

A stylized illustration of a city with various buildings, houses, and people. The scene is overlaid with a network of white lines and icons representing connectivity. Labels like 'CONNECTED CITY', 'CONNECTED THINGS', 'CONNECTED HOUSE', and 'CONNECTED HEALTH' are scattered throughout the scene. A satellite is shown in the upper left, and a car is on the road in the lower right. The overall color palette is light blue and white.

# The views of Europe: 5GPPP/5G IA activities

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& Chair, 5G Initiative Steering Board***

<http://5g-ppp.eu/>

# 5G PPP Contractual Arrangement

## KPIs for Monitoring

- **Business-related KPIs:**
  - Leverage effect of EU research and innovation funding in terms of private investment in R&D for 5G systems in the order of 5 to 10 times;
  - Target SME participation with an allocation of 20% of the total public funding;
  - Reach a global market share for 5G equipment & services delivered by European headquartered ICT companies above the level of 43 % global market share in communication infrastructure.
- **Performance KPIs:**
  - Providing 1000 times higher wireless area capacity compared to 2010;
  - Reducing the average service creation time cycle from 90 hours to 90 minutes;
  - Very dense deployments to connect over 7 trillion wireless devices serving over 7 billion people;
  - Secure & reliable Internet with a “zero perceived” downtime for services provision.
- **Societal KPIs:**
  - Enabling advanced User controlled privacy;
  - Reduction of energy consumption per service up to 90 % (vs 2010);
  - European availability of a competitive offer for 5G systems and technologies;
  - New economically-viable services of high societal value like U-HDTV and M2M applications;
  - Development & availability of 5G skills curricula in partnership with the EIT.

Source: 5G PPP Contractual Arrangement.

29/09/2017

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28-29 September 2017, Vienna

# Establishment of Working Groups and Activities in relation to the 5G PPP Contractual Arrangement

- 5G PPP is contributing to several KPIs and EU policies related matters. For that purpose the following **Working Groups and Activities** have been launched by 5G-IA:
  - WG 5G Vision and Societal Challenges
  - WG 5G Pre-standards
  - WG SME support
  - WG 5G Spectrum
  - WG Trials
  - Activity Community building and PR (Public Relations)
  - Activity 5G International cooperation
  - Follow-up of the 5G PPP Contractual Arrangement, KPIs
- 5G PPP projects launched **technology-oriented Working Groups**
  - WG Architecture
  - Use cases and performance evaluation models
  - Software Networks (SDN and NFV)
  - Network Management, QoS
  - Security
  - 5G Automotive (V2X,...), launched in July 2017

Source: 5G Infrastructure Association.

# Completion of Phase 1 Projects

	Name	M1= July 2015																																																											
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36																								
CSA	EURO 5G	Euro-5G																																																											
R&I	5G-NORMA	5G NOvel Radio Multiservice adaptive network Architecture																																																											
R&I	5G-Xhaul	Dynamically Reconfigurable Optical-Wireless Backhaul/Fronthaul with Cognitive Control Plane for Small Cells and Cloud-RANs																																																											
R&I	5G-CrossHaul	Developing an integrated 5G backhaul and fronthaul transport network																																																											
R&I	5G-Ensure	5G Enablers for Network and System Security and Resilience																																																											
R&I	CHARISMA	Converged Heterogeneous Advanced 5G Cloud-RAN Architecture for Intelligent and Secure Media Access																																																											
R&I	COGNET	Building an Intelligent System of Insights and Action for 5G Network Management																																																											
R&I	COHERENT	Coordinated control and spectrum management for 5G heterogeneous radio access networks																																																											
R&I	FANTASTIC 5G	Flexible Air INTerfAce for Scalable service delivery wITHin wireless Communication networks of the 5th Generation																																																											
R&I	Flex5Gware	Flexible and efficient hardware/software platforms for 5G network elements and devices																																																											
R&I	METIS II	Mobile and wireless communications Enablers for Twenty-twenty (2020) Information Society-II																																																											
R&I	mmMAGIC	Millimetre-Wave Based Mobile Radio Access Network for Fifth Generation Integrated Communications																																																											
R&I	SELFNET	SELFNET - FRAMEWORK FOR SELF-ORGANIZED NETWORK MANAGEMENT IN VIRTUALIZED AND SOFTWARE DEFINED NETWORKS																																																											
R&I	SESAME	Small cELLS coordinAtion for Multi-tenancy and Edge services																																																											
R&I	SPEED-5G	quality of Service Provision and capacity Expansion through Extended-DSA for 5G																																																											
R&I	SUPERFLUIDITY	Superfluidity: a super-fluid, cloud-native, converged edge system																																																											
I	SGEx	5G Exchange																																																											
I	SONATA	Service Programming and Orchestration for Virtualized Software Networks																																																											
I	VirtuWind	Virtual and programmable industrial network prototype deployed in operational Wind park																																																											

