FIWARE: the pillar of the Future Internet

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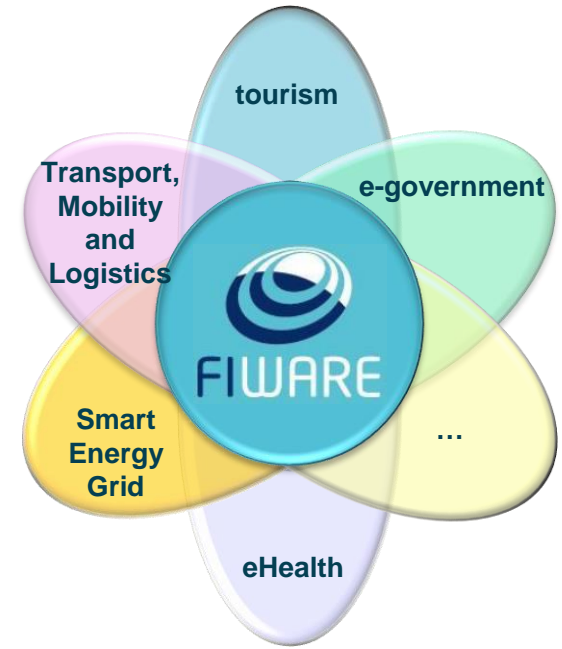Follow @FIWARE on Twitter

The FIWARE Public-Private Partnership (PPP)

- Goal: capture opportunities derived from the new wave of digitalization of life and businesses that is coming

- Strategy: Build an ecosystem that will work as catalyst for capturing the opportunities, engaging data providers and entrepreneurs

- Pillars:
  - **FIWARE** : a generic, open standard platform which serve the needs of developers in multiple domains
  - **FIWARE Lab** : a meeting point where innovation happens and data providers plus entrepreneurs can be engaged
  - **FIWARE Ops** : the suite of tools easing deployment and operation of FI-WARE instance nodes
  - **FIWARE Accelerate** : a program that funds developers and entrepreneurs, and ignites roll-out of the ecosystem
  - **FIWARE Mundus** : reach a global footprint, opening to regions that share the same vision and ambition
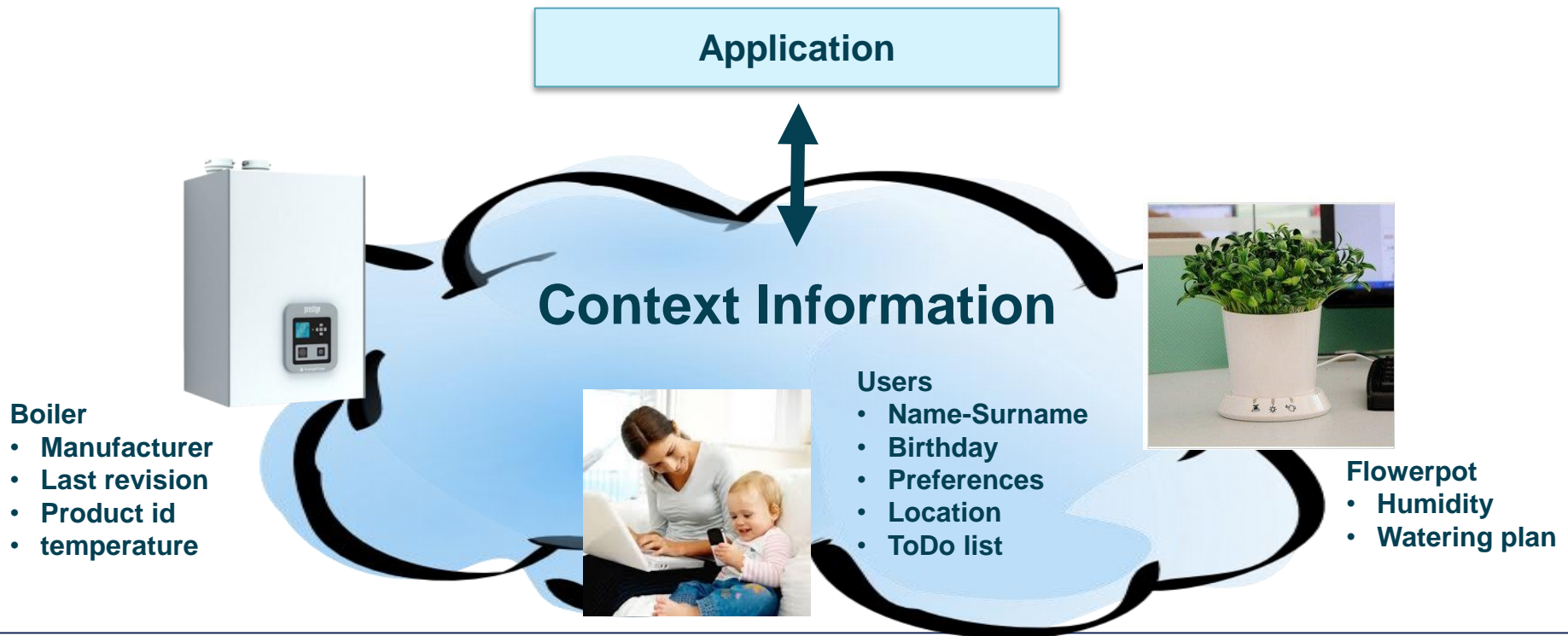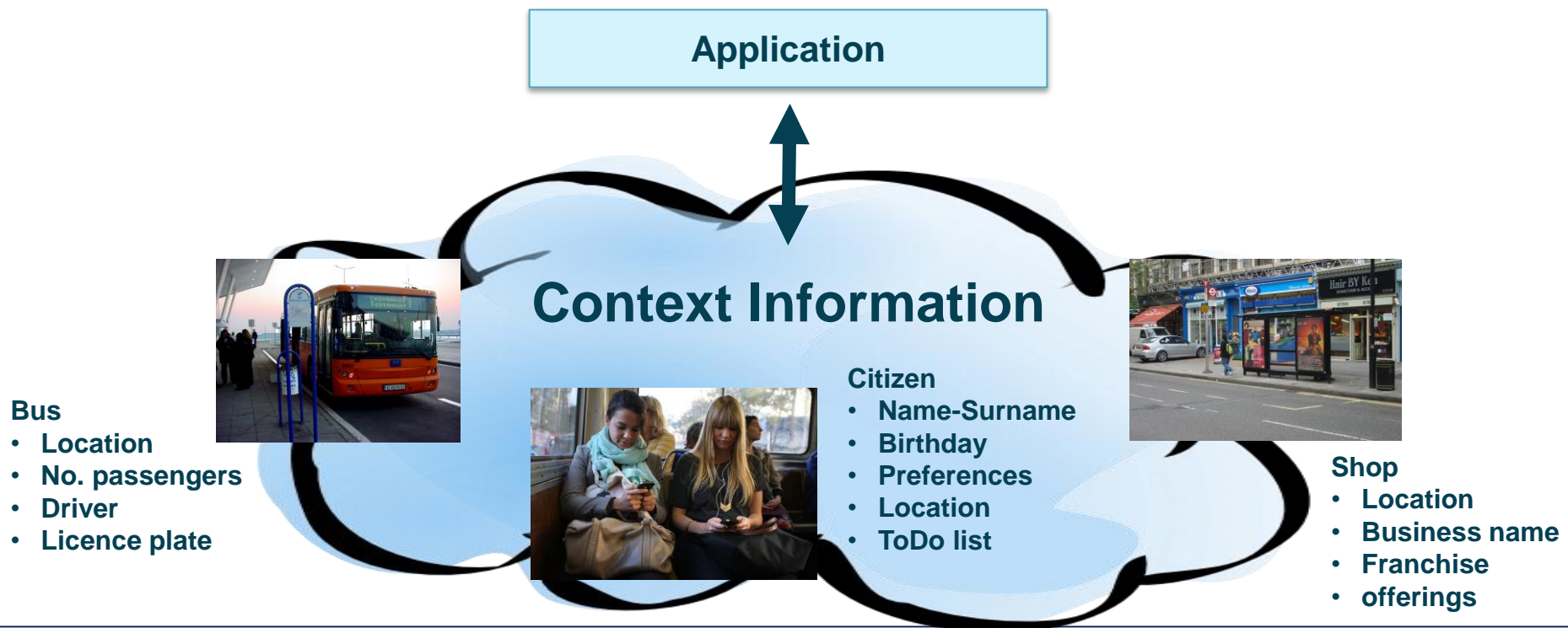
What does FIWARE provide as a platform?

