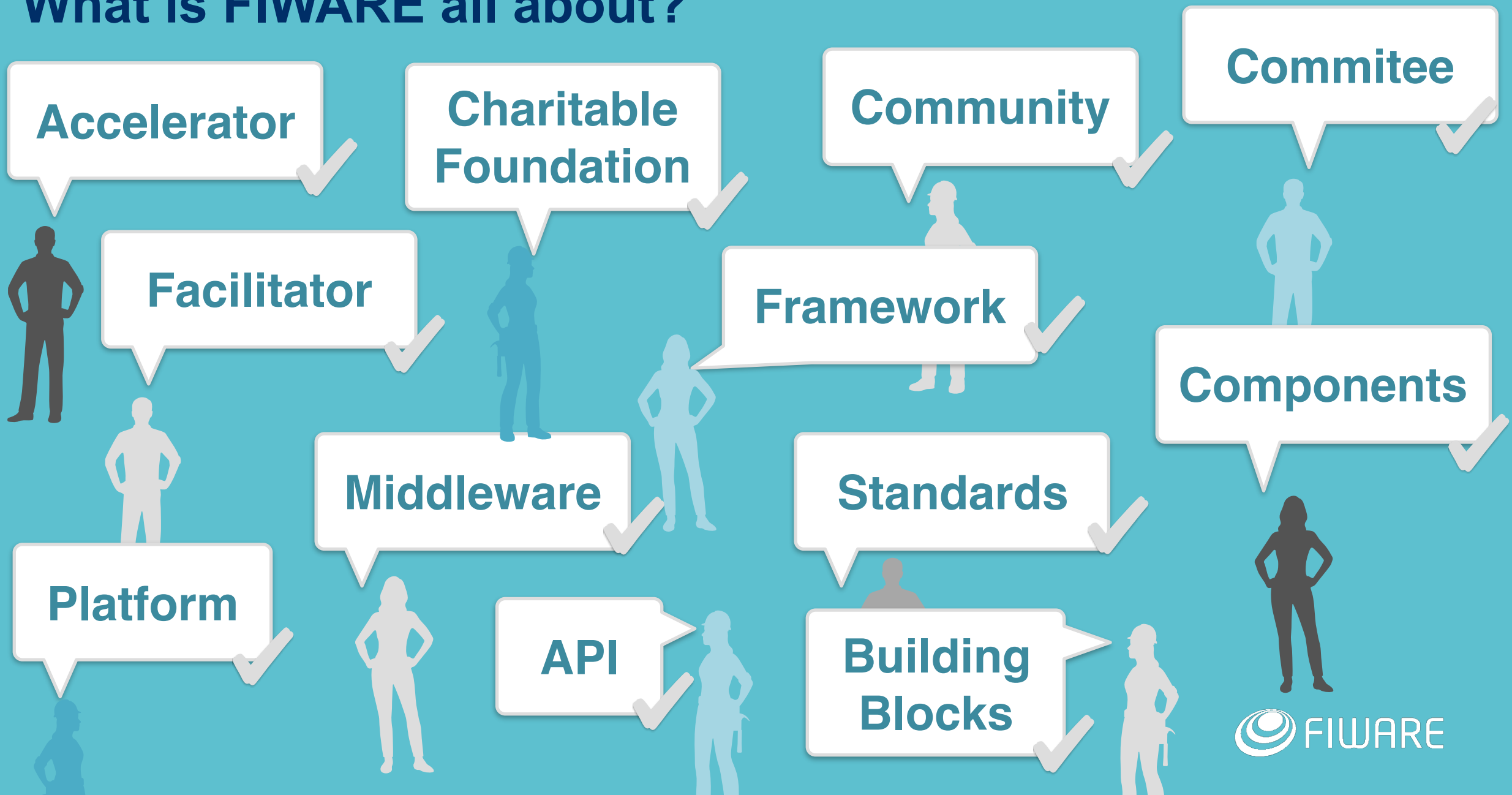
Open APIs for Open Minds

FIWARE

Standards and Community across the Globe.

FIWARE

What is FIWARE all about?



Open APIs for Open Minds

FIWARE community, standards and components for platforms of choice for Smart Cities

World Bank, Tuesday, February 19th | 12:30 – 1:30 PM EDT | MC 7-860

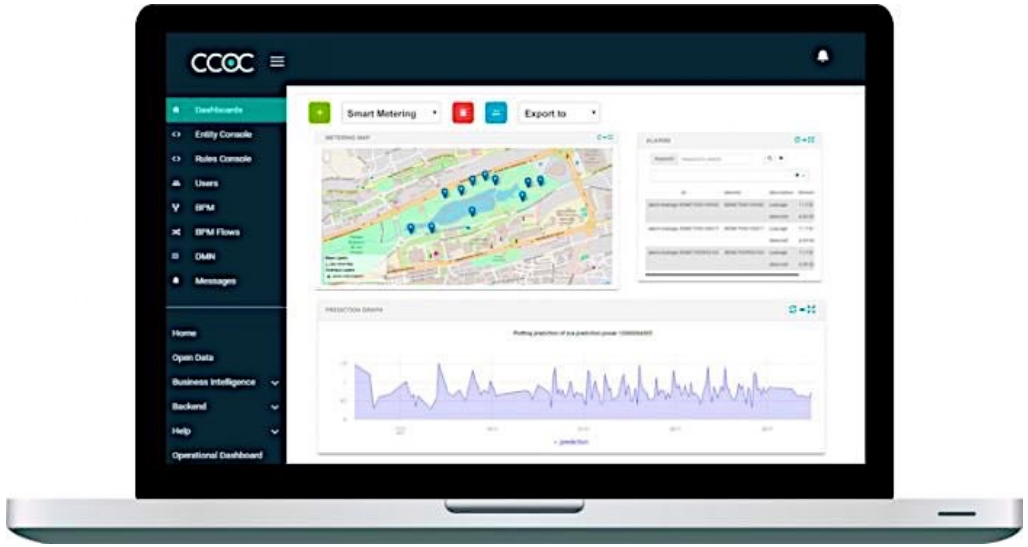
FIWARE

Open APIs for Open Minds

1. References and implementation - a tour across the globe (5-17)
2. The role of standards (18-33)
3. The right non-functional quality attributes (34-36)
4. The right governance model (37-38)
5. Towards open platforms (39-46)
6. Sustainable development goals (47-49)

FIWARE

Lisbon (Portugal), Wellington (New Zealand)



Easy integration with other applications:

Based on open standards, the CCOC uses API interfaces that allow easy integration with other existing applications or even with those that are currently under development.

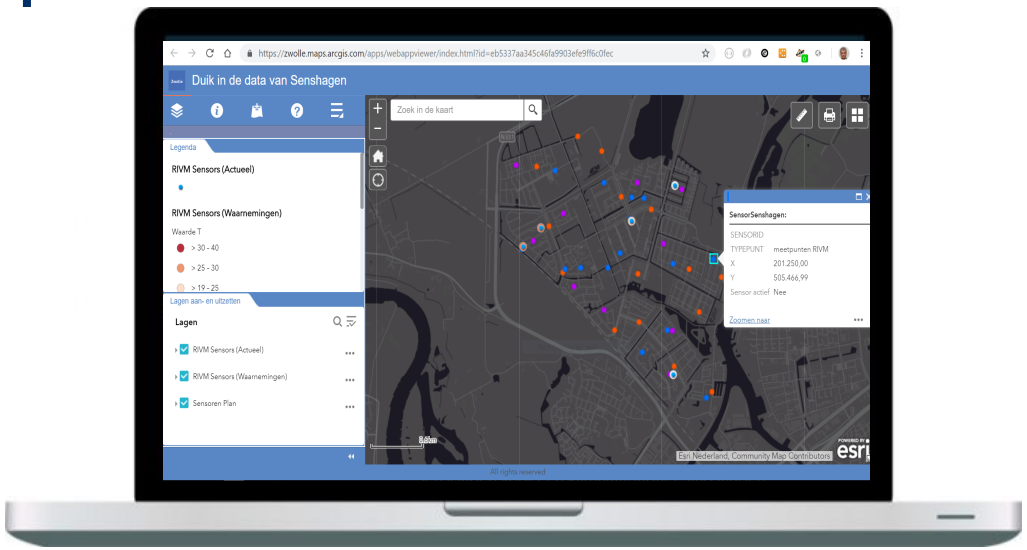
CCOC is certified by FIWARE, the European initiative enabling the right framework for the creation of innovative developments that facilitate the use of platforms and applications at a lower cost and at a City scale.

http://www.necsmartit.com/solution/

NEC

FIWARE

Eindhoven (Netherlands)

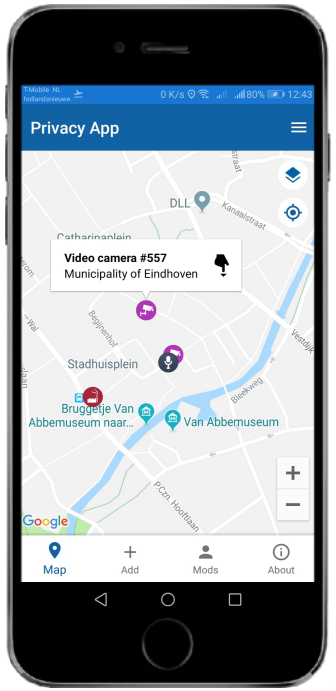


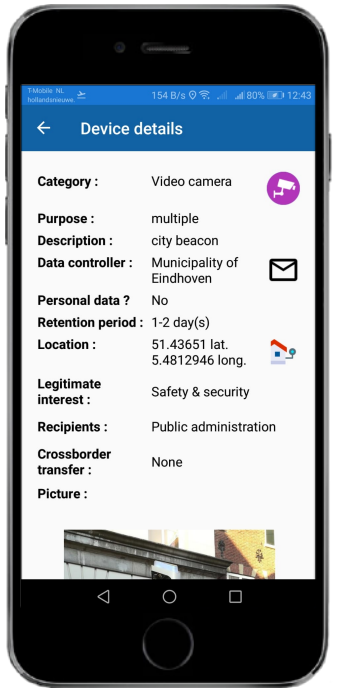
City Pulse

Starter Kit

Rick Schager, City of Eindhoven
r.schager@eindhoven.nl

Eindhoven (Netherlands): Privacy App





Crowd-sourced repository of all sensors

supporting the data-economy while gaining transparency

Rick Schager, City of Eindhoven
r.schager@eindhoven.nl

Utrecht (Netherlands)

