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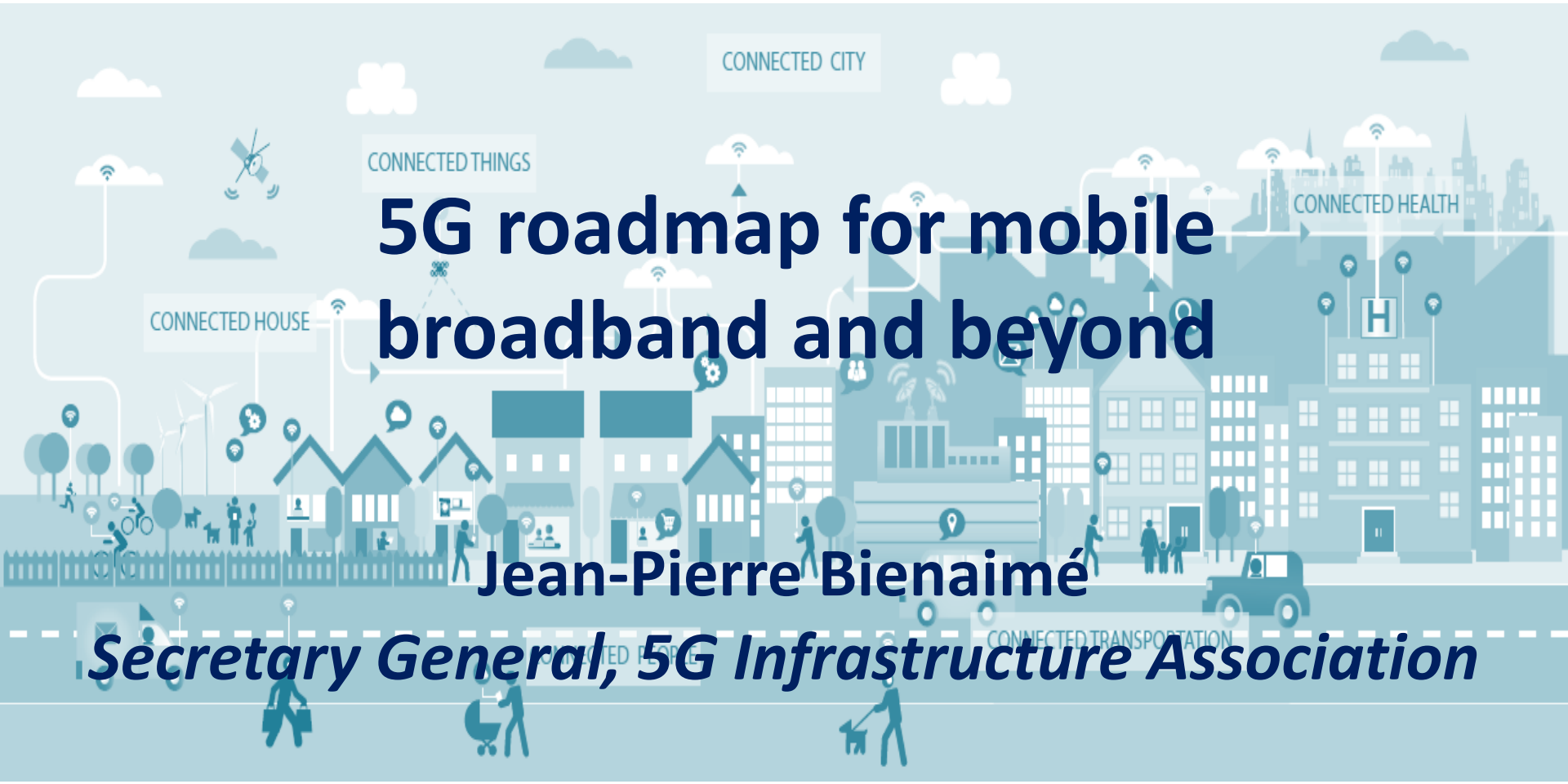


