FIWARE and OASC: making Smart Cities engines of growth

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http://www.fiware.org
http://lab.fiware.org
Follow @FIWARE on Twitter!
FIWARE for developing a “Smart” world

FIWARE distinguishing elements

FIWARE is not just about technology
FIWARE for developing a “Smart” world
A smart city app: maps.smartsantander.eu
A smart city app: maps.smartsantander.eu (2)
A Green Energy app: TERNI marketplace

Context & Problem

30% of the energy in the city of Terni is produced by distributed and renewable energy sources. While this derives benefits, as expected by the EU 20-20-20 objectives ...

...misalignment between energy consumption and production

→ Grid Imbalances, Power losses due to reverse power flows effect
Terni marketplace: Dashboard

WEATHER

ISSUE DETECTION

24.03.2016 – Gaithersburg
An Industry 4.0 app

<table>
<thead>
<tr>
<th>Opportunity for improvement</th>
<th>How to do it</th>
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<tr>
<td>Huge amounts of raw data are collected every day, but remain silent</td>
<td>Extract information from existing data</td>
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<tr>
<td>Humans waste valuable time analyzing critical situations on the spot</td>
<td>Make information reach the proper audience via cloud-enabled mobile devices</td>
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Cloud Services

Cloud Services

Huge amounts of raw data are collected every day, but remain silent. Extract information from existing data to make information reach the proper audience via cloud-enabled mobile devices.

Humans waste valuable time analyzing critical situations on the spot. Extract information from existing data to make information reach the proper audience via cloud-enabled mobile devices.
The FIWARE Public-Private Partnership (PPP) initiative

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

- **Strategy**: Build a sustainable innovation ecosystem around open standards supporting development of smart applications in multiple sectors

- **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 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
  - **Hubs**: provide local support to the community
## FIWARE PPP: main figures

### 2010-2016 (FP7)

<table>
<thead>
<tr>
<th>FIWARE budget</th>
<th>122 = 85 + 37 M€</th>
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<tr>
<td>Vertical Use Cases budget</td>
<td>95 = 66 + 29 M€</td>
</tr>
<tr>
<td>FIWARE Accelerate budget</td>
<td>80 + 20 M€</td>
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</table>

| Partners | 24 |
| Countries | 9 |
| Marketing | 6,5 M€ |
| FIWARE Lab nodes | 15 = 14 + 1 |
| Accelerators | 16+ |
| Startups/SMEs | 1300 |
| Innovation Hubs | 21 |

### 2016-2017 (Horizon 2020)

<table>
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<tr>
<th>Statement</th>
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<tr>
<td>&quot;Proposers are encouraged to use FIWARE for some or all of their platform developments, when relevant. Projects aiming to develop specific platforms, are encouraged to make them interoperable with FIWARE.&quot;</td>
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<table>
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<tr>
<th>Program</th>
<th>Budget</th>
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<tr>
<td>ICT</td>
<td>1876 M€</td>
</tr>
<tr>
<td>Greening the Economy</td>
<td>326 M€</td>
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<tr>
<td>Agrifood, marine, bio</td>
<td>410 M€</td>
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The EC is making a strong bet on FIWARE

- Mrs. Neelie Kroes launched FIWARE LAB at Campus Party Europe in London (Sept 2013 - full speech [here](#))
  - “FIWARE is one way we are levelling a playing field: a project to make innovative technologies available for all.”
  - “Smart cities are a great example … They create platforms, and use them, making open data and applications available – to citizens, to developers, to innovators, to come up with yet more ideas … and this is where initiatives like the FI-LAB come in. Led by industry, this is a major investment in generic technology.”

- She also made a reference to FIWARE Lab at the launch of the EIP on Smart Cities and Communities (Sept 2013 - full speech [here](#))
  - “Just earlier this week I launched the Future Internet lab … That’s something that you can turn into real results, real jobs, and real innovation. European platforms helping European innovation in European cities.”

- Additional mentions by the EC compiled [here](#)
FIWARE distinguishing elements
FIWARE brings the right standards for developing “Smart” apps/services.

