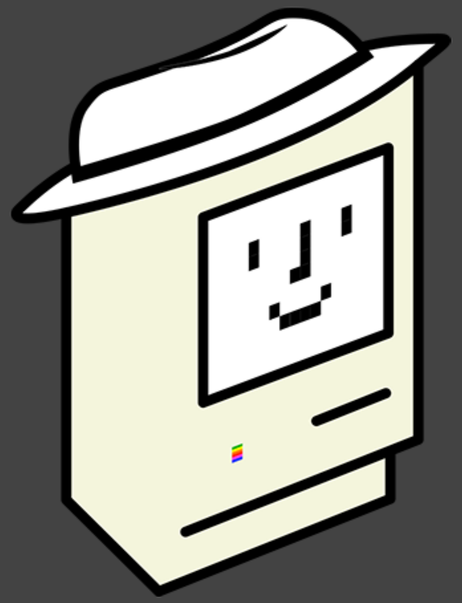
Incident Response on macOS



$ whoami

Thomas Reed

@thomasareed

treed@malwarebytes.com

What are we talking about?

✓ Incident response!

- Have access to the Mac
- What was done?
- How do you identify the threat elsewhere?
- Assuming you don't have proactive data collection

✘ Forensic collection

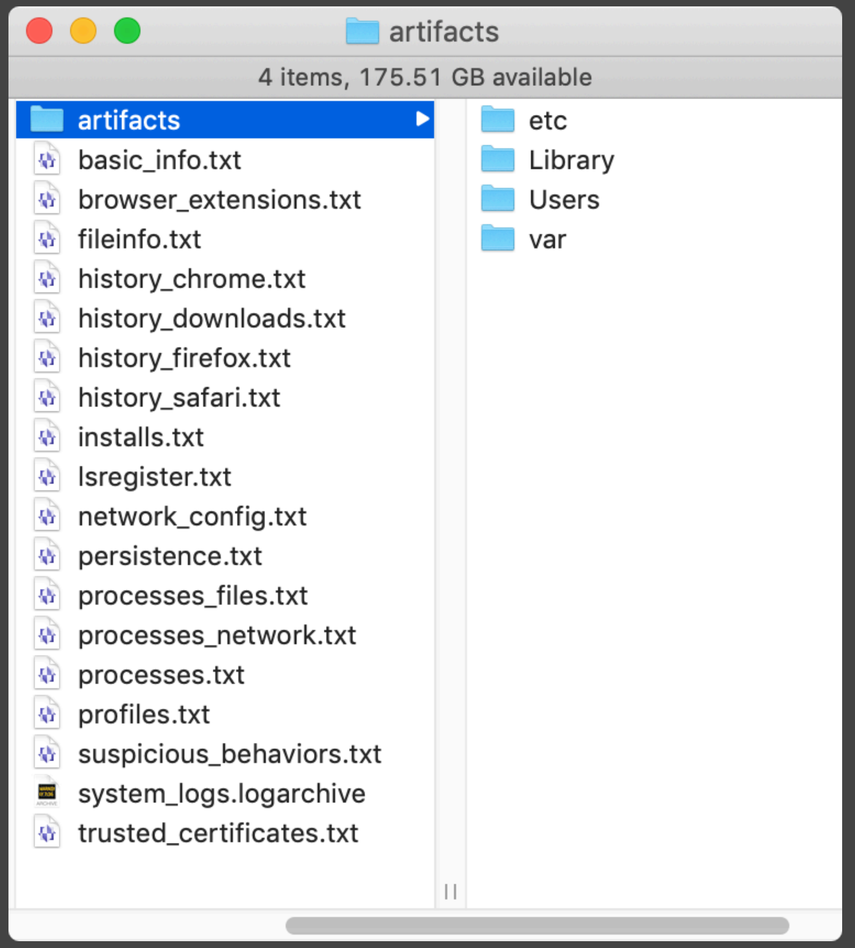
- Need data for legal evidence
- Not needed now, needs to stand up to time
- Out of scope for this talk

How do we collect IR data?

- Post-infection toolkits
  - PICT
    - https://github.com/thomasareed/pict
  - OSXCollector
    - https://yelp.github.io/osxcollector/
  - AutoMacTC
    - https://github.com/CrowdStrike/automactc
- Proactive toolkits
  - Venator
    - https://github.com/richiercyrus/Venator
  - osquery
    - https://osquery.io

PICT data collection

- Lots of data files to sort through
  - Machine info
  - File listing
  - Browser histories
  - Install history
  - Process listing/info
  - Persistence
  - Suspicious behaviors
  - etc…



basic_info.txt

- Collection time
- Uptime
- Basic config info
- System and hardware info
- User list & logins

Collected by user thomas on 2 Jul 2019 @ 21:11:40 UTC (local 2 Jul 2019 @ 17:11:40)

Uptime: 17:11 up 28 days, 7:54, 2 users, load averages: 3.02 2.97 2.58

Hostname: test.local

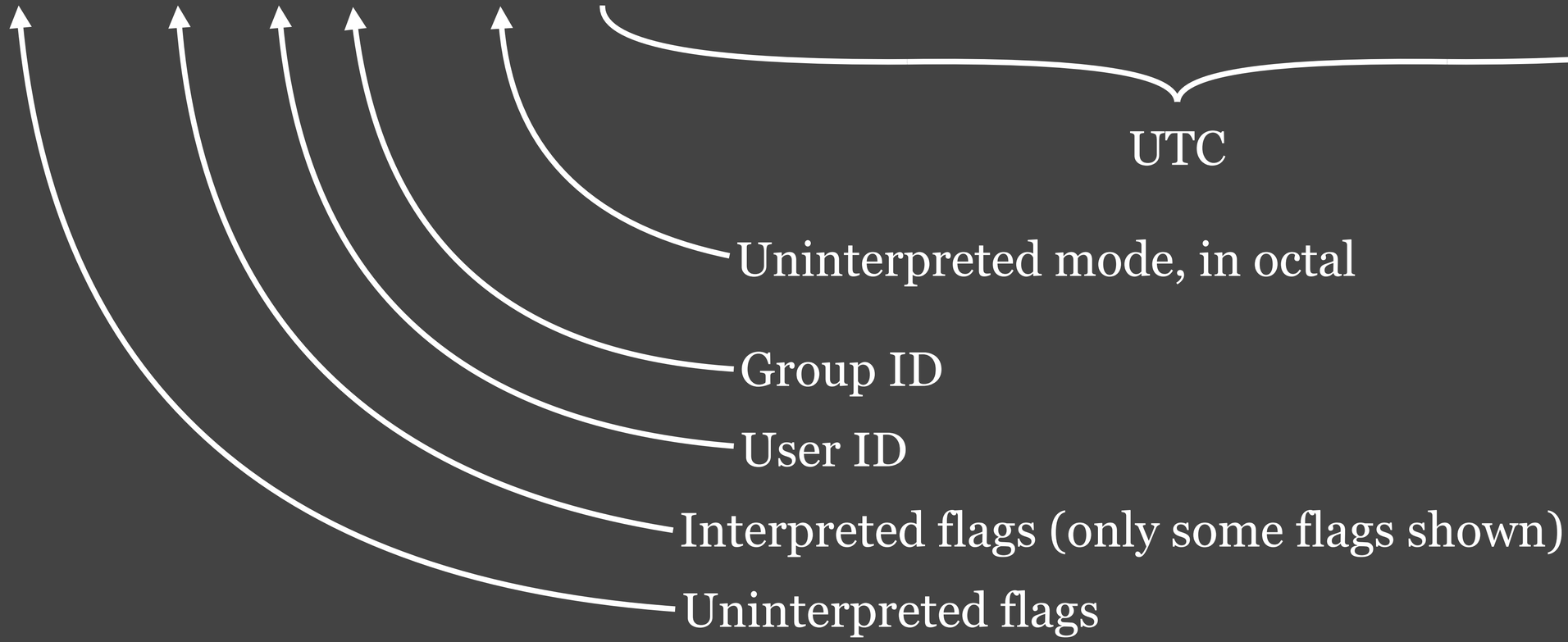
System policy security: assessments enabled

System Integrity Protection status: enabled.

