Deliverable D300.6

Final version of the Hosting Environment

WP 300

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The FIspace Project

Leveraging on outcomes of two complementary Phase 1 use case projects (FInest & SmartAgriFood), aim of FIspace is to pioneer towards fundamental changes on how collaborative business networks will work in future. FIspace will develop a multi-domain Business Collaboration Space (short: FIspace) that employs FI technologies for enabling seamless collaboration in open, cross-organizational business networks, establish eight working Experimentation Sites in Europe where Pilot Applications are tested in Early Trials for Agri-Food, Transport & Logistics and prepare for industrial uptake by engaging with players & associations from relevant industry sectors and IT industry.

Project Summary

As a use case project in Phase 2 of the FI PPP, FIspace aims at developing and validating novel Future-Internet-enabled solutions to address the pressing challenges arising in collaborative business networks, focussing on use cases from the Agri-Food, Transport and Logistics industries. FIspace will focus on exploiting, incorporating and validating the Generic Enablers provided by the FI PPP Core Platform with the aim of realising an extensible collaboration service for business networks together with a set of innovative test applications that allow for radical improvements in how networked businesses can work in the future. Those solutions will be demonstrated and tested through early trials on experimentation sites across Europe. The project results will be open to the FI PPP program and the general public, and the pro-active engagement of larger user communities and external solution providers will foster innovation and industrial uptake planned for Phase 3 of the FI PPP.

Project Consortium

- DLO; Netherlands
- ATB Bremen; Germany
- IBM; Israel
- KocSistem; Turkey
- Aston University; United Kingdom
- ENoLL; Belgium
- KTBL; Germany
- NKUA; Greece
- Wageningen University; Netherlands
- PlusFresc; Spain
- FloriCode; Netherlands
- Kverneland; Netherlands
- North Sea Container Line; Norway
- LimeTri; Netherlands
- BO-MO; Slovenia
- MOBICS; Greece
- Fraunhofer IML; Germany
- Q-ray; Netherlands
- FINCONS; Italy
- Kühne + Nagel; Switzerland
- University Duisburg Essen; Germany
- ATOS; Spain
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- CentMa; Germany
- iMinds; Belgium
- Marintek; Norway
- University Politecnica Madrid; Spain
- Arcelik; Turkey
- EuroPoolSystem; Germany
- GS1 Germany; Germany
- Mieloo & Alexander; Netherlands
- OPEKEPE; Greece
- Innovators; Greece
- CIT; Spain
- SDZ; Germany
- Snoopmedia; Germany
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Dissemination Level

PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Document Summary

This report describes the second version of the FIspace hosting environment. The Cloud architecture is based on OpenStack architecture used by FIWARE. This Infrastructure as a Service (IaaS) is the platform where components developed in WP200 and Use cases (WP400) are deployed and executed. Each workpackage has different domain on the Infrastructure. The admin of the projects can create members to manage Virtual Machines. Upon a request, any developer can be added to the projects to manage their virtual machines. The document provides details on the architecture, security, login procedures, and operational support provided by KocSistem.

Abbreviations

API	application programming interface
FI PPP	Future Internet Public Private Partnership
GE	Generic Enablers
GUI	graphical user interface
http	Hypertext Transfer Protocol
IaaS	Infrastructure as a Service
ICT	Information and Communication Technology
IDM	Identity Management
IP	Intellectual Property
MOS	Market Operations Service
RAM	Random-Access Memory
RTD	Research and Technological Development
Ssh	Secure Shell
SSL	Secure Sockets Layer
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
VPN	Virtual Private Network
WP	Work Package

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1 Hosting environment and GE integration

This document provides the system and support of Hosting Infrastructure of FIspace and GE integration to supply cloud platform in order to run the software developed WP200 (FIspace Modules), as well as the Apps as developed as part of the use case trials defined in WP400. By using OpenStack architecture for the cloud infrastructure, module owners will have an option to deploy their virtual servers to new cloud environment in case of migration, and will also support to hosting and integration of necessary FIWARE Generic Enablers. FIspace Public instance(FIspace Test), which is used by Phase3 developers as a part of T350 Experimentation environment, is also hosted on top of this hosting infrastructure.

