

National Conference on 6G (IMT-2030) Spectrum, Technologies, and Standardization by ITU

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ITU's Association in India

Introduction to IAFI

- ITU-APT Foundation of India (IAFI) is a non-profit, non-political registered society in India.
- IAFI is a non-partisan Foundation and does not identify with any Industry sector or group. We support all telecom and IT sectors: 4G, 5G, GSO –NGSO Satellites, Wi-Fi, Broadcasting, Aviation, etc.
- IAFI is recognized by the ITU as an international/regional Telecommunications organization and granted complimentary sector membership of all the three ITU Sectors - ITU-R, ITU-T and ITU-D, IAFI increased its participation and contributions in ITU and APT:
 - IAFI delegation attended to 30 ITU meetings
 - IAFI submitted 28 contributions to ITU – for ITU-R, ITU-T and ITU-D
- IAFI is become an affiliate member of the Asia Pacific Telecommunity (APT) since 2021
 - IAFI delegation attended 20 APT meetings
 - IAFI submitted 4 contributions to APT. In addition, we submitted 6 contributions to DOT for sending to APT
- IAFI activities continued to be well covered by the Media with 30 stories during the previous year
- IAFI submitted more than 20 responses to TRAI, DOT and other consultations during last year.

National Conference on 6G Spectrum, Technologies, and Standardization by ITU

6G is named by the ITU as International Mobile Telecommunications 2030(IMT-2030)

- Session 1: – IMT-2030 Framework Development – *Requirements & Use Cases*
- Session 2: – Spectrum for 6G and Mobile Broadband Services
- Session 3: – Standardization of 6G technology
- Session 4: – Mobile Technology Trends towards 6G
- Session 5: – Ubiquitous connectivity and sustainability

