

**CITIES NETWORKING
IN THE DIGITAL TRANSFORMATION
TOWARD OPEN COLLABORATION AND
MINIMAL INTEROPERABILITY**

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Chair, Danish Standards Committee on SSCC (ISO TC268)

Vice-Chair, ITU-T FG-DPM IoT & SCC

Chair, AU Smart Cities, Aarhus University





Mission: To create a global smart city market based on the needs of cities and communities

—
Demand-side

—
Global network of national networks

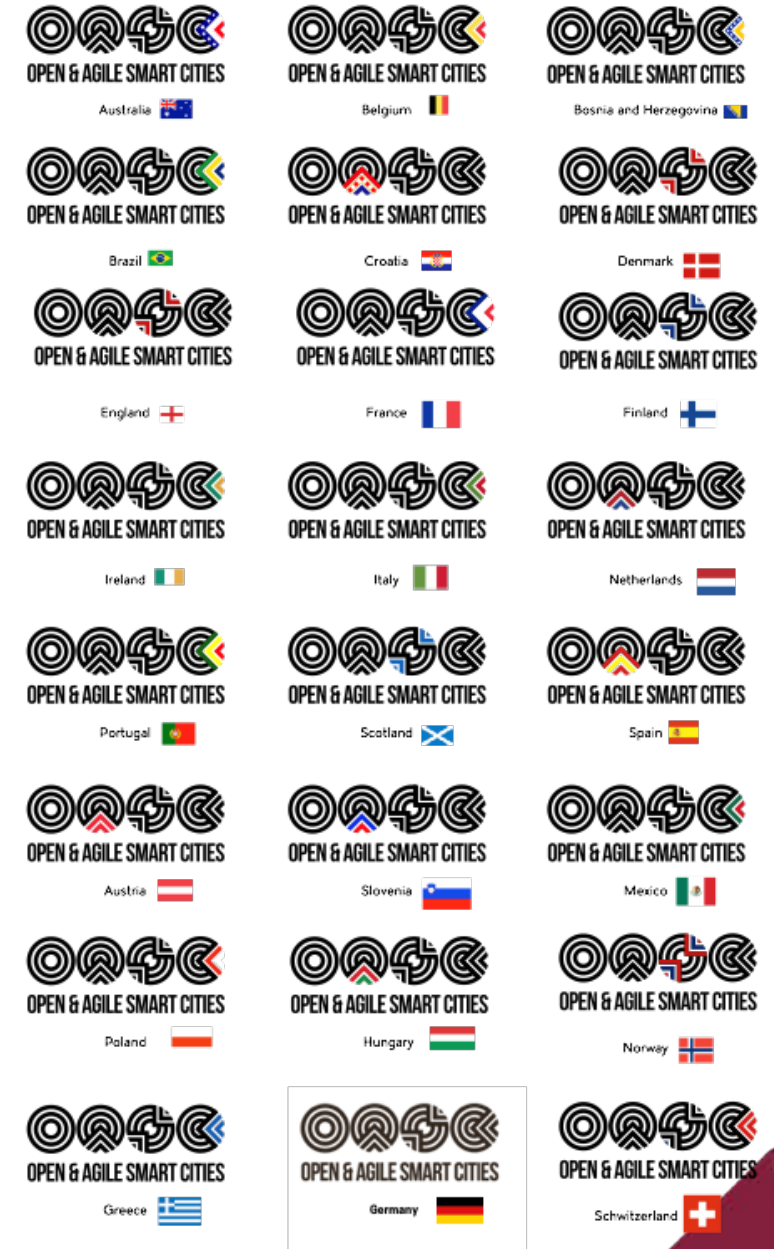
—
140 cities

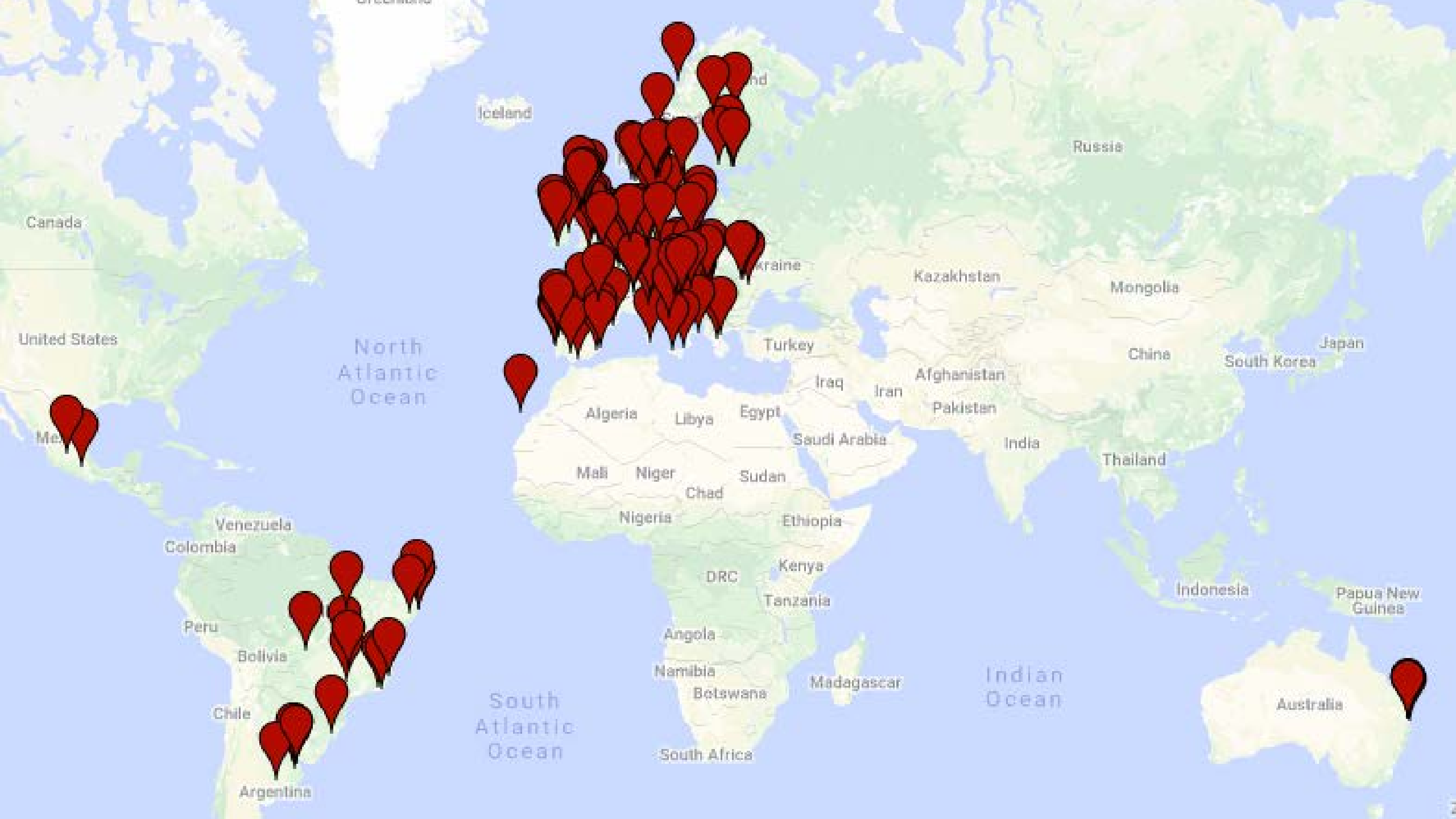
29 countries

Europe, Latin America, Asia-Pacific

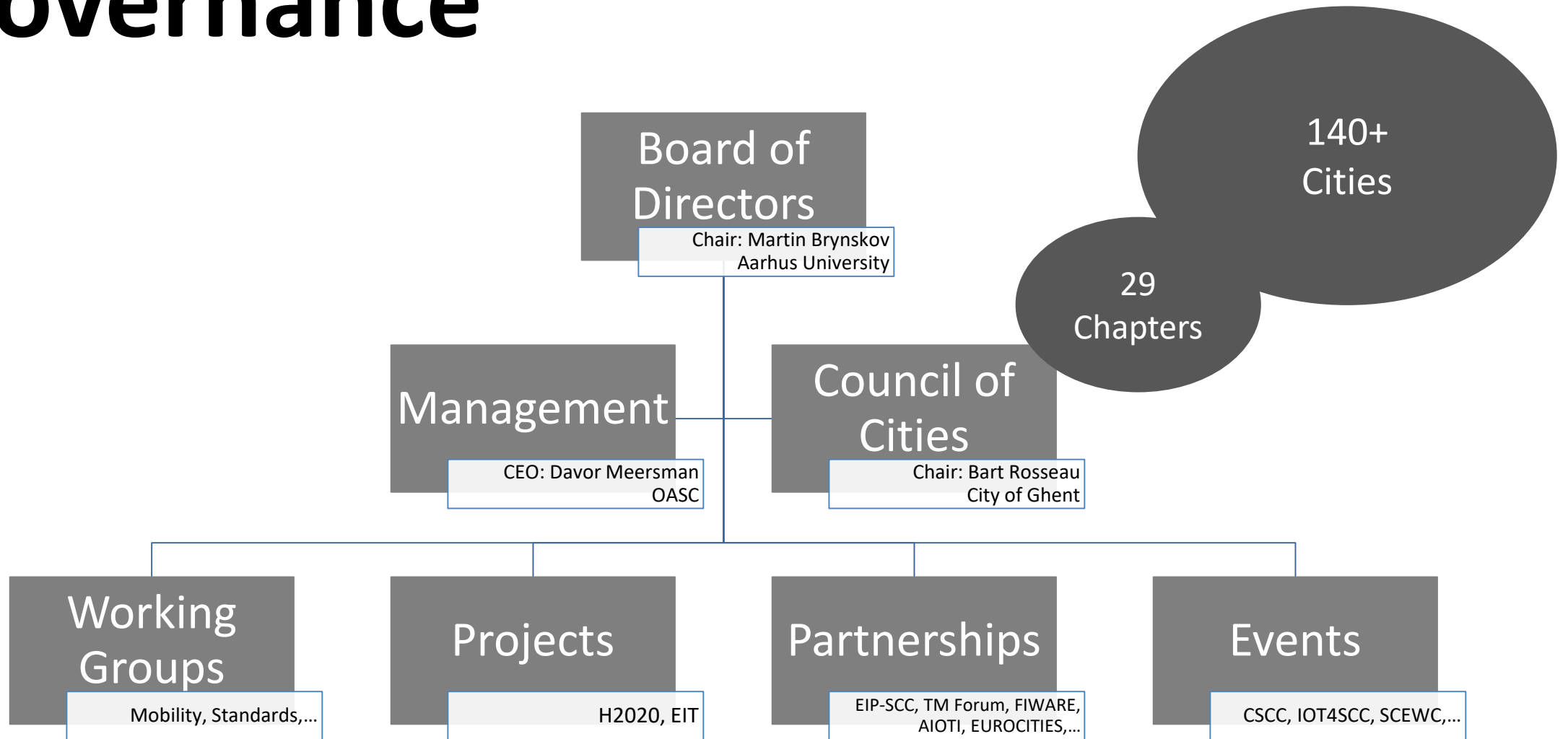
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Council of Cities Coordinator: Ghent (Belgium)

Board representative: Vienna (Austria)





Governance





OPEN & AGILE SMART CITIES



European Committee of the Regions



SYNCHRONICITY

tmforum



AIOTI



SELECT for Cities



CATAPULT Future Cities



OASC and SynchroniCity support the Declaration of IoT for Sustainable Development



- Promoting the development and adoption of IoT technologies for the benefit of humanity, the environment and sustainable development.** This includes promoting the research and the use of IoT technologies to address the 17 Sustainable Development Goals adopted by the United Nations and the international community. Governments and policy-makers from developed and developing countries should be encouraged to examine the future challenges and benefits to their economies and accelerate global competitiveness of their economy, region, continent and people by establishing plans and strategies to leverage IoT for SDGs.
- Supporting the implementation of the IoT in urban and rural context to foster the application of ICTs in providing services to build smarter and more sustainable cities and communities.** This will allow urban and community stakeholders to take advantage of technological advances and offer new opportunities for quality of life for different strata of society, by promoting accessibility to amenities, technologies and services (including social infrastructure, energy, water and healthcare), and by supporting IoT systems and data interoperability.
- Promoting a broad, vibrant and secure ecosystem for IoT, including support for start-ups and incubators.** This includes promoting policies to facilitate research, innovation and development of new solutions and eliminating policies that restrict job creation, hinder economic growth or prevent innovation. It may also include appropriate incentives, and policies to promote IoT deployment, privacy protection and secure data management. This will gradually assist in fostering an IoT data market, which contributes to the consolidation of sustainable business models and cooperation among stakeholders.

