

# Unobtrusively Capturing Human Interactions

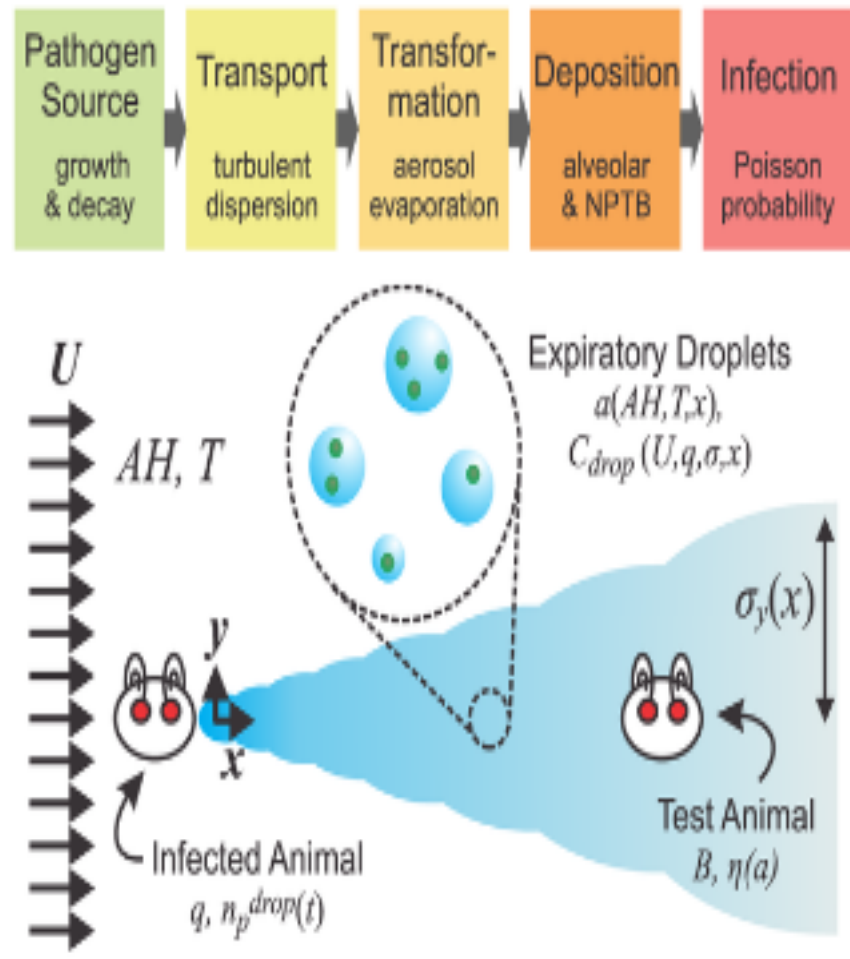
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# Individualized Computational Jewelry



# Better airborne/droplet epidemiological infection models

- Interaction Parameters:
  - Distance
  - Duration
  - Orientation

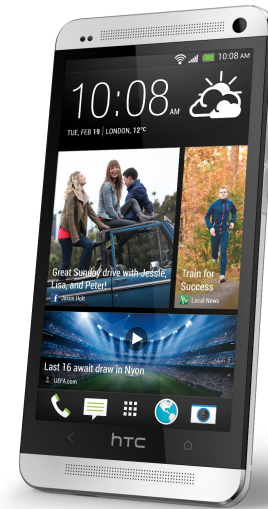


# We've primarily used surveys to create vague models

- Surveys are:
  - Coarse grained
  - Unreliable
  - Costly

# Flaws with using smartphones

- Ownership not pervasive
  - ~56% of adults
  - ~37% of teens
- Bluetooth ranging:
  - inaccurate, lacks orientation
- Acoustic ranging
  - accurate, impractical



# Current localization/ranging smart tag systems

- Past: Rf Ranging Tags
  - Poor ranging accuracy
  - Poor orientation knowledge
- Promise: Ultrasonic
  - Extremely accurate, orientation knowledge



