Towards a Future Internet Public-Private Partnership:

Second Usage Areas Workshop

Brussels, 21st -22nd June 2010

Workshop Report

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Executive Summary

The Second Usage Areas Workshop, held in Brussels on 21st-22nd June 2010, brought together around 280 participants, including representatives from key industry sectors ('usage areas'), the ICT industry and the research community. The Workshop explored the role of and challenges for demand-side actors in the take-up of Future Internet-enabled applications and services as part of the constituency-building process for a Future Internet Public Private Partnership (FI-PPP).

The Workshop considered potential examples of usage areas of high societal and economic value (namely smart energy grids; smart cities, utilities and environment; transport, mobility and logistics; health; and content), as well as additional alternative ideas not yet captured in the usage areas discussions.

In order to ensure that the FI-PPP achieves an appropriate balance between technology push and application pull, participants were asked to structure their discussions around a series of five issues and open questions, as summarised below.

1. Use Cases and Scenarios for Large-Scale Experimentations

What use case and scenario in your area would you consider the most appropriate and representative one for large-scale experimentation with the Future Internet platform to be built starting from 2013?

The Workshop identified many and diverse examples of FI scenarios and use cases. Even within the five sector sessions various potential candidates were identified, while Session 6 suggested many others: eScience, eGovernment, finance, agri-food, tourism, etc. Furthermore, many linkages and interactions between usage areas are evident (e.g. environment and health).

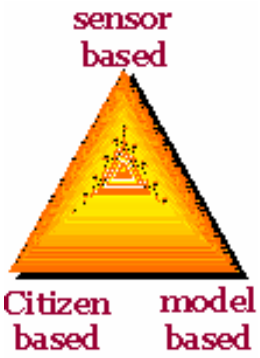
- **The scenarios and use cases need to be defined more precisely** in terms of who is involved and what applications and services are expected to be delivered. This will make it easier to differentiate between generic and specific functionalities and to elaborate common visions.
- To aid progress **comprehensive inventories of relevant FI assets** should be complied covering European programmes and beyond.

2. Innovative Internet Functionality and Technologies

What innovative Internet functionality and technologies would you consider important for your suggested use case and scenario?

Participants identified an extensive list of functionalities and technologies that could be addressed by the FI. At present, this is little more than a series of headings, however, and a common understanding between sectors is lacking. More detailed discussions are required to decide which functionalities and technologies are (or should be) **generic enablers** (i.e. addressed through the Core Platform) and which should be **specific enablers** (i.e. addressed through Platform instantiations).

- **The technology triangle** (shown below) can be a useful means of categorising the different functionalities needed for the FI as either 'sensor-based', 'citizen-based' or 'model based' (including the possibility of using extensive simulation for decision support).



- **'Real-time' is an important characteristic in many systems** but needs to be defined more precisely.
- Much work remains to be done in developing the **Internet of Things (**IoT) as a bridge between the 'real' and 'digital' worlds, in particular taking into account that intelligence lies not only in the network.
- **Strategies for standardisation** will have to be derived built on the practices of the respective usage area and technology communities.

3. Expected Core Technology Platform Functionalities

Which of the identified functionalities would you expect the Future Internet core technology platform to deliver to support your and other usage area scenarios?

Participants identified a similarly long list of functionalities that could/should be developed by the Core Technology Platform. These included (among others): data management, service/content handling, rating and billing, identity and access management, rights management, lifecycle management, security and privacy, reliability and resilience, policy-based network management, policy-based security interworking, and resilient virtualisation.

As noted above, **better definition and common understanding** of what is meant by these terms would help in the categorisation of the functionalities as generic versus specific enablers.

4. Experimentation Environments for New Services and Applications

What kind of experimentation environment would you consider necessary for broad large scale testing of the platform to be developed in your use area? What would be needed to experiment new services and applications cutting across use areas (services and application mash-up) and building a new services and application ecosystem around the prototype implementations of the platform?

There was a broad consensus that experimentation environments will be critical in realising new services and applications:

- **Experimentations should be user centric**, requiring a very clear definition of exactly who the user is for each usage area. The use cases should target sector actors as well as end-users, and so have a business focus as well as a user focus.
- The meaning of **'large-scale' test environment** needs to be discussed and defined for each usage area.

- The FI community has to **make trials attractive to the usage areas** by offering them a vision beyond the trial phase and a path by which they may migrate.
- Models should be developed for **federating existing small-scale pilots and trials** within broader pan-European test environments, while recognising the value and autonomy of existing schemes. Interoperability at European scale should be a key focus here.
- **Models/conventions for 'live' or 'online' experimentations** are needed that address the inherent risks in such activities.

5. Sectors' Role in the PPP

How do you see the potential role of your organisation in the FI-PPP, in the context of Usage areas taking a prominent role in the Initiative, to ensure an appropriate application driven approach?

Participants were highly supportive of the PPP approach and, as shown by the high attendance at the Workshop, a substantial community is mobilising around the FI-PPP initiative. Nevertheless, further efforts are needed to engage with usage area actors and involve them in the PPP.

- The FI-PPP could **link to other PPPs and European Technology Platforms as potential users** (e.g. Green Car, Energy Efficient Buildings, Factory of the Future, Smart Grids), which offer ready-formed and well-focused stakeholder communities in the areas concerned.
- Investigation is required into **how to incentivise users** to participate in the Future Internet. The means for engaging users should be a key consideration in new business models.
- While attempting to span the whole value chain, the use cases should **focus on workable configurations of stakeholders** without becoming too broad. Indeed the workability of the stakeholder relationships should be a key criterion in better defining the use cases (as indicated above). Associations can be a means of involving many stakeholders (e.g. SMEs, cities), although individual members must have a meaningful involvement.

Next Steps

The issues and findings from the Workshop should be of value to stakeholders as they prepare their involvement in the initiative. Regarding the future, specific points were emphasised in relation to:

- **Smart City Ecosystems:** Smart Cities can be considered as an ideal test environment since they represent a natural concentration of users, organisations and services. Networks of smart cities could be used to investigate synergies between usage areas in multiple contexts. The Smart City ecosystem perspective may also lead to a type of horizontal focus, exploiting synergies between co-located trial scenarios that cut across several usage areas (e.g. health, transport, environment, content).
- **Developing the Community:** While the Workshop represented a substantial achievement, further work is required to mobilise the community, especially usage area actors. This should be facilitated through **the development of the FI Stakeholder Groups** and further **usage area-specific workshops**, activities that are expected to be community-driven.

1. Introduction

The Second Usage Areas Workshop, held in Brussels on 21st-22nd June 2010, was organised by the Directorate-General Information Society & Media, European Commission in association with the EX-FI Support Action. The Workshop explored the role of and challenges for demand-side actors in the take-up of Future Internet-enabled applications and services as part of the constituency-building process for a Future Internet Public Private Partnership (FI-PPP).

Attendance at the two-day meeting was open to all interested parties within the FI community. Around 280 delegates attended, including representatives from key industry sectors ('usage areas'), the ICT industry and the research community. Usage area participants were drawn primarily from the following sectors: smart energy grids; smart cities; utilities & environment; transport, mobility & logistics; health; and content.

The workshop built on the conclusions of the 1st FI-PPP Usage Area Workshop, held in March 2010[1] and enabled a broader discussion on the needs of the usage areas and their requirements for the Future Internet. The workshop addressed the need to achieve an appropriate balance in the Future Internet Public-Private Partnership between provider "technology push" and user "application pull".

1.1 Workshop Objectives: The Crucial Role of Use Areas in the FI-PPP

During the Presidential conference "The European RTD Framework Programmes: from economic recovery to sustainability" in October 2009, a new Public- Private Partnership on the Future Internet (FI-PPP) was launched, following a Commission Communication calling for its set-up.

The Communication proposes to leverage the high European research investments and momentum on Future Internet technologies through comprehensive network and service platforms, which will enable the advent of internet-enabled innovative applications of high societal and economic relevance. A multi-sector approach will be adopted, that will cover important economic and societal usage sectors, including health, energy, transport and the environment. An EU budget of €300M has been earmarked over the period 2011-2013 to support this PPP, which will be implemented under the existing legal framework of the ICT Theme of the Seventh Framework Programme, with a first Call for Proposals foreseen to open in summer 2010[2].

The FI-PPP initiative is innovation-driven, with emphasis on the pragmatic implementation of new services and consequently a leading role is expected to be played by industrial ICT actors. While such a proactive move by the ICT industry is welcomed, it is still regarded as **extremely important to achieve a good balance between technology push and application pull**. This balance will ensure that the Future Internet developments under the FI-PPP will be driven by real user application needs. The ICT industry view must be complemented by the views of the sector usage areas, and their stakeholders, who are expected to have a significant presence in the FI-PPP initiative.

[1] http://ec.europa.eu/information_society/activities/foi/events/fippp3/fi-ppp-workshop-report-final.pdf

[2] For further information the FI-PPP initiative see the Europa website of the European Commission http://ec.europa.eu/information_society/activities/foi/index_en.htm, and the European Future Internet Portal http://initiative.future-internet.eu/.

Against this background, the Terms of Reference for the Second Usage Areas Workshop invited participants to address the following five issues and open questions during the Workshop:

1. What **use case and scenario** in your area would you consider the most appropriate and representative for large-scale experimentation with the Future Internet platform to be built starting from 2013?
2. What **innovative Internet functionality and technologies** would you consider important for your suggested use case and scenario (e.g. context awareness, sensor networks, advanced real time processing capabilities handling huge volume of data, ad hoc service composition and mash-up, managed broadband connectivity and services, embedded media support for interfaces easing the interpretation of processed contextual data, etc.)?
3. Which of the identified functionalities would you expect **the Future Internet Core Technology Platform to deliver** to support your and other usage area scenarios?
4. What kind of **experimentation environment** would you consider necessary for broad large-scale testing of the platform to be developed in your use area? What would be needed to experiment new services and applications cutting across use areas (services and application mash-up), and building a new services and application ecosystem around the prototype implementations of the platform?
5. How do you see **the potential role of your organisation in the FI-PPP**, in the context of usage areas taking a prominent role in the Initiative, to ensure an appropriate application-driven approach?

In addition to plenary presentations and discussions, there were two blocks of three parallel sessions of 4 hours, each addressing potential examples of usage areas of high societal and economic value (namely smart energy grids; smart cities, utilities and environment; transport, mobility and logistics; health; and content). The sixth session was reserved for additional alternative ideas, not yet captured in the previous usage areas discussions.

Presentation at the parallel sessions was open to all participants. Prospective speakers were required to submit a "position paper" with their registration application which provided a first set of answers to the five open questions listed above. These "Position papers" provided a starting point for the consensus-building discussions and are available on the event website[3].

