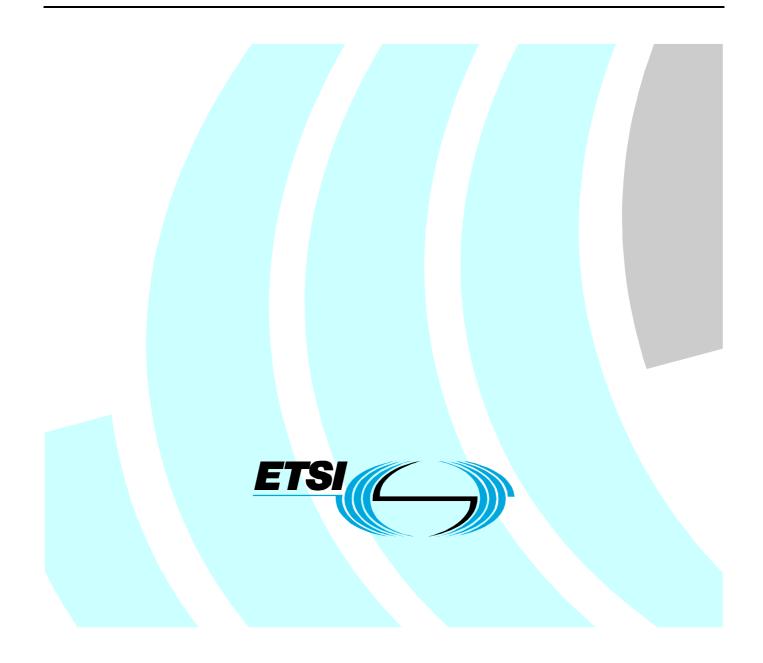Final draft ETSI EN 300 392-12-17 V1.1.2 (2001-11)

European Standard (Telecommunications series)

Terrestrial Trunked Radio (TETRA);
Voice plus Data (V+D);
Part 12: Supplementary services stage 3;
Sub-part 17: Include Call (IC)

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Project Terrestrial Trunked Radio (TETRA), and is now submitted for the Vote phase of the ETSI standards Two-step Approval Procedure.

The present document is part 12 sub-part 17 of a multi-part deliverable covering Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D), as identified below:

Part 1:   "General network design";

Part 2:   "Air Interface (AI)";

Part 3:   "Interworking at the Inter-System Interface (ISI)";

Part 4:   "Gateways Basic Operation";

Part 5:   "Peripheral Equipment Interface (PEI)";

Part 7:   "Security";

Part 9:   "General Requirements for Supplementary Services (SS)";

Part 10:   "Supplementary services stage 1";

Part 11:   "Supplementary services stage 2";

Part 12:   "Supplementary services stage 3";

Part 13:   "SDL Model of Air Interface (AI)";

Part 14:   "Protocol Implementation Conformance Statement (PICS) Proforma Specification";

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

Part 16:   "Network Performance Metrics";

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

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

1   Scope

The present document specifies the stage 3 description of the Supplementary Service Include Call (SS-IC) for the Terrestrial Trunked Radio (TETRA).

SS-IC permits the served user participating a call to include other participant to that call.

Man-Machine Interface (MMI) and charging principles are outside the scope of the present document.

Supplementary service specifications are produced in three stages according to the method defined in ITU-T Recommendation I.130 [1]. The stage 1 description specifies the service from the user's point of view (see ETS 300 392-10-17 [7]). The stage 2 description identifies the functional capabilities and the information flows needed to support the service as specified in its stage 1 description (see EN 300 392-11-17 [8]). The present stage 3 description specifies the protocols at the air interface *and at the various Inter-System Interfaces (ISI)* to support SS-IC.

> NOTE 1: According to ITU-T Recommendation I.130 [1], 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.

> NOTE 2: The latter have not been provided since they can be derived from the specification of the functional entity actions in the stage 2 description.

The present document is applicable to Voice plus Data individual and group calls; more specifically to the following entities:

-   the MS/LSs of the served user and of the affected user; and

-   the served user and the affected user Switching and Management Infrastructures (SwMIs) in an individual and group call.

2   References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

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

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

- For a non-specific reference, the latest version applies.

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

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

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

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

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

[6]   ETSI EN 300 392-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D);
            Part 9: General requirements for supplementary services".

