



D2.2

PLATFORM AVAILABLE FOR USER TEST 1ST ITERATION

March 2014

ABSTRACT

This document keeps record of the development of the first release of the Social Connected TV Platform. It describes the implementation of the platform Specific Enablers and provides further information such as a development roadmap.

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EXECUTIVE SUMMARY

The Social Connected TV Platform is a toolbox that offers powerful instruments to enhance connected TV services or TV related services for second-screen devices. This document keeps record of the development of the first release of the Social Connected TV Platform. It describes the implementation of the platform specific enablers and provides further information such as a development roadmap.

- The following Specific Enablers are part of the first release of the Social Connected TV Platform:
- Audio Fingerprinting
- Audio Mining
- Content Optimisation
- Second Screen Framework
- TV Application Layer

Moreover the following Common Specific Enablers are used:

- Content Enrichment

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ABBREVIATIONS

AKSW	Agile Knowledge and Semantic Web
API	Application Programming Interface
Apple HLS	Apple HTTP Live Streaming
AWS	Amazon Web Services
CE-HTML	Consumer Electronics-HyperText Mark-up Language
DLNA	Digital Living Network Alliance
DNS	Domain Name System
DoW	Description of Work
DRM	Digital Rights Management
EPG	Electronic Program Guide
GE	Generic Enabler
GUI	Graphical user interface
HbbTV	Hybrid Broadcast Broadband Television
HTML	HyperText Mark-up Language
HTTP	Hypertext Transfer Protocol
IaaS	Infrastructure as a Service
iOS	Mobile operating system developed and distributed by Apple Inc.
IPTV	Internet Protocol Television
MySQL	My Structured Query Language
NER	Named-Entity Recognition
NLP	Natural Language Processing
NSD	Network Service Discovery protocol
QoE	Quality of Experience
QR-code	Quick Response code
REST	Representational State Transfer
SCTVP	Social Connected TV Platform
SDK	Software Development Kit
SE	Specific Enabler
SEO	Search Engine Optimization
SME	Small and Medium Enterprises
SML	Service Modelling Language
SOAP	Simple Object Access Protocol
Solr	Open source enterprise search platform from the Apache Lucene project

TAL	TV Application Layer
UGC	User Generated Content
UK	United Kingdom
UPnP	Universal Plug and Play
URL	Uniform resource locator
VoD	Video on Demand
XML	Extensible Mark-up Language

1 - INTRODUCTION

1.1 - Overview

The Social Connected TV Platform is a toolbox that offers powerful instruments to enhance connected TV services or TV related services for second-screen devices. This document keeps record of the development of the first release of the Social Connected TV Platform. It describes the implementation of the platform Specific Enablers and provides further information such as a development roadmap.

Please be aware of the fact that this document is generated from the FIcontent Wiki [1]. Thus, the document may sometimes still refer to the FIcontent Wiki. All information in this document is also available online. We suggest to use the online version [2] for an advanced reading experience.

1.2 - Terminology

The following table contains terms, which are used in multiple deliverables. Therefore, we provide their shared definitions to ensure consistency across several documents.

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 FIcontent infrastructure to offer services
Enabler Software	Module or web service providing well-specified functionality, accessible 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 Enablers as well as 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 geo-located. 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)

Term	Definition
Scenario	Description of foreseeable interactions of users with one or several applications
Specific Enabler	An enabler realized by the FIcontent project. Specific Enablers may be layered on top of, or otherwise make use of, Generic Enablers. Please refer to the definition of a FIcontent Specific Enabler from deliverable D6.1 Architecture specification [3]
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 - SOCIAL CONNECTED TV PLATFORM ARCHITECTURE

The figure below illustrates the Social Connected TV Platform architecture. In the figure four layers can be identified. These are:

- Layer 1 (red): Scenarios
- Layer 2 (yellow): Applications
- Layer 3 (blue): Specific Enablers (SEs)
- Layer 4 (green): Generic Enablers (GEs)

