CS 598, WSI: LECTURE 12

- Privacy Risks of Wireless Networks
- Communication Privacy
- Location Privacy
- Sensing Privacy.

Privacy Risks

Q. What does the network know about you?

IllinoisNet → what websites you are visiting
IllinoisNet → Device type
IllinoisNet → Location.

Over time → when I come in to office
Over time → what times of day I go to union

· Connection.

Network Discovery

Passive Probing

- Listen for AP beacons
- Create a list
- Choose a network to connect to

→ slow.

Active Probing

- Saved networks
- Probes
  - Illinois Net
  - Starbucks
  - CMI Airport
  - Macys
  - Home

Profiling ⇒ identify users across networks, even if they randomize MAC address

Privacy implications across networks.

Location Leakage

↳ accurate location

building level →

room level → habits

human step level → health

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networks can get browsing history.

↑ encryption

MAC

· Sensing

privacy-violation ↔ Sensing

↳ location

↳ breathing / sleeping / emotion

Communication Privacy Efforts

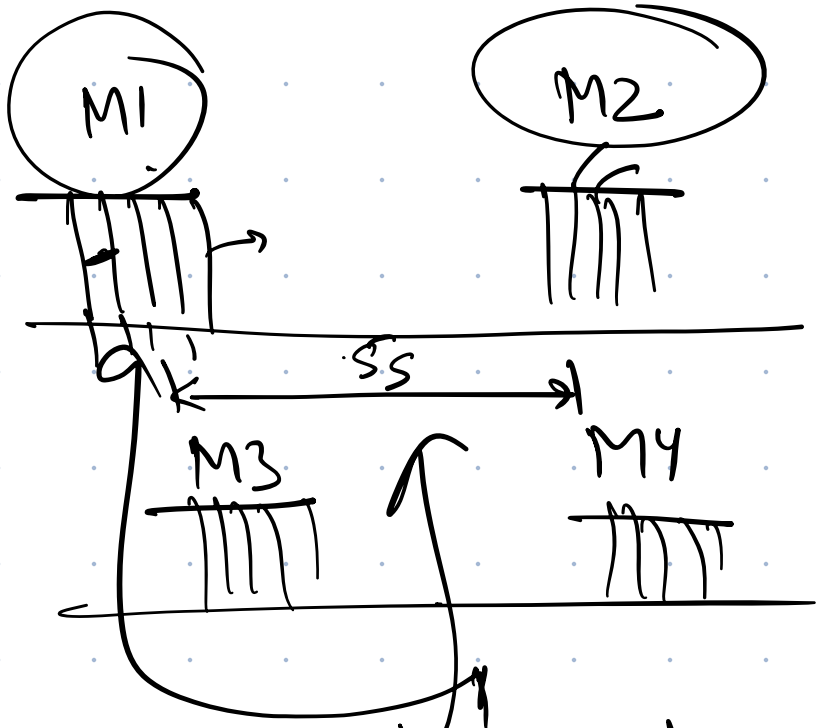
MAC randomization.

