Final Publishable Summary Report

FI-CONTENT

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Name of the scientific representative of the project's co-ordinator, Title and Organisation: Henri FOURDEUX (Technicolor)

Tel: +33 2 99 27 32 78

Fax:

E-mail: : henri.fourdeux@technicolor.com

Project website address: http://www.fi-content.eu/

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1 - Executive summary

FI-CONTENT addresses the **Media/Content usage** for the next generation internet. With inputs from 5 important content areas, spanning uses of AV, games, Web, metadata and user created content, demonstrating usage beyond state of the art, the project is proposing a number of novel and innovative scenarios for new forms of content. During the first year, the main objectives were to specify a comprehensive set of Media/Content use cases as well as to start clarifying the Future Internet architecture and enablers necessary to implement those use cases. During the second year, the use case scenarios were refined and the business models associated have been explained. The architecture and supporting enablers (generic and specific) necessary for phase 2 implementation have both been characterised. A collection of critical enablers specific to Media/Content usage has been prototyped to validate their feasibility. Finally, the project has prepared a detailed implementation plan for moving forward into the phase 2 experimentations.

The **WP2 work package** (***Content use case scenarios***) has created the use cases to drive the overall project. The participants aimed to complete the user requirements and functionalities and to carry out iterative focus group evaluation on the use cases. Several stories have been identified and this work has been carried out over several months in order to agree on a harmonised story that communicates a clear picture of the refined use cases. The participants have then elaborated on business models associated with the refined use cases scenarios to demonstrate future impact. Those objectives have been met at the end of the project and their results formed the basis for the refined **technical and functional specification document** (D2.2) and **the business plan including identification of user community's document**. There has been great collaboration among all partners in refining use cases, identifying common features across content areas and contributing to the analysis of the business model. User communities were identified through further brainstorming sessions, meetings with internal stakeholders and focus groups with end users.

Within ***WP3-Content platform architecture requirements*** FI-CONTENT has performed research to identify and validate enablers for all the project relevant content domains and their utilisation on future internet core platforms. It has identified a set of enablers potentially categorized as *Generic Enablers* as well as *Specific enablers*. Starting from an overall list of 36 enablers, as an outcome of the common work between WP2 and WP3 during the first part of the project, and as a result of our meetings, a condensed and revised set of enablers has been categorised and ranked in regard to their relevance for FI-CONTENT and also potentially further FI-PPP projects. FI-CONTENT has identified 14 enablers which can definitely be considered as essential for the Future Internet technologies from different viewpoints:

1. They support the use case scenarios elaborated in WP2 to be considered as good representatives of future internet applications.
2. They greatly enhance the end user experience with regards to searching, using and inter-acting with large volume of content and data.
3. They target domains covering entertainment, culture and education, personal content production and cover all FI-CONTENT areas (Games & Virtual environments (A), Professional Content (B), UGC Entertainment (C), High End B2B (D) and Edutainment & Culture (E)).

The enablers identified within FI-CONTENT as common to several internet domains (content, transport, health, industries, ...) were proposed as Generic Enablers for the FI-PPP Core Platform. Consequently the FI-CONTENT architecture group has invested effort in evangelising their generic characteristics in the Architecture Board. Subsequently, five initial GEs that were identified and proposed by FI-CONTENT (Efficient Web-Services/High-Performance Middleware, 3D-Internet and Services, Augmented Reality, Display as a Service and Streaming Services with Advanced Storage capability) have been accepted by the FI-PPP Architecture Board and FI-WARE as GEs that should be supported within the FI-PPP Core Platform. These were further consolidated into three enablers and selected for the FI-WARE Open Call.
At the end of the project, the objectives related to WP3 were fully met. The results were detailed within the **detailed description of generic/specific enablers** and the **platform interoperability requirements and open interfaces** documents.
Aligned with the activities done in the framework of WP3, several contributions were made or initiated to relevant standardisation bodies (HbbTV, DVB, W3C, OMA). The relevant partners will continue with this work. The **detailed plan of standardisation strategy** (D3.6) elaborates on those actions.

The objective of ***WP4- Content Specific function prototyping*** is to confirm the feasibility of the Phase 2 pilots by specifying, assessing and demonstrating the critical technologies needed to experiment the use case scenarios. During the first part of the project, the partners worked on a common methodology to describe and assess the specific enablers identified by WP3. Several iterations were required in order to refine this methodology. Then, the partners worked to provide, for each content area, the analysis of the specific enablers related to the use cases of that area. Each specific enabler has been analysed through state of the art study, maturity level, compatibility with scenario requirements, and integration and finalisation gap analysis. The **critical specific enablers** were identified by combining those criteria with a measure of the degree of criticality of the enabler. This work was based on the architectural description performed by WP3 on which WP4 developed a layered description. During the second part of the project, the partners focused on detailing all the functionalities required for each critical enabler, and also the environment and the feasibility validation scenario for each one of them. A precise assessment of all the described features and their development status was elaborated within **evaluation report for critical functions.**
At the end of the project, the objectives related to WP4 were successfully met. An open public workshop was organised alongside the NEM Summit event in October 2012, to showcase to the media/content community the specific enablers developed throughout the course of the project. This workshop was very successful and FI-CONTENT consortium won the **Award of the best set of demonstration of the NEM Summit 2012.**

WP5- Phase 2- implementation plans final goal is the creation of implementation plans for the phase 2 experiments. During the first part of the project, the definition of a coherent approach for addressing the 5 identified areas was drafted. During the second part of the project, the emphasis was put on describing for each use case scenario defined in WP2, the user communities and the associated possible infrastructure experiments. From an initial step, where eight potential experimentations sites were identified, there were several iterations taking into account the refinement of the use case scenarios towards three main platforms: Social Connected TV, Smart City Guide and Gaming. Finally six experimentations sites located in five European countries were proposed for the Phase 2 pilots.
At the end of the project, the objectives related to WP5 were fulfilled. The results were used as a basis for the proposal for the phase 2 objective 1.8 call. The proposal called FI-CONTENT 2 was finally selected during first quarter 2013 as one of the five pilots to be experimented during FI-PPP Phase 2.
More details on experimentation to be done in the framework of phase 2 are available through **Phase 2 implementations plan** public deliverables (D5.2 and D5.3).

The dissemination of project results was done at several events and conferences. The project organised two specific Workshops: the first one during FIA Aalborg (May 2012) with the FP7 Experimedia project and the second one at NEM summit 2012 in Istanbul. Several FI-CONTENT representatives were also participating to the FI-PPP event organised alongside with the Mobile World Congress in Barcelona at the end of February 2013 to showcase a sub-selection of FI-CONTENT enablers and to share with the event participants the results of the project and the plans for the next phase. Finally, DFKI received the CeBIT Innovation Award in March 2013 for an implementation of the Display as a Service Generic Enabler which the project proposed to the Architecture Board. More details on the dissemination done by FI-CONTENT project are provided within the following paragraphs of this **final publishable summary report**. Of particular interest are the two promotional video made respectively in autumn 2011 and early 2013.

2 - Summary description of project context and objectives

This project is carried out in the framework of the FI-PPP programme launched by the European Commission.

The aim of the FI-CONTENT project is to provide useful, practical requirements and inputs to drive the FUTURE INTERNET Core Platform work supporting innovative media use cases involving 5 major content areas.

This project has been carried out in the framework of FI-PPP programme launched by the European Commission
We have provided detailed use case specifications and an associated large scale deployment plan to support and guide the specifications of the future Internet Core platform functionalities addressed within objective 1.7 in order to fully answer to the objective 1.8 requirements. The project has established the necessary links to the CONCORD and INFINITY projects covering the other objectives (1.9 and 1.10) of the FI-PPP programme.

We use a presentation methodology allowing clear and concise explanations of our main topics. We have selected a number of content areas, giving example use cases within these, and finally illustrating these use cases with specific scenarios.

The content areas addressed within this project are Entertainment (professional and UGC), B2B, Education, Gaming and Social applications using the Future Internet. We have provided example use cases within these content areas. These use cases make extensive use of media content, and provide useful inputs into the Core Platform. To illustrate these, we have given indicative scenarios demonstrating key breakthroughs and technical challenges. It can be anticipated that among the Future Internet applications and services, those involving large content files (e.g. media) will play a key role and an important technical driver for their particularly rich interactive communication power possibilities (at present more than 50% of internet traffic is video or audio, and this percentage is expected to grow). Video and audio are also the most demanding applications - in terms of processing power (content production) and transmission capabilities (content delivery functions) - and thus provide challenging test cases for the Future Internet.

Ubiquitous availability of Internet connectivity, which is also expected from the Future Internet, is another requirement of those applications. For each content area, a number of relevant use cases have been proposed and comprehensively described, in order to highlight what makes those scenarios interesting study cases for the future internet, and the benefit that the final customer will be in a position to expect. Further, the project have been studying the impact of those scenarios on the future internet architecture. This has been done by elaborating on enablers and network functions which are necessary in the FI based service distribution infrastructure. For each of those enablers, a recommendation has been discussed with the core platform project in the frame of the architecture board – including Core Platform and Usage Area representatives - to decide if the enabler is generic (and thus will belong to the core platform infrastructure) or specific (only needed for the use cases addressed in this project.) Finally, the project has performed some early stage scenario research activities to ensure the feasibility of critical functions for the implementation of these services, and has elaborated on a deployment plan which will be implemented in a second phase of the FI-PPP programme (for testing purposes).

We have provided research and user story creation around 5 different content areas which together tackle some of the highest profile content groups. We have created a set of scenarios, assumed to be achievable in the timeline of the FI-PPP programme which challenge the FI-PPP context at the right level. These use case families have been selected to ensure a comprehensive coverage of content based services, with a strong network dimension.

These 5 **content areas** are:
Games and virtual environments: The delivery and the interactive utilization of content, in most cases in a social relationship with other players,

Professionally generated content: Production and distribution of content for and by professional broadcasters, combined with end user needs,
UGC entertainment: Production and sharing of content by regular consumers,
High End B2B services: A major evolution in the way business stake holders will be sharing or exchanging huge volumes of content data, opening the way to new business & service models,
Edutainment & Culture: Content consumption by end users requiring specific new features for educational and cultural purposes and using novel education methods.

The related project objectives are:

1. to **specify** a comprehensive set of experimentations based on the content use case scenarios,
2. to **identify** the **architecture** and the **technologies** required to implement those use cases,
3. to **assess** the existing R&D on which the use cases will be developed,
4. to **identify** the technologies that will be available from the core platform as **generic enablers** and those that can be considered as **domain specific**,
5. to **validate** the feasibility of the critical domain specific technologies by the development of the prototypes where needed,
6. to **build a standardisation strategy** that will support the applications above,
7. to **provide the inputs for the next phase** of the programme (implementation plan for phase 2 including the building of a user community , identification of the possible experimentation infrastructure),
8. in order to contribute in harmonised way to the overall programme to **interface** with the relevant projects addressing the complementary objectives of the PPP.

3 - Description of main S&T results

The main Scientific & Technical results achieved by the project and related to the objectives presented in previous section are exposed within the following paragraphs:

3.1 - Specifications of a comprehensive set of content use case scenarios

This first objective deals with the specification of innovative CONTENT use case scenarios with high value for phase 2 experimentations.

The overall approach to this research has been to follow the processes of user-centred design where use cases have been generated through brainstorming sessions with internal staff and consultations with end users. The ideas generated were crosschecked with the review of state-of-the-art technology to ensure our proposed user experiences are beyond use cases currently available.
The related WP made a conscious decision at the beginning of the process not to restrict the number and range of use cases generated to allow converging into more defined ones in an agile process. Within this overall approach, partners have conducted a mixture of focus groups with experts and end users, interviews, paper prototyping and questionnaires.

