

A stylized illustration of a 'Connected City' in shades of blue. It depicts various urban elements like houses, schools, hospitals, and cars, all interconnected by a network of lines and wireless signals. Labels such as 'CONNECTED CITY', 'CONNECTED HOUSE', 'CONNECTED HEALTH', and 'CONNECTED TRANSPORTATION' are scattered throughout the scene. The background is a light blue sky with clouds.

Can Europe lead in 5G ? Technologies, standards & spectrum for 5G

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Summary

- 5G Infrastructure Association in 5G PPP
- Challenges & bottlenecks for 5G development
- The importance of standards: how will they be defined ?
- Spectrum: which bands need to be harmonized?



Rationale

In the context of increasing 4G deployments worldwide, the journey to 5G has already begun and developments are taking place worldwide, notably under the umbrella of ITU and the 3GPP roadmap. The 5G PPP in Europe, as a promising partnership between the industry and the European Commission, is the biggest research investment in 5G worldwide. It has signed cooperation agreements with the other Regional 5G Associations worldwide, in order to reach a globally harmonized standard that will give place to commercial launches everywhere as of 2020. 5G has therefore the vocation to become « the system of systems » for ubiquitous, ultra fast and fully interoperable communications, whatever be access networks, locations and mobility conditions. Huge opportunities, but also challenges pave the way of these developments towards this new 5G ecosystem, in which vertical industries and sectors, such as health, security, energy, transports, automotive,..., will be major stakeholders.

5G PPP in Horizon 2020 of the EU

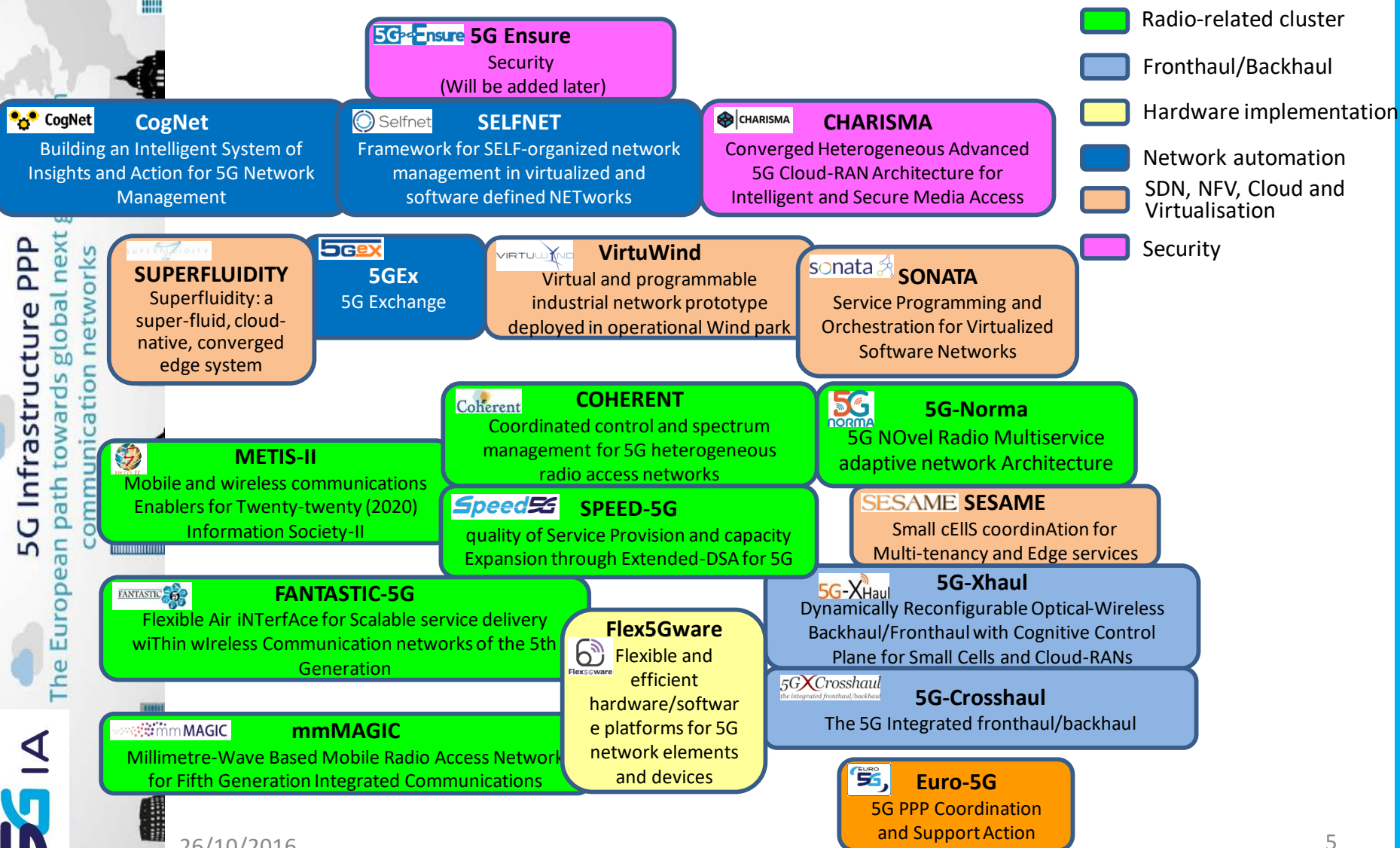
- 5G PPP is a research program in Horizon 2020 of the EU dedicated to 5G system research
- **Budget for 2014 – 2020 time frame**
 - Up to 700 million € public funding
 - Matched by private side including leveraging factor 5 of additional private investment results in private value of about 3.5 billion €
- Research program is addressing all building blocks of a future communication network and a huge number of huge cases from vertical sectors
- **5G Infrastructure Association vision paper** published at Mobile World Congress 2015 in Barcelona
<http://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>
- First set of projects started on July 1, 2015

