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## Euro-5g – Supporting the European 5G Initiative

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#### *Abstract*

The Intermediate liaison deliverable reports on European and global 5G initiatives and established contacts that have been initiated and or established with related initiatives in Europe and worldwide.

First, the document describes the status of the international environment of 5G research and main initiatives, which will have a relevant impact on standardisation and on the regulatory process, including the status of signed MoUs with major international counterparts. Secondly, the deliverable reports on the status of Global 5G Events and lessons learnt from the First Global 5G Event in China. Finally, the deliverable covers the status of the European liaison with 5G related initiatives in H2020 and beyond.

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## Executive Summary

The establishment of worldwide collaborations around 5G is a key goal to ensure that results are valid globally and based on the same standards and architectures. Accordingly, one of the key objectives of EURO-5G is the liaison with existing 5G-related initiatives globally.

A number of actions have already been covered in the past months, including:

- MoUs signature with: IMT-2020 (5G) Promotion Group (China), 5G Mobile Communications Promotion Forum (Japan), 5G Forum (Korea) and 5G Americas.
- Joint Declarations at the government level with Brazil, China, Japan and Korea.
- Organisation of the First Global 5G Event.

In the last period, EURO-5G extended the above actions by

- Supporting the establishment of international MoUs and Joint Declarations with Brazil. India and the US are under discussion on government level;
- Organising the Second Global 5G Event on 9<sup>th</sup> - 10<sup>th</sup> November 2016 in Rome, building on the lessons learnt from the First Global 5G Event;
- Reinforcing the collaboration with relevant H2020 activities such as FIRE, AIOTI, and so on;
- Exploring the status of EU-28 National activities in the context of 5G.

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## Abbreviations

<b>cPPP</b>	contractual Public-Private Partnership
<b>CSA</b>	Coordination and Support Action
<b>EC</b>	European Commission
<b>EU</b>	European Union
<b>ICT</b>	Information and Communication Technology
<b>ICTC</b>	Information and Communication Technology Committee
<b>IoT</b>	Internet of Things
<b>IP</b>	Internet Protocol
<b>IT</b>	Information Technology
<b>ITU</b>	International Telecommunications Union
<b>ITU-R</b>	International Telecommunications Union – Radio Sector
<b>MoU</b>	Memorandum of Understanding
<b>NCP</b>	National Contact Point
<b>R&amp;D</b>	Research and Development
<b>TCP</b>	Transmission Control Protocol
<b>WP5D</b>	Working Party 5D
<b>WRC</b>	World Radiocommunications Conference
<b>3GPP</b>	Third Generation Partnership Project
<b>5G</b>	Fifth Generation
<b>5G-IA</b>	5G Infrastructure Association
<b>5G PPP</b>	5G Public Private Partnership

# 1 Introduction

The research & development of 5G technologies is currently undertaken globally by different actors. Facilitating the communication among these actors is crucial for the development of common and interoperable standards that will guarantee seamless deployment of 5G-enabled services globally. One of the key goal of EURO-5G is supporting the position of the European 5G PPP initiative on the global scenario to ensure its relevance and leadership. In particular EURO-5G liaises with relevant global and EU National initiatives with the objective of promoting the results of the 5G PPP initiative.

EURO-5G supports the broad dissemination of the results produced by ongoing 5G PPP projects and related initiatives by exposing to other regions and initiatives for their value recognition, uptake and as a means to build consensus on various technical and policy matters.

Besides the efforts undertaken by individual ongoing 5G PPP Phase 1 projects and players, the role of the EURO-5G project is to ensure that liaisons are established and supported based on the agreements entered into by the 5G-Infrastructure Association, and the European Commission, EC, related to 5G. These activities are covered mainly in the work package 4, *WP4 Liaison: International, National and peer Initiatives*.

One other strategic aspect of the EURO-5G support to 5G promotion is the cooperation with relevant EU projects and initiatives beyond the 5G PPP Programme to support the use and uptake of the 5G PPP network architecture and interfaces. Relevant EU projects and initiatives include: EU-28 national programmes (identified through National Contact Points, and EUREKA Clusters), and other related EC initiatives such as the Future Internet Research and Experimentation (FIRE), and the Internet of Things (IoT) initiatives.

This deliverable provide an overview of Liaison activities covered from December 2015 (date of released of the previous report - D4.1 [1]) to end of July 2016.

## 1.1 Liaisons approach and core strategy: an overview

This deliverable takes on from the strategy depicted in D4.1 [1] with the aim of facilitating the establishment of international cooperation to support harmonisation activities on the 5G vision, requirements, design goals, system concepts, and architectures in order to build consensus ahead of future standardisation.

In line with the above major goals, EURO-5G's strategy will focus on the following actions:

- To establish liaisons with other national and European R&D programs (e.g. Eureka clusters) for the inclusion of the 5G related topics as appropriate, and foster the creation of synergies.
- To analyse international activities on 5G and ensure proper positioning of the European 5G PPP initiative so as to identify and pursue collaboration opportunities e.g. by means of MoUs.
- To establish and maintain necessary contacts and cooperation on global level with similar initiatives in other regions and countries like China, Japan, Korea, North America and others, if new initiatives emerge.
- To support the coherence and maximum impact of the 5G PPP and its projects through liaisons with other relevant R&D programs, including related EC-driven initiatives like for instance the FIRE programme.

The strategy outlined above, requires a close collaboration with bodies part of the 5G PPP programme, and in particular:

- the 5G Infrastructure Association and its policy-oriented Working Groups;
- 5G PPP projects and;
- technology-oriented Working Groups in the 5G Initiative.

To support the liaison and collaboration of the 5G PPP programme with international and national bodies active on 5G thematic it is very important to develop an appropriate communication strategy. The strategy encompasses different tools, content and media in accordance to the scope of the collaboration and to the involved stakeholders. A fundamental role in the communication strategy will

be covered by the Global 5G Events (cf. Section 2).

A number of actions have already been covered in the past months, including:

- MoUs signature with: IMT-2020 (5G) Promotion Group (China) [4], 5G Mobile Communications Promotion Forum (Japan) [3], 5G Forum (Korea) [5] and 5G Americas [2].
- Joint Declarations at the government level with Brazil, China, Japan and Korea.
- Organisation of the First Global 5G Event.

