Summary:

While studying malware analysis, I came across an interesting malware sample. The story behind this malware is captivating, as it represents a real-world threat that was sent to a company.

I will perform both static and dynamic analysis on this file to understand how it modifies the system, whether it contacts any external addresses, and how the malware can be detected on the system.

Before proceeding, here are a few things to keep in mind:

- 1- Download and install updates to ensure the system doesn't consume unnecessary resources during the analysis.
- 2-Download, install, and verify that the analysis tools are functioning properly.
- 3-In the network settings, ensure the **host-only network** option is selected.
- 4-Disable Windows Defender (or any other antivirus software) and firewalls.
- 5-Take a **snapshot** once everything is initialized.

Virustotal Link: https://www.virustotal.com/gui/file/ 15cc3cad7aec406a9ec93554c9eaf0bfbcc740bef9d52dbc32bf559e90f53fee

Ensure that the virtual machine does not have any contact with network services.







No Internet

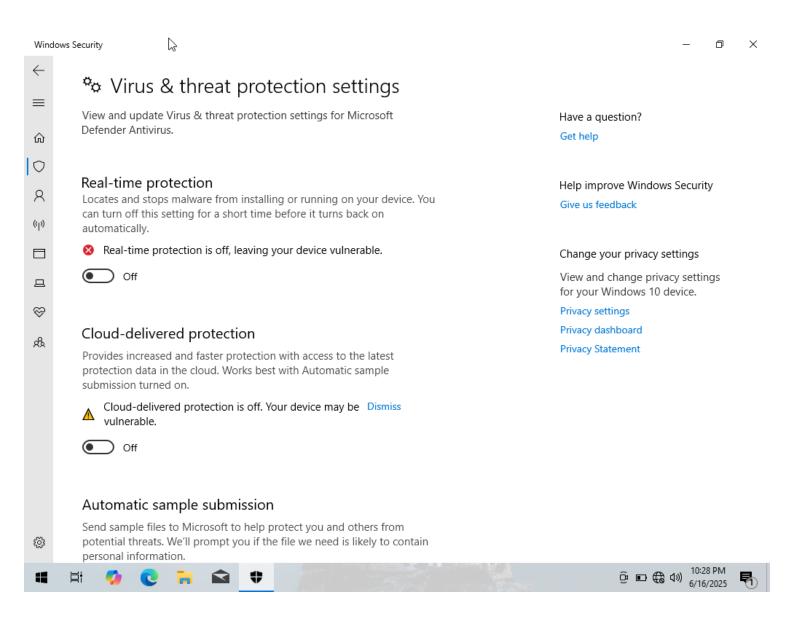
Try:

- Checking the network cables, modem and router
- · Reconnecting to Wi-Fi
- Running Windows Network Diagnostics

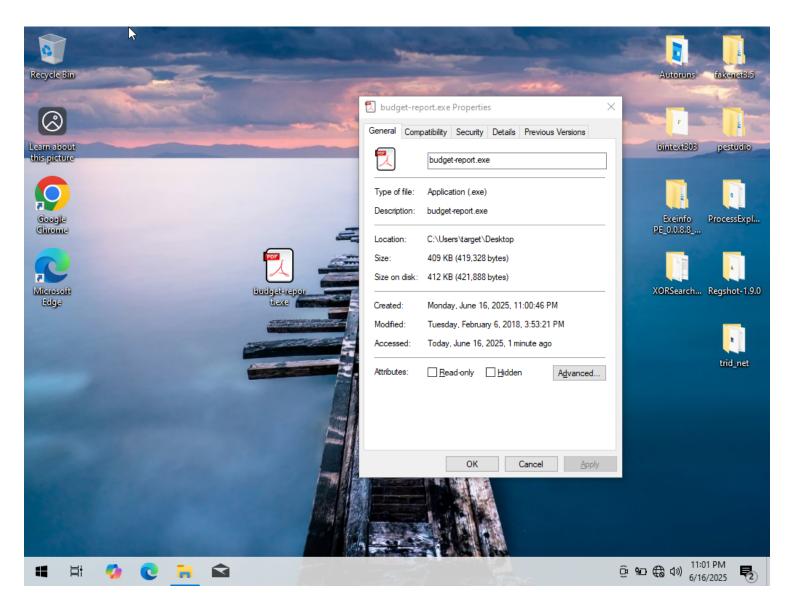
DNS_PROBE_FINISHED_NO_INTERNET



Disable antivirus protection to ensure a clean analysis without interruptions.

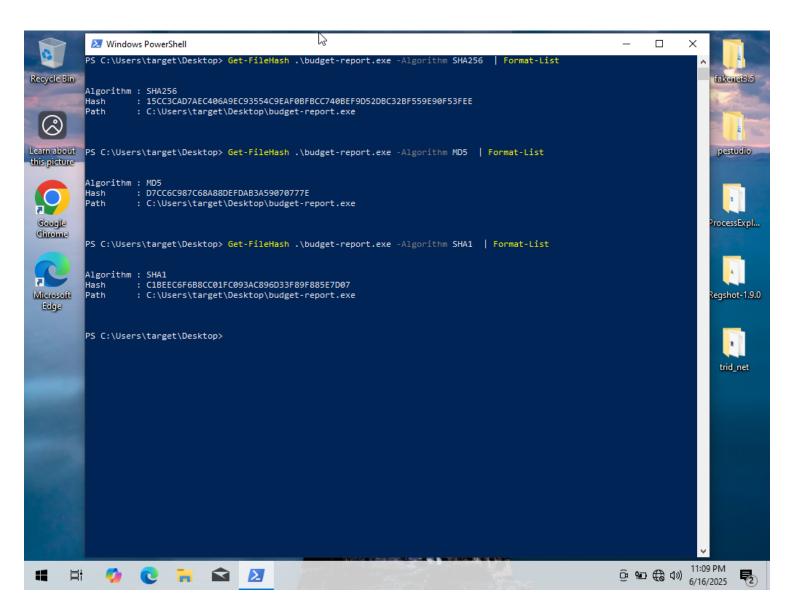


budget-report.exe (Static Analysis)



The malware looks convincing enough to fool people into thinking it's a PDF file. Many systems don't display file extensions, which can lead an amateur user to believe it's an actual PDF file, causing them to open it. Now, we can collect the hash value of the file. The reason we're obtaining the hash value is to identify this malware, as the filename can be changed, but the file hash remains unchanged.

