ETSI EN 300 392-9 V1.7.1 (2020-04)

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

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://www.etsi.org/standards-search

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx

If you find errors in the present document, please send your comment to one of the following services:
https://portal.etsi.org/People/CommiteeSupportStaff.aspx

ETSI

Contents

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

This European Standard (EN) has been produced by ETSI Technical Committee TETRA and Critical Communications Evolution (TCCE).

The present document is part 9 of a multi-part deliverable covering the Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D) and Direct Mode Operation (DMO), 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".

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.

National transposition dates	
Date of adoption of this EN:	13 November 2019
Date of latest announcement of this EN (doa):	31 July 2020
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2021
Date of withdrawal of any conflicting National Standard (dow):	31 January 2021

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.

1   Scope

The present document is applicable to any TETRA terminal equipment (Mobile Station (MS)) 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

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 (ETS 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 300 392-1: "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 EN 300 392-3-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 9: Transport layer independent, General design".

[4]   Void.

[5]   Void.

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

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

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

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

[11]   Void.

[12]   Void.

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

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

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

[16]   Void.

[17]   Void.

[18]   Void.

[19]   Void.

[20]   ETSI ETS 300 392-12-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 7: Short Number Addressing (SNA)".

[21]   ISO/IEC 10646: "Information technology -- Universal Coded Character Set (UCS)".

[22]   ETSI TS 100 392-18-3: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D) and Direct Mode Operation (DMO); Part 18: Air interface optimized applications; Sub-part 3: Direct mode Over The Air Management protocol (DOTAM)".

[23]   ETSI EN 300 392-3-10: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 10: General design, PSS1 over E.1".

[24]   ETSI EN 300 392-3-11: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 11: General design, SIP/IP".

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 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 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 102 300-5: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Designers' guide; Part 5: Guidance on Numbering and addressing".

3   Definition of terms, symbols, abbreviations and Functional Entities (FE)

3.1   Terms

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

affected user: user who is subject to the operation

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

authorized user: user who is responsible for the definition, activation and deactivation of the service

NOTE: 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

call related service: service requested from call set-up initiation until call disconnection and related to that call

NOTE: The call-related service can also be valid a certain short time after disconnection but before next call set-up is initiated.

call unrelated service: service either requested outside a call or inside a call but not referring to that call

ISI Mediation Function: entity which provides the services that are not supported by the transport layer protocol to different ANF-ISI entities

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

NOTE: See definition of **user**.

3.2 Symbols

Void.

3.3 Abbreviations

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

ACK   ACKnowledgement
AI   Air Interface
ANF   Additional Network Feature
ANF-ISIGC   Additional Network Feature - Inter-System Interface Group Call
ANF-ISIMM   Additional Network Feature - Inter-System Interface Mobility Management
ANF-ISISS   Additional Network Feature - Inter-System Interface Supplementary Service
APDU   Application Packet Data Unit
APP   APProved
CC PDU   Call Control Protocol Data Unit
DMO   Direct Mode Operation
DOTAM   Direct mode Over The Air Management protocol
EPT   ETSI Project TETRA
ETS   European Telecommunication Standard
FE   Functional Entity
GSSI   Group Short Subscriber Identity
GTSI   Group TETRA Subscriber Identity
IP   Internet Protocol
ISI SS   Inter System Interface Supplementation Service
ISI   Inter-System Interface
ISISS   Inter-System Interface Supplementary Service
ISSI   Individual Short Subscriber Identity
ITSI   Individual TETRA Subscriber Identity
ITU   International Telecommunication Union
MAC   Media Access Control
MCC   Mobile Country Code
MLE   Mobile Link Entity

MNC   Mobile Network Code
MNI   Mobile Network Identity
MS   Mobile Station
MS-ISDN   Mobile Station ISDN number
PDU   Protocol Data Unit
PICS   Protocol Implementation Conformance Statement
PISN   Private Integrated Services Network
PSS1   Private Signalling System no. 1
PSTN   Public Services Telephone Network
SAP   Service Access Point
SDL   (Functional) Specification and Description Language
SIP   Session Initiation Protocol
SS PDU   Supplementary Service Protocol Data Unit
SS   Supplementary Service

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

SSI   Short Subscriber Identity
SS-PDU   Supplementary Service PDU
SwMI   Switching and Management Infrastructure
TNCC-SAP   TETRA Network layer Call Control - Service Access Point
TNSS   TETRA Network layer Supplementary Service
TNSS-SAP   TETRA Network layer Supplementary Service - Service Access Point
TSI   TETRA Subscriber Identity
UCS   Universal Multiple-Octet Coded Character Set, also known as Universal Character Set
UCS-2   Universal Character Set coded in 2 octets
UTF-16BE   Unicode Transformation Format serialized as two bytes in Big-Endian format
V+D   Voice plus Data
WG3   TC TETRA Working Group 3
XX   generic name of an information element

Supplementary Service abbreviations

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

NOTE 1: Supplementary service abbreviations are also used without "SS-" preamble e.g. "SS-AL" and "AL" are
            used as appropriate.

NOTE 2: The supplementary services list contains also abbreviations that are not used in the present document.

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-CCBS   Call Completion on Busy Subscriber
SS-CCNR   Call Completion on No Reply
SS-CF   Call Forwarding
SS-CFB   Call Forwarding on Busy
SS-CFNR   Call Forwarding on No Reply (generic for both CFNRy and CFNRc)
SS-CFNRc   Call Forwarding on Mobile Subscriber Not Reachable
SS-CFNRy   Call Forwarding on No Reply
SS-CFU   Call Forwarding Unconditional
SS-CI   Call Identification
SS-CLIP   Calling Line Identification Presentation
SS-CLIR   Calling Line Identification Restriction
SS-COLP   COnnected Line identification Presentation
SS-COLR   COnnected Line identification Restriction
SS-CR   Call Report
SS-CRT   Call Retention
SS-CW   Call Waiting
SS-DGNA   Dynamic Group Number Assignment

SS-DL   Discreet Listening
SS-HOLD   call HOLD
SS-IC   Include Call
SS-LE   Late Entry
SS-LSC   List Search Call
SS-PC   Priority Call
SS-PPC   Pre-emptive Priority Call
SS-SNA   Short Number Addressing
SS-TPI   Talking Party Identification

3.4 Functional Entities (FE)

The functional model for each supplementary service is 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 ETSI EN/ETS 300 392-11 [8]).

4 Supplementary service concepts

4.1 Stage 1, 2 and 3 descriptions

4.1.0 General Description

Supplementary service descriptions are covered in 3 stages according to the method described in Recommendation ITU-T I.130 [13], 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 Recommendation ITU-T I.130 [13], 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 ETSI EN 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 ETSI EN/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 (see note 1)
BIC	BOC
CFU	AS
CW	PC (see note 1)
CFB	
CFNRy (see 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 interface

7.1 Methods of transportation

There are 4 methods by which information related to supplementary service may be transferred at the MS 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 a U/D-FACILITY PDU.

The first 3 methods may be used to send call related SS PDUs. The forth method is used to send call unrelated SS PDUs.

NOTE: See definition of call related and call services unrelated in clause 3.1.

7.2   Call related service information

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 ETSI EN 300 392-2 [2]. It is used to convey call related supplementary service PDUs (SS PDUs) across the air 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 annex E of ETSI EN 300 392-2 [2] shall apply for the definition of the facility information element. Notably according to clause 14.8.48 of ETSI 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	See note 1
MNI	24	C	See note 2
SS PDU	Variable	M	See 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. 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 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 and no information sub-element MNI.

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 (see 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 (see note 2)
		14	Multiparty call (see note 3)
		15	LSC invoked
		16	Call rejected due to SS-AS
		17	SS-AS not invoked/supported
		18	Called user alerted
		19	Called user connected
		20	Call proceeding
		21	SS-CFU invoked
		22	SS-CFB invoked
		23	SS-CFNRy invoked
		24	SS-CFNRc invoked
		25	AL-call or speech item (see note 4)
		26	Notice of imminent call disconnection
		27	Limited group coverage
		28	Reserved
		etc.	etc.
		63	Reserved
NOTE 1: Not to be presented to the user. NOTE 2: Refer to SS-IC. NOTE 3: Any other than TETRA group call comprising multiple participants. NOTE 4: This notification information element value is intended to be presented to the user.			

NOTE: According to the definition of this information element in clause 14.8.27 of ETSI EN 300 392-2 [2], when an SwMI receives such information element in a (call related) ISI PDU, it may relay it to the MS.

7.3 Call unrelated supplementary service information

All call unrelated SS PDUs are transported using a U/D-FACILITY PDU.

The U/D-FACILITY PDU is used to convey only call unrelated SS PDUs across the air interface. Each SS PDU is encoded as stated in clause 8. The U/D-FACILITY PDU may contain more than one SS PDU. It may contain also, or instead, one or more proprietary information elements.

The encoding rules defined in annex E of ETSI EN 300 392-2 [2] shall apply for U/D-FACILITY PDU definitions.

The contents of the U-FACILITY PDU shall be as defined in table 4.

Table 4: U-FACILITY PDU contents

Information element	Length	Type	C/O/M	Remarks
PDU type	5	1	M	See note 1
Routeing	2	1	M	See note 2
MNI	24	1	C	See note 3
Number of SS PDUs	4	1	M	See note 4
Length indicator	11	1	C	See notes 5 and 6
SS PDU contents	variable	1	C	See notes 5, 7 and 8
Proprietary	variable	3	O (see note 4)	See note 9

NOTE 1: Equal to the binary value 10000_2, as defined in clause 14.4.28 of ETSI EN 300 392-2 [2].

NOTE 2: The meaning of the information element routeing shall be the following:
- same SwMI, if its binary value is equal to 00_2;
- home SwMI of the sending MS, if its binary value is equal to 01_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 3: Shall be present if the binary value of the information element routeing is equal to 11_2.

NOTE 4: The value of the information element number of SS PDUs shall be equal at least to one when no proprietary information element is present. Conversely, if it is equal to 0, at least one proprietary information element has to be present.