FileVault status: FileVault is On.

fileinfo.txt

Raw Flags	Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0x8000	hidden	0	0	40755	2019-06-12T 11:18:01	2019-06-12T 11:18:01	2019-06-12T 11:50:53	/Volumes

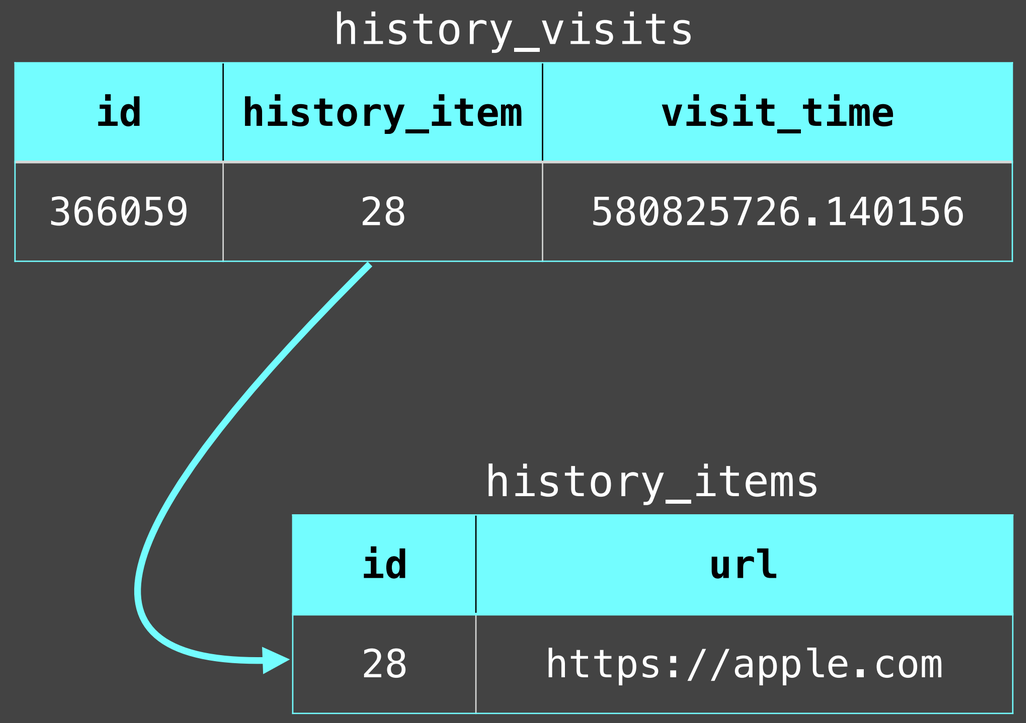


Persistence

- persistence.txt
  - Login items
  - launchd
  - kexts
  - etc
- browser_extensions.txt
  - Safari, Chrome, Firefox
- artifacts
  - launch agent & daemon plists
  - browser extensions
  - common abusable scripts
    - .bash_profile, etc

Browser histories

- Safari, Chrome, Firefox
- "Quarantine events"
- All are fairly similar SQLite databases



Install history

- Only tracked for macOS installer packages
- Logged in a couple different ways

Process info

- ps
  - process ID, parent process ID
  - path to command + arguments
- lsof
  - files being accessed
  - network connections open

```
COMMAND     PID  NODE NAME
ZoomOpene 19952   TCP localhost:19421 (LISTEN)
```

Suspicious behavior

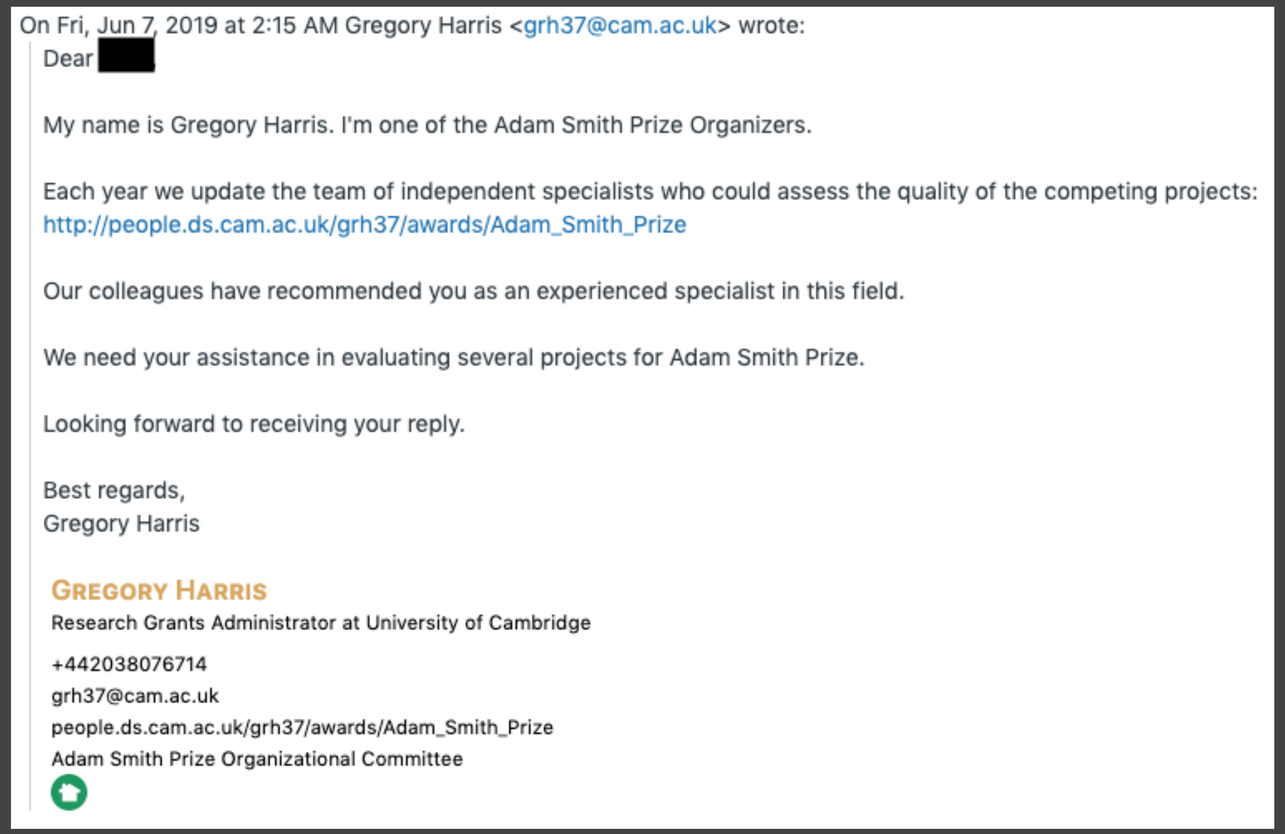
- Processes running from suspicious locations (eg, /tmp)
- Hidden processes
- launchd plists with scripts as the program
- processes pretending to belong to Apple
- suspicious sudoers or hosts changes
- etc

```
Suspicious processes
____________________________
19952 /Users/thomas/.zoomus/
ZoomOpener.app/Contents/MacOS/
ZoomOpener
```

IR examples

Wirenet

- aka NetWire, aka NetWeird
- backdoor
- prior to last year, hadn't been seen since 2014
- dropped as one of two payloads by the Firefox 0-day attack on Coinbase and other cryptocurrency companies



On Fri, Jun 7, 2019 at 2:15 AM Gregory Harris <grh37@cam.ac.uk> wrote:

Dear [redacted]

My name is Gregory Harris. I'm one of the Adam Smith Prize Organizers.