Architecture design and requirements of the cloud hosting environment is based on three major setups

1- Cloud Infrastructure Setup

2- Network and Security Infrastructure

3- Support

2 FIspace Hosting Environment

FIspace Hosting environment is running on openstack cloud platform. Firewall and SSL VPN appliances have been used to check access control mechanisms and provide network security for the development environment. All of the infrastructure details have been explained on D300.2 and user guide of the Cloud Platform.

2.1 Cloud Infrastructure

Each server has a capacity of 160 virtual machines up on required RAM, each node RAM capacity extendible up to 768 GB. 2x300GB internal storage of each node, external storage capacity is available via both NAS and SAN and will be provided upon request from module owners and deployed GE requirements.

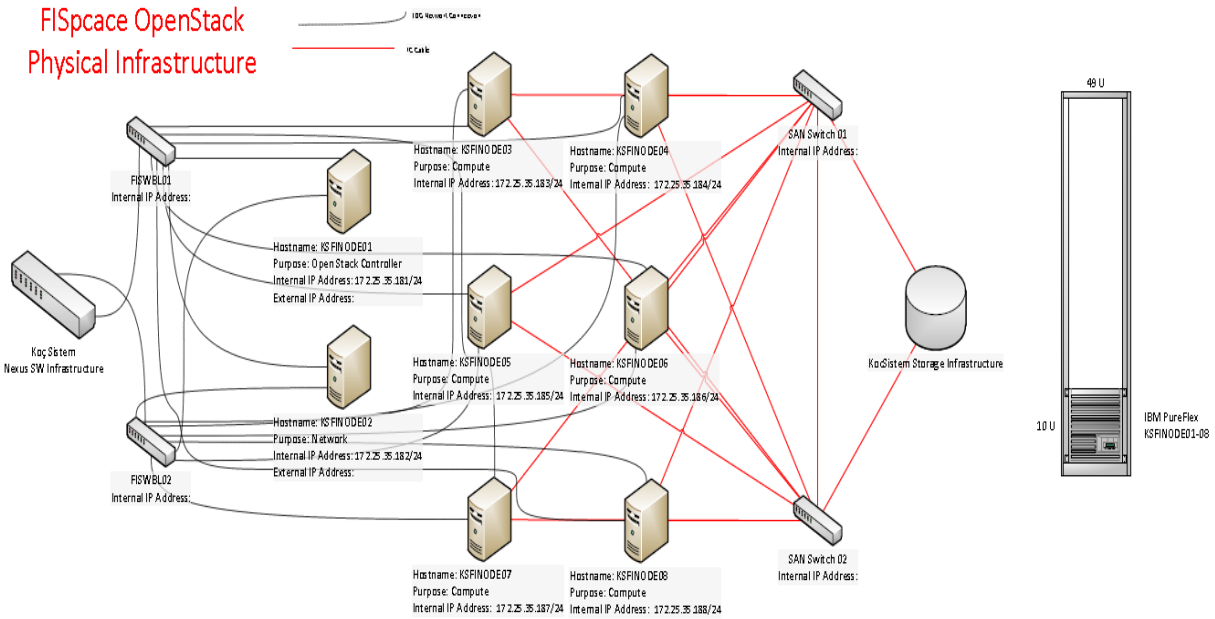
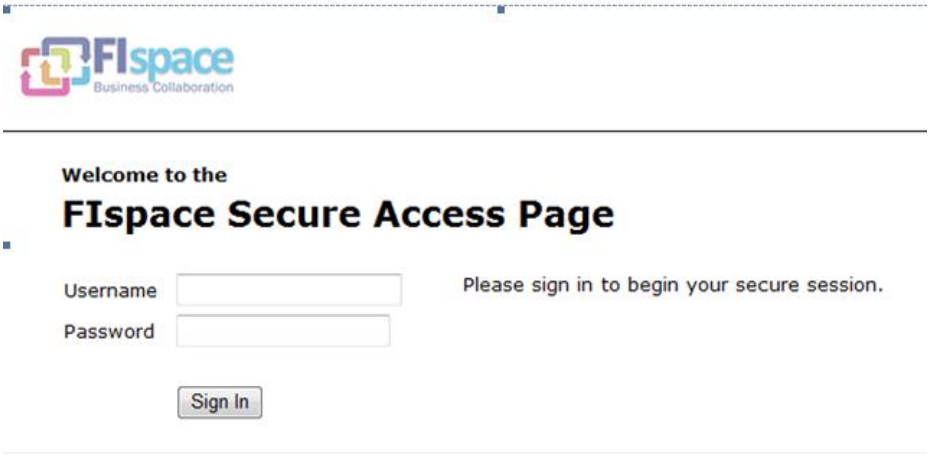


