



Institut de Recherches Economiques et  
Sociales sur les Télécommunications



The 5G Infrastructure  
Public Private Partnership



École d'ingénieurs du numérique



# La 5G en France et en Europe : enjeux et perspectives

Jeudi 7 juin 2018



Institut de Recherches Economiques et  
Sociales sur les Télécommunications



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Table-ronde animée par :

### Jean-Pierre BIENAIMÉ

Président de l'IREST et Secrétaire Général du 5G-PPP

- **Olivier COROLLEUR**

Sous-directeur des communications électroniques  
et des postes, Ministère de l'économie et des finances

- **Sébastien SORIANO**

Président de l'ARCEP

- **François RANCY**

Directeur du Bureau des Radiocommunications, UIT

- **Peter STUCKMANN**

Head of Unit Future Connectivity Systems,  
DG CONNECT, Commission Européenne

- **Emmanuel LUGAGNE**

Senior Vice-President, Orange Labs Networks

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- **Marc CHARRIÈRE**

Secrétaire Général, Nokia France

- **Xun ZHANG**

Associate Professor Laboratoire LISITE, ISEP

- Avec la participation de **Gilles BREGANT**

Directeur Général de l'ANFR



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## Olivier COROLLEUR

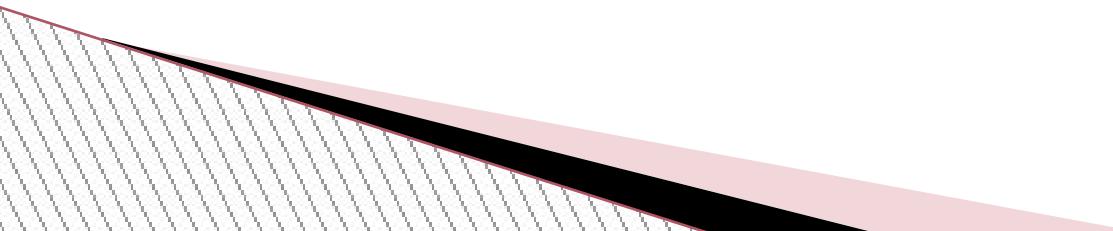
Sous-directeur des communications électroniques  
et des postes Ministère de l'économie et des finances



# Enjeux de la 5G



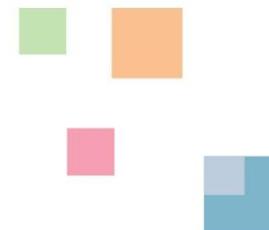
# La 5G, au carrefour des enjeux industriels

- Des investissements attendus de 56 milliards € en Europe (Commission européenne, 2016)
  - Un enjeu pour les opérateurs : investissement et diversification de revenus
  - Enjeu de l'émergence d'un écosystème de nouveaux services innovants
  - Enjeu pour la compétitivité des filières industrielles
- 

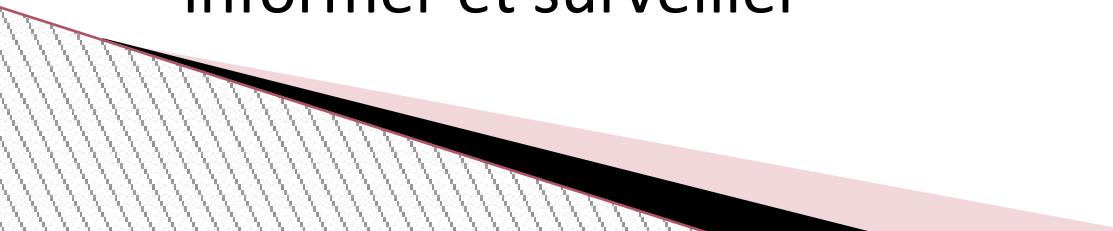


# Quelques attentes des acteurs économiques

- Besoin de visibilité sur la disponibilité des fréquences
- Besoin de réaliser des expérimentations d'usages
- Fort enjeu de compétences industrielles
- Enjeu de l'exposition du public



# Les rôles des pouvoirs publics

- Mettre à disposition les fréquences : libérer et attribuer
  - Accompagner le déploiement des infrastructures : simplifier, mutualiser...
  - Favoriser le développement de nouveaux usages, expérimenter
  - Permettre la confiance du public : informer et surveiller
- 



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# Sébastien SORIANO

Président  
ARCEP



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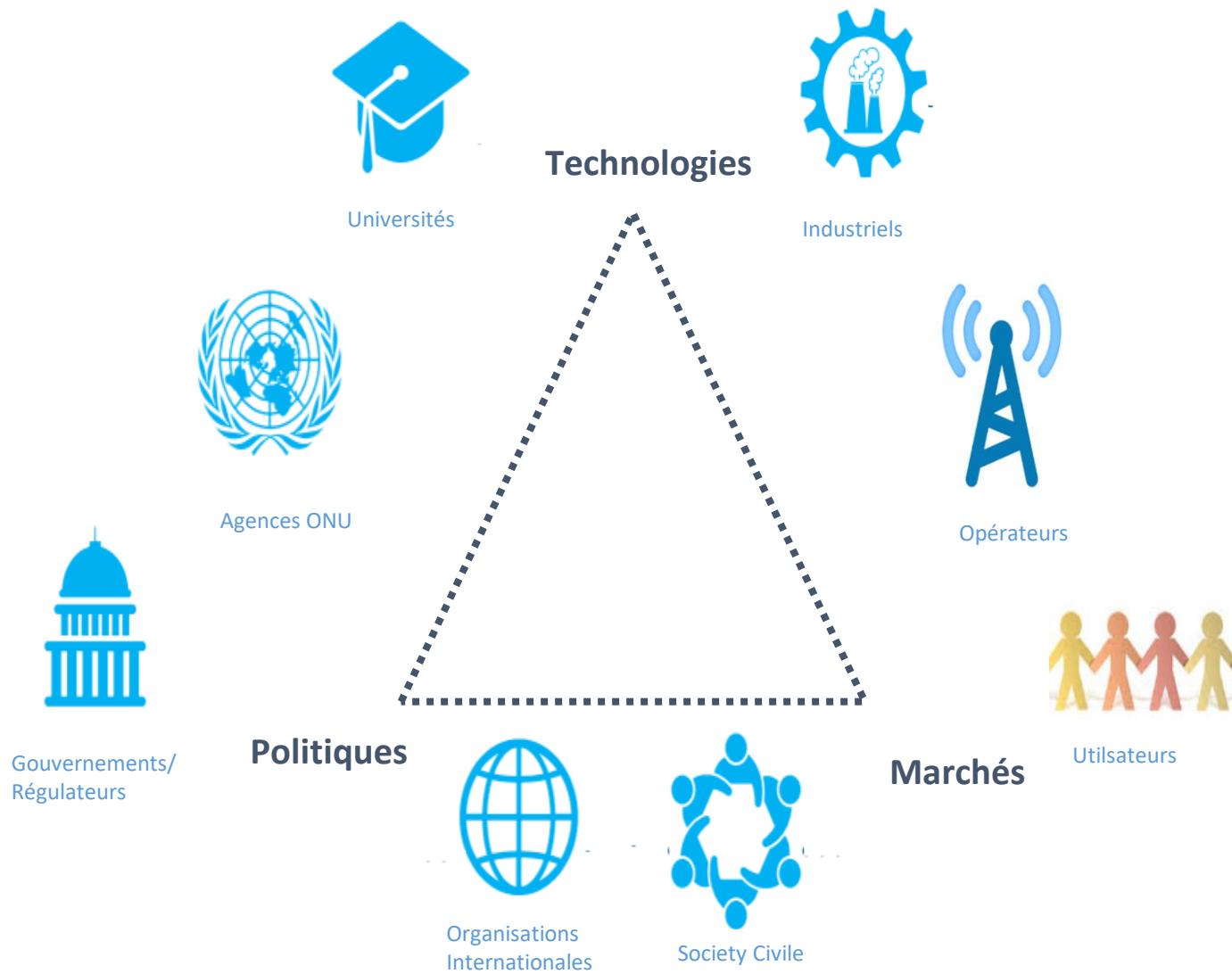
## François RANCY

Directeur du Bureau des Radiocommunications  
UIT



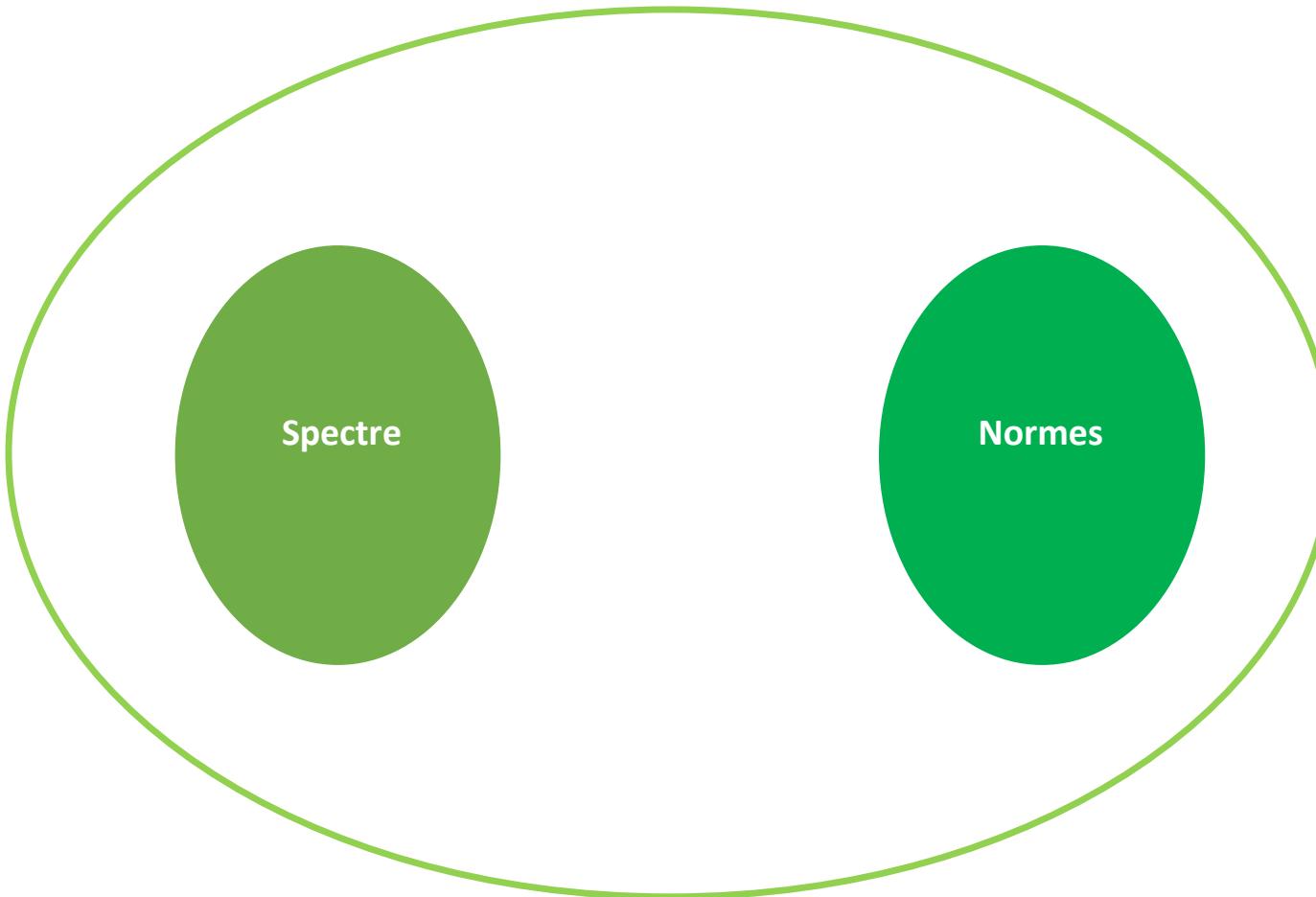
# **La 5G en France et en Europe : enjeux et perspectives**

