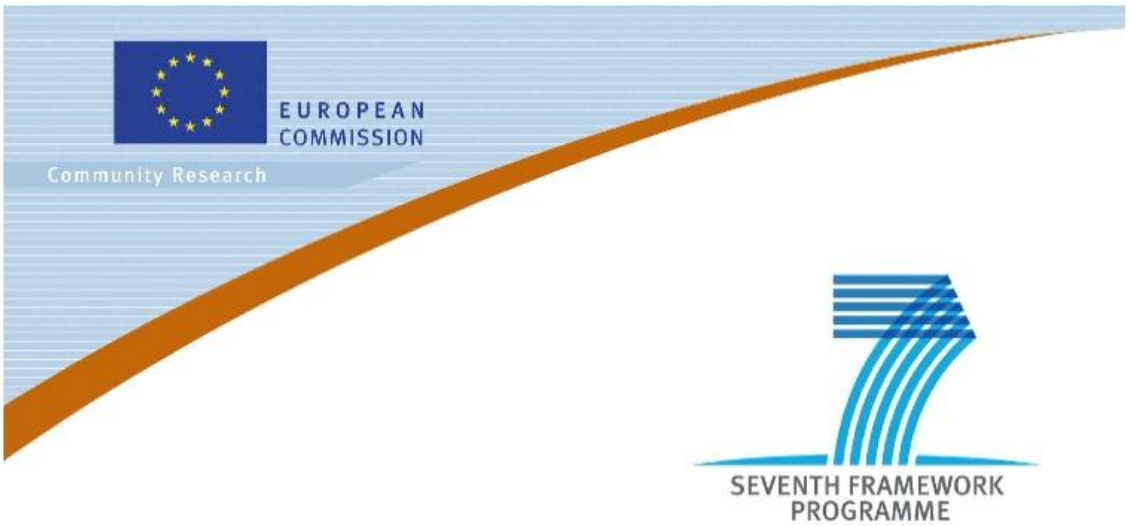

Private Public Partnership Project (PPP)

Large-scale Integrated Project (IP)

D10.2.a: FI-WARE Testbed (available to Use-case projects) report

Project acronym: FI-WARE

Project full title: Future Internet Core Platform

Contract No.: 285248

Strategic Objective: FI.ICT-2011.1.7 Technology foundation: Future Internet Core Platform

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Deliverable Type and Security: PP

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1 Introduction

1.1 Executive Summary

A main aspect of the FI-WARE project is the deployment, but also execution and operation of the FI-WARE technologies in a suitable testbed. However, the project DoW does not allocate specific budget for the acquisition of dedicated hardware for such a testbed. In this context, one of the first and more compelling challenges of the project management was to find a suitable arrangement to host the FI-WARE testbed on a suitable location at the lowest possible cost still guaranteeing high availability standards. Red.es, the National Research and Education Network (NREN) in Spain, expressed their interest to play a significant role in the Future Internet and thus offered to supply for free facilities and resources to host the FI-WARE Testbed in their datacenter. They acquired such resources through a public RFQ that was adapted to FI-WARE's needs. Part of the costs of the hardware will be covered by Regional Funds (FEDER). One additional challenge was reducing the impact of the delay caused by the public RFQ to purchase the infrastructure at Red.es. This was tackled by using contingency servers provided by Red.es on a provisional basis.

There are plans to further extend the datacenter and exploit it for complementary uses that are clearly synergic with FI-WARE (initiatives mostly related to Smart Cities). These will shape up over time and several cities have expressed interest in taking part as Malaga and Seville.

The Generic Enablers (GEs) deployed in the FI-WARE testbed have been progressively made available to Use-Case projects from the 9th of August 2012 on in order to enable their integration tasks as soon as possible.

Thanks to these efforts - that also included to work on a seamless provisional solution- most UCs have had the opportunity to build more accurate designs for their FI-PPP Phase II proposals. Additionally, this has been key in the integration of FI-WARE GEs in actual forthcoming experiments, such as the SafeCity proof-of-concept scheduled on the night from November 29th to November 30th in a railway tunnel in Stockholm.

However, this report is delivered once all testbed facilities are stable and in place in the final setting. It also includes unforeseen facilities addressing UCs issues.

The FI-WARE GEs instances available at any time in the FI-WARE testbed are listed in the so-called FI-WARE Catalogue (http://catalogue.fi-ware.eu)

1.2 About This Document

The deliverable D10.2 FI-WARE Testbed (available to Use Case projects) is of nature "P" (P = Prototype); however this accompanying report is private to be able to provide all the internal details of the testbed that are relevant to this report.

1.3 Intended Audience

The document targets the EC and reviewers appointed by them in order to provide an orderly account of the deployment of the FI-WARE Testbed.

