Lab 4: Perform Dynamic Malware Analysis

Task 1: Perform Port Monitoring using TCPView and CurrPorts

We know that the Internet uses a software protocol named TCP/IP to format and transfer data. Malware programs corrupt the system and open system input and output ports to establish connections with remote systems, networks, or servers to accomplish various malicious tasks. These open ports can also act as backdoors or communication channels for other types of harmful malware and programs. They open unused ports on the victim's machine to connect back to the malware handlers.

You can identify the malware trying to access a particular port by installing port monitoring tools such as TCPView and CurrPorts.

TCPView TCPView is a Windows program that shows the detailed listings of all the TCP and UDP endpoints on the system, including the local and remote addresses, and the state of the TCP connections. It provides a subset of the Netstat program that ships with Windows. The TCPView download includes Tcpvcon, a command-line version with the same functionality. When TCPView runs, it enumerates all active TCP and UDP endpoints, resolving all IP addresses to their domain name versions.

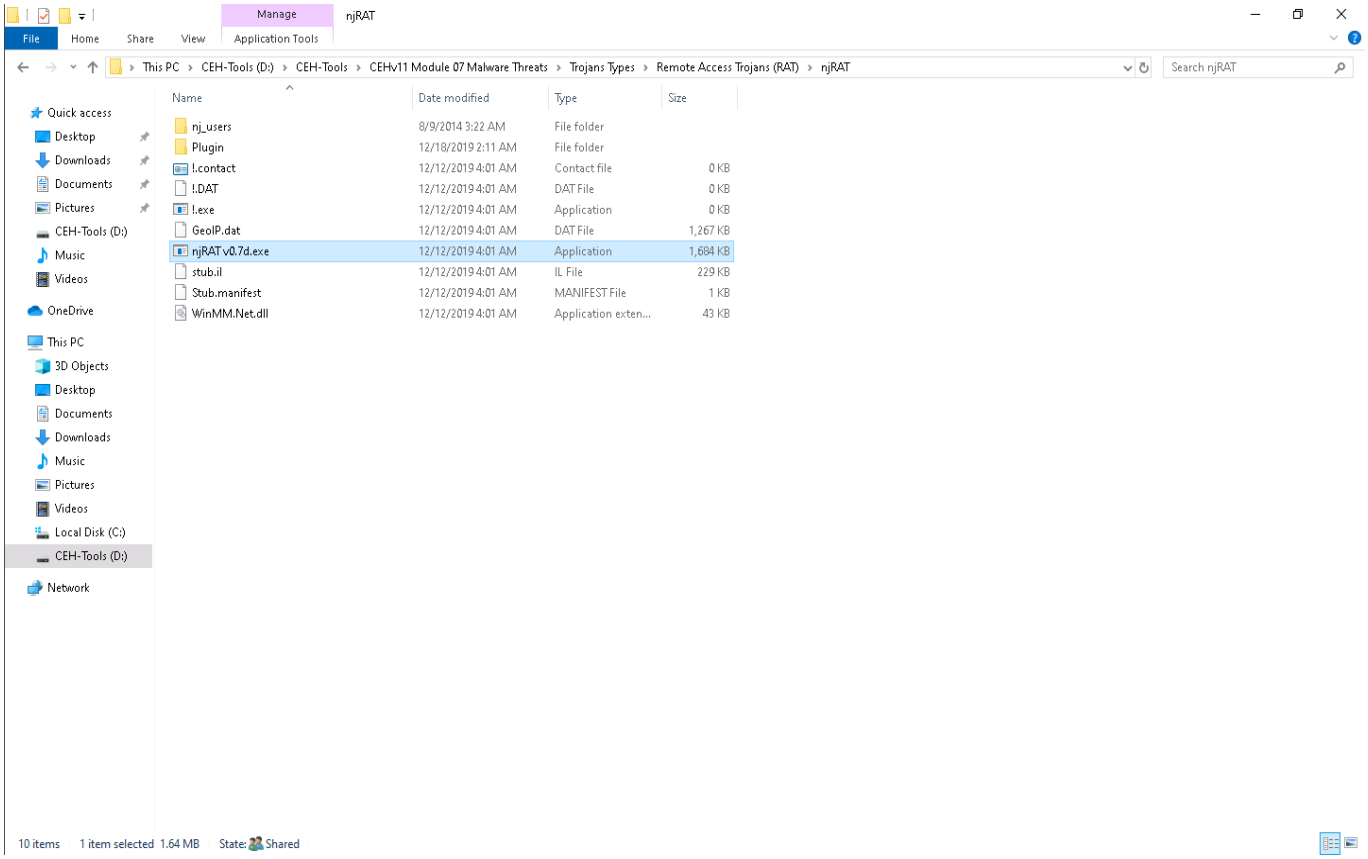
CurrPorts CurrPorts is a piece of network monitoring software that displays a list of all the currently open TCP/IP and UDP ports on a local computer. For each port in the list, information about the process that opened the port is also displayed, including the process name, full path of the process, version information of the process (product name, file description, etc.), the time that the process was created, and the user that created it.

In addition, CurrPorts allows you to close unwanted TCP connections, kill the process that opened the ports, and save the TCP/UDP port information to an HTML file, XML file, or to tab-delimited text file.

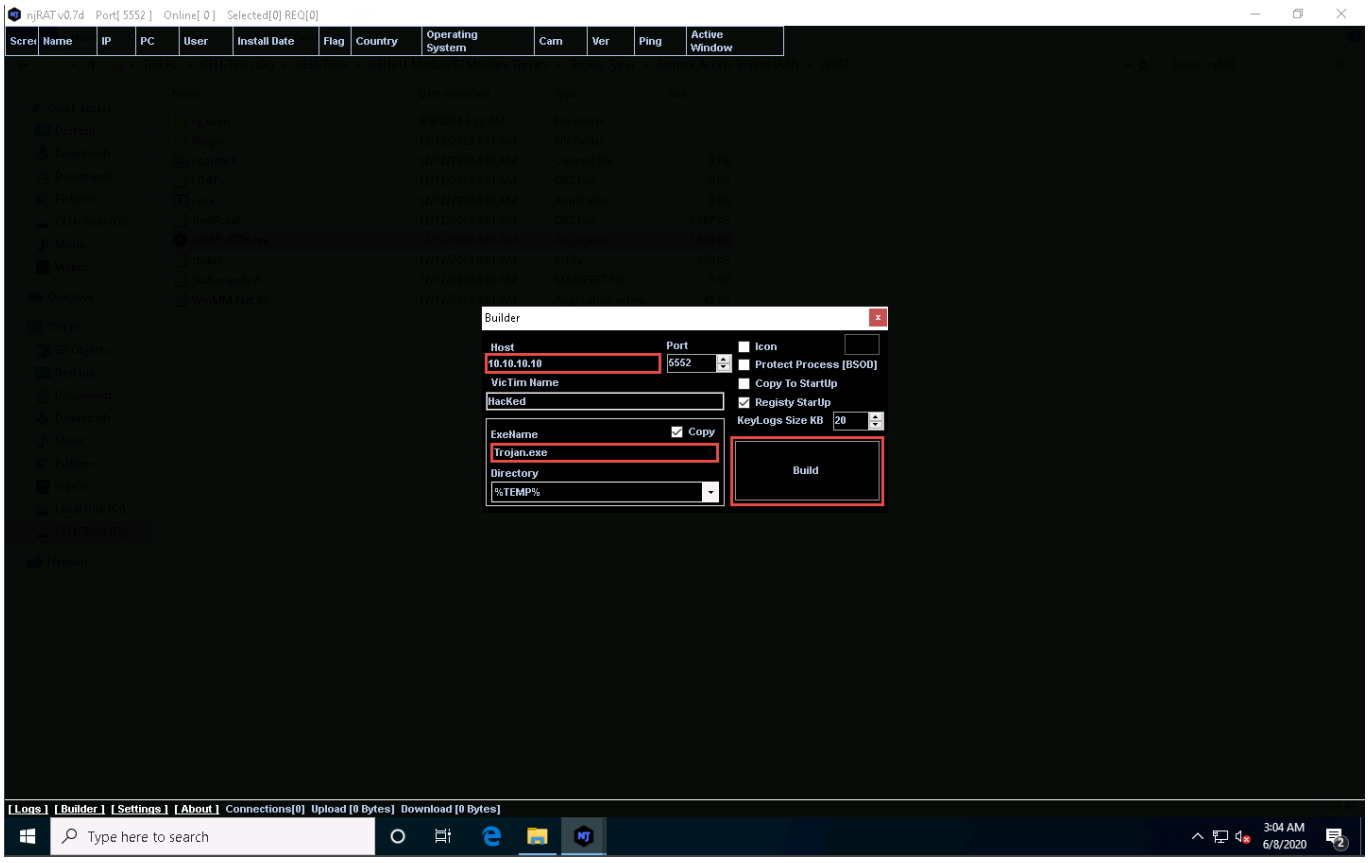
CurrPorts also automatically marks suspicious TCP/UDP ports owned by unidentified applications (Applications without version information and icons) in pink.

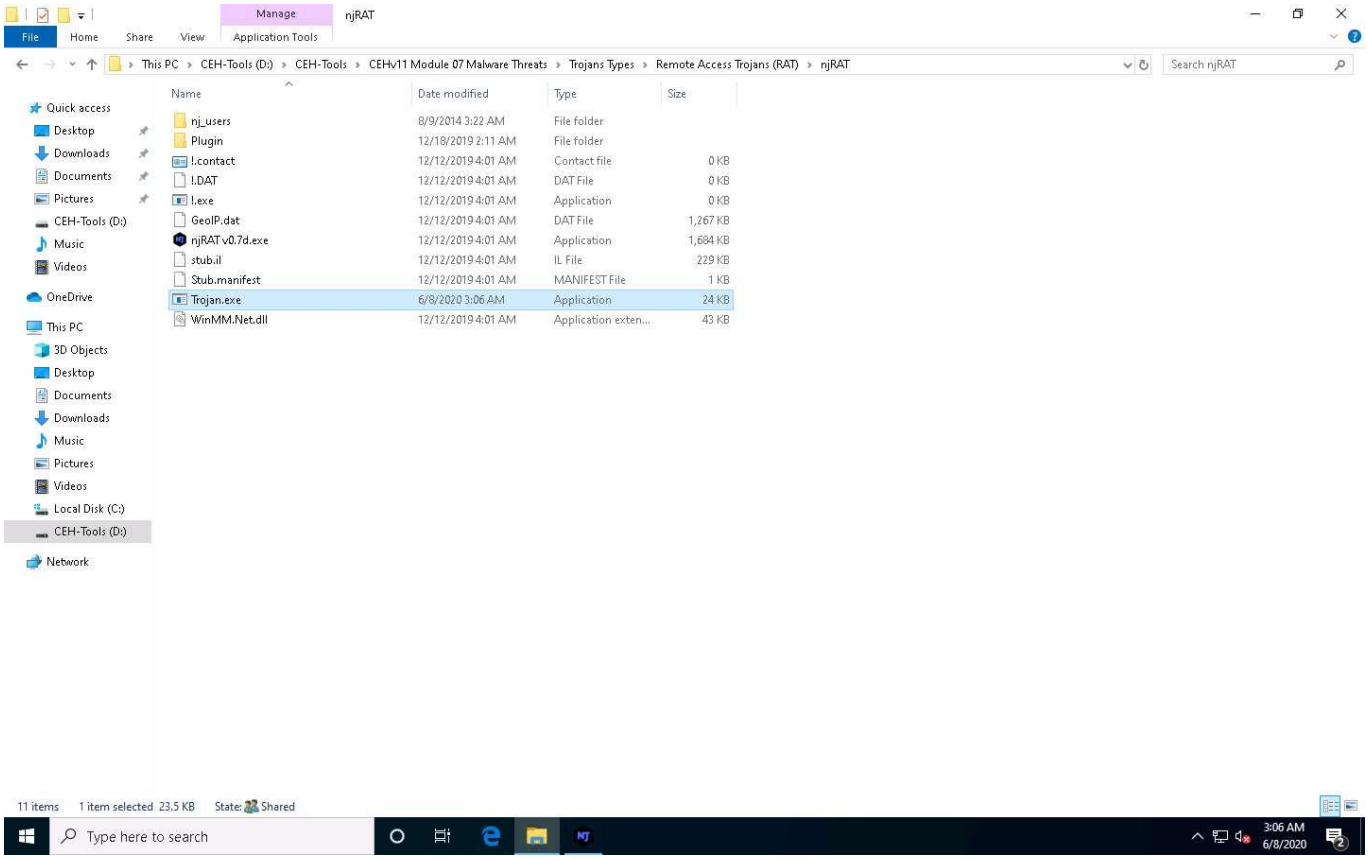
This lab activity demonstrates how to analyze malicious processes running on a machine using TCPView and CurrPorts. Here, you will first create a server using njRAT, and then execute this server from the second machine. Later, you will run the TCPView and CurrPorts applications on the second machine and find that the process associated with the server is running on it.

1. On the **Windows 10** machine, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Trojans Types\Remote Access Trojans (RAT)\njRAT** and double-click **njRAT v0.7d.exe** to launch **njRAT**.

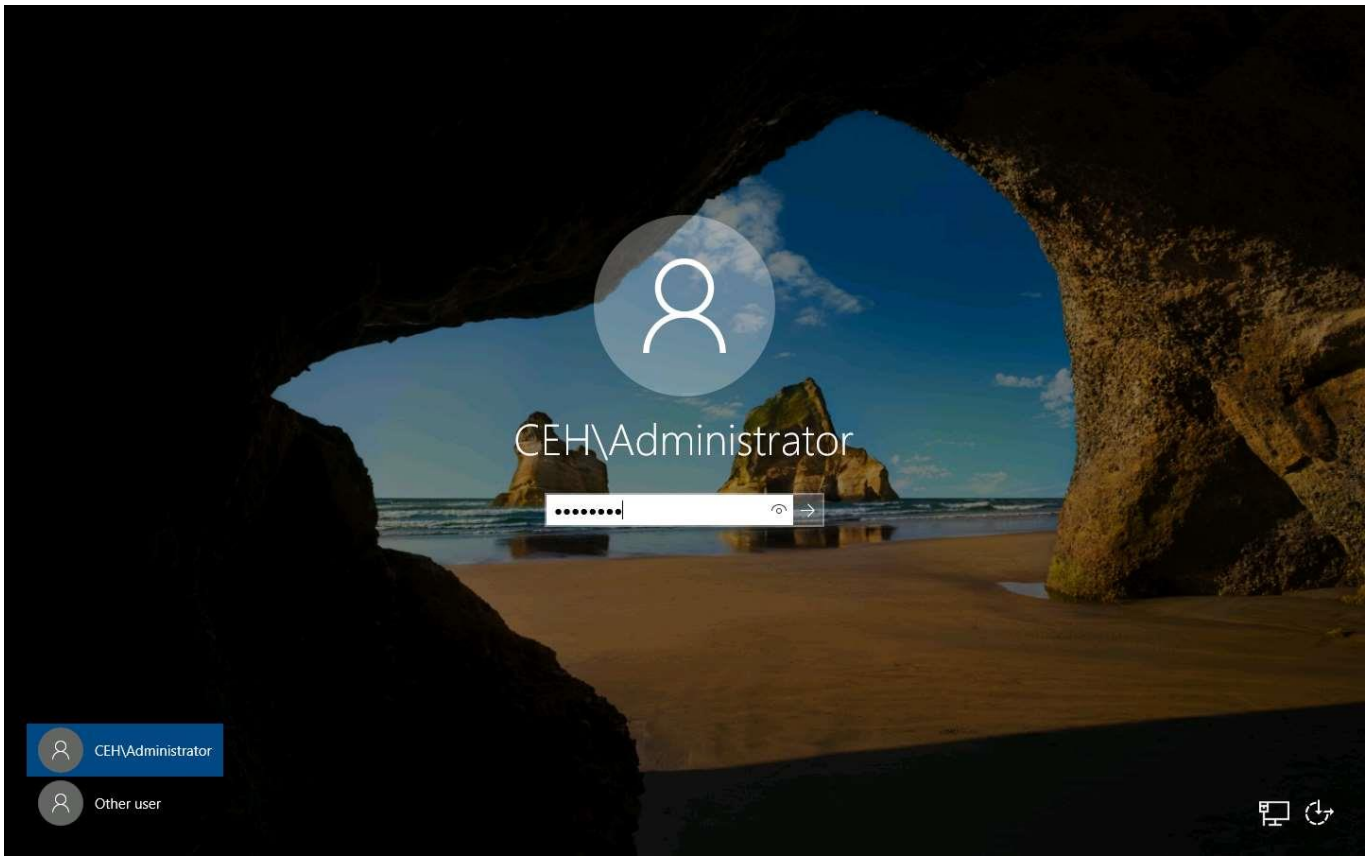


2. Create a server and save it to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Trojans Types\Remote Access Trojans (RAT)\njRAT**.
3. While building the server, assign the server name **Trojan.exe** for demonstration purposes.

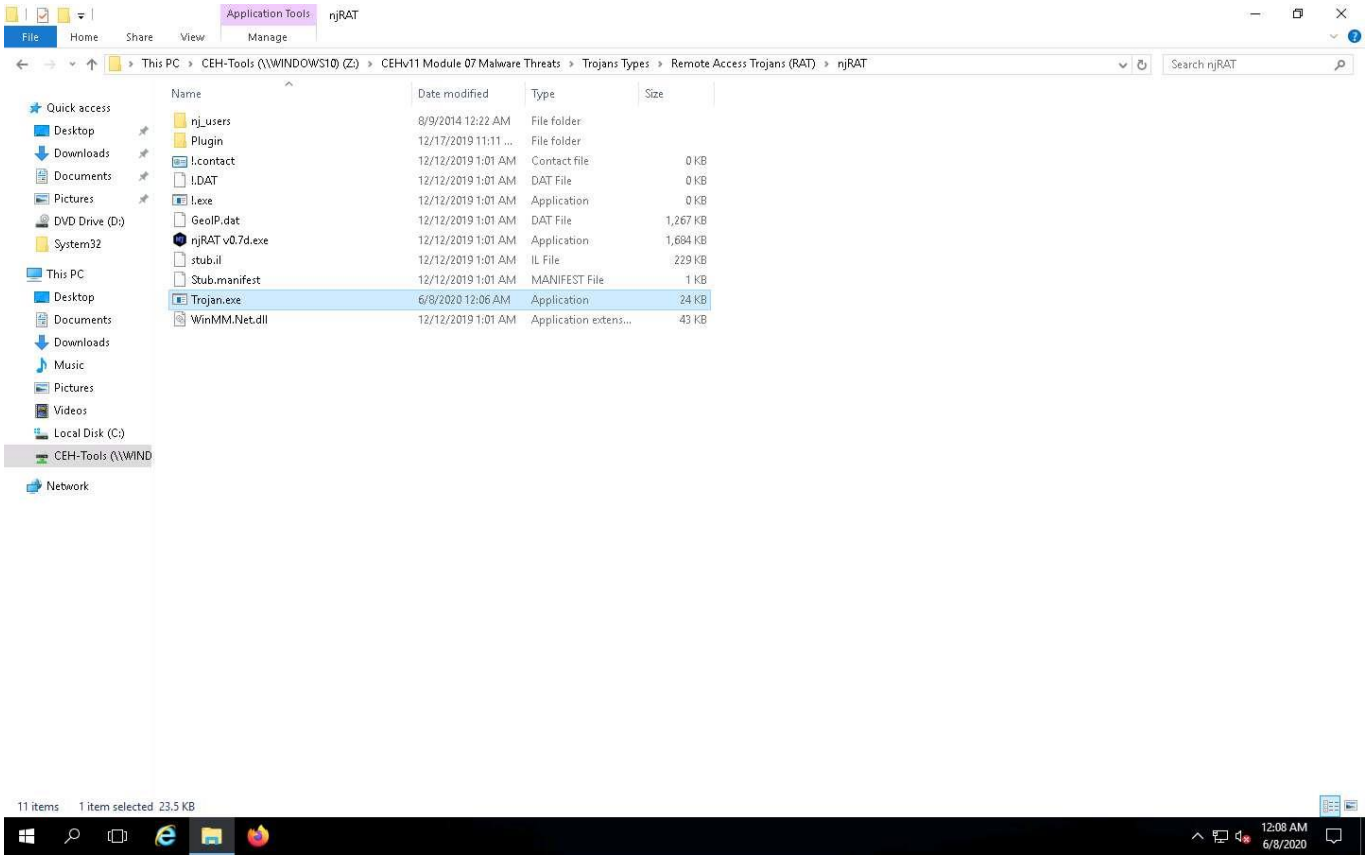




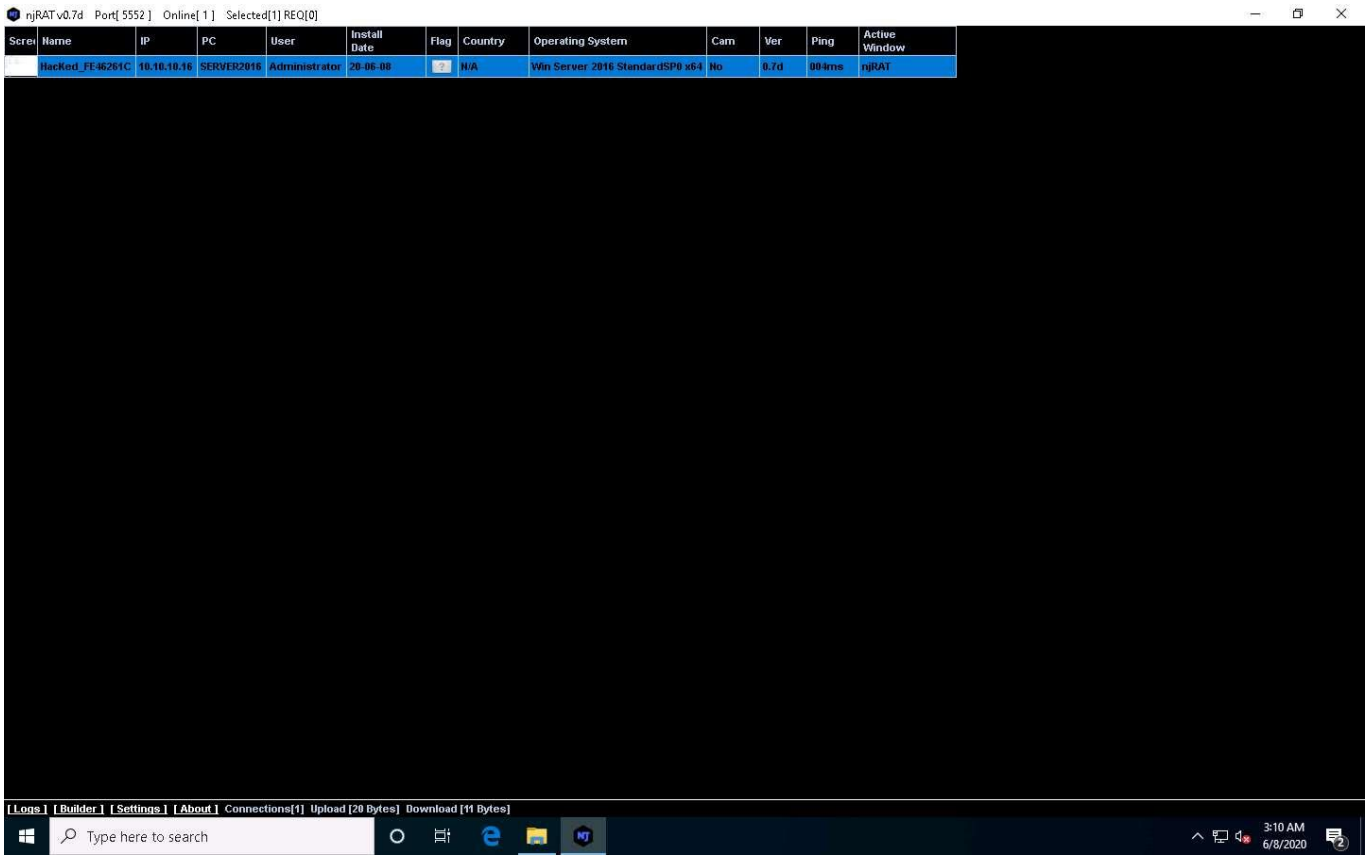
4. Click Windows Server 2016 to switch to the **Windows Server 2016** machine. Click Ctrl+Alt+Delete to activate the machine, by default, **CEH\Administrator** account is selected, click Pa$$w0rd to enter the password and press **Enter**.



5. Navigate to **Z:\CEHv11 Module 07 Malware Threats\Trojans Types\Remote Access Trojans (RAT)\njRAT** and double-click **Trojan.exe**.



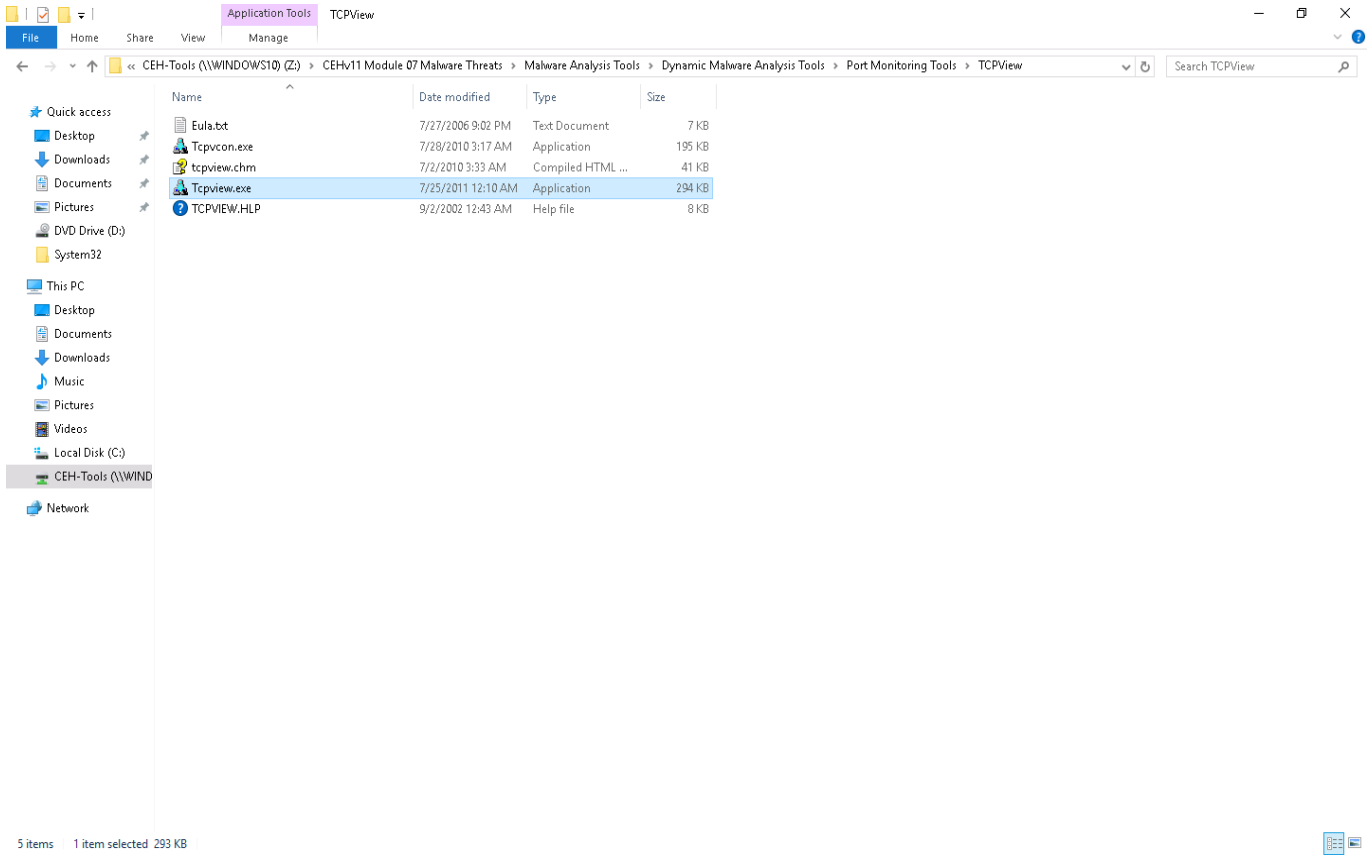
6. ☐ Observe that a connection has been established by the njRAT client. Click Windows 10 to switch to the **Windows 10** machine to observe the established connection.



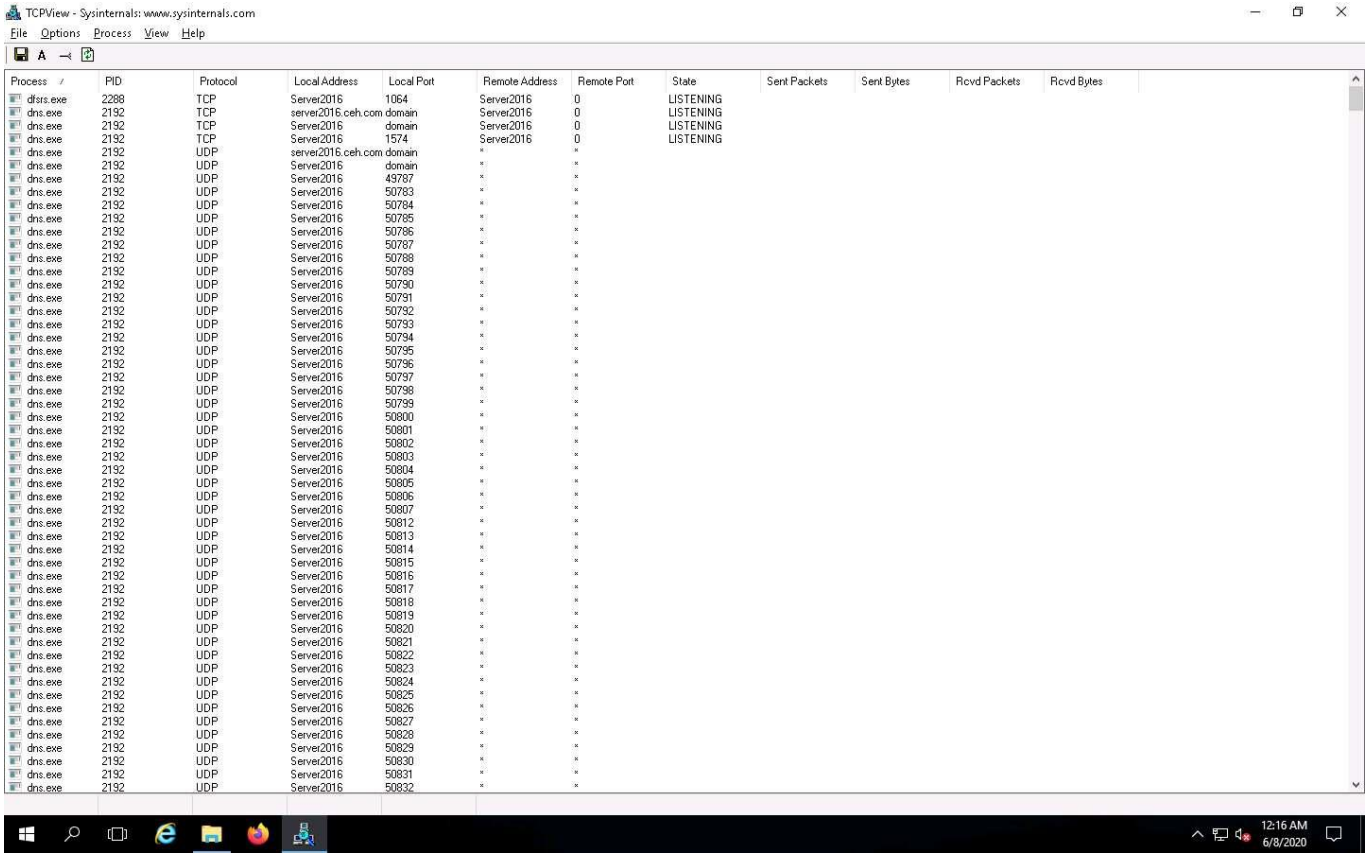
7. ☐ Now, let us analyze this process on **Windows Server 2016** using **TCPView** tool. Click Windows Server 2016 to switch back to the **Windows Server 2016** machine.

8. Navigate to **Z:\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Port Monitoring Tools\TCPView** and double-click **Tcpview.exe** to launch the application.

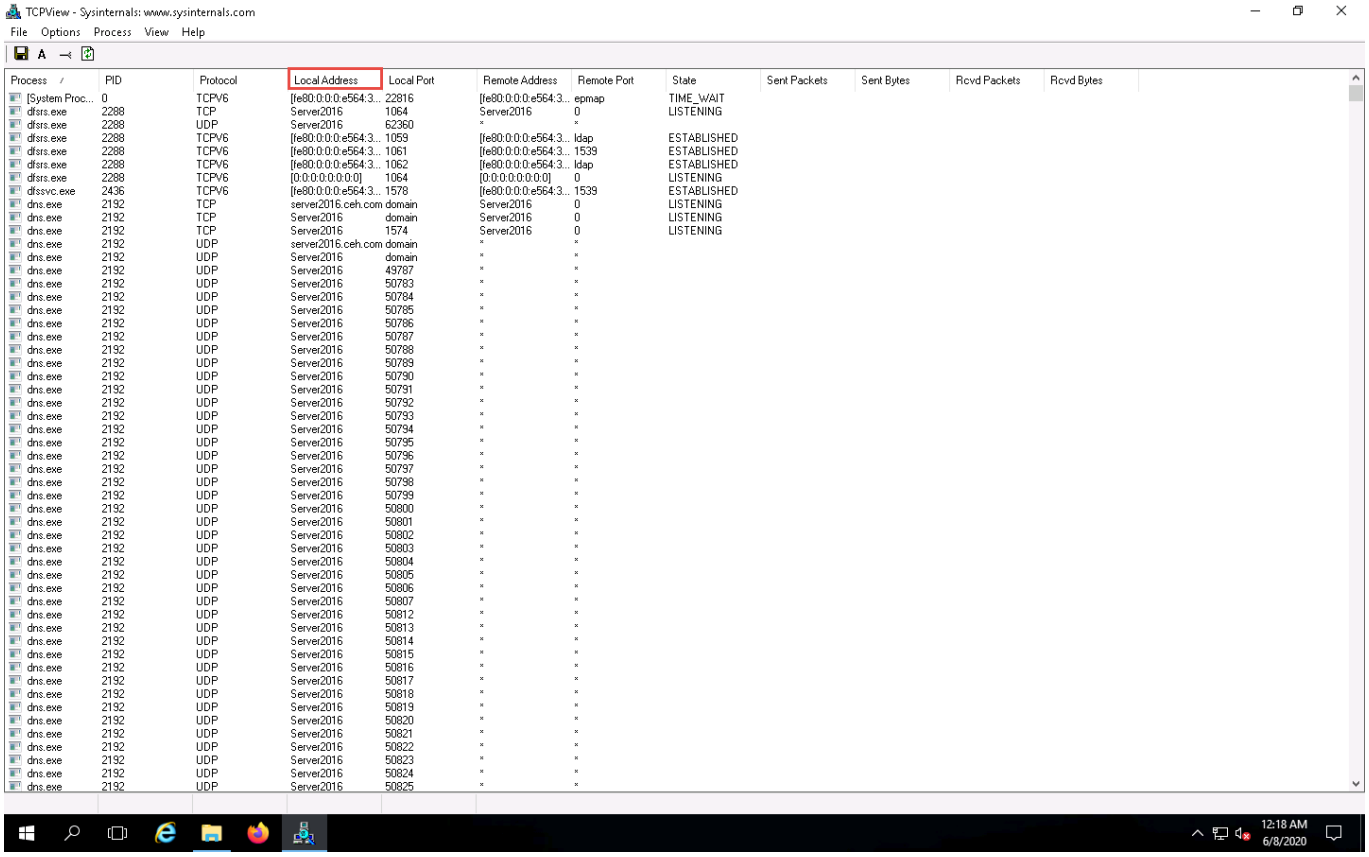
If a **User Account Control** pop-up appears, click **Yes**.



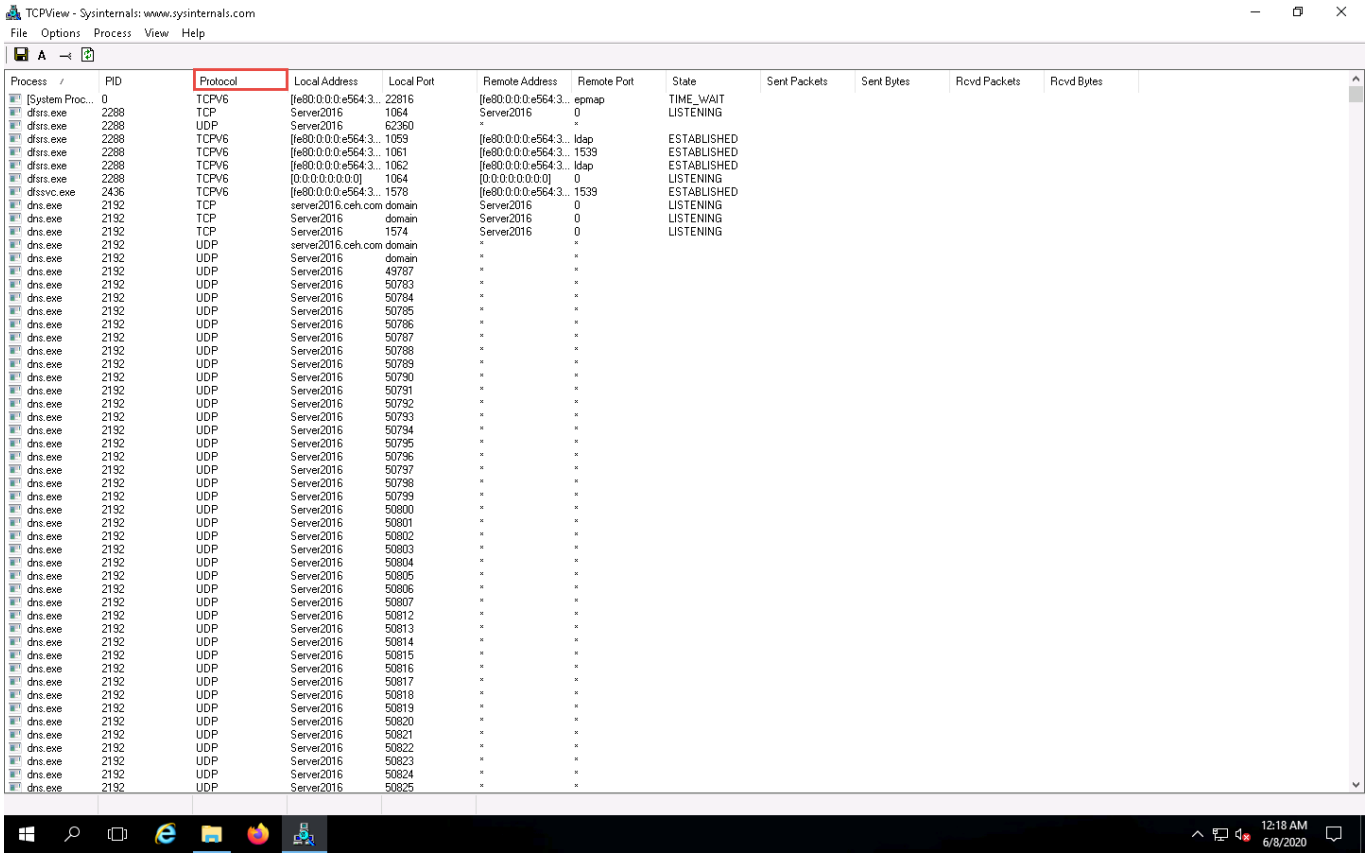
9. If a **TCPView License Agreement** window appears, click the **Agree** button to agree to the terms and conditions.
10. The **TCPView** main window appears, displaying the details such as Process, ProcessId, Protocol, Local Address, Local Port, Remote Address, Remote Port, and State, as shown in the screenshot.



11. ☐ TCPView performs **Port monitoring**. Click the **Local Port** tab to view the ports in serial order.

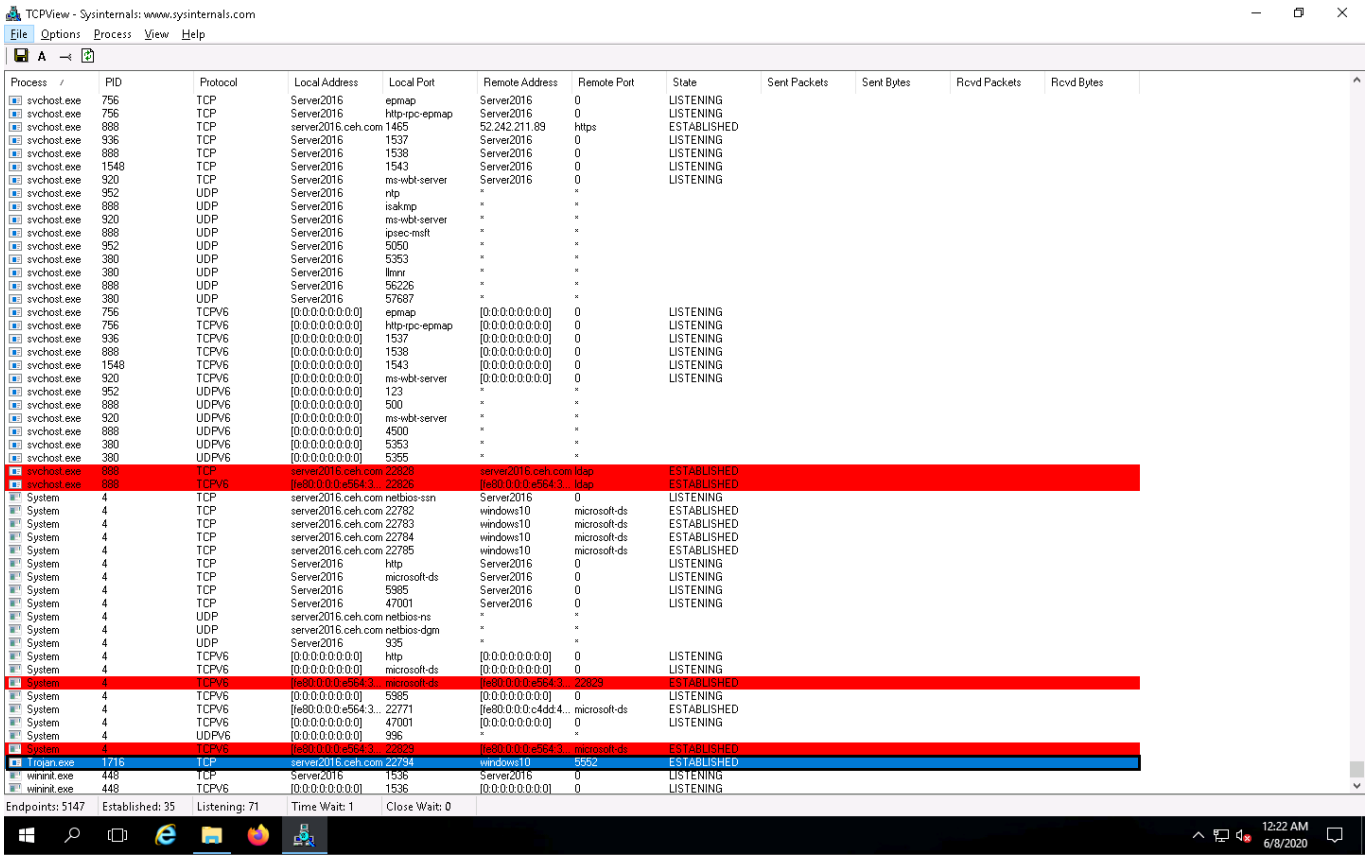


12. ☐ Observe the protocols running on different ports under the **Protocol** column.

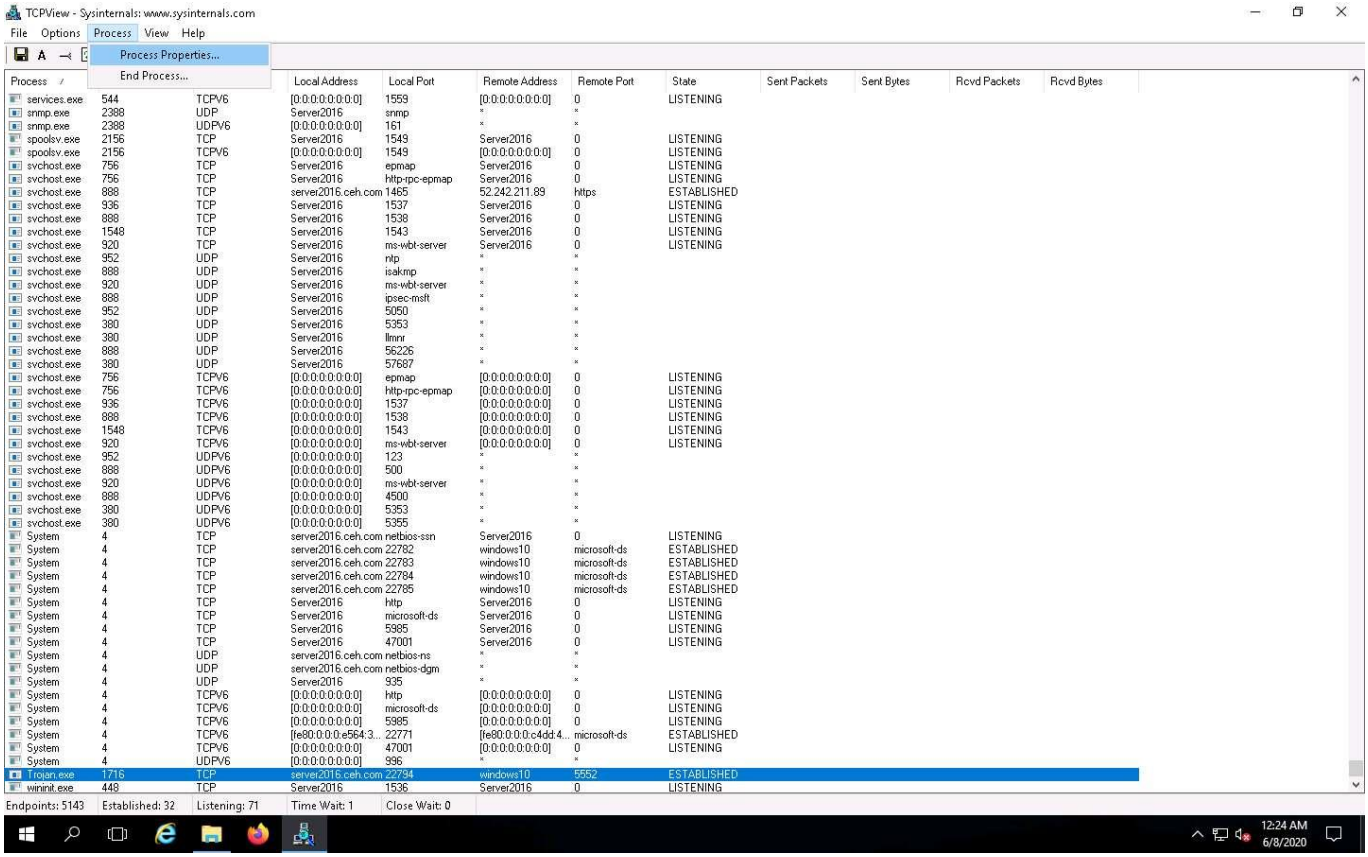


13. As you have executed a malicious application, now search for the **Trojan.exe** process in the TCPView.

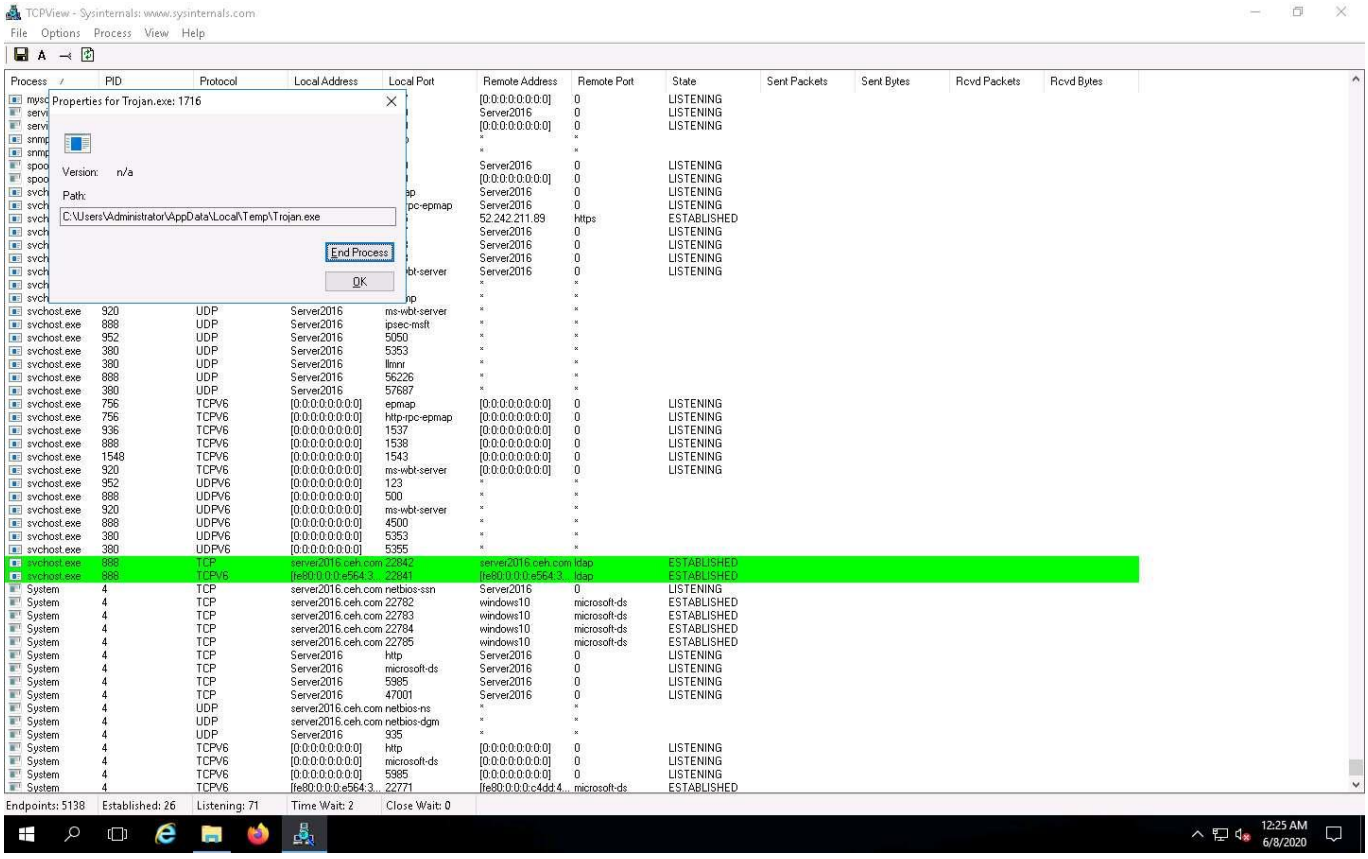
14. You can observe that the **Trojan.exe** malicious program is running on the **Windows Server 2016** machine. You can see details such as **Remote Address** and **Remote Port**.



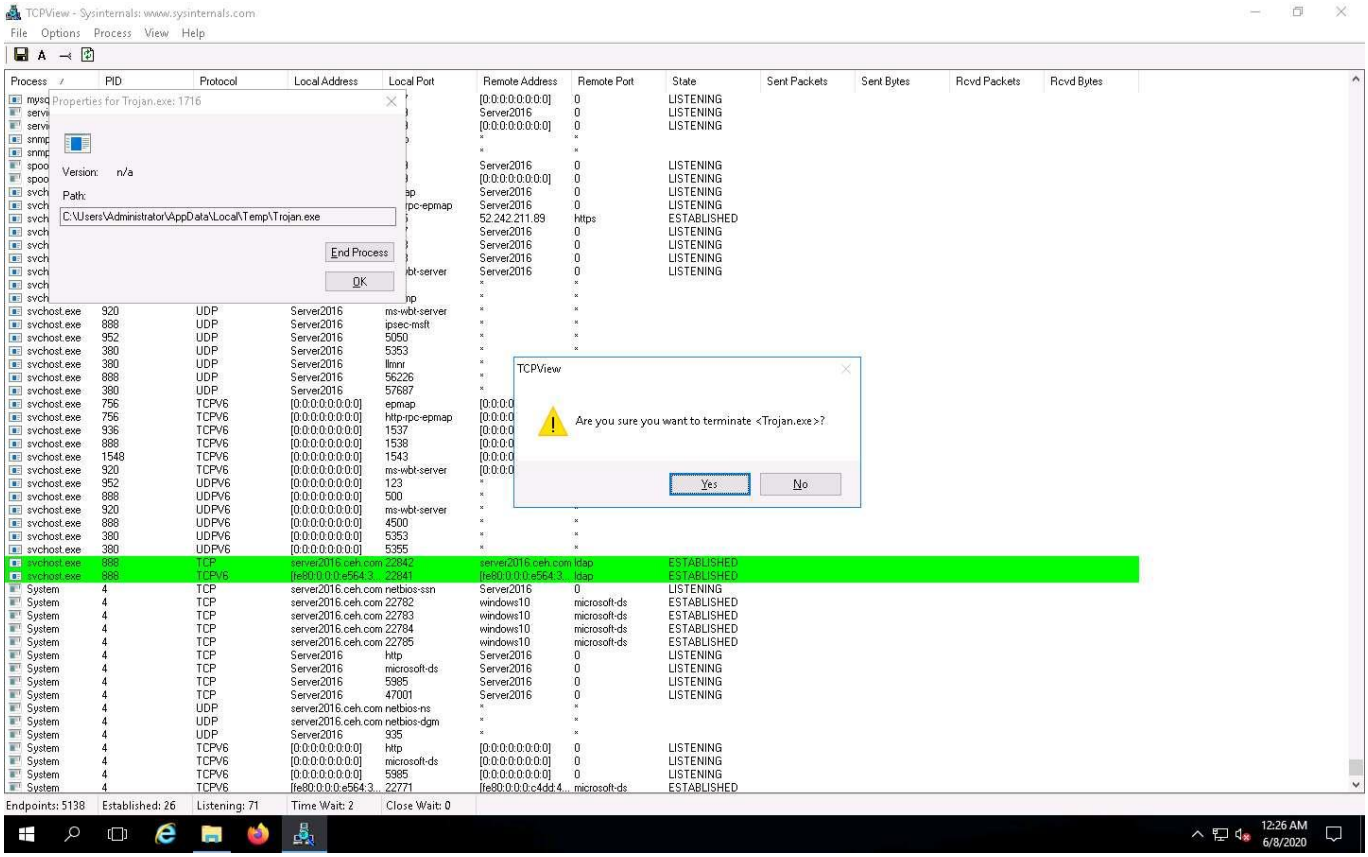
15. To see the process properties, navigate to **Process**, and then click **Process Properties**.



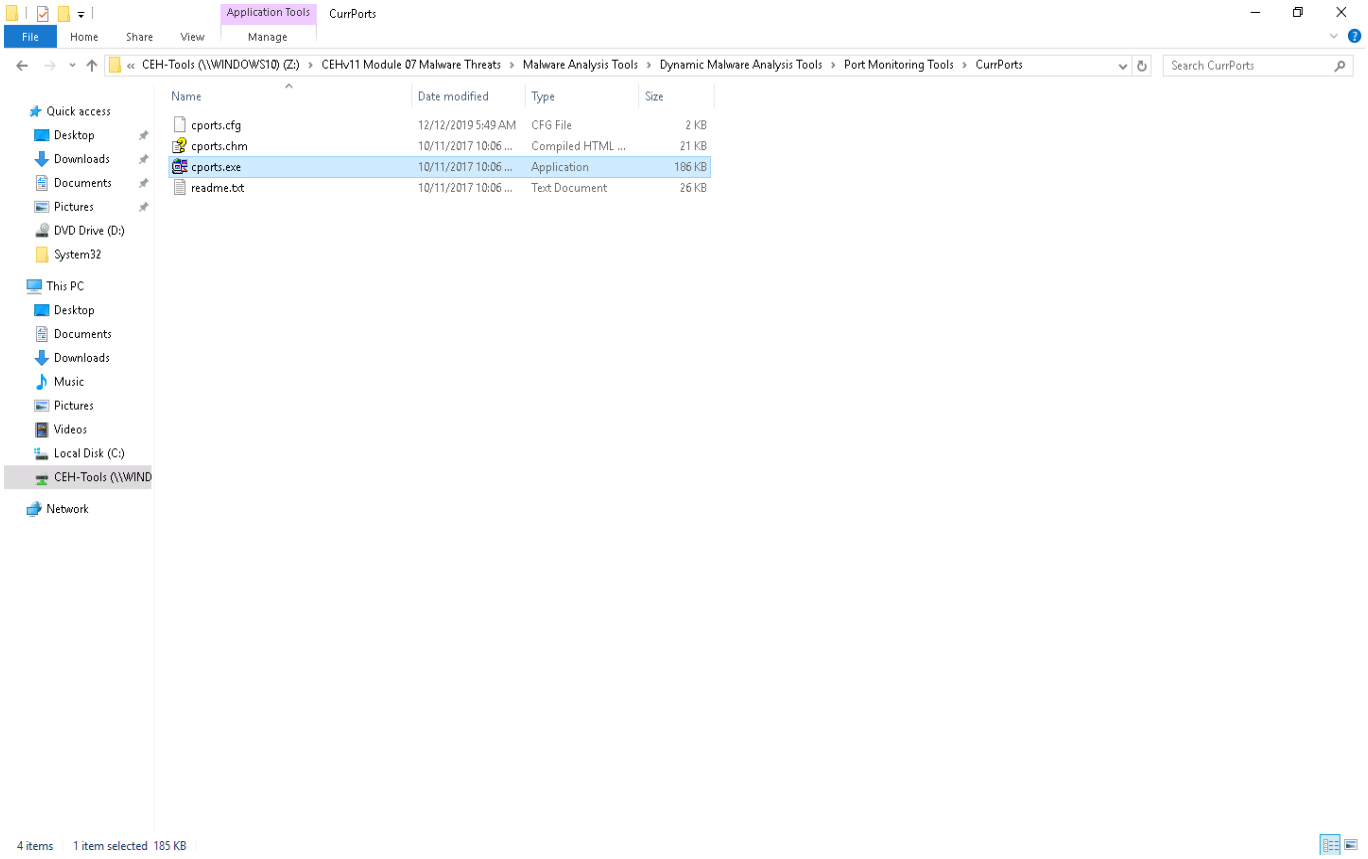
16. The properties for the selected process window appears (here, **Trojan.exe**); click **End Process** to kill the process. This will end the running process.



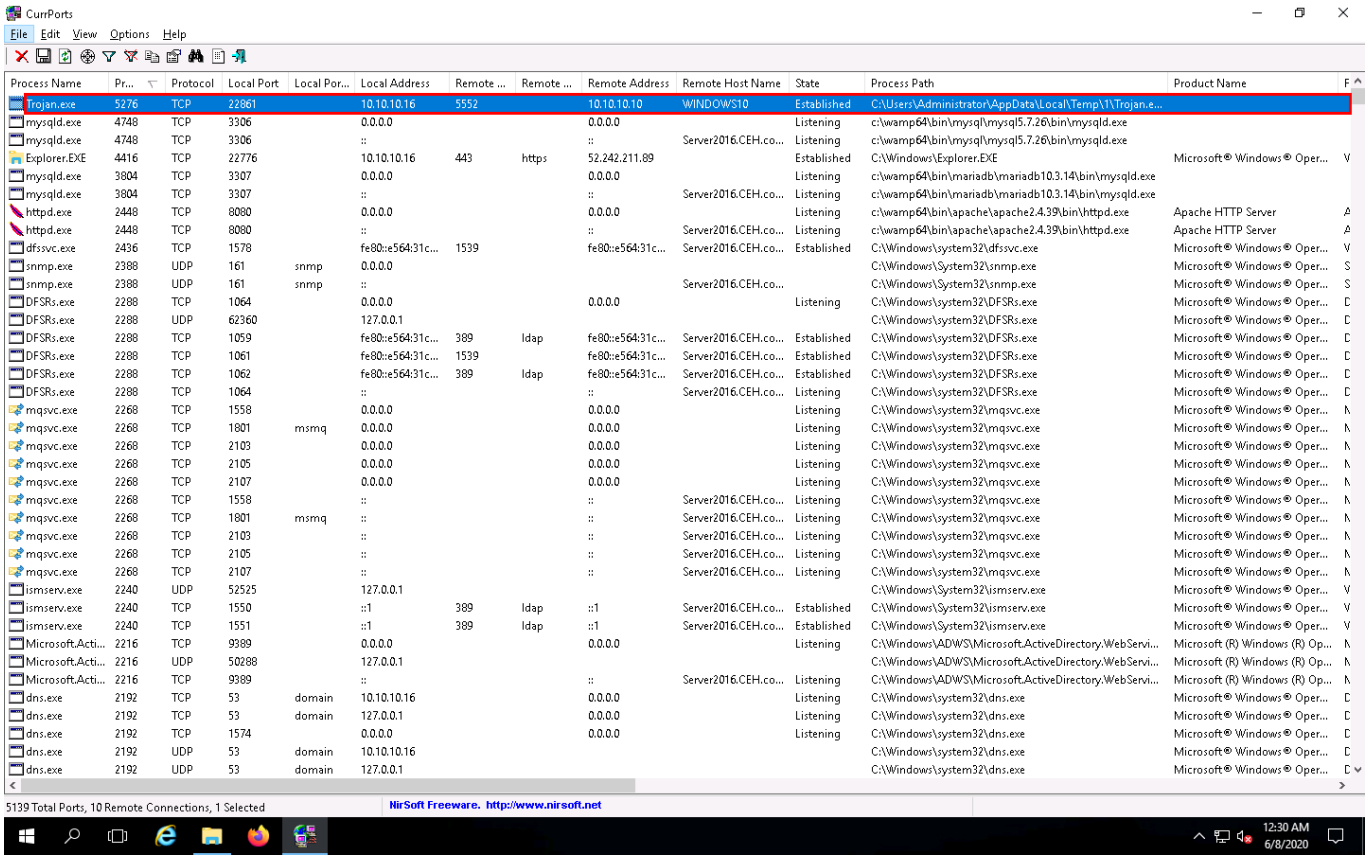
17. Normally, if a **TCPView** dialog box appears, click **Yes** to terminate the process. However, for this lab, do not Kill the process in this step as we are going to use this running process for the next task; click **No**.



18. ☐ This way, you can view all processes running on the machine and stop unwanted or malicious processes that may affect your system. If you are unable to stop a process, you can view the port on which it is running and add a firewall rule to block the port.
19. ☐ Close the **TCPView** window.
20. ☐ Now, let us analyze this process on **Windows Server 2016** using **CurrPorts**.
21. ☐ Navigate to **Z:\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Port Monitoring Tools\CurrPorts** and double-click **cports.exe**.

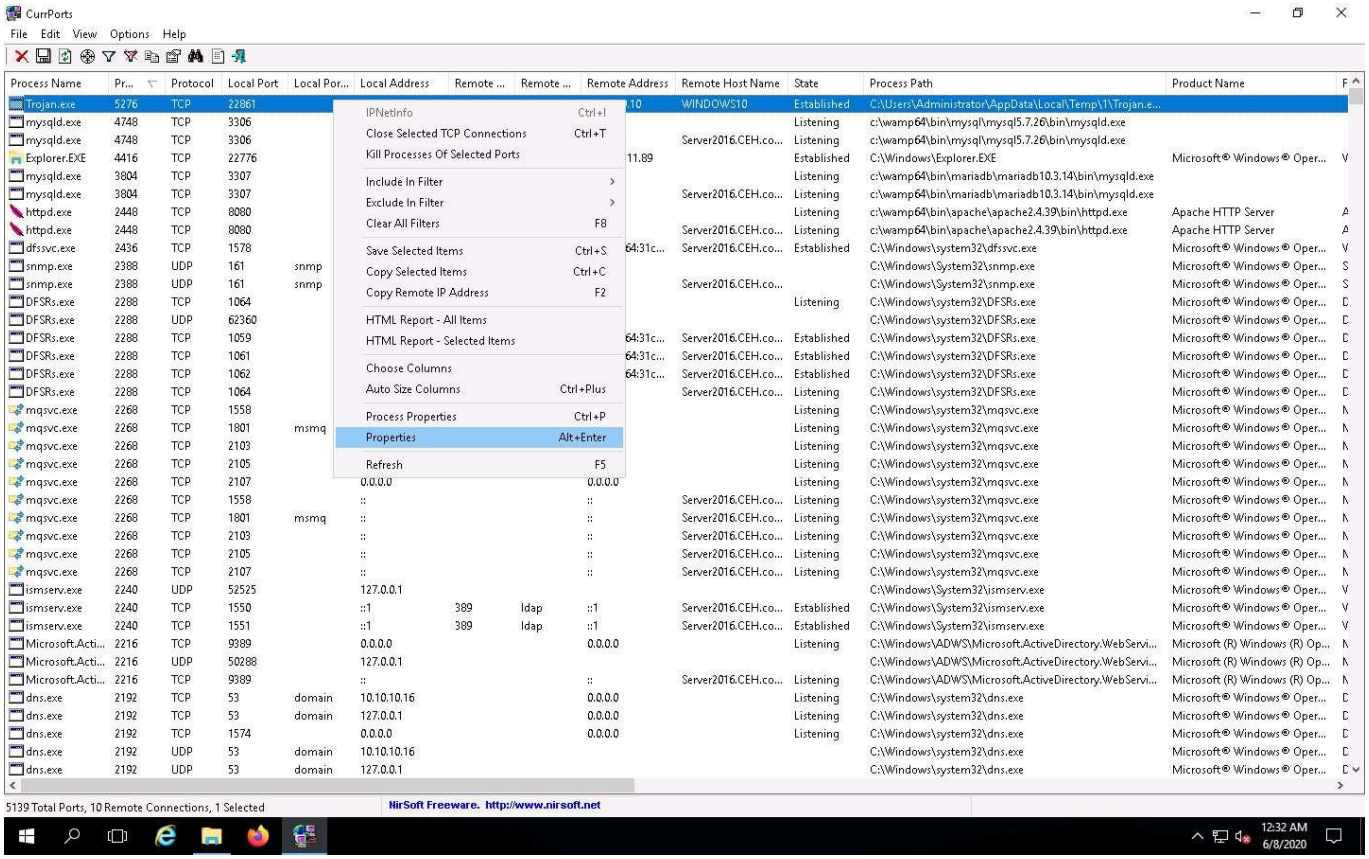


22. The **CurrPorts** window appears, displaying a list of currently open TCP/IP and UDP ports on the machine. Here, you can observe the **Trojan.exe** process running on the machine, as the shown in the screenshot.



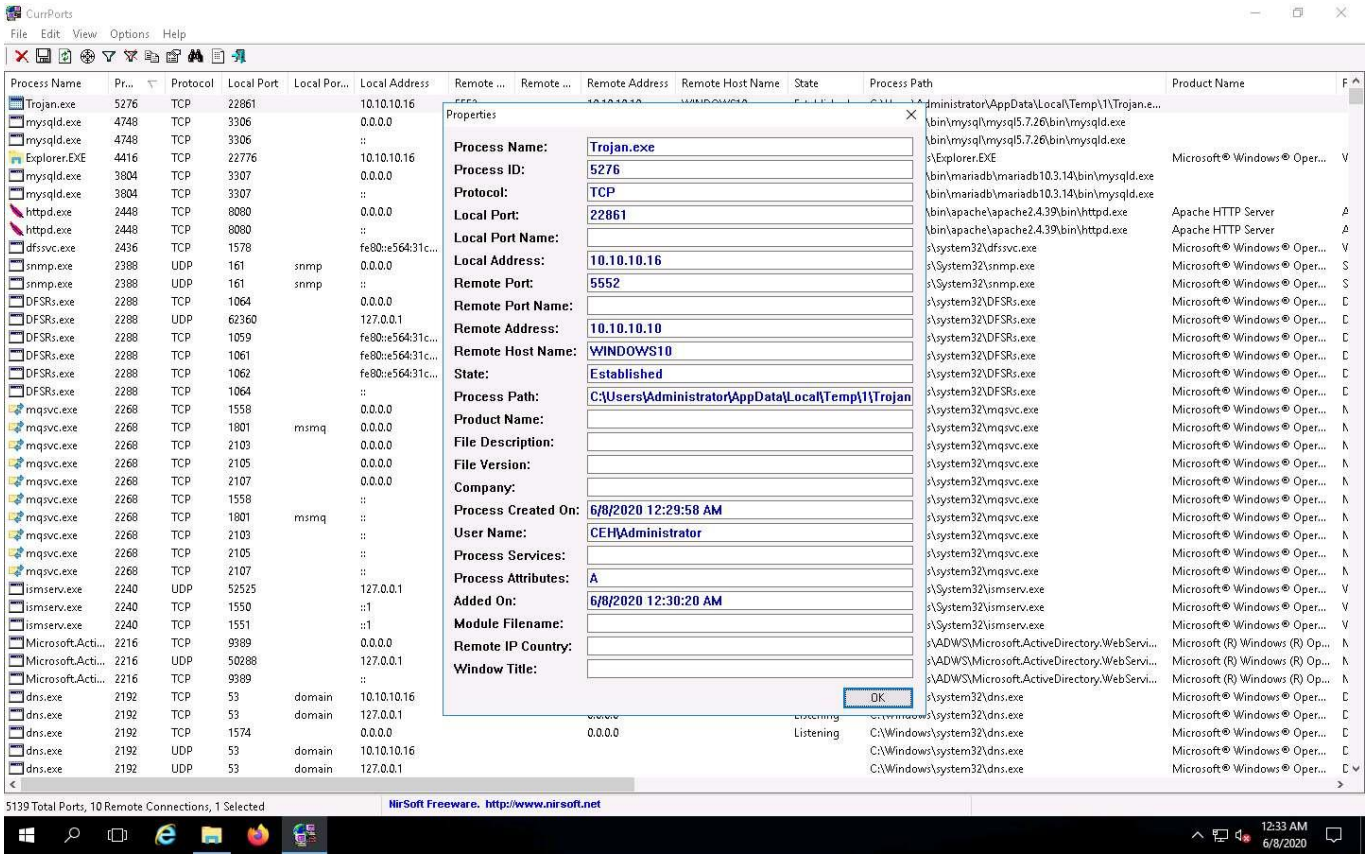
23. It is evident from the above screenshot that the process is connected to the machine on **port 5552**.

24. You can view the properties of the process by right-clicking on the process and clicking **Properties** from the **Context** menu.



