



# ICT-52-2020

## Smart Connectivity Beyond 5G

*Rémy Bayou – Programme Officer*

*Future Connectivity Systems  
European Commission – DG CONNECT*



## 5G Public Private Partnership

### Phase 3 in Work Programme 2020: Forward looking R&I

WP 2020, R&I opportunities  
- Beyond 5G

5G R&I for "Long Term Evolution"

User needs, cross industry partnerships  
with vertical industries

We are  
HERE

Phase 3 b) Integrated Verification Trial  
- radio+network+applications -

5G Connected Cars in EU:  
Cross border corridors

Phase 3 a) Verification  
Demo/Trial Platform  
- Integration radio+ network

Phase I Core Technologies

Phase 2 - Demos  
PoC\*- Core Techs  
Components

\*Proof of Concept

Y2015

2016

2017

2018

2019

2020

2021

2022



## 5G PPP Phase 3 relevant focus:

*...this Work Programme aims at leveraging 5G technologies towards downstream innovation both at service and product levels, at maintaining a significant long term commitment to prepare for 5G "Long Term Evolution" and to bridge into smart connectivity platforms, which are expected to emerge during the next multi-annual financial framework (MFF)....*

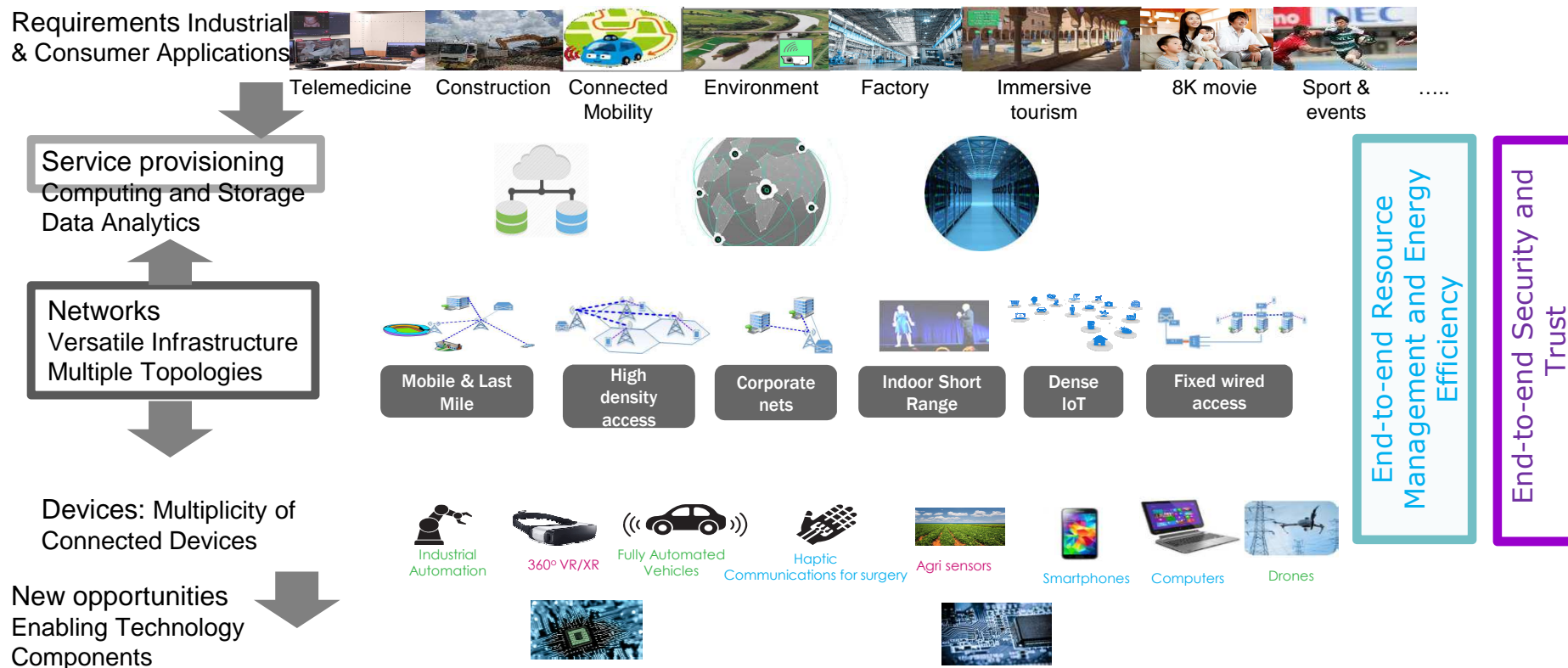
*The work also supports the needed transformation of the telecom industry with a growing part of the activities moving from hardware to software in the context of an increased virtualisation of networks.*



