



**D5.1**

# **ASSESSMENT OF BEST FEATURES FROM WP2-4 FOR DISSEMINATION**

**September 2013**

## **ABSTRACT**

This deliverable combines the best features from the three content areas that will be made available and presented to SMEs and industry players at dissemination events. It describes the methodology and rationale for selecting these features using a set of criteria.

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.

## DISCLAIMER

All intellectual property rights are owned by the FI-CONTENT 2 consortium members and are protected by the applicable laws. Except where otherwise specified, all document contents are: "© FI-CONTENT 2 project - All rights reserved". Reproduction is not authorised without prior written agreement.

All FI-CONTENT 2 consortium members have agreed to full publication of this document.

The commercial use of any information contained in this document may require a license from the owner of that information.

All FI-CONTENT 2 consortium members are also committed to publish accurate and up to date information and take the greatest care to do so. However, the FI-CONTENT 2 consortium members cannot accept liability for any inaccuracies or omissions nor do they accept liability for any direct, indirect, special, consequential or other losses or damages of any kind arising out of the use of this information.

## DELIVERABLE DETAILS

[Full project title]:	Future media Internet for large-scale CONTENT experimENTation 2
[Short project title]:	FI-CONTENT 2
[Contract number]:	603662
[WP n°]:	WP5 – Ecosystem Building
[WP leader]:	BBC
[Deliverable n°]:	D5.1
[Deliverable title]:	Assessment of best features from WP2-4 for dissemination
[Deliverable nature]:	Report (R)
[Dissemination level]:	Public (PU)
[Contractual delivery date]:	M6 (September 2013)Andy
[Actual delivery date]:	30 September 2013
[Editor]:	Andy O'Dwyer, BBC
[Internal Reviewers]:	Hélène Waters: BBC - Michael Eble, Fraunhofer IAIS
[Suggested readers]:	EC, SMEs, industry players, developers, Open Call and phase 3 proposers
[Keywords]:	
[File name]:	FI-CONTENT 2-WP5-001_D5.1_V1.0

## EXECUTIVE SUMMARY

The objective for the first six months has been to consolidate the use cases defined in phase 1 of the FI-CONTENT project in order to present the strongest features to potential phase 3 proposers and SMEs across Europe. True to the user-centred approach FI-CONTENT embraced during its previous phase, use cases have been revisited and refined following feedback from presentation at events, interviews and meetings with SMEs and industry players.

A critical analysis of the use cases and features has been made in order to assess the best breed from each content area. During this phase of work there has been a great collaboration in identifying and defining specific criteria for assessment of features through face-to-face meetings, email exchanges and regular audio conferences.

Such criteria provide a rationale for choosing which features to showcase at events and present to SMEs. This approach defines a viable measurement for identifying use cases' strengths and weaknesses and ensures consistency across the content areas.

Most importantly, it is a very significant checkpoint to ensure features are still viable on different aspects such as *innovation, user communities, business models and technical issues*.

Those objectives were met during this reporting period and their results form the basis for this assessment of best features document.

These are the best features chosen per platform:

### Social Connected TV

- integration of second screen functionalities into connected TV services
- Audio fingerprinting
- Content Enrichment
- Search & discovery applications

### Smart City Guide

- Content search & recommendation
- Content Enrichment
- Hybrid-mixed reality

### Pervasive Games

- XML3D
- Augmented reality tracking
- Reality mixer

## LIST OF AUTHORS

Organisation	Author
BBC	Andy O'Dwyer, Barbara Zambrini
RBB	Annette Duffy, Martin Gordon
Orange	Claire Bille-Bize Masson, Arnaud Brun, Franck Feurtey
Disney	Chino Noris

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>3</b>
<b>LIST OF AUTHORS.....</b>	<b>4</b>
<b>TABLE OF CONTENTS.....</b>	<b>5</b>
<b>EVALUATION CRITERIA .....</b>	<b>7</b>
<b>ABBREVIATIONS.....</b>	<b>8</b>
<b>1 - INTRODUCTION .....</b>	<b>9</b>
<b>2 - METHODOLOGY.....</b>	<b>10</b>
<b>3 - SOCIAL CONNECTED TV .....</b>	<b>11</b>
3.1 - Integration of second screen functionalities into existing connected TV services .....	11
3.1.1 - Description of assessed feature .....	11
3.1.2 - Innovation .....	11
3.1.3 - User Community.....	12
3.1.4 - Business Models.....	12
3.1.5 - Technical .....	12
3.2 - Audio fingerprinting: Content linking across devices (IAIS) .....	12
3.2.1 - Description of assessed feature .....	12
3.2.2 - Innovation .....	13
3.2.3 - User Community.....	13
3.2.4 - Business Models.....	13
3.2.5 - Technical .....	13
3.3 - Content Enrichment (FOK).....	13
3.3.1 - Description of assessed feature .....	13
3.3.2 - Innovation .....	14
3.3.3 - User Community.....	14
3.3.4 - Business Models.....	14
3.3.5 - Technical .....	15
3.4 - Search & Discovery Applications in a synchronized connected TV environment with a second screen (TRDF).....	15
3.4.1 - Description of assessed feature .....	15
3.4.2 - Innovation .....	15
3.4.3 - User Community.....	15
3.4.4 - Business Models.....	16
3.4.5 - Technical .....	16
<b>4 - SMART CITY GUIDE .....</b>	<b>17</b>
4.1 - Content Search and Recommendation.....	17
4.1.1 - Description of assessed feature .....	17

