



Euro-5g – Supporting the European 5G Initiative

D2.3: Intermediate report on 5G programme governance and operation, including event support

Version: v0.2

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Abstract

This deliverable will report on the implementation of the collaboration agreement among the 5G PPP projects as concluded within the programme Steering Board and particular measures taken for its implementation.

We planned to have two main Programme wide events with international participation within the life of the project. The main goal will be to engage all major 5G stakeholders so as to ensure exchange of information and debates to achieve coherence and maximum impact of the PPP.

More specific workshops will also be organised, possibly in co-location with other major related events. One will be specifically dedicated to promote awareness of the 5G-PPP initiative and opportunities for innovative SMEs and Web Entrepreneurs. Another one will be targeted at the involvement of key international players in the worldwide 5G scene, in view of fostering global solutions, standards and interoperability.

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Executive Summary

This deliverable, because of the general nature of the “support” topic, summarises the activities that were undertaken to enable many of the other activities in other tasks within the Euro-5G project.

For example, events required physical logistics support, web support and agenda support. The tasks worked very efficiently together but when we report on events, we can see they may appear in support, communications and even liaison due to the many different roles we performed.

The main parts of this report are:

Part 1: shows how the Programme level Collaboration agreement was successfully implemented.

Part 2: shows how the Steering Board, as the forum for inter project strategic agreements and action plans, successfully worked in the first year of the 5G PPP.

Part 3: shows how the Technical; board as the forum for inter project co-ordination on technical issues has successfully worked in the first year of the 5G PPP.

The inter project Working Groups, although part of the governance structure, are reported on in Deliverable D5.2.

Part 4: Shows the diverse set of events and activities we have supported, independently and in collaboration with the commission, to promote and position the 5G PPP on a global level.

Part 5: is a short update on the figures and data originally presented in D3.1 on how the web based communications infrastructure supports all these activities.

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1 5G-PPP Collaboration Agreement

The Phase 1 5G-PPP projects are currently sharing information, deliverables, work in progress and granting additional access rights to the 5G Action Results under the 5G-PPP collaboration agreement. Cooperation by means of cross project working groups has been established.

1.1 The Collaboration Agreement

This Agreement was created by the legal working group for the 5G-Infrastructure Association prior to the start of the 5G-PPP projects to clarify and simplify the mutual access rights, responsibilities and liabilities the beneficiaries of the 5G-PPP projects have when sharing project level information with the beneficiaries in peer projects of the 5G-PPP.

The full text of the 5G-PPP collaboration agreement is available on the www.5g-ppp.eu website as a PDF file: <https://5g-ppp.eu/wp-content/uploads/2016/04/5G-col-agrmnt-after-consultation-July2-2015-FINAL-VERSION.pdf>. The form to accede to this agreement is also available there as a word file.

This agreement was presented to the projects in a meeting prior to the 5G-PPP kick off and any questions about the terms and conditions were addressed in follow-up discussions.

1.2 Rate of Accession to the Agreement

The signature process was started even before the 5G-PPP kick-off meeting and progressed steadily as shown in the graphic below:

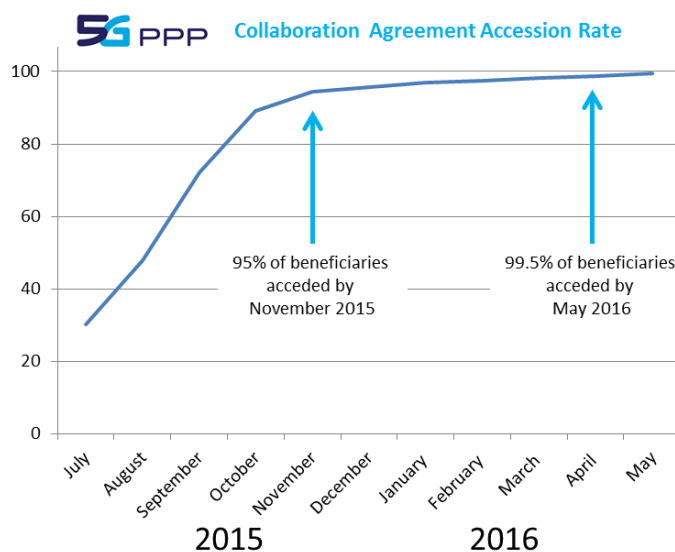


Figure 1: Collaboration Agreement Accession Rate

This agreement has now been signed by 165 of the 166 individual organisations participating in phase one. The one missing signatory belongs to a natural person participating as a beneficiary who feels the terms and conditions are not appropriate for a natural person participating in this role. This individual is not being given access to any shared information and common resources of the 5G-PPP as a result of their unwillingness to accede to the agreement.

1.3 Signatories to the Collaboration agreement

The 165 beneficiaries who have signed the agreement are listed in Annex 1 to this document.

1.4 Preparations for Phase 2 Collaboration agreement

In Phase 2, because the use of Article 41.4 of the Model Grant Agreement has been foreseen in the Work Programme, it will now be a contractual requirement on all the beneficiaries in Phase 2 to join programme level collaboration agreement.

As many of the phase two players will already be parties to the current collaboration agreement, and, as it is intended to minimise work and maximise efficiencies by continuing to use the current collaboration agreement. This approach will also allow the Phase 2 projects to avail of the work done to date in Phase 1 which will facilitate Phase 2 projects building on the results of Phase 1.

This will also fulfil the Article 41.4 requirements related to *complementary grant agreements* and have the additional benefit of uniting the different phases of the PPP. The new players in Phase 2 will be invited to join the existing agreement and thereby fulfil their legal requirement, while the existing signatories do not need to re-sign.

Acceding to this agreement provides a common text related to interworking so that all successful projects demonstrate the understanding and commitment to the 5G-PPP program level activities. This is critical in H2020 as there is no negotiation phase where these programme level commitments can be added after selection.

2 Supporting the 5G-PPP Steering Board

The Euro-5G project provides the secretarial functions for the 5G-PPP Steering Board which involves, organising the meetings, determining the Agenda with the Chairman and producing the notes of the meetings and the record of the decisions taken. In addition the SB is supported by an email exploder list to distribute all communications to all members, a BSCW document repository where such minutes and relevant documents are stored and audio conference facilities to host audio conferences as required.

To date 7 Meetings of the SB have been held, 3 were physical meetings and 4 were by audioconference. The projects have planned another physical SB meeting for September 2016 in Brussels.

2.1 Meeting 1: 1/7/15 Paris

The objective of this first meeting of the project responsible people was to review status of Work Groups to facilitate an efficient start to the work. We also needed to consider how many WGs can be active to avoid an overload of meetings and/or audioconferences. Similarly we had to consider what would be done in the SB and TB meetings.

The outcome was to prepare the Terms of References for the SB and TB and to launch the WGs.



Figure 2: Participants of the 5G-PPP Steering Board Meeting on 1 July 2015 in Paris

2.2 Meeting 2: 15/9/15 Brussels



The first task to this meeting was to adopt the SB terms of reference and to elect the SB chairman: Jean-Sebastien Bedo, nominated by the 5G-Infrastructure-Association received the most votes and was therefore elected. A proposal to elect a vice chair was deferred to be handled by email after the meeting allowing time for consideration. After that we moved quickly into a review of the WG progress, collaboration agreement (CA) signatures status and event planning.

Figure 3: SB Chairman J-S Bedo

The main outcomes were the election of the chairman and the synchronisation of the action plans for the next period.

2.3 Meeting 3: 28/10/15 Telco

In this audioconference, Olav Queseth was confirmed as the elected Vice-chair. Then we considered the action list and started discussing the preparations for the Mobile World Congress 2016.

2.4 Meeting 4: 15/12/15 Telco

In this audioconference the guidelines for use of the 5G-PPP logo were discussed and then the actions for the creation of cross project papers were discussed – most of these were emerging from the workgroups. The involvement of external (non-H2020) projects was discussed and the issue was passed to the 5G-I-A legal group to propose a solution. As always, the status of the WGs and forthcoming events were considered.

2.5 Meeting 5: 29/2/16 Brussels

This meeting considered the dissemination strategies and priorities for 2016 and started the planning for those events. The dates of the first reviews for the 5G-PPP projects were announced for September 2016. A series of info days were planned for introducing the Phase 2 of the 5G-PPP and inputs for the work plan for Phase 3 were also considered. The plan to host the European instance of the Global 5G Events was confirmed for November 2016. A significant outcome was the creation of a new WG on Security.

2.6 Meeting 6: 14/4/16 Telco

This meeting focussed on the preparations for the Global 5G Event and launched the discussion on which projects could provide demos in November 2016. The EC stressed we should publicise the “golden nuggets” of our work at this event. The cross project publications coming from the WGs were also discussed as they represent the position statements of the 5G-PPP that can be presented to the rest of the world.

2.7 Meeting 7: 2/6/16 Telco

The main focus of this meeting was to get a report from the first Global 5G Event in Beijing and to elaborate on the plans for the European Global 5G Event to be held November 2016. The venue for the European event was confirmed as Rome. The coordination of activities for EuCNC in Greece at the end of June 2016 was also discussed.

2.8 SB documentation repository

All the agendas and minutes of the 5G-PPP SB meetings are stored in the 5G-PPP BSCW document repository where they can be accessed by all beneficiaries of the 5G-PPP programme. Reference documents and slides used in the meetings, when available, are also there. In the interests of practicality, the minutes of each meeting are not attached to this deliverable but they are available on request.








































			5G-Initiative Steering Board	▼	2	 admin	2015-09-16 14:49	
			Meetings	▼	8	 UweHerzog	2016-07-12 16:22	
			2015-07-01 Paris	▼	3	 DavidKennedy	2016-07-12 16:26	
			2015-09-15 Brussels	▼	3	 UweHerzog	2015-10-02 12:17	
			2015-10-28 Telco	▼	3	 UweHerzog	2015-11-12 10:17	
			2015-12-15 Telco	▼	4	 UweHerzog	2016-01-11 16:37	
			2016-02-29 Brussels	▼	3	 olav_queseth	2016-04-18 10:27	
			2016-04-14 Telco	▼	3	 UweHerzog	2016-05-04 14:34	
			2016-06-02 Telco	▼	3	 UweHerzog	2016-06-20 15:55	

Figure 4: Steering Board documentation repository

3 Supporting the 5G-PPP Technical Board

The Euro-5G project provides support to the actions of the Technology Board (TB) chairman and provides the secretarial functions for the TB which involves, organising the audioconferences and meetings, determining the agenda with the chairman and producing the draft notes of the audioconferences and meetings and the record of the decisions and actions taken. In addition the TB is supported by an email exploder list to distribute all communications to all members, and a BSCW document repository where such minutes and relevant documents are stored.

To date 11 Meetings of the TB have been held, 1 physical meeting and 10 were by audioconference. The projects have planned another physical SB meeting targeted in October 2016 in Brussels.

