5G PPP Phase III

H2020 ICT National Contact Points Training
25 October 2017

Bernard BARANI – deputy Head of Unit
Mario SCILLIA – Programme Officer
Eric GAUDILLAT – Programme Officer

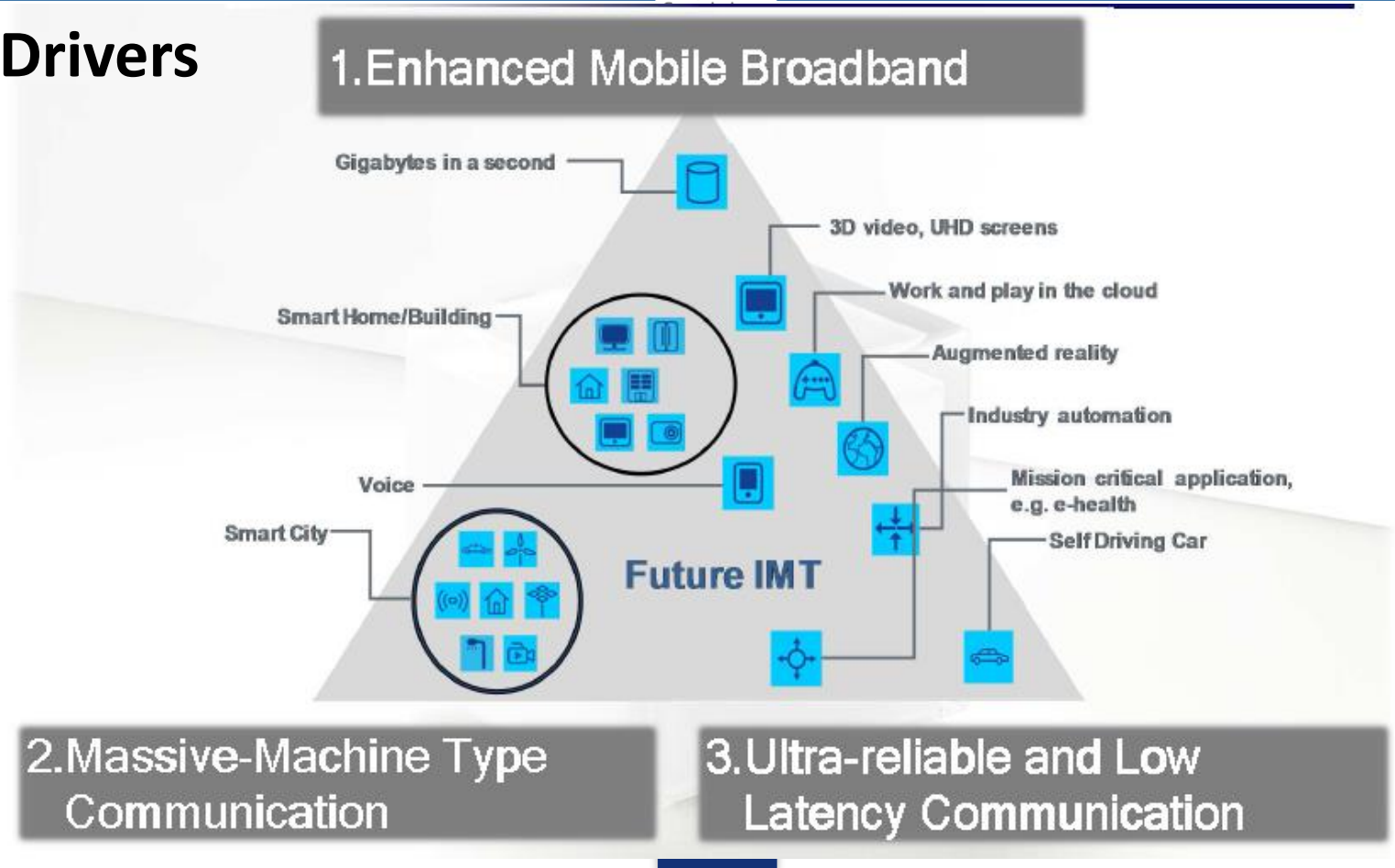
Future Connectivity Systems
European Commission – DG CONNECT