Each year we update the team of independent specialists who could assess the quality of the competing projects:
http://people.ds.cam.ac.uk/grh37/awards/Adam_Smith_Prize

Our colleagues have recommended you as an experienced specialist in this field.

We need your assistance in evaluating several projects for Adam Smith Prize.

Looking forward to receiving your reply.

Best regards,
Gregory Harris

GREGORY HARRIS
Research Grants Administrator at University of Cambridge
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grh37@cam.ac.uk
people.ds.cam.ac.uk/grh37/awards/Adam_Smith_Prize
Adam Smith Prize Organizational Committee

Image credit Coinbase: https://blog.coinbase.com/responding-to-firefox-0-days-in-the-wild-d9c85a57f15b

Wirenet walkthrough

- suspicious_behaviors.txt
  - Process with PID 529 running from a hidden folder
  - Launch agent named com.mac.host.plist
  - Are these related? 🤔

```
Suspicious processes
------------------------------
  529 /Users/test/.defaults/
Finder.app/Contents/MacOS/Finder

Suspicious agents & daemons
------------------------------
/Users/test/Library/LaunchAgents/
com.mac.host.plist
```

Wirenet walkthrough

- /Users/test/Library/LaunchAgents/com.mac.host.plist
  - Responsible for launching the Finder process

```
<dict>
    <key>Label</key>
    <string>com.mac.host</string>
    <key>ProgramArguments</key>
    <array>
        <string>/Users/test/.defaults/Finder.app/Contents/MacOS/Finder</string>
    </array>
    <key>RunAtLoad</key>
    <true/>
    <key>KeepAlive</key>
    <false/>
</dict>
```

Wirenet walkthrough

- fileinfo.txt
  - both Finder.app and com.mac.host.plist created June 29, 2019 @ 20:26:17

Raw Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0	501	20	40755	2019-06-29T 20:26:17	2019-06-29T 20:26:17	2019-06-29T 20:29:29	/Users/test/.defaults/ Finder.app
0	501	20	100750	2019-06-29T 20:26:17	2019-06-29T 20:26:17	2019-06-29T 20:29:29	/Users/test/Library/ LaunchAgents/ com.mac.host.plist

Wirenet walkthrough

- processes_network.txt
  - Finder process has a network connection open to `89.34.111.113`

```
COMMAND   PID  USER  FD   TYPE             DEVICE SIZE/OFF   NODE
NAME

Finder    529  test   3u  IPv4 0x2888275a1e50e0d5      0t0    TCP
192.168.1.13:49219->89.34.111.113:https (ESTABLISHED)
```

Wirenet walkthrough

- system_logs.logarchive
  - log show --start "2019-06-29 20:26:15+0000" --end "2019-06-29 20:26:20+0000" --timezone "00:00:00" --info --archive system_logs.logarchive

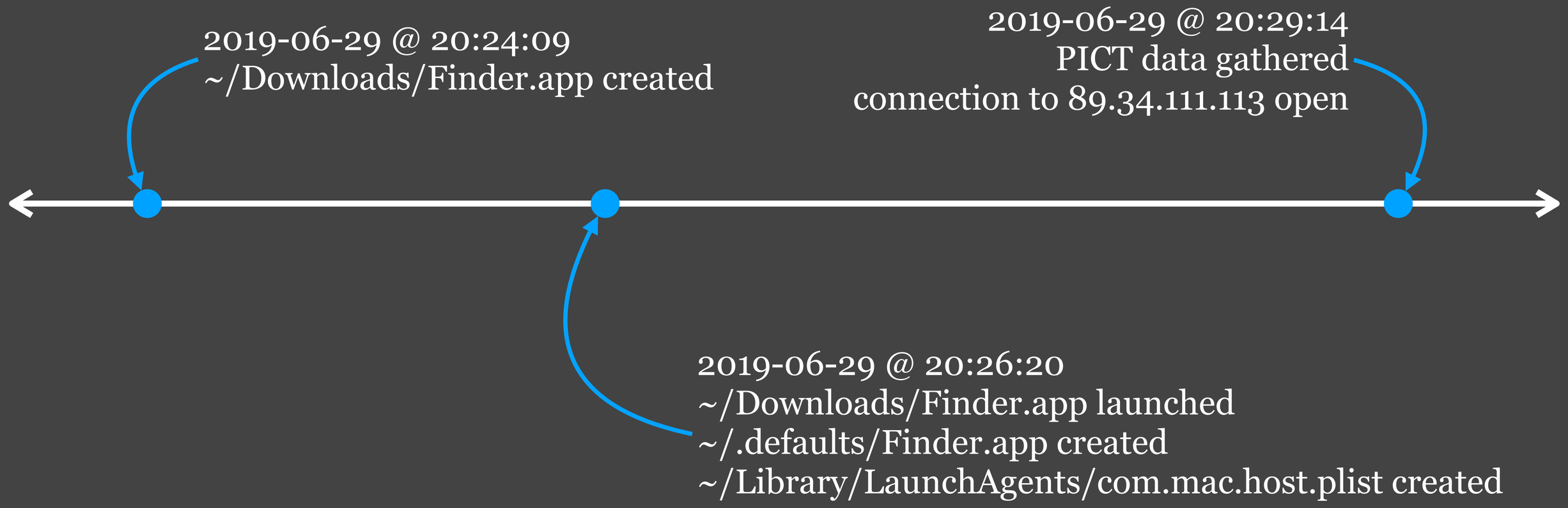
```
2019-06-29 20:26:17.237182+0000 0x1a04     Info        0x51cf                319    0
Finder: (LaunchServices) [com.apple.launchservices:cas] LaunchApplication:
appToLaunch={ "ApplicationType"="UIElement", "CFBundleExecutablePath"="/Users/test/
Downloads/Finder.app/Contents/MacOS/Finder", "CFBundleExecutablePathDeviceID"=16777220,
"CFBundleExecutablePathINode"=921876, "CFBundleName"="Finder", "CFBundlePackageType"="APPL",
"LSBundlePath"="/Users/test/Downloads/Finder.app", "LSBundlePathDeviceID"=16777220,
"LSBundlePathINode"=921873, "LSExecutableFormat"="LSExecutableMachOFormat" } modifiers:
{ "AddPSNArgument"=true, "LSAdditionalEnvironmentVars"={  }, "LSLaunchAsync"=true,
"LSLaunchStoppedTemporarily"=true } args=[ NULL ]
```

Wirenet walkthrough

- fileinfo.txt
  - ~/Downloads/Finder.app created June 29, 2019 @ 20:24:09

Raw Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0	501	20	40755	2019-06-29T 20:24:09	2019-06-29T 20:24:09	2019-06-29T 20:29:31	/Users/test/Downloads/Finder.app

Wirenet timeline



Mokes

- backdoor
- prior to the end of June, hadn't been seen since 2016
- dropped as second of two payloads by the Firefox 0-day attack on Coinbase and other cryptocurrency companies

