

Private Public Partnership Project (PPP)

Large-scale Integrated Project (IP)



D.10.1.3: FI-WARE Testbed Design

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1 Executive Summary

1.1 About This Document

This document follows the Testbed Design version 1 (available at the FI-WARE forge on https://forge.fi-ware.org/docman/?group_id=7 under the Deliverables folder) and updates the descriptions provided in that document in accordance with the new findings and achievements of the FI-WARE project.

Since Testbed Design version 1, released on 25 Feb 2012, the FI-WARE project evolved significantly, gaining high appreciation from developers both inside and outside the FI-PPP initiative. In agreement and synch with the whole FI-PPP, this evolution mainly consisted in the definition of three products and associated brands: FI-WARE (the whole set of Generic Enablers and their implementations), FI-Lab (a specific FI-WARE instance available worldwide to all, even outside the FI-PPP initiative, for experimentation purposes) and FI-Ops (the infrastructural technologies – implemented and operated by the XIFI project - on top of which FI-WARE technologies run).

In order to cope with such ambitious evolution, which pushes the project achievements outside the “traditional” R&D community, the FI-WARE project realised that a closer to production approach should have been adopted. This approach resulted in creating two different mutually independent FI-WARE testbed environments, one for the FI-WARE project team and one dedicated to the Use Case projects. In addition to those, to foster the wider adoption and experimentation of FI-WARE technologies well outside the FI-PPP boundaries, the FI-Lab environment was created.

The purpose of this document is to give to the reader a high-level description of the FI-WARE Testbed (testbed in the following), specify description of the architecture of the testbed matching its components with the deployment requirements coming from the various FI-WARE Technology Chapters, and to provide an high-level description of the FI-Lab environment both in terms of its conceptualization and architecture. Instead, the description of FI-Ops, being a result achieved outside the scope of the FI-WARE project, can be found in the XIFI project portal (www.fi-xifi.eu). In particular the description of the core backbone federation can be found in their D5.2 document published at https://bscw.fi-xifi.eu/pub/bscw.cgi/d64414/XIFI-D5.2-XIFI_Core_Backbone.pdf.

This document is a living document, it describes the status of the testbed at the moment the document is published. The most updated version of the testbed and FI-Lab can be found under the Docs tab in the Experimentations, Testing and Validation folder at: https://forge.fi-ware.org/docman/?group_id=7.

1.2 Intended Audience

This document is mainly intended for:

- FI Application designers and implementers, in particular those coming from the FI PPP Use Case projects who want to get what are the functionalities that the FI-WARE testbed is providing, i.e. which are the technologies on top of which FI Applications can be built
- Organizations interested in joining the FI-WARE Open Innovation Lab Community (FI-Lab)
- Organizations who wants to set-up their own FI-WARE Core Platform Instance.

The reader of this document is assumed to be familiar with the main concepts of the FI-PPP, FI-WARE, FI-Lab and FI-Ops, although where needed definitions are here provided for the reader convenience.

1.3 Structure of this Document

This document is structured as follows: Section 2, the main section of the document, firstly introduces the three testbed environments namely the Development Environment, the Production Environment and FI-Lab, then provides their overall architectural description and the specific content in terms of GEIs deployed, and finally provides HW/SW requirements for each GEI.

1.4 Acknowledgements

The current document has been elaborated using a number of collaborative tools, with the participation of Working Package Leaders and Architects as well as those partners in their teams they have decided to involve.

1.5 Keyword list

FI-WARE, FI-Lab, FI-Ops, FI-PPP, Architecture Board, Steering Board, Roadmap, Reference Architecture, Generic Enabler, Generic Enabler Implementation, Open Specifications, I2ND, Cloud, IoT, Data/Context Management, Applications/Services Ecosystem, Delivery Framework, Security, Developers Community and Tools.

1.6 Changes History

Release	Major changes description	Date	Editor
v1	Draft version 1	2014-04-28	Engineering
V2	Version 2 after review and contributions from Intel, SAP, Telecom Italia, and Telefonica	2014-04-29	Engineering
V3	Final version for submission after the quality check from the Project Coordinator	2014-05-08	Engineering

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2 The FI-WARE Testbed environments

2.1 Introduction

The FI-WARE project implemented a FI-WARE Instance, hereunder referred to as “FI-WARE Testbed” which intended for the Use Case projects and third parties to run and test Future Internet Applications based on FI-WARE Generic Enabler Implementations (GEIs). The FI-WARE Testbed is aimed to be complete, in the sense that it comprises reference implementations of all Generic Enablers defined in the FI-WARE Architecture. The testbed is not designed to necessarily be centralised, but still to be under central control and to be accessible from a dedicated website. Trial applications built and run by the Use Case projects, coordinated with tests defined by the FI-WARE project, help to validate Generic Enabler Open Specifications, the reference implementations of FI-WARE Generic Enablers developed within the FI-WARE project, as well as the conceptual prototypes developed by Use Case projects. The FI-WARE partners provide active support to Use Case projects in the building and deployment of their trial applications (e.g., the conceptual prototypes).

- **FI-WARE Testbed:** A concrete FI-WARE Instance operated by partners of the FI-WARE project that is offered to Use Case projects within the FI-PPP Program, enabling them to test their proof-of-concept prototypes. The FI-WARE Testbed is also offered to third parties to test their Future Internet Applications although support to them is provided on best-effort basis.

Given the very heterogeneous nature of FI-WARE GEs, the Testbed aggregates in a flexible manner all the technologies the various Generic Enablers require. It is also aimed that the Testbed as such does not to reside in a single location although its operation is centrally controlled and monitored (at this point in time the Testbed is located in Madrid and Seville). To this extent the Testbed includes software, hardware, and networking elements that allows the testing of all the components.

The open version of the FI-WARE Testbed to third parties outside the boundaries of the FI-PPP is the FI-WARE Open Innovation Lab (FI-Lab). FI-Lab aims at supporting dissemination, public training and exploitation activities as well as to help the Programme Facilitation and Support project in engaging SMEs and maximising their involvement in phases 2 and 3 of the FI-PPP Work Programme.

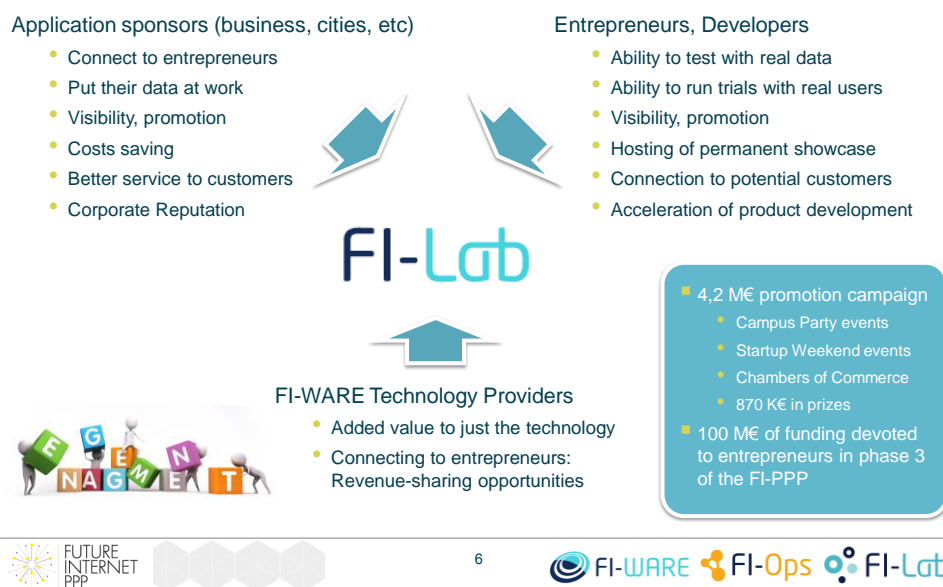
The project team realized that the availability of the FI-WARE Testbed per se does not guarantee innovation as such, therefore the FI-WARE Open Innovation Lab was created in a way to comprises and to comprise even more in the future all what is needed to stimulate awareness among target application providers and users so that they feel attracted to participate and build a community. The idea is that technologists, web entrepreneurs, and domain stakeholders have a meeting place supporting to build a community where to share experiences, needs, and possibly effective solutions. At the point in time of writing of this document actions are in place to boost the FI-Lab concept in the domain of Smart Cities. In this context cities like Rio de Janeiro (in Brazil), Espoo and Helsinki (in Finland), Roma, Torino and Trento (in Italy), Agued and Lisbon (in Portugal), Las Palmas, Lleida, Logorno, Malaga, Santander, Sevilla, Valencia, and Vigo (in Spain) and Amsterdam (in The Netherlands) have signed a protocol to connect their cities to FI-Lab. Among those Santander and Trento have already started such integration and to make available their open datasets through FI-WARE GEIs namely Cosmos and Orion.

