LAB 12 ***Dynamic Analysis Tools***

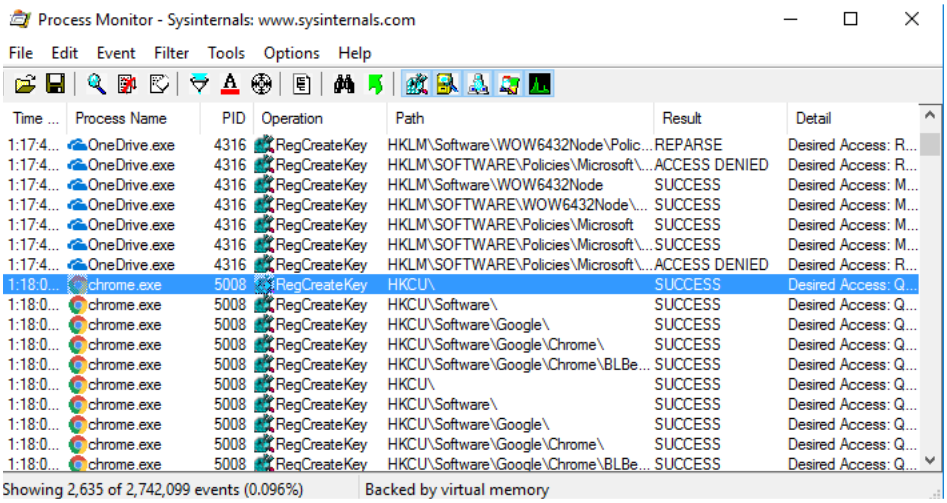
- *Process Monitor*
- *Regshot*
- *HandleDiff*

1. **Process Monitoris:** a free tool from Microsoft that displays file system, registry, process, and other activities on the system.
   - It's an invaluable tool for troubleshooting Windows problems as well as for malware forensics and analysis tasks.
   - The thoroughness of the tool is also weakness, as the amount of data captured by Process Monitor can easily overwhelm the analyst.

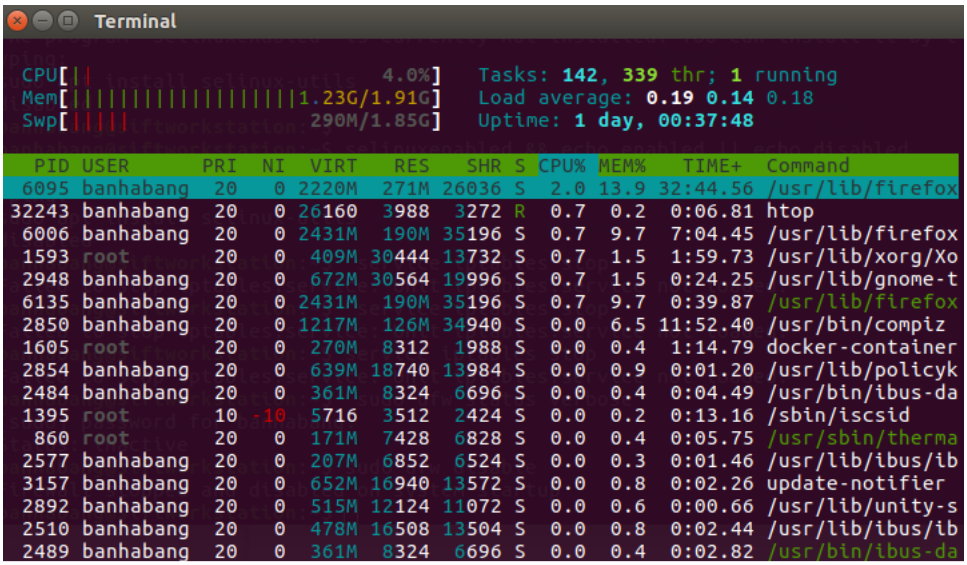
   (We have already used this tool in the previous section, so we will not introduce it again)

Install:

- ProccessMonitor on Windows: Download on https://docs.microsoft.com/en-us/sysinternals/downloads/procmon



- Htopon Ubuntu: sudo apt-get install htop



Process Monitor for Malware Analysis:

- Execute malware or malicious code.
- Using Raymond's filters on https://zeltser.com/process-monitor-filters-for-malware-analysis/
- It offers a convenient way to examine Process Monitor's log file for activities that are sometimes associated with malware, such as changing the file's attribute, deleting a file, creating a registry key, etc.

2. RegShot

RegShot takes a "snapshot" of your computer allowing you to compare any changes made.

- Registry changes: The malware changes the NoFolderOptionssetting in the registry, which prevents users from being able to control how Windows Explorer displays folders.
  It also changes the DisableRegistryToolssetting, which prevents users from starting the default registry editor(s) that Windows provides.
- Files added: The malware adds a file named 944983008.exe and csrssc.exe to the user's temporary directory. Windows OS created the Prefetchdirectory in order to store them.
  Two files named 944983008.exe and csrssc.exe executed on the system during the malware's execution.
  ➔The Prefetchfiles are good sources of forensic evidence
- Files deleted: The malware deleted a file named 944983008.exe from the user's Desktop.

