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Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for supplementary services

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Project Terrestrial Trunked Radio (TETRA).

The present document had been submitted to Public Enquiry as ETS 300 392-9. During the processing for Vote it was converted into an EN.

The present document is part 9 of a multi-part deliverable covering 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 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";

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

Part 16: "Network Performance Metrics";

Part 17: "TETRA V+D and DMO Release 1.1 specifications".

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1 Scope

The present document defines principles and requirements generally applicable to the stage 2 and 3 descriptions of supplementary services for the Terrestrial Trunked Radio (TETRA).

The present document is applicable to any TETRA terminal equipment (Mobile Station (MS) or Line Station (LS)) and to any TETRA network (Switching and Management Infrastructure - SwMI) which support at least one TETRA Supplementary Service (SS). In addition, its routeing requirements of supplementary service information are applicable to any TETRA network with a Voice plus Data (V+D) Inter-System Interface (ISI) to another TETRA network which supports at least one TETRA SS.

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

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

[3] ETSI ETS 300 392-3-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 1: General design".

[4] ETSI EN 300 392-3-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 2: Additional Network Feature Individual Call (ANF-ISIIC)".

[5] ETSI ETS 300 392-3-3: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 3: Additional Network Feature Group Call (ANF-ISIGC)".

[6] ETSI EN 300 392-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 7: Security".

[7] ETSI ETS 300 392-10-6: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Sub-part 6: Call Authorized by Dispatcher (CAD)".

[8] ETSI ETS 300 392-11: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 11: Supplementary services stage 2".

[9] ETSI ETS 300 392-12: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3".

[10] ISO/IEC 8859-1 to ISO/IEC 8859-15: "Information technology - 8-bit single byte coded graphic character sets".

[11] ISO/IEC 11571 (1998): "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Networks - Addressing".

[12] ISO/IEC 11572 (1997): "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol".

[13] ISO/IEC 11582 (1995): "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Generic functional protocol for the support of supplementary services - Inter-exchange signalling procedures and protocol".

[14] ITU-T Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[15] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[16] ITU-T Recommendation X.121: "International numbering plan for public data networks".

[17] ITU-T Recommendation X.219 (1988): "Remote operations: Model, notation and service definition".

[18] ITU-T Recommendation X.229 (1988): "Remote operations: Protocol specification".

[19] ITU-T Recommendation Z.100: "Specification and description language (SDL)".

[20] ETSI ETR 300-5 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Designers' guide; Part 5: Guidance on Numbering and addressing".

3 Definitions and abbreviations

3.1 Definitions

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

authorized user: user who is responsible for the definition, activation and deactivation of the service
The authorized user may also interrogate the service. Affected user and served user may also be authorized user as defined in each supplementary service.

authorized user SwMI: SwMI where the authorized user is currently registered

affected user: user who is subject to the operation

affected user SwMI: SwMI where the affected user is currently registered

call related: Property of information which is conveyed across the Q_T reference point (as defined in clause 4.3.3 of ETS 300 392-1) which uses a call reference which has an associated user-information connection (definition derived from that of the same term in clause 4.9 of ISO/IEC 11582)

call unrelated: Property of information which is conveyed across the Q_T reference point (as defined in clause 4.3.3 of ETS 300 392-1) which does not use a call reference which has an associated user-information connection (definition derived from that of "call independent" in clause 4.8 of ISO/IEC 11582)

served user: user for whom the supplementary service is invoked

served user SwMI: SwMI where the served user is currently registered

user: entity using the services of a telecommunications network via an externally accessible service access point

NOTE: A user may be a person or an application process.

user application: application process which acts as a user
(see definition of user just above)

3.2 Abbreviations

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

FE	Functional Entity
GTSI	Group TETRA Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
LS	Line Station
MS	Mobile Station
MS-ISDN	Mobile Station ISDN number
PISN	Private Integrated Services Network
SAP	Service Access Point
SDL	(Functional) Specification and Description Language
SS	Supplementary Service

NOTE: The abbreviation SS is only used when referring to a specific supplementary service.

