iOS Location Forensics

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PRESENTATION SCOPE

Data Locations

- Native iOS Location Features
- 3rd Party Applications

Looking in Unexpected Files

"Creative" Keyword Searching

Ease of Data Availability

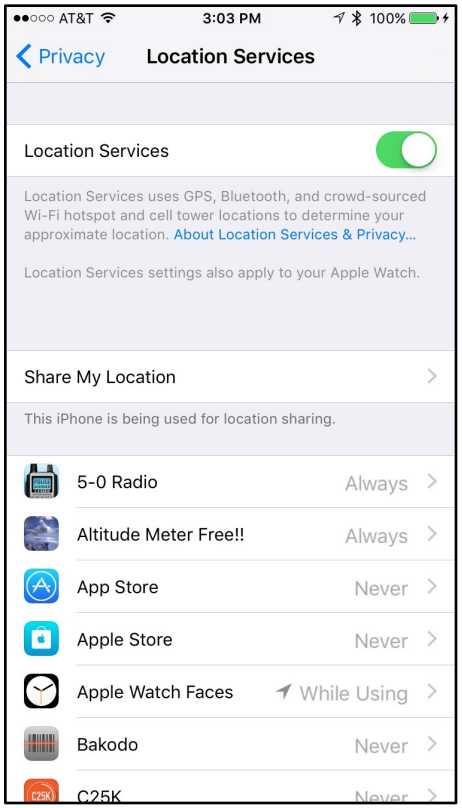
- iOS Backups/Logical Extraction
- Physical Access (ie: Jailbreak)

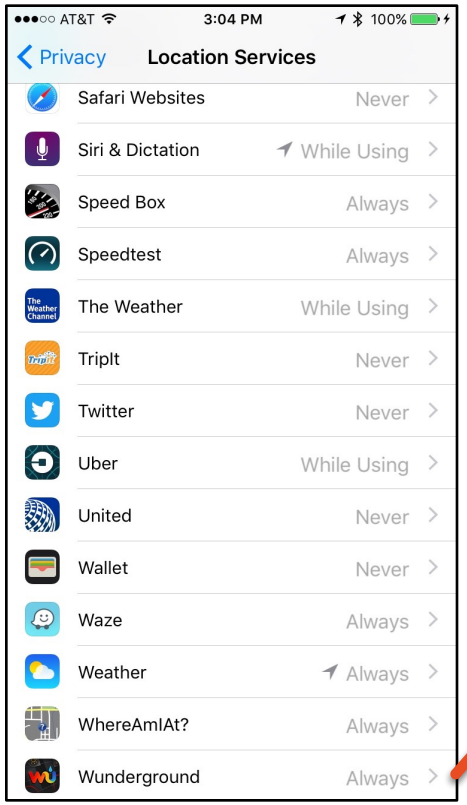
WHERE TO START? CLIENTS.PLIST

- Which apps are using Location Services?
  - Native iOS & 3rd Party Applications/Bundles/Frameworks/etc.
- File Paths:
  - Backup: /root/Library/Caches/locationd/clients.plist
  - Physical: /private/var/root/Library/Caches/locationd/clients.plist

Key	Type	Value
▼ Root	Dictionary	(95 items)
▶ com.apple.locationd.executable-/usr/libexec/locationd	Dictionary	(1 item)
▶ com.apple.locationd.bundle-/System/Library/LocationBundles/PassbookRelevancy.bundle	Dictionary	(6 items)
▶ com.myfitnesspal.mfp	Dictionary	(7 items)
▶ com.weather.TWC	Dictionary	(10 items)
▶ com.yourcompany.SpeedBoxLite	Dictionary	(9 items)
▶ com.marriott.iphoneprod	Dictionary	(5 items)
▶ com.apple.mobileslideshow	Dictionary	(6 items)
▶ com.ookla.speedtest	Dictionary	(8 items)
▶ com.apple.PassbookUIService	Dictionary	(1 item)
▶ com.facebook.Facebook	Dictionary	(7 items)
▶ com.zillow.ZillowMap	Dictionary	(6 items)
▶ com.apple.AppStore	Dictionary	(7 items)
▶ RunKeeperPro	Dictionary	(9 items)
▶ com.wunderground.weatherunderground	Dictionary	(8 items)
▶ com.apple.springboard	Dictionary	(1 item)
▶ com.zenlabs.c25k	Dictionary	(7 items)
▶ com.google.Maps	Dictionary	(8 items)
▶ com.redfin.redfin	Dictionary	(10 items)
▶ com.apple.mobileme.fmf1	Dictionary	(7 items)
▶ com.apple.locationd.bundle-/System/Library/PrivateFrameworks/HomeKitDaemon.framework	Dictionary	(6 items)
▶ com.glympse.iphone.glympse	Dictionary	(12 items)
▶ com.apple.locationd.bundle-/System/Library/LocationBundles/MotionCalibration.bundle	Dictionary	(7 items)

WHERE TO START? CLIENTS.PLIST – LOCATION SERVICES SETTINGS | PRIVACY | LOCATION SERVICES



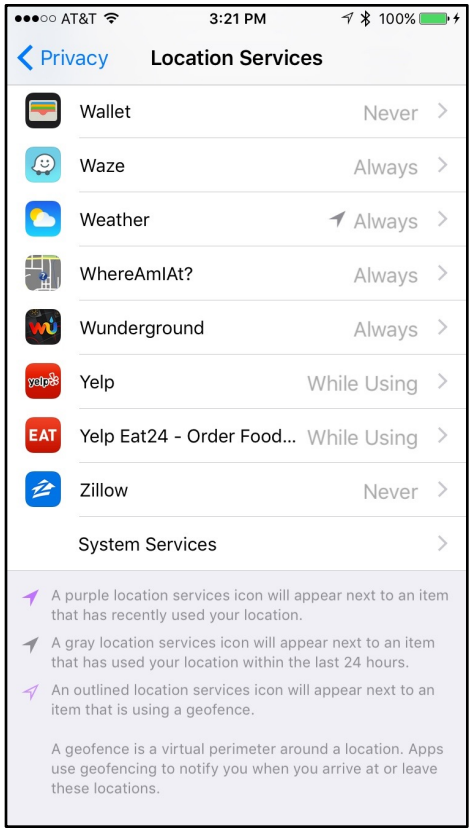


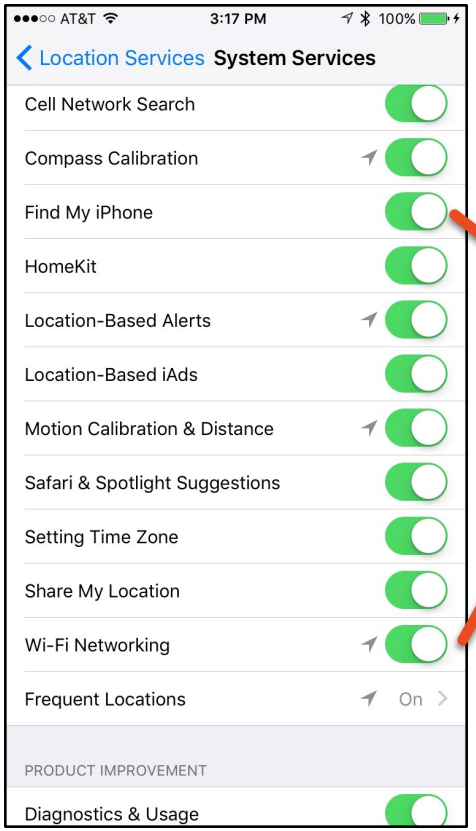
Authorization:
1 – Never
2 – While Using
4 – Always

com.wunderground.weatherunderground	Dictionary	(8 items)
Whitelisted	Boolean	NO
BundleId	String	com.wunderground.weatherunderground
SupportedAuthorizationMask	Number	7
LocationTimeStopped	Number	484,834,287.043168
Authorization	Number	4
TrialPeriodNeedsReprompt	Boolean	NO
Registered	String	/private/var/mobile/Containers/Bundle/Application/39C72
Executable	String	/private/var/mobile/Containers/Bundle/Application/39C72

WHERE TO START? CLIENTS.PLIST – LOCATION SERVICES

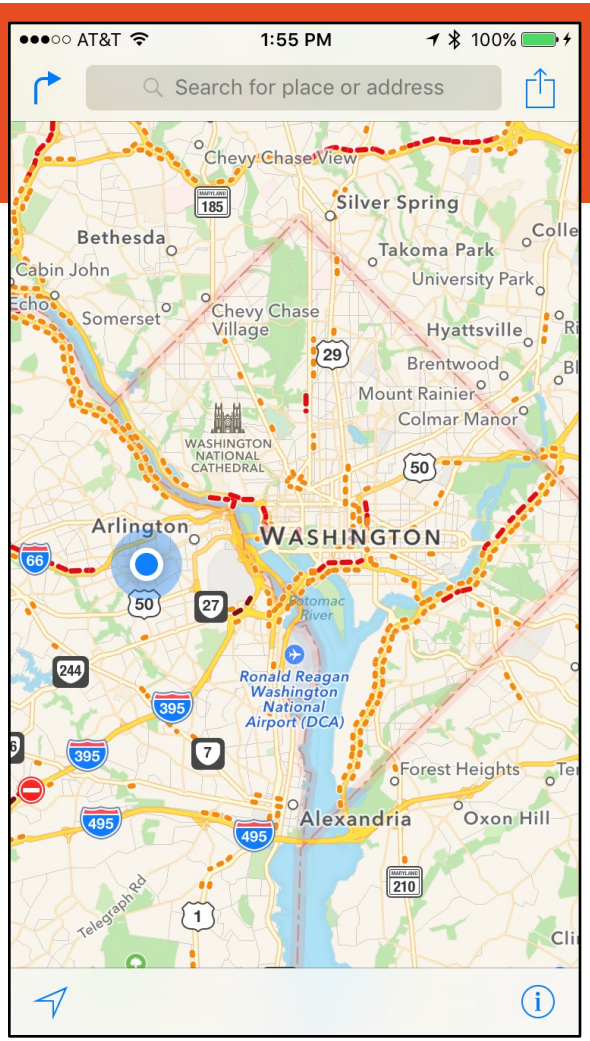
SETTINGS | PRIVACY | LOCATION SERVICES | SYSTEM SERVICES





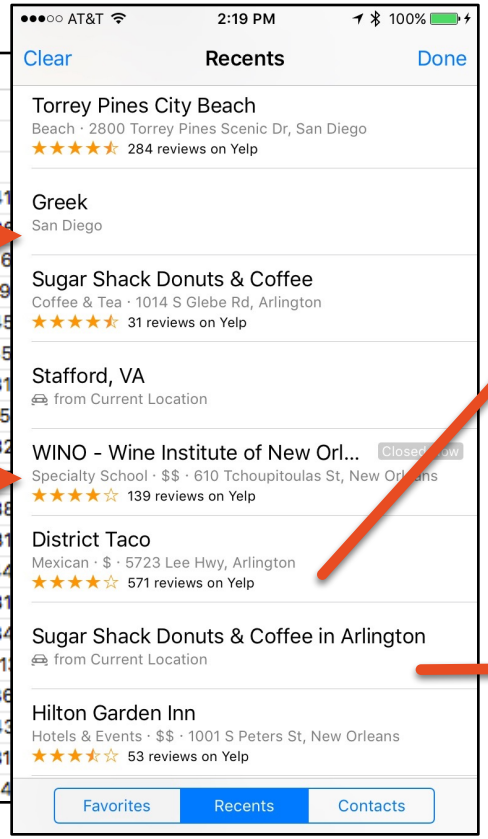
NATIVE IOS APPLE MAPS

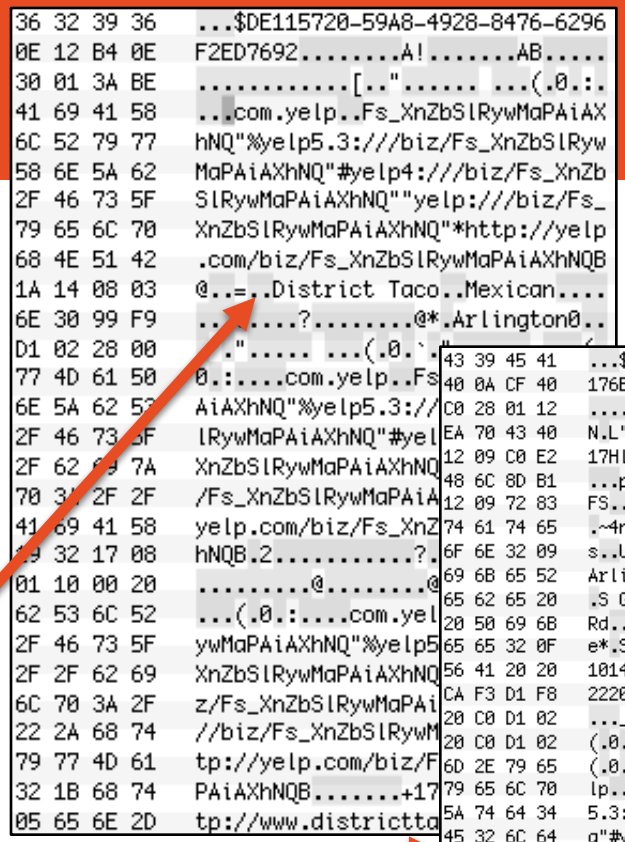
- File Paths:
  - Backup: /mobile/Applications/com.apple.Maps/*
  - Physical: /private/var/mobile/Containers/Data/Applications/<GUID>/*
  - iCloud: SyncedPrefences
- File Types:
  - Plist Files
  - Proprietary Data Files
- Data Type
  - Bookmarks/Favorites
  - Search History
  - Last Locations / Search Query

