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**Terrestrial Trunked Radio (TETRA);
Voice plus Data (V+D);
Part 3: Interworking at the Inter-System Interface (ISI);
Sub-part 2: Additional Network Functions
Individual Call (ANF-ISIIC)**

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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 consists of 14 parts as follows:

- Part 1: "General network design";
- Part 2: "Air Interface (AI)";
- Part 3: "Inter-working at the Inter-System Interface (ISI)";**
- Part 4: "Gateways";
- Part 5: "Peripheral Equipment Interface (PEI)";
- Part 6: "Line connected Station (LS)";
- 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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| Date of latest announcement of this ETS (doa): | 3 months after ETSI publication |
| Date of latest publication of new National Standard or endorsement of this ETS (dop/e): | 6 months after doa |
| Date of withdrawal of any conflicting National Standard (dow): | 6 months after doa |

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1 Scope

This ETS defines the Terrestrial Trunked Radio (TETRA) system supporting Voice plus Data (V+D). It specifies:

- general design aspects (e.g. reference points, numbering and addressing, or protocol architecture);
- the system bearer and mobility management services, and the corresponding air interface protocols;
- the interworking between TETRA networks;
- the interworking of TETRA networks with other networks, via gateways;
- the peripheral equipment interface on the mobile station;
- the Line Station (LS) interface with TETRA networks;
- the security protocols and mechanisms applicable to TETRA networks and to TETRA terminal equipment;
- the supplementary services applicable to the basic TETRA tele- or bearer services.

The TETRA V+D interworking - basic operation part defines the interworking between TETRA networks over the corresponding interface: the Inter-System Interface (ISI). It comprises the following subparts:

- ISI general design;
- Additional Network Feature - ISI Individual Call (ANF-ISIIC);
- Additional Network Feature - ISI Group Call (ANF-ISIGC);
- Additional Network Feature - ISI Short Data service (ANF-ISISD);
- Additional Network Feature - ISI Mobility Management (ANF-ISIMM);
- 8 kbit/s encoding of user information at the ISI.

This ETS is the ANF-ISIIC sub-part.

ANF-ISIIC enables calls to be set-up by a user registered in one TETRA network to another user registered in another TETRA network, operating at the ISI of both SwMIs. It also supports call restoration when a user has migrated to another TETRA network during an established call. Additionally, ANF-ISIIC allows TETRA signalling information to be passed from a TETRA SwMI to another TETRA SwMI supporting the TETRA individual call procedures as defined in clauses 11 and 14 of ETS 300 392-2 [1].

Like all other Additional Network Feature (ANF) specifications, those of ANF-ISIIC are produced in three stages, according to the method described in CCITT Recommendation I.130 [11]. This ETS contains the stage 1 and 2 descriptions of ANF-ISIIC, and its partial stage 3 description. The stage 1 description specifies the ANF as seen by its users, which are essentially the individual call control entities in both TETRA networks. The stage 2 description identifies the functional entities involved in the ANF and the information flows between them. And the partial stage 3 description of ANF-ISIIC specifies its protocol.

NOTE: According to CCITT Recommendation I.130 [11], the stage 3 description of a bearer or tele-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 functional entity actions in the stage 2 description.

This ETS applies to TETRA networks which support inter-TETRA individual calls. More specifically, it applies to their Circuit Mode Control Entities (CMCE), as defined in subclause 14.2 of ETS 300 392-2 [1], and to their ANF-ISIIC entities defined in the stage 2 description.

2 Normative references

This ETS incorporates by dated and 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 300 392-2 (1996): "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [2] 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 description".
- [3] ETS 300 392-3-5: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Inter-working at the Inter-System Interface (ISI); Sub-part 5: Additional Network Functions Mobility Management (ANF-ISIMM)".
- [4] ETS 300 392-7 (1996) "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA), Voice plus Data (V+D); Part 7: Security".
- [5] ETS 300 392-9 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); General requirements for Supplementary Services (SS)".
- [6] ETS 300 172 (1997): "Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Circuit-mode basic services [ISO/IEC 11572 (1997) modified]".
- [7] ETS 300 921 (1997): "Digital cellular telecommunications system; Part 2: Service accessibility (GSM 02.11 version 5.0.1)".
- [8] ETS 300 392-10-19 (1996): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Sub-part 19: Barring of incoming calls".
- [9] ETS 300 395-2 (1997): "Terrestrial Trunked Radio (TETRA); Speech codec for full-rate traffic channel; Part 2: TETRA codec".
- [10] ITU-T Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means to describe them".
- [11] CCITT Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [12] ITU-T Recommendation I.140 (1993): "Attribute technique for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [13] CCITT Recommendation Z.100 (1993): "CCITT specification and description language (SDL)".
- [14] ITU-T Recommendation V.110 (1996): "Support by an ISDN of data terminal equipment with V-Series type interfaces".
- [15] 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".

- [16] ISO/IEC 11574 (1994): "Information technology; Telecommunications and information exchange between systems; Private Integrated Services Network; Circuit-mode 64 kbit/s bearer services; Service description, functional capabilities and information flows".
- [17] 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".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the definitions of ETS 300 392-3-1 [2] apply, in addition to the following:

originating SwMI or SwMI A: The Switching and Management Infrastructure in which the calling user has registered.

called SwMI or SwMI B: The Switching and Management Infrastructure to which ANF-ISIIC routes the first call attempt.

SwMI C: The Switching and Management Infrastructure in which the called user has registered after having migrated from SwMI B, in the case where its home SwMI is SwMI B.

terminating SwMI: The Switching and Management Infrastructure in which the connected user is registered.

NOTE 1: Unless an interaction with one or more supplementary services which modify the routing of the call (e.g. call diversion) has occurred, the connected user will be the called user; and the terminating SwMI will be the SwMI where the called user is registered, i.e. SwMI B or SwMI C.

forward switching: A network routing algorithm which performs the diversion by joining together the first connection, from SwMI A to SwMI B, and a second connection from SwMI B to SwMI C.

home SwMI: The SwMI which is the home of the MS (or LS) ITSI, i.e. to which the Mobile Network Identity (MNI) which is part of the ITSI belongs.

re-routing: A network routing algorithm which performs the diversion by replacing the connection from SwMI A to SwMI B by another connection from SwMI A to SwMI C.

loop connection: An ISI connection which has both its ends in the same SwMI.

trombone connection: A special case of loop connection where all inter-TETRA connections making up the loop connection are used twice.

NOTE 2: If no interaction occurs with supplementary services which modify the routing of the call (e.g. call diversion), the only loop connection which can be established by an invoked ANF-ISIIC is a trombone connection (i.e. when SwMI C coincides with SwMI A).

3.2 Abbreviations

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

| | |
|------|---|
| CC | Call Control (PISN functional entity) |
| CCAp | Call Control Application (SwMI functional entity) |
| FE | Functional Entity |
| ISDN | Integrated Services Digital Network |
| ISI | Inter System Interface |
| PINX | Private Integrated Services Network Exchange |

| | |
|------|---|
| PISN | Private Integrated Services Network |
| PSS1 | Private Integrated Signalling System Number 1 |
| SDL | Specification and Description Language |
| SwMI | Switching and Management Infrastructure |

4 ANF-ISIIC stage 1 specification

4.1 Description

4.1.1 General description

ANF-ISIIC enables individual calls to be set-up from a TETRA user registered in one Switching and Management Infrastructure (SwMI) to another TETRA user registered in another SwMI. ANF-ISIIC operates at the Inter System Interface (ISI) of both SwMI Call Control Applications (CCAs), in such a manner that these calls can be routed through (transit) Private Integrated Services Networks (PISNs). Additionally, for the duration of each call, ANF-ISIIC allows TETRA signalling information to be passed from TETRA SwMI to TETRA SwMI in accordance with the TETRA Individual Call procedures as defined in ETS 300 392-2 [1]. In addition ANF-ISIIC participates in call restoration when a user has migrated to another TETRA network during an established call.

The entities with which ANF-ISIIC interacts are the originating and the terminating SwMI CCAs, and in addition, some SwMI databases, especially that of the called user home SwMI.

4.1.2 Qualifications on applicability to telecommunication services

ANF-ISIIC is applicable to all point-to-point circuit mode tele - and bearer services defined in ETS 300 392-2 [1]:

- point-to-point TETRA clear mode speech;
- point-to-point TETRA encrypted speech;
- point-to-point one slot 2,4 kbit/s, 4,8 kbit/s or 7,2 kbit/s TETRA circuit mode data;
- point-to-point N x 2,4 kbit/s, N x 4,8 kbit/s or N x 7,2 kbit/s TETRA circuit mode data, with N = 2, 3 or 4;
- point-to-point end-to-end encrypted one slot 2,4 kbit/s, 4,8 kbit/s or 7,2 kbit/s TETRA circuit mode data;
- point-to-point end-to-end encrypted N x 2,4 kbit/s, N x 4,8 kbit/s or N x 7,2 kbit/s TETRA circuit mode data, with N = 2, 3 or 4.

4.2 Procedures

4.2.1 Provision/withdrawal

Provision of ANF-ISIIC shall always be available.

4.2.2 Normal procedures

4.2.2.1 Activation/deactivation/registration/interrogation

ANF-ISIIC shall always be activated.

Registration and interrogation are not applicable to this ANF.

4.2.2.2 Invocation and operation

ANF-ISIIC shall be invoked by SwMI A CCAp, its served user, when a request from a TETRA user for an individual call to another TETRA network is received by this SwMI. The other network SwMI being called SwMI B by definition, SwMI A CCAp will identify SwMI B:

- either through analysis of the destination number when the called user home SwMI is SwMI B;
- or by a migration information when the called user home SwMI is SwMI A and this user has migrated to SwMI B.

In either case, the invoked ANF-ISIIC shall route the call over an inter-TETRA connection to TETRA network B.

ANF-ISIIC shall allow to use a PISN to interconnect these two SwMIs.

NOTE: This implies that ANF-ISIIC needs to be defined as an extension of PISN basic call control as defined by ISO/IEC 11574 [16] and 11572 [15]. This extension consists in the addition of certain procedures that PISN basic call control is unable to perform satisfactorily for TETRA networks, in remaining compatible with PISN inter-exchange signalling protocol as defined by ISO/IEC 11582 [17].

4.2.2.2.1 Call routing

If the called user is registered in TETRA network B, SwMI B will know the location of this user; ANF-ISIIC shall then allow this SwMI to complete the call with this user, by ensuring the necessary transfer of information with SwMI A.

If the called user has migrated to another SwMI (SwMI C), then ANF-ISIMM as defined in ETS 300 392-3-5 [3] will ensure that this is known from its home SwMI.

NOTE: SwMI C cannot exist when the called user home SwMI is SwMI A. This is because when a user has migrated first in a given TETRA network 1, and then migrates into a new TETRA network, SwMI A database will now hold the identity of this new network as being that of SwMI B.

Thus SwMI C as defined in subclause 3.1 will only exist when the home SwMI of the called user is SwMI B and when this user has migrated.

Then the call shall be either re-routed (from SwMI A) or forward switched (through SwMI B), depending on the ANF mode of operation.

4.2.2.2.2 Control of call time-out timers

Call time-out either for the call establishment phase or once the call has been established may be negotiated between SwMI A CCAp and the terminating SwMI (i.e. SwMI B or C) CCAp: for such negotiation SwMI A CCAp shall indicate its time-out for both durations, and the terminating SwMI CCAp should either use these values or if it decides to have a larger one for any of its corresponding timers, send it to SwMI A CCAp. SwMI A CCAp should then use the latter value (for its corresponding timer).

NOTE: While the exchange of time-out values between the two CCAs has been specified in the protocol (see subclauses 6.3.1.1, 6.3.1.7, 6.3.1.8 and 6.3.1.14), the use of the time-out values of one CCAp by the other is optional. However if this other CCAp does not use them, the risk of call attempt failure (due to premature call establishment time-out) or call interruption (due to premature call duration time-out) will be increased.

4.2.2.2.3 Transmission control

ANF-ISIIC shall remain operational for the duration of the call, sending and receiving TETRA signalling messages as appropriate under direction of the originating and terminating SwMI CCAs.

The originating SwMI shall be designated as the controlling SwMI for half-duplex operation, and all requests to transmit from the called user shall be directed to this SwMI to be granted, after the call control application of the terminating SwMI shall have reserved the corresponding radio resource for the called user.

4.2.2.2.4 Call modification

Call modification as defined in subclause 14.5.1.2 of ETS 300 392-2 [1] shall have no impact on the ISI connection(s) established by the invoked ANF-ISIIC.

NOTE: The reason for this is first that the various cases of call modification defined in subclause 14.5.1.2 of ETS 300 392-2 [1] never result in an increased number ISI capacity, and second, it is not possible to reduce the ISI connection information transfer rate defined at ANF-ISIIC set-up.

However call modification shall result in a change in the 8 kbit/s encoding of the user information when the data rate of this information changes, because of e.g. a change from data call to speech call, or from 4,8 kbit/s to 7,2 or 2,4 kbit/s, and vice-versa.

4.2.2.2.5 Call restoration after migration

If the calling or the called user migrates and registers in a new TETRA network once an inter-TETRA call has been established, an ANF-ISIMM will be invoked to inform the call control application of the SwMI where this migrating user was previously registered (hereafter called the "old SwMI"). Upon request of that call control application, the ANF-ISIIC invoked to establish this call shall then establish a new connection between the old SwMI and the new SwMI, in putting the call on hold. The call restoration request by the migrating user in the new SwMI (see subclause 14.5.1.2.4 of ETS 300 392-2 [1]) shall result in the held call being transferred by the old SwMI to this migrating user. This transfer shall be by join (i.e. through the old SwMI). It will result in a new connection (between the new network in which the user is now registered and the network where the other user engaged in the call remains registered) which shall be used by the existing ANF-ISIIC.

Figure 1 illustrates this in the case where the calling user has migrated and its home SwMI is not SwMI A.

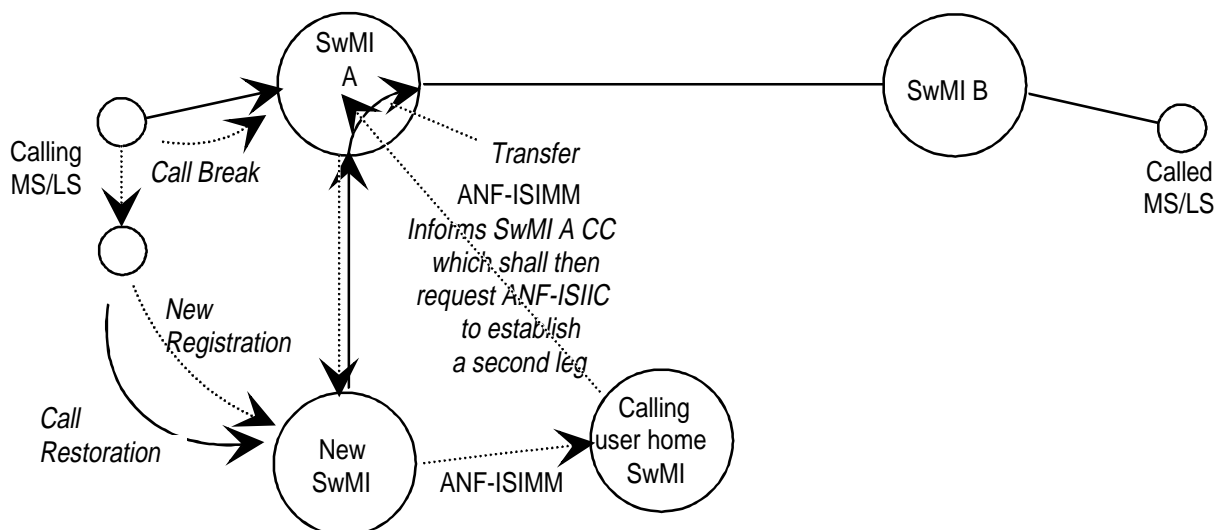


Figure 1: Call restoration by the calling user having migrated, with its home SwMI being different from SwMI A

Similarly, If the same migration of the calling or of the called user happens once an inter-TETRA call in a given SwMI has been established, an ANF-ISIMM will be invoked to inform the Call Control (CC) entity of this SwMI. This SwMI CC shall invoke an ANF-ISIIC to allow a successful call restoration.

NOTE 1: As opposed to the former case of call restoration, where an ANF-ISIIC has already been invoked and is then extended to the "new" SwMI by transfer, the latter is a very specific case of ANF-ISIIC invocation.

NOTE 2: When this migration takes place during the establishment of the call, the call will be cleared by the MS/LS, as a result of the detection of the corresponding (radio path) break by its MLE.

NOTE 3: The term "migration" corresponds to what has been defined for GSM as "national roaming": i.e. changing from one GSM Public Land Mobile Network (PLMN) area to another one (see subclauses 2.3 and 1.2 of ETS 300 921 [7]). Thus, using the GSM terminology, TETRA call restoration while migrating would correspond (at least at the stage 1 description level) to "handover" while "roaming nationally", i.e. while leaving one GSM PLMN area and entering a new one.

4.2.2.2.6 Call clearing

When clearing the call on its side, either the originating or the terminating SwMI call control applications shall clear the invoked ANF-ISIIC. This ANF-ISIIC shall then clear the ISI connection, and clear the other SwMI call control application.

NOTE 1: In the originating SwMI, the call may be cleared either by the calling user or by the call control application (e.g. if the SwMI can no longer support the call). Similarly, in the terminating SwMI, the call may be cleared either by the called user or by the call control application.

NOTE 2: Although this is purely formal, since the interfaces between ANF-ISIIC and the call control application are internal to SwMIs, to be consistent with both the stage 1 description of the PISN basic call in ISO/IEC 11574 [16] and the definition of TETRA call control primitives in clause 11 of ETS 300 392-2 [1], it will be considered that the clearings between the invoked ANF-ISIIC and the call control applications are acknowledged.

4.2.2.2.7 Interaction between ANF-ISIICs

Due to the fact that a single ANF-ISIIC shall handle the routing of the call either to the called user, even when this user has migrated, only one ANF-ISIIC shall be invoked per individual call. And thus, no interaction can possibly take place in the case of a single individual call.

As stated in the corresponding subclauses, this shall also hold in case of interactions with supplementary services, including those which modify the routing of the call (e.g. call diversion, see subclauses 4.3.6 to 4.3.8).

On the other hand, two invoked ANF-ISIIC using the same intra-TETRA connection group can interact through some supplementary services:

- SS-include call for merging two individual calls into a group call (see subclause 4.3.22);
- SS-priority call (see subclause 4.3.15) and SS-Pre-emptive Priority Call (see subclause 4.3.21) for the invocation of ANF-ISIIC for a new call: in the case of SS-Priority Call, to make a choice between two or more such invocations, and in that of SS-Pre-emptive Priority Call, to choose whether to operate such newly invoked ANF-ISIIC in clearing an active one, or to reject it.

4.2.3 Exceptional procedures

4.2.3.1 Activation/deactivation/registration/interrogation

Not applicable.

4.2.3.2 Invocation and operation

ANF-ISIIC may reject the call request with an appropriate failure indication for any of the following reasons:

- no inter-TETRA connection available, permanently;
- no inter-TETRA connection available, temporarily;
- failed call restoration (see subclause 4.2.2.2);

- the called user has migrated and is now registered in SwMI A: the invoked ANF-ISIIC shall then clear the call attempt to avoid that it be established with a trombone connection (see definition of that term in subclause 3.1) and SwMI A call control application shall establish the call as an intra-TETRA call.

NOTE 1: According to the way ANF-ISIMM operates, the latter case cannot arise when the called user home SwMI is SwMI A, since in such a case SwMI A call control application would not have invoked ANF-ISIIC.

And the terminating SwMI shall clear the invoked ANF-ISIIC in the following cases:

- the called user address is incorrect or invalid;
- unsuccessful outcome of Private Integrated Signalling System Number 1 (PSS1) basic call establishment related to the called user as described in subclause 9.3 of ISO/IEC 11574 [16];
- no details concerning the location of the called user are available.

NOTE 2: According to the way ANF-ISIMM operates, the latter case cannot arise when the called user home SwMI is SwMI A: in such a case even if this user had just migrated from SwMI B to another SwMI (which is going to become the new SwMI B), SwMI A would know it before (the old) SwMI B (which anyhow will never know it).

4.3 Interactions with other TETRA supplementary services and ANFs

Interactions with other TETRA supplementary services and ANFs for which TETRA Standards were available at the time of publication of this standard are specified below.

4.3.1 Calling Line Identification Presentation (SS-CLIP)

No interaction.

4.3.2 Connected Line identification Presentation (SS-COLP)

No interaction.

4.3.3 Calling/Connected Line identification Restriction (SS-CLIR)

In an individual inter-TETRA call, both the originating and the terminating SwMIs shall support SS-CLIR for the user at the other end (e.g. the terminating SwMI shall support SS-CLIR for the calling user).

4.3.4 Call Report (SS-CR)

No interaction.

4.3.5 Talking Party Identification (SS-TPI)

No interaction.

NOTE: The fact that the ANF-ISIIC invoked for a call carries transparently SS-TPI signalling exchanged between the calling SwMI (A) call control application and the terminating SwMI (B/C) call control application is not to be considered as an interaction.

4.3.6 Call Forwarding Unconditional (SS-CFU)

Whenever ANF-ISIIC has been invoked, it shall interact with SS-CFU if the latter has been activated (by the called user, this user being the SS-CFU served user), unless the incoming call is barred to the called user - by the barring of incoming calls or the call authorized by dispatcher supplementary services.

In addition, when the home SwMI of the called user is SwMI A, SS-CFU shall invoke ANF-ISIIC for forwarding the call if the forwarded-to user home SwMI is different from SwMI A, except possibly when the forwarded-to user happens to be registered in SwMI A after having migrated.

The full specifications of the interactions between SS-CFU and ANF-ISIIC are given in annex A.

