

3GPP Standards Overview

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Content



- The eco-system for mobile standards
- The role of 3GPP
- The impact of 5G
- Current priorities in radio, systems and core network groups
- Future Outlook and Conclusions

5G Research & Policy initiatives

Europe

- In 2013, EC established <u>Public Private Partnership on</u> <u>5G (5GPPP)</u> to accelerate R&D in 5G technology.
 - funded by <u>Horizon 2020</u> and is being organized in 3 phases:
 - Phase 1: The future 5G network architecture (2015-2017): 19 research projects
 - Phase 2: Move towards demonstration and experiments with the involvement of the vertical industries (2017-2019): 21 projects,
 - Phase 3: End to end 5G platforms, connected and automated mobility, trials across vertical industries and long term 5G evolution: 15 new projects
- EC launched <u>5G Action Plan for Europe in 2016</u> to start launching 5G services by end of 2020 in all EU member states,
 - In 2018, EC launched <u>European 5G observatory</u> to monitor the progress of the 5G Action Plan and to focus on 5G developments in Europe.

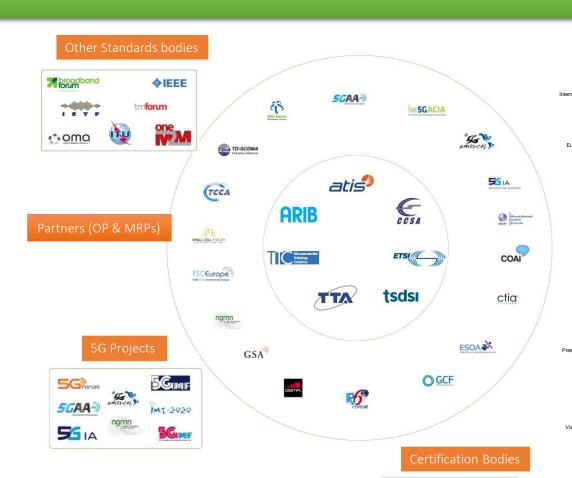
India

- Government has set up a High Level Forum (HLF) to articulate the Vision for 5G in India.
 - ✓ HLF has published a report "<u>Making India 5G</u> <u>Ready</u>"
- <u>Building an End-to-End 5G Test Bed:</u> three-year program began in March 2018 to advance R&D in 5G
 - This program has been awarded to IIT Madras, IIT Hyderabad, IIT Delhi, IIT Kanpur, CEWIT, SAMEER and IISc Bangalore.
- Telecom Regulatory (TRAI) released White Paper on <u>'Enabling 5G in India'</u>
 - highlights the specifications of the 5G technology, architecture of 5G network, spectrum requirements for 5G networks, the regulatory issues & challenges and areas that will require investment for 5G deployment.
- National Digital Communication Policy-2018 (NDCP-2018):
 - Emphasizes on Hi-speed internet, IoT/M2M by rollout of 5G technologies

3GPP standards eco-system



- Participation in 3GPP is made possible by companies and organizations becoming members of one of the 3GPP Organizational Partners, the seven Standards Developing Organizations (SDOs) - from China, Europe, India, Japan, Korea and the United States.
- Specific inputs, in the form of market requirements may also come in to the Project via any of the 18 Market Representation Partners in 3GPP. These organizations have all signed up to the 3GPP Project scope and objectives.
- There is also a lot of external cooperation with other standards bodies and a broad variety of other groups, by way of formal Liaisons.