5G Context and European policy

5G PPP - Addressing 5G as a strategic and global issue

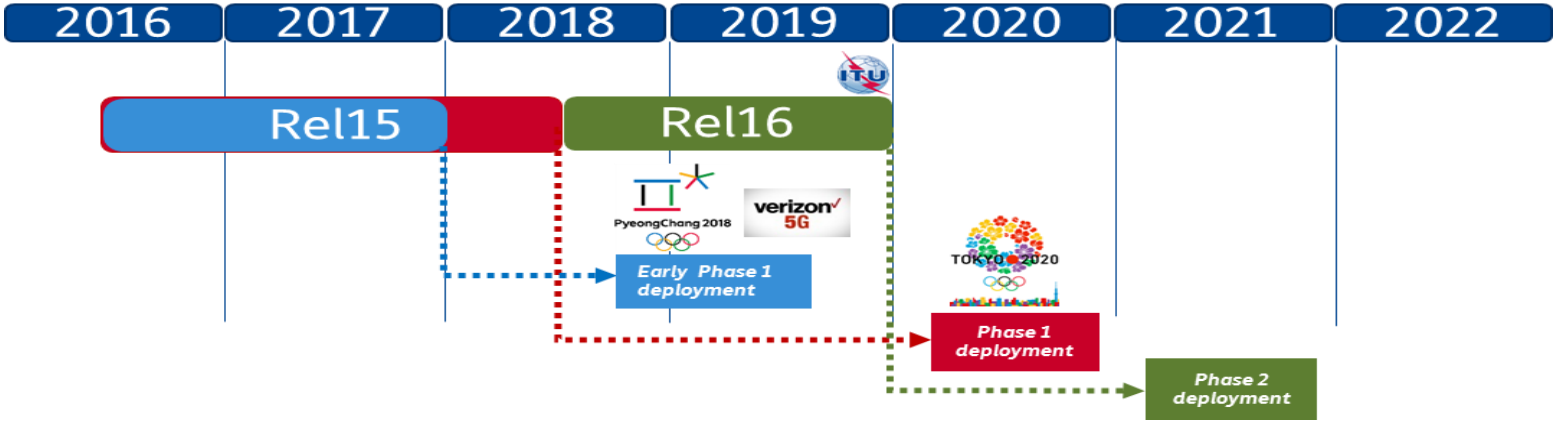
- About 10 years to develop a new network generation, R&I started around 2012 in many countries, Europe at the forefront
- Today, **huge efforts world-wide** in the context of Public-Private partnerships
- Critical for Europe to lead in 5G, both as a **supply centre of excellence** and as an **early adopter through lead markets**
- **Europe has developed its 5G path** on which traction is now being created and **needs to reach its objectives**
- **The 5G PPP is a fundamental building block of the EU 5G Policy strategy**

5G Drivers


1.Enhanced Mobile Broadband
Gigabytes in a second
3D video, UHD screens
Work and play in the cloud
Smart Home/Building
Augmented reality
Industry automation
Voice
Mission critical application, e.g. e-health
Smart City
Self Driving Car
Future IMT
2.Massive-Machine Type Communication
3.Ultra-reliable and Low Latency Communication

European Vision

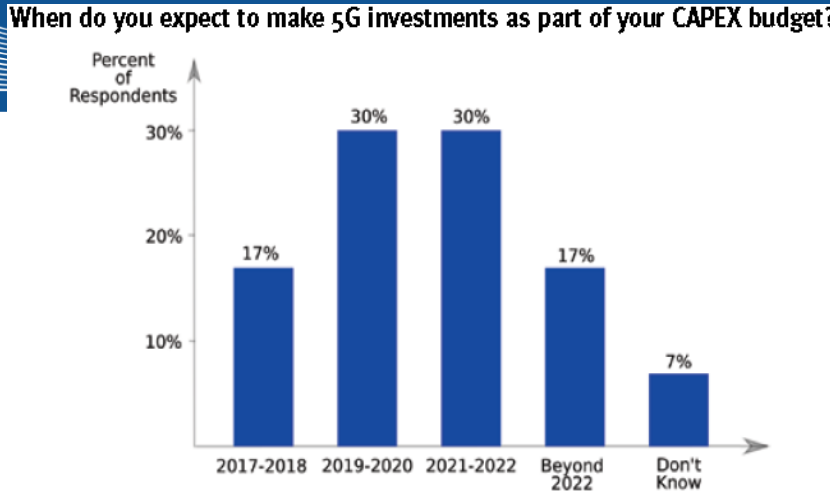
3GPP 5G overall Roadmap

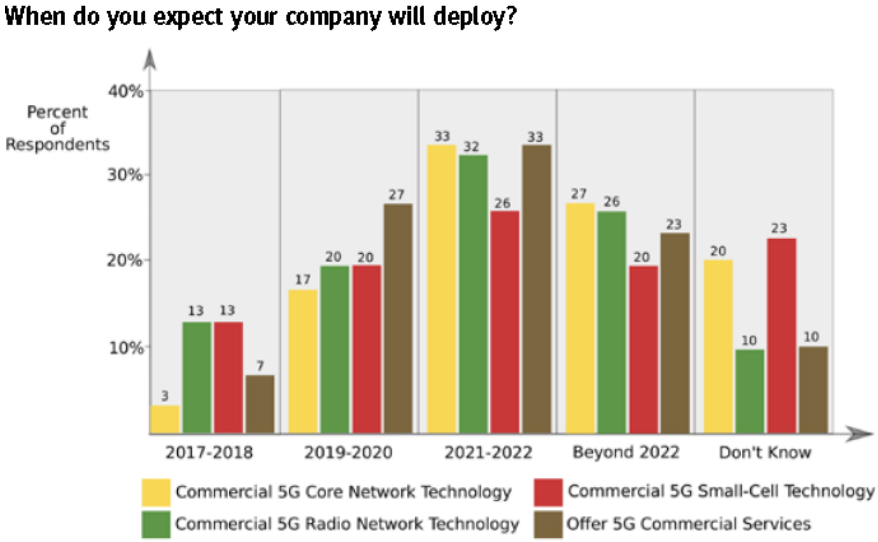


- 5G features will be phased as it will be not possible to standardize all in time for Rel-15 completion and early deployments (2018-2020)
- Release 15 (aka phase 1, by June '18) will aim at a first phase of expected deployments in 2020 (Japan Olympic Games) new radio (NR) + new core (NC)
- Release 16 (aka phase 2, by Dec '19) will target the ITU IMT-2020 submission
- Additional “Early drop” milestone (Dec '17) recently added to meet early market needs

