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IoT Enabled Sustainable Development in St Petersburg (bIoTope project)

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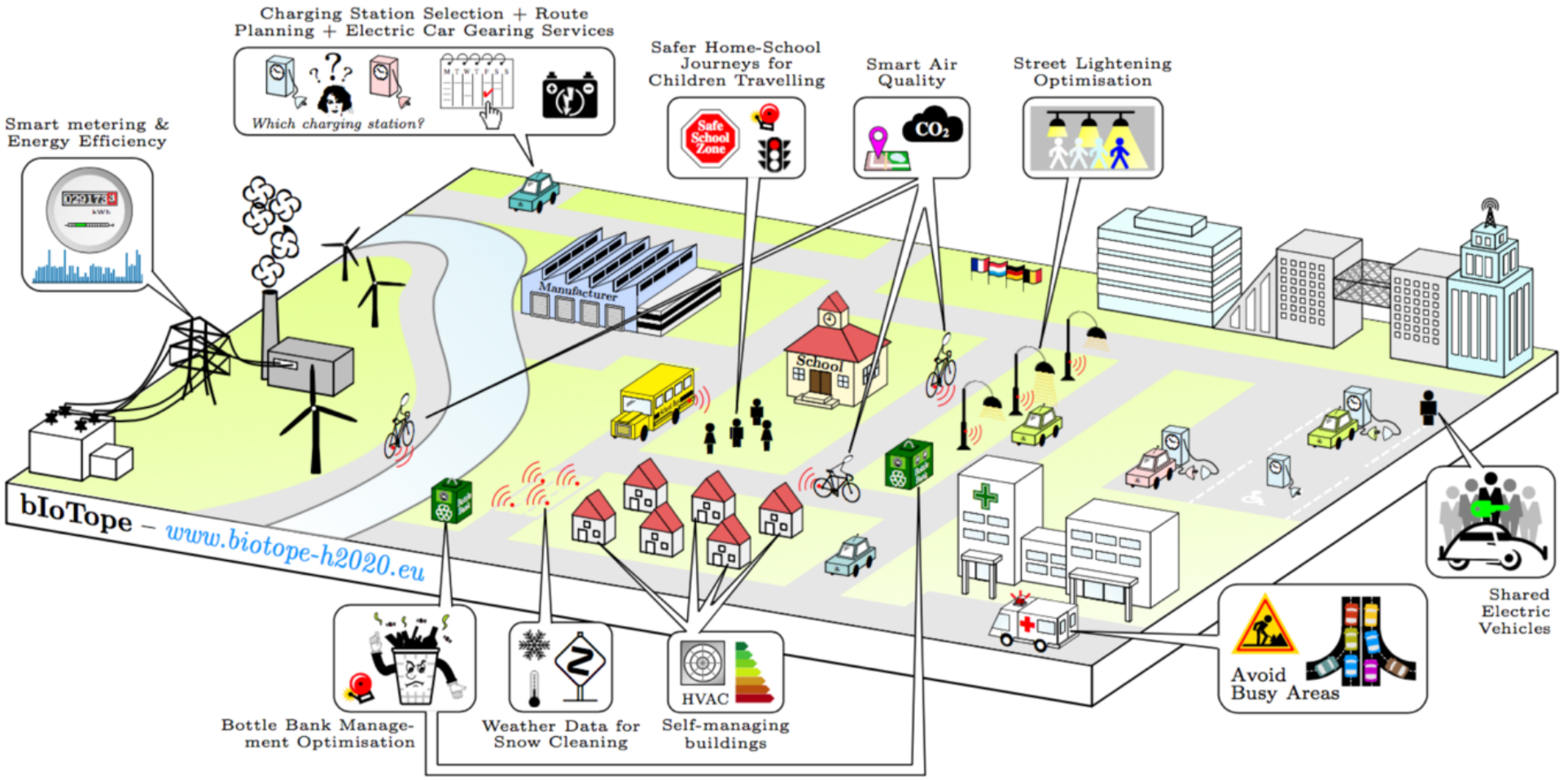
bIoTope – building an IoT OPen innovation Ecosystem for connected smart objects

http://www.biotope-project.eu



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BioTope Objectives & Standards

More then 20 partners from 10 countries.

The key objectives of the bIoTope project include the following:

- Provide the necessary standardised Open APIs to enable interoperability between today's vertical IoT silos
- Enable new forms of co-creation of services ranging from simple data collection and processing, to intelligent, situation aware and self-adaptive support of everyday work and life
- Establish a robust IoT framework for security, privacy & trust that facilitates the responsible access and ownership of data
- Develop large-scale pilots in smart cities to provide proofs-of-concept of bIoTope enabled SoS ecosystems
- Maintain, grow and sustain the socio-technical and business models of bIoTope ecosystems by establishing a governance roadmap for ecosystem evolution

Standards for IoT and Technology Innovations:
bIoTope technologies enable the publication, consumption and composition of heterogeneous information sources and services from across multiple systems (OpenIoT, FIWARE, city dashboards…). Full advantage is taken of recent IoT standards, notably the O-MI (Open Messaging Interface) and O-DF (Open Data Format) standards , while an "Everything as a Service" design enables rapid development of new IoT systems and reduced development costs.

