A GLOBAL INITIATIVE

Beginners:

# A Quick Introduction to 3GPP

*(The 3rd Generation Partnership Project)*

@3g4gUK

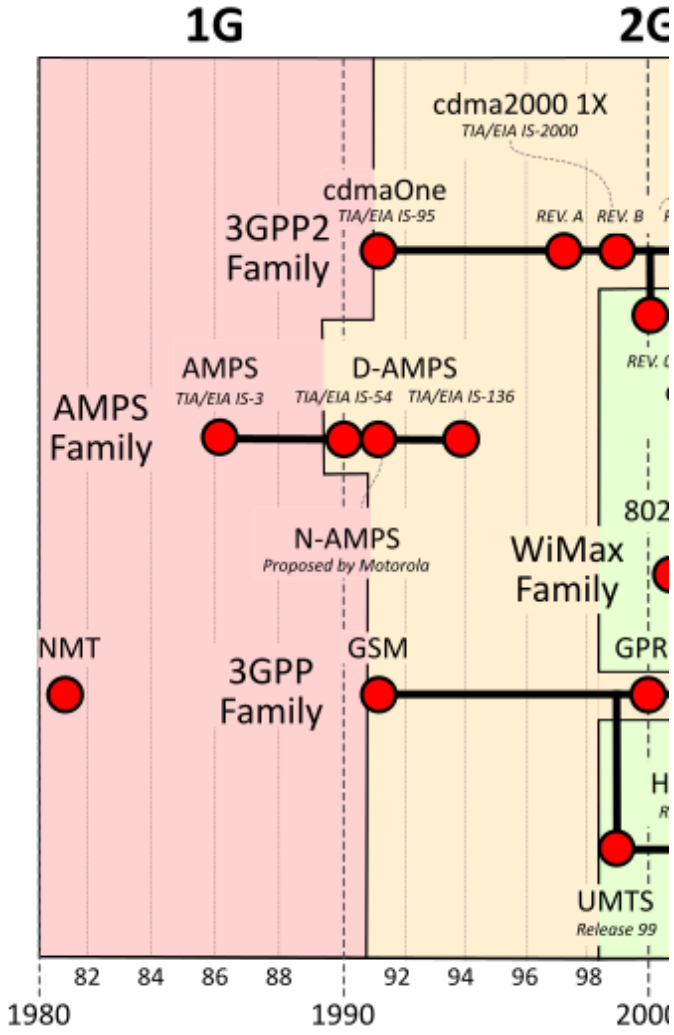
# What is 3GPP?

- 3GPP is the Third Generation Partnership Project

# Why was 3GPP formed?

- There was too many standards in 1G & 2G. This fragmentation meant that we cannot achieve economy of scale and bring the prices down. Hence 3GPP was formed, to create a single Global standard.

- Did it succeed?
  - No and Yes

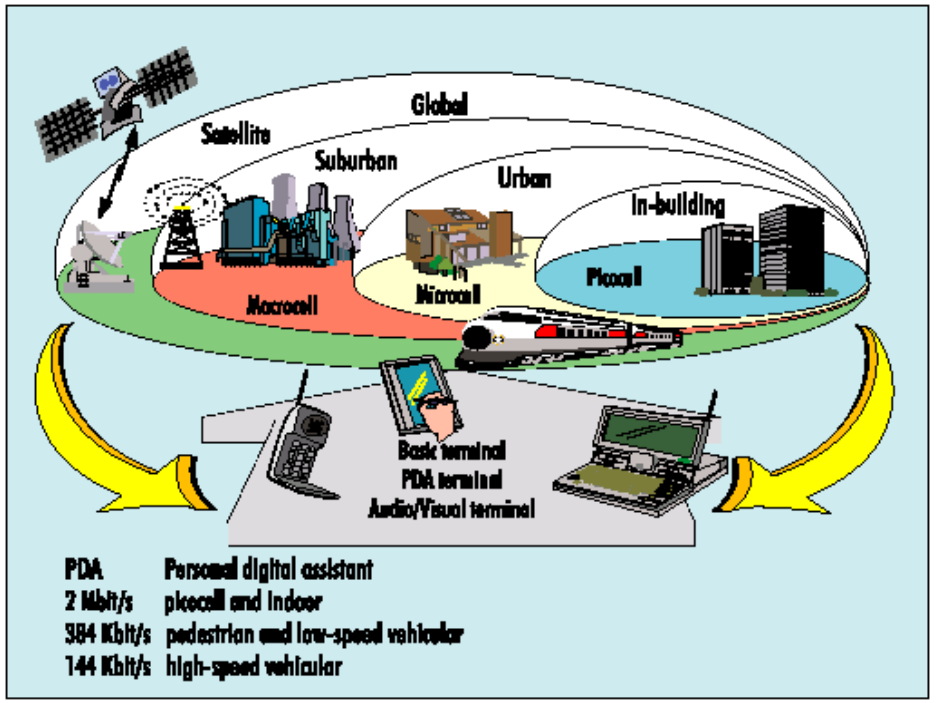



Source: Wikipedia

# When did 3GPP start?

- 3GPP officially started in December 1998 with the aim to create 3G specifications and standards based on ITU's IMT-2000.
  - IMT-2000 was called Future Public Land Mobile Telecommunications System (FPLMTS) in the start

Figure 4 — IMT-2000, a flexible, multi-functional network




Source: European Commission.

# What does 3GPP do?

- 3GPP brings together seven telecommunications standard development organizations (SDOs), known as Organizational Partners', providing their members with a stable environment to produce the Reports and Specifications that define the 3GPP system.
- Technical Specifications are then transposed by the OPs into their appropriate deliverables (e.g., standards).

# The Organizational Partners (OPs)

**ARIB**
www.arib.or.jp
The Association of Radio Industries and Businesses, Japan

**ATIS**
www.atis.org
The Alliance for Telecommunications Industry Solutions, USA

**CCSA**
www.ccsa.org.cn
China Communications Standards Association

**ETSI**
www.etsi.org
The European Telecommunications Standards Institute

**TSDSI**
http://tsdsi.org/
Telecommunications Standards Development Society, India

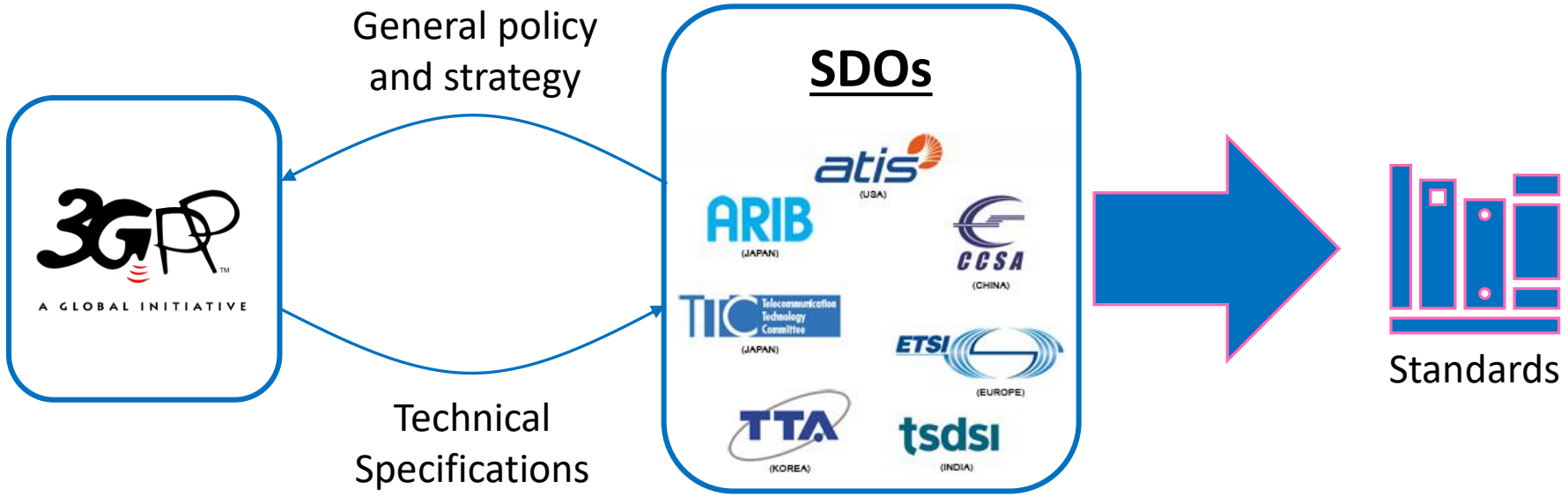

**TTA**
www.tta.or.kr
Telecommunications Technology Association, Korea

**TTC**
www.ttc.or.jp
Telecommunication Technology Committee, Japan

Source: 3GPP

# Important to Remember

- 3GPP specifications are not standards, they have no legal standing. They become “official” standards once one or more of the OPs (national / international standards bodies) transposes them.



# 3GPP TS 38.331 V16.7.0 (2021-12)

*Technical Specification*

**3rd Generation Partnership Project;**
**Technical Specification Group Radio Access Network;**
**NR;**
**Radio Resource Control (RRC) protocol specification**
**(Release 16)**



# ETSI TS 138 331 V16.1.0 (2020-07)


**5G;**
**NR;**
**Radio Resource Control (RRC);**
**Protocol specification**
**(3GPP TS 38.331 version 16.1.0 Release 16)**

# ARIB STD-T120-38.331 V16.1.0

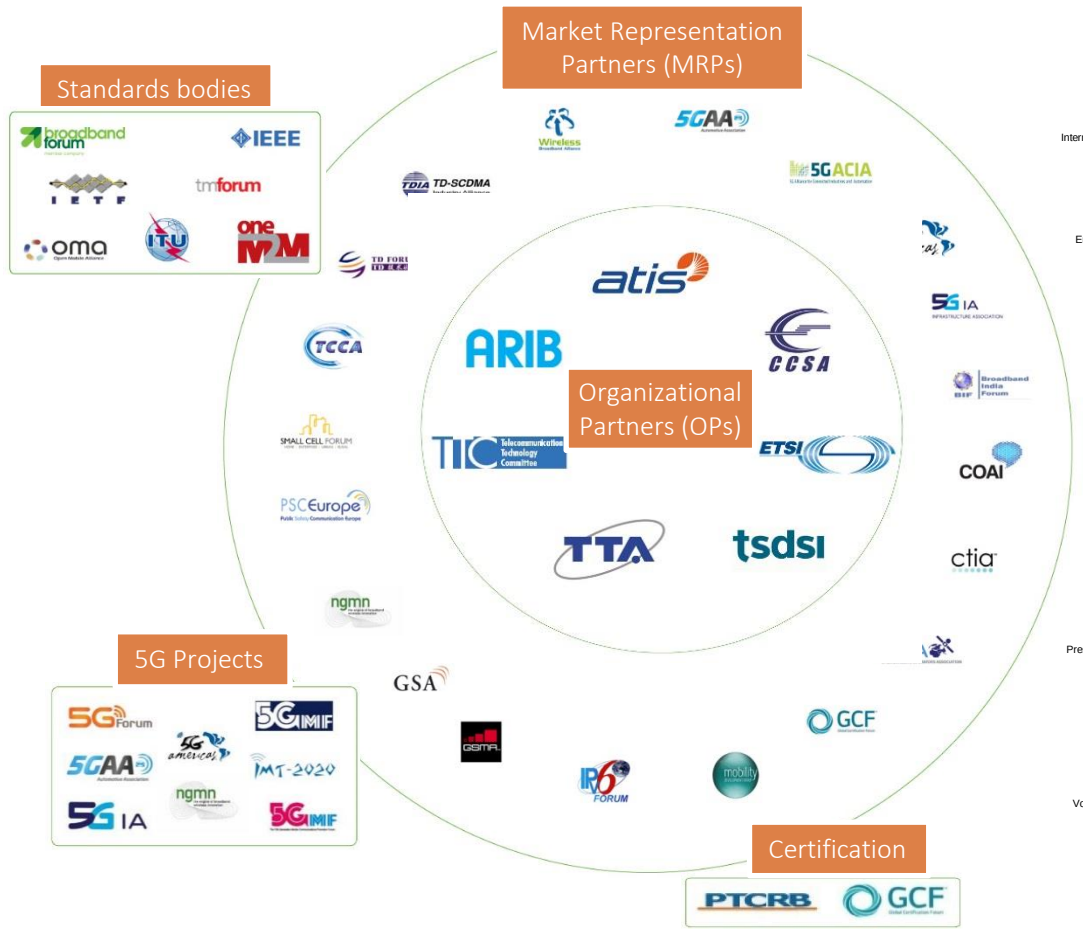
**NR; Radio Resource Control (RRC) protocol specification**

**(Release 16)**

Remarks : A UE or network vendor wishing to support Rel-16 must use version 16.2.0 or later of ARIB STD-T120-38.331

# 3GPP Ecosystem

- The 3GPP Organizational Partners (OP) are the seven Standards Developing Organizations (SDOs) - from China, Europe, India, Japan, Korea and the United States.
- Participation in 3GPP is made possible by companies and organizations becoming Individual Members (IM) of one of the OPs.
- Specific inputs, in the form of market requirements may also come into the Project via any of the twenty Market Representation Partners (MRP) in 3GPP. These organizations have all signed up to the 3GPP Project scope and objectives.
- Lots of external cooperation with other standards bodies and a broad variety of other groups, by way of formal Liaisons.