FI-Lab consists in an environment which, in a unique portal, allows third parties to access a FI-WARE Testbed instance, the FI-WARE Catalogue, FI-WARE development tools (i.e. FI-CODE), the FI-PPP University (an eLearning platform with courses for each GEI and on how to build Future Internet Applications), for set-up and run experimentations on Future Internet technologies. In summary, FI-Lab is a space where future innovations on top of the generic enablers provided by FI-WARE can be nurtured.

The basic infrastructure of FI-Lab is an experimental facility, defined as a combination of networked data-centre nodes and potentially connected experimental facilities like for instance those provided in the context of Smart Cities.

In the future it is expected FI-Lab to become a comprehensive innovation platform equipped not only with Generic Enablers instances and those tools needed to create and manage workspaces, but also with tools allowing ideas and experimentations management, closely relating with existing initiatives like ENoLL¹, CIP² projects and OISPG³. In fact, some of these ones support user-driven innovation, from which main lessons learned for community involvement will be considered.

FI-LAB: going beyond technology, the “meeting point” where a new Open Innovation ecosystem will be boosted



Since the deployment of FI-WARE Testbed version 1 it was clear that, in order to support the progress and development of the FI-WARE project and to provide the best service possible to the Use Case projects, the use of a single environment for both purposes would have created too many problems. Thus, in order to solve this aspect the project team decided to create two different specific testbed environments: the

¹ ENoLL stands for European Network of Living Labs

² CIP stands for Competitiveness and Innovation Programme. Some CIP projects of relevance for the fulfillment of Usage Area requirements will be taken into account as additional knowledge to maximize the potential for innovation of FI-WARE

³ OISPG stands for Open Innovation for Services Policy Group

Development Environment dedicated to the project team and the *Production Environment* dedicated to the Use Case projects. In particular:

- The Development Environment (AKA the **FI-WARE GE Testbed**): this is the environment needed to verify the developments of the FI-WARE project, where all the GEIs are installed, tested singularly and, where needed, in an integrated way. The functionalities of the GEIs, and their deployment is validated prior to be used by the Use Case projects and within FI-Lab.
- The Production Environment (aka the **UCs Testbed**): this is the environment which will be used by the Use Case projects to build, run and deploy their own trial applications to perform specific domain experimentations.

The following sections describe the two testbed environments as well as the FI-Lab environment.

2.2 The environments

2.2.1 The FI-WARE GE testbed

The purpose of this testbed is to allow FI-WARE project partners to fine tune and test new GEIs. With this respect the use of the FI-WARE GE testbed is restricted to FI-WARE project partners. This testbed allows GE owners to perform all phases in the production of GEIs: from software development and test to integration, where the behavior of the GEIs is validated in case of their mutual dependency, all phases can be exercised within the FI-WARE GE testbed. Final steps for GEi owners are those concerning the deployment and the start of production phases, the latter being the step where UC projects start their direct involvement and use of the GEIs. A few more details about the above mentioned phases are given by the following items:

- Developing and testing phases: Although the large part of the development is done locally to partner private environments, the GE owners can install their software, then and test and fine tune it
- Integration phase: Some GEIs are working together to provide a more structured and complex functionality to their users. These GEIs need to be installed in a stable way in order to perform the integration test (details about the dependency among different GEIs and the tests designed to validate them are provided in specific documents such as “Integration Plan” and “Integration Report” series). GE owners can use different instances for integration purposes
- Delivery phase: Once a GEi is ready for use, the release of the software can take place. The GEi can be delivered in different ways:
 - Software delivery: The software can be packaged and uploaded into a RPM FI-WARE repository (http://rpmrepository.testbed.fi-ware.org/repo/rpm/x86_64/) or a Nexus (<http://nexus.testbed.fi-ware.org/nexus/index.html>) to where software artifacts can be uploaded
 - GEI installed as service (**Global Instance**). A **GEI global instance** means a GEI provided by the Testbed as a service. This is a GE instance which is going to be shared by all the UCs, and whose service endpoint appears in the FI-WARE Catalogue (<http://catalogue.fi-ware.org>)
 - GE dedicated Instance: a **GE Dedicated Instance** is an instance which can be deployed by any UC user in his/her own environment and that is not shared with other users. There are two types of dedicated instances:

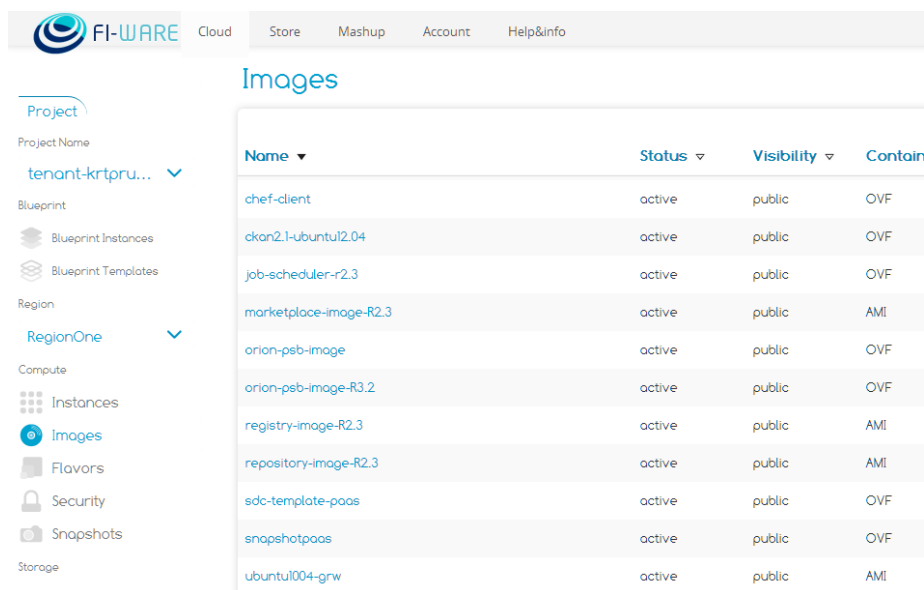
- A configured instance, which is a Cloud image for the dedicated GE
 - Cookbooks, or recipes, which are installation and configuration scripts which allow the installation of a GEi in a Virtual Machine (VM) in the FI-WARE Cloud, by using its blueprint capabilities.
- Production phase: Those GEIs which are offered as global instance will have their instance available in the UCs Testbed, which is managed by the GEI owner. The GEI owners are responsible for deploying a stable GEI version which works. In addition, by default each VM has all ports closed, so that each GE owner is responsible for opening the GEI to those UC partners interested in using it as global instance.

The portal for accessing the FI-WARE GE Testbed (sometimes colloquially referred also as the Cloud) is <http://fi-cloud.testbed.fi-ware.org/> and it has restricted usage just for FI-WARE project partners. In order to access it, it is required to explicitly authorize in the testbed firewall the public IPs from which connections will be made. The account for accessing the Cloud is manually generated and managed by the testbed team.

