I know your MAC Address: *Targeted tracking of individual using Wi-Fi*

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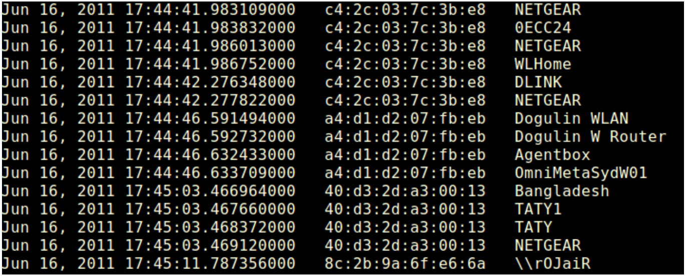
GreHack 2013

Mobile Information Leakage

- Your mobile phone leak sensitive informations



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Jun 16, 2011 17:44:41.983109000   c4:2c:03:7c:3b:e8   NETGEAR
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Jun 16, 2011 17:44:41.986013000   c4:2c:03:7c:3b:e8   NETGEAR
Jun 16, 2011 17:44:41.986752000   c4:2c:03:7c:3b:e8   WLHome
Jun 16, 2011 17:44:42.276348000   c4:2c:03:7c:3b:e8   DLINK
Jun 16, 2011 17:44:42.277822000   c4:2c:03:7c:3b:e8   NETGEAR
Jun 16, 2011 17:44:46.591494000   a4:d1:d2:07:fb:eb   Dogulin WLAN
Jun 16, 2011 17:44:46.592732000   a4:d1:d2:07:fb:eb   Dogulin W Router
Jun 16, 2011 17:44:46.632433000   a4:d1:d2:07:fb:eb   Agentbox
Jun 16, 2011 17:44:46.633709000   a4:d1:d2:07:fb:eb   OmniMetaSydW01
Jun 16, 2011 17:45:03.466964000   40:d3:2d:a3:00:13   Bangladesh
Jun 16, 2011 17:45:03.467660000   40:d3:2d:a3:00:13   TATY1
Jun 16, 2011 17:45:03.468372000   40:d3:2d:a3:00:13   TATY
Jun 16, 2011 17:45:03.469120000   40:d3:2d:a3:00:13   NETGEAR
Jun 16, 2011 17:45:11.787356000   8c:2b:9a:6f:e6:6a   \\rOJaiR
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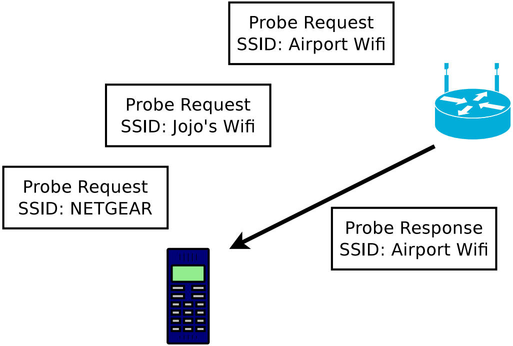
  - MAC address and SSIDs
  - Easy to collect with approriate harwdware and software

Mobile Information Leakage

- Active Wi-Fi service discovery



Mobile Information Leakage I

00:03:45:F3:AE:49
MacDonald FreeWiFi
NETGEAR
Wi-Fi de Michel
Freebox_E3729

What can be infered from SSIDs ?

Mobile Information Leakage II

- Link with company/organisation/university

Inria-internes
Insa-Lyon WiFi
NSA surveillance Van

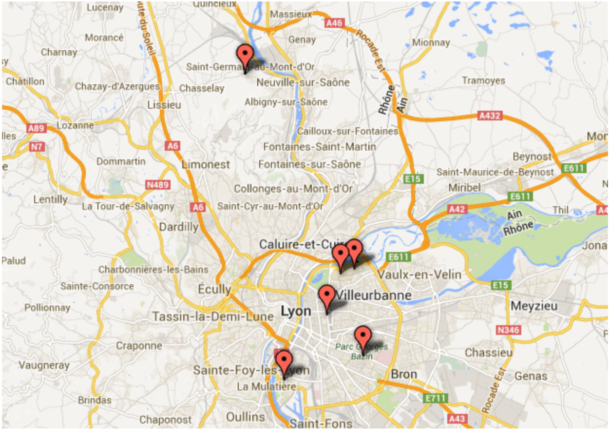
Mobile Information Leakage III

- Full Name of the owner or friend/colleague

C. Lauradoux personnal network
Angela Merkel’s iPhone
R. Stallman’s MacBook-Pro

Mobile Information Leakage IV

- Geolocation of visited places [5]
  - Using Wi-Fi geolocation DB (Wigle.net, openbmap, ...)
  - SSID → Geolocation coordinates

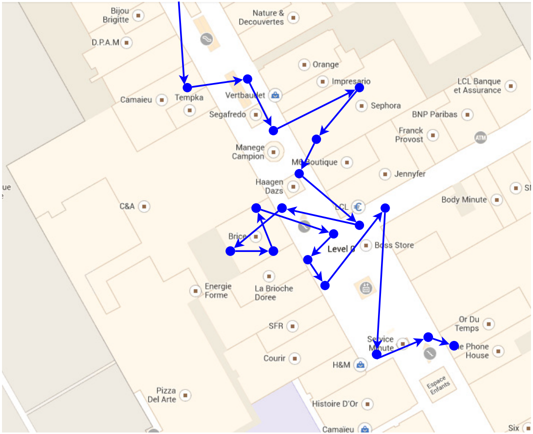


Mobile Information Leakage V

- Social links between device owners
  - By measuring the similarity between lists of SSIDs [2]

Physical tracking

- MAC address : A unique ID perfect for tracking
  - Wi-Fi tracking and Physical analytics [6]



Problem statement I

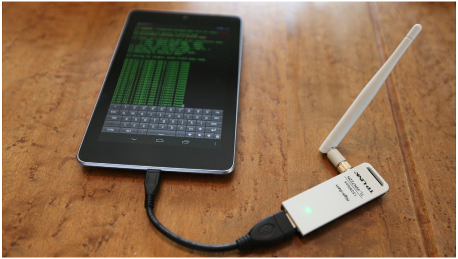
- Lots of information but who is behind ?

