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**Terrestrial Trunked Radio (TETRA);
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Part 9: General requirements for Supplementary Services (SS)**

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE

Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE

Internet: secretariat@etsi.fr - <http://www.etsi.fr> - <http://www.etsi.org>

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

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Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Terrestrial Trunked Radio (TETRA) Project of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

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

- Part 1: "General network design".
- Part 2: "Air Interface (AI)".
- Part 3: "Inter-System Inter-working (ISI)".
- Part 4: "Gateways".
- Part 5: "Peripheral Equipment Interface (PEI)".
- Part 6: "Line connected Station (LS)", (DE/TETRA-03001-6).
- Part 7: "Security".
- Part 9: "General requirements for Supplementary Services (SS)".**
- Part 10: "Supplementary Services (SS) stage 1".
- Part 11: "Supplementary Services (SS) stage 2".
- Part 12: "Supplementary Services (SS) stage 3".
- Part 13: "SDL model of the Air Interface (AI)".
- Part 14: "Protocol Implementation Conformance Statement (PICS) proforma specification".

Proposed transposition dates	
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1 Scope

This European Telecommunication Standard (ETS) defines principles and requirements generally applicable to the stage 2 and 3 descriptions of supplementary services for the Terrestrial Trunked Radio (TETRA).

This ETS 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 routing 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 Normative references

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

- [1] ETS 300 392-1: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".
- [2] ETS 300 392-2: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [3] ETS 300 392-3-1 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Inter-System Inter-working (ISI); Sub-part: 1: General design".
- [4] ETS 300 392-3-2 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Inter-System Inter-working (ISI); Sub-part: 2: Additional Network Functions Individual Call (ANF-ISIIC)".
- [5] ETS 300 392-3-3 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Inter-System Inter-working (ISI); Sub-part: 3: Additional Network Functions Group Call (ANF-ISIGC)".
- [6] ETS 300 392-7: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 7: Security".
- [7] ETS 300 392-10: "Radio Equipment and Systems (RES); Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1".
- [8] ETS 300 392-10-5: "Radio Equipment and Systems (RES); Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Part 10-05: List search call".
- [9] ETS 300 392-11 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 11: Supplementary Services (SS) stage 2".
- [10] ETS 300 392-12 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary Services (SS) stage 3".
- [11] ETS 300 900: "Digital cellular telecommunication system (Phase 2+); Alphabets and language specific information (GSM 03.38 version 5.5.1)".
- [12] ISO 8859-1 (1987): "Information processing - 8-bit single byte coded graphic character sets - Part 1: Latin alphabet No. 1".

- [13] ISO/IEC 11572 (1997): "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol".
- [14] ISO/IEC 11582 (1995): "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Generic functional protocol for the support of supplementary services - Inter-exchange signalling procedures and protocol".
- [15] ISO/IEC 10646: "Information technology - Universal Multiple-Octet Coded Character Set (UCS)".
- [16] CCITT Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [17] ITU-T Recommendation X.219 (1988): "Remote operations: Model, notation and service definition".
- [18] ITU-T Recommendation X.229 (1988): "Remote operations: Protocol specification".
- [19] ITU-T Recommendation Z.100 (1993): "CCITT specification and description language (SDL)".

3 Definitions and abbreviations

3.1 Definitions

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

authorized user: The user who is responsible for the definition, activation and deactivation of the service. The authorized user may also interrogate the service.

affected user: The user who is subject to the operation.

call related: A property of information which is conveyed across the Q_T reference point (as defined in subclause 4.3.3 of ETS 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 subclause 4.9 of ISO/IEC 11582 [14]).

call unrelated: A property of information which is conveyed across the Q_T reference point (as defined in subclause 4.3.3 of ETS 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 subclause 4.8 of ISO/IEC 11582 [14]).

served user: The user for whom the supplementary service is invoked.

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

3.2 Abbreviations

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

CMCE	Circuit Mode Control entity
FE	Functional Entity
GTSI	Group TETRA Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
LS	Line Station
MS	Mobile Station
SAP	Service Access Point
SDL	(Functional) Specification and Description Language
SS	Supplementary Service

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

SS-AL	Ambience Listening
SS-AoC	Advice of Charge
SS-AP	Access Priority
SS-AS	Area Selection
SS-BIC	Barring of Incoming Calls
SS-BOC	Barring of Outgoing Calls
SS-CAD	Call Authorized by Dispatcher
SS-CCBS	Call Completion to Busy Subscriber
SS-CCNR	Call Completion on No Reply
SS-CFB	Call Forwarding on Busy
SS-CFNRY	Call Forwarding on No Reply
SS-CFNRC	Call Forwarding on Mobile Subscriber Not Reachable
SS-CFU	Call Forwarding Unconditional
SS-CI	Call Identification
SS-CLIP	Calling Line Identification Presentation
SS-CLIR	Calling/Connected Line Identification Restriction
SS-COLP	Connected Line Identification Presentation
SS-CR	Call Report
SS-CRT	Call Retention
SS-CW	Call Waiting
SS-DGNA	Dynamic Group Number Assignment
SS-DL	Discreet Listening
SS-HOLD	Call Hold
SS-IC	Include Call
SS-LE	Late Entry
SS-LSC	List Search Call
SS-PC	Priority Call
SS-PPC	Pre-emptive Priority Call
SS-SNA	Short Number Addressing
SS-TC	Transfer of Control
SS-TPI	Talking Party Identification
SwMI	Switching and Management Infrastructure
TETRA	Terrestrial Trunked Radio
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 shall 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 dispatcher's service agent;
- FE8 service agent of user removed from a call during a pre-emptive priority call;
- FE9 service agent of user informed that another user has been removed from a call during a pre-emptive priority call;
- FE10 service agent of user affected by management functions.

FE2, the SwMI functional entity, may be split into secondary FEs when needed for a given supplementary service. These FEs are called FE2x in the corresponding stage 2 description (in the related ETS 300 392-11 [9]). Examples of this splitting are given in annex B, subclause B.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 CCITT Recommendation I.130 [16], each stage in a separate document. The contents of each stage description are described in the following subclauses.

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. This specification 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 CCITT Recommendation I.130 [16], the stage 3 description of any telecommunication service addresses the network implementation aspects. Consequently it comprises two steps, the specifications of all protocols at the various reference points involved in any of the service procedures (notably the service operation) are the first step of the stage 3 description, and the specifications of the functions of the corresponding network entities are its second step.

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

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

4.2 Concepts associated with supplementary services

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

5 Service primitives

Primitives are specified for each supplementary service at the TNSS Service Access Point (TNSS-SAP), in a specific clause of the corresponding stage 3 description in ETS 300 392-12 [10].

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 parameter, 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).

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.

Table 1: Supplementary service invocation order

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

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

7.1 Methods of transportation

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

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

7.2 Call related information

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

NOTE: See definition of call related in subclause 3.1.

7.2.1 Facility information element general construction

The facility information element is a Type 3 CC PDU element as defined in subclause 14.7 of ETS 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 subclause 14.7 of ETS 300 392-2 [2] shall apply for the definition of the facility information element. Notably according to table 132 of ETS 300 392-2 [2], the value of the corresponding type 3 element identifier will be equal to the binary value 0011₂.

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

Table 2: Uplink facility information element contents

Information sub-element	Length		C/O/M	Remarks
Routeing	2		M	note 1
MNI	24		C	note 2
SS PDU	Variable		M	note 3
<p>NOTE 1: The meaning of the information sub-element routeing shall be the following:</p> <ul style="list-style-type: none"> - same SwMI, if its binary value is equal to 00₂; - end SwMI, if its binary value is equal to 01₂; - other SwMI indicated by its MNI value, if its binary value is equal to 11₂. <p>The binary value 10₂ is reserved.</p> <p>NOTE 2: Shall be present if the binary value of the information sub-element routeing is equal to 11.</p> <p>NOTE 3: See clause 8.</p>				

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

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

7.2.2 Notification indicator information element

The notification indicator information element values that may be used shall be as shown in table 3.

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
		4	BIC Call Barred
		5-31	Reserved

NOTE: According to the definition of this information element in subclause 14.8.27 of ETS 300 392-2 [2], when a SwMI receives such information element in a (call related) ISI PDU, it will relay it to the MS/LS.

7.3 Call unrelated supplementary service information

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

NOTE: See definition of call unrelated in subclause 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 subclause 14.7 of ETS 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	note 1
Routeing	2	1	M	note 2
MNI	24	1	C	note 3
Number of SS PDUs	4	1	M	note 4
Length indicator	11	1	C	notes 5 and 6
SS PDU contents	variable	1	C	note 5 and 7
Proprietary	variable	3	O (note 4)	note 8
NOTE 1:	Equal to the binary value 10000 ₂ , as defined in table 114 of ETS 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.			
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 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.			
NOTE 7:	See clause 8.			
NOTE 8:	See subclause 14.8.35 of ETS 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 no information element routeing.

8 SS PDU contents

SS PDUs are specified in the supplementary service stage 3 descriptions, in ETS 300 392-12 [10]. 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 are encoded similarly using the procedures specified in subclause 14.7 of ETS 300 392-2 [2]. 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 subclause 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, note 1
		2	CR Call Report
		3	TPI Talking Party Identification
		4	CD Call Diversion, 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	TC Transfer of Control
		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	AoC Advice of Charge
		26-47	Reserved
		48-63	Proprietary

NOTE 1: SS-CI contains supplementary services SS-CLIP, SS-CLIR and SS-COLP.
NOTE 2: The call diversion 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 transmission problem
		3	Reserved
		4	Reserved
		5-31	Service-specific definitions

Where the value is Supplementary Service not supported, Action not supported or ISI transmission problem, there shall be no following information, e.g. if the value is Action not supported, this will not indicate which SS PDU was rejected (see also subclause 11.2).

