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SPECIFIC ENABLERS - INITIAL RELEASE
September 2013

ABSTRACT

This document describes the initial release of Specific Enablers for the Future Internet Content project. This performs the initial launch of specific features among the platforms covering Social Connected TV, Smart City Guide and the Pervasive Games Platform. The use of cloud functionalities in SE releases herein is deferred to a later release.

SEVENTH FRAMEWORK PROGRAMME

FUTURE INTERNET PPP

DISCLAIMER

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EXECUTIVE SUMMARY

This document describes the initial release of Specific Enablers (SEs) within Phase 2 of the Future Internet Content project, which delivers a core set of platforms building upon FI-WARE and XiFi capabilities as part of the FI-PPP programme. The SEs detailed in this document have been identified with all consortium partners, technical partners and experimentations site owners. They are composed of technologies targeted at key strategic areas for broad uses of interactive entertainment, including social connected TV and virtual and augmented reality environments on the Future Internet.

The Specific Enablers of the Social Connected TV Platform deliver advanced capabilities in audio fingerprinting and mining to enable new interactions with sound in media. Content optimization harmonizes additional content from disperse sources, whereas the second screen framework and TV application layer permit unprecedented levels of connectivity between TVs and a variety of devices. Smart City Guide services open up possibilities in applications delivering new forms of content to users across wide areas of cities. This platform includes local information aggregation services, an open city database providing points of interest, recommendation services based on collaboration and meta-data, and virtual mixed reality presentation of guide content. Finally, the Pervasive Game Platform Specific Enablers is a mashup of augmented reality tracking and 3D internet with Internet of Things capabilities, including a series of Reality Mixer techniques covering seamless integration of audio, visual and physical digital content with the real-world. Further the game platform delivers support for developer to build connected applications, which need content synchronization and social connectivity.

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ABBREVIATIONS

API	Application Programming Interface
DB	Database
FI	Future Internet
GE	Generic Enabler
HbbTV	Hybrid Broadcast Broadband TV
HTML	Hyper-Text Markup Language
NLP	Natural Language Processing
POI	Point of Interest
REST	Representational State Transfer
RTS	Real-Time Strategy
SE	Specific Enabler
SEO	Search Engine Optimization
SME	Small to Medium Enterprise
SOAP	Simple Object Access Protocol
TAL	TV Application Layer
UGC	User-Generated Content
VoD	Video on Demand
WebGL	Web Graphics Language

1 - INTRODUCTION

The FIcontent platforms are a collection of tools and techniques, designed to enable the creation of applications on mobile and web-enabled devices. This technical portfolio takes advantage of established tools and frameworks, of specific technical contributions (FIcontent Specific Enablers), and generic Future Internet technology (FI-WARE Generic Enablers).

This deliverable mainly consists of the initial release of the Specific Enablers (SEs) for the FIcontent platforms, which delivers a core set of platforms building upon FI-WARE and XiFi capabilities as part of the FI-PPP programme. Moreover, we provide this additional document with a brief description of the Specific Enablers per platform as well as the common Specific Enablers used by multiple platforms. The SEs detailed in this document have been identified with all consortium partners, technical partners and experimentations site owners. They are composed of technologies targeted at key strategic areas for broad uses of interactive entertainment, including social connected TV, smart city guide and virtual and augmented reality environments on the Future Internet.

The Specific Enablers of the Social Connected TV Platform offer advanced capabilities with the Audio Fingerprinting SE & Audio Mining SE to enable new interactions with sound in distributed media. The Content Optimization SE orchestrates additional content from disparate sources, whereas the Second Screen Framework SE and TV Application Layer (TAL) SE unlock connectivity between TVs and a variety of devices, such as set top boxes, phones and tablets.

Smart City Guide services open up new possibilities in applications delivering new forms of content to users across such wide areas as cities, theme and expo parks. The Smart City Platform includes local information aggregation services, an Open City Database SE providing points of interest and Recommendation Services SE based on collaboration and meta data.

