Coordination of the European Future Internet Forum of Member States

D3.3 – Potential Member States & Member State-EU Research Synergies

Willie Donnelly, Kieran Sullivan, Vilmos Nemeth, Edina Nemeth, David Pap, Brian Foley, Ana Ponte, Luis Magalhaes, Julian Sesena

Document Number	D3.3
Document Title	Potential Member States & Member State-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-June-2011	Working	Kieran Sullivan	Create working outline of report
0.2	14-June-2011	Working	David Pap	Drafting the chapters of the report
0.3	29-June-2011	Working	David Pap, Vilmos Nemeth	Finalizing the report
0.4	5-July-2011	Draft	Kieran Sullivan	Edit & format document
0.5	9-July-2011	Draft	Vilmos Nemeth, David Pap	Edit document
1.0	04-Aug-2011	Final	Kieran Sullivan, Brian Foley, Willie Donnelly	Final edit, format

Table of Contents

1. Introduction

Making Europe a leader in Future Internet technologies and applications requires a coherent approach to leverage the multiple ongoing efforts at European level and in the Member States – so suggests the European Commission in their communication of the public-private partnership (PPP) on the Future Internet.

One of the major aims of the ceFIMS project is to offer support in creating synergies and reducing duplication and fragmentation of European Future Internet research. Working towards this goal, ceFIMS has been gathering information on Future Internet research initiatives at regional, national, trans-national, and European Community levels.

This deliverable uses this information to: discuss cooperation models and pillars on which such models could stand; identify potential areas for synergies between current Future Internet projects/initiatives; and, examine the level of activity across Member States and between Member States and the EU. Thus, this document: (a) provides a background context against which the ceFIMS project will prepare a roadmap towards a Future Internet ERA-NET+; and, (b) describes the preliminary work undertaken to identify areas of potential synergies, and areas for more strategic cooperation between Member States and between Member States and the EU.

The report begins with a discussion on cooperation models. This includes the steps required to develop a cooperation model and potential pillars (themes/content, funding mechanisms, barriers/areas for more strategic cooperation) on which to build same. It then lists and describes a number of sample synergy topics and the Member States that could potentially be involved in them. Next, it analyses the level of trans-national activity across Member States and the level of engagement between Member States and the EU, including their participation in ERA-NETs and ERA-NET+s. It is against this collaboration backdrop that ceFIMS will develop its roadmap. Finally, because this report on potential synergies will feed directly into the first ceFIMS interim roadmap, a number of points are raised in order to stimulate further discussion.

2. Cooperation Models

This section discusses pillars for cooperation models for the realisation of potential synergies between Member States. The discussion focus here is on themes & content (incl. ongoing, current work), funding mechanisms, and barriers/challenges. These potential commonalities were identified by research council and funding agencies, Members of the Future Internet Forum and EU programme managers during the ceFIMS Budapest workshop. The analysis in this section also draws on the conclusions of two ceFIMS-organised workshops (PPP and ETP), which provided valuable insights, as well as data provided by Member States in the ceFIMS database.

Before considering the pillars mentioned above, it is worth bearing in mind the steps required to realise a cooperation model for potential synergies.

STEP 1: Gather and exchange information (strategic & operational). Establish a comprehensive repository of information on Future Internet initiatives at:

- EU level
- Member State level
- Regional level

STEP 2: Undertake comparative analysis to identify:

- Common themes
- Opportunities for cooperation
- Barriers to cooperation

STEP 3: Identify areas (focused) where coordination & cooperation can 'add value' to Member State and EU activities. Use working group (involving key stakeholders) to identify and define thematic areas and funding mechanisms.

STEP 4: Define appropriate cooperation frameworks for:

- Projects
  - Identification of potential project clusters
  - Support clustering activities
- Programmes
  - Identification of common research priorities and research resources
  - Defining appropriate levels of cooperation and coordination (can vary according to objectives and thematic areas): Definition of a scale of coordination activities from 'light' to 'heavy' could include opening up of national research programmes: thematic alignment; Joint Programming: ERA NET+

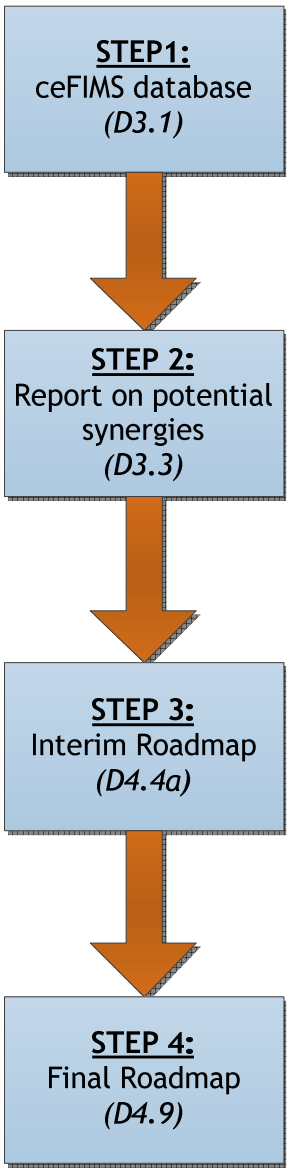

Figure 1 - ceFIMS ERA-NET+ development process

The ceFIMS project (in WP4) is developing an implementation framework for such a cooperation model (as part of its roadmapping activities) using the four-step approach, outlined above. As a starting point, the

project has established a comprehensive repository (database) on Member State and EU Future Internet initiatives. This database, along with discussions at the ceFIMS workshops captured in this report, provide valuable input to the project's roadmapping activity towards an ERA-NET+.

2.1. Themes & content

The themes and content areas with high potential (to add value and to be realised) break into three categories: underlying and enabling technologies; use cases and applications; and, those whose pan-European appeal renders them high potential.

— **Underlying/enabling technologies**

The fundamentals of the Internet could usefully be revisited. This does not necessarily mean a total clean-slate approach, but it does call for a re-examination of primary Internet elements – including security, mobility, languages, etc. Suitable **testbeds** could be used, in this regard, to jointly investigate enablers (e.g. IPv6) and potential applications (e.g. social networks, home environments, health, new media, etc.).

Generating energy in a more efficient manner to power ICT demands is another area that holds high potential. Such **green ICT** would complement many of the smart energy initiatives currently in place, where energy distribution and consumption are monitored by autonomous management systems. This green ICT would require collaboration with a number of research disciplines, including materials science, etc.

— **Use cases & applications**

A 'smarter', more dynamic Internet should be able to adopt and evolve as time progresses. Advances in **augmentation, reasoning** and the **semantic web** could lead to programmable architectures that would deliver services-on-the-fly to users. A dynamic approach to contacting applications areas directly (e.g. the oil industry) also offers potential, as do **education services** – where there is scope to develop digital library content and multimedia platforms.

In general, use cases and applications have different potential and support in different Member States. For example: tourism and health in Spain; bio-informatics and ICT-agriculture (sensor networks) in Latvia; energy, sustainability and climate change in Sweden. The following section, conversely, addresses a number of applications whose pan-European appeal renders them high potential.

— **Pan-European**

A number of specific Member State initiatives could be developed and aligned in a pan-European environment. These include: Germany's recently rolled out **e-identity management system**; Hungary's **National Technology Platform**, which allows its researchers to engage more easily with their peers in other Member States; Romania's **single sign-on facility**, giving access to their e-infrastructure. **Networked, open data** also has potential, but it must be in an interoperable format to advance current data-sharing efforts.

Europe's diversity presents a number of high potential areas. **Standards**, for example, could be developed and robustly tested across Europe's heterogeneous landscape. The **diverse expertise** available across different Member States' Science Agencies could also be taken advantage of, should the EU and/or other Member States require specific consultation. Furthermore, having a large number of Member States means there is potential to develop several small clusters of Member States who could work together on **pilot initiatives** and subsequently report on what issues (barriers, time-scales, objectives, mechanisms, etc.) might need to be resolved at EU level.

2.1.1. Multidisciplinary vs. technology-only approach

The **EU 2020 Digital Agenda**, with its commitment to reducing the digital divide, provides the background to the multidisciplinary aspect of this potential collaboration theme. Care must be taken, however, to balance technology-driven and user-driven developments, since too much consultation may lead to inertia and the loss of competitive position. Indeed, a number of Member States express primary interest in technical advances such as infrastructures, testbeds, routing, etc.

Additionally, involving users in a multidisciplinary approach can be difficult. To this end, a non-hierarchal, user-centric framework might be useful. Such a framework could give rise to a two-way interaction between providers and users, and would circumvent traditional approaches, where rigid domains restrict innovation. **Agile development**, for example, could be examined in this regard since it would iteratively take account of user needs.

Finally, a multidisciplinary approach should encompass **sociological culture barriers**, ethics, sector-specific applications and horizontal applications. These are rarely addressed in unison, however, and there is opportunity here (for SMEs) to develop business models to fill this gap.

2.1.2. Living labs vs. testbed approach

More information is required on current testbed infrastructures available across Europe. The recently started INFINITY PPP project is addressing this gap in knowledge and it will present its findings in due course. There is a school of thought, however, that says we should actually move away from testbeds (in isolation) and consider the **Internet a living labs testbed** itself. This approach would help involve users

and could test the market to identify barriers. Testbeds can again be restrictive or limited in this regard, and, therefore, a living labs approach might better support innovation and new businesses.

Parallels exist between this potential collaboration theme and the 'multidisciplinary vs. technology-only' theme. While a multidisciplinary approach is generally advised, there will be some issues that will only be resolved through technology. Likewise, while a living labs approach may be the ideal in many instances, issues will still arise where testbeds will provide the solutions.

Note however that Europe has a natural advantage with regard to any living labs approach, since it comprises a large number of heterogeneous users.

2.1.3. Novel & economic business models

Novel business models are required to fulfil pan-European potential and move it beyond the domain of Governments and public bodies, both at national and at pan-European level. There is a need to open to market funded initiatives and technology systems under development, in order to constructively advance through the pilot phase and on to the everyday usage. **Novel, flexible market- and services-oriented mechanisms** need to feed into novel business models. These business models should be able to integrate all parties and values of different nature involved in the networked transactions. They should also stimulate openness in the applications market for attracting investment.

For example, smart city projects typically involve a series of new services generated from the large-scale open networks developed. New business models should, thus, be structured in line with that novel structure of data and value transactions. This discussion is to be integrated as a critical component in the effort of taking the most benefit out from complementary and synergetic national Future Internet activities.