4.1.2 - Innovation .....	17
4.1.3 - User Community .....	17
4.1.4 - Business Models.....	17
4.1.5 - Technical .....	18
4.2 - Content Enrichment .....	18
4.2.1 - Description of assessed feature .....	18
4.2.2 - Innovation .....	18
4.2.3 - User Community .....	18
4.2.4 - Business Models.....	18
4.2.5 - Technical .....	19
4.3 - Hybrid-Mixed Reality .....	19
4.3.1 - Description of assessed feature .....	19
4.3.2 - Innovation .....	19
4.3.3 - User Community .....	19
4.3.4 - Business Models.....	19
4.3.5 - Technical .....	20
<b>5 - GAMES .....</b>	<b>21</b>
5.1 - XML3D .....	21
5.1.1 - Description of assessed feature .....	21
5.1.2 - Innovation .....	21
5.1.3 - Technical .....	21
5.2 - Augmented Reality Tracking.....	22
5.2.1 - Description of assessed feature .....	22
5.2.2 - Innovation .....	22
5.2.3 - Business Models.....	22
5.2.4 - Technical .....	23
5.3 - Reality Mixer .....	23
5.3.1 - Description of assessed feature .....	23
5.3.2 - Innovation .....	23
5.3.3 - Technical .....	23
5.4 - User Communities.....	23
5.5 - Business Models .....	24
<b>REFERENCES.....</b>	<b>25</b>

## EVALUATION CRITERIA

TOPICS	REQUIREMENTS
<b>User community</b>	<ul style="list-style-type: none"> <li>• Demonstrable interest is shown in feature by both company/institutional users and potential end-users</li> </ul>
	<ul style="list-style-type: none"> <li>• Feature is already deployed/in service/available to users</li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Feature needs to demonstrate it is still beyond state-of-the-art</li> </ul>
	<ul style="list-style-type: none"> <li>• Feature will provide novel user media experience for users</li> </ul>
	<ul style="list-style-type: none"> <li>• Feature will show potential for possible commercial exploitation</li> </ul>
<b>Business models</b>	<ul style="list-style-type: none"> <li>• Reference to an industry or consumer's problem or need: Is the feature related to a defined problem or need articulated by targeted companies or consumers? (This might and should correlate with req. no. 1 from user community)</li> </ul>
	<ul style="list-style-type: none"> <li>• Commercial usability: is the feature described in a way that offers reliable information regarding its pricing, legal and organizational aspects to potential customers/users? (This adds business-related aspects to req. no. 2 from user community)</li> </ul>
<b>Technical</b>	<ul style="list-style-type: none"> <li>• To what degree does the proposed work take advantage of the platforms provided by FI-Content_2 and/or contribute new or improved features to the platform</li> </ul>
	<ul style="list-style-type: none"> <li>• To what degree does the proposed work support the attractiveness and availability of the FI-Content_2 platform and contribute to its visibility</li> </ul>
	<ul style="list-style-type: none"> <li>• To what degree does the proposed work take advantage of recent developments in hardware and software capabilities related to the future media internet</li> </ul>
	<ul style="list-style-type: none"> <li>• To what degree is the proposed work scalable/reliable with regard to hundreds or thousands of simultaneous users</li> </ul>
	<ul style="list-style-type: none"> <li>• To what degree does the proposed work support interoperability with other existing or upcoming solutions through open interfaces and specifications and/or established standards</li> </ul>

*Table 1 Criteria for Assessment of features*

## ABBREVIATIONS

2D	Two dimensional
3D	Three dimensional
ADS	Advertisements
APPS	Applications
AR	Augmented Reality
CSS	Cascading Style Sheet
CE	Consumer Electronic
DOM	Domain Object Model
DVB-T	Digital Video Broadcasting – Terrestrial
EPG	Electronic Programme Guide
FI	Future Internet
GEO	Geographic
GPS	Global Positioning System
HbbTV	Hybrid Broadcast Broadband TV
HTML	HyperText Markup Language
HTML5	HyperText Markup Language – version 5
IDs	Identifications
ISP	Internet Service Provider
JSON	JavaScript Object Notation
POIs	Points of Interest
QR-Code	Quick Response CODE
SCG	Smart City Guide
SMEs	Small or Medium Enterprise
PDF	Portable Document Format
UGC	User-Generated Content
VOD	Video on Demand
WLAN	Wireless Local Area Network
XML	Extensible Mark-up Language

## 1 - INTRODUCTION

This document brings together information on a proposed set of features, which will be made available on the (FI) Future Internet platform. To ensure that these are going to be of value, relevant and beyond state-of-the-art, an assessment is necessary. This document details these features against a set of criteria to ensure that what is being proposed is new and can be demonstrated as bringing something which will indeed have the potential to be in demand and contribute to the overall goals of the project.

It explains the methodology employed for this phase of work that include the identification and definition of criteria for assessment of features.