In the last period, EURO-5G extended the above actions by

- Supporting the establishment of international MoUs and Joint Declarations with Brazil . India and the US are under discussion on government level;
- Organising the Second Global 5G Event on 9<sup>th</sup> - 10<sup>th</sup> November 2016 in Rome, building on the lessons learnt from the First Global 5G Event;
- Reinforcing the collaboration with relevant H2020 activities such as FIRE, AIOTI, and so on;
- Exploring the status of EU-28 National activities in the context of 5G.

## 1.2 Deliverable's organisation

The remainder of this document is organised as follows:

- Section 2 reports on the activities resulting from the international liaison, contacts and relations identified in D4.1. In particular, it reports progresses on the collaborations with international 5G projects and on the Global 5G Events.
- Section 3 reports on the identification of 5G national programmes and initiatives through the NCPs, and on the ongoing collaboration with other relevant H2020 programmes and initiatives.
- Finally, Section 4 drafts the conclusion and the next steps of the international liaison activities. It also proposes the development of an interactive map as mean to make publically available all identified 5G programmes and projects, and stimulate the submission of additional relevant contacts and pointers by the 5G community.



## 2 International Liaisons, Contacts and Relations

The 5G Infrastructure Association, as part of the activities related to the 5G PPP, established cooperation with international counterparts by means of MoUs. MoUs have been signed with

- IMT-2020 (5G) Promotion Group in China,
- 5G Mobile Communications Promotion Forum in Japan,
- 5G Forum in Korea and
- 5G Americas.

The EU Commission signed Joint Declarations on government level with the governments of

- Brazil,
- China,
- Japan and
- Korea.

Details are described in the Euro-5G Deliverable D4.1 “International, national and peer Initiatives Strategy and plan” [1]. The main objectives of the Joint Declarations and the MoUs are to open official communication channels and to cooperate on vision and requirements for 5G, spectrum and standardisation of future networks, to exchange documents and information.

In addition, these 5 organisations agreed to organise a series of Global 5G Events.

Each region is following national and/or regional strategies and interests. Global industry is very interested to develop and agree globally accepted standards, which take into account contributions and interests of all involved stakeholders. Therefore, international cooperation at an early stage in the research phase is essential to get a mutual understanding of views in different regions and stakeholders and to build consensus ahead of future standardisation.

With respect to industrial activities, it is worth reporting that a “5G Manifesto for timely deployment of 5G in Europe” from key players in the 5G technologies (BT Group, Deutsche Telekom, Ericsson, Hutchison Whampoa Europe, Inmarsat, Nokia, Orange, Proximus, Royal KPN, SES, Tele2 AB, TIM - Telecom Italia, Telefonica, Telekom Austria Group, Telenor Group, Telia Company and Vodafone) was published on July 7th, 2016. The 5G manifesto presents a consolidated industry that aligns with the 5G PPP approach by

- supporting vertical industries in digitalization of their processes and new business models; and
- paving the way for large pan-European trials.

The following sections describe achievements and future plans in the context of 5G PPP.

### 2.1 Achievements, work in progress and next steps

The 5G Infrastructure Association signed since 2014 several MoU with international counterparts (cf. D4.1 [1]). Since the start of the Euro-5G CSA, the negotiations of the MoU with IMT-2020 (5G) Promotion Group (China) were supported by the CSA. The MoU was signed on September 29, 2015.

In 2015, the 5G Infrastructure Association and their 4 international counterparts, namely, IMT-2020 (5G) Promotion Group, The Fifth Generation Mobile Communications Promotion Forum (Japan), 5G Forum (Korea) and 5G Americas, negotiated a multilateral MoU to organise a series of Global 5G Events. This MoU was signed at the EU ICT Conference 2015 on September 20, 2015 in Lisbon at a workshop on standards and spectrum, which was jointly organised by the EU Commission, the Euro-5G CSA and 5G Infrastructure Association. This was a significant step towards global cooperation to exchange views and to build consensus on 5G system concepts, vision, requirements and related policy objectives (cf. D4.1 [1]).

Based on the multilateral MoU a First Global 5G Event was organised on May 31 and June 1, 2016 in

Beijing and hosted by IMT-2020 (5G) Promotion Group (cf. Section 2.2). The 5G PPP Architecture White Paper was published at this event.

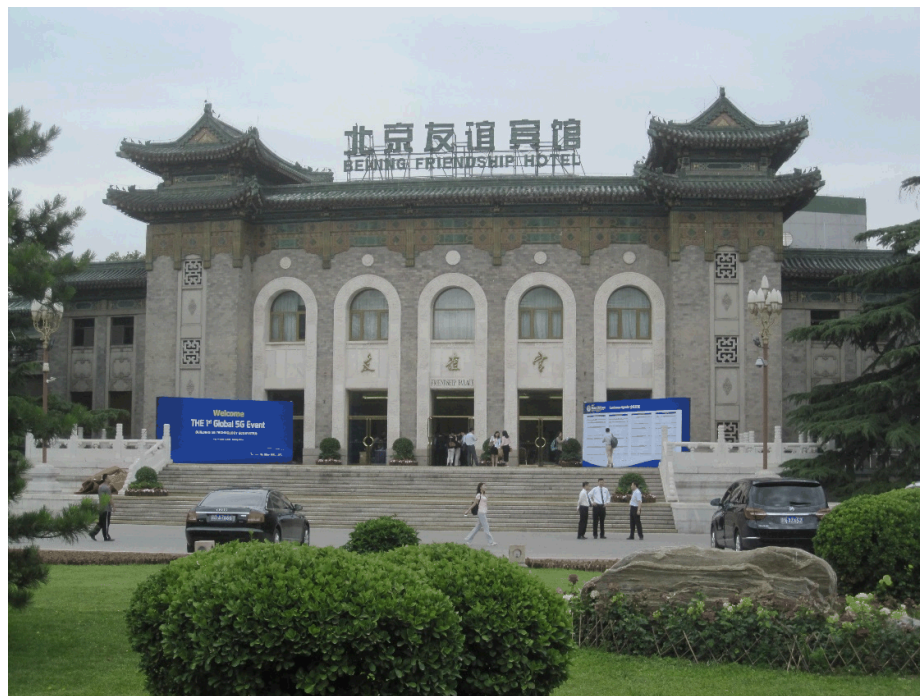
The Second Global 5G Event is currently under preparation. It will take place on 9<sup>th</sup> and 10<sup>th</sup> November 2016 in Rome and will be hosted by the 5G Infrastructure Association. EU Commissioner Oettinger, the General Director of DG Connect Mr. Viola and the Italian government have been invited to this event.

