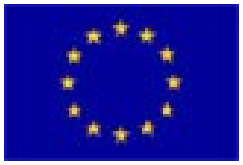

(NetSoc)

Deliverable D2.3 - Report on the building of ICT network positions during Project Year 2

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Abstract

This deliverable is describing the contributions of the NetSoc Coordination action to support community building in the ICT domain and in particular in the areas of communication networks and new media. The NetSoc support is related to the restructuring of respective European Technology Platforms towards Horizon 2020 and the launch of 5G PPP in Horizon 2020. NetSoc was instrumental to provide the necessary environment by organising meetings of the ETP for community building like workshops, General Assembly and Steering Board meetings, supporting websites, providing work spaces and e-mail distribution lists a 5G video for use by the EU Commission and the community as well as press material e.g. for the launch of 5G PPP. In addition, NetSoc facilitated elections in ETPs for Steering Board and the 5G Infrastructure Association as a neutral group. The project also supported the adaptation and new development of necessary legal documents like ETP governance models and the governance of 5G PPP. Relevant documents are included in Annexes to this Deliverable.

Disclaimer

Impressum

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Executive Summary

One of the main objectives of the NetSoc project is to support community building in the ICT domain and in particular in the areas of communication networks and new media. European Technology Platforms (ETPs) are the main tool to organise specific communities and to develop consolidated views on Strategic Research and Innovation Agendas as inputs to the preparation of future work programmes in Horizon 2020. The NetSoc project is supporting in particular the ETPs Net!Works, ISI and NEM. Since Summer 2012 the ICT ETPs and the EU Commission discussed a potential re-structuring of ICT ETPs in order to better support Horizon 2020, which is looking more from a holistic perspective and is addressing the entire value chain from basic research, to industry driven and application or societal challenges driven research.

The ETPs Net!Works, ISI and NESSI took actions to change their structure. Net!Works and ISI launched a new communications oriented ETP Networld2020 in 2013 and NEM formed a renewed ETP by incorporating more closely the creative industry.

The NetSoc project supported the restructuring of respective European Technology Platforms towards Horizon 2020 by organising meetings between ETPs and with the Commission, contributing to necessary documents on scope and ETP landscape and the update and adaption of governance models. The successful launch of the new ETPs will serve the community better in Horizon 2020.

As part of the preparation of Horizon 2020 a proposal for the 5G PPP was developed in cooperation with the EU Commission for evaluation. NetSoc was instrumental to provide the necessary environment by organising meetings, workspace and mailing list as well as the support of the signature event with the EU Commission on December 17, 2013 and a press event with Vice-President Neelie Kroes and representatives of the 5G Infrastructure Association at Mobile World Congress in February 2014 in Barcelona. Material like flyers were prepared as well as international cooperation supported. The project supported the preparation of a 5G video, which is also used by the EU Commission and other stakeholder to explain 5G to the general public.

The preparation of the detailed governance model of 5G PPP was supported by NetSoc in a legal group like the statutes of the Association and the collaboration agreement for the set of active projects under 5G PPP in Horizon 2020, which are complementing the Grant Agreement including Special Clauses to the contract. Relevant documents are included in Annexes to this Deliverable.

As part of the ETP and the 5G PPP governance NetSoc facilitated elections to ETP Steering Boards and to the bodies in the 5G Infrastructure Association. NetSoc is seen as a neutral body to organise such elections by issuing calls for candidates and running the actual elections.

NetSoc supported community building by organising workshops, General Assembly and Steering Board meetings of the ETPs and the 5G Infrastructure Association, Awareness Meetings on Horizon 2020 Call 1, updated the websites of the ETPs and of 5G PPP, provided work spaces and e-mail distribution lists.

Therefore, NetSoc played an important role in the process to develop common positions in the community on future research topics and Strategic Research and Innovation Agendas in order to support the EU Commission in the evolution of the Horizon 2020 work programme.

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1 INTRODUCTION

European Technology Platforms (ETPs) are an important tool for consensus building on positions in certain sectors [1]. In particular the ICT and communications networking domain is build on standardised solutions, which require global consensus building. Therefore, the development of commonly agreed ICT network positions in the pre-competitive collaborative research phase is supporting future standardisation activities by exploiting agreed concepts and solutions in international standardisation bodies. By means of the ETP approach views and interests of a wide community from industry, SMEs, R&D centres and universities is taken into account. Major contributions are the development of Strategic Research and Innovation Agendas as input contributions to Framework Program 7 and Horizon 2020 Work Programmes, position papers and the aligned contribution to public consultations.

In the networking domain the most relevant ETPs at the start of the NetSoc project were

- ISI – The Integral SatCom Initiative for satellite systems and communications [2],
- NEM – New European Media for content and networking related areas [3] and
- Net!Works – Converged fixed and wireless networks [4].

During the preparation phase of Horizon 2020 ICT ETPs and the EU Commission discussed adaptations of the ETP landscape in order to better support Horizon 2020. Therefore, ISI and Net!Works launched a new ETP Networld2020 [5] and NEM transformed to New NEM [3] in 2013. The NetSoc project adapted its support to the new ETPs.

These ETPs are the main instruments in Europe for community building in an open and transparent process.

This document is describing the support by NetSoc for the launch of new or re-launched ETPs in the networking domain as well as the support to facilitate the development and establishment of the proposal for 5G PPP in Horizon 2020.

2 EUROPEAN TECHNOLOGY PLATFORMS IN THE NETWORKING DOMAIN

The main European Technology Platforms in the networking domain are today

- Networld2020 for converged fixed, wireless and satellite systems [5] and
- NEM for New European Media [3].

Networld2020 was launched in October 2013 as the successor ETP for the former Net!Works [4] and ISI [2] ETPs. NEM also transformed the ETP to New NEM [3] in 2013 by adapting its scope of activities to new developments.

The NESSI ETP [6] is mainly addressing higher layers in the protocol stack and is not in scope of the support by the NetSoc project as well as the other ICT ETPs as described in [1].

The NetSoc project facilitated the change of the ETP landscape, e.g. by organising meetings and adapting websites and other information material to keep the community updated about these new developments.

2.1 Networld2020 ETP

2.1.1 Launch of new Networld2020 ETP

The Net!Works and ISI ETPs have originally been founded during Framework Programme 6 of the EU Commission and supported their respective communities and the development of Strategic Research Agendas towards Framework Programme 6 and 7. Horizon 2020 is following a more holistic approach from the networking perspective and an integration of different networks and access systems is expected in the development towards 5G communication networks. Therefore, the ETP landscape was discussed between the EU Commission (DG Connect) and the ICT ETPs since summer 2012 in order to evaluate potential improvements and adaptations in the number and scope of ICT ETPs. However, DG Research is responsible for the coordination and recognition of ETPs.

In a meeting between DG Connect and ICT ETPs on September 12, 2012 it was discussed that ETPs should be adapted towards Horizon 2020 by taking into account the new organisation of DG Connect. ICT ETPs were invited to present position paper on their future approach.

The Net!Works Steering Board discussed the ETP restructuring in its Steering Board meeting on September 25, 2012. The board supported a new communication-oriented ETP. Further steps were discussed with DG Research in a workshop on October 1, 2012 and with DG Connect in meetings on October 2, 2012, November 23, 2012 and January 18, 2013.

The ISI steering Committee started to discuss about ETP re-structuring in September 2012. Following a meeting with the DG Connect in December 2012, it was decided to explore the feasibility of creating a new ETP focusing on communication network infrastructures together with other relevant ETPs.

Based on these preparatory discussions, Net!Works and ISI started extensive discussions beginning of 2013 to explore a closer cooperation and finally the launch of a new ETP,

which should address all networking means from fixed, wireless to satellite systems and networks. Both ETPs agreed a common statement:

- ISI and Net!Works agreed to work together to explore the formation of a new network-oriented ETP incorporating different contributing sectors.
- The Steering Board of both ETPs have agreed to start this discussion.
- Teams from both groups are working on
  - Terms of reference or scope and the
  - Governance model of the new ETP.
- There is a common understanding that
  - the new ETP should encompass the scope of several existing ICT ETPs, in order to increase synergy and critical mass;
  - both Net!Works and ISI are interested to contribute to the formation of a PPP in the field of ICT infrastructure, under the guidance of the new ETP.

DG Research published an ETP strategy paper in February 2013 to describe requirements and objectives on ETPs in Horizon 2020 [7]. Based on this paper DG Research requested a self-assessment of ETPs by April 2013. Both Net!Works and ISI received the recognition by DG Research as future ETP in July 2013 based on their self-assessments.

Figure 1 shows the steps to launch the new ETP based on the former Net!Works and ISI ETPs.

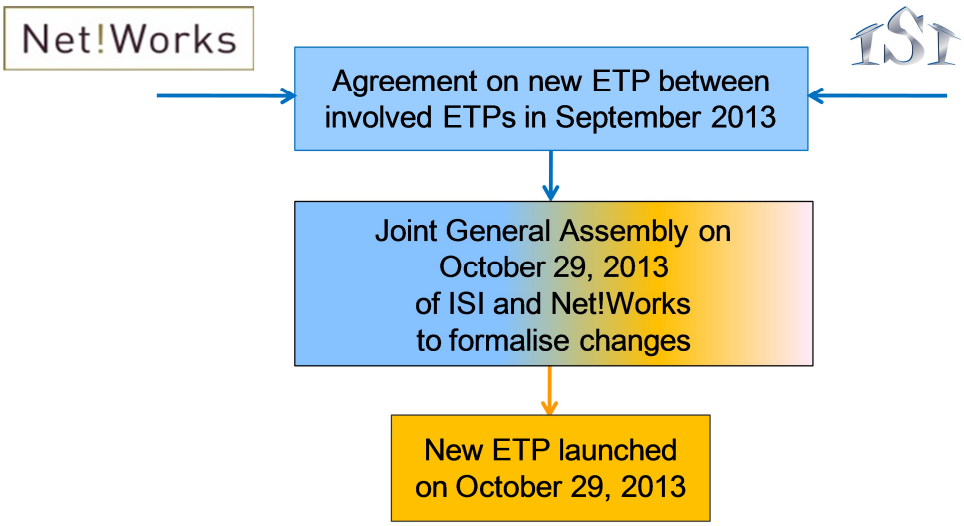

Figure 1: Formal steps to launch the new ETP

The original ETPs ISI and Net!Works are transformed to a new ETP to reflect the changing environment

- in industry of converged sectors,
- in Horizon 2020 and
- in the new Commission organisation

by ensuring support of the existing ETP membership.

After the approval of the proposed launch of the new ETP by both Steering Boards and the support of the membership of both ETPs in a voting process the NetSoc project organised a joint General Assembly of both ETPs on October 29, 2013, where the revised overall scope of the new ETP and the governance model were approved. In addition, the representatives

of the Steering Board were elected based on a Call for candidate, which was issued in the Net!Works ETP on July 26, 2013. ISI followed a similar process.

The election of chair and vice chair(s) by the new Steering Board took place on December 5, 2013.

The NetSoc project supported this restructuring process by organising the Steering Board and the General Assembly meetings, coordinating and running the electing process, providing the new website of the Networld2020 ETP, revised e-mail distribution lists and document storage space. This facilitation support was essential during the transition phase from two ETPs to a new ETP. This restructuring has been done in parallel to the preparation of the 5G PPP proposal, which is based on the ETP.