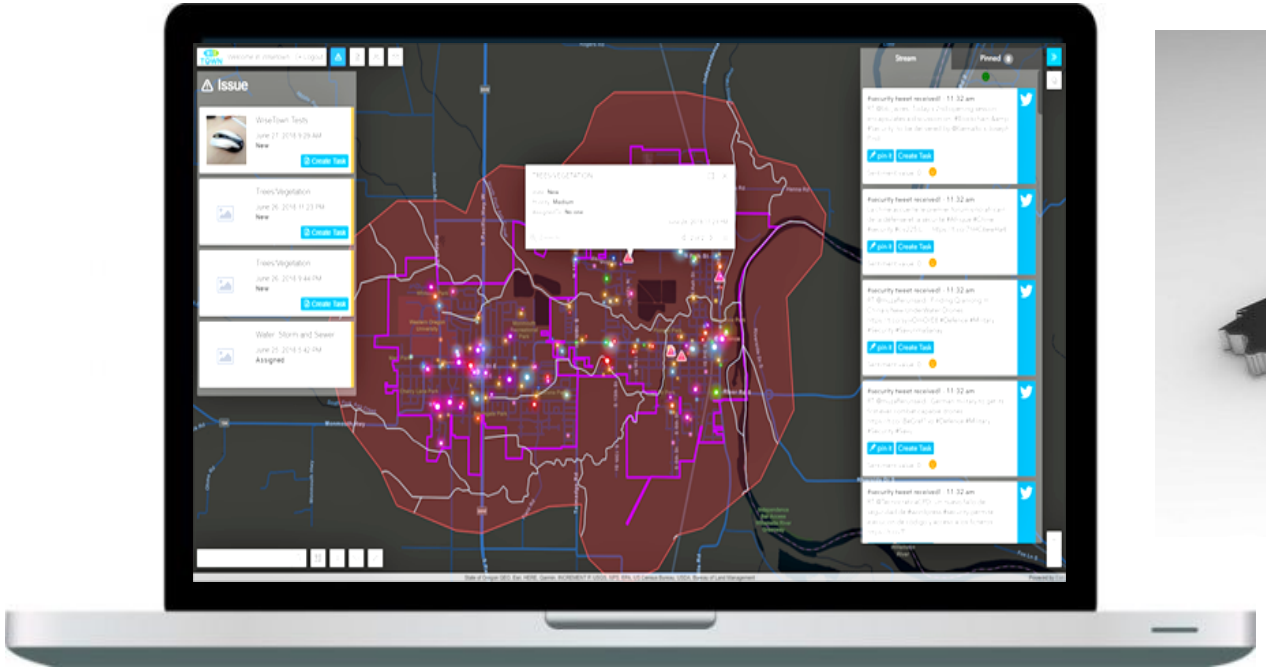
FUTURE CITY
Official FIWARE iHub
foundation

FIWARE Lab NL is initiated by a consortium consisting of Deloitte, Civity, Elba-Rec, Onetrail and Xcellent. The Province of Utrecht supports this investment in the innovation infrastructure. FIWARE Lab NL is located in Utrecht and Amersfoort.
Contact: Tom Willebrands

FIWARE

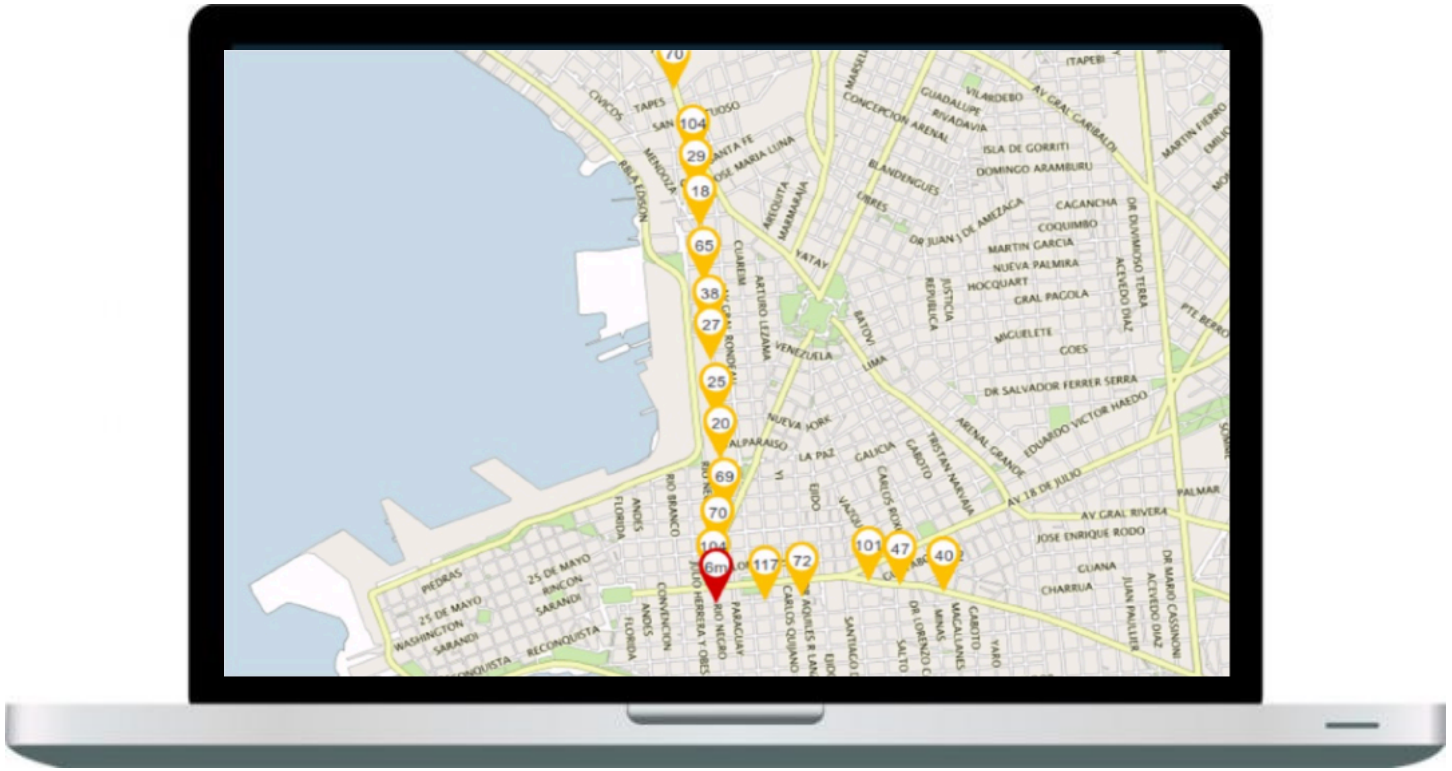
Perugia (Italy): Situation Room

City of Independence (USA)



Andrea Cruciani, CEO of TeamDev, andrea@teamdev.it
https://www.fiware.org/success-stories/wise-town/

Montevideo (Uruguay): Estimated Arrival time



Intendencia de Montevideo

antel

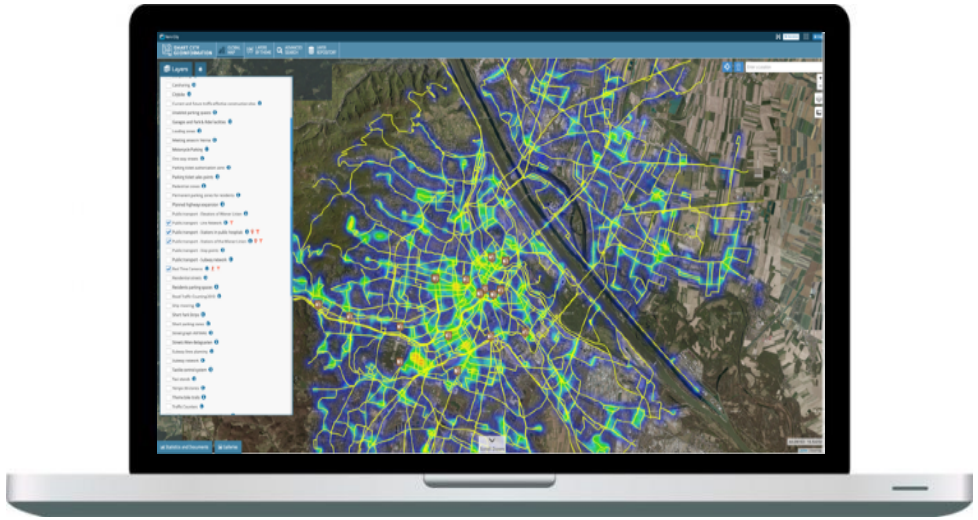
http://www.antel.com.uy/en/principal?p_p_id=101&p_p_lifecycle=0&p_p_state=maximized&p_p_mode=view&_101_struts_action=%2Fasset_publisher%2Fview_content&_101_assetEntryId=1389234&_101_type=content&_101_urlTitle=antel-recibio-la-certificacion-de-su-plataforma-de-internet-de-las-cosas-fiware&inheritRedirect=false

FIWARE

Nuova Fribourgo (Brazil)

http://novafriburgo.cityasplatform.info/

Vienna (Austria)