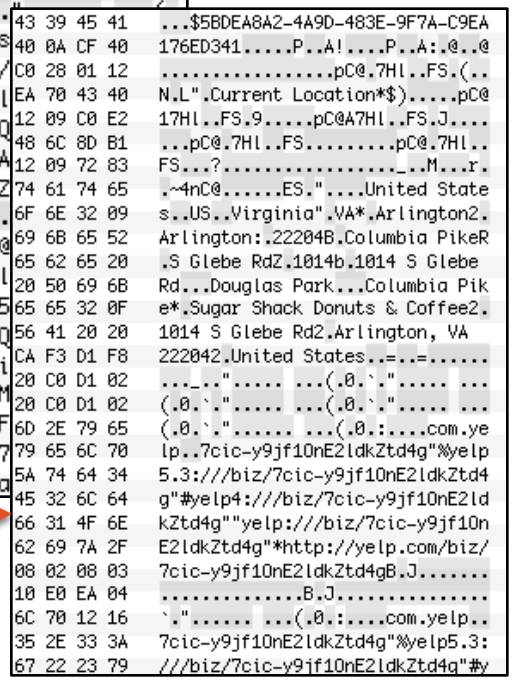


NATIVE – APPLE MAPS – RECENTS GEOHISTORY.MAPSDATA (PLIST FILE)

Key	Type	Value
▼ Root	Dictionary	(2 items)
MSPHistoryVersion	Number	1
▼ MSPHistory	Array	(20 items)
Item 0	Data	<08021224 443641
Item 1	Data	<08031224 4543
Item 2	Data	<08021224 374546
Item 3	Data	<08011224 324239
Item 4	Data	<08021224 433045
Item 5	Data	<08031224 373235
Item 6	Data	<08031224 424431
Item 7	Data	<08011224 463735
Item 8	Data	<08031224 453632
Item 9	Data	<0802
Item 10	Data	<08031224 453438
Item 11	Data	<08031224 444531
Item 12	Data	<08021224 354244
Item 13	Data	<08031224 443031
Item 14	Data	<08031224 354334
Item 15	Data	<08021224 313231
Item 16	Data	<08021224 303636
Item 17	Data	<08031224 394643
Item 18	Data	<08021224 343331
Item 19	Data	<08011224 333644



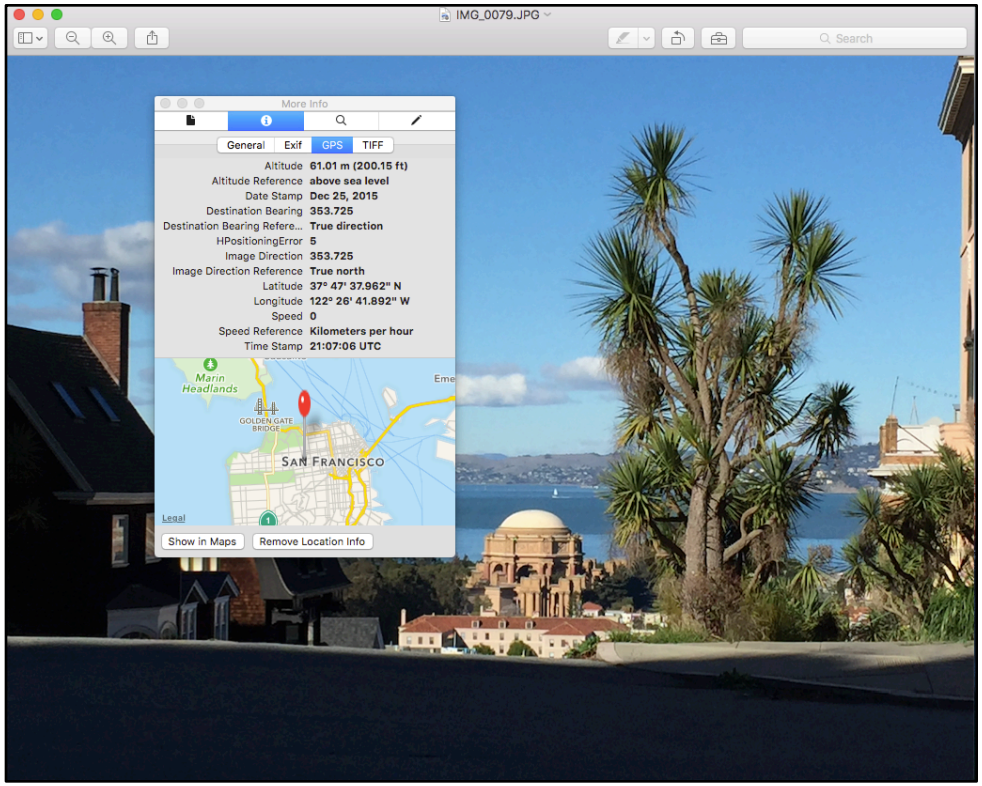




NATIVE IOS – PHOTOS
PHOTO EXIF DATA

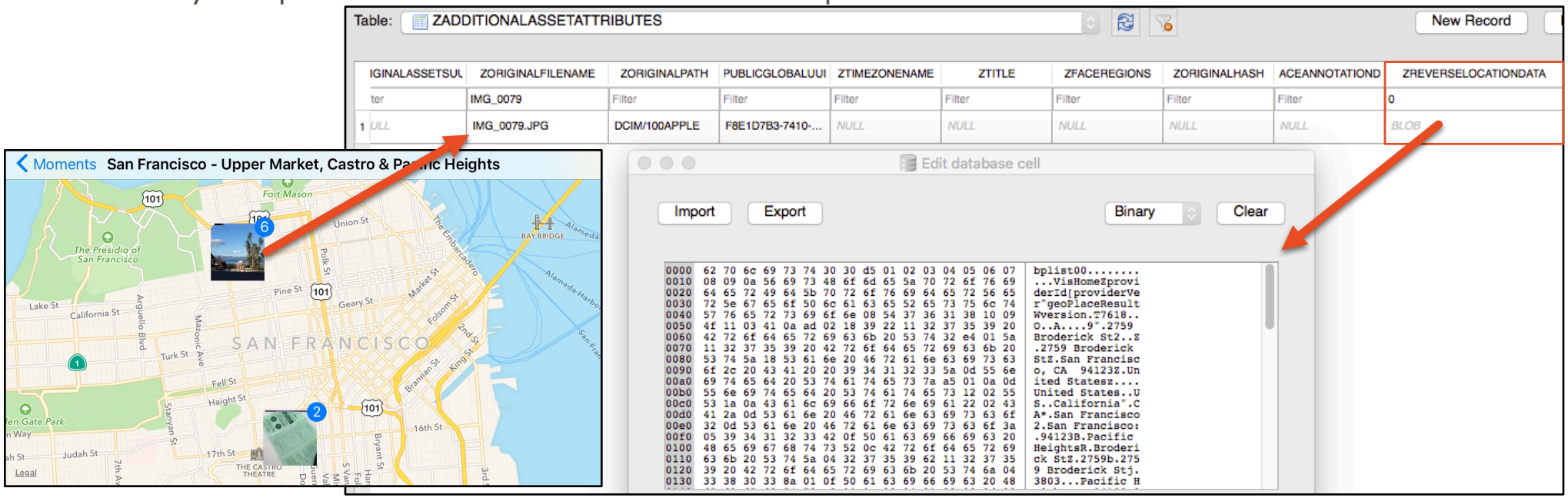
- File Paths:
  - Backup: /mobile/Media/DCIM/###APPLE/*
  - Physical: /private/var/mobile/Media/DCIM/###APPLE/

```
byte:100APPLE oompa$ exiftool IMG_0079.JPG | grep GPS
GPS Latitude Ref                : North
GPS Longitude Ref               : West
GPS Altitude Ref                : Above Sea Level
GPS Time Stamp                  : 21:07:06
GPS Speed Ref                   : km/h
GPS Speed                       : 0
GPS Img Direction Ref           : True North
GPS Img Direction               : 353.7246377
GPS Dest Bearing Ref            : True North
GPS Dest Bearing                : 353.7246377
GPS Date Stamp                  : 2015:12:25
GPS Horizontal Positioning Error: 5 m
GPS Altitude                    : 61 m Above Sea Level
GPS Date/Time                   : 2015:12:25 21:07:06Z
GPS Latitude                    : 37 deg 47' 37.96" N
GPS Longitude                   : 122 deg 26' 41.89" W
GPS Position                    : 37 deg 47' 37.96" N, 122 deg 26' 41.89" W
```



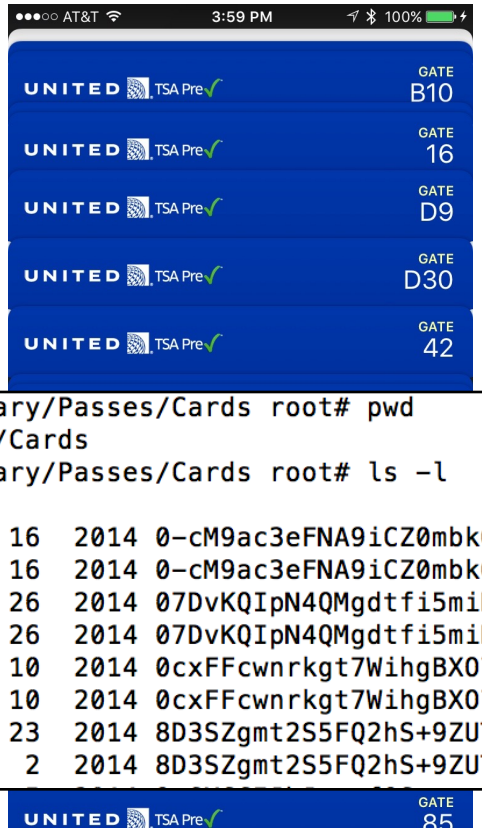
NATIVE IOS - PHOTOS
PHOTOS APPLICATION DATABASE

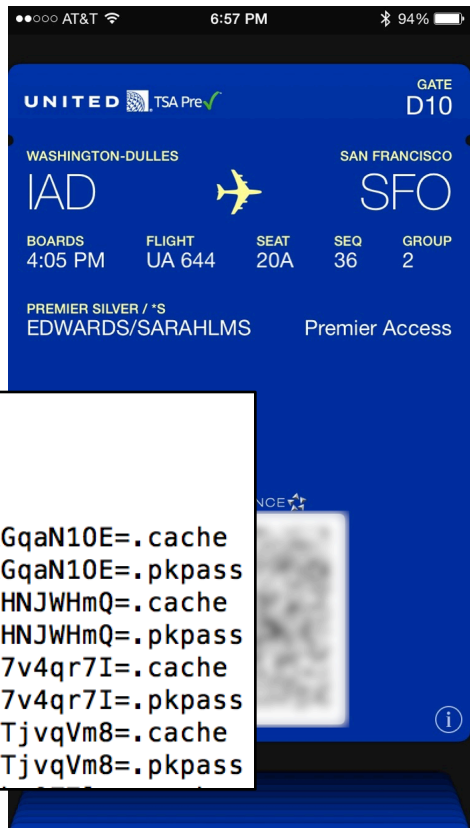
- File Paths:
  - Backup: /mobile/Media/PhotoData/Photos.sqlite
  - Physical: /private/var/mobile/Media/PhotoData/Photos.sqlite

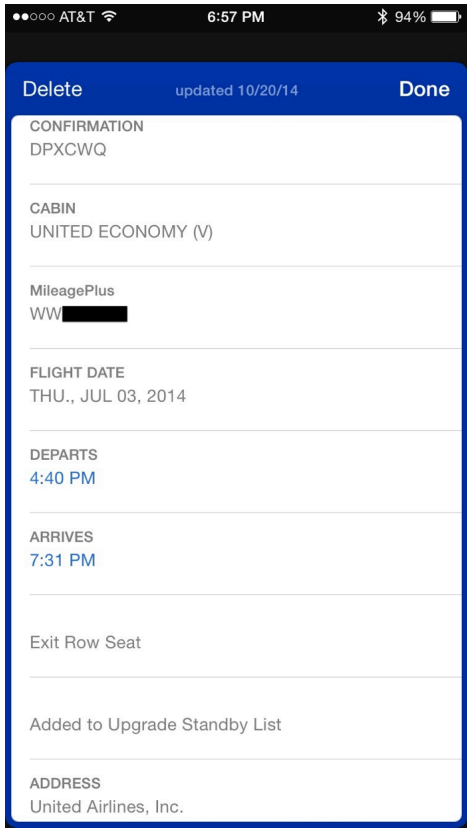


NATIVE IOS – WALLET / PASSES
PKPASS FILES

- File Paths:
- Backup:
  /mobile/Library/Passes/Cards/*
- Physical:
  /private/var/mobile/Library/Passes
  /Cards/*








```
miPhone5s:/private/var/mobile/Library/Passes/Cards root# pwd
/private/var/mobile/Library/Passes/Cards
miPhone5s:/private/var/mobile/Library/Passes/Cards root# ls -l
total 0
drwxr-xr-x 2 mobile mobile 204 Jul 16  2014 0-cM9ac3eFNA9iCZ0mbkGqaN1OE=.cache
drwxr-xr-x 2 mobile mobile 306 Jul 16  2014 0-cM9ac3eFNA9iCZ0mbkGqaN1OE=.pkpass
drwxr-xr-x 2 mobile mobile 204 Jul 26  2014 07DvKQIpN4QMgdtfi5miHNJWHmQ=.cache
drwxr-xr-x 2 mobile mobile 306 Jul 26  2014 07DvKQIpN4QMgdtfi5miHNJWHmQ=.pkpass
drwxr-xr-x 2 mobile mobile 204 Aug 10  2014 0cxFFcwnrkgt7WihgBXO7v4qr7I=.cache
drwxr-xr-x 2 mobile mobile 408 Aug 10  2014 0cxFFcwnrkgt7WihgBXO7v4qr7I=.pkpass
drwxr-xr-x 2 mobile mobile 204 Apr 23  2014 8D3SZgmt2S5FQ2hS+9ZUTjvqVm8=.cache
drwxr-xr-x 2 mobile mobile 408 Apr  2  2014 8D3SZgmt2S5FQ2hS+9ZUTjvqVm8=.pkpass
```

