5G Standardization in 3GPP

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The 3GPP Perspective

Organizational Partners

- ATIS
- ARIB
- CEPT
- ETSI
- TSDSI
- TTA

Member Organization

- Member of one or more Organizational Partners
- Participate in TSGs and WGs

Project Coordination Group

Approve organizational changes, work plan.

Technical Specification Groups

- Radio Access Network (RAN)
  - RAN1 Radio Layer 1
  - RAN2 Radio Layer 2 & 3
  - RAN3 RAN-CN interface
  - RAN4 Radio Performance
  - RAN5 Terminal Testing
  - RAN6 Legacy Radio

- System and Services Aspects (SA)
  - SA1 Service Aspects
  - SA2 Architecture
  - SA3 Security Aspects
  - SA4 Codec Aspects
  - SA5 OAM & Charging
  - SA6 Critical Comm.

- Core Networks and Terminal (CT)
  - CT1 Terminal Aspects
  - CT3 External Interwork.
  - CT4 Internal Protocols
  - CT6 Smart Card App.
5G Roadmap & IMT-2020

IMT 2020

- 2015
  - IMT 2020
  - RAN WORKSHOP
  - RAN STUDY: SCOPE, REQUIREMENTS
  - RAN STUDY: CHANNEL MODELLING
- 2016
  - REQUIREMENTS
- 2017
  - REQUIREMENTS
- 2018
  - INITIAL SUBMISSION OF PROPOSALS
  - REL-15 ARCHITECTURE WORK PLANNED
- 2019
  - EVALUATION
  - REL-15 NR & SYSTEM ARCHITECTURE CHECKPOINT
- 2020
  - IMT-2020 SPECIFICATIONS
  - FINAL 3GPP SUBMISSION
  - REL-15 NG NR + 5G Core Network
  - REL-15 NG NR + 5G CN Support of LTE access

3GPP

- 2015
  - REQUIREMENTS STUDY
  - SPECIFICATION
- 2016
  - ONGOING HSPA/LTE/NBIOT EVOLUTION
  - RELEASE 13
- 2017
  - RELEASE 14
- 2018
  - RELEASE 15
- 2019
  - RELEASE 16
5G Phase 1 (Rel-15)

• Status:
  – Stage 3 freeze complete, a few exceptions.
  – Scenario 4 and 7 will be ‘late drops:’ Dec 2018 stage 3 completion.

• Achievements
  – Scenario 3 (access via NG-RAN) and 2 (access via NG-RAN and 5GC) 
    (Soon, scenarios 4 and 7, also.)
  – Definition of 5G System aspects, the foundation – with significant 
    advances compared with the EPS.
  – Backward and forward compatibility (EPS, 5GS), intersystem mobility.
  – 5G Orchestration and management, Media, Charging...
5G Deployment Scenarios

See 3GPP TR 38.801, clause 10

Stage 3 freeze: 12.17 12.18 12.18 06.18
Option [see 38.801]: 3 7 4 2
5G Phase 2 (Rel-16)

- **Status**

- **Objectives**
  - RAN & SA have set objectives separately and in common – shown on the next slide.
  - Many aspects (media, security, management, protocol optimizations, etc.) will advance, too.
Vertical Industry Integration (1)

TSG 80 agreements, Rel-16 focus areas.
Project Management aspects will be reviewed and adjusted at each TSG meeting.
5G Phase 2 will highlight specific vertical industry features (eMBB, URLLC, mIoT.)

3GPP access will expand to fixed and non-terrestrial.

Other enhancements are for generally applicable features and efficiency.
Collaboration with ITU

• With 3GPP TSG SA WG4 (“Codecs”), Media...
  – ITU-T SG12: SA4 implements ITU-T STL; Exchange of information on 360° video, VR, QoE (G.QoE-VR, P.360-VR, FS_QoE_VR); Information sharing on AR (G.QoE-AR)
  – ITU-R BT.2100 Adoption (HLG_HDR)
  – ITU-R WP6C Information sharing on Audio Resenders
  – ITU-T SG16 Alignment/maintenance of ITU-T G.722.2 and AMR-WB
• With 3GPP TSG SA WG5 (“Telecom Management”), OAM, Charging, Energy Efficiency
  – ITU-T SG2 discussion on methodology for IRP information services (ITU-T M.3020 and TS 32.15x series): no model alignment
  – ITU-T SG5 Information exchange on Energy Efficiency
  – ITU-T SG15 Information exchange on Transport Network Management – currently trying to identify which specifications to cite for end to end slice management.
• With 3GPP TSG SA WG1 (“Services”)
  – LSs sent periodically (e.g. business role modeling).
Collaboration with SDOs, general

