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Part 9: General requirements for supplementary services

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Terrestrial Trunked Radio (TETRA), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document is part 9 of a multi-part deliverable covering Voice plus Data (V+D), as identified below:

EN 300 392-1:   "General network design";

EN 300 392-2:   "Air Interface (AI)";

EN 300 392-3:   "Interworking at the Inter-System Interface (ISI)";

ETS 300 392-4:   "Gateways basic operation";

EN 300 392-5:   "Peripheral Equipment Interface (PEI)";

EN 300 392-7:   "Security";

EN 300 392-9:   "General requirements for supplementary services";

EN 300 392-10:   "Supplementary services stage 1";

EN 300 392-11:   "Supplementary services stage 2";

EN 300 392-12:   "Supplementary services stage 3";

ETS 300 392-13: "SDL model of the Air Interface (AI)";

ETS 300 392-14: "Protocol Implementation Conformance Statement (PICS) proforma specification";

TS 100 392-15:   "TETRA frequency bands, duplex spacings and channel numbering";

TS 100 392-16:   "Network Performance Metrics";

TR 100 392-17:   "TETRA V+D and DMO Release 1.1 specifications";

TS 100 392-18:   "Air interface optimized applications".

NOTE: 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.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

1   Scope

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

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

2   References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:

    - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;

    - for informative references.

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

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

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

2.1   Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

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

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

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

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

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

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

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

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

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

[18]   ITU-T Recommendation Z.100: "Specification and Description Language (SDL)".

[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 Multiple-Octet Coded Character Set (UCS)".

2.2   Informative references

The following referenced documents are not essential to the use of the ETSI deliverable but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

3   Definitions, abbreviations and Functional Entities (FE)

3.1   Definitions

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

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: property of information which is conveyed across the Q_T reference point (as defined in clause 4.3.3 of EN 300 392-1 [1] which uses a call reference which has an associated user-information connection (definition derived from that of the same term in clause 4.9 of ISO/IEC 11582 [12]

call unrelated: property of information which is conveyed across the Q_T reference point (as defined in clause 4.3.3 of EN 300 392-1 [1] which does not use a call reference which has an associated user-information connection (definition derived from that of "call independent" in clause 4.8 of ISO/IEC 11582 [12]

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 just above.

3.2 Abbreviations

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

AL	Ambience Listening
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
AP	Access Priority
APDU	Application Packet Data Unit
AS	Area Selection
BIC	Barring of Incoming Calls
BOC	Barring of Outgoing Calls
CAD	Call Authorized by Dispatcher
CCBS	Call Completion to Busy Subscriber
CCNR	Call Completion on No Reply
CF	Call Forwarding
CI	Call Identification
CR	Call Report
CRT	Call ReTention
CW	Call Waiting
DGNA	Dynamic Group Number Assignment
DL	Discreet Listening
FE	Functional Entity
GSSI	Group Short Subscriber Identity
GTSI	Group TETRA Subscriber Identity
HOLD	call Hold
IC	Include Call
ISI	Inter-System Interface
ITSI	Individual TETRA Subscriber Identity
LE	Late Entry
LS	Line Station
LSC	List Search Call
MNI	Mobile Network Identity

MS	Mobile Station
MS-ISDN	Mobile Station ISDN number
PC	Priority Call
PDU	Protocol Data Unit
PISN	Private Integrated Services Network
PPC	Pre-emptive Priority Call
SAP	Service Access Point
SDL	(Functional) Specification and Description Language
SNA	Short Number Addressing
SS	Supplementary Service

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

SS-AL	Ambience Listening
SS-AP	Access Priority
SS-AS	Area Selection
SS-BIC	Barring of Incoming Calls
SS-BOC	Barring of Outgoing Calls
SS-CAD	Call Authorized by Dispatcher
SS-CFB	Call Forwarding on Busy
SS-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/Connected Line Identification Restriction
SS-COLP	Connected Line Identification Presentation
SS-CW	Call Waiting
SS-DGNA	Dynamic Group Number Assignment
SS-DL	Discreet Listening
SS-IC	Include Call
SS-PC	Priority Call
SS-SNA	Short Number Addressing
SS-TPI	Talking Party Identification
SSI	Short Subscriber Identity
SwMI	Switching and Management Infrastructure
TNCC-SAP	TETRA Network layer Call Control - Service Access Point
TNSS-SAP	TETRA Network layer Supplementary Service - Service Access Point
TPI	Talking Party Identification
TSI	TETRA Subscriber Identity
UCS-2	Universal Character Set coded in 2 octets
ISSI	Individual Short Subscriber Identity
UTF-16BE	Unicode Transformation Format serialized as two bytes in Big-Endian format
V+D	Voice plus Data

3.3   Functional Entities (FE)

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

-     FE1   served user's service agent;

-     FE2   SwMI service control functional entity;

-     FE3   authorized user's service agent;

-     FE5   service agent of the user affected by service operation;

-     FE6   service agent of second listening party;

-     FE7   service agent of dispatcher (in the case of SS-CAD) or of monitoring user (in the case of SS-DL);

-     FE8   service agent of user removed from a call during a pre-emptive priority call;

- FE9   service agent of user informed that another user has been removed from a call during a pre-emptive priority call;

- FE10   service agent of user affected by management functions.

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

4   Supplementary service concepts

4.1   Stage 1, 2 and 3 descriptions

Supplementary service descriptions are covered in 3 stages according to the method described in ITU-T Recommendation I.130 [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 ITU-T Recommendation 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 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 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 an U/D-FACILITY PDU.

7.2 Call related information

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

NOTE: See definition of call related in clause 3.1.

7.2.1   Facility information element general construction

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

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

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

Table 2: Uplink facility information element contents

Information 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 element routeing shall be the following: - same SwMI, if its binary value is equal to 00_2; - end SwMI, if its binary value is equal to 01_2; - home SwMI of called ITSI/GTSI, if its binary value is equal to 10_2; - other SwMI indicated by its MNI value, if its binary value is equal to 11_2. The binary value 10_2 is reserved. NOTE 2: Shall be present if the binary value of the information 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 element routeing.

7.2.2   Notification indicator information element

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

Table 3: Notification indicator information element contents

Information element	Length	Value	Remarks
Notification indicator	6	0	LE broadcast
		1	LE acknowledgement
		2	LE paging
		3	AL operation (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 EN 300 392-2 [2], when an SwMI receives such information element in a (call related) ISI PDU, it will relay it to the MS.