The event was co-organised by the EX-FI Support Action, a project that aims to expand and strengthen the Future Internet community in Europe. In particular, the project is promoting dialogue with usage areas so as to build strong constituencies of interest beyond the ICT sector, and is furthering discussion of the architecture and the openness and interoperability of the FI-PPP results.

[3] http://initiative.future-internet.eu/events/2nd-usage-area-workshop.html

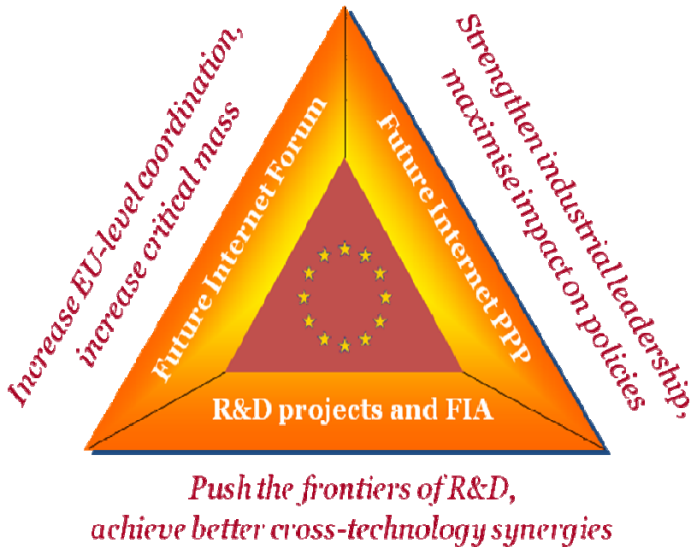
2. The Future Internet Public Private Partnership

2.1 Policy Context: The European Way to a Holistic Future Internet

The new European Commission has put the Digital Agenda at the core of Europe's future policy framework, known as EU-2020. An ambitious European Digital Agenda that takes concrete steps towards the completion of an online Single Market will be a key element in Europe's sustainable recovery and social development. The Future Internet will be at the core of the Digital Agenda, a key enabler for innovation that underpins EU policies at many levels.

The Communication[4] on a Public-Private Partnership for the Future Internet – adopted on 28th Oct 2009 - represented a very important development in this respect. In essence, the Communication proposes to leverage the high European research investments and momentum on Future Internet technologies through comprehensive network and service platforms that will form the basis for the next generation Internet-Enabled Service Economy.

Europe has developed a threefold response to Future Internet development. Firstly, the Future Internet Assembly (FIA) provides improved coordination for the research community by federating research projects and promoting dialogue on research strategy and roadmaps. Secondly, the Future Internet Forum (FIF) brings together national ICT directors to exchange experiences on national initiatives, bridge EU and local/regional level activities, and provide strategic inputs on European policies. More than 20 Member States are represented.



The Future Internet Public-Private Partnership is the third pillar. The Communication sets a framework for the creation of an FI-PPP in Europe, providing a holistic perspective on how to leverage the internet infrastructure as an open, secure and trusted platform. It aims at a multi-sectoral approach that could cover sectors as diverse as health, energy, mobility, etc. A PPP will

[4] "A Public-Private Partnership on the Future Internet", COM(2009) 479 final, http://ec.europa.eu/information_society/activities/foi/lead/fippp/index_en.htm

provide a strong focus for a smarter world: smarter energy, smarter health, smarter transport, smarter cities, and smarter living.

The FI-PPP is about leadership beyond R&D. Whereas research activities under the Framework Programme (ICT Programme Challenge 1) aim to make Europe a world leader in Future Internet technologies, the PPP aims to go beyond this by accelerating sustainable innovation to make the world 'smarter'. Only by addressing the whole Future Internet environment in a holistic way – from research and technology, to standards, intellectual property, regulations, governance, etc. – will innovations be articulated successfully within the market. In this sense, the PPP is not 'business as usual'. It focuses on integration, rather than technology development, and has a strong innovation orientation. Compared to the 'traditional' research programmes, activities will have a shorter time to market, be industry driven, and follow a more systematic, programme approach. Particular emphasis will be placed on attracting new players beyond ICT; on leveraging previous research results and existing assets; and on user-driven innovation.

Europe can build on its strengths and take a leading role in Future Internet services developments. However, with the proliferation of activity at European and national/regional levels, coordination of research, development and innovation activities is becoming ever more necessary. One of the key challenges in the FI-PPP is **to convince usage area actors to assume a responsible role**. Policy and regulatory actions are also needed to remove barriers for the take-up of FI technology.

2.2 FI-PPP Structure and Approach

The Commission has committed funding of €300M to this PPP over the period to 2013, with initial contributions under the ICT Work Programme for 2011-12. The PPP initiative was formally launched under the Spanish Presidency at a meeting in Valencia in April 2010, alongside Council Conclusions on Europe's Future Internet policy. The Programme will run initially for five years, from 2011 to 2015. The first call for proposals under the PPP will be launched in July 2010 and close in December 2010. Initial projects are expected to begin in early 2011.

The FI-PPP concept has seven key characteristics:

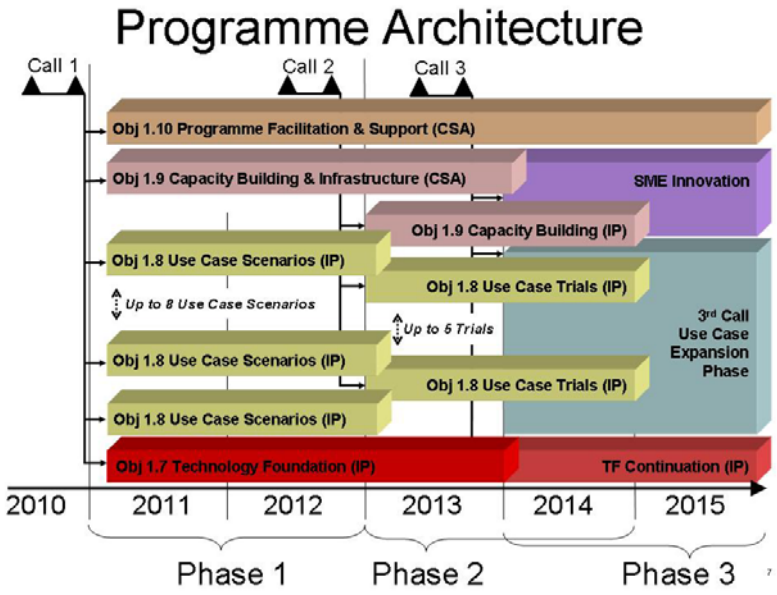
1. **Large-scale projects:** Integration will not happen in many small projects and hence projects need to be of sufficient scale to achieve effective integration.
2. **Complexity requires flexibility:** Hence the programme is structured around a three-phase approach (see further below).
3. **Systematic programme approach:** Projects have clearly identified roles within a bigger puzzle. Collaboration and synchronisation between projects will be key to success.
4. **Facilitate open sharing of project foreground:** IPR issues must not hinder collaboration.
5. **Integrate application sector competences with ICT competence** – in this way the PPP aims to enhance all sectors.
6. **Lead by example:** large-scale trials will be employed to prove the scalability and viability of the concepts developed.

7. **Synergy - build on existing results and resources:** Time and scale dictate using what is already available in Europe rather than starting from scratch.

The PPP will be an open platform. 'Openness' has several dimensions here:

- Open architectures: information on the architecture will be freely available and the architecture will be amenable to integration and evolution (possibly by third parties).
- Open standards on all levels: meaning that standards will be based on understandable, shared definitions, be accepted by the various actors, and agreed through a public and transparent process.
- Open markets: making possible several implementations, and open to various products and services.

In terms of the three phase approach, Phase 1 (from 2011-2013) will focus on developing the Technology Foundations ('Core Platform'), and developing up to eight Use Case Scenarios. Phase 2 (2013-2015) will focus on translating up to five of the use cases into Use Case Trials, as well as continuing the technology development. Phase 3 (2014-2016), to be funded under a later ICT Work Programme, will expand the use case activities and promote specific measures towards SMEs.



Capacity Building and Infrastructure Support will run throughout Phases 1 & 2. It aims to leverage existing public investments in advanced infrastructures to support the large-scale and diverse experiments, to demonstrate the versatility of the Core Platform, and to support testing across a multiplicity of heterogeneous trials and use cases. Among other activities, it will identify candidate infrastructures for large-scale experimentation, prepare the ground for phase 2 and 3 trials, and assemble a pan-European federation to support application mash-up.

Programme Facilitation and Support will be undertaken throughout the PPP. In broad terms, this will involve coordination across the programme, coherence of the technical work, ensuring outputs to standards, managing the operational issues, and thinking about the future. Specific aspects foreseen include: establishing adequate mechanisms for collaboration between projects; coordination of

standardisation and assurance of openness; managing and promoting SME-oriented measures; contributing to policy and regulatory discussions; and handling communications and public relations.

The number and types of project within each phase, and the associated budgets, are indicated in the ICT Work Programme for 2011-12[5].

There are clear dependencies between phases. So, for example, the use case specification will feed into the Technology Foundation for the definition of the generic enablers and development of generic functionalities. In turn, the generic platform functionalities will feed back into the use case scenarios where they will provide a basis for developing domain-specific platform instantiations.

Success will depend on strong partnerships. All necessary expertise must be brought together in efficient innovation teams. This includes: the ICT industry (operators, service developers and equipment manufacturers), research & innovation stakeholders, user industries and user communities (e.g. utilities, transport, health, environment), public sector stakeholders (especially in relation to the pilots), and end-user validation in particular during the platform expansion phase. These partnerships will evolve over time as the technology foundation for the Core Platform develops, and the use case scenarios and pilots become better defined.

2.3 The FI Core Platform

The Future Internet Core Platform (FI-CP) is a unified and open architectural approach that enables the creation, deployment and execution of applications by using hardware, software, network capabilities, etc. It is defined by a finite set of **generic enablers** that are common to all usage areas.

The generic or common enablers are discrete pieces of functionality that are re-usable and/or composable in multiple usage contexts. Examples include (among many others) functionalities such as: data management; service/content handling; rating and billing; identity and access management; rights management; and lifecycle management. The approach involves the tight coordination of efforts to detect generic enablers, develop them only once, identify and reuse existing components, and integrate them altogether.

Future Internet enabled applications are built on top of Future Internet Core Platform Instances (FI-CPI). These are built using all or some of the generic enablers provided by the FI-CP and following the same architectural principles. The Core Platform offers the flexibility to cater for the needs of all usage areas, using open interfaces to facilitate the assembly of enablers and guarantee interoperability. Application Providers can use **standard interfaces** provided by such a Platform Instance to deploy and monitor the applications.