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 shall be a range 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 it allows it to take up to 14 values (or sets of values) or a range of values. This range shall be defined by a lower and an upper bound of values of either:

- the information element to be repeated if there is only one; or
- the "significant" information element in the set of information elements to be repeated.

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. The range type information element shall be as specified in table 7.

Table 7: Range type information element contents

Information element	Length	Value	Remarks
Range type	4	0000 ₂	No element
		0001 ₂	One element
		0010 ₂	List of elements (note 2)
		0011 ₂	List of elements (note 2)
		..	List of elements (note 2)
		1110 ₂	List of elements (note 2)
		1111 ₂	Range of elements (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, the first element shall be the lower bound of the range, the second element the upper bound.		

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

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 identities) 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/LS) 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/LS) 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 20) equal to 011₂ (range not supported).

When an SS PDU including repeated information elements (i.e. including either a list or a range of identities) calls for a response and when such response is not the same for all repeated information elements, the information element multiple information element 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 element 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 value of the range when the binary value of the range type information element is equal to 1111₂. The meaning of each bit position shall be as defined in table 8.

Table 8: Multiple information element mask information element contents

Information element	Length	Value	Remark
Multiple information element mask	Variable	0..00 ₂	Reserved
		0..01 ₂	1 st restricted user
		0..10 ₂	2 nd restricted user
	
		10..0 ₂	Last restricted user

When the information element multiple information element mask is used in a response SS PDU, this PDU shall include the same value of the range type information element as that received in the request SS PDU. Clearly the response SS PDU shall also include the repeatable information element to which range type applies, together with the information element corresponding to the response. The repeatable information elements shall be repeated the number of times defined by the contents of the information element multiple information element mask.

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

8.4 Encoding of other SS PDU elements

This subclause 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 subclause.

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 subclause 7.2.4 of ETS 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 subclause 7.6.1 of ETS 300 392-1 [1]) followed by their SSI; or
- the supplementary service SNA.

To allow the routing of SS PDUs addressed using SS-SNA, the meaning of the corresponding SNA values has to be understood by each SwMI concerned, starting with 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 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 following shall apply for deriving the MNI to be added in front of this SSI to get the corresponding ITSI or GTSI value:

- at the uplink air (or LS) interface, for SS PDUs addressed to the local SwMI (see tables 2 and 4), the MNI shall be that of the sending MS/LS;
- at the downlink air (or LS) interface, the MNI shall be that:
 - of the receiving MS/LS if the SS PDU has been individually addressed;
 - of the group, if the SS PDU has been group addressed;
- at the ISI, 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 MS/LS.

Unless otherwise stated in the supplementary service stage 3 descriptions, this identity shall be encoded in SS PDUs as shown in tables 9, 10 and 11. It shall be preceded by an information element named address type, defined in table 12, to specify which method is being used to indicate the identity.

Table 9: Short number address information element contents

Information element	Length	Value	Remark
Short number address	8		See stage 3 description of SS-SNA

Table 10: Short subscriber identity information element contents

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

Table 11: Extension information element contents

Information element	Length	Value	Remark
Country Code	10		See ETS 300 392-1 [1] clause 7
Network Code	14		See ETS 300 392-1 [1] clause 7

NOTE 2: The term "extension" has been used in the title of table 11 instead of "MNI" for the sake of alignment with ETS 300 392-2 [2] (see e.g. table 98).

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 12: Address type information element contents

Information element	Length	Value (note 1)	Remark
Address type	2	00 ₂	Short number address (SNA)
		01 ₂	Short subscriber identity (SSI)
		10 ₂	TETRA subscriber identity (TSI) (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 subclause 7.2.4 of ETS 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 11).			

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.

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 simply 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 preceded by:

- an information element character string length indicator, to specify the number of bits in the string;
- a character set information element, to specify the alphabet used for the characters in the string.

The information element character string length indicator shall be encoded according to the principle given in table 13, which shall depend on the number of bits necessary to specify the maximum length of the character string.

Table 13: Character string length indicator information element contents

Information element	Length	Value	Remarks
Character string length indicator	(note 1)	00..00 ₂ (note 2)	note 4
		xx..x1 ₂	note 5
		xx..x0 ₂ (note 3)	note 5
NOTE 1: The maximum number of bits for coding the value shall be 11. NOTE 2: The corresponding decimal value is 0. NOTE 3: At least one of the bits x in the value is equal to 1. NOTE 4: No character present. NOTE 5: N, the number of bits comprising the character string, shall be equal to the information element value.			

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 1: The meaning of the information element character string length indicator is very similar to that defined in table 111 of ETS 300 392-2 [2].

The definition of the character set information element shall be as shown in table 14.

Table 14: Character set information element contents

Information element	Length	Value	Remarks
Character set	5	00000 ₂	note 1
		00001 ₂	note 2
		00010 ₂	note 3
		3-31	Reserved
NOTE 1: The corresponding character set shall be the 7-bit alphabet specified as default alphabet for GSM, in subclause 6.2 of ETS 300 900 [11]. NOTE 2: The corresponding character set shall be the Latin alphabet No. 1, defined in ISO 8859-1 [12]. NOTE 3: The corresponding character set shall be the 16-bit UCS2 alphabet defined in ISO 10646 [15].			

If the character string is to be defined as being repeatable in an SS PDU, it shall be included together with the applicable character set in a text information element. The latter information element shall be preceded by a text length indicator information element, very similar to the character string length indicator information element.

The text length indicator information element shall be encoded according to the principle given in table 15, which shall depend on the number of bits necessary to specify the maximum length of the character string in taking into account the three bits defining the character set.

Table 15: Text length indicator information element contents

Information element	Length	Value	Remarks
Text length indicator	(note 1)	00..00 ₂ (note 2)	note 4
		xx..x1 ₂	note 5
		xx..x0 ₂ (note 3)	note 5
NOTE 1: The maximum number of bits for coding the value shall be 11. NOTE 2: The corresponding decimal value is 0. NOTE 3: At least one of the bits x in the value is equal to 1. NOTE 4: No character present. NOTE 5: N, the number of bits comprising the text, shall be equal to the information element value.			

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

The definition of the text information element shall be as shown in table 16.

Table 16: Text information element contents

Information sub-element	Length	Value
Character set	5	note 1
Character string	variable	note 2
NOTE 1:	The definition of the character set information sub-element shall be as given in table 14.	
NOTE 2:	The character string information sub-element shall be a string of characters, the length and the meaning of each character being defined by the value of the preceding character set information sub-element: (xxxxxxx ₂)(xxxxxxx ₂)(xxxxxxx ₂)(xxxxxxx ₂) etc. ... 1st character 2nd character 3rd character 4th character	

The text information element should be qualified in each supplementary service stage 3 description where it is used, in mentioning its use in front of it e.g. information element talking/sending party mnemonic name text.

The text length indicator information element may or may not be repeated:

- if defined specifically for each repeated text information element, both shall then be repeated as a set;
- if common to all repeated text information elements, it shall not be repeated (i.e. the corresponding range type shall apply only to the text information elements).

NOTE 2: More flexible methods have been ruled out for the sake of simplicity, even though they would have been more efficient in some cases (e.g. when all repeated character strings use the same character set).

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 an information element external number digits in the corresponding SS PDU preceded by another information element: external number length indicator.

The definition of the information element external number length indicator shall be as shown in table 17.

Table 17: External number length indicator information element contents

Information element	Length	Value	Remarks
External number length indicator	5	0000 ₂	note 1
		00001 ₂	note 2
		xxx10 ₂	note 2
		xxx11.	note 2
NOTE 1:	No external number present.		
NOTE 2:	N, the number of digits in the information element external number digits, shall be equal to the information element value.		

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

Each digit of the external number shall be coded into its binary value using 4 bits, the "*" sign shall be coded as "1010₂" the "#" as "1011₂" and the four letters A, B, C and D, as "1100₂", "1101₂", "1110₂" and "1111₂", respectively. 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 information element external number digits shall be a binary string with a length equal to N x 4 bits, where N shall be equal to the value of the information element external number length indicator. The first 4 bits of this binary string shall be the coded value of the first digit (or symbol) of the external number, the next four, the coded value of its second digit (or symbol), and so on to (and including) the Nth digit.

The definition of the information element external number digits shall be as shown in table 18.

Table 18: External number digits information element contents

Information element	Length	Value
External number digits	variable	(xxx ₂)(xxx ₂)(xxx ₂)(xxx ₂) etc. ... 1st digit 2nd digit 3rd digit 4th digit

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

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 19.

Table 19: Restricted external number definition information element contents

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

8.4.5 Activation, definition, and interrogation failure values

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

In case of negative results, generic values are specified in table 20 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 20: Generic values for the failure reason information elements

Information element	Length	Value	Remarks
Failure reason	3 (note 1)	000 ₂	Rejected for any reason
		001 ₂	User not authorized
		010 ₂	Unknown TETRA identity
		011 ₂	Range not supported (note 2)
		100 ₂	Invalid PDU contents (note 3)
NOTE 1: This is the minimum length for this information element. NOTE 2: See subclause 8.3.2. NOTE 3: The PDU contents may be found invalid e.g.: - when some information element values do not exist, e.g. identity not allocated, or individual identity value being a GTSI; or because - the structure of an air interface PDU is wrong, e.g. O-bit or M-bit absent (see subclause 14.7 of ETS 300 392-2 [2]). See clause 11 for the use of this value.			

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 21.

Table 21: Manufacturer identifier definition

Information element	Length	Value	Remarks
Manufacturer identifier	8	0-255	Reserved

9 SS PDU routing

9.1 Actions at the SwMI receiving an SS PDU from a MS/LS 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 routing 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 routing) if so instructed by the value of that routing information element or if the SS PDU is call related and the call is an intra-TETRA call.

