

5G Infrastructure PPP Information Day

April 28, 2014 – Paris

Overview presentation

<http://5g-ppp.eu/>

Agenda

Opening and welcome

EU context and priorities for 5G

Part 1: Organisation and working structure

- The 5G Infrastructure Association and its activities
- Horizon 2020, ICT-14
- 5G PPP challenges: METIS Concepts for 5G :
- Role of experiments and testbeds in the 5G PPP

Part 2: Addressing the challenges - Preparing for 5G PPP Call

- A 5G-Infrastructure-Association view on how a coherent set of projects could address all the challenges
- Expression of interests by participants, opportunities for participation
- Open debate on the view presented – is coverage adequate, additions, improvements, disruptions
- Networking opportunities

Conclusions and Announcement of next open event

Brigitte Cardinael (Orange),
Werner Mohr (NSN/Association)
Bernard Barani (EU Commission)

Werner Mohr (Association)
Philippe Lefebvre (EU Commission)
Hugo Tullberg (Ericsson/METIS
coordinator)
Nikolaos Isaris (EU Commission)

Didier Bourse (Alcatel-Lucent)

All

All

All

Werner Mohr (NSN/Association)

EU context and priorities for 5G

Part 1: Organisation and working structure

The 5G Infrastructure Association and its activities

EU Commissioner Kroes called industry to join EU Commission in a PPP on 5G

- Commissioner Kroes called industry at Mobile World Congress 2013 in Barcelona, Spain

“... 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. ...”

Regulation on PPPs

Article 25

Public-private partnerships

1. Horizon 2020 may be implemented through public-private partnerships where all the partners concerned commit to supporting the development and implementation of precompetitive research and of innovation activities of strategic importance to the Union's competitiveness and industrial leadership or to addressing specific societal challenges. Public-private partnerships shall be implemented in such a way that full participation of the best European players is not impeded.
2. The involvement of the Union in public-private partnerships shall make use of the preexisting and lean governance structures and may take one of the following forms:
 - a) financial contributions from the Union to joint undertakings established pursuant to Article 187 TFEU under the Seventh Framework Programme, subject to the amendment of their basic acts; to new public-private partnerships established pursuant to Article 187 TFEU; and to other funding bodies referred to in points (iv) and (vii) of point (c) of Article 58(1) of Regulation (EU, Euratom) No 966/2012. This form of partnerships shall only be implemented where the scope of the objectives pursued and the scale of the resources required justify it taking full account of the relevant impact assessments, and where other forms of partnerships would not fulfil the objectives or would not generate the necessary leverage;
 - b) contractual arrangements between the partners referred to in paragraph 1, which specify the objectives of the partnership, respective commitments of the partners, key performance indicators, and outputs to be delivered, including the identification of research and innovation activities that require support from Horizon 2020.**

Key challenges

- PPP Programme that will deliver solutions, architectures, technologies and standards for the ubiquitous 5G communication infrastructures of the next decade
- Programme Ambitions: Key Challenges / High level KPIs
 - 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

Proposed research program

- 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

Complementary PPPs

- Progress on services (e.g. FI-PPP) is accelerating the already high pressure for improved Infrastructure(s)
- Need to advance networks (e.g. 5G Infrastructure PPP) to ensure the optimal user experience and EU Leadership



5G PPP

Signature of 5G PPP on December 17, 2013



International activities on 5G getting momentum



EU

- Framework Program 7, e.g. METIS and 5GNow projects
- 5G PPP in Horizon 2020



UK – 5G Innovation Centre (5GIC) at University of Surrey



US

- Intel Strategic Research Alliance (ISRA)
- NYU Wireless Research Center



China

- 863 Research Program
- Future Forum
- IMT-2020 (5G) Promotion Group



Japan – 2020 and Beyond Ad-Hoc Group under ARIB's Advanced Wireless Communications Study Committee



Korea – 5G Forum as PPP



Taiwan – Ministry of Economic Affairs, National Science Council



Russia – 5GRUS by Russia's Icom-Invest



NGMN – White paper on future requirements

- Company internal research

5G PPP Contractual Arrangement Overview

- Scope
- Activities, Investment and Outputs
- Specific Objectives
- Specific Commitments of the Commission
- Specific Commitments of the Private Sector
- Monitoring