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ITMO projects requirements

This research is funded by the Ministry of Education and Science of the Russian Federation under the Grant Agreement **RFMEFI58716X0031.**

System for dynamic status monitoring and management of waste management for city/district administrations and other users.

The architecture of the prototype of a solid waste collection system based on IoT technologies should establish the relationship between the following system components:

- Cloud system of decision support and management system for waste export;
- Web application for organizations-carriers;
- Web application for government agencies;
- Mobile application for drivers;
- Mobile application for workers of housing and communal services;
- Web application for citizens.

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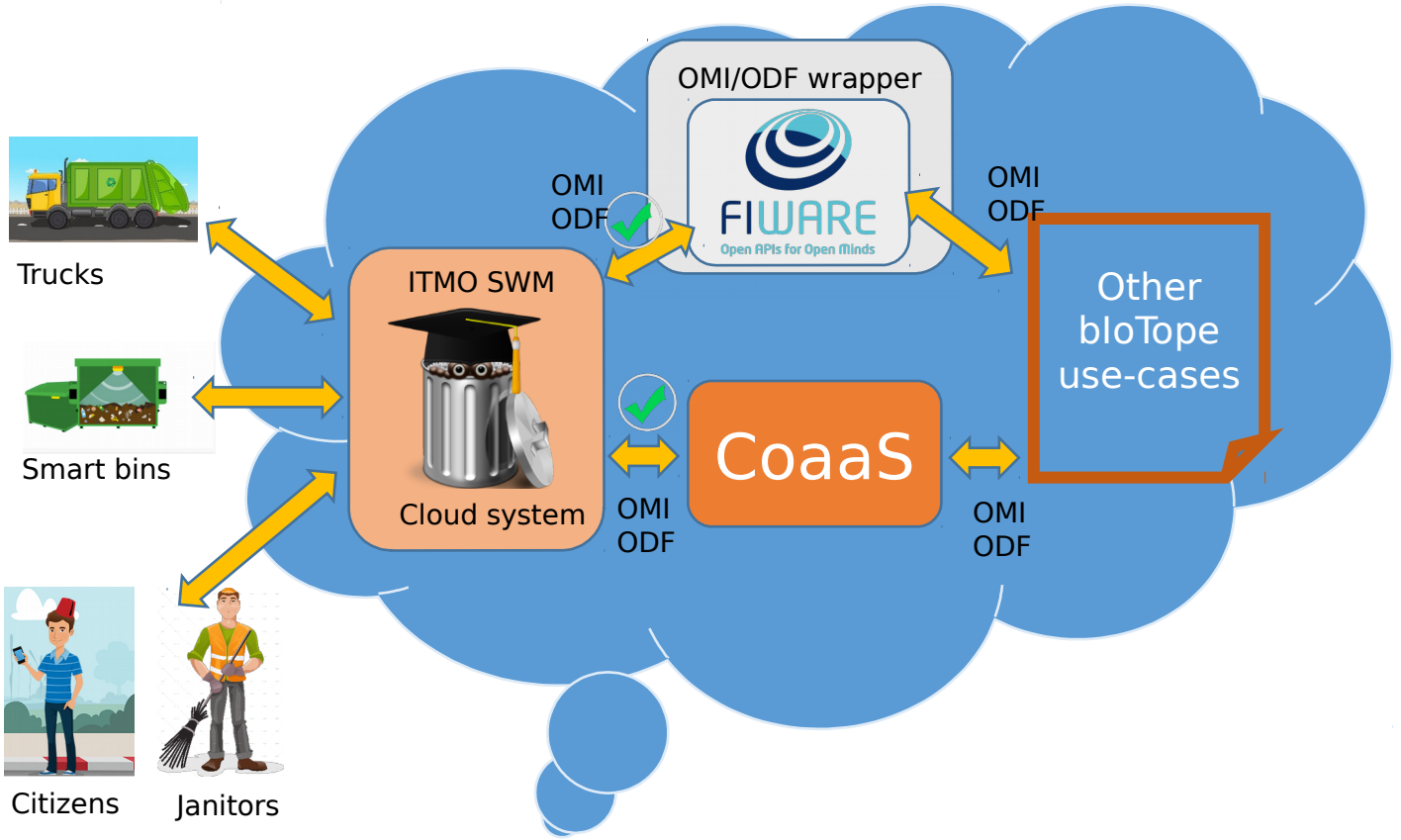
SWM integration