FIWARE

Being "Smart" requires first being "Aware"

- Implementing a Smart Application requires gathering and managing context information

- Context information refers to the values of attributes characterizing entities relevant to the application

Application

Context Information

Boiler
- **Manufacturer**
- **Last revision**
- **Product id**
- **temperature**

Users
- **Name-Surname**
- **Birthday**
- **Preferences**
- **Location**
- **ToDo list**

Flowerpot
- **Humidity**
- **Watering plan**

FIWARE

Being "Smart" requires first being "Aware"

- Implementing a Smart Application requires gathering and managing context information

- Context information refers to the values of attributes characterizing entities relevant to the application

Application

Context Information

Bus
- **Location**
- **No. passengers**
- **Driver**
- **Licence plate**

Citizen
- **Name-Surname**
- **Birthday**
- **Preferences**
- **Location**
- **ToDo list**

Shop
- **Location**
- **Business name**
- **Franchise**
- **offerings**

FIWARE

Different sources of context need to be handle

- Context information may come from many sources:
  - Existing systems
  - Users, through mobile apps
  - Sensor networks (Internet of Things)

- Source of info for a given entity.attribute may vary over time

What's the current temperature in place "X"?

Notify me the changes of temperature in place "X"

Standard API
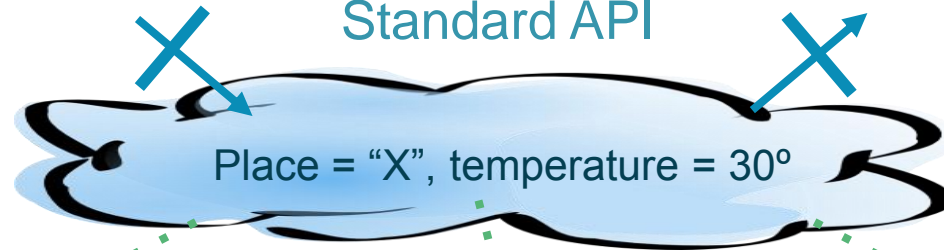
Place = "X", temperature = 30º

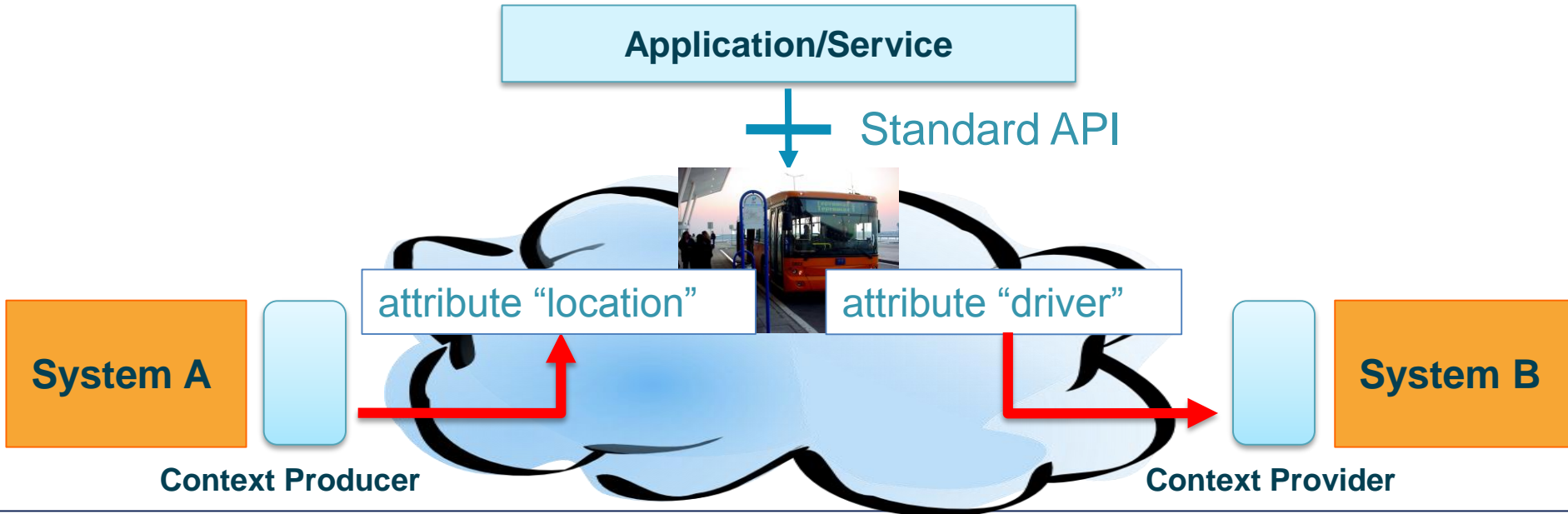It's too hot!

A sensor in a pedestrian street

A person from his smartphone

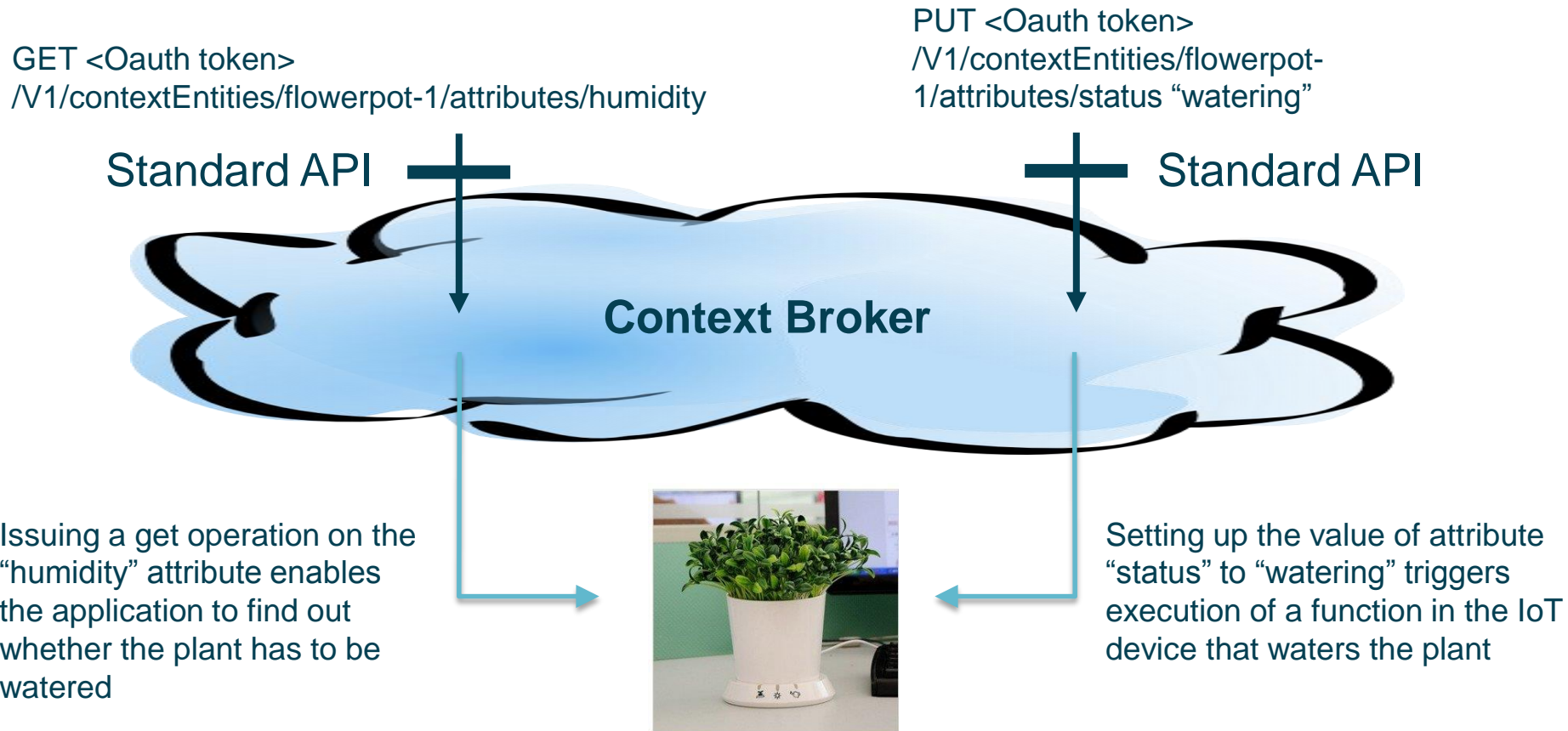**The Public Bus Transport Management system**

