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Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 4: Gateways basic operation; Sub-part 1: Public Switched Telephone Network (PSTN)

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Terrestrial Trunked Radio (TETRA) Project of the European Telecommunications Standards Institute (ETSI).

This ETS is a multi-part standard and will consist of the following parts:

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 6: "Line connected Station (LS)";

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".

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1 Scope

This European Telecommunication Standard (ETS) defines the Terrestrial Trunked Radio (TETRA) system supporting Voice plus Data (V+D). It specifies the stage one to three of the TETRA gateway to Public Switched Telephone Network (PSTN). Stage one is an overall service description from the user's point of view, but does not deal with the details of the human interface itself.

The PSTN gateway establishes a basic call, when SwMI detects an outgoing call from a TETRA user to PSTN or the PSTN gateway detects an incoming call from PSTN to a TETRA user. The PSTN gateway ensures that basic signalling required in the operation of the TETRA call and the PSTN call is maintained across the gateway.

Circuit mode data modem types and data modem data connection set-up negotiations required to set-up circuit mode data modems used in the analogue path between the PSTN gateway and a PSTN subscriber are outside the scope of this ETS.

Support of TETRA and PSTN supplementary services is outside the scope of this ETS.

The PSTN gateway and the TETRA system is seen by the external network as it were a subscriber of the external network. For incoming calls from PSTN two step dialling is used. The dialling requires Dual Tone Multi Frequency (DTMF) capability from the PSTN user provided either by normal telephone set or by a DTMF device external to the telephone set. Other means of incoming call dialling and a direct communication, using other than PSTN subscriber lines, between TETRA system and the external network exchange are outside the scope of this ETS.

End to end encryption is outside the scope of this ETS.

Gateway specifications are presented in three stages. The stage 1 specification specifies the PSTN gateway service as seen by the TETRA system and by the PSTN subscriber. The stage 2 specification identifies the functional entities involved in the gateway service and the information flows between them. The stage 3 describes the service protocol related to the services. The described network layer services and protocols apply for the Switching and Management Infrastructure (SwMI) and for the PSTN gateway and to the keypad protocol for the PSTN subscriber using TETRA services.

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This ETS describes the PSTN gateway as an Additional Network Function, which provides a PSTN interface to the SwMI. The service description is informative and does not imply any implementation.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

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

[2] ETS 300 001: "Attachments to the Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN".

[3] ITU-T Recommendation Z.100: "Specification and Description Language".

[4] ITU-T Recommendation I.530: "Integrated Services Digital Network (ISDN); Internetwork interfaces; Network interworking between an ISDN and a Public Switched Telephone Network (PSTN)".

[5] ITU-T Recommendation E.180: "Telephone network and ISDN operation, numbering, routing and mobile service, Technical characteristics of tones for the telephone service".

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[6] ETS 300 738: "Human Factors (HF); Minimum Man-Machine Interface (MMI) to public network based supplementary services".

[7] ETS 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)".

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

[9] ETS 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)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply in addition to definitions in ETS 300 392-2 [1]:

in-band tone: An audio tone indication to the user about state of the call progress. May be also an announcement.

incoming call: A call from the PSTN to the TETRA network.

outgoing call: A call from a TETRA network to the PSTN.

PSTN: Any telecommunication network, which supports analogue PSTN subscriber signalling.

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PSTN subscriber: An analogue PSTN user outside TETRA addressing domain and participates in a PSTN gateway call.

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TETRA user: A user within TETRA addressing domain and participates in a PSTN gateway call.

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3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

CC	Call Control (functional entity)
CCA	Call Control Agent (functional entity)
CMCE	Circuit Mode Control Entity
DTMF	Dual Tone Multi Frequency
FE	Functional Entity
ISI	Inter System Interface
PABX	Private Automatic Branch Exchange (analogue network)
PDU	Protocol Data Unit
PSTN	Public Switched Telephone Network (analogue network)
PSTNCC-SAP	Public Switched Telephone Network gateway Call Control Service Access Point
PSTND-SAP	Public Switched Telephone Network gateway D Service Access Point
SCC	Service Code Command
SCCF	Service Code Command Format
SDL	Specification and Description Language
SSI	Short Subscriber Identity
SwMI	Switching and Management Infrastructure
TETRA	Terrestrial Trunked Radio

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4 PSTN gateway stage 1 specification

4.1 Description

4.1.1 General description

The PSTN gateway enables calls to be set-up from a TETRA user to a PSTN subscriber and from a PSTN subscriber to a TETRA user. Additionally, for the duration of the call, the PSTN gateway allows TETRA signalling information to be passed from TETRA Switching and Management Infrastructure (SwMI) to the external network user and from the external network user to the TETRA SwMI in accordance with the TETRA Call Control (CC) procedures as defined in ETS 300 392-2 [1].

The principles defined in this ETS can be used for interfacing with other networks such as analogue private networks (e.g. Private Automatic Branch Exchange (PABX)).

4.1.2 Qualifications on applicability to telecommunication services

The PSTN gateway shall be applicable to clear mode point-to-point and point-to-multipoint circuit mode basic services as defined in ETS 300 392-2 [1]. End-to-end encryption could be supported between a TETRA user and the PSTN gateway, but all provisions are outside the scope of this ETS.

Circuit mode data modem types and data modem data connection set-up negotiations required to configure circuit mode data modems used in the analogue path between the PSTN gateway and a PSTN subscriber are outside the scope of this ETS.

