Coordination of the European Future Internet Forum of Member States

D3.4 – Report on Progress Towards MS FI and MS/EU Research Synergies

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Document Number	D3.4
Document Title	Report on progress towards MS FI and MS / EU research synergies
Version	1.0
Status	Final
Work Package	WP3
Deliverable Type	Report
Responsible Partner	NIH
Dissemination level	PU

Change History

Version	Date	Status	Author (Unit)	Description
0.1	9-Nov-2012	Working	Kevin Quinn	First Draft
0.2	28-Nov-2012	Working	Vilmos Nemeth	First Draft
0.3	27-Dec-2012	Working	Kevin Quinn, Willie Donnelly	Final Draft

Table of Contents

1. Introduction

This document should be read in conjunction with the ceFIMS deliverable D3.3 "Potential Member States & Member State-EU Research Synergies". Deliverable D3.3 gives much of the introduction to our analysis and gives the background to the Cooperation Models, the different funding schemes and the challenges involved in coordinating research across national and international schemes. We do not repeat this analysis in the current document.

The purpose of the current document is to evaluate the impact of the ceFIMS project against its objectives and document the progress that has been made towards achieving synergies among Member States (MSs) and Associated States (ASs) and between Member States, Associated States and the EU. The report will also identify future priorities for research coordination and make recommendations to the EC and FIF for further EU initiatives to maximise MS/AS/EU synergies and increase cooperation of MS/AS in FI R&D and innovation.

2. ceFIMS Project Drivers

The limitations of the present Internet require global investment to develop a Future Internet (FI) capable of meeting the unprecedented demands of the Knowledge Society. It is strategically important for Europe to engage fully in the conception, research, development and innovation of the FI. Other regions recognise the potential of the FI and have launched major initiatives, such as NetSE (US), AKARI (Japan) and AsiaFI (East Asia), targeting novel internet architectures and the Network of the Future.

Europe is already one of the leaders in internet research and adoption and wishes to lead the definition, standardisation and implementation of the FI. However Europe will achieve its FI potential only if there is good coordination of FI research activity across Member States (and Associated States) at regional and transnational levels. Otherwise, duplication of effort reduces net output and value for money across all FI programmes, and the full benefits of networking between EU-funded and national researchers are not realised, fragmenting the original research objectives and achievements. The EC already informally hosts the Future Internet Forum (FIF). ceFIMS provides functional ongoing support to the FIF to create synergies between research programmes funded by the Member States and promote outreach to similar EC-funded research.

In the short term, ceFIMS facilitates FIF by providing a Secretariat and support structures and by establishing the ceFIMS FI portal. In the medium term, it fosters knowledge sharing via the FI Forum, the creation and management of expert working groups and the development of an ongoing and constantly updated Research Roadmap on behalf of the Forum. In the longer term ceFIMS is looking to create a sound basis and implementation framework for future joint projects across FIF members and a greater awareness of Public Private Partnership (PPP) among these members.

2.1. ceFIMS Goals

From the ceFIMS Description of Work, the aims of the project are summarised as followed:

ceFIMS-Aim 1) To facilitate Future Internet research across Europe by promoting strong Member State engagement and knowledge sharing in the FI MS Forum.

ceFIMS-Aim 2) To identify synergies and improve FI research effectiveness at Member State level and between Member States and the EC.

These aims have the following elements

- Promoting MS engagement (active and representative participation in the FIF)

- MS knowledge sharing (via meetings, ongoing communication and expert working groups)

- Strategic actions (e.g., development of position papers and roadmaps) arising from improved knowledge sharing between Member States and between Member States research programmes and EC research programmes

- Promoting synergies at MS level and synergies between MS and the EC

Which gave the ceFIMS objectives as:

ceFIMS-Obj.1) To form a ceFIMS Secretariat to provide coordination and functional support for Member State FI research via the FIF.

ceFIMS-Obj.2) To liaise with an Advisory Committee (comprising existing FIF members) to ensure the project meets its objectives.

ceFIMS-Obj.3) To establish and support expert Working Groups which will be address particular topics. The Working Groups will comprise members of the Forum, augmented with leading external experts (with the prior agreement of the European Commission). Working Group expenses, where required (and as allowed) will be paid from the ceFIMS budget.

ceFIMS was intended to support the FIF in achieving its objectives through the following activity streams:

ceFIMS-Act -1) Establishment of ceFIMS secretariat

ceFIMS-Act -2) Knowledge sharing and exchange of best practice

ceFIMS-Act -3) Focused workshops (two European workshops, three thematic level workshops and one meeting on continuity beyond the lifetime of ceFIMS)

ceFIMS-Act -4) Reports on MS FI initiatives and potential for synergies

ceFIMS-Act -5) Roadmap towards achieving an FI ERA-NET+ and increasing awareness among Member States of PPP

ceFIMS-Act -6) Raised awareness of FIF and MS FI activities through dissemination and outreach activities (including the awarding of prizes for Innovation in MS FI activities)

2.2. European Commission Goals

The background to ceFIMS as a CSA was to support the goals of the European Commission, which are given below. Firstly, the Cooperation/ICT work programme[1] for 2009-2010 included, the following objectives

1. Overcoming technology roadblocks and reinforcing Europe's industrial strengths

2. Addressing synergies throughout the Programme

3. Co-ordination of non-Community research programmes

As described in the ceFIMS description of work (DoW), the project is intended to address the problem of the fragmentation of ICT research between Member States by leveraging knowledge of Member State-funded research to gain consensus about problems and approaches at the MS level. This alignment places European FI research in a stronger position, which relates to the first objective listed above.

Specifically, ceFIMS addresses two objectives which are noted in the Work Programme for FP7 Call 5:

- Coordination of research efforts to explore synergies across ongoing national initiatives

- Research roadmaps, organisation of scientific and/or policy events, strategy and policy formulation

ceFIMS supports the mandate of the Future Internet forum[2] to "*provide organisational support* [to the FIF]*, including the payment of travel and subsistence fees, when required by the Member or Associated State representative, under the Commission rules*". Other mandated objectives include *knowledge sharing* and the identification of *common approaches and complementarities.* Achieving such objectives will require background research by dedicated persons supporting the FIF, going beyond simple administration support such as hosting meeting and paying expenses. The ceFIMS project through its Secretariat, provides this support.