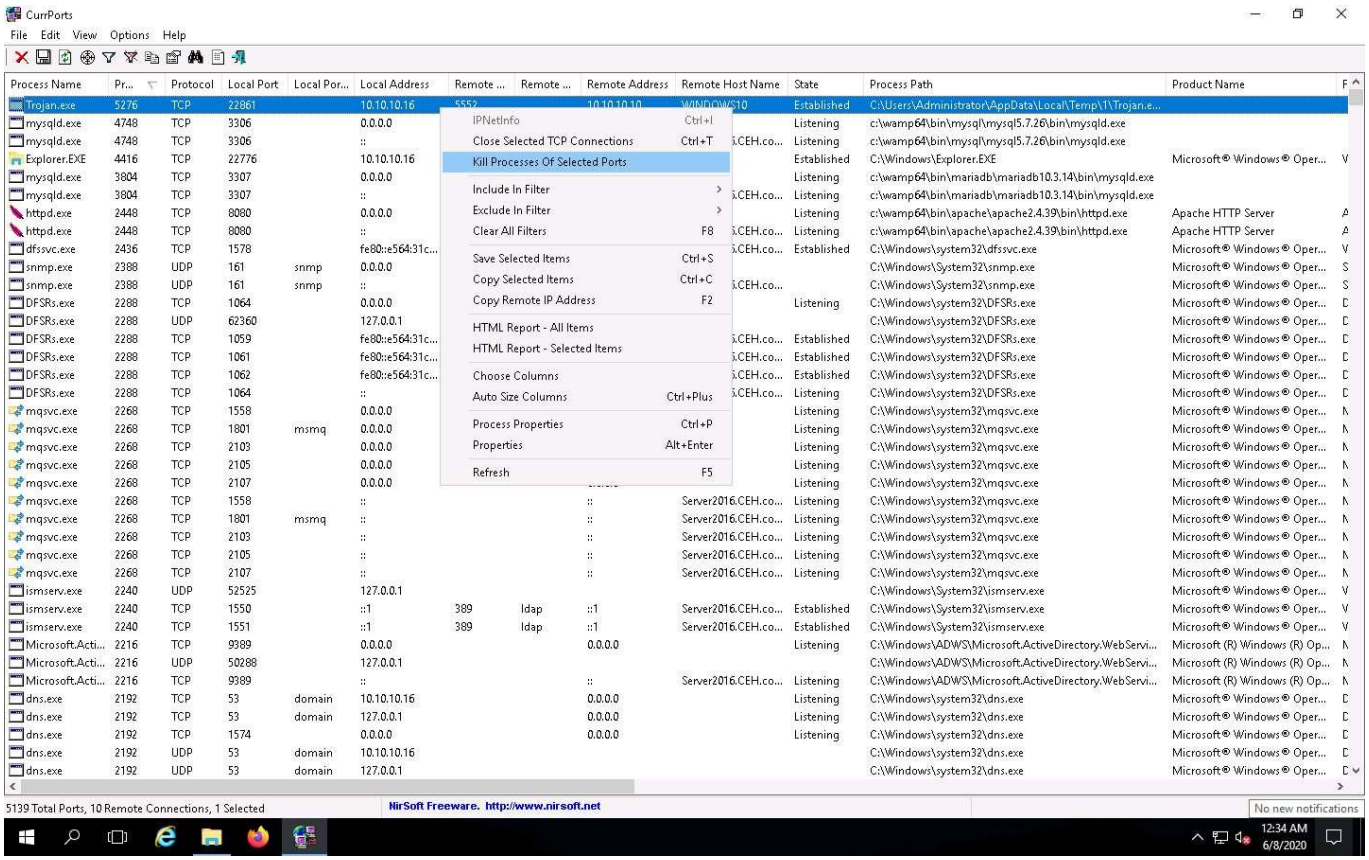
25. The **Properties** window appears, displaying information related to the process such as the name of the process, its process ID, Remote Address, Process Path, Remote Host Name, and other details.

26. Once you are done examining the properties associated with the process, click **OK**.

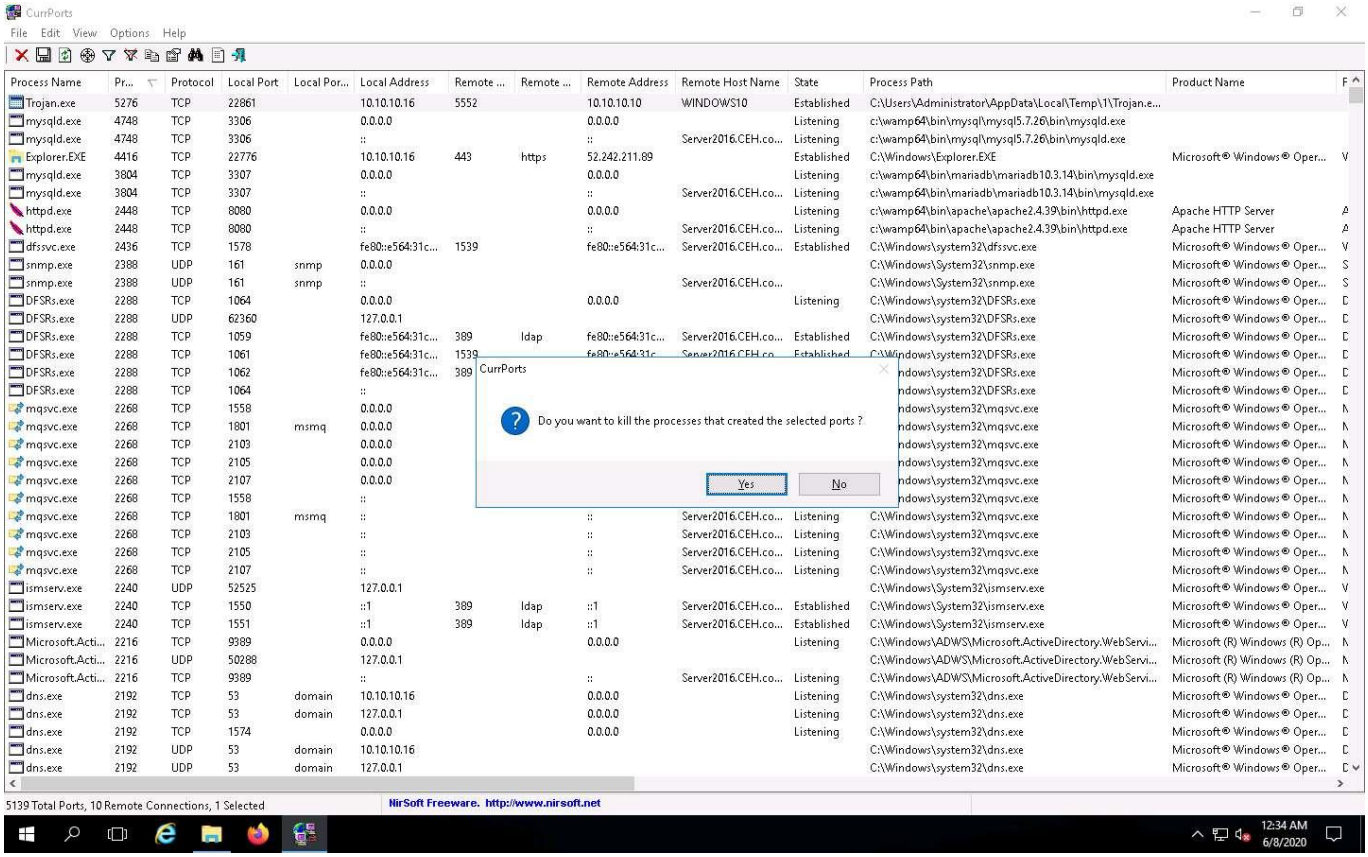


27. Because **Trojan.exe** is a malicious process, you may end the process by right-clicking on it and selecting **Kill Processes Of Selected Ports** from the context menu.

28. Alternatively, you may select **Close Selected TCP Connections**, so that the port closes, and the attacker can never regain connection through the port unless you open it.



29. Normally, when the **CurrPorts** dialog-box appears, you would click **Yes** to close the connection. However, do not Kill the process at this step, as this running process will be used for the next task; click **No**.



30. This way, you can analyze the ports open on a machine and the processes running on it.
31. If a process is found to be suspicious, you may either kill the process or close the port.
32. Close all open windows.
33. You can also use other port monitoring tools such as **Port Monitor** (https://www.port-monitor.com), **CurrPorts** (https://www.nirsoft.net), **TCP Port Monitoring** (https://www.dotcom-monitor.com), or **PortExpert** (http://www.kcsoftwares.com) to perform port monitoring.

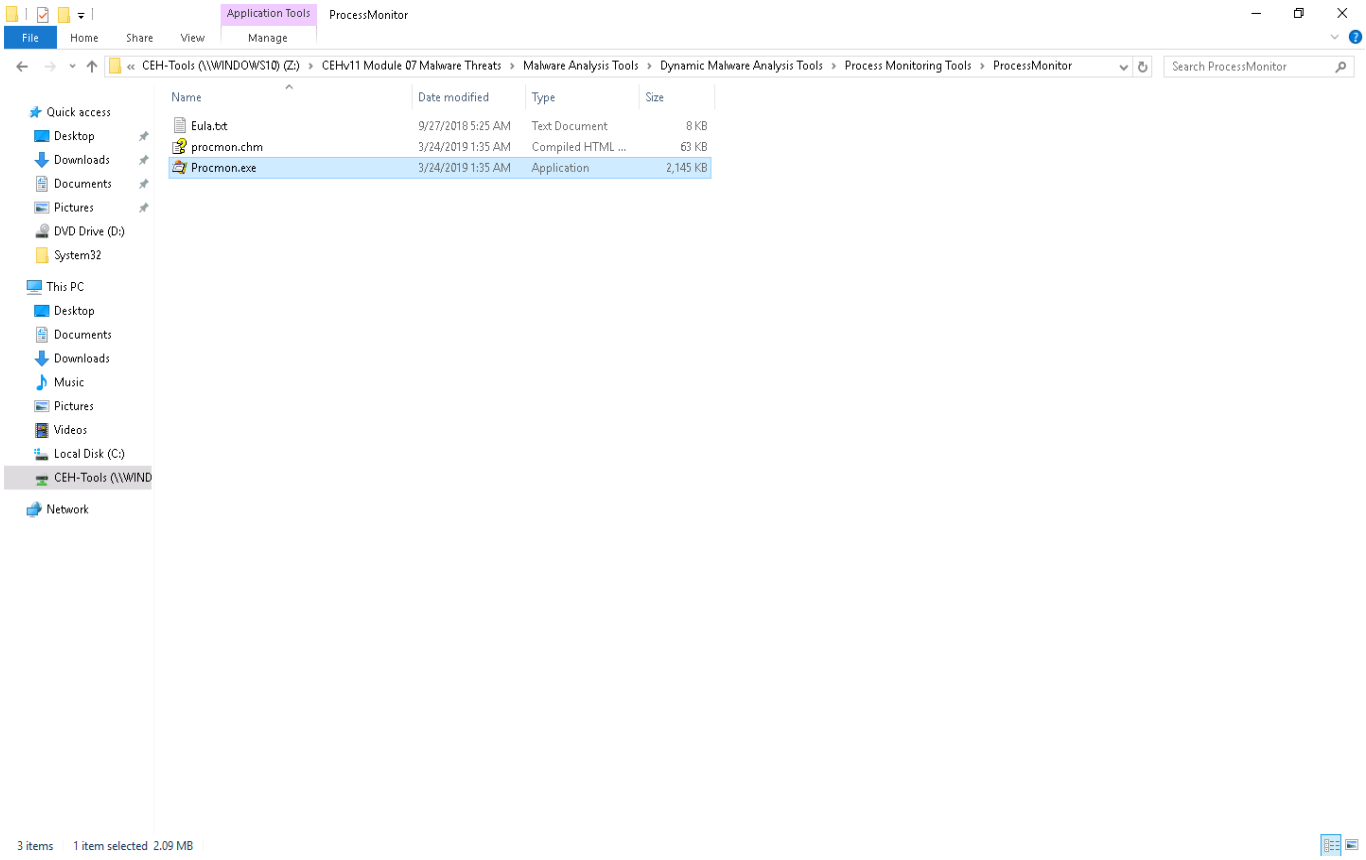
Task 2: Perform Process Monitoring using Process Monitor

Process monitoring will help in understanding the processes that malware initiates and takes over after execution. You should also observe the child processes, associated handles, loaded libraries, functions, and execution flow of boot time processes to define the entire nature of a file or program, gather information about processes running before the execution of the malware, and compare them with the processes running after execution. This method will reduce the time taken to analyze the processes and help in easy identification of all processes that malware starts.

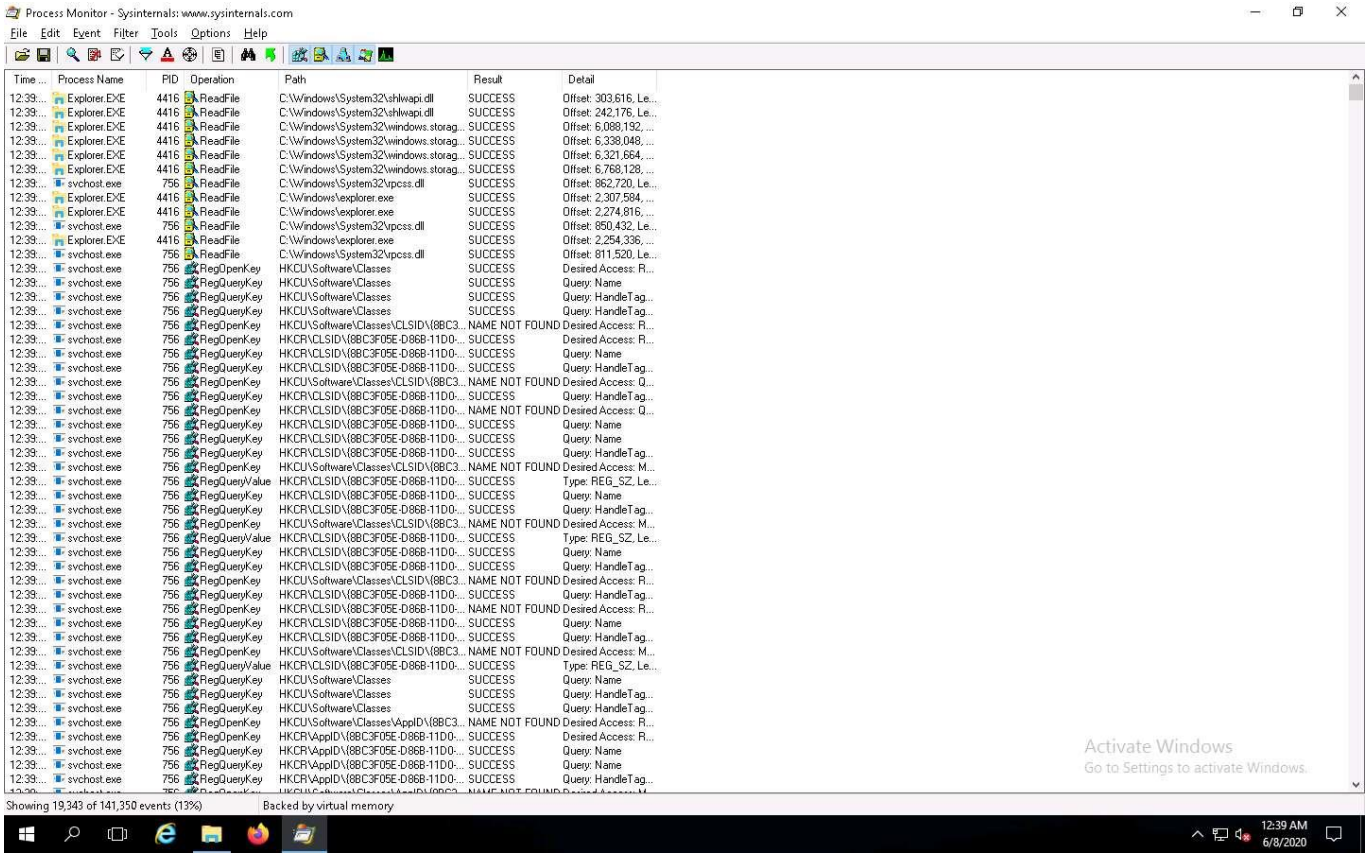
Process Monitor is a monitoring tool for Windows that shows the real-time file system, Registry, and process and thread activity. It combines the features of two legacy Sysinternals utilities, Filemon and Regmon. It adds an extensive list of enhancements including rich and non-destructive filtering, comprehensive event properties such session IDs and user names, reliable process information, full thread stacks with integrated symbol support for each operation, and simultaneous logging to a file. Unique features of Process Monitor make it a core utility in system troubleshooting and vital to the malware hunting toolkit.

Here, we will use the Process Monitor tool to detect suspicious processes.

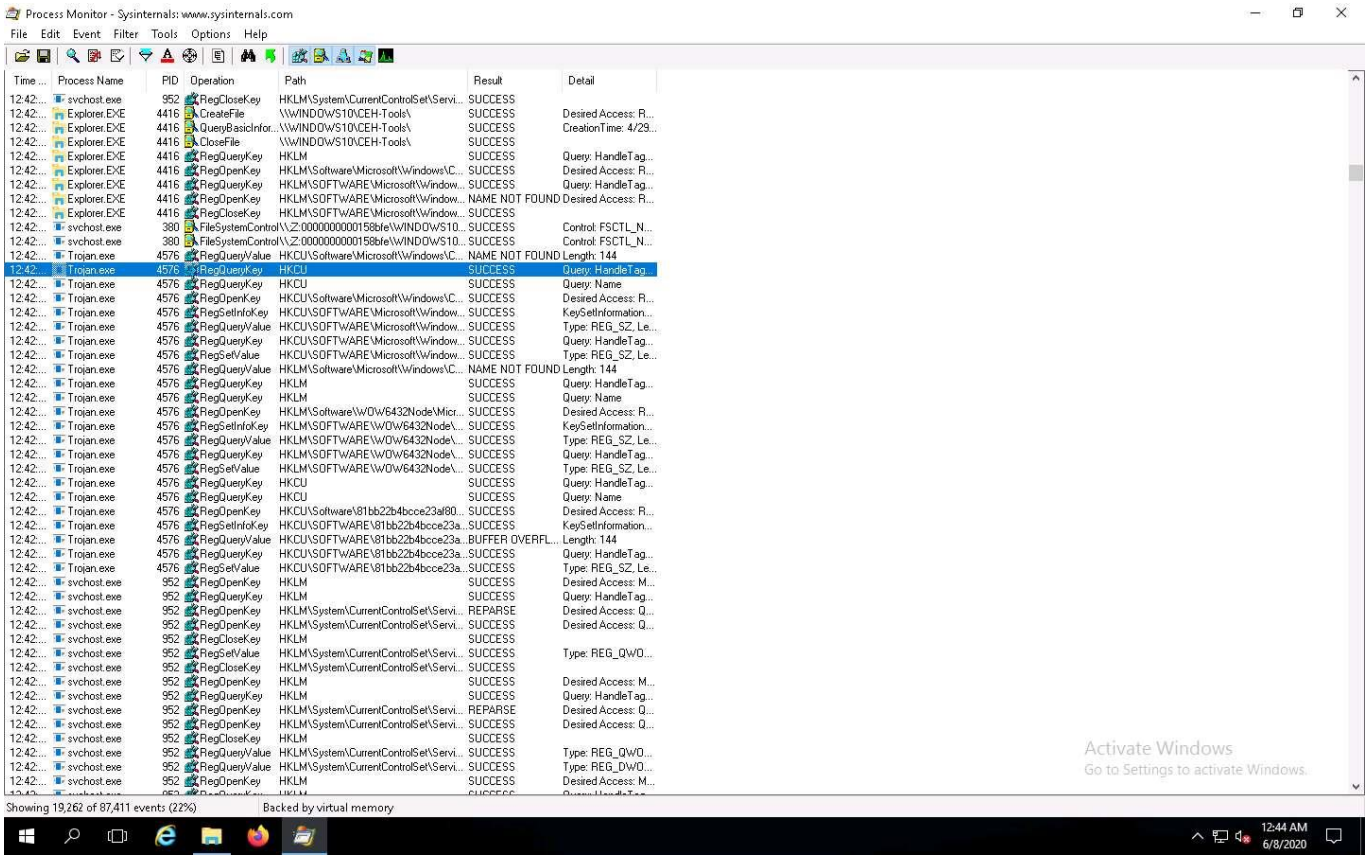
1. On the **Windows Server 2016** machine, navigate to **Z:\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Process Monitoring Tools\ProcessMonitor** and double-click **Procmon.exe** to launch the Process Monitor tool.



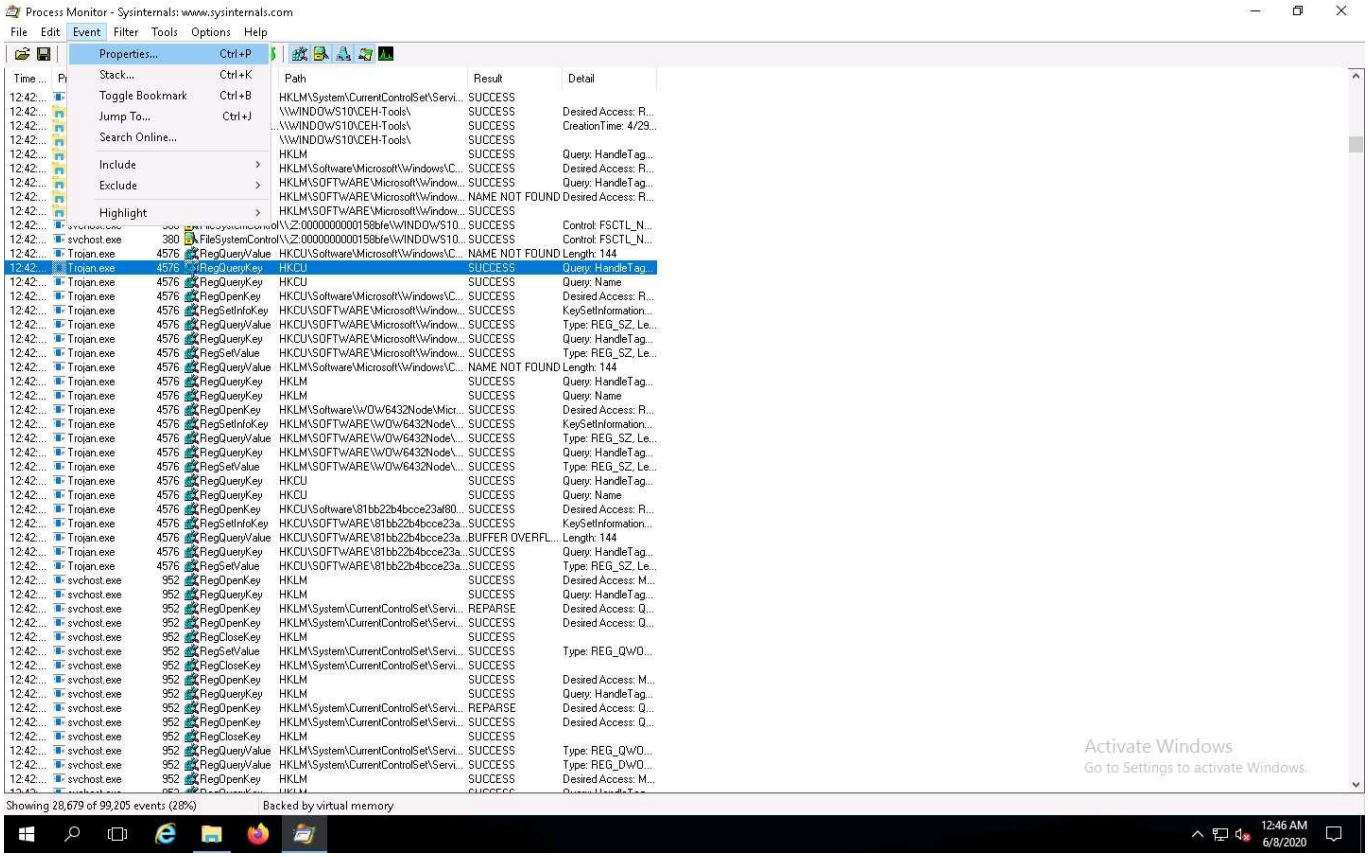
2. The **Process Monitor License Agreement** window appears; click **Agree**.
3. The **Process Monitor** main window appears, as shown in the screenshot, with the processes running on the machine.



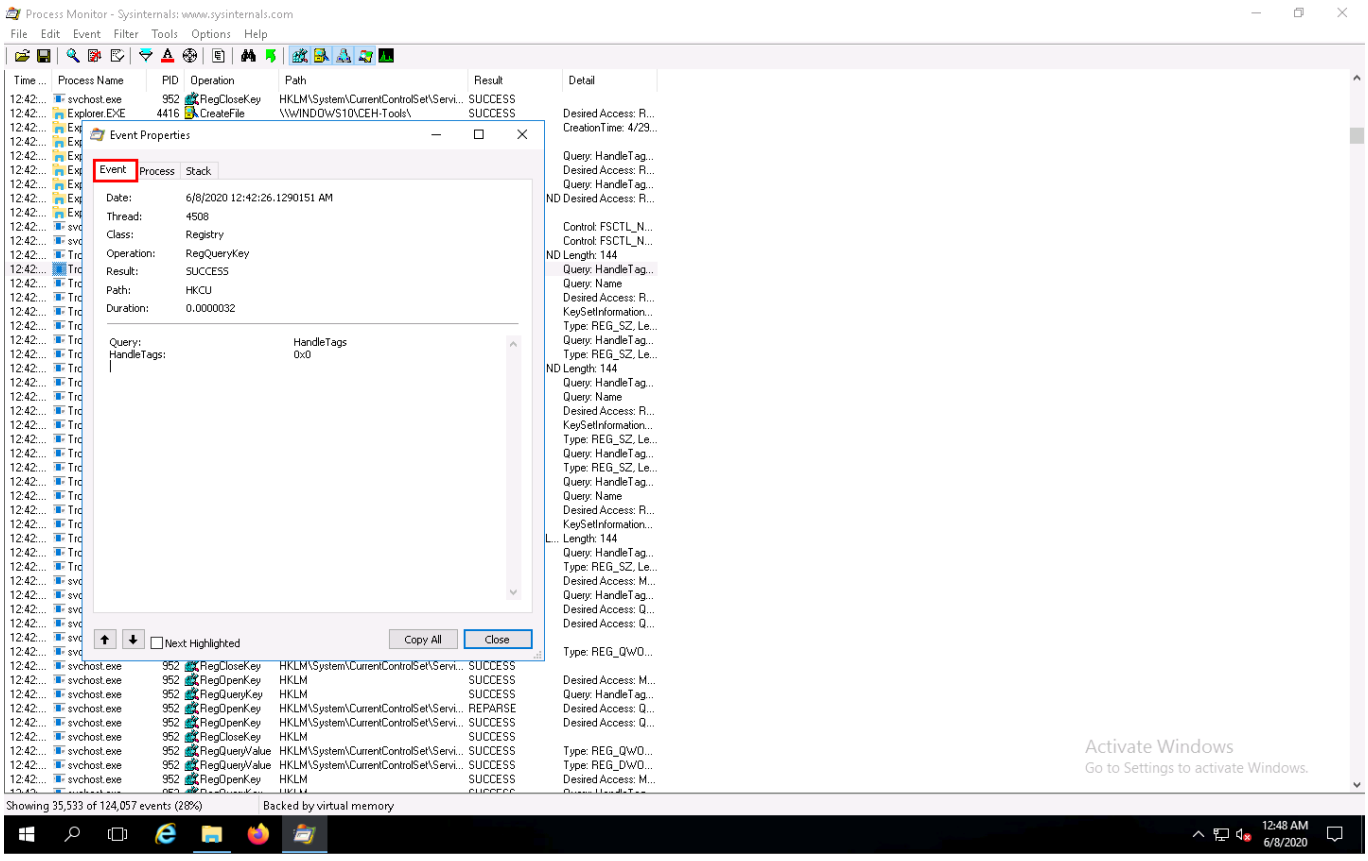
4. Look for the **Trojan.exe** process that was executed in the previous task. If you killed the process at the end of the task, then navigate to **Z:\CEHv11 Module 07 Malware Threats\Trojans Types\Remote Access Trojans (RAT)\njRAT** and double-click **Trojan.exe** to re-execute the malicious program.
5. Observe that the **Trojan.exe** process is running on the machine. Process Monitor shows the running process details such as the PID, Operation, Path, Result, and Details.



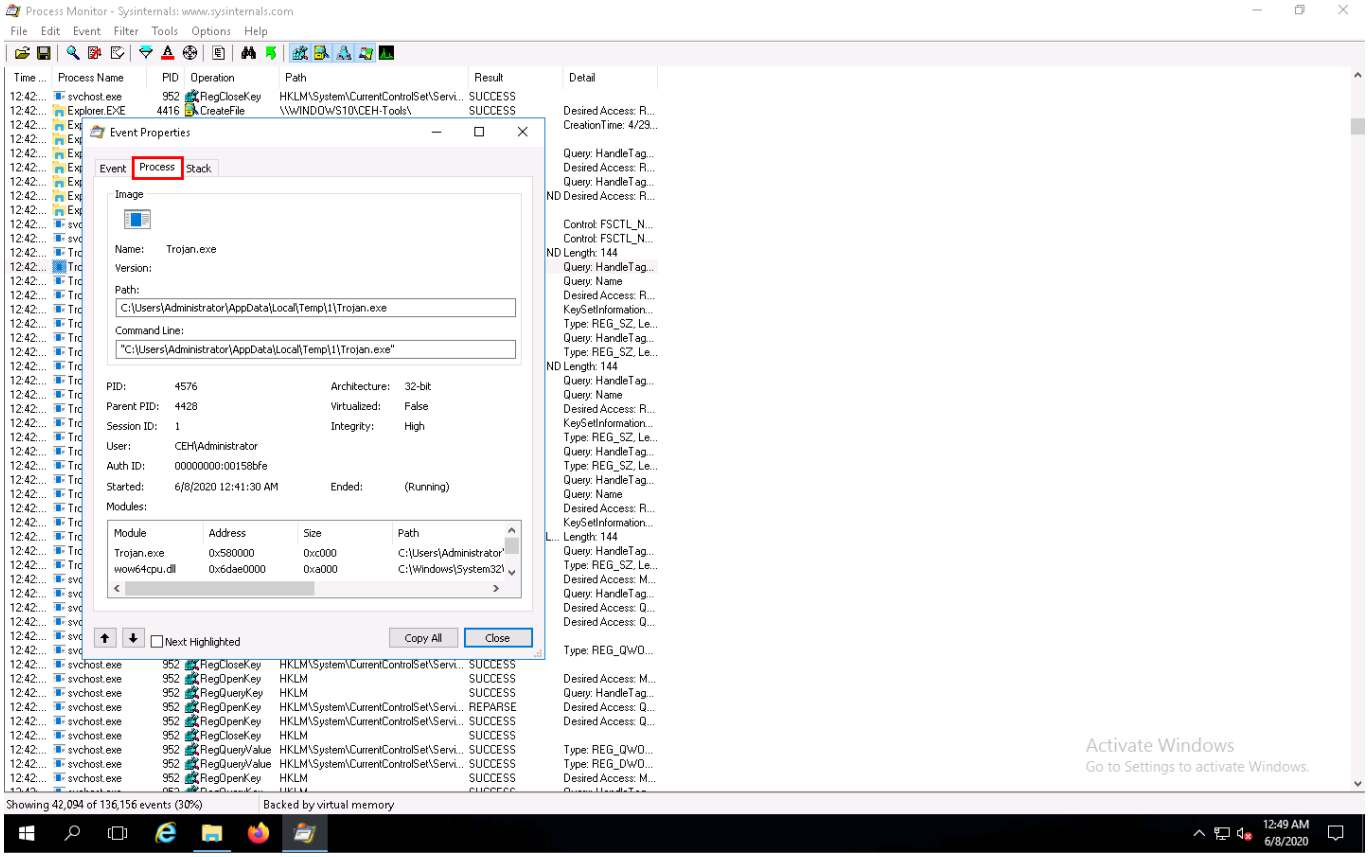
6. To view the properties of a running process, select the process (here, **Trojan.exe**), navigate to **Event**, and click **Properties** from the menu.



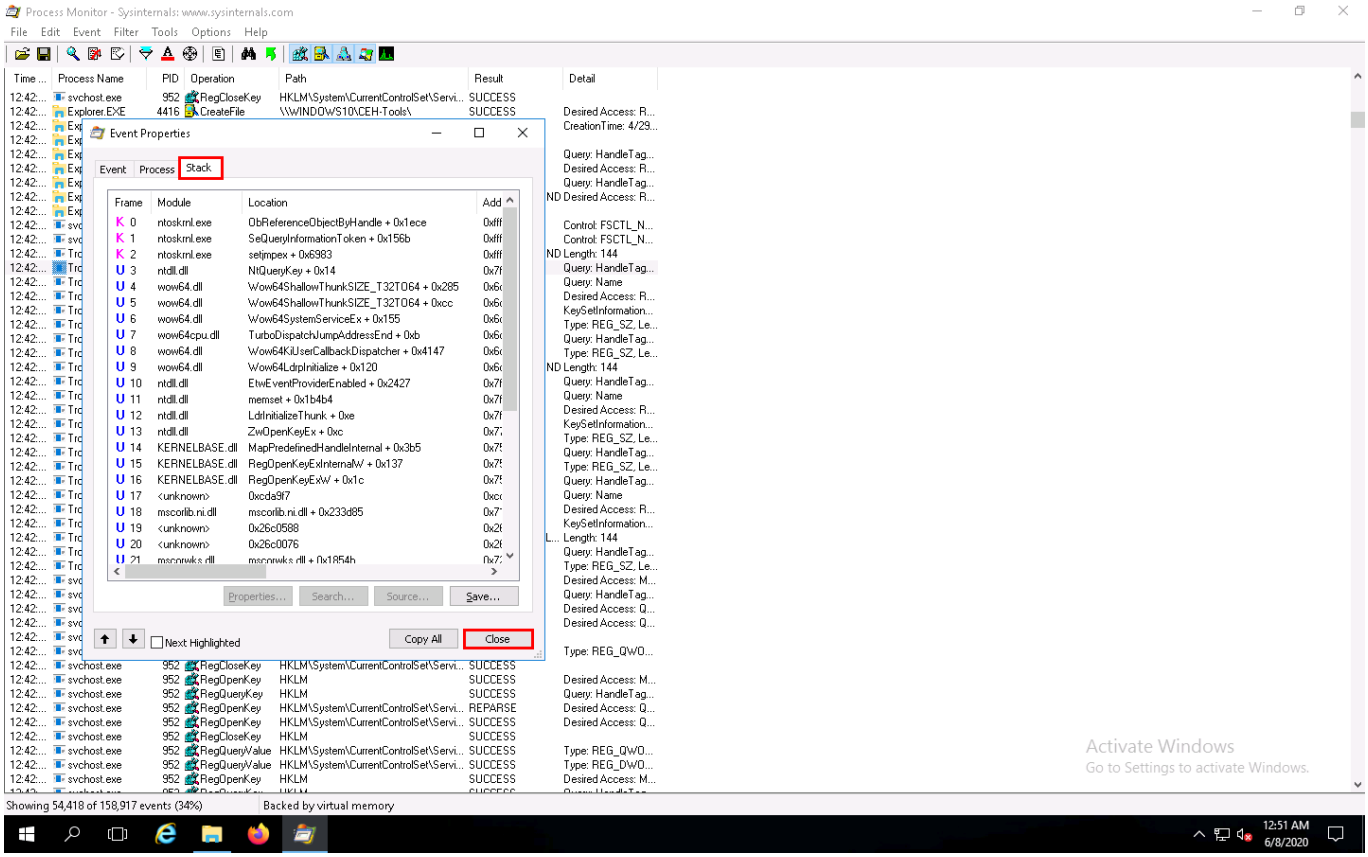
7. The **Event Properties** window appears with the details of the chosen process.
8. In the **Event** tab, you can see the complete details of the running process such as Date, Thread, Class, Operation, Result, Path, and Duration.



9. Once the analysis is complete, click the **Process** tab.
10. The **Process** tab shows the complete details of the process running, as shown in the screenshot.



11. Click the **Stack** tab to view the supported DLLs of the selected process. Once the analysis is done, click **Close**.



12. This way, you can analyze the processes running on a machine.
13. If a process is found to be suspicious, you may either kill the process or close the port.
14. Close all windows on the **Windows 10** and **Windows Server 2016** machines.
15. You can also use other process monitoring tools such as **Process Explorer** (https://docs.microsoft.com), **OpManager** (https://www.manageengine.com), **Monit** (https://mmonit.com), or **ESET SysInspector** (https://www.eset.com) to perform process monitoring.

Task 3: Perform Registry Monitoring using Regshot and jv16 PowerTools

The Windows registry stores OS and program configuration details such as settings and options. If the malware is a program, the registry stores its functionality. When an attacker installs a type of malware on the victim's machine, it generates a registry entry. One must have a fair knowledge of the Windows registry, its contents, and inner workings to analyze the presence of malware. Scanning for suspicious registries will help to detect malware. While most computer users generally do not do this, monitoring the registry entries is a great way to track any modifications made to your system.

Registry monitoring tools such as Regshot and jv16 PowerTools provide a simple way to perform the interesting task of tracking registry modifications, which proves to be useful in troubleshooting and monitoring background changes.

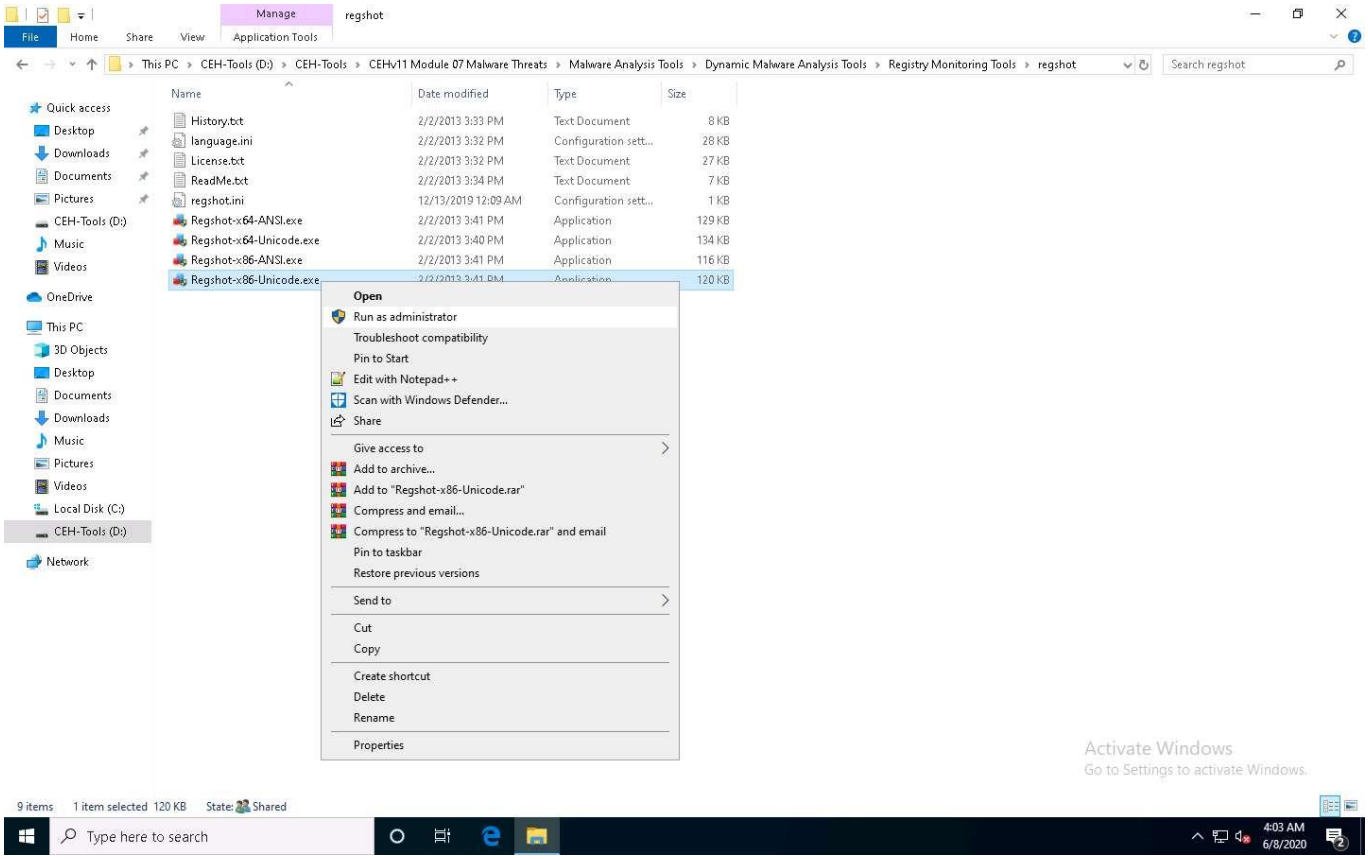
Regshot Regshot is a registry compare utility that helps to compare changes in registry entries after installing or uninstalling a program or manually modifying the registry. The purpose of this utility is to compare your registry at two separate points by taking a snapshot of the registry before and after any program or settings are added, removed, or otherwise modified.

jv16 PowerTools jv16 PowerTools is a PC system utility software that works by cleaning out unneeded files and data, cleaning the Windows registry, automatically fixing system errors, and applying optimization to your system. It allows the user to scan and monitor the Registry.

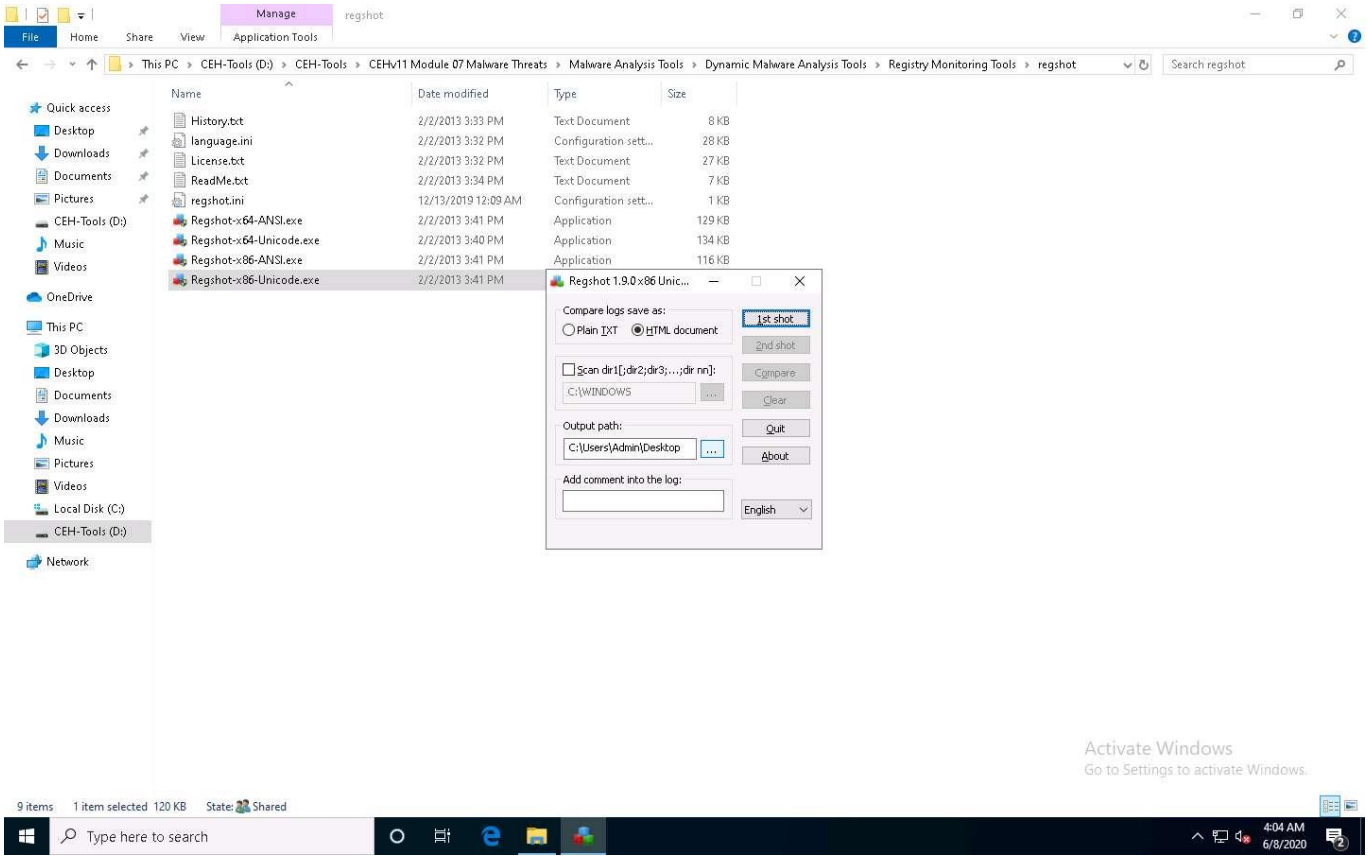
Further, jv16 helps in detecting registry entries created by malware. The "Clean and Speedup My Computer" feature of the Registry Cleaner in jv16 PowerTools is a solution for fixing registry errors and system errors, cleaning registry leftovers, as well as managing unneeded files such as old log files and temporary files.

Here, we will use the registry monitoring tools Regshot and jv16 PowerTools to scan the registry values for any suspicious entries that may indicate a malware infection.

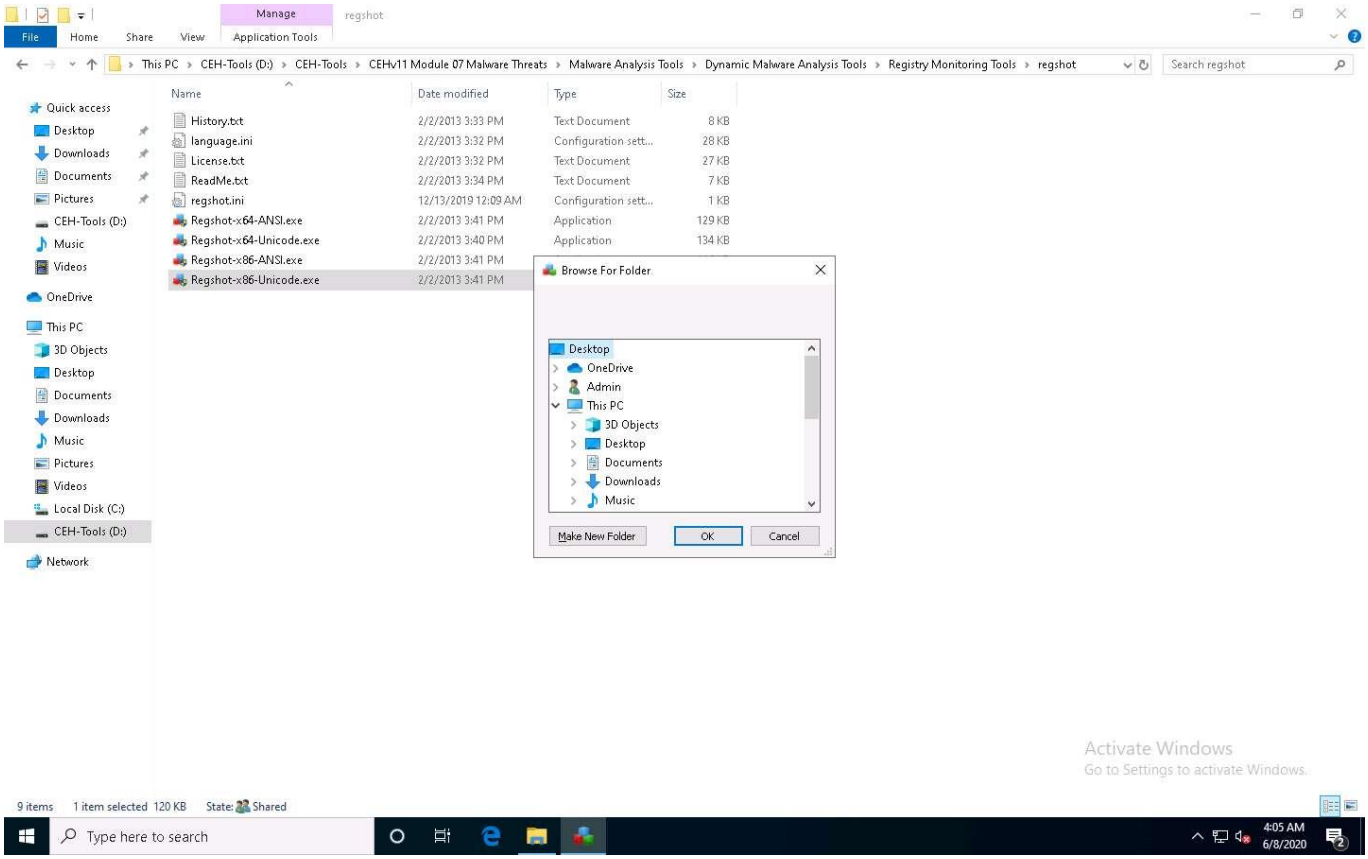
1. Click Windows 10 to switch to the **Windows 10** machine and navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Registry Monitoring Tools\regshot**. Right-click **Regshot-x86-Unicode.exe** and choose **Run as administrator** from the context menu, as shown in the screenshot.
2. If a **User Account Control** window appears, click **Yes**.



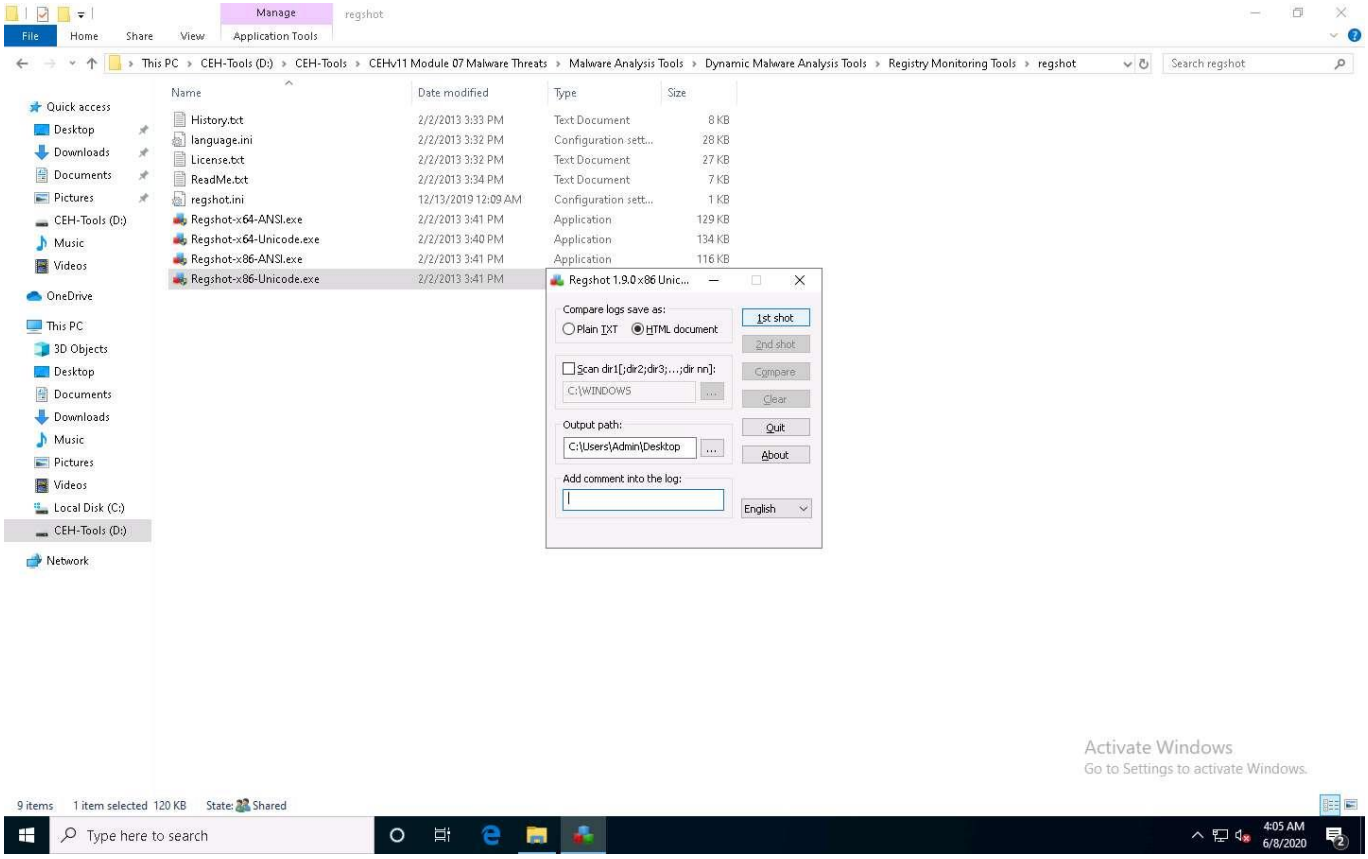
3. The **Regshot** application window opens, select the **HTML document** radio button, and in the **Output path** menu, click the ellipes button.



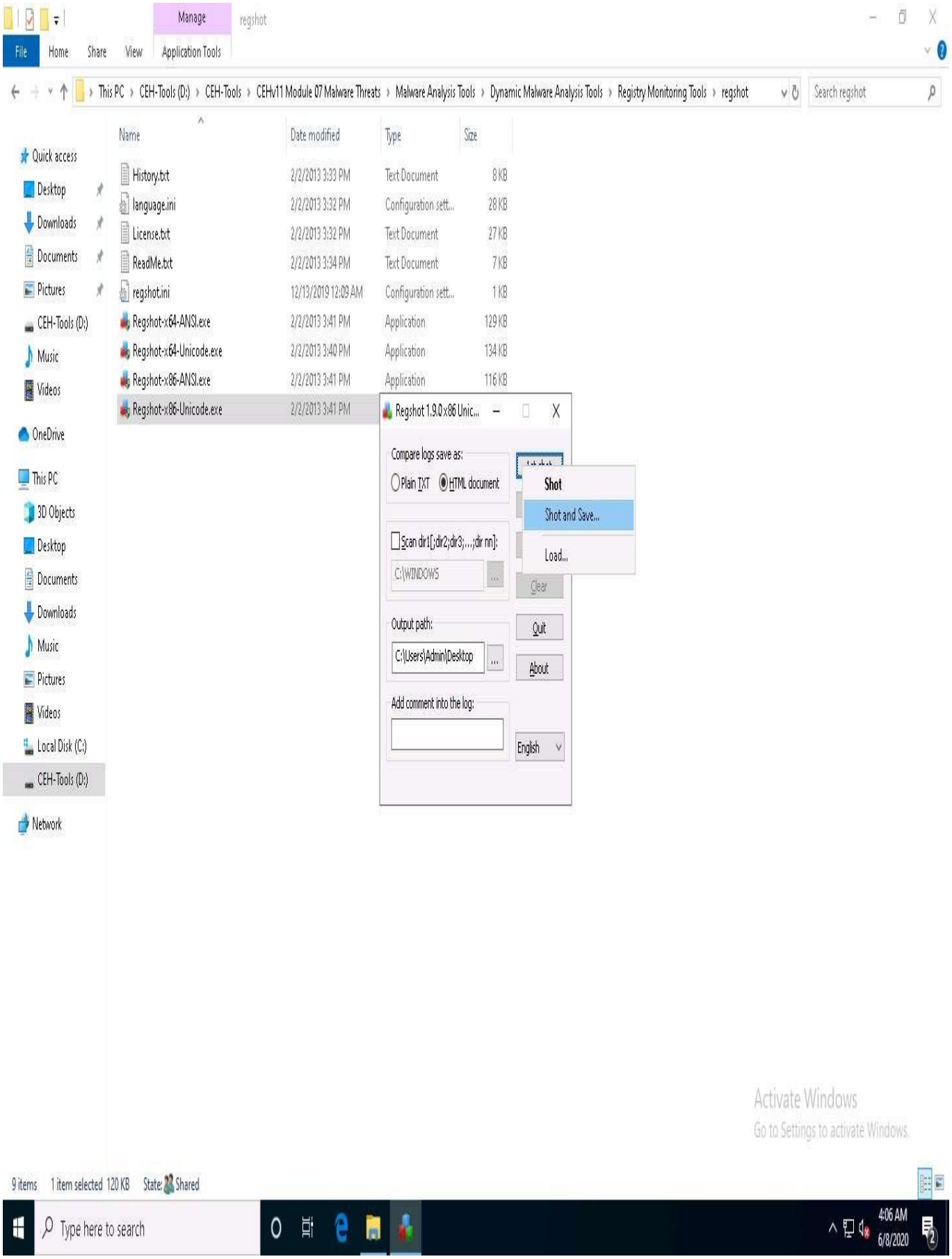
4. The **Browse For Folder** window appears; choose **Desktop**, and then click **OK**, as shown in the screenshot.



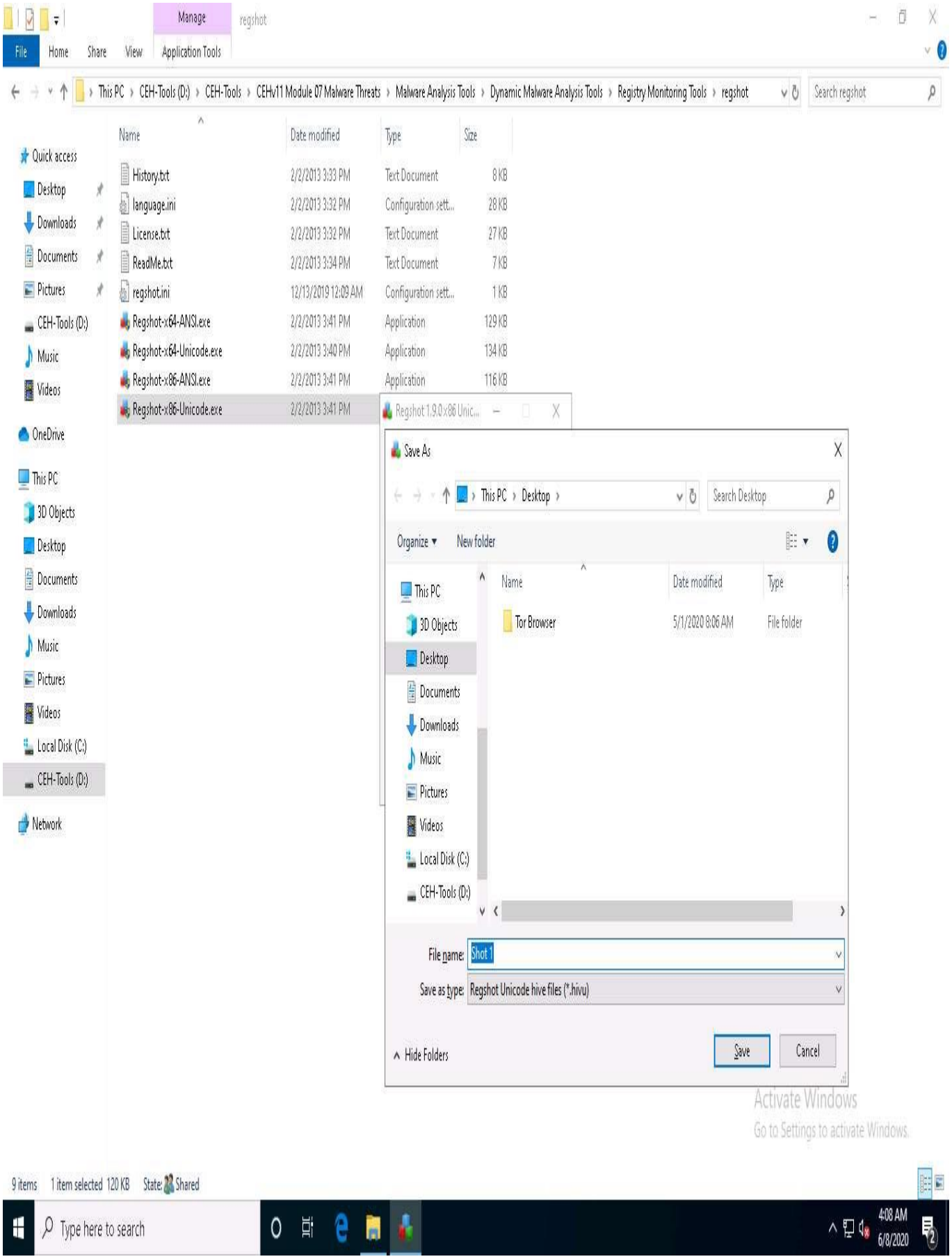
5. ☐ In Regshot's main window, click the **1st shot** button, as shown in the screenshot.



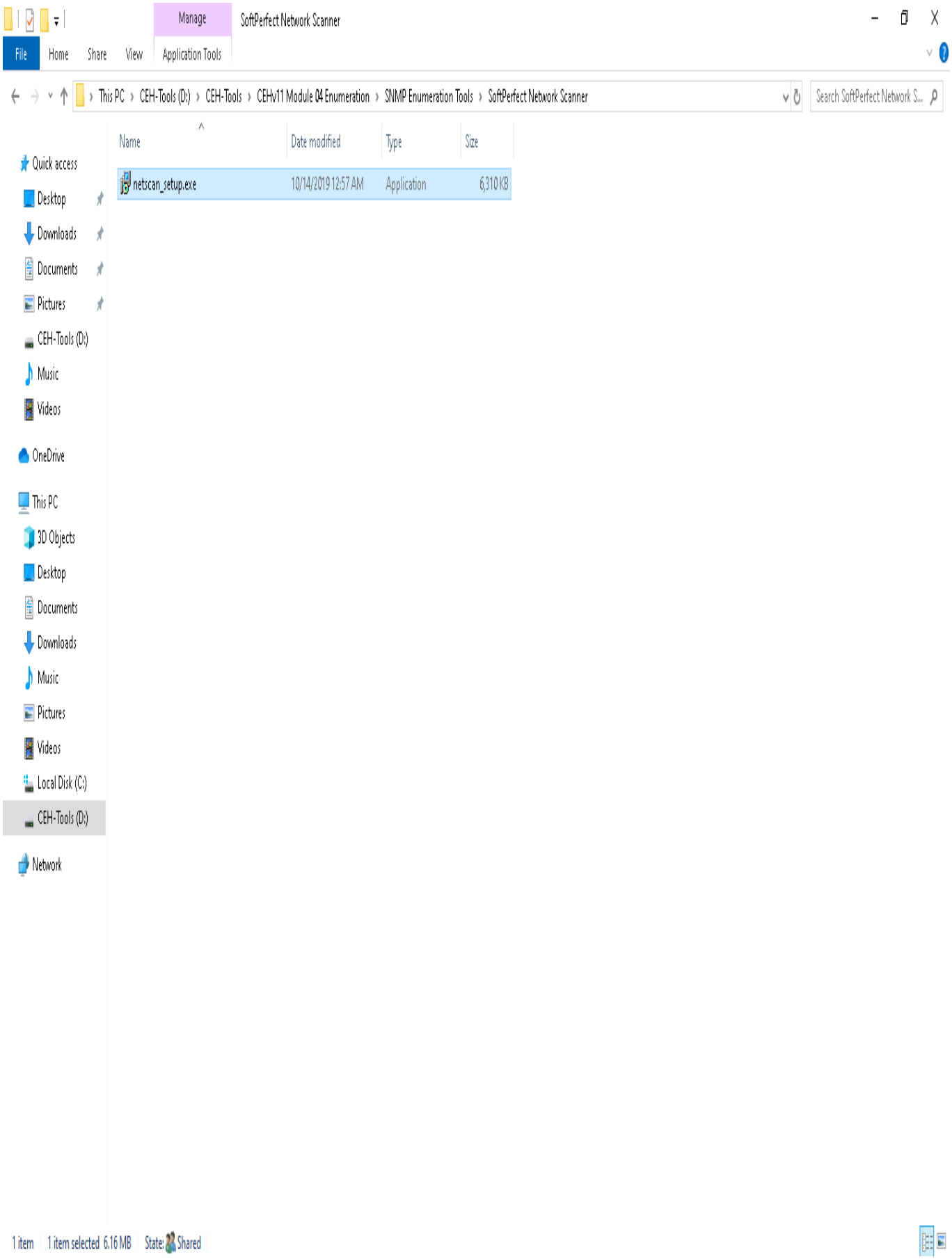
6. ☐ A context menu appears; click **Shot and Save...**.



7. ☐ The **Save As** window appears; enter the file name (here **Shot 1**) and set the location to **Desktop**. Then, click **Save**, as shown in the screenshot.

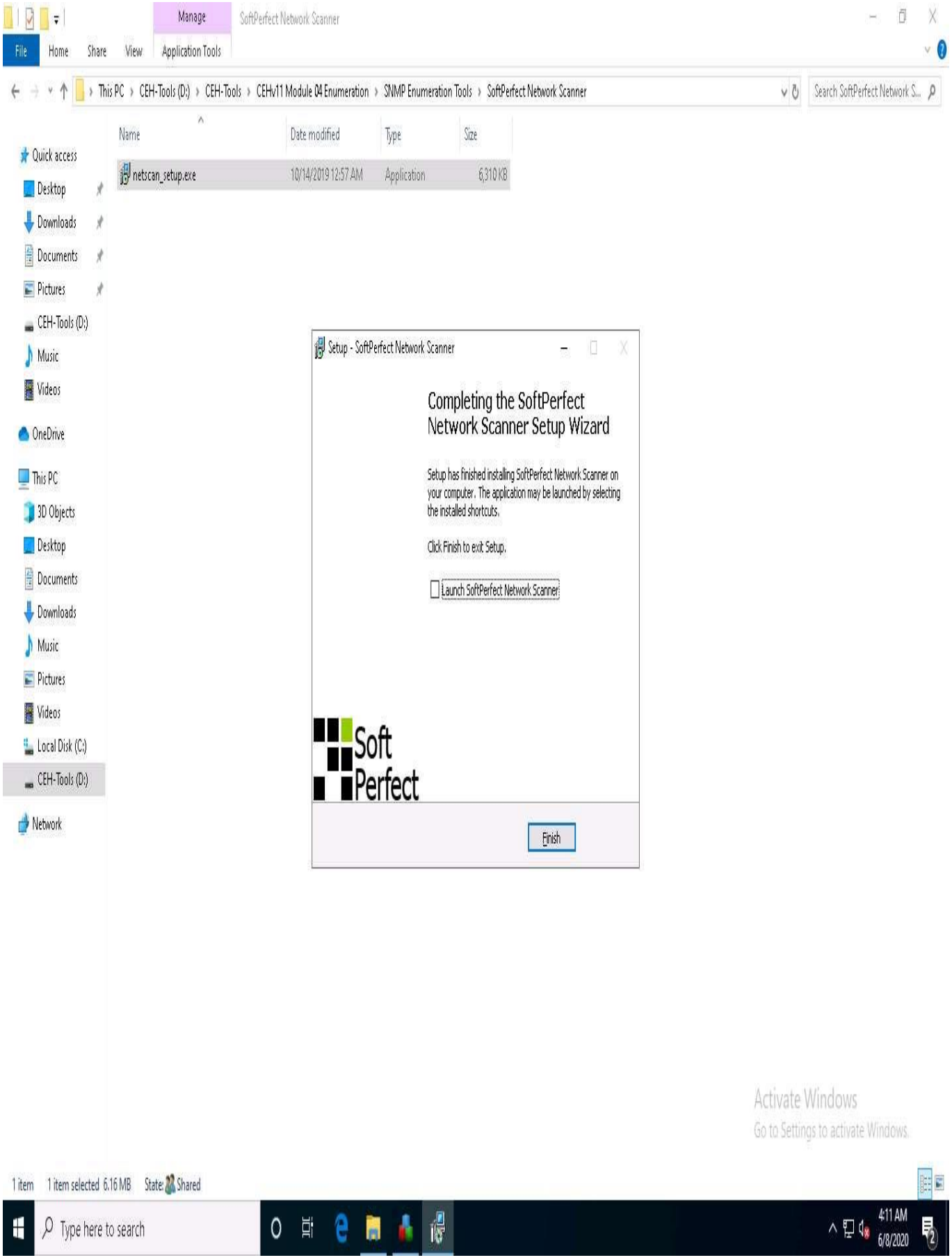


8. ☐ Now to demonstrate a change in the registry, install an application (here, **SoftPerfect Network Scanner**).
9. ☐ Navigate to **D:\CEH-Tools\CEHv11 Module 04 Enumeration\SNMP Enumeration Tools\SoftPerfect Network Scanner** and double-click **netscan_setup.exe**.



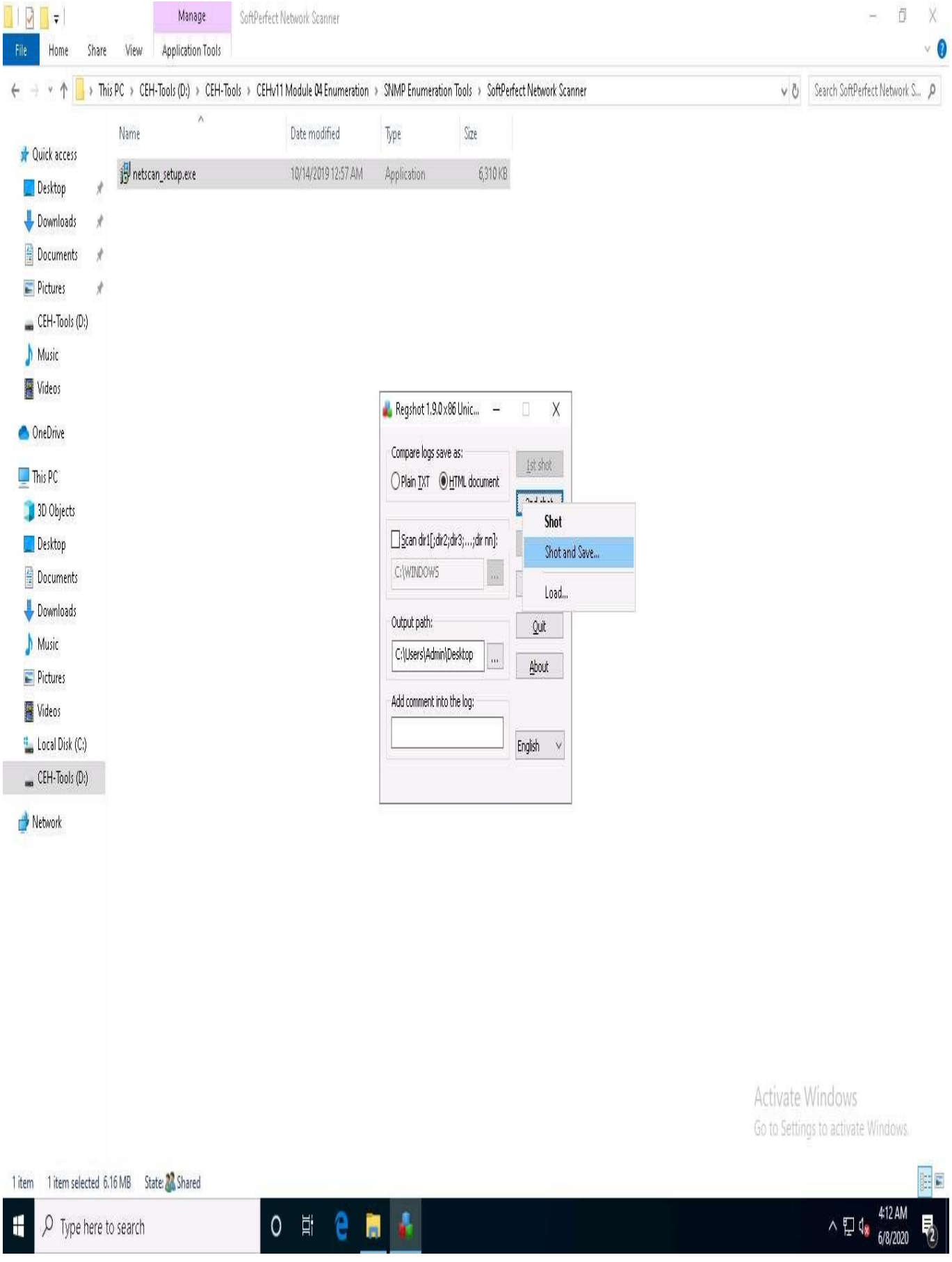
10. ☐ If a **User Account Control** window appears, click **Yes**.
11. ☐ Follow the wizard-driven installation steps to install the SoftPerfect Network Scanner.
12. ☐ Once the installation is complete, uncheck the **Launch SoftPerfect Network Scanner** option and click **Finish**.