The EU Commission signed a Joint Declaration with Brazil at MWC 2016 in February [6]. At the Net Futures Event of the EU Commission in April 2016 the Chair of the Board and the Secretary General of the 5G Infrastructure Association and representatives of the EU Commission met a delegation from Brazil to discuss future cooperation in the 5G domain. The delegation from Brazil explained that currently there is no industry association available in Brazil, which could be a counterpart on the private side for the 5G Infrastructure Association. In this meeting the Brazilian delegation was interested how the 5G Infrastructure Association and the 5G PPP are organised. Due to the current government crises in Brazil there is no progress since April 2016. EURO-5G and the 5G Infrastructure Association are following up for the next steps.

In addition, the EU Commission is negotiating a Joint Declaration with the Indian government and is in discussion with the US government. It is intended to sign the Joint Declaration with the Indian government in November 2016 most probably at the Second Global 5G Event in Rome. The 5G Infrastructure Association is currently evaluating potential counterparts in India to negotiate a parallel MoU in order to cooperate on the private side in the 5G domain. Due to a different strategic approach the discussions with the US are moving slowly.

## 2.2 First Global 5G Event in China – report and follow-up

The First Global 5G Event was organized by the IMT-2020 Promotion Group (China) with the support of 5G PPP (Europe), 5G Forum (Korea), 5G Mobile Forum (Japan), and 5G Americas (USA). The event took place on May 31 – June 1 2016 in Beijing, at the Friendship Hotel.



*Figure 1. Meeting venue at Beijing Friendship Hotel.*

The Technical Programme Committee (TPC) was formed with a representative from each of the five signatories of the multilateral MoU, namely:

- Giovanni E. CORAZZA (5G PPP - Europe)

- Hyun Woo LEE (5G Forum - Korea)
- Zhendong LUO (IMT-2020 PG - China)
- Takehiro NAKAMURA (5GMF - Japan)
- Chris PEARSON (5G Americas - USA)

The TPC worked primarily by email, given that the time-zone difference made it difficult to find convenient time slots for conference calls. Given that the IMT-2020 Promotion Group was hosting the event, they had the lead in the organization.

The event was attended by approximately 450 people, most of them from China. The European participation can be estimated at around 30-40 persons.

Considering the Programme, the Event was organized with an opening session and six content specific session. The Event was opened by Mr. Miao Wei, the Minister of Industry and Information Technology (MIIT) in China, testifying the high-level consideration that this multilateral effort received in China.



*Figure 2. Opening speech by Mr. Miao Wei, the Minister of Industry and Information Technology (MIIT), China.*

During the closing remarks, Ms. Wang Zhiqin and Dr. Werner Mohr, following the success of the event, invited everyone to join the Second Global 5G Event, to be hosted by 5G PPP in Rome (Italy). The full agenda of the event and the press release prepared by 5G IA are available in Appendix A.

### **2.2.1 Lessons learnt from the First Global 5G event**

The First Global 5G event, as first event of its series, was key to define strategy for the upcoming events. In particular, EURO-5G consider as important lessons for future events the following points:

1. The event was high level, with participation from political figures, testifying a clear industrial policy in China towards the development and deployment of 5G networks. We should show an equal level of commitment in Europe.
2. In the organization, there wasn't sufficient time for interaction between speakers and audience. This shall be improved in future events.
3. Also, it was clear that the event was somewhat dominated by one of the five region; it should be possible to improve on this by making the event more balanced, even though it is clear that the hosting Region will always play the major role.

4. The exhibition space was quite small, and no real demonstration was shown.

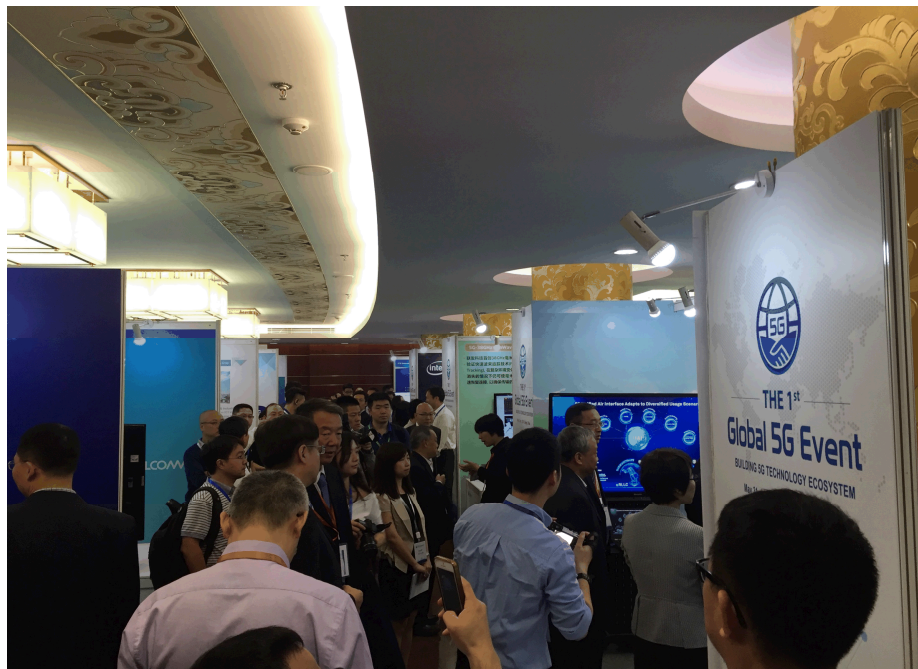


Figure 3. Exhibition at the First Global 5G Event.

## 2.3 Second Global 5G Event in Europe – plans and ongoing preparation

At the time of submission of this Deliverable, the organization of the 2<sup>nd</sup> Global 5G Event in Rome is ongoing. Martel has been appointed as overall organiser for the event, by coordinating on logistics and organisational aspects between the 5G Infrastructure Association, 5G IA, the European Commission, the Euro-5G consortium and the meeting venue.

### 2.3.1 Logistics

The event will take place at the Rome Marriott Park Hotel, 15 km away from the Leonardo da Vinci Airport in Rome (Italy), which will provide easy access for travellers. The venue provides large rooms for the conference, and also very adequate space for large-size exhibitions and receptions. A dedicated web page to provide information and registration facilities to the event has been set and already published at the 5G PPP website<sup>2</sup>.

### 2.3.2 PR and promotion

Communication and media promotion before, during and after the event will be led and coordinated by a representative of the 5G IA and iDATE on behalf of EURO-5G. On the web presence side, Eurescom is coordinating activities and ensuring information about the event to be published on a regular basis.