## Context and challenge

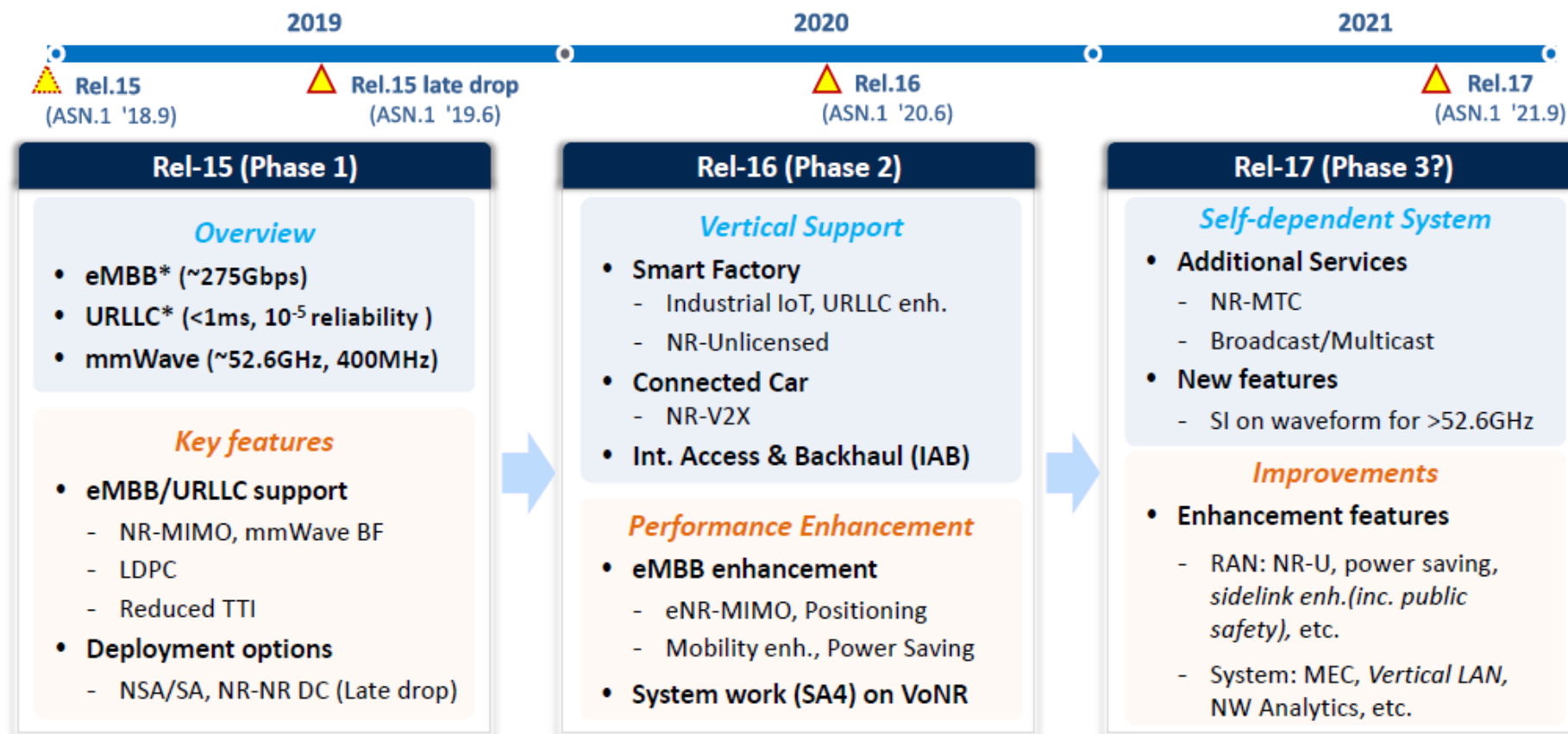
*The challenge is to go well beyond the 5G capabilities available in 2020. It also looks Beyond 5G to prepare Smart Connectivity systems as a platform for a Next-Generation Internet, supporting a highly flexible connectivity infrastructure that can dynamically adapt to innovative applications whilst facilitating user data control and innovation friendly implementation of relevant legislation. This requires a full value-chain approach towards seamless and secure end-to-end interworking with computing resources and with a range of innovative devices.*