SS-AL	Ambience Listening
SS-AP	Access Priority
SS-AS	Area Selection
SS-BIC	Barring of Incoming Calls
SS-BOC	Barring of Outgoing Calls
SS-CAD	Call Authorized by Dispatcher
SS-CFB	Call Forwarding on Busy
SS-CFNRy	Call Forwarding on No Reply
SS-CFNRc	Call Forwarding on Mobile Subscriber Not Reachable
SS-CFU	Call Forwarding Unconditional
SS-CI	Call Identification
SS-CLIP	Calling Line Identification Presentation
SS-CLIR	Calling/Connected Line Identification Restriction
SS-COLP	Connected Line Identification Presentation
SS-CR	Call Report
SS-CW	Call Waiting
SS-DGNA	Dynamic Group Number Assignment
SS-DL	Discreet Listening
SS-IC	Include Call
SS-PC	Priority Call
SS-SNA	Short Number Addressing
SS-TPI	Talking Party Identification
SwMI	Switching and Management Infrastructure
TETRA	Terrestrial Trunked Radio
TNCC-SAP	TETRA Network layer Call Control-Service Access Point
TNSS-SAP	TETRA Network layer Supplementary Service-Service Access Point
V+D	Voice plus Data

3.3 Functional Entities (FE)

The functional model for each supplementary service shall be comprised of a number of FEs. The FEs below should always have the following definitions:

- FE1 served user's service agent;
- FE2 SwMI service control functional entity;
- FE3 authorized user's service agent;
- FE5 service agent of the user affected by service operation;
- FE6 service agent of second listening party;
- FE7 service agent of dispatcher (in the case of SS-CAD) or of monitoring user (in the case of SS-DL);

- FE8 service agent of user removed from a call during a pre-emptive priority call;
- FE9 service agent of user informed that another user has been removed from a call during a pre-emptive priority call;
- FE10 service agent of user affected by management functions.

FE2, the SwMI functional entity, may be split into secondary FEs when needed for a given supplementary service. These FEs are called FE2x in the corresponding stage 2 description (in the related ETS 300 392-11 [8]). An example of this splitting is given in clause C.1.1.

4 Supplementary service concepts

4.1 Stage 1, 2 and 3 descriptions

Supplementary service descriptions are covered in 3 stages according to the method described in ITU-T Recommendation I.130 [14], each stage in a separate document. The contents of each stage description are described in the following clauses.

4.1.1 Stage 1 description

This stage is the overall service description from the user viewpoint, and also details the interaction of the service with other supplementary services.

4.1.2 Stage 2 description

Stage 2 identifies the functional capabilities and the information flows needed to support the supplementary service as specified in its stage 1 description. It defines the FEs, the information flow between these entities, the FE actions and the allocation of FEs to physical locations.

4.1.3 Stage 3 description

The stage 3 description specifies the signalling protocols needed to implement the service. The present document addresses the encoding of the service Protocol Data Units (PDU) and of the related information elements, the protocol procedures and the corresponding SDL diagrams.

NOTE: According to ITU-T Recommendation I.130 [14], the stage 3 description of any telecommunication service addresses the network implementation aspects. Consequently it comprises two steps, the specifications of all protocols at the various reference points involved in any of the service procedures (notably the service operation) are the first step of the stage 3 description, and the specifications of the functions of the corresponding network entities are its second step.

The latter have not been provided since they can be derived from the specification of the FE actions in the stage 2 description.

Service management procedures specified in the above stages (e.g. activation or interrogation) are optional unless otherwise stated in the specific supplementary service stage documents.

4.2 Concepts associated with supplementary services

The terms used to define the procedures associated with supplementary services are given in ETS 300 392-1 [1], clause 14.3.1.

5 Service primitives

5.1 Service primitive general description

Primitives are specified for each supplementary service at the TNSS Service Access Point (TNSS-SAP), in a specific clause of the corresponding stage 3 description in ETS 300 392-12 [9].

Primitive names shall take the form of TNSS-*service-name type* where:

- *service* - supplementary service identifier;
- *name* - indicates the type of function this primitive is performing (e.g. DEFINE);
- *type* - indicates whether the primitive is a request, confirm, indication or response.

For example, an INTERROGATE request primitive for the supplementary service Ambience Listening (SS-AL) would be specified as TNSS-AL-INTERROGATE request, when primitives of more than one supplementary service are used in the same document. When a document refers only to one supplementary service the short form such as INTERROGATE request may be used.

Parameters are listed with mandatory and conditional parameters first, followed by optional parameters. Repeatable parameters are identified by a comment in the remarks column in the table specifying the primitive's parameters.

Following the specifications of a service's primitives, there is a parameter description section listing alphabetically all primitive parameters used in this service and the values allowed.

Among those parameters, special mention is to be made of the parameter access priority. This parameter has to be included in every service primitive request or response, since the priority defined for the corresponding air interface (uplink) PDUs is set according to the its value (i.e low, high or emergency priority as seen by the user application of "0" to "7" as defined in the lower layer service primitives).

NOTE: For call related services the TNSS-SAP and TNCC-SAP logically form a combined SAP defining access to the total service. Some of the supplementary service parameters are actually defined as TNCC-SAP parameters.

5.2 Notification service primitive

Many of the air interface PDUs can carry supplementary service related information in special information element notification. The notification information element values are used by many supplementary services to carry information to the equipment not supporting the specific supplementary service. The information in the notification information element may be displayed to the user in some format e.g. in natural language or as a number code.

