The Urban Internet of Things

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Cities are living organisms shaped by people

Objectives of Smart Cities

- Sustainable urban development and increase in quality of life
- Usage of IT to transform **passive objects** with delayed problem management to those with **automatic sense-and-respond capabilities** getting ad-hoc upgrades

Environment

buildings, public spaces, pollution

Infrastructure

water, waste, electricity, gas, internet

Transportation

pedestrian, bikes, cars, public transport

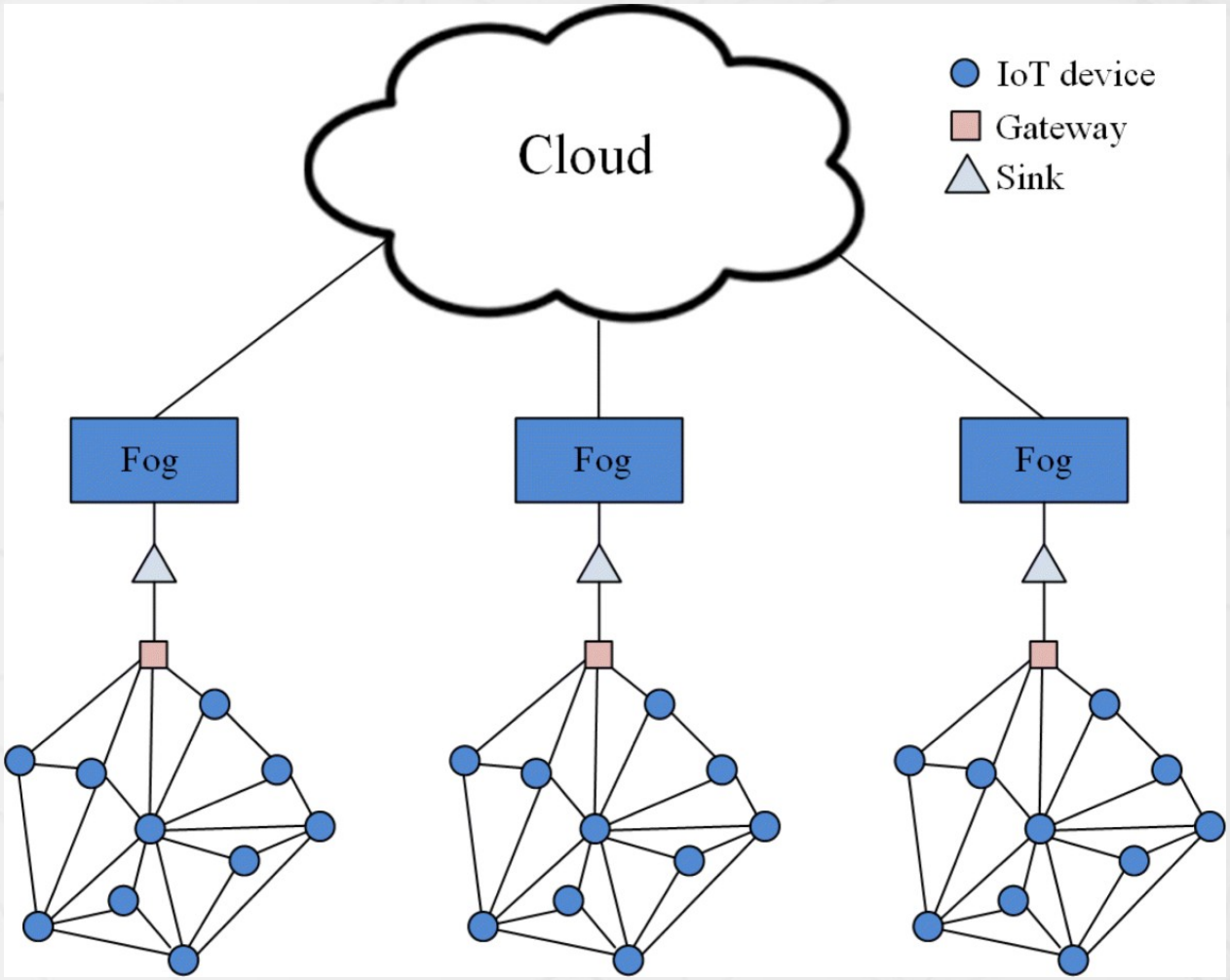
Economy

company – community – person

Services

education, welfare, culture, safety

Wireless urban sensor network of IoT devices