Source: 3GPP

# Market Representation Partners (MRPs)

- Specific inputs, in the form of market requirements may also come into the Project via any of about twenty Market Representation Partners (MRP). These organizations have all signed up to the 3GPP Project scope and objectives.


3GPP comment: The list of MRPs on this slide is not complete

Source: 3GPP

# Verticals, Operators & Vendors @3GPP

ABS
Airbus
Alibaba
BBC
Bosch

Convida
DLR
EBU
ESA
Eutelsat

Fraunhofer
IRT (Germany)
IPCom
ITRI
ligado networks

NHK
Novamint
Omesh
Philips
Sennheiser

Siemens
Suomen Virveverkko
Tencent
Thales
NL Police

TNO
Toyota
UIC
Volkswagen
ZITiS

AT&T // Avanti // Bell Canada // BT // CableLabs // CAICT // Charter // China Mobile // China Telecom // China Unicom // CISA // FirstNet

Hughes // Immarsat // Intelsat // KDDI // KPN // KT // LG U+ // NTT DoCoMo // Orange // Rogers // SES // SK Telecom // Softbank

Sprint // Telecom Italia // Telefonica // Telenor // Leonardo // Telia // Telstra // Telus // T-Mobile // Turkcell // UK HO // Verizon // Vodafone

Affirmed Networks // Apple // Blackberry // Broadcomm // CATT // Cisco // Ericsson // ETRI // Futurwei // Google // HP // Huawei

Infineon // Intel // Interdigital // Juniper // Kapsch // Kyocera // Lenovo // LG // Matrixx Sw // Mavenir // MediaTek // Mitsubishi

Motorola Mobility // Newtec // Nokia // OPPO // Samsung // Sandvine // Sharp // Sony // Spirent // Vivo // XiaoMi // ZTE

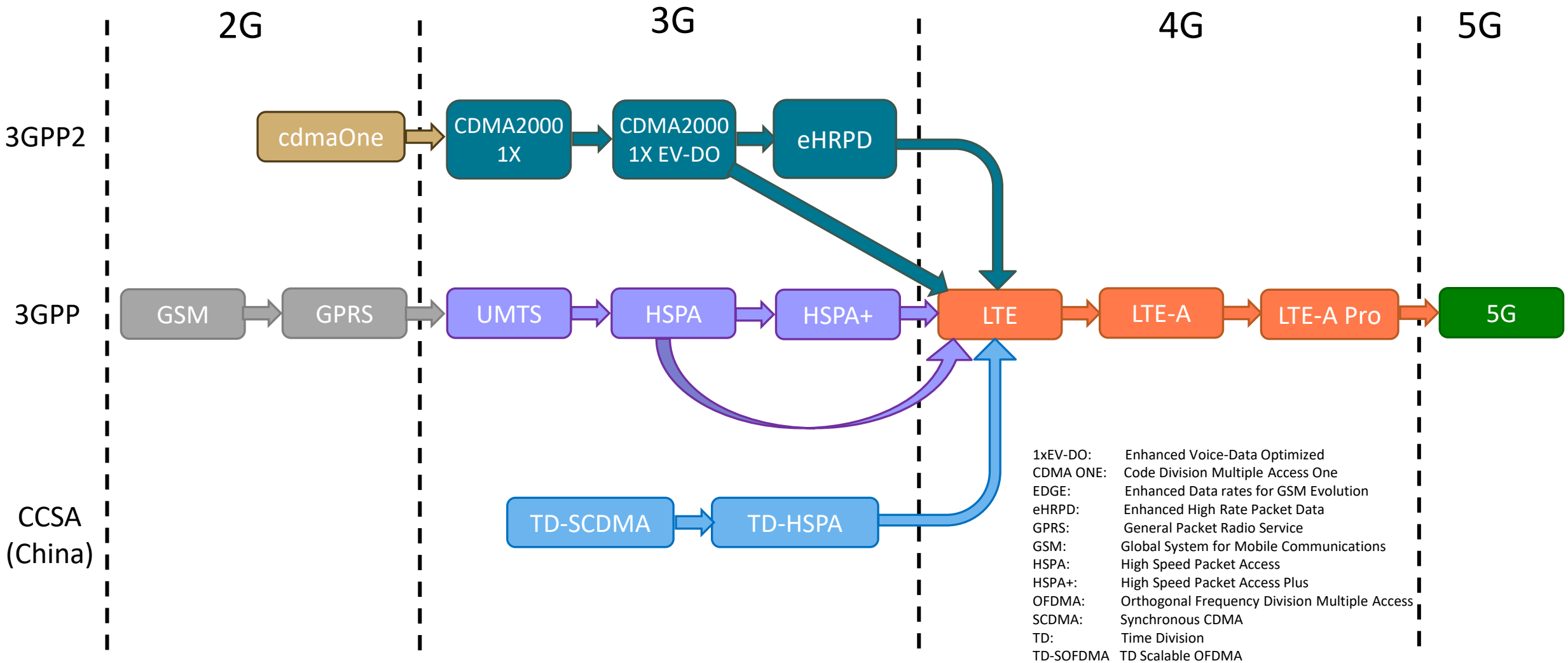
(this slide only names a subset of companies which attended September 2019 3GPP plenaries)

Source: 3GPP

# How does One Become Member of 3GPP?

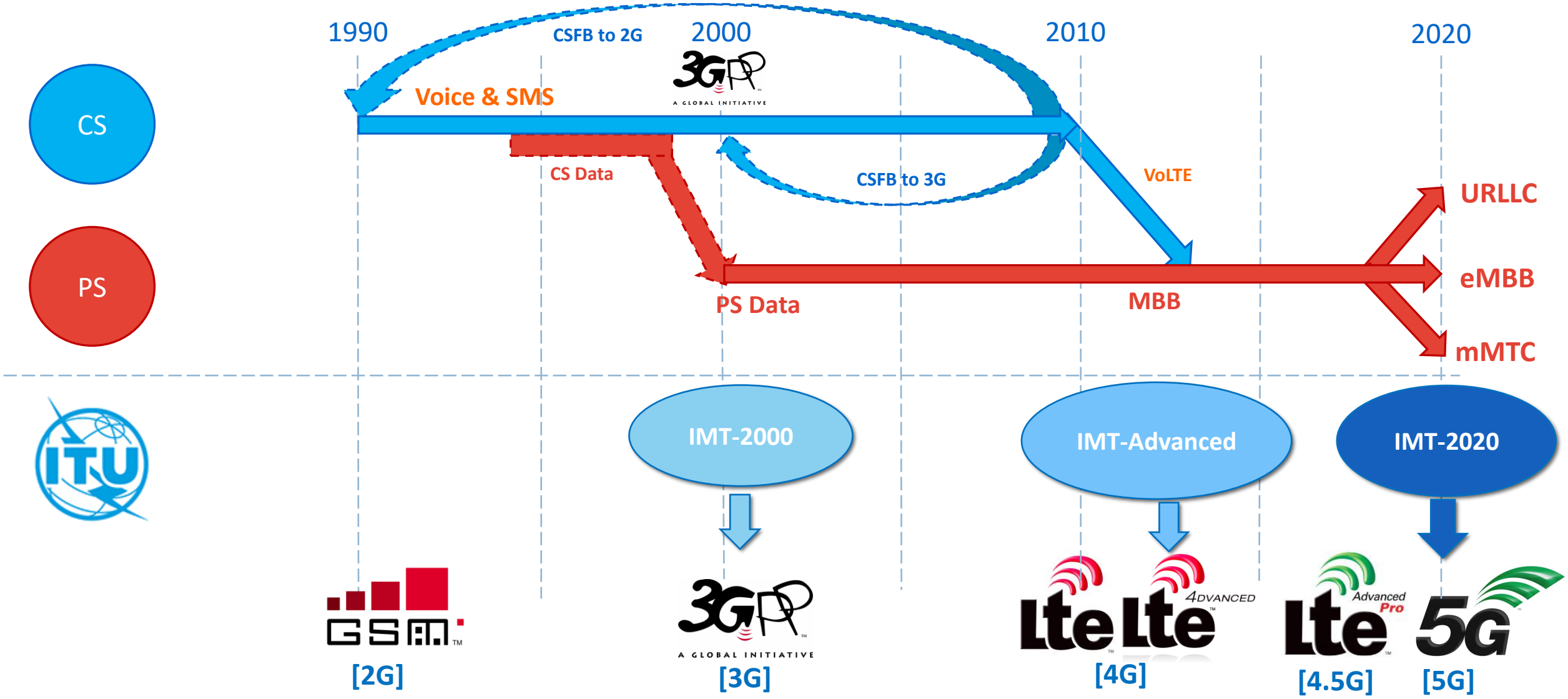
- Individuals cannot become 3GPP members, only organisations (companies, government departments, educational establishments, etc.) can.
- There is no direct membership to 3GPP as it is a Partnership project.
- The delegates come to 3GPP via their organization's membership of one of the seven 3GPP Organizational Partners.
- The organization that joins 3GPP becomes an 'Individual member'
- An organisation can be 'Full Individual Members', 'Observers' and 'Guest'