5G PPP Contractual Arrangement Activities, Investment and Outputs

- Research and innovation activities co-funded under Horizon 2020 in the scope of the partnership.
 - Subject to Horizon 2020 Rules for participation and dissemination
 - **Commission intends to allocate from Union budget an indicative financial envelope of EUR 700 million for the period of 2014-2020**
 - Private Side commits to engage the stakeholder community to invest funds in research and innovation activities specific to the partnership domain both
- Including leveraging factor 5 for private investment value of initiative: 3.5 billion €

Proposed budget for financial period 2014 - 2020

- Public contribution around 700 million €
- Private contribution around 700 million €

Year of call for proposals	2014	2015	2016	2017	2018	2019	2020	Total [million €]
Global budget	140	160	180	200	220	240	260	1 400
Estimate research actions	110	120	140	140	150	160	160	980
Estimate innovation actions	30	40	40	60	70	80	100	420

5G PPP Contractual Arrangement Monitoring

- **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.

5G PPP

5G Launch Event at Mobile World Congress February 24, 2014



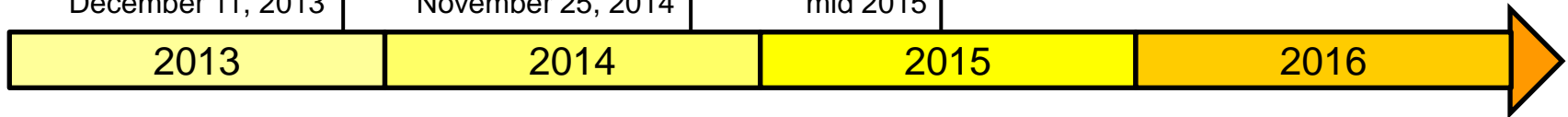
Source: 5G Infrastructure Association.

Indicative timeline

Call 1 published
December 11, 2013

Submission deadline
November 25, 2014

Start of first projects
mid 2015



Exploratory phase:

- Detailed requirements on 5G future systems
- Identify most promising functional architectures and technology options
- Build on previous research work

- Detailed system research and development by taking into account economic conditions
- Basis for Pan European experimental infrastructure

- Detailed system optimisation and final system definition
- Consensus building on globally to be identified frequency bands (consider result of WRC15)
- Validation of concepts and early trials
- Contributions to initial global standardisation activities
- Build Pan European experimental infrastructure in collaboration with GEANT and FIRE
- Preparation of WRC18



- Support of initial international standardisation
- Support of regulatory bodies for allocation of newly identified frequency bands for the deployment of new systems
- Implementation of large trials for validation under close to real world conditions

- Extension of trials to non ICT stakeholders
- Detailed standardisation process based on validated system concepts

Large scale demonstrations and trials, scalability testing, etc.

