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NEW BUSINESSES AROUND OPEN DATA, SMART CITIES AND FIWARE

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Keywords

Smart city; open data; FIWARE; accelerator; incubator; start-up

Abstract/ Executive Summary

This report presents the existing possibilities for business generation around open data in a specific ecosystem, the smart cities. The urban environments have proved to be, during the past years, one of the main open data generators worldwide. It is the aim of this report to analyse this phenomenon as well as presenting the latest findings and facts about the smart cities themselves, the initiatives around them, the technology enabling this and the new kinds of businesses and start-ups which are emerging in the European context.

On the first section an introduction to the basic concepts is presented, with the aim to introduce what a smart city is, what the technology behind it is and what the relation with open data and new businesses is.

The following sections provide a deeper analysis on the smart city and open data relation, presenting a model defining the types of cities according to their relation with the data. Then a good overview of European initiatives related to smart cities at European level is presented with the aim of understanding the kind of technological topics that are usually covered. This gives as a result the presentation of FIWARE technologies, as a foundation for smart cities and as a business generator mechanism thanks to the FIWARE Accelerate programme.

1 Introduction

1.1 Background

According to the World Health Organization (WHO), the urban population, in 2014, accounted for the 54% of the overall population in the world¹. Taking into account that in 1964 it was a 36% and the projections for the coming years, we can consider urban areas as where “the action” happens.

Far from being an empty number, these figures prove that cities are becoming, more and more, the places where an important amount of resources, both physical and digital, are consumed and/or produced. Production of resources is more evident in the digital scene. Nevertheless, this fact brings interesting challenges for policy makers, companies and citizens.

1.2 Smart City concept

At the same time, the concept of **Smart City** has entered the group of the buzzwords in the mouth of policy makers, stakeholders and even citizens of urban areas all over the world. Nevertheless, despite seeming sometimes a non-sense concept, the concept itself envisions the different sides needed to transform urban areas into better places for living. There is not a static definition on what those sides or sectors are, but the main references and activities carried out during the past years, usually target transport, energy and environment, healthcare & well-being and information and communication technologies (ICT). ICT is usually presented as the main facilitator providing “the smartness” to the whole ecosystem.

When getting closer to the Smart City situation in Europe, we see the European Union is placing a good number of efforts, and funds², into different initiatives trying to address the challenges that the growth of the population in urban areas brings. From being more energy-friendly and efficient, to reduce the time and consequences of massive movements of the population in, out and within the cities, while improving the services and quality of lives of a population growing in size and age.

The publication “The Vision of A Smart City”, Bowerman et al (2000), started this way “The vision of Smart Cities is the urban center of the future, made safe, secure environmentally

¹http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/

²<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-scc-2015.html>

green, and efficient because all structures - whether for power, water, transportation, etc. are designed, constructed, and maintained making use of advanced, integrated materials, sensors, electronics, and networks which are interfaced with computerized systems comprised of databases, tracking, and decision-making algorithms”.

1.3 The technology foundation

The “vision” above is already fifteen years old and a lot the topics addressed do have now their own names. It is not weird talking about big data when referring to the decision-making algorithms involving massive amounts of information, Internet of Things (IoT) instead of sensors and open data as the interface of these computer systems.

We should understand ICT as one of the main facilitators for the Smart City. It is not just technology for technology, but for the improvement of everyone’s existence. As a matter of fact, a long track of developments has happened during this decade and especially during the past years, when technology is allowing the vision turning into a reality. More efficient and energy aware devices, systems allowing real time decisions, millions of devices monitoring different parameters in the cities, platforms allowing the integration of different protocols and communication systems, are more and more the type of technologies which are emerging in the Smart City’s ecosystem.

And this is when one of the biggest technological investments from the European Union appears. Its name is FIWARE³ and it was created to promote the innovation of ICT sector thanks to European technologies. **FIWARE** is comprised of a set of software pieces, all of them open source, known as Enablers, tackling different aspects of ICT technologies such as big data, IoT, security, cloud computing, etc. In the beginning FIWARE was not born as a solution for Smart Cities, but the reality is that besides the technological offering for “all audiences”, **31 cities all over the world have already agreed on using FIWARE as the city integrated platform**⁴.

1.4 Open data joins “the party”

At this point, you might be wondering where open data fits in this whole scenario. Well, data in the cities is the key for the smart services, is like the money for the commerce. Without the

³ <http://www.fiware.org>

⁴ <http://ec.europa.eu/digital-agenda/en/news/31-cities-agree-use-eu-funded-open-innovation-platform-better-smart-cities-services>

data the services will not be smart, they will just be services. Moreover, if they are provided under an open license, then we start to talk about the real catalyst for the services in the city.

Let's put some clear examples on the kinds of data a typical city manages. There are data related to the financial status of the city itself, budgets, incomes, expenditure; data related to the transport systems such as bus, metro, rail, trams... data about sensors which might be deployed measuring traffic, humidity, noise levels, temperature, pollutants, water levels in a river... data about the available services, geographical information, crime statistics, etc. A good example of the kinds of data in the cities, and its quality depending on the city, is the Open Data City Census by the Open Knowledge foundation⁵.