**François Rancy**  
**Directeur du Bureau des Radiocommunications, UIT**

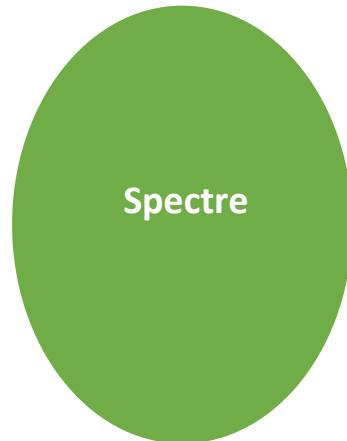




Les deux nécessitent une coopération globale



Les deux nécessitent une harmonisation globale



- Processus des CMR
- Attributions de spectre au mobile et identifications IMT
- ITU membership, Commissions d'Etude de l'ITU-R Groupes régionaux, Organisations internationales
- Conduit par les Etats Membres

- Processus des Commissions d'Etude de l'ITU-R et de l'ITU-T
- Vision IMT-2020, performances générales, spécifications interface radio
- Membres de l'ITU, organisations internationales, autres organismes de normalisation,
- Conduit par « l'industrie »

# L'ambition de la 5G

- L'ambition de la 5G est la fourniture d'une solution complète pour un monde interconnecté
- En remplaçant des réseaux physiques et des ressources de spectre dédiés à des applications différentes par un seul réseau des réseaux.
- Le découpage du réseau et la logiciellisation représentent les principaux vecteurs de ce changement. Ils permettent de nouvelles architectures de réseaux, construites par logiciel afin de fournir des solutions sur mesure et évolutives pour toutes les applications.

# Implications sur les politiques et la réglementation du spectre

- La 5G est un projet sur le long terme, qui implique
  - Des investissements importants et des mises à niveau des réseaux
  - Des ressources spectrales supplémentaires, au-delà de ce qui a été attribué pour 2G, 3G et 4G, et donc des compromis difficiles, aux CMR-19/23 et au-delà, avec les autres services utilisant ces ressources (liaisons fixes, satellitaires, de radiodiffusion et d'urgence)
  - Des attributions de fréquence et des normes globales pour assurer les économies d'échelle, l'itinérance mondiale et l'interopérabilité.
- En attendant, la priorité devra continuer à être donnée à la réduction de la fracture numérique en connectant les zones rurales à un prix abordable.



**Thank You for your attention**



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## Peter STUCKMANN

Head of Unit Future Connectivity Systems,  
DG CONNECT, Commission Européenne



# 5G – Where is Europe?

**IREST, 7 June 2018, Issy-Les-Moulineaux**

***Peter Stuckmann***

Head of Unit, Future Connectivity Systems  
DG CONNECT  
European Commission

# 5G opportunities

## FACTORIES OF THE FUTURE

- ① Time-critical process control
- ② Non time-critical factory automation
- ③ Remote control
- ④ Intra/Inter-enterprise communication
- ⑤ Connected goods

## ENERGY

- ① Grid access
- ② Grid backhaul
- ③ Grid backbone

## AUTOMOTIVE

- ① Automated driving
- ② Share My View

- ③ Bird's Eye View
- ④ Digitalization of Transport and Logistics
- ⑤ Information Society on the road

## e-HEALTH

- ① Assets and interventions management in Hospital
- ② Robotics
- ③ Remote monitoring
- ④ Smarter medication

## MEDIA & ENTERTAINMENT

- ① Ultra High Fidelity Media
- ② On-site Live Event Experience
- ③ User/Machine Generated Content
- ④ Immersive and Integrated Media
- ⑤ Cooperative Media Production
- ⑥ Collaborative Gaming

## 5G empowering vertical industries

### 5G VERTICAL SECTORS

With 5G, networks will be transformed into intelligent orchestration platforms.

By creating strong relationships between vendors, operators and verticals, 5G will open the field to new business value propositions.

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



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

Early 5G  
launch in  
selected  
areas

2018

Commercial  
launch  
of 5G services  
in at least  
one major city  
in all MS

2020

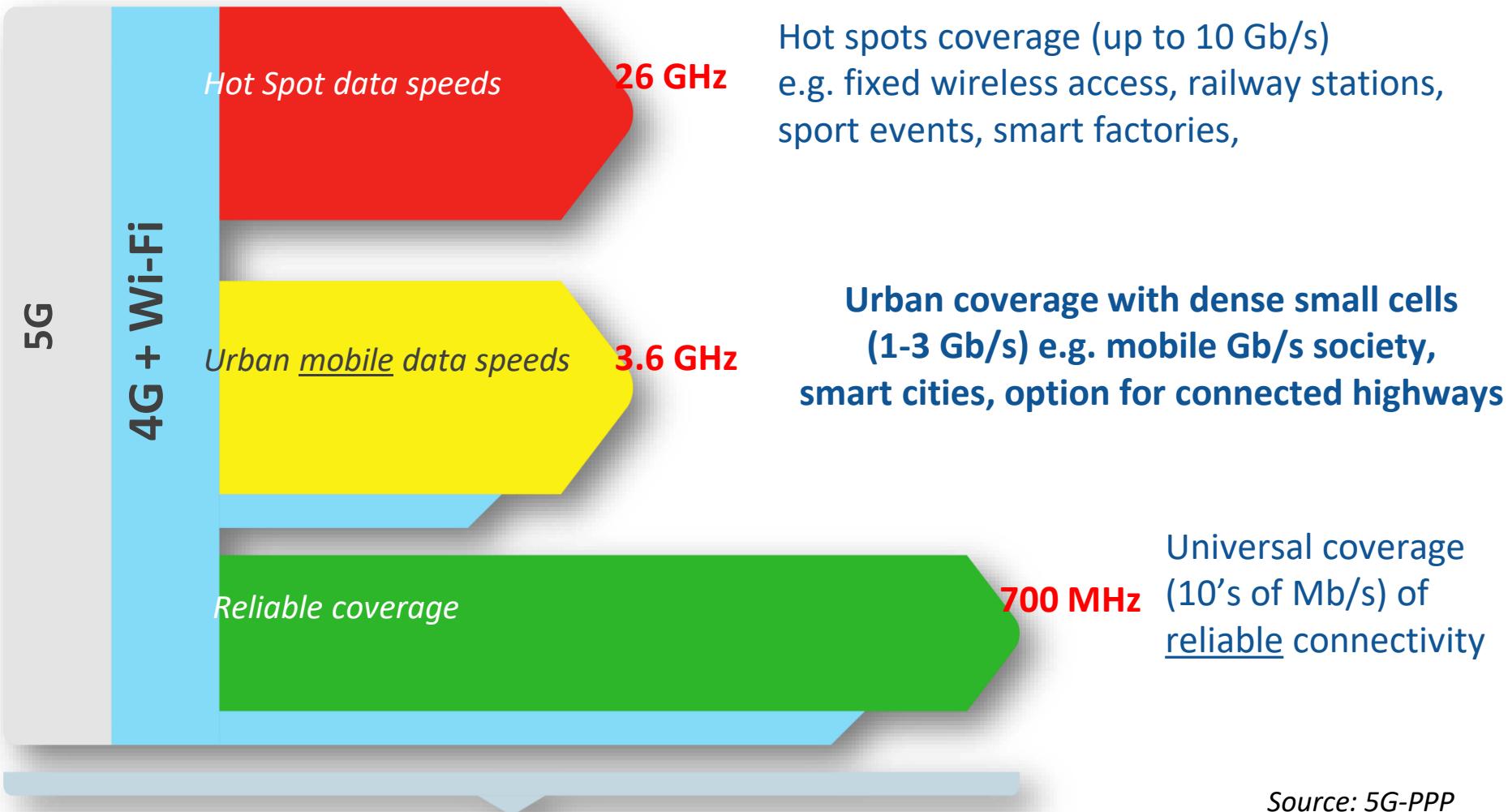
5G in  
all urban areas  
and along  
main transport  
paths