You can install any application to view the changes in the registry. For demonstration purposes, we have installed the SoftPerfect Network Scanner.

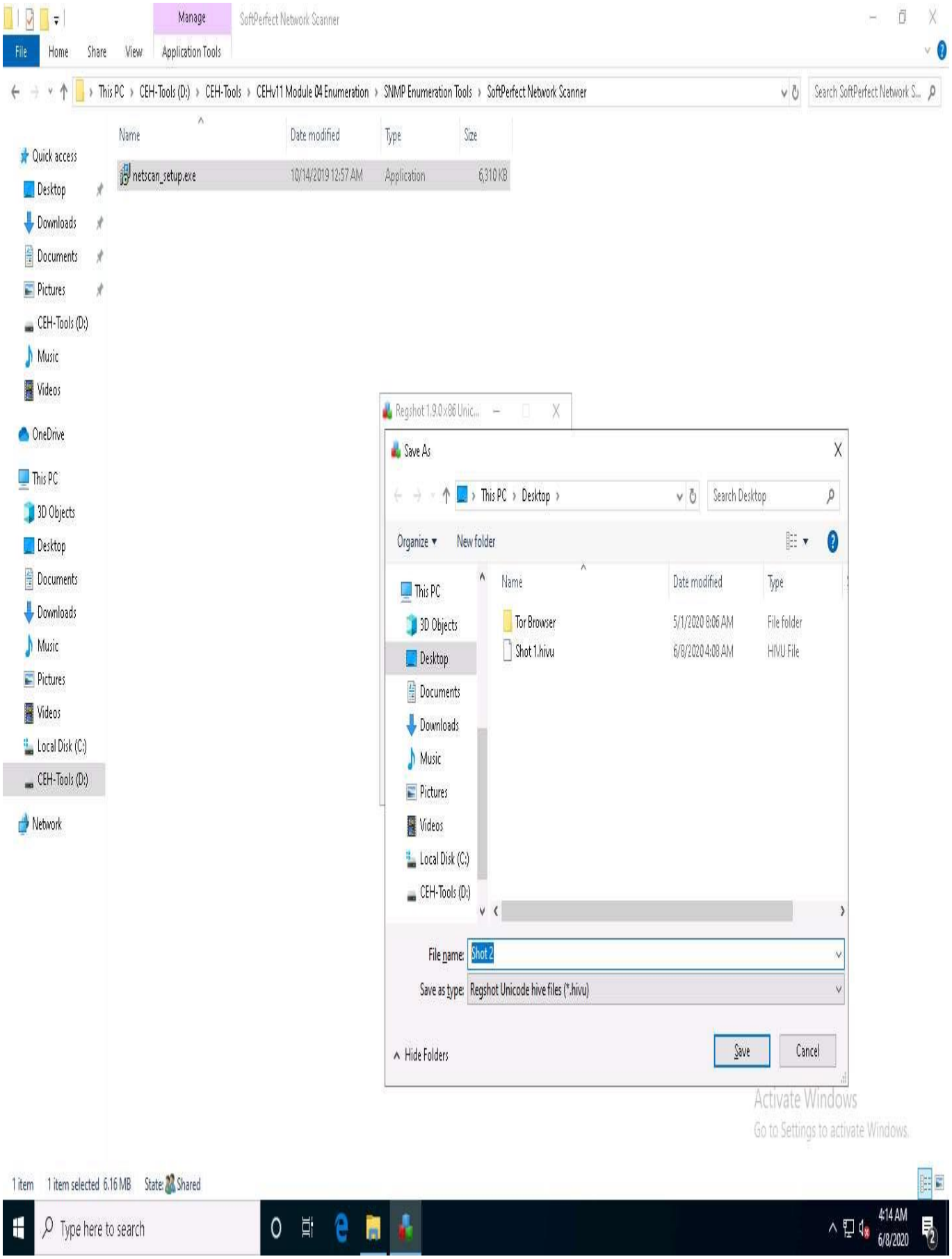


13. ☐ Switch to the **Regshot** application window; leave all settings to default, and click **2nd shot**.

14. A context menu appears; click **Shot and Save...**, as shown in the screenshot.

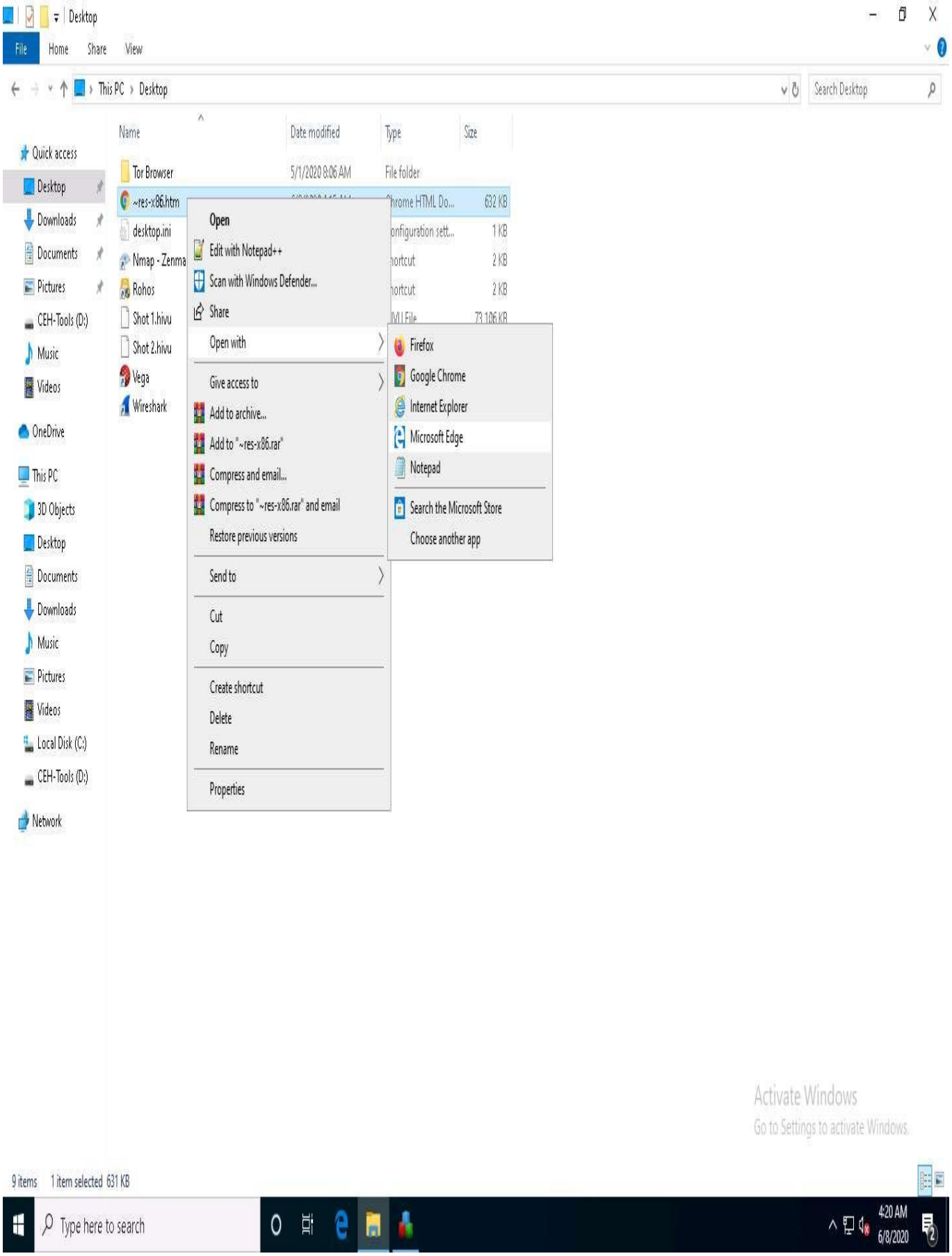


15. The **Save As** window appears; enter the file name (here **Shot 2**) and set the location to **Desktop**. Then, click **Save**, as shown in the screenshot.

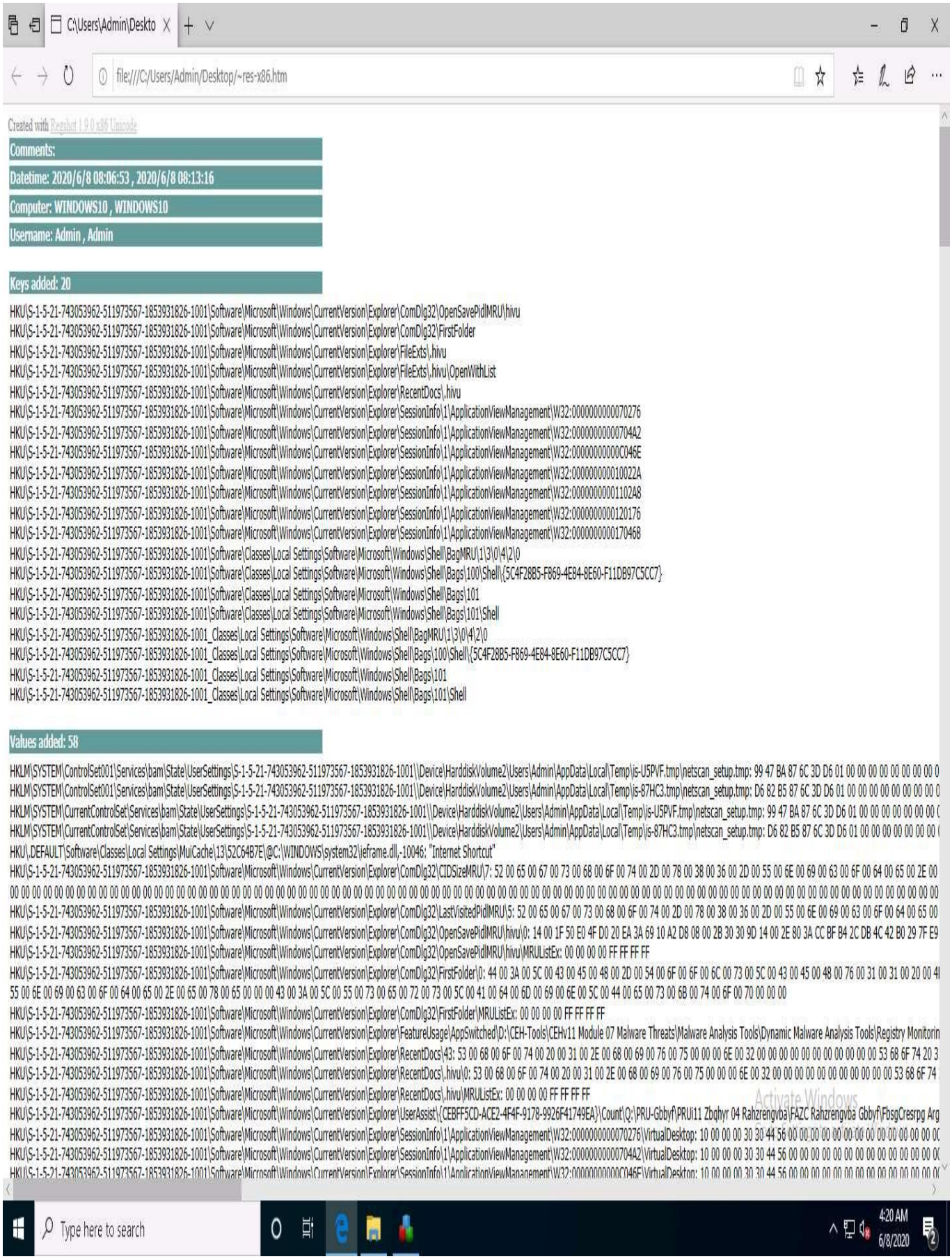


16. ☐ Now, return to the **Regshot** application window and click **Compare**, as shown in the screenshot.

17. ☐ The comparison of both shots opens in a default browser window (here, **Google Chrome**), close the browser.
18. ☐ Navigate to the **Desktop** right-click **~res-x86.htm**, navigate to **Open with** --> **Microsoft Edge**.

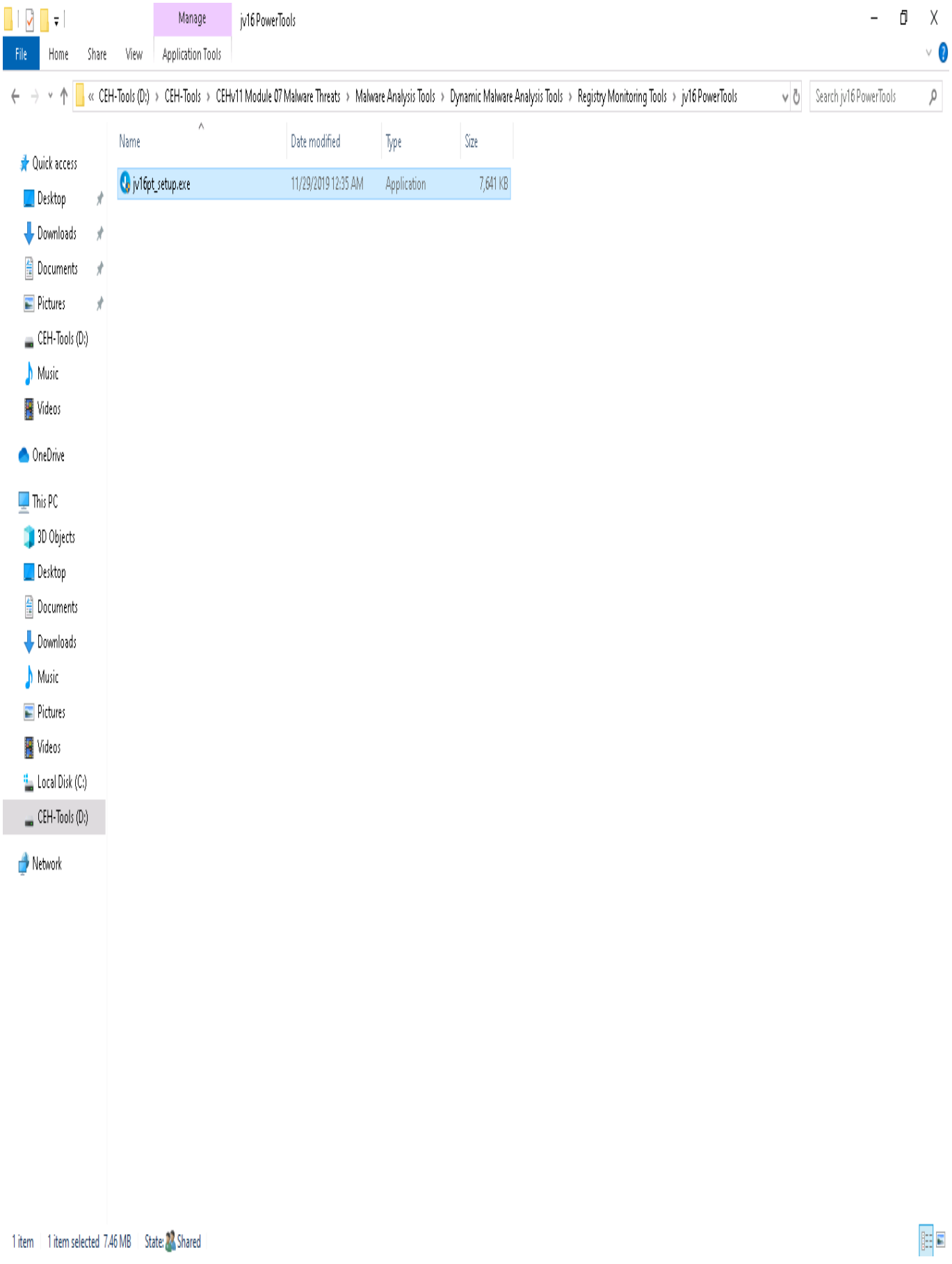


19. ☐ Observe the registry entries that have been modified by comparing the 1st and the 2nd shots, as shown in the screenshot.



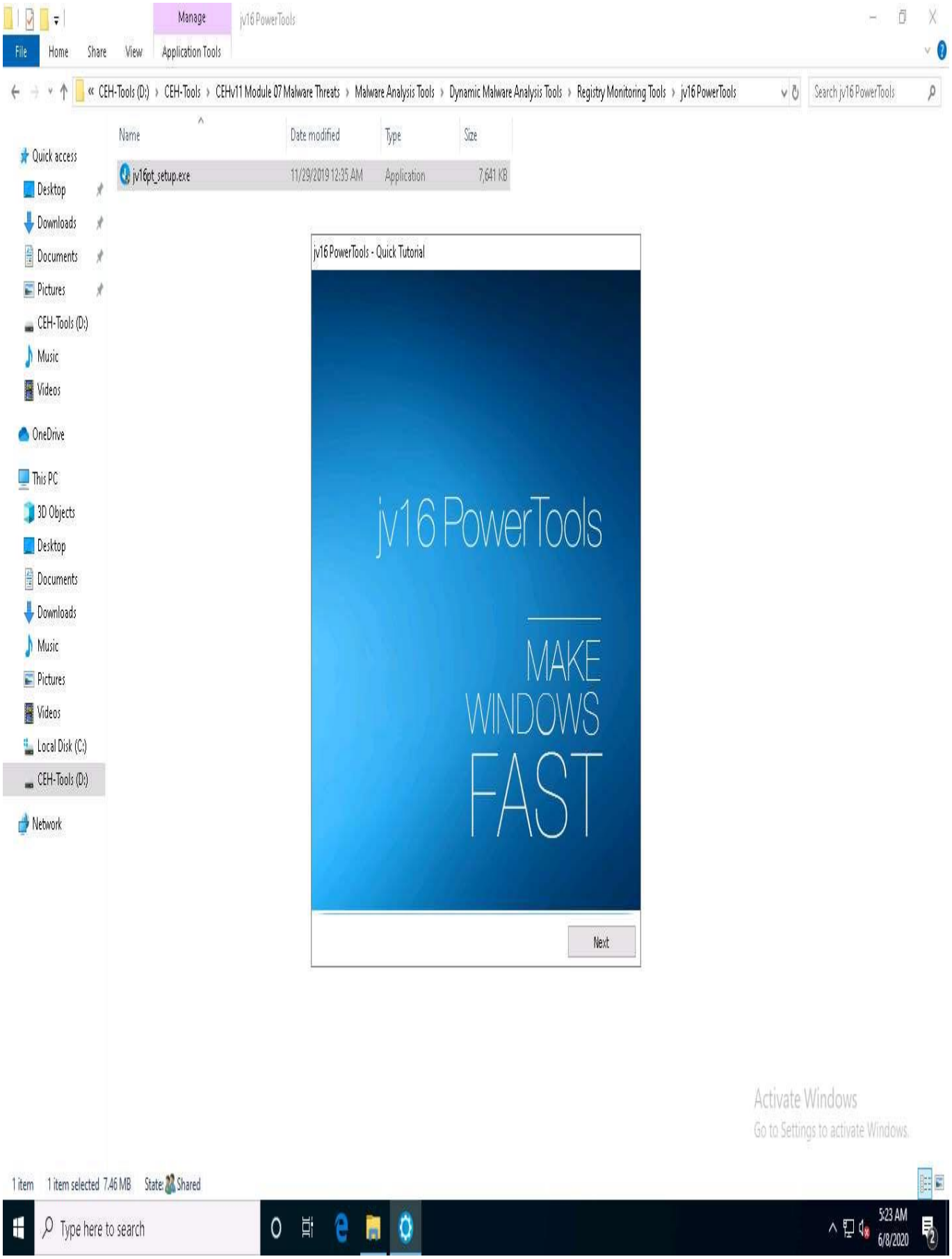
20. ☐ By examining modified registry entries in the result, you can find any unwanted registry entries on the machine and stop or delete them manually.
21. ☐ Close all open windows on the **Windows 10** machine.
22. ☐ Now, we will perform an intensive scan for unwanted resources using jv16 PowerTools.

23. On the **Windows 10** machine, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Registry Monitoring Tools\jv16 PowerTools** and double-click **jv16pt_setup.exe**.

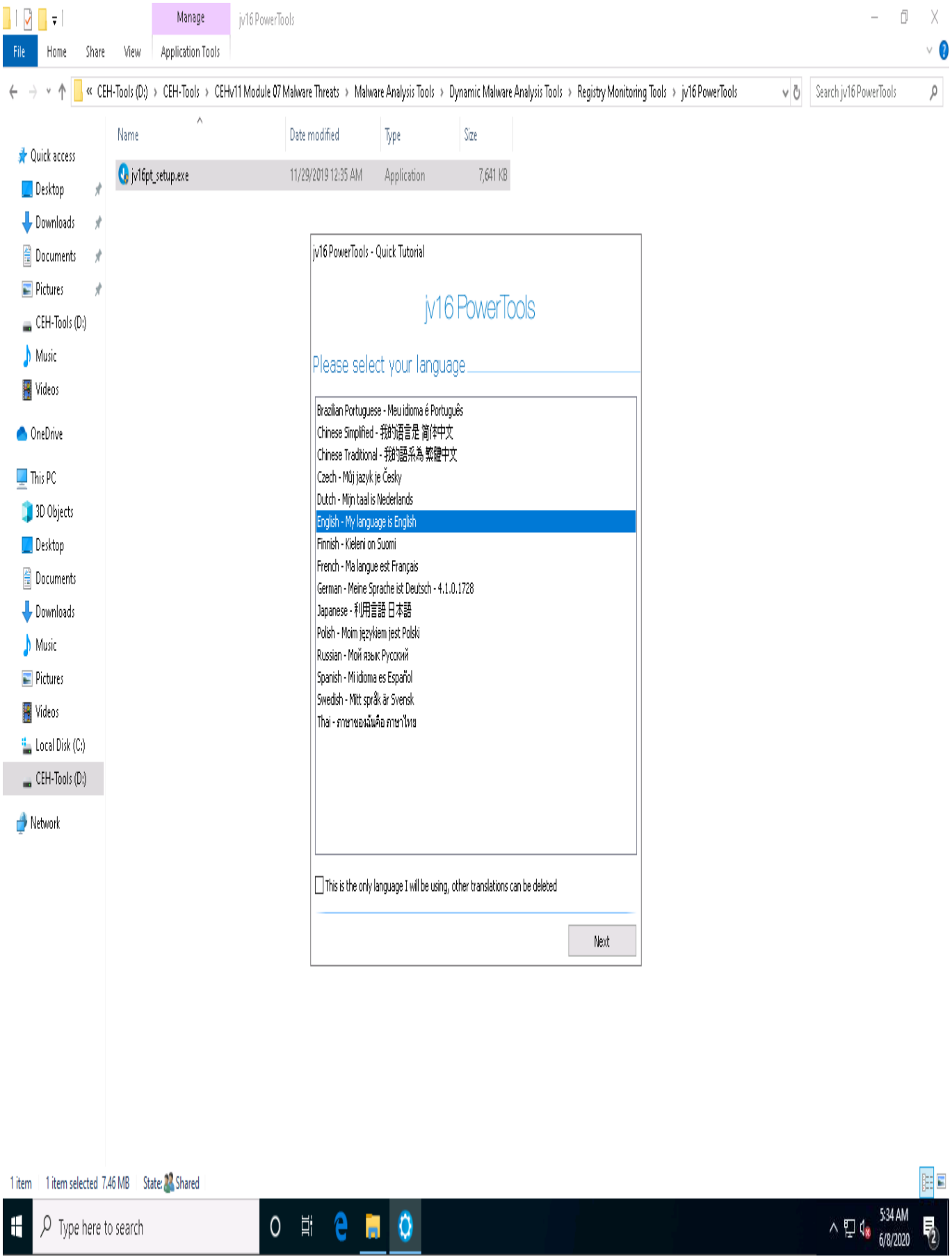


24. ☐ If the **User Account Control** window appears, click **Yes**.
25. ☐ Follow the wizard-driven installation steps to install jv16 Power Tools.
26. ☐ The **jv16 PowerTools Quick Tutorial** window appears; click **Next**.

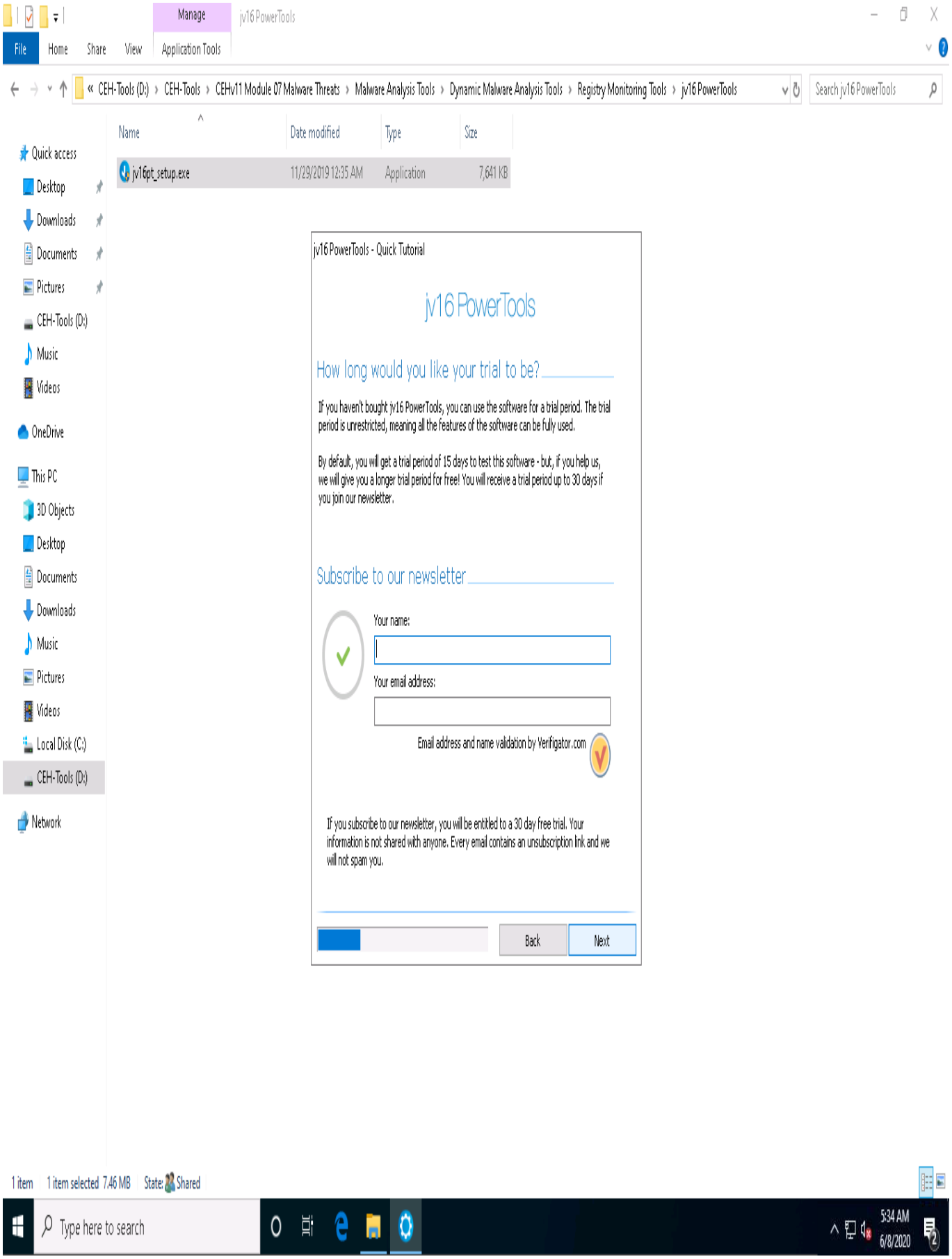
If the **jv16 PowerTools Quick Tutorial** window does not appear, then double-click the **jv16 PowerTools** short-cut icon on **Desktop** to launch the application.



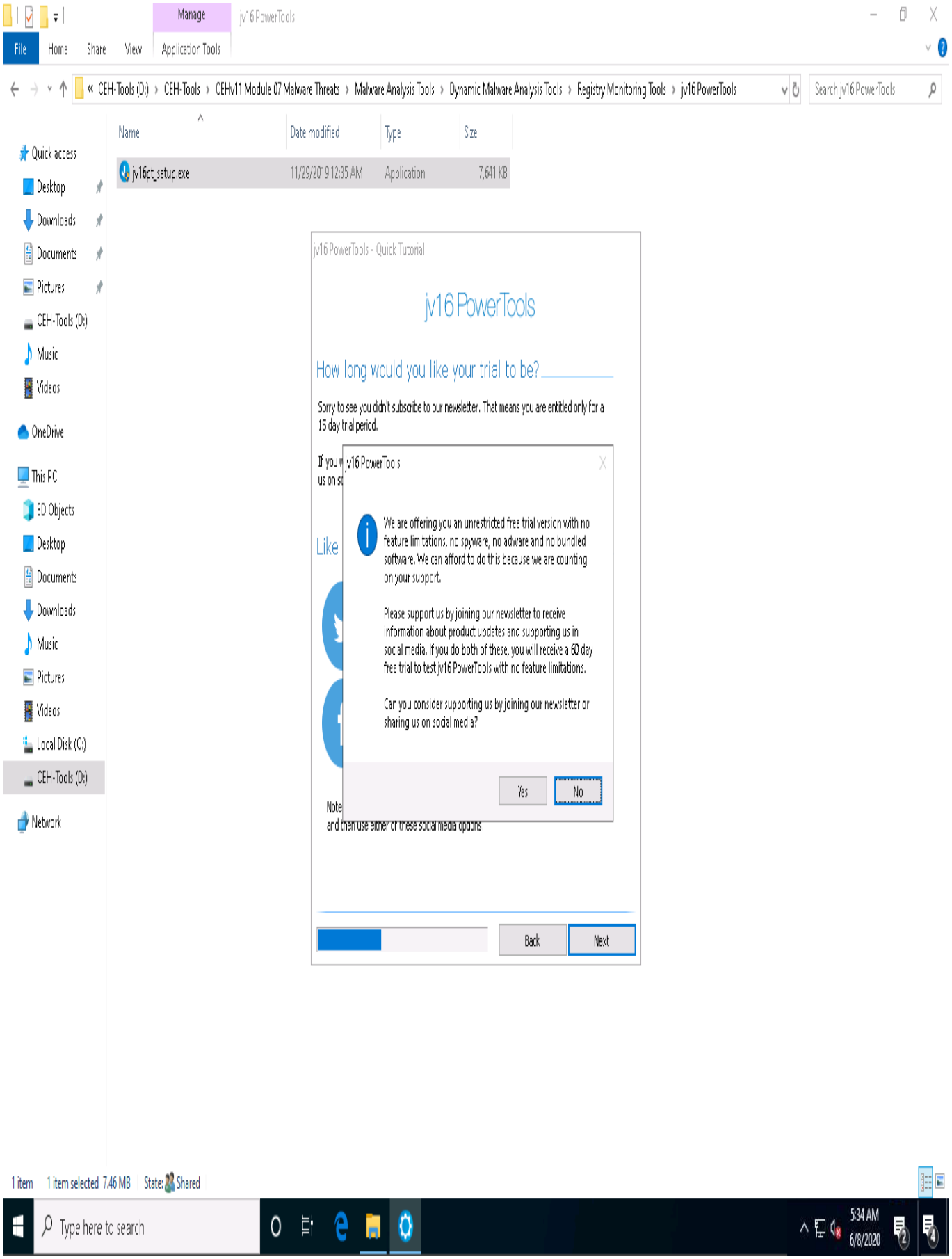
27. ☐ In the **Please select your language** wizard, choose a language (here, **English**) and click **Next**.



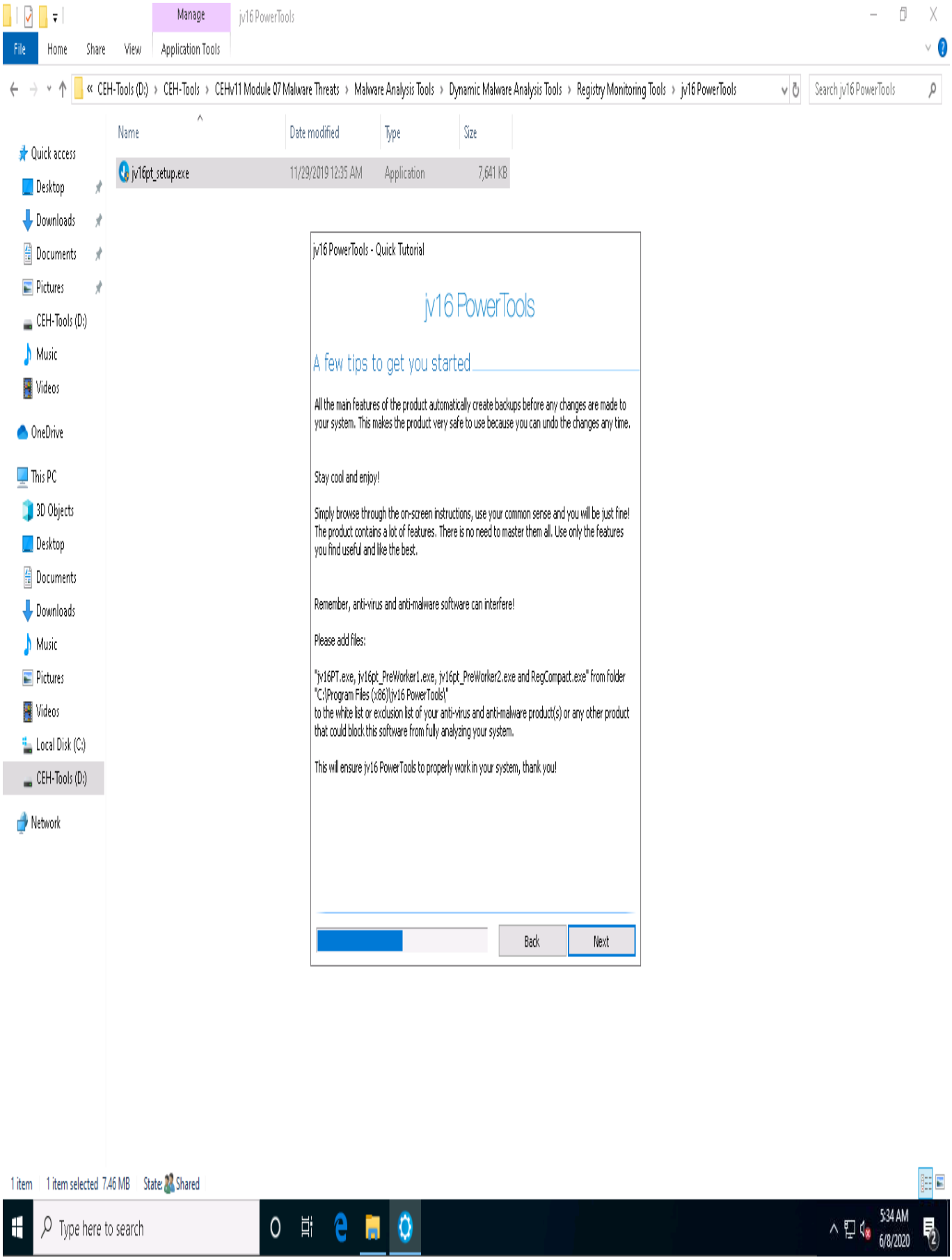
28. ☐ The **How long would you like your trial to be?** wizard appears; leave the fields blank and click **Next**.



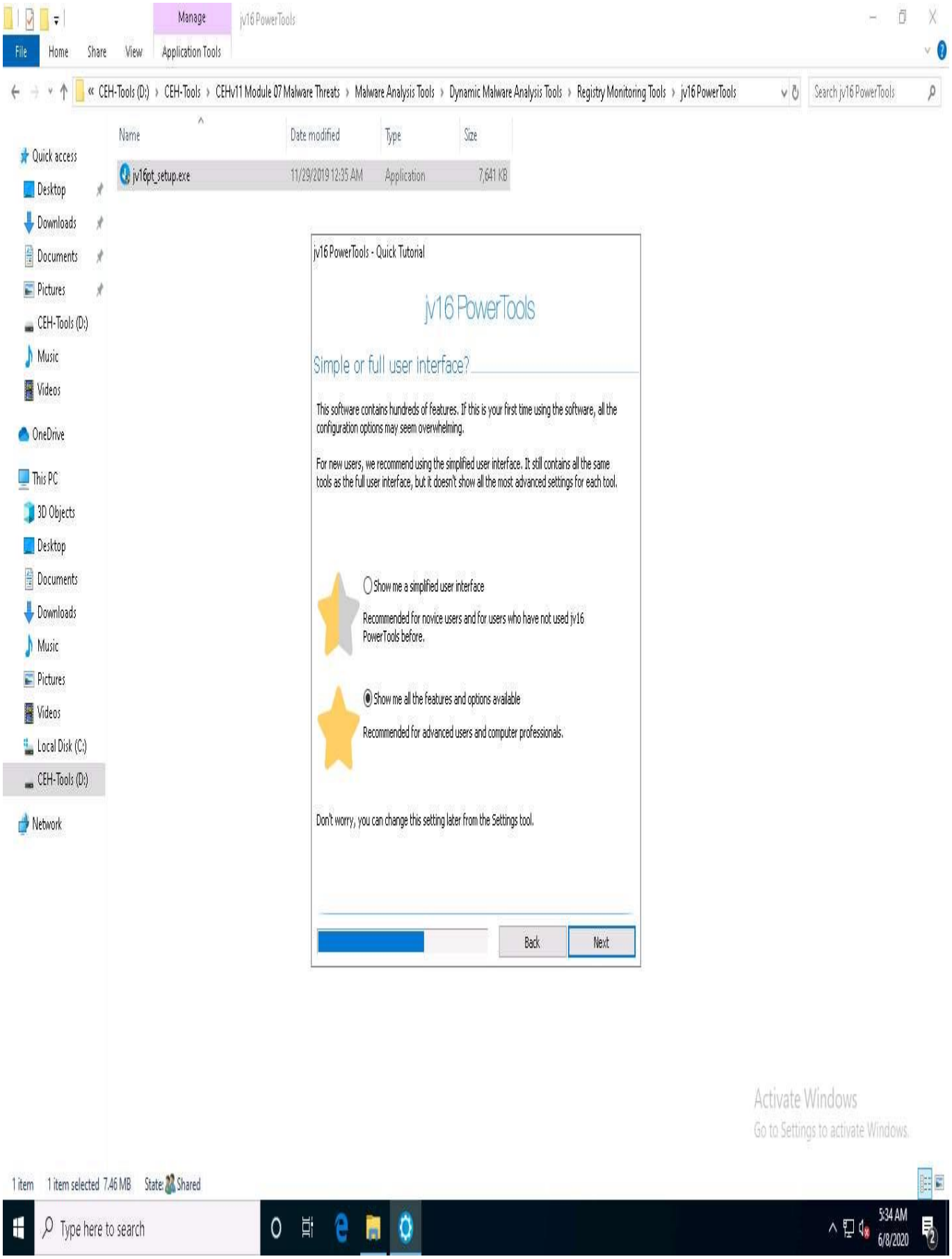
29. ☐ In the next **How long would you like your trial to be?** wizard screen, leave the fields blank and click **Next**.
30. ☐ The **jv16 PowerTools** pop-up appears; click **No**.



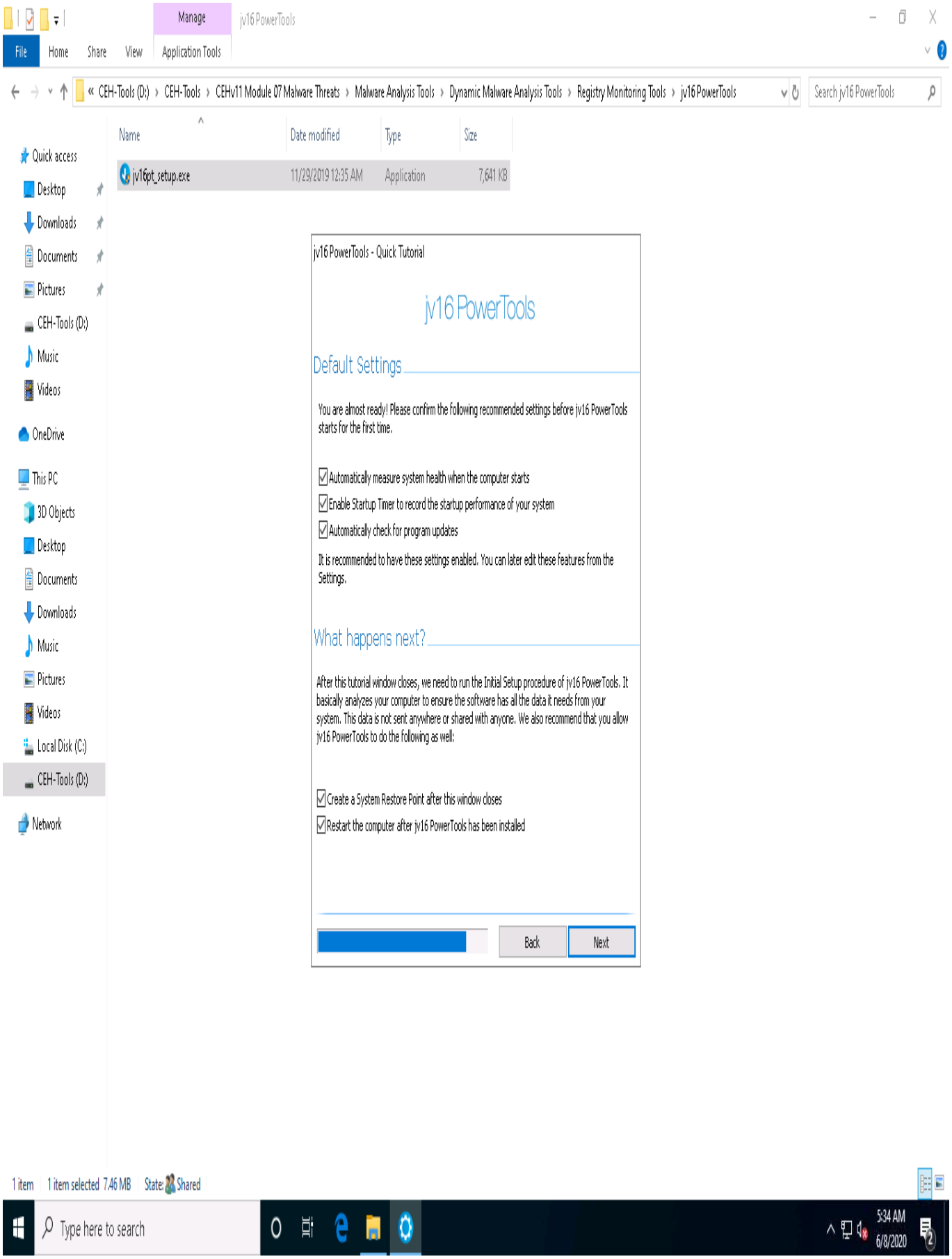
31. ☐ The **A few tips to get you started** wizard appears; click **Next**.



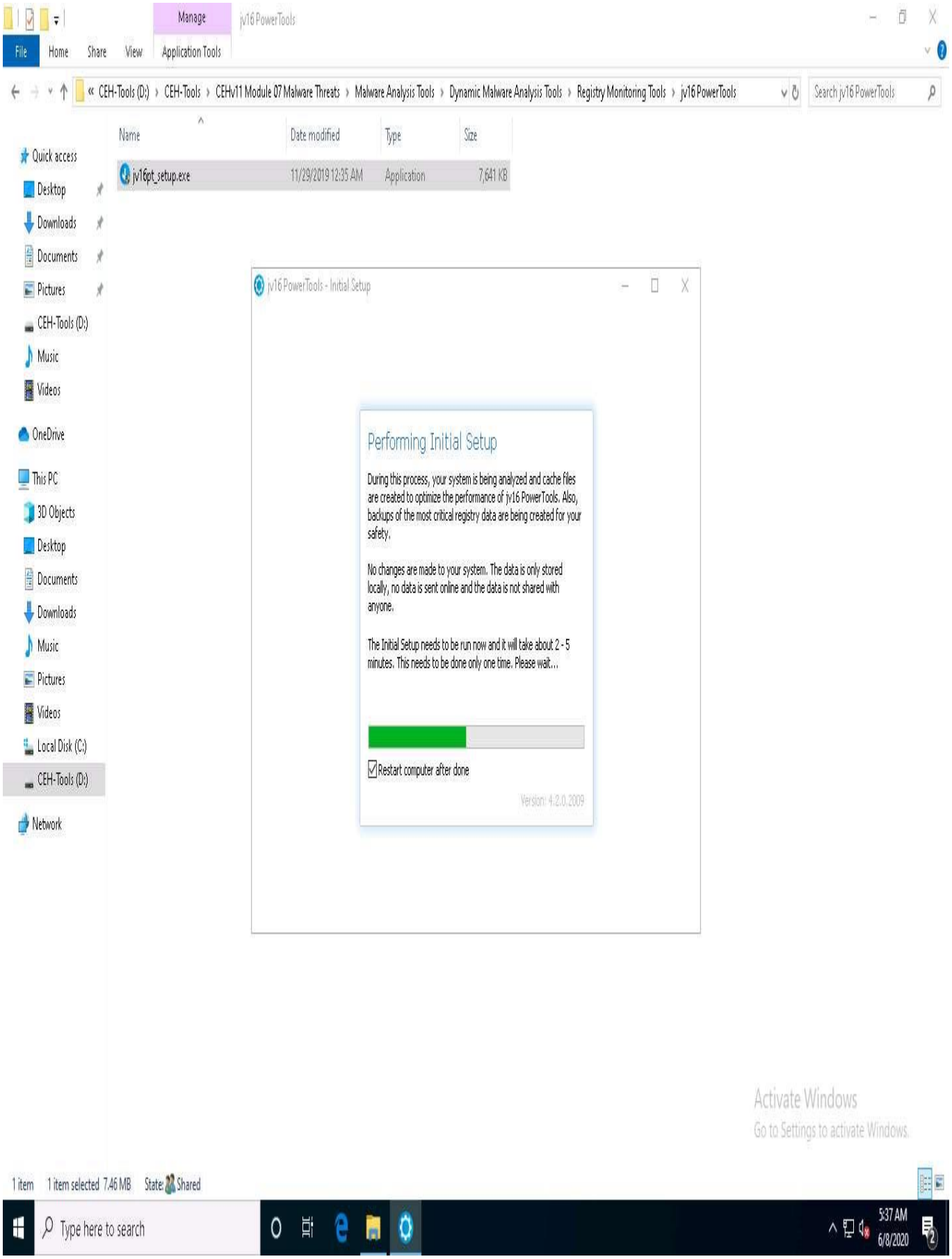
32. ☐ The **Simple or full user interface** wizard appears; choose the **Show me all the features and options available** radio button, and then click **Next**.



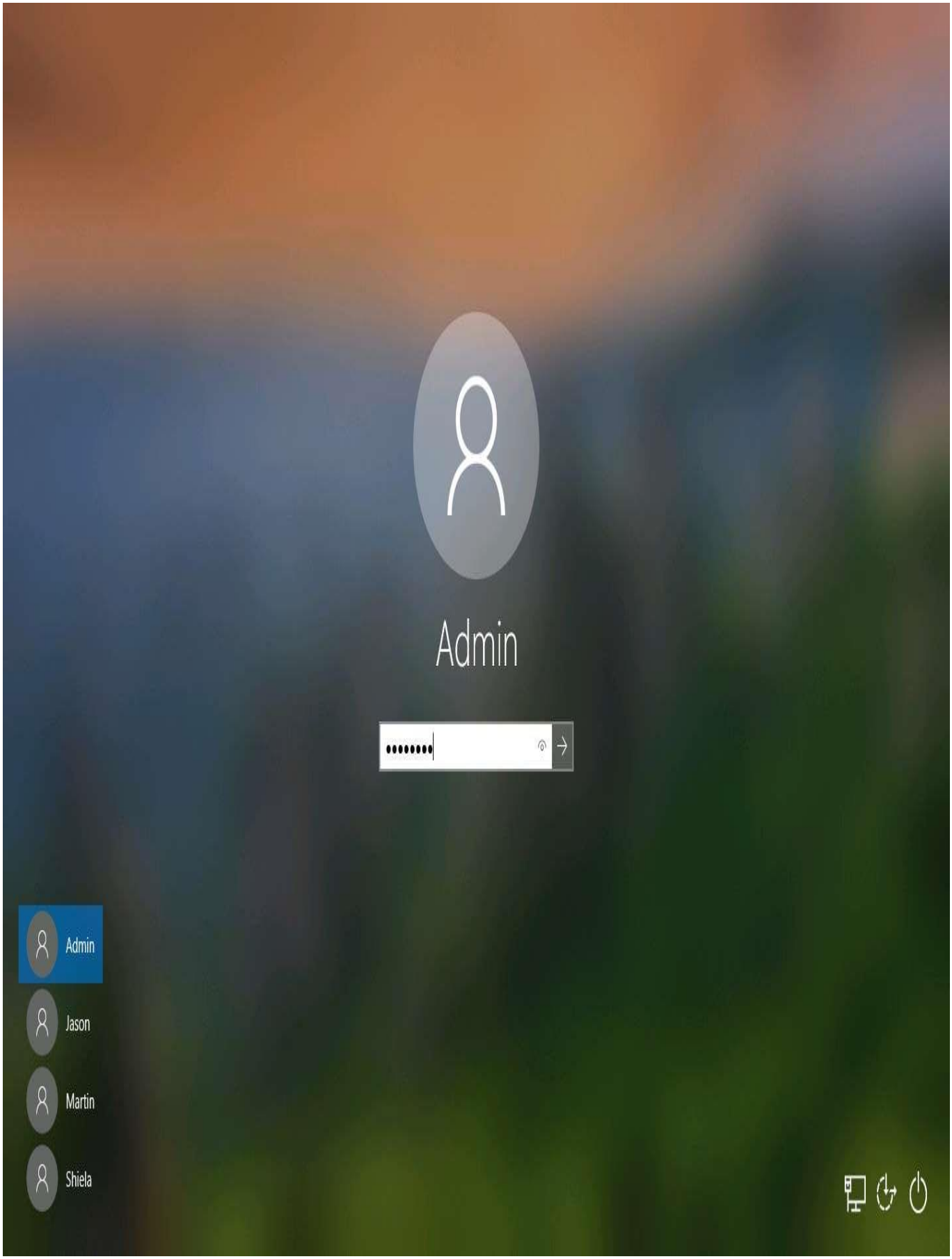
33. ☐ Click **Next** in the **Global Ignore List** wizard.
34. ☐ In the **Default Settings** wizard, leave all settings set to default, and then click **Next**.



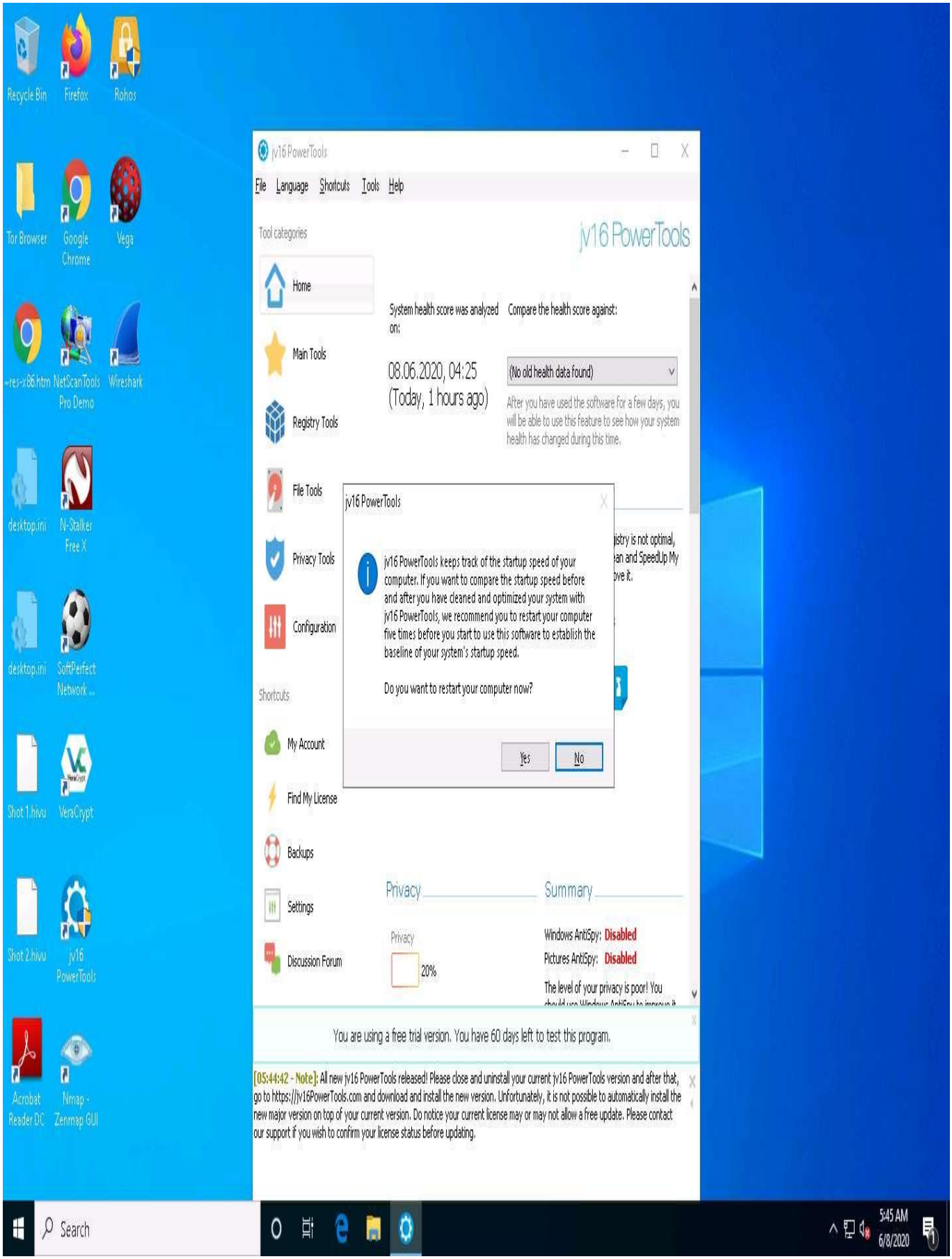
35. ☐ The **Performing Initial Setup** window appears. Make sure that the **Restart computer after done** option is checked. Once the setup is done, the machine will automatically restart.



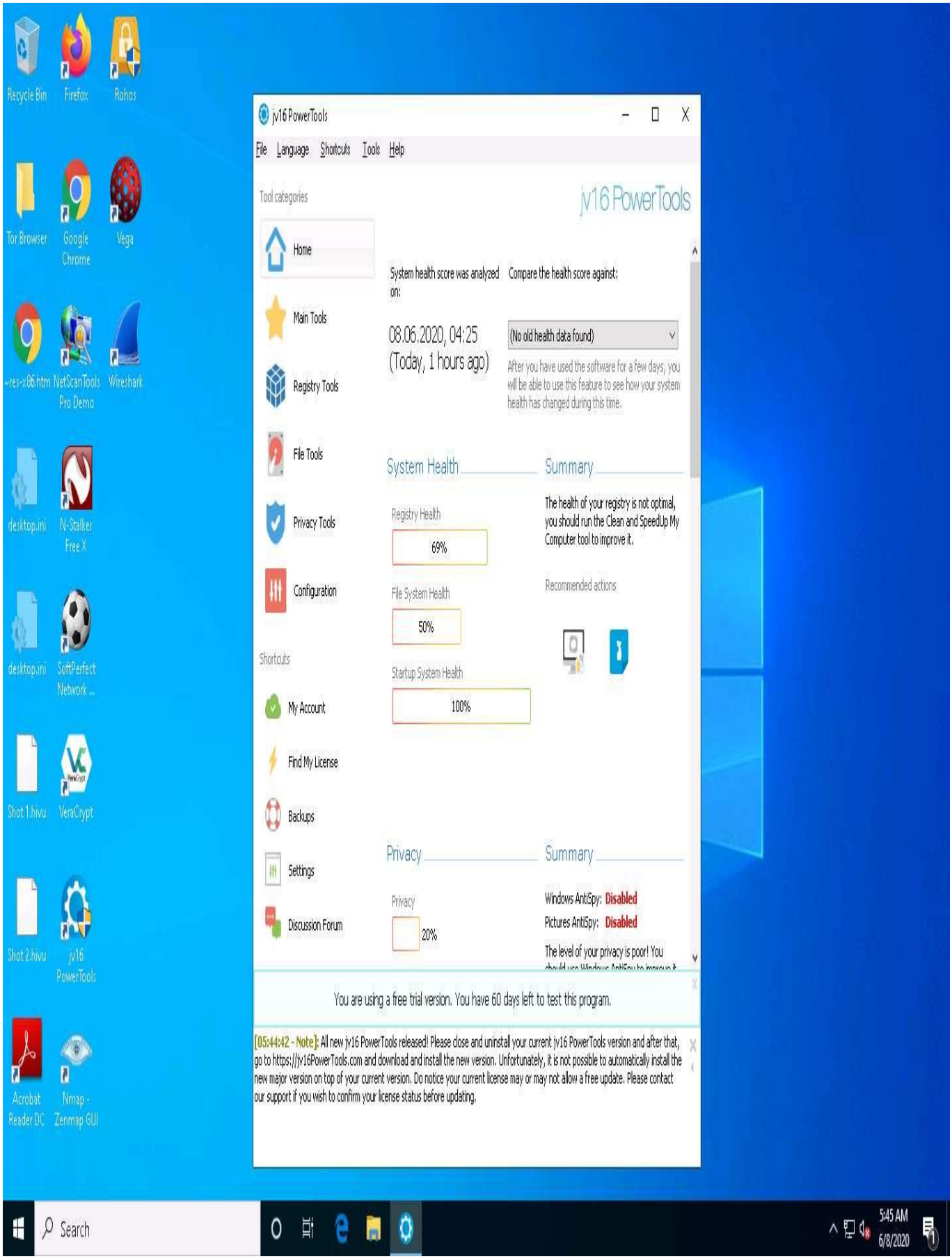
36. ☐ Once the machine has restarted, click Ctrl+Alt+Delete to activate the machine. By default, **Admin** user account is selected, click Pa$$w0rd to enter the password and press **Enter** to log in.



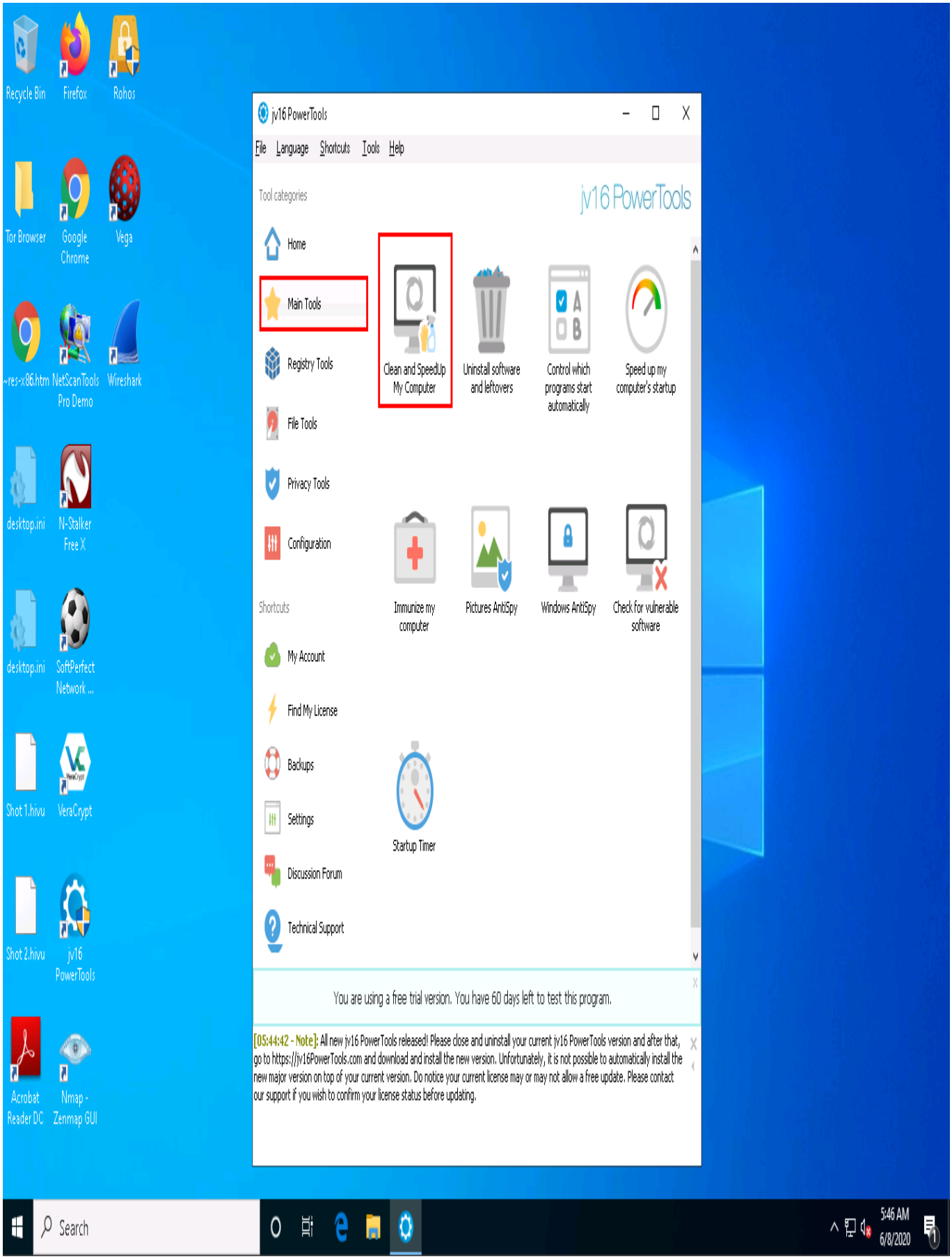
37. ☐ Observe that the jv16 PowerTools application launches automatically, along with a **jv16 PowerTools** pop-up; click **No**.



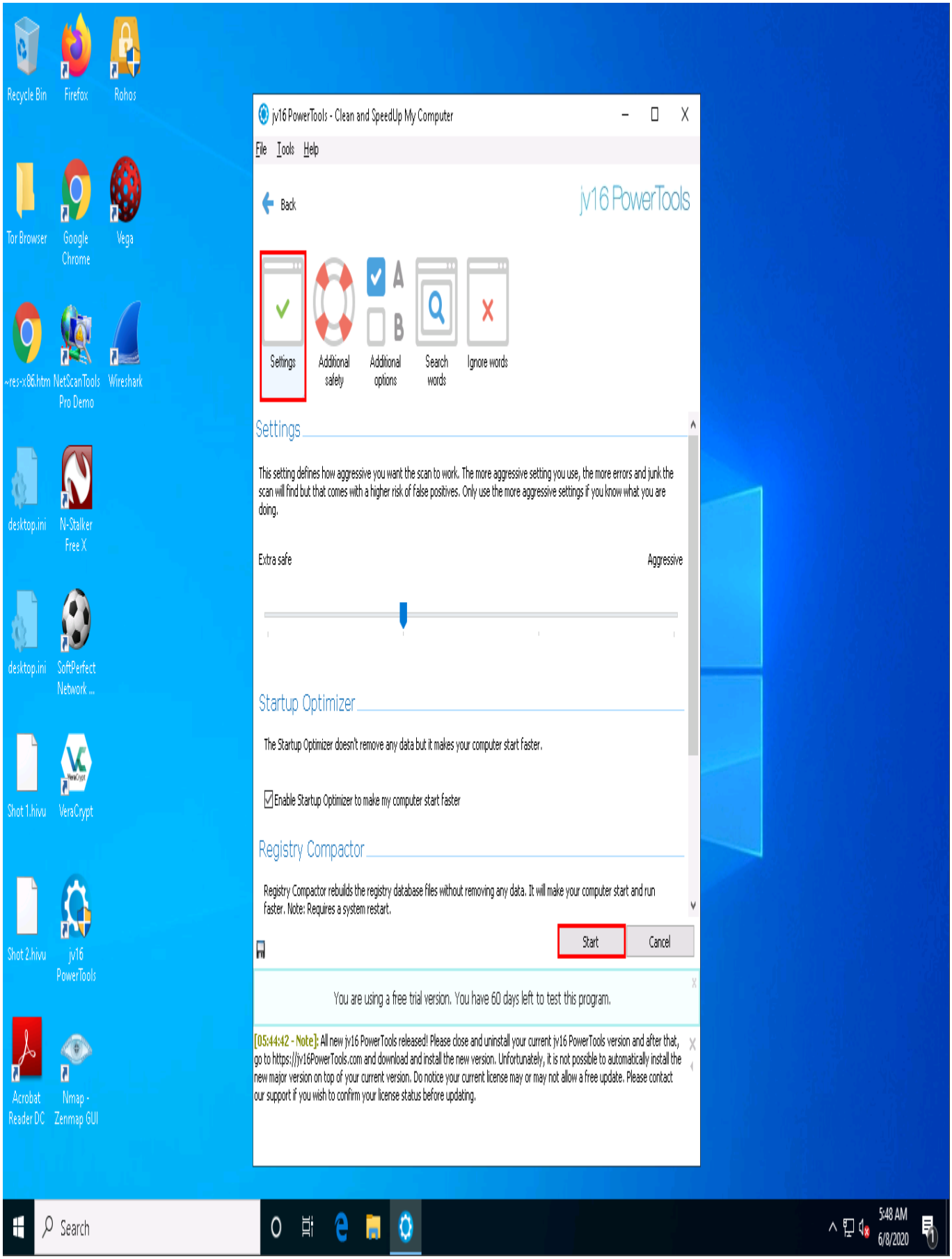
38. ☐ The **jv16 PowerTools** main window appears, as shown in the screenshot. By default, the **Home** option is selected, which displays the System Health, Privacy, Registry Integrity, and System Startup Times Summaries.



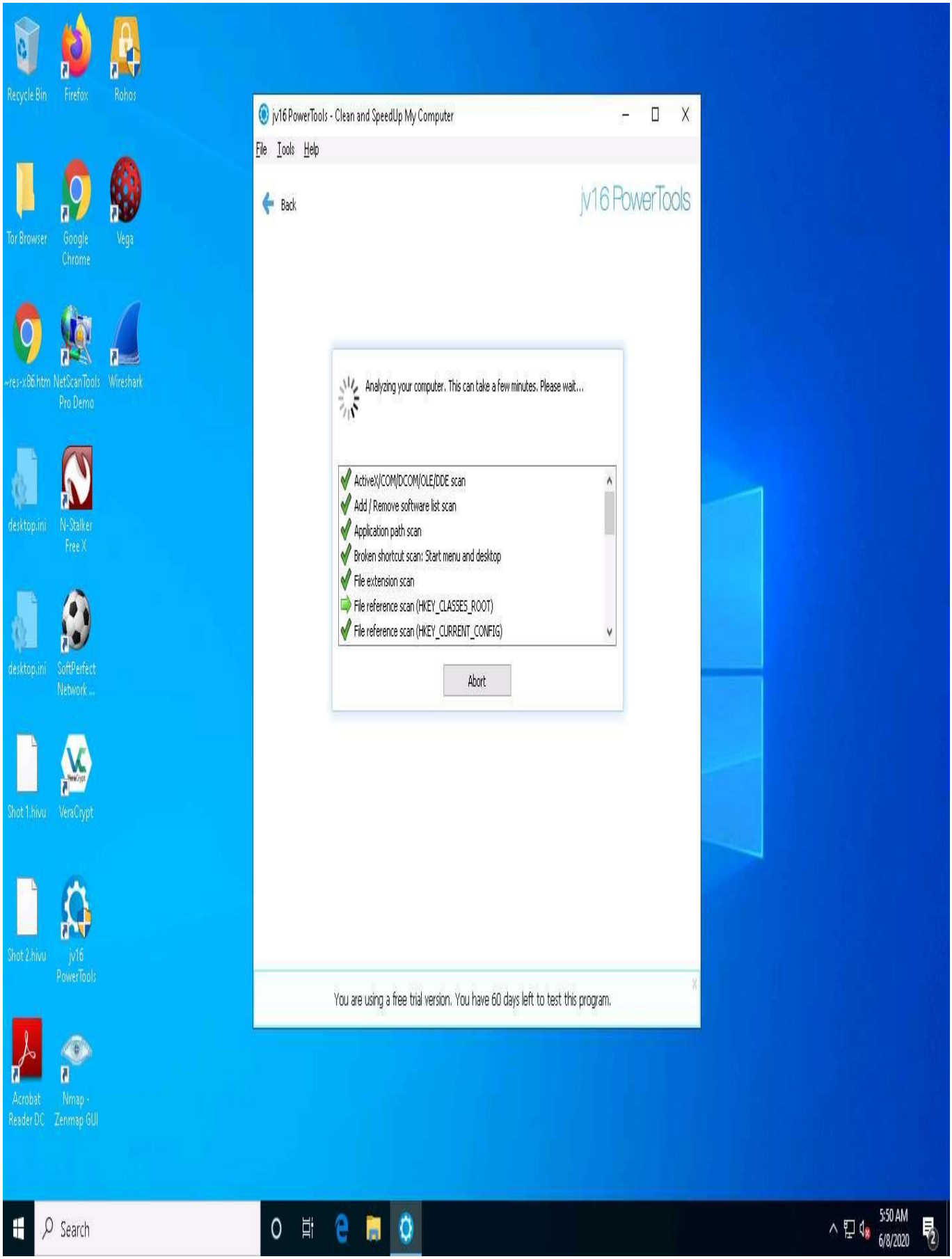
39. ☐ Click the **Main Tools** section from the left pane to view the available tools in jv16 PowerTools. The **Main Tools** section lists out all available tool features, as shown in the screenshot.
40. ☐ Click the **Clean and SpeedUp My Computer** icon.