Thus, the Future Internet Core Platform would not be built from scratch but should rely on **technology assets** that are made available and ready for integration (at least in beta version) at proper milestones. These technology assets will be tangible results coming from R&D projects. In terms of timeline, the assets will need to be either already available and delivered by relevant projects; or planned to be delivered by projects at an appropriate time during the FI-PPP.

[5] Available at http://cordis.europa.eu/fp7/wp-2011_en.html

Technology assets are currently being collected and analysed, to be used as input to work on the Baseline Architecture. This work is focusing initially on a **functional view**, defining what the FI-CP could provide in terms of functionality. The discussions with Usage Areas will help identify these functional requirements and define the overall programme.

2.4 Findings from the 1st Usage Area Workshop

Preparation of the Workshop was informed by the results of the 1st Usage Areas Workshop held in Brussels in March 2010, a summary of which was presented to participants.

This was a smaller scale event, involving around 40 invited participants, including representatives of smart grids; utilities & environment; transport, mobility & logistics; health; and content. The objectives were: i) to gauge the interest of the usage areas in the PPP; and ii) to identify key and common issues.

Discussion centred around five issues, which can be summarised as follows:

- **General appreciation of the Future Internet**: Participants gave a unanimous welcome to the PPP initiative. An open platform with broad stakeholder involvement was seen as having high potential for success. The internet is already a driver in many sectors and further integration was seen as inevitable. Significant areas of commonality were apparent and the proposed Core Platform approach was seen as well justified.

- **Balancing technology push vs application pull:** The PPP should have a strong application perspective at an early stage. Activities should be multi-faceted: development of enabling technologies, standards and integration can provide the technology push, while specific instantiations and middleware can provide the application pull. Furthermore, a value chain approach should be followed, ensuring projects are service driven and not network/system driven.

- **Application pilots:** Experimentations are key and in fact constitute the core added value of the PPP from a usage perspective. User experimentations are especially important in the last phase, as they demonstrate applicability of the concepts/technologies in a more local/regional context. Large-scale experimentations are preferred, as they justify the EU added value.

- **Cross-domain applications and services:** Mash-ups were seen as a core added value, although presenting key challenges, while Infrastructure-as-a-Service and Platform-as-a-Service were identified as important notions to interface with the environment and to realise mash-ups. Solutions should be technologically neutral in order to ensure their widest possible applicability.

- **Players' potential role & commitment:** The active participation of sector players is key, but such participation may also bring risks, for instance through disruptive changes to business models. Appropriate opportunities should be found to involve innovative SMEs, both through the Core Platform and sector-specific APIs.

2.5 Characteristics of Good Use Cases

Usage area activities driven by usage area actors will be crucial to the PPP achieving the appropriate balance between technology push and application pull. Experience to date, including discussion at the 1st Usage Area Workshop, shows that it can be difficult to get the usage area stakeholders to commit; for them the FI is just another means to support their work. As a result, the ICT industry often represents the application stakeholders by proxy. However, it is not obvious whether they gauge their views sufficiently with no misunderstandings, or misrepresentations or particular biases of their needs. Greater convergence is needed to avoid ICT and application experts 'getting their wires crossed'.

The use cases and trials foreseen under the PPP should be application scenarios with high societal and economic impact. The PPP Call text will not be prescriptive here and it will be up to the community to make proposals on suitable use cases. These could be vertical application scenarios, integrating advanced internet capabilities to achieve enhanced efficiency, sustainability, performance, etc. They should leapfrog existing internet technologies in areas such as: context awareness and sensor networks; advanced real time information processing; handling huge volumes of data; ad-hoc service composition and mash ups; managed broadband connectivity and services; and embedded media support. Horizontal scenarios, deploying different but related applications within the same ecosystem, could also be considered. In either case, the use cases will need to identify generic versus specific enablers, in collaboration with the Technology Foundation.

What makes a good use case? Given the objectives (and constraints) of the PPP, a good use case is likely to be characterised by the following:

1. **Demonstrable innovation** on the application side.
2. **Realism** in terms of large-scale trials to be carried out in a 3-5 year timescale.
3. Need for **advanced internet functionality** beyond the existing internet and that is suitable for validating the PPP Core Platform concept.
4. **Synergies with other use areas** proving value and potential of the Core Platform, e.g. sharing of data from sensors; services and application mash-up; common devices and infrastructures.
5. Possibility for **provisioning and upgrading of experimentation infrastructures** for Phases 2 & 3.
6. **Relevance to EU policies**, e.g. EU Digital Agenda, through high social and economic impact.

Identifying groups of applications, use cases and trial scenarios that fulfil these characteristics and getting the use case actors to assume a driving role is likely to prove extremely challenging. A 'matchmaking' between technology push and application pull will be required. Individual application requirements will need to be captured and then mapped to internet functionalities. Those functionalities/enablers that are generic and can serve multiple applications need to be included in the Core Platform. Concrete synergies between use cases also need to be identified.

These challenges informed the questions posed to delegates in the Terms of Reference (see section 1.1) and framed the workshop discussions.

3.0 Stakeholder Perspectives on Future Internet

3.1 Industry Views

3.1.1 European Future Internet Initiative (EFII)

David Kennedy of Eurescom GmbH outlined the work of the European Future Internet Initiative (EFII), an industry grouping that has been developing proposals for a comprehensive approach towards the core content and implementation of the PPP. These were outlined in a recent position paper[6].

EFII believes the PPP represents an important opportunity for Europe to demonstrate the viability of advanced services and enable new markets, and to implement an advanced Future Internet. We should set standards on the way so that the results can be sustainable and are worth investing in. While having long term ambitions, there should be incremental results that can be exploited and brought to market after every phase.

EFII has been active for around 18 months during which time it has contributed extensively to the PPP discussions. Its main focus now is in creating a community with the application domains through running workshops, promoting dialogue and publishing position papers. Several documents relevant to the PPP are being made available to stakeholders through its website[7], including a non-disclosure agreement[8], a description of architecture principles, facilitation and support ideas, and legal documents on issues such as project interworking. The current development of the initiative and community is supported by the EX-FI Support Action.

3.1.2 Future Internet Research Alliance (FIRA)

Thomas Michael Bohnert, of SAP, described the aims of the Future Internet Research Alliance (FIRA).

FIRA believes that guiding the evolution of the Future Internet in the present multi-stakeholder environment represents a considerable challenge, requiring profound understanding of business models and their technological enablers. FIRA will focus its efforts to become the European reference point for the Future Internet related technology innovations, and provide the overarching guidance that enables the many activities (e.g. research) to ultimately converge towards an innovation-enabling Future Internet. FIRA will be instrumental in helping to make sense out of and impact with research on FI by providing a programmatic view on available technology for integration and missing pieces for R&D actions.

To meet these objectives FIRA has chosen to adopt the following approach to its organisation and processes:

- An open group of technical experts in their respective fields who to the best of their knowledge contribute to define a sound technical agenda for FIRA that focuses on the cross-sector innovation-enabling capabilities of the FI.

[6] http://initiative.future-internet.eu/publications.html
[7] http://initiative.future-internet.eu
[8] http://initiative.future-internet.eu/common-nda.html

- On a technical level, the FIRA is developing a comprehensive set of FI "Principles" that provide a framework for system and application design to support the development of new FI applications by technology and business mash-ups, and will actively evangelise them.

- FIRA considers the inclusion of end-users in the various sectors as key for its success. To provide a strong basis for interaction with end-users, FIRA is actively promoting the establishment of pan-European Living Labs where technology can be validated with end-users in a controlled environment.

FIRA will leverage the members' participation in the various FP7 coordination activities to actively contribute to the definition of FI principles and influence future FP7/8 projects, as well as spin-off joint proposal activities to implement the FIRA vision.

3.2 Research Centres' Challenges for Usage Areas

Dr Guillermo Cisneros of UPM presented[9] views on the Future Internet, on behalf of the 'G23' group of European research centres.

While there is no universally accepted definition of the Future Internet, it is clear the FI will not be just a network but a socio-technical system. Comprising internet-accessible data sources and information repositories and services, this system will be coupled to the physical environment and human behaviour, supporting smart applications of societal importance. The Future Internet will become a *critical infrastructure* for information exchange for the conduct of business and social interactions.

Future FI applications will have a number of characteristics. They will be *smart* – intelligent and flexible so as to make choices based on a wide range of information and adapt to the user's needs. They will be *large-scale* – heterogeneous systems spanning organisational and administrative boundaries and bridging the physical and digital worlds. And they will be *integrative* – bringing together available and emerging technologies never before combined in a coherent fashion. Furthermore, applications will be shaped by other factors within the evolving internet environment. Governance objectives have changed, with competition as well as co-operation now a key feature of the internet space. New services models are emerging and societal and legal aspects are increasingly important for businesses, governments and citizens. Trust, in particular, is now a major concern for all users.

Although not primarily a research activity, the Core Platform has to address four key research-related challenges:[10]

1. **Emergent systems engineering and compliance**: How to design Future Internet systems to meet requirements, given that they will be created and evolve dynamically 'on demand' with no overall designer?
2. **Operational risk management**: How to ensure in real-time that systems with no overall controller will operate in a safe and acceptable manner, including interactions with the physical world, considering both autonomic and semi-autonomic adaptation processes?

[9] Presentation prepared by Colin Upstill IT Innovation Centre
[10] See Position Paper at http://eprints.ecs.soton.ac.uk/21086/

3. **Turning information into value**: How to make information accessible to applications that convert that information into value, and how to preserve this value over long timescales?
4. **Socio-economic and user acceptance**: What platform capabilities are needed to ensure that users and society will accept the Future Internet and use it beneficially?

The FI-PPP will be a disruptive technology programme with several competing drivers: technical vs socio-economic; horizontal vs vertical; research vs development; exploitation vs efficiency; research focus vs durability. It must balance innovative research with robust outputs for realistic open trials and the potential for commercial exploitation. This requires that it builds on previous investments from national and EU programmes in terms of generic enablers, infrastructure and platform capabilities. The G23 group is compiling a catalogue of existing pilots in the Member States across a broad range of application areas. These could provide flexible platforms for cost-effective testbeds and enable practical deployment of 'smart' applications.

3.3 EIT ICT Labs

Martti Mäntylä introduced the activities of the new EIT ICT Labs initiative. This is one of the three Knowledge and Innovation Communities (KICs) being set up by the European Institute of Innovation & Technology (EIT). The KICs will be formally launched in October 2010 and will run for seven years.

EIT ICT Labs' mission is to turn Europe into the global leader in ICT Innovation. It aims at the radical transformation of Europe towards a knowledge-based society, turning ICT innovation into quality of life. The project is a partnership between five world-class innovation centres in Berlin, Eindhoven, Helsinki, Paris and Stockholm, together with associate clusters in Budapest, London and Trento. Each node comprises at least one strong research institute, one major university, one European-based multinational company, an active regional SME network, and full national and regional support.

