



# SMART DESTINATIONS

Challenges & opportunities to create sustainable Smart Cities in the data economy

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We design innovative cities thanks to the deployment of Smart Points of Interaction (**Smart POIs**), which allow to create a multi directional communication channel among citizens, visitors and cities, establishing co-creation, culture sharing and environmental control open tools.

Our solutions meet the requirements of ***the Open and Agile Smart Cities (OASC)*** use ***OMA LWM2M*** communication protocols and allow integration with ***oneM2M*** platform and ***FIWARE*** enablers.



Members



Co-chair



IoT & Smart Cities  
Members



Gold Members



Members



## POSITION

- **Technical Comite IoT at IEEE (Co-chair)**
- **FIWARE Foundation - Gold Members**
- **ETSI ISG CIM Members**  
(Interoperability and semantic of Smart Cities)
- **OMA Members**  
(Real time communication protocols,  
device management - LwM2M, APIs - NGSI)
- **AIOTI/ ETSI OneM2M**
- **IPSO Alliance - People's Choices Award**  
(Sponsored by Google)
- **MIT Best Smart City Solution**  
(Open Data, EENA / 112 y Wearables)

## EXPERIENCES

- **Organicity: Siidi (2016/2017)**  
Co-creation, privacy management, data protection  
and user experience.
- **Smart SDK: Green Route (2016/2017)**  
Environment and mobility monitoring (Buses)
- **Synchronicity: Marketplace and pilots with  
FIWARE and interfaces with oneM2M (2017)**
- **Activage: Health care pilots with FIWARE and  
oneM2M in Smart Cities (2017)**
- **Ceutí, Murcia, Spain: Smart Destination  
with LoRA M2M (2018)**

# TECHNOLOGY

Own Open platform: Homard  
(<https://homard.hopu.eu>)



Scalable devices  
management



Build on Open  
Source

Open Stan-  
dards

COAP/HTTP

OMA LWM2M

BLE  
(Own sensors)

M2M/LoRA

Integrated with:



## Smart City Solutions



Smart POI



Environmental  
Monitoring

Air Quality: NO2, SO2, O3, CO  
Noise (Acoustic meter)  
Temperature/Humidity



Tourism

Smart Destination  
Regulation AENOR  
Citizens Engagement



Citizen  
Engagement

Co-creation  
Suggestion box (Open 311)  
Communication channels

## Security Stack



Innovation in  
Bootstrapping and keys  
manager protocols



Ultra Light Cryptography for  
IoT (ECC, EAP...) in  
Embedded Devices &  
Platform



Identity Management  
Federation and Data Protection  
Regulations Compliance for  
Sensitive Data

## FIWARE



Top company in FIWARE assesment for the  
use of technology FIWARE Acceleration  
Programme



FIWARE  
IOT Ready pionner

# IOT BUSINESS IDEAS START BY “THINGS”

## STANDARDS AND PROTOCOLS

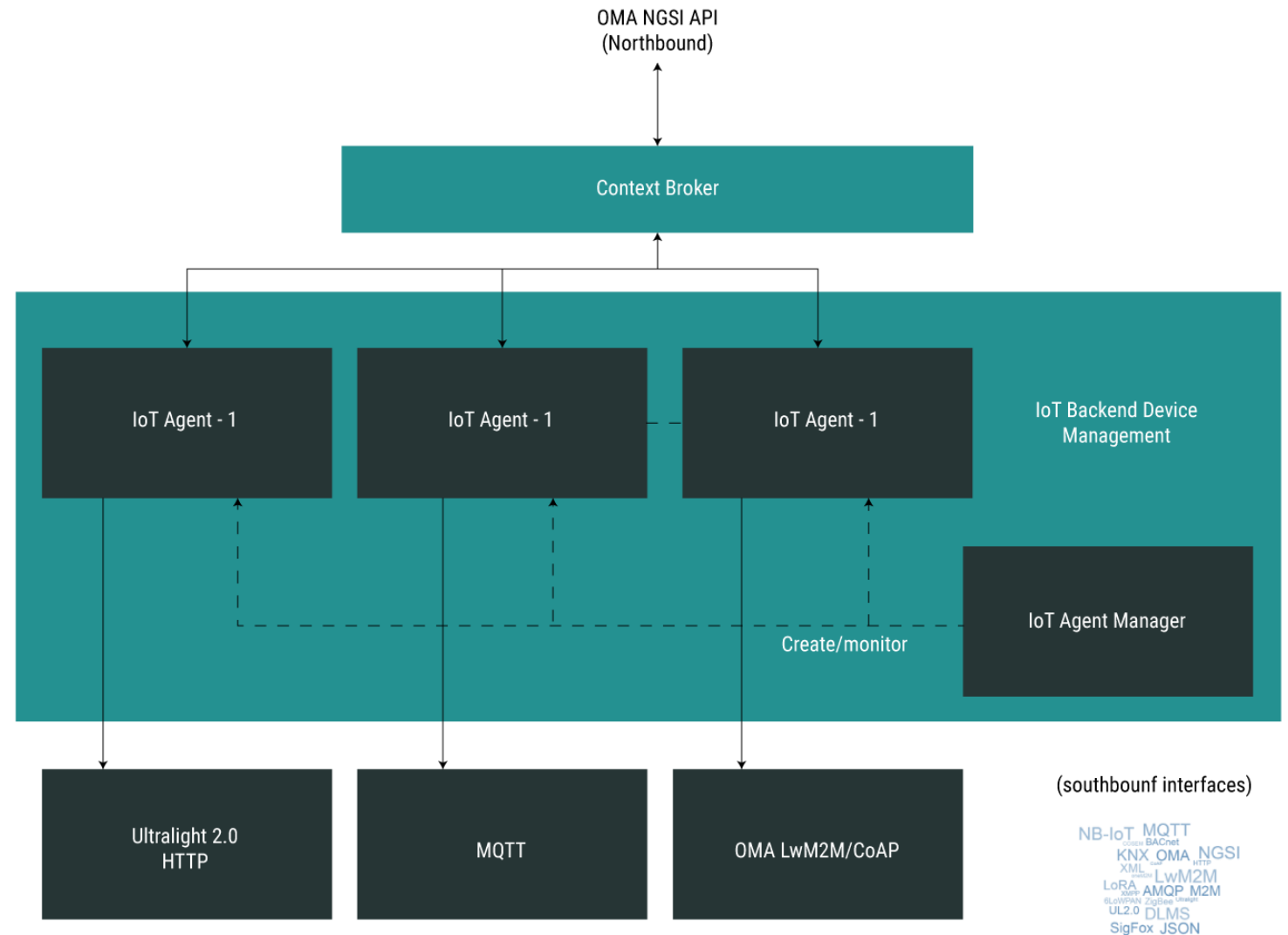
100+  
Protocols

NB-IoT MQTT  
COSEM BACnet  
KNX OMA NGSI  
XML CoAP HTTP  
oneM2M LwM2M  
LoRA XMPP AMQP M2M  
6LoWPAN ZigBee Ultralight  
UL2.0 DLMS  
SigFox JSON

25+  
SDOs  
Alliances

# IOT BUSINESS IDEAS START BY “THINGS” BUT LET ABSTRACT FROM THINGS... LET USE FIWARE

- Data-driven / Context
- Smart Queries
  - Time
  - Location
  - Frequency
- Extensible
- Harmonized
- Only one integration
  - Multiple Protocols
  - Multiple Suppliers