The iterative development of the use cases has enabled the identification of common features across content areas and resulted in the merging of some use cases. Partners have subsequently worked on the identification, analysis and definition of the business models for their respective use cases.

State of the art technology assessment, focus group feedback, prototype implementations and market analysis sources were each used to conclude on targeted, complimentary use case scenarios.

The functional and technical requirements that derived from the user experiences identified during this iterative approach have been the basis for the definition of the generic and specific enablers described in the next section.

The content areas described below and the identified scenarios inside them are expected to impact the evolution of the Future Internet platform with a strong focus on media content and all its aspects and facets that span from its creation to its classification, access, augmentation, distribution and sharing. It follows a list of examples of advances and benefits expected from the content areas and use cases:

Gaming:
Following numerous working gameplay prototypes bridging between the real and virtual world for content area A and further brainstorming activities we have refined our experimentation plans for FI-CONTENT Phase 2 into three tiered themes. Each tier covers an escalating level of connectivity requirements for future internet games and virtual worlds. These are, connected augmented reality consumer products, location based gaming and city-wide gaming. Aligned to these tiers, therefore, our experiment aims to determine the parameters of accessibility of tangible interaction in digital play, the opportunities digital instrumentation of known play space locations and the presence of embedding of virtual game content over wide physical areas. Concretely, we underpin the experiment with a next generation Future Internet game platform composed of real-time integrated components and services delivered through mobile devices supported by network server infrastructure where appropriate. Key questions to explore include: how the internet can be integrated into real world in new accessible ways, how high bandwidth low latency networks can aid responsive game interactions, how advanced video game engine capabilities can be distributed through a service oriented architecture, and how can orchestrated experiences be built to scale robustly to millions of users?

Connected TV:
Several services have been defined and prototyped making use of connected devices:

- the virtual participation to niche events – live or VoD and the streaming of multi-angle video content that can be selected through the mobile device
- group recommendations generated using personal recommendation engine and further sorting through mobile devices based on the user with highest degree of influence

- access of additional content on TV or mobile device
- a dashboard giving users visibility of the data that services hold about them and have control over their data (delete, grant/deny access to services, export data)
- simple and intuitive authentication to an online profile using low-input devices as well as smart mobile devices
- mobile device pairing with hybrid TVs using a QR code and remote control of the TV playback using a connected mobile device and second screen content delivery.

User-generated content:
Following content area C production (6 use cases, focus group, benchmark, ...) analysis we have developed a specific use case: the "Smart City Guide" (SCG). The Smart City Guide Service allows users and communities to combine, organize and visualize for the first time **live Open Data, user generated content, user experience and feedback, and editorial content** for personalized and contextualized media services aiming at discovering, places, people, venues and live events.
Our target is to experiment with content, especially User Generated Content (UGC) and Open Data coming from cities, as a social activity driver, whether a group or a single person designs the content. More details on this SCG is described in D5.3.

Streaming to cinemas:
- Distribution of movies to cinemas via streaming
- Streaming of live events to cinemas

Edutainment & culture:
For Content Area E, the main idea developed was that through the FI it is possible to offer a motivating, entertaining and richer experience for all citizens in education & culture. At the beginning we indentified 3 different use cases on education and culture aspects. Then applying a User Centric Design and iterative method, with the help of the focus group of external experts and end users, we merged them and refine our main use case scenario called "Active Experience of live cultural events: Carnival of Cultures".
To put it in a nutshell: students and teachers plan a field trip and choose a common media theme to undertake content and information discovery, explore a cultural live event with their mobile and create collaboratively a presentation of the live experience. These are then key aspects that we have investigated in our scenario from both user experience and technical point of view.

More details could be found within the associated public deliverable available on FI-CONTENT website here.

3.2 - Identification of the architecture and the technologies required

This objective concerns the identification of technologies required to experiment CONTENT use case scenarios specified in WP2 and the drafting of the functional content platform architecture.

The service domain addressed by FI-CONTENT is a very particular one in the sense of complexity, need for new technologies adapted to the end user expectations, innovative technical capabilities to manage, transform, store, distribute and represent huge volume of data but also to expose intelligent interfaces to the end users.
Therefore, to find adequate solutions to the very challenging situation coming up with "content in the Future Internet", the FI-CONTENT project requires specific architectures including in addition to simple generic enablers a number of specific and highly performing functions and algorithms.

So, after having produced a clear and precise description of the content based use cases (what is the content, how is it offered to consume it, what is the end user benefit), the main task was to build an architecture capable to support these use cases and to identify the technologies to implement the highly complex mechanisms of this architecture.

FI-CONTENT worked on architecture aspects of the future internet with a specific focus on relevant issues resulting from the use case specific features and impacting the core platform architecture. To achieve these goals, FI-CONTENT addressed the following problem aspects:

1. Identify enablers essential for the use cases to be included in the general FI-WARE specifications to become generic ones. The FI-WARE specifications were provided by the FI-WARE project,
2. Establish the relationships between these enablers and potential architectures for FI-CONTENT service delivery,
3. Describe the open interfaces and means of interworking for the enablers to fulfill the interoperability requirements,
4. Describe at the right level of details what the enablers consist of,
5. Deliver and discuss these descriptions of enablers within the FI-WARE architecture to identify commonalities between usage areas and propose FI-WARE to adopt these enablers as part of the overall specifications,
6. Consider utilization and test enablers proposed as generic enablers by the FI-WARE platform; assess their usability in the deployment of content based internet services.

A functional architecture is an interconnected set of functional elements or blocks; these functional elements are part of larger subsystems called enablers and which can be generic or specific.

- Generic means they are common to several internet domains (content, transport, health, industries, ...)
- Specific means they belong to one category and cover specific needs for this category.

3.2.1 - Functional architecture

The following figure (Figure 1) introduces the overall FI-CONTENT Architecture, which is applicable to all domains covered by FI-CONTENT and includes therefore all the enablers for the different content/domain areas.
More detailed architecture figures have also been derived for each content area (or domain) from this common one ; therefore, for each content/domain area the subset of enablers needed in this particular domain and their interconnections has been emphasized ; this is resulting in a kind of “sub-architecture” permitting and dedicate to orchestrate the different scenarios as they have been defined within the related work package on “use-case specifications - WP2”.
To go into more details, and in addition to the architecture figure, each content area has also been completed with data flows illustrating the dynamic functioning of the architecture : which message is send from which function to which other and their sequence for different use cases. These details cannot be presented in this report but are part of the detailed deliverables.

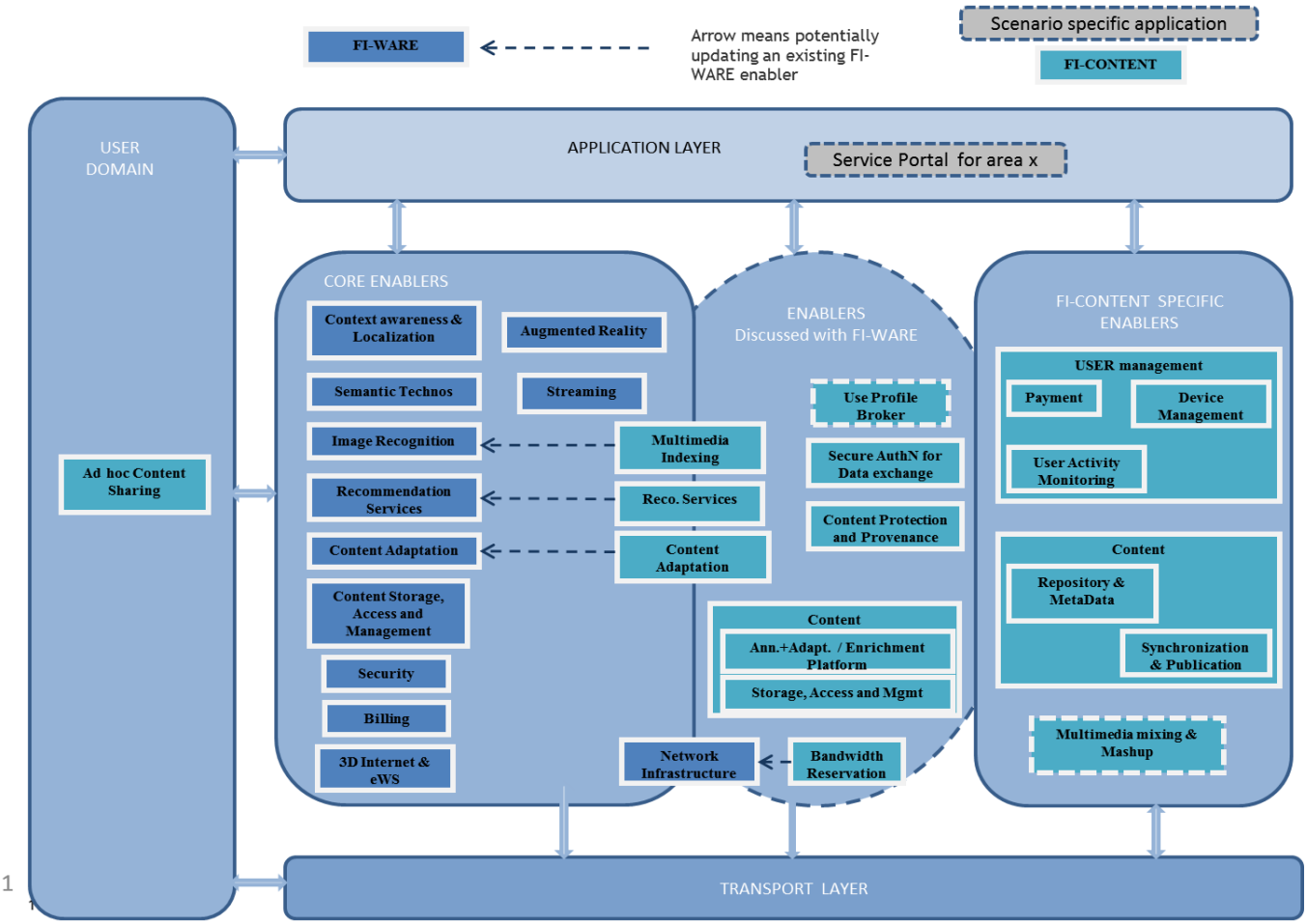


Figure 1: Layered structure of the overall FI-CONTENT Architecture

In the Figure 1, the layered structure of the FI-CONTENT Architecture includes:

- The Application Layer: this is where the user scenarios are implemented as sequences of operations running the Enablers.
- The Enabler Layer: all Enablers are registered here and are assumed to expose their API to the upper layer so as to permit their utilization in the User Domain scenarios.
- The Transport Layer is the place where the lower layer functions take place, directly controlling network resources these functions are not in the scope of the FI-CONTENT developments.
- The User Domain is including all End User devices such as tablets, mobile phones, TV sets and others.

Indeed, this Figure 1 shows how all FI-CONTENT Enablers are categorizes into layers in order to visualize how Enablers are positioned between Application Layer and the Transport Layer and it is showing also the distinction between Generic and Specific Enablers.

3.2.2 - Architecture implementation and interfaces

The functional architecture is a kind of rough skeleton with interworking blocks. It is specifying what the blocks are functionally doing, what are the connections between the blocks (the functions of enablers) and what are the functional dataflow diagrams. But the details on how to implement these interconnections remain to be precised. Therefore, the architecture has been completed in a second step with the specifications of the interfaces between all the functional elements.

The interfaces proposed are actually to be considered as being proposals of full solutions addressing the overall interoperability requirements; these requirements are resulting from the analysis of the use cases built in the related work package (WP2).

