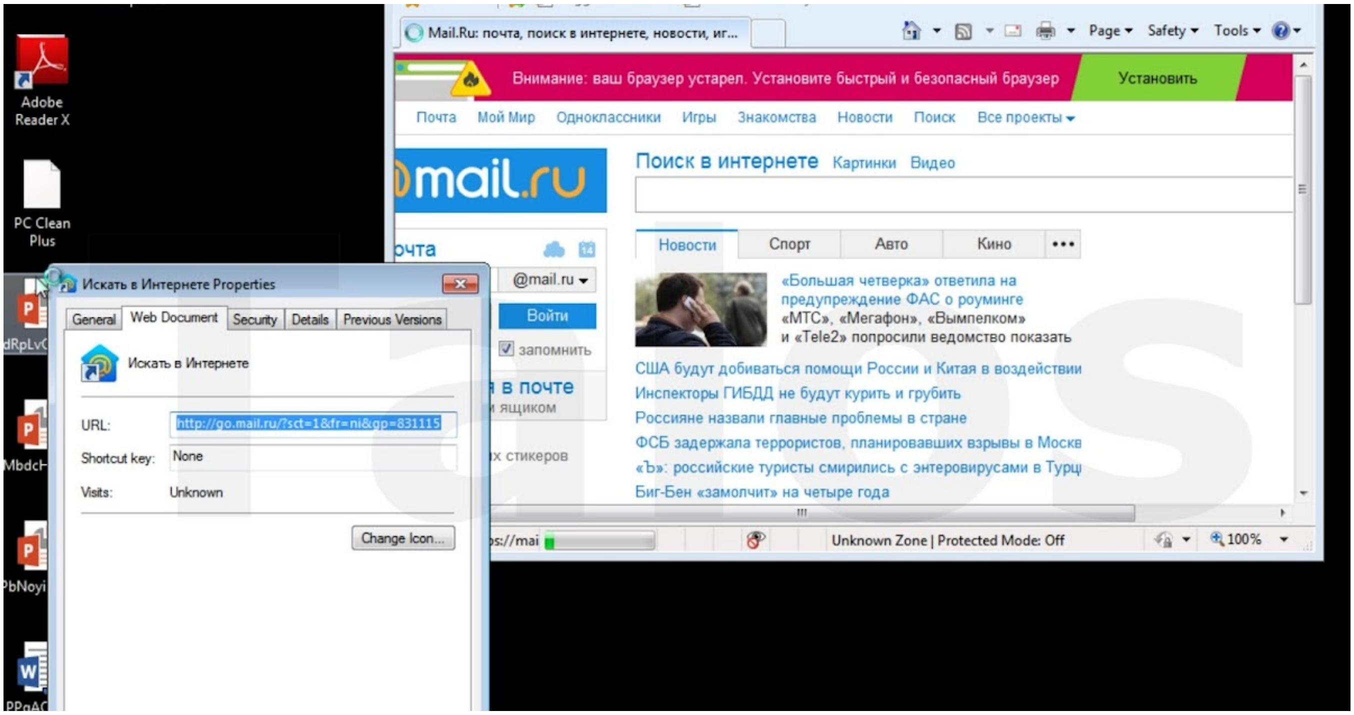
Graftor - But I Never Asked for This…



This post is authored by Holger Unterbrink and Matthew Molyett

Overview

Free software often downloaded from large freeware distribution sites is a boon for the internet, providing users with functionality that otherwise they would not be able to use. Often users, happy that they are getting something free, fail to pay attention to the hints in the licence agreement that they are receiving additional software services bundled with the freeware they desire.

Graftor aka LoadMoney adware dropper is a potentially unwanted program often installed as part of freeware software installers. We wanted to investigate the effects this software has on a user's system. According to the analysis performed in our sandbox, Graftor and the associated affiliate files it downloads perform the following functions:

- Hijacks the user's browser and injects advertising banners
- Installs other potentially unwanted applications from partners like mail.ru
- It does not ask the user, it just silently installs these programs
- Random web page text is turned into links
- Adds Desktop and Browser Quick Launch links
- User's homepage is changed
- User's search provider is changed
- Partner adware is executed and it social engineers the user to install further software
- Checks for installed AV software
- Checks for sandbox environments
- Anti-Analysis protection
- Unnecessary API calls to overflow sandbox environments
- Creates/Modifies system certificates

Functionality

One of the first actions of the software is to install additional software on the user's desktop, and change browser settings to point to third party websites (Fig.1):

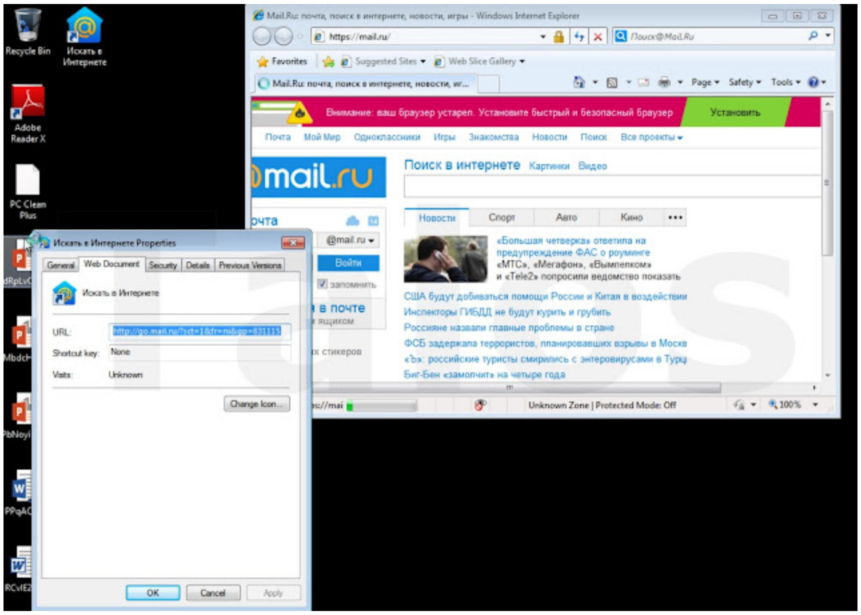


Fig. 1

Looking at the Cisco Umbrella DNS data for the CnC domain used in this campaign, we can see that the campaign only lasted for a couple of days (Fig. 2a), but affected a significant number of people. Fig. 2b and 2c show domains of two of the affiliate applications which Graftor installed during our sandbox run. It is very likely that this includes users who didn’t intend to install these additional applications.

