

# FORENSICATING THE APPLE TV

MATTIA EPIFANI – CLAUDIA MEDA

DFRWS 2018 EU

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## APPLE TV

- The Apple TV is a **digital media player** manufactured by Apple
- It can **receive digital data** from a number of sources and **stream it to a TV**
- As of March 2018, **6 models were produced**

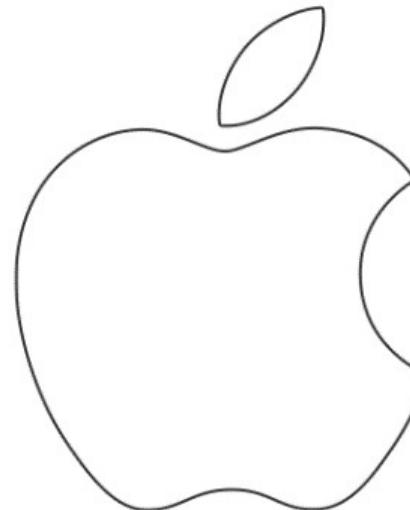
## APPLE TV – IDENTIFICATION

- Observe device appearance
- Check the label under the device
- Verify through device settings menu

Model number	Generation
A1218	I
A1378	II
A1427	III
A1469	III Rev.A
A1625	IV
A1842	4K

# APPLE TV – IDENTIFICATION

[HTTPS://SUPPORT.APPLE.COM/EN-US/HT200008](https://support.apple.com/en-us/HT200008)



Designed by Apple in California Assembled in China Model A1469 EMC 2633 100-240~ 50-60Hz 0.3A  
Complies with the Canadian ICES-003 Class B specifications. FCC ID: BCGA1469 IC: 579C-A1469



LISTED

Audio  
Video  
Product  
25WZ



Serial No.: X00XX0X0XXXX

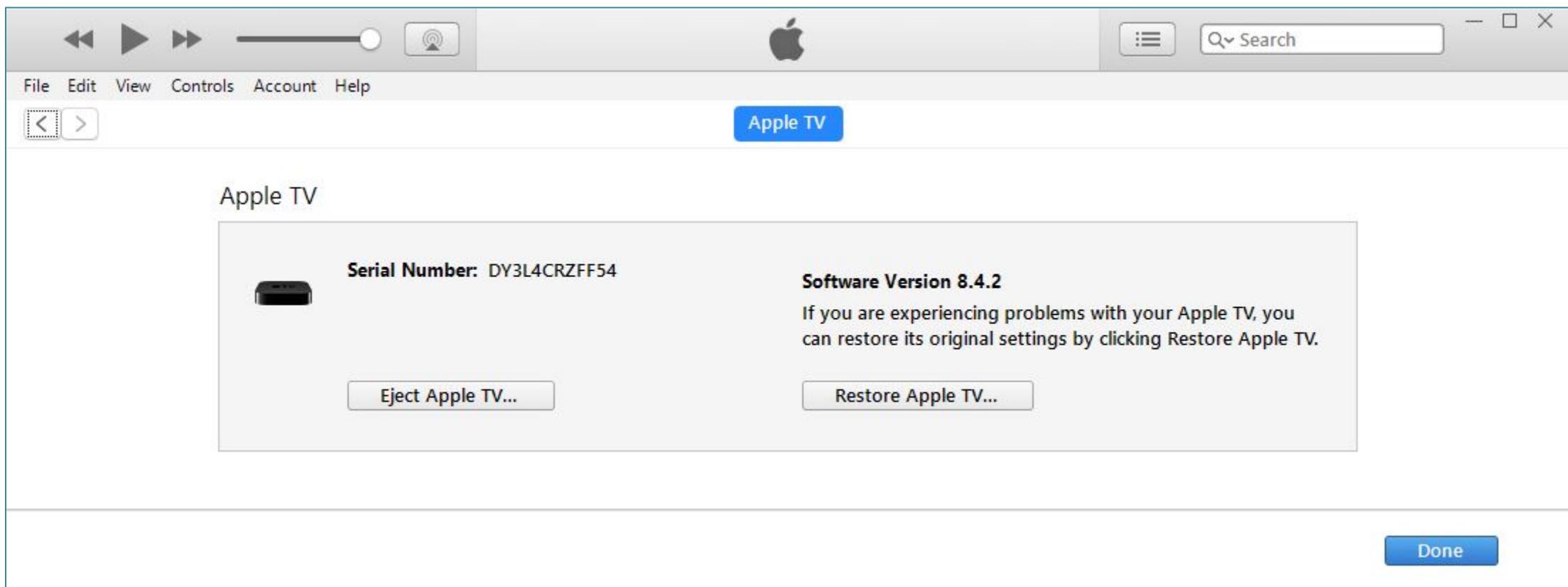
## APPLE TV – I° GENERATION – ACQUISITION AND ANALYSIS

- It contains a traditional Hard Drive that **can be extracted and imaged!**
- Traditional approach
- **“Hacking the Apple TV and Where Your Forensic Data Lives”**, Kevin Estis and Randy Robbins, Def Con 2009
- [https://www.defcon.org/images/defcon-17/dc-17-presentations/defcon-17-kevin\\_estis-apple\\_tv.pdf](https://www.defcon.org/images/defcon-17/dc-17-presentations/defcon-17-kevin_estis-apple_tv.pdf)
- <https://www.youtube.com/watch?v=z-WCy3Bdzkc>

## APPLE TV – II° – IV° GENERATION – ACQUISITION

- **Good news** → NO Passcode protection!
- **Bad news** → USB Port used only for “service and support”

# APPLE TV – II° – IV° GENERATION iTUNES CONNECTION



# APPLE TV – II° – IV° GENERATION MANUAL ACQUISITION

## Informazioni

<b>Nome</b>	Apple TV Mattia
<b>Modello</b>	A1469
<b>Numero di serie</b>	DY3L4CRZFF54
<b>Software Apple TV</b>	7.2 (7512)
<b>Risoluzione TV</b>	1080p HD - 60Hz
<b>Rete Wi-Fi</b>	NETGEAR13
<b>Indirizzo IP</b>	DHCP 192.168.1.4
<b>Indirizzo Wi-Fi</b>	a0:ed:cd:d7:12:7c
<b>Potenza segnale</b>	●●●○○

## APPLE TV – II° – IV° GENERATION USB ACQUISITION

- Not completely true that USB port is only for service and support...
- **Apple File Conduit (AFC) service is active!**
- We can access:
  - **Basic device information**
  - **Real Time Log (Syslog)**
  - Part of the **file system («Media» folder)**
  - **Crash Logs**

# APPLE TV – II° – IV° GENERATION – DEVICE INFORMATION

## IDEVICEINFO (HTTP://WWW.LIBIMOBILEDEVICE.ORG/)

```
C:\imobiledevice>ideviceinfo
ActivationState: Activated
BasebandStatus: NoTelephonyCapabilty
BluetoothAddress: a0:ed:cd:d7:12:7e
BoardId: 0
BrickState: false
BuildVersion: 12H606
CPUArchitecture: armv7f
ChipID: 35143
DeviceClass: AppleTV
DeviceColor: unknown
DeviceName: Apple TV Mattia
DevicePublicKey: LS0tLS1CRUdJTlBSU0Eg
Y0VCYWNhNEFlbjQ4amJ3K2w00WdlWVQ5MHNpU
XV4VFhyNDJ2dWpSZgo3c3E1UFztTy9ZUHVsN1
DieID: 15766959919149636
EthernetAddress: a0:ed:cd:d7:12:7d
Firmwareversion: iBoot-2261.30.3/
FirstFreePairExpired: true
HardwareModel: J33iAP
HardwarePlatform: s5l8947x
HostAttached: true
MLBSerialNumber: C0732951MPPF82PAG
ModelNumber: MD199
```

```
NonVolatileRAM:
auto-boot: dHJ1ZQ==
boot-args:
bootdelay: MA==
ota-brain-version: MTJIMzA1
ota-original-os-version: MTJINTIz
PartitionType:
PasswordProtected: false
ProductType: AppleTV3,2
ProductVersion: 8.4.2
ProductionSOC: true
ProtocolVersion: 2
RegionInfo: TY/A
SIMstatus: kCTSIMSupportSIMStatusReady
SerialNumber: DY3L4CRZFF54
SoftwareBundleVersion:
SupportedDeviceFamilies[1]:
0: 3
TelephonyCapability: false
TimeIntervalSince1970: 1505343643.302341
TimeZone: Europe/Rome
TimeZoneOffsetFromUTC: 7200.000000
TrustedHostAttached: true
UniqueChipID: 1538815294831
UniqueDeviceID: d2b0954284f3aeaada50a22b68d5e8b85166d8d5
UntrustedHostBUID: 30607839-76415530746167752
UseRaptorCerts: false
Uses24HourClock: false
WiFiAddress: a0:ed:cd:d7:12:7c
wirelessBoardSerialNumber: 35145C500BF
```