2.2. Funding mechanisms

2.2.1. EU schemes on Future Internet

Funding mechanisms are a key component in advancing the realisation of potential synergies between Member States and between Member States and the EU. Common cooperation themes and content can only be realised if appropriate funding mechanisms are put in place. Figure 2 summarises various Future Internet schemes under the umbrella of the European Union:

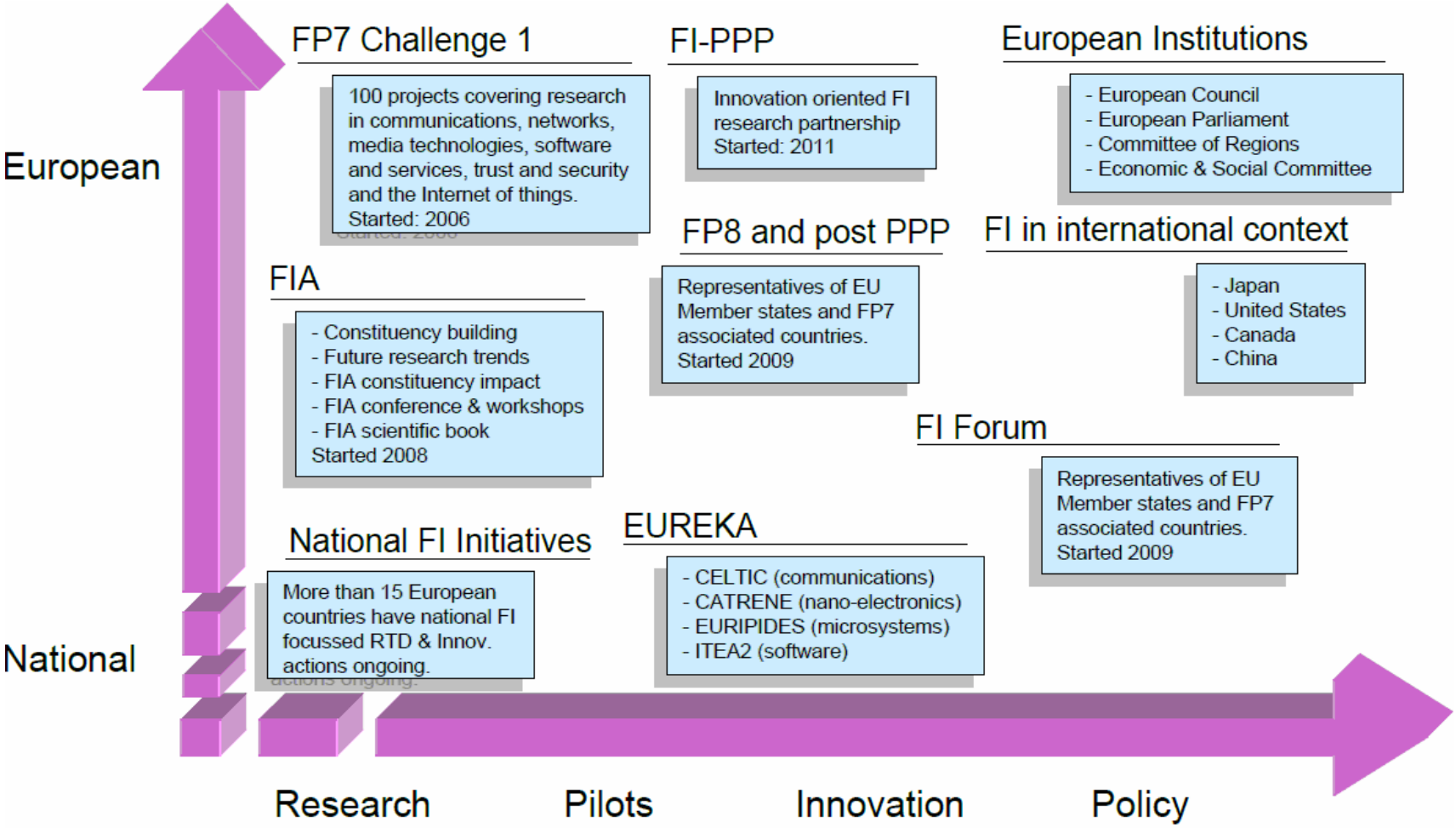

Figure 2 – Landscape of Future Internet Activities in Europe

As well as Member States finding common research funding streams on which they could cooperate in the above schema, the EC and the Member States are already required to ensure that funding and financial assistance is complementary to other financial instruments. However, while the CIP, FP and CF programmes share the broad objectives set out in the Europe 2020 strategy, achieving the necessary synergies between the instruments is a major challenge since they are underpinned by different thematic priorities, timing and funding rules. The different instruments are also based on differing logic regarding the underlying justification for their existence. Moreover, the implementation of the different programmes tends to involve different administrative levels and authorities. Coordination of major EU instruments such as FP7, SF and CIP is not only a question of political intentions, but also a policy coherence challenge (differentiates policy coherence from policy coordination and policy consistency[1]).

While the focus of the Structural Funds on research and innovation has increased as EU regional/cohesion policy has been brought into line with the Europe 2020 Strategy, there is already a substantial research and higher education component within the Structural Funds.

The following collaboration mechanism topics can also usefully be considered. These topics (whilst only representing part of the range of cooperation options) were highlighted during discussions at the ceFIMS workshop in May, 2011.

- **Member State interaction with PPP**

  Though the PPP projects have only recently started, each Member State is monitoring their progression. **Openness** is a keyword, and Member States expect their interaction with the PPP process to evolve as the projects make progress.

- **Making use of Structural Funds**

  Using structural funds for ICT research is a recurring topic. One suggestion to achieve this is to ear-mark a portion of structural funds and then establish appropriate metrics to monitor the use of same. For example, sample metrics could include: number of new start-up companies, number of PhD trained, type of products developed, etc. This approach may require EU-level direction, however, and could see the setting up of a pilot national strategic project for **'Future Internet Structural Funds'**.

[1] OECD (2003, p.9)

— **Basic research vs. public-private research**

Some Member States have two separate research funding agencies: one for basic (long-term) research and another for closer-to-market projects. Additionally, some funding agencies for basic research do not set rigid research priorities (outside of smart transport, smart cities, smart grids), but rather set national programmes. This allows them to remain open and react faster to changes in commercial technology advances. In this regard, Strategic Research Agendas are becoming less relevant than **Research Roadmaps**.

Basic research may no longer be a goal in itself, but it may be an enabler for new knowledge and, hence, new technology innovation. The challenge remains to **convert research into new business**. Ultimately, an appropriate balance must be found between basic and public-private research – depending on where priorities/funding lie.

2.2.2. New forms of sharing value in projects

Companies, public institutions and universities are undertaking Future Internet projects in diverse contexts, exploring different angles and thus achieving different types of results. There are various kinds of **intangible assets** that could be shared with increased value to partners besides the common exchange mechanisms defined for tangible assets. In fact, if tangible results are easily accountable—for addressing intangible assets such as knowledge and ideas, which are a strong component in the new networks that are being established—non-financial transactions must be considered.

Possible non-financial transactions include **providing value** back to the Member State and generating knowledge from within the project itself (e.g. sharing IPR, influencing standards and regulatory frameworks, sharing testbeds and pilots, sharing Knowledge and experience, etc). New forms of sharing value in common activities should be streamlined, and the correspondent accountability is critical for leveraging the benefits to take out of common activities at European level.

2.3. Barriers & challenges

A number of barriers and challenges will need to be addressed in the context of realisation of pan-European cooperation models. Specifically highlighted at the ceFIMS workshop in May, 2011, were the following:

— **Multiplicity of research programmes**

Many Member States have launched national initiatives on the Future Internet (research programmes, technology platforms, interest groups, etc.), demonstrating their activity on a crucial theme for the future of European competitiveness. This multiplicity of different national

and regional initiatives is an opportunity to add value to Future Internet pan-European initiatives on the basis of **complementarities and synergies**. Benefits and efficiency could, thus, be increased if those initiatives cooperated more closely.

Europe's strength lies in its diversity. Care must be taken though to maximise individual national efforts by promoting cooperation at European or bilateral level. **Structured coordination** is an opportunity to ensure Europe optimises and adds value to its funding and implements complementary and coordinated approaches in targeted areas. Consolidated infrastructure may also result from such coordination.

A lack of dissemination can lead to a number of potential challenges posed to collaborative development, including:

- Member States not seeing value in trans-national collaboration;
- Poor visibility of EU projects and achievements in Member States and vice versa: such awareness could allow Member States to focus on niche areas which complement larger, EU-wide work (e.g. create applications to work on EU-wide platforms);
- Perception of a lack of coordination between EU research and Standards and the USA, Asia;
- Perceived gap between top-down, regulated R&D and grassroots activities.

A **formal mechanism** to feed research outputs from Member State programmes into the EU framework could help address shortcomings in dissemination. Similarly, a common language or set of definitions could increase data-sharing across Europe.

— **Bureaucracy & legislation**

To increase research collaboration, a number of bureaucratic and legislative issues must be addressed. Some more obvious issues include cross-border data-sharing agreements and Intellectual Property Rights (IPR). Also, in some instances, **regulation time-scales** are mismatched with technology developments, meaning that technology moves faster than regulators can introduce it.

— **Miscellaneous**

Assorted barriers to the development of Europe's Future Internet include:

- *A lack of domain expertise in specific instances*: this presents an opportunity for a multidisciplinary approach. A mismatch sometimes exists also between domain expertise and decision-makers.

- *Cost of network access*: this can be prohibitively high and thus, impede research.
- *Future budgets not guaranteed*: agreement often only exists on specific research themes, but not on the term/availability of the required funding.

3. Potential Synergy Samples

This section begins by describing the tagging of Future Internet initiatives with their keywords on the ceFIMS database. It then details the initial work done by ceFIMS in identifying a number of sample areas where potential synergies could exist. Finally, it provides some context and pointers to further reading, in which to consider the potential synergy samples.

3.1. ceFIMS database keywords

Each Future Internet initiative (hereafter referred to as 'entry') in the ceFIMS database is tagged with 3-5 keywords so as to allow visitors to the website to search by topic for the information. Shown in Figure 3 are the current keywords and their popularity (the larger the size of the keyword in the diagram, the more entries are tagged with that keyword). Clicking on any of the keywords generates a list of entries—and the Member State where each is based—that are relevant to that topic. EU-level projects are marked as EU.

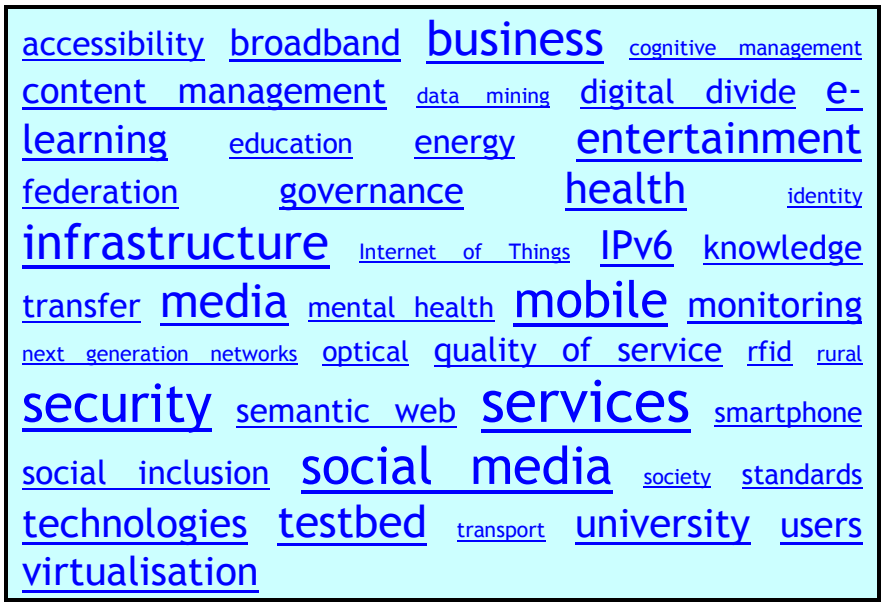

Figure 3 – Current keywords on the ceFIMS database *(July, 2011)*

3.1.1. Clustering database initiatives

Figure 4 shows an initial clustering of current European Future Internet initiatives—based on data gathered by ceFIMS in its database—around the seven-layer, OSI model of the Internet.

A full list of all entries on the ceFIMS database is included in Appendix C of this deliverable. This list states whether entries are national or EU-level projects/initiatives. Full details on all these entries are captured in deliverable **D3.2 Report on Existing Future Internet Activities** – an updated version of which is produced every six months by ceFIMS.