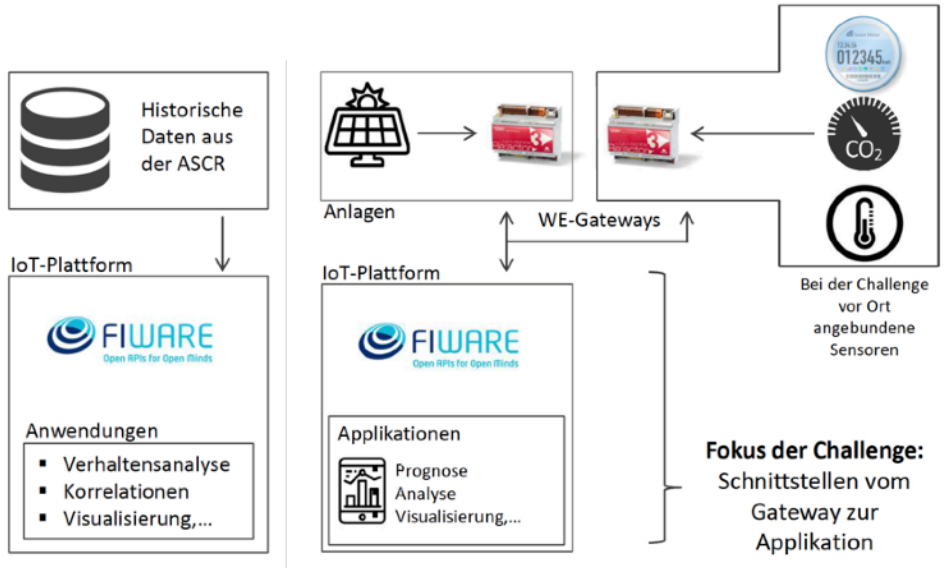


www.smartdata.wien

FIWARE

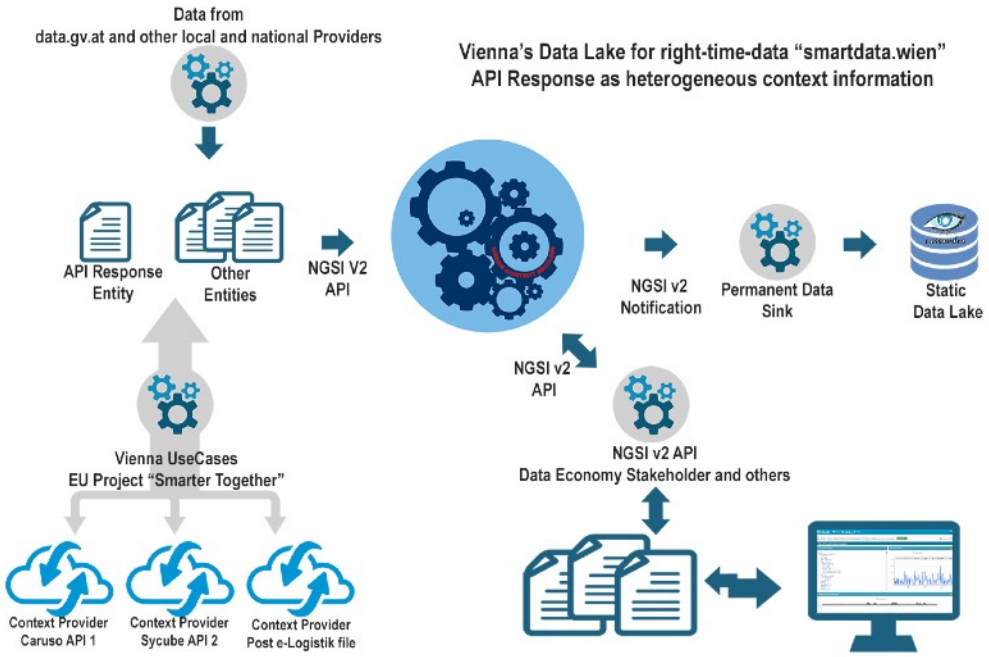
Vienna (Austria): Datalake

www.smartdata.wien



Gerhard Hartmann
Brigitte Lutz
Bernhard Schmid

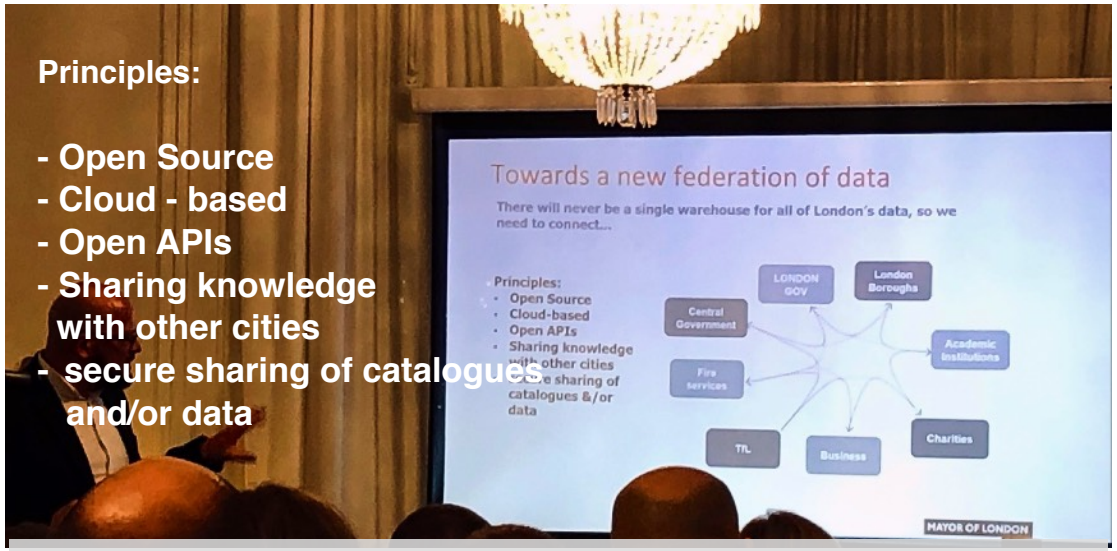
Vienna (Austria): Datalake



Principles:

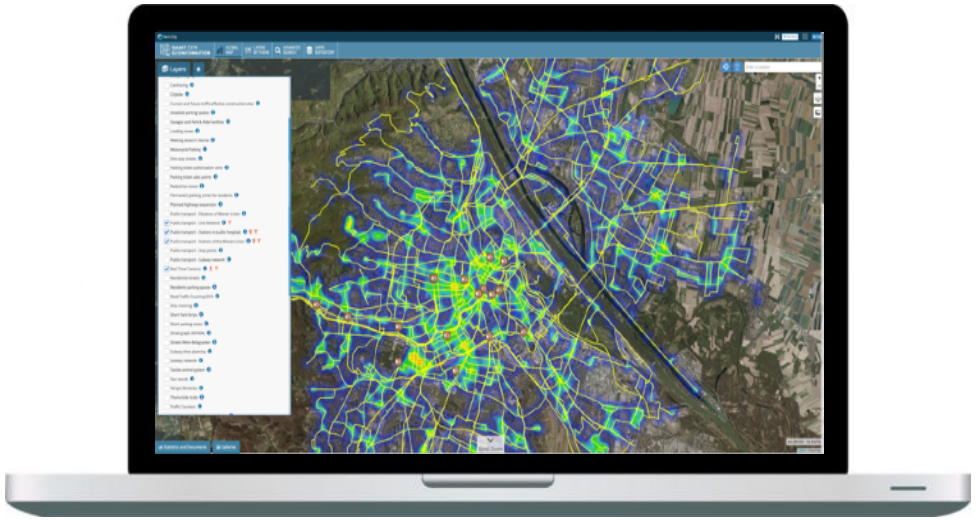
- **Open Source**
- **Cloud - based**
- **Open APIs**
- **Sharing knowledge with other cities**
- **secure sharing of catalogues and/or data within the city**

City of London (UK): Datalake



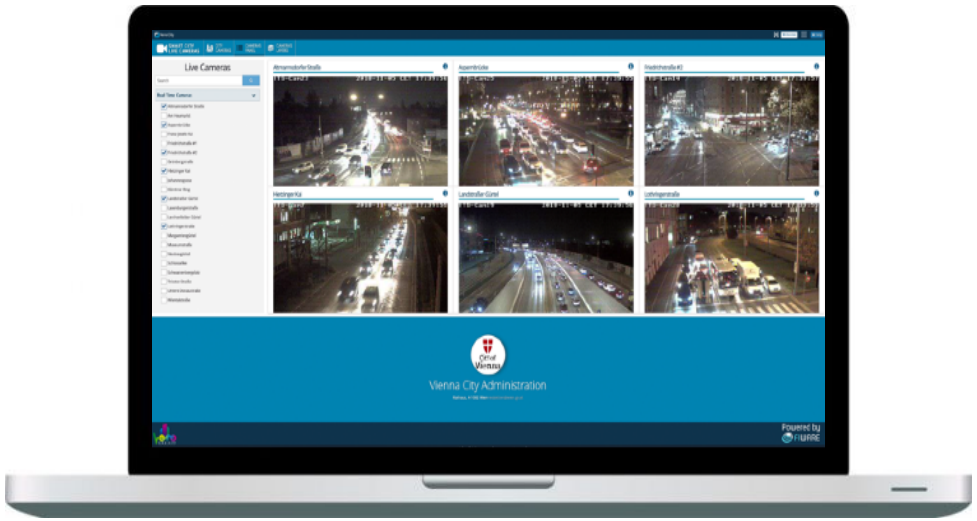
Towards a new federation of data

Vienna (Austria) : IoT



www.smartdata.wien

Traffic Monitoring



www.smartdata.wien

Smart Cities Lab

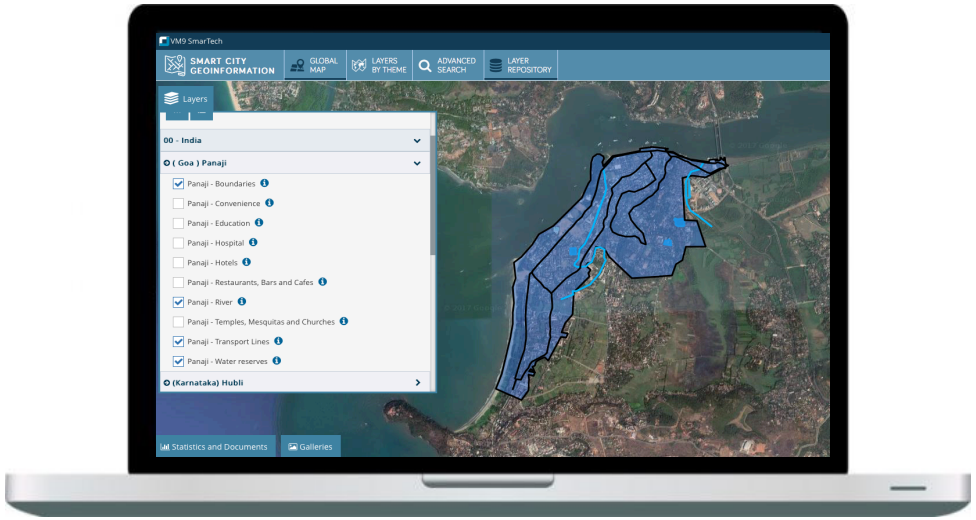
City of Vienna

Vero City

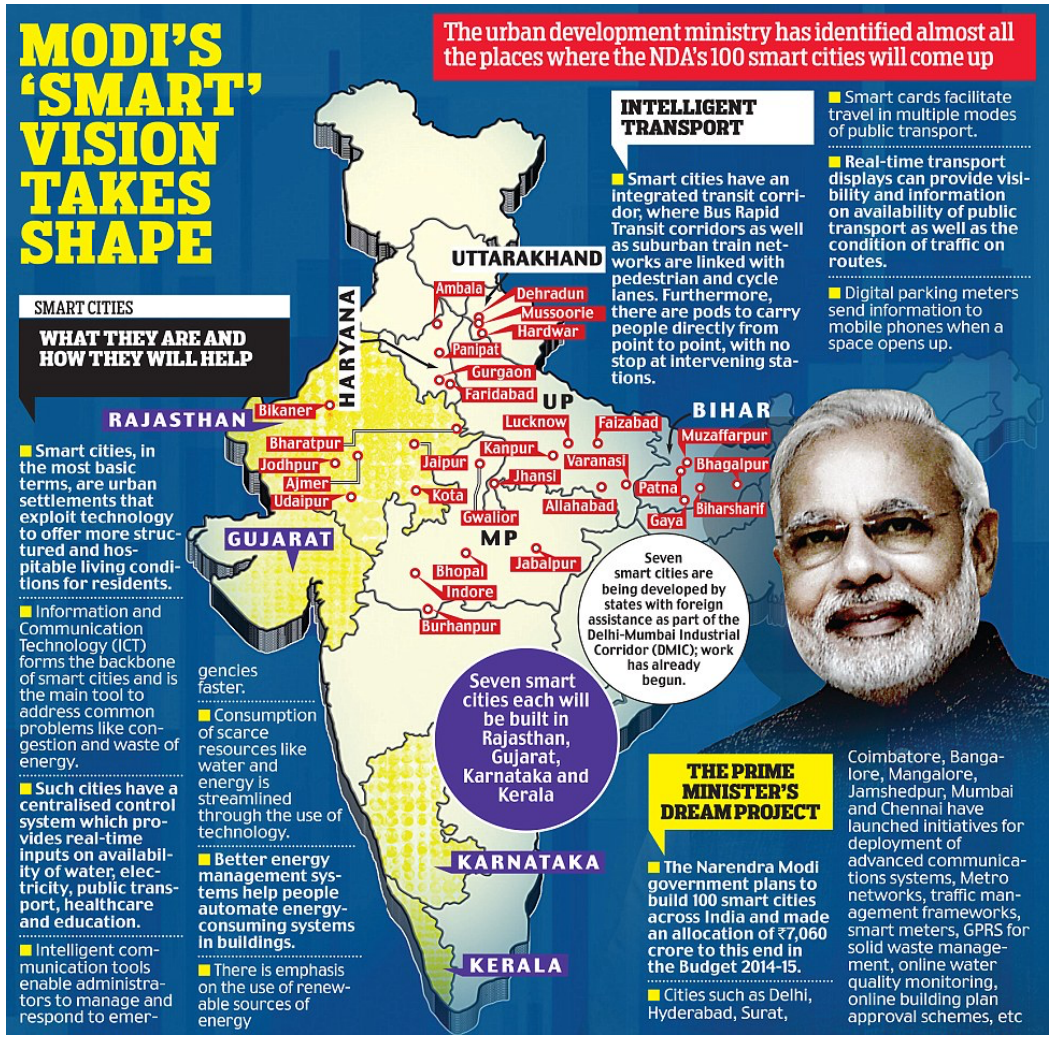
Gerhard Hartmann, Brigitte Lutz
Bernhard Schmid