NOTE 5: Shall be conditional on the value of the information element number of SS PDUs being different from 0. Shall be repeated as a set according to the value of the information element number of SS PDUs when this value is larger than 1.

NOTE 6: The value of the information element length indicator defines the length in bits of the contents of the next SS PDU. There is neither O-bit nor M-bit between the SS PDUs.

NOTE 7: See clause 8.

NOTE 8: If there is at least one SS PDU, then only the last SS PDU is followed by O-bit indicating whether any type 3/4 element will follow. If there is no SS PDU as indicated by the number of SS PDUs value 0, then the number of SS PDUs information element shall be followed by the O-bit. If there is any type 3/4 information element present in the PDU the O-bit shall be followed by the M-bit, refer to ETSI EN 300 392-2 [2], annex E.

NOTE 9: See clause 14.8.35 of ETSI EN 300 392-2 [2].

U-FACILITY PDU priority default values shall be equal to 1, 4 or 7 when the corresponding primitive access priority value is low, high or emergency priority respectively.

The U-FACILITY PDU priority values may be changed using SS-AP.

The contents of a D-FACILITY PDU shall be the same as that defined in table 4 except for that there shall be neither information element routeing nor information element MNI.

8   SS PDU contents

8.0   SS PDU contents general

SS PDUs are specified in the supplementary service stage 3 descriptions, in ETSI EN/ETS 300 392-12 [9]. Their specification is independent of whether they are carried in facility information elements or in U/D-FACILITY PDUs at the air interface: each SS PDU information element is specified to be of type 1, 2, 3 or 4 in the same manner as basic service PDUs and shall be encoded as defined in annex E of ETSI EN 300 392-2 [2] complemented as follows. The first two elements in a SS PDU are SS type and SS PDU type respectively.

As a general PDU naming convention, where a PDU name is made up of more than one word (e.g. ACTIVATE ACK) the separator character is a space (and not a dash).

If the SS PDU is proprietary, the element following SS type is the Manufacturer identifier, see clause 8.4.6.

8.1   SS type

The coding of the information element SS type shall be as defined in table 5.

Table 5: SS type information element contents

Information element	Length	Value	Remarks
SS type	6	0	Reserved
		1	CI Call Identification (see note 1)
		2	CR Call Report
		3	TPI Talking Party Identification
		4	CF Call forwarding (see note 2)
		5	LSC List Search Call
		6	CAD Call Authorized by Dispatcher
		7	SNA Short Number Addressing
		8	AS Area Selection
		9	AP Access Priority
		10	PC Priority Call
		11	CW Call Waiting
		12	HOLD Call Hold
		13	CCBS Call Completion to Busy Subscriber
		14	LE Late Entry
		15	Reserved
		16	PPC Pre-emptive Priority Call
		17	IC Include Call
		18	BOC Barring of Outgoing Calls
		19	BIC Barring of Incoming Calls
		20	DL Discreet Listening
		21	AL Ambience Listening
		22	DGNA Dynamic Group Number Assignment
		23	CCNR Call Completion on No Reply
		24	CRT Call Retention
		25	DOTAM DMO Over The Air Management (see note 3)
		26	Reserved
		etc.	etc.
		47	Reserved
		48	Proprietary
		etc.	etc.
		63	Proprietary
NOTE 1: SS-CI contains supplementary services SS-CLIP, SS-COLP and SS-CLIR.			
NOTE 2: The call forwarding supplementary services are SS-CFU, SS-CFB, SS-CFNRy and SS-CFNRc.			
NOTE 3: Refer to ETSI TS 100 392-18-3 [22].			

8.2   SS PDU type

"SS" PDU type is a mandatory information element and shall be the next element after SS type in every SS PDU, except that specific supplementary service abbreviation e.g. AL replaces "SS" in the case of the supplementary service Ambience Listening: SS-AL stage 3 description thus specifies the information element AL PDU type.

The coding of the element "SS" PDU type shall be as defined in table 6.

Table 6: SS PDU type information element contents

Information element	Length	Value	Remarks
SS PDU type	5	0	Supplementary service not supported
		1	Action not supported
		2	ISI problem
		3	Reserved
		4	Reserved
		5	Service-specific definitions
		etc.	etc.
		31	Service-specific definitions

The value corresponding to supplementary service not supported shall be used when a MS has addressed a SS PDU to the SwMI where it is registered and when that SwMI does not support the corresponding supplementary service.

The value corresponding to action not supported shall be used when a MS has addressed a SS PDU to a SwMI and when that SwMI supports the corresponding supplementary service but not that specific action as defined by the SS PDU (which is thus optional).

The value corresponding to ISI problem shall be used when a MS has addressed a SS PDU to a distant SwMI and when the SwMI where it is registered has been informed that the sending of that SS PDU over the ISI has not been successful.

NOTE 1: Due to the routeing mechanism defined in tables 2 and 4, the first and the third cases above are mutually exclusive, i.e. any SS PDU is addressed either:

- to the SwMI where it is registered; or

- to a distant one.

As to the second case it is also mutually exclusive with the two others.

In the three cases above the SS PDU sent back to the MS by the SwMI where that MS is registered shall include the two information elements SS type and SS PDU type. The value of the information element SS type shall be the same as in the related SS PDU sent by the MS, the value of SS PDU type being equal to 0, 1 or 2, depending on the problem encountered:

- corresponding supplementary service not supported;

- supplementary service is supported but not the action; or

- ISI problem having occurred.

In the second case above the information element SS PDU type shall indicate "Action not supported" in the SS PDU sent back to the MS by the SwMI where that MS is registered. The Requested SS PDU type value shall be the same as in the related SS PDU sent by the MS. Table 7 gives the contents of that SS PDU.

Table 7: SS PDU contents in the case supplementary service action not supported

Information element	Length	Value	Remarks
SS type	6	any	See note
SS PDU type	5	1	Action not supported
Requested SS PDU type	5		SS PDU type of the non-supported action
NOTE: The corresponding value shall be the same as in the related SS PDU sent by the MS.			

An MS that receives an individually addressed SS PDU for an SS, which it does not support, should reply with an SS PDU using the value "supplementary service not supported". The MS should continue with the related basic call set-up or call, unless specified differently in the SS description.

An MS that receives a group addressed SS PDU for an SS, which it does not support, should not reply with an SS PDU using the value "supplementary service not supported". The MS should continue with the related basic call set-up or call, unless specified differently in the SS description.

NOTE 2: The above recommendations to continue the related call set-up or call sets a requirement to MS implementations to take into account also supplementary services that are not otherwise supported, but standardized for TETRA.

An MS that receives an individually addressed SS PDU for an SS action it does not support, but for an SS it does support, should reply using SS PDU value "action not supported" and the Requested SS PDU type, refer to table 7. and the MS shall reply, when specifically defined in the SS description. The MS should continue with the related call set-up or call, unless specified differently in the SS description.

An MS that receives a group addressed SS PDU for an SS action it does not support, but for an SS it does support, should not reply with an SS PDU using the value "action not supported". The MS should continue with the related call set-up or call, unless specified differently in the SS description.

NOTE 3: MS designers are reminded that a SwMIs performance may suffer if multiple MSs respond to a group addressed SS PDU from the SwMI. It is strongly recommended that MS do not respond in this situation.

8.3 Repeated information element or set of information elements

8.3.1 Range type information element

Where a fixed length information element or a set of information elements are specified as being repeatable, there may be either a range type information element or a number of XX type information element preceding it indicating whether the information element or set of information elements in question is present at all, present only once or repeated. If repeated the range type allows it to take up to 14 values or sets of values. Refer to clause 8.3.3 for the number of XX mechanism.

Where the range type refers to a set of information elements, the information elements in each repeated set shall be in the order specified for the SS PDU.

In addition, a range type information element may be used to repeat an information element for all its values within a range. That range of values shall then be defined in the (SS) PDU where it is used by its lower and upper bounds: i.e. the information element shall be repeated twice after the related range type information element: the first time, with its lower bound value, the second time, with its upper bound value.

NOTE: It has been found useful to extend the above specification so that it allows a set of information elements to be repeated for all the values of its "significant" information elements within a range, especially when the set is an identity or number.

The range type information element shall be encoded as defined in table 8.

Table 8: Range type information element contents

Information element	Length	Value	Remarks
Range type	4	0000_2	No element (see note 1)
		0001_2	One element
		0010_2	Two elements (see note 2)
		0011_2	Three elements (see note 2)
		etc.	etc.
		1110_2	14 elements (see note 2)
		1111_2	Range of elements (see note 3)
NOTE 1: The value 0 shall indicate that the SS PDU does not include any repeatable information element (or set of information elements) for which the range type information element applies.			
NOTE 2: The number of repeated information elements or sets of information elements shall be equal to the value number (e.g. list of 3 information elements when the value is equal to 3).			
NOTE 3: For the binary value 1111_2, two information elements shall follow the range type in the specific (SS) PDU: the value of the first information element shall be the lower bound of the range, and the value of the second one shall be the upper bound of the range.			

In the case of repetition of set, reference to the same note should be made in the remarks column for each element in the set.

In addition, it is recommended to add a qualifier after range type in the SS PDU specification to identify to what the range type applies (e.g. range type for interrogated users).

8.3.2   Response to a SS PDU including repeated information elements controlled by a range type information element

Unless otherwise stated in some specific supplementary service stage 3 description, when a SS PDU including repeated information elements (i.e. including either a list or a range of values of an information element) controlled by a range type information element calls for a response, the following shall apply for the SS PDU sent in response:

- if the destination entity to which the first SS PDU has been sent (i.e. a SwMI or an MS) supports the repetition of information elements in this SS PDU, it shall group the corresponding responses by different outcomes (i.e. different results or actions) and send one SS PDU per outcome, e.g.:

    - if the outcome is the same for all repeated information elements it should send back the same values of the range type information element and of the repeated information elements as those received in the first SS PDU;

    - if the outcomes are not the same for all repeated information elements (e.g. successful for some and unsuccessful for the other(s)), as many different SS PDUs should be sent as there are different outcomes, e.g. one for the (repeated) information elements for which the outcome has been successful, and the other(s), for the (repeated) information elements for which it has not; in such a case, the information element multiple information element mask may be used (see its specification below);

- if the destination entity to which the first SS PDU has been sent (i.e. a SwMI or an MS) does not support the repetition of information elements in this SS PDU, it shall send an SS PDU with the following information element values:

    - same values of the range type information element and of the repeated information elements as those received in the first SS PDU;

    - value of the information element defining the outcome corresponding to negative outcome;

    - binary value of the information element defining the failure cause (see table 23) equal to 011_2 (range not supported).