FIWARE

A non-intrusive approach is required

- Capable to integrate with existing or future systems dealing with management of municipal services without impact in their architectures

- Info about attributes of one entity may come from different systems, which work either as Context Producers or Context Providers

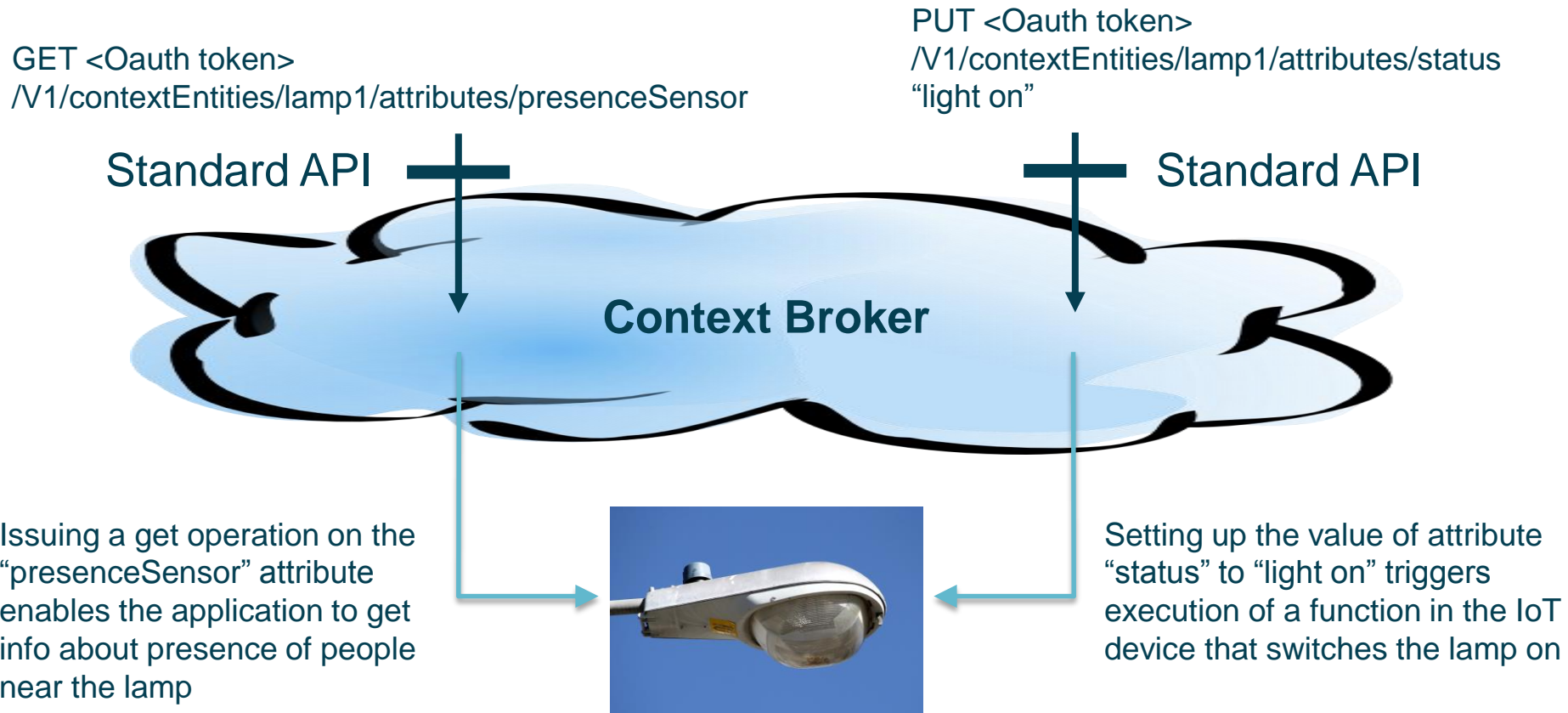- Applications rely on a single model adapting to systems of each city

Connecting to the Internet of Things

- Capturing data from, or Acting upon, IoT devices should be as easy as to read/change the value of attributes linked to context entities

GET <Oauth token>
/V1/contextEntities/flowerpot-1/attributes/humidity

PUT <Oauth token>
/V1/contextEntities/flowerpot-1/attributes/status "watering"

Standard API

Standard API

Context Broker

Issuing a get operation on the "humidity" attribute enables the application to find out whether the plant has to be watered

Setting up the value of attribute "status" to "watering" triggers execution of a function in the IoT device that waters the plant
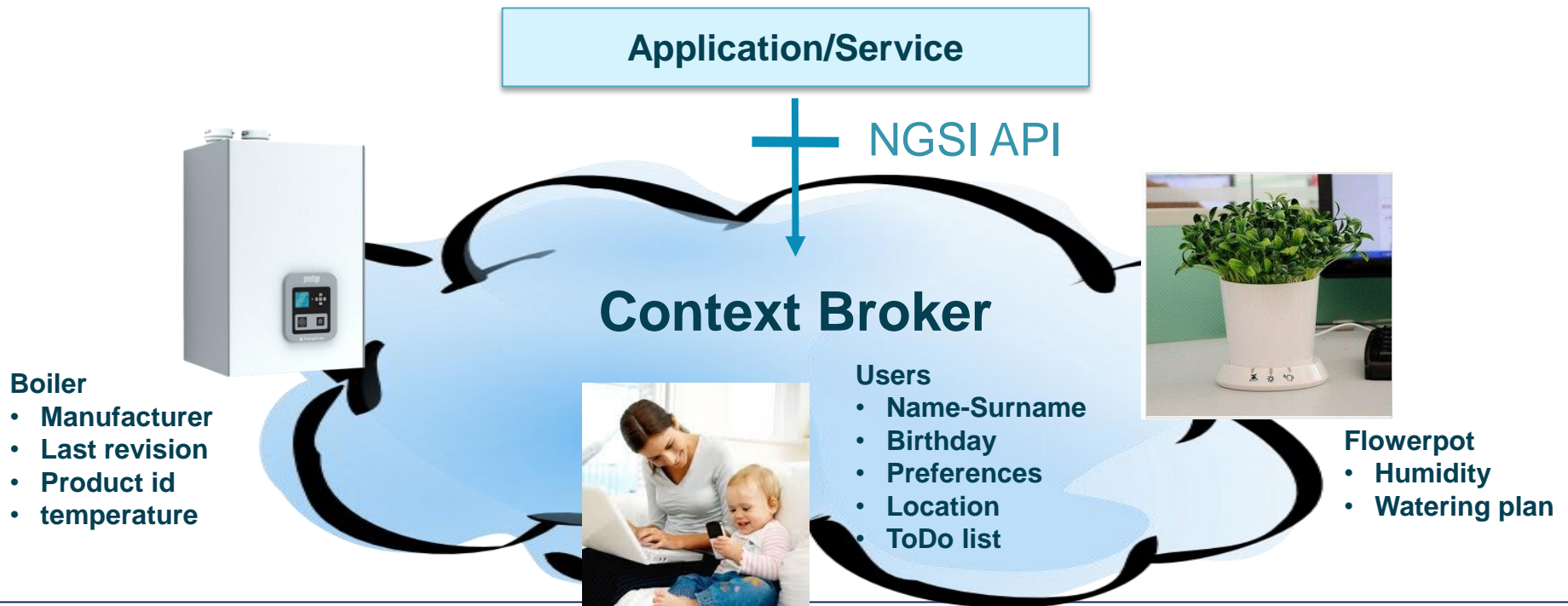
FIWARE