Regularfood[.]gdn (Command and Control Server Domain)

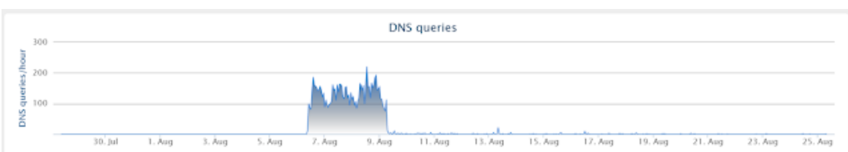


Fig. 2a

Affiliates (programs installed by Graftor):

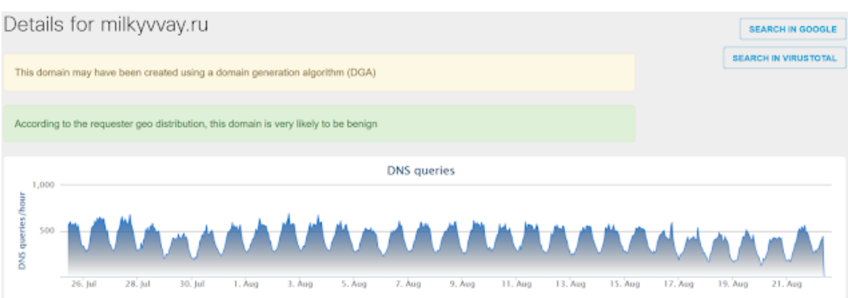


Fig. 2b

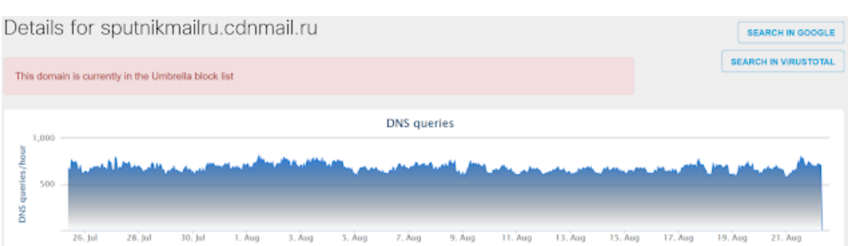


Fig. 3b

Technical Details

A few minutes after executing the original Graftor dropper (*2263387661.exe*), the software downloaded and installed a series of additional executables. This results in the process tree looking like this (Fig.3):

Fig. 3

We analysed the Graftor dropper/downloader (*2263387661.exe*). It comes with multiple stages of obfuscation. The first unpacking stage of the executable uses a heavily obfuscated but fairly simple unpacking algorithm which we will describe in the following section. This algorithm is obfuscated in the *WinMain* function distributed over several sub functions. Fig.4 shows you the complexity of the *WinMain* function in IDA, many of these building blocks are combined with further sub functions, jumping back and forth, which makes analysis particularly challenging.

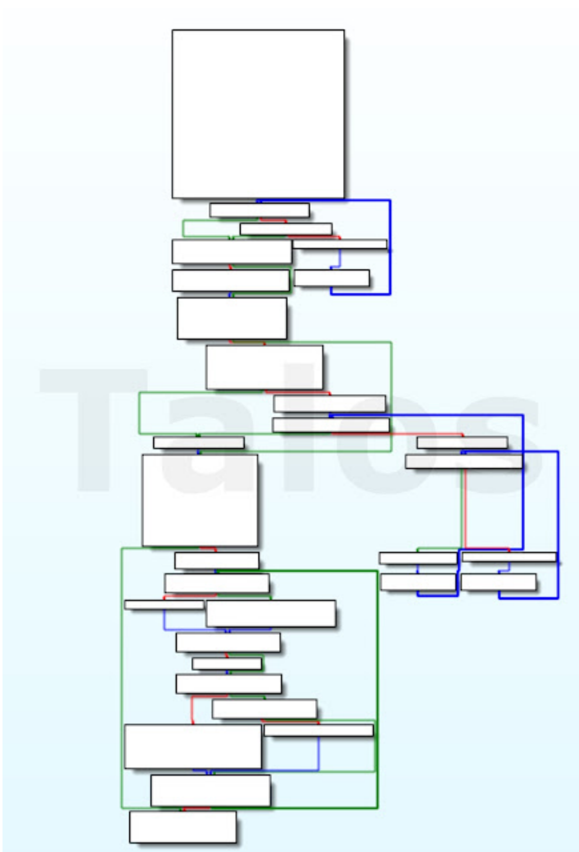


Fig. 4

First, a new buffer is allocated (see Fig.5 at 00401395) :

```
00401358 FF 15 34 20 40 00 call    ds:ReleaseSemaphore ; Indirect Call Near Procedure
0040135E E8 9D FD FF FF    call    sub_401100      ; Call Procedure
00401363 E8 3B FD FF FF    call    DoNonsenseClearEAX ; Call Procedure
00401368 68 18 E6 41 00    push    offset ProcName ; "VirtualAllocEx"
0040136D 68 28 E6 41 00    push    offset LibFileName ; "kernel32.dll"
00401372 FF 15 30 20 40 00 call    ds:LoadLibraryW ; Indirect Call Near Procedure
00401378 50                push    eax             ; hModule
00401379 FF 15 2C 20 40 00 call    ds:GetProcAddress ; Indirect Call Near Procedure
0040137F 8B 5D CC          mov     ebx, [ebp+var_34]
00401382 6A 40             push    40h
00401384 8B 45 E4          mov     eax, [ebp+var_1C]
00401387 50                push    eax
00401388 FF 75 C0          push    [ebp+var_40]
0040138B 33 C0             xor     eax, eax        ; Logical Exclusive OR
0040138D 50                push    eax
0040138E B8 FF FF FF FF    mov     eax, 0FFFFFFFFh
00401393 50                push    eax
00401394 58                pop     eax
00401395 FF D3             call    ebx             ; VirtualAlloc
00401397 A3 70 E6 41 00    mov     AllocBuffer, eax
```

Fig. 5

Then the bytes from 00416B6A (see Fig. 9 below) are decoded by different sub functions within the *WinMain* function. For example see *loc_4013EC* in Fig.6.