It provides a *description of the assessed feature*, which will enable the reader to get an account of what its purpose is and help them make a more informed decision on whether this is something they are interested in using. Within some of the descriptions for these proposed features are helpful scenarios setting out the context in which they may be applied and the benefits of use.

It describes to what extent the proposed features are regarded as innovative. It is important for the project to identify that the feature is “new” and not to some extent a duplication of something already available in the marketplace or not so significantly different as to be considered an innovation. In addition, by giving this level of detail, it will allow the project to consider if the feature fits well within the overall project framework.

Partners have agreed the features to be put forward as the best ones are also expected to have impact and value in the *user community* to which they are planned to be applied. How will a feature for example be received and positioned within this specific community? Knowing how the features may be integrated and the environment in which they are expected to sit will bring a better understanding of the realistic and everyday use of the features.

Partners have also been asked to submit expectations on how they foresee *business models* that can be established from the feature. These models from the particular domain they are targeted at can include, for example, revenue from traditional subscription-based services, where a company is prepared to pay a regular amount for its use. Another income stream can be in the form of licensing, providing the right to integrate the feature into a wider application. It is also possible that a successful feature brings in more users to an audience-facing service, and these users are of direct interest to advertisers who may have an opportunity to boost potential sales of a product. A direct financial investment in a feature is another avenue for a business model. A financial commitment is often given with the expectation of receiving a percentage of the profits. Investment can also be in the form of taking part (or total) ownership of a feature the owner is willing to sell.

## 2 - METHODOLOGY

The overall approach to this task was to identify and define clear and specific ways to measure use cases' relevance in phase 2 of the project. There has been great collaboration among partners to identify a set of topics that would constitute essential requirements applicable to all features. A regular exchange of emails, audio conference calls and internal consultations were conducted throughout this process to ensure satisfactory results.

Once the areas or topics for the analysis of the features were defined, a subset of requirements was identified. The questions asked for each topic aimed at driving partners to a methodical and in-depth analysis of each aspect of the features (see *table 1*).

As a result, the essence of each feature is described in this document. It provides the reader with a clear rationale of why these features were chosen to present the project to phase 3 proposers and industry players across Europe.

### 3 - SOCIAL CONNECTED TV

The following four features are proposed;

*Integration of second screen functionalities into existing connected TV services.* This consists of connected TV applications that avail themselves from a bi-directional communication channel to web applications on second screen devices.

*Content Linking Across Devices , audio fingerprinting.* The service recommends matching content for second screen devices. It analyses an incoming audio signal, computes a fingerprint and checks that fingerprint against a database potentially containing additional content. Finally, the service returns matching content either as links to a repository or as the content itself. The service can be implemented into Android-based applications.

*Content Enrichment:* The creation and utilization of interactive content for social connected HbbTVs / SmartTVs via multi-screen applications.

*Search and Discovery:* One or several applications helping users to browse VoD catalogues, search and discover new content in innovative ways in a multi-screen environment.

#### 3.1 - Integration of second screen functionalities into existing connected TV services

Context: Multi-Screen applications.

##### 3.1.1 - Description of assessed feature

We present connected TV applications that use a bi-directional communication channel to communicate with web applications on second screen devices. The demonstrated connected TV applications are able to launch applications on the second screen. Thus, we can showcase novel TV programme-related second screen scenarios.

##### 3.1.2 - Innovation

The feature allows communication between TV programme-related interactive TV and second screen applications. The communication channel can be used by any affiliated service. What is also special about the solution is that it does not require a particular setup of the end-users network; devices require only an Internet connection, which may be over WLAN, Ethernet or mobile.

The communication channel can be used to exchange commands between the applications. The **rbbtext** application uses this facility for synchronised navigation. Commands from either screen affect both screens. Users can also hide the second screen controls on the TV. The ARD-Mediathek uses the communication channel for the submission of video clip IDs from the second screen app to the TV application. Users can browse through the range of videos from the ARD-Mediathek on the second screen and select clips to be played back on the TV screen. The ARD-EPG application uses the communication channel to receive commands for channel change. The user can be informed about the running programme of the ARD group on the second screen and switch TV channels from the second screen device. There is no comparable solution available that uses standardised and broadly-available web technologies.

### **3.1.3 - User Community**

Second screen functionalities address an ever-increasing community of general users. Recent indications are that a typical TV user's screen-time is greater than his/her waking hours – second screen use is increasingly part of the media-consumption environment. The second screen functionality was launched earlier this year by RBB, and is now on-air. First user group testing will begin later this year.

### **3.1.4 - Business Models**

The feature is of big commercial interest. Research conducted by Red Bee Ltd<sup>1</sup> found that 40% of smart phone owners would be willing to receive ads on their mobile devices while watching TV. The feature enables an advertiser to place TV programme related ads on the second screen. Ads on the second screen can be personalised and hence more efficient.

Furthermore the feature allows broadcasters to involve their viewers with the TV programme e.g. through interactive voting or quizzes. They can enhance the user experience of interactive TV applications since the user can use the touch interface of their mobile device as a remote control. This may raise the attractiveness of the TV programme and increase the engagement of the viewers.