NATIVE IOS – WALLET / PASSES
PASS.JSON


```
{
  "boardingPass": {
    "transitType": "PKTransitTypeAir",
    "auxiliaryFields": [
      {
        "label": "BOARDS",
        "key": "boardingTime",
        "value": "4:05 PM"
      },
      {
        "label": "FLIGHT",
        "key": "flight",
        "value": "UA 644"
      },
      {
        "label": "SEAT",
        "key": "seat",
        "value": "20A"
      },
      {
        "label": "SEQ",
        "key": "seq",
        "value": "36"
      },
      {
        "label": "GROUP",
        "key": "group",
        "value": "2"
      }
    ],
```


```
-rwxr-x--x  1 oompa  staff  11264 Oct 26  2014 Thumbs.db
-rwxr-x--x  1 oompa  staff   6150 Oct 26  2014 footer.png
-rwxr-x--x  1 oompa  staff  13133 Oct 26  2014 footer@2x.png
-rwxr-x--x  1 oompa  staff   2870 Oct 26  2014 icon.png
-rwxr-x--x  1 oompa  staff   4406 Oct 26  2014 icon@2x.png
-rwxr-x--x  1 oompa  staff   5467 Oct 26  2014 logo.png
-rwxr-x--x  1 oompa  staff   8842 Oct 26  2014 logo@2x.png
-rwxr-x--x  1 oompa  staff    448 Oct 26  2014 manifest.json
-rwxr-x--x  1 oompa  staff   3551 Oct 26  2014 pass.json
-rwxr-x--x  1 oompa  staff   3239 Oct 26  2014 signature
```

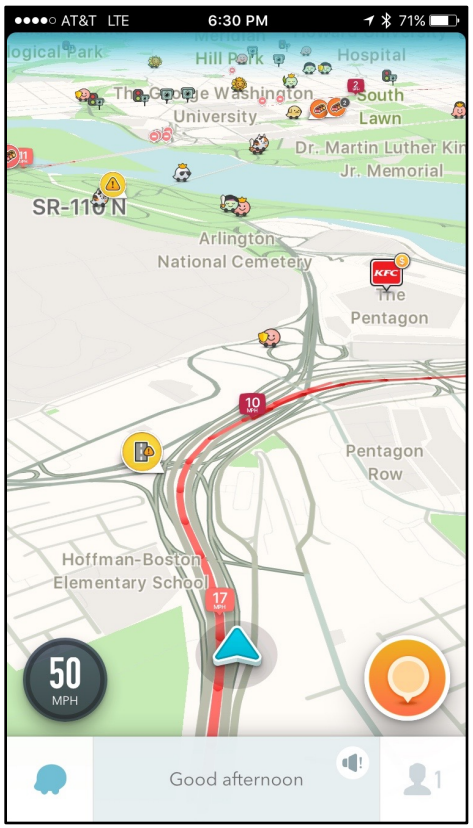

```
  "headerFields": [
    {
      "label": "GATE",
      "key": "gate",
      "value": "D10",
      "changeMessage": "Your gate has changed to %@"
    }
  ],
  "primaryFields": [
    {
      "label": "WASHINGTON-DULLES",
      "key": "origin",
      "value": "IAD"
    },
    {
      "label": "SAN FRANCISCO",
      "key": "destination",
      "value": "SFO"
    }
```

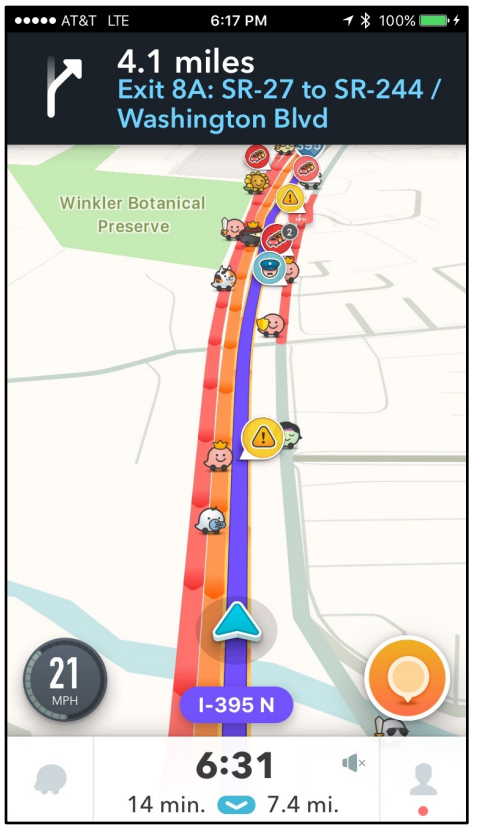


```
  "secondaryFields": [
    {
      "label": "PREMIER SILVER / *S",
      "key": "passenger",
      "value": "EDWARDS/SARAHLMS"
    },
    {
      "key": "status",
      "value": "Premier Access"
    }
  ],
  "backFields": [
    {
      "label": "CONFIRMATION",
      "key": "confirmation",
      "value": "DPXCWQ"
    },
    {
      "label": "CABIN",
      "key": "cabin",
      "value": "UNITED ECONOMY (V)"
    },
    {
      "label": "MileagePlus",
      "key": "mileagePlusNumber",
      "value": "WW[redacted]"
    },
    {
      "label": "FLIGHT DATE",
      "key": "flightDate",
      "value": "THU., JUL 03, 2014"
    },
    {
      "label": "DEPARTS",
      "key": "departTime",
      "value": "4:40 PM"
    },
    {
      "label": "ARRIVES",
      "key": "arriveTime",
      "value": "7:31 PM"
    },
    {
      "key": "exitRow",
      "value": "Exit Row Seat"
    },
```

3RD PARTY APPS
WAZE

- Crowdsourced Traffic App
- Location Data:
  - /Documents/session (Plaintext File)
  - /Documents/user.db (SQLite Database)

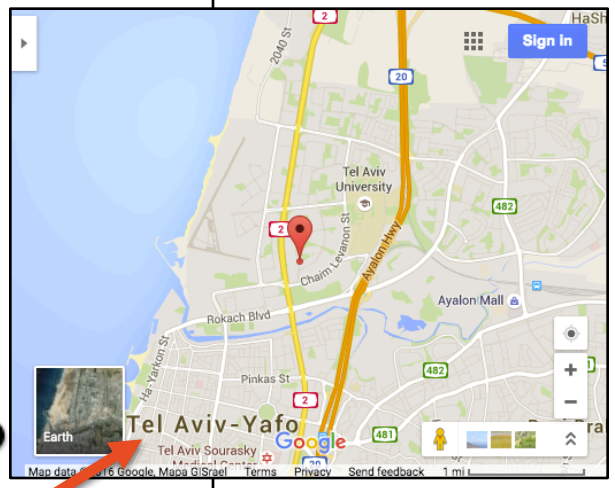




3RD PARTY APPS – WAZE /Documents/session

- /Documents/session (Plaintext File)
  - "Parking" Position
  - Address Position
  - Current Position
  - Home/Work Positions
  - Waypoints
  - Etc.
- Long,Lat (w/o Decimals)
- Default Location:
  - "34794810, 32106010"
  - 32.106010, 34.794810 = Tel Aviv, Israel

```
byte:Documents oompa$ cat session | grep -i position
Parking.Dest position: 0,0
Parking.Last GPS position: 0,0
GPS.Position: -771[redacted],388[redacted]
Destination.Position: 0, 0
Departure.Position: 0, 0
Address.Position: -771[redacted],388[redacted]
Selection.Position: -774[redacted],384[redacted]
Hold.Position: 34794810, 32106010
HoldLock.Position: 34794810, 32106010
Location.Position: -771[redacted],388[redacted]
ORIG_GPS.Position: -771[redacted],388[redacted]
Marked_Location.Position: 34794810, 32106010
Alt-Routes.Position: 34794810, 32106010
AlertSelection.Position: -771[redacted],387[redacted]
AlertSelectionGps.Position: -771[redacted],387[redacted]
WayPoint.Position: 0, 0
Parked.Position: -771[redacted],388[redacted]
preview_pin.Position: -772[redacted],386[redacted]
RouteOverview.Position: 34794810, 32106010
VenueMapPin.Position: 0, 0
Home.Position: -771[redacted],388[redacted]
Work.Position: 34794810, 32106010
Navigation.Last position: -771[redacted],388[redacted]
Navigation.Last waypoint position: 0, 0
```



3RD PARTY APPS – WAZE /Documents/user.db

- /Documents/user.db (SQLite Database)
  - Places Table
    - Home / Work (Correlate with Favorites Table)
    - Searches (Correlate with Recents Table)

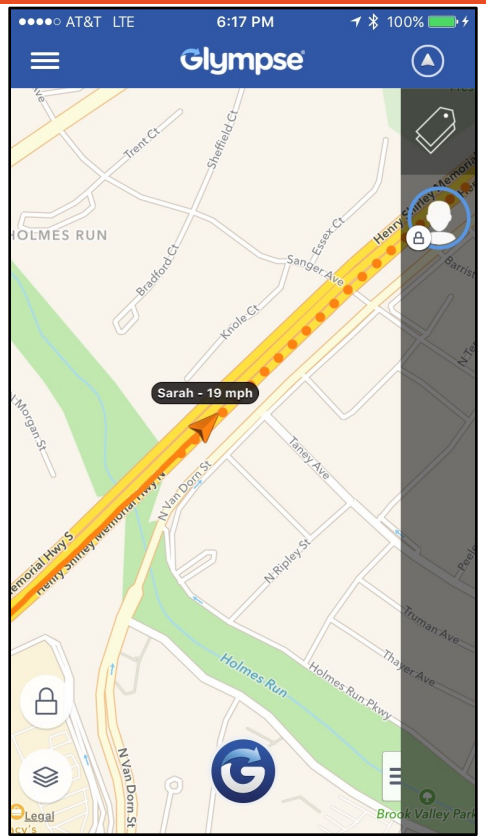
Table: PLACES

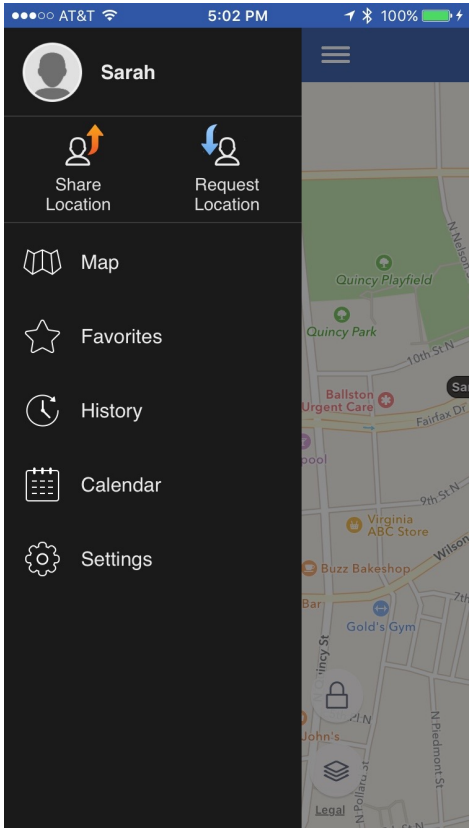
New Record | De

	id	name	street	city	state	country	house	longitude	latitude	venue_id	created_time
	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
1	1		[redacted]	Arlington	Virginia	US	[redacted]	-771[redacted]	388[redacted]	venues.1854...	1461945578
2	2	Wegman's - Potomac Town Center	Dining Way	Neabsco	VA	US	14801	-77289095	38631001	venues.1852...	1463001807

3RD PARTY APPS
GLYMPSE

- Location Sharing App
- Location Data:
  - /Documents/Glympse/places_v2.dat
  - /Documents/ImageCache/glympse_place_<lat>_<long>_<Name>.jpg

