ETSI TR 102 022-2 V1.1.1 (2015-01)

TECHNICAL REPORT

User Requirements Specification
Mission Critical Broadband Communications
Part 2: Critical Communications Application

ETSI

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee TETRA and Critical Communications Evolution (TCCE).

The present document is part 2 of a multi-part deliverable covering the User Requirement Specification (URSs) Mission Critical Broadband Communications, as identified below:

Part 1: " Mission Critical Broadband Communication Requirements";

Part 2: "Critical Communications Application".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

The Terms of Reference for TC TCCE approved at ETSI Board meeting #42, 2013 is to produce ETSI deliverables (and maintenance thereafter) in accordance with the following requirements:

a) To identify requirements for mission and business critical broadband services that will enable an evolution of digital narrowband PMR services to mobile broadband.

b) To identify and fill standardization gaps such as:

1) Architectural design of critical communications services to be delivered over mobile broadband systems.

2) The development of standards for secure services and interfaces into private and commercial broadband systems.

3) Interconnection of external PMR interfaces to critical communications systems.

c) The provision and development of proportionate security measures for TETRA and mission critical communications services.

d) The selection and development of suitable CODECs for audio and video services.

e) The evolution and enhancement of TETRA and critical communications services as required by the market with the provision of new services, facilities and functionality made possible by new technology innovations and standards.

f) To identify requirements for the further development of the TETRA standard.

g) The maintenance of the TETRA standard.

Technical Objective:

- The present document provides the User Requirement Specifications for the Critical Communications Application that facilitates digital PMR services over LTE™.

- The URS is required by TC TCCE to guide the design of the critical communications application to facilitate broadband voice and data communications for critical communications users.

1 Scope

The present document provides the User Requirement Specifications for the Critical Communications Application needed to support Broadband Mission Critical Communications over IP communications networks such as LTE.

The present document describes the functionalities which are most needed by users and the requirements they make on the technology. The present document is applicable to the specification of broadband mission critical communications equipment.

The user requirements contained in the present document are described in non-technical terms and are based on discussions in TC TCCE WG1, TC TCCE WG4, LEWP RCEG and TCCA's CCBG SA and UR Groups.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 122 468 (V12.1.0): "LTE; Group Communication System Enablers for LTE (GCSE-LTE) (3GPP TS 22.468 version 12.1.0 Release 12)".

[i.2] ETSI TS 122 278 (V12.5.0): "Universal Mobile Telecommunications System (UMTS); LTE; Service requirements for the Evolved Packet System (EPS) (3GPP TS 22.278 version 12.5.0 Release 12)".

[i.3] ETSI TR 102 022-1: "User Requirement Specification; Mission Critical Broadband Communication Requirements".

[i.4] NPSTC Recommendations for Push To Talk over Long Term Evolution Requirements, Public Safety Broadband. A NPSTC Public Safety Communications Report.

[i.5] ETSI EN 300 392-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for supplementary services".

[i.6] ETSI EN 300 392-12 (sub-parts 1, 3, 7, 8, 10, 16 and 22) : "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3".

[i.7]   3GPP TS 22.278 (V12.4.0): "Service requirements for the Evolved Packet System (EPS)".

[i.8]   Proximity-based Off Network Public Safety Use Case S1-113165 to 3GPP TSG-SA WG1 from NIST et al.

[i.9]   Requirements associated with Public Safety Off Network Use Case S1-113165 to 3GPP TSG-SA WG1 from NIST.

[i.10]   Tetrapol Specifications PAS 0001-1-2 (V3.0.1): "Part 1: "General Network Design: Part 2: Voice and Data Services in Network and Direct Mode".

[i.11]   WG4 WI DTR/TCCE-04186: "TCCE Critical Communications Architecture Reference Model".

[i.12]   ETSI EN 300 392-1 (V1.4.1): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".

[i.13]   TETRA04(13)000074r2-Use-of-TETRA-services (Work in progress for ETSI TCCE04).

