5G IA
INFRASTRUCTURE ASSOCIATION

The views of Europe: 5GPPP/5G IA activities

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& Chair, 5G Initiative Steering Board

http://5g-ppp.eu/

Summary

- *5G PPP and 5G Infrastructure Association*
- *MWC 2017 event: « 5G Action Plan: from Research to Trials »*
- *New White Paper: 5G innovations for new business opportunities*
- *The key role of standardization*
- *Spectrum for 5G*
- *The Pan-European Trials Roadmap*
- *5G PPP & international cooperation*

Members of 5G Infrastructure Association

Industry

Industry

- ADVA Optical Networking SE
- Airbus
- Atos
- Deutsche Telekom
- DOCOMO Communications Laboratories Europe GmbH
- Ericsson
- Eutelsat, France
- Huawei Technologies Düsseldorf GmbH
- IBM Research
- Indra Sistemas S.A., Spain
- Intel Mobile Communications
- Leonardo S.p.A., Italy
- Mitsubishi Electric R&D Centre Europe, France
- NEC Europe Ltd., NEC Laboratories Europe
- Netas Telecommunication A.S., Turkey
- Nokia
- Orange Labs
- Samsung Electronics Research Institute Ltd.
- SES
- Telecom Italia
- Telefónica I+D
- Telenor ASA
- Telespazio
- Thales Alenia Space
- Turk Telekomünikasyon A.Ş.
- Thales Communications & Security S.A.S., France
- ZTE Wistron Telecom AB, Sweden

Source: 5G Infrastructure Association.

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Members of 5G Infrastructure Association

Research/Academics & SMEs

Research/Academics

- CEA-LETI
- Centre Tecnologic de Telecomunicacions de Catalunya (CTTC)
- Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT)
- DLR (German Aerospace Center) – Institute of Communications and Navigation, Germany
- Fundacion IMDEA Networks
- IMEC vzw, Belgium
- Instituto de Telecomunicacoes
- Institut Mines-Télécom, France
- TNO
- University of Bologna – DEI
- Universidad de Castilla La Mancha, Spain
- Universidad de Málaga, Spain
- Universitat Politècnica de Catalunya, Spain
- University of La Laguna, Spain
- VTT Technical Research Centre of Finland Ltd, Finland

SMEs

- AICO EDV-Beratung GmbH, Austria
- AMBEENT WiRELESS YAZILIM ve BiLiSiM A.S., Turkey
- CityPassenger, France
- Ingeniería y Soluciones Informáticas S.L., Spain
- Integrasys SA
- INTERINNOV
- M.B.I. S.R.L.
- Nextworks s.r.l.
- Quobis
- Sequans Communications

Source: 5G Infrastructure Association.

