
COOCK | OPEN STAD
OPEN CITY
VALUABLE ENVIRONMENTAL INSIGHTS
THROUGH AN OPEN CITY APPROACH

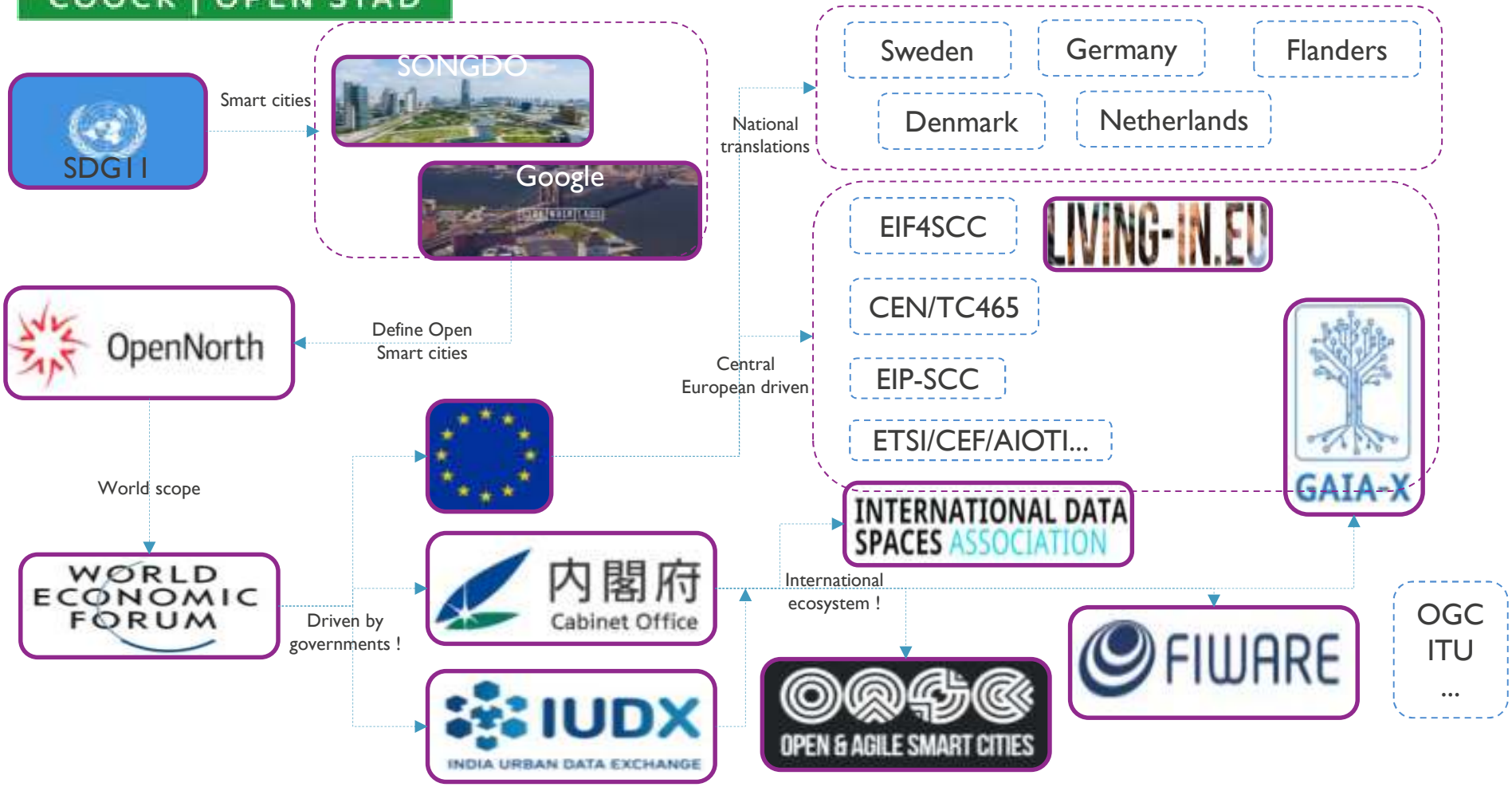
COOCK | OPEN STAD

# INTRODUCTION

- Goal : share learnings/outcome from open smart city research and activities
- 3-part series on Open Smart Cities :
  - Connecting, storing and publishing sensor data
  - Publishing and using sensor data as linked open data
  - THIS workshop
- What will we do ?
  - Imec CityOfThings & VLOCA : Flanders is not alone on open smart city (architecture) exploration : overview internationally (IMEC-EDiT)
  - Imec CityOfThings Antwerp Smart Zone : Some learnings from living lab Air Quality measurements in the Antwerp Smart Zone (IMEC-NL)
  - VLAIO CityOfThings 2019 : Some learnings from DataBroker, MoDI and ANPR) (IMEC-IDLAB

COOCK | OPEN STAD

# MINDMAP – INTERNATIONAL INITIATIVES / ALIGNED ORGS



COOCK | OPEN STAD

SDG11


Mission 2030 :
Make cities inclusive, safe, resilient, sustainable.

***Create***

- career and business opportunities
- Safe and affordable housing
- Building resilient societies and economics

***By investing in***

- Public transport
- Green public spaces
- Improving urban planning and management

***In participatory and inclusive ways***

COOCK | OPEN STAD

# SUSTAINABLE

*"Addressing the needs of the present without compromising the ability of future generations to meet their own needs – long lasting"*


politics

technology

culture

COOCK | OPEN STAD


Smart cities

Can smart cities contribute to / leverage SDG11 ?