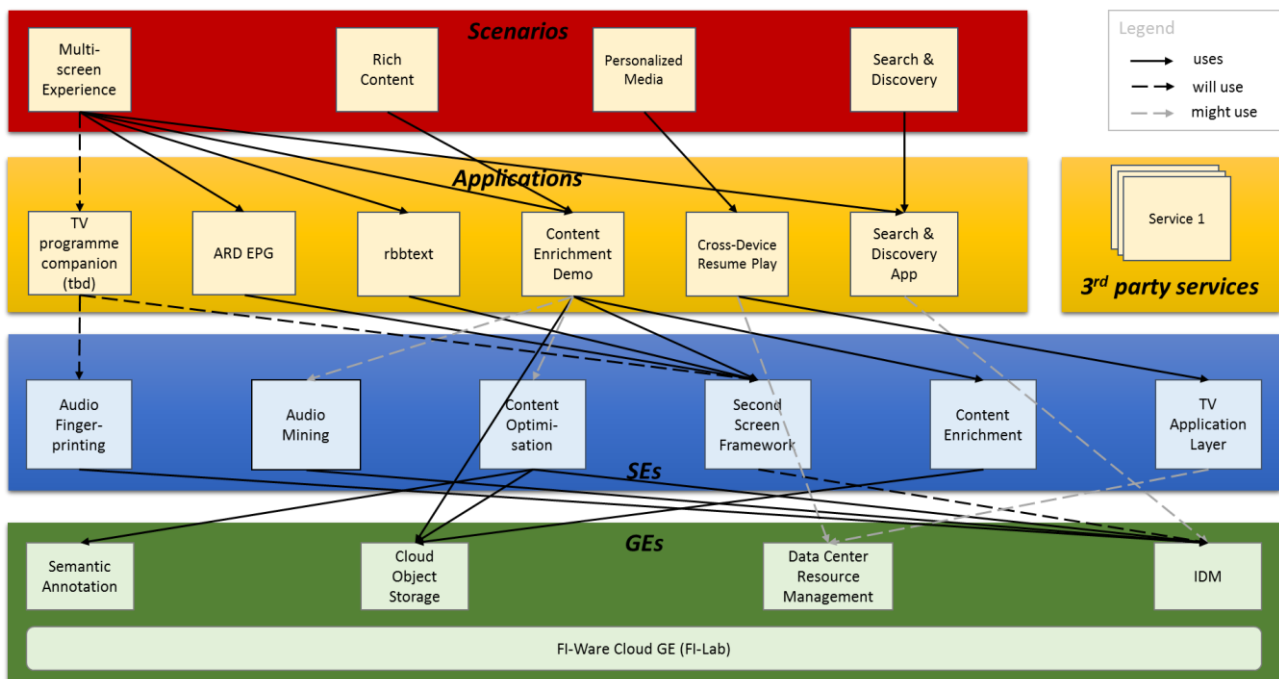


Figure 1 High-level architecture of the Social Connected TV Platform

Scenarios describe what users will be able to do with the Social Connected TV Platform. Scenarios are defined in D2.1. SEs and GEs are technological components that are used to implement the functional requirements of the scenarios. GEs are provided by the Core Platform of FI-PPP developed by the FI-WARE project. SEs are developed by FIcontent in order to complement GEs where domain specific features are needed. SEs are exposed to 3rd party developers and SMEs via the Social Connected TV Platform API.

Applications are pieces of software built on top of SEs and GEs that make certain features of Scenarios available to end-users. There are two kinds of applications. The first group is built of those applications that are implemented by FIcontent partners with the goal of validating the scenarios and the SEs and GEs. The second group is built of those applications that are developed by third parties that are involved through the Open Call, Competitions and Phase 3 of the FI-PPP programme.

The arrows in the diagram indicate dependencies between scenarios, applications and Enablers. A solid black arrow indicates that a certain link is already implemented, e.g. the ARD EPG is actually used for testing the Multi-Screen Experience scenario and the application integrates the Second-Screen Framework SE. The dashed black arrow indicates a planned usage, e.g. the Second-Screen Framework will use the IDM GE in order to allow application developers creating a personalised second-screen experience, but the GE is not yet (fully) integrated. A dashed grey arrow indicates that the use of a component is considered, e.g. it is considered to use the IDM GE to implement authentication mechanisms in the Search & Discovery App.

There is one GE in the diagram that has no connection with an arrow, i.e. the FI-Ware Cloud GE (FI-Lab). This GE is used by almost all SEs and a number of applications for web hosting. We did not explicitly

indicate the dependencies for this enabler to prevent the picture from ending up in dense mesh of arrows. A detailed overview on the use of the FI-Ware Cloud GE (FI-Lab) is given in D6.5.

2.1 - Architecture Description

Experiments conducted on the basis of the Social Connected TV Platform aim to gain findings on four major topics. These are:

- Rich Content
- Multi-screen Experience
- Search & Discovery
- Personalised Media

This section introduces how the components of the Social Connected TV Platform are used to augment TV services with features of the above mentioned domains. Moreover we provide a more detailed description of the Specific Enablers (see Section 3).

2.1.1 - Rich Content

The goal of the Rich Content scenario is to gain findings on the consumption, annotation and sharing of interactive TV content and additional available media related to it.

Media/Text Annotation (Content Augmentation) is handled by the Content Enrichment SE. The implementation covers the HbbTV-enabled TV set as well as the second-screen application which allows the user to edit and receive content related supplemental information. We are currently focussing on the TV implementation to allow the display and utilization of enriched content via the HbbTV application based on the Content Enrichment metadata model. This includes the time synchronized display of additional information for objects in the video scene and the user interaction with them. Functions to edit and receive content on the companion device will be implemented afterwards to extend the interactive content experience across multiple devices.

