FI content

D3.2

PLATFORM AVAILABLE FOR USER TEST 1ST ITERATION

March 2014

ABSTRACT

This document is a technical description of the "Smart City Platform" (1st iteration).

This document is a deliverable of the FI-CONTENT 2 integrated project supported by the European Commission under its FP7 research funding programme, and contributes to the FI-PPP (Future Internet Public Private Partnership) initiative.

SEVENTH FRAMEWORK PROGRAMME

FUTURE INTERNET PPP

DISCLAIMER

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EXECUTIVE SUMMARY

This document aims to technically describe the “Smart City Guide” platform (SCG). The “Smart City Guide” (SCG) platform is a portfolio of functions, designed to foster the development and uptake of smart of city applications based on future internet technologies. This portfolio consists of a set of technical functionalities provided by specific enablers (from FI-CONTENT) and generic enablers (FI-WARE).

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES

ABBREVIATIONS

API	Application Programming Interface
AR	Augmented Reality
FTP	File Transfer Protocol
GE	Generic Enabler
HTTP	HyperText Transfer Protocol
IMS	IP Multimedia Subsystem
LAN	Local Area Network
POI	Point Of Interest
QoS	Quality of Service
QoE	Quality of Experience
R1	Release 1 of the Smart City Guide Platform (available in September-October 2013)
R2	Release 2 of the Smart City Guide Platform (available in June.2014)
R3	Release 3 of the Smart City Guide Platform (available in March 2015)
SE	Specific Enabler
SCG	Smart City Guide
SDK	Software Development Kit
TCP	Transmission Control Protocol
UML	Unified Modeling Language
WAN	Wide Area Network
XML	Extensible Markup Language

1 - INTRODUCTION

1.1 - Overview

The Smart City Platform is a portfolio of functions, designed to foster the development and uptake of smart city applications based on future internet technologies.

This portfolio consists of a set of technical functionalities provided by Specific Enablers (from FI-CONTENT) and generic enablers (FI-WARE).

1.2 - Terminology

Term	Definition
Application or Application software	Software layered on top of one or several platforms for realizing some (presumably) useful tasks for end-users
Architecture	A structure of functional elements organized in a given way and presenting well defined interfaces
Capability	The ability of a component to satisfy a requirement
Conceptual Model	A set of view with written description of the organization of the FI-CONTENT infrastructure to offer services
Enabler Software	Module or web service providing well-specified functionalities, accessable and usable by application developers through clearly-described APIs (Application Programming Interfaces)
Experiment or Experimentation	Concrete test with actual users of one scenario in one of the experimentation sites in a given time frame
FI-WARE Tools	The tools put in place by FI-WARE to send requests for generic enablers are based on a backlog list in the frame of an agile methodology
Functional requirement	Either calculations, technical details, data manipulation, processing or other specific functionality that define what a system is supposed to accomplish
Generic Enabler	An enabler realized by the FI-WARE project or its follow up sustainability project
Platform	A comprehensive combination of technology infrastructure and - Generic and Specific - enablers capable to host and to support development of application software
Point of Interest	A POI is a place, an area or a journey (short distance) which are geolocated. For example: a place (a restaurant, etc.), an area: a public garden, a journey (a hiking trail, etc.). A POI has possibly features such as : static features (opening hours, address, name description, etc.), Dynamic features (price, menu, number of available places, the delay before the next bus, etc.), Event features (a beginning and an end)
Scenario	Description of foreseeable interactions of users with one or several applications
Specific Enabler	An enabler realized by the FI-CONTENT2 project. Specific Enablers may be layered on top of, or otherwise make use of, Generic Enablers. Please refer to the definition of a FIcontent SE from deliverable D6.1 Architecture specification

Term	Definition
Interface	The connections between domains (or sub domain or functional elements) serving the actor's actions by exchanging information
Interoperability	The capability of two or more networks, devices, applications to exchange and use information
Technology	A standard or industry specification that has the capabilities to address requirements

2 - SMART CITY PLATFORM ARCHITECTURE

The figure below shows the Smart City Platform high-level architecture, including the main scenarios (at the top) and their necessary Enablers (Generic and Specific). Generic Enablers (in green) are provided by FI-WARE and FI-Content Specific Enablers (in blue) are provided by FI-Content partners.