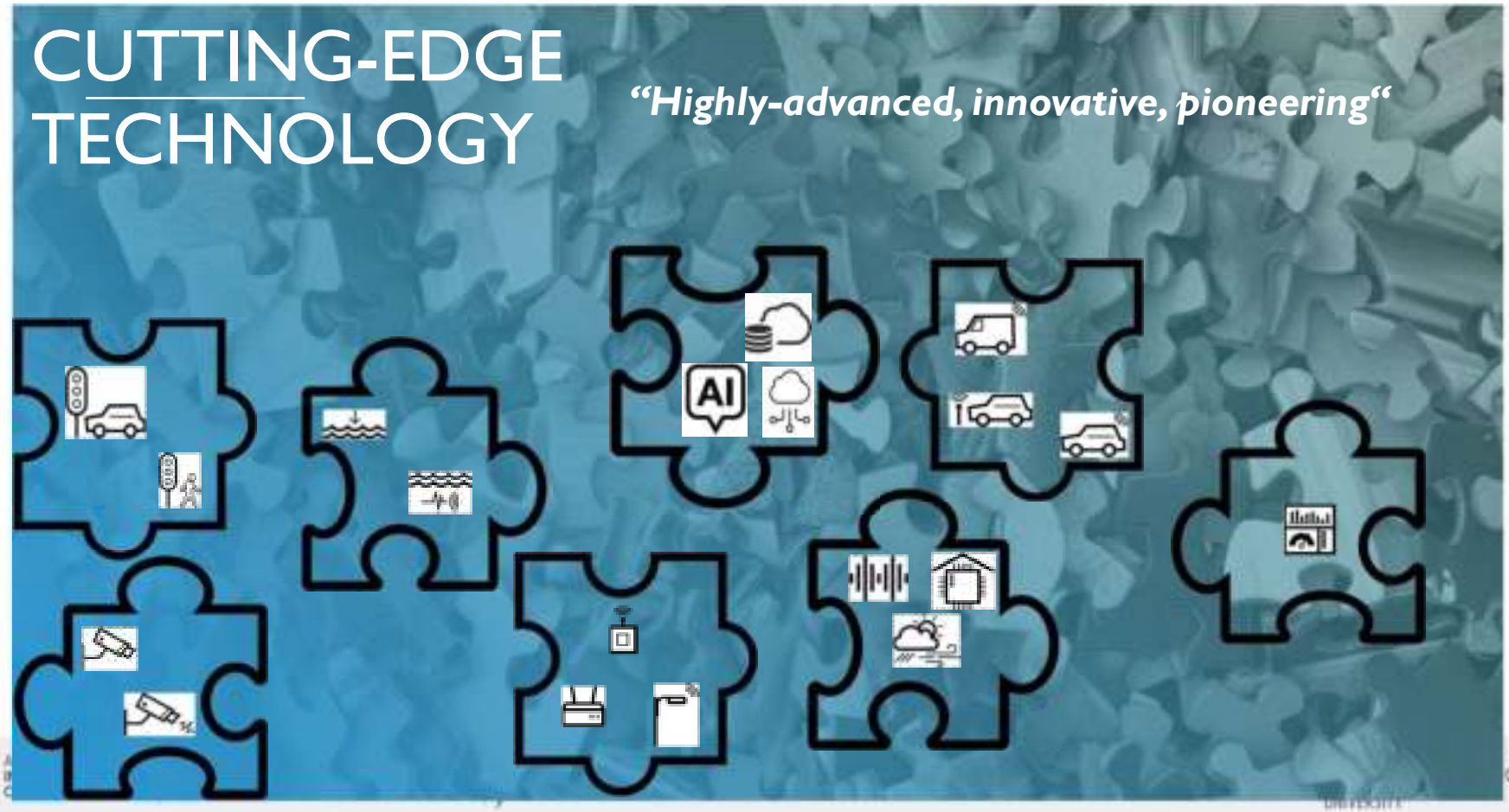
OpenNorth

**Smart cities** in the common sense of the term and as per their current manifestations are "[technologically] instrumented and networked [cities], [with] systems [that are] interlinked and integrated, and [where] vast troves of big urban data are being generated [by sensors] and used to manage and control urban life in real-time". Public administrators and elected officials invest in smart city technologies and data analytical systems to inform how to innovatively, economically, efficiently and objectively run and manage the cities they govern. Predominantly, a smart city is about quantifying and managing infrastructure, mobility, business and online government services and a focus oriented toward technological solutionism.

COOCK | OPEN STAD

# CUTTING-EDGE TECHNOLOGY

*"Highly-advanced, innovative, pioneering"*



COOCK | OPEN STAD


# CONSTRUCTING A SUSTAINABLE SMART CITY FROM SCRATCH USING C-E-T ?

***Date:*** 2003-2020

***Intended population:*** 500.000 (with 300,000 – 400,000 commuters)

***Estimated cost:*** USD $40 billion

***Sattelite :*** 25 miles of Seoul

***Size:*** >100 square kilometers

***How*** : built by architects and technologists, based on "success ingredients"

***Focus on smart public services :*** Traffic safety, crime prevention, environmental protection, disaster handling, ...

***Builds on*** principles of New Urbanism, Smart Growth, Transit Oriented Development, Green Growth

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD


# NO MAGIC ALL-INCLUSIVE FORMULA

EXIS

Takes longer th

Mobility : not yet

“Everything is exp

***Conclu***
sustaina
cutting
heart

This Week in Asia / Economics

**South Korea’s ‘Smart City’ Songdo: not quite smart enough?**

Promoted as the answer to the ills of modern-day living in Seoul, the development is overdue, overpriced and underpopulated. ‘A Chernobyl-like emptiness’, as one critic puts it

than expected

cultural fabric

cycle racks are empty”

age per month

verywhere

hich shows
ing selected
city with a
needed...

COOCK | OPEN STAD


# Alphabet's Sidewalk Labs shuts down Toronto smart city project

*The high-tech 'city-within-a-city' drew criticism from local residents*

Sidewalk Labs, Alphabet's smart city subsidiary, is walking away from its ambitious plan to transform a slice of Toronto's waterfront into a high-tech utopia.