The information is presented to the user application via TNSS-SAP using service primitive NOTIFICATION indication. The notification information element values are defined in clause 7.2.2. The same values are used as parameter values in the NOTIFICATION indication primitive.

6 Supplementary service invocation order

Before allowing an outgoing call from a calling user to proceed towards the called user, or before offering an incoming call to the called user, the SwMI shall search through the user supplementary service database for supplementary services activated and proceed with their invocation in the order detailed in table 1. Due to the interactions specified between supplementary services, the invocation of some of those listed in table 1 may result in the invocation of others further below in that list being overridden although they have been activated, e.g. SS-CAD overrides SS-BIC.

Table 1: Supplementary service invocation order

Incoming calls	Outgoing calls
PPC	SNA
PC	PPC
CAD	CAD (note 1)
BIC	BOC
CFU	AS
CW	PC (note 1)
CFB	
CFNRy (note 2)	
CFNRc	
NOTE 1: If SS-PC has been invoked for a call and if SS-CAD for outgoing call is invoked for that call and operated with diversion towards a dispatcher registered in another SwMI, SS-PC shall also be invoked for this diversion.	
NOTE 2: If the called user is busy, SS-CFNRy may only be invoked if SS-CW has been previously invoked. But the SS-CFNRy operation shall take precedence over further SS-CW operation when the CFNRy no-reply timer has elapsed.	

7 Transfer of information related to supplementary service at the MS/LS interface

7.1 Methods of transportation

There are 4 methods by which information related to supplementary service may be transferred at the MS/LS interface:

- using the facility information element in a basic service PDU;
- using specific elements in a basic service PDU (e.g. Area Selection (SS-AS) in a U-SETUP PDU);
- using the Notification indicator information element in a basic service PDU;
- using an U/D-FACILITY PDU.

7.2 Call related information

The first 3 methods in clause 7.1 may be used to send call related SS PDUs.

NOTE: See definition of call related in clause 3.1.

7.2.1 Facility information element general construction

The facility information element is a Type 3 CC PDU element as defined in clause 14.7 of EN 300 392-2 [2]. It is used to convey call related supplementary service PDUs (SS PDUs) across the air (or LS) interface and is present in all CC PDU definitions (except U/D-FACILITY). Each SS PDU is encoded as stated in clause 8.

The encoding rules defined in clause 14.7 of EN 300 392-2 [2] shall apply for the definition of the facility information element. Notably according to table 132 of EN 300 392-2 [2], the value of the corresponding type 3 element identifier will be equal to the binary value 0011_2.

The contents of the facility information element in an uplink CC PDU shall be as defined in table 2.

Table 2: Uplink facility information element contents

Information sub-element	Length	C/O/M	Remarks
Routeing	2	M	(note 1)
MNI	24	C	(note 2)
SS PDU	Variable	M	(note 3)
NOTE 1: The meaning of the information sub-element routeing shall be the following: - same SwMI, if its binary value is equal to 00_2; - end SwMI, if its binary value is equal to 01_2; - home SwMI of called ITSI/GTSI, if its binary value is equal to 10_2; - other SwMI indicated by its MNI value, if its binary value is equal to 11_2. The binary value 10_2 is reserved.			
NOTE 2: Shall be present if the binary value of the information sub-element routeing is equal to 11_2.			
NOTE 3: See clause 8.			

NOTE: Since SS PDUs are not specified in the above table 2 as being repeatable, this means that as many different facility information elements will be needed in a CC PDU as there are SS PDUs to be conveyed.

The contents of a facility information element in a downlink CC PDU shall be the same as that defined in table 2 except for that there shall be no information sub-element routeing.

7.2.2 Notification indicator information element

The notification indicator information element values that may be used shall be as shown in table 3. When, in a situation, more than one notification indicator value is applicable the SwMI may choose the most appropriate and reject the other values or it may send additional PDUs containing the other notification indicator values.

Table 3: Notification indicator information element contents

Information element	Length	Value	Remarks
Notification indicator	6	0	LE broadcast
		1	LE acknowledgement
		2	LE paging
		3	AL operation (note 1)
		4	Call barred by SS-BIC
		5	Call barred by SS-BOC
		6	Call is forwarded (diverting)
		7	Forwarding (diversion) activated
		8	Identity presentation restricted
		9	Presentation restriction overridden
		10	Call waiting invoked
		11	Call put on hold (remote hold)
		12	Call on hold retrieved (remote retrieval)
		13	Include call (note 2)
		14	Multiparty call (note 3)
		15	LSC invoked
		16	Call rejected due to SS-AS
		17	SS-AS not invoked/supported