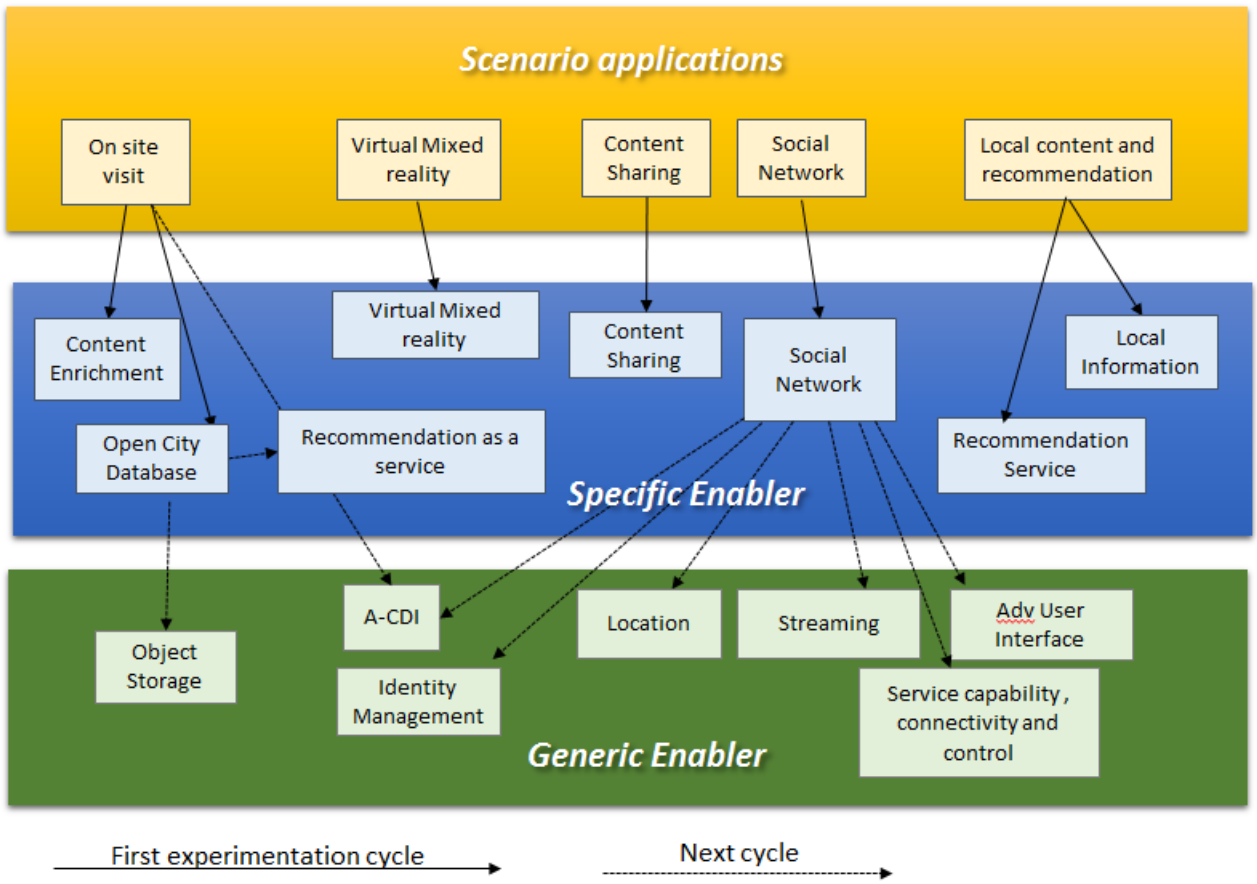

Figure 1 Smart City scenarios and corresponding Specific and Generic Enablers

2.1 - Architecture Description

For each scenario (note: all the scenario are fully described in Deliverable D3.1 - Functional Specifications release 1), this section gives details about the interfaces between the involved Enablers. The information is relative to the used interfaces (purpose, protocol, data).

2.1.1 - "Local Content and Recommendation" scenario

The Local Content and Recommendation scenario is implemented on the basis of Local Information SE and the Recommendation Services SE.

The figure below shows the integration of the Local Information SE [1], the Recommendation Services SE [2] and the Smart City Guide Android application.

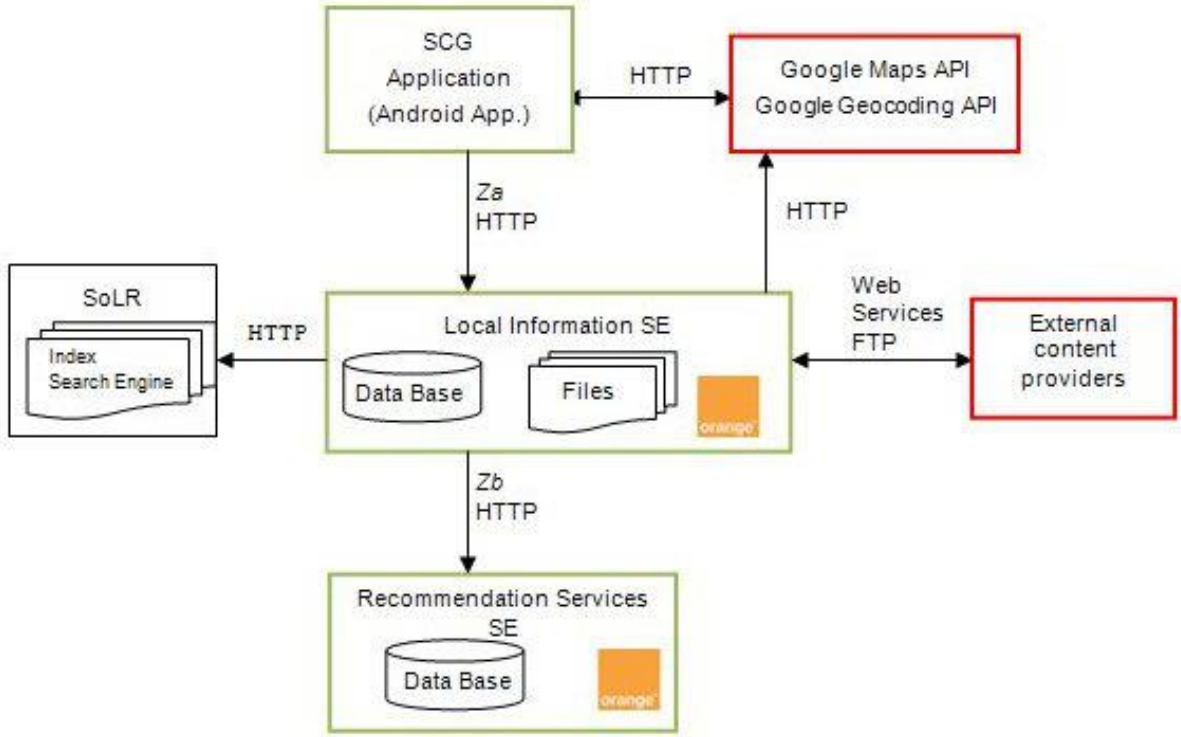

Figure 2 Architecture for the "Local Content and Recommendation" scenario

2.1.1.1 - Interface between SCG Application and Local Information SE (Za)

- Related Enablers: Smart City Guide Android Application, Local Information SE [1]
- Purpose: Accessing local content aggregated from multiple sources (open data, web sites, etc.), enriched with UGC: user profile management (creation, modification, deletion), creation of a POI (place or event)/ a route, search for a PIO/a route/an event, evaluation of a PIO /a route/an event, creation/modification/publication of UGC relative to a POI/a route
- Protocol: HTTP
- Description of data sent over this interface: User profile, POI, UGC

