

Towards the utilization of cost-effective off-the-shelf devices for achieving energy savings in existing buildings

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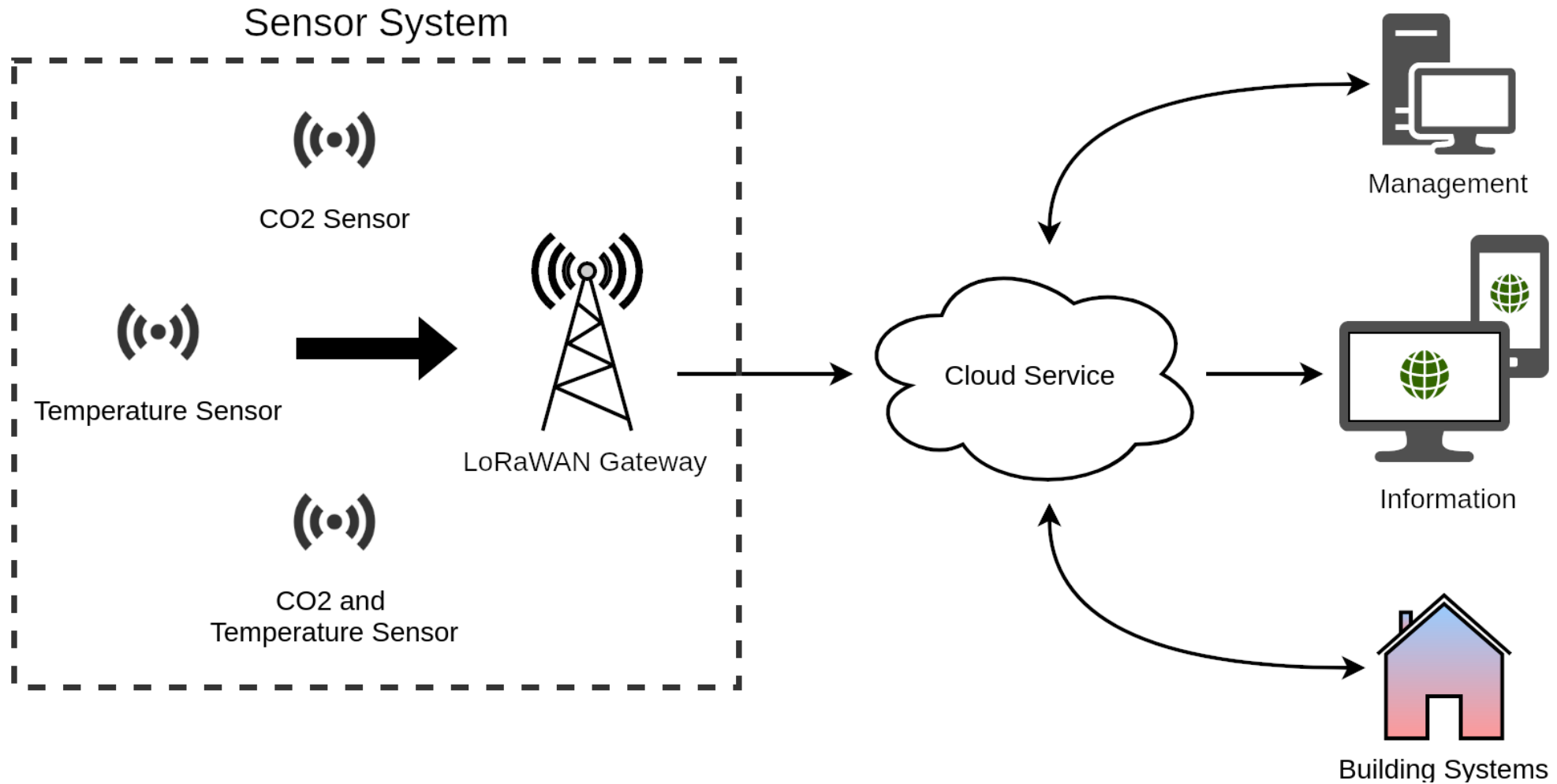
Background

- Heating and cooling of buildings consumes significant amounts of energy
- Older buildings often lack systems for monitoring conditions inside the buildings
- Commercial solutions do exist, but these are often expensive and/or targeted to larger building complexes