7.3   Call unrelated supplementary service information

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

NOTE: See definition of call unrelated in clause 3.1.

The U/D-FACILITY PDU is used to convey only call unrelated SS PDUs across the air (or LS) 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 annexe E of 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 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 ¾ information element present in the PDU the O-bit shall be followed by the M-bit, refer to EN 300 392-2 [2], annex E.
NOTE 9:	See clause 14.8.35 of 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

SS PDUs are specified in the supplementary service stage 3 descriptions, in 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 (or LS) interface: each SS PDU element is specified to be of type 1, 2 or 3 in the same manner as basic service PDUs and shall be encoded as defined in annex E of 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	Remark
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	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.			

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 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 supported but not the specific SS PDU; or

- ISI problem having occurred.

In the second case above the information element SS PDU type shall be repeated in the SS PDU sent back to the MS by the SwMI where that MS is registered. The second value given to that information element 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 option not supported

Information element	Length	Value	Remarks
SS type	6	any	(See note)
SS PDU type	5	1	
SS PDU type	5		(See note)
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 with an SS PDU using the value "action not supported" and 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, 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	Remark
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 (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 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

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 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 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 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;

- at the LS interface, the MNI shall be that of the SwMI to which LS is connected.

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 TR 102 300-5 [22].

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	Remark
Short number address	8		See SS-SNA ETS 300 392-12-7 [20]

Table 12: Short subscriber identity information element contents

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

Table 13: Extension information element contents

Information element	Length	Value	Remark
Country Code	10		See EN 300 392-1 [1], clause 7 and EN 300 392-2 [2], annex K
Network Code	14		See 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 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)	Remark
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 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 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 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 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 EN 300 392-2 [2] except that the element length can be other than 11 bits.

Table 15: Character string information element contents

Information element	Length	Type	C/O/M	Remark
Text encoding scheme	7	1	M	Refer to 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 element shall indicate the number of bits in the character string information 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 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 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 element shall be as given in EN 300 392-2 [2], clause 29.5.4.1.		
NOTE 2: The length of character string information element shall indicate the number of bits in the character string information element.		
NOTE 3: The mnemonic name information 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 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 shall be as 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 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 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 element	Length	Type	C/O/M	Remark
Number of external subscriber number digits	5	1	M	
External subscriber number digit	4		C	Repeatable (see note)
NOTE: This information element shall be present as many times as indicated by the information 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 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 ITU-T Recommendation E.164 [14].			
NOTE 2: See ITU-T Recommendation X.121 [15].			
NOTE 3: The second parameter is the meaning of the information element type of number 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).			

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 element type of number is actually conditional on the value of the information 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 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 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 elements shall follow with the number type value. NOTE 2: The value of the information element length indicator defines the length in digits of the following digit string information element. NOTE 3: Shall have a length in bits equal to N x 4, N being equal to the value of the preceding information 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 EN 300 392-2 [2].
		etc.	etc.
		255	Refer to annex H of 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 standard shall be able to route the SS PDU(s) which it receives at the air (or LS) interface in a U-FACILITY PDU (see table 4) or in a facility information element (see table 2) in a call related air (or LS) 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 ROSE 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 EN 300 392-2 [2], and clause 7.8.2.1 of 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 PISN number and route the SS PDU to that SwMI (see figure 1).
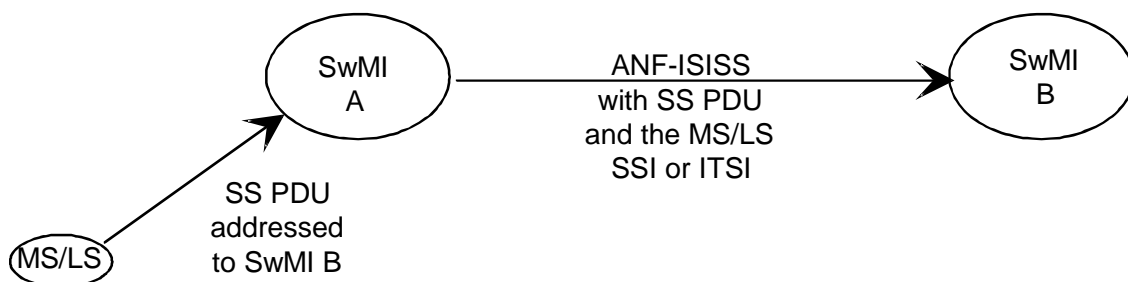
Figure 1: SS PDU addressed by a MS to a distant SwMI

# 9.2   SS PDU sent by a SwMI to a MS

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 PISN number corresponding to the visited SwMI (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.
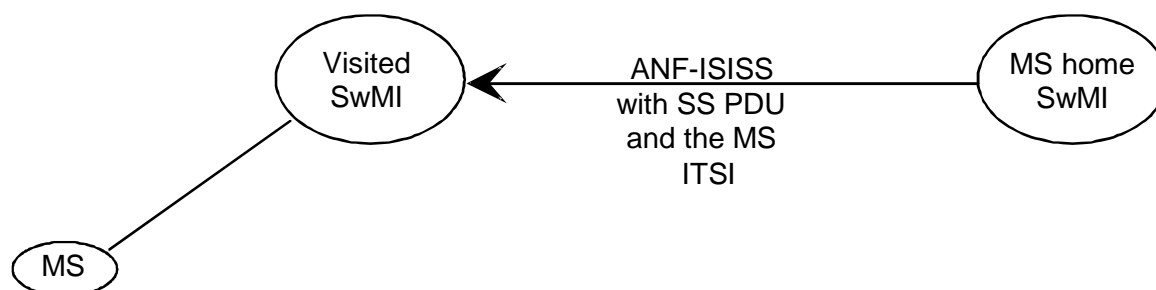
Figure 2: SS PDU addressed individually by a home SwMI to a MS having migrated

- 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 PISN number corresponding to the MNI of the home SwMI, to be used for addressing the invoked ANF-ISISS.