2.1.2 Governance Model

The Networld2020 governance model in its actual Version 02/06/2014 is publicly available on the Networld2020 website [8]. All members are represented in the General Assembly, which is electing the representatives in the Steering Board. In order to ensure on one hand an industry-led ETP and on the other hand the representation of the different stakeholder groups industry, SMEs and Research each stakeholder group is electing its own representatives. The Steering Board is fully elected based on a call for candidates. Chair and vice-chairs of the Steering Board are elected by the Steering Board.

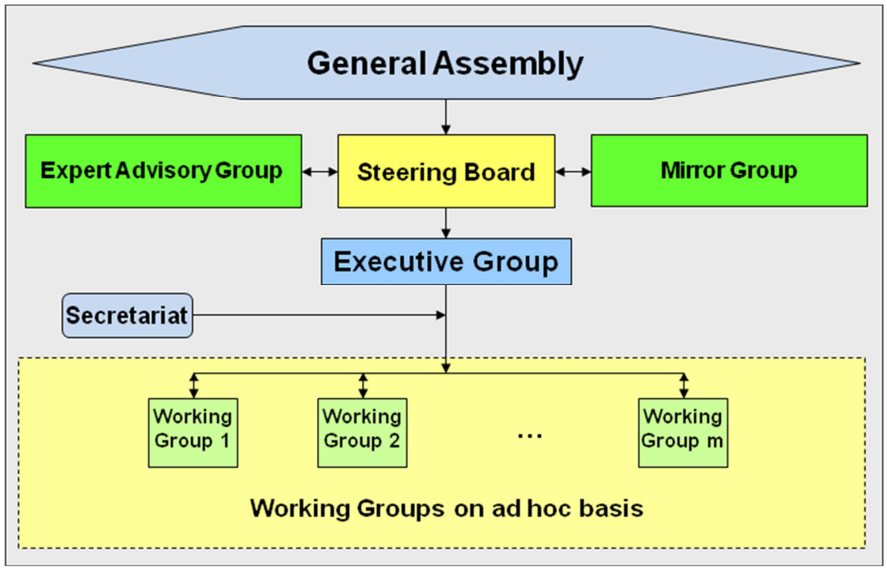

Figure 2: NetWorld2020 Platform structure

Working Groups can be launched and closed by the Steering Board. In the Annex to the governance model [9] two first initial working groups were agreed and launched from the start of Networld2020:

- Expert Advisory Group: Main objective to develop technical White Papers as contributions to updates of the Strategic Research Agenda.
- SatCom Working Group: Main objective to work on SatCom specific topics and the convergence of satellite communication with fixed and mobile communication networks

In its Steering Board meeting on June 27, 2014 an SME Working Group was established to promote the involvement of SMEs in collaborative research.

The Networld2020 governance model and the Annex on working groups are attached in Annex 1 to this deliverable.

2.1.3 Vision and Mission Statement

The mission statement of Networld2020 is part of the governance model in [8, pp. 3]:

VISION AND MISSION OF THE NETWORLD2020 PLATFORM

NetWorld2020 is the European Technology Platform for communications networks. Communications networks enable interaction between users of various types of equipment, either mobile or fixed; they are the foundation of the Internet. The NetWorld2020 European Technology Platform gathers players of the communications networks sector: industry leaders, innovative SMEs, and leading academic institutions.

The communications networks industry is supporting the following NetWorld2020 vision for the further development of mobile and wireless, fixed and satellite communications:

- *Contribute to **collaborative research programmes** on European and national level for collaborative research in the domain of **mobile and wireless, fixed and satellite communication networks** by a regularly updated research agenda.*
- *Future communication networks will provide*
  - *Significantly higher mobile and wireless area capacity and more varied service capabilities compared to 2010, which will be supported by fixed backbone and access networks and complemented by satellite networks.*
  - *Saving 90% of energy per service provided.*
  - *Reducing the service creation time cycle significantly.*
  - *Creating a secure, reliable and dependable Internet with zero perceived downtime for services.*
  - *Facilitating very dense deployments of mobile and wireless communication links for over 7 trillion wireless devices serving over 7 billion people.*
  - *Ensuring User controlled privacy.*
- *Support for **business & government processes** improves the competitiveness of the European economy.*
- *Services **hide complexity** from the user with interoperability between different access systems.*
- ***Multi-layered mobility** – users move & change devices, sub-networks in trains & cars move, software moves.*
- ***Peer-to-peer** communities emerge to empower people to collaborate.*
- *Opportunities for **social applications** expand through always-with-you qualities and reducing isolation.*

This results in the mission statement of the NetWorld2020 Platform:

- *To develop position papers on technological, research-oriented and societal issues, which are agreed in NetWorld2020 bodies to receive a joint mandate.*
- *To seek discussion of issues with decision makers in the political and public domain as well as in the industry and research community to bridge the gap between research and innovation and the expectations from the European society.*
- *To regularly develop an updated Strategic Research and Innovation Agenda (SRIA) for Europe in the communication networks domain in an open process in order to guide*

industrial and long-term oriented research and to provide means for future economic exploitation in global standards and the widespread deployment of communication systems and networks.

- *To strengthen Europe's leadership in networking technology and services so that it best serves Europe's citizens and the European economy.*
- *To support the 5G PPP initiative through the provision of the Association Members, the provision of the SRIA (including revisions) and promoting the active involvement of the ETP community in 5G initiative proposals and projects.*
- *To support general communication networks R&D&I issues.*

Further details are available at: http://www.networld2020.eu/.

These activities provide value for Europe in:

- *Helping to ensure **eInclusion** in Europe using an advanced communication infrastructure and **bridging the Digital Divide**.*
- ***Empowering citizens** with new applications.*
- *Creating **new opportunities** for businesses and governments.*
- *Creating **new wealth** in the European economy.*
- *Focussing **European resources** to achieve critical mass in R&D and build on **European leadership** in communications technology.*
- *Aligning a range of **EU instruments** in relation to the key issues of communications technology.*

2.1.4 SatCom Working Group

This group was created during the first Steering Board meeting in December 2013.

2.1.4.1 Terms of reference

They were adopted on 11th March 2013, see Annex 6.

2.1.4.2 Organisation

Figure 3 shows the structure of this Working Group.

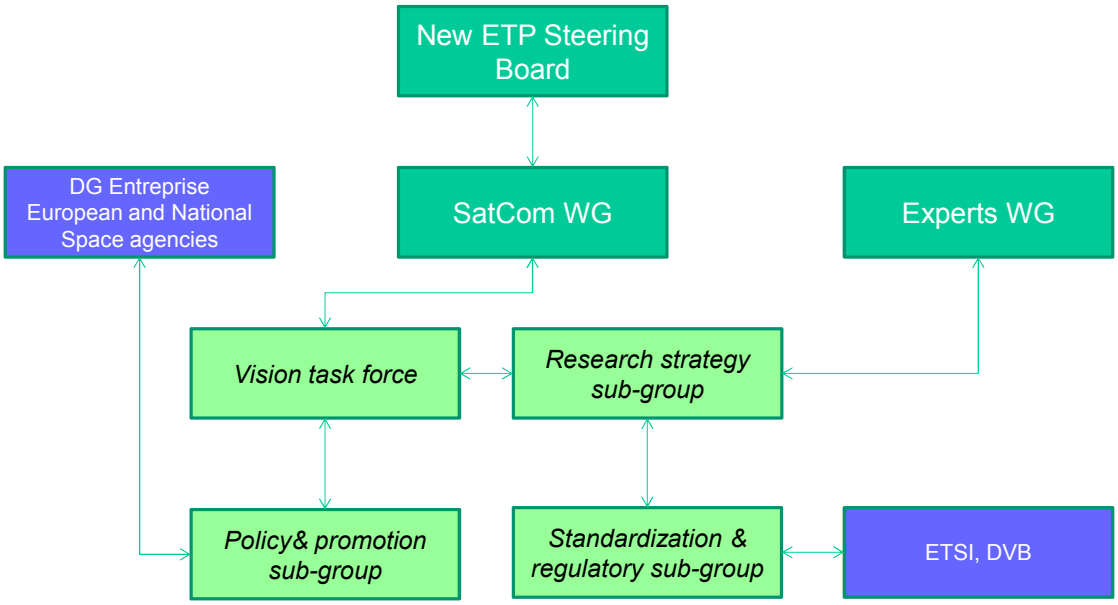

Figure 3: NetWorld2020's SatCom Working Group structure

Following an election, which was held by correspondence during February/March 2014, the core team is listed below:

Groups	Chairperson	Vice chair persons
SatCom WG	N. Chuberre (Thales Alenia Space)	• Dr. Sandro Scalise (DLR) • Graham Peters (Avanti Communications)
Policy & promotion sub-group	A. Salvatori (Airbus DS)	• C. Leurquin (SES) • Stefano Agnelli (Eutelsat) • Joan Manuel Cebrian (Indra Espacio)
Research Strategy sub-group	Prof. Barry Evans (University of Surrey)	• Hector Fenech (Eutelsat) • Dr. Symeon Chatzinotas (University of Luxembourg) • Ana Perez-Neira (CTTC) • Marcos Álvarez Díaz (Gradiant)
Standardisation & regulatory sub-group	A. Yun (Thales Alenia Space)	• -
Vision task force	Mr. Rainer Wansch (Fraunhoffer IIS)	• -

2.1.4.3 Activities

The Working Group has produced three documents:

- Vision of the WG SatCom: The role of SatCom in the telecommunication market 2020+.
- SatCom research topics in 5GPPP, circulated to the steering board on 23rd June 2014 (see Annex 5).
- And a draft document "Role of SatCom in 5G" which is being consolidated in July 2014 to be attached to the 5G white paper.

In addition, the SatCom Working Group has facilitated discussions among the SatCom stakeholders to prepare a response to DG Enterprise about their H2020 Space 2016/2017 Work Programme.

Following discussions during the last Networld2020 Steering Board meeting in Bologna on June 27, 2014 it has been proposed to merge these three documents in order to get a synthetic document encompassing the vision and the research topics. The preparation of this document has started and a first draft has been distributed within the SatCom working group on mid-July 2014. Although the consolidation in one document is now continuing after the end of NetSoc, the NetSoc initiative provided a support for the launch and the preparation of the first set of documents.

2.1.5 SME Working Group

Six SME representatives were elected in the Net!Works/ISI General Assembly which was held in Brussels on 29 October 2013, as planned in the new status agreed upon by the two ETPs. When the first Steering Board meeting was held on 5 December 2014, an idea was launched to possibly form an "SME Working Group". This idea was discussed among the SME representatives in the Steering Board, who also happen to be the SME representatives at the 5G Infrastructure Association General Assembly, and a first presentation was prepared with the support of NetSoc for the meeting of the Steering Board on 11 March 2014. The main objective of such a working group was and is still to "help and support SMEs participation in the 5G PPP and in the ETP, including (but not limited to) reaching the target of at least 20% of the 5G PPP funding going to SMEs". SME representatives were still wondering whether the creation of a working group was the best means to achieve such objectives.

The SME representatives, once again with the support of NetSoc, informed all SMEs members of the NetWorld2020 ETP that an online brokerage service was available for participation into the 5G PPP. They also reminded all other members that this brokerage service could be used anonymously, in order to find relevant SMEs as partners in the proposals which were being built up -as the question had been raised during 5G PPP information days about the fact that many proposers are not willing to disclose information on the proposal and the partners involved. This action led to several SMEs showing interest in joining and contributing to the SME Working Group, and expressing interest and questions about the brokerage service.