Datacentres on the Internet

- analyze and store data
- web interface for citizens

Aggregate one domain

- respond to specific issues

IoT Mesh of sensors

- gather environmetal state
- contrained networks

Communication with sensor nodes

Interactions based on: Time, Event, Query

Application layer

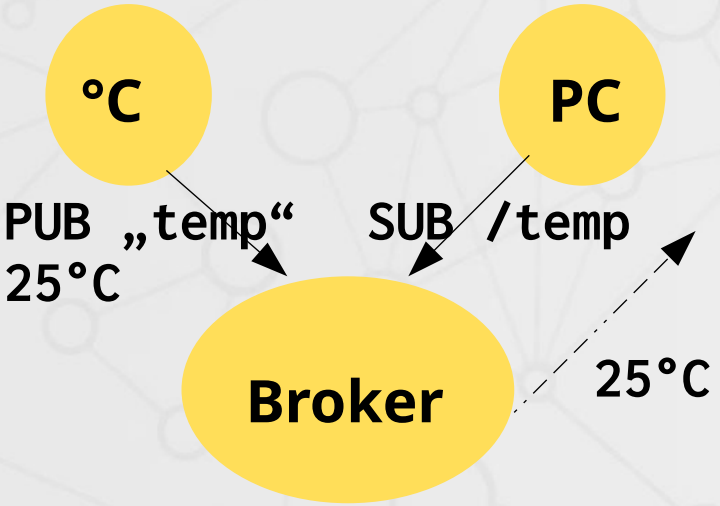
MQTT (w/TCP)
- Sensors: **Publish**
- Displays: **Subscribe**
- Central Broker

CoAP (w/UDP)
- Sensors: **POST**
- Displays: **GET**
- REST style HTTP

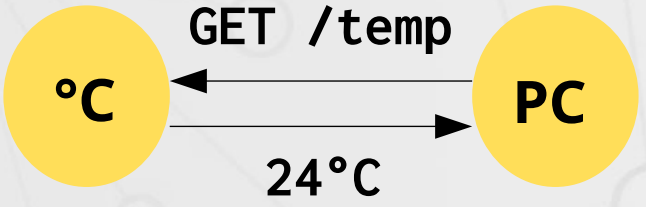
Network layer
- IPv4/6 - `2001:db8:85a3:8d3:1319:8a2e:370:7348`

Physical layer
- Wireless (Zigbee, WiMax, Bluetooth, Wifi, GSM, 4G)
- Wired (PLC, Fibre optic, DSL)