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[1] ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/ict-wp-2009-10_en.pdf

[2] http://ec.europa.eu/information_society/activities/foi/lead/fif/index_en.htm

3. Progress Towards Objectives

3.1. ceFIMS support for the FIF

In support of ceFIMS-Obj.1), as described in section 2.1 above, the ceFIMS project has provided a secretariat for the FIF forum to help achieve the objectives as set out in the FIF mandate[3]. As described in deliverable D2.1 of the ceFIMS project, this secretariat supports:

- The ongoing exchange of information between FIF meetings;

- Supporting and raising awareness of the activities of the FIF;

- Knowledge sharing and the identification of common approaches and complementarities.

The secretariat has also created the web database portal to facilitate:

- Supporting knowledge sharing between Member States (WP3);

- Preparation of the FI roadmap (WP4);

- Dissemination and outreach (WP5).

In addition, the secretariat has:

- Provided feedback from the advisory group into the workings of the FIF.
- Helped to organise FIF meetings and communicated the agenda.
- Created meeting minutes for the FIF meetings.

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[3] http://ec.europa.eu/information_society/activities/foi/lead/fif/index_en.htm

3.2. ceFIMS meetings

As detailed in the ceFIMS deliverables D1.2 and D1.3 (Project Periodic Reports), two thematic workshops have been hosted by ceFIMS throughout the project lifetime. These are listed below:

Dec 2010, Thematic Workshop with various ETPs

ceFIMS held a joint workshop with a number of European Technology Platforms (ETPs) which addressed several topics, including: how each ETP makes a contribution to EU policy objectives for smart, sustainable and inclusive growth in Europe by 2020; what research and funding instruments are required for working towards 'Europe2020: The Digital Agenda for Europe' and the implementation of the Innovation Union; opportunities for synergies between ETP and Member State initiatives; and, how to develop strategic ETP – Member State relationships.

May 2012, ERA-NET+ Workshop

ceFIMS held a workshop to discuss the possibility of an ERA-NET+ in the area of the Future Internet. Advantages and disadvantage were discussed including the lessons learned from the PIANO ERA-NET+ set up in the area of photonics.

Also in October, 2012, ceFIMS held an internal workshop to discuss the work remaining to be carried out in the course of the ceFIMS project as well as ensuring that the material and documented processes were available beyond the lifetime of the project.

3.3. ceFIMS Advisory Committee

The responsibility of the Advisory Committee (AC) (previously the Steering Committee) is to ensure that the project meets its objectives and work in line with the FIF which is comprised of the Member and Associated States. Other tasks of the AC include acting as a bridge between the project Secretariat and the FIF. The AC has a particular role in the following activities:

- Assist in the identification of topics for discussion at FIF sessions and workshops
- Assist in the identification of format improvements for discussion at FIF sessions and workshops
- Support the project in recommending experts into the Working Groups
- Work with the Executive Committee to define the scope of the roadmapping activity
- Recommend dissemination activities for project results
- Assist in identifying independent experts into the jury of the Future Internet Award

The composition of the Committee rotates every 6 months. The AC memberships were renewed in June, 2012 for the second half of the year. Currently the following countries are represented in the AC: Lithuania (chair), France, Czech Republic, Portugal, Sweden, Spain, Belgium, and Hungary.

The Advisory board meets face-to-face, at a minimum twice a year, usually during the FIA, but audio conferences (ACs), are set up particularly some weeks before the FIF, to discuss content and format of the FIF meeting as well as the other issues listed above. The most recent AC, on September 7th 2012, discussed how the FIF go forward to help FI research and coordination between Member States and the different organisations (funding agencies, research organisations). The AC dealt with the next steps of ceFIMS until the end of the project and the afterwards: How can ceFIMS affect FIF after the end of the project.

3.4. ceFIMS database

To fulfil its main goals, ceFIMS needed data on Future Internet activities (national/regional initiatives, programmes/projects). However, setting up a FI database on European Future Internet activities is not an easy task because of the lack of relevant data and the heterogeneity of the data. It is important also that gathering data and running a FI database is an ongoing task since the FI landscape changes steadily. The ceFIMS created a database containing detailed information on more than 70 different projects and initiatives (EU, national, and regional). The ceFIMS database is updated with the project partners and through the FIF members continuously.

Nearing to the end of the project, the consortium should tackle with the following important issues regarding the database:

- Efficient method for updating the database.
- Further cooperation of ceFIMS database with other EU funded projects, e.g. INFINITY
- Maintenance of the FI database after the end of the project.

3.5. ceFIMS FI Awards

The ceFIMS award has been run on four occasions. As well as rewarding outstanding projects, the process also helps to advertise the ceFIMS project and its aims. The goals for the ceFIMS award are as follows:
- Show the dramatic benefits that can be obtained from coordinated and novel Research, Development and Innovation in the FI.
- Show the benefits that can be obtained by the coordination of FI projects.
- Show the strength of R&D&I in the FI in Europe.
- Advertise the FIF and the ceFIMS CSA.

The winners of the ceFIMS award were as follows:

FIA Ghent, Dec 2010:
Two winners: PanLab and StratAG

FIA Budapest, May 2011:
Winner: Smart Santander

FIA Poznan, Oct 2011
Winner: Trilogy

FIA Aalborg, May 2012
Winner: EARTH

Since no FIA event took place in the second half of 2012, no award was given out. The next, and final, award of the ceFIMS project will be given out at the FIA event in Dublin in May 2013. The process for project submission, adjudication and selection will be kicked-off at the start of 2013.

3.6. ceFIMS Dissemination

As detailed in the ceFIMS deliverable D1.3

- Presentations on the ceFIMS project were given at the 'Future Networks' concertation/cluster event on 6-7 October, 2011 and during the 'Good Practises – Smart Specialisation' session on the opening day (24 October, 2011) of Poznan's Future Internet Conference.