NetSoc continued to coordinate the interaction between the SME representatives which finally led to a formal proposal for the creation of an SME Working Group at the Steering Board meeting in Bologna on 27 June 2014. This proposal was approved and the Working Group is now formally starting its work. Beyond the major objective already stated, other objectives include:

- Improve visibility of SMEs in the 5G PPP and in general in R&D programs, and ease participation in the new ETP.
- Activate channels that may enable, facilitate and promote SMEs contribution to the ETP Strategic Research Agenda and research topics and other strategic documents related to the ETP and to 5G PPP.
- Ensure that SMEs interests, a key player of EU economy, are adequately taken into account, more particularly in the new ETP and in the 5G PPP.
- Act as representative/interlocutor of SMEs in the telecom domain, more particularly in the new ETP and in the 5G PPP.
- Help SME to access European funds, in the 5G PPP and beyond. The Working Group could e.g. "pre-digest" material and help SMEs find their way into 5G PPP related funding and beyond.
- Analyse the participation of SMEs in projects, potentially prepare questionnaire and transmit the conclusions and results to European Commission –for the 5G PPP in particular.

The first proposed actions in the short term were:

- Take responsibility for the content of the SME page on the NetWorld2020 web site.
- Advertise active involvement of SMEs in the Working Group.
- Organise a kick-off webinar to define a first action plan with the SMEs interested.
- Define within the Steering Board and the 5G Infrastructure Association General Assembly additional actions to involve SMEs.

NetSoc is now completed but the SME Working Group has been initiated, approved and has already implemented a few actions that need to be followed in the next few months. This will be performed by the SME representatives in the NetWorld2020 ETP, which showed great interest and contributed much along with the Networld2020 Steering Board Vice-Chair from Alcatel-Lucent. An SME representative has also been elected in the Board of the 5G Infrastructure Association, showing the interest of all players to ensure a proper participation from SMEs in the 5G PPP.

2.2 NEM

During the transition period of the ETPs, the NEM Initiative analysed the situation and the future perspectives and made a decision to extend its scope towards creative industries. Accordingly, a New NEM Mission Statement (Sec. 2.2.2) have been created in summer 2013 with support of the NetSoc project and distributed to a wide public. The New NEM mission and the extensions towards the creative industries have been discussed with the NEM members at the 16th NEM General Assembly[1] in autumn 2013, where the new approach has been endorsed by the community.

The next step in re-structuring NEM, which was also supported by NetSoc, was to identify relevant stakeholders from the creative industries, which were invited to join NEM and participate in its activities. In order to efficiently work with all relevant NEM stakeholders during the transition period, work of the NEM Steering Board was open for all NEM members and for the new representatives from the creative industries.

[1] Related NEM meetings have been organised by NetSoc project, as stated in the NetSoc deliverable D3.3.

At the extended NEM Steering Board meeting in spring 2014, the decision was made to change name of NEM to "New European Media" as well as to keep the same acronym.

The NEM transition period was closed at the 17th NEM General Assembly, held in spring 2014, where elections for the new NEM Steering Board were carried out. Outcome of the elections was the involvement of a significant number of representatives from the creative industries in the Steering Board (http://nem-initiative.org/structure-membership/steering-board/).

2.2.1 Governance Model

Different from the Networld2020 and ISI ETPs, the NEM Initiative did not join or merge with another ETP and, therefore, the changes of the governance model are not significant. Besides minor text adaptations, the main discussion was carried out on proper presentation of all members' categories in the governance model in accordance with the new NEM orientation. For the time being, the following members' categories are in consideration:

- Digital content and media creators/services providers
- Creative industries
    - Games, Publishing, Film, Music, Architecture, (Product) Design, Advertising, Fashion, Culture heritage
- Application and specific service providers/developers, including management of big and open data
- Network/service delivery providers and broadcasters
- Equipment manufacturers (all kind of) and solution providers/developers
- Research, Education, and Consultancy institutions
- Clusters and associations in the NEM arena
- End users
- Others

At the next NEM General Assembly, the reviewed members' categories will be discussed with the members and afterwards, a final decision will be made.

2.2.2 Mission Document

NEW NEM INITIATIVE

New NEM, the Horizon 2020 European Technology Platform dedicated to Content dealing with Connected, Converging and Interactive Media & Creative Industries[2]

The NEM Initiative is one of the recognized European Technology Platforms (ETPs) of Horizon 2020. The NEM ETP aims at building sustainable European leadership in content, media, and the creative industries. With the launch of the Horizon 2020 programme, a renewed NEM platform ("New NEM") will pursue its objective to promote an innovative

[2] The cultural and creative sectors account for 3.3% of GDP and employ 6.7 million people (3 % of total employment) in the EU. Moreover, worldwide Big Data technology and services are expected to grow from EUR 2.4 billion in 2010 to EUR 12.7 billion in 2015.

European approach to convergent Media, Content and Creativity towards a Future Media Internet that will enhance the lives of European citizens through a richer media experience[3].

The New NEM Initiative focuses on an innovative mix of various media forms, delivered ATAWAD (Any Time, Any Where, Any Device) over technologically transparent networks, to improve the quality, enjoyment and value of life for Europe's connected 'digital citizens' and digital content/media professional users. 'New NEM' is taking cognizance of existing and new technologies, including broadband, broadcast, mobile and new media across all ICT sectors, to create a new and exciting era of advanced professional and personalised services for various markets[4]. A key focus of the New NEM is on innovative services and applications that constitute different media.

The European Technology Platform 'New NEM' is to be a key player in Interactive Content & Media and the Creative Industries, operating within the European innovation ecosystem to help turn Europe into an Innovation Union. 'New NEM' will therefore take a holistic view, identifying the pathway to commercial deployment of research, providing strategic insights into market opportunities and needs, and mobilising and connecting innovation actors across the EU in order to enable European companies and stakeholders to gain competitive advantage in global markets.

NEW NEM MISSION IN A NUTSHELL

1) A strategy function: provide a coherent business focused analysis of research and innovation bottlenecks and opportunities related to societal challenges and industrial leadership actions and develop strategies to address these;
2) A mobilising function: mobilise industry and other stakeholders within the EU to work in partnership and deliver on agreed priorities;
3) A dissemination function: share information and enable knowledge transfer to a wide range of stakeholders across the EU.

New NEM is an industry led and focused ETP. It aims to be inclusive and representative of businesses, research organisations, universities, clusters and associations in their respective fields. New NEM will work in close partnership with Member States and Member State based networks as well as with states associated to the framework programme. New NEM will also need to actively work with other ETPs and engage with stakeholders including those along the value chain such as NGOs, social platforms and consumer/societal groups, to address wider challenges and foster solutions that are socially responsible, inclusive and sustainable. It is our intention that NEM will put in practice the concept of being a cluster of clusters.

Improving the quality, enjoyment and value of the user experience is at the heart of the New NEM. To achieve this objective, we set our main goals as:

- Empowering end users in creating their own media and communications environments
- Creating business opportunity for European actors in the NEM space
- Supporting developments in networked media applications to promote and enhance public well-being

[3] The New NEM Initiative will also discuss a new name in the scope of activities related to reestablishment of the NEM in Horizon 2020.

[4] Business to Business, Business to Business to Consumer, Business to Consumer)

- Promoting environmentally beneficial and sustainable technology in the NEM domain
- Supporting Government, regulators and policy makers in their management and enhancements of the NEM environment
- Supporting and promoting European innovation from NEM communities as a worldwide opportunity for benefit and growth

PARTNERSHIP WITH THE COMMISSION AND MEMBER STATES

The Commission's proposal for Horizon 2020 specifies the channels of external advice for its programming and implementation: as well as taking into account the advice and input from advisory groups, dialogue structures, forward looking activities, targeted public consultations and interactive research and innovation processes, the Commission undertakes to take full account of relevant aspects of the research and innovation agendas established by European Technology Platforms, Joint Programming Initiatives and European Innovation Partnerships.

Together with the innovation system approach underlying the Innovation Union strategy, this provides a strong basis for New NEM to form a strong partnership with the Commission and with Member States.

In order to enable a structured dialogue between the Commission and ETPs, designated Commission representatives will actively participate in the work of the New NEM ETP. Given the cross sectorial nature of New NEM, the primary contact points defined by European Commission in DG Connect are with the Heads of Unit and Project Officers from both the ‘Converging Media and Content’ and the ‘Creativity’ Units.

RELATION TO RELATED EU INITIATIVES

With its insights into strategy, its mobilising and its dissemination capacity, New NEM will contribute to the priority setting and implementation of European Innovation Partnerships. New NEM will work closely with the other ICT ETPs and in particular with the Net!Works ETP. New NEM will work closely with existing Public-Private Partnerships (such as PPP Future Internet), Joint Programming Initiatives and EIT Knowledge and Innovation Communities. New NEM will also seek opportunities to work with ERA-nets, and, will look for support from the relevant Commission departments to help ensure that the necessary links are made, with a view to ensuring synergies are achieved with other ongoing initiatives.

New NEM will investigate a contractual and institutionalised Public Private Partnership in the field of Content, Media and Creative Industries, eventually including the field of Open Data, in order to focus such an initiative as a complementary activity to the Horizon 2020 programs.

NEW NEM CORE ACTIVITIES

The objectives of the New NEM Initiative will be achieved through the following core activities, which can be broadly categorised as:

- Development of Strategic Research and Innovation Agendas, including technology roadmaps and their implementation plans, taking into account the corresponding

sector policy objectives and the potential economic, social and environmental impacts; the agendas will focus on those actions with impact on the market and will propose timeframes for expected outcomes. They will also include regulatory as well as other non -technological barriers such as business models, skills requirements etc ;

- Encouragement of industry participation in Horizon 2020 and helping to widen participation and build capabilities within Member States through active cooperation with networks/partnerships in Member States; this includes identifying opportunities for partnership in the framework of Research and Innovation Strategies for Smart Specialisation implemented in the context of the EU Cohesion policy;
- Identification of opportunities for international collaboration and developing the necessary understanding and framework(s) to facilitate future collaboration;
- Identification of new demands, trends and requirements for education and training in the context of the new NEM environment, to help ensure the development and supply of suitably skilled professional talent, to meet the future demands of our industry sectors and drive economic growth;
- Organisation of NEM Summit events – the major annual event of the New NEM community - and New NEM General Assemblies to bring together all relevant New NEM stakeholders to exchange experiences and discuss broad matters of importance for the community;
- The provision of networking opportunities including with other ETPs to address cross-sectorial challenges and promote the move towards more open models of innovation, by providing opportunities for stakeholders to meet, exchange knowledge, make new contacts and develop ideas for working in partnership;
- Facilitation of new partnerships utilising expertise and understanding within the ETP, for example, to identify parties capable of working together to exploit the outcomes of a research project or address a specific challenge.

3 5G PPP

Horizon 2020 is offering a new instrument: cPPP – Contractual Public Private Partnership to address bigger issues that can be addressed in individual projects, which is based on Article 25 of the Horizon 2020 regulation [10]. In a cPPP the public side (represented by the EU Commission) and the private side (represented by an association) are signing a contractual arrangement. In the communication networking domain the 5G PPP has been launched in December 2013, which will work on a complete new communication network.

3.1 Proposal Preparation and further Steps

In July 2012 the EU Commission invited for a first meeting in order to discuss potential concepts for a PPP in Horizon 2020 with the intended scope on ICT infrastructure and communication networks. A focused Strategic Research and Innovation Agenda (SRIA) was requested to define the potential work program.