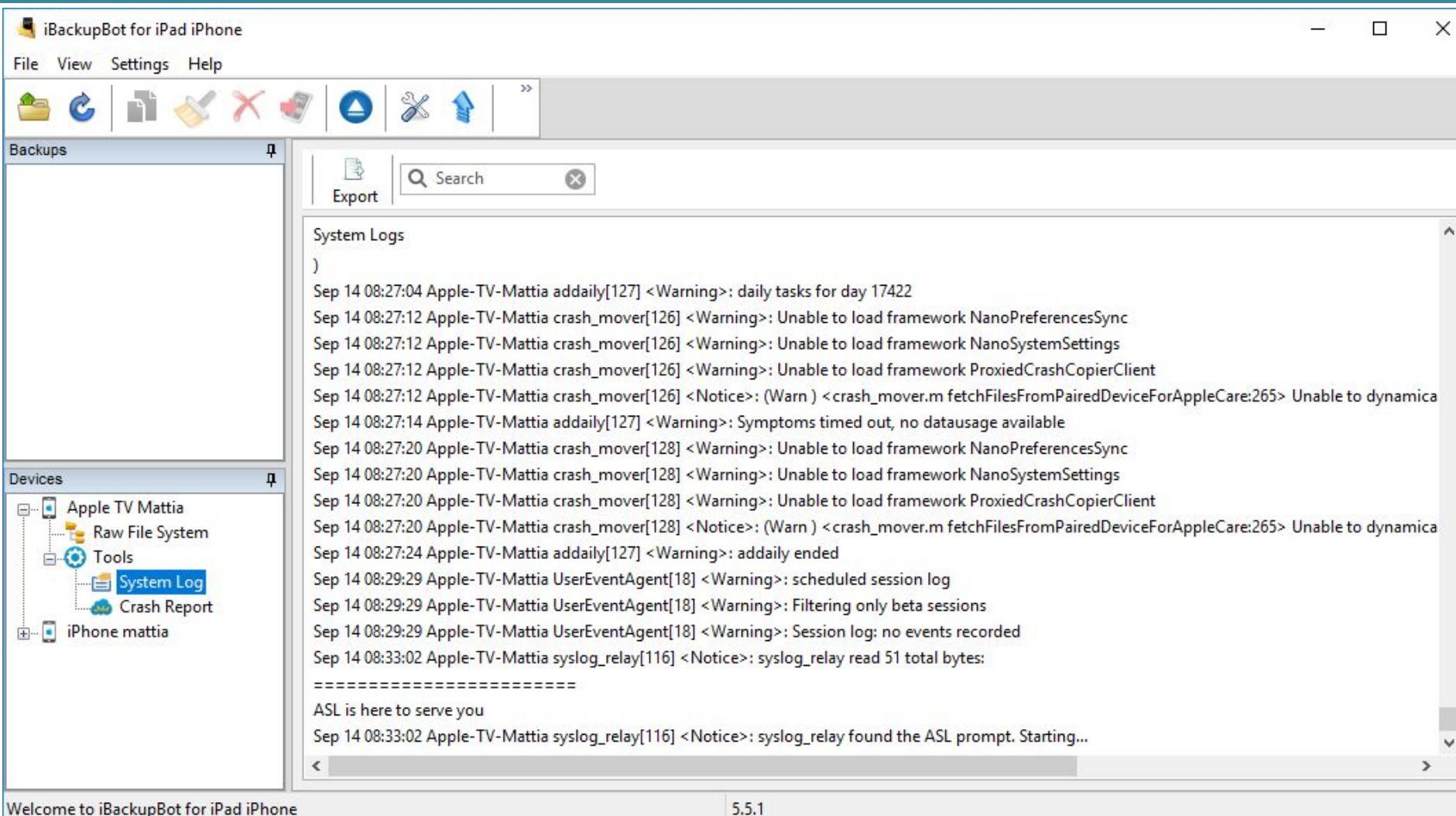
# APPLE TV – II° – IV° GENERATION – REAL TIME LOG IDEVICESYSLOG (HTTP://WWW.LIBIMOBILEDEVICE.ORG/)

```
Seleziona Prompt dei comandi - idevicesyslog

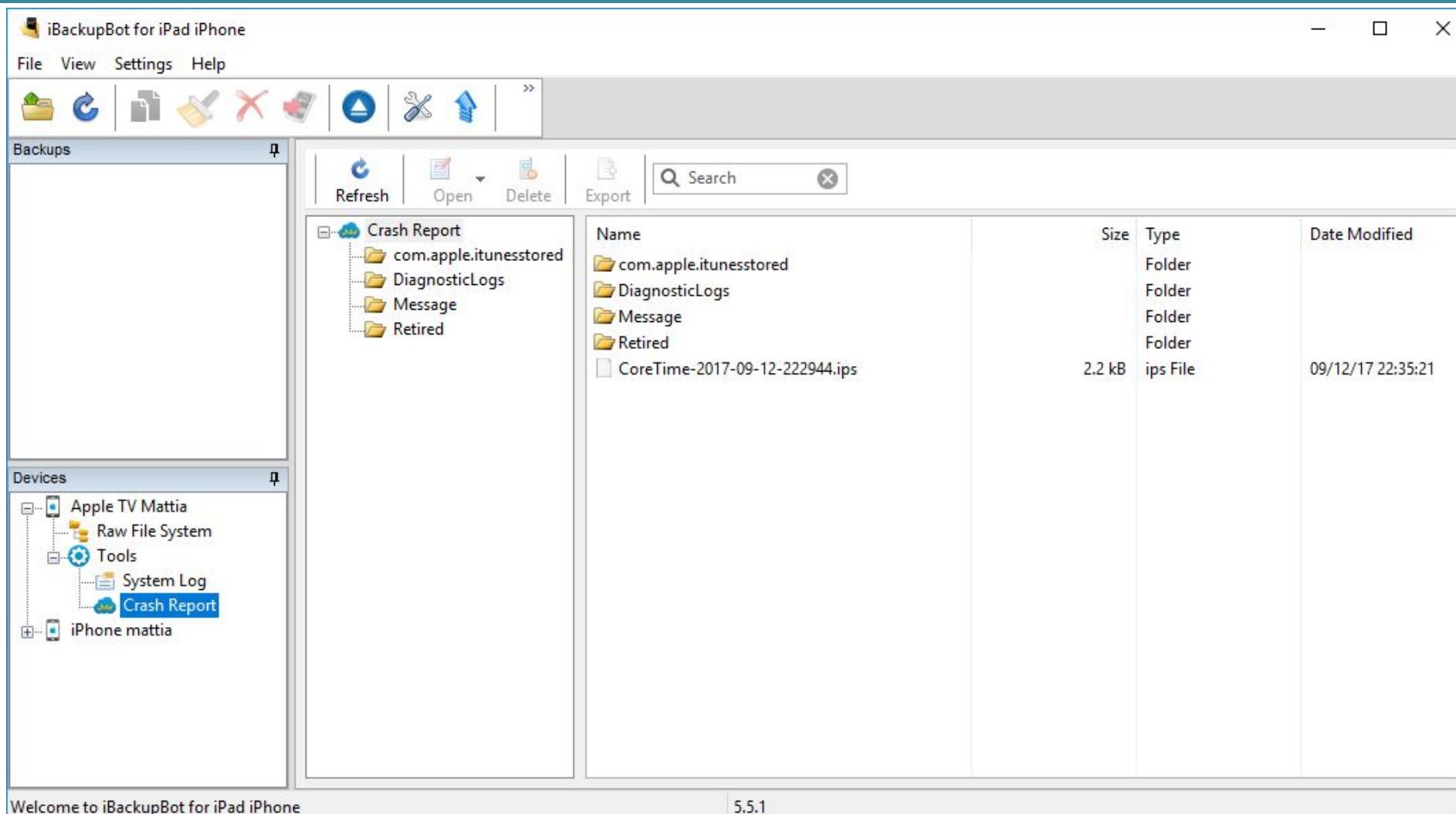
C:\imobiledevice>idevicesyslog
[connected]

Jan 1 01:00:23 Apple-TV-Mattia apsd[69] <Warning>: WiFi is associated NO
Jan 1 01:00:23 Apple-TV-Mattia wifiFirmwareLoader[43] <Warning>: WiFiUserClientCompleteMapping return 0
Jan 1 01:00:23 Apple-TV-Mattia wifiFirmwareLoader[43] <Warning>: wifiFirmwareLoaderThread exiting with 0
Jan 1 01:00:23 Apple-TV-Mattia wifiFirmwareLoader[43] <Warning>: Shutting down
Jan 1 01:00:24 Apple-TV-Mattia wifid[56] <Error>: WiFi:[-978307175.980007]: Disable WoW requested by "apsd"
Jan 1 01:00:24 Apple-TV-Mattia kernel[0] <Notice>: 000025.236306 wlan0.A[12] AppleBCMWLanCore::configureTrgDis
c(): Disabling Enhanced Trigger Disconnect Mode
Jan 1 01:00:24 Apple-TV-Mattia kernel[0] <Notice>: 000025.236384 wlan0.N[13] AppleBCMWLanCore::setupDriver():
State 0x30
Jan 1 01:00:24 Apple-TV-Mattia kernel[0] <Notice>: 000025.316365 wlan0.A[14] AppleBCMWLanCore::setupDriver():
Core Driver Initialization Time 25.316331541
Jan 1 01:00:24 Apple-TV-Mattia kernel[0] <Notice>: 000025.316539 wlan0.A[15] AppleBCMWLanIOReporting::init():
Provider 0xc8106000, name AppleBCMWLanCore
Jan 1 01:00:24 Apple-TV-Mattia kernel[0] <Notice>: bpfAttach len 60 dlt 12
Jan 1 01:00:24 Apple-TV-Mattia kernel[0] <Notice>: en1::finishAttachToDataLinkLayer name <en1> successful atta
ch to bpf type 147
Jan 1 01:00:24 Apple-TV-Mattia backboardd[45] <Notice>: 1970-01-01 01:00:24.037627 AM [AppleTVIR] Initializing
Jan 1 01:00:24 Apple-TV-Mattia backboardd[45] <Notice>: ___IOHIDSessionScheduleAsync_block_invoke: thread_id=
0x1cf0000
Jan 1 01:00:24 Apple-TV-Mattia backboardd[45] <Notice>: HID Session async scheduling initiated.
Jan 1 01:00:24 Apple-TV-Mattia backboardd[45] <Notice>: HID Session async root queue running at priority 63 an
d schedule 2.
```

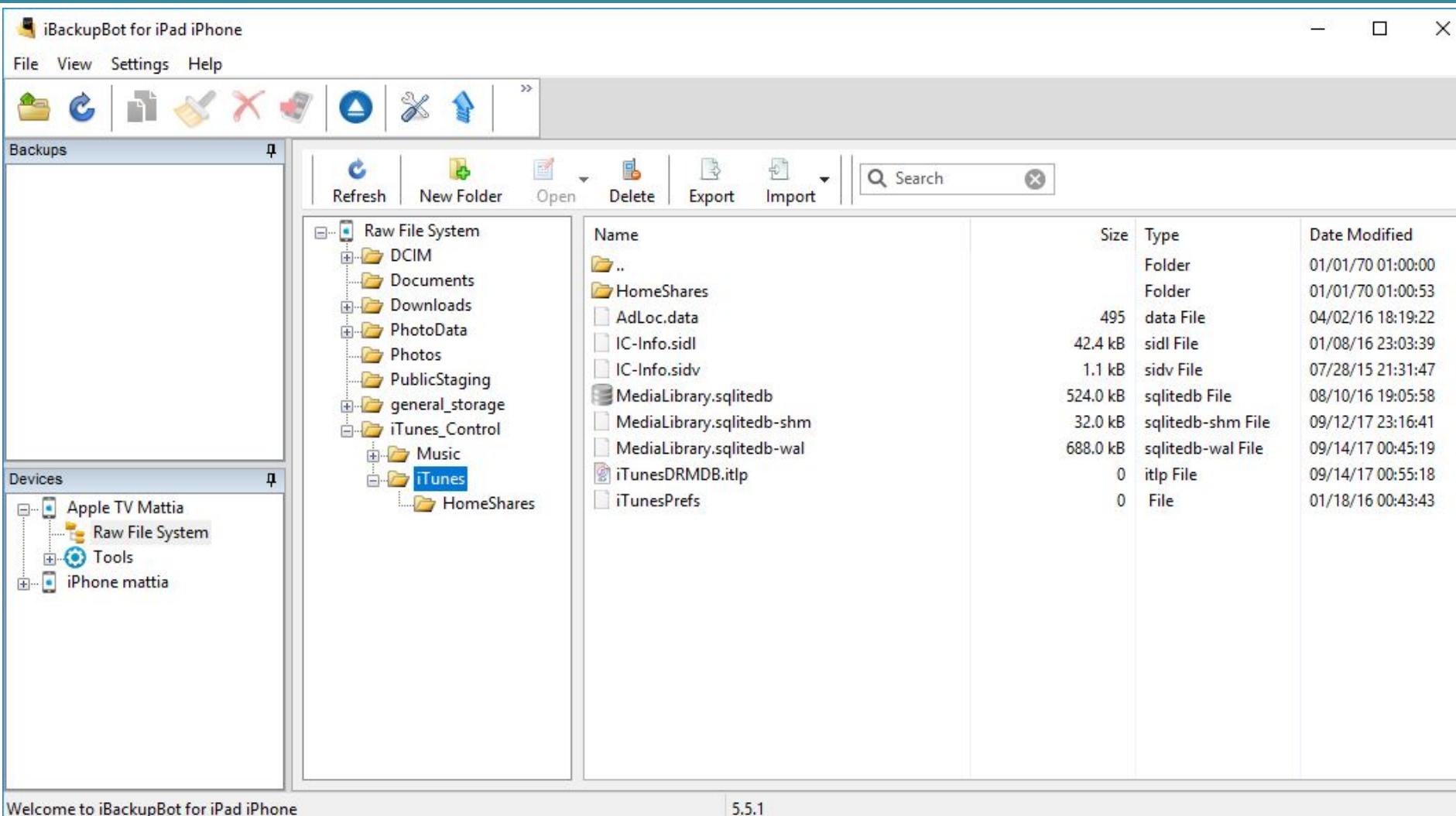
# APPLE TV – II° – IV° GENERATION IBACKUPBOT (HTTP://WWW.ICOPYBOT.COM)



# APPLE TV – II° – IV° GENERATION IBACKUPBOT (HTTP://WWW.ICOPYBOT.COM)



# APPLE TV – II° – IV° GENERATION IBACKUPBOT (HTTP://WWW.ICOPYBOT.COM)



# APPLE TV – II° – IV° GENERATION ELCOMSOFT IOS FORENSIC TOOLKIT (3.0)

```
C:\WINDOWS\system32\cmd.exe
Welcome to Elcomsoft iOS Forensic Toolkit
This is driver script version 3.0/Win for A5+
(c) 2011-2018 Elcomsoft Co. Ltd.

Write device info to file <ideviceinfo.xml>:

Write installed applications list to file <applications.txt>:

Write full installed applications info to file <applications.xml>:

Getting basic device info...

Getting installed applications list...

Getting full installed applications info...

Device info is written to ideviceinfo.xml
Installed applications list is written to applications.txt
Full installed applications info is written to applications.xml

Press 'Enter' to continue
```

```
C:\WINDOWS\system32\cmd.exe
Welcome to Elcomsoft iOS Forensic Toolkit
This is driver script version 3.0/Win for A5+
(c) 2011-2018 Elcomsoft Co. Ltd.

Write files to directory <current directory>:

Copying file /DCIM/100APPLE/iOS Forensics.pptx: OK
Copying file /Downloads/downloads.28.sqlitedb: OK
Copying file /general_storage/iOS Forensics.pptx: OK
Copying file /iTunes_Control/iTunes/AdLoc.data: OK
Copying file /iTunes_Control/iTunes/IC-Info.sidl: OK
Copying file /iTunes_Control/iTunes/IC-Info.sidv: OK
Copying file /iTunes_Control/iTunes/MediaLibrary.sqlitedb: OK
Copying file /iTunes_Control/iTunes/MediaLibrary.sqlitedb-shm: OK
Copying file /iTunes_Control/iTunes/MediaLibrary.sqlitedb-wal: OK
Copying file /iTunes_Control/iTunes/iTunesDRMDB.itlp: OK
Copying file /iTunes_Control/iTunes/iTunesPrefs: OK

Copying finished

Statistics:
    Total files: 11
    Copy OK: 11
    Copy FAILED: 0

Press 'Enter' to continue
```

# APPLE TV

## III° GENERATION

**III-generation Apple TV**  
**Model A1469**

General Information	Network Information	AirPlay Information	Remote Control Information
Name	Wi-Fi MAC address	Devices used	iPhone
Model number	Bluetooth MAC Address	Type	iPad
Serial Number	IP configuration	Name	Telecontrol
OS version	Signal power		Keyboard
Time-zone	Network used		
Date and time			

# APPLE TV

## III° GENERATION

III-generation Apple TV  
Model A1469

Artifacts	Information
Real Time Log	iCloud Account Name
	iCloud ID
Crash Log	Wi-Fi networks
	Device usage timeline
MediaLibrary.sqlitedb	Shopping database