Source: 5G Infrastructure Association.



Horizon 2020 5G PPP

Call 1 selected projects



- White papers on
 - 5G and Factories of the Future
 - 5G and Healthcare
 - 5G and Energy
 - 5G and Media
 - 5G and Automotive
- Identification of
 - main use cases
 - requirements and
 - areas for research and innovation
- Vertical workshops
 - June 18, 2015
 - November 9, 2015

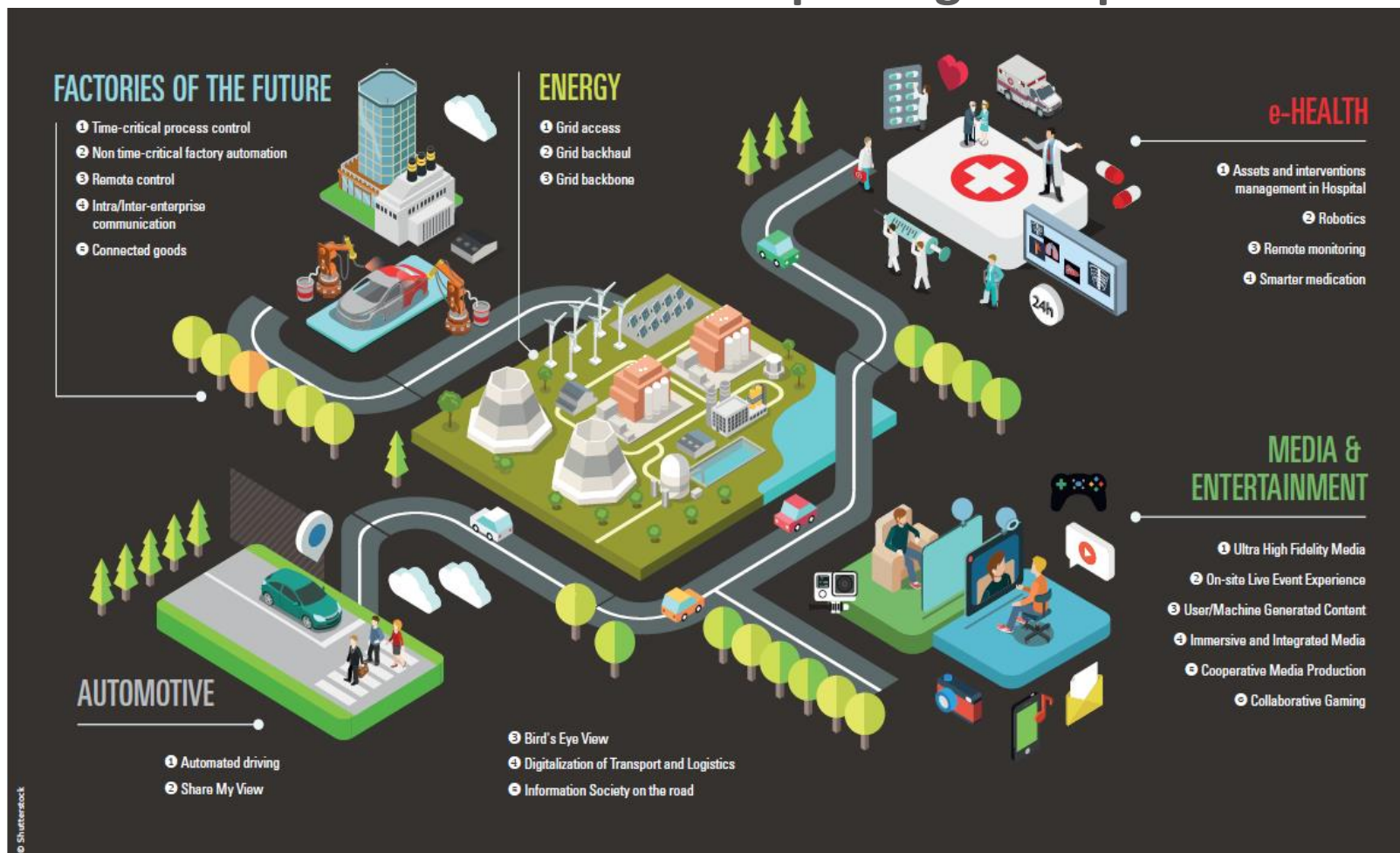


- White Paper published at Mobile World Congress 2016
https://5g-ppp.eu/wp-content/uploads/2016/02/BROCHURE_5PPP_BAT2_PL.pdf

Source: 5G Infrastructure Association.

26/10/2016

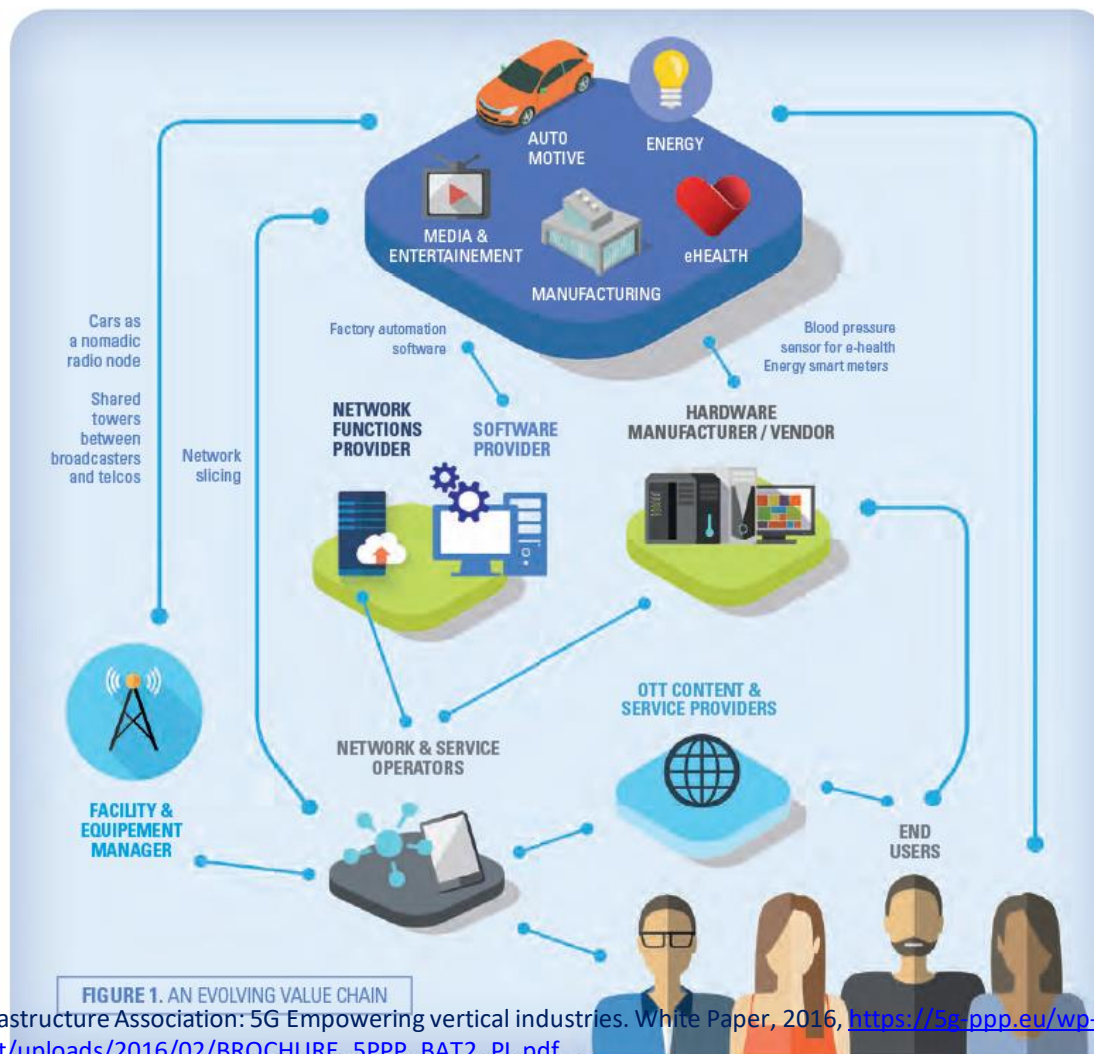
5G network infrastructures will be a key asset to support a societal transformation, leading to the fourth industrial revolution impacting multiple



