# Wombat: An experimental Wi-Fi Tracking system

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Univ Lyon, INSA Lyon, Inria, CITI, France, Région Rhône-Alpes funding

APVP 2017, Autrans

Introduction - Wi-Fi service discovery

- Wi-Fi infrastructure mode is asymmetric: access point (AP, "server") and stations (STA) ("clients")
- Stations discover APs by either:
  - listening for incoming `beacon` frames (passive mode),
  - sending `probe request` frames (active mode).
    - Less energy-consuming
   - Containing a unique identifier: the MAC address
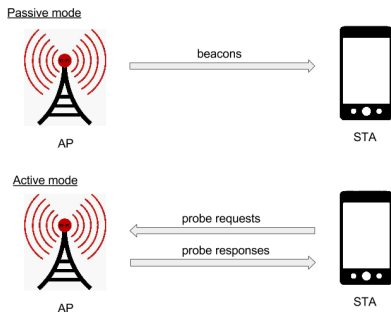
Introduction - Physical tracking
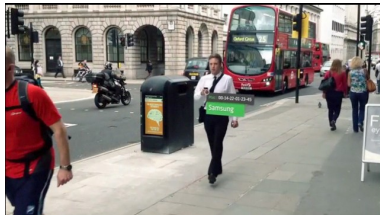
- What: getting the knowledge of a device's presence over time
- Who: businesses, intelligence services, nasty neighbours, employers...
  - Many retail tracking start-ups: Nomi, Euclid, Purple WiFi...
  - Locations: London, Oslo, Niort, Maryland, Lyon...
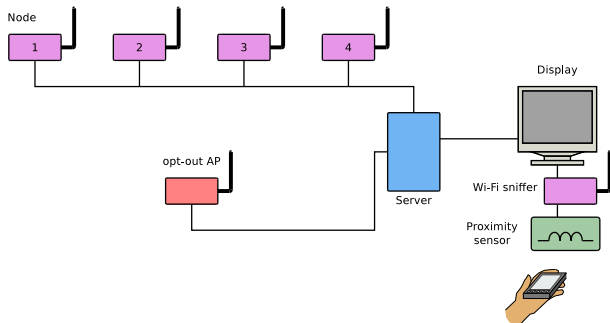- Privacy issue: no consent nor awareness
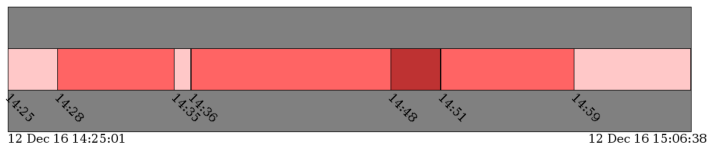
Introducing Wombat
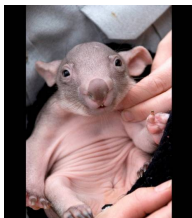
- Wi-Fi Tracking system
- Platform to experiment various privacy-related features

Architecture

14:25 14:28 14:35 14:36 14:48 14:51 14:59

12 Dec 16 14:25:01   12 Dec 16 15:06:38

legend: | noeud1 | noeud3 | noeud4 |
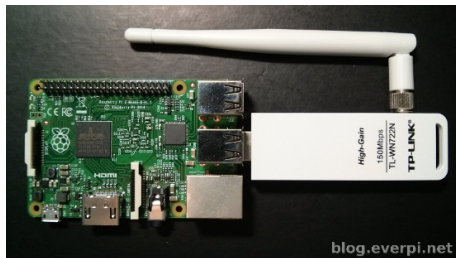
MAC address: 34:23:ba:df:90:ce
Vendor / Manufacturer: Samsung Electro Mechanics co.,LTD.
total number of frames: 2247
visit duration: 0h 41min 37sec
SSIDs: IKEA WiFi, WiFi-Cite-Espace, WiFI Hotel Les Skieurs,
hotspot-cite-sciences, grenoble

Technical details

- Raspberry pi + TP-Link Wi-Fi dongle

- Autonomous wired local network
- Crash-tolerant read-only system

Installations for popularization

- Demos
- X:enius TV show @ Montbonnot
- *Cité des Sciences de de l'Industrie*, Terra Data exhibition, Paris
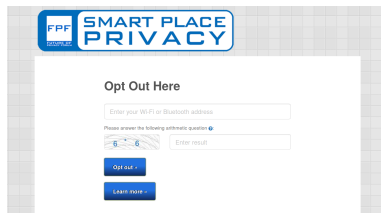

- CNIL (soon)

Privacy guarantees

- Data is erased after a fixed time (i.e. 15 minutes)
- Opt-out mechanism

Privacy-enhancing feature: opt-out mechanism

- Opt-out: exiting the system
- Legislation imposes the possibility to opt out (FTC, CNIL)
- Current mechanisms are hardly useable

- Wi-Fi-based mechanism: using a fake AP using a recognizable SSID ("Pas de suivi wi-fi. Do not track")
  - No software or hardware modification
  - Simple to use
  - Device will remember the association $\rightarrow$ user action needed only once
  - No memory of blacklisted devices
  - Global if standardized

Conclusion

- Wombat: tracking system testbed
- What next? Test privacy-preserving concepts
- Contact us if you want to make experiments or demos