The code avoids calling functions by address values, but instead calls them via the values stored in registers or variables. For example the *call ebx* instruction in Fig. 5 at 00401395 results in a *VirtualAlloc* call. This makes the static analysis of the code harder. E.g without deeper analysis it is difficult to identify the destination of the *call* at 00401395 shown in Fig. 5.

```
004013EC
004013EC                     loc_4013EC:
004013EC C7 45 AC 00 00 00+mov     [ebp+var_54], 0
004013F3 8B 5D F8          mov     ebx, [ebp+encoded_byte2]
004013F6 8B 1D 70 E6 41 00 mov     ebx, AllocBuffer
004013FC 8B 55 F8          mov     edx, [ebp+encoded_byte2]
004013FF 03 55 E8          add     edx, [ebp+Target] ; Target=Target+1 (per round) 0,1,2,3,4,...
00401402 8A 02             mov     al, [edx]
00401404 88 45 DC          mov     [ebp+encoded_byte], al
```

Fig. 6

Finally the decoded bytes are handed over to a function (Fig. 7 *write_unpkd_bytes2buf*), which writes these bytes into a buffer. This is the buffer which was allocated in Fig.5 at 00401395. The decoding loop starts again until all bytes are decoded:

```
0040144E 68 68 E6 41 00    push    offset AllocBuffer2
00401453 6A 00             push    0
00401455 6A 03             push    3
00401457 E8 A4 FB FF FF    call    write_unpkd_bytes2buf ; decode byte (add 0x4e) and write to buffer
0040145C 83 C4 18          add     esp, 18h        ; Add
```

Fig. 7

Fig. 8 shows the *write_unpkd_bytes2buf* function itself:

```
00401000 55                push    ebp
00401001 8B EC             mov     ebp, esp
00401003 83 EC 0C          sub     esp, 0Ch        ; Integer Subtraction
00401006 C7 45 F4 00 00 00+mov     [ebp+var_C], 0
0040100D C6 45 F8 00       mov     [ebp+var_8], 0
00401011 8B 45 18          mov     eax, [ebp+arg_encoded_byte] ; 42
00401014 8A 08             mov     cl, [eax]
00401016 88 4D FC          mov     byte ptr [ebp+var_4], cl
00401019 8B 55 FC          mov     edx, [ebp+var_4]
0040101C 81 E2 FF 00 00 00 and     edx, 0FFh       ; Logical AND
00401022 8B 45 1C          mov     eax, [ebp+arg_14]
00401025 8D 4C 02 4E       lea     ecx, [edx+eax+4Eh] ; (edx = encoded_byte = 42) + (arg14 = 0) + 4E = 0x90 = decoded byte
00401029 8B 55 10          mov     edx, [ebp+arg_AllocBuffer]
0040102C 8B 02             mov     eax, [edx]      ; AllocBuffer Addr
0040102E 8B 55 14          mov     edx, [ebp+arg_C] ; = 0
00401031 88 0C 10          mov     [eax+edx], cl   ; write unpacked code byte
00401034 68 10 E6 41 00    push    offset FileName ; "he*"
00401039 FF 15 50 20 40 00 call    ds:DeleteFileW  ; Indirect Call Near Procedure
0040103F 32 C0             xor     al, al          ; Logical Exclusive OR
00401041 8B E5             mov     esp, ebp
00401043 5D                pop     ebp
00401044 C3                retn                    ; Return Near from Procedure
00401044                   write_unpkd_bytes2buf endp
```

Fig. 8

The end result is that despite all of the complexity and obfuscation, the unpacking algorithm is remarkably simple and translates to the following pseudo-code (see Fig. 9 comments):

Fig. 9

This **first stage** of unpacking extracts the code into memory. After successfully unpacking this code it is executed via *call ecx* (see Fig. 10) - the **second stage** of the unpacker:

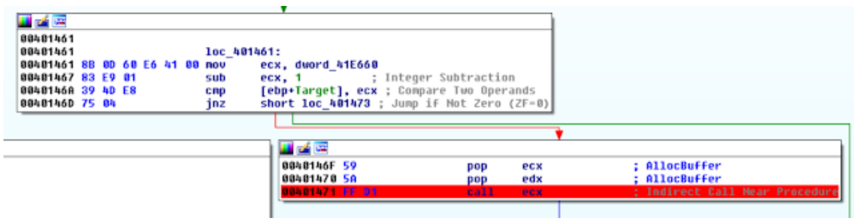


Fig. 10

This second stage code is position independent. It is loaded into a random address space picked by the operating system. The *VirtualAlloc* function in Fig.5 which we have mentioned above, is called with *LPVOID lpAddress* set to *NULL*, which means that the system determines where to allocate the memory region. This second stage is even more obfuscated by spaghetti code than the first stage. It's main task is to rebuild the *Import Address Table (IAT)* and resolve the addresses of certain library functions (Fig. 11), plus modify the original PE file.