Object database and storage functions for additional information as video, text, images, will be handled by the Object Storage GE as provided by FI-WARE. The GE is currently under installation at FOKUS Labs and will be integrated as soon as the instance is ready. Furthermore we are planning to shift the instance to XIFI node based in Berlin.

The Audio Mining SE and the Content Optimisation SE can be used to pre-process audio-visual data and generate corresponding metadata automatically. The Audio Mining SE detects speech segments in a video and then transforms the spoken words of these segments into text (speech-to-text). The generated text can then be used to either search within the video, or to link keywords with additional content using the Content Optimisation SE. This Enabler allows users to perform a Named Entity Recognition (NER) on the generated text transcripts and to store the linking information in an object database.

2.1.2 - Multi-Screen Experience

The Social Connected TV Platform eases the creation of TV-programme-related companion applications on connected mobile devices like tablet PCs or smartphones by two complementary technical means, i.e. the Second-Screen Framework SE and the Audio Fingerprinting SE.

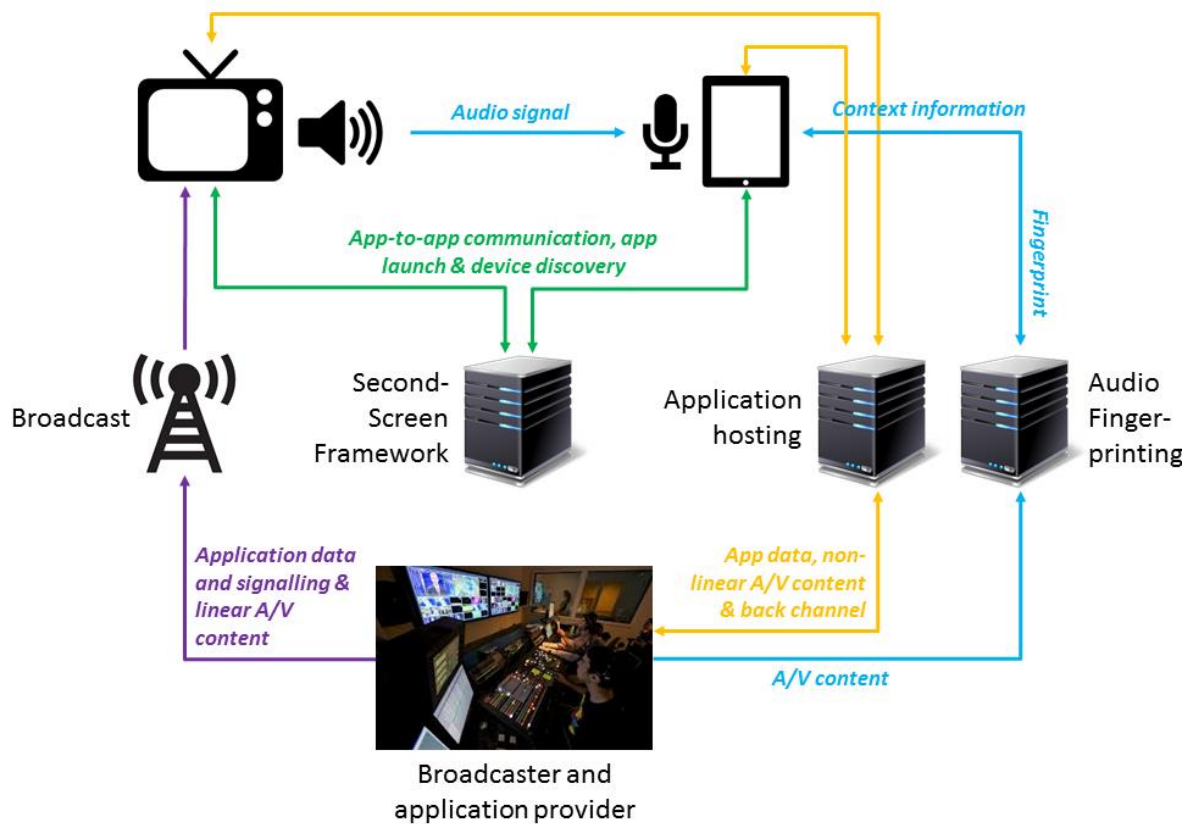


Figure 2 Realising applications that allow Multi-screen Experience with the Second-Screen Framework SE and the Audio Fingerprinting SE

The Second-Screen Framework allows creating web apps for mobile devices that are able to exchange information with a web application on a connected TV. Connected TVs that implement the HbbTV standard can interpret application data that is sent with the broadcast signal. This allows broadcasters to provide connected TV applications that go with the programmed content. The bi-directional communication path and the mechanism for automatic application launch allow keeping the second screen in contextual sync with the hybrid TV application.