2025

Coordinated launch  
throughout single market

Comprehensive roll-out  
with geographical and sectorial focus

# EU 5G 'Pioneer' Frequency Bands





# European Electronic Communications Code

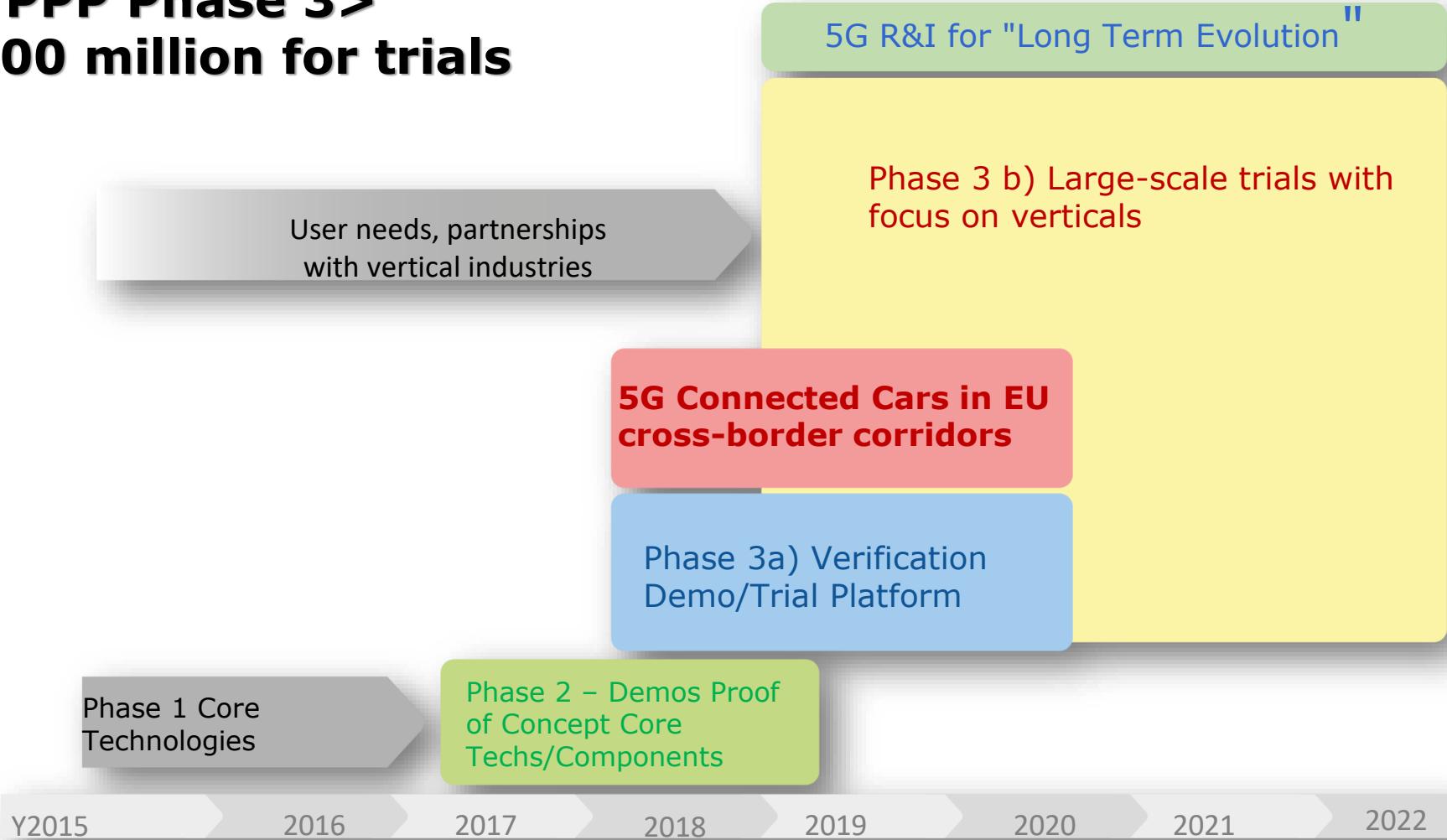
*The Code promotes investment and timely deployment of 5G networks and services\**

- **Harmonised principles and criteria** for authorisation regimes and sharing conditions
- A **reference framework** on conditions and fees for rights of use and design of assignment processes
- A **peer review** to achieve internal market **consistency** on spectrum authorisation by building best practice
- Promotion of spectrum **trading and leasing**
- **Coordinated timing** of 5G spectrum assignment
- **Common assignment deadline for 5G Pioneer Bands: December 2020**
- **Sufficiently long duration of rights** for 5G harmonised spectrum: **20 years** of regulatory predictability
- Facilitation of **small cells deployment** and **RLAN access**: removal of administrative obstacles and undue restrictions

\* The information provided is based on the provisional agreement between the European Parliament and the Council as of 1 March 2018



# 5G PPP Phase 3> € 200 million for trials





## European 5G Observatory

- Announced in Feb. 2018 by Commissioner Gabriel at MWC
- Monitor, in the context of 5G roll-out:
  - Main 5G market developments;
  - 5G pre-commercial trials;
  - National strategies and plans by EU MS;
  - Spectrum assignments by public authorities
- First reporting available on <https://ec.europa.eu/digital-single-market/en/european-5g-observatory>
- Comprehensive reports and publicly accessible online platform available In September 2018



# European 5G Observatory (from DESI 15 May)

## 5G trials

- More than **80 pre-commercial 5G trials and pilots** launched in Europe as part of the industry's [5G trial roadmap](#)
- **Seventeen Trial Cities appointed:** Amsterdam, Barcelona, Bari, Berlin, Espoo, L'Aquila, London, Madrid, Malaga, Matera, Milan, Oulu, Patras, Prato, Stockholm, Tallinn and Turin
- **Five "digital cross-border corridors"** established inter alia accommodating live tests of 5G for [Cooperative Connected and Automated Mobility](#)

## 5G Spectrum plans

- **5G pioneer bands identified** in Europe (700 MHz, 3.6 GHz and 26 GHz)
- [Common roadmap](#) for the availability of spectrum adopted by Member States
- **Consultations on spectrum assignments** launched by a first set of Member States (e.g. Austria, Denmark, Italy, Germany, France, Finland, Portugal, Sweden, UK)

## 5G Roadmaps

**Three Member States have published national 5G roadmaps** (Germany, Sweden, and the UK) and 3 have launched a public consultation (France, Poland, Spain):

- National calendars for key milestones set by the government,
- Measures to stimulate investments in 5G infrastructures such as: reducing the cost of deploying small cells; wide-ranging support to 5G trials,
- Promoting partnerships between the telecom sector and vertical industries,
- Foster public services as a lead user for early 5G deployment

More information is available on the [European 5G Observatory](#), which has been set up by the Commission to provide qualitative and quantitative information on

- Actual and expected market developments,
- Initiatives and preparatory actions taken by private and public actors in the area of 5G



## **By way of conclusion**

- 5G opportunities for digital transformation
- Consistent EU framework conditions unlocking 5G investment (spectrum, small cells, investment incentives)
- Need for industry commitment
- Trials and partnerships are key to develop 5G ecosystems at early stage



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École d'ingénieurs du numérique

**Emmanuel LUGAGNE**  
Senior Vice-President  
Orange Labs Networks

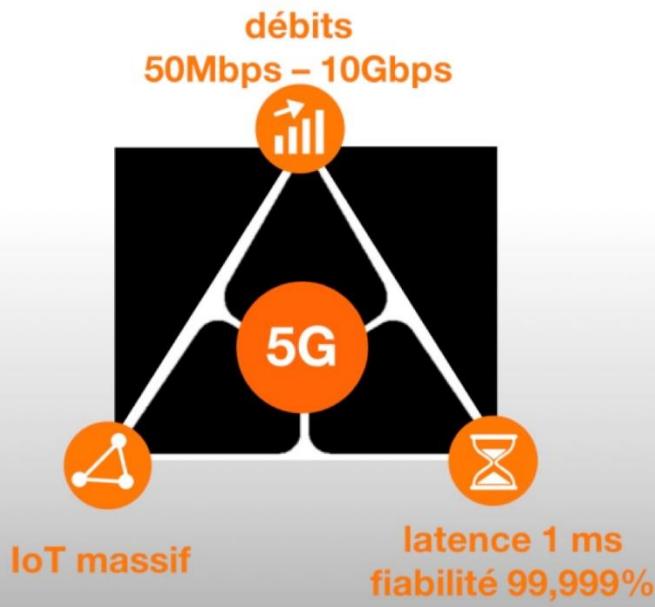
# Transformer les promesses de la **5G** en réalité



Emmanuel Lugagne Delpon  
Senior Vice President Orange Labs Networks  
07 Juin 2018