3.1 Meeting 1: 15/9/15 Brussels



The first task to this meeting, that followed the SB meeting, was to adopt the TB terms of reference and to elect the TB chairman: Didier Bourse, nominated by the 5G-Infrastructure-Association received the most votes and was therefore elected. A proposal to elect a vice chair was deferred to be handled by email after the meeting allowing time for consideration, as for the SB vice chair election. The agenda addressed then TB ambitions, joint deliverables, common demonstrations, KPIs and future TB operation and meetings.

*Figure 5: TB
Chairman D.
Bourse*

The TB does not focus on standalone technical actions but addresses technical issues of interest of more than one single project. The first TB defined and agreed actions addressed the collection of further details on projects KPIs, up-to-date 2016 Working Groups (WGs) plans and draft perspectives from TB members to match their project focus / deliverables on a functional or physical architecture.

3.2 Meeting 2: 17/11/15 Telco

The audioconference addressed the TB actions review, the Phase 1 projects / deliverables cartography, the WGs technical progress and current on-going actions, the PPP technical KPIs and projects contributions, the PPP MWC 2016 White Paper, the Phase 2 Pre-structuring Model version 1.0 and the forthcoming TB interactions and meetings. Diego Lopez was welcome as elected vice-chair. The intention of the cartography is to match the Phase 1 project focus / deliverables on a functional or physical architecture. Existing architectures figures were discussed (incl. PPP MWC 2016 Verticals White Paper, NGMN 5G White Paper, forthcoming Architecture WG White Paper figures...). The Working Groups were addressed in details to develop TB awareness and common understanding about progress and issues related to both Association WGs and Initiative (technical) WGs.

3.3 Meeting 3: 16/12/15 Telco

The audioconference addressed the TB actions review, the TB EURO-5G support, the Phase 1 projects / deliverables cartography, the WGs technical progress, current on-going actions and 2016 plans, the PPP technical KPIs and projects contributions, the Phase 2 Pre-structuring Model version 1.0 and open consultation and the forthcoming TB interactions and meetings. Bernard Hunt was welcomed as EURO-5G contributor to support the TB operation. This was decided to launch the edition of the TB Phase 1 Projects Deliverables document. This document includes all projects deliverables tables and enables synchronized understanding between TB members of the deliveries and timing of the different PPP projects. This was also decided to launch the edition of the TB WGs 2016 Plans document: This document (targeted to be up-dated on a monthly basis) includes the PPP Working Groups plans and achievements (5G Industry Association WGs and Initiative WGs) and the TB feedbacks on these plans. The WGs plans are addressed at TB level and TB members provide feedbacks and

recommendations towards the WGs to ensure the WGs plans are complementary and avoid duplications. TB members are working on 2016-17 technical / strategic plan and have cross-WGs synchronized perspectives at TMs level. TB may propose to SB the creation of a WG when a technology discussion cannot be resolved solely by the TB participants. TB may also propose to SB the closure of a WG. The audioconference also addressed the possible way forward for working on Performance KPIs and the orientation was taken to focus first on Capacity and Energy Efficiency KPIs.

3.4 Meeting 4: 28/01/16 Telco

The audioconference addressed the TB actions review, the Phase 1 projects deliverables and milestones, the Phase 1 projects cartography, the WGs technical progress, current on-going actions and 2016 plans, the PPP technical KPIs and projects contributions, the Phase 2 Pre-structuring Model version 2.0 and the forthcoming TB interactions and meetings. This was decided to launch the edition of the TB Phase 1 Projects Deliverables - Projects Interests document. This document is collecting the PPP Phase 1 projects interests related to the overall set of deliverables. The document also includes information (deliverables in bold text) related to the deliverables available on BSCW. The TB Phase 1 Performance KPIs document was circulated as input to the audioconference. This document is defining the possible orientations for addressing the PPP Performance KPIs at TB level. It focuses on Capacity and Energy Efficiency KPIs. This document was used for the first discussion of the TB KPI Experts Team organized on 10.02.16. TB members were asked to identify and nominate experts from their projects to join the TB KPIs Experts Team.

3.5 Meeting 5: 19/02/16 Telco

The audioconference addressed the TB actions review, the Phase 1 projects cartography, deliverables and milestones, the PPP technical KPIs and projects contributions, the WGs technical progress, current on-going actions and 2016 plans, the Security WG, the TB 2016 priorities and plans and the forthcoming TB interactions and meetings. This was decided to launch the edition of the TB 2016 Plans document. This document is defining the possible orientations for the PPP TB actions and forthcoming detailed TB 2016 (2017) Plans. The work started with the collection of 3 priorities per project. This was also decided to launch the edition of the TB Phase 1 Projects Milestones document. This document is collecting the PPP Phase 1 projects milestones. The PPP Phase 1 milestones are analyzed at TB level to define possible interactions on dedicated thematics and most appropriate projects synergies. A Security pre-WG PhC was organized on 12.02.16, to discuss the setting-up of the Security WG. There was unanimous support for making a dedicated Security WG, separate from the Network Management WG (incl. with clear delineation between the two WGs). The TB supported the creation of this WG, then formally decided during the SB meeting organized on 29.02.16 in Brussels.

3.6 Meeting 6: 10/03/16 Telco

The audioconference addressed the TB actions review, the TB perspectives and potential expectations on WGs 2016 plans, the TB 2016 priorities and plans, the PPP technical KPIs and projects contributions and the forthcoming TB interactions and meetings, incl. TB meeting in EuCNC 2016. The TB 2016 Plan document was discussed and several inputs were considered to be validated as priorities by the overall TB, incl. WGs up-dates, KPIs, cross-projects cooperations, annual TB meeting to review key achievements and discuss global plans for following year.

3.7 Meeting 7: 15/04/16 Telco

The audioconference addressed the TB actions review, the TB perspectives and expectations on WGs 2016 plans, the TB 2016 priorities and plans, the PPP technical KPIs and projects contributions, the PPP Annual Report (Book), the TB 1st year “Golden Nuggets” and the forthcoming TB interactions and meetings, incl. TB meeting in EuCNC 2016. The audioconference addressed the fact that the TB

could collect 1 key outcome from each project related to the 1st year and release a PPP list of 20 technical “Golden Nuggets” (19 + 1 overall at programme level). This list of 20 “Golden Nuggets” could be used for further PPP communication and dissemination, in 2H16 and 1H17. The audioconference also addressed the possible TB contribution to the Annual Report, incl. projects inputs, possible WGs inputs and potential TB members review / feedbacks.

3.8 Meeting 8: 25/05/16 Telco

The audioconference addressed the TB actions review, the TB perspectives and expectations on WGs 2016 plans, the TB 2016 priorities and plans, the PPP technical KPIs and projects contributions, the projects standardization tracking, the EuCNC posters session, the PPP Annual Report (Book), the TB 1st year “Golden Nuggets”, the 5G Global Events and the forthcoming TB interactions and meetings, incl. TB meeting in EuCNC 2016. The audioconference addressed the possible way forward to boost the PPP work on Performance KPIs and the preparation of the forthcoming TB KPIs Experts Team audioconference to be organized on 20.06.16. TB members were also further encouraged to ensure projects contributions to the pre-standardization tracking document.

3.9 Meeting 9: 03/06/16 Telco

The audioconference addressed the TB actions review, the TB perspectives and expectations on WGs 2016 plans, the TB 2016 priorities, plans and forthcoming TB interactions and meetings, the PPP technical KPIs and projects contributions, the EuCNC Posters session, the PPP Annual Report (Book), the TB 1st year “Golden Nuggets” and the 5G Global Events. There was agreement to include the SME WG inputs into the TB WG 2016 Plans document. Discussion on the possible organization of the physical TB meeting in October 2016 in Brussels, between the EC Annual projects review and the 2nd 5G Global Event..

3.10 Meeting 10: 20/06/16 Telco

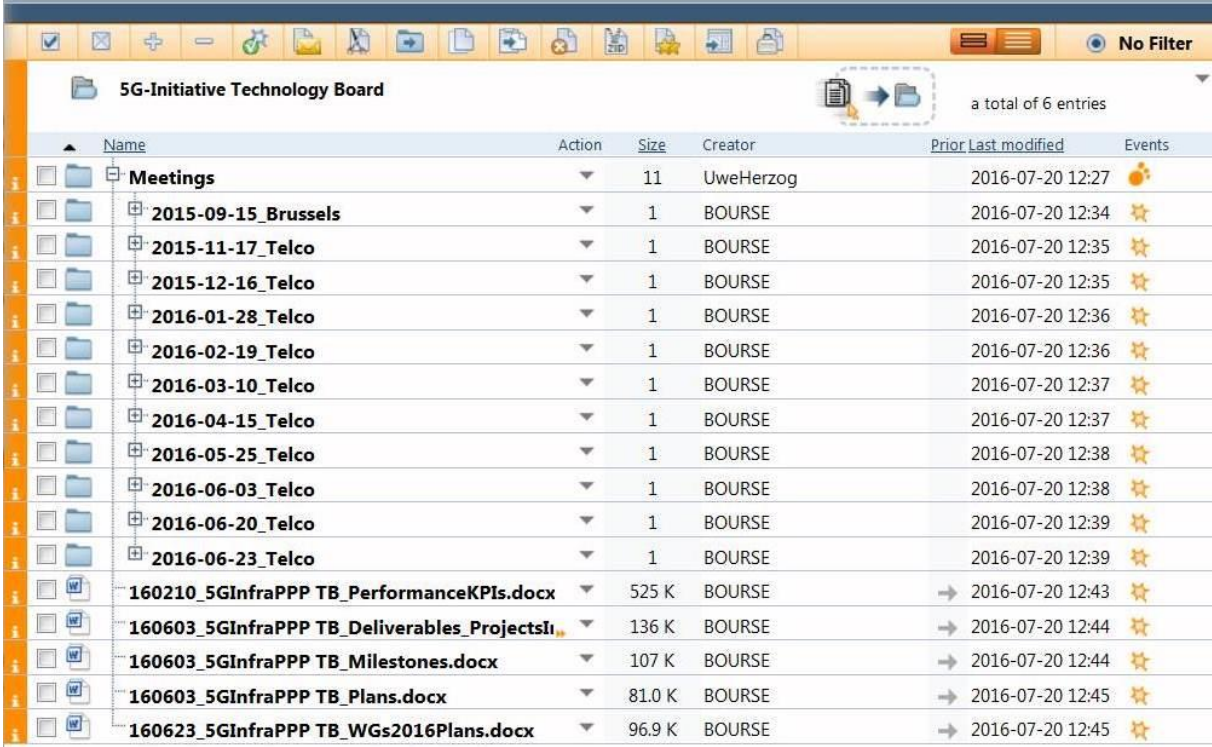
The audioconference was focused on the TB KPI Experts Group and focused on the Capacity and Energy Efficiency KPIs. Some of the key questions on KPIs at TB level include (not exhaustive list): What does the KPI mean for the project perspective? What are the metrics seen from the project perspective? How does the project assess its contribution / improvement on the KPI? How can the TB assess the overall programme contribution to the KPIs (complementary or/and consistent or/and orthogonal solutions?)? The cross-projects / METIS-II document "Living document on 5G-PPP use cases and performance evaluation models" was discussed. This was decided that projects will review the document, then provide input on the metric definitions they use for EE and Capacity. The next KPI Experts Team audioconference will be organized in August 2016.