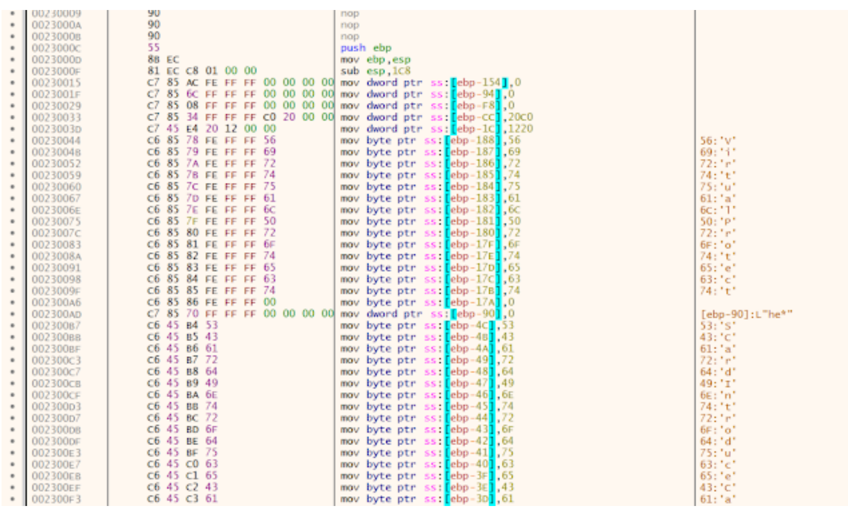


Fig. 11

It stores the function addresses in different local variables. These are passed as arguments to several setup functions, for example: change memory region 0x400000 - 0x59C000 to read/write/execute (see Fig. 12). In other words, change the whole .text, .rdata, .data, and .rsrc section of the original PE file to read/write/execute. This enables the dropper to modify and execute the code stored in these regions. As we have already seen, in order to frustrate static analysis, most calls are obfuscated by either calling registers or variables (Fig.12).

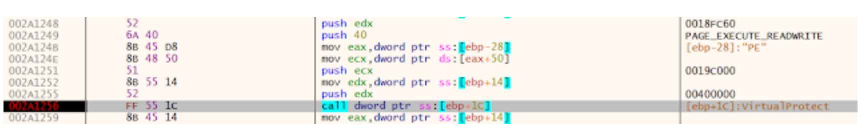


Fig. 12

Next step at 002A14F6 is to allocate a buffer located at 01DC0000:

Fig. 13

This buffer is filled with the bytes copied from 0042d049 from the original packed PE file:

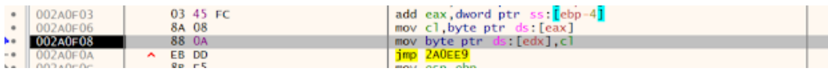


Fig. 14

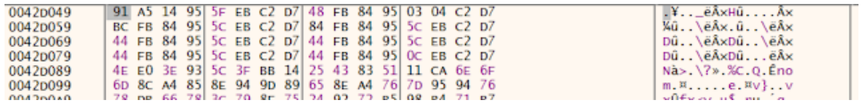


Fig. 15

This data is an encoded PE file. After copying the bytes to memory, it decodes them and writes them back to the buffer (Fig. 16a) at 01DC0000 (Fig. 16b)

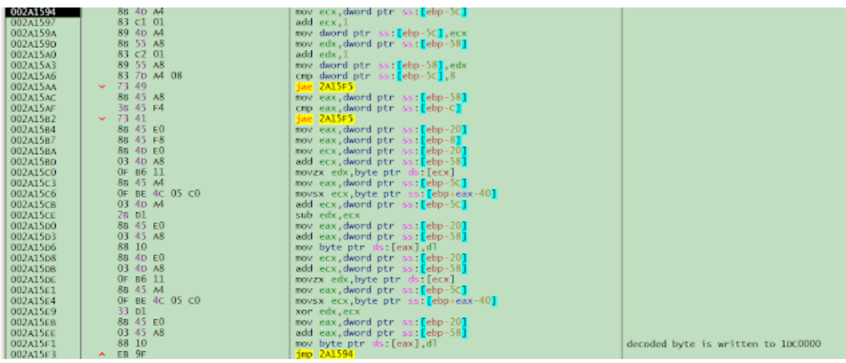


Fig. 16a

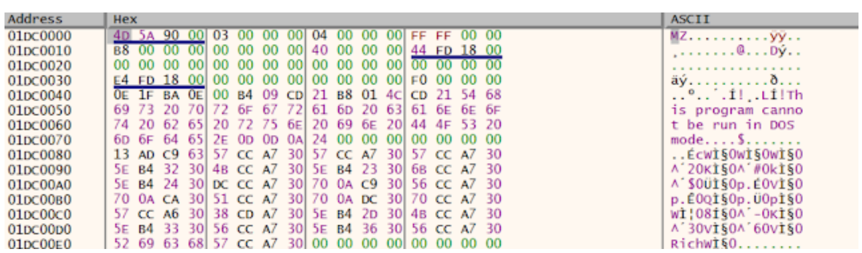


Fig. 16b

This stage is protected with an Anti-Debugging technique. The executable uses the following two GetTickCount calls to measure the time between the two calls (Fig. 17a and 17b). If it takes too long the executable will crash.

Fig. 17a

Fig. 17b

After resolving more library function addresses and fixing the IAT of the PE file in memory, it sleeps for 258 milliseconds and jumps back to 004897D3, which we will call the **third stage** from now on.

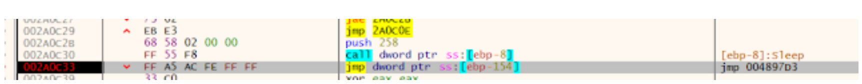


Fig. 18

The 2nd unpacking stage, the one we have just discussed, also decodes the URL which is later used to contact the command and control server. First it allocates a buffer e.g. at 002B0000 (Fig. 19a) and reads the encrypted URL from the original sample at 004020c0, decodes it and stores it in the allocated buffer i.e. 002B0000 again (Fig. 19b).

```
002A0927  FF 95 70 FE FF FF   call dword ptr ss:[ebp-190]     [ebp-190]:VirtualAlloc
```

