

The background is a light blue illustration of a smart city. It includes various icons and labels: 'CONNECTED CITY' at the top, 'CONNECTED THINGS' on the left, 'CONNECTED HEALTH' on the right, 'CONNECTED HOUSE' on the left, 'CONNECTED PEOPLE' at the bottom, and 'CONNECTED TRANSPORTATION' at the bottom. The scene depicts buildings, houses, a hospital, a car, a person with a shopping bag, a person with a stroller, and a person with a dog, all connected by a network of lines and Wi-Fi symbols.

The 5G Infrastructure Association

5G Pan-European Trials Roadmap

PSCE

Madrid, 28th of Nov. 2017

Emmanuel Dotaro, Thales, 5G-IA Board Member

5G PPP Contractual Arrangement KPIs



• **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:

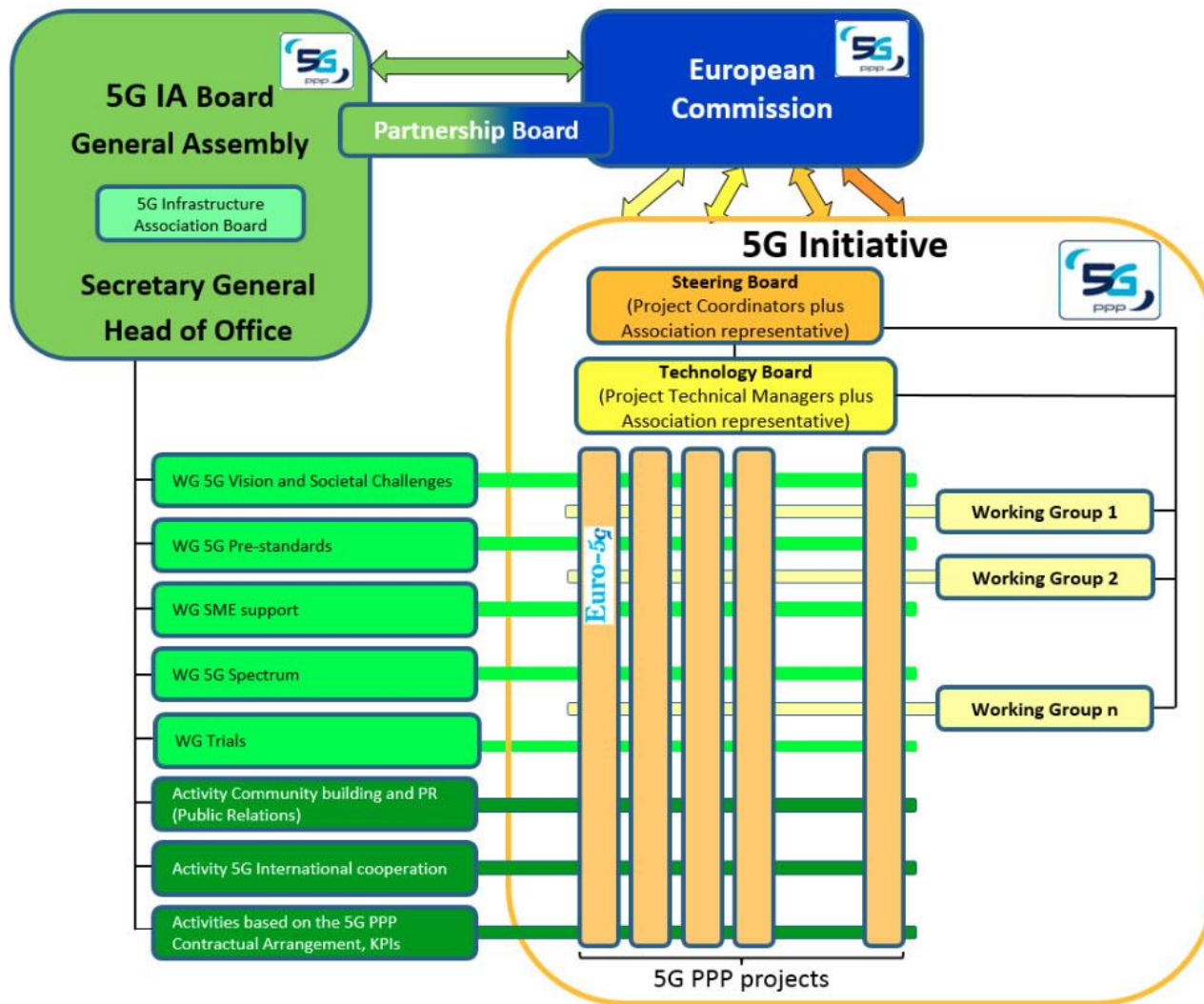
- Enabling advanced User controlled privacy;
- Reduction of energy consumption per service up to 90 % (vs 2010);
- European availability of a competitive offer for 5G systems and technologies;
- New economically-viable services of high societal value like U-HDTV and M2M applications;
- Development & availability of 5G skills curricula in partnership with the EIT.

Source: 5G PPP Contractual Arrangement.