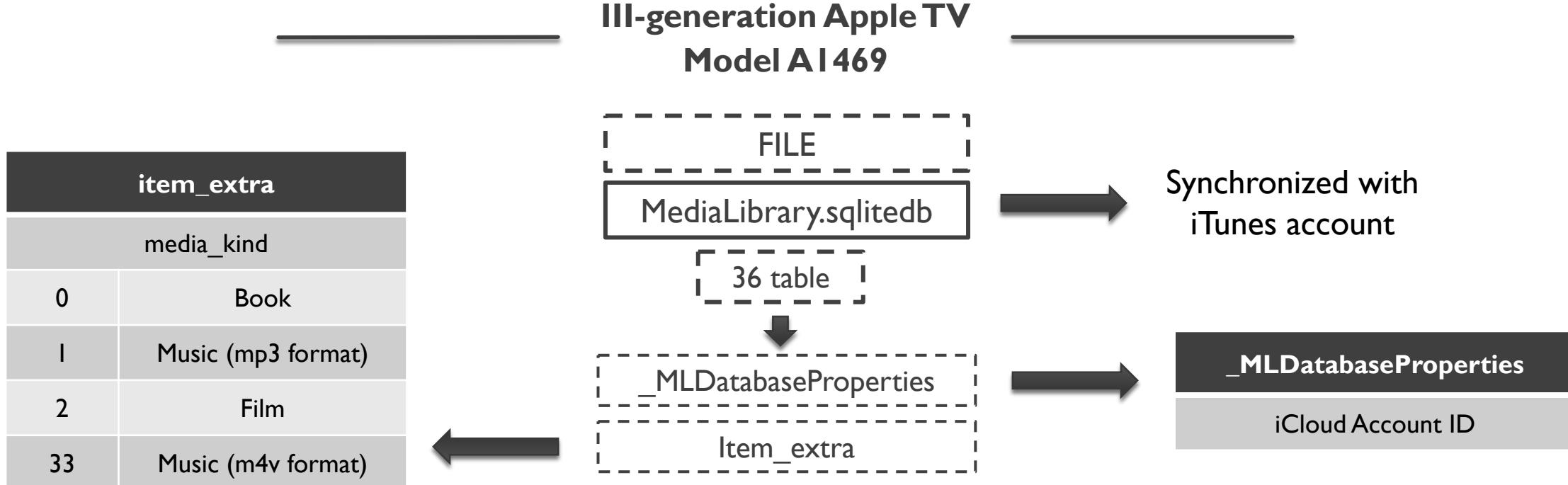
# APPLE TV

## III° GENERATION

### III-generation Apple TV Model A1469

```
Aug 12 00:03:07 Apple-TV-Mattia identityservicesd[34] <Warning>:  
[Warning] Device identity is not expired  
Aug 12 00:03:07 Apple-TV-Mattia identityservicesd[34] <Warning>:  
[Warning] Registration failed for Registration info (0x15dc42d0):  
[Registered: NO] [Type: AppleID] [Device Name: (null)] [Service  
Type: com.apple.private.alloy.multiplex1] [Env: (null)] [Main ID:  
[REDACTED]@hotmail.it] [Phone Number: [REDACTED]@hotmail.it] [AppleID:  
[REDACTED]@hotmail.it] [UserID: E:[REDACTED]@hotmail.it] [C2K: NO] [Push  
Token: <c4c34f84 f773b25c a69bfefb 677a7b6b c0a578a5 8fe2adc3  
11efe04a 996b5351>] [Region ID: R:IT] [Base Number: +390000000000]  
[URIs: ()] [Candidates: ([REDACTED]@hotmail.it, +3900000000)] [Auth  
Cert: 0x0] [Reg Cert: 0x0] [Profile ID: D:1321761630] [Auth User ID:  
(null)] [Heartbeat Date: (null)] (Error: 17)  
Aug 12 00:03:07 Apple-TV-Mattia identityservicesd[34] <Warning>:  
[Warning] Failed, invalid password => Disabling service
```

# APPLE TV MEDIA LIBRARY

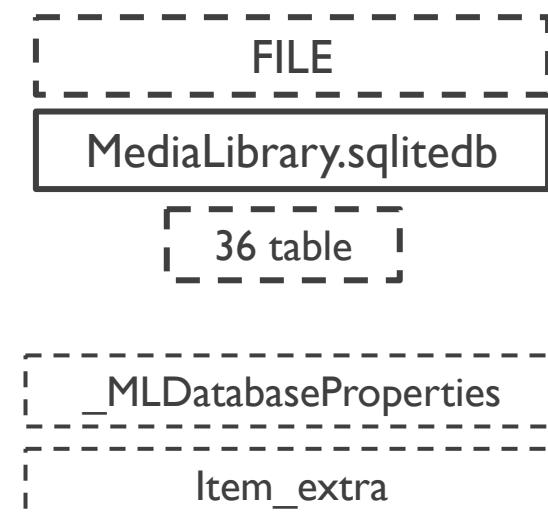


# APPLE TV MEDIA LIBRARY

III-generation Apple TV  
Model A1469

```
| select
|   ext.title,
|   ext.total_time_ms,
|   ext.file_size,
|   sto.account_id,
|   strftime('%d/%m/%Y %H:%M:%S',
|     datetime(sto.date_purchased +
|       978307200,'unixepoch')) date_purchased,
|   sto.store_item_id
|
| from item_extra ext
| join item_store sto using(item_pid)
| where ext.media_kind = 1;
```

SQL  
query



# APPLE TV – IV° GENERATION – JAILBREAKING

[HTTPS://WWW.THEIPHONEWIKI.COM/WIKI/JAILBREAK](https://www.theiphonewiki.com/wiki/Jailbreak)

**9.x**

tvOS	Jailbreak Tool	Tool Version	Device
			Apple TV (4th generation)
9.0	Pangu9	1.0.0	Yes
9.0.1	Pangu9	1.0.0	Yes
9.1	No Tool Available		No
9.1.1	No Tool Available		No
9.2	No Tool Available		No
9.2.1	No Tool Available		No
9.2.2	No Tool Available		No

**10.x**

tvOS	Jailbreak Tool	Tool Version	Device
			Apple TV (4th generation)
10.0	LiberTV	1.0	Yes
10.0.1	LiberTV	1.0	Yes
10.1	LiberTV	1.0	Yes
10.1.1	No Tool Available		No
10.2	No Tool Available		No
10.2.1	No Tool Available		No
10.2.2	greeng0blin	1.1	Yes

**11.x**

tvOS	Jailbreak Tool	Tool Version	Device
			Apple TV (4th generation) Apple TV 4K
11.0	LiberTV	1.1	Yes
11.1	LiberTV	1.1	Yes
11.2	No Tool Available		No
11.2.1	No Tool Available		No
11.2.5	No Tool Available		No
11.2.6	No Tool Available		No

# APPLE TV JAILBREAKING (IV GENERATION)

## Requirements

- Mac Computer
  - El Capitan 10.11+
  - Xcode
- Apple TV 4
  - tvOS 9.0-9.0.1
- USB-C Cable
- Apple Development Membership (\$99)

## Procedures

1. Download [atvjb.zip](#) [2]
  - a. Extract Files
2. Acquire Apple TV 4 **UDID**
  - a. Launch Xcode
  - b. Navigate to: Windows | Devices
  - c. Select Your TV
  - d. Record Identifier (**UDID**)
3. Register Apple TV
  - a. Enroll in the Apple Developer Program [3]
  - b. Login to Apple Development Center [4]
  - c. Create name, enter **UDID**, and register
4. Register new App ID [5]
  - a. Enter Name, enter **Bundle ID**, and register

## 5. Generate mobile provision file [6]

- a. Select tvOS App Development and click continue
- b. Create your developer certificate
  - i. Choose iOS App Development
- c. Select your Apple TV and click continue
- d. Enter Profile Name and click continue
- e. Download to jailbreak folder and rename as *embedded.mobileprovision*

## 6. Query **Common Name** and **Team ID**

- a. Open Keychain Access app
- b. Select "Certificates" in the category section
- c. Open property page of your developer certificate
  - i. iPhone Developer = **Common Name**
  - ii. Subject Organization Unit = **Team ID**

## 7. Run install script

a. `./Install_atv_jb.sh <UDID> <Bundle ID> <Team ID>` "iPhone Developer: <Common Name ID>"

## 8. Create a Forensic Image [7]

- a. System Partition: `ssh root@<IP address of Apple TV> dd if=/dev/disk0s1s1 conv=noerror,sync | dd of=AppleTV.img`
- b. User Partition: `ssh root@<IP address of Apple TV> tar -cpf - /private/var/ >User.tar`
- c. Password: alpine



Apple TV 从此无界

**PANGU JAILBREAK**

For iOS 9.0-9.1 / tvOS 9.0-9.0.1

atv Download  
Version 1.0.0 - Size 9.3M

## METHODOLOGY

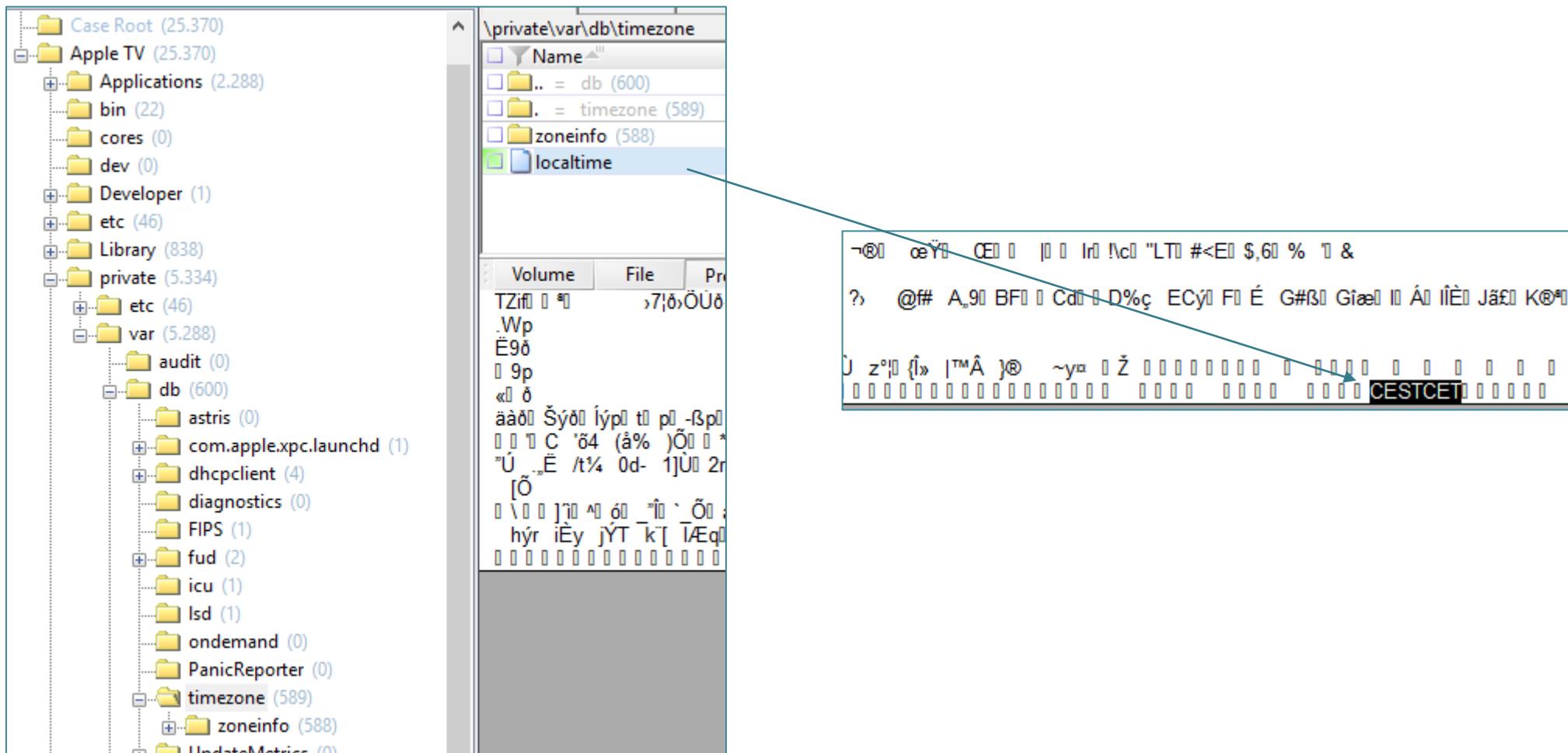
- <https://twitter.com/imarcusthompson/status/715941070543126528>

# APPLE TV

## FILE SYSTEM LAYOUT - /

```
Apple-TV:/ root# ls -la /
total 539
drwxrwxr-t 14 root      admin      816 Dec 31 1969 .
drwxrwxr-t 14 root      admin      816 Dec 31 1969 ..
d-wx-wx-wt@ 2 _unknown _unknown   68 Oct 16 2015 .Trashes
----- 1 root      admin      0 Sep 30 2015 .file
drwx----- 2 _unknown _unknown   136 May  1 18:44 .fsevents
-rw-r--r-- 1 root      admin      0 Dec 31 1969 .pg_inst
drwxrwxr-x 26 root     admin     884 Oct 16 2015 Applications
drwxrwxr-x  3 root     admin     102 Apr 23 14:23 Developer
drwxrwxr-x 13 root     admin     578 Apr 23 14:23 Library
drwxr-xr-x  3 root     wheel    102 Sep 30 2015 System
drwxr-xr-x  2 root     wheel    816 Apr 23 14:23 bin
drwxrwxr-t  2 root     admin     68 Sep 30 2015 cores
dr-xr-xr-x  3 root     wheel   1233 Dec 31 1969 dev
lrwxr-xr-x  1 root     admin      11 Oct 16 2015 etc -> private/etc
-rwrxr-xr-x  1 root     admin    259488 Apr 23 14:23 pguntether
drwxr-xr-x  4 root     wheel    136 Oct 23 2015 private
drwxr-xr-x  2 root     wheel    612 Apr 23 14:23 sbin
lrwxr-xr-x  1 root     admin      15 Oct 16 2015 tmp -> private/var/tmp
drwxr-xr-x  9 root     wheel    306 Apr 23 14:23 usr
lrwxr-xr-x  1 root     admin      11 Oct 16 2015 var -> private/var
```

# TIMEZONE /PRIVATE/VAR/DB/TIMEZONE/LOCALTIME



# NETWORK TCP/IP LEASE /PRIVATE/VAR/DB/DHCPCCLIENT/LEASES/

The screenshot illustrates the structure of network lease files on a Mac OS X system. It shows a file browser view and a detailed plist representation of a lease entry.