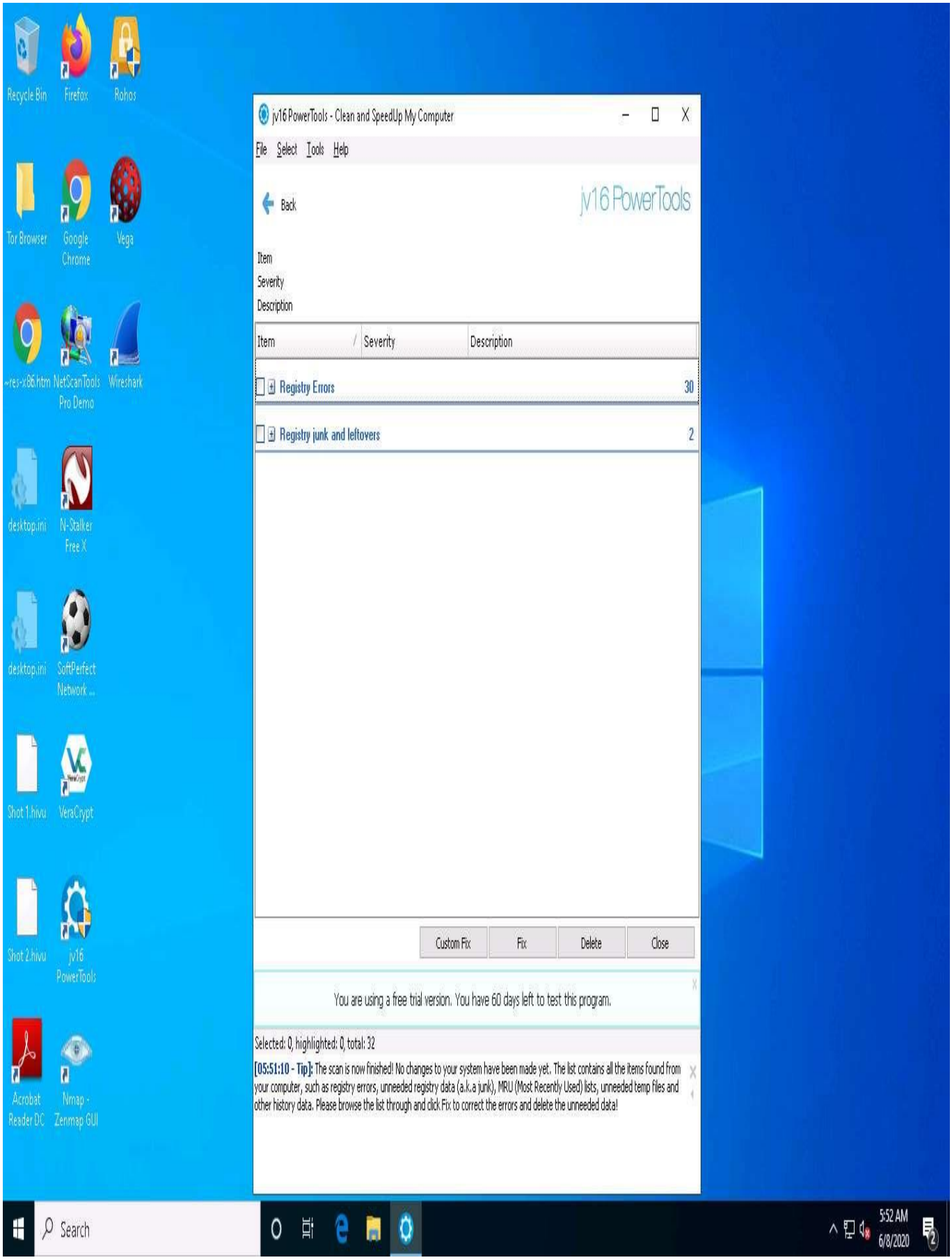
41. ☐ The **Clean and SpeedUp My Computer** wizard appears. Click the **Settings** and click **Start**.



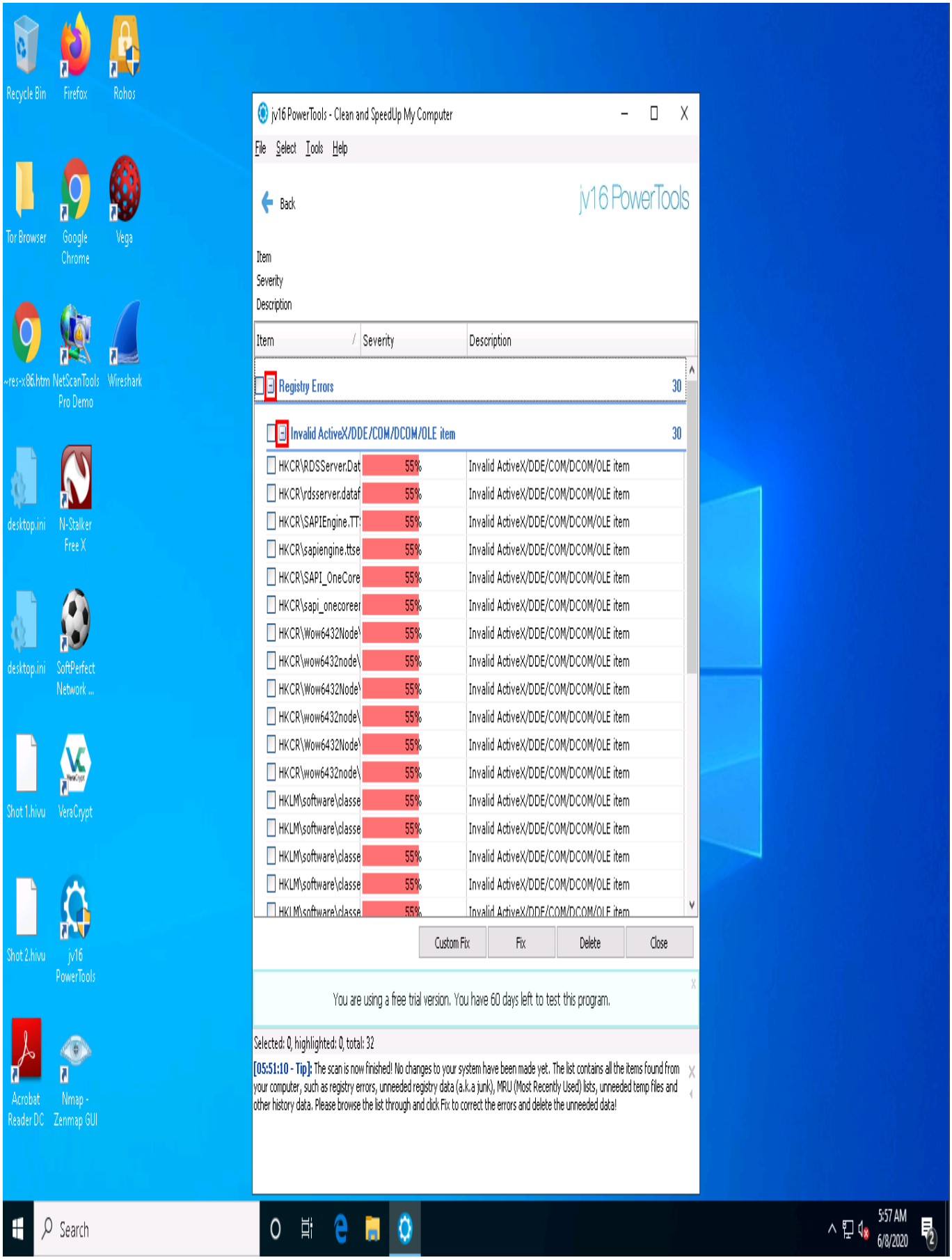
42. ☐ The tool starts analyzing the machine. The process takes a few minutes.



43. ☐ Once the scanning is complete, jv16 PowerTools displays the **Registry Errors**, **Temp Files**, and other results.

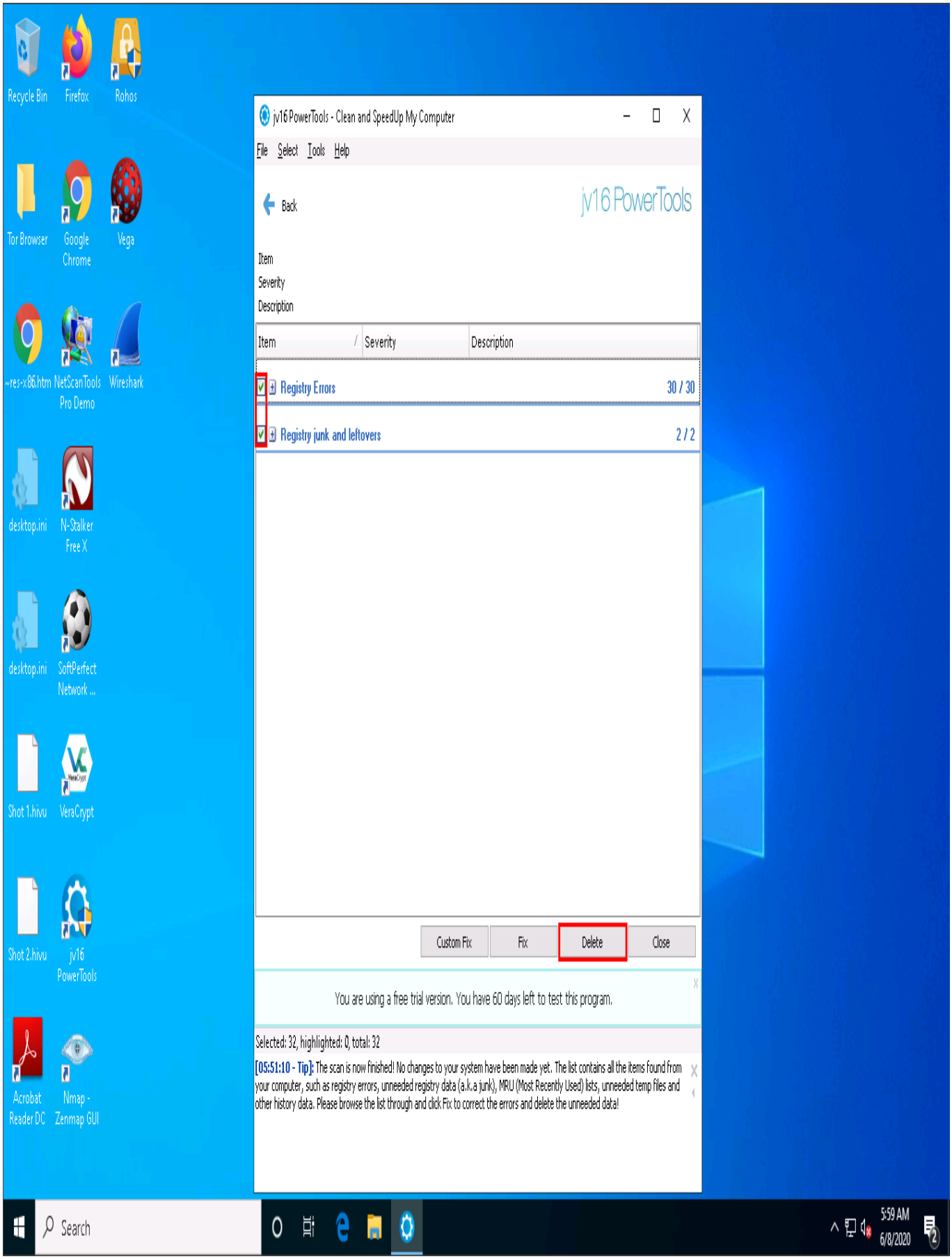


44. ☐ To view the registry errors, expand the **Registry Errors** node, and then expand the **Invalid ActiveX/DDE/COM/DCOM/OLE item** node.

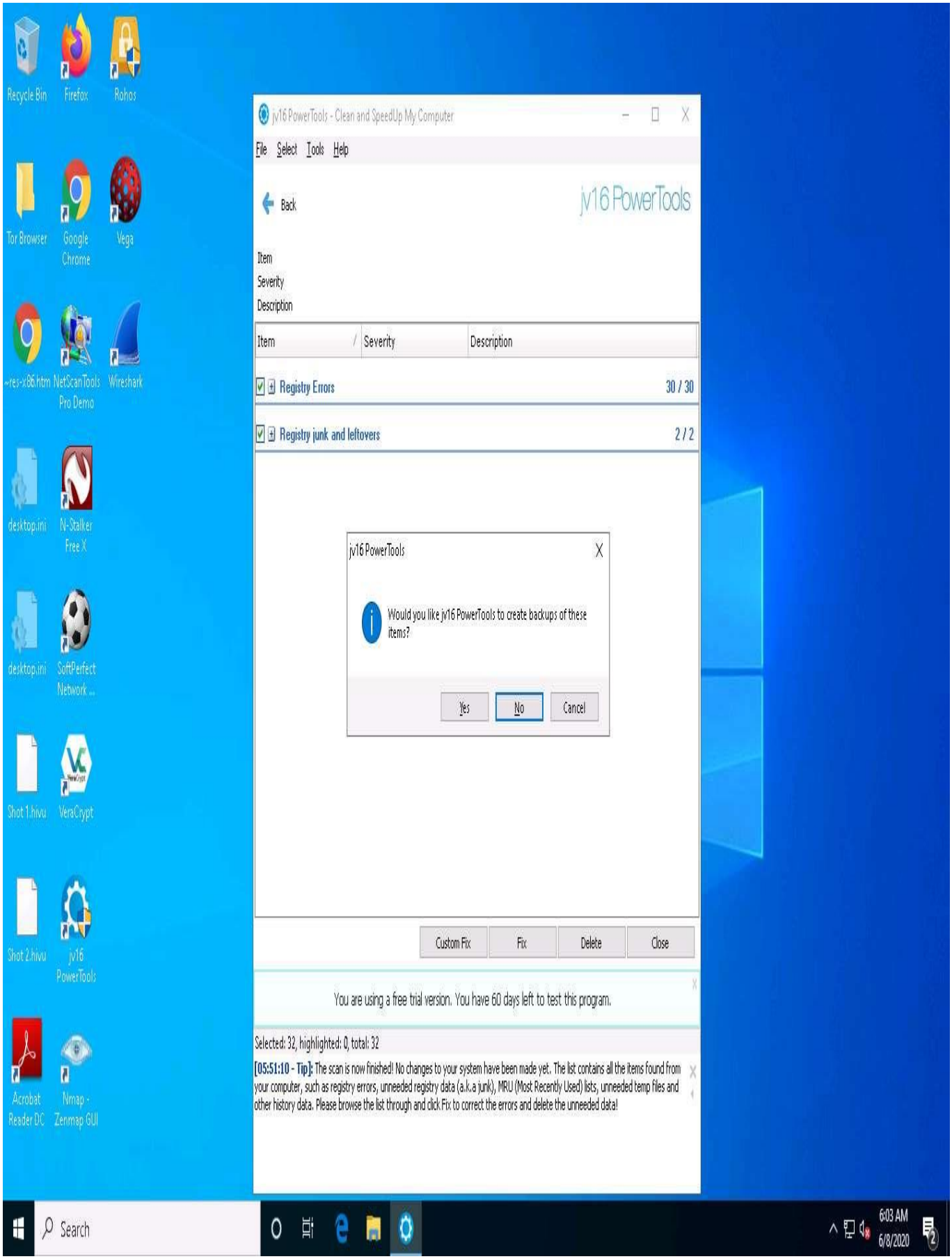


45. ☐ In the same way, expand the other items in the list to view all temporary files, log files, and other data.
46. ☐ Select all items in the application window, and then click **Delete**.

The registry errors might differ in your lab.

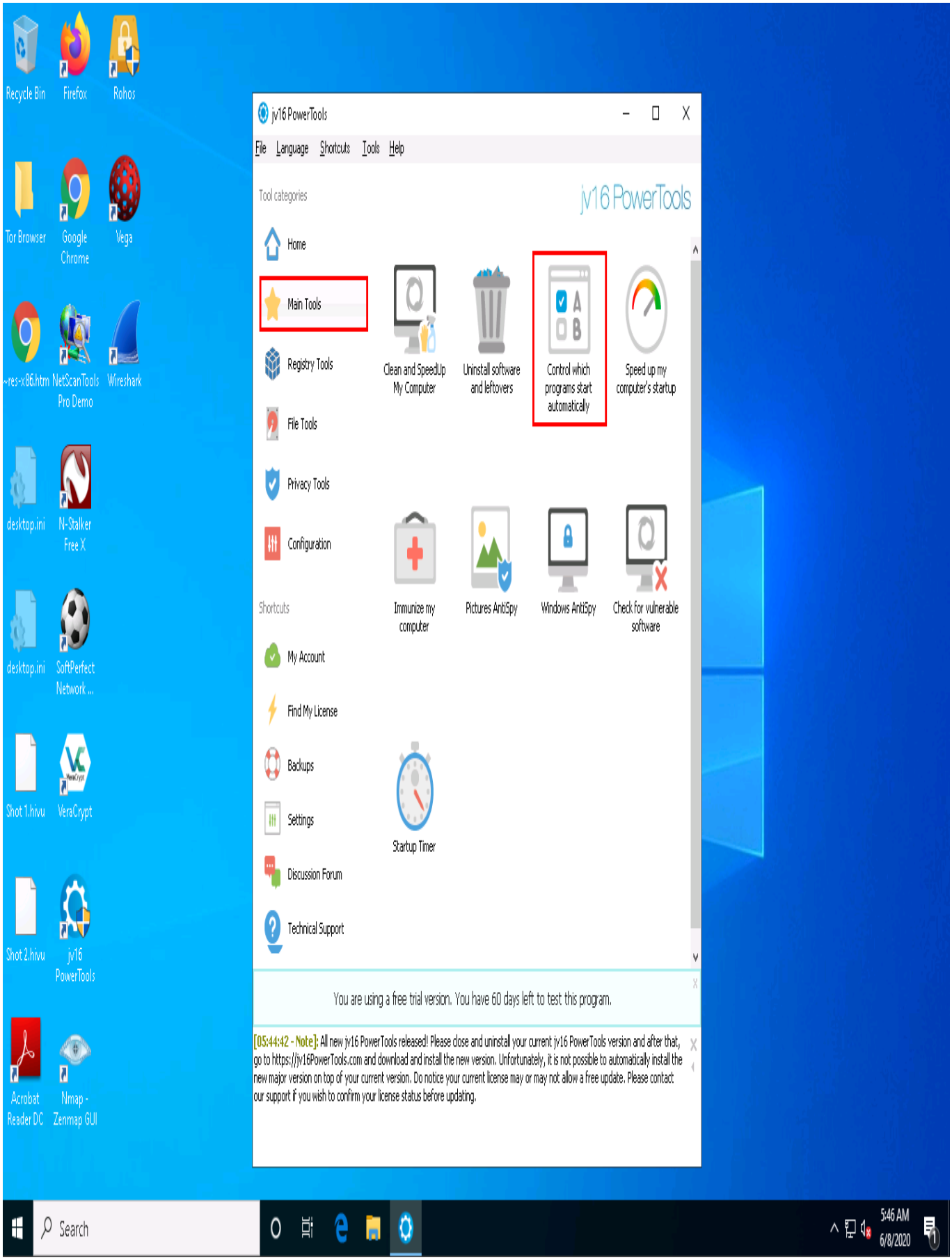


47. ☐ The **jv16 PowerTools** pop-up appears. If you want to create a backup, click **Yes**. In this lab, we have selected the **No** option, which deletes all files.

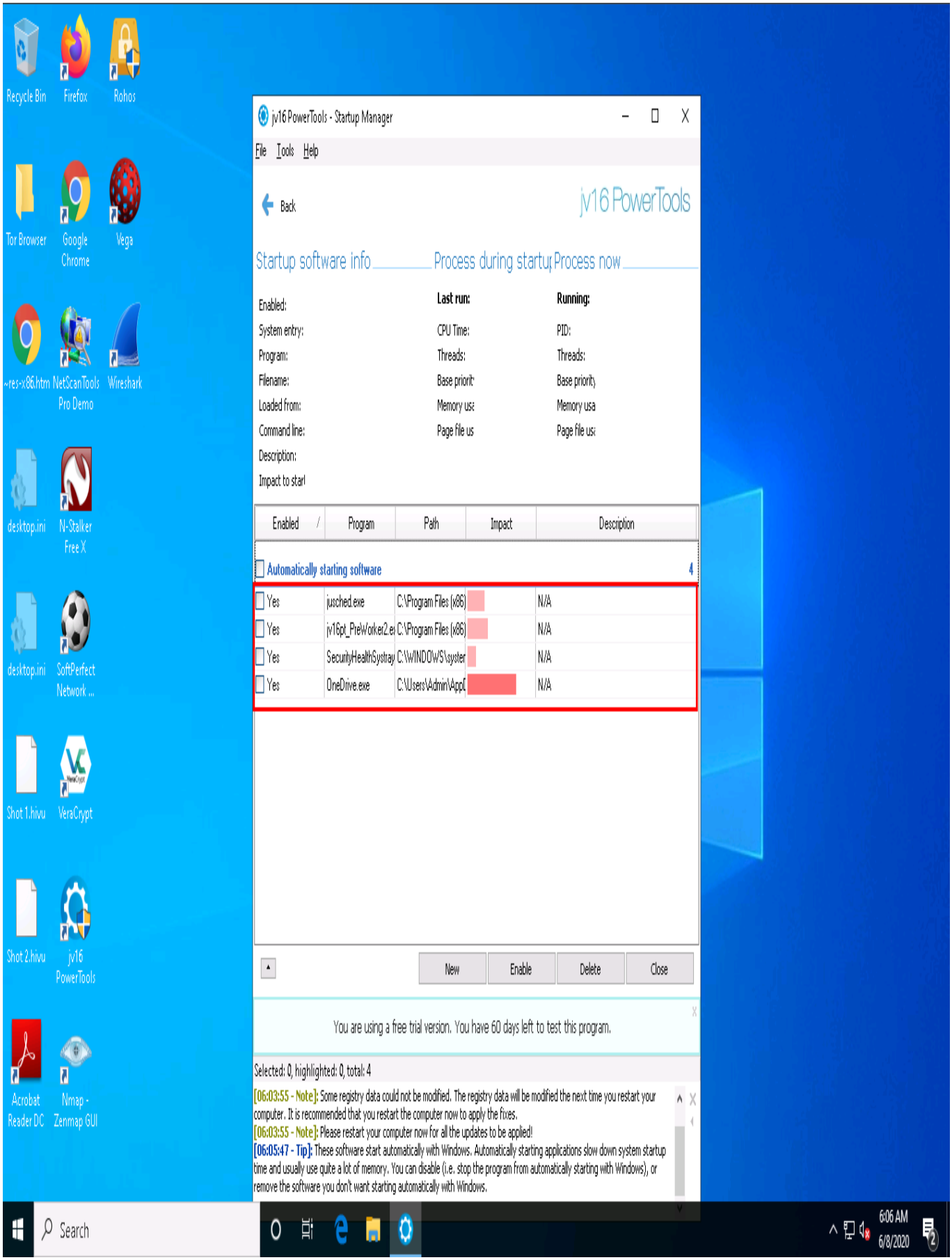


48. ☐ This deletes all unwanted or harmful registries, logs, temporary files, and other identified files, ensuring the safety of your computer.
49. ☐ If a **jv16 Power Tools** pop-up appears, asking you to restart the computer, click **No**.
50. ☐ If a **Clean and Fix My Computer** dialogue-box appears, close it.

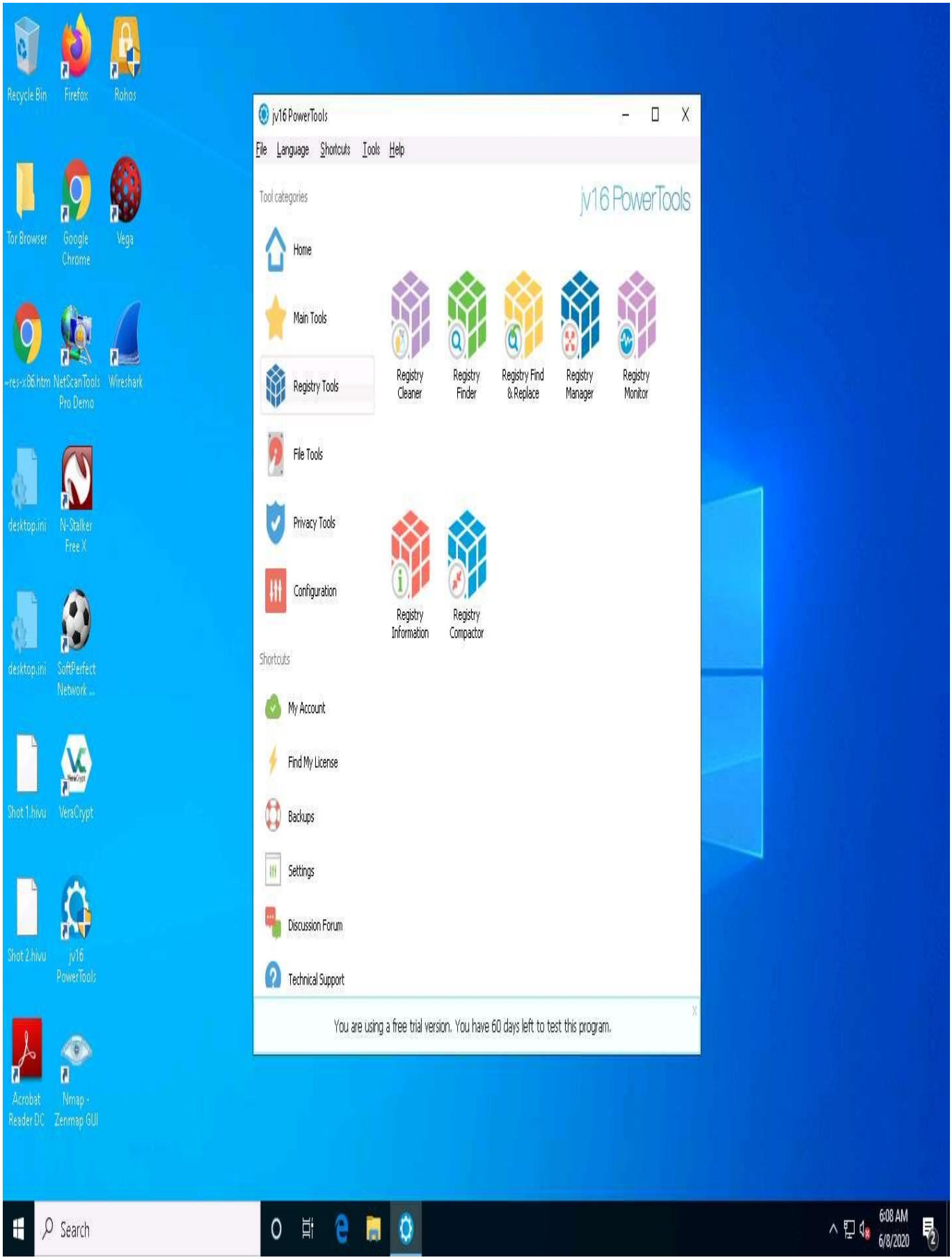
51. ☐ jv16 PowerTools redirects you to the **Main Tools** section; click **Control which programs start automatically**.



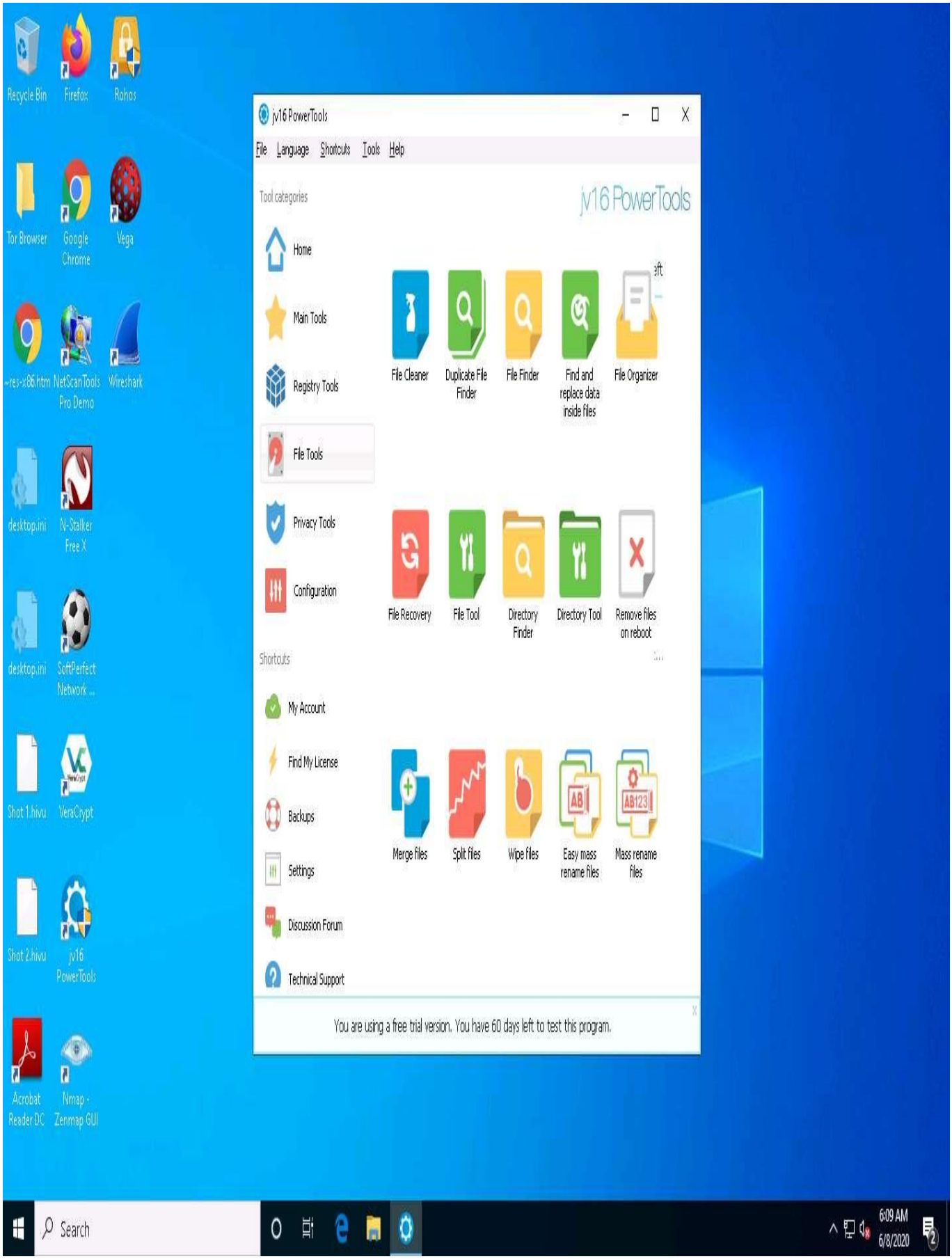
52. ☐ Select the software of your choice in the **Startup Manager** and assign the appropriate action for the software you check.



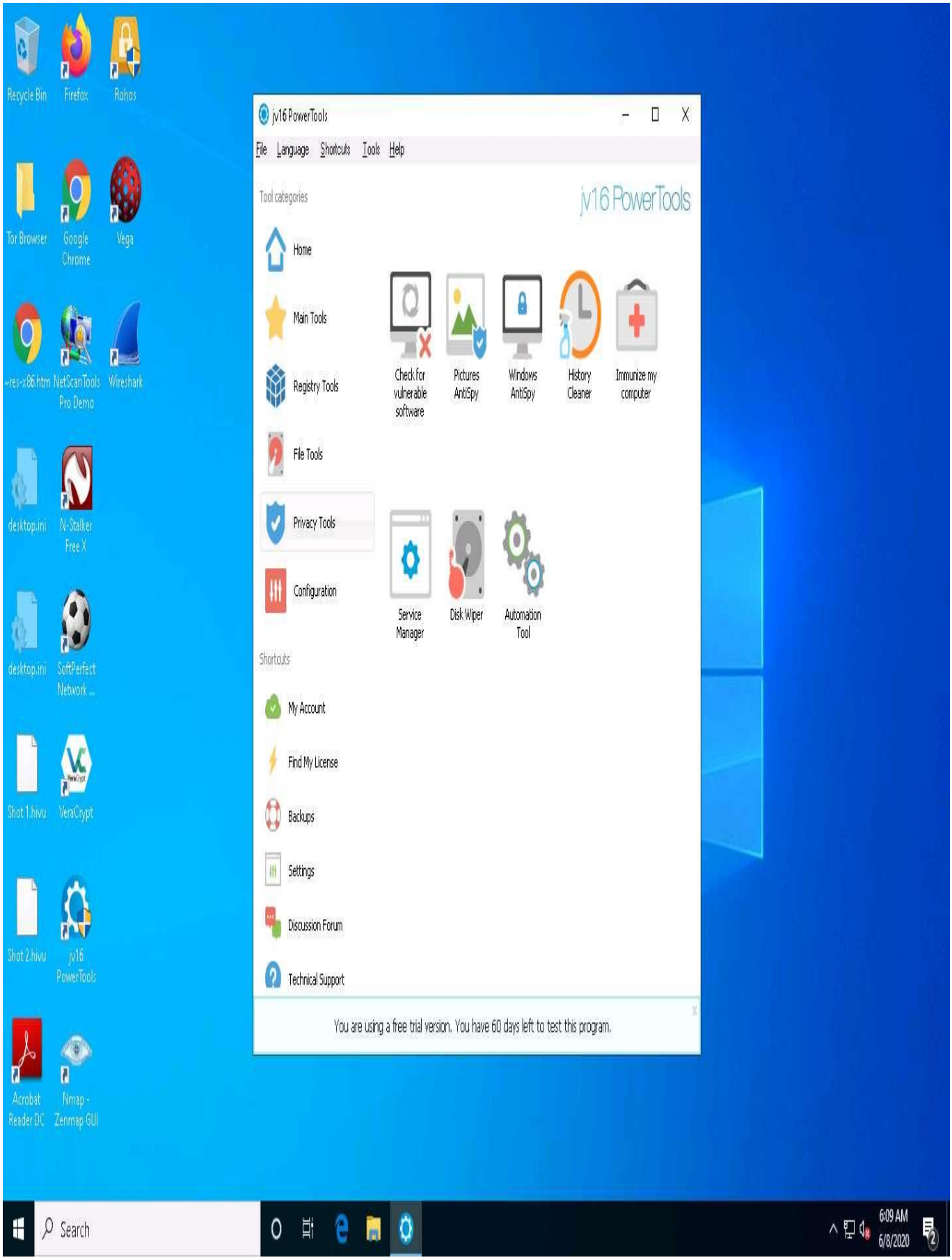
53. ☐ Thus, you could find any Trojans or malicious files running at system startup and choose the appropriate actions against them. Click **Close** in the **Startup Manager** wizard, which will redirect you to the **Main Tools** section of jv16 PowerTools.
54. ☐ Select **Registry Tools** to view Registry-related functions.
55. ☐ This section helps you to find, manage, monitor, compress, clean, or replace **registry files**.



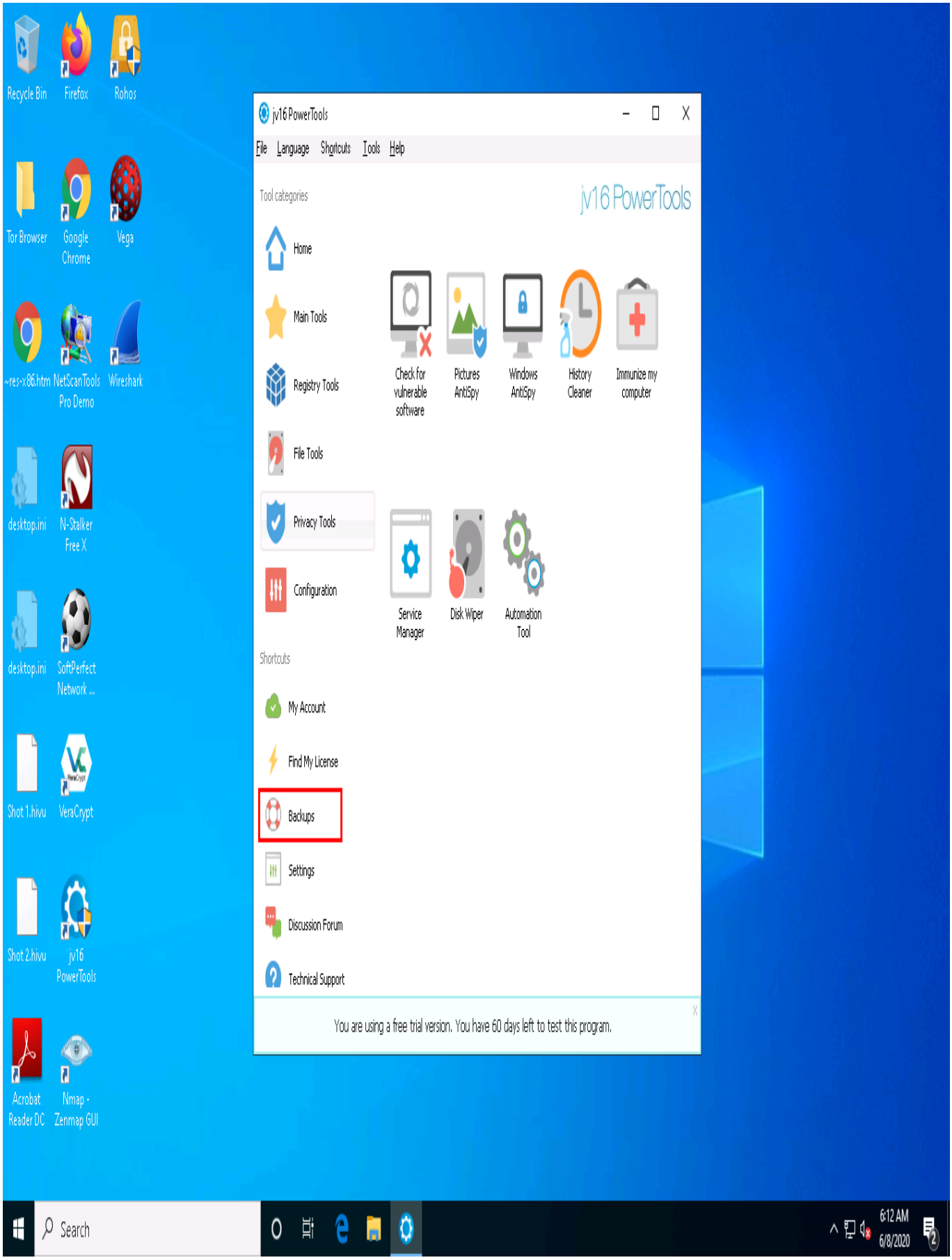
56. ☐ Click **File Tools** to view file-related functions.
57. ☐ This section helps you to find, recover, clean, organize, or merge files or directories.



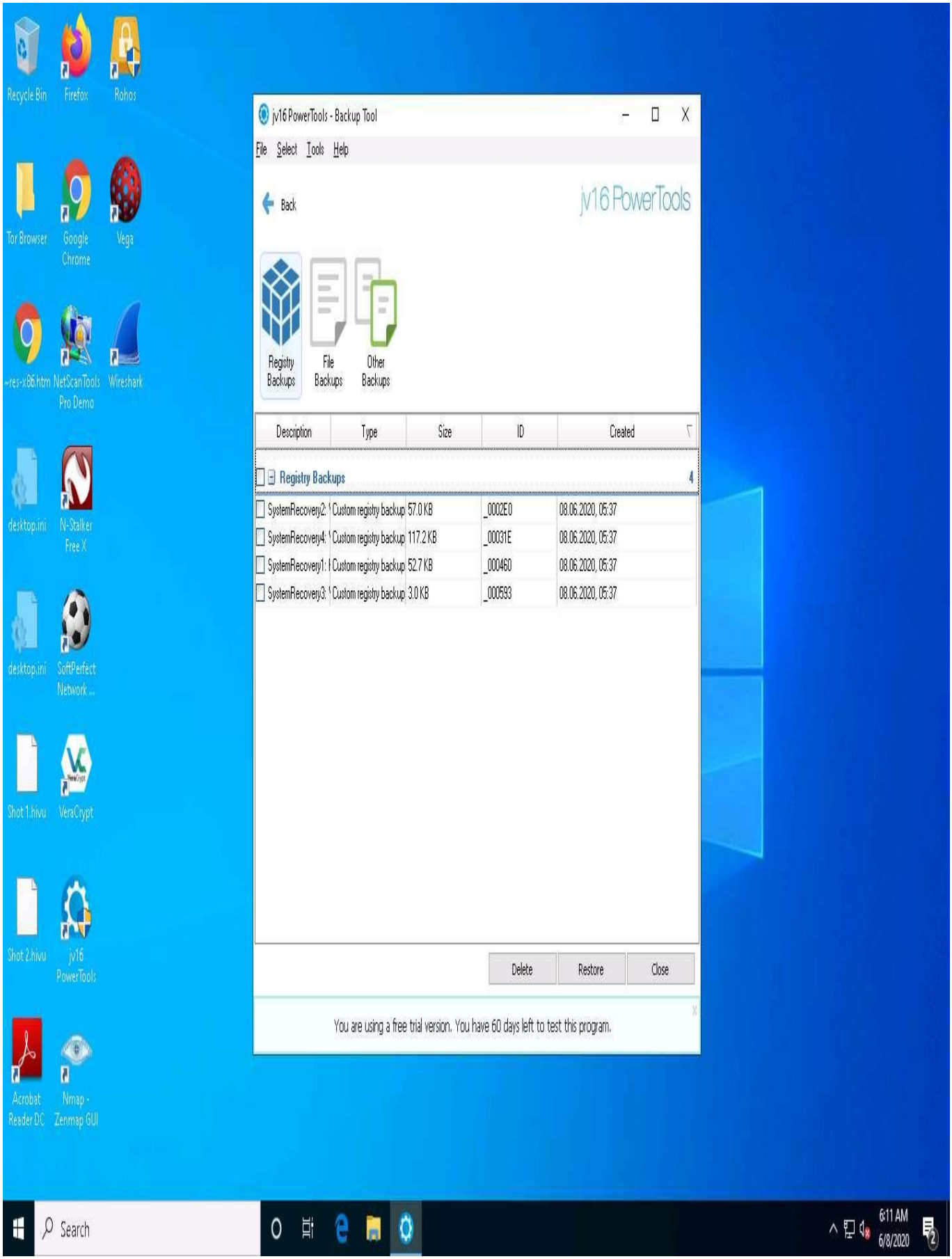
58. ☐ Select **Privacy Tools** to view privacy-related functions.
59. ☐ This section helps you to check for vulnerable software, spyware, clear your history, and perform other tasks.



60. ☐ The **Disk Wiper** option wipes the disk—this is not recommended.
61. ☐ Select **Backups** to view the system-related backups.



62. ☐ The **Jv16 PowerTools - Backup Tool** window appears, displaying the **registry**, **file**, and **other backups**.



63. ☐ You can choose whether to delete or restore backups in this window.
64. ☐ Click **Close** on the **Jv16 PowerTools - Backup Tool** window; this will redirect you to the **Main Tools** section of jv16 PowerTools.

If a restart prompt appears, then restart the machine.

65. Examining the result of the jv16 PowerTools scan reveals unwanted registry entries and other suspicious activities on the machine and allows the user to stop or delete them.
66. Close the **jv16 PowerTools** main window.
67. You can also use other registry monitoring tools such as **Reg Organizer** (https://www.chemtable.com), **Registry Viewer** (https://accessdata.com), **RegScanner** (https://www.nirsoft.net), or **Registrar Registry Manager** (https://www.resplendence.com) to perform registry monitoring.

Task 4: Perform Windows Services Monitoring using Windows Service Manager (SrvMan)

Attackers design malware and other malicious code in such a way that they install and run on a computer device in the form of a service. As most services run in the background to support processes and applications, malicious services are invisible, even when they are performing harmful activities on the system, and can even function without intervention or input. Malware spawns Windows services that allow attackers to control the victim machine and pass malicious instructions remotely. Malware may also employ rootkit techniques to manipulate the following registry keys to hide their processes and services.

HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services These malicious services run as the SYSTEM account or another privileged account, which provides more access compared to regular user accounts, making them more dangerous than common malware and executable code. Attackers also try to conceal their actions by naming the malicious services with the names similar to genuine Windows services to avoid detection.

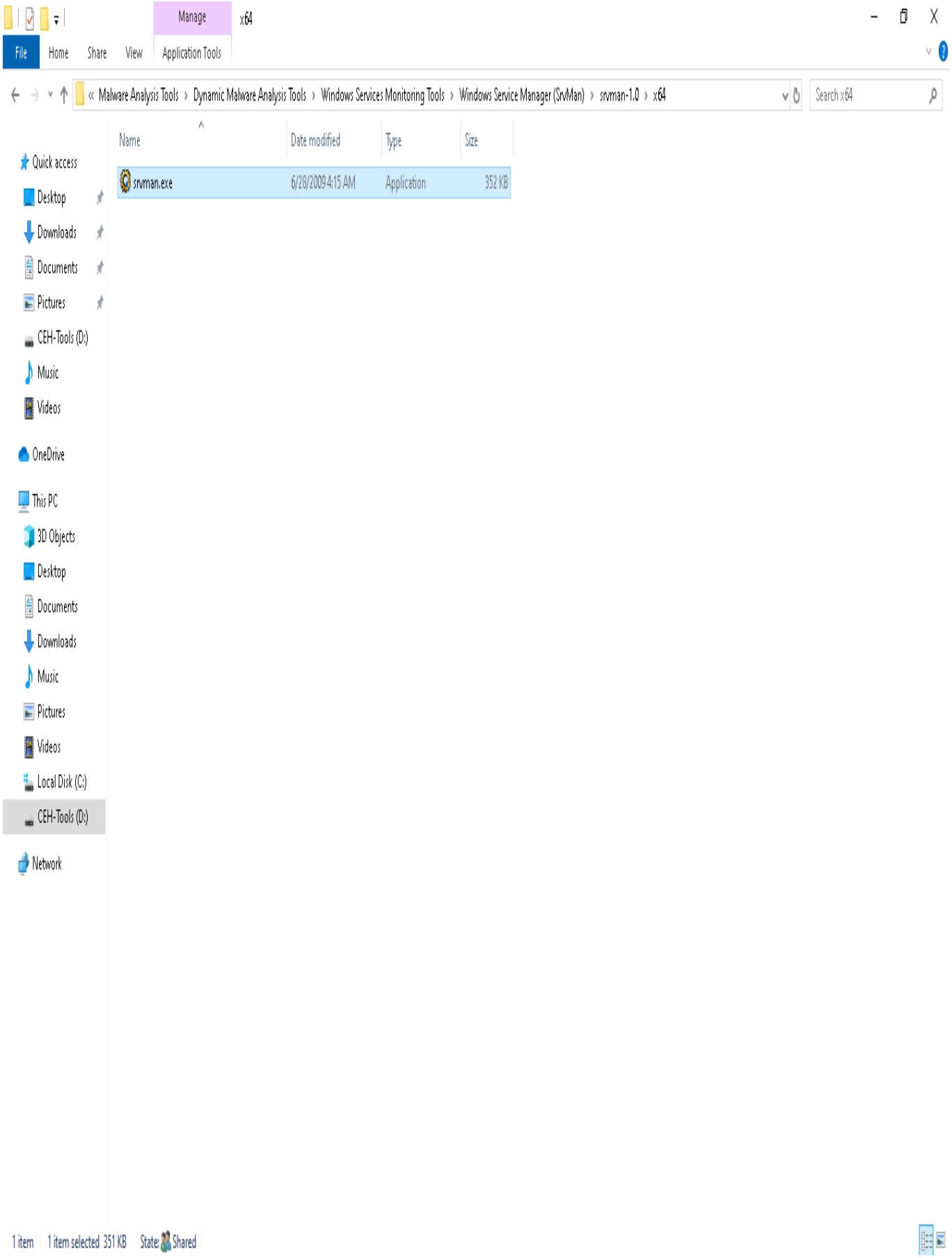
You can trace malicious services initiated by the suspect file during dynamic analysis by using Windows service monitoring tools such as Windows Service Manager (SrvMan), which can detect changes in services and scan for suspicious Windows services.

SrvMan has both GUI and Command-line modes. It can also be used to run arbitrary Win32 applications as services (when such a service is stopped, the main application window automatically closes).

Here, we will use the SrvMan tool to check for suspicious windows services.

1. On the **Windows 10** machine, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Windows Services Monitoring Tools\Windows Service Manager (SrvMan)\srvman-1.0\x64** and double-click **srvman.exe**.

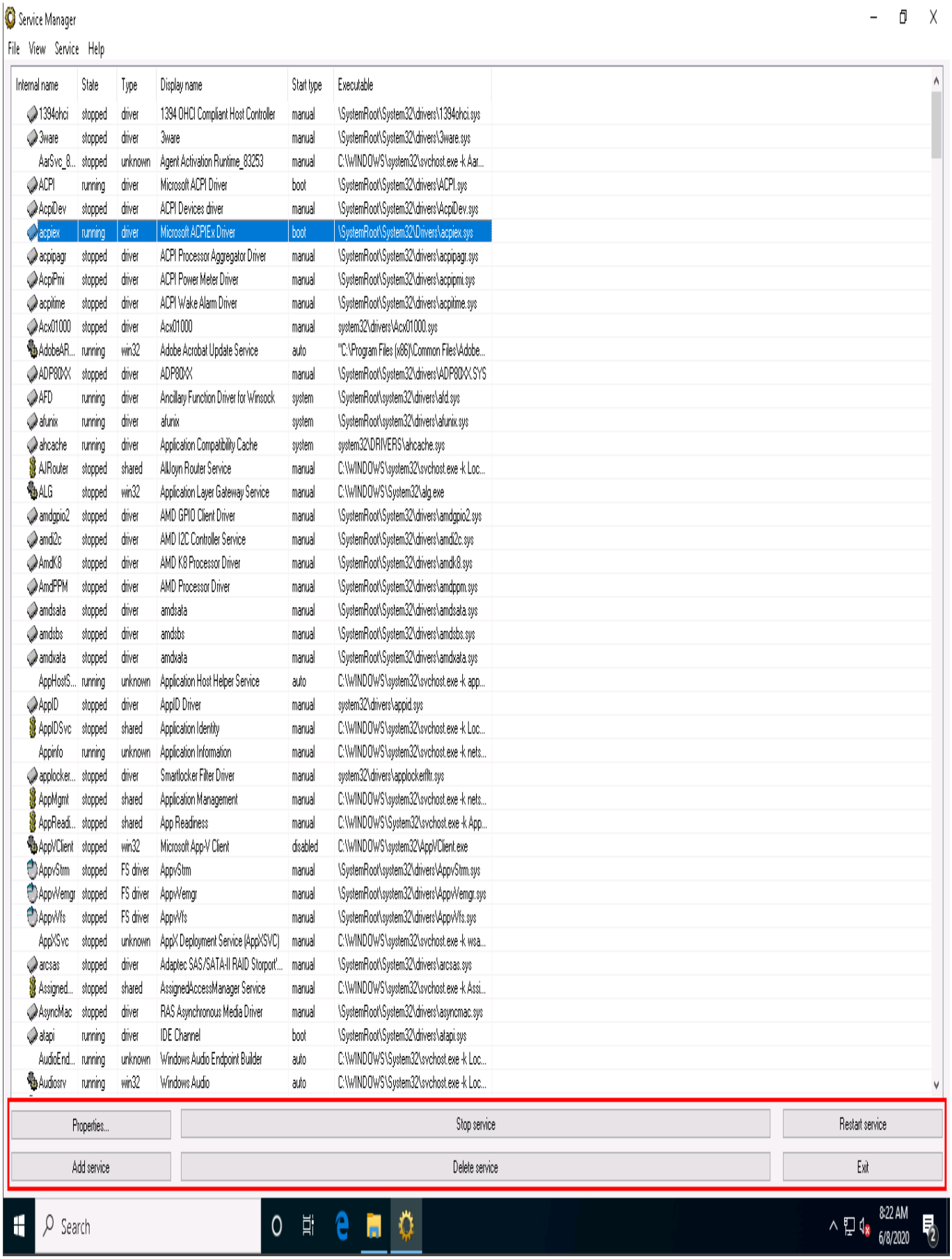
You can choose any of the executable files for the Windows Service Manager according to your computer and OS design.



2. If a **User Account Control** window appears, click **Yes**.
3. The **Service Manager** main window appears, listing all services available or running on the machine, as shown in the screenshot.

4. ☐ The Service Manager shows the **Internal name**, **State**, **Type**, **Display name**, **Start type**, and **Executable** data of the services.
5. ☐ Here, you can choose any unwanted service that is running on your computer, and **Stop** or **Delete** that service by choosing the appropriate action.

6. You can view the properties of the selected service by clicking on **Properties**.
7. To Start a stopped service, click the **Start service** button. To stop a running service, click **Stop service**.
8. To restart any running service, click the **Restart service** button.
9. To add a new service to your machine, click the **Add service** button.
10. To delete any running or stopped service, click the **Delete service** button.



11. ☐ Thus, you can monitor the unwanted services running on the machine using the Windows Service Manager.
12. ☐ Close the **Service Manager** window.

13. You can also use other Windows service monitoring tools such as **Advanced Windows Service Manager** (https://securityxploded.com), **Process Hacker** (https://processhacker.sourceforge.io), **Netwrix Service Monitor** (https://www.netwrix.com), or **AnVir Task Manager** (https://www.anvir.com) to perform Windows services monitoring.

Task 5: Perform Startup Program Monitoring using Autoruns for Windows and WinPatrol

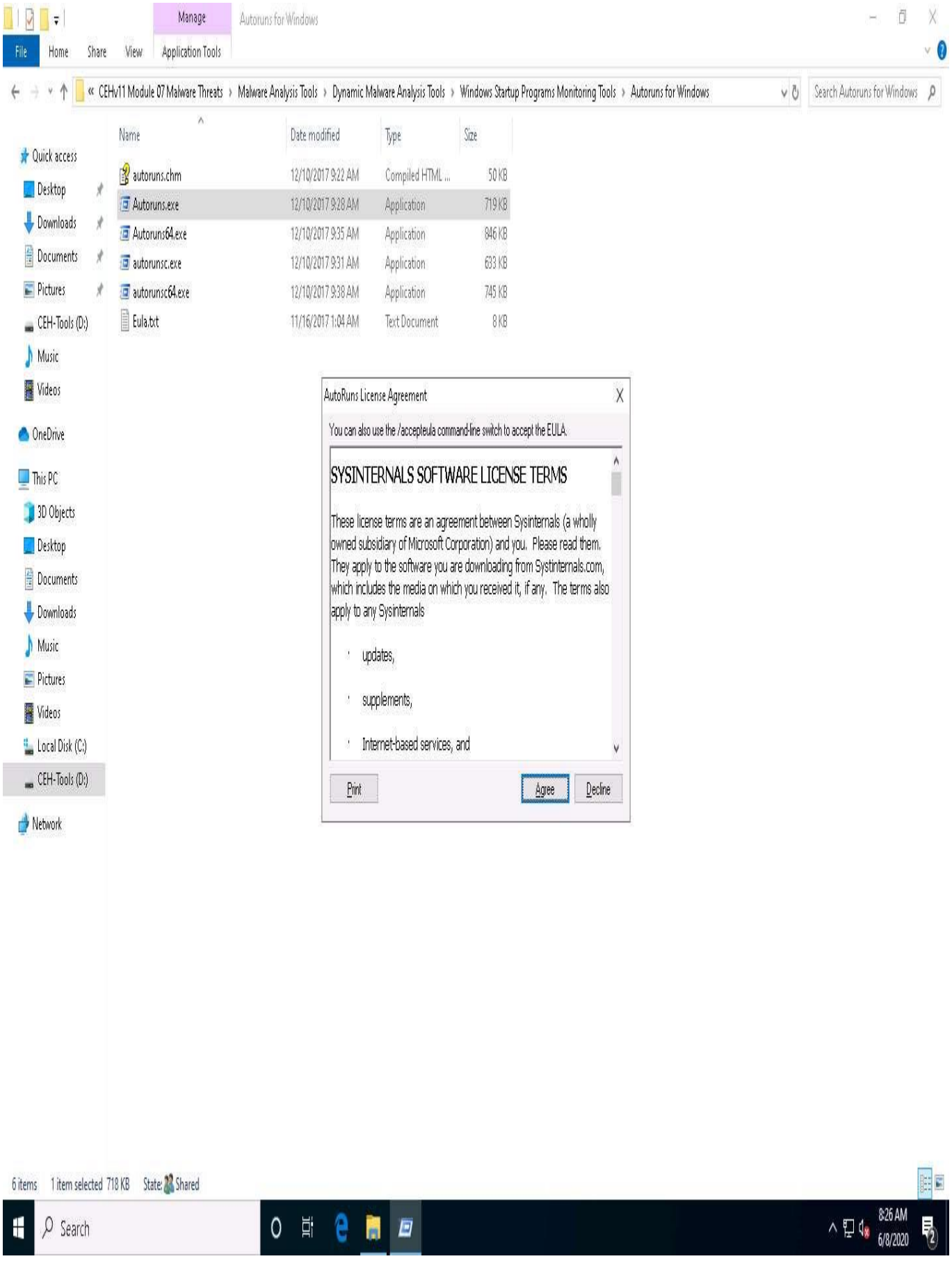
Startup programs are applications or processes that start when your system boots up. Attackers make many malicious programs such as Trojans and worms in such a way that they are executed during startup, and the user is unaware of the malicious program running in the background.

An ethical hacker or penetration tester must identify the applications or processes that start when a system boots up and remove any unwanted or malicious programs that can breach privacy or affect a system's health. Therefore, scanning for suspicious startup programs manually or using startup program monitoring tools like Autoruns for Windows and WinPatrol is essential for detecting malware.

Autoruns for Windows This utility can auto-start the location of any startup monitor, display which programs are configured to run during system bootup or login, and show the entries in the order Windows processes them. As soon as this program is included in the startup folder, Run, RunOnce, and other Registry keys, users can configure Autoruns to show other locations, including Explorer shell extensions, toolbars, browser helper objects, Winlogon notifications, and auto-start services. Autoruns' Hide Signed Microsoft Entries option helps the user zoom in on third-party auto-starting images that add to the users' system, and it has support for looking at the auto-starting images configured for other accounts configured on the system.

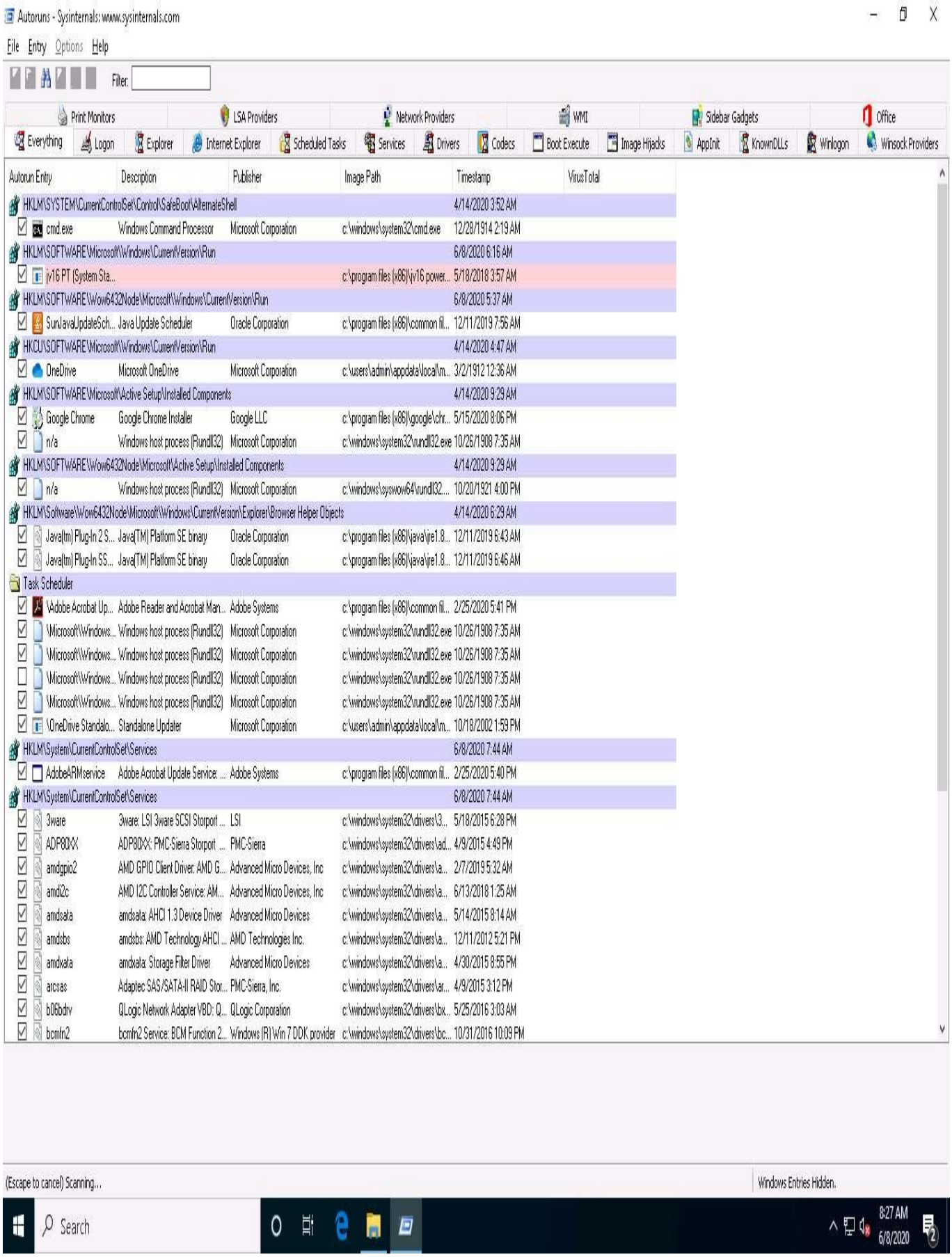
WinPatrol WinPatrol provides the user with 14 different tabs to help in monitoring the system and its files. This security utility gives the user a chance to look for programs that are running in the background of a system so that the user can take a closer look and control the execution of legitimate and malicious programs.

1. On the **Windows 10** machine, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Windows Startup Programs Monitoring Tools\Autoruns for Windows** and double-click **Autoruns.exe**.
2. The **AutoRuns License Agreement** window appears; click **Agree**.

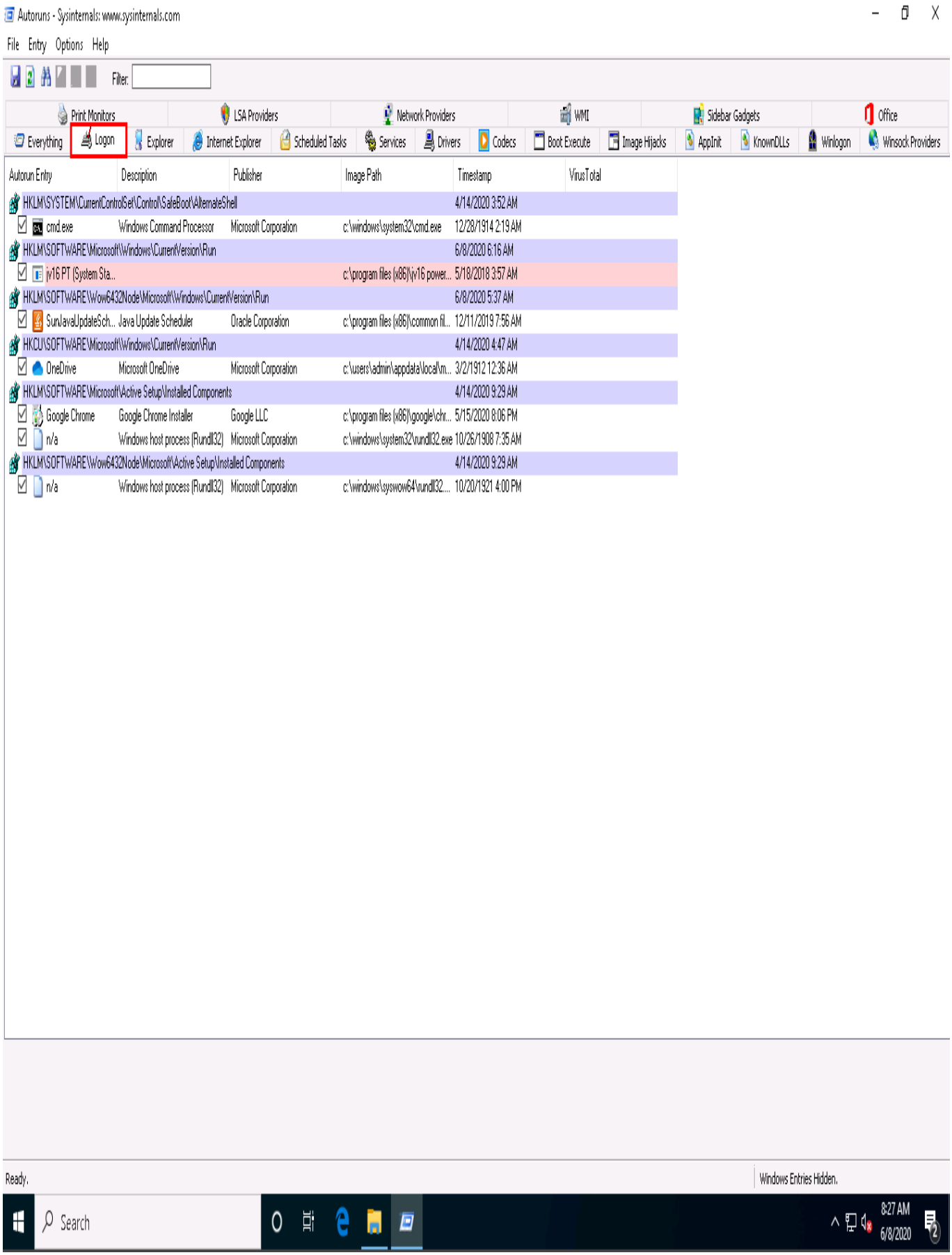


3. ☐ The **Autoruns** main window appears. It displays all **processes**, **dll's**, and **services**, as shown in the screenshot.

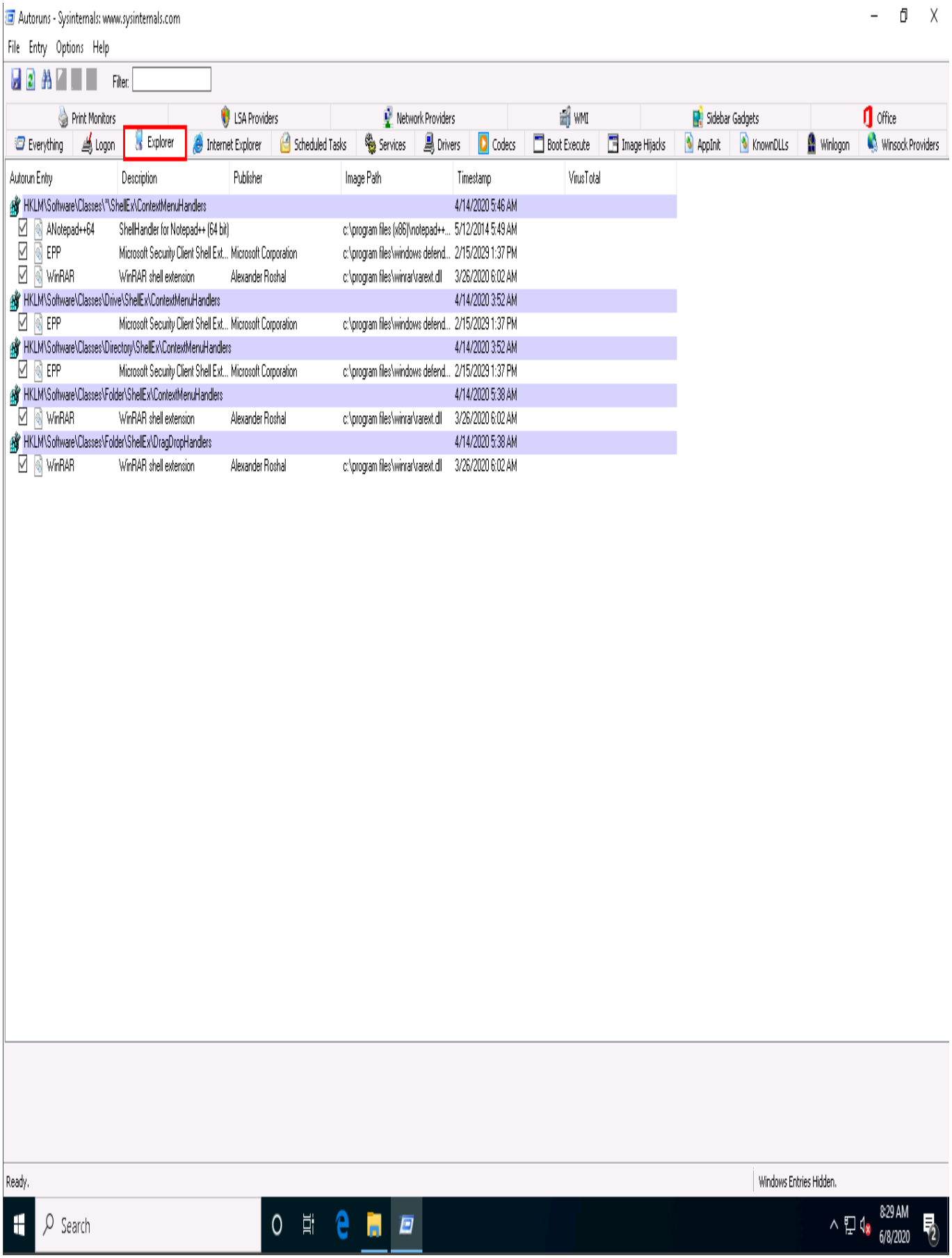
The application lists displayed under all the tabs may vary in your lab environment.