# WHY FIWARE?

## WHAT REALLY MATTERS TO BUILD AN IOT SOLUTION

1

- brings the right standards for developing “Smart” apps/services

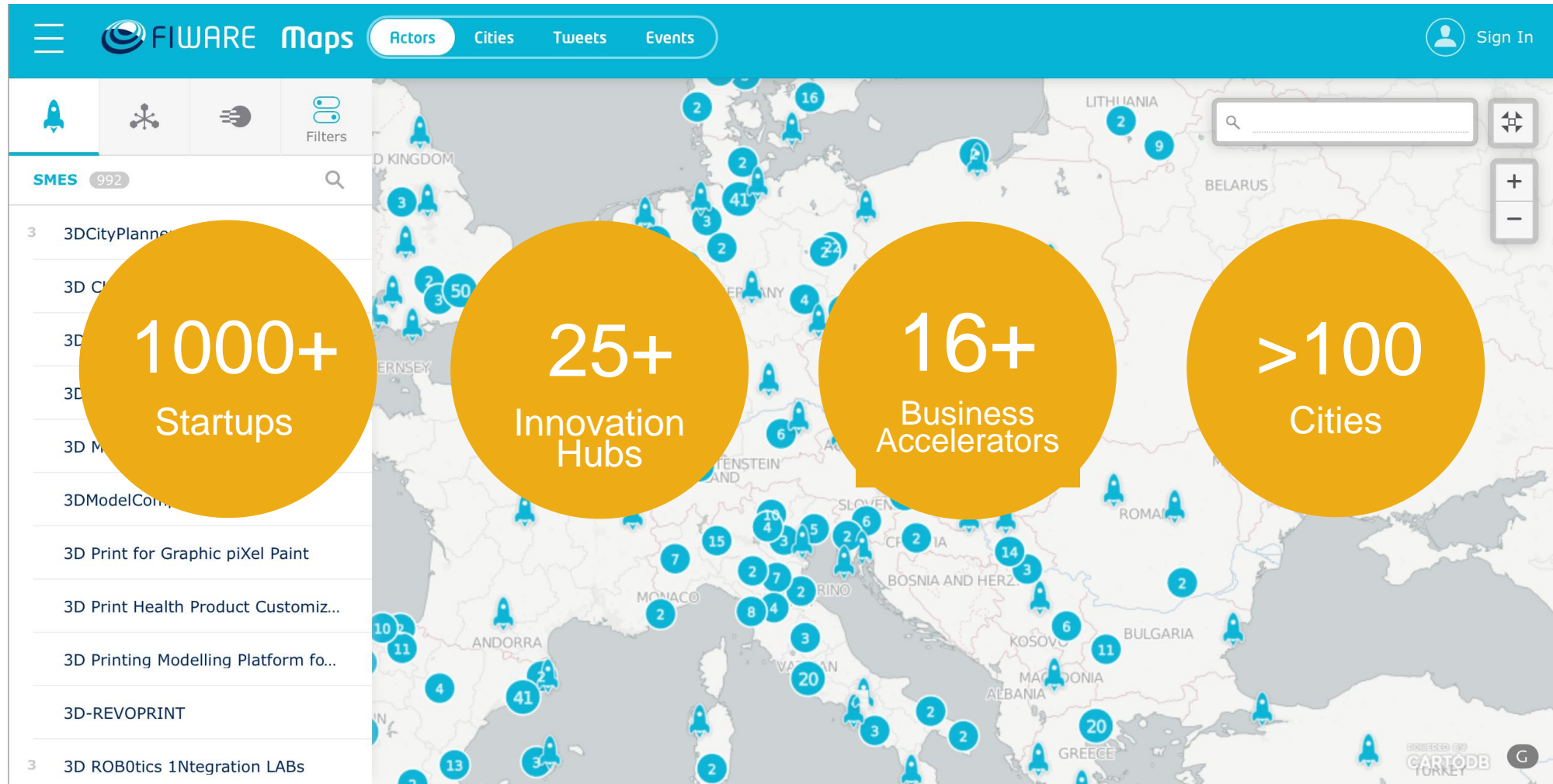
2

- allows your city to join forces with others to build a sustainable market

3

- it's not just about technology

# AN OPEN, SUSTAINABLE & GLOBAL ECOSYSTEM





# FIWARE

## THE OFFER IN SHORT

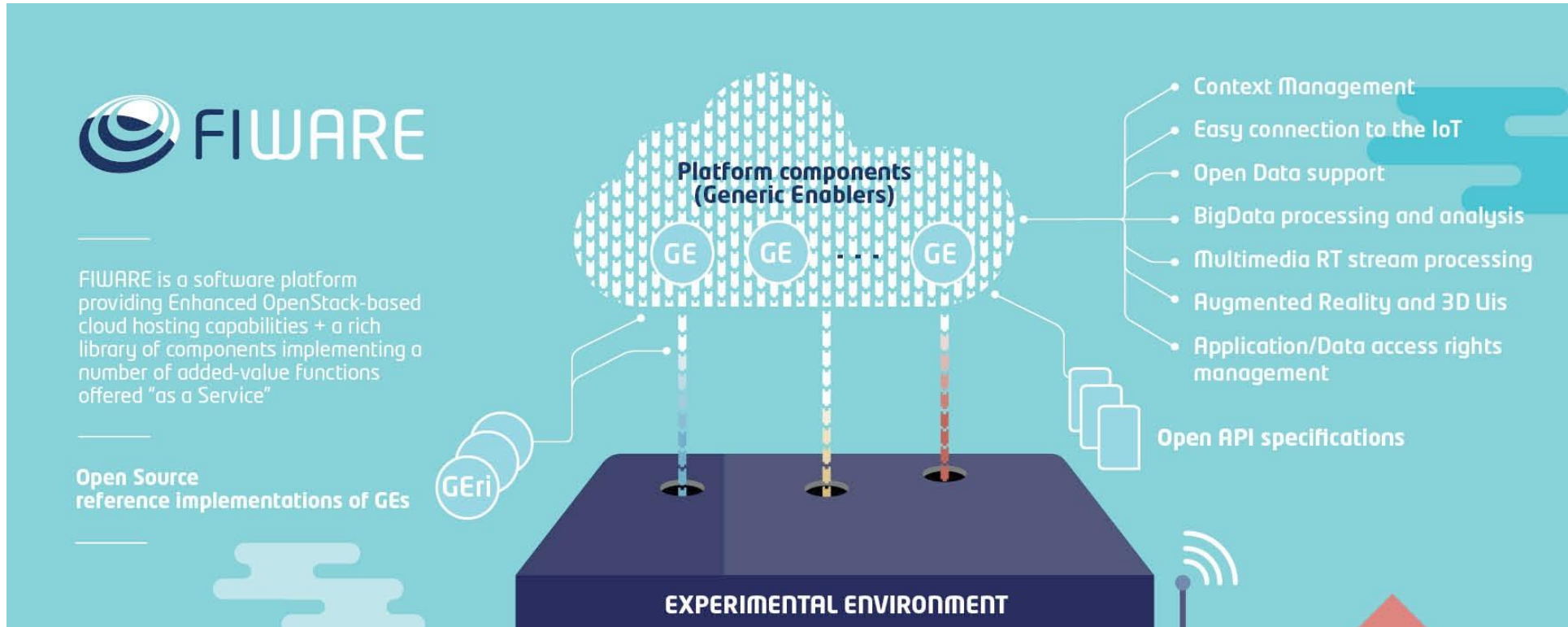
Reusability  
and  
Openness



Restful API



Cloudification  
and  
Microservices



# FIWARE LAB

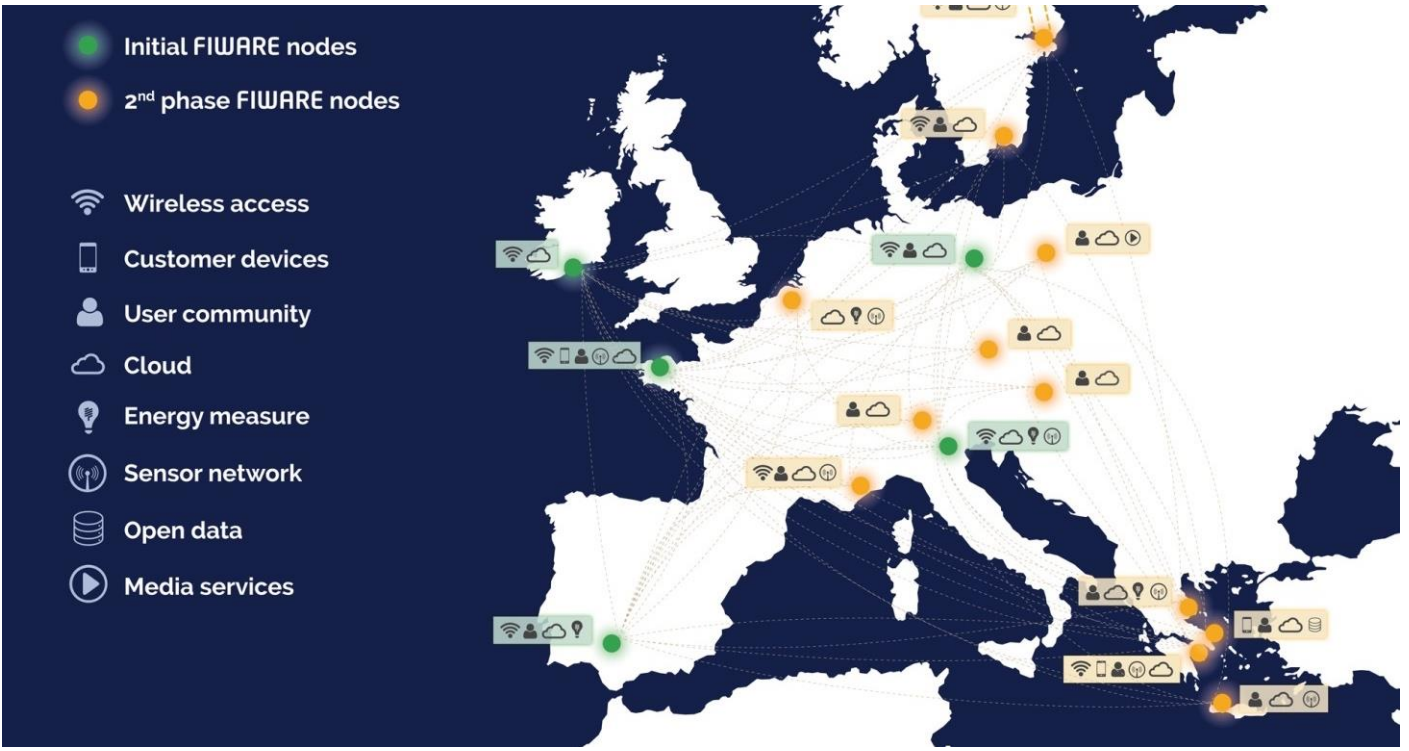
## THE CLOUD LAB FOR FIWARE DEVELOPERS

### 16 FIWARE Lab Nodes

- Currently 16 nodes in Europe providing up to 3000+ cores, 6TB+ Ram, 750TB+ HD
- 1 node in Mexico providing 1200+ cores
- 1 node in Brazil active

### ...and more to follow!

- Discussions with other regions and countries with high potential
- Commercial nodes under deployment



# FIWARE IOT READY PROGRAMME

## IOT DEVICES READY TO BE USED (CERTIFIED)

- The FIWARE IoT Ready Programme is used to demonstrate the ability of IoT solutions to seamless interoperate (plug and play) with FIWARE.
- FIWARE IoT Ready Programme aims to enlarge the FIWARE ecosystem, connecting IoT hardware (sensors/actuators) producers as technology providers to FIWARE large base of developers.
- FIWARE IoT Ready Programme opens a unique business opportunity for IoT products.