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- Encouraging the development and implementation of standards that facilitate interoperability among IoT technologies and solutions in order to pave the way to an open and interoperable IoT ecosystem,** with cost-effective solutions in line with the vision for an open economy.
- Adopting new and innovative IoT applications to deal with challenges associated with hunger, water supply, and food security** through resource monitoring to cope with the increasing consumption needs of a global population. By leveraging IoT, sensors can detect and monitor water leaks, potential contamination, soil moisture, pollutions, weather conditions, livestock movements, while remotely managing and controlling harvesters and irrigation equipment to improve the quality, quantities, yield rates, cost-effectiveness, energy efficiency and sustainability of agricultural production, including the packaging and transportation of food supplies. IoT can also be used for research and analysis into water-borne diseases and potentially new types of diseases.
- Galvanizing interest in the use of IoT for risk reduction and climate change mitigation,** taking into consideration the diversity and complexity of the Earth's geography and vulnerable populations. The IoT framework has the ability to gather and analyze real-time information for proactive prevention and faster response to deal with toxic wastes and pollutants, disasters and other natural calamities.
- Identifying and supporting the growing trend of using IoT technologies for education** and improving the access of disadvantaged and excluded groups to ICT infrastructure by promoting basic ICT literacy, virtual classrooms and interactive vocational training programmes for vulnerable segments of society.
- Embracing the application and use of IoT for biodiversity conservation and ecological monitoring** to protect the natural life and its diversity on land, air and below waters. IoT can help monitor natural ecosystems, as well as sanctuaries, detect threats linked to poaching, overfishing (or illegal fishing) and deforestation and can send alerts in real-time to authorities for immediate response.
- Contributing to global research and discussions on IoT for smart and sustainable cities through global initiatives** such as United for Smart Sustainable Cities (U4SSC). ICT-based transformative action for sustainable urban development can help highlight efficient, transparent, and equitable regulatory frameworks, inclusive planning systems, effective financial management with increased transparency and accountability to all inhabitants and urban stakeholders alike, which should help accelerate the transition to smart sustainable cities and communities.
- Promoting international dialogue and cooperation on the IoT for sustainable development** by bringing the various stakeholders together, including inter alia the academic and research community, the specialized international organizations and fora, the industry, SMEs and start-ups, the governments and public authorities (including smart cities), and other relevant stakeholders such as specialized NGOs and indigenous people.



IoT·Forum

SYNCHRONICITY





tmforum
Smart City InFocus
VIC, China, September 19-21, 2017

International Body Impact Award

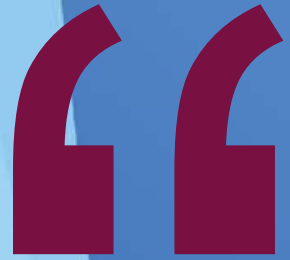
tmforum

卓越贡献奖

The winner is...

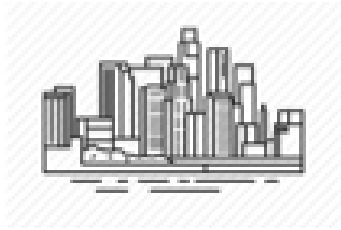
OPEN & AGILE SMART CITIES





**A robust model for
standards-based
innovation and
procurement of
IoT- and AI-enabled
services across domains**

OASC Minimal Interoperability Mechanisms (MIMs)



For cities

MIMs **avoid vendor lock-in**, and help local innovations achieve **global impact**.



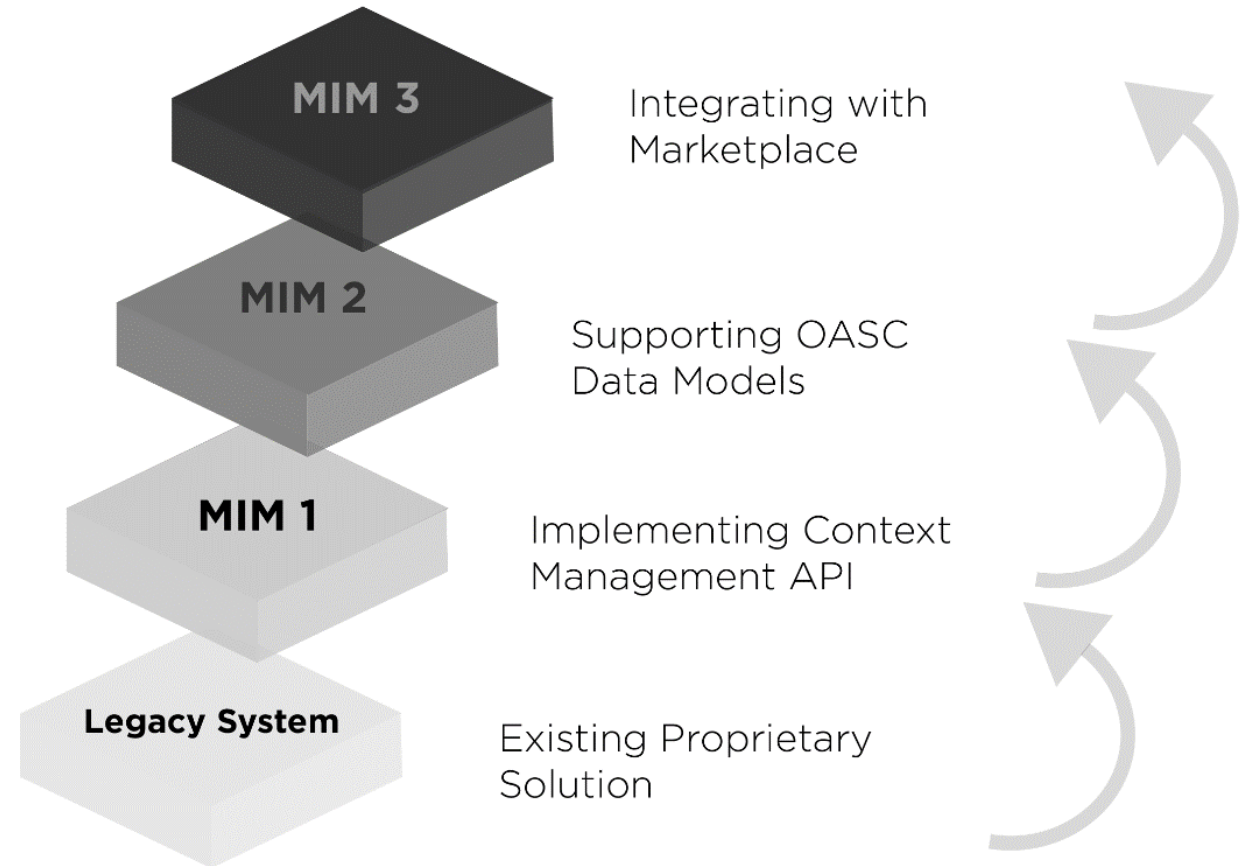
For businesses

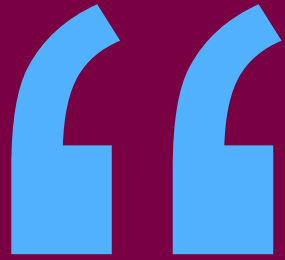
MIMs open up a global market of smart cities.
Develop cheaply, deploy often.

MIMs: Based on open standards

- MIM 1: Context Information Management
- MIM 2: Common Data Models
- MIM 3: Ecosystem Transaction Management

Validated by the IoT Large Scale Pilot *SynchroniCity* and adopted by *OASC Council of Cities*





A voice for cities and communities towards the market.

Support local priorities, leveraging global dynamics.

Free flow of data with trust.