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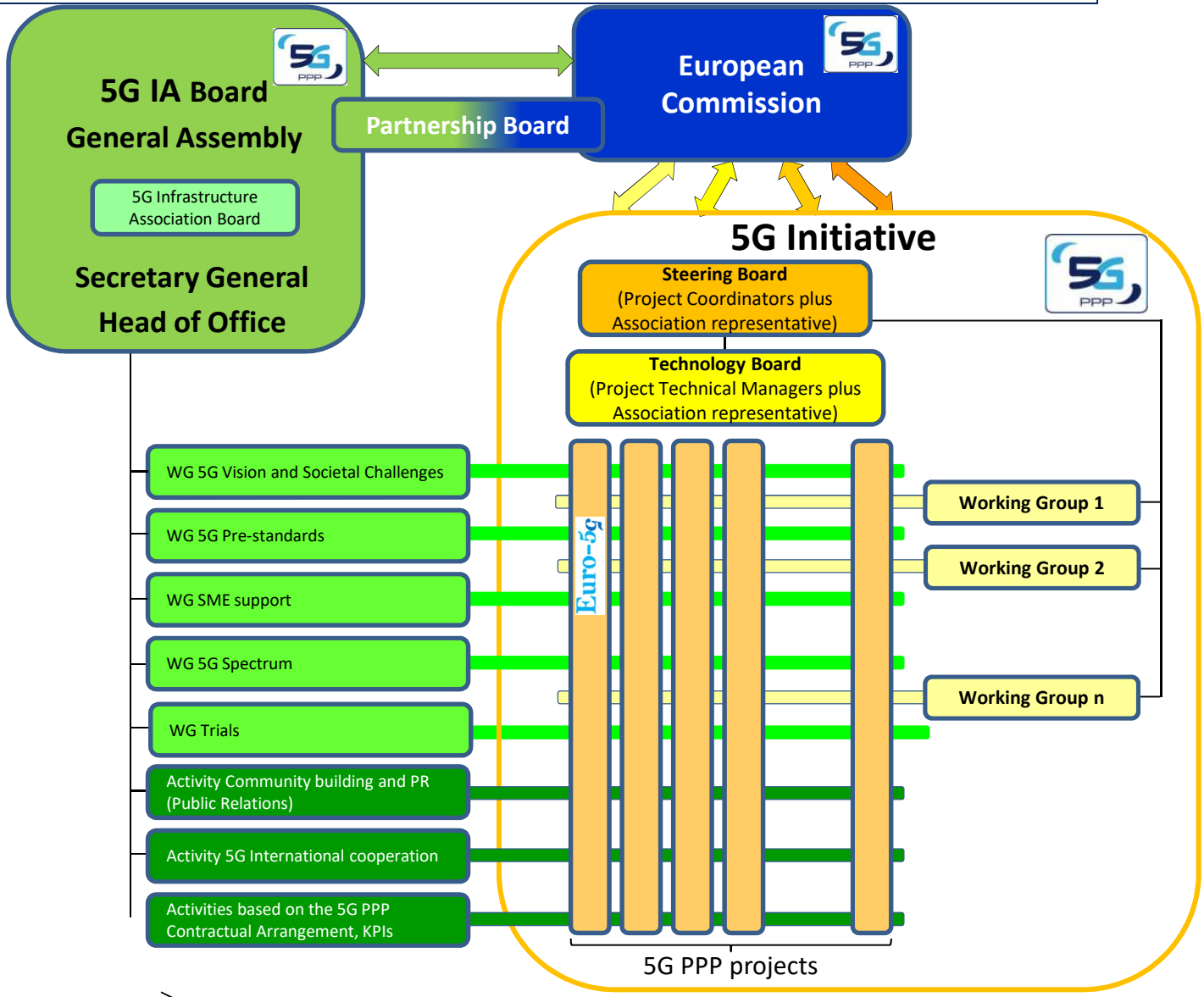
5G PPP Overall Governance



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Horizon 2020 5G PPP
19 Phase 1 projects on-going

5G Ensure
Security
(Will be added later)

CogNet
Building an Intelligent System of Insights and Action for 5G Network Management

SELFNET
Framework for SELF-organized network management in virtualized and software defined NETworks

CHARISMA
Converged Heterogeneous Advanced 5G Cloud-RAN Architecture for Intelligent and Secure Media Access

SUPERFLUIDITY
Superfluidity: a super-fluid, cloud-native, converged edge system

5GEx
5G Exchange

VirtuWind
Virtual and programmable industrial network prototype deployed in operational Wind park

SONATA
Service Programming and Orchestration for Virtualized Software Networks

COHERENT
Coordinated control and spectrum management for 5G heterogeneous radio access networks

5G-Norma
5G NOvel Radio Multiservice adaptive network Architecture

METIS-II
Mobile and wireless communications Enablers for Twenty-twenty (2020) Information Society-II

SPEED-5G
quality of Service Provision and capacity Expansion through Extended-DSA for 5G

SESAME
Small cEllS coordinAtion for Multi-tenancy and Edge services

FANTASTIC-5G
Flexible Air iNTerfAce for Scalable service delivery wiThin wIreless Communication networks of the 5th Generation