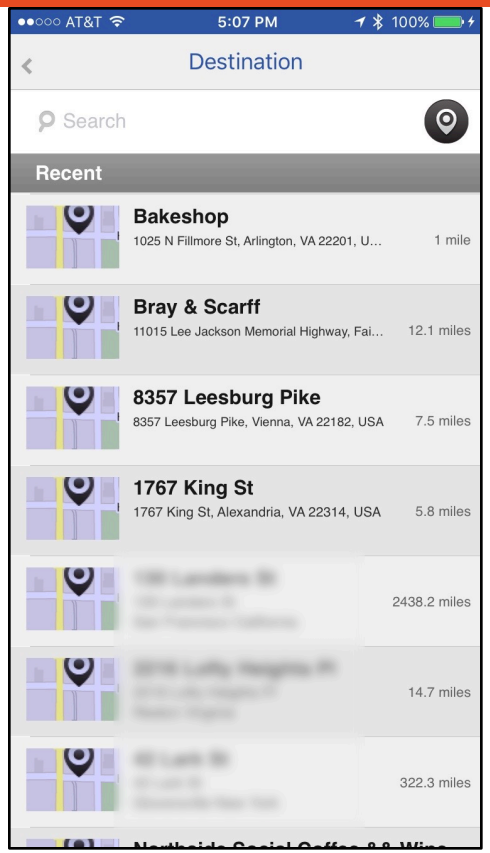




3RD PARTY APPS – GLYMPSE /Documents/Glympse/places_v2.dat

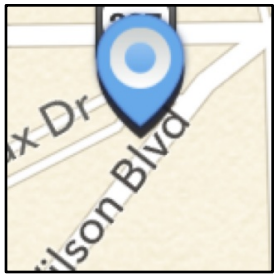
- /Documents/Glympse/places_v2.dat (JSON)
- Recents & Searches


```
{
  "al1": "1025.N.Fillmore.St,.Arlington,.VA.22201,.United.States",
  "ln": -77.092659,
  "lt": 38.885443,
  "nm": "Bakeshop"
},
{
  "al1": "11015.Lee.Jackson.Memorial.Highway,.Fairfax,.VA.22031,.United.States",
  "imgurl": "glympse-place:38.852007_-77.325539_Bray.&.Scarff.jpg",
  "ln": -77.325539,
  "lt": 38.852007,
  "nm": "Bray.&.Scarff"
},
{
  "al1": "8357.Leesburg.Pike,.Vienna,.VA.22182,.USA",
  "imgurl": "glympse-place:38.921152_-77.234453_8357.Leesburg.Pike.jpg",
  "ln": -77.234453,
  "lt": 38.921152,
  "nm": "8357.Leesburg.Pike"
},
{
  "al1": "1767.King.St,.Alexandria,.VA.22314,.USA",
  "ln": -77.05949,
  "lt": 38.806899,
  "nm": "1767.King.St"
},
```

3RD PARTY APPS – GLYMPSE /Documents/Glympse/ImageCache/*

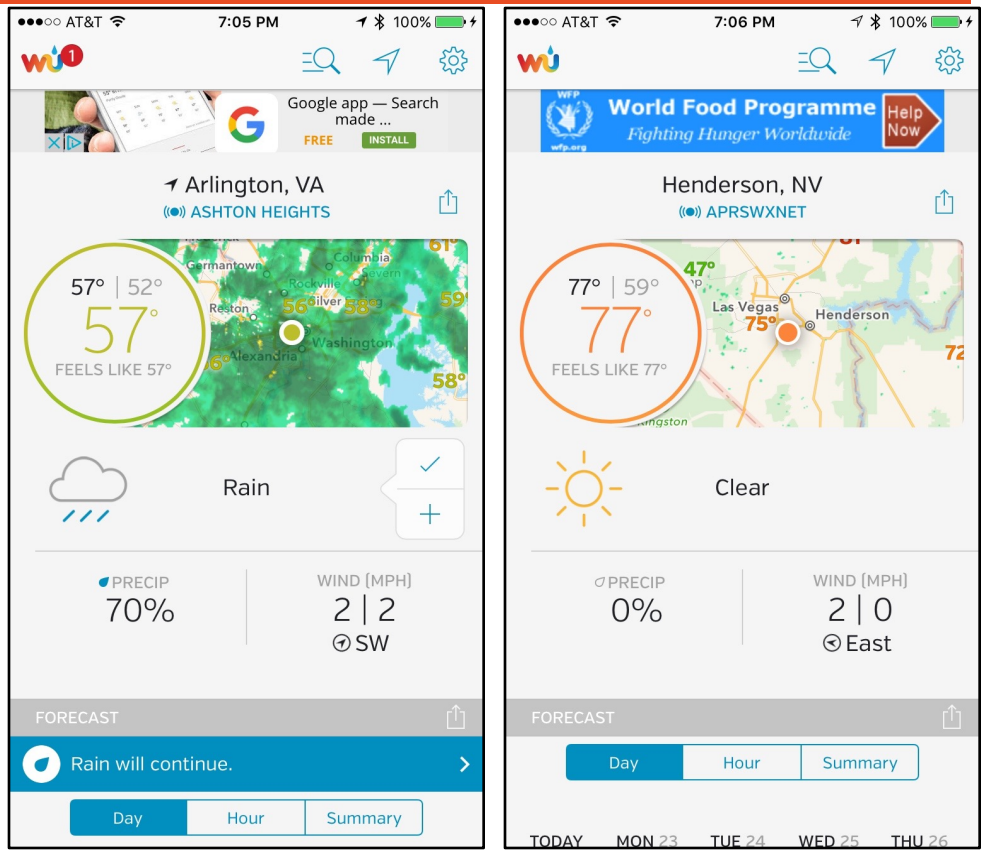
- /Documents/Glympse/ImageCache/glympse_place_<lat>_<long>_<Name>.jpg
- Recents & Searches
- Icons of Locations
- WARNING:
  - Locations not necessarily visited, just searched
- Redundant data in image_cache_index_v2.dat (JSON)




```
glympse_place_38.852007__77.325539_Bray___Scarff.jpg
glympse_place_38.885492__77.097700_Northside_Social_Coffee____Wine.jpg
glympse_place_38.921152__77.234453_8357_Leesburg_Pike.jpg
glympse_place_38.9[redacted]__77.3[redacted].jpg
glympse_place_43.993275__102.241745_Wall_Drug_Store.jpg
glympse_place_47.620560__122.349457_Seattle_Space_Needle.jpg
glympse_place_48.858532_2.294748_Eiffel_Tower.jpg
```

3RD PARTY APPS
WUNDERGROUND

- Weather Application
- Location Data:
  - /Library/Preferences/com.wundergroud.weatherunderground.plist
  - /Library/Preferences/group.com.wunderground.widgets.plist (Shared Data)
  - Snapshots Directory
  - /Library/Caches/com.wunderground.weatherunderground/cache.db



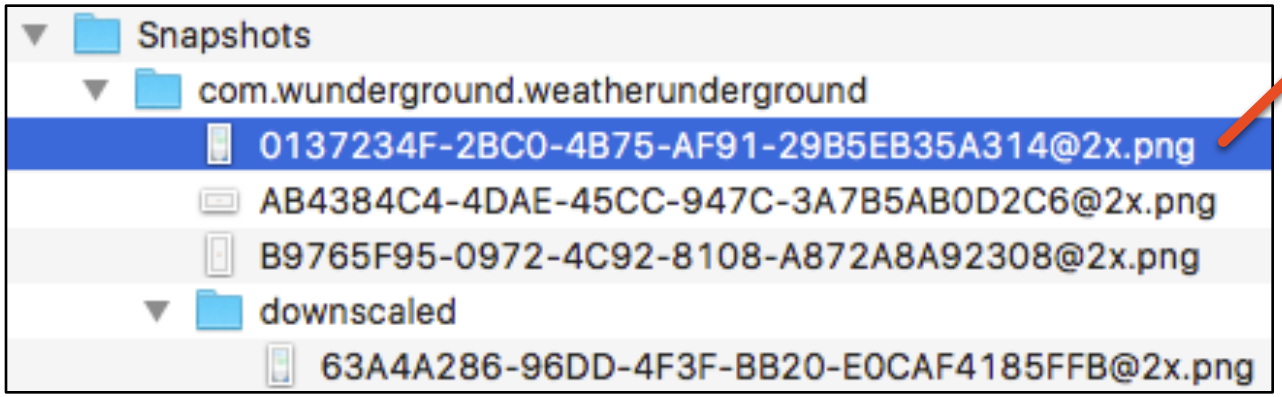
3RD PARTY APPS - WUNDERGROUND PREFERENCE FILES

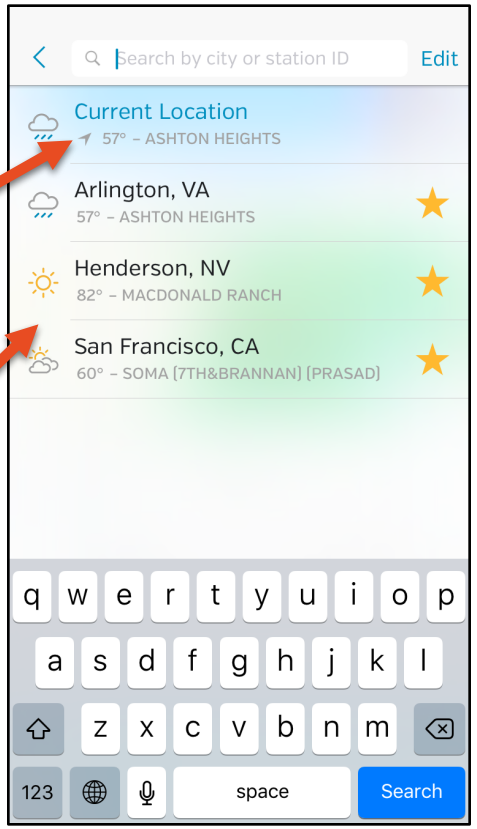
- /Library/Preferences/group.com.wunderground.widgets.plist (newer)
  - lastKnownUserLocation Key
  - NSKeyedArchive Binary Plists: locationConfigList, recentLocationsList
- /Library/Preferences/com.wundergroud.weatherunderground.plist (older)
  - Recents:
    - Locations can be very close to actual location
  - Other Keys
    - customEventsLocation (Location that is being viewed)
    - CurrentLocation2 (Not actual current location in my data)
    - MapViewCenterCoordinate

▼ Recents	Array	(8 items)
▼ Item 0	Dictionary	(3 items)
name	String	Kissimmee, FL
zmw	String	32830.1.99999
gps	String	28.359903,-81.557385
▼ Item 1	Dictionary	(2 items)
name	String	Orlando, Florida
zmw	String	32801.1.99999
▼ Item 2	Dictionary	(3 items)
name	String	Reston, VA
zmw	String	20192.1.99999
gps	String	38.940202,-77.367469
▼ Item 3	Dictionary	(3 items)
name	String	Oakton, VA
zmw	String	22124.2.99999
gps	String	38.917071,-77.366860
▼ Item 4	Dictionary	(3 items)
name	String	Sterling, VA
zmw	String	20102.1.99999
gps	String	38.955814,-77.447092
▼ Item 5	Dictionary	(3 items)
name	String	Seaside, CA
zmw	String	93940.8.99999
gps	String	36.597159,-121.843928
▼ Item 6	Dictionary	(3 items)
name	String	Monterey, CA
zmw	String	93942.1.99999
gps	String	36.600750,-121.895134
▼ Item 7	Dictionary	(3 items)
name	String	Stafford, VA
zmw	String	22554.1.99999
gps	String	38.468674,-77.411728

3RD PARTY APPS - WUNDERGROUND SNAPSHOTS DIRECTORY

- /Library/Caches/Snapshots/<bundleid>/*.png
- Created when:
  - App Moved to Background
  - iOS Device Locked
- Can be very useful in ALL applications!