# 5G, un réseau nativement multi-service



# Du concept à la réalité



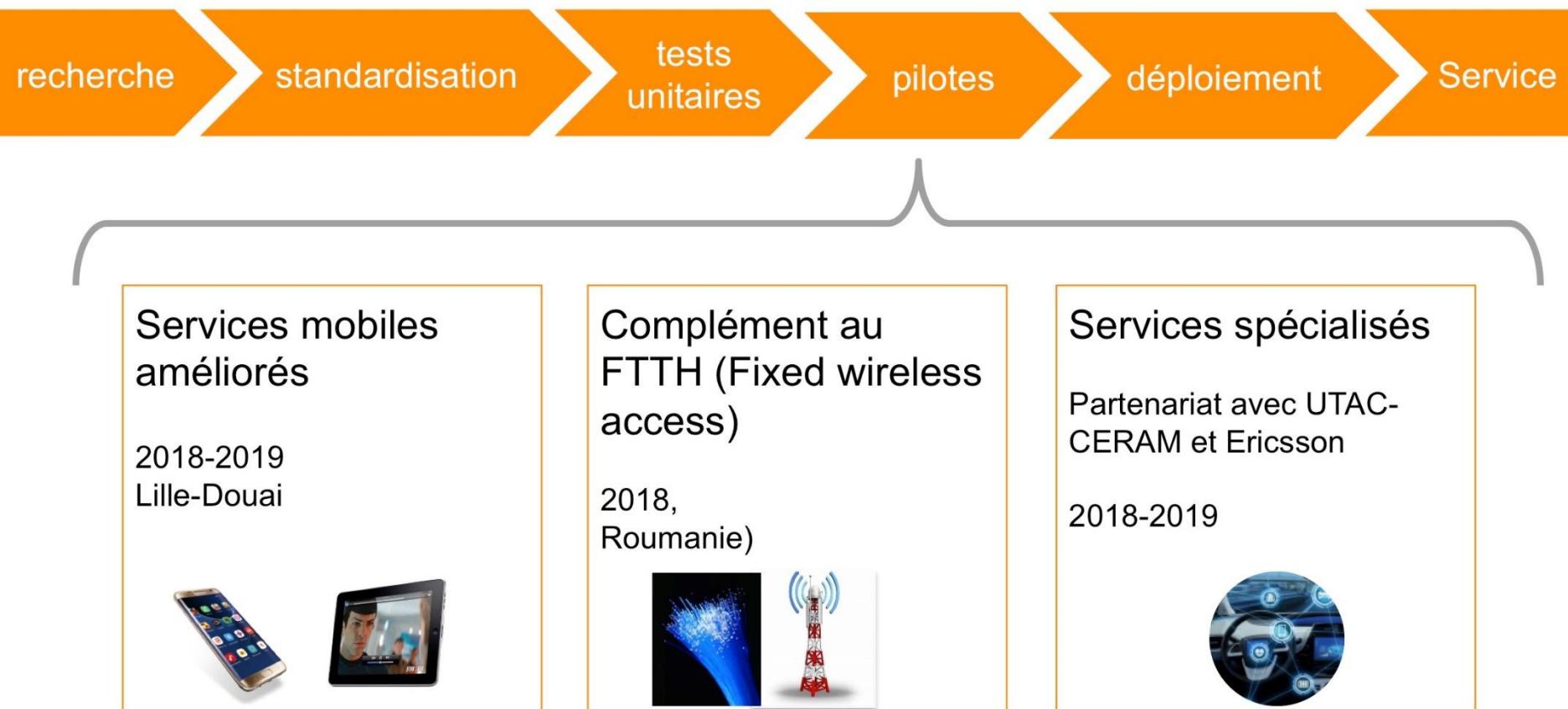
R15



R16

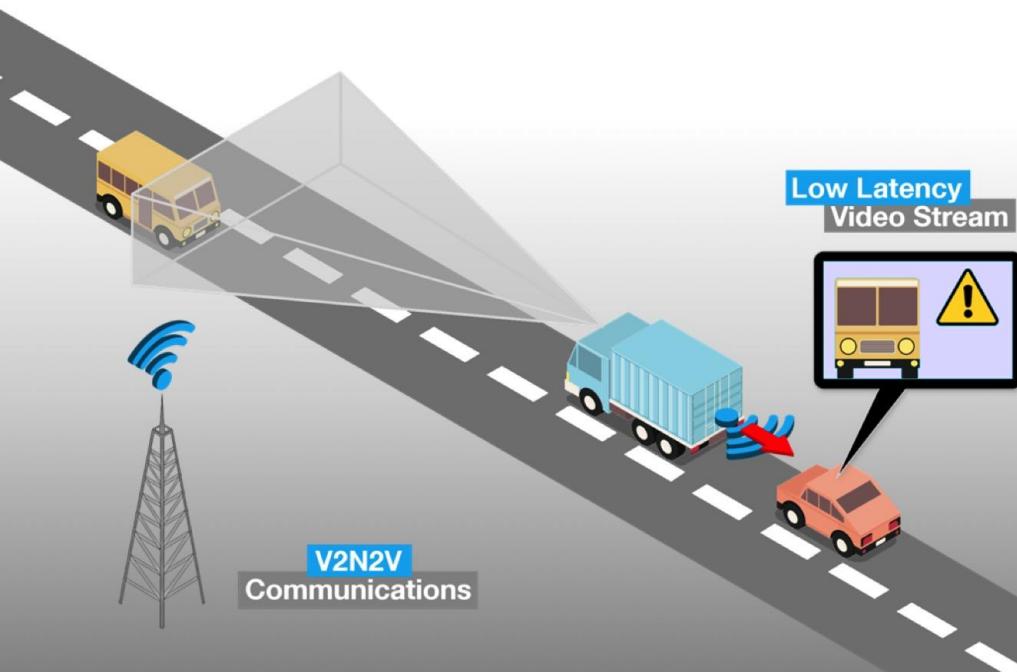


## Du concept à la réalité



# 5G et voiture connectée

Tests sur une piste équipée d'un réseau expérimental 4G, 5G et C-V2X



## Pour utilisation par nos clients à partir de 2020



merci





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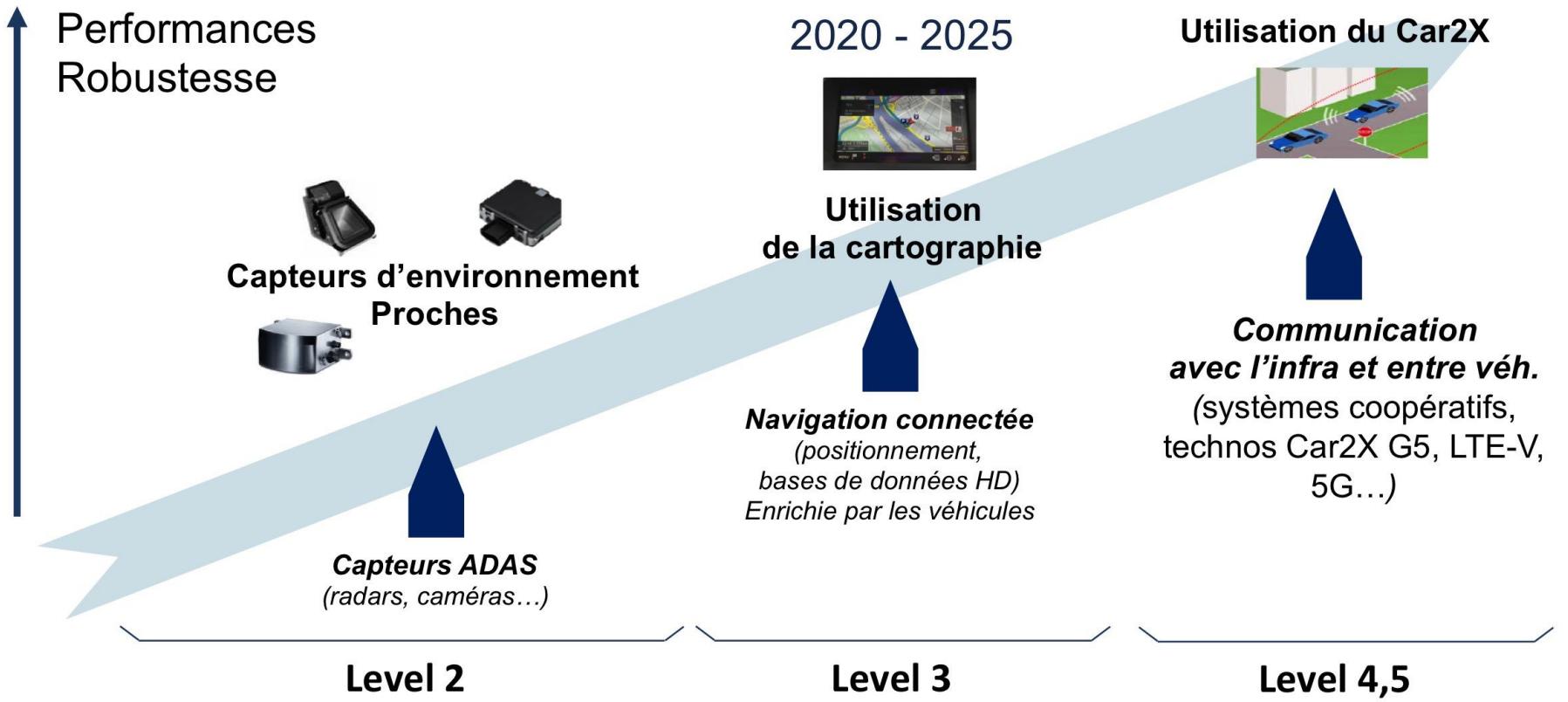
**Alain SERVEL**