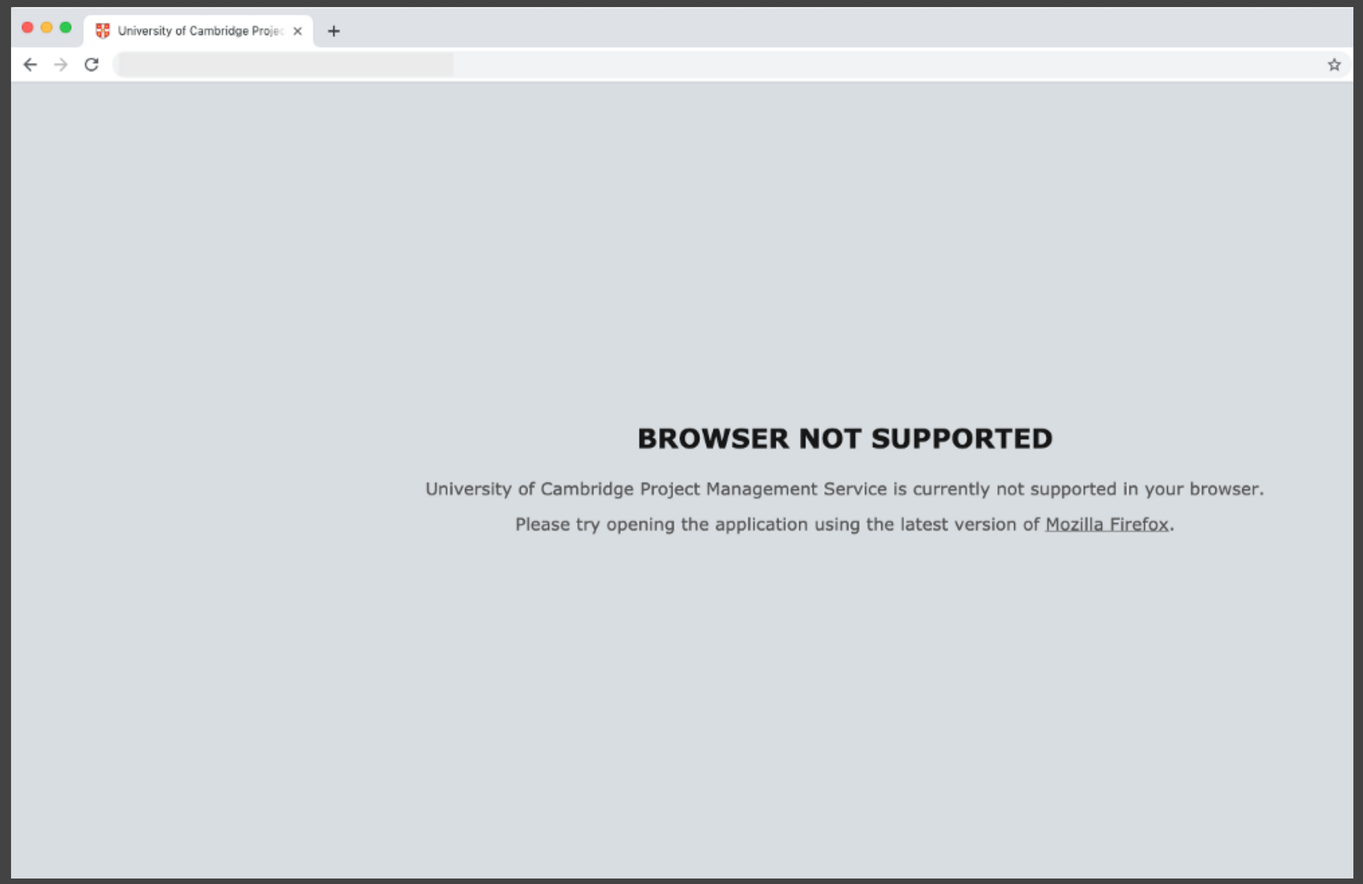


Image credit Coinbase: https://blog.coinbase.com/responding-to-firefox-0-days-in-the-wild-d9c85a57f15b

Mokes walkthrough

- persistence.txt
  - What is ~/Library/LaunchAgents/storeaccountd.plist? 🤔

```
User launch agents
----------------------------
/Users/test/Library/LaunchAgents
total 24
-rw-r--r--@  1 test  staff  -      808 Jun 20 08:42 com.google.keystone.agent.plist
-rw-r--r--@  1 test  staff  -      914 Jun 20 08:42 com.google.keystone.xpcservice.plist
-rw-r--r--   1 test  staff  -      400 Jun 29 17:34 storeaccountd.plist
```

Mokes walkthrough

- /Users/test/Library/LaunchAgents/ storeaccountd.plist
  - launches ~/Library/App Store/storeaccountd

```
<dict>
   <key>Label</key>
   <string>storeaccountd</string>
   <key>ProgramArguments</key>
   <array>
      <string>/Users/test/Library/App
Store/storeaccountd</string>
   </array>
   <key>RunAtLoad</key><true/>
   <key>KeepAlive</key><true/>
</dict>
```

Mokes walkthrough

- processes.txt
  - storeaccountd has PID 495
  - parent PID = 1 = launchd
  - launched at 5:34 PM (local time, not UTC)

```
USER   PID  PPID STARTED      TIME COMMAND
test   495     1  5:34PM   0:00.09 /Users/test/Library/App Store/storeaccountd
```

Mokes walkthrough

- basic_info.txt
  - process launched at 5:34 PM local time
  - 2019-06-29 17:35:01 local time == 2019-06-29 21:35:01 UTC
  - process launched at 21:34:?? UTC

```
Collected by user test on 29 Jun 2019 @ 21:35:01 UTC (local 29 Jun 2019 @
17:35:01)
Uptime: 17:35  up 45 mins, 2 users, load averages: 1.08 1.31 1.25
...
```

Mokes walkthrough

- fileinfo.txt
  - storeaccountd, storeaccountd.plist created 2019-06-29 @ 21:34:01

Raw Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0	501	20	100555	2019-06-29T 21:34:01	2019-06-29T 21:34:01	2019-06-29T 21:34:01	/Users/test/Library/App Store/storeaccountd
0	501	20	100644	2019-06-29T 21:34:31	2019-06-29T 21:34:31	2019-06-29T 21:35:41	/Users/test/Library/ LaunchAgents/ storeaccountd.plist

Mokes walkthrough

- processes_network.txt
  - storeaccountd has attempted to connect with `185.49.69.210`, but has not received a response

```
COMMAND   PID   USER   FD   TYPE             DEVICE SIZE/OFF   NODE NAME
storeacco 495   test   25u  IPv4 0x9ddae8da804e137b      0t0    TCP
192.168.1.13:49224->185.49.69.210:http (SYN_SENT)
storeacco 495   test   28u  IPv4 0x9ddae8da7ac74ab3      0t0    UDP *:*
```

Mokes walkthrough

- processes_files.txt
  - storeaccountd has a zero-byte file open for read/write
  - (This is a marker file, used by the malware to identify which variant is installed)

```
COMMAND   PID  USER   FD      TYPE    DEVICE   SIZE/OFF   NODE NAME
storeacco 495  test   11u      REG       1,4          0 928151 /Users/test/
Library/Application Support/72769f032fd8c672bcb1a3e21a55726a
```

Mokes walkthrough

- fileinfo.txt
  - 72769f032fd8c672bcb1a3e21a55726a created 2019-06-29 @ 21:34:21

Raw Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0	501	20	100644	2019-06-29T 21:34:21	2019-06-29T 21:34:21	2019-06-29T 21:34:21	/Users/test/Library/ Application Support/ 72769f032fd8c672bcb1a3e 21a55726a

Mokes walkthrough

- system_logs.logarchive
  - log show --start "2019-06-29 21:33:55+0000" --end "2019-06-29 21:34:05+0000" --timezone "00:00:00" --info --archive system_logs.logarchive