At the time of submission of this deliverable, broad advertisement of the event has already started, especially by creating and distributing a SAVE the DATE announcement and flyer (created by Martel) that has been distributed to all participants of the EuCNC 2016 conference that took place in Athens, 27 – 30 June 2016.

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<sup>2</sup> <https://5g-ppp.eu/2nd-global-5g-event/>



**5G PPP**  
PUBLIC-PRIVATE PARTNERSHIP

**The 2<sup>nd</sup> Global 5G Event**  
**5G Challenges and Opportunities**  
November 9th-10th, 2016 Rome, Italy

**OBJECTIVES**

- To provide a global meeting place for all parties, which are active in 5G development
- To discuss latest developments on 5G in:
  - research,
  - development and standardisation
  - and roadmaps.
- To highlight the achievements of the on-going 5G projects

**WHO SHOULD ATTEND?**

- Investors, CEOs, and marketing directors tracking the direction of 5G and/or advanced ICT services for all industrial sectors
- Innovation Managers, CTO's or Business Development Managers working in the ICT industry
- Industry analysts and consultants looking to understand the latest technology advances in 5G
- National authorities, regulatory responsible, and community representatives involved in enabling the future European economy through the provision of advanced infrastructure

**STAY TUNED**  
Information on the Agenda and Registration will be available on-line in July  
[www.5g-ppp.eu/2nd-global-5g-event/](http://www.5g-ppp.eu/2nd-global-5g-event/)

This event is being jointly organised by the 5G MoU partners:

5G IA INFRASTRUCTURE ASSOCIATION IMT-2020 5G FORUM 5G IMIF 5G AMERICAS

**SAVE THE DATE**

Discussions on the emerging global 5G Policies for spectrum, standards and roll-out as well as presentations and demos of the latest developments by the on-going 5G R&I projects.

**What 5G is about**

Diagram illustrating 5G applications: Smart wearables, Smart mobility, Smart parking, eHealth, Traffic priority, Smart grids, Entertainment Apps beyond imagination, Smart Car, Car-to-car communication, Connected house, Security & Surveillance, Smart Grids, Water quality, Utility management.

**STAY TUNED**  
Information on the Agenda and Registration will be available on-line in July  
[www.5g-ppp.eu/2nd-global-5g-event/](http://www.5g-ppp.eu/2nd-global-5g-event/)

This event is being jointly organised by the 5G MoU partners:

5G IA INFRASTRUCTURE ASSOCIATION IMT-2020 5G FORUM 5G IMIF 5G AMERICAS

Figure 4. The 2nd Global 5G Event - Announcement Flyer.

### 2.3.3 Programme

The **International Technical Programme Committee** has been confirmed to be identical to that of the First Global 5G Event, reported in the previous section. In addition to that, two local committees have been formed:

- **Conference Organizing Committee:** Jean-Sébastien Bedo, Giovanni Corazza, Bernard Barani, Didier Bourse, Simone Redana, Terje Tjelta, Uwe Herzog.
- **Exhibition Organizing Committee:** The Euro-5G consortium is supporting all the organizing committees and is responsible for the event logistics and the public relations.

### 2.3.4 Preliminary Agenda

The preliminary schedule for the Second Global 5G Event is as follows:

- Payload for the event: **“Enabling the 5G Ecosphere”**
- Day 1
  - Opening session
  - Session 1: Designing the flexible 5G system architecture
  - Session 2: Towards globally harmonized spectrum for 5G
  - Closing session Day 1: speech of EU Commissioner Oettinger (To be confirmed depending on his schedule).
- Day 2
  - Session 3: 5G air interface and radio management
  - Session 4: 5G network management & software networks

- Session 5: 5G for verticals in the new economy
- Wrap up panel: 5G: mobile broadband and beyond?
- Closing remarks

It should be noted that this is an event with only invited speakers, i.e., there is no associated Call for Papers. The intention is to invite the best speakers for each topic. In order to improve with respect to the previous event (see “lessons learned” in the previous section), it has been decided that each session will follow this organization: six speakers per session, one from each of the five MoU signatories plus an “independent” speaker from an institutional body, that will give high level indications from the global perspective. Each speaker will have a 10 minutes slot (total 60 minutes), which will then be followed by a panel of 50 minutes. This will allow having an interaction between the session moderator, the speakers, and the audience.

Regarding the Exhibition, it is foreseen that around 30 - 40 booths will be accommodated. Exhibitors shall include 5G PPP projects interested in demonstrating the technology developed in the course of 5G PPP Phase 1, industry, operators, plus the five regions which have signed the multilateral MoU.

## 3 Liaisons and Contacts to European Initiatives

### 3.1 5G National Initiatives

As defined in the overall strategy, one of the key actions to complete the European landscape is to complete the identification of National initiatives related to 5G. A first step to identify active National Programmes, it is the coordination with the National Contact Points (NCPs). Beyond national programmes (i.e. national version of 5G PPP programme), different industry lead initiatives may be active in Europe. As second step, to gather also such initiatives, EURO-5G will kick off a wider interaction with participants to 5G PPP projects, and the online scouting of national news related to 5G initiatives. In this deliverable we report the activities related to the liaison with NCPs.

#### 3.1.1 Process to identify active National Programmes through NCPs

In April 2016 it was decided to proceed with contacting the NCPs to identify ongoing actions in the EU countries related to 5G. The process was implemented in the following way:

1. Definition of a short survey and accompanying email to obtain relevant information from NCPs;
2. Identification of relevant NCPs for the 5G themes in the different EU countries;
3. Contacting the identified NCPs with the survey and accompanying email (see Appendix B).
4. Collection of results from the respondent to the survey.

To make the data collection and its analysis more efficient, the survey was created using Google Forms (see Figure 5). The survey was later extended also to NCPs of associated countries.

Figure 5. Survey on EU-28 5G National Programmes<sup>3</sup>.