**File Browser View:**

- Left pane: A tree view of the file system structure under `/private/var/db/dhcpcclient/leases`:
  - dev (0)
  - Developer (1)
  - etc (46)
    - asl (26)
    - dropbear (2)
    - ppp (0)
    - racoon (3)
    - rc.d (1)
  - Library (838)
  - private (5,334)
    - etc (46)
    - var (5,288)
      - audit (0)
      - db (600)
        - astris (0)
        - com.apple.xpc.launchd (1)
        - dhcpcclient (4)
          - leases (1)

\private\var\db\dhcpcclient\leases	
Name	Type
.. = dhcpcclient (4)	
. = leases (1)	
en1-1,d0%3A3%3A4b%3Ae6%3A47%3A2c	plist

IPAddress  
192.168.1.3

LeaseLength  
86400

LeaseStartDate  
2016-10-20T18:36:46Z

PacketData  
AgEGAMWNG3EAAgAAAAA  
AAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAA  
AQT//8AAwTAqAEBBgTAqAE

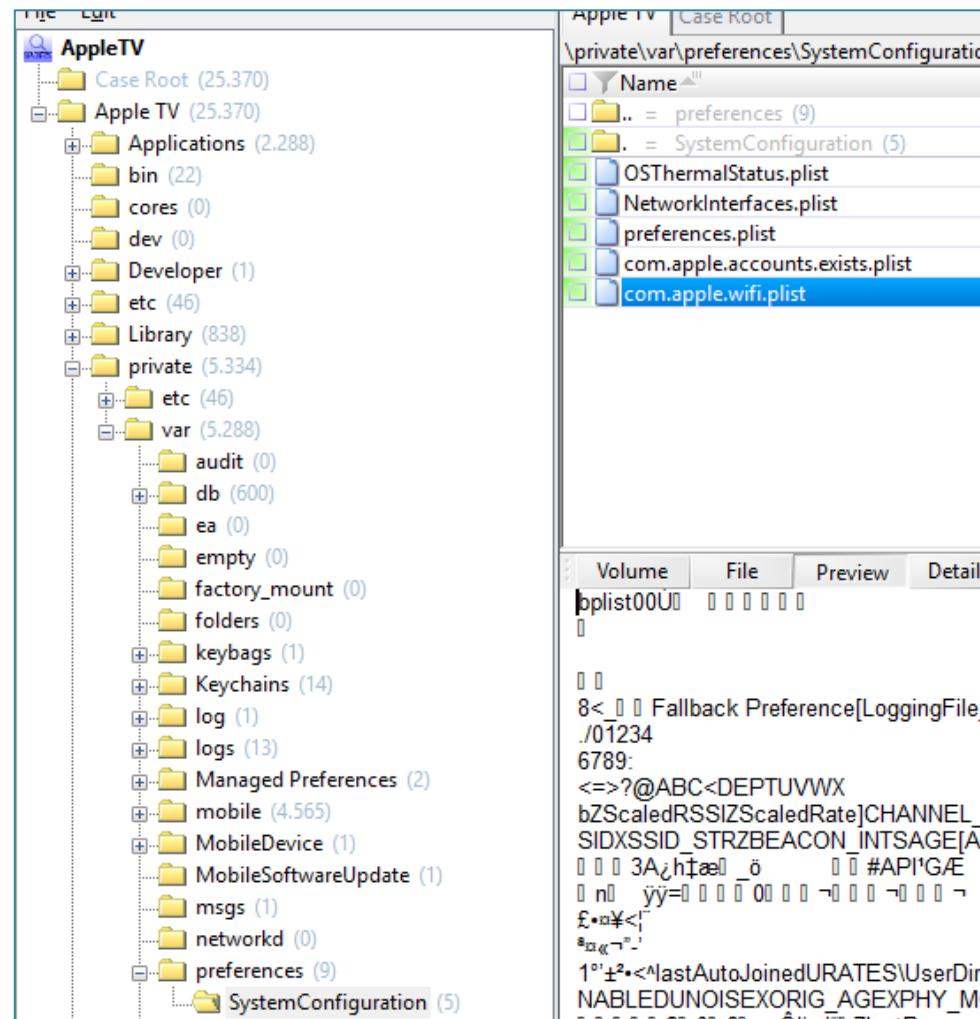
RouterHardwareAddress  
CL1DaB9I

RouterIPAddress  
192.168.1.1

SSID  
NETGEAR13

# NETWORK WI-FI HISTORY

## /PRIVATE/VAR/PREFERENCES/COM.APPLE.WIFI.PLIST



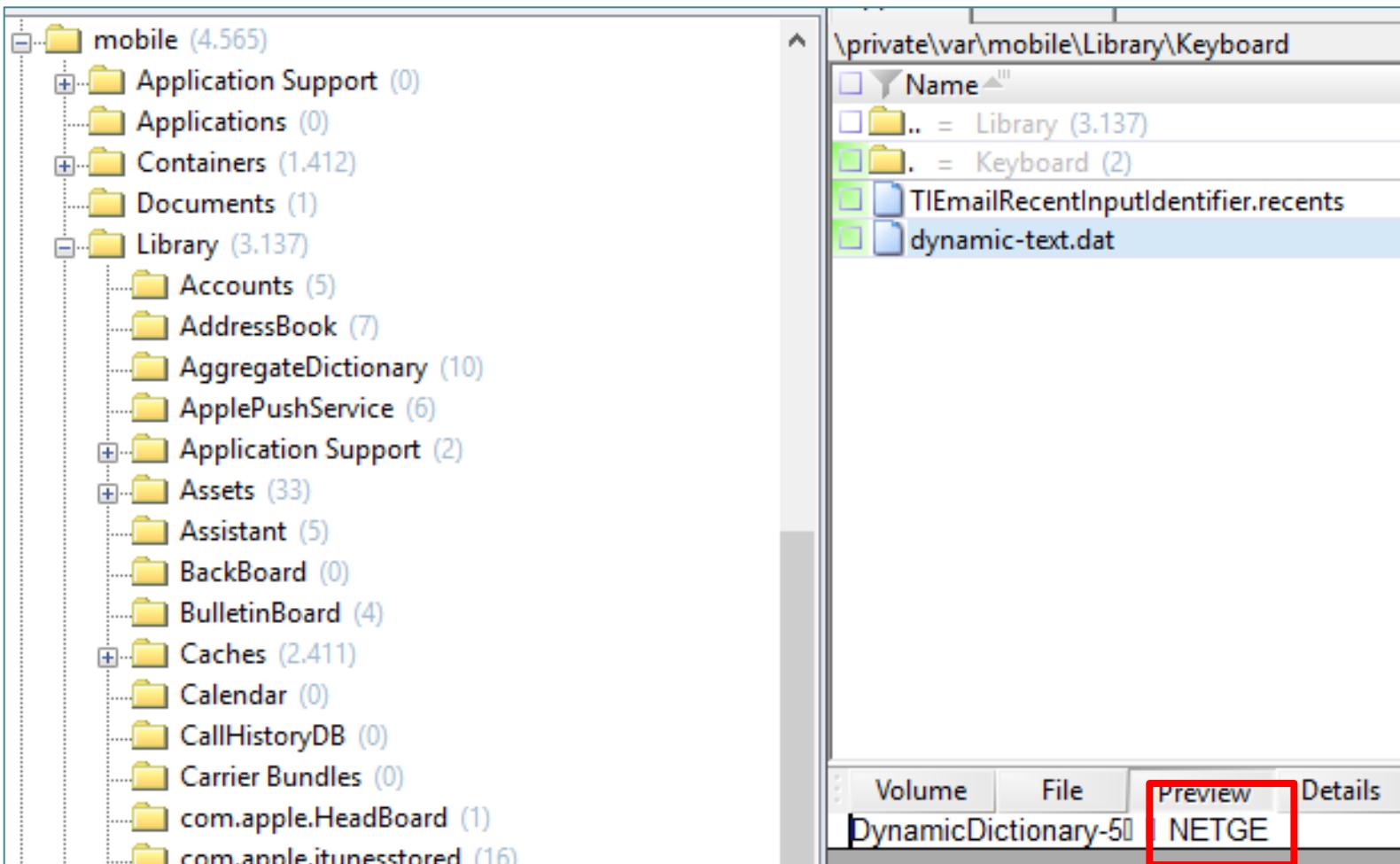
# NETWORK WI-FI HISTORY

Variable	Type	Value
<b>List of known networks</b>		
ScaledRSSI	dict	
ScaledRate	real	0.953168
CHANNEL_FLAGS	integer	1.000000
CAPABILITIES	integer	12
lastAutoJoined	date	1041
SCAN_RESULT_FROM_PROBE_RSP	date	2017-09-12 23:23:50
CHANNEL	integer	true
networkUsage	real	6
UserDirected	boolean	4269797.121467
RSSI	integer	false
NOISE	integer	-32
80211W_ENABLED	integer	-95
WiFiManagerKnownNetworksEventType	boolean	true
BSSID	string	1
lastJoined	string	8:bd:43:0:0:0
SNR	date	2016-10-20 20:36:41
SSID	integer	35
SSID_STR	data	...
BEACON_INT	string	NETGEAR13
AGE	integer	20
ASSOC_FLAGS	integer	3040
CHANNEL_WIDTH	integer	1
RATES	integer	40
networkKnownBSSListKey	array	
Strength	array	0.953168
PHY_MODE	real	16
IE	integer	...
AP_MODE	data	2
RSN_IE	integer	...
FT_ENABLED	dict	2
ORIG_AGE	boolean	real
WiFiManagerKnownNetworksEventType	integer	1.000000

<b>List of known networks</b>	array
lastAutoJoined	dict
RATES	dict
UserDirected	date
networkKnownBSSListKey	array
RSN_IE	boolean
SCAN_RESULT_FROM_PROBE_RSP	dict
SSID	array
SSID_STR	date
Strength	string
80211W_ENABLED	real
CAPABILITIES	...
BEACON_INT	boolean
AGE	1297
SNR	integer
ASSOC_FLAGS	20
EXT_CAPS	integer
ScaledRSSI	2562
FT_ENABLED	integer
NOISE	35
ORIG_AGE	integer
PHY_MODE	1
RSSI	0.901090
BSSID	true
80211D_IE	0
CHANNEL	...
AP_MODE	2562
ScaledRate	144
networkUsage	49
CHANNEL_WIDTH	integer
IE	string
lastJoined	8:dc:96:0:0:0
CHANNEL_FLAGS	0
WiFiManagerKnownNetworksEventType	40

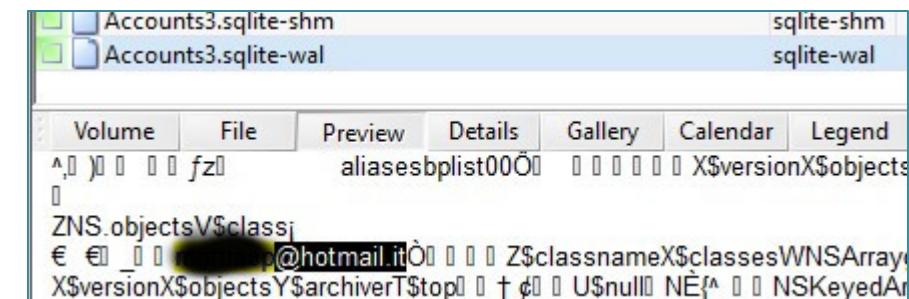
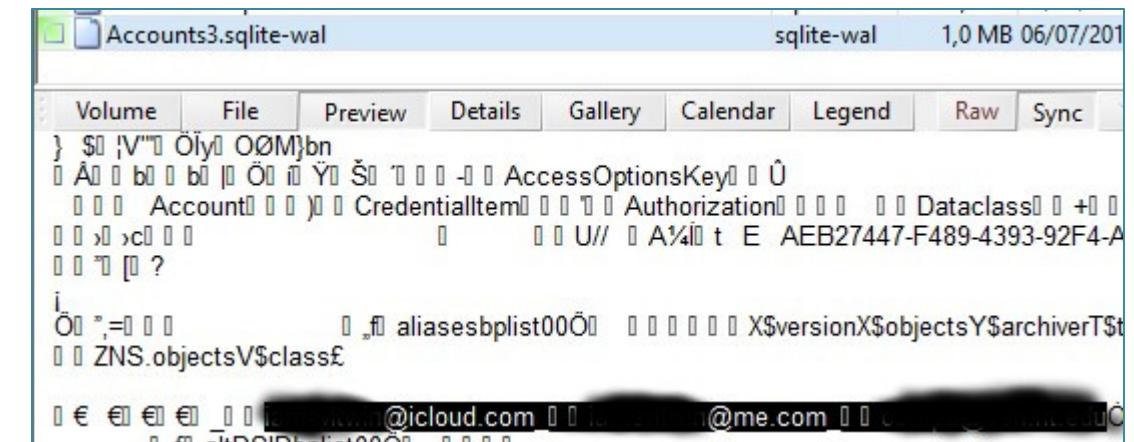
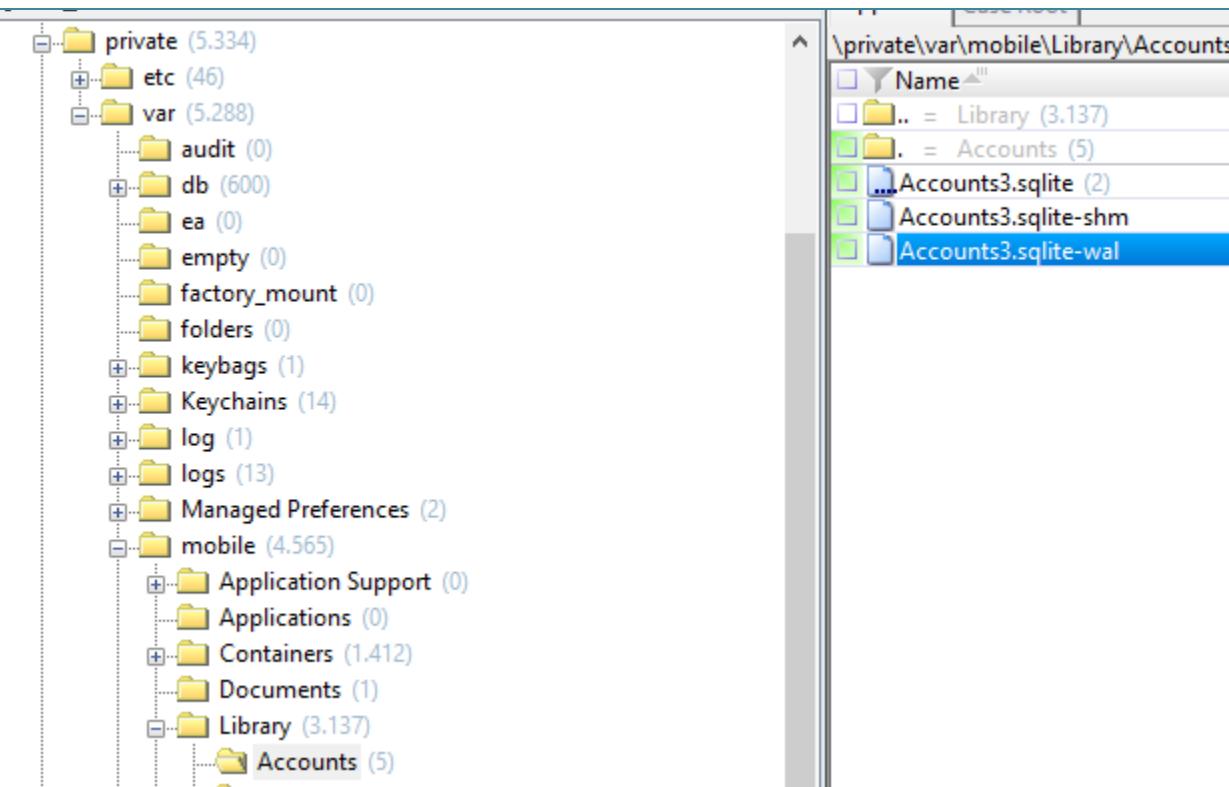
# KEYBOARD DICTIONARY