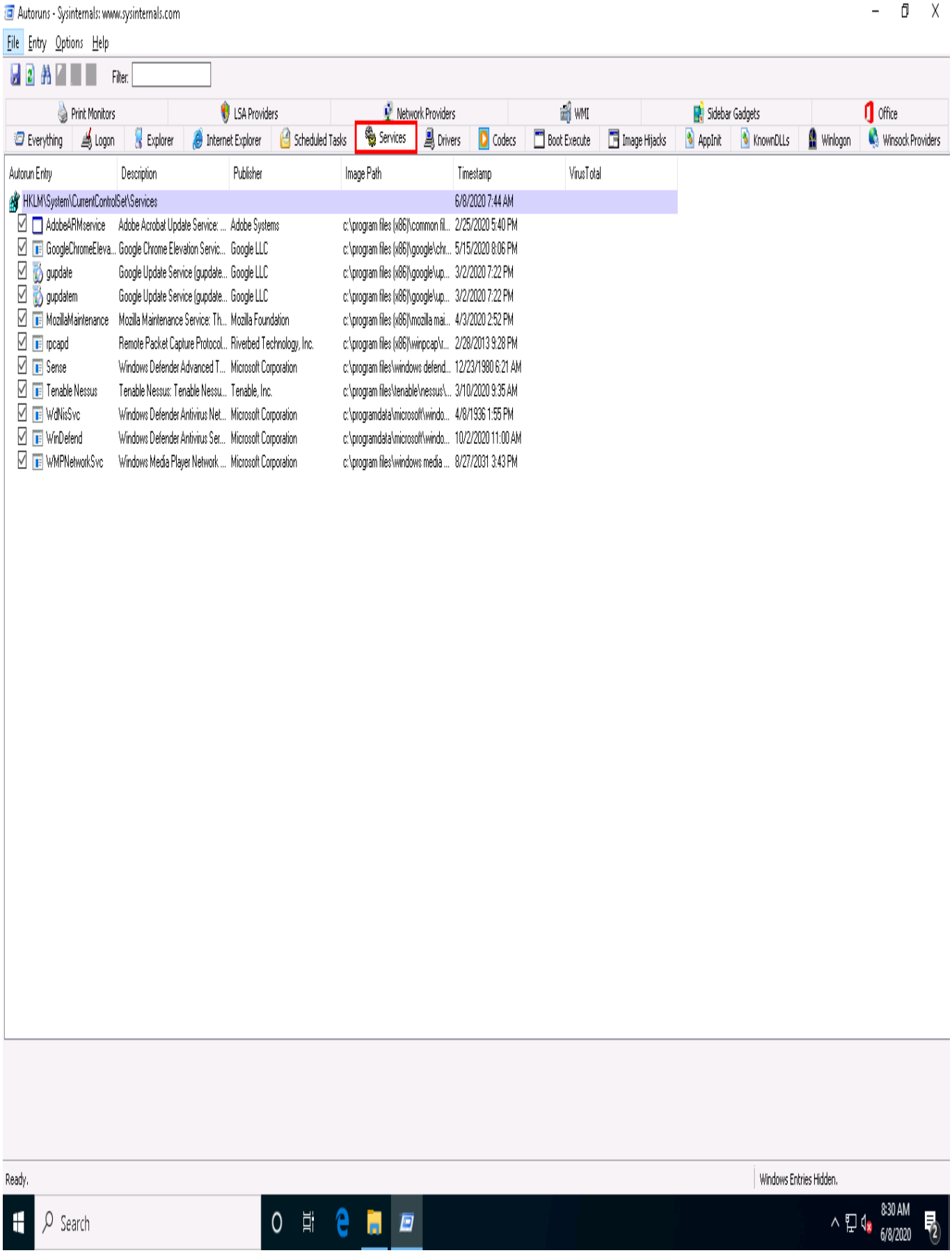
4. ☐ Click the **Logon** tab to view the applications that run automatically during login.



5. ☐ Click the **Explorer** tab to view the explorer applications that run automatically at system startup.

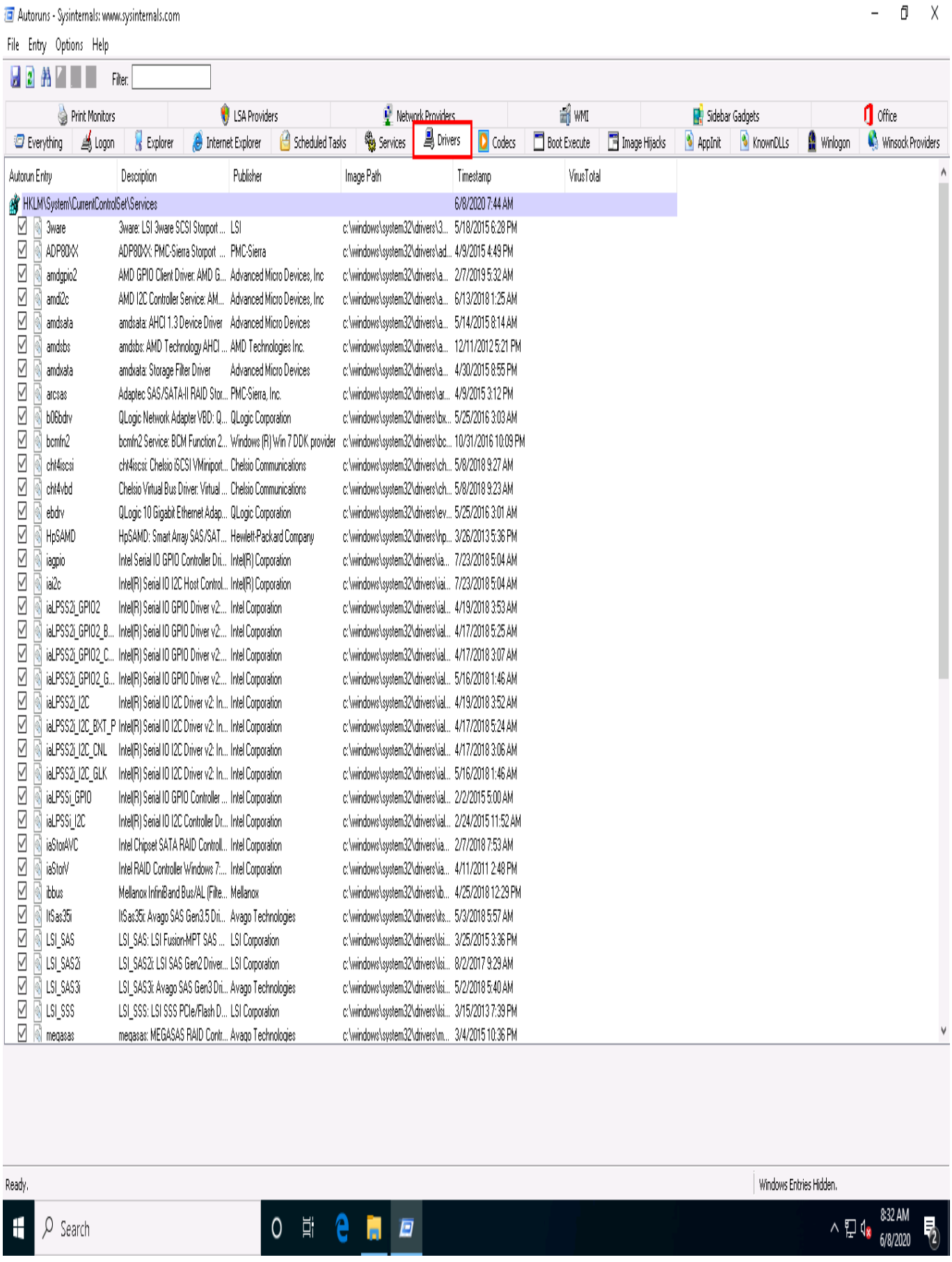


6. ☐ Clicking the **Services** tab displays all services that run automatically at system startup.

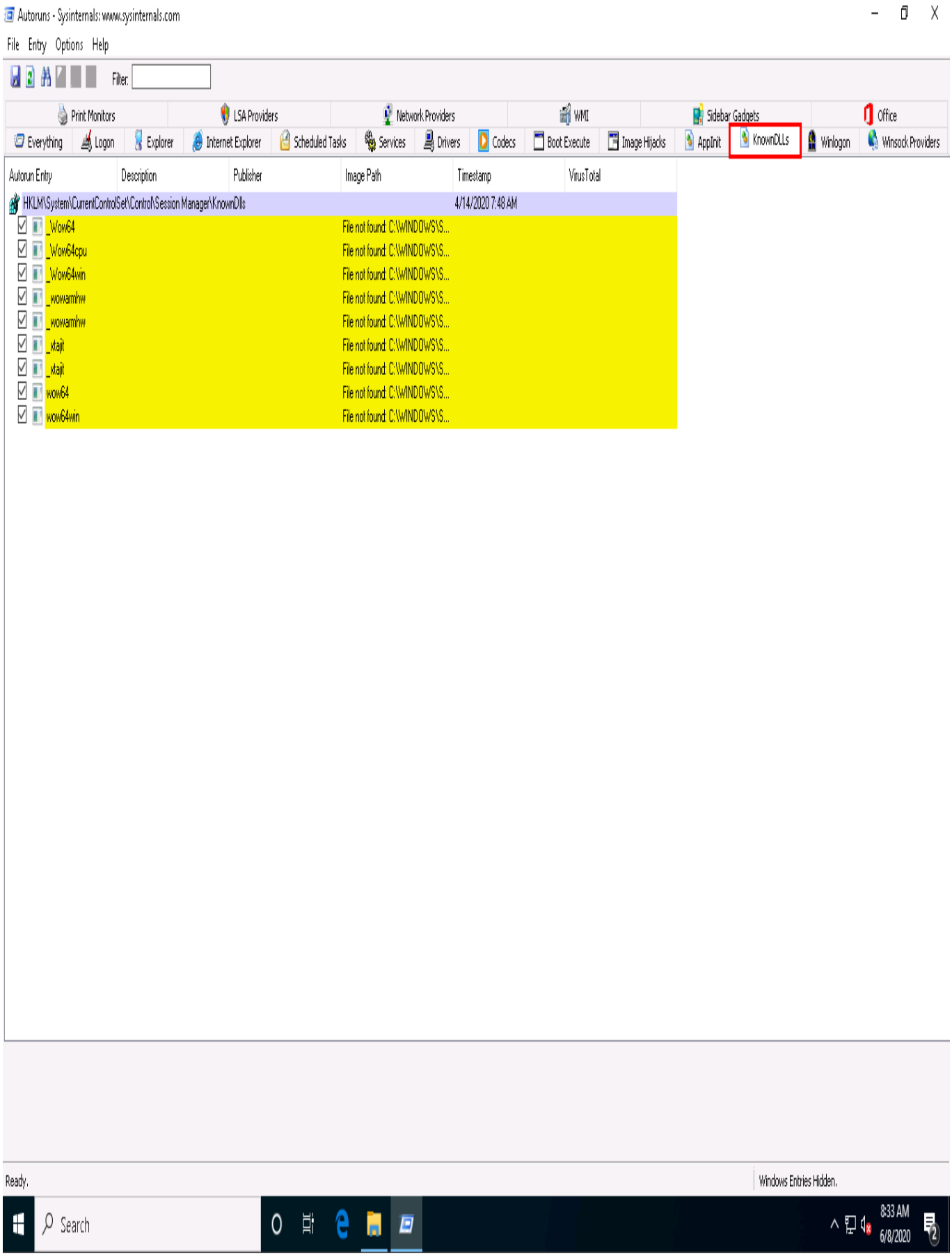


7. ☐ Click the **Drivers** tab to view all application drivers that run automatically at system startup.
8. ☐ Click any driver to display its size, version, and the time at which it was automatically run at system startup (for the first time).

The list displayed under this tab may vary in your lab environment.

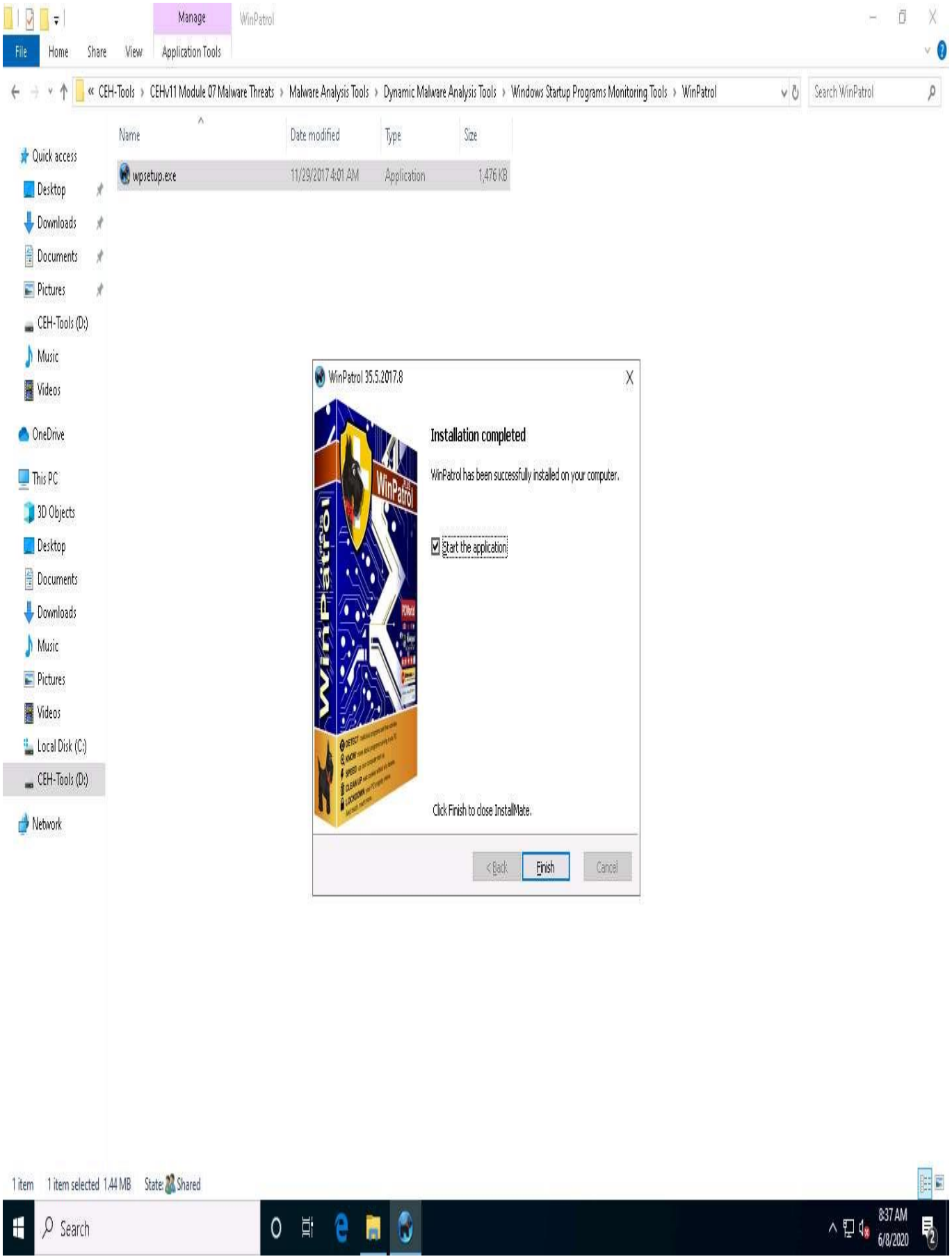


9. Click the **KnownDLLs** tab to view all known DLLs that start automatically at system startup.



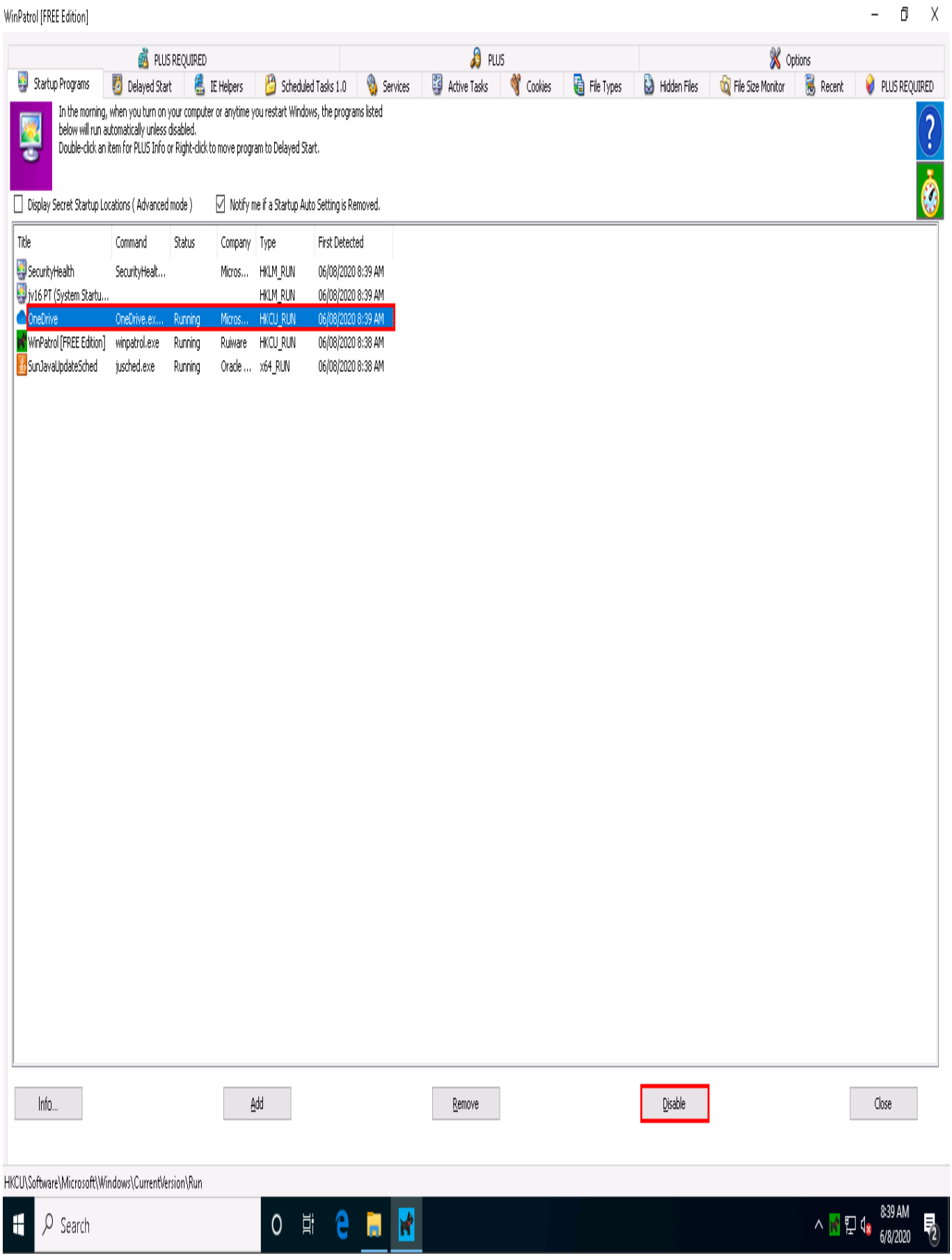
10. ☐ By examining all these tabs, you can find any unwanted processes or applications running on the machine when the system boots up and stop or delete them manually.
11. ☐ Close the **Autoruns** main window.

12. Now, we will find out which applications or processes start when the system boots up using the WinPatrol tool.
13. On the **Windows 10** machine, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Windows Startup Programs Monitoring Tools\WinPatrol**. Double-click **wpsetup.exe** to launch the setup.
14. If a **User Account Control** window appears, click **Yes**.
15. Follow the wizard-driven installation steps to install WinPatrol.
16. In the **Installation completed** wizard, make sure that the **Start the application** options is checked, and then click **Finish**. This will automatically launch the application.

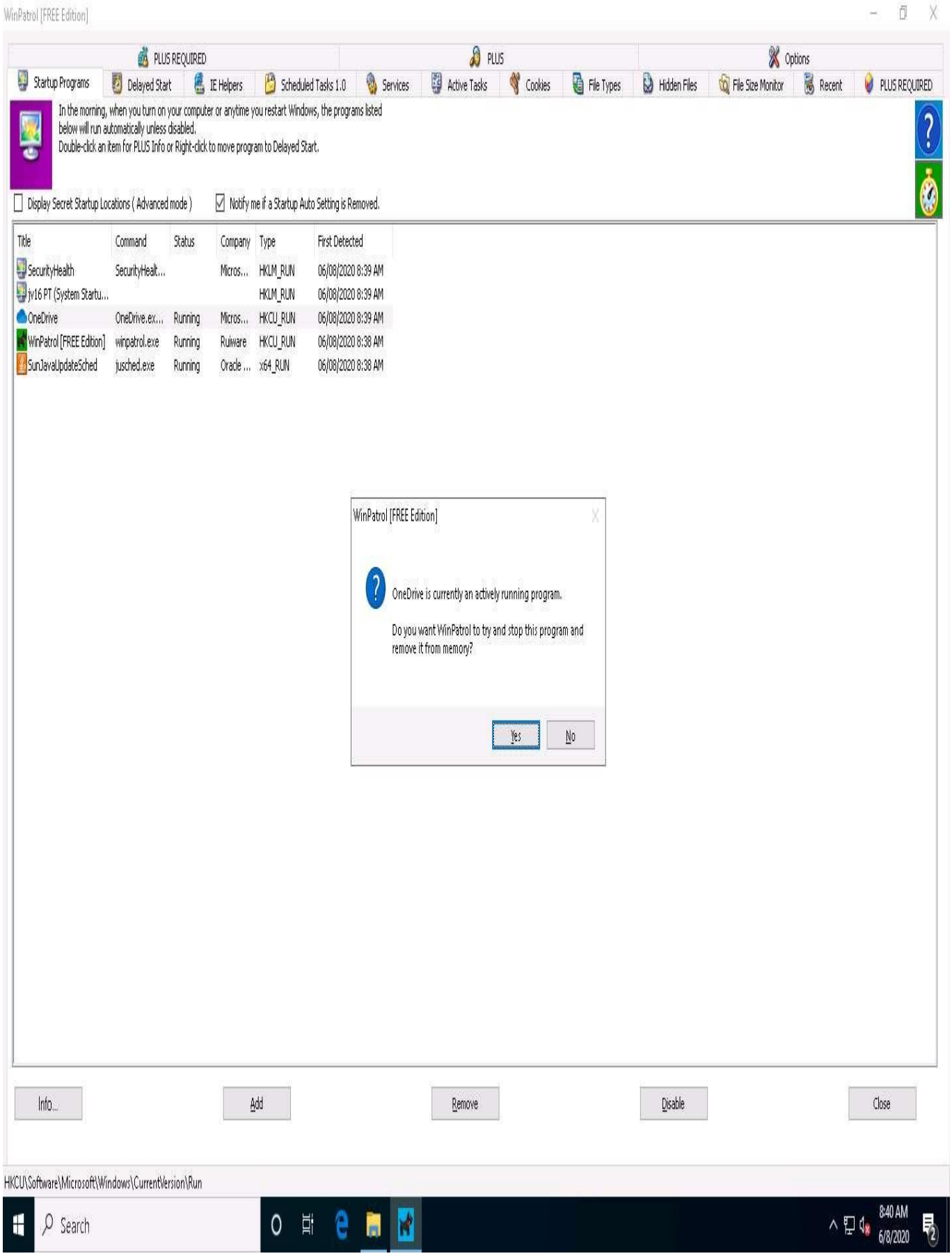


17. ☐ The WinPartol application window appears with the **PLUS** tab open by default. Click the **Startup Programs** tab.
18. ☐ Select any program that affects your system bootup (here, **OneDrive**) and click **Disable**, as shown in the screenshot.

The screenshot may differ from the image on the screen in your lab environment



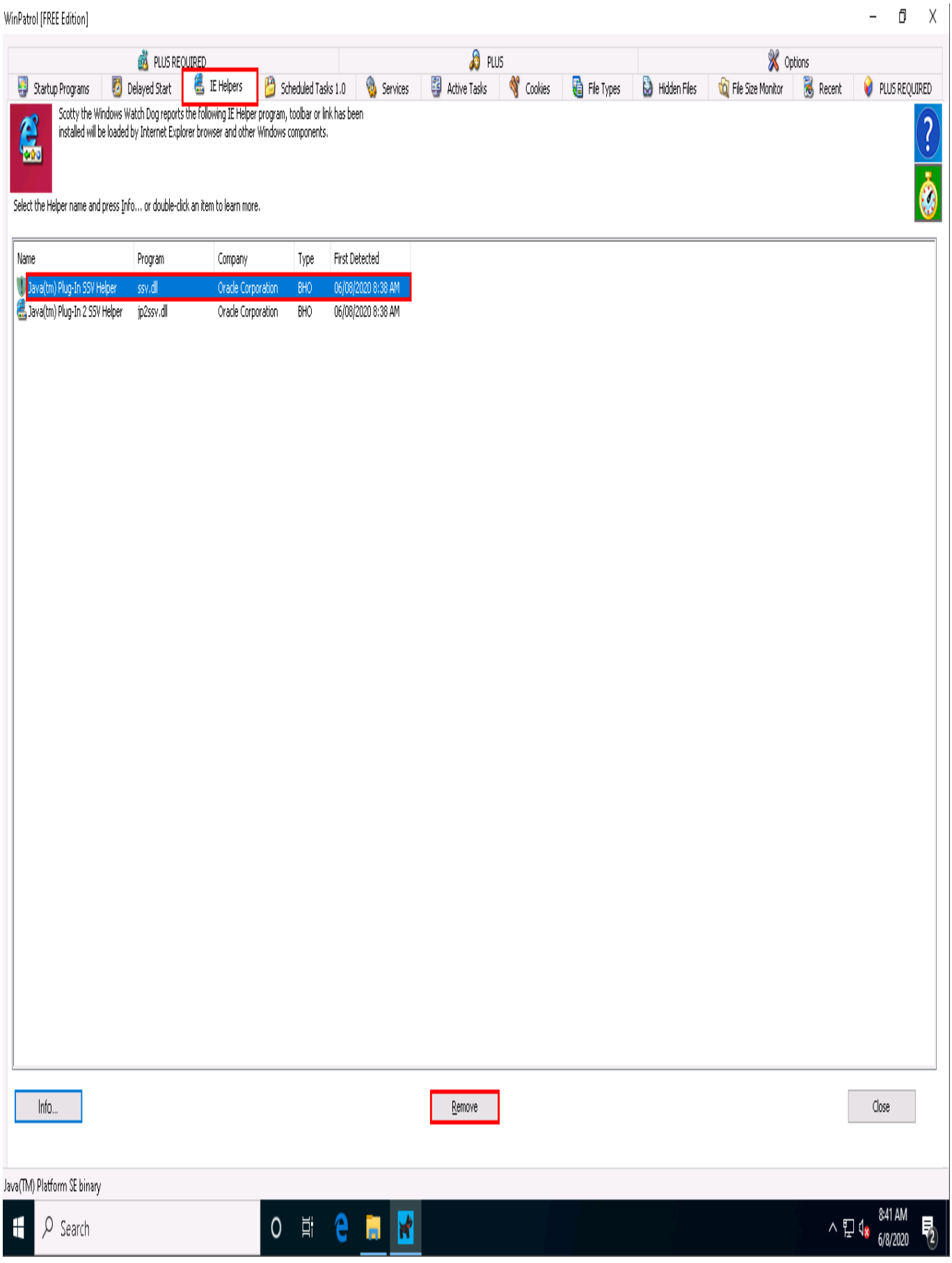
19. ☐ A popup appears, as shown in the screenshot. Click **Yes** to proceed.



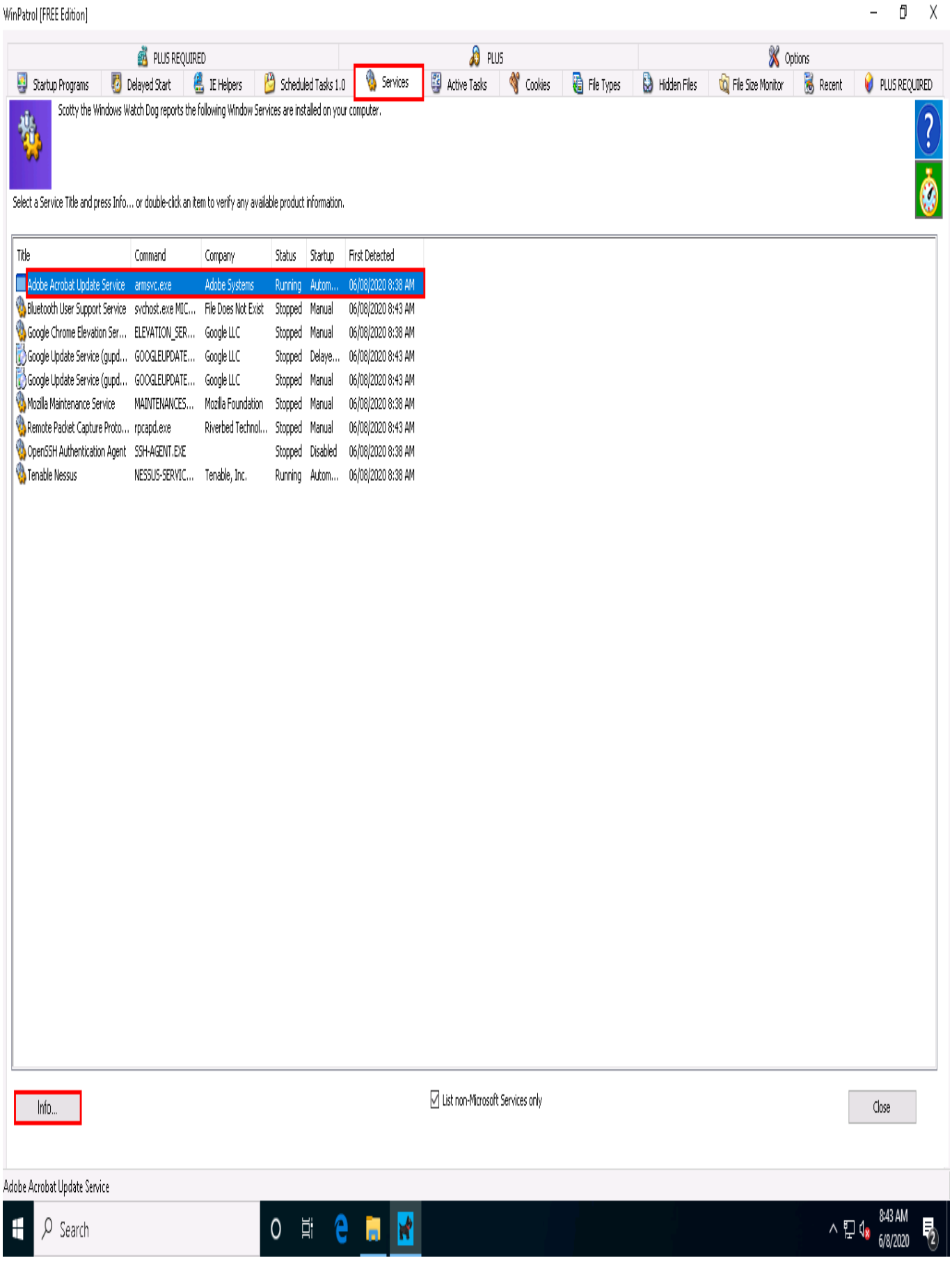
20. ☐ The OneDrive program will be deleted from the Startup Programs list. This is how to manage the Startup Programs for a Windows machine.

21. Now, switch to the **IE Helpers** tab. It shows all toolbars and links loaded by IE or other windows component. Select duplicate or non-required programs (here **Java(tm) Plug-In SSV Helper**), and then click **Remove**.

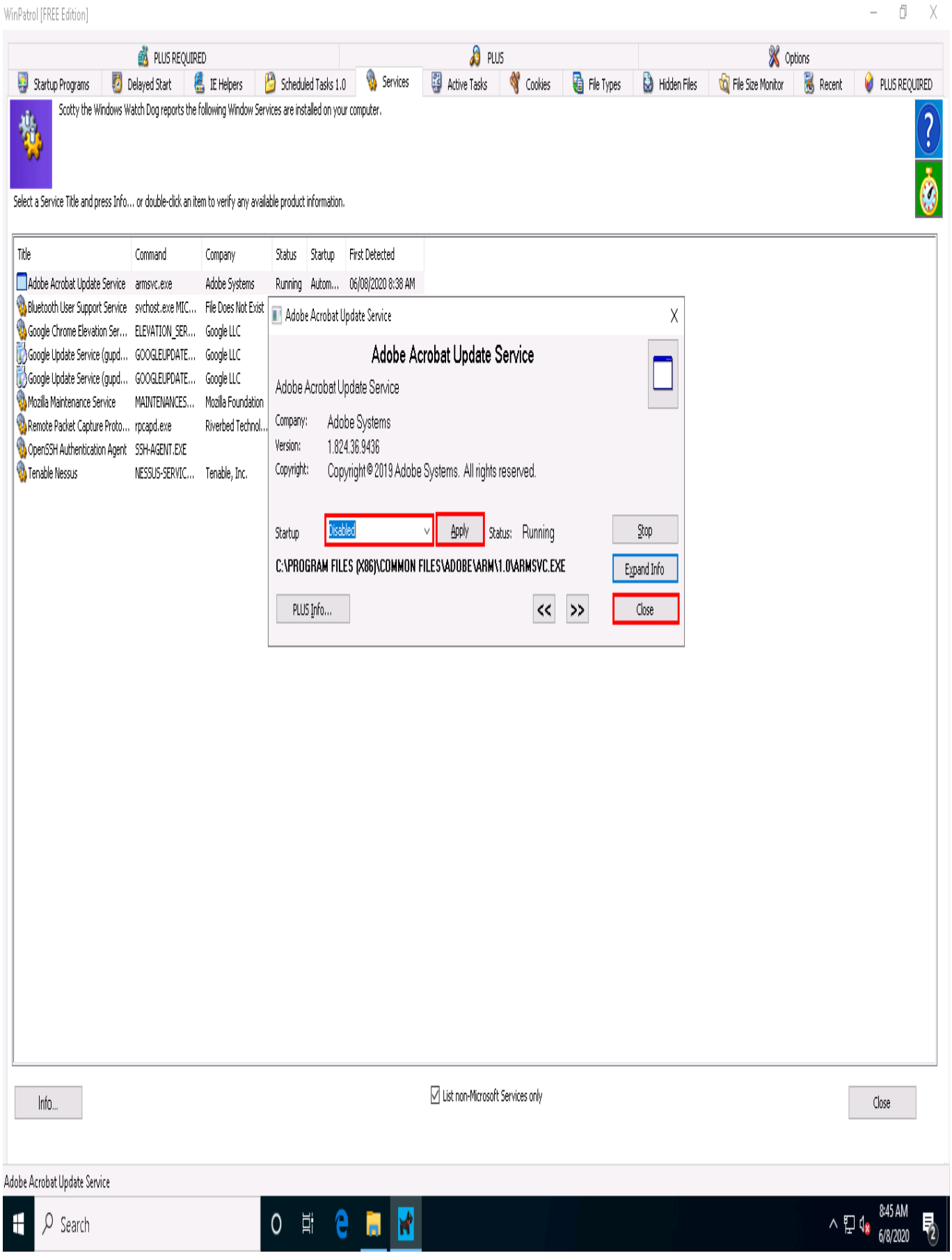
If a popup appears, as shown in the screenshot. Click **Yes** to proceed.



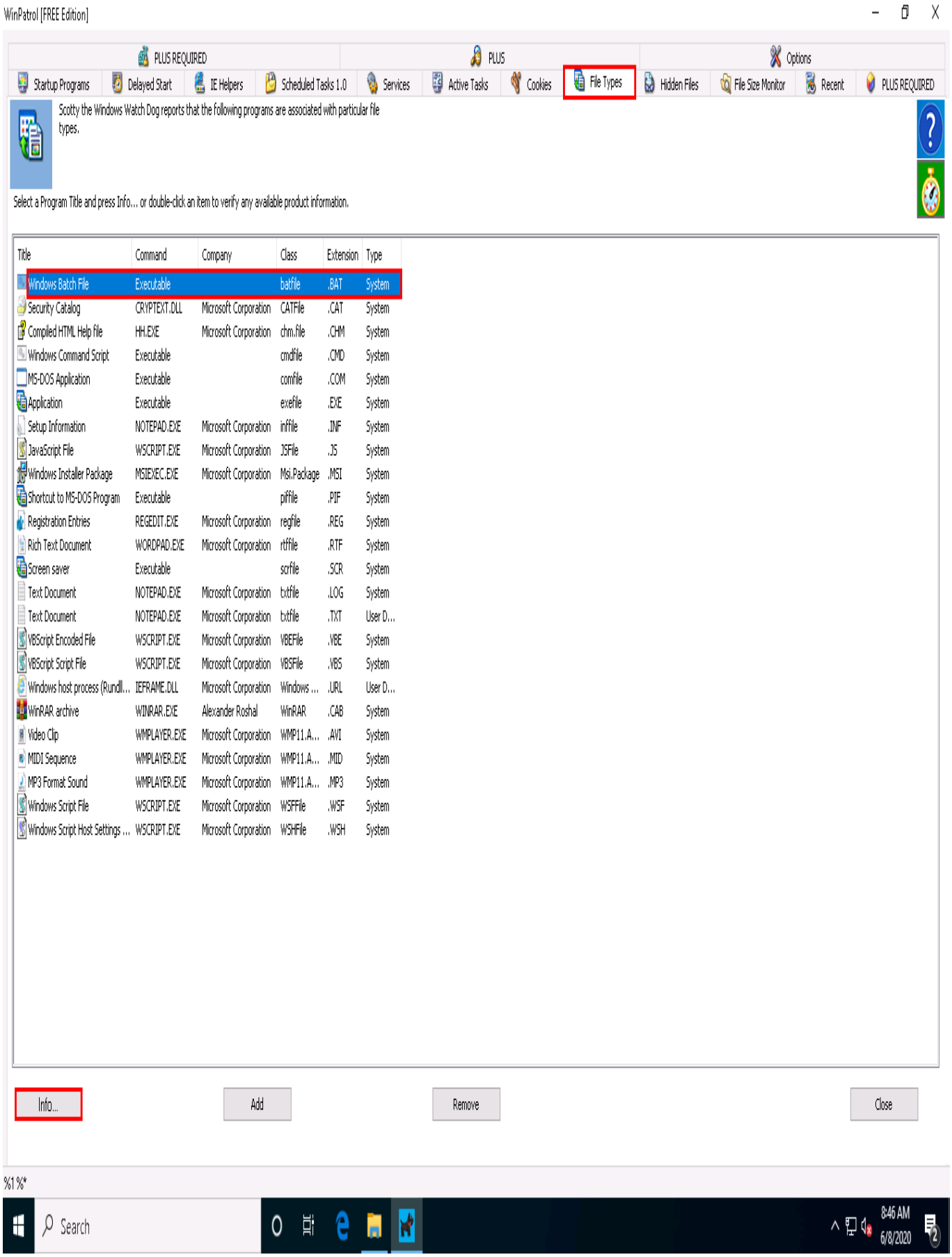
22. ☐ Switch to the **Services** tab to display the installed services on your system. Select any service and click **Info...**, as shown in the screenshot.



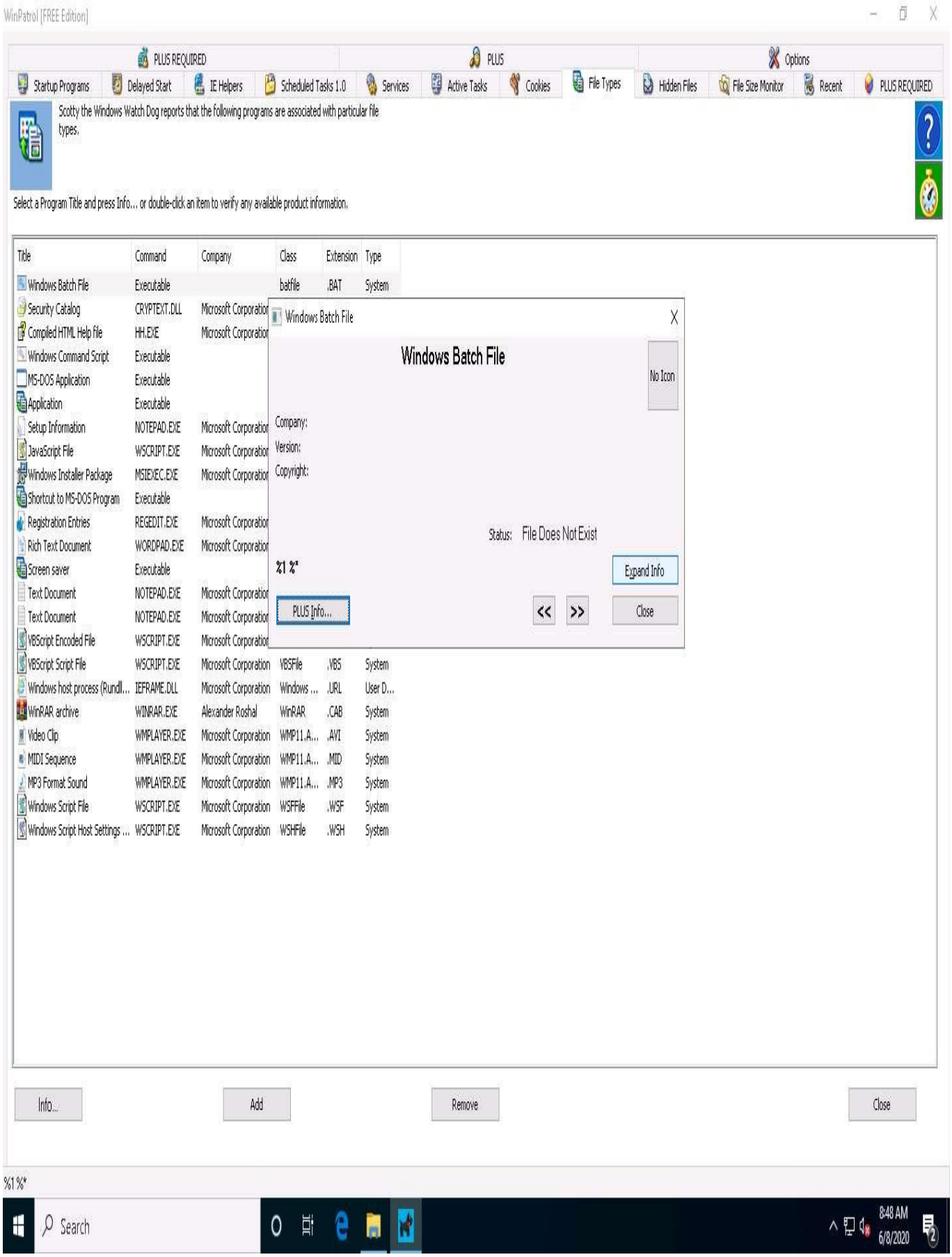
23. A window showing the service information appears. To disable a service, select **Disabled** from the drop-down list and click **Apply**, as shown in the screenshot. Click **Close** to exit the window.



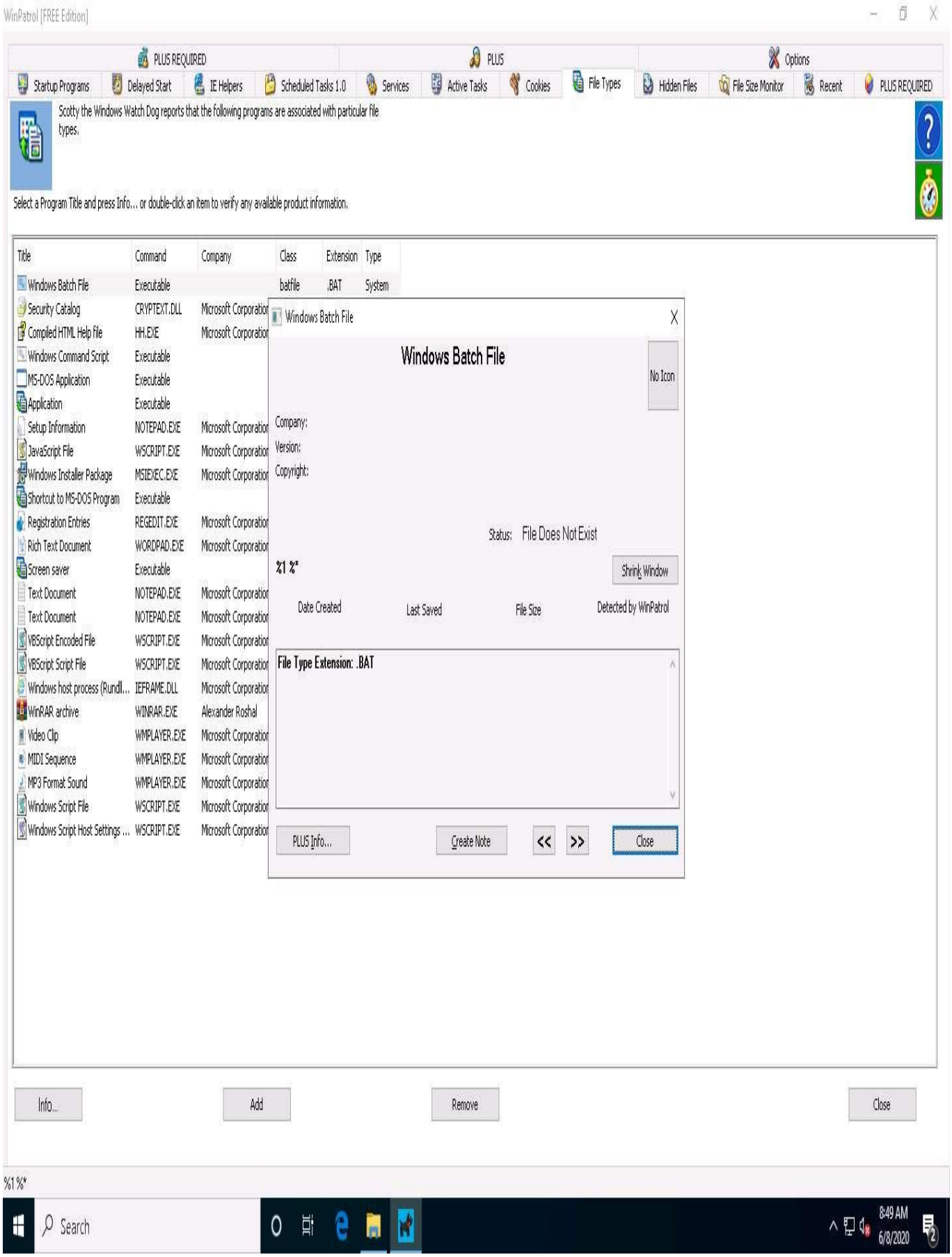
24. ☐ Switch to the **File Types** tab to view the programs associated with a file. Select a program and click **Info...** to view the available information.



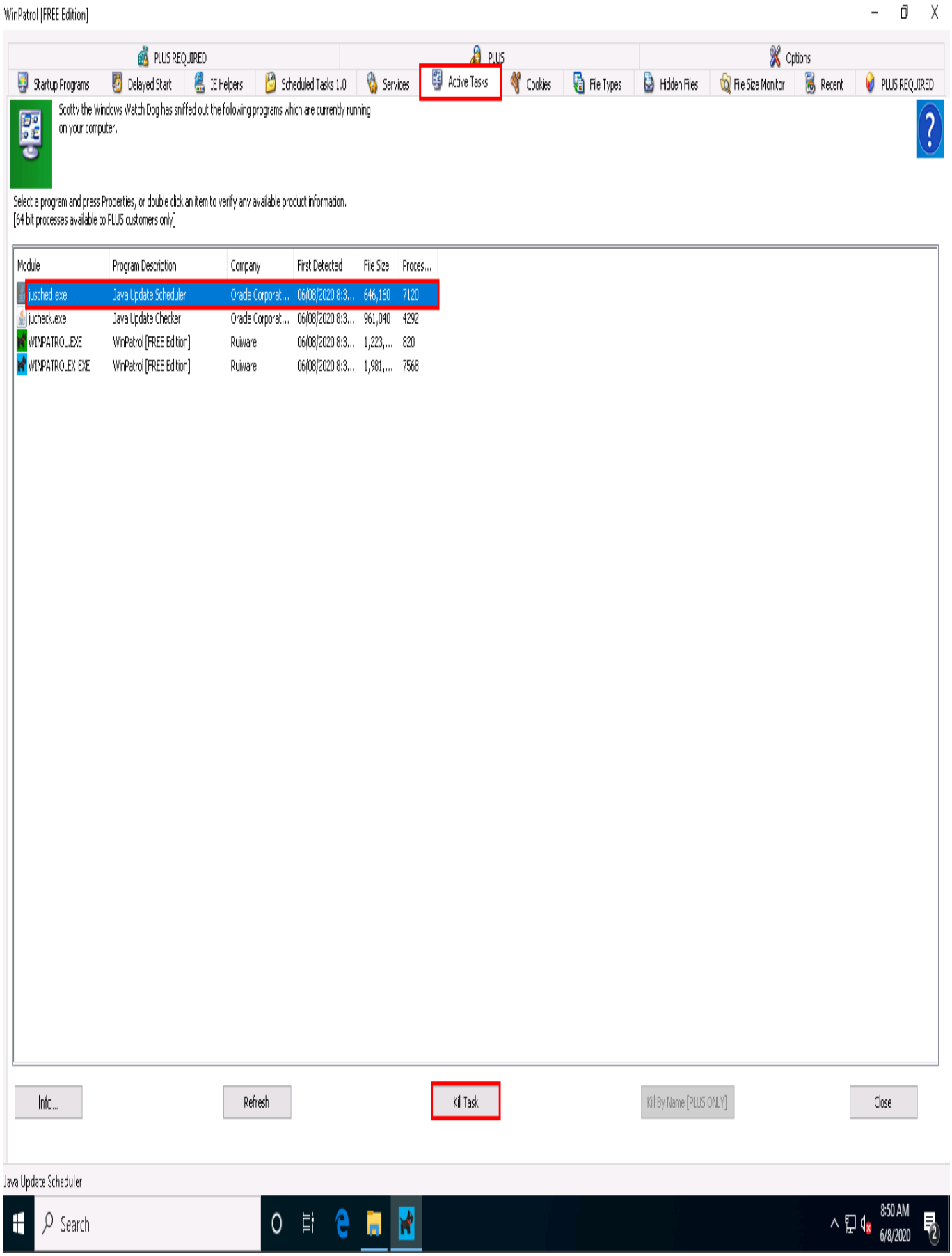
25. ☐ The **Windows Batch File** window appears, as shown in the screenshot. Click **Expand Info** to view the full info about the program.



26. ☐ The expanded view shows all information related to the program and its associated file, as demonstrated in the screenshot. Analyze the info and close the window.



27. Now, switch to the **Active Tasks** tab to view the current tasks running on your computer. Select any task and click **Kill Task** to end the task, as shown in the screenshot.



28. By examining all these tabs, you can find any unwanted process or application running on the machine when the system boots up and manually stop or delete them.
29. Close all open windows on the **Windows 10** machine.
30. You can also use other Windows startup programs monitoring tools such as **Autorun Organizer** (https://www.chemtable.com), **Quick Startup** (https://www.glarysoft.com), **StartEd Pro** (http://www.outertech.com), or **Chameleon Startup Manager** (http://www.chameleon-managers.com) to perform startup programs monitoring.

Task 6: Perform Installation Monitoring using Mirekusoft Install Monitor

When the system or users install or uninstall any software application, there is a chance that it will leave traces of the application data on the system. Installation monitoring help to detect hidden and background installations that malware performs.

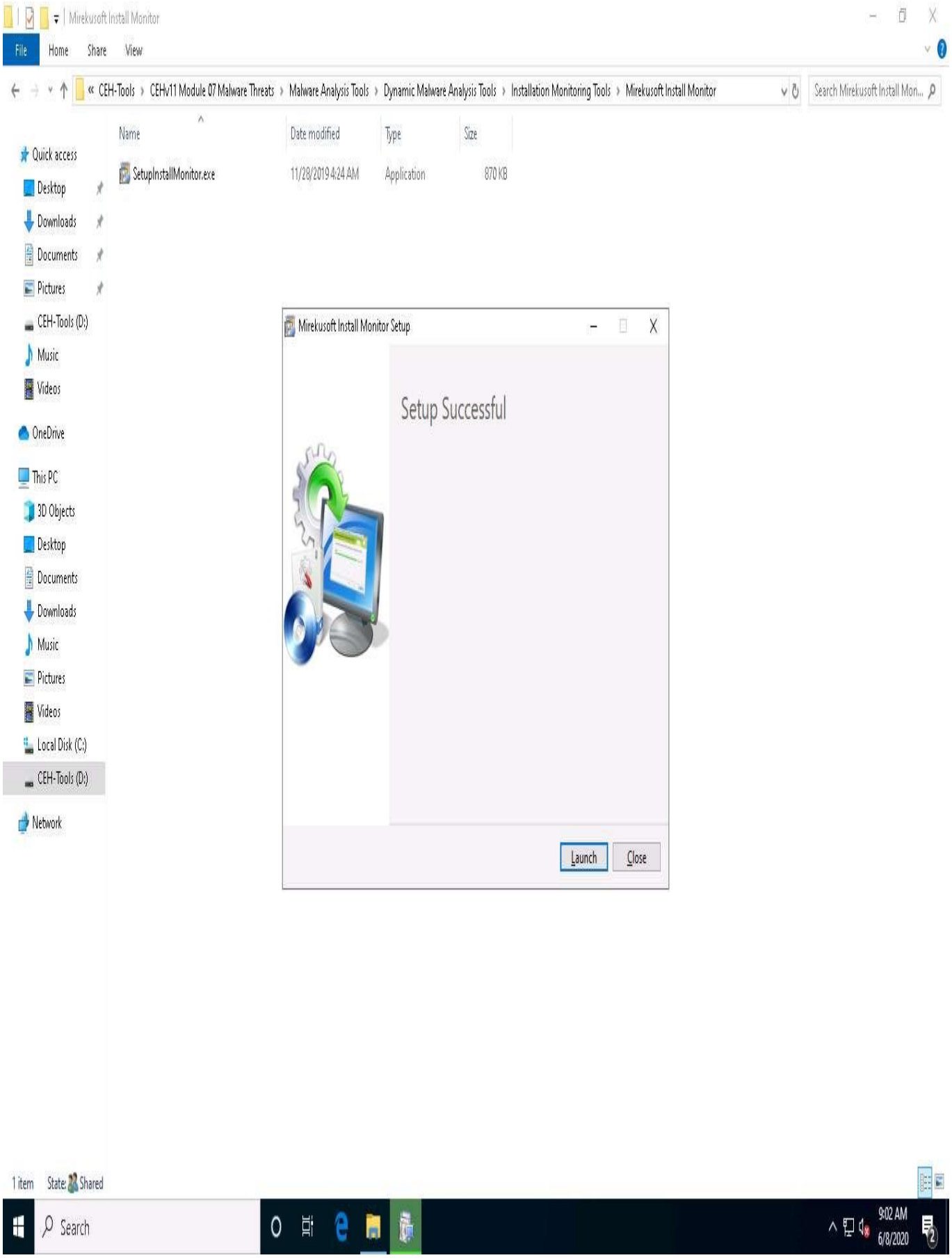
Mirekusoft Install Monitor automatically monitors what gets placed on your system and allows you to uninstall it completely. Install Monitor works by monitoring what resources such as file and registry, are created when a program is installed. It provides detailed information about the software installed, including how much disk space, CPU, and memory your programs are using. It also provides information about how often you use different programs. A program tree is a useful tool that can show you which programs were installed together.

Here, we will use the Mirekusoft Install Monitor tool to detect hidden and background installations.

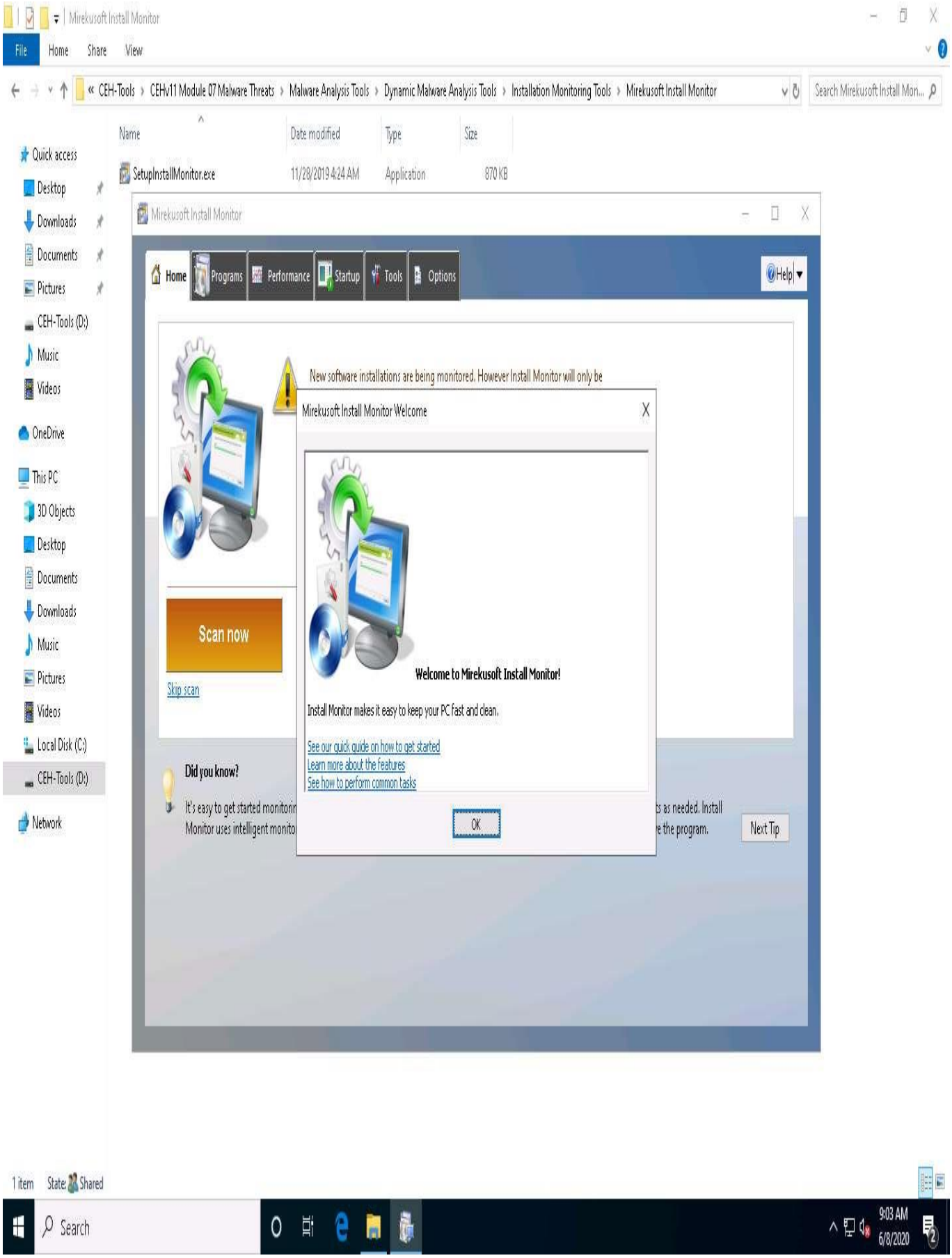
1. On the **Windows 10** machine, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Installation Monitoring Tools\Mirekusoft Install Monitor** and double-click **SetupInstallMonitor.exe**.

   If **Update Available** wizard appears, click **Update** button.
   If a **User Account Control** window appears, click **Yes**.

2. Follow the installation steps to install **Mirekusoft Install Monitor**.
3. The **Setup Successful** wizard appears; click **Launch**.

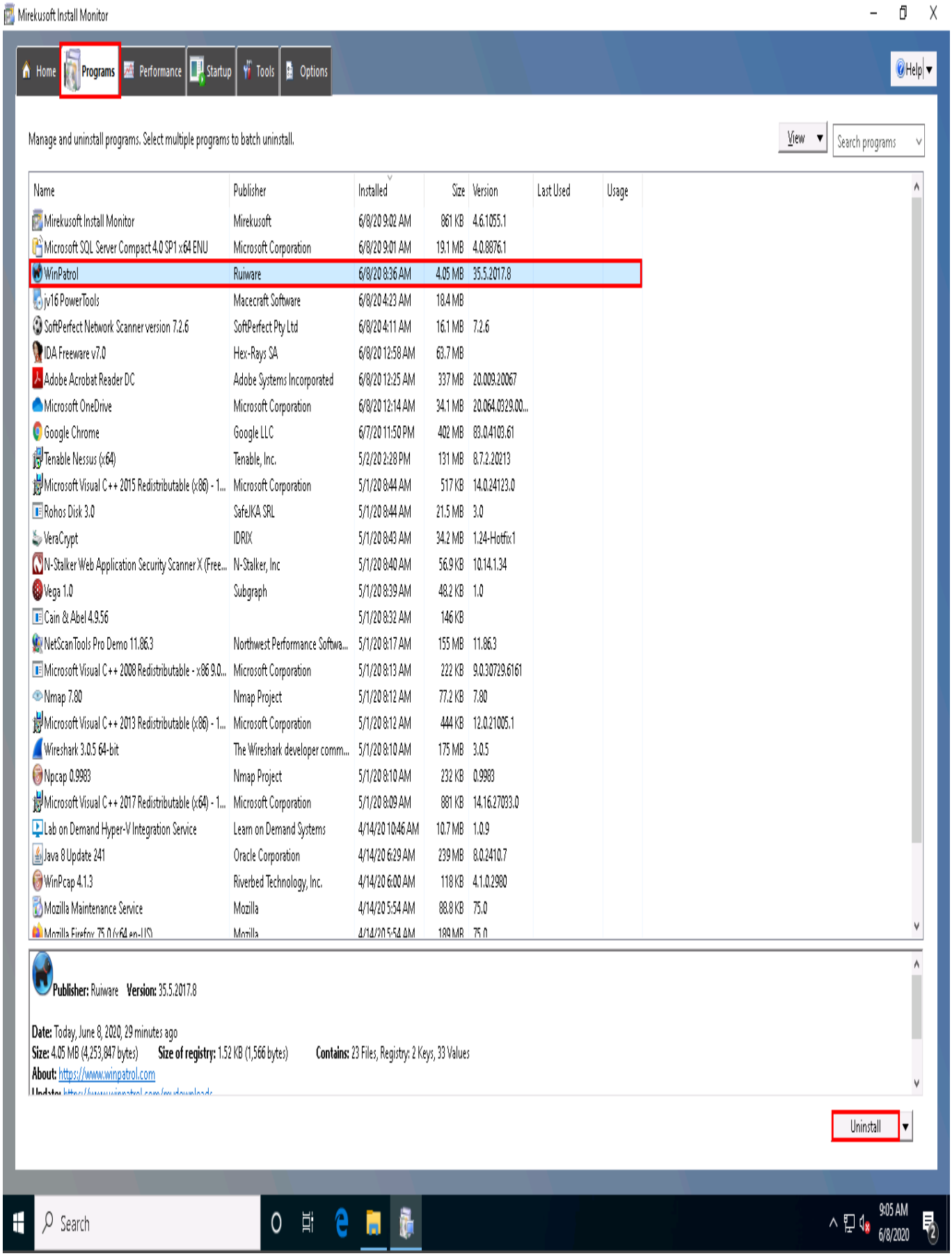


4. ☐ If a **User Account Control** window appears, click **Yes**.
5. ☐ The **Mirekusoft Install Monitor** main window appears, along with a **Welcome** pop-up, click **OK**. Click **Skip scan** in the **Home** tab.

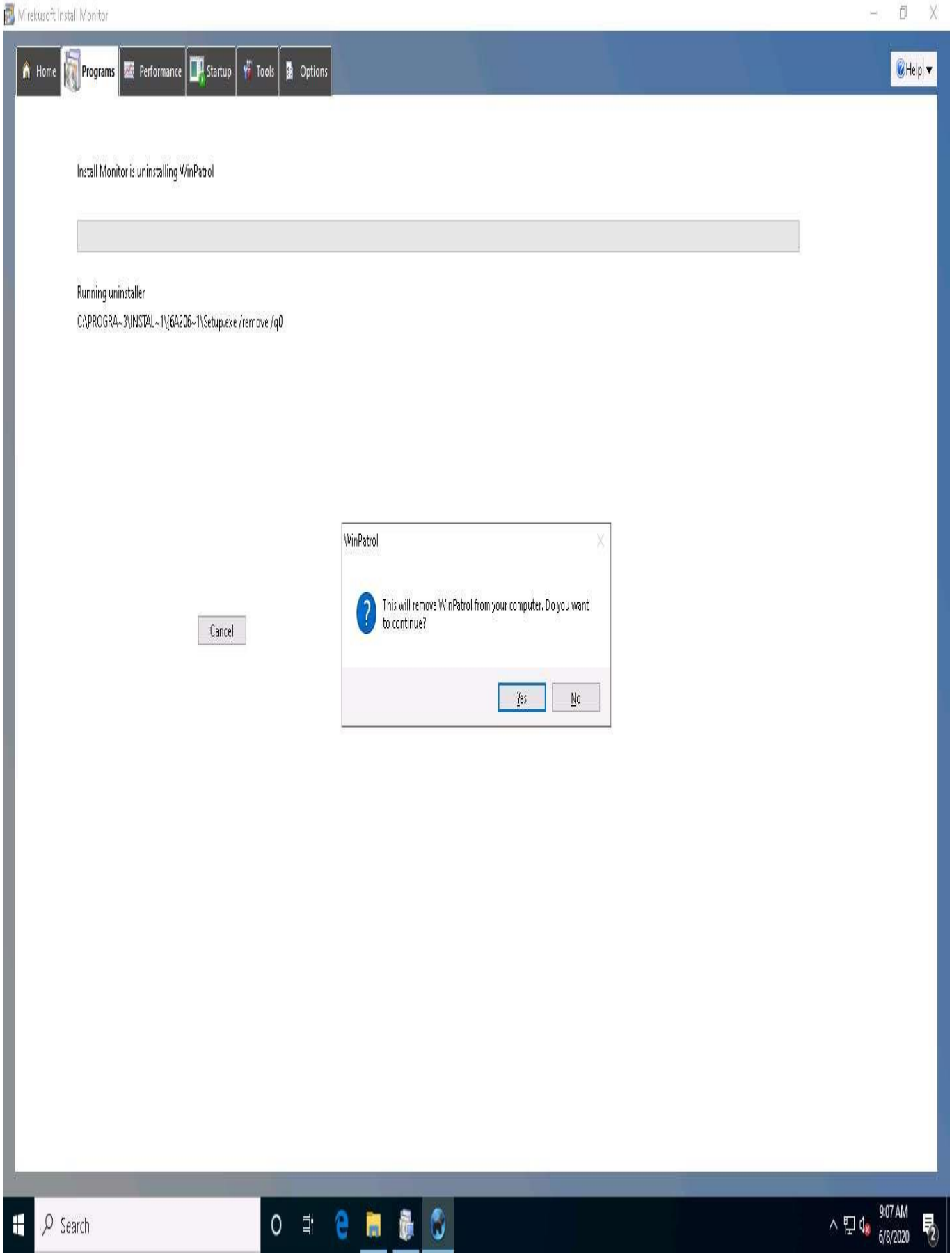


6. ☐ Click the **Programs** tab to view the programs installed on your machine. You can choose any unwanted or unused application and click **Uninstall** to remove it from your machine. In this task, we are choosing the **WinPatrol** application.

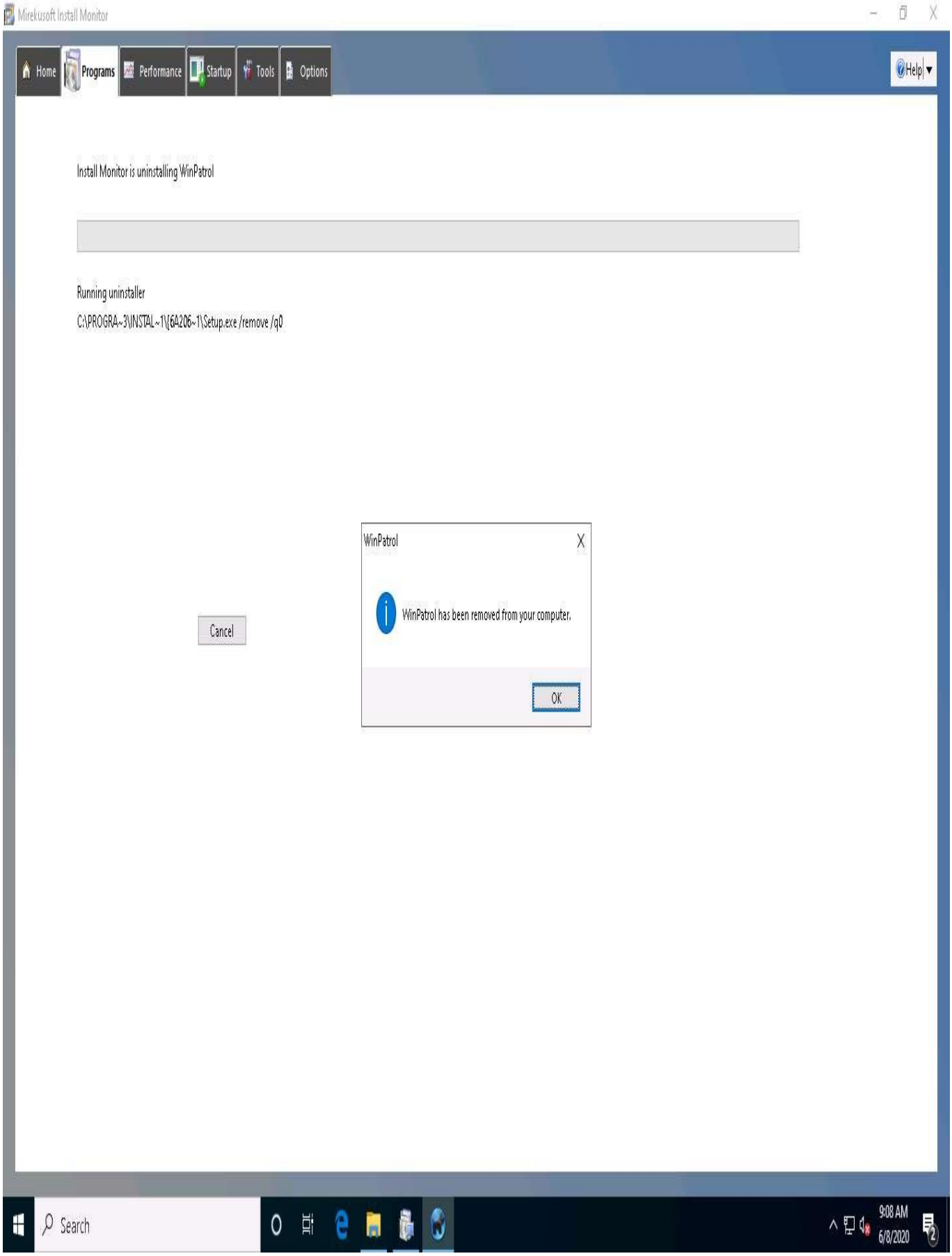
The **WinPatrol** pop-up appears; click **Reject Change**.