Hash Analysis:



We got the 3 popular hash value for this following file, SHA-256 hash is highly reliable compared to the other two because it doesn't cause collision while calculating the hash value for a file.

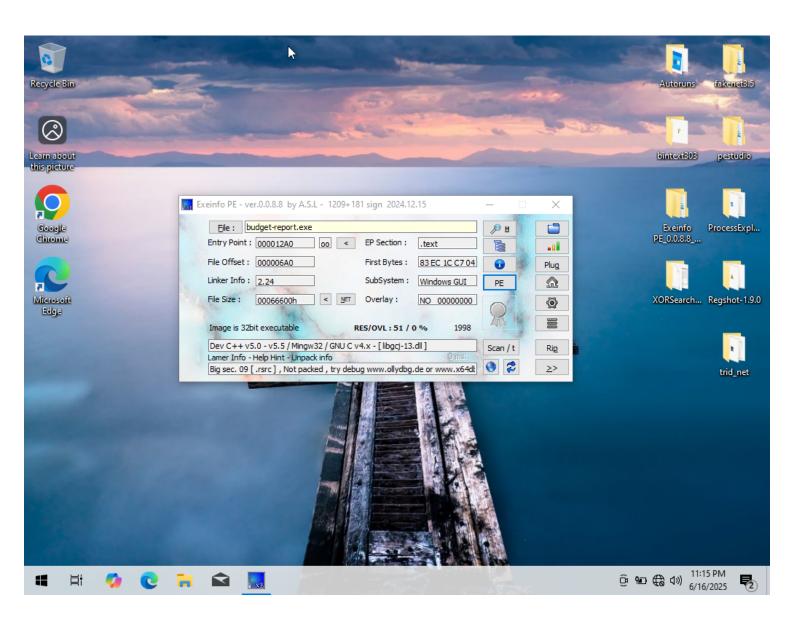
SHA256: 15CC3CAD7AEC406A9EC93554C9EAF0BFBCC740BEF9D52DBC32BF559E90F53FEE

SHA-1 : C1BEEC6F6B8CC01FC093AC896D33F89F885E7D07

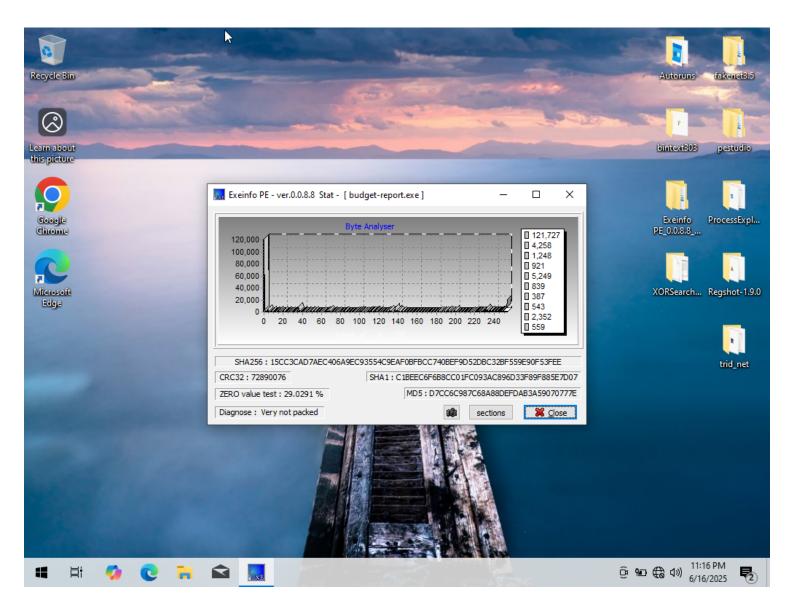
MD5 : **D7CC6C987C68A88DEFDAB3A59070777E**

File Analysis:

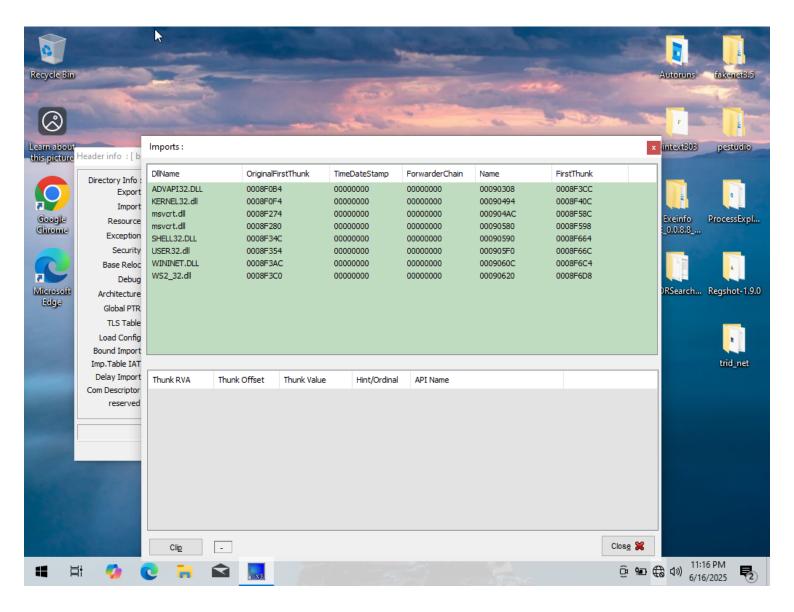
Now, let's focus on identifying the file further using the Exeinfo PE tool.



When we use **Exeinfo PE** to identify information about the file, we discover that there are no packers used, and the file was created using Dev C++, MinGW32, or GNU C.



We can also cross-verify the hash value of the file using this tool, and it matches.