3RD PARTY APPS - WUNDERGROUND CACHE.DB FILES

- /Library/Caches/com.wunderground.weatherunderground/cache.db
- All apps have a cache.db file
  - Sometime great info, sometimes not.
  - Cached network requests/responses from the iDevice
  - Not usually found in logical/backup acquisitions

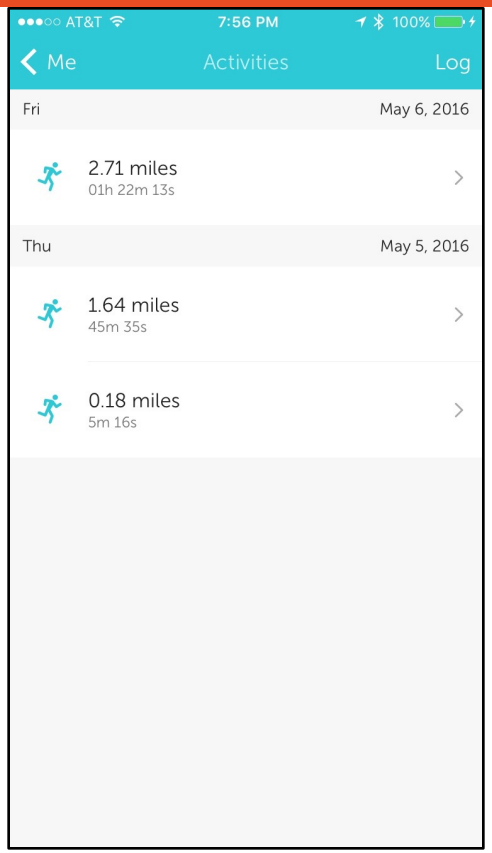
Table: cfurl_cache_response

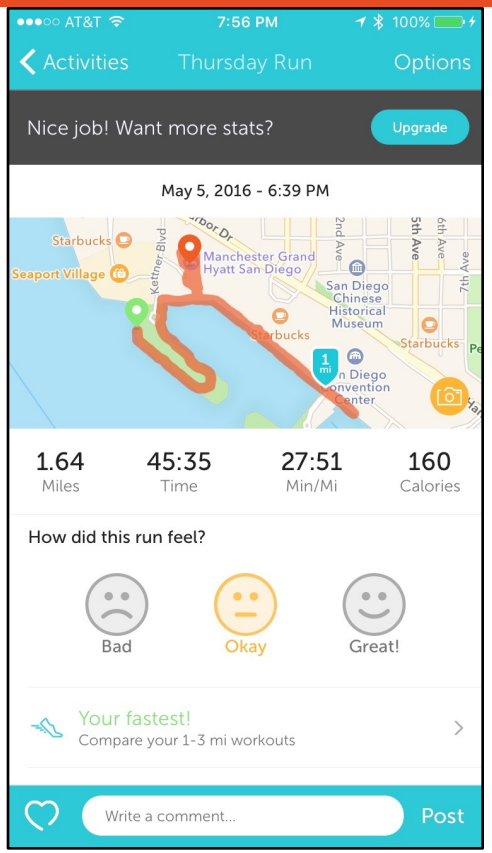
New Record

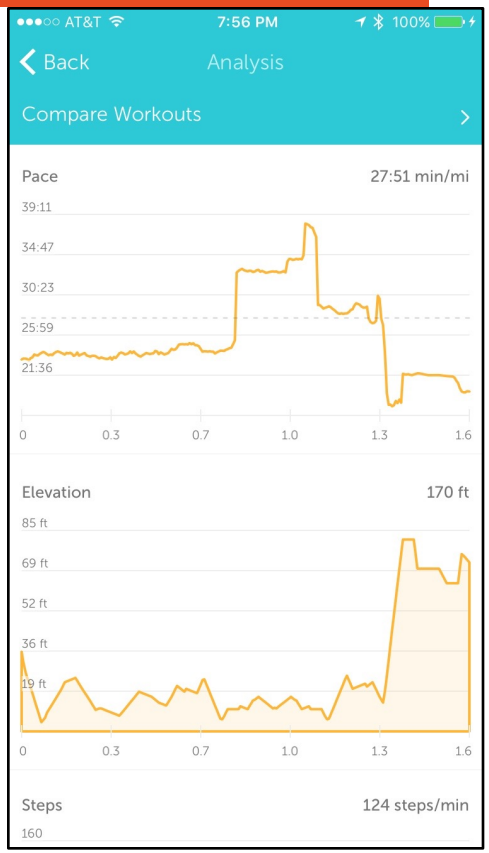
	entry_ID	request_key	time_stamp
	Filter	Filter	Filter
1	279	https://pagead2.googlesyndication.com/activeview?avi=B_hZ5FztCV8PwJcSNmQTgzJj4AgCdiarfsAIAABABOAGgBho&id=gmob&p=64%2C28%2C114%2C…	2016-05-22 23:05:01
2	280	http://www.wunderground.com/auto/iphone_app/geo/FavoriteConditions/index.html?q.0.q=38.8[redacted],-77.1[redacted]&q.1.q=38.8[redacted],-77.1[redacted]&	2016-05-22 23:05:07
3	281	https://api.wunderground.com/api/c39ea9c961f1a516/geolookup/q/38.8[redacted],-77.1[redacted]json?DMA=1	2016-05-22 23:05:34
4	282	https://api.wunderground.com/api/c39ea9c961f1a516/history_2016052020160523/q/38.8[redacted],-77.1[redacted].json?v=wuiapp	2016-05-22 23:05:34
5	283	https://api.wunderground.com/api/c39ea9c961f1a516/conditions/forecast10day/hourly10day/v:2.0/lang:EN/q/38.8[redacted],-77.1[redacted].json	2016-05-22 23:05:34
6	284	https://api.wunderground.com/api/c39ea9c961f1a516/currenthurricane/view.json	2016-05-22 23:05:34
7	285	https://api.wunderground.com/api/c39ea9c961f1a516/radio/q/38.8[redacted],-77.1[redacted]json?v=wuiapp	2016-05-22 23:05:34

3RD PARTY APPS
RUNKEEPER

- Exercise Tracking
- Location Data:
- /Documents/RunKeeper.sqlite







3RD PARTY APPS - RUNKEEPER /Documents/RunKeeper.sqlite

- /Documents/RunKeeper.sqlite – Locations in 'points' Table, correlate trip_id in 'trips' Table for time frame.

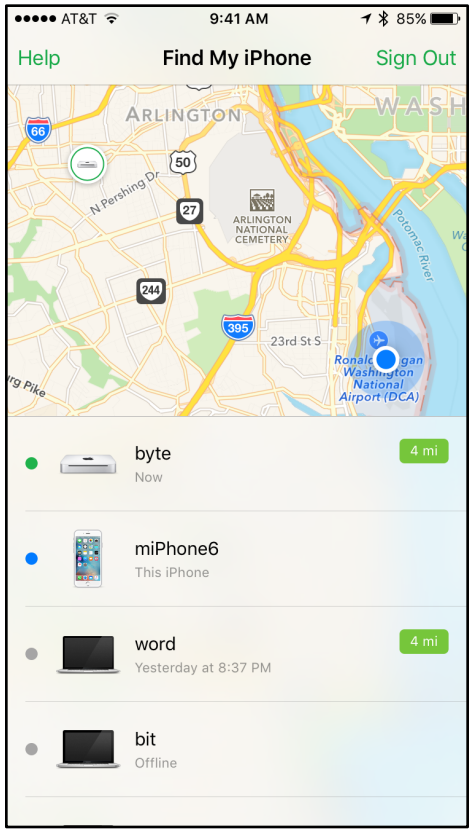
Table: points

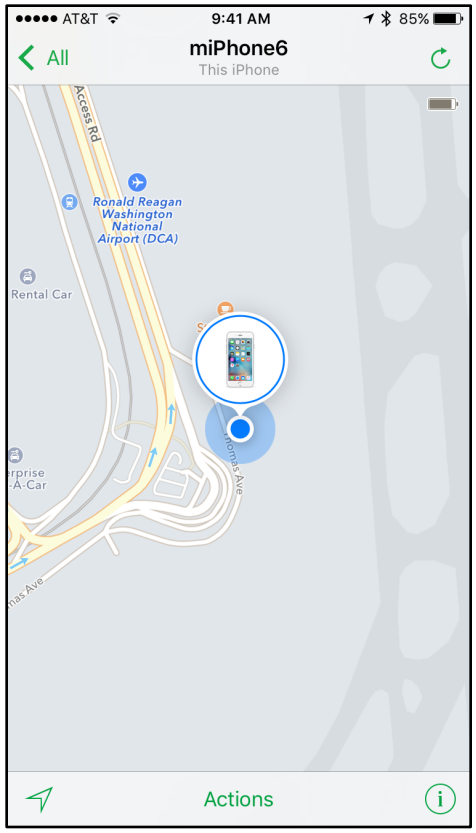
	point_id	trip_id	latitude	longitude	altitude	time_interval_at_point	speed_from_last_point
	Filter	2	Filter	Filter	Filter	Filter	Filter
166	474	2	32.7065251395411	-117.164410762598	3.81818181818182	1762.907	0.00600226053019198
167	475	2	32.7065891772813	-117.164489049574	3.81818181818182	1772.889	0.00576211446557199
168	476	2	32.7066429890997	-117.164586363469	3.81818181818182	17	
169	477	2	32.7067039674453	-117.164665572454	3.36363636363636	17	
170	478	2	32.7067630598626	-117.164761461427	2.90909090909091	18	
171	479	2	32.7068212302706	-117.164862211903	2.54545454545455	18	

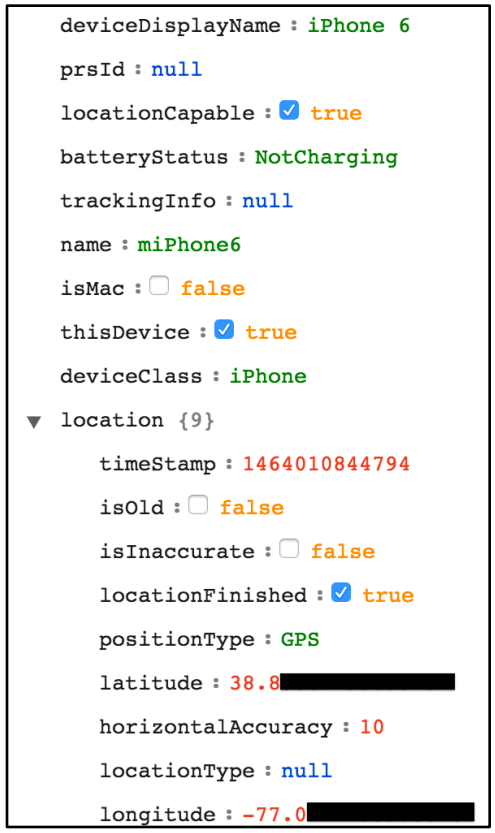
Table: trips

	trip_id	start_date	distance	elapsed_time
	Filter	Filter	Filter	Filter
1	1	1462473169.0	289.073021347779	315.999
2	2	1462473578.0	2633.62439359492	2734.999
3	3	1462550655.0	4360.74595377222	4932.64

NATIVE IOS – FIND MY IPHONE
/Library/Caches/com.apple.mobileme.fmip1/Cache.db

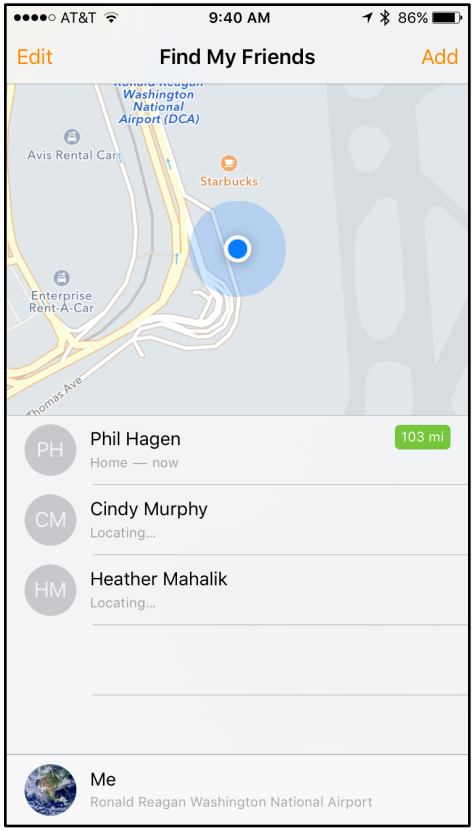


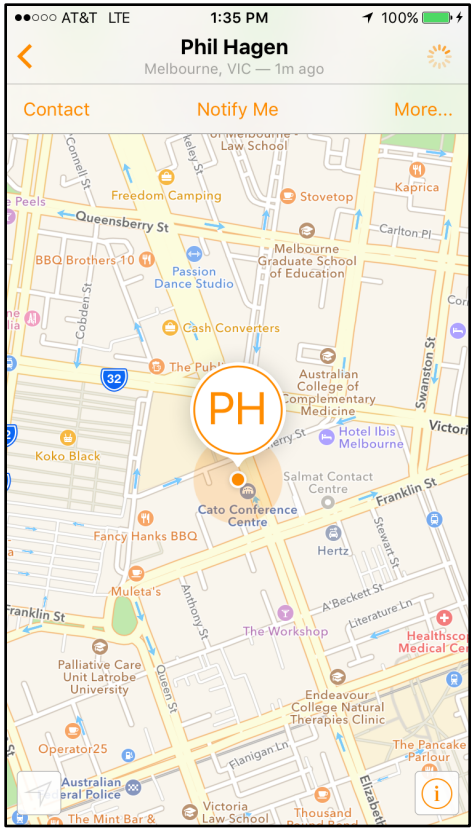




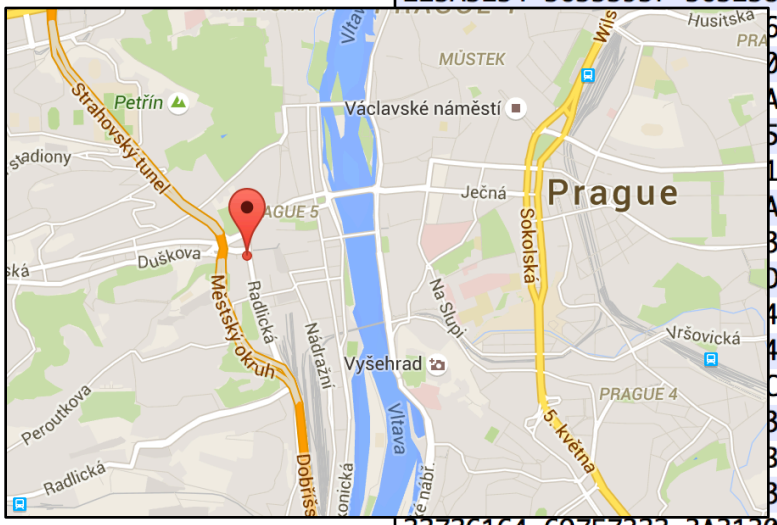
NATIVE IOS
FIND MY FRIENDS

- Locate your friends
  - If they allow you.
- Data Locations:
  - /Library/Caches/com.apple.mobileme.fmf1/Cache.db