The plan, which was projected to cost over a billion dollars and has been under development for over two years, had run into community opposition from local residents who objected to the company's high-tech, sensor-laden vision for the city's waterfront.

vergo

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

OpenNorth

Define Open Smart cities

An **Open Smart City** is where residents, civil society, academics, and the private sector collaborate with public officials to mobilize data and technologies when warranted in an ethical, accountable and transparent way to govern the city as a fair, viable and liveable commons and balance economic development, social progress and environmental responsibility.

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

OpenNorth

Define Open Smart cities

1. Governance in an Open Smart City is ethical, accountable, and transparent. These principles apply to the governance of social and technical platforms which include data, algorithms, skills, infrastructure, and knowledge.

2. An Open Smart City is participatory, collaborative, and responsive. It is a city where government, civil society, the private sector, the media, academia and residents meaningfully participate in the governance of the city and have shared rights and responsibilities. This entails a culture of trust and critical thinking and fair, just, inclusive, and informed approaches.

3. An Open Smart City uses data and technologies that are fit for purpose, can be repaired and queried, their source code are open, adhere to open standards, are interoperable, durable, secure, and where possible locally procured and scalable. Data and technology are used and acquired in such a way as to reduce harm and bias, increase sustainability and enhance flexibility. An Open Smart City may defer when warranted to automated decision-making and therefore designs these systems to be legible, responsive, adaptive and accountable.

4. In an Open Smart City, data management is the norm and custody and control over data generated by smart technologies is held and exercised in the public interest. Data governance includes sovereignty, residency, open by default, security, individual and social privacy, and grants people authority over their personal data.

5. In an Open Smart City, it is recognized that data and technology are not always the solution to many of the systemic issues cities face, nor are there always quick fixes. These problems require innovative, sometimes long term, social, organizational, economic, and political processes and solutions.

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

WORLD ECONOMIC FORUM

- INFRATECH = technology-enabled infrastructure for Smarter Cities
  - For smart, greener cities / connected transport systems / carbon-neutral construction / faster responses to pandemics / ...
- BUT it is complex and needs that :
  - Governments need to take the lead for Infratech to flourish
    - Should invest and encourage technology integration through cross-sectoral solutions
  - Adapt to evolving technologies and risks
    - Flexible guidelines, Data protection, environmental standards, ...
  - Put data at the centre of policy
    - Foster data sharing and interoperability
  - Use a broad range of policy levers
    - PPP, new public organizations, training programs, ...
  - Attract private capital

COOCK | OPEN STAD

EIP-SCC, ESPRESSO, SYNCHRONICITY, ...

European Innovation Partnership on Smart Cities and Communities

H2020 ESPRESSO
- Smart city strategy
- City maturity models
- Growth map tool
- Stakeholder mapping
- Standardization
- Recommendations

EIP-SCC DIN SPEC 91357
Reference Architecture Model
Open Urban Platform

H2020 Synchronicity
- Reference architecture for IoT-Enables Smart Cities
- Large-scale market validation of the OASC MIM approach, 49 pilot deployments in 18 cities in Europe
- Catalogue of scalable IoT and AI-enabled services

COOCK | OPEN STAD

ETSI / CEF / AIOTI / ...

AIOTI

Focusing on IoT (sensors)

- Data sharing and integration must be supported by standards (e.g. SAREF, NGSI-LD,...)
- Resilient cities must bridge the gap between IoT and public safety
- AI must be ethical and take into account social impact
- Urban planning will determine how cities will evolve, e.g. using data-driven Digital Twins

CEF


ETSI-CIM

e.g. NGSI-LD specification for CEF context broker

COOCK | OPEN STAD

LIVING-IN.EU

- Launched by the European Commission as a movement to
  - Share experiences among cities
  - Work with standard-based, interoperable and reusable solutions, focusing on aggregated material from Fiware, EIP-SCC, ESPRESSO, Synchronicity, OASC, CEF, ...

- The main principles of the declaration are :
  - Citizen-centrix approach
  - City-led approach at EU level
  - City as citizen-driven and open innocation ecosystem
  - Ethical and socially responsible access, use, sharing and management of data
  - Technologies as key enablers
  - Interoperable digital platforms based on open standards and technical specifications, APIs and shared data models

- Work Programme 2021-2022

COOCK | OPEN STAD

# EIF4SCC

The European Commission – through the Smart Cities and Communities European Interoperability Framework (EIF4SCC) – aims to support local administrations and other actors with challenges that relate to providing interoperability services to citizens and businesses. The Framework intends to support primarily local administrations and, in particular, local policy makers. This work in progress is jointly managed by DG DIGIT as part of the ISA² Programme (2016-2020), and by DG CONNECT in the framework of the Living-in.eu movement.



AGENTSCHAP INNOVEREN & ONDERNEMEN · Vlaanderen · imec · vito · Sustainable Energy, Air & Water Technology, University of Antwerp · SMIT · IDLab · GHENT UNIVERSITY · dsp valley

COOCK | OPEN STAD

CEN/TC 465


.AGORIA

De 4 belangrijkste uitdagingen van deze commissie zijn:
- Aandacht voor de behoeften van steden, burgers en lokale overheden
- Afstemming op het relevante beleidskader
- Afstemming op de lopende normalisatieactiviteiten
- Integratie van aspecten met betrekking tot duurzaamheid en veerkracht

Agentschap Innoveren & Ondernemen · Vlaanderen · imec · vito · Sustainable Energy, Air & Water Technology, University of Antwerp · SMIT · IDLab · Ghent University · dsp valley

COOCK | OPEN STAD

There are three reasons why we need GAIA-X:

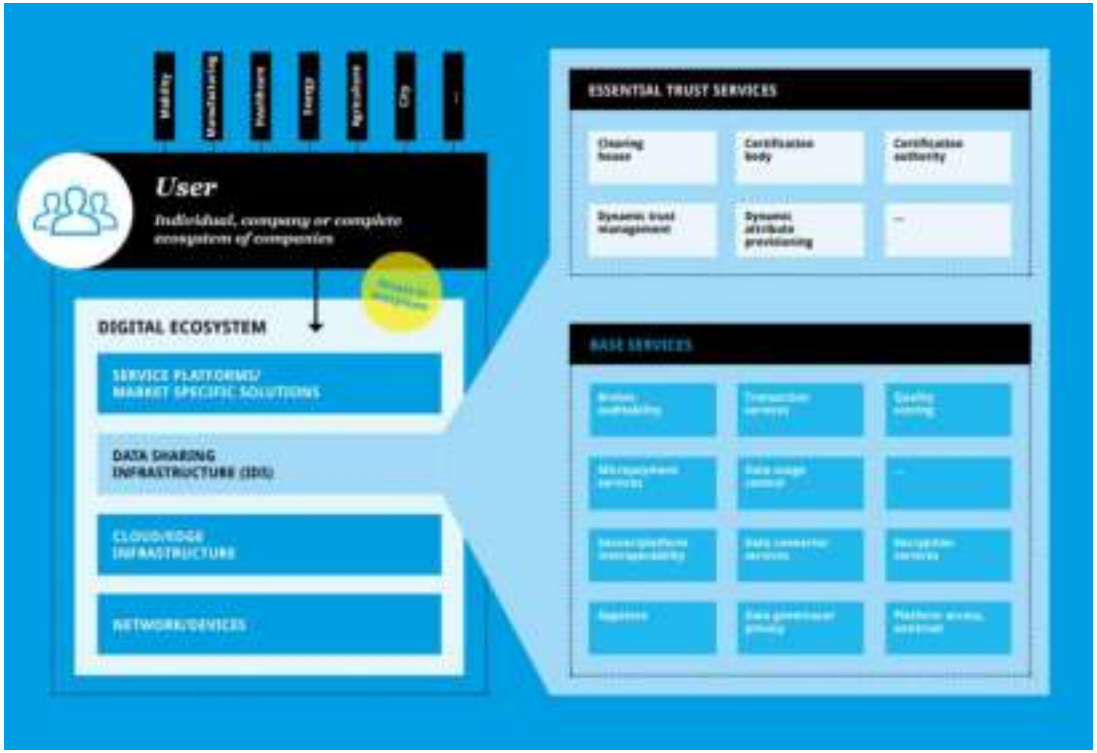
1. Data sovereignty: Existing cloud offerings are currently dominated by non-European providers, that are able to rapidly scale their infrastructure, and that hold significant market power and large amounts of capital. At the same time, we are seeing growing international tensions and trade conflicts across the globe. Europe needs to ensure that it can establish and maintain digital sovereignty permanently.
2. Data availability: We need a trustworthy, secure and transparent data infrastructure that can be used to exchange and process data. This is the only way we can use the economies of scale created by the availability of large data sets in Europe.
3. Innovation: We need a digital ecosystem that allows for the development of innovative products and helps European companies and business models scale up and be globally competitive. GAIA-X provides the basis for this.

**— 18. What does the architecture look like?**

GAIA-X is a federated data infrastructure. Each node of the infrastructure forms an independent unit and can be clearly identified and classified by the decentrally administered self-description. A software repository provides components that must or can be used by all providers, depending on their categorisation. The components can be provided interoperably across multiple nodes. The necessary interfaces, services and products should be harmonized by standards and be easily identified and used in a central repository for all participants.