MQTT



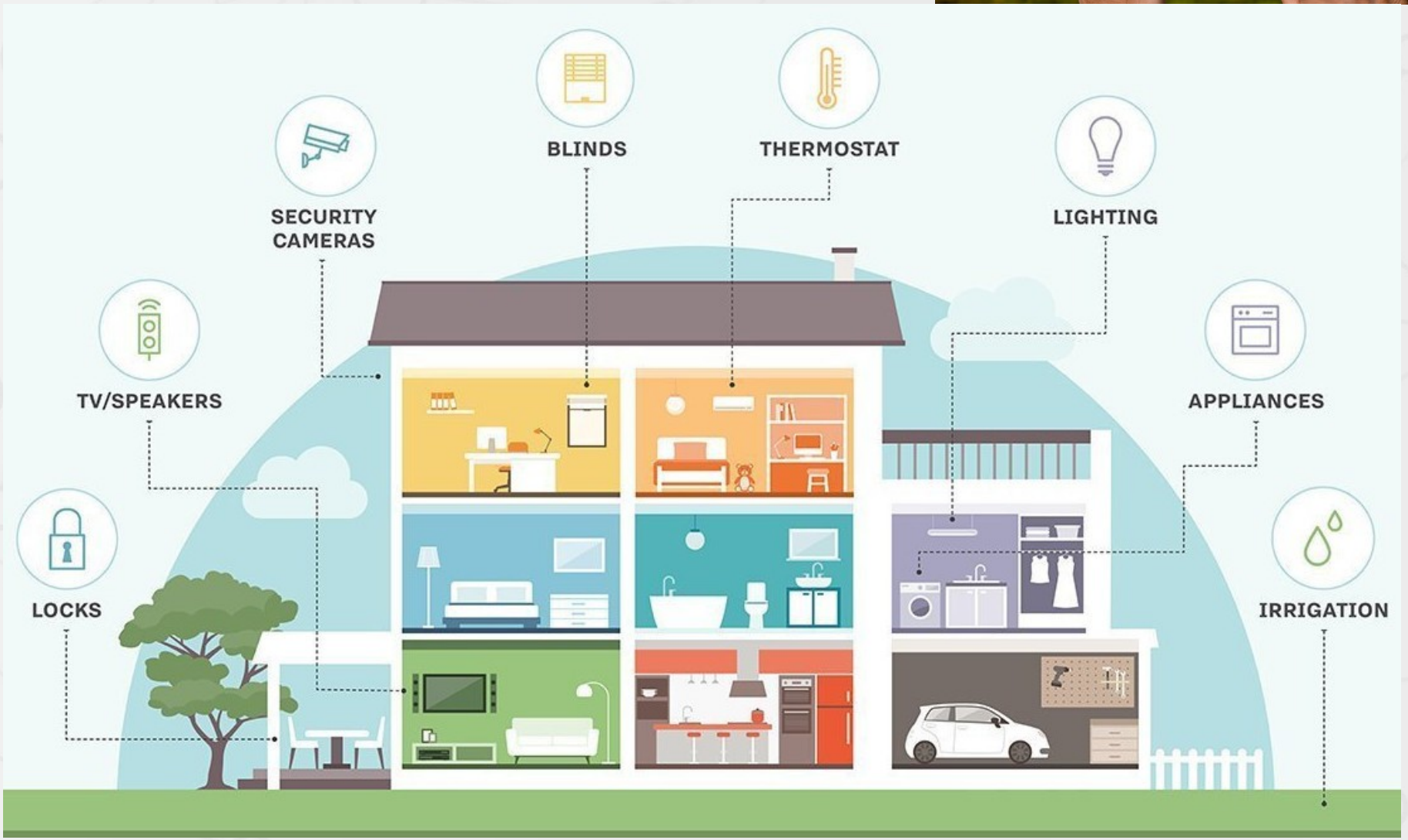
CoAP



Applications and examples in the world

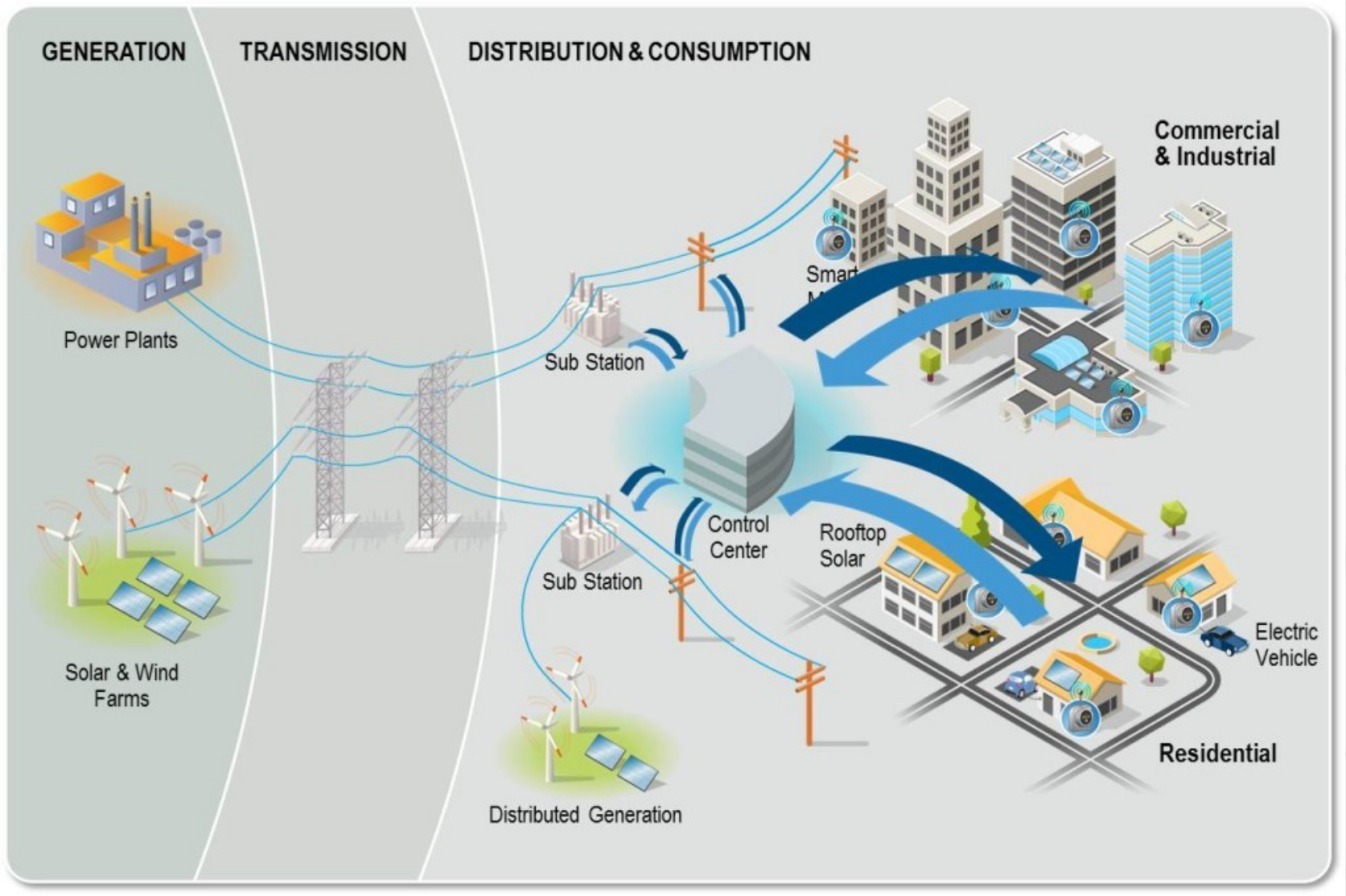
Smart Homes & Residential areas

Automatic, remotely controlled everyday household gadgets and appliances