When an SS PDU including repeated information elements (i.e. including either a list or a range of values of an information element) calls for a response and when such response is not the same for all repeated information elements, the information element multiple information elements mask allows a pruning mechanism of the range type in the original request SS PDU to indicate the subset of repeated information elements for which a response SS PDU applies. It is a binary string with one bit per repeated information element in the request SS PDU. The value of this one bit is equal to 1 if the response SS PDU applies to the repeated information element, and to 0, if not.

The bit length of the information element multiple information elements mask shall thus be equal to the number of repeated information elements in the range type for which it applies: i.e. the value of the range type information element when this value corresponds to a list, and the number of integer values within the range when the binary value of the range type information element is equal to 1111_2. The meaning of each bit position shall be as defined in table 9.

Table 9: Multiple information elements mask information element contents

Information element	Length	Value	Remarks
Multiple information elements mask	Variable	$0..00_2$	Reserved
		$0..01_2$	1st restricted user
		$0..10_2$	2nd restricted user
		etc.	etc.
		$10..0_2$	Last restricted user

When the information element multiple information elements mask is used in a response SS PDU, this PDU shall include the information element range type to which the mask applies with values either:

- equal to that received in the request SS PDU; or

- defining a subset of the range.

Clearly the response SS PDU shall also include the repeatable information element to which range type applies, together with the information elements corresponding to the response. While the definition of any response SS PDU may include more than one such information element corresponding to the response in, it shall never allow to repeat any of them when:

- the binary value of the related range type information element is equal to 1111_2 (i.e. use of range of values); and/or

- the information element multiple information elements mask is used associated to the related range type information element.

When the repeated information elements for which the information element multiple information elements mask is used refer to users, that mask is named: multiple users mask.

8.3.3   Information element number of XX

When an information element XX is repeated with different non-consecutive values in a (SS) PDU more than 14 times or no range definition is utilized, the information element number of XX may be used instead of the range type information element.

The information element number of XX shall be encoded as defined in table 10.

Table 10: Number of XX information element contents

Information element	Length	Value	Remarks
Number of XX	K (see note 1)	0	No element (see note 2)
		1	One element (see note 2)
		2	Two elements (see note 2)
		3	Three elements (see note 2)
		etc.	etc.
		N	N elements (see note 2)
NOTE 1: K, the length (in bits) of the value of the information element number of XX, shall be at least equal to the number of (significant) bits of the binary value of N, the maximum number of times the information element XX will be repeated. The PDU may define that the maximum times the information element may be repeated in the PDU to be less that the maximum possible value of the information element.			
NOTE 2: The number of information elements present shall be equal to the value number. The length of each repeated information element shall be indicated in the PDU encoding. Refer to ETSI EN 300 392-2 [2], annex E.			

The provisions in clause 8.3.2 (for the response to a (SS) PDU including repeated information elements controlled by a range type information element) shall not apply to the information element number of XX: this means that the present document does not require to have different PDUs per outcomes (e.g. success or failure) for the response to a (SS) PDU. Neither does it:

- require that the entity receiving that (SS) PDU shall have to support the repetition of information elements controlled by an information element number of such information elements (as part of its support of that (SS) PDU), because no mechanism is available for that entity to inform the source of that (SS) PDU that it does not support such repetition; or

- allow to use an information element multiple information elements mask in the specification of a response (SS) PDU to the above (SS) PDU (including repeated information elements controlled by an information element number of such information elements).

8.4   Encoding of other SS PDU elements

8.4.0   Encoding of other SS PDU elements general

This clause specifies the use and the encoding of a number of SS PDU elements to be used in the supplementary service stage 3 descriptions. The stage 3 descriptions of the specific supplementary services where such specifications apply will thus refer to this clause.

These specifications are of general use. However, it may happen that they are not appropriate for some supplementary service. The corresponding stage 3 description shall then specify the appropriate one(s).

8.4.1   User identity

The identity of a TETRA individual or group shall be defined in SS PDUs, using:

- the SSI of this individual or group as defined in clause 7.2.4 of ETSI EN 300 392-1 [1];

- the full ITSI of the individual, or GTSI of the group, which comprises the MNI of the home SwMI of the individual or group (see clause 7.6.1 of ETSI EN 300 392-1 [1]) and their SSI;

- the SSI or full ITSI of the gateway and external subscriber number (MSISDN); or

- the supplementary service SNA.

To allow the routeing of SS PDUs addressed using SS-SNA, the meaning of the corresponding SNA values has to be understood by the originating SwMI. Similarly an SNA information element should be included in an SS PDU only if the entity to which this PDU is addressed is able to translate the corresponding SNA value into an ITSI or a GTSI.

NOTE 1: In practice, this means that SS-SNA or any other short network specific numbering will not be used for addressing SS PDUs over the ISI.

When an SSI value is used alone (instead of a full ITSI or GTSI one) in some SS PDU, the same rules shall apply for deriving the MNI to be added in front of this SSI to get the corresponding ITSI or GTSI value as in ETSI EN 300 392-2 [2], clause 14.2.3 and repeated here:

- at the air interface the MNI shall be that of the SwMI to which the MS is currently registered or camped to, if registration is not needed.

NOTE 2: The MNI is the MNI of the SwMI MS is currently registered to or if no registration is required the MNI (MCC and MNC) sent in broadcast D-MLE-SYNC PDU.

NOTE 3: In practice, this means that SS PDUs need to contain full ITSI or GTSI when the MS is not registered or camped to its home SwMI.

When a message is known to go over the ISI the sending entity should use full TSI. If an SwMI receives from ISI an SS PDU containing only SSI as the address in some information element the MNI shall be that of the SwMI to which the SS PDU has been addressed. This applies notably for SS PDUs addressed to a distant SwMI by a MS, using the routeing mechanism defined in tables 2 and 4. The SwMI which provides a response to a request shall use full TSI in the SS PDU information elements, when is send the response to the MS registered into another SwMI.

However the above rule shall not apply in the specific case of SS-SNA definition procedure by the authorized user when such user defines a given short number for an external number in using a SSI identity alone (i.e. with no MNI) for the corresponding TETRA gateway and such SSI value is one of the predefined values defined in table D.1 of ETSI TR 102 300-5 [i.1].

NOTE 4: In such a case, SS-SNA standards specify that if the served user invokes SS-SNA using that short number, the corresponding TETRA gateway is that of the SwMI where that user is registered, unless no such gateway exists in which case the home SwMI gateway of the requesting user should be used.

Unless otherwise stated in the supplementary service stage 3 descriptions, this identity shall be encoded in SS PDUs as shown in tables 11 to 13. It shall be preceded by an information element named address type, defined in table 14, to specify which method is being used to indicate the identity.

Table 11: Short number address information element contents

Information element	Length	Value	Remarks
Short number address	8		See SS-SNA ETSI ETS 300 392-12-7 [20]

Table 12: Short subscriber identity information element contents

Information element	Length	Value	Remarks
Short subscriber identity	24		See ETSI EN 300 392-1 [1], clause 7

Table 13: Extension information element contents

Information sub-element	Length	Value	Remarks
Country Code	10		See ETSI EN 300 392-1 [1], clause 7 and ETSI EN 300 392-2 [2], annex K
Network Code	14		See ETSI EN 300 392-1 [1], clause 7

NOTE 5: The term "extension" has been used in the title of table 13 instead of "MNI" for the sake of alignment with ETSI EN 300 392-2 [2].

The information elements short subscriber identity and extension should be qualified in each supplementary service stage 3 description where they are used in adding in front of them the party of which the identity is being thus sent, e.g. activated/defined/interrogated/talking/sending party short subscriber identity or extension.

Table 14: Address type information element contents

Information element	Length	Value (see note 1)	Remarks
Address type	2	00_2	Short Number Address (SNA)
		01_2	Short Subscriber Identity (SSI)
		10_2	TETRA Subscriber Identity (TSI) (see note 2)
		11_2	Reserved
NOTE 1:	A single information element address type has been defined for the sake of simplicity. However the definition of some SS PDUs may be such that some values of this information element will not be used in these PDUs (e.g. the value 0 in ACTIVATE ACK PDUs, DEFINE ACK PDUs and INTERROGATE ACK PDUs since none of these PDUs includes any information element party short number address).		
NOTE 2:	As specified in clause 7.2.4 of ETSI EN 300 392-1 [1], a TETRA subscriber identity comprises an SSI preceded by an MNI (i.e. the latter being defined by the extension information element - see table 13). In the PDU encoding the typical order of those information elements is the SSI followed by the MNI.		

The information element address type should be qualified in each supplementary service stage 3 description where it is used in adding after it the party of which the type of identity is being thus specified, e.g. address type of activated/defined/interrogated/talking/sending party.

The address type information element shall be put just before the information element(s) defining the identity in the SS PDU. If the identity information element(s) is (are) defined in an SS PDU as being repeatable, this may be with a different address type for each identity. If such a case, the address type information element shall be defined together with the identity information element(s) as a repeatable set.

It is also possible to encode ITSI/ISSI or GTSI/GSSI into PDUs using information elements:

- SSI;

- MNI (address extension) present; and

- conditional information element MNI (address extension).

8.4.2   Character string

Unless otherwise stated in the supplementary service stage 3 descriptions, where characters are to be sent, e.g. a user mnemonic name, this shall be done by including a character string information element in the corresponding SS PDU. This information element shall be a bit string, the first bits corresponding to the first character to be sent.

Actually, in each supplementary service stage 3 description where character string information elements are defined, the expression "character string" should be replaced by the actual use of this "character string", e.g. information element talking/sending party mnemonic name.