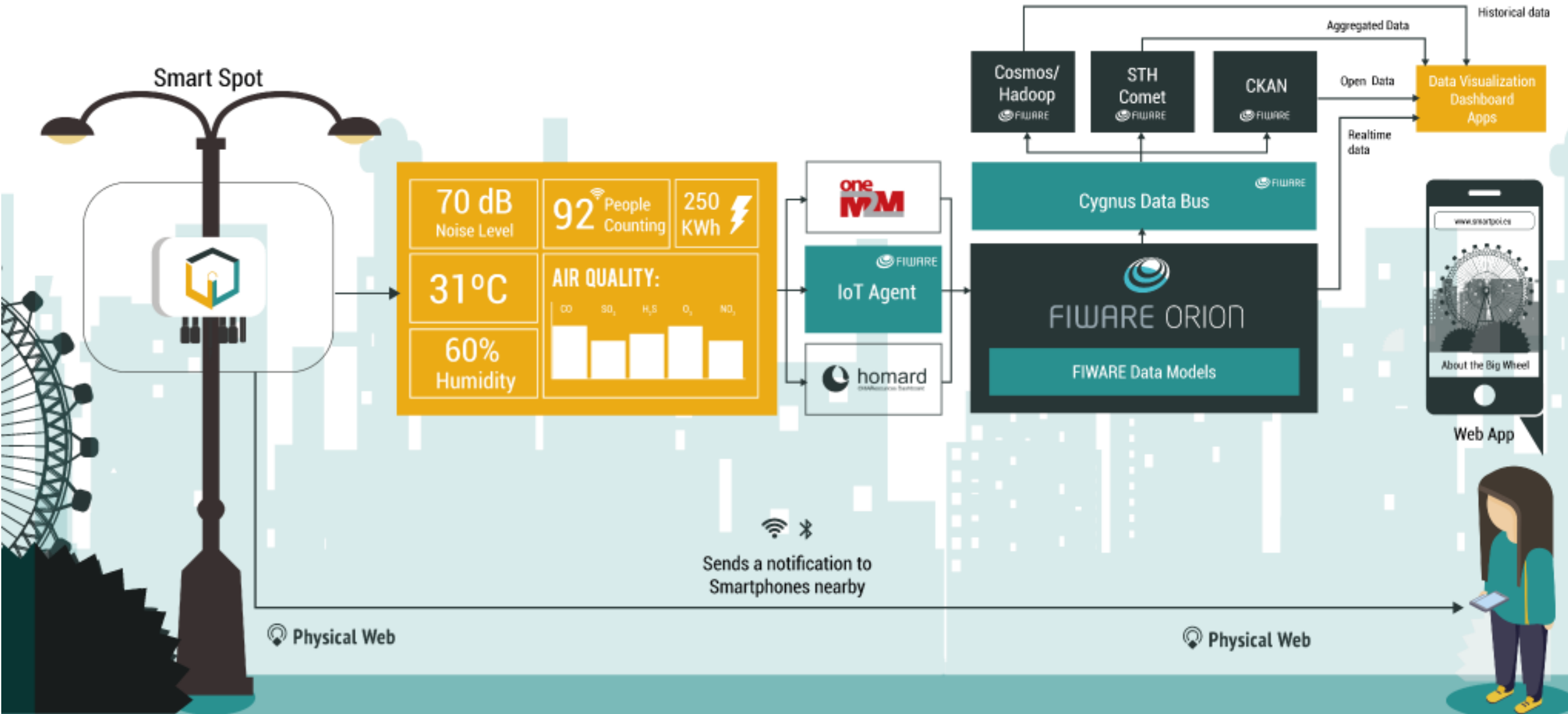
**FIWARE** Internet  
**READY** of Things

# FIWARE IOT READY PROGRAMME

## IOT DEVICES READY TO BE USED (CERTIFIED)

- **FIWARE IoT Ready Programme is a program designed to validate the following types of implementations:**
  - Proprietary devices with a **complete hardware and software solution**.
  - **Software implementations** working on a general and Open purpose hardware (such as Arduino, Raspberry PI, Mini-PC, Mote sensor, etc.). This kind of products may use real or virtual sensors.
  - **Libraries** to be used by different types of devices. This kind of product may use real or virtual sensors.
- **Benefits of using FIWARE IoT Ready Hardware:**
  - **Confidence** to consumers, who purchase products certified and evaluated by an impartial and recognized certification body.
  - **Added value** when selecting products from different providers.
  - **Protection** from purchasing substandard products.

# HOW IT WORKS



# SMART SPOT

A single solution to monitor  
everything



# SMART SPOT OVERVIEW

Spread the digital content through Bluetooth and Wi-Fi (Beacon)



Bespoke encapsulated IP-65 /Waterproof



Temperature & humidity



Crowd monitoring (Wi-Fi devices)



Remote management by OMA LWM2M, oneM2M & FIWARE platforms



Air Quality monitoring NO<sub>2</sub>, CO<sub>2</sub>, SO<sub>2</sub>, NO & O<sub>3</sub> (Calibrated sensors)



**Optical Sensors Extension**

Particle Counter

- **PM1, PM2.5 and PM10**
- Non-Dispersive Infra-Red (NDIR)
- **CO2**

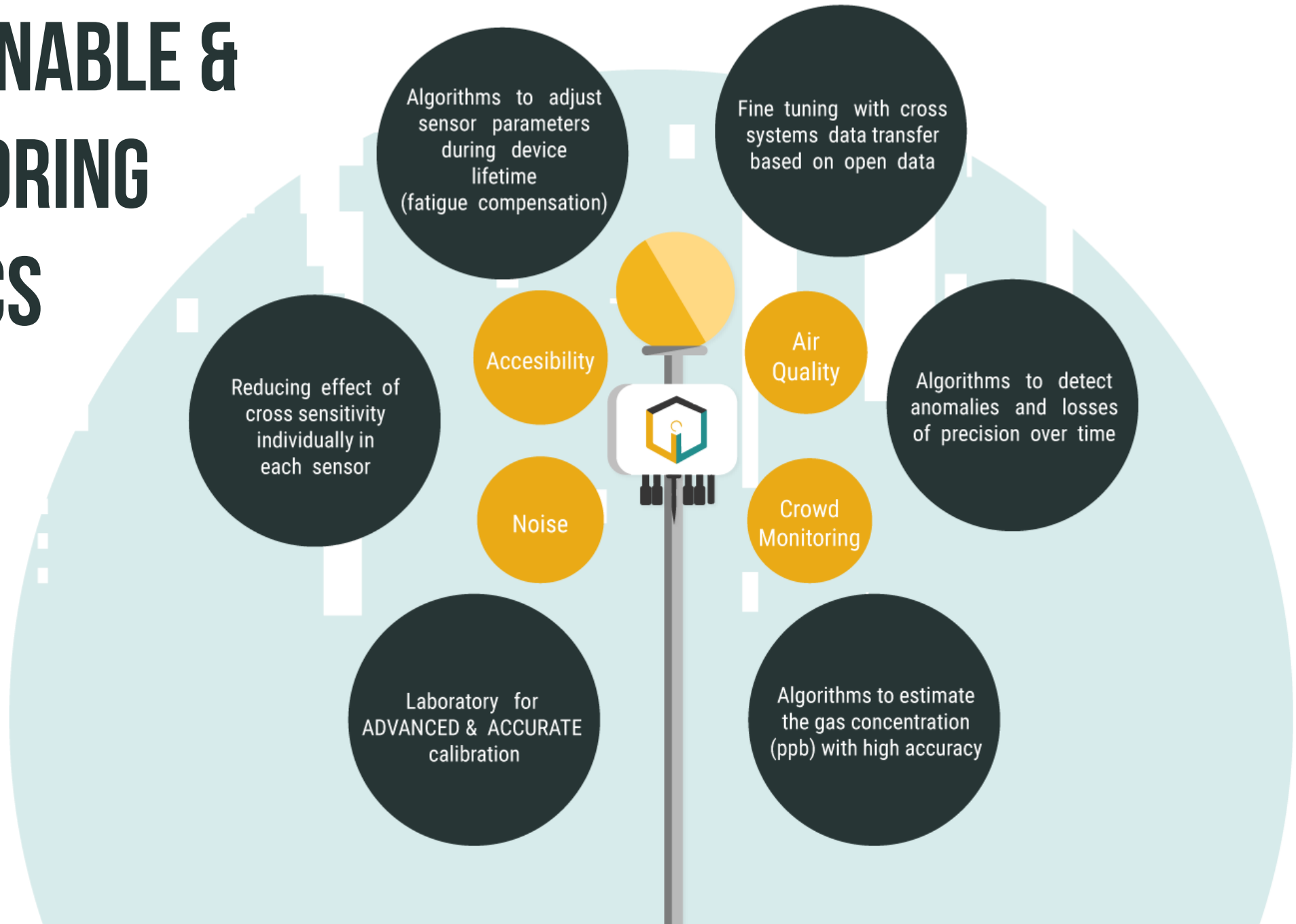
Noise pollution monitoring (30dB - 130 dB)



Measure energy consumption (non-invasive)