2.2.2 The UCs testbed

This testbed, located at <http://cloud.testbed.fi-ware.org>, is the environment used by FI-PPP partners in the UCs projects for their adoption of the FI-WARE GEIs. The UCs testbed is a Cloud which the PPP partners can use for:

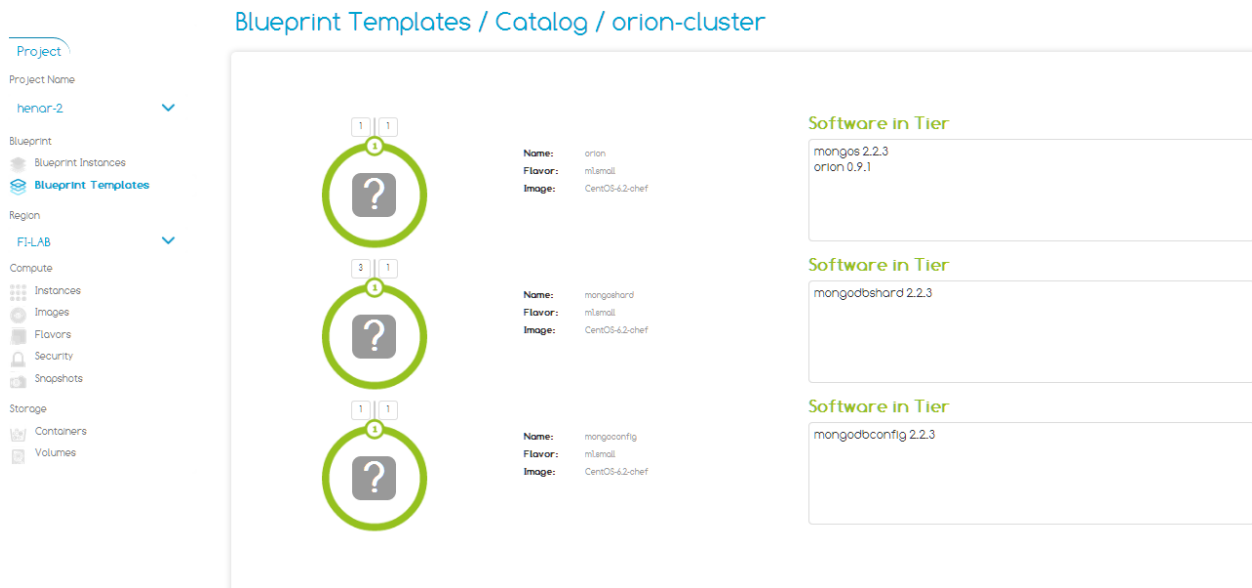
- Installing their own technology. The UC partners can use the Cloud to deploy VMs and install their software on top of those VMs
- Integrating their technology with the GE global instances. The GE Global instances are deployed in the UCs testbed and operated by the GE owners.
- Instantiating a GE instance as a dedicated instance in the UCs testbed's Cloud, which will not be shared with the rest of users. The GEIs can be delivered as a Cloud image, so that it is possible to instantiate their image as a VM and use them. The following picture is a screen shot that actually shows some GEIs delivered as images in the UCs testbed (Marketplace, Orion, Registry, Job Scheduler...)



The screenshot shows the FI-WARE Cloud interface. The top navigation bar includes the FI-WARE logo, 'Cloud', 'Store', 'Mashup', 'Account', and 'Help&Info'. The left sidebar shows a 'Project' dropdown set to 'tenant-krtpru...', followed by 'Blueprint' (with sub-items 'Blueprint Instances' and 'Blueprint Templates'), 'Region' set to 'RegionOne', and 'Compute' (with sub-items 'Instances', 'Images' (selected), 'Flavors', 'Security', and 'Snapshots'). The main content area is titled 'Images' and displays a table of available images.

Name ▾	Status ▾	Visibility ▾	Contain
chef-client	active	public	OVF
ckan2.1-ubuntu12.04	active	public	OVF
job-scheduler-r2.3	active	public	OVF
marketplace-image-R2.3	active	public	AMI
orion-psb-image	active	public	OVF
orion-psb-image-R3.2	active	public	OVF
registry-image-R2.3	active	public	AMI
repository-image-R2.3	active	public	AMI
sdsc-template-paas	active	public	OVF
snapshotpaas	active	public	OVF
ubuntu1004-grw	active	public	AMI

- Instantiating a blueprint template composed of GEIs. GEIs as well as software can be installed and configured in VMs by the blueprint capability which the Cloud portal offers. Thanks to such capabilities, it is possible to define a template specifying the hardware resources (VMs, storage, network) and the software to be installed on top of it, and then through the blueprint deploying such software. The following picture shows, as an example, the specification of the Orion GEi installed with a scalable mongodb. The picture shows the different tiers which compose the blueprint template and its features.



In order to be able to access the testbed, a user should have a registered mail address (belonging to a FI-PPP partner), since users are granted through such mechanism.

2.2.3 FI-Lab

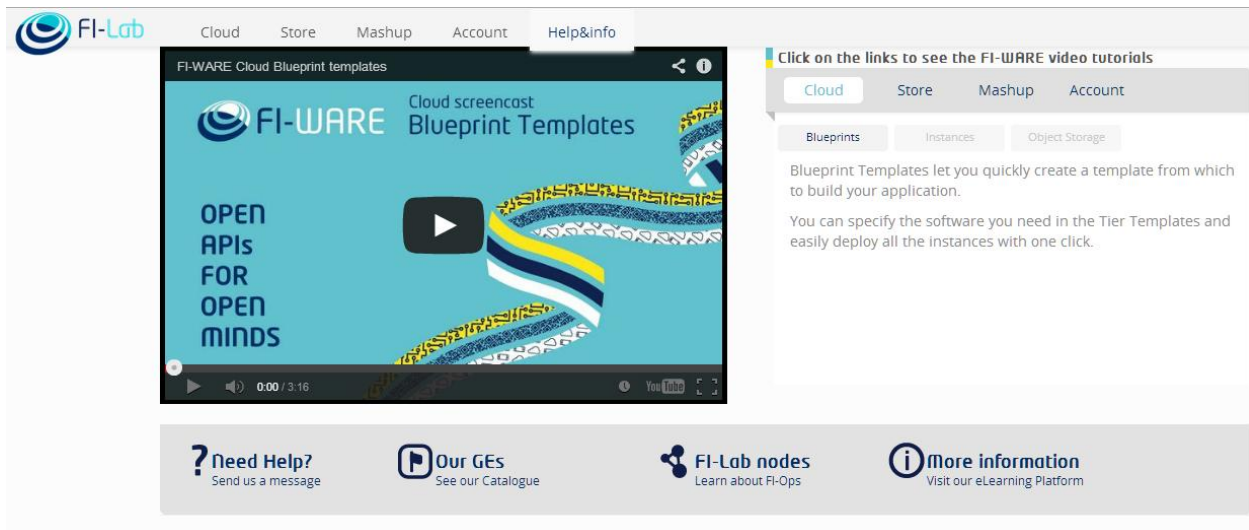
As said in previous sections, FI-Lab is a live instance of FI-WARE which makes technologies available to developers, independently they are involved in the FI-PPP, for free experimentations. From an architectural point of view FI-Lab mirrors the testbed architecture. The access to GE global instances is done through FI-WARE account credentials. FI-Lab provides the following main features:

- It includes a set of portals enabling users to self-service the virtual infrastructure to support their own experiments (store, mashup, etc..)
- Users are supported by a dedicated cloud (although with some limitations/Quotas)
- The user can deploy **Generic Enabler implementations** as dedicated instances (Cloud images)
- There are a set of **Generic Enabler implementation** instances offered "as a Service" through well-defined Service End Points (orion, big data), which can directly be used.

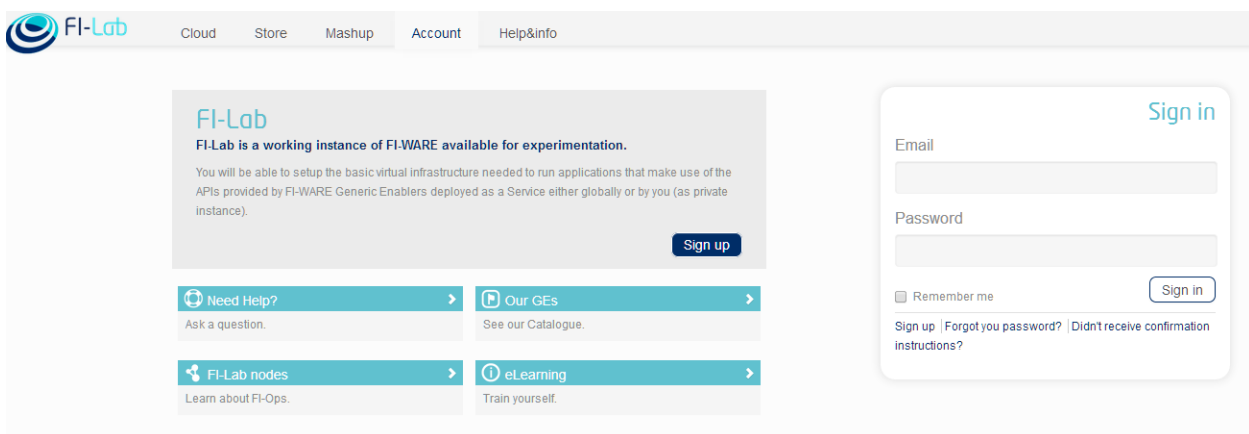
Each of such main features are detailed in the following sections.