3.11 Meeting 11: 23/06/16 Telco

The audioconference addressed the TB actions review, the TB perspectives and expectations on WGs 2016 plans, the TB 2016 priorities, plans and forthcoming TB interactions and meetings, the PPP technical KPIs and projects contributions, the TB 1st Year “Golden Nuggets”, the EC Projects Review and the 5G Global Events. There was common agreement to further progress the definition of the projects “Golden Nuggets”.

3.12 TB documentation repository

All the agendas and minutes of the 5G-PPP TB meetings are stored in the 5G-PPP BSCW document repository where they can be accessed by all beneficiaries of the 5G-PPP programme. Reference documents and slides used in the meetings, when available, are also there. In the interests of practicality, the minutes of each meeting are not attached to this deliverable but they are available on request.



The screenshot shows a web-based interface for the '5G-Initiative Technology Board'. At the top, there is a toolbar with various icons for file management and a 'No Filter' button. Below the toolbar, the title '5G-Initiative Technology Board' is displayed. A summary bar indicates 'a total of 6 entries'. The main content is a table with columns: Name, Action, Size, Creator, Prior, Last modified, and Events. The table lists a series of meetings from September 2015 to June 2016, all created by 'BOURSE'. It also lists five documents related to 5G infrastructure performance, deliverables, milestones, plans, and workgroup plans, all created by 'BOURSE' and dated July 2016. Each entry has a star icon in the Events column.

Name	Action	Size	Creator	Prior	Last modified	Events
Meetings	▼	11	UweHerzog		2016-07-20 12:27	★
2015-09-15_Brussels	▼	1	BOURSE		2016-07-20 12:34	★
2015-11-17_Telco	▼	1	BOURSE		2016-07-20 12:35	★
2015-12-16_Telco	▼	1	BOURSE		2016-07-20 12:35	★
2016-01-28_Telco	▼	1	BOURSE		2016-07-20 12:36	★
2016-02-19_Telco	▼	1	BOURSE		2016-07-20 12:36	★
2016-03-10_Telco	▼	1	BOURSE		2016-07-20 12:37	★
2016-04-15_Telco	▼	1	BOURSE		2016-07-20 12:37	★
2016-05-25_Telco	▼	1	BOURSE		2016-07-20 12:38	★
2016-06-03_Telco	▼	1	BOURSE		2016-07-20 12:38	★
2016-06-20_Telco	▼	1	BOURSE		2016-07-20 12:39	★
2016-06-23_Telco	▼	1	BOURSE		2016-07-20 12:39	★
160210_5GInfraPPP TB_PerformanceKPIs.docx	▼	525 K	BOURSE	→	2016-07-20 12:43	★
160603_5GInfraPPP TB_Deliverables_ProjectsI...	▼	136 K	BOURSE	→	2016-07-20 12:44	★
160603_5GInfraPPP TB_Milestones.docx	▼	107 K	BOURSE	→	2016-07-20 12:44	★
160603_5GInfraPPP TB_Plans.docx	▼	81.0 K	BOURSE	→	2016-07-20 12:45	★
160623_5GInfraPPP TB_WGs2016Plans.docx	▼	96.9 K	BOURSE	→	2016-07-20 12:45	★

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Figure 6: Technical Board documentation repository

4 5G-PPP Events

Euro-5G, as the 5G-PPP support action, was key in directly organising a number of events and in assisting the organisation of many others. The events listed in this section are a reflection of the ones that had the most direct involvement of the Euro-5G resources.

4.1 Global Level Events

4.1.1 5G-PPP @ ICT2015 October 2015, Lisbon

The Euro-5G project had three main activities in Lisbon that involved significant preparation effort and costs. These are addressed in the three sections below.

4.1.1.1 5G Workshop between regional initiatives, 20 October 2015, Lisbon

This high level workshop was organized in conjunction with the EU and co-located with the ICT Lisbon conference. The participation was limited to 100 invited persons who were actively involved in the public and industrial implementation of the selected 5G initiatives, complemented with relevant participants from the 5G standards/spectrum domains. The focus was on Standardisation and Spectrum issues. Euro-5G provided support for the event preparation, registration, speakers and moderators, and some travel cost assistance for designated guest participants when authorised by the EC.

The agenda and presentations from this event are available here: <https://5g-ppp.eu/5g-workshop-agenda/>

The highlight of the event was the announcement that the Leading 5G Visionary Organizations in Europe, USA, Japan, South Korea and China signed a Multi-Lateral Memorandum of Understanding about organising the series of “Global 5G Events”. The “Global 5G Events” intend to support multilateral collaboration on 5G systems across continents and countries. Basic areas of interest for the “Global 5G Events” include, but are not limited to:

- Vision and requirements of 5G systems and networks
- Basic system concepts
- Spectrum bands to support the global regulatory process
- Future 5G global standards
- Promotion of 5G ecosystem growth



Figure 7: Signatories of the Multi-Lateral Memorandum of Understanding

For more information on this agreement see the web page here: <https://5g-ppp.eu/leading-5g-visionary-organizations-in-europe-usa-japan-south-korea-and-china-sign-multi-lateral-memorandum-of-understanding-for-global-5g-events/>

4.1.1.2 [ICT2015 5G PPP Booth](#)

The 2015 ICT event was organised from the 20th to the 22nd October 2015 in Lisbon. ICT2015 (Innovate, Connect, Transform) was an event organized by European Commission together with the Fundação para a Ciência e a Tecnologia (Portugal) that comprised of a number of parallel activities: a policy conference presenting the new Commission’s policies and initiatives on Research & Innovation in ICT (Horizon 2020 Programme); an interactive exhibition showcasing the best results and impact of most recent EU ICT Research & Innovation; many networking opportunities to enhance quality partnerships, help participants find partners, connect Research and Innovation and trigger collaboration; Horizon 2020 Work Programme 2016-2017 thematic sessions, offering detailed information on the funding opportunities in the ICT sector; the Start-up Europe Forum, offering a set

of activities profiling EU policy actions for start-ups and SMEs, innovators, private and public investors.

Euro-5G organised the 5G PPP booth together with the projects METIS-II, 5G NORMA, FANTASTIC-5G and XHAUL who had demonstrations of their results on the stand.

4.1.1.3 [EC-TW workshop on the 5G Targeted opening](#)

Euro-5G, on behalf of the European Commission and ITRI Taiwan, organised a special EC-TW workshop on the 5G Targeted opening on the 21 October 2015 in the afternoon. It had to be in an adjacent building as there was no possibility to host it in the same venue as the ICT event. Euro-5G supported the costs for this event.



Figure 8: EC-TW workshop on the 5G Targeted opening

This workshop presented the themes and opportunities of the targeted opening the commission will have with Taiwan in the next 5G PPP call. The workshop gave an insight to the 5G-related activities in Taiwan and presented their specific interests in relation to the call. The primary focus points for the joint call will be access convergence and integration.

Euro-5G handled the registration and venue for this event and about 50 participants attended.

4.1.2 [5G-PPP @ Mobile World Congress 2016](#)

Euro-5G facilitated and assisted the design of the European Commission stand at the MWC in Barcelona. This involved a lot of negotiation and mediation between the Commission, the stand architect, the suppliers and the projects providing the demos.

In addition the Euro-5G project acted and the logistics agent for the EC and the 5G Infrastructure Association in securing the venue for the 5G PPP Media and Analyst briefing on the launch of the 5G PPP White paper “5G empowering verticals” which was held on the afternoon of Monday, 22nd February 2016 in the Media Village. The publication of various brochures and flyers was also focussed on this event.

The statement was that the 5G network infrastructures will be a key asset to support the digitalization of economic and societal processes, leading to the fourth industrial revolution impacting multiple sectors. This White Paper depicts innovative digital use cases from most important vertical sectors and how requirements from verticals impact 5G design. It also presents how 5G will open the field to new business value propositions by cementing strong relationships between vendors, operators and verticals. Deploying 5G for vertical markets in Europe by 2020 (the earliest date currently contemplated by the industry) should be a common framing objective.

During the event, Mr. Günther H. Oettinger, European Commissioner, Digital Economy and Society, and executives from global top technology companies discussed the impact of 5G on digital society and digital economy, as well as the need to meet the requirements from vertical industries, business models, architectures, and standardization aspects of 5G.

List of Participating Executives:

- Philippe Defraigne, Cullen International: Moderator:
- Günther H. Oettinger, Commissioner for Digital Economy and Society
- Ulf Ewaldsson, Chief Technology Officer, Ericsson
- Hermann Meyer, Chief Executive Officer, ERTICO – ITS Europe
- Wen Tong, Wireless Chief Technology Officer, Huawei
- Hossein Moiin, Chief Technology Officer, Nokia Mobile Networks, Nokia
- Alain Maloberti, Senior Vice President, Orange Labs Networks, Orange

- Karim Michel Sabbagh, Chief Executive Officer, SES
- Bjørn Taale Sandberg, Senior Vice President, Telenor Research leader, Telenor

177 participants, including many press representatives, registered for the 5G PPP Media and Analyst briefing.

In addition to this, Euro-5G organised that various representatives of the 5G-PPP would present an overview of the PPP and its activities three times during the week at the EC booth in the Mobile World Congress 2016.

These presentations gave a short overview of the European actions on 5G today, what the EU 5G vision was and what the 5G-PPP is. Discussions were invited on the next steps, future events and forthcoming publications.

4.1.3 1st Global 5G Event, Beijing, May/June 2016

The First Global 5G Event was held in Beijing, China on May 31 and June 1, 2016.

The theme for this event is “Building 5G Technology Ecosystem” and it brought together about 450 experts from all corners of the globe to discuss that status and progress on 5G through a series of focused sessions:

- Opening Session
- Session 1: 5G System Design
- Session 2: 5G Air Interface
- Session 3: 5G Network & Operation
- Session 4: Technologies for 5G Terminals
- Session 5: Testing Technologies for 5G
- Session 6: 5G and Vertical Industries

This event was organised jointly by the 5 regional organisations involved with the development of 5G.

Euro-5G supported the organisation from the European end and endured the availability of the 5G-PPP Architecture white paper (and flyer) at the event. Several members of Euro-5G were speakers at the event.



Figure 9: 1st Global 5G event, Beijing, May/June 2016

4.1.4 2nd Global 5G Event, Rome, November 2016

The ambition for this European instance of the event is to have a high standard event which demonstrates the European commitment and leadership in the 5G activities.

Euro-5G is the core logistics group for the planning and administration of this event and has already done a lot of work to secure a suitable venue in an attractive location to encourage global participation.