## General Context- Example value Chain Approach



# 3GPP standards already planning evolution

Source: 3GPP/Samsung





# ICT-52-2020 Smart Connectivity Beyond 5G

Opening 19/11/2019 - Closing 22/04/2020

**up to 55 M€**

## ➤ Research & Innovation Actions (RIA)

€ 5 to 12million/project (indicative). In particular, initiatives *with strong structuring effects* across a large set of key industry stakeholders and programmatic impact for future European actions in the domain of Smart Network and Services *may target the higher budget range*.

A complementary grant agreement will be implemented  
across **all** projects in 5G-PPP Phase 3

## ICT-52-2020 Smart Connectivity Beyond 5G Scope

- Infinite network capacity, innovative spectrum use and management, usability of new bands and radio technologies and architectures including optical capabilities
- Imperceptible latencies through flexible connect-compute technologies
- Smart connectivity of massive amounts of things and systems, impact of Mobile edge computing and energy efficiency
- Novel architectures protocols and technologies (e.g. AI) for adaptive networks
- Personalised, multi-tenant and perpetual protection based on security, privacy and trust mechanisms with innovative technologies (e.g. DLT)

*Proposals may address one or several of above topics.*





# ICT-52-2020 Smart Connectivity Beyond 5G

## Expected Impact

- Smart connectivity technologies for platforms integrating ubiquitous connectivity, storage, and computing resources opening for new service and business models.
- Smart connectivity platforms towards perceived zero latency.
- Network scalability towards a high number of resource-constrained (IoT) devices
- Characterisation and availability of secure and trusted environments for software based virtualised networks, including underlying hardware limitations and enabling trusted multi-tenancy.
- Innovative radio spectrum use, novel strategies for coverage/service extension, support of novel wireless technologies and use cases through platforms, usability of today unexplored spectrum.
- Heterogeneous networks with dynamic topologies for advanced mobility solutions.
- Dynamic scalability of network capabilities with managed and enhanced optical resources.
- Characterisation of AI and blockchain technologies in the connectivity domain, notably for network/service management and security.
- Significant reduction of total cost of ownership through improved operational and capital expenditure efficiency, and energy consumption.



# ICT-52-2020 Smart Connectivity Beyond 5G

## What we do NOT want

### Innovation Action

- Short term R&I without ambitious perspective
- One off proposals with no follow up potential under next MFF
- Technologies locked to a specific business model

In any case actions which do not clearly focus  
on European opportunities and actors

## ICT-52-2020 Smart Connectivity Beyond 5G

### Topic evolution

#### New topic

- May however piggyback on previous topics in the 5G PPP notably topic ICT 09 2017 "Networking research beyond 5G" or EUJ-02-2018 "5G and beyond" and ICT-20-2019-2020 5G Long Term Evolution

No specific instructions for evaluators

Project Portfolio : see 5G PPP websites



## ICT-52-2020 Smart Connectivity Beyond 5G Topic evolution

### ➤ Leading players

- ICT vendors, network service providers, verticals, SMEs
- Academics & R&I centers are expected to have a “visionary” role compared to the previous 5G PPP phases
- Large scale framing initiatives should be strongly industry driven

### ➤ Key group of actors – participants to projects from

- 5G PPP
- NetWorld2020 ETP



# Stakeholders Information Opportunities



<https://ec.europa.eu/digital-single-market/en/news/digital-excellence-forum-ict-proposers-day-2019>



## 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>

Funding & tender portal

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European 5G Observatory

<http://5gobservatory.eu>

5G PPP

<http://www.5G-PPP.eu>





# 5G PPP Phase III

## ICT-52-2020

**Thank you for your attention!**



# ICT-41-2020 5G PPP – 5G innovations for verticals with third party services

*Manuel Carvalhosa – Programme Officer*

*Future Connectivity Systems  
European Commission – DG CONNECT*





## 5G Public Private Partnership

**Phase 3 in Work Programme 2020: accelerating take up and industrial readiness**

WP 2020, extra R&I  
- 5G innovations for verticals with third party services

5G R&I for "Long Term Evolution"

User needs, cross industry partnerships with vertical industries

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## 5G PPP Phase 3 relevant focus:

*....this Work Programme which also aims at leveraging 5G technologies towards downstream innovation both at service and product levels...*

*Activities under this heading .....should significantly contribute to building a first class European industrial supply side for core 5G technologies with global market footprints and notably for network technologies and systems. They will support the emergence of new innovative market players taking advantage of the growing adoption of distributed cloud computing technologies in 5G networks and making possible open innovation at service level*



## ICT-41 - General context

### Challenge

- Software networks provide high flexibility through implementation of virtual network functions (VNFs). VNF's may be chained across several domains to create Network Applications (NetApps) tailored to the requirements of specific tenants.
- This requires open platforms that provide access to networks resources which can then be used to develop NetApps supporting requirements and developments from specific vertical sectors.



# ICT-41-2020 - 5G PPP – 5G innovations for verticals with third party services

Opening 19/11/2019 - Closing 22/04/2020

**up to 49 M€**

➤ Innovation Actions (IA)

€ 4 to 6 million/project (indicative)

A complementary grant agreement will be implemented across **all** projects in 5G-PPP Phase 3



## ICT-41-2020 - 5G PPP – 5G innovations for verticals with third party services - **Scope**

- Experimentation facilities able to provide enhanced experimentation infrastructures on top of which third party experimenters (e.g. SMEs) will have the opportunity to test their applications tailored to specific vertical use cases.
- To create 5G open source repositories for wide use and towards standards development
- Typical vertical use cases: automated mobility, smart factories and industry 4.0





## ICT-41-2020 - 5G PPP – 5G innovations for verticals with third party services– Expected Impact

- Testing and validation of NetApp solutions on top of a 5G virtualised experimental environment
- NetApps secure interoperability beyond vendor-specific implementation across multiple domains, availability of standards or reference implementations.
- Open-source repository of network applications that can be further leveraged by other developers.
- Creation of third party markets for start-ups and SMEs. 50% of SMEs are targeted for this action.
- Relevant 5G PPP KPI: Service creation time in minutes.
- Results that may be appropriate for transfer towards an incubator or a start up, either within the project or outside of the projects in follow up actions.



## ICT-41-2020 - 5G PPP – 5G innovations for verticals with third party services - What we do NOT want

### Innovation Action

- Experimentation facilities that are not sufficiently open, or rich in terms of VNFs, to attract third parties to test NetApps for specific vertical sectors.
- Solutions that clearly will not be taken up by SMEs or start-ups.



## ICT-41-2020 - 5G PPP – 5G innovations for verticals with third party services

### New topic

- Leveraging on 5G enabling technologies and systems developed within or out of the 5G PPP Phases 1, 2 and 3
- Extending the innovation to software innovations with low market entry barriers that can be leveraged by SME's and new actors

No specific instructions for evaluators

Project Portfolio : see 5G PPP websites





## ICT-41-2020 - 5G PPP – 5G innovations for verticals with third party services

### ➤ Leading players

- SW development companies, SMEs and research centers (public or private)
- Communication research department in universities, industries and research centers

### ➤ Key group of actors – participants to projects from

- 5G PPP



# Stakeholders Information Opportunities



<https://ec.europa.eu/digital-single-market/en/news/digital-excellence-forum-ict-proposers-day-2019>



## Find out more

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# 5G PPP Phase III

## ICT-41-2020

**Thank you for your attention!**





# 5G PPP Phase III – ICT-42-2020

## 5G core technologies innovation

*Mario Scillia – Programme Officer*

*Future Connectivity Systems  
European Commission – DG CONNECT*



## 5G Public Private Partnership

**Phase 3 in Work Programme 2020: accelerating take up and industrial readiness**

WP 2020, extra R&I opportunities  
- Supporting HW supply side and SME's

5G R&I for "Long Term Evolution"

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## 5G PPP Phase 3 relevant focus:

*Activities under this heading .....should significantly contribute to building a first class European industrial supply side for core 5G technologies with global market footprints and notably for network technologies and systems. They will support the emergence of new innovative market players taking advantage of the growing adoption of distributed cloud computing technologies in 5G networks and making possible open innovation at service level*





## ICT-42-2020: 5G PPP – 5G core technologies innovation Innovation Actions – Expected Impact

- Support to the emergence of a European offer for new 5G core technologies at TRL 7 or beyond
- Support to the emergence of new actors in the related markets
- Creation of high tech start-ups or of new business opportunities for established SME's.
- Strong SME participation is targeted







