



H2020 project (ICT30)
<http://www.biotope-project.eu>

Building an IoT OPen innovation Ecosystem for connected smart objects

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ISED 2018:
IoT: security challenges and opportunities

- **IoT (Internet of Things) — The road ahead**
- **EU's Vision & Ambition**
- **Towards Open IoT ecosystems**
- **bloTope City Pilots**
- **Conclusion**

IoT— The road ahead

IoE

Internet of
Everything

M2M

Machine-to-
Machine

Industrial
Internet

Hi, I'm...

WoT

Web of
Things

IoT

Internet of Things

IIoT

Industrial
Internet of Things

but my friends call me...

Industry 4.0

Intranet of
Things

Smart...

SmartGrid, SmartCity,
SmartMobility...

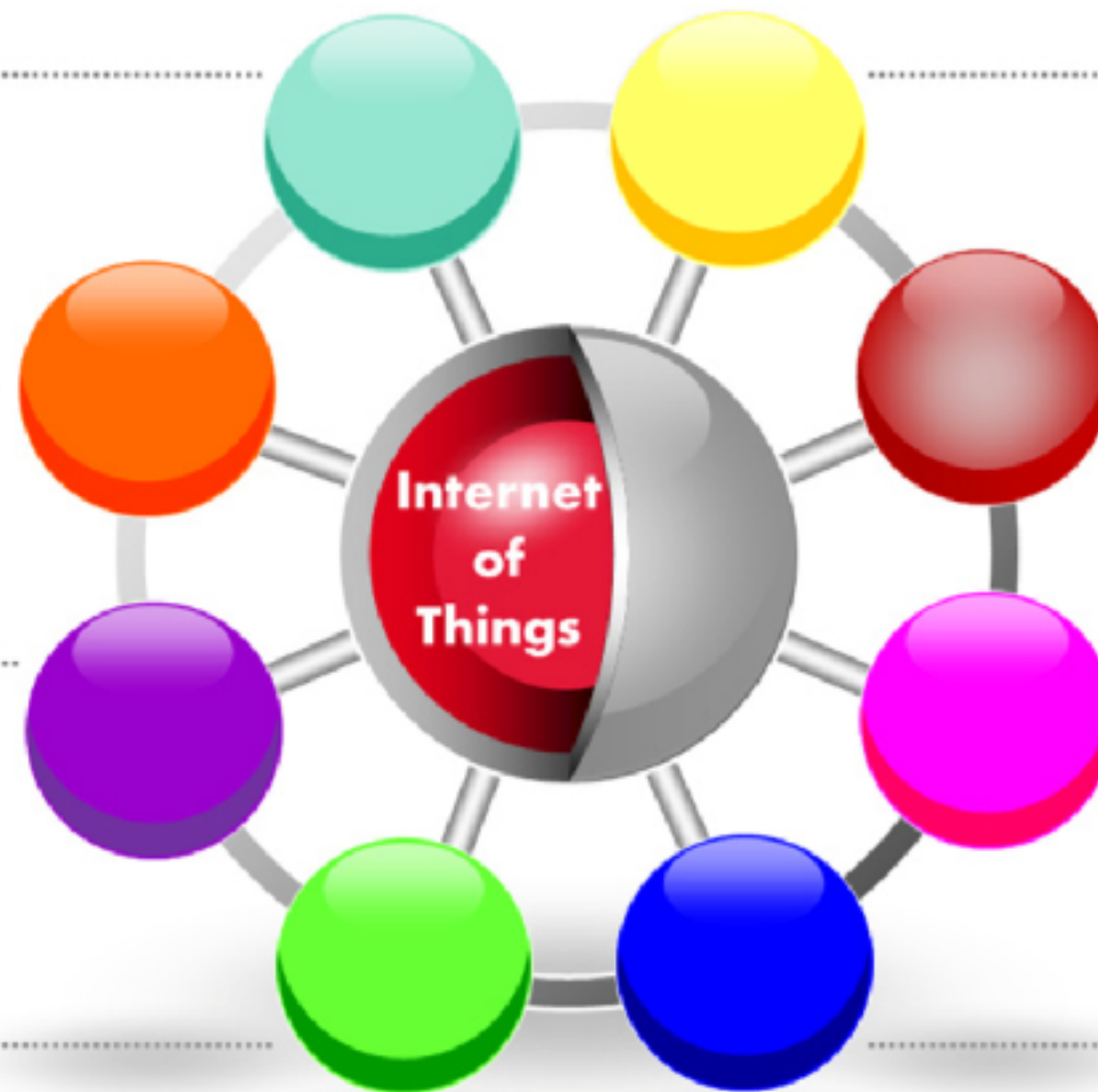
IoT— The road ahead

A dynamic global network infrastructure

with self configuring capabilities

based on standard and interoperable communication protocols

where physical and virtual “things”



have identities, physical attributes, and virtual personalities

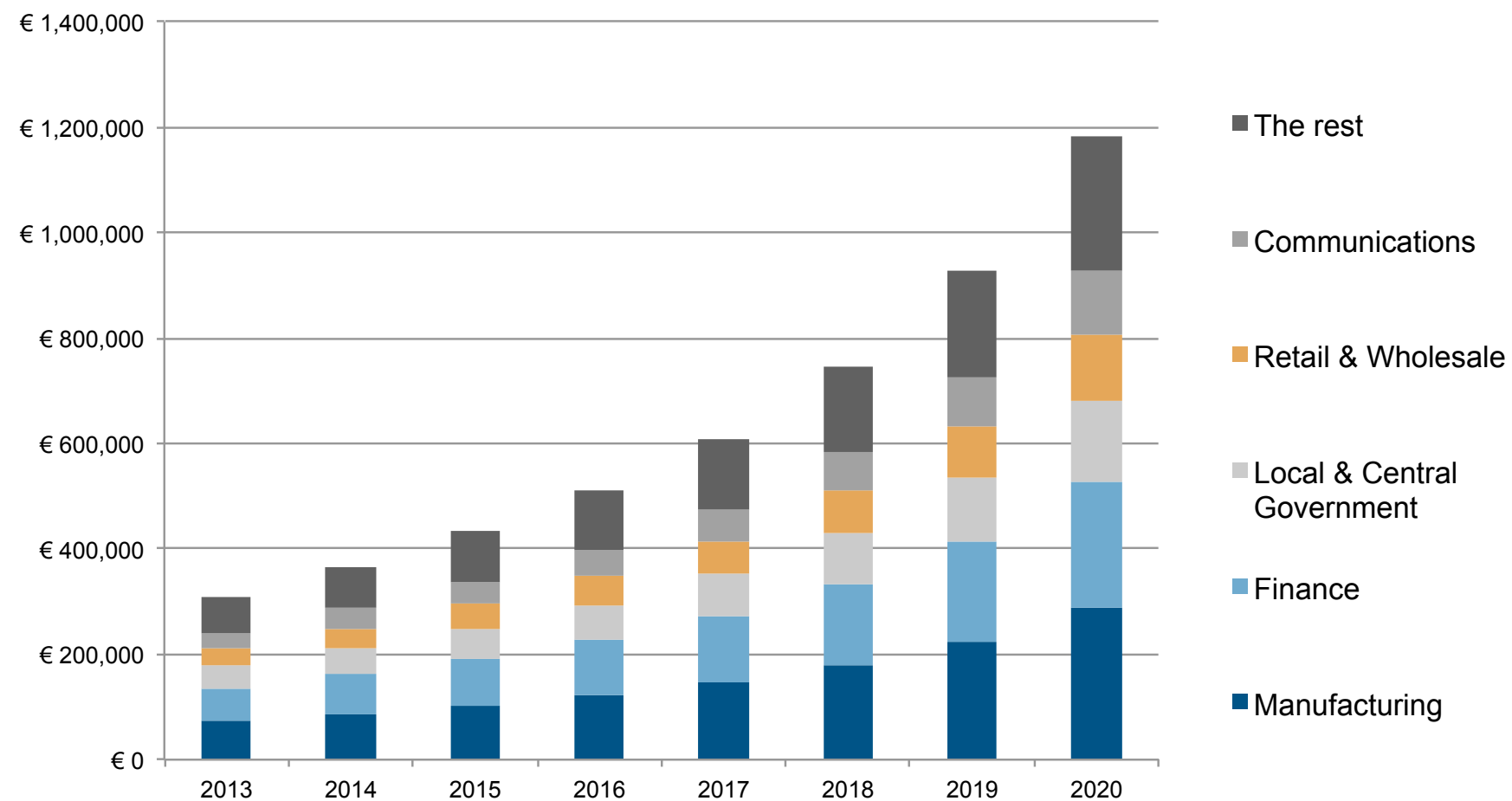
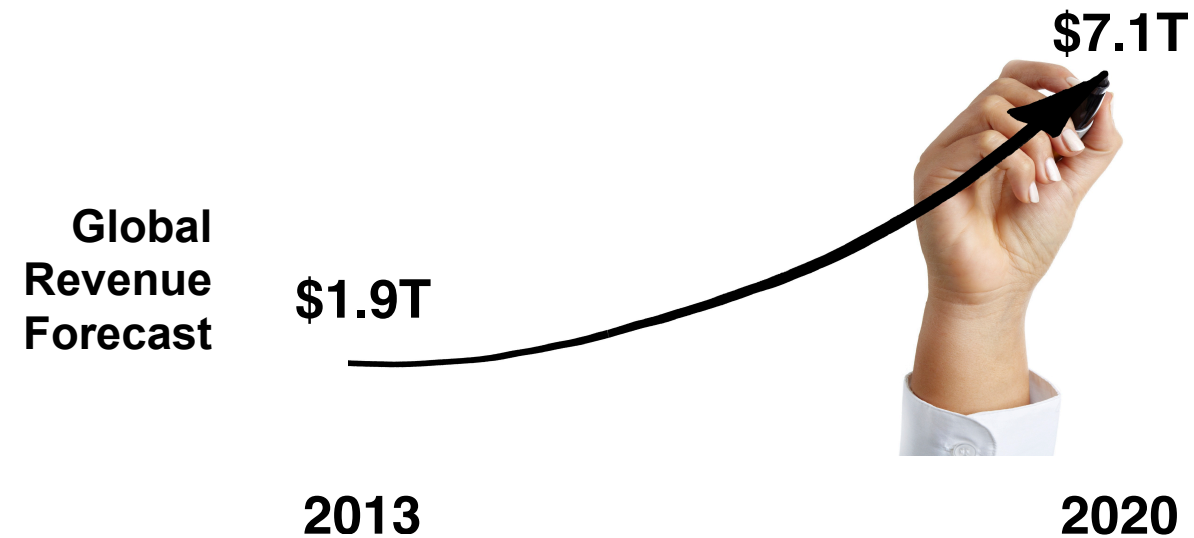
use intelligent interfaces,

and are seamlessly integrated

into the information network.

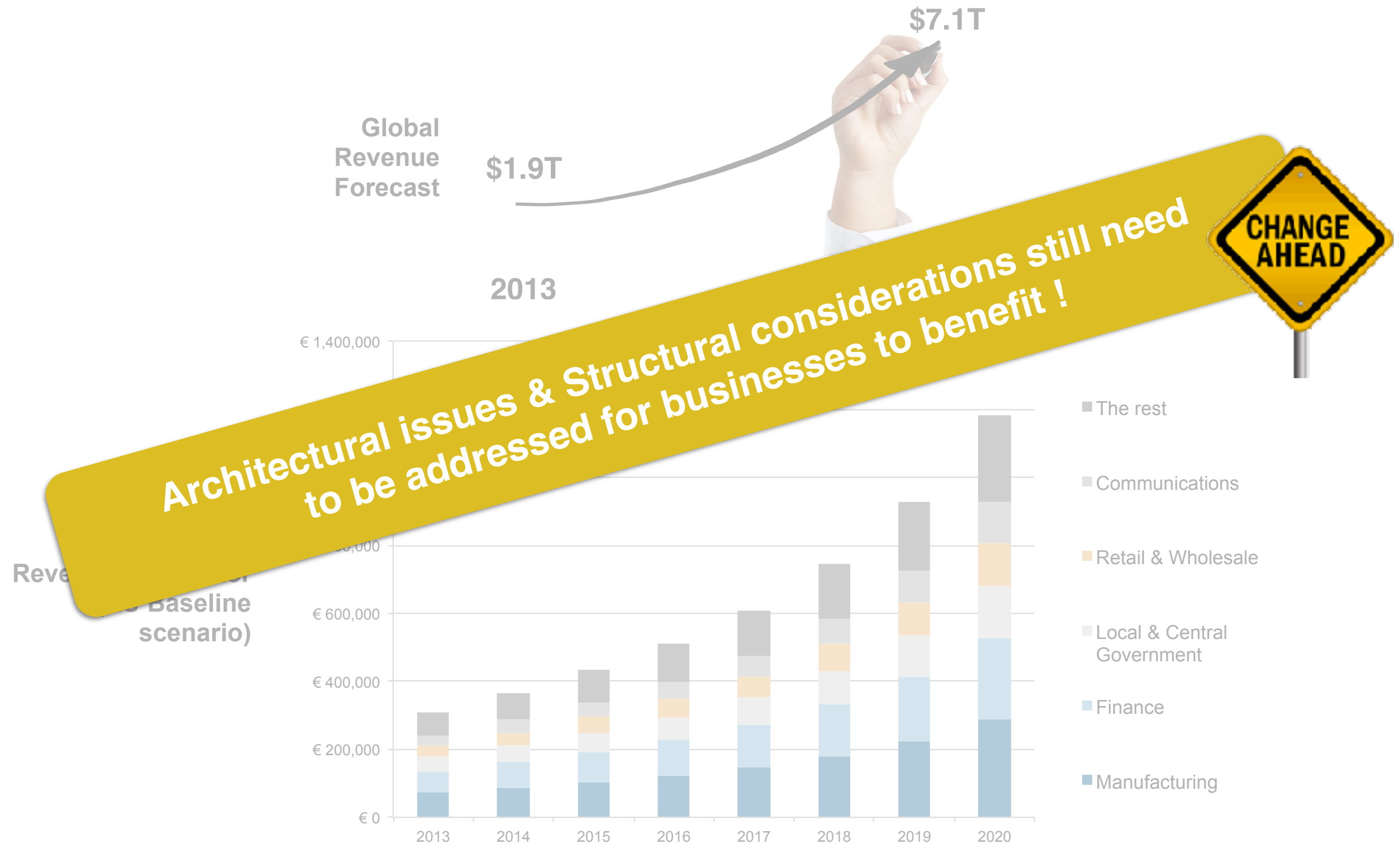
Source: O. Vermesan, P. Friess, P. Guillemin, S. Gusmeroli, et al. (2011) “Internet of Things Strategic Research Agenda”, Chapter 2 in *Internet of Things - Global Technological and Societal Trends*, River Publishers, ISBN 978–87-92329–67-7

IoT— The road ahead



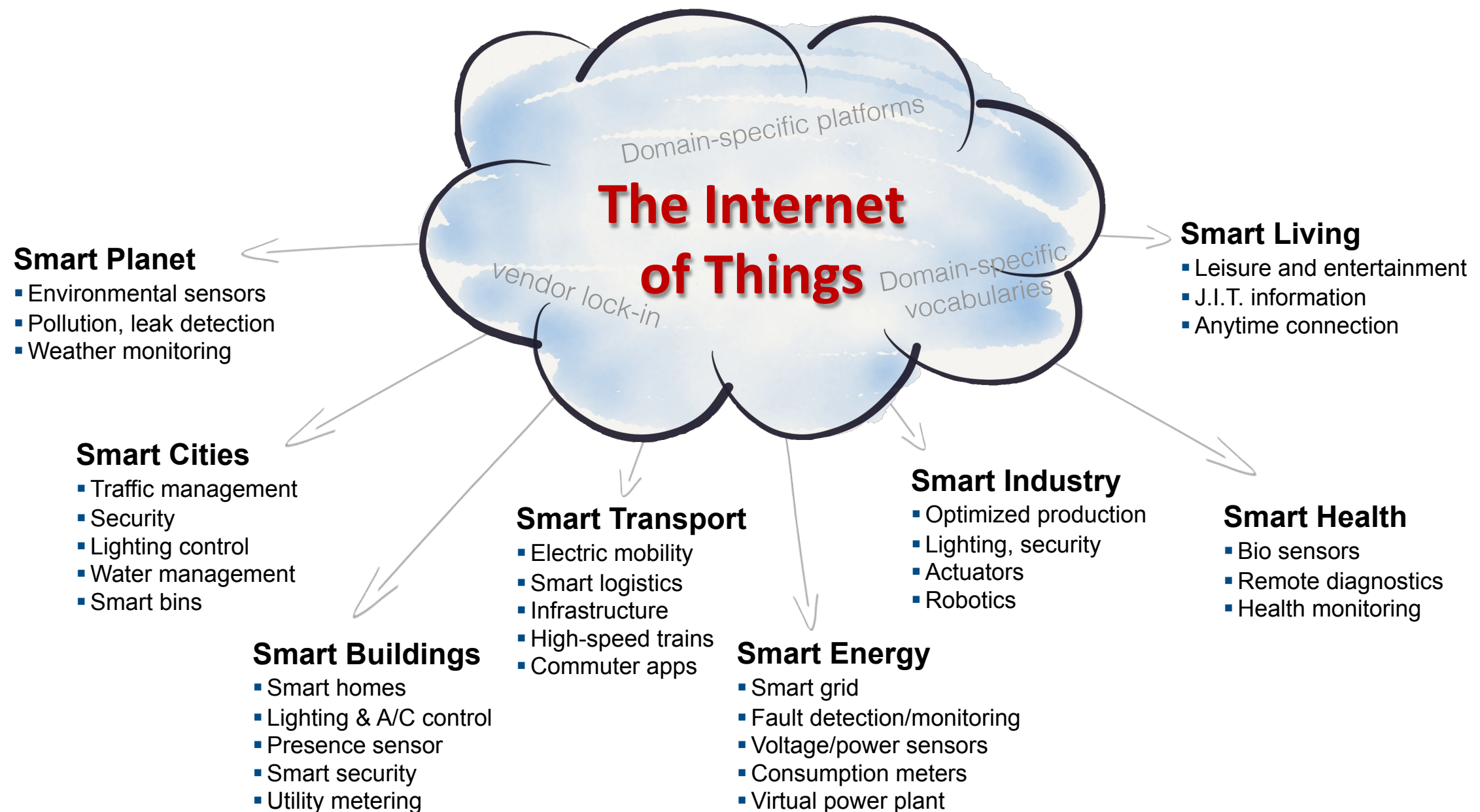
Source: Definition of a R&I strategy leveraging The combination of IoT & Cloud for DG CONNECT

IoT— The road ahead



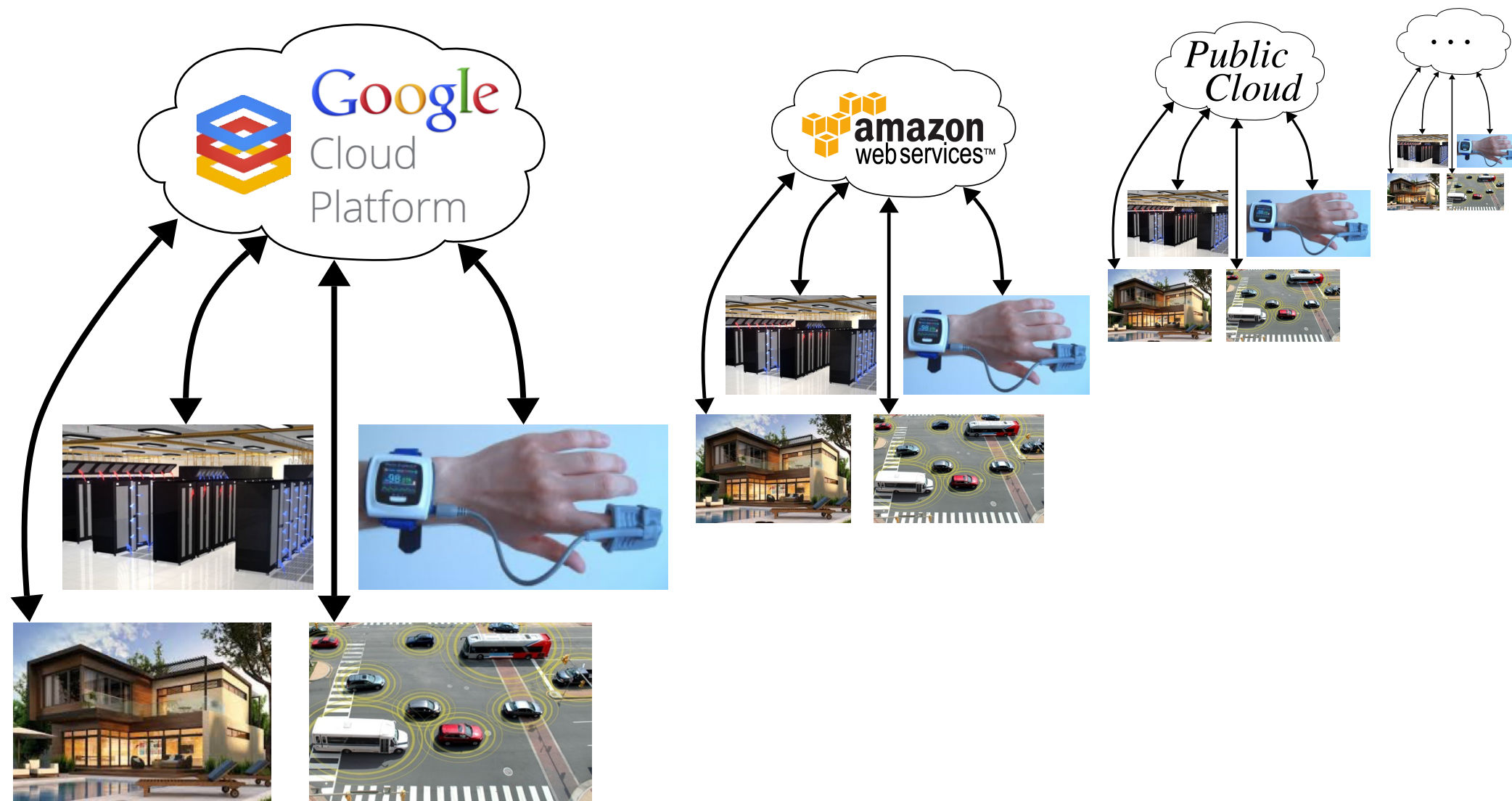
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IoT— The road ahead



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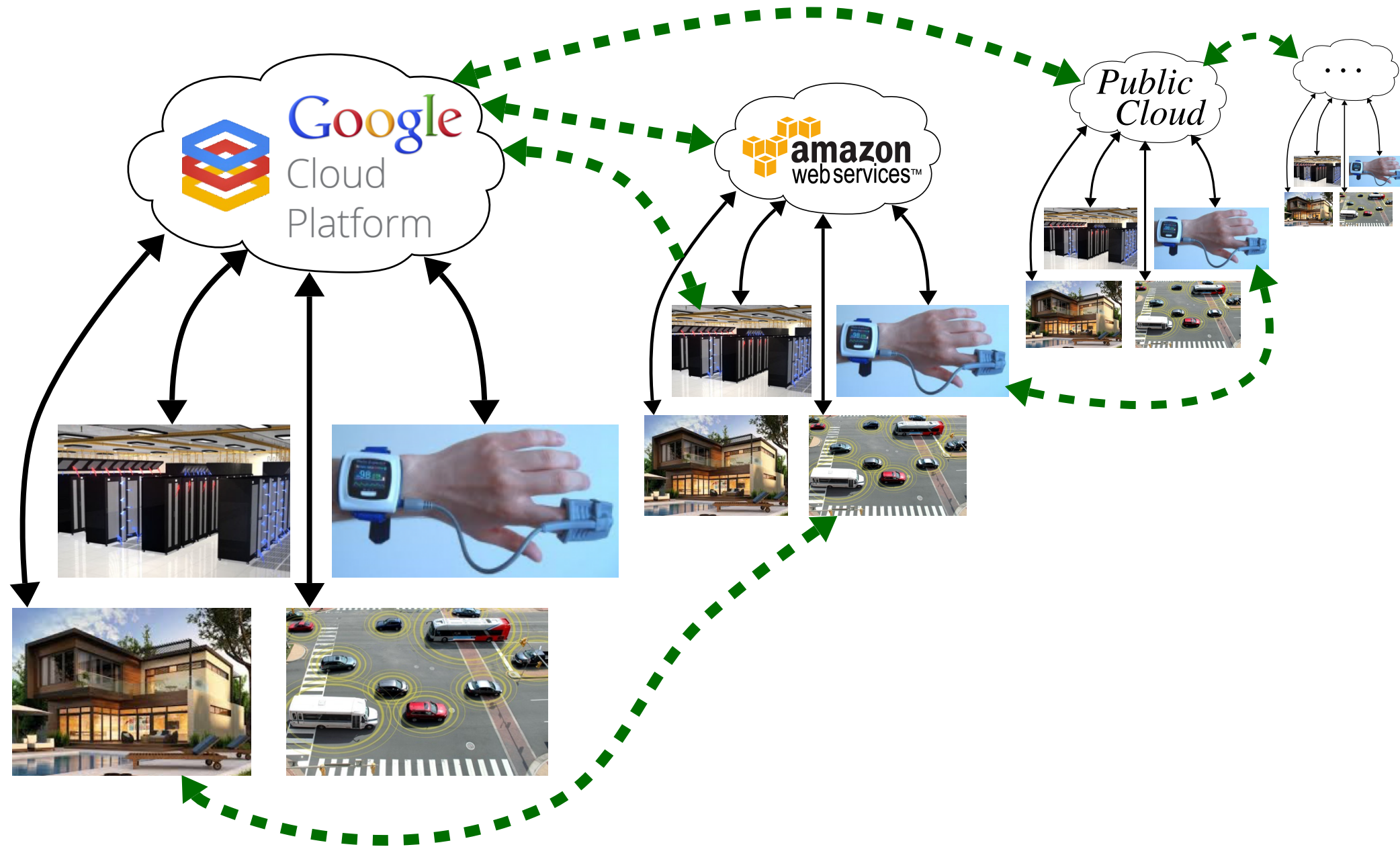
IoT— The road ahead





Legend

↔ Today's IoT : Data collected into vertical silos (pushed to vertical servers)

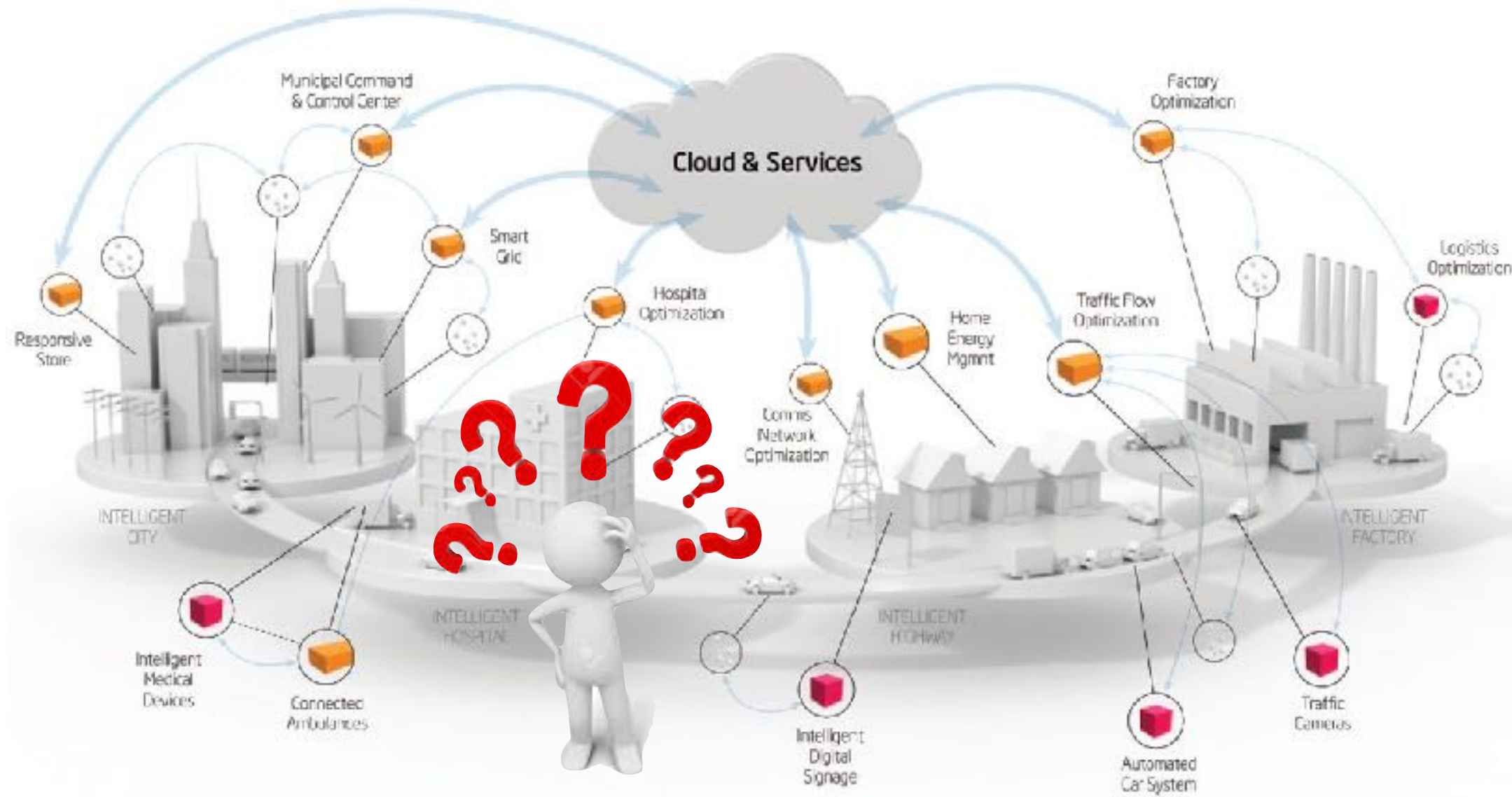
IoT— The road ahead



Legend

-  Today's IoT : Data collected into vertical silos (pushed to vertical servers)
-  Ideal IoT : Communication allowed between vertically-oriented closed systems

IoT— The road ahead



Major ICT players hand over customer data and are not willing to let the customers have a full end-to-end control, resulting in user frustration;

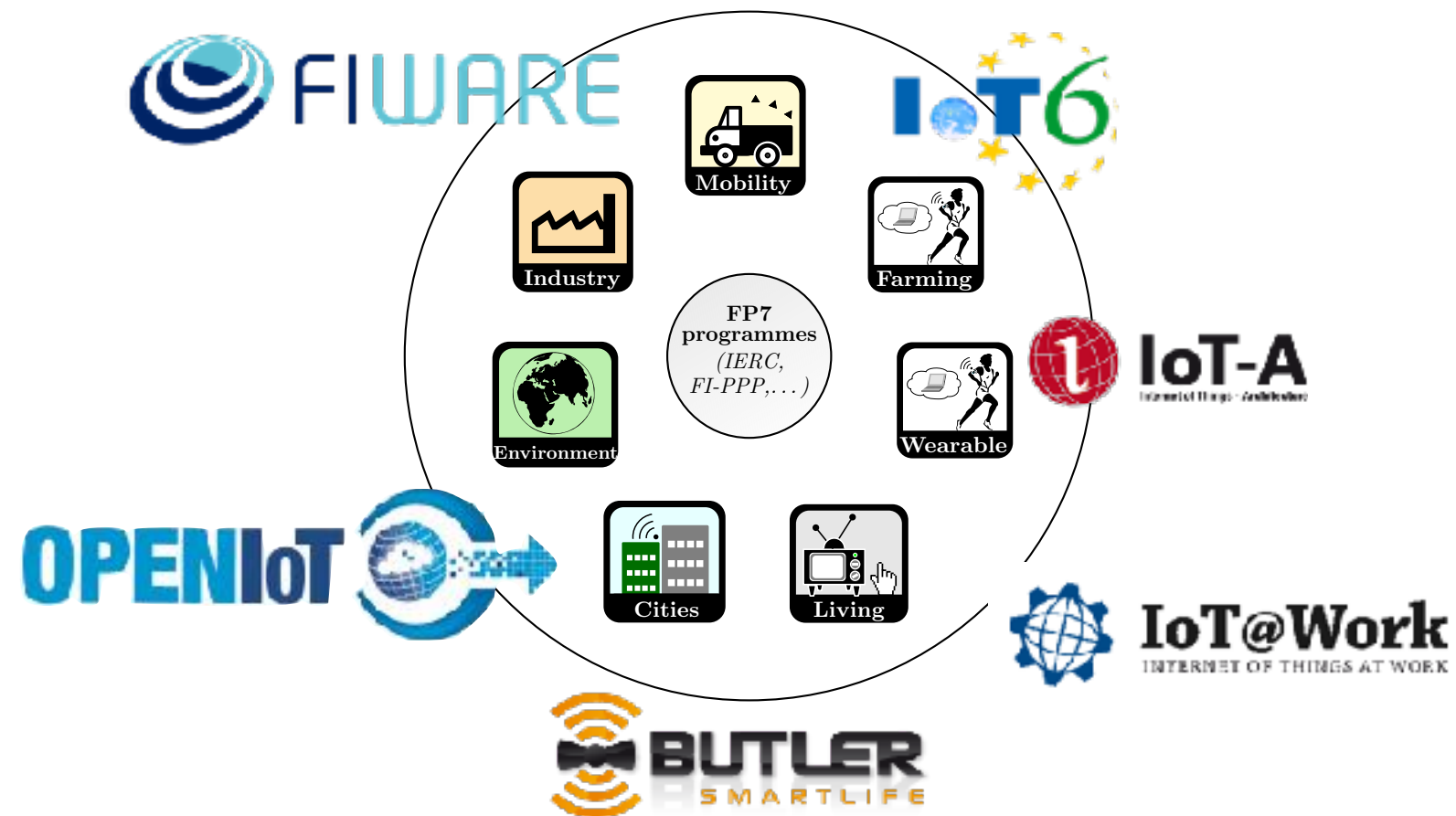


The non-maturity of the IoT makes it challenging to develop a clear approach to foster innovation, trust and ownership of data, while at the same time respecting security and privacy in complex environments.

SUMMARY

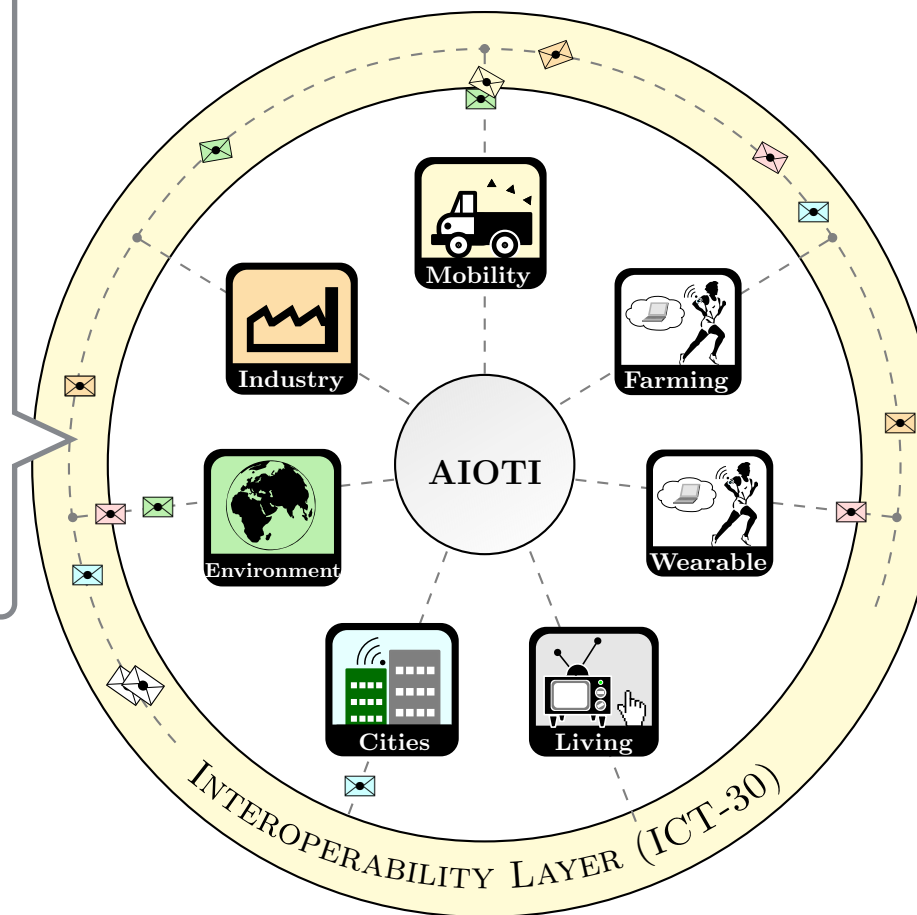
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- **EU's Vision & Ambition**
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EU's Vision & Ambition




EU's Vision & Ambition

<http://www.aioti.eu>



Project Name	Integration of devices	Creation of platforms	Interoperable APIs	Autonomous reasoning
<i>AGILE</i> – Adoptive gateways for diverse multiple environments	✓	✗	✓	✗
<i>BIG IoT</i> – Bridging the Interoperability Gap of the Internet of Things	✗	✓	✓	✓
<i>bIoTope</i> – Building an IoT oPen innovation ecosystem for connected smart objects	✗	✓	✓	✓
<i>INTER-IoT</i> – Interoperability of heterogenous IoT platforms	✓	✓	✓	✗
<i>symbIoTe</i> – Symbiosis of smart objects across IoT environments	✓	✓	✗	✗
<i>TagItSmart</i> – Smart Tags driven service platform for enabling ecosystems of connected objects	✓	✓	✗	✗
<i>VICINITY</i> – Open virtual neighbourhood network to connect intelligent buildings & smart objects	✗	✓	✓	✗

Project Coordinator

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Project Consortium

-  **EPFL**: École Polytechnique Fédérale de Lausanne (Switzerland)
-  **Uni.lu**: University of Luxembourg (Luxembourg)
-  **Fraunhofer IAIS**: Fraunhofer Institute for Intelligent Analysis and Information Systems (Germany)
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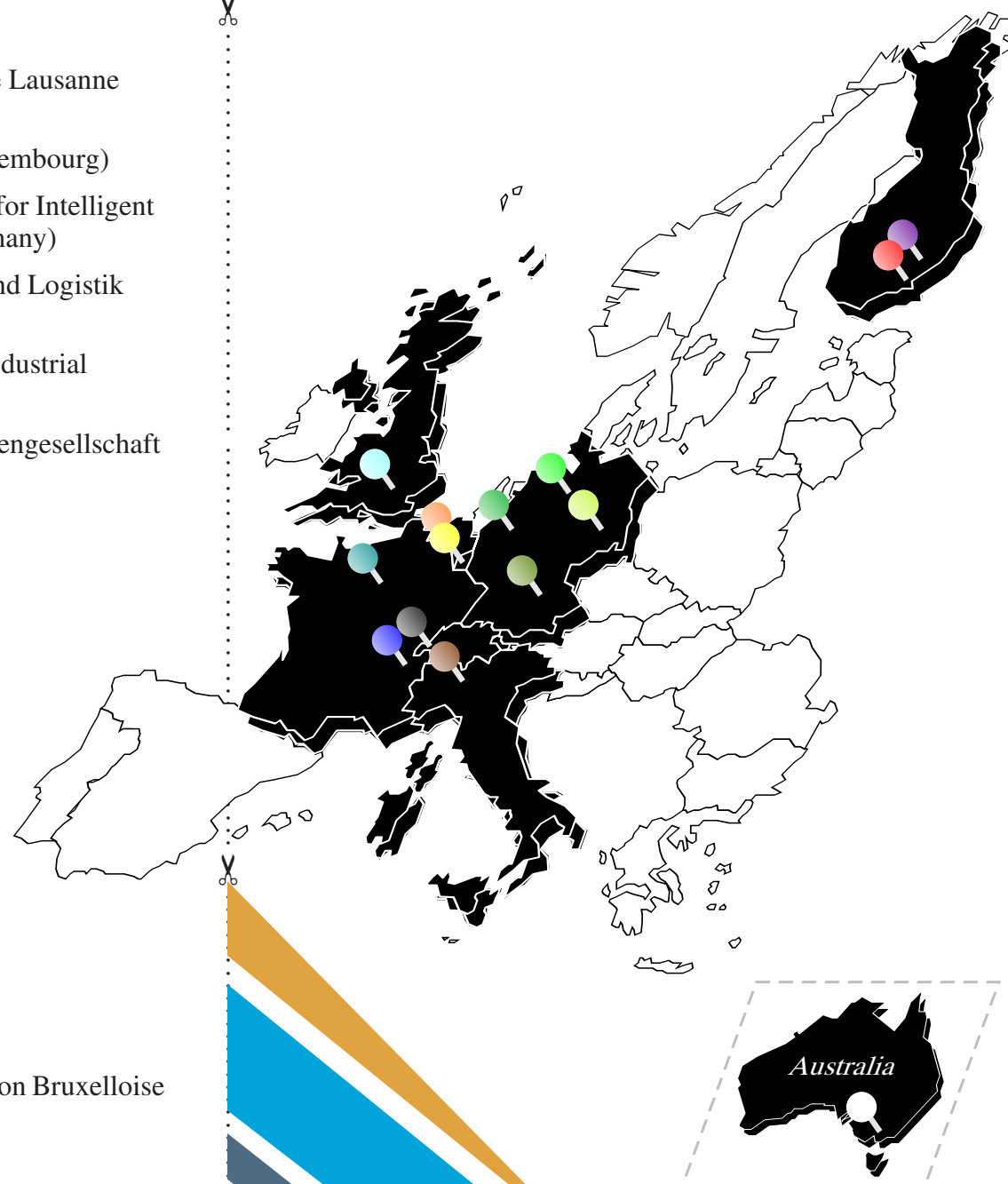


This project has received funding from the European Union's H2020 Programme for research, technological development and demonstration under grant agreement n° 688203.



Visit & Join us

- www.bIoTope-project.eu
- Twitter: @bIoTope_project

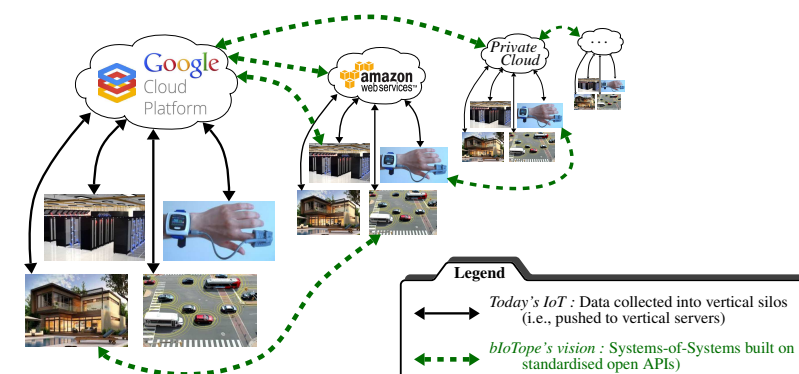


Building an IoT Open Innovation Ecosystem for Connected Smart Objects



Scope & Objectives

The Internet of Things (IoT) brings opportunities to create new services and products, reducing costs for societies, and changing how services are sold and consumed. A critical obstacle to further IoT innovation is the “vertical silos” that shape today’s IoT landscape. These silos impede the creation of cross-industry, cross-platform and cross-organisational services due to their lack of interoperability and openness.



bIoTope lays the foundation for creating open innovation ecosystems by providing a platform that enables companies to easily create new IoT systems and to rapidly harness available information using advanced Systems-of-Systems (SoS) capabilities for Connected Smart Objects – *with minimal investment*.

