Introduction to FIWARE Open Ecosystem

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http://tinyurl.com/fiare-open-ecosystem
The Internet will again transform the daily life of individuals and businesses.
Ecosystem and platform: two tied concepts

Open Standard Platform + ecosystem
  open  sustainable  global
FIWARE = advanced OpenStack-based Cloud + rich library of Generic Enablers
Why an open standard platform is required

• **Avoid vendor lock-in:**
  – Standard Southbound APIs for sensor providers.
  – Standard Northbound APIs offered to applications.
  – Portability among platform providers.
  – Interoperability of solutions enabled by the platform.

• **Larger community of developers**
  – True innovation.
  – Better prices.

• **Not any standard is enough**
  – Modularity.
  – Allow different business models.
  – Integration with standard open data platform.
  – Non-intrusive.
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.

- **At least one open source reference implementation** of FIWARE GEs (FIWARE GEris):
  - Well-known open source license.
  - Publicly available **Technical Roadmap** updated in every release.

- Available FIWARE GEis, GEris and incubated enablers published on the **FIWARE Catalogue**.
## FIWARE major differential features

<table>
<thead>
<tr>
<th>Category</th>
<th>Features</th>
</tr>
</thead>
</table>
| **Cloud** | • Federation of infrastructures (private/public regions)  
• Automated GE deployment |
| **Data**  | • Complete Context Management Platform  
• Integration of Data and Media Content |
| **IoT**   | • Easy plug&play of devices using multiple protocols  
• Automated Measurements/Action $\leftrightarrow$ Context updates |
| **Apps**  | • Visualization of data (operation dashboards)  
• Publication of data sets/services |
| **Web UI**| • Easy support of UIs with advanced web-based 3D and AR capabilities  
• Visual representation of context information. |
| **I2ND**  | • Advanced networking capabilities (SDN) and Middleware  
• Interface to robots |
| **Security** | • Security Monitoring  
• Built-in Identity/Access/Privacy Management |
FIWARE Lab: going beyond technology, the “meeting point” where innovation takes place

App Customers and Data providers
• Connect to entrepreneurs
• Put their 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
• “Competitive” approach
• Connect to entrepreneurs: jointly exploit the opportunities

- 4,2 M€ promotion campaign
  • Campus Party events
  • Startup Weekend events
  • Chambers of Commerce
  • 870 K€ in prizes
- 100 M€ of funding devoted to entrepreneurs in phase 3 of the FIWARE program
FIWARE Lab (http://lab.fiware.org)

The challenges are closing
POSTED APRIL 22, 2014 BY ADMIN

The Smart Society Challenge and the FIWARE Excellence Award are nearing the deadline. After an extension to make room for more ideas and contestants, the call for ideas is closing on the 31st.
Take the most of infrastructures while keeping costs lower and under control
VM provisioning

### Images

<table>
<thead>
<tr>
<th>Name</th>
<th>Status</th>
<th>Visibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centos-6.2-3dc</td>
<td>active</td>
<td>public</td>
</tr>
<tr>
<td>Centos-6.3-3dc</td>
<td>active</td>
<td>public</td>
</tr>
<tr>
<td>Puppetware-6</td>
<td>active</td>
<td>public</td>
</tr>
<tr>
<td>Ubuntu-1.0-3dc</td>
<td>active</td>
<td>public</td>
</tr>
<tr>
<td>Ubuntu-2.0</td>
<td>active</td>
<td>public</td>
</tr>
<tr>
<td>puppetware7</td>
<td>active</td>
<td>public</td>
</tr>
<tr>
<td>sdc-0Reg-Updates</td>
<td>active</td>
<td>private</td>
</tr>
<tr>
<td>sdc-0Reg-Updates</td>
<td>active</td>
<td>private</td>
</tr>
</tbody>
</table>