1.4 Keyword list

Tesbed, Innovation, Exploitation, Sustainability, Future Internet, Red.es, Smartcities, FI-WARE, I2ND, Cloud, Internet of Things Services Enablement, Data/Context Management, Applications/Services Ecosystem and Delivery Framework , Security, Developers Community and Tools.

1.5 Changes History

Release	Major changes description	Date	Editor
V1	First draft of deliverable submission	2012-11-07	TID
V2	Final version for deliverable submission	2012-11-12	TID, ENG

2 Overview

2.1 Functionality outline

The FI-WARE testbed is the facility provided by the FI-WARE project to Use Case projects where instances of FI-WARE core-platform GEs are installed, up and running and available to be accessed by upper-layer services.

The spirit of the tesbed is to be useful for all UCs and third parties and therefore minimize the impact of intermediate upgrades and issues and take care of their needs and feedback whenever possible.

This infrastructure is expected to be opened to other third parties beyond the FI-PPP once the FI-WARE Second Release is available. Then, it will constitute the backbone of the so called FI-WARE Open Innovation Lab. The knowledge, experience and improvements in the infrastructure and procedures previously performed with the UCs are crucial for the success of this ambitious goal. Red.es has also anticipated their plans to extend their original investment in the infrastructure in order to better the deployment of and support to the FI-WARE Open Innovation Lab.

2.2 Timeline

The FIWARE testbed availability was initially planned for July 2012 and the first set of Relase1 GEs was delivered on the 9th of August 2012 due to delays in the software development tasks.

Initially, the GE instances where deployed in virtual machines of a provisional infrastructure at Red.es (Spanish NREN) to avoid further delays.

The concrete dates and announcements of GE availability can be summarized as follows. Entries in the table follow the convention "<Name of GE> - <name of implementation product>". Some of the implementation products have not been assigned a name yet by their respective owners:

Date	**Involved GEs**
9/08/2012	Mediator – Mediator_TI Marketplace BigData Analysis - SAMSON Location Server - LOCS DB anonymizer
23/08/2012	Application Mashup - WireCloud Service Mashup - Mashup Factory Complex Event Processing - PROTON Security Data Handling Semantic Application Support
03/09/2012	Domain Compressed Video Analysis (former Multimedia

	Analysis) - Codoan Light Semantic Compositor Editor - COMPEL Things Management Identity Management – DT GCP Identity Management – One-IdM Cloud Proxy
30/10/2012	Security Monitoring - Service Level SIEM (SLS) and MulVAL Attack Paths Engine IoT Gateway Device Management - Ericsson's Gateway IoT Gateway Data Handling - Esper4FastData Pub/Sub Context Broker - TI Context Awareness Platform Semantic Anotation - SANr Media-enhanced Query Broker Cloud Hosting related GEs (available through http://cloud.lab.fi-ware.eu): • IaaS Data Center Resource Management • Object Storage • IaaS Service Management
12/11/2012	Pub/Sub Context Broker – Samson Context Broker

The testbed will be available until the end of the FI-WARE project and the GEs will be upgraded continuously and specially at the FI-WARE future major releases (Release 2 on Apr 2013 and Release 3 on January 2014).

The testbed will be opened up to third parties beyond the FI-PPP and then renamed to "FI-WARE Open Innovation Lab" once the Second Release of FI-WARE is made available.

2.3 Conditions to publish FI-WARE GEs instances

All GEs are made available and searchable through the FI-WARE Catalogue (online at http://catalogue.fi-ware.eu). All the GE implementation in the catalogue fulfill the following requirements and conditions:

- All documents are in place and reviewed by the project technical coordination (WP2). This includes open specifications, APIs descriptions, installation manual and user-guides.
- The software is available in the tesbed and healthily up and running. To ensure this status the testbed team independently verifies the sanity checks provided by the GE owner.
- The GE is properly documented on the online catalogue, adhering to the common format defined for the catalogue entries

Once the GEs are published, their availability is announced to members of the FI-PPP and members of the FI-PPP AB by means of sending an email to all@fi-ppp.eu and ab@fi-ppp.eu, respectively. It is also announced in the website and through associated social networks.

3 Testbed Architecture and Procedures

3.1 Testbed Facilities and Connectivity

The FI-WARE testbed is physically deployed at RedIRIS premises in Seville (Spain). RedIRIS belongs to Red.es public company and is the Spanish NREN (National Research and Educational Network) offering 10Gbps links and connected with GEANT2 pan-european network.