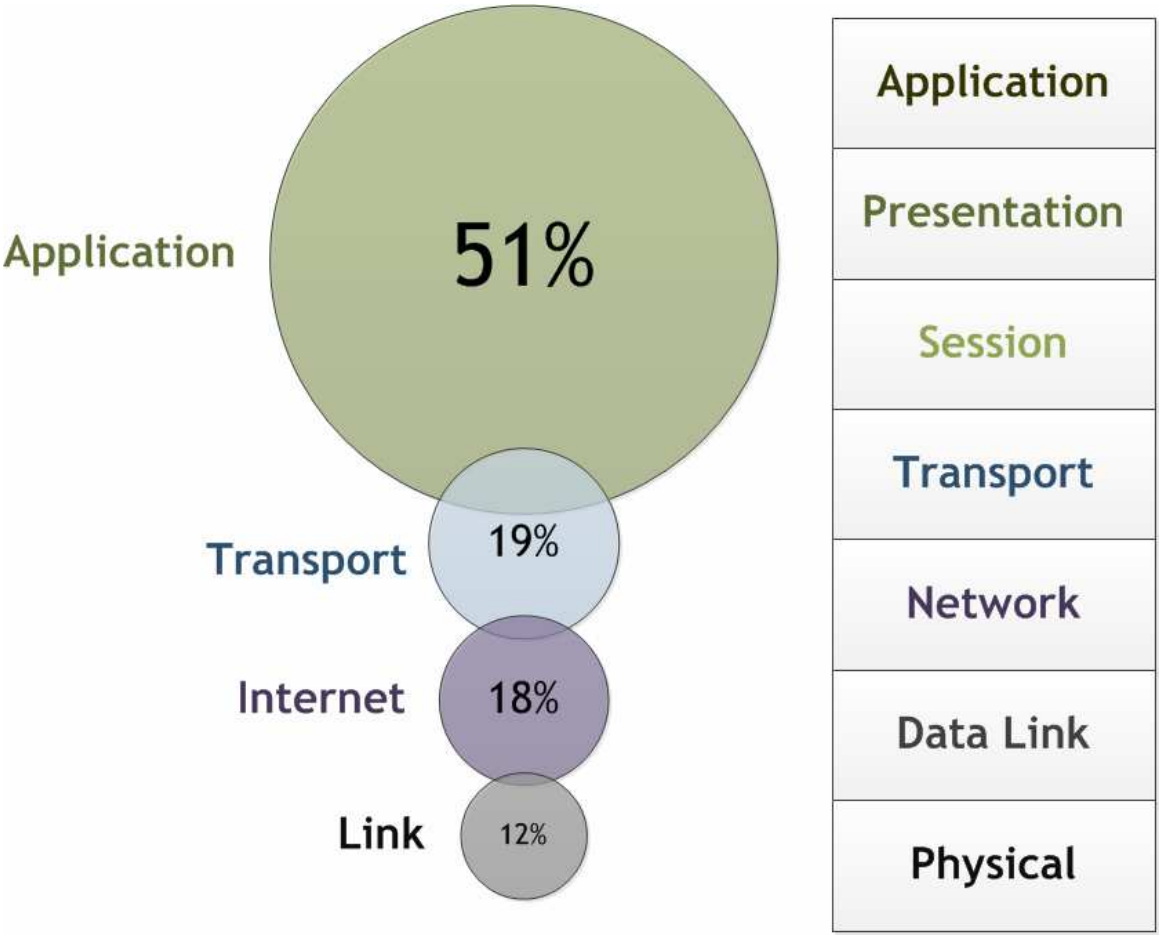

Figure 4 – Mapping Future Internet initiatives onto OSI Model

The breakdown of initiatives in the above diagram is to be somewhat expected since projects with a finished service/application are more likely to promote their work[2], and conversely, projects carrying out more commercially sensitive (lower layer) work are less likely to make their ongoing work public. The

[2] That is, more likely to disseminate their work & make it publicly available

figures above should be viewed with these considerations in mind, but we can assume that the clustering percentages are indicative nonetheless. As well as using this clustering to identify potential complementarities between initiatives (and thus, potential synergies between Member States), ceFIMS will also examine the initiatives within each clusters to begin the process of identifying potential duplication amongst them.

Table 1 shows sample potential synergy themes/content. The numbers in brackets indicate more than one initiative relevant to the topic in that Member State. These will be updated in line with ceFIMS gathering more information from Member States.

	Theme/content					
	Infrastructure	*Mobile*	*Security*	*Services*	*Social Media*	*Testbed*
Member State	EU (4)	France	Finland	EU	Hungary (2)	EU (2)
	France	Hungary (3)	France	Lithuania	Malta	Poland
	Ireland	Ireland	Hungary	Poland (3)	Netherlands (2)	United Kingdom (3)
	Lithuania	Malta	Netherlands	Sweden	Poland	
	Netherlands	Portugal (3)	Poland	United Kingdom (2)	Portugal (2)	
	Poland		Romania		United Kingdom	
	Romania		United Kingdom (2)			

Table 1 – Sample synergy topics & Member States potentially involved

The following lists expand on Table 1 and describe briefly the projects and initiatives where potential synergies lie. The accompanying diagrams for each potential theme/content shows the projects/initiatives clustered together in line with Figure 4 above, which maps all database entries of Future Internet initiatives onto the OSI Model of the Internet.

For the next phase of its work, ceFIMS will further analyse this information and establish contact with identified projects/initiatives, with the objective of building relationships between them in the context of results-sharing, collaboration, and identifying potential duplication of effort.

3.2. Infrastructure

- ***Panlab*** (EU): provides a large-scale experimental facility which offers heterogeneous testbed resources.
- ***OneFIT*** (EU): is developing and validating the vision of opportunistic networks that are managed and coordinated with the infrastructure, by advanced cognitive systems.
- ***NOBEL*** (EU): is building an energy brokerage system which allows consumers to communicate their needs with large- and small-scale producers.
- ***GEYSERS*** (EU): is addressing the convergence of the IT world with optical networks, in light of the current decoupling between application and network layers.
- ***SEANET*** (France): is developing ad hoc communication networks, specifically for high data rate ship-to-ship exchanges.
- ***GUILD*** (Ireland): is concerned with the auto-generation of city-scale infrastructure models, by converting aerial LiDAR into Finite Element Meshes.
- ***RAIN*** (Lithuania): is helping to eliminate the e-divide of broadband infrastructure between cities and rural regions through the construction and subsequent management of network infrastructure.
- ***NDIX*** (Netherlands): is an open platform which offers unlimited and secure connectivity between suppliers/developers and (potential) users of services.
- ***PLATON*** (Poland): is developing e-Services for the Polish scientific community based on the infrastructure of the national optical research and educational network PIONIER.
- ***ROLINEST*** (Romania): is setting up a national system for information and documentation in science and technology, based on the principle of virtual library catalogue.

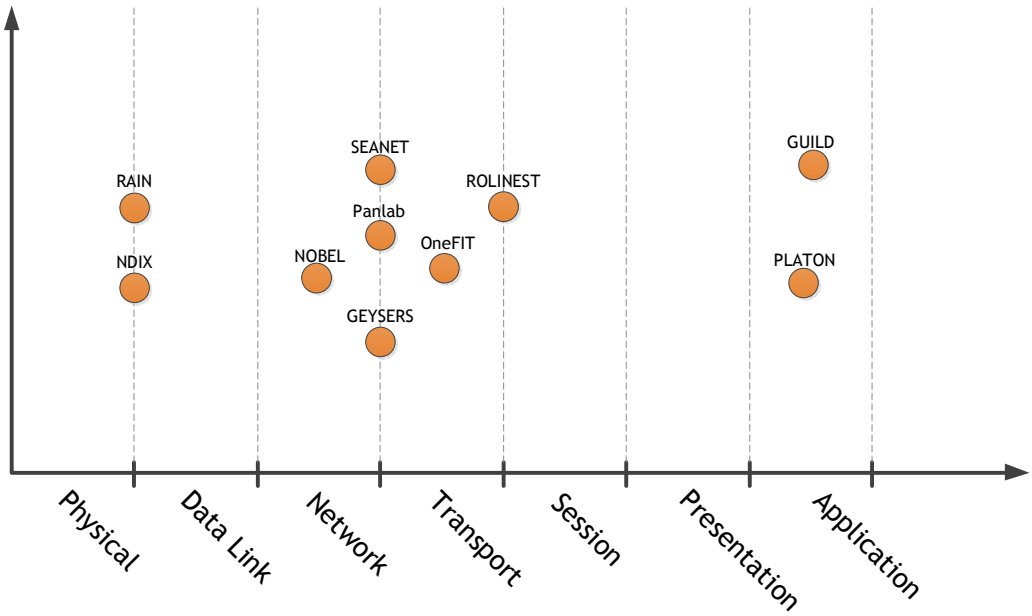

Figure 5-1 Clustering of potential projects/initiatives in '*infrastructure*' area

3.3. Mobile

- ***SEANET*** (France): is developing ad hoc communication networks, specifically for high data rate ship-to-ship exchanges.
- ***eBook Reader*** (Hungary): is examining the potential of HTML5, in particular with respect to mobile web standards.
- ***fullXS*** (Hungary): is developing a content delivery platform for mobile devices, optimised for live and recorded video content.
- ***3G Multimedia/Gaudio*** (Hungary): has produced a stream-based audio delivery system, on the Microsoft platform for 'Windows Phone 7'.
- ***StratAG*** (Ireland): is using mobile spatial interaction prototypes for data mining and analysis on location-aware smart-phones.
- ***DINOS*** (Malta): is a hybrid system, developed on the Android mobile platform, which collects and manages information for users moving around a city by making use of localisation services.
- ***Cloud Counselling for Youths*** (Portugal): provides a service of cloud counselling support to young members of communities facing social issues via SMS communication.
- ***CrowdSense*** (Portugal): is concerned with the ability to detect the presence of pedestrians across an urban environment, and to react to that information accordingly.

— ***Panaroma Networks*** (Portugal): has a networking segment to its work which is integrating the process of the IEEE 802.21 framework with a number of wireless access technologies.

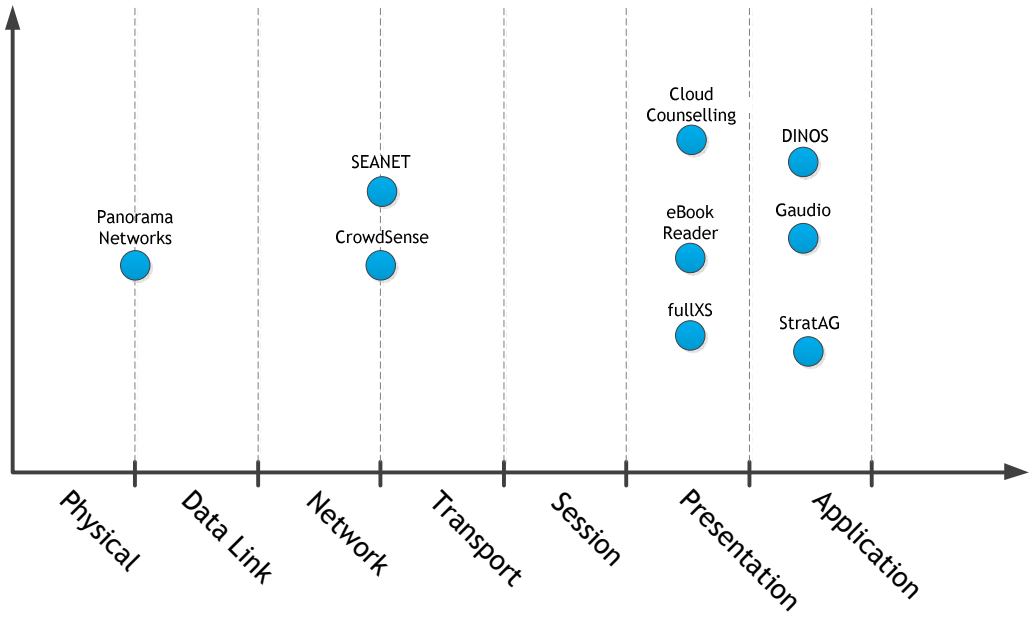

Figure 5-2 Clustering of potential projects/initiatives in '*mobile*' area

3.4. Security

— ***ICT SHOK*** (Finland): has a security element to its work that is concerned with anomaly detection, unwanted traffic, and trust and reputation.