  Figure 3 illustrates the above case.
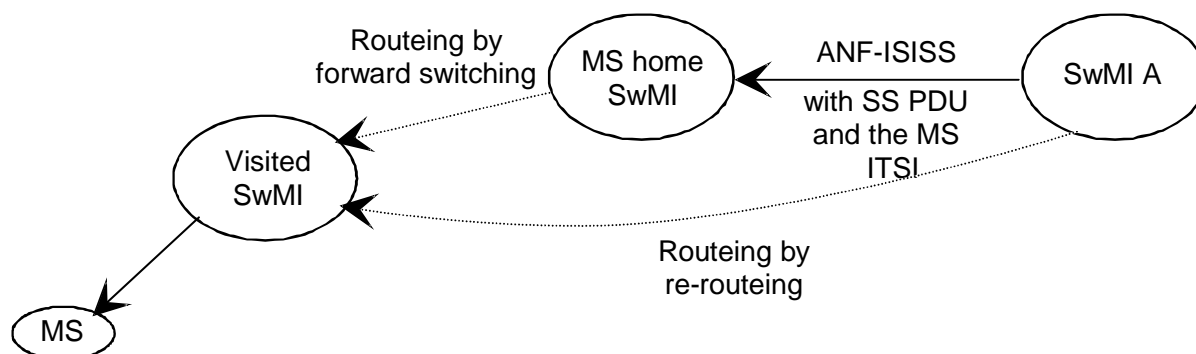
Figure 3: SS PDU addressed individually by an SwMI to an MS

NOTE: Clause 8.3.2 of EN 300 392-3-1 [3] defines how the invoked ANF-ISISS is transported to the MS visited SwMI, in the case where the MS would have migrated.

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 from which SS PDU addressed to the MSs of a group is the group home SwMI.

It shall route the SS PDU(s) internally in sending them to the MSs registered in itself, 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 or to an LS attached to this SwMI.

NOTE 1:   See note 3 of clause 9.3 for the case where the MS would not be (anymore) registered in the SwMI.

At the air (or LS) 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 (or LS) 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 2:   The standard MAC addressing specified in clause 23.4.1.2 of EN 300 392-2 [2], and clause 7.8.2.1 of 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 8.2 of EN 300 392-3-1 [3], the transport of the ANF-ISISS ROSE APDU carrying the SS PDU will be ensured using the connection oriented services of PSS1 GFT control.

9.3.1   Call related SS PDUs

In the case of transport of call related SS PDUs (e.g. received in facility information elements in a call related air (or LS) interface PDU), the standard PSS1 procedure for transporting call related APDUs specified in clause 7.1 of ISO/IEC 11582 [12] will then apply.

NOTE: Whether they are carried by PSS1 basic messages or by PSS1 FACILITY messages, call related APDUs are transported over the signalling connection used for the call.

9.3.2   Call unrelated SS PDUs

In the case of transport of call unrelated SS PDUs (i.e. received in a U-FACILITY PDU), the standard PSS1 procedure for transporting call independent APDUs specified in clause 7.3 of ISO/IEC 11582 [12] will then apply.

In the special case where the invoked ANF-ISISS carries SS PDU(s) either to a MS or to the SwMI where this MS is registered, clause 8.3.2 of EN 300 392-3-1 [3] specifies how the invoked ANF-ISISS is transported to the MS visited SwMI when the MS has migrated.

> NOTE 1:   The PSS1 procedure for transporting call independent APDUs starts by first establishing a signalling connection with the destination SwMI (the abbreviation PINX has been superseded here with SwMI). Clause 8.3.2 of EN 300 392-3-1 [3] specifies how the possible migration of the addressed MS is taken into account in this establishment.
>
> It may also happen that the signalling connection with the destination SwMI has previously been established and not yet released (e.g. call unrelated SS PDU request issued by a MS to a SwMI): the SwMI may then use this signalling connection to send e.g. the corresponding SS PDU response. If this signalling connection has been released, the SwMI may re-establish it using the originating SwMI PISN in the PSS1 (ISI) SETUP message used to establish the original signalling connection.
>
> NOTE 2:   The PSS1 signalling connection is used to send the facility information element carrying the invoked ANF-ISISS, with the destinationEntity and sourceEntity data elements of its Network Facility Extension (NFE) as defined in clause 10.3.
>
> Although clause 7.3.3 of ISO/IEC 11582 [12] does not rule out addressing any PINX crossed by the signalling connection, NFE addressing to the endPINX will generally be used (since the signalling connection has been established to the address of the PINX at the other end).

An ANF-ISISS result or another invoked ANF-ISISS carrying response(s) to SS PDU(s) received in the first invoked ANF-ISISS will also be sent back over a PSS1 signalling connection, using the same NFE addressing mechanism. As mentioned in note 1, this PSS1 signalling connection may be already established.

The same applies in case of errors detected by the destination SwMI when receiving the ROSE APDU used for ANF-ISISS or of rejection by this SwMI of this APDU (see clauses 8.4 and 8.6 of EN 300 392-3-1 [3], and clause 10.3).

> NOTE 3:   In the special case mentioned above (where the invoked ANF-ISISS carries SS PDU(s) addressed to either to a MS which has migrated or to its visited SwMI), if an existing or re-established signalling connection is used and if the MS is not be anymore registered in the SwMI at the other end of the signalling connection, the latter SwMI will send back a specific ANF-ISISS ROSE ReturnError APDU.
>
> The same will hold, with the sending back of another specific ANF-ISISS ROSE ReturnError APDU, in the case where the SwMI cannot reach the MS.
>
> In such cases, especially in the first one, the SwMI wishing to send SS PDUs to the MS should establish the corresponding signalling connection according to the standard procedure specified in clause 8.3.2 of EN 300 392-3-1 [3], which takes into account the possible migration of the addressed MS.