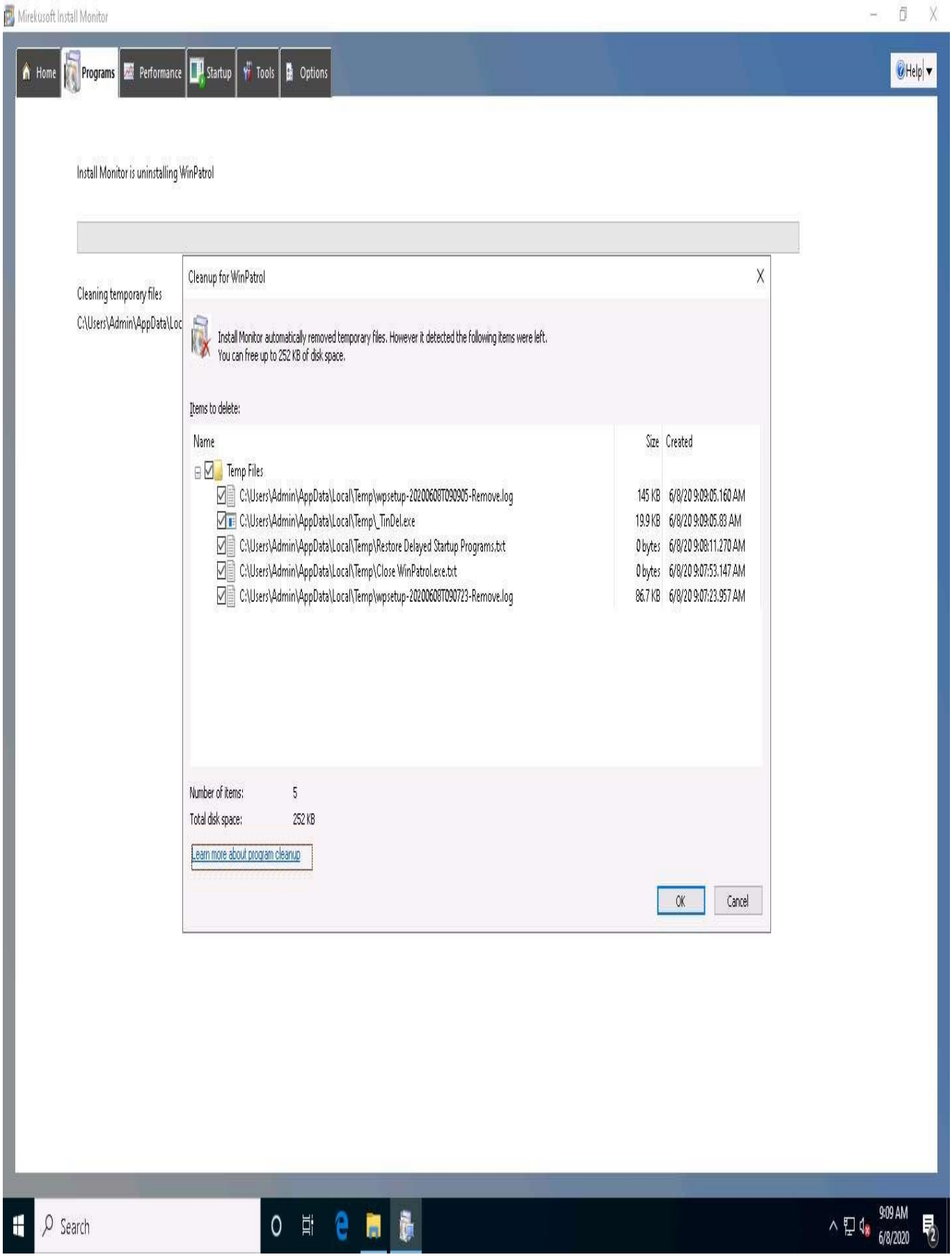
7. ☐ While uninstalling the application, a selected program pop-up appears, click **Yes** in all the **WinPatrol** pop-ups.



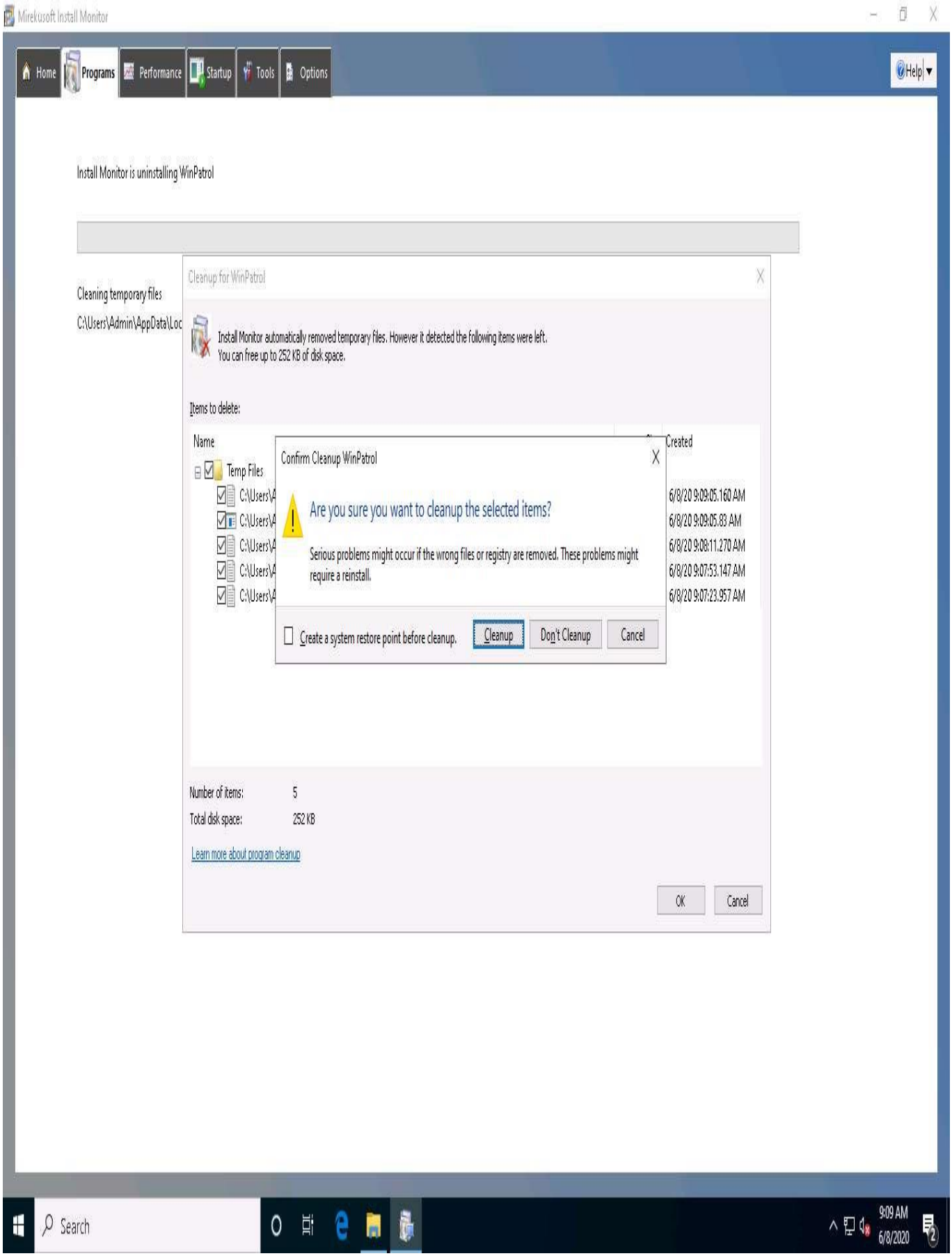
8. ☐ The **selected application is uninstalled from your computer** pop-up appears; click **OK**.



9. ☐ If a **Cleanup for Selected Program** window appears (here, **WinPatrol**), click **OK**.

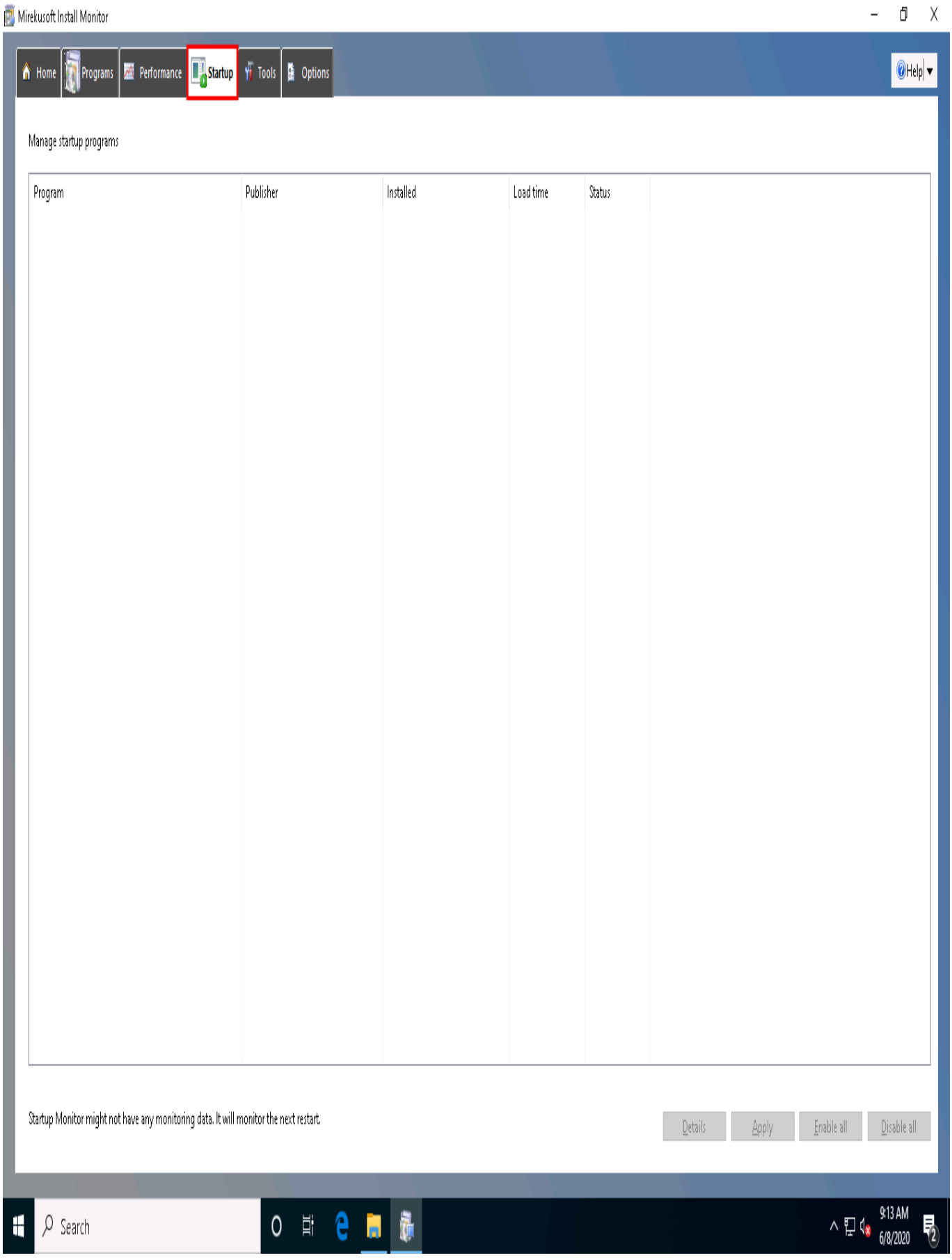


10. ☐ The **Confirm Cleanup** pop-up appears; click **Cleanup**. This will delete all the supported files for the related application that you have uninstalled from your computer.



11. ☐ The selected application is uninstalled from your computer. Click the **Performance** tab to view and terminate currently running programs.
12. ☐ Here, you can select any program from the list and click **End Program** to terminate the program.
13. ☐ Click the **Startup** tab to view the programs that run automatically on Windows Startup.

14. ☐ In this lab, Mirekusoft Install Monitor has not detected startup programs. If the program does detect them, choose the application that you want to disable on startup, and click **Disable**.
15. ☐ You can restart the machine to detect the startup programs.



16. ☐ This is how to monitor a Windows machine using Mirekusoft Install Monitor. Close all applications.
17. ☐ You can also use other installation monitoring tools such as **SysAnalyzer** (https://www.aldeid.com), **Advanced Uninstaller PRO** (https://www.advanceduninstaller.com), **REVO UNINSTALLER PRO** (https://www.revouninstaller.com), or **Comodo Programs Manager** (https://www.comodo.com) to perform installation monitoring.

Task 7: Perform Files and Folder Monitoring using PA File Sight

Malware can modify system files and folders to save information in them. You should be able to find the files and folders that malware creates and analyze them to collect any relevant stored information. These files and folders may also contain hidden program code or malicious strings that the malware plans to execute on a specific schedule.

An ethical hacker or penetration tester must scan the system for suspicious files and folders using file and folder monitoring tools such as PA File Sight to detect any malware installed and any system file modifications. PA File Sight is a protection and auditing tool. It detects ransomware attacks coming from a network and stops them.

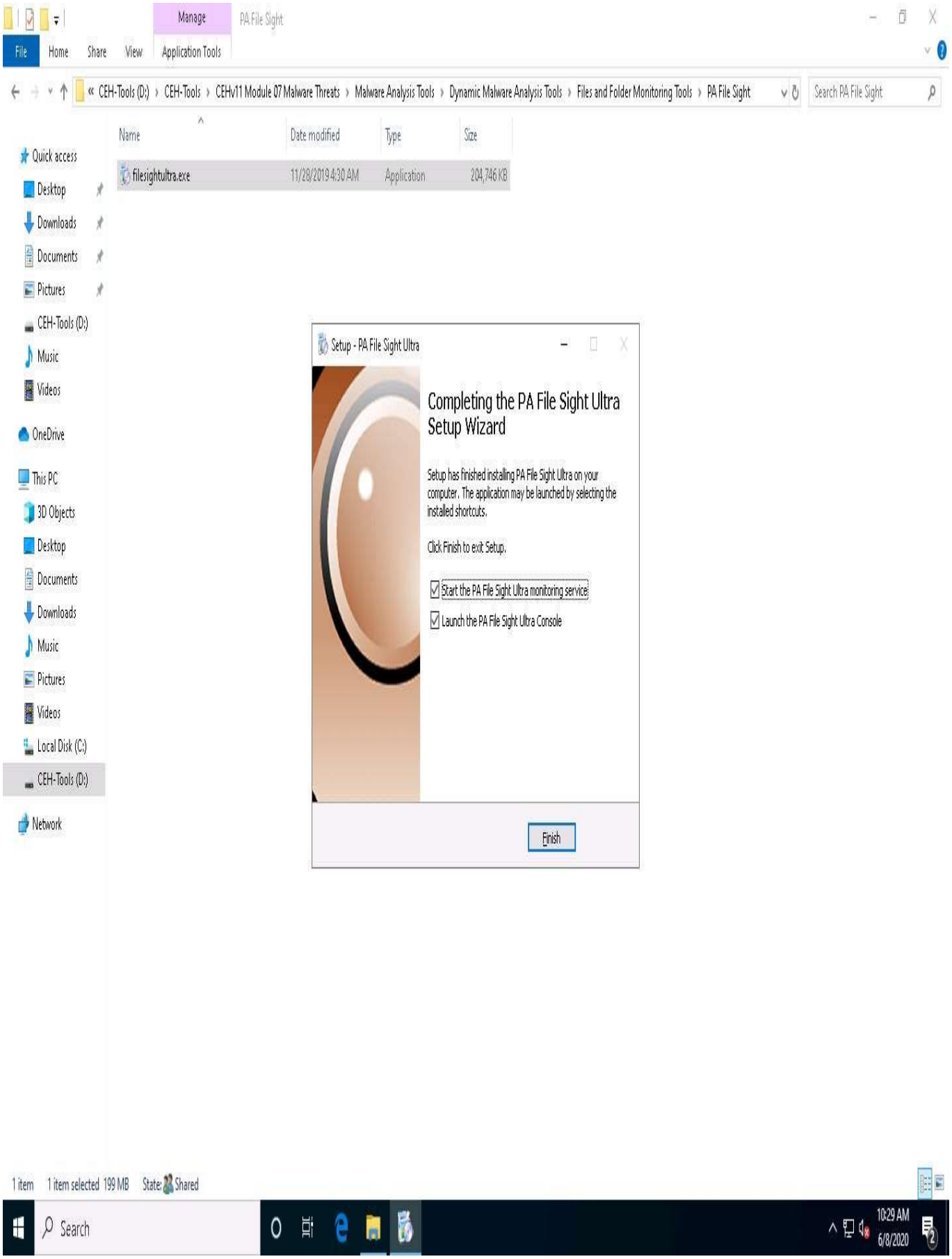
Features:

- Compromised computers are blocked from reaching files on other protected servers on the network
- Detects users copying files and optionally blocks access
- Real-time alerts allow the appropriate staff to investigate immediately
- Audits who is deleting, moving, and reading files

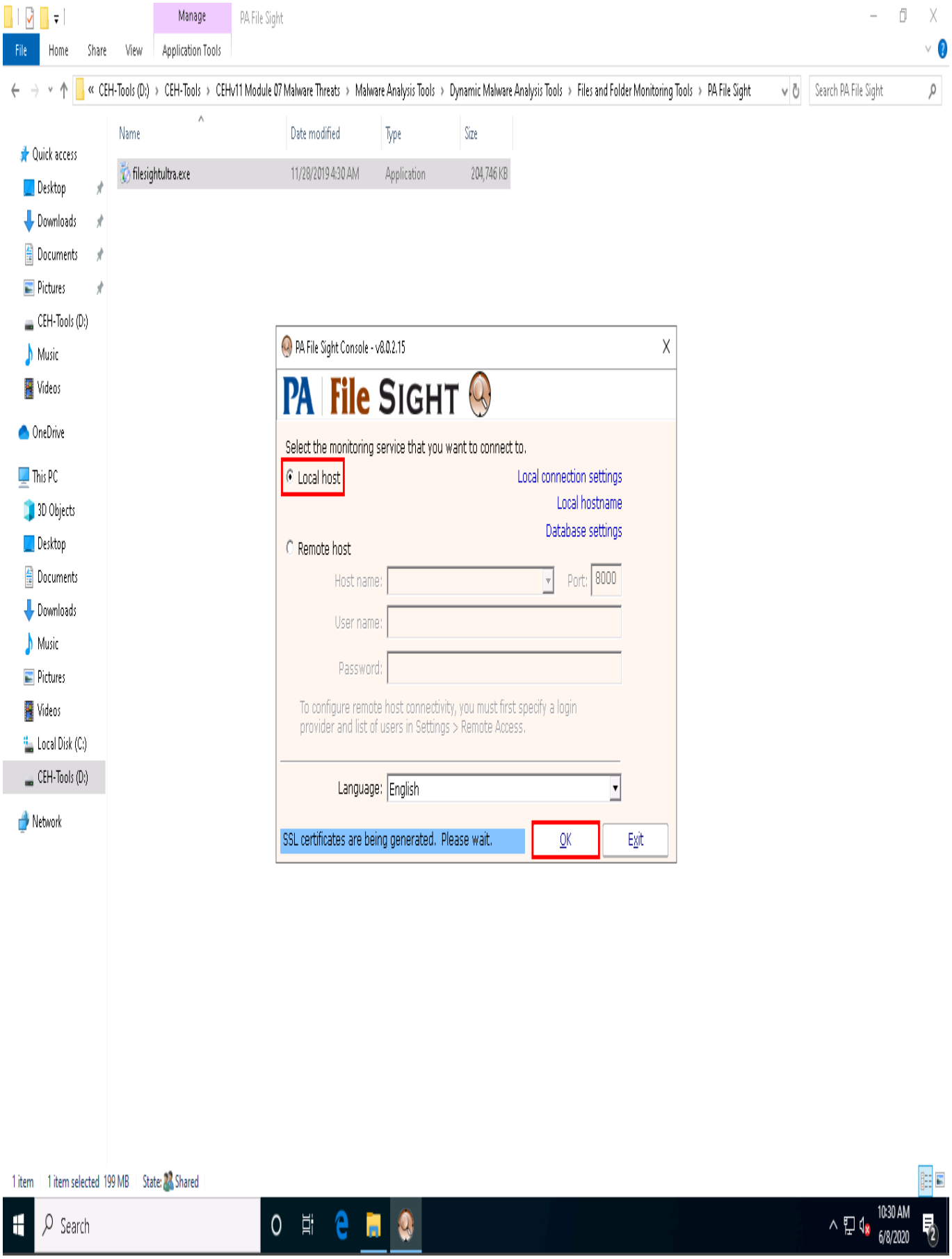
1. ☐ On the **Windows 10** machine, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Files and Folder Monitoring Tools\PA File Sight** and double-click **filesightultra.exe**.

   If a **User Account Control** window appears, click **Yes**.

2. ☐ The **Select Setup Language** pop-up appears; choose your preferred language, and then click **OK**.
3. ☐ Follow the default installation steps to install **PA File Sight**.
4. ☐ **Completing the PA File Sight Ultra Setup Wizard** appears; make sure that both the **Start the PA File Sight Ultra monitoring service** and the **Launch the PA File Sight Ultra Console** options are checked, and click **Finish**.
5. ☐ This will run the PA File Sight service and automatically launch the application.

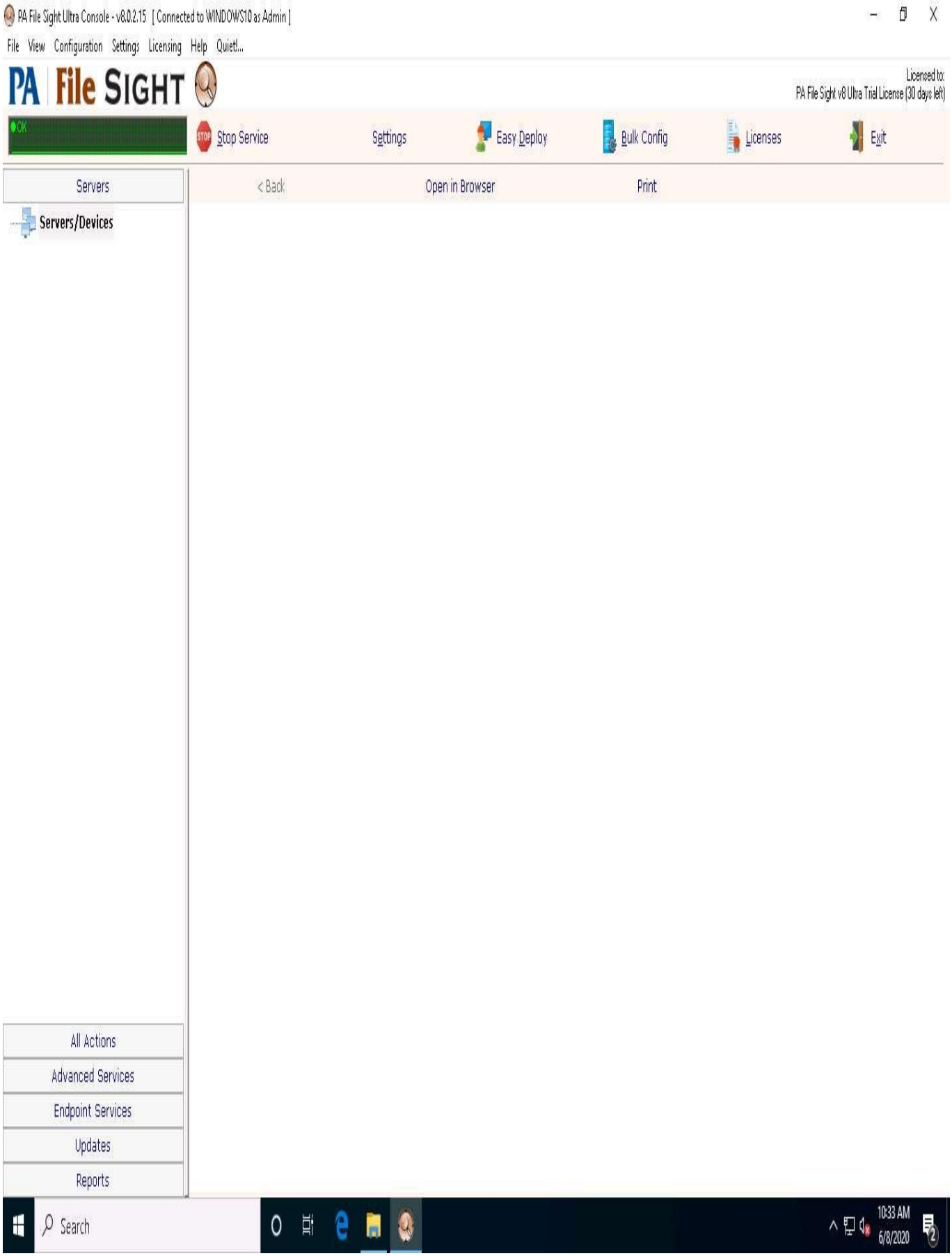


6. ☐ The **PA File Sight Console** window appears. By default, the **Local host** radio button is selected; click **OK**.

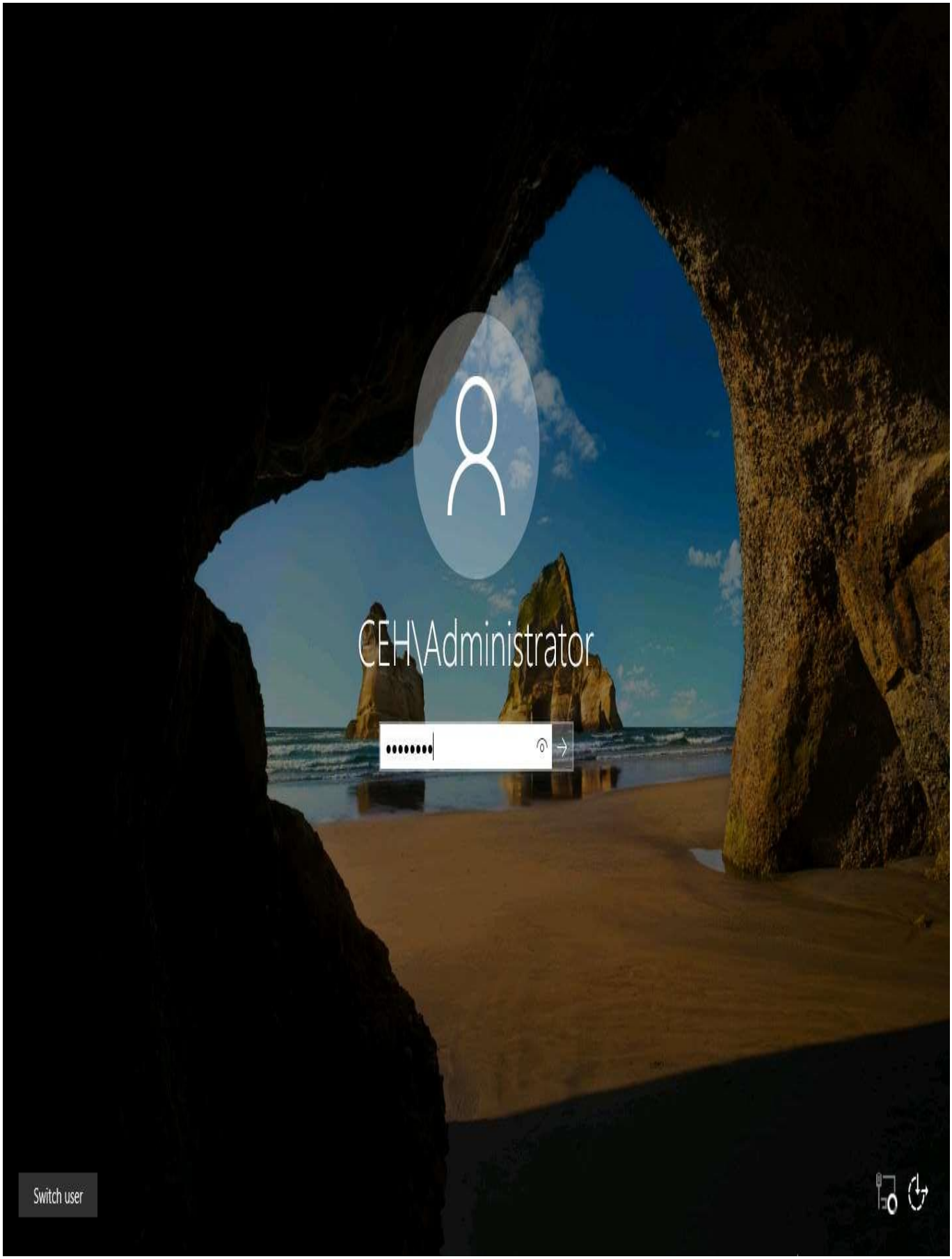


7. ☐ The **PA File Sight Ultra Console** main window appears.

If a **Start Wizard** window appears, close it.

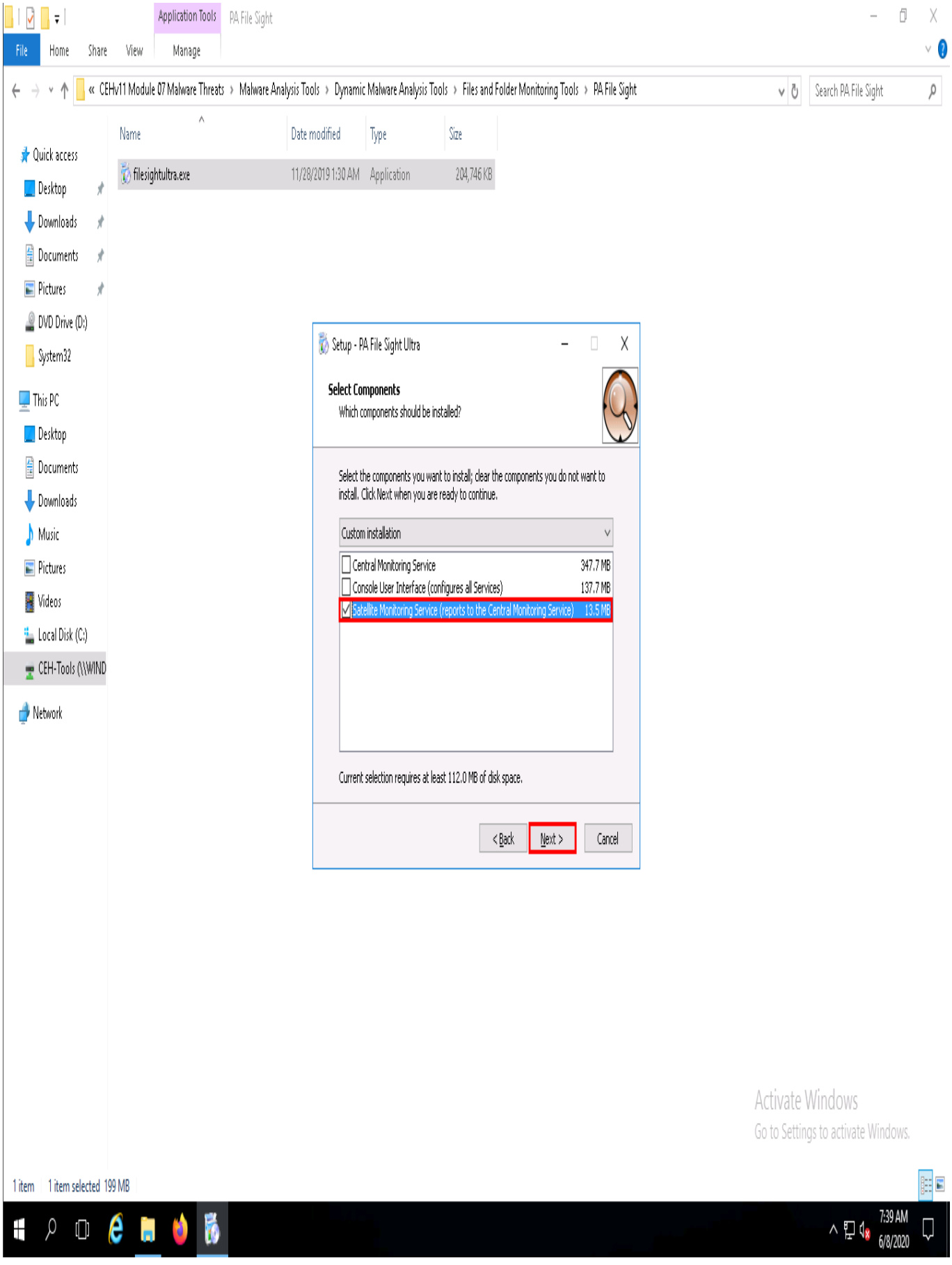


8. ☐ Click Windows Server 2016 to switch to the **Windows Server 2016** machine Click Ctrl+Alt+Delete to activate the machine, by default, **CEH\Administrator** account is selected, click Pa$$w0rd to enter the password and press **Enter**.

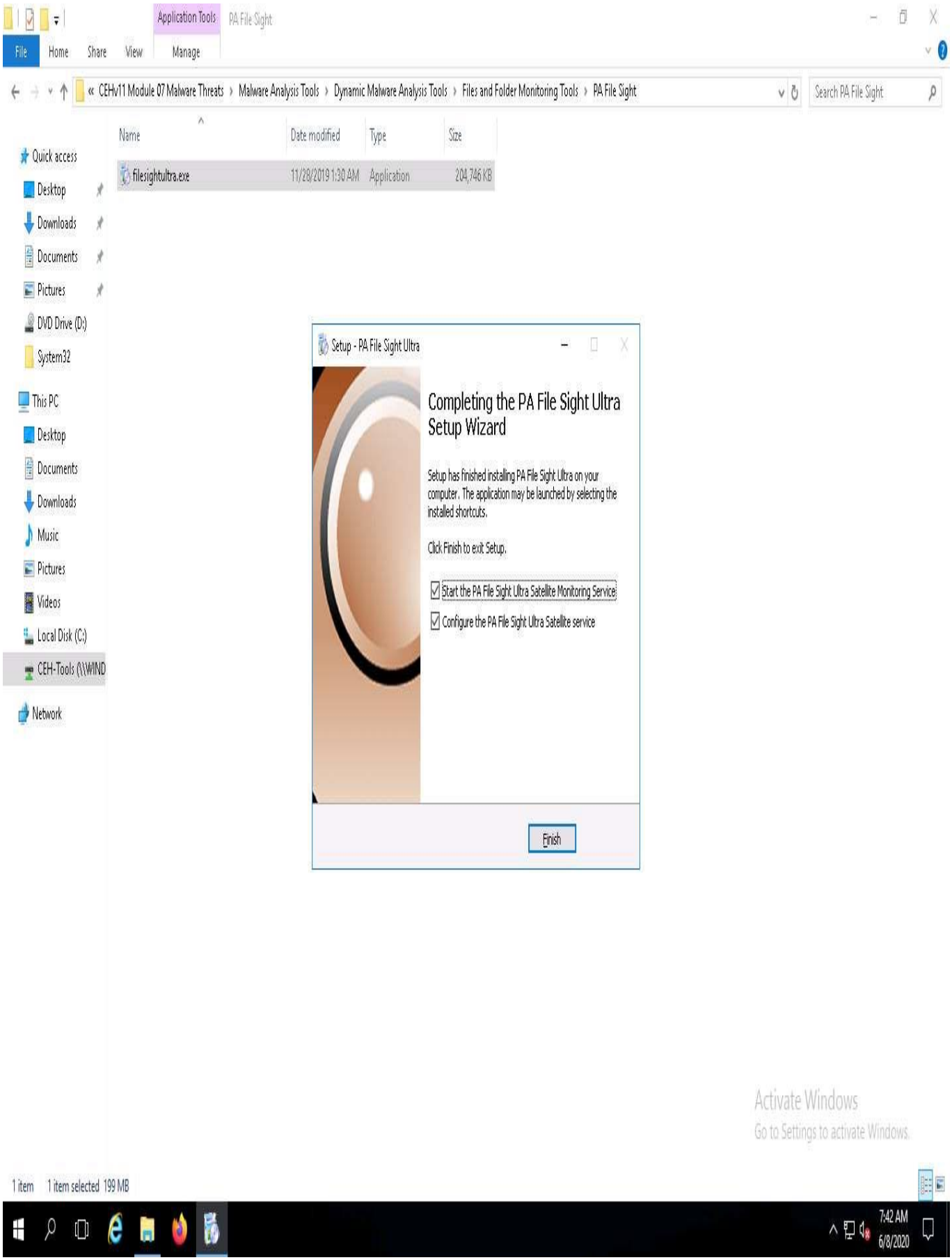


9. ☐ Navigate to **Z:\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Files and Folder Monitoring Tools\PA File Sight** and double-click **filesightultra.exe**.
10. ☐ The **Select Setup Language** pop-up appears; choose your preferred language and click **OK**.
11. ☐ Click the **Next** button until you see the **Select Components** wizard.

12. In the **Select Components** wizard, uncheck the **Central Monitoring Service** and **Console User Interface (configure all Services)** options, and check the **Satellite Monitoring Service (reports to Central Monitoring Service)** option; then, click **Next**.

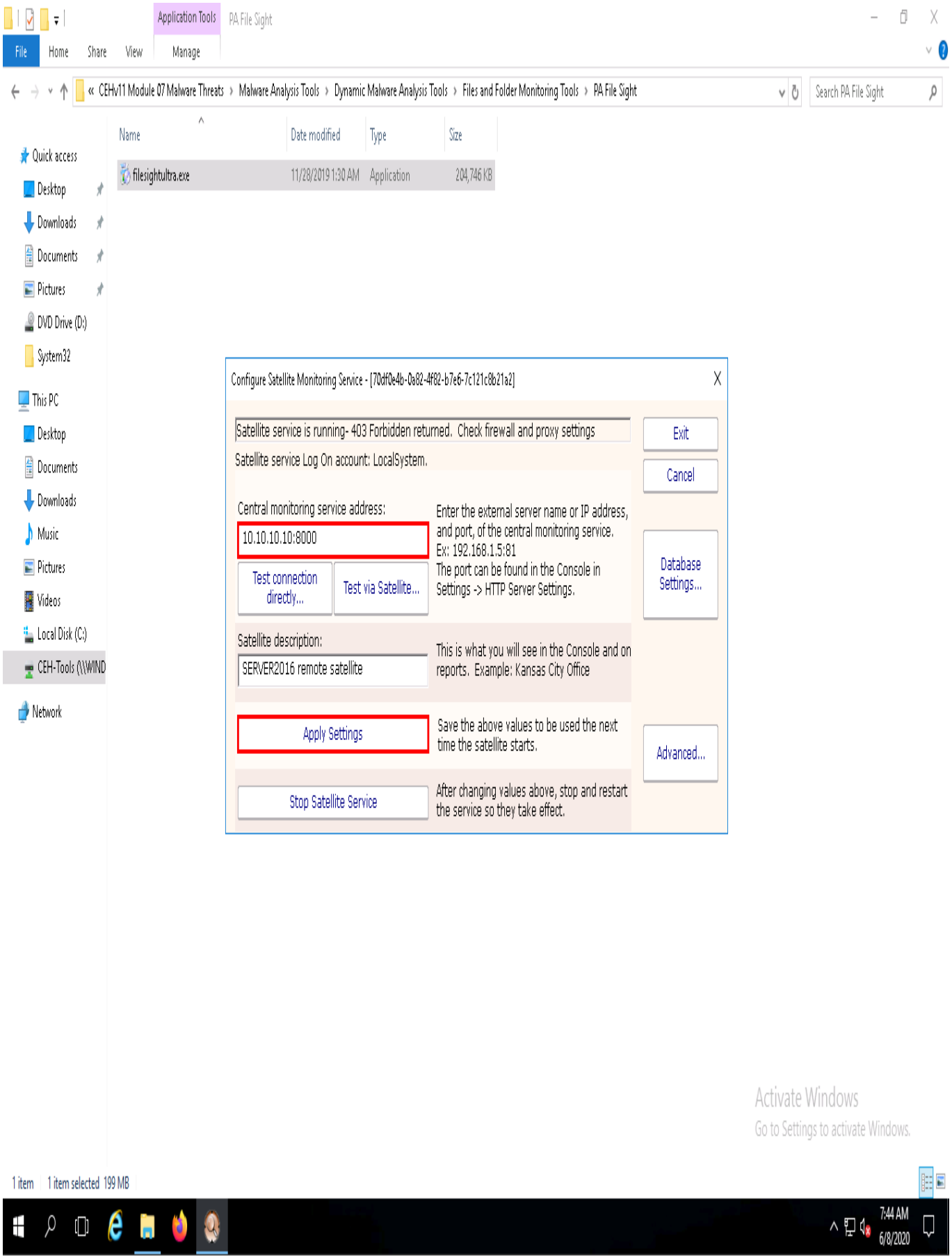


13. ☐ Follow the wizard-driven installation steps to install the application.
14. ☐ In the final step of the installation, make sure that the **Start the PA File Sight Ultra Satellite Monitoring Service** and **Configure the PA File Sight Ultra Satellite service** options are checked; then, click **Finish**.

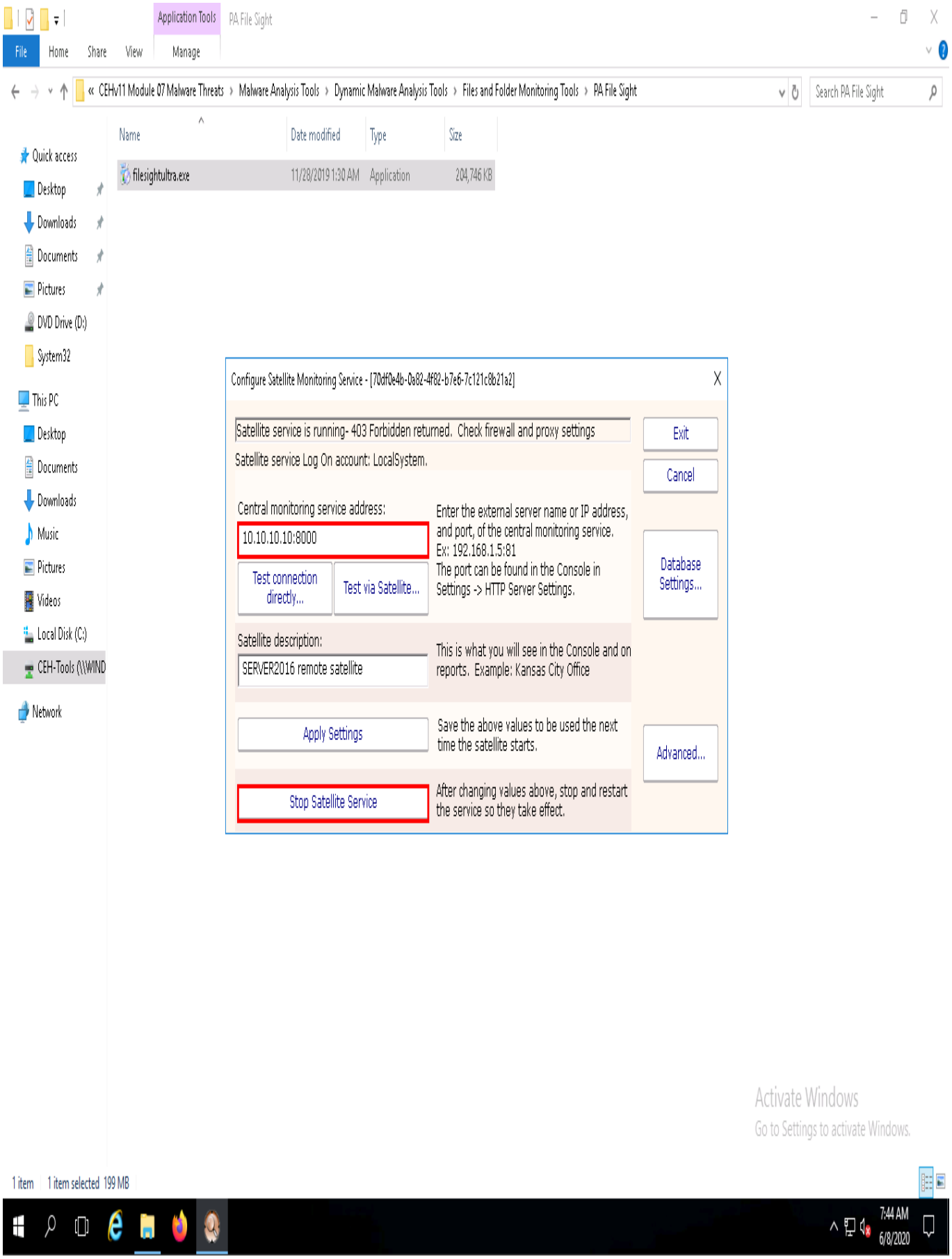


15. ☐ The **Configure Satellite Monitoring Service** window appears; type the **Windows 10** IP address into the **Central monitoring service address** field along with port **8000**. Leave the other settings to default and click **Apply Settings**.

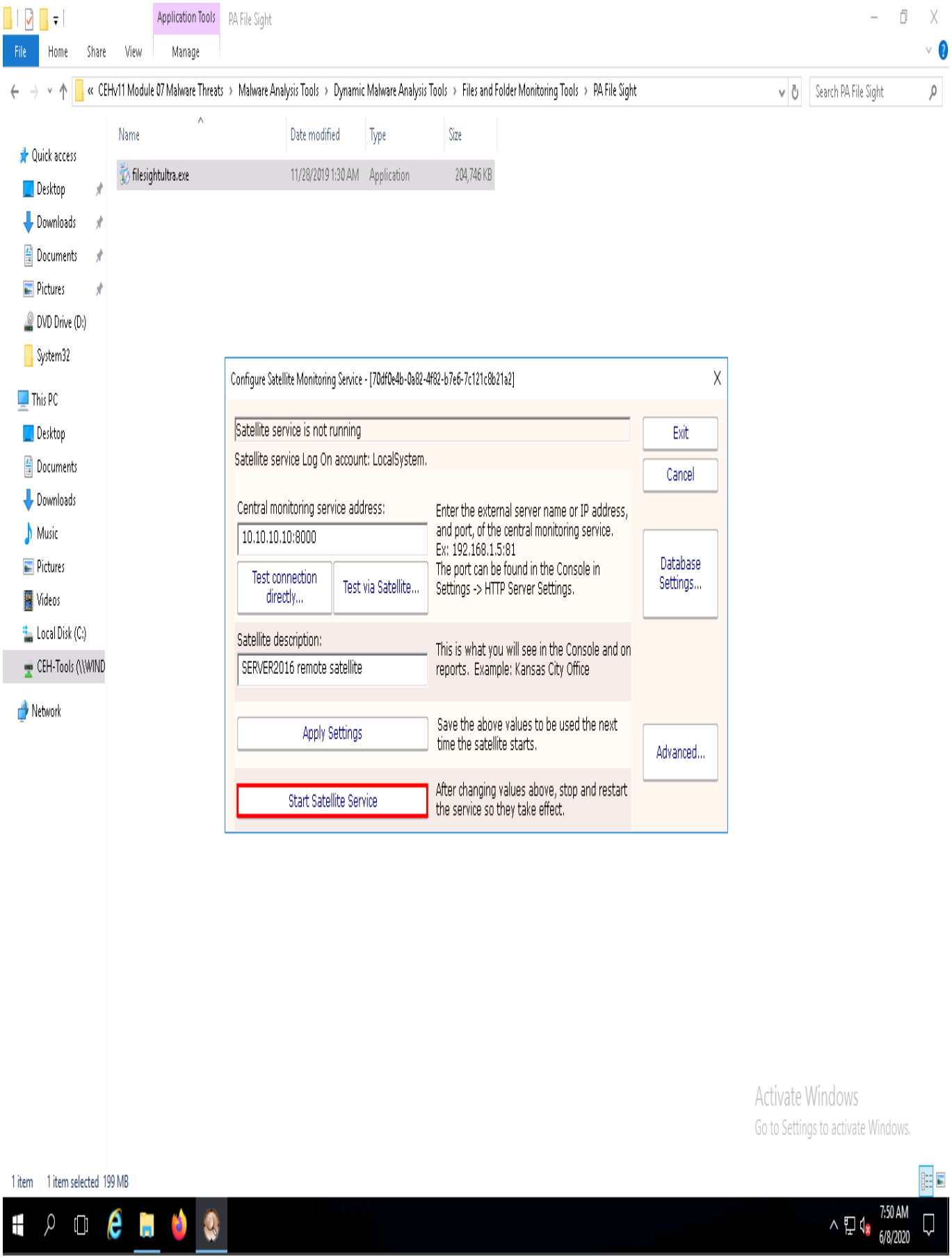
    In this task, the IP address of the **Windows 10** machine is **10.10.10.10**. the IP address may vary in your lab environment.



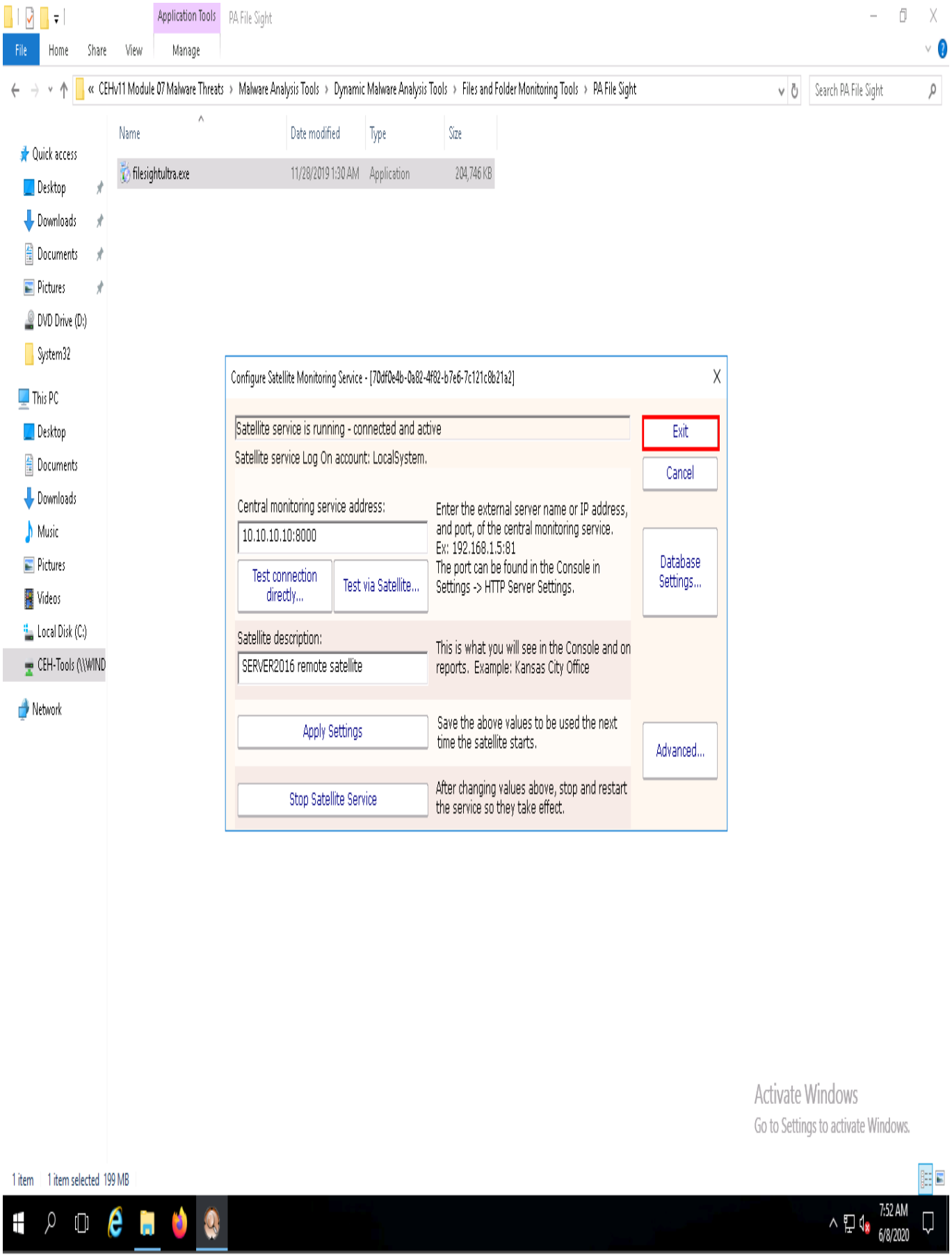
16. ☐ Click **Stop Satellite Service** to stop the satellite service.



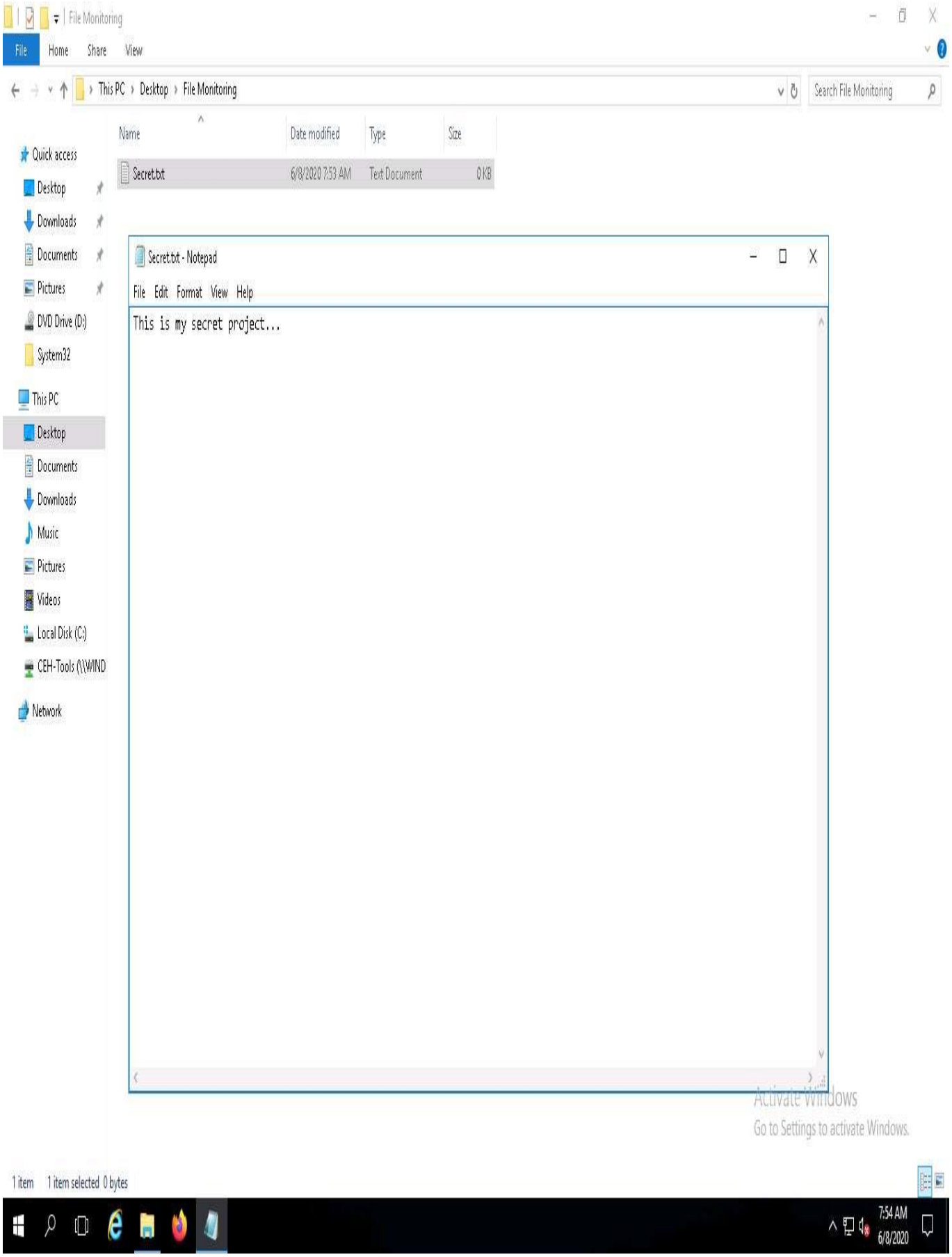
17. ☐ Once the service is stopped, click **Start Satellite Service**.



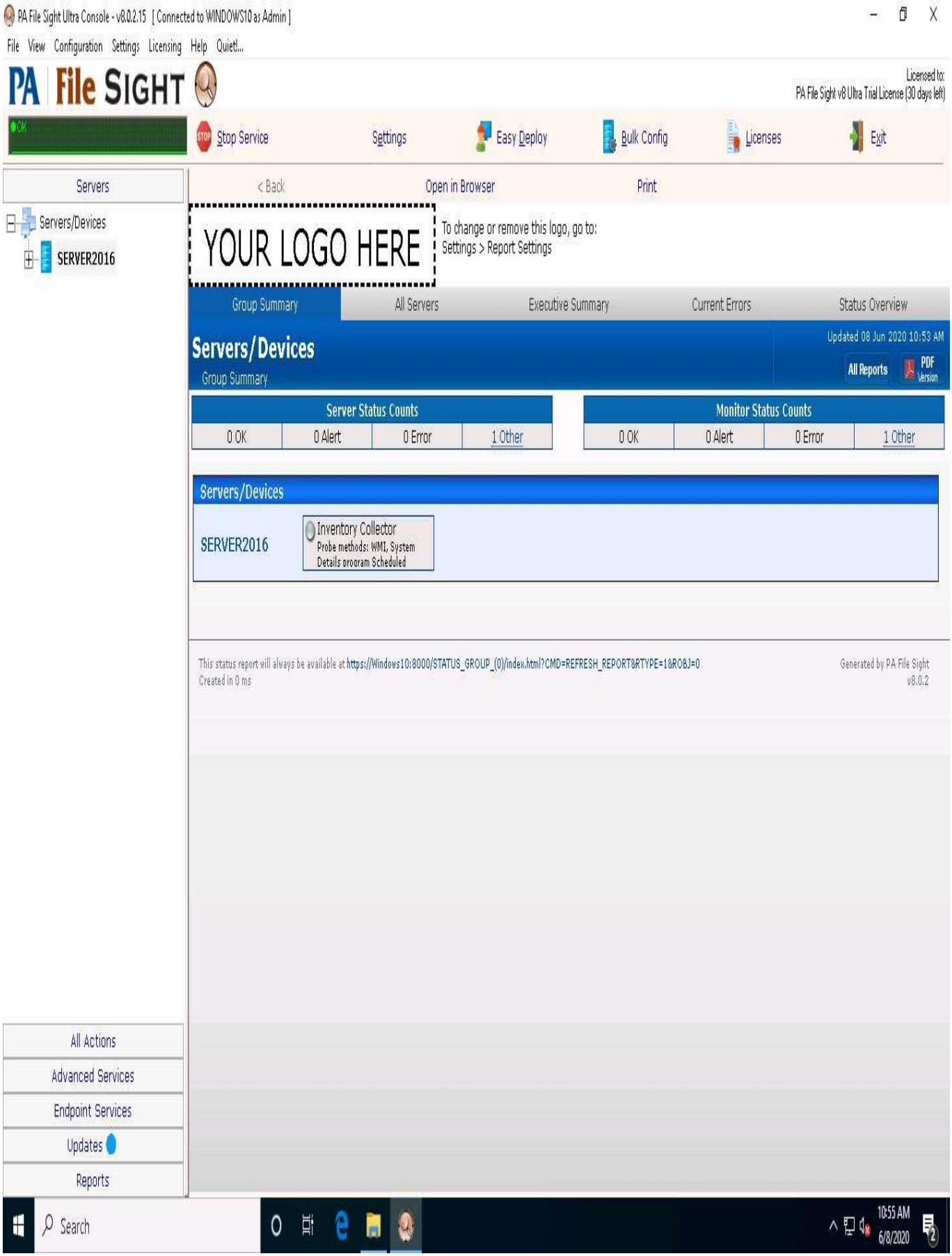
18. ☐ Once the service has started, click **Exit** to close the application.



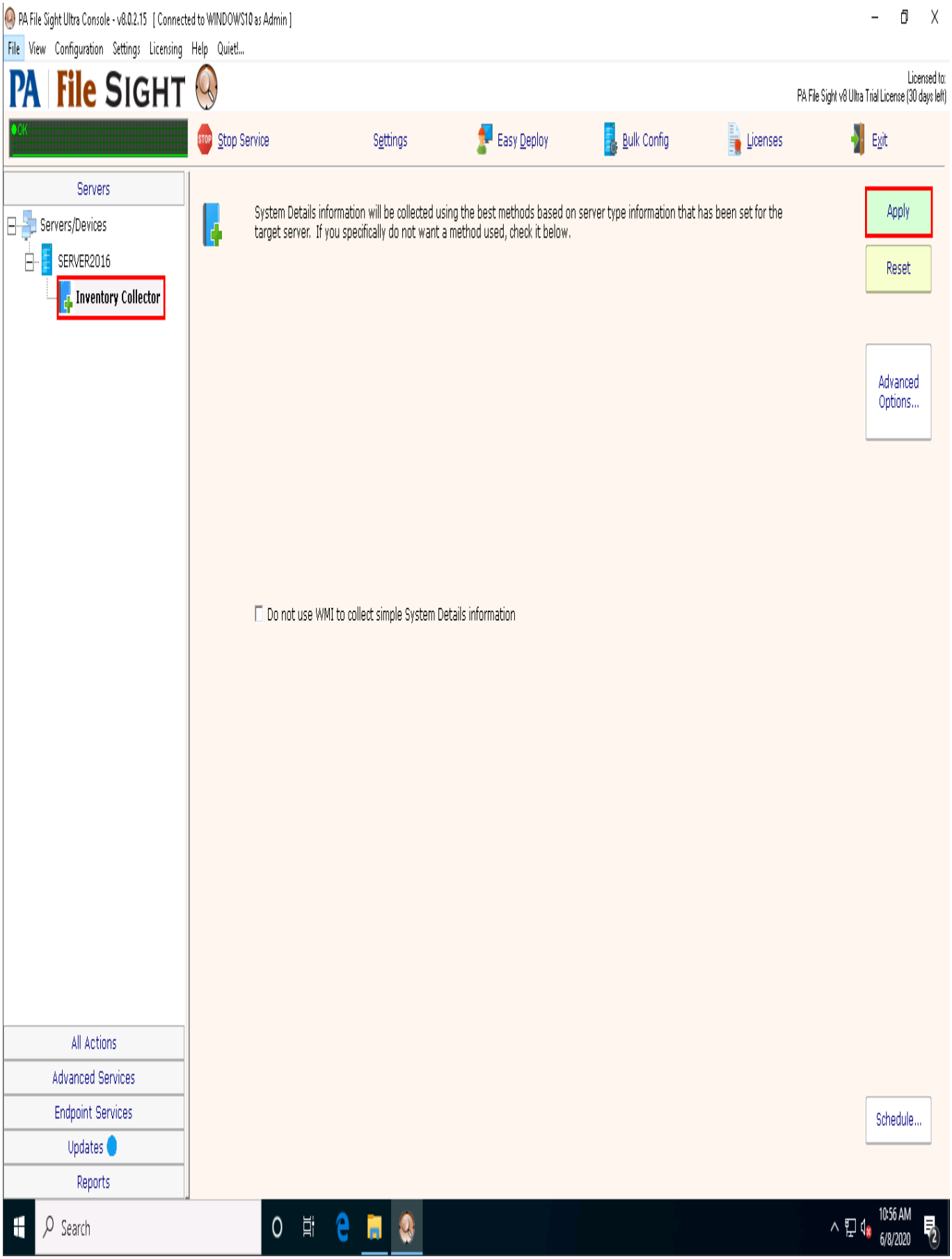
19. ☐ Create a folder named **File Monitoring** on **Desktop** and open it. Create a new text document in the folder, name it **Secret.txt**, type some text content in the file, and save it. **Close** the notepad window.



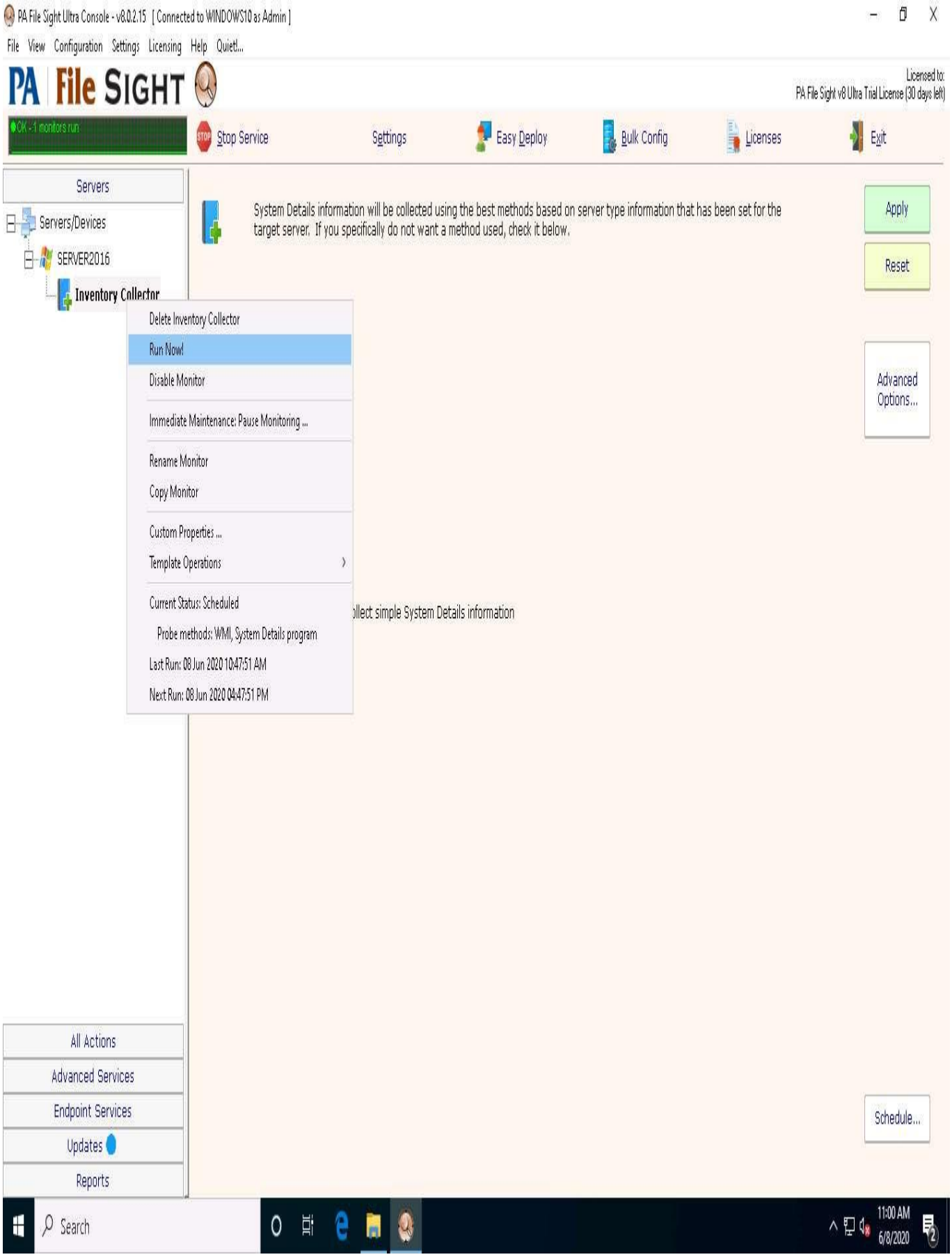
20. ☐ Click Windows 10 to switch back to the **Windows 10** machine, and observe that PA File Sight starts monitoring the **Windows Server 2016** machine.



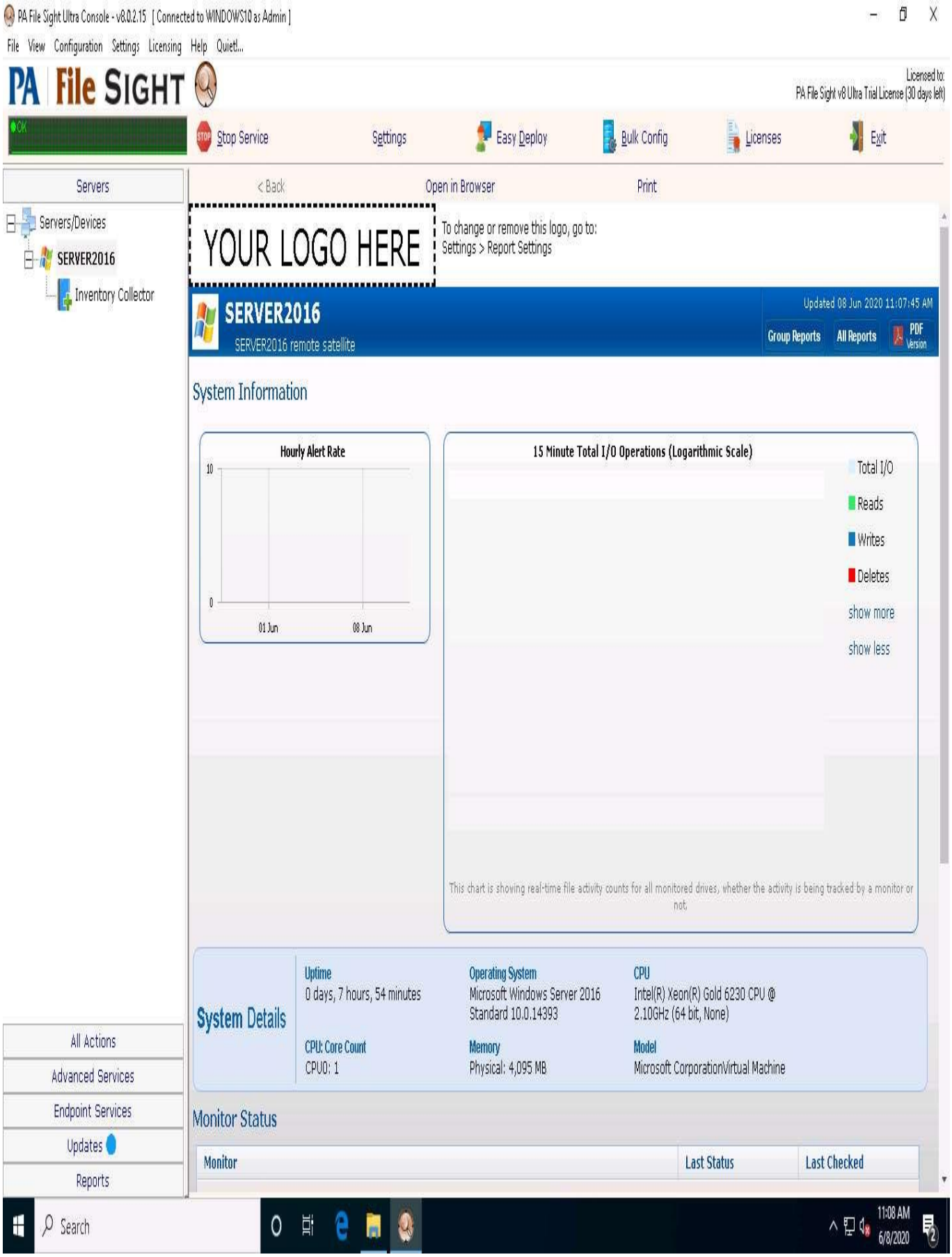
21. ☐ Expand the **SERVER2016** node, select **Inventory Collector** in the left-hand pane, and click the **Apply** button from the right-hand pane.



