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LTE;
Minimum requirements for support of
Mission Critical Push To Talk (MCPTT) service
over the Gm reference point
(3GPP TR 24.980 version 13.3.0 Release 13)

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Contents

Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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Introduction

3GPP TS 23.179 [2] defines that the SIP-1 reference point between the MCPTT UE and the SIP core uses the 3GPP Gm reference point (with necessary enhancements to support MCPTT requirements and profiled to meet the minimum requirements for support of MCPTT).

3GPP TS 24.229 [4] and 3GPP TS 24.301 [5] contain several options or alternatives for the MCPTT UE and network for support of procedures on the Gm reference point in order to obtain IMS services. In order to ensure interoperability it is necessary to define recommendations that if adhered to by both MCPTT UE and network will ensure that the MCPTT UE can obtain access to the MCPTT service.

The present document makes recommendations for the P-CSCF and S-CSCF entities defined in 3GPP TS 23.228 [6], however if the SIP core for MCPTT does not internally comply with the architecture of 3GPP TS 23.228 [6] these recommendations apply generically to whatever SIP core entity provides the equivalent functionality to the P-CCSF and S-CSCF. The MCPTT UE and SIP core adhere to the procedures on the Gm reference point defined in 3GPP TS 24.229 [4], 3GPP TS 24.301 [5] and 3GPP TS 24.379 [3].

The present document cross-references and aligns with GSMA PRD IR.92 [12], which profiles Voice and SMS over LTE (VoLTE).

1 Scope

The present document describes a minimum IMS profile of the Gm reference point for SIP core implementation to guide interoperable implementation of MCPTT solutions. In order to support procedures over the SIP-1 reference point defined in 3GPP TS 23.179 [2] and 3GPP TS 24.379 [3], and which exists between the MCPTT UE Signaling User Agent and the SIP core for obtaining access to MCPTT service and supporting MCPTT sessions, the Gm reference point is profiled to meet the minimum requirements to support MCPTT.

The Gm reference point contains many options which are not necessarily applicable for support of MCPTT or options which are alternative mechanisms (e.g. P-CSCF discovery) where if the same option is not supported by both the MCPTT UE and the network interoperability cannot be achieved.

The present document describes the following:

- Where options exist in 3GPP TS 24.229 [4] related to provision of IMS based services over the Gm reference point, those options which need to be supported to ensure interoperable MCPTT service will be identified.
- Where options exist in 3GPP TS 24.301 [5] and stage 2 functionality that are needed to provide MCPTT service over IMS, those options which need to be supported to ensure interoperable MCPTT service will be identified.
- Where optional features of MCPTT are defined that require additional options on the Gm reference point to be supported, these options will also be identified as recommended to be supported to ensure interoperability of the optional feature.

The present document will only cover on-network unicast operation.

The present document covers EPC aspects that are required by MCPTT to establish MCPTT sessions.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.179: "Functional architecture and information flows to support mission critical communication; Stage 2".

[3] 3GPP TS 24.379: "Mission Critical Push To Talk (MCPTT) call control protocol specification".

[4] 3GPP TS 24.229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[5] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[6] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[7] 3GPP TS 33.203: "3G security; Access security for IP-based services".

[8] Void.

[9] 3GPP TS 23.203: "Policy and charging control architecture".

[10] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

[11] 3GPP TS 26.179: "Mission Critical Push To Talk; Codecs and media handling".

[12] GSMA PRD IR.92 (V9.0): "IMS Profile for Voice and SMS" (http://www.gsma.com/newsroom/wp-content/uploads/IR.92-v9.0.pdf).

[13] 3GPP TS 24.383: "Mission Critical Push To Talk (MCPTT) Management Object (MO)".

[14] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

MCPTT service: A Push To Talk communication service supporting applications for Mission Critical Organizations and mission critical applications for other businesses and organizations (e.g., utilities, railways) with fast setup times, high availability, reliability and priority handling.

MCPTT related APN: An APN utilised by the MCPTT service including the MCPTT service APN for the SIP-1 reference point, an MC common core services APN for the HTTP-1 reference point and a MC identity management service APN for the CSC-1 reference point.

MCPTT UE: A UE that enables an MCPTT user to participate in MCPTT service.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

EPC	Evolved Packet Core
MC	Mission Critical
MCPTT	Mission Critical Push To Talk over LTE
PCC	Policy and Charging Control
P-CSCF	Proxy Call Session Control Function
UM	Unacknowledged Mode

4 Support of generic functions over the Gm reference point

4.1 General

4.1.1 MCPTT UE

All of the mandatory capabilities for an E-UTRAN capable UE and EPS defined in 3GPP TS 24.229 [4] are assumed as a baseline to be supported by the MCPTT UE for this profile.