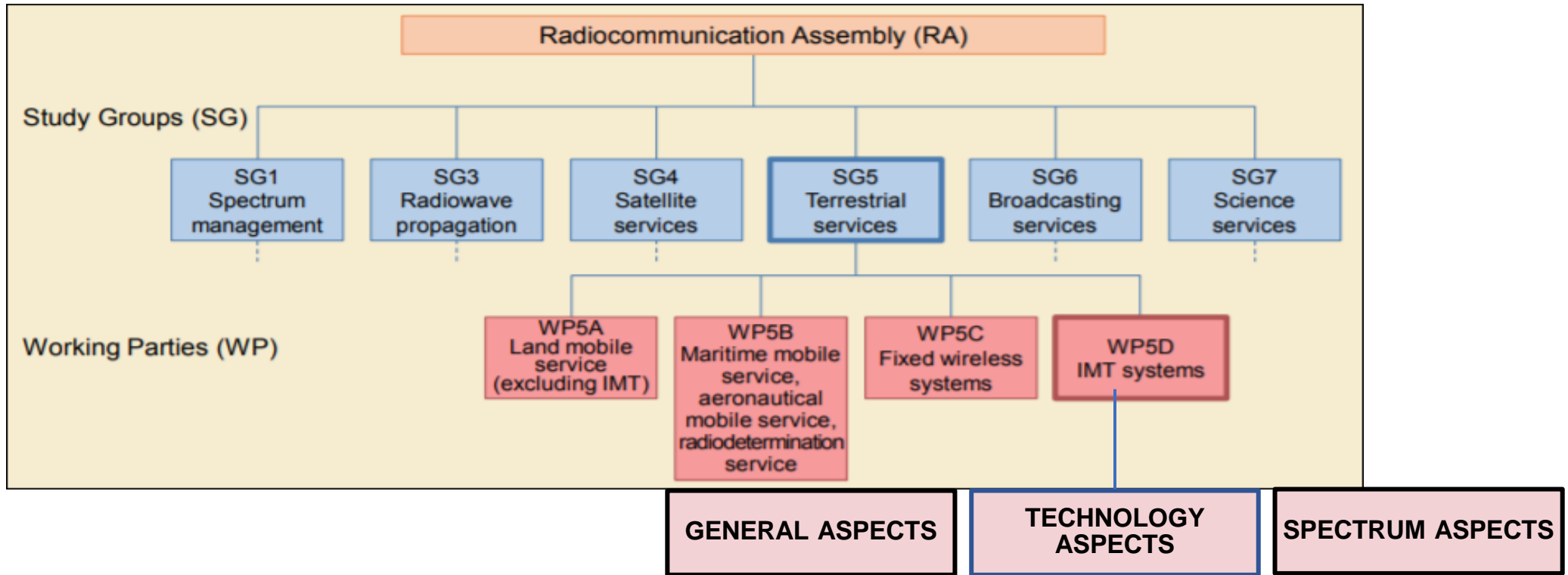


International Telecommunication Union

- Created in 1865, based in Geneva, 193 Member States, around 800 entities and academic institutions
- 13 regional offices, about 700 staff
- 3 ITU Sector:
 - ITU-R - Radiocommunications -> *global radio spectrum management and radiocommunication standardization*
 - ITU-T - Standardization -> *standardization of wireline networks, service aspects*
 - ITU-D – Development -> *assistance in the extension of ICTs to all the world's inhabitants, narrowing the digital divide*



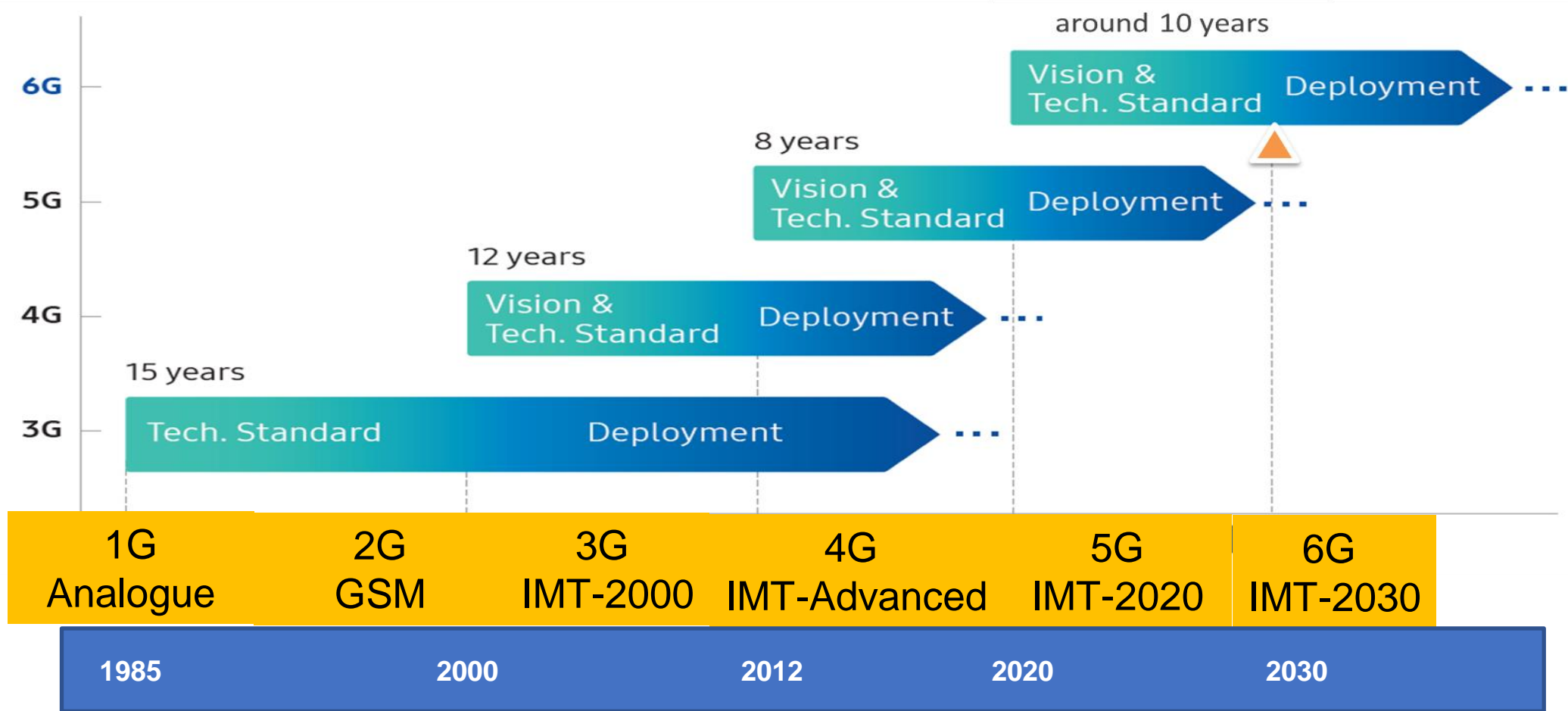
ITU-R Study Group Structure



WP 5D is responsible for the overall radio system aspects of the terrestrial component of International Mobile Telecommunications (IMT) systems, comprising the current IMT-2000, IMT-Advanced and IMT-2020.

