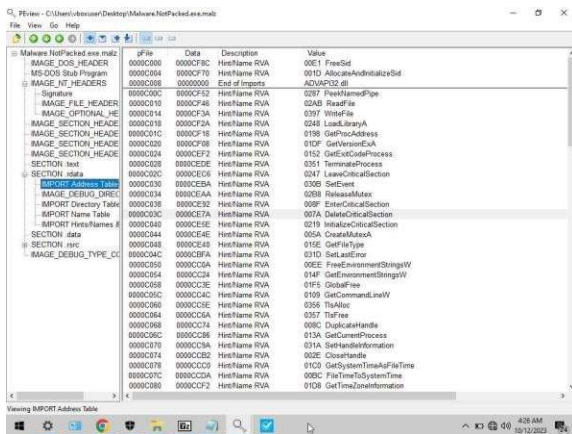
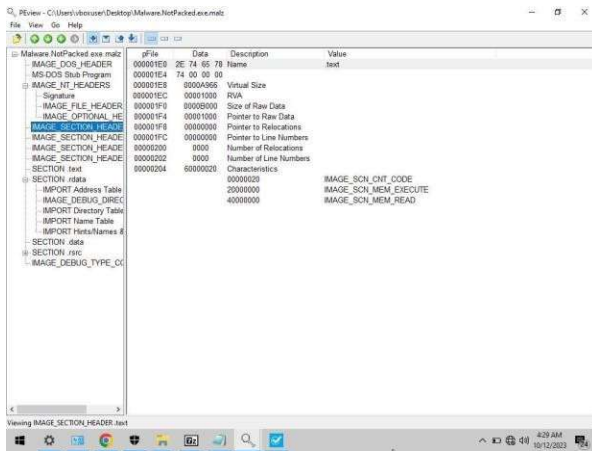
sha256: 92730427321A1C4CCFC0D0580834DAEF98121EFA8B88963DA332BF6CF1FDABA

cpu: 32-bit

file-type: executable

subsystem: console

entry



Packed:

Preview - C:\Users\vbouser\Desktop\Malware.Packed.exe.malz

	pFile	Data	Description	Value
Malware Packed.exe.malz				
IMAGE_DOS_HEADER	0000BA3C	000188AC	Hint/Name RVA	0000 FreeSid
MS-DOS Stub Program	0000BA40	00000000	End of Imports	ADVAPI32.dll
IMAGE_NT_HEADERS	0000BA44	000188D4	Hint/Name RVA	0000 LoadLibraryA
Signature	0000BA48	000188B6	Hint/Name RVA	0000 ExitProcess
IMAGE_FILE_HEADER	0000BA4C	000188C4	Hint/Name RVA	0000 GetProcAddress
IMAGE_OPTIONAL_HEADER	0000BA50	000188E2	Hint/Name RVA	0000 VirtualProtect
IMAGE_SECTION_HEADER	0000BA54	00000000	End of Imports	KERNEL32.DLL
IMAGE_SECTION_HEADER	0000BA58	000188F2	Hint/Name RVA	0000 _job
IMAGE_SECTION_HEADER	0000BA5C	00000000	End of Imports	MSVCRT.dll
SECTION UPX0	0000BA60	000188F8	Hint/Name RVA	0000 WSARefev
SECTION UPX1	0000BA64	00000000	End of Imports	WS2_32.dll
SECTION .rsrc	0000BA68	8000006F	Ordinal	006F
IMAGE_RESOURCE_DATA	0000BA6C	00000000	End of Imports	WSOCK32.dll
IMAGE_RESOURCE_DATA				
IMAGE_RESOURCE_DATA				
VERSION 0001 0409				
IMPORT Directory Table				
IMPORT Address Table				
IMPORT DLL Names				
IMPORT Hints/Names				