→ Active probing

→ per-network randomization

Illinois Net
Macys
Starbucks
Home Wi
Airport

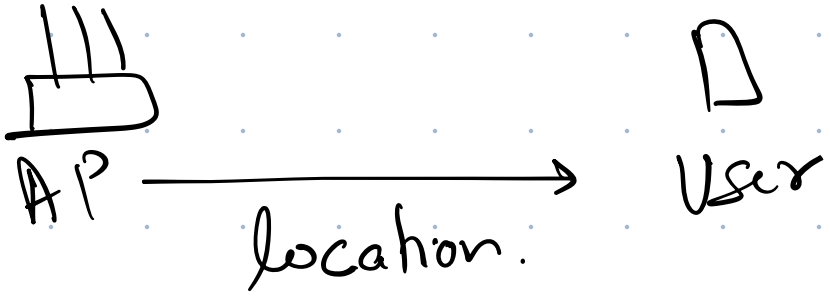
fingerprinting



or

timing attacks

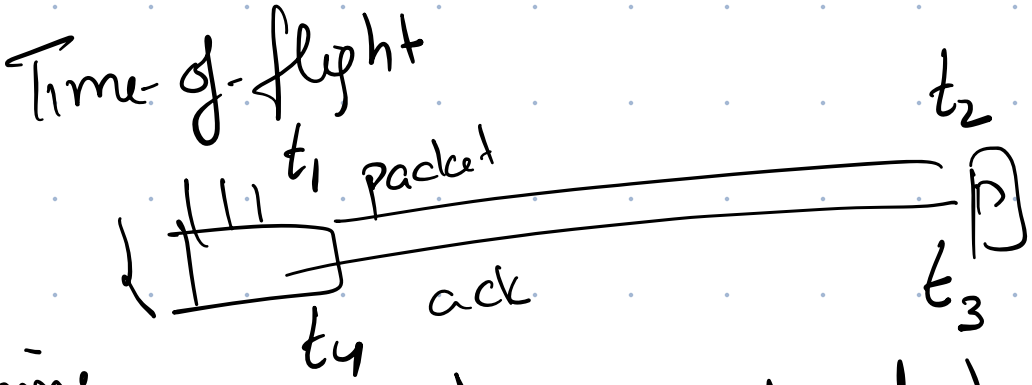
Location Privacy Tools



RSSI → intentionally send weaker / stronger signals

(randomize transmit power)

took weak ↔ low datarate



time between them → how much distance?