When the called user home SwMI is SwMI A, the main interaction is the invocation of ANF-ISIIC already mentioned. And when the called user home SwMI is SwMI B, the interactions can be summarized as follows:

- unless the called user has migrated and is now registered in SwMI A, the ANF-ISIIC originally invoked for attempting to route the call to the called user shall invoke SS-CFU if it has been activated (by the called user) in SwMI B and this ANF shall ensure SS-CFU routing;
- if the called user has migrated and is now registered in SwMI A, then the invoked ANF shall check whether another SS-CFU, a local SS-CFU, has been activated in SwMI A by the called user, and if so, it shall not invoke the SS-CFU activated in the home SwMI (thus letting SwMI A CMCE invoke this local SS-CFU).

NOTE: If no local SS-CFU has been activated in SwMI A by the called user, then the invoked ANF-ISIIC will invoke the SS-CFU activated in the home SwMI, unless SwMI A call control application can route directly calls to called users registered in this SwMI when it is not their home SwMI (i.e. as intra-TETRA calls).

- If the forwarded-to user has itself activated a call diversion supplementary service, the originally invoked ANF-ISIIC shall invoke this new call diversion supplementary service and operate its routing;
- when ensuring the SS-CFU routing mentioned above, this invoked ANF-ISIIC shall avoid loop connection (notably trombone connection) between the originating and the terminating SwMIs (e.g. SwMI where the forwarded-to user is registered coinciding with SwMI A).

In addition, the invoked ANF-ISIIC shall operate the barring of incoming calls supplementary service for each forwarded-to user.

4.3.7 Call Forwarding on Busy (SS-CFB)

The interactions between SS-CFB and ANF-ISIIC shall be the same as those between SS-CFU and ANF-ISIIC, the only difference being that whereas ANF-ISIIC invoked SS-CFU unconditionally, it shall invoke SS-CFB only if the called user is found busy.

This implies that except for local SS-CFB, the ANF-ISIIC invoked to route the call to the called user shall only route it by forward switching when SS-CFB has been activated for the called user.

NOTE 1: The latter requirement is to ensure that the invoked ANF-ISIIC invokes SS-CFB in SwMI B since SwMI B would be by-passed in the case of re-routing.

The full specifications of these interactions are given in annex B.

In addition, the invoked ANF-ISIIC shall operate the barring of incoming calls supplementary service for each forwarded-to user.

NOTE 2: This is not stated in annex B because this annex does not cover the interaction between SS-CFB and the barring of incoming calls supplementary services.

4.3.8 Call Forwarding on No Reply (SS-CFNRY)

The specifications of the interactions between SS-CFNRY and ANF-ISIIC are the same as those between SS-CFB and ANF-ISIIC.

This means that annex B shall also apply to CFNRY invocation, in replacing CFB by CFNRY together with the invocation condition "user found busy", by "user having not replied within a specified time interval". In addition, for the optional notification to the SS-CFNRY served user, SS-CFNRY shall use the ANF-ISIIC used to invoke this supplementary service, unless it has exceptionally been cleared.

NOTE: If this ANF has been released, SS-CFNRY will deliver this notification by signalling (i.e. without invoking again ANF-ISIIC).

4.3.9 Call Forwarding on Not Reachable (SS-CFNRc)

This interaction is the same as that specified in subclause 4.3.8, in replacing CFNRy by CFNRc, and the invocation condition "the called user has not replied within a specified time interval", by "the called user cannot be reached".

4.3.10 List Search Call (SS-LSC)

No interaction.

NOTE 1: SS-LSC will interact with SwMI A CC, which itself will invoke the ANF for calling a user in the list. But this is not an interaction between ANF-ISIIC and SS-LSC.

NOTE 2: The statement that there shall be no interaction implies that the choice has been made to invoke ANF-ISIIC every time a call is attempted to the next user (registered in another SwMI) in SS-LSC list (i.e. ruling out the possibility of invoking ANF-ISIIC only once for two consecutive users in this list, in the case where these two users would be registered in the same SwMI).

4.3.11 Call Authorized by Dispatcher (SS-CAD)

SS-CAD shall interact with ANF-ISIIC as follows:

- for source restricted calls, the SS-CAD control entity in the originating SwMI shall invoke ANF-ISIIC when SS-CAD operation requires that the outgoing call be diverted to the dispatcher and when this dispatcher is located in a SwMI different from the SwMI in which the restricted (calling) user is registered (i.e. this dispatcher would then be able to discuss with the calling user before allowing or not the establishment of the requested call, as opposed to a simple authorization based only on sending to this dispatcher the calling and called numbers by signalling);

NOTE 1: The call establishment will then be suspended by the originating SwMI call control and supplementary service control applications.

- once this dispatcher will have approved the call, if a call had been established with this dispatcher, the ANF-ISIIC invoked towards the dispatcher shall transfer the call to the called user;

NOTE 2: If no call has been established with a dispatcher, SS-CAD will request the SwMI call control and supplementary service control applications which suspended the call establishment to resume it.

- for destination restricted calls, the same procedure as for source restricted calls shall apply for the calls for which ANF-ISIIC has not already been invoked. This shall be the case for intra-TETRA calls either source restricted but with a "local" dispatcher, or not source restricted. It shall also be the case for inter-TETRA calls to a called user which has migrated with its home SwMI being the originating SwMI;
- for destination restricted inter-TETRA calls to a called user the home SwMI of which is the called SwMI (i.e. the called user SwMI is not SwMI A, but SwMI B), the invoked ANF-ISIIC shall invoke and operate SS-CAD. Notably when this operation requires that the incoming call be diverted to the dispatcher and when this dispatcher is located in a SwMI different from the called SwMI, this ANF-ISIIC shall divert the call to the dispatcher. If this call is authorized by SS-CAD, this ANF-ISIIC shall transfer the call to the called user in re-routing it from the called user home SwMI (i.e. SwMI B). And if in addition the called user has migrated to SwMI A, the invoked ANF-ISIIC shall pass the necessary information to call control and supplementary service control applications of this SwMI e.g. so that no local SS-BIC may be invoked for this call;

NOTE 3: If SS-CAD has been activated for both the outgoing call and the incoming call, it will be invoked separately for each.

NOTE 4: In the special case where the called user (has migrated and) is now registered in SwMI A and where SwMI A call control application can route directly (i.e. without invoking ANF-ISIIC) calls to called users registered in this same SwMI when it is not their home SwMI (i.e. they have migrated), SwMI A call control and supplementary service control applications need to be informed about the activation of SS-CAD in the called user home SwMI, to invoke it. This is why ANF-ISIMM will ensure that whenever a user which has activated SS-CAD in its home SwMI migrates to another network, the SwMI of this other network will be informed about this SS-CAD activation.

- contrary to its normal operation, ANF-ISIIC shall make no attempt to avoid any trombone connection or more generally loop connection in routing the diverted call to the dispatcher from SwMI B;

NOTE 5: The reason for this is that the resulting re-routing would by-pass SwMI B, where from the ANF-ISIIC call establishment will continue after it has been authorized by the dispatcher; this continuation being either by transfer in SwMI B, possibly followed by forward switching, if the called user has migrated, or either by transfer with re-routing in SwMI A, also if the called user has migrated.

- if the call has been diverted to the dispatcher, after the dispatcher has authorized the call establishment to be resumed, the SS-CAD diverting SwMI shall ensure that the transmission permission granting to the terminating SwMI does not result in any change for the originating SwMI call control application, i.e.:
 - if the calling user had been granted permission to transmit when the dispatcher authorizes the call to be resumed, the diverting SwMI shall ensure that the set-up message that it is sending to the terminating SwMI does not grant transmission permission to the called user;
 - if it is the dispatcher who had been granted permission to transmit when the dispatcher authorizes the call to be resumed, the diverting SwMI shall ensure that the set-up message that it is sending to the terminating SwMI grants transmission permission to the called user.
- when the originating SwMI call control application receives the response from the terminating SwMI after the call has been diverted to a dispatcher, it shall act as if the call had not been diverted for all applicable supplementary services, notably SS-CLIP, SS-COLP, SS-CLIR and SS-TPI. This shall hold even if for the originating SwMI does not support SS-CAD.

4.3.12 Short Number Addressing (SS-SNA)

No interaction.

4.3.13 Area Selection (SS-AS)

No interaction.

4.3.14 Access Priority (SS-AP)

No interaction (since SS-AP applies only locally at the radio access).

4.3.15 Priority Call (SS-PC)

If SS-PC has been activated, ANF-ISIIC shall interact with SS-PC if this operates by queuing for accessing inter-TETRA connection(s) necessary for its routing. Such interaction shall consist in having every newly invoked ANF-ISIIC competing with the other invoked ANF-ISIIC and ANF-ISIGC still in the inter-TETRA connection allocation queue, when the number of those connections available has fallen below a certain threshold. In such a case, it shall inform SwMI A CC about this.

NOTE: In the case where there is a risk of congestion due to an insufficient number of inter-TETRA connections between two SwMIs for the offered traffic, it would be recommended to split these inter-TETRA connections into two groups, one of which would be reserved to priority calls (i.e. these calls could be routed on any connection of the two groups, while the "ordinary" could only be routed on a connection of the second group).

If SS-PC has been invoked for the call and if SwMI B supports SS-PC, in the case where the ANF-ISIIC invoked for this same call routes it to SwMI C by forward switching, such queuing shall be operated first in SwMI A, and second in SwMI B.

4.3.16 Call Waiting (SS-CW)

No interaction.

4.3.17 Call Hold (SS-HOLD)

No interaction.

4.3.18 Call Completion to Busy Subscriber (SS-CCBS)

When the calling user and the called user are registered in different SwMIs, SS-CCBS shall invoke an ANF-ISIIC for its operation, either for (SS-CCBS) path reservation, or if the latter is not implemented (by SS-CCBS), when the call to the called user is reinitiated.

NOTE: When the called user migrates while remaining busy (e.g. its established call is restored - see subclause 4.2.2.2), all SS-CCBS pending invocations (i.e. not yet completed or cancelled) to this called user will be passed to the new SwMI where this user has registered. But this passing is not an interaction between SS-CCBS and ANF-ISIIC, since it will not be done by the latter.

4.3.19 Late Entry (SS-LE)

No interaction (since SS-LE does not apply to TETRA individual calls).

4.3.20 Transfer of Control (SS-TC)

No interaction (since SS-TC does not apply to TETRA individual calls).

4.3.21 Pre-emptive Priority Call (SS-PPC)

SS-PPC shall interact with ANF-ISIIC to pre-empt the inter-TETRA connection with the lowest Call Retention Value (CRV) among those which may be used to route the priority call. SS-PPC shall operate such pre-emption first in forcing the clearing of this inter-TETRA connection (with its normal operation for the connected parties to be released), and then in invoking a new ANF-ISIIC at the corresponding ISI.

NOTE: If inter-TETRA connections between the originating SwMI and the terminating one are not direct, but are established by transit through a PISN, it would desirable that this PISN offers some mechanism to assess the priority level of each possible inter-TETRA connections between these two SwMIs.

4.3.22 Include Call (SS-IC)

SS-IC and ANF-ISIIC shall interact whenever the SS-IC served user is engaged with a user registered in a different SwMI in an individual call to be included in a group call (by SS-IC).

The requirement for this interaction is to be able to change the call bearer capability from point-to-point (for the individual call) into point-to-multipoint. Such change shall be controlled by SS-IC.

In the case where the other user engaged in an individual call with the served user, is not the only group call participant registered in its SwMI, either the inter-TETRA connection established by ANF-ISIIC for this individual call shall be released, or it shall be used for the new group call.

In addition whatever SwMI was controlling the simplex transmission in the individual call shall release this control to the controlling SwMI of the new group call.

4.3.23 Advice of Charge (SS-AoC)

When SS-AoC-E and ANF-ISIIC have both been invoked for a call (i.e. delivery of charging information at the end of a call has been requested for an inter-TETRA call, or an external call routed over the ISI), both shall interact in the case where the served user wants to clear the call. In such a case, the SwMI which is controlling the served user shall not clear the invoked ANF-ISIIC. Instead, it shall request this invoked ANF-ISIIC to ensure the delivery of charging information for this call. Only after it has got such information, shall the invoked ANF-ISIIC clear the call, in ensuring that this information is transferred to the SwMI which is controlling the served user.

The same shall apply when SS-AoC-D and ANF-ISIIC have both been invoked for a call (since SS-AoC-D delivers charging information at the end of a call).

4.3.24 Barring of Outgoing Calls (SS-BOC)

No interaction.

NOTE: SS-BOC is operated by SwMI A call control and supplementary service control applications.

4.3.25 Barring of Incoming Calls (SS-BIC)

No interaction when the called user home SwMI is SwMI A (i.e. SS-BIC shall be invoked and operated by SwMI A call control and supplementary service control applications).

But when the called user home SwMI is SwMI B, the ANF-ISIIC invoked to establish the call with the called user shall invoke SS-BIC, except in the special case presented below.

In the special case where the called user (has migrated and) is now registered in SwMI A, where it has activated another SS-BIC in SwMI A for intra-TETRA calls and where SwMI A call control application has invoked ANF-ISIIC to establish the call with the called user, then this ANF-ISIIC shall operate as follows:

- it shall check whether a local SS-BIC has been activated;
- if so, it shall by-pass the invocation of the home SwMI SS-BIC (i.e. if a local SS-BIC has been activated, the home SwMI SS-BIC will not be invoked for this special case of intra-TETRA call) in invoking and operating this local SS-BIC;
- only if no local SS-BIC has been activated, shall the invoked ANF-ISIIC invoke and operate the home SwMI SS-BIC;
- if the operation of the relevant SS-BIC results in having the call barred, the invoked ANF-ISIIC shall clear the call;
- if the operation of the relevant SS-BIC results in having the call authorized, there shall be no more interaction between SS-BIC and ANF-ISIIC.

NOTE 1: As stated in subclause 4.2.3.2, the invoked ANF-ISIIC will clear itself in informing SwMI A call control application about the situation.

NOTE 2: On the other hand another issue arises if SwMI A call control application can route directly (i.e. without invoking ANF-ISIIC) calls to called users registered in this same SwMI when it is not their home SwMI (i.e. they have migrated). This issue is that, if no local SS-BIC has been activated, SwMI A call control and supplementary service control applications needs to be informed about the activation of SS-BIC in the called user home SwMI, to invoke it. This is why ANF-ISIMM will ensure that whenever a user which has activated SS-BIC in its home SwMI migrates to another network, the SwMI of this other network will be informed about this SS-BIC activation.

NOTE 3: When SS-CAD has also been activated for the called user (see subclause 4.3.11), its invocation will take precedence over that of SS-BIC, according to the definition of the interaction between these two supplementary service - in ETS 300 392-10-19 [8].

4.3.26 Discreet Listening (SS-DL)

When SS-DL has been invoked, if the user being listened and the monitoring user are registered in two different SwMIs, SS-DL shall invoke an ANF-ISIIC for its operation.

Only one ANF-ISIIC shall be invoked by SS-DL, even when the call being listened to by the invoked SS-DL is an inter-TETRA individual call.

NOTE: In the latter case, SS-DL will use a listening bridge in the SwMI where the user being listened is registered, so that the same invoked ANF-ISIIC will be used independently of which user is talking/sending.

But in the specific case where the other party engaged in the inter-TETRA individual call being listened to by the invoked SS-DL is registered in the same SwMI as the listening user, SS-DL shall still use a specifically invoked ANF-ISIIC for its operation.

4.3.27 Ambience Listening (SS-AL)

Then the SS-AL served user (i.e. the monitoring party) monitors an MS/LS registered in a given SwMI, if this user is registered in a different SwMI, SS-AL shall invoke an ANF-ISIIC for its operation.

4.3.28 Dynamic Group Number Assignment (SS-DGNA)

No interaction (since SS-DGNA is not applicable to individual calls).

4.3.29 Call Completion on No Reply (SS-CCNR)

When the calling user and the called user are registered in different SwMIs, SS-CCNR shall invoke an ANF-ISIIC for its operation, either for (SS-CCNR) path reservation, or if the latter is not implemented (by SS-CCNR), when the call to the called user is reinitiated.

NOTE: When the called user migrates, all SS-CCNR pending invocations (i.e. not yet completed or cancelled) to this called user will be passed to the new SwMI where this user has registered. But this passing is not an interaction between SS-CCNR and ANF-ISIIC, since it will not be done by the latter.

4.3.30 Call Retention (SS-CRT)

SS-CRT shall interact with the ANF-ISIIC in having the Call Retention Value (CRV) of the call for which both have been invoked assigned to the inter-TETRA connection(s) over which this call will have been routed.

4.3.31 Additional Network Feature Inter System Interface Group Call (ANF-ISIGC)

The only interactions between ANF-ISIGC and ANF-ISIIC shall be through SS-include call (see subclause 4.3.22).

NOTE: Even when all "group participants" but one have left a group call (i.e. only the group call owner and the last "group participant" are remaining in the call active state), the call remains a group call - so as to allow the easy introduction of a new (participant) user in this group.

4.3.32 Additional Network Feature Inter System Interface Short Data Service (ANF-ISISD)

No interaction.

4.3.33 Additional Network Feature Inter System Interface Mobility Management (ANF-ISIMM)

No interaction.

NOTE 1: Even in the case of call restoration, ANF-ISIMM does not interact with ANF-ISIIC: it interacts only with the call control application of the SwMI concerned - and it is this call control application which interacts with ANF-ISIIC.

NOTE 2: All updating of the SwMI databases used for the operation of ANF-ISIIC are not to be considered as interactions between ANF-ISIMM and ANF-ISIIC.

4.3.34 Additional Network Feature Inter System Interface Supplementary service (ANF-ISISS)

No interaction.

NOTE: The fact the ANF-ISISS can be invoked for carry such supplementary service information together with some specific TETRA basic call one (e.g. in the TETRA set-up message) is not an interaction.

4.4 Interworking considerations

ANF-ISIIC and PSTN shall interwork in the case of PSTN call through a TETRA gateway located in a SwMI different from that where the TETRA user involved in this call is registered. For an outgoing call (i.e. from a TETRA calling user), SwMI A call control application will invoke an ANF-ISIIC to route the call over an ISI to the PSTN gateway. This ANF shall send to SwMI B call control application the PSTN called number (received from SwMI A call control application), and indicate whether the call is a telephony call or a data call (through a bearer service requested). In the latter case, the gateway will use a modem belonging to its modem pool for the duration of the call. Before ensuring the data exchange between the PSTN and the gateway SwMI, this modem will first establish (automatically) the call to the called user modem, then possibly negotiate the data rate with the latter modem.

NOTE 1: A TETRA speech (tele-) service call will result in a standard PSTN telephony call. But a TETRA data service call to a PSTN may result in a TETRA bearer service negotiation, depending on the modem rate negotiation between the modem of the PSTN called user and the modem belonging to the PSTN gateway modem pool.

For an incoming telephony call (i.e. to a TETRA called user), the PSTN calling user will have to send the number of the called user to the TETRA PSTN gateway. This will be done using DTMF (in-band) dialling. After the gateway will have detected the DTMF digits it will convert the corresponding decimal number into an ITSI or GTSI number. Then if the analysis made by the call control application of the SwMI where this gateway is located shows first that the SSI of the called user corresponds to an ITSI number, and not to a GTSI one (i.e. the type of call requested is an individual call and not a group call), and second that the called user is registered in another SwMI, this will result in a standard invocation of an ANF-ISIIC to extend the individual call requested to the called user. This ANF will use the ITSI number converted from the received DTMF digits as the called number.

NOTE 2: A PSTN telephony call will result in a TETRA speech (tele-) service call.

A similar procedure will apply for an incoming data call, with the difference that this call would first be connected by the gateway to some modem.

NOTE 3: The DTMF addressing procedure is not compatible with the standard procedures for automatic calls by modems.

NOTE 4: For such data calls from PSTN, TETRA bearer service negotiation will be possible with the called SwMI or the TETRA called user, but only if the called SwMI can inform sufficiently fast the gateway modem on the bearer service that it supports (otherwise the negotiation phase between the two modems involved in the call establishment - one on the calling party side, the other, part of the PSTN gateway modem pool - will be over).

ANF-ISIIC and Integrated Services Digital Network (ISDN) shall interwork in the case of ISDN call through a TETRA gateway located in a SwMI different from that where the TETRA user involved in this call is registered.

For an outgoing call (i.e. from a TETRA calling user), the interworking will be the same as that between ANF-ISIIC and PSTN, in replacing PSTN number by ISDN number: SwMI A call control application will invoke an ANF-ISIIC to route the call over an ISI to the ISDN gateway. This ANF shall send to SwMI B call control application the ISDN called number (received from SwMI A call control application). Only the PSTN numbering plan will be used for this ISDN called number (since there is no means for the calling user to indicate any other numbering plan, neither to indicate any corresponding type of number). But for data call, instead of a modem pool procedure, the rate adaptation procedure defined in ITU-T Recommendation V.110 [14] will be used. The data rate for the call might then be negotiated using the (optional) in-band parameter exchange (IPE) procedure described in appendix I of this recommendation.

NOTE 5: CCITT Recommendation V.110, of September 1992, has been recently updated and republished as an ITU-T Recommendation [14]. While CCITT Recommendation V.110 did not support 28,8 kbit/s rate, ITU-T Recommendation V.110 [14] does (i.e. referring to CCITT Recommendation V.110 instead of ITU-T Recommendation V.110 [14] would have resulted in the impossibility to support TETRA 4 x 7,2 kbit/s (= 28,8 kbit/s) bearer service.

NOTE 6: A TETRA speech (tele-) service call will result in an ISDN telephony tele-service. Similarly a TETRA data service call will result in an ISDN 64 kbit/s with the following bearer service attribute values: information transfer capability value equal to unrestricted digital information, and layer 1 access protocol value corresponding to the rate adaptation in accordance with ITU-T Recommendation V.110 [14].

For an incoming call (i.e. to a TETRA called user), contrary to the case of a PSTN calling user, the ISDN calling user can send the address of the called user to the TETRA ISDN gateway. It will do this using one of the various means available (e.g. using the ISDN supplementary services sub-addressing or user to user signalling). And this calling user can also indicate the type of call, telephony or data call, through the bearer service requested.