Viewing IMPORT Address Table

Preview - C:\Users\vbouser\Desktop\Malware.Packed.exe.malz

	pFile	Data	Description	Value
Malware Packed.exe.malz				
IMAGE_DOS_HEADER	000001E0	55 50 58 30	Name	UPX0
MS-DOS Stub Program	000001E4	00 00 00	Virtual Size	
IMAGE_NT_HEADERS	000001E8	0000C000	Virtual Size	
Signature	000001EC	00001000	RVA	
IMAGE_FILE_HEADER	000001F0	00000000	Size of Raw Data	
IMAGE_OPTIONAL_HEADER	000001F4	00000400	Pointer to Raw Data	
IMAGE_SECTION_HEADER	000001F8	00000000	Pointer to Relocations	
IMAGE_SECTION_HEADER	000001FC	00000000	Pointer to Line Numbers	
SECTION UPX0	00000200	0000	Number of Relocations	
SECTION UPX1	00000202	0000	Number of Line Numbers	
SECTION .rsrc	00000204	E0000000	Characteristics	
		00000000	IMAGE_SCN_CNT_UNINITIALIZED_DATA	
		20000000	IMAGE_SCN_MEM_EXECUTE	
		40000000	IMAGE_SCN_MEM_READ	
		80000000	IMAGE_SCN_MEM_WRITE	

Viewing IMAGE_SECTION_HEADER UPX0

DYNAMIC ANALYSIS

Introduction

A software testing and analysis technique called dynamic analysis involves assessing a program's behavior while it is running or being used. Dynamic analysis focuses on the actual runtime behavior of the software as opposed to static analysis, which looks at the source code or produced code without running it. This method can identify problems that might not be seen during static analysis and offers insights into how the software acts under various circumstances.

Real-time data is used in dynamic analysis, often referred to as dynamic program analysis, to assess a technology or program. On a physical or virtual CPU, this analysis can be carried out. Instead of putting code offline, vulnerabilities and program behavior may be observed while the program is running, giving information about how it will behave in the real world.

There are basically two approaches for dynamic malware analysis which are as below:

- Firstly, analyzing the difference between two defined points , that is , in this approach comparison report states behavior of malware.
- Secondly, observing runtime behavior in which the malicious activities launched by a malicious application are monitored during runtime using a specialized tool.

WORKING:

Firstly analysing the malware on WannaCry ransomware. Then a URL request is found in static analysis.

After it Wireshark results in URL request on running the malware and the filtered HyperText Transfer Protocol request on Wireshark. Procmon filtered by Process name for Ransomware.wannacry.ex.

Secondly, on running malware without internet simulation activated, malware pings for a count of 1 and deletes itself. While on running the malware with internet simulation activated, request to URL found in the strings output goes through when malware runs. So, the request to URL found in the strings output goes through when malware is processed. Processing it adds a file to public documents.