## ICT-42-2020: 5G PPP – 5G core technologies innovation Coordination and Support Action - **Scope**

- Definition of the expected core hardware components of future connectivity systems where Europe should seize opportunities and strengthen its capabilities
- Definition of the required R&I and investment requirements related to the identified domains
- Definition of related industry roadmap in partnership among relevant EU actors, both from industry and academia





## ICT-42-2020: 5G PPP – 5G core technologies innovation Coordination and Support Action – Expected Impact

- Cross industry availability of a European roadmap for hardware enabling technologies supporting European strategic autonomy objectives for connectivity platforms



## ICT-42-2020: 5G PPP – 5G core technologies innovation

### What we do NOT want

#### Innovation Action

- R&I on components not **related to** 5G connectivity
- Actions that do not open strong SME opportunities

#### Coordination and Support Action

- Roadmaps on future connectivity systems which focus is not on hardware systems (**though related SW is in scope**)

In both case  $\Rightarrow$  actions which do not clearly focus  
on European opportunities and actors



# ICT-42-2020: 5G PPP – 5G core technologies innovation

## Topic evolution

### New topic

- Leveraging on 5G enabling technologies and systems developed within or out of the 5G PPP Phases 1, 2 and 3
- Extending the innovation to their application at hardware level for devices, terminals, network equipments

No specific instructions for evaluators

Project Portfolio : see 5G PPP and ECSEL JU websites





## ICT-42-2020: 5G PPP – 5G core technologies innovation Topic evolution

### ➤ Leading players

- Components and hardware development companies, SMEs and research centers (public or private)
- Communication research department in universities, industries and research centers

### ➤ Key group of actors – participants to projects from

- 5G PPP
- ECSEL Joint Undertaking



# Stakeholders Information Opportunities



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ECSEL Joint Undertaking

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# 5G PPP Phase III

## ICT-42-2020

**Thank you for your attention!**





# 5G PPP Phase III – ICT-53-2020

## 5G for Connected and Automated Mobility (CAM)

*Pavlos Fournogerakis – Programme Officer*

*Future Connectivity Systems  
European Commission – DG CONNECT*



## 5G Public Private Partnership

Phase 3 in Work Programme 2020: accelerating take up and industrial readiness

WP 2020, extra R&I opportunities  
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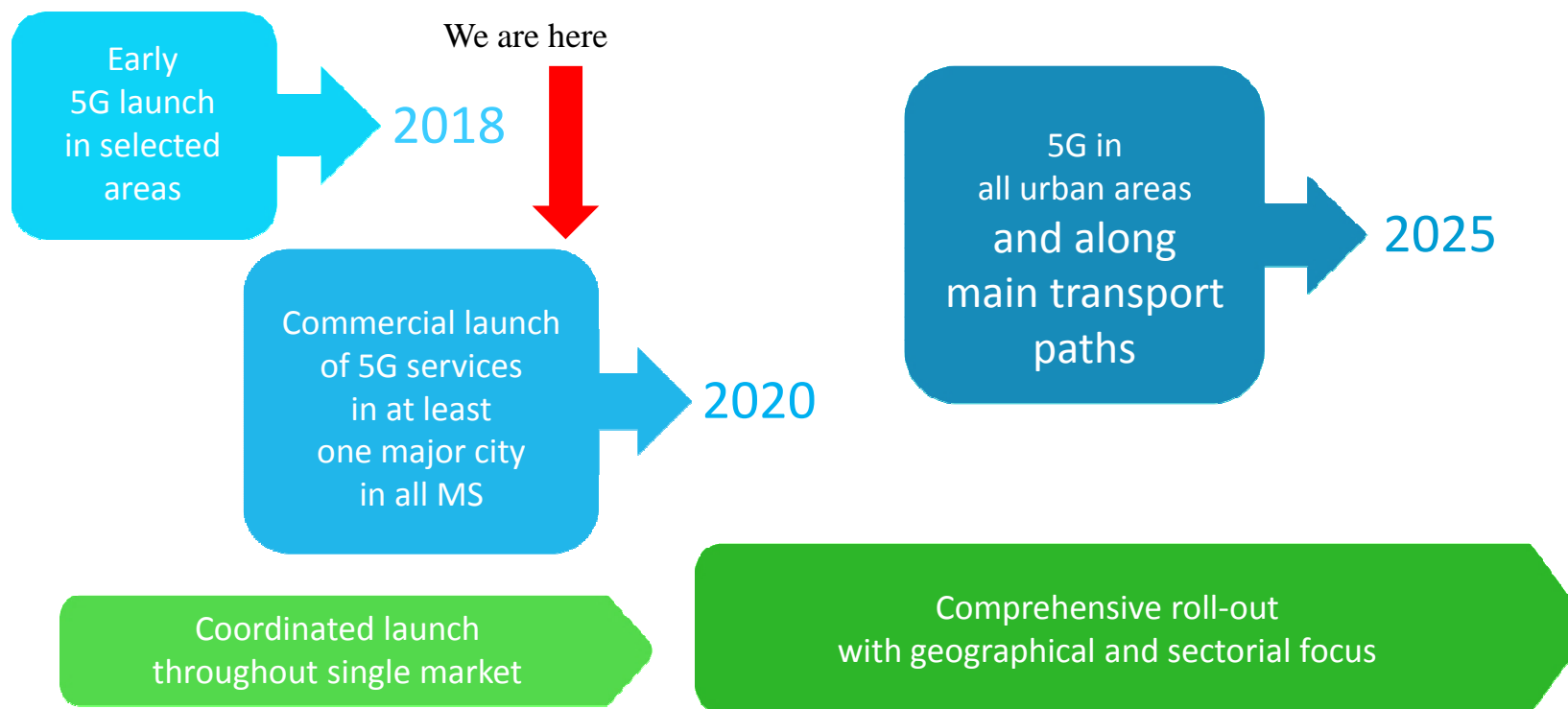
## **5G PPP Phase 3 relevant focus:**