The project has prepared an event budget and will handle the costs with a view to the event being substantially self-financing and only a small proportion of the costs being covered by the project.

4.2 Information Days

The Purpose of these information day workshops was to share the context of the 5G-PPP call 2 with all interested parties. It is important to highlight that the ambition of the 5G-PPP is to have each successive phase of the PPP making iterative progress based on the achievements of the preceding phase(s). Therefore it is important that potential proposers and participants for Phase 2 are aware of Phase 1 work and the context in which Phase 2 will start. These workshops also give organisations an opportunity to present project or technological ideas to their peers and to seek potential collaborators.

4.2.1 1st 5G-PPP Phase 2 Information day, Brussels, January 2016

The first 5G PPP Phase 2 Information Day/Stakeholders Event was held on the 21 January 2016 in Brussels. After the opening and welcome, the agenda was as follows:

- 5G PPP Phase 2, specificities and expectations from the EC
- Phase 2 preparatory steps from the 5G-I-A
- Overview of the 5G PPP Phase 1, running work and objectives from the 5G PPP SB
- Phase 2 contractual issues, - specifically info on Article 41.4 in the Model Grant Agreement from the EC

After these information points the agenda was given over to Stakeholders presentations and proposals. The European Commission organised the venue and registration for this event.

4.2.2 2nd 5G-PPP Phase 2 Information day, Bologna, March 2016

This event was hosted by the University of Bologna on the 17th March, 2016 (St Patricks Day!!) in Bologna, Italy.

After the opening address by Prof. Antonino Rotolo, Vice-Rector for Research, University of Bologna the following information presentations were given:

- | | |
|---|-------------------------|
| • 5G PPP Phase 2 explanations and expectations | Ari Sorsaniemi, EC |
| • Phase 2 preparatory steps/Brokerage/Collaboration Agreement | Werner Mohr, 5G-I-A |
| • 5G PPP Phase 1, objectives & on-going work | Jean-Sebastien Bedo, SB |
| • Discussion on a structured approach to 5G-PPP phase 2 | Didier Bourse, TB |

The event then moved into three sequential sessions of Stakeholder Presentations.

Stakeholders presentations and proposals (Part 1) Moderator: Werner Mohr

1. Al-Raweshidy: [Self-Organising and Programmable Virtual Cloud RAN for 5G and Beyond](#)
2. Buck: [microwave and millimetre-wave module design and manufacture](#)
3. Cabrero: [Video sharing for rich experiences in social events](#)
4. Ratkaj: [Audivision media services in the 5G context](#)
5. Demestichas: [Orchestration Framework for SDN/VNF Service Chaining in Low-Latency 5G Telecom Clouds](#)
6. Durucasugil: [company R&D overview](#)
7. Vázquez: [Expertise on technologies for 5G](#)
8. Favalli: [Flexible multimedia in SDR networks](#)
9. Tepeli: [5G Capabilities at Aselsan](#)

[SME involvement in 5G-PPP phase 2](#) (Q/A) Jacques Magen

Stakeholders presentations and proposals (Part 2). Moderator: Jean-Sebastien Bedo

1. Galis: [5G Software Network Research and Innovation Challenges](#)
2. Gil-Castiñeira: [SDN enabled smartphone. EPC Virtualization. 5G network equipment for experimentation](#)
3. Grazioso: [FUB experimental and research activities with the Italian PA towards 5G](#)
4. Gulpinar: [NETAS 5G projects overview](#)
5. Juwad: [Satellite role in 5G](#)
6. Kafetzakis: [Providing Small Cells as a Service: Multi-tenancy and Edge Cloud Capabilities](#)
7. Latva-aho: [Oulu Open 5G Network for Verticals Testing](#)
8. Neokosmidis: [Business and Regulatory perspectives of 5G networks](#)

9. Leeson: [Wireless body area sensor networks](#)

Stakeholders presentations (Part 3) Moderator: Giovanni Corazza

1. Magen: [Service & Technology Offer for 5G PPP Call 2](#)
2. Marini: [PRISMA Telecom Testing introduction](#)
3. Pietrzyk: [IS-Wireless R&D activities and offering](#)
4. Presi: [optical solutions supporting 5G and beyond](#)
5. Ruiz: [Network management and interoperable communication](#)
6. Spagnolini: [Fronthauling waveforms and architectures: optical fiber and copper](#)
7. Wali: [TSSG Organization Overview](#)
8. Zhu: [Energy efficient radio transceiver front-end hardware design](#)
9. Flizikowski: [ITTI — capabilities and competences for 5G PPP Phase 2](#)
10. Rodriguez-Natal: [Open Overlay Lab: SDN via programmable overlays](#)
11. Foley: [5G socio-economic impact in verticals and an extensive expert network](#)

In all, 29 Stakeholder presentations were presented and the registrations reached 126 with a few more participants turning up on the day. The registration was organised by Euro-5G.

The venue was organised by the university and the support services were paid for by Euro-5G.

4.2.3 3rd 5G-PPP Phase 2 Information day, Warsaw, May 2016

This event was hosted by the Warsaw University of Technology, Orange Poland, and the Polish ICT NCP on the 18th May, 2016.

The morning session was the information part:

- [5G PPP Phase 1, objectives & on-going work](#), Jean-Sebastien Bedo 5G-I-A
- [Phase 2 preparatory steps](#), Werner Mohr 5G-I-A
- [5G PPP Phase 2 Call, explanations and expectations](#), Ari Sorsaniemi, EC
- [Discussion on a structured approach to 5G-PPP phase 2](#), Didier Bourse, 5G-I-A
- [SME involvement in 5G-PPP phase 2](#), Jacques Magen, 5G-I-A

The afternoon sessions were given over to Stakeholders presentations and proposals:

1	Tyczka	ITTI sp. z o.o.	ITTI's interest in 5G PPP PHASE 2
2	Elmokashfi	Simula Research Lab	Empirical orchestrators for a multi-tenant 5G architecture
3	Hekkala	VTT	5GTNF
4	Tonna	Digital Catapult	Digital Catapult Profile
5	Jäntti	Aalto University	Ultra dense networks for localization and MTC
6	Paszkiewicz	Orange Polska	Orange Poland towards 5G
7	Magen	INTERINNOV	InterInnov's 5G PPP Call 2 Trusted Partnership
8	Luckner	WUT	Faculty of Mathematics and Information Science's expertise in mobile data processing and interpretation
9	Mühleisen	Hamburg Univ. of Technology	Research Challenges for Reliable 5G Systems
10	Marsch	Nokia Bell Labs Wrocław	Nokia Bell Labs Wrocław and EU research on the road to 5G
11	Pietrzyk	IS-Wireless	IS-Wireless R&D activities and offering
12	Szczęsny	Exatel	RAPID 5G
13		Citypassenger	Citypassenger Profile
14	Marchetti	Trinity College Dublin	Views and initiatives from A-CING and TCD

Table 1: Stakeholders presentation and proposals at the 3rd 5G-PPP Phase 2 Information day, Warsaw, May 2016

14 Stakeholder presentations were presented and the registrations reached 155 with a few more participants turning up on the day. The registration and the catering were organised by Euro-5G.

4.2.4 4th 5G-PPP Phase 2 Information day, Athens, June 2016

This event was held on the 30th June, 2016 – collocated with the EuCNC conference - in the Divani Apollon Palace & Thalasso Hotel, in Athens, Greece.

The agenda followed the standard format with an Information session to start followed by the stakeholder session. The information part included:

- [Introduction of the 5G-PPP Call for Phase 2 projects](#) Bernard Barani, EC
- Phase 2 preparatory steps (Q/A) Werner Mohr, 5G-I-A
- A structured approach to 5G-PPP phase 2 (Q/A) Didier Bourse, 5G-I-A
- SME involvement in 5G-PPP phase 2 (Q/A) Jacques Magen, 5G-I-A

The session on Stakeholders presentations and proposals was moderated by Werner Mohr:

1	Cattoni	Keysight Technologies	Cooperation with the EU FIRE project TRIANGLE on 5G testing possibilities
2	Magen	InterInnov	InterInnov's 5G PPP Trusted Partnership
3	Telli	HAVELSAN A.Ş.	Turkish National initiative on 5G
4	ACAR	Netas Telecommunications A.S	A Scalable Serverless Video Streaming by Using WebRTC(Web Realtime Communications) Enabled Peer-to-Peer Content-Delivery-Network on Mobile Edge
5	Barabash	IBM	The control plane challenges in converged 5G networks – scalability, application awareness, multi-tenancy, and more.
6	Calisti	Martel Innovate	Expertise offer
7	Cosmas	Brunel University	Software Defined Evolved Packet Core OMNET Model
8	Durak Ata	Istanbul Technical University	University profile/expertise
9	Barışık	Netas	Expertise Offer
10	Kaltenberger	Eurecom	OpenAirInterface – open source 5G platform
11	Lai	5G Technology Program Office, DoIT, MOEA	Taiwan ICT Development Status
12	Mühleisen	Hamburg University of Technology	Research on Reliable 5G Systems for Vehicles and Industry at Hamburg University of Technology, ComNets
13	Gutierrez	Samsung	Upwards and onwards in 5G Spectrum: from mmwave mobile access towards Terahertz communication
14	Onur	Middle East Technical University	Metamorphic Networks
15	Ran	MostlyTek Ltd	Networking Research beyond 5G. Scientific and technology advances for novel use of the spectrum potential, technological building blocks at frequencies above 90 Ghz up to Thz communications backed by innovative usage scenarios, address visible light communications and develop radically new approaches for spectrum efficiency.
6	Spagnolini	Politecnico di Milano	Waveforms and architectures for low-latency relaying
17	Stavdas	University of Peloponnese	Overview of the optical networking challenges as these are identified by the NetWorld2020 5G PPP Expert Group
18	Vassiliadis	EXUS	Security and Privacy Enablers for 5G critical applications
19	Zhang	Ranplan Wireless Network Design	Radio Access Network Optimisation for 5G and IoT
20	Prat	Universitat Politècnica de Catalunya (UPC)	Flexible WaveLength Distribution for PONs with Elastic Bandwidth Range
21	Ching-Tarng	ITRI	Taiwan's proposals for Phase 2 of the H2020 phase 2 5G program.
22	Paul Foley	Tech4i2	5G socio-economic impact in verticals & extensive expert network
23	Jara	HOP Ubiquitous S.L.	Scalable IoT Synchronization and Management in NB-IoT

Table 2: Stakeholders presentation and proposals at the 4th 5G-PPP Phase 2 Information day, Athens, June 2016

25 Stakeholder presentations were presented (and extra one turned up on the day) and the registrations reached 107 and with, as usual, a few more participants turning up on the day.

The registration was organised by Euro-5G and the venue was organised and paid for by Euro-5G.

4.2.5 5th 5G-PPP Phase 2 Information day, Bratislava, September, 2016

This event is being planned for September 2016 at the ICT Proposers Day in Bratislava, Slovakia.