Connecting to the Internet of Things

■ Capturing data from, or Acting upon, IoT devices should be as easy as to read/change the value of attributes linked to context entities

PUT <Oauth token>
/V1/contextEntities/lamp1/attributes/status
"light on"

GET <Oauth token>
/V1/contextEntities/lamp1/attributes/presenceSensor

Standard API ✝   ✝ Standard API

Context Broker

Issuing a get operation on the "presenceSensor" attribute enables the application to get info about presence of people near the lamp

Setting up the value of attribute "status" to "light on" triggers execution of a function in the IoT device that switches the lamp on
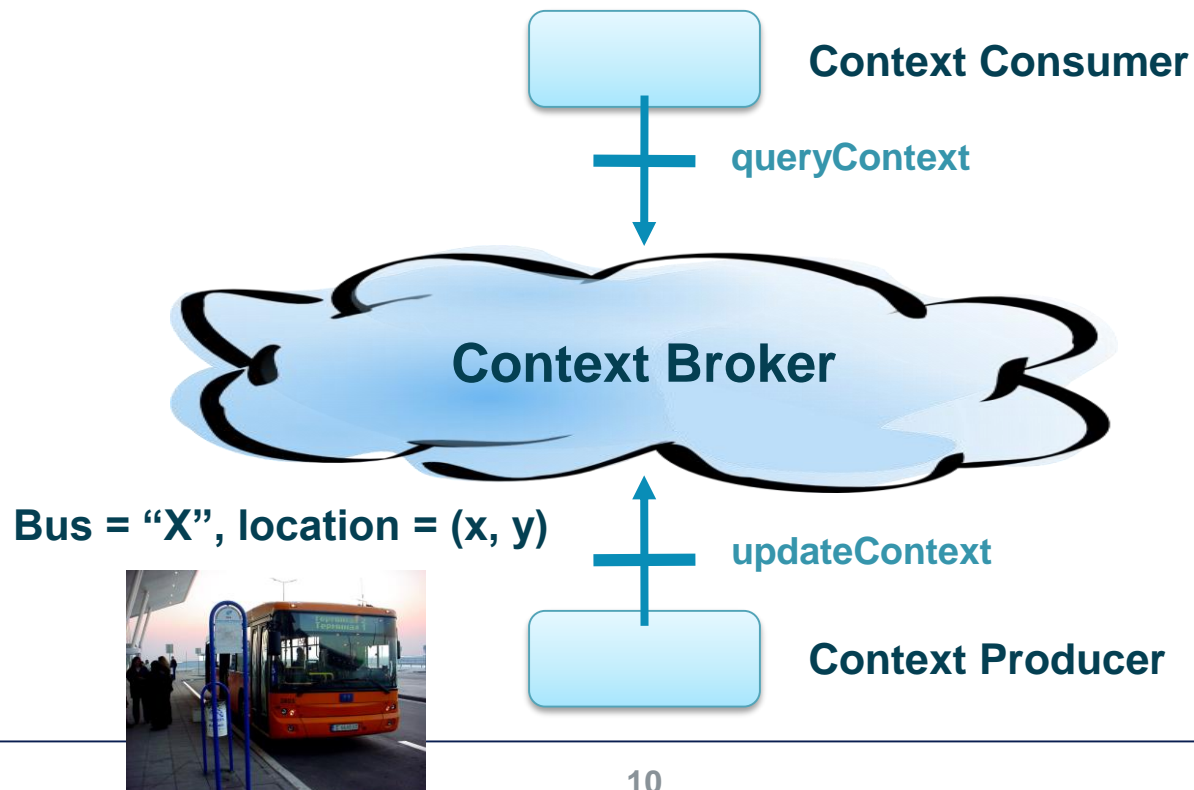
●FIWARE

Context Management in FIWARE

- The FIWARE Context Broker GE implements the OMA NGSI-9/10 API: a simple yet powerful standard API for managing Context information complying with the requirements of a smart city

- The FIWARE NGSI API is Restful: any web/backend programmer gets quickly used to it

Application/Service

NGSI API

Context Broker

Boiler
- **Manufacturer**
- **Last revision**
- **Product id**
- **temperature**

Users
- **Name-Surname**
- **Birthday**
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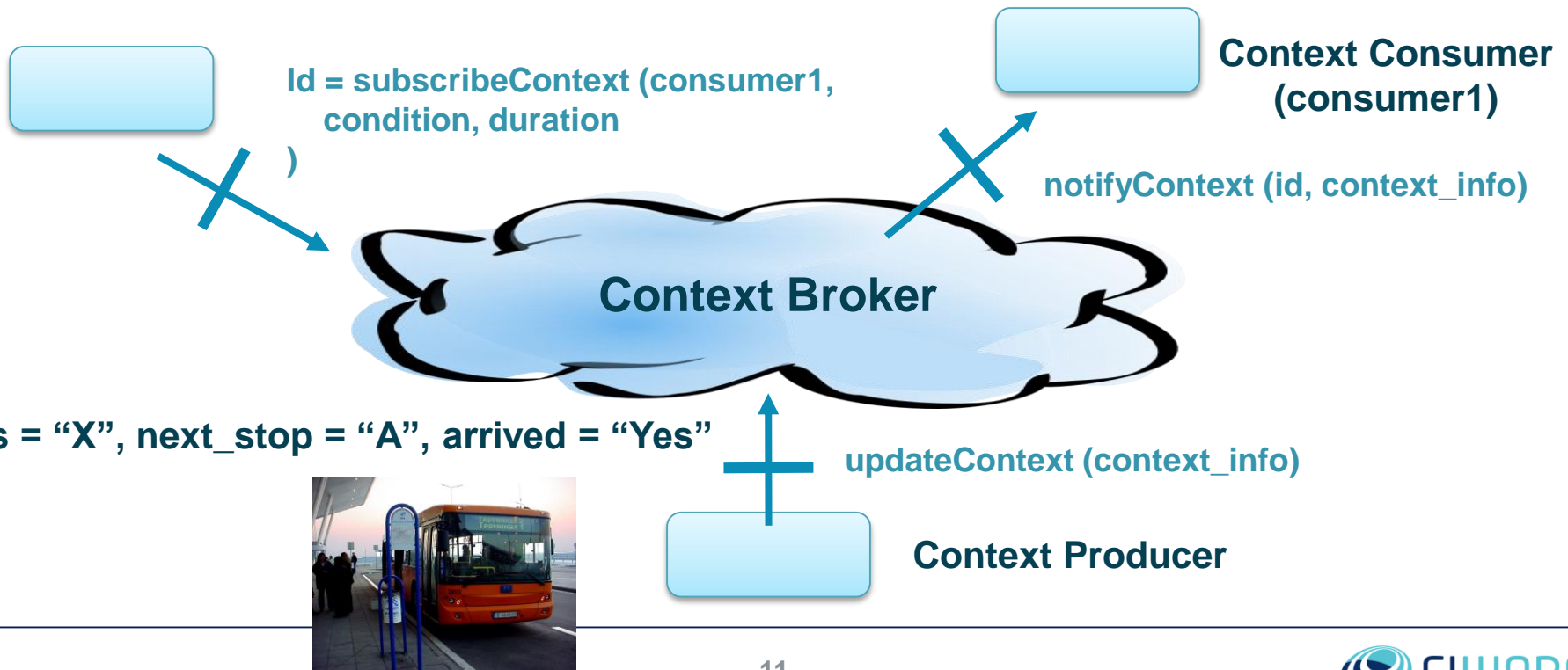
Flowerpot
- **Humidity**
- **Watering plan**

FIWARE NGSI: Basic interaction

- **Context Producers** publish context information by invoking the **updateContext** operation on a Context Broker.

