



Status and Progress on Mobile Critical Communications Standards

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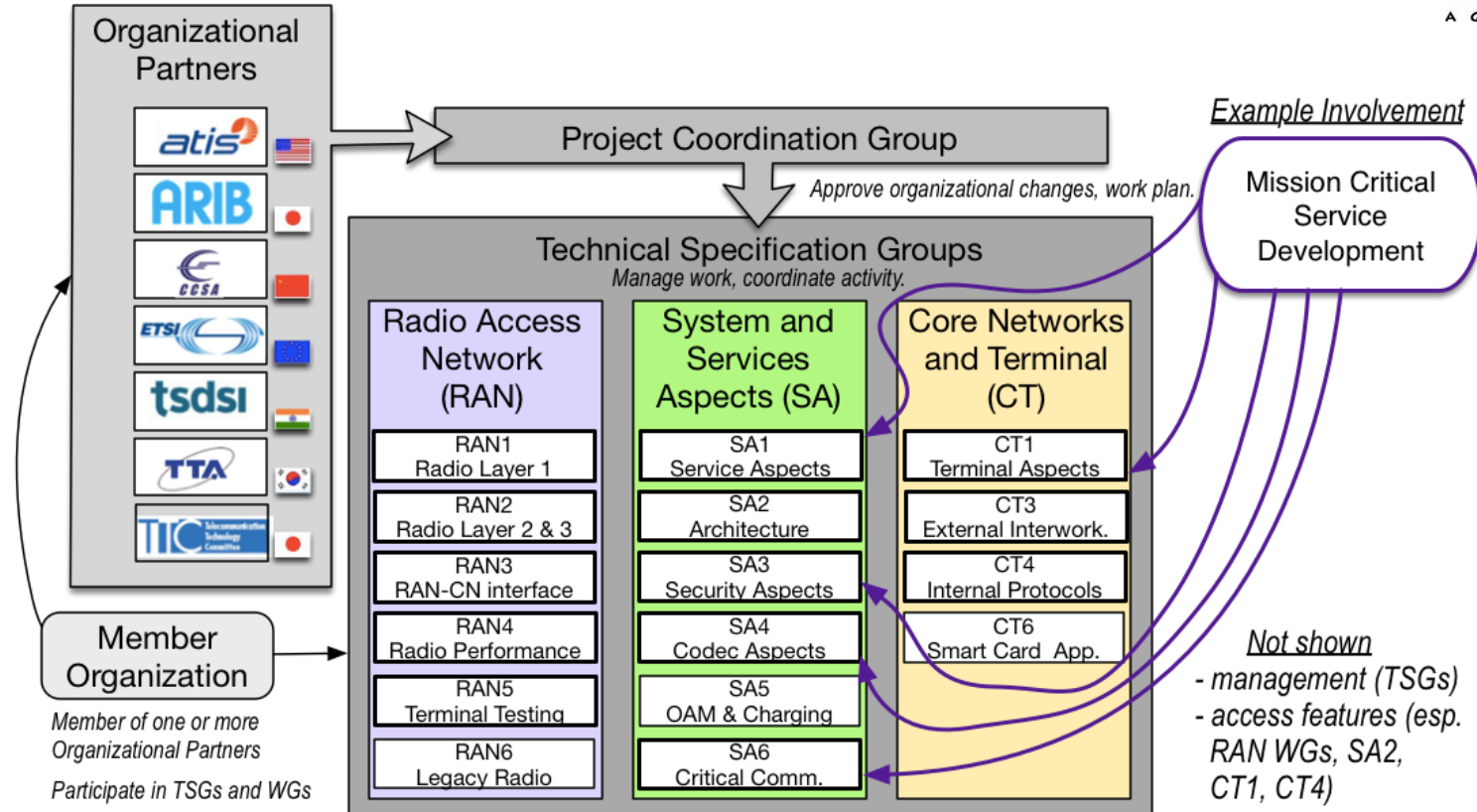
Contents