2.1.1.2 - Interface between SCG Local Information SE and Recommendation Services SE (Zb)

- Related Enablers: Local Information SE [1], Recommendation Services SE [2]
- Purpose: Recommendations to the user (content, POI, routes)
- Protocol: HTTP
- Description of data sent over this interface: User profile, Recommended content (content, POI, routes)

2.1.2 - "On site visit" scenario

For the first experimentation cycle the "on site visit" scenario was implemented on the basis of the Open City Database SE, Content Enrichment SE and Object Storage GE. For the next cycle of testing further enablers will be integrated as depicted in the figure below

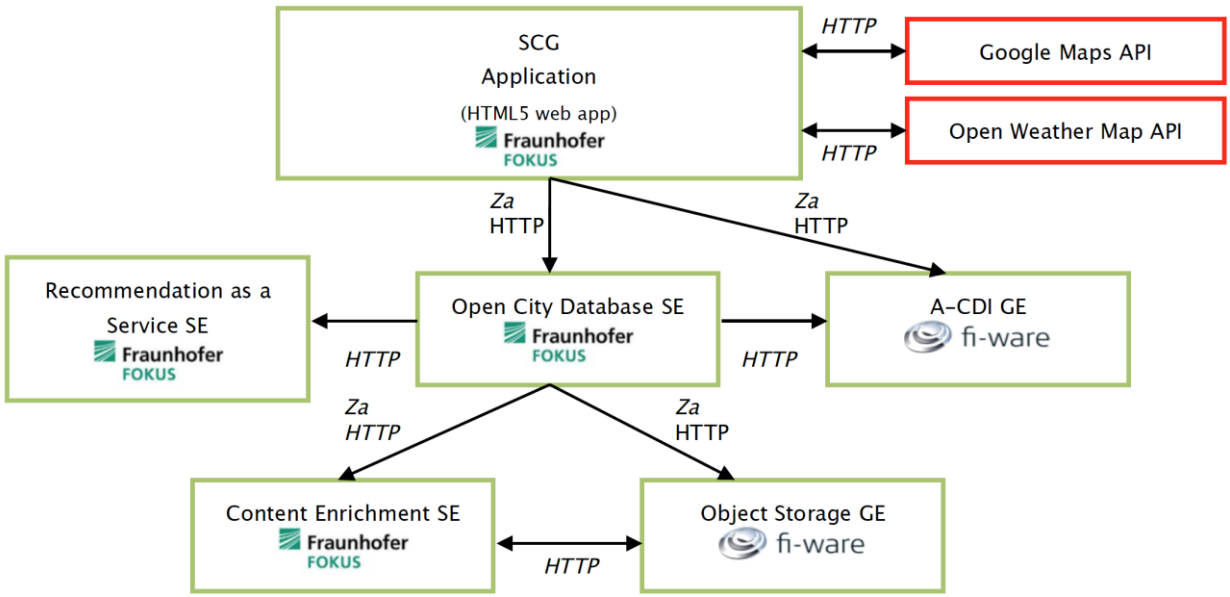

Figure 3 Architecture for the "On site visit" scenario

2.1.2.1 - Interface between SCG Application and Open City Database SE (Za)

- Related Enablers:
  - R1: Open City Database SE [3],Content Enrichment SE [4],
  - R2: Open City Database SE [3],Content Enrichment SE [4], , Object Storage GE [5],
  - R3: Open City Database SE [3],Content Enrichment SE [4], Recommendation as a Service SE, Object Storage GE [5], A-CDI GE Smart City Guide web app for mobile, tablet and PC, TV App

Purpose: Creating interactive content on SCG tour:

R1

- view and get details about a POI -> Open City Database
- Create a POI -> add to the Open City Database (smartphone, tablet)
- Display POIs (or events) around the user (tablet, PC in R3)
- Add user generated video to an existing POI
- Enrich this user generated videos with content (pictures, comments, information) -> Content Enrichment CE

R2

- Create an account on smartphone/tablet/PC
- update POI or route information -> Open City Database
- Browse and select a recommended tour
- Create a travel plan (web app only)
- Augmented reality view of POI around me (mobile devices)

R3

- Recommend content from partners around
- Get recommendations for POIs
- Report -> create photo album or postcard
- Display tour on a second screen
- View a report based on UGC related to POI

- Public transportation (augmented reality & 3D map on tablet only)

Protocol: HTTP

Description of data sent over this interface: User profile, POI, UGC, Recommended content (content, POI, routes)

2.1.3 - "Virtual/mixed Reality" scenario

The figure below shows the integration of the Virtual/Mixed Reality SE [6] and the Smart City Guide Android Application:

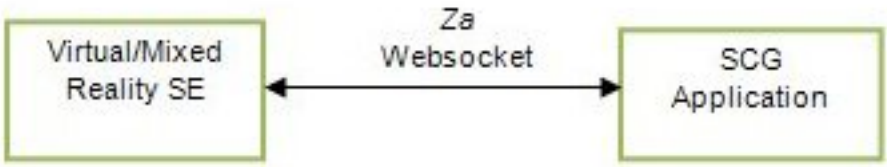

Figure 4 Architecture for the "Virtual/mixed Reality" functionality

2.1.3.1 - Information relative to the used interface (Za)

- Related Enablers: Virtual/Mixed Reality SE [6], SCG Android Application
- Purpose: Mixing virtual and real objects in a same hybrid reality: providing neighboring moving objects (either real of virtual) according to positions; the position can be computed either using antennas or cameras with AR marker databases or in case of "markerless" image tracking, "natural" marker databases
- Protocol: WebSocket
- Description of data sent over this interface: Positions, moving objects

2.1.4 - Content sharing scenario

The figure below shows the integration of the Content Sharing SE [7] and the Smart City Guide Android Application:

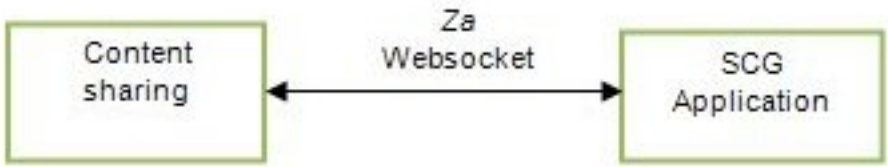

Figure 5 Architecture for the "device-to-device content sharing in geo-communities" functionality

2.1.4.1 - Information relative to the used interface (Za)

- Related Enablers: Content Sharing SE [7], Android application
- Purpose: maintain communication between users when disconnected from network provider infrastructure. Provides the ability to get content, exchange generated content, and synchronize content between users and between user and server. Has also geo-capabilities to share/distribute content depending on geo-properties
- Protocol: Provided in two pieces of software: an Android library and a Java content server.