*This 5G PPP phase also aims at developing "lead" markets involving cooperation models with key vertical sectors contributing to the wider policy objectives of industry digitisation in the Digital Single Market. It will contribute to the successful implementation of 5G-based cross-border corridors for Connected and Automated Mobility in the EU and prepare for future deployment phases under the next MFF.*

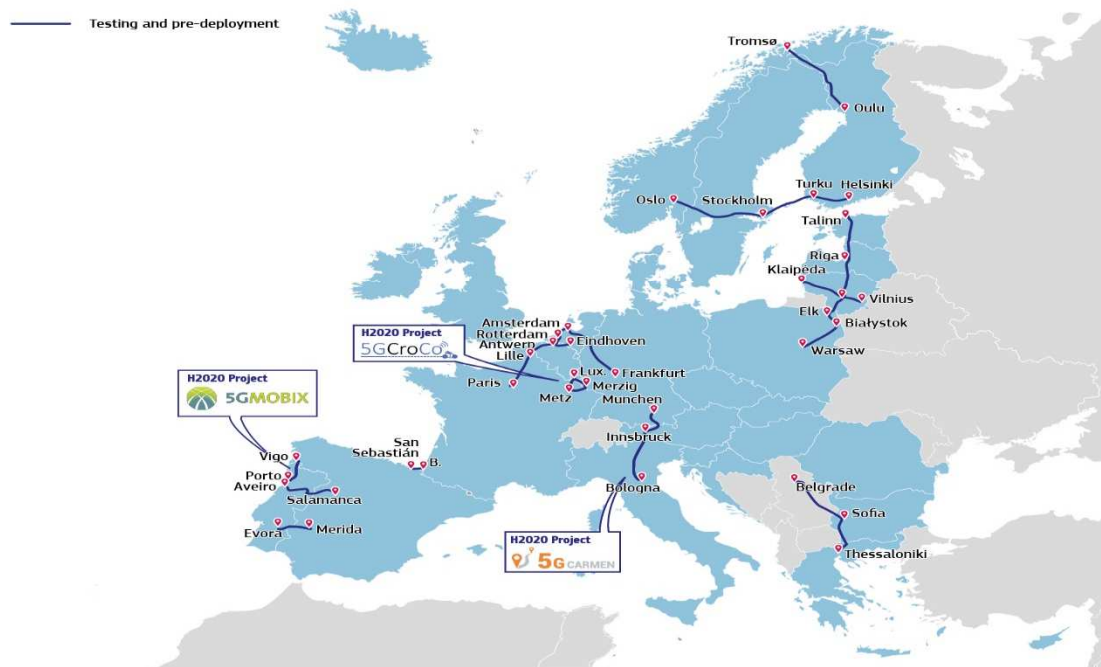


# 5G Context: European policy and 5GPPP

## 5G Action Plan: European targets for 5G introduction



# Connected & automated Mobility over cross border corridors as flagship initiative, the “Rome process”



## 3 Supporting Projects, to be expanded:

- 5G CARMEN, Brenner corridor
- 5G CROCO, Metz Merzig Corridor
- 5G MOBIX, PT-ES and EL-TK corridors

