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Part 1: Critical Communications Architecture Reference Model

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Foreword

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

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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1 Scope

The present document describes an architecture that will allow Critical Communications applications to operate across a broadband IP network. The IP network may be a wireless network, for example, a 3GPP™ specified LTE™ network. The various interfaces and reference points that comprise the architecture are detailed within the present document together with a brief outline of some of the most important services that the architecture supports.

The interfaces described include those relevant to a network to terminal application, a terminal to terminal application, and network to terminal application via a relay terminal.

2 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 referenced document (including any amendments) applies.

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2.1 Normative references

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

Not applicable.

2.2 Informative references

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 122 011: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Service accessibility (3GPP TS 22.011)".

3 Definitions and abbreviations

3.1 Definitions

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

call: a set of exchanges of information between two or more users that takes place in a conversational service

Critical Communication Application (CCA): application providing professional communication services to critical communication users over broadband IP networks, e.g. LTE networks, and to legacy professional networks

Critical Communication System (CCS): the whole system that is providing Professional Communication Services to Professional Users

NOTE: The CCS may include Access Network, Core Network, Control Rooms and Applications.

professional operator: operator in charge to provide Critical Communication Services to Professional Users (Public Safety users, Rail Users, Utility users, other professional users)

session: set of information sent from one user to one or more other users outside a Conversational Service

3.2 Abbreviations

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

ARP	Allocation and Retention Priority
CCA	Critical Communication Application
CCS	Critical Communication System
DMR	Digital Mobile Radio
EPC	Evolved Packet Core
GSM-R	Global System for Mobile communication for Railway application
HSS	Home Subscriber Server
LMR	Land Mobile Radio
LTE	Long Term Evolution
MNO	Mobile Network Operator
MVNO	Mobile Virtual Network Operator
PMR	Professional Mobile Radio or Private Mobile Radio
QCI	QoS Class Identifier
QoS	Quality of Service
SLA	Service Level Agreement
UE	User Equipment

4 Architectural Requirements

In order to satisfy the Critical Communication User requirements the Critical Communication System:

- provides generic multimedia individual and group services for Professional Communication to the Application layer (Control Rooms, Localization Applications and Multimedia Applications);
- addresses several professional markets including: Public Safety, Railway, Utilities;
- has full control of user profiles;
- has full control of security level;
- supports interworking with legacy Professional Networks (TETRA, TETRAPOL, DMR, GSM-R, P25, etc.);
- provides mechanisms ensuring the required level of resiliency;
- controls the resources usage according to users' and communications' priorities;
- supports efficient use of features such as broadcast transport and/or QoS management when these are available. This is typically the case when the broadband access is an LTE network.
- supports the ability to connect one or more broadband networks to a CCA and allows multiple CCAs to be connected to a broadband network.

5 Critical Communication System Architecture

5.1 CCS Reference Model

The Critical Communication System architecture model considers the following aspects:

- services and facilities that are provided to professional users;
- reference points / interfaces for the user plane and control plane between the CCA, Core IP Network(s) (e.g. LTE network) and legacy professional networks;

- reference points / interfaces for the user plane and control plane between the CCA and Application Layer;
- reference points / interfaces for the user plane and control plane between the CCAs on terminals (e.g. LTE UEs) for Proximity scenarios;
- reference points /interfaces to the 3rd party application layer functions in the terminal and CCA;

The performance and security aspects of the architecture are also important considerations.

To meet the Mission Critical requirements, the complete architecture of the Critical Communication System, CCS has to be considered, not only the Critical Communication Application (CCA). The CCS model also includes also the underlying IP Core Network (e.g. LTE EPC) and other functions.

The CCS Reference Model considered is the following.