- **Context Consumers** can retrieve context information by invoking the **queryContext** operation on a Context Broker

Context Consumer

queryContext

Context Broker

Bus = "X", location = (x, y)
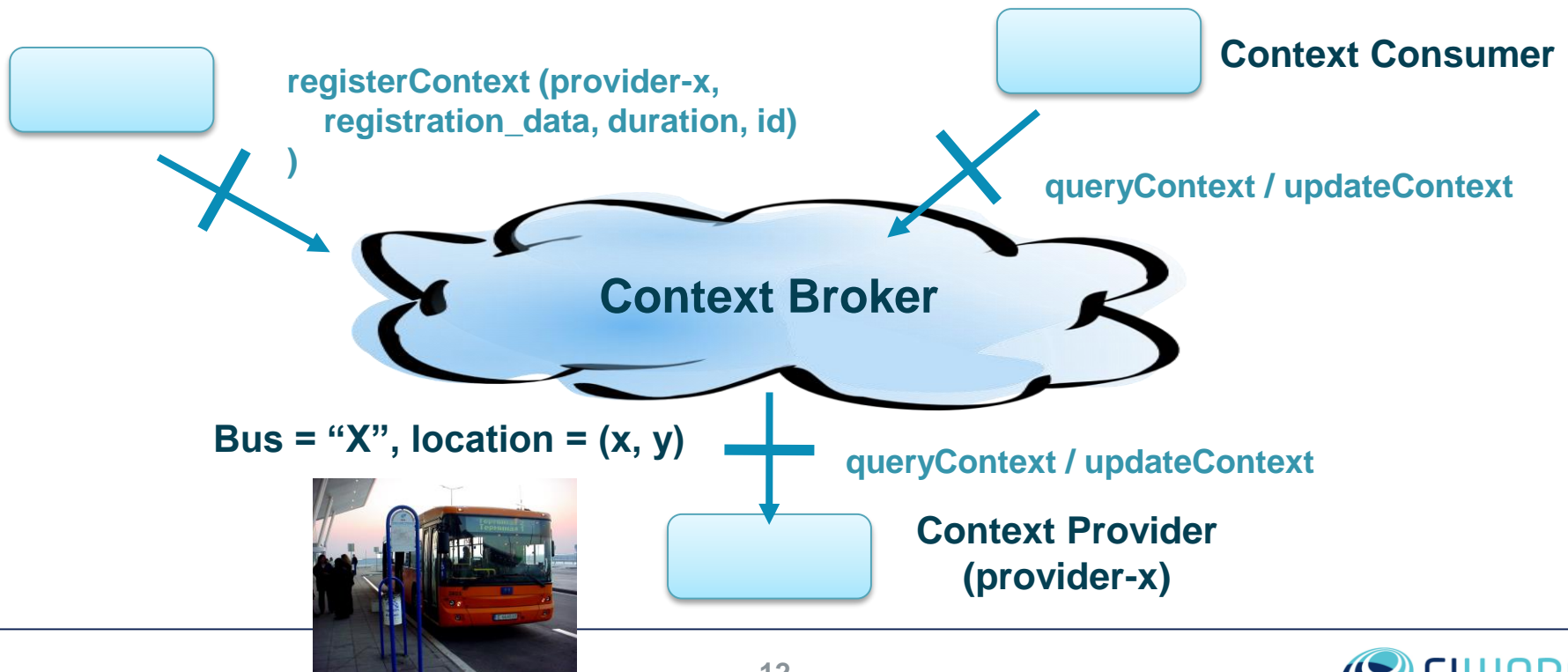
updateContext

Context Producer

FIWARE NGSI: Subscription to notifications

- **Context Consumers** can be subscribed to reception of context information complying with certain conditions, using the **subscribeContext** operation a ContextBroker exports. Such subscriptions may have a duration.

- The Context Broker notifies updates on context information to subscribed Context Consumers by invoking the **notifyContext** operation they export

Id = subscribeContext (consumer1, condition, duration)

Context Consumer (consumer1)

notifyContext (id, context_info)

Context Broker

Bus = "X", next_stop = "A", arrived = "Yes"

updateContext (context_info)

Context Producer

FIWARE NGSI: Context Providers

- **Context Providers** can be registered to the Context Broker as "holders" of certain context information.

- A Context Broker will invoke the queryContext or updateContext operations exported by Context Providers whenever they are queried for, or asked to update, context information they hold

registerContext (provider-x, registration_data, duration, id))

Context Consumer

queryContext / updateContext

Context Broker

Bus = "X", location = (x, y)

queryContext / updateContext

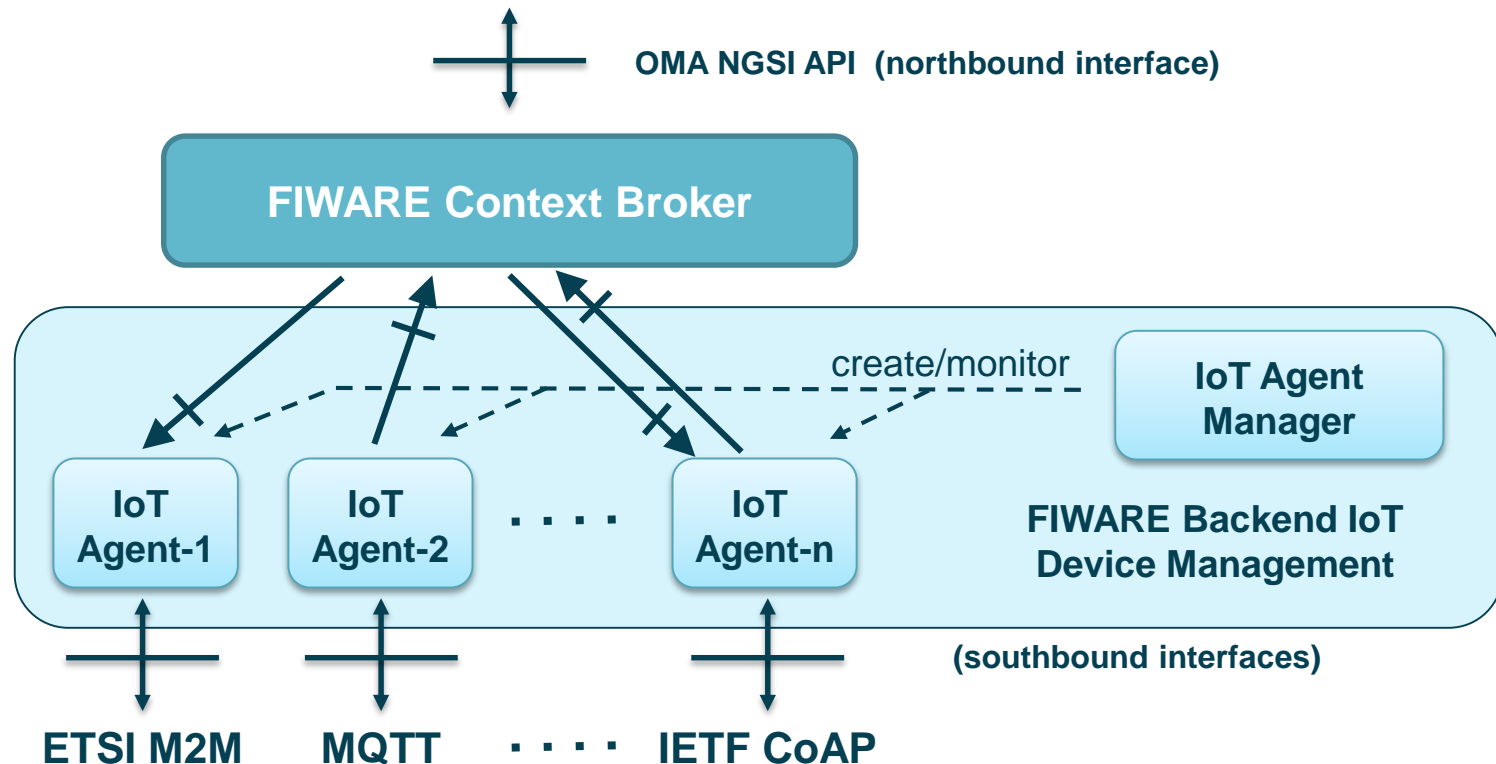**Context Provider (provider-x)**

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Integration with existing systems