### **3.1.5 - Technical**

The crucial mechanisms for discovery, connection, communication and automatic application launch are handled by the Second Screen Framework specific enabler provided by the Social Connected TV Platform. The applications show a set of use-cases that can be implemented with the help of this enabler. Thus they raise the attractiveness of the technology and the Social Connected TV Platform for providers of connected TV applications. Messages are exchanged over a central server on the Internet. Architectural decisions have been made with respect to the scalability of the component. The underlying technology is fully compliant to the HbbTV standard and based on standardised web technologies. Hence, it allows broadcasters to create novel interactive applications with direct connections to programmes, potentially targeting millions of already deployed devices on the market.

## **3.2 - Audio fingerprinting: Content linking across devices (IAIS)**

Context: Multi-screen TV applications, Recommendation

### **3.2.1 - Description of assessed feature**

This cloud-based service is intended for SMEs that need to link content across devices like TV/computer screens and mobile devices. SMEs can integrate the service into their applications and use the technologies on their fictional, factual or advertising content.

For example, one might think of a car manufacturer that wants to promote a new sports car via classical TV spots but also via corresponding content on mobile devices. The company's advertising agency creates a campaign based on video clips for TV and a mobile application with features such as "Win a test drive", "Find a dealer near you" and "Explore the car's cockpit on your tablet device". One then has the chance to win an exclusive test drive if one pushes the mobile application's "win button" during airtime of the TV commercial. Therefore, the service records the TV's audio signal via the mobile device's microphone, computes a fingerprint and triggers corresponding events.

---

<sup>1</sup> Red Bee Media Ltd., "Broadcast industry not capitalising on the second screen,"  
[http://www.redbeemedia.com/sites/all/files/downloads/second screen research.pdf](http://www.redbeemedia.com/sites/all/files/downloads/second%20screen%20research.pdf)

Another example is a broadcaster's need to synchronize a first and second screen based on content and to recommend matching content for their current programme: one might think of a fictional serial featuring a main character like Indiana Jones and his adventures around the globe. The second screen offers additional information such as a map, the adventurer's current position and possible threats around him. The broadcaster's aim here is to increase the viewer's immersion and the reach of the programme.

### **3.2.2 - Innovation**

To enable innovative applications in the fields of Second Screen and Social TV, one needs to connect the respective devices (e. g. TV screen and Tablet). Today, there are several approaches to establish such a connection. Using audio fingerprinting technology offers the advantage of allowing the use of any kind of audio/video material, since no watermark has to be added to the material itself. Therefore, it can also be applied to content one does not have in one's own databases. So, the FI-Content technology provides seamless user experience and shows promising applications for Social TV use cases.

### **3.2.3 - User Community**

An early version of the service was successfully demonstrated at the FI-Content project plenary meeting in July. Questions and comments made by partners were collected. Ongoing discussions with SMEs show promising interest in the underlying technology and its application.

### **3.2.4 - Business Models**

The technology provided is related to specific needs of different target groups. As described above, content needs to be linked across devices if one aims at offering new TV formats which can be consumed on a traditional TV screen and an additional second screen as well. The connection should be established in a way that is easy and convenient for end users. The service will be offered as a Specific Enabler - an Android application shows its potential implementation.

### **3.2.5 - Technical**

The service adds a feature to the Social Connected TV platforms, which allows the connection of a first and second screens and their respective content. It supports the attractiveness and visibility of the platform as it cannot only be used via programmatic interfaces but can be demonstrated via an Android application. The service takes into account the increasing sales of tablet computers and their usage during TV viewing. It can be combined with other services in order to enable additional Social TV scenarios.

## **3.3 - Content Enrichment (FOK)**

Context: Interactive multi-screen content

### **3.3.1 - Description of assessed feature**

The application will allow the creation, consumption and sharing of interactive TV content via a distributed, multi-screen app environment. The user will be able to connect a second screen and use it to create content annotations, comments etc. while watching the main video on the TV screen.

The feature has the following capabilities:

- Creation of UGC in terms of capturing content on the go, using the personal device (smartphone, tablet, etc.) and based on existing metadata and services such as content mash-ups
- Addition of related information such as comments, geo location, and more.
- Addition of object descriptions, generation of object identifications (subjects within scenes such as cars, buildings, persons, augmented items, products)
- Subsequent tracking of identified objects for specific time periods and furthermore the enrichment of videos and specific objects by adding video to video navigation, jump markers on object level, rich text, HTML, audio and video content, documents (PDF, XML, etc.)
- Social media integration (content sharing, linkage, publishing on social networks).

### **3.3.2 - Innovation**

Video content will no longer be a simple programme on the TV. The user will receive information about the current program with his smartphone or tablet. This could be information about an athlete, an actor or maybe a live tweet to a game show.

The content presented by the second screen correlates to the topic shown on the television screen and transforms the habit of passively watching into an active process of interaction. For example, the user is watching a broadcast that includes an HbbTV application. After pushing the Red-Button on the remote control, a QR-Code appears which enables the connection of various devices. Once the connection is established, the second screen offers additional information such as recommendations, comments, related video content and more.

### **3.3.3 - User Community**

Before the advent of content enrichment and multi-screen, the user needed a lot of time to find further information about subjects watched on TV. The appearance/disappearance of this information on the second screen is subject to the content on television. Imagine the scene shows a car and as long as it is visible on the TV screen, the application will provide further information on the second screen. When the car disappears from the TV screen, the related content on the connected devices also disappears. Furthermore, the application enables the user to make annotations, add additional video content and share this with others.

