

「日・EU 5Gシンポジウム」結果

平成28年2月19日
事務局

「日・EU 5Gシンポジウム」結果

世界各国が2020年頃までの実現を目指して取り組みを進めている第5世代移動通信システム(5G)について、欧州と日本の大学、研究機関、産業界、政府等の関係者が一堂に会し、5Gの利用シーン、ロードマップ、無線とネットワークの最先端技術、周波数、標準化など、5Gに関する最新取組について意見交換等を実施。



〔日 時〕 2016年2月8日、10日

〔場 所〕 駐日欧州連合代表部（東京都港区）

〔主催等〕 総務省、駐日欧州連合代表部、
在日フランス大使館、5GPPP、5GMF

〔参加者〕 日本：総務省、5GMF、NTTドコモ、
KDDI、NTT、富士通、三菱電機 等
欧州：欧州委員会、5GPPP、エリクソン 等

（5GPPP）

- ・5GPPPでは、2014から2020年までの間、研究開発プロジェクトに7億ユーロを投資。フェーズ1（2015-2017）、フェーズ2（2017-2019）等の成果は、WRC-19準備プロセス、3GPPリリース14-16、実証実験等に適宜反映。
- ・5G利活用業界（Verticals）との連携を開始。「Mobile World Congress2016」において、5G利活用（Verticals）に関する白書を公表予定。ファクトリー、ヘルスケア、エネルギー、メディア・エンターテインメント、自動車の5分野について、分野毎に利用シーン、要求条件、開発分野をとりまとめ。

（欧州委員会）

- ・EUは、「多数接続（IoT）」及び「高信頼/低遅延」を重視。
- ・昨年5月、総務省との間で5Gに関する共同宣言に署名（韓国、中国政府との間でも同様の宣言に署名）。米国、ブラジルとの間での締結を模索。
- ・3GPPにおいて、5Gの利用事例（ユースケース）に関する議論が開始。適切な利用事例を定義することは非常に重要。
- ・5GPPPフェーズ2（2017-2019）：予算1億5,400万ユーロ（国際協力含む）、標準化、周波数、利活用業界（Verticals）を巻き込んだ実証を重視。2016年7月から日EU共同研究を開始。

（エリクソン）

- ・5Gは、「6GHz以下の既存帯域における進化したLTE」と「6GHz以上及び新たに割り当てられる6GHz以下の帯域に導入されるNew RAT」との組み合わせで実現。
- ・5Gでは、ネットワークの仮想化で1つの共通ネットワークであらゆるサービスに対応。
- ・15GHzに対応した5G実験装置について、今後、Massive MIMOやMU-MIMO等の技術も加えつつ、プレ商用実証に対応したシステムへ進化。
- ・ユースケースを想定した2つの実証プロジェクト（「5G for Sweden」、「5G for Europe」）を実施。



The 5G Infrastructure Public-Private Partnership

5G PPP research in relation to vertical sectors

Werner Mohr

Chair of the board of 5G Infrastructure Association

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

Outline



- ITU-R vision on IMT-2020 and beyond
- 5G PPP in Horizon 2020 of the European Union
- Support of vertical sectors
- Overall 5G architecture
- Time plan
- Conclusions

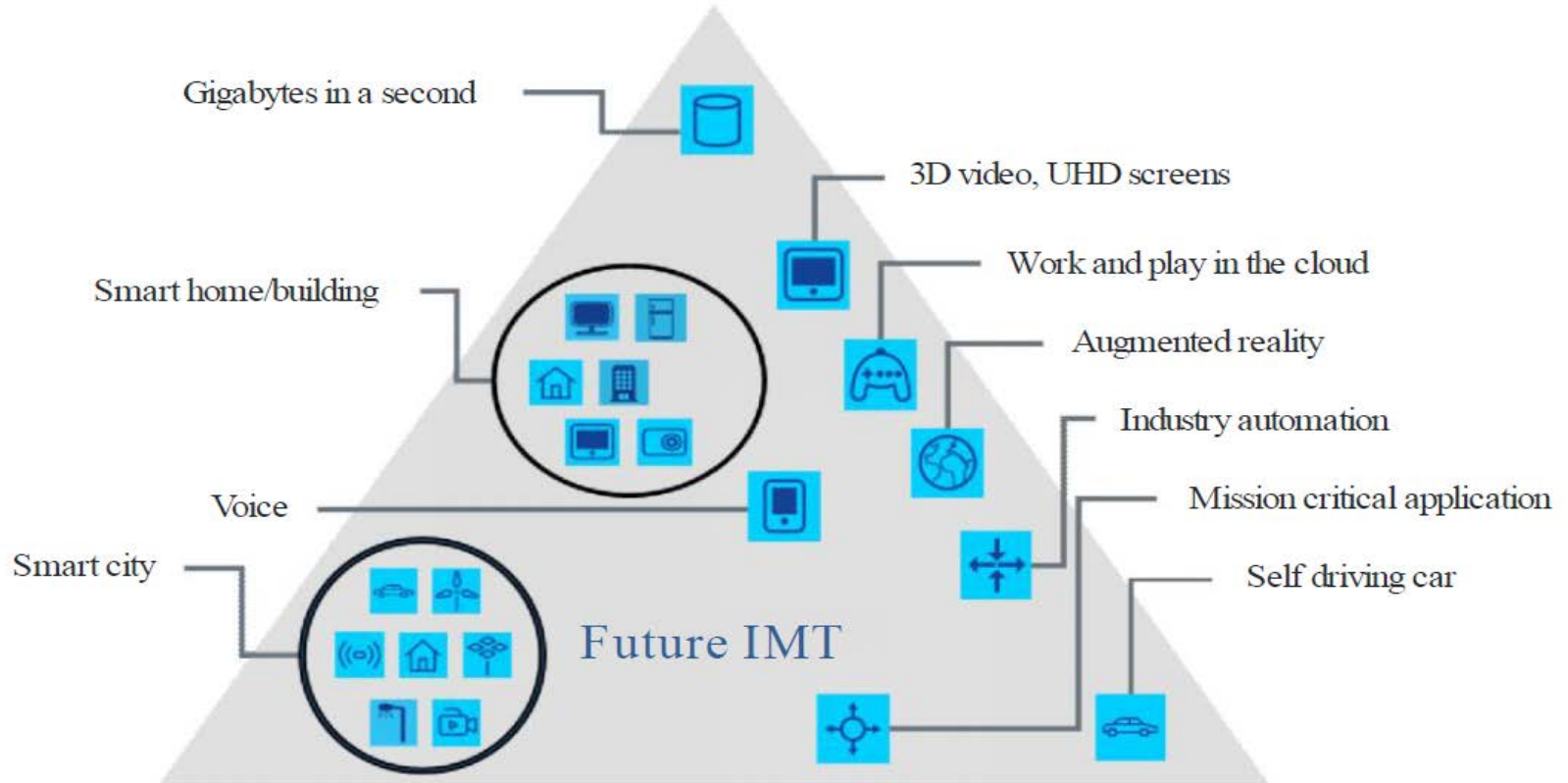
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The European path towards global next generation