If the above mentioned data is provided, as usually is, by the public authorities, then we are talking about Public Sector Information (PSI). As a result, many cities have managed to launch their own open data or PSI portals containing the referred types of information. Problems with city data are the usual ones with open data, such as having outdated information, lack of granularity, publication of information which is barely used or what it has been problem for some authorities during these years of crisis, the inherent costs of publication and maintenance. The latter is many times a big barrier for cities joining the open data movement, as there is not an easy way to measure economical returns for the public sector and justify the economic costs, no matter the huge amount of civic impacts that open data may have. A recently published article, "How Open Data Is Transforming City Life" (J. Gurin, 2014) underscores the enormous and positive impacts that open data bring to services and daily livings of the citizens.

1.5 New businesses as a result

"At first, the open data movement was driven by a commitment to transparency and accountability. City, state, and local governments have all released data about their finances and operations in the interest of good government and citizen participation. Now some tech companies are providing platforms to make this kind of city data more accessible, useful, and comparable" (J. Gurin, 2014). And this is where we lay now, creating the businesses that can benefit from one of the biggest and cheapest resources in the digital age, the open data. To this aim, the report will present in the following sections, what Europe is doing to promote the open data economy, which is quite a lot, including the support through business accelerators

⁵ <http://es-city.census.okfn.org/>

specially devoted to open data such as FINODEX (Future Internet Open Data Expansion)⁶ and ODINE (Open Data Incubator in Europe)⁷.

⁶ <http://www.finodex-project.eu>

⁷ <http://www.opendataincubator.eu>

2 The role of Smart Cities in the open data scene

Getting more into the details on what open data is doing in the cities it is important to define the role of the cities and its relation with the data. The profiles that a city, understood in this case as a set of public entities or departments, may have, would be a **data producer**, an **open data publisher**, an **open data re-user** and/or an **open data promoter**.

2.1 Data producer

Referring to a Smart City as an open data generator means understanding the city as a process in which different actors create different kinds of data which belong to the city somehow.

Being a data producer does not imply directly being a data publisher, data in the cities can be produced by all sort of sources such as paperwork from the public servants, technological devices monitoring the city or even their own citizens with the relations among them, the public agencies and their own devices (smartphones). **All cities are data producers**; the difficulty relies on sorting out the kinds of data produced and their legal ownerships and restrictions (privacy issues, closed formats for digital assets, non-digital information for old archives, shared ownership between different entities, etc.).

2.2 Open data publisher

The natural next step, when talking about open data, is publishing the data produced. This is the point where **the city becomes an open data publisher**. The city realizes of the value that open shared data may bring to society and provides repositories under open licenses to anyone for reuse.

At this point, it is where more differences are observed. Not all the cities use the same methods for publishing the data, some are not even aware of the implications that opening data can take. Opening data could be a process itself, and it should need the collaboration among citizens (as data demand) and the institutions (as data suppliers).

Having a good look of the cities adding to the wave of data-openness, it can be said that the bigger ones are the ones more involved in the publication of data. The CTIC world map⁸ for open data portals is a good starting point to check what cities, and regions and nations, have

⁸ <http://datos.fundacionctic.org/sandbox/catalog/faceted/>

already joined the movement.

2.3 Open data re-user

Talking about a Smart City is often related to talking about places where several thousands or even millions of people live. The management from the public sector in the Smart Cities is usually done by different public organisms, departments or organisations. The communication among the IT systems among the public administration itself is not as accurate as one might think of, given the fact that different departments use different systems, standards or even replicated databases without synchronized information.

Open data is now seen as a very good cost-saving method for the public administrations. An **example** could be the cadastral information in some places in Europe. This data, when is not open nor free (i.e. the Spanish Cadaster counts for a set of tariffs for their information⁹), is even sold to other public agencies which need to use it. Excuse is clear, cadastral agencies make their living out of this business, so it is sometimes logical they see it as a self-sustaining mechanism. The point is that the other public services are also paying for the cadastral data they need. In practice, these cases mean **using taxes to sustain the administrative structures** instead of investing on the citizens' direct needs.

Open data has been proven to be the tool and the way to promote internal savings in the administrative infrastructure of the public services as well as to avoid expensive data integration projects among different systems within departments. This situation happens when the city uses its own data internally and therefore can talk about **the Smart City as an open data re-user**.

2.4 Open data promoter

It is usually the **following step after becoming an open data publisher**. The Smart City counts with published data and needs to promote its reuse among third parties. Strategies vary and a different set of actions and implications are shown by the authorities. Typical activities involve organizing local hackathons, media campaigns, setting up feedback mechanisms to retrieve the opinion from the re-users, etc.

Ideally, the process here would enter into a never-ending loop to constantly self-improve the relation between the Smart City and its citizens thanks to the data.

⁹ Taxes applied by the Spanish Cadaster to retrieve information <http://www.catastro.meh.es/esp/tasas.asp>

It is often seen that data catalogues, when not used or when the initial boom stops, rapidly become outdated and the promotion process fails. There are even some cases of failure, where public administrations have closed their portals, given the difficulties to sustain the service¹⁰.