NOTE 7: An ISDN telephony tele-service will result in a TETRA speech (tele-) service call. And an incoming ISDN call requesting a bearer capability defined by an information transfer capability value equal to unrestricted digital information, and a layer 1 access protocol value corresponding to the rate adaptation in accordance with ITU-T Recommendation V.110 [14], will result in a TETRA data call.

The data rate for the call might then be negotiated using the (optional) IPE procedure described in appendix I of this ITU-T Recommendation V.110 [14].

ANF-ISIIC and PISN shall interwork in the case of PISN call through a TETRA gateway located in a SwMI different from that where the TETRA user involved in this call is registered. This interworking shall be exactly the same as that described above between ANF-ISIIC and ISDN, in replacing ISDN number by PISN number.

NOTE 8: The fact that ANF-ISIIC allows to use PISN to interconnect the SwMIs involved in inter-TETRA individual calls is not to be considered as interworking at stage 1 level.

NOTE 9: Another possibility to make an external outgoing call is first to establish an inter-TETRA call with the gateway, and then to send the called number digits (by the DTMF air interface information elements) to this gateway (i.e. two stage dialling, already mentioned in subclause 14.5.1.2.5 of ETS 300 392-2 [1]). It has not been addressed above, since from a formal point of view, it can hardly be considered as a true interworking case.

4.5 Static description of ANF-ISIIC using attributes

In accordance with ITU-T Recommendation I.210 [10], the static description of ANF-ISIIC is given below using the relevant attributes with the corresponding values as defined in ITU-T Recommendation I.140 [12].

ANF-ISIIC is extending over the ISI the TETRA bearer or tele- service invoked by an individual call calling user, by creating the necessary connection between the originating and the terminating SwMIs. The corresponding bearer service attributes are given in annex C, which is informative (since it is simply reformulating the corresponding information defined in ETS 300 392-2 [1]).

Using the terminology defined in ITU-T Recommendation I.140 [12], the connection to be created by ANF-ISIIC as a result of its invocation and operation is a connection element.

Table 1 defines the static description of this connection element in terms of the values of its attributes as listed in ITU-T Recommendation I.140 [12].

As an option another set of values is defined in table 2 for networks which can handle multirate 8 kbit/s calls (i.e. networks which first can handle 8 kbit/s - instead of or in addition to the standard 64 kbit/s channels, and second can establish calls involving more than one such channel).

NOTE 1: The attributes in tables 1 and 2 have been grouped into categories in a similar manner as in ITU-T Recommendation I.210 [10] for the bearer service attributes.

As already stated in subclause 4.2.2.2, call modification shall have no impact on the connection(s) established by the invoked ANF-ISIIC, but it shall result in a change in the 8 kbit/s encoding of the user information when the data rate of this information changes. Thus the access attribute Information transfer coding/protocol in the static descriptions of the ISI connection elements in tables 1 and 2 may change when a call modification occurs. No other attribute in these tables shall change.

NOTE 2: This means that even if the ISI connection has been established as an $N \times 8$ kbit/s connection (see table 2), the number N of 8 kbit/s ISI channels used for the call will not change. The reason for this is first that the various cases of call modification defined in subclause 14.5.1.2 of ETS 300 392-2 [1] never result in an increased number of ISI 8 kbit/s channels, and second, the definition of PISN multirate calls does not cater for the possibility of reducing the number of channels used for the call at set-up time.

As to the case of 64 kbit/s connection elements, addressed in table 1, obviously there is no possibility to change the information transfer rate of these connection elements.

Table 1: Basic definition of ANF-ISIIC connection element attributes

| Attribute category | Attribute name | Attribute value |
|---|---|--|
| Information transfer attributes | 1. Information transfer mode: 2. Information transfer rate: 3. Information transfer capability: 4. Structure: 5. Establishment of connection: 6. Symmetry: 7. Connection configuration: | circuit 64 kbit/s no restriction (see note) 8 kHz integrity demand bi-directional symmetric point-to-point |
| Access attributes | 8. Channel: 9. Connection control protocol: 10. Information transfer coding/protocol | B_Q for user information, D_Q for signalling PSS1 for D_Q -channel Encoding of each TETRA slot into an 8 kbit/s stream. In case of a (TETRA) multi-slot bearer service, the resulting 8 kbit/s streams shall be multiplexed as defined in CCITT Rec. I.460. |
| General attributes | 11. Network performance 12. Network interworking 13. Operations and management aspects | for further study for further study for further study |
| NOTE: According to the definition of the attribute information transfer capability of a connection element in ITU-T Recommendation I.140 [12], the value of this attribute for the ANF-ISIIC connection element should be "null". Since this value means that there is no restriction to the types of information which may pass through the connection element, the term "no restriction" has been preferred. | | |

Table 2: Optional definition of ANF-ISIIC connection element attributes

| Attribute category | Attribute name | Attribute value |
|---------------------------------|--|---|
| Information transfer attributes | 1. Information transfer mode: 2. Information transfer rate: 3. Information transfer capability: 4. Structure: 5. Establishment of connection: 6. Symmetry: 7. Connection configuration: | circuit N x 8 kbit/s (with n = 1, 2, 3 or 4) no restriction (see note) time slot sequence integrity (TSSI) demand bi-directional symmetric point-to-point |
| Access attributes | 8. Channel: 9. Connection control protocol: 10. Information transfer coding/protocol | 8 kbit/s channels for user information, D _Q for signalling PSS1 for D _Q -channel Encoding of each TETRA slot into an 8 kbit/s stream |
| General attributes | 11. Network performance 12. Network interworking 13. Operations and management aspects | for further study for further study for further study |
| NOTE: | According to the definition of the attribute information transfer capability of a connection element in ITU-T Recommendation I.140 [12], the value of this attribute for the ANF-ISIIC connection element should be "null". Since this value means that there is no restriction to the types of information which may pass through the connection element, the term "no restriction" has been preferred. | |

4.6 Overall SDL

Figure 2 contains the dynamic description of ANF-ISIIC using the Specification and Description Language (SDL) defined in CCITT Recommendation Z.100 [13]. The SDL process represents the behaviour of the set of SwMI entities involved, interconnected by the intervening network, possibly by a PISN, in providing ANF-ISIIC.

Output/input signals from/to the left represent primitives from/to SwMI A CC. Output/input signals from/to the right represent primitives from/to the CC of the SwMI in which the called user is registered (i.e. SwMI C in the case of re-routing or forward switching, and SwMI B otherwise), except in the case of forward switching where some output/input signals from/to the right represent primitives from/to SwMI B CC. The latter are to establish first the second leg of forward switching and then SwMI B transit operation.

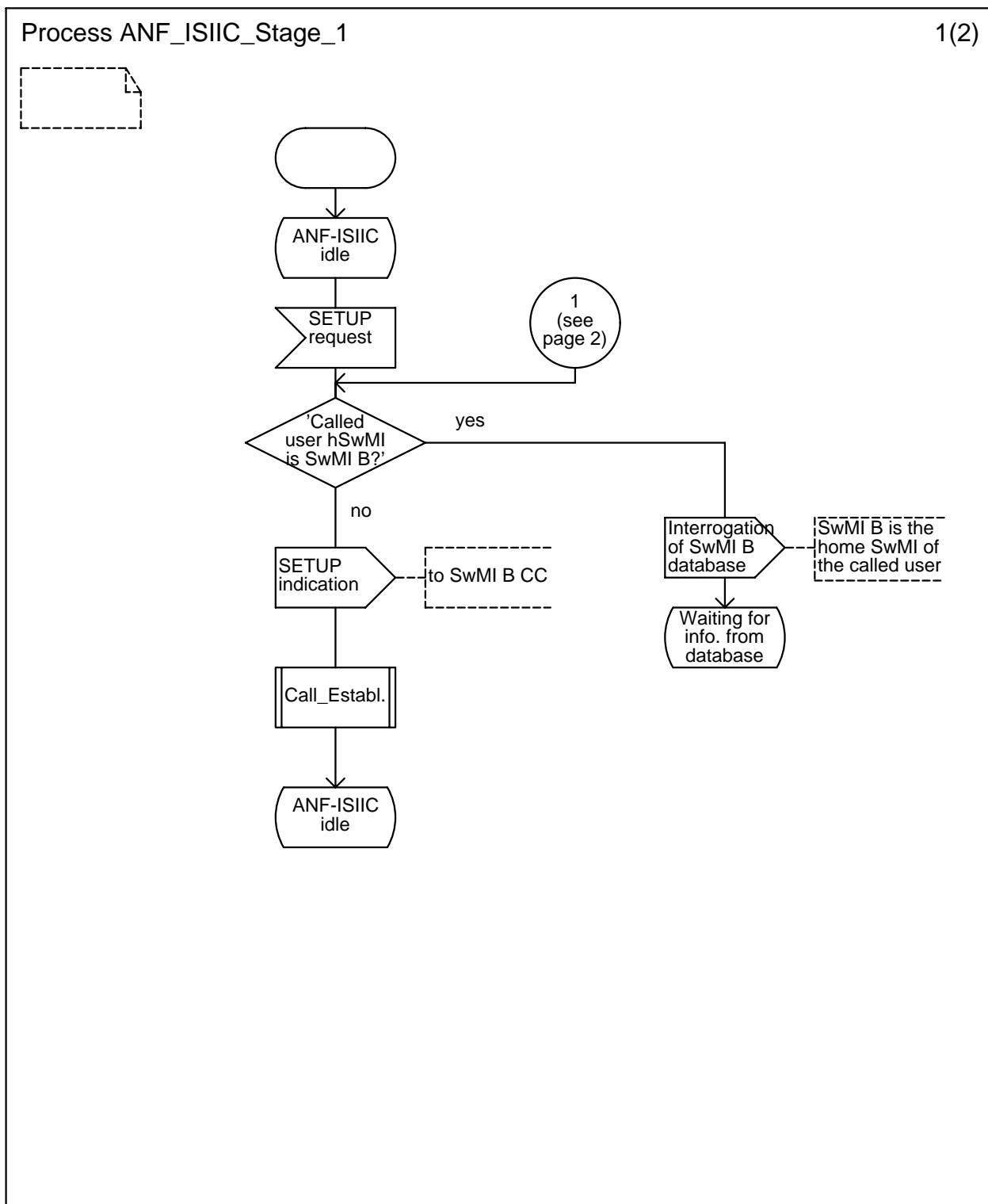


Figure 2 (sheet 1 of 5): ANF-ISIIC, overall SDL
Main diagram

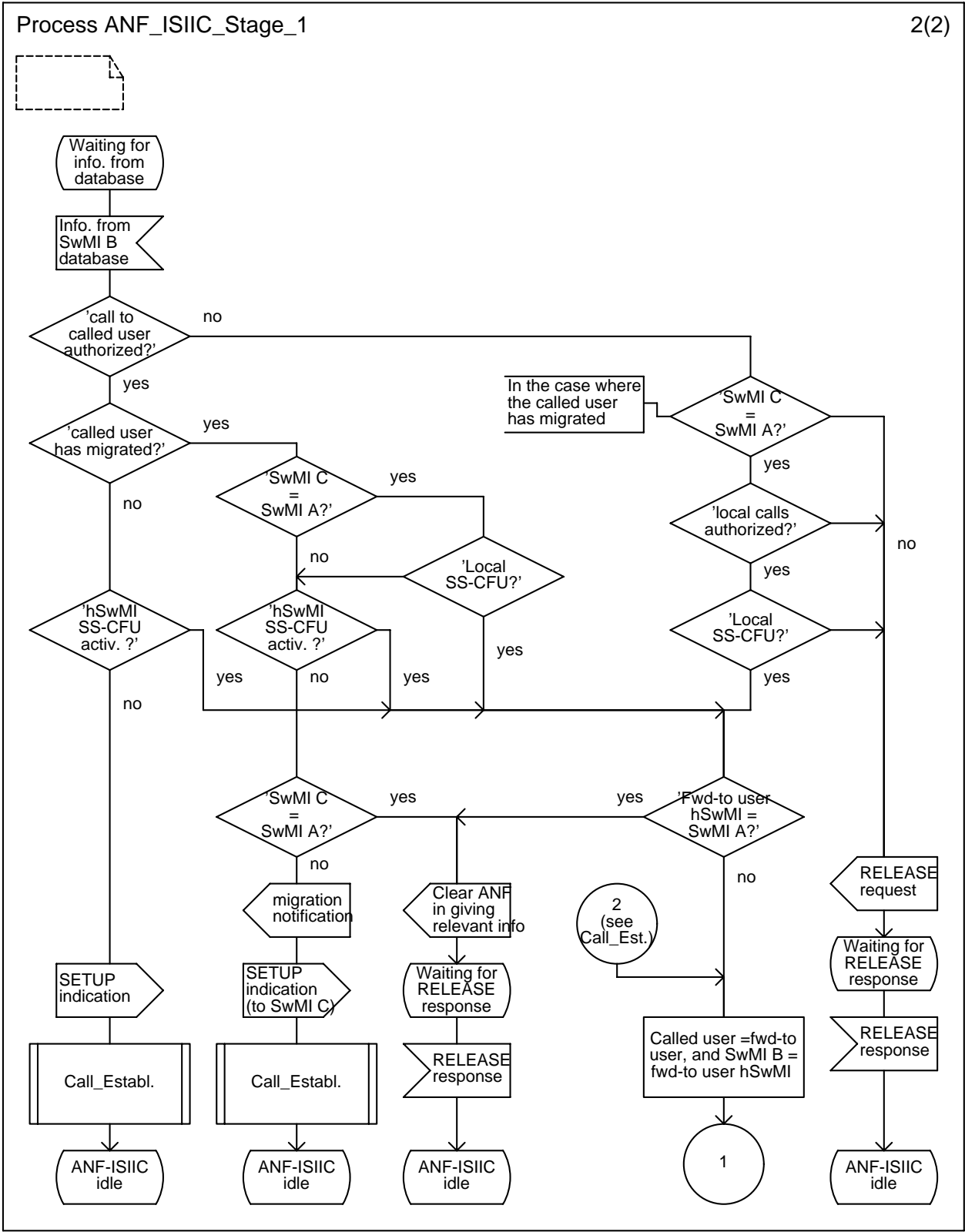


Figure 2 (sheet 2 of 5): ANF-ISIIC, overall SDL
 Main diagram

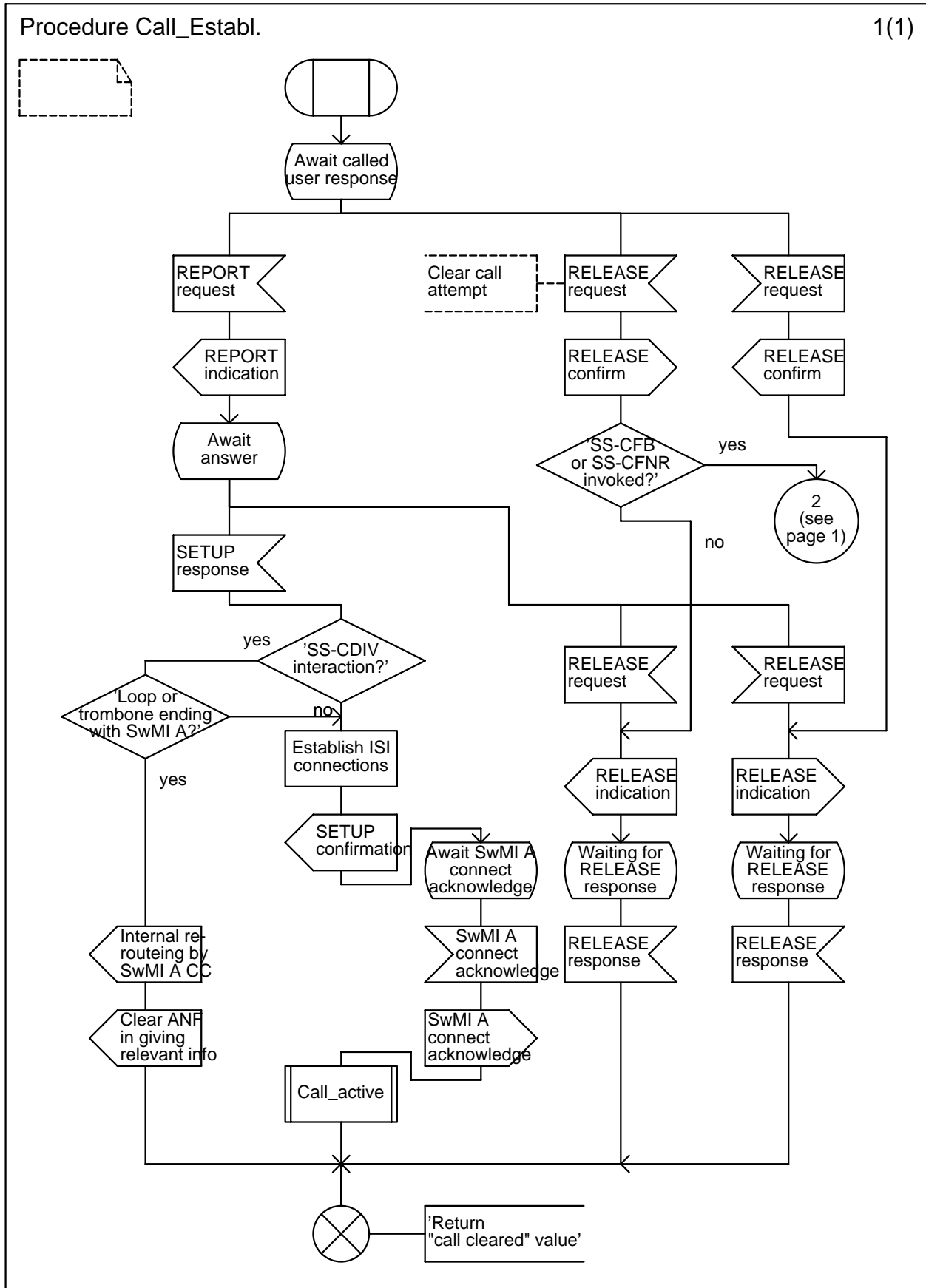


Figure 2 (sheet 3 of 5): ANF-ISIIC, overall SDL
 Call establishment procedure

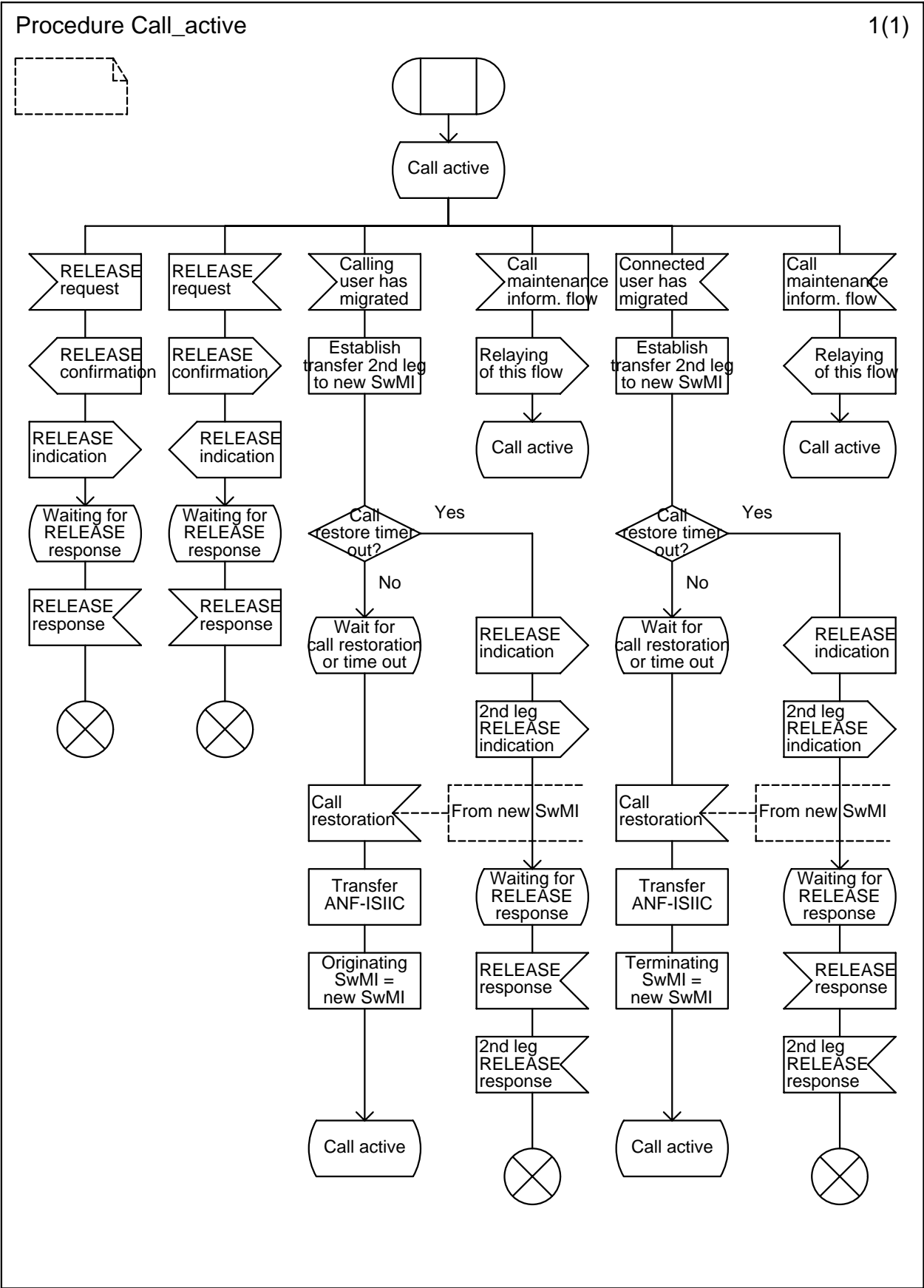


Figure 2 (sheet 4 of 5): ANF-ISIIC, overall SDL
 Call active procedure

Procedure Call_active

1(1)