5G Infrastructure PPP  
The European path towards global next generation communication networks

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# 5G PPP Phase 1 Golden Nuggets

5G Spectrum  
Requirements,  
Evaluation and  
Candidate Bands

5G Performance  
Evaluation  
Framework

5G System,  
Functional, Logical  
and Physical  
Architectures

5G Flexible RAN

5G Multi-Service  
Waveform

5G Massive Channel  
Access

5G Flexible  
Interference  
Mitigation and RRM

Technology Enablers  
for 5G RAN Platforms  
(HW & SW)

5G Integrated  
Transport Networks  
(FH/BH)

5G Network  
Management

Network Softwarization  
and Programmability  
integrating SDN and  
NFV Technologies

Flexible and Agile  
Service Deployment

E2E Orchestration in  
Single and Multi-  
Domains 5G  
Virtualized Networks

5G Networks Security  
and Integrity

Programmable  
Industrial Networks

Pre-Standardization Consensus

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# 5G PPP Pre-standardization Inputs

## 5G PPP Phase 1 main achievements:

- 5G System design & Evaluation aspects
- 5G Air interface innovations
- Network management & Security innovations
- Virtualization & Service deployment innovations

**5G PPP Projects are building pre-standards consensus** and provide contributions to standardization as well: the triad of eMBB, mMTC and URLLC was originally promoted by some first large EU projects.

## Numerous inputs to 3GPP were brought by 5G PPP Projects Phase 1:

- support for splitting of user plane & control plane
- support for slicing
- channel models used for evaluations
- scenarios and requirements
- subscriber privacy protection

# Phase 1 → Phase 2 Projects

Phase 1	Phase 2 follow up.
5G-Crosshaul	5G TRANSFORMER
5G-NORMA	5G-Monarch
5G-Xhaul	5G-PICTURE
SELFNET	SLICENET
Sesame	5G ESSENCE
SONATA	5GTANGO
EURO 5G	To-Euro-5G
FANTASTIC 5G	ONE5G

# Start of 5G PPP Phase 2

		2017							2018												2019												2020							
		June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39
ICT 7	CSA	To-Euro-5G																																						
ICT 7	CSA	Global 5G.org																																						
ICT 7	R&I	5G Car																																						
ICT 7	R&I	5G ESSENCE																																						
ICT 7	R&I	5G TRANSFORMER																																						
ICT 7	R&I	5G-Monarch																																						
ICT 7	R&I	5G-PICTURE																																						
ICT 7	R&I	5G-Xcast																																						
ICT 7	R&I	BlueSpace																																						
ICT 7	R&I	IoRL																																						
ICT 7	R&I	METRO-HAUL																																						
ICT 7	R&I	NRG-5																																						
ICT 7	R&I	ONE5G																																						
ICT 7	R&I	SAT5G																																						
ICT 7	R&I	SLICENET																																						
ICT 8	I	5G-MEDIA																																						
ICT 8	I	5G-PHOS																																						
ICT 8	I	5GTANGO																																						
ICT 8	I	MATILDA																																						
ICT 8	I	NGPaaS																																						
ICT 8	I	5G-Cities																																						