<sup>3</sup> The survey is available at: <https://goo.gl/GhT7De>

### 3.1.2 Summary of preliminary survey results

EURO-5G consortium contacted 31 EU-28 NCPs and 15 NCPs of Associated Countries (some countries have more than 1 relevant NCP for ICT related themes) in the months of May and June. Out of total 46 contacts, 17 NCPs replied covering the following countries:

- Belgium
- Cyprus
- Germany
- Iceland
- Ireland
- Israel
- Italy
- Luxembourg
- Montenegro
- Netherlands
- Norway
- Republic of Moldova
- Slovenia
- Switzerland

The results of the initial survey show that national programmes are lagging behind the EU 5G PPP programme:

- 2 NCPs declared that their nation has an ongoing national programme (Germany and Slovenia);
- 3 NCPs declared that their nation plans to activate a national programme (Cyprus, Israel, and Netherlands);
- 3 NCPs are aware of private initiatives ongoing related to 5G in their nations, but declared that their nation does not plan to have any national programme (Ireland, Luxembourg, and Republic of Moldova);
- 5 NCPs declared that their nation does not plan to have any national programme (Belgium, Iceland, Montenegro, Norway, and Switzerland);
- 1 NCP is not aware of related future plans (Italy).

### 3.1.3 Next steps

On one side, the results should be considered preliminary: several important NCPs didn't provide an answer (e.g. France, Spain, UK). On the other side, the results show little attention from national governments on 5G innovation: only 5 countries out of 14 are investing on that, while the others 9 countries are stepping back or are only aware of private initiatives.

In line with the above considerations, the next steps will focus on:

1. Gather additional feedbacks from NCP that didn't reply so far;
2. Investigate the landscape of ongoing private initiatives in the different EU countries.

Following initial analysis of online news related to 5G, it seems that private initiatives are far more promising than national programmes:

- Ericsson is activating a programme called 5G for Europe<sup>4</sup>, that foster the experimentation of 5G technologies in different EU nations through the establishment of national partnerships. E.g. 5G for Switzerland, involved Ericsson, Swisscom and EPFL; 5G for Italy involves Ericsson, TIM and Scuola Sant'Anna.

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<sup>4</sup> <https://www.ericsson.com/news/1952645>



- Telefonica, in collaboration with IMDEA, activated 5TONIC (<https://www.5tonic.org>) an open research and innovation laboratory focusing on 5G technologies.

## 3.2 Collaboration with related EC driven H2020 Initiatives

### 3.2.1 Collaboration with FIRE

During the first year of activities, the EURO-5G consortium liaised with several ongoing projects and activities within the context of the Future Internet Research and Experimentation (FIRE) initiative.

During EuCNC 2015, that was held last year in Paris, several discussions took place specifically in the context of the Workshop on 5G Testbeds and Hands-On Experimental Research<sup>5</sup>. The discussions focused on how experimental testbeds and testing facilities in the area of 5G will play a central role for R&D efforts both in the FIRE and 5G PPP communities. The importance of collaboration across the two communities has been reconfirmed during EuCNC 2016 where several ongoing 5G PPP Phase 1 and FIRE projects collaborated for the organisations of workshops and the exhibition. Martel, thanks to its role in both initiatives, supported the coordination of communication between the two initiatives through the FIRE and 5G PPP communication channels. Moreover, within the context of the ongoing FIRE STUDY project liaisons follow up between 5G PPP and FIRE will be discussed and explored at the next edition of the FIRE Forum that will take place on the 27th September in Bratislava in co-location with the ICT 2016 Proposers' Day. An entire session of the FIRE Forum, which will be moderated by Jacques Magen (InterInnov) will be dedicated to discuss about closer synergies between the FIRE and the 5G PPP within the broader context of the Next Generation Internet initiative.

### 3.2.2 Collaboration with FIF

After the Net Futures 2016 conference, the EURO-5G consortium established direct contacts to the CeFIMS-CONNECT<sup>6</sup> consortium, in charge of managing communication and coordination with the European Future Internet Forum (FIF), and to Jorge Pereira (European Commission), so as to explore the creation of synergies with initiatives led by the FIF. As of today though, while on the EURO-5G side we shared information especially related to the NCP initiative led by Task 4.1 (see Section 3.1.1), we have not been provided with any specific information nor document. On the other hand, we planned to share with Jorge Pereira the outcomes of our NCP monitoring study and continue fostering dialogue that could help also towards the transition to 5G PPP Phase 2.

### 3.2.3 Collaboration with Horizon 2020 ICTC

The Horizon 2020 ICTC (ICT Committee) is a representation of EU Member States and Associated Countries, in charge of discussing the Horizon 2020 work program and its implementation with the EU Commission.

ICTC showed interest on cPPPs and its functioning. Therefore, ICTC asked the Chair of the Board on 5G Infrastructure Association Werner Mohr for a presentation on April 27th, 2016 during the ICTC meeting in Brussels. Werner Mohr gave a presentation on the overall structure of 5G PPP, the cooperation with the EU Commission, working groups, international cooperation and the portfolio of Horizon 5G PPP Call 1 projects. In addition, ICTC was interested in lessons learned from the practical implementation of cPPP. Werner Mohr reported how 5G PPP is a direct implementation of the PPP spirit thanks to the cooperation of the different 5G PPP actions, which also formed collaborative working groups in areas of common interest. ICTC is regarding 5G PPP as a positive example of an implemented cPPP, because 5G PPP is addressing the big challenge to develop a new communication network with challenging requirements and the direct involvement of vertical sectors.

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<sup>5</sup> <http://www.eucnc.eu/2015/www.eucnc.eu/index6242.html?q=node/111>

<sup>6</sup> <http://www.cefims.eu>

Euro-5G is supporting the implementation of these cooperation means.

ICTC is also inviting other cPPPs for information exchange. 5G PPP is not a member of ICTC and will only be invited by ICTC on a need basis. Therefore, no formal cooperation can be implemented.

#### **3.2.4 Collaboration with AIOTI**

Jacques Magen (InterInnov) was invited as a member of the Board of the 5G IA by the Greek representatives of AIOTI, the Alliance for IoT Initiative, in an “IoT conference” that was held in Athens on December 17th, 2015. The main objective of this invitation was to share the views of the 5G IA / PPP on what 5G could bring to IoT. Jacques Magen delivered a presentation entitled “is 5G a necessity for IoT implementations?” and participated in a panel discussing what 5G could bring to IoT. This event helped in establishing initial links between the 5G PPP and AIOTI<sup>7</sup>.

### **3.3 Liaison with Eureka Clusters – Celtic Plus**

Some interactions have happened between the European Commission and the Celtic-Plus EUREKA Cluster in order to discuss how some 5G aspects being addressed in Celtic-Plus projects could be integrated. Although Celtic-Plus follows a bottom-up process, there was a discussion to promote some 5G issues for consideration in the upcoming Celtic-Plus calls. The Celtic-Plus Core group does not see any problem with proposals or project working on aspects of the 5G challenge but are disappointed that the 5G Collaboration agreement is not inherently open for Celtic-Plus projects to join. Currently Celtic-Plus projects may only contribute if they contribute to one of the open workshops organised but the 5G PPP Work groups or if they enter into a legal negotiation to have an extension of the 5G PPP collaboration agreement drawn up to accommodate them. Even if such an agreement were to be prepared, it is not clear if it can be adopted without signatures from all 165 signatories of the current 5G PPP Collaboration Agreement.