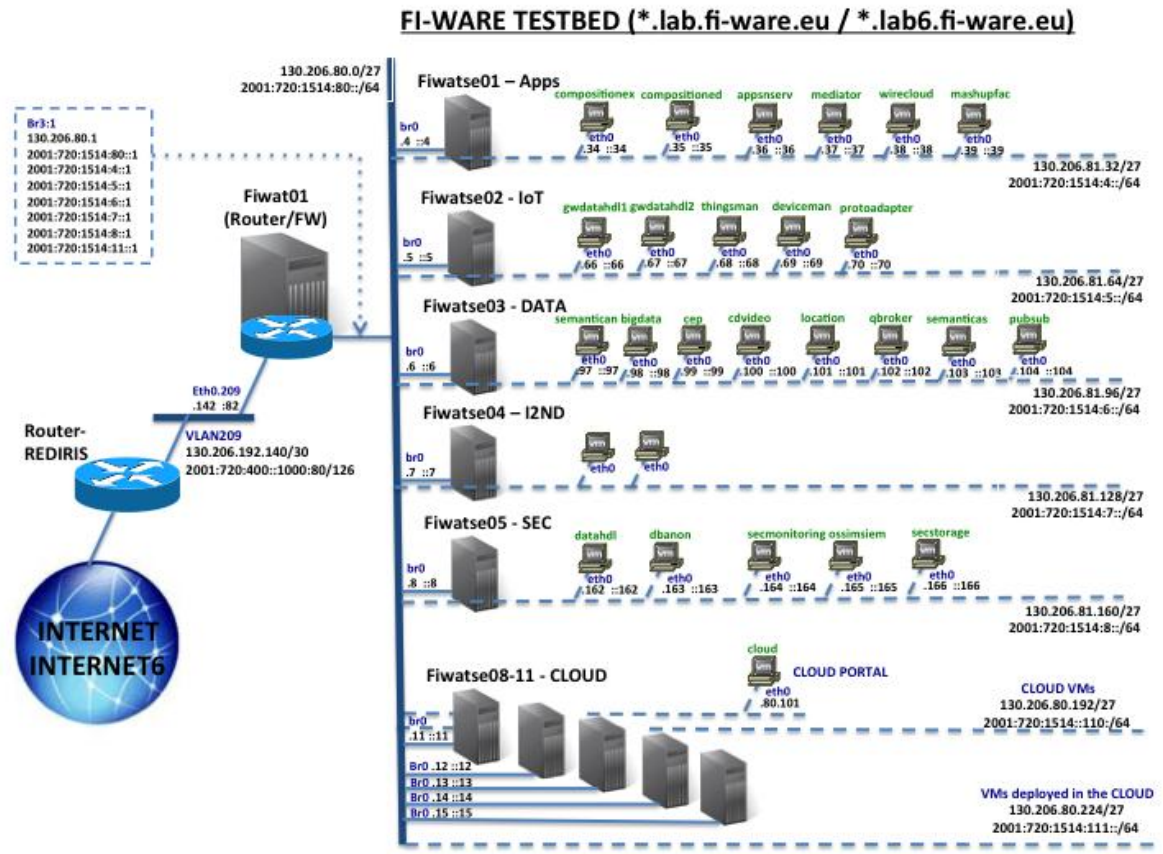
This way, the FI-WARE datacenter is connected to the Internet and the European research networks in a carrier-grade fashion and providing 24/7 maintenance and support.

The FI-WARE testbed is mainly a datacenter located in the above-described facilities and consisting in powerful machines and network components valued in up to 200 K€ investment fully provided by Red.es. As mentioned earlier, Red.es has announced their plan to extend this investment up to additional 1M€, probably expanding the infrastructure to additional nodes located both in Seville and Málaga (Spain).

3.2 Testbed Diagram

The following diagram shows the actual implementation of the FI-WARE testbed as of November 2012.

There exist several physical machines, normally one per FI-WARE chapter, where virtual machines for each the GEs have been implemented. Normally, each GE owner is assigned one independent VM for its GE instance, although they are free to run several instances in the same VM, for instance whenever UCs requirements demand separate ones.



FI-WARE Networking Diagram as of November 2012

(Confidential. Do NOT distribute)

3.3 Testbed Standard Procedures

3.3.1 Procedure1: Access from UCs networks

UCs have been requested to identify people as testbed related tasks caretakers.

These UCs caretakers have been entitled to identify and group all the IP address-ranges incoming connections from their partners and provide them in simple mail requests to the FI-WARE testbed team at Telefónica I+D that, then configure in turn the general network firewall.

Special requests for demos are handled as long as the final architecture will provide automatic configuration and secured-session access to GEs.

3.3.2 Procedure2: Installation of UCs software components

This possibility is available since October 2012, once the Cloud services of FI-WARE were in place.

UCs are provided with a Cloud portal where requests for VMs are located. Once the UCs have their VMs they can install and run components in the same FI-WARE testbed infrastructure.

4 Testbed Additional Facilities and Services

4.1 Tesbed DNS Domain and Service

In order to make life easier to testers at the UCs, a DNS domain and services have been established for the testbed.