— ***SEANET*** (France): is developing ad hoc communication networks, specifically for high data rate ship-to-ship exchanges.

— ***T-City Szolnok*** (Hungary): is allowing citizens, companies and institutes to test new Internet-based products/services – part of which involves Zigbee-enabled surveillance sensors and RFID access technologies.

— ***NDIX*** (Netherlands): is an open platform which offers unlimited and secure connectivity between suppliers/developers and (potential) users of services.

— ***SMC*** (Poland): is integrating data from heterogeneous sources and enabling the automatic detection of cyber threats.

— ***Risc-Expert*** (Romania): is developing a system for the analysis, description, classification and recording of major occupational risks, preventive measures, computer-assisted training and consultancy for employees of organisations within this occupational risk domain.

— ***NSIP*** (UK): is examining how to predict and mitigate information risks within digital services and infrastructures.

— ***EnCoRe*** (UK): is developing mechanisms to enable and simplify the process of giving and revoking consent for the storage and use of personal data.

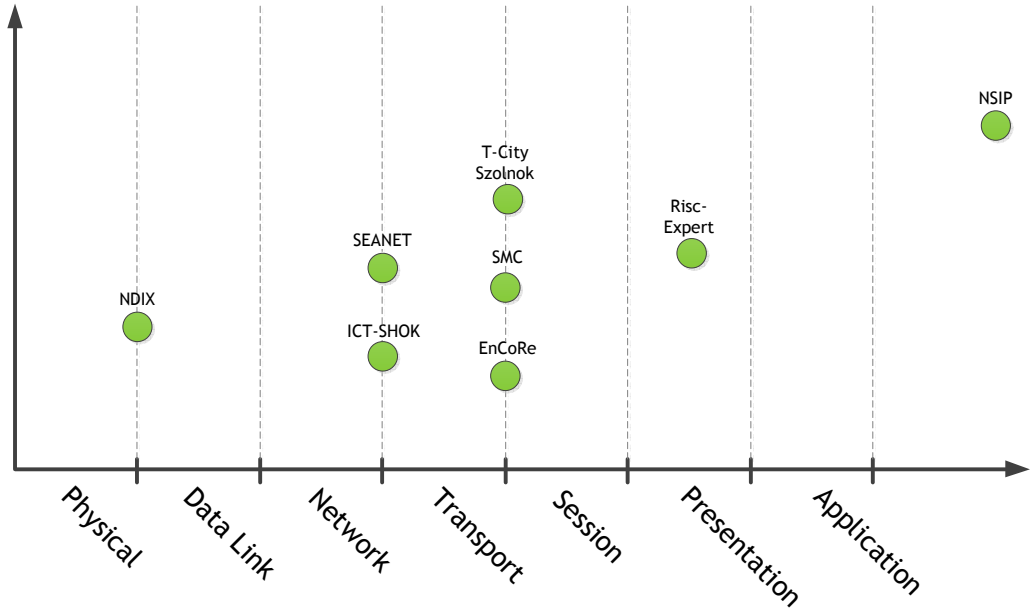

Figure 5-3 Clustering of potential projects/initiatives in '*security*' area

3.5. Services

— ***GEYSERS*** (EU): is addressing the convergence of the IT world with optical networks, in light of the current decoupling between application and network layers.

— ***RAIN*** (Lithuania): is helping to eliminate the e-divide of broadband infrastructure between cities and rural regions through the construction and subsequent management of network infrastructure.

— ***Ego: Virtual Identity*** (Poland): is enabling users to semi-automatically create their online presence to reveal their information at different Web sources.

— ***NOR-STA*** (Poland): is developing and deploying services to support the achievement and assessment of conformance to standards and norms.

— ***PLATON*** (Poland): is developing e-Services for the Polish scientific community based on the infrastructure of the national optical research and educational network PIONIER.

— ***Ambient Sweden*** (Sweden): has a research track which is examining common platforms for services – including networking opportunities for market players, standardisation and traffic exchange between operators.

— ***HIPNET*** (UK): is validating and verifying service-orientated complex next generation networks through experimental development and modelling.

— ***ITSS Platform*** (UK): is applying the 'Internet of content & knowledge' to the transport domain, to create user-friendly solutions for informed personal travel.

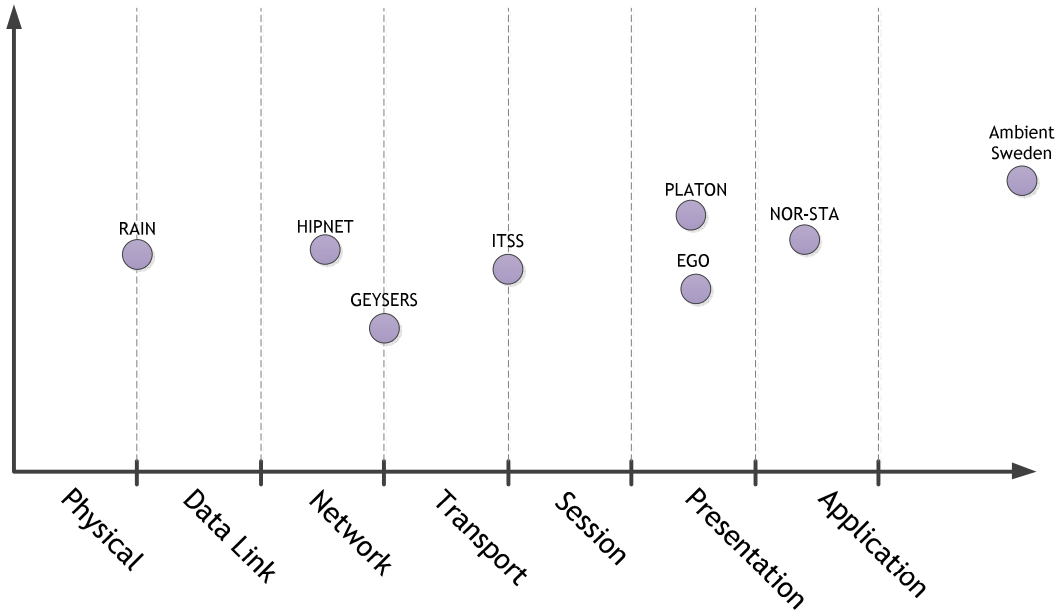

Figure 5-4 Clustering of potential projects/initiatives in '*services*' area

3.6. Social media

— ***fullXS*** (Hungary): is developing a content delivery platform for mobile devices, optimised for live and recorded video content.

— ***mindenki*** (Hungary): allows users to establish their own presence based on their interaction with online content, via a 'relevancy network'.

— ***DINOS*** (Malta): is a hybrid system, developed on the Android mobile platform, which collects and manages information for users moving around a city by making use of localisation services.

— ***NDIX*** (Netherlands): is an open platform which offers unlimited and secure connectivity between suppliers/developers and (potential) users of services.

— ***SURFconext*** (Netherlands): uses open standards like OpenSocial and SAML to simplify identity management and to improve the interoperability of online applications.

— ***SMC*** (Poland): is integrating data from heterogeneous sources and enabling the automatic detection of cyber threats.

— ***Cloud Counselling for Youths*** (Portugal): provides a service of cloud counselling support to young members of communities facing social issues via SMS communication.

— ***CrowdSense*** (Portugal): is concerned with the ability to detect the presence of pedestrians across an urban environment, and to react to that information accordingly.

— ***EnCoRe*** (UK): is developing mechanisms to enable and simplify the process of giving and revoking consent for the storage and use of personal data.

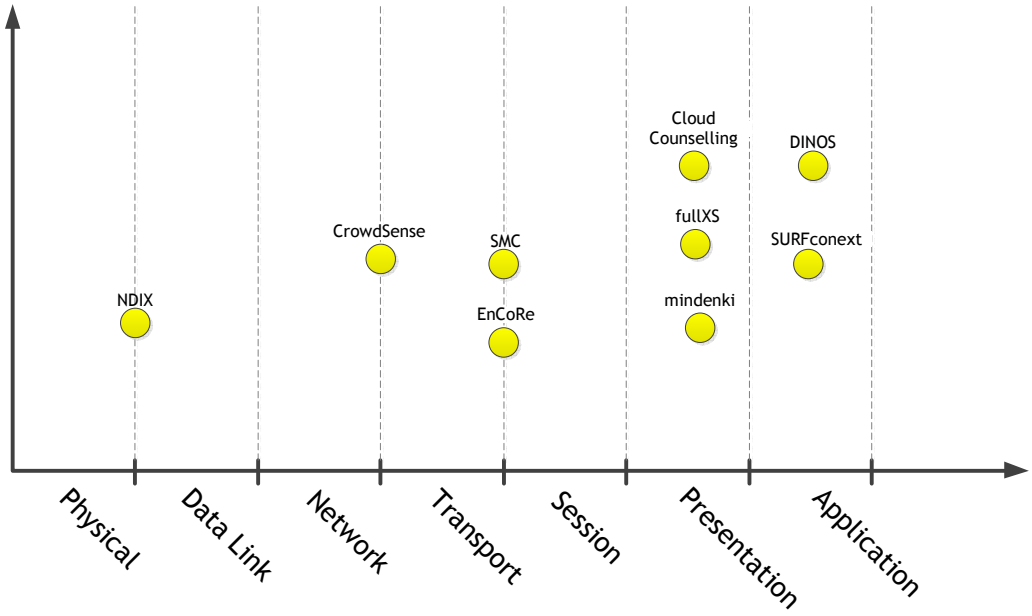

Figure 5-5 Clustering of potential projects/initiatives in '*social media*' area

3.7. Testbed

— ***Panlab*** (EU): provides a large-scale experimental facility which offers heterogeneous testbed resources.

— ***Future Internet Engineering*** (Poland): is improving current Internet capabilities by proposing more efficient network infrastructure and applications – one aspect of which involves testing virtualisation techniques, advanced applications and the transfer from IPv4 to IPv6.

— ***SmartSantander*** (EU): is an experimental facility which is enabling horizontal and vertical federation with other experimental facilities to stimulate new applications, including research on Internet-of-Technology technologies and the realistic assessment of users' acceptability tests.

— ***HIPNET*** (UK): is validating and verifying service-orientated complex next generation networks through experimental development and modelling.

— ***ITSS Platform*** (UK): is applying the 'Internet of content & knowledge' to the transport domain, to create user-friendly solutions for informed personal travel.

— ***Digital Economy Programme*** (UK): is implementing next generation networks trials, which will allow value chains to form and thus allow operators to perform real-field testing/research.