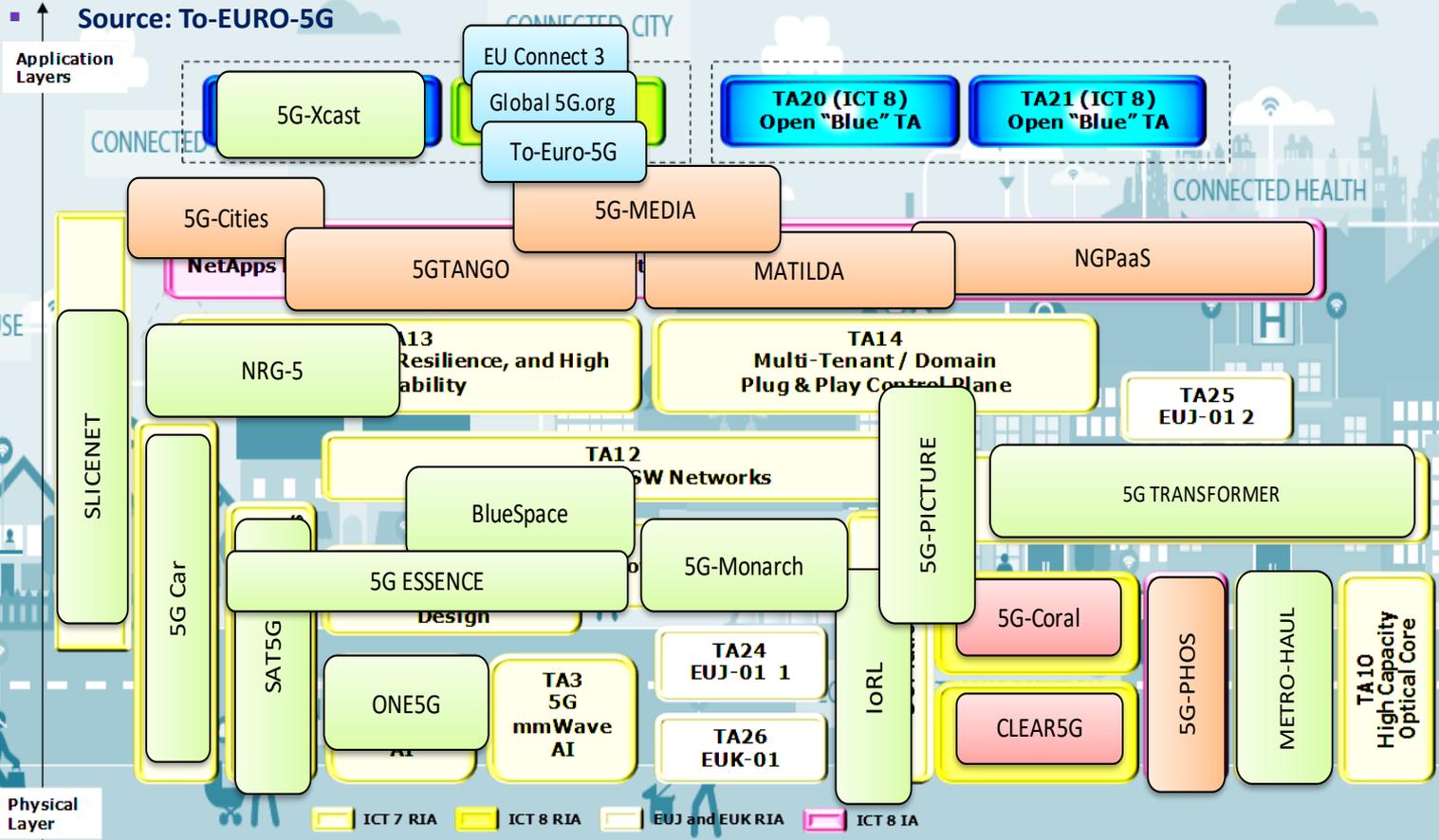
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# 5G Infrastructure PPP Phase 2 Projects Draft Cartography