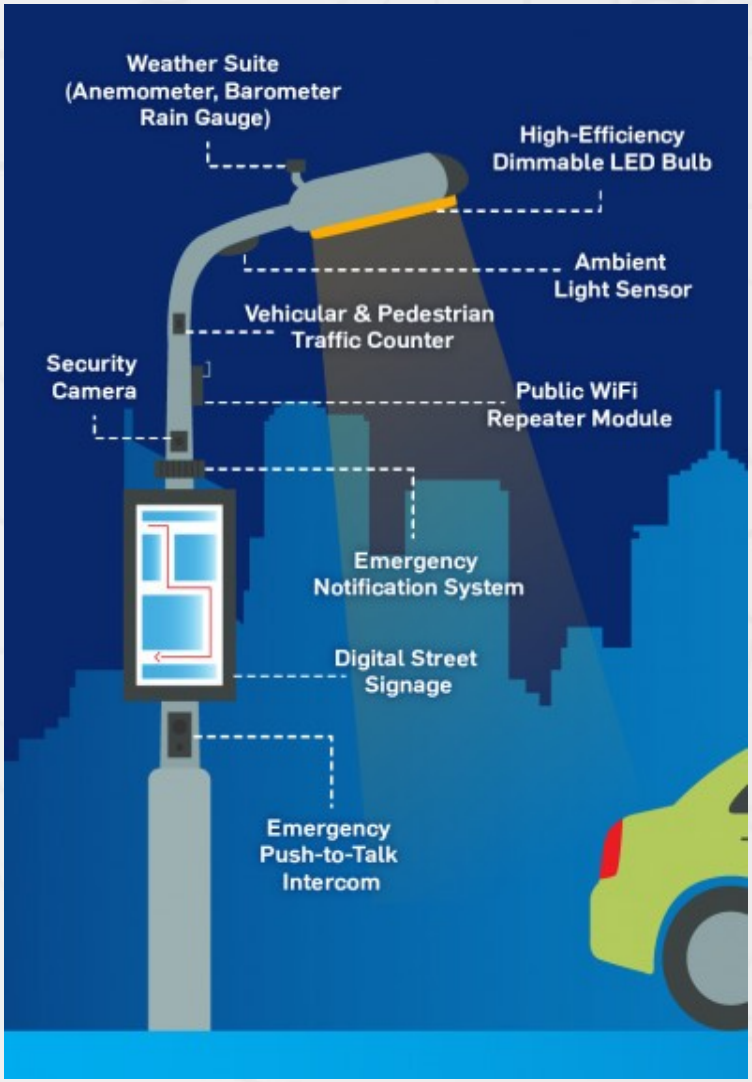
Energy grid

- Demand based electricity allocation with help of smart homes
- Address outages and mitigate them through demand-based pricing