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.
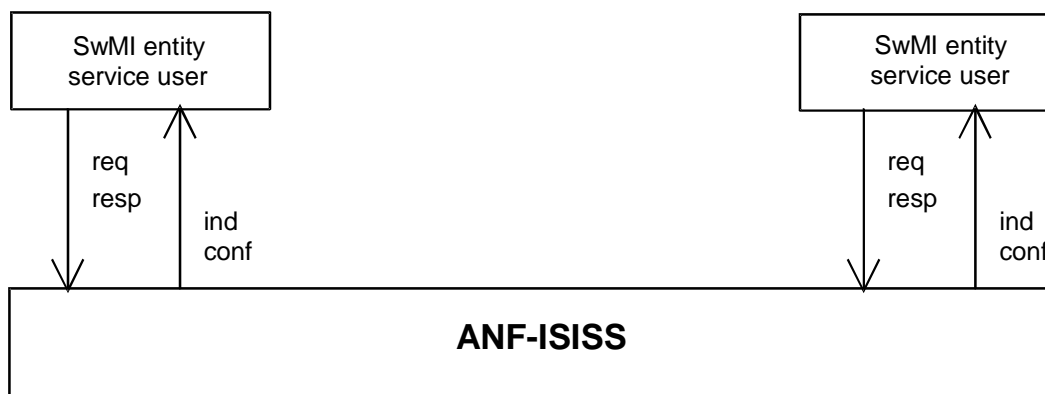

Figure 4: ANF-ISISS service model

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	Remark
ISI SS INFORMATION request/indication	M	(See note 1)
ISI SS INFORMATION response/confirm	O	(See notes 2 and 3)
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 ROSE primitive: - the RO-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 RO-ERROR request/indication with the parameters defined in clause 8.4.3 of EN 300 392-3-1 [3]; - the RO-REJECT-U request/indication or RO-REJECT-P indication, defined in ITU-T Recommendations X.219 [16] and X.229 [17].		
NOTE 3: No ISI SS INFORMATION response exists when the ROSE RO-REJECT-P indication primitive occurs.		

10.3   Protocol

10.3.1   General

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

They shall be included in the tetraMessage data element of the ROSE operation tetraIsiMessage defined in table 10 of EN 300 392-3-1 [3]. This table has been reproduced in the informative annex A.

The resulting ROSE APDU shall be sent in a facility information element in a PSS1 message (see ISO/IEC 11582 [12] clause 10). Depending on whether the SS PDUs are call related or not, they shall be sent either:

- in an ANF-ISISS PDU defined in table 26, with its conveying facility information element being sent in a call related message, which shall be:

    - either a PSS1 basic call message; or

    - a PSS1 FACILITY message.

   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 ROSE APDUs different from those carrying TETRA basic call information (i.e. message or complementary information - see annex B). According to clause 7, ANF-ISISS is not invoked when supplementary service information is included as specific elements or as a notification indicator information element in a basic call TETRA PDU, itself included in a ROSE invoke APDU in a PSS1 call related message.

- in an ANF-ISISS PDU defined in table 27, with its conveying facility information element being sent in a call unrelated message, generally a PSS1 FACILITY message.

   NOTE 2: When the call independent signalling connection to be used to convey such ANF-ISISS PDU does not already exist, that PDU may also be sent with the PSS1 message sent to establish that connection (see clause 8.3.2.2 of EN 300 392-3-1 [3]).

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

NOTE 1:   The ANF-ISISS PDU definitions in tables 26 and 27 are derived from that of the U-FACILITY PDU, in table 4.

NOTE 2:   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 ROSE operation tetraIsiMessage for ANF-ISISS, the destinationEntity and sourceEntity in the argument shall contain the value anfIsiss. And the destinationEntity and the sourceEntity data elements of the NFE in the facility information element shall contain either:

- the value endPINX; or

- the value anyTypeOfPINX. If it is the destinationEntity which contains this value, the destinationEntityAddress shall then contain a PISN number corresponding to the destination SwMI; and if it is the sourceEntity, sourceEntityAddress shall then contain a PISN number corresponding to the source SwMI.

NOTE 3:   An example of the use of the value anyTypeOfPINX for the destinationEntity in an NFE is for the SS-CAD call related ACCEPT PDU when it is sent over the ISI. This corresponds to the case where the dispatcher is registered in another SwMI than the SS-CAD intercepting SwMI and the call has been diverted to the dispatcher (i.e. the call has first been established with the dispatcher). In this case, the dispatcher MS sends the SS PDU ACCEPT PDU over the air (or LS) interface in indicating to the SwMI which receives it that this PDU has to be routed to the SS-CAD intercepting SwMI, in giving the MNI of the latter SwMI. According to clause 9.1, the former SwMI (i.e. where the dispatcher MS is registered) will determine a PISN number corresponding to this SwMI, and it will route the ANF-ISISS invoked to carry the SS-CAD ACCEPT PDU with an NFE having the value anyTypeOfPINX for the destinationEntity and its destinationEntityAddress containing the PISN number corresponding to the SS-CAD intercepting SwMI MNI.

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 transport more than one SS PDU in a single ANF-ISISS ROSE Invoke APDU.

NOTE 1:   According to figure 14 of ISO/IEC 11582 [12] only SS PDUs for which the same NFE and interpretation APDU apply may be grouped in this single Invoke APDU.

This single Invoke APDU should not include SS PDUs addressed to different MSs or to their visited SwMIs, since according to the definition of the ROSE operation errors in clause 8.4.3 of EN 300 392-3-1 [3], it would not be possible to indicate to the originating SwMI that more than one MS are not registered in the destination SwMI or cannot be reached.

According to clause 11.3.3 of ISO/IEC 11582 [12], which states that more than one ROSE APDU may be included in a single facility information element, it shall be possible to include an ANF-ISISS ROSE APDU together with another ROSE APDU carrying TETRA basic call information.

NOTE 2:   Depending on whether this TETRA basic call information is complementary information or a TETRA message, the PSS1 message used to send the facility information element including both ROSE APDUs will be a PSS1 basic call message (e.g. SETUP) or a FACILITY message, respectively.

However such grouping of ROSE APDUs in a single facility information element shall only be possible when both the NFE and the interpretation APDU of this facility information element apply to each of these ROSE APDUs. Notably if two different interpretation APDUs are to be used for two ANF-ISISS ROSE APDUs, these ROSE APDUs shall have to be included in two different facility information elements.

NOTE 3:   The maximum length constraint for PSS1 message may limit the possibility of sending many ROSE APDUs in a single PSS1 message, whether grouped in a single facility information element or sent in two or more facility information elements.

          As indicated in annex B of EN 300 392-3-1 [3], the length limitation of 255 octets for the contents of the facility information element will not be a constraint when the maximum message length supported by a given PISN is 260 octets (which is the minimum value set in annex ZA of ISO/IEC 11572 [11]).

Annex B illustrates the above in giving examples of the inclusion of more than one ROSE APDU in PSS1 messages.