All of the mandatory capabilities for the UE defined in 3GPP TS 24.301 [5] are assumed as a baseline to be supported by the MCPTT UE for this profile.

4.1.2 SIP core

All the mandatory capabilities for the P-CSCF and S-CSCF for the messages sent and received on the Gm reference point defined in 3GPP TS 24.229 [4] are assumed as a baseline to be supported for this profile.

4.1.3 EPC

All the mandatory capabilities for the MME defined in 3GPP TS 24.301 [5] are assumed as a baseline to be supported for this profile.

4.2 Registration procedures

4.2.1 MCPTT UE

The MCPTT UE follows the SIP registration procedures defined in 3GPP TS 24.229 [4]. In addition, when the conditions for performing IMS registration in bullets 2, 3, 4, 5 and 6 in subclause L.3.1.2 of 3GPP TS 24.229 [4] evaluate to true, the MCPTT UE registers with the IMS.

4.2.2 SIP core

The SIP core follows the SIP registration procedures defined in 3GPP TS 24.229 [4].

The SIP core supports network-initiated de-registration as defined in 3GPP TS 24.229 [4].

4.3 Authentication procedures

4.3.1 MCPTT UE

The MCPTT UE follows the procedures defined in 3GPP TS 24.229 [4] and 3GPP TS 33.203 [7] for authentication with IMS Authentication and Key Agreement (IMS-AKA), Sec-Agree and IPSec. The MCPTT UE supports integrity protection.

4.3.2 SIP core

The SIP core follows the procedures defined in 3GPP TS 24.229 [4] and 3GPP TS 33.203 [7] for authentication with IMS-AKA, Sec-Agree and IPSec. The SIP core supports integrity protection.

4.4 Session establishment procedures

4.4.1 General

Session establishment procedures are described in 3GPP TS 24.229 [4] and 3GPP TS 24.379 [3].

4.5 Integration of resource management and SIP

4.5.1 MCPTT UE

4.5.1.1 Loss of PDN connectivity

In accordance with GSMA PRD IR.92 [12] section 2.4.2.1, if the MCPTT UE discovers (for example during a TAU procedure) that PDN connectivity had been lost to one or more of the MCPTT related APNs (as specified in subclause 5.2.9.1 of 3GPP TS 23.179 [2]), then the MCPTT UE attempts to re-establish the PDN connections that were lost.

NOTE: This will trigger the network to initiate a new SIP signalling bearer in conjunction with the PDN connection establishment for the MCPTT service APN.

When the MCPTT UE regains PDN and IP connectivity to the MCPTT service APN, if the IP address has changed or the IMS registration expired during the period of absence of IP connectivity then the MCPTT UE performs a new initial registration to IMS.

4.5.1.2 Loss of media bearer and Radio Connection

In accordance with GSMA PRD IR.92 [12] section 2.4.2.3, if a SIP session includes media streams, and if a dedicated bearer for any media stream fails to get established, or is lost mid-session, the MCPTT UE, based on its preferences, modifies, rejects or terminates the SIP session that the dedicated media bearer is associated with, according to subclause 6.1.1 in 3GPP TS 24.229 [4].

NOTE: The MCPTT UE is assumed to have internal logic to react to the detection of loss of bearer/radio connection to handle its internal state. For multimedia communication, if the radio connection is not lost, but a bearer not used for voice is lost, then the MCPTT UE decides if the session is maintained as is, or is modified, or is released.

If the MCPTT UE loses radio connectivity and the IMS registration expires prior to regaining radio connectivity, then upon regaining radio connectivity the MCPTT UE performs a new initial registration to IMS.

4.5.2 SIP core

4.5.2.1 Loss of PDN connectivity

In accordance with GSMA PRD IR.92 [12] section 2.4.2.1, if the PDN connectivity between the MCPTT UE and the EPC to the MCPTT service APN is lost, then the network terminates all ongoing SIP sessions related to the MCPTT UE, according to the procedures in subclause 5.2.8 of 3GPP TS 24.229 [4] (for example, when the P-CSCF receives an abort session request from the PCRF).

4.5.2.2 Loss of media bearer and Radio Connection

In accordance with GSMA PRD IR.92 [12] section 2.4.2.3, if a GBR bearer used for voice fails to get established, or is lost mid-session, then the network terminates the session associated to the voice stream according to the procedures in subclause 5.2.8 in 3GPP TS 24.229 [4] (P-CSCF is informed about loss of bearer by the PCRF).