COOCK | OPEN STAD

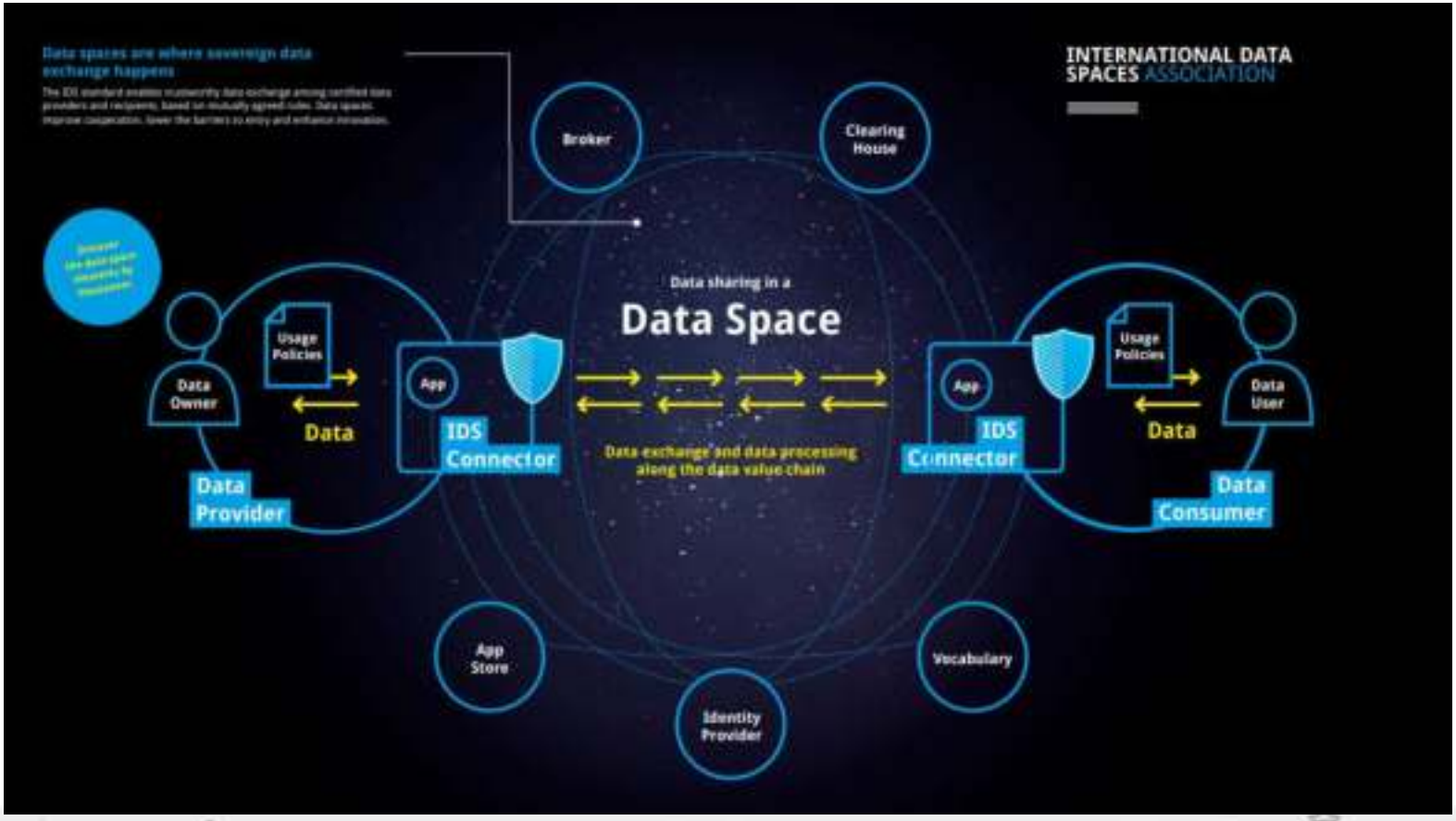
INTERNATIONAL DATA SPACES ASSOCIATION




AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

INTERNATIONAL DATA SPACES ASSOCIATION




AGENTSCHAP INNOVEREN & ONDERNEMEN · Vlaanderen · imec · vito · Sustainable Energy, Air & Water Technology University of Antwerp · SMIT · IDLab · GHENT UNIVERSITY · dsp valley

COOCK | OPEN STAD

Netherlands

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen

imec

vito

Sustainable Energy, Air & Water Technology University of Antwerp

SMIT

IDLab

GHENT UNIVERSITY

dsp valley

COOCK | OPEN STAD

Denmark

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen

imec

vito

Sustainable Energy, Air & Water Technology University of Antwerp

SMIT

IDLab

GHENT UNIVERSITY

dsp valley

COOCK | OPEN STAD

VLOCA

Flanders

Aanmelden

VLOCA

Pagina Overleg Lezen Brontekst bekijken Geschiedenis weergeven

# Welkom bij de Vlaamse Open City Architectuur (VLOCA) Kennishub

English speaking ?

## Wat wil VLOCA bereiken ?

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

OPEN & AGILE SMART CITIES

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

FIWARE

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen

imec

vito

Sustainable Energy, Air & Water Technology University of Antwerp

SMIT

IDLab

GHENT UNIVERSITY

dsp valley

COOCK | OPEN STAD

OGC, ITU, IETF, ONEM2M, ...

COOCK | OPEN STAD

COOCK | OPEN STAD

IUDX
INDIA URBAN DATA EXCHANGE

**Mission** ?
National Urban Digital Mission

Create a shared digital infrastructure for urban India, working across the three pillars of people, process and platform to provide holistic support to cities and towns, with citizen-centric and ecosystem-driven approach to urban governance and service delivery.

**IUDX Why** ?

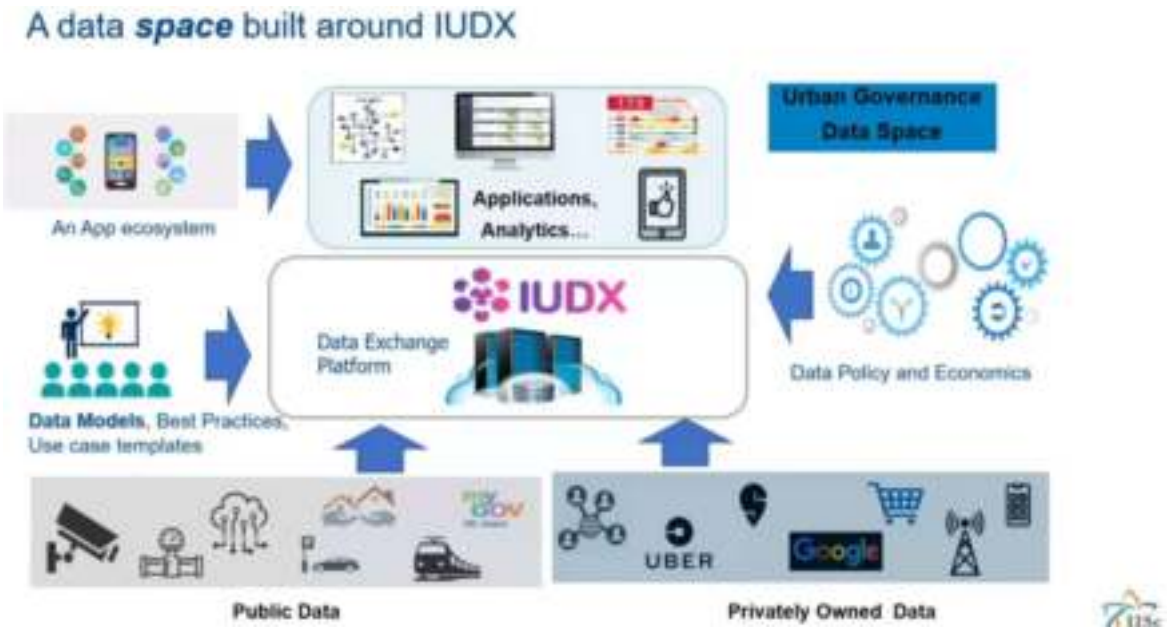
- High-Quality data is not available
- Finding Pertinent Data (catalogue...)
- Understanding the Data (semantics)
- Privacy and security policies for data sharing
  - Cybersecurity
  - Data privacy
  - Data consent
  - Data leakage