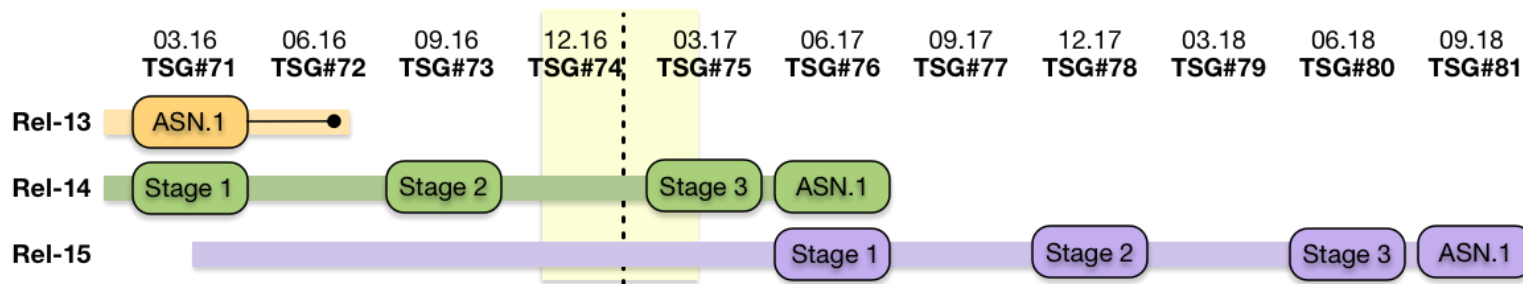
- 1) Summarized 3GPP status
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- 5) ETSI Technical work and Interoperability tests
- 6) 3GPP 5G System: New Radio (NR) and Core Network from a Critical Communications Perspective

1) Summarized 3GPP status

3GPP (A Critical Communications perspective)



3GPP Status Overview



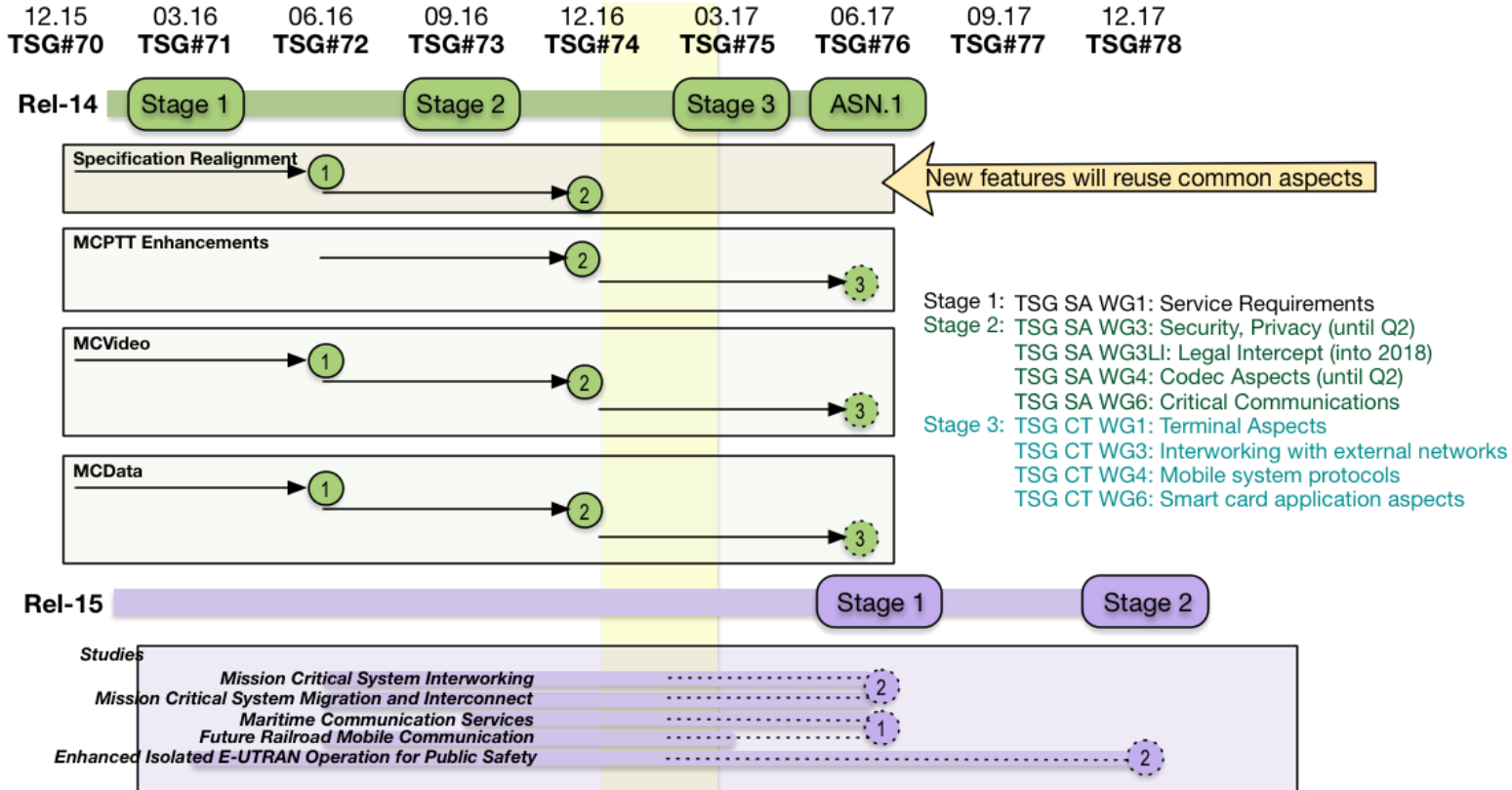
📶 Rel-14 stage 2 frozen at SA 73 except...