# SUSTAINABLE & MONITORING METRICS

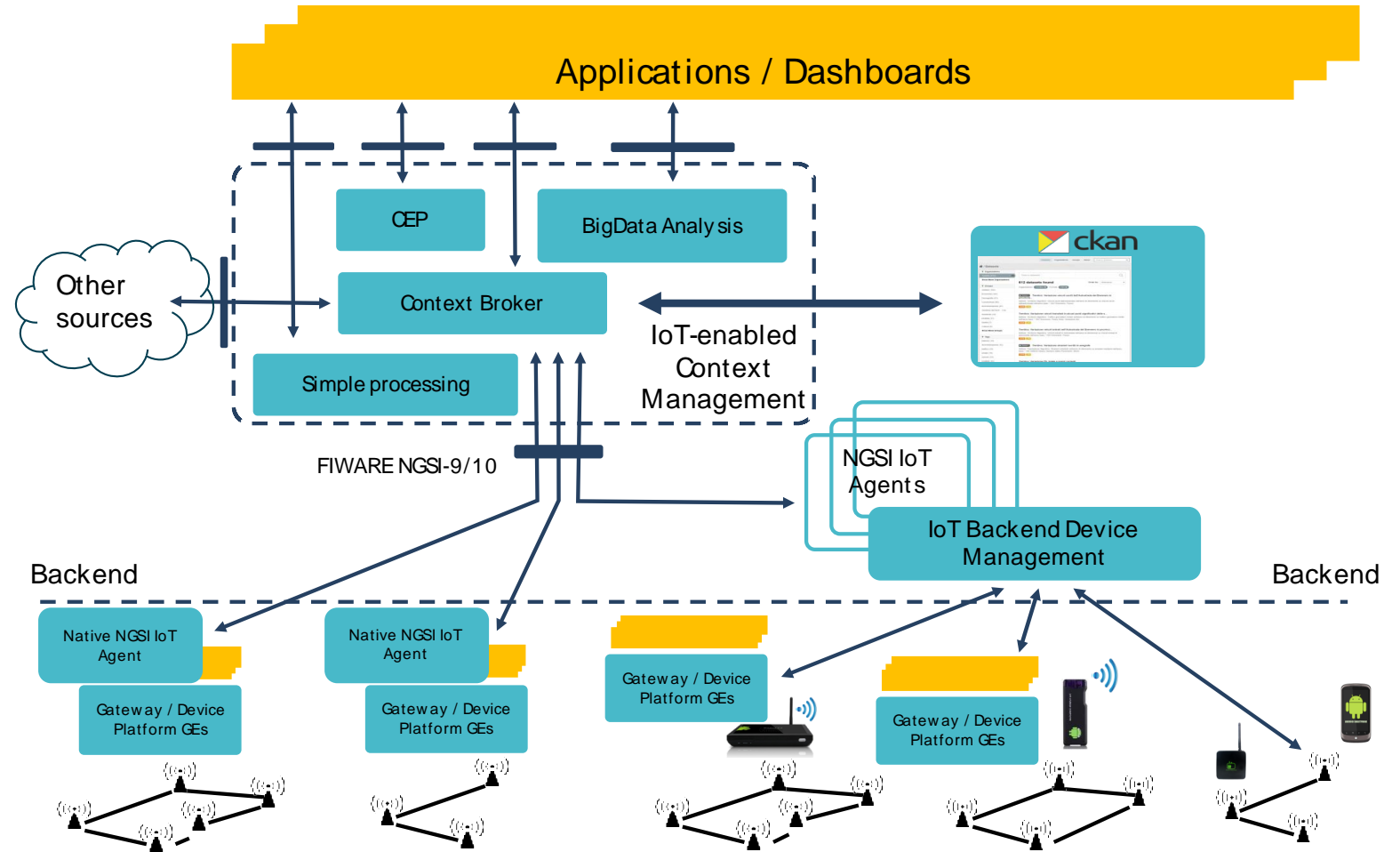




# FIWARE FOR SMART CITIES

Open and Agile Smart Cities

# 1 - BRINGS THE RIGHT STANDARDS FOR DEVELOPING “SMART” APPS/SERVICES

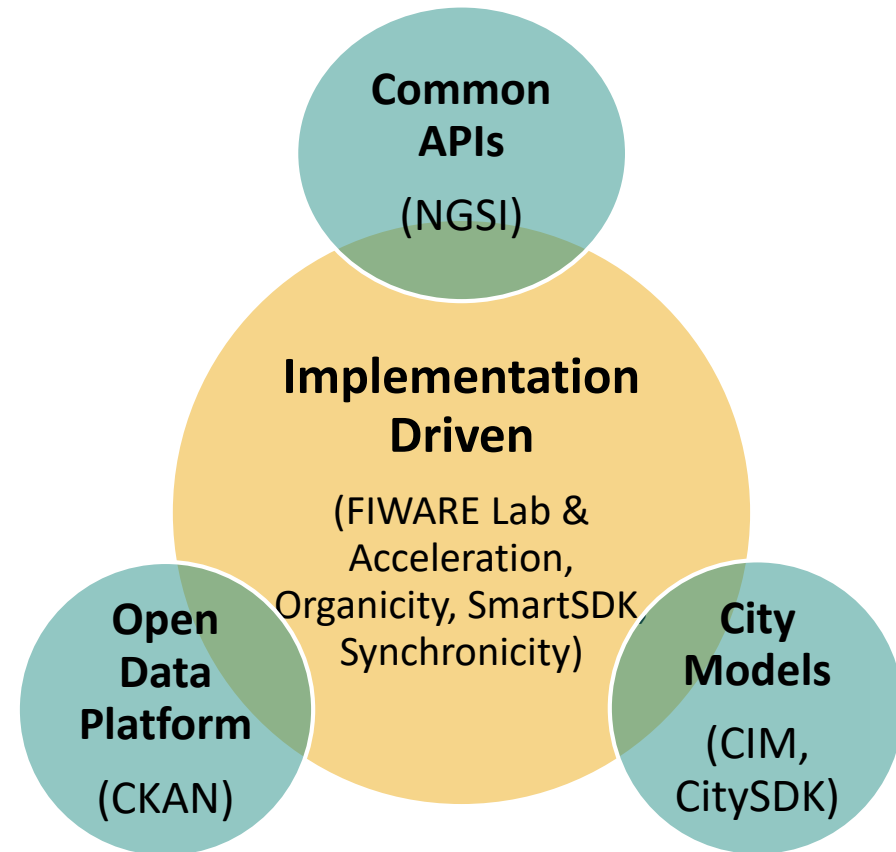


# OPEN AGILE SMART CITIES



*The vision of the Open & Agile Smart Cities initiative is to create an open smart city market based on the needs of cities and communities.*

FROM THE OASC VISION



# FIWARE DATA MODELS STANDARD (ETSI CIM)



## Alarms

Events related to risk or warning conditions which require action taking.



## Environment

Enable to monitor air quality and other environmental conditions for a healthier living.



## Civic Issue tracking

Data models for civic issue tracking interoperable with the de-facto standard Open311.



## Device

IoT devices (sensors, actuators, wearables, etc.) with their characteristics and dynamic status.



## Parks & Gardens

Data models intended to make an efficient, effective and sustainable management of green areas.



## Point of Interest

Specific point locations that someone may find useful or interesting. For instance, weather stations, touristic landmarks, etc.



## Street Lighting

Modeling street lights and all their controlling equipment towards energy-efficient and effective urban illumination.



## Transportation

Transportation data models for smart mobility and efficient management of municipal services.



## Waste Management

Enable efficient, recycling friendly, municipal or industrial waste management using containers, litters, etc.



## Weather

Weather observed, weather forecasted or warnings about potential extreme weather conditions.



## Indicators

Key performance indicators intended to measure the success of an organization or of a particular activity in which it engages.



## Parking

Real time and static parking data (on street and off street) interoperable with the EU standard DATEX II.

# HOW CAN STANDARD SMART CITY DATA MODELS EASING COMMON SOLUTIONS BE DEFINED?

- Smart City apps can be ported from one Smart City to another once their platforms provide the same set of APIs, that's why FIWARE brings a rather high value
- Without standard data models, Smart City apps would need to come with adapters that transform data made available by the city so that it complies with the data model handled by the app but that has proven to be easy with OMA NGSI (overall if NGSI is at both ends)
- Creation of standard Smart City data models would allow to avoid performing this kind of adaptation and make portability of Smart City apps across Smart City platforms a pretty straightforward task

# EXISTING MODELS

[HTTPS://GITHUB.COM/FIWARE/DATAMODELS](https://github.com/fiware/datamodels)

- **Point of interest** (entity type PointOfInterest). It models different points of interest such as public parking lots, weather or air quality stations, and others.
- **Weather**
  - **forecast** (entity type WeatherForecast). It models a weather forecast, including all the expected values for the different variables (temperature, humidity, wind speed, maximum, minimum, etc.).
  - **observed** (entity type WeatherObserved). It represents weather observations offered by the automated weather stations owned by AEMET.
  - **alarms** (entity type WeatherAlarm). They correspond to weather alarms provided by the European Meteoalarm service.
- **Ambient observed** (entity type AmbientObserved). This entity type corresponds to the observations of the air quality in a city.
- **Parking** (StreetParking or ParkingLot). Smart parking data models capture information that is needed to optimize car mobility in cities.

# DATA & CONTEXT

Data in action

# Building Smart Cities together

OPEN APIs  
FOR OPEN  
MINDS



# OPEN STANDARDS & OPEN PLATFORMS



The Connecting Europe Facility validate our solution



Scalable system about data gestion



Open APIs  
(OMA NGSI)

Open Data  
Integration  
(CKAN)



100  
Cities

Global  
Data  
Marketplace  
(Synchronicity)



- Multiplatform connection
- IoT devices and M2M with scalable integration
- Integration and interworking with Continua Alliance, OMA, Alljoyn, etc.
- Data models and Semantic (W3C SSN XG - W3C Web of Things)