Senior Expert in ADAS and ITS  
Groupe PSA

# Connectivité et Véhicule Autonome C-ITS & 5G

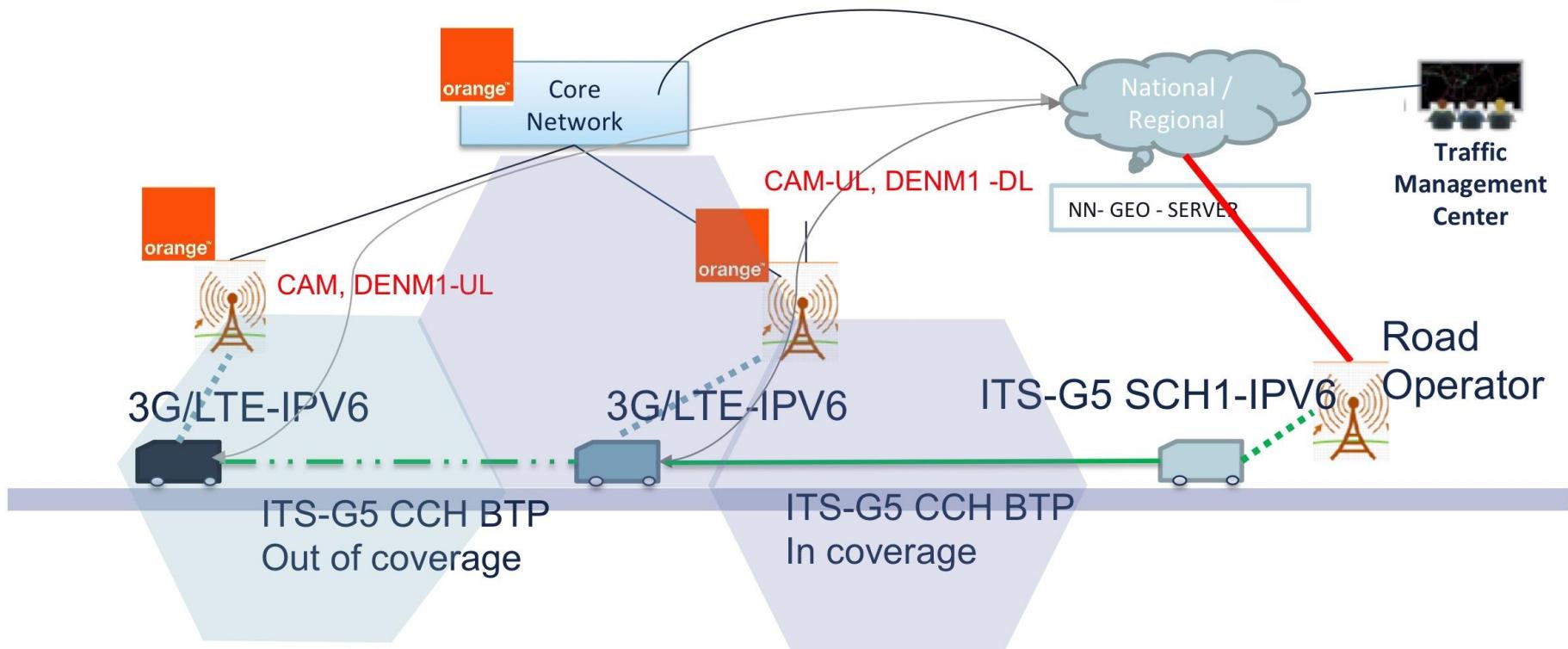


# CONNECTIVITE & VEHICULE AUTONOME



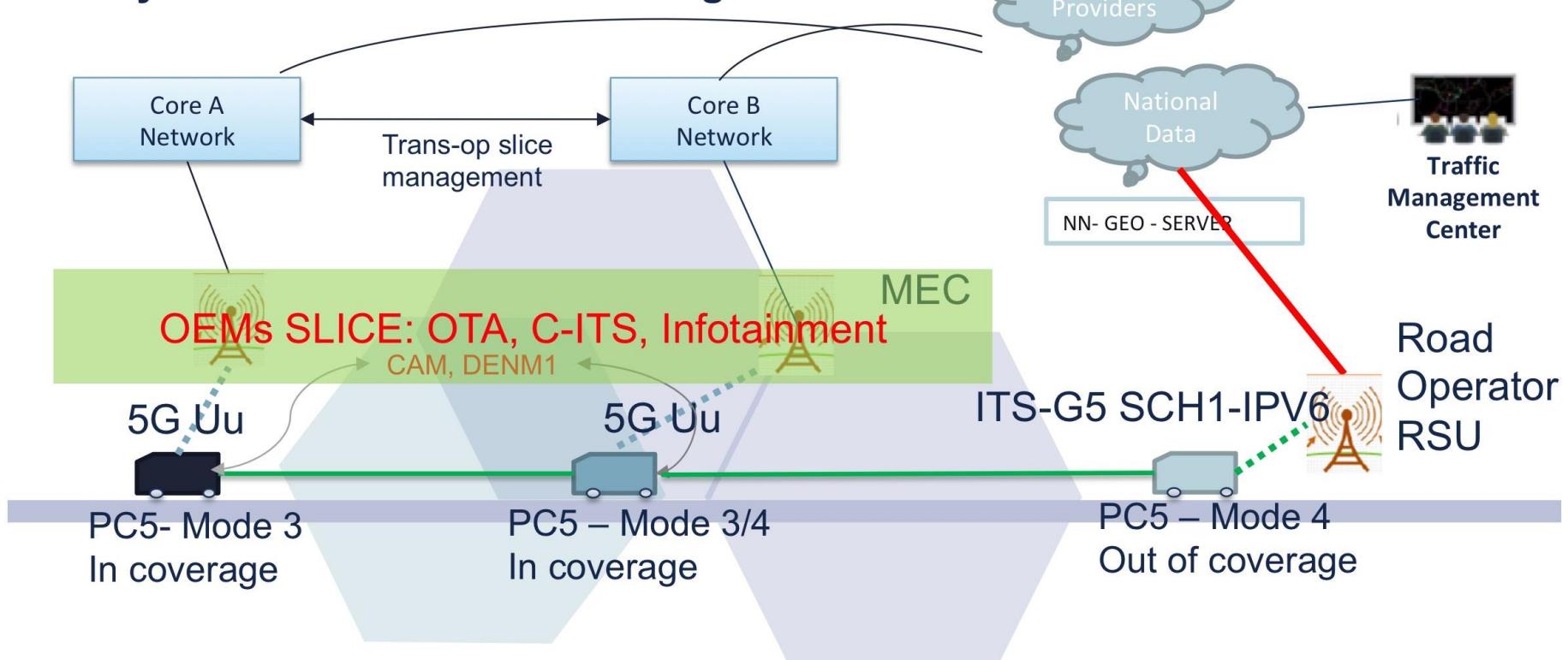
# CONNECTIVITE & VEHICULE AUTONOME

## ITS Day 1: ITS-G5 et/ou Cellulaire -> SCOOP@F-2



# CONNECTIVITE & VEHICULE AUTONOME

## ITS Day 2: 5G + Autonomous Driving



## CONNECTIVITE & VEHICULE AUTONOME

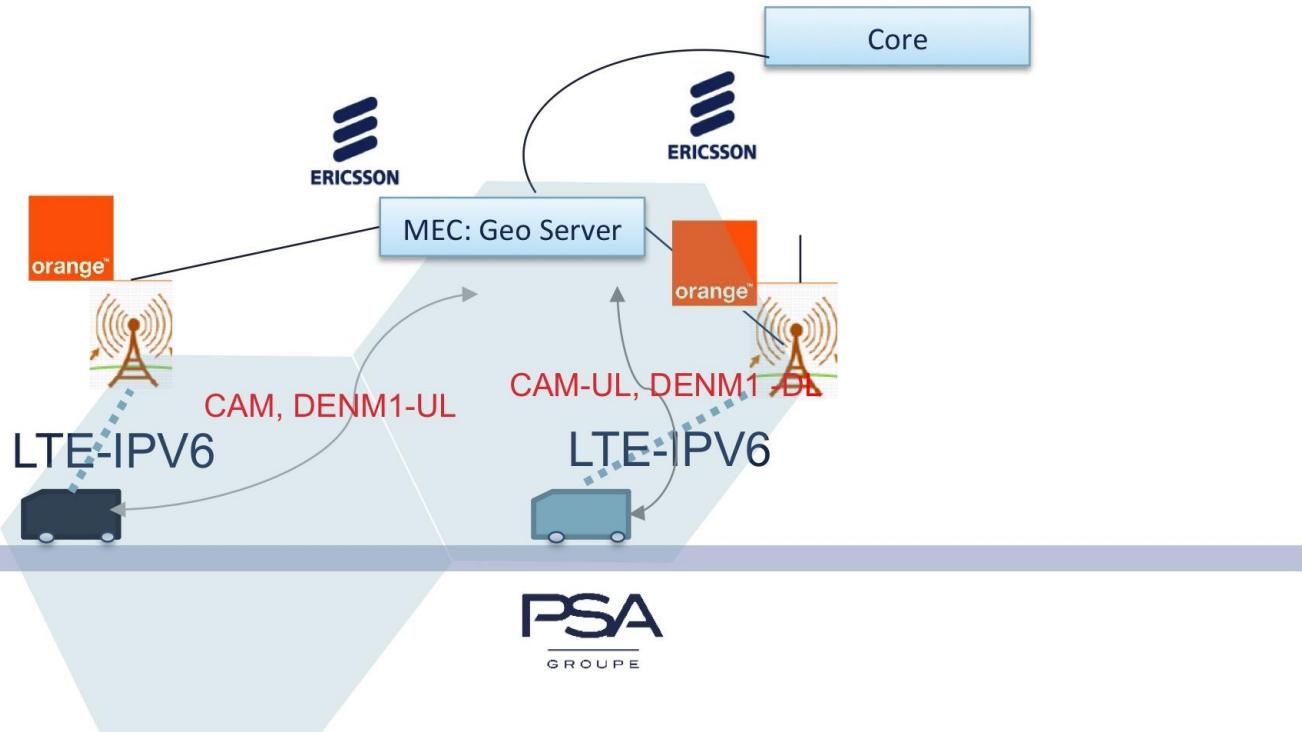
### ITS Day 1.5: Cellulaire V2N2V -> TOWARDS 5G 2017

#### Cas d'usages:

- See-Through
- Emergency Vehicle

Latences : 15ms

Débits : > 40 Mbits/s



# CONNECTIVITE & VEHICULE AUTONOME

## ITS Day 1.5: Cellulaire V2V -> TOWARDS 5G 03/2018

### Cas d'usages:

- Stationary Vehicle
- Emergency Braking



# CONNECTIVITE & VEHICULE AUTONOME

## 5GCAR

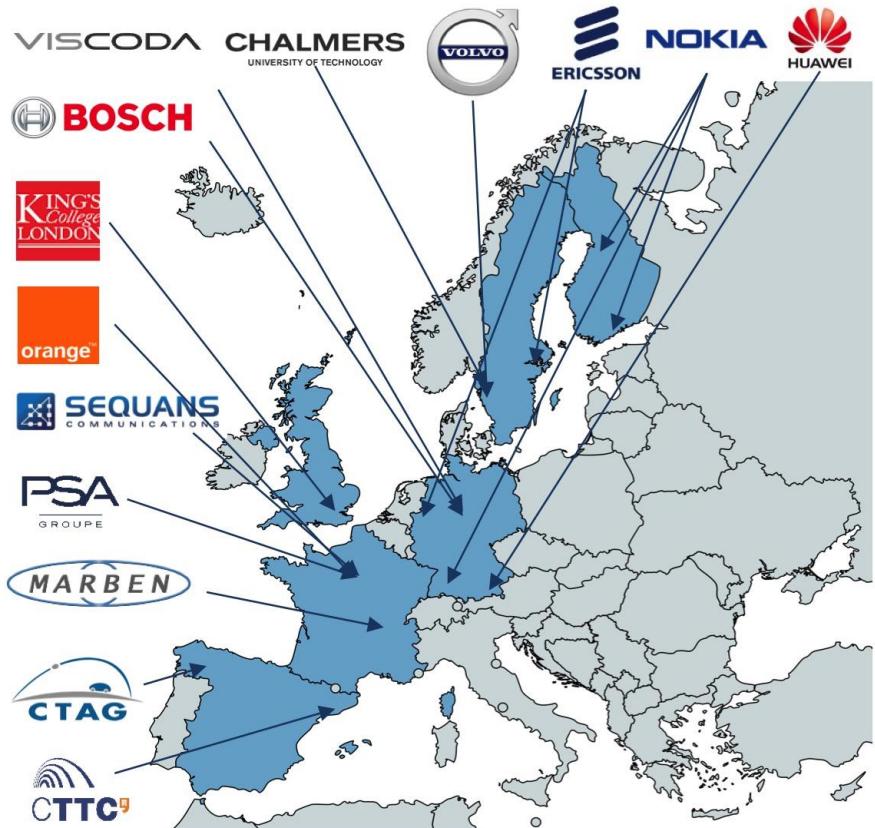
- From June 2017 to May 2019
- 30 full-time equivalents