Towards Deployment

- EU - Private trials, verticals, 2017-18
  - Deployment targets, 5G Action Plan
- US - Verizon fixed wireless access trials, 2017
  - AT&T TV streaming trials, 2017
- South Korea, winter Olympic games, 2018
- Japan, Olympic games, 2020
- China, technology and system trials under National Key Projects

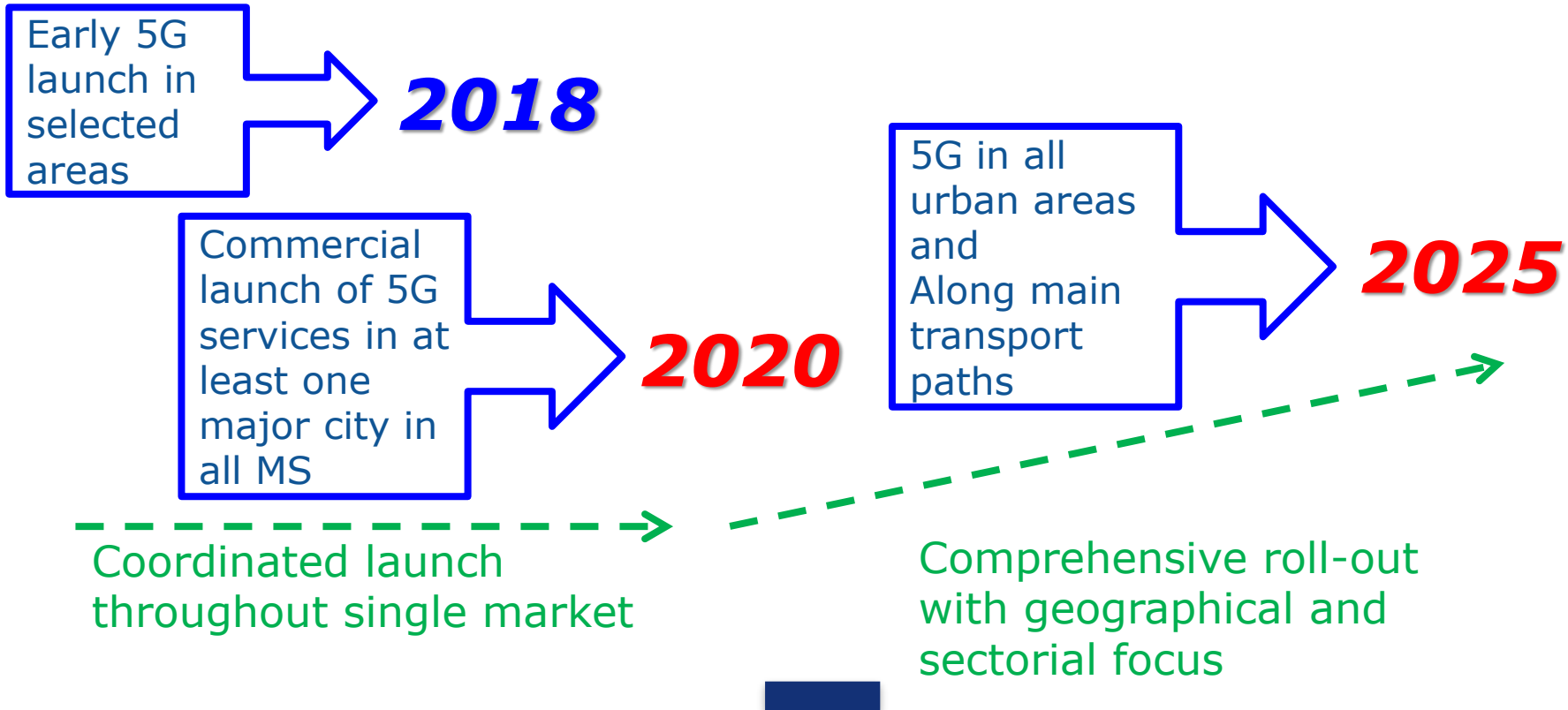




The European Commission 5G Action Plan

- EU policy measures for 5G deployment
- Part of the September 2016 "Connectivity Package"
- 2015 – 2025 deployment targets
- Pre-commercial trials to start 2018

5G Action Plan: European approach to 5G introduction



EU 5G "Pioneer Bands"

700 MHz (harmonised, ongoing assignment)

- ✓ European Commission Decision: technical harmonisation (April'16)
- ✓ UHF Decision: assignment deadline 2020 (April'17)

3.6 GHz (harmonised, available, partly used)

- ✓ Review of European Commission Decision by 2019 (ongoing)
- ✓ Re-farming/defragmentation for larger bandwidths (ongoing)

26 GHz (in preparation)

- ✓ Harmonised technical/sharing conditions (ongoing)
- ✓ European Commission Decision before WRC-19
- ✓ Services & authorisation models

European Trials Roadmap

5G Action Plan called for trials roadmap

- ✓ To help technology and business model validation
- ✓ To prepare for early deployments
- ✓ To foster partnership with verticals and creation of ecosystem

Roadmap announced in MWC in Barcelona (February '17)

- ✓ Support by key players of 5G in Europe
- ✓ Focussed on verticals and cities

5G Pan-European Trials Roadmap v1: 3rd 5G Global Event, Tokyo (May '17)

- ✓ Part of this implementation is supported by the 5G PPP
- ✓ Stakeholder commitment is key to implement the roadmap

5G Public Private Partnership (5G PPP)

Public Private Partnership (PPP) R&I Programme

- Industry driven initiative, including vertical industries
- Support EU positioning in global race to 5G
- Up to 700 million € public funding under H2020
  - To be matched by private funding of at least 3.5 billion €
- Support implementation of EU vision and policies (Pre-standardisation, Spectrum, International cooperation, trials and deployment)
- Implementation through 5G Infrastructure Association
- 3 Phases until 2020
- *BUT NOT BUSINESS AS USUAL!*

  *Focus on **programme** results and impact*

Collaboration matters!