communication networks

Usage scenarios for IMT for 2020 and beyond (ITU-R)

Enhanced mobile broadband

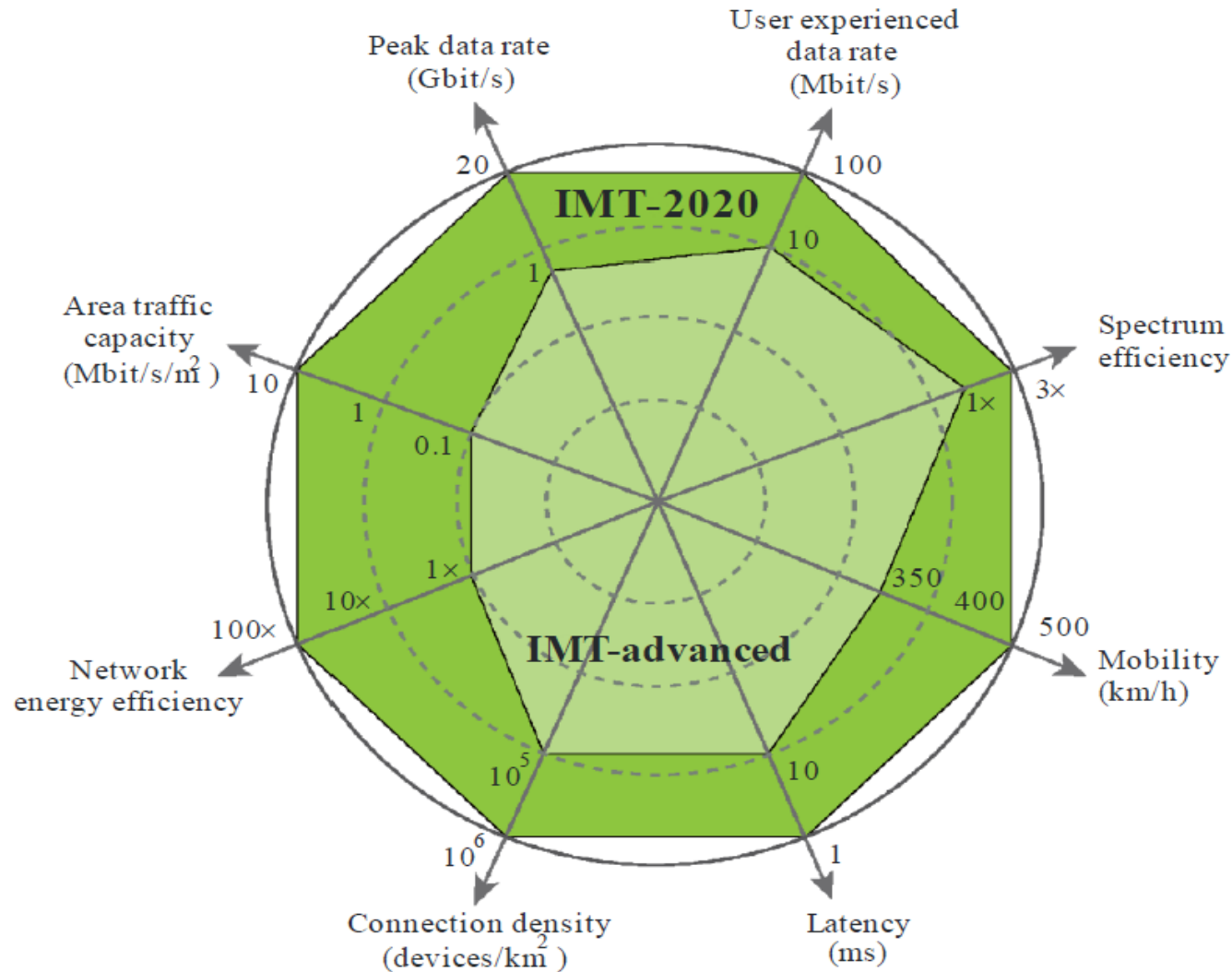


Massive machine type communications

Ultra-reliable and low latency communications

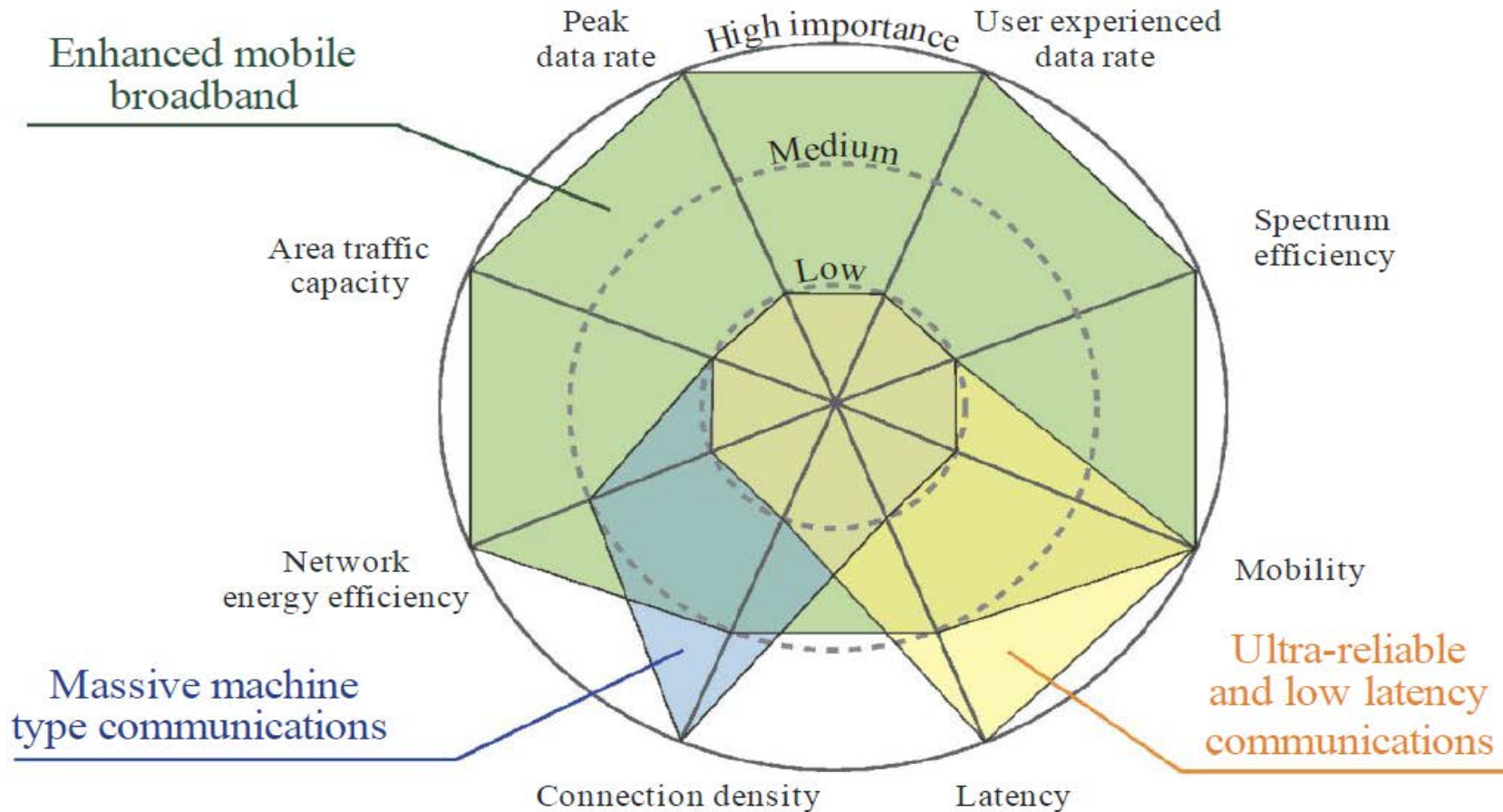
Source: ITU-R: IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond. Recommendation ITU-R M.2083-0 (09/2015), https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.2083-0-201509-1!!PDF-E.pdf.

Enhancement of key capabilities from IMT-Advanced to IMT-2020 (ITU-R)



Source: ITU-R: IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond. Recommendation ITU-R M.2083-0 (09/2015), https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.2083-0-201509-1!!PDF-E.pdf.

Importance of key capabilities in different usage scenarios (ITU-R)



5G PPP in Horizon 2020 of the EU



- 5G PPP is a research program in Horizon 2020 of the EU dedicated to 5G system research
- Budget for 2014 – 2020 time frame
 - Up to 700 million € public funding
 - Matched by private side including leveraging factor 5 of additional private investment results in private value of about 3.5 billion €