KEY INSIGHT: Delegates to each body do the work (in 3GPP, or other SDOs.) Sharing information, citation, alignment can be done by LS.
Summary

• 3GPP has made rapid progress and has completed most aspects of 5G Phase 1 standardization.
• As work on the final aspects conclude, agreements have been achieved for the contents of 5G Phase 2, which will constitute the IMT-2020 submission.
• The overall project components, its progress and plans will be considered, as well as significant work with other standards organizations to achieve the goals of 3GPP’s 5G standards program.
3GPP SA WG1 ‘Services’ Status

Rel-16

- SMARTER_Ph2 (0=>10%)  
- enIMS (0=>25%)  
- MONASTERY2 (55=>70%)  
- QoS_MON (0=>60%)  
- cyberCAV (0=>5%)  
- 5GSAT (0=>0%)  
- PDRT (0=>100%)  
- eLETR (0=>90%)  
- MuD (0=>95%)  
- MOBRT (0=>70%)  
- 5GLAN (0=>40%)  
- MARCOM (0=>0%)  
- UIA (0=>0%)  
- 5G_HYPOS (0=>0%)  
- FS_ID_UAS (0=>60%)  
- FS_FRMCS2 (80=>85%)  
- FS_V2XMP (0=>75%)  
- FS_MPS2 (10=>30%)  
- FS_NCIS (0=>0%)  
- FS_AVPROD (0=>0%)  
- FS_5GMSG (25=>60%)  
- FS_BMNS (50=>75%)  
- FS_MARCOM (75=>95%)  
- FS_5G_HYPOS (75=>90%)  
- FS_CAV (95=>100%)  
- FS_LUCIA (60=>90%)  
- FS_5GSAT (70=>100%)  

12.17  03.18  06.18  09.18  12.18  03.19  06.19  09.19  12.19  03.20
TSG#78  TSG#79  TSG#80  TSG#81  TSG#82  TSG#83  TSG#84  TSG#85  TSG#86  TSG#87

Stage 1
New Services and Markets Technology Enablers – Phase 2
Enhancements to IMS for new real time communication
Mobile Communication System for Railways 2
QoS Monitoring
Service requirements for cyber-physical control applications in vertical domains
Satellite Access in 5G
Policy delivery to UE for background data transfer
Enhancement of LTE for Efficient delivery of Streaming Services
Multi-device and Multi-identity
Inter-RAT Mobility requirements for real time service
LAN Support in 5G
Maritime Communication Services over 3GPP System
User Identities and Authentication
5G Positioning Services
Study on Remote Identification of Unmanned Aerial Systems
Study on Future Railway Mobile Communication System 2
Study on Improvement of V2X Service Handling
Feasibility Study on Multimedia Priority Service (MPS) Phase 2
Study on Network Controlled Interactive Service in 5GS
Feasibility Study on Audio-Visual Service Production
Study on 5G message service for MiOT
Study on Business Role Models for Network Slicing
Study on Maritime Communication Services over 3GPP system
Study on positioning use cases
Study on Communications in Vertical Domains
Study on Layer for User Centric Identifiers and Authentication
Study on using Satellite Access in 5G
3GPP SA WG2 ‘Architecture’ Status

- Study of enablers for Network Automation for 5G
- Study on Access Traffic Steering, Switch and Splitting support in the 5G System
- Study on encrypted traffic detection and verification
- Study on the Wireless and Wireline Convergence for the 5G system architecture
- Study on architecture enhancements for 3GPP support of advanced V2X services
- Study on Stage 2 for PARLOS
- Study for single radio voice continuity from 5G to 3G
- Study on Enhancements to the Service-Based 5G System Architecture
- Study on enhancements of URLLC supporting in 5GC
- Study on enhancement of systems using EPS for Ultra Reliability and Availability
- Study on Enhancement of Network Slicing
- Study on architecture enhancements for 3GPP support of advanced V2X services
- Study on Enhancing Topology of UMF and SMF in 5G Networks
- Study on Enhanced IMS to 5GC Integration
- Study on Enhancement to the 5GC Location Services
- Study on Cellular IoT support and evolution for the 5G System
- Study on EPC support for Mobility with Low Latency Communication
- Study on system architecture for next generation real time communication services
- Study on optimizations on UE radio capability signalling
- Study on Enhancement support of Vertical and LAN Services
- Study on supporting Flexible Local Area Data Network
- Study on architecture aspects for using satellite access in 5G
- 5GS Transfer of Policies for Background Data Transfer
3GPP SA WG3 ‘Security’ Status