FIWARE allows cities to join forces with others to build a sustainable market.
FIWARE technologies
FIWARE = advanced OpenStack-based Cloud capabilities + library of APIs that ease development of applications
FIWARE Generic Enablers (GEs)

- A FIWARE Generic Enabler (GE):
  - set of general-purpose *platform functions* available through *APIs*
  - Building with other GEs a *[FIWARE Reference Architecture]*

- **FIWARE GE Specifications** are open (public and royalty-free)

- **FIWARE GE implementation (FIWARE GEi):**
  - Platform product that implements a given GE Open Spec
  - There might be multiple compliant GEis of each GE Open Spec

- **One open source reference implementation** of each FIWARE GE (**FIWARE GEri**):
  - Well-known open source license
  - Publicly available *[Technical Roadmap]* updated in every release

- Available FIWARE GEis, GEris and incubated enablers are published on the *[FIWARE Catalogue]*
## FIWARE GEs ([http://catalogue.fiware.org](http://catalogue.fiware.org))

<table>
<thead>
<tr>
<th>FIWARE GEs</th>
<th>Description</th>
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</table>
| **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 |
FIWARE Lab: A working instance of FIWARE working as “the meeting point” where innovation takes place (http://lab.fiware.org)

Domain Stakeholders
• Connect to entrepreneurs
• Put their open data at work
• Bring new innovative services to end users
• Be more efficient
• Social Reputation

Entrepreneurs, Developers
• Develop once for a large market
• Easily meet potential customers
• Marketing, promotion
• Ability to test with real data and end users
• Simple yet powerful APIs that accelerate product development

FIWARE Technology Providers
• “Coopetitive” approach
• Connect to entrepreneurs: jointly exploit the opportunities

FIWARE Lab
Spark your imagination
FIWARE Lab: Users and Infrastructure
(infographic.lab.fiware.org)

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

2600+ open datasets from cities published and growing fast!
Ecosystem and platform: two tied concepts

ICT Platform (APIs, data models) + Digital ecosystem

FIWARE is an ecosystems enabler!
Because it brings the right standards for developing “Smart” apps/services
Being “Smart” requires first being “Aware”

- Nowadays applications require gathering and managing context information, referring to 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
Multiple system/apps can exploit context info

- Any system or third-party apps can both consume and submit context information.

- The overall system can rely on context information available (real-time and historic) to monitor and manage KPIs.
FIWARE NGSI: pivotal API

- **Simple yet powerful API** enabling updates and access to context information from different sources (not just IoT!) which may vary over time
  - Sensor networks (Internet of Things)
  - Existing systems
  - Enables a key concept which was missing: **real-time open data**

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**What’s the current traffic in street “X”**?

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**What’s the current temperature in place “X”**?

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**Notify me the changes of temperatures in place “X”**

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**A sensor in a pedestrian street**

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**The Public Bus Transport Management system**

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**Citizen’s smartphone**

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**It’s too hot!**

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**NGSI Standard API**

---

**Place = “X”, temperature = 30º**
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 using a Context Broker

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

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

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.
Integration with sensor networks

- FIWARE NGSI is capable to deal with the wide variety of IoT protocols today.
- Rather than trying to solve the battle of standards at IoT level, it brings a standard where no standard exists today: context information management.
A non-intrusive approach is possible

- Capable to integrate with existing or future systems 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
Once context information is gathered, a lot of useful complementary FIWARE Generic Enablers can be used:

- Advanced Web-based UI (AR, 3D)
- Open data publication
- Data/Apps visualization
- IoT-enabled Context Information Management
- Complex Event Processing
- Multimedia processing
- Big Data Analysis
Context Processing and Analysis

Applications

- Simple Processing (aggregation, averages, …)
  Sensor2Things

- Complex Event Processing (CEP)

- Context Broker

- BigData Analysis (Hadoop-based)

Context Management Processing and Analysis

NGSI

Programming of rules

Context Sources

24.03.2016 – Gaithersburg
Data analytics

Context Sources

Context Broker

NGSI

Extract
Transform
Load

Query/Reporting

Analysis

Data mining
Open Data publication

Context Sources

NGSI standard adapter

Context Broker

Traditional “static” historic data
NGSI resources in CKAN

Santander
Smart Santander Open Data
read more

Followers 2
Datasets 10

Order by: Relevance

10 datasets found

Tusbic real time
Real time information of bike renting (TUSBIC) stations. Every time a resource is previewed, a query of that station is sent to the Orion Context Broker in order to get the last...