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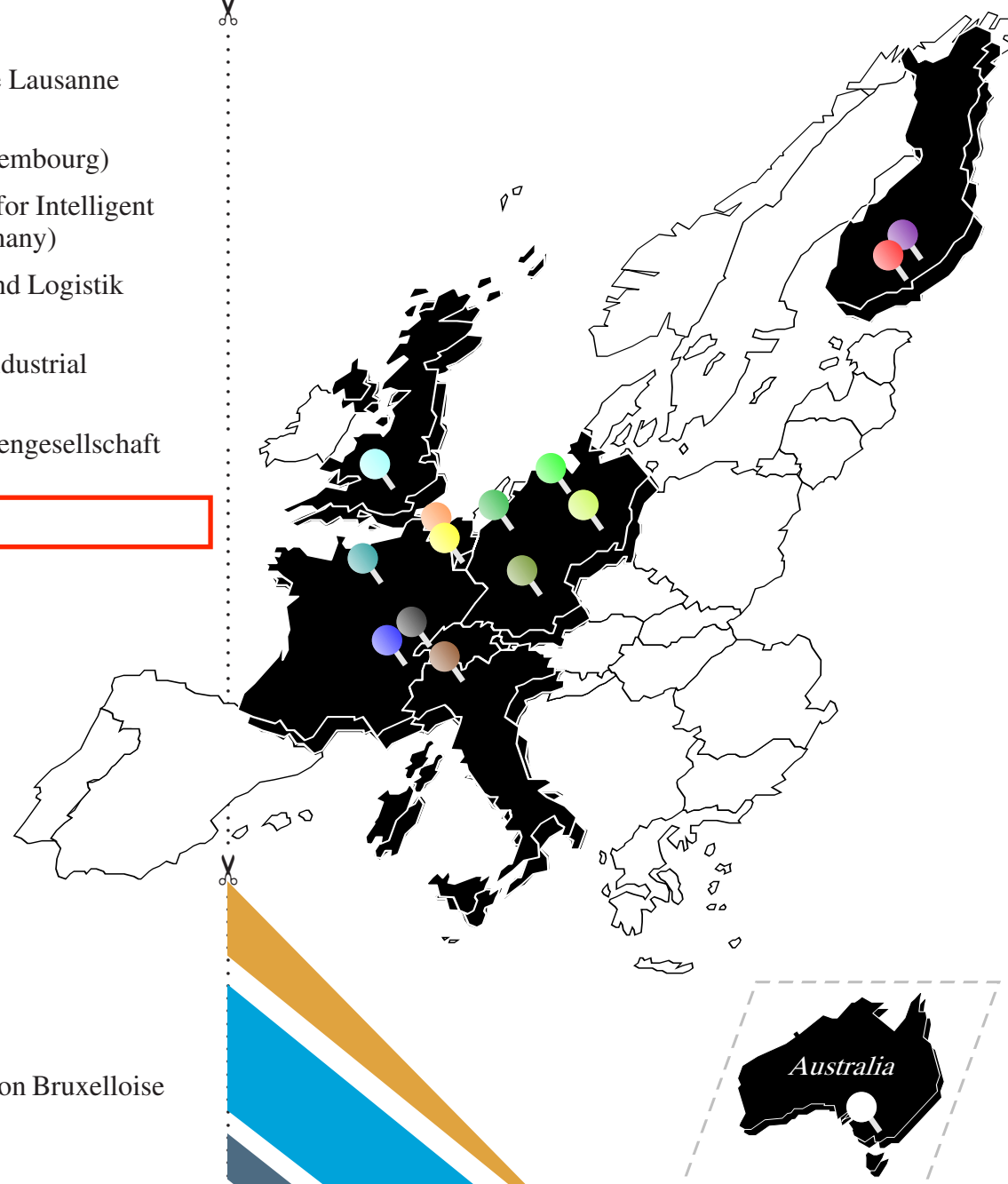


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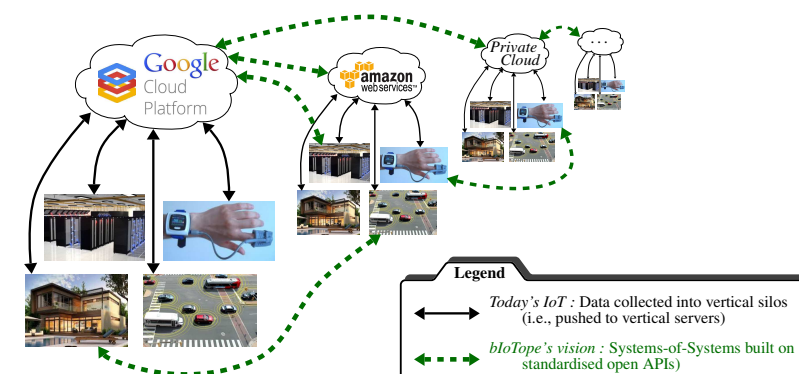


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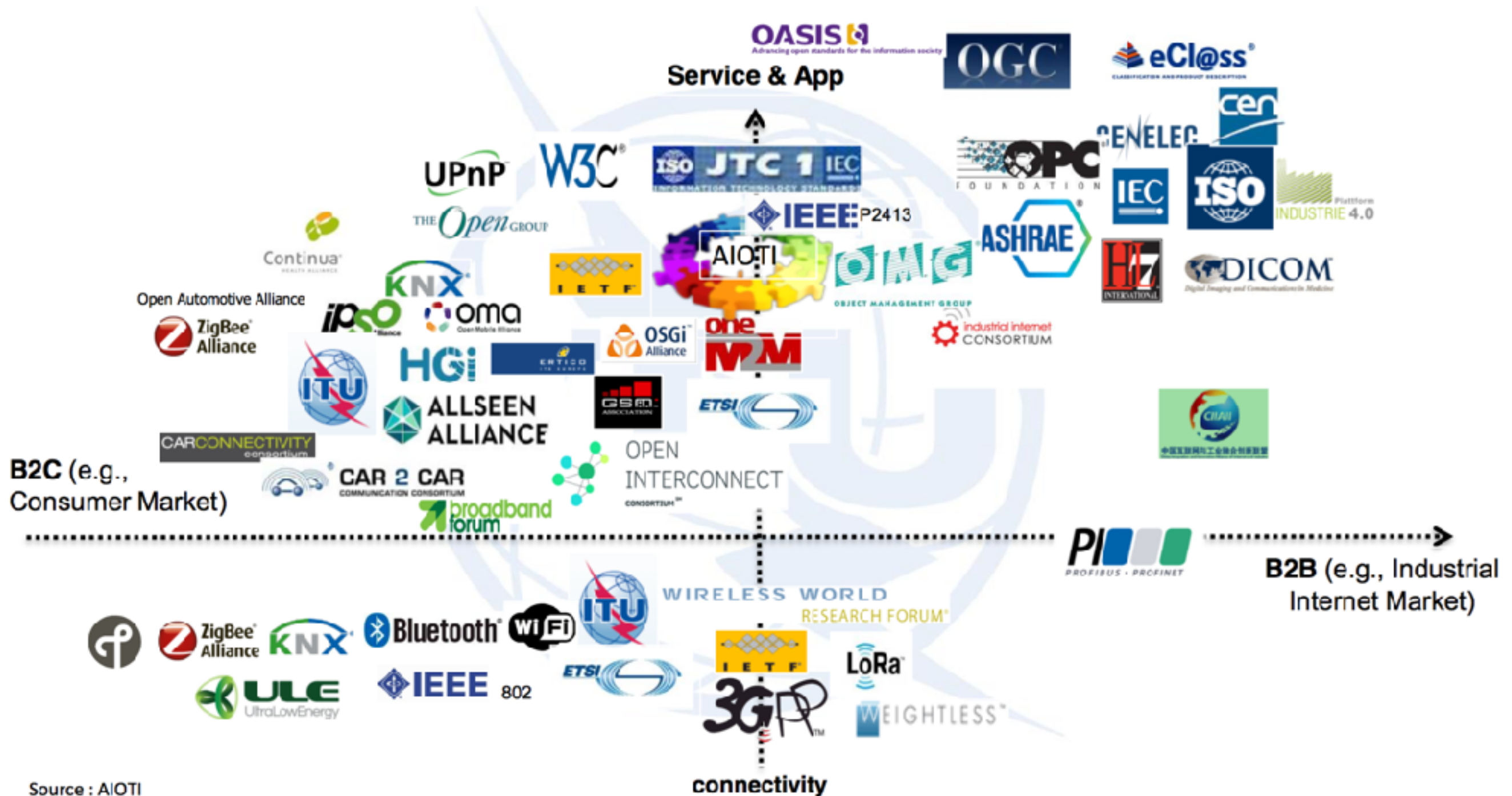
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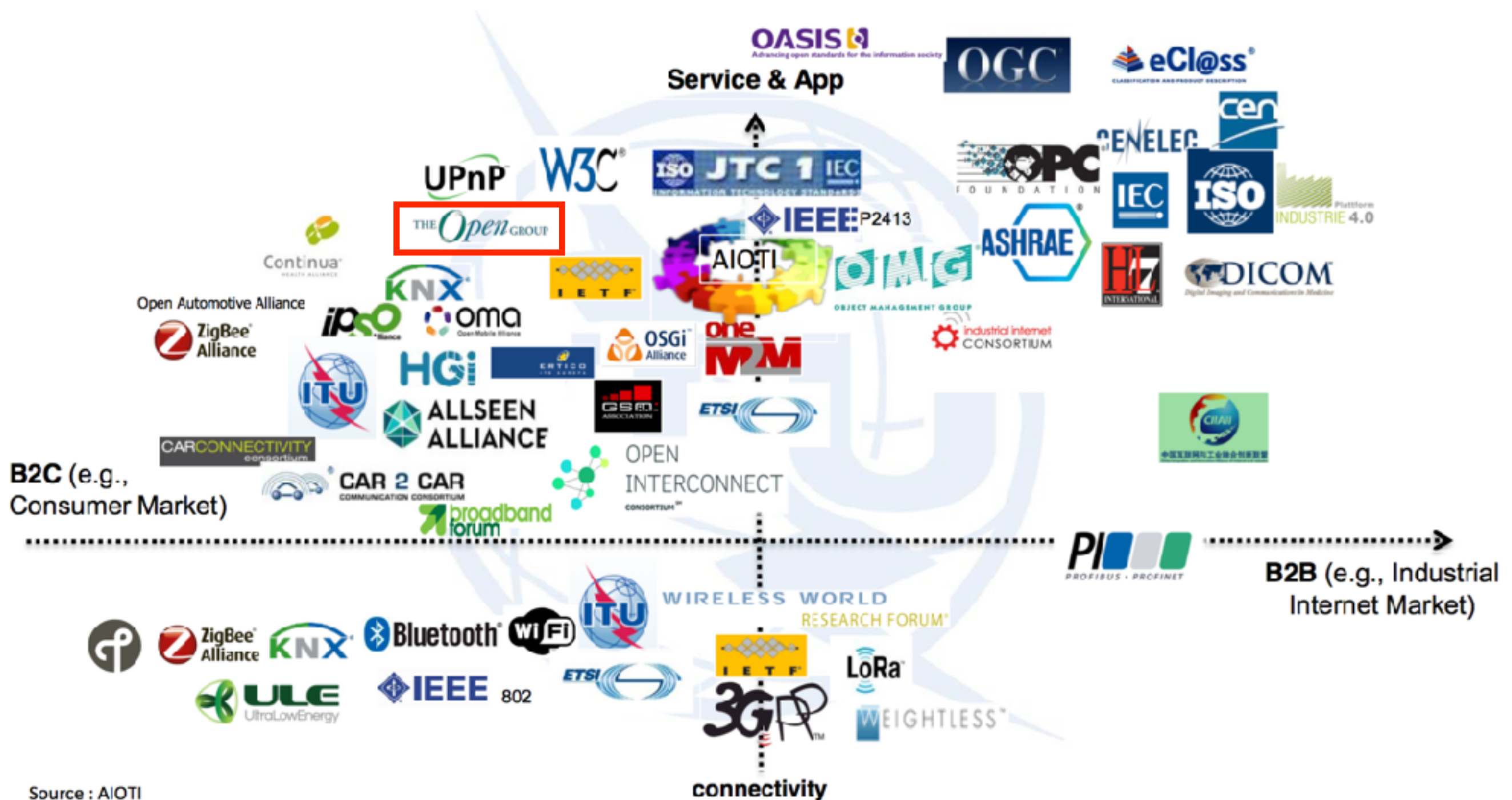


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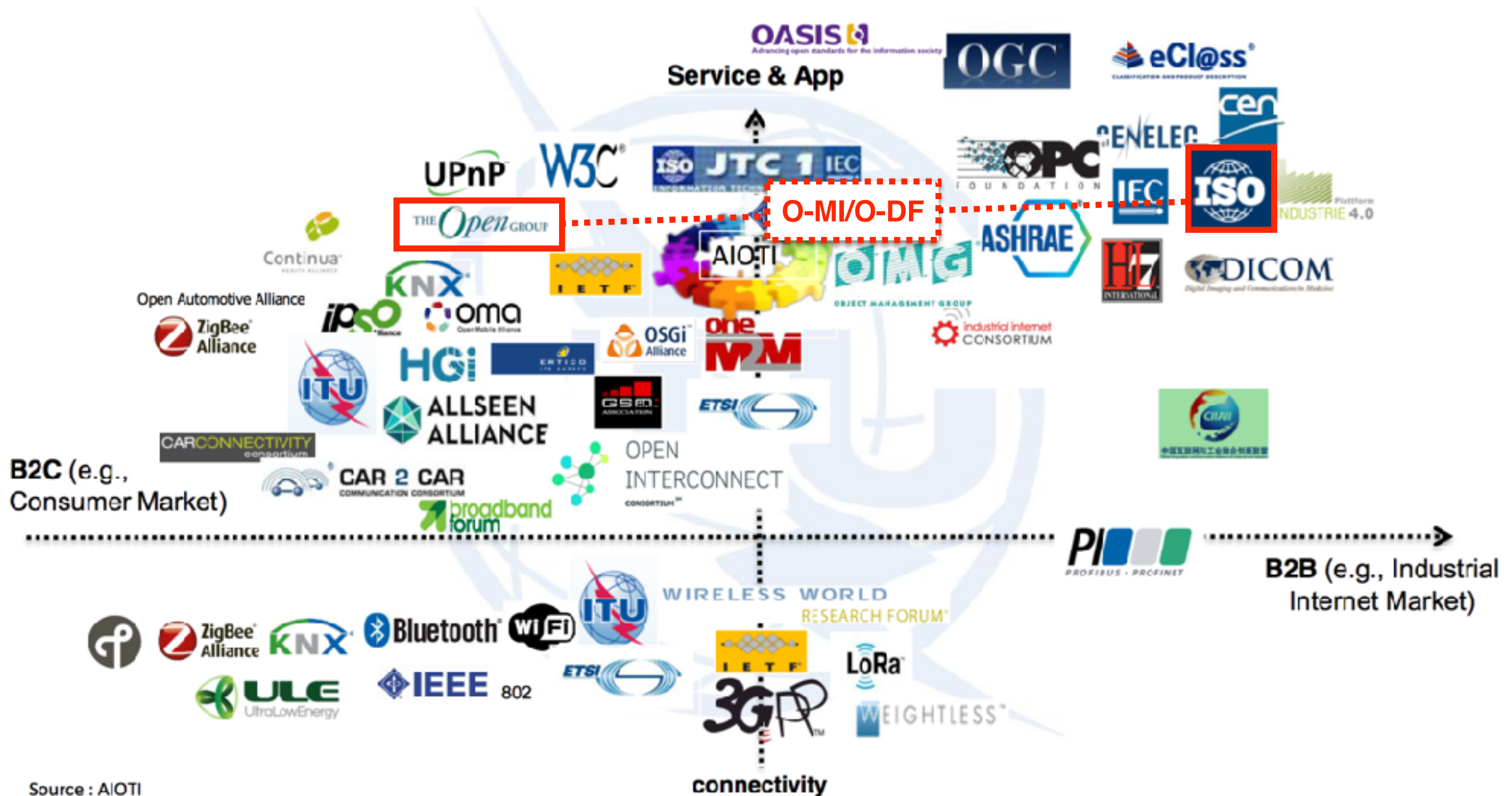
IoT— The road ahead



IoT— The road ahead



IoT— The road ahead



Source : AIOTI

IoT— The road ahead



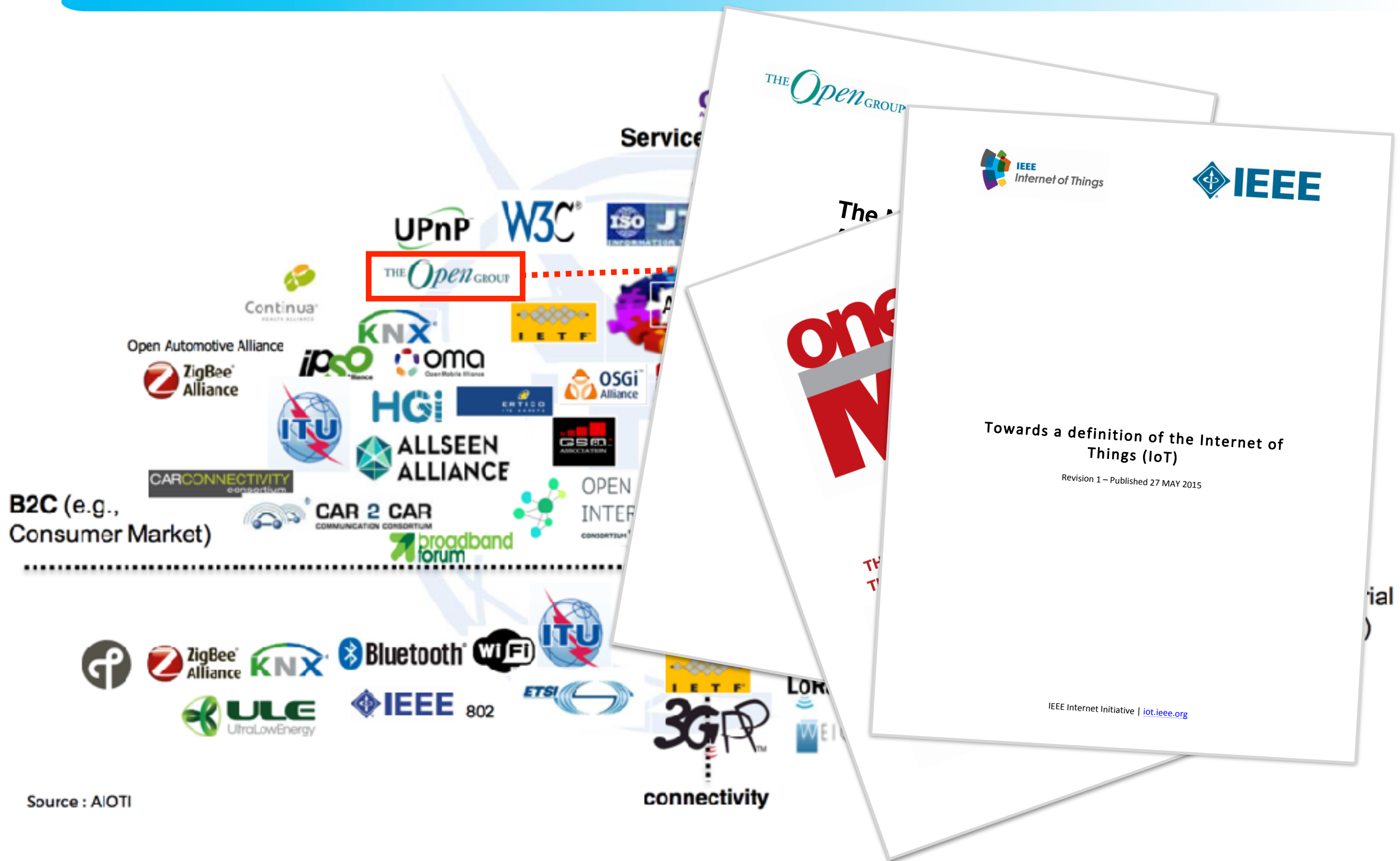
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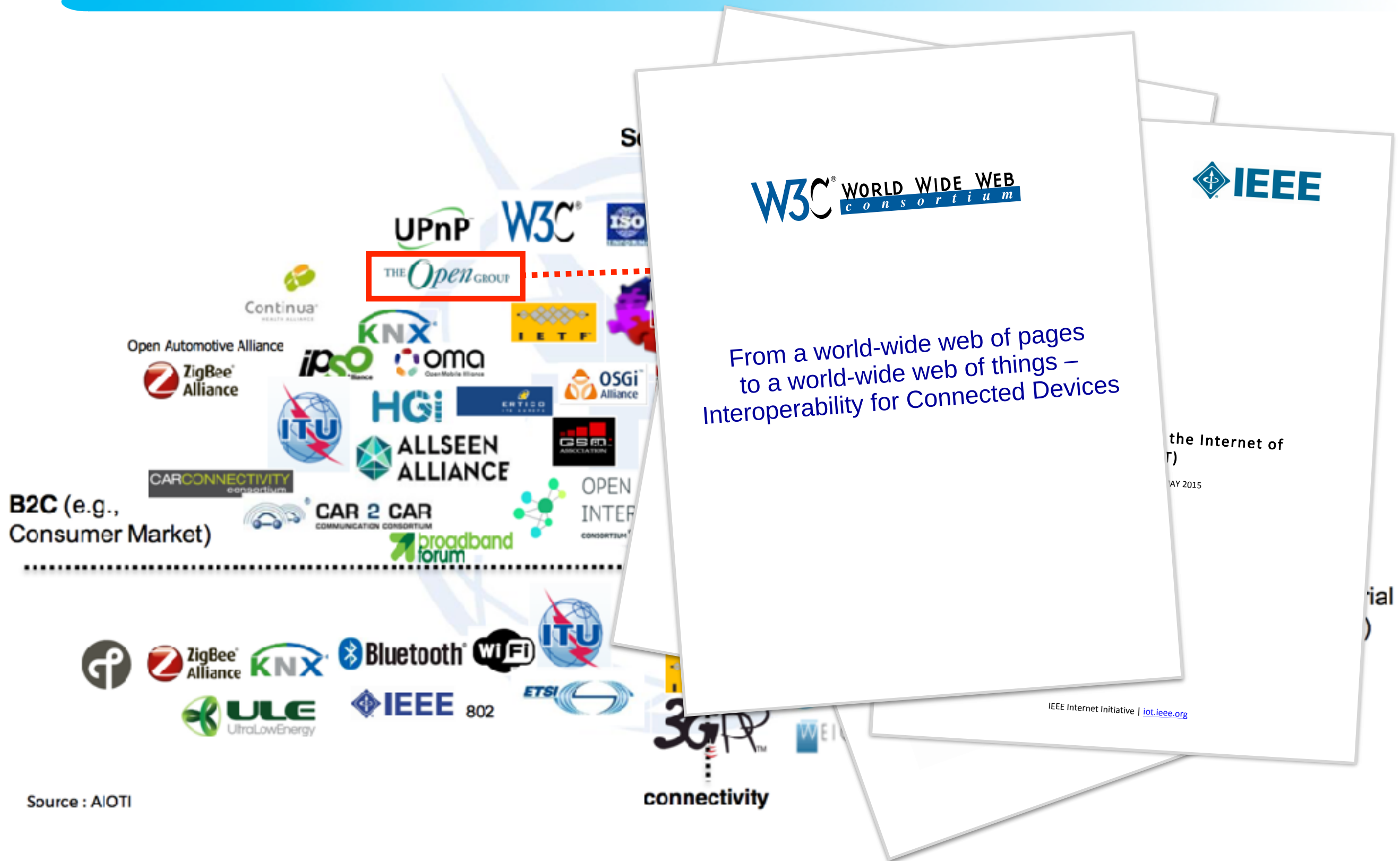


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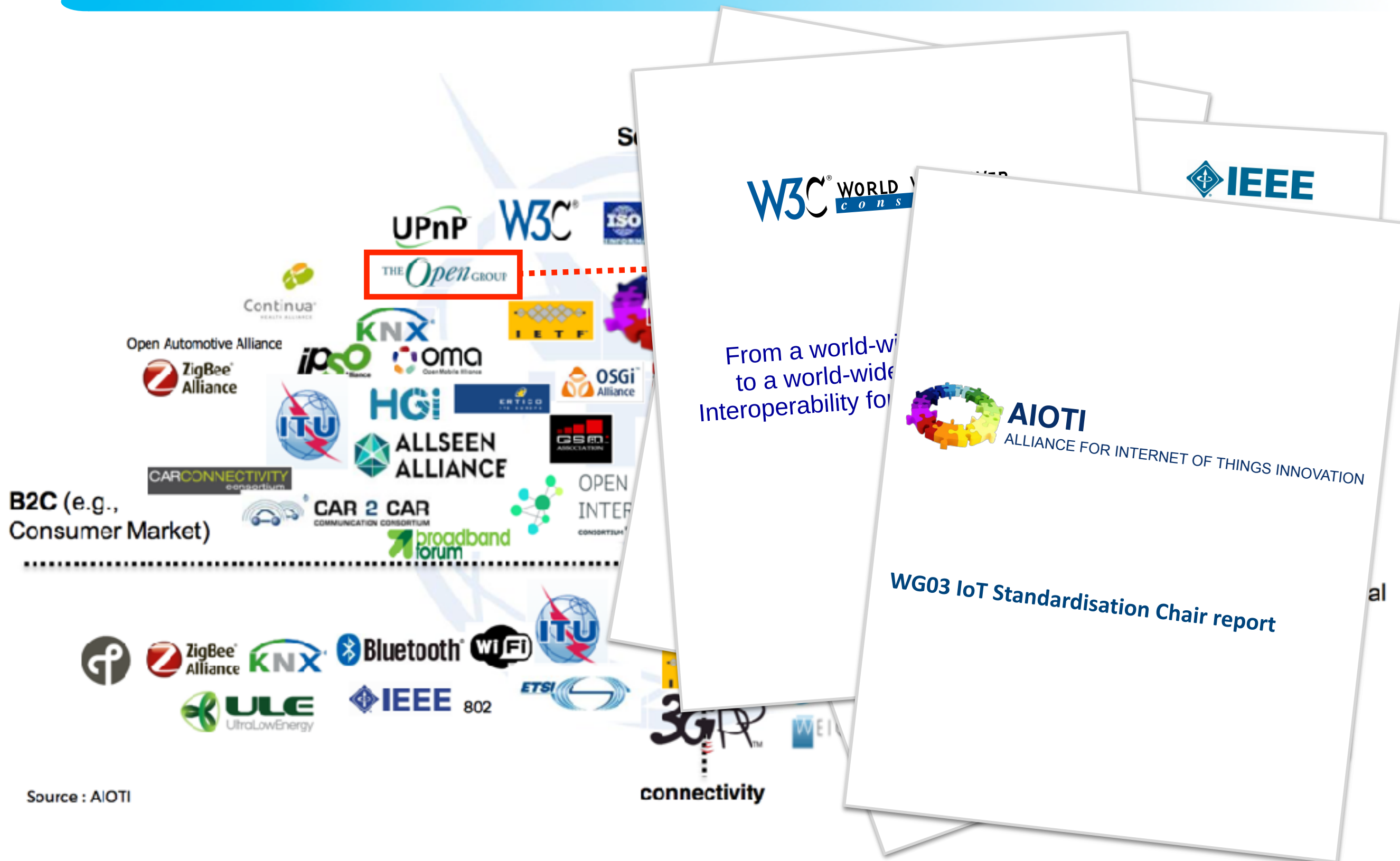
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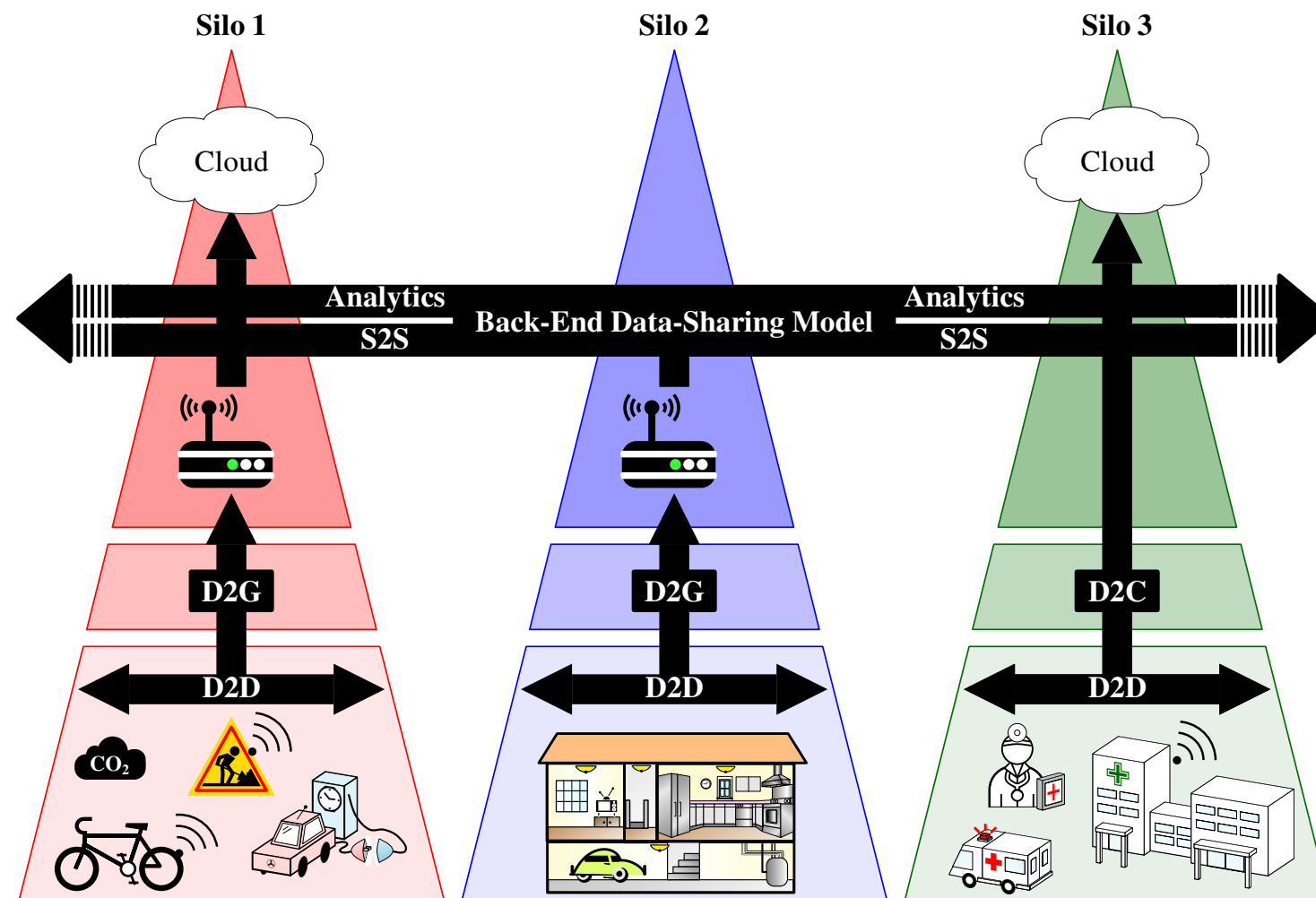
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Towards Open IoT ecosystems

Architectural Considerations



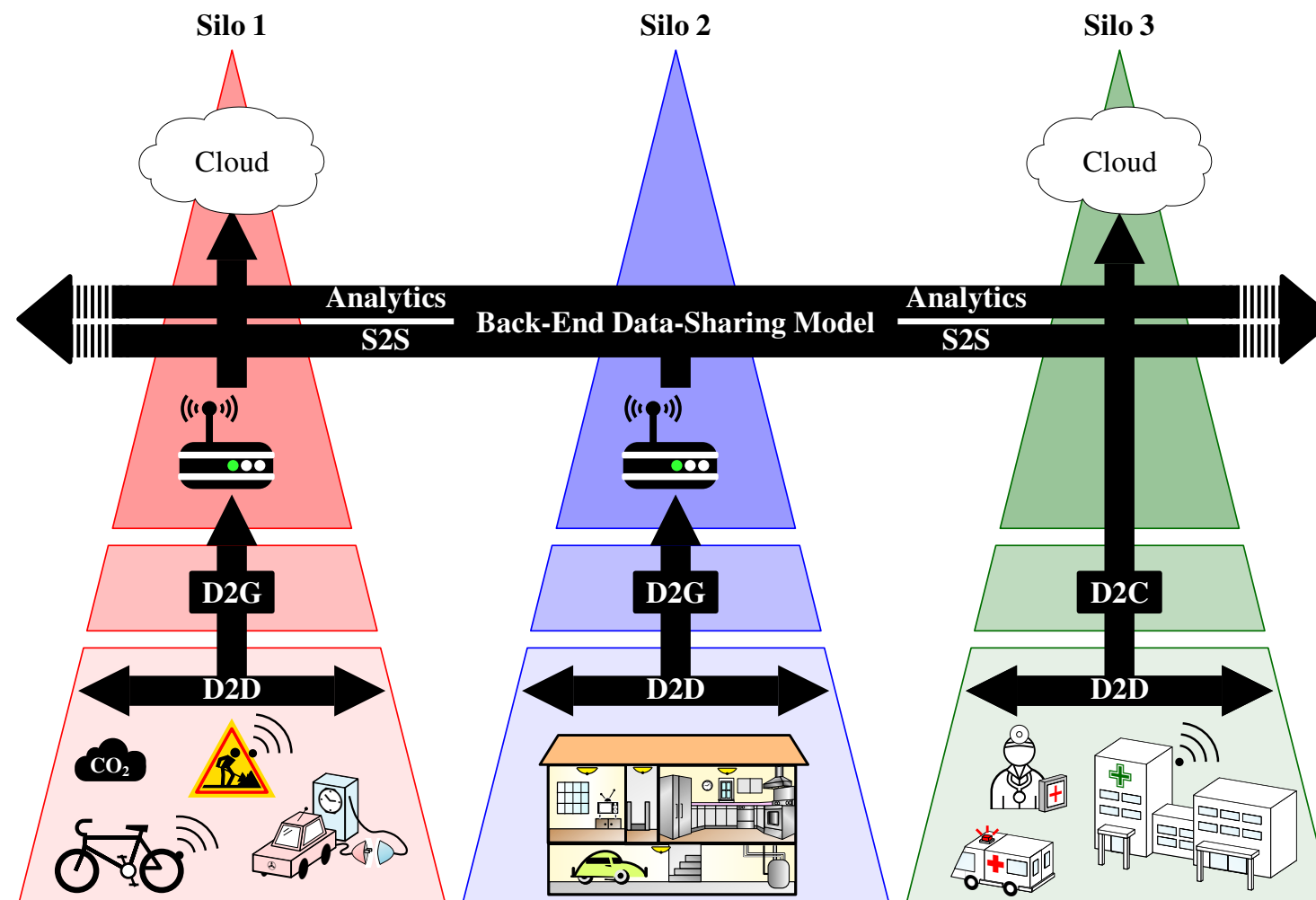
D2D : Device-to-Device D2G : Device-to-Gateway D2D : Device-to-Cloud S2S : Server-to-Server

Four common **IoT communication models (RFC7254)**:

- Device-to-Device (D2D)
- Device-to-Gateway (D2G)
- Device-to-Cloud (D2C)
- Backend Data Sharing Model (S2S + Analytics)

Towards Open IoT ecosystems

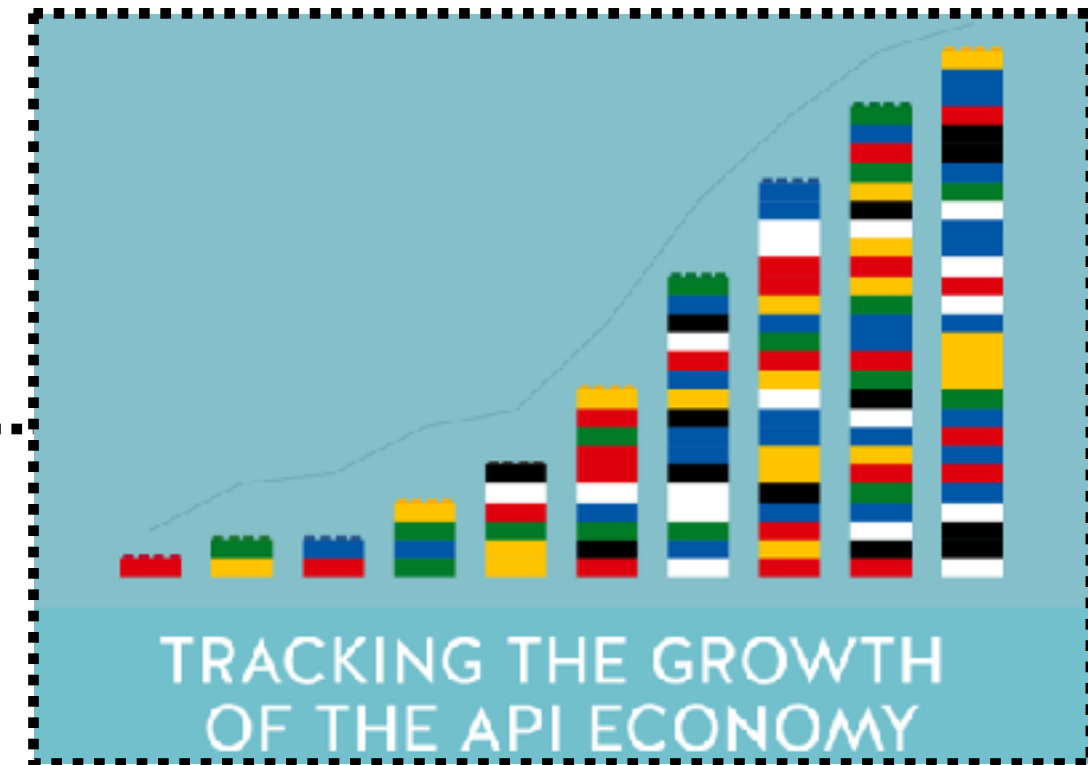
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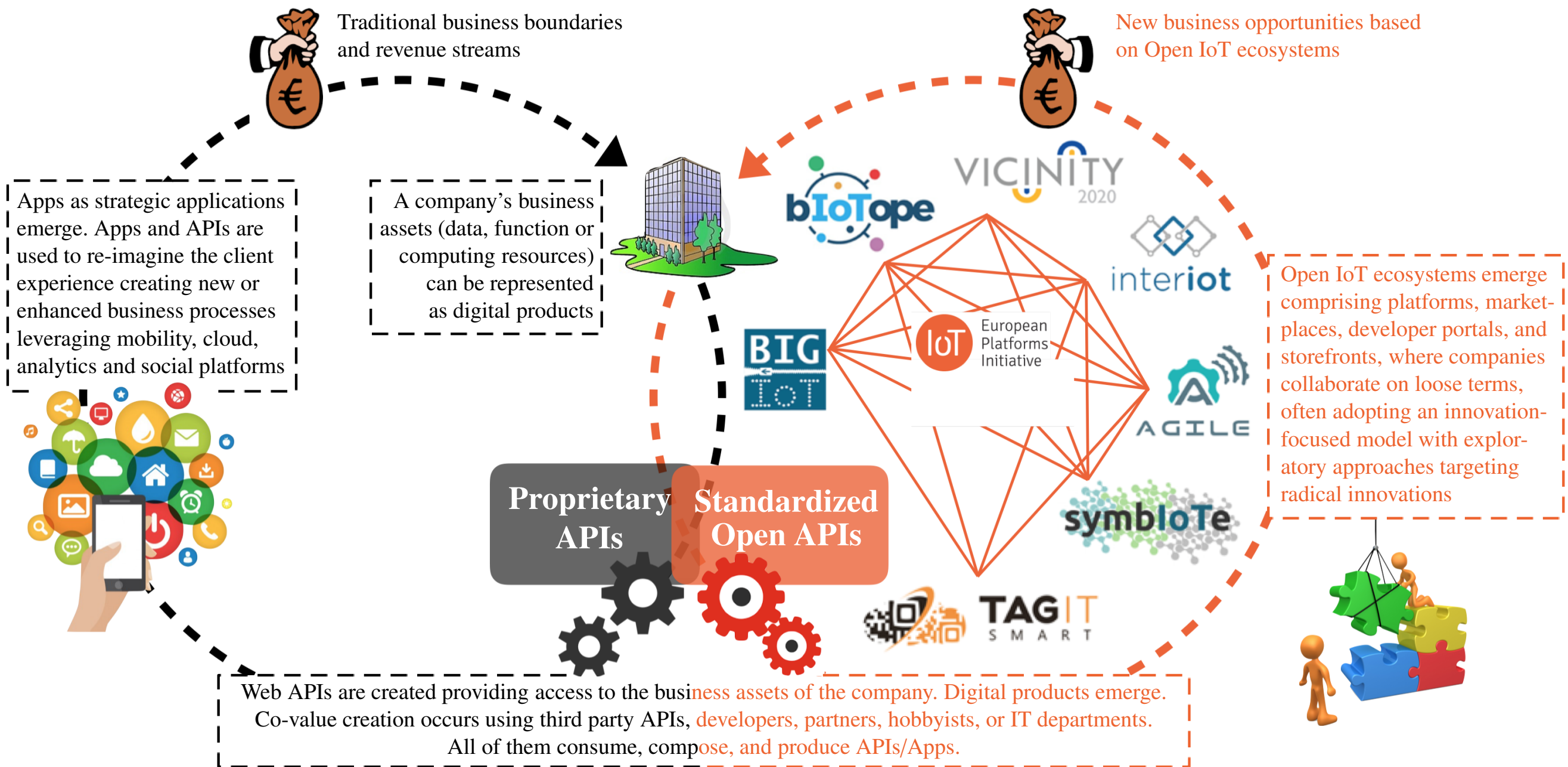
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Towards Open IoT ecosystems

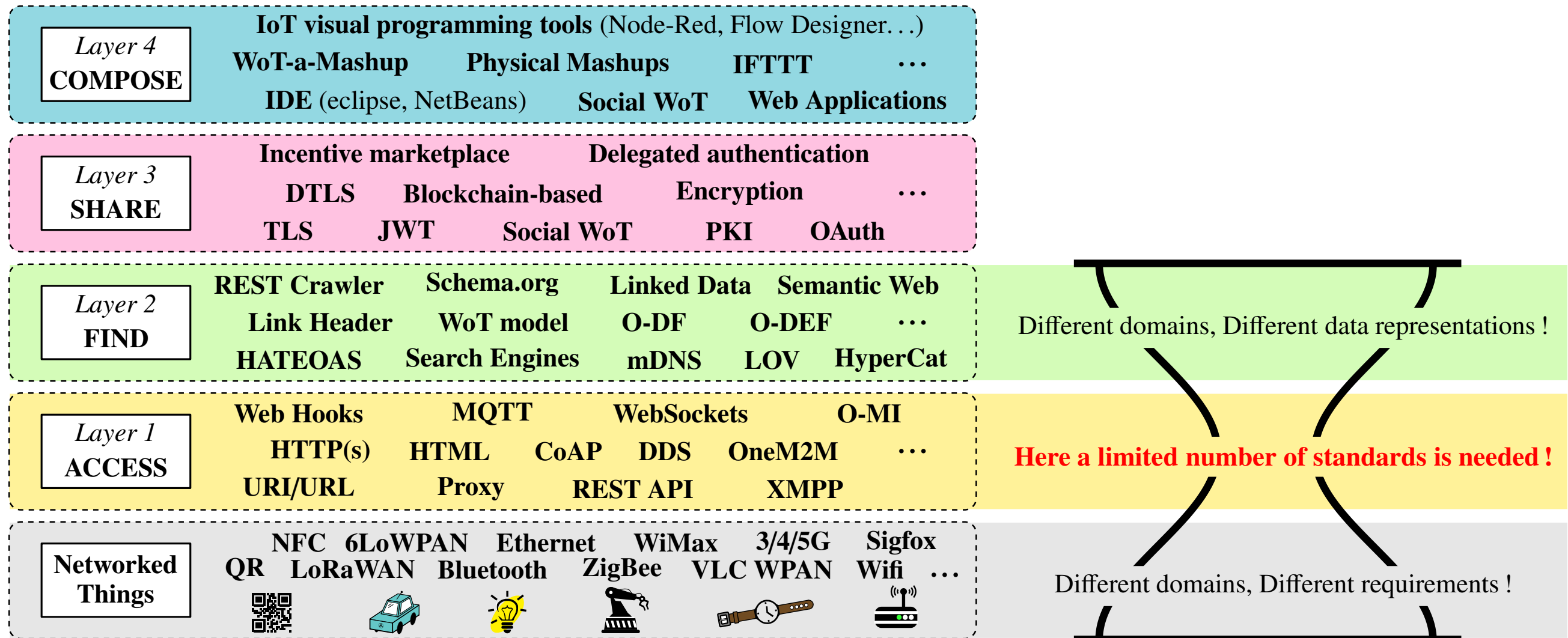
A growing API economy



Source: Robert, J., Kubler, S., Kolbe, N., Cerioni, A., Gastaud, E. and Främling, K., 2017. Open IoT Ecosystem for Enhanced Interoperability in Smart Cities—Example of Métropole De Lyon. *Sensors*, 17(12), p.2849.