# Standards Roadmap: All roads lead to LTE and 5G

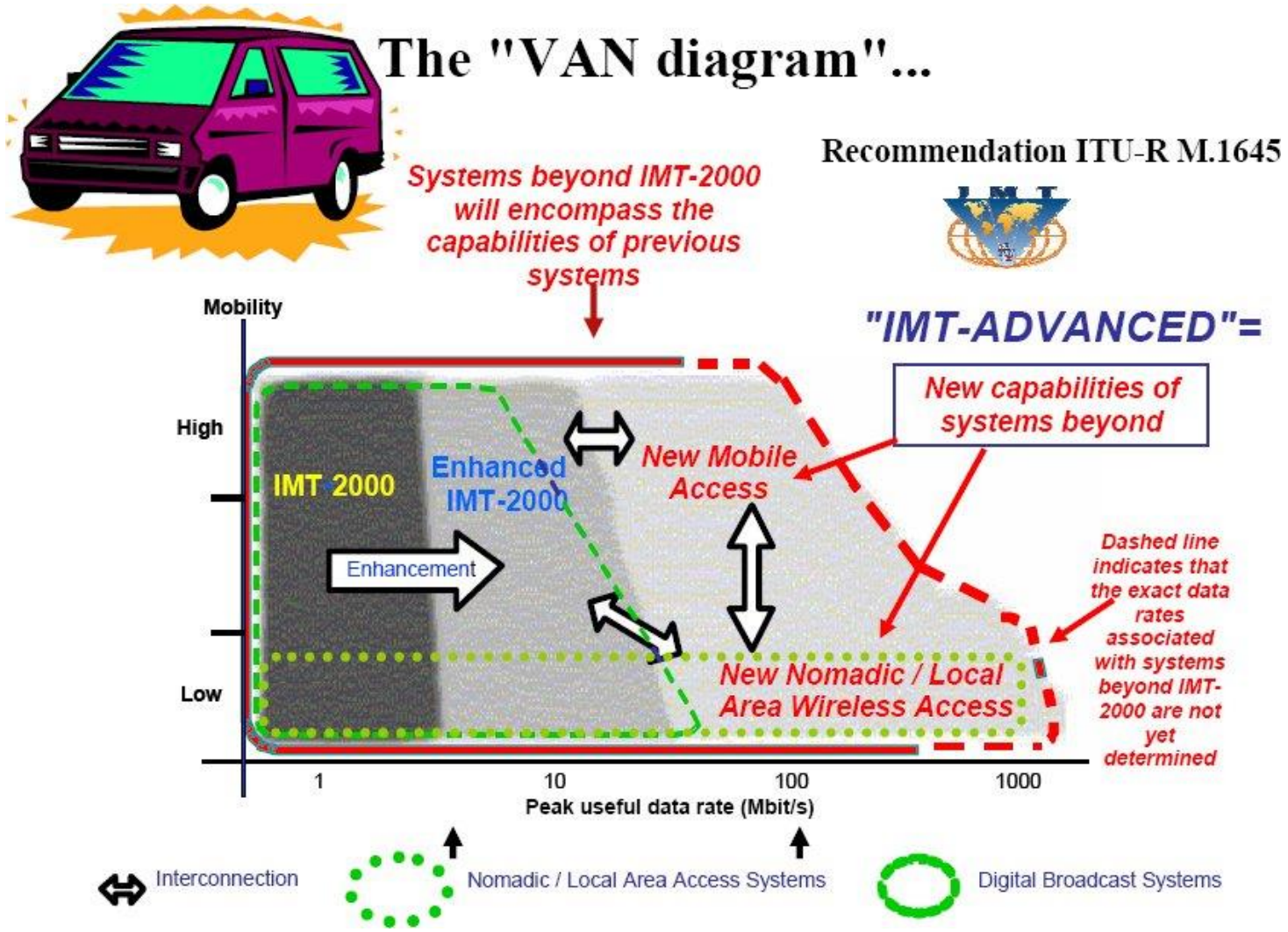



1xEV-DO: Enhanced Voice-Data Optimized
CDMA ONE: Code Division Multiple Access One
EDGE: Enhanced Data rates for GSM Evolution
eHRPD: Enhanced High Rate Packet Data
GPRS: General Packet Radio Service
GSM: Global System for Mobile Communications
HSPA: High Speed Packet Access
HSPA+: High Speed Packet Access Plus
OFDMA: Orthogonal Frequency Division Multiple Access
SCDMA: Synchronous CDMA
TD: Time Division
TD-SOFDMA TD Scalable OFDMA
UMTS: Universal Mobile Telecommunication System

# Evolution of Mobile Networks and ITU IMT Vision



# ITU-R IMT-Advanced VAN Diagram




Source: ITU

# 5G (IMT-2020) Requirements

**ITU-R IMT-2020 requirements**

**ITU recommendation ITU-R M.2083-0**

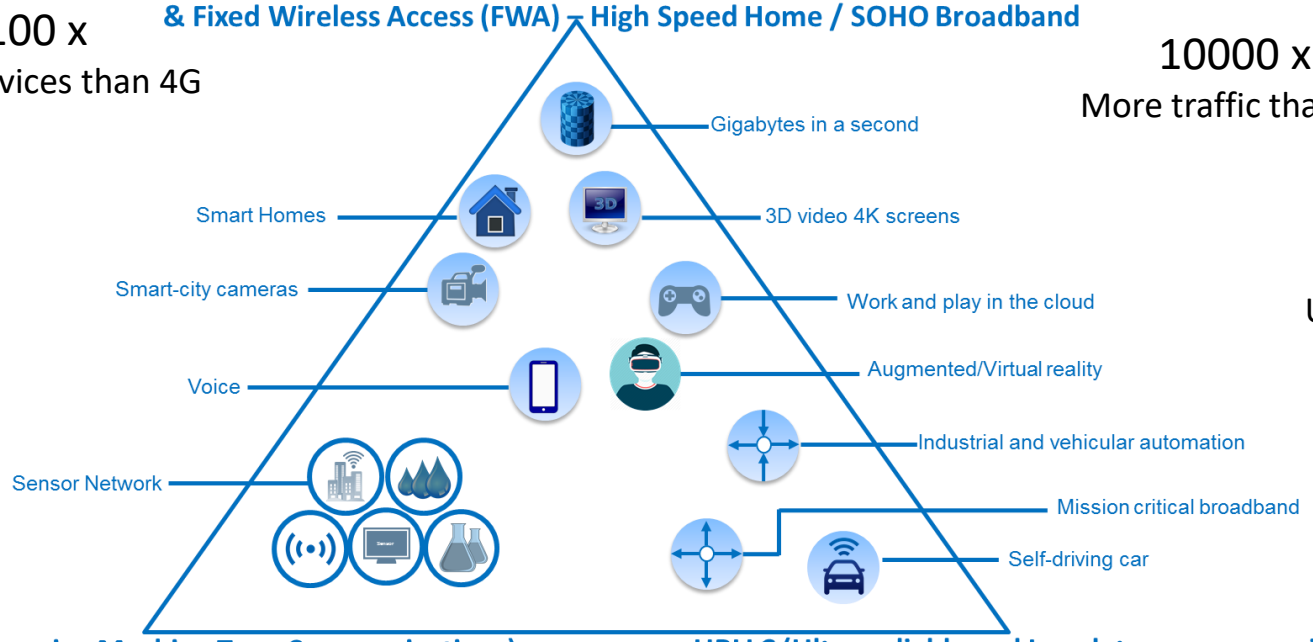
>10 Gbps
Peak data rates

100 Mbps
Whenever needed

**eMBB (enhanced Mobile Broadband) – Capacity Enhancement**
**& Fixed Wireless Access (FWA) – High Speed Home / SOHO Broadband**

100 x
More devices than 4G

10000 x
More traffic than 4G




M2M
Ultra low cost

UR
Ultra-Reliable
(99.999%)

10 years
battery life

1,000,000
devices per km$^2$

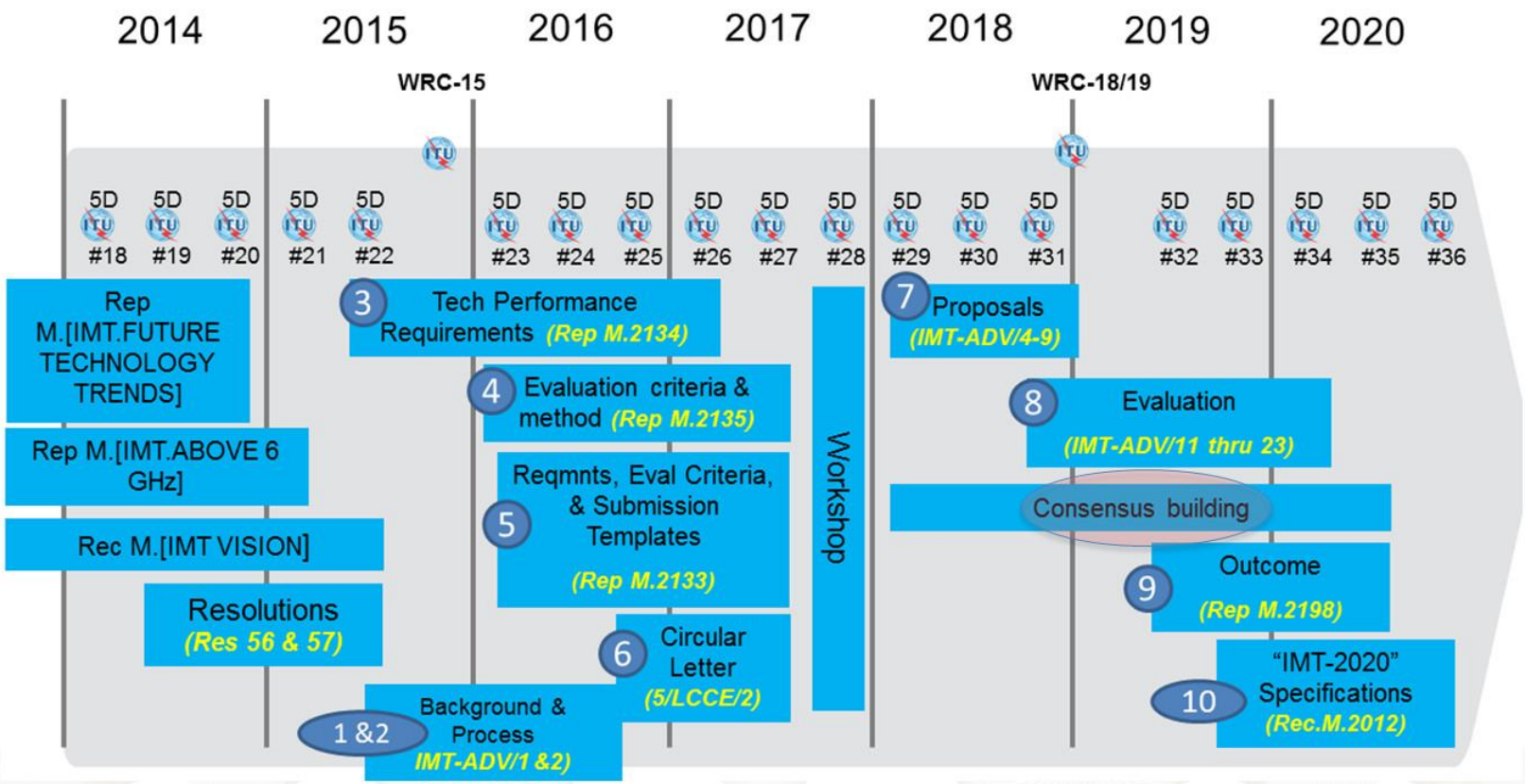
< 1 ms
Low latency on
radio interface

**mMTC (massive Machine Type Communications) – Massive connectivity**

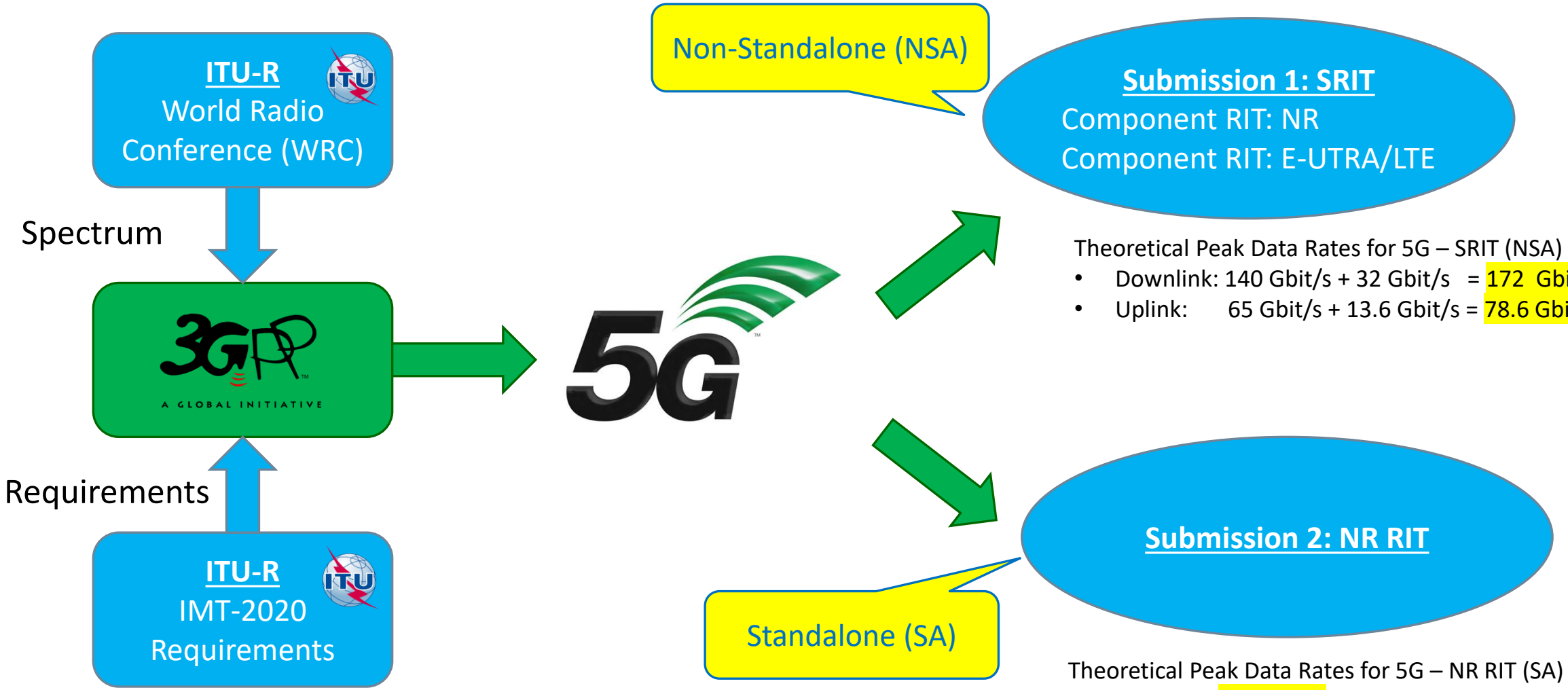
**URLLC (Ultra-reliable and Low-latency communications) – High reliability, Low latency**