FIXED SENSORS
List of entities which are deployed at static locations of Santander. Each entity provides a sound level measurement and also information about its geolocation, battery...
A Smart City platform with FIWARE

- Smart city platform as a Data/Knowledge Hub
- Non-intrusive, open to third parties
Because it allows cities to join forces with others to build a sustainable market
The Open and Agile Smart Cities (OASC) initiative

- Common APIs → FIWARE NGSI to start with
- Standard Data Models → CitySDK and more
- Platform for Open Data/API publication
- Driven by implementation approach

More info:
http://connectedsmartcities.eu/open-and-agile-smart-cities/
Open & Agile Smart Cities initiative principles

Open Platform: FIWARE Driven by Implementation
(Fiare, Fiware Lab, accelerator…)

- Common API (FIWARE NGSI)
- Open Data (CKAN)
- City Model (CitySDK)
Open & Agile Smart Cities initiative principles

Adoption of a lightweight, open-license standard API to gather, publish, query and subscribe-to real-time context information describing what’s going on in the city, enabling portability

Common API (FIWARE NGSI)

Open Platform: FIWARE Driven by Implementation
(Fiware, Fiware Lab, accelerator…)

Open Data (CKAN)

City Model (CitySDK)
Open & Agile Smart Cities initiative principles

Adoption of a flexible, easily-distributable open data publication platform which any organisation can set up at a low cost.
Open & Agile Smart Cities initiative principles

- Open Platform: FIWARE Driven by Implementation
  (Fiware, Fiware Lab, accelerator…)
- Common API (FIWARE NGSI)
- Open Data (CKAN)
- City Model (CitySDK)

Adoption of a simple initial standard data model required for effective interoperability when exchanging context information, also portability.
Open & Agile Smart Cities initiative principles

Adoption of a “driven by implementation” approach towards experimental consolidation of initial and new standard data models. The goal is that communities and developers can (1) co-create their services based on basic but commonly-defined data models, (2) influence the definition of new models by implementing and experimenting, and (3) help “curate” existing data models.
Open and Agile Smart Cities: Who

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<tr>
<th>AUSTRALIA</th>
<th>ENGLAND</th>
<th>NETHERLANDS</th>
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<td>• Amersfoort</td>
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<td>• Guadalajara</td>
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<td>• Dublin</td>
<td>• Las Palmas de Gran Canaria</td>
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<td>• Olinda (Recife)</td>
<td>• Galway</td>
<td>• Malaga</td>
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<td>• Porto Alegre (Rio Grande do Sul)</td>
<td>• Limerick</td>
<td>• Murcia</td>
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<td>• Sabadell</td>
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<td>• Taquaritinga (São Paulo)</td>
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<td>• Santander</td>
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<td>• Vitória (Espírito Santo)</td>
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<td>• Seville</td>
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CITIES have to sign a Letter of Intent (LoI) where they:
- Endorse OASC principles
- Prove their capacity to implement the principles

Launch in March 2015 at CeBIT.
How can standard Smart City data models easing common solutions be defined? The problem

- Existence of a single API (FIWARE NGSI) reduces costs when porting Smart City apps from one city to another.

- 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, that has been proved to be easy with FIWARE 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.

- How creation of these standard Smart City data models can be fostered?
How can standard Smart City data models easing common solutions be defined? The solution

- **A “design by committee” approach would not be the best approach:**
  - Such kind of approach has proven to be wrong in many other standardization efforts in the past
  - Who grants that the defined model is suitable for what apps need and developers want to have?

- **We need a “driven by implementation” approach:**
  - Identify real applications that solve a real problem and cities would like to see running in their cities
  - Check what data models they have been designed to work with and take them as input
  - Carry out a “data curation” process where input data models converge into a single common model

- **A set of standard data models and soon a portfolio of killer Smart City apps will emerge!**
Collaboration with HERE

HERE, Telefónica showcase future internet applications and services

Lori Castle
New York

18th Nov 2015
767 343 0

A smart city does not become smart on its own: it’s how data is managed that makes it smart. Now, “cities meet cities” at the Smart City Expo World Congress (SCEWC) to help create platforms and applications to enable intelligence.

The Internet of Things (IoT) not only makes smart cities possible; it is also what brings the challenge of connecting diverse end points and solutions and analyzing the resulting data to make sense of cities. HERE and Telefónica are working together to advance applications in the area.

At SCEWC, taking place in Barcelona from November 17-19, the companies will showcase how real-time open data can be displayed on HERE maps.