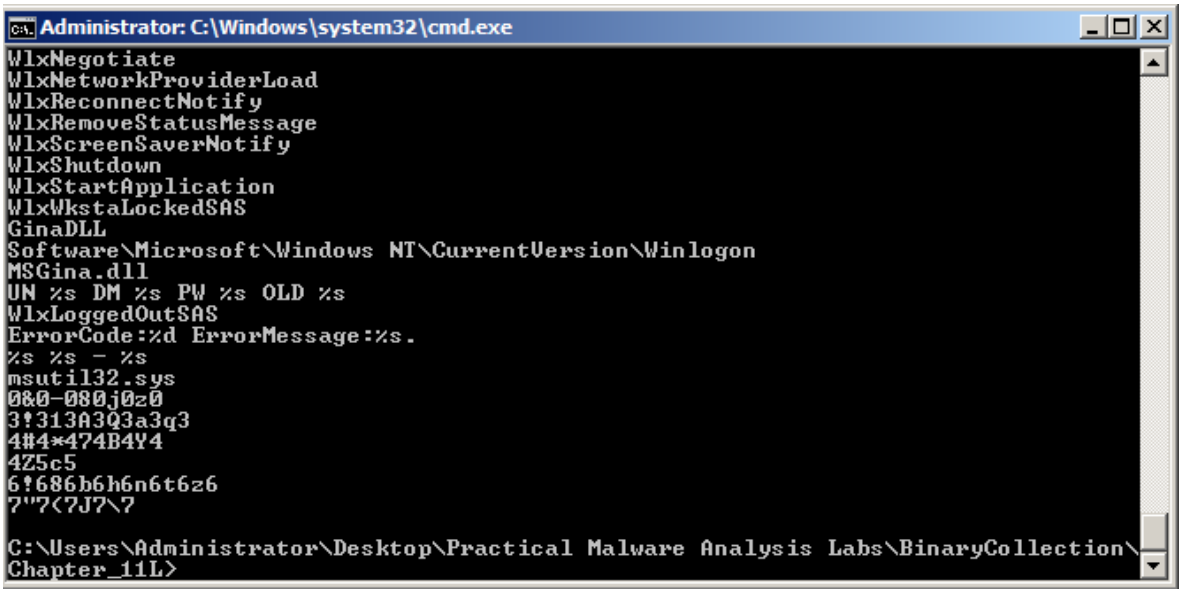
➔This file is the original malware sample. Thus, you can conclude that the malware deletes itself after executing
The malware does not directly modify any files.
➔They create two files 944983008.exe or csrssc.exe that use the WinINetAPI, in order to update the index.dat.

LAB 1:

What you need: The Windows 2008 Server virtual machine we have been using.
Purpose: Analyze malware behavior

Static Analysis with Strings

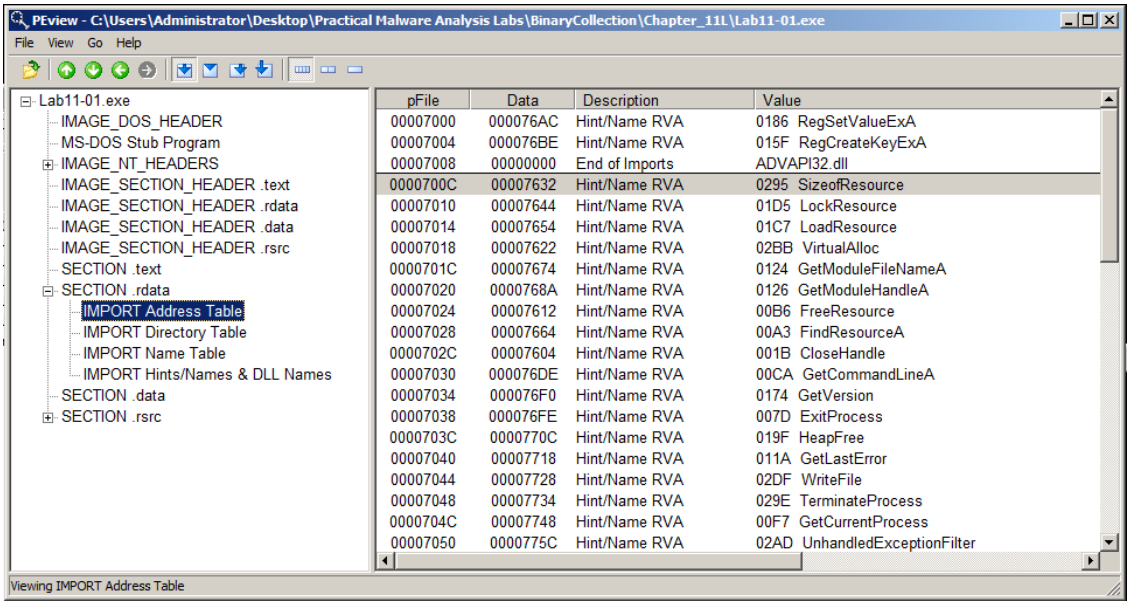
Examine the strings in Lab11-01.exe. You should find the two items below.



Static Analysis with PEview

Examine the Lab11-01.exe file in PEview. Find the items below.