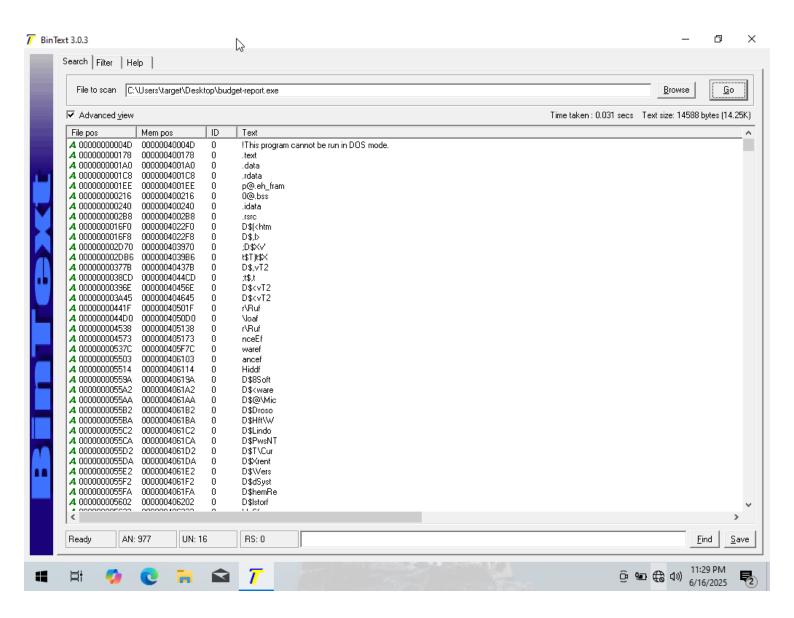


These are the following dll's which were used by the program during execution.

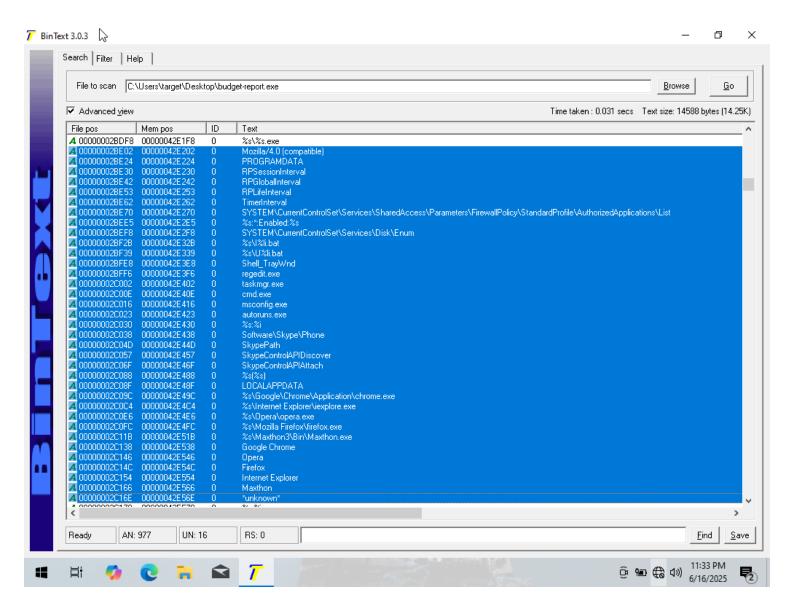
- 1- **advapi32.dll**: Provides advanced Windows API services, including security, user authentication, registry management, and event logging.
- 2- **kernel32.dll**: Handles memory management, input/output operations, process control, and basic system services for Windows programs.
- 3- **msvcrt.dll**: Contains Microsoft C Runtime Library functions for memory management, string manipulation, input/output operations, and more.
- 4- **shell32.dll**: Manages Windows shell functionality, including file management, dialogs, and user interface elements like icons and menus.
- 5- **user32.dll**: Provides user interface functions for managing windows, controls, and messages in a graphical environment on Windows.
- 6- **wininet.dll**: Manages Internet connectivity, including functions for HTTP, FTP, and other network protocols for web browsing.
- 7- **ws2_32.dll**: Provides Windows Sockets API for network communication, handling TCP/IP protocols, and managing socket-based connections.

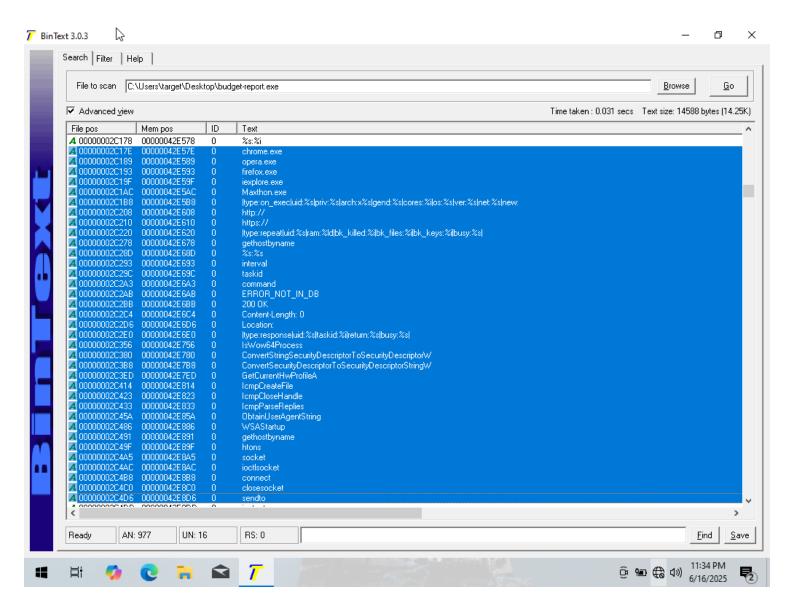
String Analysis:

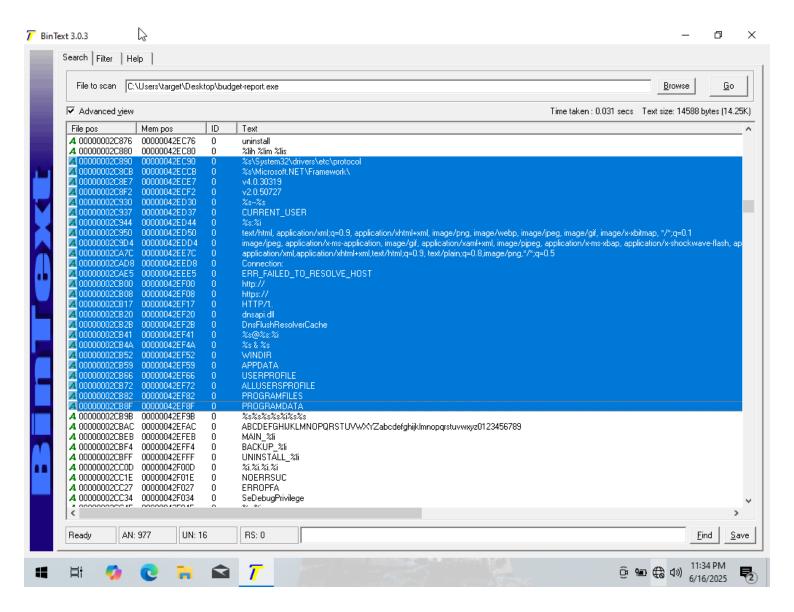
Let's find out the embedded characters in this file, as there could be some useful information that may assist in our analysis. I am using a tool called **BinText**, which reads the strings of the program and outputs them based on our filter. I set the minimum string length to 5 characters, so if the tool finds a string with at least 5 characters, it will be displayed.