As defined in table 22, the primitive ISI SS INFORMATION response/confirm may be used to respond positively to a previous ISI SS INFORMATION request/indication. A ROSE ReturnResult APDU shall then be sent. This shall be defined per supplementary service, in the relevant standards. However when a positive reply is required for a given SS PDU, it shall not be possible to transport another SS PDU in the same ANF-ISISS ROSE Invoke APDU.

NOTE 4: Otherwise a problem would arise in case of failure due to the latter SS PDU (e.g. corresponding supplementary service or simply corresponding supplementary service option not supported), since the ROSE services do not allow to return both a positive and a negative reply for a given operation.

10.3.3 Interpretation APDU

The interpretation APDU shall be omitted except in the specific case below.

This specific case is when the ANF-ISISS PDU(s) conveyed by a ROSE Invoke APDU is (are) call related and when it (they) carries (carry) PDU(s) related to supplementary service(s) of which the specification of the related operation(s) states that the call shall be cleared if the supplementary service cannot be supported for this call. In this case an interpretation APDU with the value "clearCallIfAnyInvokePduNotRecognized" shall be sent together with the ROSE Invoke APDU.

NOTE 1: According to clause 8.1.2 of ISO/IEC 11582 [12], the co-ordination function will then clear the call if the ROSE Invoke APDU is rejected by some user entity of the receiving ROSE entity and the corresponding Reject APDU is of type InvokeProblem and has the value unrecognizedOperation.

NOTE 2: According to ITU-T Recommendation X.229 [17] the element problem in the Reject APDU can be of type InvokeProblem only when the rejection has been decided by an entity different from the ROSE entity (e.g. co-ordination function, ANF-ISISS entity or supplementary service control entity). While there may be other causes for such entity to reject an Invoke APDU in giving a reason of type InvokeProblem with value unrecognizedOperation for this rejection, the main one is when there is no ANF-ISISS entity, i.e. ANF-ISISS is not supported in the receiving SwMI.

As stated in clause 8.6 of EN 300 392-3-1 [3], this case will be identified by the co-ordination function.

NOTE 3: Any supplementary service control entity of an SwMI complying with the present document will recognize at least the SS type information element of the SS PDU(s) sent. Consequently if the destination SwMI supplementary service control entity does not support the supplementary service for which ANF-ISISS has been invoked, it should not reject it (see clause 11.1.1). However if it did it, this would not be a problem, since it would result in the corresponding Reject APDU being also of type InvokeProblem with the value unrecognizedOperation, exactly as when no ANF-ISISS entity exists. As a result, the call would also be cleared if an interpretation APDU with the value "clearCallIfAnyInvokePduNotRecognized" had been sent together with the ROSE Invoke APDU.

11 Exceptional cases

11.1 ISI exceptional cases

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 ROSE invoke APDU has been segmented;

2)   another type of error among those listed in clause 8.4.3 of EN 300 392-3-1 [3] than those in cases a), b) and d.1);

3)   a ROSE Invoke APDU has been determined as being invalid.

According to clause 8.4.3 of EN 300 392-3-1 [3], in the above cases ROSE ReturnError or Reject APDUs with the appropriate error values will be received by the SwMI which has sent the corresponding ANF-ISISS ROSE Invoke APDU:

- ReturnError APDUs in cases a), 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 where the SwMI which has sent the corresponding ANF-ISISS ROSE 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 (or LS) 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).

NOTE: Since the error incompleteTetraPdu can only occur if the ROSE APDU has been segmented, according to clause 8.5.1 of EN 300 392-3-1 [3], it cannot occur if this APDU has been sent in a PSS1 basic call message.

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

11.1.1   Case a)

According to clause 8.4.3 of EN 300 392-3-1 [3], in case a) a ReturnError APDU will be returned with the error value corresponding to itsiNotRegistered or to itsiNotReachable.

11.1.1.1   Call unrelated ANF-ISISS PDU

If case a) arises with a call unrelated ANF-ISISS PDU and an already established PSS1 call independent signalling connection has been used to carry such PDU, clause 8.3.2.2.2 of EN 300 392-3-1 [3] shall apply.

Otherwise, 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.

NOTE: When an MS is not anymore registered in an SwMI during an individual call, this will result either in call restoration in the new SwMI where the MS has migrated, or in the call being cleared.

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 ReturnError APDU with the error value corresponding to itsiNotReachable: either

- in a PSS1 DISCONNECT message if it decides to clear the call; or

- in another PSS1 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 8.4.3 of EN 300 392-3-1 [3], the supplementary service control entity in the receiving SwMI will request the ROSE entity (through ANF-ISISS) to send a 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 ReturnError APDU (with the error value corresponding to "requestNotSupported") in another PSS1 message than a PSS1 clearing 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 ReturnError APDU with the error value corresponding to "requestNotSupported" in the PSS1 DISCONNECT or 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 RequestError 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 must be 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)

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

In case c) the ROSE Invoke APDU invalidity will be determined by the co-ordination function. According to clause 8.6 of EN 300 392-3-1 [3], the latter will request the ROSE entity to send a Reject APDU of type Invoke Problem with the value unrecognizedOperation.

NOTE 1: More generally, the latter requirement is specified in ITU-T Recommendation X.229 [17].

See clause 10.3.3 for the case where the invocation of ANF-ISISS has been call related and where the specification of the related supplementary service operation states that the call shall be cleared if the supplementary service cannot be supported for this call.

When the ANF-ISISS entity in the source SwMI receives a Reject APDU for a call related invoked ANF-ISISS in another PSS1 message than a DISCONNECT i.e. the corresponding call has not been cleared by the other SwMI, this

ANF-ISISS entity shall pass this Reject APDU to the supplementary service control entity in the source SwMI. This supplementary service control entity should then let the call continue.

NOTE 2:   There is no need for the supplementary service control entity of the source SwMI to clear the call because if the specification of at least one of the supplementary services concerned mandates that the call has to be cleared if such supplementary service is not supported, the receiving SwMI (more precisely its co-ordination function) would have cleared it, see clause 10.3.3.