The presentation of these specifications is done per content area in the full deliverable but here are only principles reported how to elaborate on these interfaces.
The interface description is based on two kinds of representations:

- A figure based on the functional architecture and including all the references for all relevant interfaces.
- A template in form of a table to describe more precisely each interface identified with a reference in the architecture picture.

As inputs and outputs were described in a more functional way in the functional architecture, they were completed with details on the protocols implementing the different functions to be supported by the interfaces. The kind data transported over this interfaces need also to be described.
So, to be complete, these details are including descriptive elements such as:

- List of function supported over this interface
- Existing protocols implementing these functions
- Data description
- Other constraints on the data or additional information to be known (meta-data).

To proceed further, in the **Error! Reference source not found.** itself, each connection between two boxes was named with a specific reference and this reference was then be described in a synthetic form.

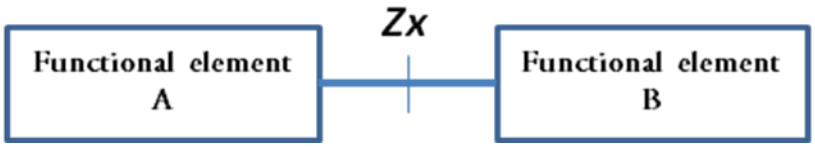


Figure 2: Referencing the interface between elements A and B with name Zx

The description of each interface reference is proposed in a synthetic manner with a profiling table described hereafter. When needed, further details on technologies and protocols are given in a specific section.

Interface Reference	***Zx***
Related enablers	Name of the enablers and pointers on the related FI-CONTENT section
Purpose	What is delivered/received over this interface : *e.g. metadata as keywords to describe the semantics of a content*
Number of supported procedures	Indication of the number of major procedures supported over this link
Existing protocol or technologies	In view of the system requirements, identify and recommend the most appropriate technologies or protocol.
Standards	Related existing standards and status of development.

Interface Reference	*Zx*
Description of data send over this interface	Consider as well data representing the content itself (the essence) as additional data describing this content. a) The content can be bitstreams or files representing a content in different formats but can also be other general data describing a service ; *e.g. the list of channels and their URLs to define a VoD service.* b) The additional meta-data and attached to the content itself and being essential to the interoperability. They are describing various aspects of the content. E.g. *attributes describing a video format.*
Additional Constraints attached to the enabler	Limitations or restrictions on flexibility regarding some dimension of the data send over the interface and to be processed by the enabler. *e.g. specific image compression format must be xyz.*
Other implicit requirements	Are there assumption or implicit information to be know applicable to some data send over this interfaces. *e.g. Image format is necessarily a bitmap of fixed size X,Y.*
FI-WARE pointer and status	When using a FI-WARE GE, how much is this interface implemented and available in the FI-WARE GE. Give a pointer to the FI-WARE reference and highlight what is missing or not compliant to our requirements

Table 1: Template for description of enabler's interfaces

3.2.3 - Relationship to FI-WARE and the Architecture Board

The architecture elaborated by FI-CONTENT was presented to the Architecture Board group; some of the enablers part of this architecture have been proposed to be adopted by FI-WARE as generic enablers. This is a major result of FI-CONTENT as highly innovative enablers have been accepted. As a result, these enablers proposed from the FI-WARE architecture have been also included in the open call managed by FI-WARE. Indeed, 3 out of a total of 5 enablers included in the open call are now coming from FI-CONTENT:

The partnership with the architecture board was build on a close cooperation :

- 2 members of FI-CONTENT attending all the meetings
- Acting as task force leaders to write down the open calls for generic enablers.

The work done as task force leaders for two major enablers proposed in the Architecture Board resulted in the specifications for three important "Future Internet" capabilities, and all of them have been mainly driven by FI-CONTENT and edited by the FI-CONTENT representatives Philipp Slusallek-DFKI and Denis Mischler-Technicolor.

- ***Middleware for efficient web services*** : to create and establish a middleware that enables flexible, efficient, scalable, and secure communication between distributed applications and between FI-WARE GEs. It will bring improvements in performance not only for traditional Web services, but for distributed applications in general, ranging from the Internet of Things to high-performance clouds. The architecture should clearly distinguish between (i) what needs to be transmitted (the contract between the end points), (ii) how the middleware communicated with the application (API and Data access layer), and (iii) how the data is transferred (Marshaling, Negotiation, Transport protocols and mechnisms).
- ***UI for 3D applications*** : The objective is to significantly improve the user experience for the Future Internet by adding new input and interaction capabilities, such as interactive 3D graphics, immersive interaction with the real and virtual world (Augmented Reality), virtualizing and thus separating the display from the (mobile) computing device for ubiquitous operations, and more.
- ***Streaming*** : the objective is to provide all the means to set up services based on the distribution or exchange of content and data in a streaming manner. A final target for this enabler could be to offer

"Streaming as a Service". Streaming thus should apply not only to media contents but also to streams of sensor data and many other forms of information within the FI-PPP.

Public deliverables: currently D3.2/D3.3

3.3 - Assessment of the existing R&D to be used as a basis

This objective concerns the assessment of existing R&D activities to be used as a basis for developing missing innovative technologies enabling future CONTENT experimentations.

FI-CONTENT is building on top of the most advanced technologies relating to multimedia services for content creation, distribution and consuming.
To do so, FI-CONTENT was identifying in existing R&D projects what is available and matching the requirements identified in WP2 and WP3 of the project.

To support the determination of what is available and what needs to be developed, WP3 was including an activity making a review and an assessment of the existing R&D projects. This has permitted to make the decision on what is available and what is missing with an exhaustive view on the current technological status and a precise knowledge on what that background offers.

The survey is covering a large number of relevant collaborative projects and other initiatives (standardization bodies, forums, publications).

The list of projects analyzed and assessed was including national and European initiatives.

Each project was briefly described to clarify what the project is about. The connection to the FI-CONTENT was identified thanks to two other descriptive items labeled ***"Interest"*** and ***"Relationship"***. They point on existing experience, modules or knowledge in whatever form useful for some FI-CONTENT use cases or enablers or point on enablers for which existing project results are available.

Template used for the description of projects of interest

Name	Full name of the project
Framework	National or European and which program or cluster
Contact name & information	Names, companies and other internet sites informations.
Summary	Brief overview of the objectives and results.
Status	Dates of start and end.
Interest	What is of interest for FI-Content : technology, specifications, software components.
Relationship	Which enablers are related and how.
Other	Any other thing good to know.

This document was given to WP4 to support the task of determining for each enabler what is available in existing projects and what needs to be developed and developed as prototypes in WP4.
As such, and in a nutshell, this deliverable makes the connection between WP3 and WP4 to focus the technological developments on relevant not already existing technologies.

The report made finally the review of existing R&D projects in national or European frameworks. About 40 projects have been identified in the five content areas structuring the FI-CONTENT project. This gives a fairly comprehensive view on what is going on in terms of R&D in the content related business area. It is a good basis for further analyzing the results of these projects and taking the benefit of them for deployment of

innovative technologies in the business of services over internet. The outcomes of these projects can take various forms, such as a simple background knowledge resulting from former experiences but also complete specifications of technologies or software modules. It is of course essential to capitalize on some solid experiences when the current objective is to prepare a deployment of technologies willing to deeply impact the societal behavior with the internet services.

3.4 - Identify Generic enablers (from the CP) and domain specific enablers

3.4.1 - Definition and aims.

As explained in the previous section, enablers can be seen as sets of functions acting like of bundle of capabilities. Each enabler is addressing different "Future Internet" requirements. But some of the enablers are dedicated to very specific application in one unique internet application field while others are common to many and different applications in different fields.
In the first case, enablers will be called "Specific Enabler" while the second category is called "Generic Enabler" (GE).
After having identified the technologies required to implement and experiment the FI-CONTENT use case scenarios, the work to be done in this objective was about the classification between those generic enablers (to be made available from the FI-WARE core platform) and the specific enablers (related to the FI-CONTENT areas).

3.4.2 - Identification of the enablers – methodology.

Enablers were elicited and discussed during project workshops. They were then presented in a ranked manner according to different criteria ; but the main one was about "innovation" and the idea was to put the focus on those enablers which really introduce new features, new capabilities, new ways for the end users to work with the Internet. This was also driven by the interest for FI-CONTENT to push the more attractive enablers to FI-WARE to become generic enablers.
Enablers were listed following such ranking criteria to put higher priority on some enablers than on others.

This clearly facilitated the process of exchange with FI-WARE as they have to also put priorities on the potentially very large set of demands for enablers they will get from all the use cases projects. As a result, FI- CONTENT became the most influent proposer of enablers in the architecture board meetings.

The methodology to hammer out the set of enablers required by FI-CONTENT is summarized in the following Figure 3.
This Figure 3 includes the three stages of the process :

- Stage 1 in WP2 : to go from use cases to functional needs in each content area
- Stage 2 in WP3 : build the list of enablers as a translation of functional requirements from Stage 1 into technical functions. Rank them according to priority criteria.
- Stage 3 in WP4 : coordinate stage 2 architecture requirements with potential critical technologies to be developed in WP4.

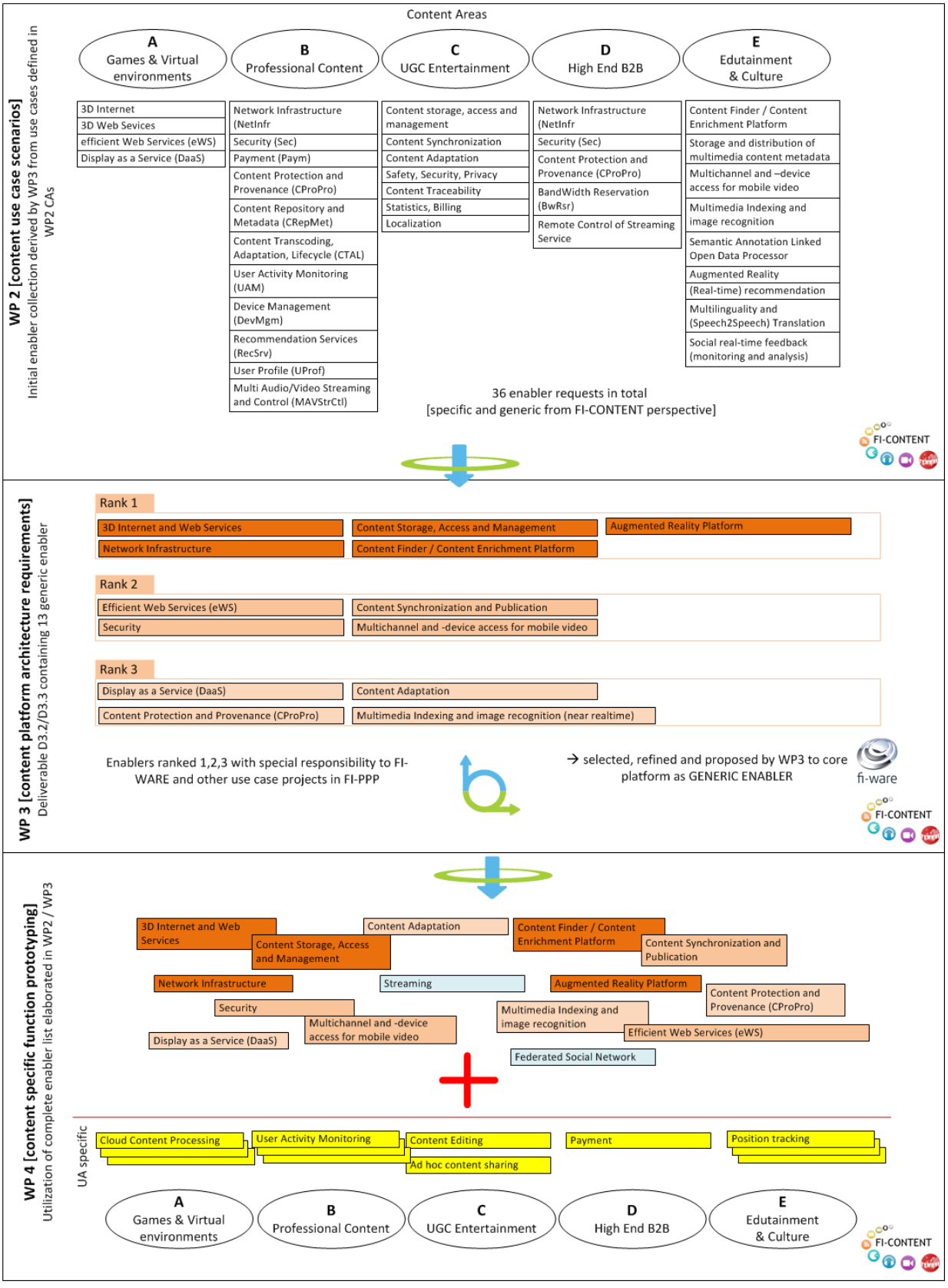


Figure 3: Methodology for the identification of generic enablers and specific functions

3.4.3 - Identification of the enablers – How to described the enablers?