Finally, the Pervasive Games Platform Specific Enablers is a carefully targeted collection of services providing augmented reality tracking and 3D Internet with Internet of Things capabilities. Importantly, this platform includes a series of Reality Mixer techniques advancing the state of the art in seamless integration of audio, visual and physical digital content with the real world. Further the game platform delivers support for developer to build connected applications including SEs for content synchronization and social connectivity.

Please be aware about the fact that this document is generated from the FIcontent Wiki [1]. You will find the wiki at http://ficontent.dyndns.org/. Thus, the document may sometimes still refer to the FIcontent Wiki. All information in this document is also available online. We suggest using the online version [2] for an advanced reading experience.

2 - ROADMAP OF THE SOCIAL CONNECTED TV PLATFORM

2.1 - Social Connected TV Platform - Release 09/13

The Social Connected TV Platform is a toolbox that offers powerful instruments to enhance connected TV services with:

Multi-screen interaction

- Intuitive interaction for advanced TV services
- More versatile content presentation across screens

Personalized TV experience

- Connected TV services tailored to single and multiple users
- Social interaction between users
- Search and discovery of content

User tracking and privacy

- Visualizing personal content consumption
- Tracking implicit and explicit user interaction
- Providing users with simple control over personal data

The features of the Social Connected TV Platform SEs address developers as well as providers of connected TV services. The following Specific Enablers are included in the September release of the Social Connected TV Platform.

2.1.1 - Audio Fingerprinting

2.1.1.1 - *What you get*

The Fingerprint SE consists of an indexing component (adding/removing media to/from a fingerprint database) and a matching component (testing unknown fingerprints against a/the database). Furthermore, a mobile SDK/software library for Android and iOS is available, which can be linked into a mobile application. It takes care of recording the audio signal, calculating an acoustic fingerprint (while also decrypting the data), sending the fingerprint to a server and passing the results back to the application.

The algorithm works independently of the spoken language and is robust towards regular background noises and distortions. Synchronization will work for compressed data and in lively living rooms. It was also successfully tested during presentations with larger crowds and over laptop speakers. Furthermore, the algorithm can be tuned to trade off speed against accuracy.

2.1.1.2 - *Why to get it*

The Specific Enabler "Audio Fingerprinting" targets at scenarios in the context of Second Screen Applications like "Content linking across device". Therefore, the SE recommends matching content for second screen devices: It analyses an incoming audio signal (e. g. from a TV or a VoD stream), computes a fingerprint and checks that fingerprint against a database potentially containing the analyzed content data. 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.

2.1.1.3 - *Documentation*

- Technical Documentation of the Audio Fingerprinting SE [3]

2.1.2 - **Audio Mining**

2.1.2.1 - *What you get*

The Audio Mining SE is based on Fraunhofer IAIS' Audio Mining software and consists of a number of analysis services (called iFinder services) for content in German language, a media asset management framework including a persistence layer, a search engine and a SOAP/REST interface. The component is a backend application, without having end-users interacting directly with the system.

iFinder services

- Structural analysis: The audio is segmented according to speaker changes or variations in the acoustic environment. Afterwards, every segment containing human speech is subject to further processing.
- Speaker identification: For every segment containing speech the most probable speaker is determined based on features derived from the voice.
- Speech recognition: Uses optimized models for previously detected speakers to ensure highest accuracy.
- Keyword Extraction: The final step is a keyword extraction to identify the most significant, distinctive and important terms from the speech recognition transcript.

2.1.2.2 - *Why to get it*

The Specific Enabler "Audio Mining" targets at scenarios in the context of Multimedia Indexing and Search like "Audio/Video SEO" and "State & Quote on Social TV". Therefore, the SE analyses a given audio/video file and returns textual information for indexing. Speech and speaker segmentation as well as speech recognition are performed in order to turn speech into text. It delivers segments, characteristic keywords and various metadata. Finally, the SE builds an index for Multimedia Search.