5G PPP Overall Governance

5G PPP

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



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
- WG Security
- Activity Community building and PR (Public Relations)
- Activity 5G International cooperation
- Follow-up of the 5G PPP Contractual Arrangement, KPIs
- IMT-2020 Evaluation, launched in October 2017

5G PPP projects launched **technology-oriented Working Groups**

- WG Architecture
- Use cases and performance evaluation models
- Software Networks (SDN and NFV)
- Network Management, QoS
- 5G Automotive (V2X,...), launched in July 2017

« 5G Innovations for new business opportunities »

- **Standardization** is essential for realizing 5G promises
- **Spectrum availability** is key for 5G deployments
- **Cost-efficient deployment** strategies are needed
- **New business opportunities** are expected to emerge from 5G, enabled by 5G PPP innovations



5G PPP

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5G Action Plan Context

5G Pan-EU Trials Roadmap Version 2.0

Context and Objectives

- 5G Pan-European Trials Roadmap Version 2.0 and related actions towards implementation (November 2017)
- Trials Roadmap worked out by 5G Infrastructure Association (5G-IA) Trials Working Group (open membership) expanding the work initiated by Industry in the context of the 5G Manifesto (July 2016) and by EC in the EC 5G Action Plan (September 2016)
- Roadmap Version 2.0 implementing the Roadmap Strategy introduced in MWC 2017 (February 2017) and further expanding the Roadmap Version 1.0 (May 2017)
- Main objectives of the Roadmap:
 - Support global European leadership in 5G technology, 5G networks deployment and profitable 5G business
 - Validate benefits of 5G to vertical sectors, public sector, businesses and consumers
 - Initiate a clear path to successful and timely 5G deployment
 - Expand commercial trials and demonstrations as well as national initiatives

5G Pan-EU Trials Roadmap Version 2.0

Main Pillars

- 5G Pan-EU Trials Strategy and Roadmap
- Building Europe 5G Readiness through 5G Private Trials
- 5G Platforms – Key Component of 5G developments
- 5G for Vertical Industries – Building the Case through Pilots Projects
- 5G for UEFA EURO 2020 – An Opportunity for a Pan-EU Showcase Event
- 5G Trials Cities

Trials WG Members organizations contributing to the Trials Roadmap Strategy

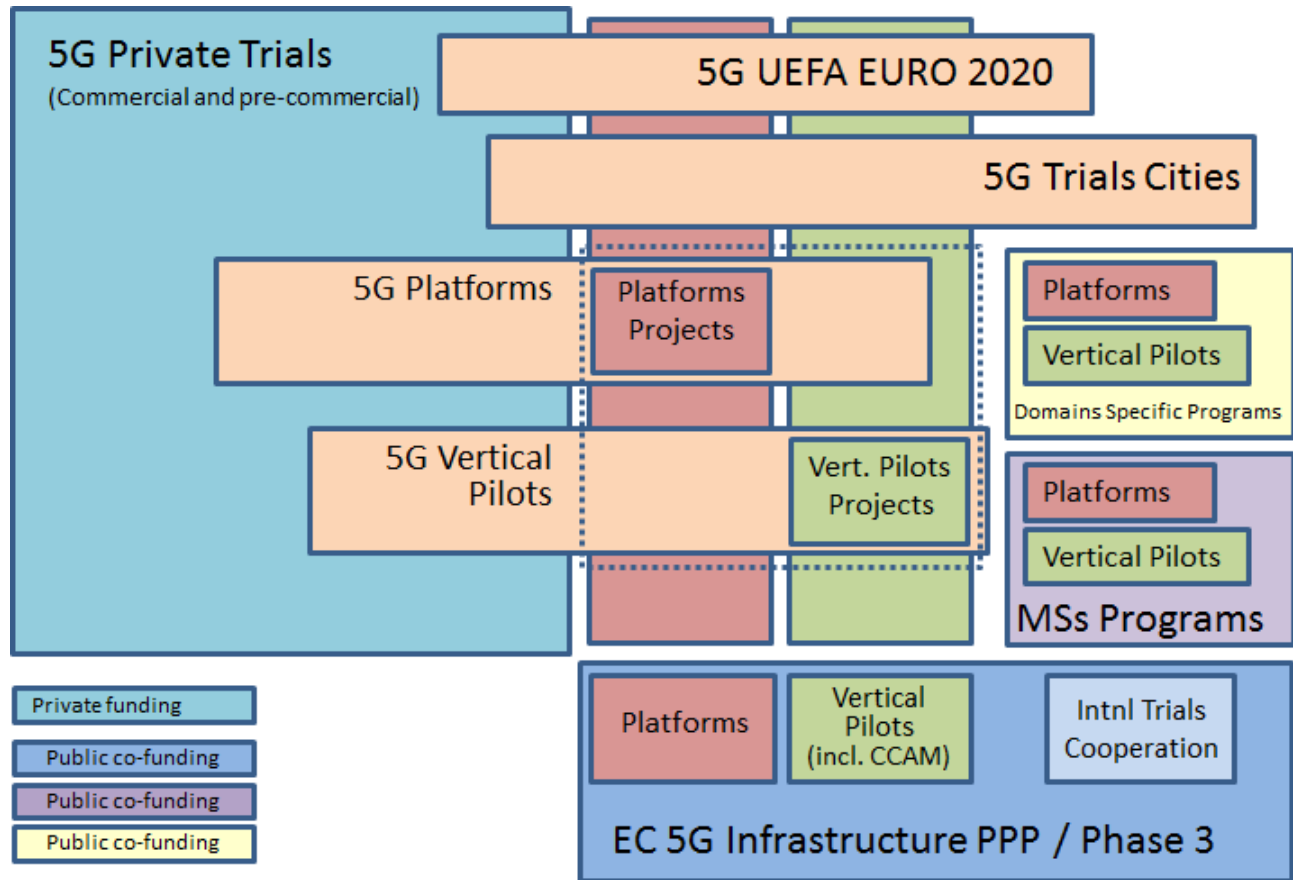
ABB, ADVA Optical Networking, Ahlers, Airbus, Altice Labs, Atos, Avanti Communications Group plc, BMW, Bosch, BT, Deutsche Telekom, DOCOMO Communications Laboratories Europe, Engineering, Ericsson, Eurescom, Eutelsat, Fiat, Huawei Technologies, IBM Research, IDATE, Indra Sistemas, Inmarsat, Intel Mobile Communications, KPN, Leonardo, LiveU, Mitsubishi Electric R&D Centre Europe, NEC Laboratories Europe, Netaş Telecommunication, Nokia, Orange, Philips, Proximus, QinetiQ, Samsung Electronics Research Institute, SES, Siemens, Telecom Italia, Telefónica I+D, Telenor, Tele2, Telespazio, Telia Company, Thales Alenia Space, Thales Communications & Security, Trenitalia, Turk Telekomünikasyon, Vodafone, ZTE Wistron Telecom, European Broadcasting Union (EBU), ECTA, ETNO, T-REGS, AICO Software, AMBEENT WIRELESS YAZILIM, CityPassenger, Ingeniería y Soluciones Informáticas, Integrasys, InterInnov, M.B.I., Nextworks, Quobis, Sequans Communications, WINGS ICT Solutions, CEA-LETI, Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), DLR (German Aerospace Center), Fraunhofer Gesellschaft zur Foerderung der angewandten Forschung e. V., Fundacion IMDEA Networks, IMEC, Institut Mines-Télécom, Instituto de Telecomunicações, IRT, TNO, Universidad de Málaga, Universidad Politecnica de Madrid, Universitat Politècnica de Catalunya, University of Bologna, University of Oulu/CWC, University of Patras, VTT Technical Research Centre of Finland, Universidad Carlos III de Madrid.