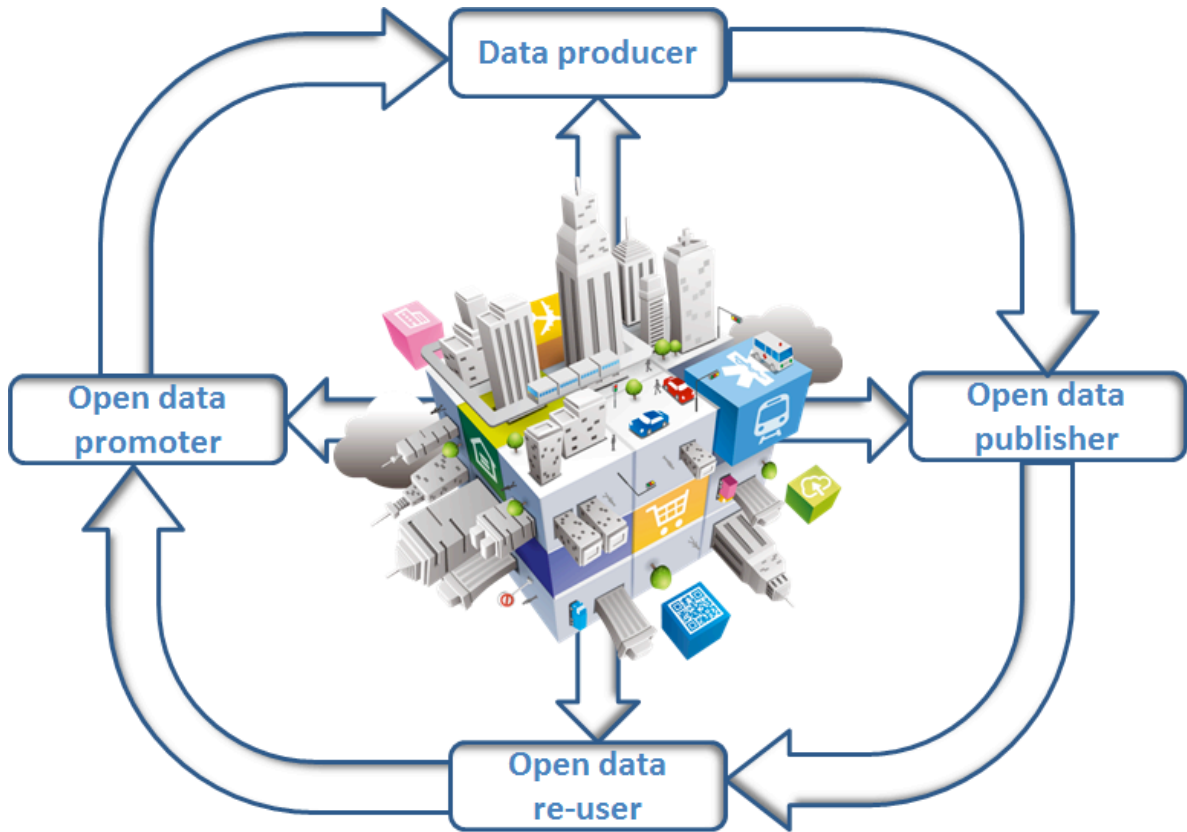


Figure 1. Smart City roles within open data¹¹.

¹⁰ http://www.eldiario.es/turing/datos_abiertos-gobierno_abierto_0_276122816.html (in Spanish)

¹¹ Edited image from <http://commons.wikimedia.org>

3 Smart cities initiatives related to open data in Europe

Smart city topic has also been in the agenda of the policy makers worldwide for the past years. If we look into Europe, there have been quite a good number of different initiatives and programmes designed for this respect. In this report, main activities related to Smart Cities and open data are present, meaning there are far more projects, initiatives and actions which have been carried out, but that are not that focused in the open data movement.

3.1 Market Place on Smart Cities and Communities

In July 2012, different Directorates-General (DGs) from the European Commission (EC) launched the European Innovation Partnership (EIP) on Smart Cities and Communities. This was a combined effort from different parts of the EC to promote a cross topic which was affecting DG ENER (Energy), DG MOVE (Transport) and DG CONNECT (ICT).

The second step was giving a structure for this EIP, which basically counts with three different parts:

- **Stakeholders.** Comprised by citizens, national initiatives, EU associations and EU initiatives (Concerto, Covenant of Mayors, etc.)
- **Implementation:** through the funding of the called lighthouse projects in the Smart Cities field¹², other activities and projects and the commitments¹³, which are actions taken by different stakeholders with no EU-funding fostering the Smart Cities across Europe.
- **EIP Governance and Constituency:** comprised by the High Level Group (mayors, main industrial companies, etc.), the Sherpa Group, and what it is more attached to the subject of open data, **the Market Place.**