The partners will work across the 'Knowledge Triangle' of education-research-innovation, promoting the mobility of people across countries, disciplines and organisations, encouraging businesses and entrepreneurship, and improving the quality of life for the citizens of Europe and beyond. Activities will include: EIT graduate and master schools; EIT-branded 'camps' for developing code, designs and business ideas; a university-industry cross-over programme; a business development lab; common testbeds and joint experiments; and an EIT 'innovation radar'.

The EIT ICT Lab is open to collaboration with the FI-PPP, which are both innovation-oriented initiatives.

3.4 ETSI - The Role of Standardisation in the FI-PPP

Ultan Mulligan of the European Telecommunications Standards Institute (ETSI) outlined the organisation's potential contribution to the PPP.

ETSI is one of the three European standardisation bodies, responsible for globally-applicable standards in all areas of information and communication technologies. With over 700 members in 62 countries, it has a track record of worldwide industrial successes (e.g. fixed, mobile, broadcast)

enabled also by an efficient IPR policy (FRAND[11]). ETSI is part of a global network of partnerships and alliances (US, China, Japan, Korea, Latin America) and has a major focus on interoperability. It is open to inputs from the research community in setting standards and has taken steps to reduce barriers to access and participation for universities, research bodies and SMEs.

The FI-PPP Communication notes that: "An essential characteristic of such a PPP should be to develop open, standardised, cross-sector service platforms". Standardisation considerations here are at two levels:

- Targeted contributions to chosen standards bodies, led by industry
- Specifications required for FI-PPP implementation: interfaces, APIs between layers, to application domains, etc.

The ETSI standardisation system is a key enabler for the success of the Future Internet PPP. All industries foreseen as partners in the use cases (eHealth, M2M, content, smart grids, ITS[12], etc.) are currently active in ETSI standardisation processes. ETSI can help bring these communities to the FI-PPP. Secondly, an ETSI Industry Specification Group offers an open development route for application communities based on an open process and existing structure. Thirdly, ETSI's experience in Partnership Projects could be used to support collaboration and co-operation among several standards groups.

[11] Fair, reasonable and non-discriminatory access to intellectual property
[12] Intelligent Transport Systems

4.0 Parallel Sessions for Individual Usage Areas

4.1 Session 1: Smart Cities, Utilities & Environment

Session Chair: Max Lemke
Session Co-Chair: Hugo De Groof (DG ENV)
Session Rapporteur: Andre Bottaro, Orange Labs

Scope and Objectives

The objective of this session was to work on the expectations of invited actors on the topics "Smart Cities" and "Utilities & Environment".

The session aimed at describing the expectations of actors in projects and trials lead by ICT players with other partners in that field. Like all of the parallel sessions, it was organised around the five questions set out in the Terms of Reference. Fifteen position papers were selected and the authors of these papers were invited to present them in the first part of the session.

The second part of the session took the form of an open discussion. Every attendee could take part to the discussion and share deeper thoughts on the subject.

Key Issues

Numerous use cases were identified within the Smart Cities, Utilities & Environment domain. These could be categorised as follows:

1. 'Pure Environment' use cases: Air quality, noise, inland water, flood, forest fires, marine ecosystem, agricultural elements, and biodiversity.

2. 'Pure Utilities': Smart metering (electricity, water, gas), city automation (public lighting, waste management, …).

3. 'Broader Smart City' use cases: health, transport, tourism, e-Government, e-Education, m-Commerce, ...

Numerous cross-cutting use cases were identified. Hugo De Groof showed that several environmental elements are linked with public health: air quality, noise, inland water quality, and that some others are related to safety: floods, forest fires. Mirko Presser (Alexandra University) emphasized major cultural events (e.g. involving more than 20,000 people) as a cross-cutting use case related to health, emergency, environment, transport, and utilities.

Presentations showed that most of the use cases require structural functionalities related to some salient challenges:

- Sensor networks. Scalability and interoperability were mentioned as challenges. (Sven Schade, EC – JRC; Cornel Pampu, Huaweï Technologies). This user contributed content, together with classical sensor measurements, such as satellites images and temperature

series, and scientific simulations, such as flood simulations, builds the basis of environmental information.

- Information system able to treat data and respond on a near-real time basis. Decreasing response time of the overall system is a technical challenge (Nenad Stojanovic, FZI Karlsruhe).
- An open and trusted platform to aggregate data and compose services from several networks and to take relevant measures (alerting). Arne Berre (SINTEF) mentioned the use of standards (ISO, OGC, OMG, W3C, OASIS) and open languages (ontologies) to enable a truly open integration.
- Databases with the challenge of huge volume of data to be treated.
- Geographical Information Systems based on dynamic maps showing past, present and future measurements.
- User-content generation. Some actors mentioned that relevant data must come from the users themselves, Sjors Provoost (Rotterdam Police) called that "community sensors".
- Simple and multimodal user interfaces.

Certain projects can serve as relevant references on the topic:

- Smart Santander (Mirko Presser, Alexandra Institute) addressing many use cases with one common architecture: Themes: transport, green, energy, culture, well-being/health/safety, knowledge, public spaces, e-governance, …
- SensorCity, Assen, The Netherlands, big enough to be representative, small enough to control (John Van Pol, Incas).
- ENVISION project (Arne Berre, SINTEF).
- Living Labs (e.g., OULLabs as Mika Rantakokko mentions, Valladolid and Palencia as César Valsameda Tranque describes them).

Key issues according to the presenters:

- Get all the players involved in the projects and trials, especially end-users: public authorities, citizens, utilities, agencies.
- Make technology and use cases acceptable to the user. Trials may re-use environments like the Living Labs (e.g., OULLabs, Valladolid and Palencia) to put quickly the user at the centre of the project.
- Interconnect existing systems and technologies to make real progress in the 3-5 years.
- Make the same experiments in various cities to draw fundamental conclusions (Fabrice Forest).

Discussion

1) **Use Cases and Scenarios for Large-Scale Experimentations**
   As the presentations showed, the Smart City represents a wide set of potential use cases. Environment is one set, Utilities is a second one, while health, transport and other topics also take place in the Smart City. Surveillance within the Smart City is another candidate,

based on networks of indoor and outdoor sensors and using functionalities from mobile Internet, and IoT. However, the city represents only one potential 'ecosystem' for cross-sector use cases and pilots. Other **ecosystem settings (i.e. amenable to scenarios that cut across usage areas)** include river basins, regions, and marine/coastal areas, etc.

The session focused on environment as a first set of general use cases (see box).

Environment as a Use Case

The Digital Agenda for Europe, as one flagship initiative of Europe 2020, directly addresses the improvement of quality of life, for example through a cleaner environment. Systems for monitoring, mapping and managing our surroundings are requested. Among others, these include interoperable eEnvironment services, which act across borders and scale from regional to European level and beyond. Innovative solutions, such as advanced sensor networks, have been identified as means to fill gaps in the required data. eEnvironment services within the Future Internet could be defined and deployed into this context.

In the workshop, the strong correlation between the environment and the city was emphasized. Sensors in streets and public spaces could be used to gather environmental data; they could also survey the surroundings, providing reassurance to citizens in sensitive locations such as airports.

Climate change demands major reductions in emissions which can only be achieved through changes in individuals' behaviour. In the UK, for instance, smart meters are being introduced: these provide information but the consumers do not know what to do with it. Utilities need to make clear what people can get out of these data and how it helps utilities manage the system. Thus, this emphasises that the use cases should be articulated through the experience the users should have. Communication to users is important, including about mitigation actions. Use cases have to be thought through end-to-end.

Another aspect concerns the relationship between environment and health. At certain times of the year people could be warned about high levels of air pollution. The price level of the road usage could even be adjusted in line with the observed pollution levels. Or the system could divert traffic onto other routes that are less congested and/or polluted.

A further scenario relates to water management by utilities: systems to monitor and plan demand for water; monitor and report pollution levels; detect and manage leaks, etc. This is becoming a high priority today, with a major impact on the environment.

2) Innovative Internet Functionality and Technologies

- Technology triangle: Sensor-based / citizen-based / model-based (simulations). System strength has the strength of the weakest link.
- Models are available and European obligations boost the market. At an advanced stage: flood risk management.
- Access of the models as a service. Capabilities given to experts, actors improving data, …

- Adapt protocols to the needs of connected things (in the city). E.g., Low power networks (a slow Internet!). The bad example of the batteries of the cell phone: lasting no longer. Meters, traffic light controllers – anything that needs to last long durations without changing the batteries. Broadband connectivity with high data rate is not sufficient.
- One idea was an effort similar to Seti@Home but with sensors. A common language may allow the interconnection of sensors to the same network. An air pollution map covering the world thanks to user sensors and agencies' systems.
- A relation to content: the users are not required to send all their content to a central place but send only what they want at the time they think it appropriate.
- Feasibility on 3-5 years: migrating some monolithic solutions to modular open ones.

3) Expected Core Technology Platform Functionalities

Relevant points are covered above.

4) Experimentation Environments for New Services and Applications

- Assen, The Netherlands and Santander. Emphasis on the openness to various applications. Can not focus on a restrained set of applications in order to let new apps emerge.
- An environment with various actors involved for application pull.
- Adapted to the targeted use cases. For water management (if this is the use case), river basin can be the geographic target.
- Use cases that involves existing sensors that only need interconnection. Interconnection may involve many players. => Synergies with many players on one only use case or the other way around? Mash-up between applications versus mash-up between actors?
- An environment with multiple cities. For escalating effects.
- Tourism: one event to test a system. A concrete use case? Is it worthwhile? Is it already addressed? 20,000+ people involved in music festivals, one example. Take the lessons from concrete platforms. A concrete critical mass. Risky to bet on one event. Getting momentum rather on several places with long experiment duration.
- The Police case: the model is given in the slides. ICT can bring solutions right now. The created environment can be re-used for other use cases (fire, ...). Another issue: how to mix classified and non-classified information? => cases may be addressed in phase 3 with systems developed in previous phases.

5) Sector's Role in the PPP

- Models are offered by distinct actors. Agencies use their favourite ones. Preferably have several available. Integration of multiple providers is a necessity. Plus, we have to think how to make proper advice to users (inc from the legal point of view). Build confidence on a restrained set?

- Social networks are successful. How do you create business models involving users? One key issue, make the users adopt and contribute to the system. Focus on already visible best practices.
- How to involve the citizens? Example: traffic alerts contributed directly by users without obligation. Creating motivating apps? Fun aspect beside financial aspects. Contributions for fun. The benefit can be news from the system back to the users. A message confirming that the info is relevant. It is necessary to send a response to the user.
- Information is not only for citizens but should target executive management. Better information systems can provide them with operational data to facilitate day-to-day management activities and reduce risk: e.g. optimizing land use, resource management.
- Living Labs, an approach to have the user at the centre of the project. Example on Transport topic: tracking of commuters. Difficulties to give information back, influence users. Model the behaviours or influence them? Conflict between collective and individual interests. How to motivate people to change their behaviours? Feedback to the users to realise the benefits. Explain to the user what measure is obtained and what result is given back.