Rel-15 Stage 2
- FS_REAR_Sec (99→100%)
- FS_NETSLICE_MGT_Sec (30→100%)
- CAPIF-Sec (40→100%)
- eMCSec (80→80%)
  - 5GS_Ph1-SEC (65→95%)
  - FS_15LSIS (35→70%)
  - LI15 (20→33%)

Stage 3
- Study on security aspects of enhancements to ProSe UE-to-Network Relay
- Study on security aspect of 5G Network Slicing Provisioning
- Security aspects of 5G System - Phase 1
- Mission Critical Security Enhancements
- Study on R15 Lawful Interception Service
- Normative work on Lawful Interception Rel-15

Rel-16 Stage 1
- FS_LTKUP (90→90%)
- FS_256_Algorithms (30→55%)
- FS_5G_UTRAN_SEC (0→50%)
- FS_AKMA (0→5%)
- FS_CIoT_sec_5G (0→5%)
- FS_SBA_Sec (0→65%)
- FS_5WWC_SEC (0→0%)
- FS_PARLOS_Sec (0→0%)
- SCAS_5G (0→0%)
- MCXSec (0→0%)

Stage 2
- Study on Long Term Key Update Procedures
- Study on Security Aspects of the 5G Service Based Architecture
- Study on evolution of Cellular IoT security for the 5G System
- Study on the security of the Wireless and Wireline Convergence for the 5G system architecture
- Security Assurance Specification for 5G
- eMCSec R16 Security
3GPP SA WG4 ‘Codecs’ Status

Rel-15

- FS_SGMedia_Distribution (60=>70%)
- FS_SG_MEDIA_MTSI (55=>80%)
- FS_MBMISIoT (80=>90%)
- FS_mV2X (10=>60%)
- FS_QoE_VR (15=>20%)
- FS_eVoLP (75=>100%)
- FS_EVS_FNCE (60=>70%)
- SPAN (50=>80%)
- FRASE (0=>30%)
- LiQuimAS (0=>15%)
- Serinter (20=>40%)
- SAND4M (60=>100%)
- FLUS (90=>100%)
- RAOT (80=>100%)
- VRStream (40=>60%)
- 5G_MTSI_Codecs (0=>60%)

Stage 1

- Study on 5G enhanced Mobile Broadband Media Distribution
- Study on Media Handling Aspects of Conversational Services in 5G Systems
- Study on MBMS User Services for IoT
- Study on V2X Media Handling and Interaction
- Study on QoE metrics for VR

Stage 2

- Study on enhanced VoLTE performance
- Study on EVS Float Conformance Non Bit-Exact
- Speech quality in the presence of ambient noise for super-wideband and fullband modes
- FEC and ROHC Activation for GCSE over MBMS
- Test Methodologies for the Evolution of Perceived Listening Quality in Immersive Audio Systems
- SAND for MBMS
- Framework for Live Uplink Streaming
- Receive acoustic output test in the presence of background noise
- Virtual Reality Profiles for Streaming Media
- Media Aspects of 5G Conversational Services

Stage 3

- Service Interactivity
- Usage of CAPIF for xMB API
- EVS Codec Extension for Immersive Voice and Audio Services

Rel-16

- FS_E2E_DELAY (10=>60%)
- CAPIF4xMB (0=>25%)
- IVAS_CODEC (10=>15%)
3GPP SA WG5 ‘Telecom Management’ Status

Rel-15

03.18 TSG#79

Stage 3

06.18 TSG#80

09.18 TSG#81

12.18 TSG#82

03.19 TSG#83

06.19 TSG#84

09.19 TSG#85

12.19 TSG#86

FS_OAM_LWI (30 → 100%)

Study on OAM aspects of LTE and WLAN integration

FS_NETPOL (35 → 100%)