Towards Open IoT ecosystems

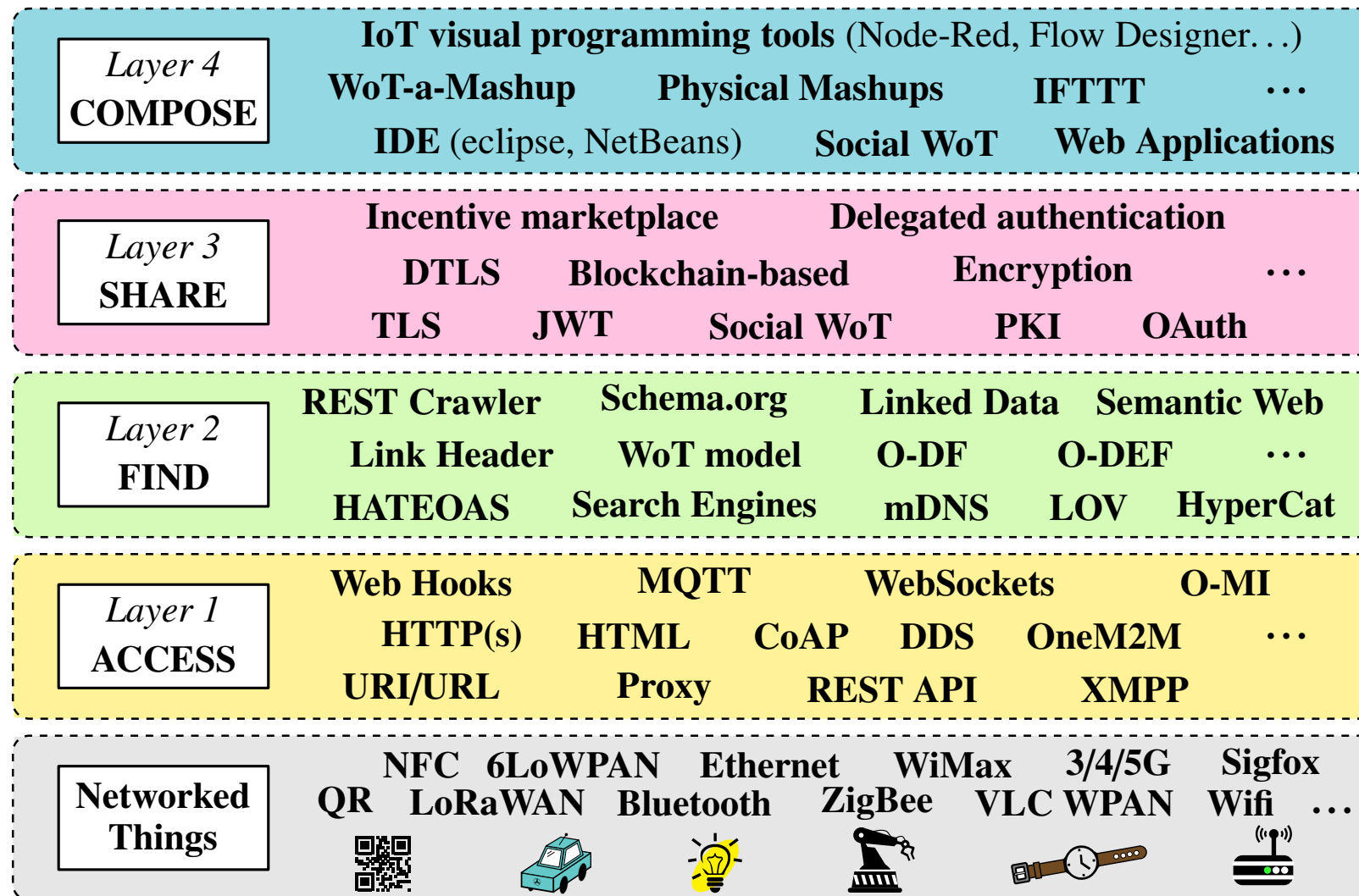
What about a striving Web of Things?



Source: Robert, J., Kubler, S., Kolbe, N., Cerioni, A., Gastaud, E. and Främling, K., 2017. Open IoT Ecosystem for Enhanced Interoperability in Smart Cities—Example of Métropole De Lyon. *Sensors*, 17(12), p.2849.

Towards Open IoT ecosystems

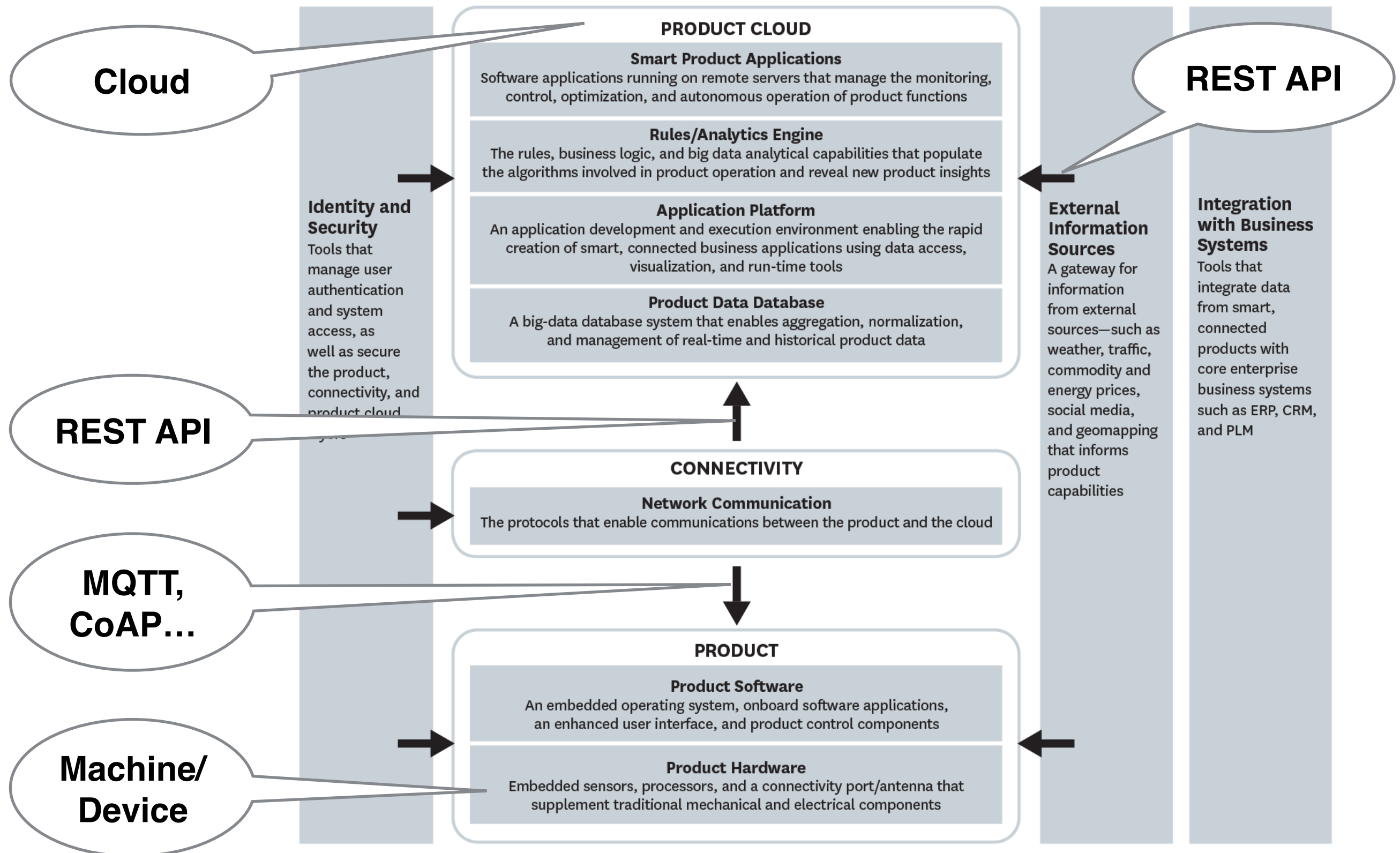
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Towards Open IoT ecosystems

A typical vertically-oriented closed platform



Applications (Verticals)

Personal Devices

Wearable Computing

pebble cookoo rucan
iM GLASS R
striv AFX MOTA
Opower M

Fitness

GARMIN Nike+ smartScale amigo iFIT
JAWBONE HIFIT VIBRANT BASIS fitbit
TOMTOM URBAN WHOOP

Health

LUMO nanower veyo kinsol
HAPIfork soundhawk SPIRE Withings
QUANTILIS Lively SCARABEE
GEMMA helio Nivico iHealth
FEMICE melon converis TELICARE

Family

FILIP Sproouting ovuline AmberHort
greatcall Good Night Lamp
OWLET Secur BELLASAI
mimo Clow pocketfinder

Lifestyle

Sports

SOBI Brain Sentry BINESPINE
InfoMotion swingbyte HAMMERHEAD

Cooking

Smart Die Scale ANOVA drop
blossom iDevices
THE ORANGE CHEF CO. portry nomiku

Pets

Whistle PetPace pintFeed PetHub
Lagg BISTRO haytag PetChaz
Petcube Tracine Pathtot giti Petzill

Toys

KAROTZ TROOP MAKIES
Kixy UBOOLY
SEEGO

Music/Video

ROLI CATCH GoPro
GARDEN plantlink BITPONICS radio EDIN
Greenbox Koubachi

Connected Home

Automation

Quirky Radiator Labs nrelatmo LEVITON
SmartThings Ubi nest LIFX gecko
iFTTT CRESTION smarthome OULTRON
ECO2000 Advancedumens vivint.SAVANT
ERSTEON ZUMBERLIN PROHECT

Monitoring

lapka sense birdi
BlueMaestro SUPERMECHANICAL leeo
knut CUBESENSORS tado° ambient

Security

HomeNinja dropcam canary ring
August Schlage RAVEN Kwikset
gobosense genie UNICOM OP LINK
GOJI scout nSmartAlarm seve

Tracker

Chipolo LinQ Lucca! TrackR

Hub

Romey revolu NINJABLOCKS
Control LOUIS nexia amussley zonoff
STUFFS

Industries

Retail

Prophet JVI ELA bytelight euclid
Perich Boni Fugitum PassiR
VerFone LoyalUp billy

Payment/Loyalty

Square shopify PayPal 3S
VerFone LoyalUp billy

Healthcare

VISI Senseonics STANLEY
VITALITY MedMinder (LifeTracking)
CENTRAC indigent Solara

Automotive

Zbie fix MOJO INRIX
navdyDELPHI dash wazeOpenXC

Infrastructure

vivint Beam kiss Johnson Controls
Trimble Robin Schneider

Agriculture

ARBUS Zed
adopt-N

Industrial Internet

Robotics

Double Robotics ALDOREX INNOVET YENEX
ROBOTECH EMPIRE Robots KUKA
VEX AN LIQUID ROBOTICS jbo

Drones/Aerospace

3DR KMJ evo 11
SKYWATCH spire dji
Parrot Skybotix

Green-tech

Highly enlightened Smart
Genevo compology AMPY

3D Scary Print

MakerBot dp Stryker HIREL 3D
Formlabs MED ph mottopart
FUEL3D AIG NEXTENGINE RepRap
ocropal DAVID FSLD Solidoodle

Smart Grid

GRIDNET e-on SilverSpring
SMART Itron Trilliant

Asset Tracking

Uggp 4 value NESA-DETHA
CISCO TOSHIBA SHARP

Platforms & Enablement (Horizontal)

Connectivity/Dev Platforms

spark kymeta
pinoccio ioBridge
Ayla Networks
resin.io Synplix
TEGOL bluecity

Software/Data Platforms

EXDSITE iconcontrol thingsquare carriers Keen IO
SaaSControl things ConnectHQ NewAer BERG Axode
Yaler.net RaceWireless SpasGua FITT greenwrt
wot.io ZALAR Cylonting aliux Yo ThingWorx
DNDK Gocoolpower JUL IOTO
bugswarm TempIQ evercam covisint
GreenSyringe ETH ERIOG PubNub INTURA SensorCloud

Open Source Platforms

webinos ALJOY
openHAB
OPEN INTERCONNECT
ThingSpeak GRIDHOME

Sensor Networks

SAFECAST placemeter
Motionloft

Personal Interfaces

NeuroBay
wit.ai LEAP
gestigon Speech
EMOTIV Moulua Recemo
Oculus

Security

inside SafeNet
utimaco
escrypt
gemalto
EASTLLE NETWORKS
MOCANA

Corporates

amazon LG intel htc
PHILIPS IBM SAMSUNG Google
WIND RIVER MOTOROLA belkin DELL
BOSCH ARM LogMeIn Microsoft
Honeywell SONY Atmel SIEMENS
QUALCOMM CISCO TOSHIBA SHARP

Building Blocks

Protocols

Bluetooth Weaved MQTT
WI FI 2 DoBer oma 2WAVE onModus HART MIWV M-Bus
2G 3G 4G LTE CoAP 6LoWPAN LWM2M DTXTml

M2M Networks

Ilidian SIGFOX
KORE
GUSTIA HACHEEN

Portable WiFi

Open Garden
GOODSPEED
BRCK

Telecom

at&t boostmobile
verizon T-Mobile Sprint USCellular
T-Mobile Sprint USCellular

M2M

arkessa
Telit

Cloud

Google Cloud Platform
amazon AWS redhat ORACLE
Microsoft Azure

Mobile

IOS Windows Phone
BlackBerry

Processors/Sensors

ARM Cortex-M0 mCube
Raspberry Pi BeagleBone Black
TI MSP430

Parts/Kits

MEATY MEATY SAM
littleBits
TinkerForge

Services

sculpteo
makexyz
CIRCUIT

Incubators

Highway1 LEONOS Labs
WEARABLE WORLD
R/GA Accelerator TechShop

Funding

KICKSTARTER
indiegogo
MedStar

Distribution

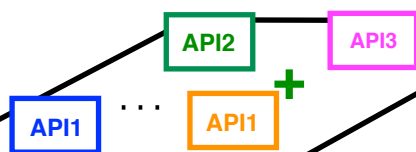
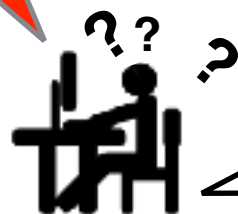
angelcam

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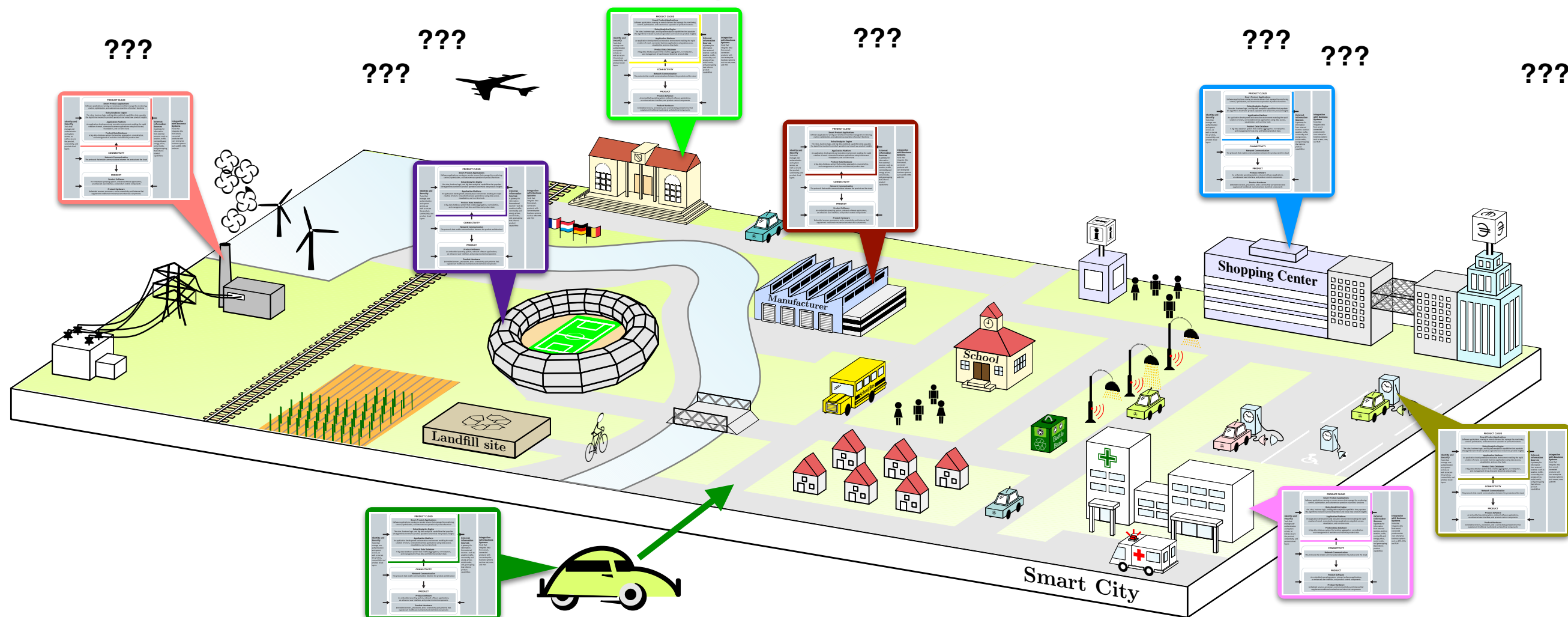
**“bloTope is about platform federation
for cross-domain innovation” -> *API economy***



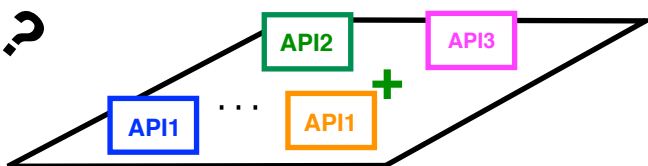
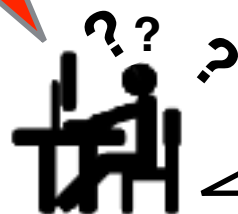
How the 'hell' may I be aware of all these WS* ??



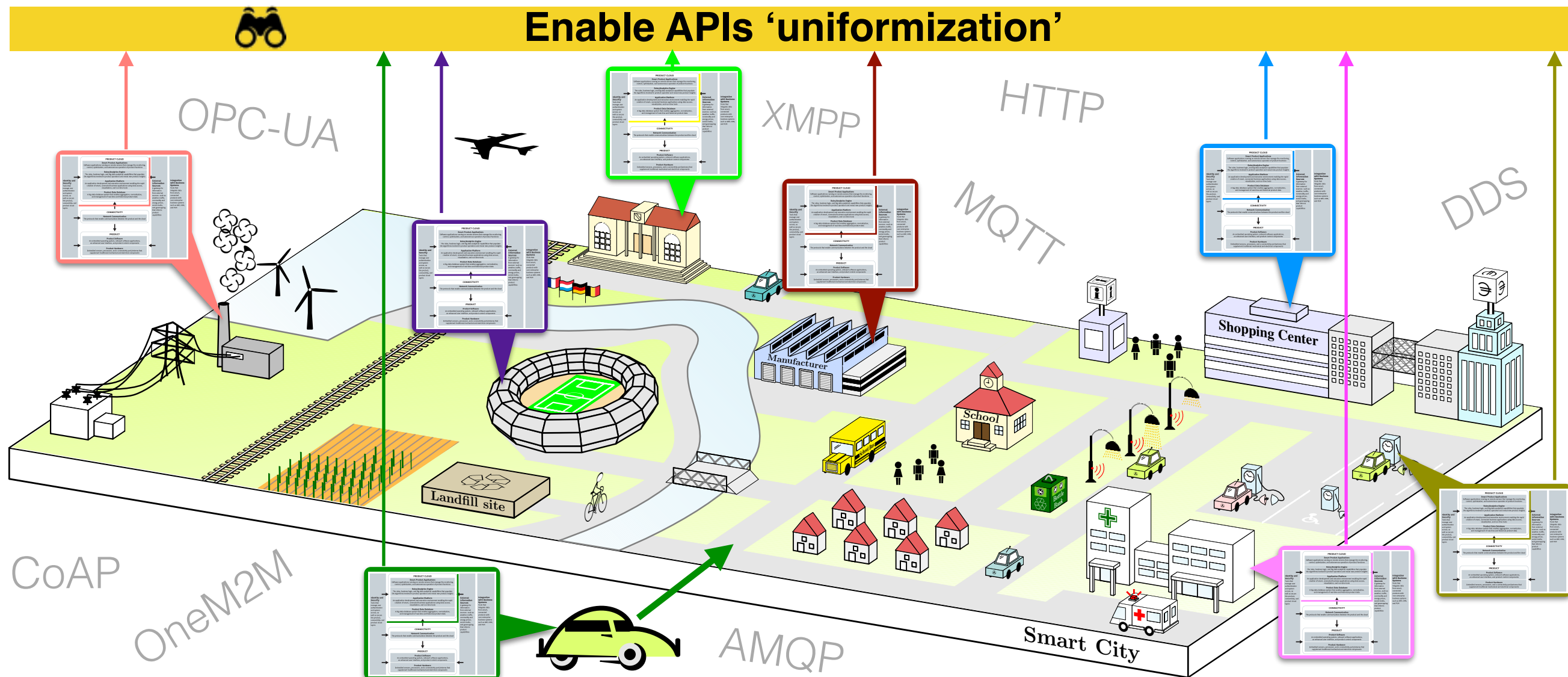
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- https://graph.facebook.com/act_{ad_account_id}/adpreviewcss
- <http://1411725015746208/48:-4.558/23000%20water.temp{sensorid=42,sensornet=X}%2016.9>
- http://<UNIVERSE_ID>/<TIME_ID>/<QUERY_1>/<QUERY_2>.../<QUERY_N>
- http://<DOMAIN>/api/datasets/1.0/search/?apikey=<APIKEY>
- <http://URL/v1.0/search/?refine.modified=2011>
- [http://URL/v1.0/FeaturesOfInterest\(id\)/Observations](http://URL/v1.0/FeaturesOfInterest(id)/Observations)
- [http://URL/v1.0/Datastreams?\\$expand=Observations](http://URL/v1.0/Datastreams?$expand=Observations)



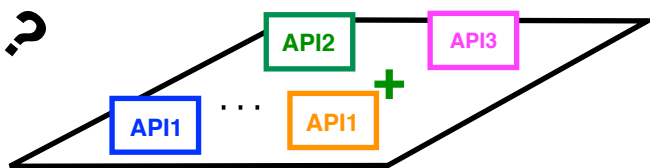
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Enable APIs 'uniformization'

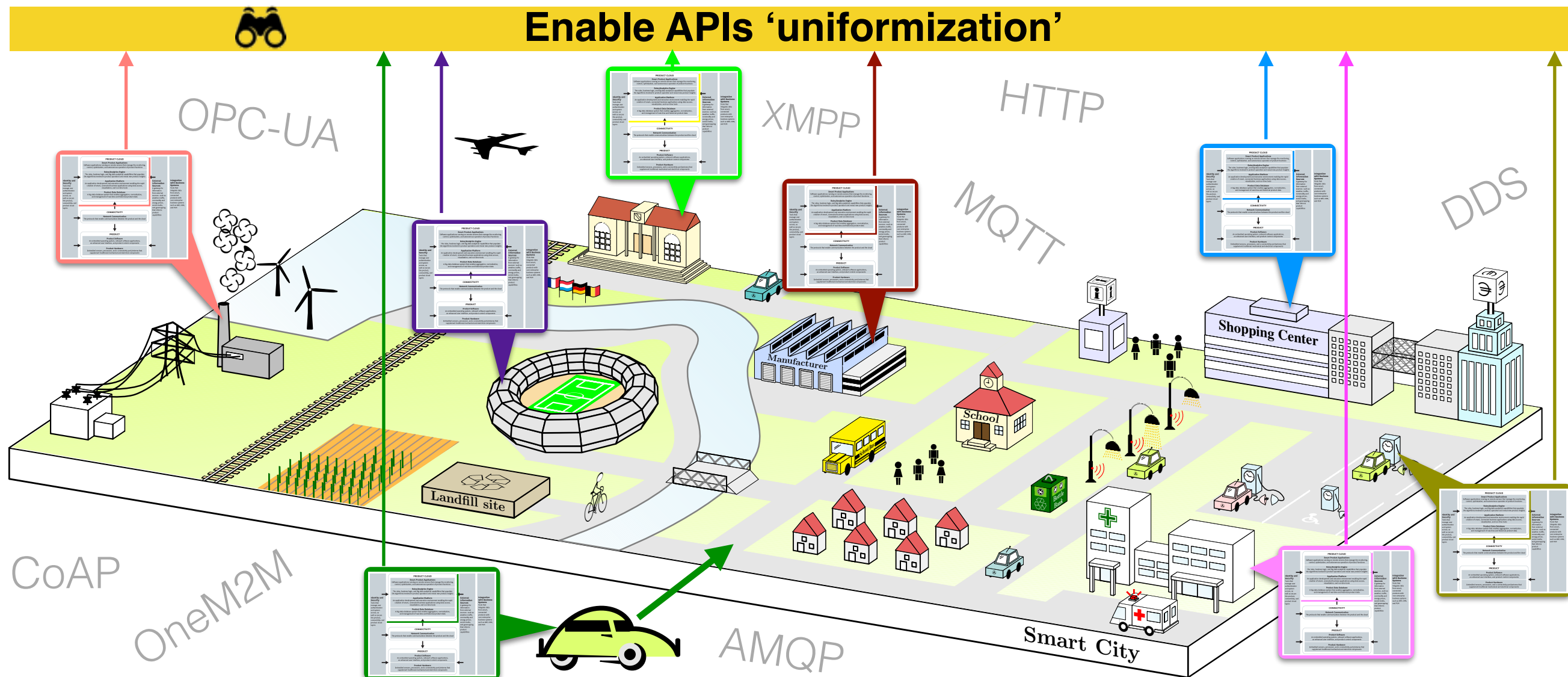


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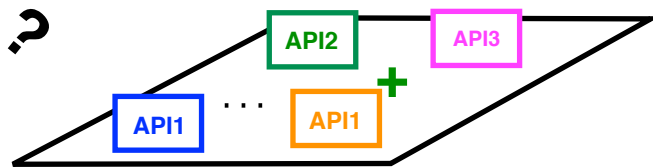


- Need for discovering and accessing available WS* (across IoT platforms) in a **standardised & uniformed manner**

Enable APIs 'uniformization'



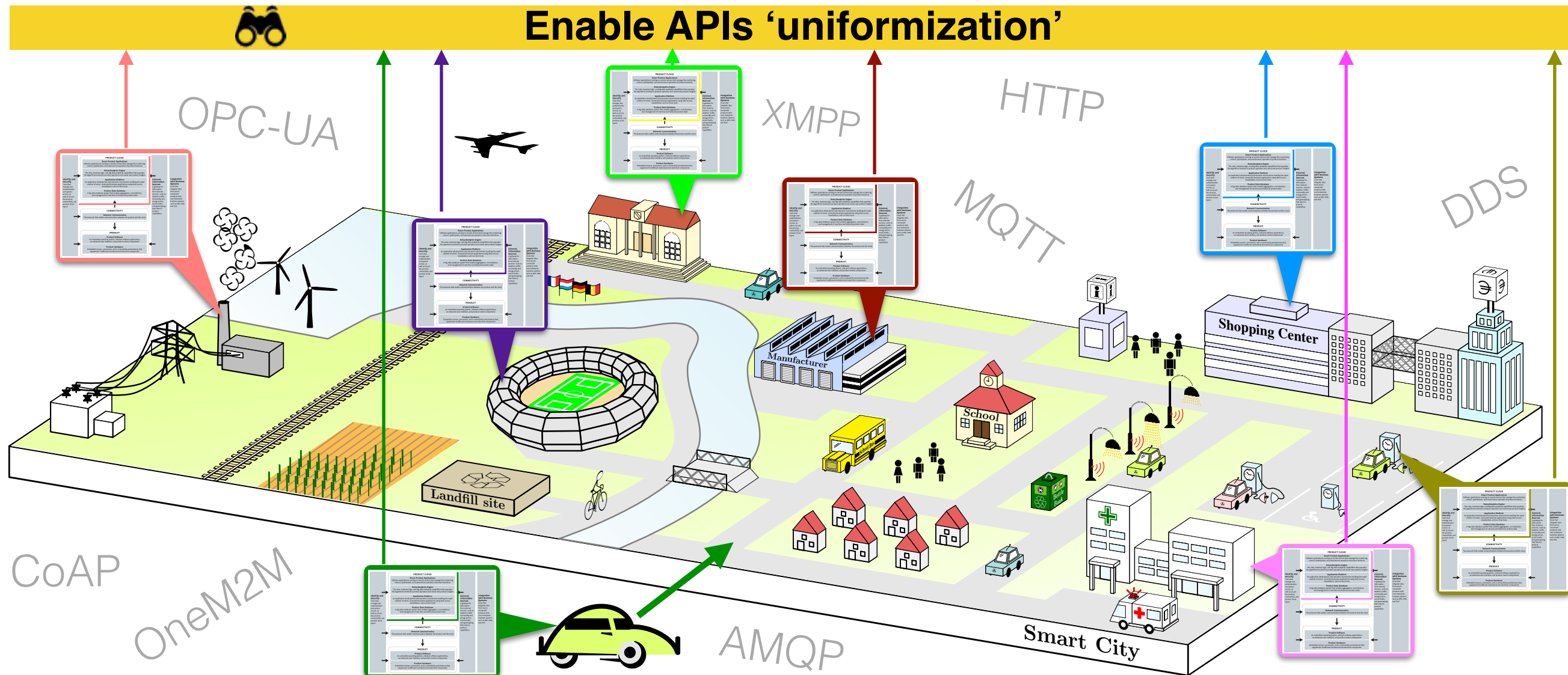
How the 'hell' may I be aware of all these WS* ??



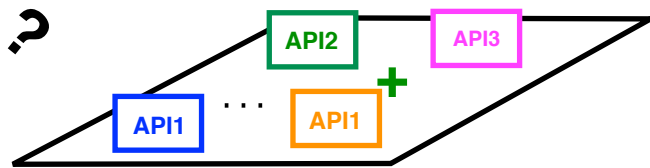
• Need for **Standardised (Semantic) Vocabularies**

• Need for discovering and accessing available WS* (across IoT platforms) in a **standardised & uniformed manner**

Enable APIs 'uniformization'

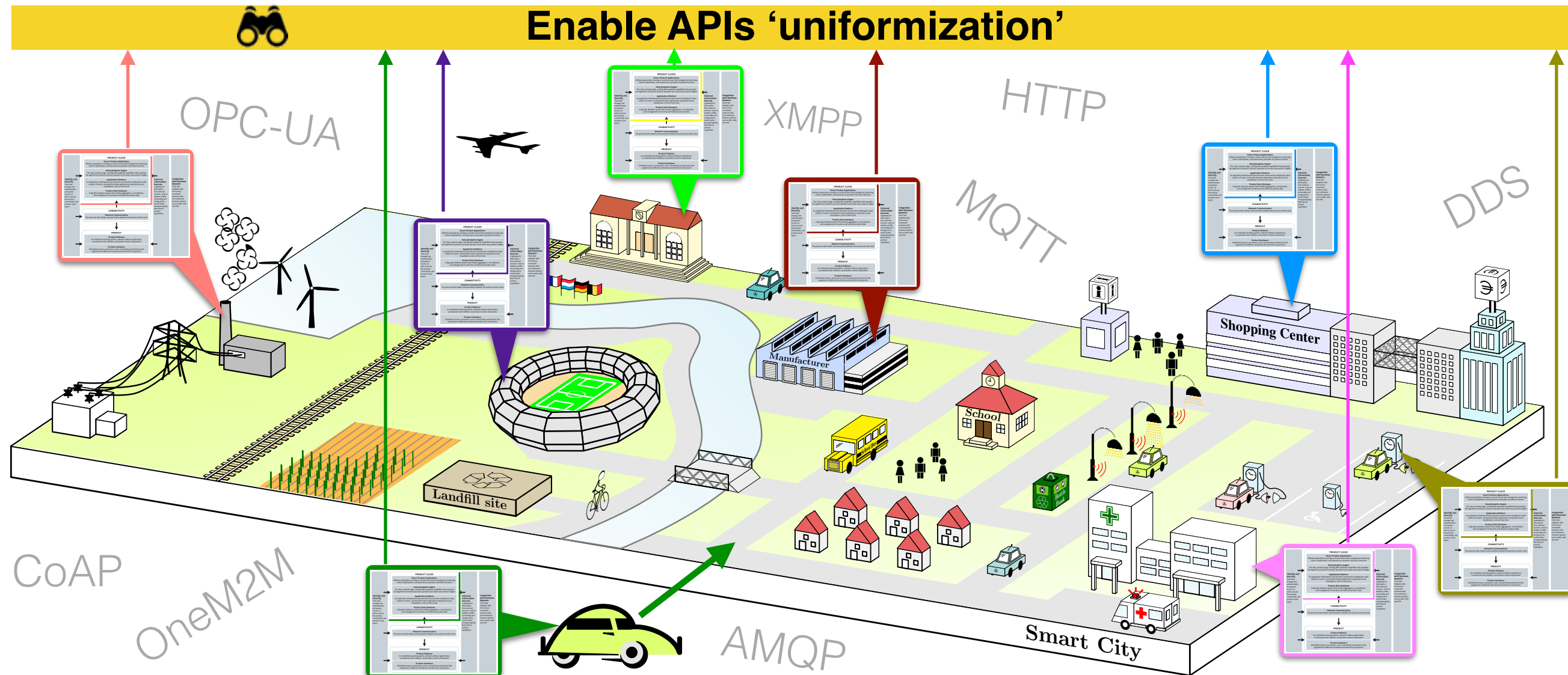


How the 'hell' may I be aware of all these WS* ??

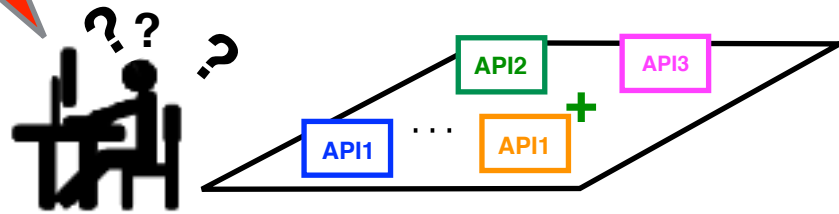


- Need for **Ad-hoc Security** mechanisms
- Need for a **Service Marketplace** to foster co-creation
- Need for **Standardised (Semantic) Vocabularies**
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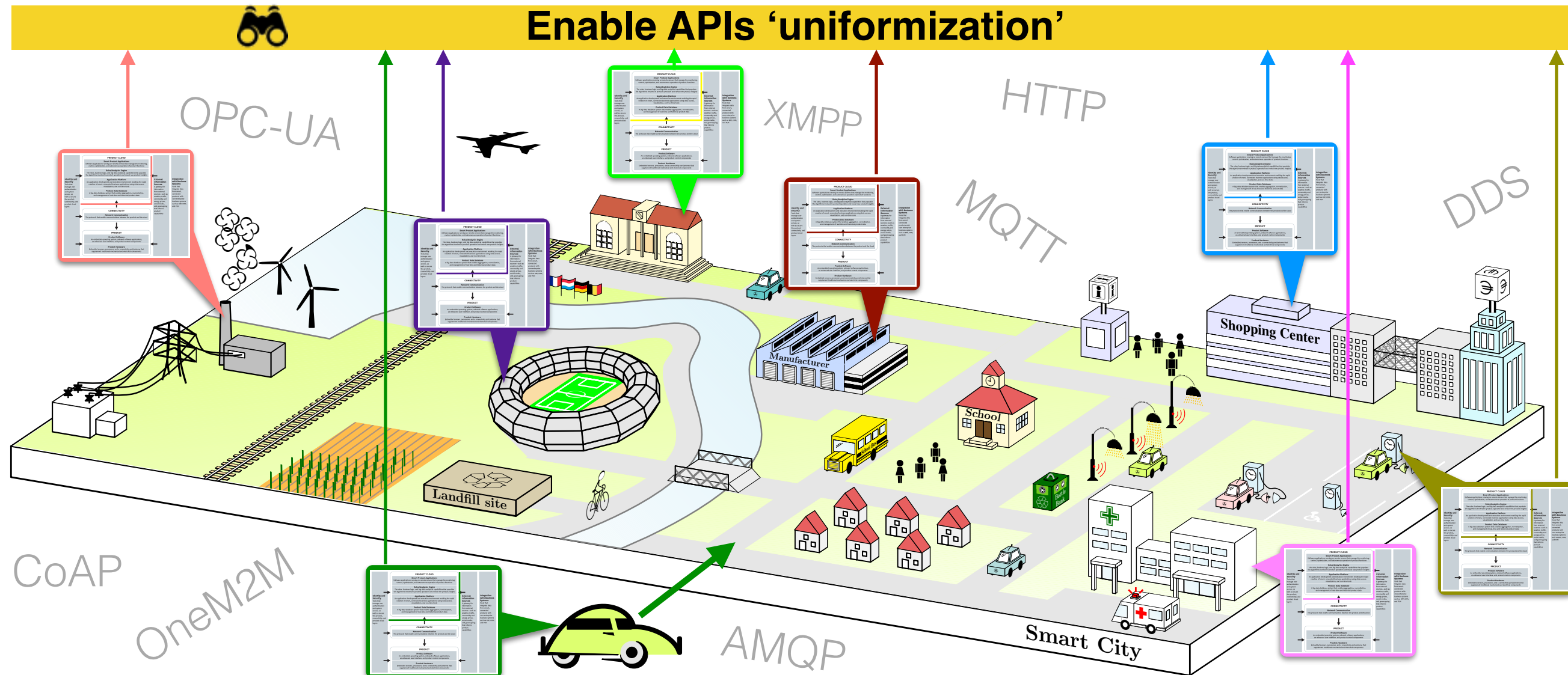


How the 'hell' may I be aware of all these WS* ??



- Need for “cognitive” systems (**Context-Aware computing**)
- Need for **Ad-hoc Security** mechanisms
- Need for a **Service Marketplace** to foster co-creation
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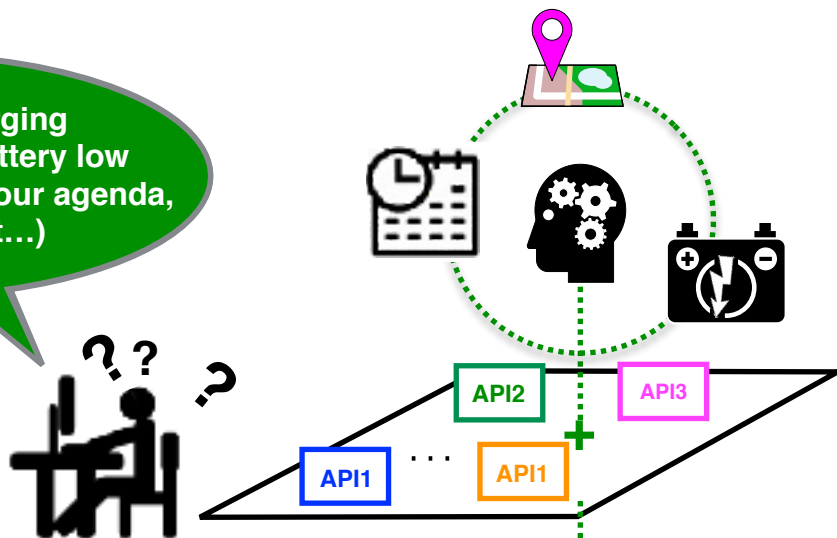
Enable APIs 'uniformization'



Cross-domain/-platform services

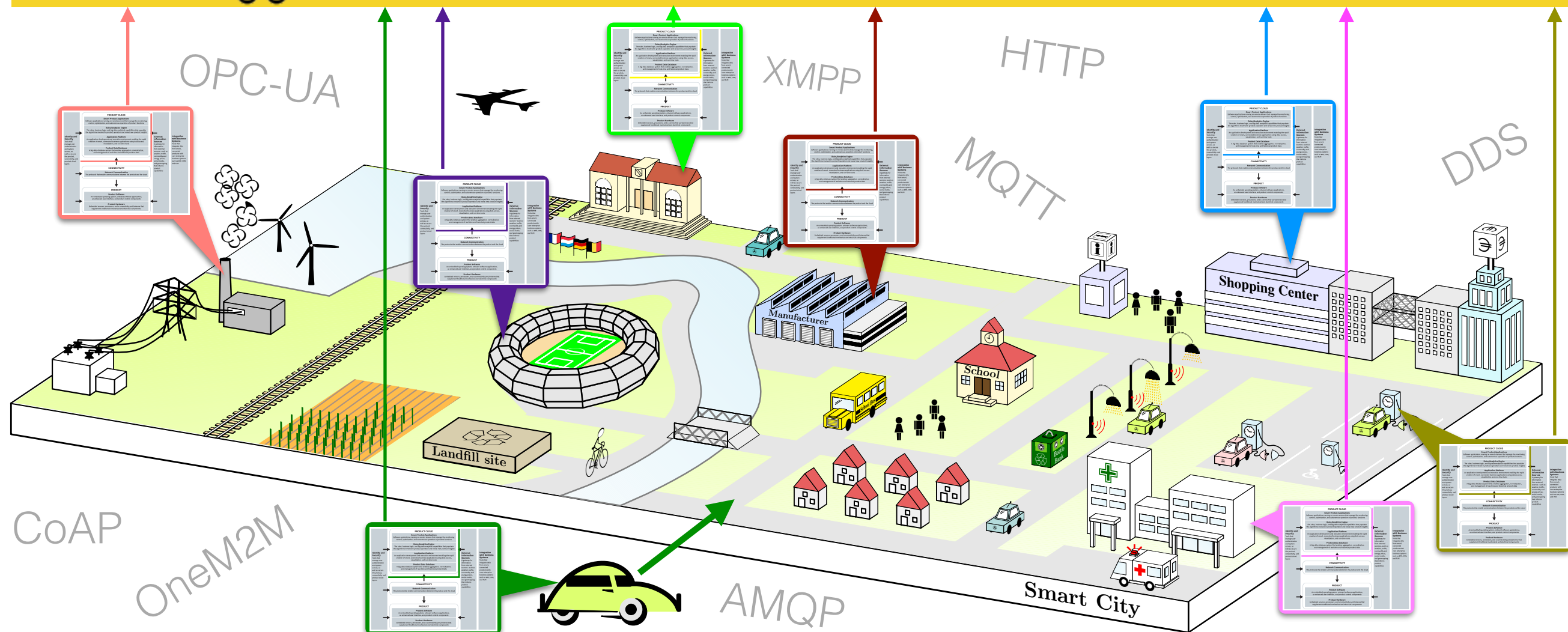
Find the best charging point for your EV if battery low (depending on the city, your agenda, weather forecast...)