2.2.3.1 The FI-Lab Portals


The FI-Lab environment is available at the URL <http://lab.fi-ware.org>. In that page a set of videos explaining the different FI-Lab functionalities, as well as a way to access to different GEIs, are provided. At the upper side of the page users find the links to access the different available portals: Cloud, Storage, Mashup, Account, Help&Info.



The first thing to do for using FI-Lab is creating an account through the accout.lab.fi-ware.org portal. Users are required to sign-up by registering in FI-Lab providing a set of identification details. In return an email will be sent to the email address specified to activate the account. Once the account is activated the user can enter in FI-WARE. The following picture shows the Account portal page.



A second functionality to be used is the Mashup component, whose portal is accessible at <https://mashup.lab.fi-ware.org>. Through this portal, users can create their own GUI for their platforms by using widgets of their interest. These widgets can be found in and selected from the FI-Lab marketplace, as shown in the following picture.



[Cloud](#)
[Store](#)
[Mashup](#)
[Account](#)
[Help&info](#)


/ marketplace / FI-LAB ▼


Order by:
Popularity ▼

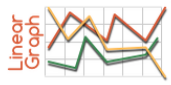
Offerings per page:
30 ▼


Filtering
View All
Keywords:
Store:
All stores ▼

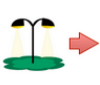
Mines Weeper Wirecloud ★★★★★
widget WStore FI-LAB **Free**

Classic game of Minesweeper. Find all mine!

Map viewer ★★★★★
widget WStore FI-LAB **Free**

Place things on map! Explore the world, trace routes... Don't carry a paper map

Smart City Lights app ☆☆☆☆☆
unknown WStore FI-LAB **Details**

No image available
Smart City Lights is an application that allows the management and

Linear Graph ★★★★★
widget WStore FI-LAB **Uninstall**

Generic linear graph.

Entity Service ☆☆☆☆☆
operator WStore FI-LAB **Free**

This operator permits us gather information about several entities from any NGS!

Entity To Poi ☆☆☆☆☆
operator WStore FI-LAB **Free**

This operator transforms entities to points of interest.

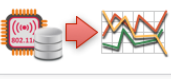



History Module to Line ☆☆☆☆☆
operator WStore FI-LAB **Install**

Produces data from History Mod to feed a line graph.

Photo Viewer ☆☆☆☆☆
widget WStore FI-LAB **Free**

This widget shows photos from different sources.

Web Map Service ☆☆☆☆☆
widget WStore FI-LAB **Free**

This widget gives users the ability to handle different map layers.


A further portal of FI-Lab is the Store, which allows applications to be purchased. This is an application marketplace like Google market or Apple market, which users can access to purchase different applications. Please note that applications can be for free or with a specified price. The Store is available at the page store.lab.fi-ware.org. The picture below shows the Store portal.



[Cloud](#)
[Store](#)
[Mashup](#)
[Account](#)
[Help&info](#)

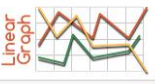
Store


Search

Top rated


MapView ★★★★★
alvaro-arranz-garcia **Free**

Place things on map! Explore the world, trace routes... Don't


MultimediaPack ★★★★★
purchased CoNWeT **Free**

A pack of multimedia Wirecloud widgets


LinearGraph ★★★★★
purchased CoNWeT **Free**

Generic linear graph.


Minesweeper ★★★★★
CoNWeT **Free**

Classic game of Minesweeper. Find all mine!

Newest

Offering Name ☆☆☆☆☆
jan-1 **Free**

Beschreibung offering

NGSIInspector ☆☆☆☆☆
CoNWeT **Free**

A testing widget able to get sensors info

RGBActuator ☆☆☆☆☆
CoNWeT **Free**

A test Widget able to change RGB leds!!!

InputBoxWidget ☆☆☆☆☆
CoNWeT **Free**

A simple widget with an input box

2.2.3.2 ***The FI-Lab Cloud***

A specific section is devoted to the FI-Lab Cloud portal, available at page cloud.lab.fi-ware.org. This is a Public Cloud IaaS. The FI-Lab Cloud can be used by anyone who has a FI-WARE account (i.e. it is not required to be part of the PPP). With a FI-WARE account, it is possible to use the Cloud, but with some restrictions or quota. At the moment it is possible to create by default a maximum of 3 VMs, 6 cores CPU, 4 GB RAM and one public IP address although we occasionally cater for particular needs.

The FI-Lab Cloud is based on Openstack with some additional advanced functionalities, based on specifically the Essex release of Openstack, but new work is being done towards the development and integration on top of new Openstack versions as Grizzly or Havana. Some components which are part of Openstack in FI-Lab are:

- Glance: this is the image service which contains all images (it includes OS based images and GE dedicated instances images)
- Nova: this is the computation services for the deployment of VMs
- Swift: this is the object storage service.
- nova-volume: for managing volumes

Some advanced functionality which FI-Lab is exposing is:

- Integrating user access to GEIs and Cloud. The same credentials used to access FI-WARE are used in the Cloud
- Blueprint capability: for the deployment of software on top of VMs
- Region management: it is possible to switch among different regions inside FI-Lab

2.2.3.3 ***The dedicated instances***

As well as in the UCs tested, the FI-Lab Cloud offers a set of images which can be used by final users for the instantiation of their own version of a GEi. This is available through the page <http://cloud.lab.fi-ware.org/#nova/images/>.

2.2.3.4 ***GEs as service***

Some GEIs such as Orion or Cosmos can be used as a service by accessing their global instance available in FI-Lab. Information about the available service end points of such GEIs is available in the FI-WARE catalogue.

2.3 The Testbeds Deployment

The FI-WARE testbed is composed of 12 working hosts, each of with the following characteristics:

- HP DL360 G8 E5-2609
- Hardware: Ram: 128 Gb ; HD: 2TBGb ; 8 Cores ; 1 Working NIC
- Software: OS: Ubuntu 12.04 Server.
- Virtualization Software: Libvirt + KVM

Regarding networking, the networks are:

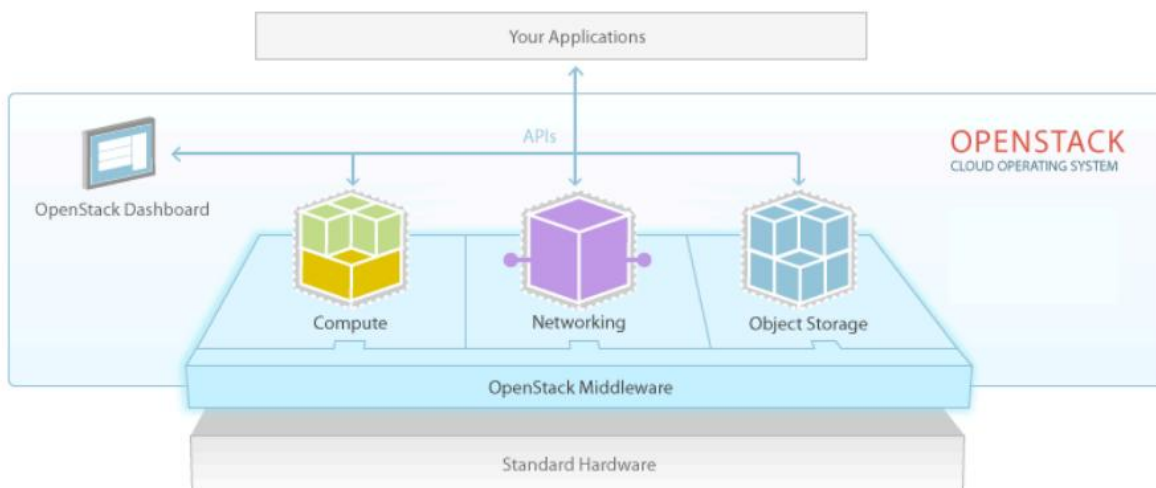
- A management network 130.206.86.0/24 to access to the physical host ILOMs.
- A service network 130.206.80.0/22.