2.1.2.3 - *Documentation*

- Technical Documentation of the Audio Mining SE [4]

2.1.3 - **Content Optimization**

2.1.3.1 - *What you get*

The Content Optimization SE consists of various modules that can be used to enrich textual content. Currently two modules are implemented: Firstly, the recommendation module can be used to generate recommendations for textual content such as audio transcripts. Secondly, the enrichment module can be used to perform Named Entity Recognition on textual content. The recognition module uses the Semantic Annotation GE and DBpedia-Spotlight to find and link entities.

2.1.3.2 - *Why to get it*

The Specific Enabler "Content Optimization" targets scenarios in the context of Multimedia Mash-ups like "Connected Encyclopedia for Social TV". Therefore, the SE processes incoming textual content (e. g. from Audio Mining SE) and extracts characteristic keywords. Afterwards, a semantically enrichment based on NLP will be performed to connect the transcripts and keywords with contextual information. Therefore, the SE integrates and harmonizes additional content from disperse sources. The SE is intended for SMEs, which want to build Second Screen Applications, e. g. for TV documentaries.

2.1.3.3 - *Documentation*

- Technical Documentation of the Content Optimization SE [5]

2.1.4 - Second Screen Framework

2.1.4.1 - *What you get*

The Second Screen Framework SE provides web applications, which are running on a TV with all the crucial functionalities to establish a persistent bi-directional communication path to a web application running in the browser of any second-screen device. This includes the possibility to launch applications from one TV on the second screen. All functionalities are provided via a slim JavaScript API and can thus be easily integrated into any web application.

2.1.4.2 - *Why to get it*

Since the solution is fully compliant to the HbbTV standard it enables content providers to create fully interactive applications with direct programme relation potentially targeting millions of already deployed devices on the market. Thus, the concept can be implemented without modifications of hardware and only minimal extensions to existing applications.

2.1.4.3 - *Documentation*

- Technical Documentation of the Second Screen Framework SE [6]
- Developer Guide of the Second Screen Framework SE [7]

2.1.5 - TV Application Layer

The TV Application Layer (TAL) is an open source library for building applications for Connected TV devices.

2.1.5.1 - *What you get*

TAL works to abstract device functionality variations. The bulk of your development can be done on a desktop browser that is built on the same origins as the TV browsers. It does not mean there would not be things that work differently once you run your application on TV devices, but it does mean that you can focus on building the features you want in your app rather than worrying about TVs too much.

2.1.5.2 - *Why to get it*

There are hundreds of different devices in the marketplace and they all use slightly different technologies to achieve the same result. The purpose of TAL is to allow you to write an application once, and be confident that it can be deployed to all HTML-based TV devices.

2.1.5.3 - *Documentation*

- Technical Documentation of the TV Application Layer SE [8]

2.2 - Social Connected TV Platform - Upcoming Releases

At the moment no additional Specific Enablers are planned for upcoming releases of the Social Connected TV Platform. Instead, we will focus on an enhancement of our existing Enablers, in particular those responsible to support interactive multi-screen content. Moreover, new partners joining the FI-CONTENT consortium through the Open Call will probably develop additional Specific Enablers. These Enablers will be from then on available within upcoming releases of the Social Connected TV Platform.

3 - ROADMAP OF THE SMART CITY PLATFORM

3.1 - 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.

3.1.1 - Local Information

3.1.1.1 - *What you get*

This Local Information SE is based on Orange's "Ma Vie Locale" product and provides access to local content aggregated from multiple sources (open data, web sites, etc.), enriched with UGC and recommendations. In particular, the 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.

3.1.1.2 - *Why to get it*

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

3.1.1.3 - *Documentation*

- Technical Documentation of the Local Information SE [9]

3.1.2 - Open City Database

3.1.2.1 - *What you get*

The Open City Database gives you back a JSON structure of a city or Points of Interests. The cities JSON object includes information's 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. The users generate the content. Therefore, more and more POIs are created by UGC.