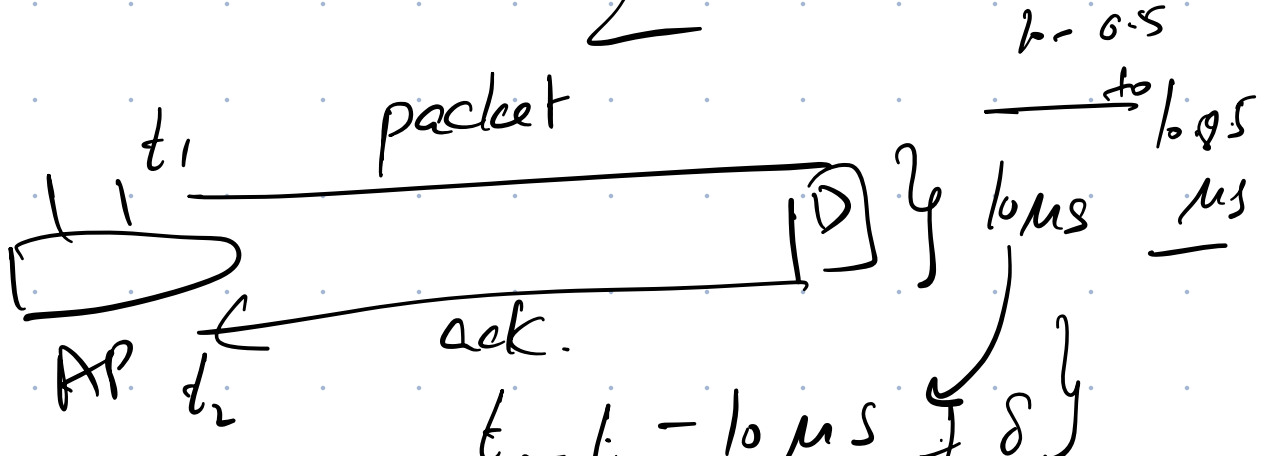
record time on both sides

↳ falsify your report

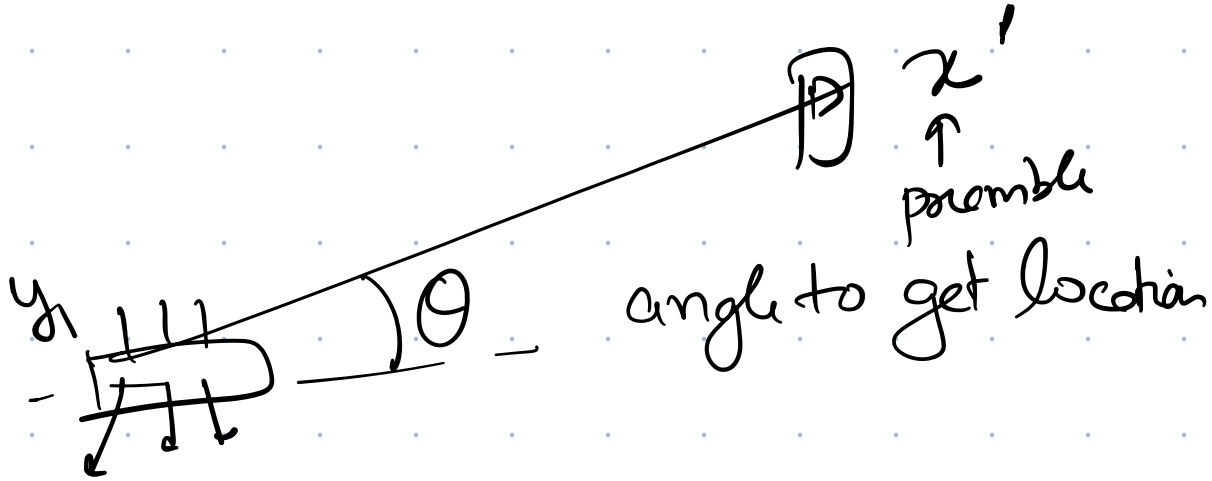
$$\frac{(t_2 - t_1) + (t_4 - t_3)}{2}$$

client

$$= (t_4 - t_1) + \frac{(t_3 - t_2)}{2}$$



MS ≈ 300 m



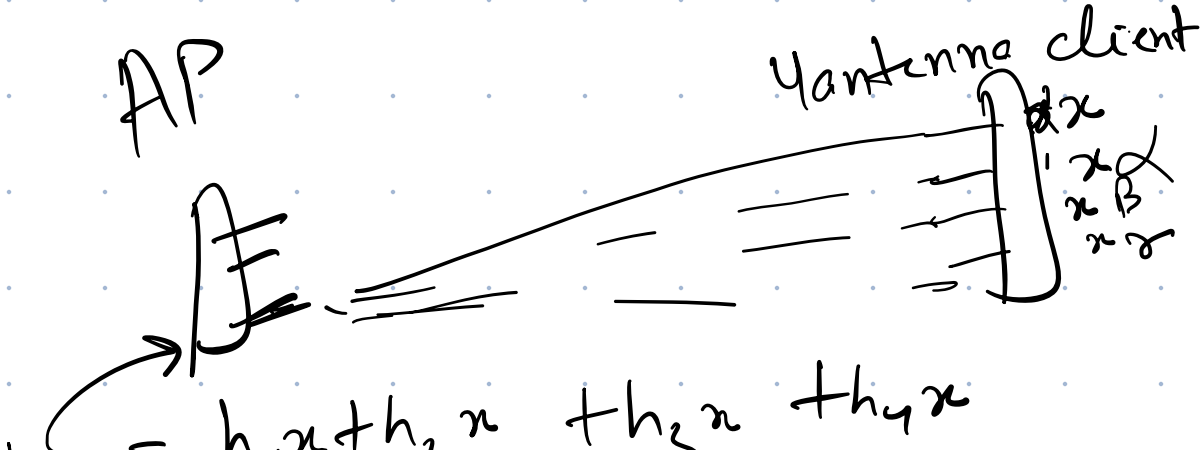
x $h_1 h_2 h_3$

$$h_1 = \frac{y_1}{x}$$

$h_2 =$

x'

h_1' ⟹ communication will break.

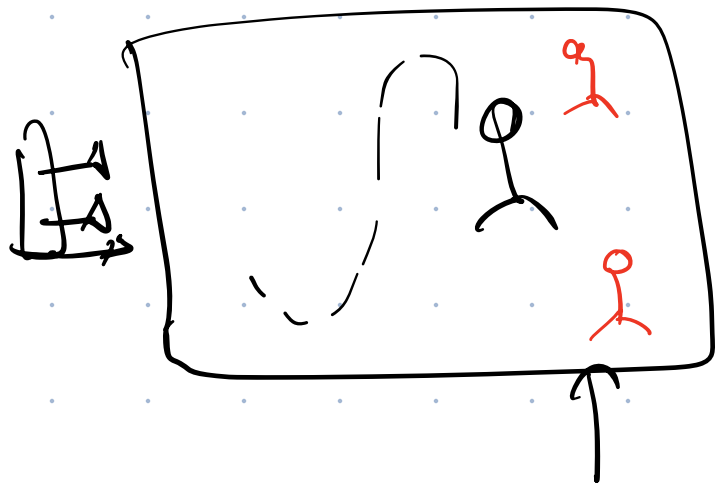


$$h_{eff} = h_1 x + h_2 x + h_3 x + h_4 x$$

$$= (h_1 + h_2 + h_3 + h_4) x$$

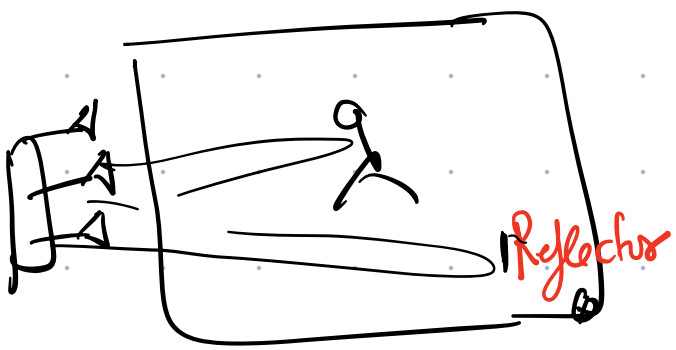
RF-Protect: Privacy against Passive Sensing