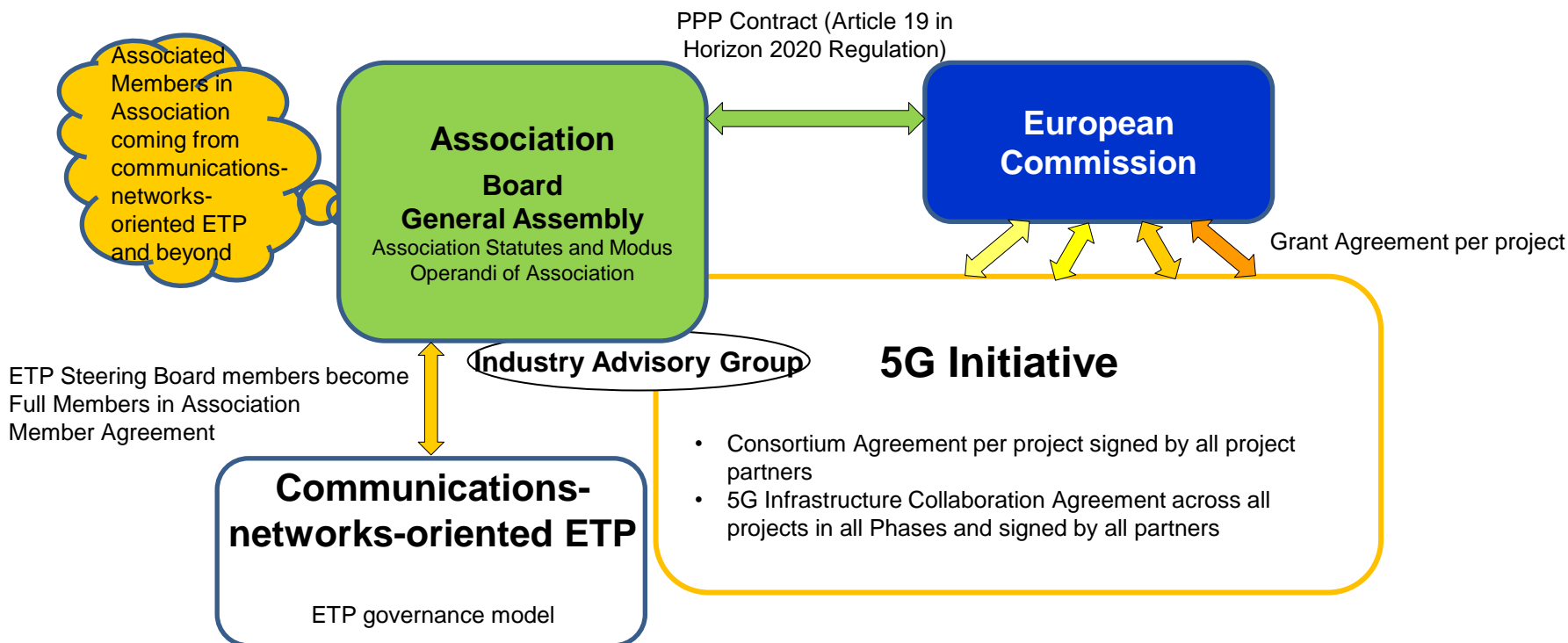
Investigation, prototypes, technology demos and pilots of network management and operation, cloud-based distributed computing and big data for network operation.

- New frequency bands available for trial network deployment and initial commercial deployment
- Close to commercial systems deployment under real world conditions to prepare economic exploitation on global basis

Governance model – Basic approach

Relation of new ETP to 5G PPP

- The New ETP will support the 5G PPP by
 - the direct relation to the PPP Association and
 - the development of the SRAI for the 5G-PPP



- The Association is an international non-profit association, named “The 5G Infrastructure Partnership” under Belgian law. It is the contractual counterpart of the European Commission for signing the 5G-PPP contract, done on 17 December 2013, see http://europa.eu/rapid/press-release_IP-13-1261_en.htm.