The character string information element shall be encoded as defined in table 15. The information element length of character string shall define how many bits are in the character string information element. The required number of bit is defined: the "number of characters" multiplied by "the character length". The character length is defined by the text encoding scheme information element value and currently can be either 7, 8 or 16 bits, refer to ETSI EN 300 392-2 [2], clause 29.5.4.1. The length (N) of the information element length of character string is recommended to be at maximum 11 bits. For a mnemonic name information element the length shall be 8 bits, which allows up to 15 characters independently of the character length, refer to table 15.

When the ISO/IEC 10646 [21] UCS-2/UTF-16BE characters are used with the extension to 32 bits long characters, then the "number of characters" shall be counted in 16 bit units in order to keep the length calculation independent of the extension. The number of displayed characters depends on how many extended characters are used. UTF-16BE uses two consecutive values to represent a character beyond the Basic Multilingual Plane (i.e. Plane 00), refer to ETSI EN 300 392-2 [2], clause 29.5.4.1.

The number of bits for coding the value of the information element character string length indicator shall be specified for each type of character string in the corresponding stage 3 description.

NOTE: The meaning of the information element character string length indicator is similar to that defined in table 111 of ETSI EN 300 392-2 [2] except that the element length can be other than 11 bits.

Table 15: Character string information element contents

Information sub-element	Length	Type	C/O/M	Remarks
Text encoding scheme	7	1	M	Refer to ETSI EN 300 392-2 [2], clause 29.5.4.1
Length of character string	N	1	M	See note 1
Character string	varies	1	C	See note 2
NOTE 1: The length of character string information sub-element shall indicate the number of bits in the character string information sub-element. When the character string is used as a mnemonic name it shall be encoded as defined in table 17.				
NOTE 2: The character string shall contain the characters in order so that the leftmost (topmost) character in normal display is the first character in the string independently of the used language. The number of characters depends on the text encoding scheme defined character length according to: - (Length of character string) / (Length of each character).				

The definition of the text encoding scheme information element shall be as defined in ETSI EN 300 392-2 [2], clause 29.5.4.1.

Table 16: Void

Mnemonic names up to 15 characters shall be encoded as defined in table 17.

Table 17: Mnemonic name information element contents

Information sub-element	Length	Remarks
Text coding scheme	7	(See note 1)
Length of the mnemonic name	8	(See note 2)
Mnemonic name character string	variable	(See note 3)
NOTE 1: The definition of the text encoding scheme information sub-element shall be as given in ETSI EN 300 392-2 [2], clause 29.5.4.1.		
NOTE 2: The length of character string information sub-element shall indicate the number of bits in the character string information element.		
NOTE 3: The mnemonic name information sub-element shall be a string of characters, the length and the meaning of each character being defined by the value of the text coding scheme information sub-element e.g. for 8 bit characters: - $(XXXXXXXX_2)(XXXXXXXX_2)(XXXXXXXX_2)(XXXXXXXX_2)$, etc. - 1st character 2nd character 3rd character 4th character.		

Table 18: Void

8.4.3 External number

Unless otherwise stated in the supplementary service stage 3 descriptions, where an external number is to be indicated in an SS PDU, e.g. an external party identification, this shall be done by including the following information elements in the corresponding SS PDU:

- number of external subscriber number digits;

- external subscriber number digits; and

- external number parameters (optional).

NOTE 1: The external subscriber number parameters information element is not normally present in the air interface PDUs. The definition of the information element external subscriber number length indicator is shown in table 19.

Table 19: Number of external subscriber number digits information element contents

Information element	Length	Value	Remarks
Number of external subscriber number digits	5	00000_2	See note 1
		$> 00000_2$	See note 2
NOTE 1: No external number present.			
NOTE 2: N, the number of digits in the external subscriber number formed by the digits of the repeated information element external number digits, shall be equal to the information element value. The maximum number of digits in the external number is limited (24) as defined in ETSI EN 300 392-2 [2], clause 14.8.20.			

The information element number of external subscriber number digit should be qualified in each supplementary service stage 3 description where it is used, in mentioning the use of the corresponding information element number of external subscriber number digits, e.g. number of allowed/restricted external subscriber number digits or number of talking/sending party external subscriber number digits.

Each digit of the external subscriber number shall be coded as defined in ETSI EN 300 392-2 [2], clause 14.8.20. According to that each digit is encoded into its binary value using 4 bits, the "*" sign shall be coded as "1010_2" the "#" as "1011_2" and the "+" as "1100_2", and the remaining binary values "1101_2", "1110_2" and "1111_2" are reserved. The order of these digits shall be that in which they would be dialled: the first one would then be entered first, and so on.

The external subscriber number, which is formed by the digits in the repeated information element external subscriber number digit, is a binary string with a length equal to n × 4 bits, where n is equal to the value of the information element number of external subscriber number digits. The first 4 bits of this binary string are the coded value of the first digit (or symbol) of the external subscriber number, the next four, the coded value of its second digit (or symbol), and so on to (and including) the Nth digit.

NOTE 2: The encoding of the external subscriber number in the air interface basic call protocol is different on how the number of digits is encoded because in the air interface the external subscriber number information element is of type 3 and the length indicator of the type 3 information element was re-used to indicated also the number of the digit. In the supplementary services on contrary the external subscriber number is encoded into the PDUs either as a mandatory or optional element of type 1 or type 2 respectively in order to make PDU encoding clearer especially when multiple external subscriber numbers are needed in the same PDU. For that reason two information elements are used in the encoding the number of external subscriber number digits and the repeated external subscriber number digit.

NOTE 3: The external subscriber number may also refer to a TETRA user as an MS-ISDN number but the name of the information element is preserved.

The information element external subscriber number may also be defined as an information element containing information elements as shown in table 20.

Table 20: External subscriber number information element contents

Information sub-element	Length	Type	C/O/M	Remarks
Number of external subscriber number digits	5	1	M	
External subscriber number digit	4		C	Repeatable (see note)
NOTE: This information sub-element shall be present as many times as indicated by the information sub-element number of external subscriber number digits. The value of the number of external subscriber number digits may be also "0" in which case no digits shall be present indicating that no number is provided.				

The information element external subscriber number parameters as recognized in TETRA shall be as shown in table 21.

Table 21: External subscriber number parameters information element contents

Information sub-element	Length	Value	Remarks
Numbering plan identification	4	0000_2	Unknown
		0001_2	PSTN/ISDN/GSM (see note 1)
		0010_2	Reserved
		0011_2	Data Numbering Plan (see note 2)
		0100_2	Reserved (Telex)
		0101_2	Reserved
		etc.	etc.
		0111_2	Reserved
		1000_2	National standard numbering plan
		1001_2	Private numbering plan
		1010_2	Reserved for extension
		etc.	etc.
		1111_2	Reserved for extension
Type of number	3	000_2	Unknown/unknown (see note 3)
		001_2	International number/level 2 regional number (see note 3)
		010_2	National number/level 1 regional number (see note 3)
		011_2	Network specific number/PISN specific number (see note 3)
		100_2	Subscriber number/level 0 regional number (see note 3)
		101_2	Reserved for extension
		etc.	etc.
		111_2	Reserved for extension
Screening indicator	2	00_2	User provided, not screened
		01_2	User provided, verified and passed
		10_2	User provided, verified and failed
		11_2	Network provided
NOTE 1: See Recommendation ITU-T E.164 [14].			
NOTE 2: See Recommendation ITU-T X.121 [15].			
NOTE 3: The meaning of the information sub-element "type of number" shall be as defined in ISO/IEC 11571 [10] when the numbering plan identification is the private numbering plan (i.e. binary value of the information element equal to 1001_2).			

NOTE 4: Although no attempt has been made to use this to optimize the coding of the information element "external subscriber number parameters", the value of the information sub-element "type of number" is actually conditional on the value of the information sub-element "numbering plan identification" (e.g. when the "numbering plan identification" corresponds to "unknown" the only possibility for the "type of number" is also unknown).

NOTE 5: No information sub-element "presentation indicator" has been included in table 20 because the corresponding information is carried as an information element in the corresponding TETRA intersystem interface PDUs.

8.4.4 External call restriction

Unless otherwise stated in the supplementary service stage 3 descriptions, where restricted external numbers are to be defined or indicated by SS PDUs, e.g. DEFINE PDU or INTERROGATE ACK of SS-BOC, this shall be done by including an information element external call restriction definition in the corresponding SS PDU.

The definition of this information element shall be as shown in table 22.

Table 22: Restricted external number definition information element contents

Information sub-element	Length	Value	Remarks
Number type	3	0	All calls (see note 1)
		1	Only international calls restricted (see note 1)
		2	Only emergency calls allowed (see note 1)
		3	Specific number restricted
		4	Number starting with the following digits restricted
		5	Specific number allowed
		6	Number starting with the following digits allowed
		7	Reserved
Length indicator	5		See note 2
Digit string	variable		See note 3
NOTE 1: No length indicator or digit string information sub-elements shall follow with the number type value.			
NOTE 2: The value of the information sub-element length indicator defines the length in digits of the following digit string information sub-element.			
NOTE 3: Shall have a length in bits equal to N x 4, N being equal to the value of the preceding information sub-element length indicator.			

8.4.5 Activation, definition, and interrogation failure values

As a general rule, the result of an activation, definition or interrogation request shall be indicated in the corresponding ACK PDU (i.e. ACTIVATION ACK PDU, DEFINITION ACK PDU or INTERROGATION ACK PDU) by a first information element indicating whether the result is positive or negative. If the result is positive, the value of this information element shall be equal to 1 and to 0 otherwise.

In case of negative results, generic values are specified in table 23 for a result element giving the reason for failure of the corresponding request. These values are valid for all services unless stated otherwise in the specific supplementary service stage 3 descriptions.

Table 23: Generic values for the failure reason information element contents

Information element	Length	Value	Remarks
Failure reason	3 (see note 1)	000_2	Rejected for any reason
		001_2	User not authorized
		010_2	Unknown TETRA identity
		011_2	Range not supported (see note 2)
		100_2	Invalid PDU contents
		101_2	SS not subscribed for user addressed
NOTE 1: This is the minimum length for this information element.			
NOTE 2: See clause 8.3.2.			