### Instances

<table>
<thead>
<tr>
<th>Instance Name</th>
<th>IP Address</th>
<th>Size</th>
<th>Keypair</th>
<th>Status</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>testJC</td>
<td>10.10.12.5</td>
<td>10.0 GB</td>
<td>None</td>
<td>ACTIVE</td>
<td>None</td>
</tr>
<tr>
<td>testJC</td>
<td>10.10.12.5</td>
<td>10.0 GB</td>
<td>None</td>
<td>SHUTDOWN</td>
<td>None</td>
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<td>SHUTDOWN</td>
<td>None</td>
</tr>
</tbody>
</table>

Selected Networks:
- net1: demonetwork
- Available Networks:
  - storage_network

Description:
Control access to your instance via keypairs, security groups, and other mechanisms.
Storage provisioning
Network provisioning

The image depicts a network provisioning interface with the following details:

- **Networks**
  - **Name**: demo_project
  - **Subnets associated**
    - **shared-net**: 172.31.0.0/24, Yes, ACTIVE, UP
    - **storage_network**: subnet 10.100.84.0/25, No, ACTIVE, UP

- **Create Network**
  - **Network Name**: demoNetwork
  - **Description**: From here you can create a new network. In addition, a subnet associated with the network can be created in the next panel.
  - **Network Address**: 10.200.40.0/25
  - **IP Version**: IPv4
  - **Shared**: No
  - **Status**: ACTIVE
  - **Disable Gateway**: Yes

- **Actions**
  - **Create Network**
  - **Add Subnet**
  - **Delete Networks**
Multi-Region Management
Management of Blueprints
Gathering, publishing, processing and analyzing private and open data at large scale
Context Management in FIWARE

• A simple yet powerful standard API should be defined that helps programmers to manage Context information.

• Context information refers to the values of attributes characterizing entities relevant to applications.
Context Management in FIWARE

- Context information may come from many sources using different interfaces and protocols … but programmers should just care about entities and their attributes …

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

Place = “X”, temperature = 30º

A sensor in a pedestrian street

A person from his smartphone

It’s too hot!

The Public Bus Transport Management system
Context Management in FIWARE

- Programmers may want to get notified when an update on context information takes place …

Notify me when bus “X” arrives at the bus stop “A”

Bus = “X”, last_stop = “A”, arrived= “Yes”
Context Management in FIWARE

- Acting on certain devices should be as easy as to change the value of attributes linked to certain entities

Street Lamp lamp1.status ← “on”

Street lamp = “lamp1”, status= “on”
Basic Context Broker operations (1)

- **Context Producers** publish data/context elements by invoking the `updateContext` operation on a Context Broker.

- **Context Consumers** can retrieve data/context elements by invoking the `queryContext` operation on a Context Broker.
Basic entities and operations (2)

- **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.
Basic entities and operations (3)

- Context Providers can be registered to the Context Broker linked to certain context information.

- A Context Broker will invoke the `queryContext` operation exported by Context Providers whenever they are queried for context information or have to notify updates in context information.

```
Application

registerContext (producer URI, registration data, duration, registration_id)

Context Provider

queryContext

Context Broker

queryContext

Context Consumer
```
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.
Easing connection to the physical world
Integration with sensor networks

- The 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.

![Diagram showing integration with sensor networks]

OMA NGSI API (northbound interface)

FIWARE Context Broker

IO Agent-1

IO Agent-2

... ...

IO Agent-n

FIWARE Backend IoT Device Management

ETSIM2M

MQTT

... ...