SOLUTIONS

DILEMMAS

SMART CITY DILEMMAS

1. Flexibility, precision, productivity – for whom?
2. We don't see the same city
3. Resilient or vulnerable?
4. Democratic immediacy or noise?
5. No-one left behind?
6. Overview or surveillance?
7. New public spaces without public authorities
8. Is planning possible?
9. Public institutions and their competences
10. Public service 2.0



SYNCHRONICITY

IoT Large-Scale Pilot for Smart Cities & Communities



This project has received
funding from the European
Union's Horizon 2020 research
and innovation programme
under grant agreement
No732240

Co-funded by



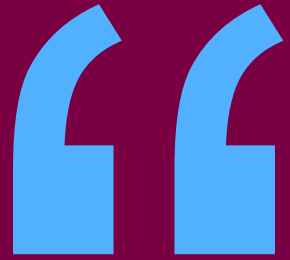
Switzerland



South Korea



Mexico



**Deliver a market for
IoT- and AI-enabled services
for cities & communities
in Europe and beyond**

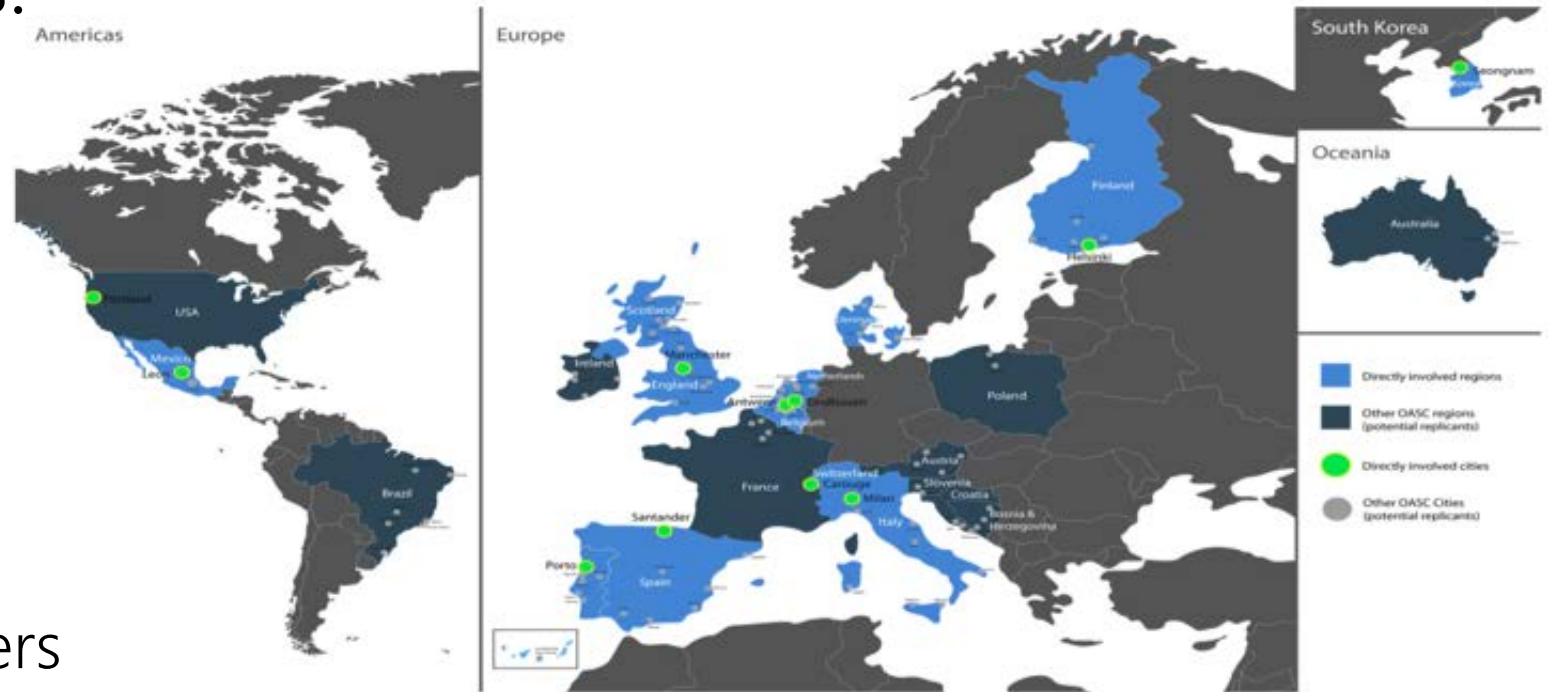
Demonstrating the Power of MIMs

Scaling up across cities:

- 50 services
- 20 cities
- 16 teams
- 6 months

Core project: 20m€ · 40 partners

More information: synchronicity-iot.eu



**SUSTAINABLE
MOBILITY**

**ENVIRONMENT
& WELLBEING**

**CITIZEN
ENGAGEMENT**

**OPEN
THEME**

THEMES



CHALLENGES



Enabling and improving mobility as a service



Climate Change mitigation



Increasing citizen engagement in decision making



Open challenge



Encouraging more non-motorised transport



Reducing noise and air pollution



Increasing a greater level of diversity in political engagement



SYNCHRONICITY BOOTCAMP KICKS OFF PILOT PHASE

20

...