[7]   ETSI ETS 300 392-10-17: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D);
            Part 10: Supplementary services stage 1; Sub-part 17: Include call".

[8]   ETSI EN 300 392-11-17: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D);
            Part 11: Supplementary services stage 2; Sub-part 17: Include Call (IC)".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in EN 300 392-9 [6] apply with the following modifications:

affected user: user or users included in the original call

>   NOTE 1:   The original call may be either a group call or an individual call but the resulting call is a group call.

affected user SwMI: any SwMI where an affected user is currently registered

another user: any other than server user in the original call to which new users will be included

another user SwMI: any SwMI where another user is currently registered

original call: call already established in which the served user participates and which will be included in a group call together with new participant added by the served user

resulting call: call formed from the original call participant(s) and new participant(s) included in the SS-IC operation

served user: user already participating in a call and who invokes the SS-IC supplementary service

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

>   NOTE 2:   The served user SwMI is the group controlling SwMI of the resulting group call.

3.2   Abbreviations

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

ANF-ISIGC   Additional Network Feature - Inter-System Interface Group Call
ANF-ISIIC   Additional Network Feature - Inter-System Interface Individual Call
ANF-ISIMM   Additional Network Feature - Inter-System Interface Mobility Management
ANF-ISISS   Additional Network Feature - Inter-System Interface Supplementary Service
IC   Include Call
ISI   Inter-System Interface
LS   Line Station
MS   Mobile Station
PDU   Protocol Data Unit
ROSE   Remote Operation Service Element
SDL   Specification Description Language
SS   Supplementary Service

>   NOTE: The abbreviation SS is only used when referring to a specific supplementary service (e.g. SS-IC).

SwMI   Switching and Management Infrastructure

4   SS-IC service description

4.1   General

SS-IC enables a served user, while already participating in an active call (original call) to place a second call and have the participant(s) in this second call included in a group call together with the participant(s) in the original call.

This clause describes the SS-IC services offered by the Circuit Mode Control Entity (CMCE) at the Supplementary Services service access point (TNSS-SAP) of the TETRA voice plus data layer 3 service boundary in a TETRA Mobile Station (MS) or TETRA Line Station (LS). The SS-IC service access point is used in conformance testing as a normative boundary in MSs and LSs.

> NOTE: As the present document deals only with SS-IC, all the service primitives has been shown without a TNSS-IC- prefix e.g. the TNSS-IC-INVOKE request is shortened into an INVOKE request.

4.2   SS-IC services offered over the TNSS-SAP

4.2.1   General on service primitives

> NOTE: As man-machine interface or user applications are outside the scope of the present document service primitives are used to define information exchange to and from the standardized part of the MS/LS. Those primitives may be only indirectly accessible.

The SS-IC service primitives at the served user MS/LS TNSS-SAP shall be:

- CANCEL request;

- INVOKE request;

- INVOKE indication; and

- INVOCATION FAILURE indication.

The SS-IC service primitives for the affected user at the MS/LS TNSS-SAP shall be:

- INFORM indication.

The SS-IC service primitives for another user at the MS/LS TNSS-SAP shall be:

- INFORM indication.

4.2.2   CANCEL

The CANCEL request primitive may be sent over the served user TNSS-SAP by the user application to the MS/LS CMCE to cancel SS-IC invocation.

The CANCEL primitive shall contain the SS-IC parameters listed in table 1.

Table 1: Parameters for the primitive CANCEL request

Parameters	Request
Included party	M

4.2.3   INFORM

The INFORM indication primitive may be sent over the affected or another user TNSS-SAP by the MS/LS CMCE to the user application to inform it that the presented call is an include call or that the current call is modified into an include call.

There are no parameters in the INFORM indication primitive.

NOTE: Actually the INFORM indication is carried as a notification indication of the basic call.

4.2.4   INVOKE

The INVOKE request primitive shall be sent over the served user TNSS-SAP by the user application to the MS/LS CMCE to invoke SS-IC. The INVOKE indication shall be sent over the served user TNSS-SAP to the user application when the inclusion of the new party or parties has been completed.

The INVOKE primitive shall contain the SS-IC parameters listed in table 2.