Source: 5G Infrastructure Association: 5G Empowering vertical industries. White Paper, 2016, https://5g-ppp.eu/wp-content/uploads/2016/02/BROCHURE_5PPP_BAT2_PL.pdf.

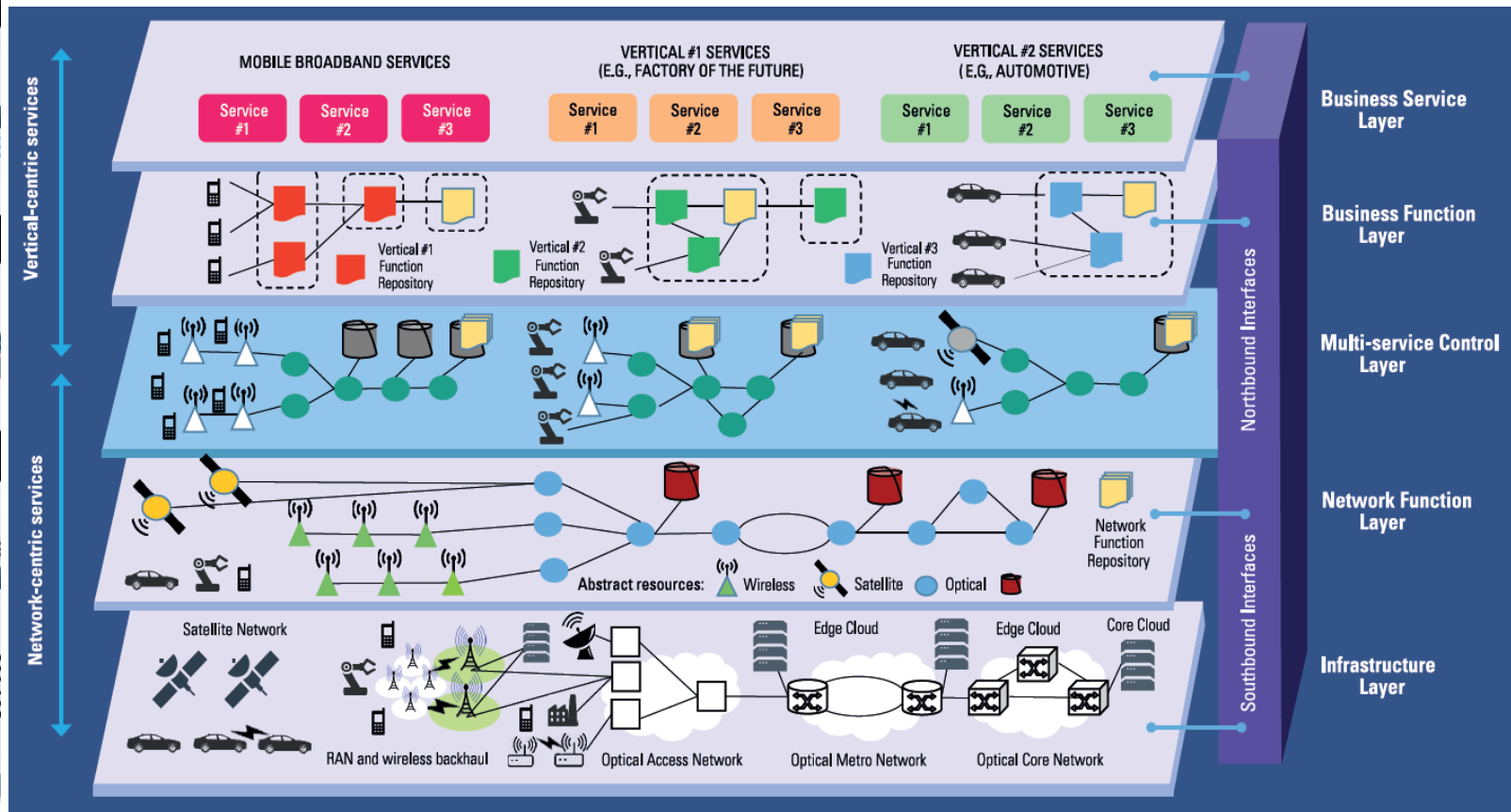
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5G will transform networks into intelligent orchestration platforms and pave the road to new business models and value propositions.