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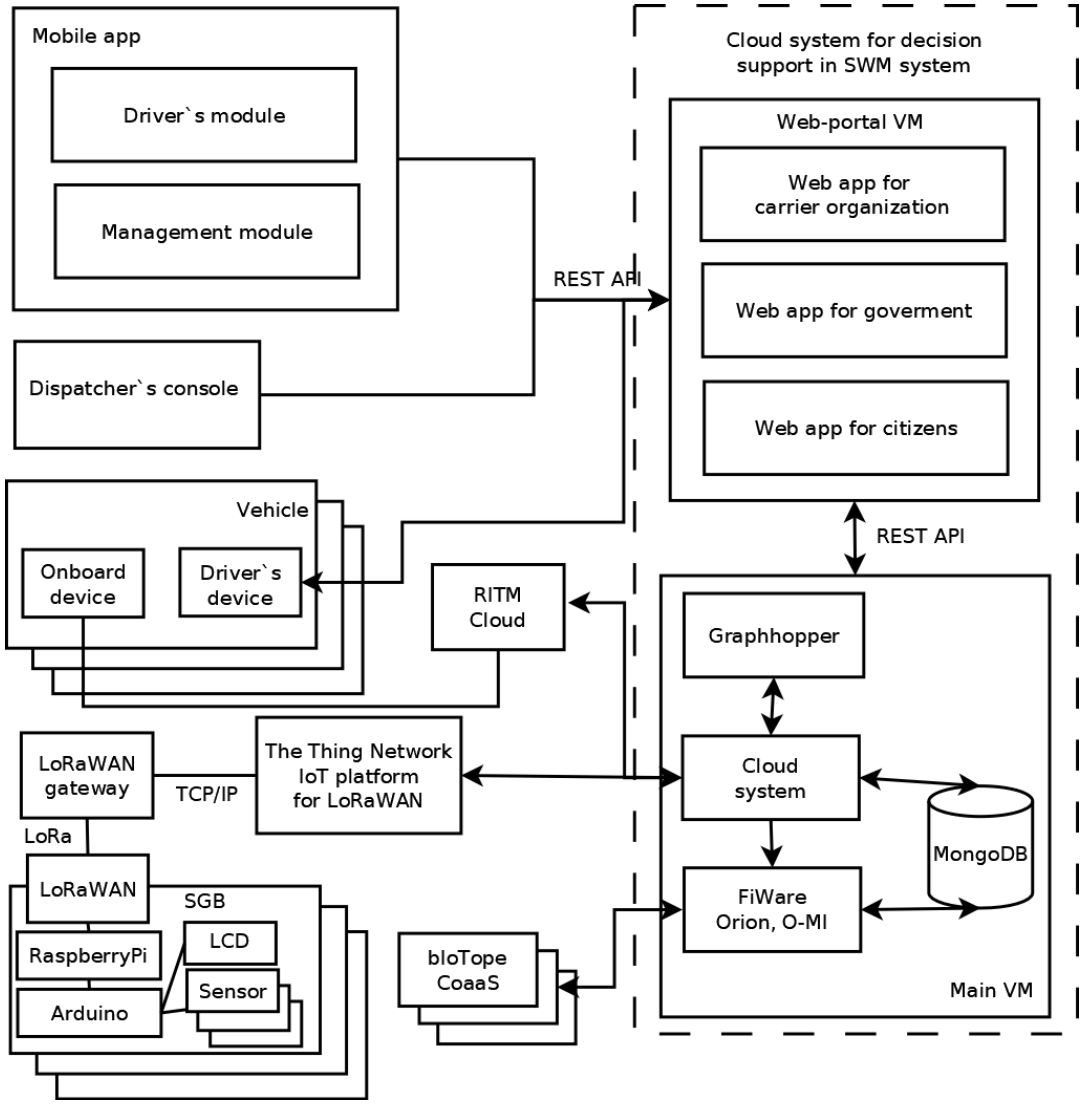
SWM general architecture



Main components:

- Cloud system
- Web apps
- Mobile apps
- Onboard devices
- SGB

Communication via:

- REST API
- LoRaWAN
- OMI
- NGSI

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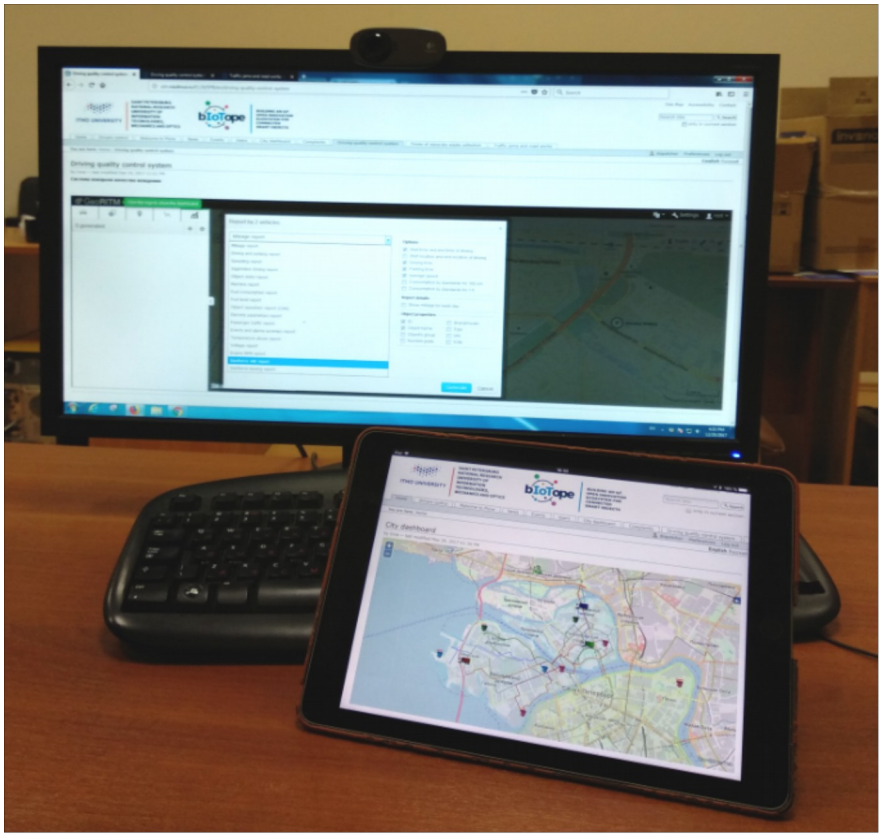
Web application for dispatchers of SWM operators

- City dashboard
- Traffic jams and road works
- Complaints & Reviews
- Automated scheduling of vehicles
- Receiving driver messages
- Reports on the quality of the collection of solid waste Driving quality control



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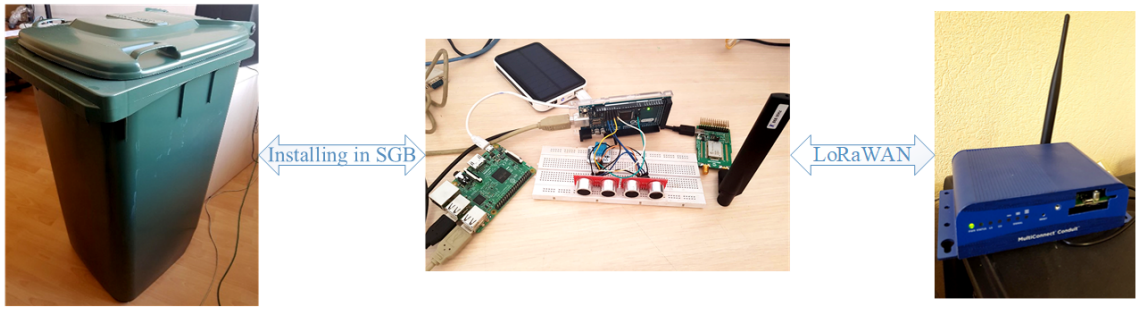
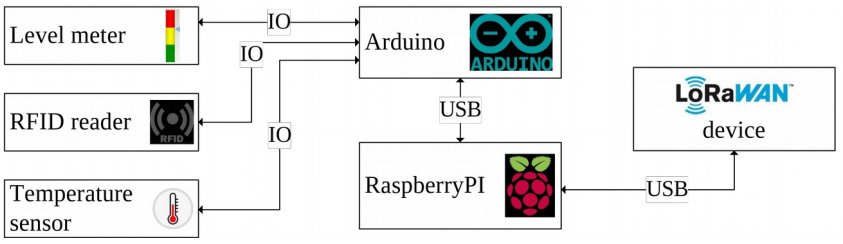
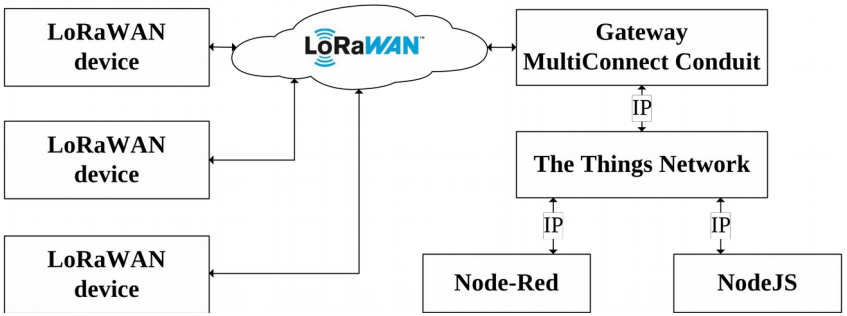
Smart Garbage Bin (SGB)







- We use Arduino board as a bridge between sensors and Raspberry Pi (RPI) platform.
- RaspberryPI aggregates raw data and represent a bridge to Cloud through LoRaWAN stack.
- The main purpose of the gateway is to ensure reliable package forwarding to IP-network.
- The Things Network (TTN) service is a cloud service for monitoring the queue of events from devices, decrypting packets, routing data to processing services

