Une vision d'opérateur sur les usages et déploiements de la 5G

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26 September 2017

The Orange vision of 5G

5G will provide all the means to access the Internet, including

- radio: existing (4G, Wi-Fi) and a new radio (NR)
- a convergent core network managing fixed and radio accesses (fibre, 4G, NR, Wi-Fi…)

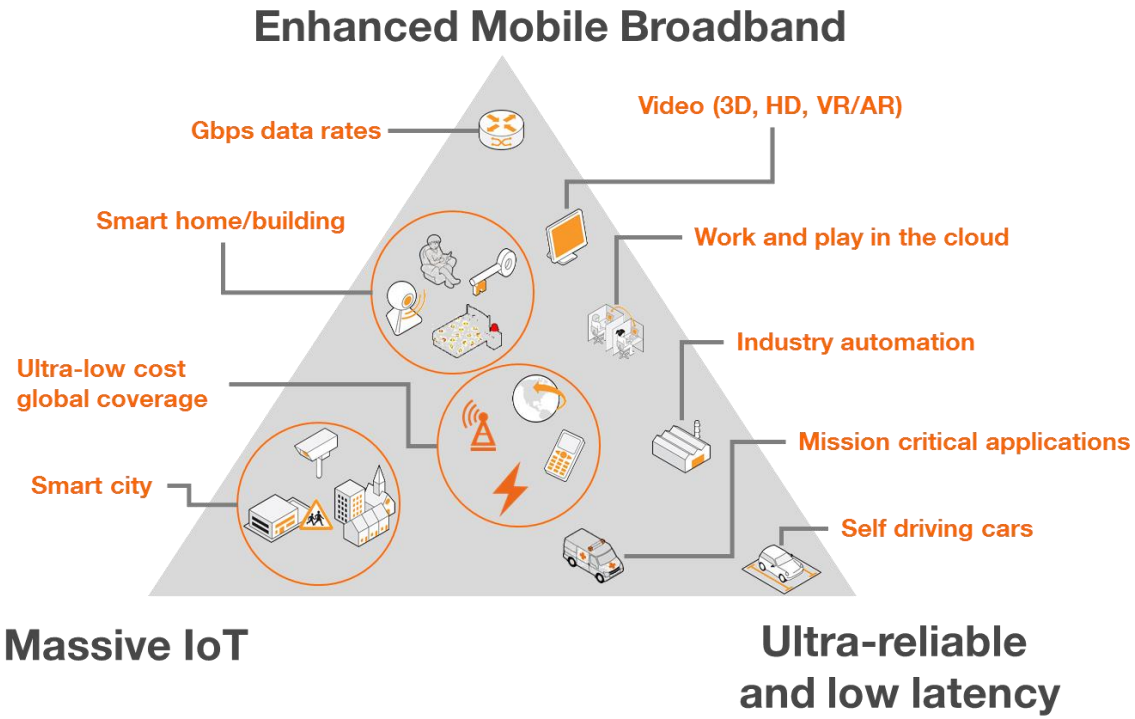
5G will deliver more than connectivity

- new business models and value propositions
- enabled by a unified infrastructure integrating networking, computing and storage resources

For high performance and new capabilities

5G connectivity services

all delivered by the same network



key expectations

- **ambient connectivity and higher minimum throughput:**
  50 Mbps “everywhere”
- **higher capacity and experienced data rates**
  Up to Gbps experienced rates
  x10 spectral efficiency vs. 4G+
  new cm/mmWave spectrum
- **expand the IoT for support of vertical industries**
  99.999% reliability
  1 to 10 ms latency
- **higher energy efficiency:**
  energy consumption divided by 2 for a traffic x1000
- **enable ultra low-cost networks**
  for low ARPU/low density areas

What can 5G offer to consumers?