# Ultrasonic solutions already give us the data we need

- Cricket, Dolphin, iBadge, AHLoS, Active Bats, etc
- Infrastructure Nodes + Smart Tags
- Bonus: Localization

# Synchronization is hard, so past solutions lacked usability



**Dimension of enclosure:**

70 x 55 x 18 mm  
(2.8" x 2.2" x 0.07")

**Weight:**

65gram (2.3oz)

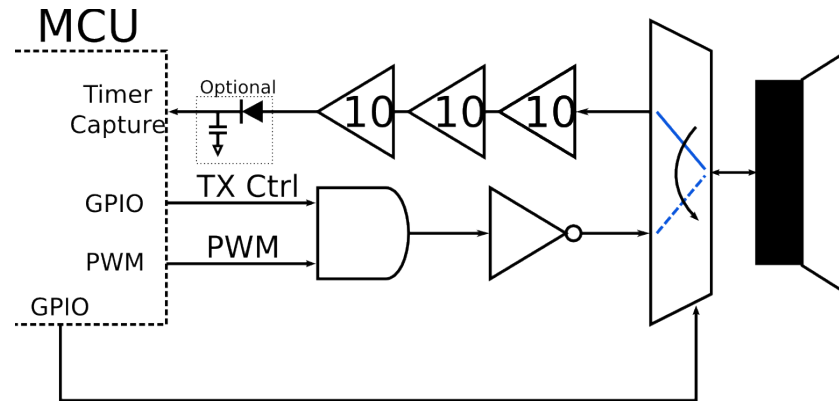
**Battery lifetime:**

4h 35min

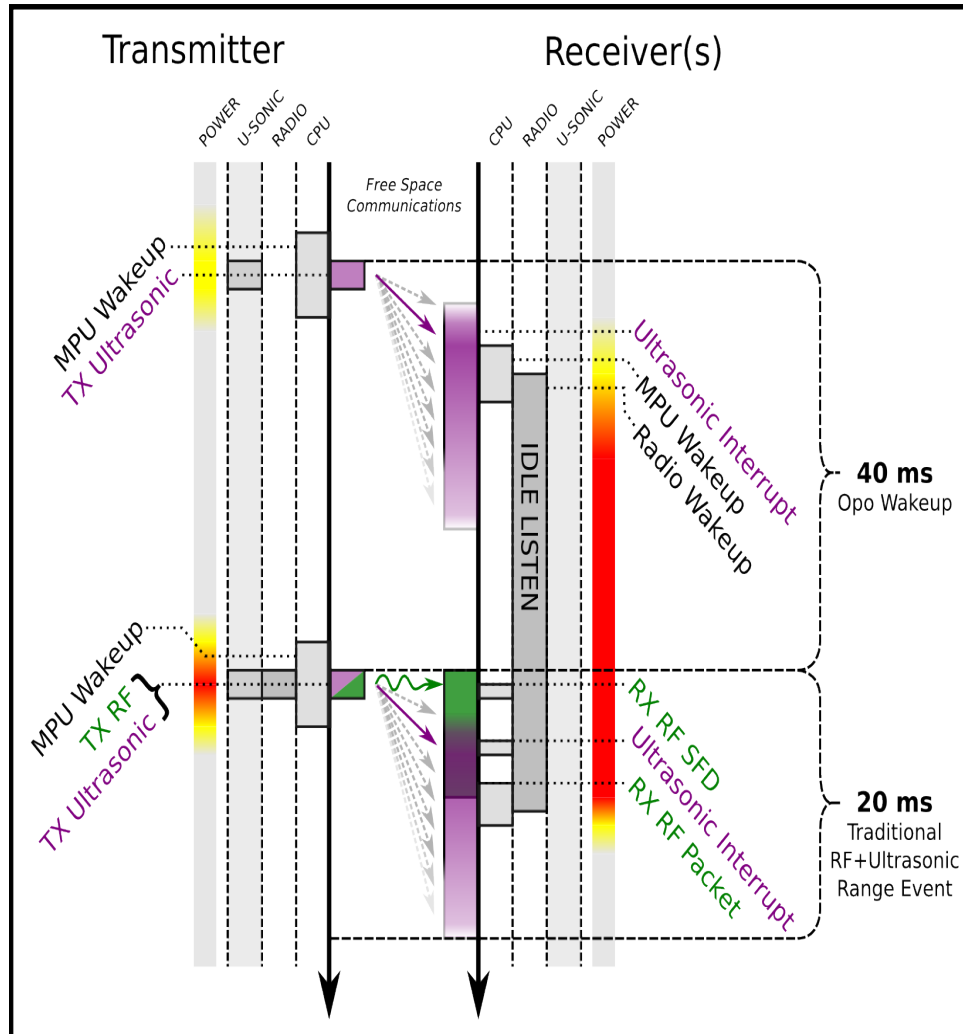