- Twitter, LinkedIn, and Facebook accounts have been created for dissemination ceFIMS information.

- ceFIMS was further highlighted at the Spanish es.INTERNET General Assembly held on 20-21 October, 2011 in Madrid, where a number of European PPP FI projects and National initiatives were presented, including a demonstration area for showing key results.

- The ceFIMS Newsletter is published regularly as detailed in the next section.

- The ceFIMS award process has been carried out four times as detailed in the previous section.

- ceFIMS partners attended the FP7 'Future Networks' concertation and cluster meeting in Brussels, 13-14, February, 2012

- The project created a work-plan for FIF activities, following the Poznan FIF meeting.

- A presentation paper was accepted and presented at the eChallenges workshop in Lisbon, Oct 17-19, 2012 entitled "Identifying Collaboration Opportunities in European Future Internet research".

3.7. ceFIMS Newsletters

The ceFIMS newsletter has been published on four occasions during the project, as scheduled.

Feb 2011 Newsletter

This edition introduced the newsletter and brought information about the ceFIMS award winners: Panlab and StratAG. It also reported on the ceFIMS workshops and ceFIMS database. It featured Slovenia and the Netherlands and their FI efforts. It carried articles on the Smart Cities of Barcelona and Ghent. It reported on the LinzAG initiative in Austria. An article on Intelligent Transport based on the DRIVE-IN project.

Aug 2011 Newsletter

This edition brought information about the ceFIMS award winner: Smart Santander. It focused on Porto as a Smart City and carried a report on the ceFIMS workshops. It reported on the SEANET and INFINITY projects. It highlighted the UK Future Internet Strategy Group and provided information on upcoming events in the FI arena.

Mar 2012 Newsletter

This edition announced the publication of the ceFIMS roadmap. It promoted the ceFIMS database and its use for coordination across MSs. It reported on the GEN6 project. It announced the opening of the ceFIMS award process and also announced the launch of the FIF version 2.0.

Sep 2012 Newsletter

This edition carried articles on the FuturICT, EARTH, StratAG and PISCES projects. It reported form the first Hungarian IPv6 conference. It informed readers about the upcoming FIF and ceFIMS meetings in Warsaw.

Again the purpose of the newsletters is to
- Show the considerable and innovative research and development taking place all around Europe in the area of FI.
- Show the benefits that can be obtained from FI projects and from communicating the efforts to coordinate the Europe-wide research effort.
- Advertise the FIF and the ceFIMS CSA.

A fifth, and final, edition is scheduled for February 2013.

3.8. ceFIMS Roadmaps

The FIF is a joint consultative body of the EC and the Member States for sharing information and increasing the cooperation between the EU and the Member States, and among the Member States as well in the Future Internet domain. Therefore there is an opportunity to create a more operational organisation that deals with policy issues and could embrace joint research project as well. This is the reason ceFIMS aimed at investigating what EU funding schemes can be appropriate for meeting these two functions.

ceFIMS prepared Interim Roadmaps for ERA-NET+ in 2011 and 2012, with the latest version submitted as deliverable D4.4b in October 2012. This was based on many different sources including the ceFIMS database on FI activities of the Member States, and analysed the current situation and the different FI initiatives and programmes of the FP7 from the FI PPP projects to FIRE, the FI programmes of other developed countries, like the US and Japan. The Interim Roadmaps also considered the various funding and collaboration instrument of the FP7 (PPP model, Joint Programming, Joint Technology Initiatives, Future and Emerging Technology Flagship Initiatives, EUREKA and Celtic-Plus Collaboration). The roadmaps reviewed the barriers and challenges of the pan-European cooperation models as well.

Although the dialog is ongoing on the possible models in the European FI research, with some views supporting the ERA-NET+ scheme and others supporting a CSA approach as the best financial instrument for pan-European FI cooperation and research. It is expected that ERA-NET+ will be a funding instrument in Horizon 2020 that will help to realise a FI ERA-NET+ project from 2014. Allied to this, PPP (Public-Private Partnership) have been investigated as the conduit to transfer new knowledge into innovative products, with economic and social benefits for EU citizens.

The final version of the ceFIMS Roadmap and a Proposal for a Memorandum of Understanding (MoU) will be produced in 2013.

4. Future Priorities to Improve Research Coordination among the Member States of the European Union

4.1. Future Internet Forum

The workings of the Future Internet Forum are described at

http://ec.europa.eu/information_society/activities/foi/lead/fif/index_en.htm

The FIF is a very active organisation, particularly in light of the fact that it is 100% voluntary. As it includes a representative from the MSs and ASs of the European Union, the FIF is an ideal forum for suggesting and developing future priorities for the focus of research in Europe. In some cases, this will lead to spin-off projects spearheaded by FIF members interested in a particular area. The ceFIMS project can be used as a vehicle for initiating discussion on these topics.

For example, in the most recent FIF meeting in Warsaw, the following topics were discussed and evaluated:

- Internet of Things for Harbours

- ICT for Agriculture

- Liaisons with the FuturICT project.

Also a group of FIF members is currently investigating areas of interest in the "Internet of Things" area. The three topics listed above came to light during the ceFIMS advisory group meeting. As a result they were added to the FIF meeting agenda. This idea-initiation role is an ideal role for ceFIMS – as a place to identify ideas that could form a project between a subset of the FIF members.

We propose that the FIF continue to present and analyse these and other topics. Based on interest in this area, we propose that the FIF should be able to create working groups of FIF members interested in a particular topic. These FIF members can work outside the FIF to develop a team and create a separate project to carry out research into a particular area. Obviously, these teams and the related projects then become independent entities, separate from the FIF. As such these teams can be comprised of some of the FIF members representatives and can also include industry partners, SMEs, third-level institutes, research organisations, as required.