### **3.3.4 - Business Models**

Product placement: content enrichment is very useful for the TV commercial industry. While a commercial is shown, the second screen can display more details, or give the viewer a chance to buy the product online. For example, when a car commercial is shown, the user can configure this car in different colours, tune the engine or doing something else.

Infotainment: Content Enrichment allows product placement and the overlay of multimedia content with additional information, such as statistics, background information etc. It defines a new paradigm for interacting with content and so enhances the user experience. Moreover it can be used for educational demonstrations in terms of teaching with the help of audio video content. The edutainment aspect is using the annotation of new media to assist students in understanding even complex issues. To give an example, complex topics could be covered, and explained by multiple interactive videos. Starting with a very high-level introduction video and then going more in detail by linking advanced videos to specific topics addressed with the main video. This is a kind of a hierarchical structure, to guide students through complex topics.

### **3.3.5 - Technical**

The feature reflects critical functionalities that will be the basis for video-related services and applications in future Internet environments. As a part of a common infrastructure for future media, content distribution and utilization, this enabler serves all major functions to enrich content in multiple ways including object identification, content annotation, content recommendation and linkage to any web-enabled supplemental information or media (audio, video, text, images, animation, PDF, contact information, social media integration, video to video navigation, content interaction). Furthermore, it provides interfaces to incorporate web 2.0 capabilities and community functionalities as well. Thus the enabler acts as a common building block in future video and multimedia infrastructure, to allow seamless, platform-independent and convenient enrichment of any type of video content using any type of device for a plurality of application cases covering UGC, and professional content as well as edutainment.

## **3.4 - Search & Discovery Applications in a synchronized connected TV environment with a second screen (TRDF)**

Context: Search & Discovery Applications

### **3.4.1 - Description of assessed feature**

Currently, searching for interesting content to watch can be time consuming on the majority of VOD commercial services. This scenario intends to explore, search and discover new interesting content for users. For the first experimentations, three applications will be proposed to users, on a tablet:

- A advanced search with auto-completion
- A discovery application, GraphMap, based on common criteria of several movies. Starting from a movie that a user likes, they will be able to navigate through a graph to discover similar criteria, such as same actors, same director.
- A second discovery application, GeoMap, based on location similarity (movies of a same area) or temporal similarity (movies whose action is set in a similar time period).

After VOD selection on a tablet the user will be able to watch the VOD on TV.

### **3.4.2 - Innovation**

The current commercial VOD technology offers lists of movies with basic search capabilities and limited ways to filter content, such as criteria to get the latest releases, using the classification by genres or the most viewed. The Applications proposed in FI-CONTENT 2 offers new ways to consume VOD by combining the personalization, social networks, gamification, and enriched metadata in a multi-screen environment.

### **3.4.3 - User Community**

For Release 1, an initial experimentation is planned to take place in Brittany with a panel group of ~ 30 people equipped with a connected TV and a tablet in their home. The users will be able to evaluate several Search & Discovery Applications applied on commercial French VOD services. The objective is to collect the feedback from the users regarding their adhesion to the service, the ergonomic, user experience, and subsequent results.

#### **3.4.4 - Business Models**

The Social Connected TV platform will offer APIs to allow content providers, providers of cinema information and web applications development companies to integrate new ways to browse lists of movies.

#### **3.4.5 - Technical**

The architecture is composed of a back-end and of several applications running on a tablet or connected TV. The back-end integrates several third-parties items such as commercial VOD catalogues, search engines, links to social networks or other external sources to enrich metadata content. Besides, the back-end manages the profile of users and embeds several innovative technologies to browse content. The applications run on a tablet and TV access to content thanks to a back-end API and communicate thanks to a proprietary communication protocol.

## 4 - SMART CITY GUIDE

The “Smart City Guide” (SCG) platform is a portfolio of functions, designed to foster the development and uptake of city guide applications for end users based on future Internet technologies.

The following three features are described:

- *Content Search and Recommendation*: providing the user with accurate information on city, in answer to specific needs.
- *Content Enrichment*: allowing the user to create an interactive photo book after the SCG tour.
- *Hybrid-Mixed Reality*: offering a city tour in a mixed-reality environment.

### 4.1 - Content Search and Recommendation

Context: Providing the user with accurate information on a city, in answer to their specific needs

#### 4.1.1 - Description of assessed feature

Search and recommend local content relative to a city: POIs (Places of Interest), events, routes and tours. The content is aggregated from multiple sources such as open data, web sites, professional and cultural resources. It can also be enriched with UGC (User Generated Content), provide recommendations and alerts to the user, plus profile preferences based on location and personal lists.

#### 4.1.2 - Innovation

This feature allows the user:

- To access contextualised, customised and geo-located information (static or dynamic), contents, persons and events
- To share customised recommendations
- To get, create and customise routes regarding interests

All these functionalities can be used in real time and the content is aggregated from multiple sources. In addition it can be enriched with the help of UGC (User Generated Content).