3.1.2.2 - *Why to get it*

Through the use of UGC 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.

3.1.2.3 - *Documentation*

- Technical Documentation of the Open City Database SE [10]

3.1.3 - Recommendation Services

3.1.3.1 - _What you get_

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

3.1.3.2 - _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 relation.

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

3.1.3.3 - _Documentation_

- Technical Documentation of the Recommendation Services SE [11]

3.2 - 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.

3.2.1 - Virtual/Mixed Reality

3.2.1.1 - _What you get_

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 provide neighboring moving objects (either real of 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.

3.2.1.2 - _Documentation_

- Technical Documentation of the Virtual/Mixed Reality SE [12]

3.2.2 - 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.

4 - ROADMAP OF THE PERVASIVE GAMES PLATFORM

4.1 - Pervasive Games Platform - Release 09/13

The first release of the Pervasive Games Platform will focus on Tier 1 gaming scenarios. For tracking, mostly existing image or marker-based approaches are used. Supported applications mainly consist of two types that will run on most devices. We concentrate in particular on mobile devices with portability in mind. For these requirements, two foundation technologies suit best: HTML5 and Unity.

Install-free HTML5 web applications. Many mobile devices support nowadays WebGL and therefore, hardware accelerated 2D and 3D graphics. For many users, a dedicated software installation can mean too much effort, but in our case it is enough to just go to a website.

Unity 3D based games for high performance and quick development. For gamers that are willing to install the Unity player software, games can be a bit more sophisticated. For game development and content creation a useful tool exists that is already used by many game developers. A game can be easily deployed to multiple operating systems.

The following Specific Enablers are included in the September release of the Pervasive Games Platform and provide the technological foundation for our gaming scenarios.

4.1.1 - Reality Mixer - Reflection Mapping

4.1.1.1 - *What you get*

All visual oriented Specific Enablers of the Reality Mixer group measure camera properties and adapt the virtual objects to visually fit to the camera image background. The Reflection Mapping SE utilizes a light probe to extract a sphere map from the camera image, which contains the environmental lighting conditions. This sphere map will be used to apply an appropriate lighting model to rendered virtual objects. Thus, the additional virtual objects are incorporated into the resulting image in a very seamless fashion leading to a more realistic experience of mixed reality applications.

4.1.1.2 - *Why to get it*

This enables a new level of realism in augmented reality applications. It may be used directly with a diffuse light probe to match the appearance of matt surfaces on virtual characters and vehicles. Furthermore, developers may experiment with mapping different materials to application objects, such as marble or crystal.

4.1.1.3 - *Documentation*
- Technical Documentation of the Reflection Mapping SE [13]
- Developer Guide of the Reflection Mapping SE [14]

4.1.2 - Reality Mixer - Camera Artifact Rendering

4.1.2.1 - *What you get*

This SE helps to render plausible virtual objects on top of a camera image. It consists of two steps which are executed on the client side, e.g. a mobile device. First, some camera parameters are estimated, such as noise, motion and white balance. This can be based on images or other sensor information of the device. The second step is to apply those parameters as a post processing fragment shader pass to the rendered virtual objects.

4.1.2.2 - *Why to get it*

This SE helps making the virtual objects more believable and fit seamlessly to the camera image in the background. When the camera imperfections such as color casts, motion blur or noise are not taken into account, the virtual objects will stand out and appear unnatural. This SE estimates such parameters from the life image and other sensors and applies a post-processing step to the virtual objects.

4.1.2.3 - *Documentation*

- Technical Documentation of the Camera Artifact Rendering SE [15]
- Developer Guide of the Camera Artifact Rendering SE [16]

4.1.3 - Leaderboard

4.1.3.1 - *What you get*

The leaderboard is a high score list for a game. You can submit an integer score together with the player information, usually after a game is over. To compare the score with the score of other players, you can retrieve an ordered list of scores and respective players. For large lists you can also only get a part of the list. In addition you can query the position of a player on the high score list. Multiple scores can be used, such as 'collected items', 'time' and 'overall score'.