- Context adapters will be developed to interface with existing systems (e.g., municipal services management systems in a smart city) acting as Context Providers, Context Producers, or both

- Some attributes from a given entity may be linked to a Context Provider while other attributes may be linked to Context Producers
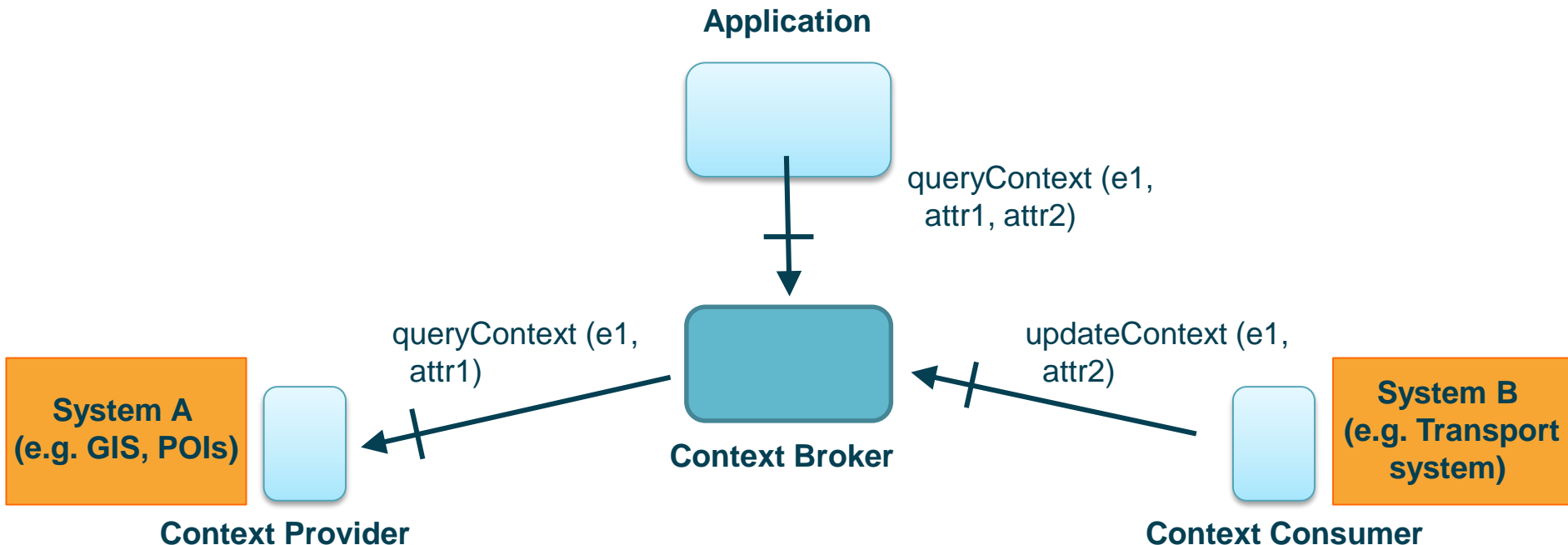
Integration with sensor networks

- The FIWARE backend IoT Device Management GE enables creation and configuration of NGSI IoT Agents that connect to sensor networks

- Each NGSI IoT Agent can behave as Context Consumers or Context Providers, or both

OMA NGSI API (northbound interface)

FIWARE Context Broker

create/monitor

IoT Agent Manager

IoT Agent-1

IoT Agent-2

. . . .

IoT Agent-n

FIWARE Backend IoT Device Management

(southbound interfaces)

ETSI M2M   **MQTT**   . . . .   **IETF CoAP**

Once context information is gathered, a lot of useful complementary FIWARE enablers can be used
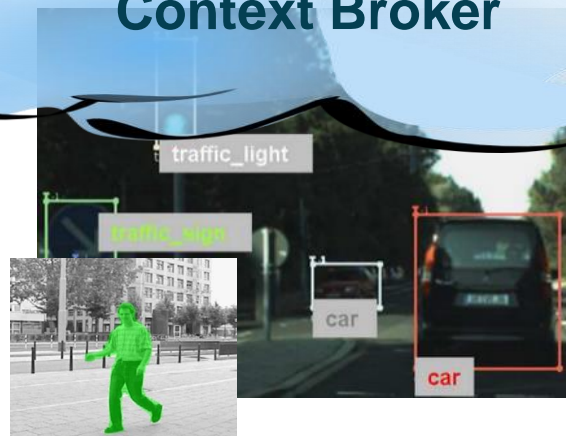
Advanced Web-based UI (AR, 3D)

Open data publication

Data/Apps visualization

Context Broker
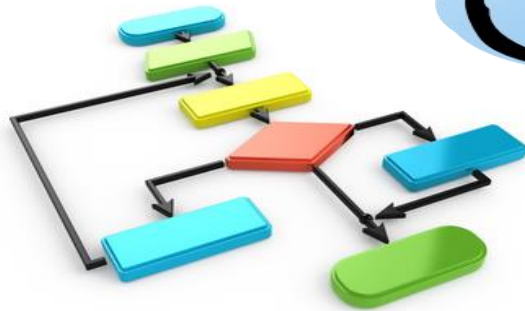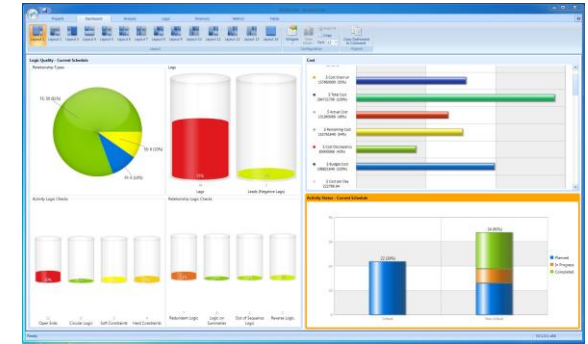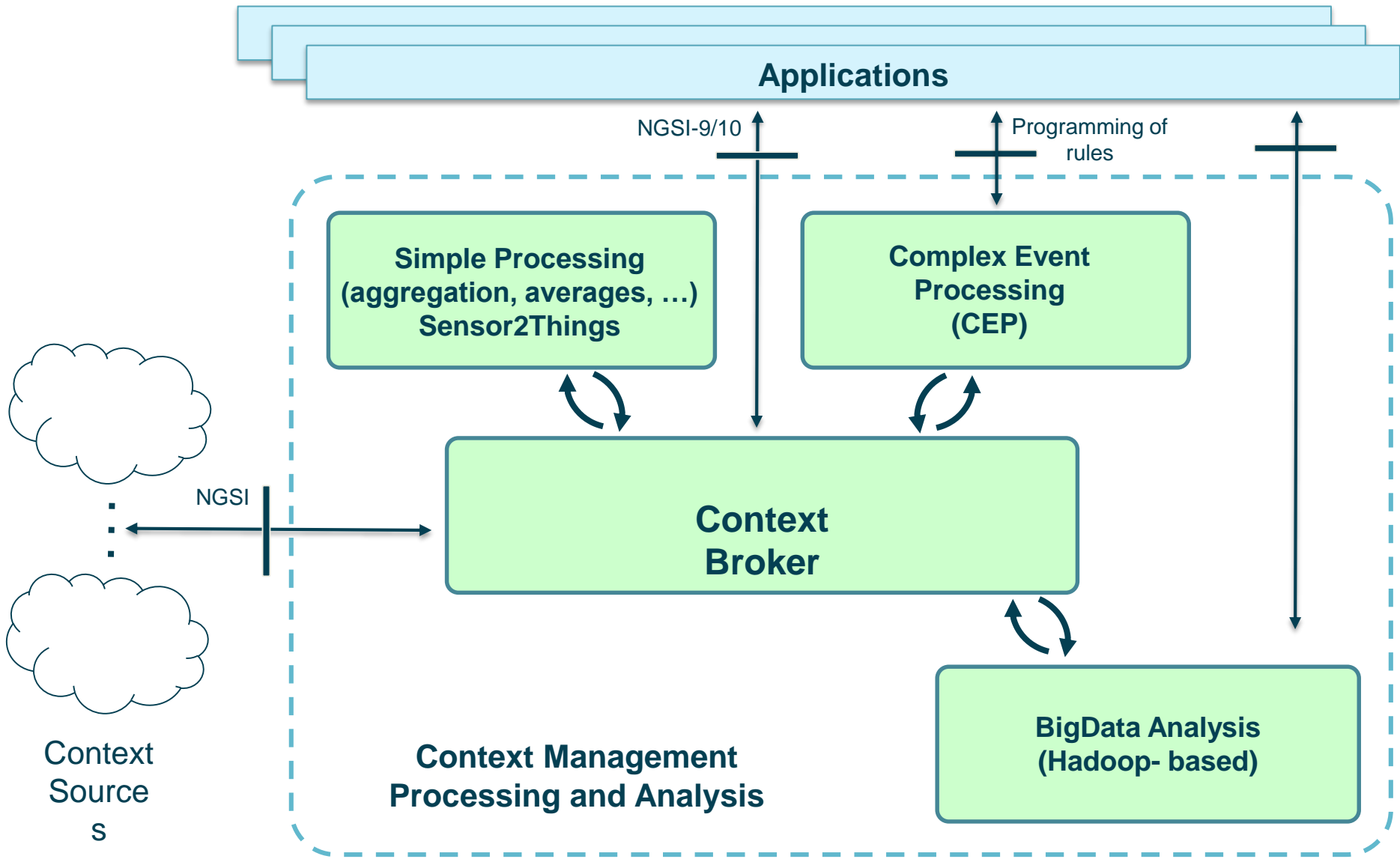
Complex Event Processing