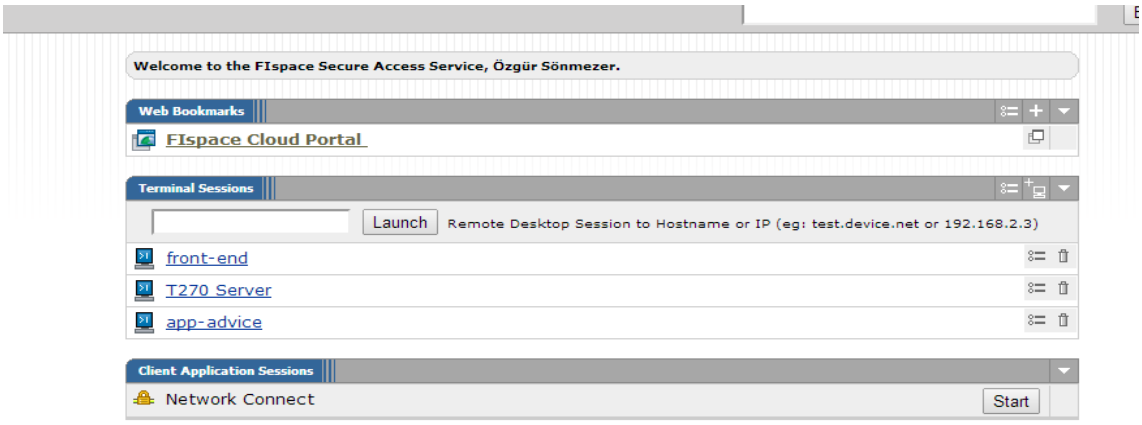
Figure 1: FIspace OpenStack Physical Infrastructure.

2.2 Access and Management of the Cloud Platform

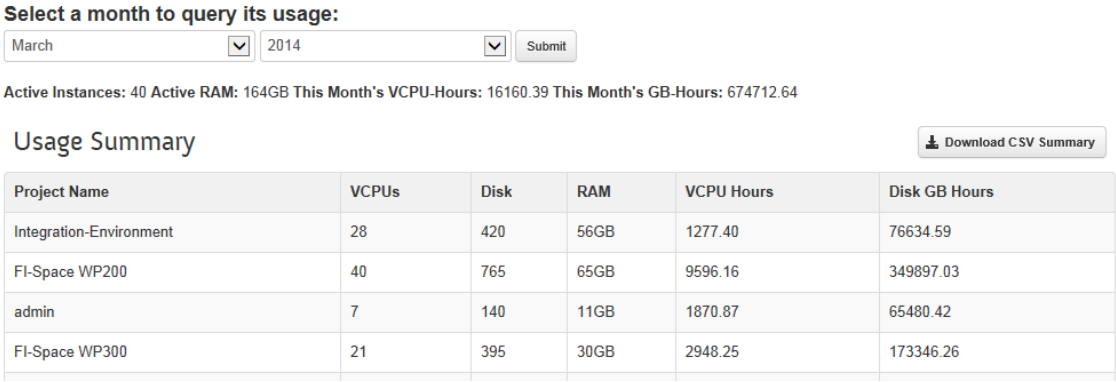


FIspace Developers logins to the secure access page of FIspace : https://vmvpn.kocsistem.com.tr/fispace

After Successful login, develpers can acces to 'FIspace Cloud Portal' link on the access page to manage Cloud Platform



After successful Login, Project overview screen appears with given permission.