¹² Call – Smart Cities and Communities

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-scc-2015.html>

¹³ List of Commitments <https://eu-smartcities.eu/commitments>

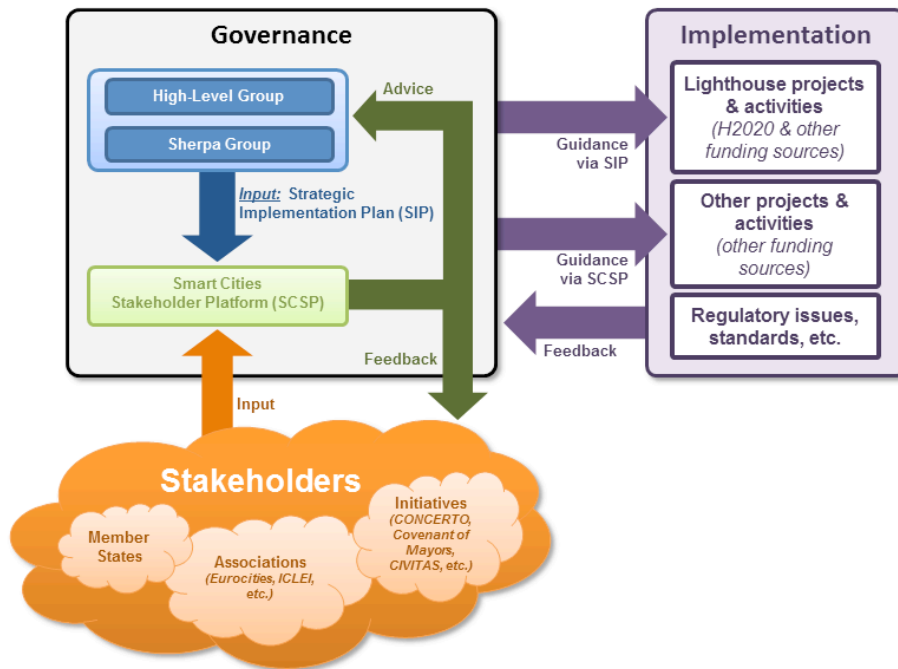


Figure 2. EIP general structure.

Market Place, Commitments and Open Data

The Market Place is an online platform allowing the different Smart Cities stakeholders meet and share experiences about the actions undertaken. The Market Place is currently divided in 6 differentiated Action Clusters (thematic areas). One of these is called Integrated Infrastructures, and within it a sub-cluster devoted to Urban Platforms and open data.

The sub-cluster is aimed at sharing experiences on the different platforms used in the cities to manage and control the different IT systems. Within it, there is a clear part related to the way cities publish and work with open data. The Market Place is open for registration to anyone at <http://eu-smartcities.eu>.

Months ago, the EIP launched a call to gather commitments related to Smart Cities in a wider sense. A commitment was defined as an action, project or activity to be done by an organisation or group of organisations without any direct funding from the EIP. As a result, a set of commitments were received and selected by the EIP to be active part of the Action Clusters and meetings within them to share their results and practices.

Just to give a figure of the importance of open data in the Market Place, there are around 200

commitments mentioning open data in their description¹⁴ across the 6 different action clusters, proving this is a cross-topic around the different domains. Around 60 are specifically in the Integrated Infrastructures action cluster.

3.2 Open and Agile Smart Cities

Connected Smart Cities network



Connected Smart Cities¹⁵ is a European Network of different partners having in common their interest and participation in some projects related to the subject. As formal members of this network there are some projects like the SmartSantander, CitySDK,

Specifi, iCity, CommonsforEurope or organisations like Forum Virium Helsinki, Manchester Digital Development Agency or networks of cities like EuroCities or the European Network of Living Labs.

The Open and Agile Smart Cities (OASC) initiative

The connected Smart Cities Network, together with FIWARE representatives have recently signed an initiative, Open and Agile Smart Cities aimed at gathering cities worldwide interested in the agreement of four different mechanisms for the development of the Smart City infrastructure. These four mechanisms are:

- **Approach:** The approach is driven by implementation. Cities in the OASC initiative have committed already, through a letter of intent, that in less than a year they will elaborate a policy or a plan where the implementation is included; a tender for the implementation; a grant proposal and to document any similar commitment.
- **API:** To support the deployment of FIWARE's NGSI API open standard, which proposes a common data model for getting real-time, contextual data about cities. The following section in the report about FIWARE will get deeper into this.
- **Data model:** To share API data models, starting with the CitySDK APIs. CitySDK is a EU-funded project which has been working a number of EU cities to test a common API standard to build apps related to different domains in the cities, such as transport or

¹⁴ https://eu-smartcities.eu/search-sm?search_term=%22open+data%22

¹⁵ <http://connectedsmartcities.eu>

tourism.

- **Platform:** To use the open source platform **CKAN to publish open data**. CKAN is an open source tool by the Open Knowledge Foundation which has become one of the most used solutions to host an open data catalogue. But besides cities on their own, even FIWARE has adopted this solution to publish the open data catalogues from the cities adhering to the OASC initiative. The FIWARE data catalogue is available through the FIWARE Lab at <http://data.lab.fiware.org>.

There are already 31 cities from all over the world committed to the initiative in a first wave and a second wave of cities is expected for May this year. Cities include a different set of countries such as Finland, Denmark, Belgium, Italy, Portugal, Spain and Brazil.

From a company's point of view, this is excellent news. For a company willing to scale-up their products/services in different cities the main principal problem is not having a reference API and data models shared among them. This driven-by-implementation approach will facilitate and open the market of smart cities solutions related to open data. Using common approaches, in different parts of the world, will help lowering the technical migrations barrier of entry for start-ups, turning the local market into an international one.