Fig.19a

```
002A093F    8B 85 40 FE FF FF   mov eax,dword ptr ss:[ebp-1C0]
002A0945    83 C0 01            add eax,1
002A0948    89 85 40 FE FF FF   mov dword ptr ss:[ebp-1C0],eax
002A094E    8B 8D 50 FE FF FF   mov ecx,dword ptr ss:[ebp-1B0]
002A0954    0F B7 51 02         movzx edx,word ptr ds:[ecx+2]
002A0958    39 95 40 FE FF FF   cmp dword ptr ss:[ebp-1C0],edx
002A095E    7D 3D               jge 2A099D
002A0960    8B 85 48 FE FF FF   mov eax,dword ptr ss:[ebp-1B8]
002A0966    03 85 40 FE FF FF   add eax,dword ptr ss:[ebp-1C0]
002A096C    0F B6 08            movzx ecx,byte ptr ds:[eax]      get encrypted byte from 4020c0+n
002A096F    8B 95 40 FE FF FF   mov edx,dword ptr ss:[ebp-1C0]
002A0975    83 F2 02            xor edx,2
002A0978    83 C2 1F            add edx,1F
002A097B    2B CA               sub ecx,edx                      decode it
002A097D    8B 85 44 FE FF FF   mov eax,dword ptr ss:[ebp-1BC]   [ebp-1BC]:"http://kskmasdqsjuzom.regula
002A0983    03 85 40 FE FF FF   add eax,dword ptr ss:[ebp-1C0]
002A0989    88 08               mov byte ptr ds:[eax],cl
002A098B    8B 8D 44 FE FF FF   mov ecx,dword ptr ss:[ebp-1BC]   [ebp-1BC]:"http://kskmasdqsjuzom.regula
002A0991    03 8D 40 FE FF FF   add ecx,dword ptr ss:[ebp-1C0]
002A0997    C6 41 01 00         mov byte ptr ds:[ecx+1],0
002A099B    EB A2               jmp 2A093F
002A099D    8B 95 44 FE FF FF   mov edx,dword ptr ss:[ebp-1BC]   [ebp-1BC]:"http://kskmasdqsjuzom.regula
```

Fig. 19b

The third stage (see above) is a C++ executable compiled with Visual Studio. Global object initializers allow custom classes to run during the C runtime initialization, before the apparent *WinMain* entry point. Organizing code in this way allows the malware to prepare the system survey in a way that is hidden from analysts who commence their analysis from *WinMain*. Later, when the associated code is used, the execution is masked by memory redirection and virtual function calls.

Below you can see the callback function addresses stored in the *.rdata* segment of the PE file (Fig.20) and its initialization function *InitCallbacks* (Fig.21 and Fig. 23).

```
_rdata          segment para public 'DATA' use32
                assume cs:_rdata
                ;org 4CB5ACh
CinitFunctions  dd 0                    ; DATA XREF: __cinit+4B↑o
                dd offset sub_4CAA5D
                dd offset sub_4CAA73
                dd offset sub_4CAA89
                dd offset sub_4CAA51
                dd offset Callbacks_crt_init
                dd offset sub_4CA724
                dd offset sub_4CA73A
                dd offset sub_4CA750
                dd offset sub_4CA766
                dd offset sub_4CA77C
```

Fig. 20

```
004CA70C
004CA70C
004CA70C
004CA70C                         Callbacks_crt_init proc near
004CA70C 000 E8 3D 7E FF FF      call    CreateCallbacks
004CA711 000 8B C8               mov     ecx, eax
004CA713 000 E8 7D 75 F3 FF      call    InitCallbacks
004CA718 000 68 95 AA 4C 00      push    offset CallbacksDestroy ; void (__cdecl *)()
004CA71D 004 E8 98 E8 FB FF      call    _atexit
004CA722 004 59                  pop     ecx
004CA723 000 C3                  retn
004CA723                         Callbacks_crt_init endp
004CA723
```

Fig. 21

From the pre-*WinMain* C Run Time library (CRT) initialization, the Callback function list gets created and populated with an association of named strings (e.g. “OS”), later observed in the CnC traffic and several system information collection callback functions. For example a "systemFS" string in the CnC traffic, leads to a call to the *Graftor_CollectSystemVolumeInformation* function or "OS" triggers the call of *Graftor_CollectWindowsInformation*.

Fig. 22 shows an example of such function calls and pseudo code which would lead to a similar assembler code as discussed.

```
loc_4C25B2:
or      ebx, 0FFFFFFFFh
push    offset aSystemfs ; "systemFS"
lea     esi, [esp+60h+WideString] ; std::widestring *
mov     [esp+60h+Status], ebx
call    std__widestring__set_wstring
mov     eax, esi
push    eax             ; std::widestring *
mov     ecx, edi        ; CallbackList *
mov     [esp+60h+Status], 2
call    FindCallback    ; operator[]<std::widestring>
push    0               ; int
push    1               ; free
mov     dword ptr [eax], offset Graftor_CollectSystemVolumeInformation
mov     [esp+64h+Status], ebx
call    std__widestring__reset
push    offset aOs      ; "OS"
lea     esi, [esp+60h+WideString] ; std::widestring *
call    std__widestring__set_wstring
mov     eax, esi
push    eax             ; std::widestring *
mov     ecx, edi        ; CallbackList *
mov     [esp+60h+Status], 3
call    FindCallback    ; operator[]<std::widestring>
push    0               ; int
push    1               ; free
mov     dword ptr [eax], offset Graftor_CollectWindowsInformation
```

```
std::map <std::basic_string<wchar_t>, void*> CallbackList;
```

```
CallbackList[L"systemFS"] = &Graftor_CollectSystemVolumeInformation;
CallbackList[L"OS"] = &Graftor_CollectWindowsInformation;
```

Fig. 22

The created list is linked to a global address location, which is later linked back again to local variables.

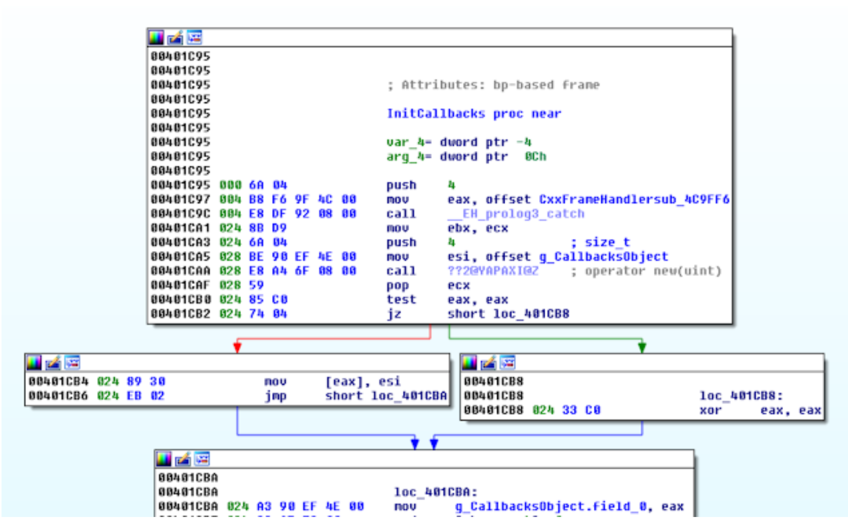


Fig. 23

Such redirection is subtle in source code, but the resulting execution means that chains of memory accesses are seen instead of just nice clean references to the object.