These hardware resources, allows the full operation of the two testbeds: i) the Development Environment (the GE testbed) and ii) the Production Environment (the UCs testbed). Both testbeds are based on the Openstack Essex version.

2.3.1 The GE testbed Deployment

The GE testbed is composed by 8 physical hosts, and contains all the GE global instances plus all the VMs needed for deployment and integration. This installation is the typical Openstack installation as next figure shows. So that, it contains the nova service for computation and the glance service for storage. The networking is provided by the nova-network service.

OpenStack: The Open Source Cloud Operating System

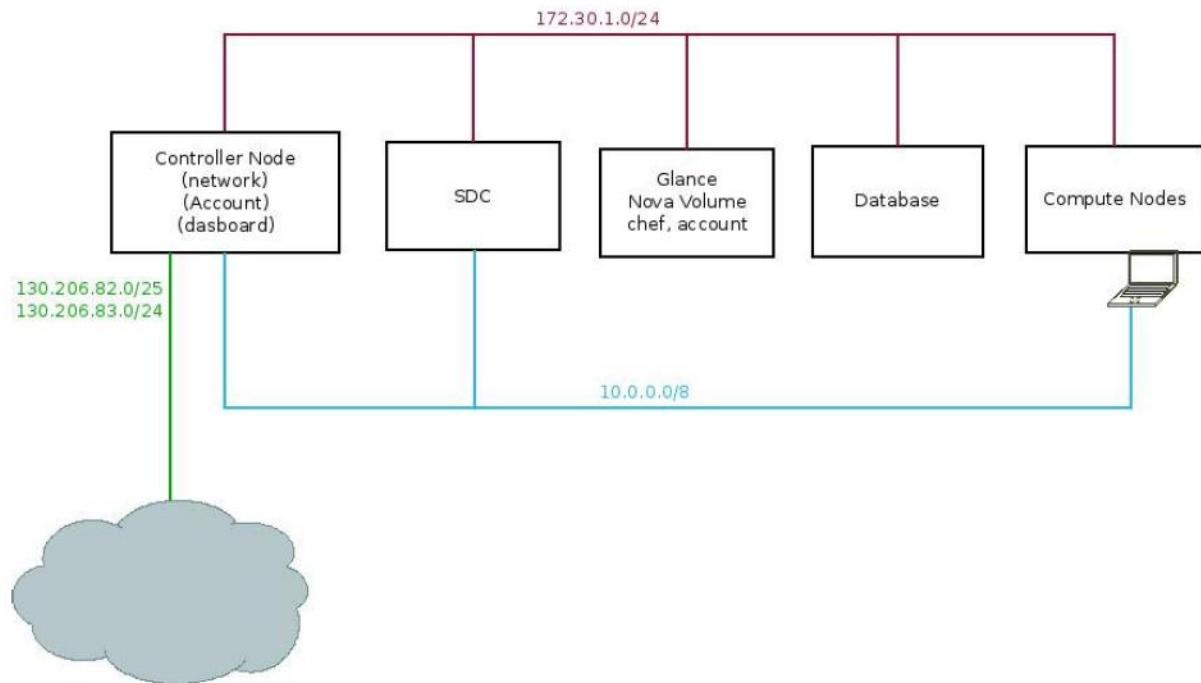


2.3.2 The UC testbed Deployment

The UC testbed is composed of 4 physical hosts, and contains all VMs deployed by the UC projects partners. Apart from the basic infrastructure (routers, cabinets, networks), the following elements can be highlighted:

- A Controller node, which hosts the basic cloud management capabilities (including OpenStack elements like nova, glance, nova-volume and other Openstack services)
- Platform GEIs, which contains the GEIs which are part of the FI-WARE platform
 - Identify Manager (Keyrock), for account management and authorization
 - Cloud advanced functionalities, like PaaS Manager and SDC for blueprint capabilities
 - Cosmos, as the Big Data Platform.

Regarding networking, all the components in the platform communicate by using a private network 172.30.1.0/24 and the VMs are obtaining IPs for the network 10.0.0.0/8. The next figure shows the network configuration.



2.3.3 GEIs deployed as global instances

The following table lists, at the point in time of writing of this document, all the GEIs which are deployed on the UCs testbed as global instance. These GEIs are those available to the UCs partners in order to create their trial applications. These GEIs are shared among all the actual users.

APPs and Services Chapter	
Application Mashup (Wirecloud)	https://mashup.testbed.fi-ware.org
LightSemanticComposition (COMPEL)	http://compositioned.testbed.fi-ware.eu/compel
Marketplace	http://appsnserv.testbed.fi-ware.eu/FiwareMarketplace/v1/
Mediator	https://mediator.testbed.fi-ware.eu:9443/carbon Image: ti-mediator-3.2.2_patch01-3
Service Description Repository	http://appsnserv.testbed.fi-ware.eu/FiwareRepository/v1/
Service Registry	http://130.206.81.39/registry/de/acme/Foo%20Bar
Store	https://store.testbed.fi-ware.org/
Revenue Sharing	http://rss.testbed.fi-ware.eu:8080/fiware-rss/
Cloud Chapter	

Cloud portal	http://cloud.testbed.fi-ware.org
PaaS Manager	http://pegasus.testbed.fi-ware.eu/paasmanager/rest
SDC	http://saggita.testbed.fi-ware.eu/sdc/rest
IoT Chapter	
Device Management (IDAS DCA)	http://eidas2.testbed.fi-ware.eu/
Configuration Management (TID)	http://orion-cm.testbed.fi-ware.eu:1027/
Configuration Management (UNIS)	<ul style="list-style-type: none"> (Sense2Web) http://130.206.82.174:8080/S2W (NGSI-9 server) http://130.206.82.174:8080/ngsi9
Iot Broker	http://iotbroker.testbed.fi-ware.eu/
Template Handler	http://130.206.81.81:8080/modeler/
NGSI Testserver	http://130.206.81.82:8080/NGSI10/contextEntities/my_house
Data Handling	http://gwdatahdl2.testbed.fi-ware.eu/Esper4FastData-3.2.3
Protocol Adapter	http://130.206.81.29:8080/EPCGE-TESTBED-NGSI/
Data Chapter	
Complex Event Processing (CEP)	http://130.206.81.23:8080/AuthoringTool/Main.html
Publish/Subscribe Broker	http://pubsub.testbed.fi-ware.eu/
Publish/Subscribe Broker (Orion)	http://orion-psb.testbed.fi-ware.eu:1026/
Semantic Annotation	http://semantican.testbed.fi-ware.eu/ajax/extract_words.php
BigData Analysis (Cosmos)	Hdfs: http://cosmos.testbed.fi-ware.org:14000/webhdfs/v1
Compressed Domain Video Analysis	http://cdvideo.testbed.fi-ware.eu/codoan
Media-enhanced Query Broker	http://qbroker.testbed.fi-ware.eu:8080/QueryBrokerServer/
Metadata Preprocessing	http://mprocessor.testbed.fi-ware.eu:8080/mdp
Location Platform	http://location.testbed.fi-ware.eu:3128/location/v1/queries/location
Semantic Application Support	http://semanticas.testbed.fi-ware.eu:8180/ontology-registry-service/webresources/
Kurento	http://kurento.testbed.fi-ware.org:8080/fi-lab-dem
I2ND Chapter	
Network Information and Control (OFNIC)	http://ofnic.testbed.fi-ware.eu/
Security Chapter	
Identity Management (Keyrock)	http://account.testbed.fi-ware.org

Data Handling GE (PPL)	http://130.206.81.77:8080/ppl-webapp
DB Anonymizer GE (DBA)	http://130.206.81.77/services/DBA/getPolicyResult/53251
Security Monitoring GE / Service Level SIEM	https://sls.testbed.fi-ware.eu/
Security Monitoring GE / MulVAL Attack Paths Engine Web Application	http://secmonitoring.testbed.fi-ware.eu/AttackPathEngine/attackgraph.jsp
Security Monitoring GE / Scored Attack Paths	http://secmonitoring.testbed.fi-ware.eu/ScoredAttackPaths
Security Monitoring GE / Remediation	http://secmonitoring.testbed.fi-ware.eu/Remediation
Security Monitoring GE / Visualisation Framework	http://sec-vis.testbed.fi-ware.eu/fiware-dashboard-2.0
Privacy	http://130.206.82.165:9093/user-ui
Content Based Security (CBS)	https://cbs.testbed.fi-ware.eu/
Context-based security & compliance (PRRS)	http://130.206.82.156:8080/prrsWebConsole/