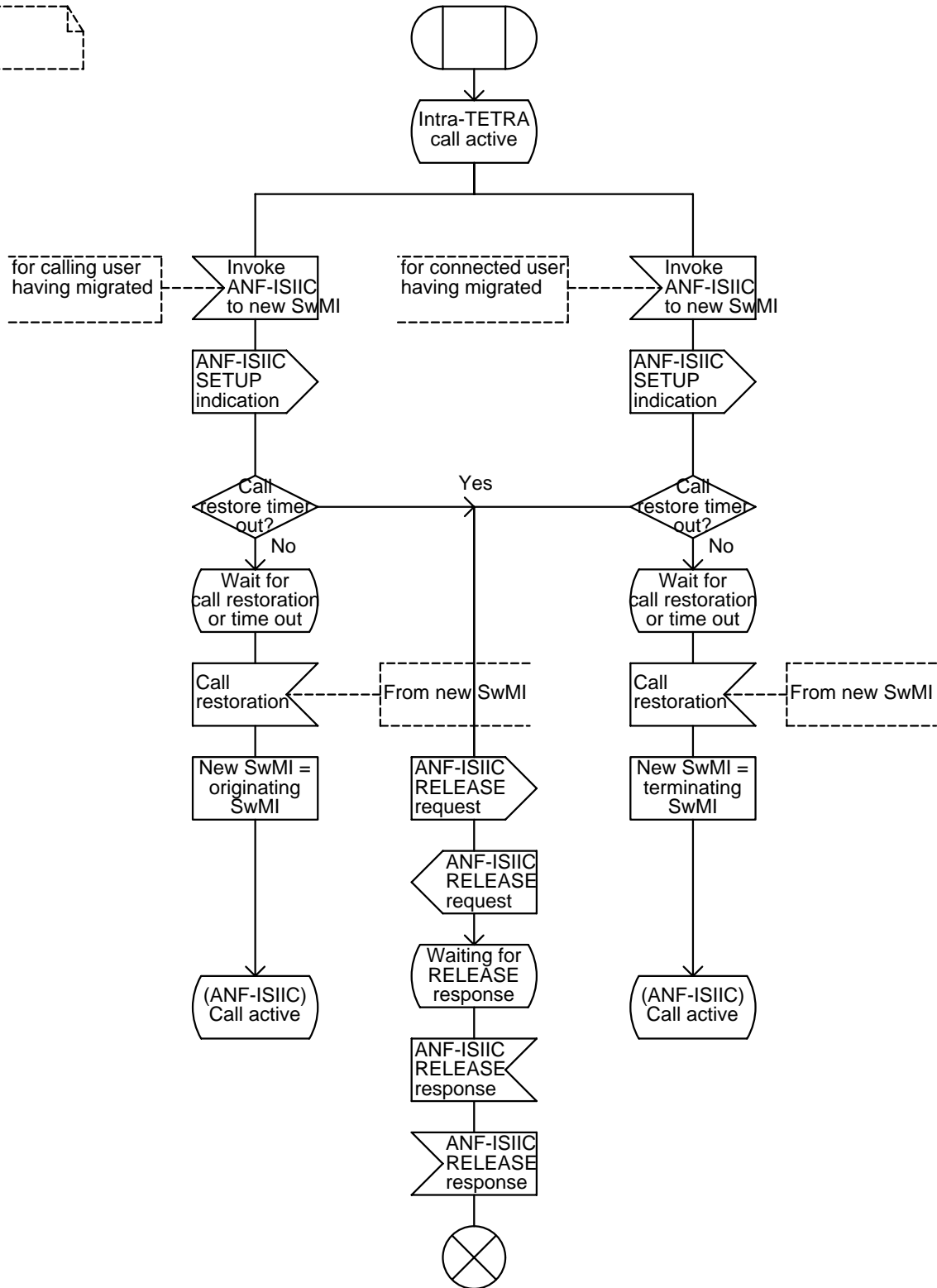


Figure 2 (sheet 5 of 5): ANF-ISIIC, overall SDL
 Invocation of ANF-ISIIC because of migration
 during an established intra-TETRA call

5 ANF-ISIIC stage 2 specification

5.1 Functional model

5.1.1 Functional model description

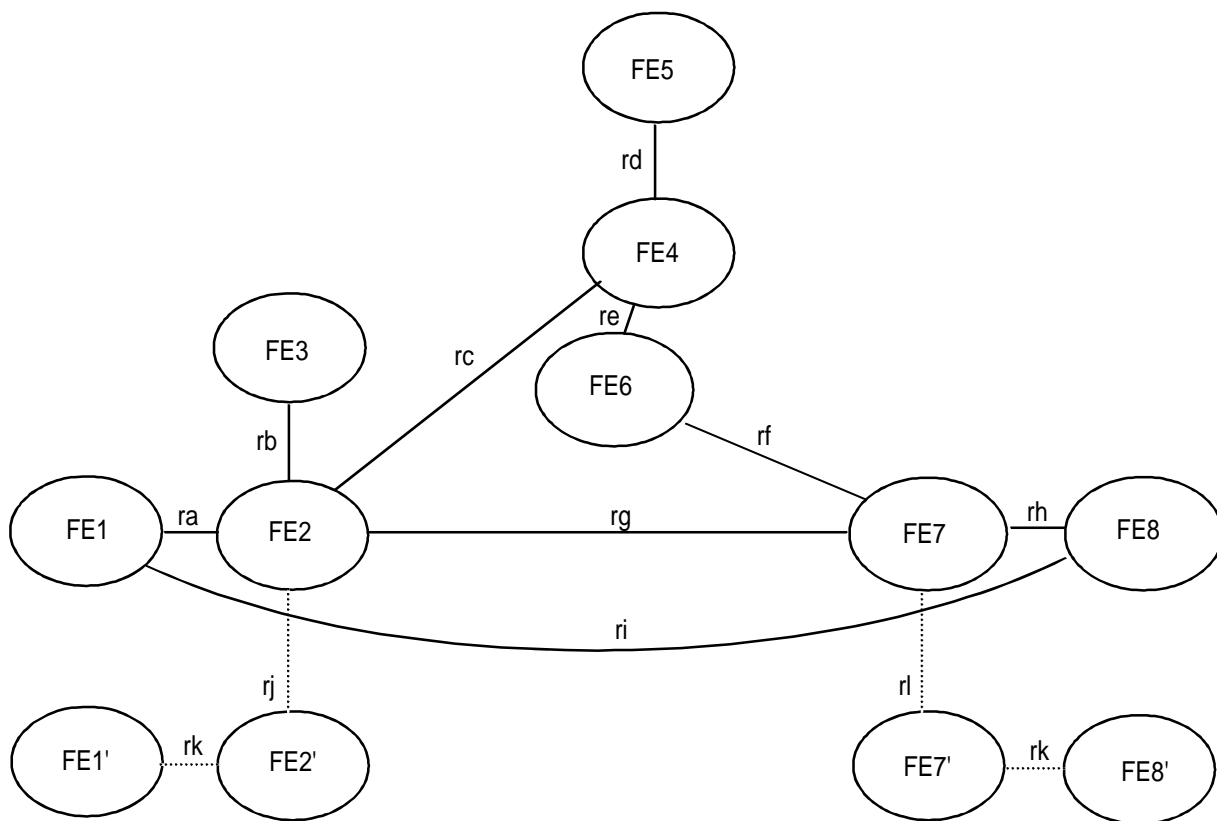
The functional model shall comprise the following functional entities (FE):

- FE1 SwMI A individual call control application functional entity;
- FE1' New SwMI call restoring functional entity for migrating calling user;
- FE2 ISI individual call originating functional entity;
- FE2' ISI individual call new originating functional entity;
- FE3 ISI individual outgoing call route determining functional entity;
- FE4 ISI individual call migration handling functional entity;
- FE5 ISI migration information provision functional entity;
- FE6 ISI migrated called user routing functional entity;
- FE7 ISI individual call terminating functional entity.
- FE7' ISI individual call new terminating functional entity;
- FE8 Terminating SwMI individual call control functional entity;
- FE8' New SwMI call restoring functional entity for migrating called user.

The following functional relationships shall exist between these FEs:

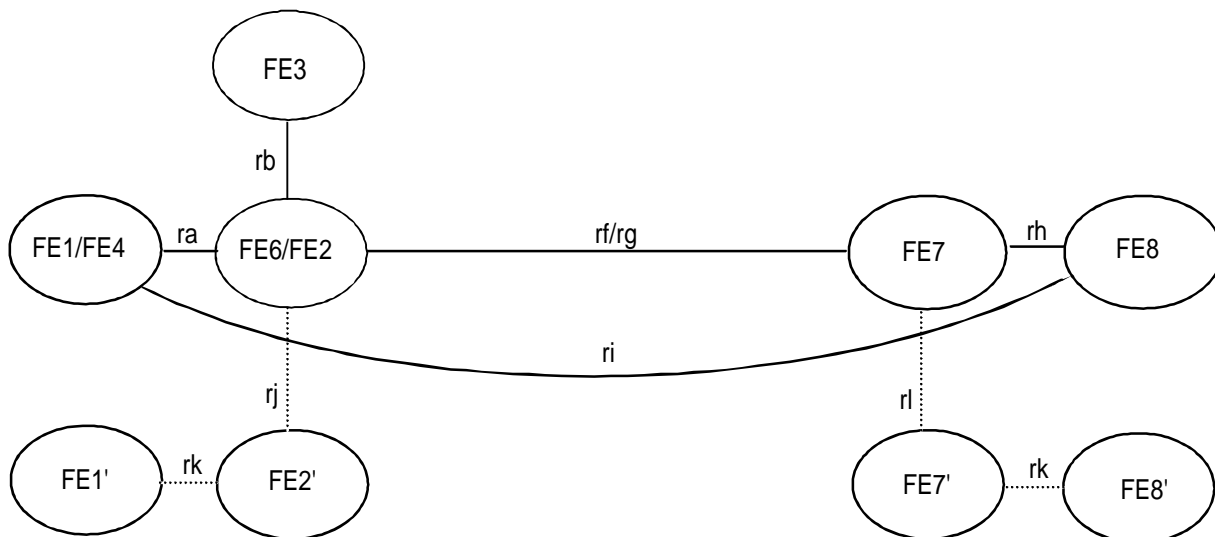
- ra between FE1 and FE2;
- rb between FE2 and FE3;
- rc between FE2 and FE4;
- rd between FE4 and FE5;
- re between FE4 and FE6;
- rf between FE6 and FE7;
- rg between FE2 and FE7;
- rh between FE7 and FE8;
- ri between FE1 and FE8;
- rj between FE2 and FE2';
- rk between FE1' and FE2' or between FE8' and FE7';
- rl between FE7 and FE7'.

Figure 3 shows these FEs and relationships in the case where the called user home SwMI is different from the originating SwMI (i.e. the called user home SwMI is SwMI B).



**Figure 3: Functional model for ANF-ISIIC
 when the called user home SwMI is different from the originating SwMI**

Figure 4 shows these FEs and relationships in the case where the called user home SwMI is the originating SwMI (i.e. the called user home SwMI is SwMI A).



NOTE: Even though it is not a functional entity of ANF-ISIIC in this case (see subclause 5.1.2.4), FE4 has been shown in figure 4 to avoid showing a direct relationship between FE1 and FE6.

**Figure 4: Functional model for ANF-ISIIC
 when the called user home SwMI is the originating SwMI**

5.1.2 Description of functional entities

5.1.2.1 SwMI A individual call control application functional entity, FE1

This functional entity invokes ANF-ISIIC when it receives a set-up information flow from a calling user (at its air interface) requesting the establishment of a call to another user which to its knowledge is registered in another TETRA network. It relays to the called user the call establishment response information flow(s) received from FE8 through FE7 and FE2 (and possibly FE6 and FE4). Once the call has been established, it ensures call maintenance (as defined in subclause 14.1.2 of ETS 300 392-2 [1]) for the calling user in exchanging related control information flows with FE8.

If FE1 is informed by ANF-ISIMM that the calling user is now registered in another network (where the calling user would have migrated during the call), it shall request FE2 to establish a connection leg with the newly created FE1', triggering the transfer of this call by FE2 once informed by FE2' that the calling user has requested call restoration. This transfer shall take place between FE1', in the other network, and FE8. FE1 shall then be cleared, and FE1' shall then become the new FE1.

5.1.2.2 ISI individual call originating functional entity, FE2

This functional entity ensures an ISI outgoing gateway function for individual calls from SwMI A call control application. This includes the following capabilities:

- the ability to establish an individual call upon request of FE1 and release it notably upon request of FE1;
- the ability to associate and mediate between FE1 and the subsequent PISN CC functional entity involved in a particular call and between FE1 and FE8, notably to transfer to FE8 any information received from FE1 (i.e. ISI end-to-end information), and vice versa;
- the ability, when the called user home SwMI is SwMI B and when this user has migrated to SwMI C, to decide, possibly on the basis of the information received from FE4, either to re-route the call over another ISI or to have it forward switched (in SwMI B);
- unless SwMI C coincides with SwMI A (i.e. the called user has migrated in the same SwMI as the originating one and the CC entity of the latter was not capable of identifying this), in which case FE2 shall ensure the interactions with local SS-BIC, SS-CAD and SS-DIV if activated for intra-TETRA calls (in SwMI A), taking into account the information received from FE4 regarding the activation of these supplementary services also for the called user but in its home SwMI. If the call is not diverted, FE2 shall clear the invoked ANF-ISIIC, with or without clearing the call, depending on whether or not the call is barred by the above mentioned incoming call restriction supplementary services.

Upon request from FE1 (to prepare for call restoration), FE2 shall establish a connection leg with FE1' through FE2', both newly created, then once informed by FE1' that the calling user has requested call restoration, shall ensure the transfer of this call between FE1' through FE2', in this other network, and FE8. FE2' shall then become the new FE2.

5.1.2.3 ISI individual outgoing call route determining functional entity, FE3

This functional entity:

- provides to FE2, or FE6 in the case where the called user home SwMI is the originating SwMI, information to route the individual call (over the ISI) to SwMI B;
- provides to FE2 information about activations and "definitions" (the latter term corresponding to the term "registrations" as defined in CCITT Recommendation I.130 [11]) of local SS-BIC, SS-CAD and SS-DIV.

5.1.2.4 ISI individual call migration handling functional entity, FE4

This functional entity ensures the handling of individual calls incoming from FE2 when the home SwMI of the called user is SwMI B. This includes the following capabilities:

- the ability to operate as a Private Integrated Services Network Exchange (PINX) node incoming side;
- the ability to ensure the interactions with the supplementary services SS-BIC, SS-CAD and SS-DIV if activated for the called user, the first two, to restrict its incoming calls, and the last one, to divert its calls. Notably FE4 shall ensure together with FE2 the specific interactions which apply in the case where the called user has migrated in the originating SwMI (i.e. SwMI C coincides with SwMI A);
- the ability, if the called user has migrated, to indicate to FE2:
 - in which SwMI the called user is registered now (i.e. SwMI C), on the basis of the information received from FE5;
 - whether or not forward switching is possible; and
 - to detect whether SwMI C coincides with SwMI A;
- the ability, if FE2 requests FE4 to forward switch the call, to operate as the incoming side of a transit PINX (the outgoing side of which is ensured by FE6).

When the called user home SwMI is SwMI A (i.e. this user has migrated and is now registered in SwMI B), FE4 will coincide with FE1 (i.e. as part of SwMI A call control application and not of ANF-ISIIC). This is because first any interaction with SS-BIC, SS-CAD or SS-DIV activated for the called user shall then be ensured by SwMI A supplementary service control applications, and not by ANF-ISIIC; and second, SwMI A call control application has to know that the called user has migrated and where it is currently registered (i.e. SwMI B) to invoke an ANF-ISIIC to extend the call.

5.1.2.5 ISI information provision functional entity, FE5

This functional entity:

- provides information to FE4 about activations and "definitions" (the latter term corresponding to the term "registrations" as defined in CCITT Recommendation I.130 [11]) of general SS-BIC, SS-CAD and SS-DIV;
- if the called user has migrated to TETRA network C, provides this information to FE4.

5.1.2.6 ISI individual call migrated called user routeing functional entity, FE6

This functional entity ensures the routeing of individual calls to called users which have migrated. When the called user home SwMI is different from the originating SwMI, depending on FE2 decision and possibly on its own decision, either FE6 shall be located in SwMI A, and the call shall then be re-routed (from SwMI A), or FE6 shall be located in SwMI B, and the call shall then be forward switched (by SwMI B). FE6 includes the following capabilities:

- for re-routing the call, the ability to supplement FE2 in sending a set-up information flow to FE7 after having got the necessary routeing information to route the call (over the ISI) to SwMI C;
- for forward switching the call, the ability to operate as the outgoing side of a transit PINX, the incoming side of which is ensured by FE4. As in the case of re-routing, that ability implies to have got the necessary routeing information to route the call (over the ISI) to SwMI C.

When the called user home SwMI is the originating SwMI (see subclause 5.1.2.4), FE6 shall replace FE2 to establish the call.

5.1.2.7 ISI individual call terminating functional entity, FE7

This functional entity ensures an ISI incoming gateway function for individual calls towards FE8. This includes the following capabilities:

- the ability to establish an individual call to FE8 upon request of FE6 and release it notably upon request of FE8;
- the ability to associate and mediate between FE8 and the subsequent PISN CC functional entity involved in a particular call and between FE8 and FE1, notably to transfer to FE1 any information received from FE8 (i.e. end-to-end information), and vice versa.

When FE6 does not exist, FE7 shall be collocated with FE4.

NOTE: According to subclause 5.1.2.6, FE6 does not exist when the called user is registered in its home SwMI (which implies, since an ANF-ISIIC has been invoked, that this called user home SwMI is SwMI B).

Upon request from FE8 (to prepare for call restoration), FE7 shall establish a connection leg with FE8' through FE7', both the newly created, then once informed by this FE8' that the calling user has requested call restoration, shall ensure the transfer of this call between FE8' through the newly created FE7', in this other network, and FE1. FE7' shall then become the new FE7.

5.1.2.8 Terminating SwMI call control functional entity, FE8

This functional entity ensures the establishment of the call to the called user according to the invoked ANF-ISIIC set-up information flow. It informs FE1 through FE7 and FE2 (and possibly FE6 and FE4) about the completion (or failure) of this call establishment. Once the call has been established, it ensures call maintenance (as defined in subclause 14.1.2 of ETS 300 392-2 [1]) for the called user, exchanging related control information flows with FE1 for the necessary co-ordination.

If FE8 is informed by ANF-ISIMM that the connected user is now registered in another network (where this user would have migrated during the call), it shall request FE7 to establish a connection leg with FE8' through FE7', both newly created, triggering the transfer of this call by FE7 once informed by FE8' that the connected user has requested call restoration. This transfer shall take place between FE8', in the other network, and FE1. FE8 shall then be cleared, and FE8' shall become the new FE8.

5.1.3 Relationship of functional model to basic call functional model

By definition, an invoked ANF-ISIIC establishes a PISN basic call. As a result its functional model matches closely that of PISN basic call (as defined in ISO/IEC 11574 [16]):

- FE1 shall be collocated with the originating PISN CC;
- FE2 shall also be collocated with the originating PISN CC (i.e. in SwMI A ANF-ISIIC outgoing gateway - gateway which may be virtual);
- FE4 together with FE6 shall be collocated in a transit PISN CC in the case of forward switching;
- FE7 shall be collocated with the terminating PISN CC (i.e. in the ANF-ISIIC incoming gateway of terminating SwMI - gateway which may be virtual);
- FE8 shall also be collocated with the terminating PISN CC.

Figures 5, 6, 7 and 8 show examples of the relationship between the two models in the cases:

- where the home SwMI of the called user is SwMI B and where this user is registered in its home SwMI, for figure 5;
- where the home SwMI of the called user is SwMI A (and where this user is registered in SwMI B), for figure 6;
- where the called user has migrated (to SwMI C), and the call has been forward switched (in SwMI B), for figure 7;
- where the called user has migrated (to SwMI C), and the call has been re-routed (in SwMI A), for figure 8.