Multimedia processing

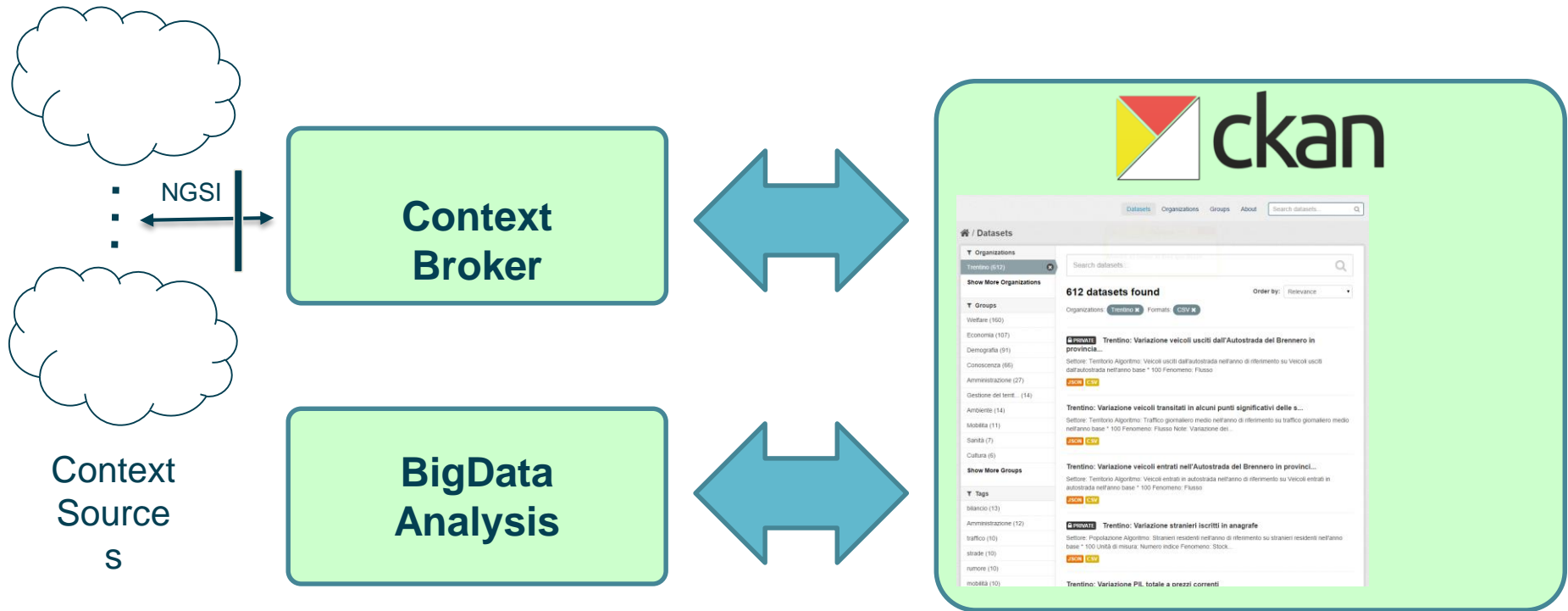Big Data Analysis

Context Processing and Analysis

FIWARE IoT & Context/Management altogether

Applications

CEP

BigData Analysis

ContextBroker

Other sources

Simple processing

IoT-enabled Context Management

FIWARE NGSI-9/10

NGSI IoT Agents

IoT Backend Device Management

Backend

Backend

Native NGSI IoT Agent

Gateway/Device Platform GEs

Native NGSI IoT Agent

Gateway/Device Platform GEs

Gateway/Device Platform GEs

Gateway/Device Platform GEs

Data analytics

Context
Sources

NGSI

**Context
Broker**

ETL

Extract
Transform
Load

Analysis

Query/Reporting

Data mining

FIWARE

Open Data publication

FIWARE = advanced OpenStack-based Cloud capabilities + library of APIs that ease development of applications

EASY
HARD

Driven by implementation

Sustainability ensured

Yes WE'RE OPEN

FIWARE major differential features

Category	Features
Cloud	• Federation of infrastructures (private/public regions) • Automated GE deployment
Data/Media Context Mgmt	• Complete Context Management Platform • Integration of Data and Media Content
IoT Services Enablement	• Easy plug&play of devices using multiple protocols • Automated Measurements/Action ←→Context updates
Data/Services Delivery	• Visualization of data (operation dashboards) • Publication of data sets/services
Advanced Web UI	• Easy incorporation of advanced 3D and AR features • Visual representation of context information
Security	• Security Monitoring • Built-in Identity/Access/Privacy Management
I2ND	• Advanced networking (SDN) and middleware • Interface to robots

Why FIWARE?

FACTS

Building a successful ecosystem requires …

Creating a vibrant community of active contributors who commit a sustainable investment over time

24 partners from 9 different countries

7430+ PMs devoted to development activities in 5 years (5165 PMs in the first 3 years)

122/76 M€ of budget/funding (37/23 M€ in the next 2 years)

Each FIWARE component is considered strategic in the portfolio of contributing partner

Building a successful ecosystem requires …

Bringing incentives for entrepreneurs and developers

80 M€ in grants to startups/SMEs in the next 2 years (FIWARE Acceleration Programme)

20 M€ to support involvement of 16 accelerators across Europe

3100+ startups/SMEs applied to 1st Open Call of the FIWARE Acceleration programme

1300 startups/SMEs to be funded (~400 as result of 1st Open Call)

Selected startup/SMEs working as evangelists

Free FIWARE Lab environment for experimentation

FACTS

Building a successful ecosystem requires …

engaging domain stakeholders

25+ relevant domain stakeholders involved in Use Cases and FIWARE Accelerator programme

95/66 M€ of budget/funding devoted to Use Cases in verticals

16+ cities have published their open data on FIWARE Lab

14+ cities launch the Open and Agile Smart Cities innitative where they commit to adopt FIWARE APIs (NGSI, CKAN)

New stakeholders triggered by awareness have approached us (e.g., Ferrovial, Bosch, …)

FACTS

Building a successful ecosystem requires …

Creating a **meeting point** where demand connects to offering and innovation takes place

FIWARE Lab environment with 3000+ Cores, 16+ TB RAM, 750+ TB HD

1900 open datasets from cities published and growing fast!