At Mobile World Congress 2013 in Barcelona, Spain Vice-President of the Commission N. Kroes called industry for cooperation [11]:

> *"… And today I call on EU industry and other partners to join us in a Public-Private partnership in this area. An open platform that helps us reach our common goal more coherently, directly, and quickly. European 5G is an unmissable opportunity to recapture the global technological lead. And I hope you will be able to support and join us. …"*

A group of organisations prepared a 5G PPP proposal. The SRIA in the proposal is based to a certain extend on the original Net!Works SRIA. The Net!Works ETP with the support of the NetSoc project published the proposed research agenda of the 5G PPP proposal for public consultation in May 2013. NetSoc provided the technical infrastructure for public consultation on the ETP website and facilitated the evaluation by means of the Net!Works Expert Group and incorporation of received comments into the final Strategic Research and Innovation Agenda.

The SRIA identified key challenges and high-level technical key performance indicators. The 5G PPP programme will deliver solutions, architectures, technologies and standards for the ubiquitous 5G communication infrastructures of the next decade:

- Providing 1000 times higher wireless area capacity and more varied service capabilities compared to 2010.
- Saving up to 90% of energy per service provided. The main focus will be in mobile communication networks where the dominating energy consumption comes from the radio access network.
- Reducing the average service creation time cycle from 90 hours to 90 minutes.
- Creating a secure, reliable and dependable Internet with a "zero perceived" downtime for services provision.
- Facilitating very dense deployments of wireless communication links to connect over 7 trillion wireless devices serving over 7 billion people.
- Enabling advanced User controlled privacy.

These challenges result in the following proposed research programme (cf. Annex 3), which is addressing a complete communication network:

- Faster, More Powerful and More Energy Efficient Solutions for integrated High Capacity Access and Core Networks for a Wider Range of Services
    - Wireless Networks
    - Optical Networks
    - Automated Network Organisation - Network Management and Automation
    - Implementing Convergence Beyond the Access Last Mile
- Re-Designing the Network
    - Information Centric Networks
    - Network Function Virtualisation
    - Software Defined Networking
    - Networks of Clouds
- Ensuring availability, robustness and security
- Ensuring efficient hardware implementations

In June 2013 the proposal was submitted to Vice-President N. Kroes for evaluation. The proposal was revised based on received evaluation comments.

On December 17, 2013 the Contractual Arrangement on the 5G PPP was signed between the EU Commission and representatives of the private side on behalf of the 5G Infrastructure Association (Figure 4) [12]. The Contractual Arrangement and the Technical Annex are attached in Annex 4.

The first Call for Proposals was published on December 11, 2013 with an overall funding budget for the 5G PPP objective ICT14 of 125 million € [13]. The submission deadline of proposals is November 25, 2014. It is expected that first projects will start in the first half of 2015.

Figure 4: Signature of the 5G PPP Contractual Arrangement

According to the Contractual Arrangement [12] the overall indicative funding budget for the time frame 2014 – 2020 is 700 million €. This amount will be matched by the private side and including an expected leveraging factor of 5 of additional private investment the value of private investment will be in the order of 3.5 billion €.

5G PPP organised an industry launch event at Mobile World Congress on February 24, 2014 for international press. This activity was supported by the 5G Infrastructure

Association and by the NetSoc project, which prepared a flyer as part of the press information.

Figure 5: Industry launch event at Mobile World Congress 2014 *

* From left to right:
- Ulf Ewaldsson, Chief Technology Officer, Ericsson
- Neelie Kroes, Vice-President of the EU Commission, Digital Agenda
- Mari-Noëlle Jego-Laveissière , Senior Executive Vice President of Innovation, Marketing and Technologies, Orange
- Hossein Moiin, Executive Vice President Technology and Innovation, Nokia
- Luis Sanchez Merlo, CEO SES Astra Ibérica
- Marcus Weldon, Chief Technology Officer and President Bell Labs, Alcatel-Lucent

The NetSoc project in cooperation with the Networld2020 ETP organised two Expert Group meetings on February 5 and 6, 2014 in Stuttgart, hosted by the NetSoc partner Alcatel-Lucent, and on June 23, 2014 in Bologna ahead of EuCNC 2014, which was supported by the NetSoc partner University of Bologna. The Expert Group developed a set of White Papers as input to an update of the SRIA, which will be endorsed and submitted by the 5G Infrastructure Association to the EU Commission as input to the Horizon 2020 Work Programme 2016/17. The following White papers are available and are currently consolidated to a single paper including an aligned roadmap:

- What is 5G (Really) About?
- Mobility/Connectivity and Networking Layer
- Network and Service Virtualisation
- Next Generation of Wireless Networks

- Role of Satellite Communications in 5G

The consolidated White Paper will be published end of July 2014 on the Networld2020 website for public consultation.

In order to address demonstration and trial activities in Phase II of 5G PPP in Horizon 2020 a new White Paper on "5G Experimental Facilities in Europe" is under preparation.

NetSoc was the facilitator of these activities, which were supporting community building, e.g. in the Expert Group, which is open for participation.

3.2 Governance structure of 5G PPP and the 5G Infrastructure Association

Figure 6 shows the governance structure of 5G PPP. Its basic approach is described in the Annex to the 5G PPP Contractual Arrangement in Annex 4 and the legal statutes are attached in Annex 5.

The 5G Infrastructure Association is an international non-profit association under Belgian law. It is the counterpart for the EU Commission to sign the 5G PPP Contractual Arrangement. In addition, the Association has the tasks to provide input to the Horizon 2020 work programme, to monitor the progress of 5G PPP and to mobilise the community to develop project proposals.

It will be supported by the Networld2020 European Technology Platform for example by its working groups, which develop in an open process and based on the wide membership base contributions to the Association for the work program. In the area of contributions to the SRIA and the work program there is a direct link between the ETP and the Association.

The actual projects, which will have a grant agreement with the EU Commission, will be organised in the 5G Initiative. In order to facilitate cooperation between 5G PPP projects a project internal consortium agreement and a collaboration agreement across 5G PPP projects will handle internal procedures, approval procedures, IPR issues and confidentiality.

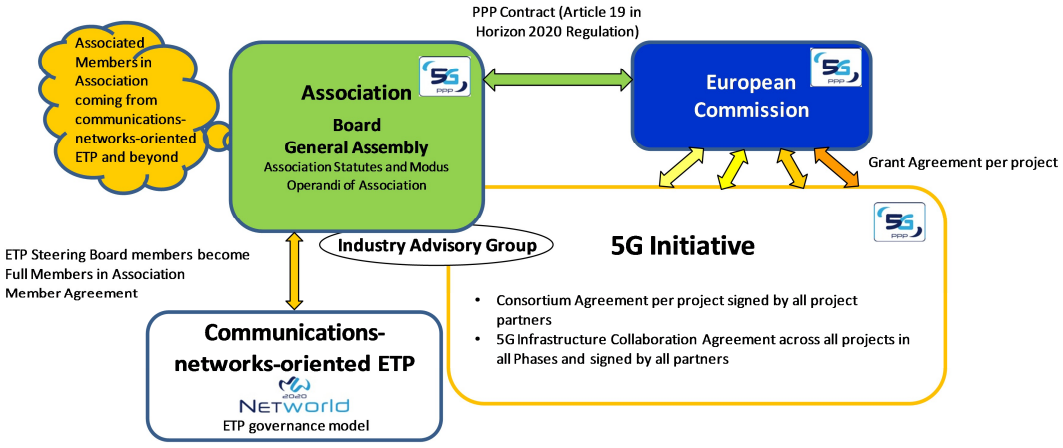

Figure 6: 5G PPP governance structure

The 5G Infrastructure has statutes, which were developed by a legal group. The NetSoc project supported the development of all necessary legal documents by providing the necessary infrastructure.

It is expected that 5G PPP will be organised in three phases during its lifetime from 2014 to 2020. In each phase a set of parallel projects will result as a response to a call for proposals and from the independent evaluation. Figure 7 describes the implementation of projects. Projects in each phase will cooperate in areas where needed. This is shown by the matrix organisation between projects and topic areas.

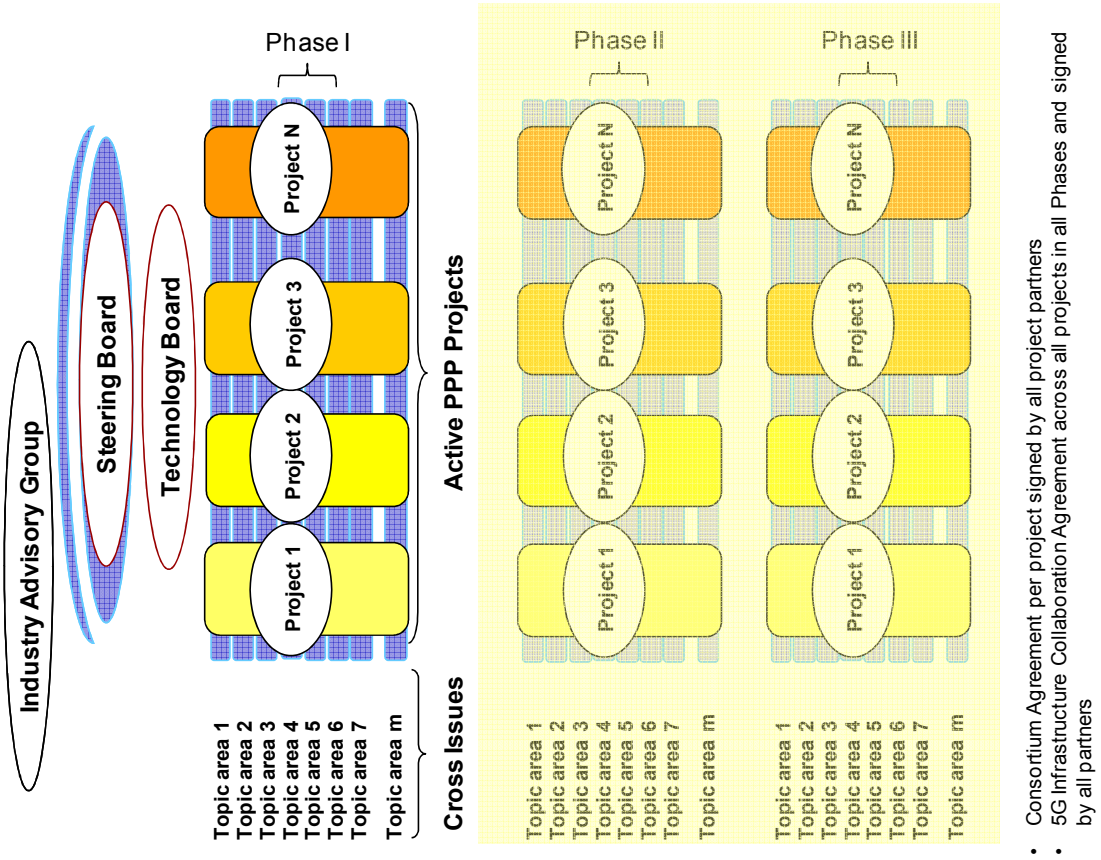

Figure 7: Project implementation in 5G PPP

Part of the governance structure are KPIs according to the 5G PPP Contractual Arrangement in Annex 4. The 5G Infrastructure Association will monitor the progress of 5G PPP based on the following KPIs:

- Business-related KPIs:
  - Leverage effect of EU research and innovation funding in terms of private investment in R&D for 5G systems in the order of 5 to 10 times;
  - Target SME participation under this initiative commensurate with an allocation of 20% of the total public funding;
  - Reach a global market share for 5G equipment & services delivered by European headquartered ICT companies at, or above, the reported 2011 level of 43 % global market share in communication infrastructure.
- Performance KPIs:

  - Providing 1000 times higher wireless area capacity and more varied service capabilities compared to 2010;
  - Reducing the average service creation time cycle from 90 hours to 90 minutes (as compared to the equivalent time cycle in 2010);
  - Very dense deployments to connect over 7 trillion wireless devices serving over 7 billion people;
  - Secure, reliable and dependable Internet with a "zero perceived" downtime for services provision.