Enhanced and New MBB experience

- better comfort
- new devices (e.g. AR/VR) and services (cloud)

FTTH-like Fixed Wireless Access

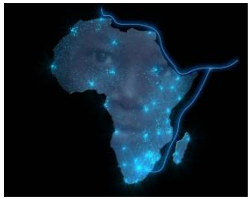
- in areas without FTTH by 202X (X dependent on spectrum availability)

More diverse IoT experiences

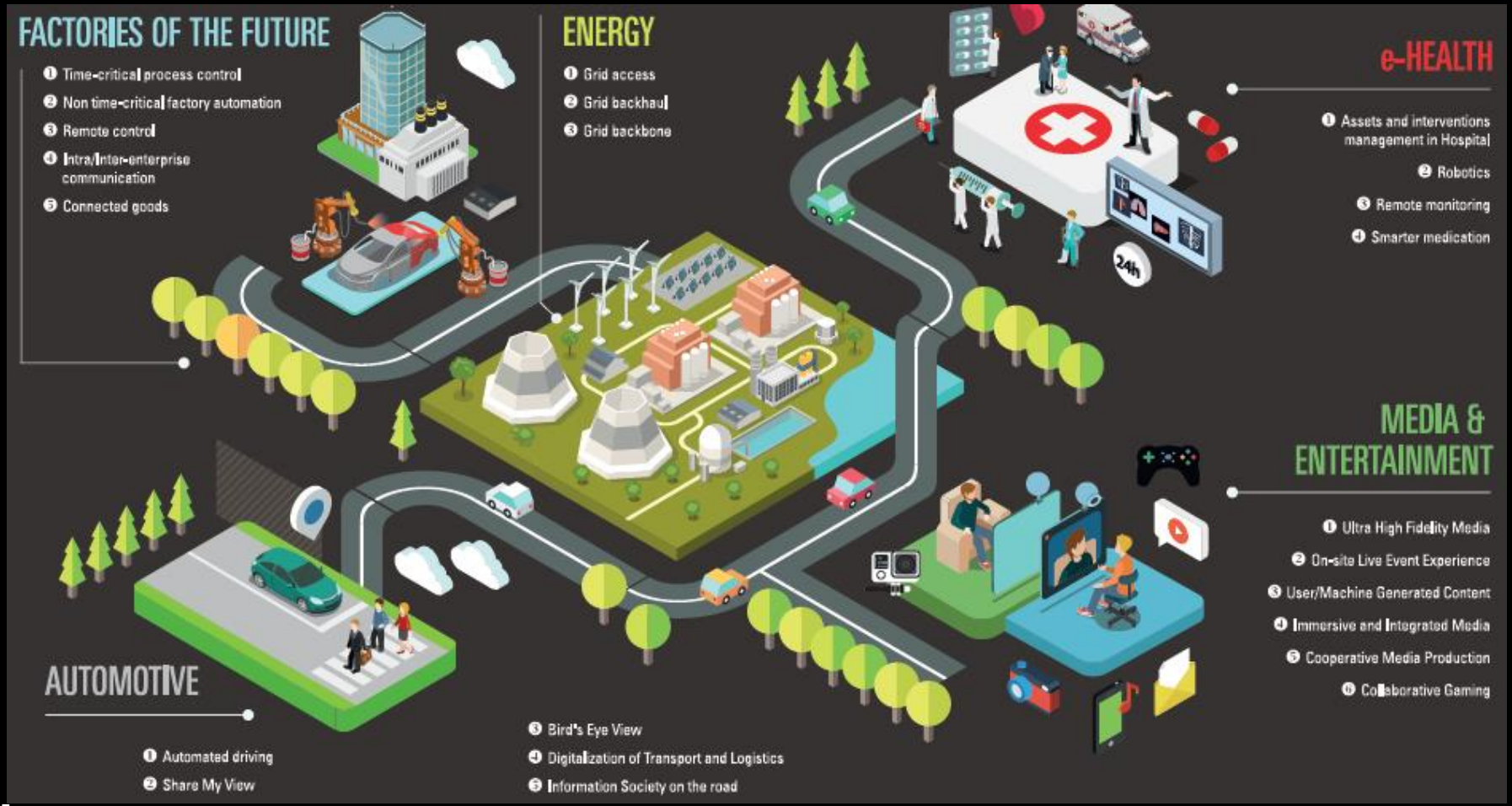
- new connected machines
- diverse usages leveraging the complementarity of LoRa, LTE-M and 5G IoT

Connectivity for everyone

- in emerging countries
- in low density areas



5G for Verticals: more efficiency for industries and the overall society



source: 5G PPP white paper «5G empowering vertical industries»