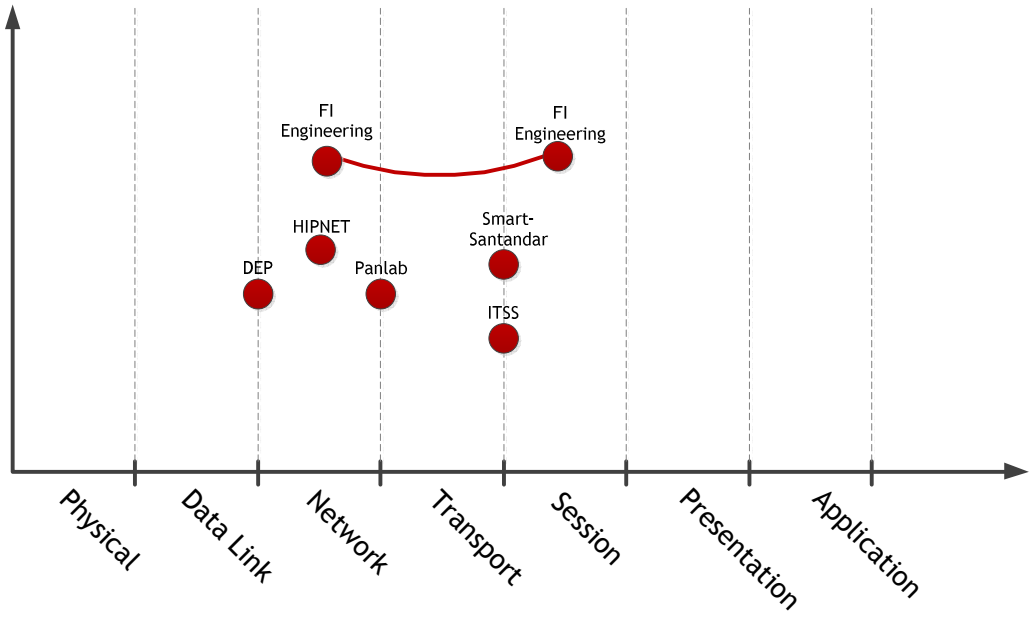

Figure 5-6 Clustering of potential projects/initiatives in '*testbed*' area

The potential synergy samples outlined here must also be viewed in light of the trans-national and EU engagement levels indicated in the following section of this document.

4. Activity Levels across Member States & between Member States & the EU

This section outlines the level of activity across Member States and between Member States and the EU. The first part of this section examines the level of participation amongst Member States in ERA-NETs and ERA-NET+s, as well as describing a number of other trans-national collaboration mechanisms. The second part presents a broad view of Member State engagement with EU initiatives, in terms of proposal submissions and research funding.

4.1. Level of activity across Member States

This section of the report provides background context for establishing any future ERA-NET+. It does so by presenting statistics on Member State participation in FP6 and FP7 ERA-NETs and ERA-NET+s, which broadly indicate the level of engagement ceFIMS can reasonably expect when preparing the ground for a Future Internet ERA-NET+. This section also outlines some other trans-national collaboration mechanisms, including joint technology initiatives (JTIs), joint-programming, FET flagship initiatives, and EUREKA and Celtic-Plus collaborations.

4.1.1. European Research Area

These actions aim to reduce the fragmentation of the European Research Area—resulting from the coexistence of several national and regional public research programmes—by favouring actions supported jointly by several Member States and the European Commission. In contrast to FP6, the ERA-NET scheme is no longer a 'stand-alone' action in FP7. Rather, it is an implementation tool, which will be used mainly in the context of the Cooperation-specific programme, but also in the Capacities Programme.

Though a number of *ICT-related* ERA-NET+s currently exist, it is difficult to identify a dedicated *Future Internet* ERA-NET or ERA-NET+ project. In the longer term ceFIMS will create a sound basis for such a particular ERA-NET+.

The EC's Joint Research Centre (JRC) has mapped ERA-NETs across Europe. An overview of the ERA-NET scheme and its results[3] points out two major facts:

1. The scheme is seen as a valuable tool by programme managers and owners across Europe to foster transnational collaboration. This is evidenced by the increasing number of countries engaging in the scheme. 51 countries participated in the scheme, which represents an increase of

[3] Source: Joint Research Centre Scientific & Technical Reports – EUR24668 - 2010 ("Mapping ERA-NETs across Europe")

approximately 27% compared to 2008. Furthermore, approximately half of the new networks set up under FP7 (including ERA-NET+ actions) are continuations of previous ERA-NETs.

2. The average size in terms of countries participating in an ERA-NET follows very similar patterns to that in FP6. On average, 13 countries participate in a network. The most relevant thematic priorities are:
    a. "Nanosciences and nanotechnologies" (15% of the total ERA-NETs)
    b. "Food, agriculture and fisheries" (13%)
    c. "Health" and "Environment", which represent around 10% each.

    The areas of "space", "security" and ICT are not currently being covered by any ERA-NET.

4.1.2. Member State participation in FP ERA-NET & ERA-NET+

Figures 6 and 7 show the levels of Member State participation in ERA-NET and ERA-NET+ schemes, in FP6 and FP7 respectively[4]. The report by the JRC also states that similar clusters of countries with different behaviour can be identified in both FP6 and FP7 ERA-NETs:

- Four large countries (France, Germany, Spain and UK) participate extensively;
- A group of small countries also have significant participation levels (Austria, Finland, the Netherlands and Belgium). Italy has similar levels of participation, despite its bigger size;
- A diverse group of countries have a medium level of participation, including countries such as Sweden, Poland, and Greece;
- New Member States have a lower degree of participation with Romania and Hungary being the most active of this group.

[4] Source: Joint Research Centre Scientific & Technical Reports – EUR24668 - 2010 ("Mapping ERA-NETs across Europe")

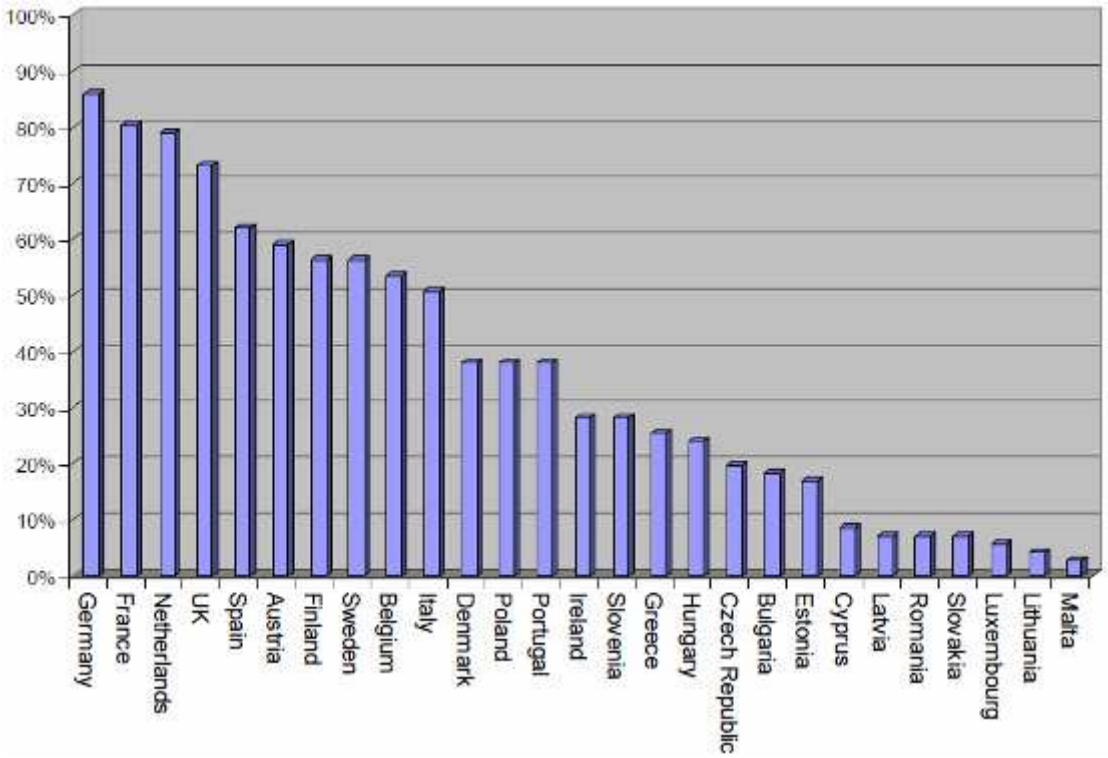

Figure 6 – Member State participation in FP6 ERA-NETs

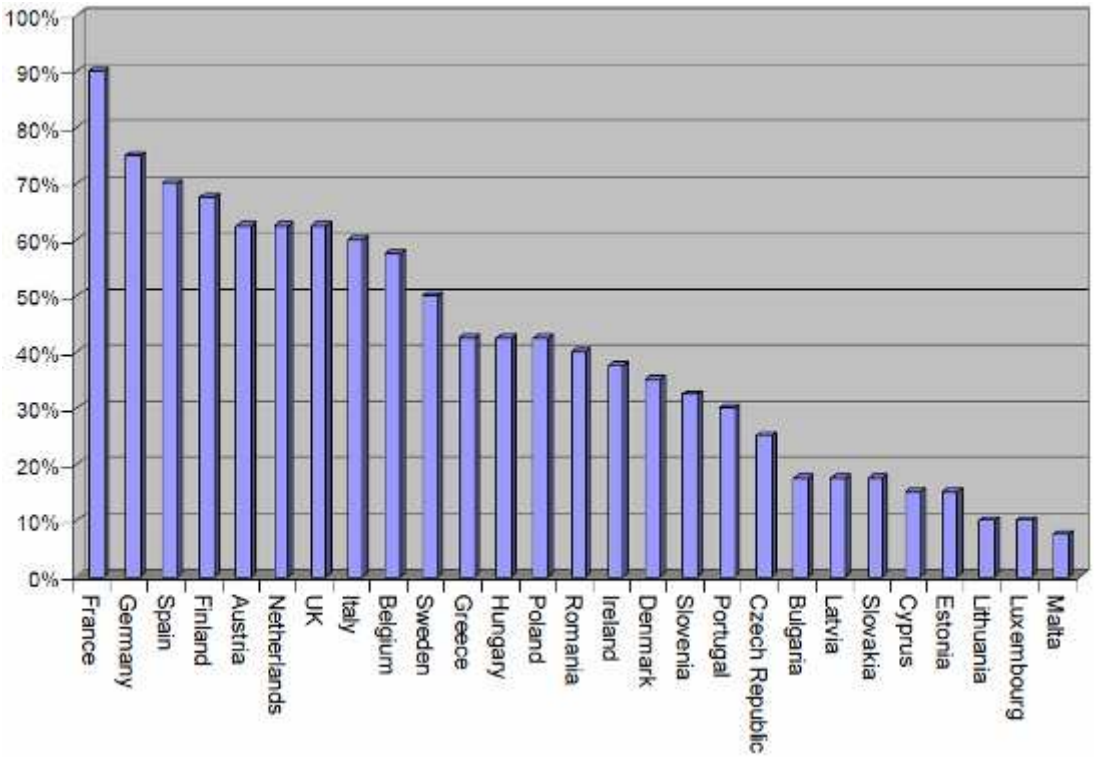

Figure 7 – Member State participation in FP7 ERA-NETs and ERA-NET+s

Almost all Associated Countries (Figure 8) involved in the Framework Programme participate in the ERA-NET and ERA-NET+ schemes, with significant participation by Turkey, Norway, Switzerland and Israel.