5G-Xhaul
Dynamically Reconfigurable Optical-Wireless Backhaul/Fronthaul with Cognitive Control Plane for Small Cells and Cloud-RANs

Flex5Gware
Flexible and efficient hardware/software platforms for 5G network elements and devices

5G-Crosshaul
The 5G Integrated fronthaul/backhaul

mmMAGIC
Millimetre-Wave Based Mobile Radio Access Network for Fifth Generation Integrated Communications

Euro-5G
5G PPP Coordination and Support Action

- Radio-related cluster
- Fronthaul/Backhaul
- Hardware implementation
- Network automation
- SDN, NFV, Cloud and Virtualisation
- Security

Source: 5G PPP, https://5g-ppp.eu/5g-ppp-phase-1-projects/.

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communication networks

5G Action Plan: from Research to Trials

28 February 2017, MWC Barcelona

- Welcome: **Christine Leurquin**, *Acting chair, 5G Infrastructure Association*
- Opening Statement: **Roberto Viola**, *Director General DG CONNECT, EC*
- Event Moderator: **Jean-Pierre Bienaimé**, *Secretary General, 5G Infrastructure Association*
- Panels:

Panel 1: 5G Research, Standardization & Projects

- **Markus Borchert**
  Senior VP Europe, Nokia
- **Ulf Ewaldsson**
  Chief Technology Officer, Ericsson
- **Wen Tong**
  CTO, Wireless Network, Huawei Technologies
- **Ruy Pinto**
  Deputy Chief Technology Officer, SES
- **Adrian Scrase**
  Chief Technology Officer, ETSI

Panel 2: Trials roadmap & verticals

- **Alain Maloberti**,
  Senior VP, Orange Labs Networks, Orange
- **Ger Baron**
  Chief Technology Officer, City of Amsterdam
- **Paola Pisano**
  Deputy Mayor, City of Turin
- **Fathi El-Dwaik**,
  VP Information, Communication Electronics, BMW
- **Lucy Lombardi**
  VP Innovation & Industry Management, Telecom Italia

- **EU/Brazil Memorandums of Understanding (MoUs):** Welcome by EC & Brazilian Ministry
  1. European 5G Infrastructure Association (5G-IA) and the Brazilian Projeto 5G Brasil;
  2. European Alliance for Internet of Things Innovation (AIOTI) and the Brazilian Internet of Things (IoT) Association, Câmara IoT.

5G innovations for new business opportunities

New 5G PPP/5G IA white paper,
MWC'17 - 28 February, 2017

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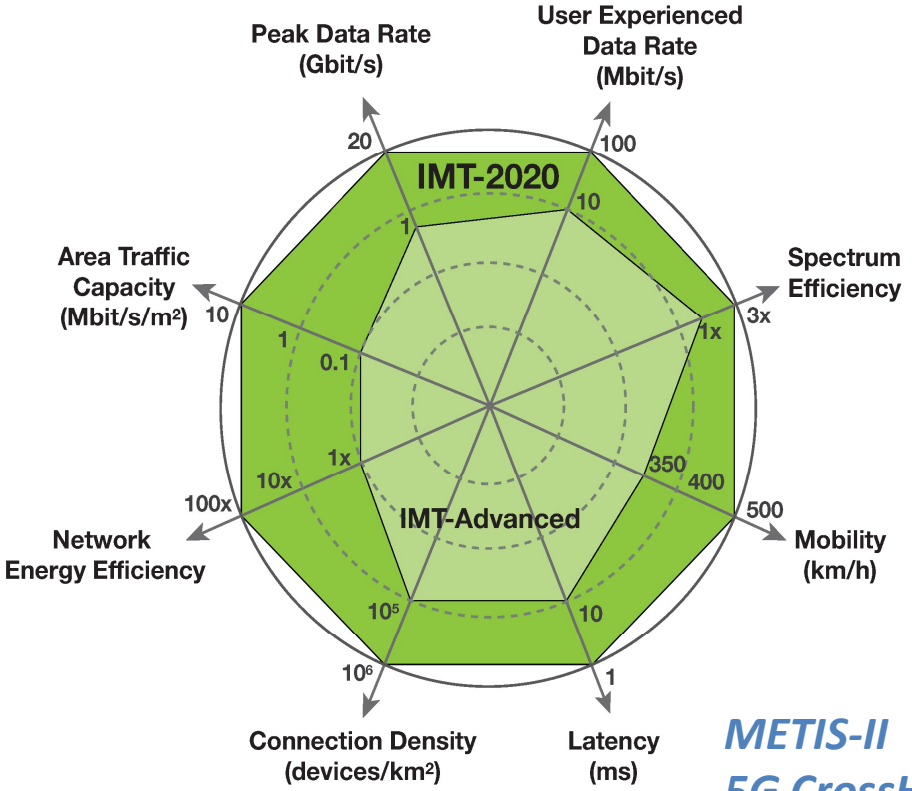
White Paper Outline