IMT Framework Development by the ITU

Earlier named as IMT vision in the ITU



Named by the ITU as International Mobile Telecommunications (IMT)

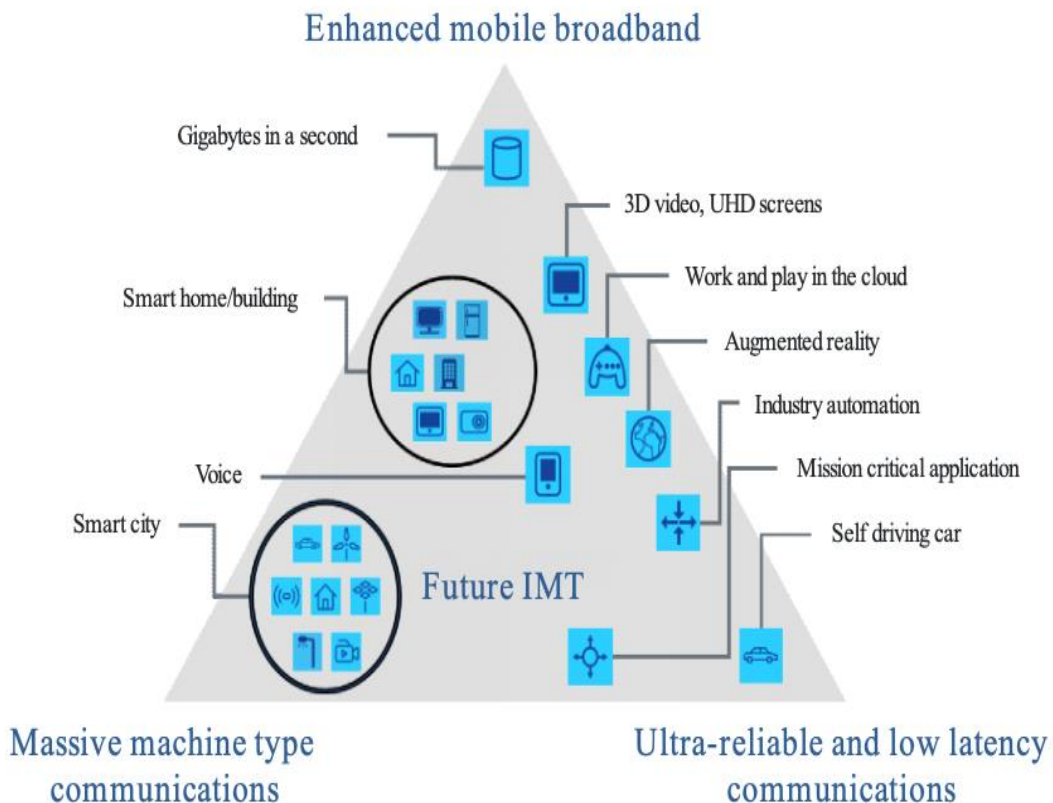


IMT-2020 standardization by ITU

➤ Detailed studies of IMT-2020/5G are conducted in WP-5D under ITU-R study groups.

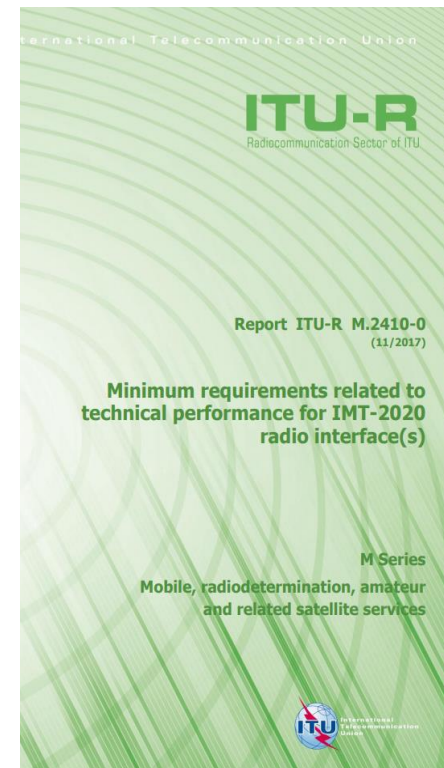
➤ ITU developed: **IMT-2020 Vision** (Recommendation ITU-R M.2083) and

