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TETRA and Critical Communications Evolution (TCCE); Interworking between TETRA and 3GPP mission critical services Part 1: General considerations for interworking

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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 1 of a multi-part deliverable covering interworking between TETRA and 3GPP mission critical services, as identified below:

Part 1: "General considerations for interworking";

Part 2: "Security of interworking between TETRA and Broadband applications".

Modal verbs terminology

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Introduction

3GPP is standardizing a set of mission critical services as applications working over 3GPP LTE systems. These services include speech PTT systems (MCPTT), data (MCData) and video (MCVideo) systems. Users have a need to interwork between TETRA and 3GPP MC systems for a number of reasons which can include:

- Communication between different user groups who receive service from the different types of system.
- Use of both systems by the same set of users to allow selection of optimum radio coverage and services in any situation.
- Migration from an existing TETRA system to a 3GPP MC system over a period of time, which may be long.

It is envisaged that an interworking function will be standardized as part of this work within ETSI TCCE to allow communication between TETRA and 3GPP MC systems. The present document provides considerations for realizing this interface.

1 Scope

The present document contains scenarios and considerations for an interworking function between TETRA and 3GPP MC services.

2 References

2.1 Normative references

Normative references are not applicable in 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 referenced 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 EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

NOTE: The latest version of either ETSI EN 300 392-2 or ETSI TS 100 392-2 applies.

[i.2] ETSI TR 102 022-2: "User Requirements Specification; Mission Critical Broadband Communications; Part 2: Critical Communications Application".

[i.3] ETSI EN 300 392-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".

[i.4] Recommendation ITU-T E.218: "Management of the allocation of terrestrial trunk radio Mobile Country Codes".

[i.5] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".

[i.6] ETSI EN 300 392-3 (all sub-parts): " Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI)".

NOTE: The referenced document has multiple parts; all parts are relevant.

[i.7] ETSI TS 123 280: "LTE; Common functional architecture to support mission critical services; Stage 2 (3GPP TS 23.280)".

[i.8] ETSI TS 123 379: "LTE; Functional architecture and information flows to support Mission Critical Push To Talk (MCPTT); Stage 2 (3GPP TS 23.379)".

[i.9] ETSI TS 123 281: "LTE; Functional architecture and information flows to support Mission Critical Video (MCVideo); Stage 2 (3GPP TS 23.281)".

[i.10] ETSI TS 123 282: "LTE; Functional architecture and information flows to support Mission Critical Data (MCData); Stage 2 (3GPP TS 23.282)".

[i.11] TETRA + Critical Communications Association: "TETRA Interoperability Profile (TIP); Part 1: Core".

NOTE: Available at https://tandcca.com/interoperability/specifications-for-interoperability/.

[i.12] ETSI TS 126 201: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Speech codec speech processing functions; Adaptive Multi-Rate - Wideband (AMR-WB) speech codec; Frame structure (3GPP TS 26.201)".

[i.13] IETF RFC 4867: "RTP Payload Format and File Storage Format for the Adaptive Multi-Rate (AMR) and Adaptive Multi-Rate Wideband (AMR-WB) Audio Codecs".

[i.14] ETSI TS 100 392-3-8: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 8: Generic Speech Format Implementation".

[i.15] ETSI EN 302 109: "Terrestrial Trunked Radio (TETRA); Security; Synchronization mechanism for end-to-end encryption".

[i.16] 3GPP TR 23.781: "Study on migration and interconnection for mission critical services".

[i.17] 3GPP TR 23.782: "Study on mission critical communication interworking between LTE and non-LTE systems".

[i.18] ETSI TS 124 379: "LTE; Mission Critical Push To Talk (MCPTT) call control; Protocol specification (3GPP TS 24.379)".

3 Definition of terms and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 300 392-2 [i.1] and the following apply:

controlling system: system responsible for call control, policy enforcement, floor control management and media distribution in a call

NOTE: A system may take either a controlling or a participating role in different circumstances.

group affiliation: mechanism by which a user's interest in one or more groups is determined

NOTE: Terminology used in 3GPP mission critical services; equivalent to TETRA group attachment.

group attachment: mechanism by which a user's interest in one or more groups is determined

NOTE: Terminology used in TETRA; equivalent to 3GPP group affiliation.

interconnection: means of communication between two systems whereby users obtaining service from one system can communicate with users who are obtaining service from one or more other systems where the systems use similar technologies

interworking: means of communication between two systems whereby users obtaining service from one system can communicate with users who are obtaining service from one or more other systems where the systems use different technologies

MCData: mission critical data service standardized in 3GPP

MCPTT: mission critical push to talk speech service standardized in 3GPP

MCVideo: mission critical video service standardized in 3GPP

migration: means for a user with a subscription to a first system to obtain service directly from a second system whilst making use of the subscription to the first system

participating system: system responsible for call control, floor control management and media distribution on behalf of its served users under the control of the controlling system

NOTE: A system may take either a controlling or a participating role in different circumstances.