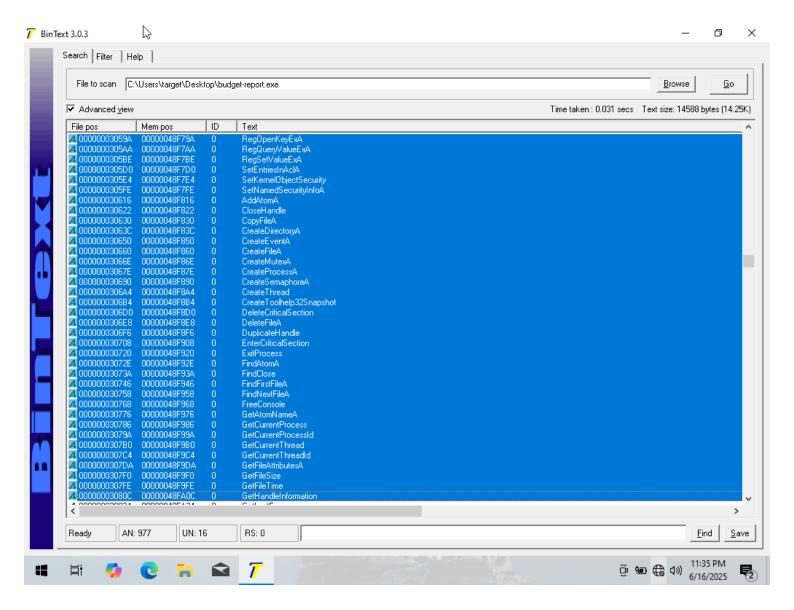


We can see that the tool has provided the available strings from the file.







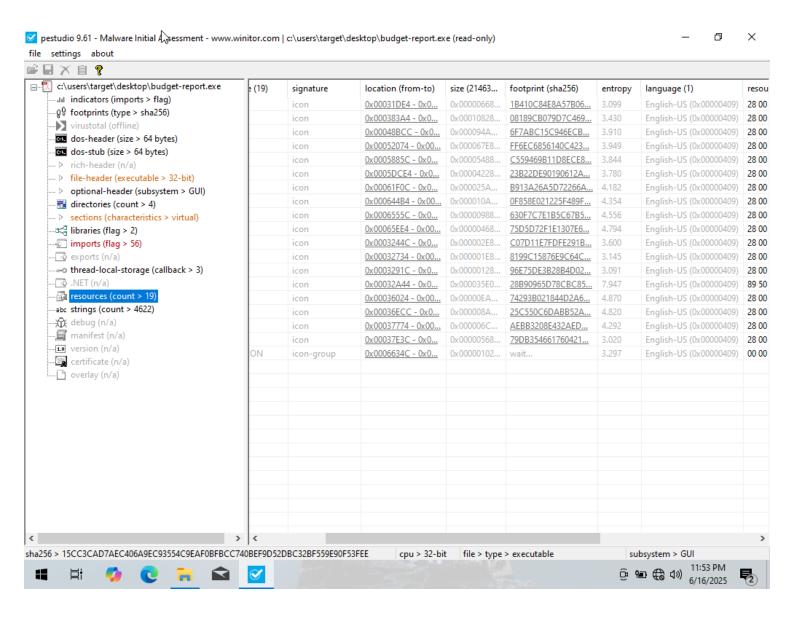


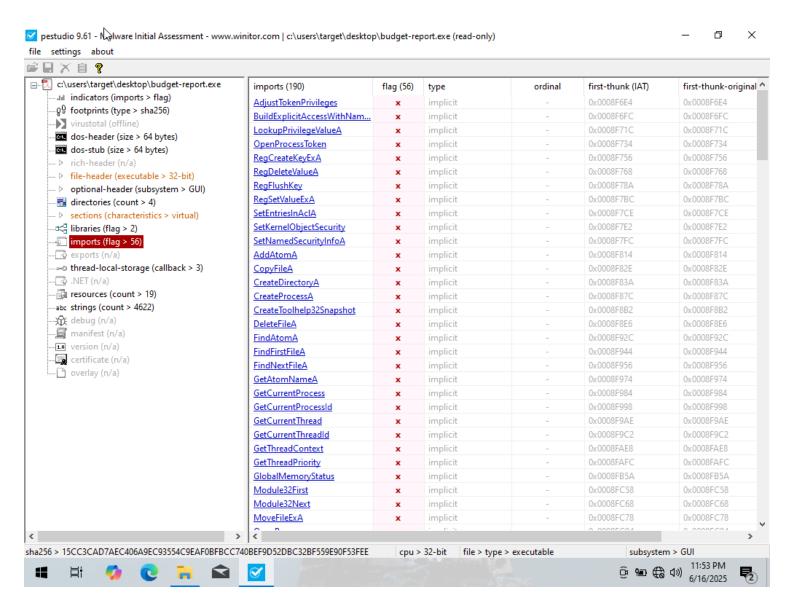
From the following images, we can observe some strings related to the file's activities. Notable strings include **cmd. exe**, **socket**, **connect**, **Skype**, and other **registry-related activity strings** present in the file. These may indicate that the file likely uses these services or activities to perform various actions on the executed target system.

We have gathered a significant amount of information so far, allowing us to form an understanding of the activities the file is likely to perform upon execution.

PE Header Analysis:

Using the PE Studio tool, I analyzed the malware and discovered some interesting information in the Resources tab. The icon resource's language is set to **English-US**, which suggests that the developer may have used a U.S. English configured personal computer. However, this cannot be considered definitive proof, as the developer could have manipulated this information.