FIWARE

Goa, Panja (India)



partly based on simulated data



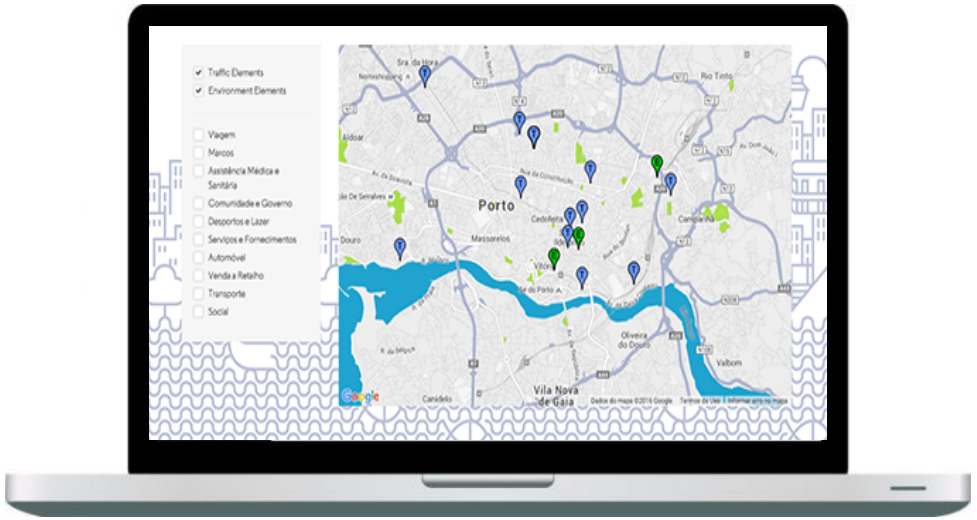
Smart Cities Lab

FIWARE

Porto (Portugal)

Water Consumption Malaga

Traffic & Environment Porto



ubiwhere SUITING THE FUTURE

citibrain:

Paulo Calzada, Porto Digital, Rui Costa, Ubiwhere, Filipe Araújo, Vice Mayor

FIWARE

IDSA

FIWARE
Open APIs for Open Minds

INTERNATIONAL DATA SPACES ASSOCIATION

DISCOVER THE REFERENCE ARCHITECTURE FOR THE DATA ECONOMY

FIND OUR USE CASES AND DEMONSTRATORS
AT THE IDSA AND FIWARE BOOTH IN HALL 8, C31

HEAD OFFICE INTERNATIONAL DATA SPACES ASSOCIATION

Joseph-von-Fraunhofer-Str. 2-4
44227 Dortmund
Germany
info@industrialdataspace.org
industrialdataspace.org

IDSA MEMBERSHIP ADVANTAGES

- Implement use cases
- Drive global standardisation forwards
- Develop architectures
- Design sustainable business models

Become a member
industrialdataspace.org/en/become-member

FIWARE MEMBERSHIP ADVANTAGES

- Have a voice in driving technology change
- Create sustainable business models whilst implementing FIWARE-based solutions
- Help to promote adoption of the FIWARE open standards

Become a member fiware.org/join

FIWARE FOUNDATION e.V.

Franklinstrasse 13 A
10587 Berlin
Germany
press.office@fiware.org
fiware.org

INTERNATIONAL DATA SPACES ASSOCIATION FIWARE

ABOUT INTERNATIONAL DATA SPACES ASSOCIATION

The International Data Spaces (IDS) approach addresses a key topic in the evolution of **Industrie 4.0:** how companies and institutions can build a space where data is shared in a decentralised manner so that each organization can use available data to improve their processes as well as govern and monetize data exported to third parties.

For this, **the International Data Spaces Association (IDSA)** is creating a reference architecture to implement secure and trustworthy data exchanges where data providers keep control over the use of their data ("data sovereignty"). It also addresses interoperability with many different data types used in global supply chains.

ACTIVE PART IN DESIGNING THE ARCHITECTURE OF THE IDS

With the establishment of the International Data Spaces Association, business and industry take an active part in designing the architecture of **the IDS.** More than 80 companies and institutions from 16 countries are members of the association. The International Data Spaces Association pools the requirements on IDS, organizes the knowledge exchange between research and business and develops guidelines for the certification, standardization and utilization of the results emerging from the different IDS-related research projects on the European and national level.

ABOUT FIWARE

FIWARE is an Open Source initiative whose mission is to build an open sustainable ecosystem around public, royalty-free and implementation-driven software platform standards for the development of Smart Applications in multiple sectors. One of the strategic areas is **Industrie 4.0.** The FIWARE platform provides a rather simple yet powerful set of Application Programming Interfaces (APIs) and also combines components enabling the connection to the Internet of Things with Context Information Management and Big Data services on the Cloud.

The **FIWARE Foundation** is the legal independent body providing shared resources to help achieving the FIWARE mission. The FIWARE Foundation is open: anybody can join contributing to a transparent governance of FIWARE activities and rising through the ranks, based on merit.

COMMON MISSION

International Data Spaces Association and FIWARE Foundation are working together on the first open source implementation of **the IDS Reference Architecture.** Its main component is the IDS Connector which, based on **the FIWARE Context Broker** and other complementary FIWARE technologies, manages all aspects related to the publication of and the access to data. Both the IDS and FIWARE platforms are listed as promising digital industrial platforms built on European strength in a recent report published by the European Union on the progress of the Digitising European Industry (DEI) initiative.

https://www.internationaldataspaces.org/cooperation-with-a-great-future-idsa-and-fiware-working-together/

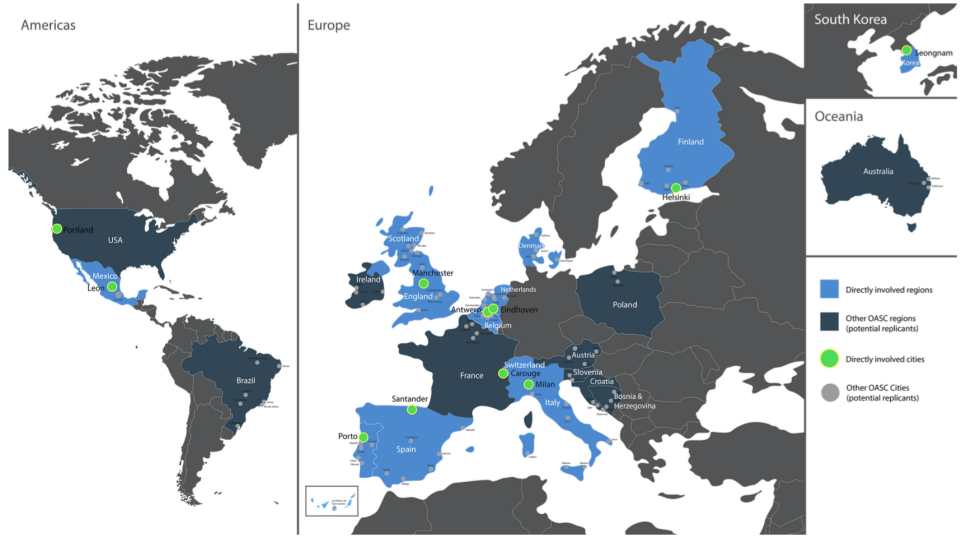
WHY

In the context of **Digitising European Industry** (DEI), the EU invests around €300 million in next-generation platform building and piloting, during the 2018-20 period. The European Commission invites you to a workshop on **'Advanced & Interoperable Digital B2B Platforms for Smart Factories and Energy'** which aims to foster cooperation of stakeholders across value chains, user-supplier integration, and fast adoption of emerging standards.

FIWARE

SynchroniCity

Antwerp (BE), Eindhoven (NL), Helsinki (FI), Manchester (UK), Milan (IT), Porto (PT), Santander (ES), Carouge (CH) …



Harmonized ecosystem for IoT-enabled smart city solutions

Reference architecture for the envisioned IoT-enabled city market place

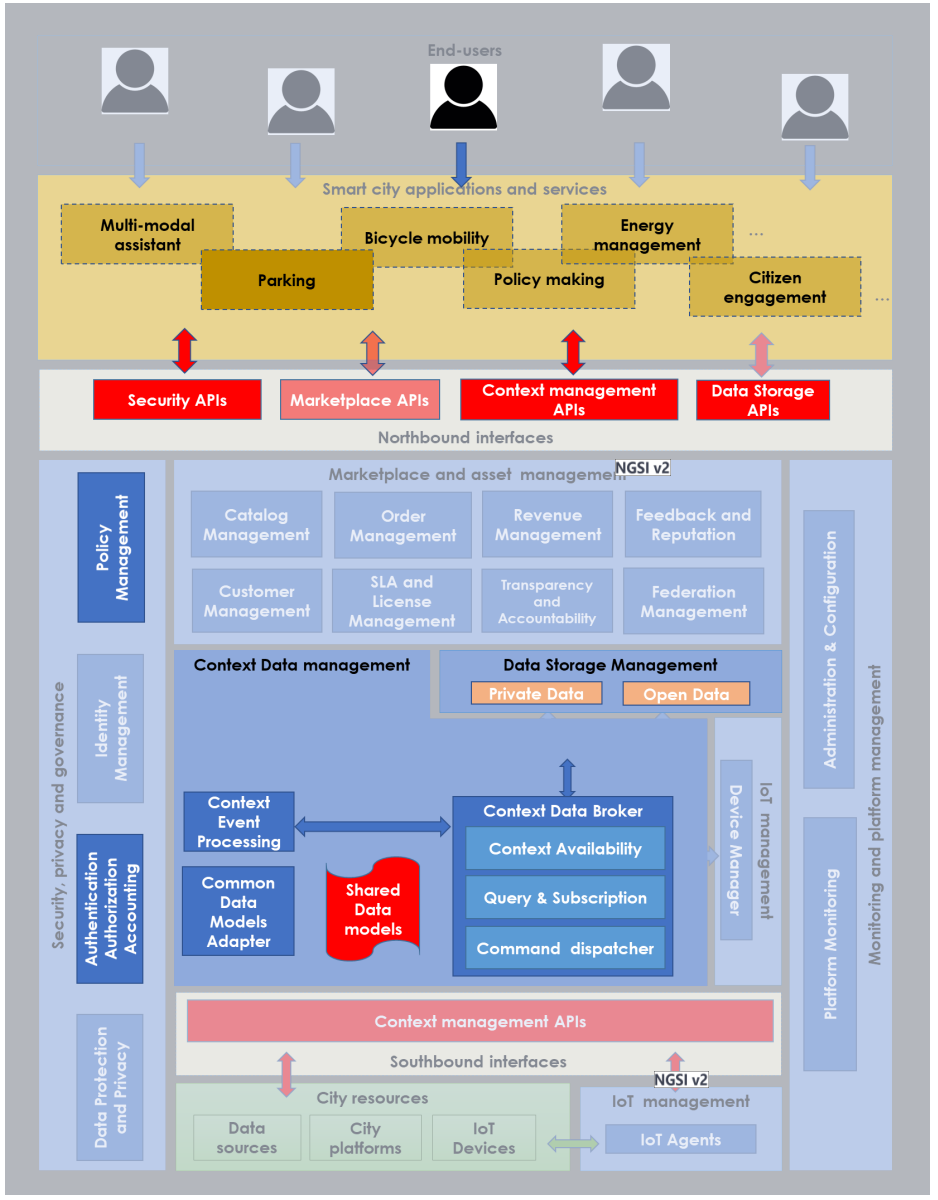
Identify interoperability points and **interfaces and data models**