- RegSetValueExA
- RegCreateKeyExA
- SizeofResource
- LockResource
- LoadResource



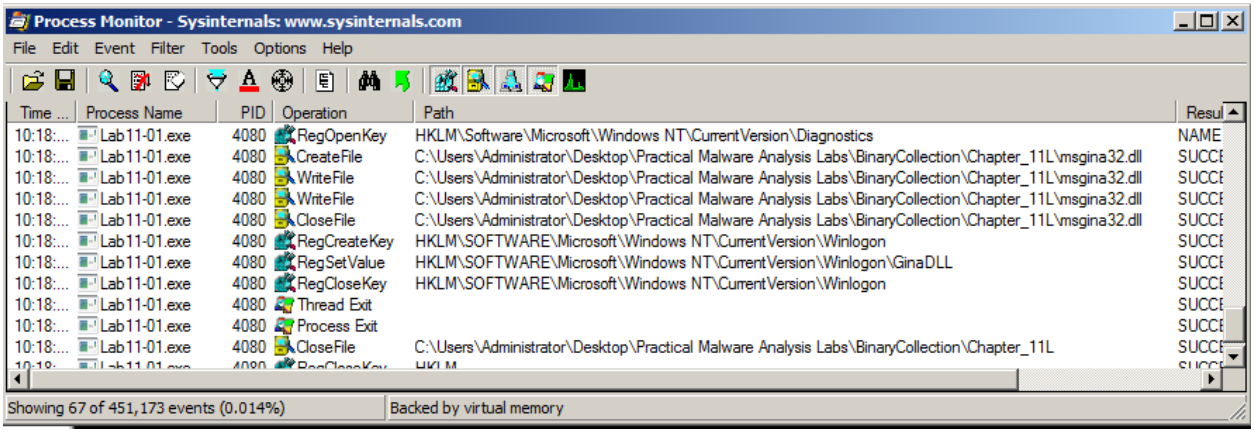
Dynamic Analysis with Procmon

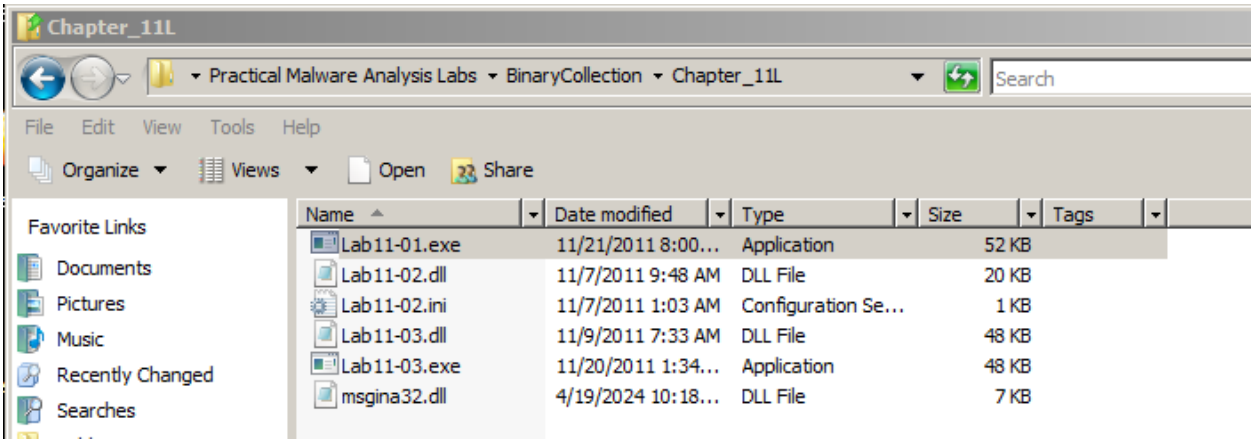
Run the malware in a virtual machine, while running Procmon to see what it does.

In Procmon, click **Filter**, "**Reset Filter**".

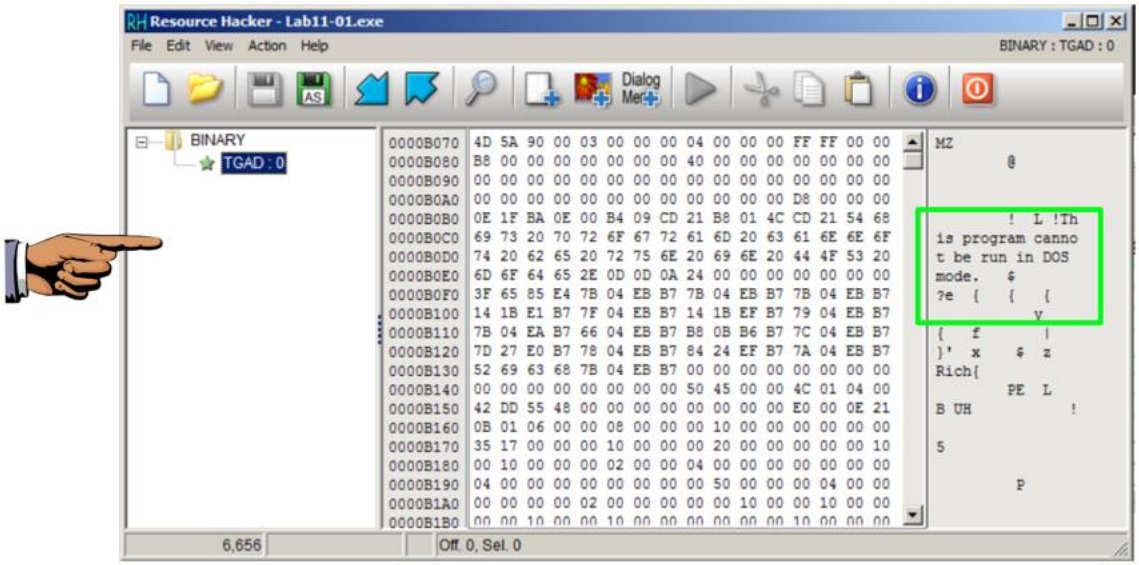
Click **Filter**, **Filter**. Filter for a "**Process Name**" of **Lab11-01.exe**.