11.1.4   Case d)

NOTE: According to clause 8.4.3 of EN 300 392-3-1 [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 ROSE 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 8.4.3 of EN 300 392-3-1 [3], a 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)

According to ITU-T Recommendations X.219 [16] and X.229 [17] the invalidity of a ROSE Invoke APDU is determined either by the ROSE entity itself or by another entity, e.g. the co-ordination function, ANF-ISISS entity or supplementary service control entity. In both cases this ROSE entity will send a Reject APDU with the appropriate problem parameter value as defined in ITU-T Recommendation X.229 [17]. The difference being that in the first case, the sending of the Reject APDU is initiated by the ROSE entity itself, while in the second case, it is initiated by the entity which has determined the invalidity of ROSE Invoke APDU (through the ANF-ISISS entity and the co-ordination function if this entity is a third one).

When the source SwMI receives such Reject APDU corresponding to case d.3, it should retransmit the corresponding ANF-ISISS ROSE 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 ROSE Invoke APDU is different from 1 (see table A.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 ROSE 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 a ROSE 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 (or LS) interface

11.2.1   No ISI involved

When an MS has sent an SS PDU to the SwMI where it is registered (or an LS, to the SwMI where it is attached), 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 (or an LS, to the SwMI where it is attached) 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 second information element in the reject SS PDU shall be:

- equal to 00000_2 if either:

    - a 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 if a 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 second 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 (see table 6).

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

12.1   Stage 2 description

A standard text with figures and tables is suggested in annex C for the stage 2 description of activation/deactivation, definition and interrogation operations of TETRA supplementary services: it covers the corresponding information flows and the related functional entity actions.

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 EN/ETS 300 392-11 [8].

NOTE: Neither annex C nor the above text address the case where different types of definition and/or interrogation operations apply for a given supplementary service, e.g. SS-TPI interrogation by identity or by name.

12.2   Stage 3 description

A standard text with figures and tables is suggested in annex D for the stage 3 description of activation/deactivation, definition and interrogation procedures of TETRA supplementary services.

NOTE: The case of assignment of definition to a managed user has not been addressed: it arises only for few supplementary services (e.g. SS-AP or SS-DGNA).

The corresponding annex suggested for the SDL representation of those procedures is annex E.

The introduction in this annex has been written for the purpose of introducing only the SDL diagrams representing the activation/deactivation, definition and interrogation procedures

Since in general if an annex on SDL representation of procedures is included in a stage 3 description standard, it will cover not only the activation/deactivation, definition and interrogation procedures but also the invocation and operation procedures, a more general text has been proposed in annex F for the introduction of such annex. This introduction thus covers both call unrelated and call related procedures. Actually it would also apply for an annex on SDL representation of the invocation and operation procedures only.

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.
NOTE 1: According to 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

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

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 class.

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 ROSE operation

Table A.1 reproduces table 10 of EN 300 392-3-1 [3]. In case of discrepancy, the latter applies.

Table A.1: ROSE operation in support of TETRA encoding PDU

```
TetraIsiOperation {ccitt (0) identified-organization (4) etsi (0) tetra(392) isi-encoding-operation(0)}


DEFINITIONS EXPLICIT TAGS ::=

BEGIN

IMPORTS     OPERATION, ERROR FROM Remote-Operations-Notation

        {joint-iso-ccitt (2) remote-operations (4) notation (0) };


TetraIsiMessage::= OPERATION

            -- TETRA ANF-ISI message encoded in the argument

ARGUMENT  IsiArgument

RESULT      IsiResult

ERRORS      { incompleteTetraPDU, requestNotSupported, invalidInfoElement, unspecified}


-- Definition of general used data types:

IsiArgument

::= SEQUENCE  {

    sourceEntity      [0] IMPLICIT AnfSubEntity,

    destinationEntity [1] IMPLICIT AnfSubEntity,

    tetraMessage      [2] IMPLICIT OCTET STRING

        }

IsiResult

::= CHOICE {

        NULL,

        IsiArgument

        }

incompleteTetraPdu    ERROR

        PARAMETER ErrorOctetString

        ::=1

itsiNotRegistered     ERROR

        ::=2
```

itsiNotReachable   ERROR

    ::=3

requestNotSupported ERROR

    PARAMETER ErrorRequestNotSupported

    ::=4

invalidInfoElement ERROR

    PARAMETER ErrorInvalidInfo

    ::=5

unspecified   ERROR

    ::= 0

AnfSubEntity   ::= ENUMERATED {anfIsiss (1), anfIsimm (2), anfIsiic (3), anfIsigc (4), anfIsisd (5), anfIsiCallUnrelatedSignalling (6)}

ErrorOctetString

 ::= SEQUENCE {

  octetstring[0] IMPLICIT OCTETSTRING

   }

ErrorRequestNotSupported

 ::= CHOICE {

  mmRequestNotSupprted   MMRequestNotSupported,

  ssRequestNotSupprted   SSRequestNotSupported

  }

MMRequestNotSupported

 ::= [0] IMPLICIT OCTET STRING

SSRequestNotSupported

 ::= CHOICE   {

  [1] IMPLICIT ListSSNotSupported,

  [2] IMPLICIT ListSSActionNotSupported,

  [3] IMPLICIT CombinedSSListNotSupported

   }

ListSSNotSupported   ::= OCTET STRING

ListSSActionNotSupported

 ::= CHOICE   {

  [4] IMPLICIT SSActionNotSupported,

  [5] IMPLICIT SEQUENCE OF SSActionNotSupported

   }

SSActionNotSupported

   ::= SEQUENCE {

     ssType   [6] IMPLICIT OCTET STRING,

     ssPduType   [7] IMPLICIT OCTET STRING

      }

CombinedSSListNotSupported

   ::= SEQUENCE {

     listSSNotSupported   ListSSNotSupported,

     listSSActionNotSupported   ListSSActionNotSupported

      }

ErrorInvalidInfo

   ::= CHOICE   {

     [0] IMPLICIT InvalidInfoType,

     [1] IMPLICIT SEQUENCE OF InvalidInfoType

      }

InvalidInfoType

   ::= SEQUENCE {

     PDUIndicator   [2] IMPLICIT OCTET STRING,

     elementType   [3] IMPLICIT INTEGER (1..3),

     elementPosition   [4] IMPLICIT INTEGER

      }

tetraIsiMessage   TetraIsiMessage ::= 1

END -- OF TetraIsiOperation

Annex B (informative):
Examples of inclusion of ANF-ISISS ROSE APDUs or PSS1 messages

As stated in clause 10.3, there are three different cases for sending ANF-ISISS in PSS1 messages.