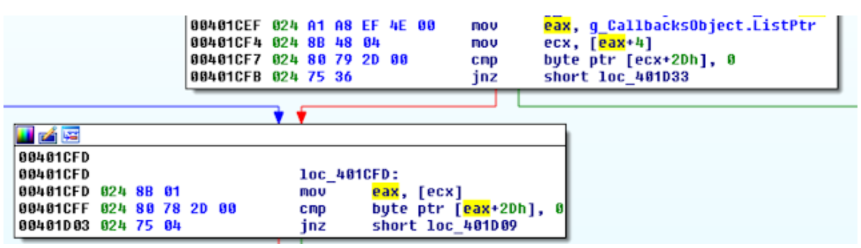


Fig. 24

Later on, a string is passed along to look up the callback and call it indirectly (Fig.25).

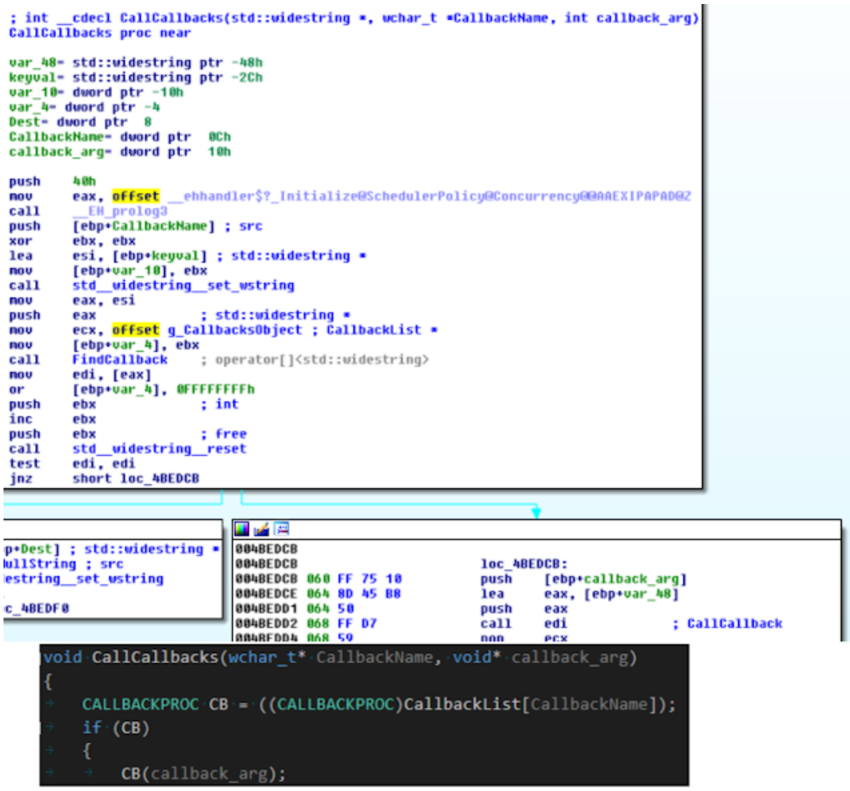


Fig. 25

By using *std::basic_string<wchar_t>* instead of just plain *wchar_t* arrays, every string interaction adds two function calls and indirection. Instead of the analyst seeing a wide string being pushed to one function, it is instead a series of three. Before significant markup is performed (or when viewed in a debugger) this is just a mess of function calls and memory manipulation. Complicating the matter is that the std library is included rather than dynamically linked, so the analyst doesn't get dll calls as hints.
Further on, this 3rd stage is protected by another anti-debugging technique: the sample registers a VectoredExceptionHandler for FirstChanceExceptions (C0000005) as you can see in Fig. 26 and 27:

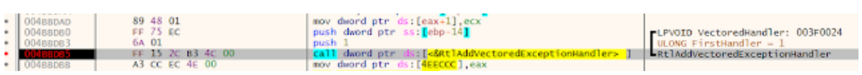


Fig. 26

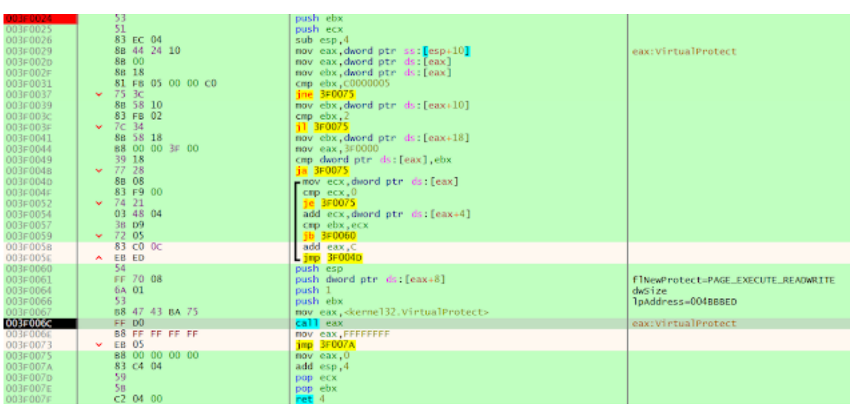


Fig. 27

Then it marks the code section as PAGE_NOACCESS.