8.4.6   Manufacturer identifier information element

If the SS PDU is proprietary, the information element following SS type is the Manufacturer identifier and the subsequent information elements are manufacturer-specific. The Manufacturer identifier is defined in table 24.

Table 24: Manufacturer identifier definition

Information element	Length	Value	Remarks
Manufacturer identifier	8	0	Refer to annex H of ETSI EN 300 392-2 [2].
		etc.	etc.
		255	Refer to annex H of ETSI EN 300 392-2 [2].

9   SS PDU routeing

9.1   Actions at the SwMI receiving an SS PDU from a MS registered in this SwMI

A SwMI compliant with the present document shall be able to route the SS PDU(s) which it receives at the air interface in a U-FACILITY PDU (see table 4) or in a facility information element (see table 2) in a call related air interface uplink PDU, to the destination SwMI indicated in the routeing information element of such U-FACILITY PDU or facility information element.

   NOTE 1: U-FACILITY PDUs carry only call unrelated SS PDUs.

Notably, the SwMI shall route those SS PDUs internally (i.e. intra-TETRA SS PDU routeing) if so instructed by the value of that routeing information element or if the SS PDU is call related and the call is an intra-TETRA call.

Otherwise (i.e. for routeing those SS PDUs over the ISI), the SwMI shall use ANF-ISISS, as specified in clause 10, in defining their source MSs as specified in tables 26 and 27.

If the SS PDU has been received in a facility information element with a value of the routeing information element corresponding to end SwMI, there is no need for any additional information to route the corresponding ANF-ISISS ISI APDU to the proper destination SwMI (see clause 9.3).

In all other cases, the value of the routeing information element in the U-FACILITY PDU or facility information element carrying those SS PDUs corresponds to a destination SwMI defined by its MNI, either explicitly, or as being the home SwMI of the MS. In the latter case the SwMI shall determine the MNI of this home SwMI as being identical to that of the ITSI of the subscriber which has originated the PDU.

   NOTE 2: The determination of this ITSI is made from the MLE and MAC layers (e.g. MAC addresses carrying this upstream PDU (see clause 23.4.1.2 of ETSI EN 300 392-2 [2], and clause 7.8.2.1 of ETSI EN 300 392-1 [1]).

Once the SwMI has determined the MNI of the invoked ANF-ISISS destination SwMI, it shall use its routeing tables to find a corresponding address information and route the SS PDU to that SwMI (see figure 1).
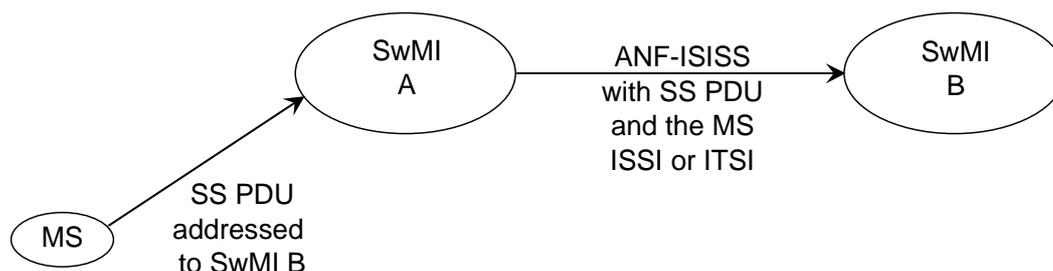
Figure 1: SS PDU addressed by a MS to a distant SwMI

9.2 SS PDU sent by a SwMI to a MS

9.2.0 SS PDU sent by a SwMI to a MS general

SS PDUs can be sent to a MS using either individual or group addressing.

9.2.1 SS PDU addressed individually by a SwMI to an MS

The source SwMI shall first determine whether or not it is the MS home SwMI:

- if yes, it shall determine whether or not this MS has migrated:

  - if no, it shall route the SS PDU(s) internally;

  - if yes, it shall invoke ANF-ISISS to carry this SS PDU (these SS PDUs) to the visited SwMI, in defining the MS as its (their) final destination as specified in tables 26 and 27. If the SS PDU(s) is (are) call unrelated, it shall fetch the address information corresponding to the visited SwMI (optionally sent by ANF-ISIMM, as part of the registration procedure in the visited SwMI), to be used for addressing the invoked ANF-ISISS.

  Figure 2 illustrates the above case.
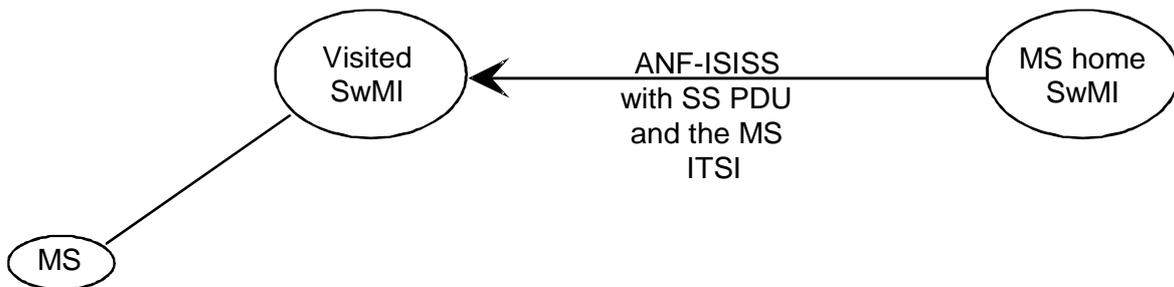
Figure 2: SS PDU addressed individually by a home SwMI to a MS having migrated

- If no, it shall determine the MNI of the home SwMI, unless it happens that the MS has migrated and is currently registered in this source SwMI, and this SwMI can identify that situation. In the latter case this SwMI shall route the SS PDU internally. Otherwise, it shall invoke ANF-ISISS to carry this SS PDU (these SS PDUs) to the SwMI where the MS is registered, in defining this MS as its (their) final destination as specified in tables 26 and 27. If the SS PDU(s) is (are) call unrelated, it shall determine the address information corresponding to the MNI of the home SwMI, to be used for addressing the invoked ANF-ISISS.

  Figure 3 illustrates the above case.

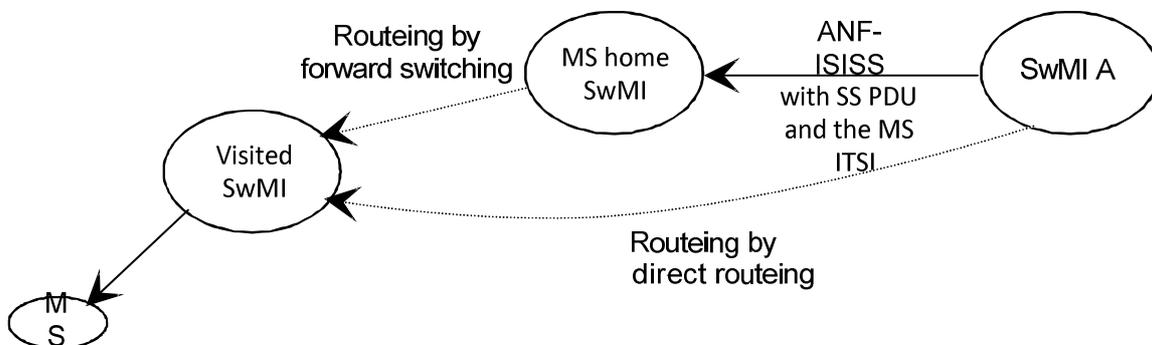**Figure 3: SS PDU addressed individually by an SwMI to an MS**

9.2.2   SS PDU originated by a SwMI using a group address

NOTE: The SS PDU(s) sent using a group address are addressed to all members of the corresponding group when they are call unrelated, or to the participants in the corresponding group call when they are call related.

The only SwMI, that can originate SS PDUs addressed to the group, is the group home SwMI.

The group home SwMi shall route the SS PDU(s) internally in sending them to the MSs registered in the nominated SwMI, if any. In addition it shall determine if the group extends over other SwMIs:

- participating SwMIs, if the SS PDU(s) is (are) call related; or

- SwMIs in which the group has been attached, if the SS PDU(s) is (are) call unrelated.

If there are such SwMIs, the group home SwMI shall invoke ANF-ISISSs to carry the SS PDU(s) to these SwMIs, in defining this group as its (their) final destination as specified in tables 26 and 27.

9.2.3   Sending of SS PDU by the destination SwMI to MS

When an invoked ANF-ISISS is addressed to a SwMI, this SwMI shall be able to identify the SS PDU(s) carried in this ANF-ISISS which are to be sent to an MS registered in this SwMI.

At the air interface of the destination SwMI, the SS PDUs shall be sent as follows:

- if the SS PDU(s) is (are) call related, the SS PDU(s) shall be included in an air interface facility information element (see table 2), and this facility information element shall be delivered to the MS in a basic call PDU if one is to be sent then, otherwise, it shall be delivered in a D-INFO PDU;

- if the SS PDU(s) is (are) call unrelated, the SS PDU(s) shall be delivered to the MS in a D-FACILITY PDU (see table 4), after deletion of the ITSI of the MS or GTSI of the group appended by the ANF-ISISS possibly invoked to carry them.

NOTE: The standard MAC addressing specified in clause 23.4.1.2 of ETSI EN 300 392-2 [2], and clause 7.8.2.1 of ETSI EN 300 392-1 [1] will be used to address the MS either individually or as member of a group, else participant in a group call.

9.3   SS PDU transport by ANF-ISISS

According to clause 7 of ETSI EN 300 392-3-9 [3] the "Transport Layer Independent General design" of ISI, the transport of the ANF ISISS ISI APDU carrying the SS PDU will be ensured by the ISI Mediation Function and the Transport Protocol Control. Presently the following transport layers has been defined:

1)   ETSI EN 300 392-3-10 [23]: "General design, PSS1 over E.1".

2)   ETSI EN 300 392-3-11 [24]: "General design, SIP/IP".