FI-CONTENT ended up with a collection of about 20 generic enablers. The next steps to progress consisted in a more detailed specifications of these enablers at the level of stage 2. Therefore a template was discussed

and adopted by all content areas to provide all the details in a structured manner. The following 2 tables were used to write down 2 categories of information:

1. General description in relation to FI-WARE pointers
2. Technical details on the enabler.

Name	…	***Owner***	xxx	***Priority***	Must
FI-WARE related chapter and contact names	Pointer on the related FI-WARE section				
FI-WARE references	General pointers to the Backlog entries in FI-WARE				
Related EPICs in FI-WARE	Specific pointers to the epics proposed in FI-WARE				
Summary of technical elements exchanged with FI-WARE	Current status of the technical exchanges and the opened tickets.				
Standards	Related standards				
FI-WARE feedback	FI-WARE position and open calls				
Availability	Status of development				
Responsibility	Which partners are in charge of the enabler				

Table 2: Table template for description of enabler's relationship to FI-WARE

Name	…	***Owner***	xxx	***Priority***	Must
Proposed by Content Area	One domain of FI-CONTENT				
Relevance for other Content Areas	Other potential domain and what for				
WP2 Use Case Functional Requirements	Pointer to WP2 initiator				
Overview	Brief description				
Basic Concepts	Details on the concepts				
Technical Functions	Set of functions provided by this enabler				
Components	Breaking into smaller elements				
Inputs	Role of incoming links				
Outputs	Role of outgoing links				
Interfaces	Protocols				
Standards	Utilization of specific standards and possible additions				
Complexity / Maturity	Effort needed for realization / level of innovation / availability for integration				
Other	Any other remarks to be explained				

Table 3: Table template for description of enabler's technical details

***Remarks on* Table 3:**
The "Owner" is the name of the person in charge of the follow-up of this enabler for ensuring coordination of specifications internally to FI-CONTENT and also to be a technical entry point for FI-WARE.
The "Priority" indicates the relevance of an enabler for the overall use case project and is separated into the conditions MUST and SHOULD

3.4.4 - Identification of the enablers – Results and conclusions

Some of the enablers were expected to be of FI-WARE responsibility. They are essential for the delivery of the services but are considered as basic support functions which are commonly used in most service domains.

They include enablers in the field of:

- Network access and secure login
- Network Infrastructure for resources reservations,

- Content Synchronization and Publication,
- Multichannel and device access for mobile video,
- Security,

But some others, even if they were addressed in some chapters of the FI-WARE specifications, looked actually very weak in what they proposed to offer as functions. For example :

- Content Storage, access and management,
- Content Finder/Content Enrichment Platform,
- Augmented reality,
- Streaming
- Content Adaptation.

These enablers appeared rather quickly as following specifications for a very narrow field of applications and could not be adopted as such for FI-CONTENT needs.

Some of the enablers coming natively from the domain of FI-CONTENT materialized after deeper analysis as very useful beyond this single use case had attracted attention from other use cases within the FI-PPP program. These enablers include:

- 3D Internet and Web Services,
- Efficient Web Services (eWS),
- Streaming,
- Internet of Displays.

The cooperation with FI-WARE, materialized as the activity within the Architecture Board was very efficient and fruitful. It consisted in technical activities led by the members, discussed during meetings and resulting in adoption of decisions ; the decisions were regarding not only the enablers themselves but also more generally their integration into testbeds in the cloud and the future utilization of these enablers by use case projects in phase 2.
As such, FI-CONTENT worked very closely with the Architecture Board. There were 2 permanent members joining all meetings and presenting proposals of generic enablers coming from our proper studies. Finally, FI-CONTENT contributed to identify some new Generic Enablers as being relevant and interesting to other use-case projects. Amongst these, 5 new GEs were selected to become part of the FI-WARE Open Calls. It is very significant to say that 3 out of these 5 were FI-CONTENT proposals : the “3D Internet”, the “Efficient Web Services” and the “Streaming + storage”. All of these received proposals during the call and one project was selected for each of them.

Finally, FI-CONTENT worked also on the evaluation of GEs to be potentially used in Phase 2 experimentations. The current result of this evaluation is a clear view on how deployment of testbed can be achieved in phase 2.

3.5 - Feasibility validation of the critical domain specific enablers

The feasibility validation of the critical domain specific enablers is the main objective of WP4 in the project FI-CONTENT, in order to secure the feasibility of Phase 2 pilots. This task has been performed by:

- Identifying the specific enablers among the enablers of the global project architecture,
- Analysing the different specific enablers,
- Distinction of the critical ones from the others, and finally,
- Validation of the critical specific enablers.

The different tasks performed in the scope of WP4 in the FI-CONTENT project are described in the following.

3.5.1 - Common methodology to describe and assess the specific enablers

This section describes the methodology that has been used for the prioritization of critical specific enablers, identified in WP3 as outcome of use case scenarios described in WP2. For that purpose, we have defined a set of prioritization criteria to rank the different enablers, described each of them, applied the prioritization criteria, and got the final table which exhibits the most critical ones.
The prioritization criteria that have been used are the following:

- Relevance to the use case: This criterion identifies which usage areas the enablers are relevant too and the degree of relevance.
- State of the art maturity: We have used here the Technology Readiness Level (TRL) measure, which is used by some government agencies and many of major companies. It allows us to evaluate the maturity of a technology prior to incorporate it in any system.
- Technical difficulty of achieving: This gives an idea of the difficulty, from a technical point of view, of using the considered enabler in a use case demonstrator. It is a natural result of the maturity of the product and represents the gap between current state and functioning state.
- Technical difficulty of integration: This criterion considers the current state of a product and, based on the requirement of the use case, provides an idea of the required effort to make use the product in a use case demonstrator. Integration issues may concern either communication protocol adaptation, data format adaptation, arrangement of the implementation of a piece of software in order to make it compatible with the interface of the product, etc.

In a first version of D4.1 - Prioritization of critical technologies and State of the art, this methodology has been applied to 39 specific enablers distributed as follows:

- 10 from Content Area A,
- 9 from Content Area B,
- 5 from Content Area C,
- 4 from Content Area D, and
- 11 from Content Area E.

It has helped to provide a first level of description for each specific enabler as well as, mainly, a first round of state of the art and available technologies assessment.

After this first step, we have pursued working on the evaluation of the available solutions and the refinement of our enablers, which has conducted us to the results presented in the final version of D4.1. This document contains a very detailed description of each specific enabler, to which we have applied the different prioritization criteria. As a result, we have identified:

- 3 critical enablers in Content Area A,
- 3 critical enablers in Content Area B,
- 2 critical enablers in Content Area C,
- 1 critical enabler in Content Area D, and
- 3 critical enablers in Content Area E.

This methodology helped us identifying the FI-CONTENT specific enablers, compared to the generic ones, developed in the scope of the FI-WARE platform. This methodology helped us achieving Phase-1 derisking activities and, through it, we have deeply described and studied each of the numerous specific enablers, identifying thus **twelve critical ones**.

3.5.2 - Validation methodology

After describing the FI-CONTENT specific enablers, identifying the corresponding technologies, assessing them, and exhibiting the most critical ones, based on the prioritization criteria described above, we have provided, for each Content Area, a validation plan which describes how each Content Area has been validated, through demonstrators and proof of concept implementations of key functionalities served by single enabler or a combination of enablers.

Our validation plan follows an approach that selects specific functions for prototyping based on the following four criteria:

1. The planned functionality validation is checked in regard to relevance to user stories and use cases, defined and described in WP2. This has been done per Content Area to collect and reflect critical specific functions that have been provided by the enablers.
2. The level of innovation, complexity and especially the feasibility of implementing the enabler functionality was analyzed.
3. Based on the outcome of WP3, mainly the architectural descriptions, a set of critical functions of an enabler has been selected from the given list of features per enabler. Acting this way assures that FI-CONTENT specific enablers are aware of enablers defined in the core platform and have been checked against FI-WARE.
4. The functions have then been checked for their utilization and combination within other content areas to find and allow ways for interoperability between specific enablers coming from different content areas.
   And finally, each content area checked how those critical functions map onto existing scenarios and use cases to be demonstrated in phase 2.

For each of the twelve identified critical enablers, we have provided a validation plan, which has insured their value in their respective content areas.

3.5.3 - Actual validation of the critical specific enablers

Our critical specific enablers have been validated in two steps. The first one occurred during the first year review where the following subset of enablers has been demonstrated:

- Reality mixer,
- Recommendation services,
- Repository and metadata,
- Second screen application,
- Content enrichment,
- Ad hoc sharing,
- Multimedia indexing, and
- eBook annotation.

Then, we had organized a workshop which aim was to demonstrate the prototypes of the FI-CONTENT specific enablers and to validate them. For this matter, we have organized a dedicated workshop during the NEM Summit 2012, held in October 2012 at Istanbul, Turkey. The workshop was one day long, on October 17th, 2012.
About one hundred people have visited the twelve stands set during this workshop to demonstrate twelve FI-CONTENT critical specific enablers and some of them have provided us a feedback about the different demonstrations and about the relevance of the project and the use case scenarios is studies.

Finally, FI-CONTENT has received the NEM Summit 2012 best workshop award to recompense the smooth organization and the quality of demonstrations.
All the FI-CONTENT critical specific enablers identified in deliverable "D4.1 - Prioritization of critical technologies and State of the art" have been validate during this workshop. We provide in the following the list of demonstrations performed during the workshop and, grouped per content area:

- **Content Area A**
  - A1 -- Hybrid Reality at Planet Scale
  - A2 -- Reality Mixer
  - A3 -- 3D-Internet with XML3D

- **Content Area B**
  - B1A -- 2nd Screen for HbbTV
  - B1B -- TV App gallery
  - B2 -- Authentication for Connected TVs
  - B3 -- Content discovery

- **Content Area C**
  - C1 -- Ad hoc sharing
  - C2 -- Content Enrichment Platform

- **Content Area D**
  - D1 -- Bandwidth reservation for cinema streaming

- **Content Area E**
  - E1 -- Multimedia Analysis in Education
  - E2 -- Social Reading and Content Finder
  - E3 -- Federated social newtork

3.6 - Implementation plans for Phase 2

This objective targets the elaboration of implementation plans to be able to experiment during phase 2. At the end of the project, the emphasis was put on describing for each use cases, the user communities and the description of the possible infrastructure experimentations.