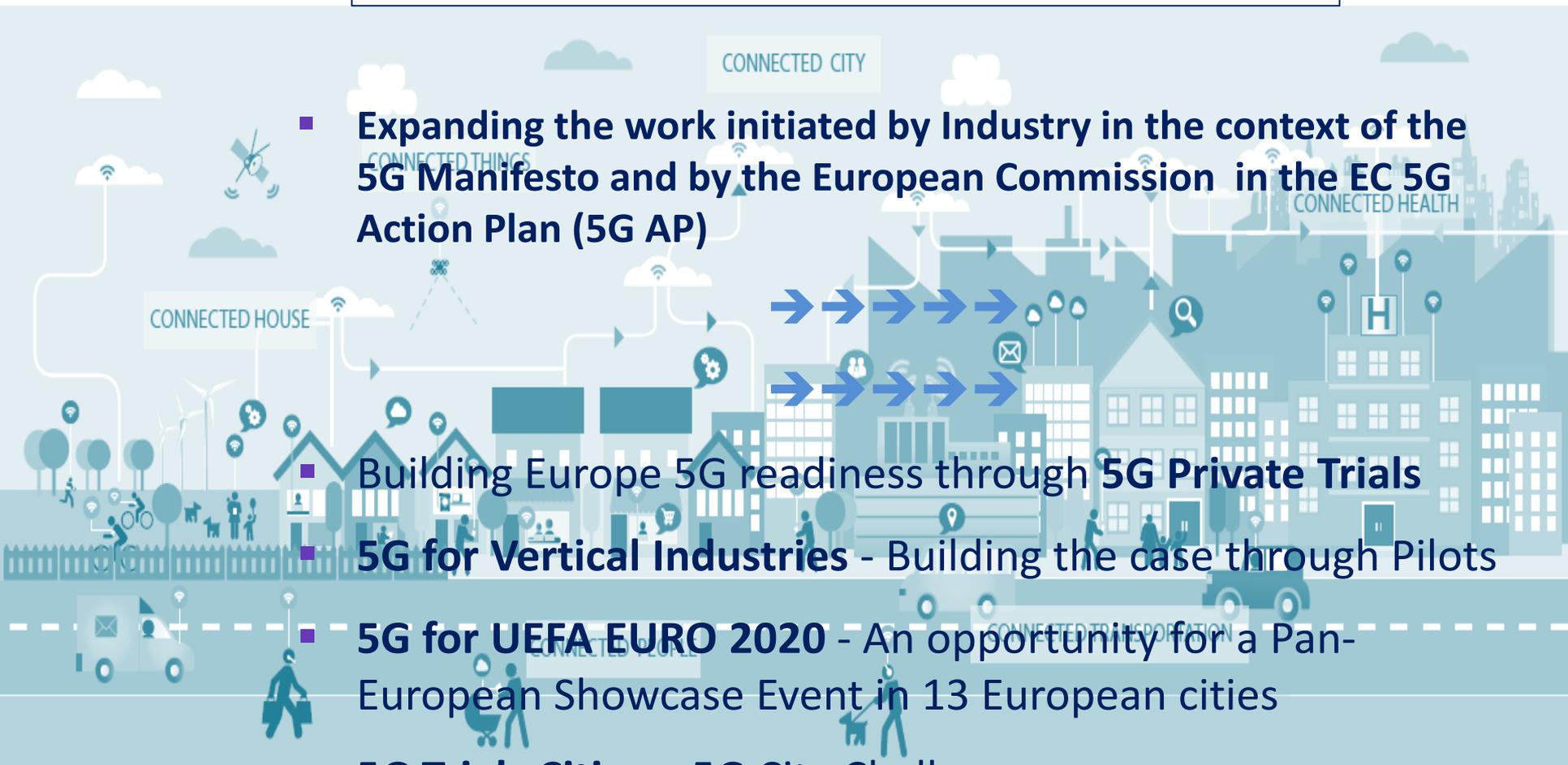
Note: The size and the orientation of the TAs boxes do not indicate the potential size or manpower of future Projects