3.3 Open Data Standardisation

Though not at a European level, a Spanish standardization normative has been recently published as an official UNE standard (similar to ISO but at Spanish level) in order to help the cities to evaluate (quantitatively) the maturity grade of their own open data project. This facilitates the start-up and maintenance of open data in the cities as well as aspects like efficiency and quality.

The normative is called UNE178301¹⁶ and was published in January 2015. It even provides a group of datasets and vocabularies recommended for publication, in a way to facilitate the public administrations assure the homogeneity of the published data.

The normative defines five main domains: political, legal, organizational, technical and economical & social, providing a set of metrics aimed to obtain a final score to the open data city initiative, in a way to know how good is the open data initiative in a given smart city.

The normative, provides some concrete vocabularies as best-practices for certain types of datasets, including some references to W3C standards. This normative is a pioneer work in

¹⁶ http://www.aenor.es/aenor/normas/normas/fichanorma.asp?tipo=N&codigo=N0054318#.VRSWF_yG_0R

Europe and could be one of the first empiric efforts to evaluate numerically how smart a city is.

4 FIWARE technologies and open data

4.1 What is FIWARE?

FIWARE is a set of open standards defined through APIs which offer different technological capacities for developers. From a practical point of view, we can define it as a set of open source software tools based on existing solutions and standards that have been designed to facilitate the creation of innovative ICT tools and services by developers.

FIWARE technologies, their different open-source software pieces, are known as Generic Enablers (GEs), being a full set of available GEs is listed at the FIWARE catalogue¹⁷.

What it is worth to underscore is the European commitment here. FIWARE technologies are the result of one of the biggest investments by the EC and the private sector in the past years. This has materialized in a set of EU co-funded projects within the called Future Internet Public Private Partnership (FI-PPP)¹⁸. The results are:

- **FIWARE technology** as such: comprised by a set of technologies or open source software pieces available at the above-mentioned catalogue.
- **FIWARE Lab**¹⁹: as an experimental platform containing the running instances of the technologies.
- **FIWARE Accelerate**: as the programme aimed at promoting FIWARE technologies between start-ups and SMEs in Europe with a global fund of €80million for 1,000 different projects.
- **FIWARE Ops**: as a set of tools for facilitating the deployment of their own FIWARE instances.
- **FIWARE Mundus**: as the programme to export FIWARE outside Europe. It must be said that Mexico, for instance counts with its own FIWARE instance.

4.2 What is the technology about?

FIWARE technology chapters

FIWARE as such, is divided into seven technical chapters offering a set of enablers aimed to cover very different things:

¹⁷ FIWARE Catalogue <http://catalogue.fiware.org>

¹⁸ FI-PPP <http://www.fi-ppp.eu>

¹⁹ FIWARE Lab <http://lab.fiware.org>

- **Advanced web-based user interfaces:** tools for 3D graphics on the web, real-time collaborative 3D applications, design of 3D environments, virtual characters, etc.
- **Internet of Things:** tools for connecting apps to the physical world in a variety of standards. This is one of the most interesting chapters for the Smart Cities.
- **Data and context management:** tools for big data analysis, management of communication among entities, massive message events handling processing and media streaming and processing. Some of GEs here are the basis for any FIWARE based-development and therefore are extremely important for Smart Cities.
- **Apps/services ecosystem and delivery framework:** tools designed for reaching target users and the monetization of apps and services.
- **Security:** including tools for the identity management of users, the access control and the monitoring.
- **Cloud hosting:** tools for the deployment of an IaaS/PaaS Management. Based on the popular OpenStack²⁰.
- **Interface to Network and Devices:** controller for software-defined networking.

The following subsections analyse the most related parts of the technology with smart cities and the open data fields, in a way to introduce the possibilities that FIWARE offer for developers interested in smart cities.

FIWARE Lab as a data platform for Smart Cities

At first sight, the number of technologies is big enough to be complex to understand and use. In a way to provide a simplified access to it, the FIWARE Lab was created. FIWARE Lab is an experimental infrastructure deployed in different nodes all over Europe (and Mexico now) allowing any user from anywhere to register and use the technology for free without the need of complex software implementations and the investment on expensive hardware facilities.

It relies on a network of distributed hardware and software and a web interface, allowing an easy deployment of virtual machines and GEs. There is a FIWARE Academy²¹ with online tutorials for training.

But moreover and here is where FIWARE Lab first links to smart cities, there is a data platform²² based on a CKAN implementation where anyone can upload and publish open data.

²⁰ OpenStack Open Source Cloud Computing Software <http://www.openstack.org>

²¹ FIWARE Academy <http://edu.fiware.org>

²² FIWARE Lab Data portal <http://data.lab.fiware.org>

It is currently used by a number of cities to publish their own data catalogues. This data repository can be seen as a central access point for the open data of different cities. There are currently 2,600 datasets from 18 cities already.