B.1 Call unrelated PSS1 FACILITY message

If more than one supplementary service PDUs are to be sent in a call unrelated PSS1 FACILITY message, they may all be carried in the same ANF-ISISS ROSE APDU. This is illustrated in table B.1.

Table B.1: Example of encoding an ANF-ISISS ROSE APDU
in a call unrelated PSS1 FACILITY message

PSS1 FACILITY message	M/O	Length	Note
Protocol discriminator	M	1	
Call reference	M	1	
Message type	M	1	
Facility information element			
Identifier	M	1	
Length	M	1	
Protocol profile (Networking Extensions)	M	1	
NFE	M	8	1
Network Protocol Profile	O	0/3	2
Interpretation APDU	-	0	3
Service APDU: ANF-ISISS ROSE APDU			
END of facility information element			
END of PSS1 FACILITY message			

NOTE 1:	According to clause 10.3.1, the destinationEntity and the sourceEntity data elements of the NFE information element contain either the value endPINX or the value anyTypeOfPINX, with the corresponding destinationEntityAddress or sourceEntityAddress being a PISN number. The length of 8 octets indicated in the table for the NFE information corresponds to the case where the destinationEntity and the sourceEntity data elements both contain the value endPINX.
NOTE 2:	The Network protocol profile is not included for a ROSE APDU (0 octet). It is included for SSE segment, in that case it is encoded in 3 octets.
NOTE 3:	According to clause 10.3.3, the Interpretation APDU information element is omitted in the case of call unrelated ANF-ISISS.

If more than one supplementary service PDUs are to be sent in a call unrelated PSS1 FACILITY message, they may all be carried in the same facility information element but in different ANF-ISISS ROSE APDUs. This is illustrated in table B.2.

**Table B.2: Example of encoding two ANF-ISISS ROSE APDUs
in a call unrelated PSS1 FACILITY message**

PSS1 FACILITY message	M/O	Length	Note
Protocol discriminator	M	1	
Call reference	M	1	
Message type	M	1	
Facility information element			
Identifier	M	1	
Length	M	1	
Protocol profile (Networking Extensions)	M	1	
NFE	M	8	1
Network Protocol Profile	O	0	2
Interpretation APDU	-	0	3
Service APDU: ANF-ISISS ROSE APDU 1			
Service APDU: ANF-ISISS ROSE APDU 2			
END of facility information element			
END of PSS1 FACILITY message			

NOTE 1:	According to clause 10.3.1, the destinationEntity and the sourceEntity data elements of the NFE information element contain either the value endPINX or the value anyTypeOfPINX, with the corresponding destinationEntityAddress or sourceEntityAddress being a PISN number. The length of 8 octets indicated in the table for the NFE information corresponds to the case where the destinationEntity and the sourceEntity data elements both contain the value endPINX.
NOTE 2:	In accordance with clause 11.3.3 of ISO/IEC 11582 [12], only one type of service APDU may be included in the same facility information element. Since it is impossible to have both ANF-ISISS APDU 1 and 2 segmented, both are to be non-segmented APDUs. The Network protocol profile is thus the default one, that for ROSE APDU(s).
NOTE 3:	According to clause 10.3.3, the Interpretation APDU information element is omitted in the case of call unrelated ANF-ISISS.

B.2   Call related PSS1 FACILITY message

If more than one supplementary service PDUs are to be sent in a call related PSS1 FACILITY message, two different ANF-ISISS may be invoked, one including the SS-PDUs corresponding to the supplementary services which have to be supported by the receiving SwMI for the call to continue, and the second, with the remaining SS-PDUs. This is illustrated in table B.3.

**Table B.3: Example of encoding two ANF-ISISS ROSE APDUs
in a call related PSS1 FACILITY message**

PSS1 FACILITY message	M/O	Length	Note
Protocol discriminator	M	1	
Call reference	M	3	1
Message type	M	1	
Facility information element 1			
Identifier	M	1	
Length	M	1	
Protocol profile (Networking Extensions)	M	1	
NFE	M	8	2
Network Protocol Profile	O	0	3
Interpretation APDU	O	0	4
Service APDU: ANF-ISISS ROSE APDU 1			
END of facility information element 1			
Facility information element 2			
Identifier	M	1	
Length	M	1	
Protocol profile (Networking Extensions)	M	1	
NFE	M	8	2
Network Protocol Profile	O	0/3	5
Interpretation APDU	O	0	4
Service APDU: ANF-ISISS ROSE APDU 2 or SSE segment			
END of facility information element 2			
END of PSS1 FACILITY message			

NOTE 1:	In call related message the call reference value in encoded in 3 octets.
NOTE 2:	According to clause 10.3.1, the destinationEntity and the sourceEntity data elements of the NFE information element contain either the value endPINX or the value anyTypeOfPINX, with the corresponding destinationEntityAddress or sourceEntityAddress being a PISN number. The length of 8 octets indicated in the table for the NFE information corresponds to the case where the destinationEntity and the sourceEntity data elements both contain the value endPINX.
NOTE 3:	The Network protocol profile is the default one, that for ROSE APDU(s).
NOTE 4:	According to clause 10.3.3, the Interpretation APDU information element is omitted or included with the value "clearCallIfAnyInvokedPduNotRecognized". In this example it is omitted.
NOTE 5:	The Network protocol profile is not included for a ROSE APDU (0 octet). It is included for SSE segment, in that case it is encoded in 3 octets.

B.3   ANF-ISIIC PSS1 basic call message

Table B.4 illustrates the same case of sending two ANF-ISISS ROSE APDUs in the same message, when this message is the PSS1 SETUP message for an individual call.