# Phase 2 selection learnings

- **Very good coverage of the work programme**, as defined by the 5G-IA pre-structuring model (Targeted Actions)
- **Leveraging on Phase 1 results** and clear move towards software and cloud networks (RAN & CN)
- **Effective inclusion of Verticals**: automotive, healthcare, energy, media...
- **New stakeholders and domains** (satellite, optical)
- **Strong potential to drive Europe towards 5G trials and demo** paving the way towards implementation
- **SME presence** now above the 20% target

# 5G Pan-EU Trials Roadmap Version 1.0

## Four Main Pillars

- 
- The background is a stylized illustration of a city with various buildings, houses, and people. It includes icons for a satellite, a house, a car, a person with a stroller, and a hospital. Text labels like 'CONNECTED CITY', 'CONNECTED HOUSE', 'CONNECTED THINGS', 'CONNECTED PEOPLE', and 'CONNECTED HEALTH' are scattered throughout. Blue arrows point from left to right across the middle of the illustration.
- Expanding the work initiated by Industry in the context of the 5G Manifesto and by the European Commission in the EC 5G Action Plan (5G AP)
  - Building Europe 5G readiness through **5G Private Trials**
  - **5G for Vertical Industries** - Building the case through Pilots
  - **5G for UEFA EURO 2020** - An opportunity for a Pan-European Showcase Event in 13 European cities
  - **5G Trials Cities** – 5G City Challenge

# MID-TERM 5G PPP REVIEW



## EUROPEAN COMMISSION

DIRECTORATE-GENERAL FOR RESEARCH & INNOVATION  
Directorate D - Industrial Technologies  
**D2. Advanced Manufacturing Systems and Biotechnologies**  
The Head of Unit

Brussels,  
RTD-D2/JT/GW

**Subject: Data reporting of the cPPPs to the mid-term review and annual monitoring exercise 2016**

### INDICATIVE TIMELINE FOR THE MID-TERM REVIEW

The Commission intends to appoint a Group of Experts under its revised Work Programme 2016/2017. Subject to the opinion of this group, the indicative timeline for the mid-term review of all the cPPPs would be as follows:

- |                |   |
|----------------|---|
| April 2017     | Appointment and first meeting of the expert group   |
| Mid May 2017   | Reception of the annual progress monitoring reports from all the cPPPs.                     |
| September 2017 | Final report from the expert group  |
| October 2017   | Public discussion of the findings of the Group of Experts at a major conference in Brussels |

# EUCNC 2017 - Oulu



**Successful edition of EUCNC 2017** in June 2017, with more than 650 participants, where many 5G PPP Phase 1 projects had a booth in the exhibition area and participated in various workshops, whereas 5G-IA Representatives delivered presentations on topics such as spectrum, connected cars, security and 5G PPP collaboration.

- EUCNC 2017 was the occasion of the **official launch of the 5G PPP Phase 2 Projects**, with the presentations by each of the 23 new projects,

# Global 5G Events & MoU



✉ Signing Ceremony in the 3rd Global 5G Event on 24 May 2017, Tokyo

## Multilateral MoU include:

- 5G Forum (Korea),
- 5G Americas (Americas),
- IMT-2020 Promotion Group (China),
- 5G-IA (Europe)
- 5GMF (Japan),
- Telebrasil – Projeto “5G Brasil” (Brazil)

To promote 5G globally as it approaches 2020.