4.3 Other events

4.3.1 1st Open 5G-PPP Architecture Workshop, Brussels,

This event was held on the 6th April 2016 in the Conference Centre Albert Borschette, in Brussels, Belgium. The purpose of this workshop was to share the views on 5G architectures being currently captured within the 5G-PPP initiative and to solicit the views of other relevant initiatives and projects whose work may also have an impact on 5G architecture design. Non 5G PPP projects and initiatives were invited to contribute to the debate.

The workshop was opened by Bernard Barani of the EC and Simone Redana, the chairman of the 5G-PPP Work Group on Architecture. The morning session then continued with Simone Redana's [presentation of the 5G-Architecture-Workgroup current architectural concepts](#).

The 2nd Morning session considered issues on access, backhaul/fronthaul, network integration

- [5GPPP arch SANSA](#)
- [5G ESA M2M presentation](#)
- [INSTINCT – Eurescom](#)

The 1st Afternoon Session focussed on: **Virtualisation and convergence**

- [SimpleCore – DoCoMo \(not presented but now available\)](#)
- [CONFIG – Huawei](#)
- [VITAL – Create-Net](#)
- [Cloud Sat \(not presented but now available\)](#)
- [iCIRRUS – UniKent](#)

While the 2nd Afternoon Session addressed: **Service Architectural issues**

- [reTHINK Service Delivery](#)
- [reTHINK 5G Identity](#)
- [Satcom and streaming services – Nomor research](#)
- [Satcom and 5G – arch experience- Avanti plc](#)

As a result of the discussions on 6 April during the first 5G PPP open workshop on 5G Architecture, a webpage to submit further contributions on architectures was opened to allow more inputs to be submitted

The 5G-PPP Architecture Working Group offered public workshops for discussion with any projects and initiatives, not already members of the 5G-PPP, with a view to ensuring that the 5G architectural requirements, captured in the architecture White Paper, are as rich and as comprehensive as possible. In addition, the working group launched a public consultation of the draft white paper.

The outcome of the 5G-PPP Architecture workshop and ensuing public consultations were published in the 5G Architecture White Paper² which was first published at the Global 5G event in China. Further updates, incorporating the results of public consultations are planned.

The venue was organised by the EC and the registrations was handled jointly by the EC and Euro-5G. Over 60 People registered for this workshop and the opportunity to contribute was greatly appreciated.

4.3.2 [Networld2020 Experts group/5G-PPP Vision WG joint meeting Bologna, March 2016](#)

The Joint Networld2020 Expert Group and 5G-PPP Vision Group Workshop was held in Bologna on March 16th 2016 in the University of Bologna. More than 80 researchers and professionals on the area of telecommunications attended the workshop, promoting a lively and intense debate in 5G and beyond technologies.

As originally scheduled, 18 contributions were presented in the workshop during four different sessions:

- experimentation with verticals,
- virtualized network and services,
- radio networks and
- optical networks

These contributions tackled several relevant topics like D2D (device-to-device) communications, C-RAN, satellite communications in 5G, distribution of audio-visual media services, WDM, UAV/RPA in 5G, VLC, V2X (vehicle to everything), softwarization, EPC virtualization, etc.

The main result of the workshop is the certainty that there are several outstanding technical proposals, envisaged to improve current networks beyond 5G. Starting from this workshop, a new Strategic Research and Innovation agenda has been drafted by NetWorld2020 Expert Group. Apart from the presentations, attendants enhanced the contributions with their questions and appropriate comments, which promoted an intense and fruitful debate.

All presentations are now public in the Expert Advisory Group webpage, and it is possible to download all of them by following the links available in the agenda.

4.3.3 [Other events where the 5G-PPP was represented](#)

4.3.3.1 [5G PPP projects and the automotive sector @ITS 2016](#)

The 5G-PPP projects had an information booth at the 11th European ITS Congress 2016 in Glasgow (Scotland, UK) from 6 to 9 June 2016. ERTICO and 5G PPP also co-organized a dedicated workshop on the 7th of June in the afternoon. The agenda was organized in 2 sessions:

Session 1

1. DG CONNECT – Eric Gaudillat European Commission activity in the domain of 5G for connected vehicles
2. Huawei – Markus Dillinger 5G communications, development and prospects
3. Ericsson – Stefano Sorrentino Radio access innovations: the road to 5G
4. ESOA – Stefano Agnelli Perspective on the role of satellites in 5G
5. 5G Infrastructure Association – Jean-Sebastien Bedo 5G empowering Vertical industries

² <https://5g-ppp.eu/wp-content/uploads/2014/02/5G-PPP-5G-Architecture-WP-July-2016.pdf>

Session 2

1. Samsung R&D Institute UK - David Gutierrez Estevez Smart Mobility in 5G
2. PSA Peugeot Citroen – Alain Servel ITS applications in 5G cellular context
3. Waterford Institute of Technology, TSSG - Michael Barros Adaptive wireless coverage for 5G connected cars networks
4. Intelsat – Trevor Willoughby Connectivity everywhere
5. Superfluidity and Bonvoyage EU projects – Lorenzo Bracciale OpenGeoBase: spatial database applications supported by innovative communications networks

This is a major activity for 5G-PPP projects since the automotive seems to be the most motivated and mature vertical sector with regards to placing demands on the 5G infrastructure. The Congress theme was “Delivering Future Cities Now” and was based on Glasgow’s pioneering work on Smart Cities which recently resulted in a GBP24M award based on the City’s and Scotland’s long history of innovation in Intelligent Traffic Control which started in 1967 with Europe’s first computerised traffic control system.

Euro-5G organised the stand and representation at this conference.

4.3.3.2 Workshop with NEM (Networked Electronic Media ETP) and EBU

Euro-5G organized a joint workshop between NetWorld2020 and NEM ETPs on the 19th of May 2016.

The agenda was the following:

Session	Speaker
Presentation of the Media & Entertainment whitepaper for feedbacks	Uwe Herzog
Presentation of the Audiovisual Services whitepaper for feedbacks	Darko Ratkaj
Lunch	
SCORSESE: The role of satellite in collaborative adaptive bitrate streaming services	Maria Guta
SATNEX: Enhanced caching techniques for satellite networks	Maria Guta
NEM views on broadcast & CDN	Pierre-Yves Danet
Discussion on interfaces between network service providers and content providers: a role for slicing?	Jean-Sébastien Bedo
Next steps for the WG	Pierre-Yves Danet & Jean-Sébastien Bedo

Table 3: Agenda of the Workshop with NEM (Networked Electronic Media ETP) and EBU

It was concluded that NEM research challenges should feed the list of research and innovation challenges which will be prepared by NetWorld2020 ETP towards 5G PPP Phase 3.

During this workshop, we had a discussion on the media and entertainment whitepaper which was published in January 2016. It was stated that the issue of how the media and entertainment applications configure the network should be highlighted in the paper.

In terms of requirements anytime, anywhere, and any device is the top priority for media.

Latency requirements were discussed. On one side, the requirement from a distribution point of view is in the order of seconds. But on the other hand, the object oriented delivery is completely disruptive and requires tight synchronization (in the order of ms) between the different media components.

At the content production level, there are also disruptions. Today production is often under one roof but when it is distributed the requirements are very high (standard definition camera = 1,5 Gbps, 4K camera = 4-6 Gbps, 22 cameras for EuroVision song contest).

It is difficult to have top 3 requirements for the whole sector because the range of use cases is very wide.

Public broadcasters would be OK to go over IP networks distribution but the technology needs to work at large scale without being too costly.

Then we discussed the audiovisual services whitepaper produced by EBU.

The audiovisual services market is still growing. This growth comes from on demand video mainly and a bit from TV subscriptions. It was stated that cable and satellite are heavily used in Germany but terrestrial TV has not a so high usage.

The replacement of terrestrial TV by IP delivery was discussed. EBU stated that today IP delivery is 3% but 15% of distribution costs. Then we exchanged views about how much time it would take to migrate from terrestrial TV to 5G if 5G would fit the requirements from public broadcasters.

The main requirements for audiovisual services are 100% coverage + one contract / head end for all networks (cable, terrestrial TV, satellite, IPTV, OTT, 3G/4G) + low cost.

It was concluded that audiovisual services can be a driver for 5G if it is not on a dedicated physical infrastructure.

On standards:

- EBU raised the question of where public broadcasters and MNOs can discuss on how to converge broadcast and broadband networks. A new ETSI ITS group was pointed out by Nokia.
- NEM also asked to NetWorld2020 to indicate how they could participate to the standardization of the API / orchestration / service intent interface on the content industry side.

[4.3.3.3 5G-PPP @ “5G: expected impact” conference organised by Telenor](#)

Telenor Research invited a number of key players to a 2-day conference to discuss 5G network opportunities and challenges in Fornebu (Norway) on 5-6 April 2016. David Kennedy (Euro-5G) and Werner Mohr (5G IA) were there as speakers on the 5G-PPP positions with respect to the opportunities and challenges.

[4.3.3.4 Networld2020 Steering Board meetings](#)

Euro-5G supported the logistics of Networld2020 Steering Board meeting on

- July 3, 2015 in Issy-les-Moulineaux, France,
- October 23, 2015 in Lisbon, Portugal,
- February 1, 2016 in Brussels and
- June 9, 2016 in Brussels.

These meetings organised the activities towards the development of contributions to the Horizon 2020 work program and the Strategic Research and Innovation Agenda.

[4.3.3.5 Networld2020 Annual Event](#)

The Networld2020 Annual Event took place in Brussels on 19 April 2016. Many of the activities of NetWorld2020 in the recent years have been towards supporting and proposing research directions of ICT topics in Horizon 2020 and in particular of the 5G PPP, e.g. by the preparation of a Strategic Research Agenda and several Whitepapers. In 2015 the first set of 5G-PPP projects started and the cooperation between projects is developing well.

The General Assembly discussed the changes being considered regarding the Governance Structure between NetWorld2020 and the 5G Infrastructure Association, resulting from the experience in the last 2 years. The ambition is to further optimise the effectiveness and efficiency of operations and

improve on the opportunity for organisations and stakeholders to get involved in the activities.

The NetWorld2020 event discussed these future plans and the rationale behind them. It also provided a good place for meeting and networking in preparation for the 5G PPP Phase 2 call which requires proposal submissions by November this year.

Euro-5G supported this event through providing the registration service and securing the venue.

[4.3.3.6 5G PPP projects @ETSI workshop on 5G: “5G, From Myth to Reality”, April 21st, 2016](#)

ETSI organised a workshop on 5G in ETSI headquarters in Sophia Antipolis (France) on April 21st, 2016. The Euro-5G project, together with the EC, organised a poster session involving SONATA, 5G NORMA, CogNET, mmMAGIC, 5G-ENSURE, SELFNET, 5G-Crosshaul, 5G-Ex, METIS-II, VirtuWind, FANTASTIC-5G to trigger an exchange of views on aspects of 5G that were not covered in the summit sessions.