**Table B.4: Example of encoding two ANF-ISISS ROSE APDUs
in a PSS1 SETUP message for an individual call**

PSS1 SETUP message	M/O	Length	Note
Protocol discriminator	M	1	
Call reference	M	3	1
Message type	M	1	
Sending complete	O	1	
Bearer capability	M	4	
Channel Id	M	6	
Progress	O	0	2
Calling PN (SwMI PISN)	M	21	3
Calling subaddress	-	0	
Called PN (SwMI PISN)	M	21	3
Called subaddress	-	0	
Low layer compatibility	-	0	
High layer compatibility	-	0	
Facility information element 1			
Identifier	M	1	
Length	M	1	
Protocol profile (Networking Extensions)	M	1	
NFE	M	8	4
Network Protocol Profile	-	0	5
Interpretation APDU	O	3	6
Service APDU: ANF-ISIIC ROSE APDU 1			
END of facility information element 1			
Facility information element 2			
Identifier	M	1	
Length	M	1	
Protocol profile (Networking Extensions)	M	1	
NFE	M	8	4
Network Protocol Profile	-	0	5
Interpretation APDU	O	0	7
Service APDU: ANF-ISISS ROSE APDU 1			
END of facility information element 2			
Facility information element 3			
Identifier	M	1	
Length	M	1	
Protocol profile (Networking Extensions)	M	1	
NFE	M	8	4
Network Protocol Profile	-	0	5
Interpretation APDU	O	3	7
Service APDU: ANF-ISISS ROSE APDU 2			
END of facility information element 3			
END of PSS1 SETUP message			

NOTE 1: The call reference is encoded in 3 octets because the PSS1 message is call related.
NOTE 2: In this example it is proposed not to include optional information element.
NOTE 3: According to the relevant ITU-T Recommendations, the maximum length of a PSTN international number is 15 digits (and 12 for a national number), then it is necessary to add 3 digits for the prefix before the international number. The length of the heading (identifiers, length) of the PSS1 called party number information element is 3 octets, to which we add 1 octet per digit.
NOTE 4: According to clause 10.3.1, the destinationEntity and the sourceEntity data elements of the NFE information element contain either the value endPINX or the value anyTypeOfPINX, with the corresponding destinationEntityAddress or sourceEntityAddress being a PISN number. The length of 8 octets indicated in the table for the NFE information corresponds to the case where the destinationEntity and the sourceEntity data elements both contain the value endPINX.
NOTE 5: According to clause 8.5.1, ROSE APDU sent in a PSS1 basic call message is not segmented. The Network protocol profile is thus the default one, that for ROSE APDU(s).
NOTE 6: According EN 300 392-3-2 [4], clause 6.3.3, the Interpretation APDU shall be included with the value "clearCallIfAnyInvokePduNotRecognized".
NOTE 7: According to clause 10.3.3, the interpretation APDU is included with the value "clearCallIfAnyInvokePduNotRecognized" or it is omitted. When included its length is 3 octets (while it is obviously 0 octet when it is omitted).

Annex C (informative):
Introduction suggested to an annex on SDL representation of call-related and call-unrelated procedures

The text below is an introduction suggested to an annex on SDL representation of call related and call unrelated procedures in supplementary services:

The diagrams in this annex use the Specification and Description Language defined in ITU-T Recommendation Z.100 [18].

Each diagram represents the behaviour of a supplementary service control entity either in a MS or in an SwMI.

Some SwMI diagrams dealing with supplementary service invocation or operation will actually represent the behaviour of two supplementary service control entities, each one operating to control either a SwMI (at the ISI) or a MS (at the air interface for a MS, and its equivalent for a LS) when another user than the served user is involved in the supplementary service invocation or operation or when the SwMI has to inter-work with another SwMI for such invocation or operation.

In accordance with the protocol model described in clause 14 of EN 300 392-2 [2], the supplementary service control entity at a MS uses the services of the V+D air interface control. The same applies for the supplementary service control entity at the SwMI where the MS is registered. If this SwMI or any other operate at the ISI, in accordance with the protocol model described in clause 8 of EN 300 392-3-1 [3], their supplementary service control entities use, via the co-ordination function, the services of ANF-ISISS for the corresponding supplementary service ISI protocols.

For MS call related diagrams, where an output symbol represents a primitive resulting from a message being received, this symbol bears the name of this message and of any SS-XXX PDU received with this message.

The basic call actions associated with the sending and receiving of the air interface PDUs specified in EN 300 392-2 [2] are deemed to occur. The same applies for basic call actions associated with the sending and receiving of:

-    of the ANF-ISIGC PDUs which will be specified in EN 300 392-3-3 [5]; and

-    of the ANF-ISIIC PDUs which will be specified in EN 300 392-3-2 [4].

All PDUs with no prefix specifying whether they are air interface (or LS) PDUs or ISI PDUs are to be understood as being air interface (or LS) PDUs if the users to which they are addressed are registered in the same SwMI, and as ISI PDUs otherwise.

Annex D (informative):
Change requests

The present document contains Change requests as identified in table D.1.

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

Annex E (informative):
Bibliography

- ISO/IEC 8859-1: "Information technology - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No. 1".

- ISO/IEC 8859-2: "Information technology - 8-bit single-byte coded graphic character sets - Part 2: Latin alphabet No. 2".

- ISO/IEC 8859-3: "Information processing - 8-bit single-byte coded graphic character sets - Part 3: Latin alphabet No. 3".

- ISO/IEC 8859-4: "Information processing - 8-bit single-byte coded graphic character sets - Part 4: Latin alphabet No. 4".

- ISO/IEC 8859-5: "Information technology - 8-bit single-byte coded graphic character sets -Part 5: Latin/Cyrillic alphabet".

- ISO/IEC 8859-6: "Information technology - 8-bit single-byte coded graphic character sets - Part 6: Latin/Arabic alphabet".

- ISO/IEC 8859-7: "Information technology - 8-bit single-byte coded graphic character sets - Part 7: Latin/Greek alphabet".

- ISO/IEC 8859-8: "Information technology - 8-bit single-byte coded graphic character sets - Part 8: Latin/Hebrew alphabet".

- ISO/IEC 8859-9: "Information technology - 8-bit single-byte coded graphic character sets - Part 9: Latin alphabet No. 5".

- ISO/IEC 8859-10: "Information technology - 8-bit single-byte coded graphic character sets - Part 10: Latin alphabet No. 6".

- ISO/IEC 8859-13: "Information technology - 8-bit single-byte coded graphic character sets - Part 13: Latin alphabet No. 7".

- ISO/IEC 8859-14: "Information technology - 8-bit single-byte coded graphic character sets - Part 14: Latin alphabet No. 8 (Celtic)".

- ISO/IEC 8859-15: "Information technology - 8-bit single-byte coded graphic character sets - Part 15: Latin alphabet No. 9".

History

Document history			
V1.1.1	July 2001	Publication	
V1.2.1	January 2004	Publication	
V1.3.1	November 2004	Publication	
V1.3.2	April 2008	One-step Approval Procedure	OAP 20080815: 2008-04-16 to 2008-08-15