https://5g-ppp.eu/wp-content/uploads/2017/05/5GInfraPPP_TrialsWG_Roadmap_Version2.0.pdf

5G Pan-EU Trials Roadmap Version 2.0

Roadmap Strategy

- Pan-European Trials Roadmap – Roadmap Strategy

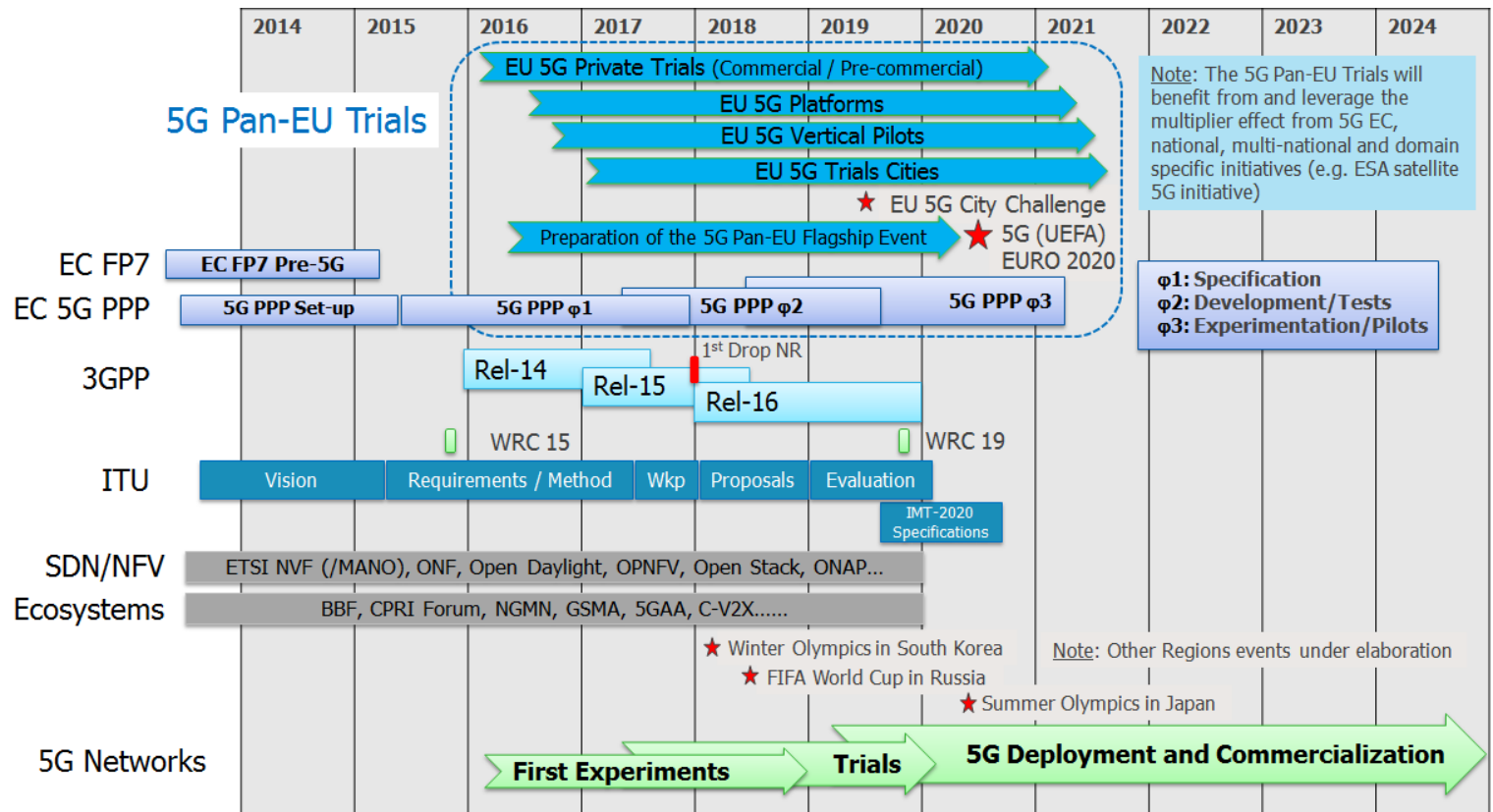


https://5g-ppp.eu/wp-content/uploads/2017/05/5GInfraPPP_TrialsWG_Roadmap_Version2.0.pdf

5G Pan-EU Trials Roadmap Version 2.0

Roadmap Time Plan