2.1.5 - Social Network

The figure below shows the integration of the Social Network SE [8] and the Smart City Guide Android Application:

Figure 6 Architecture for the "social network" functionality

2.1.5.1 - Information relative to the used interface (Za):

- Related Enablers: Social Network SE [8], SCG Android Application by Pixelpark
- Purpose: accessing user profiles and UGC; system integration of other enables (SE and GE); upload of media (text, pictures)
- Protocol: HTTP
- Description of data sent over this interface: User profiles, UGC

2.2 - Specific Enablers

We will provide the following list of Specific Enablers through the Smart City Platform:

- Recommendation Services SE [2], provided by Orange (10/13)
- Virtual/Mixed Reality SE [6], provided by Orange (12/13)
- Local Information SE [1], provided by Orange (10/13)
- Open City Database SE [3], provided by Fokus (09/13)

We will utilize the following list of common Specific Enablers for the Smart City Platform.

- Social Network SE [8], provided by Pixelpark (10/13)
- Content Enrichment SE [9], provided by Fokus (09/13)
- Content Sharing SE [7], provided by Thales Communications (12/13)
- Recommendation of a Service SE, provided by Fokus

2.3 - Generic Enablers

We plan to take advantage of the following Generic Enablers from FI-WARE within the Smart City Platform:

- Location GE [10]
- Streaming GE [11]
- Object Storage GE [5]
- Advanced-User Interface 3D-UI GE [12]
- Identity Management GE [13]
- Service Capability, Connectivity and Control (S3C) GE [14]
- A-CDI GE

3 - SMART CITY PLATFORM - RELEASE 09/13

The Smart City Platform is a portfolio of functions, designed to foster the development and uptake of Smart City Applications based on Future Internet technologies. In addition to the Specific Enablers of the Smart City Platform we will provide a Smart City Guide reference application to showcase the features of the platform. The applications will be available in two ways: as an Android Native Application and an HTML5 Web Application.

The following Specific Enablers are included in the September release of the Smart City Platform and provide the technological foundation for our Smart City Guide reference application.

3.1 - Open City Database

3.1.1 - What you get

The Open City Database provides information of a city or Points of Interests as JSON formatted set of data. The cities JSON object includes information such as country, image, name, id, POIs, location. The POI JSON object includes more detailed information such as name, image, description, id, location, rating, check ins, opening hours, entry, public transport and contact information's. As users of the Smart City Guide generate the content, the number of POI in the database increases the more the guide is used.

3.1.2 - Why to get it

Through the use of user generated content the Open City Database is always up to date, and is constantly expanding. By using the REST API, everyone can create and update POIs and cities inside the Database.

3.1.3 - Documentation

- Technical Documentation of the Open City Database SE [3]

3.2 - Local Information

3.2.1 - What you get

This Local Information SE is based on Orange's “Ma Vie Locale” product. It provides access to local content aggregated from multiple sources (open data, web sites, etc.), enriched with UGC and recommendations. In particular, this enabler allows to create POIs (places or events), create routes, search for POIs/routes and evaluate them, display POIs on a map, publish UGC attached to POIs/routes, and give recommendations to other users (use of Recommendation Services” SE).

3.2.2 - Why to get it

The Local Information SE will be used for the Smart City Guide experimentations in Brest, Barcelona and Cologne, but will not be open to developers in Phase 3.

3.3 - Recommendation Services

3.3.1 - What you get

The Specific Enabler "Recommentation Services" is based on the REPERIO product, which is a generic recommendation engine providing both content based (meta-data descriptions of items) and collaborative (logs usage) recommendations.

3.3.2 - Why to get it

REPERIO can make contextual or personalized recommendations on products (items) to users. To make recommendations, rank predictions or similarities predictions, REPERIO relies on four types of data: logs,

preferences, characteristics and relations. Recommendations supplied by REPERIO are a new way to browse items and/or users, in addition to a search engine.

3.3.3 - Documentation

- Technical Documentation of the Recommendation Services SE [2]

4 - INTERACTION AND COOPERATION WITH OTHER FI-CONTENT PLATFORMS

With regard to the effort in platform development, there is an overlap between the Social Connected TV (WP2), Smart City (WP3) and Pervasive Games (WP4) Platform.

We address these synergies in various fashions:

Common Specific Enablers. First of all, we promoted certain Specific Enabler, such as the Social Network SE, as Common Specific Enabler of FI Content due to the fact, that multiple platforms take advantage of them. For example, the social platform module of the Pervasive Games Platform utilizes the Social Network SE too.
The Social Connected TV Platform avails itself from the Content Enrichment Common SE, which has originally been introduced by the Smart City Platform. The Content Enrichment SE enables the creation, distribution and play-back of augmented interactive video content. The original target runtimes for the playback of enriched A/V content where browsers of desktop and mobile devices. During the course of the project the enabler has been adapted to requirements of Social Connected TV Platform. Since the 09/13 release of the Social Connected TV Platform the Enabler allows the playback of enriched content on HbbTV devices.
Moreover lab trial applications have been developed on the basis of the Content Enrichment SE and the Second-Screen Framework SE to investigate how media experience can be enhanced with richer content and a technology that allows making use of end-user devices core assets – the TV's large display for the presentation of content and the touch-gesture support of second-screen devices for the interaction with additional content.