- Societal KPIs:
  - Enabling advanced User controlled privacy;
  - Reduction of energy consumption per service up to 90 % (as compared to 2010);
  - European availability of a competitive industrial offer for 5G systems and technologies;
  - New economically-viable services of high societal value like U-HDTV and M2M applications;
  - Establishment and availability of 5G skills development curricula in partnership with the EIT.

The tentative time plan of 5G PPP from the today's perspective is given in Figure 8 based on the Annex to the 5G PPP Contractual Arrangement in Annex 4. Depending on the developments in the global ICT sector with respect to global standardisation and activities in ITU-R this time plan will be updated in order to keep pace with global activities.

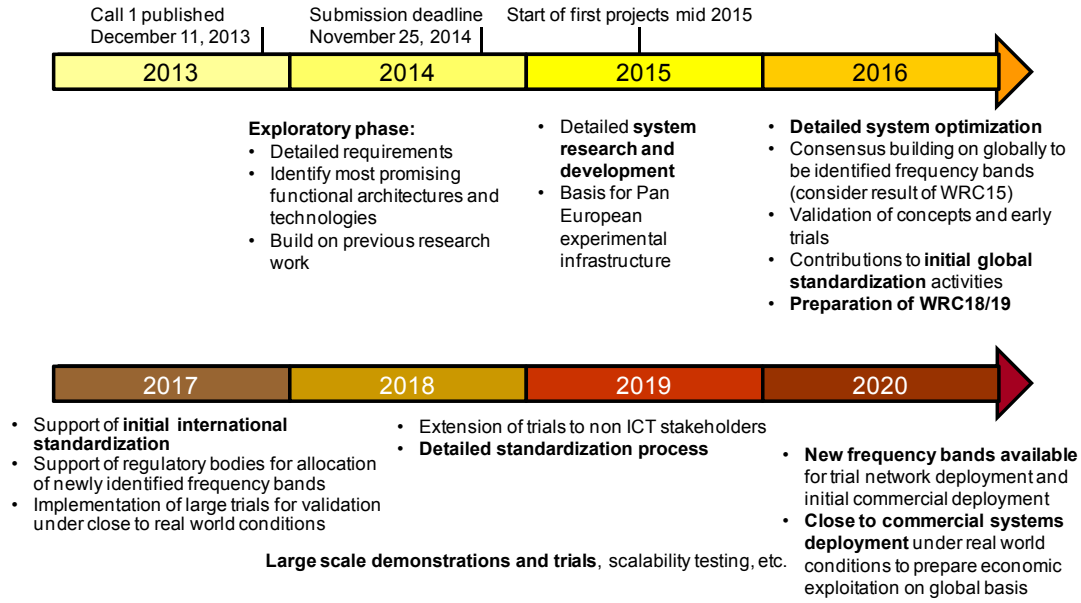

Figure 8: Tentative time schedule for 5G PPP

4 SUPPORT OF STANDARDISATION ACTIVITIES

A Space mandate M/496 (Ref. Ares(2011)946155 - 07/09/2011) has been published by DG Enterprise on 1st September 2011. It aims at fostering the development of standards in Space industry to pave the way for integrating of a variety of space systems and also with other systems.

ETSI mandated the Technical Committee – Satellite Earth Stations and Systems (TC-SES) to execute the following dossiers of the space mandate:

- Dossier 1: Navigation and Positioning (NP) Receivers for Road Applications and Airport Services;
- Dossier 4: Interoperability and Integration of Mobile Satellite Systems (MMS) and Fixed Satellite Systems (FSS) with Terrestrial Systems in particular Next Generation Networks (NGN), and with Global Navigation Satellite Systems (GNSS) in particular Galileo;
- Dossier 9: Disaster Management.

Some NetSoc partners coordinated by TAS-F continued during this second period, to provide support within ETSI to the following FP7 projects developing standards in relation to Dossier 4's space mandate which also falls under NetWorld2020's scope of activities:

Link with Space mandate dossier	Standardisation activity	Work item	Link with FP7 projects	Objective
4	Cognitive radio techniques for Satellite Communications	DTR/ERM-513	CoRaSat	Evaluate the potential of cognitive radio techniques in SatCom for flexible spectrum allocation
4	Hybrid FSS satellite/terrestrial network architecture for high speed broadband access	DTR/SES-00347	BATS	Architecture supporting broadband access delivery using both satellite and terrestrial access technologies
4	Environmental impact of Satellite broadband network	DTR/SES-00344	BATS	Framework definition to evaluate the energy efficiency of satellite broadband networks (derived from terrestrial broadband network)

The first 2 work items are now near completion and the third is planned to be finalised around end of 2014.

5 INTERNATIONAL COOPERATION

NetSoc supported activities on international cooperation by contributing to a joint workshop between the EU Commission and the Korean government on potential joint calls for proposals as well as a first step of international cooperation of 5G PPP.

5.1 Support of high-level EU-Korea event

In the scope of its activities related to international dimension of the European research and innovation programmes, the NetSoc project supported organisation of the High-level Korea-EU Workshop on "exploring common research interest in the Future Internet and Cloud", held in Seoul, Korea, on 30 September - 1 October 2013. The main NetSoc activities were in moderating and preparing the workshop sessions as well as creation of the report from the workshop, which was submitted to EC and is summarised below. Additional details from the workshop can be found in the report, which is submitted with this deliverable as a separated attachment, such as detailed research topics/issues of interest for both Korean and European communities, where both technical and non-technical issues are considered, and potential collaboration areas among Korean and European partners, targeting Horizon 2020 programme.

The Korea-EU Workshop consisted of 6 sessions in two streams with Korean and EU speakers on the following subjects:

- Session A1: Generic Architectures
- Session A2: SDN/NFV/Optical
- Session A3: Future Internet access networks for 5G
- Session B1: Internet of Things
- Session B2: Testbeds and experimental research
- Session B3: Cloud Computing

The goal of the workshop was to

- identify short and longer term commonalities between Korean and EU projects and research subjects,
- show ways ahead for cooperating in these areas,
- identify items of common interest which should be contained in the Horizon 2020 Work Programme 2016/2017.

5.1.1 Session A1 – Generic Architectures

This session was to explore the status and research trends in EU and Korea on advanced Internet architectures, notably those researched from the point of view of redefining addressing and naming of content and/or services and their access in complex networks.

Presentations

1) David GRIFFIN, "Service Oriented Networking", University College London (FUSION)
2) HeeYoung Jung, "ID-based Communication", ETRI

3) Nicola BLEFARI, "Information Centric Networking: Changing the Internet from Within" University of Rome (GREEN ICN)
4) Woojik Chun, “A Trustworthy Communication Framework based on Insulated Domains”, ETRI
5) Sergi FIGUEROLA, “Early RINA prototyping and deployment under the IRATI project, and the future research in PRISTINE and IRINA projects“, I2CAT
6) Ted “Taekyoung” Kwon, “NDN routing”, Seoul National University
7) Kostas PENTIKOUSIS "Beyond Scenarios and Architectural Discussions: ICN meets the Real World" (EICT)
8) Doug Young Suh, “Cooperative video services over mobile ICN”, Kyunghee University
9) George POLYZOS “The Publish/Subscribe Information-Centric Networking Architecture: Unique Features and Outlook”, AUEB;
10) Yong Yi & Byoung-Joon(BJ) Lee, “Modeling ICN performance for feasibility and engineering insight”, KAIST & Samsung

EU projects involved in the presentations:

- FUSION project will bring SMEs to FIRE networking facilities so that SMEs can test out and experiment with innovative applications, services and systems on state-of-the-art networking facilities. The project is running from January 2013 to December 2015. www.fusion-project.eu
- IRATI is investigating RINA. It will advance the state of the art and build a prototype. The project is running from January 2013 to December 2014.
- PRISTINE will design and develop a SDK for IRATI RINA prototype. It will also do some experimentation. It will start in Jan 2014. The project will be running from January 2014 to mid 2016.
- IRINA It will study RINA against the current networking state of the art and perform a use case study. It will start in 2 months. The project will be running from November 2013 to mid 2015.
- GREEN ICN is an EU project with several Japanese partners. It addresses how the ICN network and devices can operate in a highly scalable and energy-efficient way. Main scenarios are disaster recovery (fragmented networks) and video delivery. The project runs from April 2013 to March 2016. http://www.greenicn.org
- PURSUIT Testbed with 25 nodes in 5 countries (UK, FI, GR, D, US), tunnelled (VPN) over the public Internet.
- PSIRP Testbed in 6 countries (UK, FI, GR, D, BU, US), tunnelled over the public Internet + dedicated fibre where available.
- φSAT Testbed with SAT emulation.

Korean projects involved:

- MCCN project for cooperative video, running from 2013 to 2018. The goal is simultaneous and related video content sent from mobile devices, used to generate combined multimedia content. An application is e.g. cooperative spectators in football stadium.
- Study on ID-based networking technology for high quality future Internet. Background is the EU-Korea joint project SMARTFIRE, which is running since Nov. 2013 until end of 2015.
- Study on Architecture of Future Internet to Support Mobile Environments and Network Diversity: the study was about MOFI (Mobile oriented Future Internet): a

new architecture of future Internet to support the mobile environment, based on Host Identifier and Local Locator (HILL), Query-First Data Delivery (QFDD), and Dynamic and Distributed Mapping System (DDMS). The study was closed early 2013 as background work for the Study on ID-based networking technology for high quality future Internet. http://www.mofi.re.kr/

- DIANA: Design Principles of Domain-Insulated Autonomous Network Architecture for the Future Internet. The study was background work for the Study on ID-based networking technology for high quality future Internet.
- TREE: Modeling ICN Performance for Feasibility and Engineering Insight

Key Issues discussed

Information Centric Networking (ICN):

- ICN is a new paradigm where the network provides users with named content, instead of communication channels between hosts. Research on ICN is at an early stage, with many key issues still open, including naming, routing, resource control, security, privacy and a migration path from the current Internet. Information-centric networking has transformed over the last years from a niche research topic to a growing area which aims to provide answers to all significant challenges we are facing today with the host-centric paradigm. The ICN community has developed a number of scenarios where the approach is more suitable to the way we use networks today and demonstrated that ICN solutions are feasible in practice. We should make use of existing (testbed) infrastructure to devise methods for pushing ICN towards real-world deployment.

Service-Oriented Networking (SON):

- Resource-demanding services require more de-centralised service-aware solutions to reduce delays and increase throughput. A new service-aware anycast networking paradigm is required to route service invocations based on service names to one of many server replicas, with selection being made on proximity, network and service performance metrics.

RINA (Recursive Internet Architecture) with inter-process communication (IPC):

- RINA Architecture is a structure of recursive layers that provide IPC (Inter Process Communication) services to applications on top. All layers have the same functions, with different scope and range. The flow of RINA activities are core RINA specifications, policies for different areas, simulation, building prototypes, use case analysis, and experimentation.

ID based communication:

- ID based communication is a type of communication using solely identifiers of communication objects - Benefits are diversity, trustworthiness (self-certifying ID), evolvability (easy introduction of new network/service technology). Challenges are scalability, ID-based API, trustworthy networking. Related EU FP7 projects are SAIL, PURSUIT, RINA.