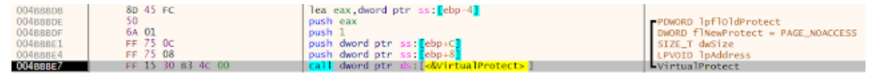


Fig. 28a

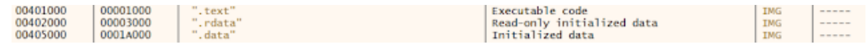


Fig. 28b

This means an exception is triggered for every single instruction in this section. The exception handler function (see Fig. 27 above) overwrites the PAGE_NOACCESS access right for the memory location which caused the exception, with a PAGE_EXECUTE_READWRITE, so it can be executed. Then the exception handler function returns to the initial instruction, it can now be executed, but the next instruction is still protected by PAGE_NOACCESS and will cause the next exception. With a debugger attached, this interrupts the debugging session for every instruction. Even if the exceptions are directly passed back to the executable, it massively slows down the execution speed.
At 004BB3FA the software starts preparing the internet request to the CnC server and encrypts the collected information to perform a GET request (Fig. 29a-c):

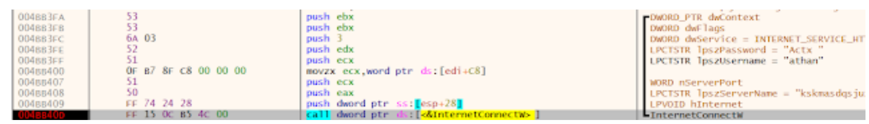


Fig. 29a

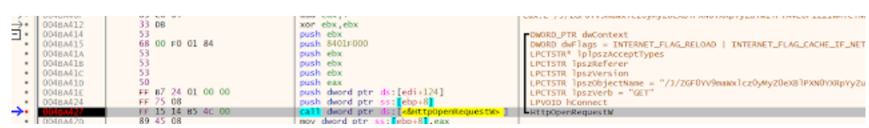


Fig. 29b

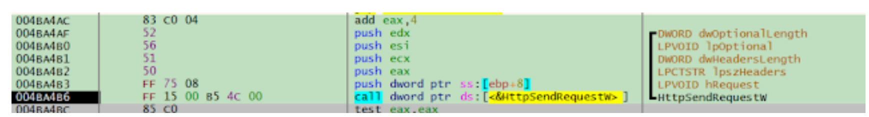


Fig. 29c

Talos has decrypted the GET request that is sent to the CnC server. The decoded content consists of a JSON file, which you can downloadhere.

The executable is capable of sending the following informations to the C2 server:

MAC, SID, HD serial number, username, GUID, hostname, HD size, HD devicename, Filesystem, OS version, browser version, DotNET version, Video Driver, Language Settings, Memory, system bios version, domainname, computername, several processor related parameters, number of processors, other installed adware and unwanted programs, running processes, keyboard settings, Antispyware, Firewall, Antivirus and more.

The server responds to this with an encrypted configuration file which is processed here:

Fig. 30

The same decryption algorithm which is used for the GET request, is also used to decrypt the CnC servers response. It generates a fairly simple stream seeded by the first byte of the packet and XORs it with the data. Underneath the encryption is a simple gzip stream.
The full decrypted file can be downloaded here. It contains the adware and other unwanted programs the Graftor downloader is supposed to install for it's partners/customers. You can see an example in Fig. 31.

Fig. 31

The first URL from the 'l' key is used to download the partner executable and install it. The 'a' key is used as its command line parameters. We have yet to identify the exact meaning of all the keys; they are passed as parameters to a quite large JSON library. This library is also statically compiled into the binary. Besides the JSON library we also found a statically compiled SQLite library, we haven't fully investigated how it is used by the executable. However at this point we have enough information to detect and stop this adware downloader.
The information presented so far clearly shows the sophistication of this piece of software. With the data presented in the two decoded files, you have a good idea of the capabilities of the software and the impact it has on infected systems.
Graftor, and the applications that it downloads also heavily check for AV products and use various techniques to detect if it is running in a sandbox environment. These are very similar to techniques commonly observed in malware.

Attempts to identify installed AV products by installation directory (6 events)	
file	C:\Program Files\avast software\avast\setup\setup.ini
file	C:\Avira
file	C:\Program Files (x86)\McAfee\Common Framework\McTray.exe
file	C:\Program Files (x86)\McAfee\MSC\McAPExe.exe
file	C:\Program Files (x86)\AVG\Framework\Common\avguix.exe
file	C:\Program Files (x86)\Avg\AV\avgui.exe
Attempts to identify installed AV products by registry key (11 events)	
registry	HKEY_LOCAL_MACHINE\SOFTWARE\AVG\AV\
registry	HKEY_CURRENT_USER\Software\Avg\AV\
registry	HKEY_LOCAL_MACHINE\SOFTWARE\AVAST Software\Avast\
registry	HKEY_CURRENT_USER\Software\AVAST Software\Avast\
registry	HKEY_LOCAL_MACHINE\SOFTWARE\ESET\ESET Security\
registry	HKEY_LOCAL_MACHINE\SOFTWARE\ESET\NOD\
registry	HKEY_CURRENT_USER\Software\G Data\AntiVirenKit\
registry	HKEY_CURRENT_USER\SOFTWARE\KasperskyLab\
registry	HKEY_LOCAL_MACHINE\SOFTWARE\McAfee\McTray\Plugins\VSEPlugin\
registry	HKEY_CURRENT_USER\Software\McAfee\DesktopProtection\
registry	HKEY_LOCAL_MACHINE\SOFTWARE\McAfee.com\
Checks the version of Bios, possibly for anti-virtualization (1 event)	
registry	HKEY_LOCAL_MACHINE\HARDWARE\DESCRIPTION\System\SystemBiosVersion

Fig. 32a

Detects VirtualBox through the presence of a device (1 event)	
file	\??\VBoxMiniRdrDN

Detects VirtualBox through the presence of a file (1 event)	
dll	VBoxHook.dll

Detects VMWare through the in instruction feature (1 event)

Time & API	Arguments
Aug. 10, 2017, 11:46 p.m. **__exception__**	stacktrace: __Get__JsonConfigImpl__Instance__-0x3d68 agloader+0xc5e8 @ 0x6fcac5e8 RunLoader+0x168 0x13cbd8a __Get__JsonConfigImpl__Instance__+0xbc97 anonymizerlauncher+0x1b597 @ 0x13cb597 __Get_ __Get__JsonConfigImpl__Instance__+0xb93d anonymizerlauncher+0x1b23d @ 0x13cb23d __Get__JsonConf VerifyConsoleIoHandle-0xb3 kernel32+0x133ca @ 0x74e833ca RtlInitializeExceptionChain+0x63 RtlAl RtlAllocateActivationContextStack-0xce ntdll+0x39ea5 @ 0x772e9ea5 exception.instruction_r: ed 81 fb 68 58 4d 56 0f 94 45 e7 5b 59 5a c7 45 exception.instruction: in eax, dx exception.exception_code: 0xc0000096 exception.symbol: __Get__JsonConfigImpl__Instance__-0x3c0b agloader+0xc745 exception.address: 0x6fcac745 registers.esp: 3601532 registers.edi: 5528040 registers.eax: 1447909480 registers.ebp: 3601588 registers.edx: 22104 registers.ebx: 0 registers.esi: 5598536 registers.ecx: 10