# So lets keep it simple, and do asynchronous wake ups

- Create always on ultrasonic receivers
- Minimal battery life impact

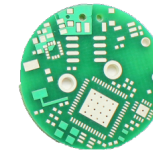
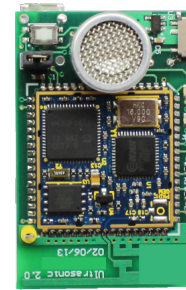
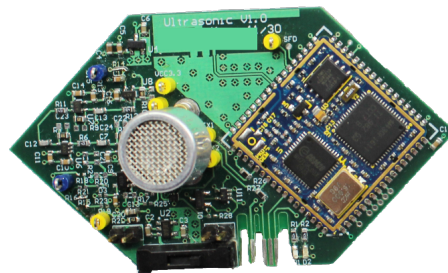
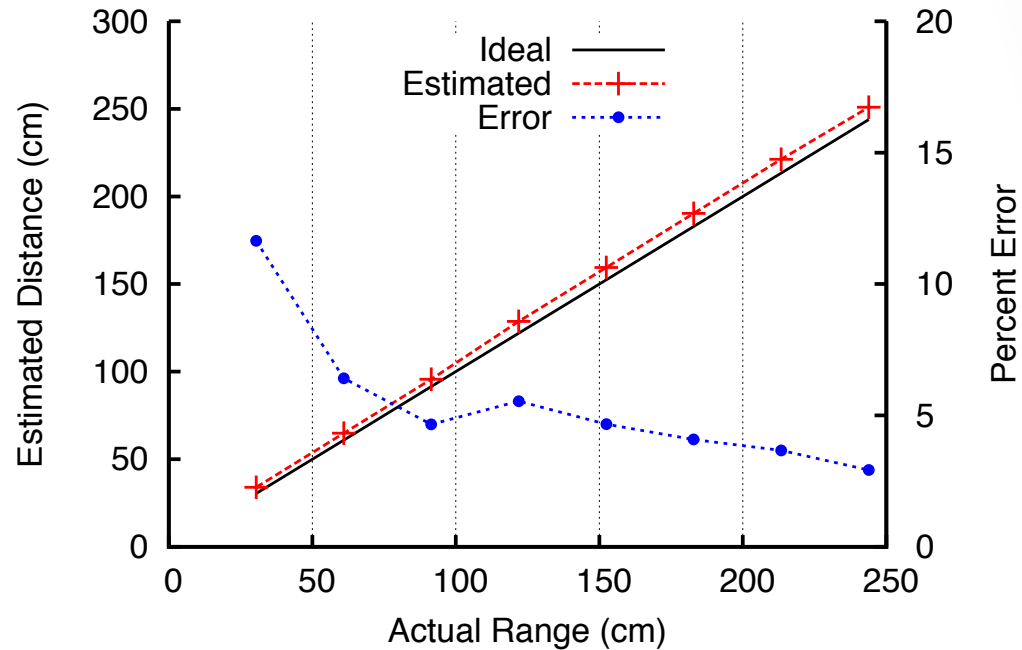


# How does it all work?



# Current Results Are Promising

- $\sim 130 \mu\text{W}$  RX power
- $\sim 5\%$  range error
- Generational improvement in size



# What does it all mean?