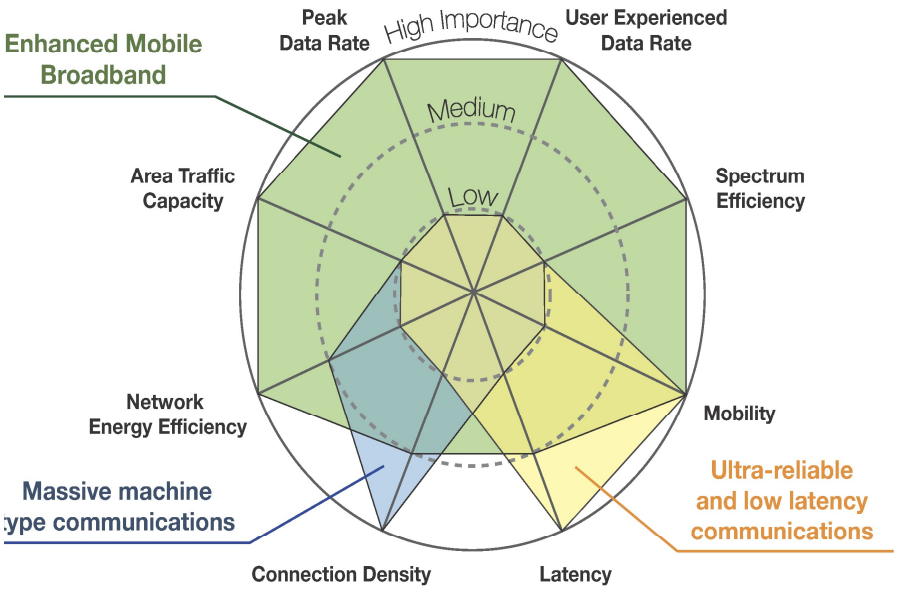
➔ The three 5G pillars - **eMBB, mMTC & uRLLC** - have very heterogeneous requirements

➔ How to achieve target KPIs: throughput, latency, high speed mobility, connection density, energy efficiency

➔ **Objective 1**: to present some innovations from 5G PPP phase 1 projects that aim at achieving these targets

Target 5G KPIs from ITU





METIS-II
5G CrossHaul
SESAME
Coherent
Speed5G
Fantastic-5G
5G Norma
mmMAGIC
Flex5GWare
Charisma
5G Xhaul

3GPP-PCG#38 & OP#37

25-26 April 2017, West Palm Beach, USA

Where do we stand with 5G requirements (1)? 3rd Cross 5G PPP Workshop 6-7 February 2017