Otherwise (i.e. for routing those SS PDUs over the ISI), the SwMI shall use ANF-ISISS, as specified in clause 10, in defining their source MS/LSs as specified in tables 23 and 24.

If the SS PDU has been received in a facility information element with a value of the routing 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 subclause 9.3).

In all other cases, the value of the routing 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/LS. 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 address carrying this upstream PDU (see subclause 23.4.1.2 of ETS 300 392-2 [2], and subclause 7.8.2.1 of ETS 300 392-1 [1]).

Once the SwMI has determined the MNI of the invoked ANF-ISISS destination SwMI, it shall use its routing tables to find a corresponding PISN number.

Figure 1 illustrates the case of a call unrelated SS PDU routed to another SwMI.

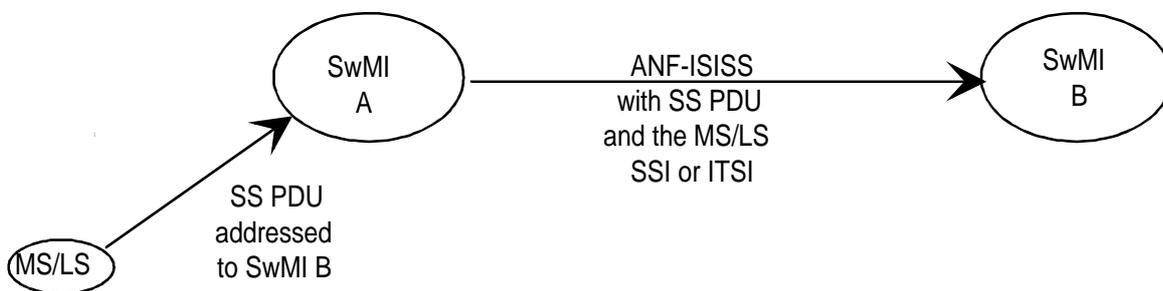


Figure 1: Call unrelated or group call related SS PDU addressed by a MS/LS to a distant SwMI

9.2 SS PDU sent by a SwMI to a MS/LS

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

9.2.1 SS PDU addressed individually by a SwMI to an MS/LS

The originating SwMI shall first determine whether or not it is the MS/LS 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 23 and 24. This case is illustrated by figure 2.

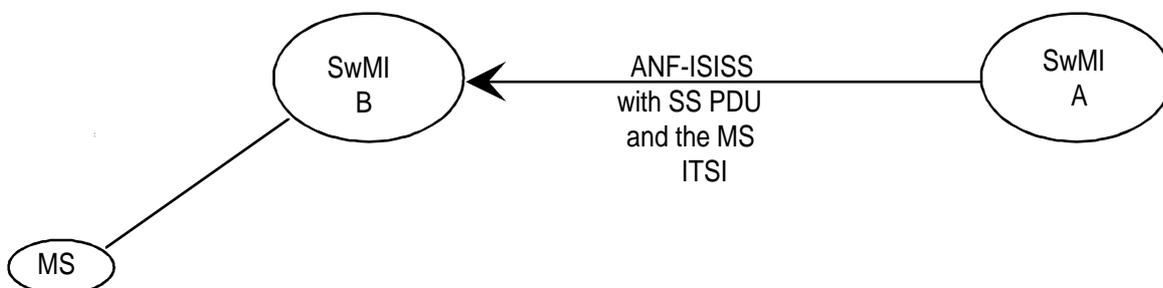


Figure 2: SS PDU addressed individually by a home SwMI to a MS having migrated

In addition, 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.

- 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 originating SwMI, and this SwMI can identify this. 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/LS is registered, in defining this MS/LS as its (their) final destination as specified in tables 23 and 24. Figure 3 illustrates this case.

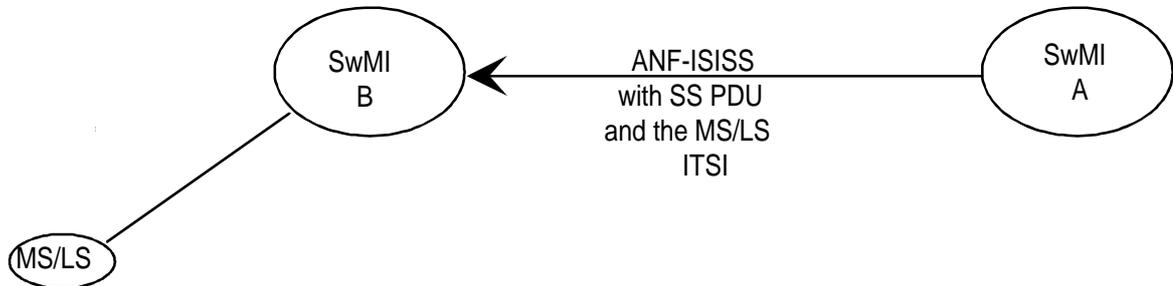


Figure 3: SS PDU addressed individually by a SwMI to an MS/LS

In addition, 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.

NOTE: Subclause 8.3.2 of ETS 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 MS/LSs of a group is the group home SwMI.

It shall route the SS PDU(s) internally in sending them to the MS/LSs 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 23 and 24.

9.2.3 Sending of SS PDU by the destination SwMI to MS/LS

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 subclause 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/LS 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/LS in a D-FACILITY PDU (see table 4), after deletion of the ITS/I of the MS/LS or GTS/I of the group appended by the ANF-ISISS possibly invoked to carry them.

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

9.3 SS PDU transport by ANF-ISISS

According to subclause 8.2 of ETS 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 subclause 7.1 of ISO/IEC 11582 [14] 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 subclause 7.3 of ISO/IEC 11582 [14] 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, subclause 8.3.2 of ETS 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). Subclause 8.3.2 of ETS 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/LS 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 subclause 10.3.

Although subclause 7.3.3 of ISO/IEC 11582 [14] 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 subclauses 8.4 and 8.6 of ETS 300 392-3-1 [3], and subclause 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 subclause 8.3.2 of ETS 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 subclause 10.2.

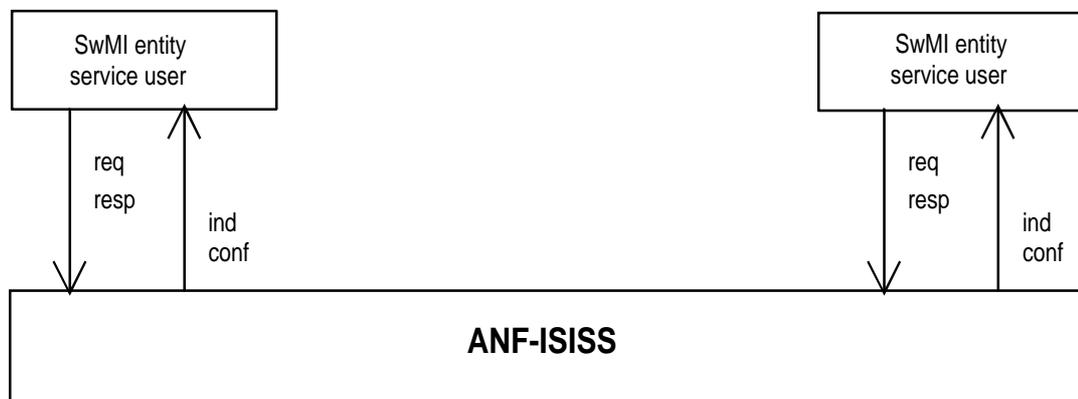


Figure 4: ANF-ISISS service model

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 22. The optional service primitive ISI SS INFORMATION response / ISI SS INFORMATION confirm may be used to send a positive or negative response to an SS PDU (or to SS PDUs) previously received in the ISI SS INFORMATION indication primitive.

Table 22: ISI SS INFORMATION primitives

Primitive	M/O	Remark
ISI SS INFORMATION request/indication	M	note 1
ISI SS INFORMATION response/confirm	O	note 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 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;	
-	the RO-ERROR request/indication with the parameters defined in subclause 8.4.3 of ETS 300 392-3-1 [3];	
-	the RO-REJECT-U request/indication or RO-REJECT-P indication, defined in ITU-T Recommendations X.219 [17] and X.229 [18].	
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 tetralsiMessage defined in table 10 of ETS 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 [14] 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 23, with its conveying facility information element being sent in a call unrelated message, i.e. PSS1 FACILITY message;
- in an ANF-ISISS PDU defined in table 24, 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: For call related message, ANF-ISISS will only exist for conveying ISI SS PDUs. These are thus sent in ROSE APDUs different from those carrying TETRA basic call information (i.e. message or complementary information - see annex B). In other words 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.

Table 23: Call related ANF-ISISS PDU contents

Information element	Length	Type	C/O/M	Remarks
Routeing	1	1	M	note 1
Number of SS PDUs	4	1	M	note 2
Length indicator	11	1	C	notes 3 and 4
SS PDU contents	variable	1	C	note 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/LS(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 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 24: Call unrelated ANF-ISISS PDU contents

Information element	Length	Type	C/O/M	Remarks
Routeing	2	1	M	note 1
Destination or source MS/LS address type	2	1	C	notes 2 and 3
Destination or source MS/LS SSI	24	1	C	note 4
Destination or source MS/LS extension	24	1	C	note 5
Number of SS PDUs	4	1	M	note 6
Length indicator	11	1	C	notes 7 and 8
SS PDU contents	variable	1	C	note 7 and 9
NOTE 1:	The meaning of the information element routeing shall be the following:			
-	if its binary value is equal to 00_2 , all the SS PDUs in the ANF-ISISS PDU are addressed to the ANF-ISISS destination SwMI and their source is the ANF-ISISS source SwMI itself;			
-	if its binary value is equal to 01_2 , all the SS PDUs in the ANF-ISISS PDU are addressed to the MS/LS(s) the identity of which is given in the next information element, assumed to be registered in the ANF-ISISS destination SwMI;			
-	if its binary value is equal to 10_2 , the source of all the SS PDUs in the ANF-ISISS PDU is a MS/LS the identity of which is given in the next information element, registered in the ANF-ISISS source SwMI.			
	The binary value 11_2 is reserved.			
NOTE 2:	Shall be present if the binary value of the information element routeing is equal to 10_2 or to 01_2 .			
NOTE 3:	Shall be as defined in table 12.			
NOTE 4:	Shall be present if the binary value of the information element destination or source MS/LS address type is equal to 10_2 or to 01_2 .			
NOTE 5:	Shall be present if the binary value of the information element destination or source MS/LS address type is equal to 10_2 .			
NOTE 6:	The value of the information element number of SS PDUs shall be equal at least to one.			
NOTE 7:	Shall 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/LS or group address or a source MS/LS address is given by an SSI alone instead of ITS/GTSI, the receiving SwMI determine the corresponding ITS/GTSI in adding its own MNI to this SSI.