CEPT ECC
Electronic Communications Committee

# 5G as IMT 2020
## long process for standardization and spectrum harmonization

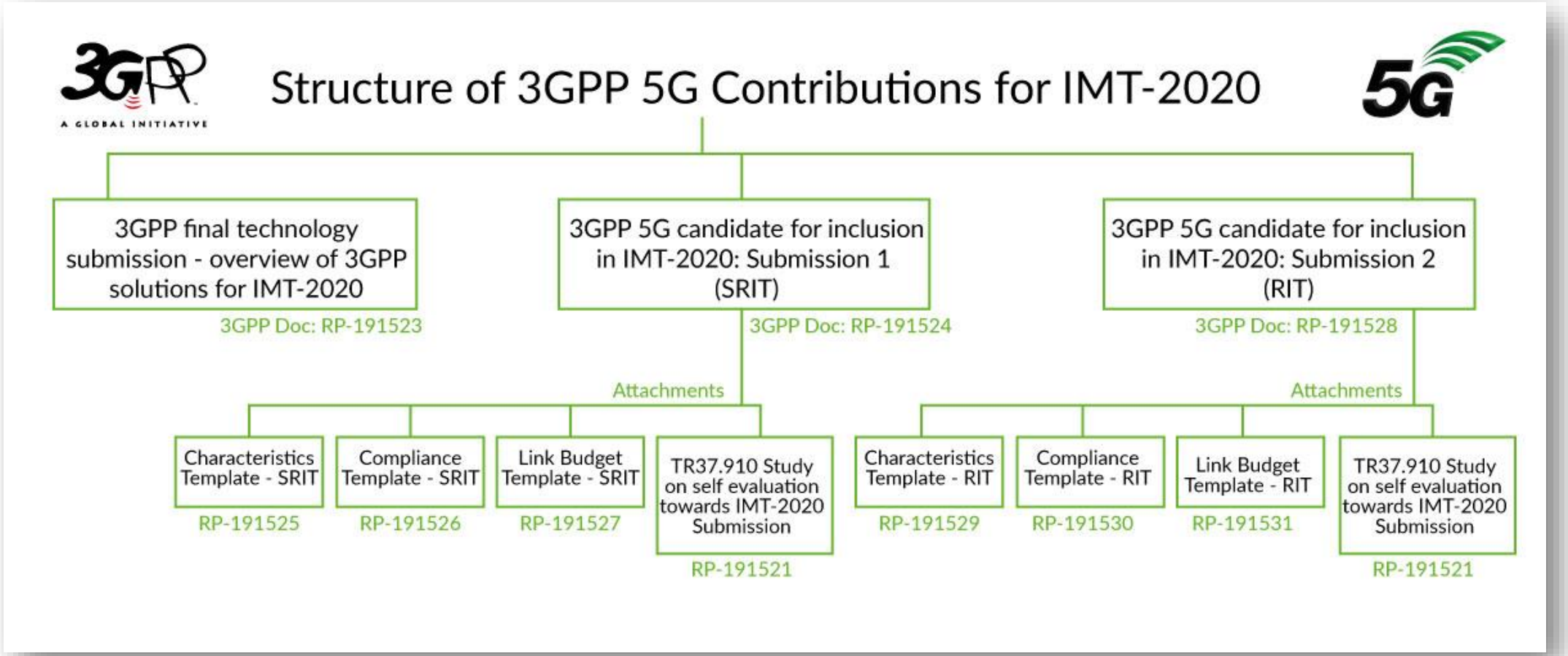


# 5G and IMT-2020



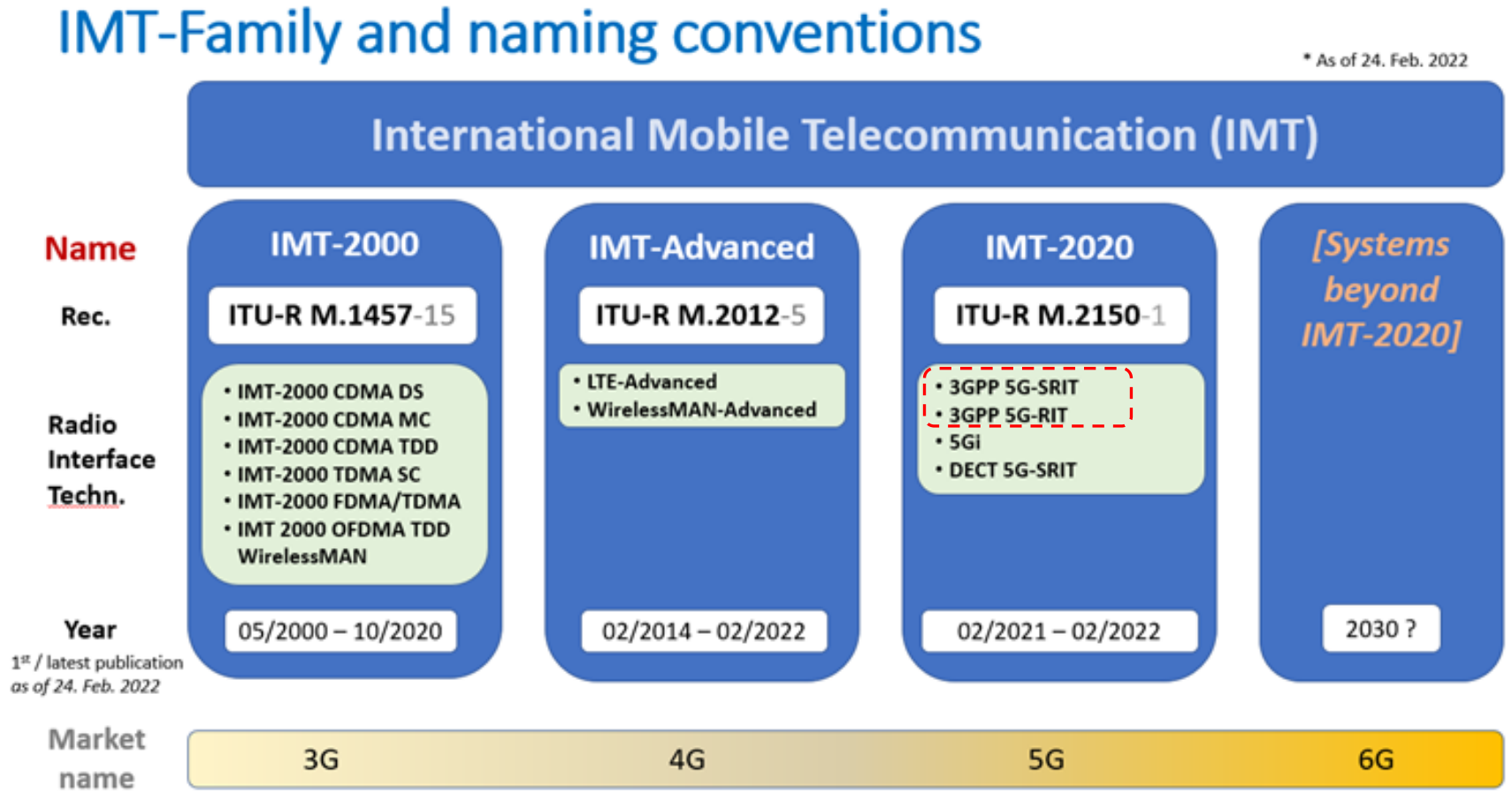

RIT = Radio Interface Technology
SRIT = Set of Radio Interface Technologies

# 3GPP meets IMT-2020



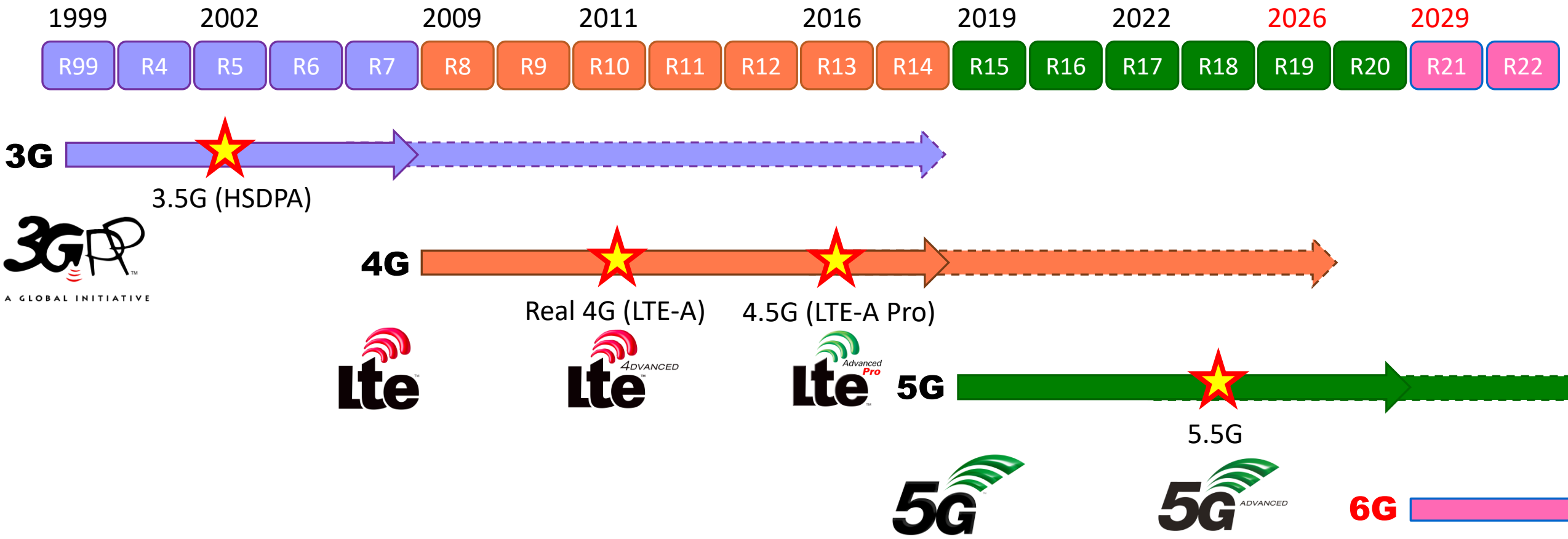

Source: 3GPP

# IMT-Family and Naming Conventions




Source: ITU

# 3GPP Releases Timeline



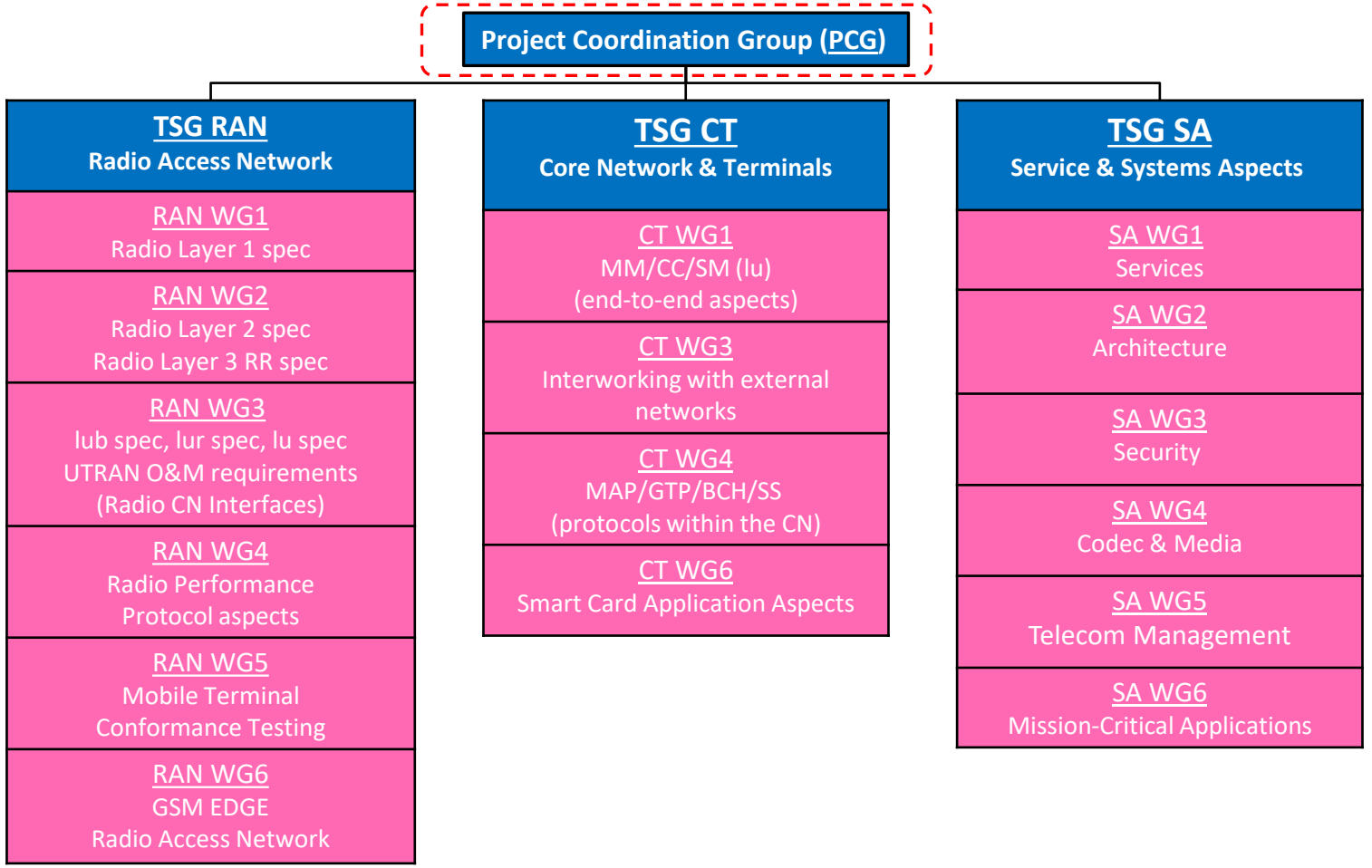

Red indicates dates and features are not confirmed

3GPP Release Dates on [3GPP Portal]

# 3GPP Organisation & Releases Overview

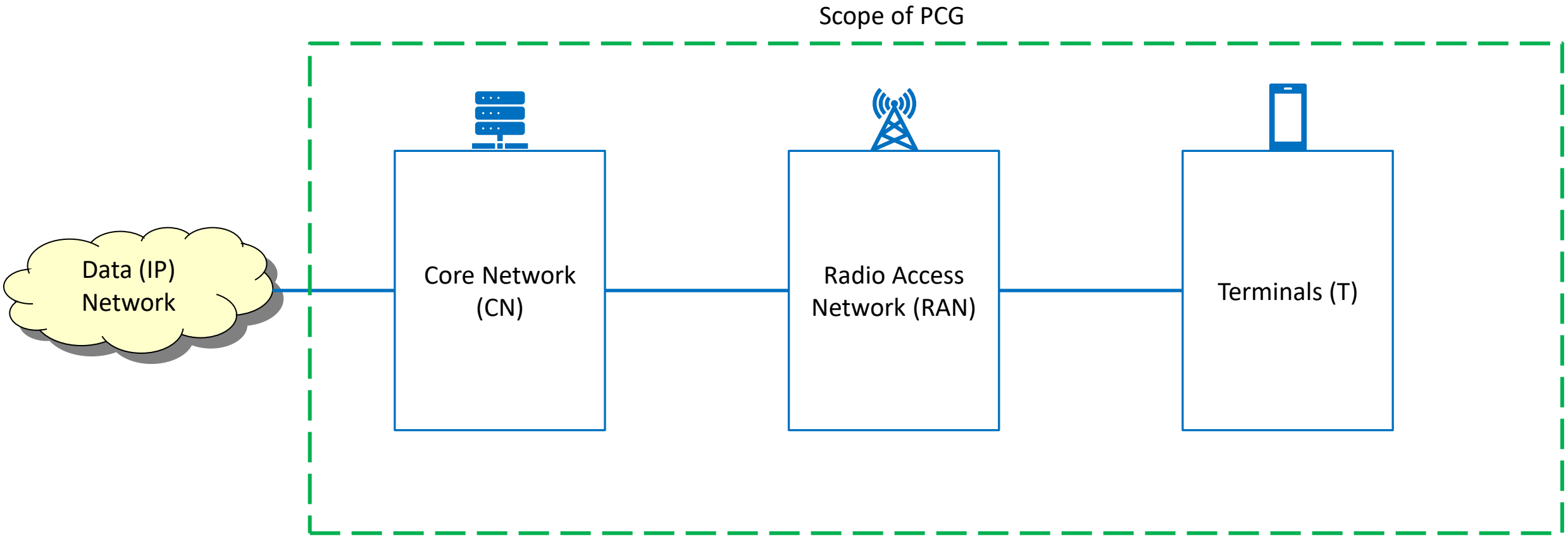