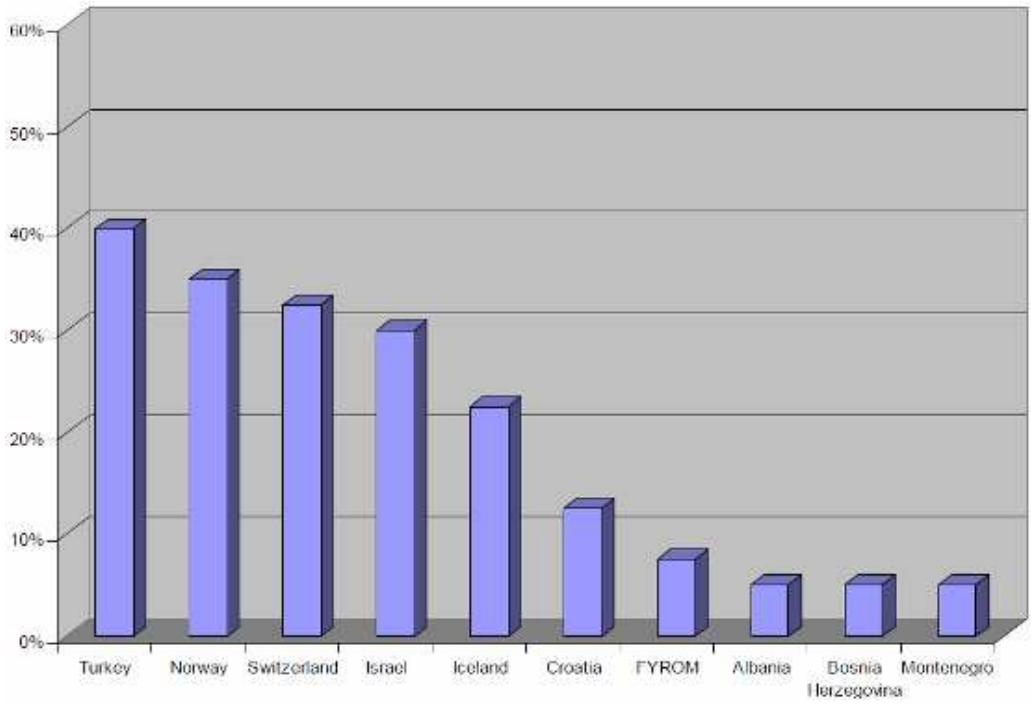

Figure 8 – Associated Countries participation in FP7 ERA-NETs & ERA-NET+s

While no authoritative levels of participation will be drawn from the above figures, they do give an indication, nonetheless, of the engagement ceFIMS can expect to encounter.

4.1.3. Joint Technology Initiatives

In its current Framework Programme for research, technological development and demonstration activities, the European Union supports a number of Joint Technology Initiatives[5] (JTIs). In the ICT field, the ARTEMIS and ENIAC JTIs were established in 2007 as Joint Undertakings (JUs), based on Article 187 TFEU (ex Article 171 EC). These two bodies constitute public-private partnerships between industry, a number of EU Member and Associated States, and the European Union. Their aim is to implement, by means of a budget from both the EU and participating Member States, a research agenda defined by the European research communities (industry and academic/research organisations) in their respective fields. The JTIs thereby seek to strengthen Europe's future growth, competitiveness and sustainable development. Their ambition and scope, the scale of the financial and technical resources that need to be

[5] www.artemis-ju.eu/publication/download/publication/1

mobilised, and the need to achieve effective coordination and synergy of resources and funding called for action at European level.

ARTEMIS and ENIAC are not giving sufficient attention to their European strategic aims, claims the interim evaluation of these instruments[6]. In 2009, however, an ISTAG Report specifically states that:

> *"ISTAG believes that the Artemis JTI, amongst other ETPs, within the federating concept of the Future Internet, can make essential contributions to the development and support of research objectives and the improvement of innovation capabilities in the area of the Internet of Things. This approach will benefit the many industrial sectors that depend on ICT innovation for their progress (automotive, aerospace, health, smart buildings, telecommunications, energy efficiency, security …) and which participate in the Artemis JTI. The technologies will also make significant contributions to a plethora of semi-autonomous "cyber-physical" systems with different local intelligence. ISTAG believes that keeping a competitive edge in design methodology for such networked systems is vital to the success of European industry."*

4.1.4. Joint Programming

Joint Programming is a new process combining a strategic framework, a bottom-up approach and high-level commitment from Member States. It builds on the experience gained from existing schemes coordinating national programmes. Suitable Joint Programming areas are identified by a High Level Group on Joint Programming ("*GPC*"- from the French "Groupe de Programmation Conjointe") comprising nominees from Member States and the EC, following a thorough consultation of stakeholders.

Based on the result of the GPC, the Council, upon a proposal by the Commission, recommends a limited number of areas in which to implement priority Joint Programming.

From there on, participation of Member States in each initiative—based on voluntary commitments that can lead to partnerships—comprises variable groups of countries. The overall aim of Joint Programming is to pool national research efforts in order to make better use of Europe's precious public R&D resources and to tackle common European challenges more effectively in key areas. These are issues such as climate change, food and energy security. They are subjects that are beyond the capacity of any individual country to resolve, and which would benefit from a co-ordinated approach to research.

Currently, there is no purely Future Internet-related Joint Programming activity. "City of the Future"[7] is probably the most relevant, followed by the "More Years, Better Lives - The Potential and Challenges of Demographic Change"[8].

---

[6] See p. 3 of footnote #5 above

[7] http://www.era.gv.at/events/13280.html

4.1.5. Future & Emerging Technologies (FET) Flagship Initiatives

Transnational collaboration also underpins the recently announced *FET Flagship Initiatives*[9]. These Flagship initiatives are centred around ICT future and emerging technologies. The preparatory work currently underway is developing research roadmaps for the flagships and a model for their implementation. These FET Flagships will be much larger than the FET Proactives already in place, and will align European research priorities at EU and national levels with very substantial research funding to address grand scientific challenges which will cut across different national science research programmes and European programmes.

4.1.6. EUREKA & Celtic-Plus Collaboration

EUREKA is an intergovernmental network which supports market-oriented R&D projects, and provides access to national public and private funding schemes[10]. A number of different types of project exist: there are the *EUREKA projects*, which are labelled by EUREKA; *cluster projects*, which are generated by a EUREKA cluster, and the *umbrella projects*, generated under an umbrella. The *clusters* are industrial initiatives that work in close collaboration with national funding authorities. The *umbrellas* are networks that focus on a particular technology or business sector.

Celtic-Plus is the EUREKA cluster in the domain of integrated telecommunications systems[11]. It is an industry-driven research initiative which defines and executes projects in the area of telecommunications, new media, future Internet, and applications & services. Celtic-Plus is financed through public and private funding streams.

4.2. Member State engagement at EU level

This section describes EU-funded projects of interest in the area of Future Internet. It also gives an indication of the level of EU engagement among Member States, by outlining the number of proposals submitted by each in FP7-ICT, as well as the amount of FP7 funding received by different Member States.

[8] http://www.jp-demographic.eu/documents/synthesis-paper

[9] http://cordis.europa.eu/fp7/ict/programme/fet/flagship/home_en.html

[10] http://www.eurekanetwork.org/

[11] http://www.celtic-initiative.org/

4.2.1. Future Networks projects under FP7

Around 90 projects have been launched since the beginning of the European Commission's Seventh Framework Programme (FP7), following the calls for proposals FP7-ICT-Call-1 and FP7-ICT-Call-4 and FP7-ICT-Call-5 under the "Network of the Future" Objective 1.1. The projects are grouped into a flexible set of clusters of common interest, to develop synergies and critical mass. Three clusters address the topics of *Future Internet Architectures & Network Management*, *Radio Access and Spectrum (RAS)*, and *Converged and Optical Networks (CaON)*[12] as seen in Figure 9. Appendix B also contains details of projects in this field.

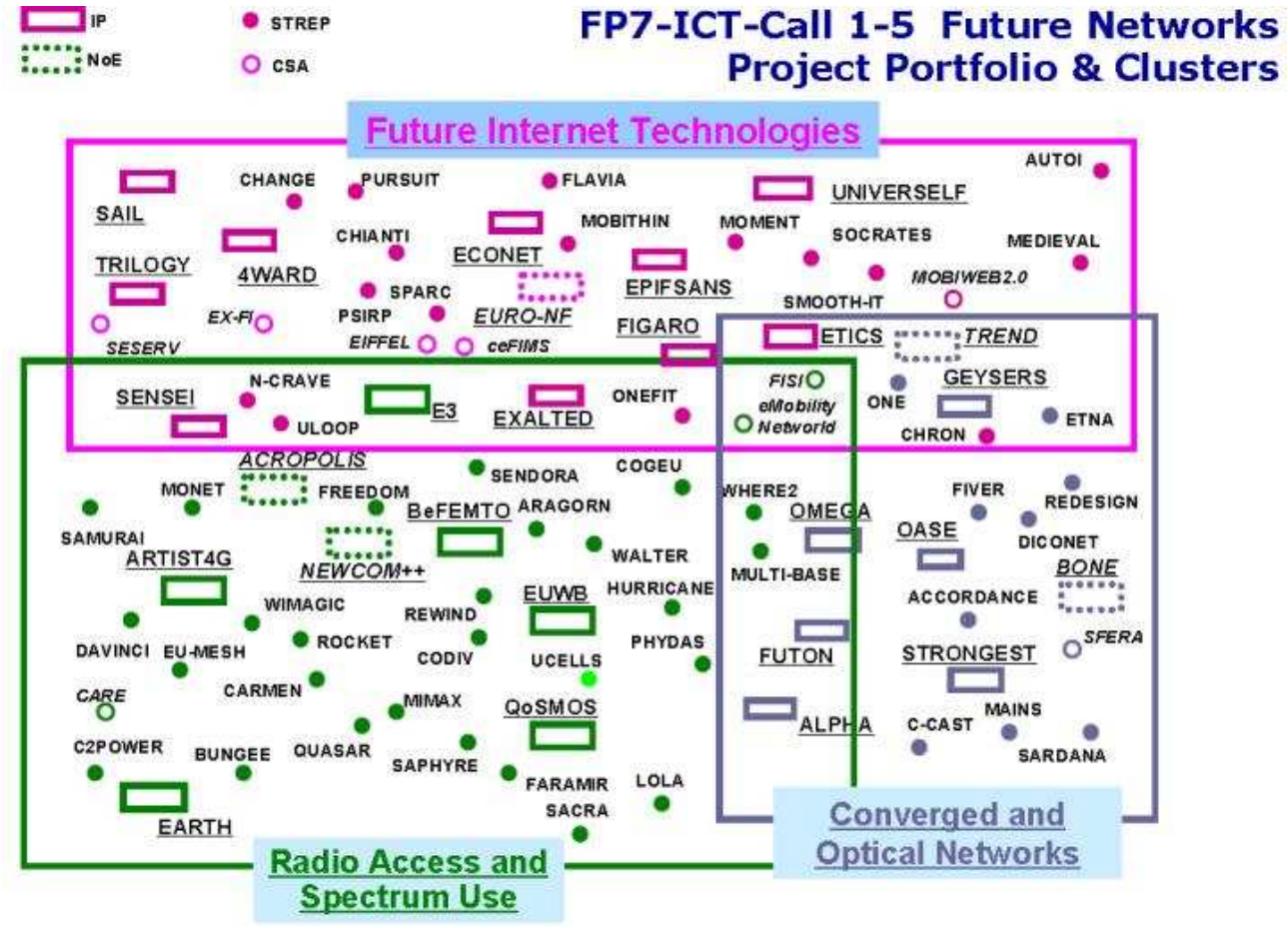

Figure 9 – Clusters of Future Networks projects *(CORDIS website)*

During the first quarter of 2008, 46 projects resulting from the FP7 ICT Call-1 have started work in these three areas, representing an investment in research of €200million of EU funding. In January 2009, a second set of 24 projects resulting from the FP7-ICT-Call-4 were launched in the RAS and CaON areas,

[12] Source: CORDIS, European Commission website, http://cordis.europa.eu/fp7/ict/future-networks/projects_en.html

representing more than €110million of EU investment. Between July and December 2010, a third set of 21 projects resulting from the FP7-ICT-Call-5 were launched, mainly in the Future Internet area, for an amount of €80million of EU funding.