OPEN & AGILE SMART CITIES

Martin Brynskov, Aarhus, https://synchronicity-iot.eu

FIWARE

Architecture / Topologie
Atomic Microservices (GE / SE)
Minimum Interoperability Mechanism (MIM)



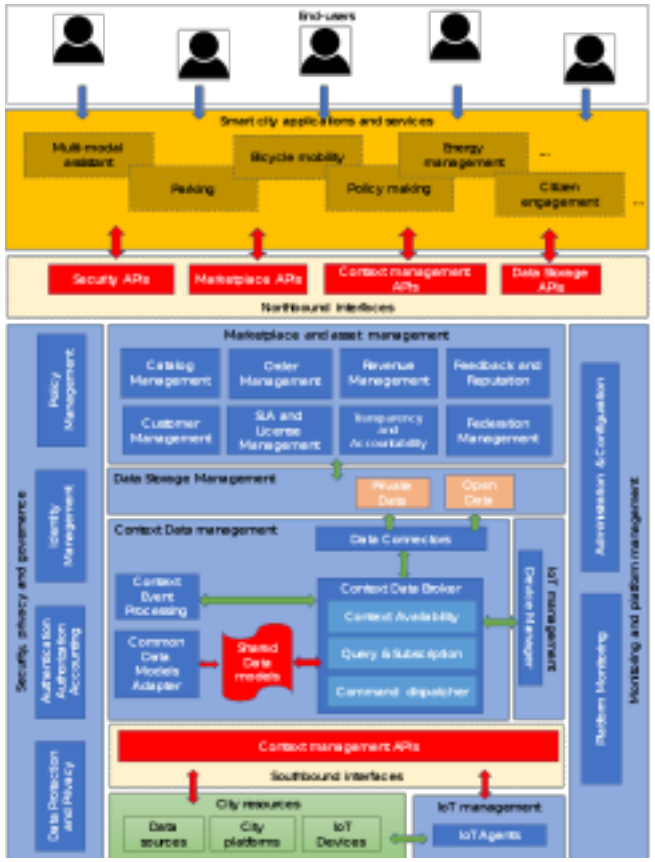
NGSI v2 orion
STH Comet
KeyRock
Wilma
Cygnus

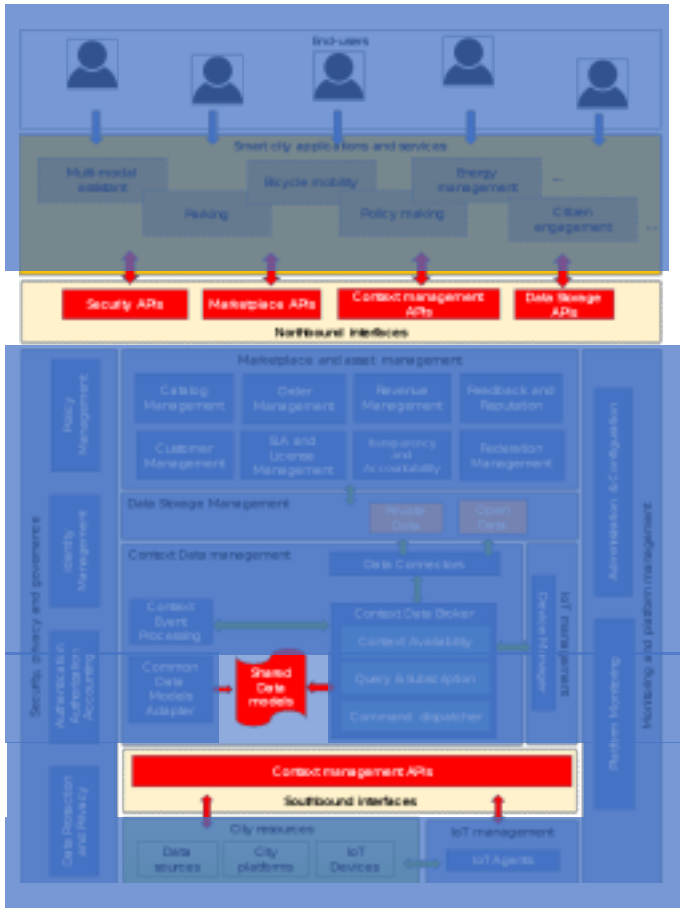
OPEN & AGILE SMART CITIES

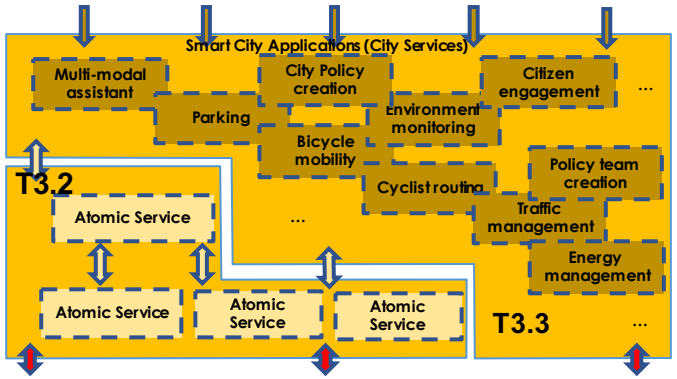
http://synchronicity-iot.eu/
https://synchronicityiot.docs.apiary.io/
https://gitlab.com/synchronicity-iot
https://opendata.synchronicity-iot.eu/

FIWARE

SynchroniCity: Technical resources: Architecture and MIMs







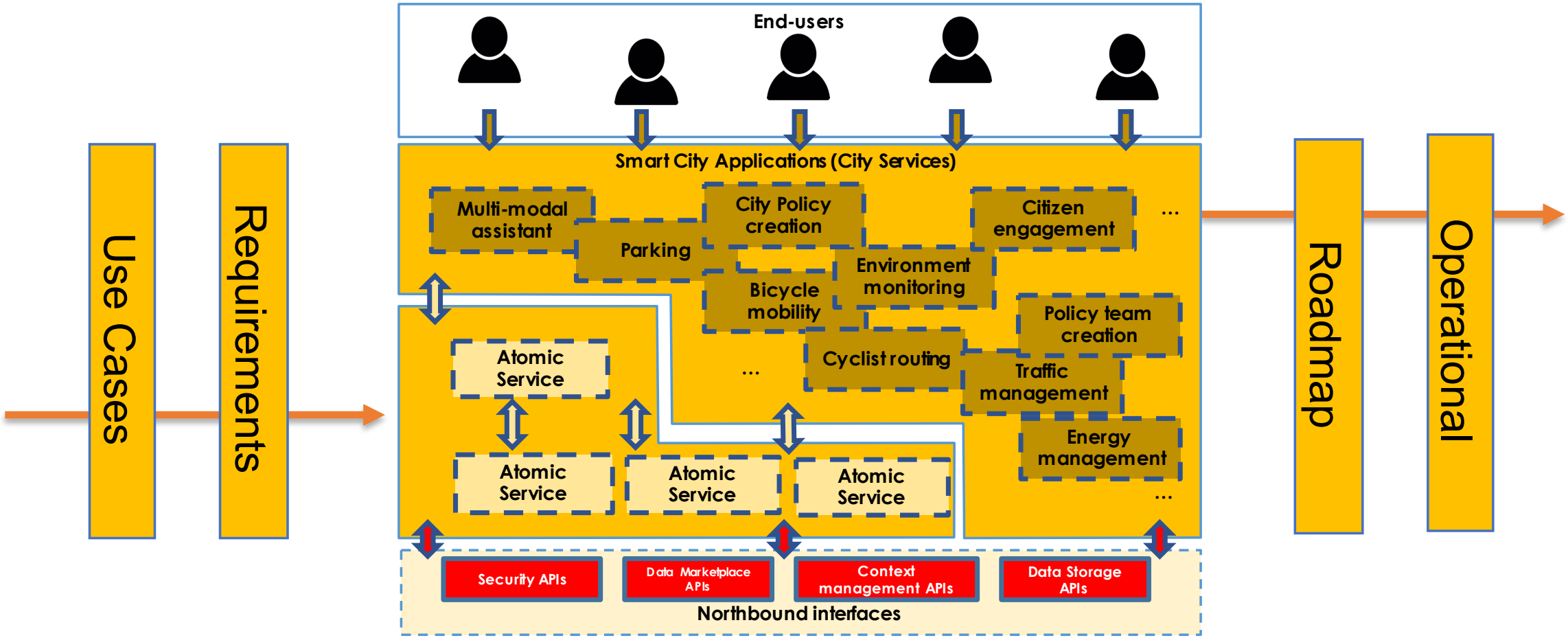
Architecture / Topologie
Atomic Microservices (GE / SE)

Minimum Interoperability Mechanism (MIM)

OPEN & AGILE SMART CITIES

FIWARE

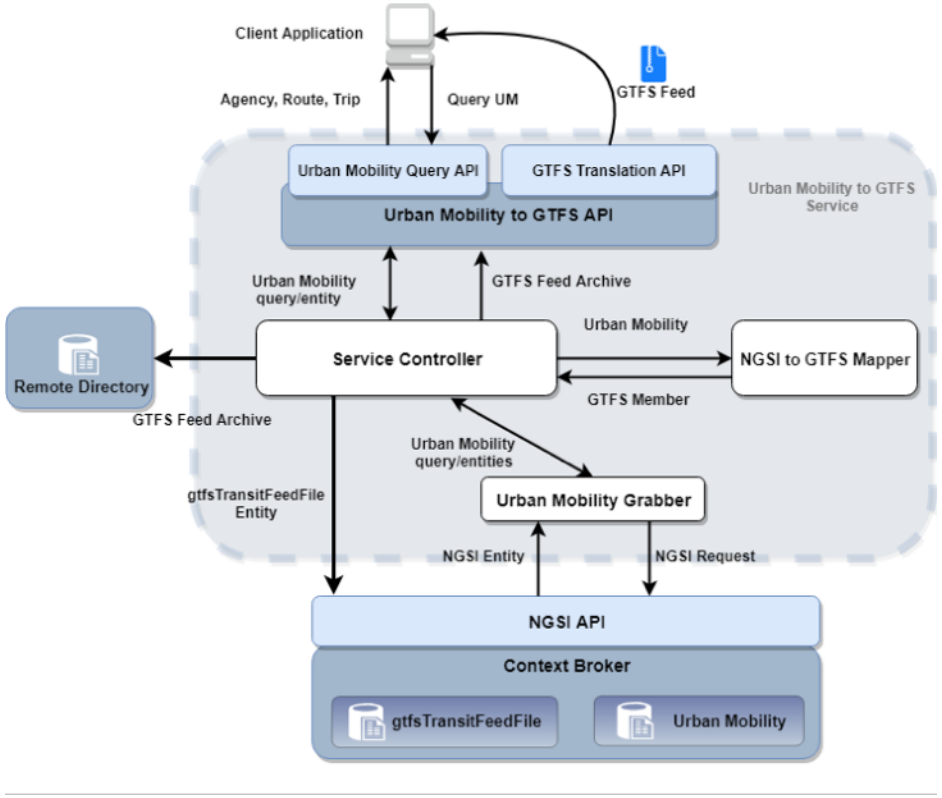
Architecture / Topologie Atomic Microservices (GE / SE) Minimum Interoperability Mechanism (MIM)