# 3GPP Organisation

- 3GPP – The 3rd Generation Partnership Project ("the project")
- PCG – Coordination of 3GPP by the Organizational Partners (OPs)




Source: 3GPP

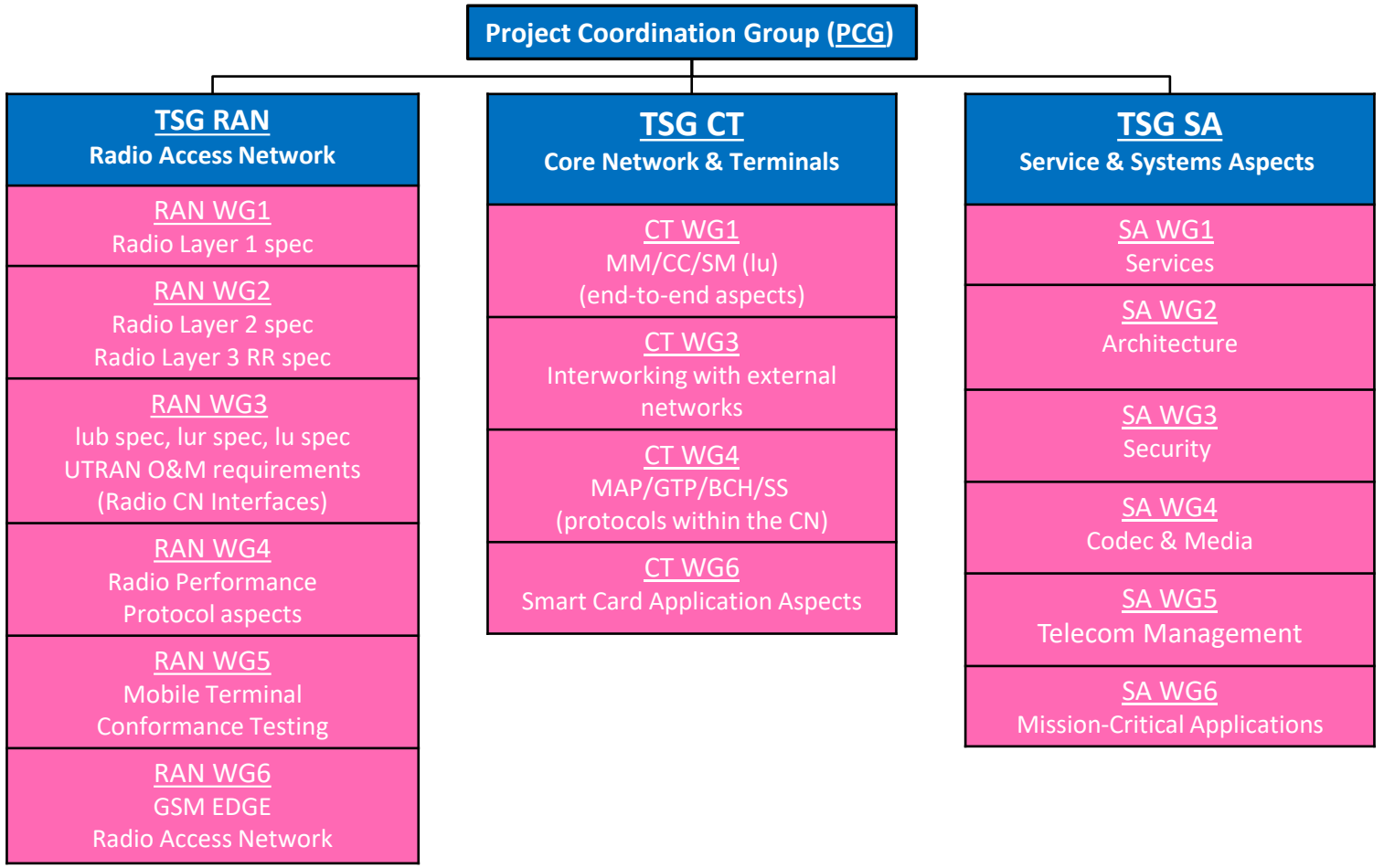
# Responsibilities Within 3GPP




PCG - Project Coordination Group

# 3GPP Organisation

- 3GPP – The 3rd Generation Partnership Project ("the project")
- PCG – Coordination of 3GPP by the Organizational Partners (OPs)
- Technical Specification Groups (TSGs) covering different aspects of 3GPP system & process




Source: 3GPP

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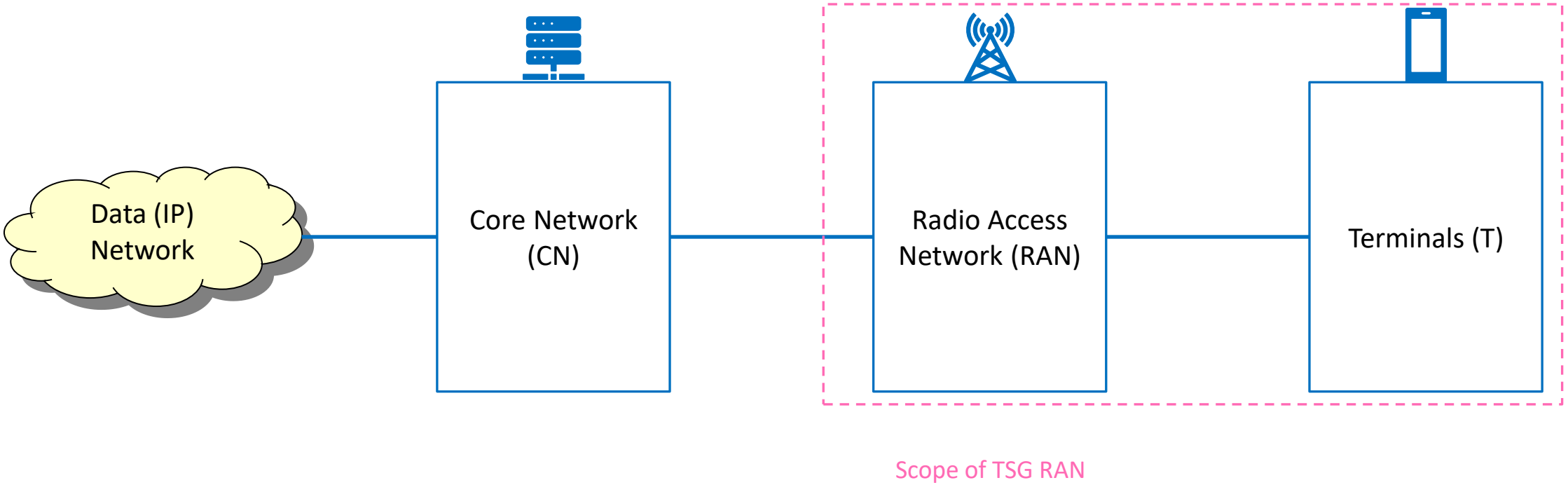