- Pan-European Trials Roadmap – Roadmap Time Plan



https://5g-ppp.eu/wp-content/uploads/2017/05/5GInfraPPP_TrialsWG_Roadmap_Version2.0.pdf

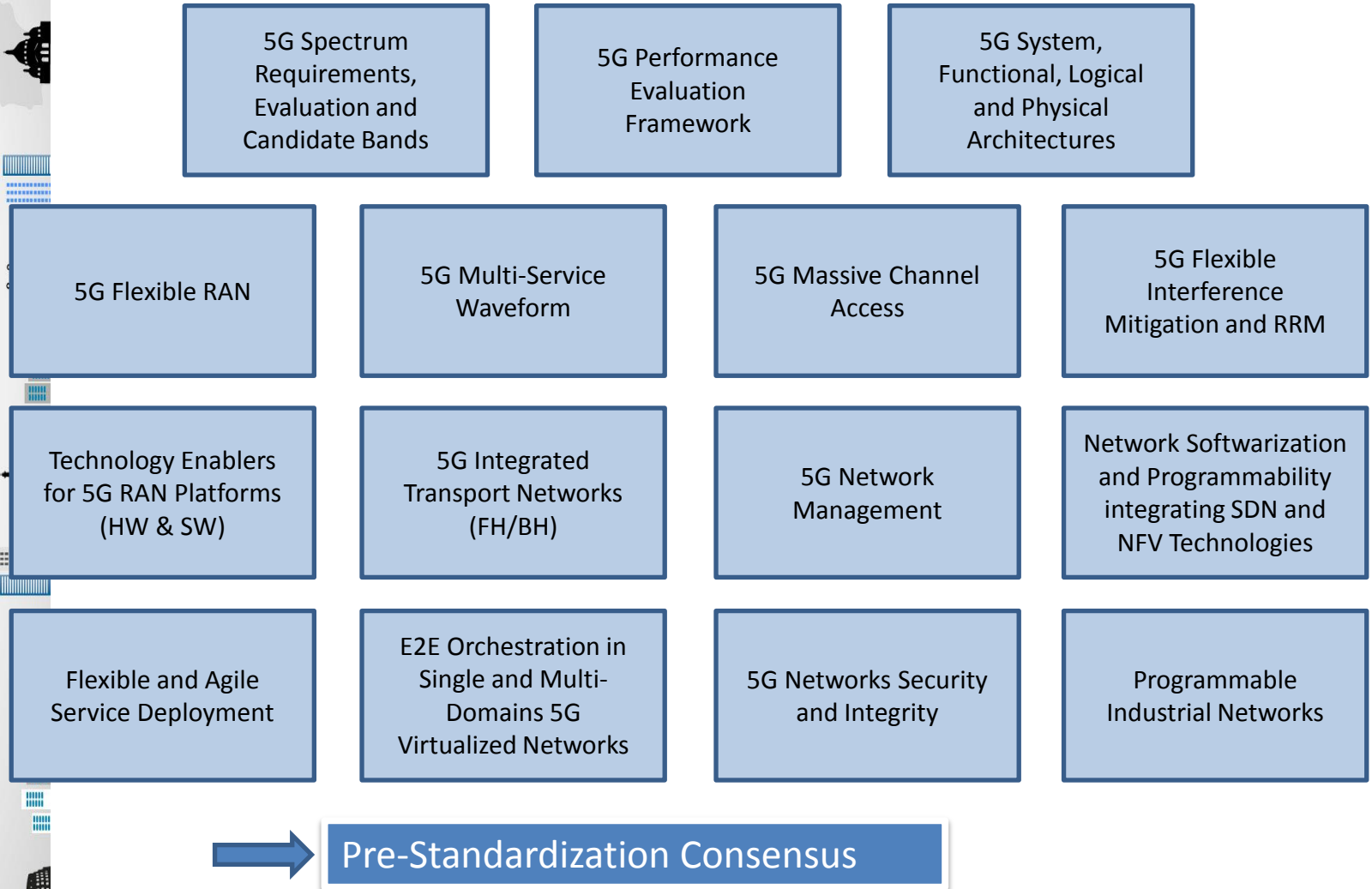
5G PPP

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5G PPP Projects & Phases

5G PPP Phase 1 Golden Nuggets

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Horizon 2020 5G PPP

Call 2 selected projects – 06.2017 – 11.2019 (08.2020)

