XLoader's Latest Trick | New macOS Variant Disguised as Signed OfficeNote App

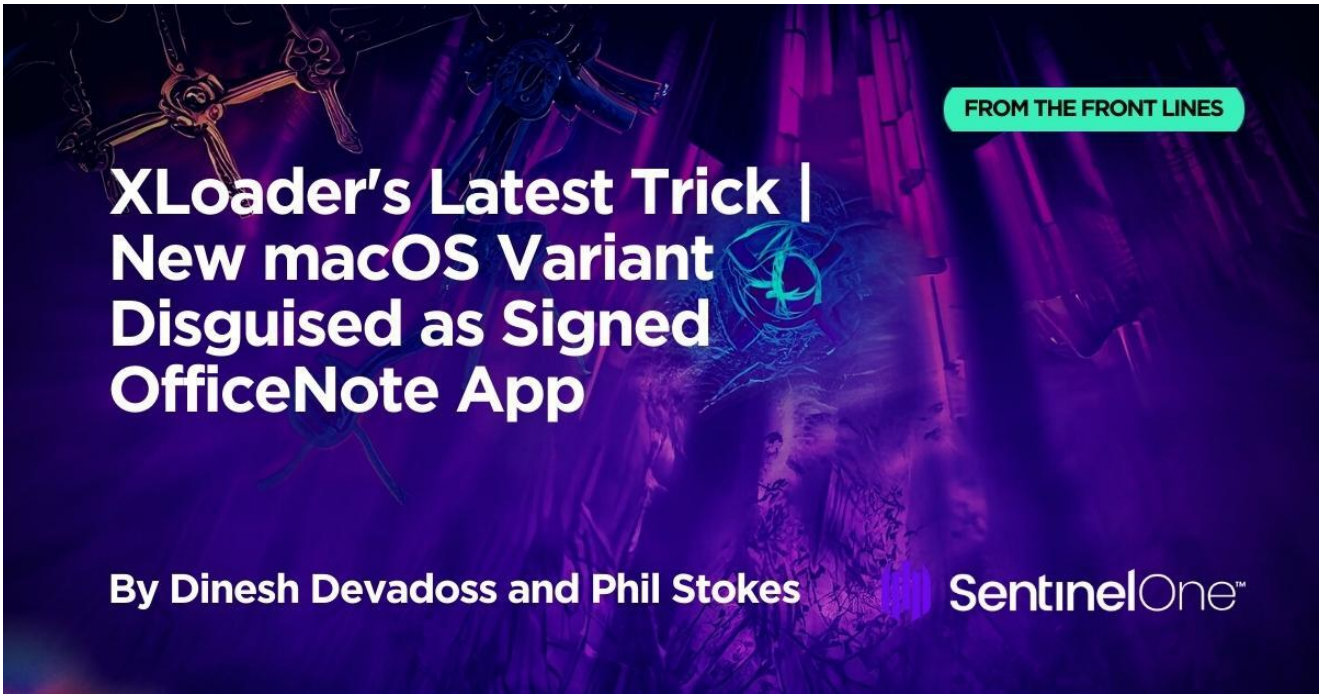
sentinelone.com/blog/xloaders-latest-trick-new-macos-variant-disguised-as-signed-officenote-app/

August 21, 2023

XLoader is a long-running malware-as-a-service infostealer and botnet that has been around in some form or another since 2015. Its first macOS variant was spotted in 2021 and was notable for being distributed as a Java program. As we noted at the time, the Java Runtime Environment hasn't shipped by default on macOS since the days of Snow Leopard, meaning the malware was limited in its targeting to environments where Java had been optionally installed.

Now, however, XLoader has returned in a new form and without the dependencies. Written natively in the C and Objective C programming languages and signed with an Apple developer signature, XLoader is now masquerading as an office productivity app called 'OfficeNote'.

In this post, we examine how this new variant works and provide indicators for threat hunters and security teams. SentinelOne customers are automatically protected from this new variant of XLoader.