Study on network policy management for mobile networks based on NFV

FS_VBCLTE (45 → 100%)

Study on Volume Based Charging

FWDCA (0 → 100%)

Forward compatibility for 3GPP Diameter Charging Applications

5GS_Ph1-SBI-CH (15 → 55%)

SON for AAS deployment management

5GS_Ph1-DCH (10 → 60%)

SON for AAS deployment management

DOCMC_CH (0 → 10%)

Diameter Overload Control Mechanisms for Charging

WAEPCH (0 → 100%)

Charging aspects of WLAN access in EPC

NAPS-CH (50 → 100%)

Charging aspects of NAPS

5GS_Ph1.IMSCH (0 → 100%)

Charging aspects of NAPS

NETSICE (60 → 85%)

Management of Network Slicing in Mobile Networks, Concepts, Use cases and Requirements

NETSICE-PRO_NS (40 → 80%)

Provisioning of network slicing for 5G networks and services

NETSICE-5GNRM (25 → 60%)

Network Resource Model (NRM) for 5G networks and network slicing

NETSICE-ADPMGS (10 → 50%)

Assurance data and Performance Management for 5G networks and network slicing

NETSICE-MNV5G (25 → 75%)

Management and virtualization aspects of 5G networks

NETSICE-5GTRACE (0 → 100%)

5G Trace Management

NETSICE-F55S (20 → 60%)

Fault Supervision for 5G networks and network slicing

REST_SS (20 → 70%)

Control and monitoring of Power, Energy and Environmental (P3E) parameters in Radio Access Networks (RAN)

QOED (25 → 25%)

Management of QoE measurement collection

OAM.SON_AAS (80 → 25%)

SON for AAS deployment management

ME_CUPS (5 → 50%)

SON for AAS deployment management

Rel-16

Stage 1

Stage 2

Stage 3

FS_ONAPDAE (10 → 20%)

Study on integration of ONAP DAE and 3GPP management architecture

FS_MAN_E (10 → 20%)

Study on management aspects of edge computing

FS_ONAPCINT (10 → 20%)

Study on integration of ONAP and 3GPP configuration management services for 5G networks

FS_PROTIMP (10 → 20%)

Study on protocol enhancement for real time communication

FS_EE_5G (60 → 65%)

Study on system and functional aspects of Energy Efficiency in 5G networks
3GPP SA WG6 ‘Applications’ Status

Rel-15
- Stage 2
  - 12.17 TSG#78
  - 03.18 TSG#79
  - 06.18 TSG#80

Rel-16
- Stage 1
- Stage 2
- Stage 3
  - 09.18 TSG#81
  - 12.18 TSG#82
  - 03.19 TSG#83
  - 06.19 TSG#84
  - 09.19 TSG#85
  - 12.19 TSG#86

- Study on MBMS APIs for Mission Critical Services
- Study on application architecture of MONASTERY2
- Study on MC services access aspects
- Study on application support for V2X services
- Study on Mission Critical services support over 5G System
- Study into discreet listening and logging for mission critical services
- Enhanced Mission Critical Push-to-talk architecture phase 2
- Enhancements to Functional architecture and information flows for Mission Critical Data
- Enhanced mission critical system migration and interconnection
- Enhanced Mission Critical Communication interworking with Land Mobile Radio Systems
- MBMS APIs for Mission Critical Services

- FS_MBMSAPI_MC (60=>100%)
- FS_FRMCS2 (0=>15%)
- FS_MCSAA (0=>15%)
- FS_V2XAPP (45=>75%)
- FS_MCOver5GS (0=>0%)
- FS_MCLOG (0=>0%)
- eCAPIF (0=>15%)
- enh2MCPTT (0=>0%)
- eMCDATA2 (0=>0%)
- eMCMSI (0=>0%)
- eMCCI (0=>0%)
- MBMSAPI_MCS (0=>0%)
5GC (5G core network) Architecture

Not shown: roaming or local breakout scenarios, defined interactions between functions (other ‘N’ interfaces), data storage interfaces, 5G-EIR, Network Data Analysis Function, Northbound APIs (exposed), Non-3GPP Interworking Function, SMS aspects, Location Services aspects...
5GC Important Innovations

• Network Slicing
• Service Based Architecture
• Uniform 3GPP and Non-3GPP Access
• New QoS Model
• Increased efficiency (e.g. session and service continuity modes)