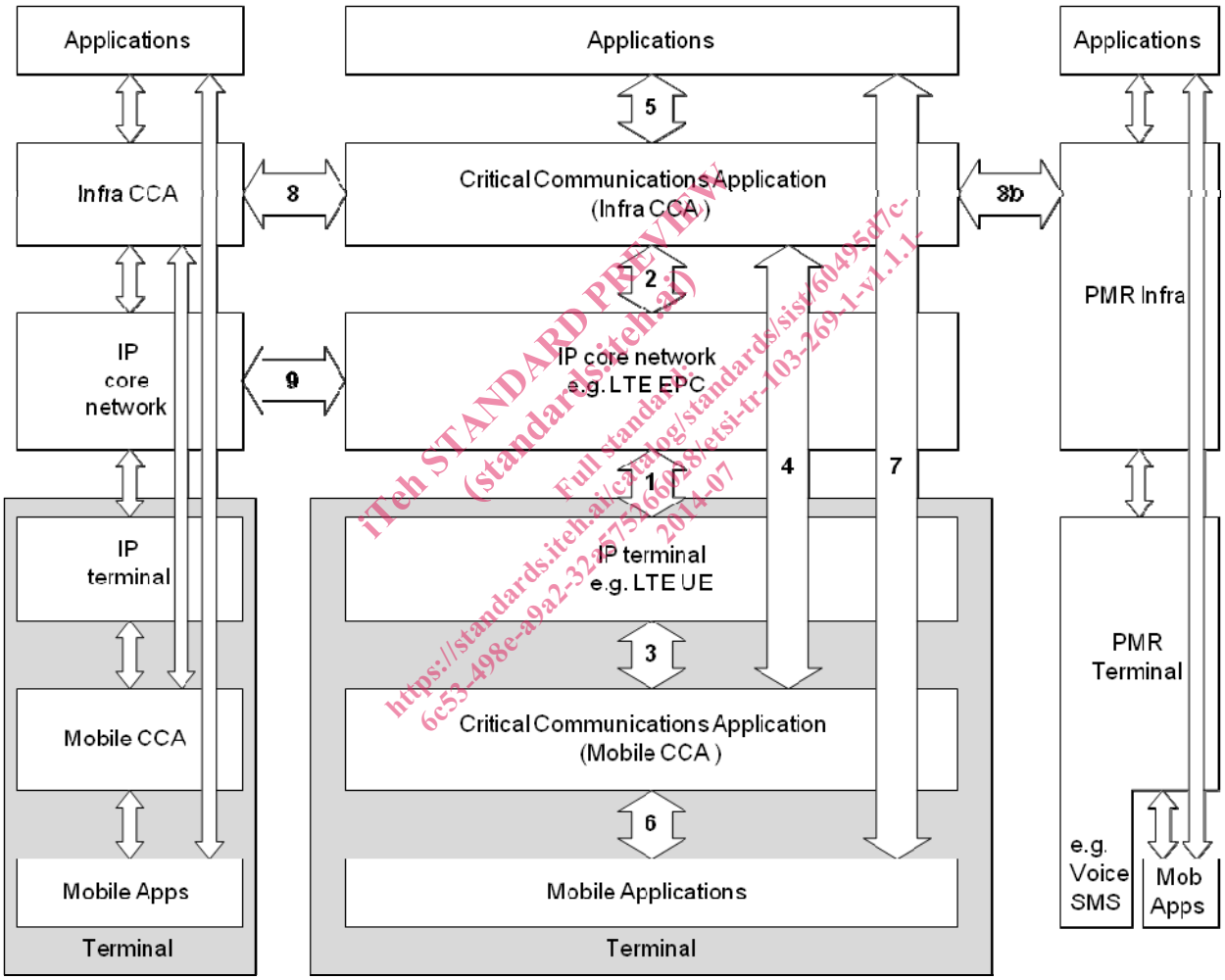

Figure 1: CCS Reference Model

In addition, derived reference models apply to the Direct Mode of Operations - see figure 2, to the Terminal to Terminal Repeater - see figure 3, and to the Terminal to Network Relay - see figure 4.