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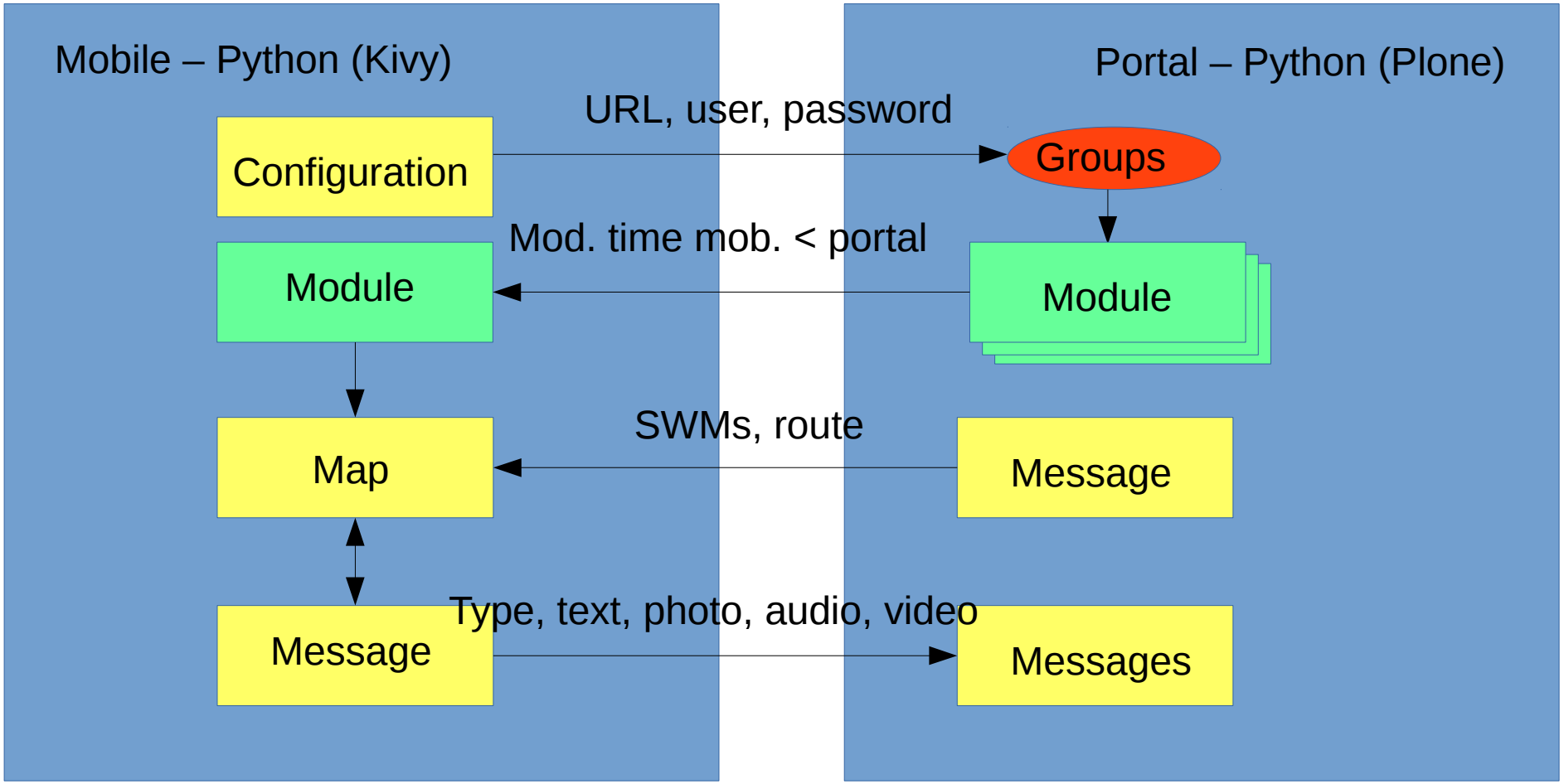
SWM mobile app. principle of work



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Mobile application on different devices