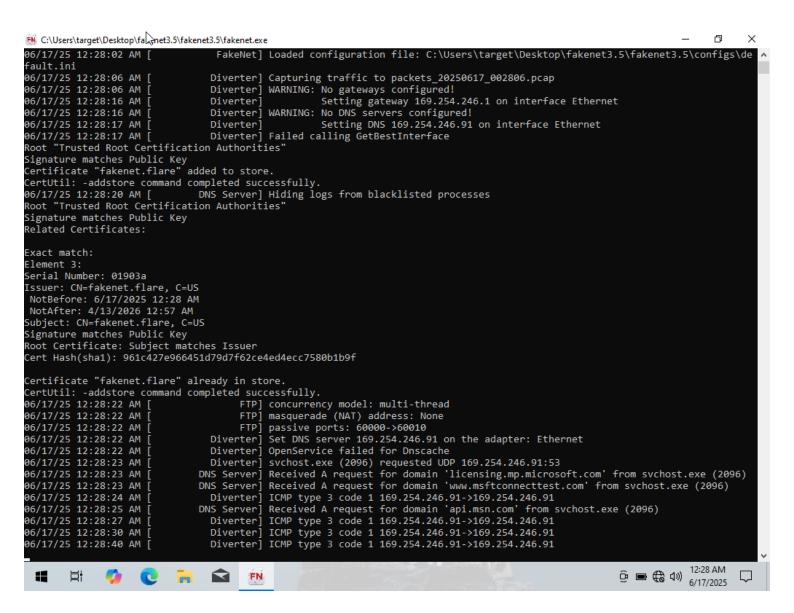




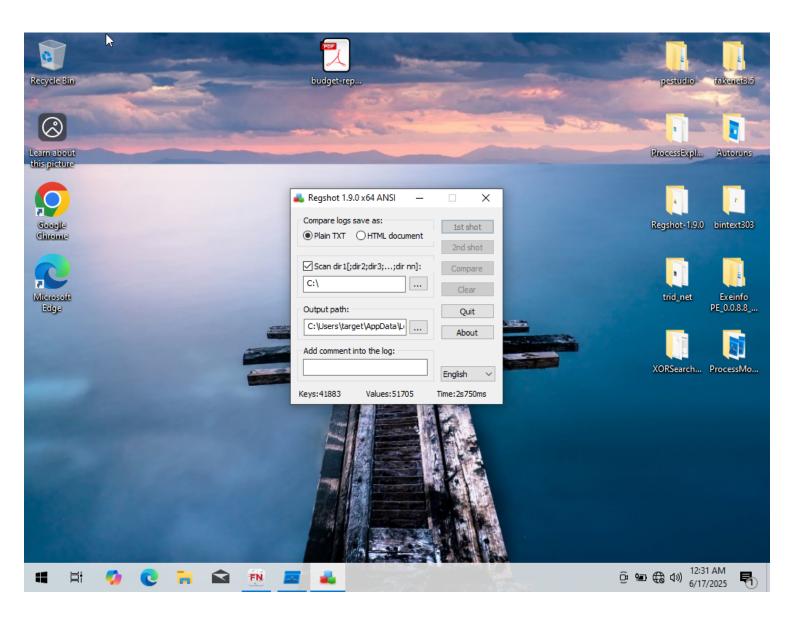
While reviewing the information about the imported Windows API functions, we can identify many that are flagged as potentially dangerous. However, these functions are not always malicious, as they are also used in legitimate programs. Each Windows API function can perform a variety of activities, and it's important to note that they may also be utilized by malware.

budget-report.exe (Dynamic Analysis)

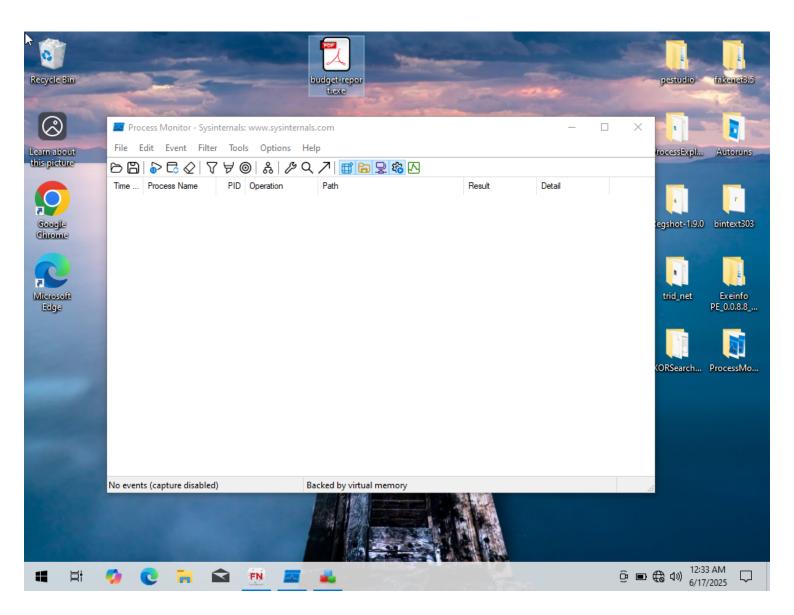
Run **FakeNet** to monitor incoming and outgoing network traffic in real-time, and also to ensure the malware believes we are connected to the internet (since some malware only activates when the target system is online).



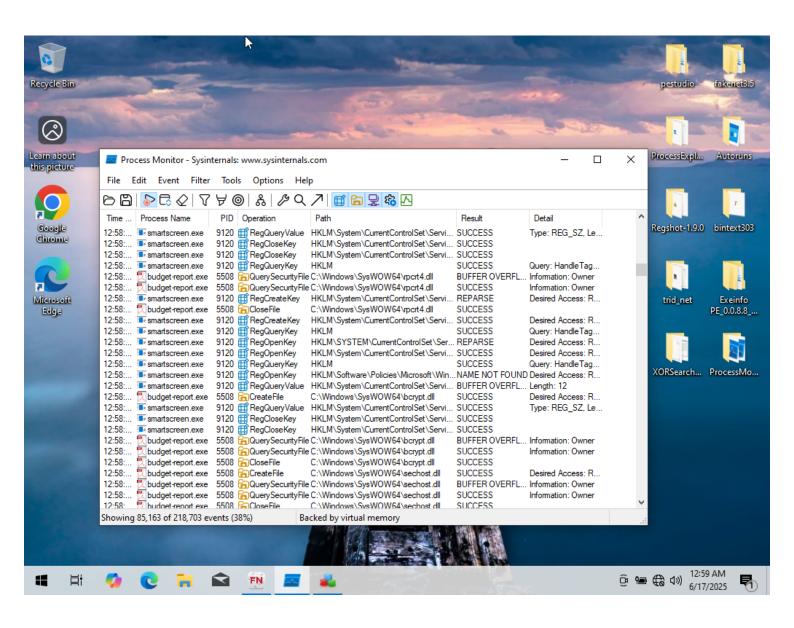
Open **Regshot** and take the first shot, saving it as a plain text log. Make sure to select the **Scan Directory** option and choose the top-level directory path (this is the best option for detecting any changes made on the storage disk). The process may take some time, so please be patient until it's complete.



