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Terrestrial Trunked Radio (TETRA);
Voice plus Data (V+D);
Part 19: Interworking between TETRA and Broadband systems;
Sub-part 1: Protocol specification for Interworking with 3GPP mission critical services

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Foreword

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

The present document is part 19, sub-part 1 of a multi-part deliverable covering the Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D), as identified below:

Part 1: "General network design";

Part 2: "Air Interface (AI)";

Part 3: "Interworking at the Inter-System Interface (ISI)":

Part 4: "Gateways basic operation";

Part 5: "Peripheral Equipment Interface (PEI)";

Part 7: "Security";

Part 9: "General requirements for supplementary services";

Part 10: "Supplementary services stage 1";

Part 11: "Supplementary services stage 2";

Part 12: "Supplementary services stage 3";

Part 13: "SDL model of the Air Interface (AI)";

Part 14: "Protocol Implementation Conformance Statement (PICS) proforma specification";

Part 15: "TETRA frequency bands, duplex spacings and channel numbering";

Part 16: "Network Performance Metrics";

Part 17: "TETRA V+D and DMO specifications";

Part 18: "Air interface optimized applications";

Part 19: "Interworking between TETRA and Broadband systems";

Sub-part 1: "Protocol specification for Interworking with 3GPP mission critical services";

Sub-part 2: "Format for the transport of TETRA speech over mission critical broadband systems".

NOTE 1: Part 3, sub-parts 6 and 7 (Speech format implementation), part 4, sub-part 3 (Data networks gateway), part 10, sub-part 15 (Transfer of control), part 13 (SDL) and part 14 (PICS) of this multi-part deliverable are in status "historical" and are not maintained.

NOTE 2: Some parts are also published as Technical Specifications such as ETSI TS 100 392-2 and those may be the latest version of the document.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The present document has been written to satisfy the identified need for interworking between TETRA and the Mission Critical applications specified by 3GPP, to permit communications between users and groups operating on the two system technologies. It provides solutions to the considerations documented in ETSI TR 103 565-1 [i.1], which studied the issues for interworking between the two technologies. Additionally, it provides an overview of the business relationships between operators of the two technologies, and describes applicable deployment scenarios.

Terminology used in the present document reflects that used in the specifications from which terms are taken, in particular the TETRA air interface specification ETSI EN 300 392-2 [1] and the 3GPP stage 2 and stage 3 specifications. This may lead to some difference in terminology between different clauses in the present document, as 3GPP stage 2 and stage 3 terms do not correspond exactly to each other.

1 Scope

The present document defines the protocol for interworking between TETRA and 3GPP standardized mission critical systems. It supports the following services:

- Group attachment/affiliation and detachment/de-affiliation.
- Group call, including broadcast group call.
- Emergency group call.
- Individual call.
- Individual emergency call.
- Short Data Service.

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 referenced document (including any amendments) applies.

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

NOTE 1: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

NOTE 2: Note that for the TETRA standards, the reference is always to a European Standard (ETSI EN 300 xxx) if such has been published, but the latest version of that standard can be either an EN or a Technical Specification (ETSI TS 100 xxx), even if this is not visible in the reference list.

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

[1] ETSI EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

[2] ETSI TS 123 283: "LTE; Mission Critical Communication Interworking with Land Mobile Radio Systems (3GPP TS 23.283)".

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

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

[5] ETSI TS 129 379: "LTE; 5G; Mission Critical Push To Talk (MCPTT) call control interworking with Land Mobile Radio (LMR) systems; Stage-3 (3GPP TS 29.379)".

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

[7] ETSI TS 129 380: "LTE; 5G; Mission Critical Push To Talk (MCPTT) media plane control interworking with Land Mobile Radio (LMR) systems; Stage 3 (3GPP TS 29.380)".

[8] ETSI TS 124 380: "LTE; Mission Critical Push To Talk (MCPTT) media plane control; Protocol specification (3GPP TS 24.380)".

[9] ETSI TS 133 180: "LTE; Security of the Mission Critical (MC) service (3GPP TS 33.180)".

[10] ETSI TS 129 582: "LTE; 5G; Mission Critical Data (MCData) interworking with Land Mobile Radio (LMR) systems; Stage 3 (3GPP TS 29.582)".

[11] ETSI TS 124 282: "LTE; Mission Critical Data (MCData) signalling control; Protocol specification (3GPP TS 24.282)".