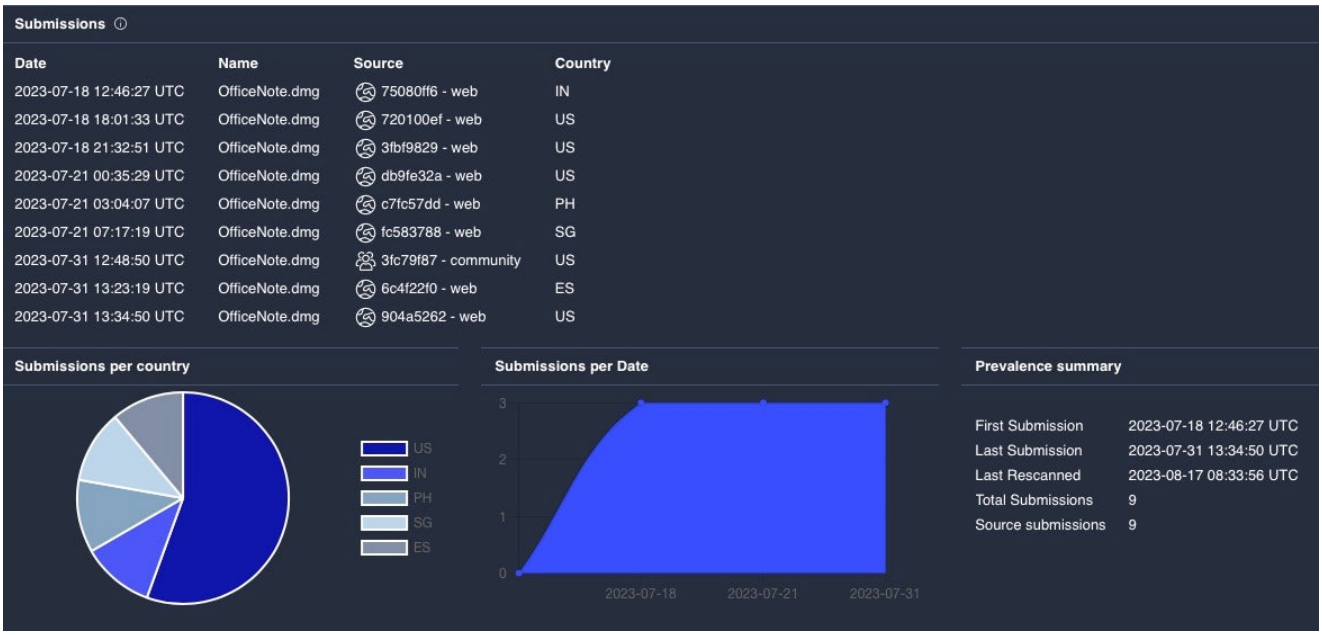
XLoader Distribution

The new version of XLoader is bundled inside a standard Apple disk image with the name `OfficeNote.dmg`. The application contained within is signed with the developer signature `MAIT JAKHU (54YDV8NU9C)`.

The application was signed on 17 July, 2023; however, Apple has since revoked the signature. Despite that, our tests indicate that Apple's malware blocking tool, XProtect, does not have a signature to prevent execution of this malware at the time of writing.

OfficeNote's revoked Apple Developer signature.

Multiple submissions of this sample have appeared on VirusTotal throughout July, indicating that the malware has been widely distributed in the wild.