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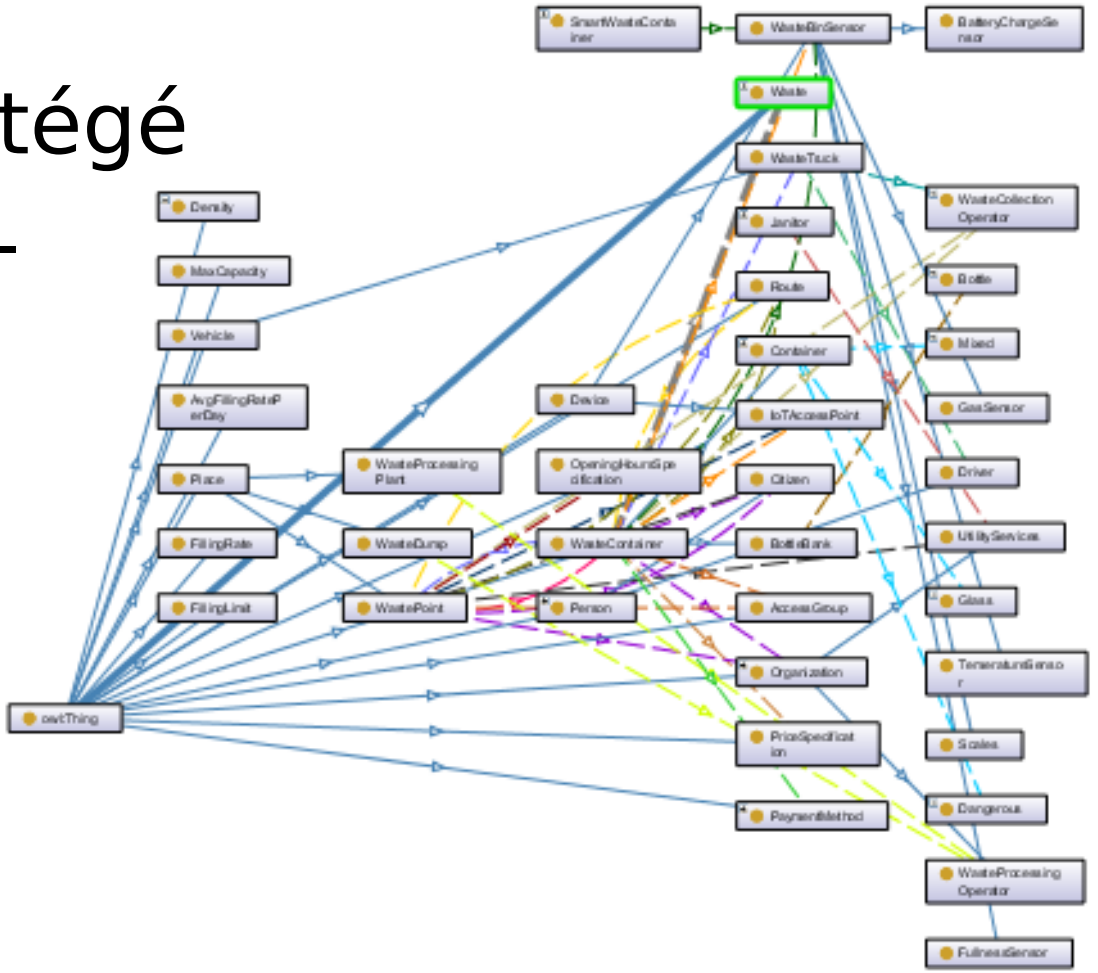
Waste Management Ontology

- Development environment - Protégé
- Source language – OWL
- [Ontology online]



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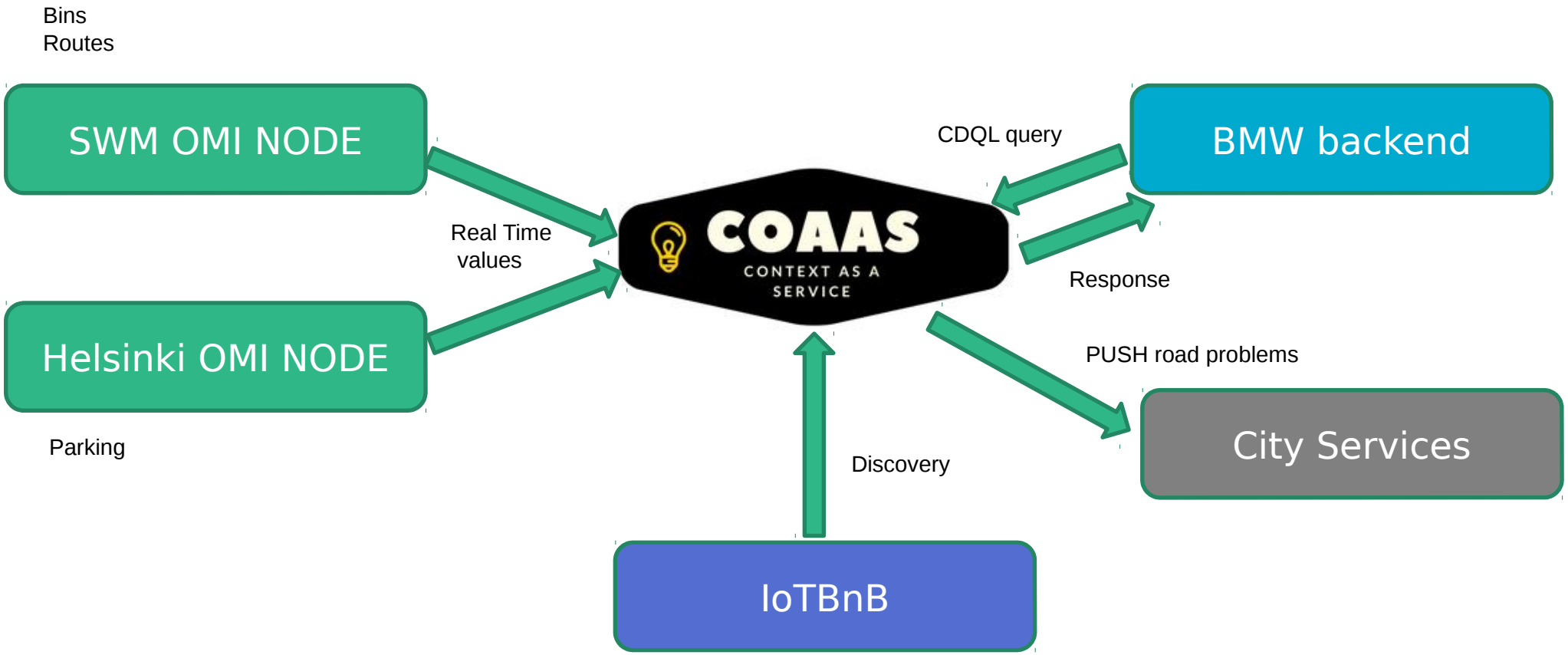
CoaaS