Project Name	VCPUs	Disk	RAM	VCPU Hours	Disk GB Hours
Integration-Environment	28	420	56GB	1277.40	76634.59
FI-Space WP200	40	765	65GB	9596.16	349897.03
admin	7	140	11GB	1870.87	65480.42
FI-Space WP300	21	395	30GB	2948.25	173346.26

Currently FIspace Cloud Platform has 4 projects:

- FIspace WP200: Current Software Development Project. Currently there are 41 Virtual Machines. Primary Integration Environment(PIE) has been setup on this project. Details of the PIE including information about VMs and how to do the integration of these VMs can be found in https://bitbucket.org/fispace/core/wiki/Preliminary%20Integration%20Environment
  Global domain names are assigned for the servers that have interfaces to the outside of the platform.

- **Experimental Environment Project(EE):** Currently there are 13 Virtual Machines.
  Experimental Environment has been setup on this project. This environment hosts FIspace public instance(FIspace Test) which is the replica of a latest stable version of the integrated platform hosted on the integration environment. FIspace public instance, is part of EE which is used by Phase3 developers to conduct their tests on the instance, is depicted and detailed on D300.11. Details of the EE including information about VMs and available services can be found in below link:
  https://bitbucket.org/fispace/core/wiki/Experimentation%20Environment
  Global domain names are assigned for the servers that have interfaces to the outside of the platform. The procedures that are followed to do the integration to create the public instance can be found on D300.11

- **Integration Environment (IE)**: Integration Environment Project created on Openstack enviroment. Currently there are 8 Virtual Machines. This environment consist of FIspace platform which is a stable cycle of the PIE and will be used by open call partners for conducting their application tests with the platform. Details of the IE including information about VMs and how to do the integration of these VMs can be found in below link:
  https://bitbucket.org/fispace/core/wiki/Integration%20Environment
  Global domain names are assigned for the servers that have interfaces to the outside of the platform.