IETF CoAP

create/monitor
Context Processing and Analysis

- Simple Processing (aggregation, averages, …)
- Sensor2Things
- Complex Event Processing (CEP)
- BigData Analysis (COSMOS)
- Context Broker
- Context Management Processing and Analysis
- Programming of rules
- NGSI-9/10

Applications

Context Sources

NGSI-9/10
CEP Technology – expanding the ECA paradigm

• From Event-Condition-Action to Pattern-Condition-Action

• In certain scenarios, single events are insignificant, a CEP engine can detect combinations of events which are meaningful, called situations, and generate derived events.
Cosmos / Big Data overview

- **Cosmos + Infinity**
  - Ephemeral private Hadoop computing clusters management
  - Security enhanced HDFS-based permanent storage
The Stream Oriented Generic Enabler

- Most important protocols and codecs (WebRTC, H.264)
- Real Time communications (B2B UA, MCU router and mixer)
- VoD: Media recording & Media playing
- Seamless Computer Vision algorithms: detection, tracking…
- 2D Agumented reality: 2D overlays, alpha blending,…
(Open) Data Platform

• Search & Discover Data:
  – keywords, browse by facets, previews & visualization
  – REST/Json APIs to access data and metadata

• Data Management for publishers
  – Easy store & update of metadata.
  – Workflows & authorization
  – Support of private datasets acquisition from FIWARE Store & Data Portal.
Offering rich web-based user interfaces
Data/Applications Visualization and Delivery
Reaching target users, monetize
Ensuring Privacy, Security and Trust
Access from everywhere, taking the most of the network and capabilities of devices.
FIWARE Catalogue (http://catalogue.fiware.org)

Welcome to the FIWARE Catalogue! Here you will find all the information, documentation and tools you need as a developer to start using a Generic Enabler Implementation.
FIWARE Catalogue (http://catalogue.fiware.org)
FIWARE Instances

• Future Internet Applications run on top of “FIWARE Instances” that are built by “FIWARE Instance Providers” upon:
  – selection of FIWARE GEIs (products) from the FIWARE Catalogue.
  – assembly of selected FIWARE GEIs with proprietary added-value products.
Welcome

Welcome to the FIWARE eLearning platform, where you can find training courses, lessons and many other contents regarding FIWARE technology.

Feel free to start browsing our offerings from the categories listed below (or from the Available Courses section), click on them and access the lessons.

Few quick steps and you can easily get access to all the public courses published in this platform.

1. Select a Category
   - Cloud Hosting
   - Data/Context Management
   - Internet of Things/Service's Enablers
   - Applications and Services in System and Delivery

2. Select a Course
   - FI Application Projects Management
     - This course introduces the design and usage of the FI Applications
     - FIRE, to create and run a project-based FI application project.

3. Log in as Guest (if necessary)
   - Some courses may allow guest access

4. Select the Course Topic
   - 1. Data Collection
     - This tutorial explains how to set Eclipse and TraccAr
     - It also collects the SAR and TCPDump data used by it.

5. Confirm the Course Topic
   - Mode: Preview: Normal

6. Start the Course
Domain-specific platforms = FIWARE + specific enablers

- SMART Agrifood Apps
- SMART City Apps
- SMART Factory Apps

Domain-specific enablers

FIWARE GEs
Envisioned target Smart City platform

- Smart city platform as a Data/Knowledge Hub
- Non-intrusive, open to third parties
FIWARE Ops: paving the way for FIWARE providers

**Deployment**
Deployment of basic Cloud Hosting GEs and Monitoring Adapters in a FIWARE node

**Federation Management**
Federate a new FIWARE node within a given FIWARE instance (e.g., the FIWARE Lab)

**Connectivity Management**
Manage connectivity of services across FIWARE nodes of a FIWARE instance

**Service Offert Management**
Registration and deployment of additional Generic Enablers, Specific Enablers and complementary Future Internet Facilities
Thanks!

Join us!

www.lab.fiware.org
www.fiware.org
@Fiware

FIWARE
OPEN APIs FOR OPEN MINDS

FIWARE Lab
Spark your imagination

FIWARE Ops
Easing your operations
Internet: a transformation engine

Navigation, Calling a taxi (Uber), Recruiting (Linkedin)…
The FIWARE Program (formerly known as Future Internet PPP)

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

- **Strategy**: Build a ecosystem that will work as catalyst for capturing the opportunities. Lead standards for Smart Cities and APIs for IoT (Internet of Things)

- **Pillars**:
  - FIWARE: a generic, open standard platform which serve the needs of developers in multiple domains
  - FIWARE Lab: a meeting point where innovation takes place, an opportunities can be incubated
  - FIWARE Accelerate: a program that funds developers and entrepreneurs, and ignites roll-out of the ecosystem
  - FIWARE Ops: the suite of tools easing deployment and operation of FIWARE instance nodes

- **Global footprint**: open to regions sharing the ambition
How can the new opportunities be captured and ultimately translated into local economy growth and creation of jobs?