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<sup>7</sup> This activity was performed as part of WP1 in order to engage with the IoT community.

## 4 Conclusions

As presented in this deliverable, the EURO-5G consortium is, together with the 5G-I-A, very active in supporting the establishment and maintenance of the European perspective and presence in the global liaison around 5G.

In particular, the work focused on the following actions:

- Supporting the establishment of international MoUs (new ones emerging now with Brazil and India)
- Progress the organisation of the Second Global 5G Event on 9<sup>th</sup>-10<sup>th</sup> November 2016 in Rome, building on the lessons learnt from the First Global 5G Event;
- Reinforce the collaboration with relevant H2020 activities such as FIRE, AIOTI, and so on;
- Explore the status of EU-28 national activities in the context of 5G.

Following the availability of qualified contacts and information on different international, European and national initiatives, EURO-5G will share a map of such initiatives to interested parties through an interactive web-based map. The interactive map will be part of the 5GPPP web site.

### 4.1 5G Actors and Activities interactive map

Euro-5G is considering if the graphical representation of the European 5G initiatives could be evolved into an interactive map of 5G actors and initiatives. If the interactive map is appealing enough and well publicized it may achieve critical mass where players in the 5G domain will become proactive about submitting additional information to the Map. The limitations from the 5G side are resources for the development and, more critically the resources for the information gathering in the initial phase. This idea is for discussion with the project officer. *Figure 6* provides a simple mock-up of how such an interactive map could look.

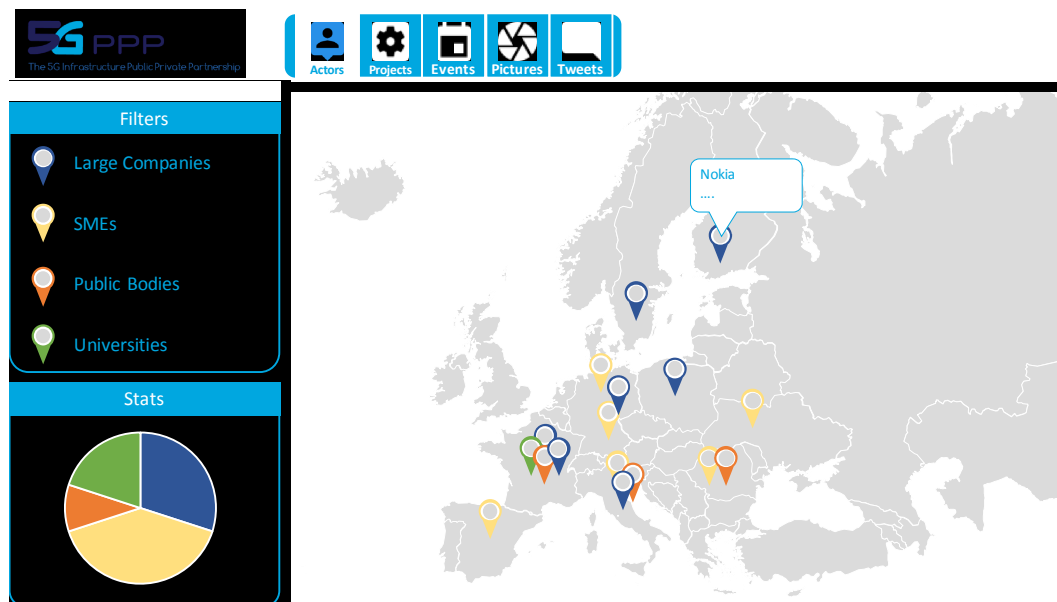


Figure 6. An example mock-up of the 5G actors interactive map.

The development of the map will follow an incremental approach following the availability of curated information. The map will be developed using Open Source tools. Currently the selected candidate is *cartodb*<sup>8</sup>, a very simple and intuitive Open Source framework for publishing georeferenced data over the web.

<sup>8</sup> <https://github.com/CartoDB/cartodb>

## References

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- [5] Press release multilateral MoU: <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/>
- [6] Press release EU-Brazil Joint Declaration on 5G: <https://5g-ppp.eu/eu-and-brazil-to-work-together-on-5g-mobile-technology/>

## Appendix A 5G PPP at the Global 5G Event in China

### A.1 Global 5G Event Agenda

The opening session speakers were:

- Dr. Werner Mohr (5G PPP) – Research and development of 5G systems in Europe by involving vertical sectors
- Prof. Susumu Yoshida (5GMF) – Overview of 5GMF Current Activities
- Prof. Younghan Han (5G Forum) – 5G Forum: Status Quo
- Chris Pearson (5G Americas) – 5G in the Americas: Next Generation Technology and Spectrum Recommendations
- Ms. Cao Shumin (IMT-2020 PG) – Research Status of IMT-2020 (5G) Promotion Group

Opening session moderators were Prof. You Xiaohu and Ms. Wang Xiaoyun, both from the IMT-2020 Promotion Group. This was followed by a panel Discussion on “Jointly Establishing a Global 5G Ecosystem”, participated by IMT-2020 PG, 5G PPP, 5GMF, 5G Forum, 5G Americas.



*Figure 7. Panel composed by the opening session speakers.*

The topic for session 1 was: “5G System Design”, and it was moderated by Prof. Giovanni E. Corazza from 5G PPP. Session 1 speakers were:

- Dr. Wen Tong (CTO of Huawei Wireless Networks & Huawei Fellow) - Accelerating the Global Momentum to Make 5G a Reality
- Edward Tiedemann (Senior Vice President, Engineering, Qualcomm) - The 5G Voyage, We Have Cast Off: Progress, Vision, and Technology
- Dr. Jiying Xiang (Chief Scientist of ZTE Corp.) - Commit to Global 5G Ecosystem
- Kimmo Kettunen (5G Program Lead, Nokia Bell Labs) - 5G System to Enable Programmable World
- Chengjun Sun (Senior Director, Samsung Electronics) - 5G Mobile Communications

The topic for session 2 was: “5G Air Interface”, and it was moderated by Ms. WANG Zhiqin, Vice Chair of IMT-2020 (5G) Promotion Group. Speakers were:

- Dr. Chih-Lin I (Chief Scientist, China Mobile Research Institute) - Close to 5G
- Dr. Wang Yingmin (CTO & Chief Scientist, Datang Telecom) - 5G New RAT for Context Era
- Peter Pitsch (Executive Director, Global Public Policy, Intel Corp) - Global 5G Spectrum Development and Intel 5G
- Gabriel Lin (Senior Director, Advanced Communications Technology Division, MTK) - Close Encounters of the Fifth Generation

- Jan Färjth (Vice President, Head of Standardisation and Industry, Ericsson) - 5G Standardization: The Enabler of the Networked Society

The session was closed by a Panel Discussion on “Building Global Consensus on 5G Standardization Roadmap”. This essentially ended the first day of the Event.