NOTE: The loss of GBR bearer can be due to loss of radio connection indicated by a S1 release with cause "Radio Connection With UE Lost" and then followed by the MME Initiated Dedicated Bearer Deactivation procedure for the GBR bearer used for voice. Or, the GBR bearer can be lost or not established, due to the current resource and radio situation. However, termination of the SIP session due to loss of the voice GBR bearer is the only way for the system to stop the IMS level charging (quickly) when the MCPTT UE loses radio connection.

5 RTP and SDP considerations to support MCPTT over the Gm reference point

5.1 General

5.1.1 MCPTT UE

The MCPTT UE supports codecs for audio media as described in 3GPP TS 26.179 [11].

5.1.2 SIP core

The SIP core supports codecs for audio media as described in 3GPP TS 26.179 [11].

5.2 Data transport

5.2.1 MCPTT UE

The MCPTT UE uses RTP, as described in 3GPP TS 26.179 [11].

5.2.2 SIP core

The entities in the SIP core that terminate the user plane use RTP, as described in 3GPP TS 26.179 [11].

5.3 RTCP usage

5.3.1 General

The RTP implementation includes an RTP Control Protocol (RTCP) implementation according to 3GPP TS 26.179 [11].

6 Bearer management

6.1 General

6.1.1 MCPTT UE

The MCPTT UE and EPS use the MCPTT related APNs as specified in subclause 5.2.9.1 of 3GPP TS 23.179 [2], which can be configured in the MCPTT UE along with other relevant information during initial MCPTT UE configuration as specified in 3GPP TS 24.383 [13].

NOTE: The MCPTT UE can be pre-configured with the MCPTT related APNs i.e. before the MCPTT UE configuration procedure occurs. If new APNs are received during initial MCPTT UE configuration, then these APNs take precedence.

6.2 EPS bearer considerations for SIP signalling and MCPTT sessions

6.2.1 MCPTT UE

The MCPTT UE establishes PDN connections to the MCPTT related APNs as specified in subclause 5.2.9.2 of 3GPP TS 23.179 [2].

For the MCPTT service APN, the MCPTT UE does not activate EPS bearers for media streams. Since the minimum requirement for the MCPTT UE is the support of one UM bearer which is used for voice (see subclause 7.3.1 and Annex B in 3GPP TS 36.331 [10]), the MCPTT UE multiplexes the media streams from multiple concurrent voice sessions, in accordance with GSMA PRD IR.92 [12] section 4.3.2.

6.2.2 EPS

An EPS bearer with QCI value of 69 (as specified in 3GPP TS 23.203 [9]) is created when the MCPTT UE creates the PDN connection to the MCPTT service APN. It is used for SIP signalling.

The network initiates the creation of a dedicated bearer to transport the voice media. The dedicated bearer for Conversational Voice utilises the standardised QCI value of 65 and has the associated characteristics as specified in 3GPP TS 23.203 [9].

The network, utilising dynamic PCC, creates no more than one dedicated bearer for voice media.

NOTE: No more than one dedicated bearer is created for voice media since in accordance to 3GPP TS 36.331 [10] states the minimum requirement for the MCPTT UE is the support of one UM bearer for voice.

If pre-established sessions are supported, then the network supports Resource Sharing as specified in 3GPP TS 29.214 [14].

6.2.3 SIP core

If pre-established sessions are supported and the SIP core interacts with PCC over the Rx reference point for control of media resource during MCPTT sessions, then the SIP core supports resource sharing as specified in 3GPP TS 24.229 [4] and 3GPP TS 29.214 [14]. If resource sharing for MCPTT sessions is supported the SIP core includes the Resource-Share header field in the initial SIP REGISTER request as defined in 3GPP TS 24.229 [4].

6.3 P-CSCF discovery

6.3.1 MCPTT UE

The MCPTT UE supports option I and option II procedures for P-CSCF discovery as defined in annex L.2.2.1 of 3GPP TS 24.229 [4].

In accordance with GSMA PRD IR.92 [12] section 4.4, the MCPTT UE indicates P-CSCF IPv6 Address Request and P-CSCF IPv4 Address Request when performing the following procedures:

1) initial attach when establishing PDN connection to the MCPTT service APN;

2) initial attach when establishing PDN connection to the MCPTT service APN; and

3) establishment of the PDN connection to the MCPTT service APN when already attached.

NOTE: The MCPTT service APN is defined in 3GPP TS 23.179 [2].