Formal Exte<u>rnal</u>

European Radiocommunications Committee (ERC ixed Mobile Convergence Alliance (FMCA)

Global TD-LTE Initiative (GTD

ernet Streaming Media Alliance

The Java Community Process (JCP

LTE/SAE Trial Initiative (LSTI)

Object Management Group (OMG

WLAN Smart Card Consortiur

Wireless World Research Forum (WWRF

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PTCRB GCF



Project Coordination Group (PCG

TSG RAN

Radio Access Network

RAN WG1

548

446

403

Radio Layer 1 spec

RAN WG2

Radio Layer 2 spec Radio Layer 3 RR spec

RAN WG3

193

lub spec, lur spec, lu spec **UTRAN O&M requirements** (Radio CN Interfaces)

RAN WG4

439

145

Radio Performance **Protocol** aspects

RAN WG5

Mobile Terminal Conformance Testing

RAN WG6

GSM EDGE

Radio Access Network

TSG CT

175

144

Core Network & Terminals

CT WG1

MM/CC/SM (lu) (end-to-end aspects)

CT WG3

113

Interworking with external networks

CT WG4

121

MAP/GTP/BCH/SS (protocols within the CN)

CT WG6

55

Smart Card Application Aspects

TSG SA

Service & Systems Aspects

SA WG1

Services

SA WG2

Architecture

SA WG3

Security

SA WG4

Speech, audio, video, and multimedia Codecs

SA WG5

Telecom Management

SA WG6

60

56

272

101

247

79

63

Mission-Critical Applications

Delegates at last meeting

Membership



3GPP Member Companies (2019 list)

450connect, 7LAYERS, Academy of Broadcasting Science, AccelerComm, Accuris, Acer, Acorn, Adare, Adtran, Adva Optical Networking, Aeroflex, Affirmed Networks, Airbus, Airwave, Alcatel-Lucent, Alibaba, Altan Redes, Altiostar, Amdocs, Analog Devices, Andrew Wireless Systems, Anemone, Anritsu, Apple, Applied Communication Sciences, AQSACOM, ARCEP (FR), AREA, ArgoNET, Aselsan, Asia Pacific Telecom, AsIaII (nd. ASTRI (HK), ASTRID, Asustek, AT&T, AT4, Australian Government, Austrian Federal Ministry for Transport, Innovation and Technology, Autotalks, Avanti, Azimuth, BAE, BankID Norge, BBC, B-Com, BDBOS (DE), Beijing Jiaotong University, Bell Mobility, BfV (DE), Bharti Airtel, Bittium, BKA (DE), BlackBerry, Bluetest, BMWi (DE), Bolloré, Bostwana Communications Regulatory Authority, Bouygues, Broadcast Networks Europe, Broadcom, Brocade, BT, BTL, Bull, BUPT (CN), Bureau Veritas (TW), C Spire, CableLabs, Cadence, Cambium, Canon, Carnegie, Casa Systems, Catapult, China Academy of Telecommunication Research of MIIT, C-DOT (IN), Cellnex, Center for Internet Security (US), Centre tecnologic de Telecomunicacions de Catalunya, Ceragon, CENC (CN), CETECOM, CEWIT (IN), Charter Communications, Chen Si Electronics, China Academy of Information and Communications Technology, China Academy of Telecommunication Technology, China Mobile, China Southern Power Grid, China Telecom, China Unicom, Chongqing University, CHTTL (TW), CICT (CN), Cisco, CITC (CN), CITCCST (CN), CISC Peter-Service (RU), CKH IOD (UK). CNES - Centre National d'Etudes Spatiales (FR), Cobham, Cohere, Coherent Logix, Commissariat à l'Energie Atomique et et aux Energies Alternatives of the Communication of the Commu

