Deep Dive Into TrickBot Executor Module "mexec": Reversing the Dropper Variant - SentinelLabs

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Published: 2020-05-14 · Archived: 2026-04-05 15:42:03 UTC

In a recent post [1], we disclosed details of a new Trickbot executor module “mexec” and analyzed the downloader variant of this module. In this follow up post, we provide the first analysis the dropper version of the mexec module.

See the report for the full list of IOCs and further details on the TrickBot executor module “mexec”.

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Background

TrickBot is the successor of Dyre [2,3], and at first was primarily focused on banking fraud and utilized injection systems in the same manner. Over the years, TrickBot has shifted focus to enterprise environments to incorporate everything from network profiling and mass data collection to lateral traversal exploits. This focus shift is also prevalent in their incorporation of malware and techniques in their tertiary deliveries that are targeting enterprise environments. Such behavior is similar to a company where the focus will shift depending on what generates the best revenue.

Research Insights

The dropper version of mexec is very similar to the downloader except that the payload is carried onboard, which makes the module substantially larger than its downloader counterpart. The dropper variant is also very similar to TrickBot’s loader but was written to be able to accommodate more generic deliveries.

The dropper version of mexec functionally overlaps with how TrickLoader works:

- Custom Base64 alphabet string encoding
- Usage of MiniLZO
- Function obfuscation using a table of offsets

This version of mexec could easily be misidentified as TrickLoader, but mexec is not used to deliver TrickBot and is simply setup as a dropper piece that will write and execute an onboard hidden executable. It’s also a DLL and designed to be executed in memory to perform its task or to deliver another piece of malware.

While the strings are encoded in the same manner you would expect in a Trickbot sample, there are noticeably fewer of them.

```
                db      0
a7eyx3jocpne49d db 'eyx3JoCpNE49dhTPm+Srsu0/MHKbQVgzAqBaLl2OfvI1X6wcDkiZjtFU8RY5WGn',0
                align 10h
aM2szq0nlbfz6m0 db 'M2sZQ0NLbFz6M0AL',0
aZsSas99ip6mod1 db '+Zs+Sas99ip6MoD1',0
aRzajs3ci9q8ako db 'rZAJS3ci9q8aKoc',0
                align 4
```

Decoding them is the same process as you would find in a TrickBot sample.

```
def decode_s(str):
        b64 = "7eyx3JoCpNE49dhTPm+Srsu0/MHKbQVgzAqBaLl2OfvI1X6wcDkiZjtFU8RY5WGn"
        std = "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/"
        str = str.translate(string.maketrans(b64,std))
        return base64.b64decode(str+'='*(len(str)%4))

Python>decode_s('M2sZQ0NLbFz6M0AL')
futuresx.exe
Python>decode_s('+Zs+Sas99ip6MoD1')
KERNEL32.dll
Python>decode_s('rZAJS3ci9q8aKoc')
SHELL32.dll
```

The first thing the sample does is spin up multiple threads, but the interesting one is the second one.

```
lea     eax, [ebp+ThreadId]
push    eax             ; lpThreadId
push    0               ; dwCreationFlags
push    0               ; lpParameter
push    offset StartAddress ; lpStartAddress
push    0               ; dwStackSize
push    0               ; lpThreadAttributes
call    ds:CreateThread
lea     eax, [ebp+ThreadId]
push    eax             ; lpThreadId
push    0               ; dwCreationFlags
push    offset dword_1001F00C ; lpParameter
push    offset loc_10001160 ; lpStartAddress
push    0               ; dwStackSize
push    0               ; lpThreadAttributes
call    ds:CreateThread
```

In the main thread that is spun up as the second one, it performs the normal deobfuscation routine that you find in a Trickbot loader sample. If you are unfamiliar with this process of deobfuscation, you can find more details in our report on TrickLoader Deobfuscation.

```
loc_10001160:                           ; DATA XREF: Control+5E↑o
                mov     ebp, esp
                call    loc_100011AF
; ---------------------------------------------------------------------------
                db 0BCh
                db    0
                db  3Dh ; =
                db    0
                db    0
                db 3
                db  70h ; p
                db    0
                db 0B0h
                db    0
                db 40h
                db 2
                db  50h ; P
                db    0
                db 50h
                dw 0
                dd 70005001h, 60003000h, 80004000h, 30009000h, 30005000h
                dd 70004000h, 6003C000h, 0C001D001h, 4000D001h, 70008000h
                dd 50006001h, 0F0005000h, 600030FFh
                db 3 dup(0)
; ---------------------------------------------------------------------------

loc_100011AF:                           ; CODE XREF: .text:10001162↑p
                pop     edi
                pop     eax
                pop     esi
                xor     eax, eax
                push    31Eh
                pop     ecx

loc_100011B9:                           ; CODE XREF: .text:100011BB↓j
```