KPI	Requirement	METIS-II performance	Key contributor
C-Plane latency	< 10 ms	7.125 ms	RRC Connected Inactive, reduction of processing time in BS and UE
U-Plane latency	< 1ms	0.763 ms	Shortening of TTI, reduction of processing time in BS and UE
mMTC energy efficiency	> 10 years on a single 5 Wh battery	> 10 years on a single 5 Wh battery	Extension of DRX, C-Plane latency reduction, deep sleep energy conservation features
Peak data rates	> 20/10 Gbps for DL/UL	21.7/12.4 Gbps for DL/UL	MIMO spatial multiplexing (for lower frequencies), exploitation of mmW bands
Mobility interruption time	0 ms	0 ms	Multi-connectivity + make-before-brake

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Where do we stand with 5G requirements (2)? 3rd Cross 5G PPP Workshop 6-7 February 2017

KPI	Requirements	METIS-II performance	Comments
User throughput (use case 1, UC2 and UC3)	UC1: 300 Mbps UC2: up to 5 Gbps UC3: 50/25 Mbps for DL/UL	UC1: 1 Gbps+ UC2: up to 7.85 Gbps UC3: 50/25 Mbps for DL/UL	Only DL values for UC1 and UC2 Different methodology applied for UC3 evaluation
mMTC device density (UC4)	> 1 mln/km^2	4 mln/km^2	Depends heavily on the traffic/report periodicity of mMTC devices. 1 upload of 1000 bits every 100 s was used in METIS-II
Reliability (UC5)	99.999% at 50/1000m for urban/highway	99.999% at 45/150m for urban/highway	For highway scenario, requirements seems very difficult to meet (revision needed?)
Network energy efficiency (UC1, UC3)	Should follow (at least) capacity improvement	For the capacity x1000, network energy efficiency improvements of 350-7500 were reported	Evaluation done only for Dense Urban environment. Savings depend on the load level in LTE-A/5G network

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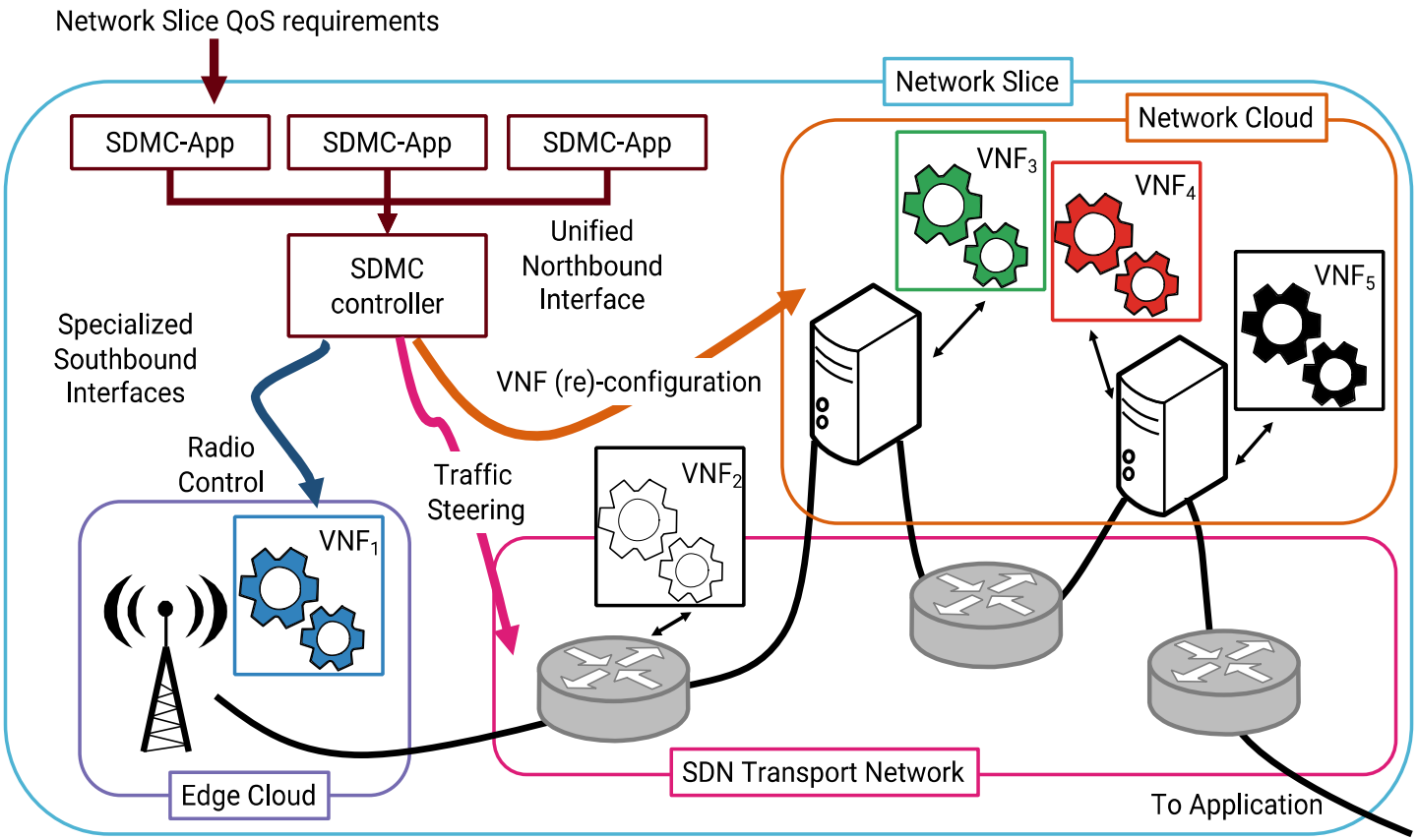
Objective 2: 5G as a flexible orchestrator including natively networking, computing & storage resources
➔ a holistic orchestration platform for verticals