50

CITIES & PILOTS





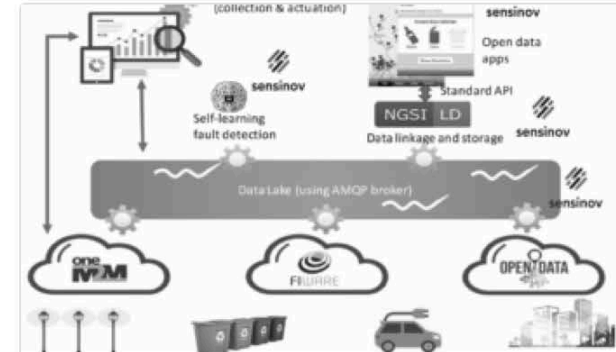
Theme: All themes



Active Travel Insights



Antwerp

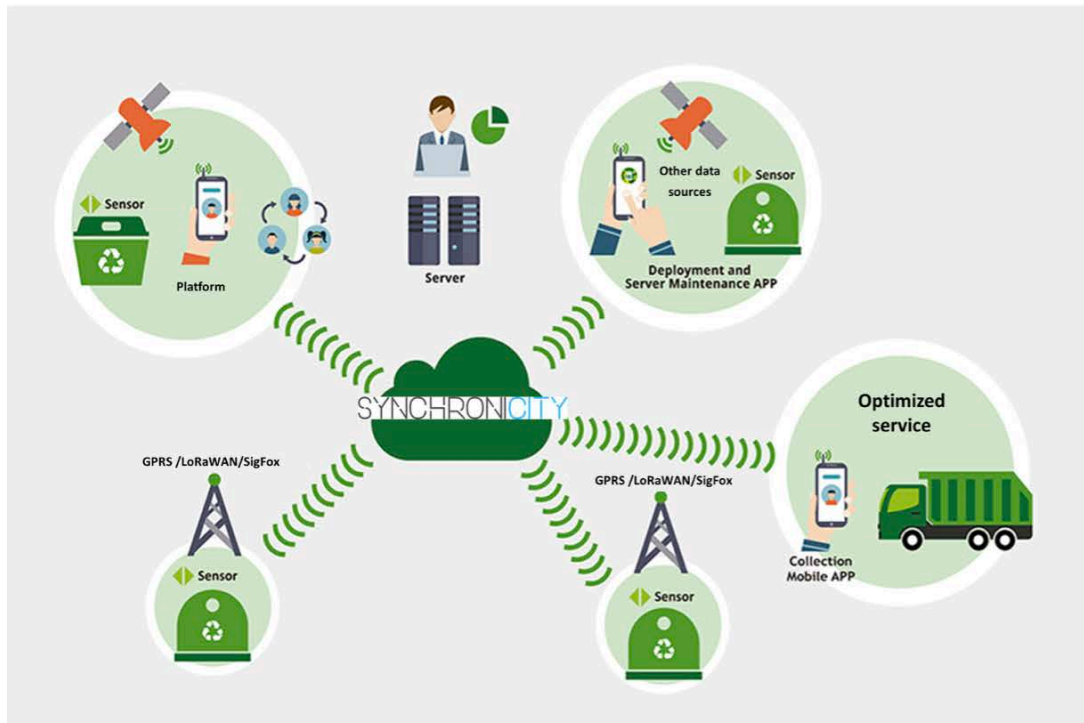


ASAP-VALUE : A Standards-based Approach to enhancing



Quamtra - Smart Waste Management

How does it work?



SYNCHRONICITY

Pilot Group



WellnessTelecom



Municipality of Calatayud

Core Pilot Cities



RainBrain

The smart blue-green roof



Healthier green roofs

- RainBrain monitors and predicts the vegetation's health
- Waters vegetation automatically when needed



The best of IoT and analytics combined

- Vegetation sensors, solar panel and LoRaWAN
- Weather data, machine learning and modeling
- RainBrain insights and controls through a mobile app



Optimized water availability

- RainBrain analyses the current and future water availability
- Anticipates on extreme weather: stores water to survive droughts, empties buffers to prevent floods



Developed by



Piloting in



Antwerp (Belgium)
Eindhoven (Netherlands)

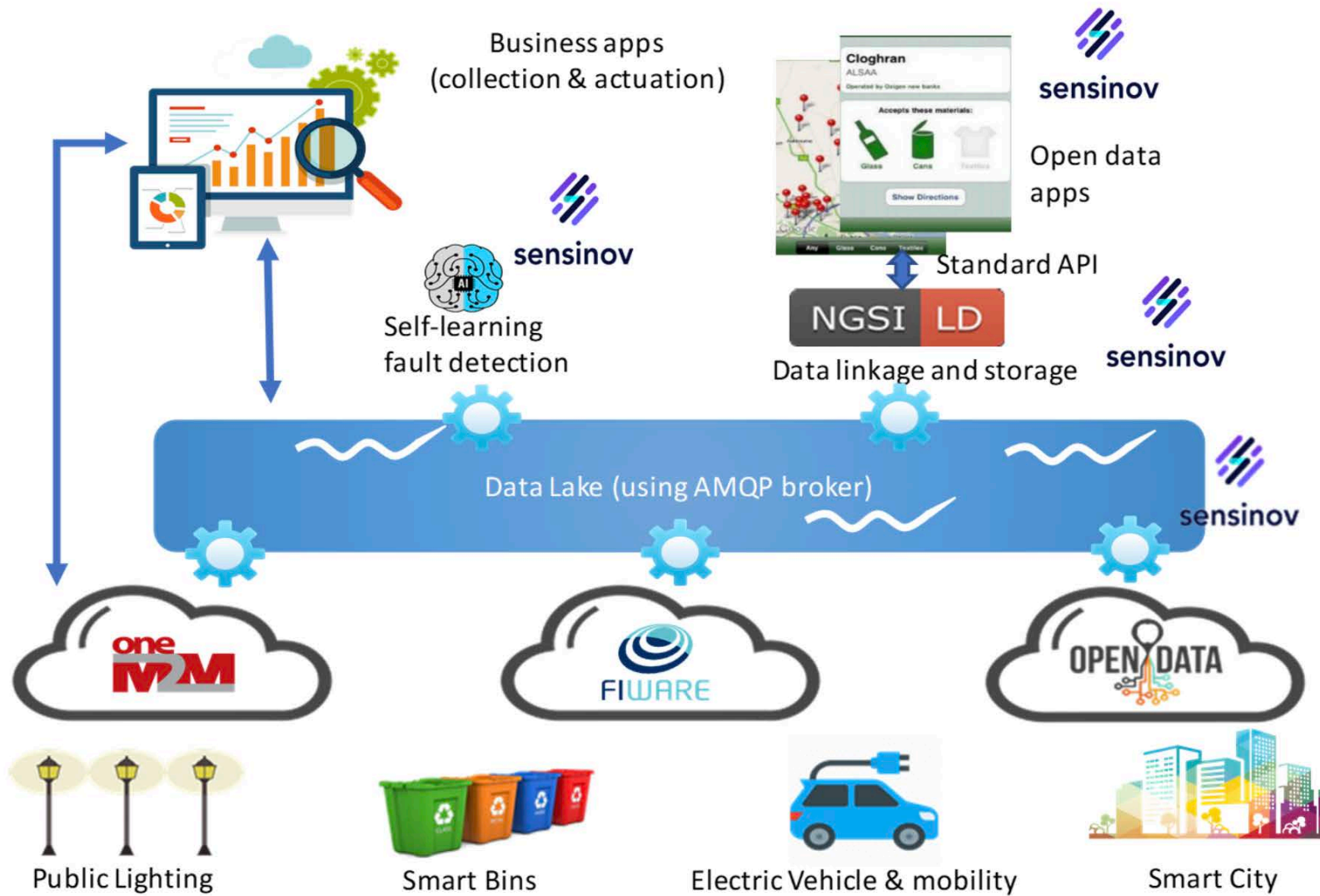
Funded by

SYNCHRONICITY

synchronicity-iot.eu/

RAINBRAIN: THE SMART BLUE-GREEN ROOF

www.synchronicity-iot.eu



ASAP-VALUE : A STANDARDS-BASED APPROACH TO ENHANCING VALUE FROM CITY DATA LAKE

SynchroniCity Catalogue

- Data
 - Open
 - Personal
 - Commercial
- Hardware
- Services/Software
 - Applications
 - Atomic services
 - Components
- Training

These marketplaces are already live in SynchroniCity and partly in IoF2020 (IoT LSP Food & Farming)