- Research program is addressing all building blocks of a future communication network and a huge number of huge cases from vertical sectors
- 5G Infrastructure Association vision paper published at Mobile World Congress 2015 in Barcelona
<http://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>
- First set of projects started on July 1, 2015



Key challenges



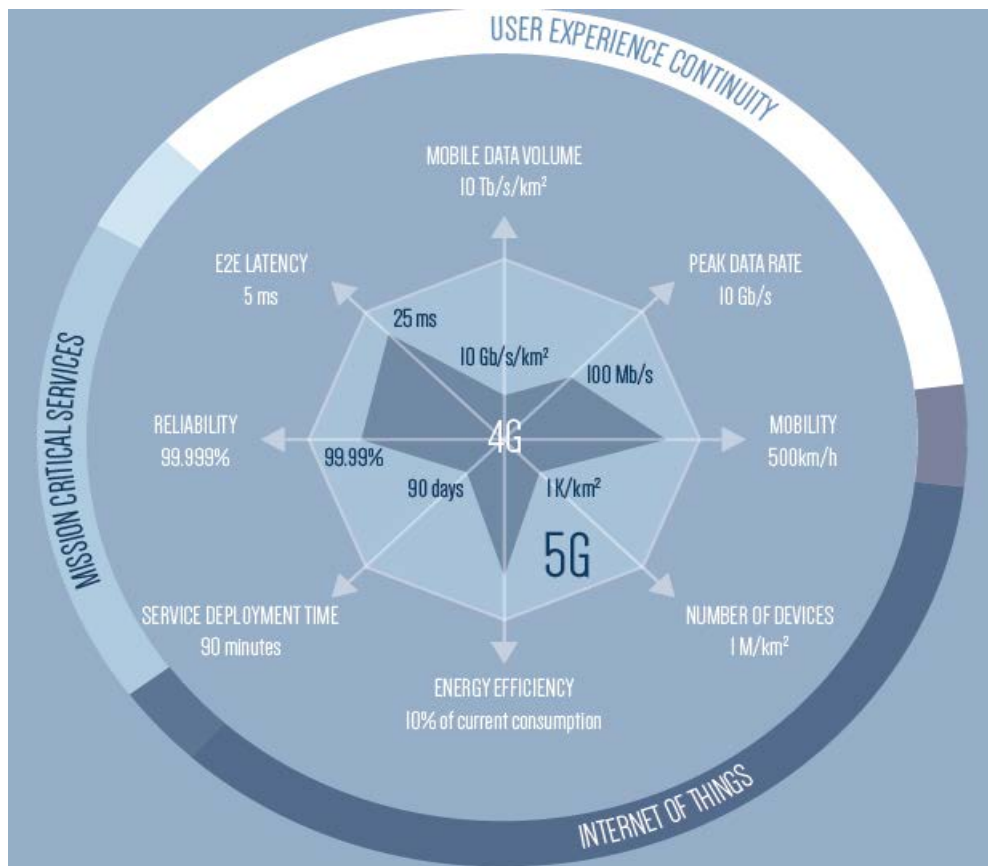
- PPP Program that will deliver solutions, architectures, technologies and standards for the ubiquitous 5G communication infrastructures of the next decade
- Program Ambitions: Key Challenges / High level KPIs
 - Providing 1000 times higher wireless area capacity and more varied service capabilities compared to 2010
 - Saving up to 90% of energy per service provided. The main focus will be in mobile communication networks where the dominating energy consumption comes from the radio access network
 - Reducing the average service creation time cycle from 90 hours to 90 minutes
 - Creating a secure, reliable and dependable Internet with a “zero perceived” downtime for services provision
 - Facilitating very dense deployments of wireless communication links to connect over 7 trillion wireless devices serving over 7 billion people
 - Enabling advanced User controlled privacy