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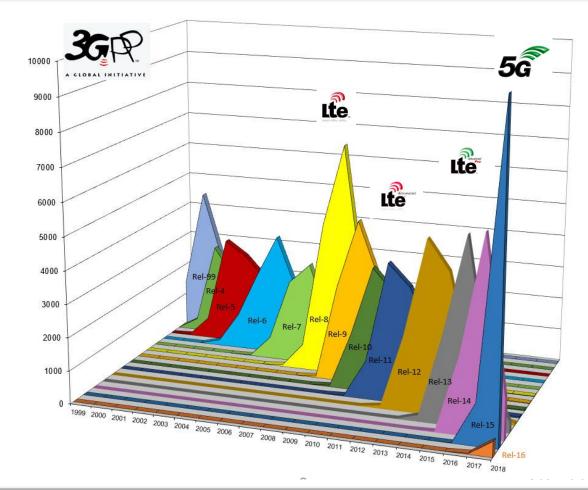
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TSG Core & Terminals	CT		Lionel	Morand	Orange
	CT	1	Peter	Leis	Nokia
	CT	2	lan	Harris	
	СТ	3	Susana	Fernandez	Ericsson
	Ci	3	Susaria	remanuez	LIICSSOII
	CT	4	Peter	Schmitt	Huawei
	CT	6	Heiko	Kruse	IDEMIA
TSG Radio Access Networks	RAN		Balazs	Bertenyi	Nokia
	RAN	1	Wanshi	Chen	Qualcomm
	RAN	2	Richard	Burbidge	Intel
	RAN	3	Gino	Masini	Ericsson
	RAN	4	Xutao	Zhou	Samsung
	RAN	5	Jacob	John	Motorola
	RAN	6	Juergen	Hofmann	Nokia
TSG - Services and System Aspects	SA		Georg	Mayer	HuaWei
13d - Services and System Aspects	37		deoig	Almodovar	iiuavvei
	SA	1	Jose Luis	Chico	TNO
	SA	2	Puneet	Jain	Intel
	SA	3	Noamen	Ben Henda	Ericsson
	SA	4	Frederic	Gabin	Ericsson
	SA	5	Thomas	Tovinger	Ericsson
	SA	6	Suresh	Chitturi	Samsung

3GPP Work Plan



- Release-based work
 - Releases are major packages of Features
 - Work plan built using Work Items that deliver the Features
 - Work Item Description exists for each of these
 - WI may cover more than one specification
 - WI may cover more than one TSG or WG
 - WI Description document exists for each WI
- Multiple releases maintained in parallel
- ≈3GPP WorkPlan:
 - http://www.3gpp.org/Work-Plan



Multiple breakthrough technologies



Perfect storm of:

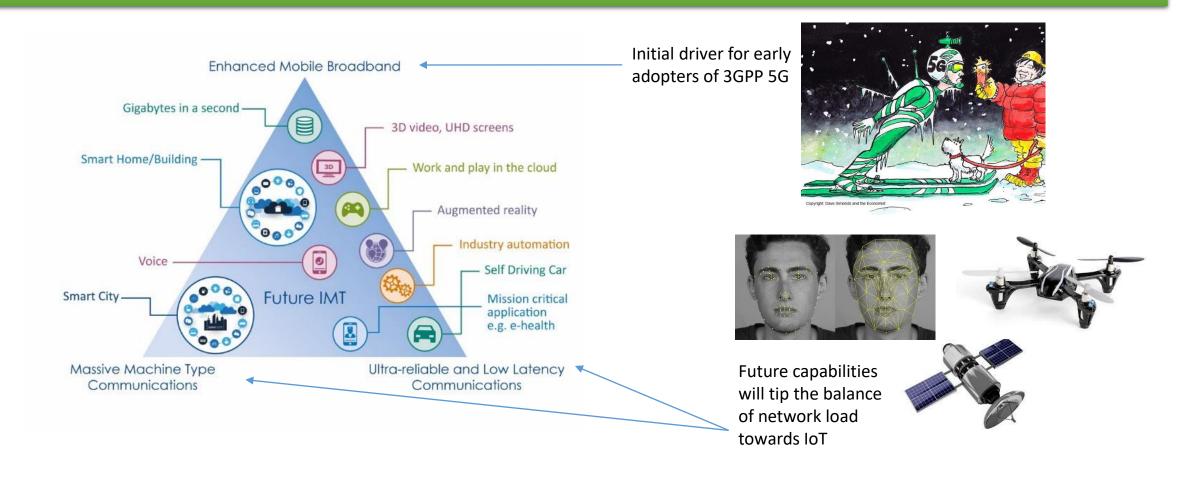
- Low latency radio with fully flexible network
- Artificial Intelligence and Automation
- Device revolution for AR/VR
- Vertical industries going cellular