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following terms and definitions apply:

Base Station (BS): set of equipment on a single site (which may be more than just a radio function)

mission critical broadband communications: work programme within ETSI Technical Committee TETRA and Critical Communications Evolution to facilitate and enhance the services and facilities of digital PMR such as TETRA operating over LTE in order to meet new user requirements for data and voice

3.3   Abbreviations

For the purposes of the present document, the following abbreviations apply:

ASSI   Alias Short Subscriber Identity
AVL   Automatic Vehicle Location
BS   Base Station
CCA   Critical Communications Application
CCBG   Critical Communications Broadband Group
CCS   Critical Communication System
DGNA   Dynamic Group Number Assignment
DISC   Discovery (not in the ETSI list)
DMO   Direct Mode of Operation
DTMF   Dual Tone Multi Frequency
EPC   Evolved Packet Core
ETSI   European Telecommunications Standards Institute
E-UTRAN   Evolved Universal Terrestrial Radio Access Network
GCSE   Group Call Service Enablers
GSCE   Group Communication System Enablers
IP   Internet Protocol
ISI   Inter System Interface
KPI   Key Performance Indicator
LEWP   Law Enforcement Working Party
LMR   Land Mobile Radio
LS   Liaison Statement
LTE   3GPP Long Term Evolution (4G)
MM   Mobility Management
MS   Mobile Station
MU   Mobile Unit comprising UE plus CCA
NB   Narrow Band

NPSTC	National Public Safety Telecommunications Council (not in the ETSI list)
OPS	Operations
PABX	Private Automatic Branch eXchange
PMR	Private Mobile Radio
ProSe	Proximity Services
PSTN	Public Services Telephone Network
QoS	Quality of Service
RCEG	Radio Communications Experts Group, a working group of LEWP
RF	Radio Frequency
SA	System Architecture (Technical Specification Group of 3GPP)
SDS	Short Data Service
SDS-TL	SDS-Transport Layer
TA	Tracking Area
TCCA	TETRA + Critical Communications Association
TCCE	TETRA and Critical Communications Evolution
TL	Transport Layer
TPI	Talking Party Identity
TR	Technical Report
UE	User equipment
UR	User Requirements
URS	User Requirement Specification
USIM	Universal Subscriber Identity Module

4 Critical Communications Application Requirements

4.1 General

In order to ensure that IP communications networks such as LTE are able to meet the requirements of critical communications some changes to the 3GPP™ standards are needed. The most critical have been proposed first and are called Group Communication System Enablers (GCSE) [i.1] and Proximity Based Services (ProSE) [i.2]. These have resulted in 3GPP Work Items for Release 12. There are likely to be further requirements. In order to benefit from the market scale available for public LTE and the attendant benefits such as lower cost, open standards, supplier choice, fast development of features and long term evolution of capability the changes proposed to date have been kept to a minimum to improve the chances of them being implemented by manufacturers. This means that to deliver the full mission critical/critical communications functionality there has to be a Critical Communications Application (CCA) that sits above the LTE protocol. This application will need to provide the services required for critical communications [i.3]. (One of these services is push or press to talk, and NPSTC have recommended requirements for Public Safety in the US [i.4]. Outside of North America the PTT voice functionality of TETRA [i.5], [i.6], [i.12] and Tetrapol [i.10] is taken as an assumed baseline on top of which further functionality appropriate to broadband is added. To avoid describing all the many standards a summary of this functionality and the exceptions, that is baseline functionality not needed in broadband are listed in clause 8). The application will need to have implementations in the infrastructure and in terminals with a standardized interface between them so that different vendors can be used.

It is important that the standardization of the CCA should be rapid and co-ordinated to match planned releases of the 3GPP standard containing the appropriate enablers. A phased approach is considered but whilst most user groups want to focus on data services there are some groups, for example in the UK working on their future mission critical communications, who want to rapidly transition to voice services as well. This means that the first release of the CCA has to support core voice and data requirements with extensions in functionality coming in later releases.

There are different needs for supporting migration away from legacy systems depending on the plans in the various user groups for the rate of migration. Some users groups see little need to operate with legacy systems and others see a sustained period of inter-working. The level of interoperability required also varies but there is clearly a need for the first release of the CCA to support some interaction with legacy systems with fuller integration coming later for those who wish to operate their legacy systems for voice and narrowband data for a longer period alongside broadband data or voice and data systems. This is dealt with in more detail in clause 7.