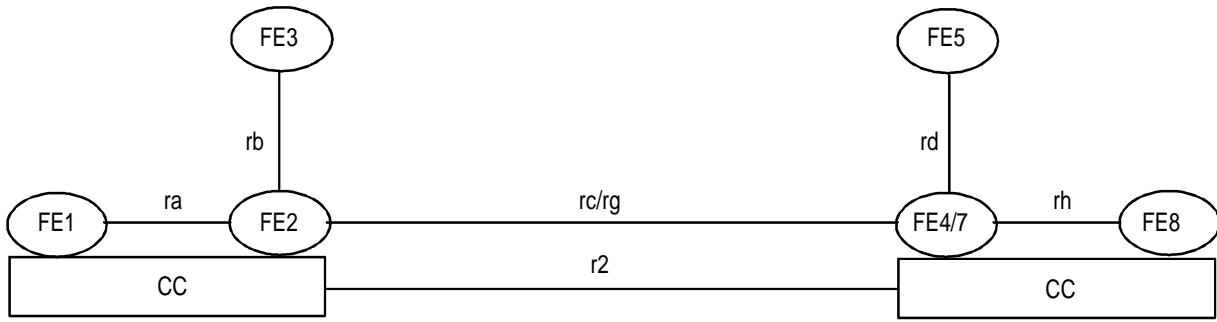


Figure 5: Example relationship between models for ANF-ISIIC and basic call in the case of called user hSwMI being SwMI B, with no migration



Figure 6: Example relationship between models for ANF-ISIIC and basic call in the case of called user hSwMI being SwMI A

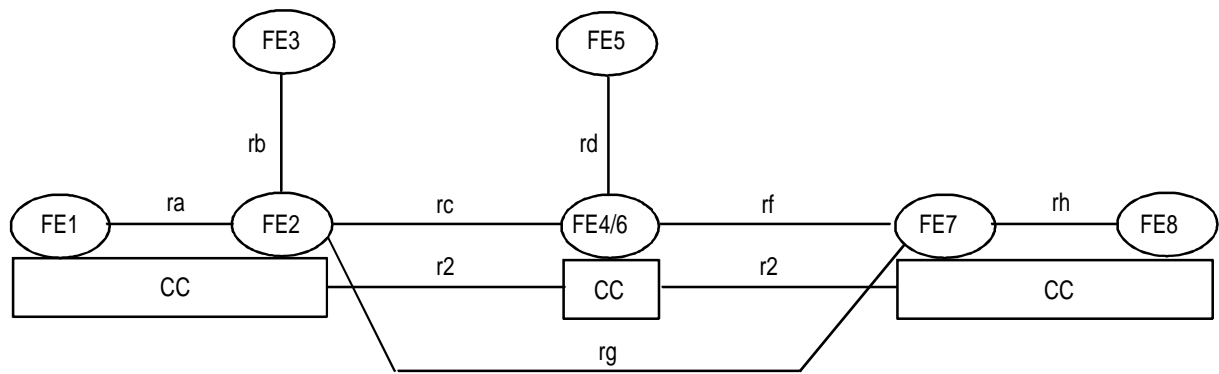


Figure 7: Example relationship between models for ANF-ISIIC and basic call in the case of forward switching

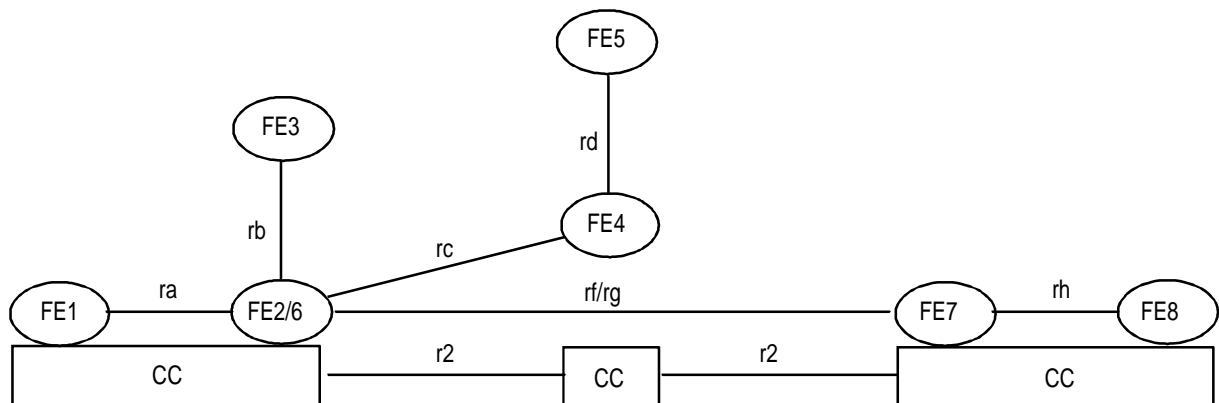


Figure 8: Example relationship between models for ANF-ISIIC and basic call in the case of re-routing

5.2 Information flow

5.2.1 Examples of information flow sequences

The stage 3 description of ANF-ISIIC provides signalling procedures in support of the information flow sequences specified below.

The figures have been drawn as Message Sequence Charts (MSC) using the SDT tool. Due to this, it has not been possible to show the stage 1 primitives (shown on stage 1 overall SDL, in figure 2) nor to represent ANF-ISIIC information flows independently from basic call (i.e. PISN basic call) information flows (e.g. with an ellipse embracing one ANF-ISIIC and one PISN basic call information flows to indicate that the two information flows occur simultaneously, or having an ANF-ISIIC information flow between two functional entities which are not adjacent -e.g. end-to-end-, while the PISN basic call information flows are always between two adjacent functional entities). Simply when an ANF-ISIIC information flow occurs together with a PISN basic call information flow, the name of the latter is shown below the corresponding arrow, and the originating and the terminating functional entities of the arrow are those of the ANF-ISIIC information flow.

NOTE: The names used for the PISN basic call information flows are those defined in ISO/IEC 11574 [16], on the stage 1 and 2 description of PISN basic call. And whenever possible (i.e. when such primitives exist), the names which have been given to the ANF-ISIIC information flows are those of the corresponding TNCC primitives, as defined in clause 11 of ETS 300 392-2 [1].

The following abbreviations are used:

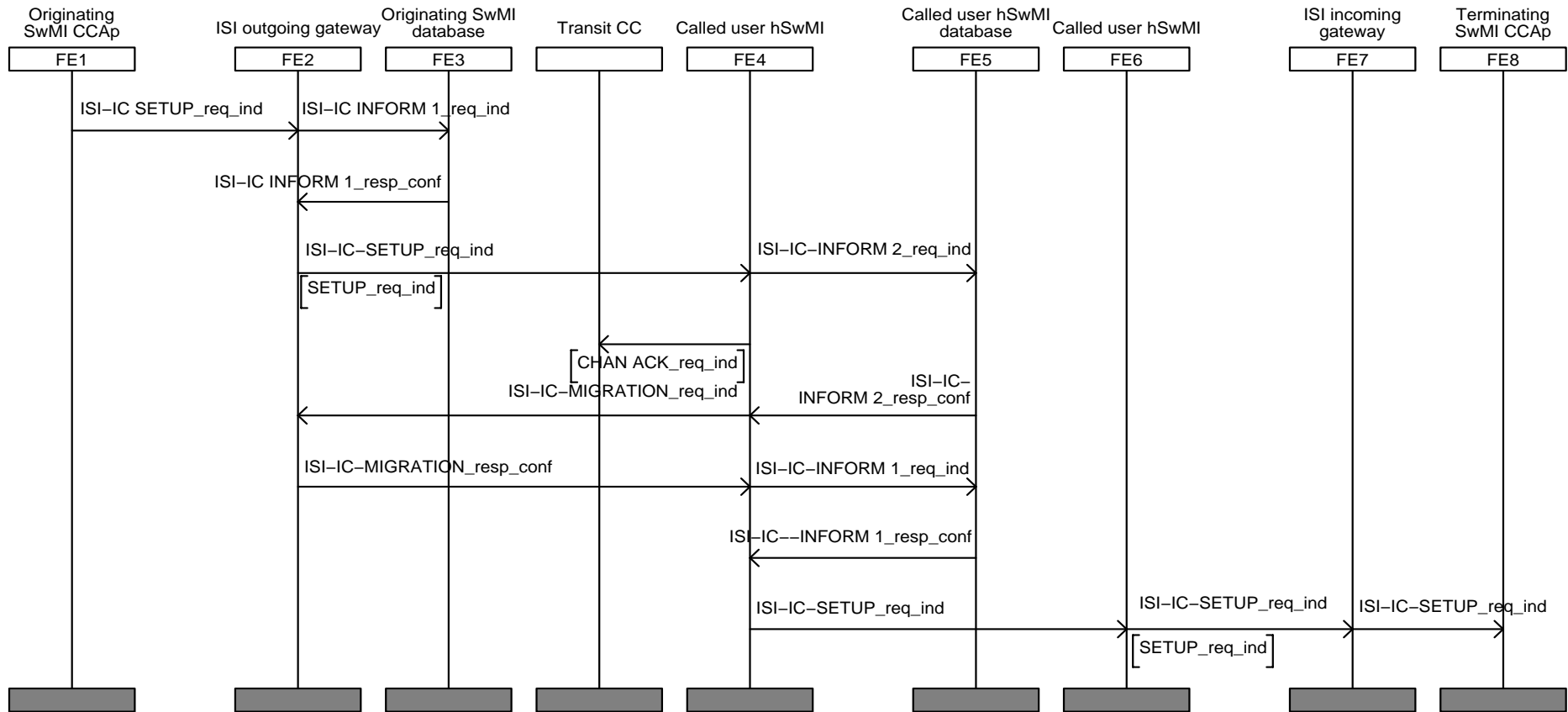
req request
ind indication
resp response
conf confirmation

5.2.1.1 Successful call set-up when the called user is registered in SwMI B and uses on/off hook signalling

Figure 9 shows the information flow sequence for ANF-ISIIC call set-up when the called user uses on/off hook signalling and when its home SwMI is SwMI B and it has not migrated.

The information flow sequence corresponding to the case where the called user home SwMI is SwMI A (and this user has migrated and is registered in SwMI B) can be derived from figure 9 in replacing FE2 by FE6/FE2, and FE4/FE7 by FE7.

MSC Successful_call_setup_migration_forward_switching



NOTE: The ISI-IC-SETUP PROLONGATION and -CHARACTERISTIC CHANGE request/indication information flows shown on the figure are optional.

Figure 9: Information flow sequence - successful call set-up using on/off hook signalling

5.2.1.2 Successful call set-up when the called user is registered in SwMI B and uses direct set-up signalling

Figure 10 shows the information flow sequence for ANF-ISIIC call set-up when the called user uses direct set-up signalling and when its home SwMI is SwMI B and it has not migrated.

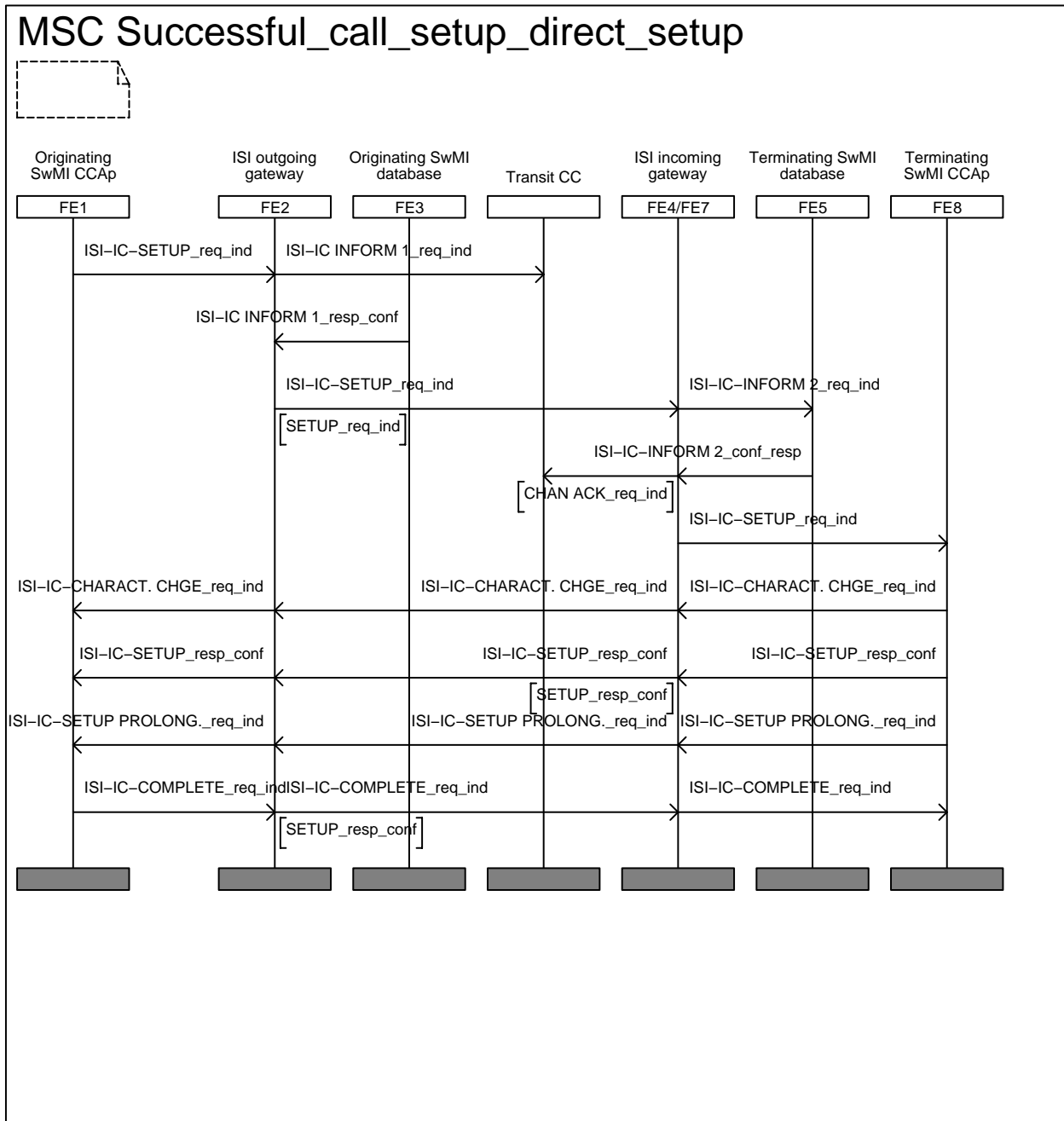


Figure 10: Information flow sequence - successful call set-up using direct set-up signalling

The information flow sequence corresponding to the case where the called user home SwMI is SwMI A (and this user has migrated and is registered in SwMI B) can be derived from figure 10 in replacing FE2 by FE6/FE2, and FE4/FE7 by FE7.

5.2.1.3 ANF-ISIIC set-up to a called user having migrated from SwMI B, using forward switching

Figure 11 shows the beginning of the information flow sequence for ANF-ISIIC call set-up when the called user has migrated from SwMI B, its home SwMI, and when SwMI A has indicated in the rb_SETUP request/indication information flow that it wants to choose the routing method in case of migration of the called user, and decides to have the call forward switched (in SwMI B) as a result of the indication in the rb_MIGRATION INFO request indication information flow.

5.2.1.4 ANF-ISIIC set-up to a called user having migrated from SwMI B, using re-routing

Figure 12 shows the beginning of the information flow sequence for ANF-ISIIC call set-up when the called user has migrated from SwMI B, its home SwMI, and when SwMI A has indicated in the rb_SETUP request/indication information flow that it wants to choose the routing method in case of migration of the called user, and decides to re-route the call as a result of the indication in the rb_MIGRATION INFO request indication information flow.

MSC Successful_call_setup_migration_forward_switching

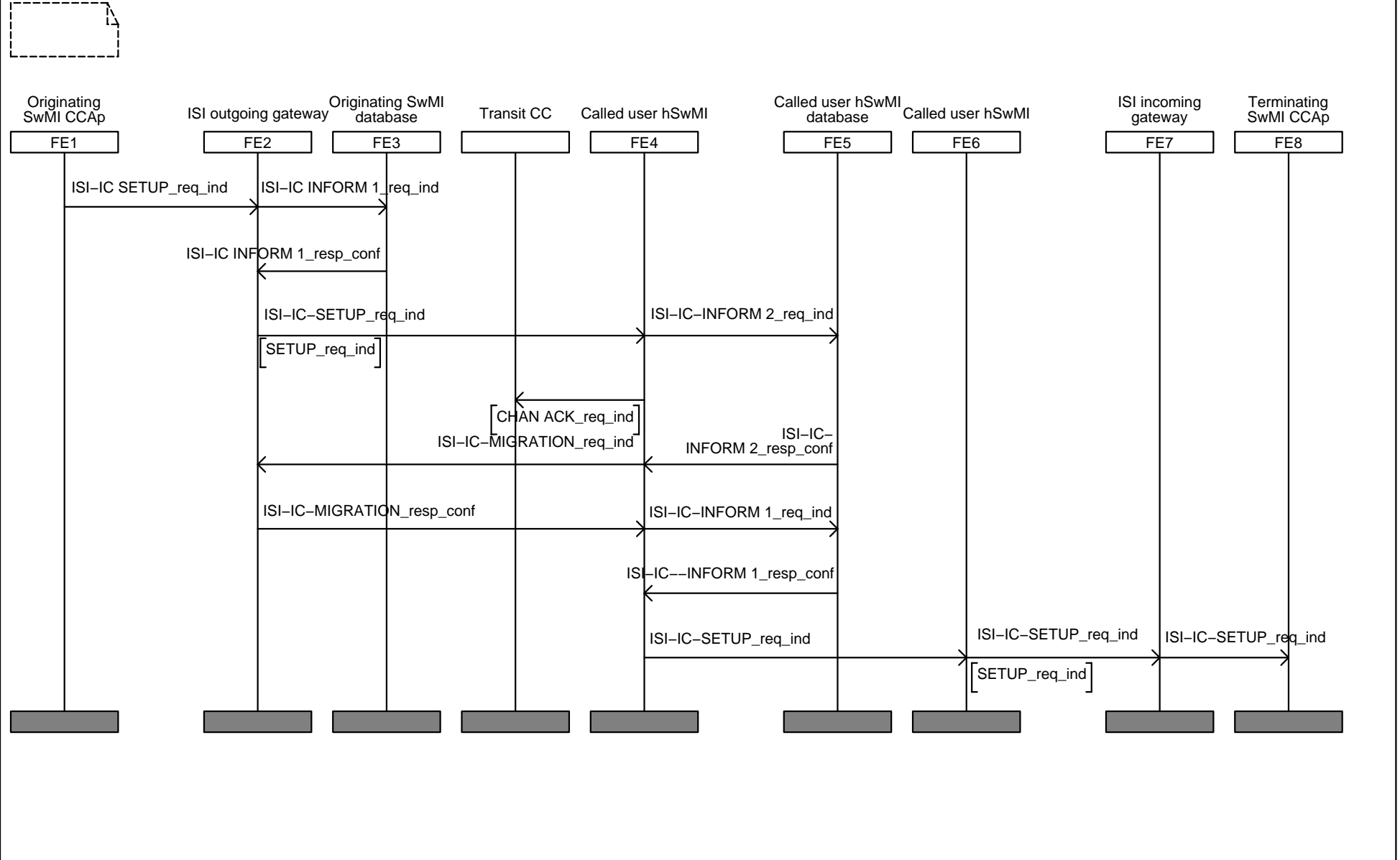


Figure 11: Information flow sequence - call set-up to a called user having migrated from SwMI B, using forward switching

MSC Successful_call_setup_migration_rerouteing

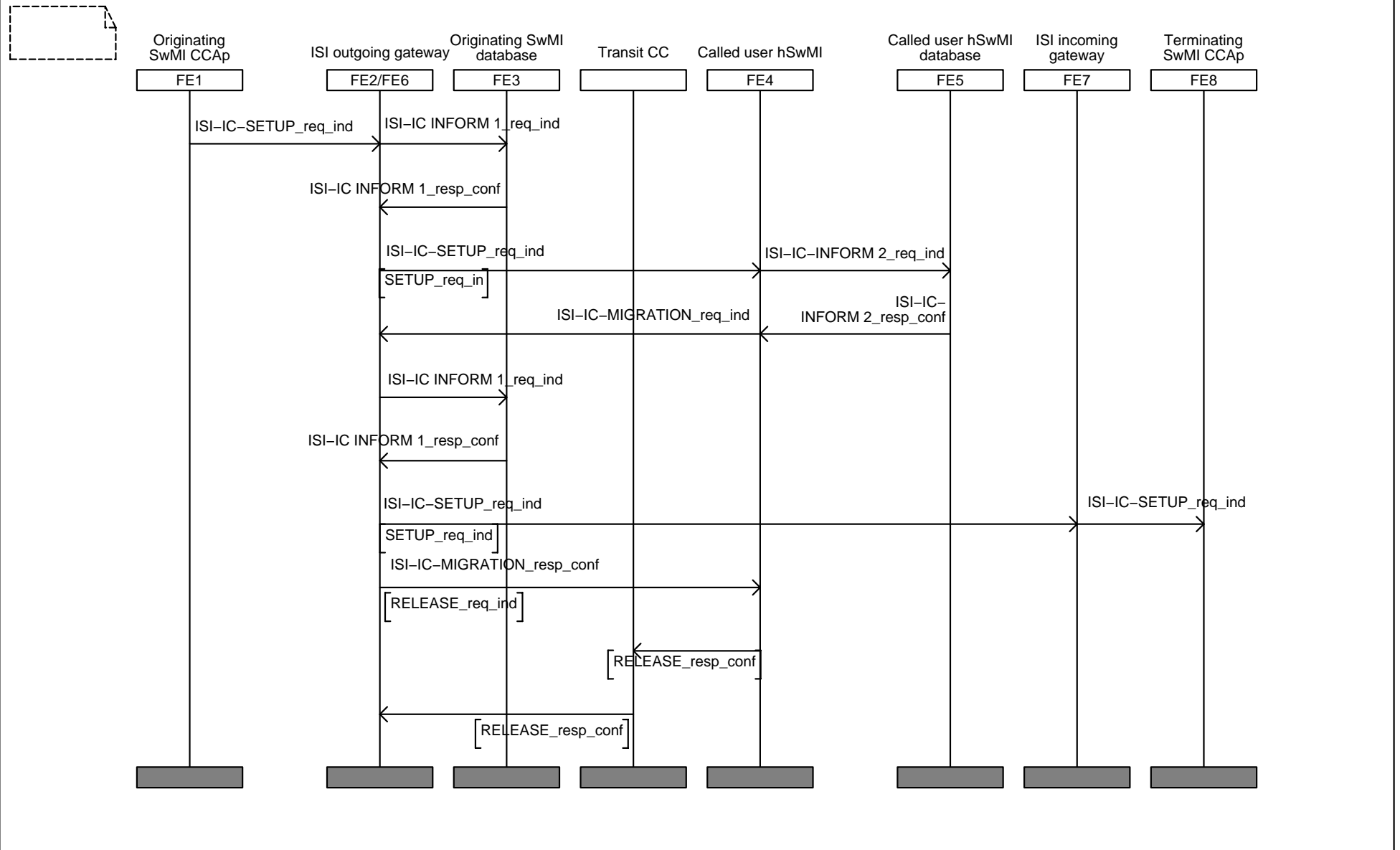


Figure 12: Information flow sequence - call set-up to a called user having migrated from SwMI B, using re-routing

5.2.1.5 Loop avoidance in case of intra-TETRA call

Figure 13 shows the information flow sequence when the home SwMI of the called user is SwMI B and when this user is registered in the originating SwMI, after having migrated. The invoked ANF-ISIIC is then cleared, and the information passed to SwMI A to continue the call as an intra-TETRA call.