[4.3.3.7 DigiWorld Summit 2015](#)

IDATE organised its 37th edition of the DigiWorld Summit conference on the 17th-19th November 2015, in Montpellier, France. The focus was on how digital innovation in ICT sectors is now totally changing all vertical sector activities. This international conference has an attendance of over 1200 professionals and 120 speakers from over 25 different countries. The plenary sessions and topical forums considered topics like: Connected Things, Future Networks, Smart City, TV & Video, Video Games, etc.

Mr. Terje TJELTA, Board Member of 5G Infrastructure Association took part in the forum devoted to “Future networks: welcome to the gigabit era?” on Behalf of Euro-5G and the 5G-I-A.

[4.3.3.8 1st 5G for Verticals Workshop](#)

The 1st 5G for Verticals Workshop was co-organised by the European Commission and the 5G Infrastructure Association in Brussels on June 18, 2015 with the automotive, energy, factories of the future / manufacturing, health, media / entertainment and ICT sectors present.

This event was held before Euro-5G started and was supported by the 5-alive project but is mentioned here to give a complete picture of the activities with respect to the verticals.

This event and the related work in Euro-5G resulted in 4 sector based white papers bring published in October 2015: <https://5g-ppp.eu/white-papers/>

[4.3.3.9 5G: Serving Vertical Industries – the 2nd 5G Verticals Workshop](#)

The 2nd Verticals workshop was held on the 9 November 2015 in the Diamant conference centre in Brussels. The workshop targeted the presentation and discussion of white papers, elaborated by vertical sectors in partnership with the ICT industry, to identify how future innovative digital business models in various industries may impact future 5G networks. Euro-5G organised this work shop and handled the venue and registrations. 120 participants registered for this Workshop.

Based on the work of this workshop, the follow-up contributions, and the discussions between the 5G-PPP Vision WG and ERTICO, EFFRA, EUTC, NEM, CONTINUA and Networld2020 communities, a joint document on **5G empowering the vertical industries** was published in February 2016 in time for distribution at Mobile World Congress 2016. Euro-5G was responsible for the editorial work of this document and its formal publication as a brochure. Euro-5G also looked after getting it shipped to Barcelona and distributed at the MWC.

The document can be seen here: [Executive Summary](#) / [Full Brochure](#)

[4.3.3.10 EC Concertation meeting](#)

Euro-5G organized the presentation of 5G PPP activities to H2020 and FP7 projects dealing with network topics during the concertation meeting organized by the EC on the 1st of March 2016. This

meeting promoted the openness of 5G PPP activities and gave a roadmap of open events where non 5G PPP projects could contribute.

4.3.3.11 [EuCNC 2015](#)

Euro-5G organised two special sessions at this event in Paris on the 2nd of July where the projects (which had only started on the 1st July) had the opportunity to present themselves and their ambitions.

The 5G-PPP also organised a number of videos of the project managers which were later used for dissemination purposes in social media and on the web.

4.3.3.12 [EuCNC 2016](#)

Euro-5G has organised a 5G PPP booth in the exhibition area of EuCNC 2016 in Athens, 28-30 June 2016. This included the submission of the booth proposal and the handling of the organisation and payment of the stand cost. Posters, roll-ups, information material and brochures were shipped to the booth and the booth was setup. In addition, all 5G Initiative projects were offered to use the booth for presenting their project at the event. Four projects made use of that offer: SONATA, mmMagic, 5G-XHaul and 5G-ENSURE. In addition, also a representative from Euro-5G was present at the booth at all times to inform visitors about the PPP. Besides information material, a video that explains about 5G PPP was running on one of the screens. Euro-5G also organised the capture of a set of videos about 5G-PPP activities and projects which are currently being edited for publication.

5 Programme support infrastructure

The information here is intended to update the information given in Deliverable 3.1 “Communication Hub” which described the programme support infrastructure at the start of the programme.

5.1 The 5G-PPP domain

5.1.1 Traffic Report (16/11/2015 – 25/07/2016)

The tables and charts below contain statistics for the recent period (November – July 2016). This is to compliment the period from the start date of the 5G-PPP web site until 15 November 2015 which was reported in D3.1: “Communication Hub”

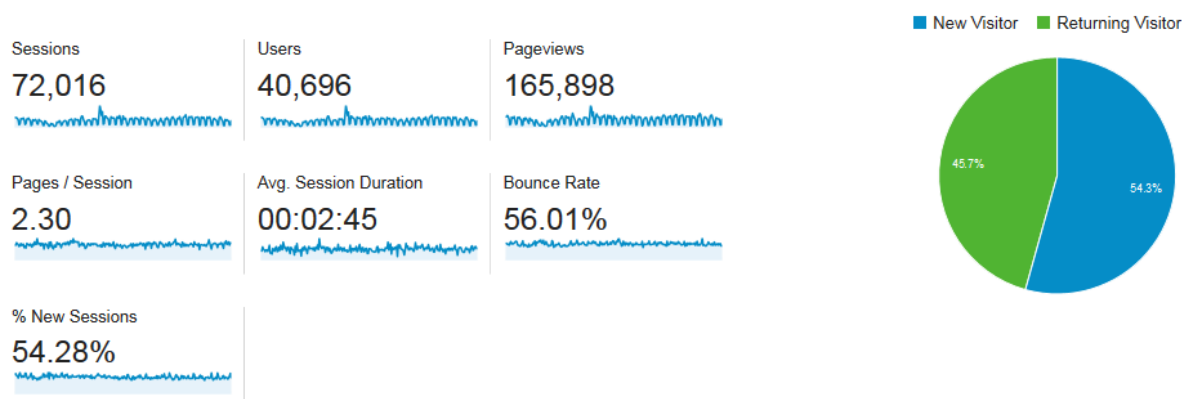


Figure 10: The 5G-PPP domain – traffic report

The site is being accessed from all corners of the globe as can be seen in the diagram below:.

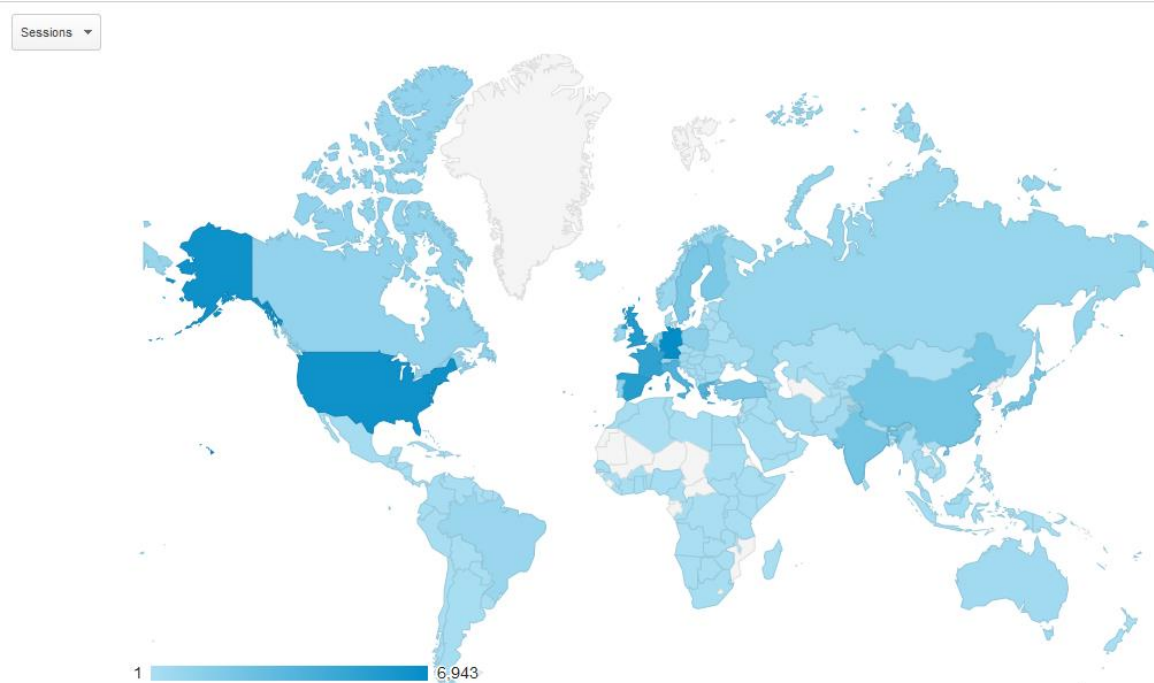


Figure 11: Countries accessing the 5G-PPP website

The www.5g-ppp.eu also supports external subdomains for projects or workgroups so that they can share the domain identity. So far two subdomains of 5g-ppp.eu were configured: cgnet.5g-ppp.eu and netmgmtwg.5g-ppp.eu. The statistics for the external domains are not part of the above figures.

When appropriate and agreed, an external organization can be granted permission to set up assigned hosts and maintain the Domain Name Service (DNS) for these hosts on their own DNS server(s). The name of each host must follow the naming scheme <ANYTHING>.<SUBDOMAIN NAME>.5g-ppp.eu, e.g. www.cognet.5g-ppp.eu

5.1.2 Top 25 Countries

	72,802 % of Total: 100.00% (72,802)	54.29% Avg for View: 54.24% (0.09%)	39,525 % of Total: 100.09% (39,491)
1. Germany	6,942 (9.54%)	44.93%	3,119 (7.89%)
2. United States	6,539 (8.98%)	67.81%	4,434 (11.22%)
3. United Kingdom	5,637 (7.74%)	53.61%	3,022 (7.65%)
4. Spain	5,626 (7.73%)	40.67%	2,288 (5.79%)
5. France	5,191 (7.13%)	50.95%	2,645 (6.69%)
6. Italy	3,839 (5.27%)	52.28%	2,007 (5.08%)
7. Greece	3,617 (4.97%)	46.09%	1,667 (4.22%)
8. Belgium	2,978 (4.09%)	44.16%	1,315 (3.33%)
9. China	2,230 (3.06%)	50.31%	1,122 (2.84%)
10. India	2,223 (3.05%)	73.41%	1,632 (4.13%)
11. Sweden	2,006 (2.76%)	52.04%	1,044 (2.64%)
12. Japan	1,988 (2.73%)	62.07%	1,234 (3.12%)
13. Finland	1,953 (2.68%)	40.30%	787 (1.99%)
14. Turkey	1,912 (2.63%)	45.92%	878 (2.22%)
15. South Korea	1,572 (2.16%)	62.09%	976 (2.47%)
16. Taiwan	1,401 (1.92%)	56.25%	788 (1.99%)
17. Poland	1,283 (1.76%)	51.91%	666 (1.69%)
18. Portugal	1,059 (1.45%)	49.01%	519 (1.31%)
19. Netherlands	1,010 (1.39%)	56.14%	567 (1.43%)
20. Canada	989 (1.36%)	61.68%	610 (1.54%)
21. Russia	779 (1.07%)	63.41%	494 (1.25%)
22. Brazil	658 (0.90%)	69.00%	454 (1.15%)
23. Ireland	643 (0.88%)	45.57%	293 (0.74%)
24. Switzerland	601 (0.83%)	55.24%	332 (0.84%)
25. Norway	598 (0.82%)	37.96%	227 (0.57%)