Table 2: Parameters for the primitive INVOKE request and indication

Parameters	Request	Indication
Included party	M	M

NOTE 1:   There are no other parameters as the call type is implied and the other relevant call parameters are the same as for the current call.

NOTE 2:   "called user alerted" is conveyed using the basic call primitives.

4.2.5   INVOCATION FAILURE indication

The INVOCATION FAILURE indication primitive may be sent over the served user TNSS-SAP by the MS/LS CMCE to the user application to inform it about the failure of a previous INVOKE request.

The INVOCATION FAILURE indication primitive shall contain the SS-IC parameters listed in table 3.

Table 3: Parameters for the primitive INVOCATION FAILURE indication

Parameters	Indication
Included party	M
Invocation failure cause	M
Disconnect cause	M

4.3   Parameter description

Disconnect cause:

- any basic call disconnection cause.

Invocation failure cause:

- rejected for any reason;

- not subscribed;

- maximum number of inclusions already reached;

- any basic call failure in the call set-up to the affected user (to be included user).

NOTE: The maximum number of inclusions is outside the scope of the present document.

5   Signalling protocol for the support of SS-IC

5.1   SS-IC operational requirements

5.1.1   Served user MS/LS

The served user MS/LS shall comply with the requirements in clause 14 of EN 300 392-2 [2] which apply to the tele- and bearer-services which it supports and which are invoked as individual or group calls. It shall also comply with the call related requirements in clauses 7, 8 and 11 of EN 300 392-9 [6] which apply to the INVOCATION FAILURE and INVOKE PDUs (see clauses 5.2.1.5 and 5.2.1.6 for the definition of those PDUs).

5.1.2   Served user SwMI

That SwMI shall support as served user SwMI the served user MS/LS complying with the requirements for individual and group calls set in clause 5.1.1. It shall also comply with the call related requirements in clauses 7 to 11 of EN 300 392-9 [6] which apply to the INVOCATION FAILURE and INVOKE PDUs (see clauses 5.2.1.5 and 5.2.1.6 for the definition of those PDUs) and to the sending of notification to the affected user.

If the resulting call is over the ISI, the served user SwMI shall comply with the corresponding ISI requirements for individual and group calls, set in EN 300 392-3-2 [3] and ETS 300 392-3-3 [4].

Served user SwMI may not support SS-IC in which case it should return the "supplementary service not supported" reason to the served user and the existing call will continue without included party.

5.1.3   Another user MS/LS

The another user MS/LS shall comply with the requirements in clause 14 of EN 300 392-2 [2] which apply to the tele- and bearer services which it supports and which are invoked as individual or group calls. In addition, it shall comply with clause 7.2.2 of EN 300 392-9 [6] (for receiving notifications).

5.1.4   Another user SwMI

That SwMI shall support as another user SwMI another user MS/LS complying with the requirements for individual call, when the original call is an individual call, and in any case group call as defined in clause 14 of EN 300 392-2 [2]. In addition, it shall comply with clause 7.2.2 of EN 300 392-9 [6] (for receiving and sending notifications).

If the call is over the ISI, i.e. another user SwMI is different from the served user SwMI, the another user SwMI shall comply with:

-    the corresponding ISI requirements for individual call, when the original call is an individual call, and in any case group call as defined in EN 300 392-3-2 [3] and ETS 300 392-3-3 [4]; and

-    the call related requirements in clauses 7, 9, 10 and 11 of EN 300 392-9 [6] which apply to the sending of notification to the affected user.

5.1.5   Affected user MS/LS

The affected user MS/LS shall comply with the requirements in clause 14 of EN 300 392-2 [2] which apply to the tele- and bearer services which it supports and which are invoked as individual or group calls. In addition, it shall comply with clause 7.2.2 of EN 300 392-9 [6] (for receiving notifications).

5.1.6   Affected user SwMI

That SwMI shall support as affected user SwMI the affected user MS/LS complying with the requirements for individual and group calls as defined in clause 14 of EN 300 392-2 [2], when individual user is included, and complying with the requirements for group calls, when group is included. In addition, it shall comply with clause 7.2.2 of EN 300 392-9 [6] (for receiving and sending notifications).