TSG - Technical Specification Groups
RAN - Radio Access Network

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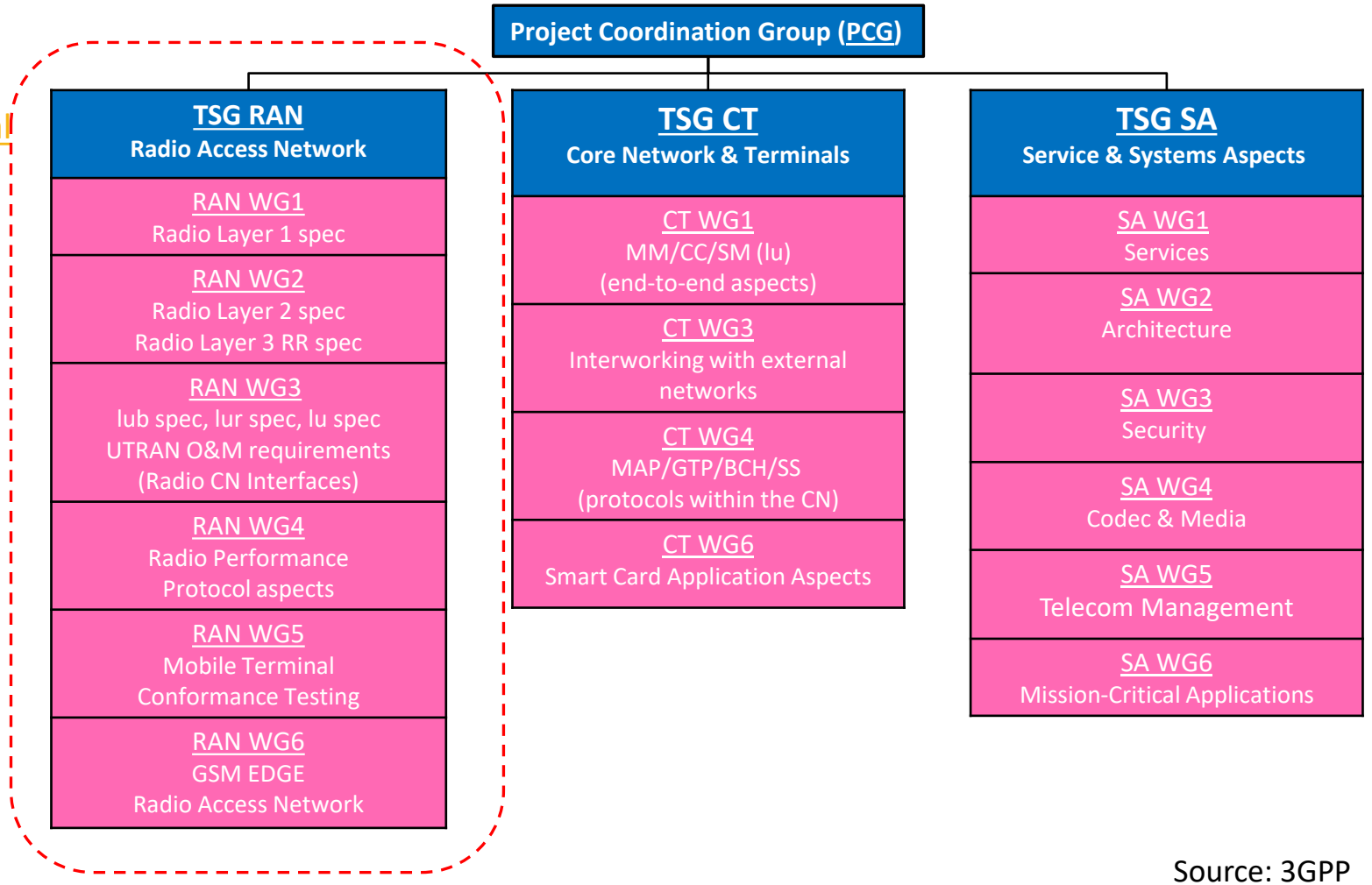
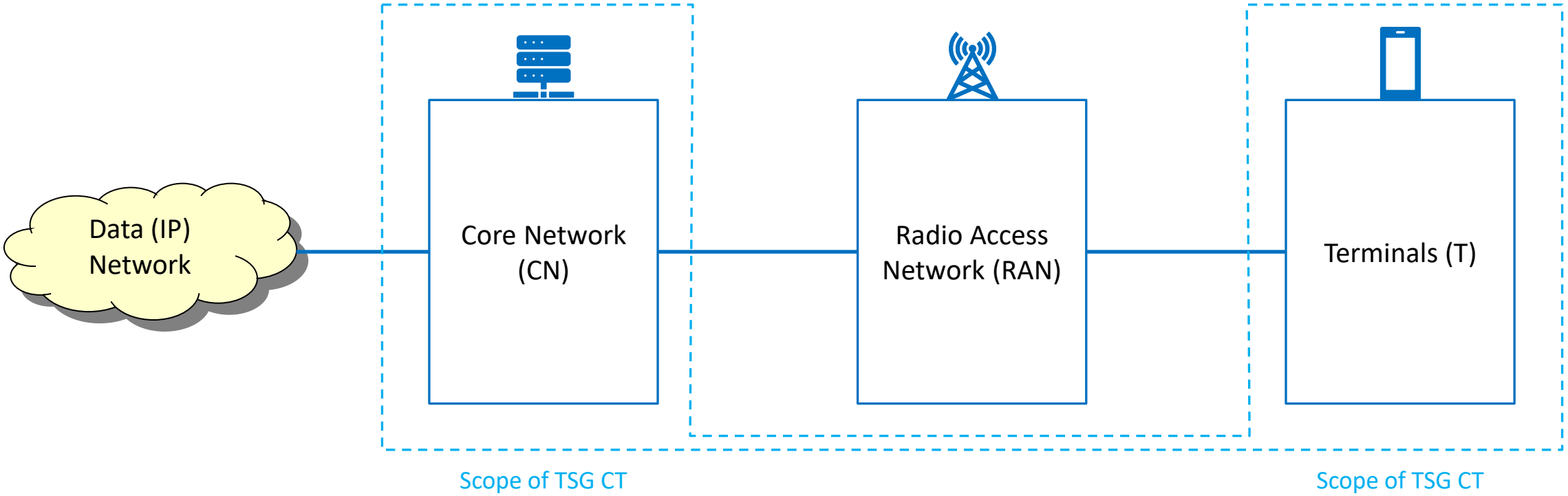



Source: 3GPP

# Responsibilities Within 3GPP




TSG - Technical Specification Groups

CT - Core Network & Terminals

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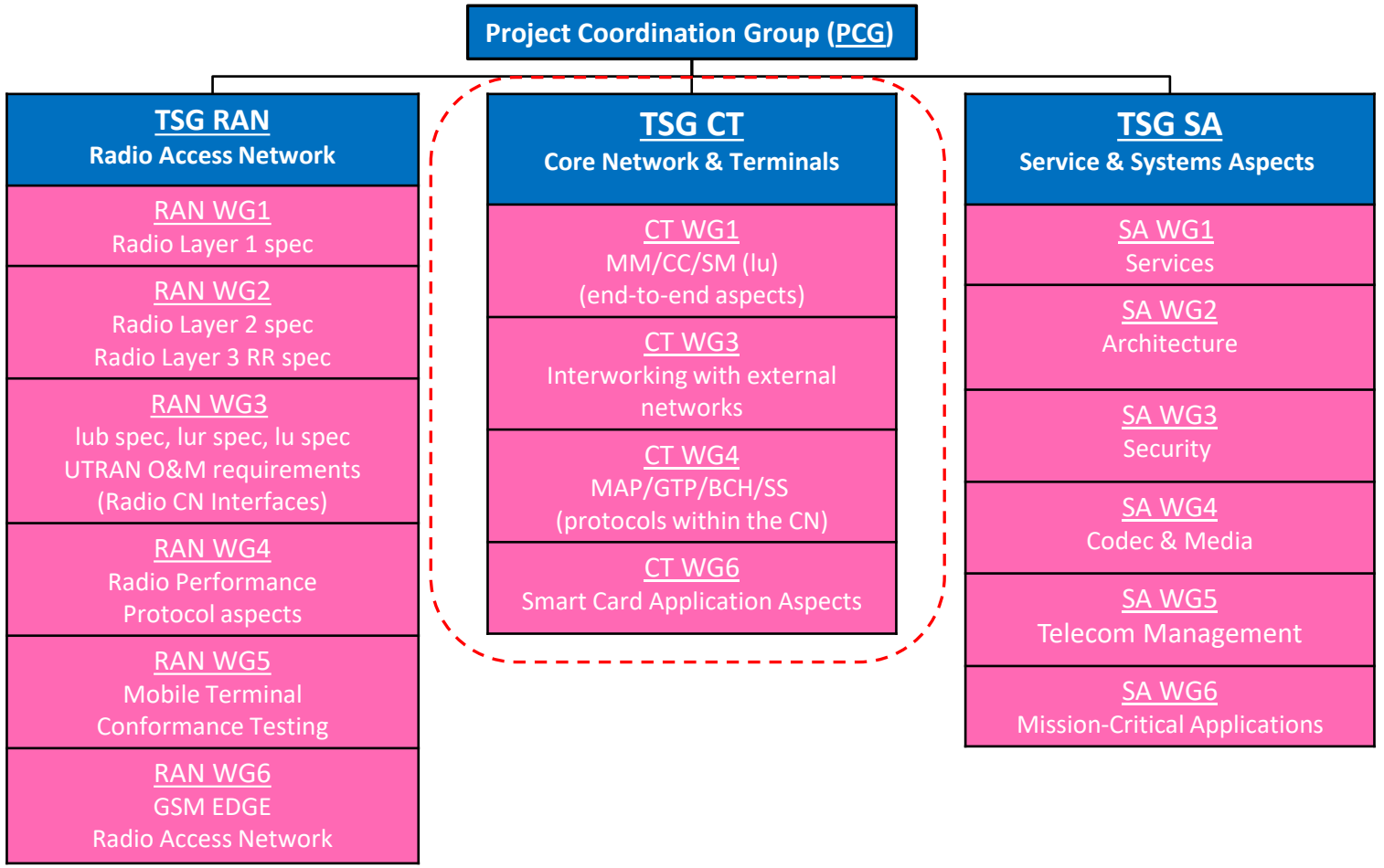
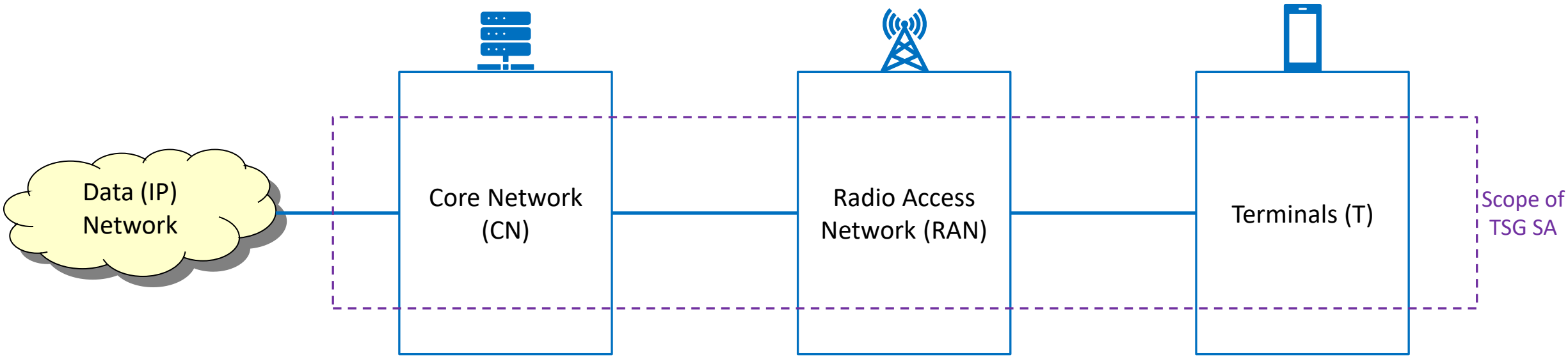