Passive eavesdropper



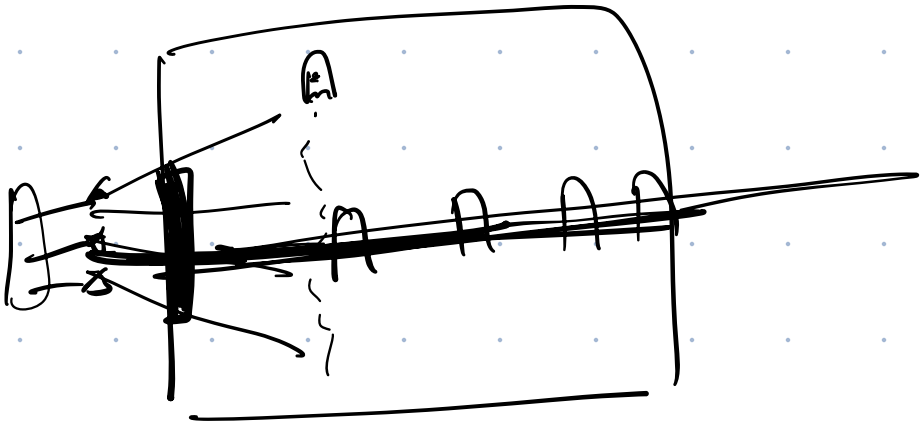
Jamming

Fake humans

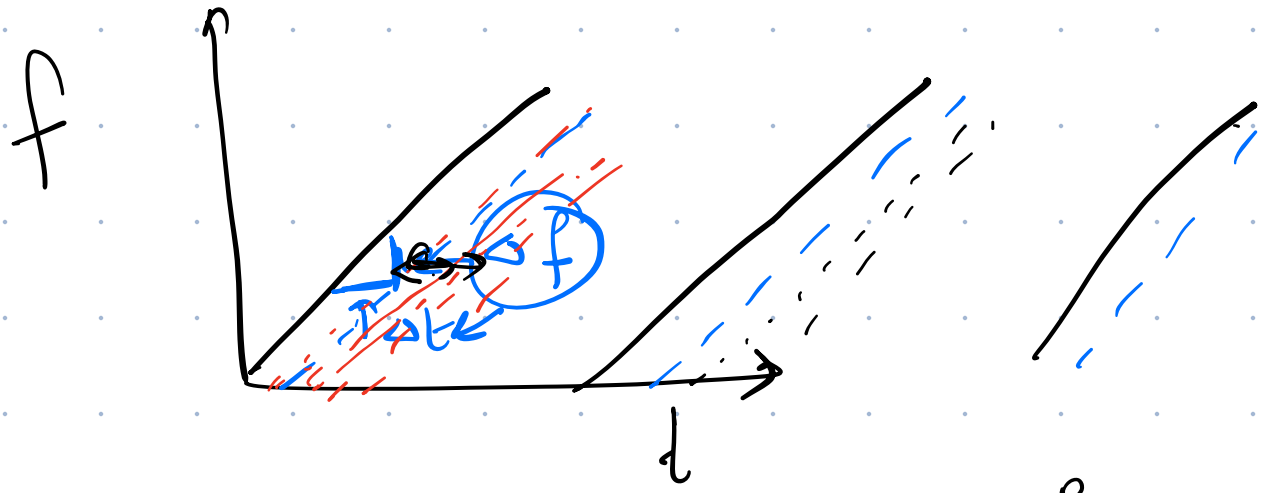


Spoof human motion realistic

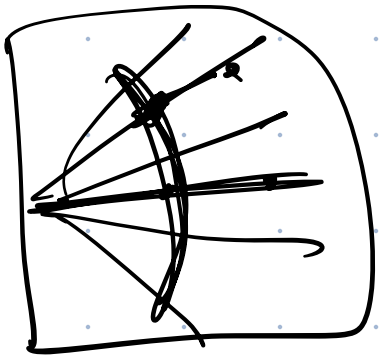
- Distance

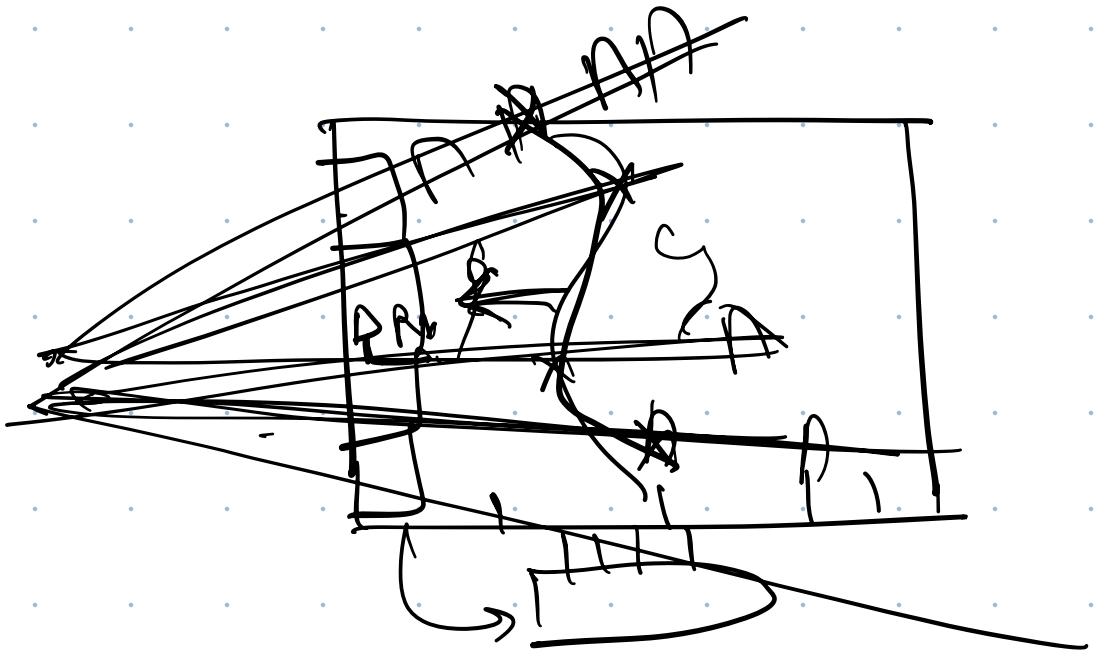


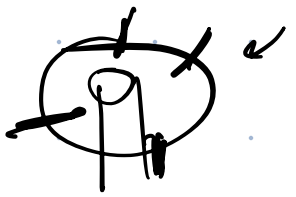
distances & angles