If the call is over the ISI, i.e. the affected user SwMI is different from the served user SwMI, the affected user SwMI shall comply with:

- the corresponding ISI requirements for individual and group calls, set in EN 300 392-3-2 [3] and ETS 300 392-3-3 [4], when an individual user is included;

- the corresponding ISI requirements for group calls, set in ETS 300 392-3-3 [4], when a group is included; and

- the call related requirements in clauses 7, 9, 10 and 11 of EN 300 392-9 [6] which apply to the sending of notification to the affected user.

5.2   Coding requirements

The information contained in the following description tables corresponds to the following keys:

Length: length of the information element or sub-element in bits.

Type: element type (1,2,3) described in clause 14.7 of EN 300 392-2 [2].

C/O/M: conditional/optional/mandatory information in the PDU.

Remark: comment or reference to note(s).

5.2.1   SS-IC PDUs

5.2.1.1   CANCEL

The CANCEL PDU is sent by the served user MS/LS either to the served user SwMI or to the group controlling SwMI to invoke SS-IC.

CANCEL PDU shall contain the SS-IC information elements listed in table .

NOTE: As the contents of this PDU refers to the INVOKE PDU that is a sub-set of the U-SETUP PDU defined in EN 300 392-2 [2] the information element names are kept so that the called party means in this context the to-be included (affected) party.

Table 4: CANCEL PDU contents

Information element	Length	Type	C/O/M	Remark
SS-type	6	1	M	Defined in EN 300 392-9 [6]
IC PDU type	5	1	M	CANCEL
Called party number type	2	1	M	
Called party short number address	8		C	see note
Called party SSI	24		C	see note
Called party extension	24		C	see note
External subscriber number		3	O	
DM-MS address		3	O	
NOTE: Shall be conditional on the value of Called Party Type Identifier (CPTI): - CPTI = 0; Called Party SNA; refer to EN 300 392-2 [2], clause 14.8.6; - CPTI = 1; Called Party SSI; - CPTI = 2; Called Party SSI + Called Party Extension.				

5.2.1.2   INCLUDED

INCLUDED PDU is sent by the SS-IC operating SwMI to the served user MS/LS in case of successful inclusion as requested by the previous invocation (sent by the INVOKE PDU).

The INCLUDED PDU shall contain information as defined in table 5.

NOTE 1:   As the contents of this PDU refers to the INVOKE PDU that is a sub-set of the U-SETUP PDU defined in EN 300 392-2 [2] the information element names are kept so that the called party means in this context the to-be included (affected) party.

Table 5: INCLUDED PDU contents

Information element	Length	Type	C/O/M	Remark
SS-type	6	1	M	Defined in EN 300 392-9 [6]
IC PDU type	5	1	M	INCLUDED
Called party number type	2	1	M	
Called party short number address	8		C	see note
Called party SSI	24		C	see note
Called party extension	24		C	see note
External subscriber number		3	O	
DM-MS address		3	O	
NOTE: Shall be conditional on the value of Called Party Type Identifier (CPTI): - CPTI = 0; Called Party SNA; refer to EN 300 392-2 [2], clause 14.8.6; - CPTI = 1; Called Party SSI; - CPTI = 2; Called Party SSI + Called Party Extension.				

NOTE 2:   The D-INFO PDU carrying this SS-IC PDU may also contain information about the inclusion success in information elements "poll response percentage" and "poll response number" when the original call was an acknowledged group call.

5.2.1.3   INFORM

There is no SS-IC specific PDU for the INFORM information flow as defined in EN 300 392-11-17 [8]. The basic call notification element shall be used instead and its value shall be set to "include call", refer to EN 300 392-9 [6] clause 7.2.2.

5.2.1.4   INVOCATION FAILURE

INVOCATION FAILURE PDU is sent by the SS-IC operating SwMI to the served user MS/LS in case of failure of the previous invocation (sent by the INVOKE PDU).

INVOCATION FAILURE PDU shall contain the SS-IC information elements listed in table 6.