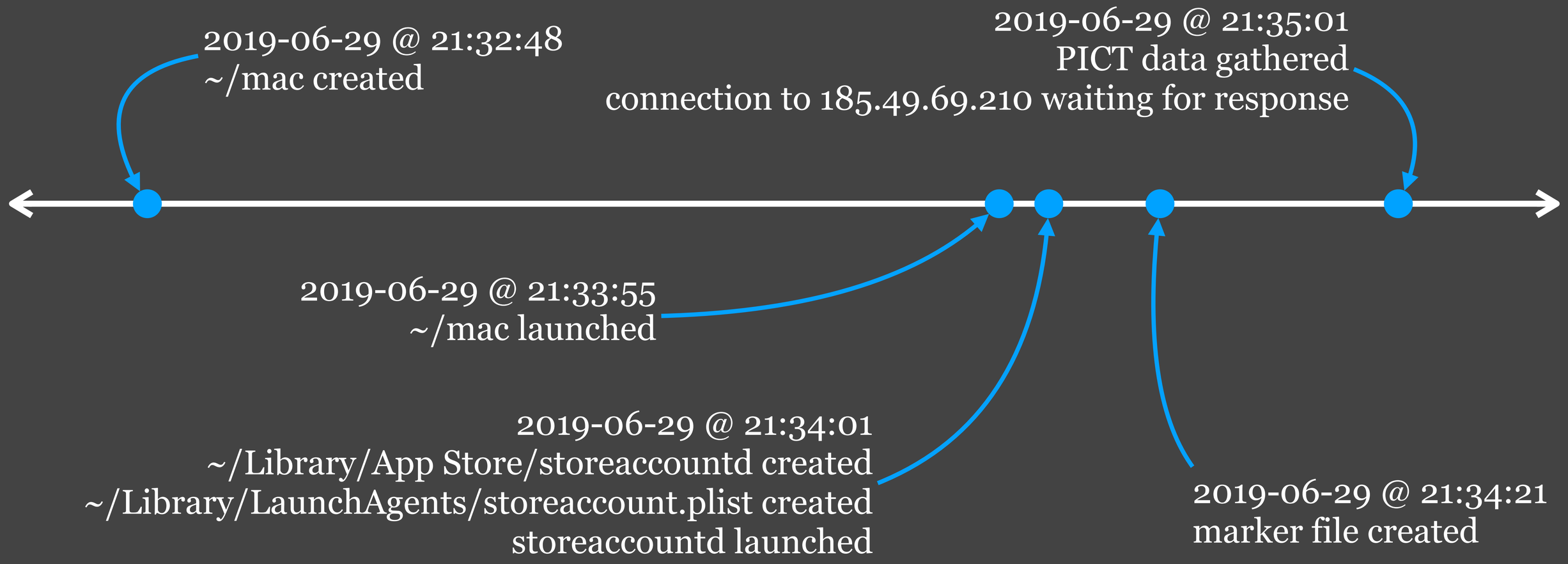
```
2019-06-29 21:33:55.600942+0000 0x249e     Info         0x0
492    0    mac: (LaunchServices) [com.apple.launchservices:cas]
{ "ApplicationType"="BackgroundOnly", "CFBundleExecutablePath"="/
Users/test/mac", "CFBundlePackageType"="????",
"CFBundleSignature"="????", "Flavor"=2, "LSArchitecture"="x86_64",
"LSCheckInTime*"=now-ish 2019/06/29 17:33:55, "LSDisplayName"="mac",
"LSExecutableFileName"="mac" }
```

Mokes walkthrough

- fileinfo.txt
  - ~/mac created 2019-06-29 @ 21:32:48

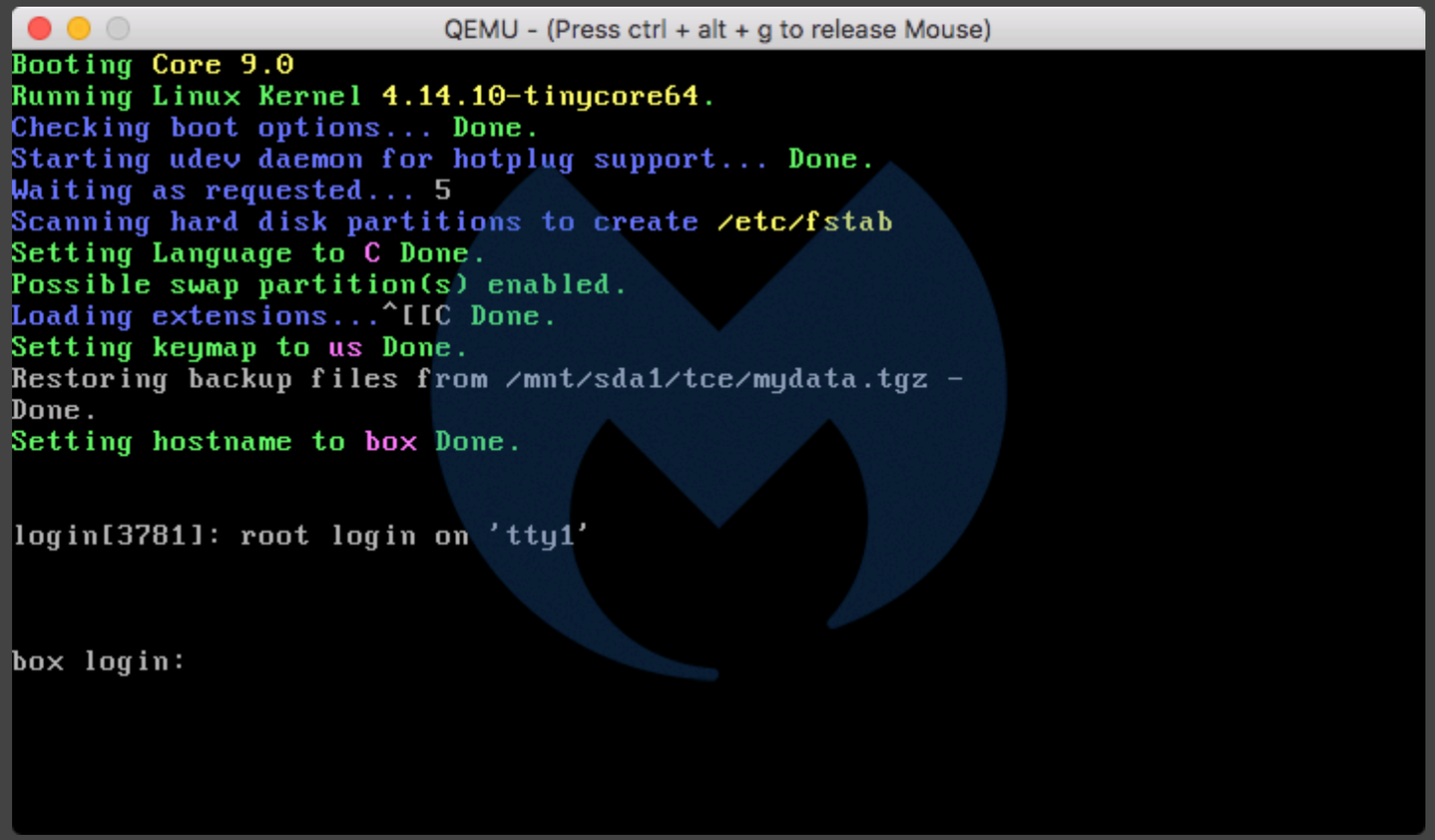
Raw Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0	501	20	100755	2019-06-29T 21:32:48	2019-06-29T 21:32:53	2019-06-29T 21:34:10	/Users/test/mac

Mokes timeline



BirdMiner

- cryptocurrency miner
- Distributed through pirated audio software
- Uses an interesting code obfuscation technique



BirdMiner walkthrough

- persistence.txt
  - Three weird-looking launch daemons

```
Launch daemons
----------------------------
total 32
-rw-r--r--   1 root  wheel  -       406 Jun 29 07:36 com.Heteroneura.plist
-rw-r--r--   1 root  wheel  -       403 Jun 29 07:36 com.Mukden.plist
-rw-r--r--   1 root  wheel  -       384 Jun 29 07:36 com.Tang.plist
```