BMW developer (customer services)



- Need for “cognitive” systems (**Context-Aware computing**)
- Need for **Ad-hoc Security** mechanisms
- Need for a **Service Marketplace** to foster co-creation
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- Need for discovering and accessing available WS* (across IoT platforms) in a **standardised & uniformed manner**

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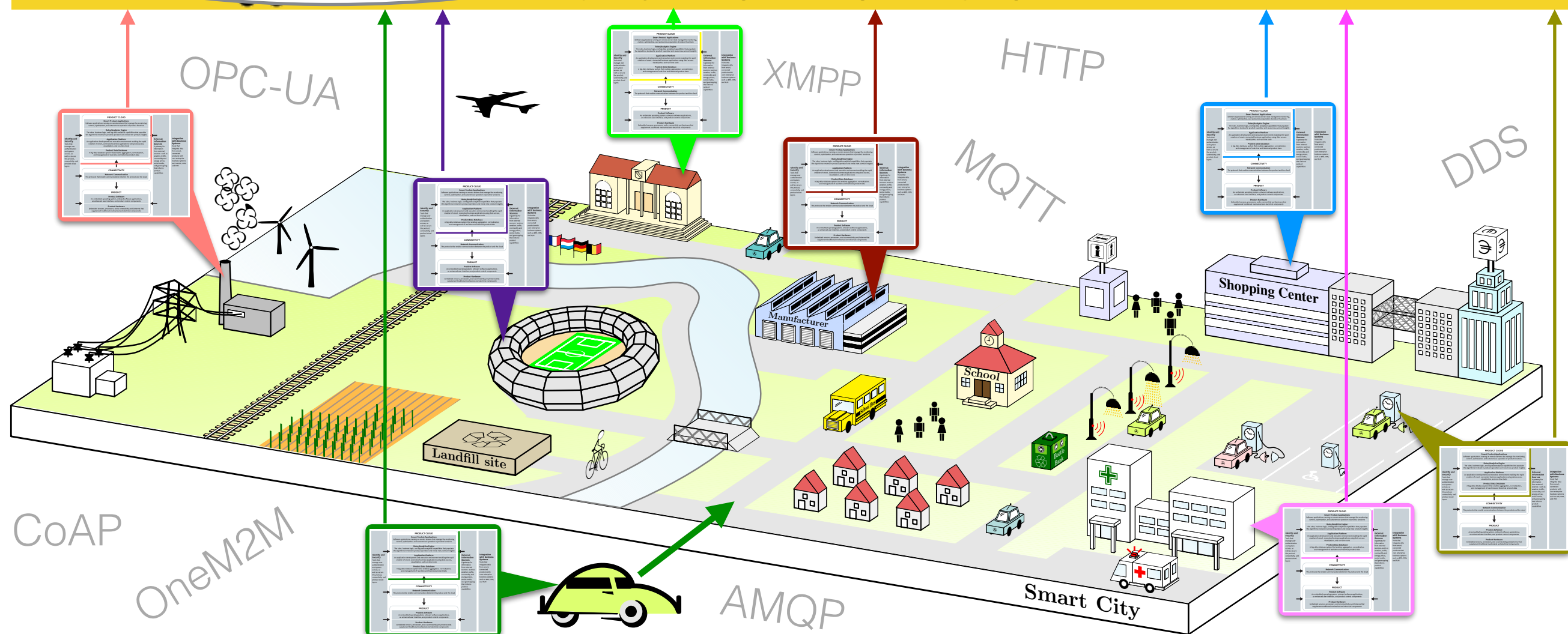


- Need for “cognitive” systems (**Context-Aware computing**)
- Need for **Ad-hoc Security** mechanisms
- Need for a **Service Marketplace** to foster co-creation
- Need for **Standardised (Semantic) Vocabularies**
- Need for discovering and accessing available services (across IoT platforms) in a **standardised & uniformed manner**

bloTope foundation (O-MI):

Provide generic IoT interfaces (read, write, subscription...) to enable P2P data exchange between smart systems

Enable APIs ‘uniformization’



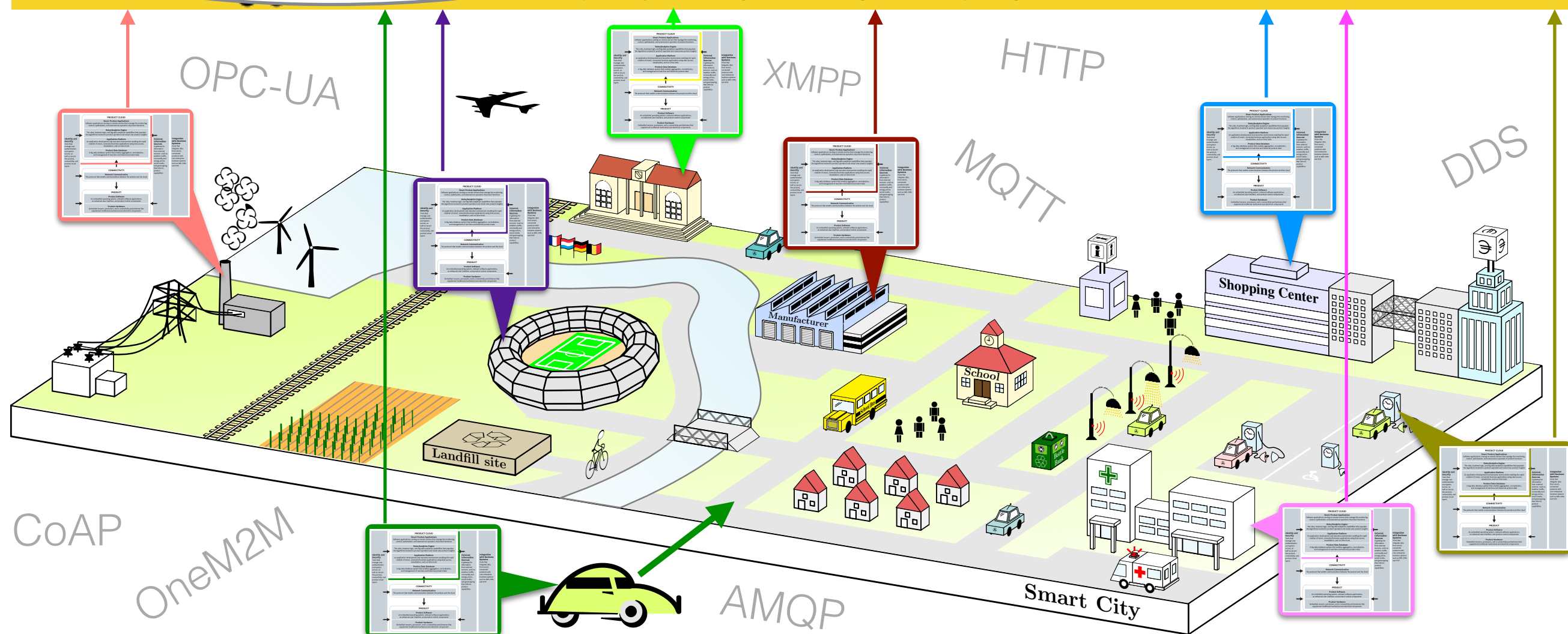
Objective 2:

Enhanced service description:

Extend O-DF standard with domain-dependent and -independent vocabularies for enhanced service description
subscription...) to enable data exchange between smart systems

- Need for “cognitive” systems (**Context-Aware computing**)
- Need for **Ad-hoc Security** mechanisms
- Need for a **Service Marketplace** to foster co-creation
- Need for **Standardised (Semantic) Vocabularies**
- Need for discovering and accessing available services (across IoT platforms) in a **standardised & uniformed manner**

Enable APIs ‘uniformization’

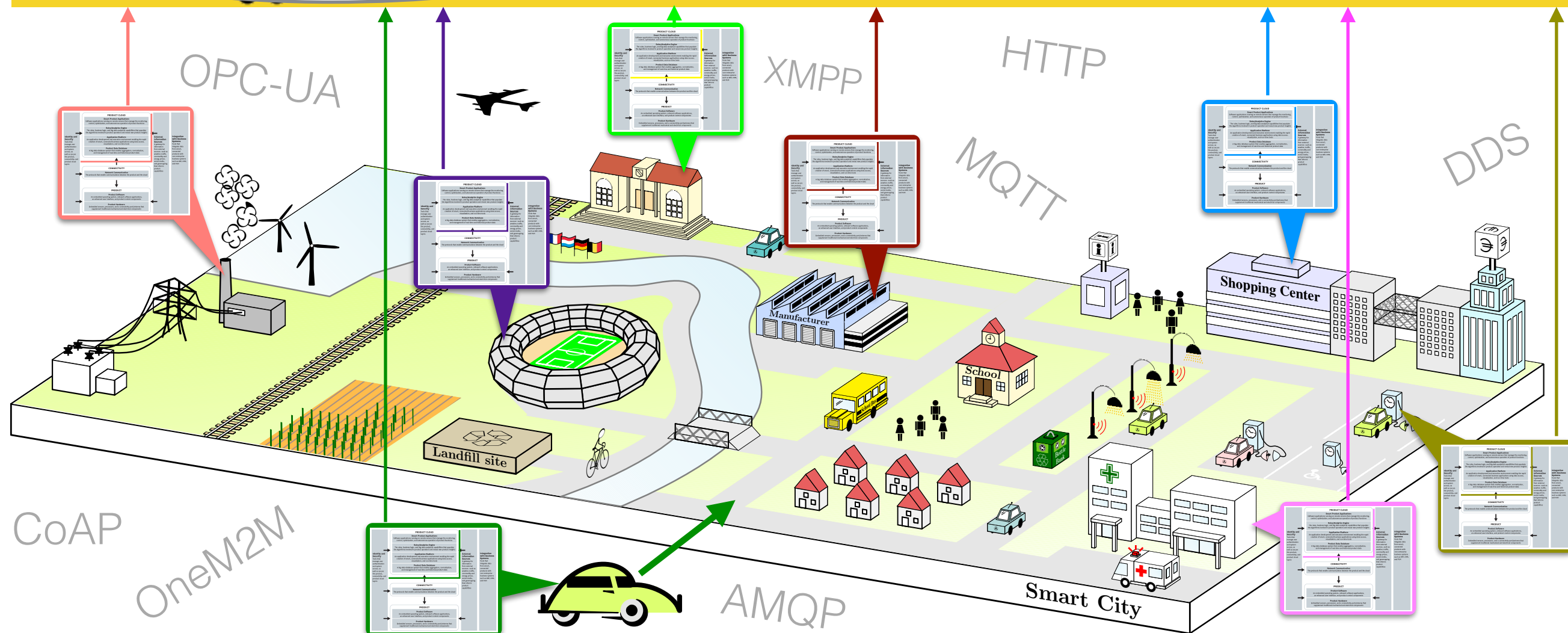


Objective 3: IoT Service Marketplace

Enable IoT developers to both publish and discover — *in an efficient manner* — relevant services for their own business
Extend existing and independent vocabularies for enhanced service description
(subscription...) to enable data exchange between smart systems

- Need for “cognitive” systems (**Context-Aware computing**)
- Need for **Ad-hoc Security** mechanisms
- Need for a **Service Marketplace** to foster co-creation
- Need for **Standardised (Semantic) Vocabularies**
- Need for discovering and accessing available services (across IoT platforms) in a **standardised & uniformed manner**

Enable APIs ‘uniformization’



Objective 4:

Enhanced security mechanisms

Investigate and develop more efficient P2P Identity & security management in the IoT

Enable IoT developers to both publish and discover — *in an efficient manner* — relevant services for their

Extend their own business

independent vocabularies for enhanced service

description

subscription...) to enable P2P data exchange between smart systems

- Need for “cognitive” systems (**Context-Aware computing**)

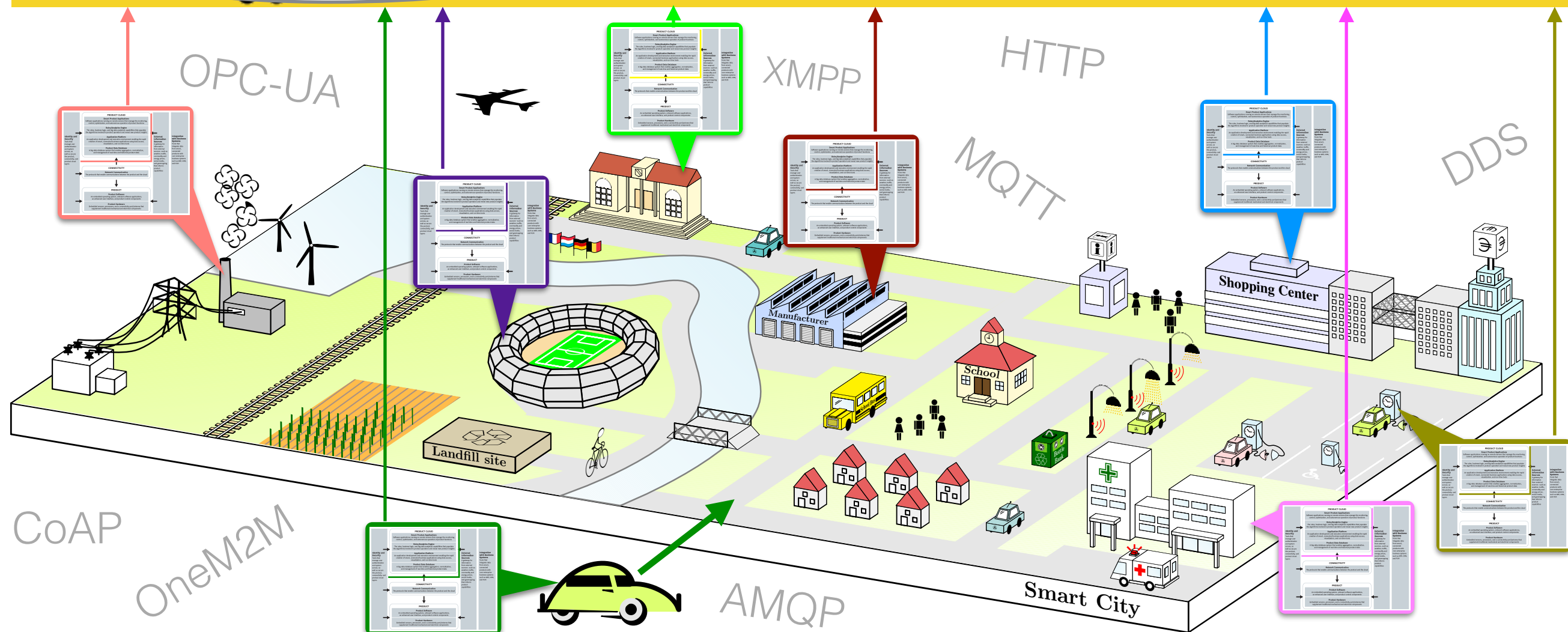
- Need for **Ad-hoc Security** mechanisms

- Need for a **Service Marketplace** to foster co-creation

- Need for **Standardised (Semantic) Vocabularies**

- Need for discovering and accessing available services (across IoT platforms) in a **standardised & uniformed manner**

Enable APIs ‘uniformization’



Objective 5:

Towards more cognitive IoT applications

Investigate and develop more autonomous and cognitive IoT systems

Investigate and develop more efficient P2P Identity & security management in the IoT

Enable IoT developers to both publish and discover — *in an efficient manner* — relevant services for their own business

Extend (and -independent vocabularies for enhanced service description subscription...) to enable P2P data exchange between smart systems

- Need for “cognitive” systems (**Context-Aware computing**)

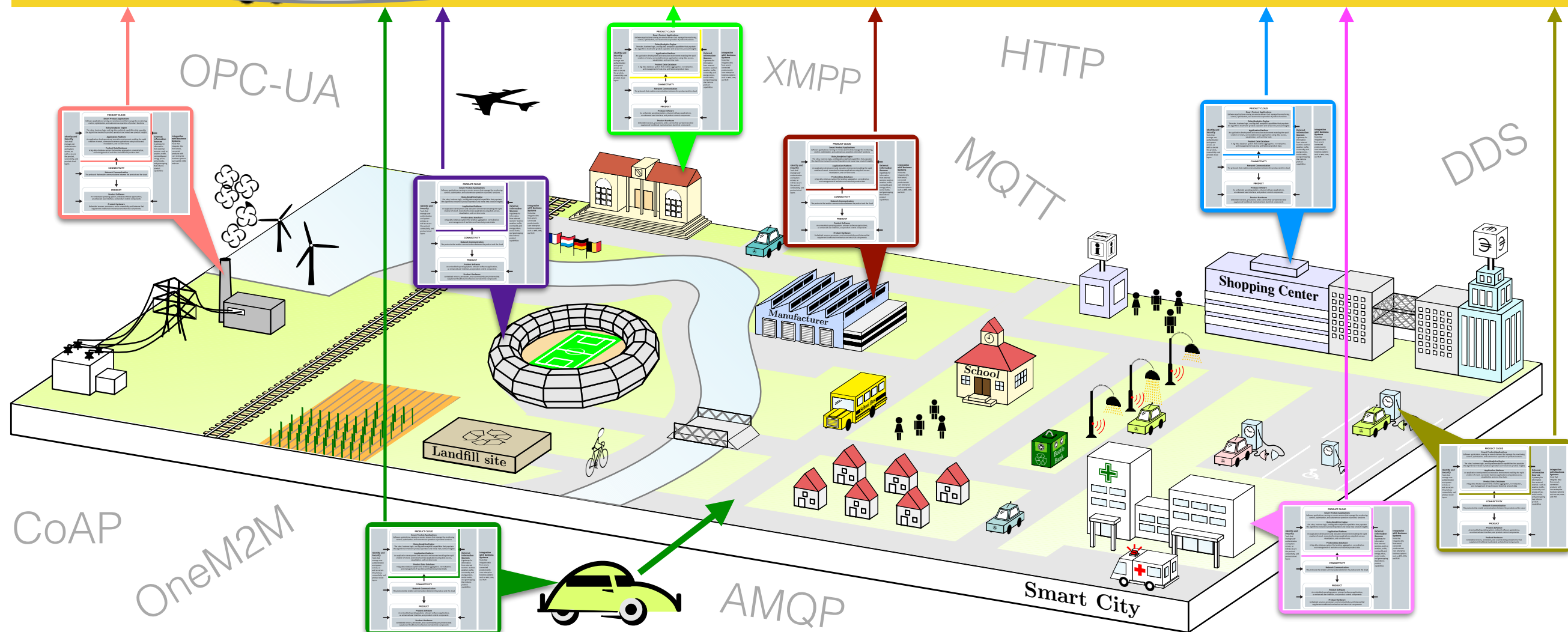
- Need for **Ad-hoc Security** mechanisms

- Need for a **Service Marketplace** to foster co-creation

- Need for **Standardised (Semantic) Vocabularies**

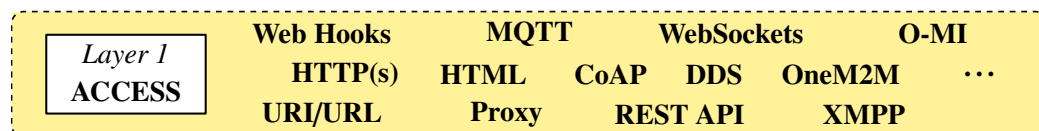
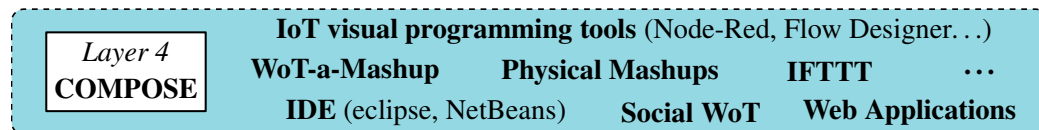
- Need for discovering and accessing available services (across IoT platforms) in a **standardised & uniformed manner**

Enable APIs ‘uniformization’



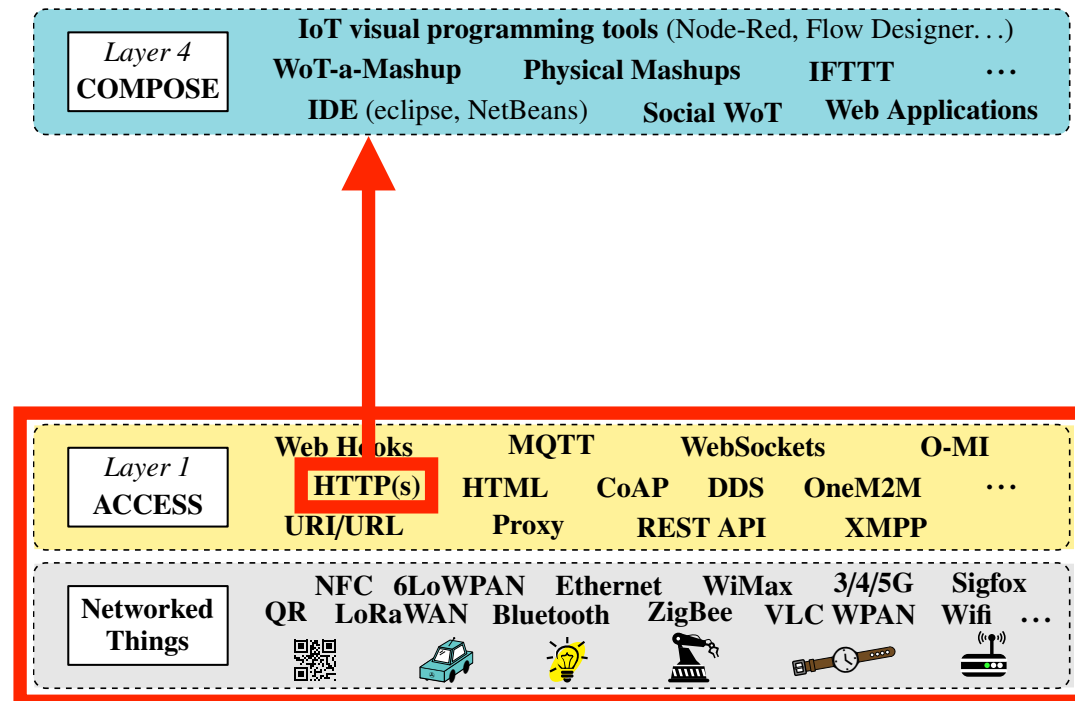
Towards Open IoT ecosystems

bIoTope ecosystem's infrastructure



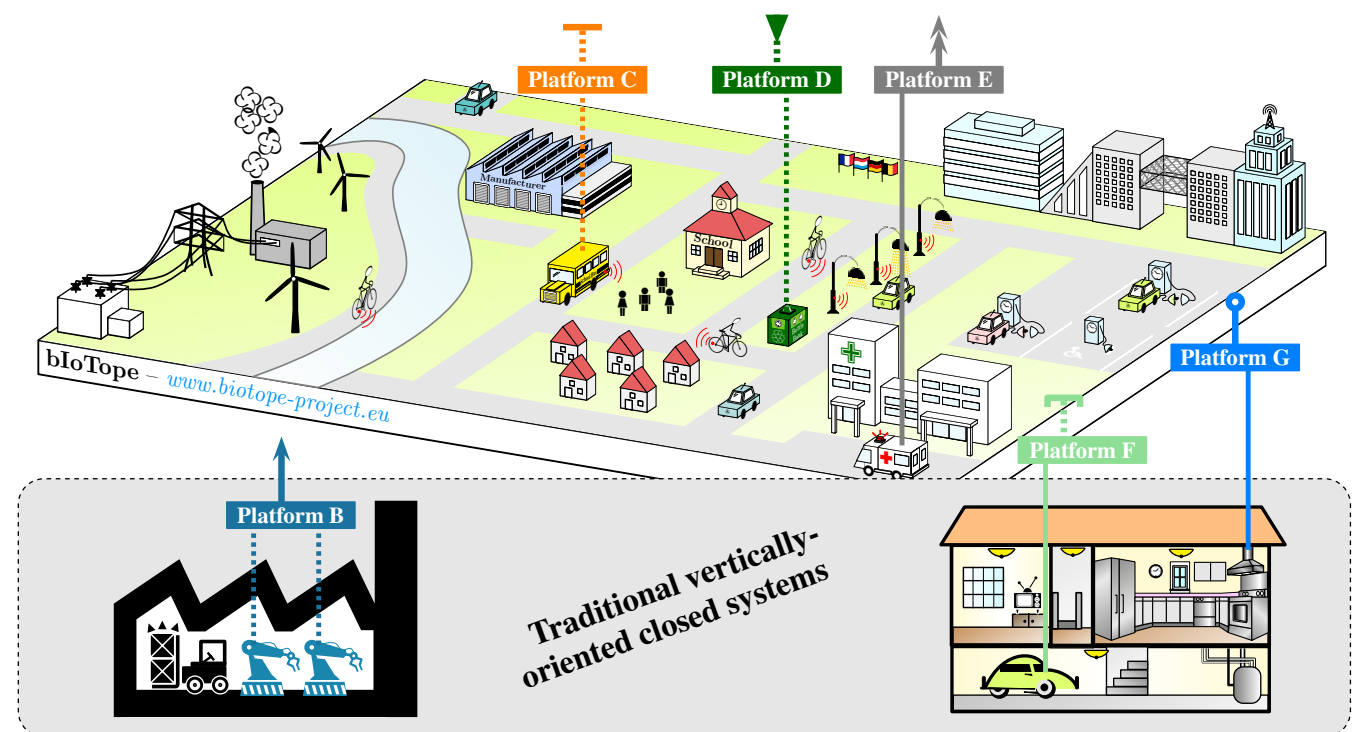
Towards Open Io

bIoTope ecosystem's infr



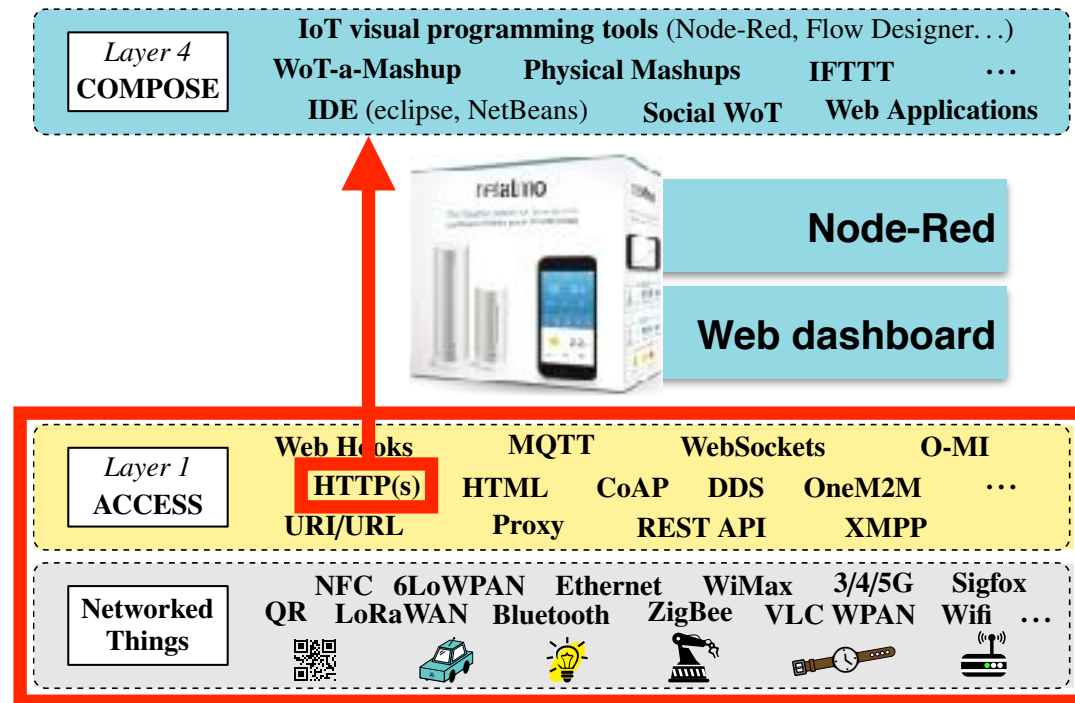
Leverage on existing platforms

Vertical Silos' issue



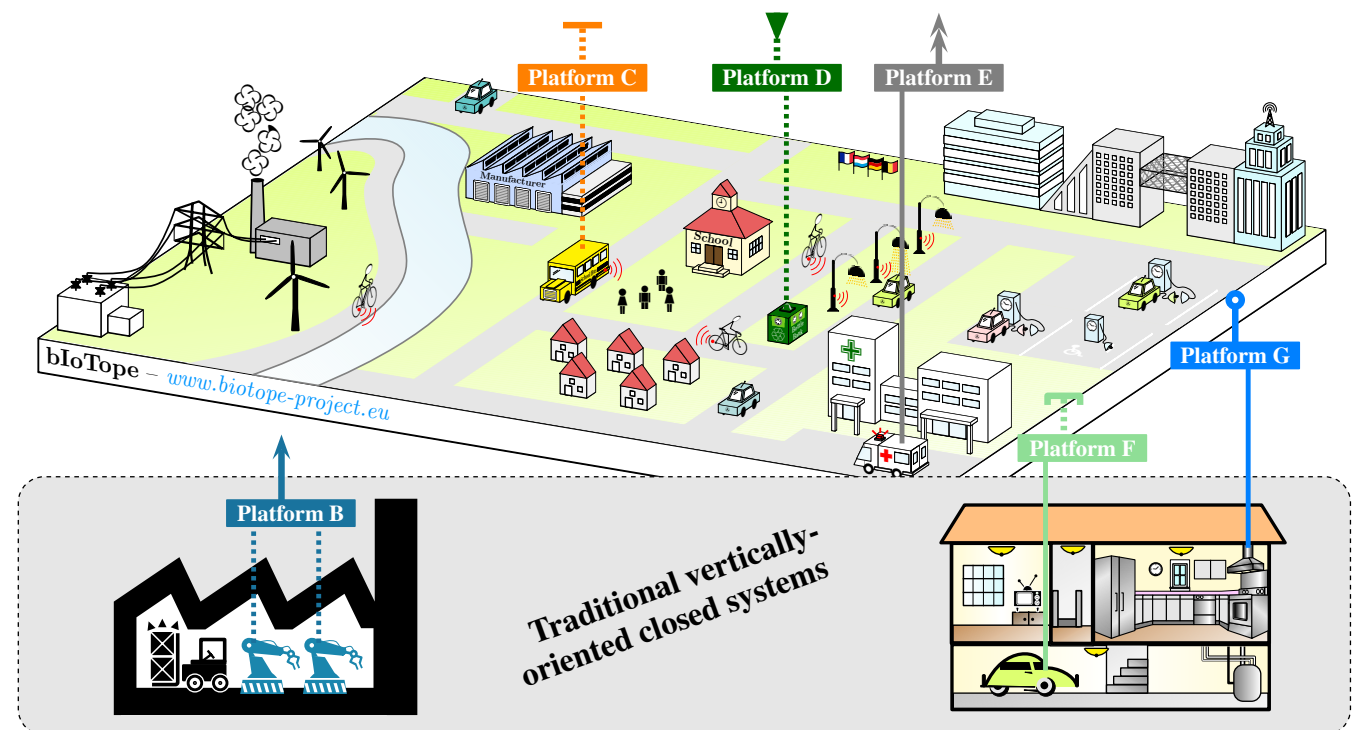
Towards Open Io

bIoTope ecosystem's infr



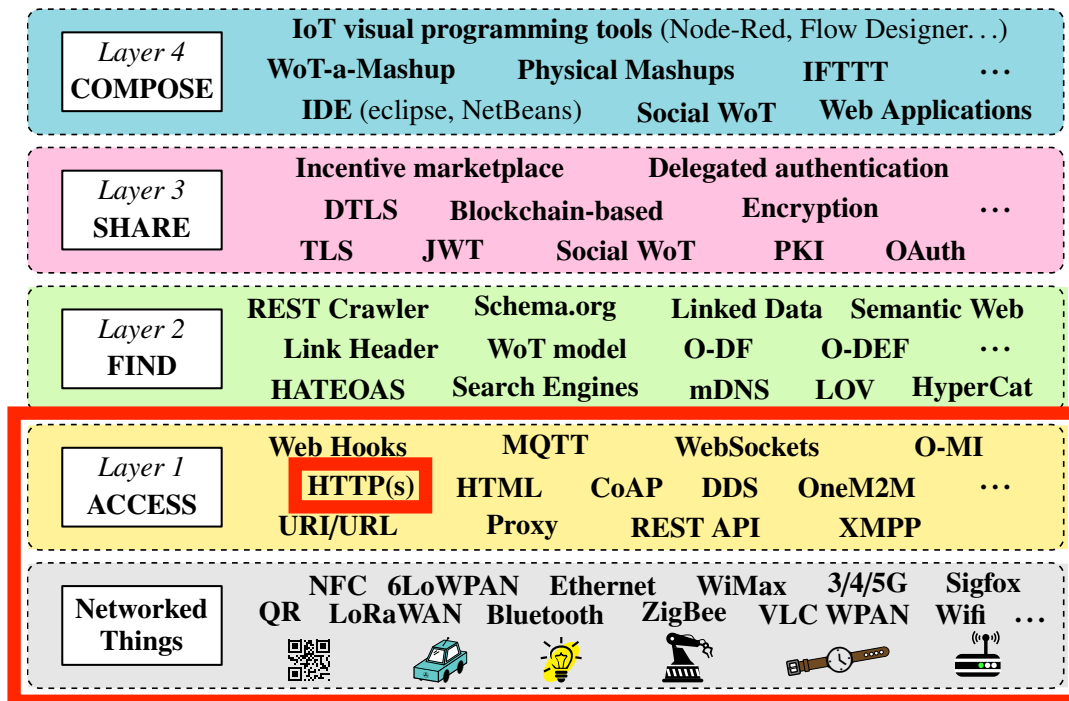
Leverage on existing platforms

Vertical Silos' issue

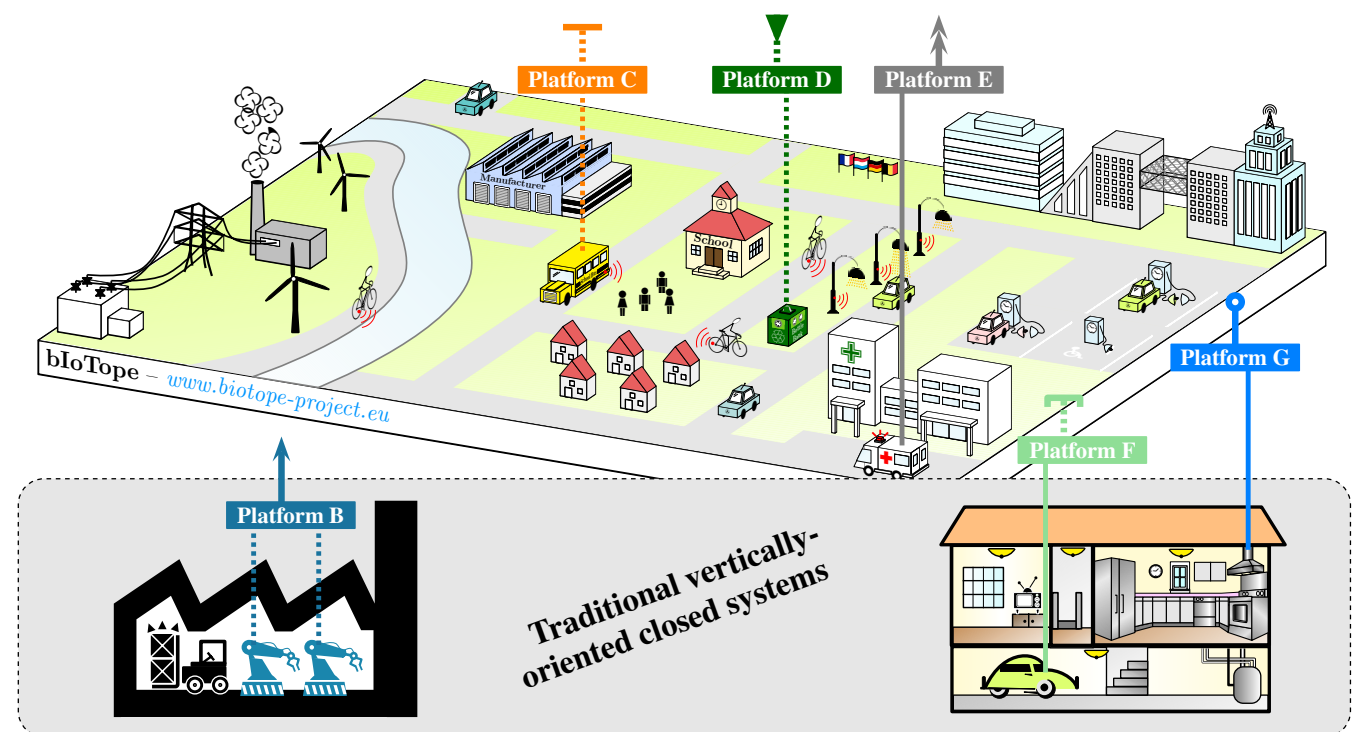


Towards Open Io

bIoTope ecosystem's infr

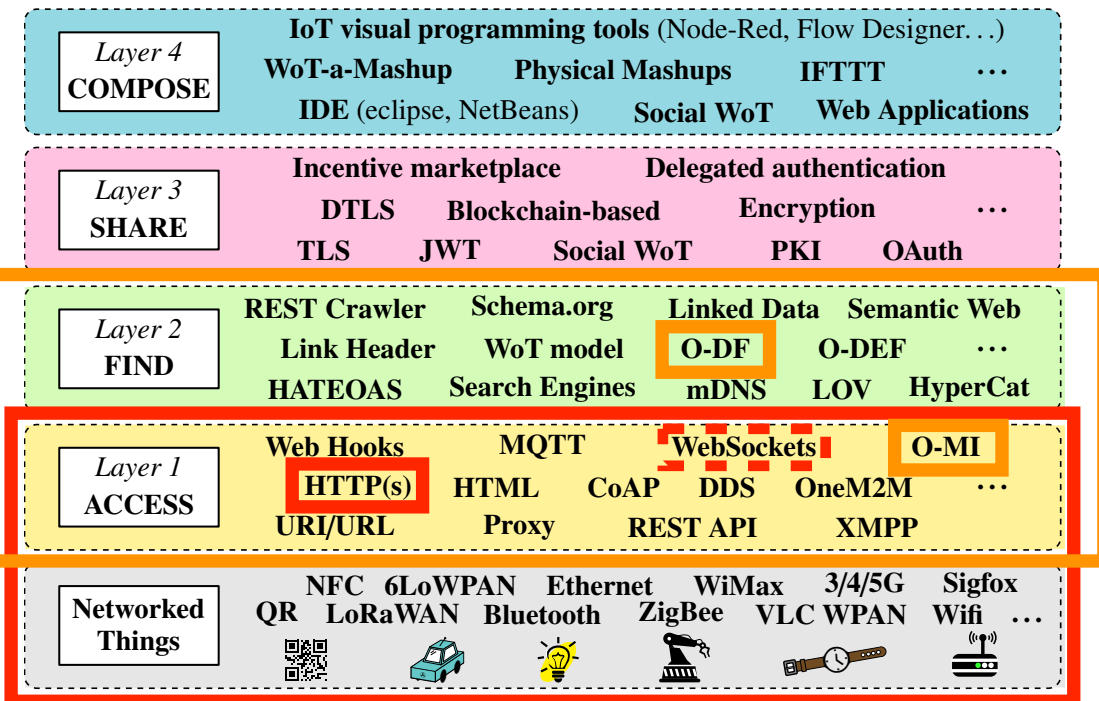


Vertical Silos' issue



Towards Open Io

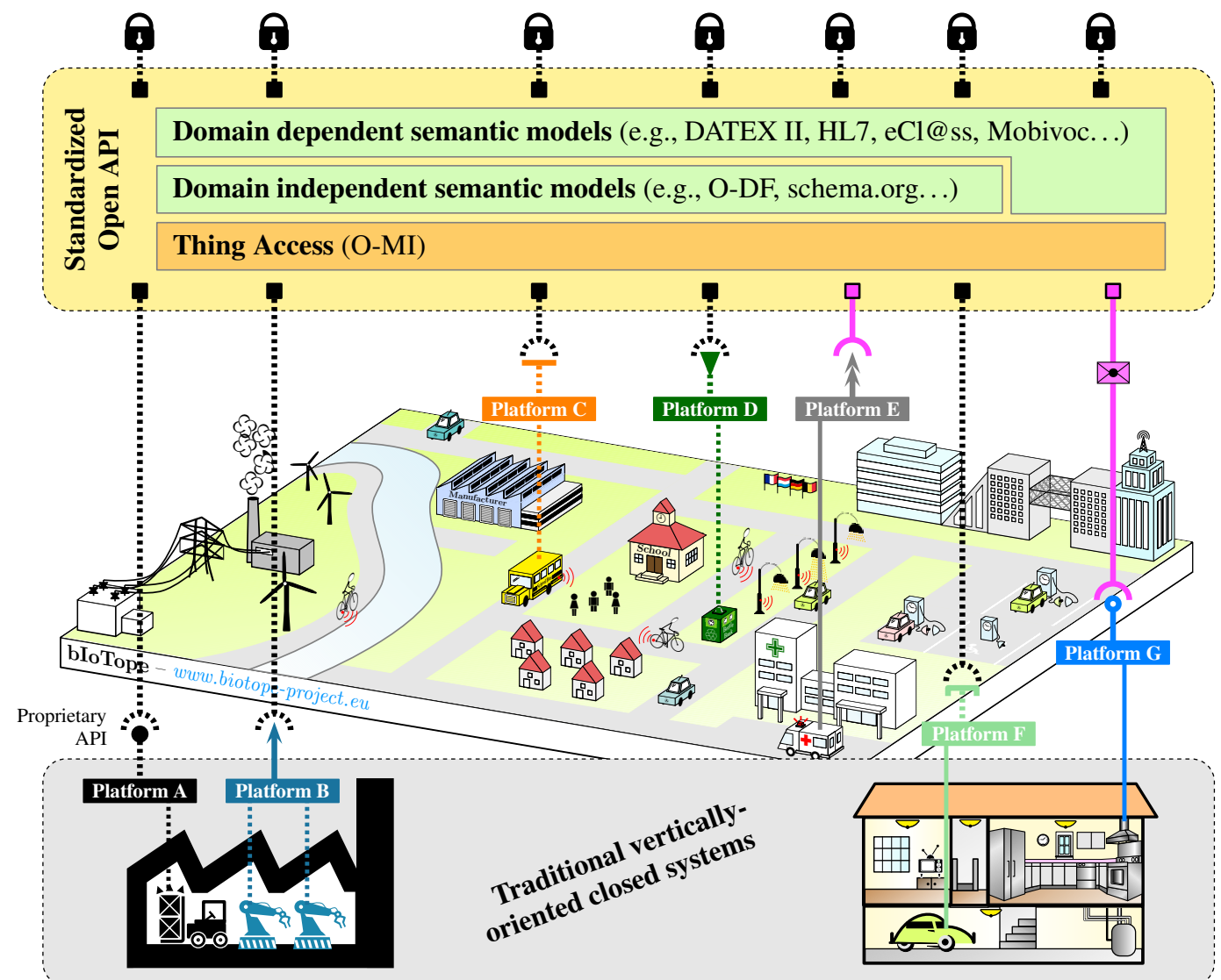
bIoTope ecosystem's infr



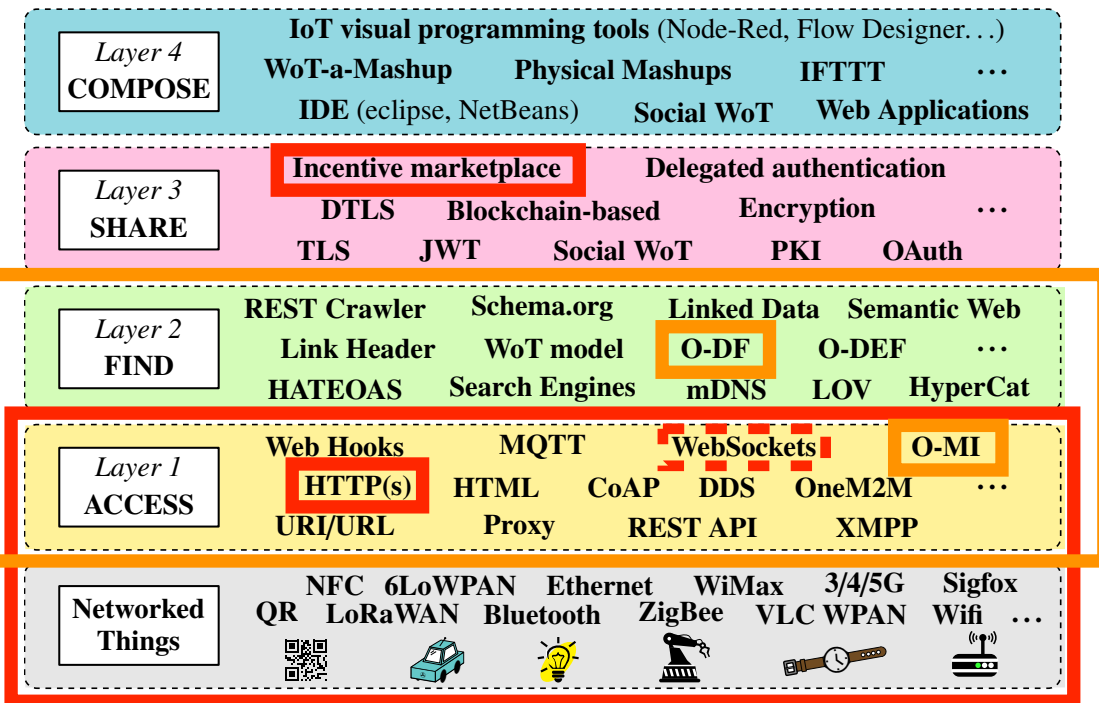
Extend Web protocols with more advanced communication interfaces (subscription mechanisms...)
&
IoT data models (e.g., using Semantic Web vocabularies)

bIoTope's Objective

Vertical Silos' issue



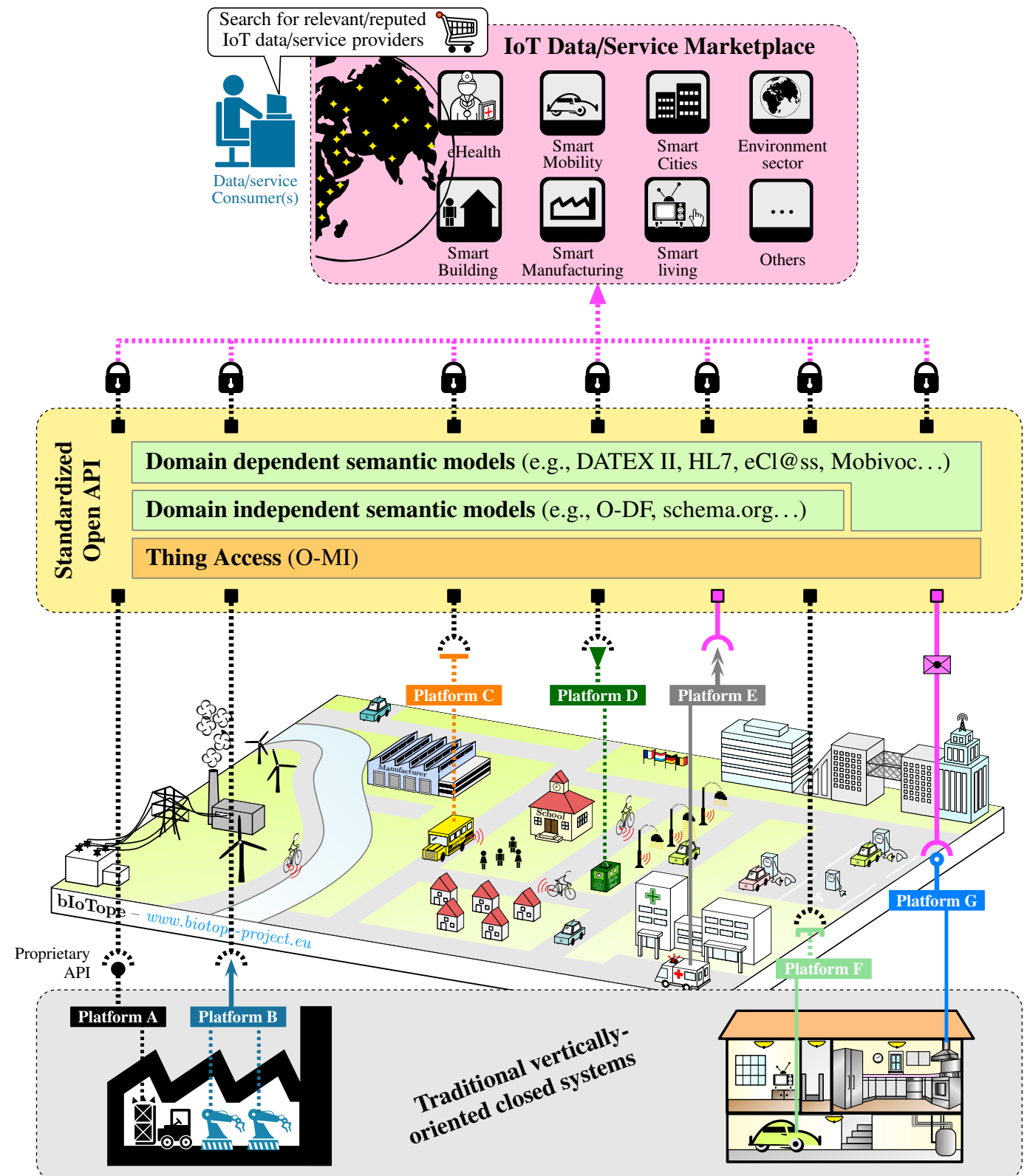
Towards Open Io bIoTope ecosystem's infr