## /PRIVATE/VAR/MOBILE/LIBRARY/KEYBOARD/DYNAMIC-TEXT.DAT



# ACCOUNTS

## /PRIVATE/Var/Mobile/Library/Accounts/



# ACCOUNTS

/PRIVATE/VAR/MOBILE/LIBRARY/PREFERENCES/COM.APPLE.IDS.SERVICE.COM

```
<string>init.ess.apple.com</string>
<key>Aliases</key>
<array>
    <dict>
        <key>Alias</key>
        <string>[REDACTED]@hotmail.it</string>
        <key>Status</key>
        <integer>3</integer>
    </dict>
    <dict>
        <key>Alias</key>
        <string>+393[REDACTED]</string>
        <key>Status</key>
        <integer>3</integer>
    </dict>
</array>
<key>UserDisabled</key>
<false/>
<key>AuthID</key>
<string>D:[REDACTED]</string>
<key>HasEverRegistered</key>
```

## ICLOUD “SYNCED PREFERENCES”

/var/mobile/Library/SyncedPreferences/

### Wi-Fi Access Points

- com.apple.wifid.plist

### Weather Cities

- com.apple.nanoweatherprefsd.plist

# WI-FI ACCESS POINTS

## /PRIVATE/VAR/MOBILE/LIBRARY/SYNCEDPREFERENCES/COM.APPLE.WIFID.PLIST

Key	Type	Value
All in One 2	dict	
_EDI FREE WiFi	dict	
Grands_2_1	dict	
Maggiemays Customer	dict	
Pango-Feliz	dict	
Linkem For Hotel Liberta'	dict	
hotspot - Salina	dict	
HotelPalazzuolo-1	dict	
PirelliBS	dict	
HMONTREAL1a	dict	
muscatairport	dict	
Ibis	dict	
C2_Residence_F3	dict	
swisscom	dict	
Inerhole Wireless	dict	
Littys Hotel	dict	
value	dict	
WEP	boolean	false
IS_NETWORK_CONFIGURED	boolean	false
BSSID	string	24:65:11:5b:32:f2
AP_MODE	integer	2
IS_NETWORK_EXPIRABLE	boolean	false
UserDirected	boolean	false
IS_NETWORK_CAPTIVE	boolean	false
added_by	string	EpiPhone
WPA_IE	dict	
RSN_IE	dict	
enabled	boolean	true
IS_NETWORK_CUSTOMIZED	boolean	false
IS_NETWORK_EAP	boolean	false
added_at	string	Oct 2 2015 15:15:38
SSID_STR	string	Littys Hotel
remotevalue	data	...
timestamp	integer	467633952

# WI-FI ACCESS POINTS

## /PRIVATE/VAR/MOBILE/LIBRARY/SYNCEDPREFERENCES/COM.APPLE.WIFID.PLIST

**Network Search**

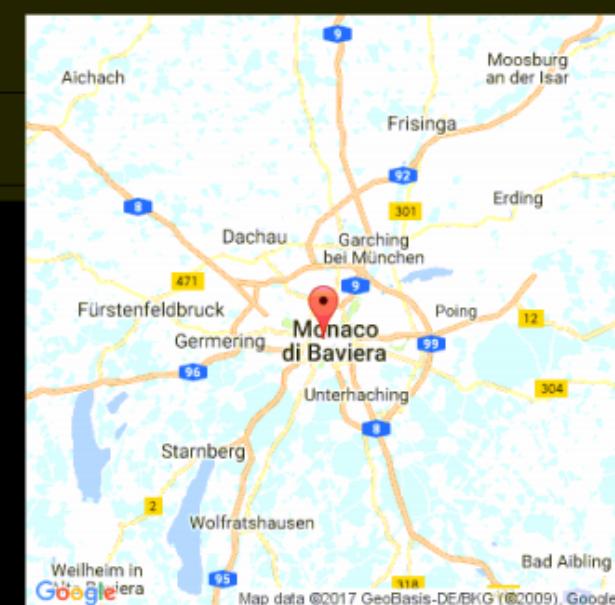
General Search Network Detail

Set coordinates by address...

Address: 1060 W Addison St, Chicago, IL 60613, USA

Update Search Parameters

Network Location



Click for interactive map

<< | showing records 1 to 1 | >>

Map	Net ID	SSID	Name	Type	First Seen	Most Recently	Crypto	Est. Lat	Est. Long	Channel	Bcn Int.	QoS
map	24:65:11:5B:32:F2	Littys Hotel		infra	2012-08-01T00:07:06.000Z	2016-09-20T13:50:51.000Z	WPA	48.13635635	11.55999966	1	0	7

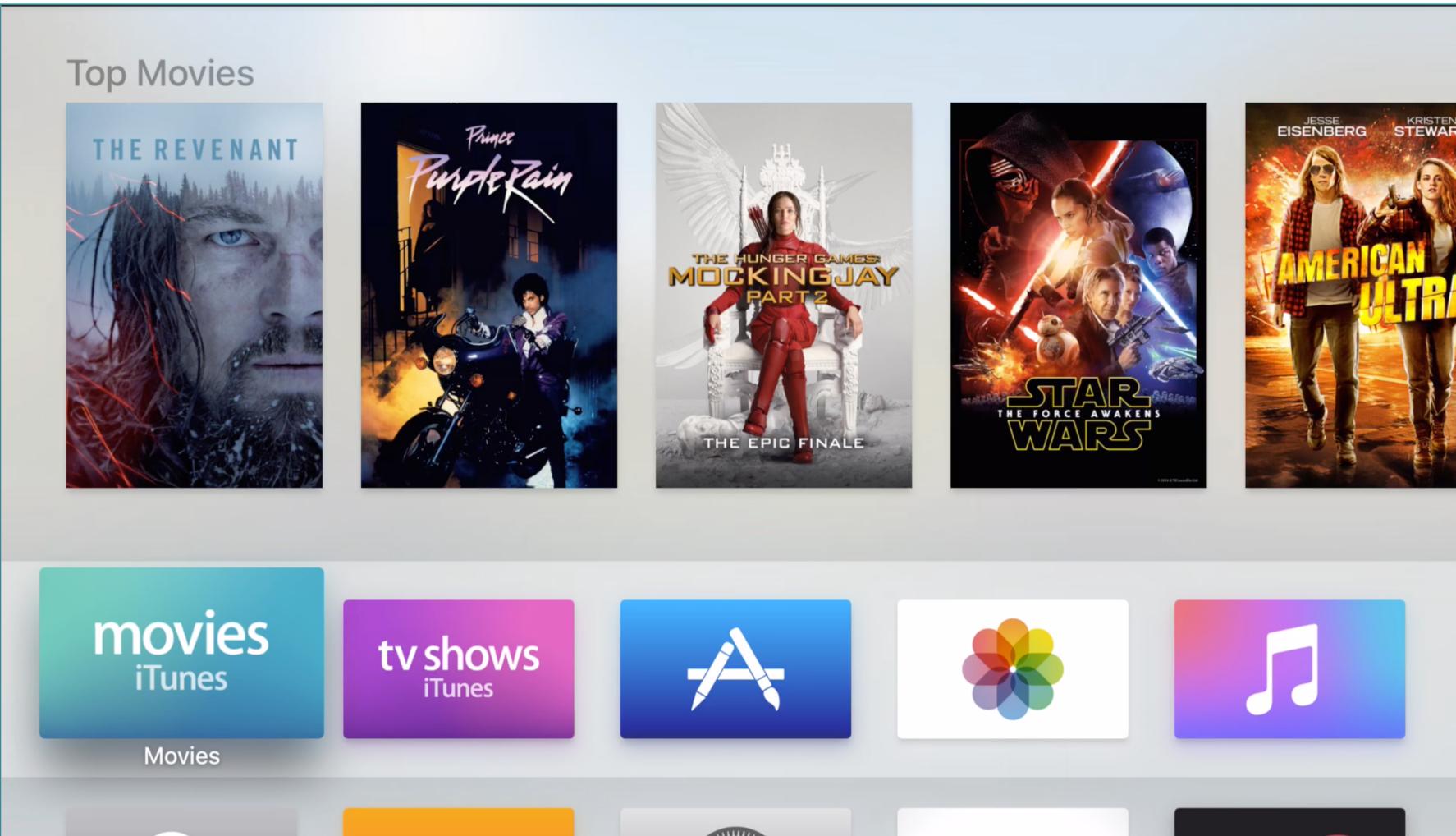
# WEATHER CITIES

/PRIVATE/VAR/MOBILE/LIBRARY/SYNCEDPREFERENCES/COM.APPLE.NANOWEATHERPREFSD.PLIST

Key	Type	Value
Root	dict	
initialsync	integer	1
journal	dict	
changecount	integer	4
versionid	string	FT=-@RU=a7a8aff4-f9c
values	dict	
CloudCities	dict	
CloudCities_v2.0	dict	
value	array	
dict	dict	
CityName	string	Genova
Latitude	real	44.419998
Longitude	real	8.910000
dict	dict	
CityName	string	Santa Marina Salina
Latitude	real	38.560001
Longitude	real	14.870000
dict	dict	
CityName	string	Milan
Latitude	real	45.479999
Longitude	real	9.180000
dict	dict	
CityName	string	Rome
Latitude	real	41.900001
Longitude	real	12.500000
dict	dict	
CityName	string	Florence
Latitude	real	43.779999
Longitude	real	11.240000