BirdMiner walkthrough

- /Users/test/Library/LaunchDaemons/com.Heteroneura.plist
  - launches /Library/Application Support/Per/Aht
- /Users/test/Library/LaunchDaemons/
  - launches /Library/Application Support/Q/Fulgora
- /Users/test/Library/LaunchDaemons/
  - launches /usr/local/bin/Augean

```
<dict>
  <key>Label</key>
  <string>com.Tang.plist</string>

  <key>ProgramArguments</key>
  <array>
    <string>/usr/local/bin/Augean</
string>
  </array>

  <key>RunAtLoad</key>
  <true/>

  <key>KeepAlive</key>
  <true/>
</dict>
```

BirdMiner walkthrough

- processes.txt
  - Aht PID = 848, Fulgora PID = 850, Augean PID = 1332, run by bash
  - Aht, Fulgora launched 7:36 am local time (11:36 UTC)
  - Augean launched 7:39 am local time (11:39 UTC)

```
USER   PID  PPID STARTED      TIME COMMAND
root   848     1  7:36AM   0:00.00 /bin/bash /Library/Application Support/Per/Aht
root   850     1  7:36AM   0:00.00 /bin/bash /Library/Application Support/Q/Fulgora
root  1332     1  7:39AM   0:00.00 /bin/bash /usr/local/bin/Augean
```

BirdMiner walkthrough

- processes.txt
  - Aht is parent process of Per, PID 861
  - Fulgora is parent process of Q, PID 870
  - Augean is parent process of `sleep`, PID 1342

```
USER   PID  PPID STARTED      TIME COMMAND
root   861   848  7:36AM   5:18.18 /usr/local/bin/Per -M accel=hvf --cpu host /Library/
Application Support/Per/Stercorarius -display none
root   870   850  7:36AM   5:17.66 /usr/local/bin/Q -M accel=hvf --cpu host /Library/
Application Support/Q/Canchi -display none
root  1342  1332  7:39AM   0:00.00 sleep 600
```

BirdMiner walkthrough

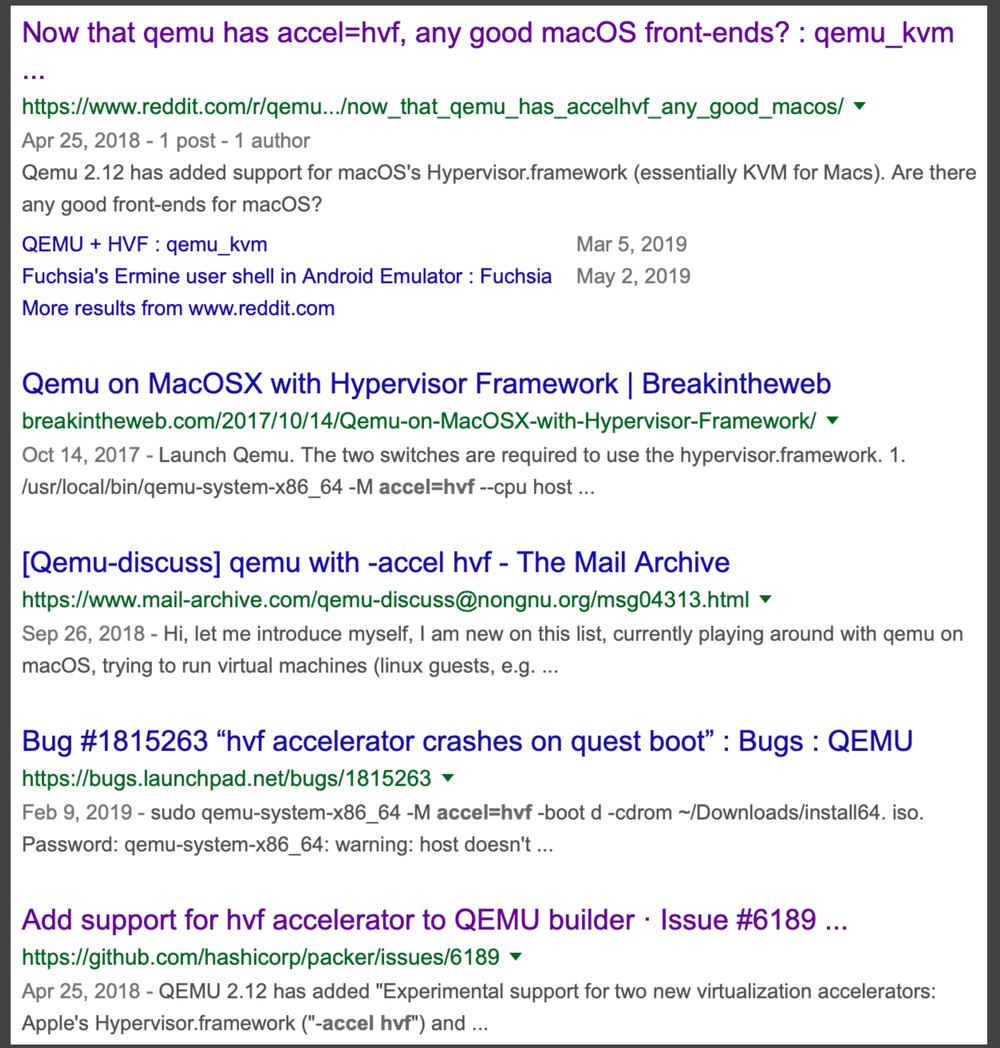
- Per, Q both have used a significant amount of processor time
  - Processes started @ 7:36 am local time
  - basic_info.txt -> capture happened @ 7:43 am local time (7 minutes later)
  - Malware has already used more than 5 minutes of processor time! 🤔

```
USER   PID  PPID STARTED      TIME COMMAND
root   861   848  7:36AM   5:18.18 /usr/local/bin/Per -M accel=hvf --cpu host /Library/
Application Support/Per/Stercorarius -display none
root   870   850  7:36AM   5:17.66 /usr/local/bin/Q -M accel=hvf --cpu host /Library/
Application Support/Q/Canchi -display none
root  1342  1332  7:39AM   0:00.00 sleep 600
```

BirdMiner walkthrough

- If we don't have samples of the files, this is useful information:
  - `Per –M accel=hvf ––cpu host .../Stercorarius`
- Google "accel=hvf"
  - First five hits relate to Qemu
  - Qemu = Linux emulator that runs on macOS
  - Stercorarius, Canchi probably Qemu VMs

🤔



BirdMiner walkthrough

- Evidence suggests this is a cryptominer
- ...but we can't be sure!
- If we had the files and could analyze, we would find XMRig code in the Qemu VM

```
#!/bin/sh
# put other system startup commands here
/mnt/sda1/tools/bin/idgenerator 2>&1 > /dev/null
/mnt/sda1/tools/bin/xmrig_update 2>&1 > /dev/null
/mnt/sda1/tools/bin/ccommand_update 2>&1 > /dev/null
/mnt/sda1/tools/bin/ccommand 2>&1 > /dev/null
/mnt/sda1/tools/bin/xmrig
```

BirdMiner walkthrough

- processes_network.txt
  - Per and Q both have connections open to subdomain of njalla.net, a hosting service
  - IP address = 185.193.126.159

```
COMMAND   PID           USER   FD   TYPE             DEVICE SIZE/OFF   NODE NAME
Per       861           root   16u  IPv4 0xc9bce5804a5a9af7      0t0    TCP
192.168.1.13:49230->host-185-193-126-159.njalla.net:http-alt (ESTABLISHED)
Q         870           root   16u  IPv4 0xc9bce5804a5a8837      0t0    TCP
192.168.1.13:49231->host-185-193-126-159.njalla.net:http-alt (ESTABLISHED)
```