In preparation to FI-CONTENT Phase 2, we have consolidated efforts on a core set of platforms and content types that build on the experiments from Phase 1. The infrastructure generated by the project will allow the development of an open ecosystem that will enable SMEs and developers to create new applications, services and experiences that exploit these future Internet platforms.

The Phase 2 will focus on 3 primary types of content:

1) High quality audio video and interactive media in the modern and future networked home environment,
2) Location and context-sensitive content (e.g. in mobile usage situations, on a handset or laptop/tablet),
3) A range of interactive gaming content.

We have carefully chosen a bouquet of six excellent running experimentation sites in Brittany, Berlin, Cologne, Barcelona, Zurich, Lancaster and an option with Milan[1], which are complementing each other by providing rural as well as urban testbed infrastructures with active user communities to run the early trials.

- Brittany with its ImaginLab, (ILB) has served as the first role model for the various FI test bed infrastructures listed in the FI-PPP Infinity Database,
- Berlin is an excellent model of a Smart City involved in the open data initiative and with Fraunhofer FOKUS' outstanding iTV and mobile user lab,
- Cologne's Living Lab was established in the ICT IP Citizen Media by pioneering participatory media community applications with great support of local stakeholders and public authorities,
- Barcelona is a prime example of the European Network of Living Labs (ENOLL) by providing the whole city as a Cultural Citilab,
- Zürich is a well established academic-industrial gaming lab cluster initiated by Disney with the support of the two local technical and art universities, the City of Zürich and the Swiss Arts Council Pro Helvetica,
- Lancaster has, for more than ten years, contained a well established rural Living Lab with a university campus, the smart village Wray and a regional network of 1500 households testing Social Connected TV and mobile applications.
- Milan (optional) as chosen city for the Expo 2015, is an ideal site to experiment innovative services for citizens as well as for visitors in the area of Social and Smart spaces, with the support also of Leonardo Campus within the Polytechnic of Milan and its academic-industrial community.

[1] At the date this report was drafted, Milan is currently not part of FI-CONTENT 2, it is considered as an option for future extension.

Experimentation Sites Overview							
Experimentation Sites	**Brittany**	**Berlin**	**Cologne**	**Barcelona**	**Zürich**	**Lancaster**	**Milan (option)**
Test Social Connected TV Applications	Yes	Yes	Yes	No	No	Yes	No
Test Smart City Guide Applications	Yes	Yes	Yes	Yes	No	No	Yes
Test Gaming Applications	No	No	Yes	Yes	Yes	No	No
Number of active members in local Focus Group preparing Trials	10	30	40	40	40	15	20
Number of Organisations joining FI-CONTENT 2 User Advisory Board	2	3	5	8	3	2	TBD
Support of Local Public Authorities	Yes	Yes	Yes	Yes	Yes	Yes	TBD
Number of trials	3 (**)	3 (**)	3 (*)	3 (***)	4	4	2
First Experimentation Cycle (month 6-12)							
First trial	MO 6	MO 6	MO 6	MO 6	MO 6	MO 6	MO 6
Second trial	MO 7				MO 9	MO 10	
Second Experimentation Cycle (month 15-22)							
Next trial	MO 15	MO 15	MO 15	MO 15	MO 15	MO 15	MO 15
Next trial		MO 18	MO 18th	MO 18	MO 18	MO 18	
Size of test user panel for mobile outdoor trials	50	30	25	30	40		50
Size of test user panel/ households for indoor trials	50	30+	20	20	N/A	1000	20
User experience evaluation based on experimentation data sharing policy..	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Phase 2 Experimentation Sites Overview

In addition, we have been active in CONCORD and INFINITY working group in order to forsee potential issues regarding policy and regulation. The FI-CONTENT services will be experimented in front of real user communities and there is a need to align them with policy (mainly Smart Specialisation Strategy and Coalition for Action ICT Regio) and regulation (Institutional Agenda Design WG).

The associated deliverables are D5.1, D5.2 and D5.3

4 - Potential impact, dissemination and exploitation of results

4.1 - Potential impact

The overall expected impact from the FI-PPP projects cover 6 targets as listed in the work plan.

Each of the content areas addressed by the FI-CONTENT project has fully contributed to those targets as is illustrated below.

*Target 1: Significant **increase of the effectiveness of business processes** and novel approaches to the operation of infrastructures and applications of **high economic and/or societal value**. This will be supported by reappraised Internet architectures, services and technologies in large-scale application contexts;*

- The work in Content area A (Games and virtual environments) has focused on the growth of a broader market with wider demographic profiles through the development of greater immediacy of game play, more concrete, context aware interaction mechanisms with physical interaction and scalable infrastructure. The technology prototypes developed during FI-CONTENT Phase 1 have shown the potential for tangible pervasive game play and interactive virtual worlds beyond traditional input and display devices. This work will ultimately be transformative **in the economic and social context of the creative industries** supported by increased participation and player empowerment.
- Content area B (Professionally generated content) has developed a series of new forms of interaction with IP-enabled TVs and the Future Internet will offer more personalized and immersive user experiences. Simplified and more effective forms of interaction with connected devices will reduce barriers for non-tech savvy users and therefore enable larger audiences to access relevant and complementary applications that that enhance the TV experience. By allowing users to and service providers to select, present and deliver professional content alongside existing open Internet content it allows for a more flexible ecosystem. The valorization and impact of these use cases can be grouped as:
    - Broadcasters: increase viewing time and reach of audiences by offering an enhanced TV experience and personalized services and recommendations
    - Regulators: the implementation of open and standardized user data dashboard help with the testing and validation of new/proposed legislation around data privacy, helping drive compliance and reduce fragmentation in implementation approaches across European borders
    - Content and TV format creators: will offer new exiting interaction with TV and connected devices, and increase selling of more content based on efficient and relevant recommendations
    - Advertisers: can offer personalized advertising, promote offers
    - Telco: can boost the request for high capacity bandwith on new high quality content delivery network with an innovative user experience
    - Third parties content: ability to work with content producers to enhance the TV experience by creating relevant and complementary applications (e.g. gateway to e-commerce, quiz, games, competitions, etc.)
    - TV viewers: will benefit from easier, seamless content discovery, personalized recommendations, social TV and have access to all the data collected by the services, have control on how it is used and by whom.
- Content area C (UGC) has developed a specific use case (the “Smart City Guide”) taking advantage of many heterogeneous content created by users but also open data and editorial content. This Smart City Guide use case will offer to the citizens and to the tourisms useful information that will help them in their daily life in real time. Such a service does not exist today because it needs open data availability in a usable format but also 4G network for a nice user experience.
  Business scenarios are various and can be combined or adapted:
    - B2C: it can be made available to end-user different level of services from “Basic”, to “Plus” and “Premium”.

  - B2B: service provider can sell their platforms (or the access to it through APIs) to Content providers and 3rd parties in order for them to build application and service on it and offer their content.
- Content area D (High End B2B services): We have proven that the future internet with its key enablers can readily compatible with the existing cinema ecosystem and its end nodes. Without major investment in new equipment, exhibitors can start receiving the streaming or live content. Without major adaptations to file formats and standards, content creators can distribute their content. On top of this we have the efficiency gain of the distribution: no more need to create physical copies; no more time wasted to transfer complete files via satellite.
- Content area E (Edutainment & Culture) from the user perspective has identified novel approaches to stimulate the learning process and culture exploration for students, tourists, citizens in general. From the service perspective, both for the service providers and the content providers, new mechanisms and enablers were designed in order to offer a rich platform for Content processing and editing, Content optimization and transformation and Content presentation and collaboration around the Content to enable innovative services and increase the chances to attract users. This is strictly related to the Business aspects were, in the business plan analysis (D2.3) for this content area, it has been identified a business model based on the availability of three level of services: "Basic", "Plus" and "Premium" to reflect progressive interest of the market.

*Target 2: Reinforced industrial capability **on novel service architectures and platforms**, building on the longer-term requirements of the Internet and encouraging players in Europe to embrace the challenges of smart infrastructures;*

- The experiments and research conducted for Content area A (Games and virtual environments) indicate that pervasive, wide area multiplayer gaming requires an energy efficient shared computation infrastructure and high bandwidth, low latency content distribution network with European and global reach. This technology setup will fortify efforts of platform and content providers towards a **smart internet infrastructure**.
- In order to deliver a seamless and enhanced TV experience there is the need to an integrated content contribution and delivery that allows for interoperability between devices. The platform has to maintain a high QoS regardless on what device is delivered on and allow for portability of data and content across mobile devices without vendor lock or closed environments.
- In order to provide such a Smart City Guide service, there is a need to develop a service platform able to grab open data from the local city. This specific interface with heterogeneous content providers is key and is a real challenge in order to be useful. In another hand, content created by users will enrich the data base and there will be a challenge to keep this information consistent and up to date. Another challenge will be to combine information so that what is presented to end users make sense to him and to his context. The platform will take also advantage of the FI-WARE generic enablers in order to take advantage of these functionalities.
- The operational model of cinema exhibition has almost not changed in the past 30 years. Due the inherent timeline of content creation and distribution; the model of booking, planning and scheduling is the same in the digital age as it was in the analog days. Enabled by the future internet, this complete model can change, e.g. last minute booking of feature film content. You can imagine models where with a kind of 'Groupon model', the movie selection is done last minute based on demographics of the audience. This will help exhibitors better tune their content to their target audience and differentiate (or become on par) with other media such as TV and online. This not only applies to standard feature films but also to alternative content (live, sports, music, shorts, …) By giving cinema owners affordable and quick access to such additional content, it will be possible for them to better make use of their infrastructure and open it for new services.
- One of the main target of the Content area E (Edutainment & Culture) is the school, to help it in its renovation to encounter new student's needs and to be aligned with the technological progress. To meet these challenges a new education platform was designed and studied to support all the players involved in the Edutainment & Culture scenario (e.g. Service provider, Network operators, Tourism stakeholders, Schools, Content Providers, Local public organizations…).

*Target 3: **New opportunities for novel business models** based on cross-sector industrial partnerships built around Future Internet value chains, **involving users and public authorities** at local, regional and national levels, and providing SME players with opportunities to offer new products, equipments, services and applications.*

- In Content area A (Games and virtual environments), we have identified business models that will contribute to the durable capability of secure monetization pathways enabling **peer achievement communities generating value for digital consumable economies** to further game-to-retail markets of user-generated and professional consumer products and large scale co-media events.
- Connected TVs platform will contribute to the creation of an ecosystem where SMEs and new players can add their content to that of broadcasters increasing the choices available to end users and enabling operators to creating innovative services. Operators and service providers will be able to source content through IP at high-end broadcast quality driving new markets and pricing models.
- The Smart City guide concept will involve many users that will share content which will facilitate their city tour. These users should be tourisms but also citizens, they will take advantage of availability of public information (transport, point of interest, facilities, …) provided by public services. Such a service is dependant of open data availability at fair and reasonable price, it is new business model for smart city guide providers but also for Public services and why not for citizen that could be paid for specific high value content (micro-payment?).
- By bringing the future internet into the cinema, you are actually hooking up its unique large screen immersive environments to applications that can benefit from this configuration. Today it is a shielded off world with different formats and an isolated distribution model. By tapping into the future internet, "basic" application such as gaming, education and advertising will find their way to the large screen. This provides a new business model for exhibitor; opening up his auditoriums in off-peak hours. But also to content owners who can leverage from the existing investment and infrastructure to bring their material more cost effective to large audiences.
  It also brings smaller exhibitors in Europe on par with the larger chains. Once content availability and bandwidth is no longer a bottleneck; they can enjoying the same benefits.
- Concerning Edutaintment & Culture, different business models can be pursued to meet the huge demand for novel applications for active user experiences. Then not only the B2C possibility can be explored (as stated above differentiating the service in three levels of service from "Basic", to "Plus" and "Premium") but also the B2B model where service provider can offer their platforms, by selling them or giving the access to them through APIs, to Content providers and 3rd parties in order for them to build application and service on it and offer their content.