5G PPP Vision and Requirements

5G will have disruptive capabilities



- 5G will provide an order of magnitude improvement in performance in the areas of more capacity, lower latency, more mobility, increased reliability and availability
- 5G infrastructures will be also much more efficient in terms of
 - energy consumption
 - service creation time
 - hardware flexibility



Horizon 2020 5G PPP Call 1 selected projects



- Radio-related cluster
- Fronthaul/Backhaul
- Hardware implementation
- Network automation
- SDN, NFV, Cloud and Virtualisation
- Security

5G Ensure **5G Ensure**
Security
(Will be added later)

CogNet
Building an Intelligent System of Insights and Action for 5G Network Management

Selfnet **SELFNET**
Framework for SELF-organized network management in virtualized and software defined NETWORKS

CHARISMA **CHARISMA**
Converged Heterogeneous Advanced 5G Cloud-RAN Architecture for Intelligent and Secure Media Access

SUPERFLUIDITY
Superfluidity: a super-fluid, cloud-native, converged edge system

5Gex **5Gex**
5G Exchange

VirtuWind
Virtual and programmable industrial network prototype deployed in operational Wind park

SONATA
Service Programming and Orchestration for Virtualized Software Networks

METIS-II
Mobile and wireless communications Enablers for Twenty-twenty (2020) Information Society-II

COHERENT
Coordinated control and spectrum management for 5G heterogeneous radio access networks

5G-Norma
5G NOvel Radio Multiservice adaptive network Architecture

SPEED-5G
quality of Service Provision and capacity Expansion through Extended-DSA for 5G

SESAME **SESAME**
Small cEllS coordinAtion for Multi-tenancy and Edge services

FANTASTIC-5G
Flexible Air iNTERfAce for Scalable service delivery wITHin wireless Communication networks of the 5th Generation

Flex5Gware
Flexible and efficient hardware/software platforms for 5G network elements and devices

5G-Xhaul
Dynamically Reconfigurable Optical-Wireless Backhaul/Fronthaul with Cognitive Control Plane for Small Cells and Cloud-RANs

mmMAGIC
Millimetre-Wave Based Mobile Radio Access Network for Fifth Generation Integrated Communications

Crosshaul
The 5G Integrated fronthaul/backhaul

Euro-5G
5G PPP Coordination and Support Action

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The European path towards global next generation communication networks

Vertical sectors



- White papers on
 - 5G and Factories of the Future
 - 5G and Healthcare
 - 5G and Energy
 - 5G and Media (under preparation)
 - 5G and Automotive
- Identification of
 - main use cases
 - requirements and
 - areas for research and innovation
- Vertical workshops
 - June 18, 2015
 - November 9, 2015
- White Paper will be published at Mobile World Congress 2016



Source: 5G Infrastructure Association.