Some thoughts have been given to the partition between functionality to be supported in 3GPP and that by the CCA (annex A). This led to a model of the architecture for Mission Critical Broadband Communications from TCCA CCBG WG SA that defined the requirements of the CCA. This model is being developed in TCCE WG4 [i.11] and a version of this is shown below purely to illustrate the scope of the requirements to be addressed. This diagram will not be updated in this URS.
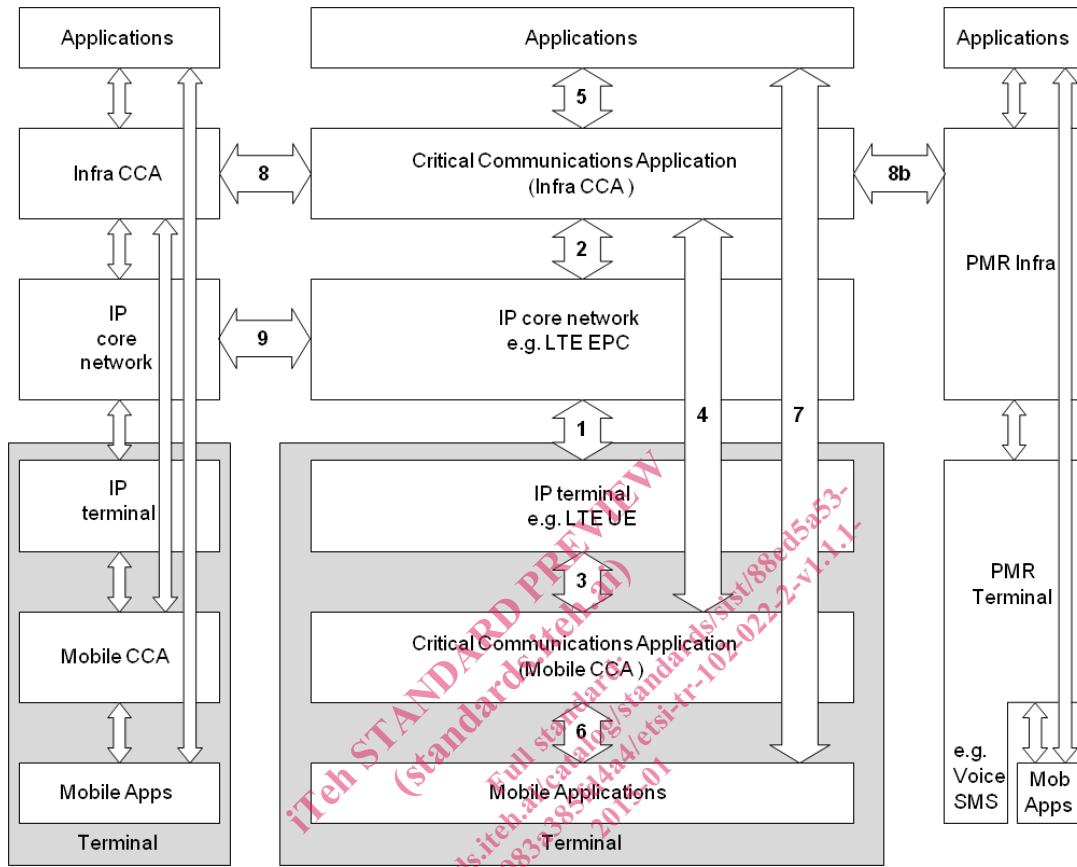