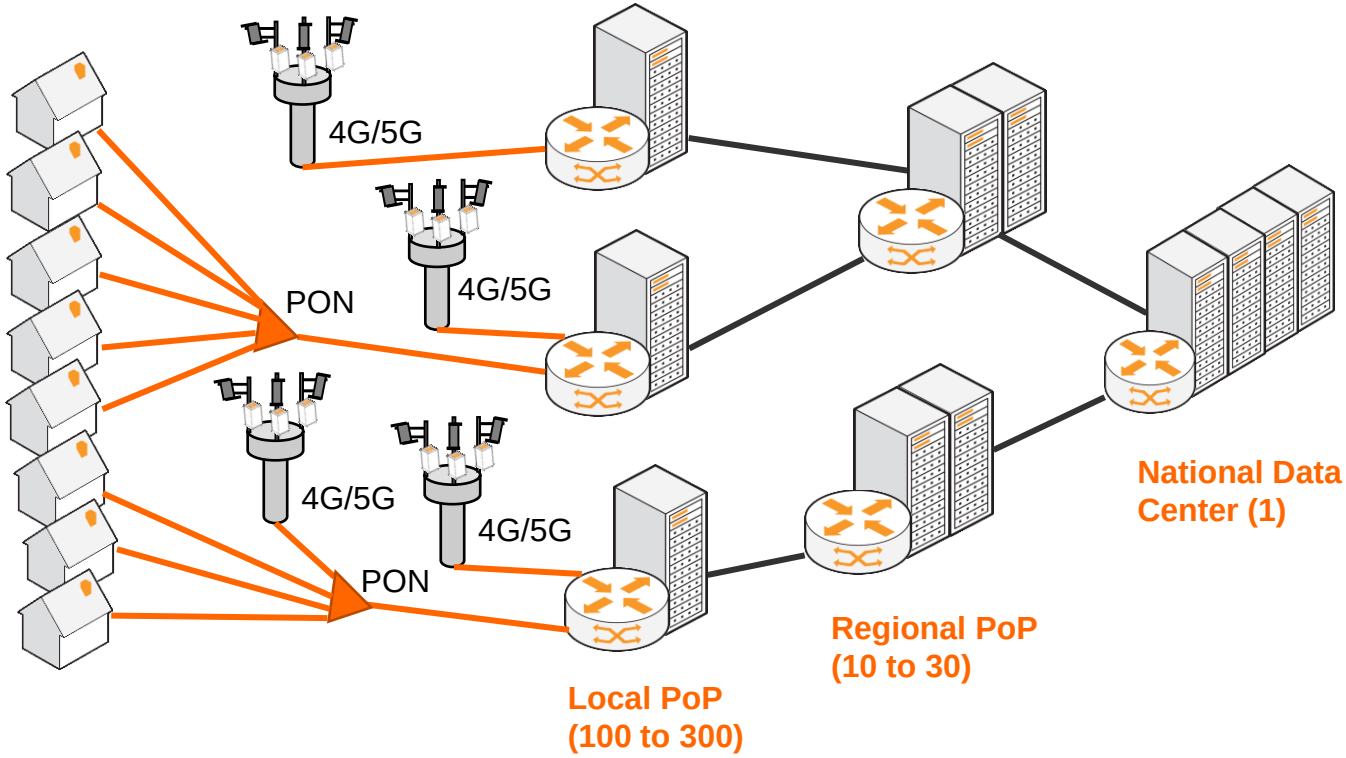
Example use cases, and their technical requirements

	Robotics in e-health	Time-critical factory process control	Smart grid backbone
Data Rate	300 Mbps for HD video streaming / augmented reality	Mbps-Gbps	1 Gb/s
Latency	10 ms (even if haptics systems latency would be around 100 ms)	100us-10ms	5 ms
Density/Nb of devices	5-10 surgical robots per hospital, several 100s care robots per hospital	10-100/m2	1 / km2
Reliability	99.99999%	99.999%	99.999%
Coverage	Very deep indoor	(deep) indoor + outdoor	extremely wide area