If the network does not provide the MCPTT UE with a list of P-CSCF IPv4 or IPv6 addresses, then the UE attempts to obtain P-CSCF addresses using DHCPv4 or DHCPv6, depending on if the MCPTT UE is configured to use IPv4 or IPv6 in on-network operation, as defined in option I procedures for P-CSCF discovery in annex L.2.2.1 of 3GPP TS 24.229 [4] and subclause 9.2.1 of 3GPP TS 24.229 [4].

If both IPv4 and IPv6 addresses are assigned to the MCPTT UE, then the MCPTT UE prefers the IP version address type as indicated in MCPTT UE configuration data when the MCPTT UE discovers the P-CSCF.

The MCPTT UE uses the discovered P-CSCF addresses as defined in 3GPP TS 24.229 [4].

In accordance with GSMA PRD IR.92 [12] section 4.4, if the MCPTT UE receives a Modify EPS Bearer Context Request message containing a list of P-CSCF addresses that does not include the address of the currently used P-CSCF, the MCPTT UE acquires a P-CSCF different from the currently used P-CSCF and initiates a new initial registration as defined in 3GPP TS 24.229 [4] subclause L.2.2.1C.

6.3.2 SIP core

Void.

6.3.3 EPC

When using the option II mechanism for P-CSCF discovery as defined in subclause L.2.2.1 of 3GPP TS 24.229 [4], P-CSCF address(es) are transferred to the MCPTT UE within the EPS bearer context activation procedures. The encoding of the request and response for list of P-CSCF address(es) within the Protocol Configuration Options information element is described in 3GPP TS 24.301 [5].

7 Common functionalities

7.1 IP version

7.1.1 MCPTT UE

The MCPTT UE supports both IPv4 and IPv6 for all protocols that are used for MCPTT.

In accordance with GSMA PRD IR.92 [12] section 5.1, after the MCPTT UE has discovered the P-CSCF and registered to IMS with a particular IPv4 or IPv6 address, the MCPTT UE uses this IP address for all SIP communication as long as the IMS registration is valid. For all SDP and RTP/RTCP communication, the UE uses the IPv4 address used for SIP communication or an IPv6 address with the same IPv6 prefix as the IPv6 prefix of the IPv6 address used for SIP communication.

7.1.2 SIP core

The P-CSCF supports both IPv4 and IPv6 for SIP and SDP.

NOTE: In accordance with GSMA PRD IR.92 [12] section 5.1, where interworking between IP versions is required, (e.g. for roaming and interconnect between networks using different IP versions) it is recommended that the interworking be provided in a manner that is transparent to the MCPTT UE.

Annex A:
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2015-10					TR skeleton agreed in C1-153813	-	0.0.0
2015-10					Contains agreed P-CRs from CT1#94: C1-153743, C1-153814, C1-153816, C1-153977	0.0.0	0.1.0
2015-11					Contains agreed P-CRs from CT1#95: C1-154418, C1-154492, C1-154882	0.1.0	0.2.0
2015-11					Editorial cleanup	0.2.0	0.2.1
2015-12	CT-70	CP-150737			Version 1.0.0 created for presentation for information	0.2.1	1.0.0
2016-01					Contains agreed P-CRs from CT1#95bis: C1-160334, C1-160479, C1-160480	1.0.0	1.1.0
2016-02					Contains agreed P-CRs from CT1#96: C1-161376, C1-161377, C1-161378, C1-161522	1.1.0	1.2.0
2016-03	CT-71	CP-160062			Version 2.0.0 created for presentation for approval	1.2.0	2.0.0
2016-03	CT-71	CP-160154			Adds reference to GSMA PRD IR.92 and includes relevant cross references	2.0.0	2.1.0
2016-03	CT-71				Version 13.0.0 created after approval	2.1.0	13.0.0
2016-03					Editorial changes by rapporteur	13.0.0	13.0.1
2016-06	CT-72	CP-160323	0001	1	Incorrect option specified for P-CSCF address retrieval	13.0.1	13.1.0
2016-06	CT-72	CP-160323	0002	4	Alignment to stage 2 of UE configuration	13.0.1	13.1.0
2016-06	CT-72	CP-160323	0003	1	Removal of editor's notes pertaining to RTP and RTCP usage	13.0.1	13.1.0

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2016-09	CT#73	CP-160505	0004	1	F	MCPTT Profile correction for P-CSCF discovery via EPC	13.2.0
2016-09	CT#73	CP-160505	0005		F	Editor's notes on applicability of TS 26.114 on MCPTT	13.2.0
2017-03	CT#76	CP-171067	0006	1	F	SIP core support for Resource Sharing	13.3.0

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