Once you've successfully taken the snapshot with Regshot, open **Process Monitor**. It will begin recording system events automatically. Pause the recording and clear the current logs before proceeding. Once the logs are cleared and you're ready to execute the malware, execute the malware.

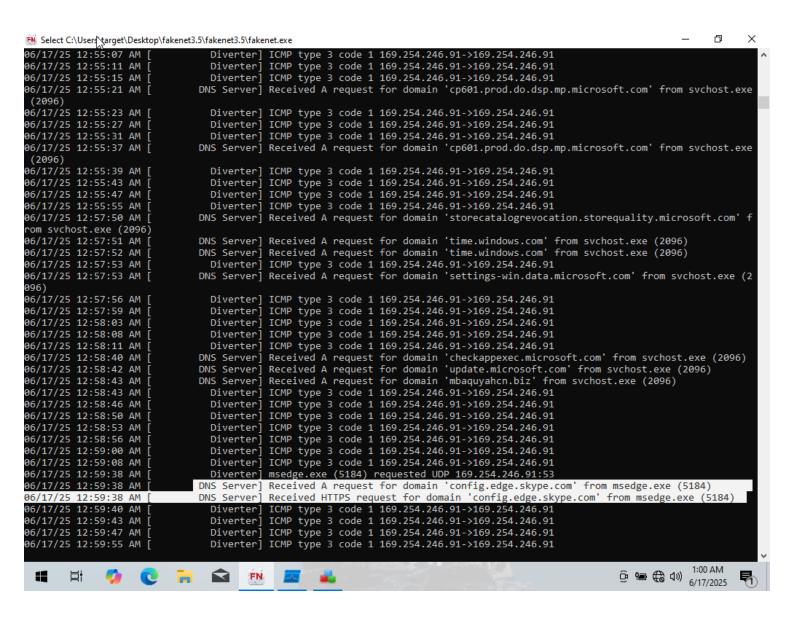


The tool will begin recording all system events. Wait for a while until it captures a sufficient number of events occurring on the system.

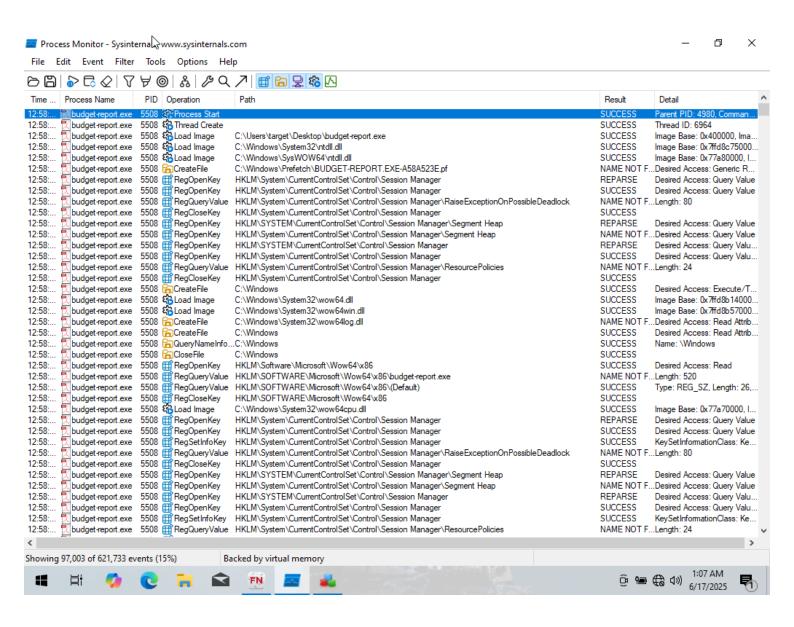


Make sure to monitor the network activities as well. If you observe any suspicious or unfamiliar network connections, be sure to document them in your notes.

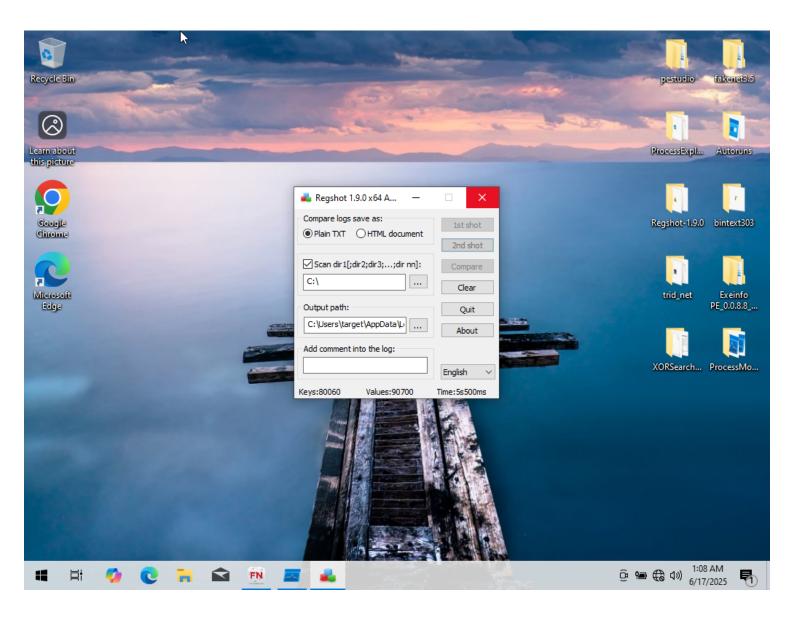
We observed a network request sent and received from **msedge.exe** to **Skype**. During the string analysis, we also identified the presence of the "Skype" string within the malware, which could indicate that the malware is attempting to use Skype's services.