2.3.4 GEs installed as dedicated instances

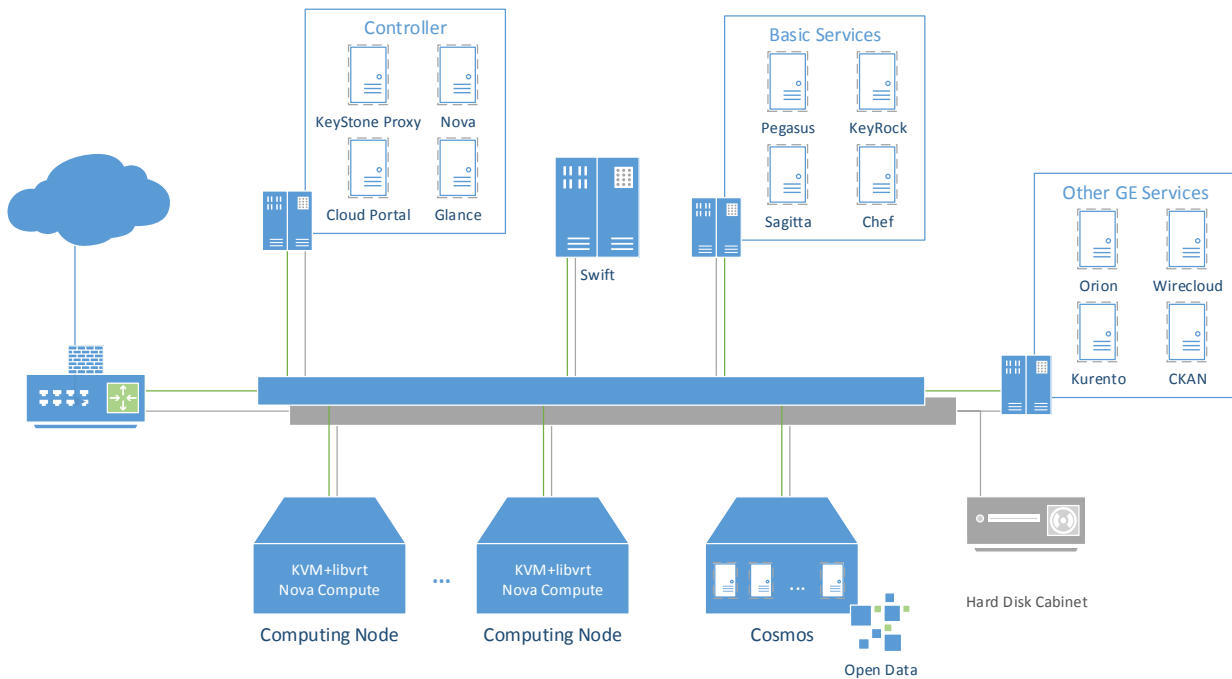
The following table lists, at the point in time of writing of this document, the GE dedicated instances deployed in the testbed to be used by the UC users in his/her own environment and that, thus, are not shared with other users. There are two types of dedicated instances: images and recipes for blueprint capabilities. The first column represents the name of the GE, the second one its image, and the third one the cookbook name for the blueprint capabilities.

APPs and Services Chapter	
Marketplace	marketplace-ri
Mediator	ti-mediator-3.2.2_patch01-3
Service Description Repository	repository-ri
Service Registry	registry-ri-r3
Revenue Sharing	fiware-rss-image
LightSemanticComposition (COMPEL)	LightSemanticComposition-imgR3.3.3
Cloud Chapter	
Job Scheduler	job-scheduler-r2.3

IoT Chapter	
Configuration Management (TID)	orion-cm-image-R3
Configuration Management (UNIS)	iot-unis-cm-image-R3v2
Iot Broker	IoTBrokerV3.2
Template Handler	Template Handler v1.0 OC
NGSI Testserver	NGSI-TestServer v1.0 OC
Protocol Adapter	CoAP MR v1.0 One Click
Data Chapter	
Complex Event Processing (CEP)	cep-r2.3.3.0-img
Publish/Subscribe Broker	ti-pubsubcb3.2.3-image
Publish/Subscribe Broker (Orion)	orion-psb-image-R3.3
Compressed Domain Video Analysis	cdva-r3.2.2.0.0-img
Media-enhanced Query Broker	MeQB-R3.2.img
Metadata Preprocessing	mdpp-3.2.405.971-img
Kurento	Kurento_3.0.4
I2ND Chapter	
Network Information and Control (OFNIC)	ofnic_image
Security Chapter	
Data Handling GE (PPL)	datahdl R3.3 testbed inst
DB Anonymizer GE (DBA)	dbanonymizer R3
Security Monitoring GE / Service Level SIEM	SecMon-SLS-3.3.3
Privacy	privacy-3.3.3
Context-based security & compliance (PRRS)	cbsec-prrs-3.3.3

2.4 The FI-Lab Deployment

The following figure depicts a simplified example of the architecture of a FI-Lab node, where the different physical nodes and services are shown. Both the nodes and their architecture are evolving continuously to provide better service to entrepreneurs and adapt to the real demand.



Apart from the basic infrastructure (i.e. routers, cabinets, networks), the following elements can be highlighted:

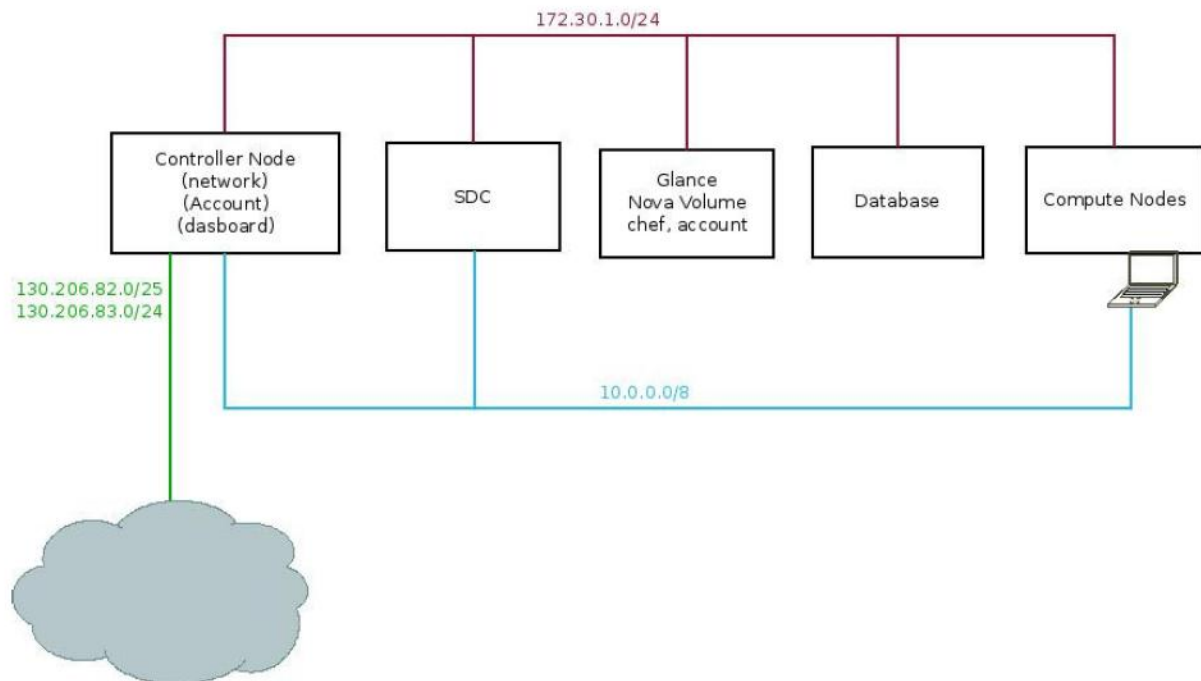
- A Controller node, which hosts the basic cloud management capabilities (including OpenStack elements like nova, glance, nova-volume and other Openstack services)
- Special nodes that host additional capabilities:
 - Swift, for object storage capabilities
 - Basic Services, for PaaS and Identity Management
- GE services, for hosting various GEIs as a service
- Cosmos nodes, where the big data clusters are deployed.