*Target 4: Creation of **new European-scale markets**, overcoming potential fragmentation, for smart infrastructures, with integrated communications functionality, contributing to economic growth and to **European leadership** in global ICT applications markets.*

- The game platform infrastructure and technology refined in Phase 1 provides a new market for game production and development in Europe. The wealth production markets of the Games and virtual environments use case are location agnostic with content accessible to the mass consumer populous. This is only achievable through focused **platform delivery with a European scale approach**.
- The creation of an infrastructure for discovery and consumption of professional content that offers the same seamless and consistent user experience across Europe will allow the creation of cross-border services and markets promoting interoperability between platforms that is currently restricted only to vertical markets. Connected TV services will push for professional content to be available to users on the move and across. A consistent and unified approach will also drive the costs down of the networks being extended into new territories.
- The smart city guide service is attached to local information (city open data) and will contribute to local business. The service provider will make business but also the Public services and the users. It will take advantage of the 4G mobile services and help telco business development. Such a service could be offered in all cities, regions which offer a huge potential. It could also be offered outside Europe as far as open data are available.
- As mentioned before, access to the future internet will bring smaller exhibitors on par with the large chains. The same is true for content creators: independent moviemaker or Hollywood studio: getting

your movies on the large screen will be as easy. This takes away the existing fragmentation. Not only within Europe, but also between Europe and the larger cinema markets such as US and India.

- In the Edutainment and Culture area, there is the need to develop a European-scale market in order to offer a seamless experience to all citizens, students, tourists visiting or living European countries, to explore its rich culture and artistic treasures. In this way Europe can leverage the economic benefits of disseminating educational and cultural content.

*Target 5: **Evolution** (not clean slate) of **Future Internet infrastructure** compatible with the emergence of open, secure and trusted service platform for building networked applications that can be leveraged through user-centred open innovation schemes;*

- In the Games and virtual environments Content area, we have taken an evolutionary approach in use case refinement to develop a three-tiered strategy for Phase 2 of the program. Each tier represents mobile game interaction of increasing difficulty with each tier building on the previous one. With this work, we intend to build on the background competencies of the participants in usability analysis, game delivery, framework and context awareness research advancement. This will integrate deeply with communications services originating in **the platform** partners to evolve and mature mechanisms closer to the customer.
- The Connected TV services are making use of hybrid TV and second screen applications, and using connected mobile devices for aggregation, sharing and multi-view of pro-niche content, user data dashboard, authentication on TV, multi-users recommendation, clickable video, and crowd sourcing. It is important for the QoS and content provenance to put in place standards so to deliver audiences a trusted and equally professional standard user experience.
- The Smart City Guide service is mainly based on a clever aggregation of services such as content aggregation, authentication, location, cloud storage, search which are available in the future internet. The challenge of the this project is to integrate these technologies in an pertinent manner also in order to present to the end user the right information at the right time depending personal information.
- Security and trust are of the highest importance when transferring movie content across the future internet. Piracy has been long linked to the internet. If we want to make this use case into a success: the enabler linked to content protection, encryption, encoding, decoding, … are of high importance. Given the existing rules and regulations, access to the future internet will open up the ecosystem for new players to come aboard and contribute.
- In a changing and fast evolving technological scenario, there is the need to take into account two aspects: user needs and new incoming technologies. During the FI-CONTENT project development, a specific approach was followed to meet both these requirements: for the Edutainment and Culture content area, the "active experience" scenario was designed studying the user feedback collected through focus groups with teachers, technical people and students, but also conducting a deep state of the art analysis to gather any interesting and useful feature emerging from new technologies.

*Target 6: A **comprehensive approach towards regulatory and policy issues** such as interoperability, openness, standards, data security and privacy within the context of the Future Internet complex and 'smart' usage scenarios. This may also address the required methodologies, procedures and best practice needed to address trans-national aspects where a high degree of public-private co-operation is needed. Participation of the public sector in the PPP will be a key asset to progress in these non-technological issues.*

- The engagement and drive for open communication, computation and control systems **standards and protocols** supporting games and virtual environments underpin the future internet. With this in mind, we have worked to establish and grow a collaboration infrastructure on future creative industries technology development in Europe with the Zurich University of the Arts and other establishments. Our results from these efforts have been disseminated in academic and public venues following non-aggressive intellectual property processing and mass market product launches.
- The adoption of open standards for Connected TV services will allow content consumption and creation at trans-border level and promote the success of a multi-vendor approach. Device certification, metadata for recommendations, user data formats best practice will encourage services to abandon closed, proprietary solutions.

- The Smart City Guide will use open data. Such content is not yet standardized and it is a challenge to push this standardization in order to make such a service available in all European cities. In addition, personal information which are used to provide the right information at the right time are subject to privacy issue as well as user generated content.
- In this project we developed and demonstrated a nice marriage between existing standardisation in the end nodes and new standards for the links. By considering the future internet as a future carrier and pushing intelligence and functionality to the end nodes, interoperability has been guaranteed, now and in the future. This makes this project and its results plug&play into the cinema scope.
- In order to allow a European-scale market for education and culture services, it must be avoided the fragmentation of vertical solutions on this field. Then the standardization actions for some features of the Edutainment & Culture platform, as well as an open design of the platform in order to make its features available (e.g. offering of APIs), are the keys for succeeding in the deploy of such services.

4.2 - Summary of main dissemination activities

4.2.1 - Presentation at conferences, shows, specific event, etc.

4.2.1.1 - BLRK:

BLRK Participated in Global Business Summit ICT Day: London Olympics 2012, British Business Embassy. Participation with FI-CONTENT project video featuring Future Internet social platforms and video processing (AR) applications.

4.2.1.2 - DRZ:

DRZ Presented FI-CONTENT Area A at Zurich Creative Day and also during London 2012 Olympics.

4.2.1.3 - DFKI:

- XML3D Physics: Declarative Physics Simulation for the Web *Workshop on Virtual Reality Interaction and Physical Simulation VRIPHYS (2011), Lyon, France, December 2011* –Kristian Sons and Philipp Slusallek, DFKI: https://graphics.cg.uni-saarland.de/2011/sonsvriphys2011/
- Participation to CeBIT 2012 held on 6 to 10 March: DFKI demonstrated several GEs prototypes: 3D-Internet/XML3D and Display as a Service
- XML3D Physics: Declarative Physics Simulation for the Web *Workshop on Virtual Reality Interaction and Physical Simulation VRIPHYS (2011), Lyon, France, December 2011* –Kristian Sons and Philipp Slusallek, DFKI: https://graphics.cg.uni-saarland.de/2011/sonsvriphys2011/
- Presentation at Siggraph 2011conference during BOF session about W3C Standardization of 3D-Internet. Co-presented by Kristian Sons from DFKI; presentation material available at: https://docs.google.com/present/edit?id=0AYiJkjx97V5CZGdqc3RzN2pfNDk2Zndxd3g4ZmY&hl=en_US
- Demonstration of XML3D - Interactive 3D for the web during *Declarative 3D for the web architecture workshop:* Word Wide Web 2012 Lyon 16-20 April 2012 -Kristian Sons and Philipp Slusallek, DFKI. http://events.declarative3d.org/Dec3D2012/program.htm
- Participated at Web3D and Siggraph conferences, August 5-9, Los Angeles, USA:
    - Paper presentation on Xflow at Web3D 2012 http://web3d2012.org/program.html#session1
    - Organized a workshop on Web-based Virtual Worlds and presented their work on XML3D/Xflow/Sirikata as part of Web3D conference http://web3d2012.org/program.html#workshop_virtualworlds
    - Organized a “Declarative 3D” workshop at Web3D conference http://web3d2012.org/program.html#workshop_declarative

  - Participated at Dec3D-Panel at Web3D through the Dec3D Community Group, http://web3d2012.org/program.html#panel
  - Presentations of XML3D at WebGL-BOF and REST3D-BOF https://www.youtube.com/watch?list=PLE2F0C44C6ADB7A23&feature=player_detailpage&v=TvFqkP7zXcs (starting at 42:50 min)
- DFKI & IVCI presented XML3D/Xflow and FI-CONTENT demos at the University Collaboration Office (UCO) Showcase, Santa Clara, USA, July 27, 2012.
- DFKI & IVCI presented XML3D/Xflow and FI-CONTENT demos at the Research@Intel days, Santa Clara, USA, July 25-26, 2012.
- DFKI & IVCI presented XML3D/Xflow and FI-CONTENT demos at the Research@Intel Europe days, Dublin, September 11-13, 2012.
- DFKI Presented XML3D/Xflow and FI-CONTENT demos at the large Intel Developer Forum (IDF 2012) in cooperation with the Intel's RiverTrail group, September 13-15th, 2012.
- Keynote at the opening of Visual Computing Institute, University of Bonn-Rhein-Sieg: Presentation of 3D-Internet technology with XML3D, overview and relation with of FI-CONTENT
- Added new tutorials for XML3D in February 2013
- Presentation of XML3D and Xflow and DaaS at CeBIT on 4-8 March 2013.
- An implementation of the Display as a Service Generic Enabler done by DFKI won the **CeBIT Innovation Award** on 4-8 March 2013. More details here.

4.2.1.4 - Fraunhofer FOKUS:

- At IFA Berlin (1-5 September 2012) and IBC (6-11 September 2012) presented "Interactive and clickable videos for SmartTVs - Content created and distributed through cloud based media services and social networks". The showcase is based on the Content Enrichment Enabler developed in FI-CONTENT.

- FI-CONTENT was represented by Fraunhofer FOKUS at one of five permanent demo booths during the 2012 European Interactive TV conference – EuroITV'12 (4-6 July 2012)

4.2.1.5 - TCF:

TCF demonstrated ad hoc sharing enabler at the following events:

- FIA event at Aalborg: presentation of the ad hoc sharing enabler,
- CCNxCoN 2012 at Sophia Antipolis 2012: presentation of content sharing enabler version based on CCNx, a new content oriented architecture,

4.2.1.6 - RBB/IRT:

RBB and IRT showcased Second Screen at IFA 2012 and IBC

IFA (Internationale Funkausstellung), the world's leading trade show for Consumer Electronics and Home Appliances is held every year in Berlin. This year RBB and IRT presented a Second Screen showcase for rbbtext HD, RBB television's digital teletext service based on the second screen framework developed by IRT in FI-CONTENT. This exciting new showcase was the first time an ARD broadcaster showcased such a second screen application and as such generated a lot of interest.

Björn Stockleben (RBB) demonstrating the rbb HD second screen showcase at the RBB booth

The second screen showcase allowed users to connect a Tablet PC to an HbbTV-enabled Smart TV by scanning a QR code on the TV screen with the Tablet PC. Once connected the text is available on both devices, the tablet can be used as remote control to navigate through the teletext on the TV screen, or can be used as an alternative to the TV screen. A further feature was the option to open links to website referenced in the text on the Tablet.

Thomas Schierbaum (IRT) demonstrating the rbb HD second screen showcase at the ARD booth

The showcase was demonstrated on both the RBB and the ARD Digital World booths. Visitors to the booths included members of the general public, colleagues from RBB and other ARD broadcasters, project partners and external companies. Special presentations were given to various groups such as management boards of several ARD broadcasters. The feedback from visitors was very positive, especially with regards the ease of use of the connection procedure and the option of opening web pages on the Tablet PC.