The cities of Porto and Aveiro in Portugal, partnering with local SME Ubiwhere, are providing access to data (environmental and events information, and public parking slots information, respectively) using the FIWARE NGSI open standard API (Application Programming Interface).
Collaboration with HERE

PORTO, A CITY THAT HAS BECOME A REAL-TIME GUIDE

Imagine walking or driving through a city and the city itself tells you which trendy spots to check out, where to park your car in that moment, or which areas to avoid because of air quality or traffic congestion. In Porto, Portugal, this vision has become a reality and the city itself is already communicating directly with residents, tourists and even startup businesses using FIWARE standards and the UrbanSense platform.

As one of the first cities that joined the Open and Agile Smart Cities (OASC) initiative back in March this year, Porto has been a pioneer city adopting FIWARE standards with the support of Ubiwhere, a Portuguese company experienced in the development of middleware and platforms. A key instrument in the development of Porto's open city platform is the UrbanSense infrastructure, which was developed under the European funded project Future Cities Project. The Future Cities Project is a partnership between the University of Porto and the City Council aiming to create a Competence Centre for Future Cities in the city of Porto. Together, but also with the participation of the Citibrain joint-venture, the city of Porto and Ubiwhere have developed the interfaces bringing access to real-time, contextual environmental data from 75 fixed and mobile units (monitoring stations) located across the city. The data is augmented by scanners installed on the city Council’s 200+ fleet of vehicles, creating a large-scale mobile scanner. External providers like the city’s water supplier, transport data providers, social media data and business startup statistics are all plugged in to the platform to allow the city itself to guide you as you explore, travel, and work. The city of Porto now has plans to leverage the results of this work and expand the FIWARE/OASC-compliant urban platform to become the central point of its new integrated management and control center. Another example of the Porto’s full commitment in the OASC initiative, the city of Porto has just created a competition (www.desafiosporto.pt) to support the development of applications on top of its integrated management and control center platform. With this competition, the city, in partnership with 4 large companies (NOS, CEIIA, EDP and EY) will fund up to 4 solutions with a total of 250 thousands of euros available.
TM Forum and FIWARE join forces to speed the development of new smart city services

BY NEWS ROOM | OPEN DIGITAL ECOSYSTEM & IOT | 1 NOVEMBER 19, 2015

TM Forum has today announced that it is working with FIWARE, an open cloud-based platform for the creation and delivery of applications and services, to deliver the key building blocks for enabling and connecting smart city ecosystems.

TM Forum is supporting FIWARE NGSI REST-based APIs for real-time access to contextual information for cities. This enables more efficient management of municipal services in areas such as mobility, water, waste, energy and environmental management, and also paves the way for the development of smart applications by third parties.

“Valuable real-time information will be shared across vertical management solutions currently working as silos, while at the same time fueling new innovative services when published as real-time open data,” said Juanjo Hierro, coordinator and chief architect of FIWARE & CTO Industrial IoT, Telefónica. Cities can therefore make better decisions based on data from multiple sources, such as real-time environmental data and traffic management patterns.

In turn, TM Forum’s Ecosystem APIs, including Product Catalog, Product Ordering and Product Inventory, will be incorporated within the specifications and open source reference implementation of the FIWARE Business Framework. This Framework enables the management and the monetization of different kinds of digital assets involving multiple partners. TM Forum’s lightweight REST-based APIs have been crowdsourced from within TM Forum’s diverse membership over the past three years and leverage more than 25 years of TM Forum’s complex management systems expertise in billing, catalog management, service level agreements and policy. FIWARE will launch the new Business Framework, powered by TM Forum’s Ecosystem APIs, at Mobile World Congress 2016.

“Leveraging TM Forum’s APIs and FIWARE’s real-time city data creates a vibrant environment for third party developers to thrive within an open innovative ecosystem,” said Joann O’Brien, vice president of Industry Collaboration, TM Forum.
FIWARE and the European Data Portal are proud to announce the beginning of a collaboration creating synergies between the two initiatives for even better serving users’ needs. Data are the fuel of any smart services and open data in particular are a treasure trove for new services and applications. FIWARE is the European open service platform for building interoperable and smart Internet based services. With growing adoption comes growing demand for access to data. The new European Data Portal launched on 16 November 2015 is the major European data asset available free to use for anybody, with already around 250,000 datasets referenced through a harmonised and multilingual interface. Users are allowed to easily download data at the source or directly consume them through interactive visualization. The collaboration with FIWARE will help bringing these data even closer to the fingertips of the growing open community of thousands of FIWARE developers, startups and new users in Europe and world-wide. In the future the two initiatives will jointly consider ways to harvest the trend towards more real-time open data by using the de-facto standard FIWARE NGSI.