OPEN & AGILE SMART CITIES

FIWARE

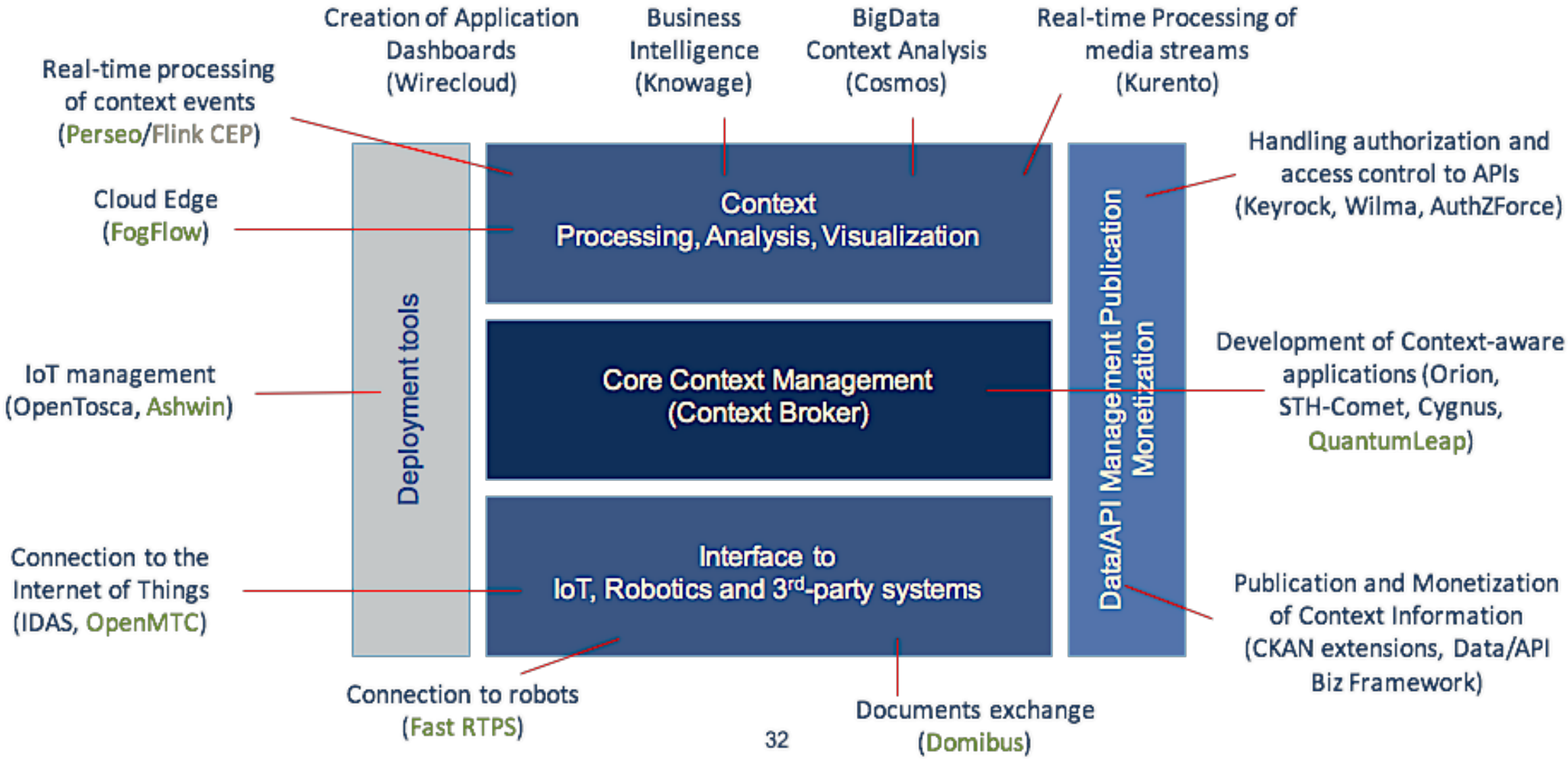
Architecture / Topologie Atomic Microservices (GE / SE) Minimum Interoperability Mechanism (MIM) in Mobility

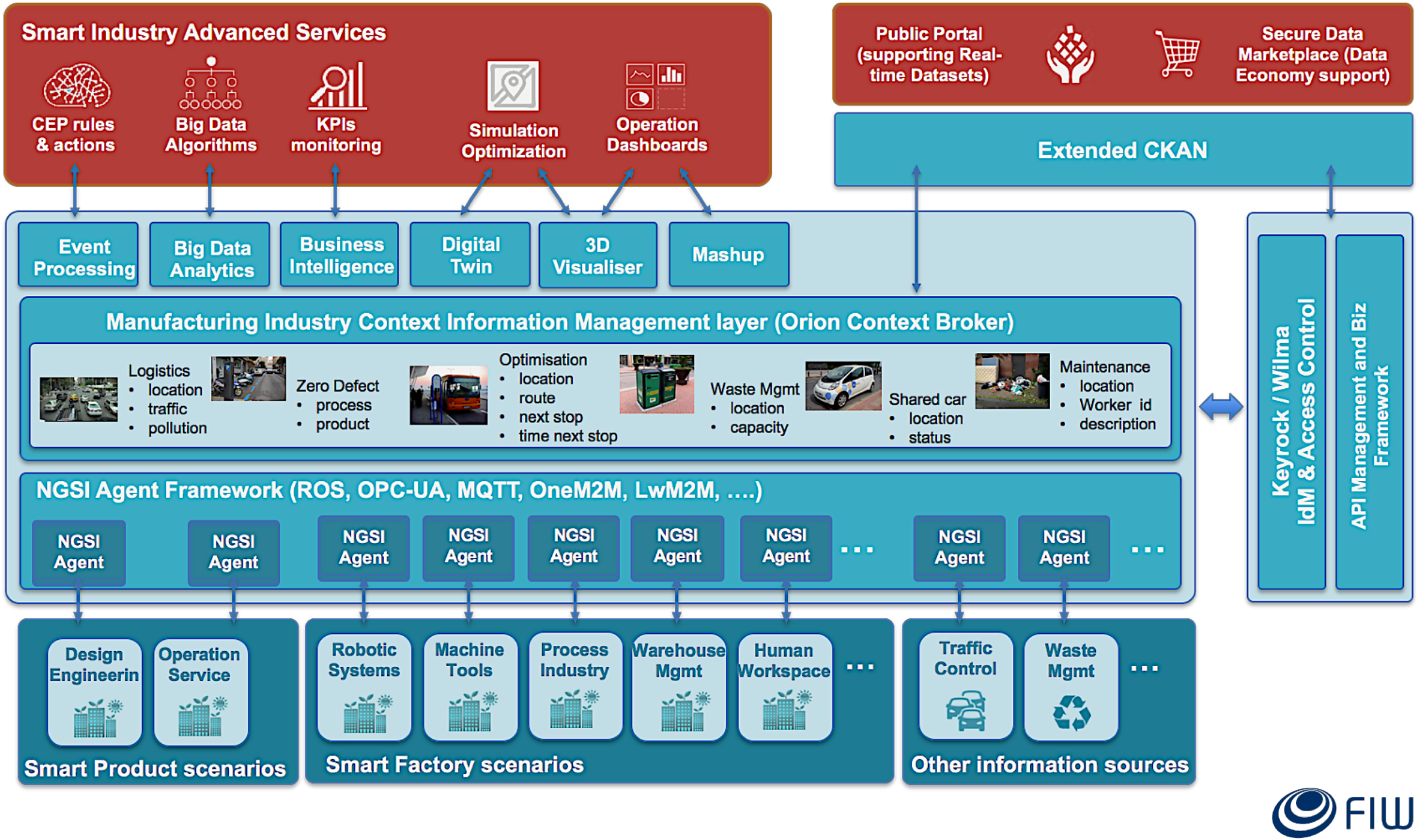


OPEN & AGILE SMART CITIES

FIWARE

Mapping of FIWARE components, API´s and new advancements




Smart Industry Advanced Services
CEP rules & actions
Big Data Algorithms
KPIs monitoring
Simulation Optimization
Operation Dashboards
Public Portal (supporting Real-time Datasets)
Secure Data Marketplace (Data Economy support)
Extended CKAN
Event Processing
Big Data Analytics
Business Intelligence
Digital Twin
3D Visualiser
Mashup
Manufacturing Industry Context Information Management layer (Orion Context Broker)
Logistics
• location
• traffic
• pollution
Zero Defect
• process
• product
Optimisation
• location
• route
• next stop
• time next stop
Waste Mgmt
• location
• capacity
Shared car
• location
• status
Maintenance
• location
• Worker id
• description
Keyrock / Wilma IdM & Access Control
API Management and Biz Framework
NGSI Agent Framework (ROS, OPC-UA, MQTT, OneM2M, LwM2M, ….)
NGSI Agent
Design Engineerin
Operation Service
Smart Product scenarios
Robotic Systems
Machine Tools
Process Industry
Warehouse Mgmt
Human Workspace
Smart Factory scenarios
Traffic Control
Waste Mgmt
Other information sources

People walk past a Huawei store in Beijing on July 20, 2015. The Chinese telecoms equipment giant dominates the 5G wireless technology market, as part of Beijing's goals to achieve tech self-reliance. (Greg Baker/AFP/Getty Images)

China's New Strategy for Tech Domination: China Standards 2035

BY ANNIE WU, EPOCH TIMES

October 31, 2018 Updated: November 1, 2018

Share

In the trade dispute with China, the United States has repeatedly called out the Chinese regime for its state-sponsored development of advanced technologies—accusing Beijing of undermining fair competition while justifying the theft of foreign technology to serve national interests of becoming a high-tech manufacturing powerhouse.

The industrial plan "Made in China 2025"—which proposes gearing China toward achieving self-sufficiency in 10 tech sectors by the year 2025—was cited repeatedly as evidence of Beijing's aggressive ambition.

China`s New Strategy 2035: Standards

To dominate cutting-edge technologies like artificial intelligence (AI), cloud computing, IoT (internet of things), and big data, China intends to accelerate efforts to develop technical standards, eventually exporting them to the international market, the report said.

While global technical standards for these technologies have not yet been established, "this is the golden opportunity for our country's industries and standards to realize the goal of 'overtaking by changing lanes,'" the report quoted an official from China's national technical committee, the Standardization Administration, as saying.