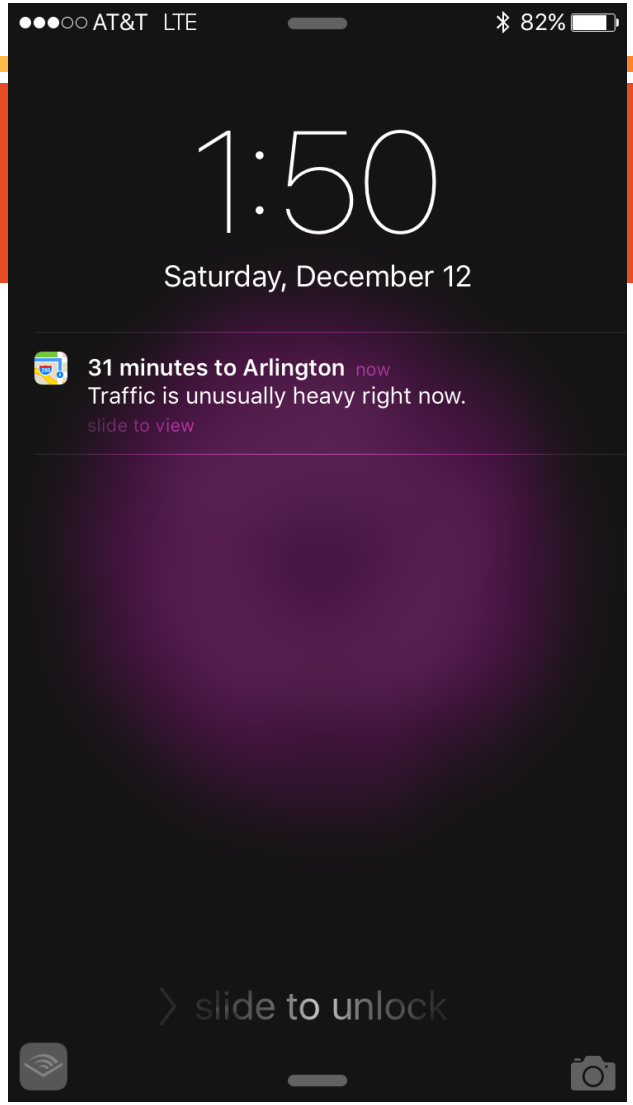
NATIVE IOS – FIND MY FRIENDS
DELETED DATABASE ENTRIES IN CACHE.DB




```
3A5B5D2C 226D6F64 656C5665 ô!  ≤D{"pendingOffers":[],"modelVe
2C223232 223A302C 22313222 rsion":"1","fetchStatus":"200","dataContext":{"11":0,"22":0,"12"
223A3134 36333937 36323839 :0,"13":1463963423693,"18":146396308776411,"19":1,"0":1463976289
533 444,"1":1463976289444,"2":1463963078431,"5":0,"6":33,"8":1463963
022 248549,"9":"6F84028F9C69827212736D82CD8B9780","20":0,"21":0,"10"
A7B :1464010805366},"myFencesISet":[],"futureFollowing":[],"prefs":{
54C "allowFriendRequests":"Yes","fenceNotification":"FRIENDS","hideL
140 ocation":"No","shouldReceiveEmails":"Yes","primaryEmail":"oompa@
A22 csh.rit.edu","favorites":null},"myFencesOthersSet":[{"address":"
339 ","followerIds":["MTE1MzQ3NjkzMQ~~"],"latitude":50.0714591954639
065 9,"locationType":"","label":"","trigger":"exit","type":"NotifyMe
472 ","onetimeonly":true,"updateTimestamp":1444245024391,"prettyAddr
422 ess":"","phoneNumbers":[],"emails":[],"streetName":"","friendId"
C22 :"","fullAddress":{"formattedAddressLines":["Pal√°c K≈ôi≈æ√≠k","
37A Radlick√° 615/4","150 00 Prague","Czech Republic"],"country":"Cz
3C3 ech Republic","streetName":"Radlick√°","streetAddress":"Radlick√
34F ° 615/4","locality":"Prague","administrativeArea":"Prague"},"isC
22726164 69757322 3A313030 n":true,"id":"90c987be-8690-4fad-ab16-5e4741ec3dfc","radius":100
75646522 3A31342E 34303038 .0,"fenceId":null,"createdById":"1153476931","longitude":14.4008
69746174 696F6E46 726F6D48 4815694506}],"futureFollowers":[],"followers":[{"invitationFromH
```

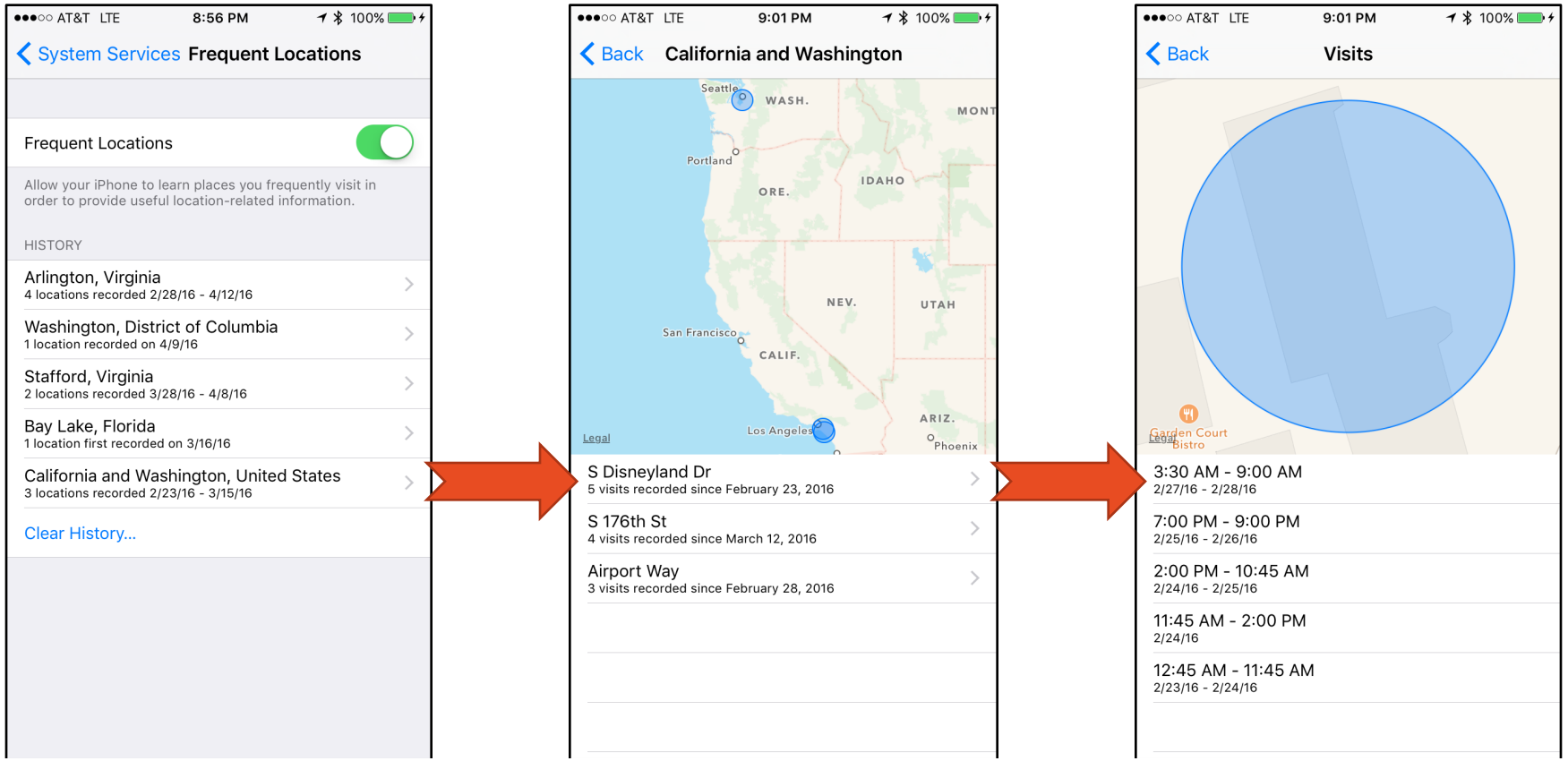
NATIVE IOS - FREQUENT LOCATIONS (ROUTINED)

- User Viewable (View Yours!):
  - Settings ->
  - Privacy ->
  - Location Services ->
  - System Services ->
  - Frequent Locations
- Uses Location Services
- More like "Frequent" and "Recent" Locations
- "Frequent" algorithm is unknown



NATIVE IOS - FREQUENT LOCATIONS (ROUTINED)

Settings | Privacy | Location Services | System Services | Frequent Locations



NATIVE IOS - LOCATIONS (ROUTINED)
/private/var/root/library/caches/locationd/cache_encryptedB.db

```
1  select datetime(timestamp+978307200,'unixepoch','localtime') as timestamp, Latitude, Longitude,
2  Altitude, HorizontalAccuracy, VerticalAccuracy from location
```

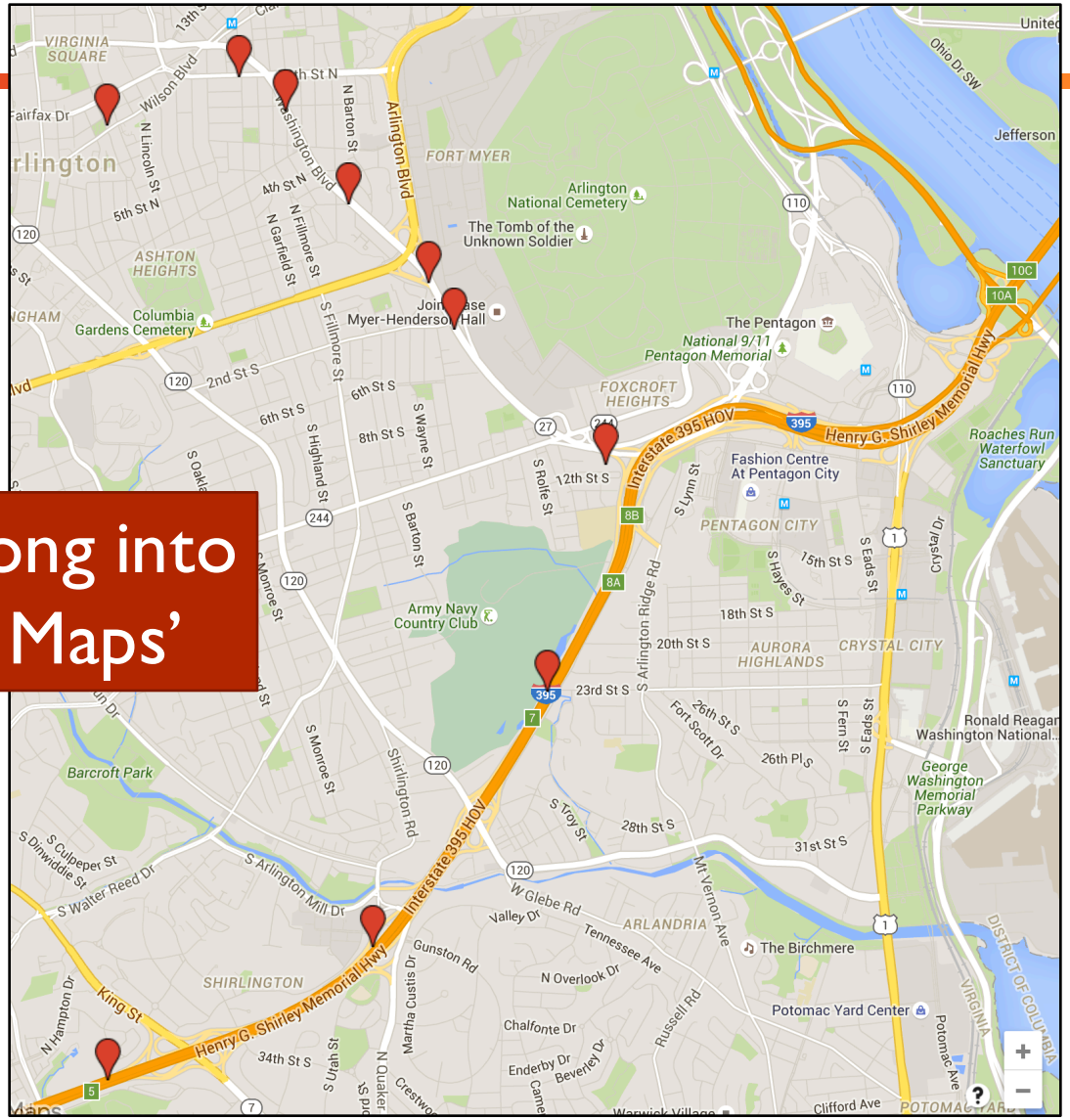
	timestamp	Latitude	Longitude	Altitude	HorizontalAccuracy	VerticalAccuracy
1	2016-04-12 08:00:30	38.8819415801995	-77.1033633413063	83.9911193847656	65.0	49.8430881839981
2	2016-04-12 08:02:09	38.8844267330494	-77.0947589586276	89.2934923546982	5.0	3.66666666666667
3	2016-04-12 08:03:07	38.8826809963573	-77.0916912951774	88.0339636439803	5.0	3.0
4	2016-04-12 08:04:08	38.8779316521612	-77.087568450791	72.6745093025534	5.0	3.0
5	2016-04-12 08:04:55	38.8739400334087	-77.0823709108653	61.1218382208071	5.0	3.0
6	2016-04-12 08:05:16	38.8715504400133	-77.0806616785783	53.1938431752319	5.0	3.0
7	2016-04-12 08:06:17	38.8646755004663	-77.0707583986941	47.0308895830595	5.0	3.06666666666667
8	2016-04-12 08:07:17	38.8531212901097	-77.0745927480677	21.0405486171192	5.0	3.48387096774194
9	2016-04-12 08:08:18	38.8401141554299	-77.0860081836699	23.9693750537383	5.0	3.51612903225806
10	2016-04-12 08:09:18	38.8333078032593	-77.1033353773503	64.1204422513992	5.0	3.44827586206897