Conclusions and Next Steps

The session led to a broad discussion on the use cases. Despite the variety of use cases, presentations and discussions well described at high level the technical architecture needed. Part of the solutions already exist today, the interconnection and the integration of existing systems are key for the innovation in 3-5 years. Above all, this integration has to be pulled by the use cases and the user needs. Existing experimental environments may be re-used in order to accelerate projects and to quickly put the user at the centre of the scene. One key success criterion is to encourage all relevant end-user groups to be represented in projects.

4.2 Session 2: Transport, Mobility & Logistics

Chair: Miguel Montanero-Navajo, INFSO F4
Co-chair: Helen Köpman, INFSO G4
Rapporteur: Thierry Nagellen, FT/Orange

Scope and Objectives

The session was organised with the presentations of the different contributions to share ideas of innovative scenario and technical constraints to aim PPP Future Internet objectives.

Five raised questions have been proposed to structure all presentations. Within the 18 presentations, three were from transport sector actors, six from transport-related ICT companies, eight from R&D centres and one from an SME association. A productive 1½ hour discussion ensued, involving around 50 attendees as summarised below.

Discussion

- **Use Cases and Scenarios for Large-Scale Experimentations**

Three different potential use cases emerged from the presentations: Logistics; Traffic Management and Cooperative Systems; and Personal Mobility.

Many contributors emphasized that previous FP6 projects or running FP7 projects related to ICT for Transport could provide relevant technical material on which to base scenarios. A complete state-of-the-art of existing results has to be done by actors who are interested in proposals to propose a consistent use of existing results.

No new technology was proposed; rather the use of existing technologies and how they are to be integrated in different projects is certainly not one of the major issues.

The Transport sector is organised in a B2B2C model and some specific intra-industry developments (B2B part of the ecosystem) are required to propose end-users services. But the projects have to integrate both sides because for Phase 2, pilots will involve end-users.

In view of the differences, it would seem appropriate to maintain three distinct use cases, rather than to merge them, unless common functionalities and/or common stakeholders could be identified.

- **Innovative Internet Functionality and Technologies**

A number of innovative internet functionalities were identified (interest expressed in three presentations at least), namely: Internet of Things, data management, context awareness, real-time processing, identity management…

Associated with scalability and data integrity, the real-time dimension is crucial for new services related to Intelligent Transport System and Cooperative Services. It appears that existing results do not address jointly these constraints.

Regarding the Internet of Things, the transport sector has a main concern about network interfaces required for V2V and V2I technologies, covering both IP and non-IP addressed sensors/actuators.

This usage area uses also smart devices and lots of different on-board devices are developed and deployed. They are becoming ever smarter and any architecture has to take into account that the intelligence in not only in the network.

Related to standardisation, it was noted that important standards already exist in the area, although few presentations mentioned them.

- **Expected Core Technology Platform Functionalities**

Some innovative functionalities could be integrated in the Core Platform as real-time data management, data integrity, trust management, massive personalisation. Regarding the Internet of Things general architecture, some enablers have to be divided into two parts: context awareness and sensor networks. The common functionalities with the other usage areas, part of the Core Platform enablers, need to be identified.

The use case scenarios, defined by the different usage areas, will be helpful to define the functional border between the Core Platform and the specific enablers per domain.

Potential synergies:

Based on the presentations, transport and energy are connected for electric vehicle service management. Some other common functionalities of Internet of Things should define links with Utilities and Environment area. If Social Networks is another relevant usage area, some links should be established, especially to instantiate community of drivers or passengers.

- **Experimentation Environments for New Services and Applications**

The definition of large-scale pilots is an open question. Typically the experimentation environment requires either a large geographical area or several geographically distinct areas. It seems that "connected cities" to define a whole system to go from point A to B is not relevant to emphasize the openness of the system.

The meanings in relation to the Transport sector (or any other) are not readily apparent. What is “a large number of users” (100, 1 000) and “a large number of devices” (the pilot have to implement the devices inside vehicles!). But the large-scale pilots have also to involve all relevant stakeholders.

Cities are essential for testbeds as the availability of public information and innovative networks. They are the key elements to be able to implement real-time services. Thus, it seems relevant to define better the criteria for "real experimentation".

It was proposed to study later how some cross-usage area experimental environments could be established.

- **Sector’s Role in the PPP**

A list of stakeholders was established, describing the complexity of the Transport ecosystem but it is difficult to imagine now how all of them should be involved in projects and pilots:

- Automakers and automotive equipments makers
- Transport operator (HK: road (urban, inter-urban), rail, air, sea and freight)
- Local authorities
- Road infrastructure provider
- Mobile network provider
- Device manufacturer
- Logistics/fleet management company
- Navigation system provider
- Users association

Conclusions and Next Steps

In summary, the conclusions of the workshop were:

6) Involvement of more Transport sector actors is required to be able to clearly define the technical border with the Core Platform: what are generic enablers and specific enablers?

7) Improve the definition and criteria for large-scale pilots.

8) A better scenario definition will enable common visions to be elaborated between relevant areas.

9) It is especially important to identify results that have been industrialised or can be reused to take benefit of previous European research.

4.3 Session 3: Content

Session Chair: Wout Van Wijk, INSFO F5
Session Co-Chair: Stefano Bertolo, INFSO E2
Session Rapporteur: Henri Fourdeux, Technicolor

Scope and Objectives

The session was an opportunity for the participants to present their position paper relevant to Content Usage Area in the framework of FI-PPP.

At the beginning of the session the co-chair reminded participants of the five questions to be addressed by presentations, as set out in the TOR.

Key Issues

A large part of the presentations dealt with technologies applicable to content. All the areas relevant to more specific usage were more or less covered: AV entertainment, games, social networks, education, news.

A very small representation of content owners/creators/providers was noted and no end-user communities were represented.

During the discussion, the following areas/groups with relevant content use case scenarios were identified:

- Games, serious games, social networking;
- AV multimedia content, including education & news (mash-up/creation from continually evolving large datasets).

Discussion

Games, serious games, social networking:

Use Cases and Scenarios for Large-Scale Experimentations

- On line games
- Virtual communities connected with games
- ....

Innovative Internet Functionality and Technologies

- New human interfaces
- Keep the content application layer open for creators
- Games are currently the most demanding mass-application for computer hardware and will remain so in the future.

Expected Core Technology Platform Functionalities

- Network, infrastructure, middleware (e.g. latency context), and server management technologies

Experimentation Environments for New Services and Applications

- Reliability and pan-European speed of the network for large volumes of data in real time.
- Cloud computing, mobile services and online services, large databases, low latency.
- Internet of today allows independent developers to communicate directly with the consumer: good for Europe

Sector's Role in the PPP

- Keeping game developers in the centre of the Future Internet PPP is a cornerstone of implementing a user centric approach.

For AV multimedia content:

Use Cases and Scenarios for Large-Scale Experimentations

- Hybrid TV: SD-/HD-/3D-TV
- Interactive & Personalised TV
- Content creation
- Content management
- Education, e-learning
- News edition/mash-up
- ..

Innovative Internet Functionality and Technologies

- Privacy-conserving profiling functionalities, content & context awareness
- Recommendation engines/systems
- Smart content: better integration of metadata, preservation throughout production and distribution chains
- Immersive Experience
- 'Quality of Experience' (QoE)
- Ubiquitous access

Expected Core Technology Platform Functionalities

- Content development network (CDN) technologies for distribution and storage, inc cloud services
- Generic search engine, indexing
- 'Quality of Service' (QoS)
- Real time streaming
- Data mining

Experimentation Environments for New Services and Applications

- Several Pan-European existing testbeds: living labs,…
- Support from existing infrastructure owners (cities, transport operators, broadcasters, network operators)
- Reliable gateways between "future" Internet and existing infrastructure

For education:

- Schools over Europe, etc

Sector's Role in the PPP

- Broadcaster and content provider/aggregator federation in Europe through DVB
- Interfaces and APIs to enable 3rd party applications, including SMEs and other web partners

Conclusions and Next Steps

One major output/next step of this workshop will be to enlarge - as planned in Phases 2 and 3 of the proposed FI-PPP programme - the emerging Content Area Stakeholder Group in order to contribute to building a European Future Internet open community, particularly towards SMEs.

4.4 Session 4: Smart Energy Grids

Session Chair: Peter Fatelnig, INFSO D5
Session Co-Chair: Pierre Chastanet, INFSO H4
Session Rapporteur: Johannes Riedl, Siemens AG

Scope and Objectives

European energy policies set very ambitious goals, like the 20-20-20 programme or the vision for 2050. A major component to achieve these goals is the realisation of the Smart Grid vision. In this respect, Pierre Chastanet, EU Research Programme Officer for "ICT for Sustainable Growth", made clear by his introductory talk that a close connection of IT (Information Technology) and ET (Energy Technology) is a major prerequisite.

One of the key aspects to enable the Smart Grid is Smart Metering, since collecting information on the energy consumption of the consumers and providing this information to the consumers themselves or an energy management service provider is required to perform a suitable energy management on a large scale. To put it in a nutshell: "If you cannot measure it, you cannot improve it!" In this context a working group has been established within the European Smart Grid Task Force to identify the requirements for Smart Meters, which will be available by end of 2011.

Key Issues

Numerous challenges were identified by the presentations and during the open discussions. In summary, three types of challenges could be distinguished: generic technical challenges, non-technical challenges, and challenges for shaping the Smart Grid related activities within the FI-PPP to achieve a big impact.

One of the major generic technical challenges is the handling of renewable energy sources like wind power or solar panels, given that the amount of generated energy is volatile by nature. Under these conditions making sure that energy demand and supply match at any time is a very intense control task. Secondly, energy services need to be provided anytime and anywhere: e.g., the users need to be able to increase or reduce energy consumption in their homes by easy-to-use remote control through mobile devices. As an even more complex task, depending on the context of the user the energy consumption of the user's environment has to be optimised automatically. Thirdly, security and safety are challenges which need to be considered at any time, since on the one hand, the power grid is a critical infrastructure and should not fail. On the other hand, a failure could easily endanger human life which must be avoided in any case. Finally, when developing new Smart Grid solutions, a clear, safe and seamless migration path to introduce such a solution has to be provided. This is important, since 'a greenfield scenario' will arise very rarely and the lifecycles in the energy industry are quite long, i.e. in the range of tens of years.