Source: 3GPP

# Responsibilities Within 3GPP




TSG - Technical Specification Groups

SA - Service & Systems Aspects

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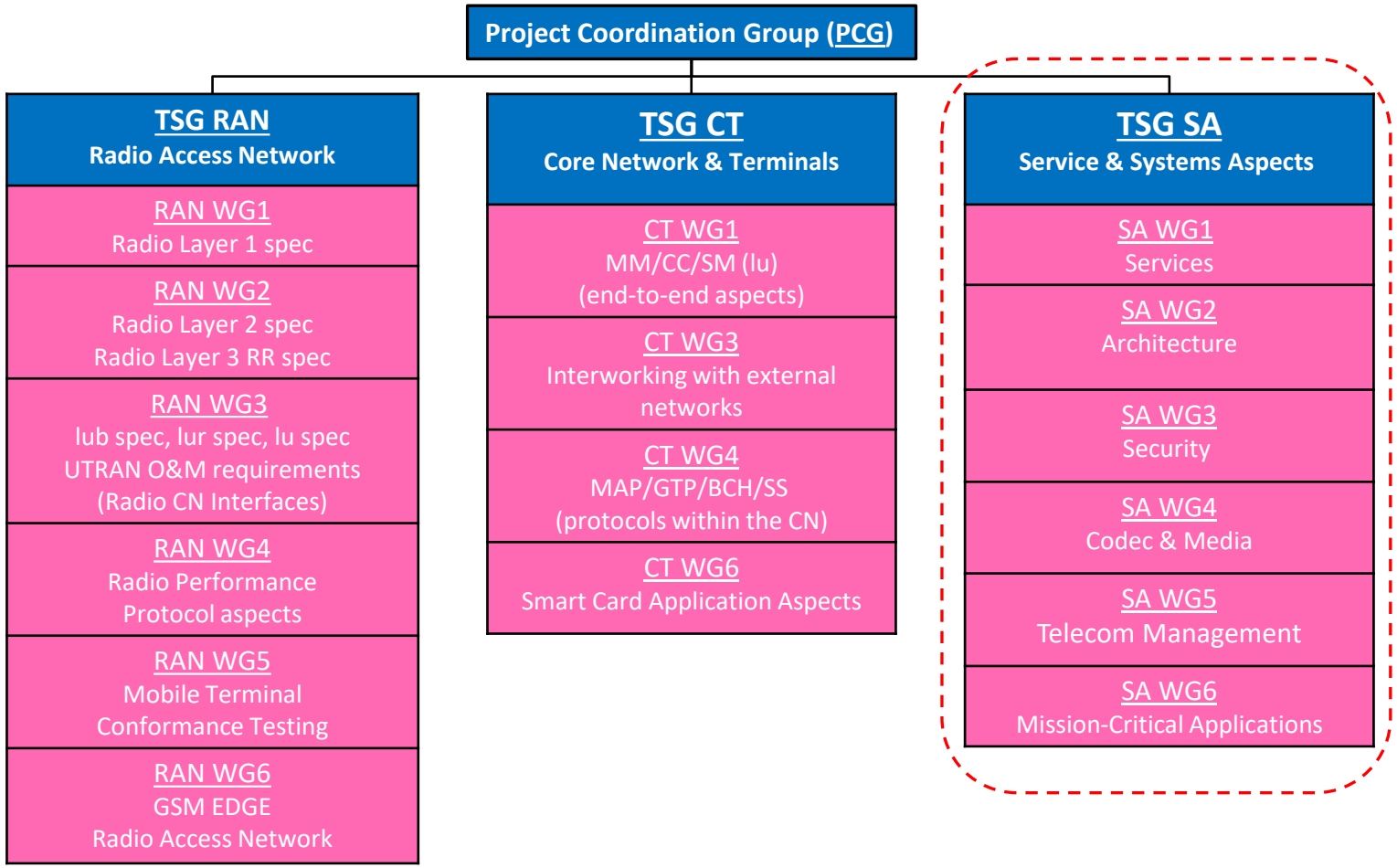
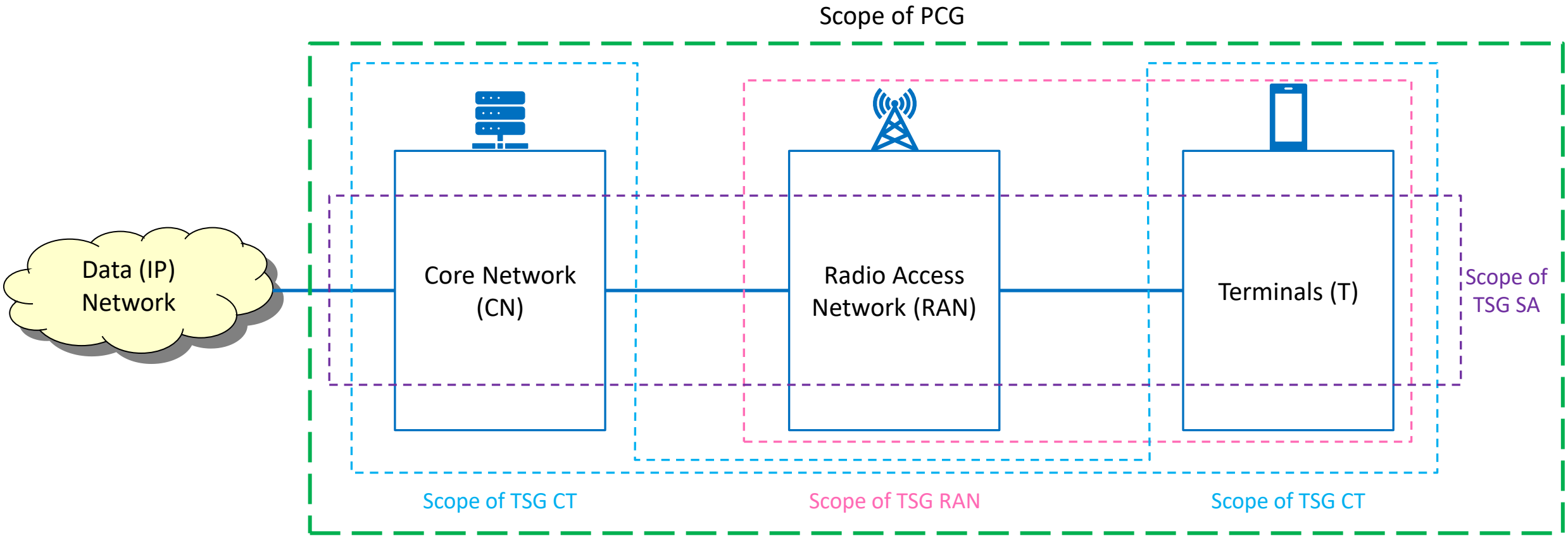



Source: 3GPP

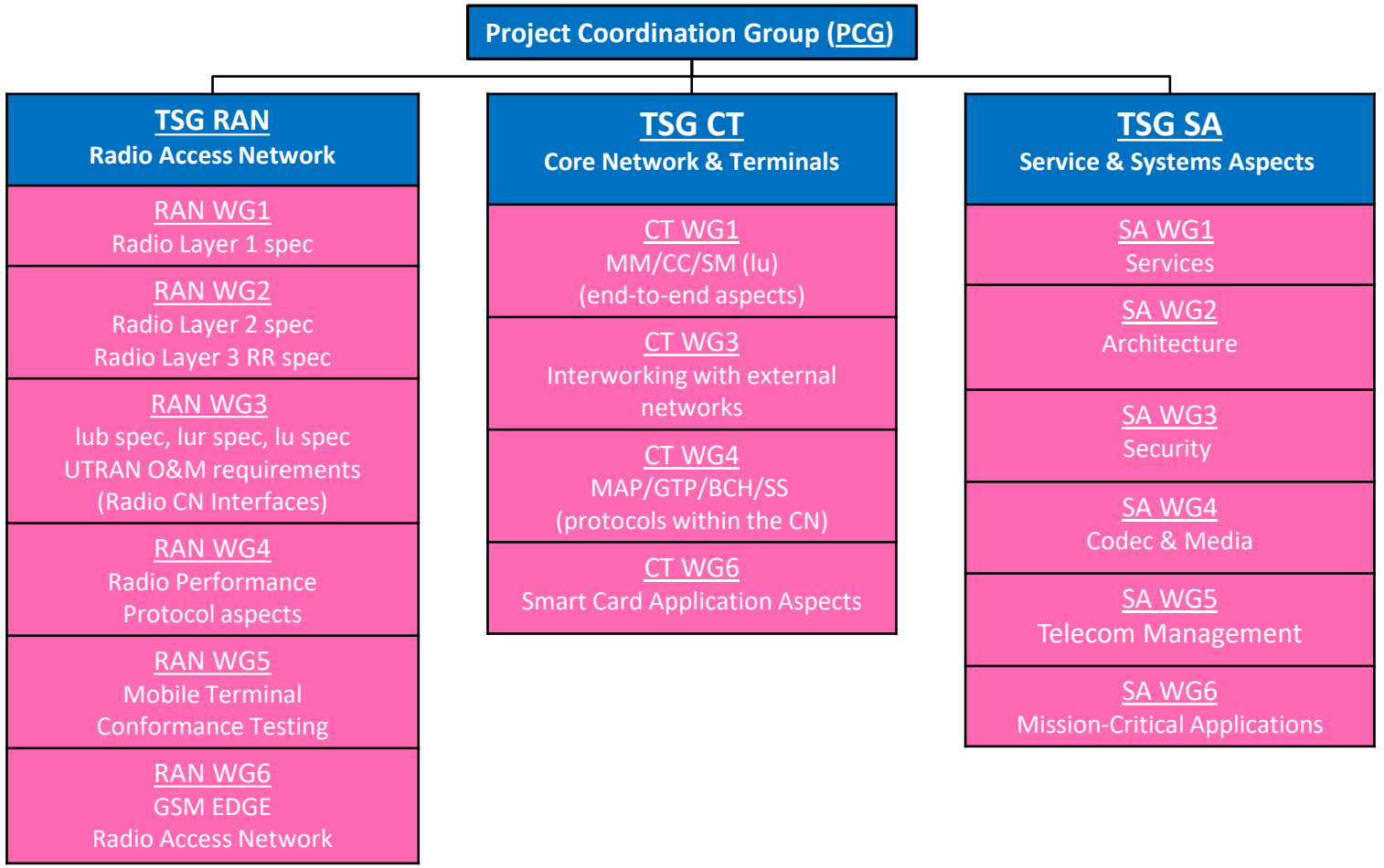
# Responsibilities Within 3GPP




PCG - Project Coordination Group
TSG - Technical Specification Groups
RAN - Radio Access Network
CT - Core Network & Terminals
SA - Service & Systems Aspects

# 3GPP Organisation

- 3GPP – The 3rd Generation Partnership Project ("the project")
- PCG – Coordination of 3GPP by the Organizational Partners (OPs)
- Technical Specification Groups (TSGs) covering different aspects of 3GPP system & process
- TSGs are organized into Working Groups (WGs)
- TSGs meet 4 times a year in the so-called "Plenary meetings" (co-located)
- WGs meet once or more per plenary cycle (mostly not co-located)
- Each TSG and each WG elects its own leadership (2 year terms / 2 terms)
- Technical work is mostly done in WGs
- Overall planning and coordination in TSGs