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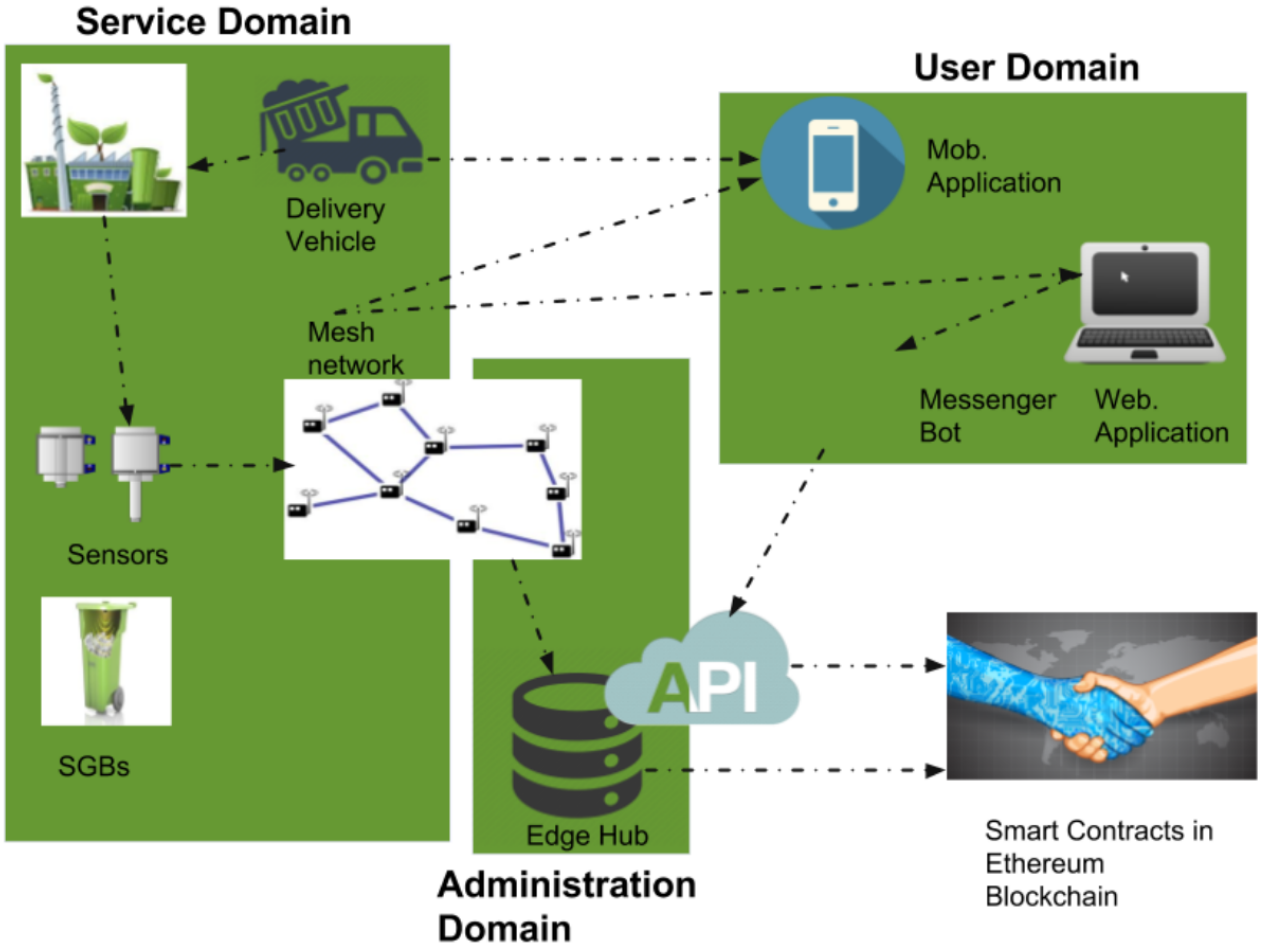
Smart City

The test data used in the works should correspond to the standard data of a modern metropolis with a population of more than one million people.