3.2 Abbreviations

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

3GPP	3rd Generation Partnership Project
ACELP	Algebraic Code-Excited Linear Prediction
AMR-WB	Adaptive Multi Rate - Wide Band
ASSI	Alias Short Subscriber Identity
BS	Base Station
codec	coder-decoder
DGNA	Dynamic Group Number Assignment
DTX	Discontinuous Transmission
FFS	For Further Study
GSSI	Group Short Subscriber Identity
GTSI	Group TETRA Subscriber Identity
ID	IDentity
IP	Internet Protocol
ISI	Inter System Interface
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
IWF	Inter Working Function
MC	Mission Critical
MCC	Mobile Country Code
MCPTT	Mission Critical Push To Talk
MNC	Mobile Network Code
MNI	Mobile Network Identity
MS	Mobile Station
PTT	Push To Talk
QoS	Quality of Service
RFC	Request For Comment
RTP	Real Time Protocol
SDS	Short Data Service
SDS-TL	Short Data Service - Transport Layer
SIP	Session Initiation Protocol
SSI	Short Subscriber Identity
SwMI	Switching and Management Infrastructure
TCCA	TETRA and Critical Communications Association
TETRA	TErrestrial Trunked RAdio
TIP	TETRA Interoperability Profile
TX	Transmitter
URI	Uniform Resource Identifier

4 Service overview

4.1 Services

User requirements are specified in ETSI TR 102 022-2 [i.2].

The following services are required to be carried across an interworking function between TETRA and 3GPP MC services:

a) Individual call - duplex and semi duplex.

b) Group call.

c) Variants of these, such as emergency calls and broadcast calls.

d) Short Data Service.

e) Packet data service (see note).

Users will also require the following supplementary services to be supported:

a) Late entry on either system.

b) Talking party identity, carried between systems.

c) Calling party identity, carried between systems.

d) Restriction of calling and talking party identities carried between systems.

e) Group management on both systems.

f) Further supplementary services as required.

Additional service characteristics to be supported are:

a) Prioritization schemes allowing priority requests to be resolved between systems.

b) Pre-emption.

NOTE: Packet data service interworking is FFS, but may simply make use of IP routing techniques outside the scope of this study.

Security services such as authentication, air interface encryption and end to end encryption need to be maintained appropriately.

Note that the TETRA standard supports a wider range of functionality than the set that is required for interworking with mission critical applications over broadband. Also, some aspects of services within the TETRA standard are not commonly utilized within TETRA implementations, and are not specified for interoperability in the TCCA core TIP [i.11] and accompanying specifications. Aspects of TETRA standard functionality that are not specified for interoperability in [i.11] or not required for interworking in ETSI TR 102 022-2 [i.2] will not be discussed within the present document. Additional functionality specified in the interoperability documentation following publication of the present document may be reflected in future revisions of the present document.

4.2 Interworking realization

The concept of the interworking function can be as shown in figure 4.2-1.

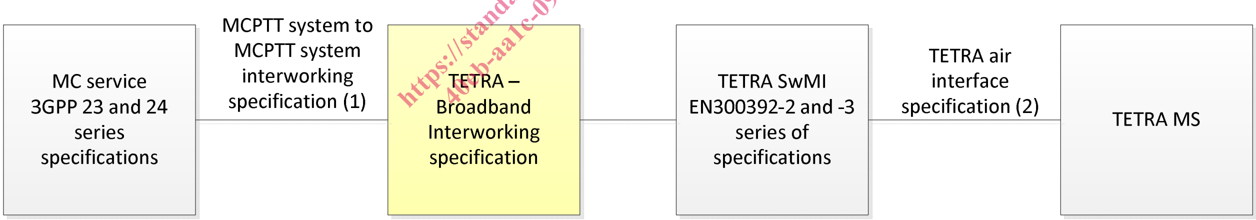

Figure 4.2-1: Concept of the interworking function

The interworking function to be specified as a result of this study will take the TETRA Inter-System Interface, specified in the ETSI EN 300 392-3 series of specifications [i.6] as a model of the functionality possible between TETRA systems, and the MCPTT interworking interface, which is expected to be specified within 3GPP Release 15, as inputs. The interface to the TETRA SwMI could make use of the TETRA ISI, or could be outside the scope of the standardization process.