Security:

- The Internet was born in a small and trustworthy environment, but now becomes global and untrusted. There is no ultimate solution on attacks. The goal must be to go back to a trustworthy environment, and still keep global connectivity. The presented framework builds a trust zone as an “insulated domain” and extends it to general public.

5.1.2 Session A2 – SDN/NFV/Optical

This session explored the impact/benefits perspective of the expected massive deployments of software technologies in networks and how network may be reshaped accordingly, from the perspective of running (upcoming) Korean and EU projects. It included research trends in the areas of control and management for optical networks, including associated technologies, aiming at addressing the need to have more dynamic and flexible networks, as well as the management of heterogeneity within and between networks.

Presentations

1) Jun-Ku Kevin Rhee, “CDN interconnection: IETF Telco CDN model”, KAIST
2) Dimitra SIMEONIDOU, "Application Programmable Optical Networks: Application Enablers & Challenges", University of Bristol (STRAUSS)
3) Ioannis TOMKOS, "Cognitive flexible optical networking as enabler for the future internet", AIT (FOX-C)
4) Sun-Me Kim, “SDN-based Control Technology for Access-to-Core Optical Transport Network”: SDON, ETRI
5) Juan FERNANDEZ-PALACIOS, “Control plane and SDN interworking for E2E networks”. Telefonica I+D (IDEALIST)
6) Myung-Ki Shin, “A Formal Verification of SDN and Carrier grade SDN”, ETRI
7) Sergi FIGUEROLA, “OpenNaaS: an European Open Source framework for the delivery of NaaS. An enabler for SDN and NfV”, I2CAT
8) Ki Sang Ok, “Service Chaining and Network Management with SDN”, KT
9) Diego LOPEZ, "The Abstraction Track. Going beyond Network Virtualisation", Telefonica, (T-NOVA)
10) Seung-Won Shin, “Redesigning Network Security Applications with SDN”, KAIST

EU projects involved:

- STRAUSS Project with various Japanese partners. The project defines a highly efficient and global (multi-domain) optical infrastructure for Ethernet transport, covering heterogeneous transport and network control plane technologies, enabling an Ethernet ecosystem.
- CHRON: cognitive network (self-learning network optimization and adaptation, significant reduction of routing calculation complexity). The CHRON physical testbed allows the performance evaluation of the cognitive decision system in a realistic physical testbed including the control plane and the data plane.
- FOX-C: all optical grooming techniques, add-drop sub-channels. Expected benefits are reduction of the total number of transponders, and spectrum savings, which could be utilized for the provisioning of new traffic and/or revenue generating services.
- INSPACE: Spatially and Spectrally Flexible Optical Networking. Extend the flexibility to the space switching domain, multi-dimensional switching granularity,

channel allocation over multiple Modes/Cores/fibres & multiple spectral slots, optimized system bandwidth usage with combined spectral and spatial optimization, multi-dimensional flexible switching.
- IDEALIST: modular and standard SDN controller; example: multi-layer provisioning workflow.
- OpenNaaS is an EU project providing a robust and extensible open framework for offering the network as a service.

Korean projects involved:

- KAIST CDN Interconnection s a large project with various partners. Issues: CDN / ISP conglomeration, ISP-ISP cooperation, CDN-CDN contract with exchange of cost.
- Korea CDNI Testbed 2012 and Korea CDNi Field Trial Service Testbed 2013 (user locations interconnected via GIGA Zone). Korea developed a CDNi testbed in 2012 (first CDNi testbed in the world) and performs a CDNi field trial in 2013
- Formal Verification of SDN and Carrier grade SDN was launched this year; currently investigating key technologies

Key Issues discussed

Optical networks:

- OpenFlow Extensions for Optical SDN - Space Division Multiplexing (SDM) has been proposed to increase the capacity of optical fibres. Open optical hardware: one hardware provides any function (within hardware limits) at any time. A first SDN and multi-granular testbed with programmable optical nodes is existing. Dynamic Multi-Layer Planning/Operation of Flexible Multi-Terabit Core Networks - Spectrum/Bitrate Flexible Core Optical Networks to support elastic-Bandwidth: Introduction of the concepts of Routing and Spectrum Assignment (RSA) and Routing, Modulation Level and Spectrum Assignment (RMLSA) algorithms.

Software Defined Networking (SDN):

- Software Defined Networking (SDN) over SDM (Space Division Multiplexing) - Main issues: can SDN enable a single platform for programmability and multi-technology infrastructure convergence? Is it scalable to trillions of devices? Software Defined Optical Network (SDON) can help to increase revenue, reduce CAPEX/OPEX and provide vendor independency through their flexibility, standard, openness, and virtualisation. The momentum of SDNs and the number of vendors providing interfaces supporting OpenFlow and Web Services offers and excellent opportunity and confirms that the market is already moving in this direction. Also network security applications can be redesigned with SDN in a cost effective manner. OpenNaaS is extensible, scalable and programmable; different stakeholders can benefit from tailored solutions implemented with OpenNaaS. OpenNaaS HAL allows virtualization and a separation of control and forwarding planes enabling SDN architectures.

Network Function Virtualisation (NFV):

- The NFV concept sees long lasting features (transport) HW based; and easy to change, service/technology dependent features SW based. Benefits are increased

speed to market, reduced cost, wide variety of eco-systems, etc. Challenges are high performance, co-exiting with legacy frameworks, etc.

Content Delivery Network Interconnection (CDNi):

- Telcos need to minimize IX traffic (ISP interconnection). CDNi can minimise CAPX investment. Research issues are: formal methods for verification of CDNi, performance monitoring with live traffic, standardisation of relevant topics, telco business models and related issues.

Network Convergence (closely linked with session A3!):

- Convergence of fixed transport networks with wireless network connectivity at the edge.

Business Cases (linked with all sessions)

- Telcos need to reduce their CAPEX and OPEX, and provide services in a faster and simpler way. SDN and NFV can help for that.

5.1.3 Session A3 - Future Internet Access Networks for 5G

This session explored technological trends towards integration of access networks towards 5G and advanced approaches towards broadband wireline/wireless networks with prospects of lower OPEX/CAPEX.

Presentations

1) Dr. Dongjoo PARK, "The 5G Mobile and Wireless Communications: Network Architectures", Ericsson-LG (METIS)
2) Younglak Kim, “SUPER Cell for 5G”, SK Telecom
3) Jean Charles POINT, "Challenges in Fixed / Mobile Converged broadband access networks", JCP Consult (COMBO)
4) Jaewon Cho, “Millimeter-wave communication for 5G”, Samsung Electronics
5) Thomas BONHERT, “Mobile Cloud Network, Motivation, Vision and Challenges”, University of Zurich for applied sciences (MOBILE CLOUD NETWORK)
6) Jiehyun Lee, “The way forward to wired & wireless converged access networks”, ETRI
7) Colin WILLCOX, "Integrated Self-Management for Future Radio Access Networks", NSN
8) Dongseung Kwon, “Smart Mobile Cloud Radio Access System”, ETRI
9) Emilio CALVANESE-STRINATI, "mmW Small Cells: Challenges and opportunities", CEA-LETI, (MIWEBA, MIWAVES – mm access)

EU projects involved:

- METIS (Mobile and wireless communications Enablers for the Twenty-twenty Information Society). Integrated Project under FP7 to lay the foundation of 5G, the next generation mobile and wireless communications system. https://www.metis2020.com/
- COMBO: Integrated Project under FP7 dealing with business and technological challenges of FMC.

- MOBILE CLOUD Networking: FP7 project extending the Concept of Cloud Computing beyond data centres towards the Mobile End.
- SEMAFOUR is a FP7 Project running from September 2012 to August 2015 to develop a unified self-management system efficiently operating a heterogeneous mobile network comprising a multitude of radio access technologies and layers. www.fp7-semafour.eu/
- MIWEBA: smaller scientific & technically focused project in the Call Europe-Japan. The project conducts research and development of mm-wave overlay heterogeneous network in which mm-wave ultra-broadband base stations employing recent state-of-art technologies of mm-wave devices are introduced and integrated into conventional cellular networks.
- MIWAVES: large Integrated Project under FP7.

Korean projects involved:

- SUPER Cell: SK's vision for network evolution (driven by mobile traffic growth, Internet of Everything, service enrichment and data explosion). Small cell network architecture.
- GIGA KOREA: low-cost and high capacity NG-PON2 core technology for next generation multi-service applicable access platform, developing key technology for OFDMA-PON with 10 Gb/s
- SCRAN: wireless access virtualisation Smart Cloud RAN controller, Cloud radio resource management technology; a testbed prototype is available.
- Contents delivery RAN: upcoming project addressing issues on current RAN: mobile operator OTT provider, mobile user HD video content with high QoE, Intelligent Base Station and ICN inside RAN.
- Low-cost and high capacity NG-PON2 core technology for next-generation multi-service applicable access platform developing cost-effective key components (VCSEL array TOSA, tunable transceiver, burst-mode amplifier, array LDD, burst TIA) for NG-PON2. The project is running from beginning of 2010 to beginning of 2015.
- PON Transceiver with Real-Time OTDR function implemented a "dedicated OTDR", which enables "in-service" monitoring and develops a cost-effective "External OTDR". The project is running from mid 2012 to mid 2015.
- Developing key technology for OFDMA-PON with 10 Gb/s line rate implementing DSP based real-time processing for OFDM modem and investigating cost-effective & low-complexity configuration for access network. The project is running from mid 2011 to beginning of 2015.
- Advanced Technologies of Access Network for Traffic Capacity Enhancement investigating advanced technologies for B4G access network and developing "Dynamic wavelength allocation" in "Ring-topology" configuration. The project is running from beginning of 2013 to end of 2015.
- Radio over fiber network for 5G distributed antenna system investigating IF multiplexing technology for access network and developing cost-effective analogue optical transmitter with high linearity. The project will be running from beginning of 2014 to end of 2016.

Key Issues discussed

5G Architecture:

- Driven by: increased traffic volume (about 10-fold in 4 years), more multimedia, more and richer services, Internet of everything (connected devices up to 50 Bln), decreased energy consumption. Very important for the 5G architecture is the backhaul. 5G architecture shall allow the decoupling of data and control planes and define a methodology to simplify addition of new function sand determine combination of such functions for new services. Existence of moving nodes (e.g. cars) which can act as a nomadic access nodes.

Key features and technological challenges:

- Increase spectrum requirements - Millimetre-wave communication for 5; larger bandwidth is required for Gigabit user experience, e.g. through higher frequencies and aggregation. Heterogeneous network with mmW small cells and backhaul, Blue radio: EMF reductions over all network, Green radio: energy efficient low power systems.

Business models (linked with all sessions):

- Creation of new revenue streams. Reduction of CAPEX/OPEX. Increase of ARPU. Reduction of energy consumption. CAPEX in mobile networks is very high (about 15% of revenues). 5G will need sustainable new business models for fixed and mobile broadband subscriptions. Dual access subscribers will need specific service bundles in which FMC networks are key to support them.

Mobile Cloud Networks:

- Data centres need to move closer to the mobile end user. Potential Mobile Cloud Network services are: MCN services (e.g. RANaaS), MCN support services (e.g. load balancing), MCN atomic services (e.g. storage).

Fixed/mobile convergence (closely linked with session A2):

- FMC networks should overall target a better distribution of fixed and mobile network elements and functions. Multi-operator/multi-vendor fixed and mobile environment must be enabled. A converged network needs to be open and support multiple operators as well as multi-vendor interoperability.