„overtaking by changing lanes…"

FIWARE

China`s New Strategy 2035: Standards

People walk past a Huawei store in Beijing on July 20, 2015. The Chinese telecoms equipment giant dominates the 5G wireless technology market, as part of Beijing's goals to achieve tech self-reliance. (Greg Baker/AFP/Get

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China's New Strategy for Tech Do China Standards 2035

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our country's industries and
changing lanes,'" the report
cal committee, the

ing lanes…"

FIWARE

FIWARE facilitates and establish Standardization on a global scale

CEF DIGITAL
European Commission

FIWARE NGSI and **Context Broker** Technology have been announced on Feb. 5th, 2018 as new CEF (Connecting Europe Facility) Building Blocks

Existing CEF Building Blocks so far:

- **eDelivery**
- **eInvoicing**
- **eID**
- **eSignature**
- **eTranslation.**

FIWARE Standardization:

GSMA

tmforum

NIST National Institute of Standards and Technology

ETSI World Class Standards

The ETSI has decided to give the name "NGSI-LD" to the Context Information Management API. The rationale is to reinforce the fact that this specification leverages on the … **FIWARE NGSIv2** to incorporate the latest advances from Linked Data (published on 25.04.2018)

FIWARE

across the world cities are joining:

OPEN & AGILE SMART CITIES

117 cities*
24 countries

- Common APIs:

so-called MIM´s ✓ FIWARE NGSI to start with

- Standard Data Models
- Platform for Open Data
- Driven by implementation approach

NOV 8, 2017

NEC SMART CITY SOLUTION IS NOW CERTIFIED "POWERED BY FIWARE"

Madrid, November 7, 2017 – NEC ... and its advanced Smart City ... the CCOC, has been ... "powered by...

MAR 6, 2018

BAREILLY TO BECOME THE FIRST INDIAN SMART CITY TO IMPLEMENT MOBILEPEDIA'...

Mobilepedia, first company in India to receive a contract from the ... Bank to pilot the FIWARE...

La Plata, Argentinien October 2018

Montevideo Uruguay October 2018

Ongoing: Greece, Netherlands, Austria, Germany, Finland, Portugal, Japan, India

FIWARE

FIWARE-NGSI v2 Specification

This specification defines the FIWARE-NGSI version 2 API. FIWARE-NGSI v2 is intended to manage the entire lifecycle of context information, including updates, queries, registrations, and subscriptions.

The FIWARE NGSI (Next Generation Service Interface) API defines

- a **data model** for context information, based on a simple information model using the notion of *context entities*
- a **context data interface** for exchanging information by means of query, subscription, and update operations
- a **context availability interface** for exchanging information on how to obtain context information (whether to separate the two interfaces is currently under discussion).

https://fiware.github.io/specifications/ngsiv2/stable/

ETSI Whitepaper on NGSI-LD https://www.etsi.org/images/files/ETSIWhitePapers/etsi_wp31_NGSI_API.pdf

FIWARE

FIWARE-NGSI as CEF Building Block

CEF supports multiple digital infrastructure projects, which contribute to improvements in the daily lives of Europeans through digital inclusion, the connectivity and interoperability of European digital services, and the development of a Digital Single Market.

The CEF Context Broker is composed by two major software components: the Orion Context Broker component which implements the core Context Broker functionality itself and the Cygnus component which complements Orion. Cygnus captures updates on context information managed by the Orion Context Broker and produces a stream of context data history which can then be stored into a specific persistent data sink storage, such as MySQL, MongoDB, Flink or HDFS for further processing or CKAN for Open Data publication.

https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/2018/10/03/CEF+Context+Broker%3A+FIWARE-NGSI+v2+Specification+Launched

FIWARE

FIWARE-NGSI as ETSI Standard

The goal of ISG CIM is to develop technical specifications and reports to enable multiple organisations to develop interoperable software implementations of a cross-cutting Context Information Management (CIM) Layer. It is about bridging the gap between abstract standards and concrete implementations.
The CIM Layer enables applications to update, manage, and access context information from many different sources, as well as publishing that information through interoperable data publication platforms.

The work of ISG CIM will be done in a phased manner. The initial phase will be purely informative and result in an ISG CIM Group Report (GR). It will be followed by a second normative phase resulting in several ISG CIM Group Specifications (GS).

Throughout both phases relevant organizations will be considered as appropriate in order to avoid duplication of work.

https://portal.etsi.org/tb.aspx?tbid=854&SubTB=854

ETSI World Class Standards

FIWARE

FIWARE-NGSI as GSMA Standard

This document specifies a generalized architectural framework for the delivery of Big Data services based on the Internet of Things. It identifies the key functions and interfaces that enable IoT Big Data services to be delivered, and makes selections and recommendations particularly in the area of interfaces that support the creation of the IoT Big Data ecosystem. The framework outlines a logical architecture and it should be noted that operators may make different implementation decisions. In addition, not all mobile operators will implement exactly the same IoT Big Data services and this framework provides flexibility for them to approach the market according to their own strategy.

IoT Big Data NGSIv2 Profile: „Contextual data is data that gives context to a person, entity or event. Examples of context data might include geographic/ mapping information, weather forecasts, schedules e.g. for transportation, or information generated from mobile networks/ users.“

https://www.gsma.com/iot/wp-content/uploads/2016/11/CLP.25-v1.0.pdf

GSMA

FIWARE

INTEROPERABILITY

as QUALITY CHARACTERISTICS

- Federation
- Comparability
- Replaceability
- Transparency
- Open Source
- Portability

- Modularity
- Scalability
- Replaceability
- Reuseability

FIWARE

Non-Functional

requirements

- Federation
- Sustainability
- Standard based
- Implementation driven
- Low implementation risk
- accountable

- Time to market
- Collaboration
- New Market
- Global Scalability

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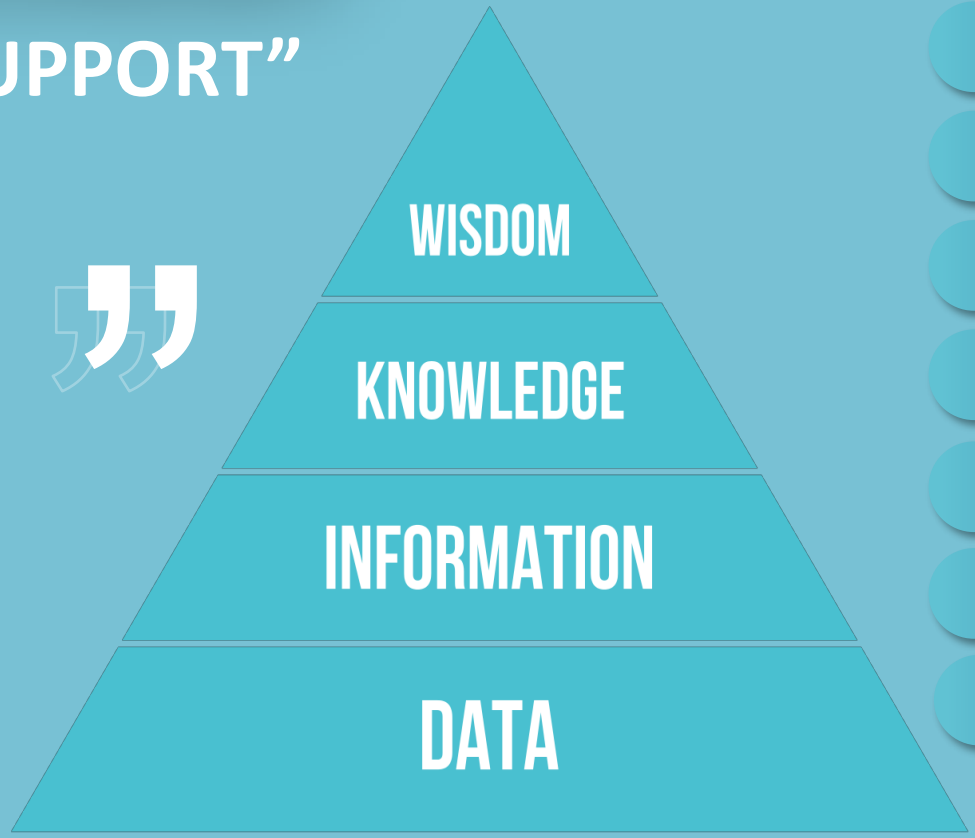
DATA ECONOMY

“SUPPORT”



- Edge & Fog computing
- Collaboration
- Breaking Data Silos
- Cross Domain
- Platform Agnostic
- Community Driven
- Open Innovation
- Agile & lean
- Common Datamodels
- Context Aware

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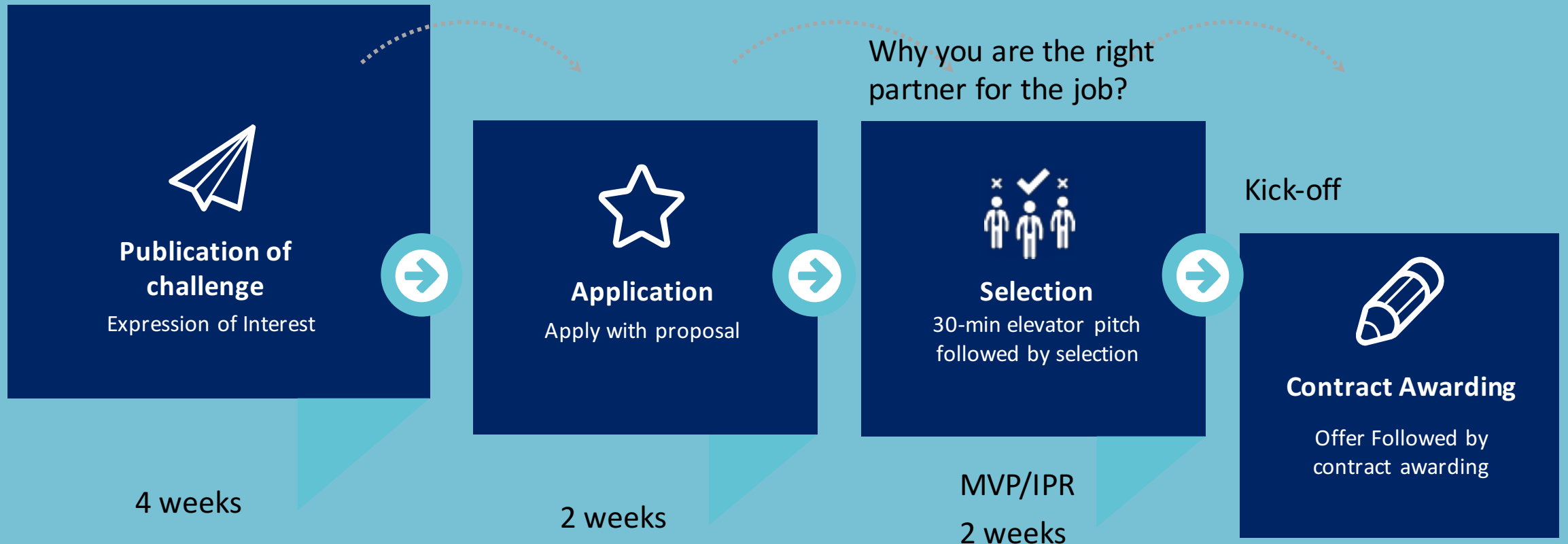
Procurement Process in 4 steps
Funnel Approach