Map Satellite EN

P
?? / 120

P
500 / 1100

P
101 / 900

P
800 / 4000

P
600 / 1400

P
100 / 1200

P
500 / 1000

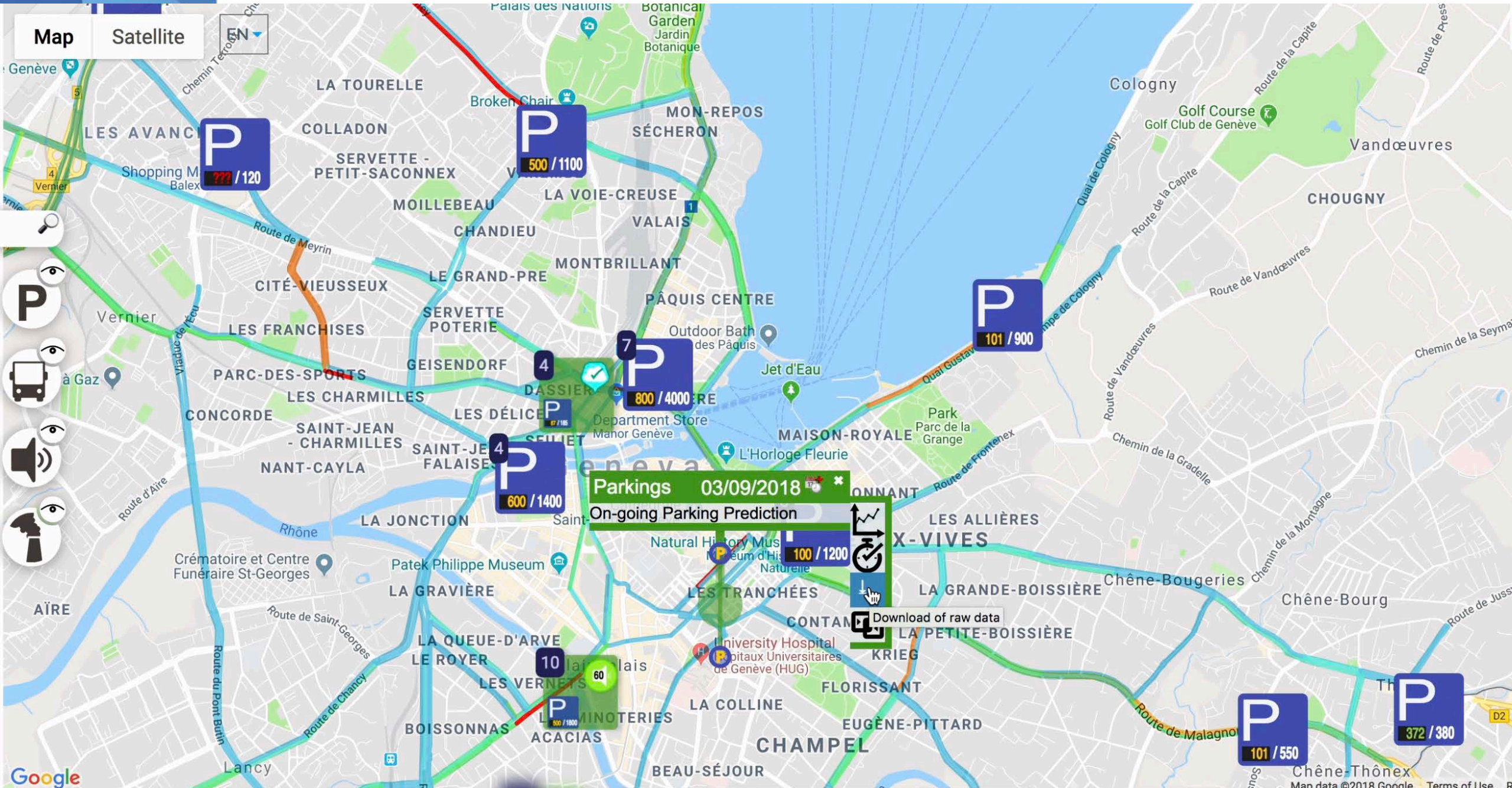
P
101 / 550

P
372 / 380

Parkings 03/09/2018
On-going Parking Prediction

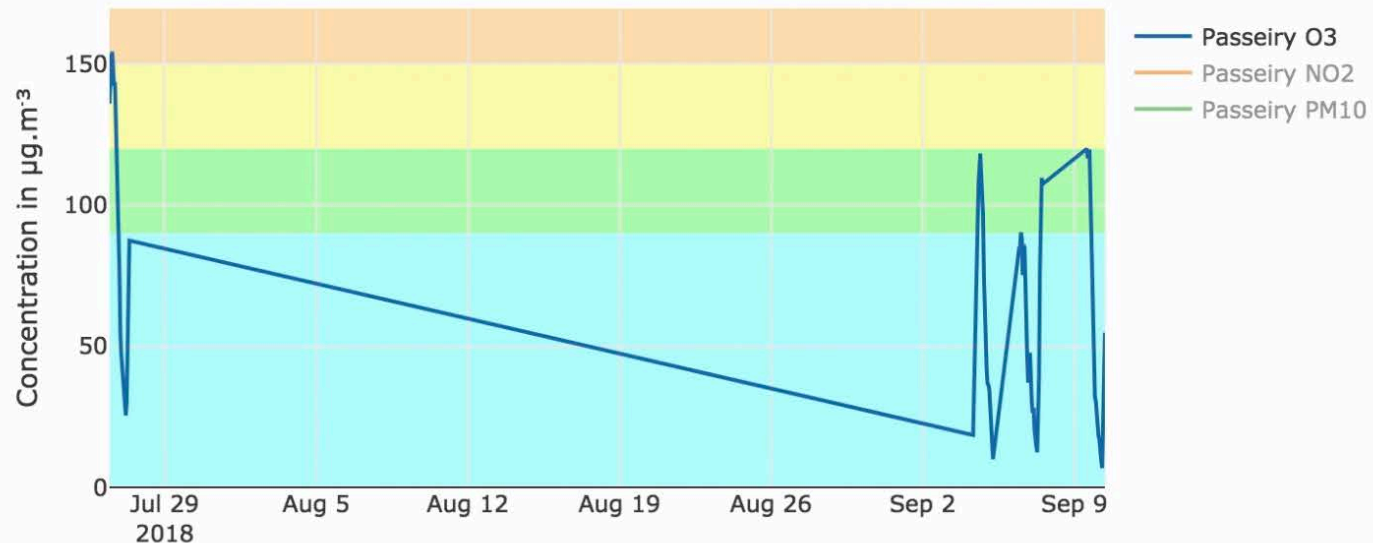


Download of raw data



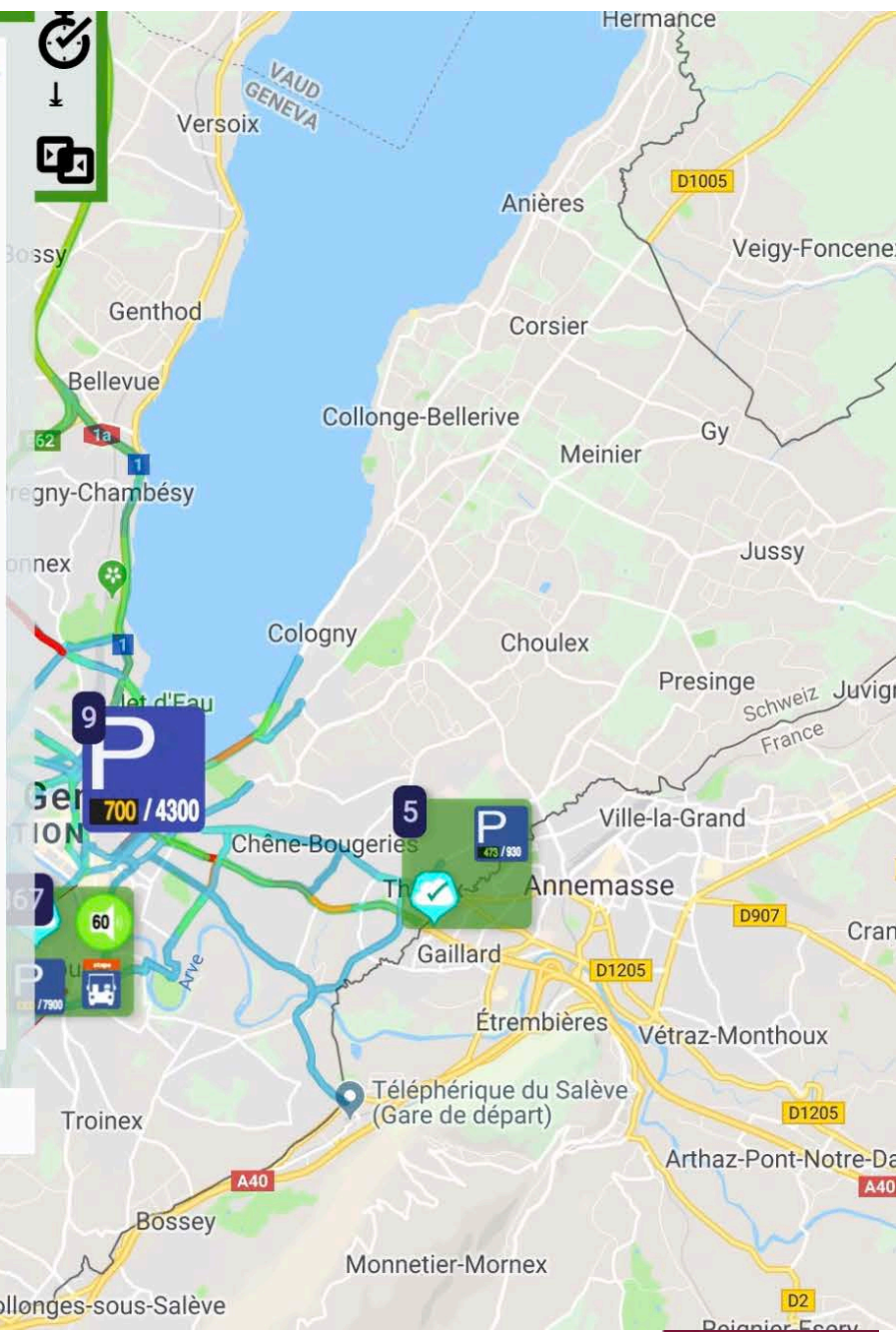
Map Satellite EN

Evolution of the air quality



| ozone | low | average | significant | relevant | high | very high |
|-------|--------|----------|-------------|-----------|-----------|-----------|
| | 0 - 90 | 90 - 120 | 120 - 150 | 150 - 180 | 180 - 240 | 240+ |

Filter on the curves



SCORE Smart Cities and Open data REuse

| | |
|------------------|-------------------|
| Programme | NSRF |
| Duration | 4 years |
| Project partners | 14 |
| Budget | €5.7M |
| EC-contribution | €2.8M |
| Coordinator | City of Amsterdam |



Solutions developed in SCORE will be open source and based on Open Data



Water level sensors can inform early flood warning systems



Real-time information about free parking spaces can reduce CO2 emission by decreasing traffic by up to 30%



Public transit frequency can be adjusted based on live user data



Waste collection can be improved by intelligent routing



Streetlight sensors can be used to measure traffic flows and improve traffic management

Background Aim Approach Results Impact

Cities aim to improve the delivery of public services based on innovative software solutions and data sharing.

However, Data has not and will not automatically lead to better public service delivery.

To capture that potential, value from data needs to be unlocked by making it interoperable between departments and organisations.

The shared challenge is how to generate innovative solutions that address common city needs.

SCORE aims to increase the efficiency and quality of public service delivery of cities in the sectors of Environment, Waste & Water, Parking & Traffic, and Sustainable Mobility by developing innovative open source solutions that use urban data. Contributing to Interreg NSR's objective by stimulating "the public sector to generate innovation demand and innovative solutions for improving public service delivery".