The above code is the start of the process of building out the function address table; it jumps over a table of offsets to kick off the process.

```
loc_100011BA:                           ; CODE XREF: .t
                push    eax
                loop    loc_100011BA
                mov     eax, edi
                push    edi
                mov     ebp, esp
                add     eax, 1C049h
                mov     [ebp+4], eax
                mov     eax, esi
                mov     [ebp+20h], eax
                push    0FFF0h
                pop     ecx
                mov     esi, edi
                mov     edx, edi
                cld

loc_100011DA:                           ; CODE XREF: .t
                mov     eax, ecx
                lodsw
                test    eax, eax
                jz      short loc_100011FE
                cmp     eax, ecx
                jb      short loc_100011F9
                sub     eax, ecx
                push    ecx
                mov     ecx, edi
                add     ecx, 1C051h
                shl     eax, 2
                add     ecx, eax
                mov     eax, [ecx]
                pop     ecx
```

After rebuilding the address table, the function responsible for decoding functions is called.

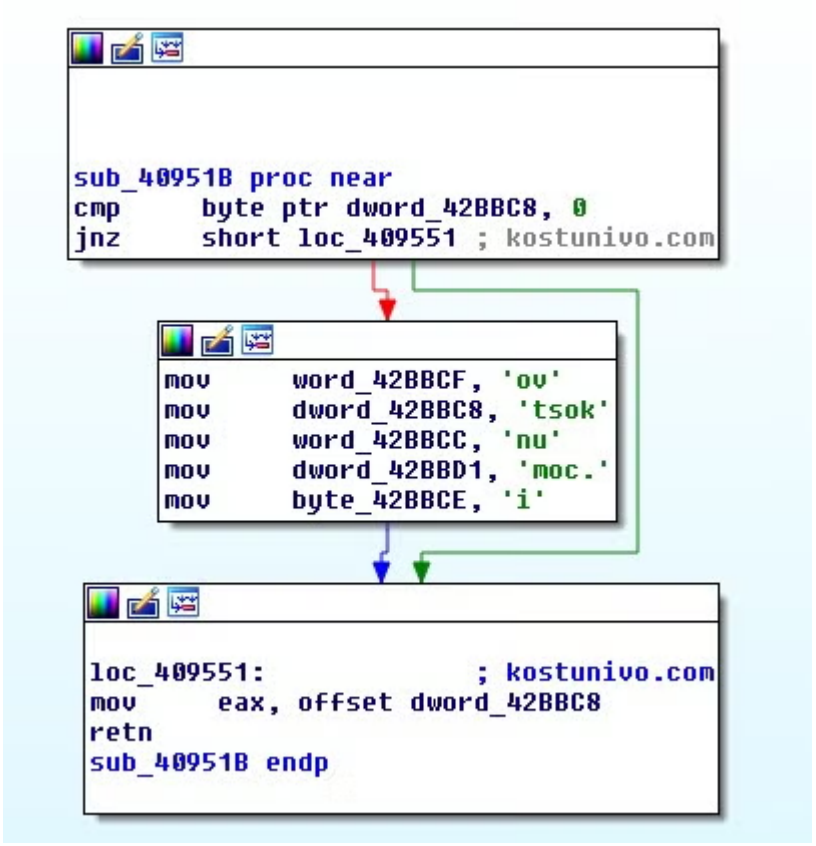
```
decode_10002AC0 proc near
                push    ebx
                push    edi
                push    esi
                push    ebp
                pop     eax
                shl     ecx, 2
                sub     eax, ecx
                push    eax
                mov     edi, [eax]
                pop     ecx
                dec     ecx
                dec     ecx
                dec     ecx
                dec     ecx
                mov     eax, [ecx]
                sub     eax, edi
                push    eax
                mov     ecx, eax
                cld
                push    edi
                mov     eax, [ebp+4]
                add     eax, 0Ch
                mov     esi, eax
                push    1Dh
                pop     ebx
                push    ebx

loc_10002AE7:
                push    ecx
                mov     eax, esi
                inc     esi
```

