MalwareAnalysisReports/GCleaner/GCleaner Techincal Analysis with BinaryNinja.md at main · VenzoV/MalwareAnalysisReports

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Sample Information

Packed

SHA256
0918a0e9939f235924a5fb65284c97efff83f871bc1851c7e61b1b9800512885

Unpacked

SHA256
931309bc4cca2b42beae4a162c200bf76dc5a3dba9980f93d7959dc1001b9c

i found the sample initially on malware bazaar, and wanted to try out BinaryNinja and its API. Luckily I found this sample with simple stack strings, so I could practise the base usage of some of the API, like going through code and instructions. There is probably a better way to write some of the code, but the API is very new to me.

Stack Strings With Binary Ninja API

Most of the stack strings are fetched from a single initial function. Hex values are pushed into memory locations. Two functions are called which cancel each other out. They simply +5 and xor by 0x13 and the other does the inverse. In the end, the hex values are the characters that will be concatenated to form a string. Let's call them:

- mw_xor_b
- mw_xor_string

mw_xor_b is called on each single hex byte,and saved to sequential memory block. mw_xor_string is finally called on the pointer to the start of the memory block.

The two functions help build out a pattern which looks something like this:

mw_xor_b(location) mw_xor_b(location+1) mw_xor_b(location+2) mw_xor_string(&location)

```
00427021    ecx_6 = 0x62;
00427023    str_LoadLibraryA[5][0] = eax_5;
00427028    char eax_6;
00427028    int32_t ecx_7;
00427028    eax_6 = mw_xor_b(ecx_6);
0042702d    ecx_7 = 0x72;
0042702f    str_LoadLibraryA[6][0] = eax_6;
00427034    char eax_7;
00427034    int32_t ecx_8;
00427034    eax_7 = mw_xor_b(ecx_7);
00427039    ecx_8 = 0x61;
0042703b    str_LoadLibraryA[7][0] = eax_7;
00427040    char eax_8;
00427040    int32_t ecx_9;
00427040    eax_8 = mw_xor_b(ecx_8);
00427045    ecx_9 = 0x72;
00427047    str_LoadLibraryA[8][0] = eax_8;
0042704c    char eax_9;
0042704c    int32_t ecx_10;
0042704c    eax_9 = mw_xor_b(ecx_9);
00427051    ecx_10 = 0x79;
00427053    str_LoadLibraryA[9][0] = eax_9;
00427058    char eax_10;
00427058    int32_t ecx_11;
00427058    eax_10 = mw_xor_b(ecx_10);
0042705d    ecx_11 = 0x41;
0042705f    str_LoadLibraryA[0xa][0] = eax_10;
0042706e    str_LoadLibraryA[0xb][0] = mw_xor_b(ecx_11);
00427077    str_LoadLibraryA[0xc][0] = 0;
0042707d    mw_xor_string(&str_LoadLibraryA);  //  LoadLibraryA
```

Using the BinaryNinja API, the script will go through all the basic blocks of the .text section, identify all the single hex bytes that are before any call to mw_minus5xor. This is because we know once mw_minus5xor is called the string is complete in memory.

This gives us all the strings and the relevant locations in the code. From here things are as simple as just reading through the code.

The script is in the folder "Scripts".

Note: the the variables are called "decrypted" "encrypted" the string here at encrypted at all but as mentioned are just hex values. Initially I though they were and was too lazy to change the var names.

Strings:

```
 [Default] /cpa/ping.php?substr=%s&s=ab&sub=%s
[Default] 185.172.128.90
[Default] one
```

```
[Default] two
[Default] three
[Default] four
[Default] five
[Default] six
[Default] seven
[Default] eight
[Default] nine
[Default] ten
[Default] SOFTWARE\BroomCleaner
[Default] Installed
[Default] 1
[Default] 185.172.128.65
[Default] /ping.php?substr=%s
[Default] 185.172.128.65
[Default] /syncUpd.exe
[Default] 185.172.128.144
[Default] /BroomSetup.exe
[Default] HTTP/1.1 200 OK
[Default] Content-Length
[Default] Transfer-Encoding
[Default] chunked
[Default] :
[Default]
[Default] POST
[Default] GET
[Default]  HTTP/1.1
[Default] Host:
[Default] User-Agent:
[Default] Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36
[Default] (KHTML, like Gecko) Chrome/122.0.6261.129 Safari/537.36
[Default] Content-Length:
[Default] LoadLibraryA
[Default] Kernel32.dll
[Default] GetProcAddress
[Default] ExitProcess
[Default] GetLastError
[Default] CreateFileA
[Default] WriteFile
[Default] User32.dll
[Default] GetModuleFileName
[Default] MoveFileA
[Default] Sleep
[Default] CloseHandle
[Default] CreateDirectoryA
[Default] WaitForSingleObject
[Default] msvcrt.dll
[Default] memcpy
```

```
[Default] Shell32.dll
[Default] ShellExecuteEx
[Default] SHGetFolderPathA
[Default] ws2_32.dll
[Default] WSAStartup
[Default] socket
[Default] gethostbyname
[Default] htons
[Default] connect
[Default] send
[Default] recv
[Default] closesocket
[Default] WSACleanup
```