The projects are the engine of the 5GPPP:

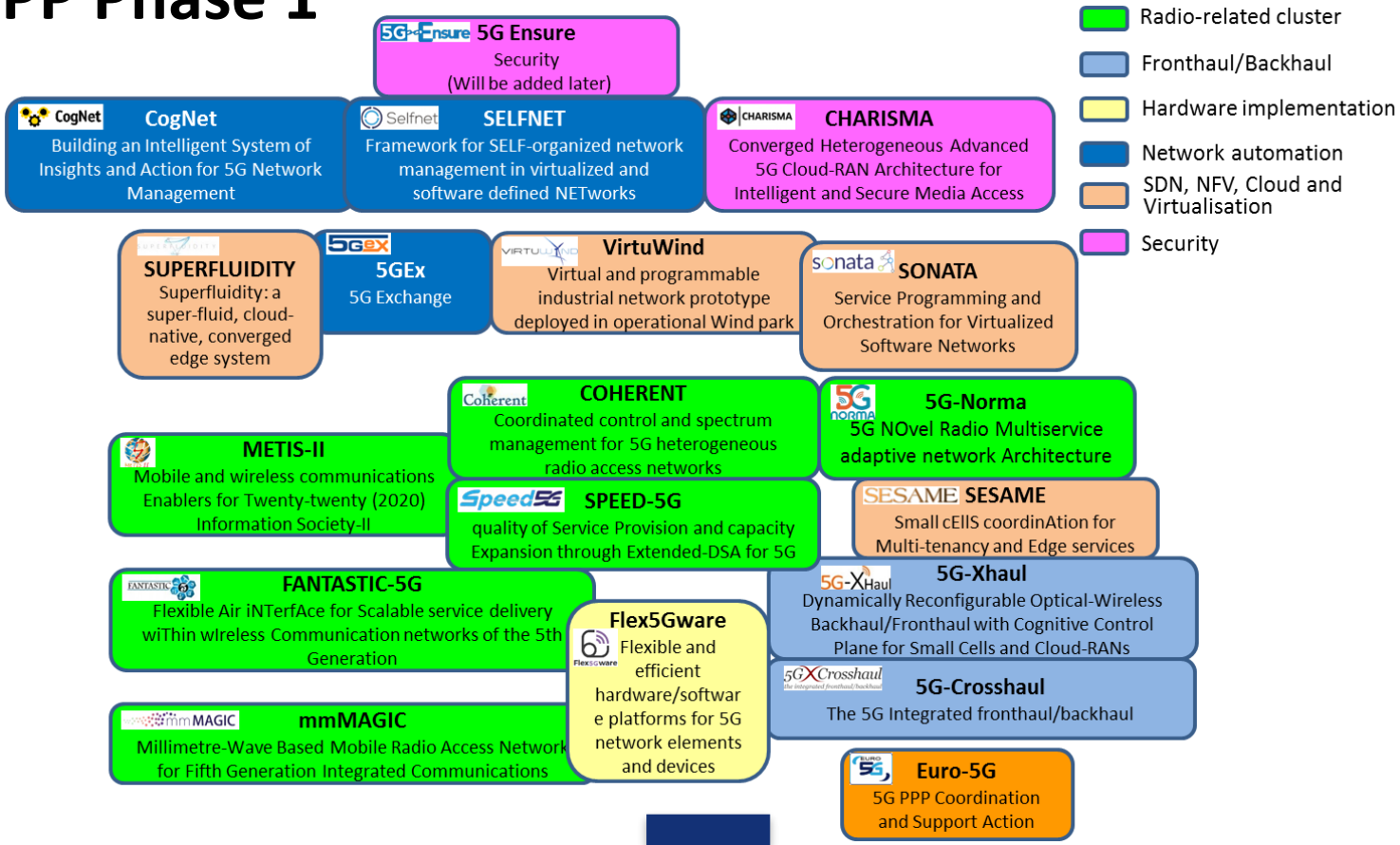
- ✓ Support implementation of EU Vision and policies
- ✓ Populating the 5G association's working groups and collaboration structures
- ✓ Providing substantial inputs (ex: standardization, spectrum, KPIs)
- ✓ Integration to and contribution towards international developments and deployment

Collaboration agreement between projects through Complementary grants, Art 41.4 MGA (in the model of Phases 1 and 2)

