Standards: Keeping our Customers and Communities Connected

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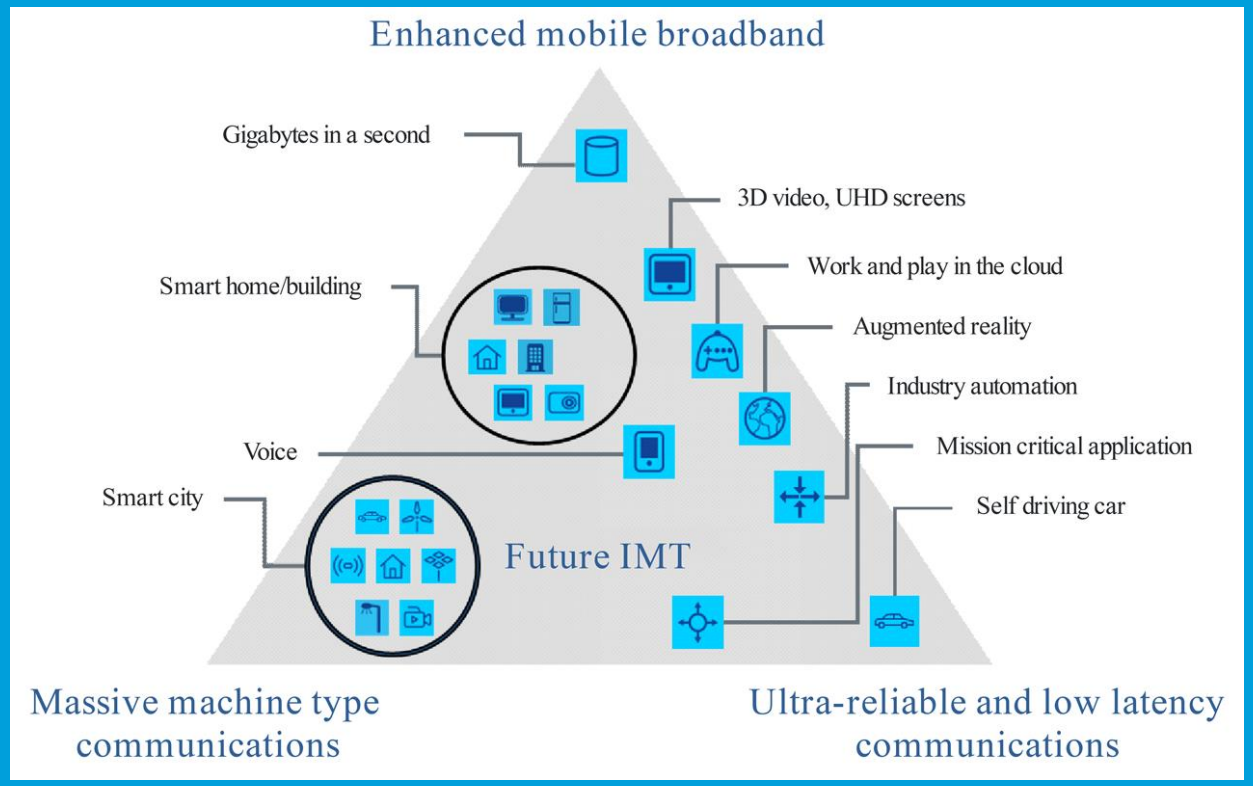
IMT-2010 IMT-2020



5G Phase 1 & 2 3GPP Release 15 & 16

Release 15

- NR
- The 5G System – Phase 1
- Massive MTC and Internet of Things (IoT)
- Vehicle-to-Everything Communications (V2x) Phase 2
- Mission Critical (MC) interworking with legacy systems
- WLAN and unlicensed spectrum use
- Slicing – logical end-2-end networks
- API Exposure – 3rd party access to 5G services
- Service Based Architecture (SBA)
- Further LTE improvements
- Mobile Communication System for Railways (FRMCS)

Release 16

Radio enhancements:

- Enh. for NR URLLC
- NR Industrial Internet of Things (NR_IIOT)
- NR-based access to unlicensed spectrum (NR_unlic)
- Integrated Access and Backhaul (IAB)
- MTC enh. for LTE (LTE_eMTC5)
- NB-IoT (NB_IOTenh3)
- NR Vehicle-to-Everything (NR_V2X)
- 5G V2X with NR sidelink (5G_V2X_NRSL)
- NR positioning support (NR_pos)
- Optimisations on UE radio capability signalling (RACS-RAN)
- UE Power Saving in NR (NR_UE_pow_sav)
- Enh. on MIMO for NR (NR_eMIMO)
- NR mobility enh. (NR_Mob_enh)
- 2-step RACH for NR (NR_2step_RACH)
- LTE-NR & NR-NR Dual Connectivity and NR Carrier Aggregation enh. (LTE_NR_DC_CA_enh)
- LTE-based 5G terrestrial broadcast (LTE_terr_bcast) Cross Link Interference handling and Remote Interference Managementfor NR (NR_CLI_RIM)
- DL MIMO efficiency enh. for LTE (LTE_DL_MIMO_EE)
- Navigation Satellite System for LTE (LCS_NAVIC)
- Non-Orthogonal Multiple Access Study (NR_NOMA)