The IMT vision







Work on 5G NR



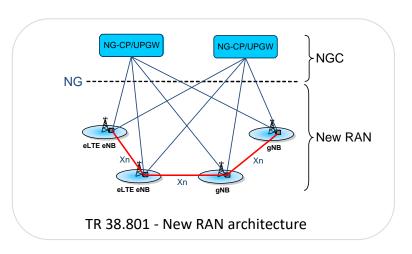
- Operation from <u>low to very high</u> bands: 0.4 100Ghz
 - Including standalone operation in unlicensed bands
- Ultra wide bandwidth
 - Up to 100MHz in <6GHz
 - Up to 400MHz in >6GHz
- Set of <u>different numerologies</u> for optimal operation in different frequency ranges

3GPP will standardize
the Radio Access
Architecture and Interfaces
for a New Radio
Technology for 5G.

5G NR



- Native forward compatibility mechanisms
- New channel coding
 - LDPC for data channel, Polar coding for control channel
- Native support for <u>Low Latency and Ultra</u> <u>Reliability</u>
- Flexible and modular RAN architecture: split fronthaul, split control- and user-plane
- Native end-to-end support for <u>Network Slicing</u>



Where are we now on 5G?

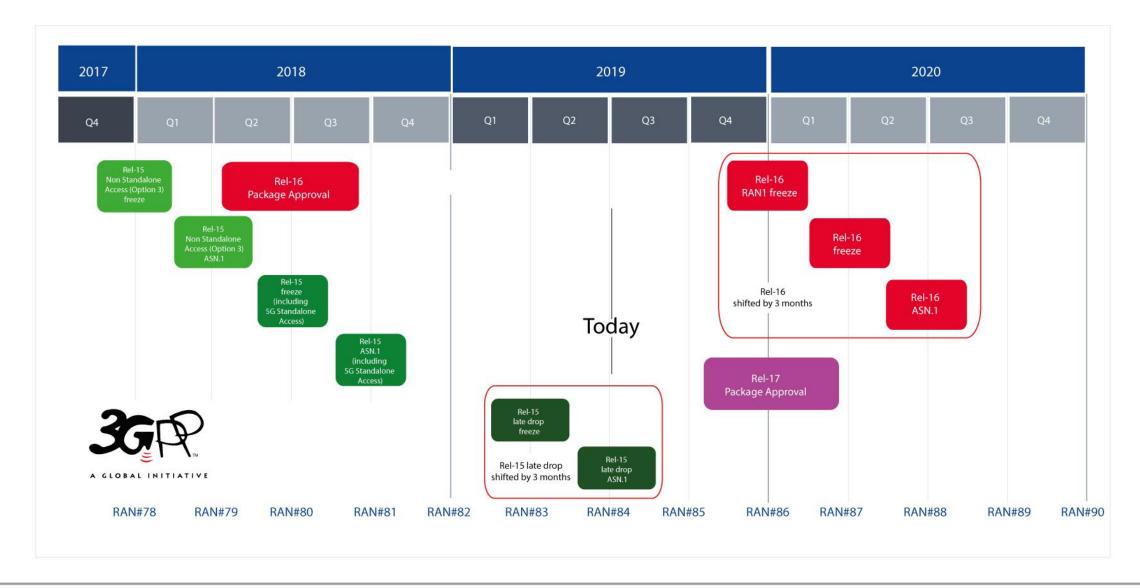




- 3GPP continues to expand the LTE platform to improve its efficiency to meet the mobile broadband demand
- 3GPP is on schedule with the standardization of 5G, addressing the expanded connectivity needs of the future
- Phases for the normative 5G work
 - Phase 1 (Rel-15): Addresses the more urgent subset for commercial deployments
 - Phase 2 (Rel-16): Completes the IMT 2020 submission, addresses all identified use cases & requirements



Adjusted schedule for 2nd wave of 5G specifications (As at TSG RAN#82):