NOTE 1: The ANF-ISISS PDU definitions in tables 23 and 24 are derived from that of the U-FACILITY PDU, in table 4.

NOTE 2: The systematic use of the address type mechanism defined in subclause 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/LS 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 anflsiss. 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/LS 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 subclause 9.1, the former SwMI (i.e. where the dispatcher MS/LS 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 23 and 24, 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 [14] 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 subclause 8.4.3 of ETS 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 subclause 11.3.3 of ISO/IEC 11582 [14], 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 ETS 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 [13]).

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 "clearCallIfAnyInvokePduNotRecognised" shall be sent together with the ROSE Invoke APDU.

NOTE 1: According to subclause 8.1.2 of ISO/IEC 11582 [14], 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 unrecognisedOperation.

NOTE 2: According to ITU-T Recommendation X.229 [18] 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 unrecognisedOperation 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 subclause 8.6 of ETS 300 392-3-1 [3], this case will be identified by the co-ordination function.

NOTE 3: Any supplementary service control entity of a SwMI complying with this ETS 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 subclause 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 unrecognisedOperation, exactly as when no ANF-ISISS entity exists. As a result, the call would also be cleared if an interpretation APDU with the value "clearCallIfAnyInvokePduNotRecognised" 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 subclause 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 this ETS, but the corresponding ANF-ISISS PDU is addressed to this SwMI (and not to an MS/LS 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 this ETS (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 subclause 8.4.3 of ETS 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 subclause 8.4.3 of ETS 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 subclauses (i.e. belonging to subclause 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 subclauses below refer only to the ISI. See subclause 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. subclause 11.1.4.1 shall apply).

NOTE: Since the error incompleteTetraPdu can only occur if the ROSE APDU has been segmented, according to subclause 8.5.1 of ETS 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. subclause 11.1.1 shall apply).

11.1.1 Case a)

According to subclause 8.4.3 of ETS 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, subclause 8.3.2.2.2 of ETS 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 a 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 subclause 8.4.3 of ETS 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 service may impose that when it has been invoked for a call and when it cannot be supported, this call has to be cleared (e.g. SS-DL). 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 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 a PSS1 DISCONNECT message, thus clearing the call; and
- 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.

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: 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 subclause 8.6 of ETS 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 [18].

See subclause 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 subclause 10.3.3.

11.1.4 Case d)

NOTE: According to subclause 8.4.3 of ETS 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 subclause 8.4.3 of ETS 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 Recommendation X.219 [17] and X.229 [18] 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 [18]. 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 found higher than 5 (see table A.1). As a consequence the specification of some supplementary service operation may state 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/LS a reject SS PDU including:

- the same value of the information element SS type as in the original SS PDU; and
- the value 00000₂ if the SwMI does not support the corresponding supplementary service, or 00001₂, if the SwMI supports this supplementary service but not the SS PDU (see table 6).

NOTE: In the latter case, by definition the SS PDU not supported is optional.

If the SS PDU sent by the MS/LS is invoking a supplementary service the specification of which states that the call shall be cleared if the supplementary service cannot be supported, the corresponding reject SS PDU shall be sent to the MS/LS in a D-RELEASE PDU.

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, subclause 11.2.1 shall apply.

In addition, if this SwMI supports this SS PDU or if it has been addressed to another SwMI, the former SwMI shall send the reject SS PDU defined in subclause 11.2.1 to the MS/LS for each SS PDU sent over the ISI when the ISI exceptional procedures specified in subclause 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 00000₂ 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 00001₂ 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 00000₂ 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 00000₂ shall be sent in a D-RELEASE PDU if it is sent as a result of the invocation of a supplementary service the specification of which states that the call shall be cleared if the supplementary service cannot be supported.

In all other exceptional cases mentioned in subclause 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 00010₂ (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 ETS 300 392-11 [9].

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 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 25 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 25: 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 (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 (note 1)	N.A. /R	yes	N.A.
Short number addressing	no (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 ETS 300 392-10-5 [8], 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 On how to support the authentication requirements stated in table 25

Two different cases have to be taken into account regarding the support of the authentication requirements stated in table 25 for both the authorized user and the affected user, depending on whether or not authentication is supported in their home SwMIs.

In the first case, the home SwMI of the authorized user shall decide whether or not this authorized user shall have to be authenticated (e.g. for call unrelated or call related SS-DGNA definition -or redefinition), both when this user is registered in its home SwMI or when it has migrated. If the authorized user has migrated and cannot be authenticated by the visited SwMI, i.e. because this SwMI does not support authentication, then the authorized user's procedures for some supplementary service may not be provided. Similarly, the affected user shall decide whether or not it shall authenticate the infrastructure (i.e. home SwMI plus visited SwMI if this user has migrated) before accepting any assignment or de-assignment from the SwMI where it is registered. If it cannot authenticate the infrastructure because this procedure is not supported by the visited SwMI, the assignment or de-assignment of this affected user shall be delayed until this user has registered in a SwMI which allows infrastructure authentication (to this user).

And in the second case, since the authorized user cannot be authenticated in its home SwMI, it cannot be authenticated in a visited SwMI either (due to the authentication procedure for user as defined in ETS 300 392-7 [6]). Then it shall be the operator decision as to whether or not the authorized user procedures shall be possible, with a difference being possibly made between the case where this user is registered in its home SwMI and that where it has migrated.

Similarly if the affected user MS cannot authenticate the infrastructure because it does not support this procedure then it shall be an implementation option for this MS whether or not it supports some specific supplementary service procedures (e.g. DGNA assignments and de-assignments).

NOTE: Normally, if the home SwMI of the authorized user is the same as that of the affected user, one would expect that if this home SwMI can authenticate its registered users, then both this SwMI and the affected user should support the infrastructure authentication procedure. But this shall not necessarily always be the case.

	PARAMETER ErrorInvalidInfo
	::=5
unspecified	ERROR
	::= 0
AnfSubEntity	::= ENUMERATED {anflsiss (1), anflsimm (2), anflsiic (3), anflsigc (4), anflsisd (5)}
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 OPTIONAL,
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,

}

tetralsiMessage TetralsiMessage ::= 1

END -- OF TetralsiOperation

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

As stated in subclause 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 subclause 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 subclause 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 subclause 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 subclause 11.3.3 of ISO/IEC 11582 [14], 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 subclause 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 is encoded in 3 octets.
- NOTE 2: According to subclause 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 subclause 10.3.3, the Interpretation APDU information element is omitted or included with the value "clearCallIfAnyInvokedPduNotRecognised". 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 subclause 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 subclause 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 ETS 300 392-3-2 [subclause 6.3.3, the Interpretation APDU shall be included with the value "clearCallIfAnyInvokePduNotRecognised".

NOTE 7: According to subclause 10.3.3, the interpretation APDU is included with the value "clearCallIfAnyInvokePduNotRecognised" or it is omitted. When included its length is 3 octets (while it is obviously 0 octet when it is omitted).

Annex C (informative): Suggested contents of the stage 2 description of activation/deactivation, definition and interrogation operations of TETRA supplementary services

In the following, "SS-XXX" stands for the supplementary service being described. XXX should be replaced by the abbreviation of the actual supplementary service.

C.1 Suggested text and figure in clause 4, on functional model

C.1.1 Suggested text and figure in subclause 4.1, on the functional model description

The functional model shall comprise the following Functional Entities (FEs) for managing SS-XXX:

FE20 Managed user/group home SwMI FE;

FE3 Authorized user's functional entity.

NOTE: Depending on the supplementary service, other FEs may need to be defined, e.g. FE10, the affected user's functional entity.

The relationship rx shall exist between FE3 and FE20.

Figure C.1 shows these FEs and relationship for the management part of SS-XXX.

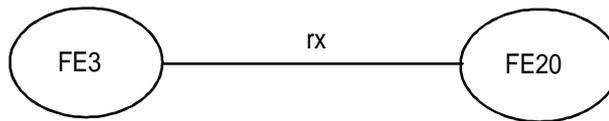


Figure C.1: Functional model for the management part of SS-XXX

NOTE: All requests issued by the authorized user for an SS-XXX managed user or group are to be addressed to the home SwMI of this managed user or group. If the managed user has migrated to another SwMI or if the group is attached in other SwMIs than the group home SwMI, ANF-ISIMM will update these SwMIs. So there is no need to show any managed user visited SwMI FE.

C.1.2 Suggested text in subclause 4.2, on the description of functional entities

C.1.2.1 Suggested description of functional entity managed user/group home SwMI FE, FE20

If the optional activation/deactivation procedure is supported by the home SwMI of the managed user, FE20 shall receive SS-XXX activation/deactivation requests from FE3 and check them. For those requests that FE20 finds authorized and correct, it shall carry out the corresponding activations/deactivations in the SwMI and shall confirm their completions to FE3. As to the others, FE20 shall reject them and inform FE3.