# H2 2017 main events

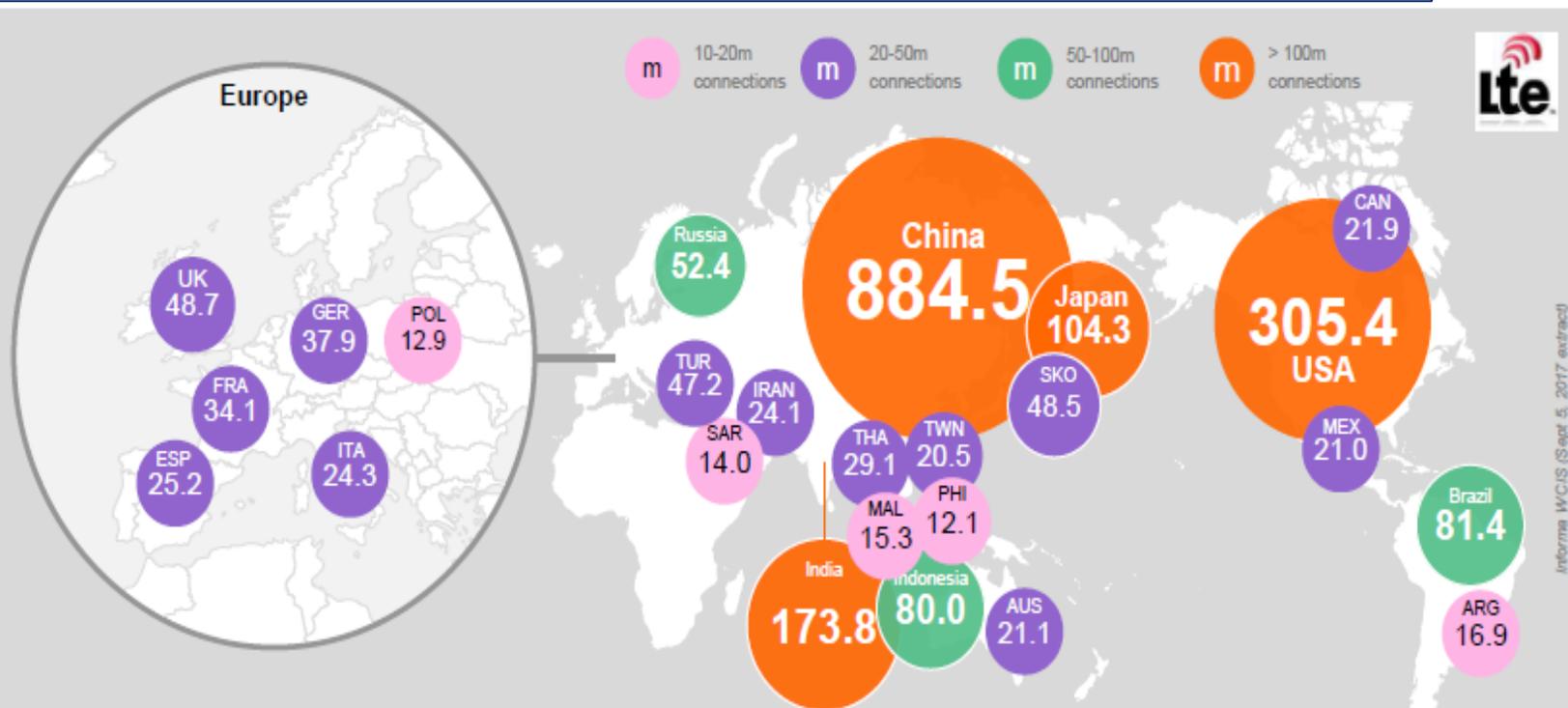
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- **EU – China 5G Development Workshop**, 12 July 2017, Brussels,
  - **Futurecom 2017**, 2-5 October 2017, Sao Paulo
  - **ITU-R IMT-2020 Workshop**, 4 October 2017, Munich
  - **5G PPP Phase 3 Info Days**, 17 October, Ljubliana, and 9-10 November, Budapest
  - **5G Week 2017, Fokus Fuseco Forum**, 9-10 November 2017, Berlin
  - **4th Global 5G Event**, 22-24 November, Seoul

