



la 5G et ses nouvelles possibilités pour les entreprises

un futur à co-construire



Orange Labs
26 Octobre 2017

The Orange vision of 5G

5G will provide and integrate 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

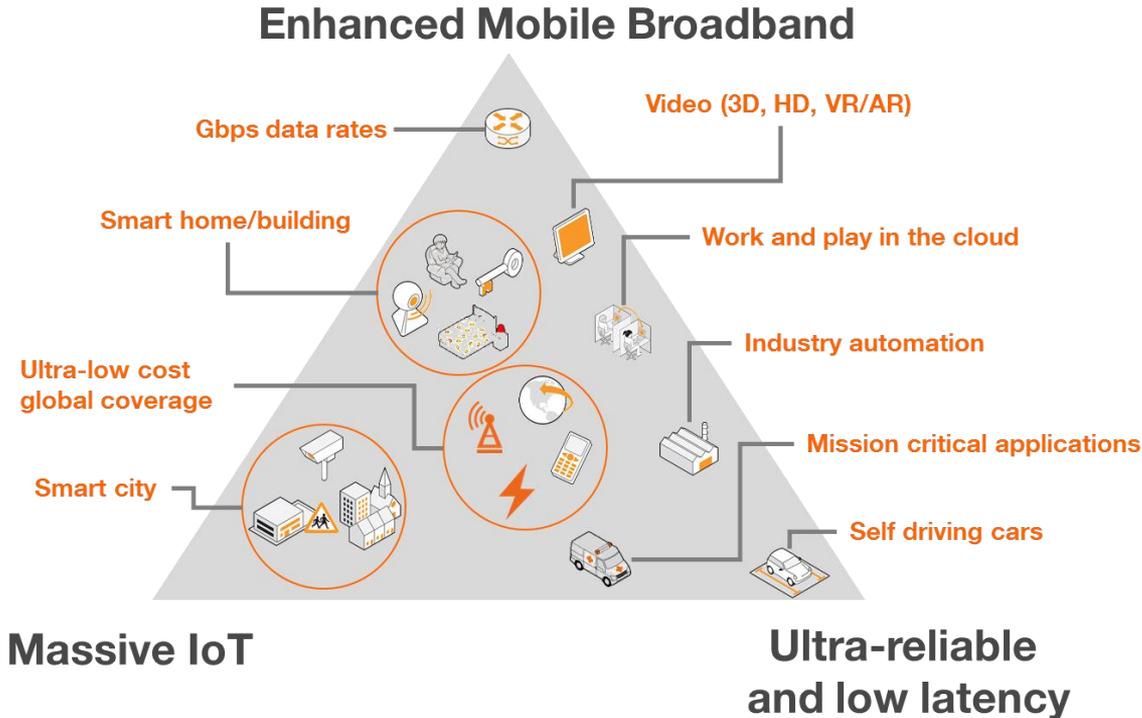
- new business models and value propositions
- enabled by a unified infrastructure integrating networking, computing and storage resources