The funding of such spin-out projects from the FIF has been an area of much discussion. Earlier in the ceFIMS project it was assumed that the ERA-NET and ERA-NET+ vehicles would be the best approaches to having these liaisons funded. However, recently, due to the inclement economic situation in some of the MSs, it has become more difficult to successfully apply for funding under

these schemes. It may now be the case that other funding schemes (for example CSAs) may provide a better opportunity for funding for these spin-off projects. The funding vehicle for each spin-out project will have to be investigated on a case-by-case basis.

4.2. National FI Chapters

By the initiative of the National ICT Research Directors, the European Commission created the Future Internet Forum of Member and Associated States (FIF) during the Future Internet Assembly in Prague in May 2012. The three main missions of the Forum are:

- Share knowledge, experience and best practices on Future Internet research in Europe.

- Identify key national actors, institutions and activities in the field of Future Internet.

- Devise common approaches and complementarities between the various frameworks.

During the FIF meeting in Poznan, Poland in October 2011, it was agreed to investigate the potential for FIF delegates to act as Future Internet Ambassadors within their own country. A working group of FIF representatives – some of them are participating in the ceFIMS project as well - was established and charged with the task of developing a position paper on the scope, operation and support infrastructure required to support this role. An initial draft of the position paper was presented in FIF meeting in Aalborg, Denmark in May, 2012. The position paper entitled of "Future Internet Forum Members. Institutionalising the Ambassador Role and the FI Forum Chapters" was presented by Dr. Willy Donnelly (IE), project coordinator of ceFIMS, in the FIF meeting in Warsaw, Poland on 26-27 of September, 2012. The FIF members discussed the revised document produced by the working group, and agreed on that the activation and mobilisation of the national FI eco-system is more important than that the role of the FI Ambassador in the countries. Therefore, the FIF members – together with the representatives of the EC – decided to call for the countries represented in FIF to create National FIF Chapters.
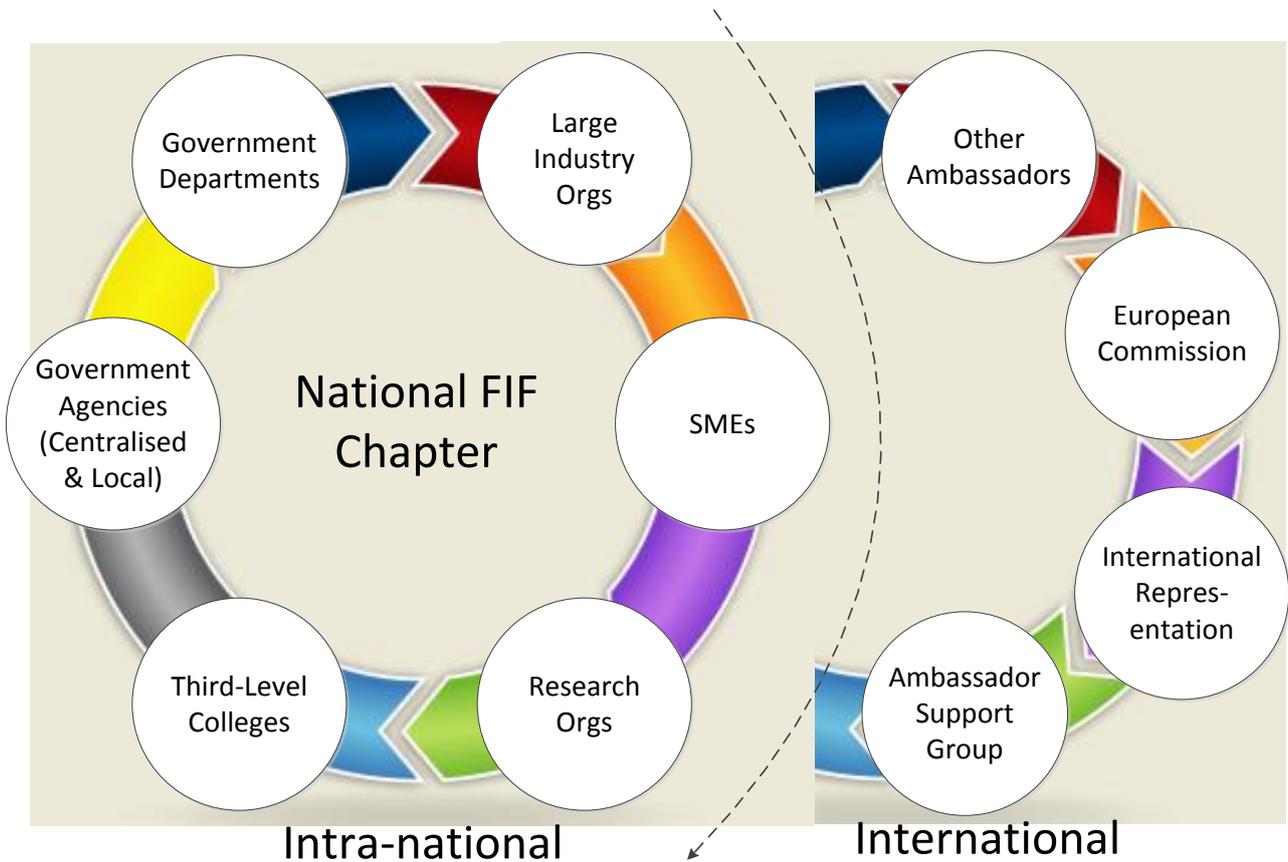
Figure 1: *Position and role of the National FIF Chapters*

According to the position paper of the FIF working group, the National FIF Chapter should play a role as an information and anchor point of FI activities in each country. The FIF Chapters embrace the main national stakeholders in the Member States, including

- Relevant National Contact Points (NCP)

- Large industry groups

- Governmental departments (both regional and national)

- Funding agencies and other governmental organisations

- Regulatory bodies (governmental and independent)

- Research groups

- SME associations

- Third-level institutes

- Independent Research groups (such as CERN)

- Standards groups

- Any other relevant professional organisations

The National FIF Chapters is to carry out the following functions in cooperation with the FIF members as local representatives of the Future Internet:

- Engage as 'quasi-neutral' communication facilitators between the FIF and their national organisations.
- Promote collaborative efforts between the FIF and their national organisations (e.g. define a thematic portfolio for engagement – Digital Agenda, Horizon 2020, Internet governance, policy, security, privacy, IPv6, broadband, socioeconomics, etc.)
- Promote the formation of and attract members to the national FIF chapter, in line with the EU-FIF ethos.
- Report to the FIF on their own national strategic research activities/priorities.
- Engage all stakeholders in this national initiatives, including those listed above.
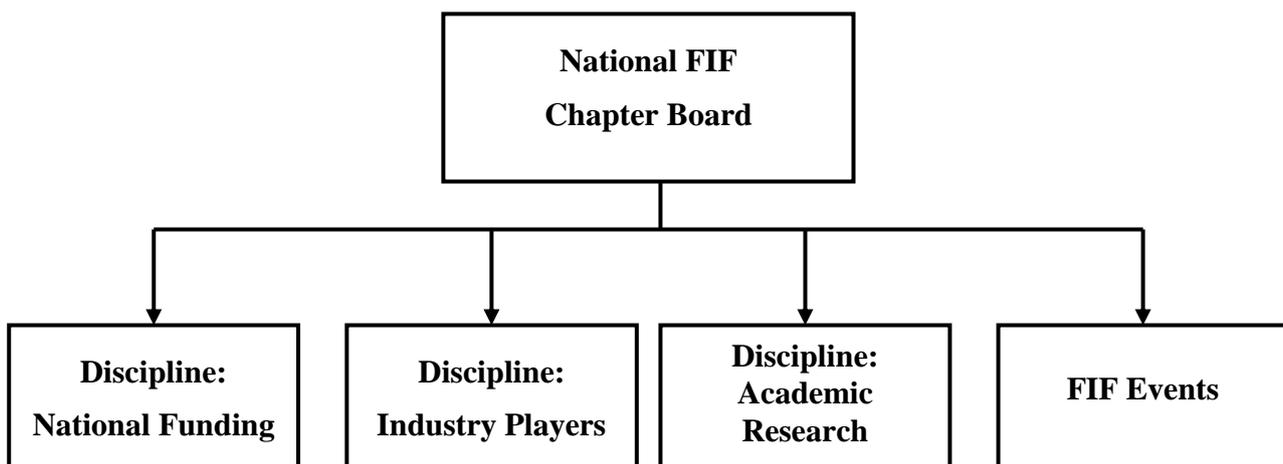
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                    ┌─────────────────────┐
                    │    National FIF     │
                    │   Chapter Board     │
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| Discipline: National Funding | Discipline: Industry Players | Discipline: Academic Research | FIF Events |

Figure 2: *Example hierarchy of the National FIF Chapter*

The figure above shows the possible structure and functions of a National FIF Chapter. However, it is important to note that the FIF members should decide how best to carry out the National FIF Chapter roles in their own Member State. The EC has to support the establishment and the operation of FIF Chapters by information, documents, as well as general action points and examples best practice related to Future Internet research and development.

The FIF working group proposed also that the National FIF Chapters be supported by any follow-on FIF Coordinated Support Action (CSA). This would create the possibility of providing a process for creation of the National FIF Chapters as well as providing informational material that could be used by each FIF Chapters to carry out the activities listed above. This could ease the financial burden associated with the creation of these institutions.

The FIF meeting in Warsaw accepted an Action Item to launch National FIF Chapters in the Member States. The FIF called the attention of its members to immediately establish and operationalise the National FIF Chapters with a well-defined role. The FIF stressed that the National FIF Chapters are encouraged to organise a workshop before the next FIA in Dublin in May 2013, with the support of FI PPP projects, to gather information, identify target actors and build innovation eco-systems mainly with a view towards Phase 3 of the FI PPP. The EC will invite INFINITY and FI-WARE projects to contribute to the workshops.

5. Discussion

5.1. Cooperation models and pillars for Future Projects

One of the main goals of the ceFIMS project is to facilitate Future Internet research across Europe by promoting Member State engagement. To reach this goal, ceFIMS addresses the problem of the fragmentation of ICT research and produces a research roadmap to explore the synergies between the EU and MS FI R&D activities.

To find the synergies between the EU and the Member State initiatives ceFIMS investigated the possible cooperation models and EU support schemes. According to the preliminary investigations, which results are included in the interim roadmap report, ERA-NET+ would be a suitable cooperation model for both the EU and the Member States, because this scheme provides collaborations at policy and research levels as well. But it should be emphasized that these cooperation models can work efficiently only in the case of stable commitment of the participants.

There are important research areas also that have to be part of the cooperation in FI research in Europe. FI experiments need large-scale infrastructures to test new technologies, applications and services. The FIRE (Future Internet Research and Experimentation) of the EU aimed at promoting these type of experimental research and integrating the separated national FI pilot systems and testbeds. The European FI research in Horizon 2020 will need to continue the experimentally-driven work and cooperation based on the infrastructures and research results of FIRE.

Smart applications and services are becoming more and more significant elements of the Future Internet domain, like smart mobile applications. Future Internet PPP programme of the EU can be an efficient model not only for EU-Member States FI cooperation but MS-MS collaboration as well, because this model embraces technology- and service-oriented projects implemented by academic institutions and enterprises jointly. There is an opportunity here to investigate how the PPP model could be expanded on other FI areas in the framework of Horizon 2020. Concerning the Member States, they should launch pilot PPP projects in particular fields to test this possible cooperation scheme.

Sometimes the following question was raised: What technology areas of the FI should the EU and the Member States focus on for cooperative research? There are many important research problems in the field of FI, but based on the intensive discussions within ceFIMS, it seems that we cannot lift some technological areas out of the whole system, the only possibility is to put more emphasis on particular aspects. Hopefully, the main pillars of Horizon 2020 include horizontal approaches (Excellent Science, Industrial Leadership, Societal Challenges) will provide appropriate environments and conditions for European FI research and also for the involvement of the Member State activities as well.