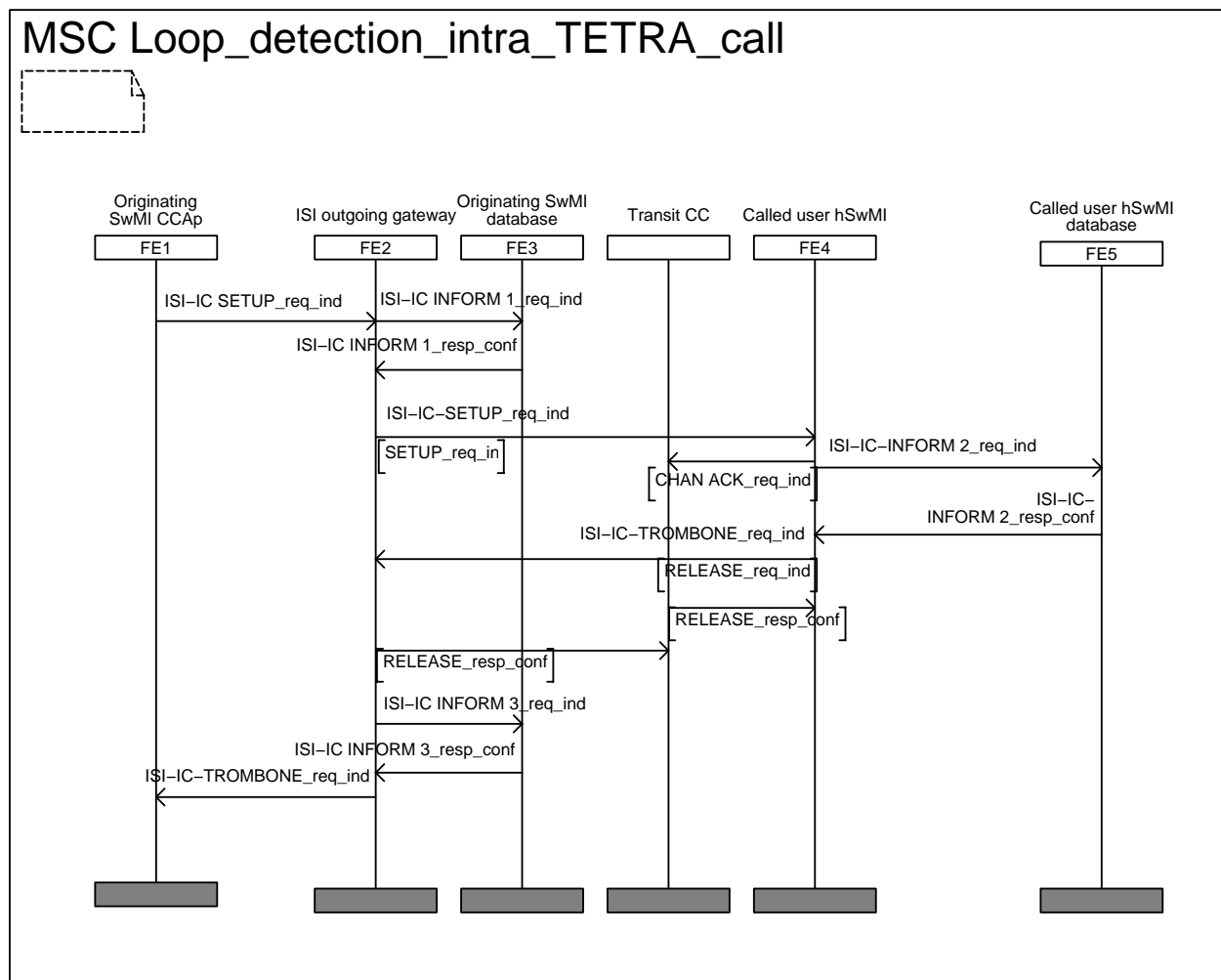
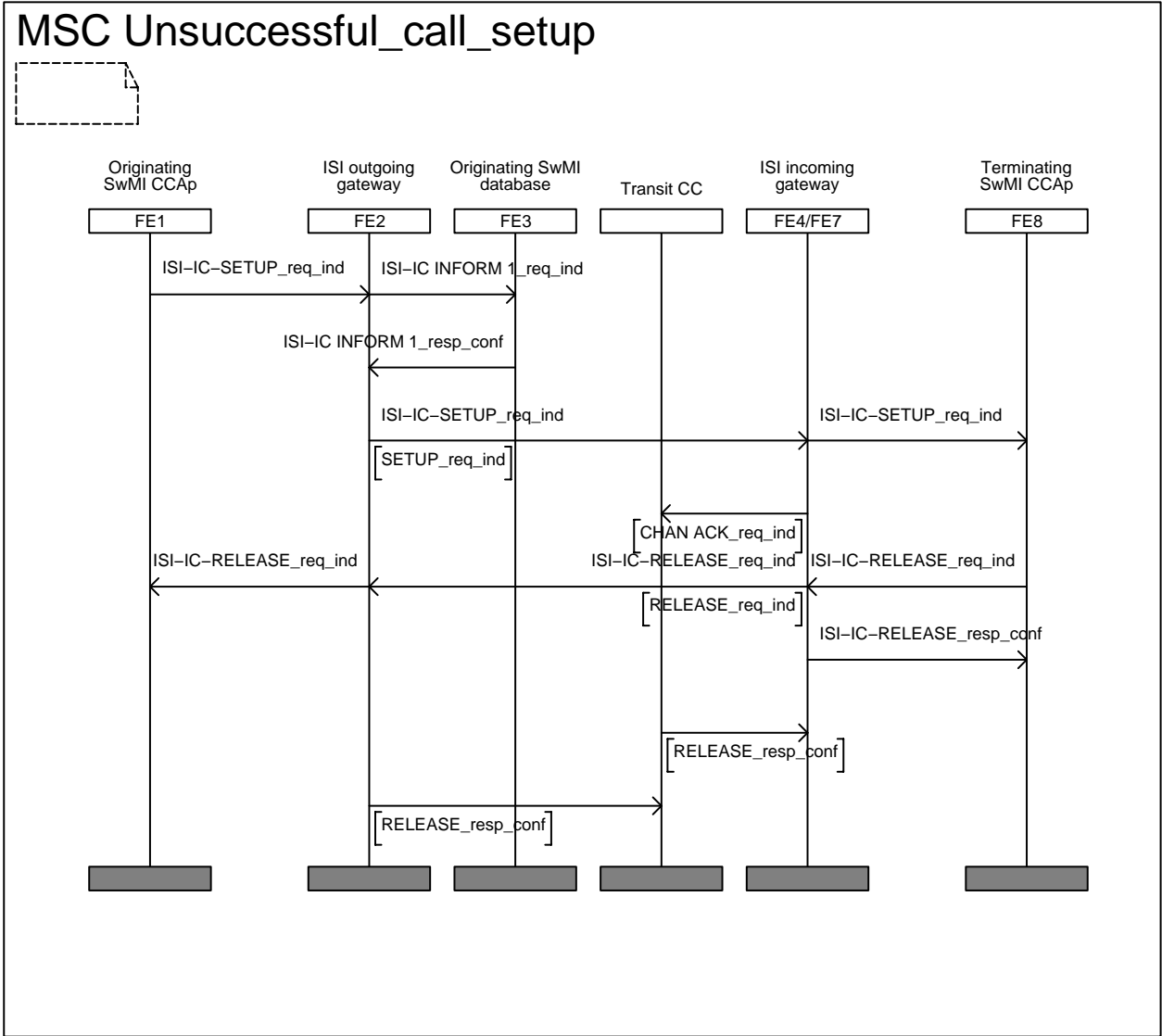


Figure 13: Information flow sequence - loop avoidance in case of intra-TETRA call

5.2.1.6 Unsuccessful ANF-ISIIC call set-up

Figure 14 shows the information flow sequence for an unsuccessful ANF-ISIIC call set-up when the call attempt is rejected either by the terminating SwMI CC entity or by the called user.

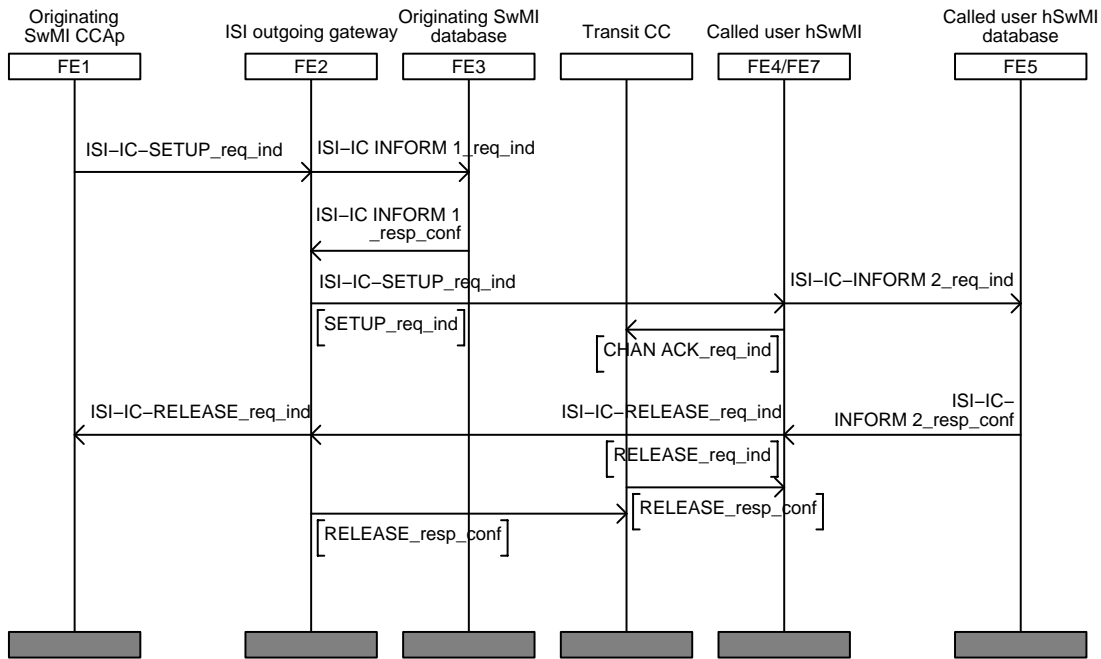


NOTE: The call set-up may also be rejected directly by the called SwMI, e.g. when it cannot match the air interface security level requested for the call. The corresponding information flow sequence has not been shown because it can easily be derived from figure 15.

Figure 14: Information flow sequence - call rejected by the terminating SwMI or by the called user

Figure 15 shows the information flow sequence for an ANF-ISIIC call set-up rejected by the called SwMI (i.e. SwMI B) as a result of the information provided by FE5.

MSC Call_setup_rejection

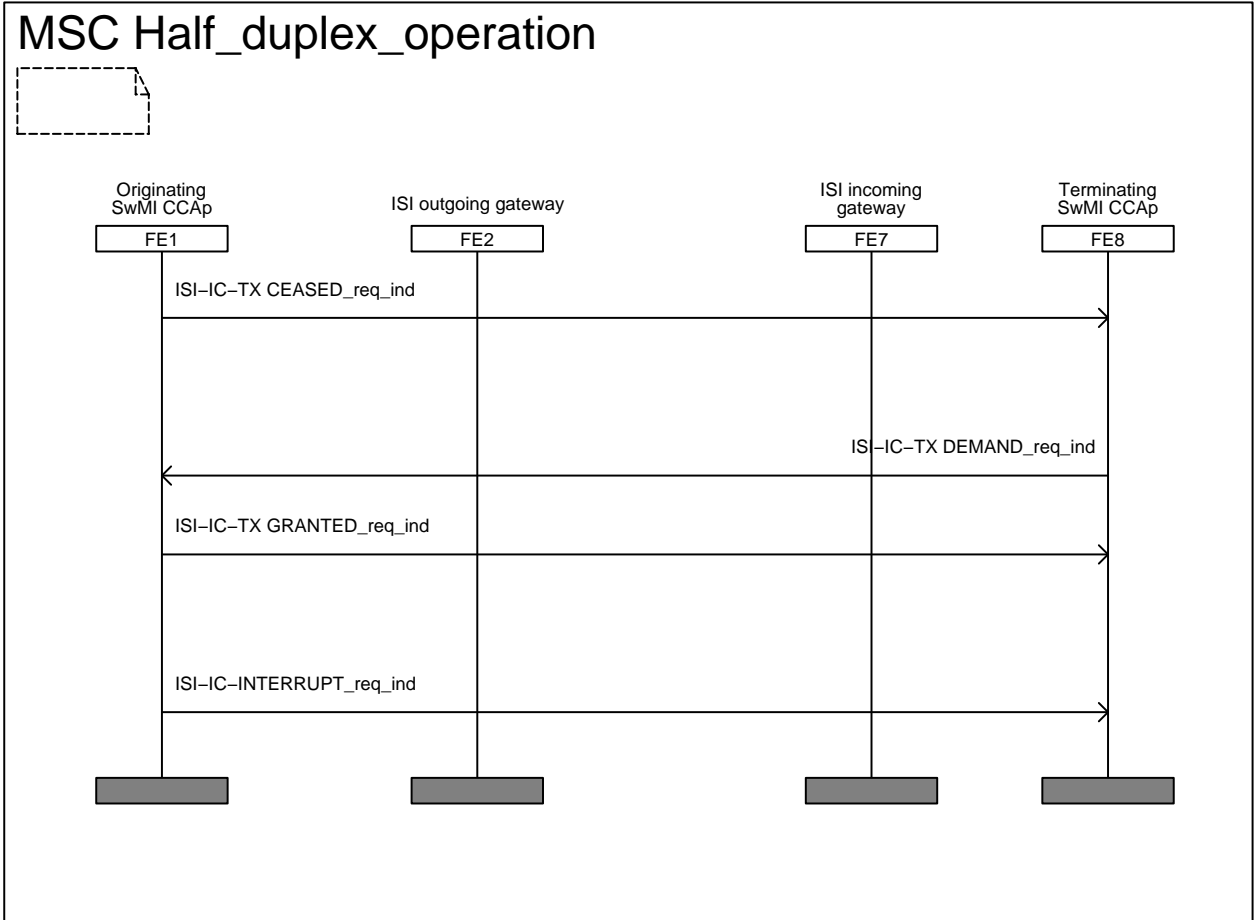


NOTE: In line with ISO/IEC 11574 [16], on the stage 1 and 2 descriptions of PISN basic call, the RELEASE information flows have been shown as confirmed information flows on this figure. However, the corresponding PSS1 protocol may operate differently: notably if the call is rejected before a PSS1 responding message has been sent, the PSS1 RELEASE request shall not be acknowledged (this corresponds to the ANF-ISIIC incoming gateway having rejected the call set-up with a PISN message RELEASE COMPLETE - see subclause 10.2 of ISO/IEC 11572 [15]).

Figure 15: Information flow sequence - call rejected by the called SwMI

5.2.1.7 Transmission control

Figure 16 shows the information flow sequence for half-duplex operation, when the called user requests to transmit.



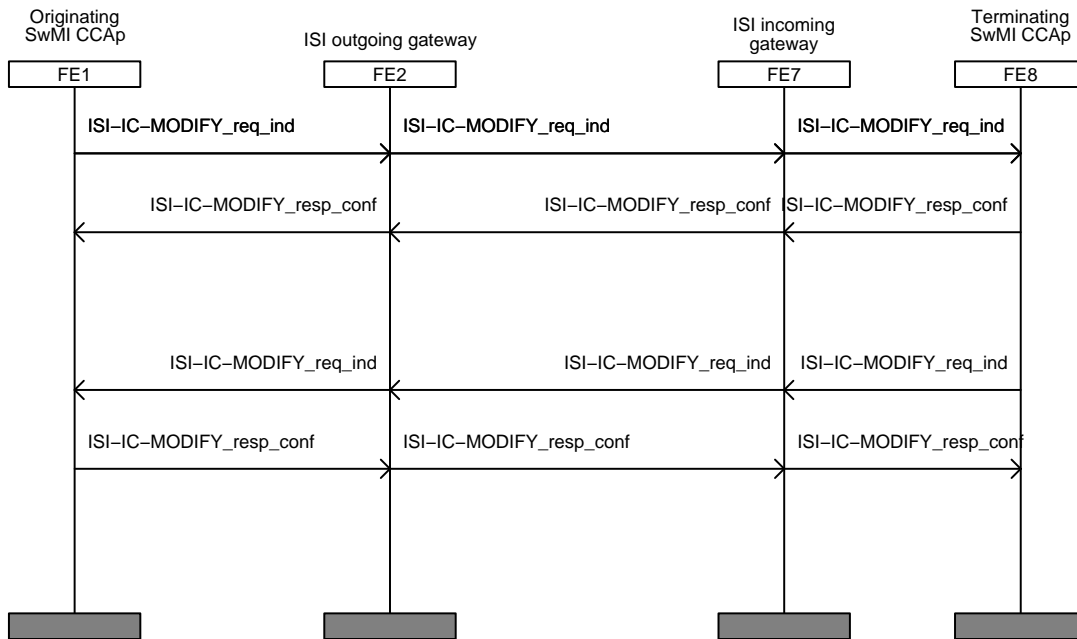
NOTE: All information flows which shown in figure 16 are across relationship ri, i.e. end-to-end between FE1 and FE8.

Figure 16: Information flow sequence - half-duplex operation with the called user requesting to transmit

5.2.1.8 Call modify

Figure 17 shows the information flow sequence for call modification, when the modification request comes from the originating SwMI.

MSC Call_modify



NOTE: The MODIFY information flows are not end-to-end between the originating and the terminating SwMI because they may result in a change in the 8 kbit/s encoding of the user information at the ISI, i.e. if the circuit mode service is modified, i.e. from speech to data service or vice-versa, or if the circuit mode service being data service, this service is changed, e.g. from 7,2 kbit/s to 4,8 kbit/s.

Figure 17: Information flow sequence - call modification

5.2.1.9 Call restoration after migration

Figure 18 shows the information flow sequence for call restoration in a new SwMI.

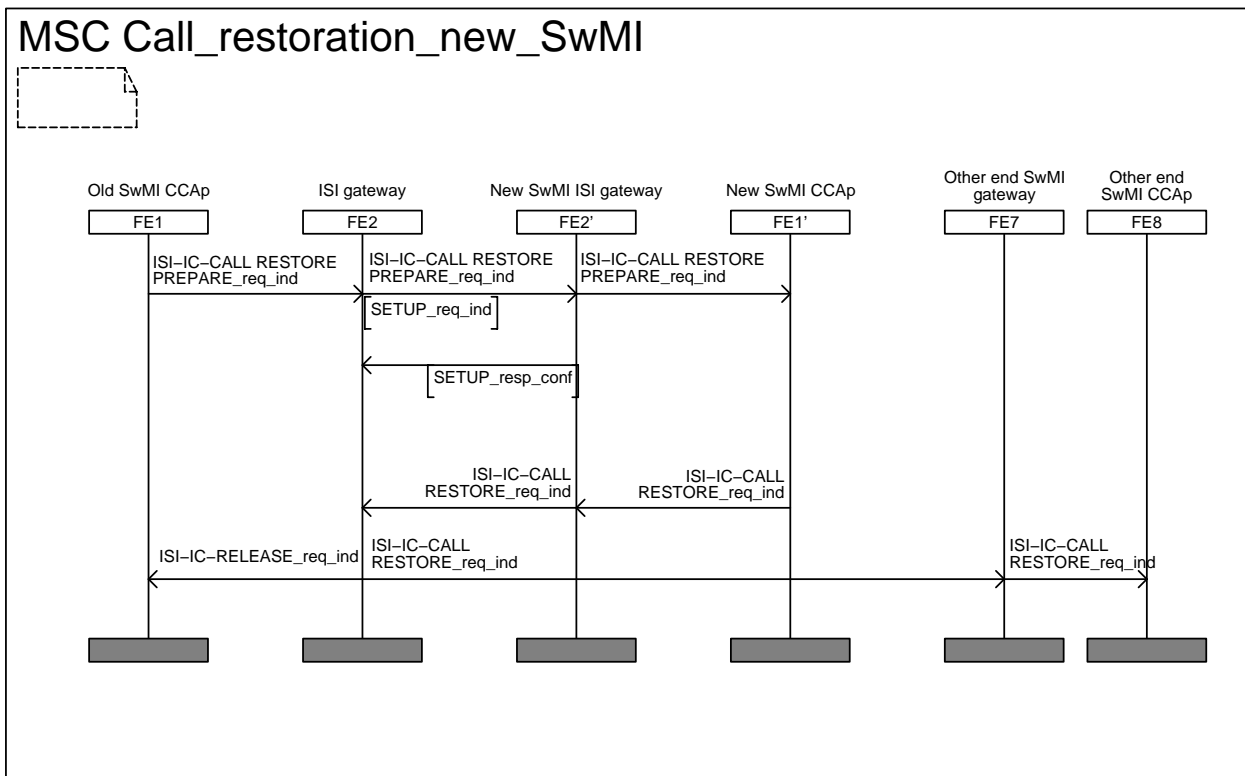


Figure 18: Information flow sequence - call restoration of an established inter-TETRA call in a new SwMI

Figure 19 shows the information flow sequence for call restoration in the forward switching SwMI.