- SA2 exceptions and SA6 normative work concluded at SA 74.
- SA3, SA4, SA5 stage 2 work may continue past stage 2 freeze.

📶 Rel-15

- Stage 1 started for SA1 after TSG#72.
- Stage 2 5G Architecture Work Item approved at TSG#74.

Critical Communications Work Summary



Ongoing Work







- 📶 Mission Critical Features introduced in past releases continue to be enhanced (e.g. MCPTT [Rel-13] was enhanced [Rel-14]). This will continue in Rel-15 and beyond (also for MCData and MCVideo, etc.)
- 📶 Ongoing enhancements of the access system provide additional benefits to those deploying 3GPP Mission Critical systems – as LTE is enhanced, etc.
- 📶 5G is being defined by stakeholders. Please join!

2) Past Releases of Critical Communication Features

Release 12 and before

- 📶 [Rel-11] Public Safety Broadband High Power UE for Band 14 for Region 2
- 📶 [Rel-12] Proximity-based Services
 - Device to Device Communication
 - Direct Discovery
 - Essential for Off-network mission critical services
- 📶 [Rel-12] Group Communication System Enablers
 - Support for application servers to use multicast/broadcast or unicast services, as appropriate
 - Essential for Group Communication over LTE
 - Does not define any application layer (e.g. MCPTT)

-  Mission Critical Push To Talk
 - The first mission critical service defined.
 - Some aspects were 'general', supporting more than PTT. (In Rel-13, the common services core'. In Rel-14 these aspects were refactored as the 'common services architecture'.')
-  Isolated E-UTRAN Operation for Public Safety
 - Documents isolated operation and secure configuration.
-  Enhancements to Proximity-based Services
 - Adds UE-to-Network Relay
 - Enhancements to discovery and direct communication
-  Support of single-cell point-to-multipoint transmission in LTE
 - Efficient, dynamically geographically distributed transmission.



3) Release 14 Critical Communications Features

Overview



- 📶 In stage 1 and 2, MCPTT split into Mission Critical general aspects and MCPTT-specific aspects
- 📶 Enhancements
 - General Mission Critical Aspects (among them MBMS enhancements)
 - MCPTT-specific enhancements
- 📶 New Features
 - Mission Critical Data
 - Mission Critical Video

Mission Critical Enhancements

-  Common Functional Architecture (CFA)
 - Reworked MCPTT specification so that the roles and entities can support diverse mission critical services with common procedures.
 - Group management and configuration management extended to support diverse (distinct) mission critical services, e.g. Future Railway Mobile Communication Services
 - Added location management as a common function.
 - Identities, Session, Affiliation, etc. all now specified in a generic way.
-  MBMS enhancements
 - Improved signalling (suspension notification), bearer aspects (announcement, quality detection, multi-server coordination), and Service continuity in MBMS scenarios

MCPTT-specific Enhancements

- 📶 Support of Ambient Listening Call
- 📶 Location of current talker
- 📶 Temporary Call Group – User Regroup
- 📶 MCPTT Private Call Call-back Request
- 📶 First-to-answer Call Setup
- 📶 Floor control for Audio Cut-In enabled Group
- 📶 Entering ‘MCPTT Emergency Alert Area’
- 📶 MCPTT Group Selection
- 📶 Enhanced MCPTT Group Call Setup Procedure with MBMS Bearer

MCDData

MCDData

Uplink Data Transaction; Distribute Downlink Data (unicast and multicast); Replicate Data; Store and Forward; Reporting Functions off-network as well as on-network; Supports service configuration, affiliation / de-affiliation for group control

Short Data Service (SDS)	•	•	•	Send 'small data items' (1 PDU) to receiving users.
File Distribution	•		•	Apply policies for reception (location, privilege) Associated with metadata (URL, size, etc.); Allow user interaction; HTTP or multicast file distribution.
Data Streaming			•	Request, start, stop, terminate, etc. data streams.
Enhanced Status	•	•	N/A	Updates of (arbitrary) status, potentially continuously.
Transmission Control	•		•	For specific services: request indications, control timing, request transmission, etc.
Conversation Management	•		N/A	To aggregate MCDData transmissions for a given activity
Communication Release	•		N/A	Supports termination of reception of MCDData.