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

IUDX
INDIA URBAN DATA EXCHANGE

**What ?**




AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

IUDX
INDIA URBAN DATA EXCHANGE

**What ?**

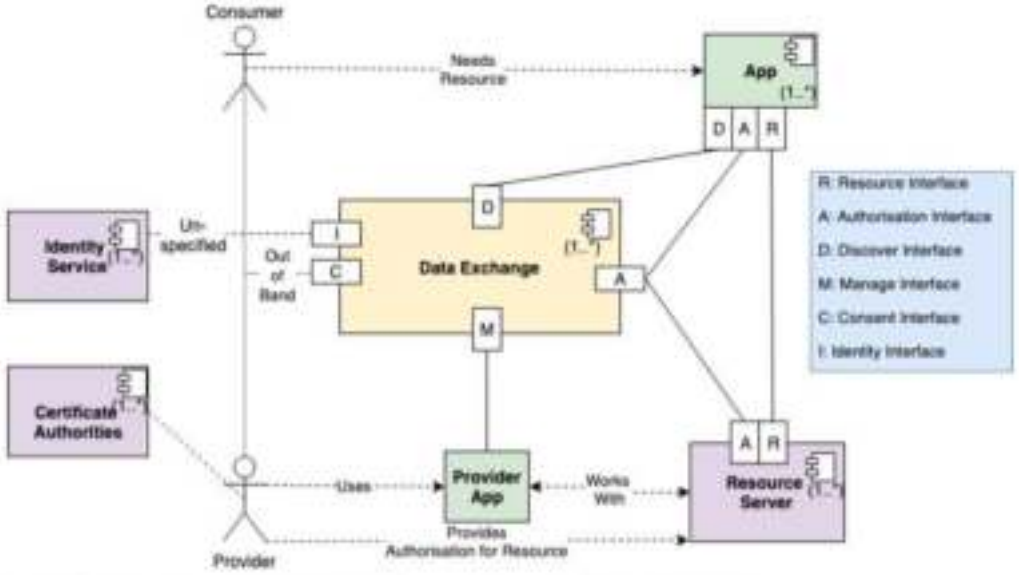



**Figure 4-1:** High Level Architecture of the Data Exchange Framework

COOCK | OPEN STAD

IUDX
INDIA URBAN DATA EXCHANGE

**Roadmap** ?


AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

IUDX
INDIA URBAN DATA EXCHANGE

**Current ?**

## Current Deployment

- IUDX deployed in cities of Pune, Varanasi and Surat
- Surat
  - Bus Transit Data, AFCS data, SWM data etc.
  - Mobility Use Case
- Pune
  - AQM sensor data, Flood sensor data, Weather data
  - Flood prediction use case
- Varanasi
  - Solid Waste Management data, AQM sensor data, Crowd-source issue reporting data
  - SWM use case
- Deployment in additional 6 cities by March 2021

COOCK | OPEN STAD

IUDX
INDIA URBAN DATA EXCHANGE

**Principles ?**

## Design Principles

- **Open APIs** and **data models**
- **Consent Driven**
  - Allows sharing of data only if an explicit consent is provided by the data provider
- **Secure by design**
  - Security considerations are part of the design right from the start and all the best practices are followed
- **Minimalistic**
- **Open source**
  - Uses leading tools, technologies from the open-source industry
- **Cloud deployable**
  - Designed for cloud deployment and utilize the state-of-the-art cloud infrastructure
- **Scalable and Elastic by design**
  - Upfront considerations for scalable and elastic designs for all the software components
- **Service oriented**
  - Incorporate service-oriented designs which can be scaled up/down without affecting the other components

COOCK | OPEN STAD

内閣府 Cabinet Office

**WHO ?** Japan : Cross-Ministerial Strategic Innovation Promotion Program (updates 2020)

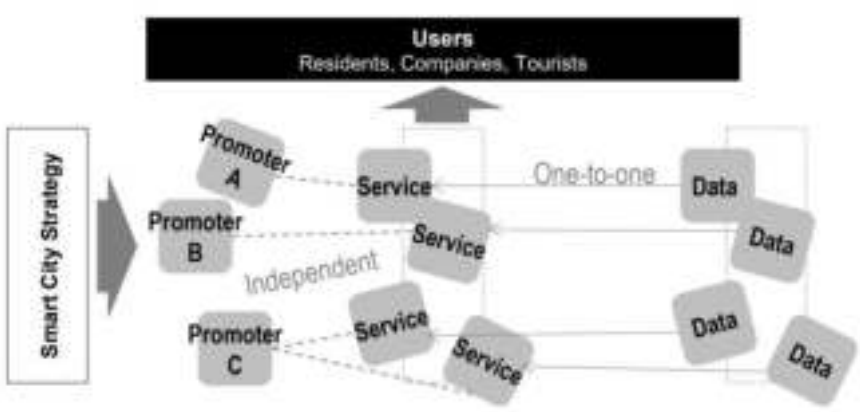
**Domain** ?

- Big-data and AI enabled Cyberspace techno
- Smart City Architecture Development
- Smart City Architecture Design and Promotion

**GOAL** ?

- Become the leading nation of Smart City through efficient development in many regions.
- Society 5.0 : human-centered that balances economic advancement with the resolution of social problems by a system that highly integrates cyber and physical spaces.

