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**with Land Mobile Radio Systems**  
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# Foreword

This Technical Specification 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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# 1 Scope

The objective of this technical specification is to specify interworking between MC systems and LMR systems that satisfy the MCPTT requirements in 3GPP TS 22.179 [3], MCCoRe requirements in 3GPP TS 22.280 [2] and the MCDData requirements (SDS only) in 3GPP TS 22.282 [4].

The present document refers to an InterWorking Function (IWF). The structure and functionality of the IWF is out of scope of the present document. The definition of reference points between the IWF and MC systems and the interactions between the IWF and MC systems are in scope of the present document.

---

# 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 22.280: "Mission Critical Services Common Requirements (MCCoRe); Stage 1".
- [3] 3GPP TS 22.179: "Mission Critical Push to Talk (MCPTT); Stage 1".
- [4] 3GPP TS 22.282: "Mission Critical Data services".
- [5] 3GPP TS 23.280: "Common functional architecture to support mission critical services; Stage 2".
- [6] 3GPP TS 23.282: "Functional architecture and information flows to support Mission Critical Data (MCDData); Stage 2".
- [7] 3GPP TS 23.379: "Functional architecture and information flows to support Mission Critical Push To Talk (MCPTT); Stage 2".
- [8] 3GPP TS 33.180: "Security of the mission critical service"
- [9] TIA-603-D: "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

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# 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].

**End-to-End Encryption:** encryption that is applied by an originating terminal or client and is decrypted only by chosen terminating terminals or clients.

**User homed in the IWF:** is an MC service ID that represents an LMR user in the MC system.

**Interworking:** a means of communication between mission critical systems and LMR systems whereby MC users obtaining service from a mission critical system can communicate with LMR users who are obtaining service from one or more LMR systems.

**Interworking function:** adapts LMR Systems to mission critical systems via the IWF interface and supports interworking between LMR systems and mission critical systems.

**Interworking group:** a group, which is composed of group members from the MC system and the LMR system and defined in the MC system or the LMR system.

**LMR system:** the collection of applications, services, and enabling capabilities providing a land mobile radio service offering group and private communications.

**LMR user:** a user of a device which allows participation in an LMR system.

NOTE: The term LMR user is defined for discussion purposes only and is out of scope of the present document.

## 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].

|       |                                     |
|-------|-------------------------------------|
| E2EE  | End-to-End Encryption               |
| IWF   | InterWorking Function               |
| KEK   | Key Encryption Key (TETRA)          |
| KMS   | Key Management Service              |
| MC    | Mission Critical                    |
| MCPTT | Mission Critical Push To Talk       |
| LMR   | Land Mobile Radio                   |
| OTAK  | Over-The-Air-Key Management (TETRA) |
| OTAR  | Over-The-Air Rekeying (P25)         |
| P25   | Project 25                          |
| SDS   | Short Data Service                  |
| TETRA | TErrestrial Trunked Radio           |
| UE    | User Equipment                      |
| UKEK  | Unique Key Encryption Key (P25)     |
| URI   | Uniform Resource Identifier         |

## 4 Introduction

Mission critical users currently employ a wide range of LMR mission critical Push To Talk services, and associated data capabilities where available.

The present document describes the architecture to support the interworking between the MC system and the LMR system to satisfy interworking requirements specified in 3GPP TS 22.179 [3] and 3GPP TS 22.282 [4]. Other LMR technologies may interwork as long as they conform to the present document.

The IWF, along with its LMR system, will appear as a peer interconnected MC system. This is meant as an approach for defining interactions on the IWF interface but is not intended to specify the functionality of the IWF nor meant to mandate a deployment model.

## 5 Assumptions and architectural requirements

### 5.1 Key management

Interworking requirements for key management for encrypted interworking include:

- a) a mechanism to securely (i.e. authenticity, integrity, confidentiality) share an LMR E2EE traffic key for a private call sessions between a party in an MCPTT system and a party in the LMR system;
- b) a mechanism to securely convey to group members, the LMR E2EE key or set of LMR E2EE keys associated with an MC service group or set of MC service groups, to be used for encryption of interworking group calls spanning the multiple systems;
- c) a mechanism to securely share with temporary group members in MC systems, the LMR E2EE key(s) associated with a temporary MC service group to be used in interworking group calls spanning the multiple systems;
- d) key management solutions shall not preclude the ability of an IWF to allow one or more individual Mission Critical Organizations from having sole control over and sole access to LMR E2EE traffic keys used for the entity's media traffic and users' key encryption keys (UKEKs or KEKs);
- e) key management solutions shall support the ability of the IWF to decrypt/reencrypt the media traffic for zero or more groups; and,
- f) for deployments where Mission Critical Organizations wish to use LMR E2EE mechanisms when interworking with LMR users:
  - i) a mechanism to securely provision an MC service client with the user's UKEK or KEK; and,
  - ii) a mechanism to convey LMR OTAR or OTAK message contents.

## 5.2 Packet format

Each LMR technology defines its own packet format for voice media transmission. For interworking sessions, there might be cases where LMR formatted media is required to be transferred between the IWF and LMR aware MCPTT clients. An example of such a case is where E2EE is used and thus the IWF is not able to decrypt the media. In such cases, media that is sent over the IWF-1 interface needs to be routed within MCPTT systems to/from LMR aware MCPTT clients using methods described in 3GPP TS 23.379 [7].

Requirements for media transmission across the IWF-1 interface include:

- a) media transmission to carry the LMR formatted media between the IWF and LMR aware MCPTT clients; and
- b) the MCPTT system, along with the IWF, may choose to encrypt the LMR formatted media using 3GPP mechanisms.

NOTE: The contents of the LMR formatted media is out of scope of the present document.

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## 6 Involved business relationships

No business relationships have been identified.

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## 7 Functional model

### 7.1 General

### 7.2 Functional model description

Figure 7.2-1 shows the functional model for the application plane for interworking between MC systems and LMR systems. Functional entities and interfaces depicted on the right-hand side of the IWF-x interfaces are defined in 3GPP TS 23.280 [5], 3GPP TS 23.379 [7], and 3GPP TS 23.282 [6].