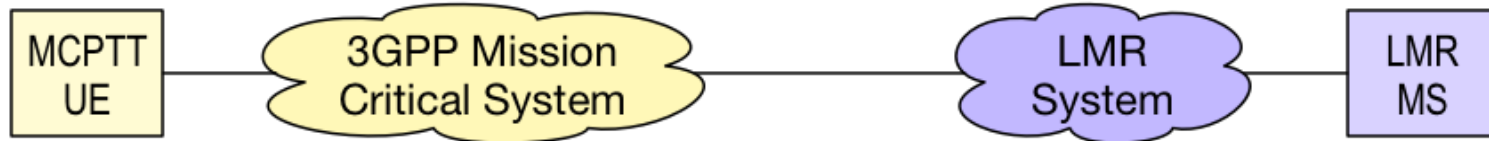
On-network
Off-Network
Functional
Models

MCVideo

- 📶 Allows video streaming from cameras or files.
- 📶 Similar to MCPTT voice, but for video.
 - Group Call, Private Call, Video Push, Video Pull, Capability information sharing, Transmission control, Ambient Viewing, Capability information sharing, Support for multiple devices by a single viewer.
 - Diverse Group Call capabilities: Emergency Group Call, Imminent Peril Group Call, Group or User Broadcast Call.
- 📶 MCVideo has no floor control.
 - Rather requires transmission and reception control to manage network usage & user experience for group/private communications.
- 📶 Off-network support as above. Note that features shown in purple may (for off-network support) be deferred (fully or in part) to a future release.

4) Release 15 Critical Communications Outlook

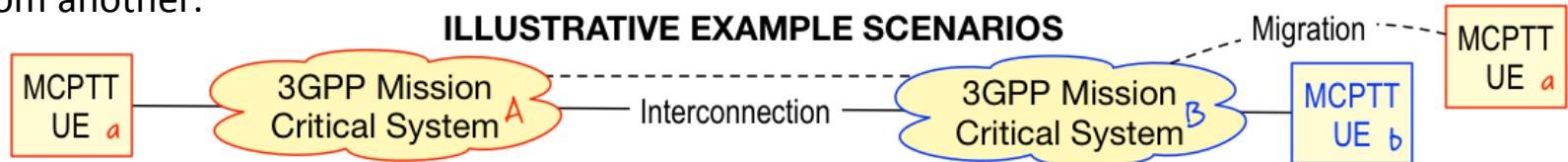
Study On Interworking



- 📶 Stage 1 requirements exist for interworking between 3GPP mission critical systems and non-3GPP mission critical systems (since Release 13).
- 📶 Stage 2 study is '22% complete', see TR 23.782, planned 100% 06.2017.
 - Scenarios identify interworking for individual features of MCPTT and LMR/PMR. For example – private calls, group calls, group management.
 - Key issues enumerate problems to solve. Solutions have only begun to be studied.
 - The study will expand to consider MCData and MCVideo interworking scenarios.
- 📶 Normative work awaits study completion.

Study on Migration and Interconnection

- 📶 Stage 1 requirements were added in Release 13.
- 📶 Stage 2 study is '48% complete', see TR 23.781, planned 100% 06.2017.
 - **Interconnection** allows communication of users in distinct 3GPP mission critical systems (e.g. two agencies.)
 - **Migration** allows a user from one 3GPP mission critical system to obtain service *directly* from another.



- Considers different scenarios, the key issues (problems) to solve, potential solutions and their impacts.
- 📶 Normative work awaits study completion.

Study on Marine

- 📶 Stage 1 requirements '10% complete', TR 22.819, planning for completion ongoing (currently Jun 2017, later seems advisable to get broader input.)
 - Maritime radio communication behind on-land systems.
 - International Maritime Organization (IMO) studies an advance in their standards, to complete 2019.
 - A goal is to identify how to integrate with currently available communication infrastructure and how to use it.
 - Develop use cases for services for authorities & public.
 - Study how to harmonization with mission critical standards based systems.
 - Study interworking between the 3GPP system and existing and future Maritime communication systems for seamless voice and data communications, on land and sea.
- 📶 Stage 2 study has not yet begun.

Study on Future Mobile Railway Communication System



- 📶 Stage 1 requirements are '65% complete' (after January 2017 meeting), TR 22.889, planned 100% Mar 2017.
 - GSM-R obsolescence planned for 2030. FMRCS trials planned for 2020.
 - FRMCS requirements from ETSI TC RT. Other requirements considered as well. 3GPP-relevant requirements and gaps are assessed by the study.
 - Railway communication services include:
Train control services, Maintenance services, Railway specific services (e.g. Emergency Call, functional and location based addressing), Other services (info on train operation, interworking with existing railway communication systems)
- 📶 Stage 2 study has not yet begun.