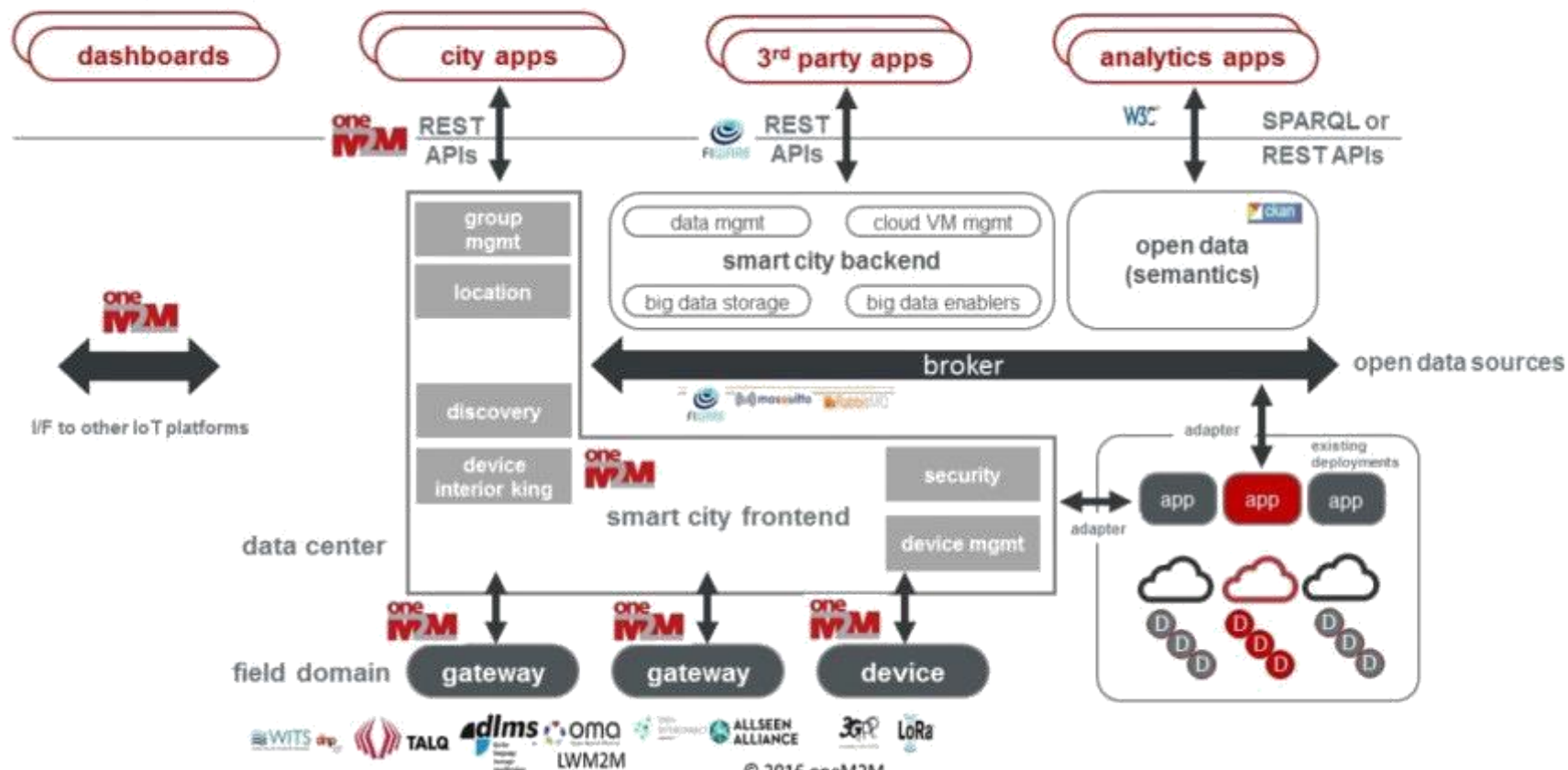


- Devices with remote control
- Software and firm actualization
- Efficiency maintenance
- FIWARE & OneM2M integration



# ETSI ONEM2M + FIWARE

## possible smart city blue-print cloud apps

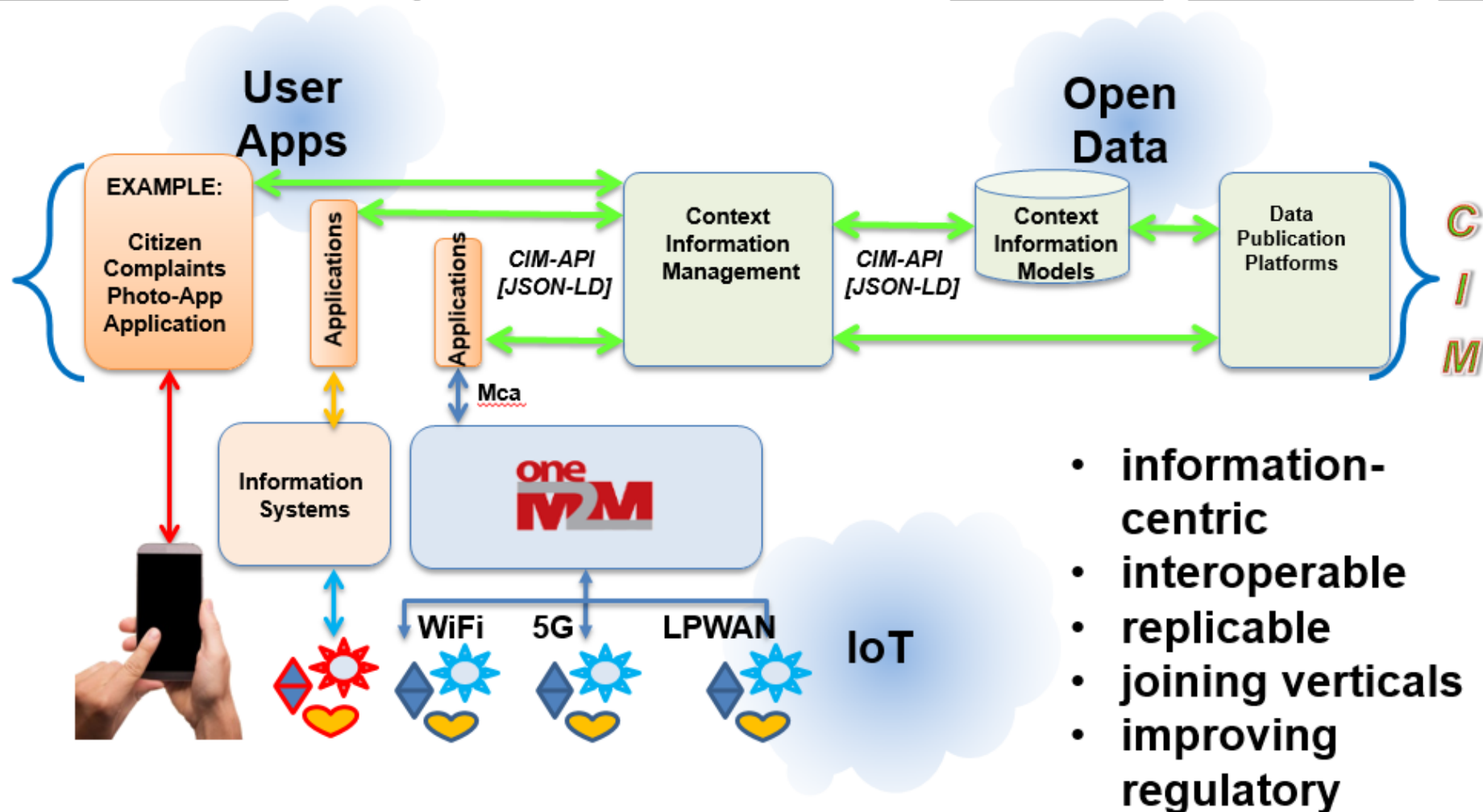


© 2016 oneM2M

# CONTEXT INFORMATION MANAGEMENT (CIM)

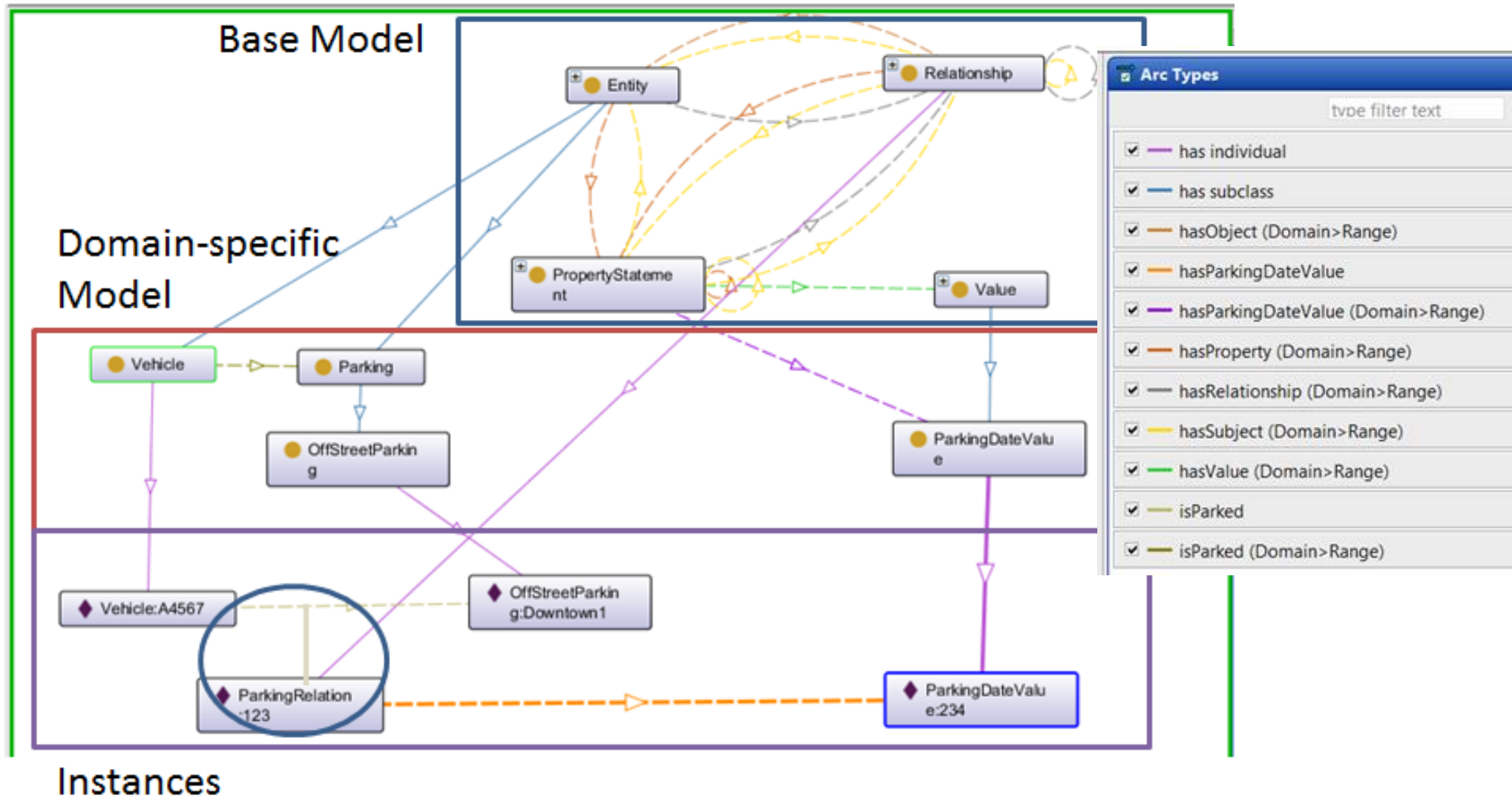
## ETSI ISG CIM ACTIVITIES

Cross-domain: info producers/consumers in OpenData, User Apps, IoT



- information-centric
- interoperable
- replicable
- joining verticals
- improving regulatory