**Next MFF: proposal towards operational deployment**

Note: List of corridors is non exhaustive and subject to extensions

— Testing and pre-deployment  
— Large-scale deployment

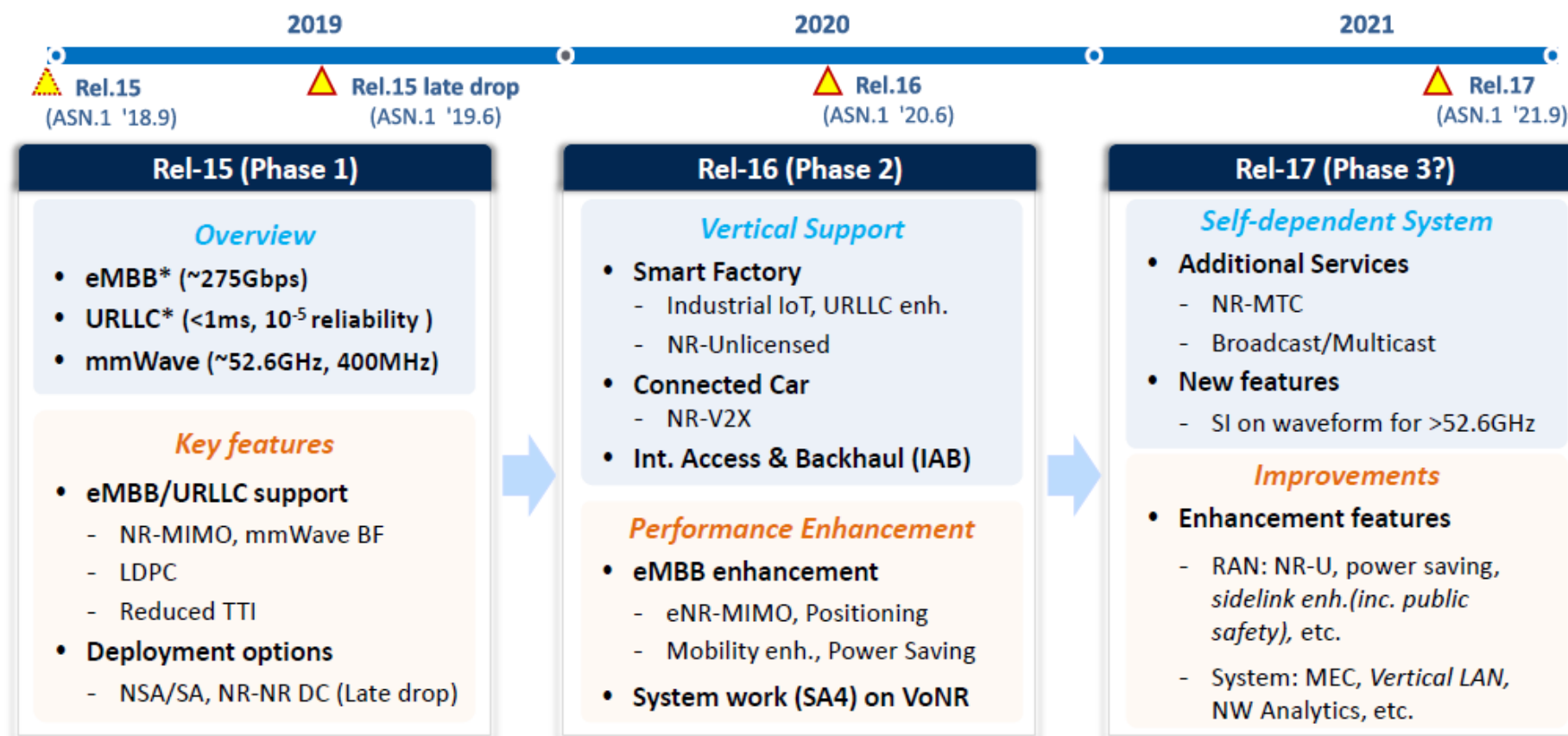
Target corridors under  
CEF2 programme

« Strategic Deployment  
Agenda » under  
development



# 3GPP standards already planning evolution

Source: 3GPP/Samsung





# **ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility (CAM)**



## ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility (CAM) - general context

- Connected and Cooperative Assisted Mobility (CCAM) identified as a strategic industrial opportunity in the EU in line with 5G Action Plan objectives
  - Member State support with Letter of Intent, signed at ministerial level in March 2017
  - 5G specifications from 3G PP release 16 will be available early 2020 (5G NR-V2X and beyond)
  - Paves the way towards operational deployment as envisaged with the Connecting Europe Facility proposal
  - Relevant to cross border railway corridors in view of providing services to trains
- ➔ ICT 53 aims at validating 5G for CAM in this wider techno-policy context



## ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility (CAM) - **scope**

- Validation of the latest available 5G specification in the context of innovative CAM applications under realistic conditions and seamlessly functioning across borders covering significant portions of roads or railways.
- Broad innovation perspective covering use cases in the vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), vehicle-to-pedestrian (V2P), and vehicle-to-network (V2N) domains including the supporting service infrastructure.
- Core technological innovation expected from 5G, such as radio, RAN and core network. Innovations in the area of Artificial Intelligence (AI) to enable advanced CAM use cases are also included.

## ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility (CAM) - scope

- Multi-tenant business architecture to optimise the return on investments and the efficiency of the deployed infrastructure, while considering the opportunity of a European cloud supporting roaming of CAM services
- Expected to provide a clear co-existence between multiple technologies (IEEE 802.11p, C-V2X, 5G-V2X) and migration path towards the use of 5G as the technology for CAM.
- It may include advanced services on board of international trains covering passenger services, train traffic management services, as well as other operational services in preparation for the advent of the Future Railways Mobile Communication Systems (FRMCS)

## ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility (CAM) - expected impact

- Validation of 5G technologies and architecture in a CAM context, including business models and applicable standards as well as AI features to support most advanced CAM use cases
- Validated cost/benefit analysis of cross border 5G deployment enabling CAM along 5G corridors potentially including several business domains.
- Characterisation of 5G Release 16 or beyond for the most advanced CAM use cases including innovative spectrum use
- Technological validation of 5G introduction for train/railways use cases
- Development of a sustainable model for a pan-European cloud infrastructure
- Participation of key European industrial partners with high standardisation impact

## ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility (CAM)

- Opening 09/07/2019
- Closing 13/11/2019
- € 7 to 10 million/project (indicative)
- Type of action: Innovation action
- Proposal may address automotive use case, railways, or both
- Special conditions!
  - A complementary grant agreement will be implemented across all projects in 5G-PPP Phase 3

**up to 30 M€**



## ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility

### What we do NOT want

#### Innovation Action

- Actions that are based on G5 only
- Addressing already covered corridors only
- Focus on use cases already covered by 5G CARMEN, CROCO and MOBIX





## ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility (CAM)

### Expansion of ICT-18 topic

- Leveraging on 5G enabling technologies and systems developed within or out of the 5G PPP Phases 1, 2 and 3
- Extending coverage, technology (e.g. AI), use cases, impact towards standards
- Opportunity for new players

No specific instructions for evaluators

Project Portfolio : see 5G PPP ICT-18 projects







## ICT-53-2020: 5G PPP – 5G for Connected and Automated Mobility (CAM)

### ➤ Leading players

- Telecom operators, vendors, IT cloud actors, AI R&D centres, academics
- Automotive industry, road operators, public transport authorities

### ➤ Key group of actors – participants in projects from

- 5G PPP, ICT-18 projects
- 5G Automotive working group, SDA preparation members
- 5GAA



# Stakeholders Information Opportunities



<https://ec.europa.eu/digital-single-market/en/news/digital-excellence-forum-ict-proposers-day-2019>



## Find out more

### 5G Action Plan for Europe

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### 5G PPP

<http://www.5G-PPP.eu>

### Horizon2020 web site

<http://ec.europa.eu/programmes/horizon2020>

### H2020 Helpdesk, including FAQ

<http://ec.europa.eu/research/index.cfm?pg=enquiries>





# 5G PPP Phase III

## ICT-53-2020

**Thank you for your attention!**