# HEADBOARD

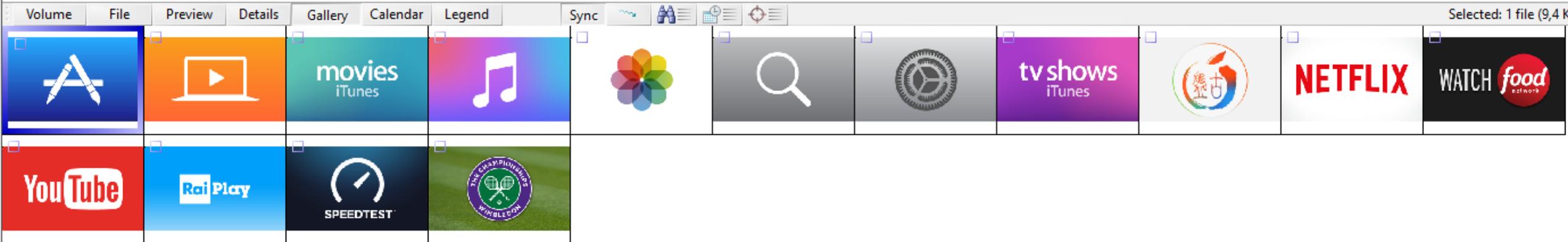
/PRIVATE/VAR/MOBILE/LIBRARY/COM.APPLE.HEADBOARD/APPOORDER.PLIST



# HEADBOARD

/PRIVATE/VAR/MOBILE/LIBRARY/CACHES/COM.APPLE.TVICONSCACHE/COM.APPLE.HEADBOARD

Name	Type	Size	Created	Modified	Record changed	Attr.	1st sector	Analysis	Report tab	Comments
.. = com.apple.TVIconsCache (24)		615 KB	16/09/2017 00:58:51	16/09/2017 00:58:54						
. = com.apple.HeadBoard (15)		414 KB	16/09/2017 00:58:51	16/09/2017 00:58:54						
com.apple.TVAppStore-807e3f153a556677f83d52843faea394-466673089.000000	png	9,4 KB	16/09/2017 00:58:51	23/04/2016 22:28:42		A		0% skin tones		
com.apple.TVHomeSharing-79deb4302c018c2a107cd71321df236b-466673089.000000	png	4,7 KB	16/09/2017 00:58:51	23/04/2016 22:28:42		A		86% skin tones		
com.apple.TVMovies-4dac223be956ac2af54d07be5ee5f1a9-466673089.000000	png	36,0 KB	16/09/2017 00:58:52	23/04/2016 22:28:42		A		0% skin tones		
com.apple.TVMusic-b86bc26da1097a99cc32e781d32cd77c-466673089.000000	png	34,5 KB	16/09/2017 00:58:52	23/04/2016 22:28:42		A		0% skin tones		
com.apple.TVPhotos-7ef0d7864eac625c8df7fea1d49b328c-466673089.000000	png	17,7 KB	16/09/2017 00:58:52	23/04/2016 22:28:42		A		6% skin tones		
com.apple.TVSearch-e928b15a2846d3c1d474e2cf6c4c4e04-466673088.000000	png	8,2 KB	16/09/2017 00:58:52	23/04/2016 22:28:42		A		0% skin tones		
com.apple.TVSettings-215061a70f98604c137126165114be1b-466673089.000000	png	25,4 KB	16/09/2017 00:58:52	23/04/2016 22:28:42		A		0% skin tones		
com.apple.TVShows-26ba7eebca2f73339f1fb079bd22e5ff-466673089.000000	png	40,5 KB	16/09/2017 00:58:52	23/04/2016 22:28:42		A		0% skin tones		
com.dfir.atvjb2-0654818b24c33b62b2b072d13c91bc21-483139056.000000	png	27,7 KB	16/09/2017 00:58:52	23/04/2016 23:17:38		A		2% skin tones		
com.netflix.NFLIX-ae559914bb1912743ccf81463185872c-493866956.000000	png	19,4 KB	16/09/2017 00:58:53	26/08/2016 03:15:58		A		4% skin tones		
com.foodnetwork.tveverywhere-3d639b8d3f1cbbe484fed6c35bad18ed-4938669...	png	25,5 KB	16/09/2017 00:58:53	26/08/2016 03:16:00		A		10% skin tones		
com.google.ios.youtube-59bf59acbda7ebb17c95600445528ed8-521060847.000000	png	9,9 KB	16/09/2017 00:58:53	06/07/2017 21:14:27		A		4% skin tones		
it.rainet.ipad.raity-99075012feb9584e4e067f0f0d324da0-521060763.000000	png	13,5 KB	16/09/2017 00:58:54	06/07/2017 21:14:27		A		0% skin tones		
com.ookla.speedtest-9f37feb7a82ad74c992355412c103832-521061471.000000	png	40,4 KB	16/09/2017 00:58:54	06/07/2017 21:19:46		A		0% skin tones		
com.ibm.wim09-92a7312951659c1056cebb01d1385ddb-521061947.000000	png	101 KB	16/09/2017 00:58:53	06/07/2017 21:26:50		A		0% skin tones		



# HEADBOARD

/PRIVATE/VAR/MOBILE/LIBRARY/CACHES/COM.APPLE.HEADBOARD/FSCACHEDDATA

\\private\\var\\mobile\\Library\\Caches\\com.apple.HeadBoard\\fsCachedData							20 days ago
	Name	Type	Size	Created	Modified		
.. = com.apple.HeadBoard (323)			58,0 MB	06/07/2017 22:30:18	06/07/2017 22:30:53	06/07/2017 22:30:53	06/07/2017 22:30:53
= fsCachedData (89)			7,0 MB	06/07/2017 22:30:53	06/07/2017 22:31:07	06/07/2017 22:31:07	06/07/2017 22:31:07
2DD01A91-A5BA-4209-8C0F-9FE82703F505	jpg	59,1 KB	06/07/2017 22:30:54	23/04/2016 22:32:24	23/04/2016 22:32:24	23/04/2016 22:32:24	23/04/2016 22:32:24
6A0A9077-AA8B-454C-A3CF-6F953F29214B	jpg	114 KB	06/07/2017 22:30:56	23/04/2016 22:38:20	23/04/2016 22:38:20	23/04/2016 22:38:20	23/04/2016 22:38:20
8B748007-D9F8-452E-8809-1FDD53CDE00E	jpg	155 KB	06/07/2017 22:30:58	23/04/2016 22:38:20	23/04/2016 22:38:20	23/04/2016 22:38:20	23/04/2016 22:38:20
962E8988-326C-4CA2-B0B3-288C8D7CC20B	jpg	107 KB	06/07/2017 22:30:58	23/04/2016 22:38:20	23/04/2016 22:38:20	23/04/2016 22:38:20	23/04/2016 22:38:20
4052EF61-5A98-4BA6-8950-73B9BB01B39C	jpg	89,1 KB	06/07/2017 22:30:56	23/04/2016 22:38:42	23/04/2016 22:38:42	23/04/2016 22:38:42	23/04/2016 22:38:42
067F07FC-C2D3-4E81-82B4-6C40C24F6D52	jpg	80,3 KB	06/07/2017 22:30:54	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
2573308A-B4B0-4725-8692-8D8738035F04	jpg	68,8 KB	06/07/2017 22:30:54	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
385CC2BE-3E46-44A1-80F0-B7B6F9AE4EC0	jpg	46,8 KB	06/07/2017 22:30:54	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
3E5FCC21-7EDB-4D78-8E77-B5C6E74D4557	jpg	65,8 KB	06/07/2017 22:30:56	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
45AA2400-175C-404B-84C0-BB231C979124	jpg	76,1 KB	06/07/2017 22:30:56	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
7278807F-D0E6-4FOB-98A1-047395E2EA51	jpg	87,2 KB	06/07/2017 22:30:57	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
837095B1-517C-489A-999C-882116E3BD2F	jpg	31,8 KB	06/07/2017 22:30:58	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
97AE9065-D5B4-4677-BB6F-0132247F8AAB	jpg	33,7 KB	06/07/2017 22:30:58	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
A82E17F2-34C6-4BE8-BDE1-B40CF7D37763	jpg	47,8 KB	06/07/2017 22:30:58	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21
AC6935F8-409B-432F-86FE-8468A6ADEDD7	jpg	92,1 KB	06/07/2017 22:30:58	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21	23/04/2016 22:39:21

# APP SNAPSHOTS

/PRIVATE/VAR/MOBILE/LIBRARY/CACHES/COM.APPLE.PINEBOARD/ASSETLIBRARY/SNAPSHOTS/

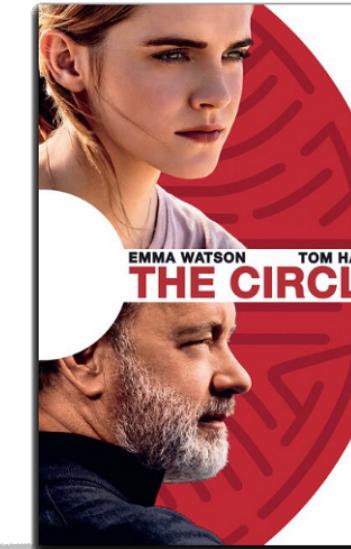
Name	Type	Category	Size	Created	Modified	Record changed	Attr.	1st sector	Analysis	Report tabl	Com
<b>1 \private\var\mobile\Library\Caches\com.apple.PineBoard\AssetLibrary\Snapshots</b>											
.. = AssetLibrary (15)											
.. = Snapshots (15)											
com.apple.TVShows	png	Pictures	1,5 MB	06/07/2017 22:31:03	23/04/2016 22:44:46		A		3% skin tones	Screenshot?	
com.foodnetwork.tveverywhere	png	Pictures	1,6 MB	06/07/2017 22:31:04	25/04/2016 01:30:41		A		2% skin tones	Screenshot?	
com.dfir.atvjb2	png	Pictures	119 KB	06/07/2017 22:31:04	02/05/2016 03:43:40		A		0% skin tones	Screenshot?	
it.rainet.ipad.raity	png	Pictures	1,3 MB	06/07/2017 22:31:05	17/10/2016 23:57:02		A		1% skin tones	Screenshot?	
com.apple.TVMusic	png	Pictures	822 KB	06/07/2017 22:31:02	06/07/2017 21:22:35		A		1% skin tones	Screenshot?	
com.apple.TVHomeSharing	png	Pictures	35,5 KB	06/07/2017 22:31:02	13/07/2017 01:05:00		A		b/w	Screenshot?	
com.google.ios.youtube	png	Pictures	1,0 MB	06/07/2017 22:31:05	09/09/2017 23:20:02		A		3% skin tones	Screenshot?	
com.apple.TVAppStore	png	Pictures	1,0 MB	06/07/2017 22:31:02	09/09/2017 23:21:22		A		2% skin tones	Screenshot?	
com.apple.TVSearch	png	Pictures	89,6 KB	06/07/2017 22:31:03	09/09/2017 23:21:25		A		b/w	Screenshot?	
com.netflix.NFLX	png	Pictures	102 KB	06/07/2017 22:31:05	09/09/2017 23:21:57		A		0% skin tones	Screenshot?	
com.ibm.wim09	png	Pictures	1,6 MB	16/09/2017 00:51:58	09/09/2017 23:22:15		A		8% skin tones	Screenshot?	
com.apple.TVPhotos	png	Pictures	63,4 KB	06/07/2017 22:31:03	12/09/2017 23:25:55		A		b/w	Screenshot?	
com.apple.TVMovies	png	Pictures	429 KB	06/07/2017 22:31:02	12/09/2017 23:28:06		A		1% skin tones	Screenshot?	
com.apple.TVSettings	png	Pictures	115 KB	06/07/2017 22:31:03	12/09/2017 23:40:10		A		b/w	Screenshot?	
com.apple.HeadBoard	png	Pictures	1,8 MB	06/07/2017 22:31:02	16/09/2017 00:47:03		A		6% skin tones	Screenshot?	

# HEADBOARD SNAPSHOTS

Purchased



Top Films



**movies**  
iTunes

Movies



# TVMOVIES SNAPSHOTS

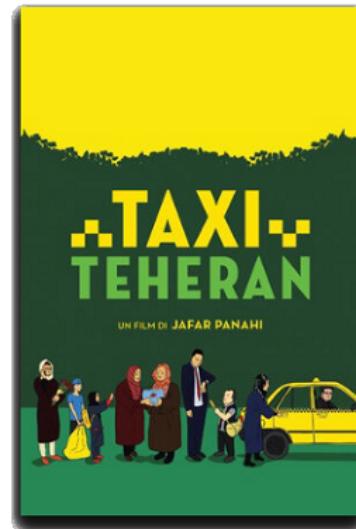
Purchased

Top Films

Genres

Recommended

Search



# CACHED VIDEO

/PRIVATE/VAR/MOBILE/LIBRARY/CACHES/APPLETV/VIDEO/

# CACHED VIDEO

/PRIVATE/VAR/MOBILE/LIBRARY/CACHES/APPLETV/VIDEO/

# INSTALLED APPLICATIONS

## /PRIVATE/VAR/DB/LSD/COM.APPLE.LSDIDENTIFIERS.PLIST

The screenshot shows a file system browser and a plist editor side-by-side.

**File System Browser:** On the left, under the path \private\var\db\lsd, the com.apple.lsidentifiers.plist file is selected.

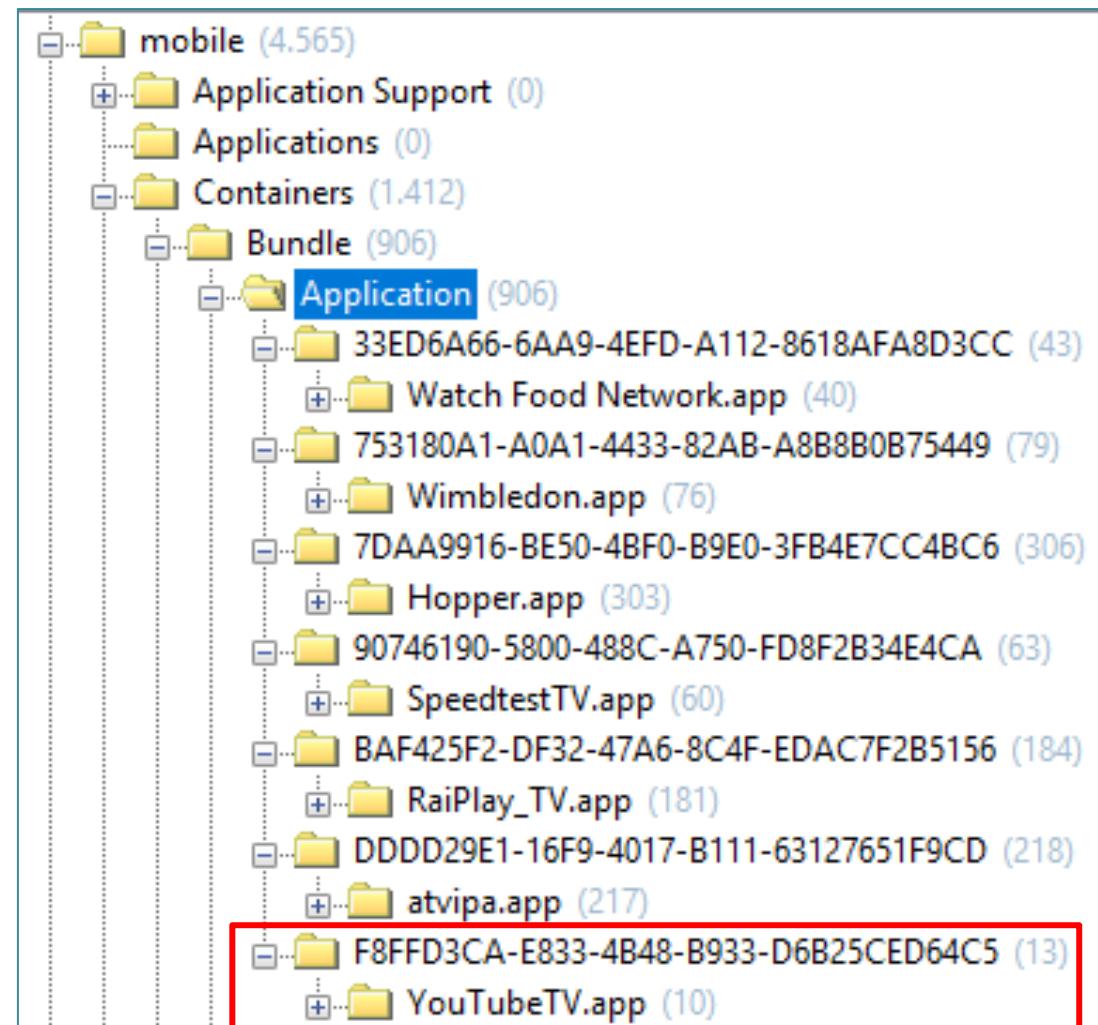
**Plist Editor:** On the right, the XML View of the com.apple.lsidentifiers.plist file is displayed. The table lists various application entries, each containing vendor information and a list of installed applications.