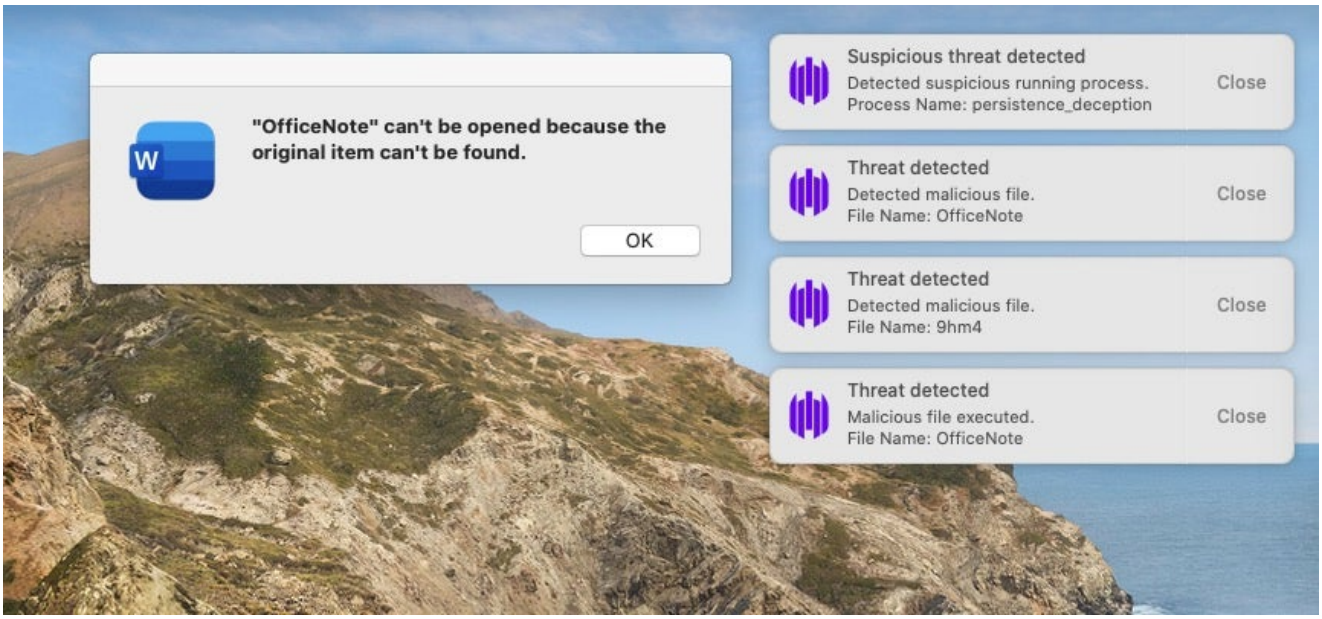


XLoader submissions to VirusTotal July 2023

Advertisements on crimeware forums offer the Mac version for rental at $199/month or $299/3 months. Interestingly, this is relatively expensive compared to Windows variants of XLoader, which go for $59/month and $129/3 months.

XLoader Dropper and Persistence Module

When executed, the OfficeNote application is hardcoded to throw an error message indicating that the application is non-functional. Meanwhile, the malware drops its payload and installs a persistence agent, behavior that is immediately detected by the SentinelOne agent.



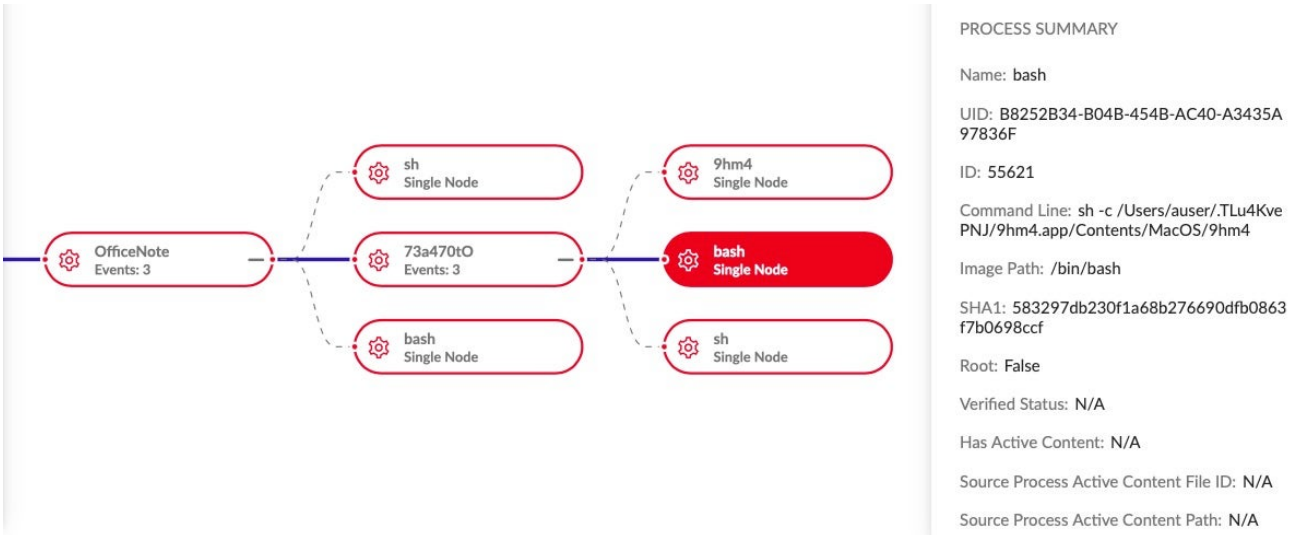
XLoader is immediately detected as a threat by the SentinelOne agent