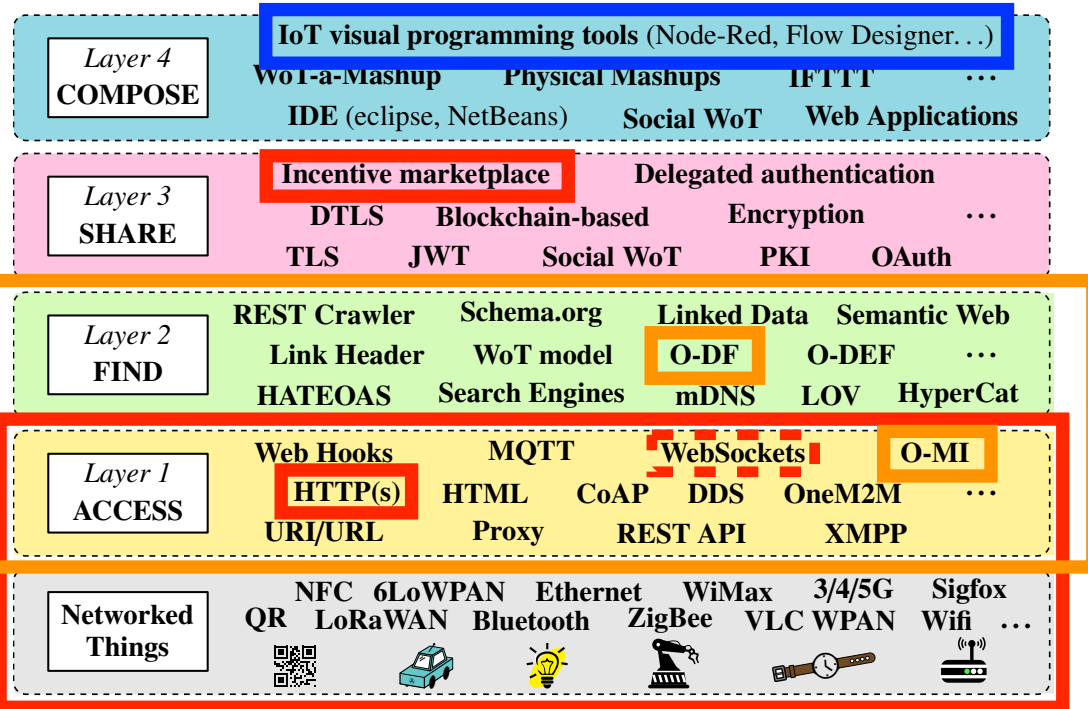
Trade personal IoT data/services

bIoTope's Objective

Vertical Silos' issue

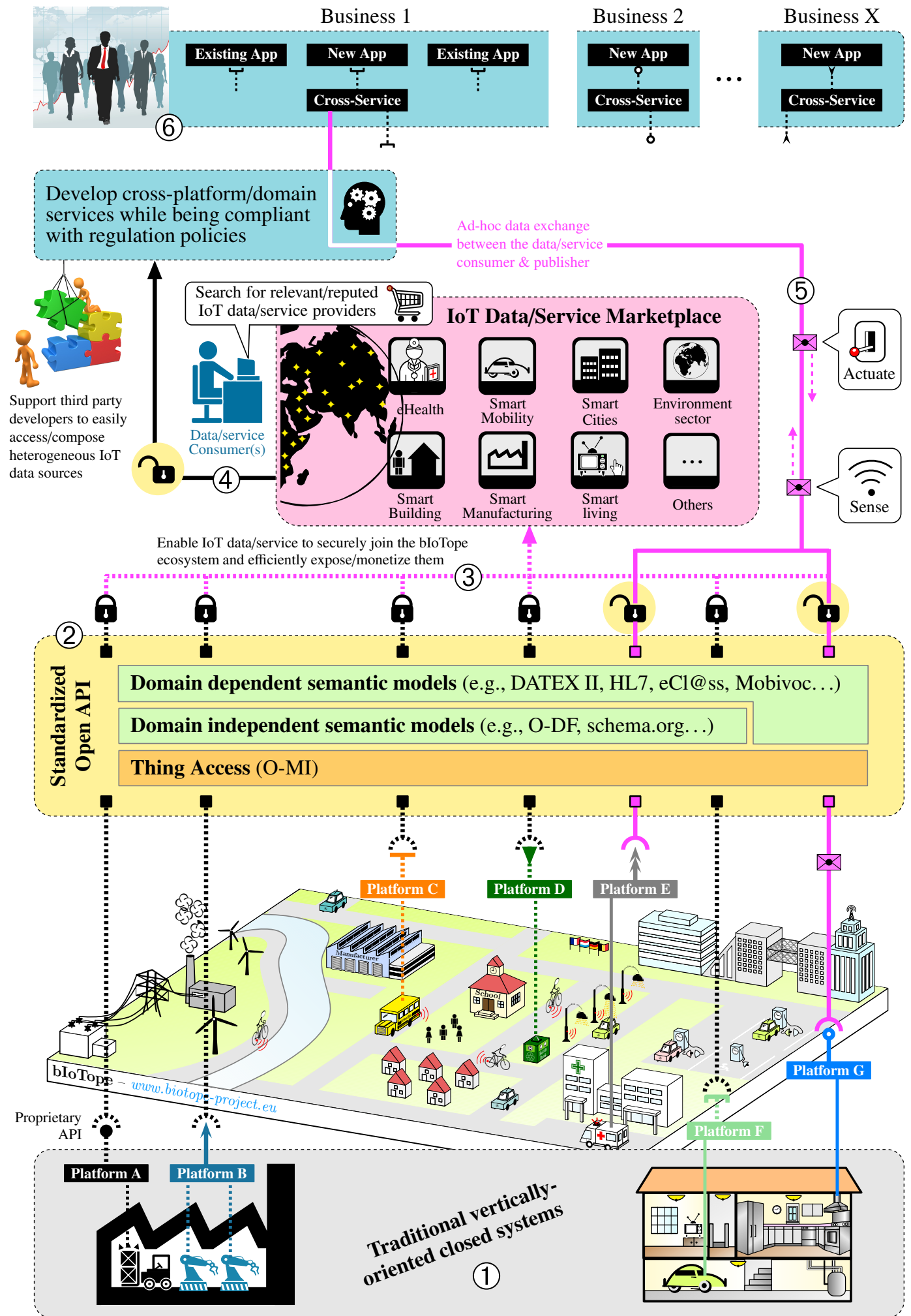


Towards Open Io bIoTope ecosystem's infr

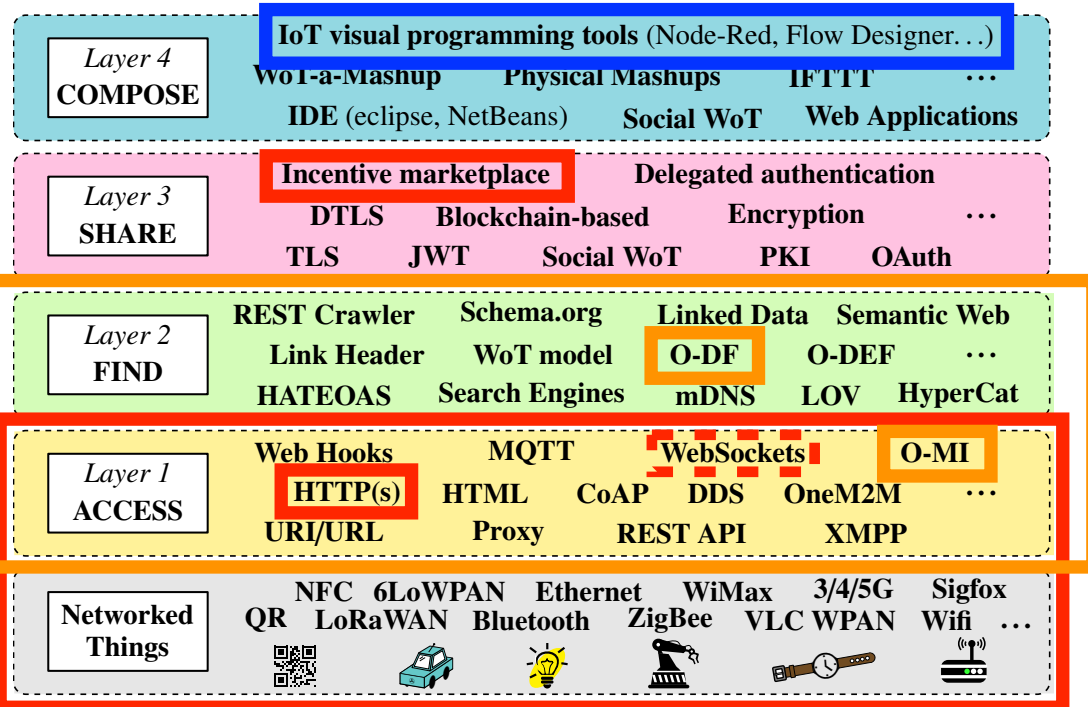


Compose innovative IoT services that fulfill untapped needs

bIoTope's Objective

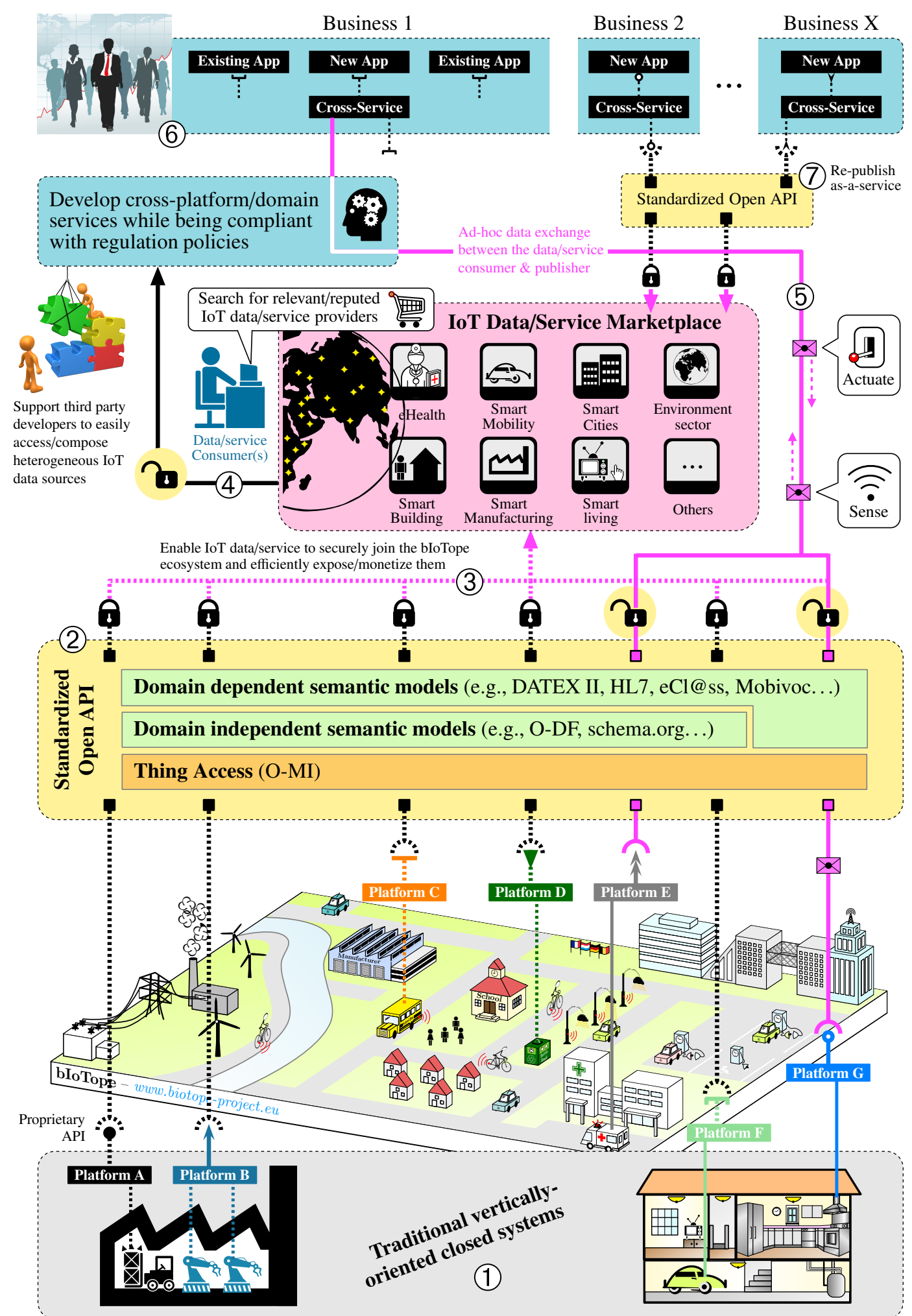


Towards Open Io bIoTope ecosystem's infr



Make business out of the proposed innovative services

bIoTope's Objective



Vertical Silos' issue

Developing cross-platform Services (Apps) based on bIoTope's ecosystem

A concrete example

Scenario Context & Settings

Apps often developed based on domain- or vendor-specific platforms (i.e., Siloed” Apps”)



JCDecaux API

...

Other...

...

Other...



BMW API



Hue API



Netatmo API



...

...

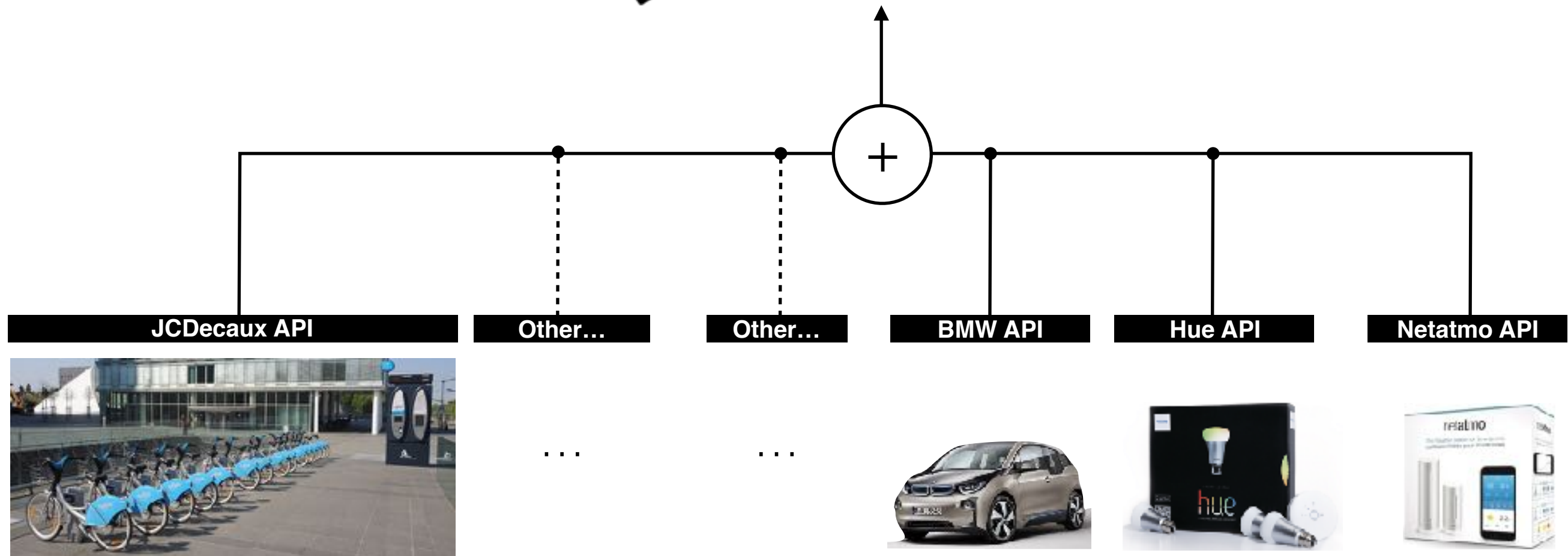


Scenario Context & Settings



How to create innovative Apps
with such disparate systems
and specific API definition?

Jérémy: our bloTope stakeholder
(e.g., SME developer)



Scenario Context & Settings

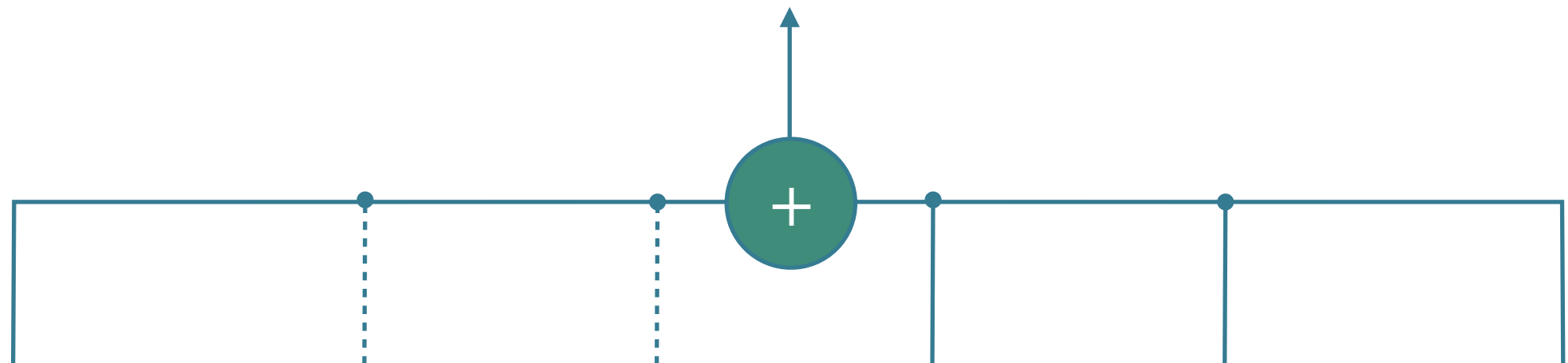
Jérémy: our bloTope stakeholder
(e.g., SME developer)



It would be great if there would be a market place in which I could find Services (APIs) which serves certain types of data



O-DF
O-MI



O-MI/O-DF standards + Standardized vocabularies (schema.org, SSN...)

JCDecaux API

Other...

Other...

BMW API

Hue API

Netatmo API



...

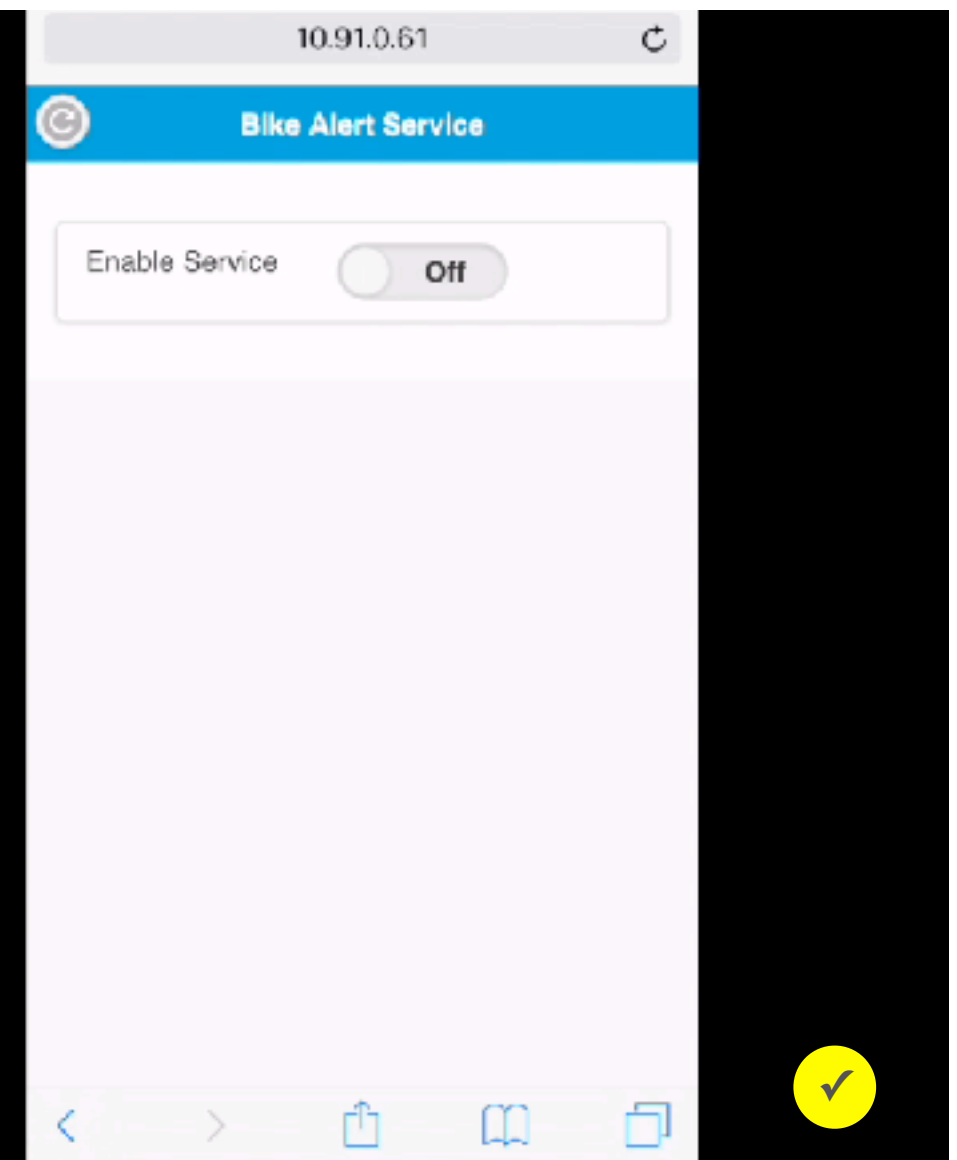
...



Notify/Alert the end-user,
when needed, about the most appropriate bike
parking spot taking into consideration bike
availability & weather preferences

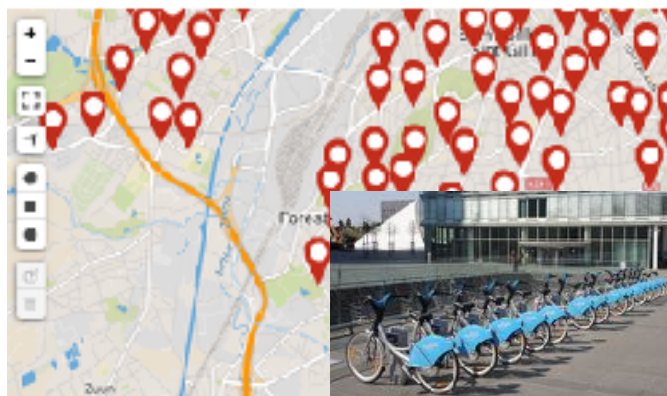


Jérémy

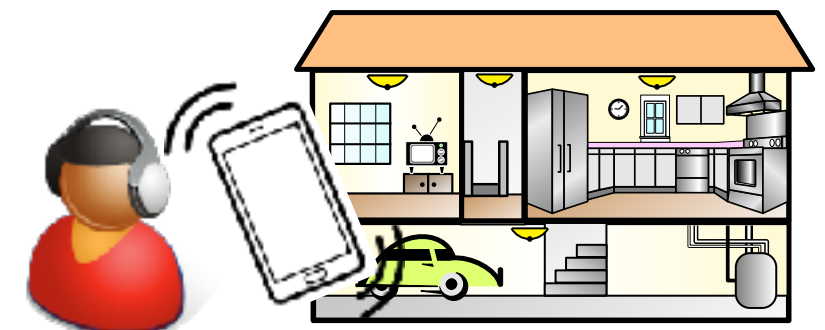


O-M/I/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API



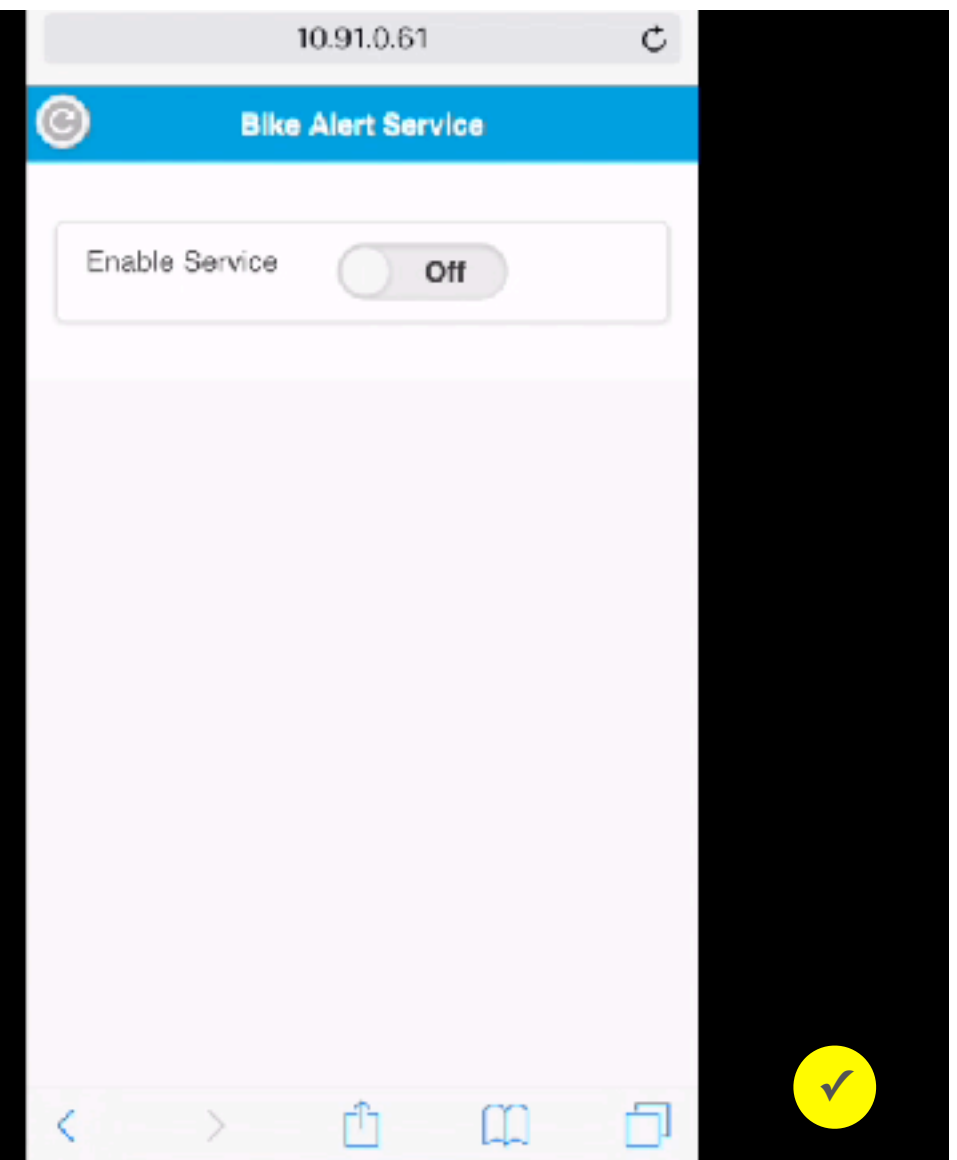
Netatmo API



Notify/Alert the end-user,
when needed, about the most appropriate bike
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availability & weather preferences

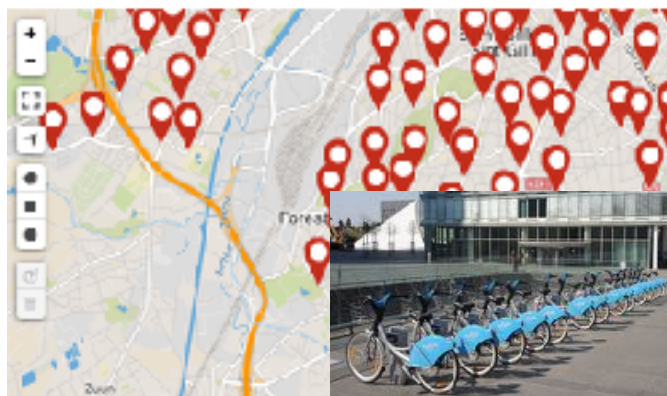


Jérémy

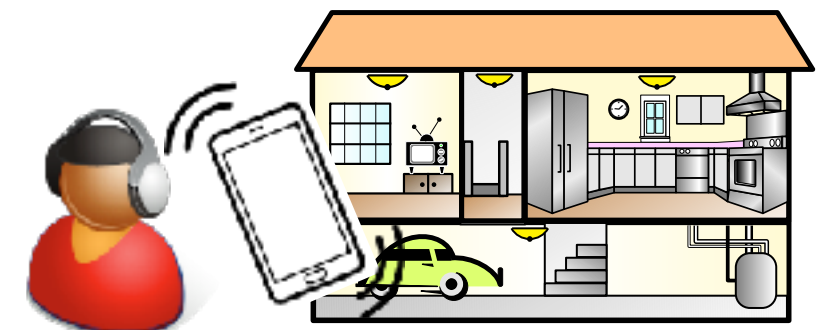


O-M/I/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API



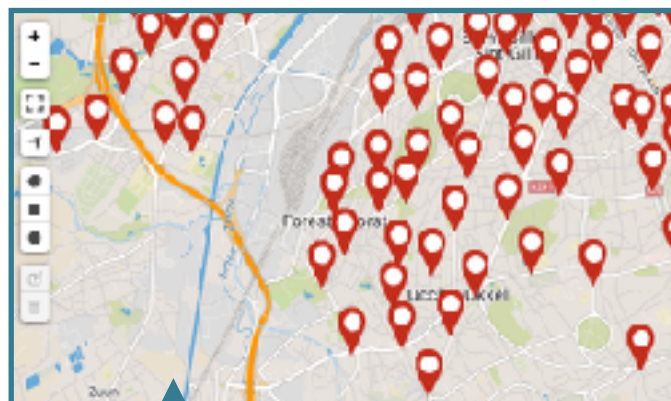
Netatmo API



Notify/Alert the end-user,
when needed, about the most appropriate bike
parking spot taking into consideration bike
availability & weather preferences



Jérémy



O-MI
NodeCity



Bike Alert Service

Enable Service ☒

Your home address:

Distance max when bad weather (in meter)

0

Distance max when good weather (in meter)

0

Departure Time

08:00

List of parking spot:

First Device Alerting:

Your Mobile Vibration will be used to alert you.

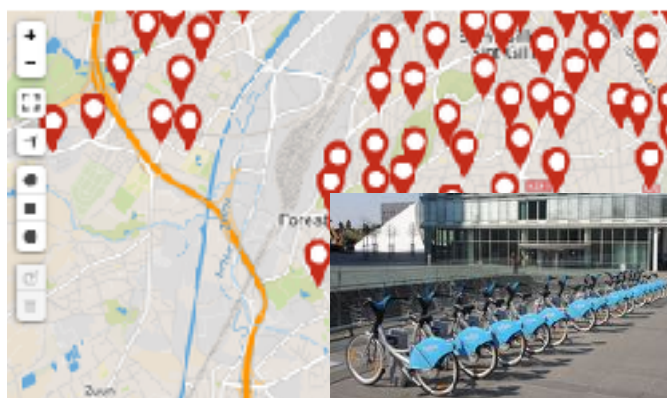
Second Device Alerting to show the bike unavailability rate

Hue Light ☒

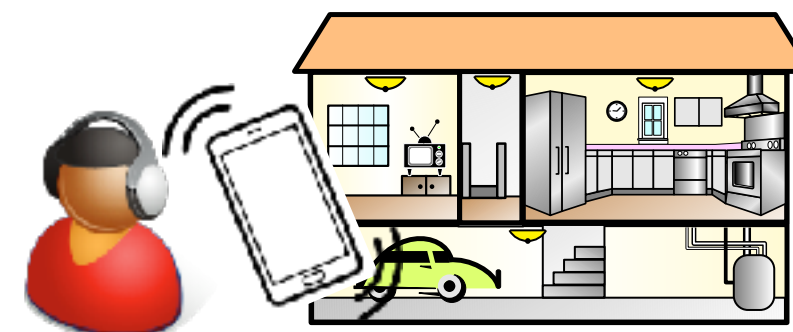
Apply

O-MI/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API



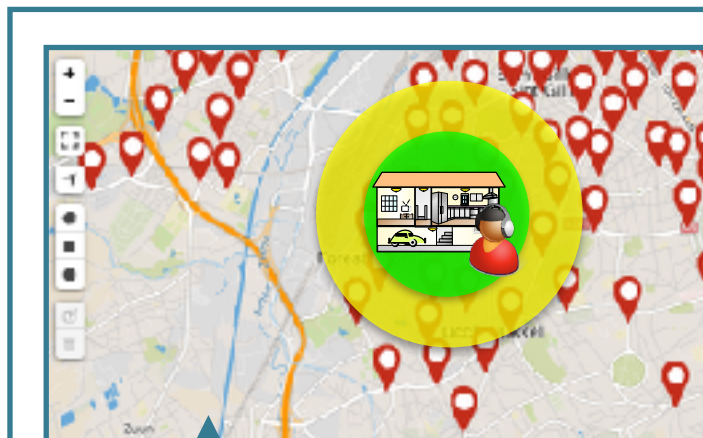
Netatmo API



Notify/Alert the end-user,
when needed, about the most appropriate bike
parking spot taking into consideration bike
availability & weather preferences



Jérémie



Daily departure
time



Home address



Spot area when
good weather



Spot area when
bad weather

O-MI
NodeCity



Bike Alert Service

Enable Service
☒ On

Your home address:

Distance max when bad weather (in meter)

Distance max when good weather (in meter)

Departure Time:

List of parking spot:

First Device Alerting:

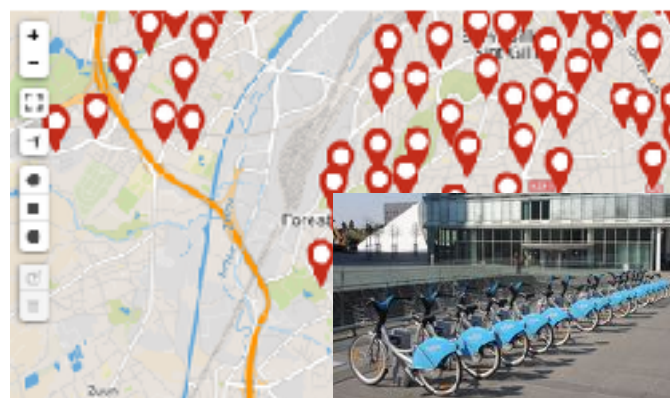
Second Device Alerting to show the bike unavailability rate

Hue Light
☒

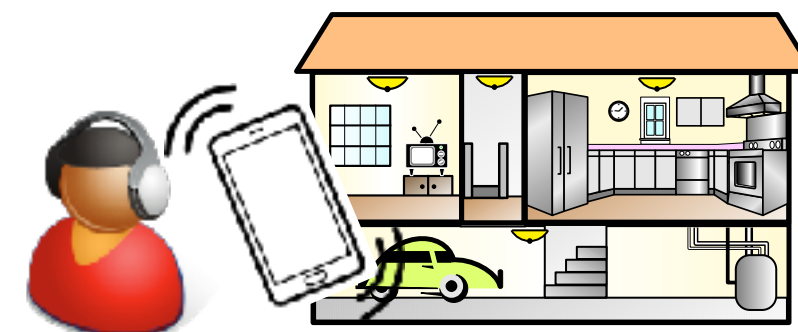
Apply

O-MI/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API



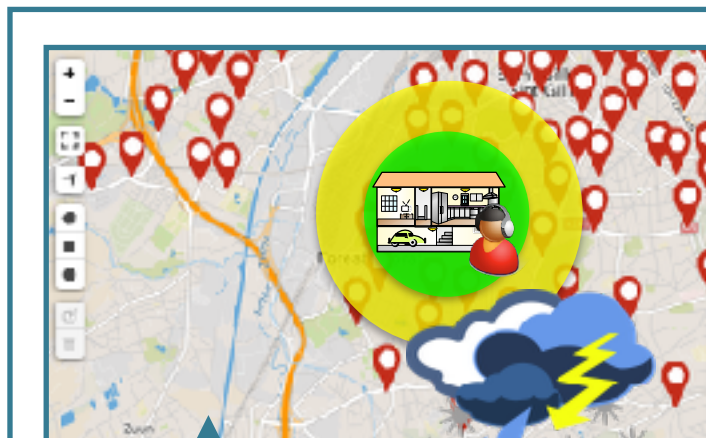
Netatmo API



Notify/Alert the end-user,
when needed, about the most appropriate bike
parking spot taking into consideration bike
availability & weather preferences



Jérémy



Daily departure
time

Home address

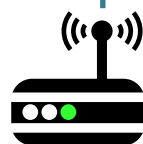
Spot area when
good weather

Spot area when
bad weather

O-MI
NodeCity



O-MI
NodeX



Bike Alert Service

Enable Service ☒

Your home address:

Distance max when bad weather (in meter)

0

Distance max when good weather (in meter)

0

Departure Time

08:00

List of parking spot:

First Device Alerting:

Your Mobile Vibration will be used to alert you.

Second Device Alerting to show the bike unavailability rate

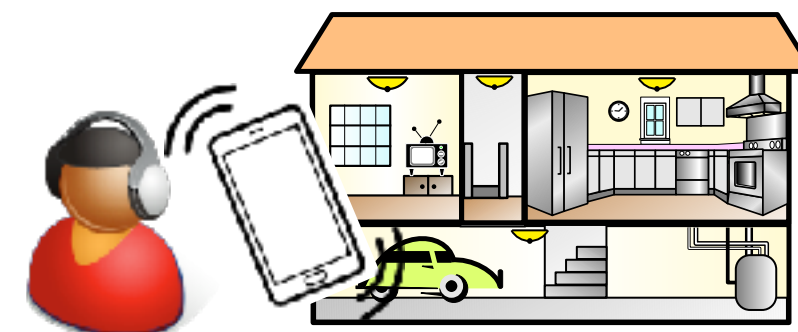
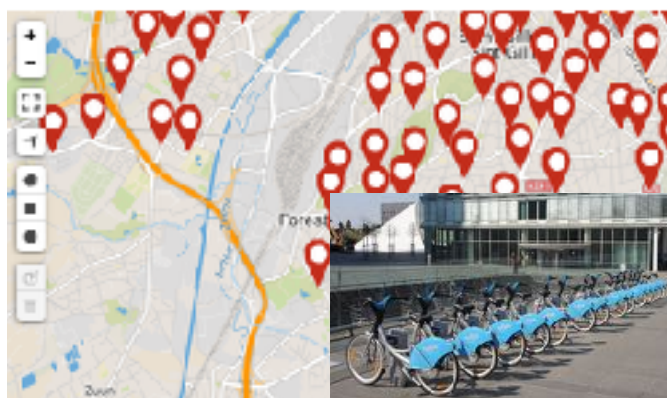
Hue Light

Apply

O-MI/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API

Netatmo API

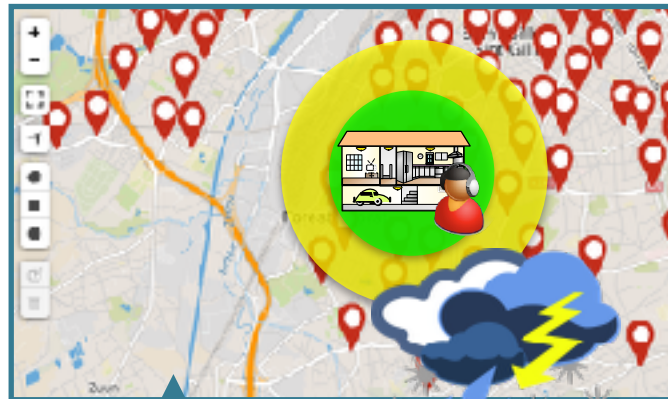


Notify/Alert the end-user,
when needed, about the most appropriate bike
parking spot taking into consideration bike
availability & weather preferences

Find appropriate parking
spots with the highest number of bikes
in the requested area (depending on
the weather), and then notify the end-
user sufficiently in time!