- Radio-related cluster
- Fronthaul/Backhaul
- SDN, NFV, Cloud and Virtualisation
- Optical networks and technology
- Network automation
- Security, privacy, resilience, availability
- Platforms

Most projects are cooperating with vertical use cases

5GCity 5G CITY
 Distributed multi-tenant cloud and radio platform for municipalities and infrastructure owners acting as 5G neutral hosts

5G MEDIA 5G MEDIA
 Programmable edge-to-cloud virtualization fabric for the 5G Media industry

MATILDA
 A holistic, innovative framework for the design, development and orchestration of 5G-ready applications and network services over sliced programmable infrastructures

5G Xcast 5G Xcast
 Broadcast and Multicast Communication Enablers for the Fifth Generation of Wireless Systems

5Gtango 5G TANGO
 5G Development and Validation Platform for global Industry-specific Network Services and Apps

SLICENET
 End-to-End Cognitive Network Slicing and Slice Management Framework in Virtualised Multi-Domain, Multi-Tenant 5G Networks

NRG5 NRG-5
 Enabling Smart Energy as a Service via 5G Mobile Network advances

IoRL
 Internet of Radio-Light in Buildings

METRO-HAUL
 METRO High bandwidth, 5G Application aware optical network, with edge storage, compUte and low Latency

5G phos 5G PHOS
 5G integrated Fiber-Wireless networks exploiting existing photonic technologies for high-density SDN-programmable network architectures

NGpaas PaaS
 Next Generation Platform as a Service (PaaS)

SPACE Bluespace
 Building on the Use of Spatial Multiplexing 5G Networks Infrastructures and Showcasing Advanced technologies and Networking Capabilities

5G CAR
 Fifth Generation Communication Automotive Research and Innovation for e2e V2X connectivity and multi-RAT interworking

5G TRANSFORMER 5G Transformer
 5G Mobile Transport Platform for Verticals

5G PICTURE 5G PICTURE
 5G Programmable Infrastructure Converging disaggregated network and compUte Resources

CLEAR5G
 Converged wireless access for reliable 5G MTC for factories of the future (Machine type communications)

5G-MONARCH 5G MoNArch
 5G Mobile Network Architecture for diverse services, use cases, and applications in 5G and beyond

ONE5G
 E2E-aware Optimizations and advancements for the Network Edge of 5G New Radio

SAT 5G
 Satellite and Terrestrial network for 5G for integration of satellite and terrestrial systems

5G ESSENCE 5G ESSENCE
 Embedded Network Services for 5G Experiences

5G-CORAL 5G-CORAL
 A 5G Convergent Virtualized Radio Access Network Living at the Edge