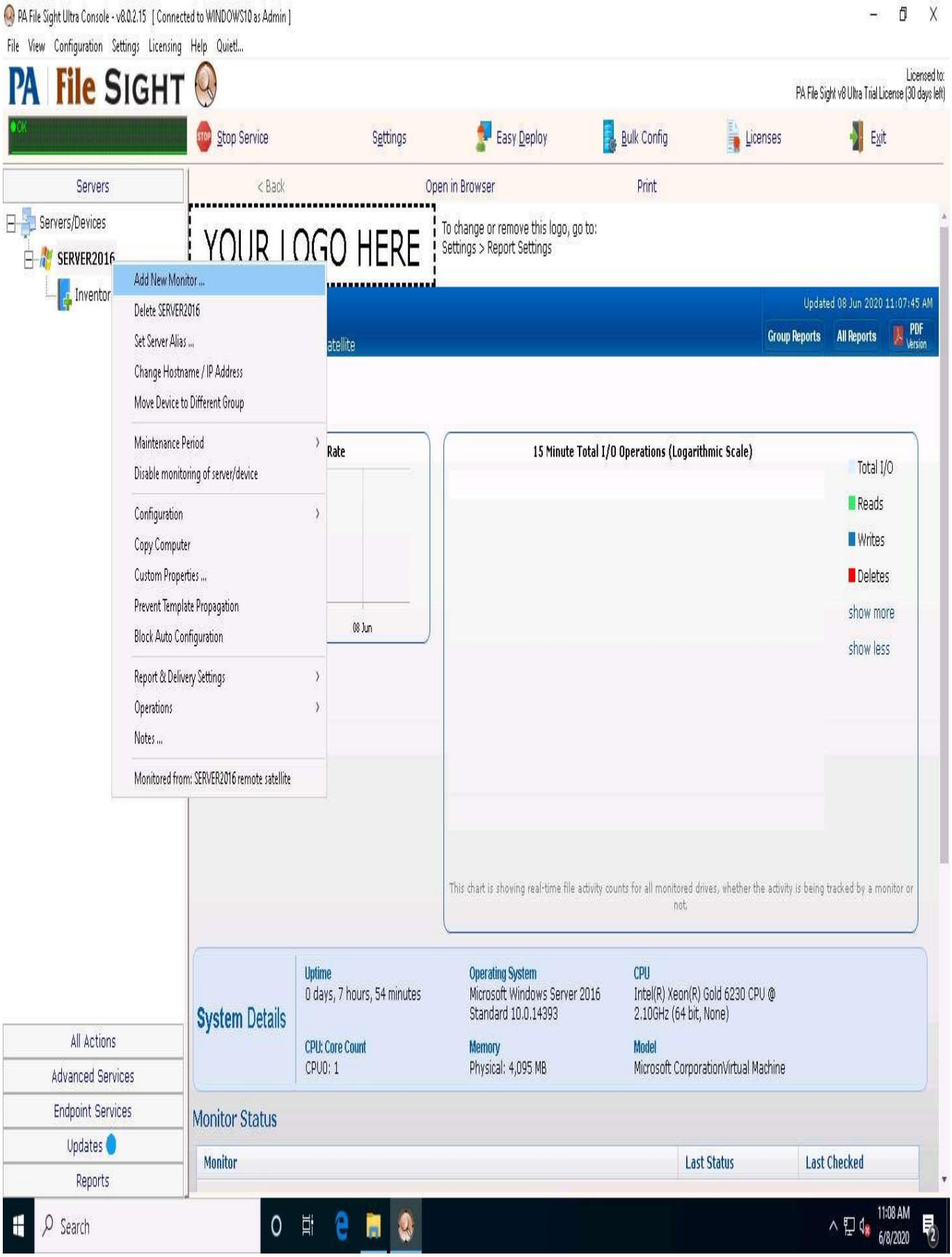
22. ☐ Now, right-click on **Inventory Collector** and click **Run Now!** from the context menu.



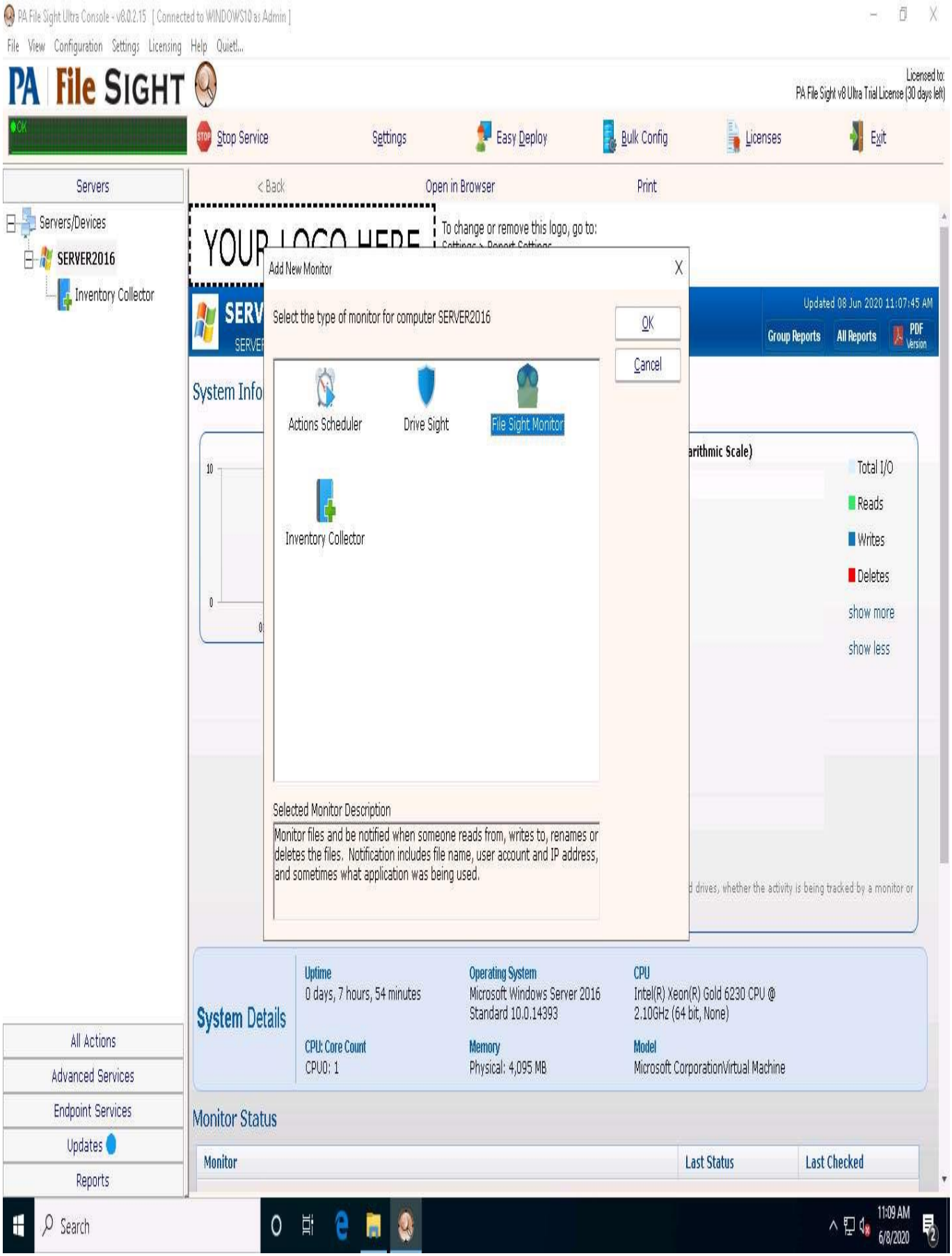
23. ☐ Select **SERVER2016** in the left pane and scroll down, and you can see the complete system information for the **Windows Server 2016** machine on the dashboard.



24. ☐ Right-click on **SERVER2016** and click the **Add New Monitor** option from the context menu.

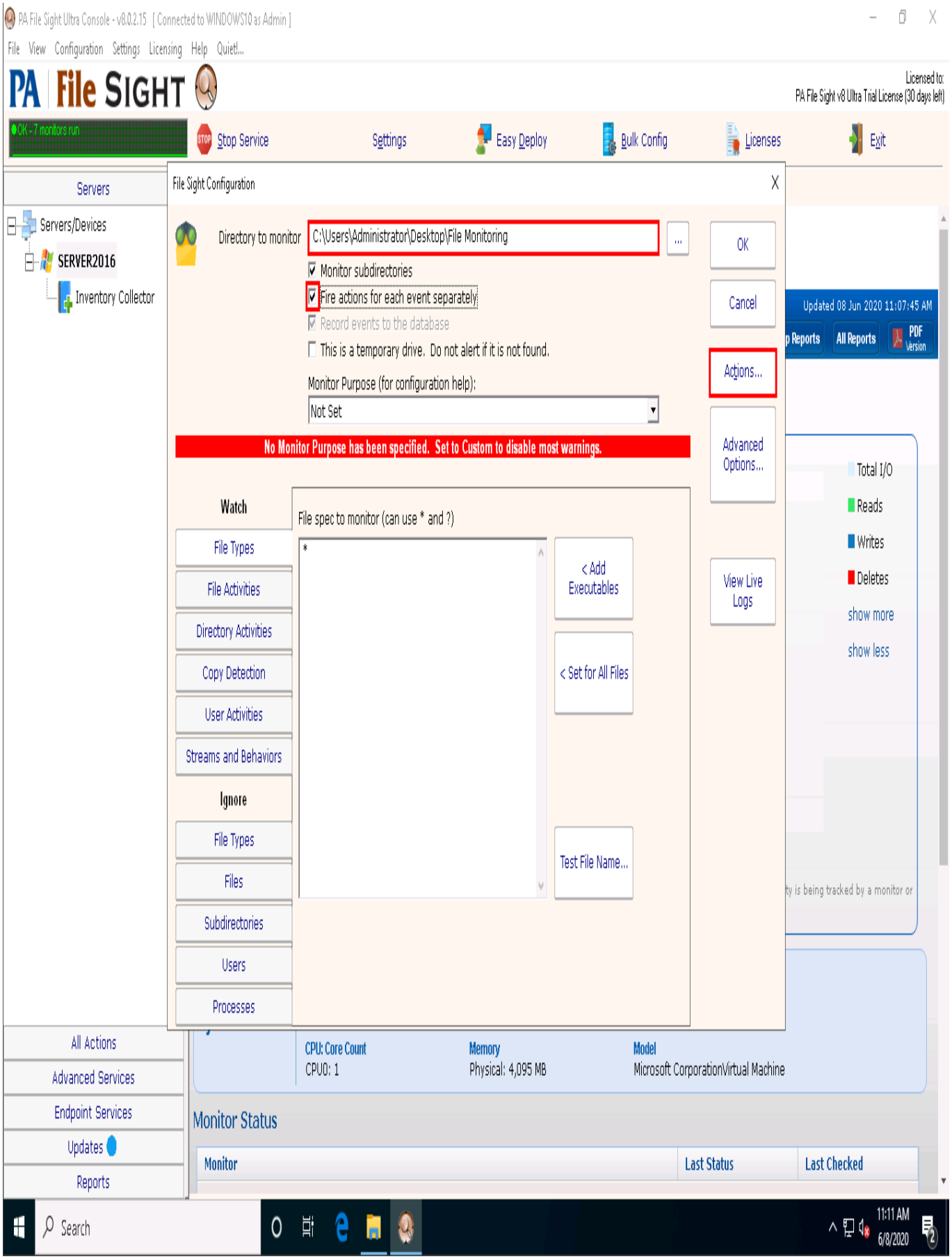


25. ☐ The **Add New Monitor** window appears, select the **File Sight Monitor** icon, and then click **OK**.

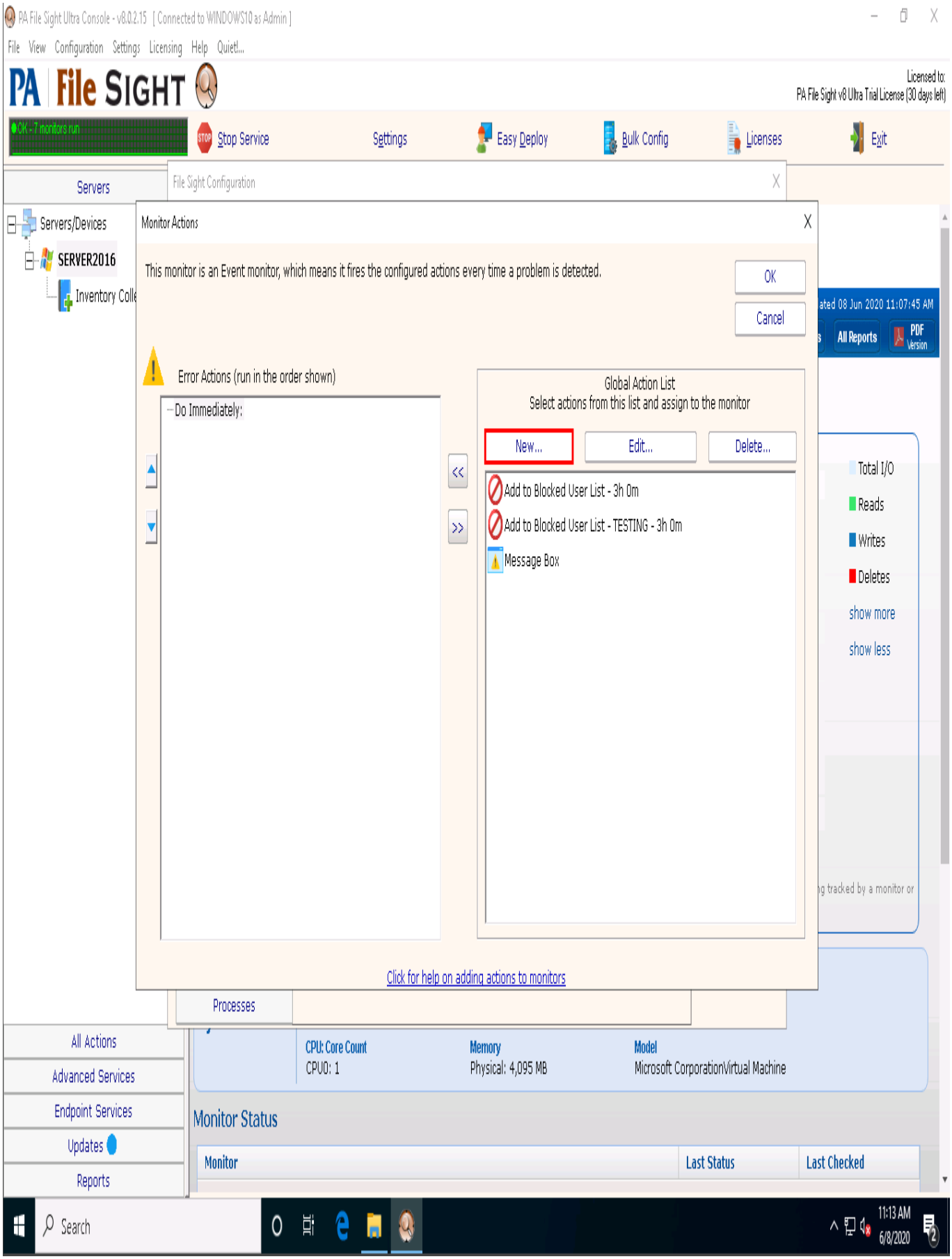


26. ☐ The **File Sight Configuration** window appears; click the **Browse** button to provide a path for directory monitoring for the **SERVER2016** machine (here, **C:\users\Administrator\Desktop\File Monitoring**) and tick the **Fire actions for each event separately** checkbox.

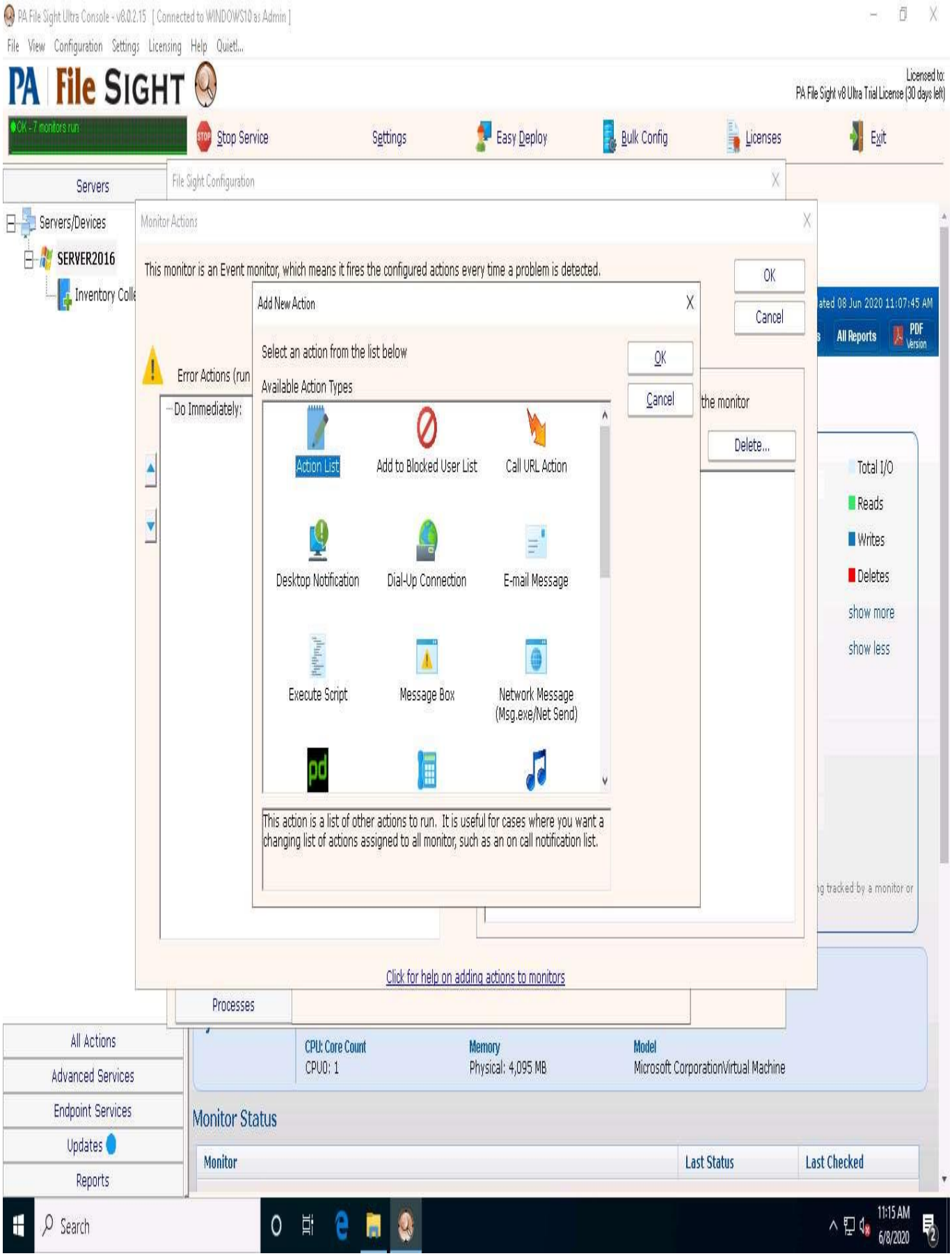
27. ☐ Choose **Audit file activity** from the **Monitor Purpose (for configuration help)** drop-down list, and then click **Actions**.



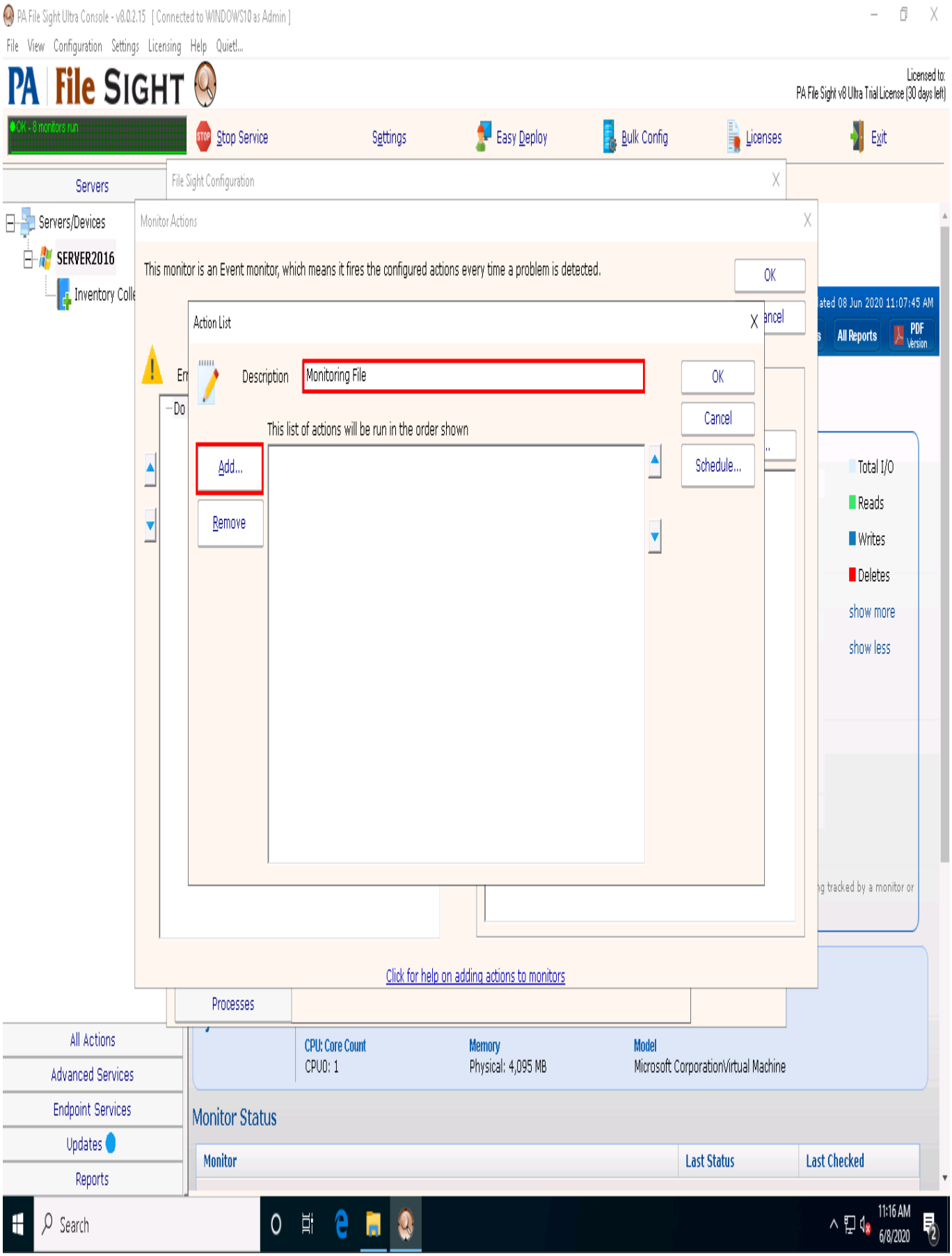
28. ☐ The **Monitor Actions** window appears; click **New** under **Global Action List**.



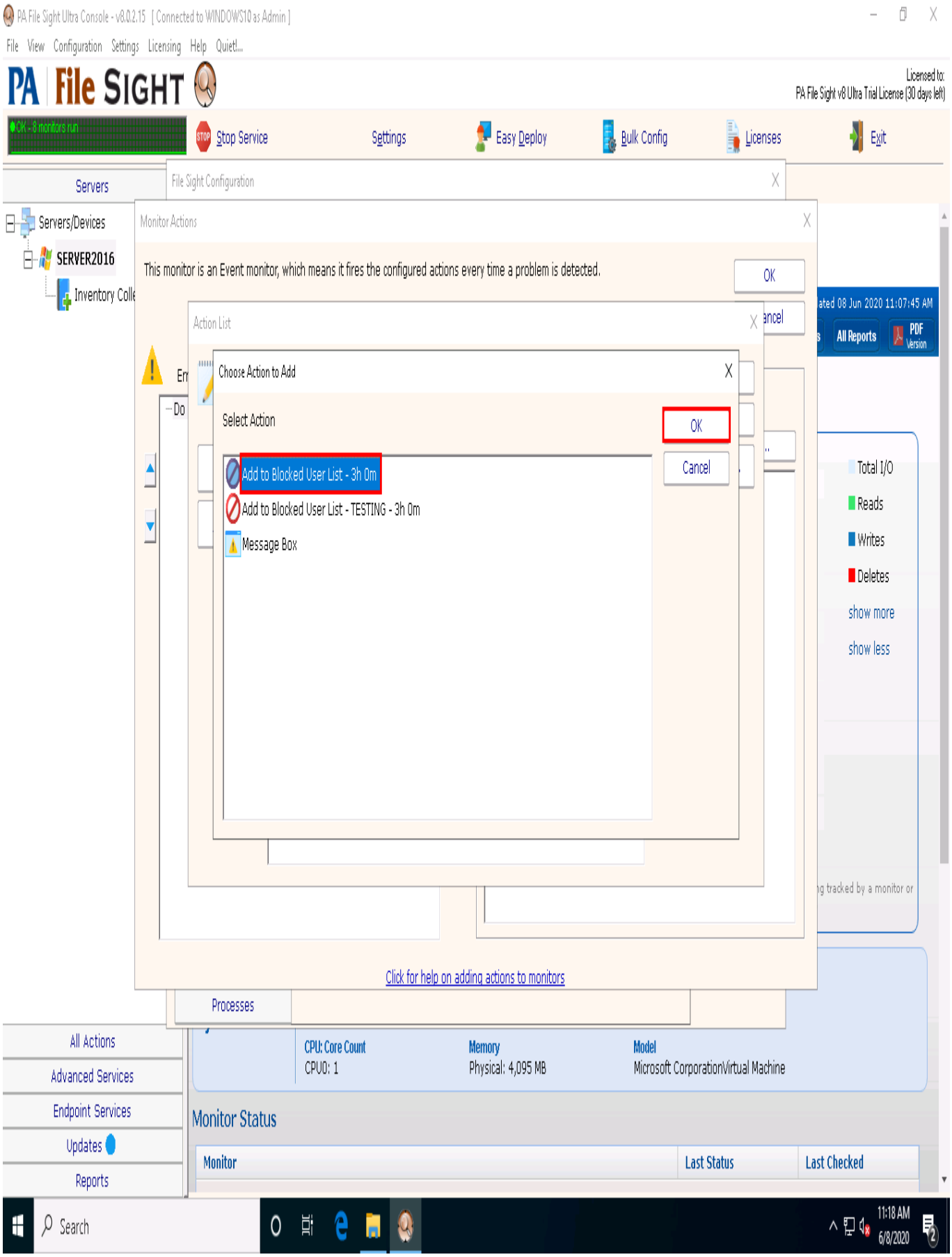
29. ☐ The **Add New Action** window appears. Select the **Action List** icon and click **OK**.



30. ☐ The **Action List** window appears. Type a description in the **Description** field and click **Add** to choose actions.

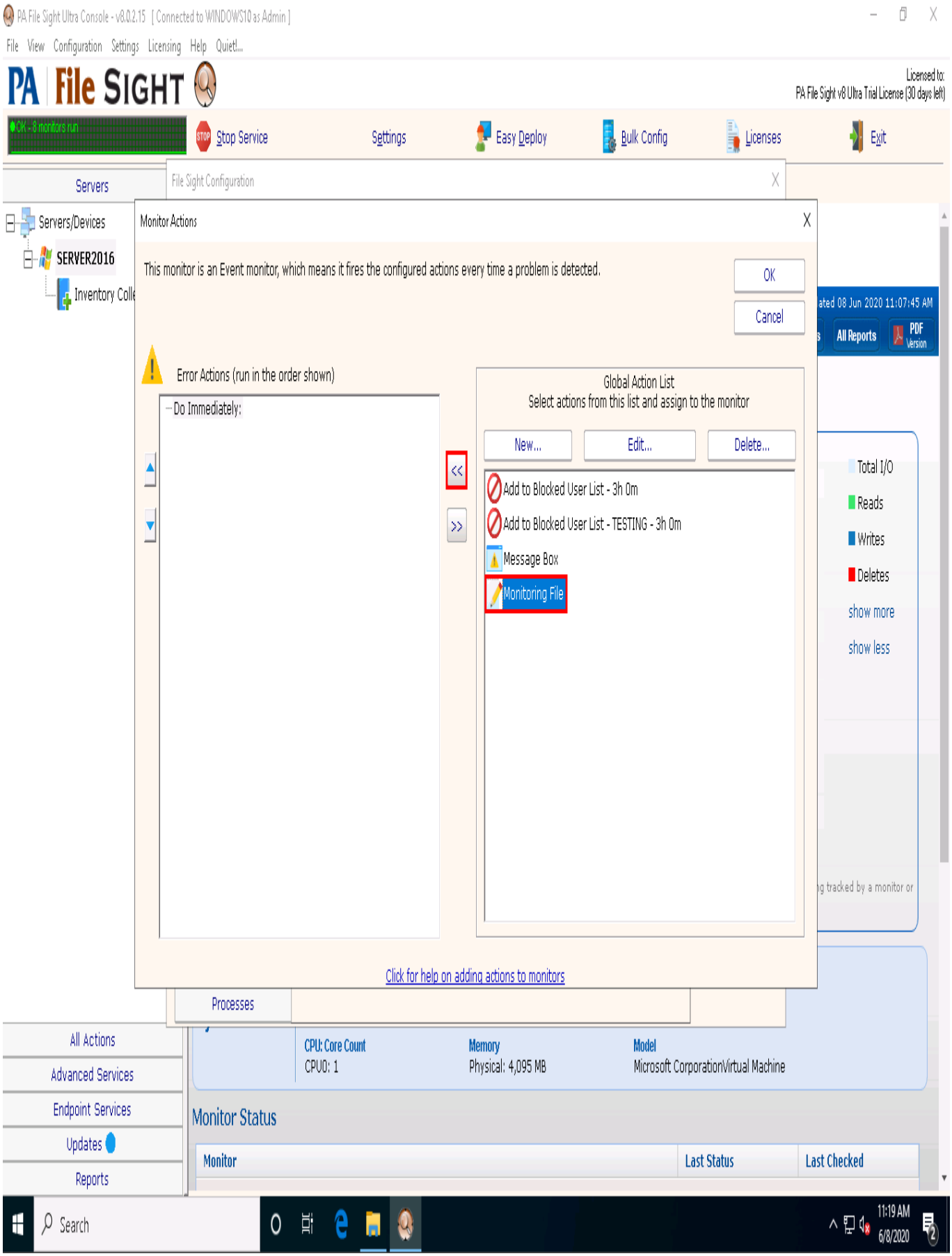


31. ☐ The **Choose Action to Add** window appears; choose any action from the list and click **OK**.

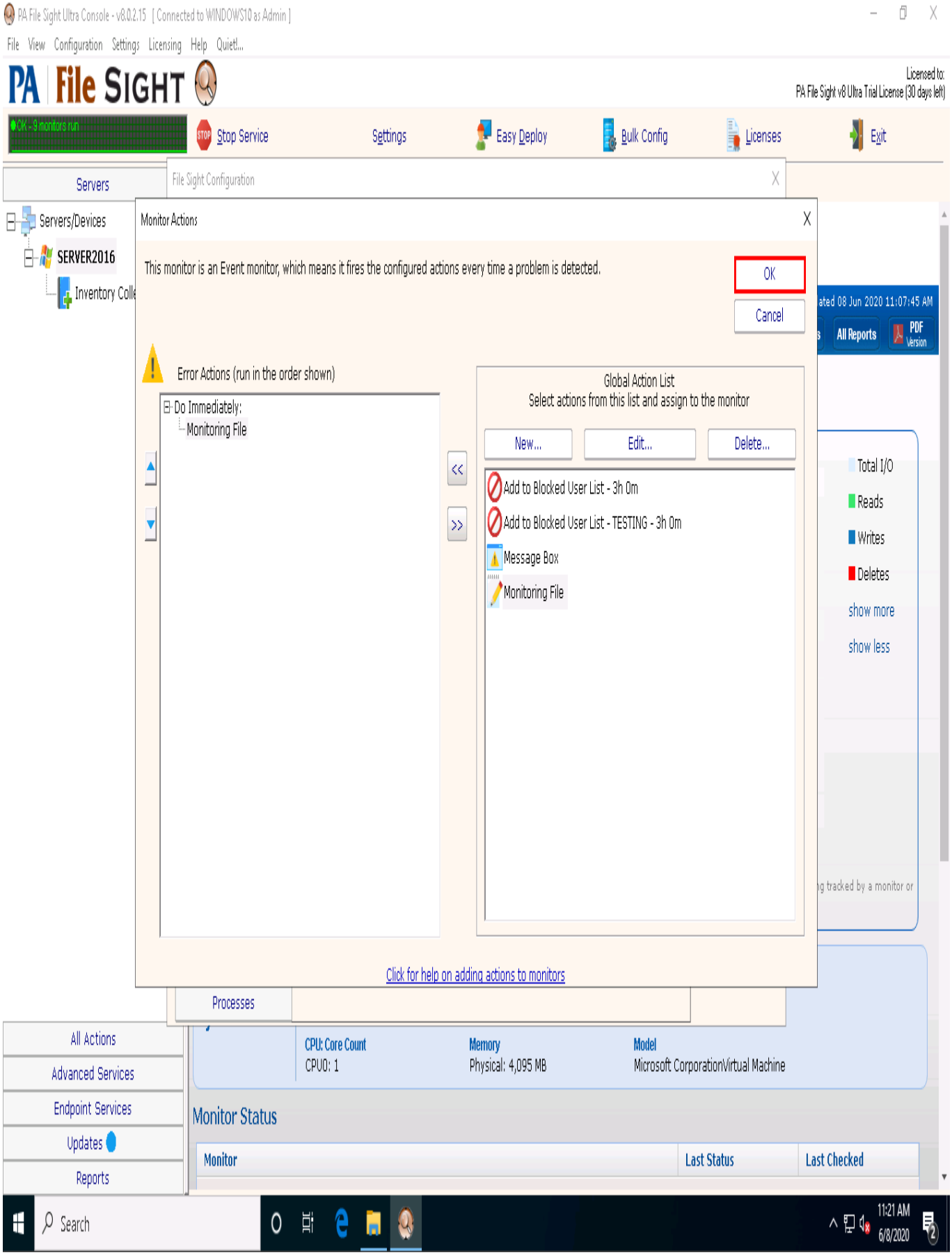


32. ☐ Click **OK** in the **Action List** window.

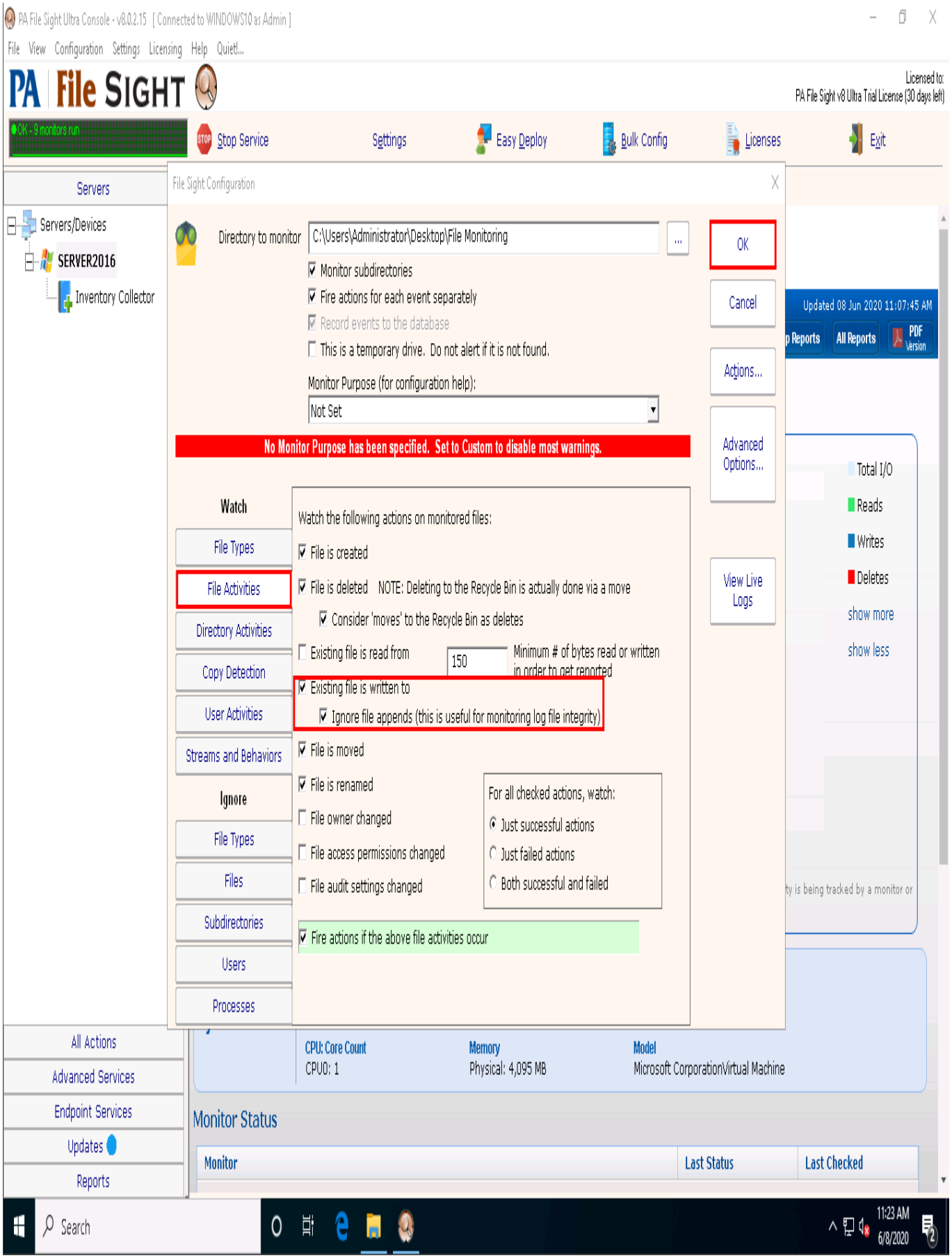
33. ☐ The **Monitor Actions** window appears; choose the newly created action (here, **Monitoring File**); and then click the **<<** icon to add the action.



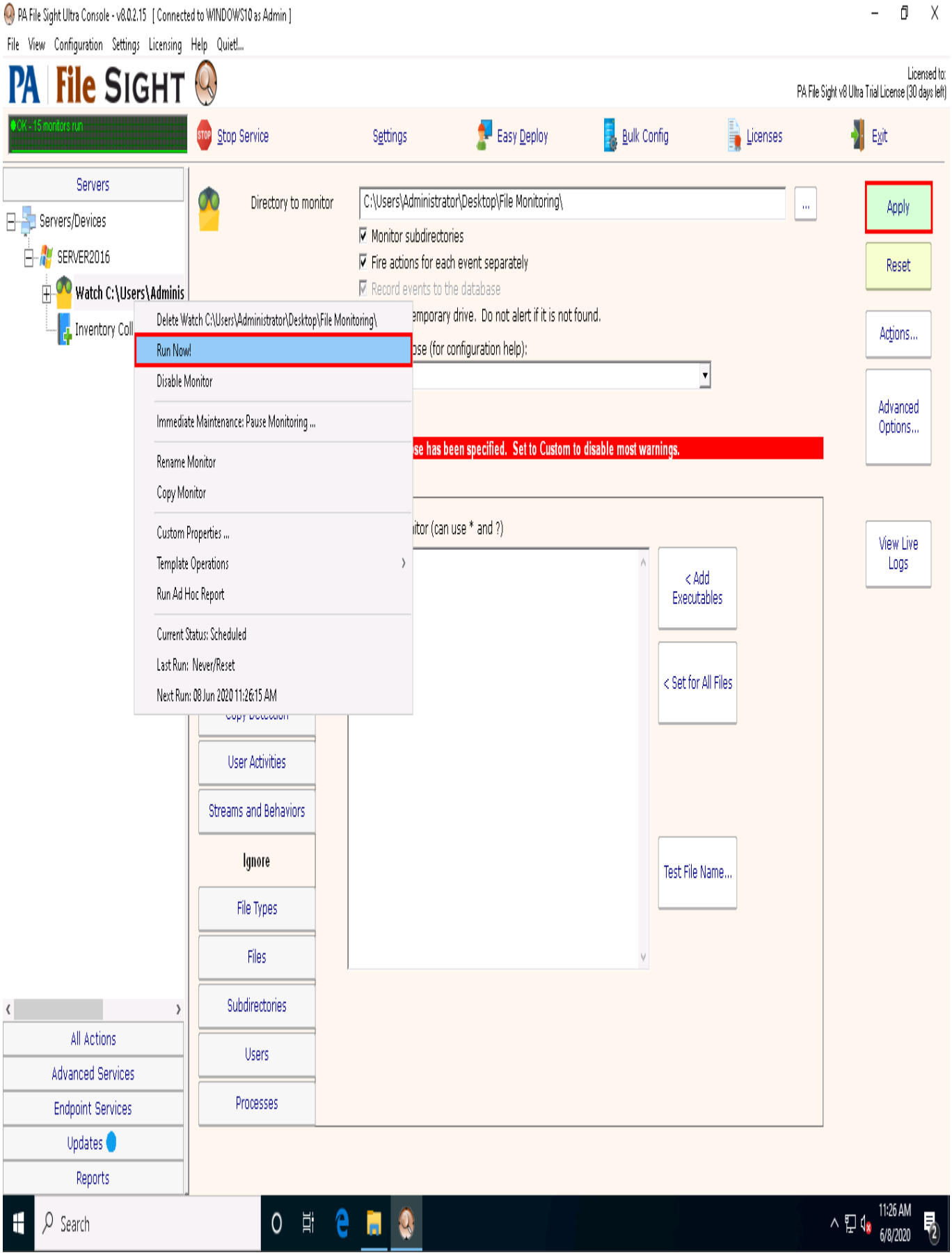
34. ☐ Once the action is added to the **Monitor Actions** window, click **OK**.



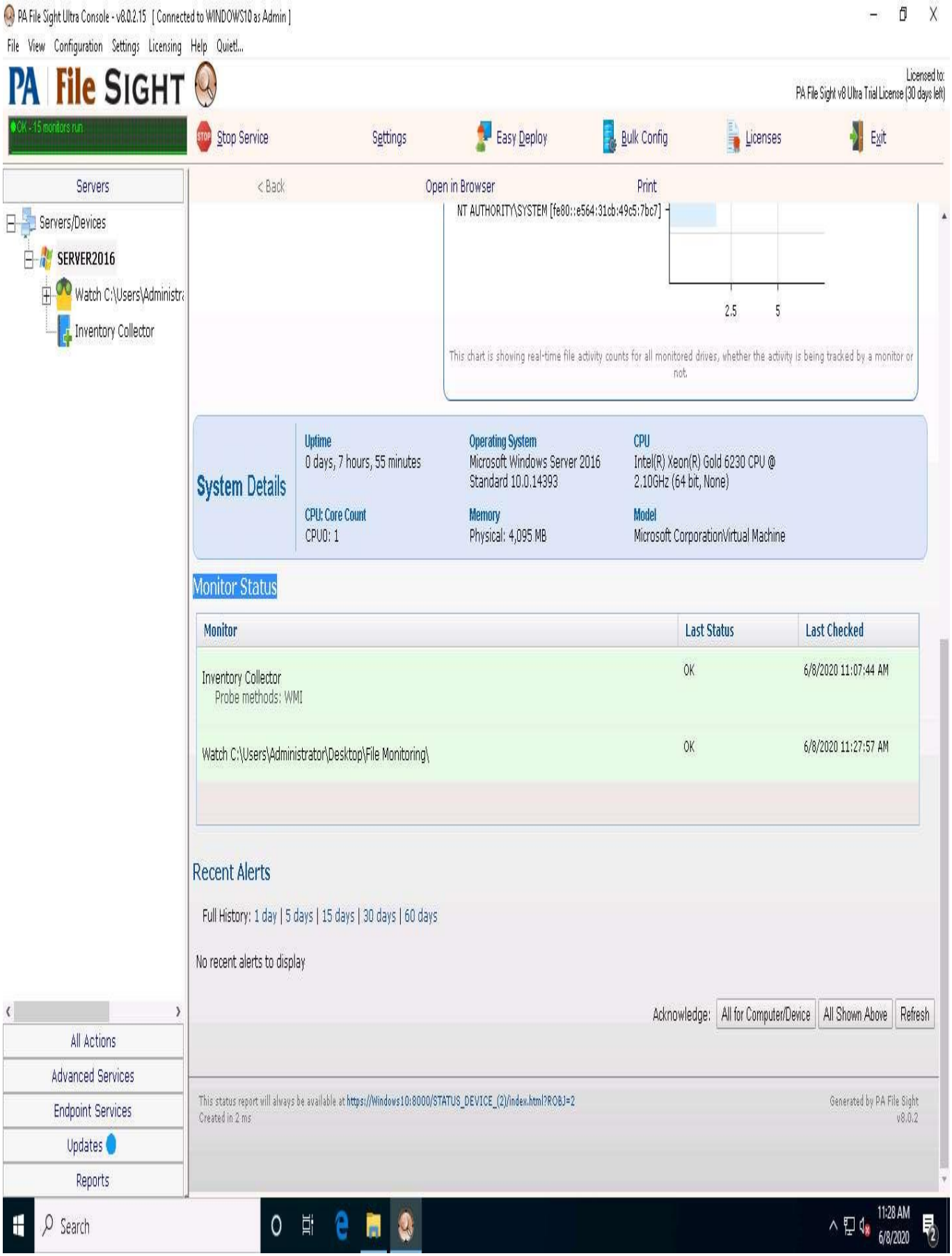
35. ☐ In the **File Sight Configuration** window, click the **File Activities** tab and check the **Existing file is written to** and **Ignore file appends (this is useful for monitoring log file integrity)** options. Leave the other settings to default and click **OK**.



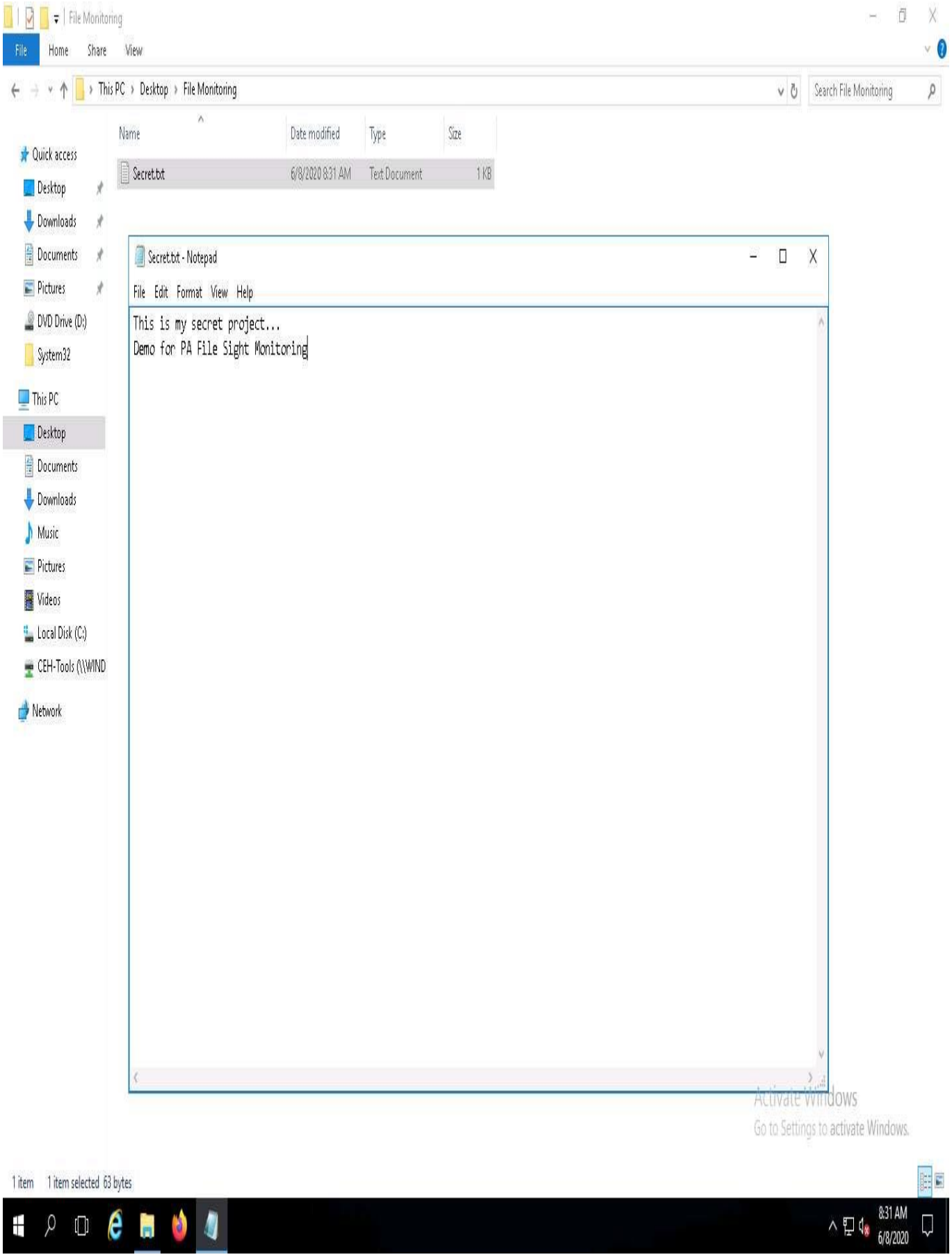
36. ☐ Under the **SERVER2016** node, File Sight Directory Monitoring will be added, as shown in the screenshot. Click **Apply**, and then right-click on the **File Monitoring** node and click **Run Now!** from the context menu.



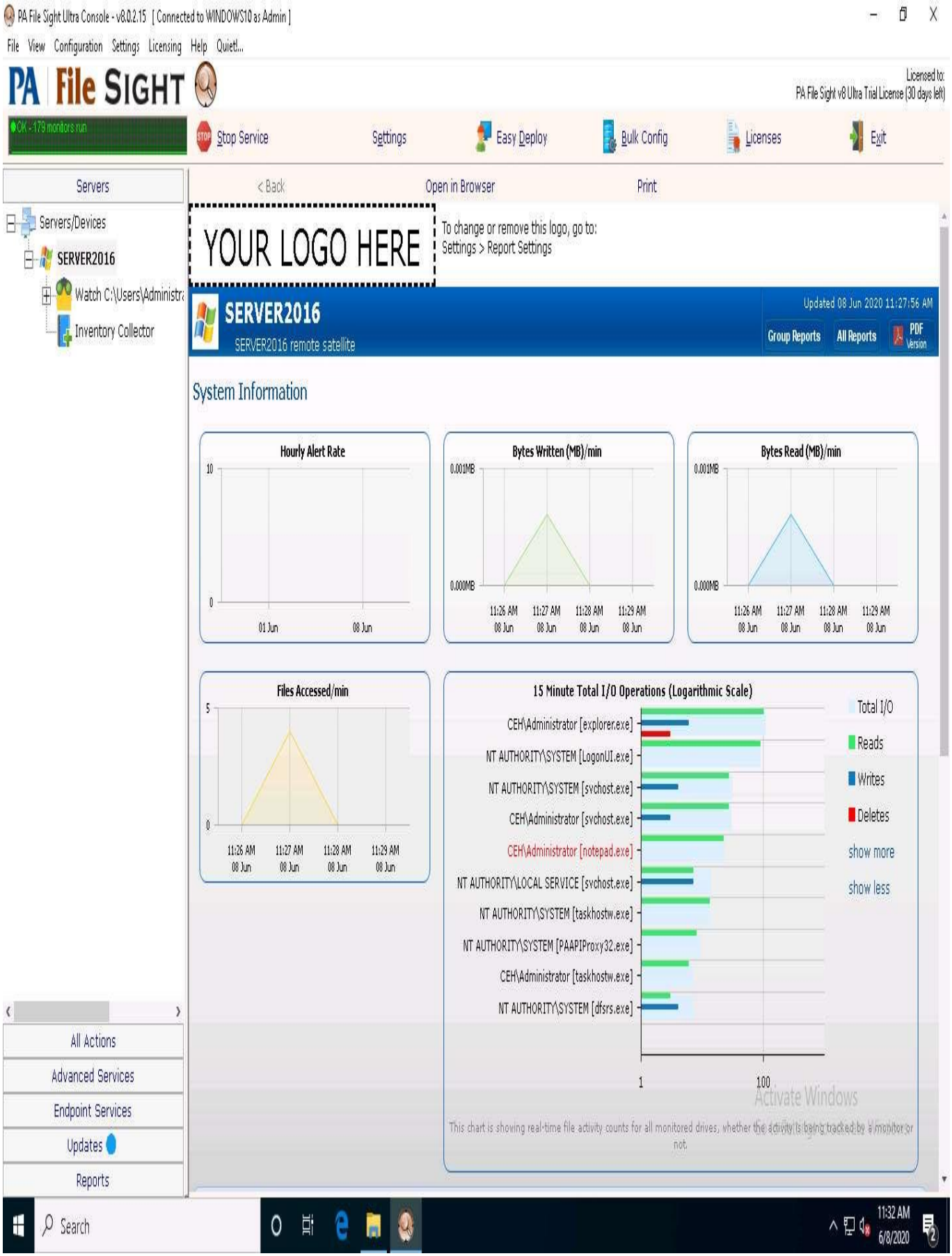
37. ☐ Click the **SERVER2016** node to view the dashboard. Scroll down in the dashboard; observe that the File Monitoring directory is being monitored.



38. ☐ Click Windows Server 2016 to switch to the **Windows Server 2016** machine Click Ctrl+Alt+Delete to activate the machine, by default, **CEH\Administrator** account is selected, click Pa$$w0rd to enter the password and press **Enter**. Open **Secret.txt** in the **File Directory** on **Desktop**, modify some of the text in the file, and then **Save** and close the file.

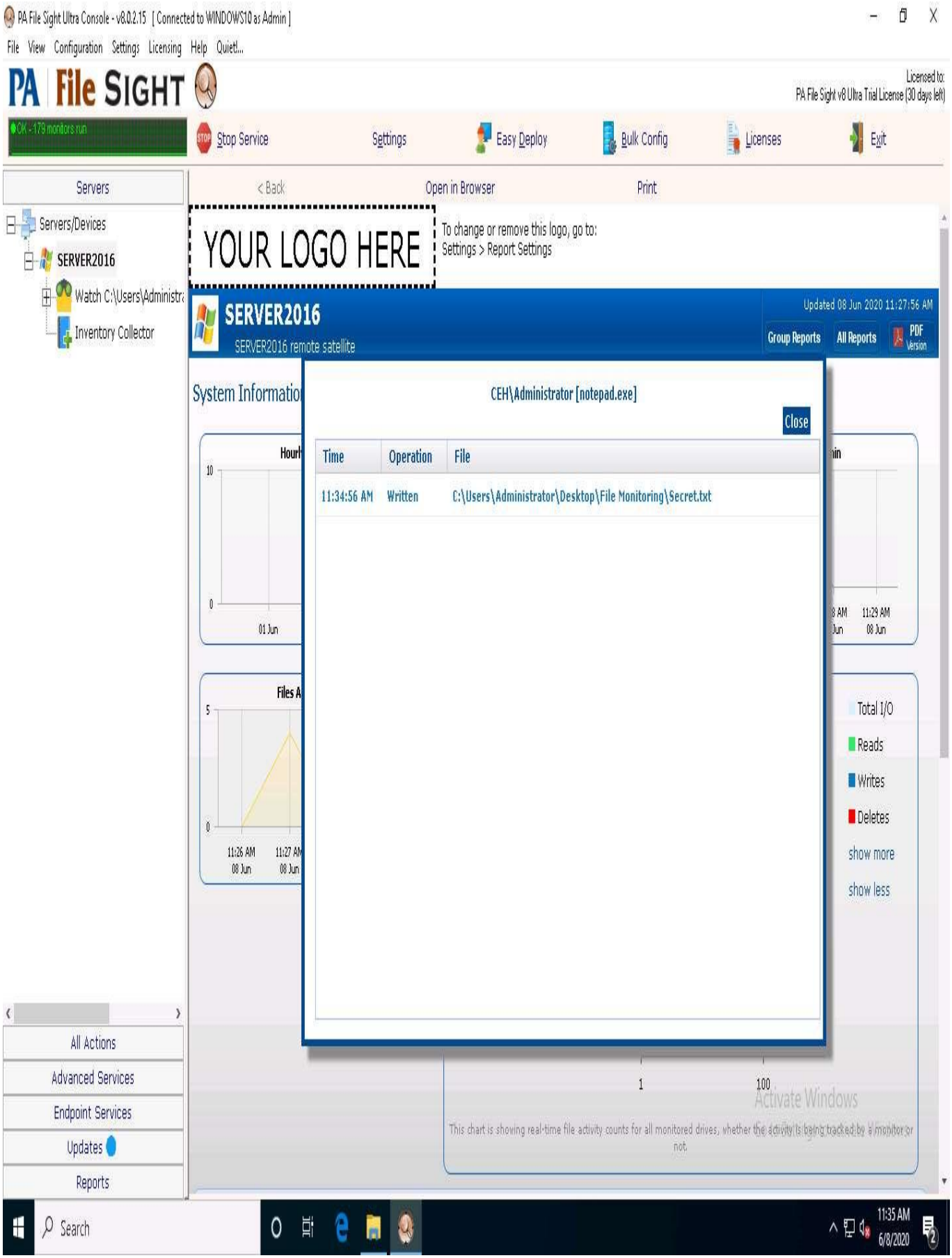


39. ☐ Click Windows 10 to switch back to the **Windows 10** machine and observe that PA File Sight has recorded some activity in the notepad file, as shown in the screenshot.
40. ☐ The software even shows the File Accessed/min in the graphical method, as shown in the screenshot.
41. ☐ Click on the **notepad.exe** link to view the activities done by the user.



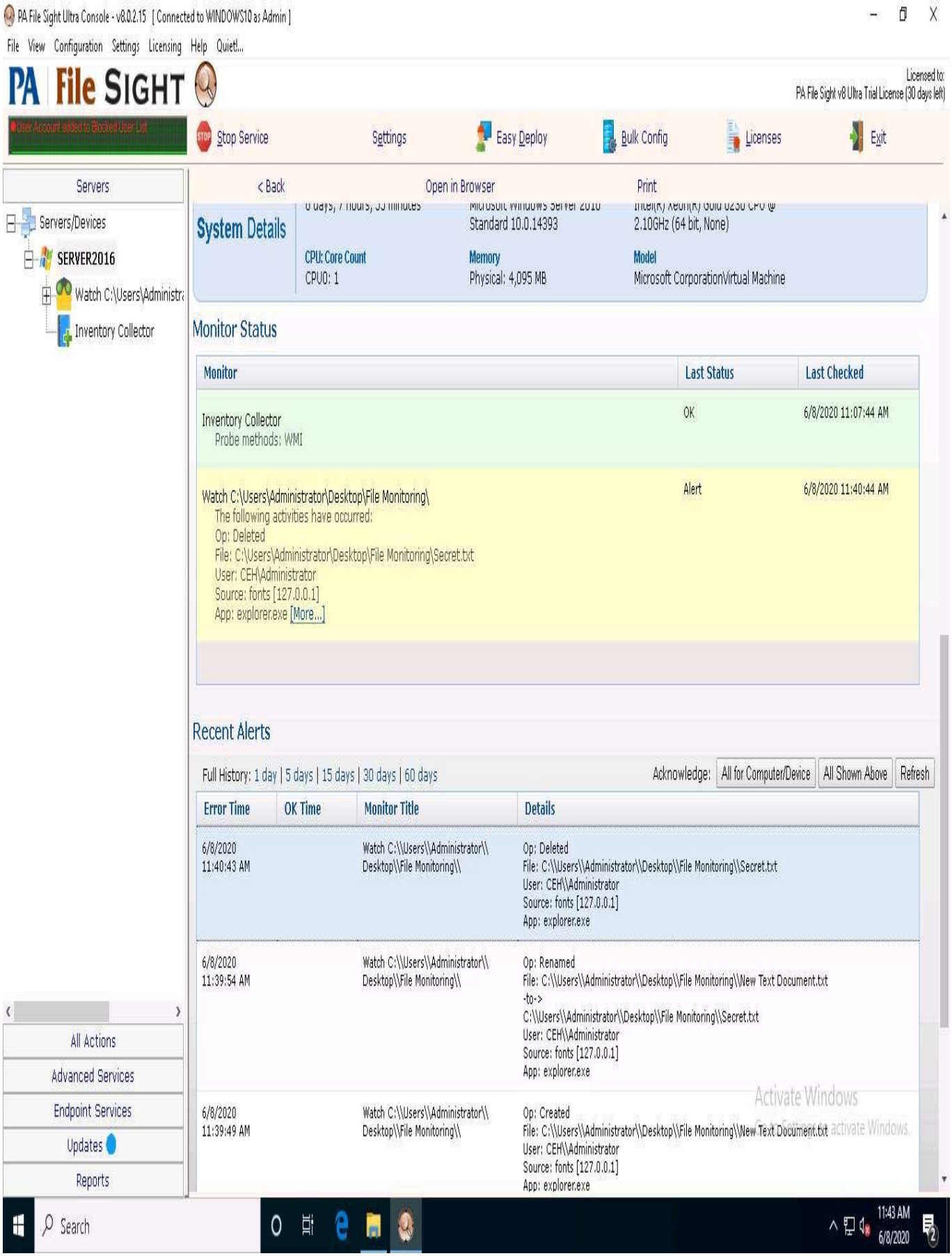
42. ☐ The **CEH\Administrator notepad.exe** window appears. If it shows a blank window, then click Windows Server 2016 to switch to the **Windows Server 2016** machine, type some content into the **Secret.txt** file, save the file, and then immediately click Windows 10 to switch back to the **Windows 10** machine to view the activity.

43. If you have added some text in the Secret.txt file, you can view that in the activity window.



44. Click Windows Server 2016 to switch back to the **Windows Server 2016** machine and delete the **Secret.txt** file, then click Windows 10 to switch back to the **Windows 10** machine and scroll down to view the **Recent Alerts** section; you will find that the file has been deleted.
45. You can see all the actions performed on that file.

If you do not see the alerts, then click **Refresh** button to update alerts.



46. ☐ This is how to monitor the file integrity using PA File Sight.
47. ☐ Close all open windows.
48. ☐ You can also use other file and folder integrity checking tools such as **Tripwire File Integrity and Change Manager** (https://www.tripwire.com), **Netwrix**

Auditor (https://www.netwrix.com), **Verisys** (https://www.ionx.co.uk), or **CSP File Integrity Checker** (https://www.cspsecurity.com) to perform file and folder monitoring.

Task 8: Perform Device Driver Monitoring using DriverView and Driver Reviver

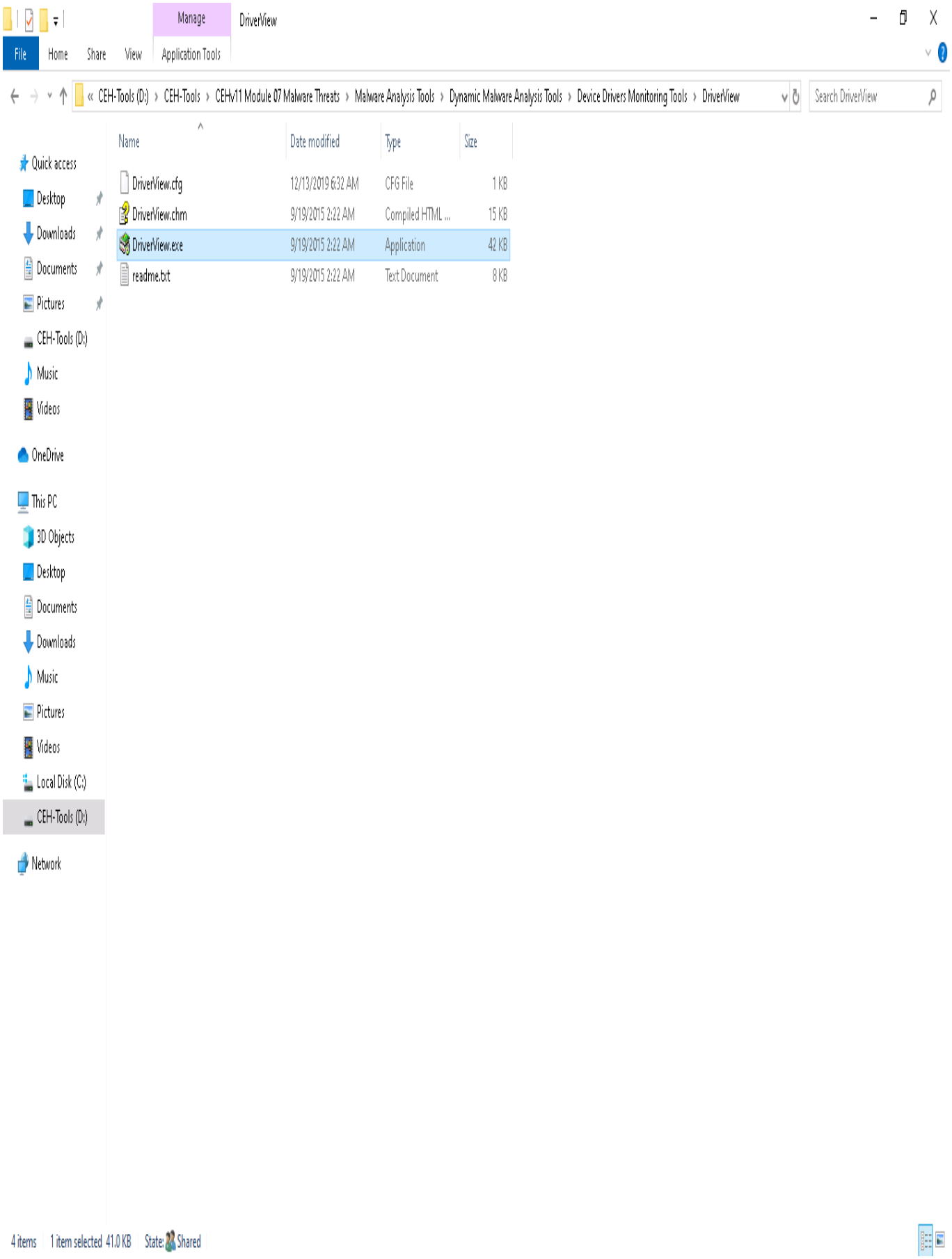
When the user downloads infected drivers from untrusted sources, the system installs malware along with the device drivers; malware uses these drivers as a shield to avoid detection. One can scan for suspicious device drivers using tools such as DriverView and Driver Reviver that verify if they are genuine and downloaded from the publisher's original site.

DriverView The DriverView utility displays a list of all device drivers currently loaded on the system. For each driver in the list, additional information is displayed such as the load address of the driver, description, version, product name, and developer.

Driver Reviver Without proper drivers, computers start to misbehave. Sometimes updating the drivers using conventional methods can be a daunting task. Outdated drivers are more vulnerable to hacking and can lead to a breach in the system. Driver Reviver provides an effective way of scanning your PC to identify out of date drivers. Driver Reviver can quickly and easily update these drivers to restore optimum performance to your PC and its hardware and extend its life.

An ethical hacker and penetration tester must scan the system for suspicious device drivers and make sure that the systems runs smoothly by ensuring that all outdated drivers are updated and that the system processes optimized to keep the performance of the system at its peak.

1. On the **Windows 10** machine, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Device Drivers Monitoring Tools\DriverView** and double-click **DriverView.exe** to launch the application.



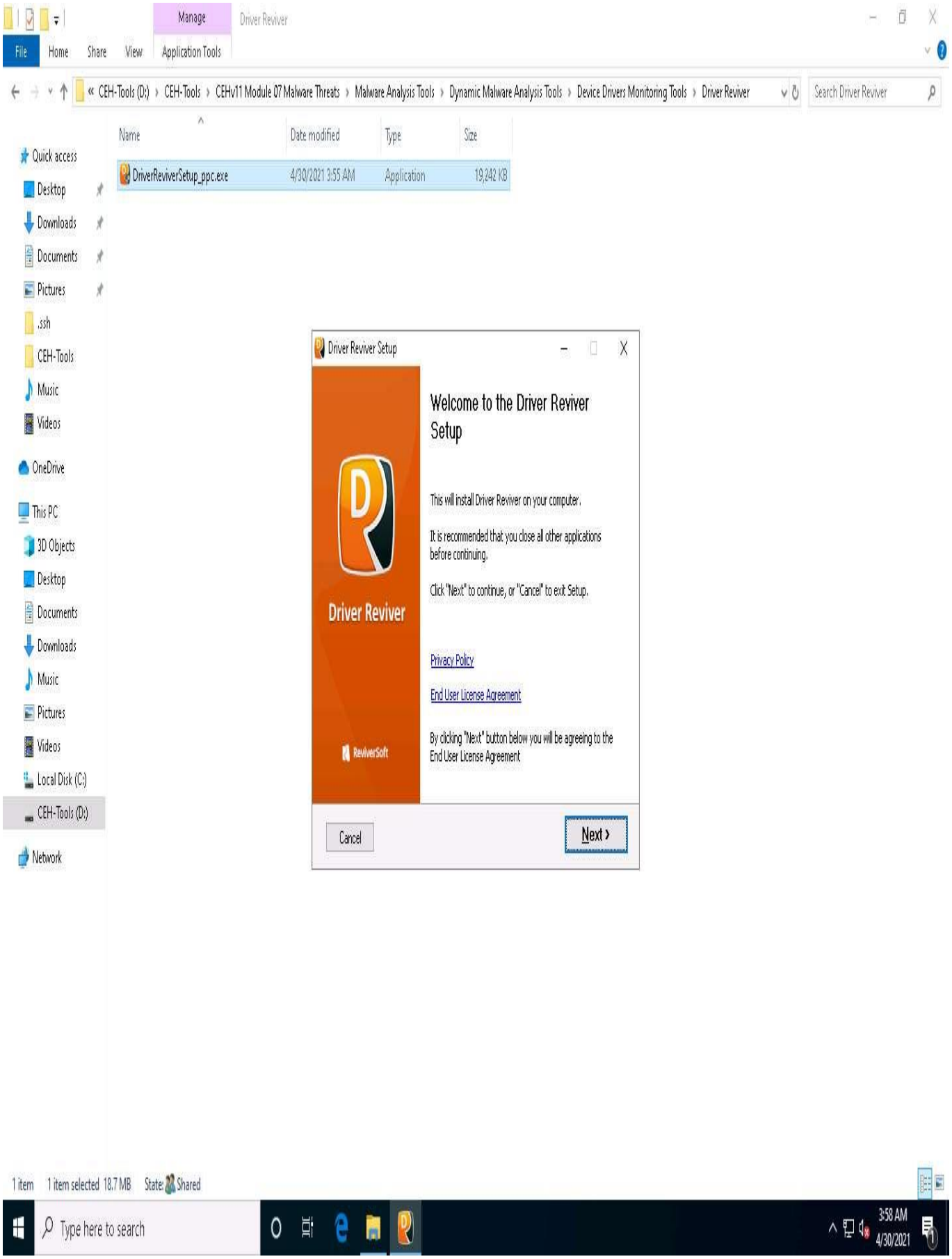
2. The **DriverView** main window appears with a list of the installed drivers on your system, as shown in the screenshot.