Technology Transfer. Moreover, groups of Specific Enablers developed within WP4, such as the Augmented Reality SEs and Reality Mixer SEs, dedicated for gaming in the first place, but probably useful as well for advanced interaction techniques in the context of Smart City Services.

Finally, few partners, which are driving the technological platform development and being involved in multiple work packages, act as bridge with regard to common requirements and sharing efforts between those work packages.

5 - SMART CITY PLATFORM - UPCOMING RELEASES

For the upcoming releases of the Smart City Platform we will in particular focus on augmented reality aspects of the platform. We will try to integrate mixed reality concepts and an interactive way to augment POIs with user generated content. Thus, the following Specific Enablers are planned to be integrated into upcoming releases of the Smart City Platform.

5.1 - Virtual/Mixed Reality

Mixed reality combines the real world with virtual objects, characters and information. The Virtual/Mixed Reality SE is the core component of a mixed reality service, managing a large number of geo-localized moving objects in real-time, with a distributed architecture allowing almost unlimited scalability.

This SE provides neighboring moving objects (either real or virtual) according to the user's position. The position can be computed either using antennas or cameras with AR marker databases or in case of markerless image tracking, natural marker databases.

5.2 - POI Explorer

This Specific Enabler will provide advanced interaction techniques with Points of Interest (POIs) based on Augmented Reality and Mixed Reality applications. It will utilize multiple tracking methods to improve the accuracy for outdoor AR applications. Moreover, it will handle user generated content (i.e. pictures, videos, 3D-content) in order to augment POIs with this.

5.3 - Recommendation as a Service

The Recommendations as a Service Platform (RaaS) provides the ability to create a professional recommendation engine with just a few mouse-clicks and no programming skills. This platform can persist your item and user data and will host your recommendation engine as a service in the cloud or on your own server infrastructure. Thereby, decision makers can choose whether to use ratings, likes, check-ins or implicit feedback, such as clicks or consumption time. In addition, they can adjust the way, the personalization works by selecting from a wide range of well-explained algorithms.

6 - DEPLOYMENT OF THE SMART CITY PLATFORM

Infrastructure for the 1st experimentation (1st version of the Smart City Platform) is built on Specific Enablers only. These Specifics Enablers are hosted in several data centers (more information available in the "Infrastructure used in the 1st Experimentation Cycle" section 6.5).

For the coming versions of the Smart City Platform, the Generic and Specifics Enablers will be distributed in the XIFI data centers of Britany, Berlin and Sevilla/Malaga (see figure below which gives example of Brittany XIFI node).

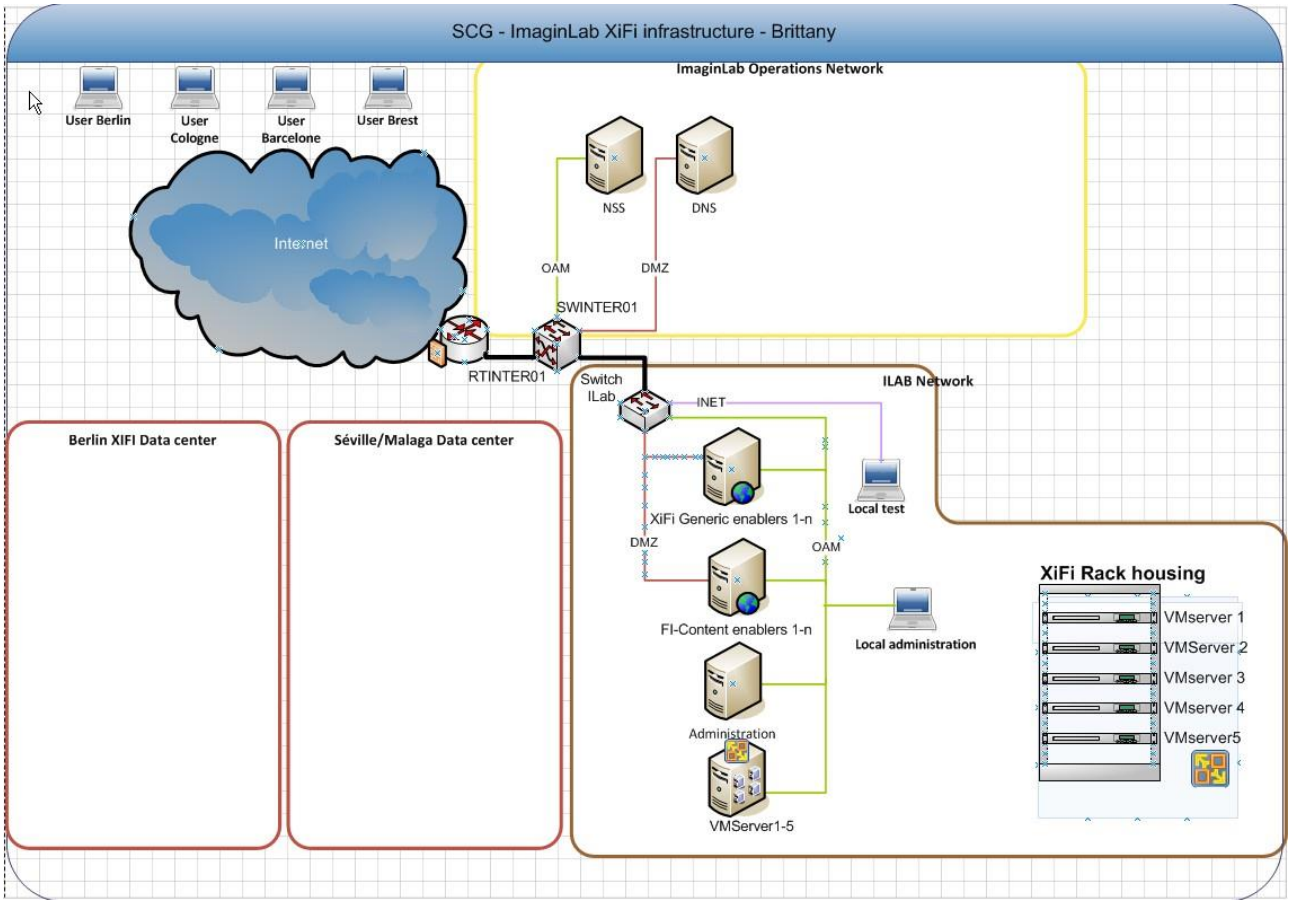

Figure 7 XIFI infrastructure – Brittany example

6.1 - Client Side Enablers

On client side, two Smart City Guide applications are available, an Android Native application and a HTML5 Web application and two Social Network applications, an Android Native application and a HTML5 Web application.