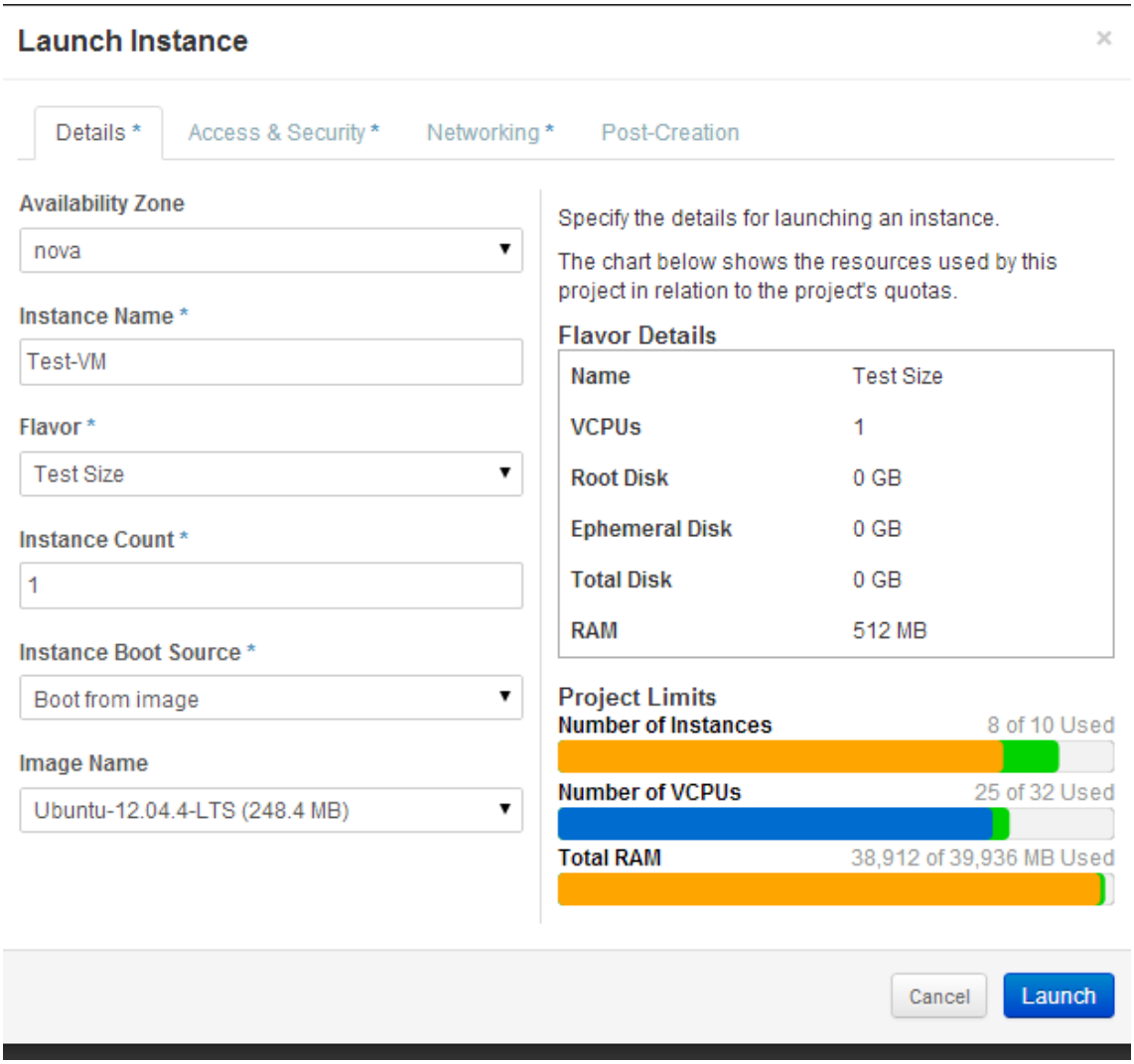
- **Contingency Enviroment (CE):** This environment is used as a contingency environment in case of any failure or outages occurs on the hosting infrastructure which is controlled by Openstack, or in the cloud computing software itself. This environment is hosted on separate physical infrastructure and with the different cloud computing software that is VMware. Any module servers of the specific environment or the platform instances of PIE,IE,EE can be hosted on this environment in case of failure or the outage on the default hosting infrastructure.

- **Production Environment (PE)** : This is the Production Environment Project created on Openstack enviroment. Currently there is no VM in this environment since the development of the platform is going on with bug fixing activities to supporting phase3 developers. This environment is planned to consist of the latest release of the FIspace platform, as a future commercial platform,which is to be used by the future potential customers.

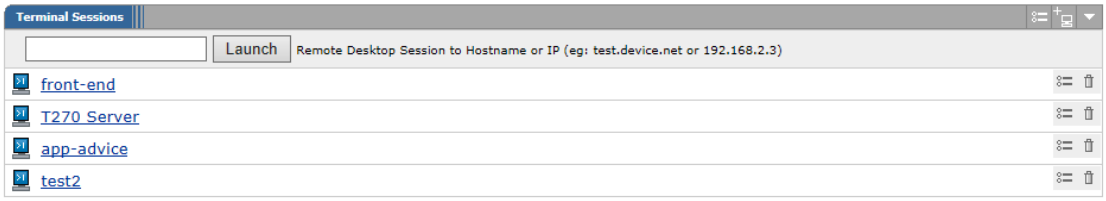
Each project, members can be assign to create virtual machines and can be managed form secure access page. Most of the configurations has been predefined like ip subnet instance size, security groups and images of the operating systems and so on.