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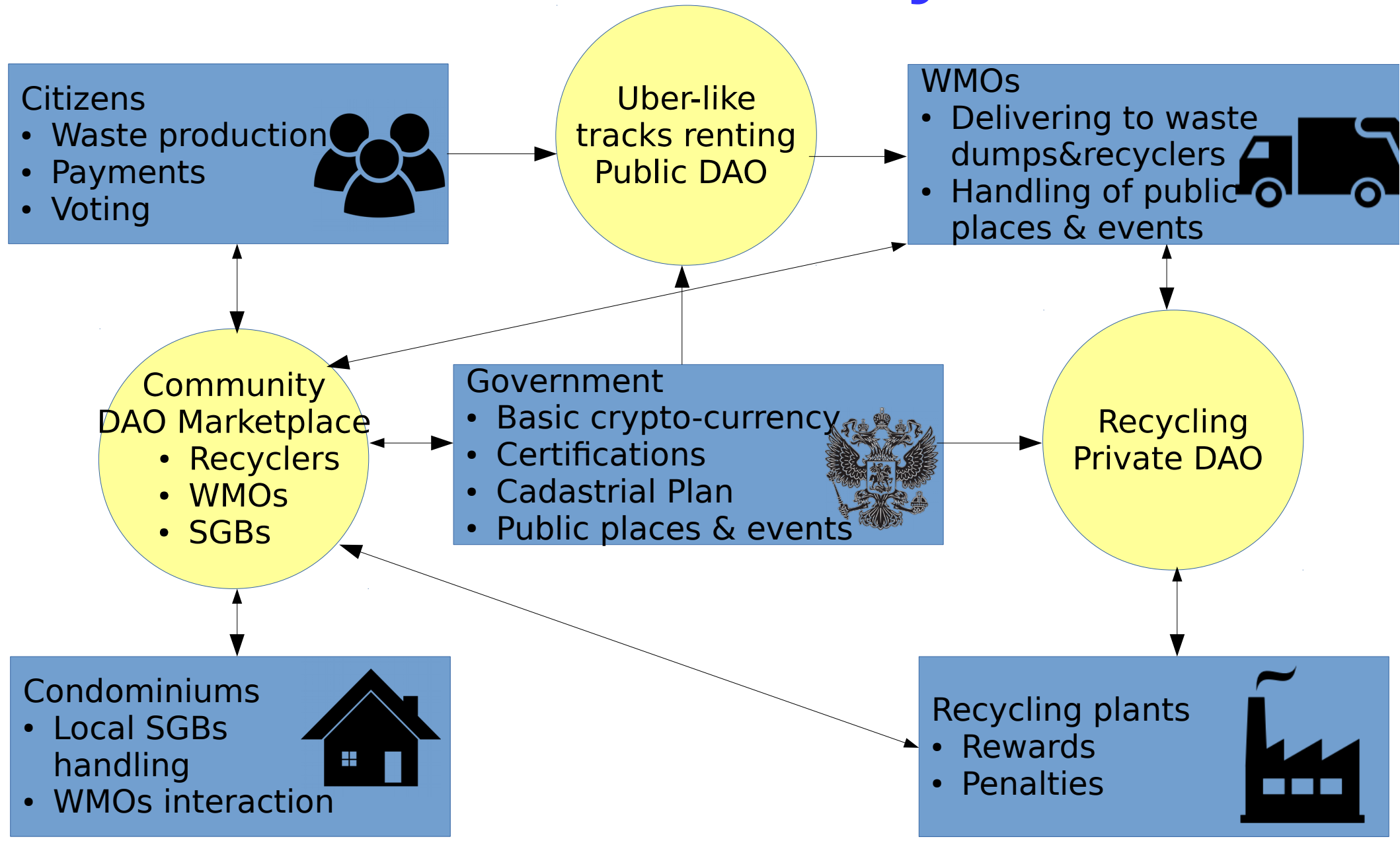
Blockchain Ecosystem



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- EU HORIZON 2020 bIoTope project
- Ministry of Education and Science of the Russian Federation under the Grant Agreement **RFMEFI58716X0031**
- Erasmus Mundus Joint Master Degree (EMJMD) in Pervasive Computing and Communications for Sustainable Development (PERCCOM)

Resources:

- http://sdn.ifmo.ru/waste-management-system
- https://github.com/itmo-swm