Prototype System - Requirements

- Movability
- Cost-effectiveness
- (De facto) standards

Prototype System – High-level architecture



Sensor System – Sensor Units

- Sdaq Explorer (Arduino)
- BME680 sensor for temperature, relative humidity and atmospheric pressure
- SGP30 for CO₂ and TVOC

Test Scenarios

- University classroom
- Building used for eldercare

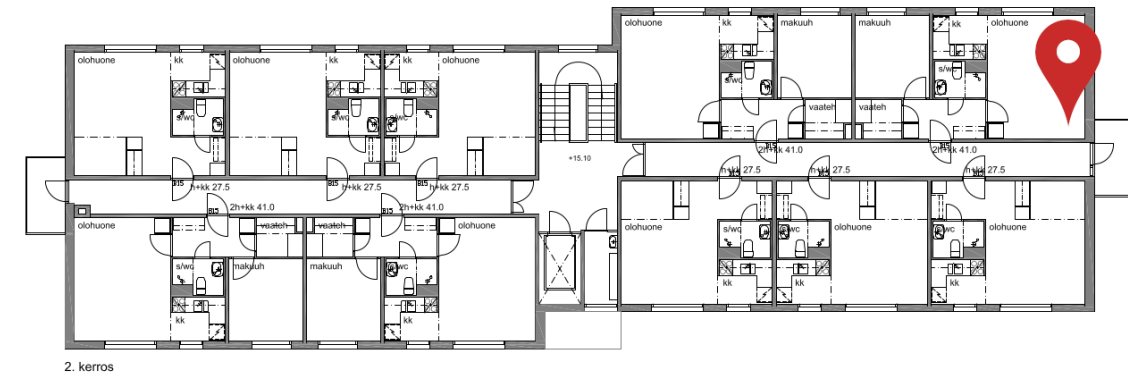
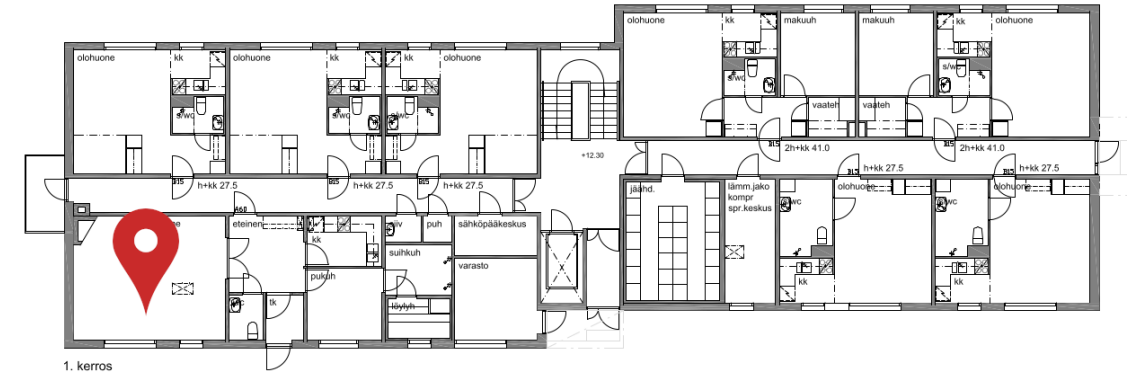
- Reference sensors: Aranet4 Air Quality Sensors,
Netatmo Weather Station

Scenario – University Classroom

- Air-conditioned
- Usage of the room is known (based on university's room reservation systems / class schedules)
- Duration: 2 weeks
- 2 Sensors units

Scenario – Building used for Eldercare

- Three-story concrete building constructed in the 1980s
- No air-conditioning
- 1 sensor unit in a common room on the 1st floor
- 1 sensor unit in an apartment on the 2nd floor
- Duration: 1 month



Results

- No significant variances in temperature, atmospheric pressure and relative humidity
- The CO₂ measurement was more challenging
 - The general changes (trends) are detectable
 - Calibration and/or reference measurement required
 - Erratic behaviour of the SGP30 sensor in high CO₂ and TVOC values
- LoRa appears to be a good choice for communication

Challenges

- Automatic detection of room occupancy
- No practical means of controlling (adapting) the heating and cooling
- One-size-may-not-fit-all

Thank You!