The same shall apply for the optional definition procedure and for the optional interrogation procedure if they are supported by the home SwMI(s) of the managed user(s) for these procedures.

NOTE: The managed user may not be the same for the activation/deactivation procedure, for the definition procedure and for the interrogation procedure (e.g. SS-TPI, where the managed user for the activation/deactivation is the served user, while for the definition it is the would be talking/sending user).

C.1.2.2 Suggested description of authorized user's functional entity, FE3

If the optional activation/deactivation and/or definition and/or interrogation procedures are supported by the authorized user MS/LS, FE3 shall send SS-XXX activation/deactivation, definition or interrogation requests to FE20. FE3 may perform local checks for the corresponding requests before sending them: it shall then send them only if it finds them valid. If FE3 rejects a request, it shall indicate it to the user application. At the reception of the response from FE20, FE3 shall forward the result to the user application.

C.1.3 Suggested text in subclause 4.3, on the relationship with basic service

Being call unrelated, the activation/deactivation, definition and interrogation procedures are independent from CC or CCA.

C.2 Suggested text in clause 5, on information flows

C.2.1 Suggested text and tables in subclause 5.1, on the definition of information flows

In the tables listing the elements in information flows, the column headed "Type" indicates which of these elements are Mandatory (M), which are Optional (O) and which are Conditional (C).

C.2.1.1 Suggested text and table in the subclause on ACTIVATE

ACTIVATE is an unconfirmed information flow across relationship rd from FE3 to FE20 which activates or deactivates SS-XXX is for one or more identities (specify whether such identities are ITSIs and/or GTSIs).

NOTE: The response/confirmation information flow corresponding to the ACTIVATE request/indication information flow is ACTIVATE ACK (see subclause 5.1.X).

Table C.1 lists the elements within the ACTIVATE information flow.

Table C.1: Contents of ACTIVATE

Element	Type
Activated/deactivated identity	M (note)
Activation/deactivation request	M
NOTE: May be repeated	

The element activated/deactivated identity may include a GTSIs or an ITSIs.

The element activation/deactivation request, defined in subclause 5.2.2.Y of ETS 300 392-12-X, indicates possible activation options of SS-XXX.

C.2.1.2 Suggested text and table in the subclause on ACTIVATE ACK

ACTIVATE ACK is actually the response/confirmation information flow corresponding to the ACTIVATE request/indication information flow. It is thus across relationship rd from FE20 to FE3. It is used to acknowledge the activation state of SS-XXX for one or more identities.

NOTE: The definition of how a given ACTIVATE ACK information flow relates to the corresponding ACTIVATE information flow is outside the scope of the stage 2 description: it will be given in the stage 3 description.

Table C.2 lists the elements within the ACTIVATE ACK information flow.

Table C.2: Contents of ACTIVATE ACK

Element	Type
Activated/deactivated identity	M (note 1)
Activation/deactivation result	M (note 2)
Activation state	C (notes 2 and 3)
NOTE 1:	May be repeated.
NOTE 2:	Shall be repeated as appropriate if the element activated/deactivated identity is repeated.
NOTE 3:	Present if activation/deactivation result is positive.

The element activation/deactivation result, defined in subclause 5.2.2.Y of ETS 300 392-12-X, indicates if the ACTIVATE information flow request/indication has been successful or not. If it has been successful, the element activation state, defined in subclause 5.2.2.Z of ETS 300 392-12-X, gives the detail about SS-XXX activation/deactivation.

C.2.1.3 Suggested text and table in the subclause on DEFINE

DEFINE is an unconfirmed information flow across relationship rd from FE3 to FE20 which defines the parameters (specify which are those parameters) of one or more individual identities for SS-XXX.

NOTE: The response/confirmation information flow corresponding to the DEFINE request/indication information flow is DEFINE ACK (see subclause 5.1.Y).

Table C.3 lists the elements within the DEFINE information flow.

Table C.3: Contents of DEFINE

Element	Type
Identity	M (note 1)
Parameter 1	M (note 2)
Parameter 2	M (note 2)
Parameter ...	M (note 2)
NOTE 1:	May be repeated.
NOTE 2:	Shall be repeated if the element individual identity is repeated.

NOTE: The DEFINE request/indication information flow may be used with the element identity being a group identity: to give a mnemonic name to this group.

C.2.1.4 Suggested text and table in the subclause on DEFINE ACK

DEFINE ACK is actually the response/confirmation information flow corresponding to the DEFINE request/indication information flow. It is thus across relationship rd from FE20 to FE3. This flow is used to inform FE3 about the completion of the corresponding definition request.

NOTE: The definition of how a given DEFINE ACK information flow relates to the corresponding DEFINE information flow is outside the scope of the stage 2 description: it is given in the stage 3 description.

Table C.4 lists the elements within the DEFINE ACK information flow.

Table C.4: Contents of DEFINE ACK

Element	Type
Individual identity	M (note 1)
Definition result	M (note 2)
Activation state	C (note 3)
NOTE 1:	May be repeated.
NOTE 2:	Shall be repeated as appropriate if the element individual identity is repeated.
NOTE 3	Present if the definition result is positive.

The element definition result, defined in subclause 5.2.2.Y of ETS 300 392-12-X, indicates if the DEFINE information flow request/indication has been successful or not. If it has been successful, the element activation state, defined in subclause 5.2.2.Z of ETS 300 392-12-X, gives the detail about SS-XXX activation/deactivation.

C.2.1.5 Suggested text and table in the subclause on INTERROGATE

INTERROGATE is an unconfirmed information flow across relationship rd from FE3 to FE20 which is used to interrogate the home SwMI of a user known by its identity about:

- the activation state of SS-XXX for this user;
- other specific SS-XXX parameters related to this user.

NOTE: The response/confirmation information flow corresponding to the INTERROGATE request/indication information flow is INTERROGATE ACK (see subclause 5.1.Z).

Table C.5 lists the elements within the INTERROGATE information flow.

Table C.5: Contents of INTERROGATE

Element	Type
Interrogated identity	M (note)
NOTE: May be repeated.	

C.2.1.6 Suggested text and table in the subclause on INTERROGATE ACK

INTERROGATE ACK is actually the response/confirmation information flow corresponding to the INTERROGATE request/indication information flow. It is thus across relationship rd from FE20 to FE3. It is used to respond to the corresponding interrogation request.

NOTE: The definition of how a given INTERROGATE ACK information flow relates to the corresponding INTERROGATE information flow is outside the scope of the stage 2 description: it is given in the stage 3 description.

Table C.6 lists the elements within the INTERROGATE ACK information flow.

Table C.6: Contents of INTERROGATE ACK

Element	Type
Interrogated identity	M (note 1)
Interrogation result	M (note 2)
Activation state	C (notes 2 and 3)
Specific SS-XXX parameter 1	C (note 2)
Specific SS-XXX parameter 2	C (note 2)
Specific SS-XXX parameter ...	C (note 2)
NOTE 1: May be repeated.	
NOTE 2: Shall be repeated as appropriate if the element interrogated identity is repeated.	
NOTE 3: Conditional on the value of the element interrogation result.	
NOTE 4: May be absent even with an interrogation result positive.	

C.2.1.7 Suggested text in the subclause on information flow elements

The element contents of the information flows are derived from the service primitives and operational and management requirements. Unless they are self-explanatory (e.g. user identity), these elements have been given the same names as the corresponding PDU information elements defined in ETS 300 392-12-X, on the stage 3 description of SS-XXX.

C.2.2 Suggested text and table in subclause 5.2, on the relationship of information flows to basic call information flows

Table C.7 summarizes the relationship of the SS-XXX information flows with those of the basic call both over the air (or LS) interface and Inter-System interface (ISI).

Table C.7: The relationship between SS-XXX information flows and basic service information flows

Information flow	Independent of basic call?	With basic call?	Basic call flows:
ACTIVATE	yes	no	
ACTIVATE ACK	yes	no	
DEFINE	yes	no	
DEFINE ACK	yes	no	
INTERROGATE	yes	no	
INTERROGATE ACK	yes	no	
INTERROGATE NAME	yes	no	
INTERROGATE NAME ACK	yes	no	

NOTE: Table C.7 is to be complemented with the information flows related to the SS-XXX invocation and operation procedures.

C.2.3 Suggested text and figures in subclause 5.4, on examples of information flow sequences

ETS 300 392-12-X, on SS-XXX stage 3 description, specifies the signalling procedures in support of the information flow sequences specified in the following subclauses. In addition, it specifies signalling procedures to cover other sequences arising from service specific error situations, interactions with basic call, interactions with other supplementary services, different topologies etc.

In the figures, SS-XXX information flows are represented by solid arrows and basic call information flows are represented by broken arrows. An ellipse embracing two information flows indicates that the two information flows occur together. Within a column representing an SS-XXX functional entity, the numbers refer to functional entity actions listed in clause 6.

C.2.3.1 Suggested text in the subclause on activation/deactivation

Figure C.2 shows the information flow sequence of SS-XXX activation/deactivation.

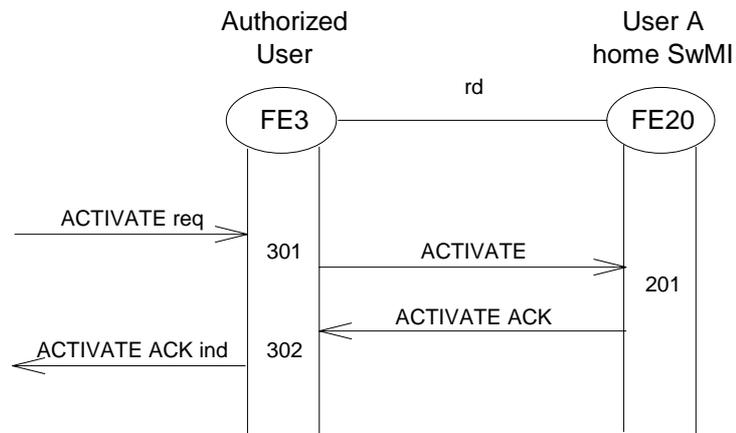


Figure C.2: Activation of SS-XXX

C.2.3.2 Suggested text in the subclause on definition

Figure C.3 shows the information flow sequence of SS-XXX definition.