Figure 1: CCS Reference Model

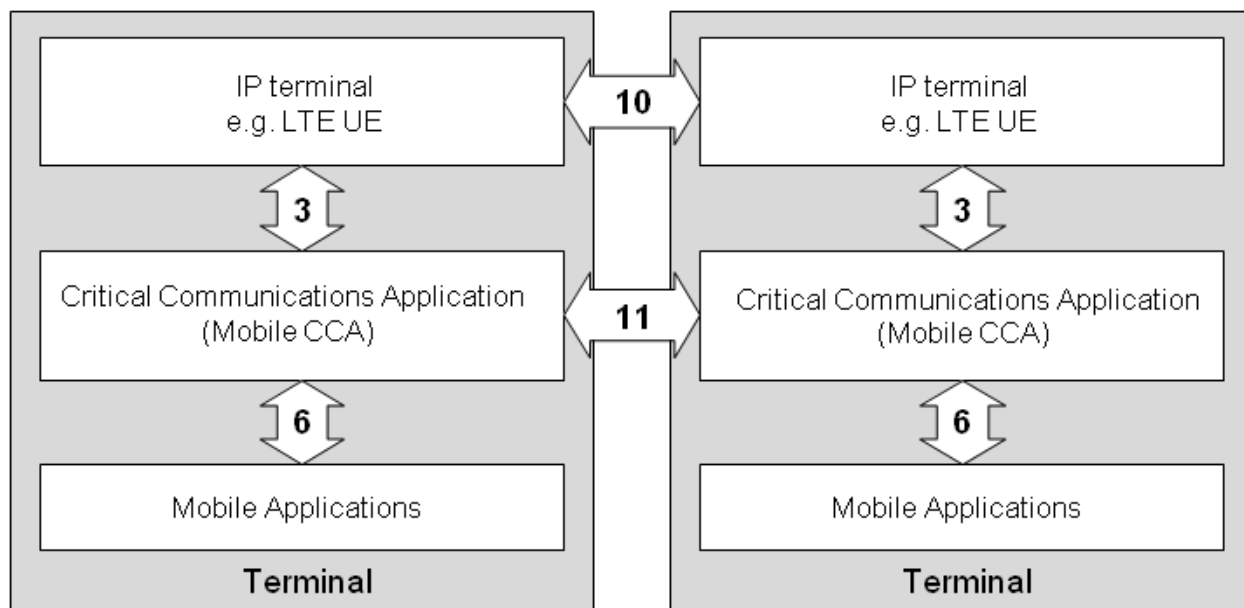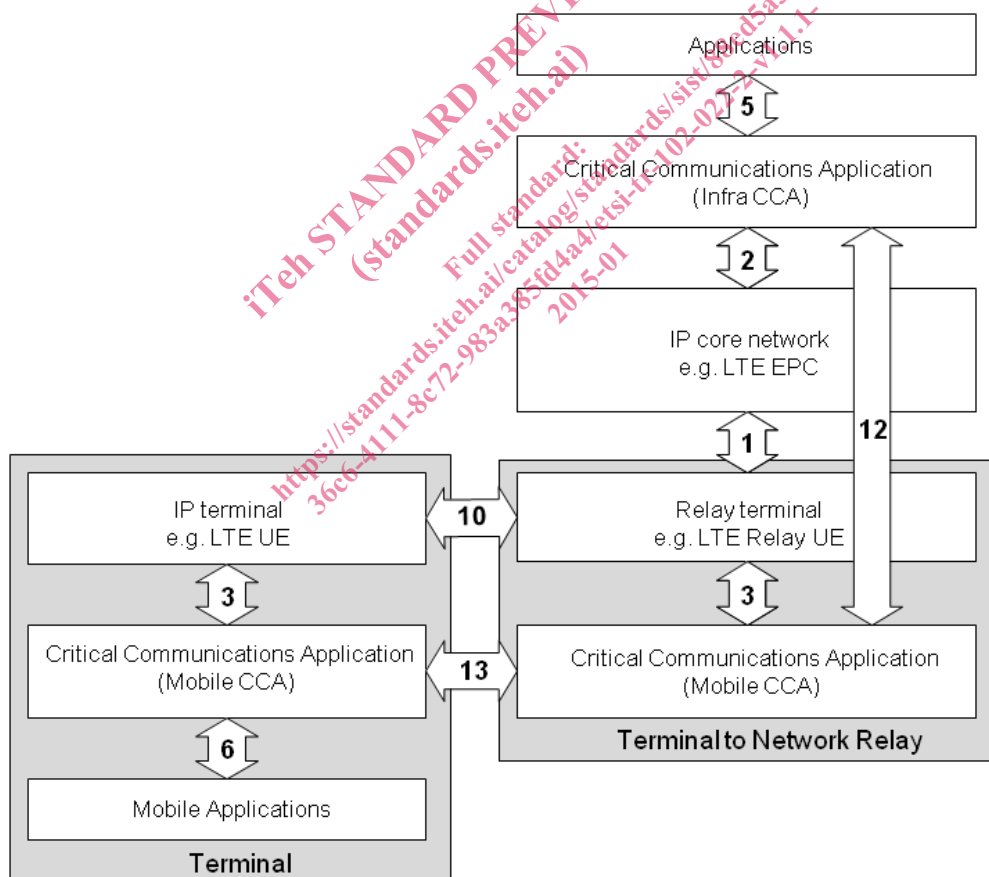**Figure 2: Proximity Services Reference Model**

Figure 3:Terminal to Network Relay Reference Model

4.1.1 Description of Interfaces in Figures 1 to 3

Interface 1 LTE Core Network - UE

This interface is specified according to the network protocols of the underlying IP network. Where the underlying network is LTE, it consists of the 3GPP specified standardized LTE UE to EPC interfaces.