* source 5G PPP

The 5G network infrastructure: convergent and IT-ized

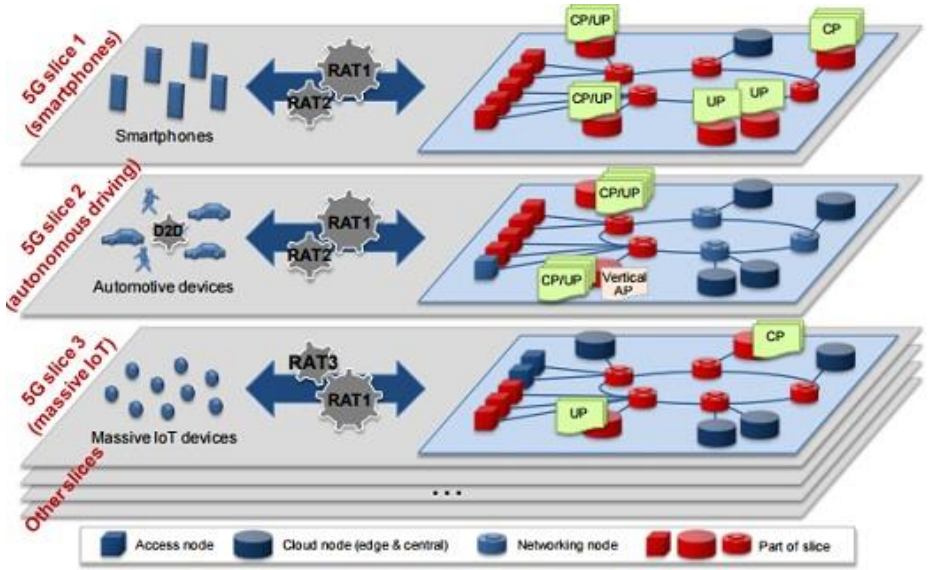
Distributed networking, computing and storage, enabling new services



A software infrastructure delivering multiple services

5G offers the possibility to run specialised virtual networks “network slices” on a mutualized physical infrastructure

- **slices will be established on demand, in minutes and only with the required functionalities**
- **a mutualized infrastructure will cost less than dedicated physical networks**

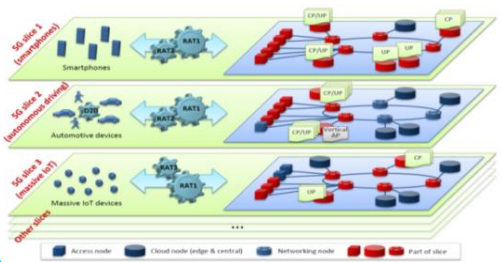


network slices: Virtual Sub-networks pre-programmed to serve specific services using dedicated or shared resources

Key enablers for 5G and related challenges

Softwarization

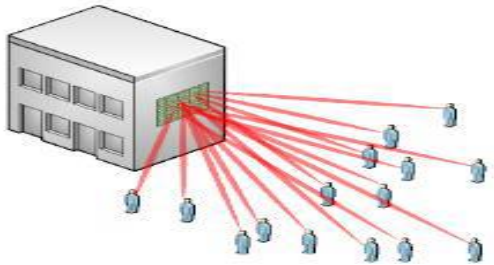
Flexible network partitioning & functionality



- how to manage a distributed software infrastructure?
- slices creation and management
- inter-vendor interworking

Massive MIMO

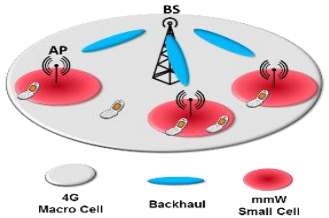
Ultra-narrow beams for coverage, throughputs and capacity



- cost of network and devices equipment?
- deployment in low bands
- network engineering