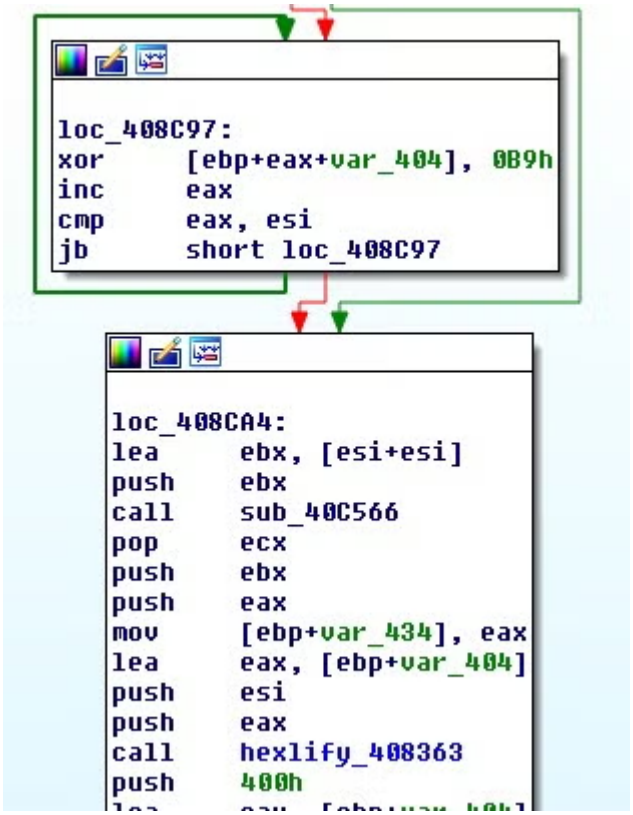
In the exact same way that we go over deobfuscating the TrickLoader binary, we can do the same with this sample. This will then leave us with all of the decoded functions.

One of the decoded addresses from the table does not appear to be a function; in fact, much like TrickLoader, this is a LZO compressed PE file.

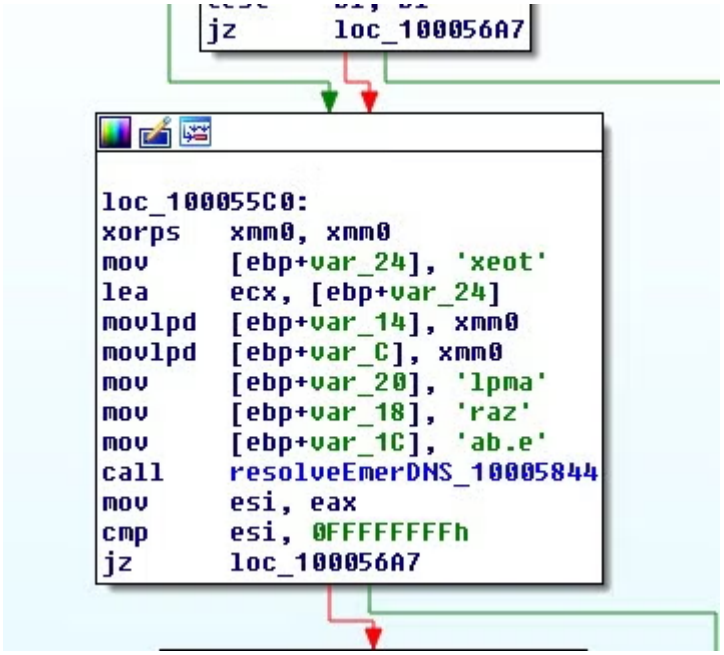
```
db 1Ah
db  4Dh ; M
db  5Ah ; Z
db 90h
db 0
db    3
db    0
db    0
db    0
db    4
db  4Eh ; N
db    0
db 0FFh
db 0FFh
```

After decompressing and analyzing the PE file, we discover this version of mexec is dropping the DNS variant of Anchor TrickBot[4].





Another variant recovered was also dropping the normal variant of Anchor TrickBot.



Pivoting on the decoding string of “futuresx.exe” from above also leads to a sandbox report[4] on an Anchor DNS sample. In VirusTotal, we can see this same hash was also delivered through the downloader variant:

Read the Full Report

See the report for the full list of IOCs and further details on the TrickBot executor module “mexec”.

[Read the Full Report]

References

1: Deep Dive Into TrickBot Executor Module “mexec”: Hidden “Anchor” Bot Nexus Operations
2: https://blog.malwarebytes.com/threat-analysis/2016/10/trick-bot-dyrezas-successor/
3: https://www.fidelissecurity.com/threatgeek/archive/trickbot-we-missed-you-dyre/
4: https://www.sentinelone.com/labs/anchor-project-the-deadly-planeswalker-how-the-trickbot-group-united-high-tech-crimeware-apt/