Analysis on WannaCry ransomware

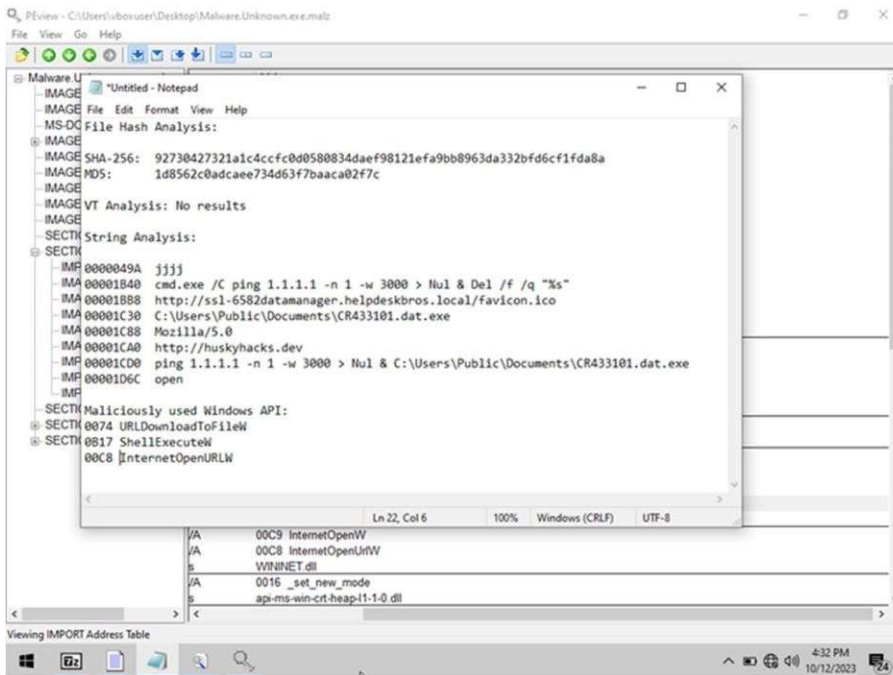
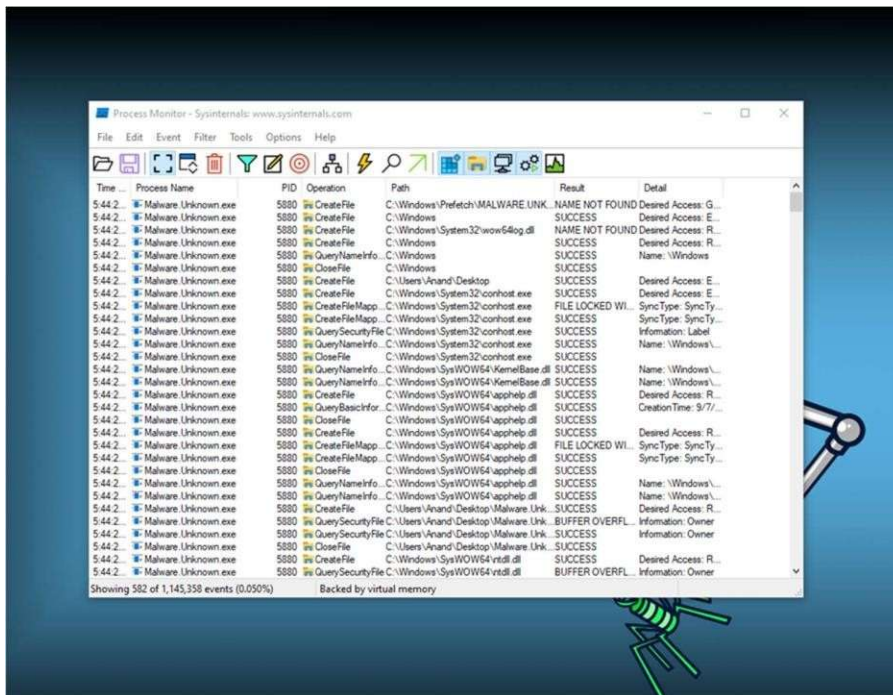


Fig 11: URL request found in static analysis

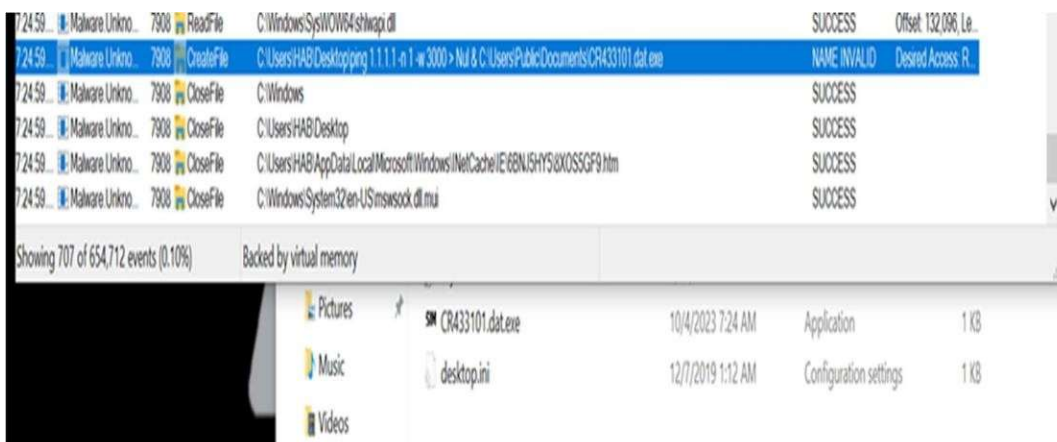
Wireshark results in URL request on running the malware



Filtered http request on wireshark.