# CONTEXT INFORMATION MANAGEMENT (CIM) METAMODEL



# CONTEXT INFORMATION MANAGEMENT (CIM)

## EXAMPLE

```
{
  "@context": {
    "id": "@id",
    "type": "@type",
    "data": "@graph",
    "value": "urn:cim:value",
    "object": {
      "@id": "urn:cim:object",
      "@type": "@id"
    },
    "providedBy": "http://example.org/provenance",
    "reliability": "http://example.org/reliability",
    "Vehicle": "http://example.org/Vehicle",
    "OffStreetParking": "http://example.org/OffStreetParking",
    "brandName": "http://example.org/brandName",
    "parked": {
      "@id": "http://example.org/parked"
    },
    "availableSpotNumber": "http://example.org/availableSpotNumber",
    "parkingDate": {
      "@id": "http://example.org/parkingDate",
      "@type": "http://schema.org/DateTime"
    }
  },
  "providedBy": "http://city.org/Utrecht",
  "data": [
    {
      "id": "urn:cim:Vehicle:P9876K",
      "type": "Vehicle",
      "brandName": "Mercedes",
      "parked": {
        "type": "urn:cim:Relationship",
        "object": "urn:cim:OffStreetParking:Downtown123",
        "parkingDate": "2017-07-29:12:00:09"
      }
    }
  ]
},
{
  "id": "urn:cim:OffStreetParking:Downtown123",
  "type": "OffStreetParking",
  "name": "Downtown Parking",
  "availableSpotNumber": {
    "type": "urn:cim:PropertyStatement",
    "value": 120,
    "reliability": 0.7
  }
}
]
```

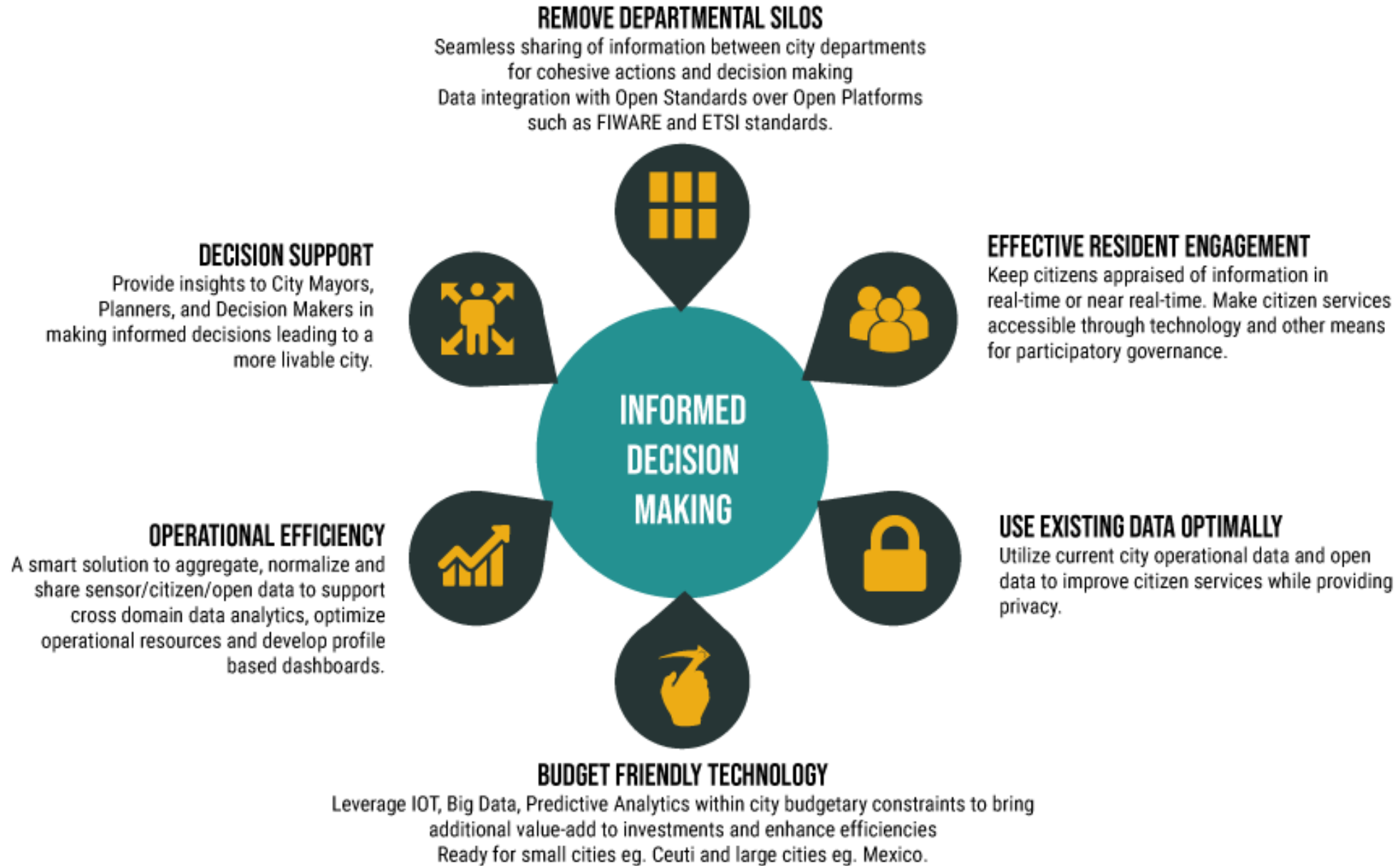
# TOOLS

Informed Decision Making



# DECISION MAKING:

- Map visualization (LIVE)
- Historical data (visualizer)
- Crowd monitoring (people flows)
- Metrics & indicators
- Open Data (CKAN portal)



# DASHBOARD

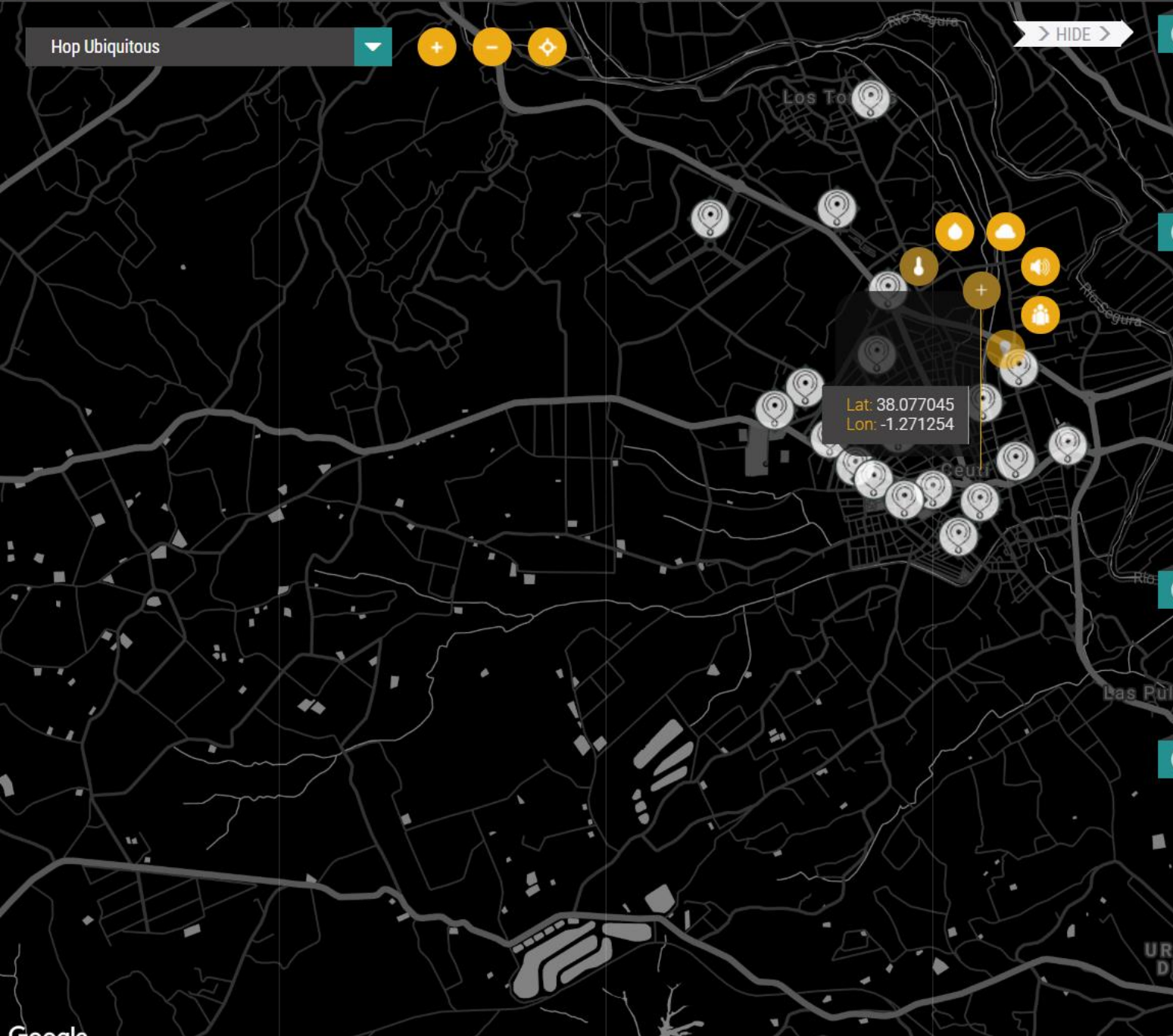


[HTTPS://LIVE.HOPU.EU](https://live.hopu.eu)