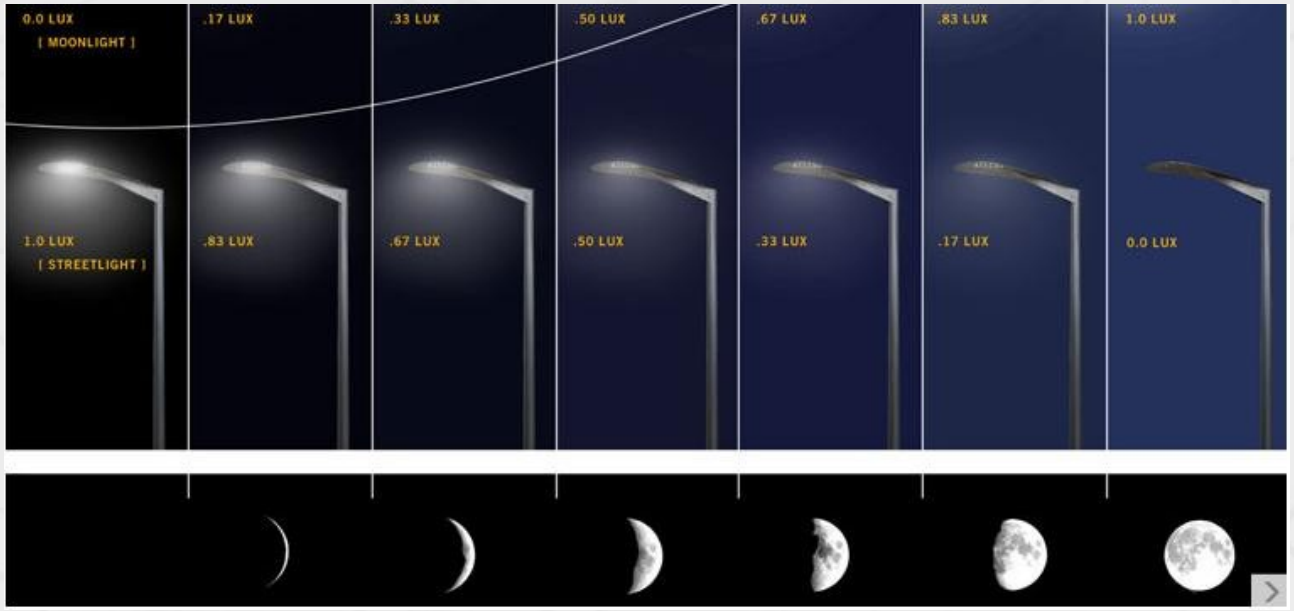


Street lights responsive to lighting conditions

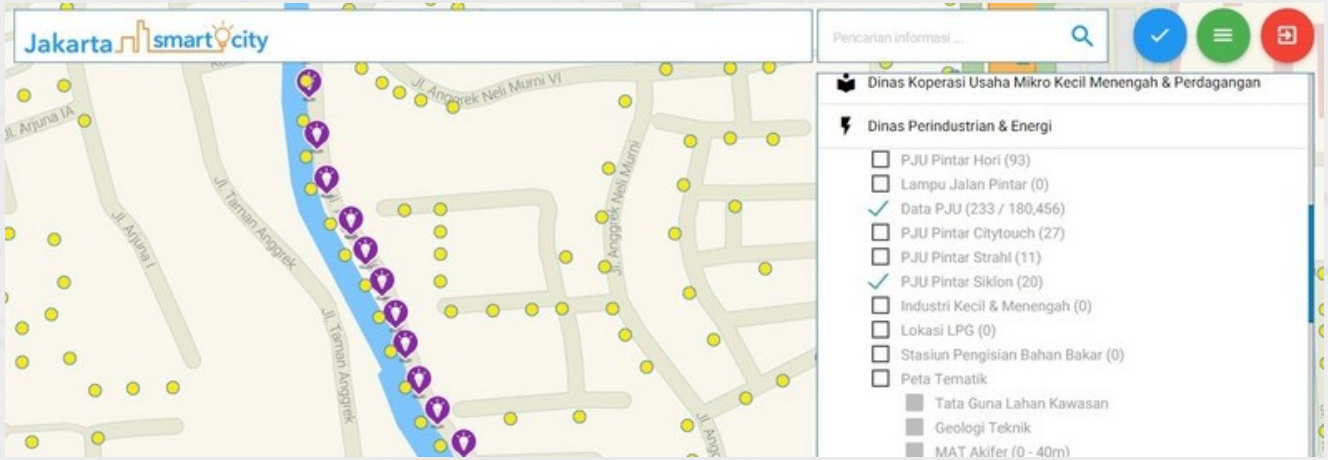
Lamppost Design