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

- might be used for certain type of households without FTTH in 202X



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

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

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

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

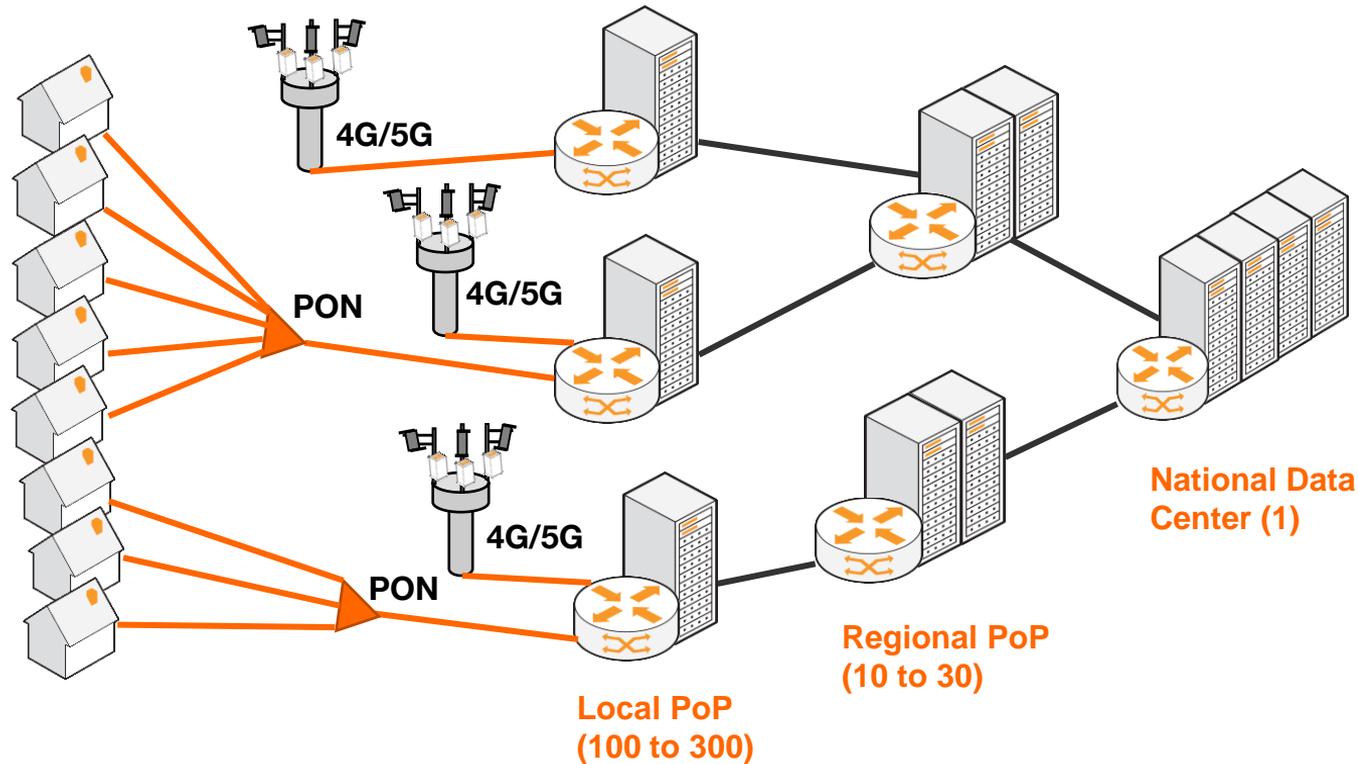
Example use cases, and their technical requirements



| | 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 |

The 5G network infrastructure: convergent and IT-ized

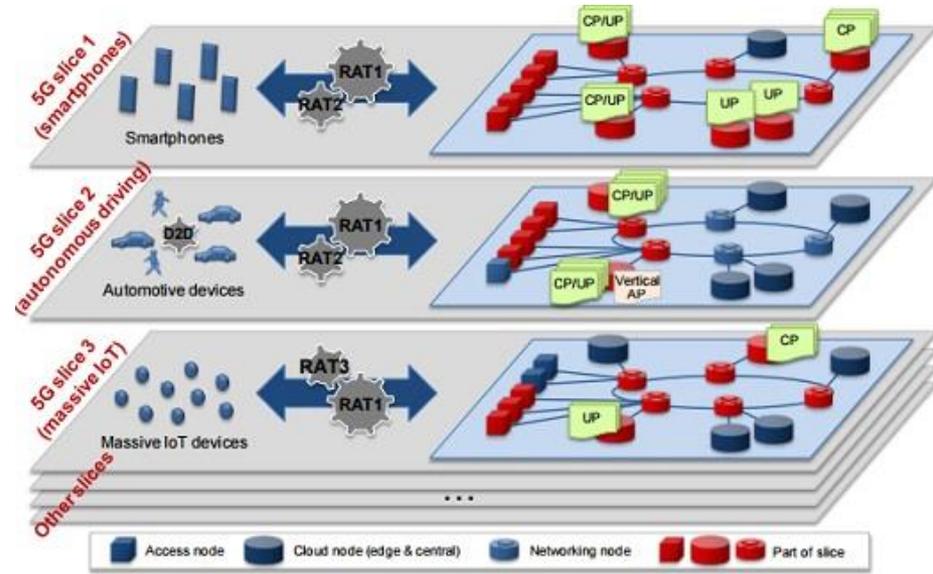
Distributed networking, computing and storage, enabling new services



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
- possibility to extend a slice within a customer’s infrastructure (e.g. data center)