5.2. Media, Testbeds & Living Labs, Smart cities

The convergence of ICT technologies (media, computing, telecommunications, networking, content) have been increasing continuously. Among them the role of the media is getting stronger as well, because usually media technologies and devices transmit the information to the users. The number of the users of social media networks has surpassed billions and the usage of mobile and interactive multimedia is spreading quickly as well. Social media and networks enable us to make contacts and to keep relationship, and open huge business opportunities, like marketing in social networks. Social networks create a new form of the democracy for the citizens, but they raise a lot of concerns regarding security and privacy, too, that should be solved by advanced FI technologies.

In Europe the Networked and Electronic Media Initiative (NEM), is a European Technology Platform under the Seventh Framework Programme. As an industry-led initiative, NEM aims at fostering the convergence between consumer electronics, broadcasting and telecoms in order to develop the emerging business sector of networked and electronic media.

The NEM Initiative supports Europe's activities on the Future Internet and is actively contributing to the definition of the related research and innovation areas. In particular, the Future Media Internet has been identified by the NEM community as its major innovation area. The main NEM innovation domains

- Digital content
- Distributed media applications
- Future media delivery networks and network services
- New user devices and terminals

are closely related to other Future Internet programmes of the EU.

The proliferation of the smart mobile phones and the mobile Internet bring new dimensions and business opportunities into the digital world. Unfortunately the European equipment and terminal vendors lag behind the Asian and US companies. Therefore Europe should primarily focus on the development of mobile Internet services and applications, and the EU and the Member States should increase their efforts in this field.

The developed countries are doing significant research and development work on Future Internet technologies and services. To do experiments with new network components and technologies it is necessary to test them in experimental systems. All over the world, as well as in Europe, a great number of pilot systems and testbeds have been set up in recent years, like OneLab, PanLab, FEDERICA, WISEBED, etc. The testbeds are playing an important role in the development of the technology of Future Internet, examining new protocols and research regarding the interaction of the past and emerging technologies. In spite of state-of-the-art projects granted under the 7th Framework Programme, more synergies between projects would be beneficial. To gear up and promote the experiments on FI infrastructures, the European Commission launched the FIRE – Future Internet Research and Experimentation – initiative under the FP7 ICT research programme – Challenge 1: "Pervasive and Trustworthy Networks and Service Infrastructures", Objective 1.6 – Future Internet Experimental facility and experimentally-driven research.

FIRE has two interrelated dimensions:

1. FIRE Facility aiming to provide the researcher a tool and sustainable resource to investigate, test and compare visionary approaches towards the Future Internet. The FIRE Facility is open to all European research activities, public or private.

2. FIRE Research, where visionary concepts for the Future Internet are explored using an experimentally-driven multidisciplinary approach, considering also social, economic, environmental or energy-related concerns, and taking a holistic view of the Internet as a complex system.

During the years 2008-2010 two waves of FIRE projects established the first prototypes of FIRE Facility and used for the visionary research on Future Internet. The ICT Workprogramme in 2011-2012 extended the FIRE activities further on. Regarding to the FIRE initiative, the main issue is the sustainable operation of the testbeds.

For Europe it is important to cooperate with other countries in experimental FI research, to stimulate the link to international levels, involving research testbeds and research institutes from emerging economies and testbeds from within the Member States. This would foster cooperation between EU testbeds and countries such as the USA, Japan and South-Korea. Similarly, EU supporting programmes should interact actively with international Standardisation bodies, such as the IETF (Internet Engineering Task Force), and research activities in China and the USA, aiming to impact on worldwide Future Internet research and development process.

The Living Labs community is rapidly extending not only in Europe, but in other continents too. In the world there are more than 200 Living Labs today. Living Labs are a real-life test and experimentation environment where users and producers co-create innovations. Living Labs have been characterised by the European Commission as Public-Private-People Partnerships (PPP) for user-driven open innovation. The European Network of Living Labs (ENoLL) is a successful initiative which has a strong interaction with the Future Internet Research and Experimentation (FIRE) initiative of the EU. Strengthening both EU and Member State Living Labs could help in making a success of European Future Internet initiatives, particularly in the small countries of the Community.

The dynamic expansion of the Living Labs in the field of ICT is very useful for the European industry because the involvement of users into the development of new products and applications accelerate the research to market process that means comparative advantages for them against their competitors. Usually the students are very keen on new, high-tech innovations, therefore the higher educational institutions are attractive place for Living Labs. There is an opportunity to support the Living Lab initiatives at the universities.

Nowadays, over-population of the Earth and the environmental contamination are principal challenges of the human beings, and the population of the cities has been increasing not only in the modern, but the developing countries as well. ICT technologies can help us to mitigate these problems.

The concept of "Smart Cities" is trying to address these and other challenges of the big cities through the open innovation model. This way, Smart Cities are an implementation of the Living Lab idea. The concept of the smart city as the next stage in the process of urbanisation has been quite fashionable in the policy arena in recent years, with the aim of drawing a distinction from the terms digital city or intelligent city. Its main focus is still on the role of ICT infrastructure, but much research has also been carried out on the role of human capital/education, social and relational capital and environmental interest as important drivers of urban growth. The EU in particular, has devoted constant efforts to devising a strategy for achieving urban growth in a smart sense for its metropolitan city-regions. Other international institutions and think-tanks also believe in a wired, ICT-driven form of development. In Europe there are several success stories such as Santander (Spain) and Oulu (Finland). Smart cities are in a key position to test new internet-based services and also to bring these to wider society. It could be fruitful to launch new national, regional or local government-based smart city initiatives.

Wireless sensor networks is a specific technology that helps to create Smart Cities. The aim is to create a distributed network of intelligent sensor nodes which can measure many parameters for a more efficient management of the city. The data is delivered wirelessly and in real-time to the citizens or the appropriate authorities.

For example, citizens can monitor the pollution concentration in each street of the city or they can get automatic alarms when the radiation level rises above a certain level. It is also possible for the authorities to optimise the irrigation of parks or the lighting of the city. Water leaks can be easily detected or noise maps can be obtained. Rubbish bins can send an alarm when they are close to being full.