From a non-technical viewpoint two major challenges have been worked out. Even if elegant technical approaches are available to move towards a future Smart Grid, the users need to explicitly benefit from making use of this new technology. For example, unless consumers recognise a benefit for using Smart Metering – which could be financial or non-financial – then they will be unwilling to install it. Of course, regulation can also play its role here, as it is doing in the Smart Meter context to

some extent, but the general challenge remains whenever a new technology is foreseen to be rolled out on a large scale. As indicated before, the users can be provided a tariff-based or a non-tariff based benefit; in evaluating especially the latter on its potential and suitability seems to be very interesting and promising. The second non-technical challenge in connecting IT and ET lies in the very different innovation and lifetime cycles in these industries. Whereas the IT business moves very fast, the utilities industry adjusts quite slowly to new solutions due to much longer investment cycles.

Assuring a successful PPP activity in the area of Smart Energy/Grid requires setting proper focus points in the preparation phase of the corresponding project(s). Thus, the challenges for shaping the Smart Energy / Grid related activities within the FI-PPP are to work out and decide which domains should be addressed and which should not. Moreover, the section below will summarise the use cases and scenarios which have been identified. Since the number of use cases mentioned is quite high, a suitable prioritisation is required and a focus has to be set on the most important ones. Attempting to address the whole Smart Grid as such risks the results being too generic and thus failure to have large impact.

Finally, there was extensive discussion on standards. Although participants agreed that standardisation in general is of major importance, there is a need to decide in which areas (like transmission, distribution, in-home/in-building, vehicles, etc.) the standardisation efforts should be concentrated within the FI-PPP projects.

Further Discussions

This section summarises the statements of the presenters as well as the discussion during the whole session which was guided by the questions asked of the participants in preparation for the workshop.

(a) Use Cases and Scenarios for Large-Scale Experimentations

More than ten distinct scenarios were brought up by the participants. Due to time restrictions a detailed discussion of each of them was not possible, but the list below outlines each scenario very briefly. As a next step a more detailed evaluation is required to potentially combine some of the scenarios and prioritise them.

- Smart Metering: even though roll-out has already started in some European countries, more advanced use cases need to be identified and evaluated. The corresponding business cases/market models need to be understood.
- Demand Side Management / Load Balancing: (Some) energy consumers are expected to allow for reduction or increase of energy consumption to a certain extent. Based on the available energy, suitable energy management systems can actively control the consumption and thus avoid energy shortage or overload situations.
- Advanced Distribution Automation / Smart Grid Control: Since energy generation is becoming more and more decentralised due to the intensive use of renewable energy sources, the energy flow will become bidirectional. This requires advanced control and protection concepts of low and medium voltage networks supported by ICT.

- Fine-grained Home automation: Equipping the relevant home appliances with communication modules and installing a Home Area Network. The energy management task could be performed by a service provider through the Future Internet.
- Interfacing to Smart Buildings / Smart Industries: Large Buildings and Factories (which can also be seen as small energy ecosystems by themselves) can be very energy intensive. Through an intelligent interfacing to the Smart Grid, these units can significantly contribute to stabilise the global energy ecosystem.
- Creation of a competitive environment for multiple stakeholders in a single entity (e.g., single household, commercial building): investigation of how ICT can support the creation of an open environment for players like energy providers, aggregators, energy brokers, and energy management providers. Deregulation will require such open environments.
- Community-based micro-grid: Groups of (private) investors operating wind turbines and solar parks on their own need to be enabled to actively participate in the Smart Grid as a group. Intelligent interfacing to the Smart Grid and participation in the energy stock exchange are mandatory - both ask for suitable ICT support.
- Electric vehicle management: electric vehicles are expected to play a major part in the future Smart Grid, e.g., from an energy storage viewpoint.
- Cloud services / data centre services for Smart Grid: In the future Smart Grid a variety of services and applications will be required. These include control and protection applications, data collection and storage services, data (pre)processing and many more. They could partly be realised by cloud services through data centres.
- Smart Energy - Reduction of waste of energy and resources through intensive usage of Future Internet technologies
- Smart Energy - Total Energy Lifecycle management: in most cases, neither the industry nor the end-users are usually aware of the total energy consumption of used products/solutions throughout their whole lifecycle. At least awareness needs to be generated at industry and end-user side about the products' energy balance to push for energy saving products/solutions.

(b) Innovative Internet Functionality and Technologies

A large variety of functionalities and technologies have been presented being essential from a Future Internet viewpoint to support the Smart Energy / Grid usage area. Of course a more detailed analysis and prioritisation need to be done during the preparation for the FI-PPP programme and especially during project runtime. Giving a complete list of the discussed topics goes beyond this summary, but the most often mentioned topics were:

- Open architecture, scalable open platform
- Industry-driven open standards and interoperability
- Support for (new) business / market models
- Built-in security, trust and privacy
- Assuring of and support for disaster recovery and risk management
- Usability, human-to-network interfaces, visualisation technologies

- Sensor, actuator networks
- SOA (Service-Oriented Architecture) support
- Management platform(s) for manifold purposes, like: element/object management system; data collection and management; accounting, billing
- Name services
- Connectivity in a plug-and play manner, allowing for heterogeneous networks, Communication services providing (soft) real-time support, determinism, mobile broadband access, and Quality of Service coupled with cost efficiency
- Distributed computing / networking, cloud computing
- Context-awareness
- Real-time decision making, tools for real-time pricing
- Ability of handling of huge amounts of data
- *and many more* …

(c) Expected Core Technology Platform Functionalities

The functionalities and technologies identified above need to be analysed as to whether they should be addressed in the usage area projects or in the Future Internet Technology Foundation. Some of them clearly need to be addressed in both activities, like an open architecture, standardisation or the business/market model investigations, certainly with a different focus in the respective projects activities.

On the other hand, the purely technical topics need to be investigated one by one whether they are generic or specific enablers, whereas 'generic' means that this enabler/feature is required in other usage areas as well. This distinction is expected to be a major activity of the FI-PPP programme as such. During the usage area workshop this could not be discussed in depth.

(d) Experimentation Environments for New Services and Applications

The need to establish pan-European test environments was highlighted, especially since there are already many smaller scale trial environments available. These have either been setup already or will be setup soon under various European activities (e.g. FP7-Energy projects, national initiatives like E-Energy, the European Industrial Initiatives instantiated by the SET programme, the CIP ICT programme, and many local cooperation projects between industrial and academic partners). It was pointed out frequently that all these smaller scale or more focused trials/pilots should eventually be consolidated as part of a pan-European test environment in the Smart Energy/Grid context.

Many good experiences have been had by in-life testing. Therefore it would be highly appreciated to try to focus on this kind of testbed within the FI-PPP. Of course, reliable energy supply and safety needs to be assured at any time, which puts very high pressure on the realisation of an in-life Smart Energy/Grid test environment. One possible approach could be to start with a more simulation-based testbed and continuously replace parts of the simulation by real infrastructure in a well coordinated manner.

Building a new service and application ecosystem requires an experimental environment which is part of a "Smart Eco City". Only in such an integral scenario can multi-utility horizontal services be enabled across usage-areas.

Finally, today there are major issues in the area of international interconnectivity, since systems are often not interoperable across national borders. It should be a major goal of the FI-PPP activities to at least trigger towards more and easier international interoperability. In particular, the foreseen pan-European test environment needs to show that this is technically feasible. To finally turn such global technical approaches into reality, the regulatory bodies need to be addressed as well, and hence it will be essential to involve them in the activities from the very beginning.

(e) Sector's Role in the PPP

Many different partners presented themselves, summarising their potential activities and positioning in a FI-PPP project consortium as well as some first assets which they could provide covering a broad spectrum:

- declaring the willingness to shape and lead a consortium,
- bringing in even more partners, results and deployments from national initiatives (and discussions are already ongoing),
- increasing the community by involving partners on the utilities' side with whom academic players already today have close collaborations,
- quoting capabilities and experiences which will be required when running the programme, like: use case modelling, business case / market model analysis, diversity of know-how in the ICT arena and technology integration in close cooperation with utilities, and
- offering first solution bricks in the energy area, like advanced SCADA systems or tools for efficient management.

Conclusions and Next Steps

One of the next steps in this area will be to extend the recently initiated "Smart Grid Stakeholder Group", which will be the part of the European Future Internet Community representing all organisations having interests in the usage area Smart Energy / Grid. Since this is an open community, anybody will be able to join. As a first step, all industrial stakeholders are invited to immediately join the group to identify a suitable working mode. This is expected to happen until end of July. Next the academic players will be invited to join.

At the end of the session there was also a discussion about other activities and programmes in the area of Smart Grid. Pierre Chastanet mentioned, for example, the European Technology Platform Smart Grid as well as a call on energy efficient buildings that would soon be issued in the ICT Work Programme. Thus, the Future Internet activities have to be treated as an important building block for the way to realise the Smart Grid vision. All in all, about half a trillion euros will be invested in the Smart Grid area in the next twenty years; €3.5 billion thereof will be for ICT.

4.5 Session 5: eHealth and Well-Being

Session Chair: Andrew Houghton, INFSO D1
Session Co-Chair: Loukianos Gatsoulis, INFSO H1
Session Rapporteur: Josema Cavanillas, Atos Origin

Scope and Objectives

The subject "eHealth and Well-Being" addresses advanced ICT research for sustainable high-quality healthcare, demographic ageing, and social and economic inclusion. This encompasses, among others, the following techniques: Personal Health Systems (PHS), Virtual Physiological Human (VPH), Patient Guidance Systems (PGS) and all possible applications of IT to health.

This is based on the fact that EU2020 has as one of its flagships the Digital Agenda for Europe. This Digital Agenda is implemented via Key Actions. Key Action 13 states explicitly "online access to patient's medical data". Hence, patient empowerment is one of the pillars of the Future Internet services within the eHealth and Well-Being area.

Apart from that, the following topics were identified as part of the scope:

- Ambient-assisted living as part of everyday life, not something apart. Integration into the home.
- Living labs at large.
- Potential connection to a whole context (Connection to food info infrastucture, to sports context infrastructure, to worn devices, pharmacy, hospital, every other institution related to patient's ordinary life processes which tackle body functions).

Key Issues

The key issues shown by the speakers can be grouped in the following categories:

- Information interoperability: This encompasses the connection of all systems at hospital, municipal, regional, national, EU levels, in order to achieve a single information space.
- Patient-centric approaches:
    - Empowerment of patient in terms of access to information and participation in decisions.
    - Transparency in the information storage and access by user.
    - Involvement of all actors (doctor, nurses, specialists, pharmacists, and patients) in the process of construction of the IT solutions.
    - Mobility as one of the most important elements to empower the patient, which allows mHealth
    - All IT solutions addressed should be built under the perspective of a growing aging society, with the adequate considerations on usability, complexity of information provided, etc.

- Chronic diseases, as cause of more than 80% of health budget, should be a priority for the application of IT on health.