- "Smart City Guide" Android Native Application:

  The "Smart City Guide" Android Native Application was developed using the standard Android SDK (use of standard Android components).It is optimized for the Samsung Galaxy S3 Titanium 4G handset.

- "Smart City Guide" HTML5 Web Application:

  The "Smart City Guide" HTML5 Web Application can be used by all Smartphones, Tablets and PCs with an HTML5 enabled browser. This application is not bounded to specific operating systems (e.g. iOS, Android. Windows phone). It is a web application which gives each user the opportunity to use it

with his mobile device or PC. The App is developed in the programming languages HTML5, CSS3, JavaScript and utilizes the Open City Database. In Release 1, the HTML5 Web Application is optimized for the Samsung Galaxy S4 with Chrome.

- "Social Network" Android Native Application:

  The "Smart City Guide" Android Native Application was developed using Phonegap, encapsulating an HTML5/JS application. It is optimized for the Nexus 5 handset.

- "Social Network" HTML5 Web Application:
  Like the "Smart City Guide", the "Social Network" HTML5 Web Application can be used by all Smartphones, Tablets and PCs with an HTML5 enabled browser and is also developed in HTML5, CSS3 and JavaScript.

6.2 - Server Side Enablers with a Shared Instance

Not Applicable in first version of the Smart City Platform.

6.3 - Server Side Enablers with a Global Instance

The 1st Experimentation Cycle is built on Specific Enablers only (no use of Generic Enablers).Those Specifics Enablers are hosted in several data centers:

- 2 of them in the ImaginLab data center in Lannion: Local Information ("Ma Vie Locale", Orange product), Recommendations Services ("Reperio", Orange product)
- 1 in the Orange data center in Issy-les-Moulineaux: Virtual/Mixed Reality ("Kiwano" Orange product)
- 2 in the Fraunhofer Fokus data center in Berlin: Content Enrichment, Open City Database
- 1 in the FI-LAB node: Social Network

6.4 - Enablers on Both Client and Server Sides

Not Applicable in first version of the Smart City Platform.

6.5 - Infrastructure used in the 1st Experimentation Cycle

6.5.1 - Brittany infrastructure

The infrastructure for the 1st Experimentation Cycle is built on Specific Enablers only (no use of Generic Enablers). This infrastructure has been used for Brittany and Barcelona SCG experimentations.