Vehicle traffic can be monitored in order to modify the city lights in a dynamic way. Traffic can be reduced with systems that detect where the nearest available parking slot is. Motorists get timely information so they can locate a free parking slot quickly, saving time and fuel. This information can reduce traffic jams and pollution improve the quality of life.

Many Smart City projects have been done in Europe recently from community resources (EU, regional, municipal). There are interesting and promising experiments, however the it should be mentioned that the underlying technology is not matured and the sustainability of the smart systems and networks in the cities cannot be ensured yet. Long-term challenges of the Smart City solutions are: further miniaturisation of the sensors and actuators, long-term energy supply of the sensors, and processing of the big data provided by the sensors.

One of the main pillars of the next R&D support programme of the EU, Horizon 2020 aims at concerns shared by all Europeans such as climate change, developing sustainable transport and mobility, making renewable energy more affordable, ensuring food safety and security, or coping with the challenge of an ageing population. Future Internet based Smart City solutions can help us to address these challenges.

5.3. PPP

The Future Internet Public Private Partnership (FI-PPP) aims to advance Europe's competitiveness in Future Internet technologies and systems, and to support the emergence of Future Internet-enhanced applications of public and social relevance. It addresses the need to make public service infrastructures and business processes significantly smarter through tighter integration with Internet networking and computing capabilities. The FI-PPP has clear and relevant goals, such as increasing the effectiveness of business processes and of the operation of infrastructures supporting applications. The FI-PPP programme is in its second phase and will evolve into the 3rd phase till 2015.

The FI-PPP follows an industry-driven, holistic approach encompassing R&D on network and communication infrastructures, devices, software, service and media technologies. The FI-PPP provides an efficient, service-oriented model for cooperation between academia and industry. But the tight priorities of the Call and the industry structure of the countries narrows the possibility to have every country involved. To increase the participation of MS in the EU-wide FI-PPP process it is necessary to raise awareness of national policy- and decision-makers regarding this research and innovation scheme throughout EU MSs, and also it would be useful to create similar national or regional R&D programmes related to FI-PPP to boost national players onto this European field. A new EC Communication to develop national and regional FI-PPP programmes funded by Structural Funds or national resources would give a spur to this effort. Pilot projects would also speed up the involvement of FI-PPP model in the innovation system of the Member States and help to localise the FI-PPP approach.

FI-PPP awareness making is a priority of The Future Internet Forum (FIF) of Member and Associated States as well. At the FIF meeting in Warsaw on 26-27 October 2012 it was agreed the National FIF Chapters will organise workshops before the next Future Internet Assembly (FIA) in Dublin in 2013, with the support of FI-PPP projects, to gather information, identify target actors and build innovation eco-systems with a focus on the Phase 3 of the FI-PPP.

5.4. SME involvement

The SME sector one of the main pillars of the EU economy. There are many fast-growing SMEs in the EU with high R&D intensity. Unfortunately, sometimes it is difficult for these business entities to be engaged in the EU's FI research programmes and initiatives.

The EU, and specifically the FIF, can make greater efforts to bring these players into the field. The necessity of such involvement also stems from the need to turn research results into successful business products and/or services. The key of the stronger involvement of SMEs in the FI research in Europe is the cooperation of these enterprises with academic institutions that have been more integrated into the EU R&D activities may help them to participate in Future Internet programmes

at EU level. The decrease of the administrative burden and simplification of the financial accounting in the EU funded projects could also elevate the SME participation in FI-PPP projects.

The National Technology Platforms and the European Technology Platforms can also help to involve SMEs in the European Future Internet activities.

The European Institute of Innovation & Technology (EIT) ICT Labs support innovation in existing companies and the creation of new business opportunities in ICT through a set of tools. Some of the EIT ICT Labs' business catalysts are: best-practice benchmarking, Entrepreneurs Club, Entrepreneurship Support System, European SME program, Innovation Radar.

Innovative start-ups are very important to exploit the FI research, therefore it is essential to increase their number in the EU. In order to push the creation of new SMEs in the field of FI, it would be useful to study the status and conditions of this process in the Member States, and the opportunities to facilitate it. It is recommended to FIF also to have a discussion on this topic at one of its next meetings or at a FIF Start-up Workshop.

The 'Future Internet Award', supported and organised by the ceFIMS Coordination Action, is an opportunity for European national and regional Future Internet initiatives to promote their work. The award will be awarded at each FI Assembly meeting to the initiative that is adjudged to have the greatest potential to advance the Future Internet and which provides an exemplar for innovate products/services. Further dissemination of information on FI Award among the business sector can increase the participation of SMEs in the Call on the Award.

5.5. Regional/national initiatives

Besides the EU, the Member States and the regions have launched FI R&D initiatives in recent years with the support of community and/or national/regional funds. The FI programmes of the EU encouraged the cooperation and the synergies between these programmes. The FIF is also a useful instrument to reach common ground and accord in FI research and innovation in the EU.

Unfortunately, the economic problems in some Member States set back the implementation of the national and regional FI initiatives. To overcome the current difficulties, increased funding is being sought for local initiatives and programmes, as well as shared information and best practices on successful FI projects and business models.

Regional partnerships on FI R&D can boost cooperation between the Member States. Structural Funds could provide a suitable financial source for FI research at national and regional level. However, since the EU's current fiscal period (2007-2013) started before launching the FI initiatives in Europe, only a few national/regional FI projects received support from the Structural Funds. One of the few examples is Hungary, which has started Future ICT Research Programmes with the support of the Structural Funds and of the National Research and Technological Innovation Fund (KTIA) this year. In order to create more opportunities for national and regional FI R&D

activities supported from the Structural Funds these programmes should be included in the new National Development Plans (NDP) for the period of 2014-2020.