<https://5gcar.eu/>



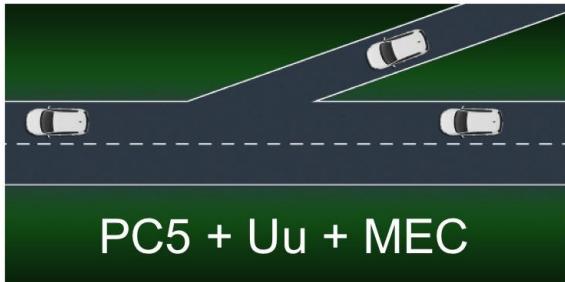
## 5G PPP Phase 2 Projects

<https://5g-ppp.eu/5g-ppp-phase-2-projects/>



# CONNECTIVITE & VEHICULE AUTONOME

## Evaluation du LTE-V avant la 5G (3GPP R15 & R16)



Lane merge



See-through



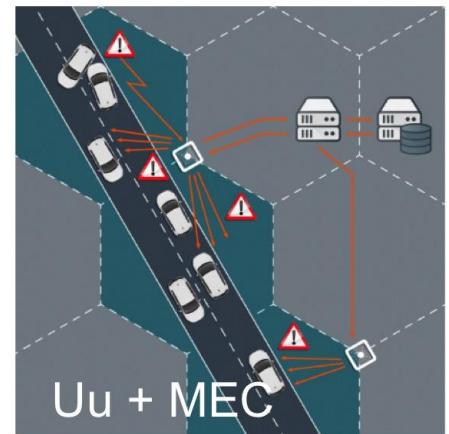
Network assisted vulnerable  
pedestrian protection



Remote driving

for automated  
parking

<https://5gcar.eu/>



High definition local  
map acquisition



## CONNECTIVITE & VEHICULE AUTONOME

### Performances attendues en C-V2X

	Lane Merging	See Through	Pedestrian position	HD Map	Remote Driving
Latency (ms)	< 30	< 50	< 60	< 30	< 30
Avail. / Rel. (%)	99,99	99	99.99	99.99	99.999
Data rate (Mb/s)	6	29	0.128	< 1.9	< 29
Relevance (m)	< 350	< 500	70	> 250	> 1000
Mobility (km/h)	< 150	< 200	< 100	< 250	< 30
Accuracy (m)	< 4	< 10	< 0.5	< 0.5	< 0.5



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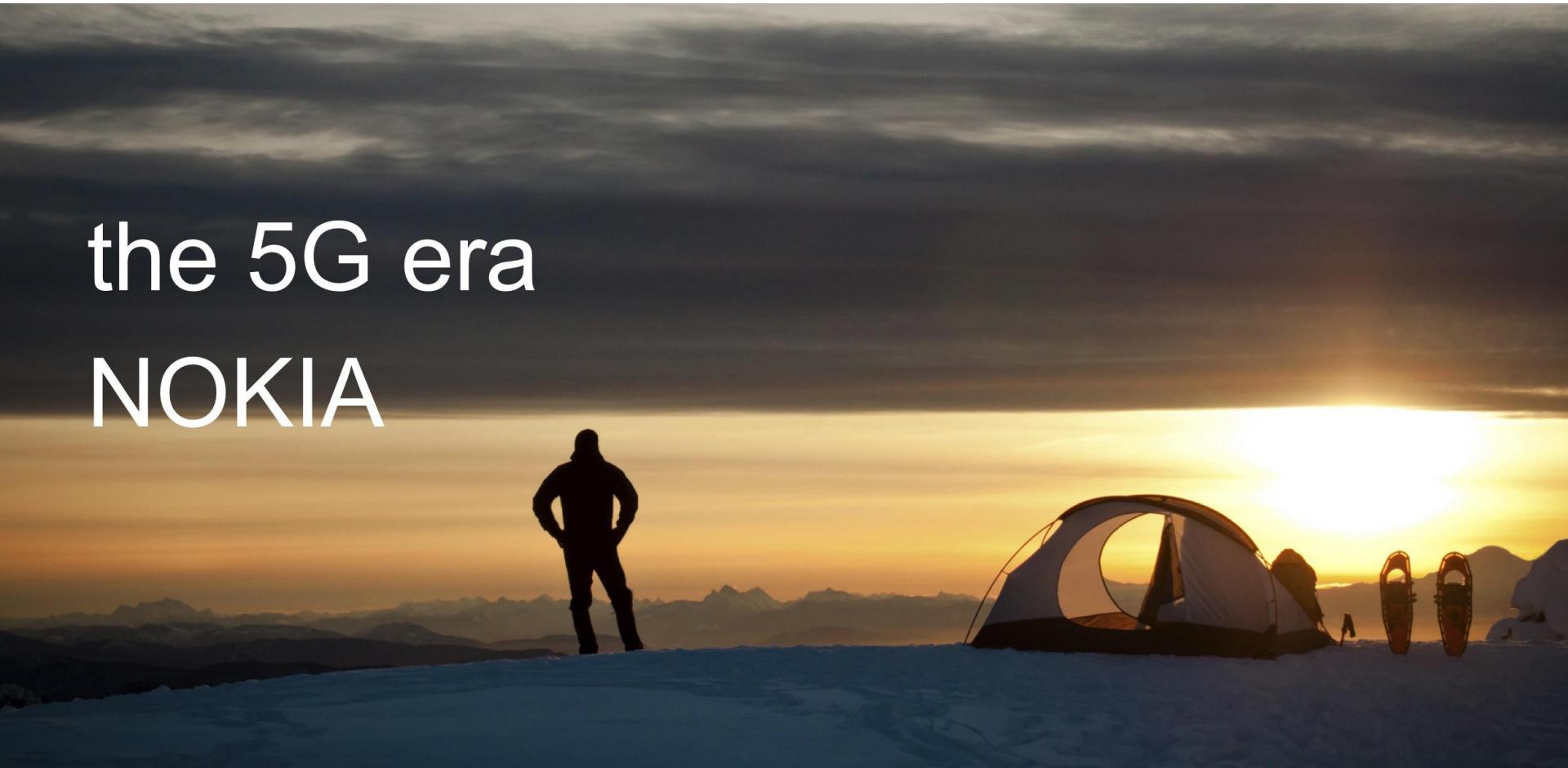
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Secrétaire Général

Nokia France

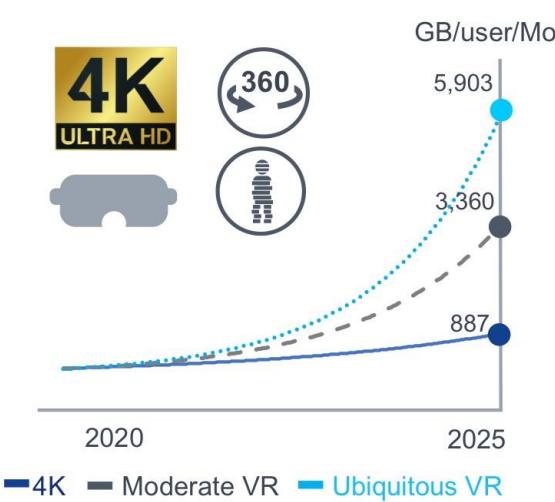
the 5G era  
NOKIA



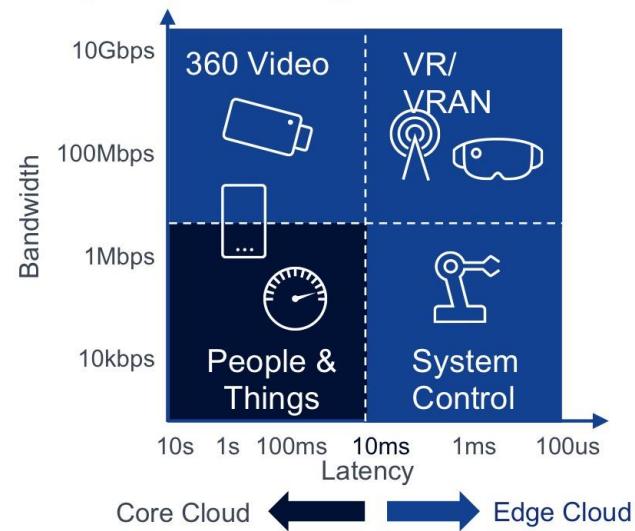
# What challenges are we facing?