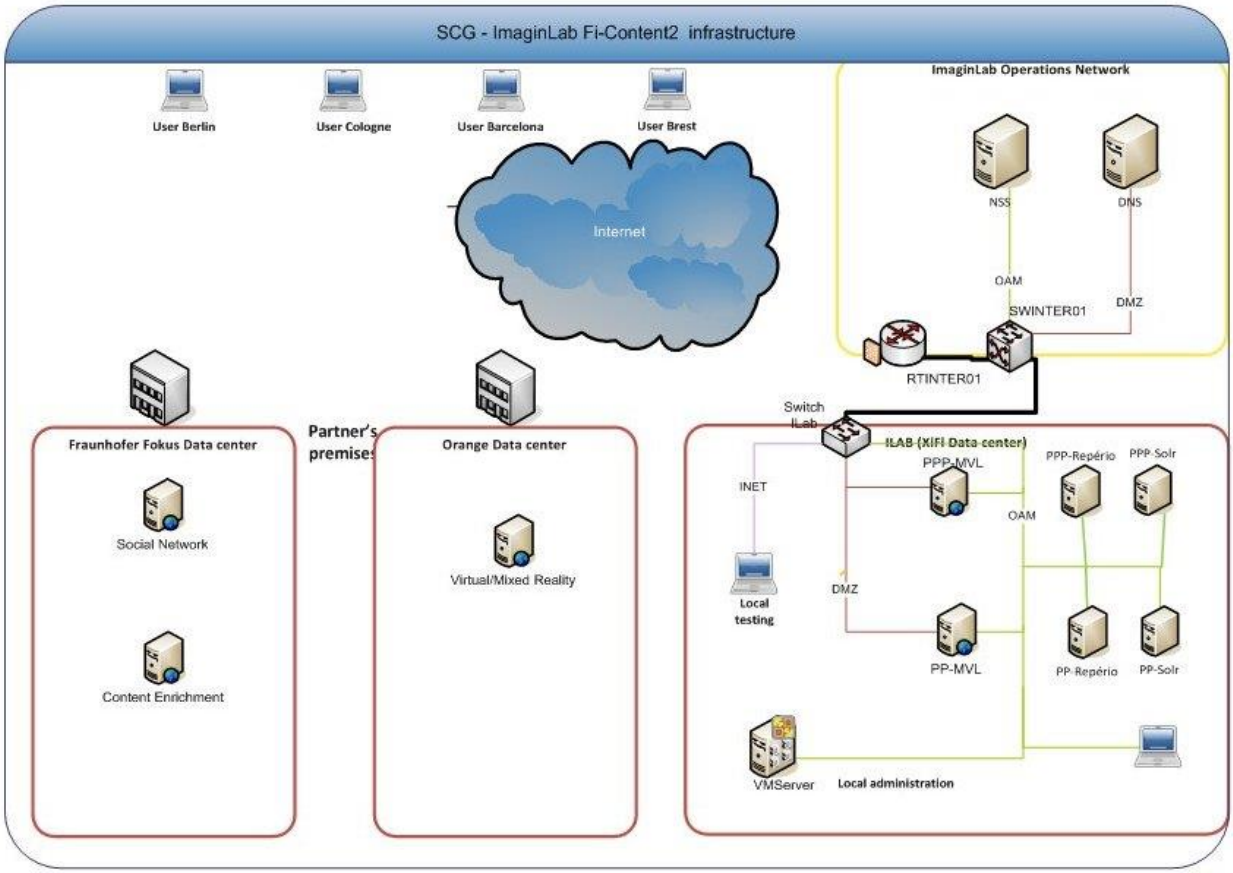

Figure 8 SCG global infrastructure

We can observe that this infrastructure is very similar to the Brittany XiFi one as it has been built directly on the top of it to simplify transfer to the node.

6.5.1.1 - ImaginLab data center infrastructure:

The trials in the 1st test cycle have been conducted on the ImaginLab data center infrastructure detailed below:

VMware: VMWare ESX 4.1 is installed on a HP server in order to use several Virtual Machines.

Virtual Machines: In order to fulfill the project needs, 6 VMs are installed on the ESX server. 3 of them are pre-production platforms (ppp) and the other 3 are production platforms (pp). Changes have to be made on pre-production platforms, and then once confirmed, are reproduced on the production platform. So there are 3 main "services", each of them installed both on a pre-production and on a production platform. All those 3 services are developed by Orange:

- "mvl" stands for "Ma vie locale" (Local Information Specific Enabler): this enabler is providing information from external contents.

- "reperio" (Recommendation Services Specific Enabler) : indexation, requests.

- "solr": Solr Search Engine.

6.5.1.2 - Access to contents (from local and remote experimentation sites):

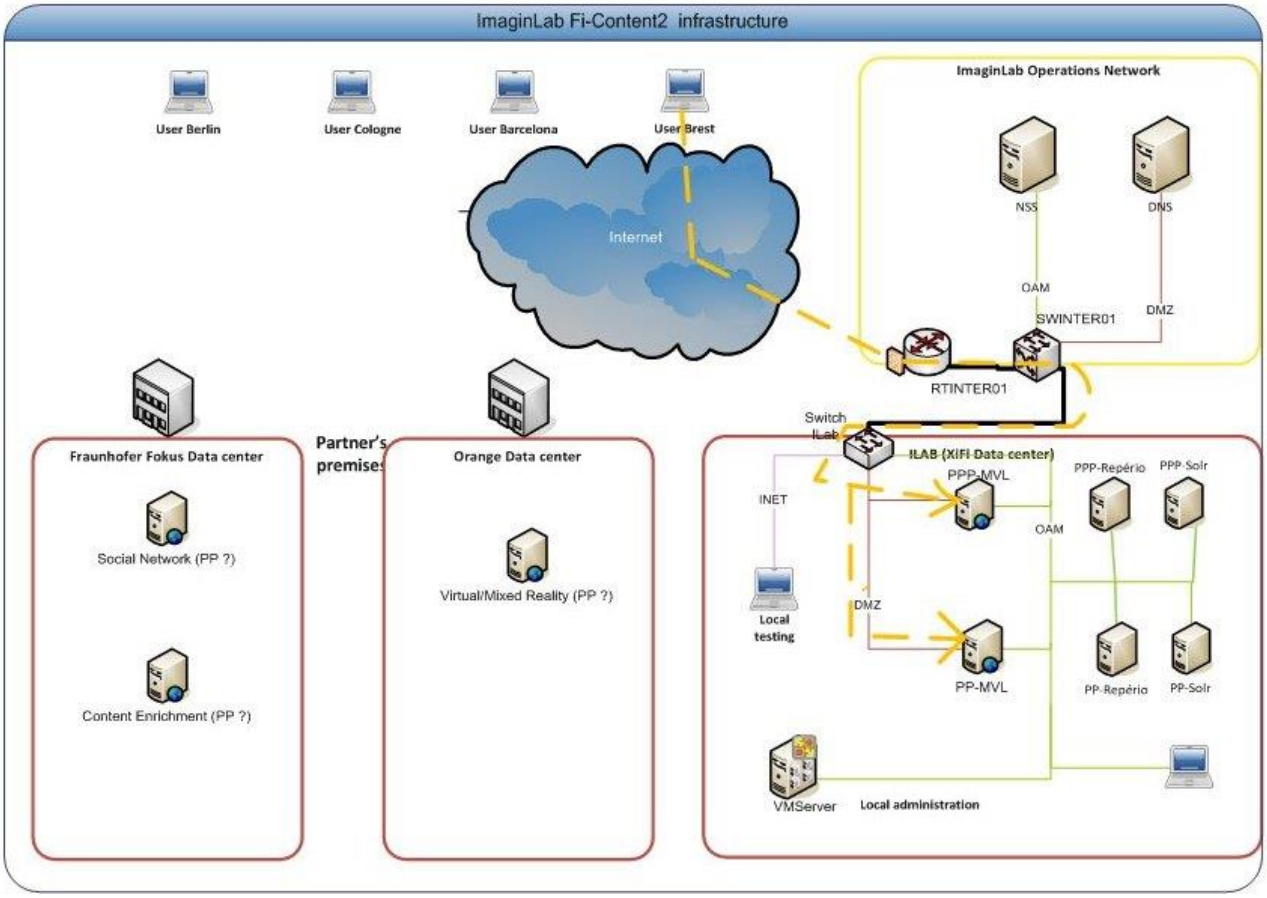

Figure 9 Access to contents

6.5.2 - Berlin infrastructure

For the first release of the Smart City Guide Web App no GE were used. Following the first experimentation and further developments an increasing number of enablers were included in the Berlin infrastructure.