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

Need for regulation to allow specialized services

Spectrum for 5G

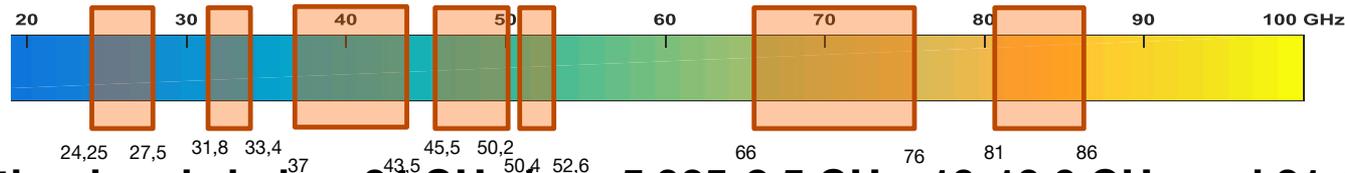
Sufficient amounts of spectrum will be critical for the success of 5G

The bands below 6GHz 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
- eMBB services will require a large bandwidth in the 3.4-3.8 GHz band

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

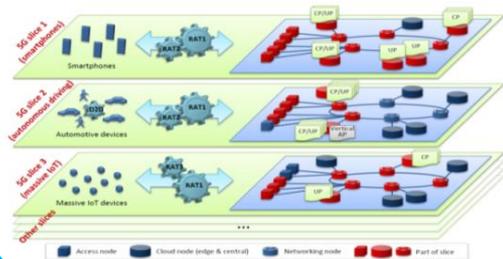


- Other bands below 24 GHz (e.g. 5.925-8.5 GHz, 10-10.6 GHz and 21.4-22 GHz), present a strong potential and could be identified on a regional basis

Some key technical enablers & related challenges

Softwarization

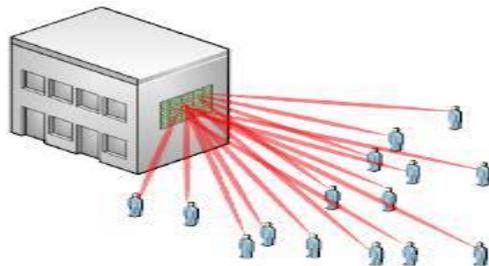
Flexible network partitioning & functionality



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

Massive MIMO

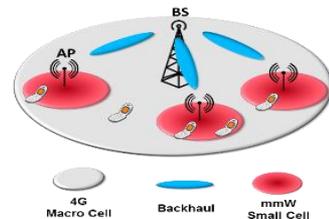
Ultra-narrow beams for coverage, throughputs and capacity