# 2018 expected main events

- 
- The background is a light blue illustration of a city with various buildings, houses, and people. It is overlaid with a network of white lines and icons representing connectivity. Labels like 'CONNECTED CITY', 'CONNECTED THINGS', 'CONNECTED HOUSE', 'CONNECTED HEALTH', 'CONNECTED PEOPLE', and 'CONNECTED TRANSPORTATION' are scattered throughout the scene. Icons include Wi-Fi symbols, a satellite, a house, a hospital, a car, a person with a briefcase, and a person with a dog.
- **MWC 2018**, 26 February – 1st March 2018, Barcelona
  - **5th 5G Global Event** (in conjunction with 5G World North America), 16-17 May 2018, Austin (USA)
  - **5G World Congress**, 10-11 April 2018, London
  - **EUCNC 2018**, June 2018, Ljubliana, Slovenia
  - **6th Global 5G Event** (in conjunction with Futurecom 2018), October 2018, Sao Paulo

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# Top 4G LTE Countries @ 30 June 2017



Informe WCIS (Sept 5, 2017 extract)

### 4G USAGE

**67%**

LTE networks account for 67% of mobile data traffic today (ABI Research). The figure is 50% globally for Telefonica, 82% at Telekom HU, 84% at Orange BE (+12pts YoY in Q2 2017).

### 4G SUBS

**2.36bn**



### 4G CHINA

**630m**

China Mobile, which has already recruited 59m 4G subs in 1H 2017 want to add a further 41m this year to reach 630m 4G TD-LTE subs at year-end. (China Mobile, Aug 15, 2017)

### TD-LTE

**628m**

TD-LTE connections worldwide @30 June 2016 (mostly in China), equivalent to nearly one in three 4G subs worldwide. (GSMA Intelligence, Sep 5 2017)

### LTE-A

**190**

LTE operators worldwide have already launched LTE-A as of Sep 2017 and 43 have also launched LTE-A Pro (GSMA Intelligence, Sep 5, 2017)

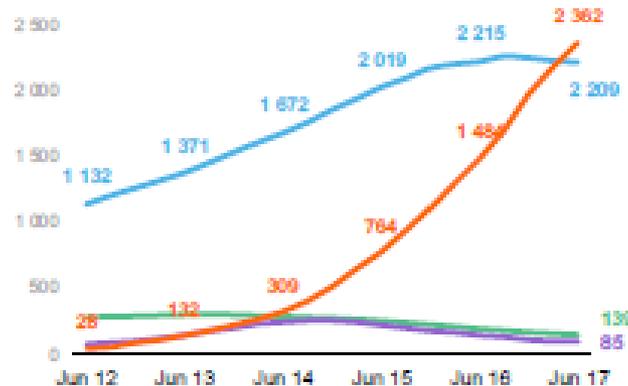
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# The race is now on for Gigabit LTE...