Jérémy



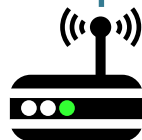
Daily departure
time

Home address

Spot area when
good weather

Spot area when
bad weather

O-MI
NodeCity



O-MI
NodeX

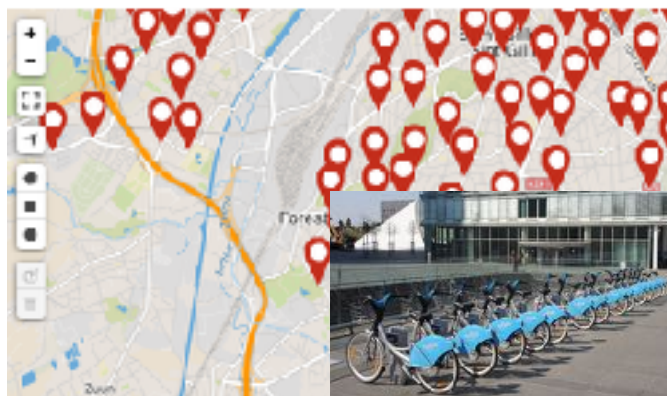


O-MI/O-DF standards + Standardised vocabularies (schema.org, SSN...)

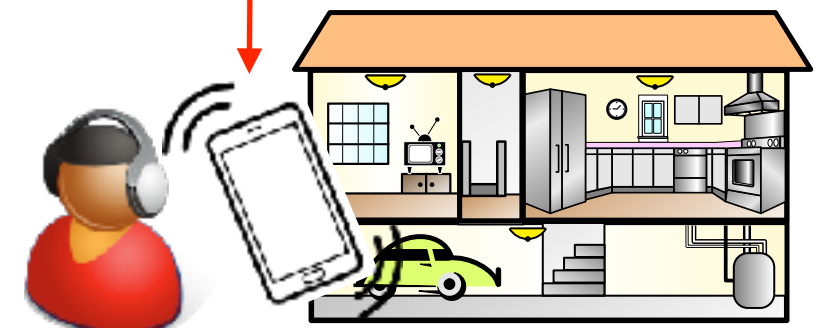
JCDecaux API

Netatmo API

Hue API



Send a notification when needed (depending
on the distance and departure time) of the
most appropriate bike parking spots



Light color giving
feedback about the bike
unavailability rate

O-MI Node
End-user

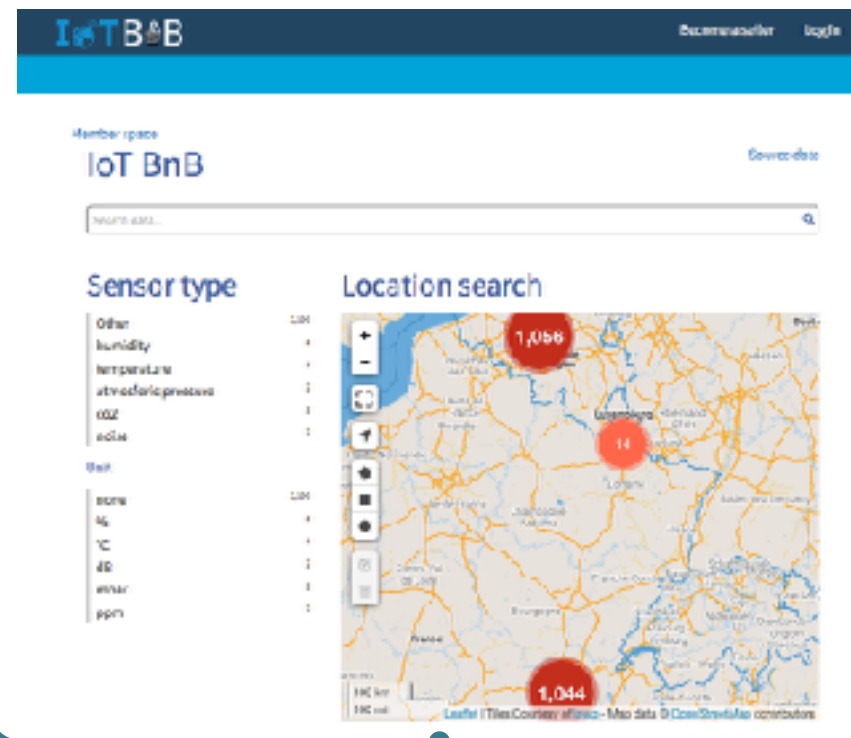
Developing cross-platform Services (Apps) based on bIoTope's ecosystem

IoTBnB: IoT Service puBlication & Billing

Development stages

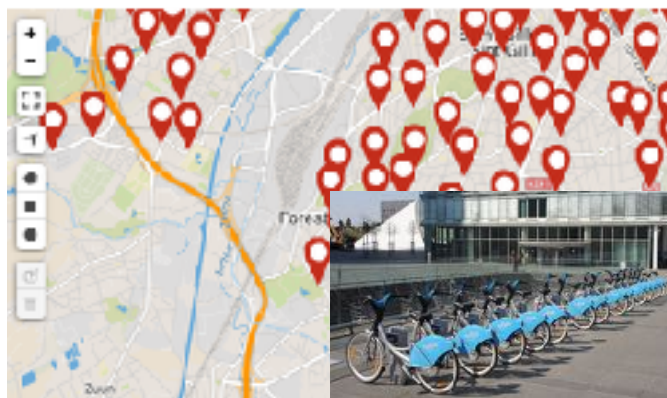


bloTope Service Marketplace



O-M/I/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API



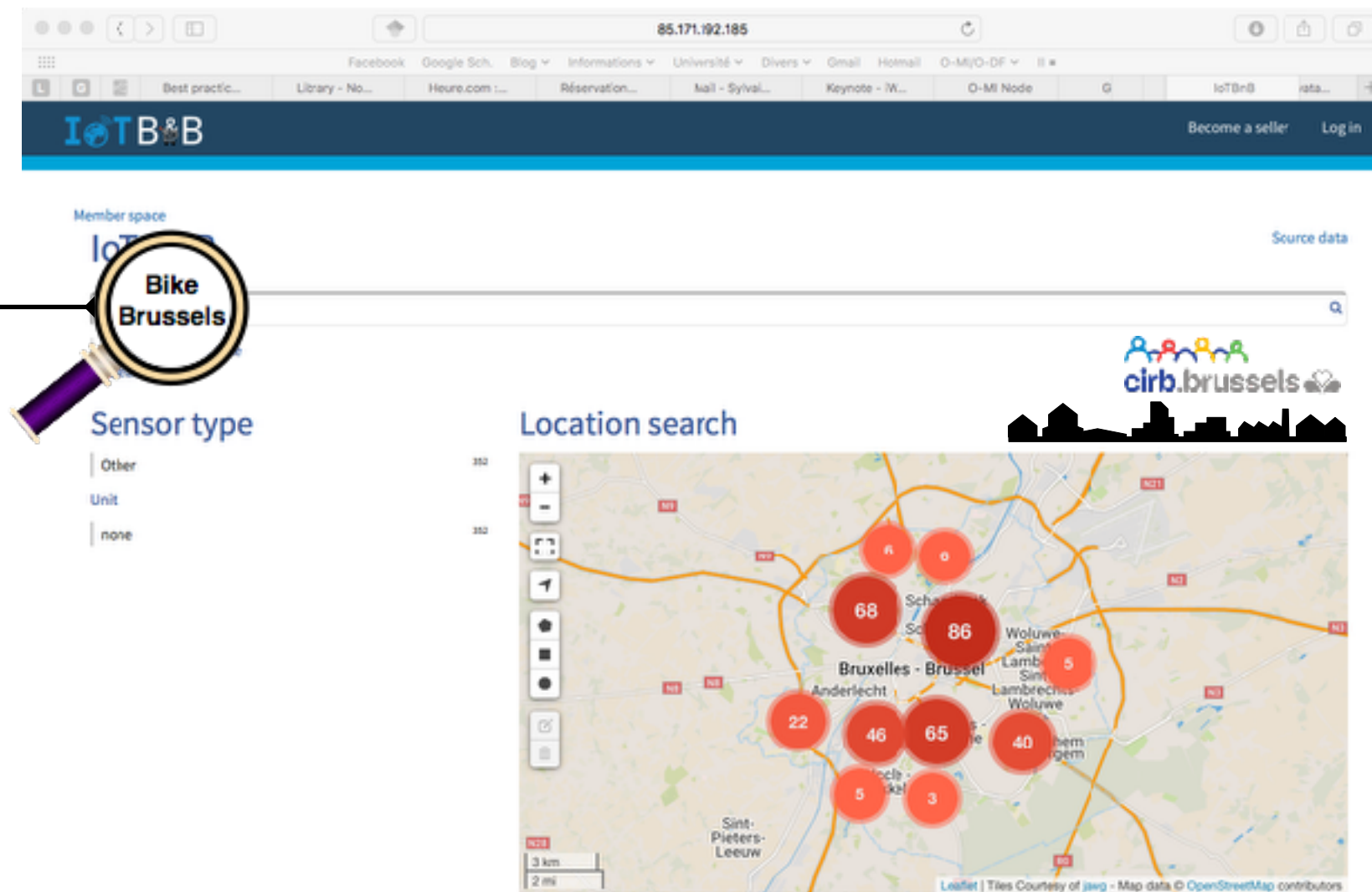
Netatmo API



Hue API



Development stages




DATA SOURCES

Only the 100 first entries are shown. To refine your selection, please use the filters

Development stages





Member space

Bike Brussels

Sensor type

Other

Unit

none

LyonBikesParkingSpot/10074/BikeStands

DATA OVERVIEW

Format's Standard Vocabulary Metadata

XML none 0

ACCESSIBILITY

Value:

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    <oml:result msgformat="odf">
      <oml:response returnCode="200">
        <oml:msg>
          <Object>
            <Object>
              <id>BruxellesBikesParkingSpot</id>
              <Object>
                <id>320</id>
                <InfoItem name="BikeStands">
                  <value unixTime="1473867687799" dateTime="2016-09-14T17:41:27.799+02:00" type="xs:int">22</value>
                </InfoItem>
              </Object>
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          </Object>
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  </oml:response>
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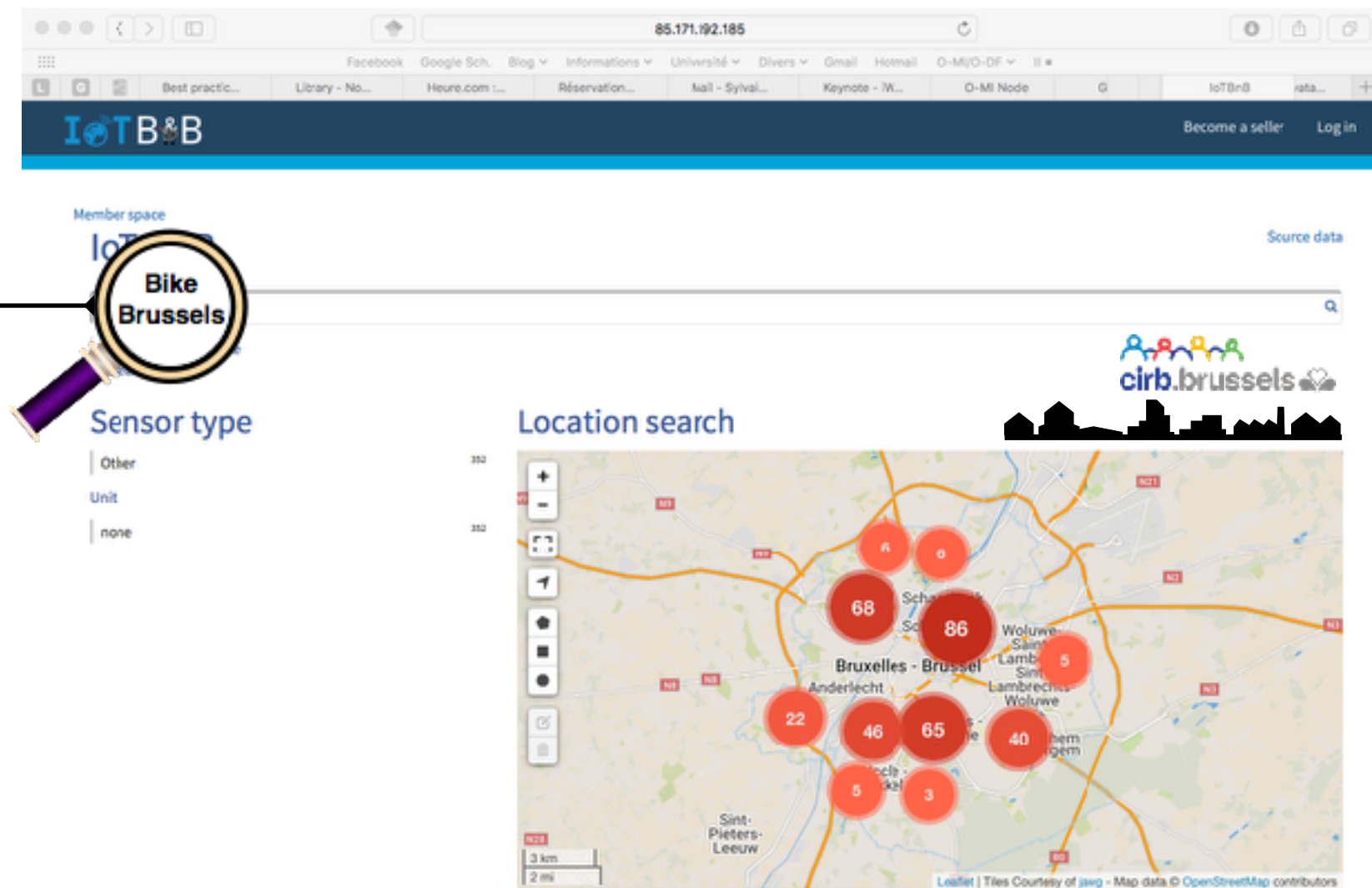
DATA SOURCE

Only the 100 first entries

Type	Root URL	OMI node path	Resource link	Price	Reputation	Overview	
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/320/BikeStands		1 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/82/BikeStands		4 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/168/BikeStands		1 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/223/BikeStands		7 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/304/BikeStands		1 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/251/BikeStands		3 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/120/BikeStands		5 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/109/BikeStands		4 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/265/BikeStands		2 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/44/BikeStands		7 B	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBikesParkingSpot/271/BikeStands		2 B	★★★★☆		Add to Cart

[Show Cart](#)

Development stages



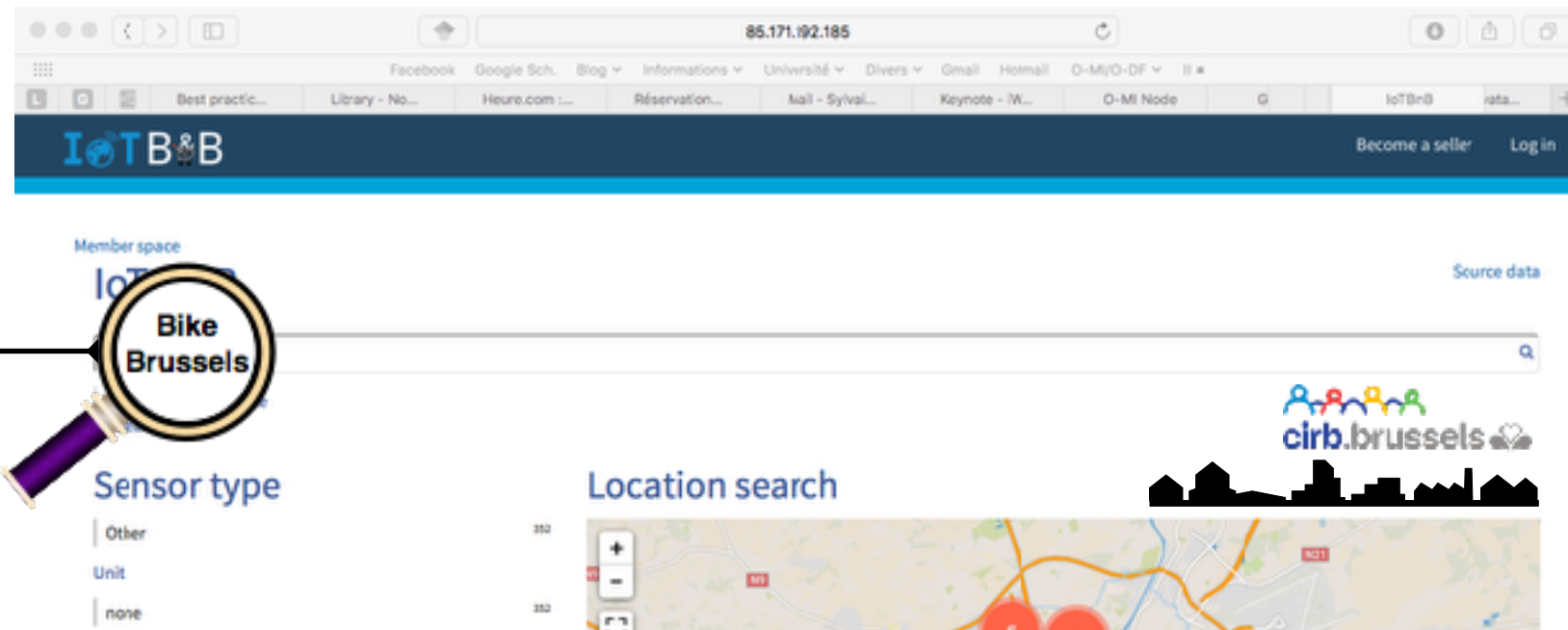
DATA SOURCES

Only the 100 first entries are shown. To refine your selection, please use the filters

Type	Root URL	OMI node fath	Resource link	Price	Reputation	Overview	
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/320/BikeStands	🔗	1 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/82/BikeStands	🔗	4 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/168/BikeStands	🔗	1 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/223/BikeStands	🔗	7 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/304/BikeStands	🔗	1 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/251/BikeStands	🔗	3 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/120/BikeStands	🔗	5 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/109/BikeStands	🔗	4 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/265/BikeStands	🔗	2 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/44/BikeStands	🔗	7 B	★★★★☆	📄	Add to Cart
Other	http://biotope.sntiotlab.lu8080/	BruxellesBilesParkingSpot/271/BikeStands	🔗	2 B	★★★★☆	📄	Add to Cart

[Show Cart](#)

Development stages

Cart

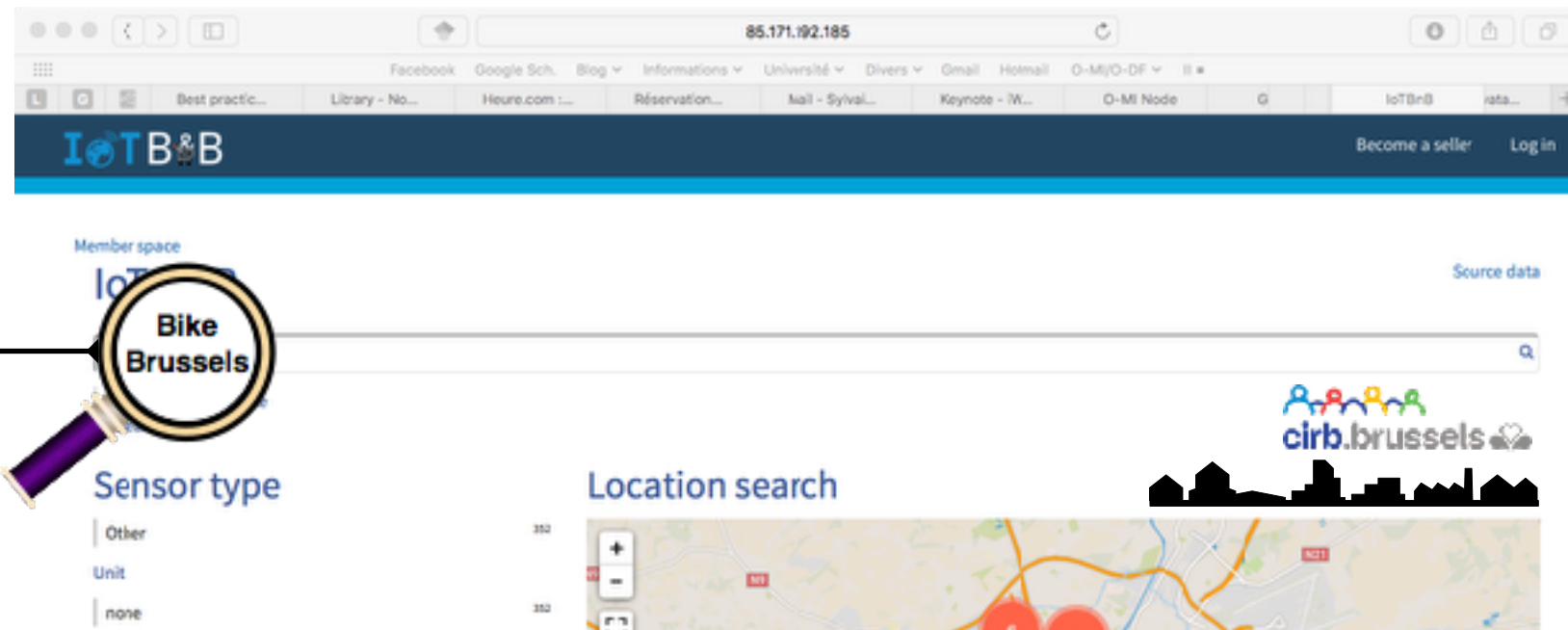
		Validity Period (in week)	Amount	Total
✕	http://biotope.sntiotlab.lu:8080/Objects/BrusselsBikesParkingSpot/59/AvailableBikes	- 1 +	10 ₣	10 ₣
✕	http://85.171.192.185:8080/Objects/LyonBikesParkingSpot/9010/BikeStands	- 2 +	10 ₣	20 ₣
			Total:	30 ₣

Buy Data

Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/120/BikeStands	5 ₣	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/109/BikeStands	4 ₣	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/265/BikeStands	2 ₣	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/44/BikeStands	7 ₣	★★★★☆		Add to Cart
Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/271/BikeStands	2 ₣	★★★☆☆		Add to Cart

Show Cart

Development stages



Cart

		Validity Period (in week)	Amount	Total
✕	http://biotope.sntiotlab.lu:8080/Objects/BrusselsBikesParkingSpot/59/AvailableBikes	- 1 +	10 ₣	10 ₣
✕	http://85.171.192.185:8080/Objects/LyonBikesParkingSpot/9010/BikeStands	- 2 +	10 ₣	20 ₣
			Total:	30 ₣

Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/120/BikeStands	5 ₣	★★★★☆	Add to Cart
Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/109/BikeStands	4 ₣	★★★★☆	Add to Cart
Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/265/BikeStands	2 ₣	★★★★☆	Add to Cart
Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/44/BikeStands	7 ₣	★★★★☆	Add to Cart
Other	http://biotope.sntiotlab.lu:8080/	BruxellesBikesParkingSpot/271/BikeStands	2 ₣	★★★☆☆	Add to Cart

Show Cart

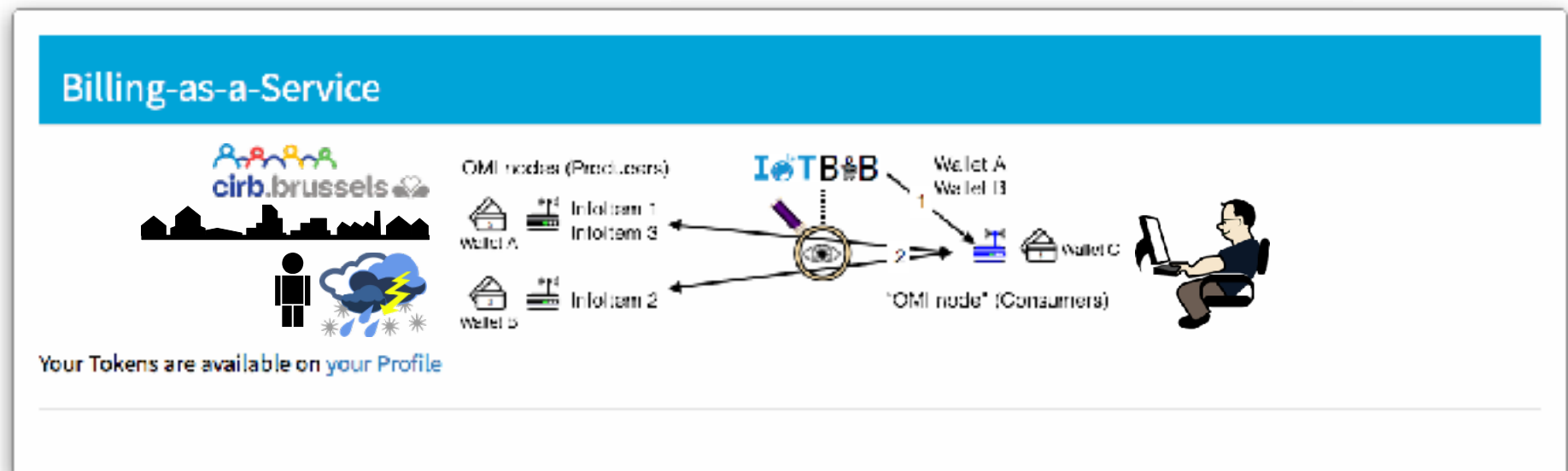
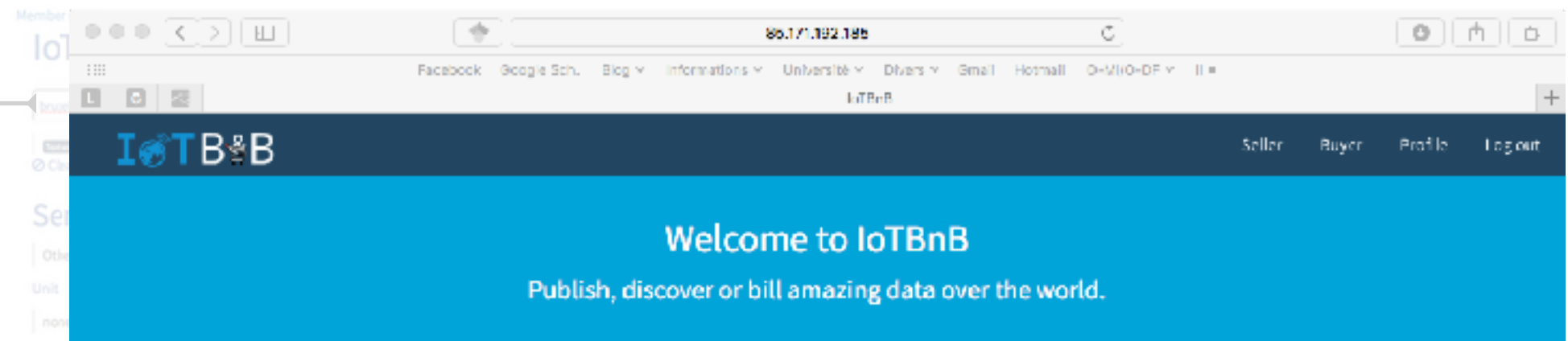
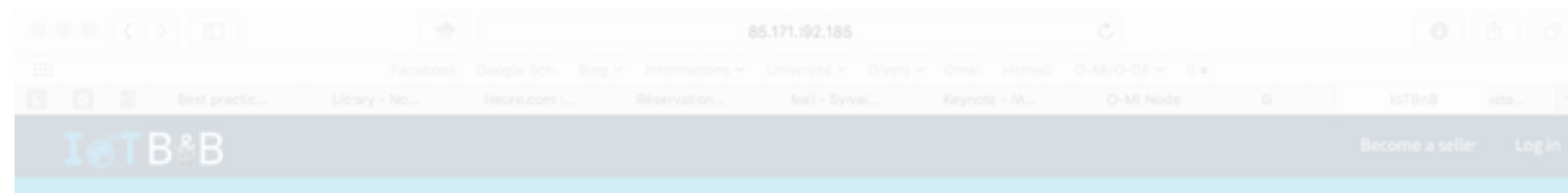
Buy Data



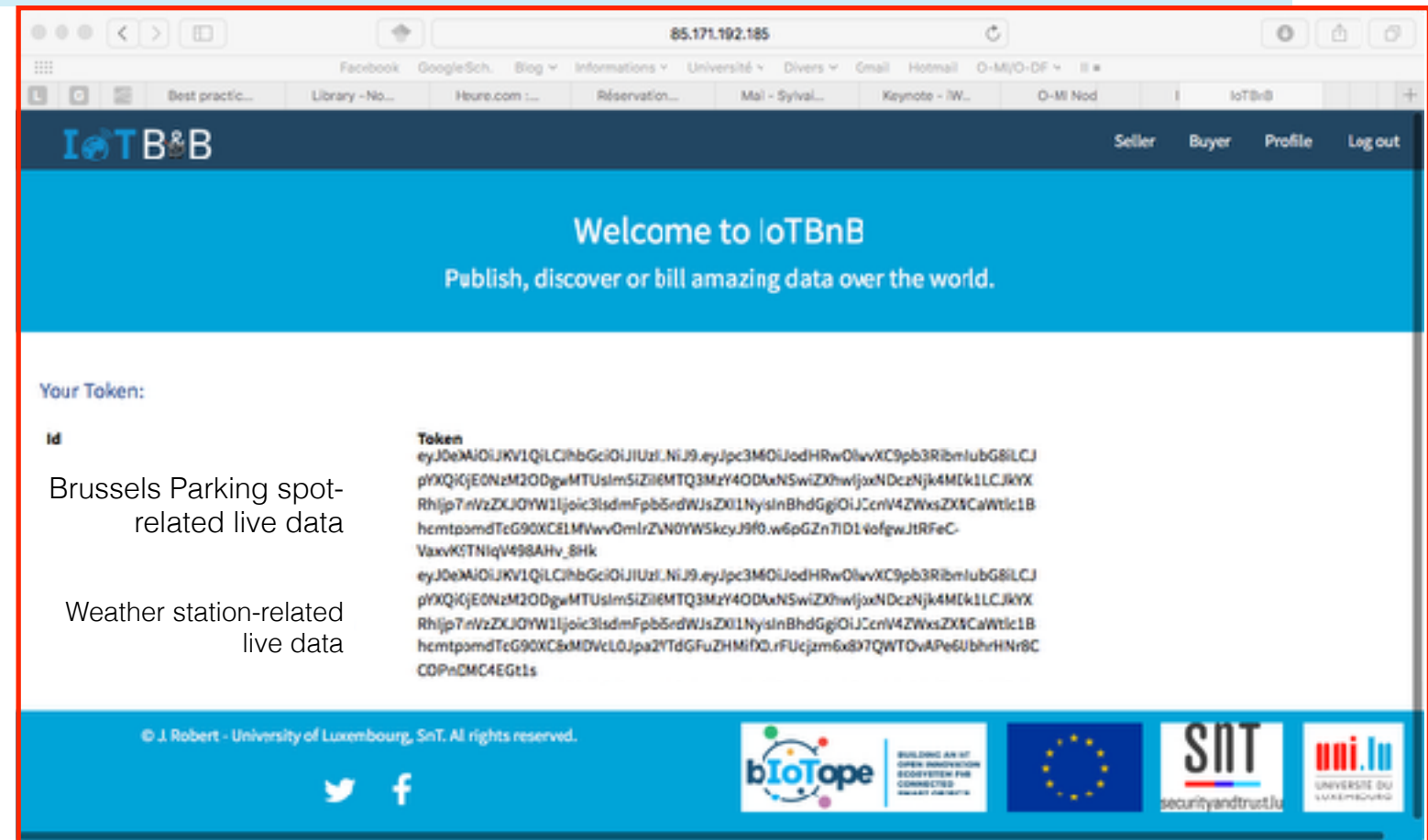
Development stages



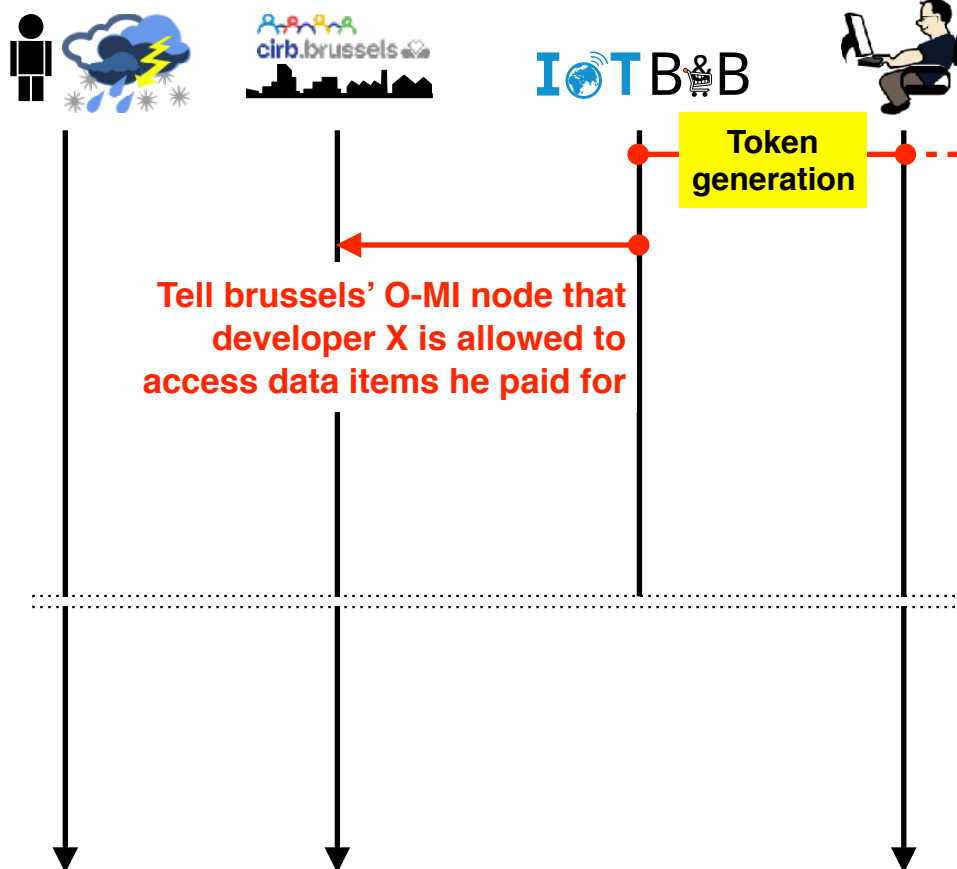
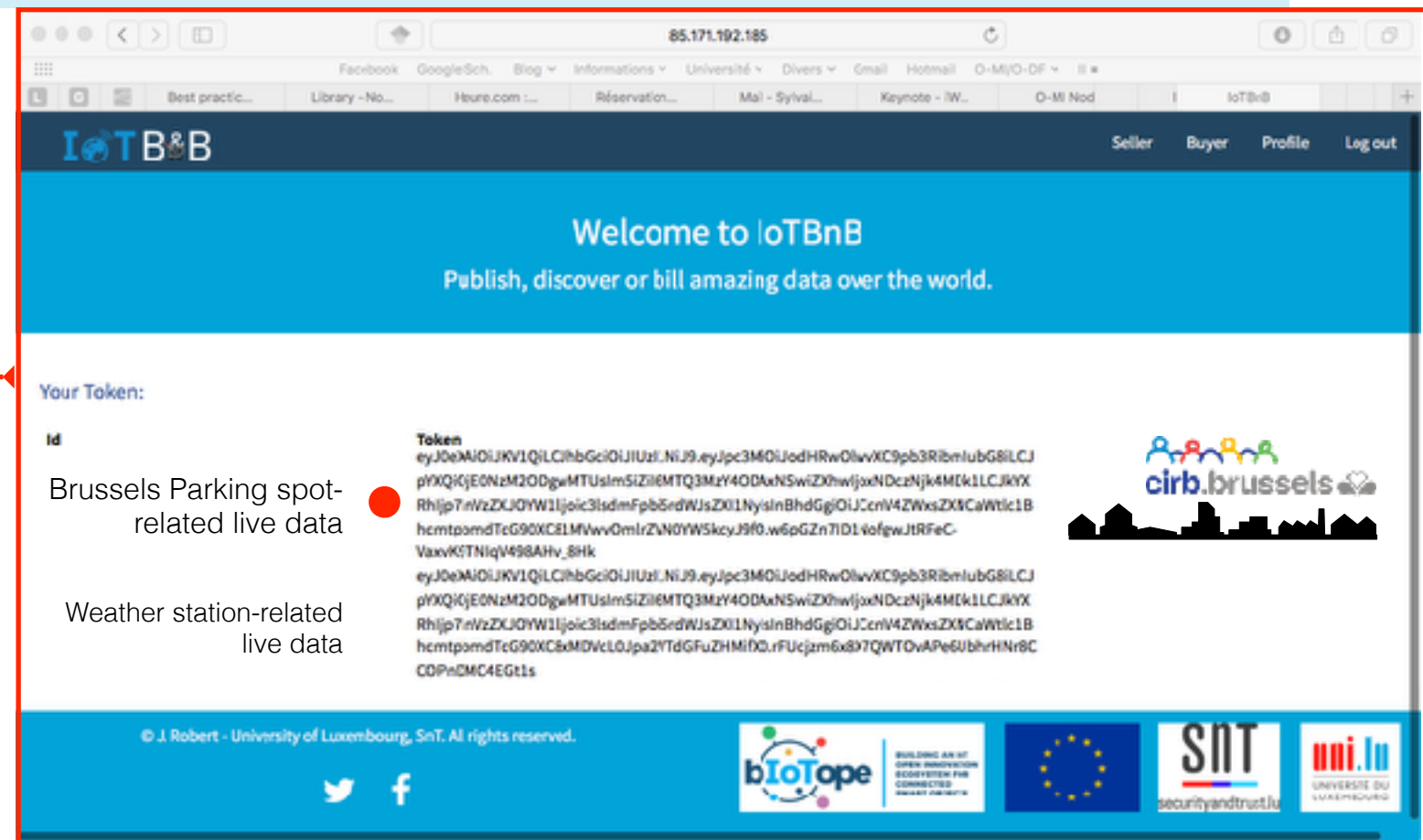
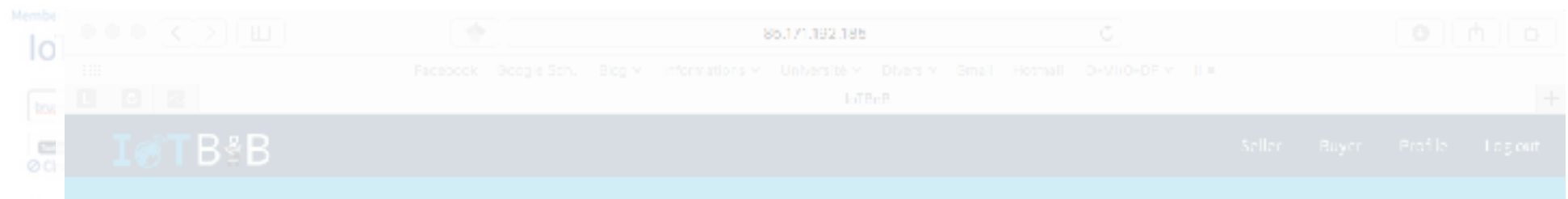
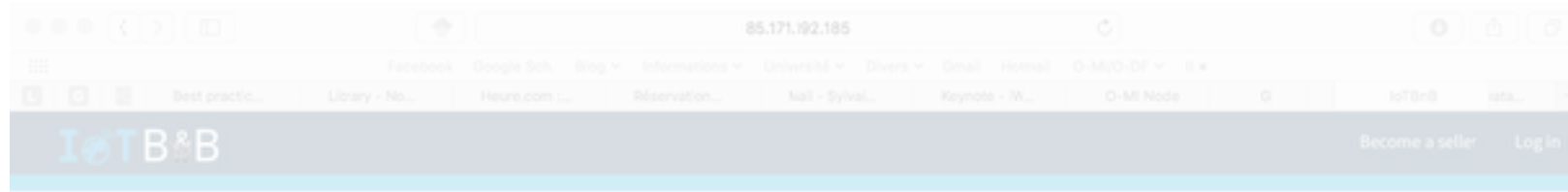
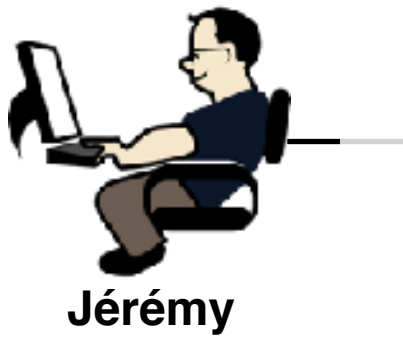
Jérémy