2.4.1 FI-Lab Configuration

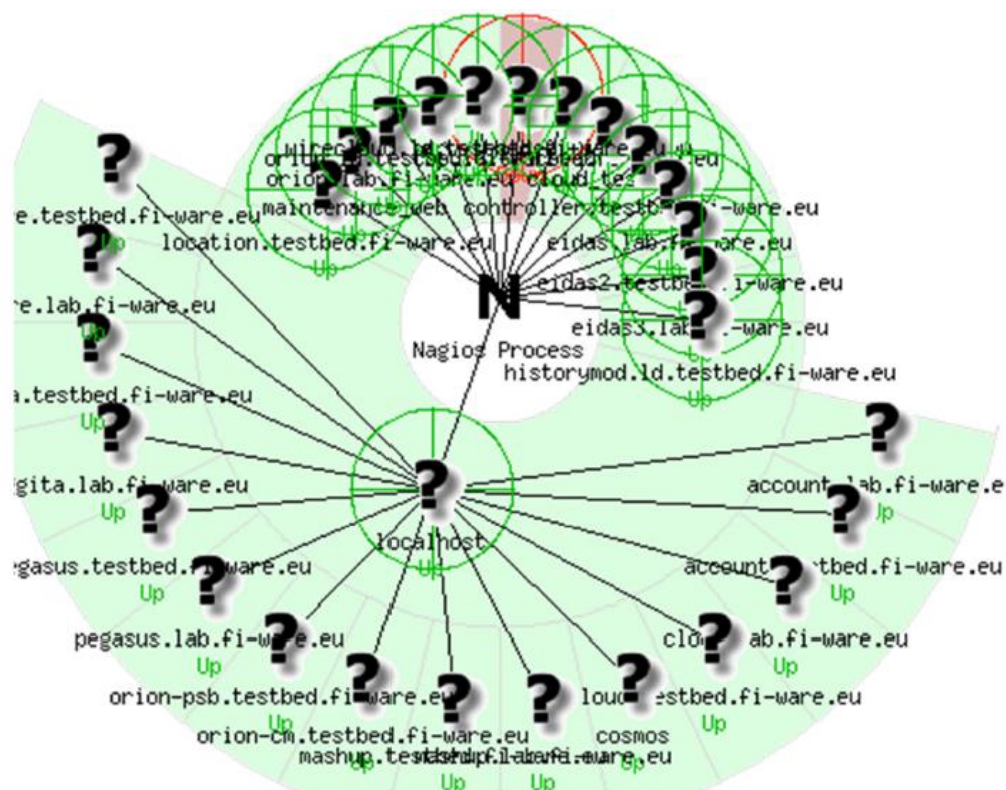
The FI-Lab has at present an active capacity of 24 working hosts, each of which with the following characteristics:

- Hardware: Ram: 16Gb ; HD: 128Gb ; 8 Cores ; 1 Working NIC
- Software: OS: Ubuntu 12.04 Server.
- Virtualization Software: Libvirt + KVM

Regarding networking, all the components in the platform communicate by using a private network 172.30.1.0/24 and the VMs are obtaining IPs for the network 10.0.0.0/8. The next figure shows the network configuration.



The FI-Lab platform is monitored continuously in order to react towards failures of any components, by using the software Nagios. The following figure represents a graph with the nodes and services which are being monitored. The figure simulates the failure of one node.



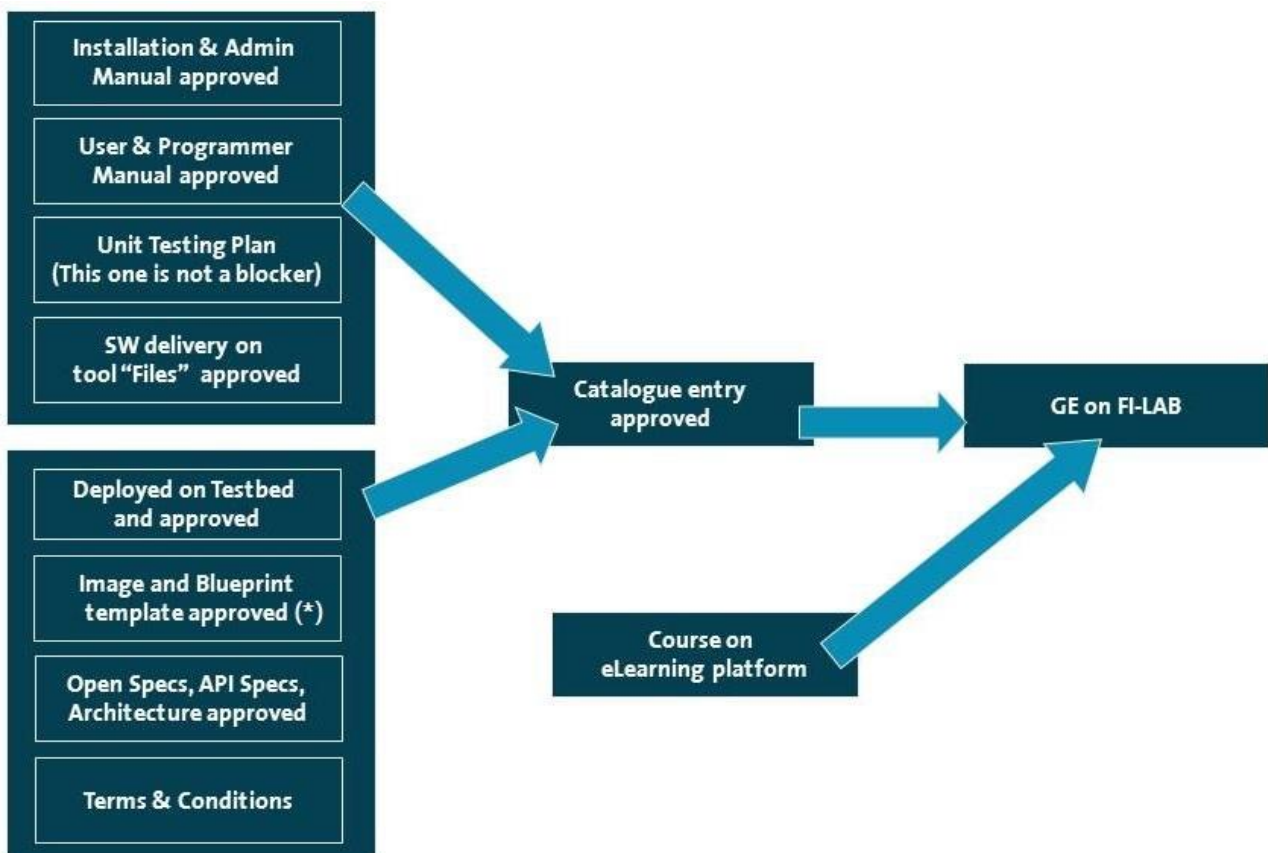
2.4.2 FI-Lab GEIs deployment procedure

Once GEIs are well defined and tested in the FI-WARE testbed they can eventually be moved in FI-Lab. Currently not all GEIs in the FI-WARE UCs Testbed are also made available in FI-Lab due to main reasons:

The community of developers outside the FI-PPP is not necessarily aligned with the culture and experiences gained inside the FI-PPP. This requires all the documentation to be provided in line with product view which is certainly more stringent with respect to R&D documentation

The community outside the FI-PPP is unknown, so more stringent security requirements need to be in place.

So in order to fulfil the above two main requirements the FI-WARE project established a specific deployment procedure for GEIs in FI-Lab which is sketched in the following picture:



The basic principles are:

- Documentation linked to the GEI has to pass the internal review which considers whether the documentation reaches a minimum level as to be shared with third parties outside the FI-PPP community. This refers to the following documentation:
 - Installation and Administration guidelines
 - User and Programmers guidelines
- Completeness of information in the FI-WARE Catalogue. Here, special attention is on info about licenses and External Availability. Overall, it is also checked whether description of the GEI is complete and well-written including that all necessary links to documentation, architecture and API specifications and, when appropriate, source code are to public available resources.