Energy savings in bright moonlight

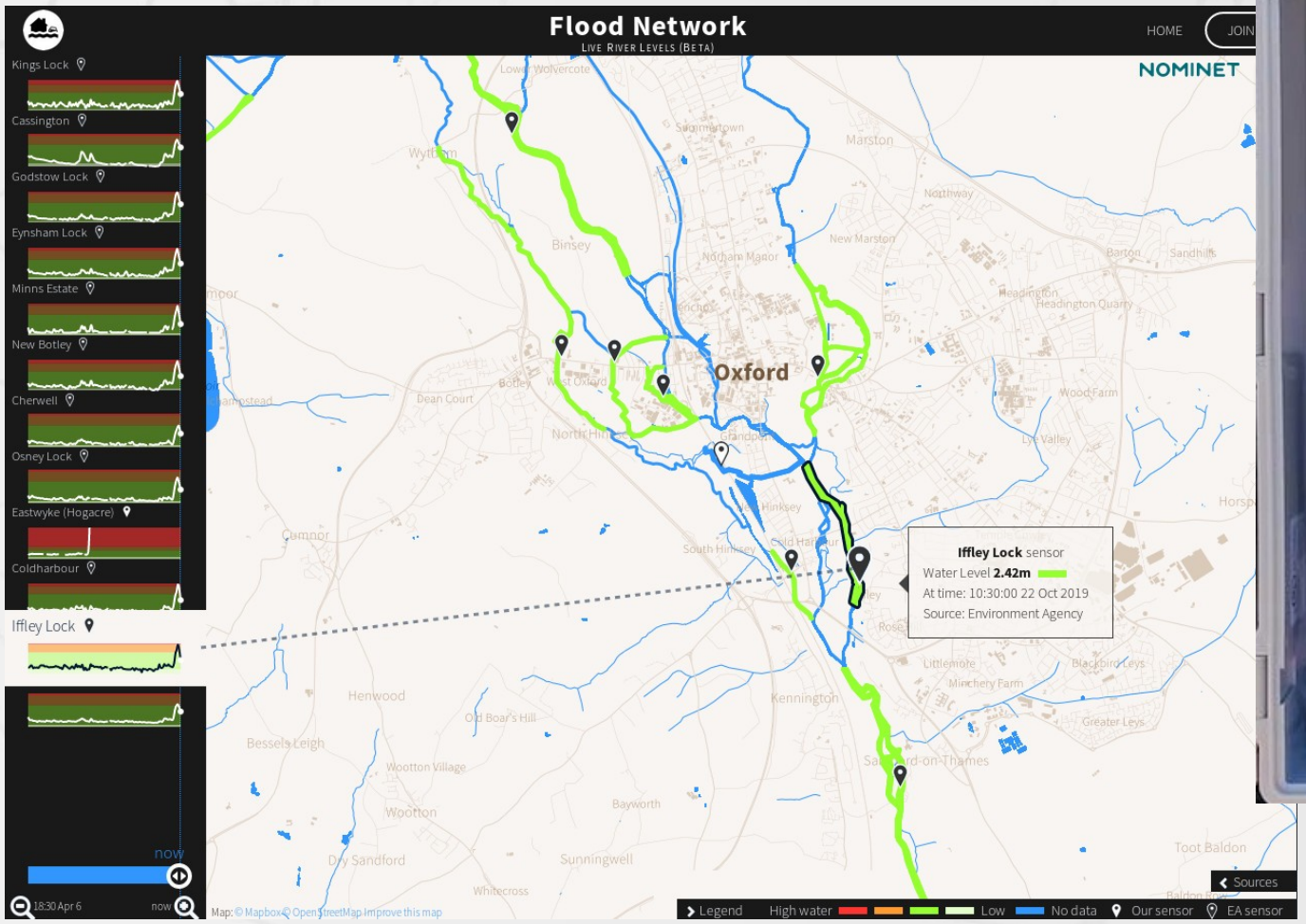


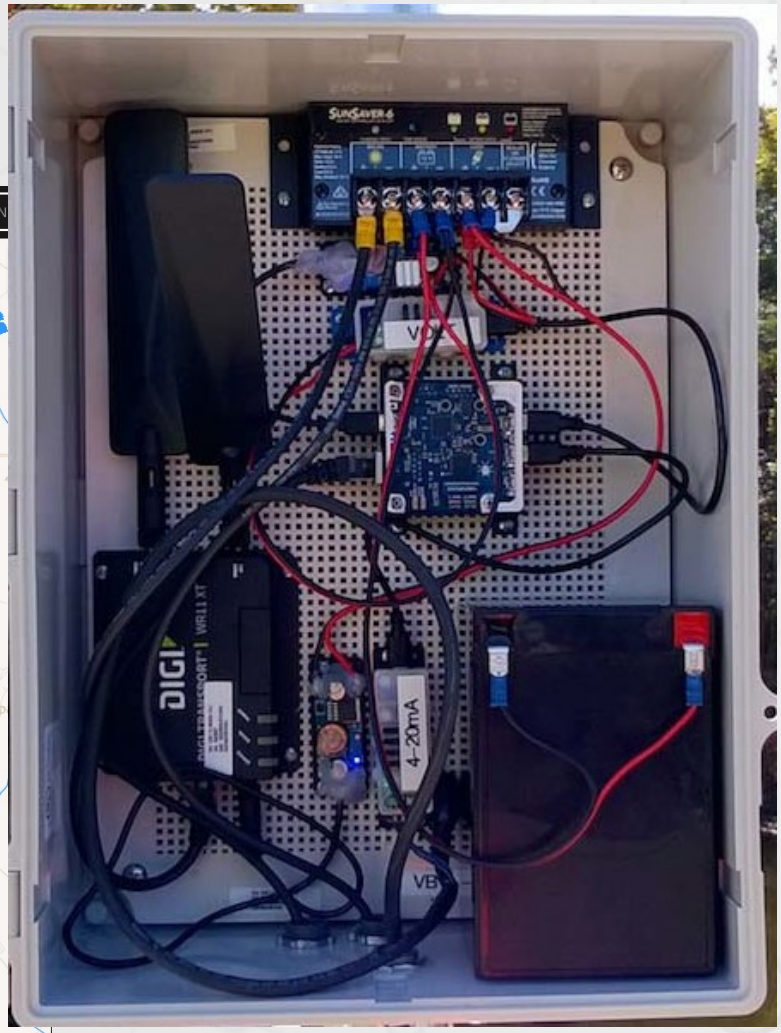
User interface for municipality mantainers