Management for Future Radio Access Networks:

- In the area of future mobile network management the current key challenge is managing future network complexity. Key areas to be addressed are dynamic spectrum and interference, automated traffic steering, active reconfigurable antenna systems, integrated SON management. 5G systems will need to make better use of available context information in order to predict user location and traffic demand for a more efficient resource management.

5.1.4 Session B1 – Internet of Things

This session explored major research trends in relation to Internet of Things (IoT) infrastructures, architectures and applications. The preferred approach is oriented towards common architecture and infrastructure frameworks and enabling platforms, which should support multiple use case and application scenarios.

Presentations

1) Emilio Calvanese Strinati, "European IoT infrastructure perspective", CEA-LETI
2) Kae-Won Choi, "Service discovery in device-to-device communication", SNUST
3) Raffaele Giaffreda, "iCore cognitive framework: results and challenges ahead for a Smart IoT" , CREATE-NET (ICORE)
4) Raffaele Giaffreda (on behalf of Jorge Pereira-Carlos, ATOS), "The holistic IoT Infrastructure - Facing Smart City Challenges to federated IT platforms and organizational frameworks"
5) Daeyoung Kim, "The Three Musketeers, IoT, Cloud, and Big Data: One for All, and All for One", KAIST
6) Jaiyong Lee, "WSN Management Technology for sustainable IoT Services", Yonsei Univ.
7) Dongman Lee, "Spontaneous service provision framework in an IoT-rich smart place, KAIST
8) KangYoon Lee, "IoT leads Smarter Industry Transformation" , IBM Korea Lab
9) Gregor Schiele, "Linked Data and the Internet of Things", DERI (OPENIOT & VITAL)

EU projects involved:

- CityPulse: Real-Time IoT Stream Processing and Large-scale Data Analytics for Smart City Applications
- GAMBAS: Generic Adaptive Middleware for Behavior-driven Autonomous Services
- iCORE: Internet Connected Objects for Reconfigurable Eco-systems: A project aiming to develop a cognitive framework for smart IoT objects
- OpenIoT: Open Source Cloud Solution for the Internet of Things
- VITAL: Smart, secure & cost-effective integrated IoT deployments in Smart Cities

Korean projects involved:

- WSN management technology for sustainable IoT services (Yonsei University)
- SpinRadar: A Place-Aware Service Provision Framework in An IoT-rich Smart Space. A Future Internet service platform for Smart IoT environments (KAIST).
- Real-Time and Embedded Systems Laboratory (KAIST) – covering various projects: Sensor Networks For An All-Ip World (Snail), Seahaven(Visual Sensor Networks+Cloud+Big Data), IoT Mashup As A Service (IOTMAAS), Scalable EPC Sensor Networks, Cognitive Radio Enablers.
- IoT Service Platform (IBM Korea)- Platform is being applied in the context of automotive market (Kang Yoon Lee)
- Service discovery in device-to-device communication (SNUST)

Key Issues discussed

The general theme of the session was convergence between IoT, Big Data and Cloud (what Daeyoung Kim of KAIST called 'the Three Musketeers'). This convergence spans from individual contexts and IOT-rich spaces to specific IOT applications and systems, to integrated smart city environments. As IoT matures and becomes much more widely deployed, there is a need to move from bespoke applications to more standardised approaches.

Integrating IoT into Smart City Environments

- With the move to 'smart cities', urban environments are becoming more and more equipped with digital artifacts, sensors, actuators, displays, networks, and platforms. IoT technologies are a key element of the ICT framework of the smart city: enabling data collection, storage, analysis and evaluation; supporting cross-domain information structuring and exchange; easing knowledge discovery, creation and sharing; and facilitating minimal or non-human involvement. Cities are not green-fields for IoT platforms, however. On the contrary, many existing 'silos' of approaches, solutions, services, applications and networks have to be overcome in order for new IoT technologies to be integrated into smart city environments. In addition, there are many challenges beyond technology. As yet, examples are lacking for large-scale deployment of IoT integrated platforms within a real world Smart City infrastructure. Similarly, there is no clear business case to develop, deploy and maintain such platforms at large scale. Developments on governance, economics, policy-making and other organizational aspects required for the adoption of the technology show slow progress.

'Big Data' from IOT Sources

- IoT is intimately connected to the Big Data 'explosion'. By 2020 there will be billions of connected objects able to collect data and communicate via the network. Thus, there is a growing need to dynamically interpret and filter this wealth of object-produced data and make it useful across application domains. This requires us to move from today's 'craft IoT', where data is interpreted and used in specific contexts, to a more 'cognitive IoT', where we are able to model the system and extract knowledge from it. Such innate cognitive abilities will help make IoT more interoperable, resilient and dependable.

IoT Services on the Cloud

- Closely related to Smart Cities and Big Data is the issue of IoT-based service platforms. For IoT to deliver services that are relevant to user's daily life and work, Future Internet Service Platforms will be needed that provide user-centric services. These service platforms must bridge cyber-space (services) and physical space (IoT and real-world objects, RWOs) and take account of the user's context (place, time, semantics, intentions, etc). Place/space ontologies, context extraction, service composition/ reconfiguration, and IoT mashup-as-a-service are all potential research areas.

IoT Infrastructure

- The infrastructure for IoT will continue to evolve taking account of developments such as: device-to-device (D2D) communication, an emerging wireless technology enabling direct communication between devices; the sustainability of wide-scale wireless sensor networks (WSNs), requiring lifetime criteria of WSN and energy efficient management techniques; novel approaches to energy management and low power communications; and new approaches to network management in the context of M2M and many autonomous resources.

5.1.5 Session B2 – Testbeds and experimental research

This session explored testing and experimental facilities approaches in both the EU and Korea with the objective of defining joint research through testbeds and experiments, and possibilities to federate experimental facilities in the two regions.

Presentations

1) Taesang Choi, “Application Optimized SDN Experimentation between EU and Korea”, ETRI
2) JongWon Kim, “OF@TEIN: OpenFlow-enabled SDN testbed over TEIN”, GIST
3) Sungwon Lee, “Open Mobile Testbed Platform based on Open Source Software”, Kyunghee Univ.
4) Nikos Makris, “SMARTFIRE - Enabling SDN ExperiMentAtion in WiReless Testbeds exploiting Future Internet Infrastructure in South KoRea and Europe”, University of Thessaly (SMARTFIRE)
5) Taejoon Park, “Cyber-physical systems: Testbeds and beyond”, DGIST
6) Kostas Pentikousis, "Large scale testbed configuration and control: the OFELIA experience and the way forward", EICT (OFELIA, FELIX, ALIEN)
7) Bart Puype, “Testbed federation: architecture, infrastructure and applications, iMinds (FED4FIRE and FELIX)
8) Alina Querheillac, “Testbed Interoperability Architecture in the OpenLab initiative”, INRIA (OpenLab)
9) Dimitra Simeonidou, “Testbed in High Performance Networks”, University of Bristol (OFELIA, FIBRE, ALIEN)

EU projects involved:

- FED4FIRE: is delivering a common federation framework for Future Internet Research and Experimentation facilities that will be widely adopted by different communities (experimentation facilities, experimenters, academia, industry).
- FELIX: (FEderated Test-beds for Large-scale Infrastructure eXperiments). Aims to create a common framework in which users can request, monitor and manage a slice provisioned over Future Internet experimental facilities in Europe and Japan. The OCF will be used to federate between Japanese testbeds (non-OCF) and European ones.
- FIBRE: Aims to federate different test-beds between Brazil and Europe. The project operates one global trans-oceanic test-bed using OFELIA Control Framework (OCF).
- OFELIA: An OpenFlow for researchers and other projects in Europe. The concept is based on the federation of resources “islands” in BE, DE, ES, CH, IT & UK, with links to Brazil, Japan and Internet2.
- OpenLab: aims to create a Future Internet Experimental facility to explore Future Internet proposals, integrating eight existing testbeds, and enabling easy integration of future testbeds.
- RISE (Research Infrastructure for large-Scale network Experiments): an OpenFlow testbed over JGN-X, with wide-area coverage from US West coast to Southeast Asia. Users can experiment and validate their own SDN, cloud, and OF controller solution in the RISE sandbox.
- SMARTFIRE: an EU FP7 project that aims to provide a large-scale intercontinental OpenFlow-based testbed with wireless and wired packet switching; and the creation

of a federated facility out of many smaller-scale testbeds in Europe and South Korea.

Korean projects involved:

- OF@TEIN: OpenFlow-enabled SDN testbed over TEIN
- Application-optimized SDN Experimentation between Europe and South Korea: a proposal under development addressing key challenges in the field of SDN (ETRI)
- KOREN, an NIA project for a WLAN/cellular testbed using open source software and connecting five Korean universities (Kyunghee Univ).
- Cyber-Physical Systems, including testbeds for smart homes, smart vehicles and smart microgrids (DGIST).

Key Issues discussed

Development of large-scale SDN-based testbeds

- Many of the presentations focused on the future development of large-scale SDN-based experimental testbeds. The central challenge is to prove the scalability of SDN concepts in various contexts. Extending and enhancing current SDN architectures and integration with different (existing) control frameworks would be one such goal. There is also a need for common APIs and for optimising between the application layer and the resource layer. Novel applications and uses of these next-generation SDN networks were also discussed: one aim would be to extend SDN control to distinct network segments such as the optical layer. In addition, there are opportunities in Network DevOps, using SDN-based testbeds to train the next generation of skilled network operators. On the European side, there was considerable discussion of OCF, OFELIA Control Framework, an open source software suit for experimenting with Openflow-/SDN-related technologies. This is seen as providing an excellent testbench for Openflow/SDN controller development. It offers a scalable, distributed architecture that is resource independent, allowing users to experiment on top of real/virtual OpenFlow facilities and to deploy their own private virtual facility for experimenting with OpenFlow.

Supporting novel networking innovation

- The ability to combine existing and emerging technology and tools within novel networking scenarios is a key driver in the development of Future Internet experimental facilities. SDN offers the potential to provide a single platform for interconnecting/federating cross-technology experimental testbeds, allowing experiments with emerging technologies such as Internet of Things, information-centric networking (ICN), and wired/wireless. With the advent of 5G systems, novel testbeds targeted to the needs of telcos are of particular interest. In testing this next generation of open mobile communication systems, there are opportunities for evolution from current approaches based on cloud networking, open source networks and network function virtualisation towards SDN and other software-based approaches. In Korea, for example, five universities are connected via KOREN, an NIA-funded project to implement a WLAN/cellular testbed using OSS. Current use cases (all using SDN) include: heterogeneous carrier aggregation, 3GPP core network evolution, and content-centric handover.

Exploiting existing initiatives

- A major cooperation between South Korea and Europe in the area of testbeds is already underway in the SMARTFIRE project. This is implementing a large-scale intercontinental OpenFlow-based testbed with wireless and wired packet switching by federating many smaller-scale testbeds in Europe and South Korea. The key focus is in enhancing OpenFlow experimentation with wireless connectivity. The five Korean testbeds bring experience in high speed OpenFlow connections, and especially in the utilization of their capabilities for content-centric experimentation. The three European testbeds bring their knowledge in wireless experimentation. One of the objectives is to harmonize the Korean testbeds by using the frameworks that are widely used worldwide for testbed control, experimentation and federation (OMF & SFA). The project involves five European partners, five Korean partners, plus National ICT Australia.