Source: 5G Infrastructure Association: 5G Empowering vertical industries. White Paper, 2016, https://5g-ppp.eu/wp-content/uploads/2016/02/BROCHURE_5PPP_BAT2_PL.pdf.

5G architecture will provide multiple, highly flexible, end-to-end network and cloud infrastructure slices over the same physical infrastructure.



5GPPP Architecture Work Group

White paper published June 1, 2016

- Launched within the 5GPPP Initiative with participation of 5GPPP projects but input also from non-5GPPP projects



<https://5g-ppp.eu/white-papers/>
<https://5g-ppp.eu/5g-architecture-paper/>

Members of 5G Infrastructure Association



Industry

- ADVA Optical Networking SE
- Alcatel-Lucent
- Airbus
- Atos
- Deutsche Telekom
- DOCOMO Communications Laboratories Europe GmbH
- Ericsson
- Huawei Technologies Düsseldorf GmbH
- IBM Research
- Intel Mobile Communications
- NEC Europe Ltd., NEC Laboratories Europe
- Nokia
- Orange Labs
- Samsung Electronics Research Institute Ltd.
- SES
- Telecom Italia
- Telefónica I+D
- Telenor ASA
- Telespazio
- Thales Alenia Space
- Turk Telekomünikasyon A.Ş.