➤ **technical requirements** (Report ITU-R M. 2410) to kick start the IMT-2020 process



Usage scenarios of IMT for 2020 and beyond

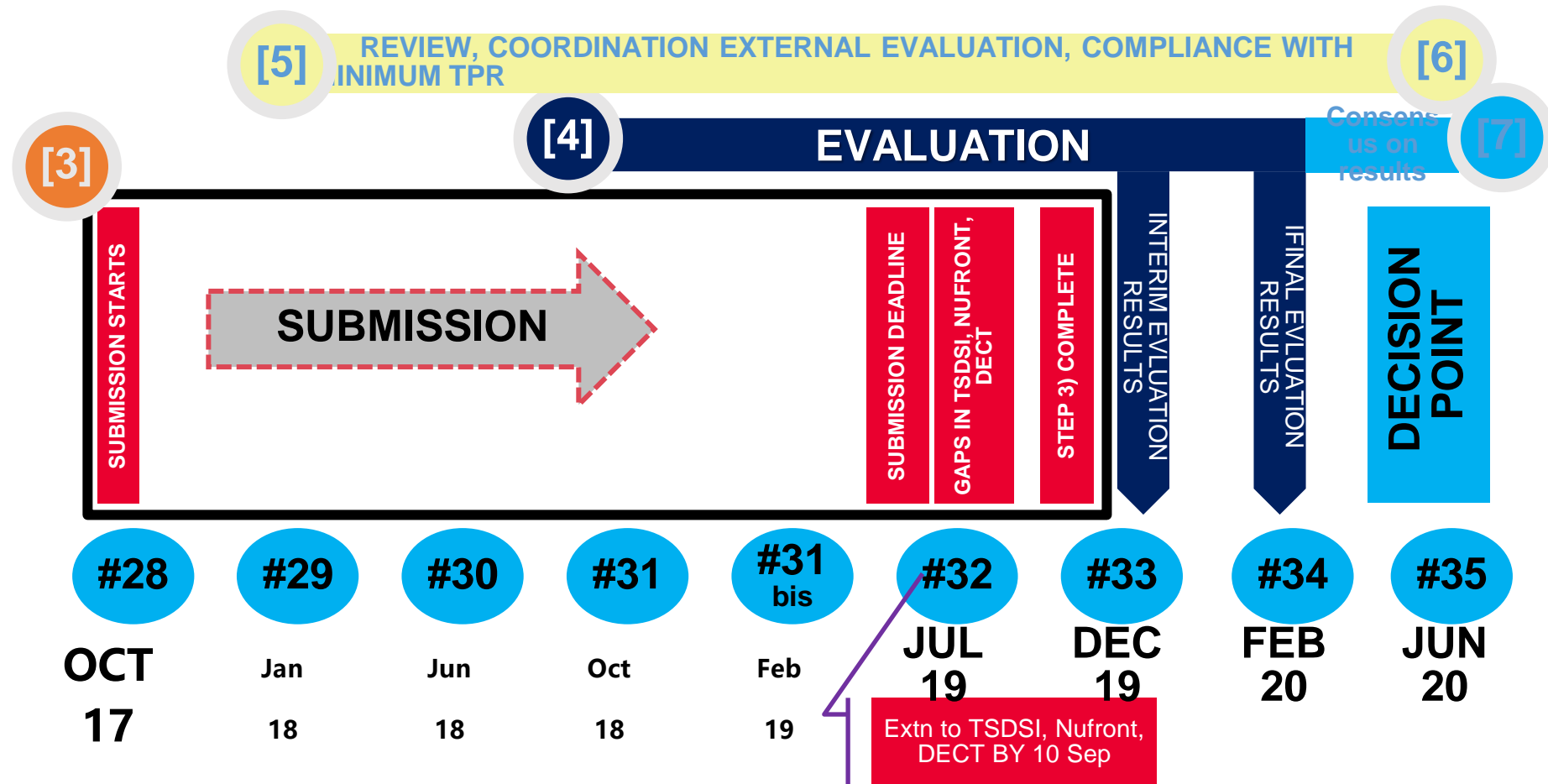
From Rec. ITU-R M.2083



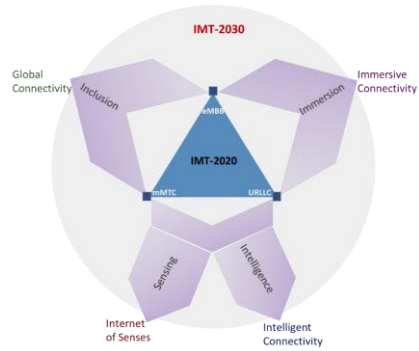
ITU takes about 3 years to evaluate and approve the technologies