4.2.2. FP7: Call proposals & funding levels

The following statistics give a broad indication of Member States' involvement with FP7-ICT Calls and FP7 funding. Table 2 shows the % of Member States participation in recent FP7-ICT Calls[13]:

Member State	% of proposals in FP7-ICT
Austria	3.45%
Belgium	3.84%
Bulgaria	0.78%
Cyprus	0.65%
Czech Republic	1.00%
Denmark	1.25%
Estonia	0.25%
Finland	2.60%
France	9.48%
Germany	16.60%
Greece	6.77%
Hungary	1.30%
Ireland	1.74%
Italy	13.48%
Latvia	0.16%
Lithuania	0.27%
Luxembourg	0.29%
Malta	0.12%
Netherlands	4.40%
Poland	2.02%
Portugal	2.07%
Romania	1.37%
Slovakia	0.36%

[13] Source: SPRERS FP7 project, Deliverable D1.2 Actions for better integration of new Member States at FP7-ICT

Slovenia	0.95%
Spain	9.63%
Sweden	3.25%
United Kingdom	11.93%

Table 2 - % proposals per Member State in FP7-ICT Calls

Given their populations, it is to be expected that larger Member States naturally feature in larger numbers of proposals. Similarly, longer enrolled EU Member States will be expected to be more prominent than newer, recently joined Member States (EU15 versus EU12).

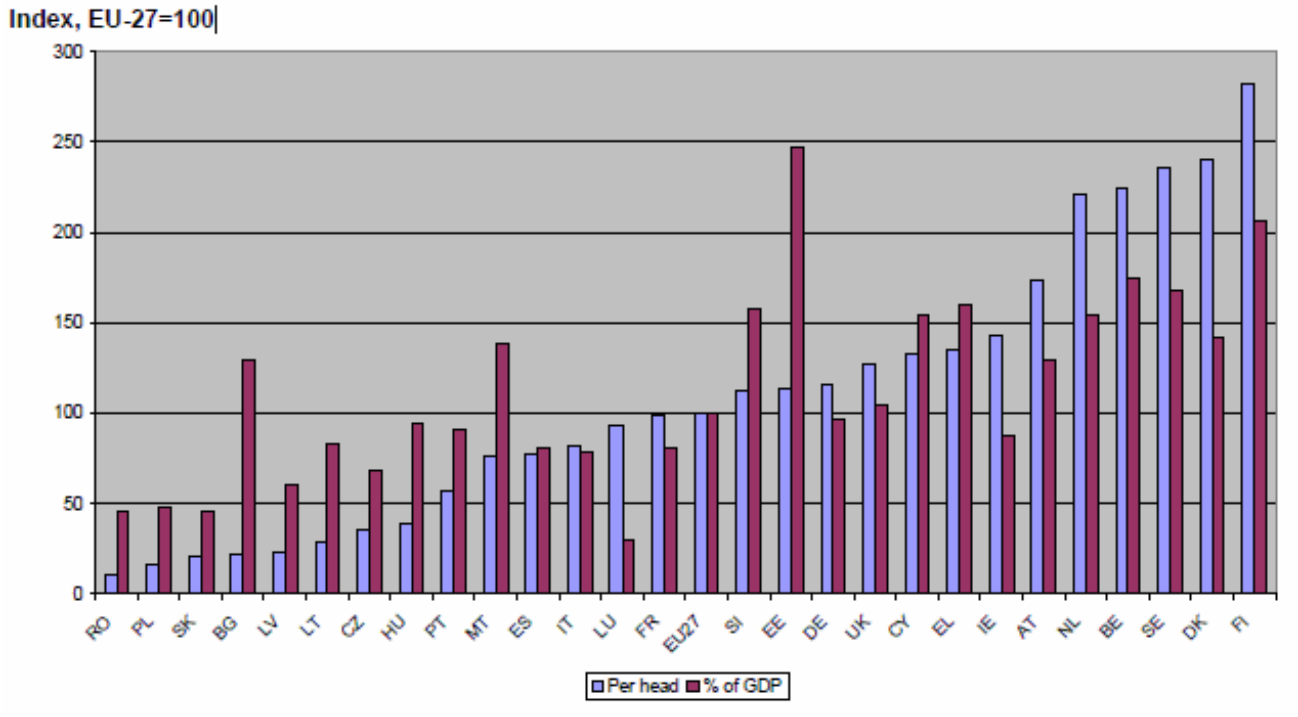

Figure 10 – EU contribution to retained projects

Figure 10 shows the average EU contribution to retained projects in the years 2007 – 2009, both per head of population and as a % of GDP[14]. The highest recipients per head were Finland, Denmark, Sweden, Belgium and the Netherlands.

[14] Source: Calculations by the Expert Group

5. Discussion

This potential synergies report will feed directly into the first ceFIMS interim roadmap. With this in mind, this section outlines a number of points which will help stimulate discussion ahead of the initial drafting of this roadmap.

5.1. Cooperation models and pillars for an ERA-NET+

Particular thematic discussion points include revisiting primary Internet elements like security, languages & mobility, generating green ICT energy, extending the semantic web & augmentation, developing specific Member State initiatives on a pan-European stage, and taking advantage of Europe's diversity to advance Standards. Member States may also find common ground in their approach to Future Internet development. Some favour a multidisciplinary style while others concentrate more on technology advances. Similarly, some Member States prefer a living labs approach as opposed to a testbed approach. These choices are not mutually exclusive and varying degrees of emphasis may provide opportunities for collaboration.

The recently started PPP projects also provide potential for cooperation between Member States and the EU. Though it is early in this new PPP process, each Member State is monitoring its progress, with some already trying to identify topics in the use case projects that might relate to their own areas of interest. An additional area for potential collaboration could be the use of Structural Funds to complement other streams of research funding. Member States may also find they have similar views on basic versus public-private research, and on whether research priorities or research roadmaps better suit their needs.

Barriers and challenges to developing a Future Internet in Europe are varied. They range from the multiplicity of research programmes to various legislative issues such as cross-border data-sharing agreements and Intellectual Property Rights. Improved dissemination of research results and achievements could also remove potential barriers to greater cooperation between Member States.

5.2. Media, testbeds & Living Labs, smart cities

In technological aspects and services of the Future Internet the media has an important and intensifying role to play. Therefore, the EU could emphasise its approach in Future Internet media, especially in interactive multimedia applications and cognitive media.

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 Framework Programme, there remains a lack of synergies between them. The EU could 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 actively interact 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, with over 200 Living Labs listed 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. 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.

“Smart cities” are still a fuzzy concept; they are, however, 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.

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. But the tight priorities of the Call and the industry structure of the countries narrows the possibility to have every country involved. Member States need similar initiatives next to the FI-PPP to boost national players onto the European field. It is also important to raise awareness of local policy-makers regarding the approach of this new EU instrument.

The Future Internet Forum (FIF) of Member and Associated States would be an appropriate organisation to foster the establishment of national Future Internet PPP programs. This would localise the Future Internet PPP approach. A pilot project in one of the Member States may help to launch this process.

5.4. SME involvement

SMEs are fast-growing, with high R&D intensity. The EU should 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.

Unfortunately, in new Member States the number of innovative SMEs is relatively low. Therefore support for them could be improved since many find it difficult to join EU- or nationally-funded Future Internet programmes or projects. 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.

National Technology Platforms can also help to involve SMEs in Future Internet activities in Europe.

5.5. Regional/national initiatives

Regional innovation partnerships could also boost cooperation between the Member States. A good example is the Danube Strategy, which aims at better coordination and alignment of policies and funding. A considerable amount of funding is already available to the region, especially through a host of EU programmes. For instance, €100billion alone has been allocated from the Cohesion policy (European Regional Development Fund, Cohesion Fund, and European Social Fund) between 2007 and 2013. Moreover, 41 Territorial Cooperation programmes cover the geographical area of the Danube Region. Working together towards commonly identified objectives is important. Using this available support to greater effect and showing how macro-regional cooperation can help tackle local problems are central principles of the Strategy. The Strategy has been prepared following the initiative of the Danube countries and it is now their responsibility to work on the implementation. A regional FI PPP based on the Danube Strategy would stimulate the research cooperation as an integrated approach.

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[15]) and Hungary (Future Internet National Technology Platform[16]).

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

5.6. EU competitive advantage

To ensure the leading position of the EU regarding Future Internet research, we should focus on the comparative advantage which the EU has: mobile communication and testbeds. We need more centralised top-down initiatives in these fields.

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 the EU should strengthen the operation KICs of the EIT and deepen the cooperation between the EIT ICT Labs and the Member States institutions.

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.

5.7. Financial support

Few Member States have a strong, ongoing financial basis to support a coherent ICT funding strategy behind thematic ICT R&D support initiatives. Neither can they realistically consider financing possible national FI-PPP programmes. Structural Funds, however, could provide a suitable financial source. The EU should encourage the Member States to re-examine Structural Funds and start national Future Internet initiatives. In this vein, infrastructures are essential to perform state-of-the-art research activities - Member States could perhaps use Structural Funds to build their own.

5.8. Fragmentation & experimentation

Research on the Future Internet is currently fragmented, due to the diversity of approaches, coming from several different communities which have traditionally evolved along separate lines; and which only very recently found a common denominator in the generic “Internet” connotation. There is agreement that the complexity of the phenomena underpinning current Internet developments—at technological, societal and economic levels, and their even more complex interrelations—cannot be understood without a genuine multidisciplinary approach, involving scientific disciplines and human sciences as well. We need a unifying theory that can be fulfilled by technological networks but which understands the networking needs of humans. This kind of multidisciplinary and holistic research cannot be based solely on theories:

[16] http://futureinternet.hu/

experimentation and, more in general, an empirical approach, are essential to the definition of this emerging science. And this experimentation of theories must be conducted in research environments which are as close as possible to the real world, in terms of scale and of user involvement.