Data Retention:
~1 Days

Timestamps:
Accurate*

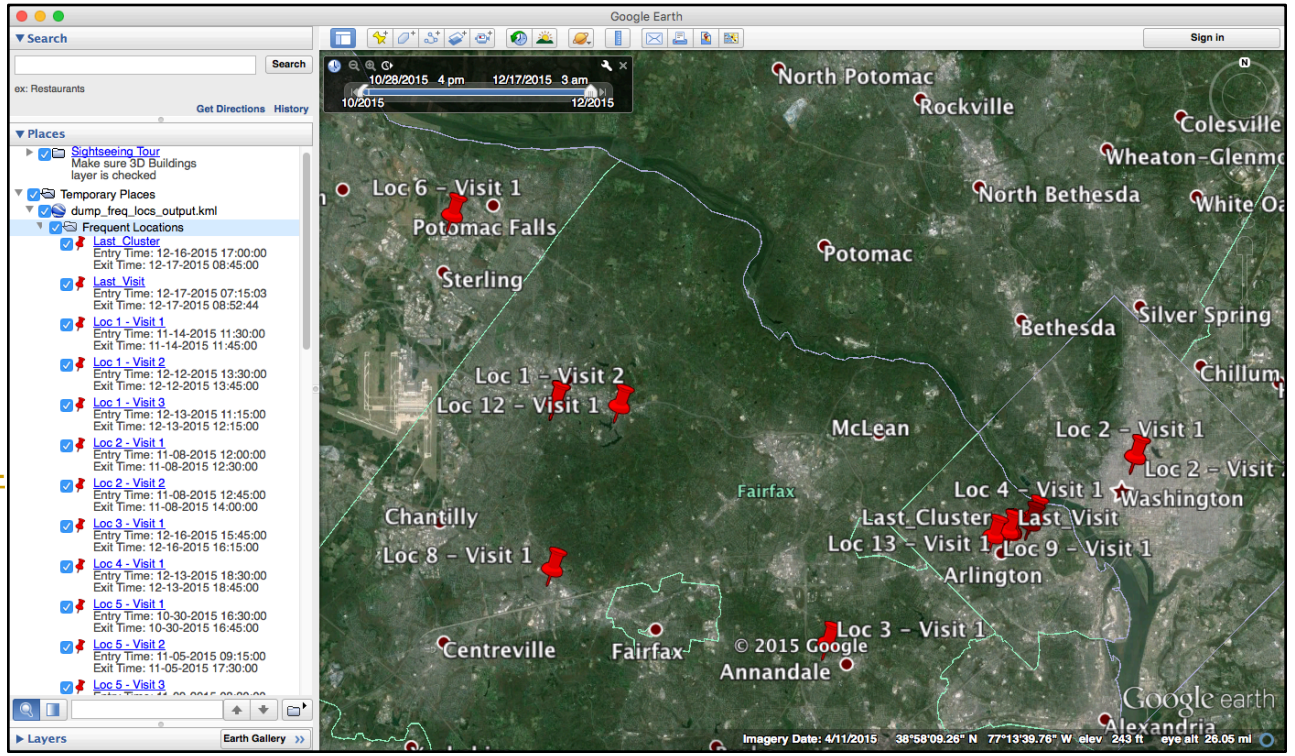
GPS Accuracy:
Close, but YMMV

Import Lat/Long into Google'My Maps'



NATIVE IOS - FREQUENT LOCATIONS
/private/var/mobile/library/caches/com.apple.routined/StateModel#.archive [1 or 2]

- Contains Historical Data
  - Not every location for all time
  - Uses algorithm to decide
- NSKeyedArchiver Property List Files
  - No immediate context to keys/values
  - Very manual analysis process. ☹
- Python Script!
  - https://github.com/mac4n6/iOS-Frequent-Locations-Dumper
- Outputs
  - KML
  - CSV
  - Textual (Example Next Slide)



NATIVE IOS - FREQUENT LOCATIONS

/private/var/mobile/library/caches/com.apple.routined/StateModel#.archive [1 or 2]

```
######################################################################
Location Entry Number 1:
       Entry Last Update Timestamp:   11-13-2015 02:08:19

Location BLOB Contents:
[DataPoints: 0]

Hexdump Output:
----------------------------------------------------------------------------
00000000: 0A A5 02 18 39 22 1A 32  33 30 31 E2 80 93 32 33  ....9".2301...23
00000010: 37 37 20 43 6C 61 72 65  6E 64 6F 6E 20 42 6C 76  77 Clarendon Blv
00000020: 64 32 EB 01 5A 1A 32 33  30 31 E2 80 93 32 33 37  d2..Z.2301...237
00000030: 37 20 43 6C 61 72 65 6E  64 6F 6E 20 42 6C 76 64  7 Clarendon Blvd
00000040: 5A 14 41 72 6C 69 6E 67  74 6F 6E 2C 20 56 41 20  Z.Arlington, VA
00000050: 20 32 32 32 30 31 5A 0D  55 6E 69 74 65 64 20 53   22201Z.United S
00000060: 74 61 74 65 73 7A A7 01  0A 0D 55 6E 69 74 65 64  tatesz....United
00000070: 20 53 74 61 74 65 73 12  02 55 53 1A 08 56 69 72   States..US..Vir
00000080: 67 69 6E 69 61 22 02 56  41 2A 09 41 72 6C 69 6E  ginia".VA*.Arlin
00000090: 67 74 6F 6E 32 09 41 72  6C 69 6E 67 74 6F 6E 3A  gton2.Arlington:
000000A0: 05 32 32 32 30 31 42 0A  43 6F 75 72 74 68 6F 75  .22201B.Courthou
000000B0: 73 65 52 0E 43 6C 61 72  65 6E 64 6F 6E 20 42 6C  seR.Clarendon Bl
000000C0: 76 64 5A 0B 32 33 30 31  E2 80 93 32 33 37 37 62  vdZ.2301...2377b
000000D0: 1A 32 33 30 31 E2 80 93  32 33 37 37 20 43 6C 61  .2301...2377 Cla
000000E0: 72 65 6E 64 6F 6E 20 42  6C 76 64 8A 01 14 43 6C  rendon Blvd...Cl
000000F0: 61 72 65 6E 64 6F 6E 2D  43 6F 75 72 74 68 6F 75  arendon-Courthou
00000100: 73 65 8A 01 0A 43 6F 75  72 74 68 6F 75 73 65 4A  se...CourthouseJ
00000110: 12 09 4A E9 3E A5 EF 71  43 40 11 31 6B 18 F4 94  ..J.>..qC@.1k...
00000120: 45 53 C0 58 02 70 C2 3B                           ES.X.p.;
None
----------------------------------------------------------------------------
Hex Output:
[0aa5021839221a32333031e280933233373720436c6172656e646f6e20426c766432eb015a1a323
33031e280933233373720436c6172656e646f6e20426c76645a1441726c696e67746f6e2c2056412
020323232303315a0d556e697465642053746174657465737aa7010a0d556e697465642053746174657465731
20255531a0856697267696e6961220256412a0941726c696e67746f6e320941726c696e67746f6e3
a053232323031420a436f757274686f757365520e436c6172656e646f6e20426c76645a0b3233303
1e2809332333737621a32333031e280933233373720436c6172656e646f6e20426c76648a0114436
c6172656e646f6e2d436f757274686f7573658a010a436f757274686f7573654a12094ae93ea5ef7
1434011316b18f4944553c0580270c23b]
----------------------------------------------------------------------------
```

```
Location Data:
        Latitude:               38.8901452083
        Longitude:              -77.0872245449
        Confidence:             0.1
        Uncertainty:            110.17950307
        Update Timestamp:       11-13-2015 02:08:17

Visits (Entry/Exits):

        Visit Number: 1
        Entry Timestamp:        11-11-2015 12:09:33
        Exit Timestamp:         11-11-2015 13:08:03

Transition Data:

        Transition Number: 1

                Start/Stop: 1
                        Motion Activity Type: <<Not Populated>>
                        Route UUID: $null
                        Start Timestamp:        11-11-2015 13:03:03
                        Stop Timestamp:         11-21-2015 13:13:15
```

NATIVE IOS - CELL LOCATIONS
/private/var/root/library/caches/locationd/ cache_encryptedA.db & lockCache_encryptedA.db

```
1  select datetime(timestamp+978307200,'unixepoch','localtime') as Timestamp,
2  latitude, longitude, mcc, mnc, tac, ci, uarfcn
3  from LteCellLocation
```

	Timestamp	Latitude	Longitude	MCC	MNC	TAC	CI	UARFCN
781	2016-04-09 16:35:05	38.89591594	-77.02227692	310	120	6152	51742266	-1
782	2016-04-09 16:35:05	38.90686029	-77.04580937	310	260	20234	10298625	-1
783	2016-04-09 16:41:23	38.88934702	-77.03765539	310	410	4638	168769552	-1
784	2016-04-09 16:41:23	38.8708062	-77.00907997	310	410	4631	167985533	-1
785	2016-04-09 16:41:23	38.88175763	-77.03926338	310	410	4638	168769546	-1
786	2016-04-09 16:41:23	38.87029243	-76.99438353	311	480	27400	104194848	-1
787	2016-04-09 16:41:23	38.86216224	-77.06727286	311	870	44929	82579467	-1
788	2016-04-09 16:41:23	38.88934702	-77.01273611	311	480	27410	104319008	-1

Data Retention:
~1 Week
(Varies Per Table)

Timestamps:
Accurate*

GPS Accuracy:
Within General Area (See Next Slide)

Many Other Tables:
- CDMA
- SCDMA
- LTE
- WIFI
- "Indoor"
- Application/"WTW"

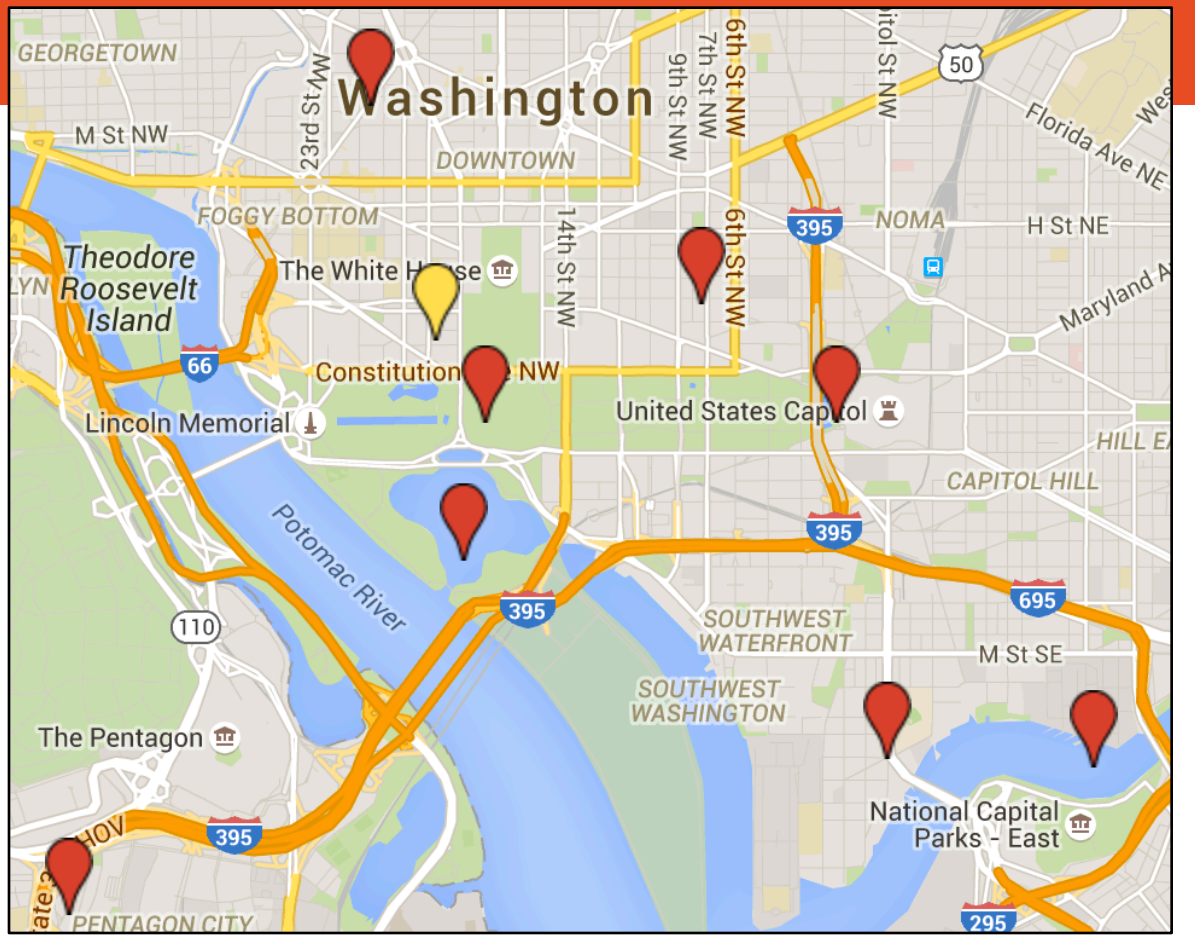
NATIVE IOS - CELL LOCATIONS

cache_encryptedA.db

Yellow Point:
My Actual Location

Red Points:
"LTE Cell Locations"