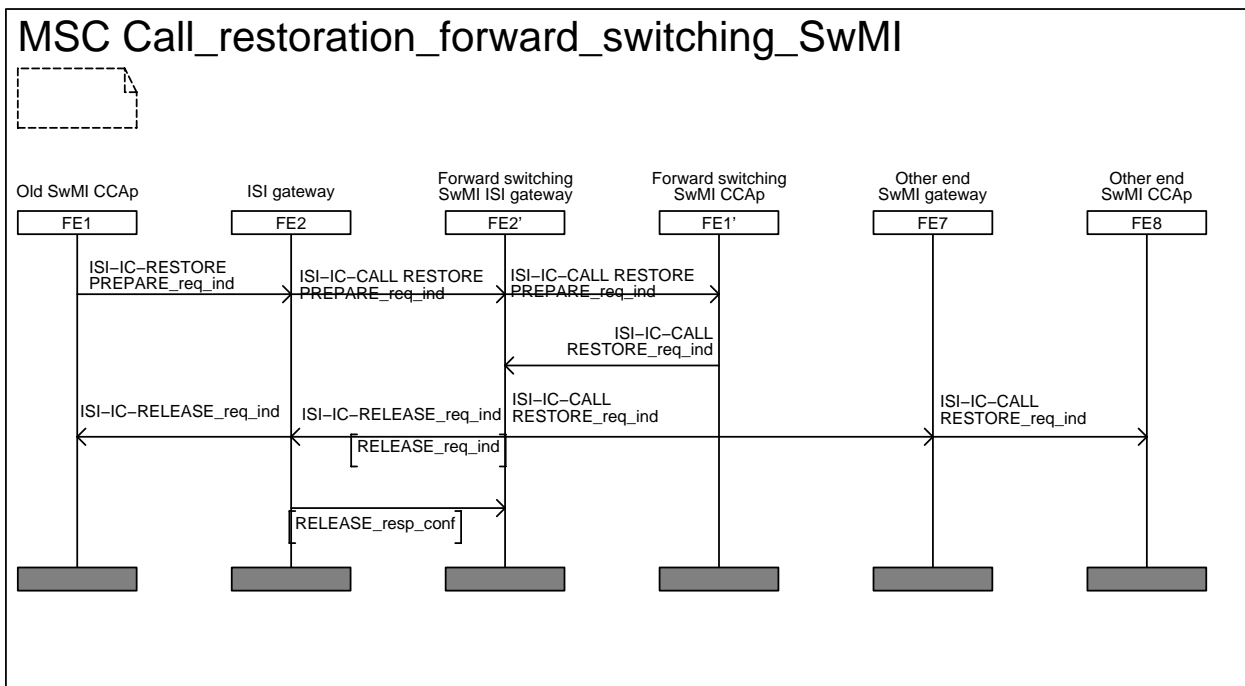


Figure 19: Information flow sequence - Call restoration of an established inter-TETRA call in the forward switching SwMI

Figure 20 shows the information flow sequence for call restoration in the other end SwMI.

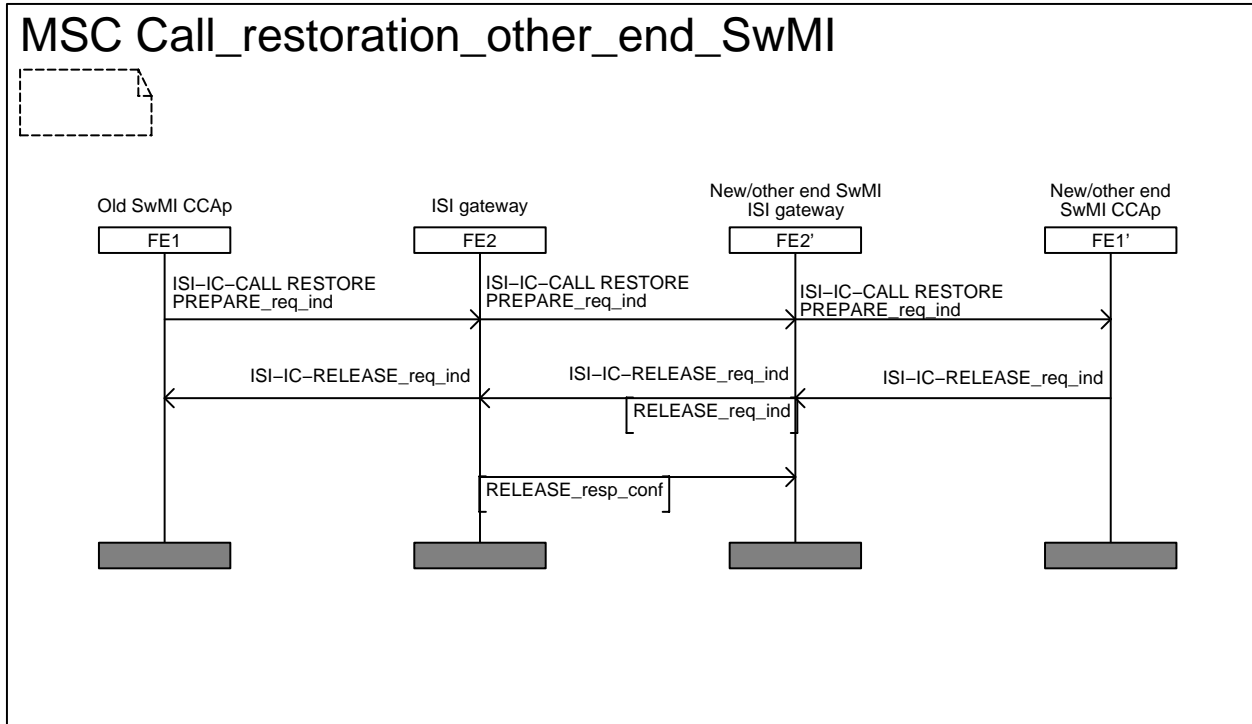


Figure 20: Information flow sequence - call restoration of an established inter-TETRA call in the other end SwMI

Figure 21 shows the information flow sequence for call restoration of an intra-TETRA call in another SwMI.

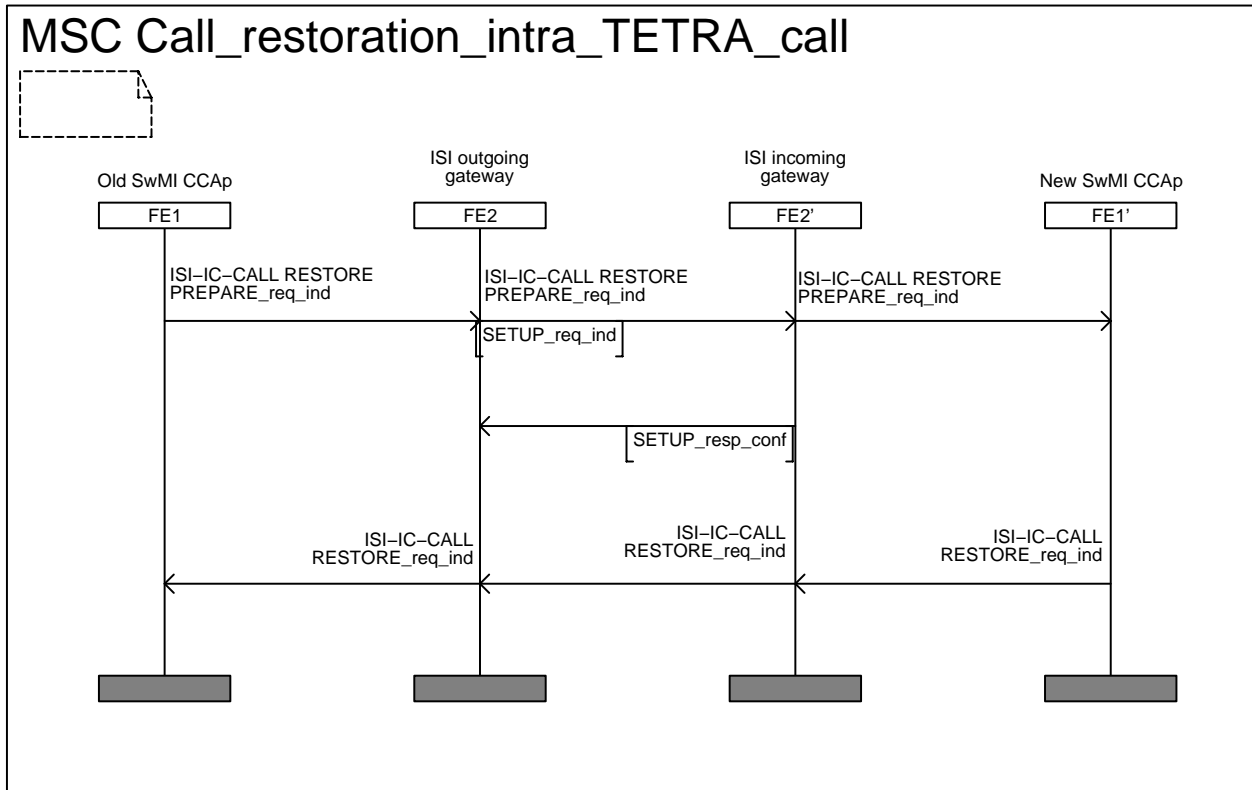


Figure 21: Information flow sequence - call restoration of an established intra-TETRA call

5.2.1.10 Call clearing

Figure 22 shows the information flow sequence when a call is cleared by its calling user. A symmetrical sequence applies when a call is cleared by its called user.

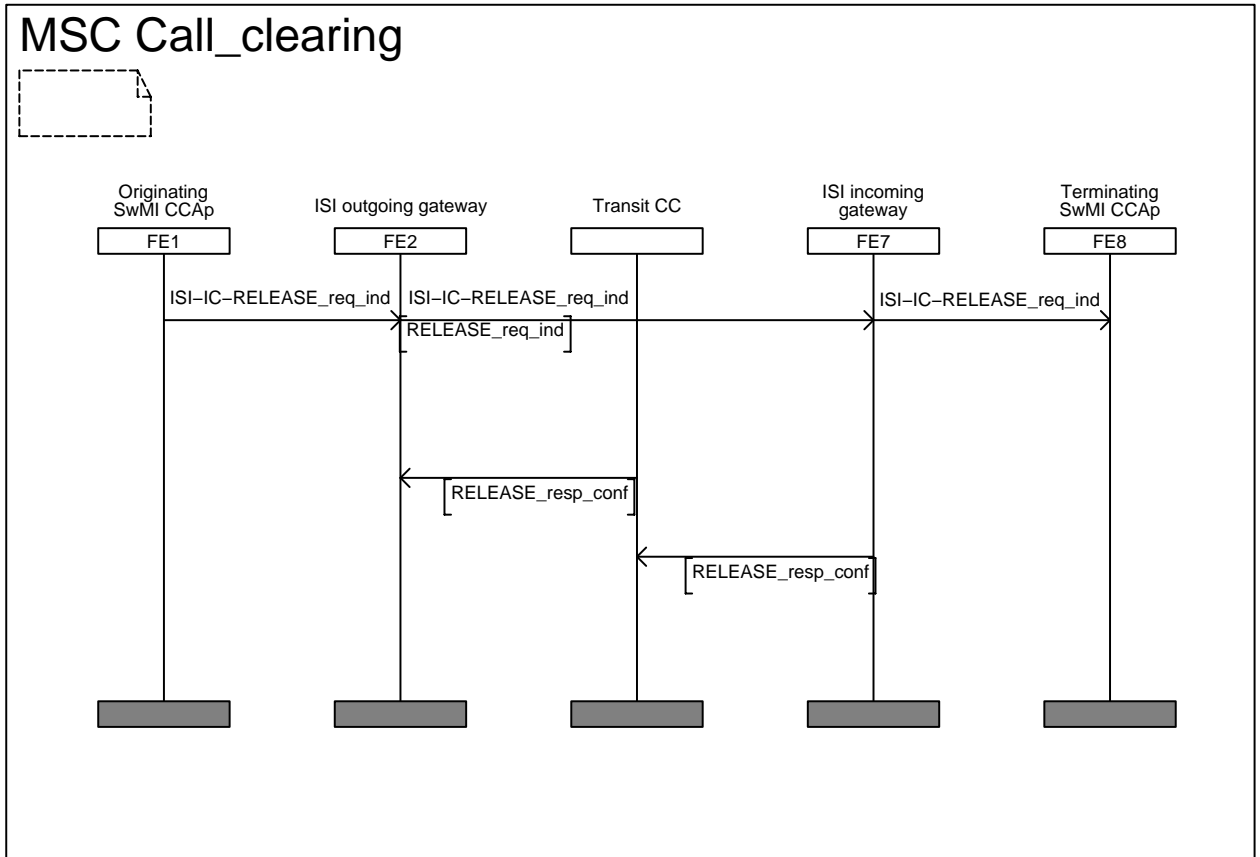


Figure 22: Information flow sequence - call clearing

5.2.2 Definition of information flows

In the tables listing the service elements in information flows, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

5.2.2.1 CALL RESTORE

CALL RESTORE is an unconfirmed information flow across the following relationships:

- rk from FE1' to FE2', rj from FE2' to FE2, rg from FE2 to FE7 and rh from FE7 to FE8, if the user restoring the call is the calling user;
- rk from FE8' to FE7' rl from FE7' to FE7, rg from FE7 to FE2 and ra from FE2 to FE1, if the user restoring the call is the connected user.

It informs the SwMI where the user was previously registered that it is not going to be anymore an end SwMI and that it should take the actions specified for call restoration (e.g. in the general case: joining the leg with the new SwMI and the existing ISI call path with the other end SwMI).

It also informs the SwMI at the other end about the call restoration, with possible call modifications proposed by the new SwMI.

Table 3 lists the service elements within the CALL RESTORE information flow.

Table 3: Contents of CALL RESTORE

| Service element | Request |
|---|--------------|
| New SwMI MNI | M |
| Simplex/duplex selection | M |
| Call priority | M |
| Basic service information | M |
| Transmission request permission | O (see note) |
| Transmission grant | O (see note) |
| Call status | O |
| NOTE: Mandatory if this information flow is sent by FE1' (corresponding to controlling SwMI). Not to be included if this information flow is sent by FE8'. | |

5.2.2.2 CALL RESTORE PREPARE

CALL RESTORE is an unconfirmed information flow across the following relationships:

- ra from FE1 to FE2, rj from FE2 to FE2' and rk from FE2' to FE1', if the user restoring the call is the calling user;
- rh from FE8 to FE7, rl from FE7 to FE7' and rk from FE7' to FE8', if the user restoring the call is the connected user.

It informs the SwMI where the user is now registered to prepare for call restoration.

Table 4 lists the service elements within the CALL RESTORE PREPARE information flow.

Table 4: Contents of CALL RESTORE PREPARE information flow

| Service element | Request |
|---|------------|
| Other end SwMI MNI | M |
| Basic service information | M |
| Speech services supported | O (note 1) |
| Security level at calling user air interface | M |
| Call priority | M |
| Call time-out | |
| Simplex/duplex selection | M |
| Transmission request permission | O (note 2) |
| Transmission grant | O (note 2) |
| NOTE 1: May be sent if the service requested (in the service element basic service information) is a speech service. | |
| NOTE 2: Mandatory if this information flow is sent by FE1 (corresponding to controlling SwMI). Not to be included if this information flow is sent by FE8. | |

5.2.2.3 CHARACTERISTIC CHANGE

CHARACTERISTIC CHANGE is an unconfirmed information flow across relationship rg from FE7 to FE2. It is an advance indication from the terminating SwMI to the originating one that some of the characteristics requested in the SETUP information flow are going to be changed, either because the terminating SwMI wants to change them (e.g. basic service not supported, or simply call set-up time-out extension), or because it knows that they are not supported by the called user. The sending of this information flow by FE7 is optional.

Table 5 lists the service elements within the CHARACTERISTIC CHANGE information flow.

Table 5: Contents of CHARACTERISTIC CHANGE

| Service element | Request |
|--|----------|
| Call time-out in set-up phase | O |
| Simplex/duplex selection | O |
| Call status | O |
| Basic service information | O (note) |
| NOTE: Only if different from requested | |

5.2.2.4 COMPLETE

COMPLETE is an information flow:

- across relationship ra, between FE1 and FE2;
- across relationship rh, between FE7 and FE8;
- and:
 - if the called user is registered in SwMI B, depending on whether or not FE4 is collocated with FE1, across relationship rf, between FE6 and FE7, or across relationship rc, between FE2 and FE4;
 - if the called user is registered in SwMI C (after having migrated):
 - if the call is forward switched, across relationships rc, between FE2 and FE4, re, between FE4 and FE6, and rf, between FE6 and FE7;
 - if the call is re-routed, across relationship rf, between FE6 and FE7.

If the call is established using on/off hook signalling, COMPLETE is a confirmed information flow, as shown in figure 9. It is an unconfirmed information flow if the call is established using direct set-up signalling, as shown in figure 10.

Table 6 lists the service elements within the COMPLETE information flow when it is a confirmed flow, and table 7 lists them when it is an unconfirmed flow.

Table 6: Contents of confirmed COMPLETE information flow

| Service element | Request | Response |
|---------------------------------|---------|----------|
| Terminating SwMI MNI | M | - |
| Call amalgamation | O | |
| Call time-out | M | M |
| Connected party identity | M | - |
| Simplex/duplex selection | M | - |
| Transmission request permission | M | M |
| Transmission grant | M | M |

Table 7: Contents of unconfirmed COMPLETE information flow

| Service element | Request |
|---------------------------------|---------|
| Call time-out | M |
| Transmission request permission | M |
| Transmission grant | M |

5.2.2.5 INFORM 1

INFORM 1 is a confirmed information flow across rb from FE2 to FE3, and across rd from FE4 to FE5. It is used by FE2 to get information on how to route the invoked ANF-ISIIC to SwMI B, or in case of re-routing, to SwMI C, and by FE4, to get information on how to route the invoked ANF-ISIIC to SwMI C in case of forward switching.

Table 8 lists the service elements within the INFORM 1 information flow.

Table 8: Contents of INFORM 1

| Service element | Request | Response |
|--|---------|----------|
| Routeing information towards FE4 or FE7 | M | M |
| Call priority | M | (note) |
| NOTE: The routeing information provided (by FE3 or FE5) in response to the request shall take into account the call priority if SS-PC or SS-PPC have been invoked. | | |

5.2.2.6 INFORM 2

INFORM 2 is a confirmed information flow across rd from FE4 to FE5. It is used by FE4 to know the where the called user is registered (i.e. in SwMI B, or in SwMI C), and to get information on the SS-BIC, SS-CAD or SS-Call diversion possibly activated.

Table 9 lists the service elements within the INFORM 2 information flow.

Table 9: Contents of INFORM 2

| Service element | Request | Response |
|---|---------|----------|
| Identity of the SwMI where the called user is registered | M | M |
| SS-BIC activation | M | M |
| SS-BIC "definition" | - | C (note) |
| SS-CAD activation | M | M |
| SS-CAD "definition" | - | C (note) |
| SS-Call diversion activation | M | M |
| SS-Call diversion "definition" | - | C (note) |
| NOTE: Mandatory if the corresponding SS has been activated. | | |

5.2.2.7 INFORM 3

INFORM 3 is a confirmed information flow across rb from FE2 to FE3. It is used by FE2 in the case where SwMI C coincides with SwMI A, to get information on the local SS-BIC, SS-CAD or SS-CDIV possibly activated.

Table 10 lists the service elements within the INFORM 3 information flow.

Table 10: Contents of INFORM 3

| Service element | Request | Response |
|---|---------|------------|
| Local SS-BIC activation | O | O (note 1) |
| Local SS-BIC "definition" | - | C (note 2) |
| Local SS-CAD activation | O | O (note 1) |
| Local SS-CAD "definition" | - | C (note 2) |
| Local SS-Call diversion activation | O | O (note 1) |
| Local SS-Call diversion "definition" | - | C (note 2) |
| NOTE 1: Mandatory if requested. | | |
| NOTE 2: Mandatory if the corresponding (local) SS has been activated. | | |

5.2.2.8 MIGRATION

MIGRATION is an information flow across relationship rc from FE4 to FE2. The MIGRATION request information flow is sent by FE4 when the called user is registered in SwMI C (i.e. the home SwMI of the called user is SwMI B and this user has migrated). It is a confirmed information flow unless FE2 has informed in advance FE2 that the call has to be forward switched when the called user has migrated (in another SwMI than the originating one). The MIGRATION information flow shall not be sent when SwMI C coincides with SwMI A.

NOTE: It is then replaced by the TROMBONE information flow - see hereafter.

Table 11 lists the service elements within the MIGRATION information flow when it is a confirmed flow, and table 12 lists them when it is an unconfirmed flow.

Table 11: Contents of confirmed MIGRATION information flow

| Service element | Request | Confirm |
|--|---------|---------|
| Identity of the SwMI where the called user is registered | M | - |
| Forward switching (note) | M | M |
| NOTE: In the request information flow, this information element indicates whether forward switching is supported or not (or possibly if FE4 refuses that forward switching takes place). In the response information flow, it indicates whether FE2 wants that the call be forward switched or not, i.e. the call is going to re-routed. In the latter case, this information flow shall be interpreted by FE4 as a RELEASE request/indication information flow. | | |

Table 12: Contents of unconfirmed MIGRATION information flow

| Service element | Request |
|--|---------|
| Identity of the SwMI where the called user is registered | M |

5.2.2.9 MODIFY

MODIFY is a confirmed information flow across relationships ra, rg and rh, from FE1 to FE8 via FE2 and FE7 and vice-versa. The MODIFY request/indication information flow sends a request to modify the existing basic service into another one, and/or to change from duplex to half-duplex, or vice-versa, and/or to change the call duration. The MODIFY response /confirmation information flow indicates the response to this request. FE2 or FE7 may reject such request if the ISI gateways in which they are located do not support the user information 8 kbit/s encoding entailed by a request to change the basic service.

Table 13 lists the service elements within the MODIFY information flow.

Table 13: Contents of MODIFY

| Service element | Request | Confirm |
|---|----------|----------|
| Basic service information: | | |
| Circuit mode service | O | O |
| Communication type | O | O |
| Data call capacity | C (note) | C (note) |
| Data service | C (note) | C (note) |
| Encryption flag | O | O |
| Speech service | C (note) | C (note) |
| Call time-out | O | O |
| Simplex/duplex selection | O | O |
| NOTE: Depending on the value of circuit mode service. | | |

5.2.2.10 RELEASE

RELEASE is an unconfirmed information flow across relationships ra, rh, rc, rf and rg. It shall be sent to clear the call (together with the invoked ANF-ISIIC).

NOTE: As recalled in the note to figure 15, the PISN RELEASE information flow is a confirmed information flow on all PISN basic call relationships which support relationships rc, rf and rg. But this does not make the ANF-ISIIC RELEASE information flow a confirmed one.

Table 14 indicates the only service element within the RELEASE information flow.

Table 14: Contents of RELEASE

| Service element | Request |
|------------------|---------|
| Disconnect cause | M |

5.2.2.11 SETUP

SETUP is a confirmed information flow:

- across relationship ra from FE1 to FE2;
- across relationship rh from FE7 to FE8;
- and:
 - if the called user is registered in SwMI B, depending on whether or not FE4 is collocated with FE1, across relationship rf from FE6 to FE7, or across relationship rc from FE2 to FE4;
 - if the called user is registered in SwMI C (after having migrated):
 - if the call is forward switched, across relationships rc from FE2 to FE4, re from FE4 to FE6, and rf from FE6 to FE7;
 - if the call is re-routed, across relationship rf from FE6 to FE7.