Hop Ubiquitous



> HIDE >



TEMPERATURE · PER HOUR (AVERAGE)



Time: 20:00 Value: 25.42 Status: Cold

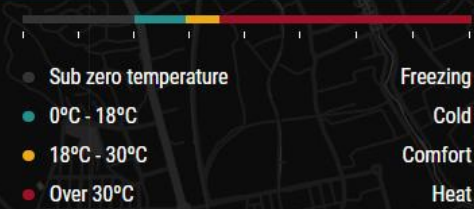
TEMPERATURE · DAILY (AVERAGE)

13 Apr	25.48 °C
14 Apr	25.49 °C
15 Apr	25.49 °C
16 Apr	25.48 °C
17 Apr	25.42 °C
18 Apr	25.49 °C
19 Apr	25.48 °C
20 Apr	25.48 °C
21 Apr	25.49 °C
23 Apr	25.49 °C
24 Apr	25.49 °C
25 Apr	25.5 °C
26 Apr	25.48 °C
27 Apr	25.48 °C
30 Apr	25.49 °C

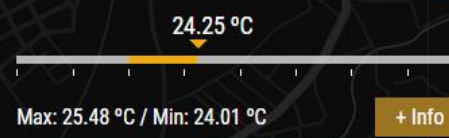
TEMPERATURE · SENSOR INFO

Sensor Status	On
Sampling Rate	30 sec
Precision	95 %
Transfer data rate	0.002 s

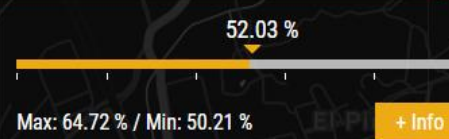
TEMPERATURE · LEGEND



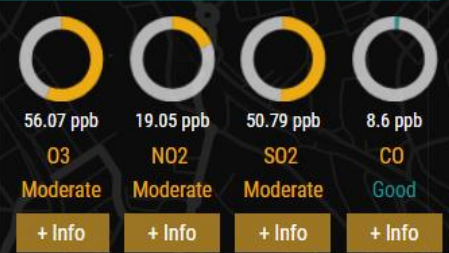
TEMPERATURE



HUMIDITY



GASES



NOISE



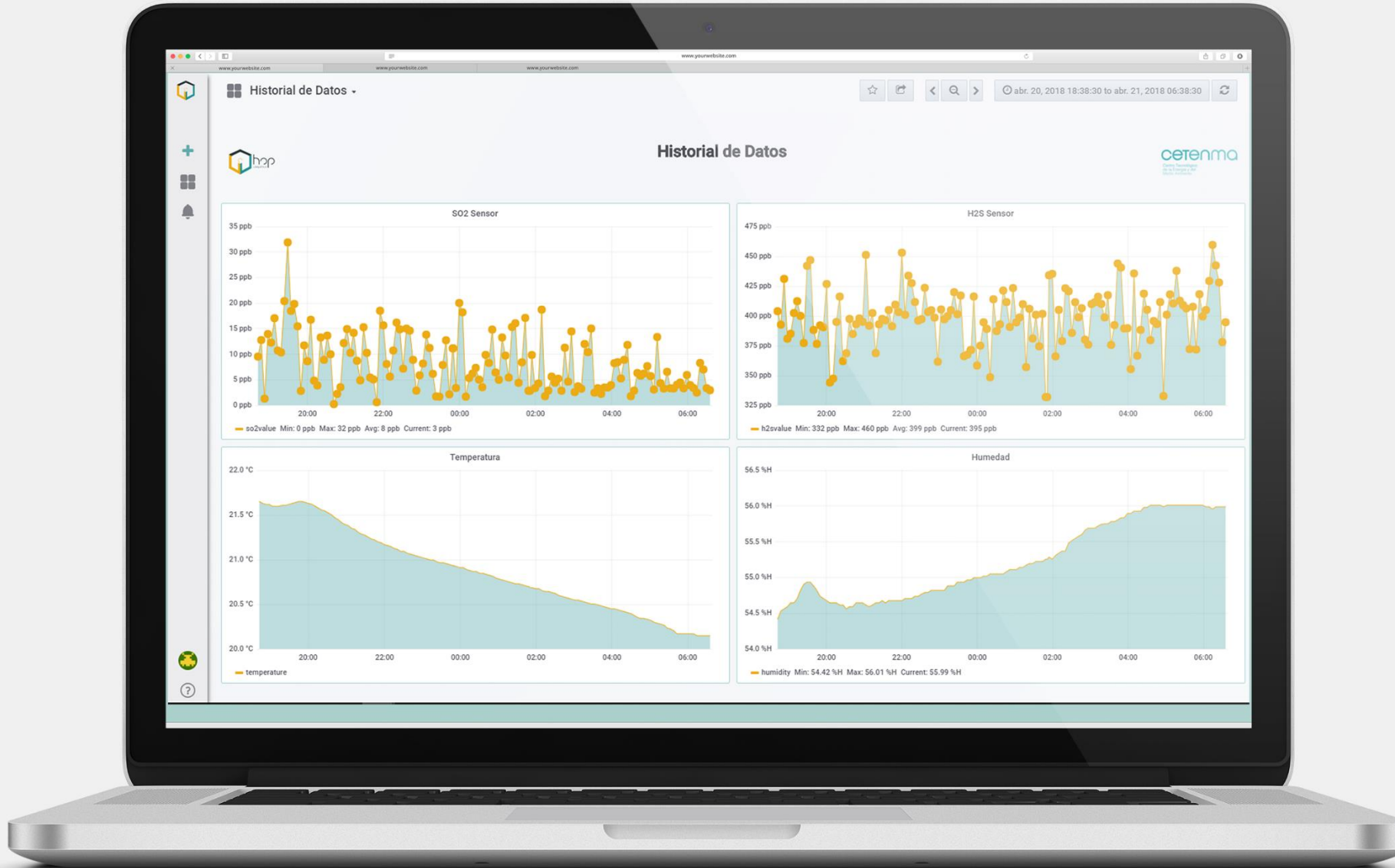
CROWD MONITORING



PHYSICAL WEB URL

Hop Ubiquitous Device

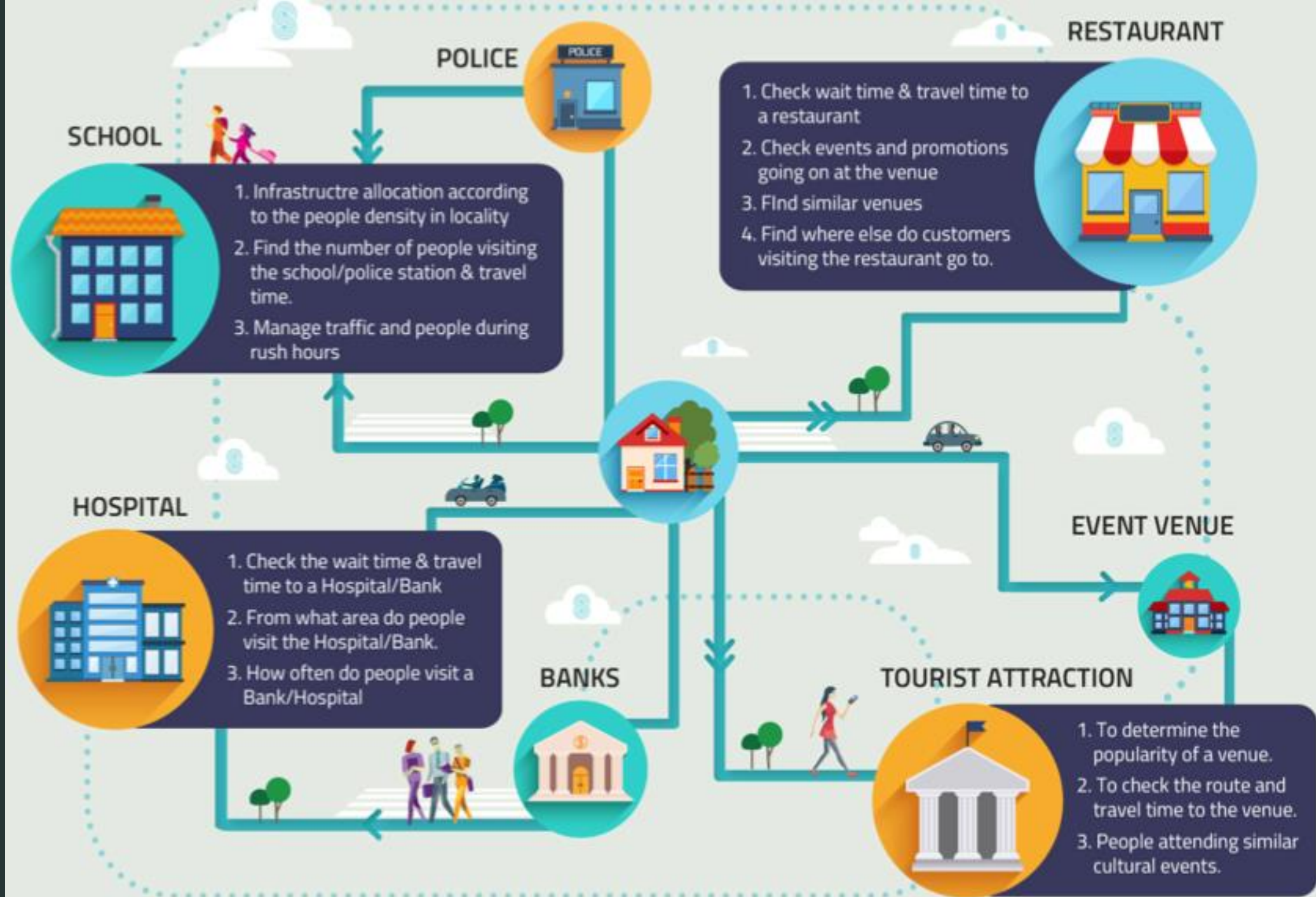




# CROWD MONITORING

Visitors Flow based on Wi-Fi monitoring

- Density
- Path
- Routes
- Affinity
- Engagement
- traffic



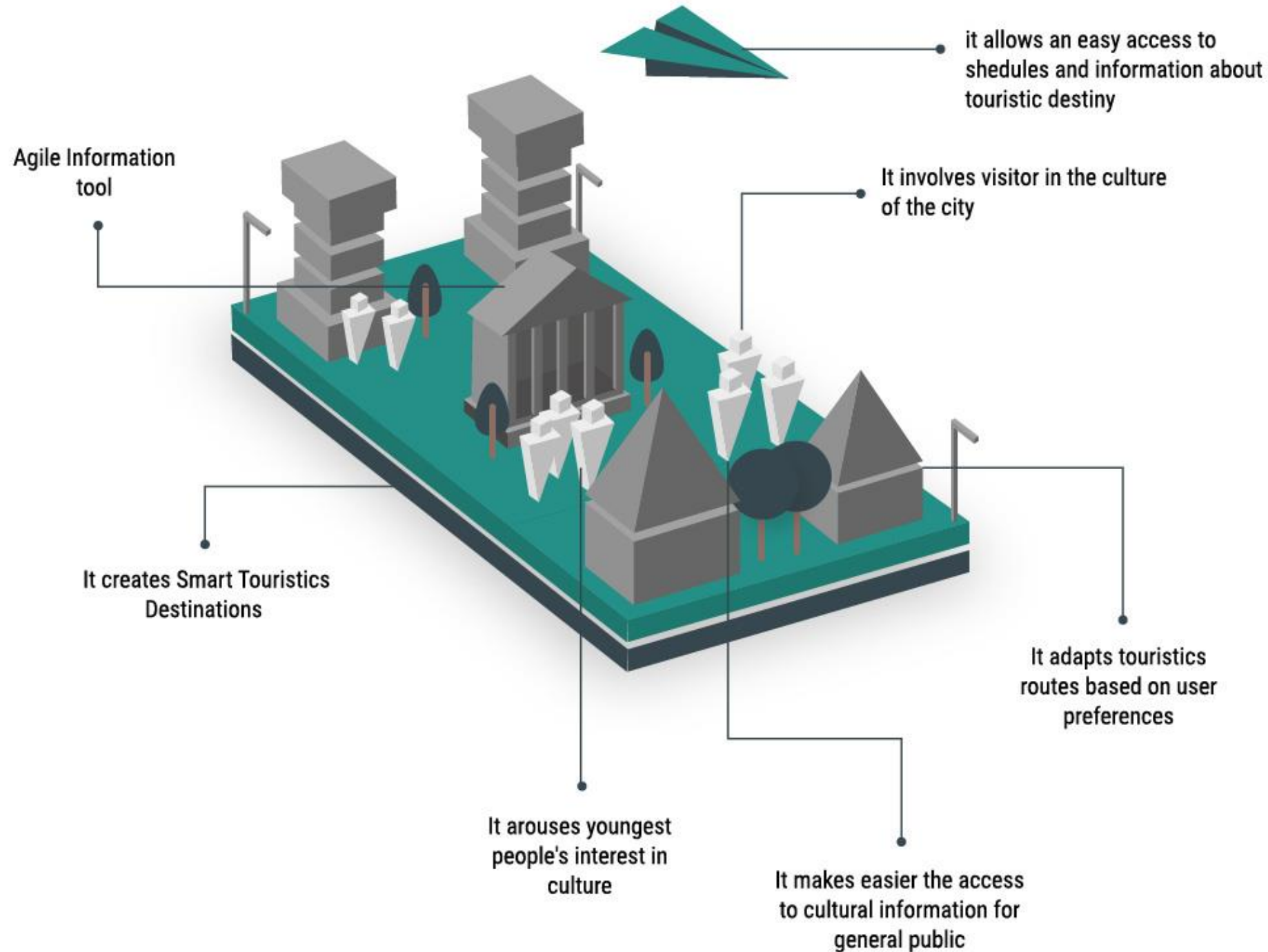
# EXPERIENCIES

Creating Smart Destinations



# SMART DESTINATION

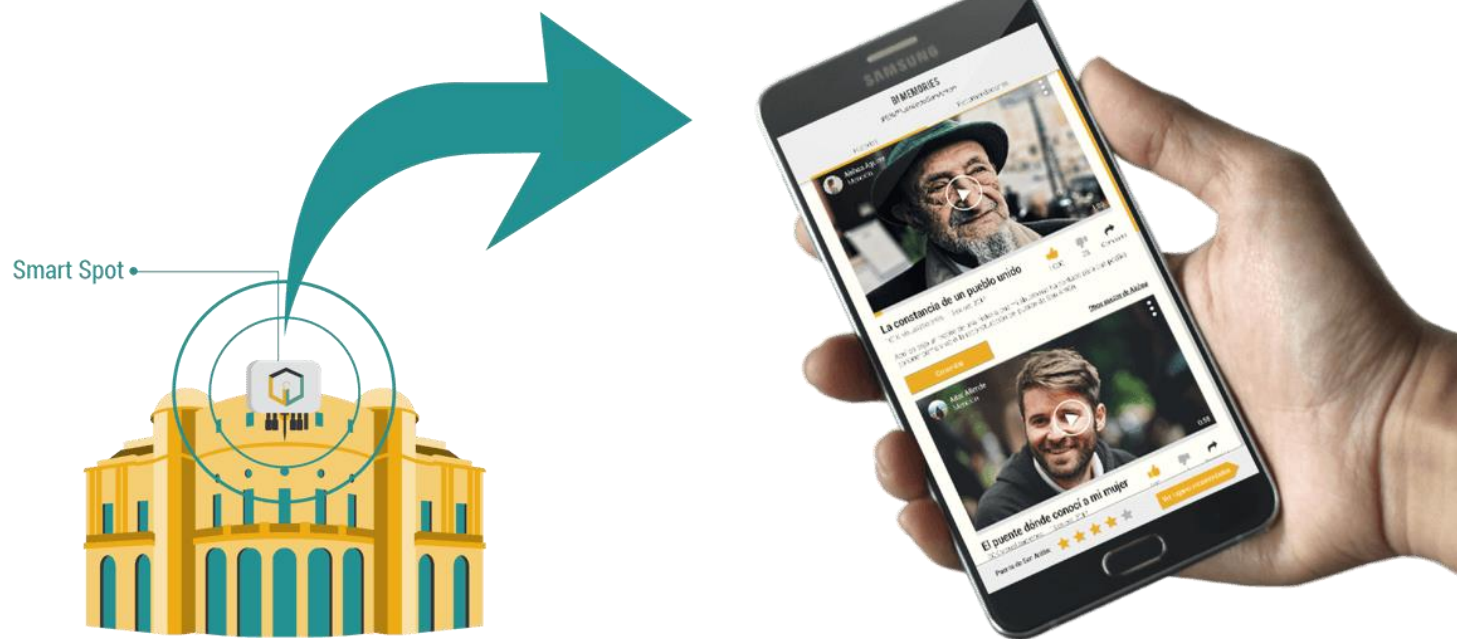
*"One's destination is never a place, but a new way of seeing things"*



# Be Memories

A new communication channel  
more agile for tourist

- Disseminate connect online thanks to the Smart Spots and Captive Wi-Fi Portal, contextualizing online information in each point of interest sending notifications non-intrusive.
- Provide more agile experiences about the Point of Interest and create a transmedia experience with new multimedia content co-created by the citizens