The second day, June 1, was opened by Session 3, dedicated to “5G Network & Operation”, moderated by Dr. Kohei SATOH, Secretary General of 5GMF. Speakers for Session 3 were:

- Dr. Cao Lei (Director, Technology Department, China Telecom) - The New Generation Network and 5G
- Mr. Takehiro Nakamura (VP and Managing Director of 5G Laboratory, NTT DoCoMo) - 5G Deployment in 2020 and Beyond
- Jean-Sébastien Bedo (Head of Networks Foresight and Strategy, Orange Labs Research) - 5G: A Global Platform for the Digitalization of Vertical Industries
- Dr. LEE Jongsik (Vice President, 5G TF, Institute of Convergence, KT) - Paving the Road to 5G

This session was followed by the release of two White Papers, one by the IMT-2020 PG and one by the 5G PPP Architecture WG. The presenters of the two White Papers were:

- Mr. LI Xiayu (Vice Chair, Network Technology WG, IMT-2020 PG) - The Novel Design of 5G Architecture
- Simone Redana (Chairman of Architecture WG, 5G PPP) - View on the architecture for the 5G era

Session 4 was dedicated to “Technologies for 5G Terminals”, and moderated by Prof. Kim DongKu, Vice Chair of Executive Committee, 5G Forum. Speakers in Session 4 were:

- Ying Huang (Vice President, Lenovo) Looking forward to the 5G era
- Yi Kang (Global Vice President, Spreadtrum) - 5G: From Concept to Reality
- Mr. LEE Joo Hee (Fellow, Mobile R&D Center, LG Electronics) - >6GHz Antenna: Challenges and Solutions
- ZHANG Yunfei (Head of Industrial Standards Dept., Coolpad) Opportunities and Challenges: Terminal Small Cell (T-SC) for 5G

The afternoon of the final day was opened by Session 5, dedicated to “Testing Technologies for 5G”, moderated by Yang Fengyi, Expert of IMT-2020 Promotion Group. Speakers in Session 5 were:

- Dr. Wei Kejun (5G Trial Lead, IMT-2020 (5G) Promotion Group, CAICT) - 5G Trial Status in China
- Mr. Satish Dhanasekaran (Keysight VP, General Manager of Wireless Device & Operators, Communications Solutions Group, Keysight Technologies) - Test & Measurement ensure 5G's success, the challenges and solutions
- Lifang Kirchgessner (VP of Wireless & Mobile Com., Rohde & Schwarz GmbH & Co.) - The Road to IMT 2020 - R&S 5G Test Solution
- Mr. Zhang Ping (President & CEO, StarPoint) - 5G Testing Technology and Platform
- Mr. Wu Jie (Director of Asia-Pacific Service Development, Spirent) - 5G Network Testing Technology

Finally, Session 6 was dedicated to “5G and Vertical Industries”, moderated by Chris Pearson, (President, 5G Americas). Speakers in Session 6 were:

- Dr. Nigel Jefferies (WWRF Chairman) - What do vertical industries want from 5G and how do we make it happen?
- Lars Danielson (SVP, Volvo Car Group and CEO, Volvo Car Asia Pacific) - The requirements

to 5G technology from autonomous driving development perspective

- Other speeches by Baidu, Foxconn., and SANY

## A.2 Press Release by the 5G Infrastructure Association

Leading 5G Wireless Associations Discuss Future Roadmap at The First Global 5G Event in Beijing, China

Beijing, China – June 2, 2016 – Industry executives representing five of the leading wireless associations worldwide shared their knowledge at the first of the bi-annual Global 5G Events in Beijing on May 31 and June 1, 2016. Hosted by IMT-2020 (5G) Promotion Group in China with the theme of “*Building 5G Technology Ecosystem*”, the conference was jointly organized by: The 5G Public Private Partnership (5G PPP, Europe), IMT-2020 (5G) Promotion Group (China), The Fifth Generation Mobile Communications Promotion Forum (5GMF, Japan), 5G Forum (Korea) and 5G Americas (Americas).

During this two-day event, over 500 government representatives, association leaders and industry experts participated and shared the latest Research and Development (R&D) achievements and views on 5G technologies, standards, spectrum, trials, and applications, particularly on 5G system design, 5G air interface, 5G networks and operation, technologies for 5G terminals, testing technologies for 5G, convergence of 5G and vertical industries, and 5G Standardization Roadmap. Meanwhile, the latest achievements of 5G technology and equipment R&D were exhibited by multiple leading companies.

MIAO Wei, the Minister of Ministry of Industry and Information Technology (MIIT), China, attended this event and made an opening speech.

CAO Shumin, Chair of IMT-2020 (5G) Promotion Group, stated, “A globally unified 5G standard in the framework of ITU and 3GPP has been a global consensus. Both enhanced Mobile Broadband (eMBB) and Internet of Things (IoT) are the essential application fields of 5G and should be studied with the same priority. To make 5G vision into reality, 5G standard requires innovative technologies, especially in system design, key technologies, and network architecture. 5G trial plays an important role in the R&D of 5G. It is very important to build 5G trial in an open and collaborative way.”

Werner Mohr, Chair of the Board, 5G PPP, declared “gathering the leading 5G visionary organizations for the first time in Beijing enabled a fruitful collaboration and reinforces the links between our organizations. We look forward to welcoming our counterparts in Rome in November 9-10, 2016 for the second round of Global 5G Events.”

Susumu Yoshida, Chairman of 5GMF, stated “International cooperation and collaboration on 5G field trials is very important, and we understood that the Global 5G Event could be a good opportunity to discuss it further. In addition, we just published the full-scale White Paper on 5G Mobile Communications Systems for 2020 and beyond, and it is now available on our web-site (<http://5gmf.jp/en/>).”