4.2 Procedures

4.2.1 Provision/withdrawal

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The PSTN gateway service shall be provided by prior arrangement with the service provider or they may be generally available.

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This service may be withdrawn by the service provider at any time without a prior indication.

4.2.2 Normal procedures

4.2.2.1 Activation/deactivation/registration/interrogation

PSTN gateway shall be permanently activated upon provision.

Registration and interrogation are not applicable.

4.2.2.2 Invocation and operation

The PSTN gateway shall be invoked either when a call request has been received (outgoing call) by the SwMI to a PSTN subscriber, or when a call request (incoming call) is received by the gateway from the PSTN.

In the outgoing call case the PSTN gateway shall route the call to the PSTN network using the information found in the TETRA address and/or in the external subscriber address element. The PSTN gateway shall dial the external network number using appropriate dialling mechanisms defined for that network (see ETS 300 001 [2] or relevant national requirement not covered by ETS 300 001 [2]).

In the incoming call case the PSTN gateway shall forward the called TETRA user identity to the SwMI CC entity for the call set-up completion.

The PSTN gateway shall remain operational for the duration of the call, sending and receiving TETRA signalling messages as appropriate under direction from the SwMI.

A PSTN gateway supporting full duplex calls shall ensure an appropriate echo cancellation for PSTN (see ITU-T Recommendation I.530 [4]).

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A PSTN gateway supporting semi-duplex calls may inform the PSTN subscriber about the state of the call and may either receive explicit requests to transmit from the external network user, or use a voice detection mechanism for the requests to transmit. The exact mechanisms for voice detection, and its algorithms, and how the result is used for the request to transmit are outside the scope of this ETS.

4.2.3 Exceptional procedures

4.2.3.1 Activation/deactivation/registration/interrogation

Are not applicable.

4.2.3.2 Invocation and operation

The PSTN gateway may reject the call request with an appropriate failure indication for any of the following reasons:

- no destination number provided;
- PSTN access line congestion;
- the called user does not answer;
- the called user is busy;
- the called user address is incorrect.

In addition, all restrictions and exceptional procedures for TETRA basic call establishment shall apply.

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4.3 Interaction with TETRA supplementary services

Interactions with invocation and operation of supplementary services are specified below.

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4.3.1 Ambience Listening (SS-AL)

There shall be no interaction. A PSTN subscriber cannot be ambience listened to.

4.3.2 Access Priority (SS-AP)

Shall not be applicable.

4.3.3 Area Selection (SS-AS)

There shall be no interaction. The SS-AS information exchange with the PSTN subscriber may be limited.

4.3.4 Barring of Incoming Calls (SS-BIC)

There shall be no interaction. The SS-BIC information exchange with the PSTN subscriber may be limited.

4.3.5 Barring of Outgoing Calls (SS-BOC)

There shall be no interaction. The SS-BOC information exchange with the PSTN subscriber may be limited.

4.3.6 Call Authorised by Dispatcher (SS-CAD)

There shall be no interaction. The SS-CAD information exchange with the PSTN subscriber may be limited.

4.3.7 Completion of Calls to Busy Subscriber (SS-CCBS)

There shall be no interaction. The SS-CCBS information exchange with the PSTN subscriber may be limited.

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4.3.8 Completion of Calls on No Reply (SS-CCNR)

There shall be no interaction. The SS-CCNR information exchange with the PSTN subscriber may be limited.

4.3.9 Call Forwarding Busy (SS-CFB)

There shall be no interaction. The SS-CFB information exchange with the PSTN subscriber may be limited.

4.3.10 Call Forwarding No Reply (SS-CFNRy)

There shall be no interaction. The SS-CFNRy information exchange with the PSTN subscriber may be limited.

4.3.11 Call Forwarding Not Reachable (SS-CFNRc)

There shall be no interaction. SS-CFNRc cannot be activated against PSTN user or users as the PSTN users shall be considered always reachable. The SS-CFNRc information exchange with the PSTN subscriber may be limited.

4.3.12 Call Forwarding Unconditional (SS-CFU)

There shall be no interaction. The SS-CFU information exchange with the PSTN subscriber may be limited.

4.3.13 Calling Line Identification Presentation (SS-CLIP)

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There shall be no interaction. The SS-CLIP information exchange to the PSTN subscriber may be limited. The calling PSTN subscriber number may not be available.

4.3.14 Calling/Connected Line Identification Restriction (SS-CLIR)

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There shall be no interaction. The PSTN line presentation shall be independent of TETRA SS-CLIR.

4.3.15 Connected Line Identification Presentation (SS-COLP)

There shall be no interaction. The SS-COLP information exchange to the external user may be limited. The connected PSTN subscriber number may not be available.

4.3.16 Call Report (SS-CR)

There shall be no interaction. The SS-CR information exchange with the PSTN subscriber may be limited.

4.3.17 Call Retention (SS-CRT)

There shall be no interaction. The SS-CRT information exchange with the PSTN subscriber may be limited.

4.3.18 Call Waiting (SS-CW)

There shall be no interaction. The SS-CW information exchange with the PSTN subscriber may be limited.

4.3.19 Dynamic Group Number Assignment (SS-DGNA)

There shall be no interaction.

4.3.20 Discreet Listening (SS-DL)

There shall be no interaction. The listening invocation service may be provided to a PSTN subscriber with special arrangements outside this ETS.