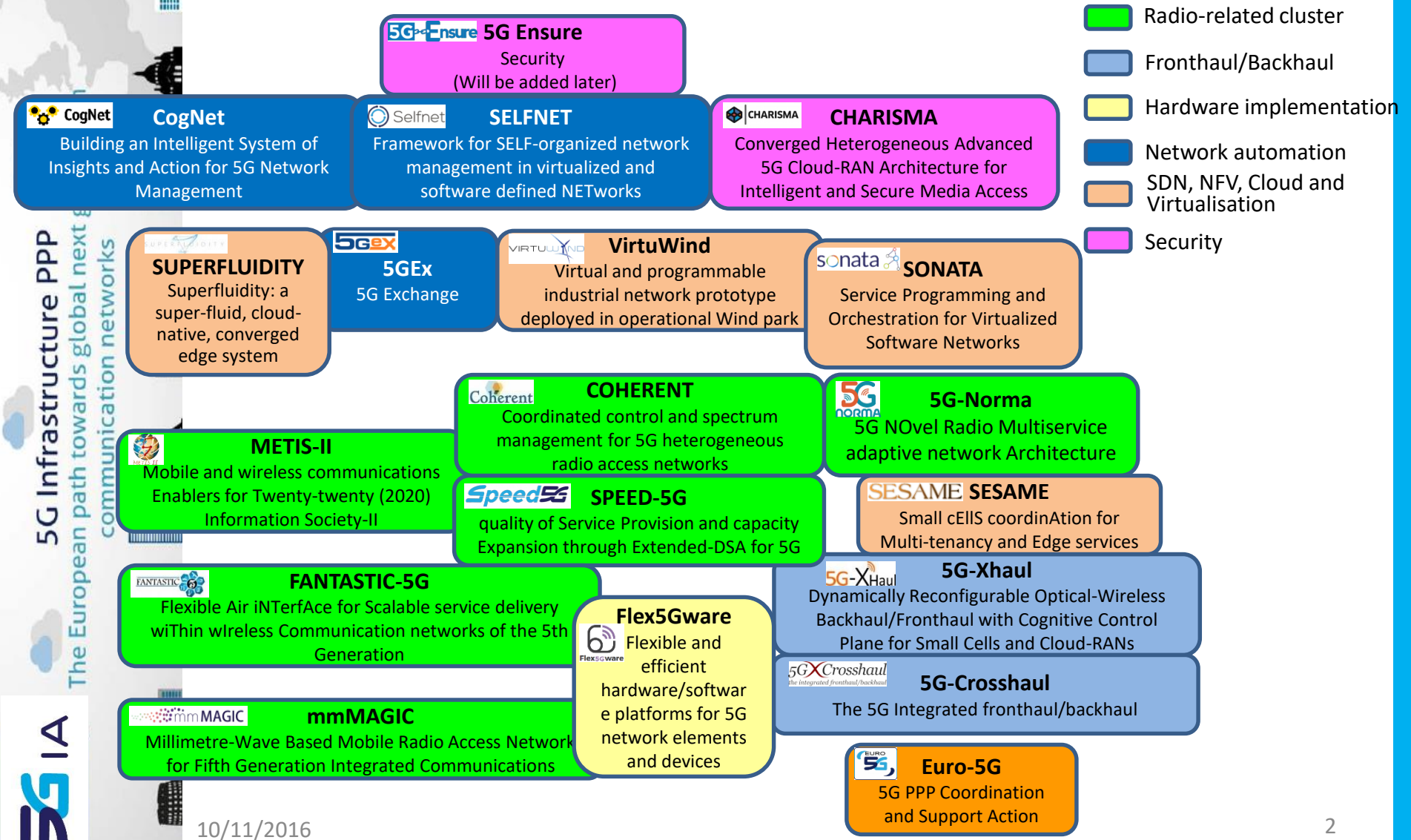
5G roadmap for mobile broadband and beyond