The same rbbtext HD second screen showcase was also demonstrated at the IRT's booth at IBC from 7th – 11th September 2012 in Amsterdam. Here the showcase also attracted a lot of positive attention and interest. Booth visitors included members of SRG, Swiss Text, Kabel Deutschland,Telewizja Polska, KBS, YLE, NHK, NBC, Neotion, Open, GloboTV, SBS, EU, Tara Systems, Media Broadcast, BBC, EBU and ARD.

Ralf Neudel from IRT made a Presentation of FI-CONTENT (focus on 2nd screen fw and TVAppGallery) to Brazilian universities and broadcasters at USP in Sao Paulo on 20-23 January 2013.

4.2.1.7 - FI-CONTENT at NEM Summit 2011, Turin

FI-CONTENT was present during the NEM summit 2011 held in Turin on September 27-29. A booth dedicated to the project was organised and the following material were used to explain and exchange with visitors about the project:
1 flyer, 5 Posters (general, Games & Virtual environments, Pro Content, UGC and Edutainment & Culture)
1 video: "How can the medium of Internet best be used in future in education and culture?"
1 demo: "Augmented Reality Toys" showing a virtual spider on a real picture-very demonstrative
Material used plus some photos of the booth are available on website: http://www.fi-content.eu

4.2.1.8 - FI-CONTENT at Future Internet week October 2011, Poznan

FI-CONTENT was present during the Future Internet Week held in Poznan on 24-27 October 2011. On FI-PPP stand, representatives from DFKI showed FI-CONTENT material: flyer, poster and 2 demos:"mobile Augmented Reality Game" from Disney and "3D Internet & Distributed Virtual World" from DFKI. Fruitful returns were given by visitors. Material plus some photos of the booth are available on website: http://www.fi-content.eu

4.2.1.9 - FI-CONTENT at 2nd Fokus Media Web Symposium November 2011 Berlin

FI-CONTENT was present during the 2nd Fokus Media Web Symposium held on 10-11November 2011 in Berlin. This event was organised by Fraunhofer FOKUS who provided an exhibitor booth which was equipped with flyers, poster and the live Disney demo on virtual environments. Interactive discussions were held with visitors. A summary of MWS is available on http://www.fi-content.eu

4.2.1.10 - FI-CONTENT at Mobile World Congress 2013, Barcelona

From **February 25th** until **February 28th, 2013,** FI-CONTENT together with all our Future Internet PPP partners have been present at the **Mobile World Congress 2013, Barcelona** exhibition area, with multiple demo slots and possibility to directly engage with us at **Hall 8.1 Stand 8.1L4**

FI-CONTENT DEMO at MWC

The FI-CONTENT Demo at the MWC has been dedicated to the presentation of the project and the results attained during FI-PPP phase 1. During this very productive period, a comprehensive set of Media/Content use cases was specified and their requirements described. The Future Internet architecture and the enablers necessary to implement FI-CONTENT use cases have been characterized.

Partners have showcased a selection of their FI-CONTENT specific enablers as well as generic enablers validation demonstrator in the following five demonstrations:

Name of Demo	Partner
1. Content Discovery	Technicolor
2. Content distribution in collaborative geo-communities	Thales
3. Networked virtual character	Disney
4. Content Enrichment	Fraunhofer FOKUS
5. GE validation demonstrator	UPM

4.2.1.11 - FI-CONTENT at FI-PPP Event Barcelona

From **February 28th** until **March 1st, 2013** FI-CONTENT together with all our Future Internet PPP partners have been present at the **Future Internet PPP event in Barcelona** called:

Engage! Towards cross-border experimentation with European Stakeholders

(Located at: The Palau de Congressos de Barcelona, Avinguda Reina Maria Cristina, 08004 Barcelona, Spain)

As the phase 1 of Future Internet Public-Private Partnership is drawing to a close, this **Barcelona FI-PPP Event** has been the right moment to engage and share the overall vision, objectives and outcomes of this strategic European programme going towards phase 2 and 3.

During this FI-PPP event, FI-CONTENT was present by showcasing some DEMO but also participated to several talks with some others FI-PPP representatives

The FI-CONTENT partners present have showcased the FI-CONTENT specific enablers and generic enabler validation demonstrator in the following seven demonstrations:

Partner	Which Demo
1. Chino 'NORIS (Disney)'	Networked virtual character" demo
2. Christopher Krauß (Fraunhofer FOKUS)	Content Enrichment
3. Bertrand Leroy (Technicolor)	Content Discovery" demo.
4. Franck Feurtey(FT)	Hybrid Reality
5. Ralf Neudel, Christoph Ziegler (IRT)/Annette Duffy , Oliver Pidancet (RBB)	2nd-Screen-Framework & App-Gallery.
6. Juan Quemada-Joaquin Salvachua (UPM)	Generic Enabler Validation Demonstrator
7. Philipp Slusallek and Felix Klein (DFKI)	Interactive 3D Graphics and Augmented Reality in the Browser with XML3D and Xflow

Some FI-CONTENT DEMO representatives at the FI-PPP event:

FI-CONTENT representatives, namely Carmen Mac Williams-GAR, George Wright-BBC and Joachim Köhler-FhG/IAIS were presenting FI-CONTENT results achieved and discussed the approach for phase 2 and 3.
More specific Mr. George Wright, Head of the Internet Research & Future Services Team, BBC presented the FI-PPP **phase 1 results** and the overview of **FI-CONTENT 2 objectives**; Ms. Carmen Mac Williams from Grassroots Arts and Research gave an Overview of **FI-CONTENT 2 User Community Activation and Experimentation Sites** and Joachim Köhler from IAIS/ Fraunhofer presented **Internet content economics**.

More material and a Video of the conference are available on FI-PPP website here.

4.2.1.12 - FI-CONTENT at Media Web Symposium 2013 Berlin

FOKUS-Christopher Krauss has showcased the Content Enrichment Enabler at the Media Web Symposium in Berlin on March 14-15 2013.

Moreover RBB-Oliver Pidancet/Annette Duffy and IRT-Christoph Ziegler have demonstrated FI-CONTENT enablers by showing two demos: A second-screen service synchronised with TV content and subtitles customised by users.

4.2.2 - Articles published

BLRK, DRZ:

- Light Factorization for Mixed-Frequency Shadows in Augmented Reality-*10th IEEE International Symposium on Mixed and Augmented Reality (Proceedings of ISMAR 2011)*-Derek Nowrouzezahrai[1] Stefan Geiger[2] Kenny Mitchell[3] Robert Sumner[1] Wojciech Jarosz[1] Markus Gross[1,2] ([1]Disney Research Zürich, [2]ETH Zürich, [3]BlackRock Studios): http://zurich.disneyresearch.com/~wjarosz/publications/nowrouzezahrai11light.html

DFKI:

- An Open Modular Architecture for Effective Integration of Virtual Worlds in the Web *Proceedings of the 10th IEEE International Conference on Cyberworlds, 2011* -Sergiy Byelozyorov, Vincent Pegoraro and Philipp Slusallek, DFKI: https://graphics.cg.uni-saarland.de/fileadmin/cguds/papers/2011/byelozyorov_cw2011/4467a046.pdf
- Published the paper "From real cities to virtual worlds using an open modular architecture", by "Sergiy Byelozyorov, Rainer Jochem, Vincent Pegoraro and Philipp Slusallek, in The Visual Computer, https://graphics.cg.uni-saarland.de/2012/from-real-cities-to-virtual-worlds-using-an-open-modular-architecture/
- Published the paper "Xflow - Declarative Data Processing for the Web", by Felix Klein, Kristian Sons, Dmitri Rubinstein, Sergiy Byelozyorov, Stefan John and Philipp Slusallek, in Proceedings of the 17th International Conference on Web 3D Technology, August 2012, https://graphics.cg.uni-saarland.de/2012/xflow-declarative-data-processing-for-the-web/
- Published the paper "Reverse Genlock for Synchronous Tiled Display Walls with Smart Internet Displays", by Jochen Miroll, Alexander Löffler, Julian Metzger, Philipp Slusallek and Thorsten Herfet, in Proceedings of the 2nd IEEE International Conference on Consumer Electronics (ICCE-Berlin), September 2012. DOI: 10.1109/ICCE-Berlin.2012.6336456

4.2.2.1 - Dissemination within FI-PPP snack

FI-CONTENT Vision published through FI-PPP Snack June 2012 to FI PPP community.

Some contributions were done to FI-PPP snacks to give updates on FI-CONTENT project towards the FI-PPP community: http://www.fi-ppp.eu/snack/?id=56; http://www.fi-ppp.eu/snack/?id=57; http://www.fi-ppp.eu/snack/?id=58.

4.2.3 - Workshop

4.2.3.1 - Workshop co-organised with Experimedia during FIA Aalborg

Half a day workshop was co-organised with Experimedia project during the Future Internet Assembly held in Aalborg on 9th to 11th of May 2012. More than 30 participants were present to this workshop. The exchanges held during the workshop open the door for close collaboration with Experimedia testbeds to prepare Phase 2 implementation plan.

The summary and the agenda of the workshop are reproduced hereafter:

Short summary of the workshop: More than 50%(growing) of internet traffic is now represented by video and audio content. Media applications and services are key drivers for Future Internet infrastructures capabilities. Through this session, we propose to built on early results achieved by the FI-CONTENT and EXPERIMEDIA projects. Several potential testbeds will be presented opening the conversation: how testbeds can support pilots, with special consideration to challenges such as user participation and

architecture/integration approaches allowing the introduction of innovative technologies(generic and specific enablers).

Agenda

Introduction

Speaker: Michael Boniface – IT Innovation/EXPERIMEDIA

FI-CONTENT objectives: Media and content usage area for FI-PPP

Media traffic represents already more that 50% of internet. The objective of FI-CONTENT is to identify a representative set of use case scenarios that can benefit from the expected progresses that the future internet will bring to the society.

Speaker: Henri FOURDEUX- Technicolor/FI-CONTENT coordinator

EXPERIMEDIA objectives: FIRE facility for social and networked media experiments

Offering collective and participative experiences to real-world and online communities is at the heart of the Future Media Internet and forms an essential part of entertainment, collaborative working, education, product and service innovation and advertising. EXPERIMEDIA aims to explore new forms of social interaction and rich media experiences through experiments and pilots conducted at live events offered by culturally and economically important Smart Venues.

Speaker: Michael Boniface – IT Innovation/EXPERIMEDIA

FI-CONTENT: Media scenarios driving future internet infrastucture capabilities

The work of FI-CONTENT is based on studying innovative use case scenarios with demanding technology and network performances. 5 important content areas, spanning future uses of AV, games, Web, metadata and user created content, are considered and will demonstrate usage beyond current state of the art.

Speaker: George Wright – BBC/FI-CONTENT

Key enabling technologies for media scenario experimentations

From the use case scenarios a technical analysis is performed, in order to identify the relevant technologies needed to implement those scenarios into services to the users. Such technology "enablers " contribute to a service platform architecture which is discussed with network experts.

Speaker: Farid Benbadis – Thales/FI-CONTENT

Accessing and utilizing Smart Venues for experiments and pilots

Technologists innovating in novel Future Media Internet applications and services need to rapidly validate ideas and assumptions by transitioning prototypes in the lab to pilots integrated and operated in real-world ecosystems. To integrate technology into an existing ecosystem requires a transition in maturity level and technologists must overcome both technical (e.g. interoperability, integration, etc) and socio-economic barriers (e.g. legal, regulatory, and commercial) to ensure insights gained through experimentation are representative and robust. EXPERIMEDIA directly tackles these issues by offering experiments Smart Venue infrastructure enhanced with generic FMI technologies and a methodology to pull it all together that considers the important relationship between Content Lifecycle (How we experience) and Experiment lifecycle (How we learn).