These documents specify the specific requirements for the transport of ANF-ISISS ISI APDUs.

10   ANF-ISISS

10.1   Service model

Figure 4 shows the service model for ANF-ISISS. ANF-ISISS offers services to supplementary service control entities in different SwMIs. The corresponding primitives are defined in clause 10.2.
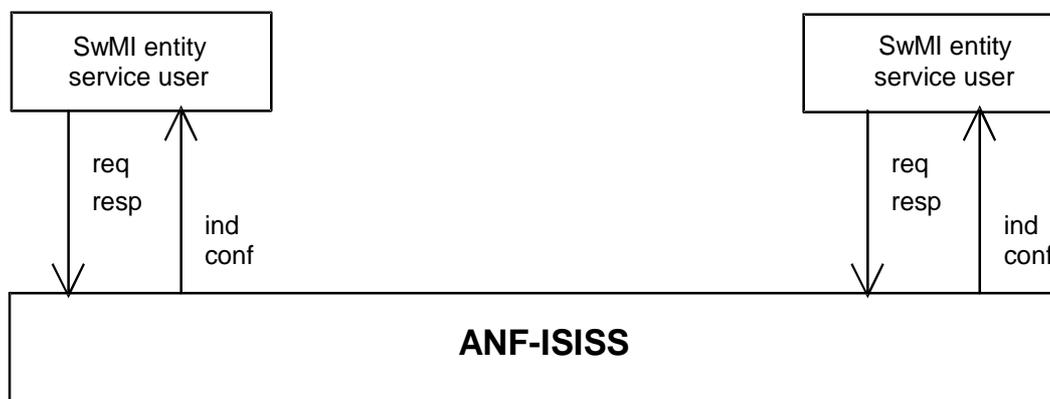

Figure 4: ANF-ISISS service model

ANF-ISISS may be used by the supplementary service control entity of any SwMI (the subscriber's home SwMI or visited SwMI, or any other SwMI).

10.2   Service primitives

The ANF-ISISS service primitives ISI SS INFORMATION request/ISI SS INFORMATION indication shall contain the SS PDU(s) which needs (need) to be conveyed, as defined in table 25. The optional service primitive ISI SS INFORMATION response/ISI SS INFORMATION confirm may be used to send a negative response to an SS PDU (or to SS PDUs) previously received in the ISI SS INFORMATION indication primitive.

Table 25: ISI SS INFORMATION primitives

Primitive	M/O	Remarks
ISI SS INFORMATION request/indication	M	(See note 1)
ISI SS INFORMATION response/confirm	O	(See note 2)
NOTE 1: The ISI SS INFORMATION request/indication parameter shall be the SS PDU(s) to be conveyed over the ISI.		
NOTE 2: If the ISI SS INFORMATION response/confirm primitive is sent/received, its associated parameter shall include first either a destination or a source address, second the same parameter as that of the corresponding ISI primitive: - the ISI-RESULT request/indication, with, as parameter, SS PDU(s) sent in response to the ISI SS PDU(s) received in the corresponding ISI SS INFORMATION request/indication primitive (this feature is not currently used in any supplementary service); - the ISI-ERROR request/indication with the parameters defined in clause 7.4.3 of ETSI EN 300 392-3-9 [3]; - the ISI-REJECT request/indication defined in clause 7.4.4 of ETSI EN 300 392-3-9 [3].		

10.3   Protocol

10.3.1   Protocol general

The SS PDUs shall be exchanged between SwMIs using ANF-ISISS.

They shall be included in the tetraMessage data element of the ISI operation tetraIsiMessage defined in table 1 of ETSI EN 300 392-3-9 [3].

In case of call related SS PDUs the resulting ANF-ISISS APDU is defined in table 26.

> NOTE 1:   ANF-ISISS will be invoked only to convey ISI SS PDUs. When they are call related, those PDUs will thus be sent in dedicated ANF-ISISS APDUs. ANF-ISISS is not invoked when supplementary service information is included as specific elements or as a notification indicator information element in ANF-ISIIC or ANF-ISIGC PDUs.

In case of call unrelated SS PDUs the resulting ANF-ISISS APDU is defined in table 27.

Table 26: Call related ANF-ISISS PDU contents

Information element	Length	Type	C/O/M	Remarks
Routeing	1	1	M	(See note 1)
Number of SS PDUs	4	1	M	(See note 2)
Length indicator	11	1	C	(See notes 3 and 4)
SS PDU contents	variable	1	C	(See notes 3 and 5)

NOTE 1:   The meaning of the information element routeing shall be the following:
    -    if its value is equal to 0, all the SS PDUs in the ANF-ISISS PDU are addressed to the ANF-ISISS destination SwMI;
    -    if its value is equal to 1, all the SS PDUs in the ANF-ISISS PDU are addressed to the MS(s) participating in the call and registered in the ANF-ISISS destination SwMI.
NOTE 2:   The value of the information element number of SS PDUs shall be equal at least to one.
NOTE 3:   Shall be repeated as a set according to the value of the information element number of SS PDUs when this value is larger than 1.
NOTE 4:   The value of the information element length indicator defines the length in bits of the contents of the next SS PDU.
NOTE 5: See clause 8.				

Table 27: Call unrelated ANF-ISISS PDU contents

Information element	Length	Type	C/O/M	Remarks
Routeing	3	1	M	See note 1
Destination or source MS address type	2	1	C	See notes 2 and 3
Destination or source MS SSI	24	1	C	See note 4
Destination or source MS extension	24	1	C	See note 5
Number of SS PDUs	4	1	M	See note 6
Length indicator	11	1	C	See notes 7 and 8
SS PDU contents	variable	1	C	See notes 7 and 9
NOTE 1: The meaning of the information element routeing shall be the following: - if its binary value is equal to 000_2, all the SS PDUs in the ANF-ISISS PDU are addressed to a fixed SwMI, which is the ANF-ISISS destination SwMI (as determined by the call independent signalling connection over which over which the invoked ANF-ISISS is sent) and their source is also a fixed SwMI, which is the ANF-ISISS source SwMI (itself also determined by the call independent signalling connection already mentioned);   - if its binary value is equal to 001_2, all the SS PDUs in the ANF-ISISS PDU are addressed to the SwMI where the MS the identity of which is given in the next information element is currently registered; the identity of that SwMI is assumed to be that of the SwMI at the other end of the call independent signalling connection over which the invoked ANF-ISISS is sent. The source of all those SS PDUs (in the ANF-ISISS PDU) is the ANF-ISISS source SwMI (which for the destination SwMI is   the SwMI at the other end of the call independent signalling connection already mentioned);   - if its binary value is equal to 010_2, the source of all the SS PDUs in the ANF-ISISS PDU is the SwMI where the MS the identity of which is given in the next information element is currently registered. The destination of all those SS PDUs (in the ANF-ISISS PDU) is the ANF-ISISS destination SwMI (as determined by the call independent signalling connection over which over which the invoked ANF-ISISS is sent);   - if its binary value is equal to 011_2, all the SS PDUs in the ANF-ISISS PDU are addressed to the SwMI where the MS the identity of which is given in the next information element is currently registered, and their source is the SwMI where the MS the identity of which is given in the next information element is currently registered. The identity of the destination SwMI is assumed to be that of the SwMI at the other end of the call independent signalling connection over which the invoked ANF-ISISS is sent. The identity of the source SwMI is implicitly given as being that of the SwMI at the other end of the call independent signalling connection already mentioned;   - if its binary value is equal to 101_2, all the SS PDUs in the ANF-ISISS PDU are addressed to the MS the identity of which is given in the next information element; that MS is assumed to be currently registered in the SwMI at the other end of the call independent signalling connection over which the invoked ANF-ISISS is sent. The source of all those SS PDUs (in the ANF-ISISS PDU) is the ANF-ISISS source SwMI (determined by the call independent signalling connection already mentioned);   - if its binary value is equal to 110_2, the source of all the SS PDUs in the ANF-ISISS PDU is the MS the identity of which is given in the next information element (that MS being currently registered in the SwMI which for the destination SwMI is the SwMI at the other end of the call independent signalling connection which the invoked ANF-ISISS is sent). The destination of all those SS PDUs (in the ANF-ISISS PDU) is the ANF-ISISS destination SwMI (as determined by the call independent signalling connection already mentioned).   The binary values 100_2 and 111_2 are reserved.
NOTE 2: Shall be present if the binary value of the information element routeing is equal to 001_2, 010_2, 101_2 or to 110_2. Shall be repeated twice if the binary value of the information element routeing is equal to 011_2: the first value given shall then correspond to the destination MS address type (the second one corresponding to the source MS address type).
NOTE 3: Shall be as defined in table 14, where the value 0 shall be excluded.
NOTE 4: Shall be present if the binary value of the information element destination or source MS address type is equal to 10_2 or to 01_2 (see table 14).
NOTE 5: Shall be present if the binary value of the information element destination or source MS address type is equal to 10_2 (see table 14).
NOTE 6: The value of the information element number of SS PDUs shall be equal at least to one.
NOTE 7: Shall be repeated as a set according to the value of the information element number of SS PDUs when this value is larger than 1.
NOTE 8: The value of the information element length indicator defines the length in bits of the contents of the next SS PDU.
NOTE 9: See clause 8.

When either a destination MS or a source MS address is given by an SSI alone instead of ITSI, the receiving SwMI determine the corresponding ITSI in adding its own MNI to this SSI.

NOTE 2: The ANF-ISISS PDU definitions in tables 26 and 27 are derived from that of the U-FACILITY PDU, in table 4.

NOTE 3: The systematic use of the address type mechanism defined in clause 8.4.1 has been preferred to the introduction of a new one bit information element to define only whether or not the information element destination or source MS extension (i.e. the MNI of the corresponding ITSI/GTSI) is present.

In the ISI operation tetraIsiMessage for ANF-ISISS, the destinationEntity and sourceEntity in the argument shall contain the value anfIsiss.

10.3.2   Possible groupings of ISI SS PDUs and of invoked ANF-ISISSs

According to their definitions in tables 26 and 27, ANF-ISISS PDUs may include more than one SS PDU.