A Software-defined Mobile Network Controller (SDMC) extends the concept of network programmability beyond SDN, offering a high level interface to several networking functions, ranging from radio control to traffic steering

➔ One programmable and unified infrastructure



Recommendations

➔ **Standardization** is essential for realizing 5G promises

➔ **Spectrum availability** is key for 5G development and deployments

➔ **Cost-efficient deployment** strategies are needed

➔ **New business opportunities** are expected to emerge from 5G, enabled by 5G PPP innovations

5G-IA supporting the 5G Standardization roadmap

5G-IA new Market Representation Partner (MRP) of 3GPP & ETSI Partner

Roadmap/approach on how best to influence or benefit from accelerating developments at 3GPP and ITU level.

Spectrum for 5G: towards WRC-19

- **RSPG vision:** ***"5G will drive industrial and societal transformation, and economic growth in Europe from 2020 and beyond".***

- **5G-IA proposed pioneer bands:**
  - **3.4 - 3.8 GHz**

    ➔ eMBB for single digit Gbit/s urban mobile coverage
  - **24.25 - 27.5 GHz ("26 GHz") & 31.8 - 33.4 GHz ("32 GHz")**

    ➔ eMBB for up to double digit Gbit/s
  - **700 MHz**

    ➔ mMTC/uRLLC universal coverage

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5G for Europe: an Action Plan

Action 1 — The **Commission** will work with **Member States** and **industry stakeholders** towards the voluntary establishment of a **common timetable** for the **launch of early 5G networks by the end of 2018, followed by the launch of fully commercial 5G services in Europe by the end of 2020**. The common timetable should be developed as quickly as possible. The EU timetable should be driven by the following key objectives:

- Promoting **preliminary trials,** under the 5G-PPP arrangement, to take place **from 2017 onwards,** and **pre-commercial trials** with a clear EU cross-border dimension **from 2018**.
- Encouraging **Member States** to develop, **by end 2017, national 5G deployment roadmaps** as part of the **national broadband plans**[17].
- Ensuring that **every Member State will identify at least one major city to be "5G-enabled" by the end of 2020**[18] **and that all urban areas and major terrestrial transport paths have uninterrupted 5G coverage by 2025**[19].

http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17131

Pan-European Trials Roadmap 2017-2020+ Objectives

- Enable global **European leadership on 5G technology**, deployment and profitable business models.
- Demonstrate benefits of 5G to **vertical sectors**, and associate them to the standardization and development process.
- Show a clear path to **successful and timely deployment**, and complement commercial trials and demonstrations as well as national initiatives.