## New applications redefine network requirements

Seemingly infinite capacity

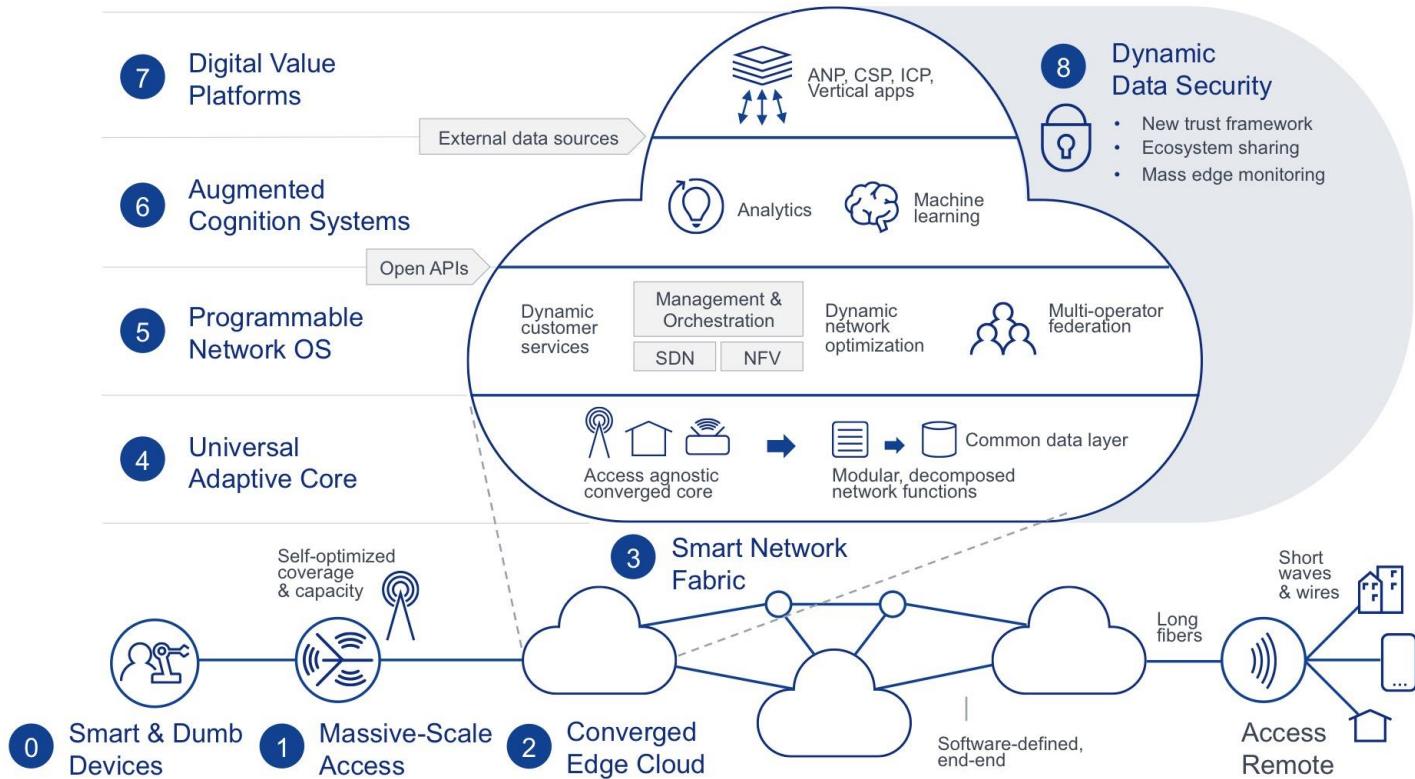


Imperceptible latency



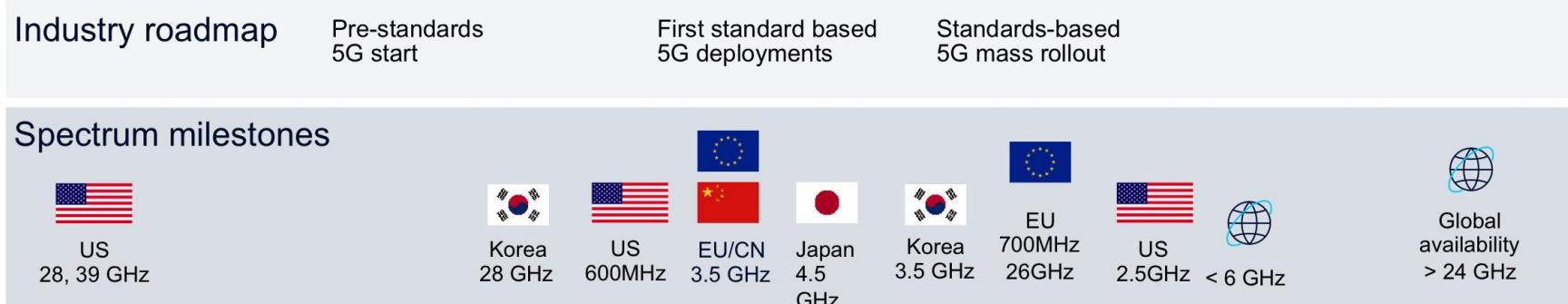
~100x more capacity in < 10 years and ms latency for networks & 'human' services

# Nokia's vision for the 5G era – driven by “Future-X” architecture



# High level Industry Roadmap Vision of 5G

## Standards roadmap



\*) NSA: Non standalone; SA: Standalone

## Main industry forces driving the 5G New Radio (5G NR) standards ecosystem

### Early deployments

- Consumer/people-centric
- Pre-standard (Regional use case specific)
- 3GPP Non-Standalone (NSA)

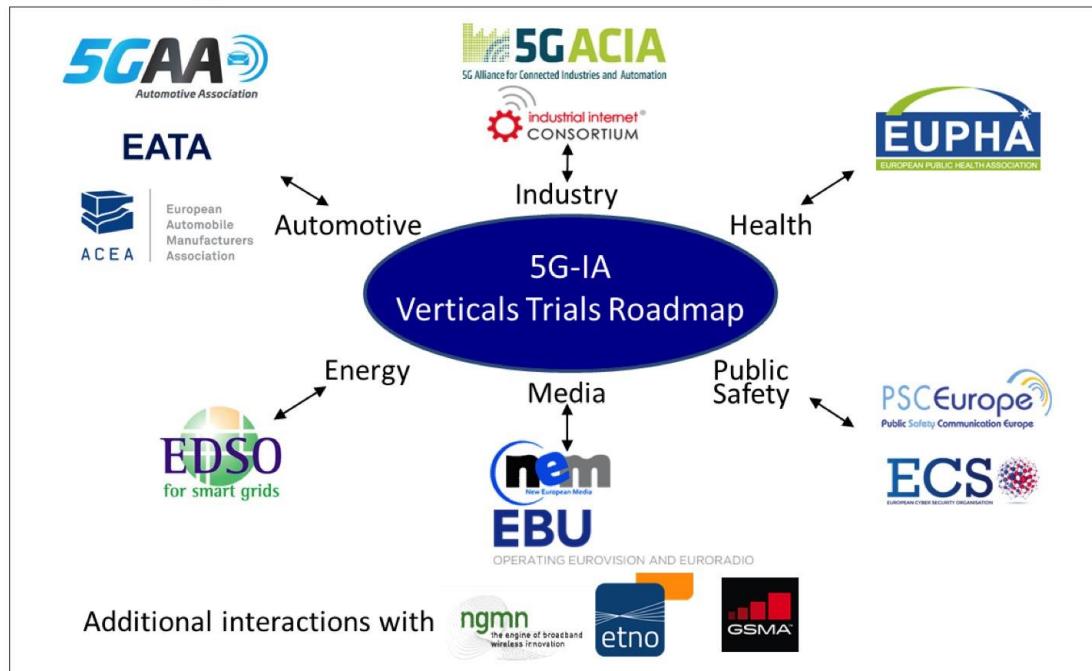
### Revolutionary leap

- Industrial & Infrastructure IoT-centric
- 3GPP Standalone (SA) & Unlicensed/Shared Spectrum



## 5G Pan-EU Trials Roadmap Version 3.0 Vertical Pilots (Highlights)

- 5G Vertical Strategy – Verticals Sectors and Associations





NOKIA



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**Xun ZHANG**

Associate Professor  
Laboratoire LISITE, ISEP

# Internet of Radio Light in Buildings

Xun ZHANG

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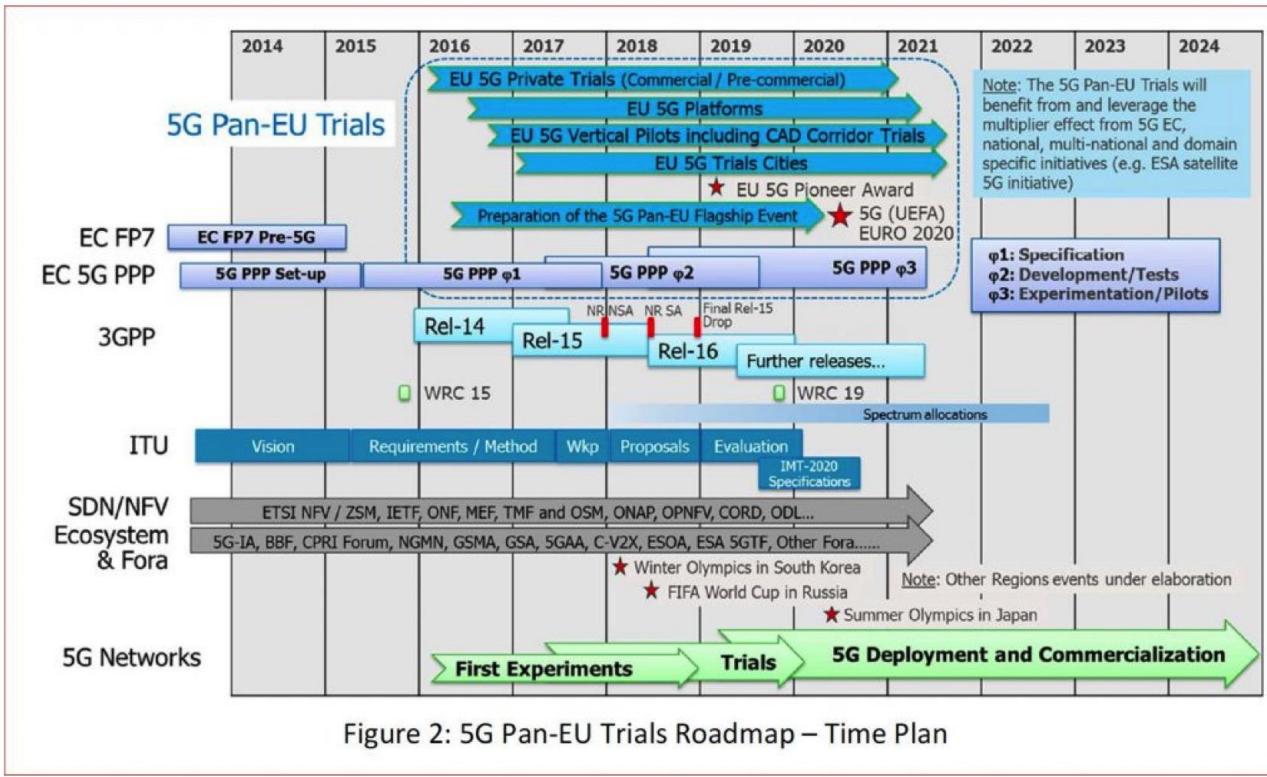


**5G PPP**  
The 5G Infrastructure Public Private Partnership



- **Background and motivation**
- **Overview of IoRL architecture**
- **Applications**

