

# Lo sviluppo del 5G: Evoluzione o rivoluzione? Quali sfide per l'industria e le istituzioni

Seminario AGCOM

Roma, 29 Aprile 2017



Alessandro Casagni  
Director, Wireless Regulatory Policy EMEA  
Wireless Strategies & Business Development Dept.

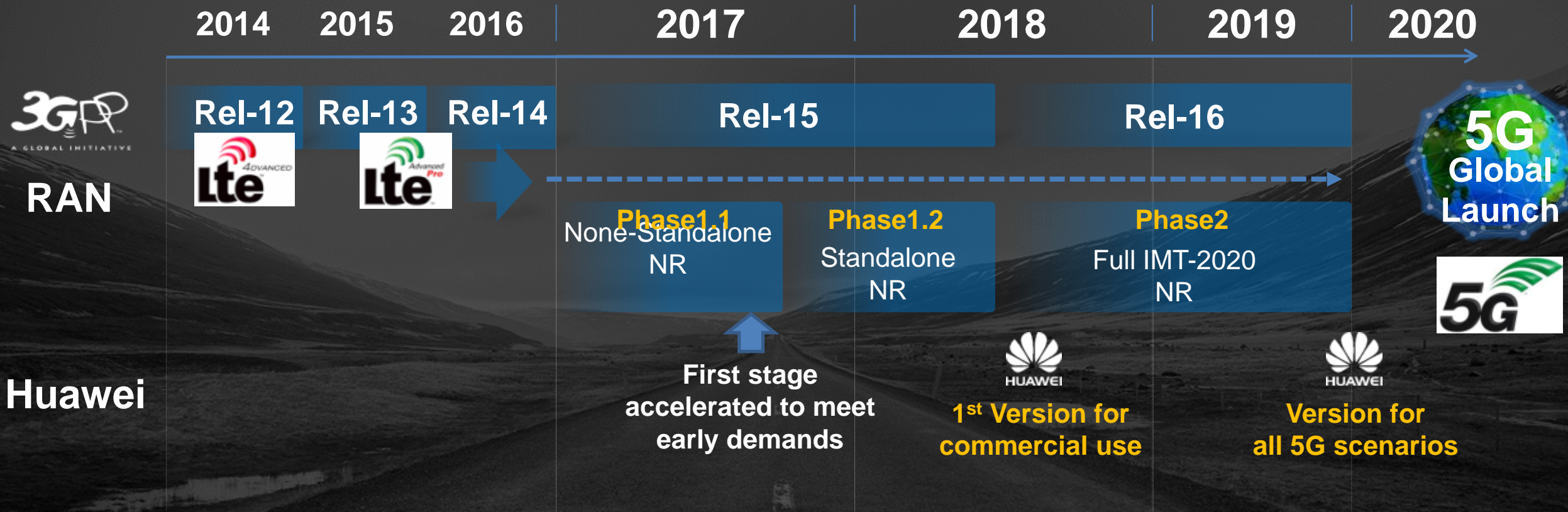
# Evolution AND Revolution

## 5G: key enabler of the 4<sup>th</sup> Industrial Revolution



Play an historic role in driving digitalization of vertical industries.  
Requiring long term strategic decisions

# Evolution AND Revolution Leveraging on one unified standard



## 5G comprises:

- New Radio (NR)
- Evolution of LTE Advanced Pro
- NextGen Core
- Evolution of EPC

# 5G Use Cases

## AR/VR and WTTx

### AR/VR market: huge potential by 2025



Source: Goldman Sachs, AR&VR Report

More speed/capacity required for AR/VR



Normal experience: **48.94 Mbps**

3960(pix) X 2160(pix); 60fps

Excellent experience: **1.29 Gbps**

12000(pix) X 7800(pix); 120fps

Source: Huawei wireless X Labs

### “WTTx”

last-mile “fiber in the air” for households

Households with Internet globally

> 10Mbps 0.3 B

< 10Mbps 0.4 B

No Access 1 B

Source: ITU 2015 ICT Facts

WTTx provides:

**Fiber-like** experience

**Fast** TTM & ROI

# 5G Use Cases Verticals

Cases

## Connected cars



- Collision avoidance
- Platooning
- Traffic control
- See through

## Smart Grids



- Monitor & control
- Grid self-recovery

## Drones



- Public safety
- Agriculture & forestry
- Infrastructure

## Healthcare



- Remote surgery

## Factory Automation



- Robots communication & control

Latency (\*)  
**5~10 ms**  
Reliability (\*)  
**>99.999%**

Latency  
**5~50ms**  
Reliability  
**Ultra-High**

Latency  
**10~30ms**  
Reliability  
**High**

Latency  
**10~100ms**  
Reliability  
**High**

Latency  
**10~100ms**  
Reliability  
**Ultra-High**

**5GAA**

(\*) Collision avoidance application

**Cross-industry** exchange platform involving Mobile operators, Verticals, OTTs...

## Exploration



Research together  
Joint labs

## Innovation



Produce new applications together  
Joint labs

## Ecosystem



Develop new markets together  
Business model research

**Innovation centers**  
Today's focus



Europe

- Connected cars
- Smart factory
- eHealth



USA

- Video
- eHealth



Japan

- VR/AR
- Home applications
- Service Robots

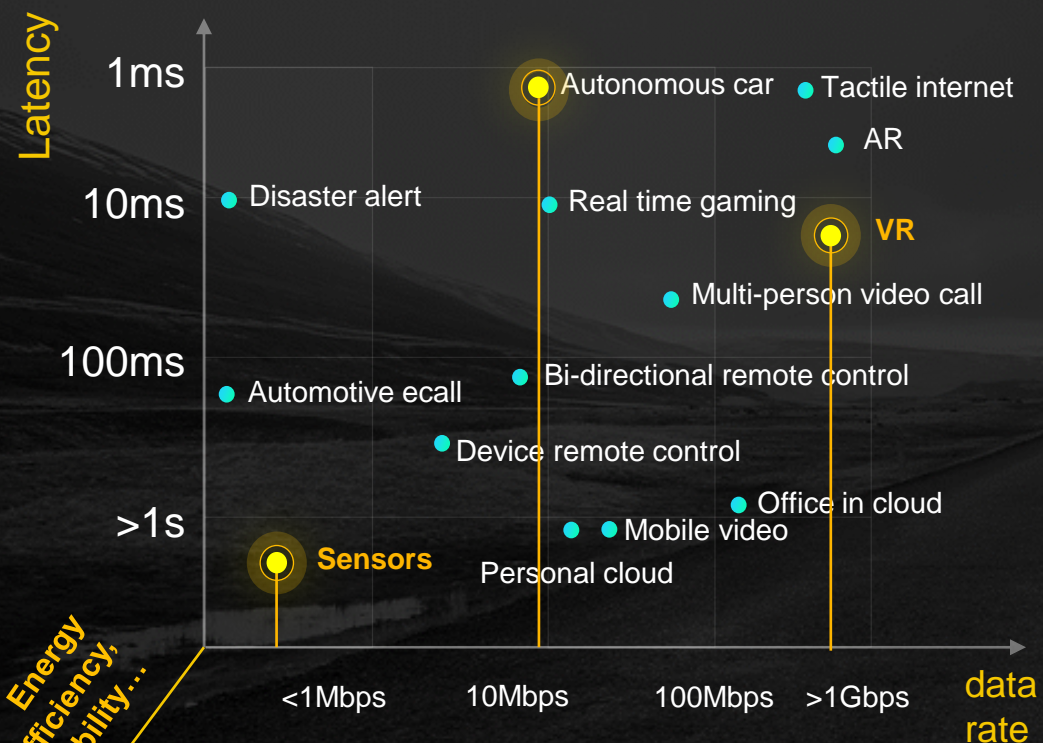


China

- Drones
- Service robots

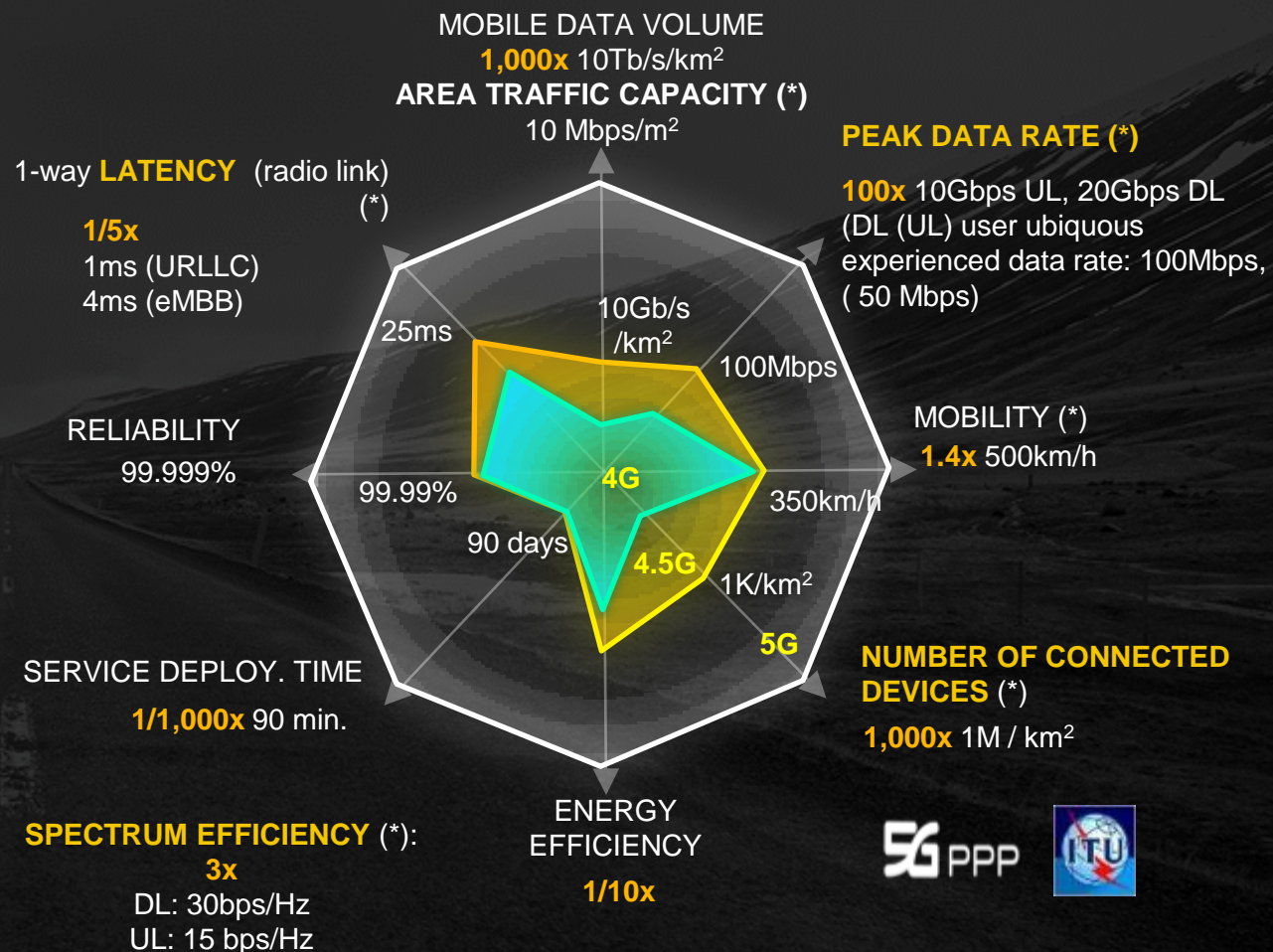
# Diversified requirements

## Diversified service requirements



Source: GSMA & Huawei Wireless X Labs

## Impressive step forward (IMT-2020 technical performance requirements)



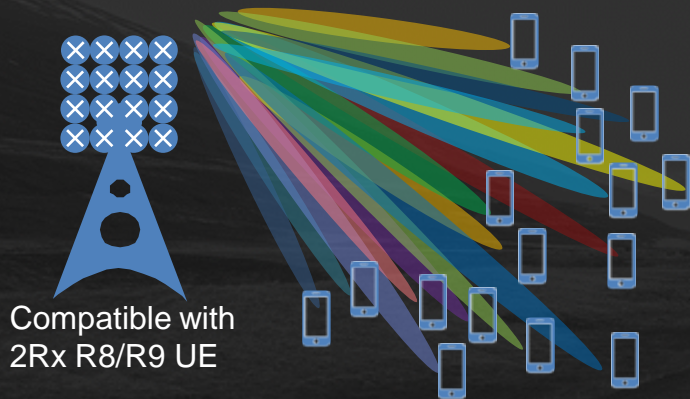
(\*) Draft Report M.[IMT-2020.TECH PERF REQ] completed by WP5D in Feb '17. submitted to ITU-R SG5 for final approval in Nov '17