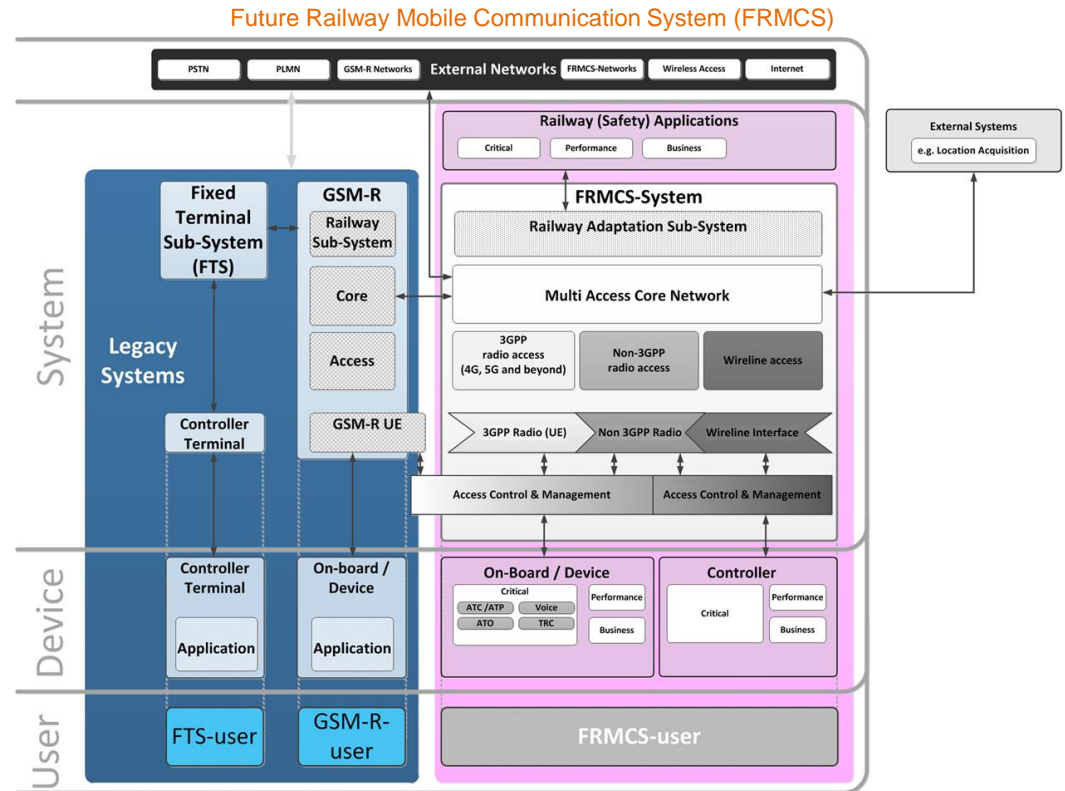
5) ETSI Technical work and Interoperability tests

ETSI Railway Telecommunications

Technical Committee RT



- UIC requirements & Use Cases provided for Gap Analysis with 3GPP. Working with SA1 and possibly SA6
- TR 103 333 addressing EU harmonization of the current extended GSM-R frequency band, is finalized
- TR 103 459 will study next generation end-to-end system architecture
 - RT TR will be upstream of 3GPP outputs on architecture
 - RT to align with Use Cases provided by 3GPP (TR 22.889)
 - TR 103 459 will help define the Railways Ecosystem input to 3GPP



ETSI TETRA and Critical Communications Evolution

Technical Committee TCCE



- TETRA terminal shipments reached 5.7 million by the end of 2016 *(Source: IHS)*
- Inter System Interface (ISI) trial completed in 2016, demonstrated TETRA interconnectivity between regional networks*
- Narrowband (TETRA Release 1) and Wideband (TETRA Release 2, “TETRA TEDS”) Complete, continued maintenance
- Study into Air Interface Encryption algorithm replacement
- User Requirements Specification Mission Critical Broadband Communications; Application (TR 101 022-2)
- Technical Report for the Critical Communications Architecture Reference Model (TR 103 269-1)
- Technical Report for Critical Communications application mobile-to-network interface architecture (TR 103 269-2)

ETSI TR 103 269-1 V1.1.1 (2014-07)



* Nov. 2016 - interoperability trials for cross-border TETRA communication system took place, linking RAKEL and Nødnett, Sweden and Norway's public safety networks.