**WHY** ?



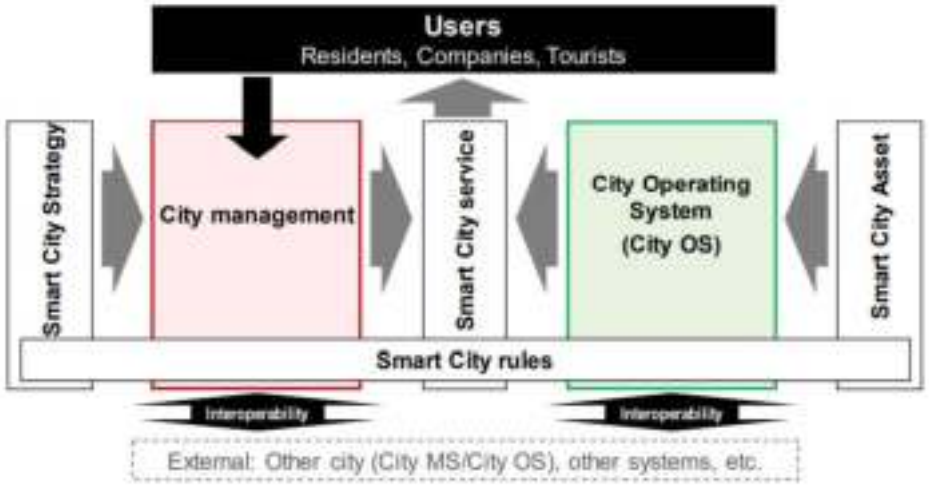

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

内閣府 Cabinet Office

**SCOPE** ? Society 5.0 reference architecture


**ARCHITECTURE** ?

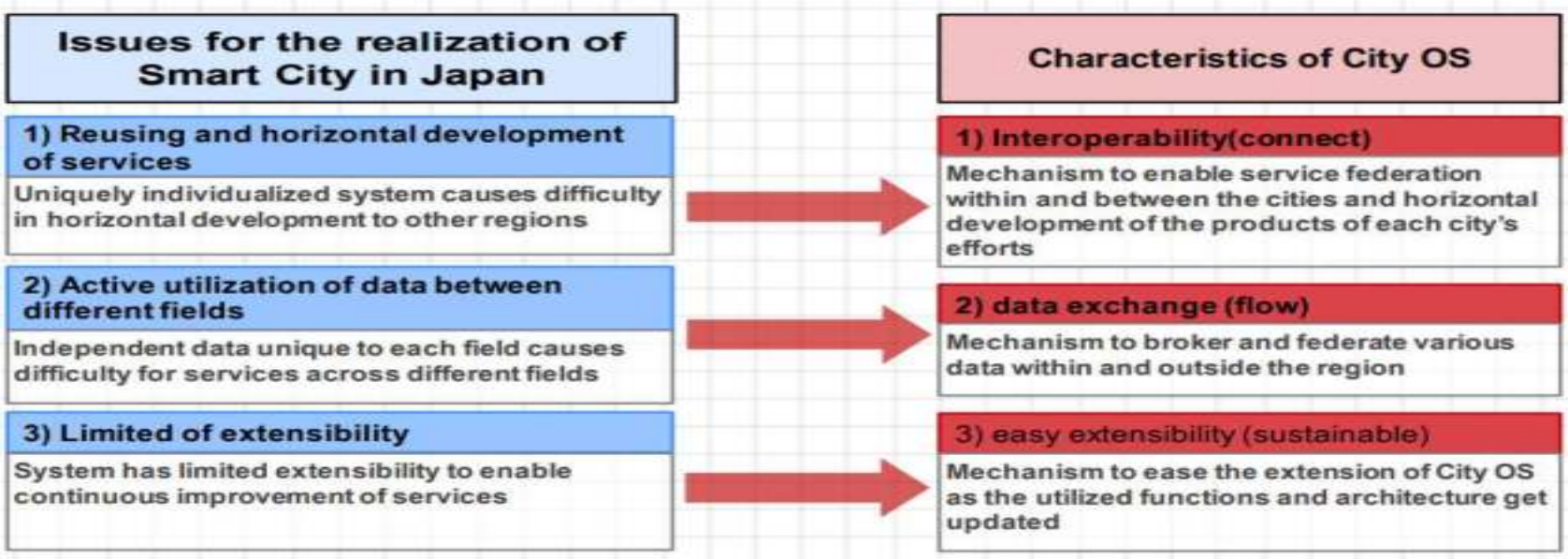



AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

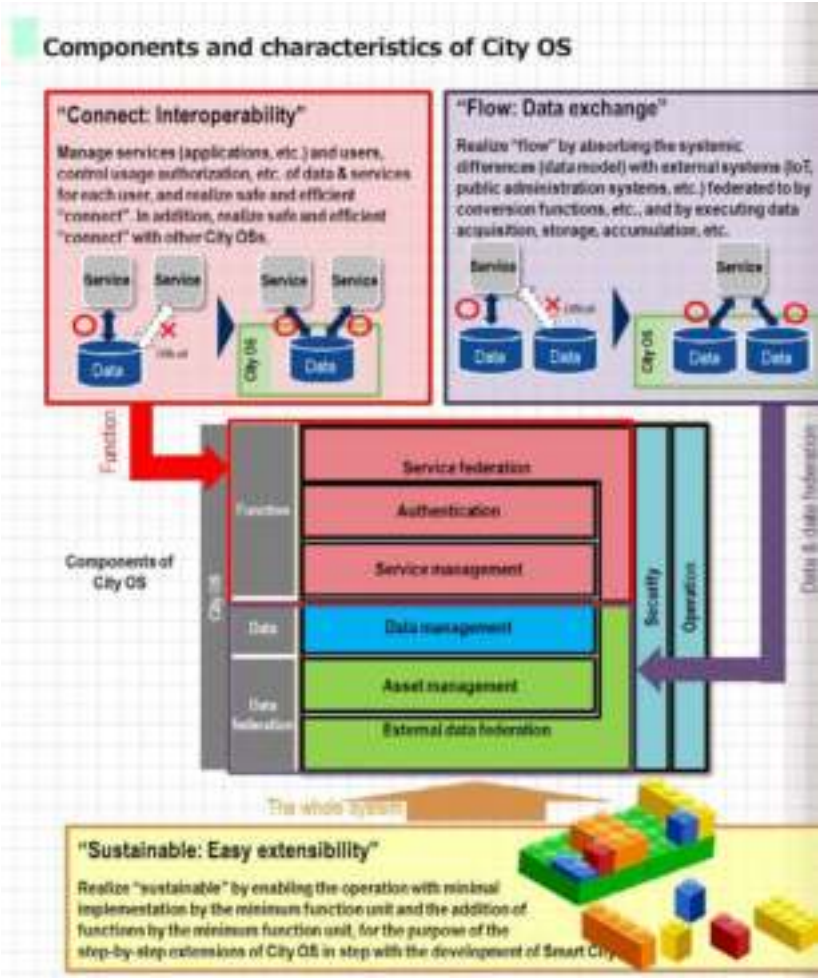
内閣府 Cabinet Office

**Fundamentals problems to solve ?**




AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD



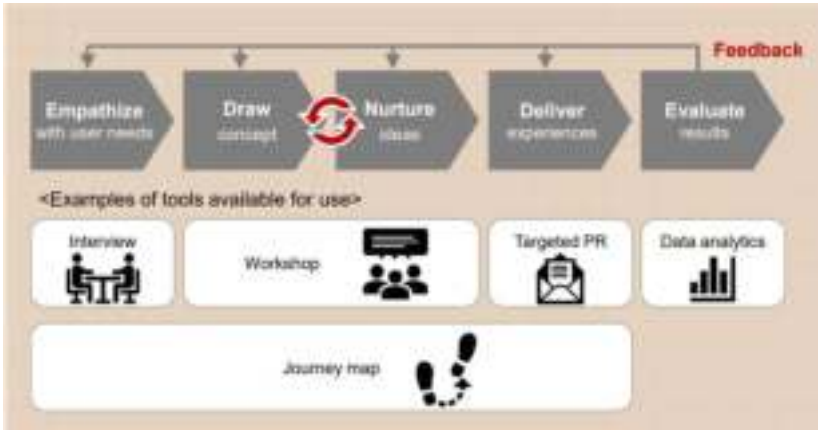

内閣府
Cabinet Office

AGENTSCHAP INNOVEREN & ONDERNEMEN
Vlaanderen
imec
vito
Sustainable Energy, Air & Water Technology University of Antwerp
SMIT
IDLab
GHENT UNIVERSITY
dsp valley

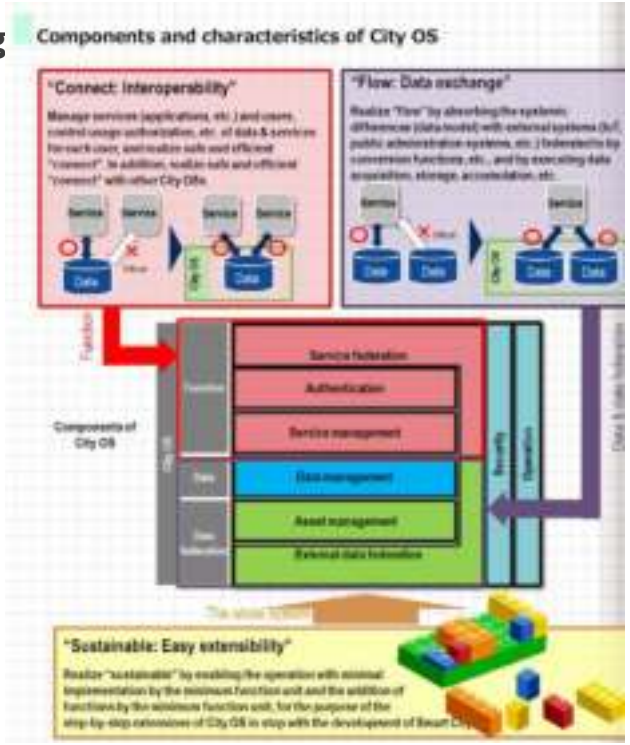
COOCK | OPEN STAD

内閣府
Cabinet Office

## User Experience ?




## City manag




AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

内閣府 Cabinet Office

## Use cases ?

- CASE 1 Citizen safety-care (improving crime prevention in the region) (p43)
- CASE 2 Wide-area disaster prevention – developing robust region (p48)
- CASE 3 Developing healthy region (p53)
- CASE 4 Region with the leading-edge services promoted by City OS & users' viewpoint (p58)
- CASE 5 Regional development utilizing sensor network (p63)
- CASE 6 International business center by way of digital & content (p69)