Fig. 32b

Checks amount of memory in system, this can be used to detect virtual machines that have a low amount of memory available (1 event)

Time & API	Arguments	Status
Aug. 10, 2017, 11:43 p.m. **GlobalMemoryStatusEx**		success

Fig. 32c

A process attempted to delay the analysis task. (2 events)	
description	2263387661.exe tried to sleep 263 seconds, actually delayed analysis time by 263 seconds
description	explorer.exe tried to sleep 240 seconds, actually delayed analysis time by 240 seconds

Fig. 32d

Executes one or more WMI queries which could be used to identify virtual machines (19 events)

Fig.32e

The software makes many excessive API calls such as the following (Fig. 33) which has the effect of polluting sandbox analysis.

Aug. 10, 2017, 11:42 p.m. **FindResourceExW**	module_handle: 0x76cd0000 type: #0 name: #14 language_identifier: 0	failed

Fig. 33

Conclusion

Graftor continues to be one of the most notorious potentially-unwanted-software downloaders we see in the wild. Users may be unaware that it is being bundled and executed as part of the freeware installation, since these installation files silently execute Graftor alongside the freeware. Once Graftor is running, it exfiltrates a huge amount of user and machine identifiable information and installs additional potentially-unwanted-applications from its partners. The downloader requests administrative rights on the local machine, with this access, it can do anything it wants to do on the user's machine.

Solutions such as AMP for endpoints and AMP on network devices give administrators visibility of when software such as Graftor, and the

further packages it downloads, are installed on devices. Similarly, network based detection can identify and block the CnC activity (Snort SID 44214). Thought should be given to blocking access to freeware websites to prevent the download of the Graftor installer. However, much freeware does not come bundled with Graftor and may be of great use to some users.
At the end of the day, keep in mind that if the software is free, you might be the product. Anyone using freeware should closely review the EULA before installing it. We know it is painful, but trying to remove this kind of software is likely more painful.

Coverage

Additional ways our customers can detect and block this threat are listed below.

PRODUCT	PROTECTION
AMP	✔
CWS	✔
Email Security	✔
Network Security	✔
Threat Grid	✔
Umbrella	✔
WSA	✔

Advanced Malware Protection (AMP) is ideally suited to prevent the execution of the malware used by these threat actors.

CWS or WSA web scanning prevents access to malicious websites and detects malware used in these attacks.

Email Security can block malicious emails sent by threat actors as part of their campaign.

The Network Security protection of IPS and NGFW have up-to-date signatures to detect malicious network activity by threat actors.

AMP Threat Grid helps identify malicious binaries and build protection into all Cisco Security products.

Umbrella, our secure internet gateway (SIG), blocks users from connecting to malicious domains, IPs, and URLs, whether users are on or off the corporate network

IOC

Alternate Data Streams(ADS):
C:\Users\dex\AppData\Local\Temp\2263387661.exe:Zone.Identifier
C:\Users\dex\AppData\Local\Temp\QBPO5ppcuhJG.exe:tmp
C:\Users\dex\AppData\Local\Temp\2263387661.exe:tmp
C:\Users\dex\AppData\Local\Temp\AyWdp7tHPIeU.exe:tmp
C:\Windows\System32\regsvr32.exe:Zone.Identifier **Hashes:**

2263387661.exe (Graftor Dropper)
9b9ce661a764d84a4636812e1dfcb03b (MD5)
Fd3ccf65eab21a77d2e440bd23c59d52e96a03a4 (SHA1)
41474cd23ff0a861625ec1304f882891826829ed26ed1662aae2e7ebbe3605f2 (SHA256)

Dumped 2nd stage:
40bde09fc059f205f67b181c34de666b (MD5)
99c7627708c4ab1fca3222738c573e7376ab4070 (SHA1)
Eefdbe891e35390b84181eabe0ace6e202f5b2a050e800fb8e82327d5e57336d (SHA256)

Dumped 3rd stage:
1e9f40e70ed3ab0ca9a52c216f807eff (MD5)
7c4cd0ff0e004a62c9ab7f8bd991094226eca842 (SHA1)
5eb2333956bebb81da365a26e56fea874797fa003107f95cda21273045d98385 (SHA256)

URLs:

Command and Control Server GET Request:
hxxp://kskmasdqsjuzom[.]regularfood[.]gdn/J/ZGF0YV9maWxlcz0yMyZ0eXBlPXN0YXRpYyZuYW1lPVRlbXAlNUMyMjYzMzg3NjYxLmV4ZSZybm

Set-Cookie: GSID=3746aecf3b94384b9de720158c4e7d88; expires=Sat, 12-Aug-2017 15

Command and Control Server POST Request
hxxp://kskmasdqsjuzom[.]regularfood[.]gdn/J/ZGF0YV9maWxlcz0yMyZ0eXBlPXN0YXRpYyZuYW1lPVRlbXAlNUMyMjYzMzg3NjYxLmV4ZSZybm

Set-Cookie: GSID=3746aecf3b94384b9de720158c4e7d88; expires=Sat, 12-Aug-2017 15

Domains from sandbox run:
arolina[.]torchpound[.]gdn
binupdate[.]mail[.]ru
crl[.]microsoft[.]com
dreple[.]com
gambling577[.]xyz
jvusdtufhlreari[.]twiceprint[.]gdn
kskmasdqsjuzom[.]regularfood[.]gdn
mentalaware[.]gdn
mrds[.]mail[.]ru
nottotrack[.]com
plugpackdownload[.]net
s2[.]symcb[.]com
sputnikmailru[.]cdnmail[.]ru
ss[.]symcd[.]com
xml[.]binupdate[.]mail[.]ru

Snort Rules:
SID 44214