Flood prevention by water level monitoring

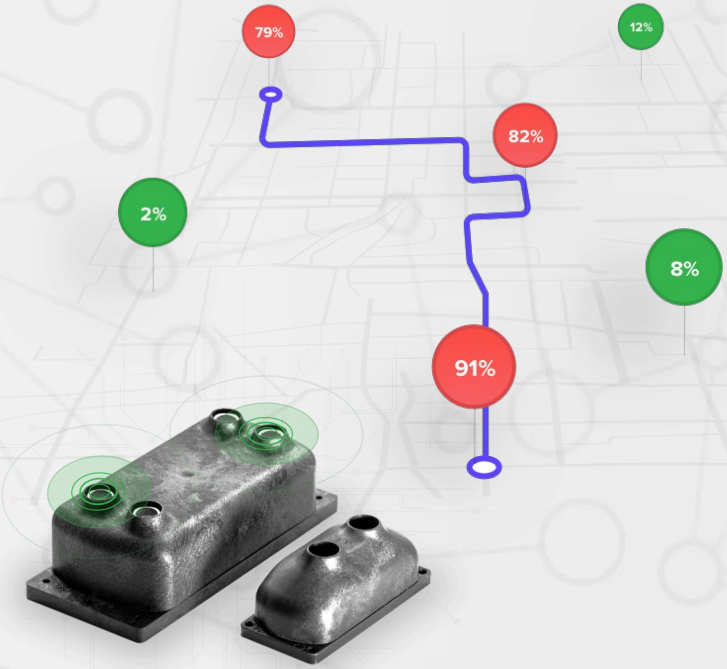
- Water level sensor and Rainfall sensors
- Communal real time monitoring of rivers and streams (with national hydrology service)





Waste management

- semi-underground containers with waste level sensors
- plan garbage collection routes
- reduce soil pollution



Transportation

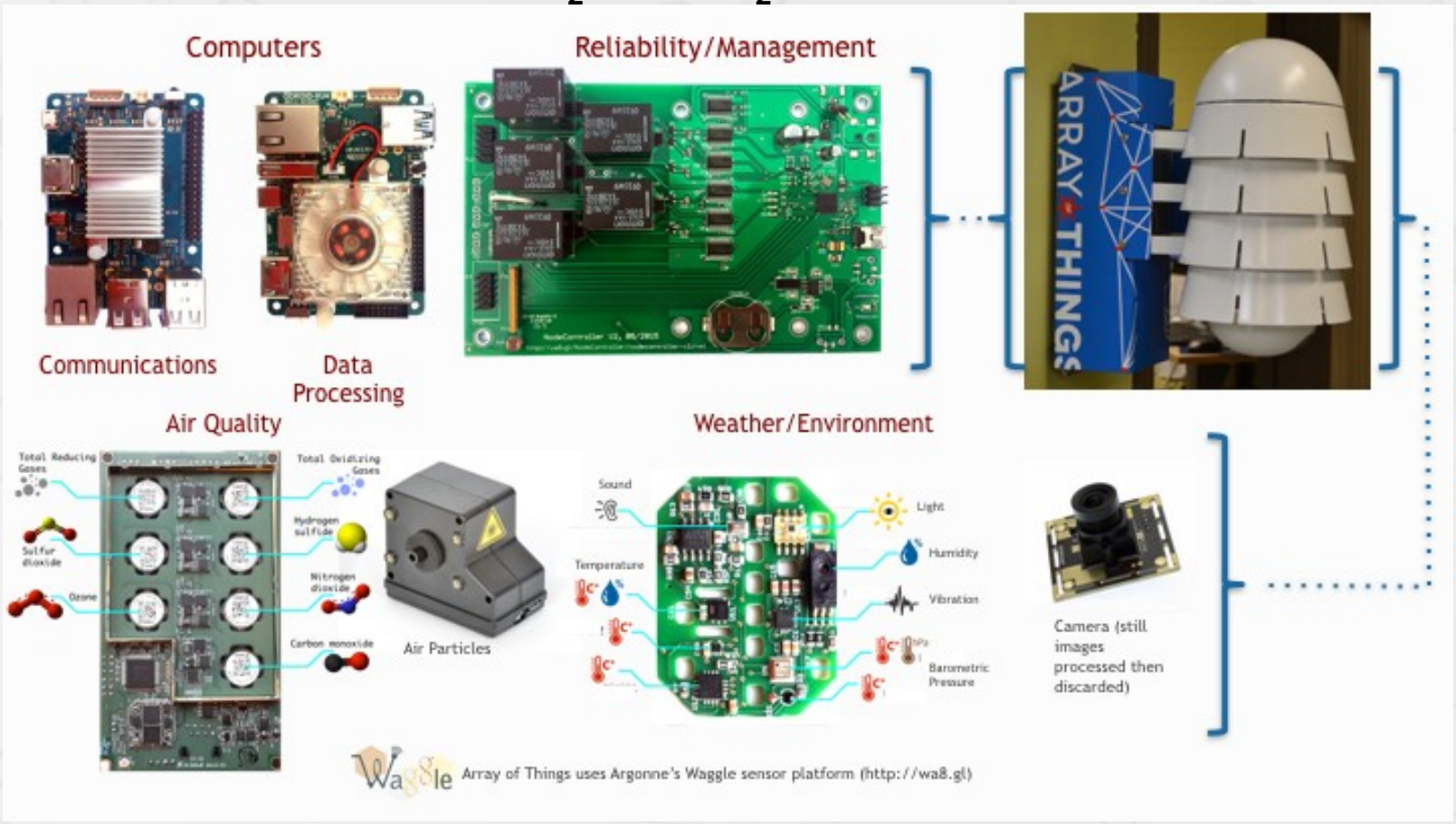
Air pollution and weather conditions

Chicago Array of Things:

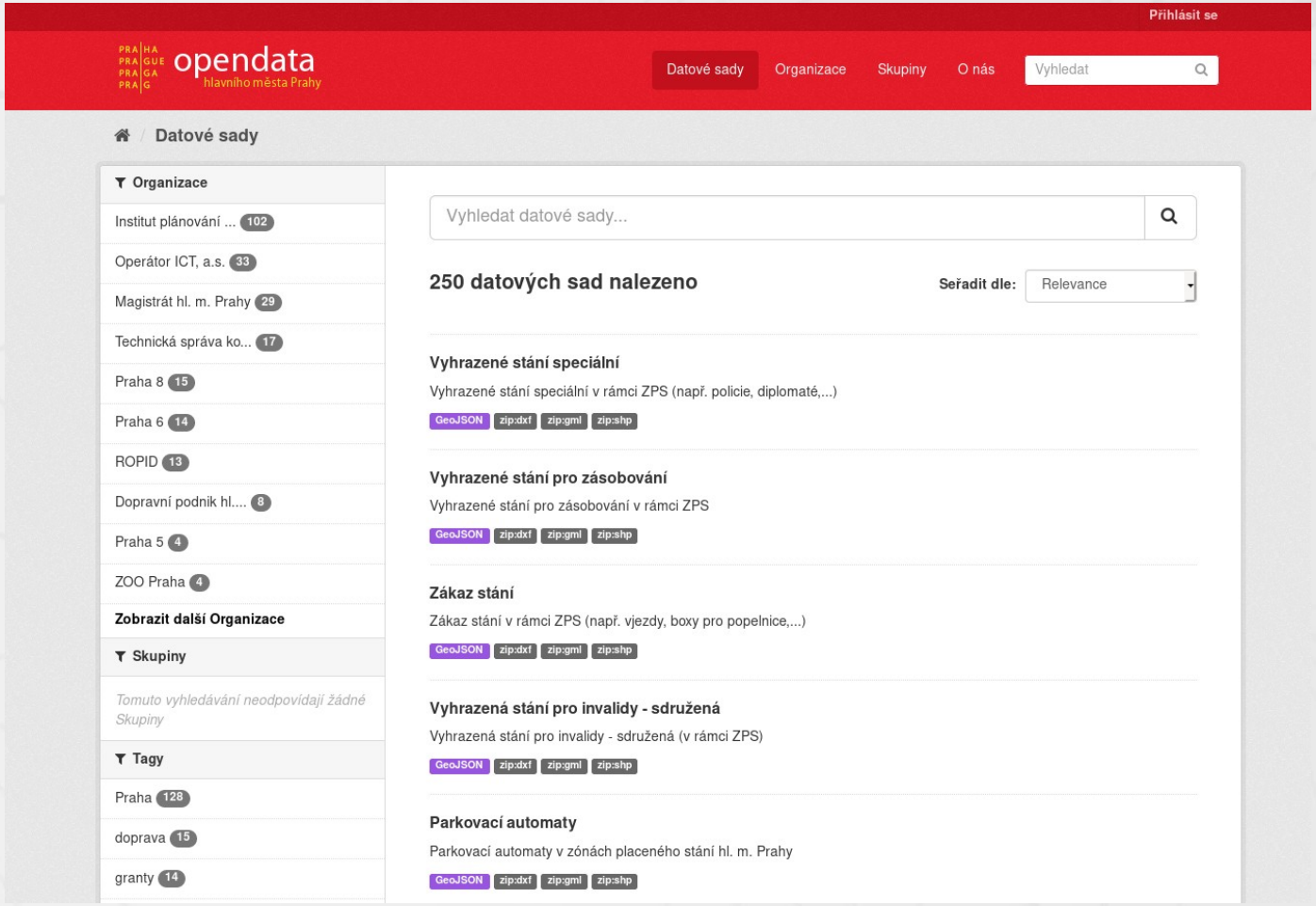
– weather (temperature, pressure, humidity)

– ambient light level, RMS sound pollution, vibrations

– air pollutants **(CO, H_2S, NO_2, O_3, SO_2)**



Data accesibility for public use via Open Datasets, API, GIS



OPEN DATA BRATISLAVA

opendata hlavního města Prahy

NYC OpenData

CHICAGO DATA PORTAL

Discussion - Q&A

1. Which issues can modern cities solve with IT in the coming years?

2. What should be done first in order to introduce IoT technology into cities‘ infrasturctures?

3. What is your opinion on monitoring of public spaces?

4. What do you think about benefits versus risks these kinds of surveillance systems pose?

5. How can public access to data about the city make life in the area better?