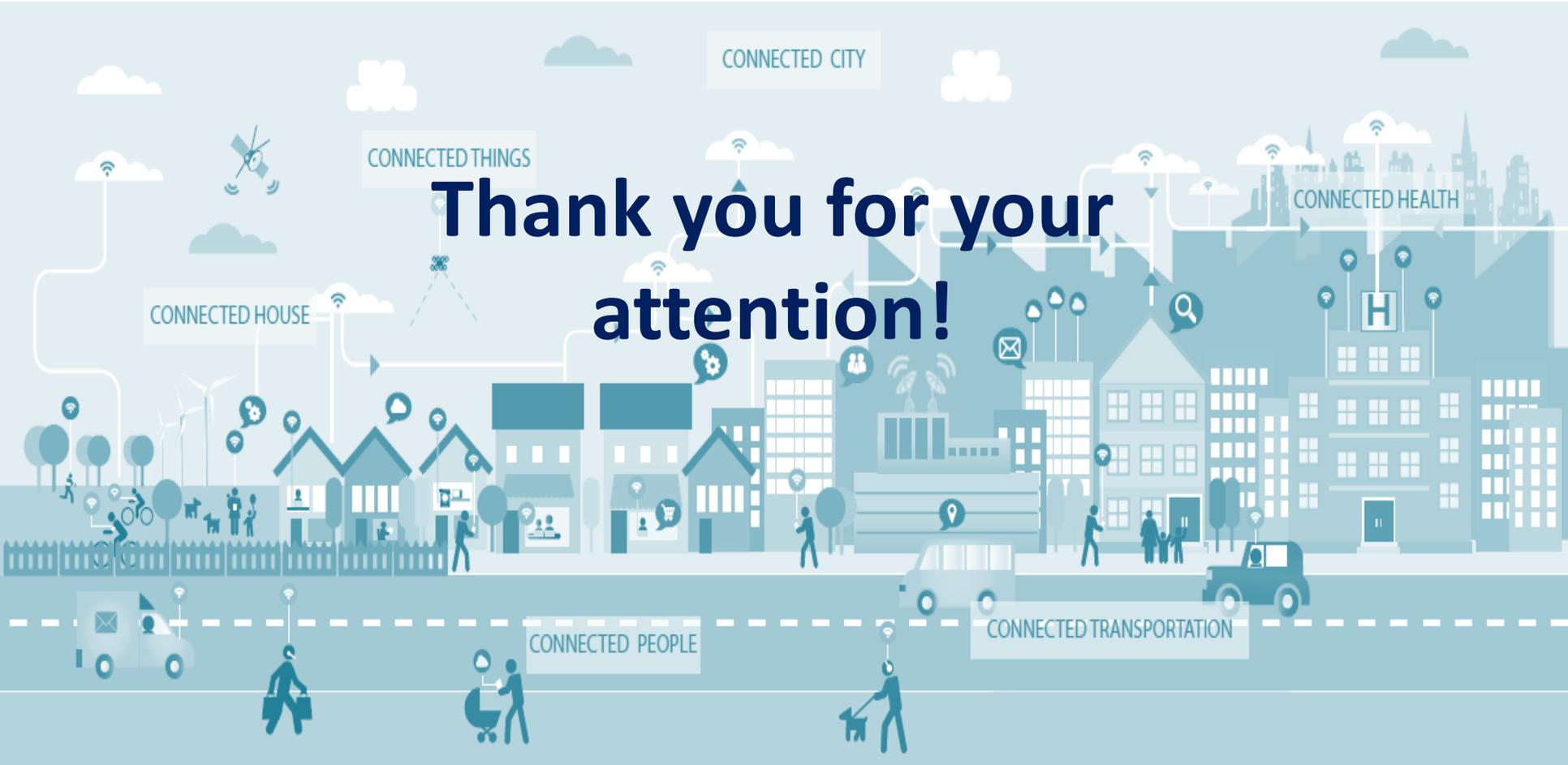
Total 3G/4G subscribers @30 June 2017

TOTAL 3G/4G	W-CDMA/HSPA	YoY growth	weigh(Mobil)
4.794bn +19.4% YoY	2208.6m	-0.3%	46.1%
	EV-DO	YoY growth	
	139.2m	-24.3%	
TOTAL MOBILE	TD-SCDMA	YoY growth	
7.803bn	84.8m	-36%	
3G/4G PENET.	LTE	YoY growth	weigh(Mobil)
61.4%	2362.0m	+59%	49.3%



- LTE-A is now mainstream: 190+ cellcos in 100 countries
- LTE-A Pro is gradually coming to the market: Telstra first commercial Gigabit LTE network in Jan 2017 with 4CA + 4x4 MIMO antennas;
- LTE-U/LAA enters the Gigabit fray with US and European players

- **Europe's vision for 5G is very ambitious**, aiming at a deep ecosystem transformation with vertical industries and disruptive applications
- **5G will be a full connectivity platform**, and not only an improved air interface, even aggregated with other technologies
  - ➔ *Deutsche Telekom*: « WE NEED A JOINT INDUSTRY PUSH FOR A MUCH MORE INNOVATIVE 5G SYSTEM ARCHITECTURE IN ORDER TO BE ABLE TO DELIVER ON THE 5G VISION ! » (EUCNC, June 2017)
- Let's implement 5G PPP Phase 2 projects, prepare Phase 3, towards **5G full commercial deployments and 5G Evolution...**



**Thank you for your attention!**

**3GPP-PCG#39 & OP#38**

**28-29 September 2017, Vienna**