This error message is hardcoded using a stack string technique, typical of previous versions of XLoader.

```
;-- asm.str.0_Document_2:
0x10000171d      c645c044      mov byte [s], 0x44          ; 'D' ; 68
0x100001721      c645c16f      mov byte [var_3fh], 0x6f    ; 'o' ; 111
0x100001725      c645c263      mov byte [var_3eh], 0x63    ; 'c' ; 99
0x100001729      c645c375      mov byte [var_3dh], 0x75    ; 'u' ; 117
0x10000172d      c645c46d      mov byte [var_3ch], 0x6d    ; 'm' ; 109
0x100001731      c645c565      mov byte [var_3bh], 0x65    ; 'e' ; 101
0x100001735      c645c66e      mov byte [var_3ah], 0x6e    ; 'n' ; 110
0x100001739      c645c774      mov byte [var_39h], 0x74    ; 't' ; 116
0x10000173d      0f2945b0      movaps xmmword [var_50h], xmm0
0x100001741      0f2945a0      movaps xmmword [var_60h], xmm0
0x100001745      0f294590      movaps xmmword [var_70h], xmm0
0x100001749      0f294580      movaps xmmword [var_80h], xmm0
0x10000174d      c6458020      mov byte [var_80h], 0x20    ; mach0_segment64_0
0x100001751      c6458163      mov byte [var_7fh], 0x63    ; 'c' ; 99
0x100001755      c6458261      mov byte [var_7eh], 0x61    ; 'a' ; 97
0x100001759      c645836e      mov byte [var_7dh], 0x6e    ; 'n' ; 110
0x10000175d      c6458427      mov byte [var_7ch], 0x27    ; '\'' ; 39
0x100001761      c6458574      mov byte [var_7bh], 0x74    ; 't' ; 116
0x100001765      c6458620      mov byte [var_7ah], 0x20    ; mach0_segment64_0
0x100001769      c6458762      mov byte [var_79h], 0x62    ; 'b' ; 98
0x10000176d      c6458865      mov byte [var_78h], 0x65    ; 'e' ; 101
0x100001771      c6458920      mov byte [var_77h], 0x20    ; mach0_segment64_0
0x100001775      c6458a6f      mov byte [var_76h], 0x6f    ; 'o' ; 111
0x100001779      c6458b70      mov byte [var_75h], 0x70    ; 'p' ; 112
0x10000177d      c6458c65      mov byte [var_74h], 0x65    ; 'e' ; 101
0x100001781      c6458d6e      mov byte [var_73h], 0x6e    ; 'n' ; 110
0x100001785      c6458e65      mov byte [var_72h], 0x65    ; 'e' ; 101
0x100001789      c6458f64      mov byte [var_71h], 0x64    ; 'd' ; 100
```