- CreateFile ... msgina32.dll
- RegCreateKey HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Winlogon
- RegSetValue HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Winlogon\GinaDLL

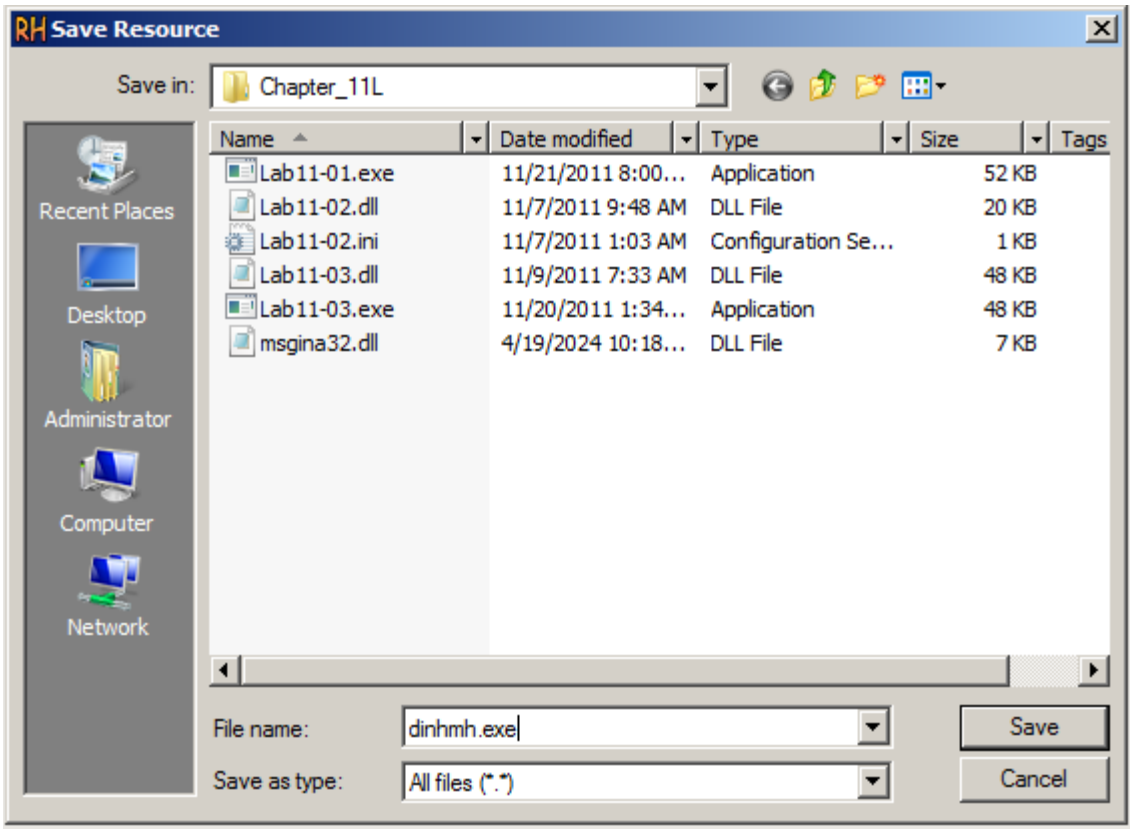




Resource Hacker
Download Resource Hacker here:
http://www.angusj.com/resourcehacker/
Open **Lab11-01.exe** in Resource Hacker.
The "**BINARY TGAD 0**" starts with **MZ** and contains the telltale text "This program cannot be run in DOS mode", as shown below--this is an EXE file.



In Resource Hacker, in the left pane, click **0** ti highlight it, as shown above.
Click **Action**, **Save Resource as a binary file...**".
Save the file as **YOURNAME-TGAD0.exe**, replacing the text "YOURNAME" with your own name.