New ETP: Scope of the technology areas include



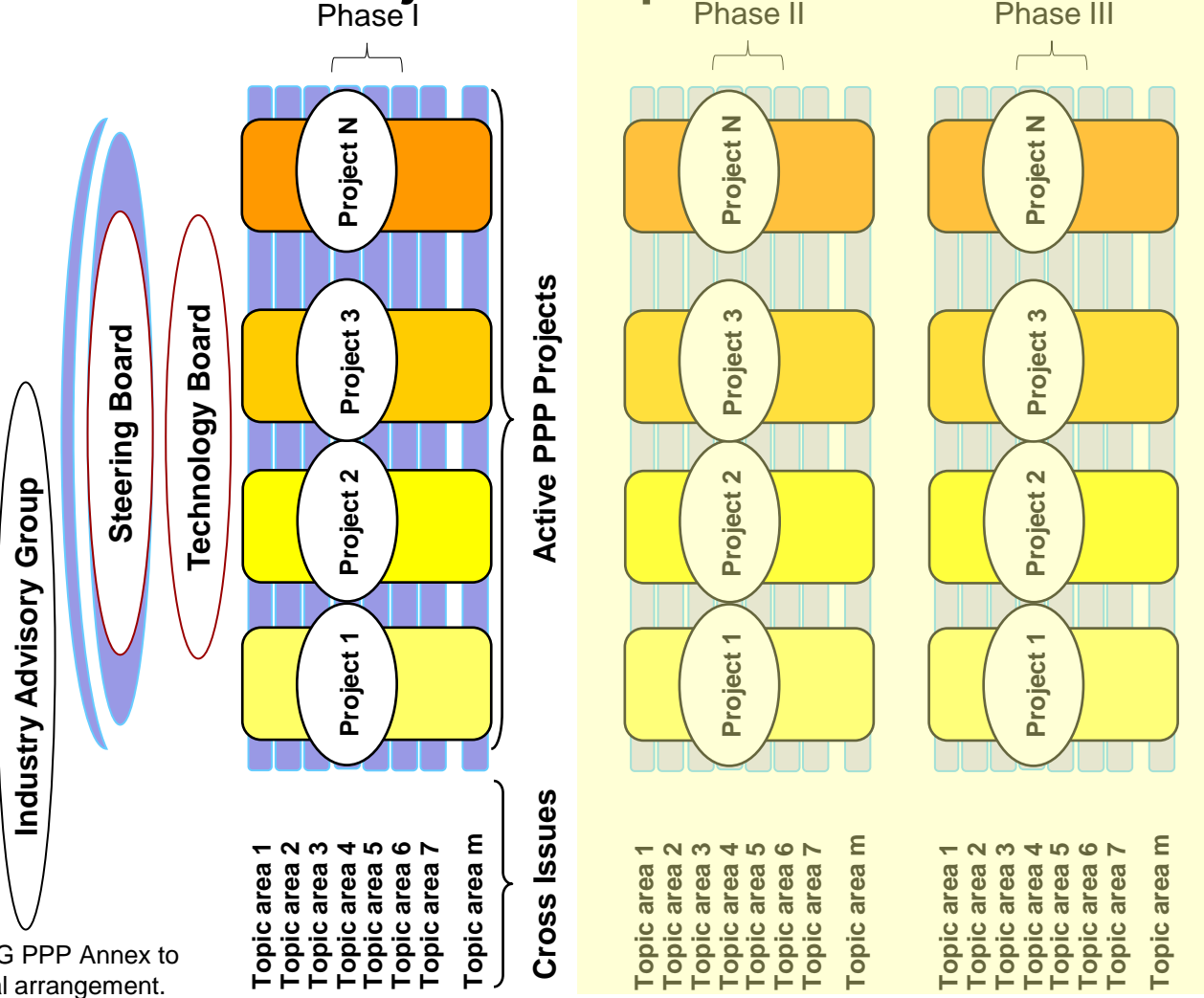
Seamless and transparent access to

- mobile and wireless,
- fixed and
- satellite-based

voice, data and multimedia services

- Communication network infrastructures combining some or all of the above technologies
- The new ETP will address all communication networking issues (mobile and wireless communications, fixed/optical communications and satellite communications) from a holistic perspective

Governance model Project implementation



Source: 5G PPP Annex to contractual arrangement.

- Consortium Agreement per project signed by all project partners
- 5G Infrastructure Collaboration Agreement across all projects in all Phases and signed by all partners

ETP Steering Board composition 2013 – 2015

Industry (also Association members)

- Alcatel-Lucent
- Astrium Satellites
- Atos
- Deutsche Telekom
- DOCOMO Communications Laboratories Europe GmbH
- Ericsson
- Huawei Technologies Düsseldorf GmbH
- NEC Europe Ltd., NEC Laboratories Europe
- Nokia Solutions and Networks
- Orange Labs
- Portugal Telecom
- SES
- Telecom Italia
- Telefónica I+D
- Telenor ASA
- Telespazio
- Thales Alenia Space
- Turk Telekomünikasyon A.Ş.

Research (also Association members)

- CEA-LETI
- Centre Tecnologic de Telecomunicacions de Catalunya (CTTC)
- Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT)
- Fundacion IMDEA Networks
- Instituto de Telecomunicacoes
- University of Bologna – DEI

SMEs (also Association members)

- Integrasys SA
- INTERINNOV
- M.B.I. S.R.L.
- Nextworks s.r.l.
- Quobis
- Sequans Communications

Observers in ETP SB

- EU Commission and
- ESA
- ETSI – accepted
- NGMN – accepted
- Photonics21 – accepted

Election of additional 6 members to the 5G Infrastructure Association

- *Sector "Terminal devices, smart cards"*: Samsung Electronics Research Institute Ltd.
- *Sector "Optical communications"*: ADVA Optical Networking SE
- *Sector "IT"*: IST – University of Lisbon
- *Sector "IoT, M2M"*: TNO
- *Sector "Microelectronics"*: Intel Mobile Communications
- *Sector "Security"*: IBM Research