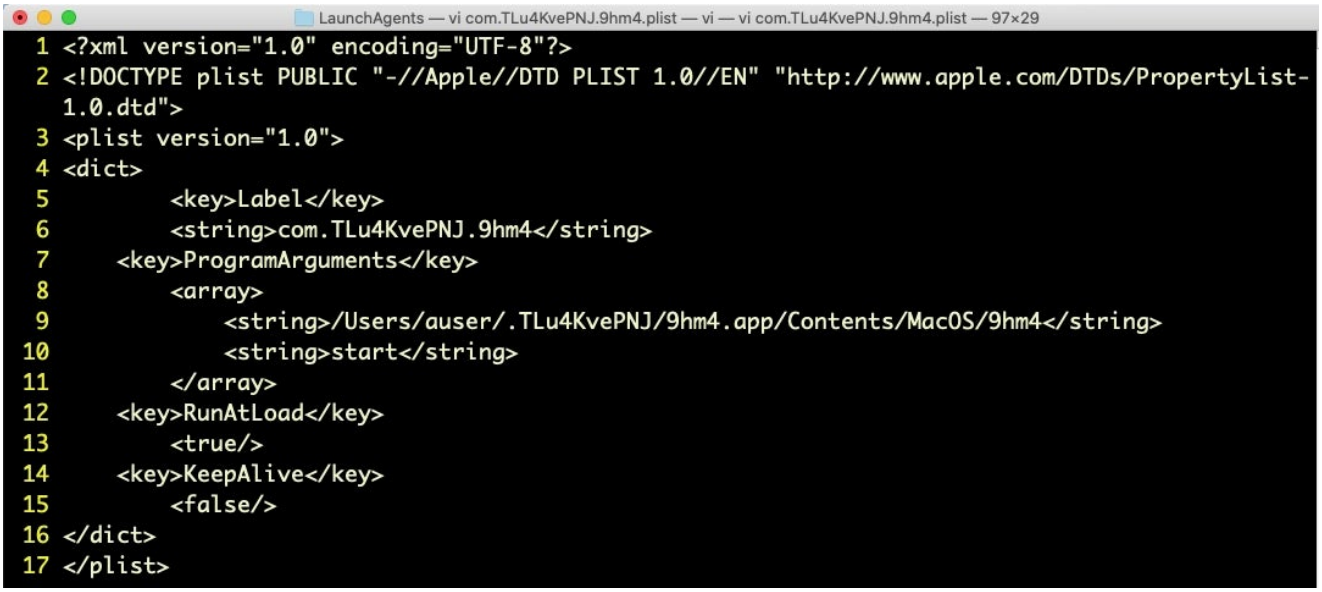
Hardcoded error message constructed on the stack

At this point, however, the malware has already been busy dropping the payload and LaunchAgent. The payload is deposited in the user's home directory as `~/73a470tO` and executed. It creates a hidden directory and constructs a barebones minimal app within it, using a copy of itself for the main executable. Although the name of the payload is hardcoded into the dropper, the names of the hidden directory, app and executable are randomized on each execution.



Execution of OfficeNote and creation of a hidden application as seen in the SentinelOne console

Meanwhile, a LaunchAgent is also dropped in the User's Library folder. This agent is similar to that used in the previous version of XLoader, providing a `start` value to the executable. This ensures that the binary can distinguish between its first run and subsequent runs.



XLoader LaunchAgent for persistence

XLoader Payload Behavior

As in previous versions, the malware attempts to steal secrets from the user's clipboard via the Apple API `NSPasteboard` and `generalPasteboard`. It targets both Chrome and Firefox browsers, reading the `login.json` file located in `~/Library/Application Support/Firefox/Profiles` for Firefox and `~/Library/Application Support/Google/Chrome/Default/Login Data` for Chrome. As with other infostealers we've observed recently, Safari is not targeted.

XLoader uses a variety of dummy network calls to disguise the real C2. We observed 169 DNS name resolutions and 203 HTTP requests. Among the many contacted hosts the malware reaches out to are the following suspicious or malicious IP addresses.

```
23[.]227.38[.]74
62[.]72.14[.]220
66[.]29.151[.]121
104[.]21.26[.]182
104[.]21.32[.]235
104[.]21.34[.]62
137[.]220.225[.]17
142[.]251.163[.]121
```