Total process time is about 10 years

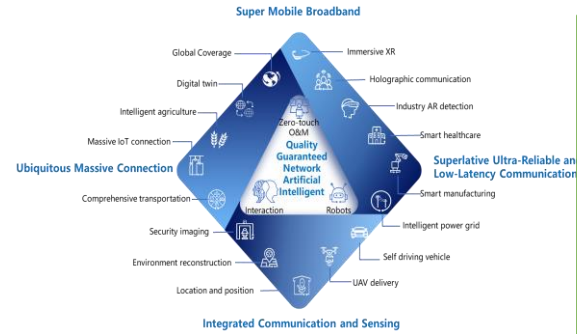
Framework Development, Requirements, submission, evaluation and Final Specifications



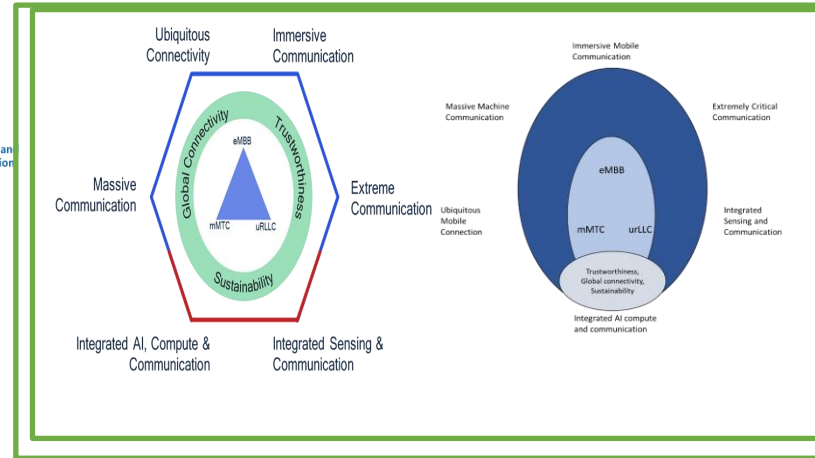
ITU is now working on 6G Vision (Framework)



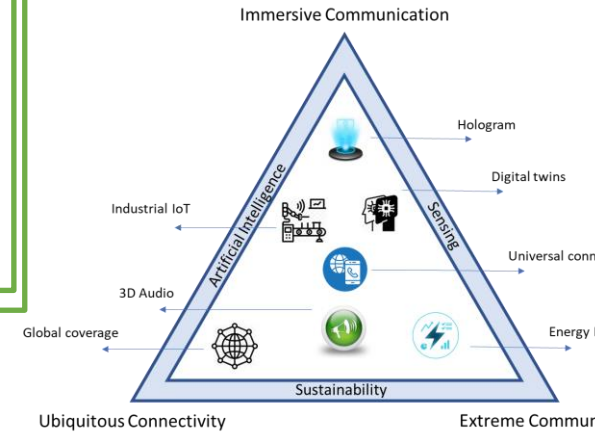
[WWRF]