FIWARE Context Broker

One of the main components in the FIWARE technologies is the Context Broker. The Context Broker is a GE allowing the handling of context information at a large scale, enabling apps querying, updating and subscribing to that context information. The context information is the value of different attributes characterizing those entities that are relevant for an app. As an example, the image below shows a set of entities (bus, citizen, shop) and its attributes:

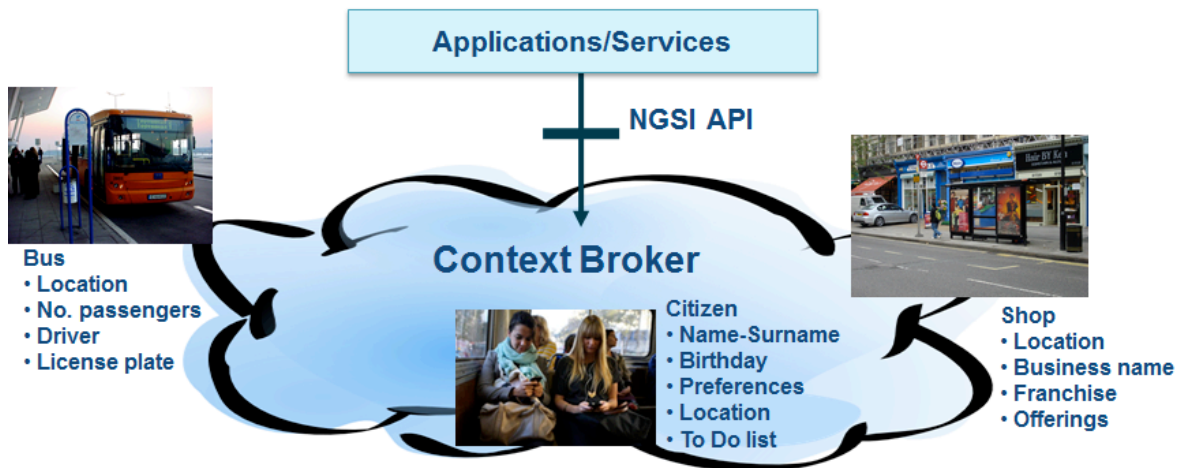


Figure 3. Context information in a Smart City²³

The management of the context information is done through a standard by the Open Mobile Alliance (OMA), the NGSI²⁴. NGSI is an HTTP and REST-based technology allowing the retrieval of the information in XML and JSON formats.

Within the Smart City context, the data portal at FIWARE Lab provides a good set of examples of cities which are currently using the Context Broker to provide real-time data on the existing sensors in the city.

One of those is the city of Santander in Spain, which provides real-time open data coming from sensors monitoring traffic, public transport, lights, noise, temperature, etc. under JSON and

²³ Introduction to FIWARE open ecosystem <http://es.slideshare.net/flopezaguiar/introduction-to-fiware-open-ecosystem>

²⁴ OMA NGSI Context Management Standard Specification http://technical.openmobilealliance.org/Technical/release_program/docs/NGSI/V1_0-20120529-A/OMA-TS-NGSI_Context_Management-V1_0-20120529-A.pdf

XML formats. Check the figures below:

CB QUERY: <http://130.206.85.12:1026/v1/queryContext?limit=300>

Data source: http://datos.santander.es/api/rest/datasets/control_flotas_posiciones.json

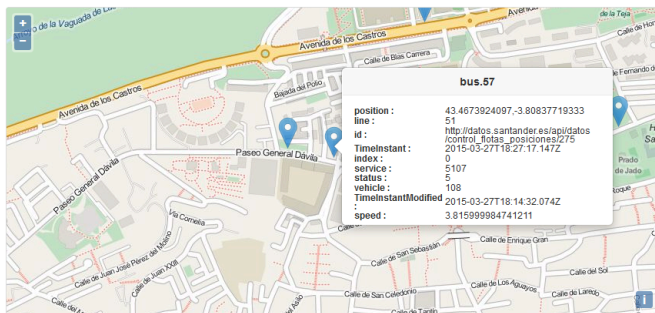


Figure 4. Real time position of public transport buses in Santander (ES).

```

{
  "contextResponses": [
    {
      "contextElement": {
        "type": "device",
        "isPattern": "false",
        "id": "bus.182",
        "attributes": [
          {
            "name": "position",
            "type": "coords",
            "value": "43.4762677359,-3.8319918483",
            "metadatas": [
              {
                "name": "location",
                "type": "string",
                "value": "WGS84"
              }
            ]
          }
        ]
      },
      {
        "name": "line",
        "type": "string",
        "value": "18"
      }
    ]
  }
}

```

Figure 5. Partial JSON response about bus positioning in Santander (ES).

FIWARE IoT (Internet of Things)

A smart city usually counts with a set of sensors/actuators providing context information which can bring valuable information in many senses. FIWARE technology counts with a GE dedicated to IoT management, called FIWARE IoT Backend Device Management GE. It is defined to provide both built-in support of some of the most relevant IoT standards (SensorML/UL2.0, MQTT, ETSI M2M, OMA-LWM2M/CoAP...) as well as the ability to integrate additional IoT protocols (e.g., protocols supported by the device manufacturer). Its role is the connection with the devices.

It accomplishes that goal by means of implementing an architecture where interaction with IoT devices is handled through processes referred as "IoT-Agents". Each of these IoT-Agents

handles interaction with a given set of devices, using the specific protocols they support and working as Context Producers and/or Context Providers. The data is therefore passed to the Context Broker and a connection between the physical device and the context data is established.