Youngnam Han, Chair of Executive Committee, 5G Forum, mentioned “The first multilateral 5G forum event organized by IMT-2020 PG will expedite and harmonize the standardization process under very healthy exchange of information on the activities in each country. We really want to take this opportunities to collaborate and cooperate together with any vertical industry for ICT convergence through 5G technology development.”

Chris Pearson, President of 5G Americas, stated “The multi-lateral association 5G event hosted in Beijing was a great success as it emphasized the importance of leading 5G wireless organizations working together to progress the next generation of wireless technology. Cooperation on pre-standard 5G development will benefit wireless stakeholders and future 5G subscribers.”

The First Global 5G Event is an important milestone for building the 5G technology ecosystem and lays a good foundation for the globally unified 5G standard. The five organizations will further strengthen communications and cooperation in 5G technology, standard, spectrum and trial, and jointly promote to establish a global 5G ecosystem. The Second Global 5G Event will take place in Rome (Italy) on November 9-10, 2016.



## About the Global 5G Event

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A Memorandum of Understanding (MoU) to cooperate on the organization of a series of “*Global 5G Events*” in the interest of efficiency and building global consensus on 5G, was announced in October 2015 by the following parties of the Memorandum: The 5G Public Private Partnership (5G PPP, Europe), IMT-2020 (5G) Promotion Group (China), The Fifth Generation Mobile Communications Promotion Forum (5GMF, Japan), 5G Forum (Korea) and 5G Americas (Americas). The five associations will hold the global 5G event twice a year to discuss the status and progress on 5G jointly.

### About The 5G Public Private Partnership

5G PPP is a collaborative research program that is organized as part of the European Commission’s Horizon 2020 program – The European Union Program for Research and Innovation. It is aimed at fostering industry-driven research, which is controlled by business- related, performance and societal KPIs. The 5G PPP has a lifetime from 2014 to 2020 and is open for international cooperation and participation. Within this research and innovation framework, the European Commission, with the approval of the European Parliament, has committed 700M€ of public funds to supporting 5G PPP activities. Complementary private investment in the order of five times this amount is expected to be provided by Industry, SME, and Research Institutes to realize the 5G-PPP vision. The private side in 5G PPP is represented by the 5G Infrastructure Association.

More information is available at <http://5g-ppp.eu/> Twitter: @5GPPP

About IMT-2020 (5G) Promotion Group: The major platform to promote 5G research in China □ IMT-2020 (5G) Promotion Group has been jointly established by three ministries in China (the Ministry of Industry and Information Technology, the National Development and Reform Commission and the Ministry of Science and Technology) in February 2013, based on the original IMT-Advanced Promotion Group. It is the major platform to promote the research of 5G in China. Its members include the leading operators, vendors, universities, and research institutes in the field of mobile communications.

More information is available at [www.imt-2020.cn](http://www.imt-2020.cn)

### About The 5G Mobile Communications Promotion Forum Japan

The Fifth Generation Mobile Communications Promotion Forum (5GMF) was created to conduct research & development concerning the fifth Generation Mobile Communications

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Systems and research and study pertaining to standardization thereof, along with liaison and coordination with related organizations, the collection of information, and dissemination and enlightenment activities aimed at the early realization of the Fifth Generation Mobile Communications Systems, all with the aim of thereby contributing to the sound development of the use of telecommunications.

More information is available at <http://5gmf.jp/en/>

### About the 5G Forum

The Ministry of Science, ICT and Future Planning and mobile industries in Korea founded the 5G Forum in Seoul on May 30 2013. 5G Forum members consists of public and private sectors, including mobile telecommunication carriers, manufacturers and academic professionals.

The goal of the 5G Forum is to assist in the development of the standard and contribute to its globalization. By 2020 the South Korean government intends to commercially deploy 5G mobile telecommunication technology for the first time in the world featuring five core 5G services during the Pyeongchang 2018 Winter Olympics. This would include social networking services; mobile 3D imaging; artificial intelligence; high-speed services; and ultra- and high- definition resolution capabilities; and holographic technologies.

Hyounghee LEE, business division head of SK Telecom, South Korea's largest Telecom



Company is chairperson of the forum. The Electronics and Telecommunications Research Institute (ETRI); three major telecom companies; and several major electronics companies, including Samsung Electronics, LG electronics, KMW and Dio Interactive, were appointed to the Board as co-chairs.

More information is available at [www.5gforum.org](http://www.5gforum.org).

About 5G Americas: The Voice of 5G and LTE for the Americas:

5G Americas is an industry trade organization composed of leading telecommunications service providers and manufacturers. The organization's mission is to advocate for and foster the advancement and full capabilities of LTE wireless technology and its evolution beyond to 5G, throughout the ecosystem's networks, services, applications and wirelessly connected devices in the Americas. 5G Americas is invested in developing a connected wireless community while leading 5G development for all the Americas. 5G Americas is headquartered in Bellevue, Washington and officially announced the change of the organization's name from 4G Americas on February 12, 2016.

More information is available at [www.5gamericas.org](http://www.5gamericas.org) or Twitter @5GAmericas.

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## Appendix B Email accompanying the NCP survey

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*Dear XXX,*

*We are contacting you on behalf of 5G PPP Initiative with the goal to investigate and identify related innovation framework running in the European Member States so as to create synergies within the context of the Horizon 2020 5G PPP Programme.*

*The 5G PPP initiative, launched by the EC in collaboration with top leader industry manufacturers, Telco operators, service providers, SMEs and researchers, aims to promote delivery of solutions, architectures, technologies and standards for the ubiquitous next generation communication infrastructures. This to ensure leadership in specific areas where Europe has a strong tradition or where there is potential for majorly contributing to vertical market segments such as smart cities, intelligent transport, smart factories, health, education and entertainment & media.*

*Your input is crucial to identify collaboration opportunities and foster growth of the overall 5G ecosystem in Europe. To this purpose we created an easy and rapid to answer to on-line survey we kindly ask you to fill in. Essentially, we ask you to inform us about existing or planned 5G related R&D programmes within your country and to provide us any pointer for further investigations.*

*You will find the survey at this link:*

*<https://goo.gl/GhT7De>*

*We will then keep you informed about the survey outcomes and possible next steps to mark further progress for effective collaborations to be fostered across all related 5G initiatives.*

*Many thanks in advance for your precious time.*

*On behalf of the 5G PPP team,*

*xxxxxx*