

Advanced Occupancy Sensors for Better Buildings Workshop

July 13, 2016
Portland, OR

Workshop Materials

- Day 2 Technology Breakout



DAY #2 BREAKOUT

The Technical Challenge



CHALLENGE:

MINIMUM VIABLE SYSTEM

– focus on the **SENSORS**

- 1) No Beacons. This includes Phones.

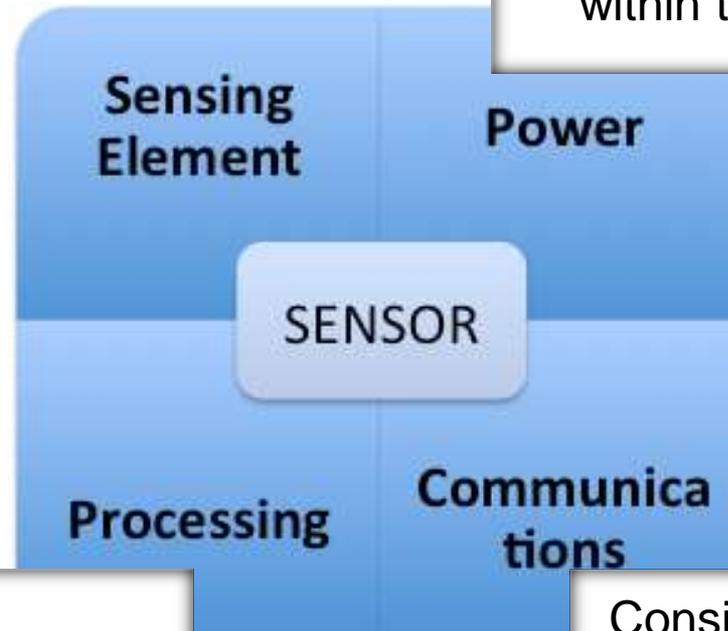
DAY #2 BREAKOUT

The Technical Challenge

2 options:

- ultra low power (with limitations)
- Luminaire power (with limitations)

Do not discuss how- just work within these constraints



NO CLOUD

All onboard

Yes – discuss algorithms!

Consider: **no** WI-FI

DAY #2 BREAKOUT

The Technical Challenge

Given the input from Breakout 1, including cost, deployment, and lifetime targets, develop your ideal occupancy sensing solution for select indoor environments.

Detail the pros and cons for utilizing state-of-the art technologies vs. what would be desired in novel, yet-to-be developed technologies.

Consider: accuracy, cost, installation, calibration, operation, and maintenance of occupancy sensing technologies.

Day 2 – Breakout Activity

Apply ideal occupancy sensing solutions to indoor environments

Step-by-step

- ▶ Install your dream occupancy sensing solution into the floor plans listed in the following slides.
- ▶ On the same slide identify foreseen challenges with installation, calibration, operation, and maintenance of the dream sensing solution.
- ▶ Discuss how utilizing state-of-the-art technologies would compare under the same scenario.

Seed questions

- ▶ How can you meet the customer requirements of Breakout 1?
- ▶ What sort of electronics, power, range, communications (etc.) are necessary?
- ▶ How do these sensors operate within different control architectures? What are the key technical risks and needs?
- ▶ What are the key technical barriers? (Hardware, Algorithms, Platform, Packaging,...)
- ▶ What kinds of technologies can be used to enhance the installation and usability of these sensors into existing systems?
- ▶ Are there any other needs, for example in choice of thermostat or VAV control interface?

Day 2 – Breakout Activity Readout Group A

Residential Space – Detached-Single-Family



Floor Plan description:

- Ranch Style Home
- One level, small rooms w/ open living area

Dream Tech Challenges:

- People are outside in/out to yard
- Pet immunity/adaptability
- Need for anticipation, someone coming home



Identified Gaps in SOA Tech:

- Higher accuracy boundary method occupancy counting
- Environmental pollution on acoustic/vibration signals (signal to noise)
- Interoperability
- Lifetime/longevity of products, e.g. pressure pads

Day 2 – Breakout Activity Readout Group B

Attached multi-unit residential building



Floor Plan description:

- Small 1BR apt
- Single level,
- Open living area
- Single door w/ a balcony

Key Conclusions

- ▶ The customer is the building owner or property owner
- ▶ Focus is detecting presence, not counting people – binary
- ▶ User interface – single button: *Work*
- ▶ Commissioning should be easy
 - Performed during apartment turnover by professionals from management company
 - Easy pairing of sensors – bring close to thermostat, bump
- ▶ Use a combination of PIR, thermopile, and ultrasonic sensor that can integrate with a thermostat that accepts an on/off
 - Systems play, need to integrate commercially available sensors, reduce cost
- ▶ Two options for installation – could be wired sensors in fixtures or battery operated sensors scattered throughout the apartment
- ▶ Utility incentives/regulatory changes very helpful

Day 2 – Breakout Activity Readout Group C

Commercial Space Office



Floor Plan description:

- Older envelope
- Renovated interior
- Open interior w/ exterior offices
- Multiple point entry (some with badges)

Dream Tech Challenges:

- A. Diverse use cases across buildings (e.g., 1 zone office v. multiple zone offices, _HVAC types)
- B. Thermal zone differentials within building (within a single building – need to map zones to optimal sensors)
- C. Connectivity to controls – interoperability
- D. Privacy
- E. Sensor Fusion on-board other platforms (e.g., gateway, NOT in cloud)

Identified Gaps in SOA Tech:

- A. Lack of understanding of capabilities/trade-offs of existing sensor technologies (e.g., CO2 sensor response time is too slow)
- B. Limited on-board processing and computing at the sensor level
- C. Lack of standards for interoperability

Day 2 – Breakout Readout Group D

Commercial Space with Highly Dynamic Occupancy



Floor Plan description:

- Newer Construction
- Small open layout
- 24/7 Occupancy
- Complex thermal system and ventilation needs
- Multiple occupants enter per door and opening event

Dream Tech Challenges:

- Challenge is people counting in main space
- installation cost, power
- Communications?

-lights and back offices through motion sensing

Cameras: no privacy concerns, security cameras may not be accessible, installation cost may be prohibitive , can power through light fixtures

-small photocell

-mat

Identified Gaps in SOA Tech:

- Integration
- Industry segmentation
- _____