Jean-Pierre Bienaimé

Secretary General, 5G Infrastructure Association

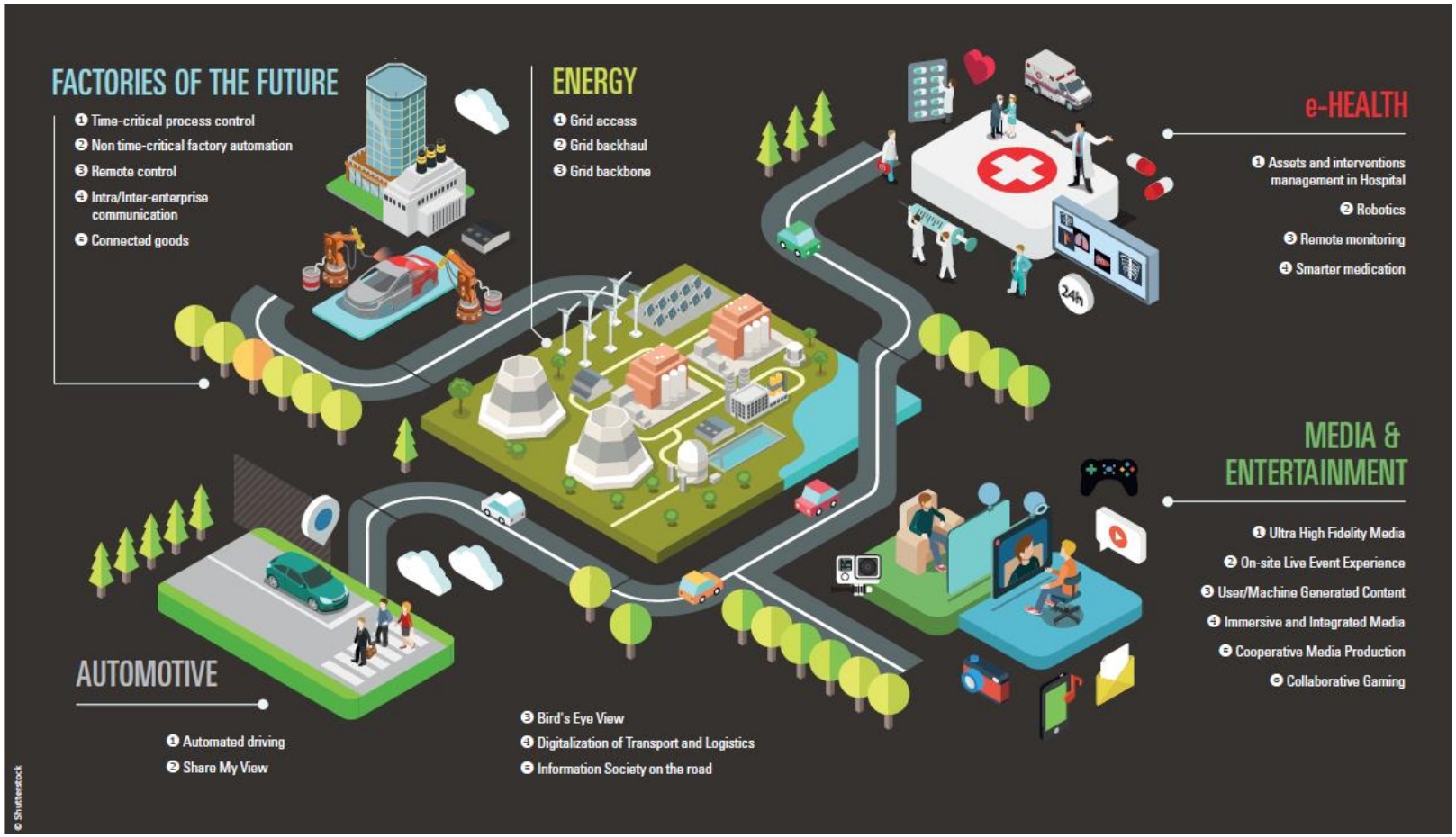
http://5g-ppp.eu/

Horizon 2020 5G PPP
19 Call 1 selected projects on-going



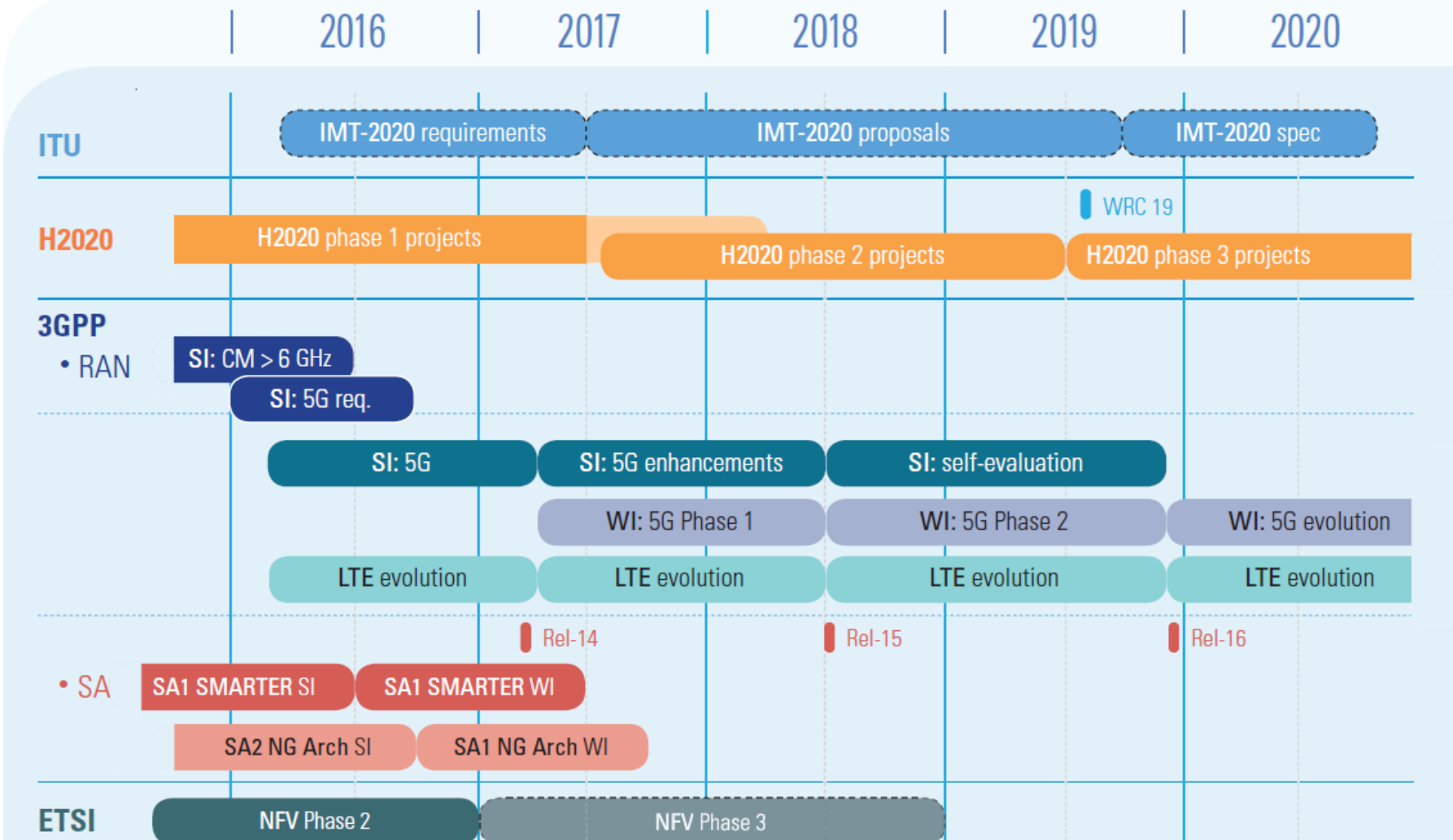
Source: 5G PPP, https://5g-ppp.eu/5g-ppp-phase-1-projects/.

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



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.

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-IA supporting the 5G Standardization roadmap

- 5G-IA new Market Representation Member (MRP) of 3GPP as of 21st October 2016

- 5G-IA next member of ITU-R

Why a new 5G Architecture?

- **5G Architecture enables**
  - new business opportunities meeting the requirements of large variety of use cases
  - 5G to be future proof
- **by means of**
  - implementing **network slicing** in cost efficient way
  - **addressing both** end user and operational services
  - supporting natively **softwarization**
  - **integrating** communication and computation
  - integrating **heterogeneous technologies** (incl. fixed and wireless technologies)

Source: 5G PPP Architecture Working Group.