System enhancements:

- 5G System (5GS) enablers for new verticals:
  - Industrial automation, including Time Sensitive Communication (TSC), Ultra Reliable and Low Latency Communication (URLLC) and Non-Public Networks (NPNs)
  - Cellular Internet of Things (CIoT) support for 5G system
  - Vehicle-to-Everything (V2X) communication
- Mobile Communication System for Railways (FRMCS Phase 2)
- Satellite Access in 5G
- NR-based access to unlicensed spectrum (nr-U)
- 5G Wireless Wireline Convergence (5WWC)
- Enh. for Network Analytics (eNA)
- Support for Access Traffic Steering, Switching and Splitting (ATSSS)
- Optimized UE radio capability signalling (RACS)
- Enh. Network Slicing (eNS)
- Enh. Service Based Architecture (eSBA)
- Single Radio Voice Call Continuity (5G-SRVCC)
- Enh. Location Services (eLCS)
- Enh. Common API Framework for 3GPP Northbound APIs (eCAPIF)

5G Efficiency: Interference Mitigation, SON, eMIMO, Location and positioning, Power Consumption, eDual Connectivity, Device capabilities exchange, Mobility enh.

The detail in this graphic is a snap-shot of some of the key features. Full details of all of the Release 16 features are at: www.3gpp.org/specifications/work-plan

3GPP Release 17

Release 17

- NR MIMO
- NR Sidelink enh.
- 52.6 - 71 GHz with existing waveform
- Dynamic Spectrum Sharing (DSS) enh.
- Industrial IoT / URLLC enh.
- IoT over Non Terrestrial Networks (NTN)
- NR over Non Terrestrial Networks (NTN)
- NR Positioning enh.
- Low complexity NR devices
- Power saving
- NR Coverage enh.
- NR eXtended Reality (XR)
- NB-IoT and LTE-MTC enh.
- 5G Multicast broadcast
- Multi-Radio DCCA enh.
- Multi SIM
- Integrated Access and Backhaul (IAB) enh.
- NR Sidelink relay
- RAN Slicing
- Enh. for small data
- SON / Minimization of drive tests (MDT) enh.
- NR Quality of Experience
- eNB architecture evolution, LTE C-plane / U-plane split
- Satellite components in the 5G architecture
- Non-Public Networks enh.
- Network Automation for 5G - phase 2
- Edge Computing in 5GC
- Proximity based Services in 5GS
- Network Slicing Phase 2
- Enh. V2x Services
- Advanced Interactive Services
- Access Traffic Steering, Switch and Splitting support in the 5G system architecture
- Unmanned Aerial Systems
- 5GC LoCation Services
- Multimedia Priority Service (MPS)
- 5G Wireless and Wireline Convergence
- 5G LAN-type services
- User Plane Function (UPF) enh. for control and 5G Service Based Architecture (SBA)

These are the Rel-17 headline features, prioritized during the December 2019 Plenaries (TSG#86)

Release 18

TSG SA priorities*

SA2 led - System Architecture and Services

- XR (Extended Reality) & media services
- Edge Computing Phase 2
- System Support for AI/ML-based Services
- Enablers for Network Automation for 5G Phase 3
- Enh. support of Non-Public Networks Phase 2
- Network Slicing Phase 3
- 5GC LoCation Services Phase 3
- 5G multicast-broadcast services Phase 2
- Satellite access Phase 2
- 5G System with Satellite Backhaul
- 5G Timing Resiliency and TSC & URLLC enh.
- Evolution of IMS multimedia telephony service
- Personal IoT Networks
- Vehicle Mounted Relays
- Access Traffic Steering, Switching & Splitting support in the 5G system architecture Phase 3
- Proximity-based Services in 5GS Phase 2
- UPF enh. for Exposure & SBA
- Ranging based services & sidelink positioning
- Generic group management, exposure & communication enh.
- 5G UE Policy Phase 2
- UAS, UAV & UAM Phase 2
- 5G AM Policy Phase 2
- RedCap Phase 2
- Support for 5WWC Phase 2
- System Enabler for Service Function Chaining
- Extensions to TSC Framework to support DetNet
- Seamless UE context recovery
- MPS when access to EPC/5GC is WLAN

SA3 led - Security and Privacy

- Privacy of identifiers over radio access
- SECAM and SCAS for 3GPP virtualized network products and Management Function (MnF)
- Mission critical security enhancements Phase 3
- Security and privacy aspects of RAN & SA features

SA4 led - Multimedia Codecs, Systems and Services

Systems & Media Architecture:
- 5G Media, Service Enablers
- Split-Rendering
- 5G AR Experiences Architecture

Media:
- Video codec for 5G
- Media Capabilities for Augmented Reality Glasses
- AI / ML Study

Real-Time Communications:
- XR conversational services
- WebRTC-based services and collaboration models