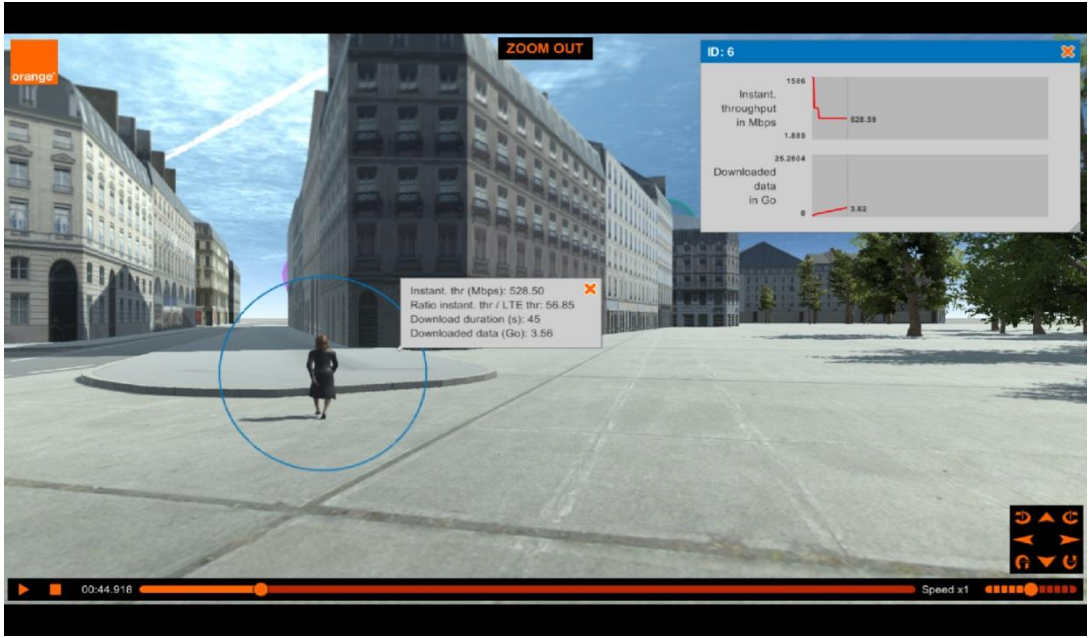
cm/mm-Waves

Use of spectrum above 6GHz



- cost of network and devices equipment?
- performance?
- usage scenarios?
- network engineering

Demo: user experience of 5G cm-waves and massive MIMO in dense areas



Spectrum for 5G

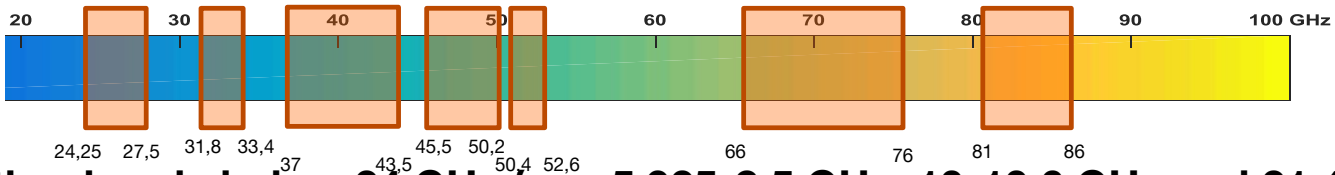
Sufficient amounts of spectrum will be critical for the success of 5G

The bands below 6GHz, in particular below 1 GHz will play an important role in the 5G ecosystem

- **3.4-3.8 GHz and 700 MHz bands are expected to be Core 5G Bands for initial deployment of 5G networks**
- **harmonization of spectrum is key**

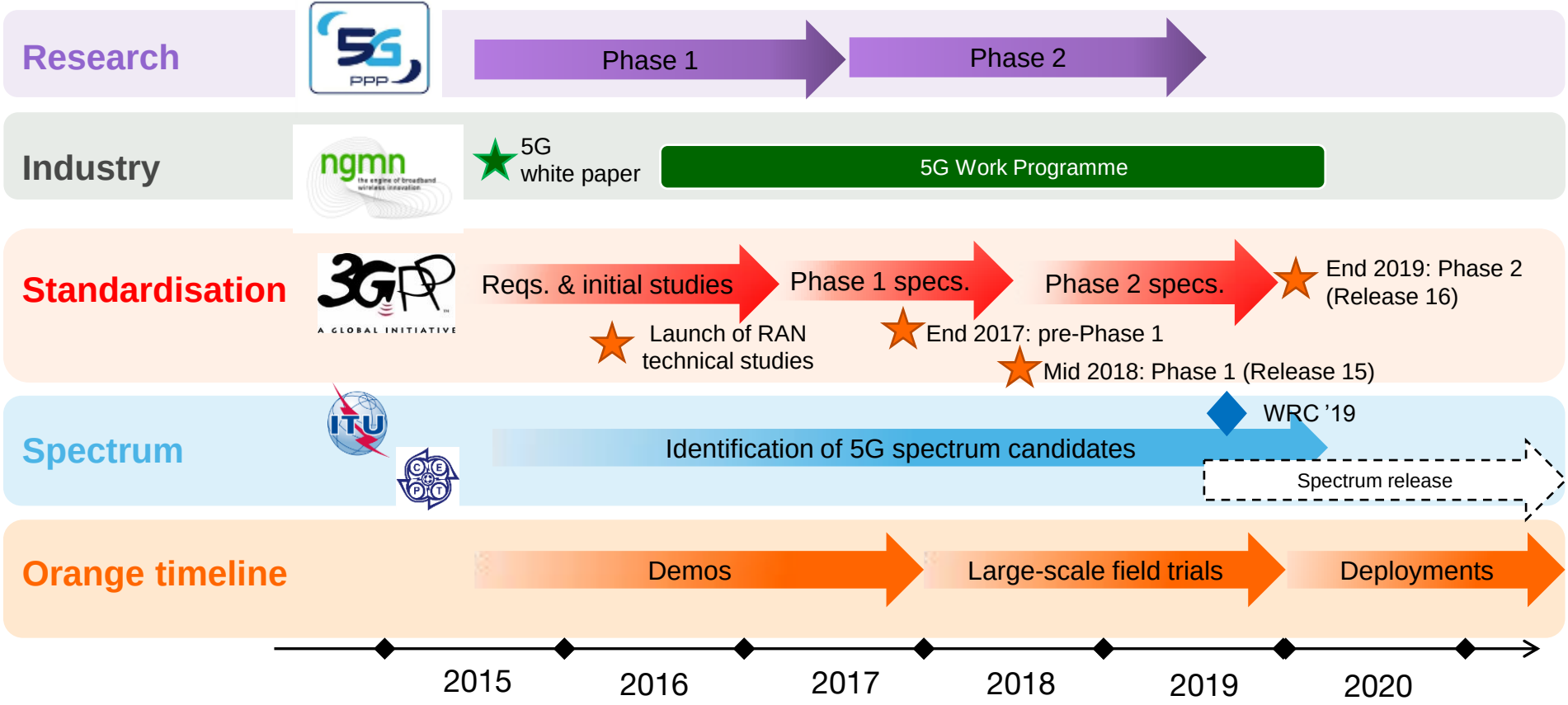
The bands above 6GHz will respond capacity and performance needs