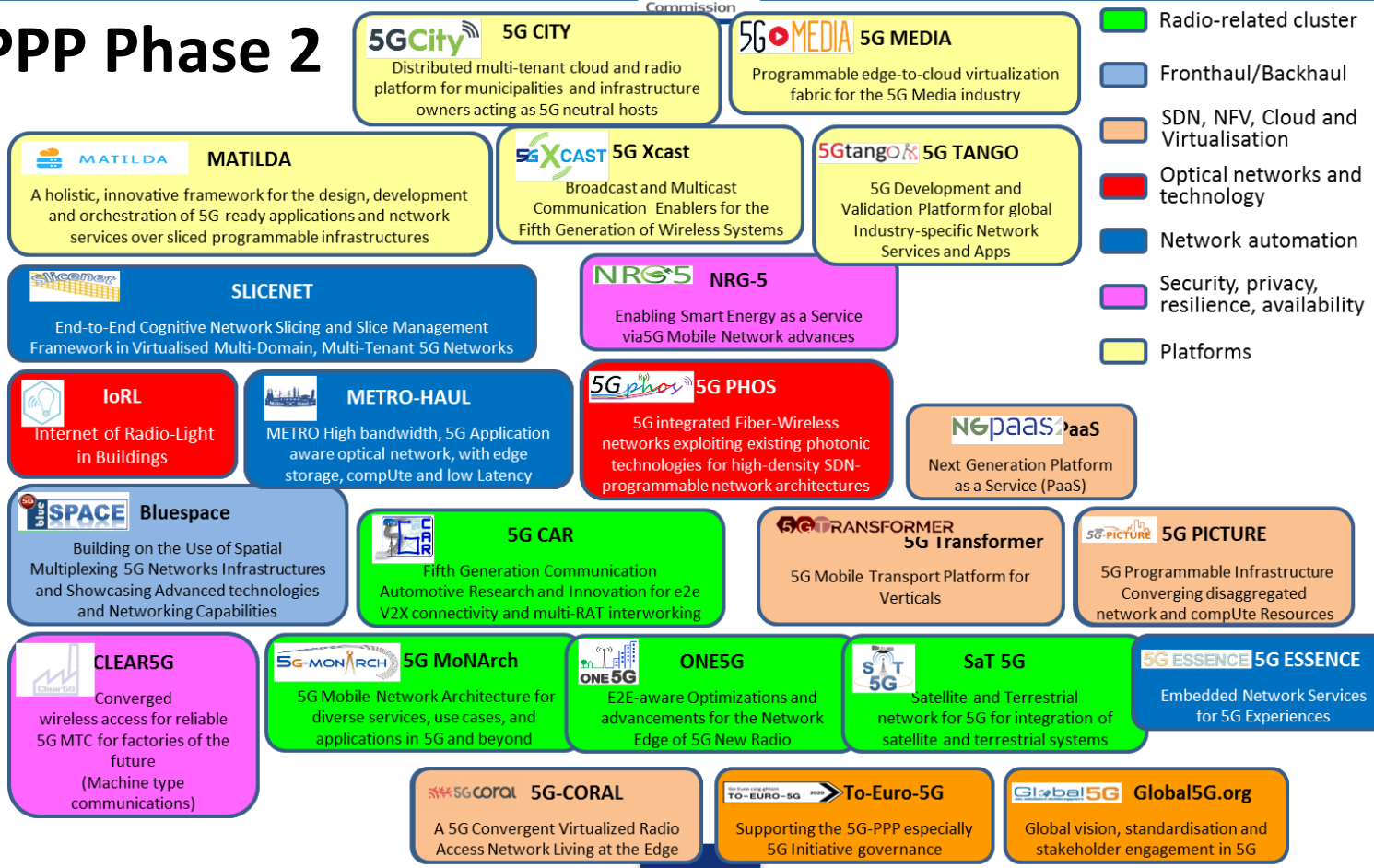
- ✓ Joint definition of issues of common interests
- ✓ Sharing of results
- ✓ common approaches to standardization
- ✓ common dissemination and awareness raising activities

More than just projects – it's a PROGRAMME!