17 nodes across Europe

1st node in LATAM deployed in Mexico. New nodes being setup: Brazil and Chile

Building a successful ecosystem requires …

Raising awareness (which means an investment in **marketing**) and creating a **brand**

6,5 M€ in marketing activities (4 M€ so far)

450K€ just in sponsorship of events during 2015-16

Lead by reputed on-line marketing partner (Ogilvy)

FACTS

Building a successful ecosystem requires …

Scale and go global

21 Innovation Hubs in Europe

**First FIWARE Lab nodes
in Mexico and Brazil**

**1,4 M€ funding assigned to
FIWARE mundus activities
targeted to build links with
Mexico, Brazil, Chile, Japan,
Canada, Korea, BRIC countries …**

FIWARE PPP: main figures

122 = 85 + 37 M€
FIWARE budget (phases 1-2 + phase 3)

24
partners

6,5 M€
marketing

99 = 76 + 23 M€
FIWARE funding (phases 1-2 + phase 3)

9
countries

450 K€
sponsorships next 2 years

18 = 17 + 1
FIWARE Lab nodes

21
Innovation Hubs

16+
Cities

95/66 M€
budget/funding of Vertical Use Cases

80 + 20 M€
for startups/SMEs

1300
Startups/SMEs

FIWARE

What does FIWARE bring to Smart Cities?
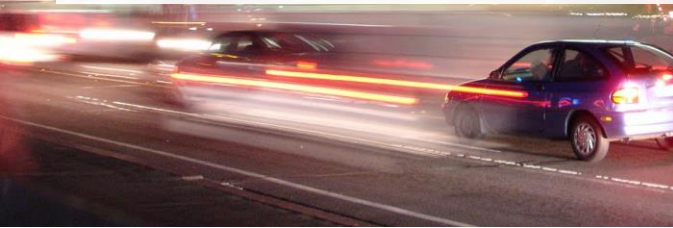
Smart Cities can be engines of growth

- Cities are where daily life and businesses actually happen …

- Smart Cities are not simply about more efficient municipality services but transforming Cities into ICT platforms enabling development of smart applications

- This way, cities would transform into engines of economy growth and improvement in the well-being of citizens

Why standards are relevant for Smart Cities

- The current lack of standards means an impediment for the development of Smart Cities
  - The target market for solution and services is not large enough to attract investment
  - Solutions and services become tailor made, therefore expensive.
  - Cities get locked-in to solution/application providers

- Pillars of the FIWARE programme support the creation of a sustainable ecosystem:
  - The FIWARE platform brings the necessary standards
  - The FIWARE Lab becomes the meeting point where cities meet entrepreneurs and innovation takes place
  - The FIWARE Acceleration programme helps to attract a first wave of developers (startups/SMEs)
  - The FIWARE mundus programme helps to expand globally
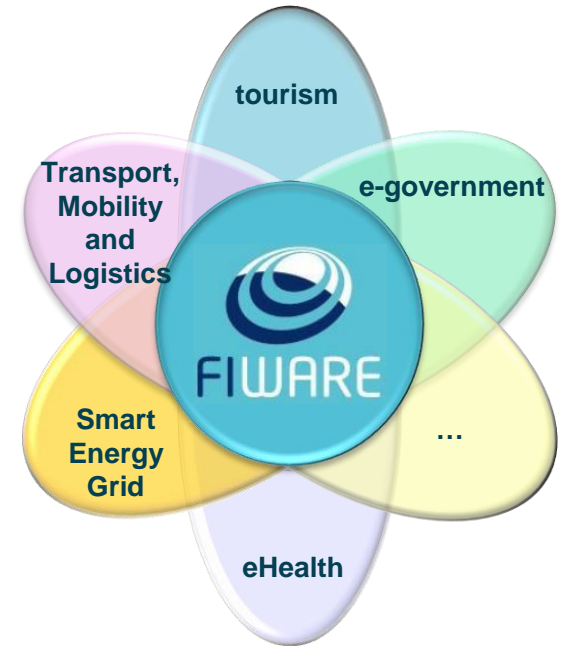 - The FIWARE Ops suite of tools ease the task to deploy FIWARE instances

Target Smart City platform
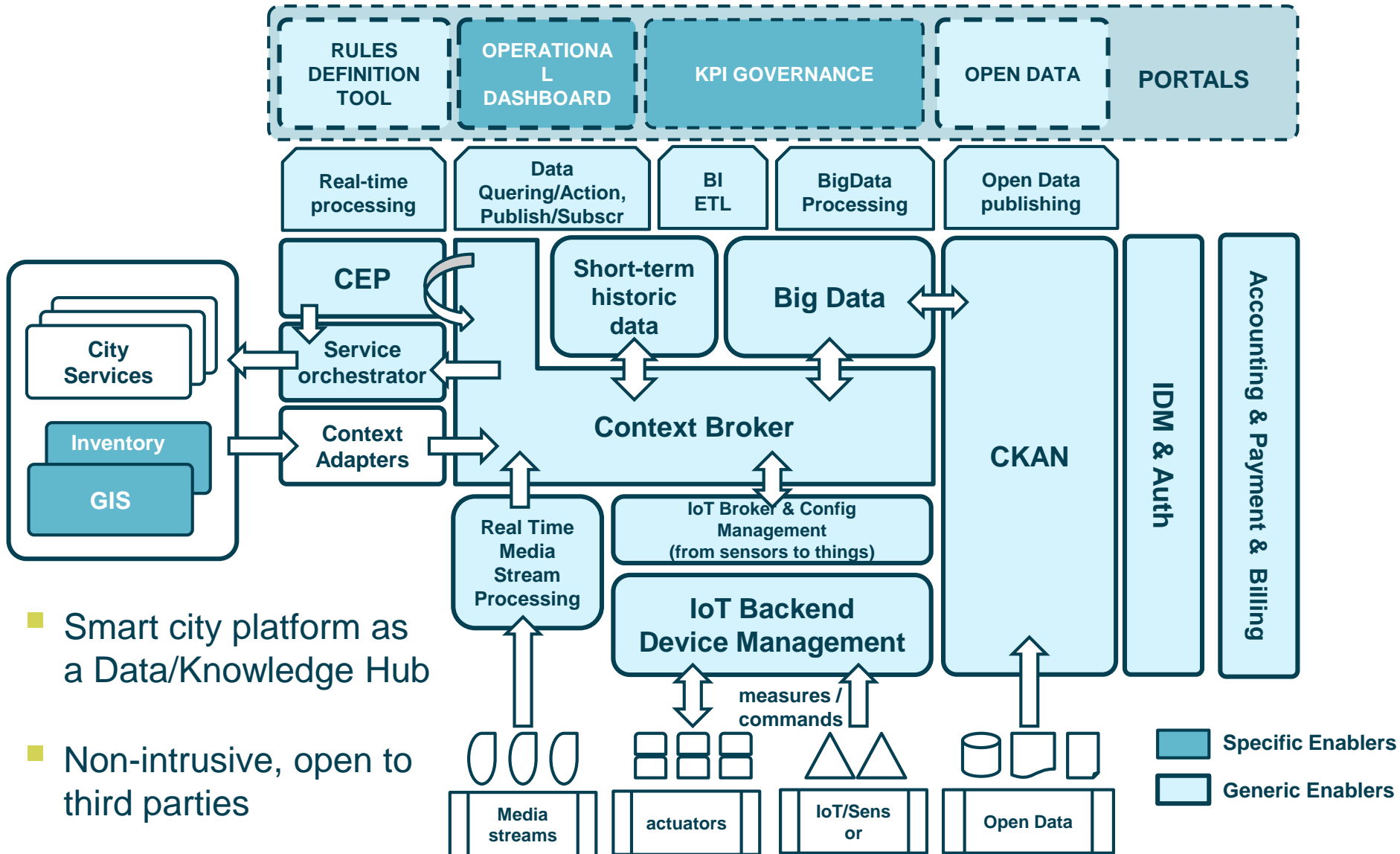
- Smart city platform as a Data/Knowledge Hub

- Non-intrusive, open to third parties

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Thanks!

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http://lab.fiware.org

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