Appendix A. Acronyms

CIP - Competitiveness and Innovation Framework Programme

CF - Cohesion Fund

EC – European Commission

EIT - European Institute of Innovation and Technology

ENoLL - European Network of Living Labs

EU – European Union

FIF – Future Internet Forum

FIRE - Future Internet Research and Experimentation

FP – Framework Programme

ICT – Information and Communication Technologies

IETF - Internet Engineering Task Force

JTI – Joint Technology Initiatives

KIC - Knowledge and Innovation Community

LL – Living Labs

MS – Member States

PPP – Public-Private Partnership

SME – Small and Medium Enterprises

Appendix B. FP7 Future Networks projects

Project Number	Project Acronym	Instrument	Project Title	Project Factsheet	Project Presentation
216041	4WARD	IP	Architecture and Design for the Future Internet	509KB	360KB
248654	ACCORDANCE	STREP	A converged copper-optical-radio OFDMA-based access network with high capacity and flexibility	653KB	391KB
212352	ACROPOLIS	STREP	Advanced coexistence technologies for radio optimisation in licensed and unlicensed spectrum	479KB	577KB
212352	ALPHA	IP	Architectures for fLexible Photonics Home and Access networks	265KB	2.574KB
216856	ARAGORN	STREP	Adaptive reconfigurable access and generic interfaces in radio networks	148KB	290KB
247223	ARTIST4G	IP	Advanced Radio Interface Technologies for 4G Systems	431KB	444KB
216404	AUTOI	STREP	Autonomic Internet	172KB	348KB
248523	BeFEMTO	IP	Broadband Evolved FEMTO Networks	1011KB	636KB
216863	BONE	NoE	Building the Future Optical Network in Europe	155KB	661KB
248267	BuNGee	STREP	Beyond Next Generation Mobile Broadband	610KB	300KB
248577	C2POWER	STREP	Cognitive radio and Cooperative strategies for POWER saving in multi-standard wireless devices	397KB	790KB
248272	CARE	CA	Coordinating the Antenna Research in Europe	336KB	1589KB
214994	CARMEN	STREP	CARrier grade MEsh Networks	230KB	1.281KB

216462	C-CAST	STREP	Context Casting	539KB	1.347KB
258542	ceFIMS	CSA	Coordination of the European Future Internet Forum of Member States	658KB	124KB
257422	CHANGE	STREP	A Network Architecture for Innovation	627KB	719KB
216714	CHIANTI	STREP	Challenged Internet Access Network Technology Infrastructure	160KB	809KB
258644	CHRON	STREP	Cognitive techniques find its way into the Optical Networks	1,3MB	5,4MB
215477	CODIV	STREP	Enhanced Wireless Communication Systems Employing Cooperative Diversity	133KB	233KB
248560	COGEU	STREP	COgnitive radio systems for efficient sharing of TV white spaces in EUropean context	499KB	520KB
216203	DaVinci	STREP	Design And Versatile Implementation of Non-binary wireless Communications based on Innovative LDPC Codes	154KB	316KB
216338	DICONET	STREP	Dynamic Impairment Constraint Networking for Transparent Mesh Optical Networks	515KB	1.341KB
216248	E3	IP	End-to-End Efficiency	635KB	1.304KB
247733	EARTH	IP	Energy Aware Radio and NeTwork TecHnologies	967KB	677KB
258454	ECONET	STREP	low Energy COnsumption NETworks	878KB	1,8MB
215549	EFIPSANS	IP	Exposing the Features in IP version Six protocols for designing/building Autonomic Networks and Services	1.002KB	237KB
216068	EIFFEL	CSA	Laying the foundation for Future Networked Society	164KB	97KB
214089	eMobility CA	CSA	Creating roadmaps for the European telecommunications sector	135KB	75KB

257516	eMobility NetWorld & Net!Works	CA	eMobility NetWorld	671KB	1.066KB
248567	ETICS	IP	Economics and Technologies for Inter-Carrier Services	366KB	546KB
215462	ETNA	STREP	Ethernet Transport Networks, Architectures of Networking	323KB	762KB
215320	EU-MESH	STREP	Enhanced, Ubiquitous, and Dependable Broadband Access using MESH Networks	323KB	762KB
216366	Euro-NF	NoE	Euro-NF, Anticipating the Network of the Future - From Theory to Design	122KB	488KB
215669	EUWB	IP	EUWB - Coexisting Short Range Radio by Advanced Ultra-Wideband Radio Technology	337KB	1.176KB
258512	EXALTED	IP	EXpAnding LTE for Devices	808KB	2,2MB
257262	EX-FI	CA	Expanding the European Future Internet Community	692KB	3.783KB
258378	FIGARO	STREP	Future Internet Gateway-based Architecture of Residential Networks	1.4MB	3.517KB
248351	FARAMIR	STREP	Flexible and spectrum-Aware Radio Access through Measurements and modelling In cognitive Radio systems	574KB	1527KB
257118	FISI	CSA	Future Integral SatCom Initiative	619KB	794KB
257263	FLAVIA	STREP	FLexible Architecture for Virtualizable wireless future Internet Access	765KB	402KB
249142	FIVER	STREP	Fully-Converged Quintuple-Play Integrated Optical-Wireless Access Architectures	1845KB	912KB
248891	FREEDOM	STREP	Femtocell-based netwoRk Enhancement by intErference managEment and coorDination of	831KB	479KB

			infOrmation for seaMless connectivity		
215533	FUTON	IP	Fibre optic networks for distributed, heterogeneous radio architectures and service provisioning	157KB	319KB
248657	GEYSERS	IP	Generalised architEcture for dYnamic infraStructure sERvices	453KB	727KB
216006	HURRICANE	STREP	Handovers for Ubiquitous and Optimal Broadband Connectivity among Cooperative Networking Environments	156KB	269KB
248993	LOLA	STREP	Achieving Low-Latency in Wireless Communications	388KB	308KB
247706	MAINS	STREP	Metro Architectures enablINg Sub-wavelengths	914KB	401KB
258053	MEDIEVAL	STREP	MultimEDia transport for mobIlE Video AppLications	964KB	1MB
213952	MIMAX	STREP	Advanced MIMO systems for maximum reliability and performance	312KB	240KB
216946	MobiThin	STREP	Intelligent distribution of demanding services and applications to mobile thin client devices	198KB	394KB
212430	MobiWeb2.0	CSA	Mobile Web 2.0	134KB	64KB
215225	MOMENT	STREP	Monitoring and Measurement in the Next generation Technologies	191KB	255KB
247176	MONET	STREP	Mechanisms for Optimization of hybrid ad-hoc networks and satellite NETworks	341KB	388KB
216541	Multi-Base	STREP	Multi-Base - Scalable Multi-tasking Baseband for Mobile Communications	196KB	232KB
215252	N-CRAVE	STREP	Network Coding for Robust Architectures in Volatile Environments	136KB	1.229KB
216715	NEWCOM++	NoE	Network of Excellence in Wireless COMmunications++ (NEWCOM++)	207KB	1.626KB

249025	OASE	IP	Optical Access Seamless Evolution	540KB	247KB
213311	Omega	IP	OMEGA	243KB	2.083KB
258300	ONE	STREP	Towards Automated Interactions between the Internet and the Carrier-Grade Management Ecosystems	532 KB	1,6 MB
257385	ONEFIT	STREP	Opportunistic networks and Cognitive Management Systems for Efficient Application Provision in the Future InterneT	577 KB	518KB
211887	PHYDYAS	STREP	PHYDYAS: physical layer for dynamic spectrum access and cognitive radio	406KB	633KB
216173	PSIRP	STREP	Publish-Subscribe Internet Routing Paradigm	141KB	128KB
257217	PURSUIT	STREP	Publish Subscribe Internet Technology		
248454	QOSMOS	IP	Quality of Service and MObility driven cognitive radio Systems	497KB	777KB
248303	QUASAR	STREP	Quantitative Assessment of Secondary Spectrum Access	615KB	375KB
217014	ReDeSign	STREP	Developing cable network architectures & technologies for the near & distant future	236KB	1.114KB
216751	REWIND	STREP	RElay based WIreless Network and standarD - REWIND	317KB	647KB
215282	ROCKET	STREP	Reconfigurable OFDMA-based Cooperative Networks Enabled by Agile Spectrum Use	364KB	1.227KB
249060	SACRA	STREP	Spectrum and energy efficiency through multi-band Cognitive Radio	334KB	204KB
257448	SAIL	IP	SAIL: Scalable & Adaptive Internet soLutions	822 KB	1.947KB
248268	SAMURAI	STREP	Spectrum Aggregation and Multi-User MIMO: Real-world Impact	557KB	339KB

248001	SAPHYRE	STREP	Sharing Physical Resources – Mechanisms and Implementations for Wireless Networks	678KB	652KB
217122	SARDANA	STREP	Scalable Advanced Ring-based passive Dense Access Network Architecture	268KB	3.144KB
216076	SENDORA	STREP	Sensor Network for Dynamic and Cognitive Radio Access	257KB	576KB
258138	SESERV	CSA	Socio-Economic SERVices for European research projects	1,2 MB	n/a
215923	SENSEI	IP	SENSEI - Integrating the Physical with the Digital World of the Network of the Future	576KB	243KB
216104	SFERA	CSA	Structural Funds for European Regional Research Advancement	181KB	334KB
215134	sISI	CSA	sISI - Support action to the Integral Satcom Initiative	919KB	283KB
216259	SmoothIt	STREP	Simple Economic Management Approaches of Overlay Traffic in Heterogeneous Internet Topologies	241KB	n/a
216284	SOCRATES	STREP	Self-Optimisation and Self-Configuration in Wireless Networks	136KB	n/a
258457	SPARC	STREP	Split architecture carrier class future networks	000KB	1.354KB
247674	STRONGEST	IP	Scalable Tunable and Resilient Optical Networks Guaranteeing Extremely-high Speed Transport	444KB	414KB
257740	TREND	NoE	Towards Real Energy-efficient Network Design	272KB	629KB
216372	Trilogy	IP	Trilogy: Re-Architecting the Internet	440KB	2.106KB
216785	UCELLS	STREP	Ultra-wide band real-time interference monitoring and CELLular management Strategies	254KB	1.169KB

257418	ULOOP	STREP	User-centric Wireless Local-Loop	617KB	777KB
257513	UniverSelf	IP	UniverSelf	1,9MB	252KB
216312	WALTER	STREP	WALTER: Specifying, testing and improving interoperability of broadband radio devices	370KB	1.142KB
217033	WHERE	STREP	WHERE: Wireless Hybrid Enhanced Mobile Radio Estimators	1.215KB	420KB
217033	WHERE2	STREP	Wireless Hybrid Enhanced Mobile Radio Estimators - Phase 2	978KB	320KB
215167	WiMAGIC	STREP	Worldwide Interoperability Microwave System for Next-Generation Wireless Communications	423KB	84KB

Appendix C. ceFIMS database of Future Internet Projects/Initiatives

1. **Austria**
— FIT-IT
— Robobraille
2. **Czech Republic**
— CESNET
3. **EU-level**
— PanLab
— GEYSERS
— SmartSantander
— OneFIT
— CrowdSense
— NOBEL
— 4WARD
— Zonerider
4. **France**
— SEANET
— THD Platform
5. **Finland**
— ICT Shok
— TIVIT Programmes
6. **Germany**
— G-Lab Deep
— G-Lab_Ener-G
— IKT2020
7. **Hungary**
— BudapestAR
— Creative Selector
— eBook Reader
— fullXS
— Grandparents-Grandchildren Competition of Informatics
— iGlue
— Integrated Programme to support FI research
— mindenki
— NonStopLive.com
— T-City Szolnok
— VirCA
— 3G Multimedia / Gaudio
8. **Ireland**
— FI Forum & IPv6 Taskforce
— GUILD
— NDLR
— StratAG
9. **Malta**
— DINOS
10. **Lithuania**
— RAIN
11. **Luxembourg**
— IPv6 Council
12. **The Netherlands**
— Internet Economy: Discussion Paper
— NDIX
— Surfconext
13. **Poland**
— Future Internet Engineering
— Ego: Virtual Identity
— eXtraSpec
— NOR-STA
— PLATON
— Semantic Monitoring of Cyberspace
14. **Portugal**
— Cloud Counselling for Youths
— Panorama Networks
15. **Romania**
— Risc-Expert
— ROLINEST
16. **Spain**
— es.INTERNET
— I-Beds
17. **Sweden**
— Ambient Sweden
18. **United Kingdom**
— Digital Economy Programme
— EnCoRe
— Europana Future Digital City
— HIPNET
— IU-ATC
— ITSS
— Network Security
— Oxford Internet Institute