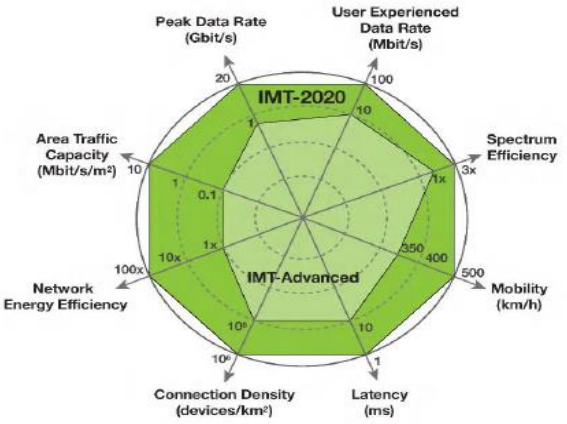
5GPPP Architecture Work Group
White paper published June 1, 2016

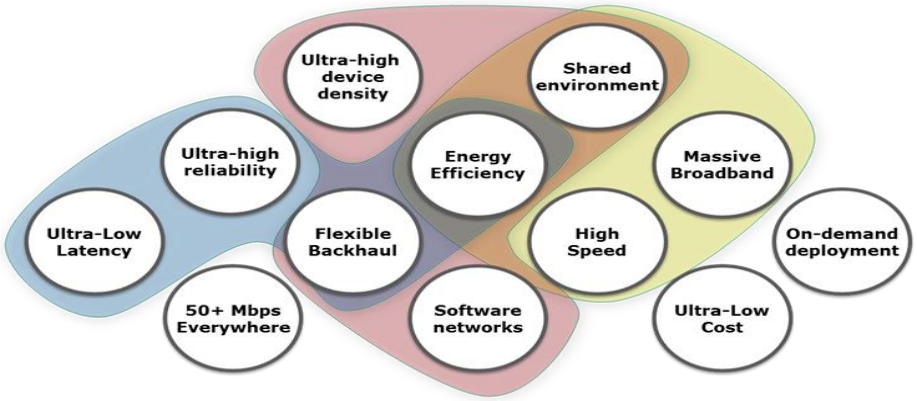
- Launched within the 5GPPP Initiative with participation of 5GPPP projects but input also from non-5GPPP projects

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

Source: 5G PPP Architecture Working Group.

5G expectations: Combine the strength of satellite and terrestrial networks (source: ESA)





- **5G a network of networks** responds to diverse use cases. Not all of them will be served by a single network.
- Combination of terrestrial and satellite networks to provide timely requested system functionality at lowest costs while maintaining expected level of end-to-end quality for given network coverage

➢ ***Pressure for faster convergence: Combine the strength of satellite and terrestrial networks to deploy 5G***

➢ ***Fostering complementarity***

➢ ***Enabling seamless connectivity***

➢ ***Provisioning collaborative hybrid services to fulfill cost, technically efficient and timely manner the 5G expectations***

Satellite complementary capabilities (source: ESA)

- **Ubiquity**
  - Across-borders
  - Pan-European / Global
  - Deployment speed
  - Remote areas / geography
- **Resilience**
  - Overlay to terrestrial
  - Backup
  - Scalability
- **Multicast/Broadcast (1:many, 1:all vs unicast)**
- **Global Mobility/Fully flexible space segment**
- **Public safety & emergency**
- ***Serve Smart combined use cases: (automotive/transportation + energy + smart city) + public safety & emergency***

Spectrum for 5G: towards WRC-19

- WRC-15 discussed on **several frequency bands above 6GHz** to be studied within ITU for 5G in the period leading up to WRC-19. ITU-R agreed to conduct sharing and compatibility studies by end March 2017 for a number of SHF and EHF portions in 24-86 GHz ranges – the highest frequencies yet to be evaluated for mobile broadband. But in a first phase, **sub-6GHz spectrum** will be promoted (700MHz, 3.4-3.8GHz,…).
- **Spectrum for 5G will enable many new highly advanced services** that will improve the life of people, especially those living in large cities of the world with a pressing need for advanced communications.

  ➔ **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

Source: 5G - IA WG Spectrum

Members of 5G Infrastructure Association

5G Infrastructure PPP
The European path towards global next generation communication networks

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
- 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

Source: 5G Infrastructure Association.

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

Source: 5G Infrastructure Association.

5G Infrastructure PPP
The European path towards global next generation communication networks

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**.

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 » announcements

- **Be quick and business-oriented**: Plan 5G trials now, including the verticals, and not delay 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!