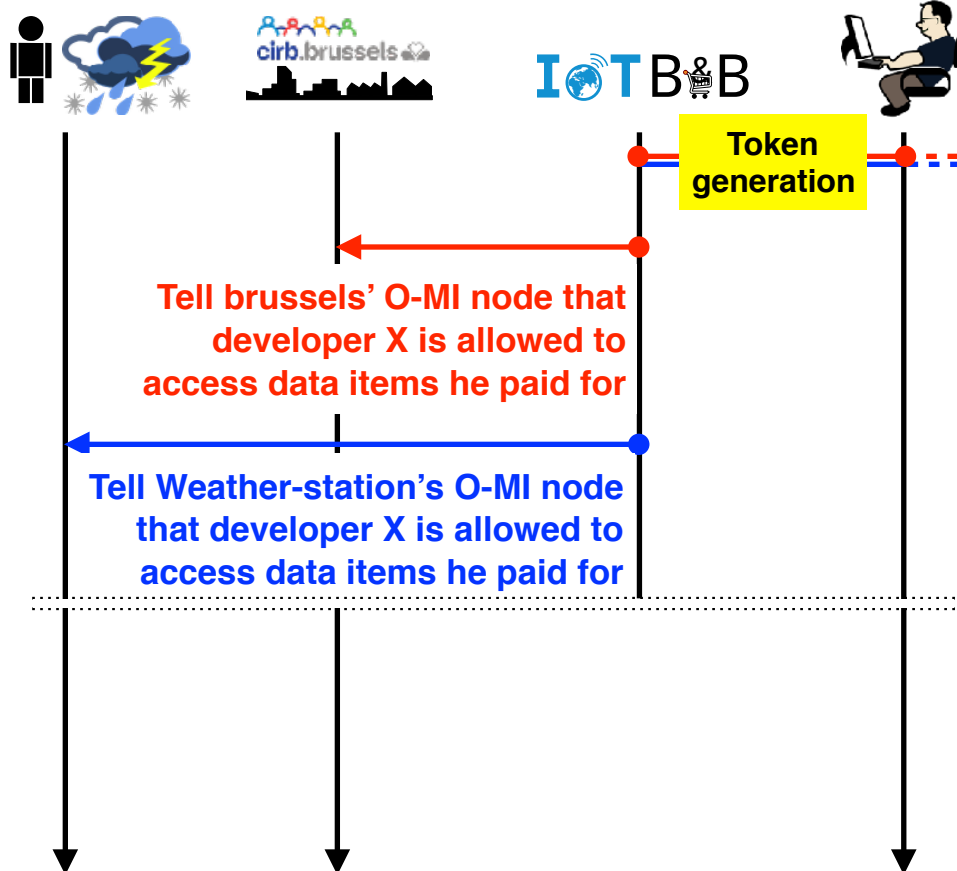
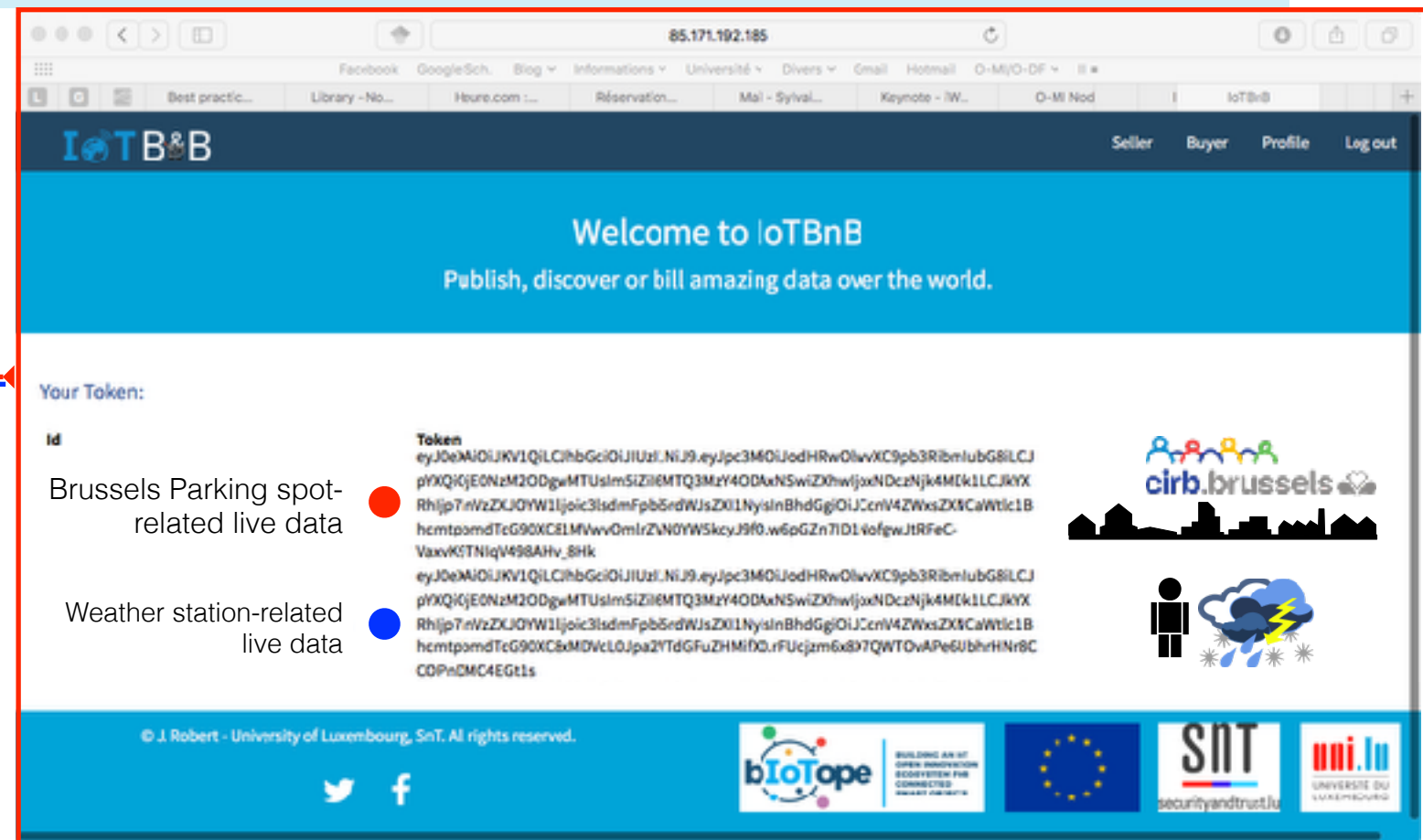
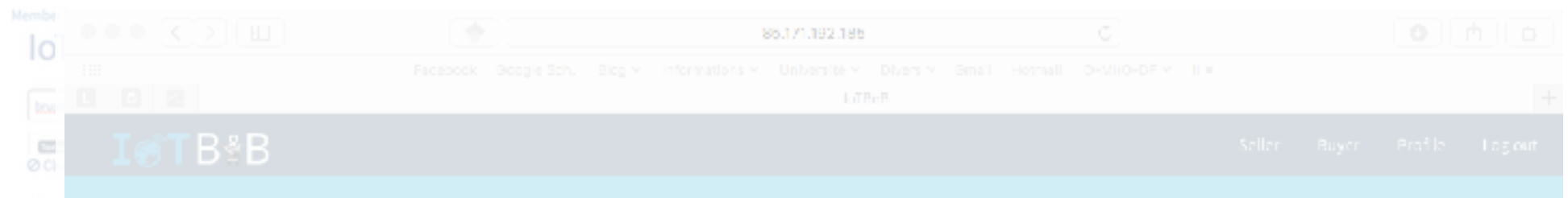
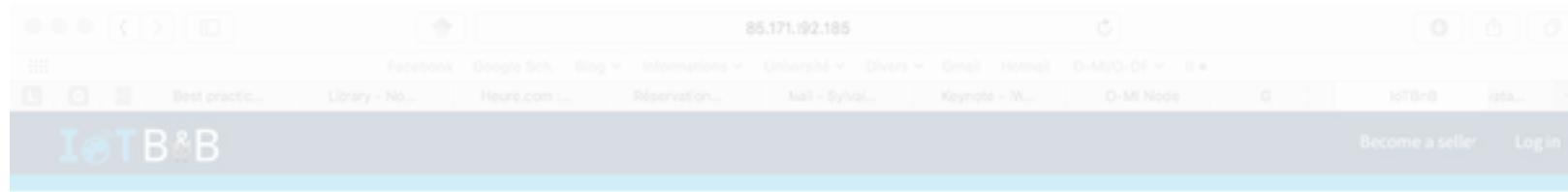
Show Cart



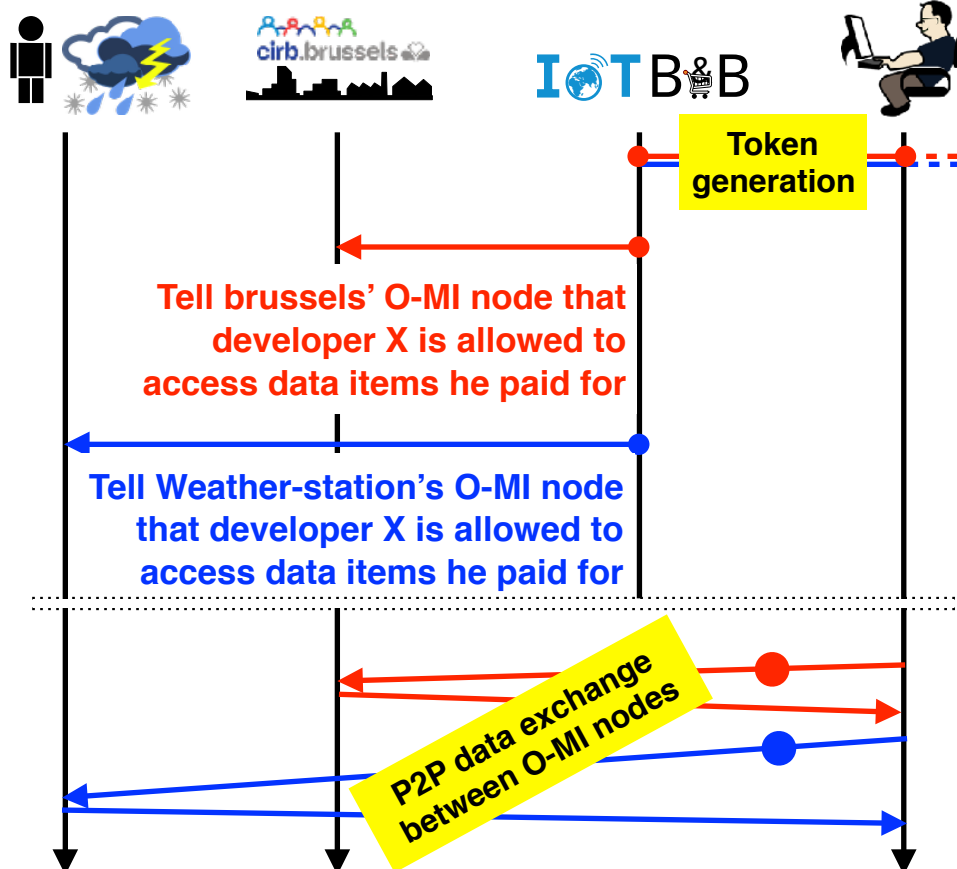
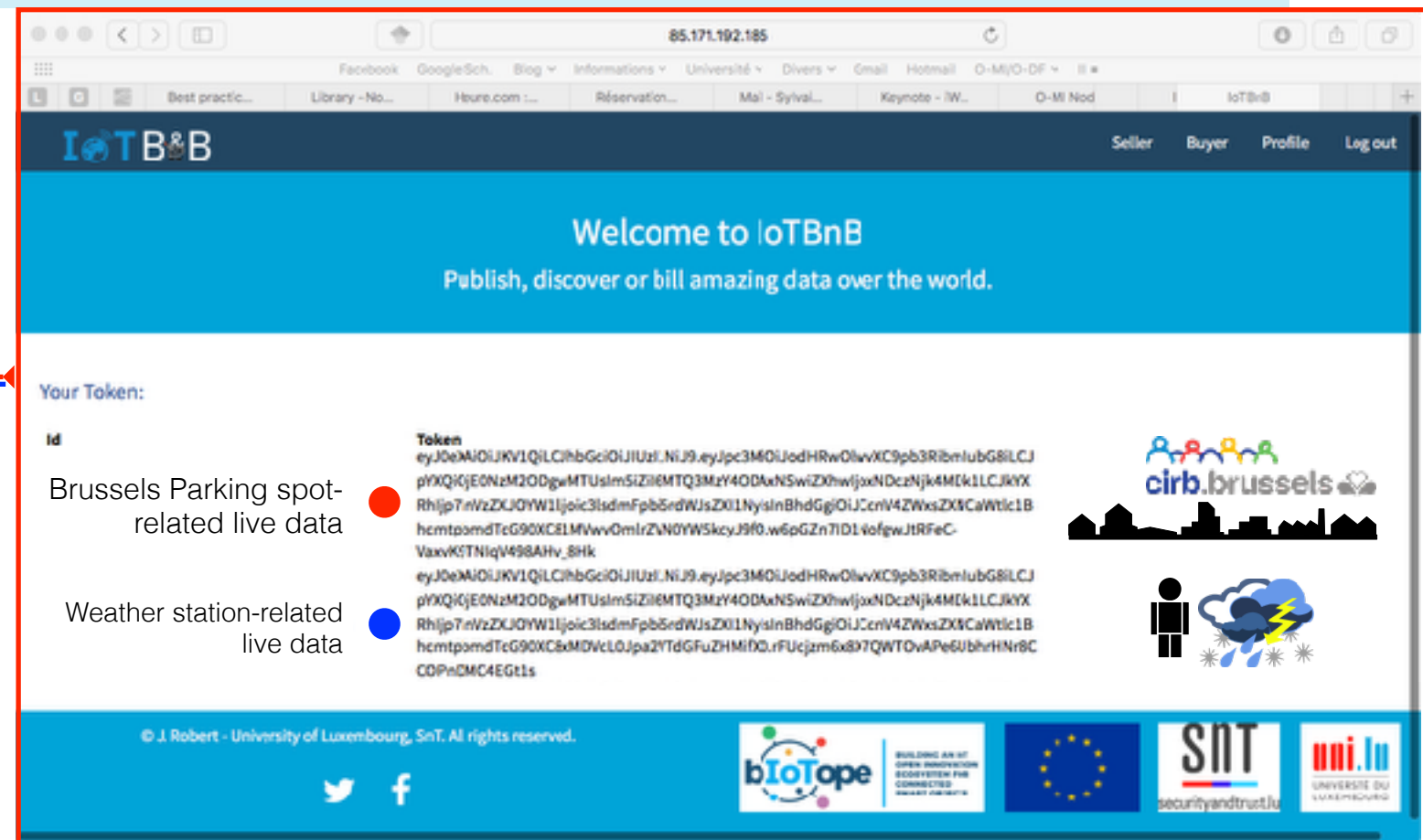
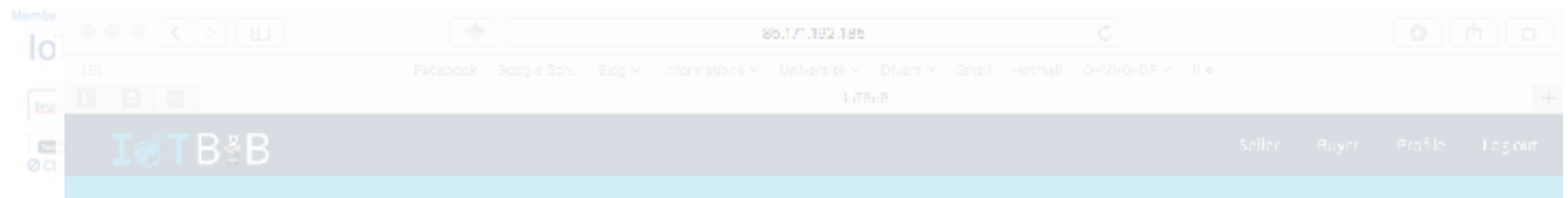
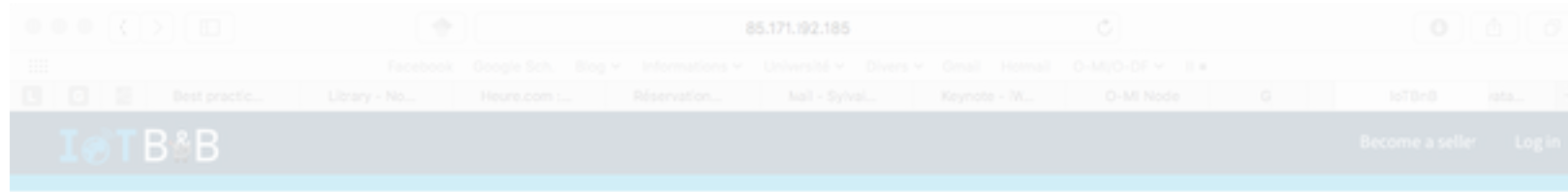
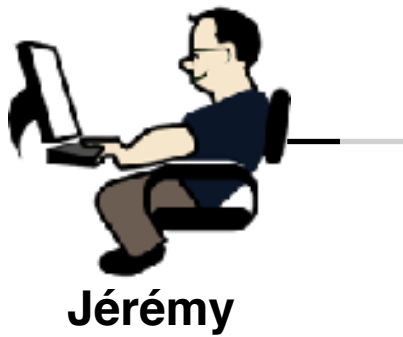
Development stages



Development stages



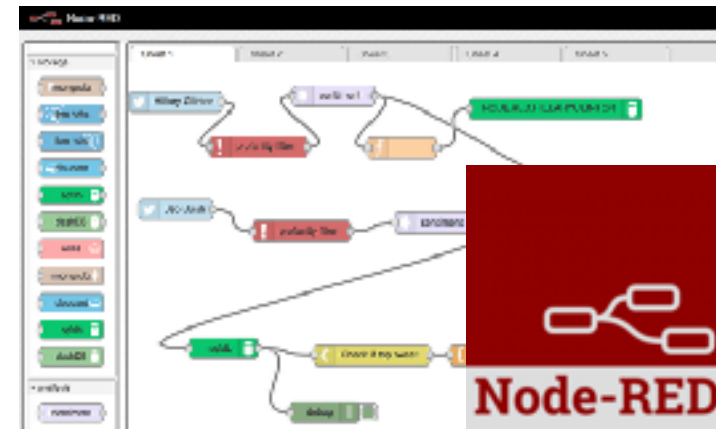
Development stages



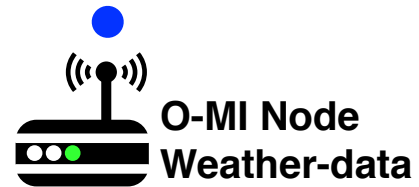
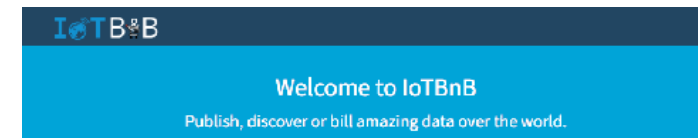
Development stages



My favorite IDE

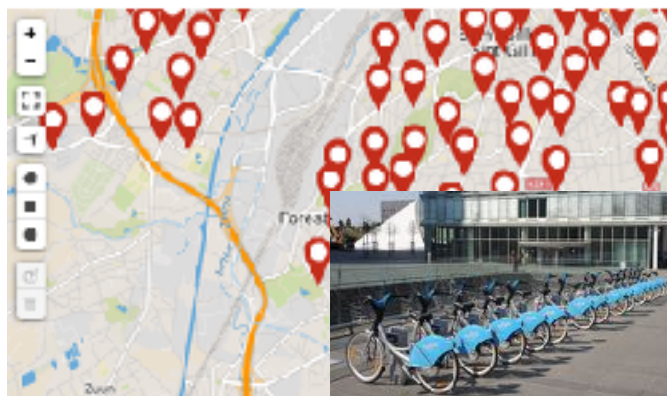


bloTope Service Marketplace



O-MI/O-DF standards + Standardised vocabularies (schema.org, SSN...)

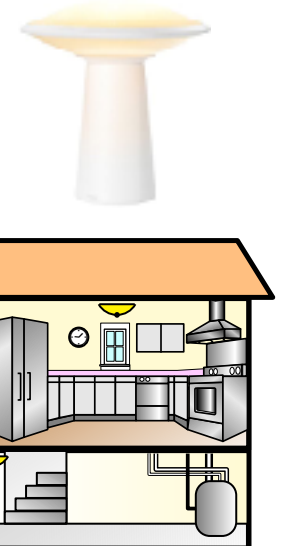
JCDecaux API



Netatmo API



Hue API



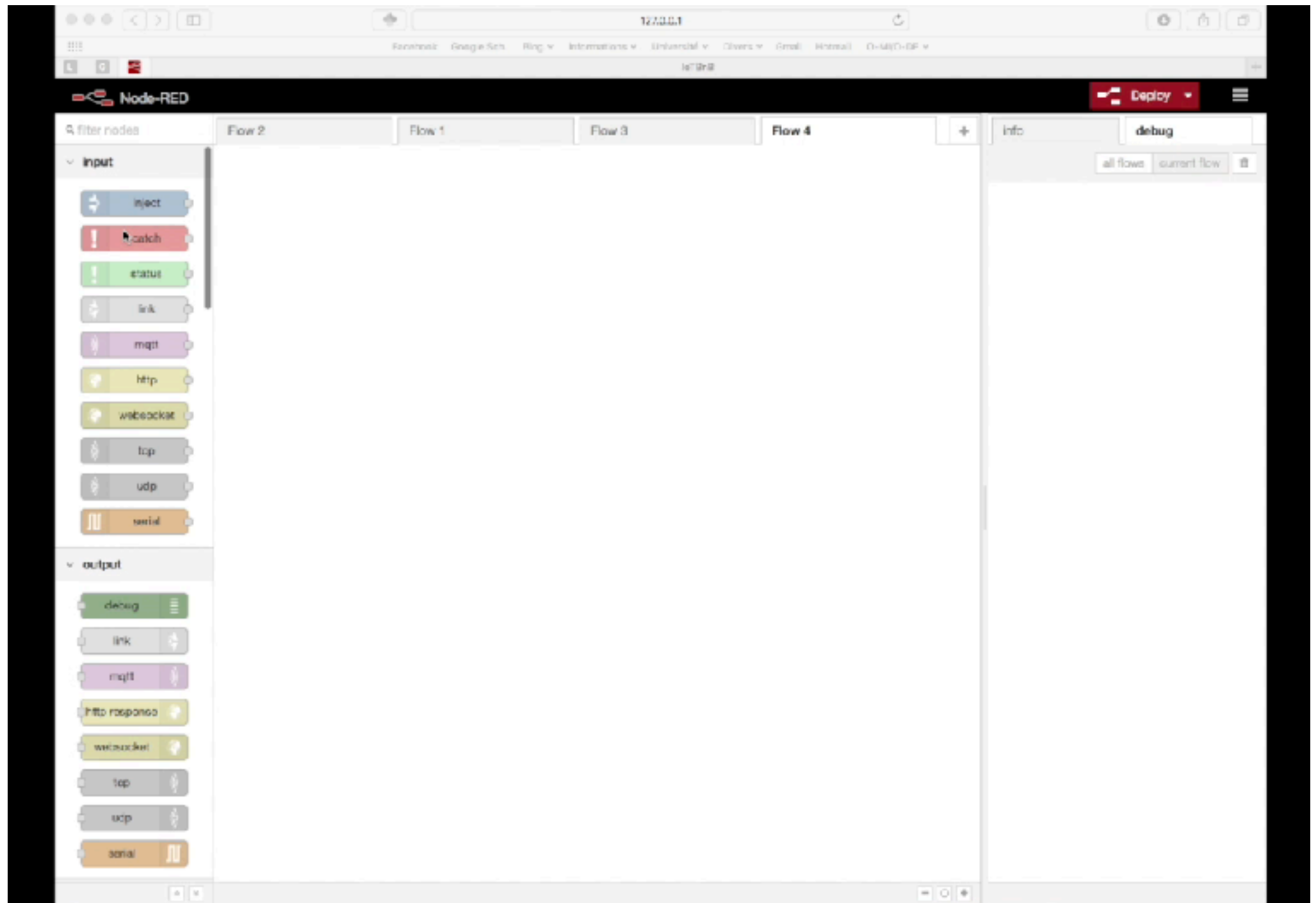
Development stages



Jérémy



My favorite IDE



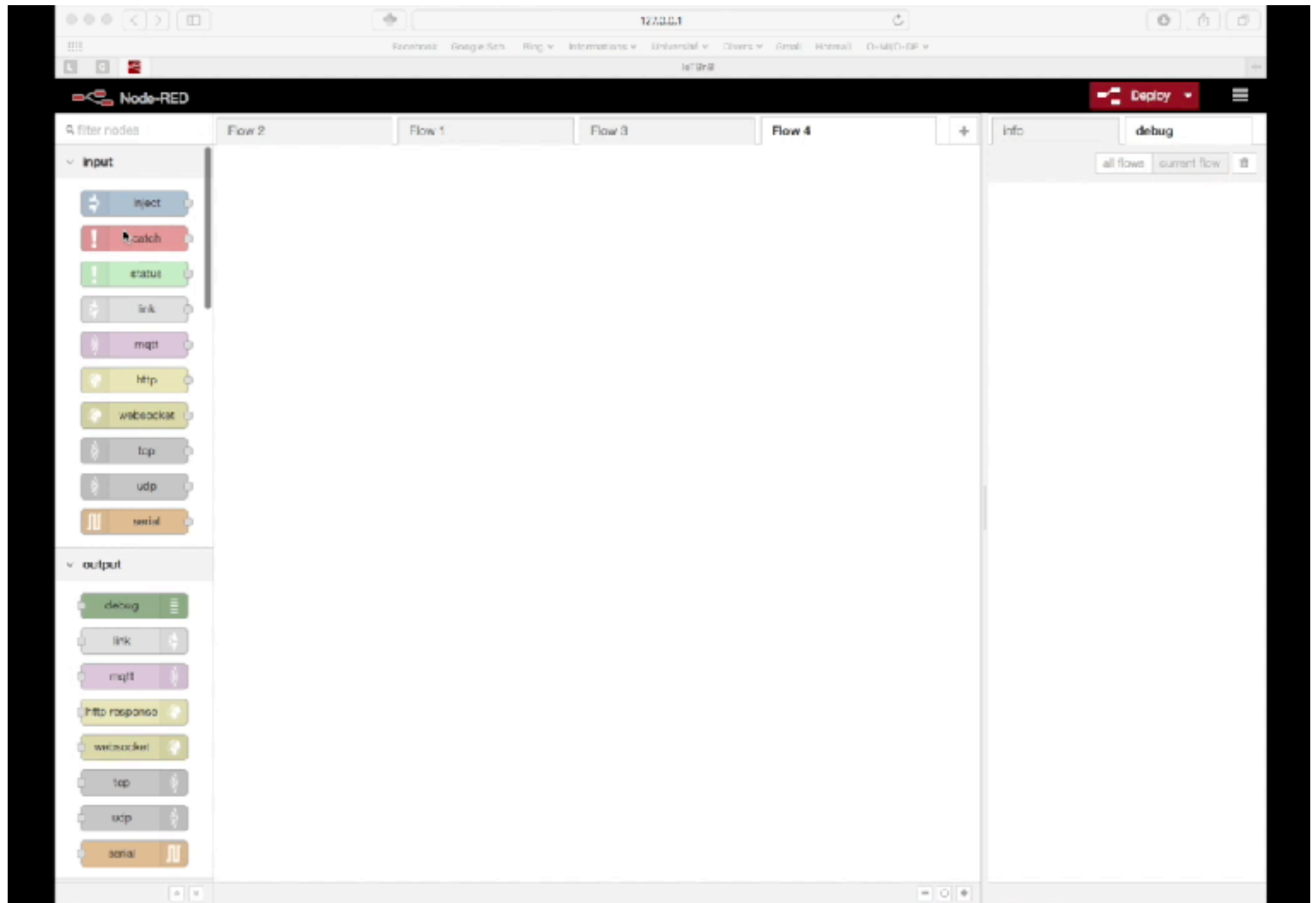
Development stages

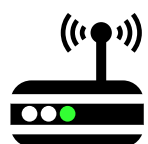
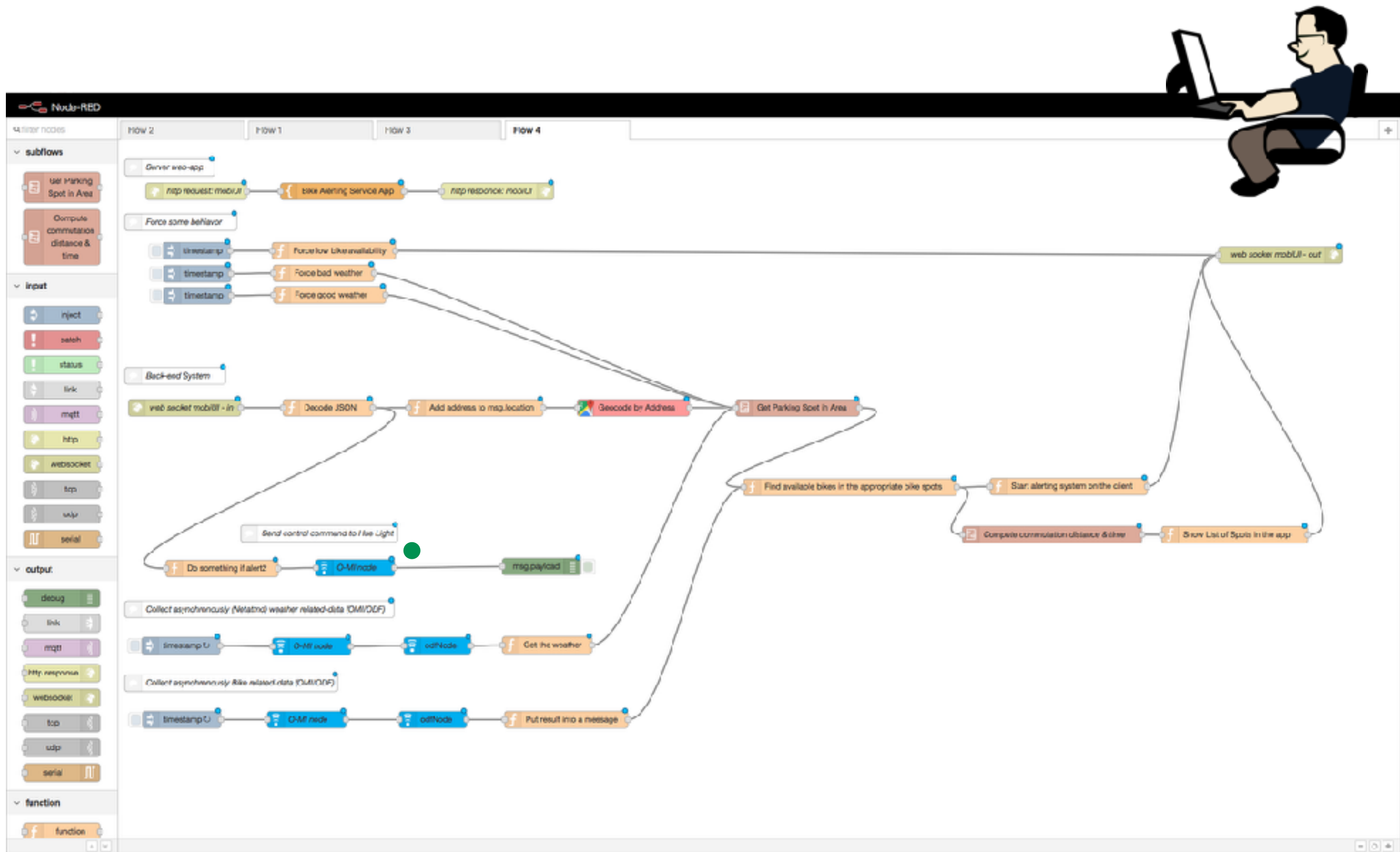


Jérémy

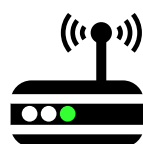


My favorite IDE

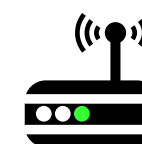




O-MI Node
Brussels



O-MI Node
Weather-data



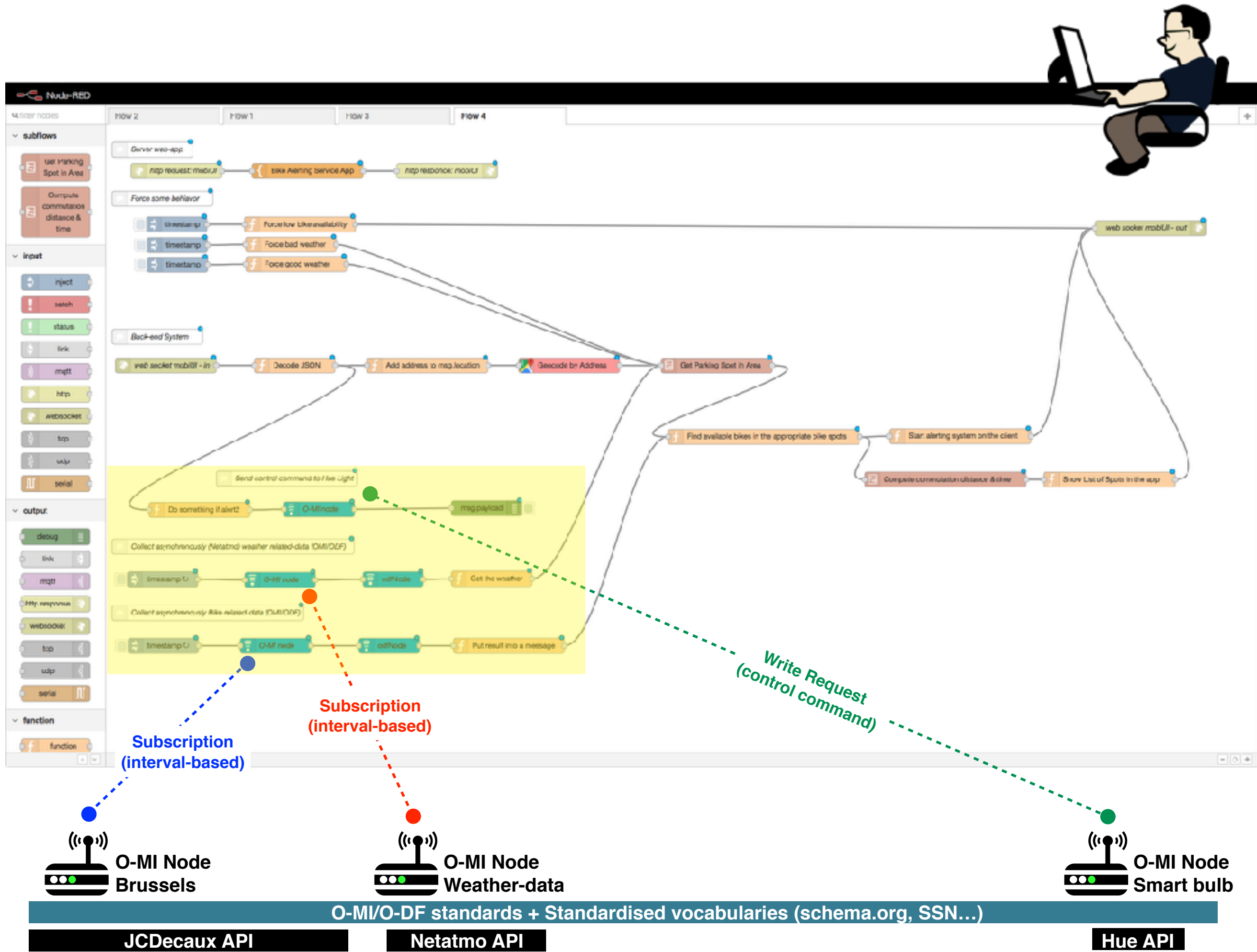
O-MI Node
Smart bulb

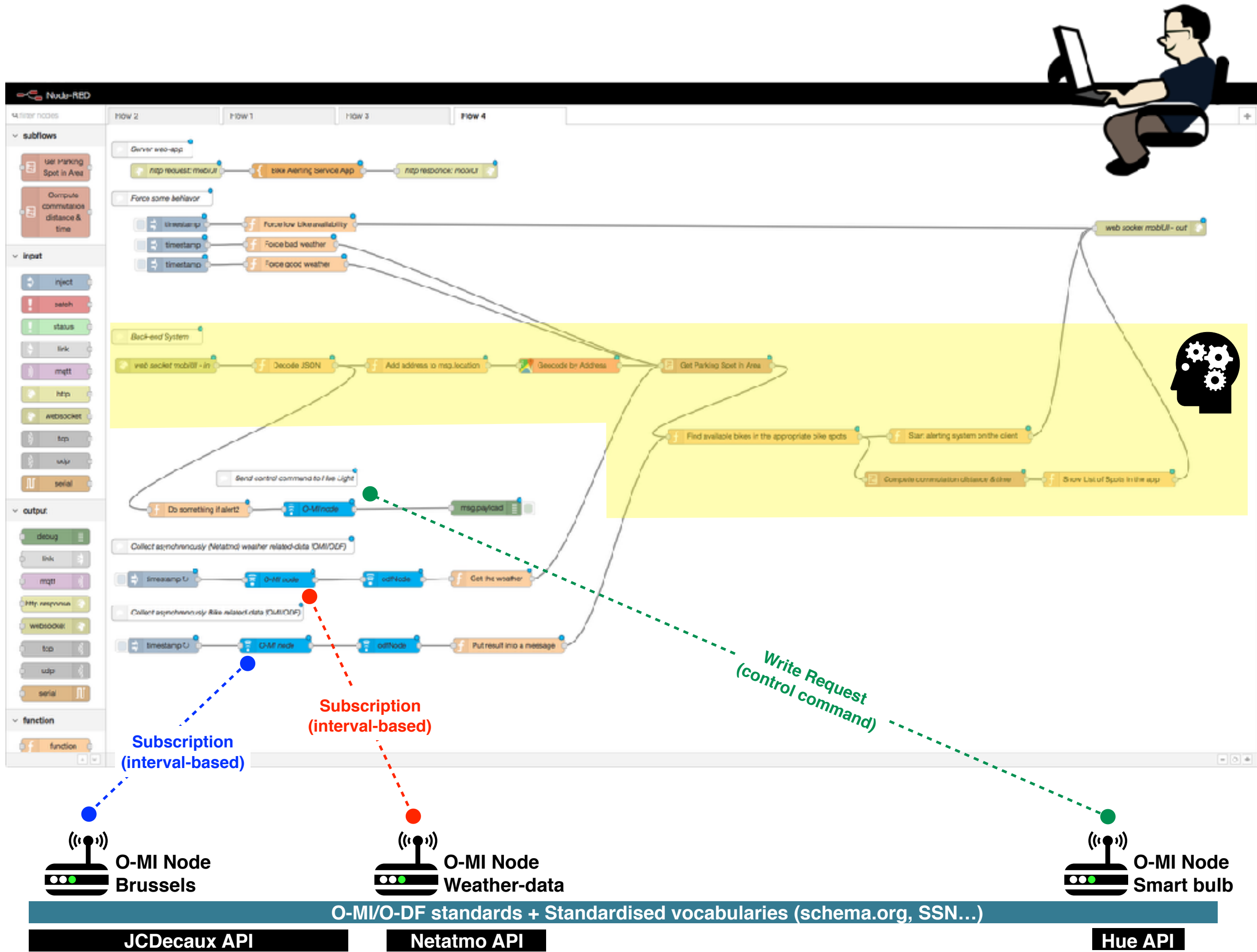
O-MI/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API