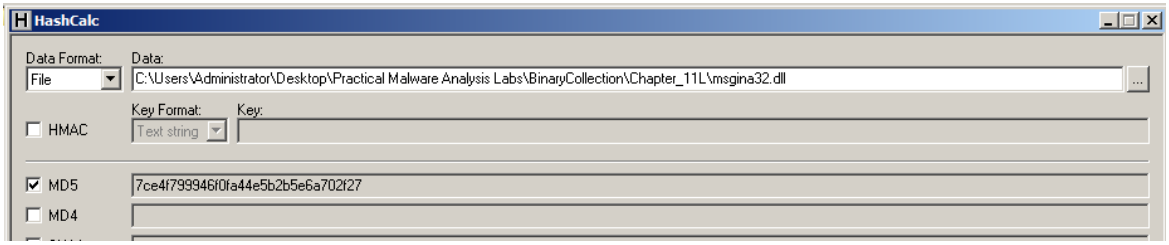


HashCalc

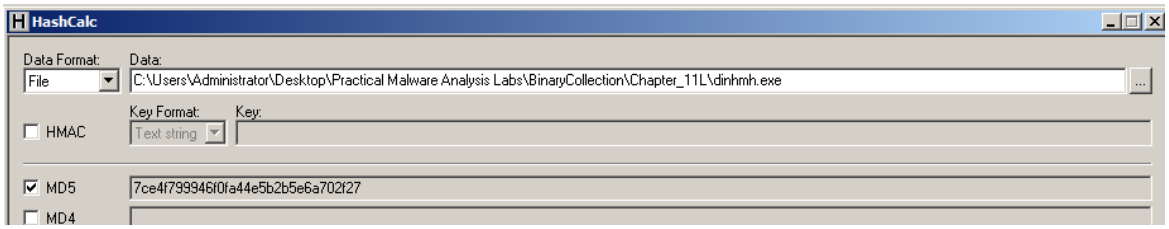
If you don't have it, get HashCalc here:
http://www.slavasoft.com/hashcalc/

Calculate the MD5 hash of the msgina32.dll file created by running the malware.

The MD5 hash begins with **7ce4**, as shown below.



Calculate the MD5 hash of the **YOURNAME-TGAD0.exe** file, as shown below.



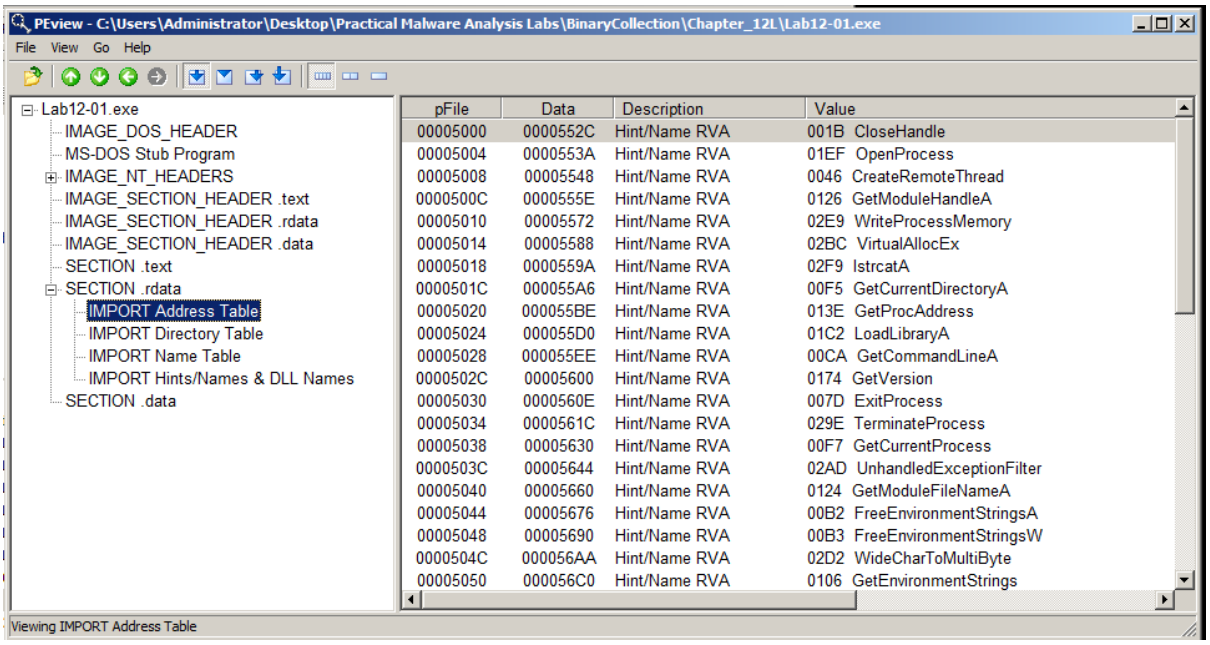
LAB 2:

What you need: The Windows 2008 Server virtual machine we have been using.
Purpose: Analyze malware behavior

Imports

Examine **Lab12-01.exe** in PEView. Find these three imports, which are used in process injection:

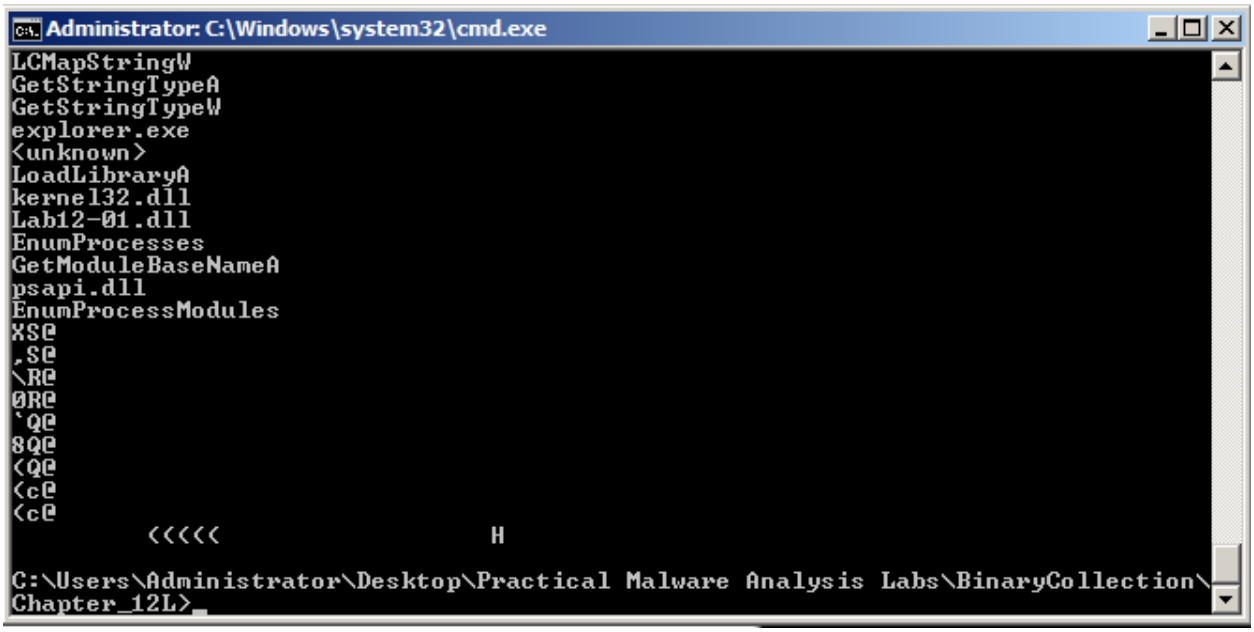
- **CreateRemoteThread**
- **WriteProcessMemory**
- **VirtualAllocEx**



Strings

Examine the strings in **Lab12-01.exe**. Find these three strings, which show the process being injected, the DLL file used, and *psapi.dll*, which is used for
process enumeration:

- **explorer.exe**
- **Lab12-01.dll**
- **psapi.dll**

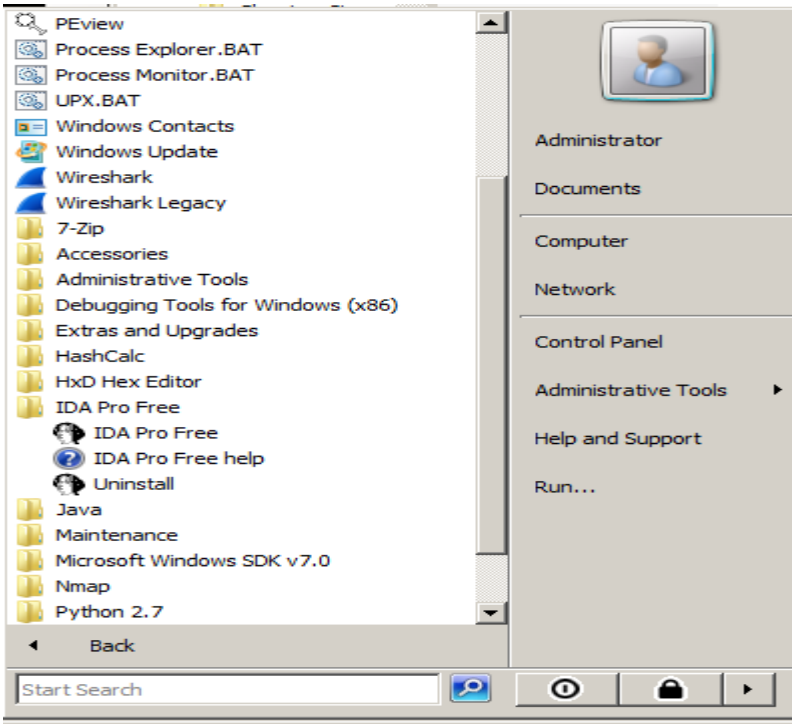


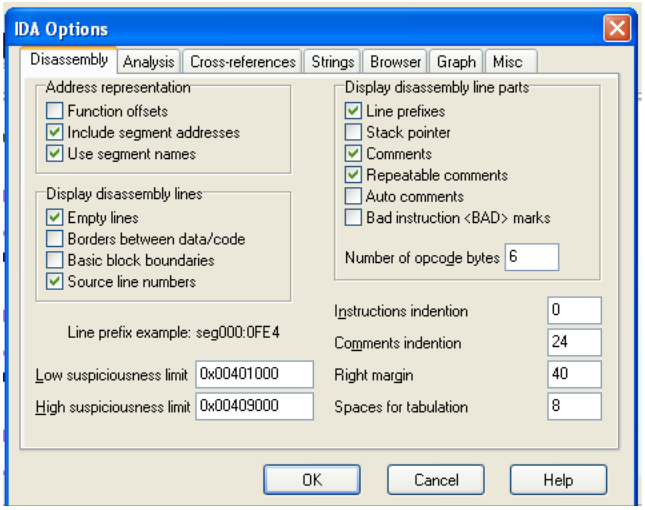
IDA Pro

Load **Lab12-01.exe** in IDA Pro Free.