Figure 12: Top 25 countries accessing the 5G-PPP website

5.1.3 Top 25 Page Titles

Page ?	Pageviews ?	Unique Pageviews ?	Avg. Time on Page ?	Entrances ?	Bounce Rate ?	% Exit ?
	165,898 % of Total: 100.00% (165,898)	134,437 % of Total: 100.00% (134,437)	00:02:06 Avg for View: 00:02:06 (0.00%)	71,838 % of Total: 100.00% (71,838)	56.01% Avg for View: 56.01% (0.00%)	43.30% Avg for View: 43.30% (0.00%)
1. /	32,685 (19.70%)	26,463 (19.68%)	00:01:57	23,533 (32.76%)	46.83%	44.03%
2. /white-papers/	13,090 (7.89%)	8,531 (6.35%)	00:02:24	3,301 (4.60%)	63.08%	43.35%
3. /roadmaps/	6,573 (3.96%)	5,057 (3.76%)	00:02:22	2,131 (2.97%)	70.73%	46.80%
4. /5g-ppp-phase-1-projects/	5,802 (3.50%)	4,876 (3.63%)	00:01:35	1,458 (2.03%)	44.89%	27.44%
5. /event-calendar/	4,656 (2.81%)	3,648 (2.71%)	00:01:20	1,309 (1.82%)	57.07%	33.78%
6. /european-5g-actions/	3,693 (2.23%)	2,939 (2.19%)	00:01:11	761 (1.06%)	47.58%	25.83%
7. /metis-ii/	3,115 (1.88%)	2,704 (2.01%)	00:03:13	1,901 (2.65%)	45.19%	54.06%
8. /projects/	3,101 (1.87%)	2,226 (1.66%)	00:02:22	1,111 (1.55%)	45.55%	34.89%
9. /our-members/	2,783 (1.68%)	2,407 (1.79%)	00:02:18	681 (0.95%)	60.26%	43.84%
10. /global-5g-actions/	2,506 (1.51%)	2,116 (1.57%)	00:01:10	206 (0.29%)	55.71%	29.37%
11. /5g-normal/	2,450 (1.48%)	2,103 (1.56%)	00:02:48	1,291 (1.80%)	44.52%	47.76%
12. /5g-ppp-phase-2-pre-structuring-model/	2,433 (1.47%)	2,036 (1.51%)	00:03:37	1,117 (1.55%)	67.52%	60.05%
13. /xhaul/	2,420 (1.46%)	2,052 (1.53%)	00:03:08	1,413 (1.97%)	57.31%	55.66%
14. /mmmagic/	2,362 (1.42%)	2,086 (1.55%)	00:03:20	1,516 (2.11%)	52.85%	59.74%
15. /5g-ppp-phase-2-information-day-and-stakeholders-event/	2,035 (1.23%)	1,738 (1.29%)	00:03:54	1,470 (2.05%)	72.45%	68.40%
16. /5g-xhaul/	1,991 (1.20%)	1,662 (1.24%)	00:02:58	889 (1.24%)	41.98%	44.45%
17. /coverage-plans/	1,968 (1.19%)	1,656 (1.23%)	00:01:33	283 (0.39%)	63.60%	27.18%
18. /about-us/	1,938 (1.17%)	1,656 (1.23%)	00:01:54	580 (0.81%)	64.48%	38.75%
19. /5g-ppp-work-groups/	1,780 (1.07%)	1,500 (1.12%)	00:01:37	208 (0.29%)	50.00%	26.52%
20. /5gex/	1,749 (1.05%)	1,491 (1.11%)	00:03:00	973 (1.35%)	50.31%	54.66%
21. /5g-ppp-mwc-2016/	1,748 (1.05%)	1,470 (1.09%)	00:02:34	1,155 (1.61%)	67.88%	57.78%
22. /ppp/	1,731 (1.04%)	1,527 (1.14%)	00:01:28	500 (0.70%)	87.20%	42.29%
23. /sesame/	1,537 (0.93%)	1,338 (1.00%)	00:02:44	859 (1.20%)	48.90%	52.18%
24. /brokerage-platform-new/	1,499 (0.90%)	1,036 (0.77%)	00:01:27	578 (0.80%)	54.50%	34.22%
25. /ec-5g-infrastructure-ppp-phase-2-pre-structuring-model-open-consultation/	1,458 (0.88%)	921 (0.69%)	00:01:18	488 (0.68%)	31.29%	32.78%

Figure 13: Top 25 page titles of the 5G-PPP website

5.1.4 Highlight of Web Traffic

We have particularly noted the traffic to the Architecture white paper as a crude measure of the interest and uptake of the 5G-PPP outputs.

We were positively surprised to see that the original version of the [5G PPP View on 5G Architecture \(White Paper\)](#) was downloaded 5151 times in the last couple of months since it was put online.

Equally impressive is the fact that the updated version of the [5G PPP View on 5G Architecture \(White Paper - Updated July 2016\)](#) was downloaded 1155 times in the first 2 weeks since it was put online.

Clearly this indicates that there is a strong interest in the results of the 5G-PPP work.

5.1.5 Overview statistics for the period since the launch of the 5G PPP web

Below some information on web visitors and statistics is given for the whole period since the page has been launched in March 2014.

Report (17/03/2014 – 25/07/2016)

151,541 visits
3 min 15s average visit duration
52% visits have bounced (left the website after one page)
2.9 actions (page views, downloads, outlinks and internal site searches) per visit
391,032 page views,
21,876 outbound downloads ³

In the past 8 months (Nov 2015 – July 2016) the number of visits and page views nearly doubled compared to the first 20 months (March 2014 – Nov 2015).

The web site currently consists of 184 published pages and posts and 4941 files. The total size of the web is 750 Megabytes.

³ “Outbound Downloads” shows the list of external URLs that were clicked by our visitors from our website pages. All clicks on URLs that are not the same domain as the website (5g-ppp.eu) being tracked are counted as “Outbound Downloads”.

5.1.6 Top 25 Outbound Downloads

“Outbound Downloads” shows the list of external URLs that were clicked by our visitors from our website pages. All clicks on URLs that are not the same domain as the website (5g-ppp.eu) being tracked are counted as “Outbound Downloads”.

	14,845 % of Total: 99.93% (14,856)
1. bscw.5g-ppp.eu	1,671 (11.26%)
2. networld2020.eu	1,536 (10.35%)
3. metis-ii.5g-ppp.eu	827 (5.57%)
4. 5gnorma.5g-ppp.eu	714 (4.81%)
5. 5g-mmmagic.eu	538 (3.62%)
6. www.5g-xhaul-project.eu	517 (3.48%)
7. 5g-crosshaul.eu	514 (3.46%)
8. www.sesame-h2020-5g-ppp.eu	484 (3.26%)
9. www.5gex.eu	469 (3.16%)
10. www.networld2020.org	443 (2.98%)
11. telecomtv.com	412 (2.78%)
12. www.flex5gware.eu	368 (2.48%)
13. www.charisma5g.eu	349 (2.35%)
14. www.cognet.5g-ppp.eu	332 (2.24%)
15. selfnet-5g.eu	293 (1.97%)
16. www.networks-etp.eu	273 (1.84%)
17. superfluidity.eu	252 (1.70%)
18. speed-5g.eu	233 (1.57%)
19. www.5gensure.eu	232 (1.56%)
20. scic.ec.europa.eu	220 (1.48%)
21. www.ict-ras.eu	214 (1.44%)
22. www.youtube.com	214 (1.44%)
23. fantastic5g.eu	203 (1.37%)
24. www.sonata-nfv.eu	203 (1.37%)
25. ec.europa.eu	192 (1.29%)

Figure 14: Top 25 down loads of the 5G-PPP website

5.2 Programme Repository

5.2.1 Scale / Scope

A document sharing web service BSCW has been setup to provide a document repository for the various bodies and working groups of the 5G PPP. It also acts as a repository for deliverables and documents shared between projects.

Currently 1489 documents are stored in 289 folders with a total size of 12 Gigabytes.

5.3 Tools

5.3.1 Mail Lists

Over 150 mailing lists have been setup for 5G PPP and NetWorld2020 ETP. The number is quite dynamic and new communication groups are evolving quite frequently.

By July 2016 the 5G-PPP mail server had distributed 964000 mails with a traffic size of 221 Gigabytes.

An e-mail server and personal accounts have been created for the 5G Infrastructure Association and these are actively used by the board members when communicating on behalf of the 5G-I-A.

The Association member accounts of the 5G Infrastructure Association are personal in the form name@5g-ppp.eu. This enables the Board members to communicate visibly as a member of the 5G Infrastructure Association, instead of using their company- or university email account.

5.3.2 Audio and Web conferences

The audio conference bridge service has been used frequently the 5G Steering Board, Technology Board, projects and work groups.

However, there is a noticeable shift to using the Web-conferencing tool, in this case based on WebEx, that has been deployed and is available for the same groups as the audio conferencing facilities.

5.3.3 Registration services

Online registration facilities have been used for a number of workshops and information days. They consist of a web based form which gathers information into a database and automatically sends an acknowledgement to the registrant.

The database information is then used to prepare participant lists and send updated information to the participants.

Similar forms have also been used for to enable the community to submit feedback in public consultations e.g. on Whitepapers or the Pre-structuring model. In these cases an online form captures the information and it is stored in a database. Then the key information is exported to a spreadsheet which the editors of the document under consultation use to produce the next version of the document.

5.3.4 Brokerage Service

As part of the preparation for phase 2 of the 5G PPP a brokerage service was created and introduced. This service allows people to submit either proposal ideas or expertise offer profiles to the Brokerage Platform. Each submission will be published after approval by the brokerage platform moderator team from Euro 5G. Proposal ideas may be posted without publishing the idea owner's identity if they only wish to be contacted via the Brokerage Platform.

The platform offers search and contact request forms which allows idea proposers to find matching partners for a project consortium and companies to find interesting proposal ideas to cooperate in.

There are over 30 expertise offers posted on the site and these are searchable via expertise, interest areas or type of organisation (e.g. SME). There is only one project idea posted so far because proposal leaders generally are secretive about their proposals. However, we are aware that they do use the search facility to find complementary resources for their proposals.

5.3.5 eVoting tool

This tool enables decisions and elections to be held electronically using an secured system where the access and voting rights are controlled. For example, it has been successfully used for electing the 5G PPP SB and TB Vice-Chairs when it was not possible to assemble the candidate list in the physical meeting.