C2 communication

There is one specific function which deals with interaction with the C2 server. The function is called 4 times. Each time, before the call some memory allocations take place for the parameters that need to be sent to the C2. The code makes use of the API seen in the strings from the dll ws2_32.dll:

- WSAStartup
- socket
- gethostbyname
- htons
- connect
- send
- recv
- closesocket
- WSACleanup

The first time the malware proceeds to reach out to C2 (185.172.128.90) with URI:

- /cpa/ping.php?substr=%s&s=ab&sub=%s

The second time it reaches to the C2 (185.172.128.65) with URI:

- ping.php?substr=%s

And also sending out the following information:

- "SOFTWARE\BroomCleaner Installed 1"

The third time it calls the C2 (185.172.128.65) for a binary:

- syncUpd.exe

Last time it calls for the C2 (185.172.128.144) for another binary:

- BroomSetup.exe

File execution

The files will be executed with ShellExecuteEx after some initial setups of structures necessary to sue the API call. File is written to the temp folder with a temporary name, this is achieved with the inbuilt function _tmpnam_s.

```
00425e3c  int32_t __fastcall mw_CreateFileA(char* arg1, void* arg2)

00425e3c  {
00425e3f      char* var_8 = arg1;
00425e45      int32_t esi = 0;
00425e47      char* ebx = arg1;
00425e50      int32_t eax;
00425e50      if (*(uint32_t*)((char*)arg2 + 0x44) <= 0x400)
00425e50      {
00425e5c          eax = 0;
00425e50      }
00425e50      else
00425e50      {
00425e52          arg1 = *(uint32_t*)((char*)arg2 + 0x40);
00425e55          eax = mw_CheckPE_Magic(arg1);
00425e50      }
00425e60      if (eax != 0)
00425e60      {
00425e68          // generates a temporary filename in system temp
00425e68          _tmpnam_s(eax, arg2, arg1, ebx, 0x104);
00425e71          sub_425cfa(ebx);
00425e86          int32_t eax_1 = ptr_API_CreateFileA(ebx, 0x40000000, 0, 0, 4, 0x80, 0);
00425e90          if (eax_1 != 0)
00425e90          {
00425ea5              esi = ptr_API_WriteFile(eax_1, *(uint32_t*)((char*)arg2 + 0x40), *(uint32_t*)((char*)arg2 + 0x44), &var_8, 0);
00425ea7              ptr_API_CloseHandle(eax_1);
00425e90          }
00425e60      }
00425eb3      return esi;
00425e3c  }
```

```
00425ed5      do
00425ed5      {
00425ecf          *(uint8_t*)eax = 0;
00425ed1          eax = ((char*)eax + 1);
00425ed2          i = i_1;
00425ed2          i_1 = (i_1 - 1);
00425ed5      } while (i != 1);
00425edb      int32_t* eax_1 = &arg_4;
00425ede      int128_t xmm0 = data_436db0;
00425ee5      if (arg1 >= 0x10)
00425ee5      {
00425ee5          eax_1 = arg_4;
00425ee5      }
00425ee9      int32_t* var_3c = eax_1;
00425ef0      var_4c = 0x3c;
00425ef3      int32_t var_48 = 0;
00425ef6      int32_t var_44 = 0;
00425ef9      int32_t var_40 = 0;
00425efc      int128_t var_38 = xmm0;
00425f00      int32_t eax_2 = ptr_API_str_ShellExecuteEx(&var_4c);
00425f0a      if (eax_2 != 0)
00425f0a      {
00425f0c          int32_t var_c = 0x8000;
00425f11          var_10 = var_14;
00425f14          ptr_API_WaitForSingleObject(var_10, var_c);
00425f1d          ptr_API_CloseHandle(var_14);
00425f0a      }
00425f26      std::basic_string<char,s...::allocator<char> >::_Tidy_deallocate(&arg_4);
00425f31      *(uint32_t*)fsbase = var_10;
00425f39      return eax_2;
00425eb4  }
```