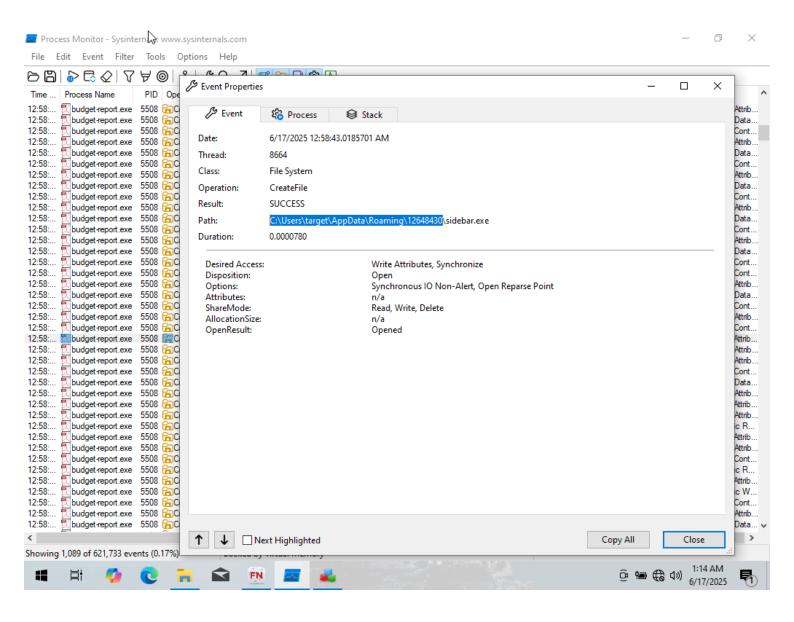
After a while, I stopped the Process Monitor and applied filters to display only the relevant malware related events. As seen below, there are still numerous events to review, fortunately with the help of effective filtering, I was able to narrow it down to the essential information.



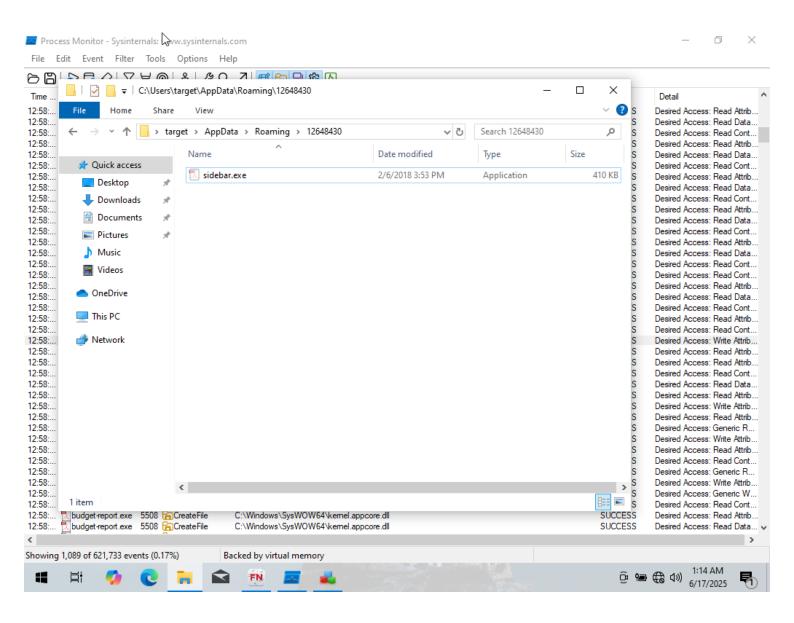
Now, let's take the second shot using the Regshot tool to analyze the changes made by the system during this period. The process may take some time, so let's go back to process monitor while it is running.



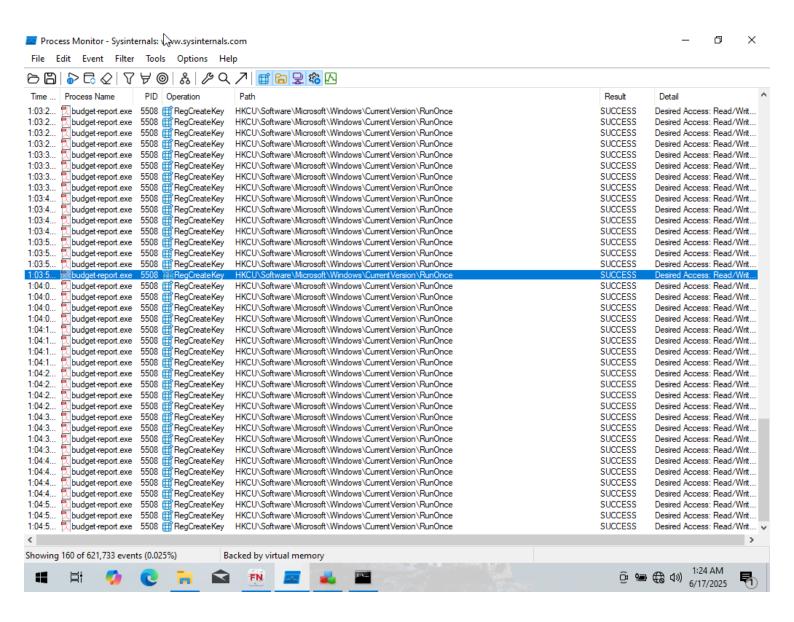
While analyzing the malware events using Process Monitor, we discovered a new file named **sidebar.exe** in the AppData folder.



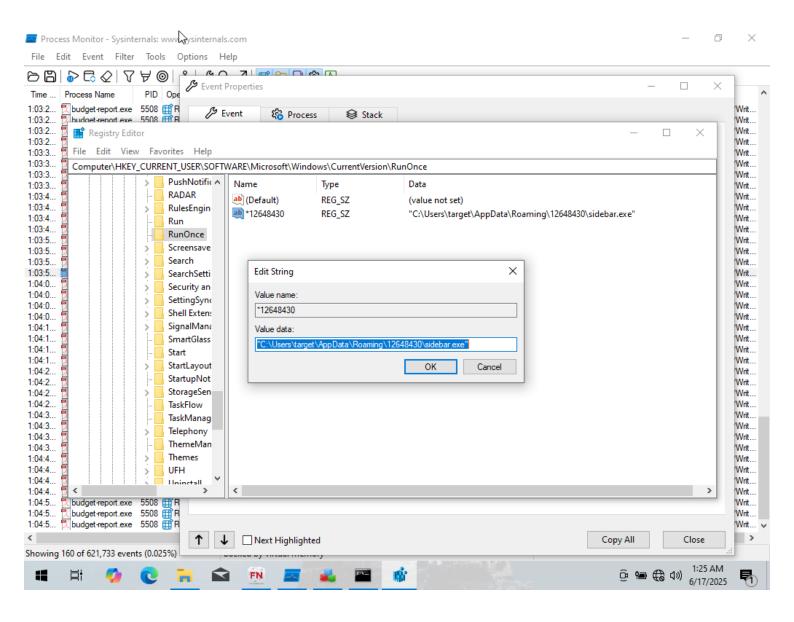
We can verify the existence of this file by navigating to the following folder in File Explorer.