#### 4.1.3 - User Community

This feature is designed for users who want to discover a city environment, look for practical information or simply want to learn and educate themselves. It was presented to our institutional partners (Brest Métropole Océane, Brest Tourism Office), who showed a lot of interest. This feature has been tested regularly by end-users. The Kano test has been applied to identify the usefulness of some of the features proposed. Further feedback will be provided following additional user trials at events throughout the project.

#### 4.1.4 - Business Models

The Business Models are to be studied further. Several business cases can be envisioned, for instance:

- For SMEs providing content: providing paid content.
- The possible addition of targeted advertising content (according to a user’s profile, user’s location and on-going activity)

#### **4.1.5 - Technical**

This feature relies on two Specific Enablers available on the Smart City Guide Platform (“Local Information” Enabler and “Recommendation Services” Enabler). The content (POI, tours, content, etc.) is rich; it is provided by numerous external sources: The recommended content is based on location and user’s profile. The “Recommendation Services” Enabler can be used to recommend any kind of objects (whatever their format), in any domain (not necessary tourism).

## **4.2 - Content Enrichment**

Context: Creating an interactive photo book after a SCG tour

### **4.2.1 - Description of assessed feature**

The Smart City Guide (SCG) is an interactive app of a city guidebook with many innovative features. SCG users can use their Smart City Guide App on mobile devices (tablet Release 1 or smartphone (Release 1), on PCs (Release 2) and use on SmartTVs (R1 with Samsung SDK) is planned as well. As opposed to the traditional city guidebook, the SCG can show the user different tours, find places of interest (POI), create new POI or add a video to a POI, get recommendations for POI and display events around the user and many more features. Once the SCG user has completed their tour, the app creates a report (interactive photo book) based on the UGC related to the POI.

### **4.2.2 - Innovation**

The user has got all their highlights and experiences in one app on their mobile device (smartphone or tablet). Immediately after their trip, the user has their own tour report. The report includes not only pictures and videos of their trip, but also their route map, POI they visited and additional information such as the POI opening times, costs and feedback of other users.

### **4.2.3 - User Community**

While touring with the Smart City Guide webapp, the end user generates their own content with their mobile device. They take pictures, record videos, rate POI or comment on POI. With this user-generated content the SCG creates a report similar to an interactive photo book. This “photo book” is a review of their trip. It shows the user’s tour, the POI they visited with the associated entry costs and comments, pictures and videos. The user can therefore later share the experience with their friends via the app, and they can also recommend some interesting POI to friends and family.

### **4.2.4 - Business Models**

In the enriched videos, targeted product placement should be offered in the form of advertisement in the video. The user recognizes products as well as POI and recommends them while watching a video. A payment model can be introduced for the use of the interactive photo book feature, which could be offered as a one-off transaction, or as a subscription for regular users. SMEs can therefore generate revenue from the sale or licensing of a service based on this feature. For example, a video on a user’s SCG interactive photo book with content enrichment, includes a tagged restaurant on a market square. The user looks at their smartphone to see if the Smart City Guide recommends the market square as a POI. The SCG shows them the market square as a POI with a video. The user opens the video and finds a tagged restaurant. If they click on the restaurant they are given further information about it such as prices, opening times and

comments. After checking this, the user decides to have lunch at the restaurant. The feature therefore offers a novel commercial opportunity for the restaurant (or other POI) to get advertised.

#### **4.2.5 - *Technical***

A basis for video-related services and applications in future Internet environments will be the content enrichment feature, which reflects critical functionalities. This enabler serves all major functions to enrich content in multiple ways. This contains object identification, content annotation, content recommendation and linkage to any web-enabled supplemental information or media (audio, video, text, images, animation, PDF, contact information, social media integration, video to video navigation, content interaction). Moreover, community functionalities are integrated which provide interfaces to web 2.0 capabilities. Thus the enabler acts as a common building block in future video and multimedia infrastructures. This includes a platform-independent, seamless and convenient enrichment of any kind of video content with any type of tool for a variety of applications covering user-generated and professional content and the possibility of edutainment.

### **4.3 - Hybrid-Mixed Reality**

Context: City tour in a mixed reality environment

#### **4.3.1 - *Description of assessed feature***

Mixed reality combines the real world with virtual objects, characters and information. A large number of moving objects can be managed in real time. In the domain of the Smart City Guide, the proposed scenario allows users to participate in city tours, either physically or virtually. For instance, in the “mixed reality” world, users can see in real time buses and subways in real time, or check where their friends and family are.

#### **4.3.2 - *Innovation***

Virtual worlds already exist, augmented reality already exists, but this scenario provides a novel implementation of mixed reality on a large scale (at the scale of the planet!). To support this scalability, specific algorithms have been designed and published in academic papers. This new technology opens a large potential for service innovation.

#### **4.3.3 - *User Community***

The feature is available to download from a web browser, or as a mobile application. Anyone can register, customize the feature’s appearance, enter the mixed reality world and chat with other users. Several people visiting the same place (physically or virtually) will be able to see each other, communicate, exchange information and participate in a tour. Content creators (such as institutions or artists) will be able to add their own virtual content to the mixed reality world and share it with other users. Demonstrations of such features have generated a lot of interest and an experiment is planned which will use real time public transport information from Brest in France.