Table 6: INVOCATION FAILURE PDU contents

Information element	Length	Type	C/O/M	Remark
SS-type	6	1	M	Defined in EN 300 392-9 [6]
IC PDU type	5	1	M	INVOCATION FAILURE
Invocation failure cause	3	1	M	
Disconnection cause	5	1	M	see note 1, refer to EN 300 392-2 [2]
Called party number type	2	1	M	
Called party short number address	8		C	see note 2
Called party SSI	24		C	see note 2
Called party extension	24		C	see note 2
External subscriber number		3	O	
DM-MS address		3	O	
NOTE 1: If the invocation failure cause is any other than "basic call failed to the requested party", then the disconnect cause shall be set to "cause not defined or unknown". NOTE 2: Shall be conditional on the value of Called Party Type Identifier (CPTI): - CPTI = 0; Called Party SNA; refer to EN 300 392-2 [2], clause 14.8.6; - CPTI = 1; Called Party SSI; - CPTI = 2; Called Party SSI + Called Party Extension.				

NOTE: The "not supported" information flow defined in stage 2 of the EN 300 392-11-17 [8] is supported by the generic supplementary service not supported information, refer to clause 5.2.1.5.

5.2.1.5   INVOKE

INVOKE PDU is sent by the served user MS/LS either to the served user SwMI or to the group controlling SwMI to invoke SS-IC.

INVOKE PDU shall contain the SS-IC information elements listed in table 7.

NOTE: As the contents of this PDU is a sub-set of the U-SETUP PDU defined in EN 300 392-2 [2] the references in the notes are to the clauses of that document. The information element names are kept so that the called party means in this context the to-be included (affected) party.

Table 7: INVOKE PDU contents

Information element	Length	Type	C/O/M	Remark
SS-type	6	1	M	Defined in EN 300 392-9 [6]
IC PDU type	5	1	M	INVOKE
Area selection	4	1	M	see note 1
Call priority	4	1	M	see note 2
CLIR control	2	1	M	see note 3
Called party type identifier	2	1	M	Short/SSI/TSI
Called party short number address	8		C	see note 4
Called party SSI	24		C	see note 4
Called party extension	24		C	see note 4
External subscriber number		3	O	
DM-MS address		3	O	
NOTE 1: This information element is used by SS-AS, refer to EN 300 392-2 [2], clause 14.8.1. NOTE 2: This information element is used by SS-PC, refer to EN 300 392-2 [2], clause 14.8.12. NOTE 3: Refer to EN 300 392-2 [2], clause 14.8.17b. NOTE 4: Shall be conditional on the value of Called Party Type Identifier (CPTI): - CPTI = 0; Called Party SNA; refer to EN 300 392-2 [2], clause 14.8.6; - CPTI = 1; Called Party SSI; - CPTI = 2; Called Party SSI + Called Party Extension.				

5.2.1.6   SS NOT SUPPORTED

The SS NOT SUPPORTED PDU is a basic supplementary services PDU and is not specific to SS-IC. Refer to
EN 300 392-9 [6].

5.2.2   TETRA PDU information element and sub-element coding

5.2.2.1   IC-ISI-PROFILE

IC-ISI-PROFILE is actually an ANF-ISIMM information sub-element, part of the information element SS-migration
profile (original) sent for SS-IC by the home SwMI to the served user SwMI when that user migrates, in the
ANF-ISIMM PDU SS-PROFILE UPDATE (see ETS 300 392-3-5 [5]).

IC-ISI-PROFILE shall simply be the SS-IC information element activation state as shown in table 8.

Table 8: IC-ISI-PROFILE information sub-element contents

Information sub-element	Length	Type	C/O/M	Remark
Activation state	1	1	M	see note

NOTE: The activation state may have values:
              - not subscribed; and
              - subscribed.				

5.2.2.2   IC PDU type

The information element IC PDU type shall indicate the type of the IC PDU, as defined in table 9.

Table 9: IC PDU type information element contents

Information element	Length	Value	Remark
IC PDU type	5	00000_2	See EN 300 392-9 [6]
		00001_2	See EN 300 392-9 [6]
		00010_2	See EN 300 392-9 [6]
		00011_2	See EN 300 392-9 [6]
		00100_2	See EN 300 392-9 [6]
		00101_2	INVOKE
		00110_2	INVOCATION FAILURE
		00111_2	INCLUDED
		$> 00111_2$	Reserved

5.2.2.3   Invocation failure cause

The information element invocation failure cause shall give the reason why the INVOCATION FAILURE PDU is sent. It shall be encoded as defined in table 10.