To-Euro-5G
 Supporting the 5G-PPP especially 5G Initiative governance

Global5G.org
 Global vision, standardisation and stakeholder engagement in 5G

27/11/2017

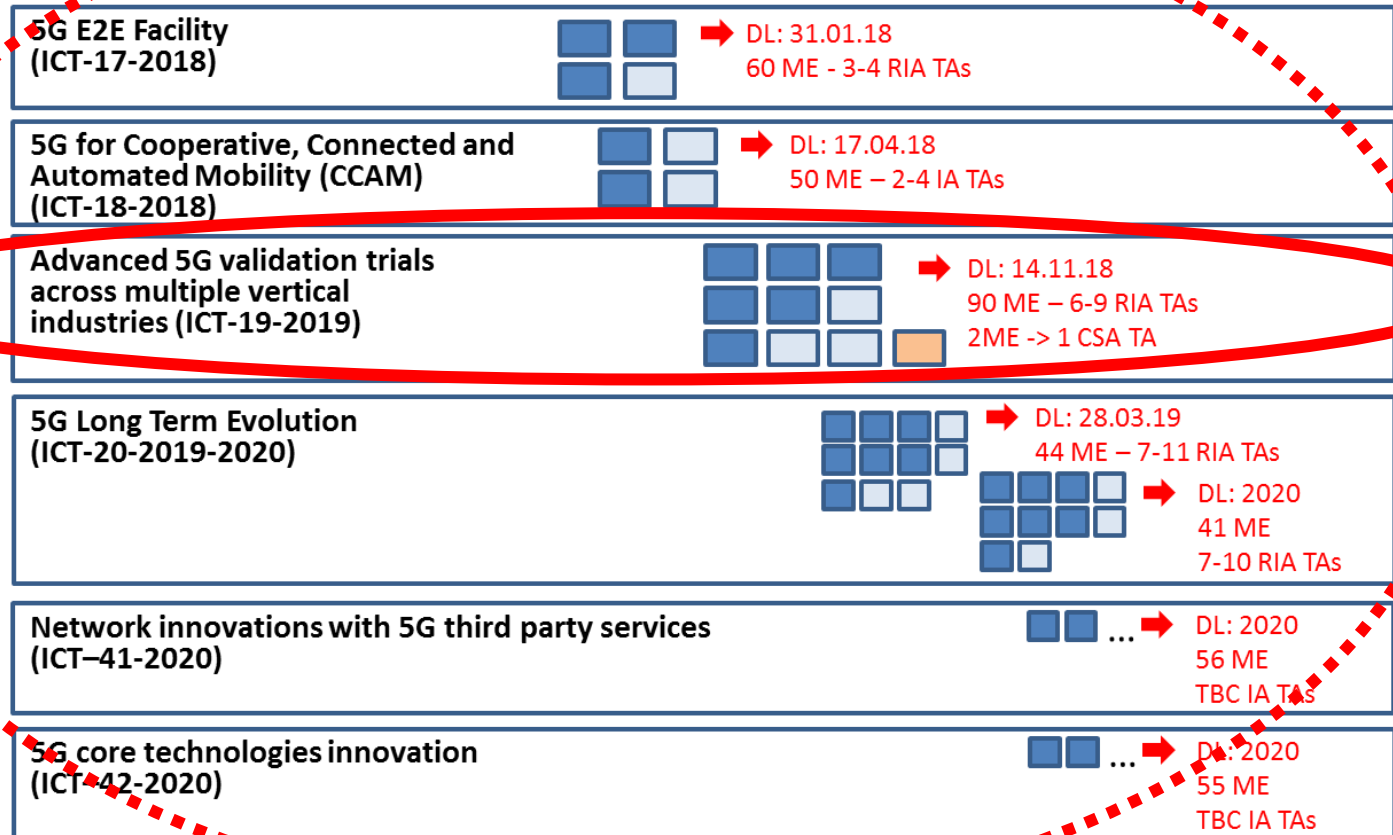
H2020 5G Infrastructure PPP

Phase 3(.I) PSM Scope & Coverage (1/3)

- Phase 3(.I) PSM addressing the following EC WP2018-20 5G Infrastructure PPP Strategic Objectives, related to experimentation and trials (http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-leit-ict_en.pdf)
 - ICT-17-2018: 5G End-to-End Facility (RIA)
 - ICT-18-2018: 5G for Cooperative, Connected and Automated Mobility (CCAM) (IA)
 - ▪ ICT-19-2019: Advanced 5G validation trials across multiple vertical industries (RIA *and* CSA)
 - ICT-21-2018: EU-US Collaboration for advanced wireless platforms (CSA)
 - ICT-22-2018: EU-China 5G Collaboration (RIA)
 - EUJ-02-2018: 5G and beyond (RIA)
 - EUK-02-2018: 5G (RIA)
- The following Strategic objectives will be addressed by the Phase 3(.II) PSM (targeted in February 2018)
 - ICT-20-2019-2020: 5G Long Term Evolution
 - ICT-41-2020: Network innovations with 5G third party services
 - ICT-42-2020: 5G core technologies innovation
 - ICT-23-2019: EU-Taiwan 5G Collaboration
 - ICT-43-2020: EU-Brazil 5G collaboration

H2020 5G Infrastructure PPP Phase 3(.1) PSM Scope & Coverage (2/3)

- EC H2020 5G Infrastructure PPP Phase 3 – Strategic Objectives (1/2)



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H2020 5G Infrastructure PPP Phase 3(.I) PSM Scope & Coverage (3/3)

- EC H2020 5G Infrastructure PPP Phase 3 – Strategic Objectives (2/2)


EU-US Collaboration for advanced wireless platforms (ICT-21-2018)

 → DL: 17.04.18
2 ME – 1 CSA

EU-China 5G Collaboration (ICT-22-2018)

 → DL: 31.01.18
6 ME – 1 RIA TA

EU-Taiwan 5G Collaboration (ICT-23-2019)

 → DL: 15.01.19
4 ME – 2 RIA TAs

5G and beyond (EUJ-02-2018)

 → DL: 31.01.18
6 ME – 4 RIA TAs

5G (EUK-02-2018)

 → DL: 31.01.18
4 ME – 2 RIA TAs

EU-Brazil 5G collaboration (ICT-43-2020)

 → DL: 2020
1 ME – 1 RIA TA

2018

2019

2020

5G Pan-EU Trials Roadmap Version 2.0 Vertical Pilots (Highlights)

- Structure to support developing concrete 5G Verticals Pilots plans, including 5 Verticals Clusters for Trials and Pilots
 - Smart City cluster embracing Public administration, Tourism, Assisted living, People mobility and Residential energy management and provisioning
 - Consumer and Professional Services cluster embracing Media & Entertainment (B2C, B2B2C), Personal communications, Emergency communications, Smart buildings, Smart health and On the move services
 - Industry Cluster embracing Factory and process automation, Energy, Logistics/Transport and Farming technology
 - Digital Health (eHealth) cluster embracing Smart pharmaceuticals, Smart pharmaceuticals augmented with supply chain and cost clearing and Medical emergency management
 - Public Safety & Digital divide resorption embracing Rapid disaster response, Public event management, Critical asset protection and Remote area coverage



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More...