6.5.2.1 - OpenStack

The Generic Enabler “Object Storage” is hosted on an OpenStack on the Berlin XIFI node. All user generated videos and photos will be located there. The Object Storage GE is divided in two sections. The OpenStack Keystone provides identity, token, catalog and policy service, the OpenStack Swift provides high available and distributed Object Store.

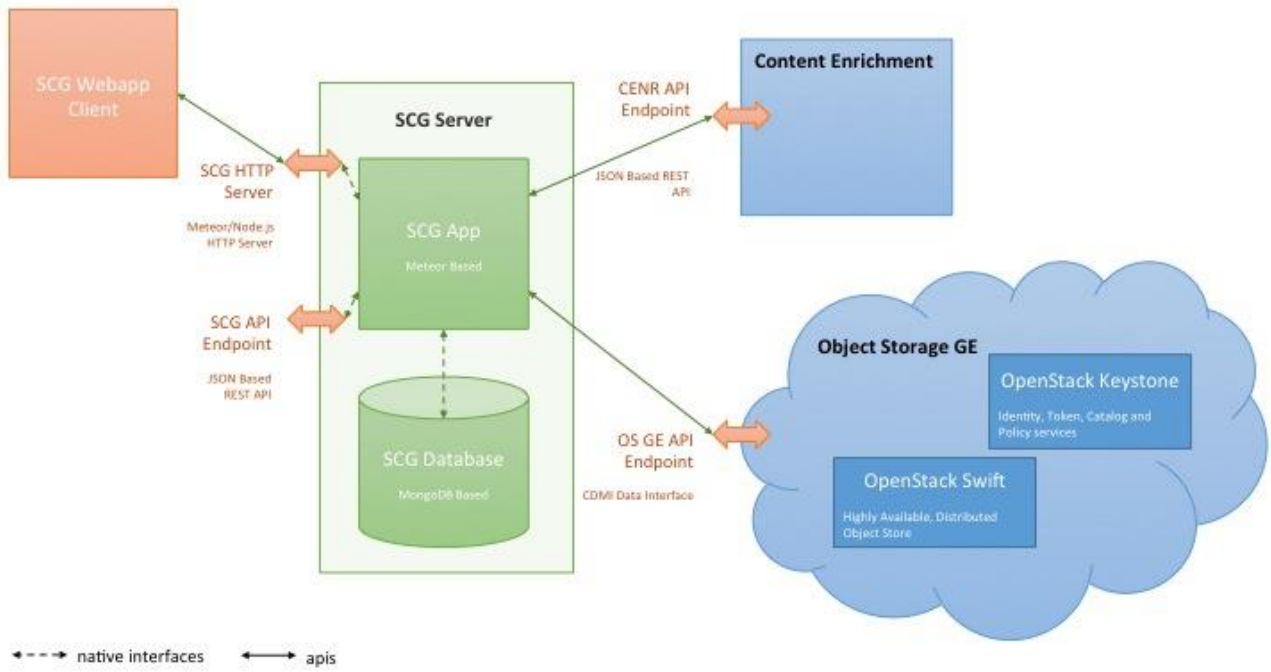

Figure 10 Smart City Guide Web App Infrastructure

The SCG scenario “on site visit”, uses the Content Enrichment SE deployed at Fraunhofer FOKUS and the Object Storage GE deployed at XIFI Node Berlin. The user generated video, uploaded on the server, will be split off and pushed in smaller steps to the Object Storage. After the video is uploaded the user can enrich the video. This metadata will be pushed to the Content Enrichment SE API. Every time a video is viewed, the video is loaded from the Object Storage and the enriched content is loaded from the Content Enrichment API.

6.5.2.2 - Virtual Machines

The Smart City Guide Web App is located on a virtual machine at Fraunhofer FOKUS.

- Ubuntu 64-bit 12.04 LTS
- 8GB Ram 40GB HDD
- 4* Intel XEON E7540 2.0Ghz
- on a VMWare VCenter-Server 5.50

6.5.3 - Cologne infrastructure

The productive Cologne experimentation runs entirely on the FI-LAB infrastructure.

7 - CONCLUSION

In this document, we have presented a technical description of the Smart City Platform. First, we have presented the overall architecture of the platform, listing the groups of Specific Enablers and Generic Enablers that are involved, as well as how they interact with each other.

Second, we have presented the development roadmap, including a description of what will be available in the first platform release and in upcoming releases. This includes a high-level description of the Specific Enablers provided by the partners behind the Smart City Platform. For a detailed description of Specific Enablers, please refer to FI-Content Wiki [15]. Description of FI-WARE GEs is referred to the FI-WARE catalogue.

Finally, we have discussed the deployment of the platform and pointed out the diversity of environments hosting the utilized enablers between client devices and server instances.

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[2] http://wiki.mediafi.org/doku.php/ficontent:smartcity:enabler:recommendationservices:start

[3] http://wiki.mediafi.org/doku.php/ficontent:smartcity:enabler:opencitydatabase:start

[4] http://wiki.mediafi.org/doku.php/ficontent:smartcity:enabler:contentenrichment:start

[5] http://wiki.mediafi.org/doku.php/ficontent:fiware:ge_usage#object_storage_ge

[6] http://wiki.mediafi.org/doku.php/ficontent:smartcity:enabler:virtualmixedreality:start

[7] http://wiki.mediafi.org/doku.php/ficontent:common:enabler:contentsharing:start

[8] http://wiki.mediafi.org/doku.php/ficontent:common:enabler:socialnetwork:start

[9] http://wiki.mediafi.org/doku.php/ficontent:common:enabler:contentenrichment:start

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[12] http://wiki.mediafi.org/doku.php/ficontent:fiware:ge_usage#advanced-user_interface_3d-ui_ge

[13] http://wiki.mediafi.org/doku.php/ficontent:fiware:ge_usage#identity_management_ge

[14] http://wiki.mediafi.org/doku.php/ficontent:fiware:ge_usage#service_capability_connectivity_and_control_s3c_ge

[15] http://wiki.mediafi.org/doku.php/ficontent:private:deliverables:d32:ficontent:private:start

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