# Enabling Technologies

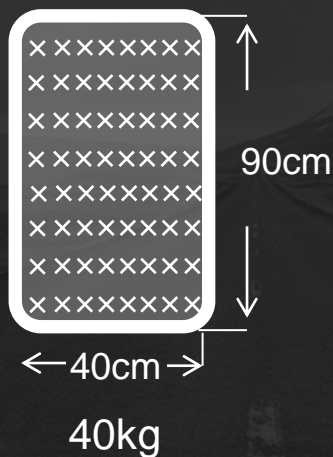
## C-band M-MIMO Boosts Capacity with Affordable Complexity

**C-Band + M-MIMO**  
boosts capacity with affordable complexity

**64T64R: 16+ Layers MU-BF**



**3.5GHz  
Massive MIMO**



**Downlink** speed improvement  
(3.5GHz 100MHz, 1.8GHz 20MHz)

**~5.7~8.4 x**

**Cloud-native architecture for E2E Slicing**



# Spectrum for 5G



**5G requires spectrum from the three layers in parallel.  
Each MNO will identify its specific most suitable combination of bands.**

# Challenges for Institutions and Industry

- **Technology innovation**
- **Global unified standard, enable economies of scale**
- **Setup of ecosystems for “Verticals”**
  
- **Timely spectrum availability, starting from C-Band: 3400-3800 MHz**
- **Cross-industry regulation**



# Keep on Exploring Far and Wide On 5G journey

## Thank You.

**Copyright©2016 Huawei Technologies Co., Ltd. All Rights Reserved.**

The information in this document may contain predictive statements including, without limitation, statements regarding the future financial and operating results, future product portfolio, new technology, etc. There are a number of factors that could cause actual results and developments to differ materially from those expressed or implied in the predictive statements. Therefore, such information is provided for reference purpose only and constitutes neither an offer nor an acceptance. Huawei may change the information at any time without notice.