How to create a new VM in FIspace Openstack cloud environment can be found in the following link:

https://bitbucket.org/fispace/core/wiki/DevFaqCreateVM



Finally, terminal session to the servers can be manually configured by the developer on the Secure Access Portal. For example, if a Linux virtual machine is created, ssh terminal service can be defined with given parameters.



2.2.1 Monitoring of the Cloud platform

The health of FIspace cloud platform is currently monitored by monitoring each VM on different enviroments(PIE,EE). Zabbix network monitoring open source solution is used for the monitoring activities.In order to achieve this task, Zabbix agents are installed to each of the VMs resides on the environments that are hosted on FIspace cloud platform.Currently development environment(PIE) and public platform instance(EE) are monitored,other enviroments can also be monitored if requested.Monitoring data collected from agents and presented on the Zabbix controller servers that are also installed as a part of this task. Monitoring data can be used for optimization of virtual machines, health of the applications that are running on the VMS, alarms detection, alert creation

and checking the logs. In case of VM node, network or application module failures, alerts are sent to admins by default. Any other customized rules to monitor different data from Vms and specific alerts can be created by the module owner or admin in case of a request.

2.3 Network & Security Infrastructure

Internal and real IP addresses are defined as below. Private Network has been used for the internal communication of the software's and virtual machines. Floating IP addresses has been used for internet connections to the firewall. Finally static real IP addresses have been used to reach to the servers directly form internet with the defined ports and services like http, https, ssh and so on.

Private Network	172.32.101.0 / 24
Public Network	37.131.251.0 / 24

SSL VPN technology provides secure access to the servers and modules. In case of need to reach servers & applications directly through internet, real IP addresses will be used to the servers from public network pool. Otherwise, private ip address will be used for the modules & servers.

In Figure 2, Network & Security infrastructure are shown.

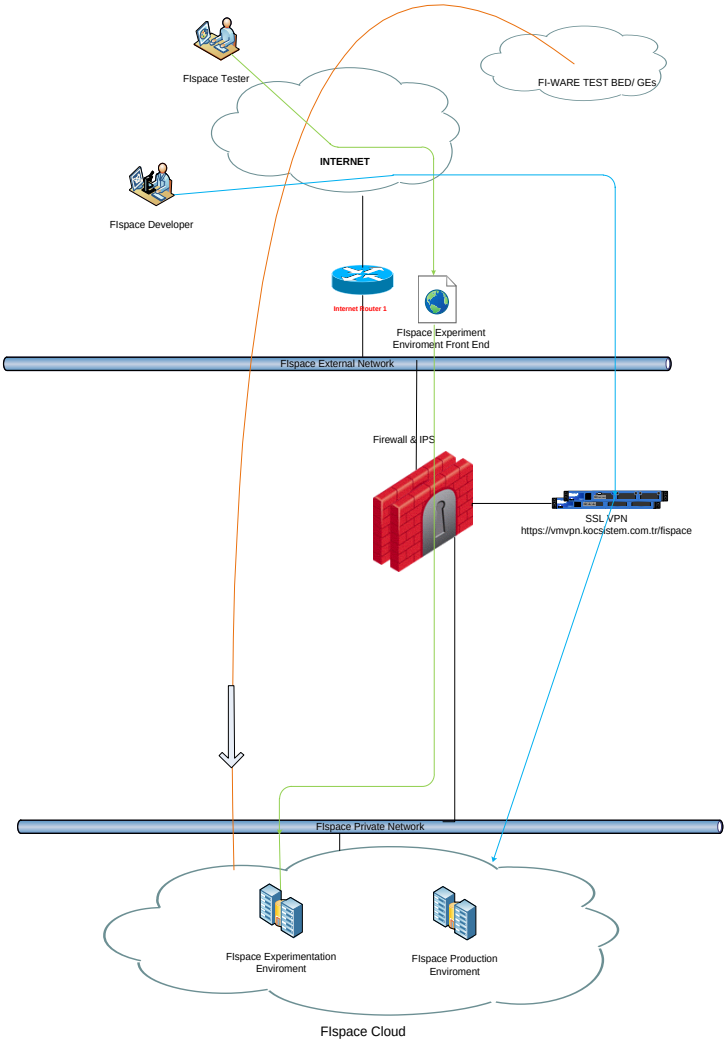


Figure 2: Network & Security infrastructure

Firewall and IPS will provide the secure infrastructure as well as access control to the systems. SSL VPN will provide to the secure access to the systems with user and role based. SSL VPN portal will be capable of to provide web bases access to the systems. In case of need of using IPsec vpn, it will be provided with a Java plugin to the client environment to provide TCP/UDP connections to the servers.