Interface 2 Infra CCA - LTE Core Network

This interface is specified according to the network protocols of the underlying IP network.

Where that underlying network is an LTE EPC, it consists of existing Rx and SGi interfaces, plus the GC2 interface developed in the GCSE-LTE work item from 3GPP Release 12, to allow use and control of LTE broadcast bearers.

Interface 3 LTE UE to Mobile CCA

This interface relies on the services available from the IP network terminal.

In an LTE environment, it utilizes the interfaces provided by the UE to any application and may evolve to include developments related to GCSE-LTE work item from 3GPP Release 12.

This interface itself is not fully standardized since it is dependent on the terminal implementation and operating system.

Interface 4 Infra CCA to Mobile CCA

The objective of this interface is to allow interoperability between a CCA infrastructure and terminals from different manufacturers.

This interface provides similar functionality to existing digital PMR Layer 3 Air Interface messages, supporting, but not limited to, user registration, setup and control of individual and group communications, media transfer and management and short data transport.

Interface 5 Infra CCA to Application

The objective of this interface is to allow easy integration of Applications in a CCA environment, and portability of those applications to CCAs from different manufacturers.

This interface is made of two main components:

- A Call interface, to provide control of sessions (C-Plane) and of media transport (U-Plane) within a communication. This interface may be similar to a Dispatch interface in existing PMR systems, extended to Multimedia.

NOTE 1:   A single communication session can be an organized set of one or more communications used to transport the same information to or from one or several mobiles. Independent sessions implies that there can be several separate communications taking place between different sets of parties which can be accessed through this interface.

- A Routed Transport interface to transport and route data messages (e.g. signalling, geo-location information, text messages) and data files (e.g. picture, map) between mobiles and applications.

Interface 6 Mobile CCA to Mobile Application

The objective of this interface is to allow easy integration of Mobile Applications in a CCA environment, and portability of those applications between terminals from different manufacturers.

Interface 7 Application to Mobile Application

Some components of this interface may be defined by standards, for specific applications that require generic formats to ensure interoperability between mobile applications and control room application for instance: geo-location, video format, vocoder, etc.

Interface 8 Inter CCA

The objective of this interface is to allow interoperability and interworking between CCS.

This interface supports interconnection of communications between users operating on different CCS.

This interface should support mobility of users between different CCS.

Interface 8bis CCA to Legacy PMR

The objective of this interface is to allow interworking between a CCS and existing legacy PMR systems such as TETRA, TETRAPOL and P25.

This interface is intended to support interconnection of communications between users operating on a CCS and on a legacy PMR system.

Interface 9 Core Network to Core Network

This interface is determined by the underlying core IP network. Where the underlying network is an LTE EPC, it makes use of 3GPP standard interfaces.

This interface provides support and control of mobility and roaming of terminals between different core networks.

NOTE 2: Where the underlying core networks use different technologies, a standardized interface may not be available.

Interface 10 Terminal to Terminal

This interface is determined by the terminal technology.

Where the terminals are LTE Ues, this interface will be a standard 3GPP interface, defined under the Proximity Services (ProSe) work item in 3GPP Release 12.

This interface supports direct communications between terminals and also the terminal to Network Relay configuration.

Interface 11 Mobile CCA to Mobile CCA

The objective of this interface is to provide control of direct CCA Services between two or more terminals without any infrastructure path. Where the terminals are LTE Ues, it relies on underlying services defined by 3GPP ProSe.

Interface 12 Infra CCA to Relay CCA

The objective of this interface is to support the specific configuration of a Terminal to Network Relay. This interface can be considered to be a subset of the interface 4 Infra CCA to Mobile CCA.

Interface 13 Mobile CCA to Relay CCA

The objective of this interface is to support the specific configuration of a Terminal to Network Relay. This interface can be considered to be a subset of the interface 11 Mobile CCA to Mobile CCA.

CCA Features

- User Management
  - on top of device mobility
  - Single Sign On
- Group Management
- Communication Control
  - Handling the communication tree (connecting different transport sessions if needed)
  - Individual and Group
  - Floor Control (or exclusive transmitter within one session)
  - Supplementary services
- Session Control
  - Set up, Release, priorities,… (C-Plane) of transport sessions
  - Individual, Group (U-Plane)
- Signaling Transport
  - to transport and route signaling messages between mobile and applications
  - similar to Short Data or to Control Channel messages
  - e.g. geo-location information, Status,…

Figure 4: Critical Communications Application Features.