Table 10: Invocation failure cause information element contents

Information element	Length	Value	Remark
Invocation failure cause	3	000_2	Rejected for any reason
		001_2	Supplementary service not subscribed for user
		010_2	Basic call failed to the requested party (see note 1)
		011_2	Maximum number of inclusions already reached (see note 2)
		$> 011_2$	Reserved
NOTE 1: The use of this invocation failure cause value implies that the disconnect cause information element gives more information of the failure reason.			
NOTE 2: The maximum number of inclusions is outside the scope of the present document.			

5.2.3   Additional coding requirements over the ISI

The following shall apply for the PSS1 facility information element carrying an APDU of the ROSE operation used by ANF-ISISS for SS-IC PDUs:

- both the source Entity and destinationEntity data elements in the Network Facility Extension of this PSS1 facility information element shall contain the value endPINX;

- no interpretation APDU shall be included in this PSS1 facility information element.

NOTE: It may thus happen that the destinationEntity data element in the Network Facility Extension of this PSS1 facility information element contain a value different from endPINX (in the case of call restoration with loop or trombone avoidance - e.g. individual call initially established by forward switching through the called user home SwMI to a user who has migrated and that (called) user migrates back, into that SwMI).

5.3   SS-IC state definition

5.3.1   States at the served user MS/LS

Only one conceptual state has been identified in the served user MS/LS for writing the SS-IC procedures (i.e. for operation): idle.

5.3.2   States at the served user SwMI

The following conceptual states have been identified in the served user SwMI for writing the procedures for SS-IC invocation and operation:

- idle;

- waiting_for_inclusion (of a specific to-be included party).

None of the defined states will prevent the existing call continuation as defined for the basic call in EN 300 392-2 [2]. The conceptual state of each specific to-be included party may be replaced by variables, but that is outside the scope of the present document.

5.3.3   State at the another user MS/LS

Only one conceptual state has been identified in the another user MS/LS for writing the SS-IC procedures (i.e. for operation): idle.

5.3.4   State at the another user SwMI

Only one conceptual state has been identified in the another user SwMI for writing the SS-IC procedures (i.e. for operation): idle.

5.3.5   State at the affected user MS/LS

Only one conceptual state has been identified in the affected user MS/LS for writing the SS-IC procedures (i.e. for operation): idle.

5.3.6   State at the affected user SwMI

Only one conceptual state has been identified in the affected user SwMI for writing the SS-IC procedures (i.e. for operation): idle.

5.4   SS-IC signalling procedures

Examples of message sequences are implied by the stage 2 information flow sequences in clause 5.4 of EN 300 392-11-17 [8].

5.4.1   Actions at the served user MS/LS

5.4.1.1   Normal procedures

When the served user has invoked SS-IC during a call, the served user MS/LS shall send the U-INFO PDU (see table 77 of EN 300 392-2 [2]) including the INVOKE PDU.

> NOTE: Since node actions are not to be described as part of the protocol, it should be reminded that, according to EN 300 392-11-17 [8], on SS-IC stage 2 description, except for special applications, once the served user has invoked SS-IC, if the initial value of his MS/LS basic call timer T304 (see clause 14 of EN 300 392-2 [2]) is less than 30 seconds, that MS/LS should extend it at least to 30 seconds.

When the served user MS/LS receives INCLUDED PDU it knows that the inclusion and the supplementary service operation is completed and shall inform the served user application by an INVOKE indication.

5.4.1.2   Exceptional procedures

The following shall apply when the user has invoked SS-IC and when that invocation fails for one of the following reasons:

- the supplementary service has not been subscribed for him;

- the basic call set-up to the new participants is unsuccessful; or

- the maximum number inclusions has already been reached.

Upon reception of a D-INFO PDU including the INVOCATION FAILURE PDU the served user MS/LS knows that the inclusion has failed and the supplementary service operation is completed and shall inform the served user application by an INVOCATION FAILURE indication and shall return idle state.

The value of the information element invocation failure cause in that PDU shall indicate which of the above reasons applies. When the reason is due to the basic call a disconnection cause value should indicate a more detailed one.

> NOTE: If SS-IC invocation by a user fails because the SwMI where that user is registered does not support SS-IC, that user will be informed about it according to the procedure defined in clause 8.2 of EN 300 392-9 [6].

5.4.2 Actions at the served user SwMI

5.4.2.1 Normal procedures

When the served user SwMI has received the U-INFO PDU including the INVOKE PDU, it shall identify that the served user has invoked SS-IC.

