

## Internet of Things and Smart Cities



- +1 500 000 urban population every week [1]
- Cities account for 60% - 80% of world annual energy needs
- Sensors are getting smarter, cheaper and consuming less energy
- Buildings and public equipment in cities are being equipped with communication abilities
- Low Power Wide Area Network (LPWAN) technologies introduce new communication scheme and capabilities

## Motivation

- In 2017, global consumption for street lighting and building lighting was about 2 700 TWh, which emitted 150 million tons of CO<sub>2</sub> [2]
- Good lighting is essential for road safety, personal safety, and urban ambience.

## Objectives

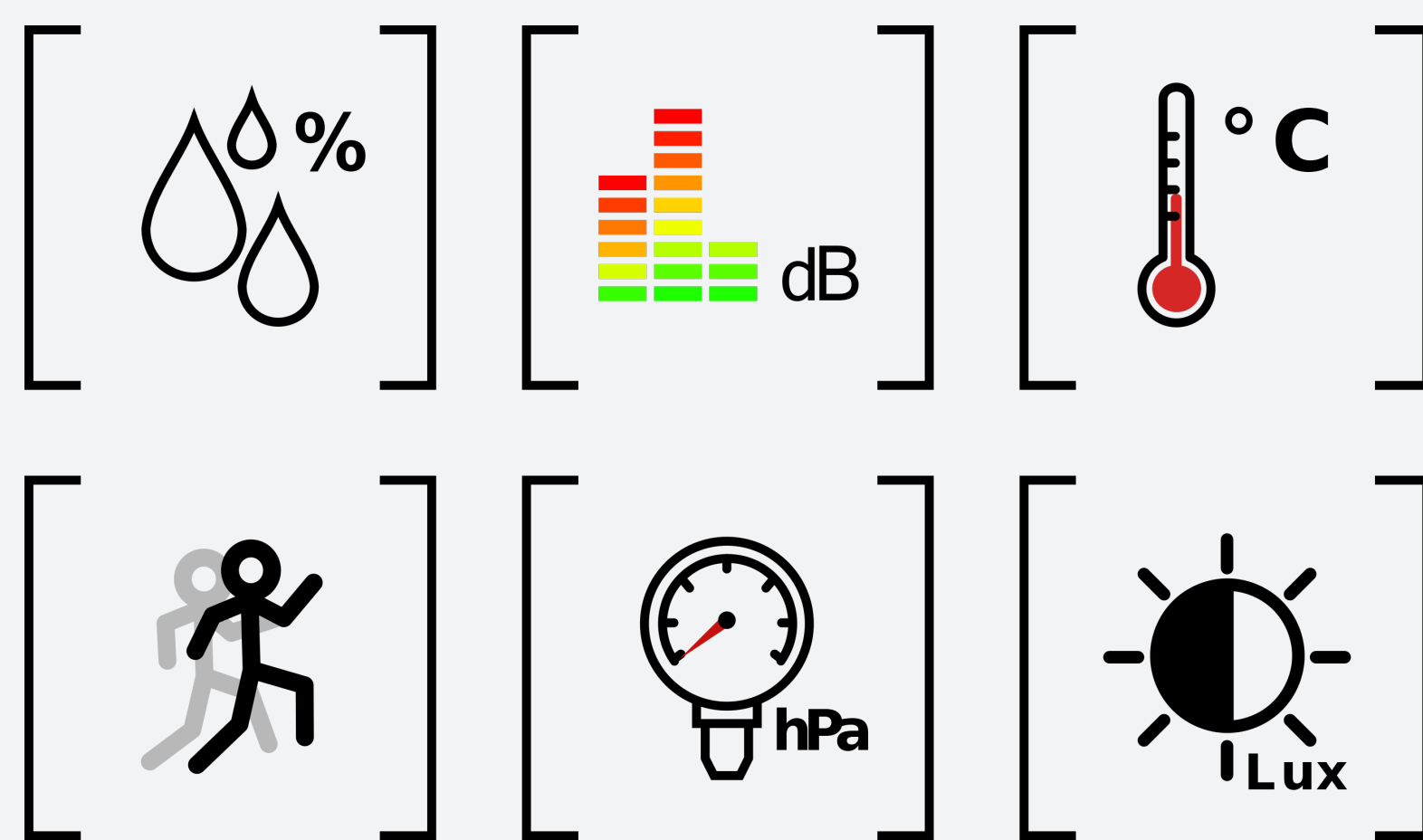
- Reduce lighting power consumption of cities by regulating street light intensity
- Minimize light pollution
- Monitor street sound level and pollution