For secure access, SSL VPN will be used with address of https://vmvpn.kocsistem.com.tr/FIspace

For each project team, groups will be defined and for each team member user roles will be defined. Access policies will be defined based on user roles and groups.

Detailed information about FIspace Modules and planned to be used FIWARE GEs in FIspace infrastructure needs to be collected by WP300 team for planning the hosting infrastructure and creating the FIspace instance with proper integration of modules and GEs. FIspace Modules and FIWARE GEs inventory list is created by WP300 team in order to collect information including necessary hardware specs and operating environment for each FIspace modules and FIWARE GEs Inventory list is filled by WP200 and WP400 task leads and maintained by KocSistem.

FI-Space Modules and Applications inventory list contains the following items:

- Module or Application Name
- Operating System
- Network
- Considered as to be used GE and GE implementation
- Release/Version of the GE
- Tested / Contact person
- Important Links of GEs
- Applications / Platform
- Remote Access
- Internet Connection
- Resource Availability
- Acceptance Test of GE for the module
- Problems / Success with GEs

FIWARE GEs inventory list with its items can be found in section “2.4 FIWARE GEs Installations & Integrations”.

2.3.1 Secure Access Connection to the Infrastructure

Connection to the FIspace infrastructure based on Secure Access / SSL VPN technology Access and GUI Settings are explained as below;

FIspace Project member list contains the user information including work package and task information that drives to access policies to the FIspace infrastructure. For example, developer and a tester from WP200 will have different access rights to the same application or servers from FIspace platform. User and developer information for the secure access will be collected with the following items:

- User Name / Family Name
- User full email address
- User WP / Task
- User Modules / GEs / Applications to connect
- User Role
- Remote Access Applications
- Comments

2.4 Advanced Integration of FIWARE GEs

FIspace cloud infrastructure has been set up to provide running environment for FIpsace applications and FIWARE GEs . Some of the GEs has been installed on cloud infrastructure and some FIspace applications has been integrated with FIWARE GEs that has been installed out of the FIspace cloud. Necessary applications, operating systems and platform information have been collected and setup. Integration and Installation of exploited GE process is explained below:

Installation of GEs

- Assumed that setup files /codes from FIWARE has been provided
- Installation of GE with GE expert from WP200 or WP400

Integration of GEs

- Assumed that integration information has been provided from FIWARE
- Integration will be setup with FIWARE GE developers, FIspace GE expert.

FIWARE GEs inventory list contains following the items and has been used for the GEs deployment and integrations

- GE name
- GE's Release
- Operating System
- Applications / Platform
- Network
- GE Sources
- Remote Service Access
- API Specification
- GE's FIWARE test bed information
- Resource Availability
- GE/Server Location
- Integration
- Related WP / Task
- WP / Task lead
- FIWARE Links
- Comments

The GE inventory List available at the time of writing (with selected items) is shown in the Table 1 below (this list will be continuously updated during the course of the project).