App Sponsors and Data providers
- Connect to entrepreneurs
- Put their 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

Technology Providers
- Ability to “coopete”
- Connect to entrepreneurs: jointly exploit the opportunities
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ecosystem
open sustainable global

Technology Providers
- Ability to “coopete”
- Connect to entrepreneurs: jointly exploit the opportunities
Building the FIWARE ecosystem: the vision

- Creation of dedicated GE instances
- Use of Global shared GE instance

FIWARE provider A

FIWARE provider B

FIWARE Catalogue
How the ecosystem is actually emerging: the case of Smart Cities

• Some cities already connecting to FIWARE Lab:
  – Italy: Trento, Torino, Veneto
  – Spain: Valencia, Sevilla, Málaga, Santander, Logroño, Vigo, Lleida, Sabadell, ...
  – Finland: Helsinki, Espoo
  – Netherlands: Amsterdam
  – Portugal: Lisbon
  – Discussion with cities in other countries ongoing

• FIWARE Challenge on Smart Cities:
  – Launched end of October
  – 300+ teams (individuals, startups, SMEs – few researchers) applied to the challenge (ES, EN)
  – 20 final teams run the final in CPBR 14
  – quite amazing results!
## Why FIWARE

<table>
<thead>
<tr>
<th>Driver</th>
<th>What is needed?</th>
<th>What does FIWARE bring?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology</strong></td>
<td>Open, driven by implementation, specs (open source reference implementation)</td>
<td>Open specifications backed by open source reference implementations (see [1], [2])</td>
</tr>
<tr>
<td></td>
<td>Sustainable investment over time</td>
<td>100+ M€ of investment (2011-2016)</td>
</tr>
<tr>
<td><strong>Experimental environment</strong></td>
<td>Ability to experiment with real data coming from cities (not just open historic datasets but real-time data). Free Cloud capacity enabling entrepreneurs to test and host a permanent showcase of their applications.</td>
<td>15 cities (7 in Spain) already working on setting up a connection to FIWARE Lab [3]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3000+ cores, 16Tb RAM and 750+ Tb HD will be the free computing capacity provided by the FIWARE Lab Cloud across 16 nodes distributed in Europe</td>
</tr>
<tr>
<td><strong>Incentives for creating the ecosystem</strong></td>
<td>Engagement of technology providers, entrepreneurs, data providers, customers Funding for first entrepreneurs joining the ecosystem. Investment in promotion and dissemination activities</td>
<td>52 partners, 13 countries (just FIWARE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 M€ devoted to fund entrepreneurs in 2014-2016. Additional opportunities in Horizon 2020. 6,2+ M€ devoted to dissemination</td>
</tr>
<tr>
<td><strong>Global footprint</strong></td>
<td>Helping entrepreneurs and technology providers to create opportunities not just in Europe but other regions (Latam, Asia and, why not, USA)</td>
<td>FIWARE Lab nodes in Mexico and Brazil. Conversations between EC and public authorities in Mexico and Brazil to explore collaboration opportunities</td>
</tr>
</tbody>
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Extending the FIWARE Lab offering for service providers and developers

- Availability of 5 nodes (end of March 2014) with 500+ cores, 1TB+ Ram, 100TB+ HD
- Additional 12 nodes (April / September 2014) up to 3000+ cores, 16TB+ Ram, 750TB+ HD
- Level 1 and Level 2 support for the nodes
- Showcases for developers, infrastructures, smart businesses