4.1.3.2 - *Why to get it*

A simple interface makes it convenient to use. Internally, the Identity Management GE will be used. With a leaderboard the players can be motivated to improve their skills and competitively compare their results with the results of their friends.

4.1.3.3 - *Documentation*

- Technical Documentation of the Leaderboard SE [17]
- Tutorials and Example Code for the Leaderboard SE [18]

4.1.4 - Augmented Reality - Fast Feature Tracking

4.1.4.1 - *What you get*

All Specific Enablers of the Augmented Reality group provide various tracking methods to enable augmented reality applications. The Fast Feature Tracking SE learns targets by color, and then matches the center of the color area (for example a colored football) in the camera image to retrieve the relative camera pose information. This extends an application with the capabilities to apply the matching transformation to 3D-scene content and render them onto respective targets.

4.1.4.2 - *Why to get it*

With the Fast Feature Tracking SE you will be able to easily create applications with basic markerless augmented reality functionality. With this Specific Enabler you can learn the color of targets on-the-fly in an application and then track the center and size of the target for camera relative placement of animated interactive graphics such as virtual characters or vehicles.

4.1.4.3 - *Documentation*

- Technical Documentation of the Fast Feature Tracking SE [19]

4.1.5 - Augmented Reality - Marker Tracking

4.1.5.1 - *What you get*

All Specific Enablers of the Augmented Reality group provide various tracking methods to enable augmented reality applications. The Marker Tracking SE utilizes AR markers to retrieve camera pose information through Xflow. This extends XML3D with the capabilities to apply the matching transformation to 3D-scene content and render them onto respective markers in a web-based environment. The Marker Tracking SE follows the declarative approach of XML3D and is real-time capable.

4.1.5.2 - *Why to get it*

With the Marker Tracking SE you will be able to easily create web applications with basic augmented reality functionality. The specific enabler nicely captures all the necessary computations into Xflow nodes. Thus, you can create AR application without being an expert in computer vision. Basic knowledge in web technologies is sufficient to produce great applications using XML3D/Xflow together with the Marker Tracking SE.

4.1.5.3 - *Documentation*

- Technical Documentation of the Marker Tracking SE [20]

4.1.6 - Game Synchronization

4.1.6.1 - *What you get*

This enabler provides functionality to synchronize the game world. We consider the following taxonomy. For the connection of the parties, we consider Peer-to-peer (p2p) and Server-to-Client (s2c). This enabler serves different networking models, such as:

- RTS-lockstep (p2p) - [*September 2013*].
- Authoritarian Client (p2p), also known as 'Host' model - [*November 2013*].
- Authoritarian Server (s2c) - [*November 2013*].

The RTS-lockstep is intended for games with a large game state that would be difficult to synchronize over the network. This is indeed the case of RTS games with many units. In the peer-to-peer scenario, after a hand-shaking phase (see the use of SmartFoxServer) the network is only used to transfer the players' input, and the game simulation is done locally on each client. Both Authoritarian solutions are intended for games where the game-state has a manageable size, and can be transferred over the network. The authority (either a client or a dedicated server) will act as authority and simulate the game, sending the updated game-state to the clients. Clients send back the player input.

4.1.6.2 - *Why to get it*

Synchronization of game content is often game specific. As a developer, one has to choose the networking model, and often invest resources in crafting something that fits the particular needs. The choice of using this enabler depends on the complexity and requirement of your game, as well as your resources.

With this enabler, we focused on two classic paradigms, peer-to-peer and server-to-client, with the intent to build a base for developers to build upon. This enabler provides a working base that can be extended to the specific needs without having to start from scratch.