The present document is intended to lead to a Technical Specification which specifies the interaction between the interface between a TETRA MS and a TETRA SwMI under the conditions of inter-system behaviour (shown as (1) in figure 4.2-1), and the MC system interworking interface (shown as (2) in figure 4.2-1).

The TETRA Inter-System Interface is defined in ETSI EN 300 392-3 [i.6], and an MCPTT to MCPTT interface has been studied in 3GPP TR 23.781 [i.16]. An MCPTT to non MCPTT interworking interface has been studied in 3GPP TR 23.782 [i.17].

For the purposes of this study, the interface will be considered to be a single logical interface between each pair of one MCPTT service and one TETRA SwMI. Any realization of multiple interfaces between a pair of systems e.g. for resilience is FFS.

NOTE: Interface addressing is considered a lower layer function and is outside the scope of the present document.

5 Considerations

5.1 General

Considerations relating to TETRA - 3GPP MC service interworking are described in this clause.

5.2 Addressing

5.2.1 TETRA and MCPTT addressing

The TETRA standard identifies a subscriber by an Individual TETRA Subscriber Identity ITSI. This consists of a 24 bit Mobile Network Identifier MNI (consisting of Mobile Country Code MCC and Mobile Network Code MNC), and an Individual Short Subscriber Identity ISSI. The numbering scheme is described in ETSI EN 300 392-1 [i.3] and the management of MCC and MNC is specified in Recommendation ITU-T E.218 [i.4].

3GPP MCPTT and MCData specify an MCPTT-ID and an MCData-ID which are a URIs; see ETSI TS 123 280 [i.7], ETSI TS 123 379 [i.8] and ETSI TS 123 282 [i.10]. A URI is expected to be an alphanumeric string consisting of individual user part and domain part. The MCPTT-ID and MCData-ID identify the system or systems within which the MCPTT and MCData user subscriptions are located. There may be no limit on length, however IETF RFC 3986 [i.5] recommends a maximum length of 255 characters. The 3GPP MC series of specifications also define an MCPTT Group ID and an MCData Group ID, which are also URIs and which identify both the system and the MCPTT or MCData server within the system where the group is defined. Additional services defined in ETSI TS 123 281 [i.9] and ETSI TS 123 282 [i.10] define further service specific identities with the same structure; and the generic structure for MC service identities from 3GPP Release 14 is defined in ETSI TS 123 280 [i.7].

TETRA is capable of carrying an external subscriber number field to convey an address that uses a numbering system outside that of TETRA, however the limitations specified for this in ETSI EN 300 392-2 [i.1], clause 14.8.20, are that it should have a maximum of 24 digits, where each digit is represented by a 4 bit number which can be numbers 0-9, '*', '#' or '+'. A new external number field could conceivably be added to the TETRA standard, but the carriage of up to 255 characters, which could require 1 785 bits or 2 040 bits (if 7 or 8 bit alphabets were used) could prove problematic, especially in the case of talking party identity. Somewhere around 8 full slots of information sent using the Basic Link are unlikely to be sufficiently reliable, and could delay the start of a call by nearly half a second, hence this is unlikely to be a valid solution.

Group identities have similar structures in each technology: a TETRA group is represented by a Group TETRA Subscriber Identity, the GTSI, which is composed of the MNI and Group Short Subscriber Identity GSSI.

It is likely that an address book facility will be needed as part of the interface to allow an address in one system to be represented as a different address in the other type of system in a way that is compatible with that system. This could also act as a 'whitelist' if needed to gate which users are permitted to communicate on the other system. The address book may only need to function in one direction if a URI is translated to a TETRA ITSI or GTSI, but the TETRA ITSI or GTSI is provided in some form of URI on the MC system (e.g. as SSI@MNI such as 12345@67890). However, it may also be more useful to show a name related to the ITSI or GTSI rather than numerical information on the MC system. An address book translation of a URI representing an MCPTT user or MCPTT group to a TETRA ITSI or GTSI could map the system identity part of the URI to a TETRA MNI, thus allowing different MCPTT systems to be represented as different TETRA system MNIs to users within the TETRA system. As different MC service IDs may be used for the same user when using different services on the 3GPP MC system, the address book in the interface may need more than one service specific identity on the MCPTT side to map to a single ITSI on the TETRA side.