# European Horizon 2020 5G 2-Phase projet



@ 5G Trials Roadmap version 3.0: <https://5g-ppp.eu/newsflash-may-2018/>



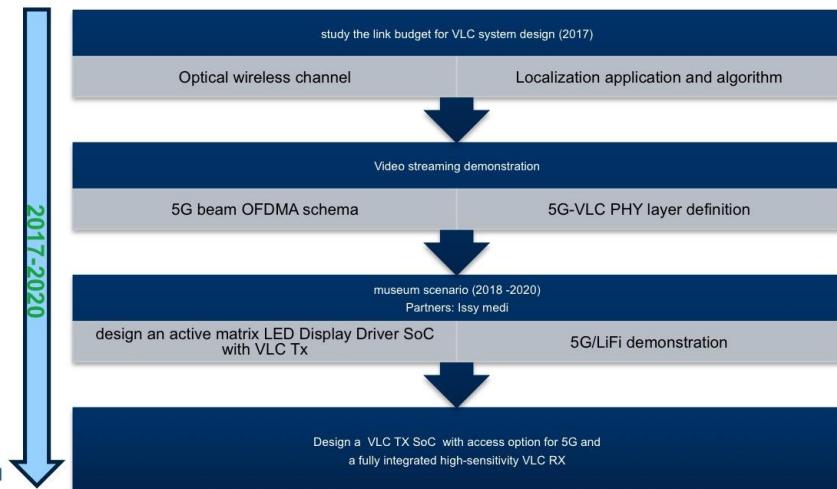
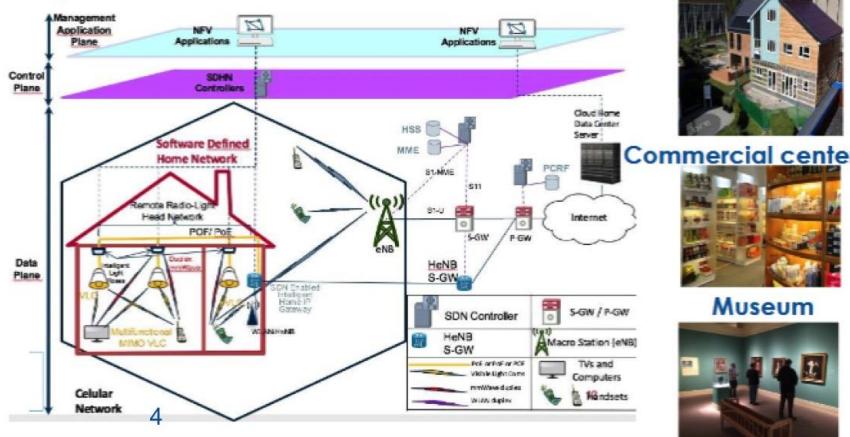
**5G PPP**

The 5G Infrastructure Public Private Partnership



## European H2020 project: IoRL Internet of Radio-Light in Buildings

- A joint project: with 9 Countries in the world
- Future network based on visible light and micrometer waves
- Widely use in public and private spaces
- High data rate:  $\geq 10$  Gbits/second



Call: H2020-ICT-2016-2

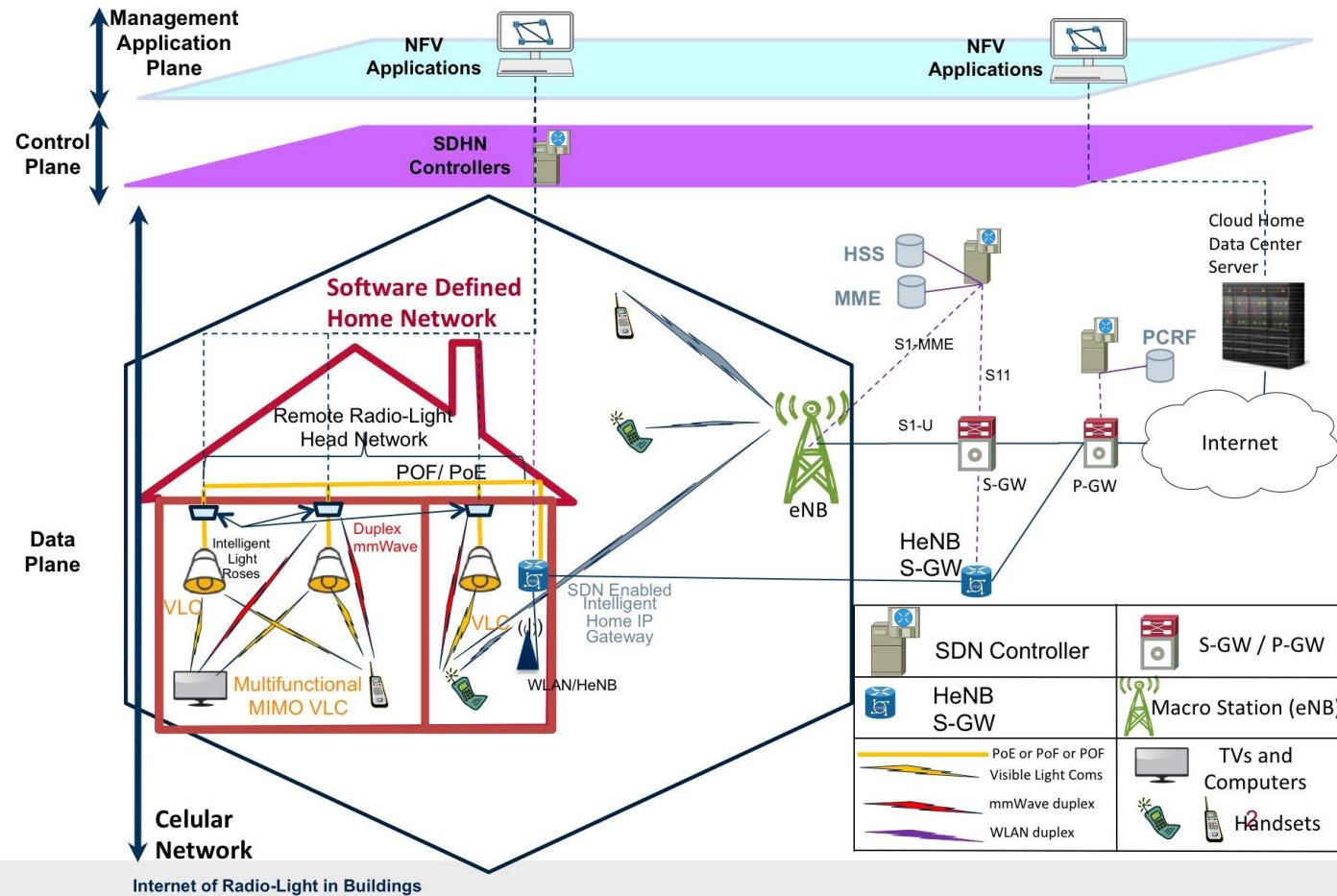
Type of Action: RIA

Topic: ICT-07-2017: 5G PPP Research and Validation of critical technologies and systems

# Partners

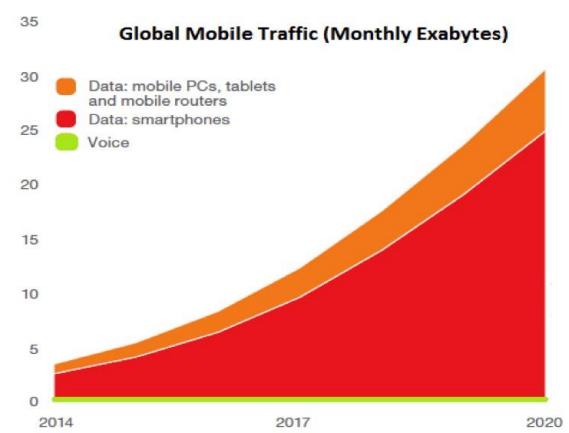
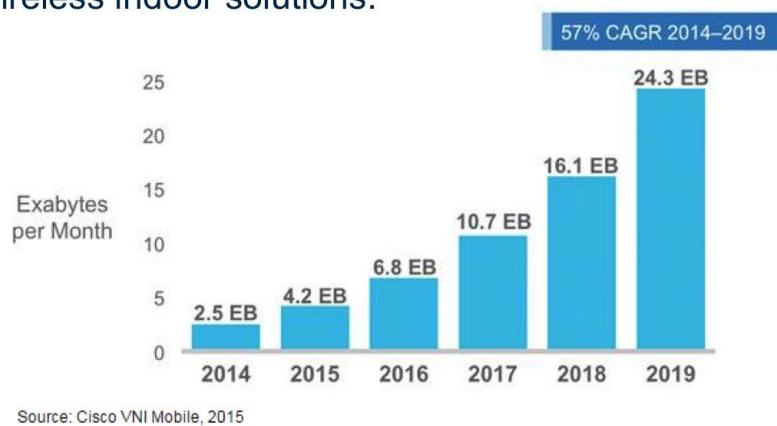


# Software Defined Home Network Architecture



# Growth in In-door Mobile Data Traffic

- CISCO forecasts a compound annual growth rate (CAGR) of 57% for mobile data traffic with forecasts of 24.3 Exabytes mobile data traffic by 2019;
- 80% of this growth is generated indoors, which is growing 20% faster each year than outdoor wireless traffic;
- Increasing capacity demand for data traffic from Smartphones, mobile PCs and Tablets with voice traffic occupying only a fraction of the total capacity;
- Fewer than 2% of commercial and public buildings are currently covered by dedicated wireless indoor solutions.



# Applications

Homes (UK)



Public Spaces Shopping Malls (CHINA)



Public Spaces Museums (FR)



Public Spaces – Transport Hub (ES)



# Home and Museum Verticals



**Building Research Establishment Home**

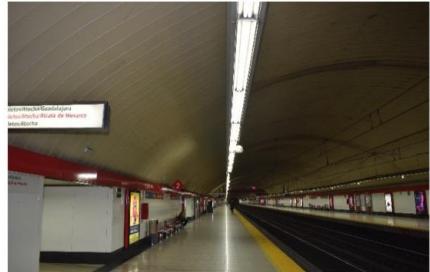
- Internet of Radio-Light Office
- AV Streaming to UHDTV
- 360° AV Streaming to VR Headsets
- < 10cm Location accuracy of UE
- Intra Building and Inter gNB Handover
- Home Video Security Monitoring
- DoS and Rogue Tx Network Security



**Musée de la Carte à Jouer**

- < 10cm Location accuracy of UE
- Location Based Data Access Applications
- Monitoring of UE Locations Applications
- Guiding of UE Applications
- Interaction with Internal/External Database Applications
- 360° AV Streaming to VR Headsets
- Museum Video Security Monitoring
- DoS and Rogue Tx Network Security Monitoring

# Train Station and Supermarket Verticals



## Nuevos Ministerios Station Platform & Tunnel

- Monitoring of UE Locations Applications
- Location Based Data Access Applications
- AV Streaming to UHDTV
- Video Conferencing
- DoS and Rogue Tx Network Security Monitoring
- Eavesdropping Network Security Monitoring

## Chinese Supermarket

- Interaction with Internal/External Database Apps
- Location Based Data Access Applications
- Monitoring of UE Locations Applications
- Guiding of UE Applications
- AV Streaming to UHDTV
- Video Security Monitoring
- Video Conferencing
- DoS and Rogue Tx Network Security Monitoring
- Eavesdropping Network Security Monitoring

# Thank you for your attention

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<https://iorl.5g-ppp.eu/>



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- Avec la participation de **Gilles BREGANT**

Directeur Général de l'ANFR