The Audio Fingerprinting SE facilitates the creation of second-screen applications that go with the programmed content event if the end-users do not have a connected TV. Context awareness is achieved through analysis of the audio signal of the content played back on the TV. Although the second screen cannot be used to interact with the content on the TV, still users avail themselves of the mobile device as display for contextually synced additional information.

The above described set-up allows broadcasters offering interactive programme accompanying content on second screens to a broad audience. It enables them creating a comprehensive Multi-screen Experience.

2.1.3 - Search & Discovery

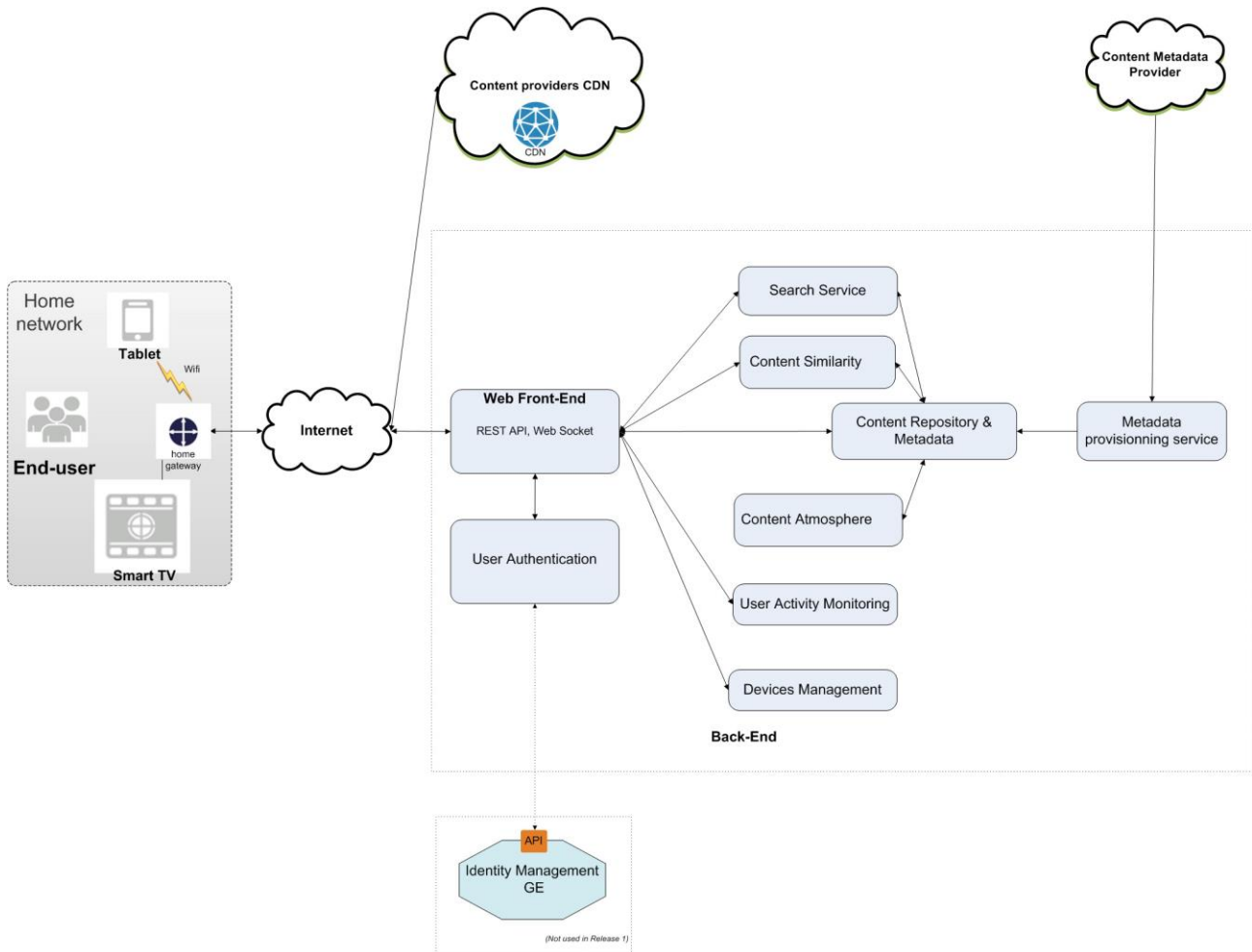


Figure 3 Realisation of applications in the area of Search & Discovery

Today, searching for interesting content to watch is time-consuming for the majority of commercial VoD offers. This scenario intends to explore several ways to explore, search and discover new interesting content for users. This scenario includes the following functionalities running on a tablet:

- An advanced search, with auto-completion, handled by “search service” component.
- A discovery function based on similarity, handled by the “Content Similarity” component. Starting from a movie a user likes, he is able to navigate inside a graph to discover other movies with common aspects, such as same actors, same director, or similar movies proposed by a content to content recommendation engine.
- A discovery function enabling movie selection by indicating multiple criteria such as genres, people, countries, production years, handled by “Content Repository and metadata” component.
- A discovery function based on the combination of genres, handled by both “Content Similarity” component and “Content Repository & metadata” component. A predefined list of cocktails are proposed to the user. User is also invited to create his/her own cocktail by combining its favourite genres.
- A discovery function based on screenshot, handled by “Content Repository and metadata” component: five lists of screenshots are proposed to the user without any additional information. Each list proposes screenshot of a single movie. When the user selects a list he/she gets the movie detail page and discovers which movie was behind these screenshots.

Discovery based on the mood of movies is handled by the "Content Atmosphere" component. This feature has not been evaluated during this first experimentation phase.

Ingest of the VOD catalogues are handled by both “Metadata provisioning service” component and “Content Repository and Metadata” component.

The “Content Atmosphere” component and the “Content Similarity” component will be introduced as Specific Enablers in the upcoming release of the Social Connected TV Platform.

2.1.4 - Personalised Media

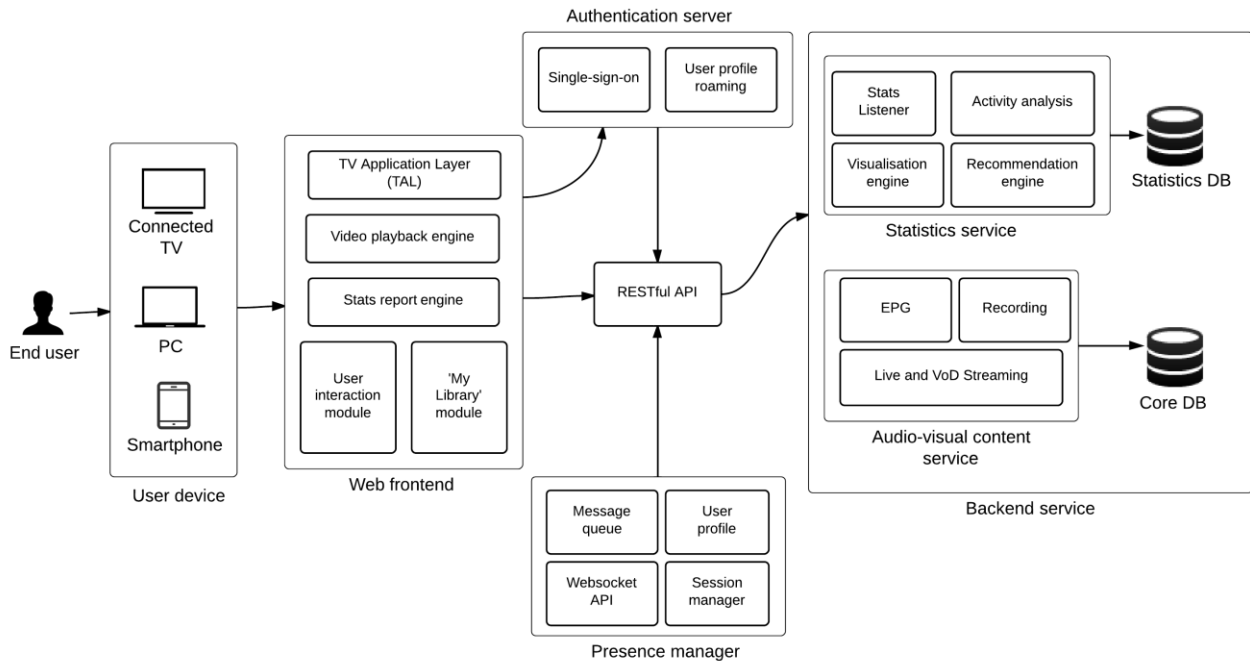


Figure 4 Realising applications in the area of Personalised Media.

Our goal in this scenario is to explore some of the different possible added values of personalised media in the context of an interactive IPTV service. We plan to introduce a series of features that allows users to manage their usage via different devices, and also to combine their consumption with that of others. One such feature is the Pause-Resume feature that allows users to view their watching history and resume playback regardless of the current or previous devices used. This is not only limited to devices capable of rendering the rich web interface, such as desktops, laptops, tablets, and smart phones), but also gaming consoles and smart TVs. This is made possible through an application we developed using the BBC’s TV Application Layer (TAL) SE along with the DataCenter Resource Management (DCRM) GE.