BirdMiner walkthrough

- fileinfo.txt
  - Aht, Fulgora modified 2019-06-29 @ 11:36:14
  - No data for `/usr/local/bin/Augean`, because `/usr` has restricted flag, and was skipped

Raw Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0	0	80	100700	2019-06-29T 11:36:14	2019-06-29T 11:36:57	2019-06-29T 11:37:08	/Library/Application Support/Per/Aht
0	0	80	100700	2019-06-29T 11:36:14	2019-06-29T 11:36:57	2019-06-29T 11:36:57	/Library/Application Support/Q/Fulgora

BirdMiner walkthrough

- fileinfo.txt
  - Stercorarius, Canchi accessed 2019-06-29 @ 11:38:35

Raw Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0	0	80	100700	2019-06-29T 11:39:06	2019-06-29T 11:39:06	2019-06-29T 11:38:35	/Library/Application Support/Per/Stercorarius
0	0	80	100700	2019-06-29T 11:39:06	2019-06-29T 11:39:06	2019-06-29T 11:38:36	/Library/Application Support/Q/Canchi

BirdMiner walkthrough

- installs.txt
  - Something called ValhallaVintageVerb was installed on 2019-06-29 @ 11:36:15

```
2019-06-29 11:36:15 +0000  Library/Application Support/Digidesign/Plug-Ins installer
valhallavintageverb-1.pkg  com.ValhallaDSP.valhallavintageverb171.ValhallaVintageVerb-2.pkg
1.7.1
2019-06-29 11:36:15 +0000  Library/Application Support/Valhalla DSP, LLC/ValhallaVintageVerb/
Presets/  installer presets.pkg  com.ValhallaDSP.valhallavintageverb171.Presets.pkg 1.7.1
2019-06-29 11:36:15 +0000  Library/Audio/Plug-Ins/Components installer
valhallavintageverb.pkg com.ValhallaDSP.valhallavintageverb171.ValhallaVintageVerb-3.pkg 1.7.1
...
```

BirdMiner walkthrough

- history_safari.txt
  - Site vstcrack[dot]com visited on 2019-06-29 @ 11:31:42

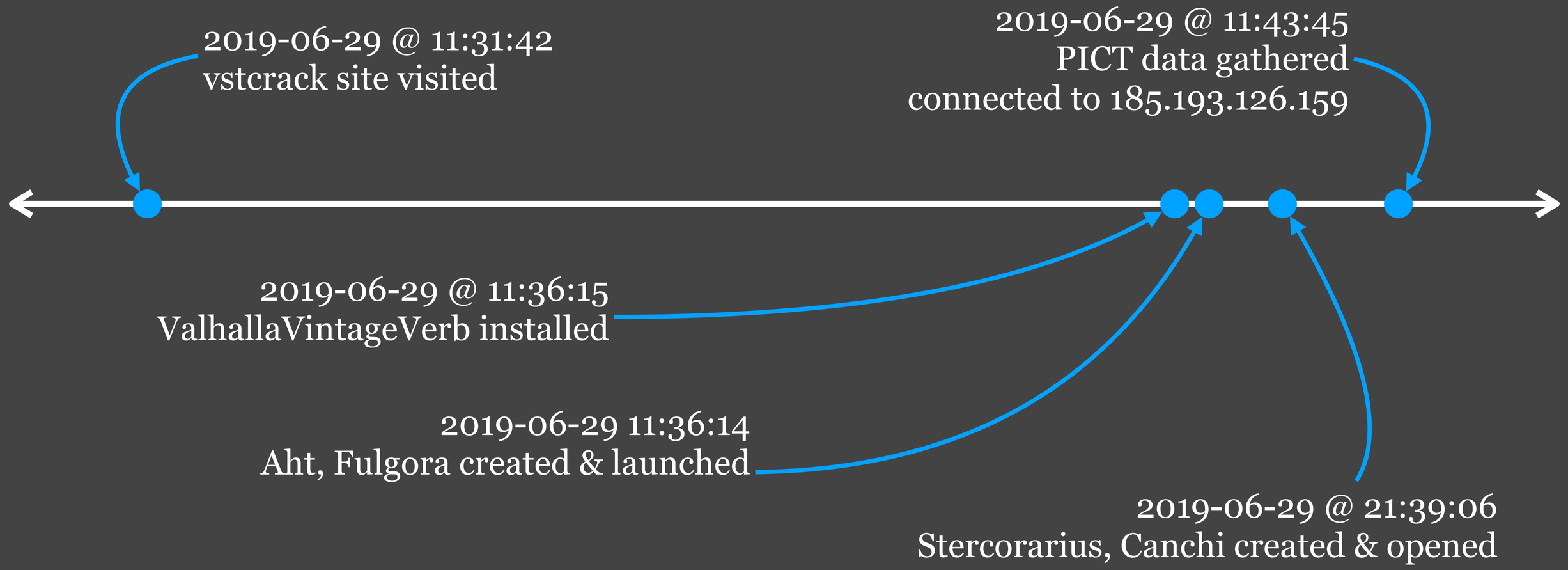
```
2019-06-20 16:40:47 https://www.google.com/search?
client=safari&rls=en&q=firefox&ie=UTF-8&oe=UTF-8
2019-06-20 16:40:50 https://www.mozilla.org/en-US/firefox/new/
2019-06-20 16:40:52 https://www.mozilla.org/en-US/firefox/download/thanks/
2019-06-29 11:31:42 http://www.vstcrack.com/elementor-240/
2019-06-29 11:31:42 http://www.vstcrack.com/elementor-240/
2019-06-29 11:31:43 http://www.vstcrack.com/elementor-240/
```

BirdMiner walkthrough

- history_downloads.txt
  - Last entry for Firefox, no sign of what was downloaded from vstcrack
  - This is unreliable for Safari!

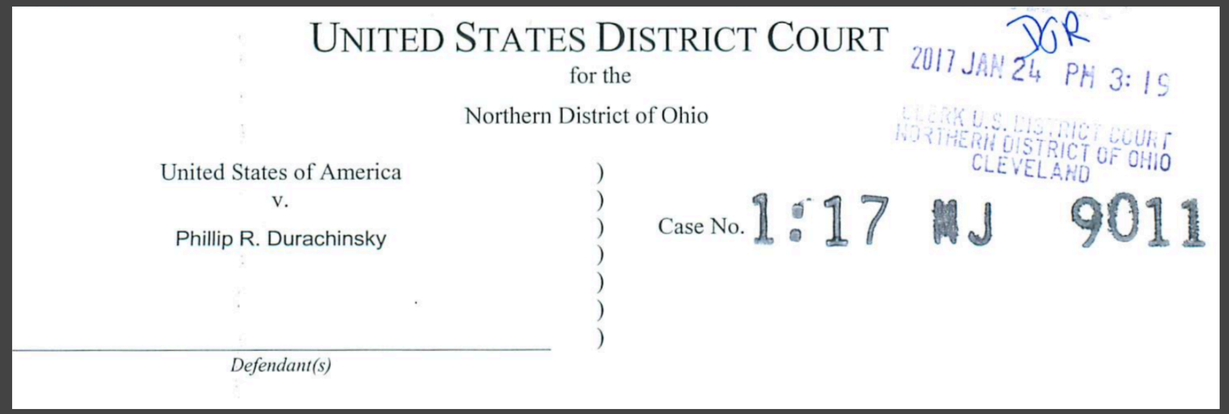
```
Downloaded: 2019-06-20 16:41:38  by agent: com.apple.Safari
File:
   https://download-installer.cdn.mozilla.net/pub/firefox/releases/67.0.3/mac/en-US/
Firefox%2067.0.3.dmg
Origin:
   https://www.mozilla.org/en-US/firefox/download/thanks/
```