00:03:45:F3:AE:49

Problem statement II

- Getting the link between individual and a MAC @
- Foward problem: Identity → MAC @
  - without physical access
  - without getting noticed
  - with a high probability

Sniffing tools I



- How to collect Wi-Fi traffic (while on the move)
  - A Laptop or Tablet
  - Wi-Fi interface supporting monitoring mode
  - Network traffic analysis tools (tcpdump, wireshark)

Stalker attack I

- Random encounters in the street are usually short
- Filter out noise (MAC@ of random individual) to only keep your target
- The actual attack :
  1. Follow the target in the street for N minutes while monitoring Wi-Fi channels
  2. Search in the capture for the device that appear during the full capture

Stalker attack II

- How long is enough ?

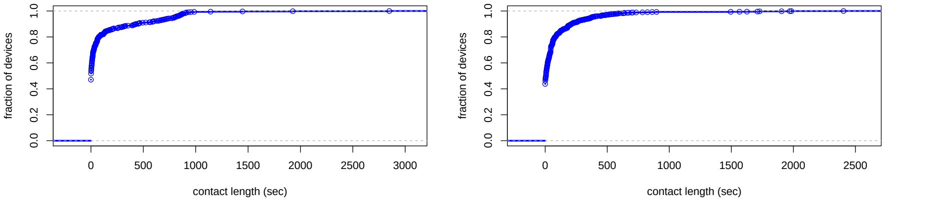


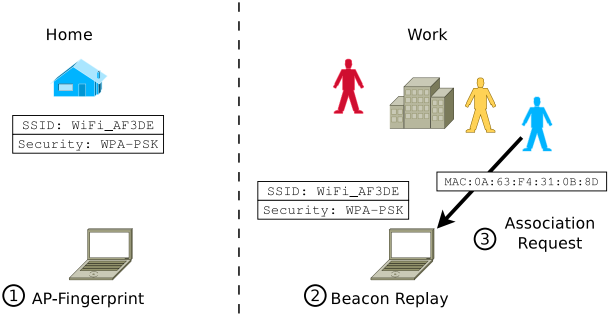
Figure: CDF of contact length during a random walk in the street

- All contact shorter than 40 minutes, and majority of them shorter than 15 minutes
- If multiple candidates: reiterate the attack to narrow down the target MAC@

Beacon replay attack I

- The home/work location pair [4]
- Unique identifier in most cases
- Uniquely identify your target based on its home and work address

Beacon replay attack I



1. Acquire target's home and work location
2. Go at home and capture a fingerprint of the Wi-Fi environement : beacons of visible APs
3. Go at work and replay the beacons
4. Target phone will the only device to respond to your beacons

Beacon replay attack II

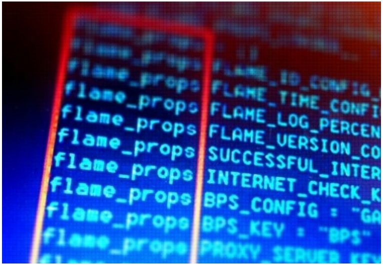
- Limitation : only work with 'unique' SSIDs (Freebox_34567) and not with common SSIDs (FreeWiFi)

Applications

- High-profile individual tracking
  - Deploy monitoring nodes in {St Tropez, Concert venue, Airport}
  - Receive notification when target in range of a monitoring mode
  - Know at what exit you need to be to get a {Autograph,Picture,Line of shoot} (Great for paparazi and stalkers)
- Cheap and distributed monitoring plateform already available : Snoopy[3] and CreepyDOL [7]

Applications

- Who were you with today ?
  - Jealous husband can plant a monitoring software on Wife phone and identify her lover
  - Spy can remotely plant a monitoring software on target's phone and discover social and professional circles
    - Actually used by Flame malware with bluetooth version[1]



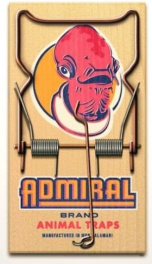
```
flame_props FLAME_ID_CONFIG_
flame_props FLAME_TIME_CONFI
flame_props FLAME_LOG_PERCEN
flame_props FLAME_VERSION_CO
flame_props SUCCESSFUL_INTER
flame_props INTERNET_CHECK_K
flame_props BPS_CONFIG : "GA
flame_props BPS_KEY : "BPS"
flame_props PROXY_SERVER_KEY
```

[1] http://www.symantec.com/connect/blogs/flamer-recipe-bluetoothache

Applications

- Targeted attack
  - Rogue access point
  - MiTM attacks

Applications



- Wi-Fi boobytrap
  - Trigger an action when targeted device is in close range
    - Where action $\in$ {Detonate bomb, Play birthday song, Play prank}
    - Target $\in$ {Best friend, professor, president}

Conclusion

- Wi-Fi devices are leaking a lot of information
- Identification of individual MAC@ possible
  - Stalker and Beacon-replay attack
- Lot of funny/scary applications
- Future work: solve the backward problem
  - Identity → MAC@

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Questions ?