Immersive Voice & Audio:
- EVS Codec Extension for Immersive Voice and Audio Services (IVAS_Codec)
- Terminal Audio quality performance and Test methods for Immersive Audio Services (ATIAS)

Streaming & Broadcast services:
- 5GMS Enh. (Network slicing, Low latency, Background traffic, 5GMS Uplink)
- Further MBS Enh. (Free to air, Hybrid unicast/broadcast)

SA5 led - Management, Orchestration and Charging

Operations, Administration, Maintenance and Provisioning (OAM&P):
- Intelligence and Automation: Self-Configuration of RAN NEs, Enh. autonomous network levels, Evaluation of autonomous network levels, Enh. intent driven management services for mobile networks, AI/ ML management, Enh. of the management aspects related to NWDAF
- Management Architecture and Mechanisms: Network slicing provisioning rules, Enh. service based management architecture
- Support of New Services: Enh. Energy Efficiency for 5G Phase 2, New aspects of Energy Efficiency for 5G networks Phase 2, Enh. management of Non-Public Networks, Network and Service Operations for Energy Utilities, Key Quality Indicators(KQIs)for 5G service experience, Deterministic Communication Service Assurance

Charging:
- Charging Aspects for Enh. Support of Non-Public Networks

SA6 led - Application Enablement & Critical Communication Applications

Critical Communications:
- MCX Enhancements – MC over 5GS (5MBS, ProSe) Adhoc group comm., MCPTT Enh.
- Railways - Gateway UE, Interworking

Service Frameworks:
- Edge App Architecture Enh., SEAL Enh., Subscriber-Aware API (CAPIF Enh.)
- Fused location, Application Data Analytics, App Layer NW Slicing

Enablers for Vertical Applications:
- Enhancements to V2X, UAS application-enablement
- Future Factories, Personal IoT networks, Capability exposure for IoT platforms

*These are preliminary lists (As at SA#94-e)

TSG RAN priorities*

RAN1 led - Radio Layer 1 (Physical layer)

- NR-MIMO Evolution
- AI/ML - Air Interface
- Evolution of duplex operation
- NR Sidelink Evolution
- Positioning Evolution
- RedCap Evolution
- Network energy savings
- Further UL coverage enhancement
- Smart Repeater
- DSS
- Low power WUS
- CA enhancements

RAN2 led - Radio layer 2 & layer 3 Radio Resource Control

- Mobility Enhancements
- Enhancements for XR
- Sidelink Relay Enhancements
- NTN (Non-Terrestrial Networks) evolution - NR
- NTN (Non-Terrestrial Networks) evolution - IoT
- UAV (Uncrewed Aerial Vehicle)
- Multiple SIM (MUSIM) Enhancements
- In-Device Co-existence (IDC) Enhancements
- Small data
- MBS

RAN3 led - UTRAN/E-UTRAN/NG-RAN architecture & related network interfaces

- Additional topological improvements – IAB/VMR
- AI/ML for NG-RAN WI
- AI/ML for NG-RAN SI
- SON/MDT Enhancements
- QoE Enhancements
- Resiliency of gNB-CU-CP

RAN4 led - Radio Performance and Protocol Aspects

- RAN4-led spectrum items
- <5MHz in dedicated spectrum

Rel-18 Workplan for TSG CT

CT will work on Stage 3 completion and ASN.1 code and OpenAPI freeze of Rel-17 until June 2022 (TSG#96).

Work Item discussion on Rel-18 Stage 2 / Stage 3 (under CT) from June 2022.

*Source: RP-213697 (RAN#94-e)

See the 3GPP Work Plan for full details, as Release 18 develops: www.3gpp.org/specifications/work-plan

Driving Openness

AT&T

6G VISION

HIGHER BANDWIDTHS, LOWER LATENCY

MORE CONNECTIONS

MORE DYNAMIC, OPEN NETWORKS

HIGHER SECURITY & DATA PRIVACY

AT&T

Laying the Foundation for 6G Innovation

NEXT G ALLIANCE

Building the foundation for North American leadership in 6G and beyond

We have a once-in-a-generation opportunity to close the digital divide through public-private cooperation

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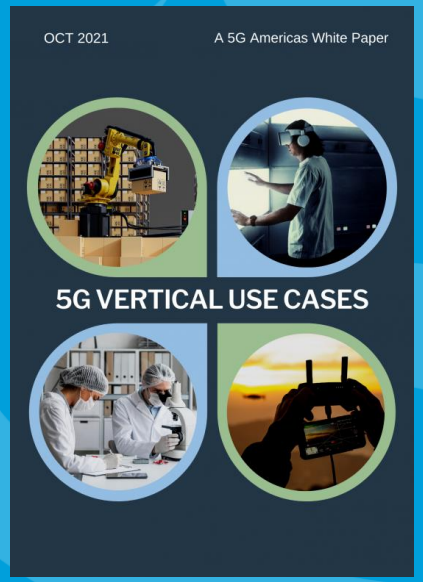
For Further Reading



https://www.5gamericas.org/white-papers/

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