Warning:
Locations are in general area, NOT exact area



NATIVE IOS - WIFI LOCATIONS

/private/var/root/library/caches/locationd/cache_encryptedB.db

```
1  select datetime(timestamp+978307200,'unixepoch','localtime') as Timestamp,
2  MAC, Channel, Latitude, Longitude
3  from WifiLocation
4  order by Timestamp
```

	Timestamp	MAC	Channel	Latitude	Longitude
283	2016-04-09 14:06:26	202552290261808	1	38.89331141	-77.03996022
284	2016-04-09 14:06:26	202552290420464	1	38.89339663	-77.04031012
285	2016-04-09 14:06:26	202552290802784	11	38.89340956	-77.04041513
286	2016-04-09 14:06:26	202552290803296	11	38.89345488	-77.04029103
287	2016-04-09 14:06:26	202552290803904	6	38.89339626	-77.04028187
288	2016-04-09 14:06:26	202552291496976	1	38.89326488	-77.04264756
289	2016-04-09 14:06:26	202552291958080	11	38.8921614	-77.04037459

Data Retention:
~4 Days

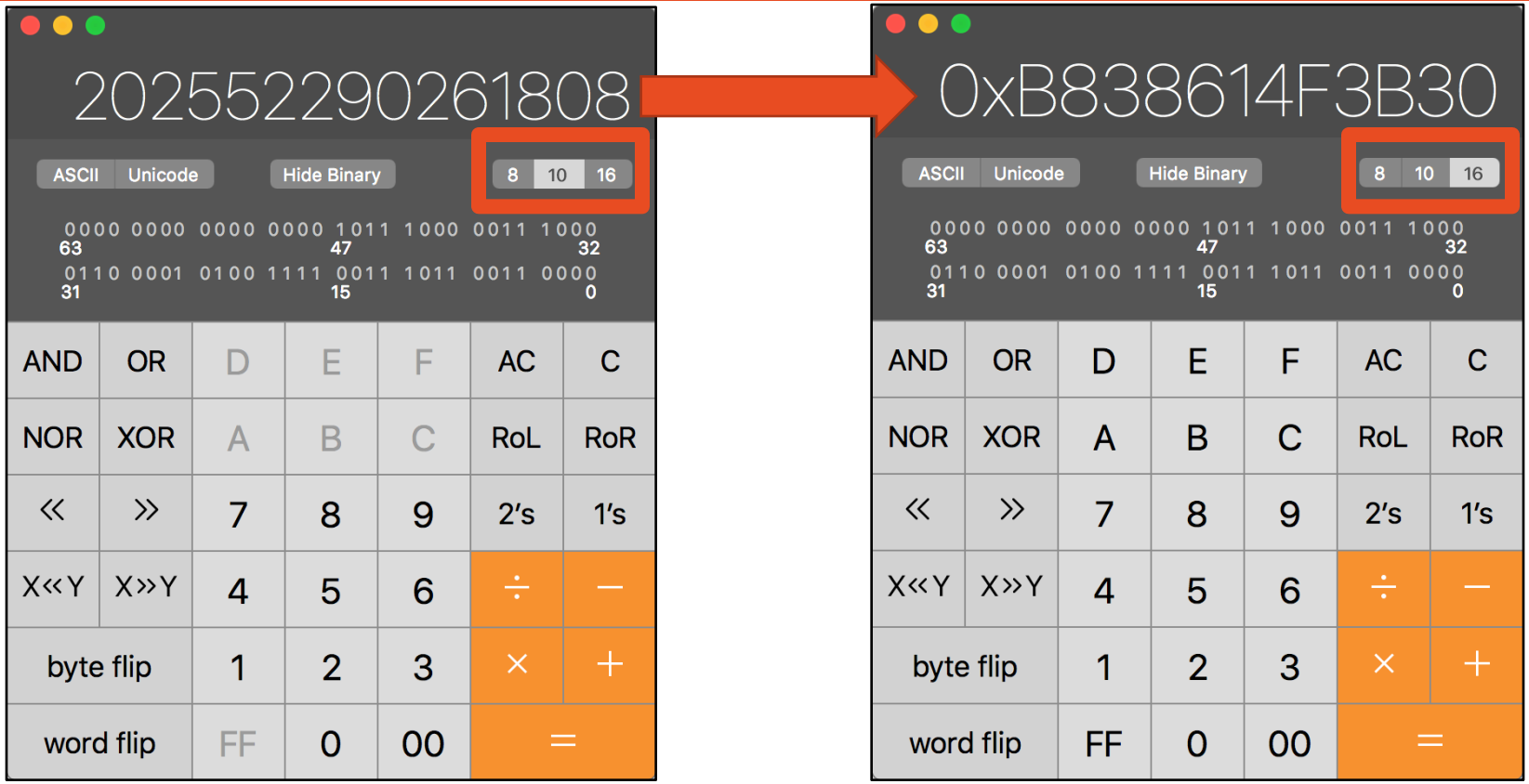
Timestamps:
Accurate*

GPS Accuracy:
Within General Area

MAC Address:
Stored in Base10

NATIVE IOS - WIFI LOCATIONS

/private/var/root/library/caches/locationd/cache_encryptedB.db



https://wigle.net/search

View | Uploads | Info | Stats | Tools

Network Search

General Search | Network Detail

Query for networks

Latitude: 47.25264 to: 47.25265 Longitude: -87.256243 to: -87.256244

Search Radius Tolerance(+/- degrees): 0.010

BSSID/MAC: b8:38:61:4f:3b:30

SSID / Network Name (exact match): foobar

SSID / Network Name (wildcards[1]: % and _): foobar%

Last Observed: 2001092517454

Must Be a FreeNet | Must Be a Commercial Pay Net | Only Networks I Was the First to Discover

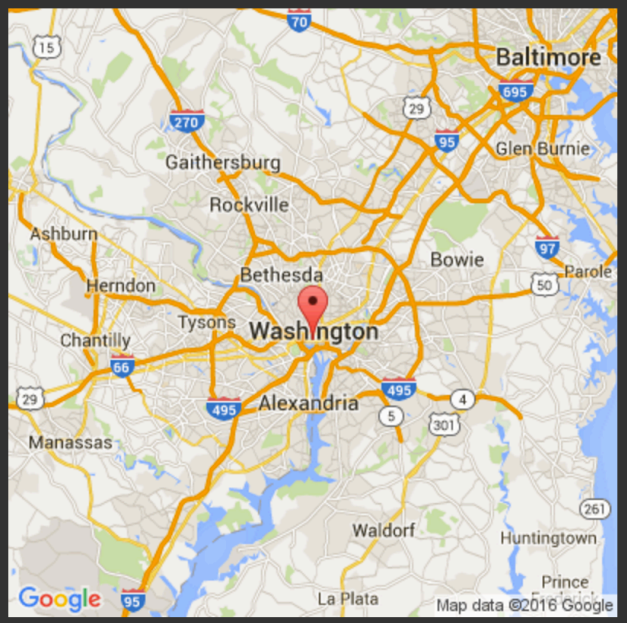
Addresses are for the U.S. only (2002 Census data)

Street Address: 1600 Pennsylvania Ave State: DC Zip: 20502

Query | Reset

[1] SSID cannot start with a wildcard. '%' means zero-or-more characters, '_' means a single character.

Network Location



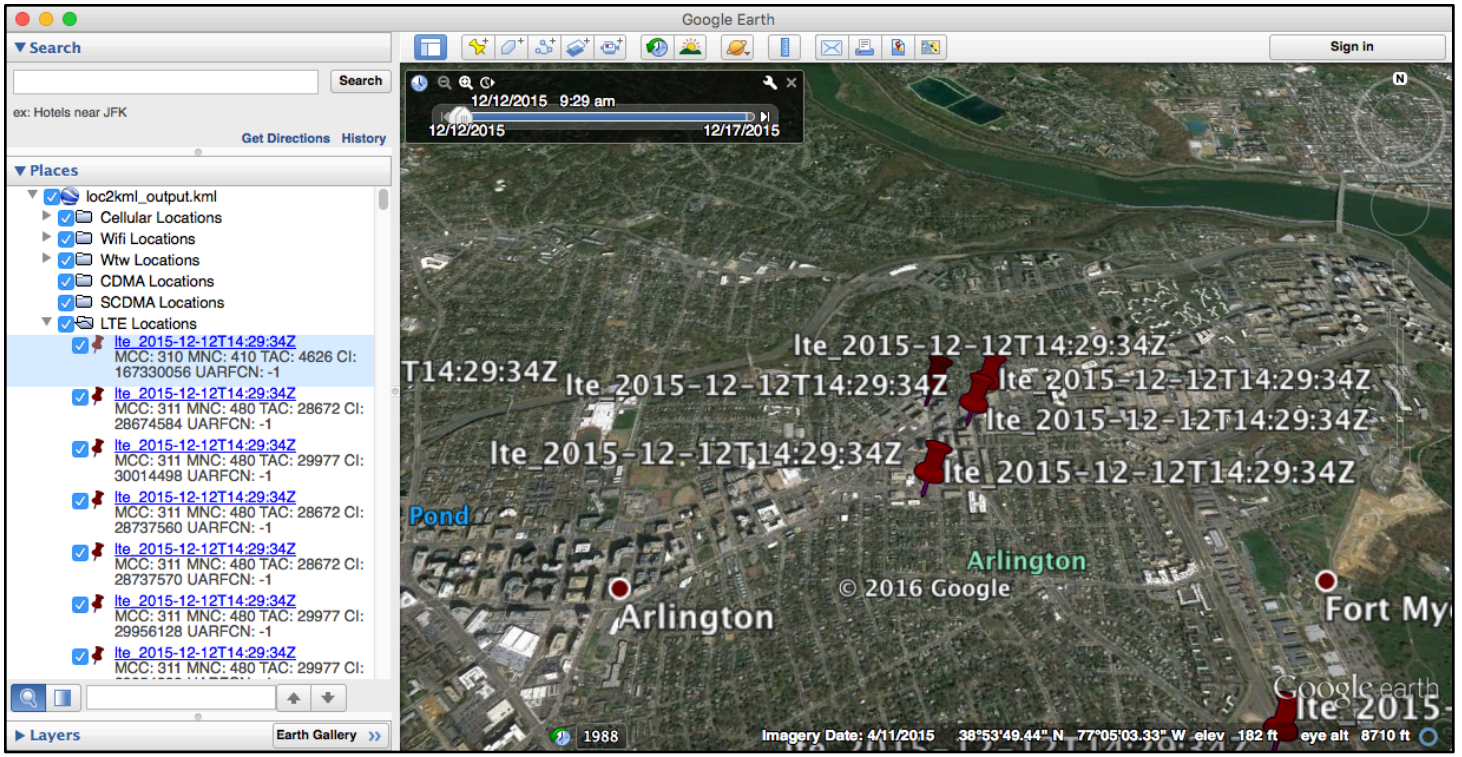
Click for interactive map

<< | showing records 1 to 1 | >>

Map	Net ID	SSID	Name	Type	First Seen	Most Recently	Crypto	Est. Lat	Est. Long	Channel	Bcn Int.	QoS	Found by Me	Free	Pay	Comment
map	B8:38:61:4F:3B:30	OAS_OPEN		infra	2014-10-05 15:51:05	2015-05-09 14:45:51		38.89290619	-77.03944397	1		2				add comment

LOCATIONS SCRAPER (COMING SOON!) PYTHON SCRIPT

- Gimme All the Locations!
  - Routined
  - Locationd
- Python Script!
  - Will Release Soon!
  - Making code less redundant
  - Need it NOW? Just ask, politely.
- Outputs
  - KML
  - CSV



WHEN ALL ELSE FAILS, KEYWORD SEARCH!

Latitude	Longitude	Lat	Long	Lon
gps	coord	geo	Actual coordinates of location of interest (38,-77)	Address (1060 W Addison St, Chicago, IL 60613)
		False Positives		