MCPTT Plugtests Event

- 📶 Pre-testing
 - via VPN Tunnels from Remote Labs
- 📶 15 – 20 Test Scenarios covering:
 - Group Call (unicast)
 - Group Call (multicast - eMBMS)
 - Emergency Group Call
 - Floor Control
 - Registration
 - Authentication
 - Affiliation
 - Group Management

<http://www.etsi.org/news-events/events/1137-1st-mcptt-plugtest>

Vendors

Air Lynx
Airbus DS
Alea
Athonet
Com4innov
ESChat
Etelm
Frequentis
Funkwerk Systems
GenakerHarris
Huawei
Hytera
IIT Bombay
Motorola Solutions
Nemergent
one2many
Tassta
Thales
ZTE

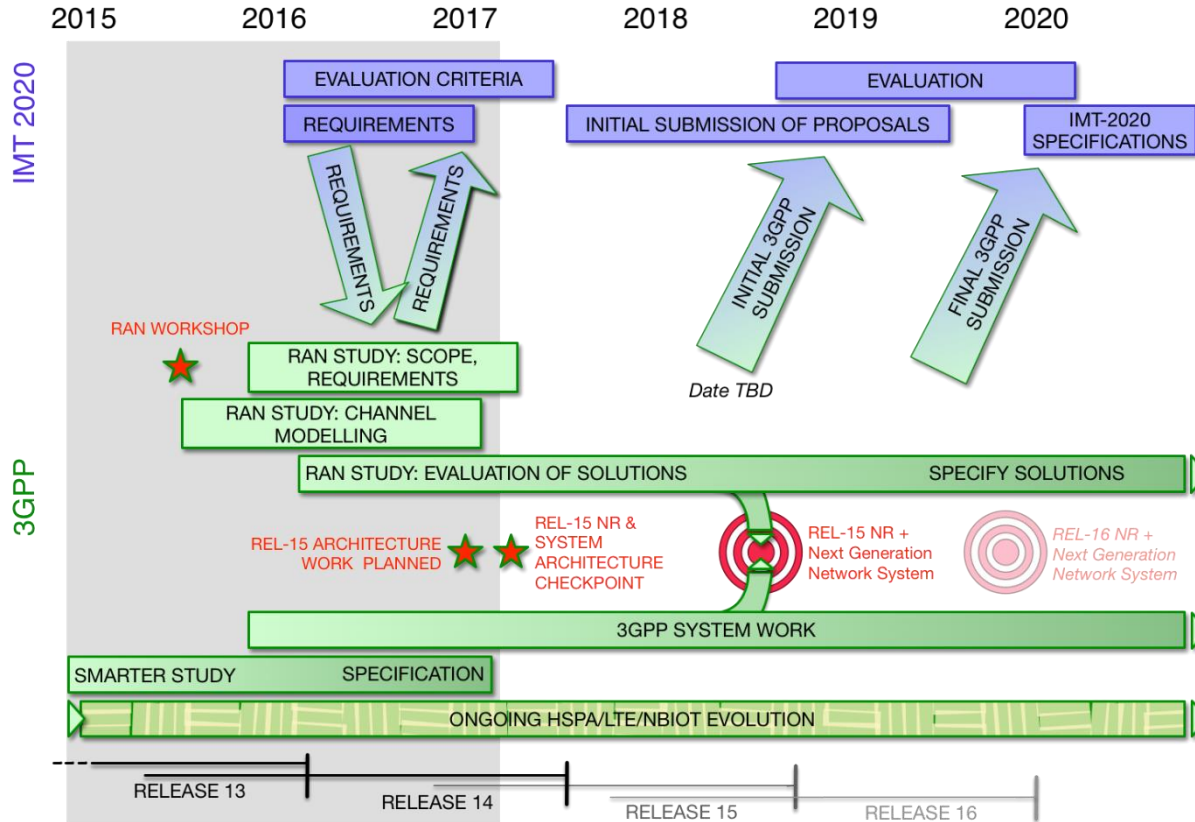
Users and Observers

ASTRID (Belgium)
State Security Networks (Finland)
Ministère de l'intérieur (France)
Gendarmerie Nationale (France)
P3 Communications (Germany)
The Police of the Netherlands (Netherlands)
Directorate for Emergency Communication (Norway)
Home Office (UK)
NIST/PSCR (USA)
EENA (Europe)