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

cm/mm-Waves

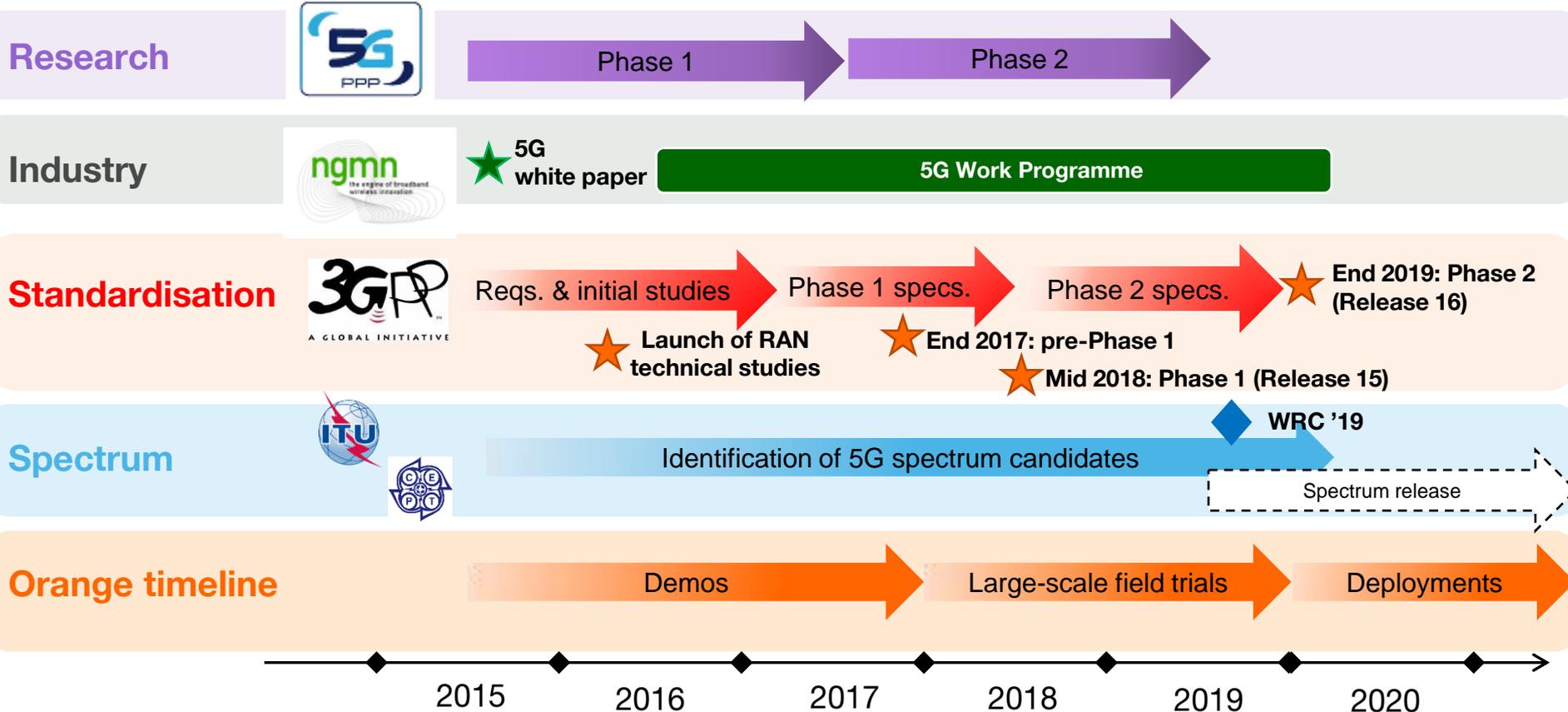
Use of spectrum above 6GHz



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

Need for experimentations to validate the technologies maturity

The 5G roadmap: from now to deployments



Orange actively contributes to the 5G ecosystem

Research partnerships

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



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

In industry fora (NGMN, GSMA)

- leadership of the worldwide NGMN 5G Tests and Trials Initiative and IPR Forum
- Member of the NGMN Board
- Vice-chair of the GSMA Board
- 4 delegates GSMA Future Networks programme and member of Steering Group



Towards 5G connected cars test runway

In regulation organisations (ITU, CEPT)

Orange actively contributes to 5G standardisation

3GPP

- 26 delegates in 3GPP
- 1 working group chair, 2 vice-chairs
- 3 in ETSI NFV, 4 in Broadband Forum



ETSI

- 3 delegates in ETSI NFV, including vice-chair and sub-group chair
- Member of the ETSI Board, and leader of 5G Communications Topic at the Board
- Participation in ETSI MEC, NTECH, ITS, MSG...



BBF

- 4 delegates



Souveraineté télécom 5G (NFI) Pilotage Orange et Nokia de l'action 5G



Favoriser l'émergence d'un écosystème 5G vertueux pour l'ensemble de l'industrie

- Écriture d'un White paper avec les recommandations pour la France
- Cartographie des acteurs pour une meilleure visibilité de l'écosystème français 5G
- Coordination et « Parrainage » d'académique et de PME par les grands groupes (+ de 20 projets ciblés en phase 2) sur les projets 5GPPP
- Informer l'eco-système sur les grands évènements de la 5G: Edition d'une **newsletter** trimestrielle, journée d'information et de partage (5 info-days), ...
- Réponse aux consultations sur l'IoT, sur les fréquences pour la 5G, ...



NOKIA



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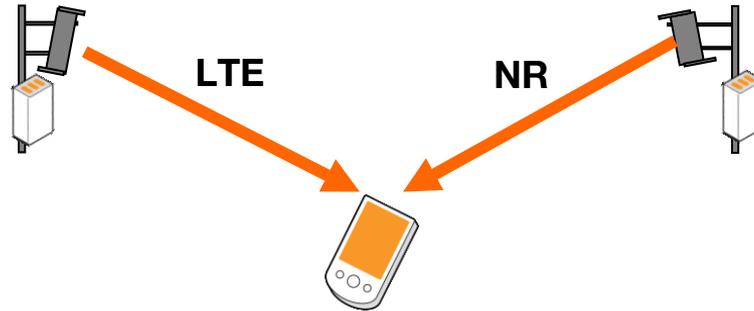
E3link



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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

Questions for the media sector

- **What are the evolutions you wish in your operations?**
- **What are the associated new telecom / digital needs?**
- **What are their technical requirements?**

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)

A cross-industries collaboration is essential for the 5G success

- for the telecom industry to understand the vertical sectors technical requirements
- to prepare the 5G ecosystem and business models

Thank you