NOTE: The present document assumes that the served user SwMI operates the SS-IC. That assumption is valid and required when the original call is an individual call. In the case when the original call is already a group call the served user could send the INVOKE PDU to the group controlling SwMI and the inclusion process would not need any modification other modification than that the communication between the served user and the SS-IC operating SwMI may go via another SwMI. Details of the operation are outside the scope of the present document.

Since node actions are not to be described as part of the protocol, it should be reminded that, according to EN 300 392-11-17 [8], on SS-IC stage 2 description when the served user SwMI receives an include call invocation, it should check whether:

- SS-IC has been subscribed for that user; and

- the maximum number of additional calls to that user has not been reached.

If the conditions are met the served user SwMI shall try to set up a call to the affected user or group using information element values as in the INVOKE PDU. The SwMI may modify the information elements using the same rules as in the basic call, refer to EN 300 392-2 [2]. The D-SETUP PDU shall contain notification information element with value "include call".

5.4.2.1.1 Individual user inclusion specific protocol issues

For an individual user inclusion the basic call type in the D-SETUP PDU shall be individual call and the basic service shall be the same as in the current call the served user is participating. The hook method can be either "no hook signalling" or "hook signalling". The SwMI shall enter into state waiting_for_inclusion. If a U-ALERT PDU is received the SwMI may inform the served user by sending a D-INFO PDU containing notification information element with value "called user alerted".

When the SwMI receives from the affected user U-CONNECT PDU it shall confirm it and modify the call into a group call using basic call mechanisms. The D-INFO PDU used in the call modification process towards the original call shall contain a notification information element with value "include call". The call modification D-INFO PDU to the affected user may contain a notification information element with value "include call". The SwMI shall inform the served user by sending an INCLUDED PDU in a D-INFO PDU.

NOTE: When an individual call is modified into a group call the basic call allocates a temporary group number to be used as the receiving address during the rest of the call, refer to EN 300 392-2 [2] clause 14.5.1.2.3. Once the call is a group call the modification need to be performed only with the new included parities. After completion of the inclusion the SwMI shall continue the call using basic call procedures and enter into state idle for the supplementary service.

5.4.2.1.2 Group inclusion specific protocol issues

For a group inclusion the basic call type in the D-SETUP PDU shall be group call and the basic service shall be the same as in the current call the served user is participating. If the group call is an acknowledged group call the SwMI shall enter into state waiting_for_inclusion. The SwMI shall inform the other participants about the inclusion by sending a D-INFO PDU containing notification information element with value "include call". The SwMI may also modify the basic call by allocating a new temporary address to the original call or to the included group or to the both, refer to EN 300 392-2 [2] clause 14.5.2.3, which is modified by the addition of the temporary group number allocation option.

NOTE: The use of a temporary address for the whole include call may be useful in order to isolate it from other signalling such as SDS intended only to particular participants of the whole call.

Once the acknowledgement process is successfully completed or the immediately if the call was normal group call the SwMI shall inform the served user by sending an INCLUDED PDU in a D-INFO PDU and the SwMI shall enter into state idle for that supplementary service.

5.4.2.2   Exceptional procedures

When the served user MS/LS has sent the INVOKE PDU and that invocation fails the served user SwMI shall send back the D-INFO PDU including an INVOCATION FAILURE PDU. The value of the information element invocation failure cause in the INVOCATION FAILURE PDU shall give the corresponding failure cause:

- the supplementary service has not been subscribed for him;

- the basic call set-up to the new participants is unsuccessful; or

- the maximum number inclusions has already been reached.

In the first case the served user SwMI shall send the INVOCATION FAILURE PDU in a D-INFO PDU to the served user (which is not really a served user by definition) without any other action.

In the second case the basic call to the affected user has failed and the served user SwMI has received a DISCONNECT PDU or would send one to the served (calling) user if the call were a basic call. Instead the SwMI shall send an INVOCATION FAILURE PDU in a D-INFO PDU to the served user and enter into state idle for that supplementary service.

The third case may result of the complexity of the resulting call if the requested inclusion were performed. Normally the served user SwMI knows that before even trying to include new participants and should send an INVOCATION FAILURE PDU in a D-INFO PDU to the served user without any other action and in any case enter into state idle for that supplementary service, if not already there.