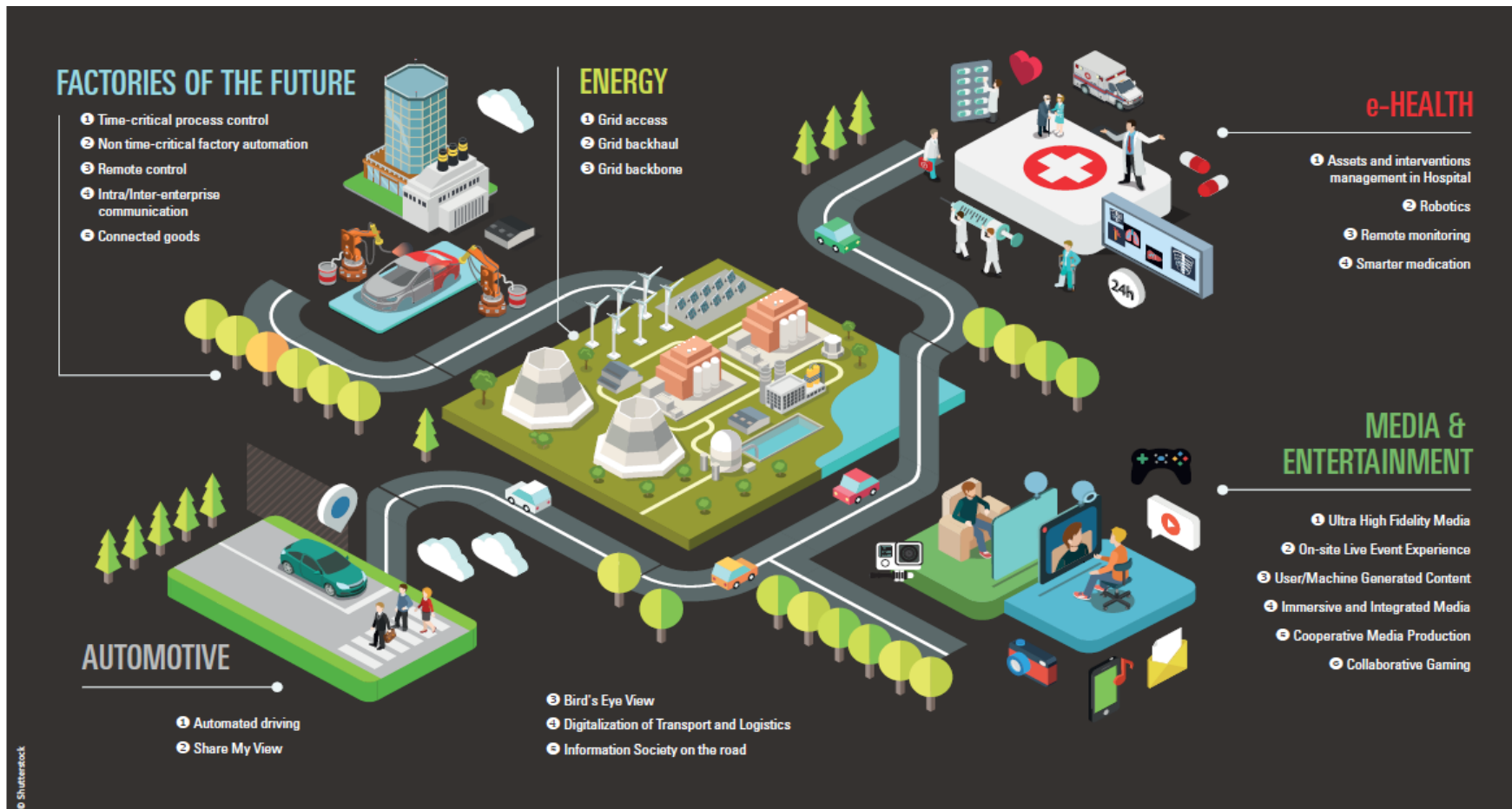
23/02/2016



5G – A driver for industrial and societal changes (5G PPP)

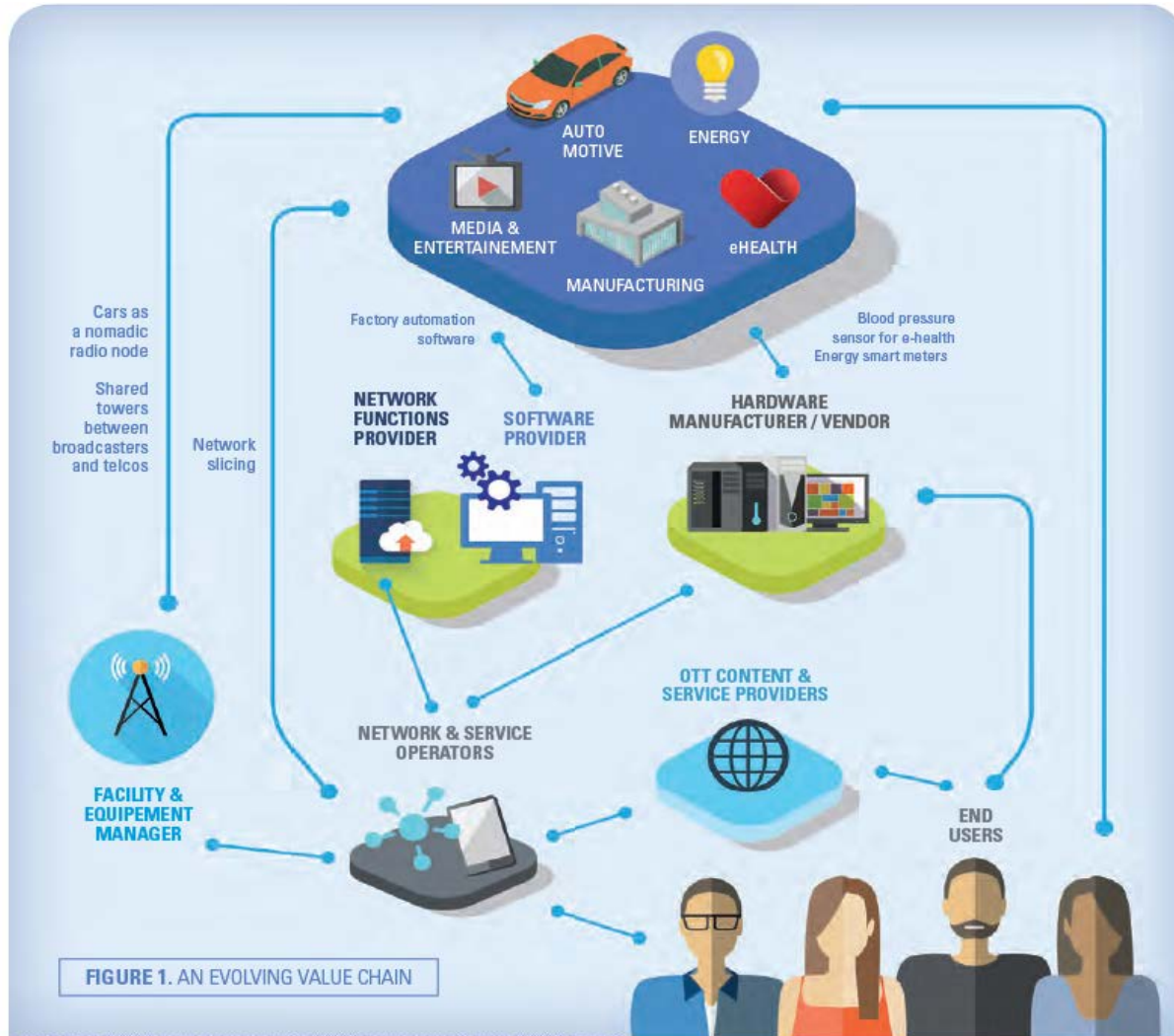


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An involving value chain (5G PPP)