This single ANF-ISISS PDU should not include SS PDUs addressed to different MSs.

10.3.3   Void

11   Exceptional cases

11.1   ISI exceptional cases

11.1.0   General

There shall be no exceptional case specific to supplementary services when the information related to such services is carried either as specific elements in a basic service PDU or as notification indicator information elements (see clause 7.1). When ANF-ISISS has been invoked, the following exceptional cases may arise:

a)   the ANF-ISISS PDU is addressed to an MS which is not anymore registered in the SwMI, or to a group which is not anymore attached in the SwMI, else it is addressed to a non-reachable MS;

b)   the receiving SwMI complies with the present document, but the corresponding ANF-ISISS PDU is addressed to this SwMI (and not to an MS assumed to be registered in this SwMI) and includes one or more SS PDUs that this SwMI does not support;

c)   the receiving SwMI does not comply with the present document (e.g. it does not support any supplementary service over the ISI): notably it does not have an ANF-ISISS entity;

d)   one or more errors of the following types have been detected by the receiving SwMI:

1)   a segmentation error: of course this implies that the corresponding ANF-ISISS ISI invoke APDU has been segmented;

2)   another type of error among those listed in clause 7.4.3 of ETSI EN 300 392-3-9 [3] than those in cases a), b) and d.1);

3)   an ISI Invoke APDU has been determined as being invalid.

According to clause 7.4.3 of ETSI EN 300 392-3-9 [3], in the above cases the appropriate response will be received by the SwMI which has sent the corresponding ANF-ISISS ISI Invoke APDU:

•   ISI-Invoke APDU with the appropriate application level reject information in case a);

•   ReturnError APDUs in cases b), d.1) and d.2); and

•   Reject APDUs in the other cases, i.e. cases c) and d.3).

In the clauses (i.e. belonging to clause 11.1):

- the SwMI which has sent the corresponding ANF-ISISS ISI Invoke APDU is named the source SwMI. The actions specified for this SwMI in the clauses below refer only to the ISI. See clause 11.2 for its actions at the air interface;

- if case d.1) occurs together with case a) or b), case d.1) shall override the latter (i.e. clause 11.1.4.1 shall apply);

- similarly if case a) and case b) occur together, case b) shall override case a) (i.e. clause 11.1.1 shall apply).

11.1.1 Case a)

11.1.1.1 Call unrelated ANF-ISISS PDU

The decision taken by the supplementary service control entity of the source SwMI shall be an implementation matter.

11.1.1.2 Call related ANF-ISISS PDU

Case a) may arise for a call related ANF-ISISS PDU only when the MS is not reachable.

The SwMI where the MS is registered may or may not decide to clear the call in such a case. Depending on this decision, it shall send to the source SwMI the Invoke APDU with the result/ rejection of the service, either:

- in a Call Release message if it decides to clear the call; or

- in another Transport Layer message if it decides to continue the call.

In the latter case, the decision taken by the supplementary service control entity of the source SwMI shall be an implementation matter.

11.1.2 Case b)

In case b), in accordance with clause 7.4.3 of ETSI EN 300 392-3-9 [3], the supplementary service control entity in the receiving SwMI will request the ISI Mediation Function to send an ISI-ReturnError APDU with the error value corresponding to "requestNotSupported" and the accompanying error parameter indicating for the SS PDUs included by the source SwMI in the invoked ANF-ISISS, those not supported by the receiving SwMI in qualifying them as either corresponding to supplementary services not supported or as optional SS PDUs not supported.

The specification of some supplementary services may impose that when one such supplementary service has been invoked for a call and it is not supported by the receiving SwMI, this call has to be cleared. In such a case, the corresponding procedure specification (in the stage 3 description of this supplementary service) should state that the supplementary service control entity in the source SwMI will clear the call which it receives that ISI-ReturnError APDU (with the error value corresponding to "requestNotSupported") in another Transport Layer message than a Call Release message.

In addition, the supplementary service control entity in the receiving SwMI (i.e. the SwMI which does not support the supplementary service considered) should send the above ISI-ReturnError APDU with the error value corresponding to "requestNotSupported" in the Call Disconnect or Call Release messages, thus clearing the call. This recommendation applies for SS-AL, which is presently the only supplementary service the specification of which states that the call shall be cleared if the supplementary service has been invoked and is not supported.

NOTE 1: The latter recommendation cannot be included in the stage 3 description of that supplementary service, since by hypothesis, the supplementary service control entity in the receiving SwMI does not support that stage 3 description.

When the ISI-ReturnError APDU is being received by the source SwMI:

- for a call related invoked ANF-ISISS;

- with the error value corresponding to "requestNotSupported"; and

- when no supplementary service imposing that the call has to be cleared is indicated as being not supported in its accompanying error parameter.

The decision taken by the supplementary service control entity in the source SwMI shall be an implementation matter.

NOTE 2: The possible decisions taken by this supplementary service control entity in this case are either:

  ▪ to continue the call in ignoring the SS PDUs which it had included in the original ANF-ISISS Invoke APDU and on which the above RequestError APDU does not give any information; or

  ▪ to send a new ANF-ISISS Invoke APDU modified by taking into account the supplementary service(s) or the optional SS PDU(s) not supported.

  However, the latter will not be possible for some call related SS PDU(s) when the stage 3 description of the corresponding supplementary service specifies that such SS PDU is sent together with some specific basic call TETRA ISI PDU which cannot be repeated, e.g. TETRA ISI SETUP PDU.

11.1.3   Case c)

11.1.3.1   Case c) General

Case c) arises when an ANF-ISISS has been invoked, i.e. an ISI Invoke APDU has been addressed to an ANF-ISISS AnfSubEntity, and this sub-entity does not exist.

In case c) the ISI Invoke APDU invalidity will be determined by the ISI Mediation function. According to clause 7.4.4 of ETSI EN 300 392-3-9 [3], the latter shall send an ISI Reject APDU of type Invoke Problem with the value unrecognizedOperation.

When the ANF-ISISS entity in the source SwMI receives an ISI-Reject APDU for a call related invoked ANF-ISISS the ANF-ISISS entity shall pass this ISI-Reject APDU to the supplementary service control entity in the source SwMI. This supplementary service control entity should then let the call continue unless the receiving SwMI at the same time is clearing the call.

11.1.4   Case d)

11.1.4.0   Case d) General

NOTE: According to clause 7.4.3 of ETSI EN 300 392-3-9 [3], case d.2) will occur when none of the other error cases occurs, i.e. case a), b) and d.1) and either:

  ▪ if at least one information element in an SS PDU carried the ANF-ISISS ISI Invoke APDU is invalid; or

  ▪ another error case has occurred, qualified as unspecified.

11.1.4.1   Cases d.1) and d.2)

According to clause 7.4.3 of ETSI EN 300 392-3-9 [3], an ISI-ReturnError APDU will be returned with the error value corresponding to incompleteTetraPdu, in case d.1), and to either invalidInfoElement or unspecified, in case d.2).

In a segmentation error has occurred, retransmission of the invoked ANF-ISISS should be attempted.

The same should apply in the cases of invalid SS PDU information element(s) or of unspecified error.

NOTE: However the latter will not be possible for some call related SS PDU(s) when the stage 3 description of the corresponding supplementary service specifies that such SS PDU has to be sent together with some specific basic call TETRA ISI PDU which cannot be repeated, e.g. TETRA ISI SETUP PDU.

11.1.4.2   Case d.3)

The invalidity of an ISI Invoke APDU is determined by the ISI Mediation Function, and the acceptance of the SS-PDU by the ANF-ISISS entity or supplementary service control entity. In all cases the Mediation Function will send an ISI-Reject APDU with the appropriate problem parameter value. The difference being that in the first case, the sending of the ISI-Reject APDU is initiated by the ISI Mediation Function itself, while in the other cases, it is initiated by the entity which has determined that the SS service cannot be applied.

When the source SwMI receives such ISI Reject APDU corresponding to case d.3), it should retransmit the corresponding ANF-ISISS ISI Invoke APDU, unless this is not possible.

NOTE 1:   It will not be possible for some call related SS PDU(s) when the stage 3 description of the corresponding supplementary service specifies that such SS PDU has to be sent together with some specific basic call TETRA ISI PDU which cannot be repeated, e.g. TETRA ISI SETUP PDU.

According to its definition, case d.3) excludes case c). However it may happen that case d.3) hides case c), e.g. when the value of the destination ANF-ISI sub-entity in a received call related ISI Invoke APDU is different from anfIsiss (value '1', see definition of the ISI operation in ETSI EN 300 392-3-9 [3], table 1). As a consequence the specification of some supplementary service operation may require not only that the call shall be cleared if the supplementary service cannot be supported but in addition that the rejection of the ANF-ISISS Invoke APDU conveying the SS PDU which invokes such supplementary service has to be considered as equivalent to the fact that the supplementary service is not supported. If this is the case, the corresponding call shall be cleared by the source SwMI when it receives an ISI Reject APDU for a call related ANF-ISISS Invoke APDU conveying such SS PDU(s).

In all other call related occurrences of case d.3), whether retransmission has failed again, or has not been attempted, the decision taken then by the supplementary service control entity of the source SwMI shall be an implementation matter.

NOTE 2:   The possible decisions taken by this supplementary service control entity in this case are either:

- to continue the call in ignoring the SS PDUs which it had included in the original ANF-ISISS Invoke APDU; or

- to clear the call.

11.2   Exceptional cases at the air interface

11.2.1   No ISI involved

When an MS has sent an SS PDU to the SwMI where it is registered, this SwMI shall determine whether or not it supports such SS PDU. If it does not support it, it shall send back to the MS a reject SS PDU as defined in clause 8.2.

If the SS PDU sent by the MS is invoking a supplementary service the specification of which requires that the call shall be cleared if the supplementary service has been invoked and is not supported, the corresponding reject SS PDU shall be sent to the MS in a D-RELEASE PDU. This shall apply for SS-AL, which is presently the only supplementary service for which such specification applies.

NOTE: The latter recommendation cannot be included in the stage 3 description of that supplementary service, since by hypothesis, the supplementary service control entity in the SwMI does not support that stage 3 description.