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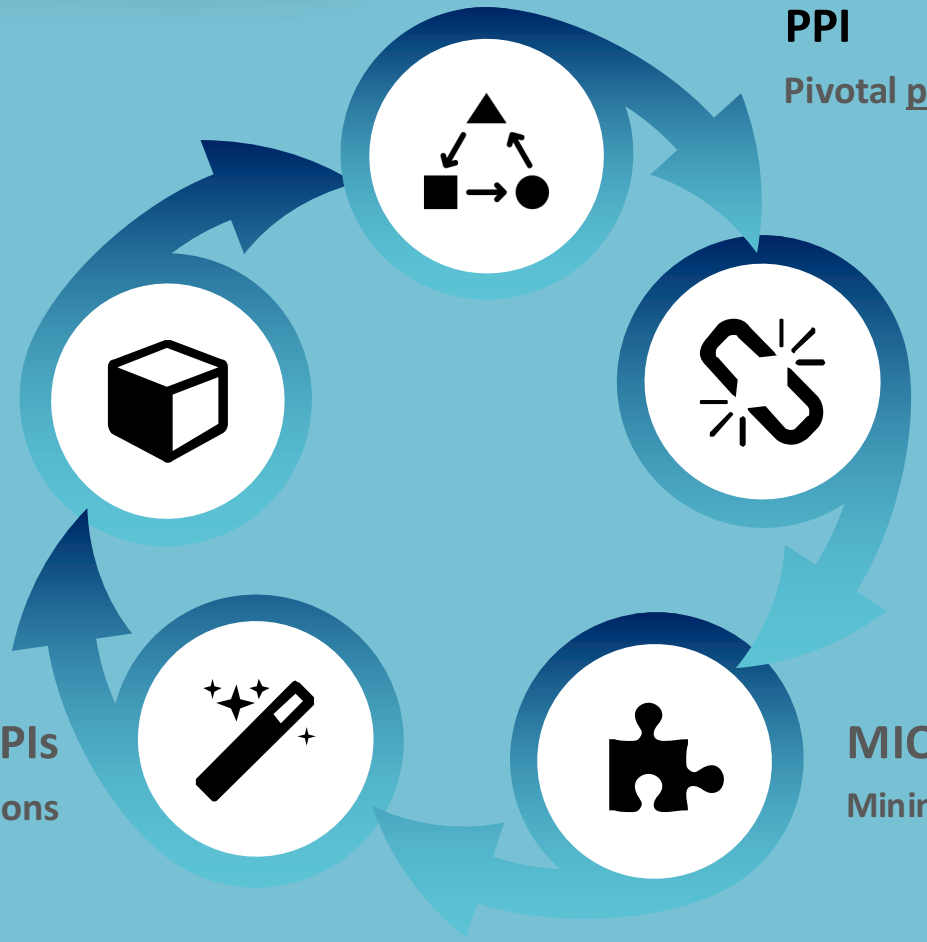
Consensus Framework



PPI

Pivotal points of interoperability

MIM

Minimum Interoperability Mechanism

MIOS

Minimum Information interoperability standards

PPIs

Public Procurement of Innovative solutions

PCP

Pre-Commercial Procurement

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FIWARE community invite and running various programs with Cities

FrontRunner Program

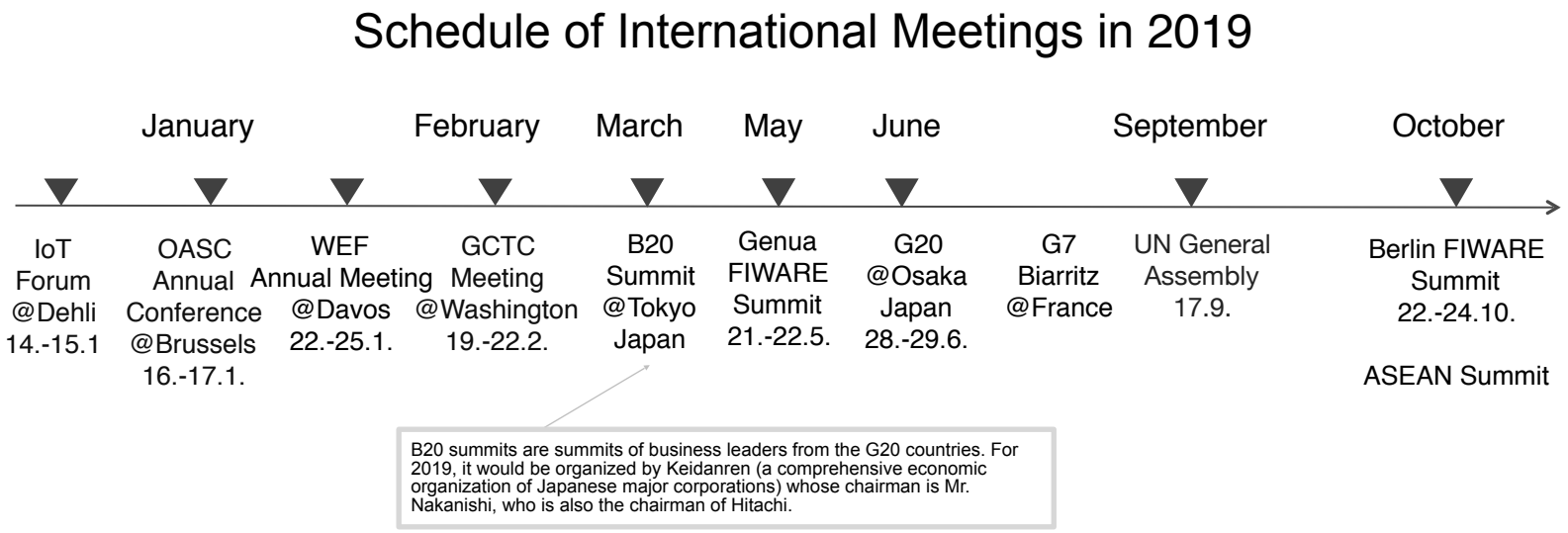
Future State Foundery

Nice (France), Porto (Portugal) , Santander (Spain), Utrecht (Netherlands), Saint Quentin (France), Porto (Portugal), Valencia (Spain), La Plata (Argentina), Montevideo (Uruguay), Vienna (Austria) - Liverpool(UK), Tampere (Finland), Paderborn (Germany), Almere (Netherland), Surabaya (Indonesia), Oxford (UK) …

Towards Open Platform technologies for materializing the Society 5.0

To realize Society 5.0 at the city level, we aim to create

- **the smart city coalition of cities with system interoperability,**
- **data governance framework that ensures data portability for citizens**



WORLD ECONOMIC FORUM
tmforum connecting digital ecosystems
OPEN & AGILE SMART CITIES
PIONEERED BY THE ROCKEFELLER FOUNDATION 100 RESILIENT CITIES
GLOBAL CITY TEAMS CHALLENGE
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Towards Open Platform technologies for materializing the Society 5.0

Gaining for **sustainable global marketplace**
where solutions are **interoperable and replicable**
thus **investments of the cities are protected**
and (**vendor lock-in**) (lock-out)

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Towards Open Platform technologies for materializing the Society 5.0

”

The **governance** , **architecture** and **topology** of adopted open platform technologies as implicit and inseparable quality should also be considered, as should the purely functional features of digital products and services.

Considering a **driven-by-implementation** approach as opposed to a design-by-committee approach is required to ensure an agile adoption.

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Towards Open Platform technologies for materializing the Society 5.0

Shortcomings in the "**right**" management of digitization have had negative effects worldwide and led to distortions.

Non-functional qualities such as **interoperability, openness, transparency, replicability, portability** or **modularity** are suitable for significantly enhancing and promoting the purely technical advantages of a digital product or service

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Towards Open Platform technologies for materializing the Society 5.0

FIWARE in particular proposing in the area of Smart Cities: the Data (a) and the corresponding Mobility Sector (b) to start with:

”

The target is to demonstrate the benefits derived from adoption of a minimum common set of open platform technologies enabling the creation of a sustainable global market for **interoperable** and **replicable** smart city solutions as well as the transformation of cities into platforms for the **Data Economy**

The Mobility sector currently is in a huge transformation phase, and the potential impact on livability of cities (congestion, air pollution, health, etc.) is obviously significant as well as new targets and change is urgently needed …

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NGSI Standards helping Smart Cities in their transformation journey

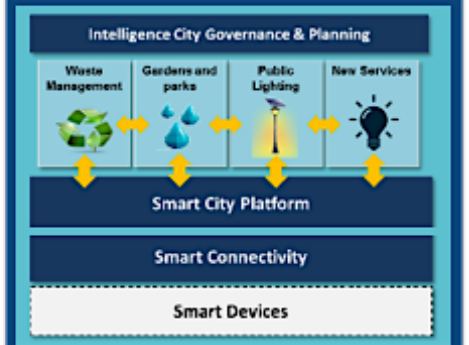
FINANCES 1 — FINANCES 2 — FINANCES 3 — 4

Efficient and Open

- Vertical solutions (some being IoT-enabled) bringing efficiency in silos
- Historic data as open data
- Information still in vertical silos, no global picture

Truly Smart

- Horizontal platform gathering "right-time" context info from different vertical services
- Common information models
- Smart City Governance Solutions



Unleashing Right-time Open Data

- right-time context info published to third parties
- authorization and access control (API management)
- open innovation ecosystem

Support to Data Economy

- city as a platform including also 3rd party data enabling innovative business models
- open and commercial data enabling multi-side markets

FIWARE FOUNDATION

George Orwell and beyond

Is this at the core of a „smart“ city?

Source: Korea Example: Green Trust

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This visualization shows for which of the 230 *Sustainable Development Goals (SDGs) Indicators* data is available at **SDG-Tracker.org**.

= Indicators for which recent global official metrics are available,
or for which alternative good-quality cross-country source are available (e.g. estimates from independent research institutes).

= Indicators that do have official metrics, but for which available data is very incomplete or outdated.
Yellow boxes also mark Indicators for which there are no official metrics, but for which closely related estimates are available that allow informative but imperfect monitoring.

= Indicators for which – to the best of our knowledge – global monitoring is not currently possible.

What would Greta have been done?

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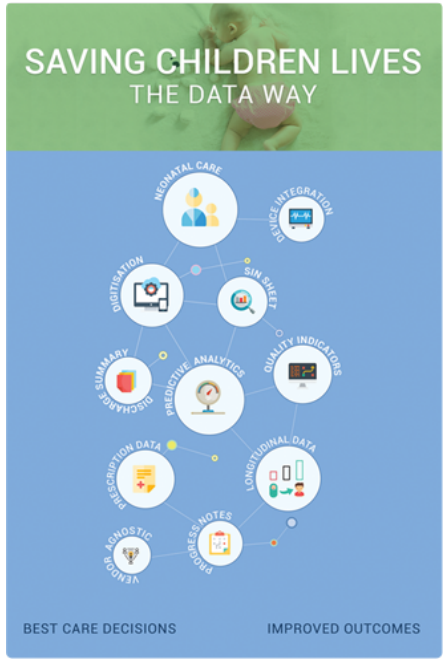
Saving Children Lives: The data way

Adapting information technology in healthcare services…

Errrors in manually plotting the parameters in growth charts results in missed opportunities for early detection of growth disorders in children



Harpreet Singh http://inicucloud.com/publications.html

Reducing flooding in rice paddies with data

11.3 gigatons of carbon dioxide emissions can be reduced,
Farmers could realize $519 billion in additional profits
and can dramatically reduce greenhouse gas emissions, and conserve water and boost yields.

https://www.drawdown.org/solutions/food/improved-rice-cultivation **Source:** drawdown.org **Photo:** WRI.ORG by IRRI.

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Thank you!

http://fiware.org
Follow @FIWARE on Twitter

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Co-Founder and CEO of VeroCity

Chair of Smart Cities Committee and
Member of Board of Directors FIWARE Foundation, Berlin

Council of Open & Agile Smart Cities Initiative
Member of Funding Working Group

Advisor VC Fund Future State Foundery

Initiator of Smart Mobility as a Service Platform

FIWARE