This collaboration among two leading European ICT initiatives shows the interest of the public and private partnership supporting these and, our capacity to set standards and is clearly another step towards a European single digital market.
FIWARE PARTNERSHIP WITH THE NIST GLOBAL CITY TEAMS CHALLENGE 2016 PROGRAM NOW OFFICIAL!

19th November 2015.- FIWARE is proud to announce that the FIWARE’s participation as a Partner in the National Institute of Standards and Technology’s, NIST, Global City Teams Challenge 2016, GCTC 2016, program has been officially confirmed on the 12th November 2015 at the GCTC 2016 Kick-Off Workshop in Gaithersburg, Maryland, USA.

As explained by Jacques Magen, responsible for FIWARE globalization activities (FIWARE Mundus Programme), “FIWARE and GCTC share common objectives in providing cities and their stakeholders with an environment and a program that can help them replicate Smart Cities solutions and services that are efficient and scalable through replicable, standards-based collaborative platforms. This also represents a great opportunity for the FIWARE community to expand its reach internationally and contribute to boost innovation for the development of Smart Cities’ applications and services all over the world”.

“Cities around the world are looking to advanced Internet of Things concepts to make their communities safer, more vibrant, and more livable and workable,” said Chris Greer, Senior Executive for Cyber-Physical Systems at the US National Institute of Standards and Technology. “We can best achieve these goals by working together on interoperable smart city architectures that can serve as the foundation for innovation in cities worldwide and we are pleased to join with FIWARE through our Global City Teams Challenge in an international, cooperative effort.”
AIOTI (Alliance for IoT Innovation)
AIOTI and WG8 Goals

- Creation of a dynamic European IoT ecosystem supported by open technologies and platforms
  - Overcoming market fragmentation
  - Fostering entrepreneurship
  - Addressing standardisation, interoperability and policy challenges for IoT Applications.

- Preparation of future IoT research as well as innovation and standardisation policies: Helping to shape H2020
About WG8

- 200+ organizations involved
  - 20+ very active participants
  - Composition:
    - Mostly supply side (Large IT companies + SMEs)
    - A few Universities and Technological centers
    - A few Cities and other demand side organizations
    - Chair: Telefonica, Co-Chair: Engineering

- Regular calls and two F2F meetings (June-Lisbon, September-Madrid)
FIWARE ecosystem of SMEs/startups in Europe

- Currently total of 831 startups and SMEs
- Good geographical coverage (except France)
- 60% < 5 years experience (14% no experience at all!)
- 60% by small team (< 5 people)
- 63% bring a solution not available in the market
- 45% close to market delivery
- For 30% this is their “first job”
Because it is not just about technology
Building a successful ecosystem requires ...

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

**FACTS**

- **Fully open source platform**
  - OS community ready since summer 2015
- **7430+ PMs** devoted to development activities in 5 years (122/76 M€ of budget/funding)
- **Funding opportunities** available in several R&D programs during 2017-18 (e.g., Horizon 2020)
- **Each FIWARE component** is considered strategic in the portfolio of the contributing partner

*Telefonica, Orange, Engineering and AtoS join forces to push common standards for Smart Cities based on FIWARE platform*

15.03.2016 – Modena
The FIWARE Open Source Community: governing principles

- Board made up of member representatives (core members + elected members):
  - Approves changes to governance model
  - Oversees activities of Working Groups
  - Elects Officer of Foundation

- Foundation (future):
  - Secretariat and other support
  - Owns FIWARE brand
  - FIWARE Lab operation support?

- Technical Chapters:
  - Architecture Chapters
  - Mission Support chapters

- TC deals with overall technical coordination
  - Made up of Chapter Leaders, plus additional seats
  - Active Chapter Contributors elect corresponding Chapter Leaders and additional seats
  - chair elected among members

- New FIWARE technologies can be proposed for incubation and later be part of the FIWARE Core, once they gain traction and subject to approval of Technical Committee
Questa è un'installazione di FIWARE che consente lo sviluppo ed il deployment di applicazioni software commerciali basate su tecnologie FIWARE.
Thank you!

http://fiware.org

http://lab.fiware.org

Follow @Fiware on Twitter!

Check latest videos at www.youtube.com/user/FIWARE