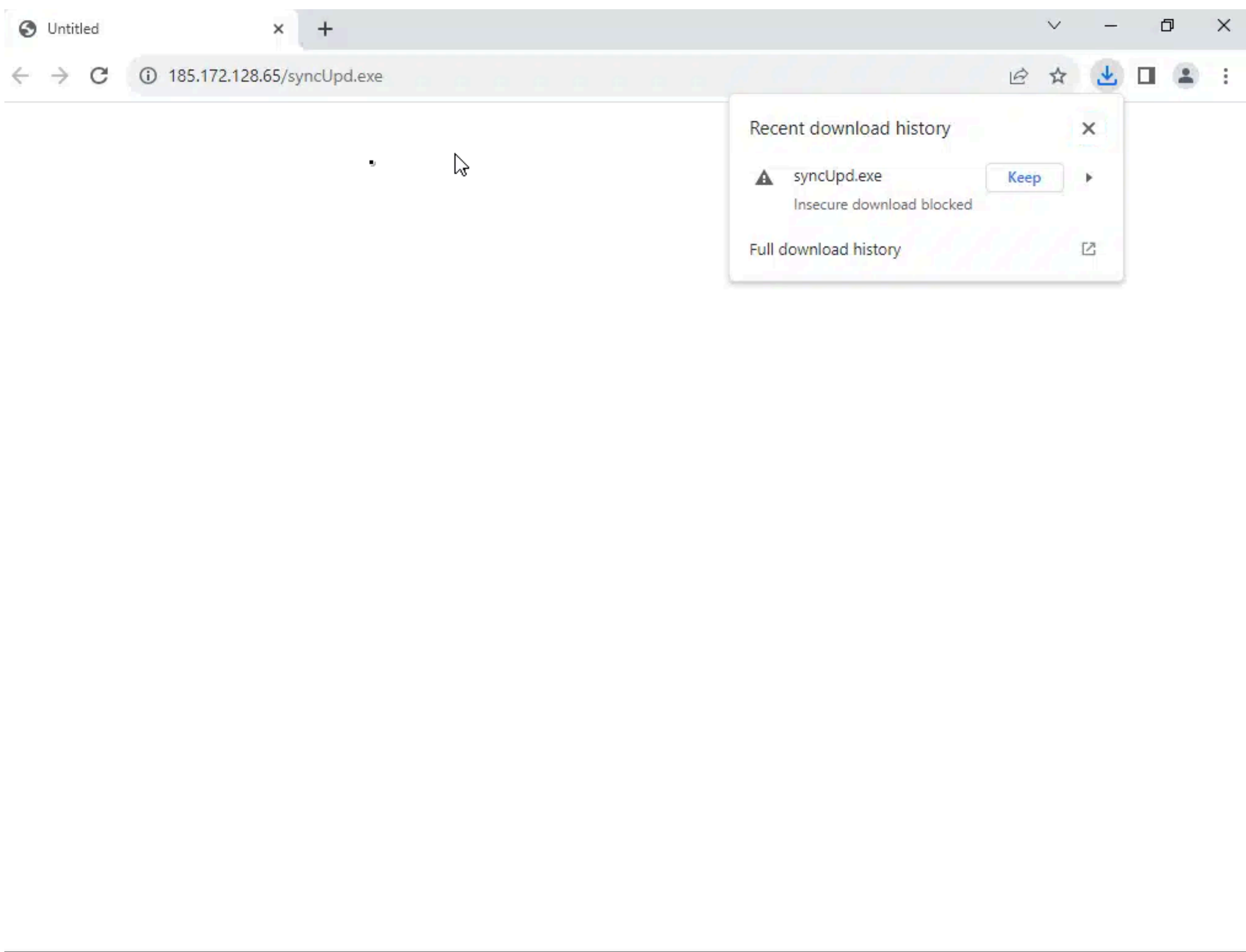
Downloaded Binaries

At time of analysis binaries were still up. According to unpac.me category, these seem to be StealC binaries. Below the links for both VT and unpac.me.

synUpd.exe

SHA256
4ddb70f6593a3b8989c814b1cf9bc6607ee72c316685f904bf1e7014f87e85a2

- https://www.virustotal.com/gui/file/4ddb70f6593a3b8989c814b1cf9bc6607ee72c316685f904bf1e7014f87e85a2
- https://www.unpac.me/results/a5fcd9fc-dd3e-48e1-af52-79e836e2320d



BroomSetup.exe

SHA256
4f07e1095cc915b2d46eb149d1c3be14f3f4b4bd2742517265947fd23bdca5a7

- https://www.virustotal.com/gui/file/4f07e1095cc915b2d46eb149d1c3be14f3f4b4bd2742517265947fd23bdca5a7
- https://www.unpac.me/results/6300fa43-b28f-4b89-adb8-dedb6d52c4f0

References

- https://www.unpac.me/results/077f0c59-26e8-4bff-8032-a7a9db10bb81?hash=0918a0e9939f235924a5fb65284c97efff83f871bc1851c7e61b1b9800512885#/
- https://www.virustotal.com/gui/file/4f07e1095cc915b2d46eb149d1c3be14f3f4b4bd2742517265947fd23bdca5a7
- https://www.virustotal.com/gui/file/4ddb70f6593a3b8989c814b1cf9bc6607ee72c316685f904bf1e7014f87e85a2
- https://research.openanalysis.net/gcleaner/loader/debugging/encryption/opendir/2024/03/17/new-gcleaner.html
- https://www.unpac.me/results/a5fcd9fc-dd3e-48e1-af52-79e836e2320d
- https://www.unpac.me/results/6300fa43-b28f-4b89-adb8-dedb6d52c4f0

Source: https://github.com/VenzoV/MalwareAnalysisReports/blob/main/GCleaner/GCleaner%20Techincal%20Analysis%20with%20BinaryNinja.md