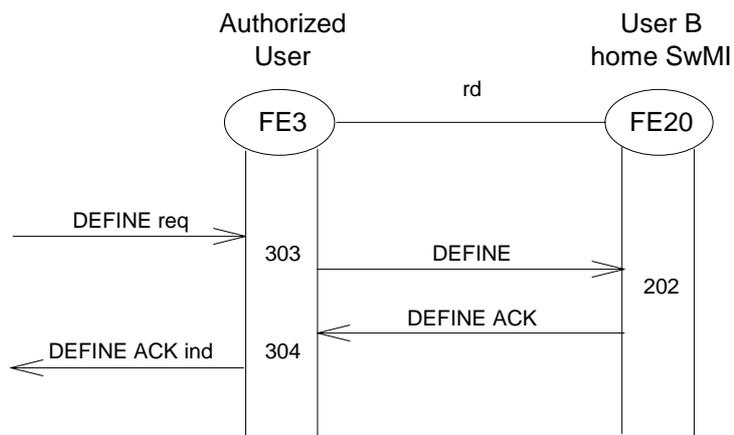


Figure C.3: Definition of SS-XXX

C.2.3.3 Suggested text in the subclause on interrogation

Figure C.4 shows the information flow sequence for normal operation of SS-XXX interrogation.

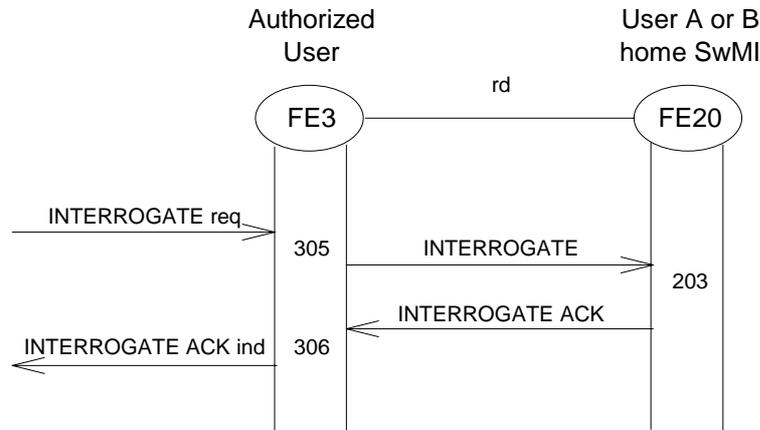


Figure C.4: Interrogation of SS-XXX using identity

C.3 Suggested text in clause 6, on functional entity actions

These functional entity actions cover items presented in the previous scenarios. There may be other actions due to exceptional cases.

C.3.1 Suggested text in the subclause on functional entity actions of FE20

- 201 On receipt of ACTIVATE, verify that the request is allowed. If the request is allowed and its parameters are valid, activate the SS-XXX and send the ACTIVATE ACK information flow to FE3. If the request is not valid or authorized, return an error indication to FE3.
- 202 On receipt of DEFINE request/indication information flow, verify the identity/identities and the authorization for the request. If the definition is acceptable, make the SS-XXX definition to the SwMI and send the DEFINE ACK information flow to FE3.
- 203 On receipt of INTERROGATE request/indication information flow, verify that the request is allowed and its parameters are valid. If the request is valid, fetch the SS-XXX data and send it in the INTERROGATE ACK information flow to FE3. If the request is not valid or authorized, return an error indication to FE3.

C.3.2 Suggested text in the subclause on functional entity actions of FE3

- 301 On receipt of user application request for activation, send to FE20 the corresponding ACTIVATE request/indication information flow.
- 302 Deliver to the user application the information received in ACTIVATE ACK.
- 303 On receipt of user application request for defining a SS-XXX definition, send to FE20 the corresponding DEFINE request/indication information flow.
- 304 Deliver to the user application the information received in DEFINE ACK.
- 305 On receipt of user application request for interrogation based on identity/identities, send to FE20 the corresponding INTERROGATE request/indication information flow.
- 306 Deliver to the user application the information received in INTERROGATE ACK.

C.4 Suggested text in clause 7, on the allocation of functional entities to physical equipment

The possible scenarios for the allocation of SS-XXX management functional entities to SwMIs and MS/LSs are shown in table C.8.

Table C.8: Scenarios for the allocation of FEs to physical equipment/SwMIs in the case of management

	FE3	FE20
Scenario 1	MS/LS	Home SwMI of affected user
Scenario 2	Home SwMI of affected user (note)	Home SwMI of affected user
NOTE: This scenario is outside the scope of SS-XXX standardization.		

NOTE: Table C.8 does not take into account the possible assignment of definition to MS/LSs.

C.5 Suggested text in clause 8, on inter-working considerations

The case where SS-XXX extends to several TETRA networks has already been taken into account in the preceding clauses.

NOTE: The case of inter-working with PSTN, ISDN or PISN should also be addressed.

Annex D (informative): Suggested contents of the stage 3 description of activation/deactivation, definition and interrogation procedures of TETRA supplementary services

D.1 Suggested text in the subclause on additional coding requirements over the ISI

Clauses 9, 10 and 11 of ETS 300 392-9 [xx] shall apply.

D.2 Suggested text in the subclause on the supplementary service state definitions

D.2.1 Suggested text in the subclause on the supplementary service state definitions at the authorized user MS/LS

There are no conceptual supplementary service states within the authorized user MS/LS.

NOTE: The activation definition and interrogation are not defined as confirmed services in the supplementary service procedures.

D.2.2 Suggested text in the subclause on the supplementary service state definitions at the SwMI where the authorized user MS/LS is registered

There are no conceptual supplementary service states within the SwMI where the authorized user MS/LS is registered.

NOTE: The activation definition and interrogation are not defined as confirmed services in the supplementary service procedures.

D.2.3 Suggested text in the subclause on the supplementary service state definitions at the managed user home SwMI

There are no conceptual supplementary service states within the SwMI where the authorized user MS/LS is registered.

NOTE: The activation definition and interrogation are not defined as confirmed services in the supplementary service procedures.

D.3 Suggested text in the subclause on the supplementary service signalling procedures

D.3.1 Suggested text in the subclause on the actions at the authorized user MS/LS

The SDL representation of procedures at the authorized user MS/LS is shown in clause E.1.

D.3.1.1 Suggested text in the subclause on the normal procedures at the authorized user MS/LS

The authorized user MS/LS shall send one ACTIVATE, DEFINE or INTERROGATE PDU for any supplementary service in a U-FACILITY PDU in filling in the appropriate value for the routing information element (see table 4). This value shall correspond:

- usually, to the managed user home SwMI; or
- for some supplementary services and when the managed user has migrated, to the managed user home SwMI.

NOTE: The latter applies for supplementary services which apply only for intra-TETRA calls, e.g. SS-CAD, SS-BIC or the call diversion supplementary services.

In accordance with subclause 8.4.1 of ETS 300 392-9 [xx], identities included in ACTIVATE, DEFINE or INTERROGATE PDUs may be indicated using only their SSIs in the case where the corresponding MNI is that of the SwMI to which those PDUs are addressed.

If the specification of the ACTIVATE, DEFINE or INTERROGATE PDUs for a given supplementary service provides the possibility to indicate such identities using SNAs, this may be done provided that:

- SS-SNA is supported by the destination SwMI; and
- SNA values have been defined against such identities for the authorized user.

The authorized user MS/LS shall receive one ACTIVATE ACK, DEFINE ACK or INTERROGATE ACK PDU for any supplementary service in a D-FACILITY PDU.

In accordance with subclause 8.4.1 of ETS 300 392-9 [xx], the authorized user MS/LS shall complement any identities indicated using only their SSIs which have been included in any received ACTIVATE ACK, DEFINE ACK or INTERROGATE ACK PDU.

D.3.1.2 Suggested text in the subclause on the exceptional procedures at the authorized user MS/LS

Subclause 11.2 of ETS 300 392-9 [xx] shall apply for the exceptional procedures at the authorized user MS/LS.

D.3.2 Suggested text in the subclause on the actions at the supplementary service control entity at the SwMI where the authorized user is registered

The SDL representation of procedures at the supplementary service control entity at the SwMI where the authorized user is registered is shown in clause E.2.

D.3.2.1 Suggested text in the subclause on the normal procedures at the supplementary service control entity at the SwMI where the authorized user is registered

The supplementary service control entity at the SwMI where the authorized user is registered shall:

- receive the U-FACILITY PDU containing an ACTIVATE PDU, a DEFINE PDU or an INTERROGATE PDU, and route them according to the value of the routing information element in the U-FACILITY PDU (see table 4 of ETS 300 392-9 [xx]). This routing shall be as defined in subclause 9.1 of ETS 300 392-9 [xx];
- if the SwMI where the authorized user is registered coincides with the managed user home SwMI, its supplementary service control entity shall process the ACTIVATE, DEFINE or INTERROGATE PDU. Notably, in accordance with subclause 8.4.1 of ETS 300 392-9 [xx], the SwMI shall then complement any identities indicated using only their SSIs which have been included in that PDU;
- if the SwMI where the authorized user is registered does not coincide with the managed user home SwMI, subclause 9.1 of ETS 300 392-9 [xx] shall apply to route the ACTIVATE, DEFINE and INTERROGATE PDU(s) over the ISI. Notably the identity of the authorized user will be added to the ACTIVATE, DEFINE and INTERROGATE PDU(s) in the corresponding ANF-ISISS PDU (see table 24 of ETS 300 392-9 [xx]).