- **additional bands in the 24.25-86 GHz range are expected to be identified by WRC-2019. The 24.25-27.5 GHz band is identified as pioneer band in Europe**



- **Other bands below 24 GHz (e.g. 5.925-8.5 GHz, 10-10.6 GHz and 21.4-22 GHz), present a strong potential and could be identified on a regional basis**

The 5G roadmap: from now to deployments



Some initiatives to prepare 5G (with Orange)

Research partnerships

- **5G PPP: Orange participates in 10 projects**
- **Bilateral partnerships with** ERICSSON NOKIA HUAWEI
- towards 5G **connected cars partnership with PSA and Ericsson**

Industry initiatives

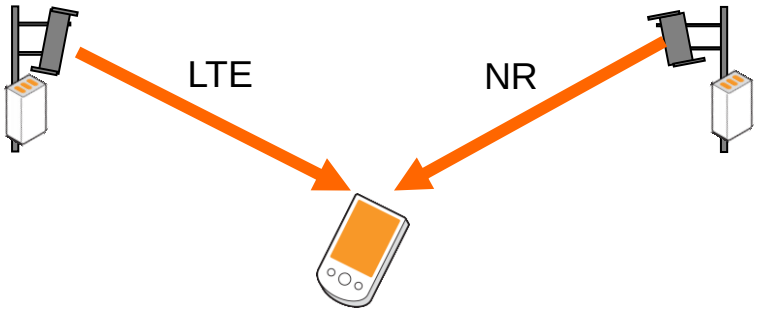
- **Open Connectivity Initiative: imagine 5G-enabled user experiences in the 2024 Paris Olympics**
- **NGMN: 5G Tests and Trials Initiative**
- **5G Pan-European Trials Roadmap**

Orange propagation measurements in candidate 5G cm/mm bands, in Belfort

Towards 5G connected cars test runway

What about LTE?

LTE will be an integral part of 5G: 5G devices will be able to operate LTE and 5G New Radio simultaneously through dual connectivity



LTE will continue to evolve in the 5G era, at least in the early years because existing LTE spectrum will be maintained

- **to maximise 5G devices performance (operating on LTE and 5G new radio)**
- **to support capacity needs**
- **to support evolutions of specialized services on LTE spectrum**

Conclusion

5G will arrive from 2020 with

- **significantly enhanced user experience**
- **significantly enhanced network performance, especially energy efficiency**
- **support of new services (new IoT services, support of vertical industries, ultra low-cost networks)**

Conditions of 5G success

- **global technology standards, supporting the market needs**
- **sufficient amounts of spectrum, below and above 6 GHz**
- **cross-industries dialogue and joint trials to prepare the 5G ecosystem and business models (for car industry, healthcare, utilities, farming, manufacturing…)**

Thank you