➔ **Before 2018:** technology trials run by independent trial consortia in various countries, including Vertical industries, and aiming to demonstrate key 5G functionalities and technical / technological enablers.

➔ **From 2018:** trials aim to demonstrate wider interoperability and support for vertical use-cases in order to claim global public attention.

Pan-European Trials Roadmap 2017-2020+
Strategy and Streams

5G Private Trials: Achieved and planned private trials and pilots (public information)

5G / 5G AP Trials Events | Smart Cities? | Smart Cities? MWC 2019? | **EURO 2020** (UEFA)

5G Platforms: Experimentation & Trials on the basis of existing / new Platforms, open to ecosystem stakeholders R&I (e.g. Verticals). Covering both technological and E2E Platforms

5G Vertical Pilots: Experimentation & Trials dedicated to Vertical Use Cases. Possible prioritization of key Vertical Pilots at Pan-EU level (e.g. Automotive, Industry, eHealth…)

5G International Trials Cooperation | China, South Korea, Japan, USA, Brazil…

5G / 5G Action Plan (AP) Regulation & Policy

2017 **2018** **2019** **2020**

5G PPP International cooperation
Bilateral & Multilateral MoUs

- China
  - MoU signed with IMT-2020 (5G) Promotion Group on September 29, 2015 in Beijing
- Japan
  - MoU signed with The 5G Mobile Communications Promotion Forum on March 25, 2015 at NGMN Industry Conference in Frankfurt, Germany
- South Korea
  - MoU signed with 5G Forum on June 17, 2014 after signature of Joint Declaration between EU Commission and Korean government in Seoul, Korea
- USA
  - MoU signed with 5G Americas on March 2, 2015 at Mobile World Congress 2015 in Barcelona, Spain
- Brazil

  - MoU signed with Telebrasil – Projeto 5G Brasil on 28 February, 2017 at Mobile World Congress 2017 in Barcelona, Spain

Source: 5G Infrastructure Association.

5G PPP supports international cooperation towards consensus building

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Pre-standards

Spectrum

Vision and Societal Challenges

Activity 5G PPP Contractual Arrangement, KPIs

5G IA INFRASTRUCTURE ASSOCIATION

Trials

Activity Community building and Public Relations

5G IMF The Fifth Generation Mobile Communications Promotion Forum

5G Forum

5G americas

IMT-2020

SME support

Telebrasil Associação Brasileira de Telecomunicações

and further international partners…

Architecture

Use cases and performance evaluation models

OPNFV Software Networks (SDN and NFV)

Security

Network Management, QoS

3GPP-PCG#38 & OP#37
25-26 April 2017, West Palm Beach, USA

Source: 5G Infrastructure Association.

The 3rd Global 5G Event in Tokyo, Japan

The 3rd Global 5G Event will be held on 24 - 25 May 2017 with Wireless Technology Park (WTP 2017).

Rainbow Bridge

WTP (Exhibition)

Tokyo Big Sight

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Towards a smooth and committed 5G roadmap…

- **Avoid fragmentation**, and respect all the standardization steps towards full 5G globally harmonized standard *(« Short-term solutions will not solve long-term issues… » Giuseppe Recchi, TIM):*
  - 3GPP roadmap (Rel. 15 & 16)
  - ITU-R IMT-2020 standard completion
  - Spectrum bands identification & harmonization
  - Avoid premature « 5G » launch announcements

- **Be quick and business-oriented**: Plan 5G trials now, including the verticals, and boost the standardization process:
  - Pan-European 5G technology trials as of 2017
  - Pre-commercial trials as of 2018
  - Push International cooperation , including in trials