- Health Professionals:
  - Health professionals should be enabled to develop their own contents, share them with their colleagues and access information for mash-up and composition all over.
  - They should be ensured about the reliability and trustworthiness of the information stored. The information accessed must be certain, endorsed and unchanged, and the information created by them must be guaranteed as secured, stable and only accessible by those with the relevant permissions.
  - Digital signature and consistency of the information must be provided.

- Healthcare service:
  - Measurement of healthcare service is an issue. Care is not just a pure consumption market. Patients should be convinced by the quality of delivery.
  - Information Technology support to Clinical trials, one the pillars of healthcare is extremely underperforming.

Discussion

The following subjects were addressed in the discussion:

1) Use Cases and Scenarios for Large-Scale Experimentations

The following Use Cases were stated as especially appropriate sites for developing large-scale experimentations:

- University of Gent. Large healthcare facilities, enabled with information technologies infrastructure.
- Healthcare Authorities – Walloon Region, Belgium. Large network of hospitals and First Aid centres, interconnected at a regional scale. Unification in the electronic information transmission.
- Charité Klinik Berlin. One of the top research centres in the world for IT Health activities and topics.
- Hospital Universitario Central de Asturias (HUCA) – A brand new hospital provided with wireless connection at a global scale, shown as a 'perfect' site to develop Future Internet experimentations.
- Technische Universität Kaiserlautern – This university is provided with a set of apartments with built-in sensors and actuators which can be used for AAL experimentations.
- Madrid Technical University (UPM) – This university has a Smart House inside the university facilities prepared to run pilots on domotics and Future Internet health applications.

2) Innovative Internet Functionality and Technologies

The most relevant functionalities and technologies discussed were:

- Technologies for the user:
    - Domain analysis, co-creation process, technological translation, including value network model from the start and also taking language issues into account.
    - Security - basic services like security, authentication, identification, timestamping. Security services should not be obsolete, excessive, or too demanding for the user.
    - Technologies that link health data to environmental data.

- Specific technological issues:
    - Overcome the contradicting demands on interoperability and privacy.
    - Develop eHealth application stores.
    - Include Alerting & Identification services, trust.
    - Discuss the technologies that can sort out the problems of clinical trials – design & planning, trial implementation, findings dissemination.
    - Telehealth should become interactive.
    - Drug repositioning trends.

- Functionalities and non-technological discussions:
    - In the long run, long term discussions should involve genetics and combination with environmental conditions, to define patient's health status
    - Regarding impact and cost, the problem has been there for many years, but doing it in a cost-effective way is not easy

3) Expected Core Technology Platform Functionalities

The most expected functionalities and technologies in the discussion were:

- Usability: All technologies that support user interaction, including unification of interfaces.
- Information Management:
    - Context awareness and Context Acquisition and Synthesis
    - Endorsement of information
    - Semantic interoperability
    - High quality semantic annotation for health web services
    - Storing and sharing contents, as well as advanced multimedia contents functionality.
- Service Management: Service composition and mash-ups, together with high computational capacity.
- Internet of networks: Global communications, "always connected" approach and wider broadband.
- Internet of Things: M2M communications and software engineering platforms with sensing and actuating capabilities.

4) Experimentation Environments for New Services and Applications

The following were considered the right elements for experimentation environments:

- Diabetes, as the most common of all chronic diseases
- Co-creation process abilities for health professionals
- Ability to develop persona models
- Mobile early warning systems
- Multi-purpose smart home for disabled people.

5) Sector's Role in the PPP

The role of health and well-being in the Future Internet PPP was discussed among the audience.

- Why is health important as an application field for Future Internet? Basically, because it is about human beings and our health is important to all of us.
- Two tracks should be considered for applying Future Internet in health: the technology track and the people track. If they don't get together, there will be no real evidence for the user. That's why CIP programme is so important.
- There is a difference between 'Future Internet Health' and 'Information Technologies applied to Health'. Challenges for the Core Platform are not just 'applications' but a whole new architecture/core platform. There is no need of Future Internet for the specific health domain, but it helps.
- Some unsolved challenges (like security, interoperability, clinical data, EHR) should be strongly addressed by the Future Internet.
- The traditional issue of "in health, either you buy the whole suite, or it does not work" should be overcome. Nowadays, interoperability is not ensured. There is a missing internet architecture that allows complete replaceability of items.
- The internet Information layer could definitely help the advancement of pharmaceutical research, helping to achieve interdisciplinary research results. The health market exists with or without technology. But maybe IT can help to better understand the need of the health sector.

Conclusions and Next Steps

Future Internet technologies and applications should be built upon many existing available elements. Ongoing CIP pilots, with large involvement of Member States, should not be redone. Continua, IHE, M403, and Open URC alliance also exist and should be taken into account. The main concern is that we should not 'reinvent the wheel'.

Existing projects like UNIVERSAAL, i2HOME, Smart Home Platform, in both Challenge 1 and Challenge 5 projects should also be taken into account.

4.6 Session 6: Alternative Usage Areas

Session Chair: Georgios Tselentis, INFSO F4
Session Co-chair: Anne-Marie Sassen, INFSO D3
Session Rapporteur: Didier Bourse, Alcatel-Lucent

Scope and Objectives

This session was reserved for additional alternative ideas, not yet captured in the previous usage area discussions and potentially candidates for forthcoming usage area proposals. The session was organised first with the presentations of the different contributions, then through an open and structured discussion around the five raised questions. Twenty-four contributions were received and 17 were presented within the session. In total 22 position papers/presentations are available on the workshop website. The session was, by nature, heterogeneous and one of the key discussion points was the identification of potential synergies/commonalities between the alternative ideas.

Key Issues and Discussion Points

The key points addressed during the session, according to the five questions posed, are captured in the following sub-sections.

(1) Use Cases and Scenarios for Large-Scale Experimentations

Following the presentation of the different contributions and subsequent discussion, it was possible to cluster the thematics/intentions as follows:

- Tourism
- Networked Manufacturing: Virtual company concept - Connecting all actors in the supply chain – connection to FoF PPP
- Food Production - Agri-Food (Healthy food from farm to fork)
- ICT for Environment (Water, Forest, Natural Resources) – connection to Utilities & Environment?
- Quality of Life:
    - Users & Internet / Digital Communities / (happy healthy) Ageing Population,
    - Family and Social Networking,
    - Education and Training,
    - Entertainment – connection to “Content”?
    - Media and Culture – connection to “Tourism”?
- eGovernment – eParticipation, Public service provision, Modernisation of the public sector
- Scientific developments e.g. LHC, radio astronomy, computational socio-geonomics…
- Smart Buildings – connection to EeB PPP
- Finance
- Crisis Management.

The tourism thematic was "officially" announced as a proposal under preparation. The networked manufacturing and food production thematics could lead to specific proposals, depending on the interest of potential partners. The ICT for Environment thematic may be further discussed in the context of "Utilities & Environment" (see Session 1). The Quality of Life thematic was widely discussed during the session and specific sub-thematics could lead to the development of proposals or be included in the context of "Content" or "Tourism" discussions.

(2) Innovative Internet Functionality and Technologies

The identified requirements were clustered during the discussion into four main categories, (1) basic requirements corresponding to the extension of current internet functionalities (e.g. scalability or enhancement), (2) usage areas requirement corresponding to specific functional requirements, (3) socio-economic requirements corresponding to business and sociological / users requirements and (4) technical / technological requirements (refer to the presentations slides for the "exhaustive" list discussed during the session):

- Basic requirements -> Existing functionalities to be enhanced and further scaled (e.g. for eGovernment),
- Usage requirements -> Internet-based technologies and applications contributing to e.g.:
  - Increasing management efficiency of global networked manufacturing,
  - Increased logistics efficiency, real-time monitoring of material flows,
  - Real-time monitoring of resource use,
  - Life-cycle management including product upgrades, re-manufacturing, recycling,
  - Advanced maintenance technologies and services,
  - Knowledge-based manufacturing for better decision making,
- Socio-economic requirements:
  - Sustainable business models,
  - User involvement – connection to Living Labs,
- Technical and Technological Requirements (not exhaustive):
  - Network Monitoring,
  - Automated Bandwidth Allocation,
  - Virtualisation,
  - Wireless sensors and networks,
  - Augmented reality,
  - Geo-information,
  - Mobile (real time) data handling,
  - Context-sensitive eContent,
  - Web mashups,
  - Social/semantic web,
  - (ERP) cloud software (BPM, SOA, Saas),
  - Hybrid Terrestrial/satellite sensor-based infrastructure,
  - Resilience and Security,
  - Seamless data transport mechanism,
  - Service provision adapted across a range of communications capabilities,
  - Service delivery both in Smart Cities and to remote rural communities,

- Unified resource monitoring and metering systems of resource for wireless sensors networks,
- Context awareness,
- Self-configuring, self-adaptive, self-healing object networks and protocols,
- Distributed semantic reasoning based on common ontologies,
- Heterogeneous networks,
- Energy harvesting hardware modules,
- Low-bandwidth, low-cost, low energy wireless data networks,
- Cloud and grid computing facilities at urban sites (including cloud-of-clouds interoperability),
- Personalisation as a way to offer services and contents adequate to culture, interests, experience, time,
- New service-oriented architectures to allow interoperability and access to a wider range of services and content providers,
- New algorithms and tools to help in the manipulation, generation and sharing of multimedia contents,
- Streaming and rendering of 3D Graphics,
- Reduced latency on network (LTE and NGN) and on Cloud Core Platform,

It should be noted that the 'specific' and 'generic' enabling technologies have to be discussed in the context of the detailed definition of the usage areas and the Core Technology Platform. Generic enablers, in the sense of being of interest to more than one usage area project, would be addressed inside the Core Technology Platform development, while specific enablers, relevant to the unique usage area could be tackled inside the usage area Phase 1 & 2 projects.

(3) Expected Core Technology Platform Functionalities

In direct connection to the previous question (2), several Core Technology Platform requirements were identified / addressed during the session (refer to the presentations slides for the "exhaustive" list discussed during the session):

- Data management,
- Service/content handling,
- Rating and billing,
- Identity and access management,
- Rights management,
- Lifecycle management,
- Security and privacy,
- Reliability and resilience,
- Policy-based network management,
- Policy-based security interworking,
- Resilient virtualisation: Failover, adaptation, ubiquity.

Two additional interesting discussion points were raised:
1. the Core Technology Platform should offer a mix of transport mechanisms and management architectures to support the required usage areas functions; and

2. the Core Technology Platform could potentially serve other PPPs (developing synergies between the FI-PPP and others, e.g. Factory of the Future).