. Angle.

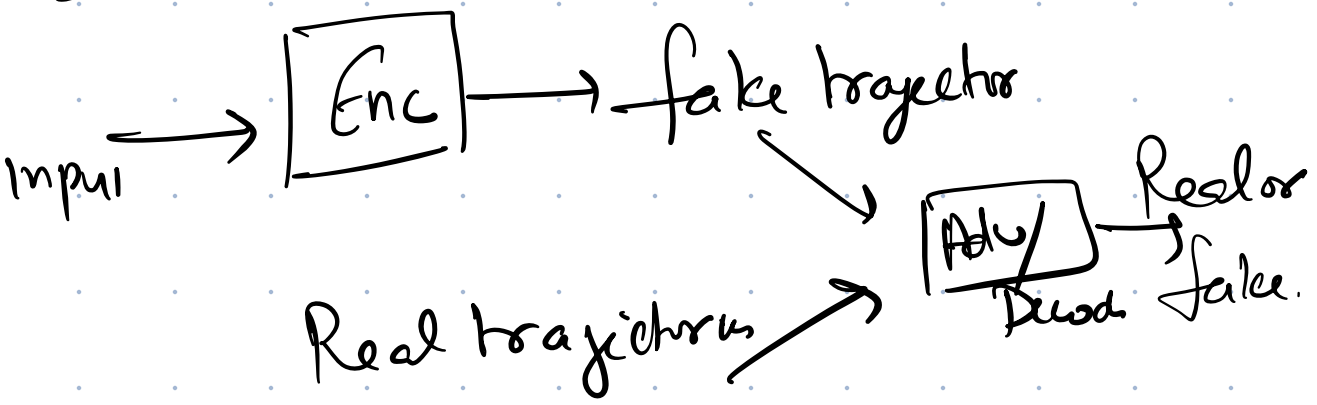






Anglet distance → random trajectories

GAN



Limitations

- if you ~~or~~ know how many people?
- layout? / restrictions
- patterns can become predictable?
- Need to know where the Radar is / ~~or~~ to freq. bands.
- deployment-heavy.

. Demo.