Running the malware adds a file to public documents,



Process flow of current malware sample:

If URL exists:

- Download file
- Writes to disk
- Run favicon.ico
- If URL does not exist:
- Delete from disk

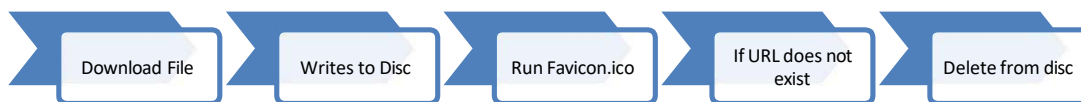


Fig:13 Process Flow

CHAPTER-6:

PROJECT OUTCOME AND APPLICABILITY

6.1 PROJECT OUTCOME

In this chapter, we present the outcomes and significance of our malware analysis project. The project's findings, impact assessment, threat intelligence, and mitigation strategies are discussed to provide a comprehensive overview of the analysis results.

Analysis Results

- **Characteristics of a malware:** We identified the key characteristics of the analysed malware, including its code structure, obfuscation techniques, and persistence mechanisms.
- **Classification:** The malware was classified as a variant of a known threat family, providing valuable context for its behaviour and potential impact.
- **Behaviour and Capabilities:** Through dynamic analysis, we observed the malware's behaviour, including its attempts to communicate with external servers, its evasion tactics, and its ability to propagate through the network.

Impact Assessment

Our assessment of the malware's impact revealed its potential threat level. The malware exhibited the capability to leak sensitive data, making it a significant concern for data security. Additionally, its evasive techniques could potentially bypass conventional security measures, necessitating proactive defences.

Threat Intelligence

The analysis provided valuable threat intelligence in the form of indicators of compromise (IOCs) and behavioural patterns. These IOCs can be integrated into security systems to enhance threat detection and response capabilities.

Mitigation Strategies

Based on our analysis results, we recommend the following mitigation strategies:

- Update signatures and security software to detect and prevent the analysed malware.
- Patch vulnerabilities and perform system hardening to mitigate potential exploits.
- Enhance employee cybersecurity training to recognize and report suspicious activities.

6.2 APPLICABILITY

In this section, we explore how the project outcomes can be applied in various contexts within the field of cybersecurity and threat management.

Practical Use Cases

The analysis findings have practical applications in the following scenarios:

- Incident Response: Our project findings are useful for incident response teams. When a similar malware attack occurs, they can use our insights to understand the threat quickly and take action to stop it before it causes significant damage.
- Network Security: Organizations can apply our insights to improve their network security. By configuring their firewalls and intrusion detection systems based on our findings, they can better detect and block similar malware activities, reducing the risk of breaches.

CHAPTER 7: CONCLUSION

7.1 Conclusion

The report for the project “Malware Analysis using Method Identifiers” contains a systematic overview of Malware, their classification and the static and dynamic analysis of different kinds of malware, the project's objectives, methodologies and outcomes. In addition to that, we conclude the context of malware analysis and its future scope in evolution of cyber security.

7.2 Project Contribution

Our contributions to the field of cybersecurity by this project are:

- We successfully identified and classified the analysed malware, gaining information about its threat level and potential impact.
- Our static analysis uncovered the malware's real-time behaviour, revealing its impact and intention towards our system.
- Programmers and developers can benefit from the use of automated tools, while validating and looking at the source code without actually running it.

7.3 Future Scope

The objective of the project is to detect the different kinds of malwares and classify them as evasive malware detection is still challenging. For evasive malware detection efficient extraction techniques are required. Techniques such as hashes and string analysis have been used to detect different malware behaviours.

- This project can be an inspiration for new programmers and developers for their malware analysis journey and can help them analyze or develop more challenging malicious softwares.

7.4 References

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