Table 1: GE inventory List

GE Name	Hosting Environment	Applications Platform	FIspace Integration
Marketplace	NKUA	java 1.6	Connected with Marketplace Operations Service (MOS) ,W-Store.
IDM GE	FIWARE	N/A	Integrated with LPA
Access Control GE	FIWARE	JDK 6 and 7, Glassfish Server 3.1.2 or later, OpenDJ 2.5-Xpress1 or later	Integrated with IDM GE and LPA
Repository GE	NKUA	MongoDB 2.x - mandatory Java 1.6.x - mandatory Application Server, Apache Tomcat 6.x - mandatory Repository Software - mandatory Mongo Shell - optional	Connected with Marketplace Operations Service(MOS) and Wstore GE

GE Name	Hosting Environment	Applications Platform	FIspace Integration
Store - WStore GE	FIspace Cloud	A Web Server (i.e Apache) MongoDB Python 2.5, 2.6 or 2.7. Python 3 and other versions are not supported. Django nonrel 1.3 or 1.4 djangotoolbox django_mongodb_engine lxml rdflib 3.2.0+ rdflib-jsonld Pymongo Pylucene paypalpy django-crontab wkpdf2html	Connected with Store component(T230), Marketplace GE,Repository GE and Wirecloud
Wirecloud Application Mashup GE	FIspace Cloud	Python 2.7 pip 1.4.1 Apache 2.x MySQL 5.x	Integrated with Store and FIspace Front End
Complex Event Processing GE	FIspace Cloud	Java SE 6 or later Apache Tomcat 7	Integrated with-FIspace B2B component

3 Support

First level support of Hosting environment, GE integrations and deployment will be done by KocSistem experts. Second and third level support responsible will be GE owners from FIWARE via escalation method from FIWARE Fusion Forge support and ticketing portal. Same holds for FIspace modules and Apps, the support for which is delegated to the respected product owners of the modules and Apps.

Wp320_support@kocsistem.com.tr mail address bas been used to open a ticket directly to responsible engineer in the organization and/or his/her backup to make immediate response to support request. IBM RTC, the developer tool of choice in the project, will be used to issue tickets

SLA of support has been shown on table:

Table 2: SLA of support

SLA	Via	Level
5x8 and/or 7x12 depend of Task Leader's requirements and Project Management Board approval.	Mail / Phone / Skype	First Level -KocSistem

4 Conclusion and Future Work

As D300.5 is concerned with providing an OpenStack based hosting environment, FIspace module integration with associated FIWARE GE integration. Integration activities have been done for the EE environment and necessary support have been given for each module that resides on PIE,IE and EE by working with WP200 partners and FIWARE GE owners. This report describes the third version of the hosting Infrastructure, including cloud and network architecture. This infrastructure executes the software developed in WP200, the use case trials defined in WP400 and Experimental Environment from WP300. D300.5 has also presented status of integration activities of FIWARE GEs to the software developed in WP200.

The changes have been done to the hosting environment can be outlined as below:

- Two DNS servers installed in Openstack, one is dedicated to EE and the other servs to IE,PIE and PE.
- Cloud-init scripts created for the automatic network configuration of instances when they are created.
- IE VM snapshots created for each module and for each development cycle
- Disk drives added for supporting increased number of snapshots and VM requirments.
- Integration of the modules for the generation of EE was completed to create the replica of IE.
- Agents are installed to all the VMs hosted in each enviroment to enable monitoring activities via monitoring servers.

The Cloud architecture is based on OpenStack architecture used by FIWARE where OpenStack development has been supported by FIspace ICT project partners. Each workpackage has different domain on the Infrastructure. Admin of the projects can create members to manage Virtual Machines. Upon on a request, any developer can be added to the projects to manage their virtual machines.

Planned Network, Security Infrastructure and storage capacity of the Cloud Architecture is extendable in case of need of reel / private IP addresses, increase of internet connection bandwidth and increase storage capacity.

All the VMs created on the hosting infrastructure is monitored on network level and application level and alerts are sent to predefined administrators and VM module owners when outage or failure occurs.

Developers, testers and/or users from each work packages will connect to the Cloud Architecture securely with appropriate rights by using SSL/VPN technologies. Firewall and IPS technologies will provided by the security of FIspace Cloud Architecture.

First level Support has been handled by KocSistem experts related with Cloud Architecture and Fispace modules in each environment (IE,PIE,CE and EE). Second and third level support of the GEs will be escalated to FIWARE developers by using FIWARE Fusion Forge support and ticketing portal.

FIspace

Business Collaboration