Speaker: Simon Crowe – IT Innovation

Testbeds for CONTENT experimentations

An important task of FI-CONTENT is to prepare an experimentation to validate the enablers identified in the project as the key technologies for the realisation of future media internet. That work contemplates several testbeds that will prepare such experimentation. As a starting point, a set of several testbed infrastructure has been identified, that will in a further project phase be deployed to the needed scale in view of life tests. FI-CONTENT will also activate user communities for the large scale experiments in phase 2 and has access to already established regional user focus groups. The user community bootstrapping activities will be fed with all the discussions and trials which have been performed so far by the focus groups in phase 1, in order to build on top of their results.

Speakers: Pierre-Yves Danet - Orange/FI-CONTENT; Carmen Mac Williams- Grassroot Arts/FI-CONTENT

EXPERIMEDIA testbed e.Gg.Schladming Ski resort will be presented.
Speakers: Peter Ljungstrand - Interactive Institute/EXPERIMEDIA

Conclusion of the workshop
Speaker: Henri FOURDEUX- Technicolor/FI-CONTENT coordinator

4.2.3.2 - FI-PPP Living Labs Workshop

FI-CONTENT was present at a panel session discussing about "Exploring the role of Living labs in the Future Internet PPP" held in the framework of FI-PPP living Labs workshop (Mechelen -23 May 2012)

Participants to this session were:
Keynote and panel moderator: Peter Fatelning (EC, DG-INFSO, FI-PPP task force leader)
Juan Bareño (ATOS Research, FI-WARE)
Sven Schade (JRC, ENVIROFI project)
Carmen Mac Williams (Grassroots Arts and Research**, FI-CONTENT** project)
Pieter Ballon (IBBT, Apollon project, CONCORD project, ENoLL)

This session gave the opportunity to the FI-CONTENT representative to communicate about user communities that have been activated during the first year of the project as well as the testbeds identified in phase 1 for preparing phase 2.

4.2.3.3 - FI-CONTENT NEM Summit 2012 Workshop

FI-CONTENT organized a dedicated workshop on 17 October during the NEM Summit 2012 in Istanbul-Turkey-.

This workshop had two main purposes: validate the FI-CONTENT critical specific enablers and present the project results after 18 months. The workshop was held in two sessions of one hour and thirty minutes each, during which the project coordinator and the different work package leaders presented a short introduction of the project and key results followed by specific enabler demonstrations.

About one hundred people visited the twelve booths showcasing twelve FI-CONTENT critical specific enablers. We took advantage of this to get feedback about the different demonstrations and about the relevance of the use case scenarios developed.

4.2.3.3.1 - Demonstrations

All the FI-CONTENT critical specific enablers identified in deliverable "D4.1 - Prioritization of critical technologies and State of the art" have been validated during this workshop. The deliverable "D4.3 - Evaluation report for critical functions" reports the validation steps, conditions, and status of each of these enablers. Both deliverables contain detailed technical and functional descriptions of each enabler.

4.2.3.3.1.1 - List of demonstrations

We provide in the following, the list of demonstrations performed during the workshop and, grouped per content area:

Content Area A
A1 -- Hybrid Reality at Planet Scale
A2 -- Reality Mixer
A3 -- 3D-Internet with XML3D
Content Area B
B1A -- 2nd Screen for HbbTV
B1B -- TV App gallery
B2 -- Authentication for Connected TVs
B3 -- Content discovery

Content Area C
C1 -- Ad hoc sharing
C2 -- Content Enrichment Platform
Content Area D
D1 -- Bandwidth reservation for cinema streaming
Content Area E
E1 -- Multimedia Analysis in Education
E2 -- Social Reading and Content Finder
E3 -- Federated social newtork

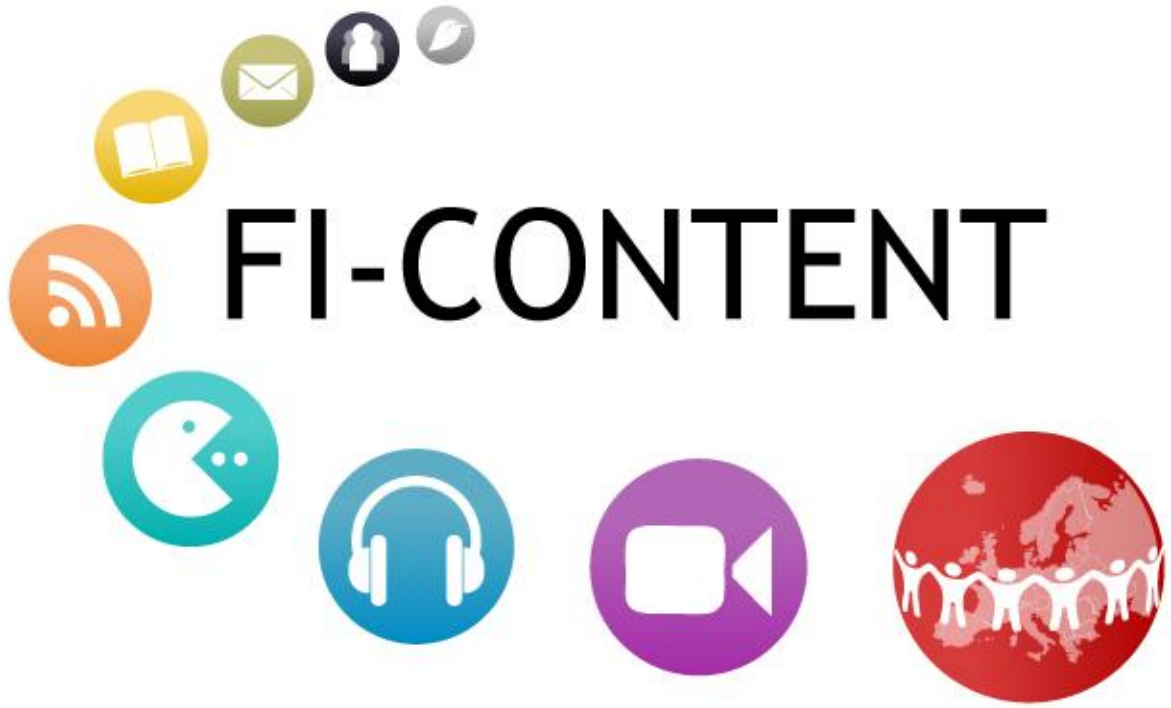
The following photo shows a Wide view of the NEM Summit 2012 workshop room during preparation.

During this workshop, about one hundred people attended twelve demos presented by the different partners involved in the project.
This workshop was very successful; the discussions and interactions with visitors were very valuable for us to qualify the level of innovation of the presented demonstrations.
And finally, the project won the Award of the best set of demonstration of the NEM Summit 2012.

Some photos of the workshop are given hereafter:

4.2.4 - FI-CONTENT logo

A logo representing the project was selected from partners proposals during the first months of the project and was used for all dissemination actions:



4.3 - Exploitation of results

The results achieved by FI-CONTENT project will mainly be exploited through 2 aspects:
Experimentations planned for Phase 2 of FI-PPP programme and standardization.

4.3.1 - Through experimentations planned for Phase 2

Results have been widely used to set up the FI-CONTENT-2 project proposal as well as the XiFi proposal. This means that FI-CONTENT 2 experiments will be really integrated in the Future Internet Phase 2 program.
Now, there is a real consistency between FI-CONTENT experiment and Future Internet platforms :

- Brittany : Smart City Guide + Connected TV + XiFi Node (France, Suisse)
- Berlin : Smart City Guide + Connected TV + XiFi Node (Germany)
- Barcelona : Smart City Guide + Gaming + Xifi node (Spain)
- Cologne : Smart City Guide, Connected TV and Gaming + XiFi Node (Germany)
- Zurich : Gaming
- Lancaster : Connected TV
- Milan[2] (optional) : Smart city Guide + XiFi Node (Italy)

4.3.2 - Standardization

The involved partners have effectively contributed to international standardization activities by seeking active involvement in different groups. All involved partners continuously monitored different initiatives and standardization bodies to get in the position to strategically contribute with FI-CONTENT's results. The individual activities and plans are explained in Deliverable D3.6 which was interactively prepared and improved during the project. The specific standardization activities include:

- Contributions related to “Second screen” - e.g. through requirements collection process of the HbbTV Consortium. The Second/Companion Screen feature for application-to-application communication has good chances to become part of the new ETSI HbbTV specification. Parallel contributions to the on-going DVB Commercial Module activities on Companion Screens (cf. CM1303).

- Augmented Reality Services involving aspects of: APIs for mobile hardware devices to operate advanced rendering and tracking methods; integration with location services; marker interchange/registration representation formats; spatial and temporal conventions; as well as a standardization of audio and physical augmented reality features. Specific activities include the identification of an Open GL ES 2.0 limitation in occlusion culling processing. A first mobile device edge tracking method using an optimized sparse depth buffer rasterization algorithm lead to the adoption of the necessary occlusion culling pixel counts feature in Open GL ES 3.0 and can be found in new and upcoming mobile devices.

- Secure Authorization for Data Exchange: Ability for the user to securely pair a device such as a connected TV to an authenticated online account. Plans to propose the authentication method developed within FI-Content as a stand-alone protocol separate from RadioTAG, which is specific to the application of tagging (bookmarking) items of broadcast or internet-delivered media content. This will be done firstly within the RadioDNS project, in the form of a new RadioAUTH protocol proposal, and subsequently in ETSI. Further participation within the HbbTV and DVB standards bodies to develop standards for authentication on connected TVs. Ongoing assessments whether any future authentication protocol development is suitable for IETF standardization.

- XML3D at the World Wide Web Consortium (W3C) in the context of the Community/Incubator Group "Declarative 3D for the Web (Dec3D)". A key success was the extension of XML3D by Xflow (published at Web3D 2012), which allows for declarative descriptions of animations and image processing, particularly targeted at efficient AR processing in the browser. In addition, an early strategy into standardization for “Display as a Service (DaaS)” is outlined. DaaS has received the CeBIT

[2] See footnote 1 – page 22

Innovation Award 2013, which generated broad interest in this technology, including concrete interest from big companies like Intel and Samsung. While, DaaS is still a new technology for which no actual standardization activities have been started yet, potential options have been identified, including: IETF, W3C, OGC (Open Geospatial Consortium), MPEG, ISO. Initial conversations have taken place with W3C with regard to use the browser both as the source as well as the destination for virtual display content.

- Monitoring of EDCF, SMPTE and ISDCF in order to ensure that their R&D work on streaming technology is in-line with existing and upcoming standards. This will help to further improve impact and future market perspectives.

- Federated Social Networks: a concept targeting a set of APIs which can be used to publish content and activities on a social storage: following and driving several specifications, being particularly active in the development of OpenSocial and WebFinger specifications. This includes compliance with all of these specifications in developing SNEW specifications in Open Mobile Alliance.

- The alignment and coordination with FI-WARE activities was also part of this process.

Contributions to standardization must be understood as a mid- to long-term activity. Partners are committed to continue standardization activities well beyond the project's lifetime and further standardization perspectives were identified, e.g., in the areas Secure Authorization for Data Exchange and Display as a Service.

5 - Project public website

The FI-CONTENT website developed during the project life is accessible at the following address: http://www.fi-content.eu/

Of particular interest are the two promotional video realized respectively by fall 2011 and in early 2013.

The FI-CONTENT Public deliverables are accessible on website:Link to FI-CONTENT public deliverables

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