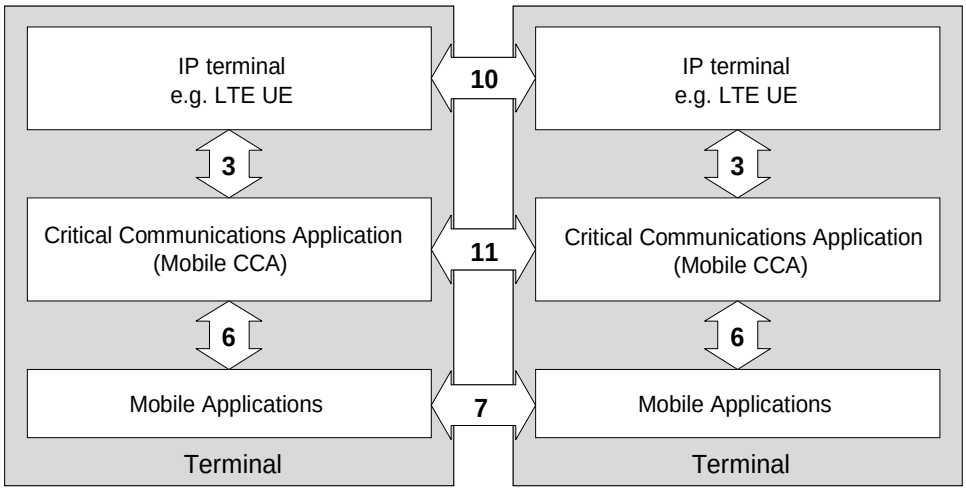

Figure 2: Direct Mode of Operations Reference Model

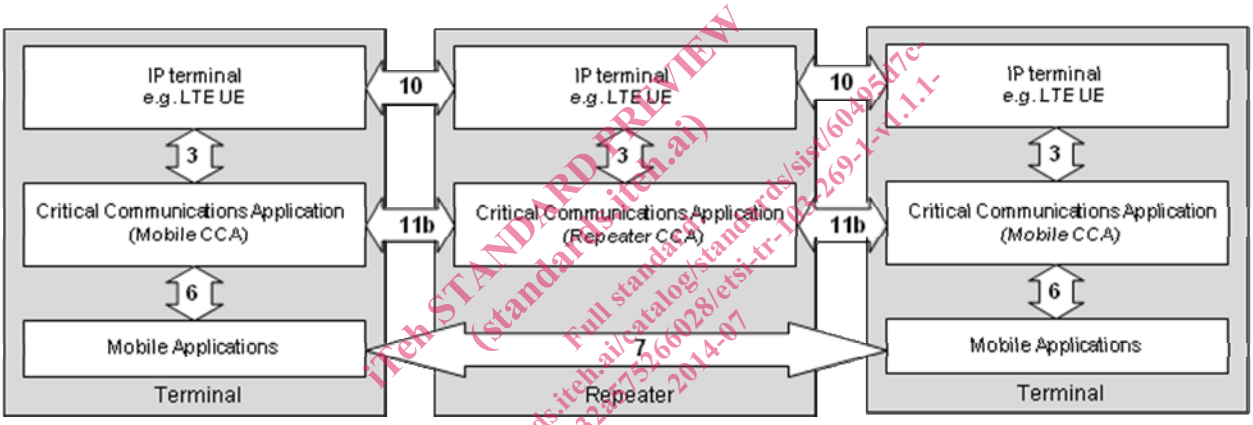

Figure 3: Terminal to Terminal Repeater Reference Model

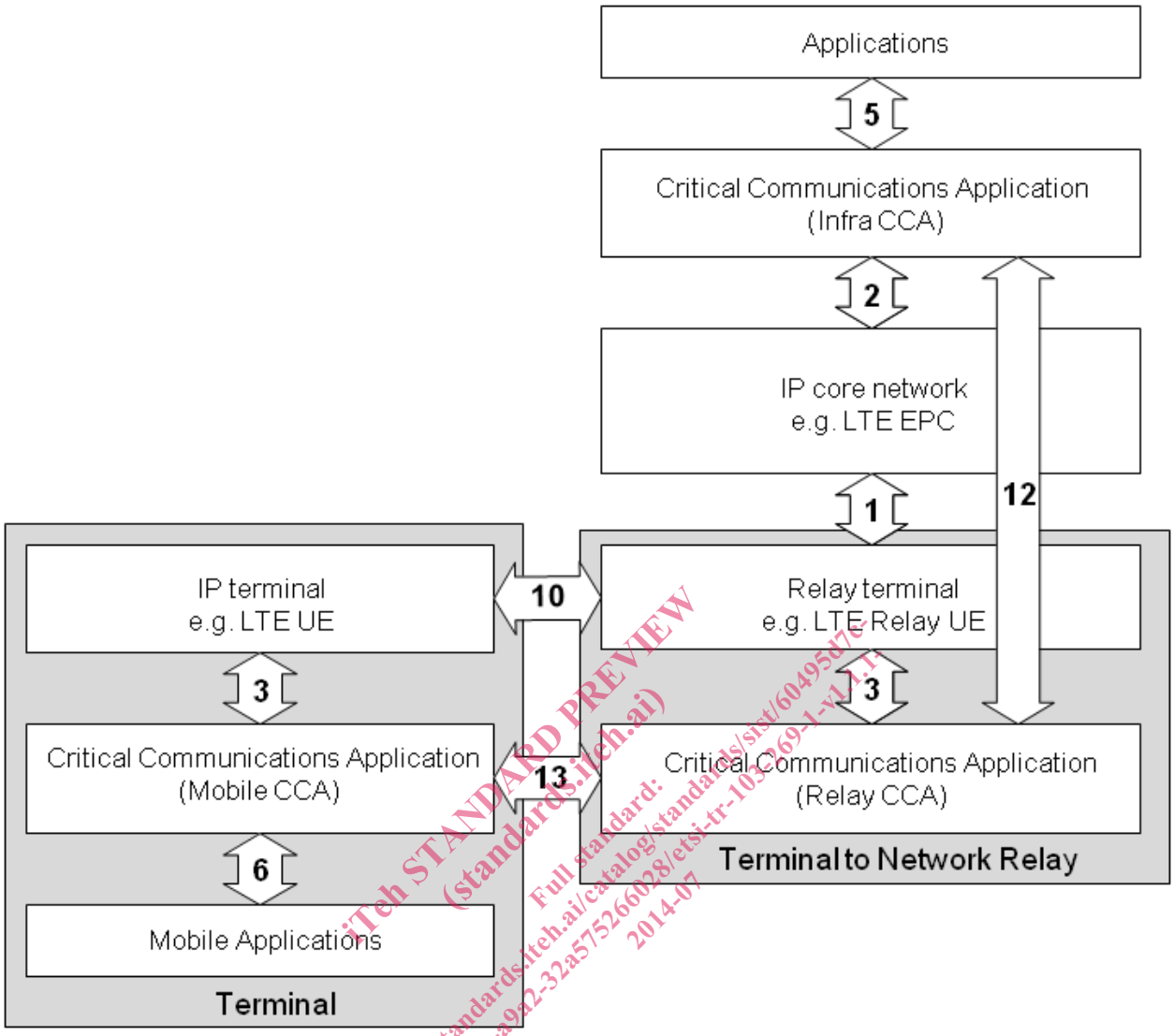

Figure 4: Terminal to Network Relay Reference Model

5.2 Interfaces

5.2.1 [1] IP Core Network - IP Terminal interface

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 LTE UE to EPC interfaces.

5.2.2 [2] Infra CCA - IP Core Network interface

The objective of this interface is to allow interworking between an Infrastructure CCA and IP Core Networks from different manufacturers. 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 MB2 interface developed in the GCSE-LTE work item from 3GPP Release 12, to allow use and control of LTE broadcast bearers

This interface may also provide additional reporting information from the IP network (e.g. location, charging or some other function).