## Smart Lighting - Campus La Doua INSA Lyon

- Develop a device able to detect people and cars passing by in the street, and measure environmental data

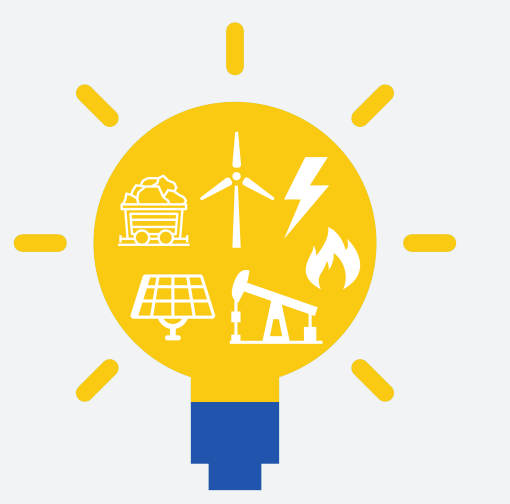
### Detect :

- Day & night cycles
- Movement & direction prediction
- Noise level & source
- Urban heat island



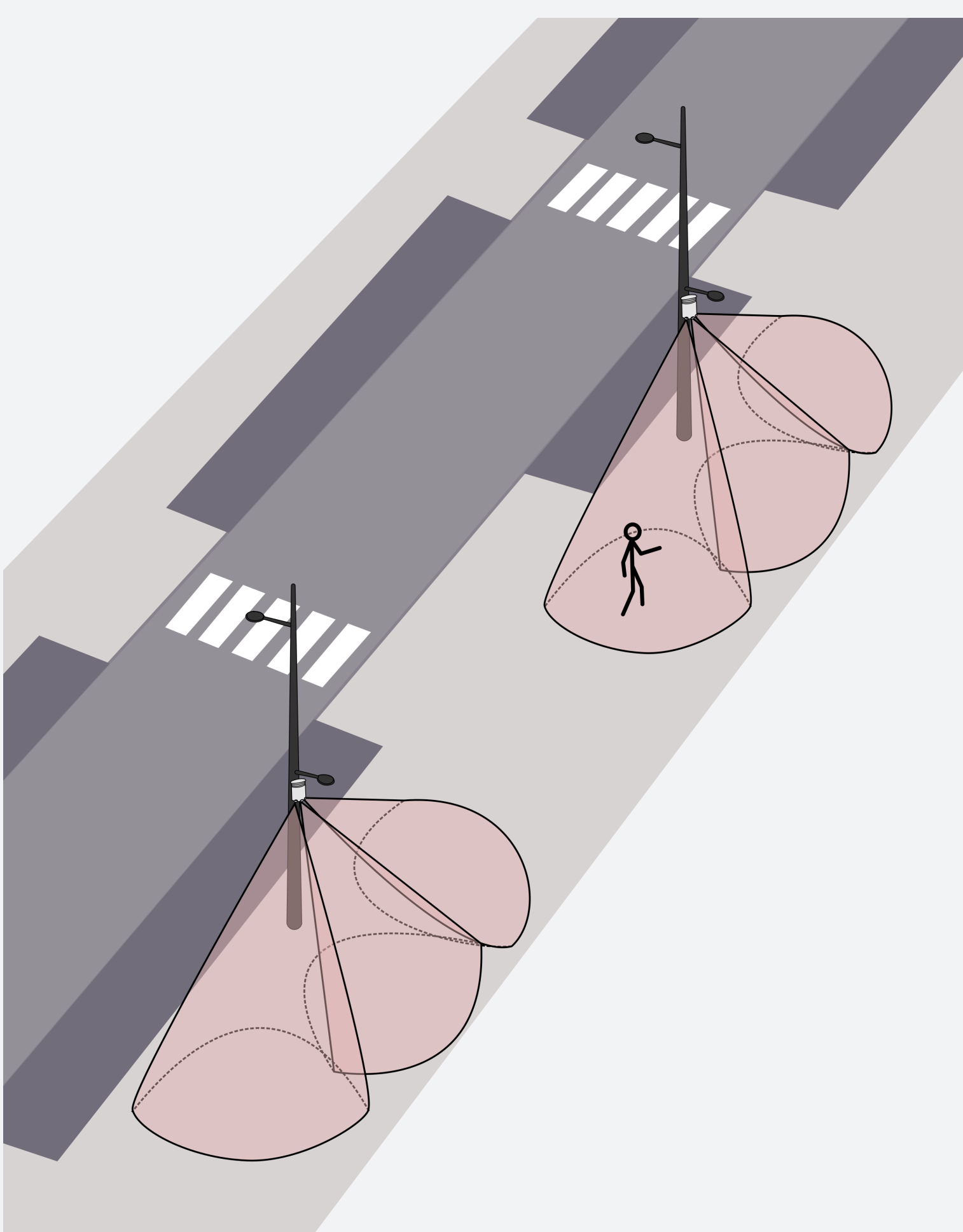
## Challenges

- Low cost solution
- Energy efficient
- Real time data
- Remote updates
- Battery powered
- Weather proof
- Secure