6) 5G System



5G Timeline



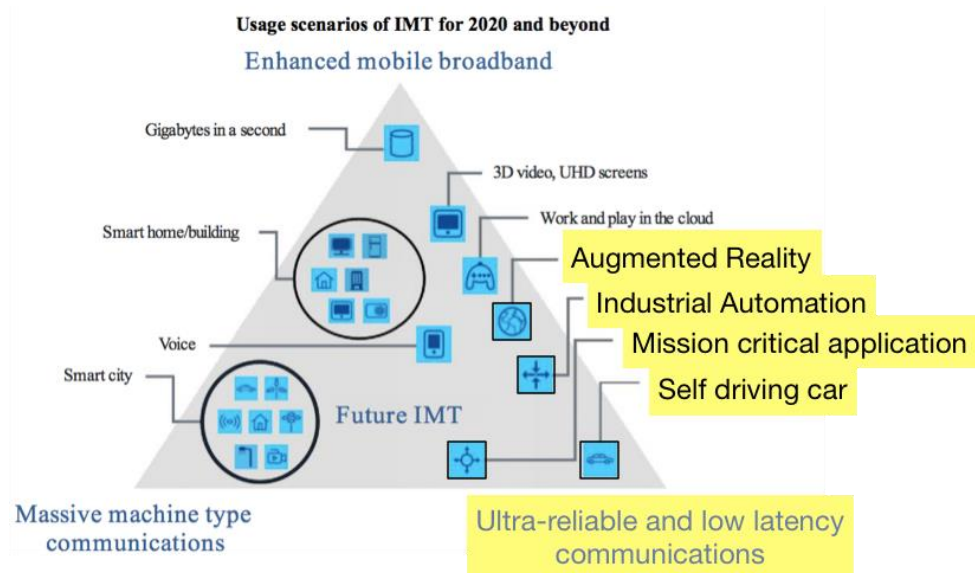
Organization of Work

- 📶 As for all work, TSGs perform program management while working groups are responsible for activity.
- 📶 5G Phase 1 will complete in Rel-15, Phase 2 in Rel-16.
 - Specific RAN and CN features target Phase 1. No targets yet exist for Rel-16.
- 📶 SA Working Groups focus on the system and 5G Core Network.
 - Requirements will freeze Mar 2017.
 - Architecture normative work has started, to conclude Dec 2017.
 - Ongoing studies on Security and OAM for 5G.
 - Stage 3 specification (mainly by TSG CT) will complete Sep 2018.
- 📶 RAN Working Groups focus on Rel-15 NR studies.
 - RAN Work items will be defined Mar 2017 to complete Sep 2018. Rel-16 studies may be initiated in Mar 2017.

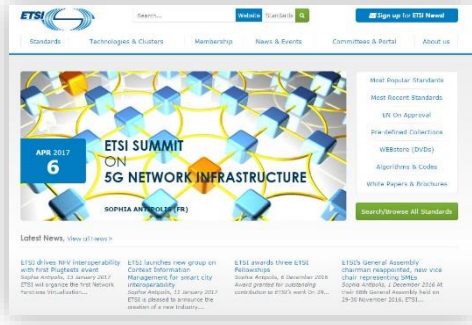
Critical Communications in 5G

📶 Stage 1 Study “Enablers for Critical Communications” TR 22.862 considers new 5G capabilities as business requirements.

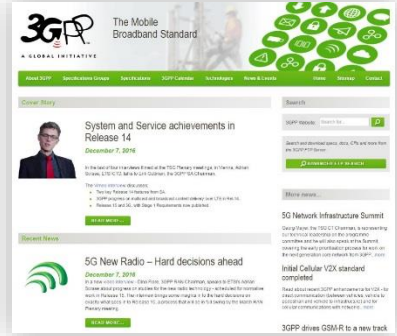
- Normative requirements are being specified in TSs (by 03.17)
- Public Safety requirements will be considered in Rel-16.



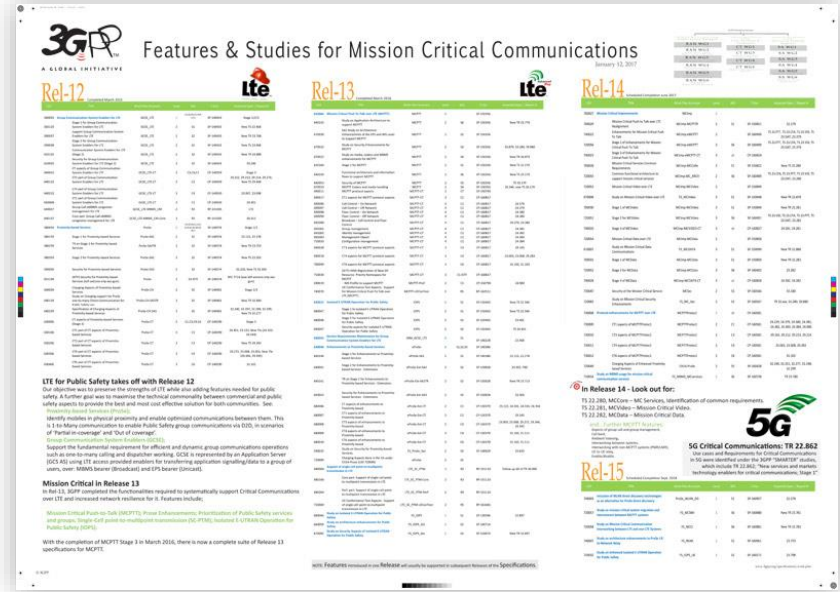
Thank you. Questions?