5.4.3   Actions at the affected user MS/LS

In addition to procedures specified in clause 5.1.4 the affected user MS should not modify the hook method, when is receives a D-SETUP PDU with notification information element value "include call".

5.4.4   Actions at the affected user SwMI

When the affected user SwMI is different from the served user SwMI, the affected user SwMI will receive in the ANF-ISIIC-SETUP PDU notification information value "include call" and shall deliver it to the affected user MS/LS in the D-SETUP PDU as defined in the basic call. Upon request the affected user shall modify the call to the affected user into a group call again using basic call procedures.

    NOTE: No specific procedures apply for the affected user SwMI for passing the notifications received from the
              served user SwMI to the affected user MS/LS (when the served user invokes SS-IC for the incoming call)
              beyond those for specified in clause 5.1.5.

5.5   SS-IC impact of interworking with other networks

5.5.1   SS-IC impact of interworking with other TETRA networks

The impact on the SS-IC call related procedures of interworking with other TETRA networks is limited:

- to the information to the affected user (i.e. to the called user of the individual call due to invocation of SS-IC);

- to the information to another user or users; and

- to the call modification into a group call or to the allocation of a temporary address.

The only other SS-IC impact of interworking with other TETRA networks is the need to exchange information about SS-IC subscription for the served user when that user migrates.

5.5.2   SS-IC impact of interworking with external networks

The calling party of an individual call may be an external user. In such a case it shall be up to the corresponding TETRA gateway to send to the external network the notification that the TETRA served user has (just) invoked SS-IC, if such procedure is supported in the external network.

If the external network supports the supplementary service SS-IC (as defined in that network), if the external user invokes that supplementary service successfully for a call a TETRA user participates and if the external network notifies the other party of such invocation.

Those impacts have been taken into account in clause 5.4.

5.6   Protocol interactions between SS-IC and other supplementary services and ANFs

5.6.1   Protocol interactions with other supplementary services

No protocol interactions between SS-IC and other supplementary services have been identified.

5.6.2   Protocol interactions with ANFs

5.6.2.1   Interaction with ANF-ISIGC, ANF-ISIIC and ANF-ISISS

Since SS-IC modifies an individual call to group call, there shall be protocol interactions between SS-IC, ANF-ISIIC and ANF-ISIGC.

The protocol interactions have already been taken into account in clause 5.4.

As to ANF-ISISS, there are no protocol interactions between it and SS-IC.

5.6.2.2   Interactions with ANF-ISIMM

When the served user migrates into a visited SwMI, the following exchange of information shall be ensured, through ANF-ISIMM (see ETS 300 392-3-5 [5]):

-   the information element basic migration profile (original) in the ANF-ISIMM-PROFILE PDU sent with the value of the profile type information element corresponding to individual subscriber shall indicate that SS-IC has been subscribed for the served user;

-   the visited SwMI shall inform the home SwMI whether or not it supports SS-IC in the ANF-ISIMM-PROFILE RESPONSE PDU sent back in setting the value of the information element basic migration profile info to 0 (i.e. profile accepted as received);

-   unless the home SwMI has received earlier the information that the visited SwMI does not support SS-IC (in the ANF-ISIMM-PROFILE RESPONSE PDU), when the home SwMI sends the ANF-ISIMM-SS-PROFILE UPDATE PDU to the visited SwMI, it shall include in that PDU the information sub-element IC-ISI-PROFILE defined in table 8 in the information element SS-migration profile (original) with the value of the information sub-element SS-type corresponding to SS-IC. The value of the accompanying information sub-element profile status corresponds then to profile replacement;

-   the visited SwMI shall then acknowledge the SS-IC profile information received in the ANF-ISIMM-SS-PROFILE UPDATE PDU as defined in ETS 300 392-3-5 [5].

5.7   SS-IC interaction with call timer

The SS-IC may be invoked close to the expiry of T310 (call duration timer) and the served user SwMI should update the timer when needed in order to allow a sensible time for the call with new participants.

History

Document history			
V1.1.1	November 2000	Public Enquiry	PE 20010330: 2000-11-29 to 2001-03-30
V1.1.2	November 2001	Vote	V 20020111: 2001-11-12 to 2002-01-11