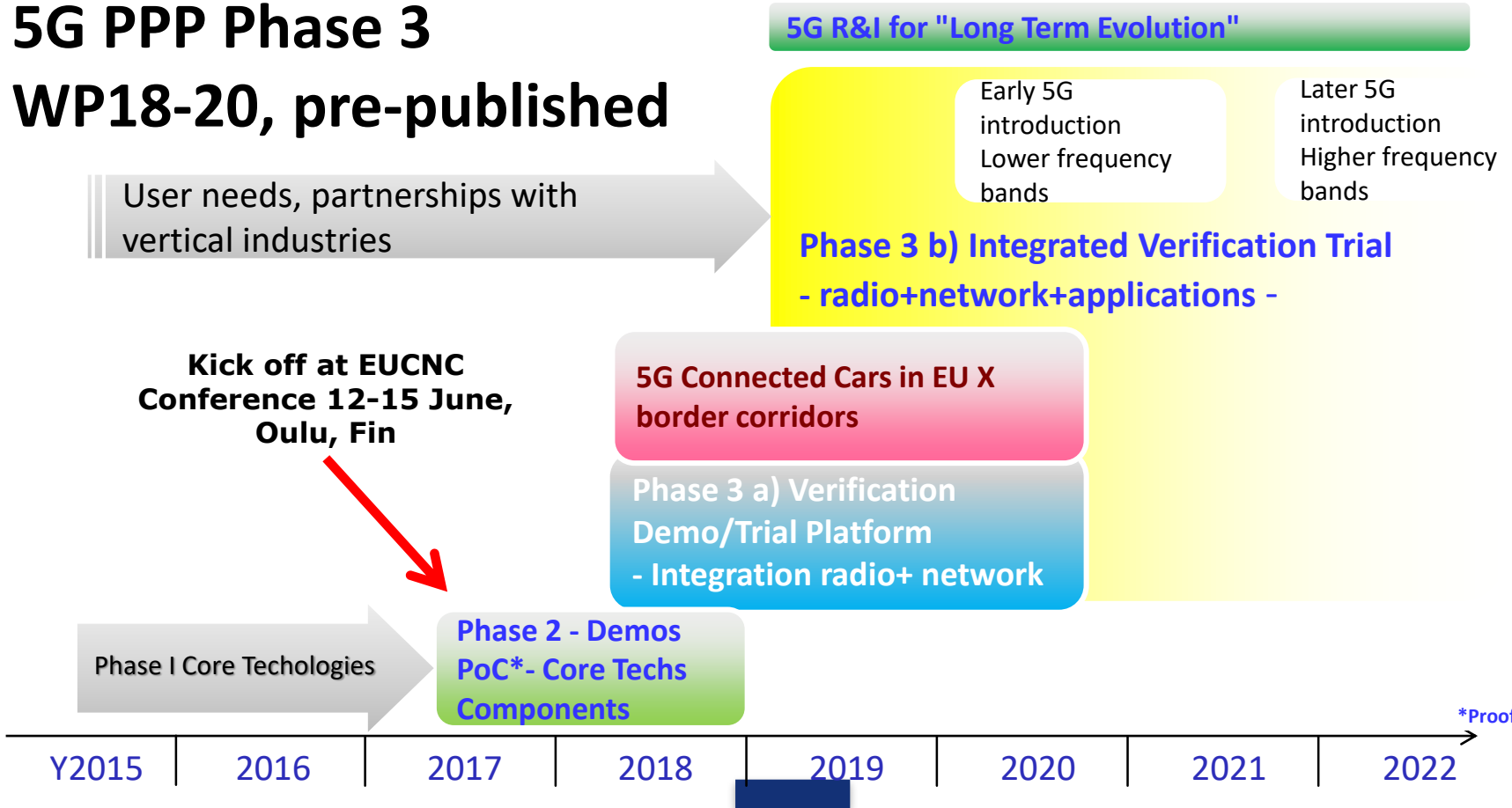
5G PPP Phase 1



5G PPP Phase 2



5G PPP Phase 3
WP18-20, pre-published



International cooperation, moving forward

	R&D , 2018-20 Work Programme	Policy
JAPAN	- Applications and trials with 5G networks - Beyond 5G, applicability of spectrum >275 GHz	- Spectrum, interoperability at different bands
REPUBLIC OF KOREA	- Application trials at mmwave bands - Interworking across multiple radios	- Standards, validation of specs
CHINA	- eMBB Trials at 3,5 GHz and in the V2X context	- Spectrum co-operation - Standards, preparing 5G phase 2 through trial results
TAIWAN	- 5G trials addressing end-to-end testbeds for specific applications	
USA	- Coordination of EU-NSF projects relevant to the Advanced Wireless Platform programme	
BRAZIL	- Trials	- Spectrum co-operation - Standards - Trials

5G PPP Phase 3, Calls Specifics

5G PPP Phase 3 topics closing in 2018

	Title	Closing Dates
ICT-17-2018	5G End to End Facility	**31 January 2018**
ICT-22-2018	EU-China 5G Collaboration	
EUJ-02-2018	EU-Japan Joint Call - 5G and beyond	
EUK-02-2018	EU-Korea Joint Call - 5G	
ICT-18-2018	5G for cooperative, connected and automated mobility (CCAM)	**17 April 2018**
ICT-21-2018	EU-US Collaboration for advanced wireless platforms	
ICT-19-2019	Advanced 5G validation trials across multiple vertical industries	**14 November 2018**

ICT-17-2018: 5G end-to-end facility - general context

- Availability of Pan European platforms that can be used to validate in end to end manner the 5G KPI's, from the 5G PPP and beyond
- Critical to go beyond capabilities that can be demonstrated with running pre commercial trials of industry
- Novel features in relation to vertical, notably end-to-end slicing are of particular importance
- Platforms are to be reused by ICT 19 projects, in support of trials
- Open to support implementation of 5G AP trial roadmap
- Impact critical
- Open to support different stakeholders constellations

ICT-17-2018: 5G end-to-end facility - scope

- The target 5G end-to-end network facility covers fixed/multi radio access, backhaul, core network, service technologies and architectures targeted for 5G including end to end virtualisation and slicing as key component
- The objective is
  - to validate the 5G network KPIs through representative network trials, as defined by the 5G PPP
  - to prepare an extensive validation platform for verticals use cases

ICT-17-2018: 5G end-to-end facility - scope

The targeted facility

- allows to validate early versions of the standards and to prepare for later "forward compatible" versions
- may be based on the interworking of several experimental platforms existing in Europe
- requires availability of an openness framework (both legal and technical, e.g. open APIs) enabling "vertical" projects to access and use it
- requires a methodology to consistently compare technologies where appropriate