5G Pan-EU Trials Roadmap Version 2.0

5G Private Trials (Highlights) (1/2)

5G Private Trials (Fall 2017 Highlights)

MEDIA | 10-12-2017 | MARION KESSING | 1 COMMENT

Europe's first 5G antennas are transmitting in Berlin

<https://www.telekom.com/en/media/media-information/archive/europes-first-5g-antennas-are-transmitting-in-berlin-505686>

Vodafone Portugal 5G tests achieve speeds of 20 Gbps

Thursday 5 October 2017 | 21:32 CET | News

<https://www.telecompaper.com/news/vodafone-portugal-5g-tests-achieve-speeds-of-20-gbps--1214817>

Tele2 Latvia builds 5G-ready base stations

Monday 16 October 2017 | 13:28 CET | News

Mobile operator Tele2 Latvia has deployed its first 5G-ready base stations. The Nokia AirScale Radio Access equipment has been installed on base stations in the settlements of Ziepniekkalna and Talsi. The equipment will be ready to provide broadband at up to 1 Gbps in the near future, and up to 28 Gbps is expected to be available after the launch of 5G services.

<https://www.telecompaper.com/news/tele2-latvia-builds-5g-ready-base-stations--1216101>

Telenor Norway to launch 5G testing in Kongsberg next year

13 NOVEMBER 2017

<https://www.mobileeurope.co.uk/press-wire/telenor-norway-to-launch-5g-testing-in-kongsberg-next-year>

TIM, Fastweb and Huawei: together for the "Bari Matera 5G" project

Investment of 60 million euros in 4 years to test 5G and new services from June 2018

Coverage of the two cities to be completed by 2019

Bari will be one of the first 4.0 ports in Italy, allowing better management of logistics and transport

In Matera, the 2019 European capital of culture, 3D reconstruction of archaeological sites and museums

<http://www.telecomitalia.com/tit/en/archivio/media/comunicati-stampa/telecom-italia/mercato/business/2017/PR-Progetto-Bari-Matera-5G-8-11-2017-EN.html>

Orange Spain hits 15GBps in 5G demonstration

27 SEPTEMBER 2017

<https://www.mobileeurope.co.uk/press-wire/orange-spain-hits-15gbps-in-5g-demonstration>

News |

Ericsson and Magyar Telekom demonstrate first 5G link in Hungary

Oct 19, 2017

<https://www.ericsson.com/en/news/2017/10/ericsson-and-magyar-telekom-demonstrate-first-5g-link-in-hungary>

5G Pan-EU Trials Roadmap Version 2.0

5G Private Trials (Highlights)

- The 5G-IA Trials WG developing connections with the NGMN 5G Trial & Testing Initiative (TTI), launched in June 2016

NGMN is Leading the Way to a Healthy 5G Ecosystem - 5G Trial and Testing Initiative Frankfurt, Germany - 14th November 2017

The Next Generation Mobile Networks (NGMN) Alliance that has been shaping the industry of wireless communication for the past 12 years is determined to drive the industry towards a healthy 5G ecosystem. This year's NGMN Forum, which took place on 25th -26th , October 2017 in Seattle/US, demonstrated an encouraging convergence of the 5G technology, enabled by a strong spirit of co-operation of all NGMN Partners.

Among the many projects reported by NGMN, the **5G Trial and Testing Initiative (5G TTI)** attracted particularly broad attention. Since the approval of this project by the NGMN Board in June 2016, operators, vendors and researchers have been working together hand in hand on a framework in accordance with the 3GPP work schedule, to guide the technology from standard to market. Leveraging on the experience from the 4G development, the 5G TTI has the single goal of facilitating the maturity of the technology and assuring an early interoperability of the products. Given the significance of this initiative to the availability of the technology and the time-to-market, the project team has adopted a systematic and pragmatic approach, to address the following four important aspects relevant to 5G, carried out as four work streams:

<http://ngmn.org/news/ngmn-news-and-press-releases/ngmn-news-and-press-releases-details/article/ngmn-is-leading-the-way-to-a-healthy-5g-ecosystem-5g-trial-and-testing-initiative.html>

5G Pan-EU Trials Roadmap Version 2.0

5G Platforms (Highlights)

- 5G Platforms (Highlights)

5G TNF OVERVIEW PROJECTS 5THGEAR PROGRAMME NEWS & EVENTS CONTACTS

VISION
5G Test Network Finland enables Finland to provide the best and most appealing 5G test network environment and ecosystem in the world for research and business development.

MISSION
5G Test Network Finland coordinates the integration of the Finnish 5thGear testbeds and facilitates the cooperative creation of a joint open innovation platform for 5G technology and service development.

<http://sgtnf.fi/>

STONIC HOME ABOUT US RESEARCH PLATFORM NEWS SB INTRANET

GET INVOLVED
Be part of a rich open innovation ecosystem

[join us](#)

WELCOME TO STONIC
AN OPEN RESEARCH AND INNOVATION LABORATORY FOCUSING ON 5G TECHNOLOGIES
FOUNDED BY TELEFONICA AND IMDEA NETWORKS BASED IN MADRID.
The objective of STONIC is to create a global open environment where members from industry and academia work together in specific research and innovation projects related to 5G technologies with a view to boost technology and business innovative ventures. The laboratory will promote joint project development and entrepreneurial ventures, discussion fora, events and conference sites in an international environment.