3. ☐ Right-click on any driver from the list and click **Properties** to view the complete details of the driver.

4. ☐ The **Properties** window appears with the complete details of the installed driver, as shown in the screenshot. Once the analysis is done, click **OK**.

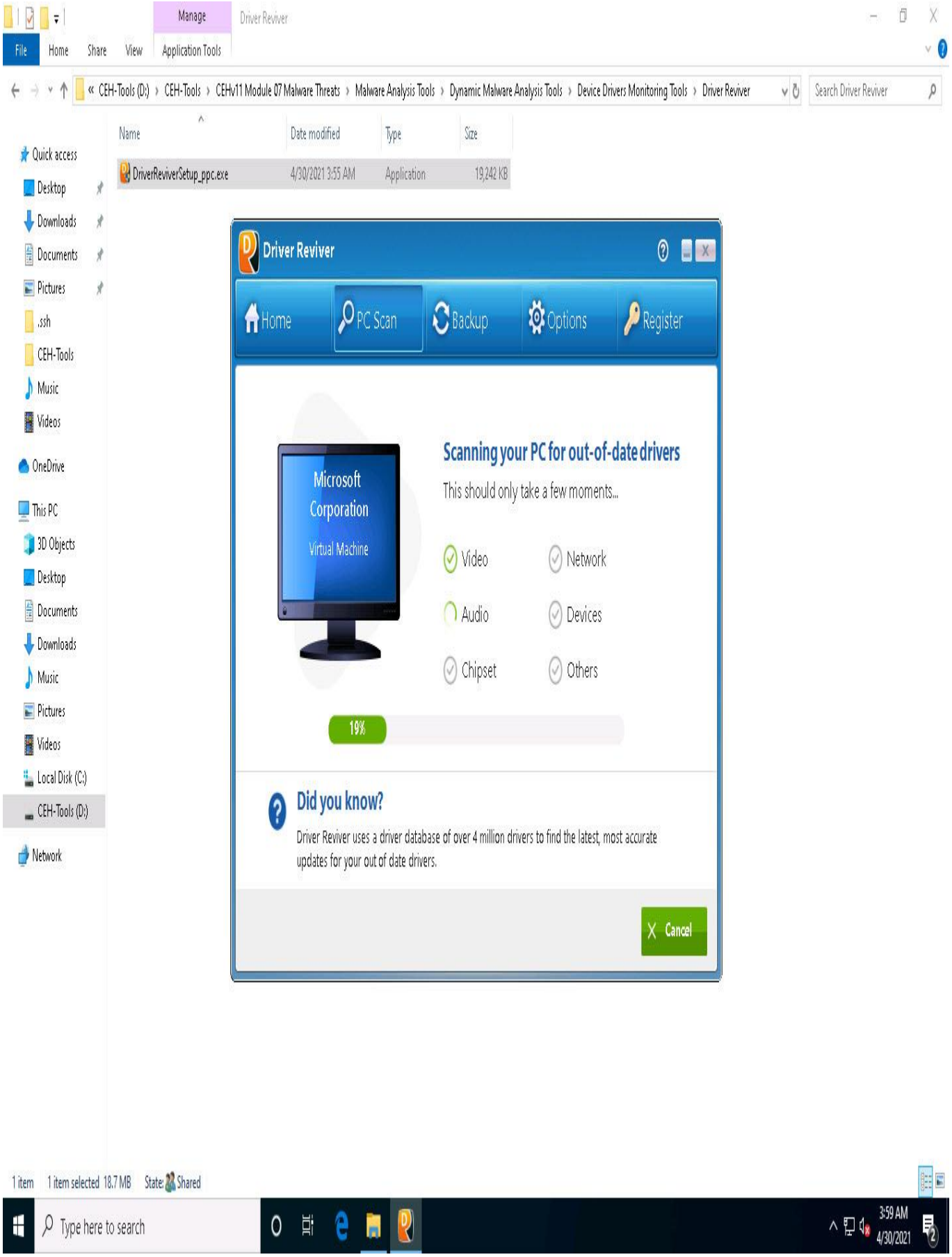
5. ☐ This is how to monitor the drivers installed on a machine. **Close** the **DriverView** window.
6. ☐ Now, we will see how to update system drivers and optimize the PC performance using Driver Reviver.

7. On **Windows 10**, navigate to **D:\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\Device Drivers Monitoring Tools\Driver Reviver**. Double-click **DriverReviverSetup.exe** to launch the setup.
8. If a **User Account Control** window appears, click **Yes**.
9. **Driver Reviver Setup** window appears, click **Next** to install the tool.

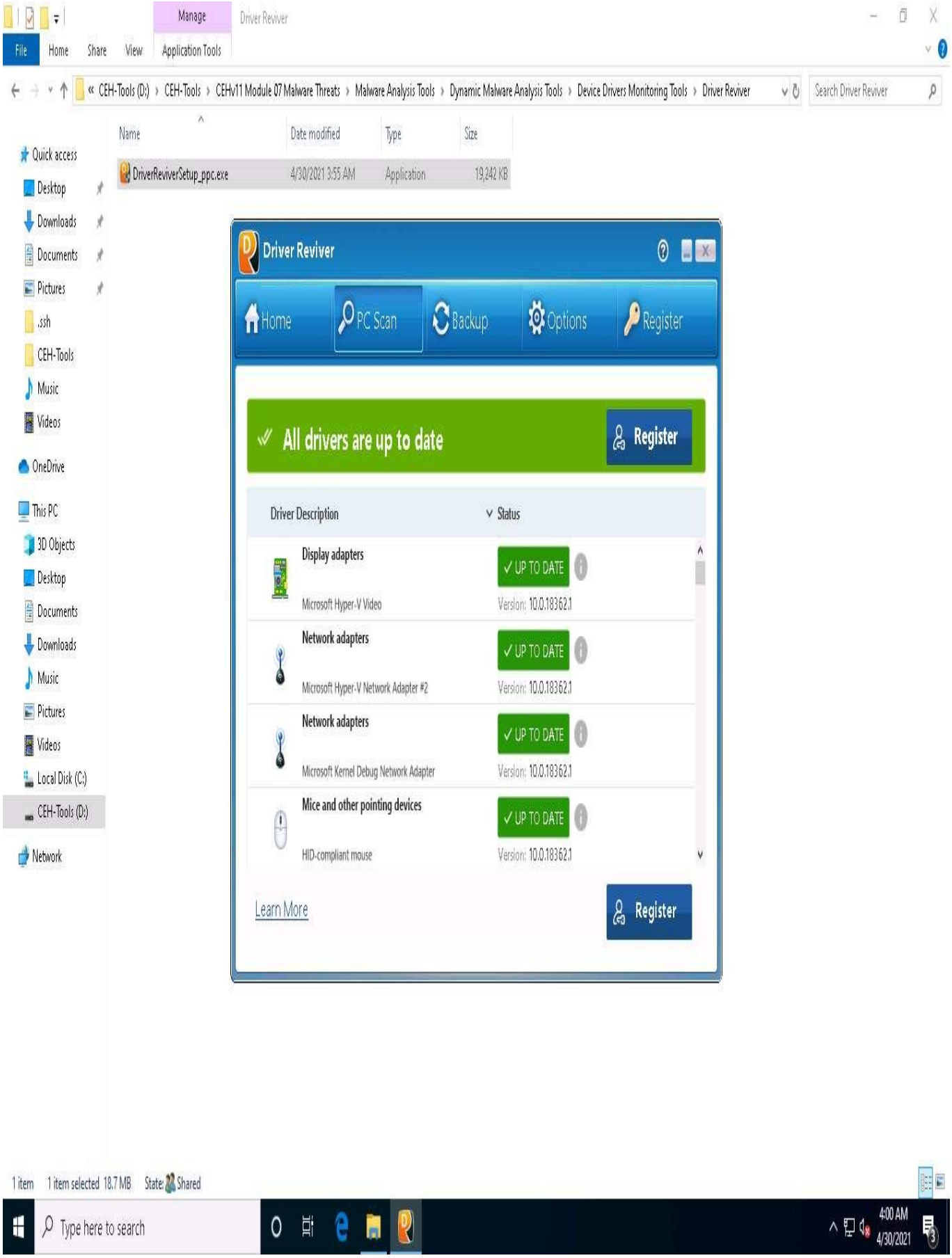


10. ☐ Installation window appears and after the completion of installation, Driver Reviver initializes the scan for drivers, as shown in the screenshot.

If a browser window opens automatically close the browser.

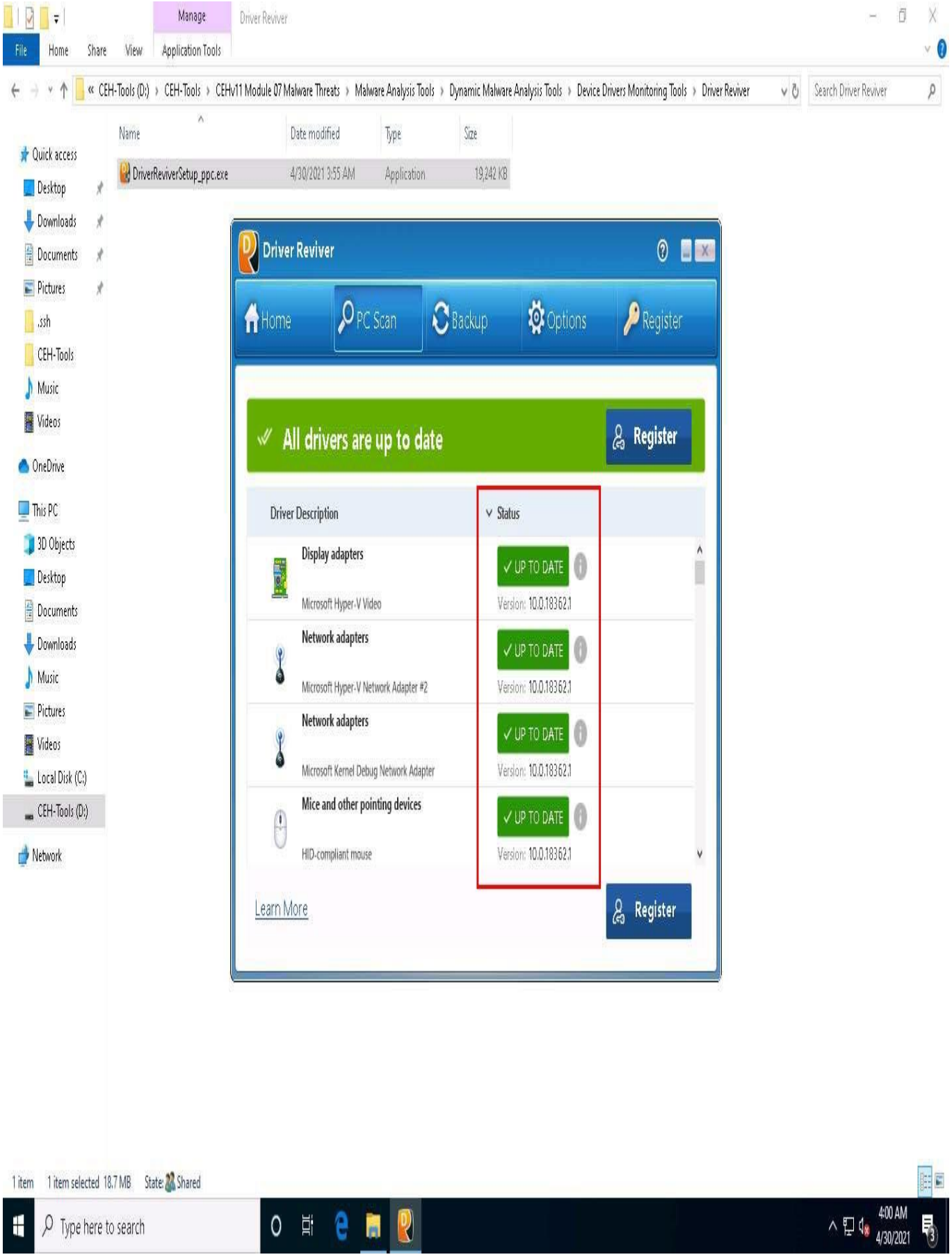


11. ☐ After the scan finishes, a list of system drivers are displayed.

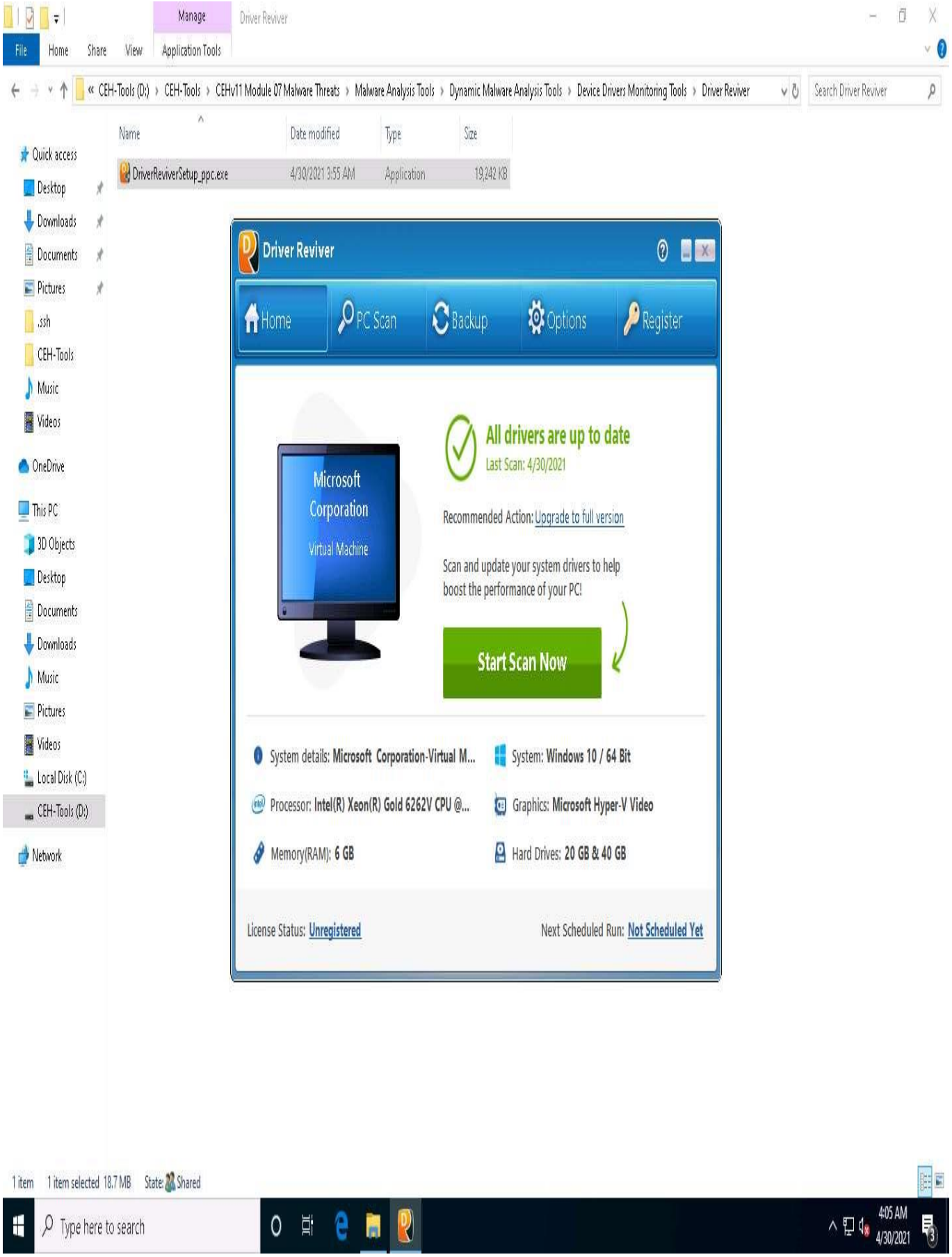


12. ☐ Along with the list of drivers you can see their **Status** as **OUTDATED** or **UP TO DATE**.

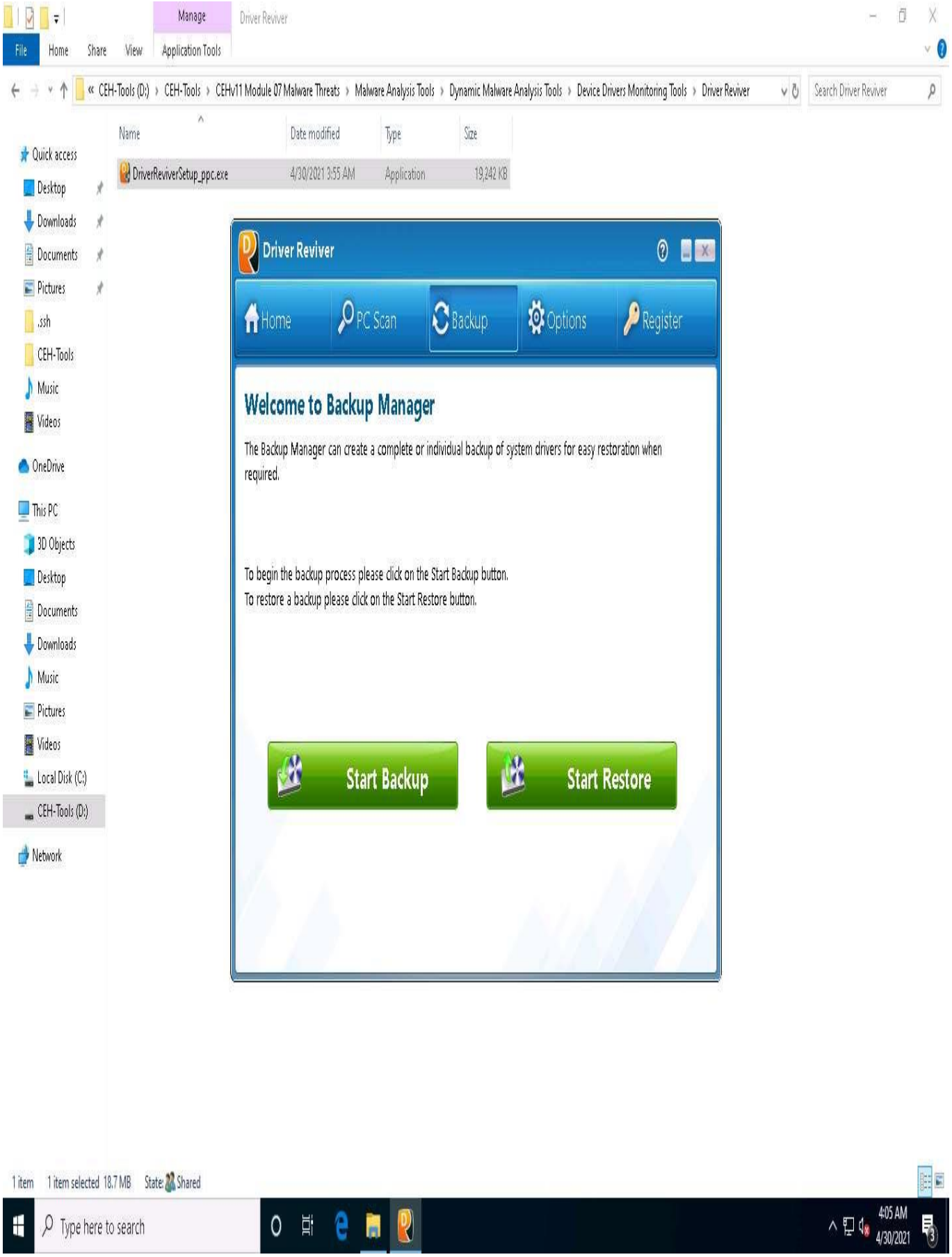
Here, all the drivers are already up to date.
The result might vary in your lab environment



13. ☐ If the drivers are outdated then you can click **Update All** button to update all the drivers.
14. ☐ Now, navigate to the **Home** tab, here you can view information such as **System details**, **System**, **Processor**, **Graphics**, **Memory(RAM)** and **Hard Drives**, as shown in the screenshot,



15. ☐ Navigate to the **Backup** tab, here you can create Backup or Restore the system drivers.



16. ☐ Uninstall the **Driver Reviver** software by navigating to **Control Panel** --> **Programs** --> **Uninstall a program**.

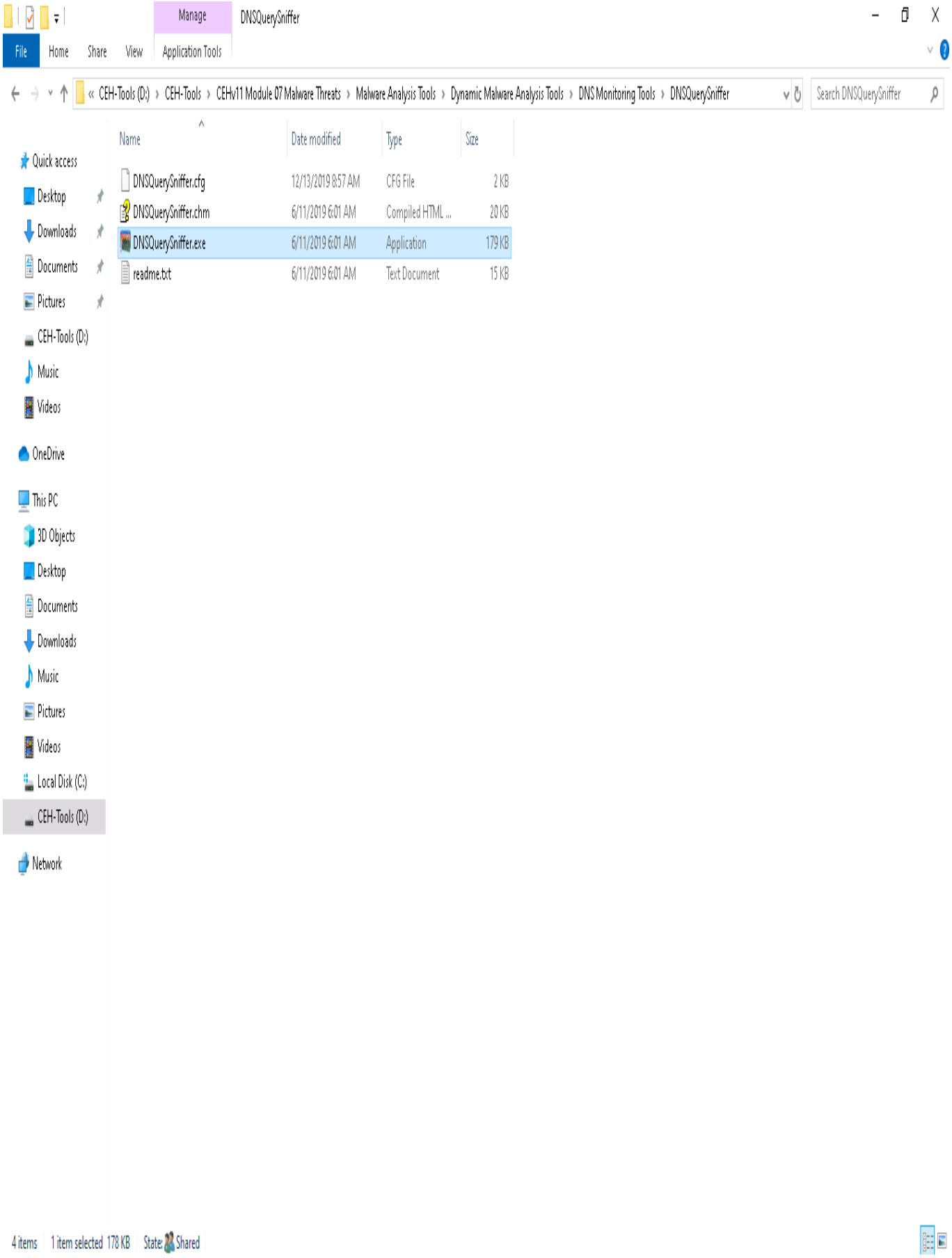
While uninstalling, remove all the files of tools from the system.

17. ☐ Close all open windows.
18. ☐ You can also use other device driver monitoring tools such as **Driver Booster** (https://www.iobit.com), **Driver Easy** (https://www.drivereasy.com), **Driver Fusion** (https://treexy.com), or **Driver Genius** (http://www.driver-soft.com) to perform device driver monitoring.

Task 9: Perform DNS Monitoring using DNSQuerySniffer

DNSQuerySniffer is a network sniffer utility that shows the DNS queries sent on your system. For every DNS query, the following information is displayed: Host Name, Port Number, Query ID, Request Type (A, AAAA, NS, MX, and other types), Request Time, Response Time, Duration, Response Code, Number of records, and the content of the returned DNS records. You can easily export the DNS query information to a CSV, tab-delimited, XML, or HTML file, or copy the DNS queries to the clipboard and then paste them into Excel or another spreadsheet application.

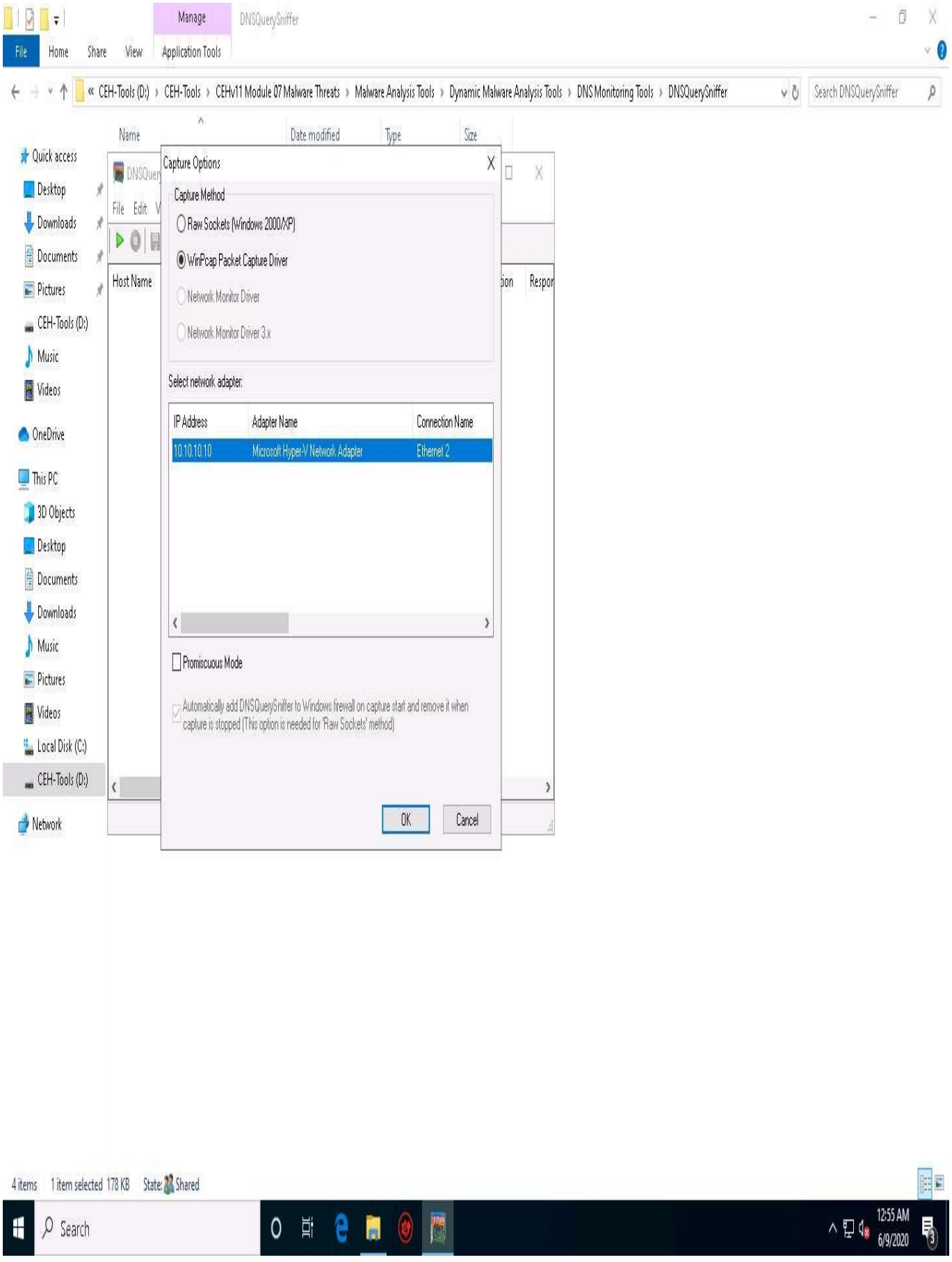
1. ☐ On the **Windows 10** machine, navigate to **D\CEH-Tools\CEHv11 Module 07 Malware Threats\Malware Analysis Tools\Dynamic Malware Analysis Tools\DNS Monitoring Tools\DNSQuerySniffer**, and then double-click **DNSQuerySniffer.exe**.



2. ☐ The main window of **DNSQuerySniffer** appears, along with the **Capture Options** window.

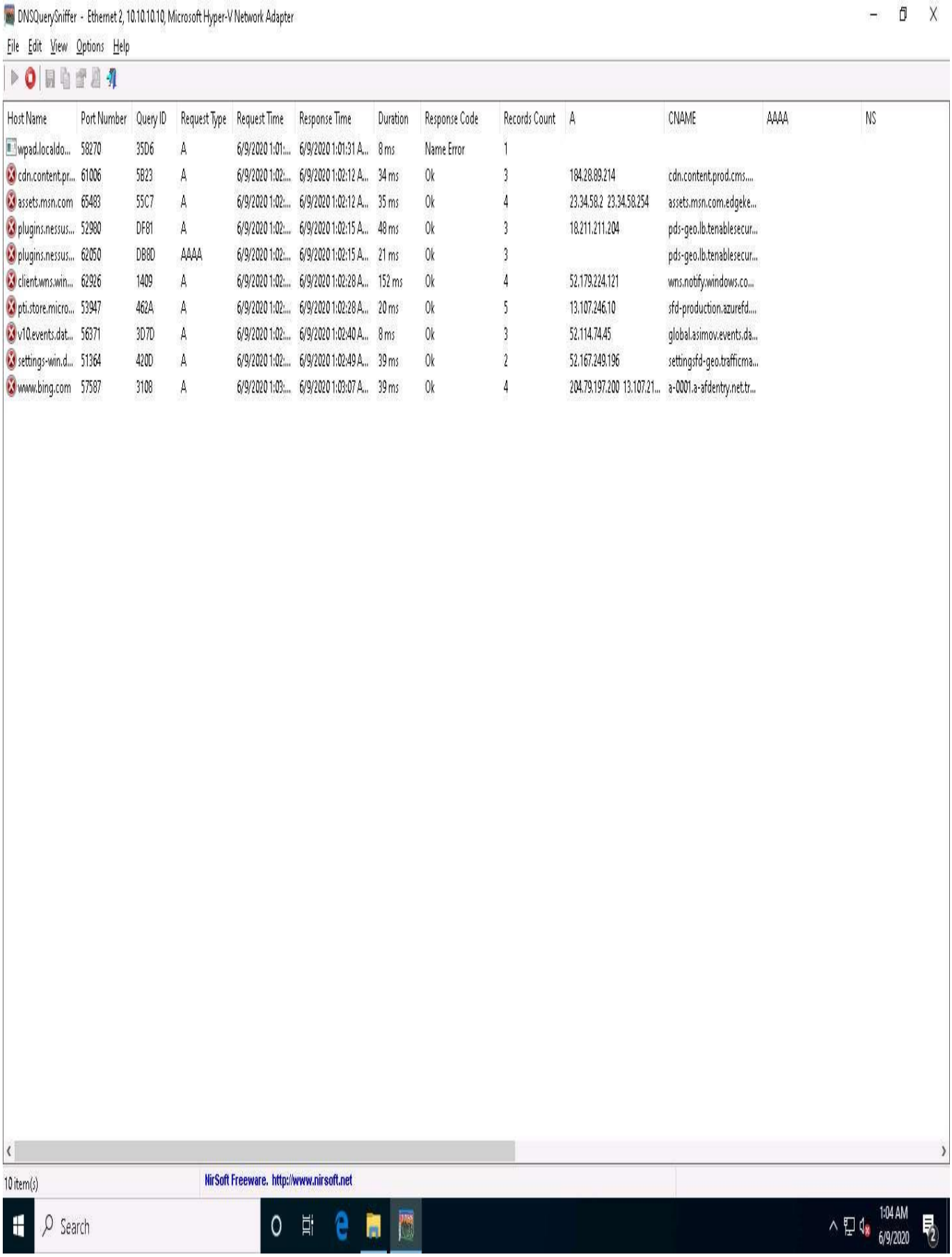
If the **Capture Options** window does not appear, then navigate to the **Options** menu and select **Capture Options**.

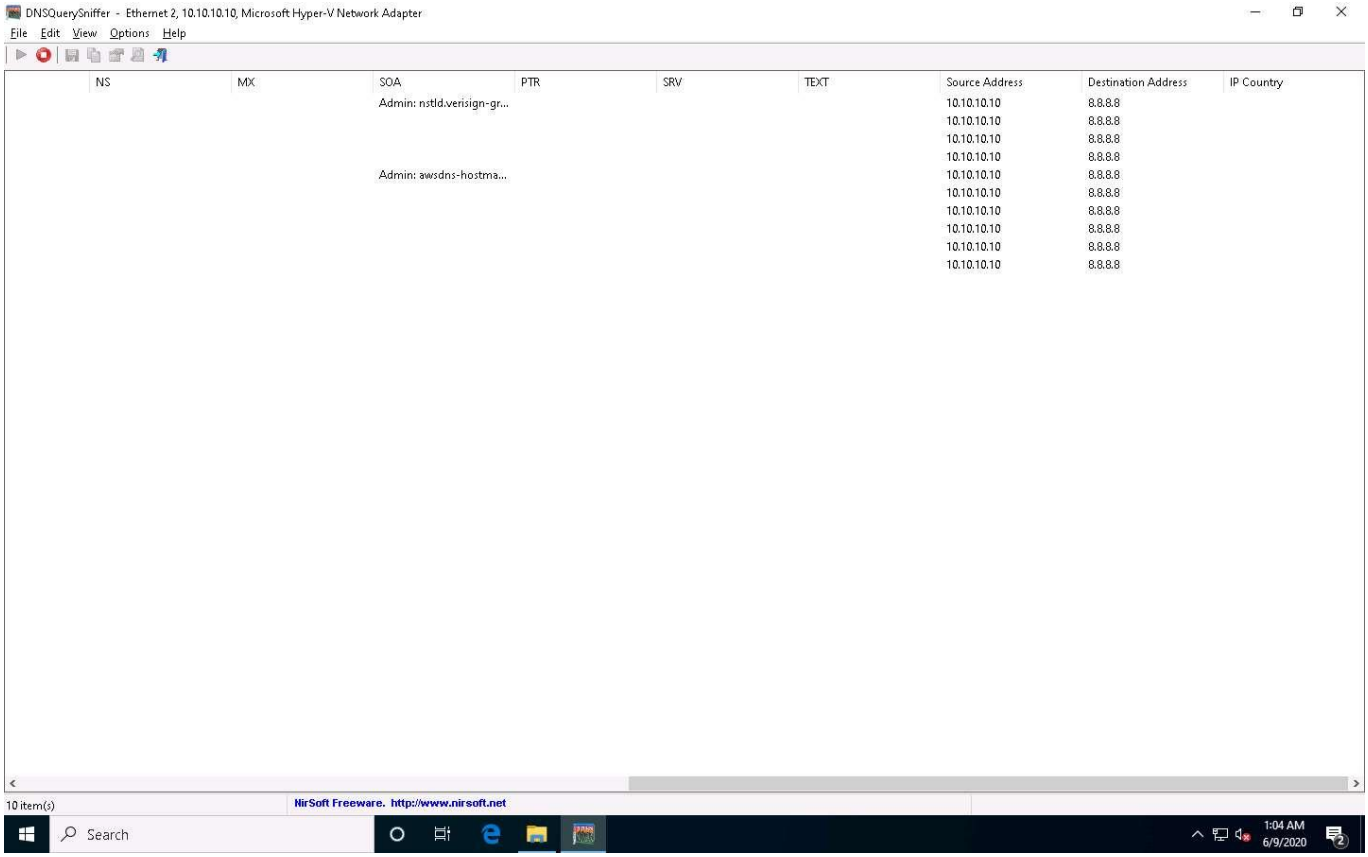
3. In the **Capture Options** window, ensure that the **WinPcap Packet Capture Driver** option is selected under the **Capture Method** field.
4. In the Select network adapter section, select the **Windows 10** network adapter (here, **Ethernet2**).
5. Click **OK** to start sniffing.



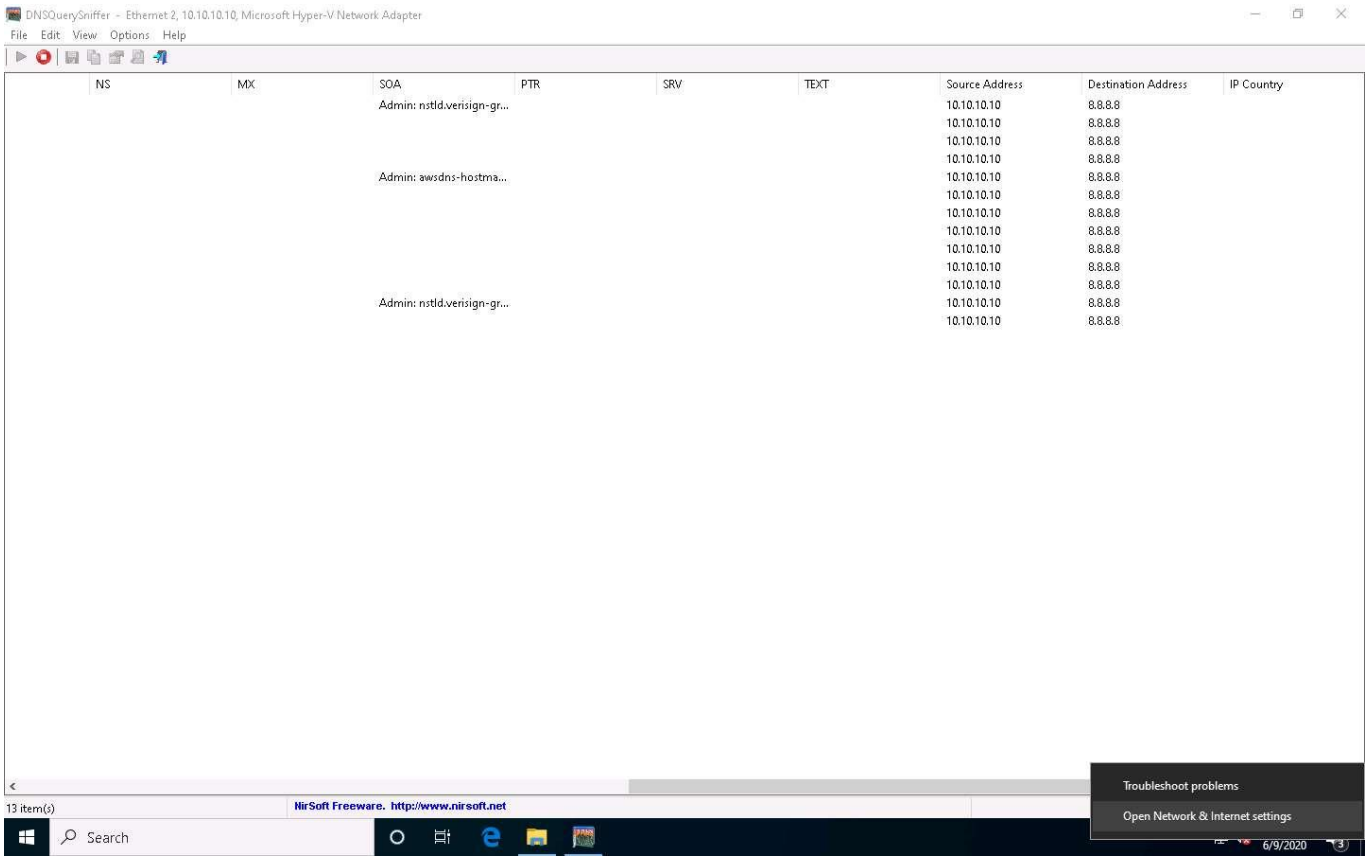
6. The DNSQuerySniffer starts monitoring the network traffic and takes some time to capture the traffic. Leave the window intact. It shows the DNS queries sent on your system along with its complete information such as host name, port number, request time, response time, duration, source address, and destination address, as shown in the screenshot.

To view the **Source Address** and **Destination Address** columns, scroll to the right side of the window.

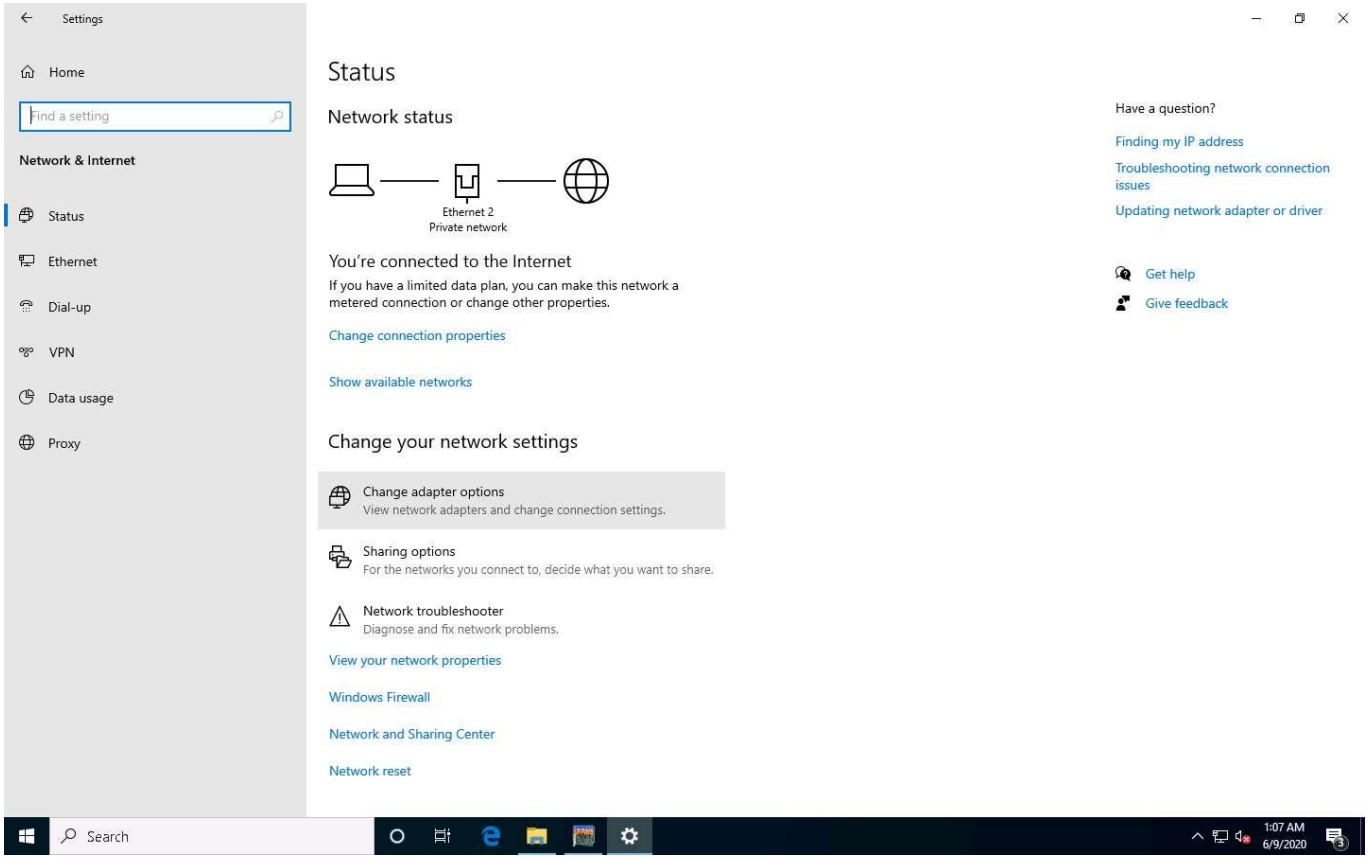

DNSQuerySniffer - Ethernet 2, 10.10.10.10, Microsoft Hyper-V Network Adapter
File Edit View Options Help
Host Name | Port Number | Query ID | Request Type | Request Time | Response Time | Duration | Response Code | Records Count | A | CNAME | AAAA | NS
wpad.localdo... | 58270 | 35D6 | A | 6/9/2020 1:01:... | 6/9/2020 1:01:31 A... | 8 ms | Name Error | 1
cdn.content.pr... | 61006 | 5B23 | A | 6/9/2020 1:02:... | 6/9/2020 1:02:12 A... | 34 ms | Ok | 3 | 184.28.89.214 | cdn.content.prod.cms....
assets.msn.com | 65483 | 55C7 | A | 6/9/2020 1:02:... | 6/9/2020 1:02:12 A... | 35 ms | Ok | 4 | 23.34.58.2 23.34.58.254 | assets.msn.com.edgeke...
plugins.nessus... | 52980 | DF81 | A | 6/9/2020 1:02:... | 6/9/2020 1:02:15 A... | 48 ms | Ok | 3 | 18.211.211.204 | pds-geo.lb.tenablesecur...
plugins.nessus... | 62050 | DB8D | AAAA | 6/9/2020 1:02:... | 6/9/2020 1:02:15 A... | 21 ms | Ok | 3 | | pds-geo.lb.tenablesecur...
client.wns.win... | 62926 | 1409 | A | 6/9/2020 1:02:... | 6/9/2020 1:02:28 A... | 152 ms | Ok | 4 | 52.179.224.121 | wns.notify.windows.co...
pti.store.micro... | 53947 | 462A | A | 6/9/2020 1:02:... | 6/9/2020 1:02:28 A... | 20 ms | Ok | 5 | 13.107.246.10 | sfd-production.azurefd....
v10.events.dat... | 56371 | 3D7D | A | 6/9/2020 1:02:... | 6/9/2020 1:02:40 A... | 8 ms | Ok | 3 | 52.114.74.45 | global.asimov.events.da...
settings-win.d... | 51364 | 420D | A | 6/9/2020 1:02:... | 6/9/2020 1:02:49 A... | 39 ms | Ok | 2 | 52.167.249.196 | settingsfd-geo.trafficma...
www.bing.com | 57587 | 3108 | A | 6/9/2020 1:03:... | 6/9/2020 1:03:07 A... | 39 ms | Ok | 4 | 204.79.197.200 13.107.21... | a-0001.a-afdentry.net.tr...
10 item(s)
NirSoft Freeware. http://www.nirsoft.net
Search
1:04 AM
6/9/2020



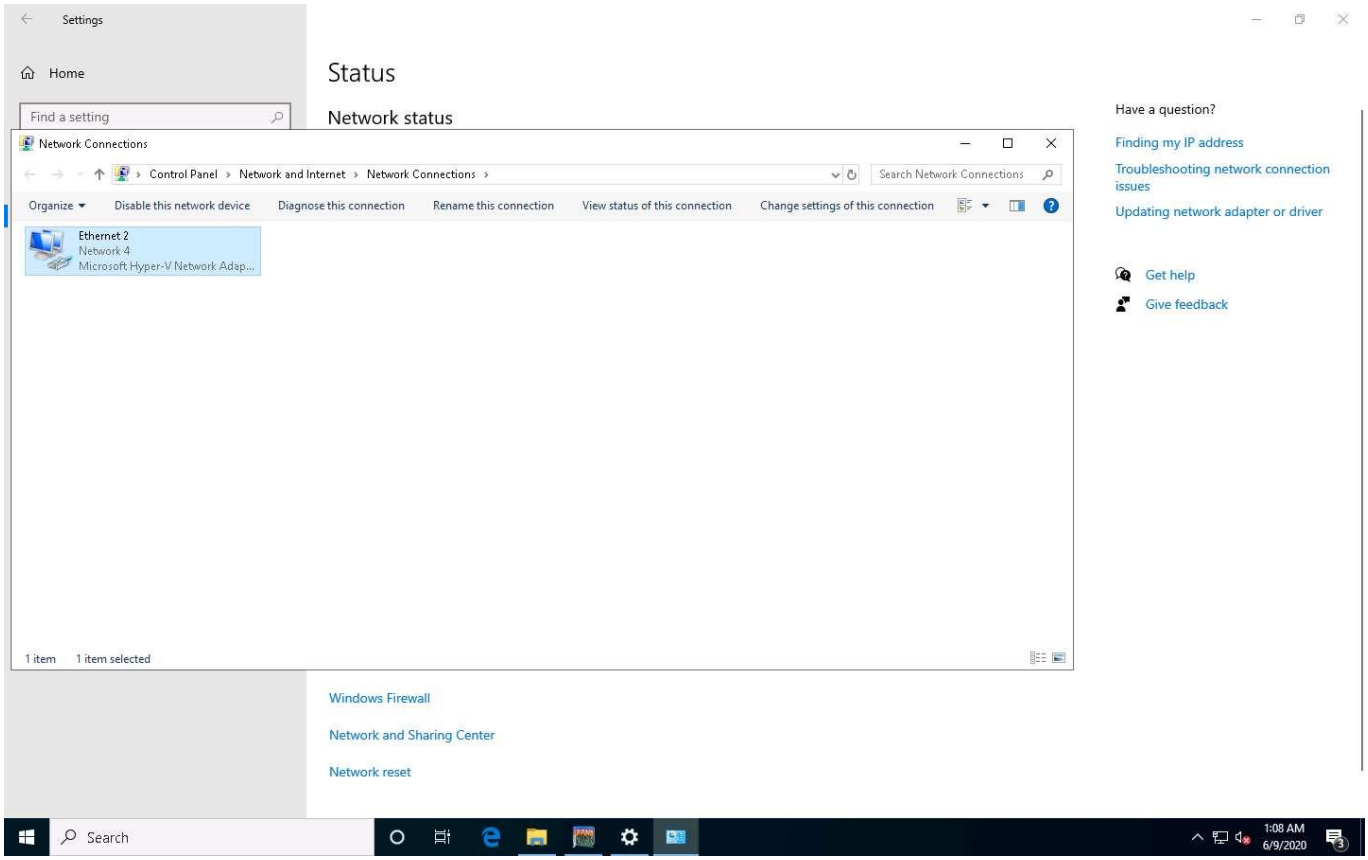
7. As you can see in the above screenshot, the DNS address is **8.8.8.8**.
8. In real-time, attackers will use malicious applications like DNSChanger to change the DNS of the target machine. For demonstration purposes, we are changing the DNS of the **Windows 10** machine in the **Network & Internet settings**.
9. Right-click on the **Network** icon in the lower-right corner of Desktop and click **Open Network & Internet settings**.



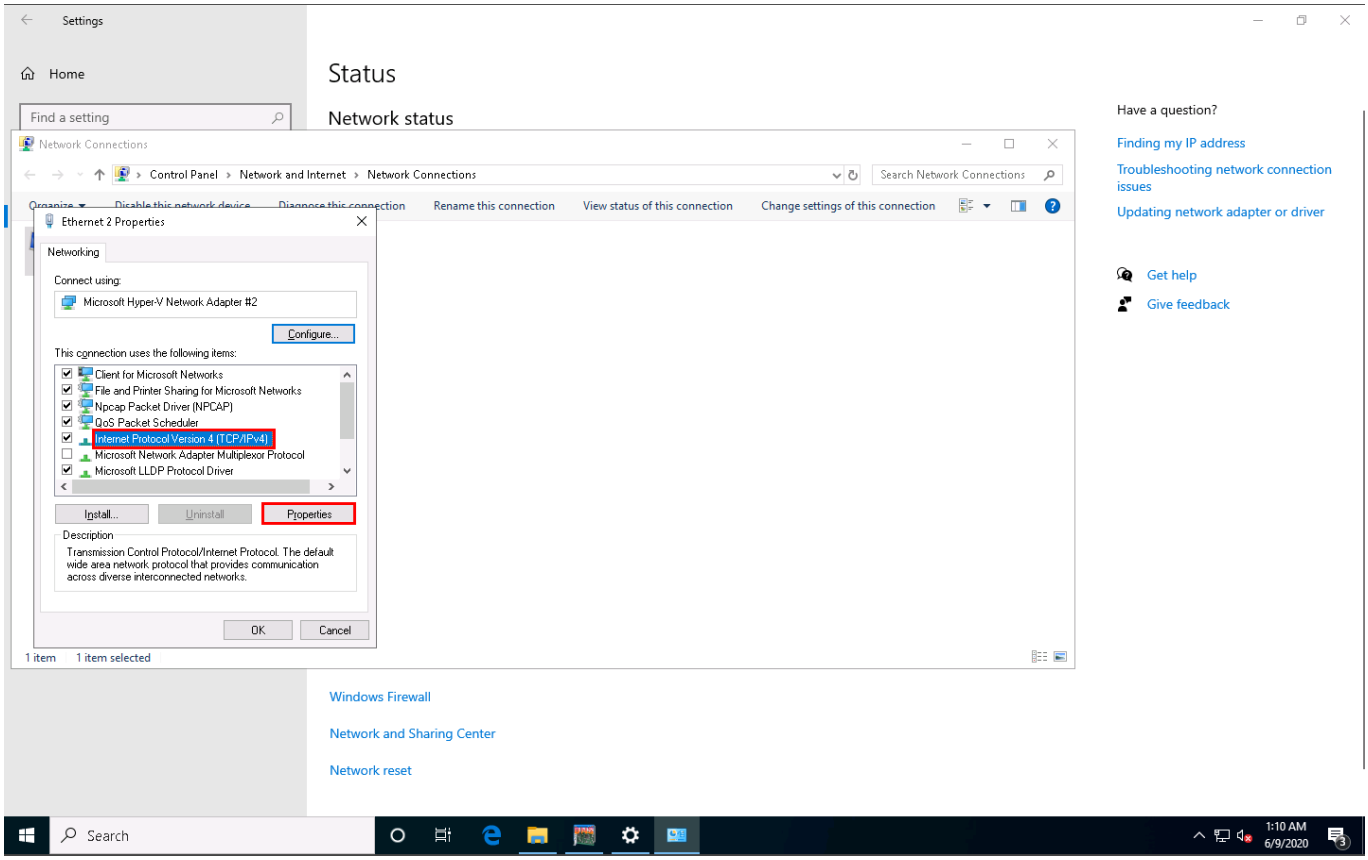
10. The **Network Status** window appears. Click **Change adapter options** under **Change your network settings**.



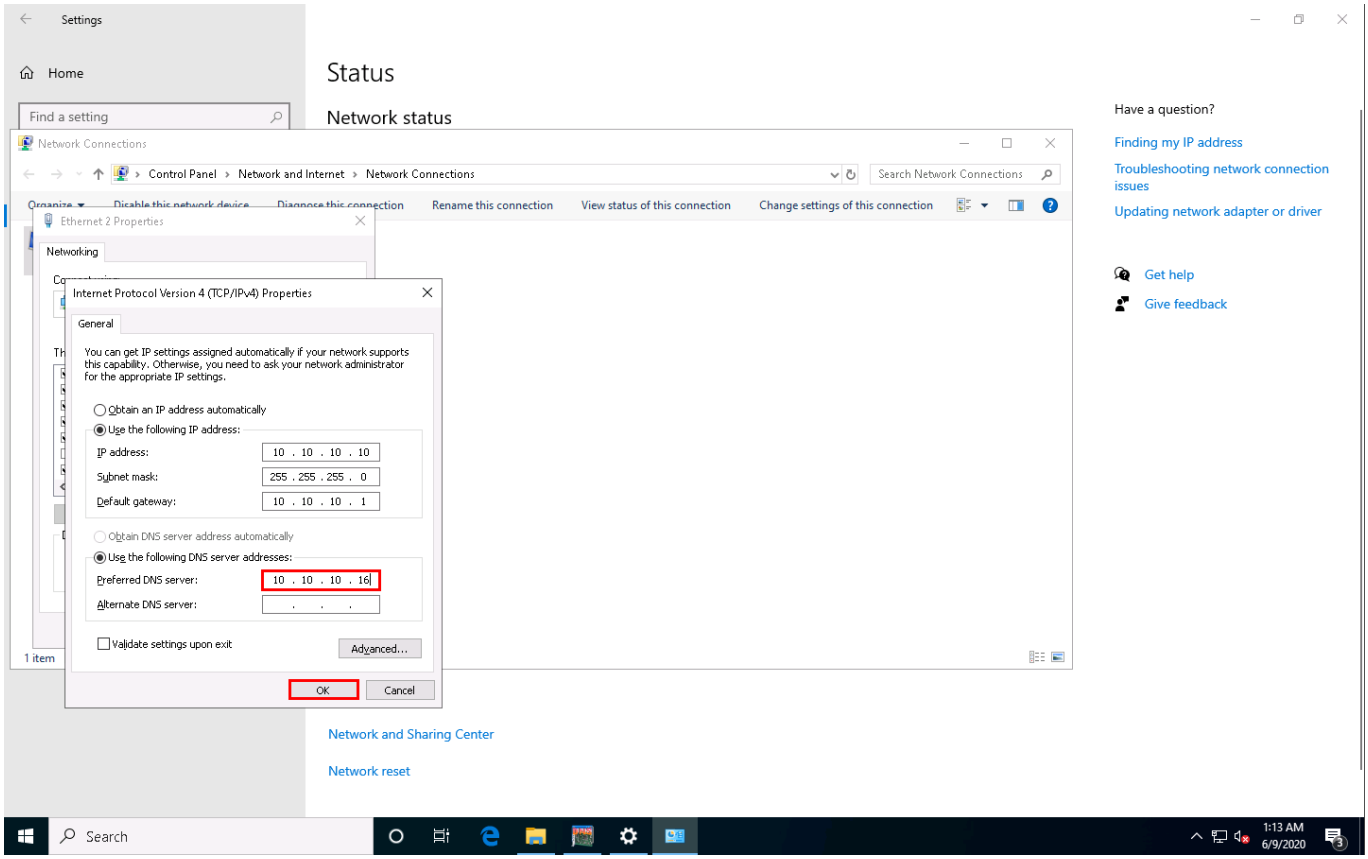
11. Right-click on the network adapter (here, **Ethernet2**) and click **Properties**.



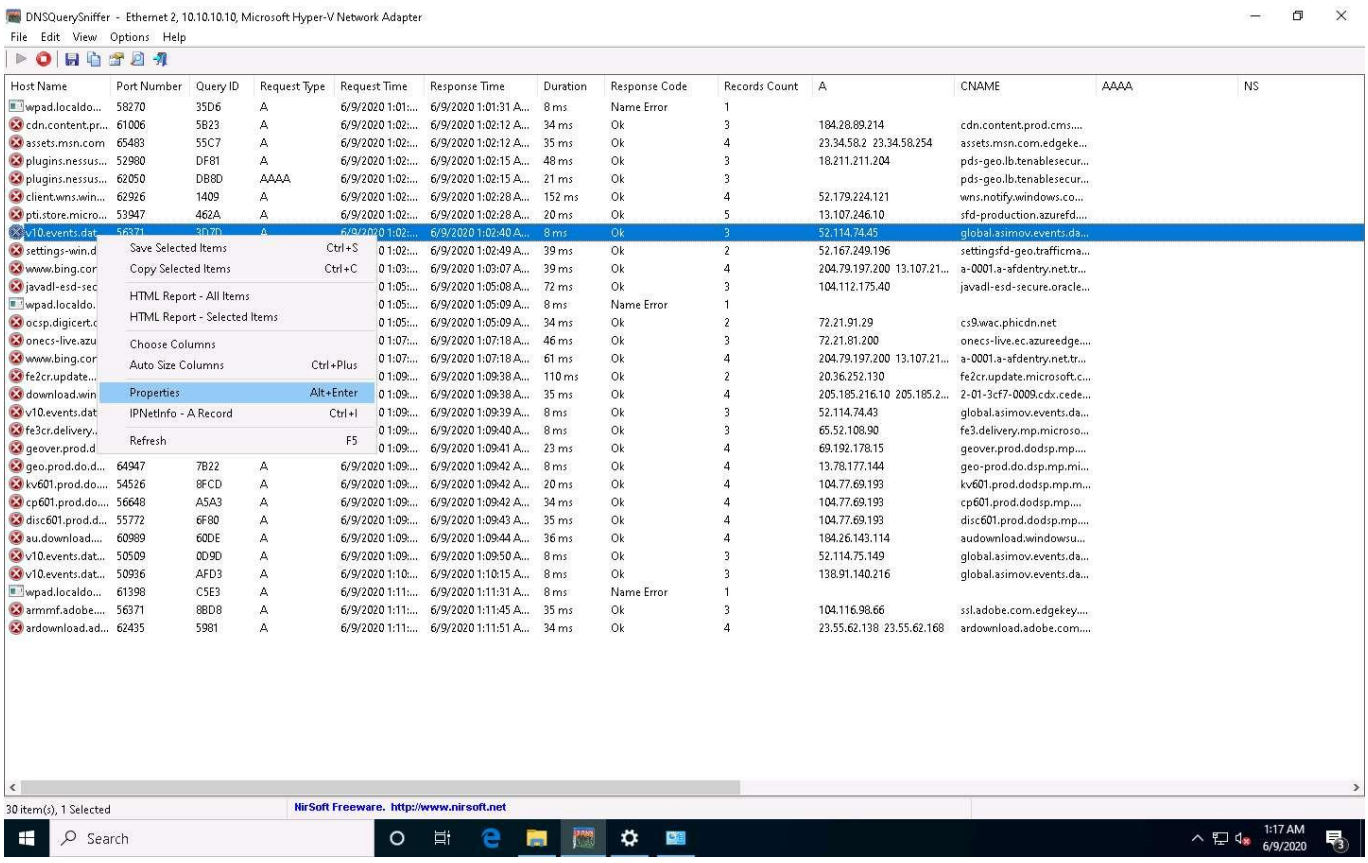
12. ☐ The **Adapter Properties** window appears. Select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.



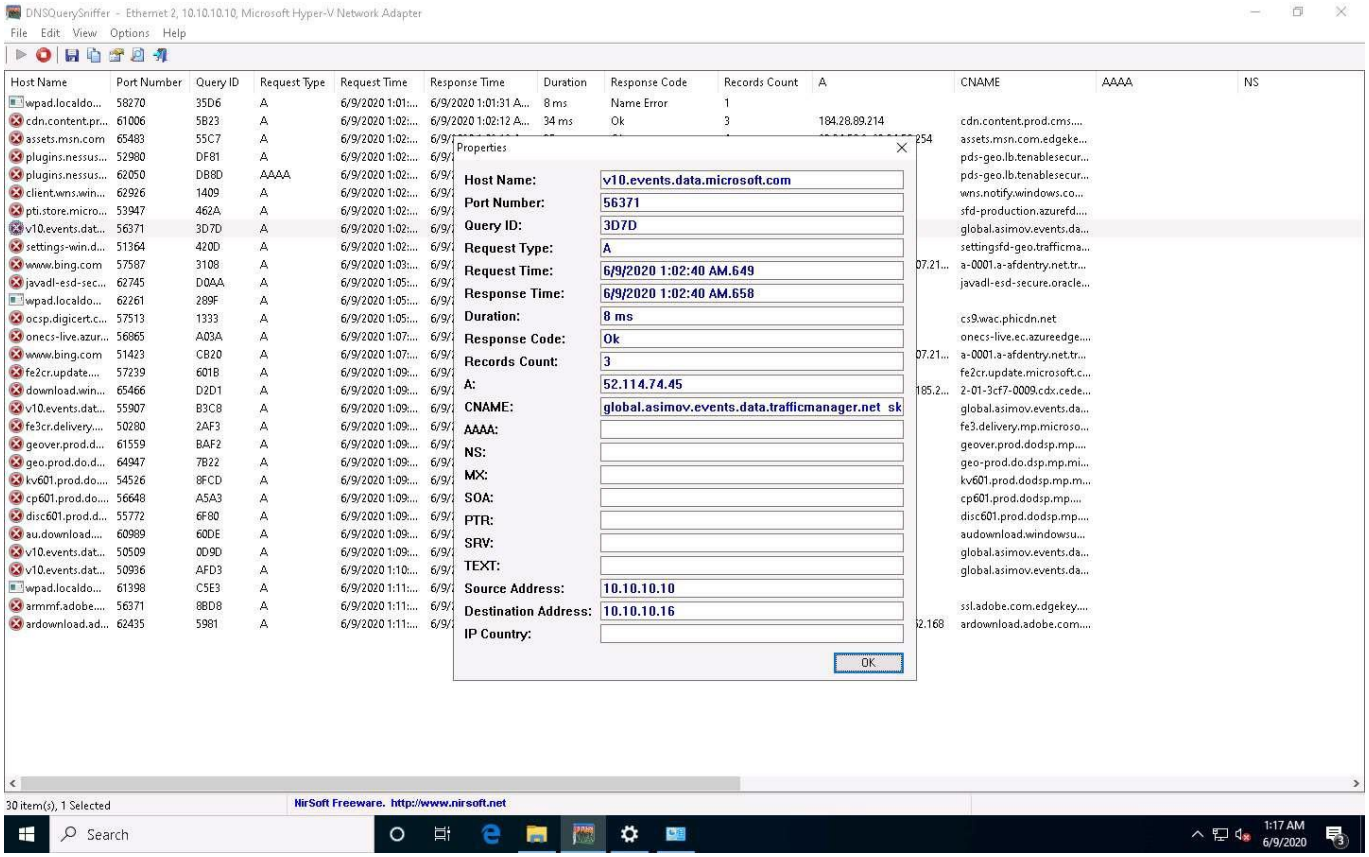
13. ☐ The **Internet Protocol Version 4(TCP/IPv4) Properties** window appears. Change the **Preferred DNS server** with the **Windows Server 2016** IP address and click **OK**. In this task, the **Windows Server 2016** IP address is **10.10.10.16**. This may vary in your lab environment.
14. ☐ Click **OK**, and then **Close** the Adapter Properties window.



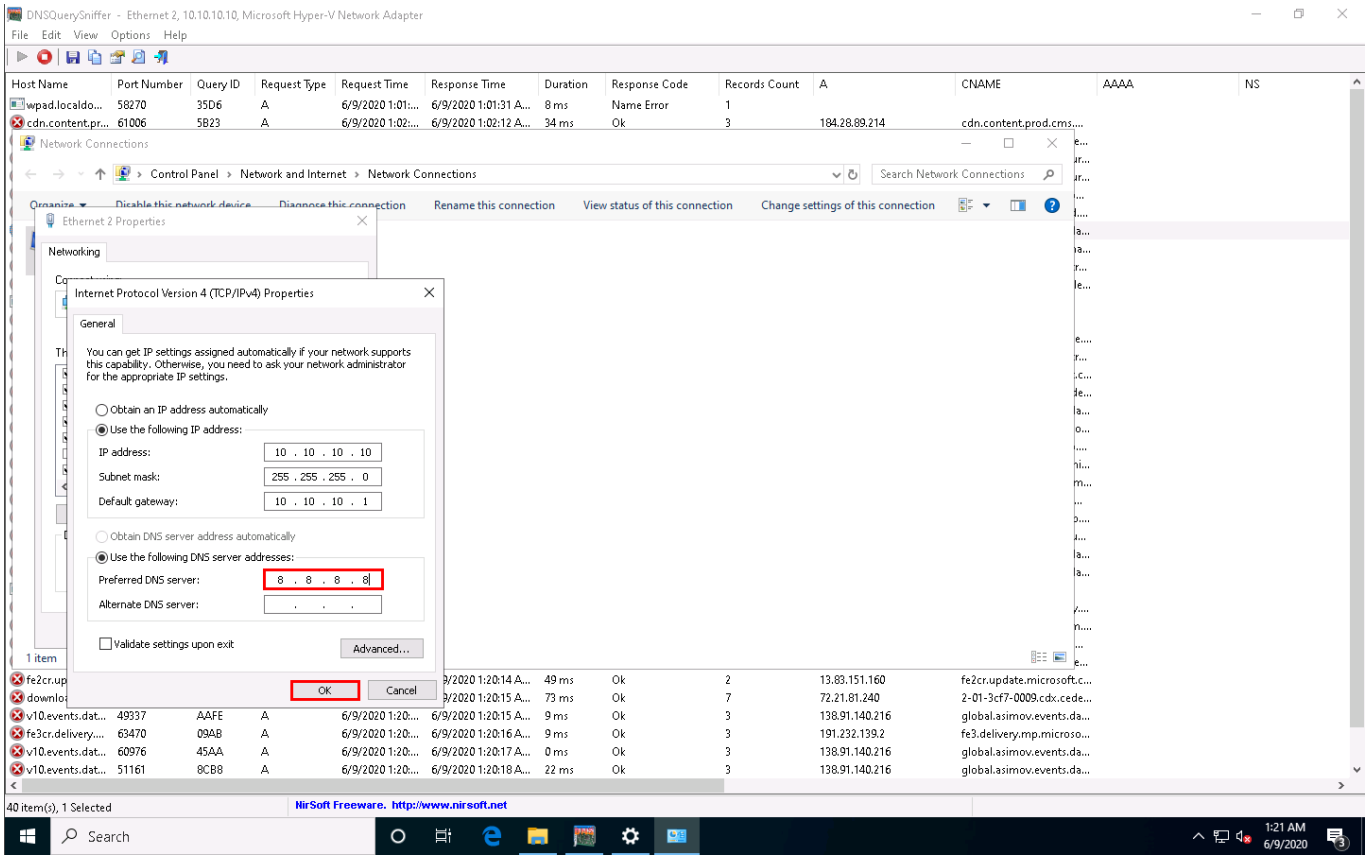
15. Switch to the **DNSQuerySniffer** window; observe the few recorded logs. Right-click on the log for which DNS has changed and select **Properties** from the context menu.



16. In the **Properties** window, observe that there is a change in DNS.



17. ☐ After completion of the task, go to the network settings, change DNS **8.8.8.8** in the **Windows 10** machine, and close all applications.



18. ☐ Close all open windows.

19. ☐ You can also use other DNS monitoring/resolution tools such as **DNSstuff** (https://www.dnsstuff.com), **DNS Lookup Tool** (https://www.ultratools.com), or **Sonar Lite** (https://constellix.com) to perform DNS monitoring.