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www.3gpp.org




ETSI / 3GPP Stand at CCE

- More Information on the MCPTT test event and other eCall and 112 testing events at the ETSI / 3GPP stand in the exhibition.
- You can also pick up a poster on 3GPP Mission Critical Work.
- Please join in and take on some of the work.

Annex: 5G Architecture WID Objectives

 The objective of the 5G System Architecture Phase 1 work item is to develop Stage 2 normative specification based on conclusions captured in TR 23.799. Features include:

- Network Slicing
- Use of virtual environments
- Service-based architecture
- Network capability exposure
- Support for edge computing
- Access and mobility management
- Session management separate from mobility management
- (Re)selection of efficient user plane path
- Session and service continuity
- QoS
- Policy Framework
- Network discovery and selection
- Network sharing
- Untrusted non-3GPP access
- Roaming with EPS
- Interworking with and migration from EPS
- IMS services (including support for emergency calls)
- Public Warning System (PWS)
- Location services as per related service requirements & in alignment with NG RAN
- SMS over NAS

 Phase I architecture also serves as a foundational architecture for enhancements in future releases that would support additional features.

5G NR Phase 1 Study Priorities

RAN 73
Sep 16

RAN 74
Dec 16

RAN 75
Mar 17

Agreement: Put items on hold until RAN 75/Mar 1 (no time dedicated for study in RAN WGs)

Waveforms above 40GHz
mMTC
[Flexible duplex of paired spectrum]
Interworking with non-3GPP systems
Wireless relay
Satellite communication
Air-to-ground and light air craft communications
Extreme long distance coverage
Sidelink (direct communications)
V2V and V2X
Multimedia Broadcast/Multicast Service
Shared spectrum and unlicensed spectrum
[Location/positioning functionality]
Public warning/emergency alert

Agreement: As RAN 73, however 'working groups must consider forward compatibility' so the list of items can be operated in an efficient manner.

TBD: The scope of ongoing study and targets of NR work in Rel-15 will be **decided**.

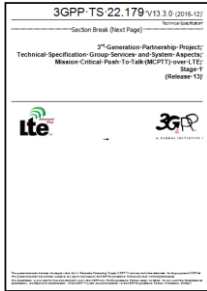
RAN work items will be considered in terms of the decisions take in SA. In particular the 'stand-alone' and 'non-stand-alone' deployment scenarios work will be planned in detail. (This has both RAN and SA aspects.)

RAN will review their priorities and decisions at *each* RAN meeting.

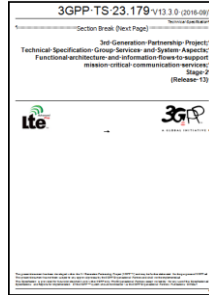
Release 13 Critical Communications Specifications

Also the following existing specs were modified:

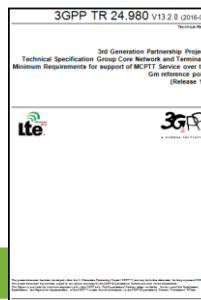
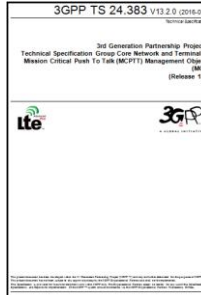
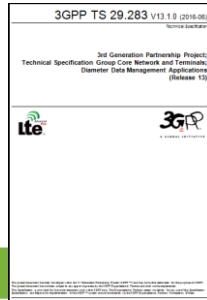
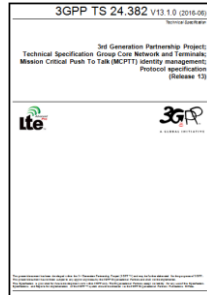
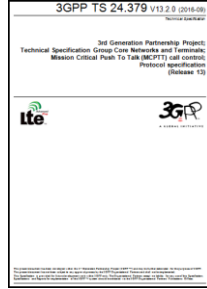
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- 29.165,
- 29.228,
- 29.230,
- 31.102,
- 31.103



Stage 1



Stage 2



Stage 3

Release 14 Critical Communications Specifications