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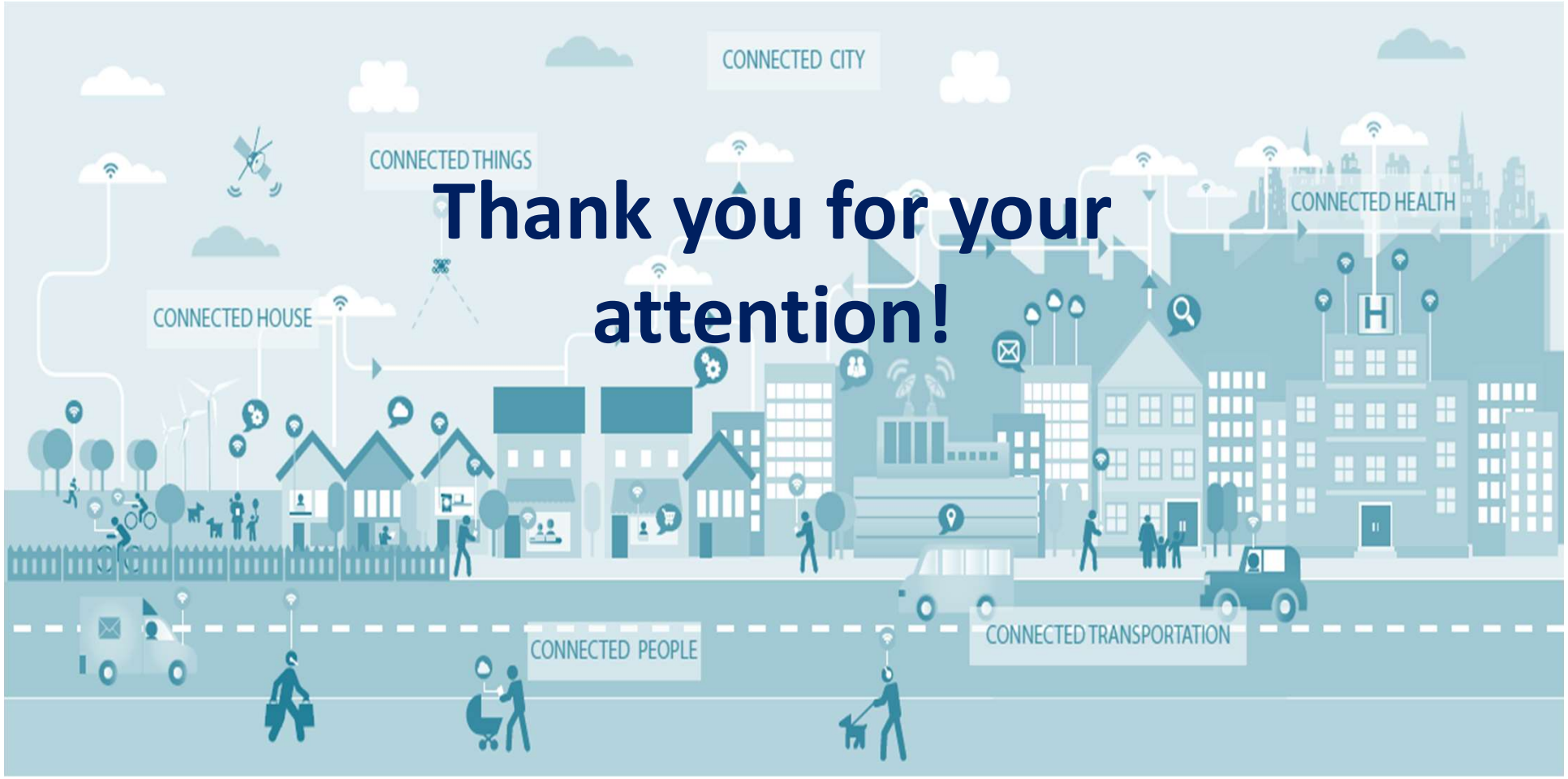

Thank you for your attention!