The solutions will be free to use by other cities, adhere to EU standards, and replicable.

9 cities from 7 countries in the NSR will be grouped according to their shared challenges. The cities will formulate 6 public service challenges based on their in-depth understanding of the city's operations (business case), the available data (feasibility) and knowledge of their existing programmes and initiatives (funding).

Each challenge will form a group that will develop 2 open source solutions using urban data. The solutions will be tested in Urban Living Labs. All cities will collaborate throughout the development process to ensure relevance and compatibility. In fact, solutions will be replicated transnationally at least twice within the SCORE project period.

By implementing the innovative open source solutions, SCORE will:

- Reduce by 10% service provision costs of public authorities in the sectors of urban sustainability using open data and open source solutions.
- Improve by 20% the quality of public service provision as valued/assessed by citizens.
- Reduce by 30% the software development time in cities.

SCORE will solve public service delivery challenges common to partner cities through innovation. This community will contribute to the open-source movement and deliver solutions that are free to use by other NSR cities and beyond.

The partnership will create an ecosystem with cities, research institutions and network organizations for smart public service delivery innovation. Organisations learn from each other while building solutions, eg in agile software development, transitioning towards being more data-driven.



Key events 2019/20

- **IoT Week 2019**, Aarhus, Denmark, June 17-21
- **Super Cities @ G20**, Osaka, Japan, June 29
- **SynchroniCity scale-up conference**, Milan, October 2-3
- **Helsinki Impact Conference**, Finland, October 9-10
- **Smart City Expo**, Barcelona, November 19-21
- **Upscaling Digital Solutions in Cities**, Oulu, Finland, December 10-11
- **Connected Smart Cities & Communities**, Brussels, January 23, 2020
- **Cities Forum**, Porto, January 31, 2020