- Availability of tools for automated creation of instances. It should be feasible to deploy the GEi using virtual pre-configured images, recipes and blueprints. All this information need to be documented in the "Creating instances" tab linked to the GEi in the FI-WARE Catalogue. Besides those that do not need to be deployed on FI-Lab because of their nature (e.g., GEIs linked to IoT gateways, the Cloud proxy GEi, the CDI GEi or the advanced middleware GEi), the following GEIs are excluded and do not need to follow this rule (the rule has to be fulfilled by all the rest):
 - WireCloud GEi in the Apps chapter
 - Business Framework related GEIs in the Apps chapter
 - GEIs in the Cloud Hosting chapter
 - GEIs in the Security chapter
 - GEIs in the I2ND chapter
- Training material. There should be complete training material for the GEi uploaded in the "Help&Info" webpage of FI-Lab or the FI-WARE eLearning platform.

2.4.3 FI-Lab GEs installed as global instances

Some GEIs such as Orion or Cosmos can be used as a service by accessing their global instance available in FI-Lab. Information about the available services end points of such GEIs is available in the FI-WARE catalogue. The following table lists, at the point in time of writing of this document, the GEIs which are deployed on the FI-Lab as global instance.

APPs and Services	
Application Mashup (Wirecloud)	https://mashup.lab.fi-ware.org
Store	https://store.lab.fi-ware.org/
Revenue Sharing	http://rss.lab.fi-ware.org:8080/fiware-rss/
Cloud	
Cloud portal	http://cloud.lab.fi-ware.org
PaaS Manager	http://pegasus.lab.fi-ware.eu/paasmanager/rest
SDC	http://saggita.lab.fi-ware.eu/sdc/rest
IOT	
Device Management (IDAS DCA)	http://eidas.lab.fi-ware.eu/
Data	
Publish/Subscribe Broker (Orion)	http://orion.lab.fi-ware.eu:1026/
BigData Analysis (Cosmos)	Hdfs: http://cosmos.lab.fi-ware.org:14000/webhdfs/v1
Kurento	http://kurento.lab.fi-ware.org:8080/fi-lab-dem
Security	
Identi Management (Keyrock)	http://account.lab.fi-ware.org

2.4.4 FI-Lab GEs installed as dedicated instances

The following table lists, at the point in time of writing of this document, the dedicated instances deployed in the testbed to be used by UC projects developers in their own environment and that are not shared with other users. There are two types of dedicated instances: images and recipes for blueprint capabilities. The first column represents the name of the GE, the second one its image and the third one the cookbook name for the blueprint capabilities.

APPs and Services		
Marketplace	marketplace-ri_2	
Service Description Repository	repository-image-R3.2-2	
Service Registry	registry-ri	
Cloud		
Job Scheduler	jobscheduler	
Data		
Complex Event Processing (CEP)	cep-image-R2.3	cep
Publish/Subscribe Broker (Orion)	orion-psb-image-R3.3	orion
Compressed Domain Video Analysis	cdva-image-R2.3	cdvideoanalysis
Media-enhanced Query Broker	meqb-image-R2.3	me-querybroker
Kurento	kurento-R4.2.2	kurento
IoT		
Template Handler GE		
Protocol Adapter GE		
I2ND		
Network Information and Control (OFNIC)	ofnic-image-R2.3	
Security		
Data Handling GE (PPL)	datahandling-ppl	
DB Anonymizer GE (DBA)	dbanonymizer-dba	
Privacy	privacy-3-3-3	
Access Control	accesscontrol-gei-tha-3.3.3-1	
Tools		
Test and evaluation server environment for NGSI		

2.5 GEIs hw/sw requirements

[illegible]

[illegible]

(Gateway) Protocol Adapter (CoAP MR)	SAP	n.i	1	n.i	n.i	n.i	YES	1	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i
Big Data Analysis (Cosmos)	TID	X86-64	1 (name node + Jobtr acker) + 6 (data nodes + Task trackers)	Yes (for performance reason)	2 BG (Min), 46BG (Max)	50 GB	YES	1	CentOS 6.2	n.i.	n.i.	n.i.	n.i.	MongoDB	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Complex Event Processing	IBM-IL	n.i.	≥ 1	Yes (for performance reason)	4GB	10GB	YES	1	Linux	Java J2SE 6	Tomcat 7	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Metadata Preprocessing	Siemens	x86-64	1	n.i.	4GB	n.i.	YES	1	Linux / Windows	C#	Mono / .Net	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	≥ Microsoft .Net 4.0	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Compressed domain video Analysis	Siemens	x86 or x86-64	1	n.i.	4GB	n.i.	YES	4	Linux / Windows xp	C++	Mongoose web server	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Publish/Subscribe Broker	Telecom Italia	n.i.	1	High Network Connectio n(1GB bandwidth)	2GB	50GB free space	YES	2	CentOS5 server	n.i.	JBoss	n.i.	n.i.	MySQL	n.i.	n.i.	n.i.	Java Se SDK	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Publish/Subscribe Broker (Orion)	TID	X86-64	1		8 GB	250 GB	YES	2	CentOS 6.3					MongoDB 2.2.3												
Media-Enhanced Query Broker	Siemens	x86	1	n.i.	4GB	n.i.	YES	2-4	Windows or Linux	Java	Tomcat	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	≥ JRE 1.7	Eclipse	Javadoc	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Semantic Annotation	Telecom Italia	n.i.	1	High Network Connectio n(1GB bandwidth)	16GB	1 TB free space	YES	2	Ubuntu or CentOS server	PHP	Tomcat	n.i.	n.i.	MySQL	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	DBpedia dataset	Virtuoso	Freeling	n.i.	n.i.	n.i.
Semantic Application Support	Atos	n.i.	1	n.i.	12GB	1 TB free space	YES	2	Ubuntu or CentOS server	n.i.	Tomcat and JBoss	n.i.	n.i.	SQL DB required	n.i.	Sesame and OWLIM	n.i.	Java JDK 1.6	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Location Platform	Thales		1		2 GB	80 GB	YES	2	Ubuntu 10.04 or Red Hat 5.3	Java JRE 6.0				MySQL Server and client version > 5.1.49												
Pub/Sub Semantic	Orange		1		12 GB	1 TB	YES	1	Ubuntu	Java				Virtuoso DBS		Sesame	n.i.	Java JDK								

Extension									Server							and OWLIM		1.6									
Network Information and Control (Altoclient)	Alcatel-Lucent Germany	n.i.	1	Yes (connection to external network info source)	400Kb min	270 Kb	YES	1	Linux	gcc	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i
Network Information and Control (VNEIC)	Alcatel-Lucent Italy	n.i.	1	Yes (connection to a private ip equipped with vmware hypervisor)	n.i.	n.i.	YES	1	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	Java JDK	n.i	n.i	n.i	n.i	n.i	n.i	Hypervisor Vmware	n.i	n.i
Network Information and Control (VNP)	NSN	n.i.	1	n.i.	n.i	n.i	YES	1	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i
Network Information and Control (OFNIC)	UNIROM A	X86	6		512 MB	512 MB	No	1	Debian 6.0.7	C++, Python	SNMP																
Service, Capability, Connectivity, and Control (S3C)	Jointly FOKUS (contact point), DT, Ericsson, Orange	n.i.	6	YES (network connections among them)	n.i.	n.i.	YES	1	n.i.	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i
Context-based security and compliance (PRRS)	Atos	x86	1	n.i.	512 MB	2 GB	YES	1	GNU Linux i686, Ubuntu server 12.04 LTS	Java	Tomcat	n.i	n.i	MySQL	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i
Data Handling (PPL)	SAP	x86	1	n.i.	2 GB	1 GB	YES	1	Windows	Java	Tomcat	n.i	n.i	MySQL	Groovy	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i
DB Anonimisation	SAP	n.i.	1	n.i.	2 GB	3 GB	YES	1	n.i.	Java	Tomcat	n.i	n.i	MySQL	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i
Security Service Storage	Thales	n.i.	1	n.i.	n.i.	n.i.	YES	1	Linux	n.i.	Tomcat 6	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	Java JRE	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Security Monitoring	Thales	n.i.	1	n.i.	n.i.	n.i.	YES	1	n.i.	n.i.	Required	n.i	n.i	MySQL	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i	n.i
Security Monitoring GE / Service Level SIEM	Atos				4 GB			2	Linux Debian or Ubuntu																		

Table 1 - Testbed hw/sw requirements table