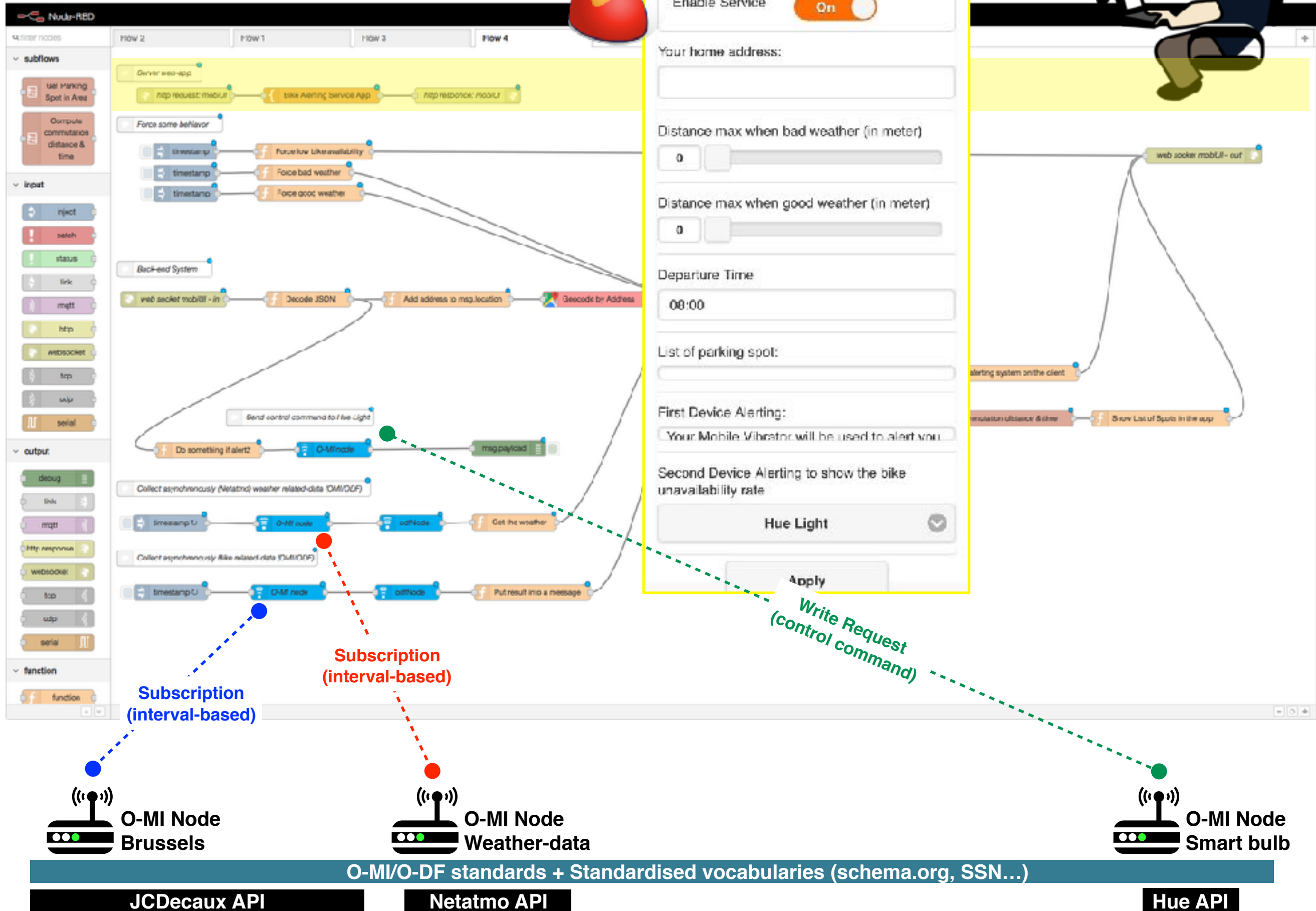
Netatmo API

Hue API

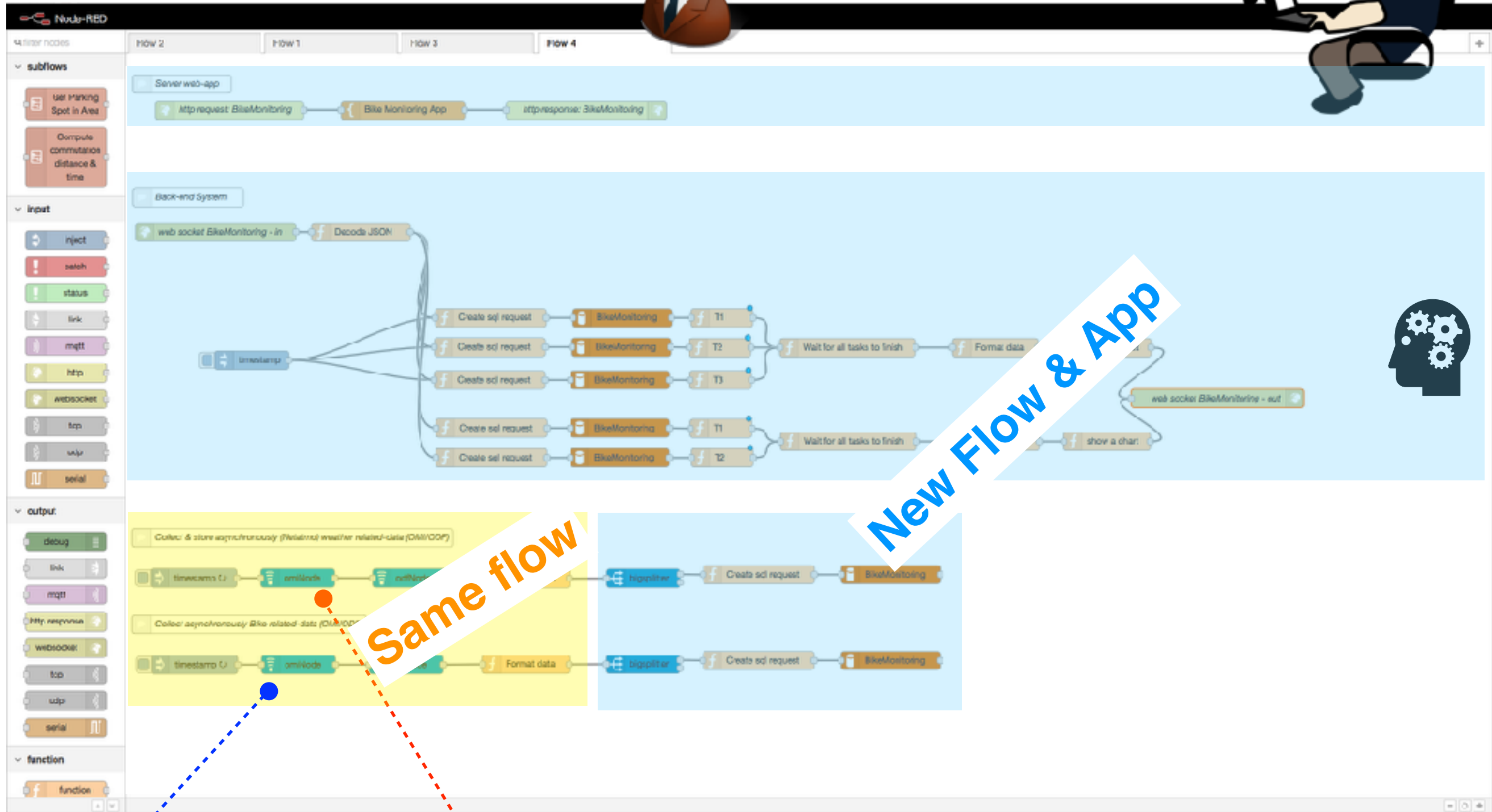




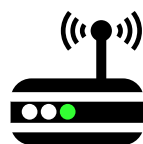
Citizen



City manager



O-MI Node
Brussels



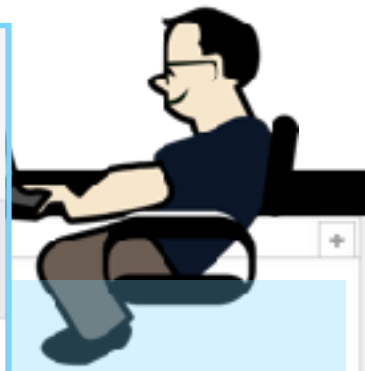
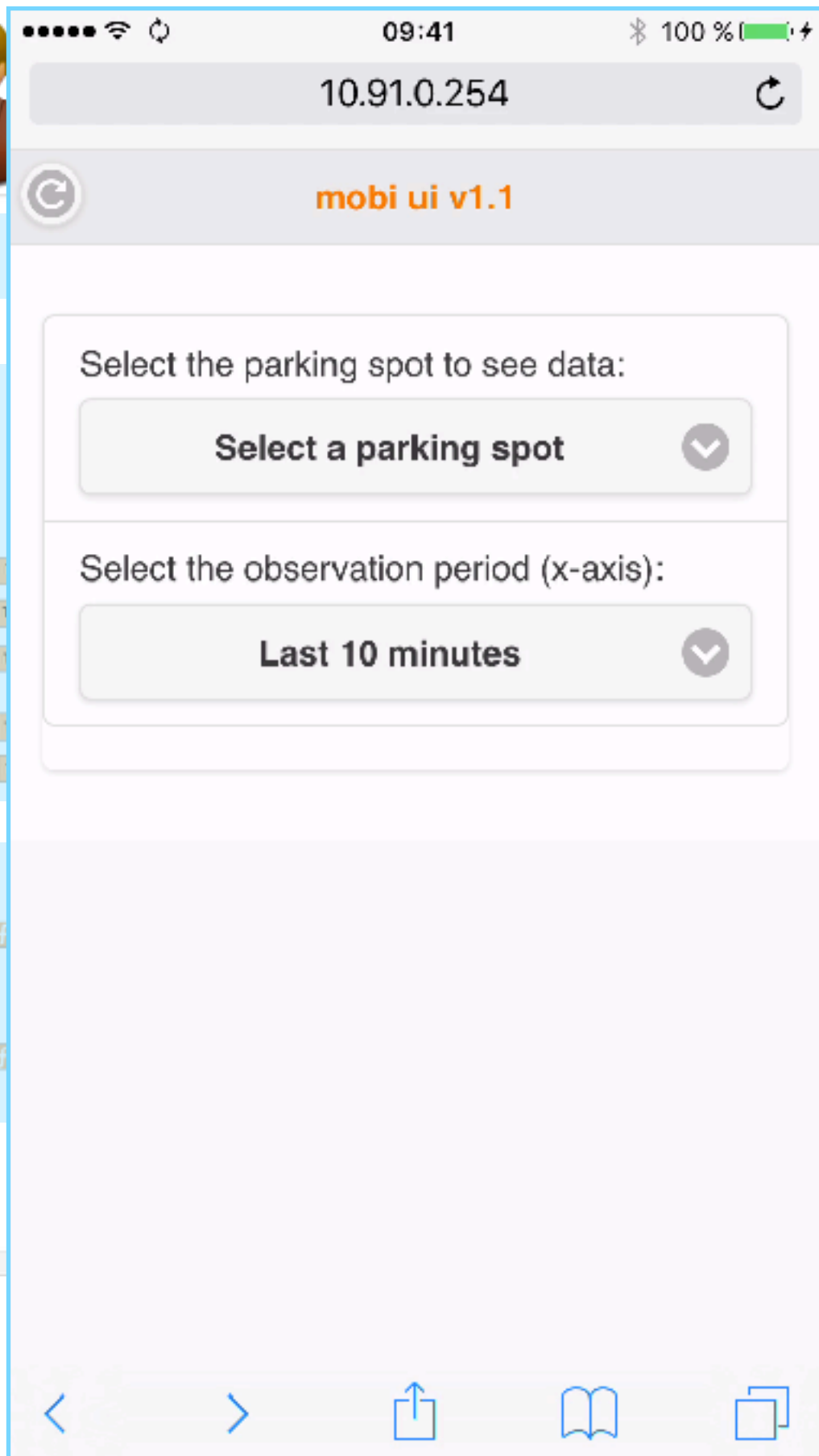
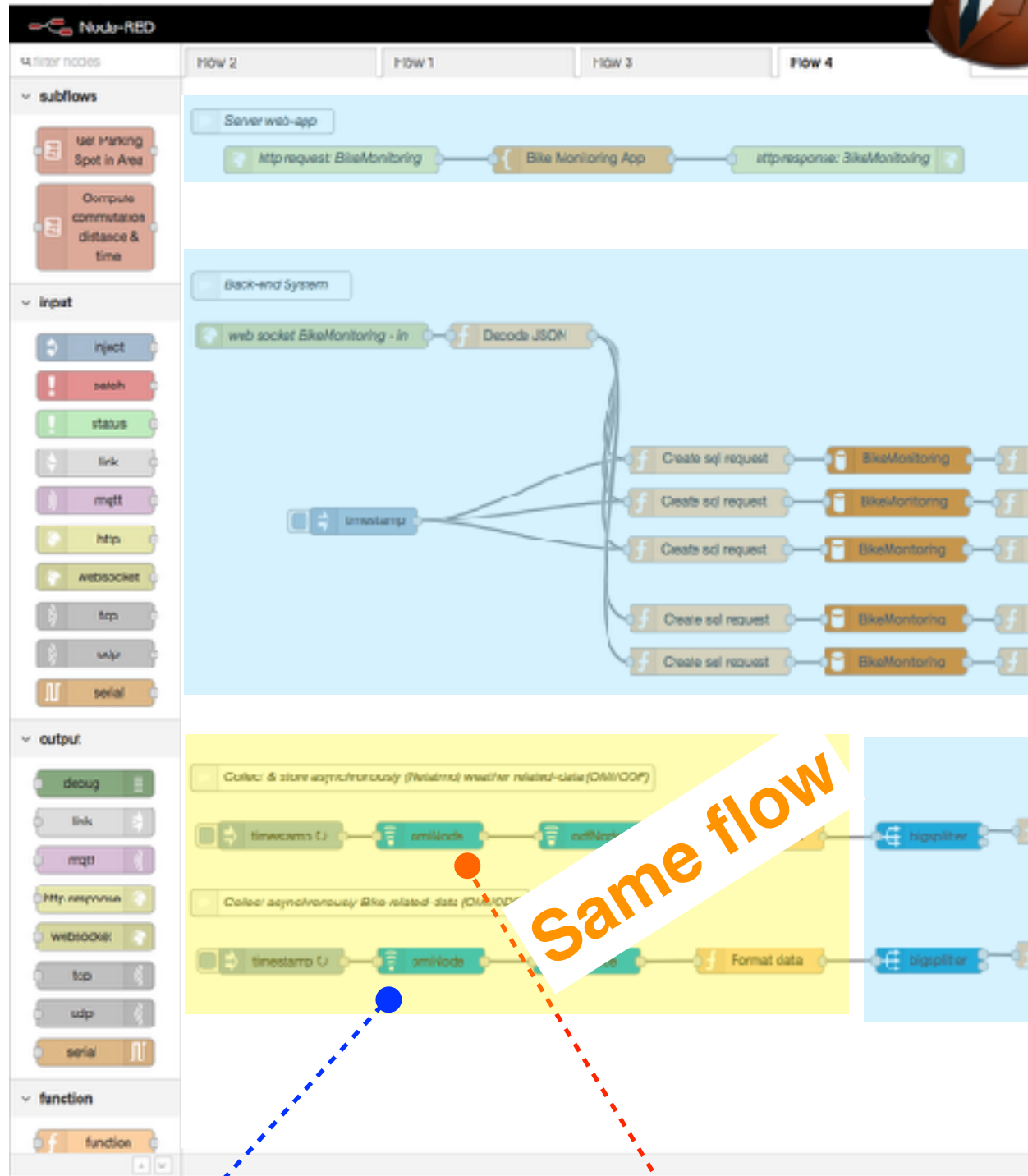
O-MI Node
Weather-data

O-MI/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API

Netatmo API

City manager



O-MI Node
Brussels



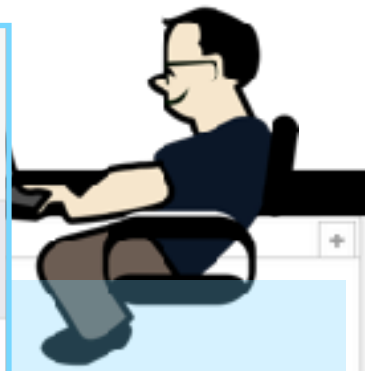
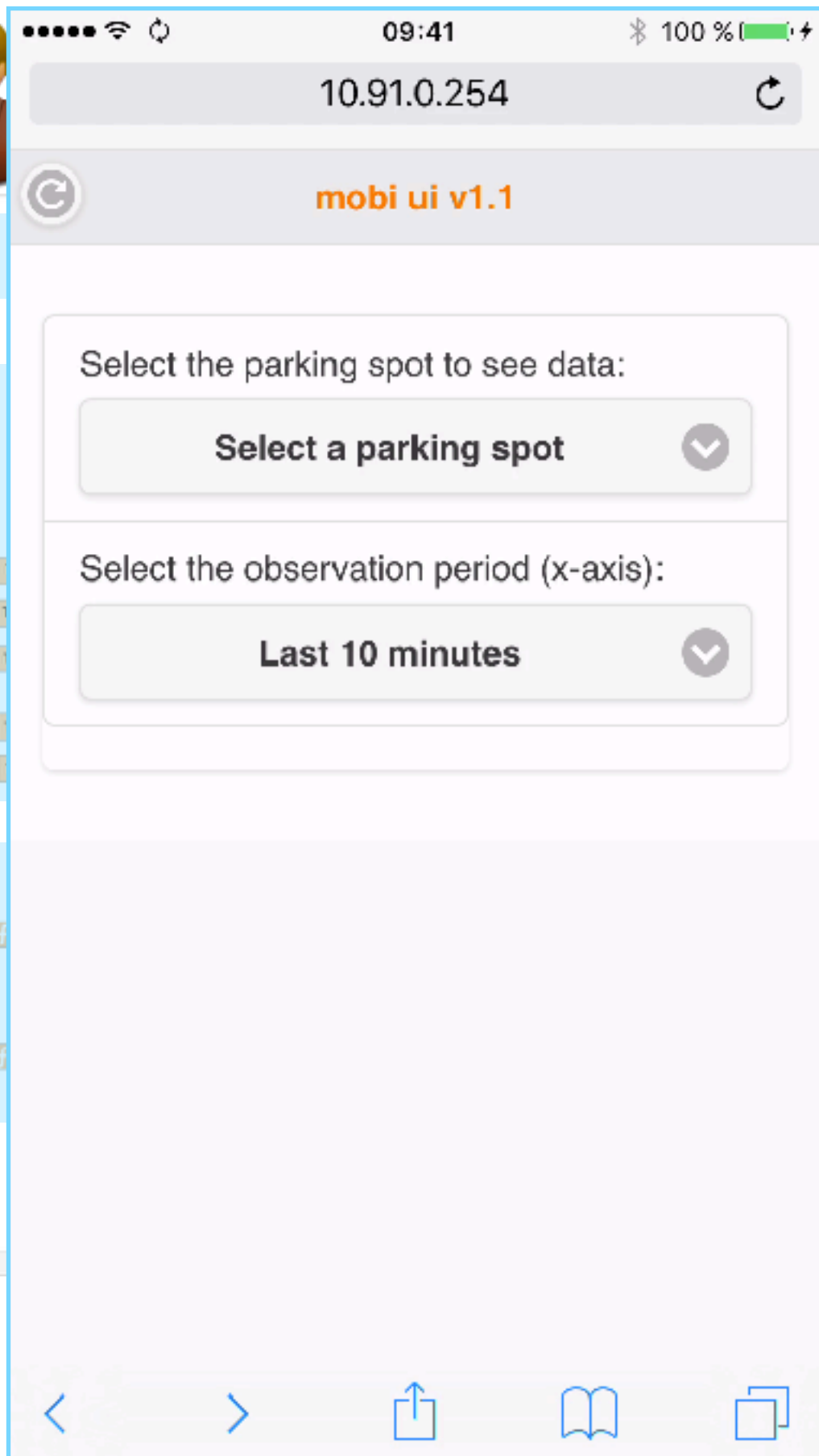
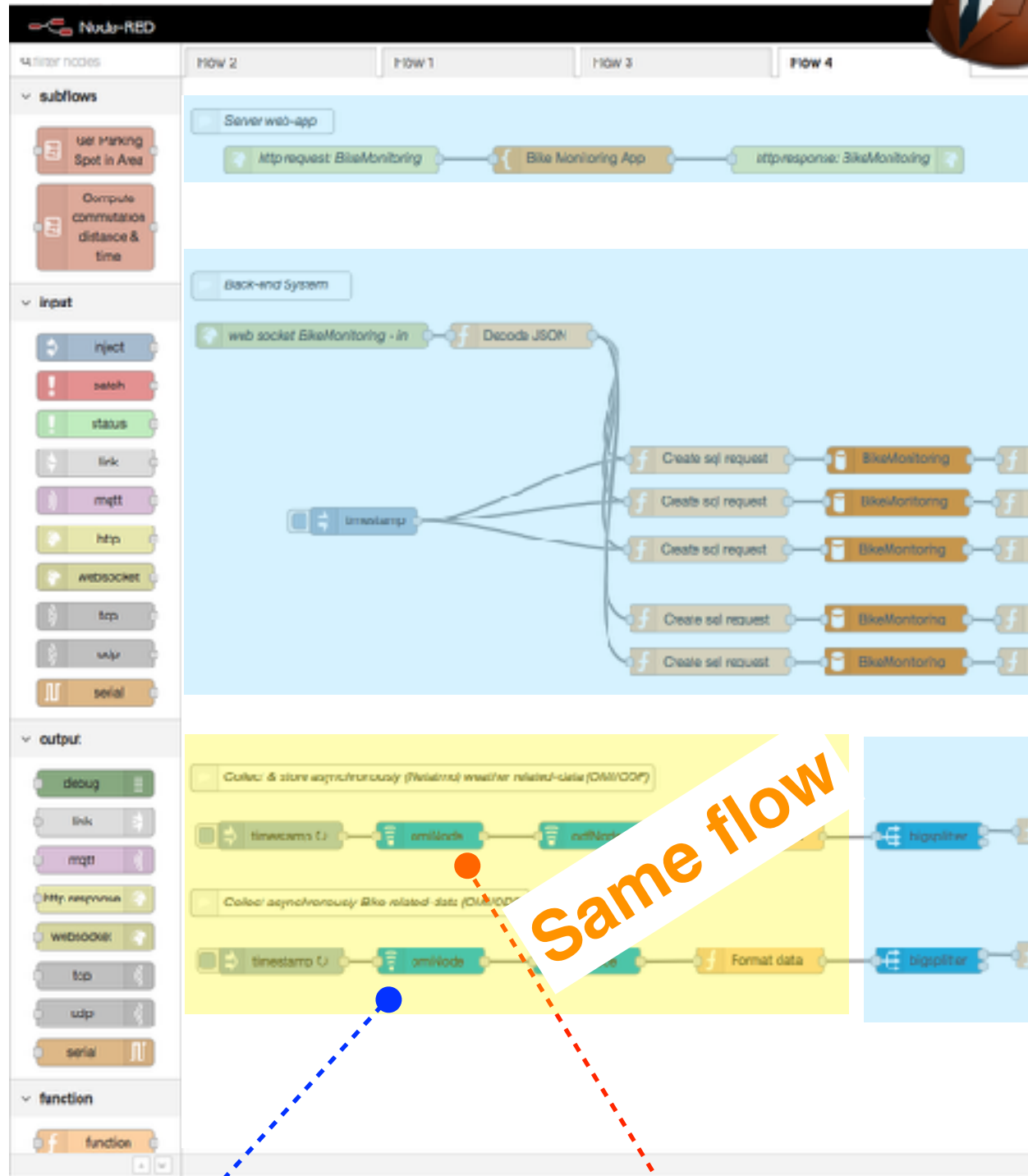
O-MI Node
Weather-data

O-MI/O-DF standards + Standardised vocabularies (schema.org, SSN...)

JCDecaux API

Netatmo API

City manager



O-MI Node
Brussels



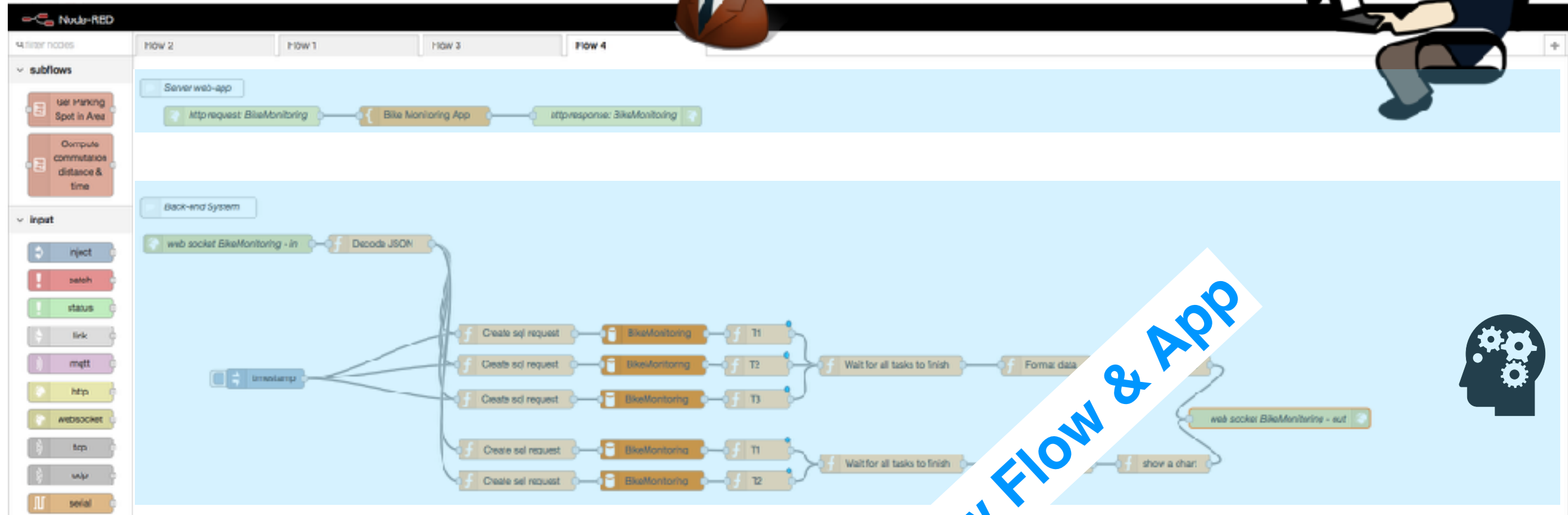
O-MI Node
Weather-data

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JCDecaux API

Netatmo API

City manager

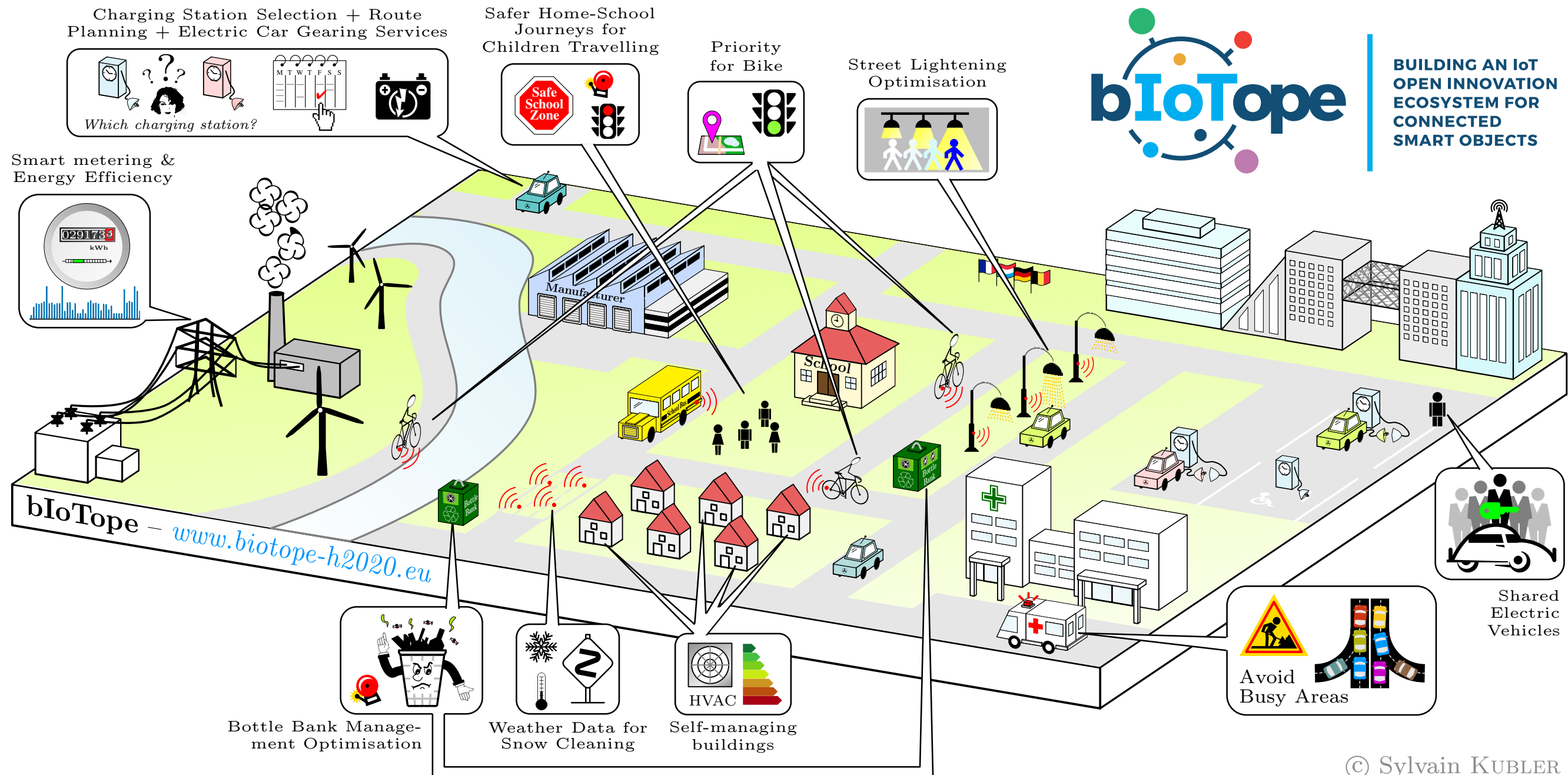


SUMMARY

- **IoT (Internet of Things) — The road ahead**
- **EU's Vision & Ambition**
- **Towards Open IoT ecosystems**
- **bloTope City Pilots**
- **Conclusion**

bIoTope City Pilots

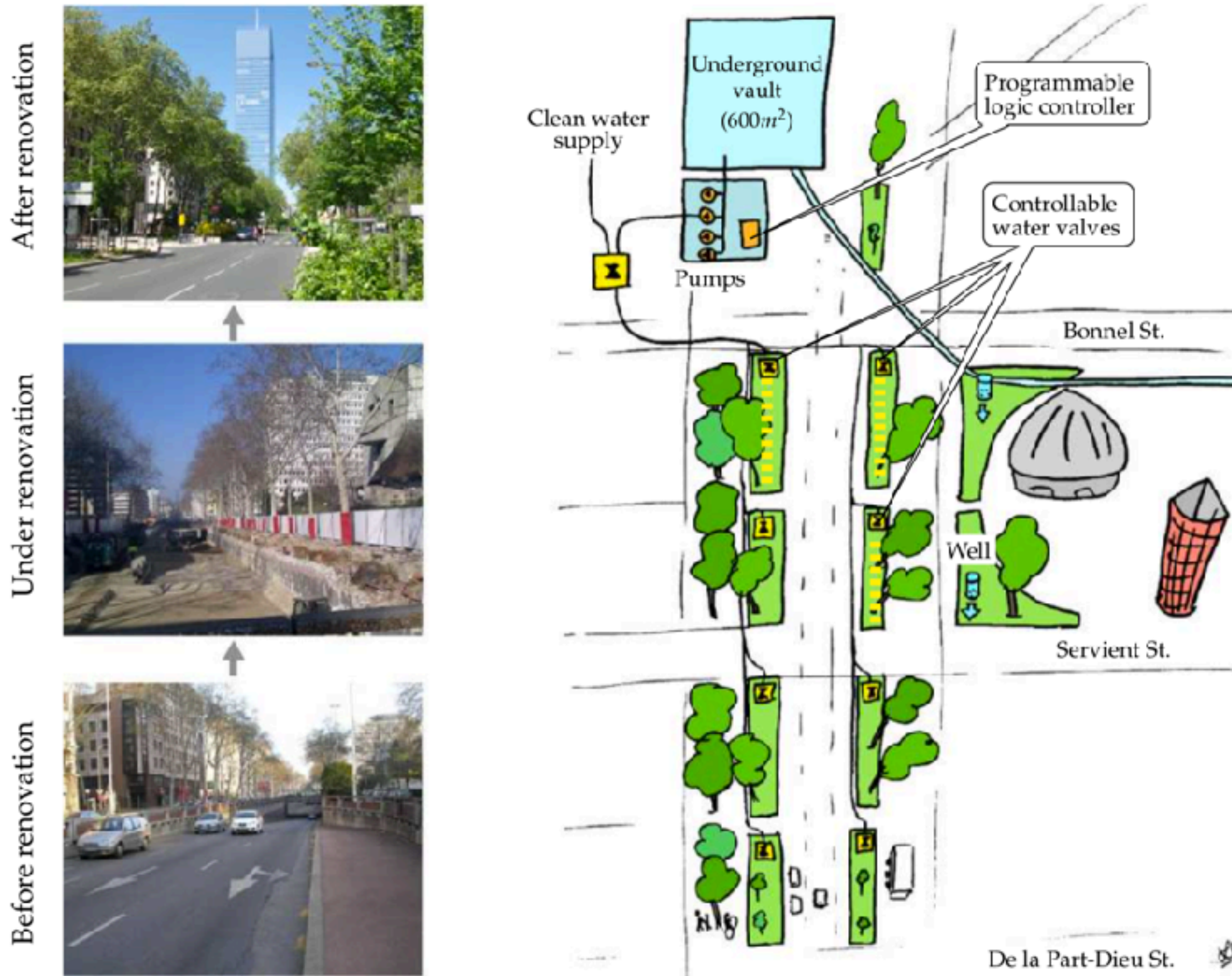
An overall overview



© Sylvain KUBLER

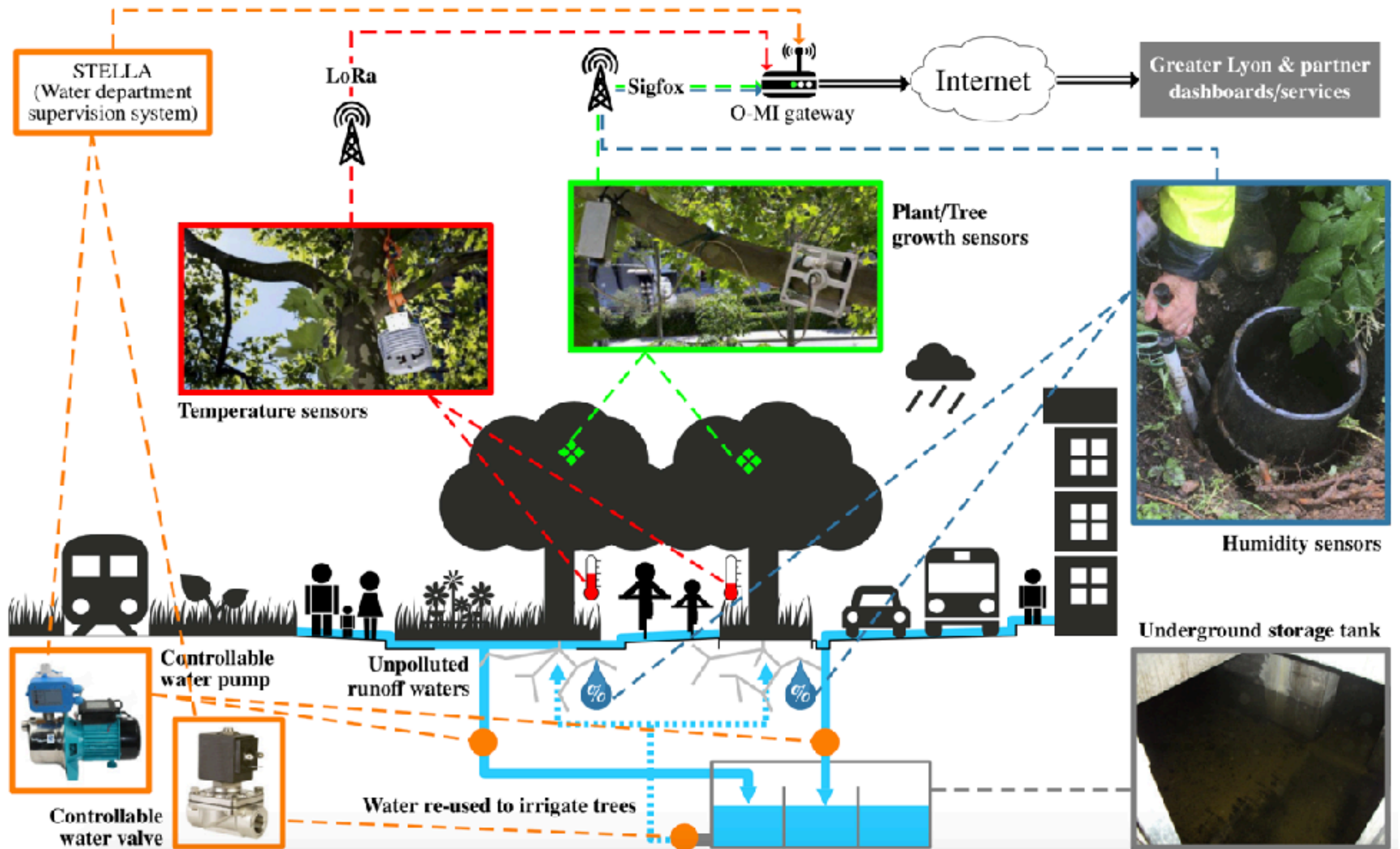
bIoTope City Pilots

Example of Métropole De Lyon



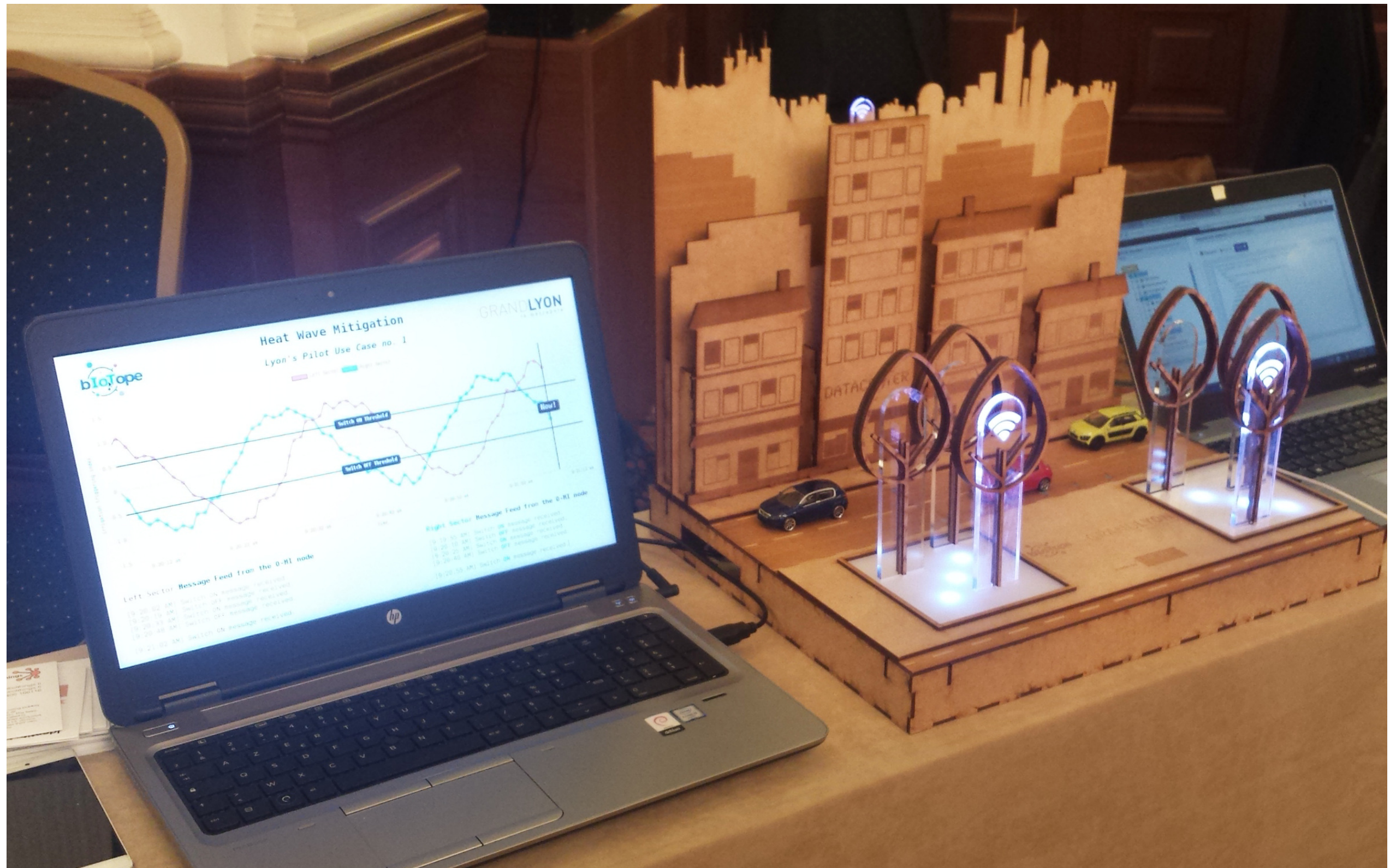
bIoTope City Pilots

Example of Métropole De Lyon



bIoTope City Pilots

Example of Métropole De Lyon

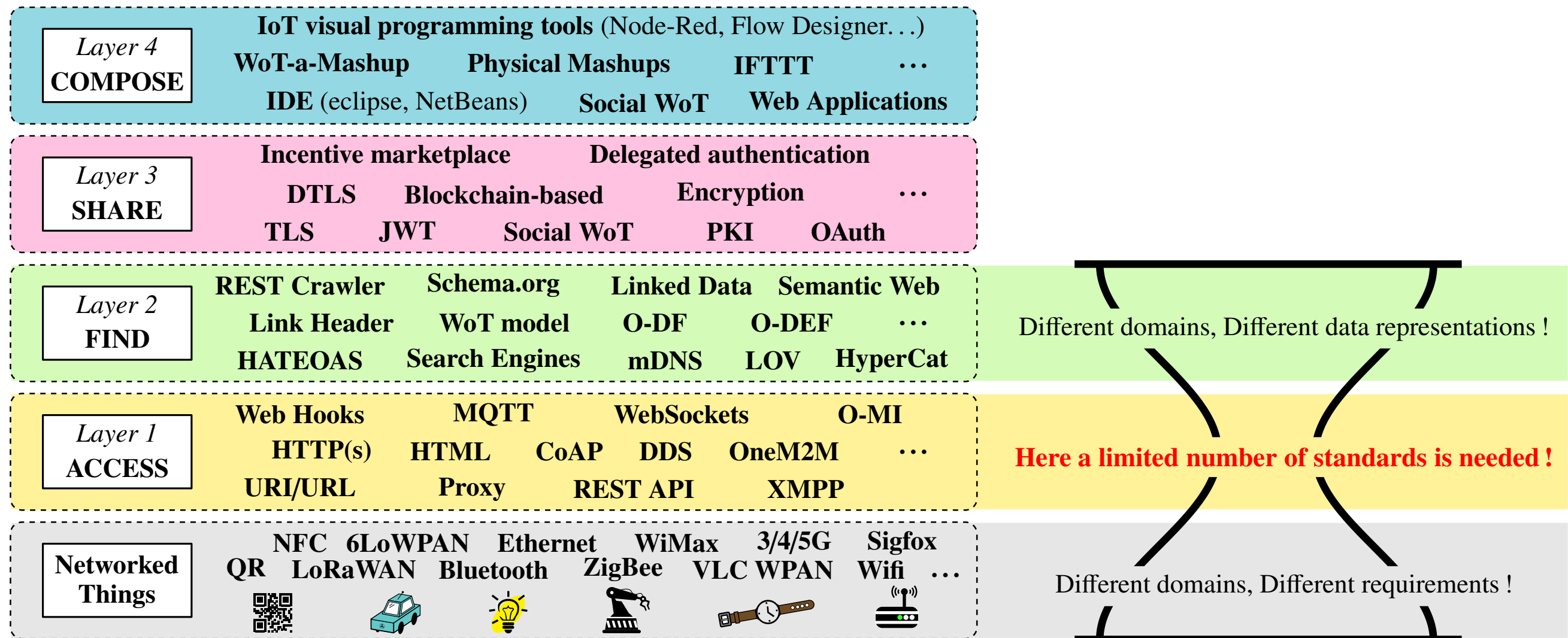


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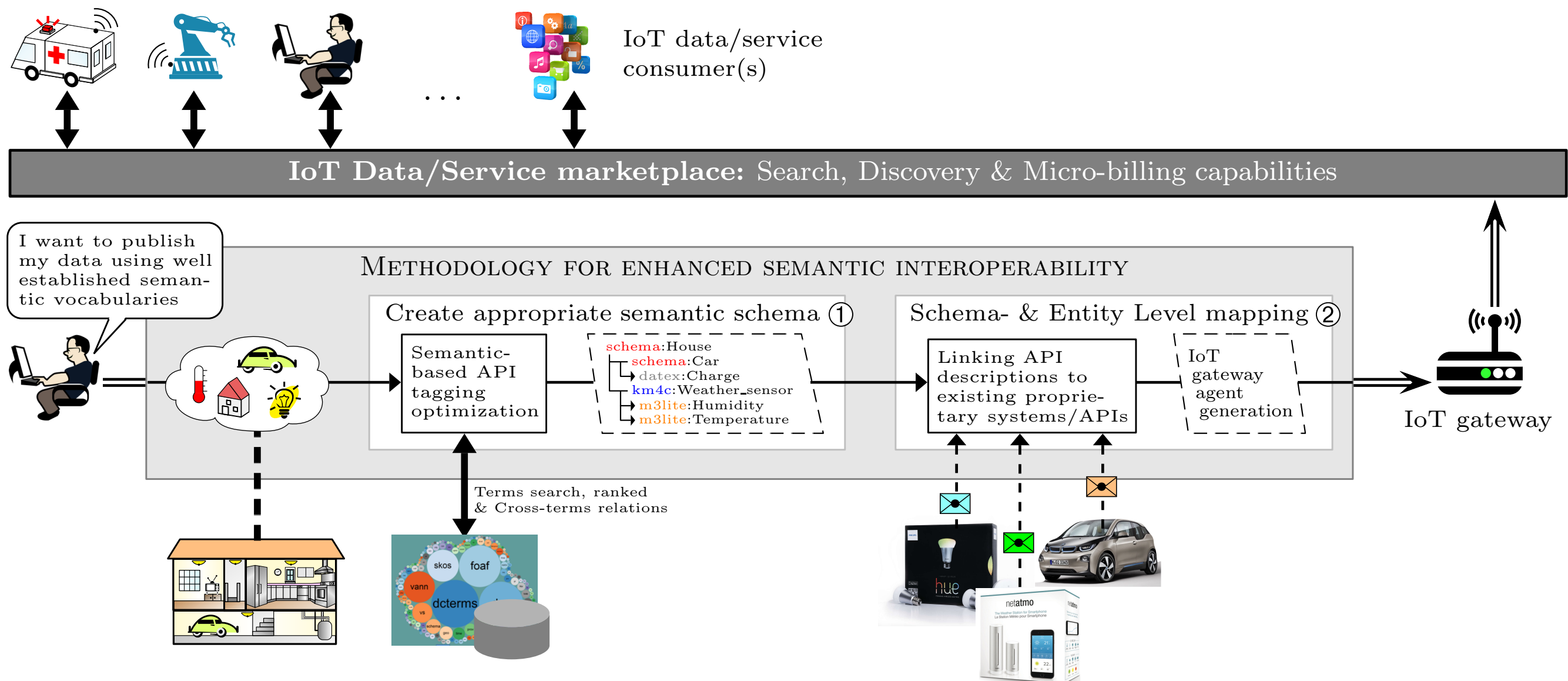
Conclusion

- The success of open IoT ecosystems will depend on how to tackle:
 - the “*hourglass*” challenge;



Conclusion

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 - “hourglass” challenge;
 - automatic annotation of IoT data/services;



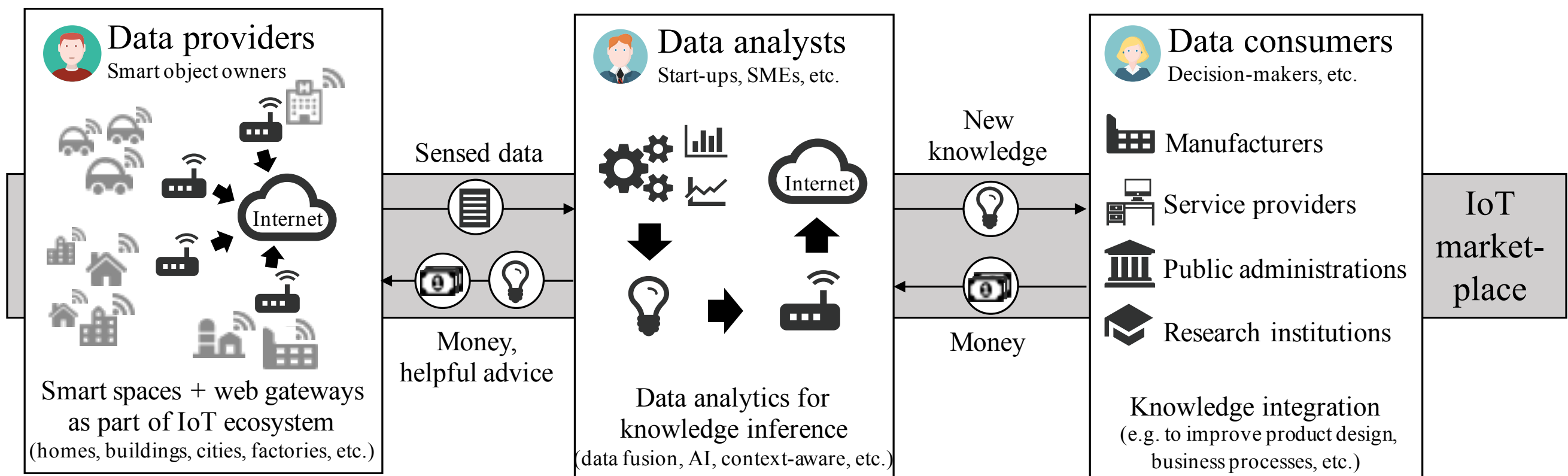
Conclusion

- The success of open IoT ecosystems will depend on how to tackle:
 - “*hourglass*” challenge;
 - automatic annotation of IoT data/services;
 - end-to-end security & privacy across platforms/applications;



Conclusion

- The success of open IoT ecosystems will depend on how to tackle:
 - “*hourglass*” challenge;
 - automatic annotation of IoT data/services;
 - end-to-end security & privacy across platforms/applications;
 - incentivizing IoT marketplaces (e.g., including smart contract capabilities, data quality evaluation...)





H2020 project (ICT30)
<http://www.biotope-project.eu>

Building an IoT OPen innovation Ecosystem for connected smart objects

Dr. Sylvain Kubler

Université de Lorraine, Centre de Recherche en Automatique de Nancy

s.kubler@univ-lorraine.fr
<http://sylvainkubler.fr>



ISED 2018:
IoT: security challenges and opportunities