BirdMiner timeline



FruitFly

- backdoor
- Used to infect Macs for a decade
- Creepy! Likes to access the webcam, microphone, etc
- Alleged culprit, Phillip Durachinsky, is in prison awaiting trial



UNITED STATES DISTRICT COURT

for the

Northern District of Ohio

2017 JAN 24 PM 3:19

CLERK U.S. DISTRICT COURT
NORTHERN DISTRICT OF OHIO
CLEVELAND

United States of America
v.
Phillip R. Durachinsky

Case No. 1:17 MJ 9011

Defendant(s)

Image captured from: https://assets.documentcloud.org/documents/4346337/Philip-Durachinsky-Criminal-Complaint.pdf

FruitFly walkthrough

- suspicious_behaviors.txt
  - user launch agent: com.client.client.plist

```
Suspicious agents & daemons
---------------------------
/Users/test/Library/LaunchAgents/com.client.client.plist
```

FruitFly walkthrough

- /Users/test/Library/LaunchAgents/com.client.client.plist
  - launches ~/.client
  - NSUIElement indicates no icon should be shown in the Dock

```
<dict>
    <key>KeepAlive</key>
    <true/>
    <key>Label</key>
    <string>com.client.client</string>
    <key>ProgramArguments</key>
    <array>
        <string>/Users/test/.client</
string>
    </array>
    <key>RunAtLoad</key>
    <true/>
    <key>NSUIElement</key>
    <string>1</string>
</dict>
```

FruitFly walkthrough

- processes.txt
  - Shows no matches for "client"
- persistence.txt
  - .client launched with PID 536

```
345   0  com.apple.UserEventAgent-Aqua
470   0  com.apple.followupd
-  0  com.apple.ReportPanic
536   0  com.client.client
403   0  com.apple.identityservicesd
407   0
com.apple.telephonyutilities.callserv
icesd
-  0  com.apple.DwellControl
```

FruitFly walkthrough

- processes.txt
  - Java was launched with PID 536
  - Is .client a shell script that runs Java? 🤔

```
USER               PID  PPID STARTED      TIME COMMAND
test               536     1  3:41PM   0:00.07 java
```

FruitFly walkthrough

- processes_files.txt
  - Process 536 listed as perl... `.client` must be a perl script!

```
COMMAND   PID    USER   FD      TYPE    DEVICE   SIZE/OFF   NODE NAME
perl5.18  536    test  txt       REG       1,4      52864 819599 /usr/bin/perl5.18
...
perl5.18  536    test    3r      REG       1,4      82947 916530 /Users/test/.client
```

FruitFly walkthrough

- fileinfo.txt
  - ~/.client created 2019-06-29 @ 19:38:47

Raw Flags	UID	GID	Mode (oct)	Created	Modified	Accessed	Path
0	501	20	100711	2019-06-29T 19:38:47	2019-06-29T 19:38:47	2019-06-29T 19:41:30	/Users/test/.client

FruitFly walkthrough

- history_*.txt, installs.txt, /Library/Receipts/InstallHistory.plist
  - A whole lot of nuthin'!
  - It doesn't look like this was downloaded/installed by the user

FruitFly walkthrough

- /Users/test/.bash_history
  - Evidence of manual installation!
  - Did the attacker have physical or remote access?
  - logout at the end suggests remote, but how can we be sure?

```
ls -al
ls -al
chmod +x .client
launchctl load Library/LaunchAgents/com.client.client.plist
ls -al Library/LaunchAgents
launchctl load Library/LaunchAgents/com.client.client.plist
ls -al Library/LaunchAgents
ls -al
chmod +x .client
launchctl load Library/LaunchAgents/com.client.client.plist
ls -al
launchctl list
launchctl list | grep -v com.apple
launchctl load Library/LaunchAgents/com.client.client.plist
launchctl load -w Library/LaunchAgents/
com.client.client.plist
launchctl list | grep -v com.apple
logout
```

FruitFly walkthrough

- system_logs.logarchive
  - `log show --start "2019-06-29 19:38:40+0000" --end "2019-06-29 19:39:00+0000" --timezone "00:00:00" --info --archive system_logs.logarchive`

```
2019-06-29 19:38:47.211236+0000 0x19ba     Info         0x0                  517    0
sshd: Postponed keyboard-interactive/pam for test from 192.168.1.8 port 58996 ssh2
[preauth]
...
2019-06-29 19:38:47.216254+0000 0x19ba     Info         0x0                  517    0
sshd: Accepted keyboard-interactive/pam for test from 192.168.1.8 port 58996 ssh2
2019-06-29 19:38:47.217026+0000 0x19bd     Info         0x0                  72     0
opendirectoryd: [com.apple.opendirectoryd:session] PID: 518, Client: 'sshd', exited with 0
session(s), 0 node(s) and 0 active request(s)
```

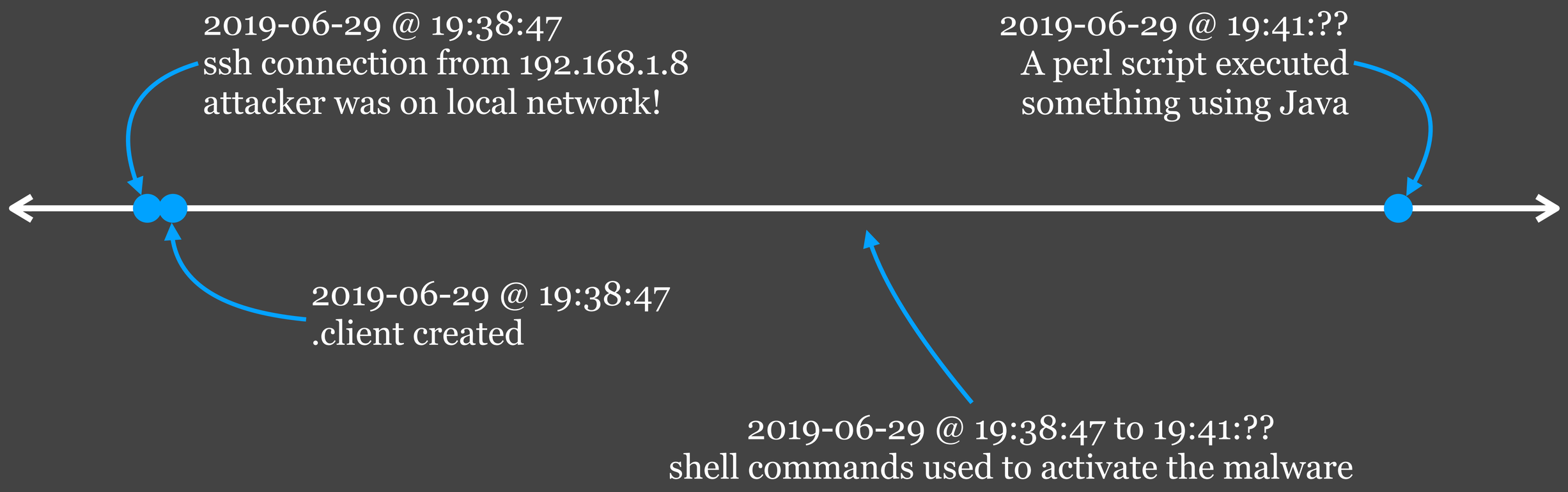
FruitFly walkthrough

Technical Details

The attack vector included the scanning and identification of externally facing Mac services to include the Apple Filing Protocol (AFP, port 548), RDP, VNC, SSH (port 22), and Back to My Mac (BTMM), which would be targeted with weak passwords or passwords derived from 3rd party data breaches.

Image captured from: http://files.constantcontact.com/41a82b1a001/49f05b25-7e3c-428b-bb9b-3535c757ffc6.pdf

FruitFly timeline



Questions?

slides ->