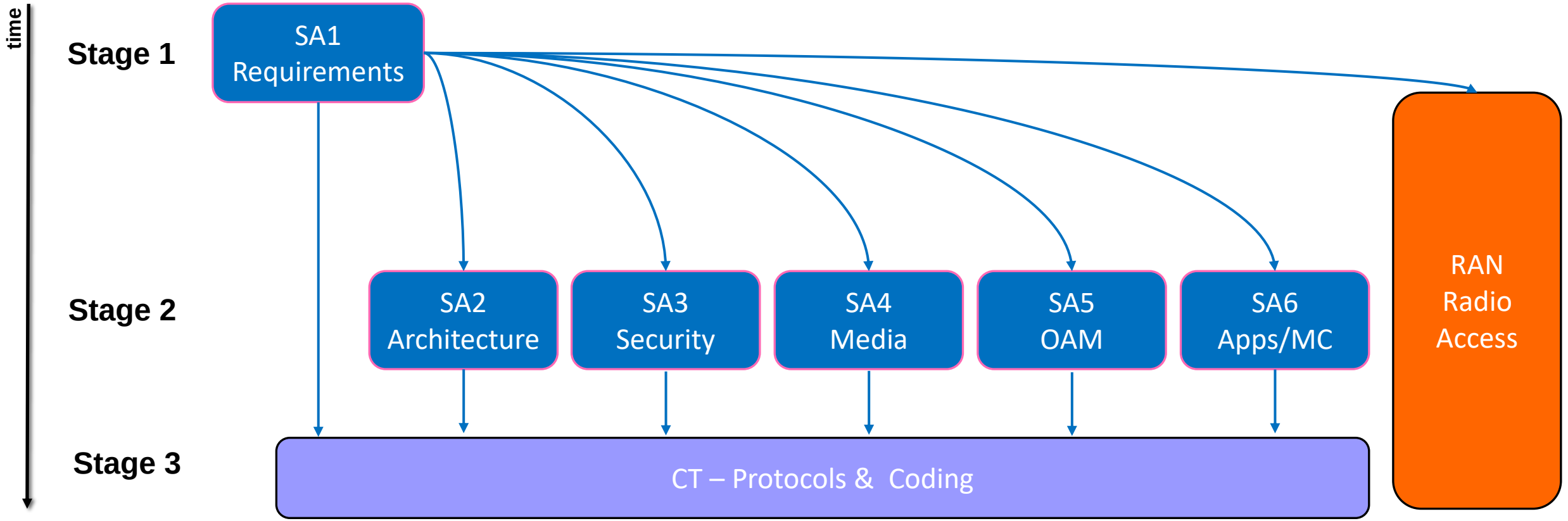

Source: 3GPP

# Work Organisation and Planning

- Work organization
  - Study Items, Work Items
  - Releases with fixed time-lines, which are partially overlapping
  - Work Plan (good overview)
- 3 stages, often overlapping
  - Stage 1: Requirements
  - Stage 2: Architecture
  - Stage 3: Protocols

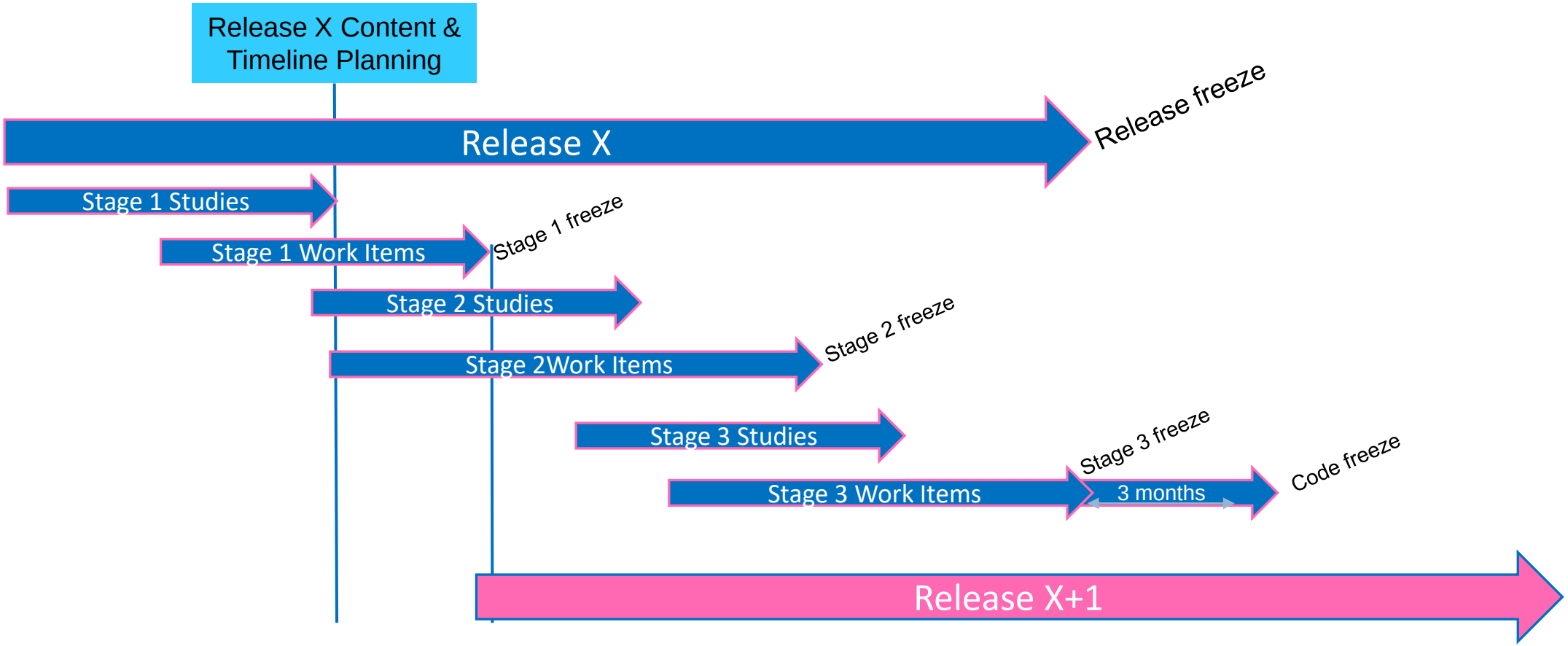
Source: 3GPP

# Stage 1/2/3 (very simplified SA view)



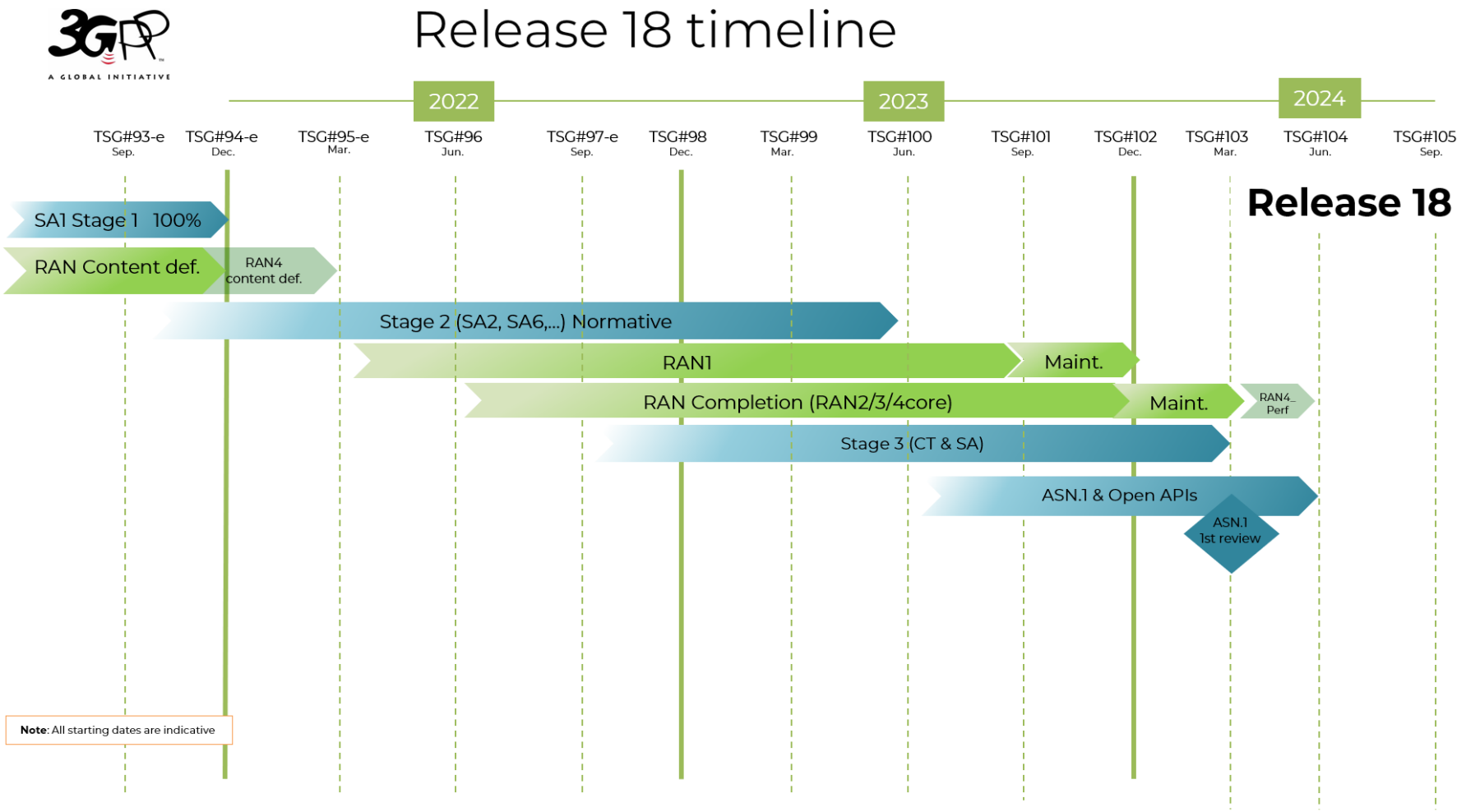

Source: 3GPP

# Simplified SA View of 3GPP Releases




Source: 3GPP

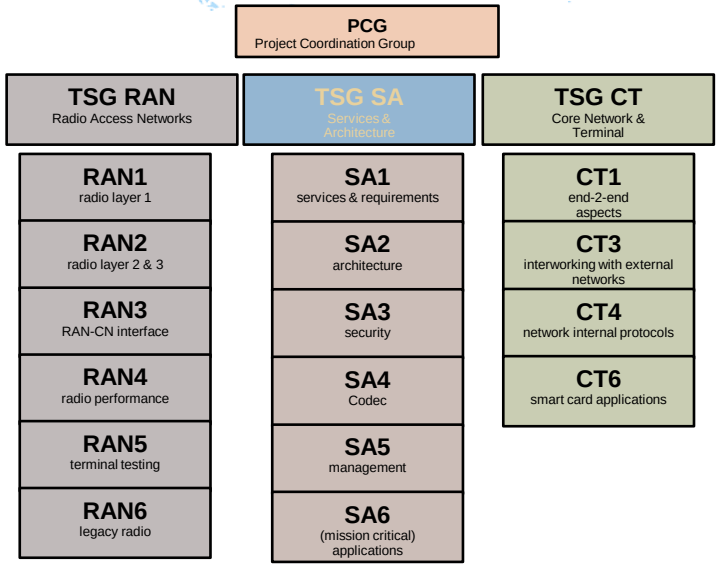
# Example of Release-18 Timeline




Source: 3GPP

# Summary - 3GPP On A Single Slide

- Global standards organization for mobile communication
- 760+ Companies from all over the world actively participating
- A new Release every 15 to 24 months
- A new Generation every 10 years – 3G/UMTS, 4G/LTE, 5G
- Standards for all sectors of mobile communication – VoLTE, NB-IoT
- ~20 Working Groups & TSGs, each meeting 4 to 8 times a year
- Contribution driven
- Consensus based


Source: 3GPP

# References & Further Reading

- 3GPP: How we work (link)
- ITU: An inside look at mobile broadband standards development (link)
- Qualcomm OnQ Blog: Understanding 3GPP – starting with the basics, Aug 2017 by Lorenzo Casaccia (link)
- 3GPP: Breakfast talks for newcomers (link)
- 3GPP Newcomer Orientation (link)
- Prakash Sangam on RCR Wireless: The inside story of 3GPP–Who are the unsung heroes that create the standards? (link)
- The 3G4G Blog: IMT-2020 (5G) Requirements (link)
- 5G PPP IMT-2020 Evaluation Group (link)
- 3GPP meets IMT-2020 (link)

# Thank You

To learn more, visit:

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3G4G Blog – https://blog.3g4g.co.uk/

Telecoms Infrastructure Blog – https://www.telecomsinfrastructure.com/

Operator Watch Blog – https://www.operatorwatch.com/

Connectivity Technology Blog – https://www.connectivity.technology/

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