Key	Type	Value
Root	dict	
LSVendors	dict	
RAI - Radio Televisione Italiana S.p.A.	dict	C7836D00-43CC-4D36-AFED-1029190EF006
LSVendorIdentifier	string	
LSApplications	array	
string	string	it.rainet.ipad.raity
BundleID:com.dfir	dict	
Rai Net	dict	
Television Food Network G.P.	dict	
BundleID:com.apple	dict	
Google, Inc.	dict	C2121CBA-1F21-493D-800D-1469993450D7
LSVendorIdentifier	string	
LSApplications	array	
string	string	com.google.ios.youtube
The All England Lawn Tennis Club	dict	
Ookla	dict	
LSVendorIdentifier	string	996DCF1C-13B6-4F56-83FC-6D269C2FF585
LSApplications	array	
string	string	com.ookla.speedtest
Netflix, Inc.	dict	
LSAdvertiserIdentifier	string	94B09305-CBEA-45CD-B5C4-881F4120908C

A red box highlights the entry for Google, Inc., and a blue arrow points from the file system browser to this highlighted entry.

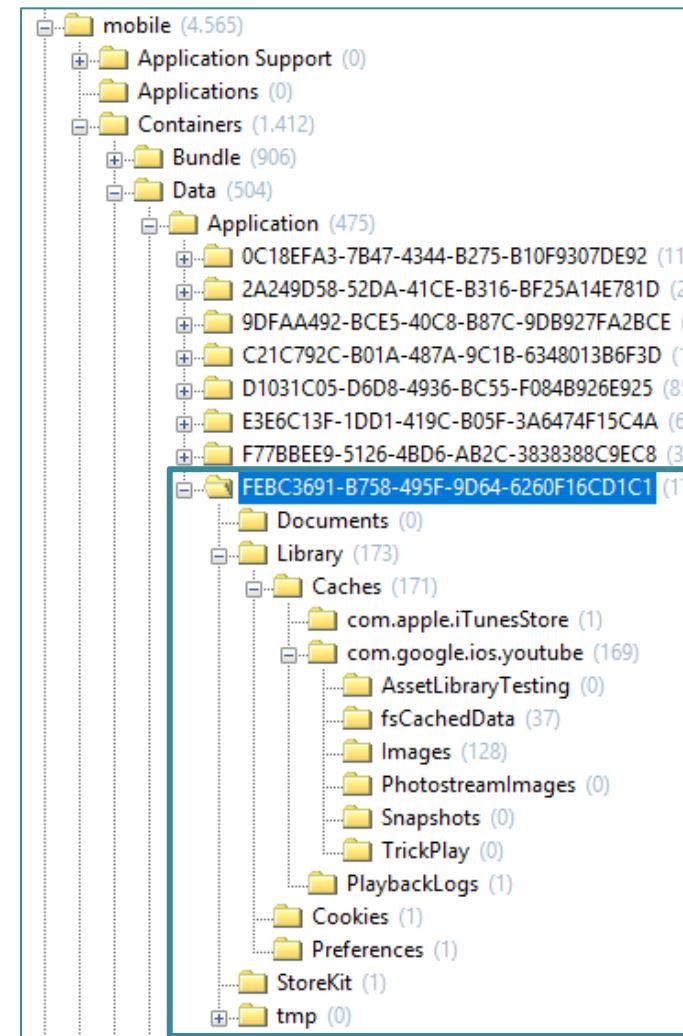
# INSTALLED APPLICATIONS

## /PRIVATE/VAR/MOBILE/CONTAINERS/BUNDLE/



# INSTALLED APPLICATIONS

## /PRIVATE/VAR/MOBILE/CONTAINERS/DATA/APPLICATION/



# INSTALLED APPLICATIONS

## YOUTUBE

The screenshot shows a file browser interface with a tree view on the left and a detailed view on the right.

**Left Panel (File Tree):**

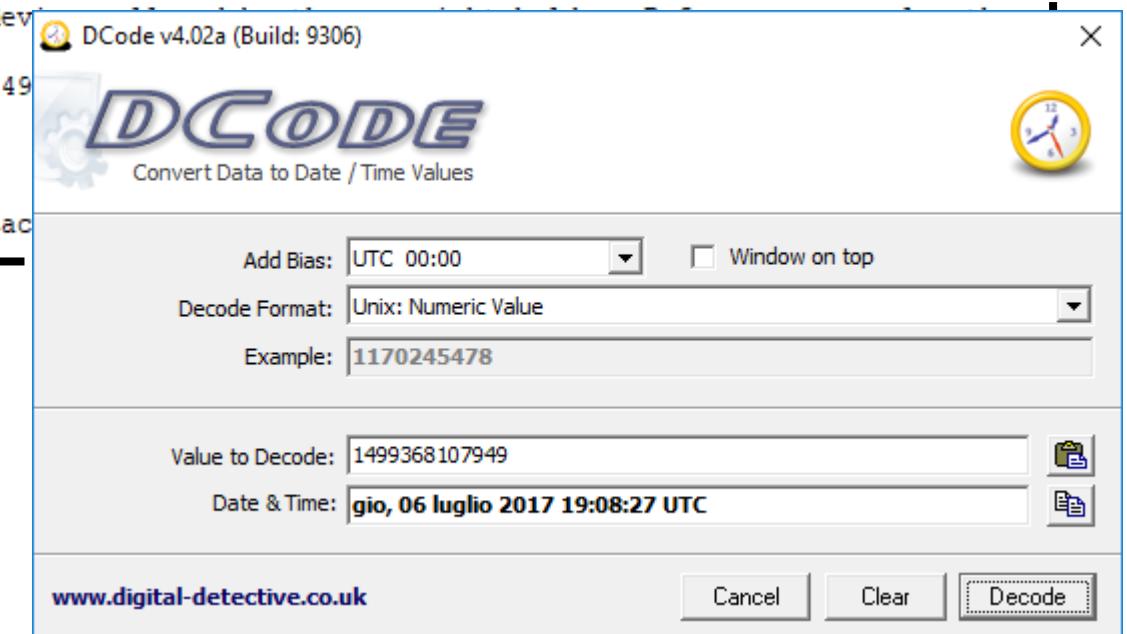
- mobile (4.565)
  - Application Support (0)
  - Applications (0)
  - preferences.plist

**Right Panel (Content View):**

```
<key>preferences.plist</key>
<dict>
    <key>environment</key>
    <string>{"autoplay_disabled":"0","reload_optional_text":"Would you
    "YouTube is unavailable. Please try again later.", "base_url":"https
    "country":"IT","fps_video_forbidden":"This video is not available."
    "default_failure_reason":"We are experiencing problems with our ser
    "device_model":"AppleTV5,3","fps_already_pinned_on_a_device":
    "This video has already been downloaded on the maximum number of de
    "reload_dialog_button_update":"Update",
    "fexp":"9405991,9422596,9431012,9434289,9443436,9446054,9446364,944
    <key>last-activity</key>
    <real>1499368107949.000000</real>
    <key>retention-data</key>
    <string>app_anon_id=5cbd0e7d-358a-4739-9cle-28e8943870cb&firsta
</dict>
```

Below the plist content, there is a folder structure for com.google.ios.youtube (109):

- AssetLibraryTesting (0)
- fsCachedData (37)
- Images (128)
  - PhotostreamImages (0)
  - Snapshots (0)
  - TrickPlay (0)
- PlaybackLogs (1)
- Cookies (1)
- Preferences (1)
- StoreKit (1)
- tmp (0)



# APP SNAPSHOT

## YOUTUBE

Search   Home   Subscriptions   My YouTube   Settings

### Trending



**ZAYN - Dusk Till Dawn ft. Sia**  
20,052,271 views



**GUARDATE COSA FA!!**  
5 regali pazzeschi su Amazon a | 200,406 views



**Tiziano Ferro - Valore Assoluto**  
386,508 views



**CLEMENTINO - UN GIORNO ALL'**  
573,175 views

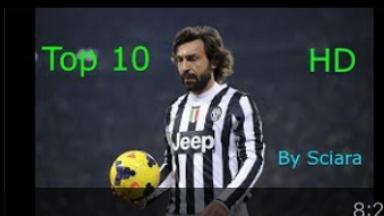
### Recommended



**Film Dazione Completati In Italiano**  
182,338 views



**10 Razze Di Cani Sconosciute Pi**  
1,924,676 views



**Le 10 Punizioni Più Belle Della St**  
778,050 views



**Pio e Amedeo a casa di PAULO** ▶ Video  
2,357,715 views

IN

mobile (4.565)

- + Application Support (0)
- + Applications (0)

Containers (1.412)

- + Bundle (906)
- + Data (504)
  - + Application (475)
    - OC18EFA3-7B47-4344-B275-B10F9307DE92 (114)
    - 2A249D58-52DA-41CE-B316-BF25A14E781D (2)
    - 9DFAA492-BCE5-40C8-B87C-9DB927FA2BCE (1)
    - C21C792C-B01A-487A-9C1B-6348013B6F3D (1)
    - D1031C05-D6D8-4936-BC55-F084B926E925 (85)
    - E3E6C13F-1DD1-419C-B05F-3A6474F15C4A (67)
    - F77BBEE9-5126-4BD6-AB2C-3838388C9EC8 (30)
  - + FEBC3691-B758-495F-9D64-6260F16CD1C1 (175)
    - Documents (0)
    - Library (173)
      - Caches (171)
        - com.apple.iTunesStore (1)
        - com.google.ios.youtube (169)
          - AssetLibraryTesting (0)
          - fsCachedData (37)
          - Images (128)
          - PhotostreamImages (0)
          - Snapshots (0)
          - TrickPlay (0)
        - PlaybackLogs (1)
      - Cookies (1)
      - Preferences (1)
      - StoreKit (1)
    - tmp (0)

1	https://i.ytimg.com/vi_CevxZvSJLk8/mqdefault.jpg_438x247_o	jpg	20,1 KB	06/07/2017	22:28:44	06/07/2017	21:13:26				
2	https://i.ytimg.com/vi_E0Xz3UMF1zk/mqdefault.jpg_438x247_o	jpg	26,3 KB	06/07/2017	22:28:44	06/07/2017	21:13:26				
3	https://i.ytimg.com/vi_sDGJRVwHGTk/mqdefault.jpg_438x247_o	jpg	22,7 KB	06/07/2017	22:28:49	06/07/2017	21:13:26				
4	https://i.ytimg.com/vi_1G4isv_Fylg/mqdefault.jpg_438x247_o	jpg	17,6 KB	06/07/2017	22:28:42	06/07/2017	21:13:26				
5	https://i.ytimg.com/vi_o99rV03Vp0Q/mqdefault.jpg_438x247_o	jpg	21,4 KB	06/07/2017	22:28:49	06/07/2017	21:13:26				
6	https://i.ytimg.com/vi_2KUANQyexF0/mqdefault.jpg_438x247_o	jpg	31,8 KB	06/07/2017	22:28:42	06/07/2017	21:13:26				
7	https://i.ytimg.com/vi_nfWlot6h_JM/mqdefault.jpg_438x247_o	jpg	20,4 KB	06/07/2017	22:28:48	06/07/2017	21:13:26				
8	https://i.ytimg.com/vi_H0fhlwTYsj8/mqdefault.jpg_438x247_o	jpg	22,0 KB	06/07/2017	22:28:45	06/07/2017	21:13:26				
9	https://i.ytimg.com/vi_MtJ0lrlGSAE/mqdefault.jpg_438x247_o	jpg	21,2 KB	06/07/2017	22:28:46	06/07/2017	21:13:26				
10	https://i.ytimg.com/vi_5Z7h0JrUrnw/mqdefault.jpg_438x247_o	jpg	16,8 KB	06/07/2017	22:28:43	06/07/2017	21:13:26				
11	https://i.ytimg.com/vi_XNkoxeGLdoM/mqdefault.jpg_438x247_o	jpg	21,0 KB	06/07/2017	22:28:47	06/07/2017	21:13:26				
12	https://i.ytimg.com/vi_QtXby3twMml/mqdefault.jpg_438x247_o	jpg	28,9 KB	06/07/2017	22:28:46	06/07/2017	21:13:26				
13	https://i.ytimg.com/vi_Ro_S6M9Mqml/mqdefault.jpg_438x247_o	jpg	16,9 KB	06/07/2017	22:28:46	06/07/2017	21:13:26				
14	https://i.ytimg.com/vi_6WNzc66ap-g/mqdefault.jpg_438x247_o	jpg	24,1 KB	06/07/2017	22:28:43	06/07/2017	21:13:26				
15	https://i.ytimg.com/vi_K0OloUF4wjE/mqdefault.jpg_438x247_o	jpg	15,5 KB	06/07/2017	22:28:45	06/07/2017	21:13:26				

## APPLE TV FORENSICS GUIDELINES

1. Identify the model
2. **Apple TV I Gen** → Acquire the hard drive and analyze it
3. **Apple TV II - IV Gen**
  1. Acquire **Real Time Logs**
  2. Acquire **Crash Logs**
  3. Acquire **File System via AFC**
  4. Acquire information via **Manual Acquisition**
  5. Verify if jailbreaking is applicable (type and OS version)
    1. **Jailbreak and acquire the whole file system**

# APPLE TV USEFUL TOOLS

- **Libimobiledevice** <http://www.libimobiledevice.org/>
- **iMobileDevice** <http://docs.quamotion.mobi/en/latest/imobiledevice/download.html>
- **iBackupBot** <http://www.icopybot.com/itunes-backup-manager.htm>
- **iExplorer** <https://macroplant.com/iexplorer>
- **iFunBox** <http://www.i-funbox.com/>
- **iOSLogInfo** <http://support.blackberry.com/kb/articleDetail?articleNumber=000036986>
- **Jailbreak**
  - **Pangu** **tvOS 9.0/9.1** [http://dl.pangu.25pp.com/jb/Pangu9\\_ATV\\_v1.0.zip](http://dl.pangu.25pp.com/jb/Pangu9_ATV_v1.0.zip)
  - **LiberTV** **tvOS 10.0/10.1** <http://newosxbook.com/forum/viewtopic.php?f=12&t=16823>
  - **LiberTV** **tvOS 11.0/11.1** <http://newosxbook.com/libertv/>
  - **Greengoblin** **tvOS 10.2.2** <https://nito.tv/>

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## Q&A?