4.1.6.3 - *Documentation*

- Technical Documentation of the Game Synchronization SE [21]
- Tutorials and Example Code for the Game Synchronization SE [22]

4.1.7 - **Spatial Matchmaking**

4.1.7.1 - *What you get*

Connecting to others in your vicinity is often a challenge in cities and around the country. This enabler focus on enabling people with matched interests to connect when they are close to one another. Moreover, it opens up new possibilities for interacting with digital content among like-minded people.

4.1.7.2 - *Why to get it*

This SE matches clients allowing the developer to connect clients without programming a server back end. Application users will then be able to connect without having to exchange connection information. In particular game developers, who want to connect nearby gamers, will benefit from this Specific Enabler.

4.1.7.3 - *Documentation*

- Technical Documentation of the Spatial Matchmaking SE [23]
- Developer Guide of the Spatial Matchmaking SE [24]

4.2 - Pervasive Games Platform - Upcoming Releases

For the upcoming releases of the Pervasive Games Platform we will shift our focus to Tier 2 and Tier 3 gaming scenarios. Therefore, we will extend the portfolio of Specific Enablers of the Pervasive Games Platform and add dedicated Enablers to handle these scenarios. Moreover, we will improve our existing Specific Enablers with additional features, performance improvements and alternative implementations. We may introduce new Enablers based on existing ones to provide more advanced feature set.

The following Specific Enablers are planned for upcoming releases of the Pervasive Games Platform and will provide the technological foundation for our Tier 2 and Tier 3 gaming scenarios.

4.2.1 - **Game Server**

This enabler is planned as simplified abstraction to the SmartFoxServer service. This is a platform for networked games available for most of the existing game engine platforms. It gives developers the tools to create and run multiplayer games, both in terms of game modules, server hosting, and analysis tools.

4.2.2 - **Sketch-Based Game Design**

The goal of the Sketch-Based Game Design SE is to create interface to game design suitable to kids and non-technical users, where most of the design process is done on paper. A user creates a drawing on paper and takes a photograph of it. The photo is processed for content recognition and an interpreter directs the instancing of game assets and the logic between them.

4.2.3 - **Reality Mixer - Simulation Continuum**

Augmented reality experiences further take place with virtual objects placed in the real world. Virtual objects under a physically accurate simulation thus far have no physical effect on real objects and conversely rigid and soft body dynamics captured from real objects have no physically simulated effect in virtual objects. This enabler includes development of methods for achieving a simulation continuum between real and virtual objects.

4.2.4 - **Games Content - Cloud Physics Processing**

Physics simulations can be demanding in terms of computation power, memory and power consumption. On mobile devices only simple simulations are feasible. With this SE we will offload the computation to a server. This is especially useful when multiple co-located mobile devices send input to a single simulation and receive the results streamed by the server.

4.2.5 - Reality Mixer - Augmented Audio

Sound effects add another level of immersion to games. By taking the acoustic properties of the environment into account, the sound will feel more integrated and less artificial. Especially reflections (echo) are important. Without a direct line of sight, the spectrum of the sound is attenuated non-linearly. With binaural sound we might even add a convincing sense of direction of the sounds.

4.2.6 - Augmented Reality - Skeletal Tracking

For Tier 1 game scenarios it is useful to track the position and orientation of a toy. This SE goes one step further by recovering the pose of the toy such as the angles of arms and legs with respect to the body or the head rotation. This can be used to react on the physical pose or for better visual augmentations on the toy itself. Maybe, the same technology can even be used to get information on the pose of other players.

4.2.7 - Games with Things - Things Composer

To simplify the management of many individual Things and associating them together with Game Logic, we propose the Things Composer. This will provide an single interface to the Configuration Management GE and the Complex Processing GE to enable the end user to define a reusable "Set Of Things" configuration with associated logic for use in Games. This is especially important in Tier 3 games, where the abstraction must be transportable around and between cities.