## Interop ecosystem ?

| Inter Operability | Component element | Options (example) |
|---|---|---|
| Semantic | Vocabulary scheme (type, code, etc.) | •Common vocabulary base<br>•Data/Catalog vocabulary (DCAT)<br>•Schema.org, RDFS etc. |
| | Data item | •Government CIO portal<br>•FIWARE/SynchronCity<br>•Open311, GSMA, DATEX II etc. |
| | Data structure | •Schema.org<br>•NGSI/NGSI-LD<br>•RDF+OWL etc. |
| | API specification | •OAuth2.0/OpenID Connect<br>•NGSI/NGSI-LD<br>•SPARQL, OData, SQL etc. |
| | API model | •REST/RESTful<br>•GraphQL etc. |
| | Data format | •JSON/JSON-LD, XML, CSV<br>•Database(RDB,NoSQL) etc. |
| Technical | Communication protocol | •HTTP/HTTPS<br>•MQTT, CoAP etc. |
| | Transport | •TCP, UDP |
| | Internet | •IP |
| | Network interface | •WWAN, LPWAN, WLAN |

**Data model**

Data specifications standardized for data transmission across domains and regions

**API provided on City OS**

Federation specifications utilized in common for cross domain OS link, service federation, asset federation & other systems federation

Figure 7.3-6 Consideration policies for API on City OS and data model

AGENTSCHAP INNOVEREN & ONDERNEMEN Vlaanderen imec vito Sustainable Energy, Air & Water Technology University of Antwerp SMIT IDLab GHENT UNIVERSITY dsp valley

COOCK | OPEN STAD

# SUMMARY – LESSONS LEARNED

COOCK | OPEN STAD

# SUMMARY – NETWORKED INITIATIVES