WAY FORWARD

CIVIC

Driven by public needs, backed by industry

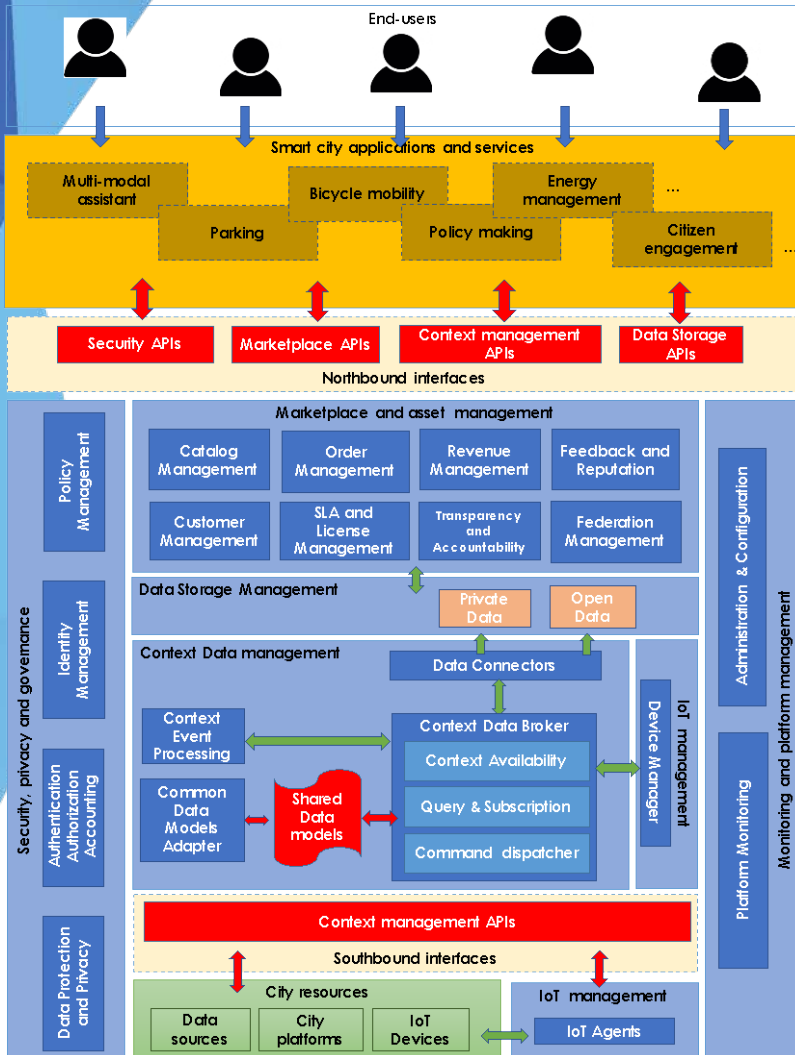
COMMON

Understanding & standards

CONCRETE

Linking instruments (projects, policy, financing, places)

SynchroniCity Architecture Model



- **IoT Management:** to interact with the devices that use different standards or protocols making them compatible and available to the SynchroniCity platform.
- **Context Information Management:** to manage the context information coming from IoT devices and other public and private data sources.
- **Data Storage Management:** to provide functionalities related to the data storage and data quality interacting with heterogeneous sources.
- **Marketplace:** to implement a hub to enable digital data exchange for urban data and IoT capabilities providing features in order to manage asset catalogues, orders, revenue management.
- **Security:** to provide crucial security properties such as confidentiality, authentication, authorization, integrity, non-repudiation, access control, etc.
- **Monitoring and Platform management:** to provide functionalities to manage platform configuration and to monitor activities of the platform services.

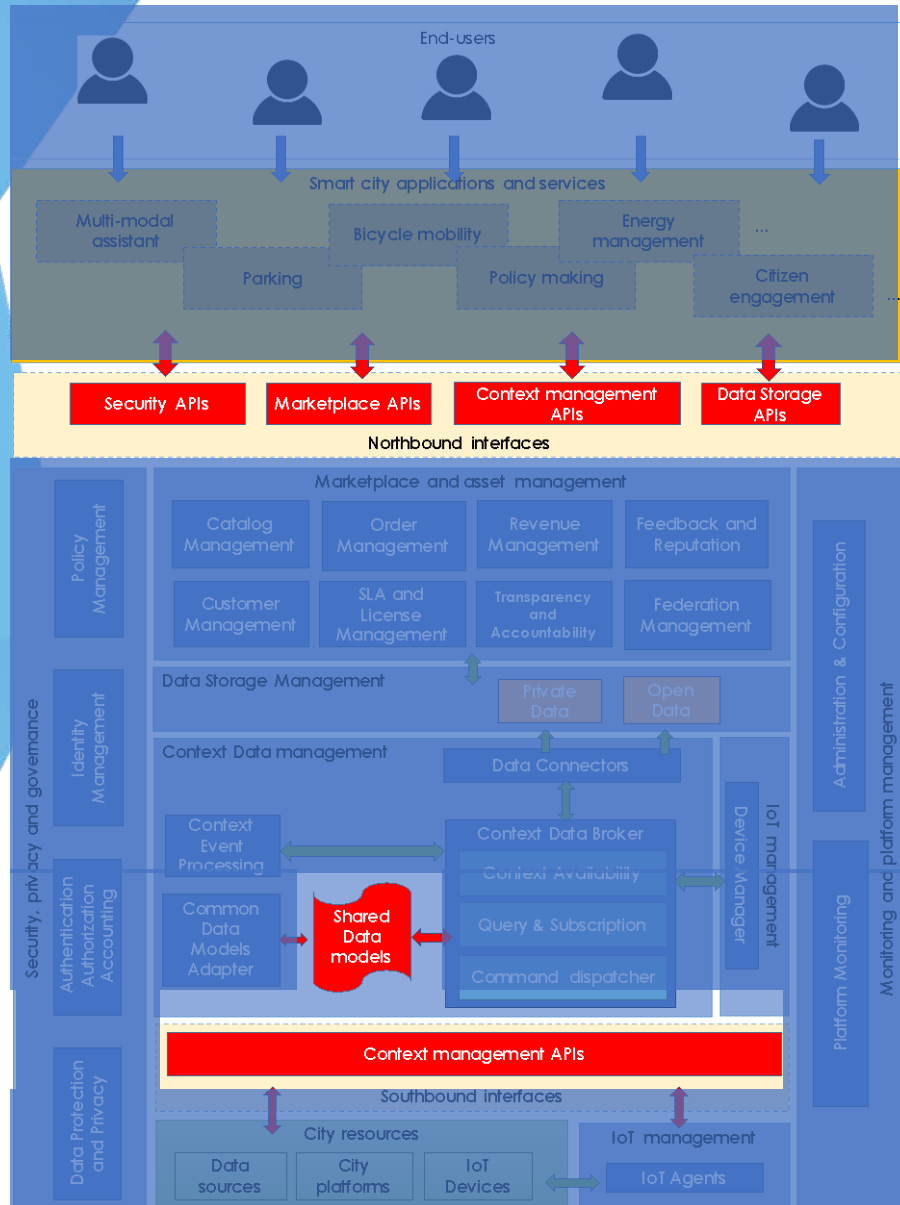
Baseline: SynchroniCity Cities/Reference Zones, OASC, FIWARE, EIP-SCC, NIST IES-CF.

Related standards: ITU-T SG20*/FG-DPM* (*drafts), ISO TC268.

Spec. doc.: Reference Architecture for IoT Enabled Smart Cities (D2.10)

<http://synchronicity-iot/docs>

Interoperability Points



- **Interoperability Points** represent the main interfaces that allow a city (or any Reference Zone, RZ) and applications to interact with SynchroniCity platform
- Interoperability points are independent from the specific software components that realize them and can be implemented by cities in different steps to reach different levels of compliance
- The architecture has been designed following the OASC principles and the definitions of **Minimal Interoperability Mechanisms (MIMs)**. MIMs, are the actual specifications of the interfaces at the Interoperability Points: they are standard API and guidelines that have to be implemented by a city in order to be compliant with the SynchroniCity framework