5 - ROADMAP OF THE COMMON SPECIFIC ENABLERS USED ACROSS PLATFORMS

5.1 - FI-CONTENT Common Enablers - Release 09/13

The following common Specific Enablers are included in the September release of the FI-CONTENT platforms. These common Specific Enablers are not dedicated to a single platform of domain-specific applications. More generally, they may have the capability to be later promoted as Generic Enabler in the Future Internet.

5.1.1 - Social Network

5.1.1.1 - *What you get*

The Social Network SE is a federated social network. It features user and profile management and the ability of creating status updates, uploading assets (text, pictures, etc.) and social functions (liking, commenting, etc.) with real-time updates to one's peer group (i.e. followers).

5.1.1.2 - *Why to get it*

The Social Network SE is one way of 'glueing' the different enablers and components into a full-fledged social network. Users of these components can communicate, share, comment and like assets. This is especially relevant if the business model and the use cases of the SME services needs a community and the management thereof.

5.1.1.3 - *Documentation*

- Technical Documentation of the Social Network SE [25]

5.1.2 - Content Sharing

5.1.2.1 - *What you get*

The main functionality of the Content Sharing SE consists of a transparent content synchronization with regards to underlying network connectivity (infra, ad hoc). This allows for instance the synchronization of feeds containing linked content such as comments on images, or images related to one another.

5.1.2.2 - *Why to get it*

The Content Sharing SE mainly provides the ability to share content in infrastructure-less situations. This is useful to transfer data directly between users or to a server. As an example, downloaded content can directly be shared with other users without requiring additional infrastructure. For mobile devices the service is designed with power efficiency and possible connectivity disruptions in mind.

5.1.2.3 - *Documentation*

- Technical Documentation of the Content Sharing SE [26]

5.1.3 - Content Enrichment

5.1.3.1 - *What you get*

The Content Enrichment enabler provides the following capabilities

- **Media & Text Annotation** - allows any type of media (e.g. video, audio, photos or text) to be enriched with user-generated video content, add or edit comments, notes, enrich the media with

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custom drawings. Also to create custom mash-ups of media content and enable the retrieval of related information (e.g. via access to external resources, location & content sensitive metadata, object tracking etc.)

- **Object-based Media Discovery** - enriched media content contains metadata information on available objects within the media. Referenced information on available objects can be used to discover other object-related media content
- **Cross-Video Navigation** - Allows user interaction to jump back and forth in-between video content

5.1.3.2 - *Why to get it*

To create, distribute and play interactive content video content across platforms and devices. 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 infrastructures, 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, professional content as well as edutainment.

5.1.3.3 - *Documentation*

- Technical Documentation of the Content Enrichment SE [27]

5.2 - FI-CONTENT Common Enablers - Upcoming Releases

At the moment there are no further common Specific Enablers planned for upcoming releases of the FI-CONTENT platforms. But it might be the case that additional SEs from a dedicated platform will be promoted to become more generic and thus common Specific Enablers of FI-CONTENT. For instance, the Augmented Reality SEs of the Pervasive Games Platform are good candidates to be utilized within the Smart City Platform as well.

6 - CONCLUSION

In this document, we have presented a brief description of the Specific Enablers for the first release of the FI-CONTENT platforms. In preparation of the Specific Enablers we have made use of established tools and frameworks, specific technical contributions (FI-CONTENT Specific Enablers), and generic Future Internet technology (FI-WARE Generic Enablers). The technical outline consists of the Enablers of the Social Connected TV Platform, Smart City Platform and the Pervasive Games Platform.

First, we have presented a listing of the groups of Specific Enablers that are involved, as well as their significance in delivering new models of Future Internet Content. Additionally, we have indicated further sources of information associated with each enabler to the interested target audience.

Second, we have presented the development roadmap, including a description of what will be available in the first platform release and in upcoming releases for Specific Enablers as part of each technology area and also those common between content platforms. The high-level description of Specific Enablers is provided in cooperation among all consortium partners.

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