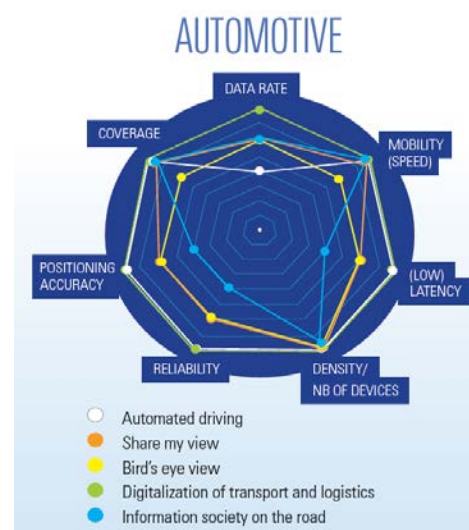
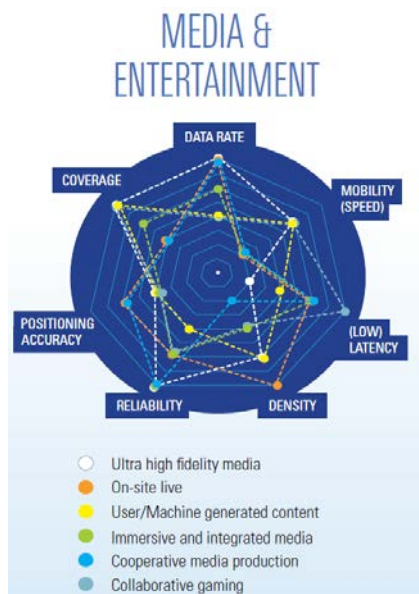
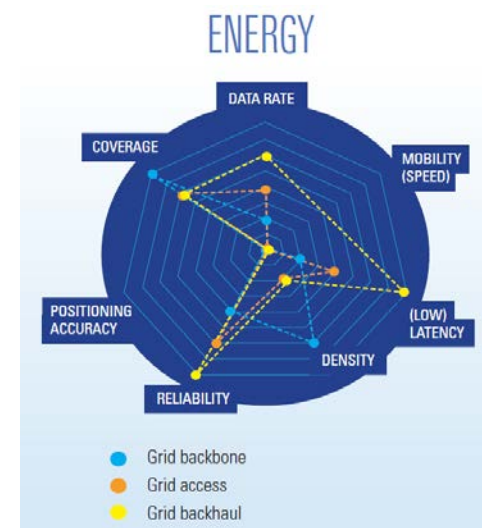
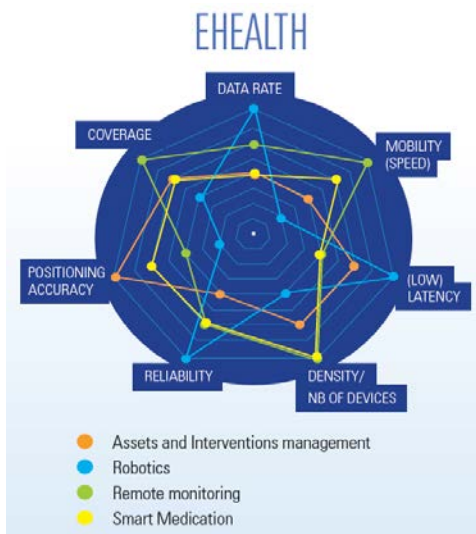
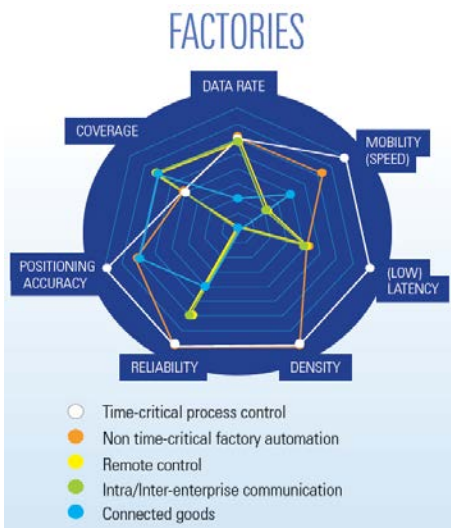


Source: 5G Infrastructure Association: 5G Empowering vertical industries. White Paper, 2016.
23/02/2016