Associated members in 5G Infrastructure Association

- PPPs with relation to ICT or increasingly will use ICT

- FI-PPP: Invitation of FI-PPP Program Chair
- FoF – Factories of the Future
- EeB – Energy efficient Buildings
- ROBOTICS
- HPC – High Performance Computing
- SPIRE – Sustainable Process Industry
- EGVI – European Green Vehicles Initiative
- PHOTONICS

- Other Commission programs and organisations

- Living Labs program
- EIT ICT Labs
- Committee of the Regions

- Recognised ETPs and JTIs by the EU Commission

- Energy: SmartGrids
- Environment: WssTP
- ICT: ECSEL (new combined JTI based on ARTEMIS, ENIAC and EPoSS), NEM, NESSI
- Transport: ERRAC (rail transport)

- User groups

- OTT
- User groups in the domain of civil society, emergency rescue and resilience

- Other sectors

- Smart Home, e.g. DLNA
- Automotive sector
- M2M/IoT, possibly GMA – Global M2M Alliance
- Internet user association
- ERTICO on transport issues

- Other organisations

- ETSI
- Celtic-Plus
- NGMN

5G PPP Call 1 objectives

Radio network architecture and technologies

Support anticipated 1000 fold mobile traffic increase and very different classes of traffic/services

- Network architecture, protocols and radio technologies capable of at least a ten times increase in frequency reuse and new frequency ranges above 3,6 GHz
- Versatile low cost ubiquitous radio access infrastructure equally supporting low rate IoT and very high rate ($\gg 1$ Gbit/s) access
- Flexible and efficient radio, optical or copper based backhaul/fronthaul with low latency
- Innovative architectures for 5G transceivers and micro-servers
- Experiment based research preparing for large scale demonstrator and test-beds

Convergence beyond last mile

Support integration of a ubiquitous access continuum composed of cooperative, cognitive fixed and heterogeneous wireless resources, with fixed optical access reaching at least the 10 Gb/s range

- Solving the management heterogeneity of different fixed and heterogeneous wireless networks
- Architectures to optimize reuse and sharing of functionality across heterogeneous access technologies and networks

Network management

Challenge to radically decrease network management Opex through automation whilst increasing user perceived quality of service, of experience and security

- Novel simplified (low Opex) approaches to overall management of the network (e.g. Self-organizing networks –SON) and service level management
- Combination of software defined network implementations with autonomic management of resources
- Network security across multiple virtualized or SDN domains

Network virtualization and Software Networks.

Highly flexible, manufacturer-independent model of controlling reconfigurable resources supporting changing/emerging application requirements

- Virtualization of network functionalities at infrastructure level and implementation of network services
- Orchestration logic (SDN), enabling network programmability, automation of cross domain network configuration, simplification and programmability of devices
- Tighter integration between application/service layers and networking layers
- Support of open network functionalities for dynamic integration with third party and OTT cloud environments

How to participate

- Participate in ETP (<http://new-etp.eurescom.eu/>) and Association (<http://5g-infrastructure-ppp.eu/>)
 - Contribute to the Expert Group to update SRIA
 - Support requirements capturing on future networks
 - Members of ETP can be candidates for ETP Steering Board / Association and additional members in Association
 - Contribute via Associate Members
- In 5G PPP projects
 - Commission is publishing Open Calls for Proposals
 - Everyone can submit proposals
 - Independent evaluators select proposals based on criteria
 - scientific and technological excellence,
 - impact and
 - Implementation
 - Integration of successful proposals into the PPP program in order to ensure cooperation of projects
- There is no membership in 5G PPP, because participation in PPP projects is open

Part 1: Organisation and working structure

Horizon 2020, ICT-14

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5G PPP challenges presentation

Part 2: Addressing the challenges - Preparing for 5G PPP Call

A 5G-Infrastructure-Association view on how
a coherent set of projects could address all
the challenges

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Role of experiments and testbeds in the 5G PPP

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Open debate on the view presented – is
coverage adequate, additions, improvements,
disruptions

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Expression of interests by participants,
opportunities for participation

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Networking opportunities

Conclusions and Announcement of next open event

- Workshop at EuCNC 2014 “The 5G PPP: Vision and Opportunities”
 - Bologna
 - June 26, 2014
 - <http://eucnc.eu/>



- If sufficient Interest an additional event may be organised end of May 2014