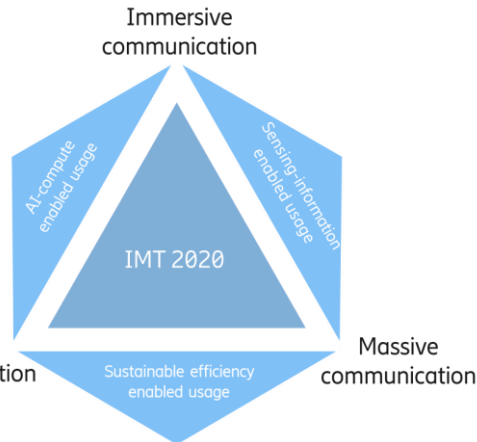
[CHN]



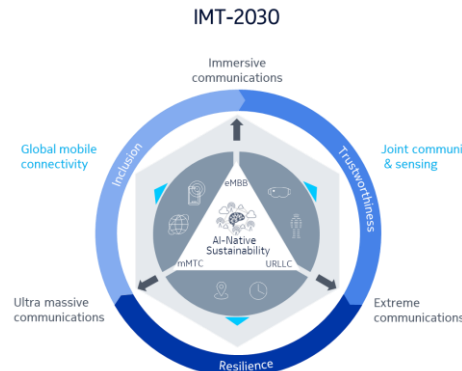
[IND]



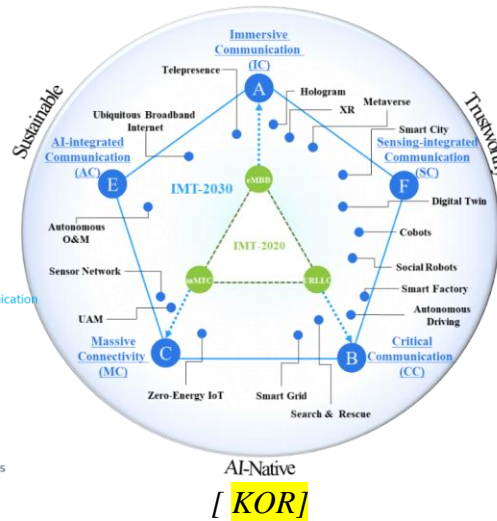
[Qualcomm]



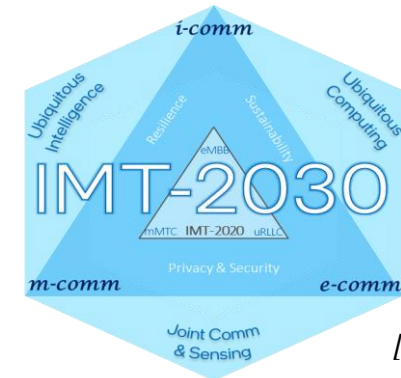
[Ericsson]



[Nokia]



[KOR]



[Intel]

IMT-2030 usage scenarios build upon those of IMT-2020, and more.
 i-comm: immersive communications
 e-comm: extreme communications
 m-comm: massive communications

A key part of the 6G Vision is the Technology Capabilities

Legacy capabilities:

- | | <u>To become “Target for research”</u> |
|-------------------------------|---|
| 1) Peak data rate | [>100, 100, 200, 100s, 1000] Gbps |
| 2) User experienced data rate | [>1] Gbps |
| 3) Spectrum efficiency | [N x IMT-2020, N>1] |
| 4) Area traffic capacity | [100 x IMT-2020], [0.1 – 10] Gbit/s/ m ² |
| 5) Connection density | [10 ⁶ - 10 ⁷] / [10 ⁷] / [10 ⁷ -10 ⁸] dev/km ² |
| 6) Mobility | [1000 km/h], [N x INMT-2020] |
| 7) Latency | [0.1] / [0.1~1] / [0.02~1] ms |
| 8) Reliability | [1-10 ⁻⁶ ~1-10 ⁻⁷] / [1-10 ⁻⁷] / [1-10 ⁻⁷ ~1-10 ⁻⁹] |

→ **Mostly agreed descriptions, multiple number ranges**

Additional* capabilities:

- 9) [Coverage/Reachability]
- 10) Positioning
- 11) Sensing[-related] capabilities
- 12) AI[-related] capabilities / Support of AI functionalities / AI/compute capabilities
- 13) Security, privacy and resilience(trustworthiness)
- 14) Sustainability

[X] Open and interoperable networks]

[Y] Continuous development]

→ **More difficult to agree on descriptions**

* Additional / Native / Overarching / Generic / Qualitative...?