[12] ETSI TS 100 392-19-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 19: Interworking between TETRA and Broadband systems; Sub-part 2: Format for the transport of TETRA speech over mission critical broadband systems".

[13] ETSI TS 100 392-3-15: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 15: Transport layer independent Additional Network Feature, Mobility Management (ANF-ISIMM)".

[14] IETF RFC 5373: "Requesting Answering Modes for the Session Initiation Protocol (SIP)".

[15] IETF RFC 5366: "Conference Establishment Using Request-Contained Lists in the Session Initiation Protocol (SIP)".

[16] ETSI EN 300 392-12-10: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 10: Priority Call (PC)".

[17] ETSI EN 300 392-12-16: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 16: Pre-emptive Priority Call (PPC)".

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

[19] ETSI TS 124 481: "LTE; Mission Critical Services (MCS) group management; Protocol specification (3GPP TS 24.481)".

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 TR 103 565-1: "TETRA and Critical Communications Evolution (TCCE); Interworking between TETRA and 3GPP mission critical services Part 1: General considerations for interworking".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

chat group call: 3GPP mission critical group call where establishment of SIP session and bearers is carried out independently of call establishment, and where call establishment and termination can take place using floor control signalling

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.

floor control: arbitration system that determines which party has the authority to transmit at a point in time during a call

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.

group call: one of either a TETRA group call as defined in ETSI EN 300 392-2 [1], a chat group call, or a pre-arranged group call

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

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.

pre-arranged group call: 3GPP mission critical group call where SIP session and bearers are established at commencement of call, and where sessions and bearers are removed or modified at termination of call

3.2 Symbols

Void.

3.3 Abbreviations

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

3GPP	3rd Generation Partnership Project
5GS	5th Generation System
AMR	Adaptive Multi-Rate
DGNA	Dynamic Group Number Assignment
E2EE	End-to-End Encryption
EPS	Evolved Packet System
GSSI	Group Short Subscriber Identity
GTSI	Group TETRA Subscriber Identity
ICSI	IMS Communication Service Identifier
ID	IDentity
III	Instance of Interworking Interface reference point set
ISI	Inter-System Interface
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
IWF	InterWorking Function
KMS	Key Management Server
LIP	Location Information Protocol
LMR	Land Mobile Radio
MC	Mission Critical
MCData	Mission Critical Data

MCO	Mission Critical Organization
MCPTT	Mission Critical Push To Talk
MIME	Multi purpose Internet Mail Extension
MNI	Mobile Network Identifier
MNO	Mobile Network Operator
MS	Mobile Station
OTAK	Over The Air Keying
PC	Priority Call
PCK	Private Call Key
PCK-ID	Private Call Key IDentifier
PID	Protocol IDentifier
PPC	Pre-emptive Priority Call
SDP	Session Description Protocol
SDS	Short Data Service
SDS-TL	SDS-Transport Layer
SIP	Session Initiation Protocol
SS	Supplementary Service
SSI	Short Subscriber Identity
SSRC	Synchronization SouRCe
SwMI	Switching and Management Infrastructure
TETRA	Terrestrial Trunked Radio
UDH	User Data Header
UDP	User Datagram Protocol
UE	User Equipment
URI	Uniform Resource Identifier
XML	eXtensible Mark-up Language

4 Services

4.1 General

This clause describes the services for interworking between TETRA and 3GPP MC systems supported in the present document.

4.2 Group attachment/detachment

This clause describes Group attachment/detachment services that are supported for groups defined on the MCPTT system and groups defined on the TETRA system.

The following aspects of group attachment & detachment are supported:

- Group attachment (group affiliation) as selected group.
- Group attachment (group affiliation) as scanned group.
- Group detachment (group de-affiliation).
- Group assignment (DGNA) with attachment (group affiliation).
- Group detachment due to group de-assign (DGNA) (group de-affiliation).

4.3 Group call

This clause describes group call services that are supported in the present document for groups defined on the MC system and groups defined on the TETRA system.