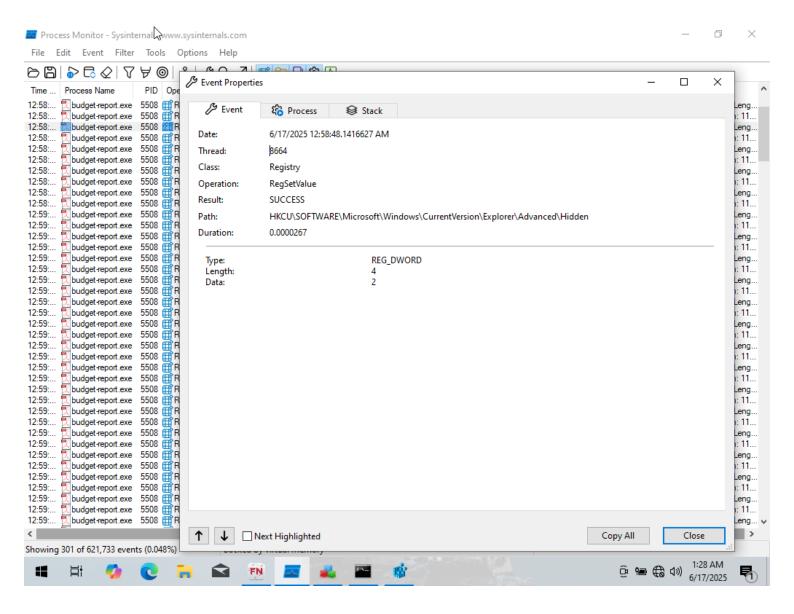
While analyzing the changes made to the registry, we observed that the file created a new entry in **HKCU\Software\ Microsoft\Windows\CurrentVersion\RunOnce**. This registry key is commonly used to ensure the persistence of a file on the system, allowing it to run once at the next system startup.



In the Registry Editor, when we navigate to the following path, we find an entry named *12648430, which holds a value pointing to the file created by the malware.

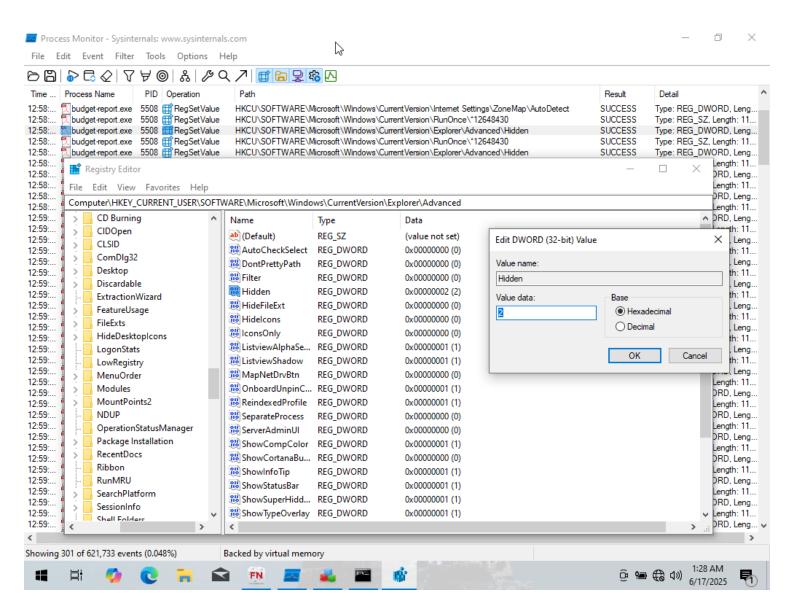


We also found another intriguing registry change made by the malware in **HKCU\SOFTWARE\Microsoft\Windows \CurrentVersion\Explorer\Advanced\Hidden**, where its value was set to **2**.



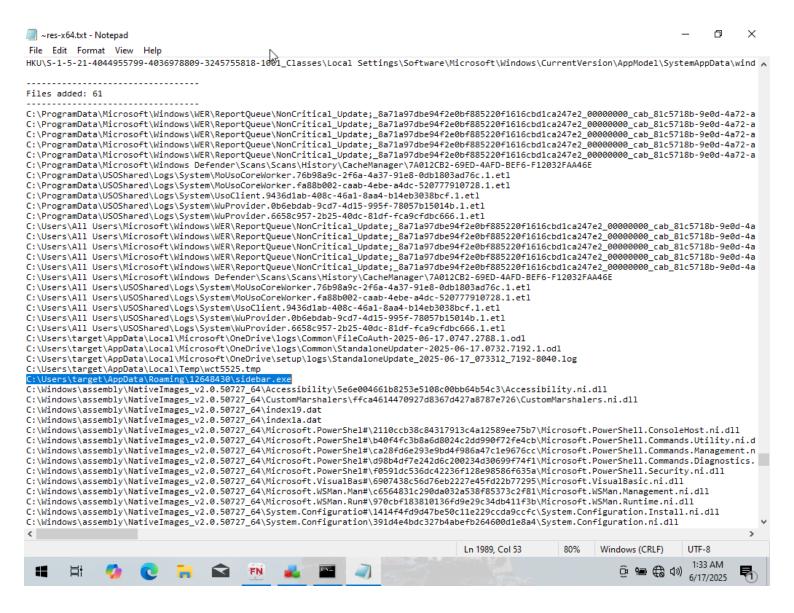
By modifying this value, we can control the visibility of hidden files and folders in File Explorer.

- 1. **Value 0**: Hides protected operating system files and makes hidden files and folders invisible.
- 2. Value 1: Displays hidden files and folders, but still hides protected operating system files.
- 3. **Value 2**: Shows both hidden files, folders, and protected operating system files.



When we compare the shots taken by Regshot, we can observe information that aligns with what we already learned from the Process Monitor tool. There will likely be numerous activities recorded, but not all of them may be caused by the malware itself. Regshot is useful for identifying changes made to the system over a specific period of time.

In the image below, we can see that the **sidebar.exe** file has been created.



Scrolling down, we can see the files that were deleted by the malware after execution. This confirms that the malware deletes itself to prevent detection and analysis.