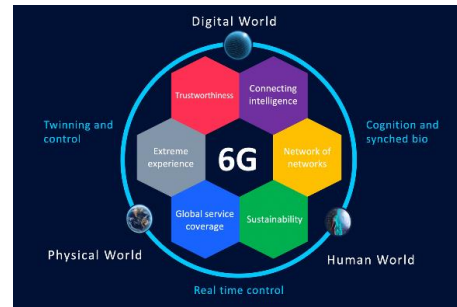
Major Countries are spending Billions on 6G research programs

China



www.caict.ac.cn

Europe



www.hexa-x.eu

Japan



www.b5g.jp/en

USA

NEXT G
ALLIANCE

www.nextgalliance.org

Korea



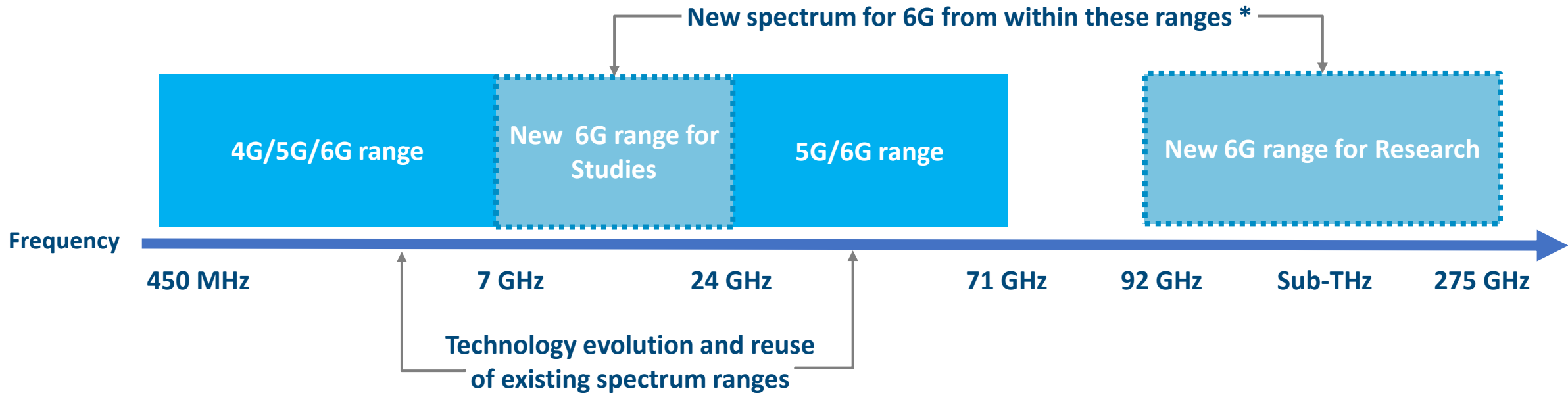
<http://6gglobal.org/en/sub/about/about.php>