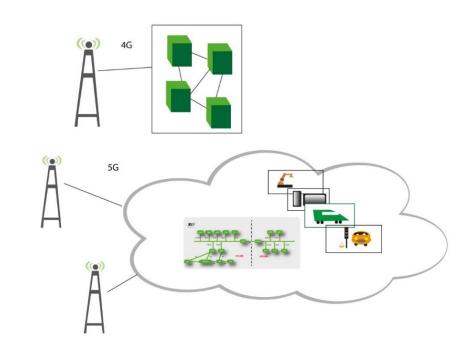


Network Transformation



- One Network fits all → Open & Flexible Enabler
- ▼ Telecom Operators → Multiple Stakeholders

- Static Topology On-demand Resources
- - Network Function → Virtualization
 - Single Network → Slice



Future outlook





- Vehicle Communication, Mission Critical Communications, Industrial IoT, Audio Visual Production...
- Enhancements for the system coming:
 - 5G LAN, High Precision Positioning, Cellular IoT for 5G, URLLC capabilities, Fixed and Satellite as 3GPP accesses, ONAP interworking, QoS Monitoring, Network Automation, protocol and core network improvements...
- 5G will span several releases, look out for the Rel-17 work plan soon

36Release 17 Functional Freeze: June 2021*

- TSG SA content & prioritization discussion at SA#85 (September 2019):
- 5G System Enhancement for Advanced Interactive Services
- Cellular IoT enhancement for the 5G System
- System enhancement for Proximity based Services in 5GS
- Enhancement of support for 5G LAN-type service
- Integration of Satellite in 5G Systems
- Architectural enhancements for 5G multicast-broadcast services
- Support for 5G Wireless Wireline Convergence
- Application Awareness Interworking between LTE and NR
- Extended Access Traffic Steering, Switch and Splitting support in the 5G architecture
- Enhanced IMS to 5GC Integration
- Enhancement to the 5GC LoCation Services Phase 2
- Enablers for Network Automation for 5G Phase 2
- Enhancement of support for Edge Computing in 5GC
- Enhanced support of Non-Public Networks
- Enhancement of Network Slicing Phase 2
- Enhancement of 5G UE Policy
- Architecture enhancements for 3GPP support of advanced V2X services - Phase 2
- Supporting Flexible Local Area Data Network
- Supporting Unmanned Aerial Systems Connectivity, Identification, and Tracking
- Enhanced support of Industrial IoT TSC/URLLC enhancements
- Multimedia Priority Service (MPS) Phase 2
- Support for Multi-USIM Devices
- System architecture for next generation real time communication services
- Service-based support for SMS in 5GC
- Smarter User Plane
- UPF enhancement for control and SBA
- Usage of User Identifiers in the 5G System
- Enhancements for cyber-physical control applications in vertical domains
- Support for Minimization of service Interruption
- Complete Gap Analysis for Railways Mobile Communication System

TSG RAN Work Areas under discussion

For final decision on the Rel-17 content at RAN#86 (December 2019):

- NR Light
- Small data transfer optimization
- Sidelink enhancements
- NR above 52.6 GHz (inlc 60GHz unlicensed)
- Multi SIM operation
- NR multicast broadcast
- Coverage enhancements
- NB-IoT and eMTC enhancements
- Industrial IoT & URLLC enhancements
- MIMO enhancements
- NR for Non Terrestrial Networks
- Integrated Access and Backhaul enhancements
- Generic enhancements to NR-U
- Power saving enhancements
- RAN data collection enhancements
- Positioning enhancements

Projected

019

Conclusions



- 3GPP is an industry driven standardization activity with truly global reach
- Standardization of interfaces enables an interoperable, multi-vendor approach to deployment and generates mass market economies of scale
- NR remains high focus for RAN groups
- IMT-2020 '5G' process progressing 3GPP leading the way
- Release 16 focus continues to expand towards new use cases and new sectors
- The 3GPP processes are necessarily complex, but we need to adapt to bring new sectors in to the work
- 5G will be a multi-Release technology (beyond Release 16), Rel-17 in the planning stage

For more Information







www.3gpp.org



portal.3gpp.org