In addition only the following options shall apply for the PSS1 facility information element carrying this ANF-ISISS PDU (as a ROSE Invoke APDU):

- both the sourceEntity and the destinationEntity data elements in the Network Facility Extension (NFE) of this PSS1 facility information element shall contain the value endPINX (see subclause 10.3.1 of ETS 300 392-9 [xx]);
- no interpretation APDU shall be included in this PSS1 facility information element (see subclause 10.3.3 of ETS 300 392-9 [xx]).

- if the resulting ACTIVATE ACK, DEFINE ACK and INTERROGATE ACK PDU(s) is (are) sent, the supplementary service control entity at the SwMI where the authorized user is registered shall receive the corresponding ANF-ISISS ROSE Invoke APDU.
- the ACTIVATE ACK, DEFINE ACK and INTERROGATE ACK PDU resulting from an authorized user request shall be sent to the authorized user MS/LS in a D-FACILITY PDU. Such D-FACILITY PDU shall be individually addressed.

D.3.2.2 Suggested text in the subclause on the exceptional procedures at the supplementary service control entity at the SwMI where the authorized user is registered

Clause 11 of ETS 300 392-9 [xx] shall apply for the exceptional procedures at the supplementary service control entity at the SwMI where the authorized user is registered, taking into account the fact that the support of each of the three PDUs: ACTIVATE, DEFINE and INTERROGATE is optional for every supplementary service.

The information defined in subclause 11.2 of ETS 300 392-9 [xx] shall be sent to the authorized user MS/LS in a D-FACILITY PDU. Such D-FACILITY PDU shall be individually addressed.

D.3.3 Suggested text in the subclause on the actions at the supplementary service control entity at the managed user home SwMI

The SDL representation of procedures at the supplementary service control entity at the managed user home SwMI is shown in clause E.3.

D.3.3.1 Suggested text in the subclause on the normal procedures at the supplementary service control entity at the managed user home SwMI

The supplementary service control entity at the managed user home SwMI shall:

- extract the ACTIVATE, DEFINE or/and INTERROGATE PDU(s) in the received ANF-ISISS ROSE Invoke APDUs specified in clause 10 of ETS 300 392-9 [xx];
- process these PDUs. Notably, in accordance with subclause 8.4.1 of ETS 300 392-9 [xx], the SwMI shall then complement any identities indicated using only their SSIs which have been included in such PDU(s). If the response to an ACTIVATE, DEFINE or INTERROGATE PDU is positive, the SwMI shall generate the corresponding ACTIVATE ACK, DEFINE ACK or INTERROGATE ACK PDU, respectively;
- it shall send such ACK PDU(s) according to subclause 9.2 of ETS 300 392-9 [xx] [xx]. Notably the identity of the authorized user will be added to the ACTIVATE ACK, DEFINE ACK or INTERROGATE ACK PDU(s) as its(their) final destination in the corresponding ANF-ISISS PDU (see table 24 of ETS 300 392-9 [xx]).

In addition only the following options shall apply for the PSS1 facility information element carrying this ANF-ISISS PDU (as a ROSE Invoke APDU):

- both the sourceEntity and the destinationEntity data elements in the Network Facility Extension (NFE) of this PSS1 facility information element shall contain the value endPINX (see subclause 10.3.1 of ETS 300 392-9 [xx]);
- no interpretation APDU shall be included in this PSS1 facility information element (see subclause 10.3.3 of ETS 300 392-9 [xx]).

D.3.3.2 Suggested text in the subclause on the exceptional procedures at the supplementary service control entity at the managed user home SwMI

Subclause 11.1 of ETS 300 392-9 [xx] shall apply for the exceptional procedures at the supplementary service control entity at the managed user home SwMI, taking into account the fact that the support of each of the three PDUs: ACTIVATE, DEFINE and INTERROGATE is optional for every supplementary service.

Annex E (informative): Specification and Description Language (SDL) representation of call unrelated procedures

The diagrams in this annex use the Specification and Description Language defined in ITU-T Recommendation Z.100 [19].

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

In accordance with the protocol model described in clause 14 of ETS 300 392-2 [2], the supplementary service control entity at a MS/LS 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/LS is registered. If this SwMI or any other operate at the ISI, in accordance with the protocol model described in clause 8 of ETS 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.

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.

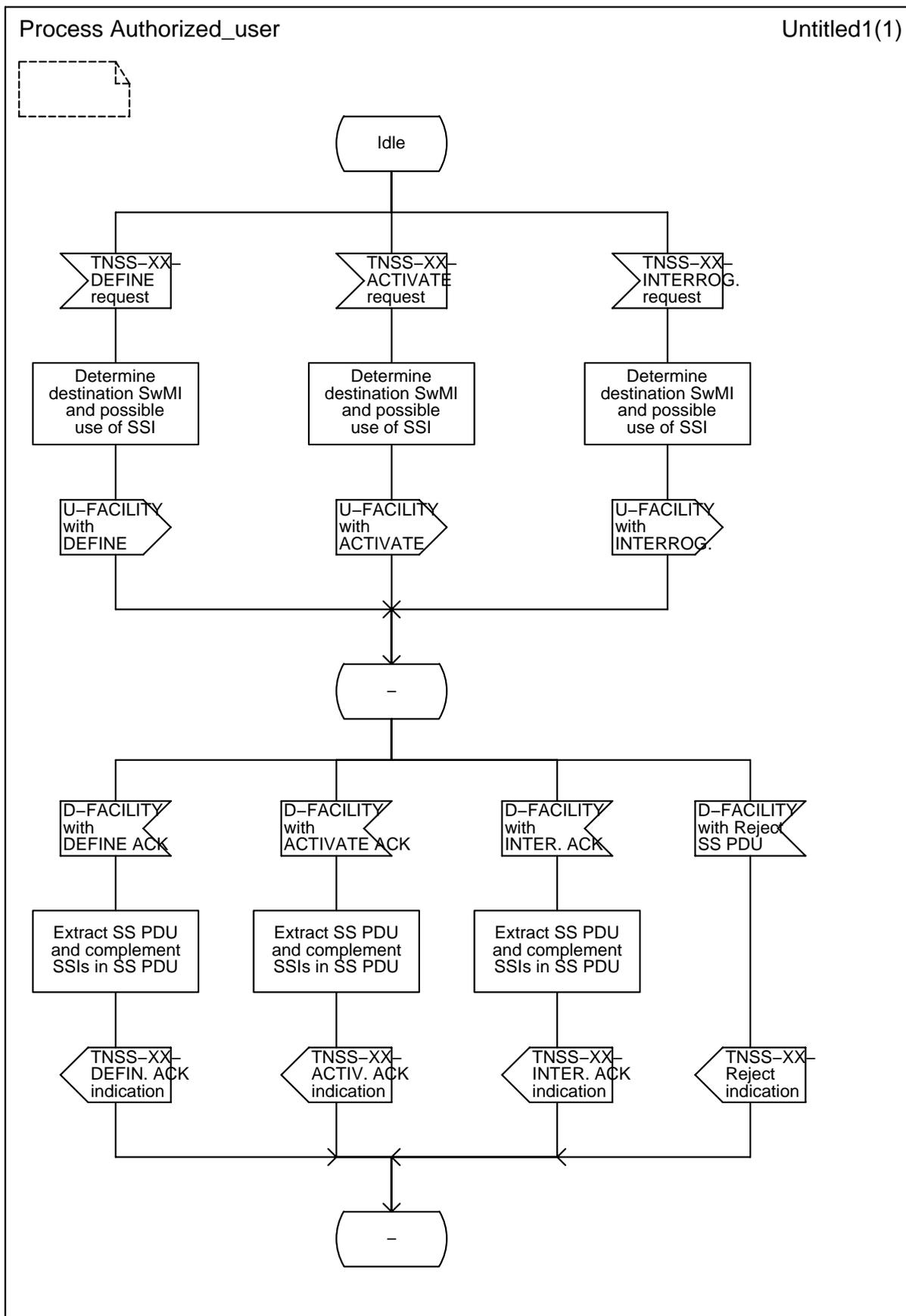
The suffix PDU has been omitted after the PDU names (e.g. ACTIVATE or ACTIVATE ACK).

E.1 SDL representation of SS-XXX at the authorized user MS/LS

Figure E.1 shows the behaviour of the supplementary service control entity within the authorized user MS/LS.

Input signals from the right and output signals to the right represent air interface PDUs.

Input signals from the left and output signals to the left represent primitives to the authorized user.



NOTE: In the case where the served user would have some (limited) authorized user capabilities, this SDL would be applicable to the served user MS/LS.

Figure E.1: Authorized user MS/LS SDL

E.2 SDL representation of supplementary service control entity at the SwMI where the authorized user is registered

Figure E.2 shows the behaviour of the supplementary service control entity specific to the SwMI where the authorized user is registered.