Appendix A List of organisations that have acceded to the 5G-PPP Collaboration Agreement

	Participant Organisations	Country
1	AALBORG UNIVERSITET	DK
2	AALTO-KORKEAKOULUSAATIO	FI
3	ADVA OPTICAL NETWORKING SE	DE
4	AIRRAYS GMBH	DE
5	ALCATEL - LUCENT BELL LABS FRANCE	FR
6	ALCATEL-LUCENT DEUTSCHLAND AG	DE
7	ALCATEL-LUCENT ISRAEL LTD	IL
8	ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA	IT
9	ALVARION TECHNOLOGIES LTD	IL
10	APFUTURA INTERNACIONAL SOLUCIONES SL	ES
11	ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS - RESEARCH CENTER	EL
12	ATHONET SRL	IT
13	ATOS SPAIN SA	ES
14	AZCOM TECHNOLOGY SRL	IT
15	B-COM	FR
16	BEN-GURION UNIVERSITY OF THE NEGEV	IL
17	BISDN GMBH - BERLIN INSTITUTE FOR SOFTWARE DEFINED NETWORKS	DE
18	BLU WIRELESS TECHNOLOGY LIMITED	UK
19	BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY	UK
20	BUDAPESTI MUSZAKI ES GAZDASAGTUDOMANYI EGYETEM	HU
21	BYTEMOBILE EUROPEAN DEVELOPMENT CENTER MEPE	EL
22	CENTRE TECNOLÓGIC DE TELECOMUNICACIONS DE CATALUNYA	ES
23	CHALMERS TEKNISKA HOEGSKOLA AB	SE
24	COMMAGILITY LIMITED	UK
25	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	FR
26	CONSORZIO NAZIONALE INTERUNIVERSITARIO PER LE TELECOMUNICAZIONI	IT
27	CORE NETWORK DYNAMICS GMBH	DE
28	COSMOTE KINITES TILEPIKOINONIES AE	EL
29	CREATE-NET (CENTER FOR RESEARCH AND TELECOMMUNICATION EXPERIMENTATION FOR NETWORKED COMMUNITIES)	IT
30	CREATIVE SYSTEMS ENGINEERING (C.S.E) MONOPROSOPI EPE	EL
31	DEUTSCHE TELEKOM AG	DE
32	DEUTSCHES FORSCHUNGSZENTRUM FUER KUENSTLICHE INTELLIGENZ GMBH	DE
33	DOCOMO COMMUNICATIONS LABORATORIES EUROPE GMBH	DE
34	E-BLINK	FR
35	ERICSSON AB	SE
36	ERICSSON MAGYARORSZAG KOMMUNIKACIOS RENDSZEREK K.F.T.	HU
37	ERICSSON Spain	ES
38	ERICSSON TELECOMUNICAZIONI	IT
39	ETHERNITY NETWORKS LTD	IL
40	EURECOM	FR
41	EURESCOM-EUROPEAN INSTITUTE FOR RESEARCH AND STRATEGIC STUDIES IN TELECOMMUNICATIONS GMBH	DE
42	EUROPEAN CENTER FOR INFORMATION AND COMMUNICATION TECHNOLOGIES GMBH	DE
43	FAIRSPECTRUM OY	FI
44	FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS	EL

45	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	DE
46	FUJITSU LABORATORIES OF EUROPE LIMITED	UK
47	FUNDACIO PRIVADA I2CAT, INTERNET I INNOVACIO DIGITAL A CATALUNYA	ES
48	FUNDACION CENTRO DE TECNOLOGIAS DE INTERACCION VISUAL Y COMUNICACIONES VICOMTECH	ES
49	FUNDACION IMDEA NETWORKS	ES
50	HELLENIC TELECOMMUNICATIONS ORGANIZATION S.A. - OTE AE (ORGANISMOS TILEPIKOINONION TIS ELLADOS OTE AE)	EL
51	HEWLETT PACKARD ITALIANA SRL	IT
52	HUAWEI TECHNOLOGIES CO LTD	CN
53	Huawei Technologies Duesseldorf GmbH	DE
54	IBM IRELAND LIMITED	IE
55	IHP GMBH - INNOVATIONS FOR HIGH PERFORMANCE MICROELECTRONICS/LEIBNIZ-INSTITUT FUER INNOVATIVE MIKROELEKTRONIK	DE
56	IMINDS VZW	BE
57	INCITES CONSULTING SARL	LU
58	INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE INCORPORATED	TW
59	INEA SPOLKA AKCYJNA	PL
60	INNOROUTE GMBH	DE
61	INSTITUT DE L'AUDIOVISUEL ET DES TELECOMMUNICATIONS EN EUROPE - IDATE	FR
62	Institut Mines-Telecom	FR
63	INSTITUTO DE TELECOMUNICACOES	PT
64	INTEL MOBILE COMMUNICATIONS GMBH	DE
65	Intel Shannon Limited	IE
66	INTERDIGITAL EUROPE LTD	UK
67	INTERINNOV SAS	FR
68	INTERROUTE S.P.A.	IT
69	INTRACOM SA TELECOM SOLUTIONS	EL
70	IP.ACCESS LIMITED	UK
71	ITALTEL S.P.A.	IT
72	JANMEDIA INTERACTIVE SPOLKA ZOO	PL
73	JCP-CONNECT	FR
74	KABUSHIKI GAISHA ENU TI TI DOKOMO	JP
75	KATHOLIEKE UNIVERSITEIT LEUVEN	BE
76	KEYSIGHT TECHNOLOGIES DENMARK APS	DK
77	KING'S COLLEGE LONDON	UK
78	KUNGLIGA TEKNISKA HOEGSKOLAN	SE
79	LUNDS UNIVERSITET	SE
80	MARTEL GMBH	CH
81	NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS"	EL
82	NEC EUROPE LTD	UK
83	NEXTWORKS	IT
84	NIXU OY	FI
85	NOKIA SOLUTIONS AND NETWORKS DANMARK AS	DK
86	NOKIA SOLUTIONS AND NETWORKS GMBH & CO KG	DE
87	NOKIA SOLUTIONS AND NETWORKS MANAGEMENT INTERNATIONAL GMBH	DE
88	NOKIA SOLUTIONS AND NETWORKS OY	FI
89	NOKIA SOLUTIONS AND NETWORKS SP ZOO	PL
90	NOMOR RESEARCH GMBH	DE
91	ONAPP LIMITED	GI
92	OPTARE SOLUTIONS SL	ES

93	ORANGE SA	FR
94	ORION INNOVATIONS PRIVATE COMPANY	EL
95	OY L M ERICSSON AB	FI
96	PANEPISTIMIO THESSALIAS	EL
97	POLITECHNIKA POZNANSKA	PL
98	POLITECNICO DI BARI	IT
99	POLITECNICO DI TORINO	IT
100	POLYTECHNIC INSTITUTE OF NEW YORK UNIVERSITY CORP	US
101	PROEF, SGPS SA	PT
102	PT INOVACAO E SISTEMAS SA	PT
103	Qamcom Research and Technology AB	SE
104	REAL WIRELESS LIMITED	UK
105	RED HAT ISRAEL LTD	IL
106	REDZINC SERVICES LIMITED	IE
107	ROHDE & SCHWARZ GMBH&CO KOMMANDITGESELLSCHAFT	DE
108	RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY	US
109	SAMSUNG ELECTRONICS (UK) LIMITED	UK
110	SEQUANS COMMUNICATIONS SA	FR
111	SICS Swedish ICT AB	SE
112	SIEMENS AKTIENGESELLSCHAFT	DE
113	SISTELBANDA SA	ES
114	SMNET AE	EL
115	STMICROELECTRONICS GRENOBLE 2 SAS	FR
116	SYNELIXIS LYSEIS PLIROFORIKIS AUTOMATISMOU & TILEPIKOINONION MONOPROSOPI EPE	EL
117	TECHNISCHE UNIVERSITAET BERLIN	DE
118	TECHNISCHE UNIVERSITAET DRESDEN	DE
119	TECHNISCHE UNIVERSITAET KAISERSLAUTERN	DE
120	TECHNISCHE UNIVERSITAET MUENCHEN	DE
121	TECNOLOGIAS SERVICIOS TELEMATICOS Y SISTEMAS S.A.	ES
122	Teknologian tutkimuskeskus VTT Oy	FI
123	TELCARIA IDEAS SL	ES
124	TELECOM ITALIA INFORMATION TECHNOLOGY SRL	IT
125	TELECOM ITALIA SPA	IT
126	TELEFONICA INVESTIGACION Y DESARROLLO SA	ES
127	TELEKOM SLOVENIJE DD	SI
128	TELENOR ASA	NO
129	TELNET REDES INTELIGENTES SA	ES
130	TES ELECTRONIC SOLUTIONS GMBH	DE
131	THALES ALENIA SPACE ESPANA, SA	ES
132	THALES COMMUNICATIONS & SECURITY SAS	FR
133	THALES SERVICES SAS	FR
134	THE 5G INFRASTRUCTURE ASSOCIATION	BE
135	THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD	UK
136	TRUST-IT SERVICES LTD	UK
137	UBIWHERE Lda	PT
138	UNIFIED STREAMING BV	NL
139	UNIVERSIDAD CARLOS III DE MADRID	ES
140	UNIVERSIDAD COMPLUTENSE DE MADRID	ES
141	UNIVERSIDAD DE MURCIA	ES

142	UNIVERSIDAD DEL PAIS VASCO/ EUSKAL HERRIKO UNIBERTSITATEA	ES
143	UNIVERSIDAD POLITECNICA DE MADRID	ES
144	UNIVERSITA DEGLI STUDI DI TRENTO	IT
145	UNIVERSITA DI PISA	IT
146	UNIVERSITAET BREMEN	DE
147	UNIVERSITAET DUISBURG-ESSEN	DE
148	UNIVERSITAET PADERBORN	DE
149	UNIVERSITAT POLITECNICA DE CATALUNYA	ES
150	UNIVERSITAT POLITECNICA DE VALENCIA	ES
151	UNIVERSITATEA POLITEHNICA DIN BUCURESTI	RO
152	UNIVERSITE DE LIEGE	BE
153	UNIVERSITY COLLEGE LONDON	UK
154	UNIVERSITY OF BRIGHTON	UK
155	UNIVERSITY OF BRISTOL	UK
156	UNIVERSITY OF ESSEX	UK
157	UNIVERSITY OF SOUTHAMPTON	UK
158	UNIVERSITY OF SURREY	UK
159	UNIVERSITY OF THE WEST OF SCOTLAND	UK
160	VIRTUAL OPEN SYSTEMS SARL	FR
161	VISIONA INGENIERIA DE PROYECTOS SL	ES
162	WATERFORD INSTITUTE OF TECHNOLOGY	IE
163	WINGS ICT SOLUTIONS INFORMATION & COMMUNICATION TECHNOLOGIES EPE	EL
164	WORLDSENSING S.L.N.E.	ES
165	ZURCHER HOCHSCHULE FUR ANGEWANDTE WISSENSCHAFTEN	CH

Table 4: List of organisations that have acceded to the 5G-PPP Collaboration Agreement