### Mattia Epifani

- Digital Forensics Analyst
- CEO @ REALITY NET – System Solutions
- GCFA, GCFE, GASF, GMOB, GNFA, GREM, GCWN



[mattia.epifani@realitynet.it](mailto:mattia.epifani@realitynet.it)



[@mattiaepr](https://twitter.com/mattiaepr)



[http://www.linkedin.com/in/mattiaeprfani](https://www.linkedin.com/in/mattiaeprfani)



<http://www.realitynet.it>



<http://blog.digital-forensics.it>

### Claudia Meda

- Digital Forensics Analyst  
@ REALITY NET – System Solutions



[claudia.meda@realitynet.it](mailto:claudia.meda@realitynet.it)



[@KlodiaMaida](https://twitter.com/KlodiaMaida)



<https://www.linkedin.com/in/claudia-med/>



<http://www.realitynet.it>



<http://blog.digital-forensics.it>

# APPLE TV – MODEL IDENTIFICATION

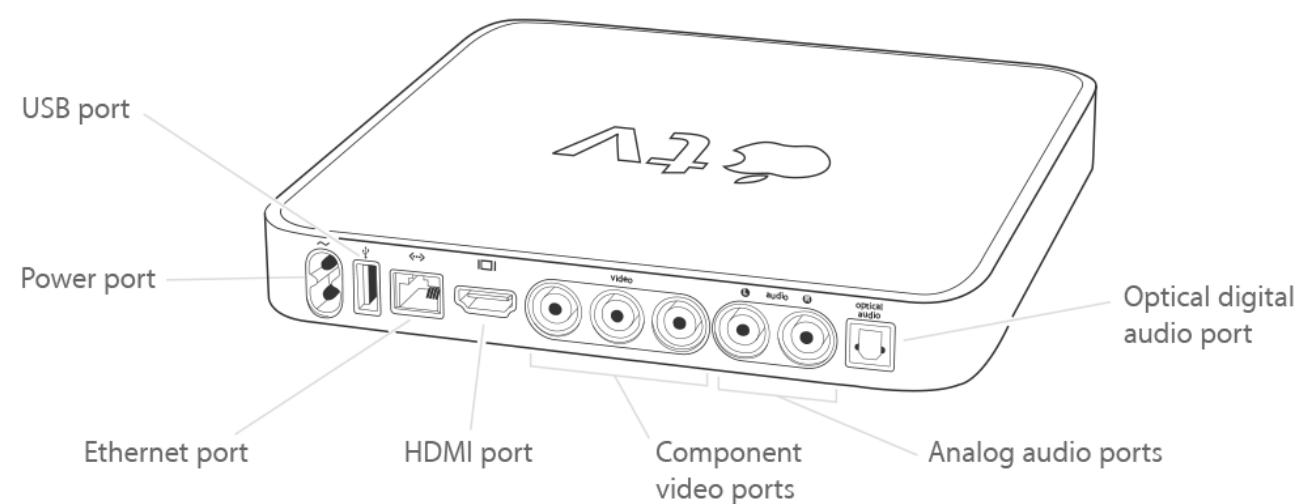
MATTIA EPIFANI – CLAUDIA MEDA

DFRWS 2018 EU

FLORENCE, 23 MARCH 2018

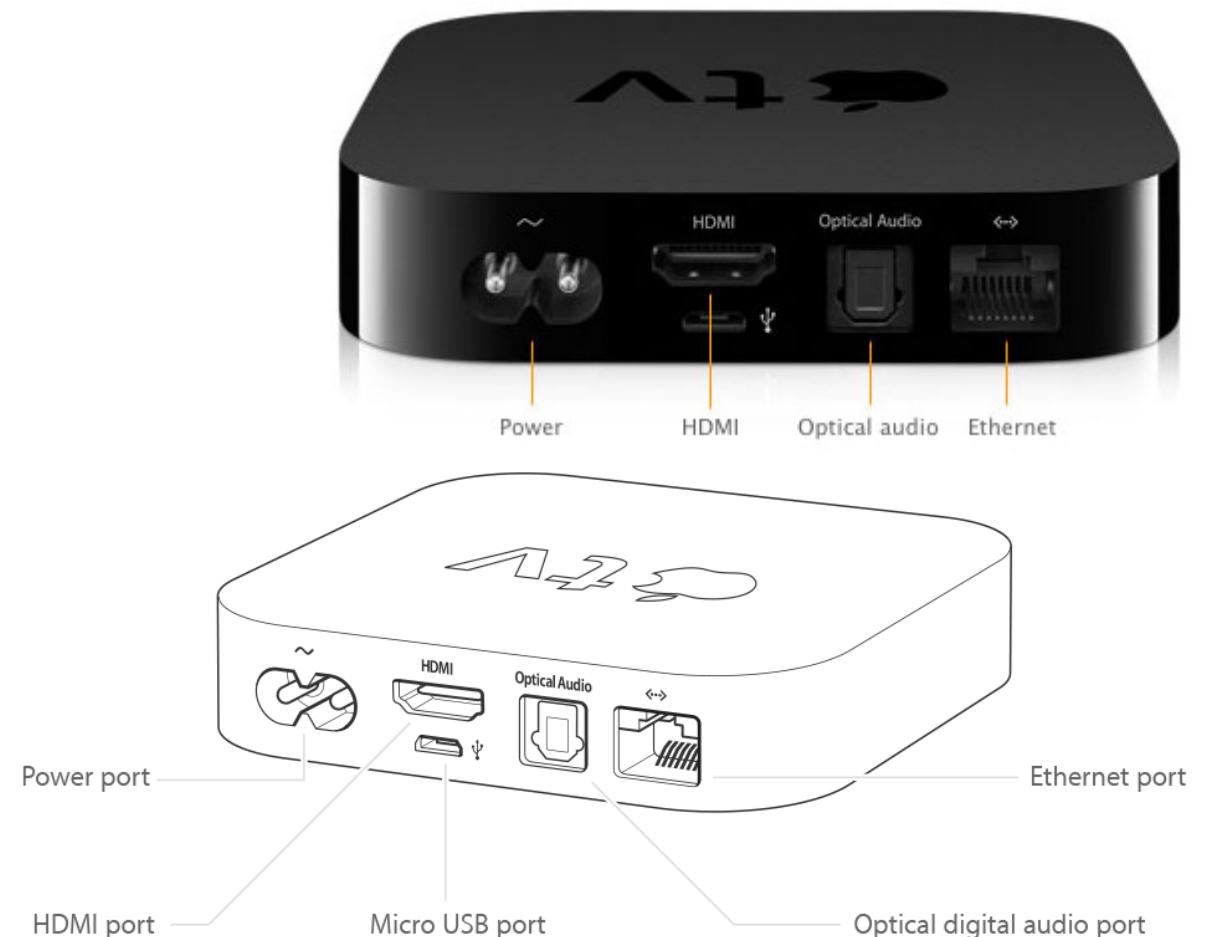
## APPLE TV – I° GENERATION

- Released in **2007**
- It contains a **traditional hard drive** (40 or 160 GB)
- The OS is based on **Mac OS X**
- Connectivity
  - Wi-Fi
  - Ethernet 10/100
  - USB 2.0
  - HDMI



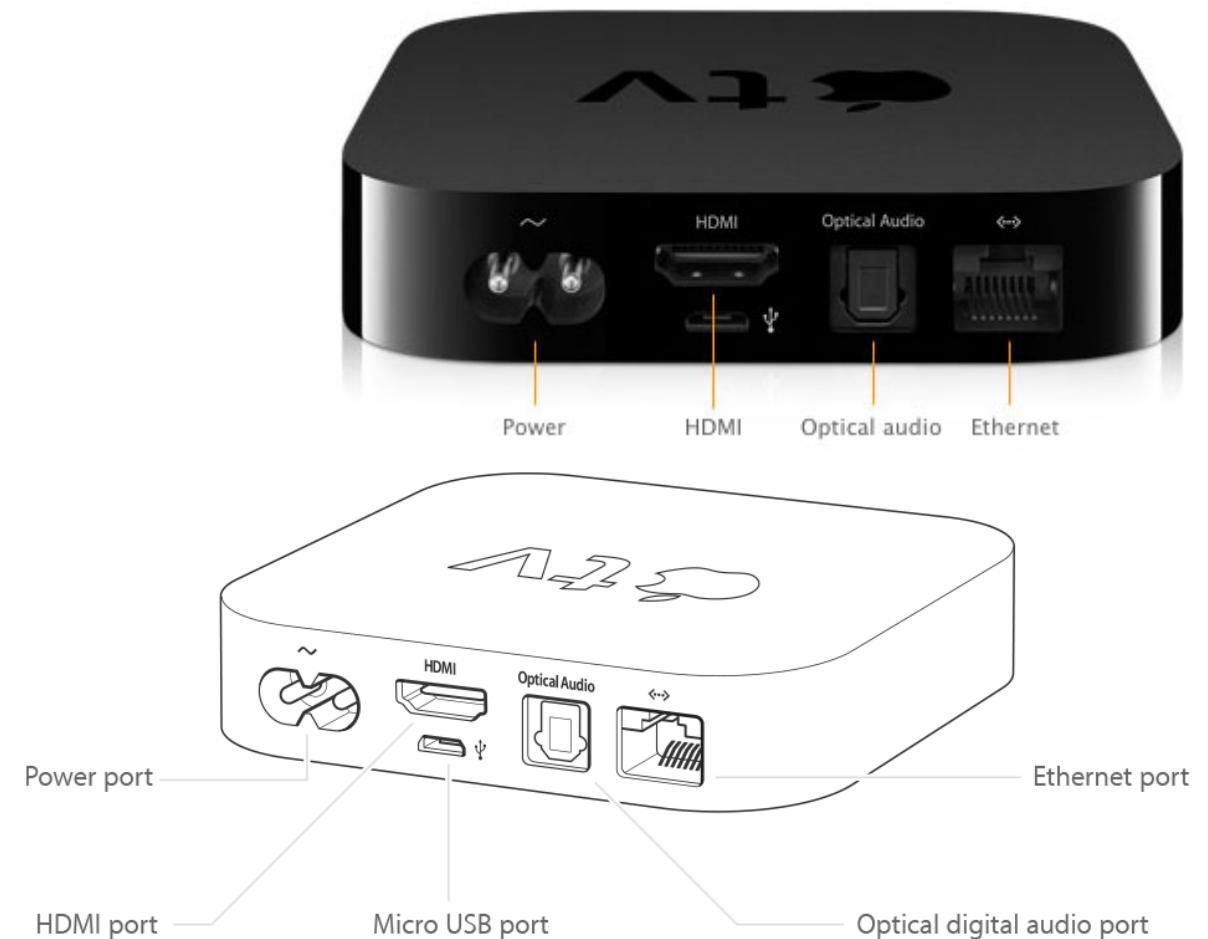
## APPLE TV – II° GENERATION

- Released in **2010**
- It contains a **NAND flash memory (8 GB)**
- The OS is based on **iOS**
- Connectivity
  - Wi-Fi
  - Ethernet 10/100
  - Micro USB
  - HDMI



## APPLE TV – III° GENERATION / III° GENERATION REV.A

- Released in **2012**
- It contains a **NAND flash memory (8 GB)**
- The OS is based on **iOS**
- Connectivity
  - Wi-Fi
  - Ethernet 10/100
  - Micro USB
  - HDMI



## APPLE TV – IV° GENERATION

- Released in **2015**
- It contains a **NAND flash memory (32 or 64 GB)**
- The OS (**tvOS**) is based on **iOS**
- Connectivity
  - Wi-Fi
  - Ethernet 10/100
  - Bluetooth
  - USB-C
  - HDMI



# APPLE TV – 4K (V° GENERATION)

- Released in **September 2017**
- It contains a **NAND flash memory (32 or 64 GB)**
- The OS (**tvOS**) is based on **iOS**
- Connectivity
  - Wi-Fi
  - Gigabit Ethernet
  - Bluetooth
  - HDMI