#### **4.3.4 - *Business Models***

The business model is to be studied further. One possibility could be as follows:

- Access to the mixed reality environment will be open and free for end-users.
- Service providers wishing to develop new applications based on the platform will be offered free usage up to a threshold, after which a license will be required. Content providers will be offered free

spaces to insert new content into the mixed reality world. Some premium spaces will also be available at a fee. It is hoped that those premium spaces will be valuable since they will allow new interactions with users, and since they will be location-based, they will be relevant.

#### **4.3.5 - *Technical***

This scenario is based on the Hybrid-mixed reality enabler which is part of the Smart City Guide platform. It will bring to the platform some innovative features fully in line with the vision of the Future Media Internet. It will also raise interest in the platform from application developers and content providers, since it is a new way for them to distribute their services and products. Thanks to innovative algorithms, the platform can scale smoothly to manage virtually as many users and objects as needed. Openness is guaranteed since the platform offers an API to developers based on state-of-the-art, open technologies such as websocket or JSON.

## 5 - GAMES

The pervasive game platform is a collection of tools and technological components that interact with each other and enable the creation of pervasive games and experiences. The aim is to take gamers out of their living room and make them experience the real world in a different way. The pervasive game platform takes advantage of three distinct pools of technology. First, it connects to future Internet technology, as provided by FI-WARE. Secondly, it offers APIs that plug into established game development tools, such as Unity3D and SmartFox, proposing environments that have been proven in the field, and that many developers may find familiar. Finally, it proposes unique technology that targets augmented reality for mobile, web, and computational intensive applications.

### 5.1 - XML3D

#### 5.1.1 - *Description of assessed feature*

One of the strengths of the pervasive game platform is the ability to reach as many users as possible. Advanced web technologies often require the installation of plug-ins, which may or may not be available for all browsers, or may confuse non-experienced users. XML3D provides the ability to describe 3D content and display it through WebGL in a transparent way. Content is embedded seamlessly in the browser page, without the user needing to understand the difference with classic 2D elements. The advanced UI system allows you to use both 3D and 2D elements as an interface to the user, making it a natural experience.

#### 5.1.2 - *Innovation*

The current web evolved to a full-fledged application platform, which provides constantly and instantly available applications. Therefore, 3D graphics are today a commodity and it becomes necessary to integrate 3D content into HTML5 documents. In that fashion of a declarative way to handle 3D graphics content, XML3D is one of only two approaches, which reuses the document object model for its purposes. Thus, XML3D is an enabler technology to extend the existing functionality of established web technologies with capabilities to handle 3D content in a very similar and well-known way for web developers. Subsequently, there is a common effort to create an international standard within W3C on the foundation of XML3D. This is why seven XML3D-related peer-reviewed publications were released in the last 3 years.

XML3D brings in new capabilities to imagine innovative 3D UIs for the web. Its commercial exploitation particularly takes place with tools for the integration into content management systems, the storage of XML3D content into databases, and an intuitive web-based 3D editor. Recently, Cocomore AG, in collaboration with DFKI, started the integration of XML3D support into Drupal.

#### 5.1.3 - *Technical*

XML3D contributes to the FI-Content platform the capabilities to run usual 3D application in existing web browsers. Therefore, the utilized technology is platform-independent and is supported across a huge range of devices, including desktops, tablets, and mobiles. The applications using XML3D run instantly with no downloading, installing, or configuring. Indeed, this eases the deployment of new applications built upon XML3D. Moreover, the instant accessibility to the user lowers the bar for the exploitation of the provided applications, which in turn increases the attractiveness and availability of the FI-Content platform and contributes to its visibility. Since XML3D runs mainly on the client side, its applications support a very large number of active users, such as hundreds or thousands of simultaneous users using the same web application. Hence, a high scalability and reliability is inherently given for XML3D-based web applications.

In addition, XML3D technology is based on other web technology, e.g. DOM, HTML5, CSS, DOM Events, XHR, WebSockets, and interoperates with them. It is therefore also interoperable with related convenient libraries, like reveal.js and jQuery. Thus, XML3D fits seamlessly into the set of existing well-established web frameworks as a supplement for 3D web content. Besides, the declarative approach of XML3D is well-known

to web developers. So getting started with the promising possibilities of the 3D Internet, by using XML3D as part of the FI-Content platform, is quite straightforward for experienced web developers.

## 5.2 - Augmented Reality Tracking

### 5.2.1 - Description of assessed feature

The AR tracking enablers allow developers to overlay content on the real world. This technology allows mobile devices to know where they are with respect to objects and the environment. This allows applications to be visually context-aware and present in the real space around the user. The tracking enablers of the pervasive game platform are a group of individual integrated enablers, including initially Fast Feature Tracking, Motion Sensor Tracking and Fiducial Marker Tracking, and further Image Marker Tracking, 3D Object Tracking and Depth-Aware Tracking. These enablers work effectively with and in some cases on top of the FI-WARE AdvUI epic Augmented Reality enablers.