India

Bharat 6G

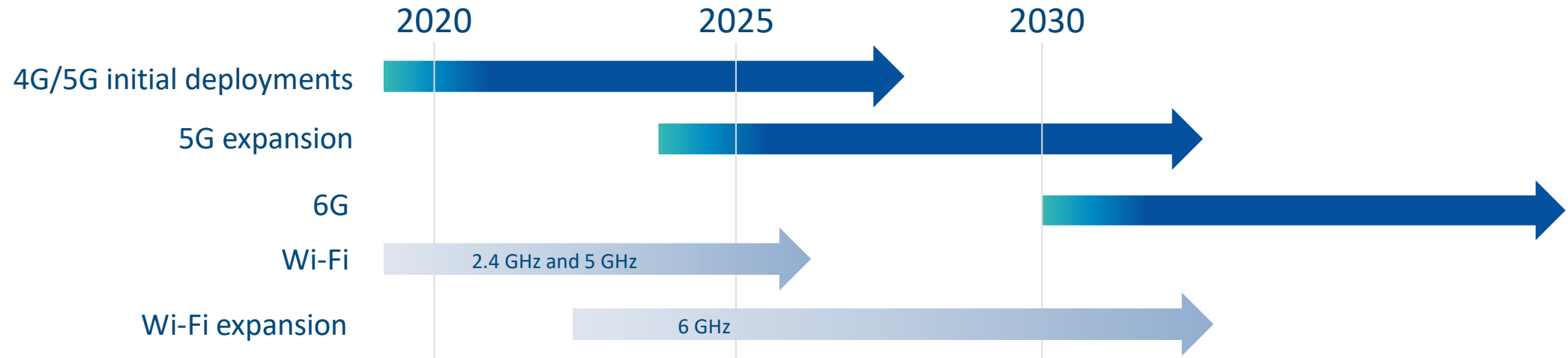
<https://dot.gov.in/bharat-6g>

Spectrum for 6G



- * Frequency bands from within these ranges will need to be selected for further study, taking into account sharing possibilities of IMT with other Radiocommunication Services allocated on a primary basis.
- * Existing users of mobile applications such as those supported by UWB should also be considered for relevant bands where applicable.
- * The lower the frequency the better from within the 'essential range' in terms of propagation, cell size and economic network deployments.
- * IMT Agenda Item for WRC-27 is a key step towards a successful device ecosystem and economies of scale

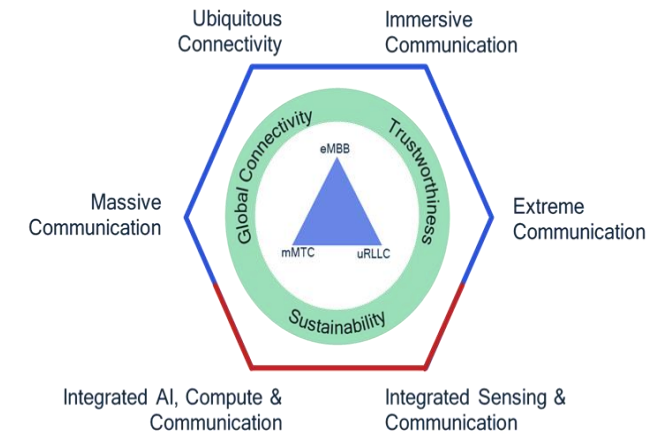
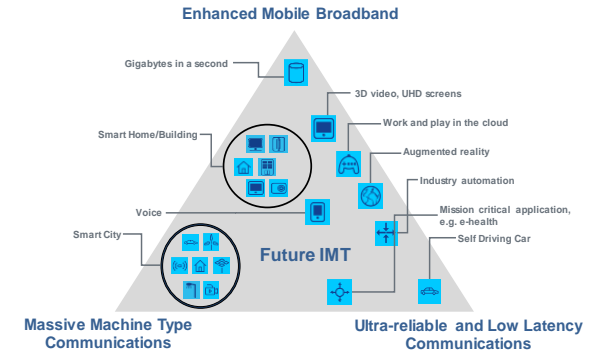
Mobile Services will continue to need more spectrum from 2023 to 2030



Band (MHz)	600-960 MHz	1.4 GHz, 2GHz, 2.5 GHz	3.6 GHz	4.4 - 6 GHz	6-24 GHz	26 GHz	40,50, 60 GHz	80-400 GHz
5G Initial	700 MHz	1700-2300 MHz	3300-3670 MHz			26 GHz		
5G Expansion	600 MHz	1.4 GHz	3800-4200 MHz	4.4 - 4.95 GHz		26 GHz	40 GHz	
6G	600-960 MHz	2.5 GHz		4.4- 4.95 GHz	Parts of 7-24 GHz		40. 50, 60 GHz	80-400 GHz
Wi-Fi		2.4 GHz		5 GHz	6 GHz		60-70 GHz (V band)	
CNPN	700 MHz		3700-3800	4.95-4.99 GHz		28 GHz		

Summary of 6G work in ITU

- Current innovation on 5G for enterprise and consumers to continue into 6G
- The IMT-2030 schedule agreed in ITU-R WP5D#41 June meeting towards year 2030
- The new ITU Framework Recommendation is a key document for the continued work on IMT-2030 to follow after RA/WRC-23
- Use of existing frequency bands for migration to 6G/IMT-2030 and new bands at WRC-27 important to secure future mobile growth in society and industries
- An Agenda Item on IMT at WRC-27 is key step to secure future IMT developments – need 10 countries for an ACP





THANK
YOU

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