Click **Options**, **General**.

Check "**Line Prefixes**" and set the "Number of opcode bytes" to **6**, as shown below.

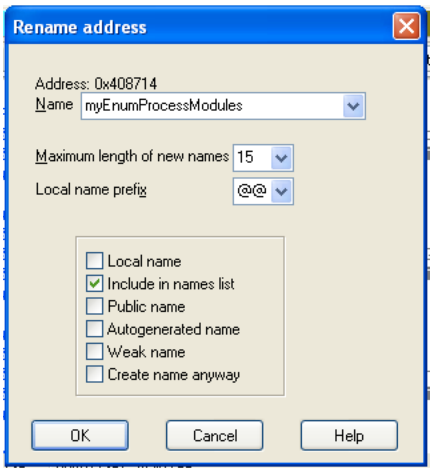




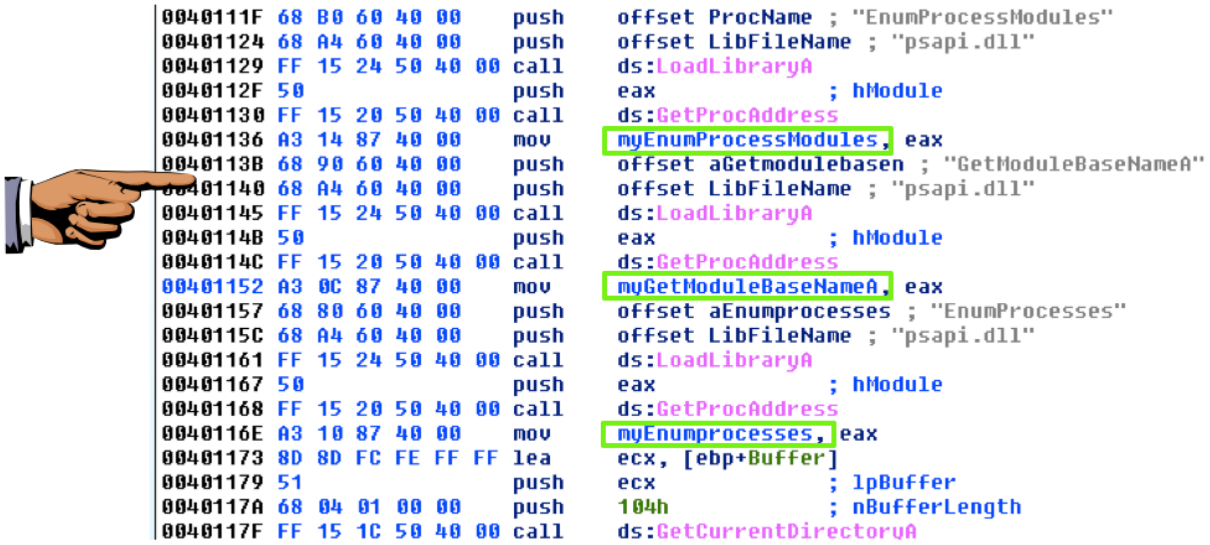
Find the code shown below, near the start of main():

```
0040111F 68 B0 60 40 00    push    offset ProcName ; "EnumProcessModules"
00401124 68 A4 60 40 00    push    offset LibFileName ; "psapi.dll"
00401129 FF 15 24 50 40 00 call    ds:LoadLibraryA
0040112F 50                push    eax             ; hModule
00401130 FF 15 20 50 40 00 call    ds:GetProcAddress
00401136 A3 14 87 40 00    mov     dword_408714, eax
0040113B 68 90 60 40 00    push    offset aGetmodulebasen ; "GetModuleBaseNameA"
00401140 68 A4 60 40 00    push    offset LibFileName ; "psapi.dll"
00401145 FF 15 24 50 40 00 call    ds:LoadLibraryA
0040114B 50                push    eax             ; hModule
0040114C FF 15 20 50 40 00 call    ds:GetProcAddress
00401152 A3 0C 87 40 00    mov     dword_40870C, eax
00401157 68 80 60 40 00    push    offset aEnumprocesses ; "EnumProcesses"
0040115C 68 A4 60 40 00    push    offset LibFileName ; "psapi.dll"
00401161 FF 15 24 50 40 00 call    ds:LoadLibraryA
00401167 50                push    eax             ; hModule
00401168 FF 15 20 50 40 00 call    ds:GetProcAddress
0040116E A3 10 87 40 00    mov     dword_408710, eax
```