The following aspects of group call are supported:

- Initiating a group call to an attached (affiliated) group, with and without end-to-end encryption.
- Receiving call setup from an attached (affiliated) group, with and without end-to-end encryption.
- Receiving call setup from an attached (affiliated) group where transmit permission in response is not permissible (broadcast call).
- Requesting transmission permission (initiating a floor request) in an ongoing group call.
- Requesting transmission permission which overrides an existing talking party in an ongoing group call.
- Transmission permission granted.
- Transmission permission removal (override).
- Transmission permission request which is rejected.
- Transmission permission request which is queued.
- Cancellation of queuing transmission permission request.
- Transmission of speech within group call, with and without end-to-end encryption.
- Reception of speech within group call, with and without end-to-end encryption.

The following aspects of group call are not supported in the present document:

- Call-based queueing.
- Resource-based call pre-emption.
- Functional alias (MC system option).

4.4 Emergency group call

Emergency group calls, i.e. group calls with emergency pre-emptive priority, can in rare cases be exposed to the rejection/queuing scenarios described in clause 4.3: however, in most cases it will not be exposed due to the call having the highest priority.

Pre-emptive priority group calls, i.e. group calls with pre-emptive priority other than emergency pre-emptive priority, are supported for the same cases as described in clause 4.3.

4.5 Individual (private) call

The following aspects of individual (private) call are supported in the present document:

- Initiating an individual call with and without hook signalling, in semi-duplex (with floor control) or duplex (without floor control) mode, and with and without end-to-end encryption, from a user on the TETRA system to a target defined on the MC system.
- Receiving an individual call with and without hook signalling, in semi-duplex (with floor control) or duplex (without floor control) mode, and with and without end-to-end encryption, from an initiator defined on the MC system by a user on the TETRA system.
- Requesting transmission permission (initiating a floor request) in an ongoing individual call.
- Transmission permission removal (override) and rejection.
- Call pre-emption.
- Call rejection.

- Transmission of speech within individual call, with and without end-to-end encryption.
- Reception of speech within individual call, with and without end-to-end encryption.

The following aspects of individual call are not supported in the present document:

- Functional alias (MC system option).
- Call diversion supplementary services.

4.6 Individual emergency call

Emergency individual calls, i.e. individual calls with pre-emptive priority, are supported for the same cases as described in clause 4.5.

Emergency individual calls, i.e. individual calls with emergency pre-emptive priority, can in rare cases be exposed to the rejection/queuing scenarios described in clause 4.5: however, in most cases it will not be exposed due to the call having the highest priority.

Pre-emptive priority individual calls, i.e. individual calls with pre-emptive priority other than emergency pre-emptive priority, are supported for the same cases as described in clause 4.5.

Conversion of an ongoing individual call (without pre-emptive priority) to an emergency individual call (with pre-emptive priority) and vice versa is not supported.

4.7 Status and short data service

The use cases for sending SDS from a user to a single user or group are listed in table 4.7-1 below.

Table 4.7-1: Use cases for SDS

Initiator	Group defined on	Recipient(s)
User on TETRA system	-	User on MC system
User on MC system	-	User on TETRA system
User on TETRA system	TETRA system	Group members on MC system
User on TETRA system	MC system	Group members on MC system
User on TETRA system	MC system	Group members on TETRA system
User on MC system	MC system	Group members on TETRA system
User on MC system	TETRA system	Group members on TETRA system
User on MC system	TETRA system	Group members on MC system
NOTE: A group whether defined in TETRA system or the MC system may have group members in either system and an SDS will be sent towards to all members of the group. These use cases only address the parts where group interactions via the IWF apply.		

The MCData Short Data messages may be mapped to and from TETRA SDS type 4, SDS-TL and OTAK Short Data messages.

The maximum size of SDS message that can be sent is determined by system configuration in the MCData and TETRA systems (including the IWF). A single SDS-4 transmission may contain up to 2 047 bits of user defined data; an SDS-TL message supports slightly less user data due to the capacity taken by the SDS-TL header. TETRA implementations may support a smaller maximum user data size (typically 1 120 bits of user data in an SDS-TL message) to allow an SDS-TL message to be sent using the TETRA basic link without too great a probability of retransmission. Longer user message content may be sent using SDS-TL message concatenation, where a number of SDS-TL messages may be sent as parts of a longer user message (however, typical implementations may limit the maximum number of SDS-TL message parts to 10). The IWF/SwMI may enable MCData user messages that are longer than a single SDS-TL message to be sent between MCData users and TETRA MSs by implementing a message concatenation service on the TETRA system. The configuration of the IWF and the maximum sizes of SDS messages and maximum sizes of complete user messages are outside the scope of the present document.