Research

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

SMEs

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



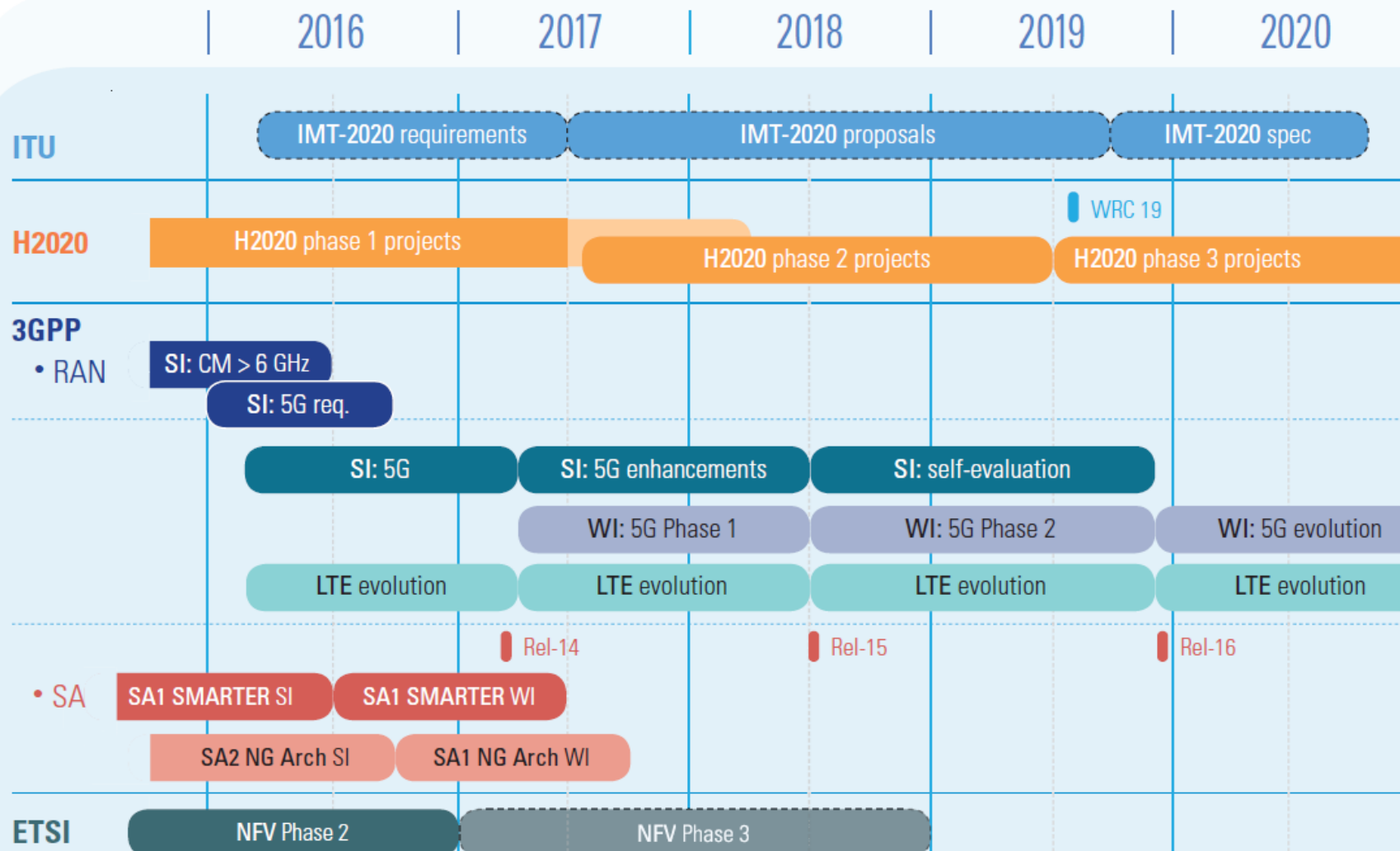
- **5G PPP Program** will deliver solutions, architectures, technologies and standards for the ubiquitous 5G communication infrastructures of the next decade
- **Program Ambitions: Key Challenges / High level KPIs**
 - Providing **1000 times higher** wireless area capacity and more varied service capabilities compared to 2010
 - **Saving up to 90% of energy** per service provided. The main focus will be in mobile communication networks where the dominating energy consumption comes from the radio access network
 - Reducing the average service deployment time cycle **from 90 hours to 90 minutes**
 - Creating a **secure, reliable and dependable Internet** with a “zero perceived” downtime for services provision
 - Facilitating **very dense deployments** of wireless communication links to connect over 7 trillion wireless devices serving over 7 billion people
 - Enabling advanced User **controlled privacy**

EC 5G Action Plan (Sept 2016)


The Commission has identified the following **key elements for the plan**:

- Align roadmaps and priorities for a **coordinated 5G deployment across all EU** Member States, targeting early network introduction by 2018, and moving towards commercial large scale introduction by the end of 2020 at the latest.
- Make provisional **spectrum bands available for 5G ahead of WRC-19**, to be complemented by additional bands as quickly as possible, and work towards a recommended approach for the authorisation of the specific 5G spectrum bands above 6 GHz.
- Promote **early deployment in major urban areas** and along major transport paths.
- Promote **pan-European multi-stakeholder trials** as catalysts to turn technological innovation into full business solutions.
- Facilitate the **implementation of an industry-led venture fund** in support of 5G-based innovation.
- Unite leading actors in working towards the **promotion of global standards**.

Use-cases originating from verticals have to be considered as drivers of 5G requirements from the onset with high priority and covered in the early phases of the standardization process.




5G PPP International cooperation

- 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
- 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
- Multilateral MoU on a series of Global 5G Event
 - Two events per year
 - Rotation between continents
 - MoU signed between IMT-2020 (5G) Promotion Group, 5GMF, 5G Forum, 5G Americas and 5G Infrastructure Association on October 20, 2015 in Lisbon





 is inviting you to the
5G Global event in Rome, Italy
on November 9 and 10, 2016
Enabling the 5G Ecosphere

Spectrum proposed pioneer bands

- **3.4 - 3.8 GHz**
 - ➔ eMBB for single digit Gbit/s urban mobile coverage
- **24.25 - 27.5 GHz (“25 GHz”) 31.8 - 33.4 GHz (“32 GHz”)**
 - ➔ eMBB for up to double digit Gbit/s
- **700 MHz**
 - ➔ mMTC/URLLC universal coverage

Source: 5G - IA WG Spectrum

