

5G PPP and Beyond 5G



Németh Vilmos EU H2020 ICT 2017 Workshop

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Innovation Waves



5G – A New ICT Paradigma









Evolution of the Mobile Communications

Mobile communications: from 1G to 4G



5G – More than Broadband Mobile

5G will be the communication technology and infrastructure of the 21st century, which will radically change the ICT applications and services.

5G will meet the increasing user needs and integrate the Machine-to-Machine communication (50 billion devices by 2020) in the Internet.

The high speed 5G networks with Gbit data rates and almost zero latency will trigger revolutionary new applications in the future.

Besides computing, 5G will virtualize the networks (Software Defined Networks – SDN), too.



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ICT Roadmap-based Research



EU-5G PPP Association Agreement



On 17 December, 2013 the European Commission and the European 5G Infrastructure PPP Association (Ericsson, DT, Nokia, Orange, Telenor, Alcatel-Lucent, etc.) made an agreement on the cooperation and joint work in the EU's 5G PPP Programme for 2014-2020, and they agreed on the objectives, the implementation and financial issues of the 5G PPP Programme.

Funding: EU – 700 million Euros (2014-2020) Industry – appr. 3.5 billion Euros

5G PPP Governance Model



5G PPP – High-Level KPIs

- 1000 times higher wireless area capacity and more service capabilities
- 1-10 Gbit/s mobile data rates
- 90% energy saving in mobile networks
- 10-100 times more connected devices
- "Zero perceived" service delay (E2E latency < 1ms)
- Enabling advanced user privacy
- Stronger user controlled privacy

5G technology will trigger an innovation wave in the global economy and will have a great influence on the competitiveness of the regions and the countries over the world!

5G PPP Roadmap



5G PPP – Pre-structuring Model

- More than a group of standalone projects, pulling strands together
- Pre-structuring model
 - Ensuring that the right set of projects will work together
 - Model focused on projects not proposals as such
 - Possible set of projects scopes, their interfaces ant the possible cross-issues between projects
- Possibility to have proposals submitted according to the model
- Avoiding duplication and gaps issues

5G PPP Phase 1 - Pre-structuring Model



5G PPP Call 1 – Selected Projects



5G PPP Phase 2 – Call 2 (1)

- ICT-07-2017: 5G PPP research and Validation of critical technologies and systems
 - Strand 1: Wireless access and radio network architectures/technologies (RIA)
 - Strand 2: High capacity elastic optical networks (RIA)
 - Strand 3: Software Network (RIA)
 - Coordination and Support Actions (CSA)

Deadline: 08 Nov 2016 Funding: 101+3 MEuro

5G PPP Phase 2 – Call 2 (1)

- ICT-08-2017: 5G PPP Convergent technologies
 - Strand 1: Ubiquitous 5G access levaraging optical technologies (IA)
 - Strand 2: Flexible network applications (IA)
 - Strand 3: Cooperation in access convergence (RIA)

Deadline: 08 Nov 2016 Funding: 40+5 MEuro 5G PPP Research and Validation of Critical Technologies and Systems (ICT-07-2017/1)

- Research and Innovation Actions
- Strand: Wireless access and radio networks architecture/technologies:
 - Novel air interface technologies
 - Hardware architectures and building blocks
 - Cooperative operation of heterogeneous access networks
 - Support of numerous devices with different capabilities, with unified management capabilities
 - Coordination and optimization of user access to heterogeneous radio access
 - Multi-tenancy for Radio Access Network (RAN) sharing, covering ultra-dense networks deployments
 - Integration of Satellite Networks

5G PPP Research and Validation of Critical Technologies and Systems (ICT-07-2017/2)

• Strand: High capacity elastic – optical networks:

- Support of very high traffic and capacity increase originating from an (5G) heterogeneous access networks with matching capabilities from the core and metro environments
- New spectrally efficient, adaptive transmission, networking, control and management approaches to increase network capacity by a factor of >100
- To provide high service granularity, guarantees for en-to-end optimization and QoS – reducing power consumption, footprint and cost per bit and maintaining reach
- Integration of such new optical transport and transmission designs with novel network control and management paradigms (e.g. SDN)

5G PPP Research and Validation of Critical Technologies and Systems (ICT-07-2017/3)

- Strand: Software networks:
 - Software network architecture to support an access agnostic converged core network and control framework enabling next generation services
 - A unified management of connectivity, with end-to-end security mobility and routing for flexible introduction of new services
 - Solutions that allow re-location or anycast search of services and their components
 - Scalability

5G PPP Covergent Technologies (ICT-08-2017/1)

- Innovation Actions
- Strand: Ubiquitous 5G access leveraging optical technologies:
 - To develop and assess new optical access networks based on integrated optical devices prototypes
 - New optical transmission, switching and information processing techniques to support key access functionalities such as beam forming, high accuracy cm/mmWave generation and massive MIMO deployments
 - Cooperative radio-optical approaches
 - Techniques to map 5G channels to optical transport and a codesign of the optical and wireless interfaces and protocols

5G PPP Covergent Technologies (ICT-08-2017/2)

- Strand: Flexible network applications:
 - Development of a multiplicity of Virtualised
 Network Functions (VNF) for deployment of
 Network Applications
 - Cloud-like 5G infrastructures, supporting network services, resource and service orchestration
 - Open source development framework for control functionalities and application development, open platforms to third parties

5G PPP Covergent Technologies (ICT-08-2017/3)

- Research and Innovation Actions
- Strand: Cooperation in access convergence:
 - To take advantage of the supporting 5G research and demonstration facilities offered by Taiwan towards collaborative 5G research with EU

Networking Research Beyond 5G (ICT-09-2017)

- Specific Challenge:
 - To support European scientific excellences notably in the DSP domain, and to bring the most promising long term research coming from the labs closer to industrial innovation.
 - Full exploitation of the spectrum potential with new waves of technologies.
 - Bringing wireless systems to the speed of optical technologies
 - Decelopment of new cooperation networking and protocols.
 Deadline: 25 Apr 2017

Funding: 2 MEuro

Scope of Networking Research Beyond 5G (1)

- Scientific and technology advances in spectrum usage:
 - Frequencies above 90 GHz up to THz for wireless communications and new usages
 - Realise visible light communications and new usages
 - Develop radically new approaches for spectrum efficiency



Scope of Networking Research Beyond 5G (2)

- Advanced signal processing:
 - Antenna processing and massive MIMO
 - New ideas and optimisation information theory and coding
 - Reach Tbit/s in wireless communications



Scope of Networking Research Beyond 5G (3)

- Demand-attentive and cooperation networking:
 - Alternatives to 5G architectures, heterogeneous networks
 - Opportunistic networks
 - Novel architectures and protocols for routing, latency and caching in complex networks notably for mobility

International 5G Activities



EU

US

ITU-R Visions Group

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



Germany – 5G Lab Germany at TU Dresden

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

- Intel Strategic Research Alliance (ISRA)
- NYU Wireless Research Center
- 4G Americas

China

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



Japan – The 5G Mobile Communications Promotion Forum

Korea – 5G Forum

Taiwan – TAICS, Ministry of Science and Technology, Ministry of Economic Affairs

Russia – 5GRUS by Russia's Icom-Invest

CJK White Paper



- NGMN White paper on future requirements
- Company internal research

5th Gear Programme - Finland





5th Gear

More Information

5G PPP Association

- ✓ https://5g-ppp.eu
- Participants portal

http://ec.europa.eu/research/participants/portal

Köszönöm a figyelmet!

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