ICT-17-2018: 5G end-to-end facility - expected impact

- Demonstrated feasibility of **5G PPP KPIs beyond 4G evolution**. It requires clear analysis of the state of the art and how 5G goes beyond
- Demonstration of **innovative radio spectrum use** and sharing applicable to 5G spectrum: (un)-licensed, licensed-shared access
- Validation of a representative **end to end 5G architecture** including end to end service provisioning with slicing capabilities
- Impactful contribution to **standards**. Participation of key European industrial partners with high standardisation impact is desired
- Availability of 5G facility that may be further used for validation through specific **vertical use cases** and/or for **large scale showcasing** events

ICT-17-2018: 5G end-to-end facility

- Opening 31/10/2017
- **Closing 31/01/2018**
- Target is 3 to 4 projects
- Type of action: Research and Innovation action
- **Special conditions!**
  - The limit for a full proposal is 100 pages
  - Complementary grant agreements (through special clause 41.4): One collaboration agreement to be signed by the 5G PPP projects aiming at, for example, → Joint definition of issues, → shared results, → common approach to standardisation and disseminations, …

up to 60 M€

ICT-18-2018: 5G for cooperative, connected and automated mobility (CCAM) - general context

- Connected and Cooperative Assisted Mobility (CCAM) identified as a strategic industrial opportunity in the EU
- 5G considered as the connectivity platform of choice (long term) for CCAM use cases
- Member State support with Letter of Intent, signed at ministerial level in March 2017
- European Automotive and Telecom Alliance (EATA) launched in September 2016
- 5G Automotive Association (5GAA) launched in September 2016

➔ ICT 18 aims at validating 5G for CCAM in this wider techno-policy context

ICT-18-2018: 5G for cooperative, connected and automated mobility (CCAM) - scope

- Validation of 5G in a broad CCAM context is realised through cross border trials along 5G corridors
- Core technological innovation expected from 5G, such as (but not limited to):
  - New Radio, new frequency bands
  - C-RAN
  - Mobile Edge Computing
  - network virtualisation
  - new network architecture
  - cross domains data flows

ICT-18-2018: 5G for cooperative, connected and automated mobility (CCAM) - scope

- Define options for deployment, taking into account the evolution from earlier cellular technology (e.g. LTE-V2X), and possible co-existence with other technologies (e.g IEEE 802.11p)
- Includes cost/complexity assessment of the various technology deployment options. Identifies who has to invest and who will benefit commercially

ICT-18-2018: 5G for cooperative, connected and automated mobility (CCAM) - expected impact

- Validation of 5G technologies and architecture in an "extended CCAM" context
- Validated cost/benefit analysis of cross border 5G deployment enabling CCAM along 5G corridors potentially including several operator's domains
- Availability of deployment scenarios and strategies with broad base industry and administration consensus
- Identification of spectrum and standardisation gaps. Participation of key European industrial partners of both the ICT and the automotive sectors and with high standardisation impact is desired

ICT-18-2018: 5G for cooperative, connected and automated mobility (CCAM)

- Opening 31/10/2017
- **Closing 17/04/2018**
- Target is 2 to 4 projects
- Type of action: Innovation action
- **Special conditions!**
  - The limit for a full proposal is 100 pages
  - Complementary grant agreements (through special clause 41.4): One collaboration agreement to be signed by the 5G PPP projects aiming at, for example, → Joint definition of issues, → shared results, → common approach to standardisation and disseminations, …

up to 50 M€

ICT-19-2019: Advanced 5G validation trials across multiple vertical industries - general context

- Trials and demonstrations are key to demonstrate 5G applicability to vertical industries and to prepare for mature cross sector business cases
- Trials may also be considered in support of the 5G AP Trial Roadmap developed under the 5G PPP
- 5G technology can only be validated in its fullest extent if used by several applications at the same time with different requirements (cloud like behaviour and isolation)
- Multi domain management of resources is important in such shared technology environments, including strong isolation and security aspects
- Trials expected to support later releases of 3G PP standards enabling full coverage of vertical requirements

ICT-19-2019: Advanced 5G validation trials across multiple vertical industries - scope

Research and innovation action:

- Trials of various scales, depending on the target technology, demonstrating that performance conforming to 5G PPP KPIs requirements are met in the context of specific vertical use cases
- Technology/architecture trials targeting concurrent usage of resource by multiple verticals, addressing eMBB, mMTC, URLLC use cases
- To demonstrate that 5G architecture and technologies enabling multi domain management of resources are in line with concurrent vertical performance requirements
- Preferably implemented over the 5G end to end platforms developed under ICT-17-2018 and contribute to 5G demonstration in the context of large showcasing events

ICT-19-2019: Advanced 5G validation trials across multiple vertical industries - scope

Coordination and support action:

- Cooperation of the implemented 5G Research and Innovation Actions (RIA) and Innovation Actions (IA) towards joint leveraging of results:
  - Management and orchestration of 5G PPP project cooperation for horizontal issues of common interests (e.g. KPIs, security, energy efficiency, spectrum, standardisation, societal impact of 5G)
  - Portfolio analysis, coverage, mapping and gap analysis, roadmaps
  - Support to key international co-operation activities (standards, spectrum)
  - Organisation of stakeholder events
  - Monitoring of the openness, fairness and transparency of the PPP process
  - Maintenance of the "5G web site"

ICT-19-2019: Advanced 5G validation trials across multiple vertical industries - expected impact

Research and innovation action:

- Validated core 5G technologies and architectures in the context of specific vertical use cases and deployment scenarios and for differentiated performance requirements
- Viable business models for innovative digital use cases
- Impactful contributions towards standardisation bodies, involving vertical actors
- Validation of relevant KPIs linked to specific vertical sectors
- Europe 5G know how showcasing

ICT-19-2019: Advanced 5G validation trials across multiple vertical industries - expected impact

Coordination and support action:

- Organisation of the 5G PPP as a programme
- Maximised output and exploitation of 5G PPP project results in key domains (standardisation, spectrum)
- Constituency building, stakeholder support, support to key international cooperation events and activities; dissemination, support to relevant stakeholder events; definition of future R&I actions

ICT-19-2019: Advanced 5G validation trials across multiple vertical industries

- Opening Early September 2018
- **Closing 14/11/2018**
- Target is 6 to 9 projects
- Type of action: Research and Innovation action (90 M€), Coordination and support action (2 M€)
- **Special conditions**
  - The limit for a full proposal is 100 pages
  - Complementary grant agreements (through special clause 41.4):
    One collaboration agreement to be signed by the 5G PPP projects aiming at, for example, → Joint definition of issues, → shared results, → common approach to standardisation and disseminations, …

up to 92 M€

ICT-21-2018: EU-US collaboration for advanced wireless platforms (closing 17 April 2018)

- To establish EU US collaboration on advanced wireless research beyond 5G
- To develop notably research roadmaps, workshops, scientific exchanges, tools for experimentation, cross atlantic trials
- Proposals to foresee projects entities twinning, including NSF PAWR projects
- Expected impact: reinforced cooperation with the US in Wireless research towards beyond 5G connectivity systems and services
- Target: 1 CSA project (EU) with total funding up to 2 M€

ICT-22-2018: EU-China 5G collaboration

5G PPP Project

5G trial infrastructures

6M€

Twinning of projects

unified trial specifications
unified trial frequency bands
Sharing of data
Joint deliverables, tests reports, white papers, publications and standard contributions

NSTMP Project

5G trial infrastructures

6M€

The National Science and Technology Major Project (NSTMP) is a main 5G research program in China

ICT-22-2018: EU-China 5G collaboration (closing 31 January 2018)

- Conduct 5G trials addressing two specific scenarios: enhanced Mobile Broadband (eMBB) and Internet of Vehicles (IoV)
- Both scenarios shall be implemented in both regions (EU and China)
- Not restricted to 5G radio access, also for network slicing, virtualisation, cross-domain orchestration
- In EU, trials are preferably implemented over the 5G end-to-end platforms developed under ICT–17-2018.
- Expected Impact: Global interoperability demonstrations for 5G networks, Joint contributions to global 5G standards specifications, …
- Target: 1 Research and Innovation action (EU) with total funding up to 6 M€

EUJ-02-2018: 5G and beyond (closing 31 January 2018)

- Part of the 4th EU-Japan Joint Call between EC, MIC and NICT
- Area 1: Large-scale demonstrations and trials towards 5G applications
  - Focus on trials and demonstrations of 5G applications in eMBB and Broadband Access in Dense Areas
- Area 2: Joint research on enabling technologies for beyond 5G
  - Focus on the enormous capacities foreseen to be needed in the backhaul and fronthaul networks
- Target: 2 Research and Innovation actions (1/area) with total funding up to 3 M€ (EU)
- **Check the special conditions!**

EUK-02-2018: 5G (closing 31 January 2018)

- Part of the 2nd EU-Korea Joint Call between EC and MSIP/IITP

- Area 1: mmwave and super broadband services
  - should include demonstration of 5G technologies for Access networks, Core networks
- Area 2: interoperability and integration of 5G vertical testbeds on heterogeneous environments
- Target: 2 Research and Innovation actions (1/area) with total funding up to 4 M€ (EU)
- **Check the special conditions!**

Future Foreseen Topics after 2018

ICT-20-2019-2020: 5G long term evolution (closing March 2019)

- The longer term vision targets the realisation of pervasive mobile virtual services
- 3 strands:
  - Extension of virtualisation technologies and architectures for Network Management
  - Security
  - Radio network enabling technologies, architectures and advanced signal processing
- Research and Innovation actions

ICT-23-2019: EU-Taiwan 5G collaboration (closing 15 January 2019)

- Conduct 5G trials addressing technology and business validation of 5G end-to-end connectivity and associated management from applications in Taiwan
- Expected Impact
  - Validation of core 5G technologies and architectures in the context of specific vertical use cases
  - Leverage cooperation towards industrial consensus between EU and Taiwan
  - Accelerate the pre-commercialization trials of the use cases introduced by IMT-2020 (eMBB, mMTC, URLLC)
- Research and Innovation actions with total funding up to 4 M€

Stakeholders Information Opportunities

https://ec.europa.eu/digital-single-market/en/events/ict-proposers-day-2017

https://www.4th-g5ge.org/

Find out more

5G Action Plan for Europe

https://ec.europa.eu/digital-single-market/en/5g-europe-action-plan

ICT Work Programme

https://ec.europa.eu/programmes/horizon2020/en/what-work-programme

5G PPP	http://www.5G-PPP.eu
Horizon2020 web site	http://ec.europa.eu/programmes/horizon2020
Participants portal	http://ec.europa.eu/research/participants/portal
H2020 Helpdesk, including FAQ	http://ec.europa.eu/research/index.cfm?pg=enquiries

5G PPP Phase III

Thank you for your attention!