XLoader also attempts to evade analysis both manually and by automated solutions. Both the dropper and payload binaries attempt to prevent debuggers attaching with ptrace's `PT_DENY_ATTACH` (`0x1f`).

```
push rbp                    ; [00] -r-x section size 296153 named 0.__TEXT.__text
mov rbp, rsp
push r14
push rbx
mov rbx, rsi                ; argv
mov r14d, edi               ; argc
mov edi, 0x1f               ; 31 ; __ptrace_request request
xor edx, edx                ; void*addr
xor esi, esi                ; pid_t pid
xor ecx, ecx                ; void*data
call sym.imp.ptrace         ; long ptrace(__ptrace_request request, pid_t pid, void*addr, void*data)
                            ; long ptrace(?, -1, ?, ?)
mov edi, 2                  ; int64_t arg1
mov esi, 1
```

XLoader attempts to prevent analysts reverse engineering the malware

On execution, the malware executes `sleep` commands to delay behavior in the hope of fooling automated analysis tools. The binaries are stripped and exhibit high entropy in an attempt to similarly thwart static analysis.

```
[0x100001920]> it; iS entropy
md5 c68e9ab57bff9de72414c83d612636dc
sha1 26fd638334c9c1bd111c528745c10d00aa77249d
sha256 adda1b2139b7bbec7f051ecb58d1015d9ac8d5552987374ec48c6598acf54de8
[Sections]

nth paddr          size vaddr          vsize perm entropy    type                 name
-------------------------------------------------------------------------------------
0   0x00001400  0x1db3e 0x100001400  0x1db3e -r-x 7.12157708 REGULAR              0.__TEXT.__text
1   0x0001ef3e      0x6 0x10001ef3e      0x6 -r-x 1.79248125 SYMBOL_STUBS         1.__TEXT.__stubs
2   0x0001ef44     0x1a 0x10001ef44     0x1a -r-x 3.11508276 REGULAR              2.__TEXT.__stub_helper
3   0x0001ef60     0x40 0x10001ef60     0x40 -r-x 0.00000000 REGULAR              3.__TEXT.__const
4   0x0001efa0     0x48 0x10001efa0     0x48 -r-x 1.51041723 REGULAR              4.__TEXT.__unwind_info
5   0x0001f000     0x10 0x10001f000     0x10 -rw- 0.00000000 NONLAZY_POINTERS     5.__DATA.__nl_symbol_ptr
6   0x0001f010      0x8 0x10001f010      0x8 -rw- 1.75000000 LAZY_SYMBOL_POINTERS 6.__DATA.__la_symbol_ptr
```

The XLoader binaries exhibit high entropy in the *__text* section

Conclusion

XLoader continues to present a threat to macOS users and businesses. This latest iteration masquerading as an office productivity application shows that the targets of interest are clearly users in a working environment. The malware attempts to steal browser and clipboard secrets that could be used or sold to other threat actors for further compromise.

IT and security teams are advised to deploy a trusted third party security solution to prevent and detect malware such as XLoader. To see how SentinelOne can help protect the macOS devices in your fleet, contact us or request a free demo.

Indicators of Compromise

SHA1	Description
26fd638334c9c1bd111c528745c10d00aa77249d	Mach-O Payload
47cacf7497c92aab6cded8e59d2104215d8fab86	Mach-O Dropper
5946452d1537cf2a0e28c77fa278554ce631223c	Disk Image

958147ab54ee433ac57809b0e8fd94f811d523ba	Mach-O Payload

FilePaths

`~/73a470tO`

Developer ID

MAIT JAKHU (54YDV8NU9C)

Network Communications

```
23[.]227.38[.]74
62[.]72.14[.]220
66[.]29.151[.]121
104[.]21.26[.]182
104[.]21.32[.]235
104[.]21.34[.]62
137[.]220.225[.]17
142[.]251.163[.]121

www[.]activ-ketodietakjsy620[.]cloud
www[.]akrsnamchi[.]com
www[.]brioche-amsterdam[.]com
www[.]corkagenexus[.]com
www[.]growind[.]info
www[.]hatch[.]computer
www[.]kiavisa[.]com
www[.]lushespets[.]com
www[.]mommachic[.]com
www[.]nationalrecoveryllc[.]com
www[.]pinksugarpopmontana[.]com
www[.]qhsbobfv[.]top
www[.]qq9122[.]com
www[.]raveready[.]shop
www[.]spv88[.]online
www[.]switchmerge[.]com
```