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In collaboration with SONARAX MAKING SENSE OF SOUND

XiNOW Ltd. Signal Processing Pros.

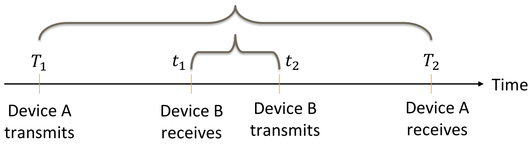
Acoustic Positioning with Unsynchronized Sound Sources

Guy Feferman, Michal Blatt, Guy Shofen, Alon Eilam

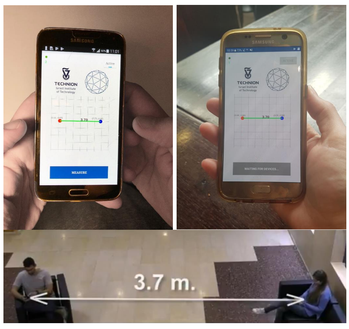
- Many applications provide location based services
- **Problem:** GPS signals are not available indoors
- **Solution:** A system for acoustic-based positioning
  - Applicable for any smartphone and IoT device
  - Operates with acoustic signals beyond human hearing range
  - No common time base in the system, each device operates with its own, local time base
- Two modes of operations: **Active** and **Passive**

Positioning of Active Devices

- Unsynchronized devices emit and receive acoustic signals to detect each other
- For timing recovery, each device listens to
  - Its own emitted signal
  - Signals received from other devices
- Time difference multiplied by the speed of sound provides the distance between devices

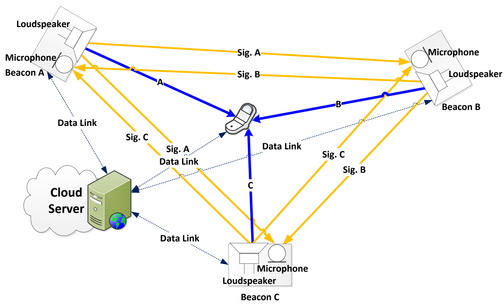


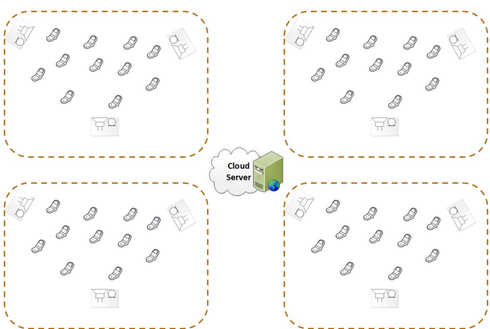
$$d = \frac{(T_2 - T_1) - (t_2 - t_1)}{2} \cdot v_{sound}$$



Positioning of Passive Devices

- The system is controlled by a Cloud Server
- Devices do not transmit
- Beacons transmit inaudible, Unsynchronized acoustic signals
- Devices receive Beacons signals and measure time differences between them
- Timing recovery is done by the Server, analyzing devices measurements
- The system provides fast simultaneous positioning of any number of devices in multiple sites





A demo at