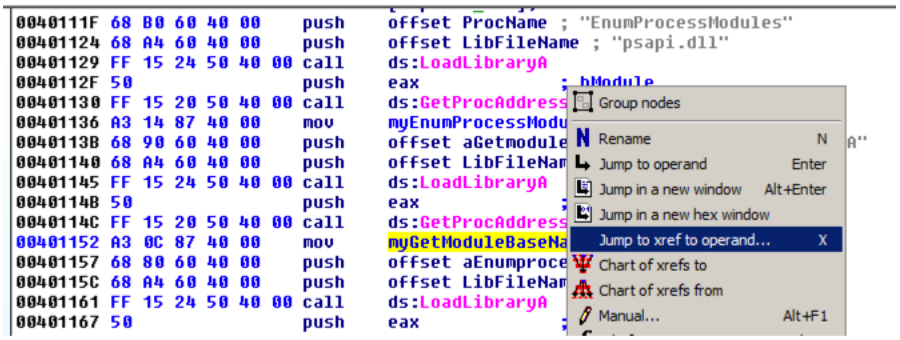
This code uses *psapi* three times to locate a Windows API function and store its address in a numerical address. This obfuscates the code, so later calls to
these functions will be difficult to recognize.
We'll assign labels to these memory addresses in IDA Pro to make later analysis easier.
The first section of code assigns a pointer to the function EnumProcessModules.
In the line starting with address 00401136, right-click **dword_408714** and click **Rename**.
Enter a new Name of **myEnumProcessModules** in the box, as shown below. Click **OK**.
Increase the length limit when you are prompted to.



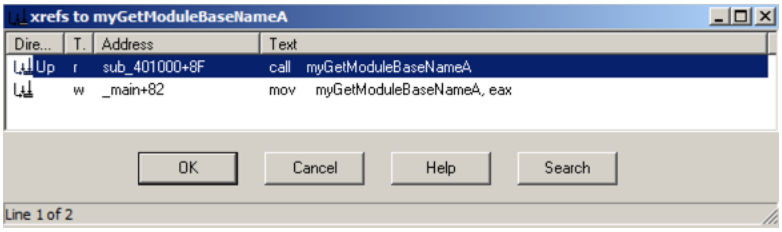
Repeat the process to rename **dword_40870C** to **myGetModuleBaseNameA**
Repeat the process to rename **dword_408710** to **myEnumProcesses**



Right-click **myGetModuleBaseNameA** and click "**Jump tp xrefs of operand**", as shown below:

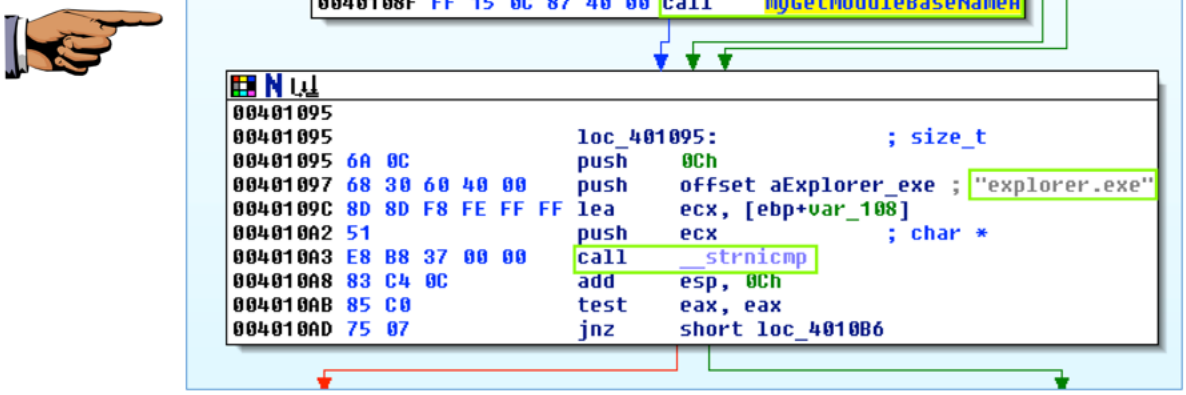


An xrefs box pops up, as shown below, showing that this address is only used once, in sub_401000.

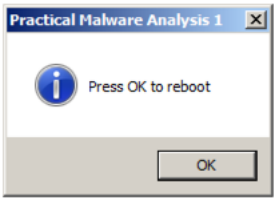


In the xrefs box, click **OK**.
This routine enumerates the modules and compares each module name to "explorer.exe", to find the module into which to inject code.
Make sure you can see these three items on your screen, as shown below:

- **call myGetModuleBaseNameA**
- **"explorer.exe"**
- **call __strnicmp**



Process Explorer
Close IDA Pro. Double-click **Lab12-01.exe** to run the malware.
A box pops up saying "Press OK to reboot". as shown below. Drag this box out of the way.



Open **Process Explorer**.
In the upper pane, scroll to the bottom of the list. Click **explorer.exe** to select it.
In Process Explorer, from the menu bar, click **View** and make sure "**Show Lower Pane**" is checked.
In Process Explorer, from the menu bar, click **View**, "**Lower Pane View**", **DLLs**.
In the lower pane, find the **Lab12-01.dll** that has been injected into explorer.exe, as shown below.