11.2.2   ISI involved

When an MS has sent an SS PDU to the SwMI where it is registered which is addressed to this SwMI, clause 11.2.1 shall apply.

In addition, if that SwMI supports that SS PDU or if it has been addressed to another SwMI, the former SwMI shall send the reject SS PDU defined in clause 11.2.1 to the MS for each SS PDU sent over the ISI when the ISI exceptional procedures specified in clauses 11.1.2 and 11.1.3 have occurred. More precisely, the value of the SS-PDU Type information element in the reject SS PDU shall be:

- equal to 00000_2 , Supplementary service not supported, if either:

  - an ISI-ReturnError APDU has been received with the error value corresponding to "requestNotSupported" and with an error parameter which indicates that the corresponding supplementary service is not supported; or

  - case c) has occurred;

- equal to 00001_2 , Action not supported, if an ISI-ReturnError APDU has been received with the error value corresponding to "requestNotSupported" and with an error parameter which indicates that the SS PDU is not supported.

The above conditions for sending a reject SS PDU with the value of its SS-PDU Type information element being equal to 00000_2 shall also apply when a supplementary service is automatically invoked with an SS PDU sent over the ISI for this purpose.

Any reject SS PDU with the value of its second information element being equal to 00000_2 shall be sent in the D-RELEASE PDU if it is sent as a result of the invocation of a supplementary service the specification of which requires that the call shall be cleared if the supplementary service has been invoked and is not supported. This shall apply for SS-AL, which is presently the only supplementary service for which that requirement holds.

NOTE: The latter recommendation cannot be included in the stage 3 description of that supplementary service, since it does not apply to the originating SwMI (only to the called user home SwMI, and to the terminating SwMI if it different).

In all other exceptional cases mentioned in clause 11.1 where the SwMI can consider that an SS PDU has not been received after having been sent over the ISI (in an ANF-ISISS Invoke APDU), the SwMI should send a reject SS PDU including:

- the same value of the information element SS type as in the original SS PDU; and

- the value 00010_2 , ISI problem, in SS-PDU Type information element (see table 6).

12   Generic specification of activation/deactivation, definition and interrogation operations

12.1   Stage 2 description

Each of the activation/deactivation, definition and interrogation operations of TETRA supplementary services shall correspond to a user application primitive:

- ACTIVATE request;

- ACTIVATE ACK indication;

- DEFINE request;

- DEFINE ACK indication;

- INTERROGATE request;

- INTERROGATE ACK indication.

Since the decision has been made to describe the user application primitives of the TETRA supplementary services together with the stage 2 descriptions of these services, the above primitives should be included in the corresponding lists of primitives given in of ETSI EN/ETS 300 392-11 [8].

12.2   Stage 3 description

Stage 3 description is out of the scope of the present document.

13   Authentication issues

13.1   Authentication requirements for TETRA supplementary services

Table 28 applies for the activation/deactivation and definition of the TETRA supplementary services for the authorized user for each supplementary service as well as for the possible impact of SS definition on the affected user. This table covers also the case of interrogation by the authorized user, being understood that in many cases, the affected or the served user may also place interrogations about SSs. However, usually the scope of such interrogation will be restricted to the supplementary services activated for this user.

Table 28: Authentication requirements for TETRA supplementary services

SS Name	Authentication needed or not for authorized user			Authentication needed or not for impact of definition on affected user
	Activation/ deactivation	Definition (see note 3)	Interrogation	
Call identification	N.A.	N.A.	N.A.	N.A.
Call report	N.A.	N.A.	N.A.	N.A.
Talking party identification	N.A.	N.A.	yes	N.A.
Call diversion	yes	yes	yes	N.A.
List search call	yes	yes/R	yes	N.A.
Call authorized by dispatcher	yes (see note 1)	N.A./R	yes	N.A.
Short number addressing	no (see note 2)	yes/R	yes	N.A.
Area selection	N.A.	yes/R	yes	N.A.
Access priority	N.A.	yes/R	yes	yes
Priority call	yes	yes/R	yes	yes
Call waiting	N.A.	N.A.	yes	N.A.
Call hold	N.A.	N.A.	yes	N.A.
Call completion to busy subscriber	N.A.	N.A.	yes	N.A.
Late entry	yes	yes/R	yes	N.A.
Transfer of control	N.A.	N.A.	yes	N.A.
Pre-emptive priority call	N.A.	N.A.	yes	N.A.
Include call	N.A.	N.A.	yes	N.A.
Barring of outgoing call	yes	yes/R	yes	N.A.
Barring of incoming call	yes	yes/R	yes	N.A.
Discreet listening	N.A.	N.A.	yes	N.A.
Ambience listening	N.A.	N.A.	yes	N.A.
Dynamic group number assignment	N.A.	yes/R	yes	yes
Call completion on no reply	N.A.	N.A.	yes	N.A.
Call retention	N.A.	yes/R	yes	N.A.

SS Name	Authentication needed or not for authorized user			Authentication needed or not for impact of definition on affected user
	Activation/ deactivation	Definition (see note 3)	Interrogation	
NOTE 1: According to ETSI EN 300 392-10-6 [7], the authorized user is the served user (i.e. the dispatcher). NOTE 2: The "no" put here means that it is not the activation of SNA which is a problem, but the change of its definition (rather formal difference). NOTE 3: The symbol "/R" in this column indicates that the corresponding stage 1 description standard states that the authorized user has to be "registered".				

13.2   The use of security class to meet authentication requirements for TETRA supplementary services

13.2.0   General

Security class is defined in ETSI EN 300 392-7 [6], clause 6.2.

13.2.1   Class 1

In class 1 cells, authentication is optional, its use being determined by the SwMI. For cells in which authentication is not applied those supplementary service actions which require authentication (as shown in table 28) should not be provided.

If authentication is provided in class 1 cells the lack of encryption of the data over the air interface should be treated with due care, and may inhibit the use in the same way as if no authentication were applied.

13.2.2   Class 2

In class 2 cells, authentication is optional, its use being determined by the SwMI. For cells in which authentication is not applied those supplementary service actions which require authentication (as shown in table 28) should not be provided.

Where authentication is provided, the class 2 encryption of data over the air interface requires that there should be no further restriction on provision of any supplementary service action as listed in table 28.

13.2.3   Class 3

In class 3 cells, authentication is mandatory. In class 3 systems, there should be no restriction on provision of any supplementary service action as listed in table 28.

13.2.4   Impact of ISI

The ISI should support data transfers required for supplementary services only between cells/SwMIs of the same security level.

13.2.5   Security of data within a SwMI

The TETRA standards provide no mechanisms for security of data within an SwMI. It is however recommended that data held within each SwMI for use by the air interface protocols should be protected in a manner equivalent to that of the air interface security class. This should apply for access control to the data (equivalence of authentication) and to privacy of the data when transported (equivalence of encryption).

Annex A (informative):
Definition of the ISI operation

Definition of the ISI operation is presented in ETSI EN 300 392-3-9 [3].

Annex B:
Void

Annex C:
Void

Annex D (informative):
Change requests

The present document contains Change requests as identified in table D.1. The "Standard version" column indicates the version that was used as basis for the change request.

Table D.1: Change requests

No	CR vers.	Standard version	Clauses affected	Title	Remarks
001	APP	V1.1.1	7.2.2	Additional Notification Indicator (Call proceeding) required	EPT approved 011128
002	APP	V1.1.1	7.2.2	Addition of AL-call or speech item notification information element value	EPT approved 030307
003	APP	V1.1.1	8.4.2	Mistake in the referred clause number 29.5.4.3	EPT approved 030307
004	APP	V1.1.1	7.2.2	Addition of new SS-CF values	EPT approved 030307
005	APP	V1.1.4	8.4.2	Mnemonic name presentation in table 17	EPT approved 030708
101	APP	V1.2.1	8.4.2	Definition of how characters beyond that available with UCS-2 encoding is to be supported	EPT approved 040521
102	APP	V1.2.1	8.2	Use of SS PDU type's Supplementary service not supported and Action not supported by the MS	EPT approved 040521
103	APP	V1.2.1	7.2.2	Notification indicator: Called user alerted	EPT approved 040521
104	APP	V1.2.1	7.2.2	Notice of imminent call disconnection	EPT approved 040521
201	APP	V1.3.1	7.2.2	Restricted group coverage	TETRA approved 071012
202	10	V1.3.2	7.2.1, 7.3, 8, 8.3.1, 8.3.2, 8.4.2, 8.4.3, and 8.4.4	Reference and editorial corrections	WG3 approved 091112
203	10	V1.3.2	2.1, 8,1	Addition of DOTAM protocol	WG3 approved 091112
301	10	V1.4.1	8.2	Correction to PDU information element name presentation	WG3 approved 110407
401	10	V1.5.1	Foreword, 2.1, 3.1, 9.2.1, 9.2.2, 9.3, 10.2, 10.3.1, 10.3.2, 10.3.3, 11 (and sub-clauses), 13.2.4, annex B, C and E	Support of SIP/IP as transport media for ISI APDUs	WG3 approved 171221
402	10	V1.5.1	1, 3.2, 3.3, 9.2.3, 10.3.1, 11.1.3.1, 12.1, 12.2	Essential corrections to 392-9 v 151	WG3 approved 180514.
501	02	1.6.2	2.1, 2.2, 9.3, 10.2, 10.3.1, 11.1.0, 11.1.2, 11.1.3.1, 11.1.4.0, 11.1.4.1, 11.1.4.2	Correction to references	Approved

Annex E:
Void

History

Document history				
V1.1.1	July 2001	Publication		
V1.2.1	January 2004	Publication		
V1.3.1	November 2004	Publication		
V1.3.2	August 2008	Publication		
V1.4.1	August 2010	Publication		
V1.5.1	April 2012	Publication		
V1.6.1	May 2018	Publication as ETSI TS 100 392-9		
V1.7.0	August 2019	EN Approval Procedure	AP 20191113:	2019-08-15 to 2019-11-13
V1.7.1	April 2020	Publication		