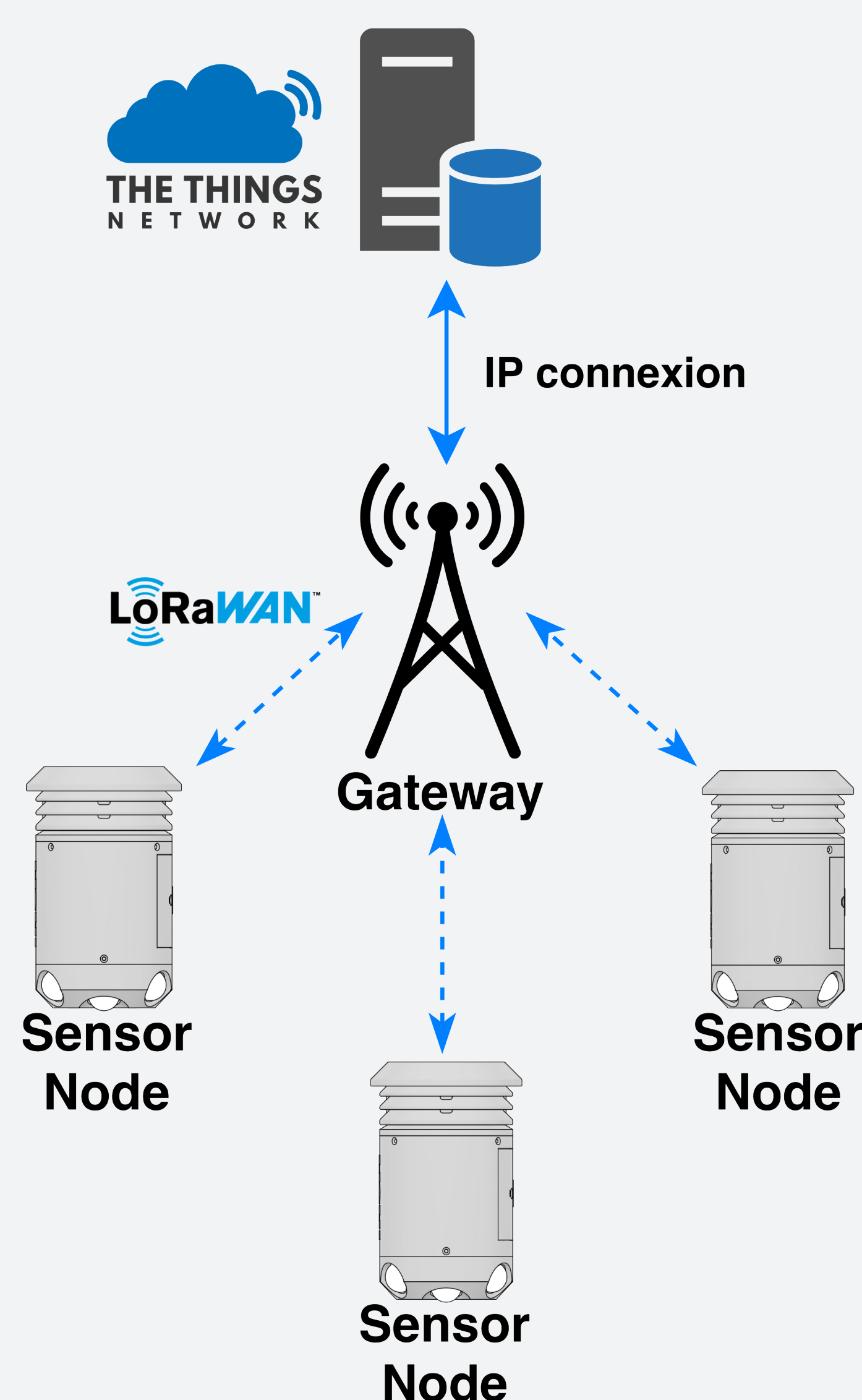


## Detection Scheme

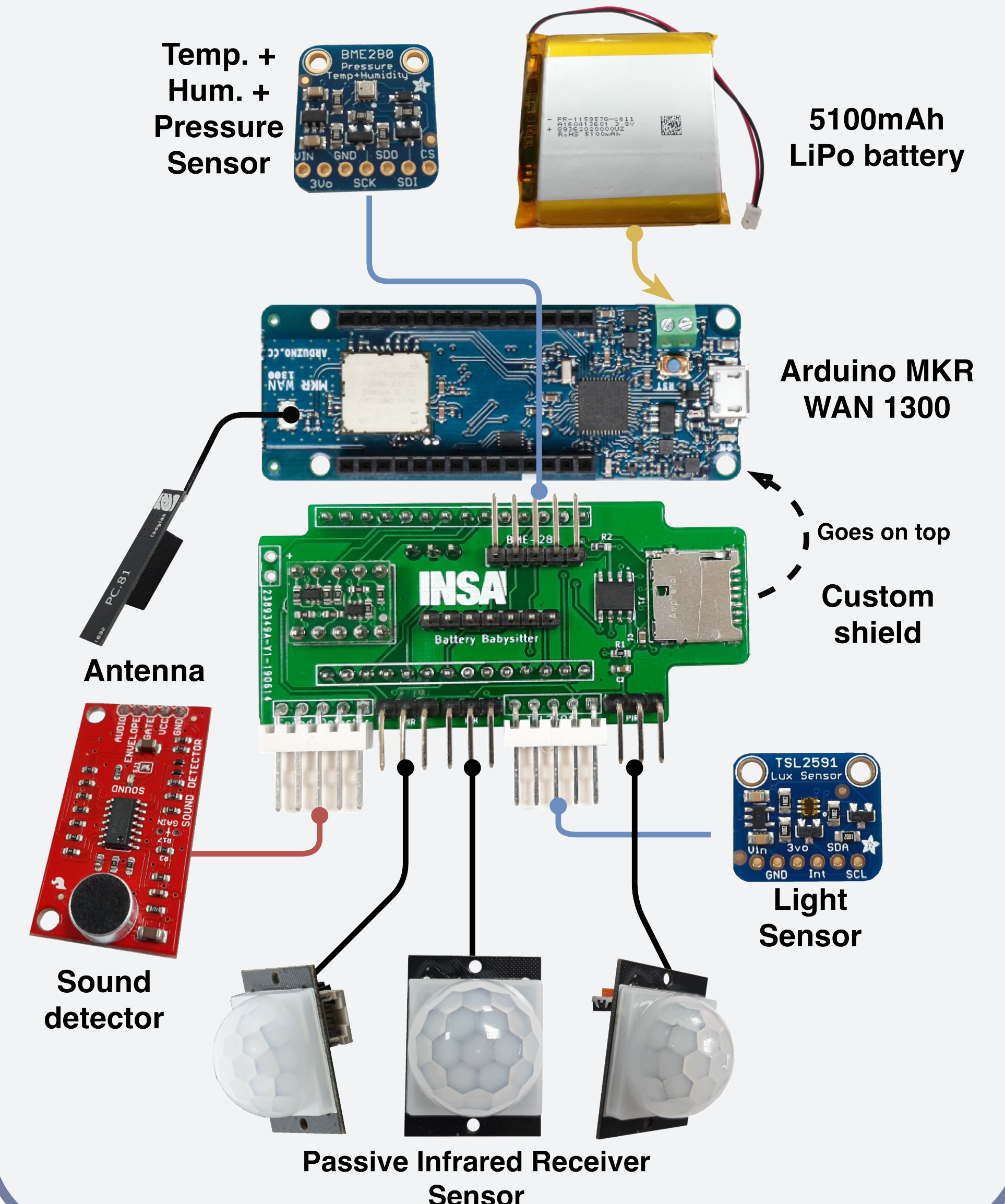
Make use of three independent movement detection sensors to predict direction



## System Architecture



## Prototype



## Future Work

- Collect and validate data from pilot
- Compute expected energy savings
- Calibrate and improve detection and prediction algorithms
- Estimate return on investment

## References

- [1] PwC analysis of United Nations, Department of Economic and Social Affairs, Population Division (2014)  
 [2] Association française de l'éclairage. <http://www.afe-eclairage.fr>