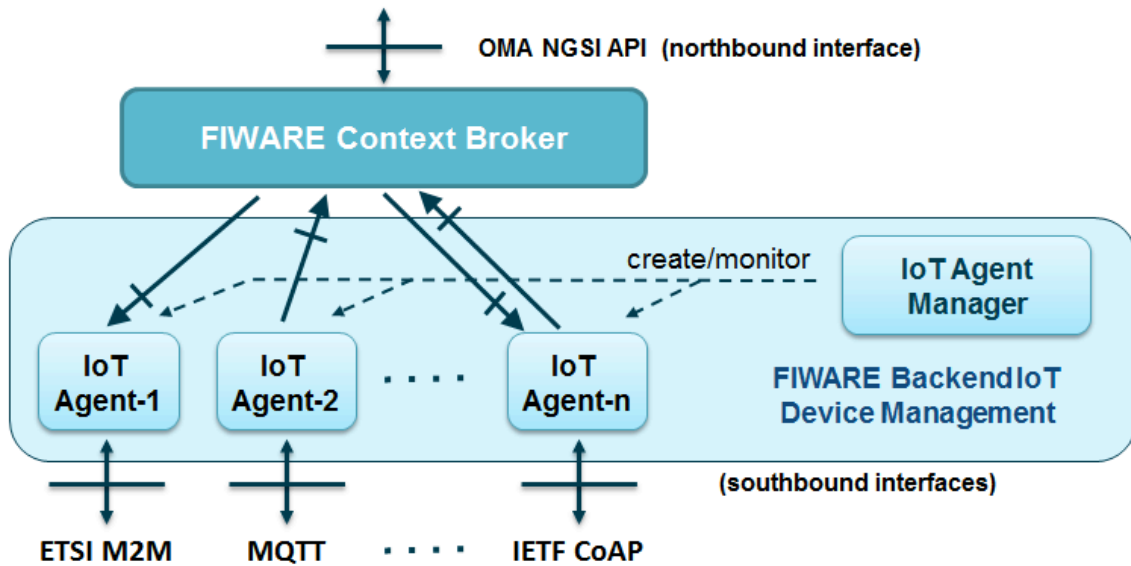


Figure 6. FIWARE Backend IoT Device Management basic architecture.

Additional Capacities

The universe of FIWARE technologies is wide and counts with many additional features which are related to the Smart Cities and its technological offering. Nevertheless, to avoid extending too much this chapter it is recommended to visit the FIWARE Academy for a deeper understanding on what is offered. The objective of this section is describing the main characteristics related to open data and Smart Cities thanks to FIWARE technologies.

5 The business ecosystems in Smart Cities with open data

After all what it has been exposed so far, we could consider that during the past years, different initiatives have been working on setting the conditions to catalyze the Smart Cities as a world of new opportunities for companies and citizens.

These conditions have been presented so far, in this report, as a set of initiatives by the administrations, a technology foundation and a full list of open datasets made available in different places.

Cities are obviously first seen as a local market, where small businesses can provide digital services under a known geographical scope and with limited possibilities for scaling up to wider markets.

The point here, and this is the crucial side of all what the smart term could really mean for a city, is **the use of standards and common frameworks to allow businesses and citizens run in a number of cities from different countries.**

Data are then understood as one of the catalysts making this real. Imagine using the same data formats and models for the description of similar context information in different places. A small enterprise making use of these data assets would have jumped one of the main barriers that deny the scaling-up of their businesses.

The open data accelerators

Now come to think of specific programmes targeting to companies willing to develop innovative products and services based on open data and urban environments. These are the called data accelerators, which are currently providing direct funds and support to a number of SMEs and web-entrepreneurs across Europe.

The concept of an accelerator relies on speeding up the process of taking companies from the project idea to the market stage. An accelerator provides many kinds of support such as mentoring, help in the elaboration of business plans, contacts with potential customers, investors or stakeholders and direct funds, usually against equity of the company. Some examples of these EU data accelerators are:

- **FINODEX:** First for being the first one of its kind in Europe. FINODEX stands for Future

Internet Open Data Expansion. It is a start-up accelerator launched with the overall FIWARE Accelerate programme. The main characteristic is that it provides direct funding, no-equity taken, up to €170k per project, for the creation of innovative products and services based on the re-use of open data, and the use of the earlier explained FIWARE technologies. FINODEX has already selected 49 projects, some of them under the Smart City domain, fostering the creation of new businesses and stimulating the job generation. It is expected a total of 100 companies to be accelerated by FINODEX during 2015 and 2016.

- **ODINE:** During the following 18 months they will select and incubate around 50 companies from all over Europe interested in the business generation related to open data. It will offer up to €100.000 and will set up an environment and EU-wide network, including business angels, VCs and funding agencies, to support small and medium enterprises and startups in creating commercial value from open data
- **FIWARE Accelerate:** This is a set of 16 accelerators (one of them is FINODEX) born for promoting the FIWARE technologies among start-ups and entrepreneurs all over Europe. Some of the accelerators are directly focused on the Smart City concept, such as SOUL-FI or Frontier Cities, and as such, some businesses reusing open data have been already selected and funded by the accelerator. The full list of projects being accelerated thanks to FIWARE Accelerate programme is being published as an open dataset at the FIWARE Lab²⁵.