The IPTV system provides programme information, live and on-demand TV/Radio streaming as its core service. Users can log in to the IPTV system on desktop, laptop, smartphone or tablet and view their TV [and radio] history including any programmes part-watched [and flagged for resume viewing], regardless of which device they last watched on. The single-sign-on and user profile roaming features of the authentication server support the log in function. The Stats report engine of the web frontend keeps track of play back position of a user session using heartbeat mechanism. Statistics service at the backend receives user stats reports from user devices via RESTful web service and provides features such as user activity analysis, visualisation and recommendation. After playback is paused on one user device (through the User interaction module), users can then resume play on a different device from the point at which they stopped viewing, [or from any other point]. Presence manager maintains user session, user profile and interacts with user devices for session transfer and synchronisation. A DCRM-based infrastructure is used to host the Presence manager, gathering their session information and watch history to facilitate seamless cross-device functionality. This provides tailored user experiences and allows the infrastructure to scale by creating a distinction between video content and user-specific data. TAL is used as a common framework to build applications for divergent platforms, such as smart TVs and gaming consoles. Suitable metadata is made

available using the My Library module to the user about programmes displayed in this way so they can quickly identify what to watch [or listen to]. Users are also able to delete items from their history.

2.2 - Specific Enablers

We will provide the following list of Specific Enablers through the Social Connected TV Platform.

- Audio Fingerprinting SE [4] (Release 09/13)
- Audio Mining SE [5] (Release 09/13)
- Content Optimisation SE [6] (Release 09/13)
- Second Screen Framework SE [7] (Release 09/13)
- TV Application Layer SE [8] (Release 09/13)

We will utilize the following list of common Specific Enablers for the Social Connected TV Platform.

- Content Enrichment SE [9]

2.3 - Generic Enablers

We will take advantage of the following Generic Enablers from FI-WARE within the Social Connected TV Platform.

- Identity Management GE [10]
- Semantic Annotation GE [11]
- Object Storage GE [12]
- Data Center Resource Management GE [13]

3 - 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.

3.1 - Audio Fingerprinting

3.1.1 - What you get

The Audio Fingerprinting SE consists of an indexing component (adding/removing media to/from a fingerprint database) and a matching component (testing unknown fingerprints against a 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 encrypting 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. Synchronisation 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.

3.1.2 - Why to get it

The Specific Enabler 'Audio Fingerprinting' targets at second-screen scenarios like 'Multi-Screen Experience'. 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 analysed 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.

3.1.3 - Documentation

- Technical Documentation of the Audio Fingerprinting SE [4]

3.2 - Audio Mining

3.2.1 - 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's sound.
- 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.

3.2.2 - Why to get it

The Specific Enabler "Audio Mining" targets at scenarios in the context of Multimedia Indexing and Search like "Rich Content". 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.

3.2.3 - Documentation

- Technical Documentation of the Audio Mining SE [5]

3.3 - Content Optimisation

3.3.1 - What you get

The Content Optimisation 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.

3.3.2 - Why to get it

The Specific Enabler "Content Optimisation" targets at scenarios in the context of Multimedia Mash-ups. 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 harmonises additional content from disperse sources. The SE is intended for SMEs which want to build Second Screen Applications, e. g. for TV documentaries.

3.3.3 - Documentation

- Technical Documentation of the Content Optimisation SE [6]

3.4 - Second Screen Framework

3.4.1 - 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.

3.4.2 - 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.

3.4.3 - Documentation

- Technical Documentation of the Second Screen Framework SE [7]
- Developer Guide of the Second Screen Framework SE [14]

3.5 - TV Application Layer

3.5.1 - What you get

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

3.5.2 - 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.

3.5.3 - Documentation

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

4 - INTERACTION AND COOPERATION WITH OTHER FCONTENT PLATFORMS

The Social Connected TV Platform avails itself from the Content Enrichment SE [15], which has originally been introduced by the Smart City Platform [16] and has been promoted as Common Specific Enabler in Fcontent. 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 were 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 Release 09/13 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.

5 - SOCIAL CONNECTED TV PLATFORM - UPCOMING RELEASES

For the upcoming releases of the Social Connected TV Platform, we will enhance our existing Enablers considering feedback gathered from third party developers and (large scale) trials. Moreover we will release new Enablers, that are crucial for realising our upcoming content experimentations and might also be of interest for other developers. These planned Enablers are described below.

5.1 - Content Atmosphere SE

The Content Atmosphere SE will allow to discovering new content thanks to ambient movie's mood. The movie atmosphere can be described with 2 dimensions, the arousal one (calming to exciting) and the valence one (dark to positive). The similarity between content can be computed thanks to these values. It relies on machine learning algorithms to compute (arousal, valence) values. It uses a supervised learning technique called Support Vector Regression Machine (also known as SVR machine) to compute these values.