<https://www.stonic.org/>

athens-5Glink
A LARGE-SCALE 5G TESTBED

[READ MORE](#)



<http://www.athens5glink.eu/>

5GBarcelona 5G City-Wide Field and Lab Trials
5G City-Wide Field and Lab Trials

5GBarcelona Contact Partners

5GBarcelona

Vision

5GBarcelona aims at offering an integrated metropolitan city-wide field and lab environment for 5G validation and experimentation.

<http://www.5gbarcelona.cat/>

5G Berlin

Vision & Features News & Events Research About us Partners

Welcome to the 5G Capital Berlin

Let's get you 5G ready!
Providing 5G-Access, 5G-Core & Xhaul Technologies in combination with SDN/NFV/MEC Service Platforms at a single location NOW

Partners

<http://www.5g-berlin.org/>

ESA BUSINESS APPLICATIONS LOGIN REGISTER

artes **esa**

HOME FUNDING PROJECTS CONTRACTORS

SATISS - DEMONSTRATOR FOR SATELLITE-TERRESTRIAL INTEGRATION IN THE 5G CONTEXT

SATiS5

System/ Network/ Protocols Core Competitiveness Advanced Technology

Status: Ongoing Last updated: 2017-11-06 00:00:00 Activity Code: 34.075

<https://artes.esa.int/projects/satis5>

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5G Pan-EU Trials Roadmap Version 2.0 Vertical Pilots (Highlights)

- Connected Cars is considered as one of the vertical priorities for a strategic 5G European roadmap
- EC policy on CCAM (<https://ec.europa.eu/digital-single-market/en/cooperative-connected-and-automated-mobility-Europe>)
 - EC, European Ministers and Industry agreed to work together on digital cross-border corridors and started mapping them
 - On 15.09.17, test sections included Metz-Merzig-Luxembourg, Rotterdam-Antwerp-Eindhoven, Porto-Vigo and Merida-Evora (corridor Lisbon – Madrid), the E8 "Aurora Borealis" corridor between Tromsø and Oulu and the "Nordic Way" between Sweden, Finland and Norway (<https://ec.europa.eu/digital-single-market/en/news/cooperative-connected-and-automated-mobility-stepping-efforts-Frankfurt>)
 - Further test sections might be added in the coming months to the set of test sections agreed among MS (e.g. Munich-Brenner-Bologna)

5G Pan-EU Trials Roadmap Version 2.0

Vertical Pilots (Highlights) (3/3)

- EC 5G Infrastructure PPP Phase 2 Projects – Vertical Trials

Vertical industry/ main focus	5G PPP project phase 2	Rationale: objective	Vertical company involved
Automotive		Autonomous cars	
Media & Entertainment		Immersive media to 8K, Ultra High Definition Television, Virtual/Augmented /Mixed Reality...	
		SDN and NFV concepts to media applications	
Energy		Smart Energy-as-a-Service	
Transport/logistics		Test beds in sea port and touristic city	
Dense urban area		Demonstration in three cities	Barcelona, Bristol and Lucca cities

<https://5g-ppp.eu/newsletter-10/>

5G Pan-EU Trials Roadmap Version 2.0

5G for UEFA EURO 2020 (Highlights)

- Target flagship event to get widespread media attention and serve as a milestone for industry, governments and the general public that 5G is coming now and is beneficial for individuals and society
- The UEFA EURO 2020 football championships will be played in 13 different cities in Europe (Glasgow, Dublin, Copenhagen, Budapest, Bucharest, Brussels, Bilbao, Amsterdam, Saint Petersburg, Rome, Munich, Baku and London)
- EURO 2020 acting as the “launching event” for 5G in Europe with a number of 5G services that will be trialed, incl. (among others) 5G Augmented and virtual reality applications, Automated transportation and Advanced public safety services
- In each of the cities a consortium is needed of local governments, playing stadiums, operators, infrastructure vendors and application providers
- A Pan-European steering committee will ensure a consistent coordination of trial objectives and implementation

5G Pan-EU Trials Roadmap Version 2.0

5G Trials Cities (Highlights)

- Specific cities in Europe already announced their plans to become 5G Trials Cities (not exhaustive list): Amsterdam, Barcelona, Bari, Berlin, Espoo, L'Aquila, London, Madrid, Malaga, Matera, Milan, Oulu, Patras, Prato, Stockholm, Tallinn and Turin
- In addition 5G Research & Innovation Programs running in several Members States, include the development of specific labs and platforms, generally anchored in specific cities
- In addition, Members States should communicate before end 2017, in the context of the 5GAP, the information on their 5G Pioneering city (or multiple cities) where 5G will be deployed in 2020
- These different actions clearly create a strong momentum on 5G from cities and countries perspectives
- Under the 5G Infrastructure PPP initiative, a "5G City Challenge" will be organized as a call for interest towards interested cities prepared to sign a 5G charter and aiming at supporting cooperation among the cities involved in 5G experimentation and trials