### 5.2.2 - Innovation

AR overlay on mobile devices is often limited to virtual scenes, which do not align precisely to what is seen naturally by the user, or basic overlay of arrows with highly inaccurate localization due to limitations of GPS and weak point of interest standards. These limitations prevent truly immersive augmented reality where media and game content blend seamlessly with the real world. Breakthrough technology such as those provided in our Reality Mixer enablers is not possible without quality AR tracking methods. We provide patent-pending methods of tracking, suitable for advanced context-aware content. For example, our Fast Feature Tracking method requires no prior knowledge of the scene, operates anywhere (even in Space! <http://bit.ly/SkyeAR>) and is suitable for computation anywhere, even in a web browser running on low-powered energy efficient mobile hardware. Further hardware capabilities are becoming available and we adapt to these new opportunities, such as with our Depth Aware Tracking enabler.

### 5.2.3 - Business Models

AR embodies the tremendous potential typical of a 'discontinuous' technology (Bessant et al 2005 [1]). While there are divided opinions concerning its immediate expansion (from those who envisage a potential market of \$600 billion by 2016, to those who caution that it will be 5-10 years before AR enters the mass market (Gartner, 2012 [2]), there are a number of indicators to show that AR will become prominent over the next few years.

Currently over 800 million high-end mobile phones are expected to be AR-enabled by next year; more than 100 million cars are anticipated to contain AR technology by 2020; and, recently, a crop of companies have either disclosed prototypes, or already started shipping wearable AR displays (Bernardos & Casar 2011 [3]). These new products fall into three categories: smart glasses (Google glass etc.), immersive head mounted displays (Sony HMZ etc.) and contact lenses (Innovega's iOptik etc.).

Our broad definition of Augmented Reality inclusive of video processing of virtual enhancements as employed by ESPN and CG film production, and physical device integration in the Internet of Things as well as regular AR video game uses suggests the opportunities for expansive business models are rather larger than the above studies have contemplated.

#### **5.2.4 - Technical**

The placement of augmented content overlays through our tracking enablers is provided by a careful selection of techniques. The position, orientation and scale of objects and environmental points of interest are recovered with accuracy ranging from 5 degrees of error in motion sensor tracking with gyroscopes to highly accurate sub-pixel location in camera image space for image and depth-aware tracking.

Recognition of the object to be tracked precedes accurate tracking and consequently, the tracking enablers of the Pervasive Gaming Platform are able to recognise objects and locations. Recognition in this context is not necessarily exclusive or unique identification, although the tracking enablers may be built upon to provide unique identification.

### **5.3 - Reality Mixer**

#### **5.3.1 - Description of assessed feature**

The pervasive game platform proposes a collection of tools that aim at creating a seamless integration of the virtual elements in the real world. These tools consider properties such as the lighting and materials of a real world scene, as well as the configuration of the camera, such as lenses and sensors, and alter the appearance of virtual elements accordingly to achieve high quality blending.

#### **5.3.2 - Innovation**

Even when tracking is available and a device knows its location with respect to the environment, the challenge is to represent virtual elements so that they look as realistic as possible, so that they blend seamlessly with reality and that the illusion works.

#### **5.3.3 - Technical**

The mix of reality and virtual world is provided through a number of enablers. By introducing light probes into a scene, the overall scene lighting is captured and used to render virtual elements appropriately. This works in real-time, so that changes to the lighting are immediately reflected on the virtual objects. Similarly, through the use of probes, the interaction of the light with particular materials is faithfully reproduced when rendering virtual elements.

The interaction of real and virtual objects is also obtained at a physical level with the provided simulation continuum enablers. Real objects are tracked in order to apply forces and compute collisions with virtual objects. In particular, objects crafted in the real world can also react to virtual forces, closing the loop.

Additional aspects of the reality mixer include simulation of virtual sound sources with correct behavior within a scene made of both real and virtual objects, as well as the simulation of lens and camera sensor artifacts to the virtual objects to improve the blending.

### **5.4 - User Communities**

The features presented for this Games community offer API's that plug into existing games development tools, so integration can take place into an established arena. The interest from end users is likely to be high with regards to novel features such as displaying 3D through WebGL in a transparent way and Augmented Reality Tracking, through the use of mobiles. Plus the Reality Mixer offers the opportunity to blend the real with the virtual world.

## 5.5 - Business Models

For Games the business models can develop in a number of ways. These can be from start-up where a commercial route is identified in exploiting a new technology and creating a new market with a unique product. Or they can build on an existing technology or service and bring enhancements which people or companies are willing to invest in, license or buy. As an example, the business model for the Augmented Reality Tracking feature has identified that AR will be more readily available in mass market devices such as mobiles and cars in the next few years. So as these applications become commonplace there is a chance to reach a larger consumer market with commercial opportunities.

One of the strengths of the pervasive game platform is the ability to reach as many users as possible. Advanced web technologies often require the installation of plug-ins, which may or may not be available with all browsers, or may confuse non-experienced users. XML3D provides the ability to describe 3D content and display it through WebGL in a transparent way. Content is embedded seamlessly in the browser page, without the user needing to understand the difference with classic 2D elements. The advanced UI system allows you to use both 3D and 2D elements as interface to the user, making it a natural experience.

## REFERENCES

- [1] Bessant, J., R, Lamming, H. Noke and W. Phillips (2005). "Managing innovation beyond the steady state." *Technovation* 25(12), pp1366-1376
- [2] Emerging Technologies Hype Cycle 2012, Gartner
- [3] Bermardos, Casar (2011). "Analyzing business models for mobile augmented reality", ICIN 2011