# SUCCESS STORIES

## #CEUTÍCUENTASUHISTORIA (Ceuti tells their stories)



16 Smart Spot  
deployed



Content adapted  
to the destination



Creation of  
experiences



Design and develop the  
Web App

Partners



Ayuntamiento  
de Ceuti

2018   
EUROPEAN YEAR  
OF CULTURAL  
HERITAGE  
#EuropeForCulture

#Ceutícuéntasuhistoria

# BE MEMORIES:

## *Communication channel*

- The interaction areas with a **Smart Spot** disseminate the content geolocated through two ways:
  - **Nearby technology:** Sends notification to the Smartphones nearby with the Bluetooth and GPS on. The notification includes an URL with the website.
  - **Wi-Fi:** The user can connect to the Wi-Fi “Be-Memories” and the website will open automatically.



#Ceutícuentasuhistoria

# BE MEMORIES

## Co-created content

- The website is composed by short videos of 1 minute where the citizens tell stories about their town in the point of interest.
- This type of content provide the following benefits for a Smart Destination:
  - **Digitalize** the immaterial heritage of a city
  - **Co-create** the content with the citizens, involving the communities of the city in the process as old people, children, etc.
  - Make the content more **attractive** for the new travellers (Millennials)
  - Create new **communications channels** to disseminate local business and restaurants



# AWARDS



*Hackathon WeLive winner  
"Best Tourist solution"*



*Tested in Deusto,  
Bilbao*



*ITH Smart Destination Awards  
In FITUR 2017*



*Google hackathon finalist*

# THANK YOU!

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