(4) Experimentation Environments for New Services and Applications

Following the presentation of the different contributions and according to the live discussion, several opportunities were identified, among others:

- GEANT,
- Smart Cities, e.g. Smart Barcelona (-> Smart Regions),
- Network of Smart Cities:
    - Each of those making available a service platform and a device/object virtualisation layer with common characteristics (service formats, brokering services, energy- and health- oriented ontology),
    - Plus a federated/hybrid public/private cloud-based data centre facilities to host secure databases for real-time computing and historical storage,
- Networked manufacturing pilot plant…

It was noted that the experimentation environment must explore service offerings across a range of user communities:
(1) Remote communities with poor communications infrastructure
(2) Smart Cities
(3) Various legal frameworks
(4) Local, regional, national and pan-European service offerings.
The importance to involve social science expertise in assessing user experience, socio-legal aspects, economic drivers/constraints was also raised during the discussion.

(5) Sector's Role in the PPP

The fifth question provided the opportunity for discussion on the potential expression of interests regarding potential proposals leaderships and contributions. Several organisations/persons manifested interest for contributing to Usage Areas and Core Technology Platform proposals:

- Project proposal on Tourism (SEGITTUR, AETIC, TID…),
- Potential proposal on Networked Manufacturing (connection to FoF),
- Potential proposal on ICT for Environment (TRAGSA),
- Potential proposal on Agri-Food (Wageningen University).

Conclusions and Next Steps

The discussions led to very interesting interactions. One of the key outcomes is the identification of new usage area expressions of interest, e.g. tourism, agri-food, networked manufacturing. One of the issues expressed relates to the low participation of usage area representatives, in order to directly express usage expectations, that could be translated into technical objectives (too technology push at this stage). There was additional discussion on the relative user focus vs business focus (e.g. tourism is not only users but also hotels, travel agencies…) and the potential engagement of SMEs in the FI PPP proposals. It was suggested to organise follow-up discussions, e.g. EC/EFII workshops focused on specific usage areas.

5.0 Key Issues: Cross-Sector Synergies and How to Make them Work in Practice

5.1 Use Cases and Scenarios for Large-Scale Experimentations

What use case and scenario in your area would you consider the most appropriate and representative one for large-scale experimentation with the Future Internet platform to be built starting from 2013?

The Workshop identified many and diverse examples of FI scenarios and use cases. Even within the five sector sessions various potential candidates were identified, while Session 6 suggested many others: eScience, eGovernment, finance, agri-food, tourism, etc. Furthermore, many linkages and interactions between usage areas are evident (e.g. environment and health).

- **Better definition of use cases:** At present the candidates are only vaguely described. The scenarios and use cases need to be defined more precisely in terms of who is involved and what applications and services are expected to be delivered. This will make it easier to differentiate between generic and specific functionalities (see below) and to elaborate common visions.
- **Inventories of FI assets:** We should not reinvent the wheel. Rapid progress requires that the FI-PPP builds on existing technologies, research results, activities and infrastructures. This in turn calls for **comprehensive inventories of relevant assets** within European programmes and beyond – a major undertaking in itself.

5.2 Innovative Internet Functionality and Technologies

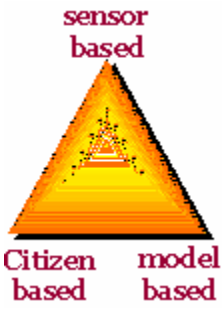
What innovative Internet functionality and technologies would you consider important for your suggested use case and scenario (e.g. context awareness, sensor networks, advanced real time processing capabilities handling huge volume of data, ad hoc service composition and mash-up, managed broadband connectivity and services, embedded media support for interfaces easing the interpretation of processed contextual data, etc.)?

Participants identified an extensive list of functionalities and technologies that could be addressed by the FI, which provides a useful reference. At present, this is little more than a series of headings, however. It is not even clear that sectors share a common understanding of terms such as 'privacy', 'trust', and 'usability'. More detailed discussions are required to decide which functionalities and technologies are (or should be) **generic enablers** (i.e. addressed through the Core Platform) and which should be **specific enablers** (i.e. addressed through Platform instantiations).

- **Defining 'real-time':** 'Real-time' was frequently mentioned as an important characteristic but requirements vary enormously. In a safety-critical application such as transport, for instance, a real-time response means a fraction of a second, whereas for the display of environmental or other non-critical data a one- or even a five minute response may be sufficient. This is just one example of where greater definition is required.
- **The Internet of Things as a core technology:** The IoT is at the core of many usage areas and related functionalities were frequently cited (e.g. protocols, power management, network interfaces). The usage areas are becoming ever more intelligent as numerous smart devices and objects are developed and deployed. "If you can't measure it, you can't improve it", and

in many applications measurement depends on advanced sensor networks. Much work remains to be done in developing the IoT as a bridge between the 'real' and 'digital' worlds, in particular taking into account that intelligence lies not only in the network.

- **The technology triangle** (shown below) can be a useful means of categorising the different functionalities needed for the FI as either 'sensor-based', 'citizen-based' or 'model based' (including the possibility of using extensive simulation for decision support).



- **Deriving and utilising standards:** Standards were mentioned in general terms as being a useful means for facilitating the FI. However, cultures related to standardisation vary in the different use areas and also on different technology levels. Strategies for standardisation have to be derived built on the practices in the respective communities.

5.3 Expected Core Technology Platform Functionalities

Which of the identified functionalities would you expect the Future Internet core technology platform to deliver to support your and other usage area scenarios?

Participants identified a similarly long list of functionalities that could/should be developed by the Core Technology Platform. These included (among others): data management, service/content handling, rating and billing, identity and access management, rights management, lifecycle management, security and privacy, reliability and resilience, policy-based network management, policy-based security interworking, and resilient virtualisation.

As noted above, **better definition and common understanding** of what is meant by these terms would help in **the categorisation of the functionalities as generic versus specific enablers**.

5.4 Experimentation Environments for New Services and Applications

What kind of experimentation environment would you consider necessary for broad large scale testing of the platform to be developed in your use area? What would be needed to experiment new services and applications cutting across use areas (services and application mash-up) and building a new services and application ecosystem around the prototype implementations of the platform?

There was a broad consensus that experimentation environments will be critical in realising new services and applications. Relevant points here were:

- **Defining the user:** Experimentations should be user centric, which requires a very clear definition of exactly who the user is for each usage area. The use cases should target not just end-users (e.g. patients, citizens, consumers) but also sector actors as operators, managers, service providers, etc. Thus, they should have a business focus as well as a user focus.

- **Defining 'large-scale':** Again terminology issues arise; 'large-scale' may have different meanings in different contexts. Hence, definitions of and criteria for 'large-scale' testing need to be discussed on a case by case basis.
- **Setting migration paths:** Trials may be interesting for ICT players but have little value for usage area actors unless they can be shown to contribute to their business model. Thus, the FI community needs to **make trials attractive to the usage areas** by offering them a vision beyond the trial phase and a path by which they may migrate.
- **Models for federating existing trials:** We need to identify models for federating existing small-scale pilots and trials within broader pan-European test environments, while recognising the value and autonomy of existing schemes. Interoperability at European scale should be a key focus here.
- **Models for live experimentation:** 'Live' or 'online' experimentations have great value as test environments but carry high risks. Models/conventions are needed as to how to approach such activities.

5.5 Sectors' Role in the PPP

How do you see the potential role of your organisation in the FI-PPP, in the context of Usage areas taking a prominent role in the Initiative, to ensure an appropriate application driven approach?

Participants were highly supportive of the PPP approach and, as shown by the high attendance at the Workshop, a substantial community is mobilising around the FI-PPP initiative. Nevertheless, in all of the usage areas user/application actors and communities are not sufficiently represented as yet and in some sectors are virtually absent. Further efforts are needed to engage with usage area actors and involve them in the FI-PPP.

- **Mobilising other PPPs and ETPs:** One means for strengthening the role of usage areas could be by linking to other PPPs as potential users (Green Car, Energy Efficient Buildings, and Factory of the Future). These offer the advantage of ready-formed and well-focused stakeholder communities in the areas concerned. The European Technology Platforms offer similar opportunities, e.g. in relation to Smart Grids.
- **Incentivising users:** Users are key to the Future Internet. They could/should play a central role in new applications and services, such as contributing traffic data, reporting environmental conditions, and installing new energy technologies. The question is how to incentivise users to participate, not necessarily through commercial means. Thus, the means for engaging users should be a key consideration in new business models.
- **A value chain approach?:** The need for a 'whole value chain approach' is frequently cited in relation to the FI-PPP. While the aim is laudable, it will be difficult to achieve in practice because of the very broad range of stakeholders involved in most of the usage areas. Thus, the use cases should focus on a broad but workable array of stakeholders – indeed the workability of the stakeholder relationships should be a key criterion in better defining the use cases (as indicated above). Associations can be a means of involving many stakeholders (e.g. SMEs, cities), although individual members must have a meaningful involvement.

6.0 Conclusions and Next Steps

This 2nd Usage Area Workshop brought together a broad range of stakeholders to discuss the role of and challenges for demand-side actors in the take-up of Future Internet-enabled applications and services. It was the largest gathering to date focused on the use and application of the FI and further extended the discussion on the needs of the usage areas and their requirements.

The issues and findings outlined above, structured according to the five questions posed in the Terms of Reference, should be of value to stakeholders as they prepare their involvement in the initiative.

Finally, two further points are emphasised:

Smart City Ecosystems

With a tight timetable and only a limited number of usage area pilots, it is essential that the selected pilots maximise synergies. There are two dimensions to this:

- Large-scale local: Several co-located usage areas (e.g. health, transport, environment, content) working together within the context of a Smart City ecosystem.
- Distributed small-scale: A single usage area working across several cities/regions so as to test concepts and approaches in different economic, social and cultural contexts with potential links and synergies between cities/regions.

Smart Cities are considered an ideal catalyser for exploiting synergies between usage areas since they represent a natural concentration of people (i.e. users), organisations and services. Networks of smart cities could be used to investigate such synergies in multiple contexts.

The Smart City ecosystem perspective may also lead to a type of horizontal "usage area" focus different from the vertical ones discussed so far. By picking trial scenarios that cut across several usage areas, synergies between applications can be exploited. Such scenarios have the potential of being able to demonstrate many of the new functionalities the FI core platform is expected to offer (e.g. application and services mash-up, common devices across applications, …). An example mentioned is that of tourism, or in more concrete terms that of a high profile event organised in a city or region with all the services/applications related to that event in areas like transport and mobility, access to content, energy efficiency and environment, and health.

Developing the Community

While the Workshop represented a substantial achievement in mobilising such a large audience around the usage area discussions, further work is required to ensure the strong technology push is complemented by application pull. This should be facilitated through **the development of the FI Stakeholder Groups** and further **usage area-specific workshops**. Whereas these two usage area workshops were initiated by the Commission, future activities are expected to be more community-driven.