Vertical sectors

Main technical requirements

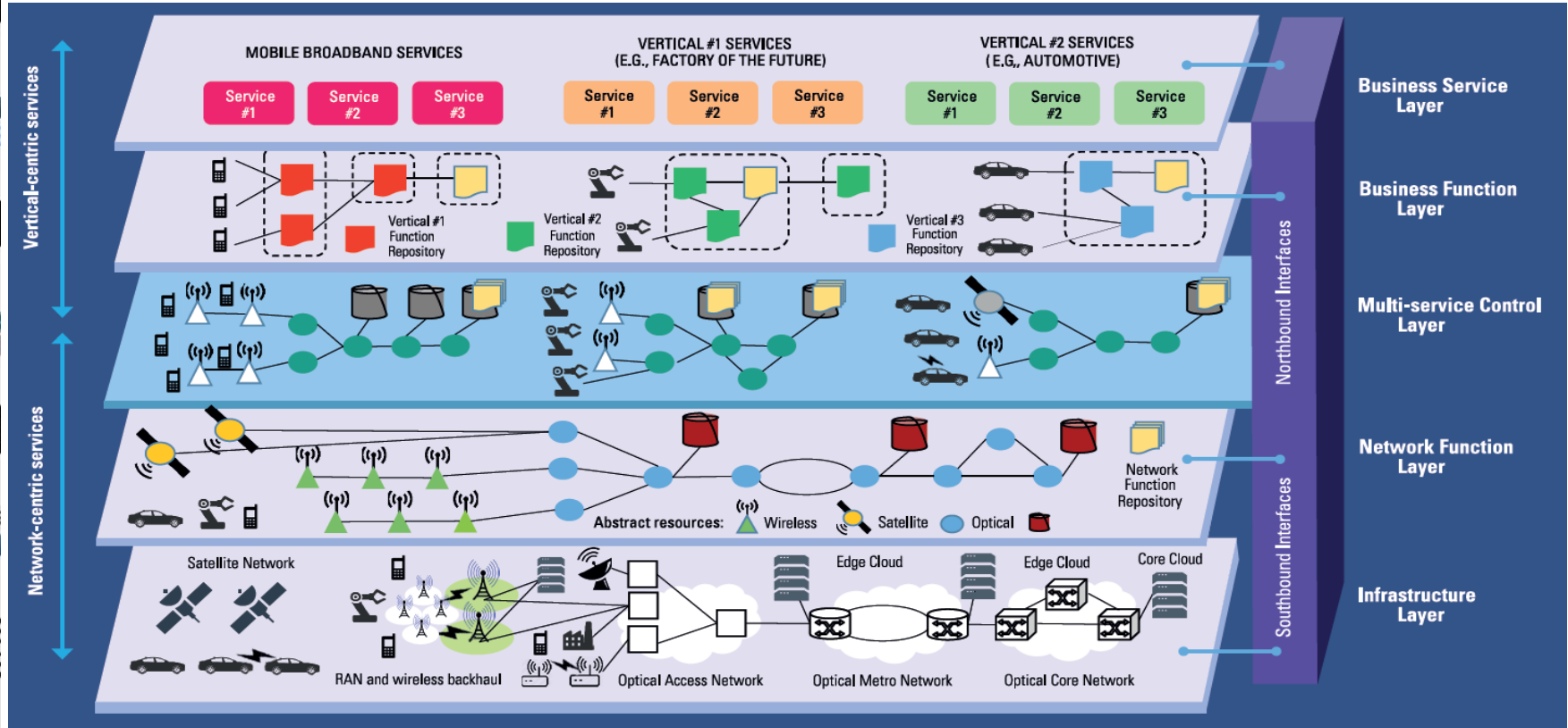
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Integrated 5G architecture for mobile broadband and vertical services (5G PPP)

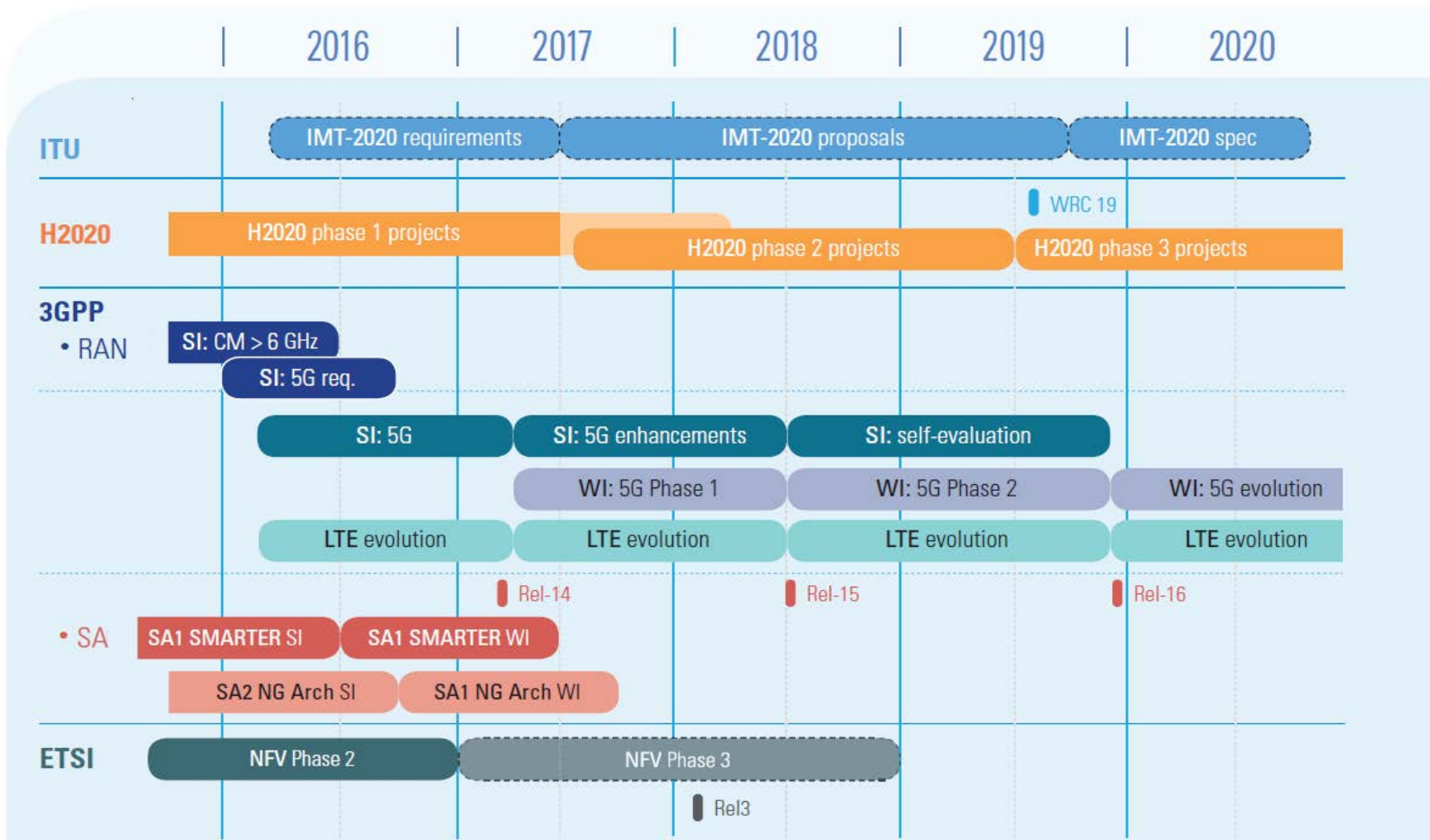


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5G PPP Vision and Requirements

