

# LTE-Advanced Pro and its evolutions



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# Orange mobile services today

Mobile networks in **29 countries**  
**188 millions** customers worldwide  
**108 millions** in MEA

4G/LTE services in **16 countries**  
**23 millions** 4G customers in Europe

**>95% 4G coverage**  
**across European footprint**  
**planned in 2018**

% pop. covered by 4G (yoy change)



H1 2016 results, 26<sup>th</sup> July 2016



**IoT radio** under deployment in France

# Orange LTE networks main technical features

**Commercially  
deployed**

- 2Tx/2Rx MIMO
- 2DL carrier aggregation
- VoLTE
- BBU-RRH deployment

**Under testing/study**

- 3/4DL carrier aggregation
- 4x4 MIMO
- 256 QAM

**MBB experience  
enhancements /  
Gbps peak rates**

- Licensed Assisted Access

**complement to  
licensed spectrum?**

- LTE cat. 1 UE

**IoT**

- 4G RAN virtualisation

**flexibility, efficiency**

# Drivers for LTE-Advanced Pro

**Mobile  
broadband  
customer  
experience**

- higher data rates
- higher capacity
- higher cell-edge throughput
- reduced latency

## Main Rel-13/14 LTE-A Pro enablers

Extended  
CA

Adv.  
Rx,  
MUST

E-BF,  
FD-  
MIMO

LAA

Shorter TTI

**Diversification  
to support new  
connectivity  
needs**

- Internet of Things
- Professional Mobile Radio,  
including Public Safety
- Vehicle-to-X (V2X) Commun.

Cat. M1

D2D

V2X

**Bridging the gap with the coming 5G**

# Future of LTE-Advanced Pro vs. 5G

**The future of LTE-Advanced Pro is 5G**

**But at least in the early years of 5G, LTE-A evolutions are expected to be needed because existing LTE spectrum will be maintained**

- to serve LTE-only devices
- to support specialized services launched before 5G (e.g. IoT, some PMR services, V2V?)

**So enhancements compatible with legacy devices are expected to be needed**

- to maximise 5G QoE (5G devices will operate on LTE and 5G new radio)
- to support capacity needs
- to support evolutions of specialized services on LTE spectrum

# Possible LTE-A evolutions beyond Rel-14

**Mobile  
broadband**

**Enhancements towards more capacity, higher experienced data rates, more consistent user experience**

**Verticals  
support**

**Enhancements towards increased reliability and further reduced latency**

**How?**

- **Application of generic and compatible 5G features**
- **Exploitation of centralized RAN virtualization, e.g. for interference mitigation**
- **Prioritize software upgrades of pure LTE equipments, as large investments will likely be on 5G infrastructure**

# Thank you