5.1.6 Session B3 – Cloud Computing

This session explored on-going research activities in the EU and Korea regarding Cloud Computing, covering topics such as heterogeneous clouds, cloud brokering and cloud storage. The aim was to identify and specify the areas where joint research is needed to build up a federated Cloud environment, in which services and data can be hosted and executed efficiently across borders. The focus of the joint research will be to develop technologies leading to global and interoperable standards thus allowing portability of cloud applications and services.

Presentations

1) Jaesuk Ahn, 'Open Source cloud technology to support large scale public cloud'
2) Vladimir Bataev, "MobiCloud: a novel cloud-based infrastructure for developing and managing cross-platform context-aware mobile applications for enterprises" (MOBICLOUD), EsperantoXL
3) Patrizio Dazzi, "Contrail Cloud Federations" (CONTRAIL), CNR
4) Geir Horn, "Automated support for multi Cloud deployment" (PASSAGE), U. Oslo
5) Eui-Nam Huh, 'Mobile Cloud with Wearable Devices', Kyunghee Univ.
6) Sungin Jung, 'Technology for achieving Cloud service ecosystem', ETRI
7) Bumsoo Kim, ‘Software defined storage in cloud: automatic storage tiring, storage virtualization', Korea Telecom
8) Kirk Kim, 'Samsung Data System's (SDS) open source cloud case study on to support massive mobile echo system'
9) Marta Patino-Martinez, "Ultra-Scalable Data Management and Transactional Processing" (CUMULONIMBO & COHERENTPAAS), UPM
10) Ewald Quak, "Agile Engineering in the Cloud" (CLOUDFLOW), Sintef
11) Antonia Schwichtenberg, "Brokerage Services in the Cloud from an Industrial Perspective" CAS, (BROKER@CLOUD)
12) Alexander Wolf, "Hardware- and Network-Enhanced Software Systems for Cloud Computing" (HARNESS), Imperial College
13) Chanhyun Yoon, 'Cloud collaboration system and management', KAIST

EU projects involved:

- BROKER@CLOUD. The project aims to enable continuous quality assurance and optimization in future enterprise cloud service brokers.

- CLOUDFLOW, aims to allow manufacturing businesses to access engineering services on the Cloud, including HPC resources. The consortium aims to expand CloudFlow from an FP7 project to an international CloudFlow Manufacturing Technology Platform (MTP) project as part of the IMS program. CloudFlow will also join I4MS-Gate, a European reference portal on ICT innovation for manufacturing SMEs (www.i4ms.eu).
- CONTRAIL, aims towards federations that facilitate the deployment and management of applications on multiple clouds. It manages the diversity by abstracting resources at low level, and so is more than just a portal or brokerage.
- CUMULONIMBO & COHERENTPAAS, CumuloNimbo has delivered an ultra-scalable SQL that aggregates computing power across thousands of nodes. CoherentPaaS extends CumuloNimbo with support for NoSQL, Complex Event Processing (CEP) and SQL technologies integrated in a single unified platform, allowing applications to access any combination of data stores.
- HARNESS, aims to incorporate innovative hardware and network technologies seamlessly into data centres that provide platform-as-a-service cloud infrastructures.
- MobiCloud: A novel cloud-based infrastructure for developing and managing cross-platform context-aware mobile applications for enterprises
- OPTIMIS is a 'software infrastructure-as-a-service' offering that enables organizations to automatically externalize services and applications to best-execution venues in the hybrid cloud model. The project, which has just completed, delivered an open specification and a toolkit that supports the construction of next generation cloud architectures.
- PASSAGE, aims at creating a development and deployment platform together with an appropriate methodology for helping software engineers create new applications and migrate old applications that can run on multiple Cloud platforms.
- VISIONCLOUD is developing an architecture and reference implementation of a cloud-based infrastructure building on open standards and new technologies, capable of optimized delivery of converged data-intensive services. [The project was not represented at the meeting but has expressed interest in future collaboration].

Korean projects involved:

- Mobile Cloud with Wearable Devices (Kyunghee Univ)
- Cloud Collaboration System, focusing on cloud collaboration middleware for virtualized resource management, brokering and SLA management (KAIST)
- Technology for Achieving Cloud Service Ecosystem, focusing on cloud brokering (ETRI)
- Software defined storage in cloud, a proposal to use SDS based on the Openstack to cost-effectively build distributed & heterogeneous cloud storage infrastructure and reduce the managing cost of data (Korea Telecom)
- SDS Personal Cloud Service (Samsung)

Key Issues discussed

Participants explored opportunities for joint research to build up a federated Cloud environment, in which services and data can be hosted and executed efficiently across borders. Hybrid, federated and mobile aspects featured prominently in the discussion.

Advanced federated clouds

- Advanced brokering in multi-cloud environments was highlighted. As enterprise IT environments becoming increasingly complex, cloud brokers are emerging as intermediaries between customers and services providers, providing quality assurance and helping to optimise efficiency. Technically the brokerage model is quite challenging, however, as there are no clear standards for interoperability on the SaaS and PaaS layer of cloud computing. New brokerage frameworks are required. Other aspects include (virtualized) resource management, service level agreements (SLAs) and resource pricing policies for advanced federated environments.

Heterogeneous cloud computing

- With cloud environments becoming increasingly heterogeneous, there is a need for efficient approaches for managing these heterogeneous resources. 'Management' spans virtualization, modelling, and monitoring. In addition to 'conventional' hybrid (i.e. public/private) and federated (i.e. multi-provider cloud stacks) situations, specialist resources have to be considered (such as GPUs, FPGAs, SSDs...). Seamlessly incorporating these innovative hardware and networking technologies will improve cloud-hosted resources for computation, communication, and storage but poses hard technical challenges in terms of the PaaS cloud infrastructure.

Mobile cloud computing

- Ultra-scalable data management is a promising area for cooperation (i.e. scalable cloud platforms for mobile, M2M and IoT applications). This would combine European competences in areas such as Big Data, OLTP & OLAP, and SQL/NoSQL/CEP with Korean expertise in mobile cloud applications, M2M application cloud platforms, and IoT. Context-awareness will be a key feature of the mobile cloud, making use of Big Data, sensors, wearable devices, M2M and D2D communication to deliver new context-rich applications and services. Wearable devices, in particular, present major challenges – and opportunities. Deployment is also an important issue. Enterprises are lagging behind in mobile and cloud technology innovation, partly due to concerns about how to integrate with legacy infrastructure and applications. Strong business models and use cases for cloud are needed, especially in large enterprises and traditional sectors.

Open source cloud developments

- Open source developments were addressed in various presentations. KT is investigating Software defined storage (SDS) based on the OpenStack as a way to cost-effectively build and manage distributed and heterogeneous cloud storage infrastructure. Olleh, KT's IPTV service, was described as one of several use cases. Samsung described its SDS Personal Cloud Service (SPCS), a hybrid B2C cloud service ecosystem combining private and public clouds. This experience has shown hybrid solutions are complex to deploy and operate (due to lack of management tools and inconsistent APIs) and that OpenStack (on which the solution is partly based) was also not easy to deploy. OS approaches are also a key element in European projects and in the European cloud effort overall.

5.2 International cooperation in 5G PPP

The 5G PPP and in particular the 5G Infrastructure Association is establishing an international cooperation strategy. Details of intended activities are already identified in the Annex to the 5G PPP Contractual Arrangement in Annex 4 to this Deliverable. Major identified countries – but not limited to – are the US, Japan, China and Korea. It is intended to sign MoUs between 5G PPP and respective bodies in these countries. These activities are carried out on close cooperation with the EU Commission, which is negotiating joint declarations on government level between the governments of these target countries and the EU Commission.

At the occasion of a visit of Vice-President Neelie Kroes in Seoul, Korea a Joint Declaration between the Korean government and the EU Commission was signed on June 16, 2014 in Seoul (Figure 9) [14]. In parallel, the 5G Infrastructure Association negotiated and signed an MoU with 5G Forum in Korea on June 17, 2014 (Figure 10).

Figure 9: Signature of the Joint Declaration on 5G between the Korean government and the EU Commission on June 16, 2014 in Seoul, Korea

Figure 10: Signature of the MoU on 5G between 5G Forum in Korea and 5G Infrastructure Association on June 17, 2014

This first step towards international cooperation was enabled by the NetSoc project by its continuous support to establish 5G PPP during 2013 and 2014.

6 NETSOC DEDICATED ACTIONS

In the following the main support activities of NetSoc to the community are summarised on form of a bullet list.

6.1 Restructuring of ETPs

- Community building in the ICT domain by supporting respective European Technology Platforms.
- The supported European Technology Platforms are Net!Works, ISI and NEM.
- ETPs are used as the platform to develop consolidated views on Strategic Research and Innovation Agendas as inputs to the preparation of future work programmes in Horizon 2020.Support of discussions between the EU Commission and ICT ETPs to restructure the ETP landscape in order to better support Horizon 2020.
- Providing work spaces and e-mail distribution lists.
- Support of the restructuring process by organising meetings between ETPs and with the Commission, contributing to necessary documents on scope and ETP landscape and the update and adaption of governance models.
- Update of ETP websites.

6.2 Preparation of 5G PPP proposal and launch of 5G PPP

- Support of the development of a proposal for the 5G PPP in cooperation with the EU Commission for evaluation.
- Providing the necessary environment by organising meetings, workspace and mailing list as well as the support of the signature event with the EU Commission on December 17, 2013 and a press event with Vice-President Neelie Kroes and representatives of the 5G Infrastructure Association at Mobile World Congress in February 2014 in Barcelona.
- Development of material like flyers, templates and roll-ups.
- Preparation of a 5G video, which is also used by the EU Commission and other stakeholder to explain 5G to the general public.
- Design of a new 5G PPP website.
- Providing work spaces and e-mail distribution lists.
- Support of the preparation of the detailed governance model of 5G PPP by NetSoc in a legal group like the statutes of the Association and the collaboration agreement for the set of active projects under 5G PPP in Horizon 2020, which are complementing the Grant Agreement including Special Clauses to the contract.

6.3 International cooperation activities

- Support of a workshop in Korea between the EU Commission and the Korean government in order to identify areas of common interest for joint calls for proposals by providing a rapporteur.
- Support of first activities in 5G PPP on international cooperation by an MoU between 5G Forum in Korea and 5G Infrastructure Association.

6.4 Organisation of meetings and events

- Organisation of workshops, working group meetings, General Assembly and Steering Board meetings of the ETPs and the 5G Infrastructure Association, Awareness Meetings on Horizon 2020 Call 1
- Several hundred participants were reached in Awareness Meetings on Call 1 in Horizon 2020.
- Facilitating elections to ETP Steering Boards and to the bodies in the 5G Infrastructure Association.
- NetSoc is seen as a neutral body to organise such elections by issuing calls for candidates and running the actual elections.

7 CONCLUSIONS

The NetSoc project was instrumental to support the ETPs Net!Works and ISI (now as new communication networks oriented ETP Networld2020) and NEM to reach a wide community and to support the development of consolidated Strategic Research and Innovation Agendas.

During the project lifetime these ETPs were restructured based on discussions with the EU Commission in order to support Horizon 2020 as best as possible. Both ETPs together reach significantly more than 1000 organisations in Europe.

A proposal for the 5G PPP in Horizon 2020 was supported, which was successfully evaluated by the EU Commission.

NetSoc supported necessary meetings and the development of required documents like Strategic Research and Innovation agendas, governance models and other legal documents as well as material on 5G, which is also used by the EU Commission.

The project played an important role to support the communication networks sector in Europe in the preparation of Horizon 2020 and the preparation of Call 1 for Proposals.