5.2 - Content Similarity SE

The goal of this SE, is to compute a weighted genre list for each movie thanks to content provider catalogue's descriptive metadata and deduce a similar movie list for each movie of content provider catalogue.

5.3 - HbbTV App Toolkit SE

The HbbTV App Toolkit SE aims to enable a fast and easy creation of programme-related HbbTV applications. It will provide a CMS with a set of GUI templates that can be filled with content via an easy to use user interface. A REST-API to the content model of the HbbTV App Toolkit SE's CMS will allow its integration into the CMS used by content creators in their production environment. In addition, the HbbTV App Toolkit SE will support HbbTV developers by providing a library with solutions for recurrent tasks for developers, e.g. navigation through a button list, scrollable elements, channel change, etc.

The HbbTV App Toolkit will facilitate the integration of features provided by other Social Connected TV Platform enablers like the Second-Screen Framework SE and the Content Enrichment SE into HbbTV applications. Thus it will help exploiting the projects results.

6 - DEPLOYMENT OF THE SOCIAL CONNECTED TV PLATFORM

The figure below illustrates where the Enabler of the Social Connected TV Platform are located, i.e. where they are installed and running. On the left side the cloud services are listed that mostly have a RESTful API to be used by clients or other services. The right side shows Enablers that are running exclusively on the client side. The center contains Enablers that run code on both the client and the server side.

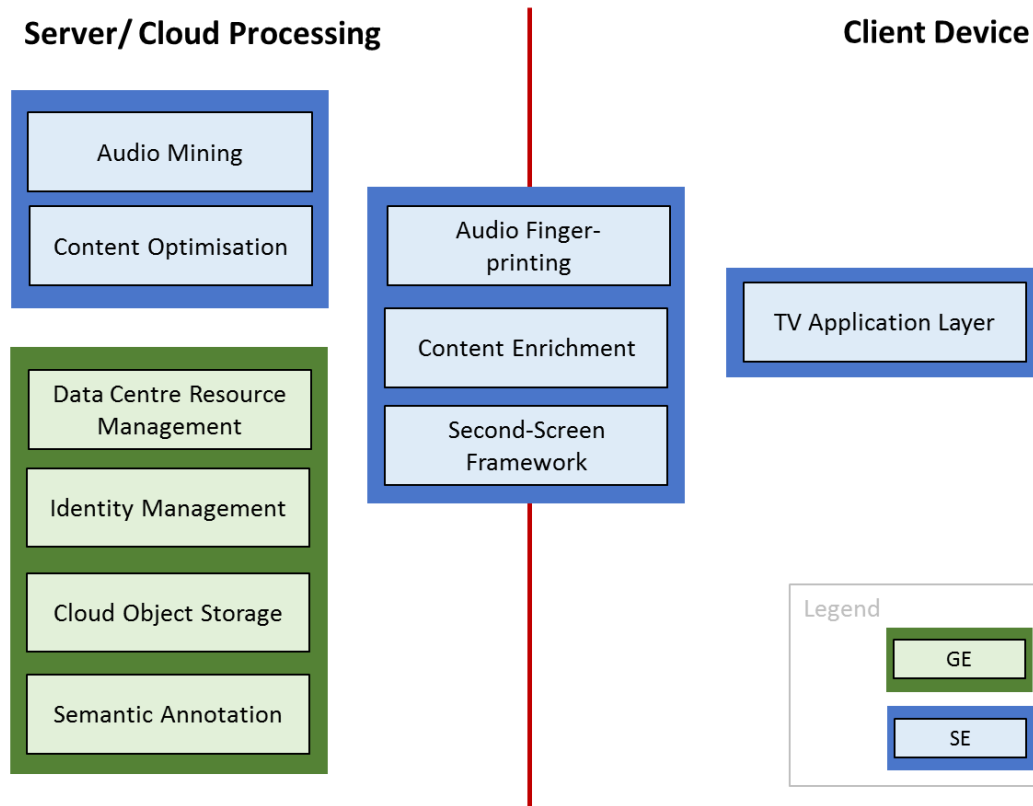


Figure 5 Deployment locations of the Social Connected TV Platform Enablers

6.1 - Client Side Enablers

Some Specific Enablers of the Social Connected TV Platform are exclusively deployed on the client side. They consist of libraries, installation packages or standalone applications. Client Side Enablers will be made available through download links via the FIcontent catalogue ('where to get') but the files will be hosted usually by each responsible partner to allow easy updates. Client Side Enablers are:

- TV Application Layer SE [17]

6.2 - Server Side Enablers with a Shared Instance

Some GEs and SEs hold data that is used by multiple applications. These Enablers are provided as a single instance that is shared by different applications. These Enablers are:

- Identity Management GE [10]
- Object Storage GE [12]
- Semantic Annotation GE [11]

6.3 - Server Side Enablers with one Instance per Application

Some Specific Enablers are web services that are specific for the application making use of it. These Enablers need to be installed on web servers or PaaS environments by the application provider. These Enablers are:

- Data Center Resource Management GE [13]
- Audio Mining SE [18]
- Content Optimisation SE [19]

For most server side Enablers we use the XIFI FI-LAB testbed infrastructure. Three notable exceptions exist where dedicated servers might be used at the respective test sites:

- Latency-critical message handling for multi-user applications
- Ethical requirements regarding user data
- CPU computing power for high performance computing if not available on the XIFI FI-LAB testbed infrastructure

For these cases, the respective experimentation site provides its own server infrastructure for local experiments.

6.4 - Enablers on Both Client and Server Side

Some Enablers have components that are deployed on the client and on the server side. These Enablers are:

- Audio Fingerprinting SE [20]
- Content Enrichment SE [15]
- Second-Screen Framework SE [21]

6.5 - Infrastructure used in the 1st Experimentation Cycle

6.5.1 - Berlin Experimentation Site

The Infrastructure used for testing on the Berlin Experimentation Site is described in a on the wiki and chapter "Technical Infrastructure" in D7.1.2.

6.5.2 - Lancaster Experimentation Site

The Infrastructure used for testing on the Lancaster Experimentation Site is described in a on the wiki and chapter "Technical Infrastructure" in D7.1.2.

6.5.3 - Brittany Experimentation Site

The Infrastructure used for testing on the Brittany Experimentation Site is described in a on the wiki and chapter "Technical Infrastructure" in D7.1.2.

7 - CONCLUSION

In this document, we have presented a technical description of the Social Connected TV Platform. 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. A development roadmap has been presented which includes a description of what is available in the first platform release and in upcoming releases. Finally, we have discussed the deployment of the platform pointing out the diversity of environments hosting the platform components.

In the course of the FIcontent project, the technologies provided through the Social Connected TV Platform will be improved in an iterative approach. Findings on the conclusiveness of scenario concepts, usability of the developed applications and state-of-maturity of Enablers with regard to stability, security etc. will be gathered from the experimentations. Insights will feed back into the implementation of scenarios and platform Specific Enablers and ensure high quality of the developments in future releases of the Social Connected TV Platform.

REFERENCES

- [1] <http://wiki.mediafi.org/>
- [2] <http://wiki.mediafi.org/doku.php/ficontent.deliverables.d22>
- [3] http://wiki.mediafi.org/doku.php/ficontent.deliverables.d61#definition_of_a_ficontent_specific_enabler
- [4] <http://wiki.mediafi.org/doku.php/ficontent.socialtv.enabler.audiofingerprinting>
- [5] <http://wiki.mediafi.org/doku.php/ficontent.socialtv.enabler.audiomining>
- [6] <http://wiki.mediafi.org/doku.php/ficontent.socialtv.enabler.contentoptimisation>
- [7] <http://wiki.mediafi.org/doku.php/ficontent.socialtv.enabler.secondscreenframework>
- [8] <http://wiki.mediafi.org/doku.php/ficontent.socialtv.enabler.tvapplicationlayer>
- [9] <http://wiki.mediafi.org/doku.php/ficontent.common.enabler.contentenrichment>
- [10] http://wiki.mediafi.org/doku.php/ficontent.firmware.ge_usage#identity_management_ge
- [11] http://wiki.mediafi.org/doku.php/ficontent.firmware.ge_usage#semantic_annotation_ge
- [12] http://wiki.mediafi.org/doku.php/ficontent.firmware.ge_usage#object_storage_ge
- [13] http://wiki.mediafi.org/doku.php/ficontent.firmware.ge_usage#data_center_resource_management_ge
- [14] <http://wiki.mediafi.org/doku.php/ficontent.socialtv.enabler.secondscreenframework.developerguide>
- [15] http://wiki.mediafi.org/doku.php/ficontent.common.roadmap#content_enrichment
- [16] <http://wiki.mediafi.org/doku.php/ficontent:smartcity:architecture>
- [17] http://wiki.mediafi.org/doku.php/ficontent.socialtv.roadmap#tv_application_layer
- [18] http://wiki.mediafi.org/doku.php/ficontent.socialtv.roadmap#audio_mining
- [19] http://wiki.mediafi.org/doku.php/ficontent.socialtv.roadmap#content_optimisation
- [20] http://wiki.mediafi.org/doku.php/ficontent.socialtv.roadmap#audio_fingerprinting
- [21] http://wiki.mediafi.org/doku.php/ficontent.socialtv.roadmap#second_screen_framework

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