How are the open-data businesses like?

Answering this question needs a bit of theory first. A good number of literatures have been already written on theoretical open data based business models. Reviewing some of them, we can see different approaches to this with some common aspects:

- The value chains are not simple and involve different actors: public administrations, ICT sector and users from non-profit and profit organisations.
- Different models for business generation are found going from freemium to premium services/products. They include services taking advantage of the mixture of public and private data, selling refined data as a product, creation of tools for publishing data, using free apps as advertisement for further services, etc.
- The business on open data might be out of the open data itself, but in its combination with other sources of data (private) and/or using the open data as a marketing tool.

²⁵ <https://data.lab.fiware.org/dataset/fiware-accelerators-results>

- Benefits to society have been the centre of open data so far and now need to converge with profitable ideas allowing for sustainability of the released data.

But may be the best way to understand what the businesses are like is analyzing some of the EU companies re-using open data within their businesses. Current analysis is based in the data obtained from the FIWARE Accelerate results dataset and includes only data from companies in FINODEX accelerator:

***M-VTA by Vocalia Technologies S.L.*²⁶**

- What is it about? Creation of a virtual touristic agent based for mobile devices based on natural language recognition.
- What open data? Data about touristic attractions in different cities.
- Where is the business? Offering small local business promoting in the app to attract customers and/or offering a pay per use options.

***OpenMove by Lucial Srl*²⁷**

- What is it about? A unique app to pay for tickets for bus, train, parking and more.
- What open data? Open data for transportation.
- Where is the business? Geolocalised advertising campaigns for merchants in the cities. The service is free for users and transport providers.

***SAPIN by Jotaweb Rare Design S.L.*²⁸**

- What is it about? A platform that will enhance the practice of sporting activities as well as interactively promote physical exercise among citizens.
- What open data? Open data on the spot where the sporting activity takes place (position, traffic, weather, etc.).
- Where is the business? Tailor made services provided to users willing to practice sport as well as acting of intermediaries between users and facilities or trainers.

***TALKYCAR by Talkycar S.L.*²⁹**

²⁶ <http://vocalia.es>

²⁷ <http://openmove.org/>

²⁸ <http://www.jweb.es/en/>

²⁹ <http://www.talkykar.com/>

- What is it about? Offering a wide variety of services to vehicle users, through an app and optionally through a hardware connected to the CAN bus/OBD of the vehicle
- What open data? Geographical, weather data and set of related points of interest.
- Where is the business? Petrol stations, garages and service areas that decide to promote and offer discounts. Car insurance companies that want to use the app information to avoid scams of driver identification, place and speed. Selling data retrieved.

***INFOMUSIC by I3Code S.L.*³⁰**

- What is it about? App that lets you know instantly which are the songs being played at a favorite venue, and discover which style of music is predominant in a disco or club, or in an area of the city.
- What open data? Geographical information, music/artists information.
- Where is the business? Entertainment venues pay to promote themselves within the app.

A wider set of examples can be extracted to the above mentioned open dataset <https://data.lab.fiware.org/dataset/fiware-accelerators-results> where all the FIWARE Accelerate projects are published.

Another good source for checking open data based companies (not only in the Smart Cities domain) are the OpenData500-like studies in the US³¹, Mexico³² or Australia³³ whose lists of companies re-using open data are available online.

At the same time the World Wide Web Consortium (W3C) Data on the Web Working Group has recently published Data on the Web Best Practices Use Cases & Requirements (February 2015) in which different Use Cases provide a narrative description of an experience of publishing and using data on the web. Some of these use cases are provided by companies that can be also very good examples on what an open-data business could be like.

³⁰ <http://i3code.es/>

³¹ Open Data 500 <http://www.opendata500.com/us/>

³² Datos Abiertos 100 México <http://www.opendata500.com/mx/>

³³ Open Data 500 Australia <http://www.opendata500.com/au/>

6 Conclusions and recommendations

In an attempt to summarise the presented concepts there are some conclusions that can be extracted from this report:

- The smart city concept is not new (Bowerman et al, 2000) but it is currently flourishing in many places all over the world.
- Europe has placed an important investment in the smart cities during the past year targeting all the areas related to it, such as energy, transport and technologies.
- Talking about the technologies around the smart cities, open data are of great importance, as the digital catalyst to the generation of innovative products and services. Cities can be seen as generators, publishers, promoters and even re-users of open data.
- FIWARE is one of the biggest European initiatives from the past years willing to promote a set of technology standards to lower the technological barriers to the cities and its providers, in a wider sense, facilitating the scaling-up of digital businesses in different places.
- The European Commission is already promoting the acceleration of companies with a different set of programmes aimed at the creation of innovative products in the smart cities making use of open data.

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Miguel has recently led the publication of the first open dataset about the results of the FIWARE Accelerate programme and has cooperated with the Open Knowledge Foundation in the Local Data Census of the Spanish chapter. Miguel holds a BSc Computing and a BEng Industrial Organisation at the University of Deusto (Bilbao, Spain).

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