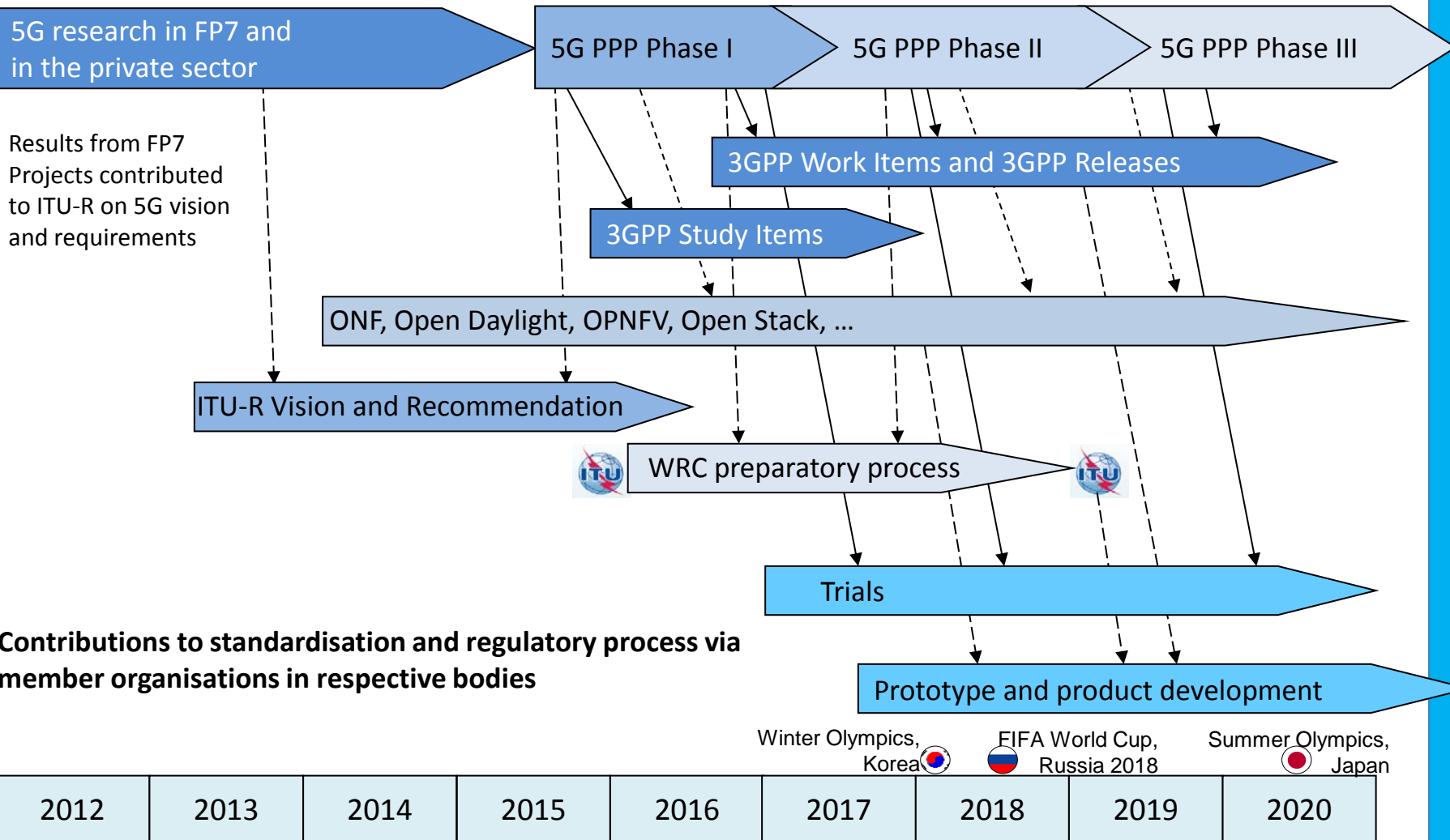
5G roadmap



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Exploitation of results



5G research in FP7 and in the private sector

5G PPP Phase I

5G PPP Phase II

5G PPP Phase III

Results from FP7 Projects contributed to ITU-R on 5G vision and requirements

3GPP Work Items and 3GPP Releases

3GPP Study Items

ONF, Open Daylight, OPNFV, Open Stack, ...

ITU-R Vision and Recommendation

ITU WRC preparatory process

Trials

Prototype and product development

Contributions to standardisation and regulatory process via member organisations in respective bodies

Winter Olympics, Korea (2018) | FIFA World Cup, Russia 2018 | Summer Olympics, Japan (2020)

2012	2013	2014	2015	2016	2017	2018	2019	2020
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23/02/2016

Release 12

Release 13

Release 14

Release 15

FIFA World Cup, Qatar 2022



Conclusions



- ITU-R developed a vision recommendation on IMT-2020 and beyond
- 5G PPP vision is complementary to ITU-R vision
- 5G PPP project portfolio is addressing all major building blocks of 5G systems
- Close cooperation with vertical sectors initiated
- Different vertical use cases have different
 - needs and
 - technical requirements on 5G systems
 - high flexibility required
- 5G PPP time plan in line with global activities on standardisation and regulatory activities
- Horizon 2020 is open for international participation

Acknowledgement: The author would like to thank his colleagues for their contributions.

23/02/2016

Source: 5G Infrastructure Association.





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

Thank you for your attention!