The Danube Strategy is a good example for regional cooperation in Europe, which aims at better coordination and alignment of policies and funding. The Strategy was prepared following the initiative of the Danube countries and it is now their responsibility to work on the implementation. The Danube Strategy has four pillars and 11 priority areas. The 7th Priority Area (PA7) of the DS is "To Develop the Knowledge Society through Research, Education and Information Technologies". The Danube countries prepared a Roadmap for PA7 Actions that proposes projects related to the societal and technological challenges of the EU. Some of the proposed projects are also in connections with EU ICT programmes (e.g. promotion of Information Society in rural areas and for SMEs, e-Government, e-contents and e-services). The National Innovation Office of Hungary raised the issue to include a new action line in the DS Roadmap to support the FI activities of SMEs in the Danube Region through the PPP cooperation model.

National Technology Platforms (NTPs) could also provide a strong basis for cooperation between Member States. This could help channel national research activities, with NTPs perhaps also becoming associate partners in the Future Internet Forum, based on Member States strengths and ambitions. There are already a number of strong examples of Future Internet National Technology Platforms in Spain (es.INTERNET[4]) and Hungary (Future Internet National Technology Platform[5]).

5.6. EU competitive advantage

Europe is to the forefront of Future Internet research. In order to better exploit the results of the EU and nationally funded Future Internet research projects, and to be competitive with the USA and some developed Asian countries in Internet business, Europe should focus more on the business models of Future Internet. Standardisation is also an important element of the effective use of R&D results and could strengthen the competitive advantage of EU in the Internet business.

There are several advantages of Europe against its competitors that should be benefited much better in the field of the next generation Internet. In spite of the problems of the telecommunication industry, Europe is in a good position regarding the mobile telecommunication technologies and services. The future will be characterised by heterogeneous (fixed, wireless) Internet from anywhere, anytime. To be more competitive we should focus on the comparative advantage which the EU has: e.g. mobile communications. It would be necessary for Europe to make a unified open mobile communication service area without limiting the usage of mobile Internet with huge data roaming costs. An integrated mobile Europe would accelerate the development and the use of mobile applications and services. The introduction of free Wi-Fi zones in public spaces like higher

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[4] http://www.idi.aetic.es/esInternet

[5] http://futureinternet.hu/

educational institutions, airports, shopping centres, hotels, etc., can facilitate the general use of mobile applications and services, and also the creation of new businesses.

GÉANT is the pan-European data network dedicated to the research and education community. Together with Europe's national research networks, GÉANT connects 40 million users in over 8,000 institutions across 40 countries. The pan-European Research and Education Network (REN) connects the most important universities and institutions in Europe. National RENs participate mainly in the Future Internet Research and Experimentation (FIRE) programmes. If we transformed these institutions to Future Innovation Hubs, it would extend the FI innovation activities in Europe. To implement such a goal the EU could initiate FI R&D and innovation programmes involving GÉANT and the National RENs.

Now the Internet influences many aspects of our daily life. Future Internet will have much stronger effect on the activities of the individuals, the institutions and the businesses in the years to come. The degree of the usage of ICT applications and services will determine the performance of the economies and the societies. To increase the extent of FI applications and services we should take the FI knowledge into the educational institutions, where millions of students could learn the latest Internet technologies and applications and how the FI will change ways we learn and teach.

The ICT Labs Knowledge and Innovation Community (KIC) set up under the aegis of the European Institute of Innovation and Technology (EIT) plays a central role in the Future Internet research by creating an effective interaction surface between the academic institutions and the industry players. To achieve maximum synergy there is an opportunity to strengthen the operation KICs of the EIT and deepen the cooperation between the EIT ICT Labs and the Member States institutions.

5.7. Financial support

The EU has made a number of pioneering initiatives in FI and started many FI related R&D programmes and projects in the 7th RTD Framework Programme. Because FI is one of the areas that will determine the competitiveness of Europe in the next decades, and the Member States are interested in the continuation of these initiatives in the future, therefore the level of focus on FI R&D in Horizon 2020 is of particular interest. The main pillars of Horizon 2020 (Excellent Science, Industrial Leadership, Societal Challenges) can provide appropriate conditions for the technology- and service-oriented, and the experimental FI research activities in Europe, but the integration of these research areas has to be ensured as well.

As it was mentioned in the Section 5.5, the Member States could use the sources of the Structural Funds more intensively and efficiently for financial support of national and regional FI research and innovation programmes, especially for the development of FI testbeds, pilot systems and for FI-PPP projects. The Structural Funds could provide a suitable and steady financial source for national FI R&D programmes. Member States should be encouraged to include FI research and innovation

programmes in the New National Development Plans for the next EU fiscal period (2014-2020) to enable successful FI initiatives and cooperation models in FP7.

5.8. Fragmentation & experimentation

The EU and the Member States have initiated a number of FI programmes in the recent years. Research on the Future Internet is currently fragmented globally and within Europe as well. The US is traditionally quite strong in ICT business applications, the Asian countries have made great strides in the ICT services, while Europe is strong in ICT technology and experimentation. Due to the intense fight in the area of ICT among these regions, Europe should strengthen its position in some areas of research and innovation.

The European research institutions and enterprises are doing well in research on FI technologies and experimental research. In 2010 the EU launched the FIRE (Future Internet Research and Experimentation) initiative for the support of the experimentally-driven research and to set-up large scale experimental facilities by integrating the separated pilot systems and testbeds in Europe. The FIRE initiative creates an open research environment, which facilitates strategic research and development on new Internet concepts giving researchers an instrument to carry out large-scale experimentation on new paradigms.

Appendix A. Acronyms

AC	Audio Conference
AS	Associated State (of the European Union)
ceFIMS	Coordination of the European Future Internet Forum of Member States
CSA	Coordination and Support Actions
DoW	Description of Work
DS	Danube Strategy
EC	European Commission
EIT	European Institute of Innovation & Technology
ETPs	European Technology Platforms
EU	European Union
FI	Future Internet
FIRE	Future Internet Research and Experimentation
FIF	Future Internet Forum
ICT	Information and Communications Technology
KIC	Knowledge and Innovation Community
MS	Member State (of the European Union)
NTP	National Technology Platform
PPP	Public-Private Partnership
R&D	Research and Development
R&D&I	Research and Development and Innovation
REN	Research and Education Network
SME	Small and Medium Enterprises.