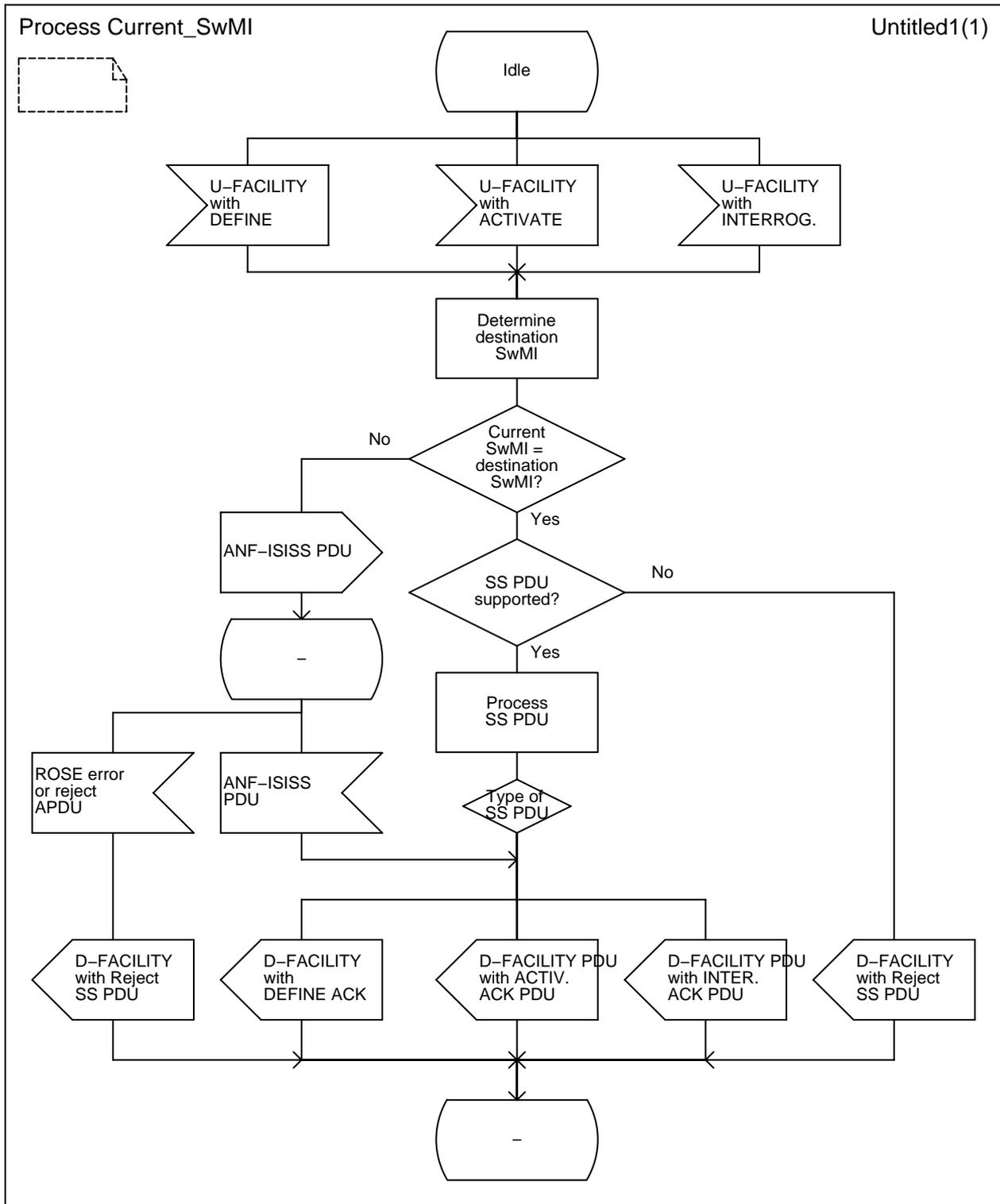
Depending on whether or not this SwMI is also the managed user home SwMI, it is or it not the destination SwMI of the ACTIVATE, DEFINE or INTERROGATE PDUs sent by the authorized user MS/LS.

Input signals from the right represent PDUs received from the managed user home SwMI.

Output signals to the right represent PDUs sent to the managed user home SwMI.

Input signals from the left represent PDUs received from the authorized user MS/LS.

Output signals to the left represent PDUs sent to the authorized user MS/LS.



NOTE: Every ANF-ISISS PDU or ROSE APDU is conveyed by a PSS1 FACILITY message. The latter has not been shown in the corresponding signal symbols.

Figure E.2: Authorized user current SwMI SDL

NOTE 1: In the case where the served user would have some (limited) authorized user capabilities, the SDL in figure E.2 would be applicable to the SwMI where this user is registered.

NOTE 2: In the case where a user involved in the invocation or operation of some supplementary service would be registered in the same SwMI as the authorized user, the SDL applicable to the SwMI where the former user is registered would apply in addition to figure E.2 to the SwMI where the authorized user is registered.

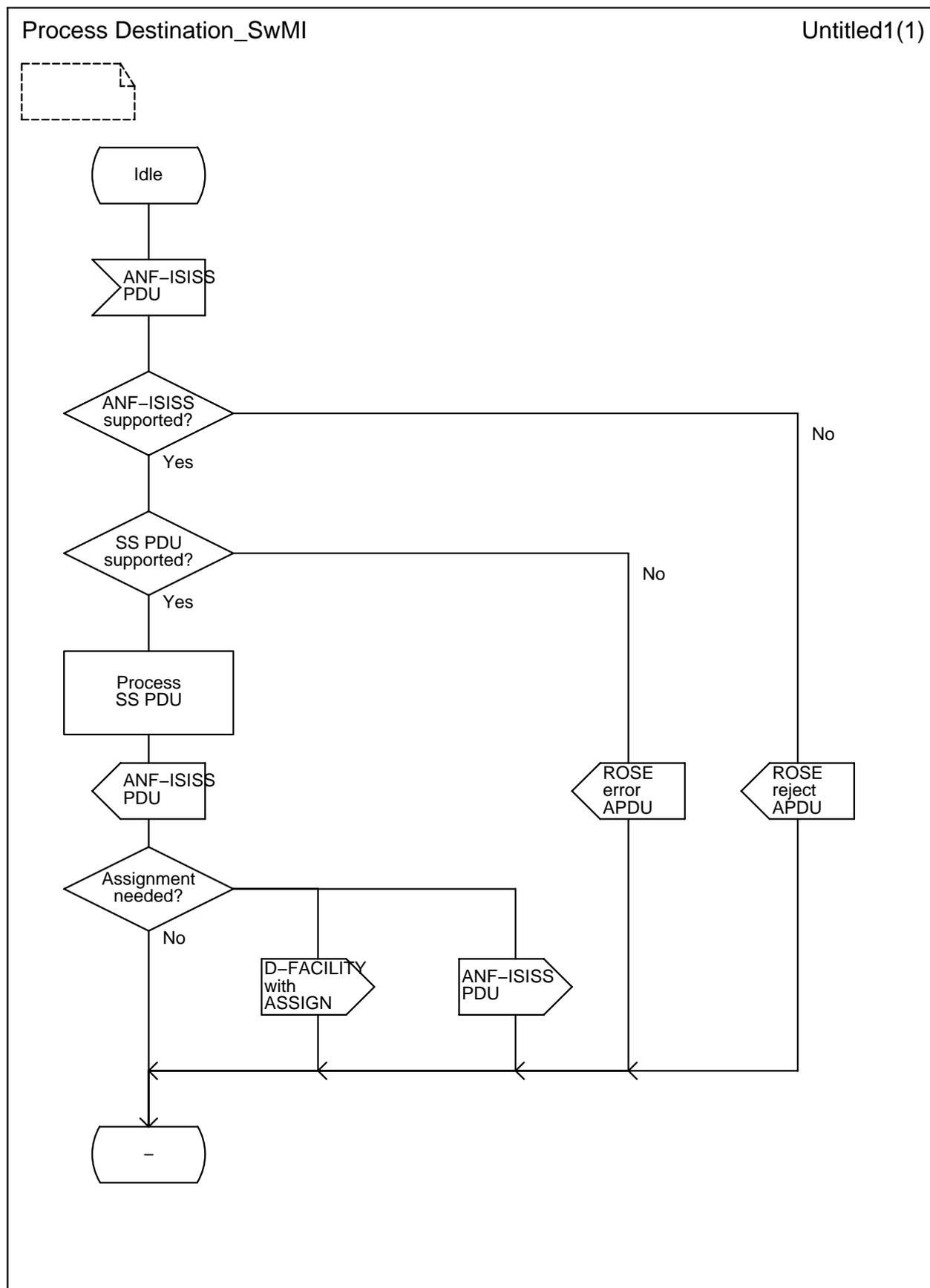
E.3 SDL representation of supplementary service control entity at the managed user home SwMI

Figure E.3 shows the behaviour of the supplementary service control entity specific to the managed user home SwMI.

Input signals from the left represent PDUs received from the SwMI where the authorized user is registered.

Output signals to the left represent PDUs sent to the SwMI where the authorized user is registered.

Output signals to the right represent either ASSIGN PDU sent to MS/LS(s) registered in the same SwMI and to which some specific supplementary definition is to be assigned, or to another SwMI where such MS/LS(s) is (are) registered.



NOTE: Every ANF-ISISS PDU or ROSE APDU is conveyed by a PSS1 FACILITY message. The latter has not been shown in the corresponding signal symbols.

Figure E.3: Managed user home SwMI SDL

NOTE: If the managed user home SwMI is involved in the invocation or operation of some supplementary service e.g. because the managed user then becomes the served user, the SDL applicable to the corresponding SwMI would apply in addition to figure E.3.

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

The diagrams in this annex use the Specification and Description Language defined in ITU-T Recommendation Z.100 (1993) [19].

Each diagram represents the behaviour of a supplementary service control entity either in a MS/LS or in a 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/LS (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 ETS 300 392-2 [2], the supplementary service control entity at a MS/LS 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/LS is registered. If this SwMI or any other operate at the ISI, in accordance with the protocol model described in clause 8 of ETS 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/LS 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 ETS 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 ETS 300 392-3-3 [5]; and
- of the ANF-ISIIC PDUs which will be specified in ETS 300 392-3-2 [4].

The following abbreviations are used:

CNNCT. for CONNECT
DMD. for DEMAND
GRT. for GRANTED
IRT. for INTERRUPT

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.

The suffix PDU has been omitted after the PDU names (e.g. ACTIVATE or ACTIVATE ACK).

History

Document history	
May 1998	Public Enquiry PE 9841: 1998-05-20 to 1998-10-16