This way, all virtual machines and GEs are configured in the domain "*.lab.fi-ware.eu", as indicated in the Testbed architecture diagram included

4.2 Access from Restricted Networks

Some UCs are not accessing from Laboratories but regular corporate infrastructures that use proxies to connect to the Internet.

As a result, these potential users cannot access RESTful services and/or APIs beyond the standard ports 80 (WEB or HTTP) and 443 (Secured WEB or HTTPs) and they have requested FI-WARE APIs to be deployed over those well-known ports.

However, some GEs are not able to fix this as requested for various reasons:

- Some GEs, use different ports to serve various UCs. The option of using different instances in separate virtual machines would mean to multiply the GE instance maintenance efforts, future upgrades, etc.
- For security reasons, some GEs prefer to avoid running as root user and use ports above 1024. Changing this at this point would mean to change the security approach impacting how the code is designed and developed.

Taking into account the facts described above, the solution finally adopted is twofold:

- All GEs able to migrate to the standards ports have done so.
- For the remaining GEs, we have enabled a reverse proxy and a new DNS name for those GEs that will be used only for users coming from restricted networks.

  This solution is suitable and effortless for both GE owners (the proxy and the DNS entry is managed by the testbed team) and the UCs accessing from restricted networks (they will just access a new URL published in the GE section in the catalogue for them).

The new URLs for the proxy access are provided in the "*.labproxy.fi-ware.eu" domain. This way, to access the CEP (IBM Complex Event Processing) this kind of users will access "http://cep.labproxy.fi-ware.eu" instead of "http://cep.lab.fi-ware.eu:8080".

4.3 IPv6 Readiness

4.3.1 FI-WARE IPv6 support and connectivity

FI-WARE Datacenter is deployed in the Seville premises of RedIRIS, the Spanish NREN offering both IPv4 and IPv6 native connectivity services. RedIRIS owns an outstanding access to the Internet6 including connection in relevant IX points and to the GEANT2 IPv6 infrastructure.

As shown in the architecture diagram before, all subnetworks, physical hosts and virtual machines in the FI-WARE testbed have been addressed with IPv6 and routed to the global IPv6 networks (i.e. the Internet6 or IPv6-Internet).

4.3.2 How we are providing IPv6-capable GEs

The main feature of FI-WARE testbed is not to provide IPv6-ready virtual machines to GE owners or UCs software components, but to make FI-WARE GEs accessible in the IPv6-Internet.

A major issue is that most available GEs solely expose HTTP RESTful APIs over IPv4 at this point.

In order to solve this and provide and seamless solution for GE owners, we have adopted a reverse-proxy and DNS strategy similar to the previous section and similar to the strategy of Facebook, Google and many other content providers for the "World IPv6 Day" in 2011.

Basically, GEs keep on running natively on IPv4 and the testbed team has configured a reverse-proxy translating HTTP/TCP/IPv4 queries/responses into HTTP/TCP/IPv6 ones. Additionally, the domain "*.lab6.fi-ware.eu" has been configured.

Whenever an external party makes an HTTP request over IPv6 it actually hits the proxy server that handles the communication over IPv4 to the actual GE in the backend.

External users can this way access to the REST APIs of the GEs over IPv6 and, at the same time, GE owners can handle the transition in a longer period. Whenever a GE will support IPv6, the DNS entry will be redirected to the GE itself, instead of the proxy.

4.3.3 Who is interested in FI-WARE IPv6-readyness and what are the benefits

Thanks to the service described above, FI-WARE core-platform is one of the first -if not the very first one- solutions to build Future Internet services with existing components for Applications, IoT, Data/Context management, Security, Cloud and I2ND.

The IPv6 Forum and other EU projects dealing with IPv6 specifics have already shown interest right after the announcement of this possibility in the context of the IPv6 World Conference organized in Amsterdam (June 27th 2012).

4.3.4 Status of IPv6 Deployment

2012 has been the year of the actual worldwide IPv6 deployment involving most of the main Internet content providers, the US relevant operators/ISPs and some other ISPs elsewhere.

This all has occurred mainly thanks to the ISOC-organized "World IPv6 Launch Event" where many content providers committed to offer their contents in the Internet6 (IPv6 Internet) too and some ISPs committed to make deployments and surpass the threshold of 1% traffic.

The fact today (Nov 2012) is that almost the forth part of the most accessed web contents are offered both in IPv4 and IPv6. Sites like Google, Youtube, Facebook, Yahoo and the Wikipedia offer their contents in the Internet6 too.

Regarding end-customers, Comcast has announced in November 23rd 2012 the availability of IPv6, including IPv6-capable cable-modems- for the 50% of their 18 Million customers in the US. AT&T and Verizon are also known to have launched massive deployments in the US while in Europe, operators like Free in France have also started.

For smartphones, the absolute leader today is the T-Mobile USA IPv6-only service covering 100% of their operations in the US and leveraging on Google Android OS in Samsung and LG Nexus devices.