The SETUP request/indication information flow enables the TETRA call to be set-up by the originating SwMI up to the terminating SwMI. The SETUP response/confirmation information flow is sent by the terminating SwMI upon the first response of the called user, i.e.:

- in the case of on/off hook signalling, this first response will generate a U-ALERT air interface PDU. The (ISI-IC-)SETUP response/confirmation information flow shall then be carried together with the PISN REPORT request/indication information flow(s). The TNCC ALERT primitive may be sent to the calling user by SwMI A call control application;
- while in the case of direct set-up signalling, this first response will generate a U-CONNECT air interface PDU. The ISI-IC-SETUP response/confirmation information flow shall then be carried together with the PISN SETUP response/confirmation information flow.

Table 15 lists the service elements within the SETUP information flows.

Table 15: Contents of SETUP

| Service element | Request | Confirm |
|--|--|------------|
| Originating SwMI MNI | M | - |
| Routeing method choice | O | - |
| Terminating SwMI MNI | | O (note 2) |
| Call time-out, set-up phase | M | O (note 3) |
| Basic service information: | | |
| Circuit mode service | M | O (note 2) |
| Communication type | M | O (note 2) |
| Data call capacity | C (note 1) | C (note 1) |
| Data service | C (note 1) | C (note 1) |
| Encryption flag | M | O (note 2) |
| Speech service | C (note 1) | C (note 1) |
| Speech services supported | O (note 4) | - |
| Security level at calling user air interface | M | M |
| Call priority | M | O (note 2) |
| Call amalgamation | - | O (note 2) |
| Call time-out | M | O (note 2) |
| Called/Connected party number | M | O (note 2) |
| Calling party number | M | - |
| Hook method selection | M | M (note 5) |
| Request to transmit/send data | M | |
| Simplex/duplex selection | M | M |
| Transmission request permission | M | |
| Transmission grant | M | |
| Call queued | - | O (note 6) |
| NOTE 1: | Depending on the value of circuit mode service. | |
| NOTE 2: | Mandatory in the case of direct set-up signalling. Not to be included in the case of on/off hook signalling. | |
| NOTE 3: | Mandatory in the case of on/off hook signalling. Not to be included in the case of direct set-up signalling. | |
| NOTE 4: | May be sent if the service requested is a speech service. | |
| NOTE 5: | Mandatory to indicate the actual choice made by the called user: in other words, it indicates whether the called user has accepted or changed the hook selection method requested. | |
| NOTE 6: | Optional in the case of on/off hook signalling. Not to be included in the case of direct set-up signalling. | |

NOTE: The service element call priority has been included in table 15 for the purpose of alignment with the definition of the TNCC-SETUP primitive in table 48 of ETS 300 392-2 [1]. From a formal point of view it should not have been included in that table because it is not needed by ANF-ISIIC basic call: it is needed only for the interaction between the invoked ANF-ISIIC and the supplementary services SS-PC and SS-PPC.

5.2.2.12 SETUP PROLONGATION

SETUP PROLONGATION is an unconfirmed information flow across relationships ra, rg and rh, from FE1 to FE8 via FE2 and FE7 and vice-versa, to request a set-up time-out extension. Table 16 shows the service element within the SETUP PROLONGATION information flow.

Table 16: Contents of SETUP PROLONGATION

| Service element | Request |
|-----------------------------|---------|
| Call time-out, set-up phase | M |

5.2.2.13 TROMBONE

TROMBONE shall be a confirmed information flow across relationship rc from FE4 to FE2. The TROMBONE request information flow It is sent by FE4 when FE4 has identified that SwMI C coincides with SwMI A. And the TROMBONE response is then a confirmation that the invoked ANF-ISIIC FE4 may be cleared.

Table 17 lists the service elements within the TROMBONE request information flow (sent by FE4). There are no service elements within the TROMBONE response information flow (sent by FE2).

Table 17: Contents of TROMBONE

| Service element | Request |
|--|-------------------|
| Terminating and originating SwMIs coinciding | M |
| Results of possible SS-BIC and SS-CAD (for incoming calls) | M (notes 1 and 2) |
| NOTE 1: If none of these supplementary services has been activated, this shall be indicated. | |
| NOTE 2: The case where the result would be that the call is not authorized by SS-CAD is excluded, since it would not result in the sending of a TROMBONE request information flow, but in the ANF-ISIIC call establishment being rejected. | |

5.2.2.14 TX-CEASED

TX-CEASED is an unconfirmed information flow across ri from FE8 to FE1 to indicate that transmission from the called user has ceased.

Table 18 lists the service elements within the TX-CEASED information flow.

Table 18: Contents of TX-CEASED

| Service element | Request |
|---------------------------------|---------|
| Transmission request permission | M |
| Notification indicator | O |
| Facility | O |
| Proprietary | O |

5.2.2.15 TX-CONTINUE 1

TX-CONTINUE 1 is an unconfirmed information flow across ri from FE1 to FE8 to indicate that transmission has resumed.

Table 19 lists the service elements within the TX-CONTINUE 1 information flow.

Table 19: Contents of TX-CONTINUE 1

| Service element | Request |
|---------------------------------|---------|
| Continue | M |
| Transmission request permission | M |
| Notification indicator | O |
| Facility | O |
| Proprietary | O |

5.2.2.16 TX-CONTINUE 2

TX-CONTINUE 2 is an unconfirmed information flow across ri from FE8 to FE1 to indicate that transmission may resume.

Table 20 lists the service elements within the TX-CONTINUE 2 information flow.

Table 20: Contents of TX-CONTINUE 2

| Service element | Request |
|------------------------|---------|
| Notification indicator | O |
| Facility | O |
| Proprietary | O |

5.2.2.17 TX-DEMAND

TX-DEMAND is an unconfirmed information flow across ri from FE8 to FE1. It is a request from the terminating SwMI to the originating/controlling SwMI for transmission grant (following the corresponding request received from the called user).

Table 21 lists the service elements within the TX-DEMAND information flow.

Table 21: Content of TX-DEMAND

| Service element | Request |
|---------------------------------|---------|
| Transmission request permission | M |
| Encryption control | M |
| Speech service | M |
| Notification indicator | O |
| Facility | O |
| Proprietary | O |

5.2.2.18 TX-GRANTED

TX-GRANTED is an unconfirmed information flow across ri from FE1 to FE8. It is an indication to the terminating SwMI from the originating/controlling SwMI that permission to transmit has been granted to either the calling or the called user.

Table 22 lists the service elements within the TX-GRANTED information flow.

Table 22: Content of TX-GRANTED

| Service element | Request |
|---------------------------------|---------|
| Transmission grant | M |
| Transmission request permission | M |
| Encryption control | M |
| Speech service | M |
| Notification indicator | O |
| Facility | O |
| Proprietary | O |

5.2.2.19 TX-INTERRUPT

TX-INTERRUPT is an unconfirmed information flow across ri from FE1 to FE8. It is an indication to the terminating SwMI from the originating/controlling SwMI that permission to transmit has been withdrawn.

Table 23 lists the service elements within the TX-INTERRUPT information flow.

Table 23: Content of TX-INTERRUPT

| Service element | Request |
|---------------------------------|---------|
| Transmission grant | M |
| Transmission request permission | M |
| Encryption control | M |
| Speech service | M |
| Notification indicator | O |
| Facility | O |
| Proprietary | O |

5.2.2.20 TX-WAIT

TX-WAIT is an unconfirmed information flow across ri from FE1 to FE8 or from FE8 to FE1 to indicate that transmission has been interrupted.

Table 24 lists the service elements within the TX-WAIT information flow.

Table 24: Contents of TX-WAIT

| Service element | Request |
|---------------------------------|---------|
| Transmission request permission | M |
| Notification indicator | O |
| Facility | O |
| Proprietary | O |

5.2.3 Relationship of information flows to basic call information flows

The (TETRA ANF-ISIIC) SETUP request/indication information flows across relationships rc and rf shall be sent in conjunction with the PISN basic call r2_setup request/indication information flows sent to initiate the establishment of the necessary PISN call.

The (TETRA ANF-ISIIC) SETUP response/confirmation information flows across relationships rf and rc shall be sent in conjunction with either the PISN basic call r2_report request/indication information flows if the called user uses on/off hook signalling, or the PISN basic call r2_setup response/confirmation information flows if the called user uses direct set-up signalling.

The (TETRA ANF-ISIIC) COMPLETE request/indication information flow across relationships rc and rf shall be sent in conjunction with the PISN basic call r2_setup response/confirmation if the called user uses on/off hook signalling.

The (TETRA ANF-ISIIC) RELEASE request/indication information flows across relationships rc, rf and rg shall be sent in conjunction with the PISN basic call r2_release request/indication information flows.

None of the other (ANF-ISIIC) information flows are related to any PISN basic call information flows.

5.3 Functional entity actions

The following FE actions shall occur at the points indicated in the figures in subclause 5.2.1.

5.3.1 Functional entity actions of FE1

To be defined.

5.3.2 Functional entity actions of FE2

- 201 Receive from FE1 an outgoing ISI call and send an INFORM 1 req/ind to FE3 requesting information for routeing the call to SwMI B and wait for response.
- 202 Use the routeing information received from FE3 to decide over which ISI route the call, generate SETUP request information flow and send it to FE4. Send notification to SwMI A CC (for calling user). Wait for response from FE4.
- 203 Receive indication from FE4 that the called user is being alerted and pass it to SwMI A CC (for calling user).
- 204 Receive from FE4 indication that, depending on the radio traffic channel assignment method used, the called user either has been or is ready to be connected to SwMI B, together with request to establish ISI connection on its side. Pass information to FE1 (for calling user).
- 205 Receive confirmation from FE1 that calling user has been connected to this SwMI (notably the calling user has been assigned a radio traffic channel). Generate COMPLETE information flow (a request information flow if the called user has used direct set-up signalling, or a response, if the called user has used on/off hook signalling) and send it to FE4 together with confirmation that ISI connection has been established in SwMI A.
- 206 Receive information from FE4 that the call set-up has been rejected by the called SwMI/called user. Pass information to FE1 and clear possible ISI connection and return to Idle state.
- 207 Receive information from calling user via FE1 that the talking user has ceased to transmit, generate the corresponding TX-CEASED request information flow and send it to FE7.
- 208 Receive TX-DEMAND request information flow from FE7, which means that the called user wishes to transmit, and pass it to FE1.
- 209 Receive the information from FE1 that that the called user has been granted permission to transmit, generate the corresponding TX-GRANTED request information flow and send it to FE7.
- 210 Receive information from FE1 that permission to transmit has been withdrawn, generate the corresponding TX-GRANTED request information flow and send it to FE7.
- 211 Receive request from FE1 or from FE4 to clear ongoing call, generate the corresponding RELEASE request information flow and send it to FE4 or to FE1 respectively.
- 212 Receive from FE4 indication that the called user has migrated to TETRA network C. If SwMI B does not support forward switching receive call attempt clearing indication from FE4. If SwMI B supports forward switching, check whether the call to the called user is authorized to the calling user. If no, clear the call attempt. If yes, request FE4 either to clear ISI call attempt if it has decided to re-route call, or to forward switch the call.
- NOTE: As mentioned in subclause 4.2.2,2, due to the way ANF-ISIMM operates, the case where the called user home SwMI would be SwMI A and would have first migrated to SwMI B, then to SwMI C is excluded.
- 613 Under the hypothesis that FE2 has decided to re-route the call, as a result of action 212, re-route call generate the corresponding SETUP request information flow and send it to FE7, using relevant information on migrated user received from FE3. Wait for response from FE7. And then reproduce actions 207, to 210, in replacing FE4 by FE7.
- 619 Receive information from FE7 that the call set-up has been rejected by the terminating SwMI/called user. Clear possible ISI connection pass information to FE1.
- 1xx Receive indication from FE4 that the call has been successfully established with the called user by forward switching.

5.3.3 Functional entity actions of FE2

- 201 Receive a request for information regarding the calling user service profile information and information to route call (over ISI) to SwMI B in a ra_INFORM 1 req/ind from FE1. Retrieve the information and return to FE1 in a ra_INFORM 1 resp/conf. Return to Idle state.
- 202 In the case of re-routeing, provides information to FE1 to route call (over ISI) to SwMI C.

5.3.4 Functional entity actions of FE3

- 301 Receive a call set-up request to the called user.
- 302 Request and receive information from FE4 relating to the called user: whether it has migrated to another TETRA network or not, with the identity of that network if yes (i.e. network C); and, if no, the called user service profile. Decide whether the call can continue (i.e. if the called user has not migrated and if interaction with call restricting supplementary services activated for the called user, e.g. barring of incoming calls, allows it to receive a call from the calling user).
- 303 If the call can continue, send message to SwMI B CC that there is an incoming call for the called user.
- 304 Return indication to FE1 that the called user has been alerted.
- 305 Send to FE1 indication that, depending on the radio traffic channel assignment method used, the called user either has been or is ready to be connected to SwMI B together with request to establish ISI connection in SwMI A.
- 306 Receive confirmation from FE1 that the calling user has been connected to SwMI A and that ISI connection has been established in SwMI A. Relay this confirmation to SwMI B CC (so that SwMI B CC, after having itself established the ISI connection on its side, will be able to send to the called user through connect acknowledgement).
- 307 Receive information related to the call status and supplementary services from FE1 and pass it to SwMI B Circuit Mode Control Entity (CMCE).
- 308 Send information related to the call status and supplementary services to FE1.
- 309 Send information to FE1 that the call set-up has been rejected by the called SwMI/called user.
- 310 Receive information from FE1 that the talking user has ceased to transmit and pass it to SwMI B CC.
- 311 Send information to FE1 that the called user wishes to transmit.
- 312 Receive information from FE1 that the called user has been granted permission to transmit and pass it to SwMI B CC.
- 313 Receive information from FE1 that permission to transmit has been withdrawn from the called user and pass it to SwMI B CC.
- 314 Receive request from FE1 or from SwMI B CC to clear the ongoing call and pass it to SwMI B CC or to FE1 respectively.
- 315 Return to FE1 that the called user has migrated to TETRA network C and whether SwMI B supports forward switching. If SwMI B does not support forward switching, reject the ISI call attempt and request FE1 to clear it.
- 316 If SwMI B supports forward switching, receive request from FE1 either to clear ISI call attempt, or to forward switch the call.
- 323 To establish the second leg of forward switching (to SwMI C), use the routeing information received from FE4 to decide over which ISI route the call, repeat the Set-up PDU received from FE1 and send a call SETUP to FE5. Wait for response from FE5.

- 324 Receive indication from FE5 that the called user is being alerted, relay it to FE1 and request SwMI B to establish internal connection between its ISI to SwMI A and that to SwMI C - if it had not been established earlier. Wait for further instructions.
- 325 Receive from FE5 indication that, depending on the radio traffic channel assignment method used, the called user either has been or is ready to be connected to SwMI C, together with request to establish internal SwMI B connection between the ISI to SwMI A and that to SwMI C - if it had not been established earlier. Request SwMI B CC to establish this connection, and relay FE5 indication to FE1 with request to establish ISI connection in SwMI A.
- 326 Receive confirmation from FE1 that calling user has been connected to SwMI A and that ISI connection has been established in SwMI A. Relay this information to FE5 together with confirmation that internal SwMI B connection between the ISI to SwMI A and that to SwMI C has been established.
- 327 Relay to FE5 all information received from FE1, and vice versa, up to and including request to clear ongoing call. Request then SwMI B CC to clear internal SwMI B connection between the ISI to SwMI A and that to SwMI C. And confirm clearing to the requesting FE, and wait for confirmation from the other one.

5.3.5 Functional entity actions of FE4

- 401 Receive a request for information regarding the called user in a rc_CHECK req from FE3: whether it has migrated to another TETRA network or not, with the identity of that network if yes (i.e. network C); and, if no, the called user service profile. Retrieve the information and return it to FE3 in a rc_CHECK conf. Return to Idle state.

5.3.6 Functional entity actions of FE5

- 501 Receive a call set-up request to the migrated called user registered in the system.
- 502 Request and receive information from FE6 relating to the called user, first to confirm that it has not migrated to another TETRA network, and if this is confirmed, decide whether the call can continue (i.e. if the called user has not migrated and if its service profile allows it to receive a call from the calling user).
- 503 If the call can continue, send message to SwMI C CC that there is an incoming call for the called user.
- 504 Return information to FE1 (possibly via FE3 if the call is being forward switched by FE3) that the called user has been alerted.
- 505 Send to FE1 indication (possibly via FE3 if the call is being forward switched by FE3) that, depending on the radio traffic channel assignment method used, the called user has been or is ready to be connected to SwMI C together with request to establish ISI connection in SwMI A. In addition, in case of forward switching, request also FE3 to establish internal SwMI B connection between the ISI to SwMI A and that to SwMI C - if it had not been established earlier.
- 506 Receive confirmation from FE1 (possibly via FE3 if the call is being forward switched by FE3) that the calling user has been connected to SwMI A that the calling user has been connected within SwMI A and that ISI connection has been established in SwMI. In addition, in case of forward switching, receive confirmation from FE3 that internal SwMI B connection between its ISI to SwMI A and that to SwMI C has been established. Send distant connection confirmation to SwMI C CC (so that, after having itself established the ISI connection on its side, it will be able to send to the called user through connect acknowledgement).
- 507 Receive information related to the call status and supplementary services from FE1 (possibly via FE3 if the call has been forward switched by SwMI B) and pass it to SwMI C CC.
- 508 Send information related to the call status and supplementary services to FE1 (possibly via FE3 if the call has been forward switched by SwMI B).

- 509 Send information to FE1 (possibly via FE3 if the call is being forward switched by SwMI B) that the call set-up has been rejected by the called SwMI/called user.
- 510 Receive information from FE1 (possibly via FE3 if the call has been forward switched by SwMI B) that the talking user has ceased to transmit and pass it to SwMI C CC.
- 511 Send information to FE1 (possibly via FE3 if the call has been forward switched by SwMI B) that the migrated called user wishes to transmit.
- 512 Receive information from FE1 (possibly via FE3 if the call has been forward switched by SwMI B) that the migrated called user has been granted permission to transmit and pass it to SwMI C CC.
- 513 Receive information from FE1 (possibly via FE3 if the call has been forward switched by SwMI B) that permission to transmit has been withdrawn from the migrated called user and pass it to SwMI C CC.
- 514 Receive information from FE1 (possibly via FE3 if the call has been forward switched by SwMI B) to clear the ongoing call and pass it within SwMI.

5.3.7 Functional entity actions of FE6

- 601 Receive a request to confirm that the called user is still registered in SwMI C (i.e. it has not migrated to another TETRA network), and if so for information regarding the service profile of the called user in a re_CHECK req from FE5. Retrieve the information and return to FE5 in a re_CHECK conf. Return to Idle state.

5.4 Allocation of functional entities to physical equipment/SwMIs

The different scenarios for the allocation of FEs to physical equipment/SwMIs is shown in table 25.

Scenario 1 corresponds to the case where the called user is registered in its home SwMI, this SwMI being different from the originating SwMI.

Scenarios 2 and 3 both correspond to the case where the called user has migrated to a third SwMI (SwMI C), its home SwMI being different from the originating SwMI. In scenario 2, the call is forward switched (in SwMI B); while in scenario 3, it is re-routed (in SwMI A).

Scenario 4 is a special case of scenario 3 when SwMI C coincides with SwMI A: the invoked ANF-ISIIC shall then be cleared and as stated in subclause 4.2.3.2, SwMI A call control application shall establish the call as an intra-TETRA call.

Scenario 5 corresponds to the case where the called user has migrated, its home SwMI being the originating SwMI.

NOTE: In scenario 5, there are only two SwMIs. In line with subclause 3.1, on definitions, the second SwMI has been called SwMI B.

Table 25: Scenarios for the allocation of FEs to physical equipment/SwMIs

| | FE1 / Originating SwMI CCAp | FE2 / Originating SwMI ISI gateway | FE3 / Client of originating SwMI databases | FE4 / hSwMI migration handling | FE5 / Client of hSwMI databases | FE6 / migration routeing | FE7 / Terminating SwMI ISI gateway | FE7 / Terminating SwMI CCAp |
|------------|--|---|---|---------------------------------------|--|-------------------------------------|---|------------------------------------|
| Scenario 1 | Any SwMI CCAp (SwMI A CCAp) | SwMI A ISI outgoing gateway | SwMI A routeing table client | SwMI B | SwMI B | - | SwMI B ISI incoming gateway | SwMI B CCAp |
| Scenario 2 | Any SwMI CCAp (SwMI A CCAp) | SwMI A ISI outgoing gateway | SwMI A routeing table client | SwMI B | SwMI B | SwMI B ISI forward switching entity | SwMI C ISI incoming gateway | SwMI C CCAp |
| Scenario 3 | Any SwMI CCAp (SwMI A CCAp) | SwMI A ISI outgoing gateway | SwMI A routeing table client | SwMI B | SwMI B | SwMI A ISI re-routing entity | SwMI C ISI incoming gateway | SwMI C CCAp |
| Scenario 4 | Any SwMI CCAp (SwMI A CCAp) | SwMI A ISI outgoing gateway | SwMI A routeing table client | SwMI B | SwMI B | SwMI A CCAp | | |
| Scenario 5 | Any SwMI CCAp (SwMI A CCAp) | SwMI A ISI outgoing gateway | SwMI A routeing table client | - (note) | - (note) | SwMI A ISI outgoing gateway | SwMI B ISI incoming gateway | SwMI B CCAp |
| NOTE: | In scenario 5, FE4 and FE 5 are not ANF-ISIIC FEs: the corresponding functions are ensured by SwMI A call control application. | | | | | | | |

6 ANF-ISIIC stage 3 specification

6.1 ANF-ISIIC description

See clause 4.

6.2 ANF-ISIIC operational requirements

The requirements specific for each type of SwMI are stated below. In addition, each SwMI shall comply with the requirements stated in:

- annex ZA of ISO/IEC 11572 [15], for the support of the PSS1 message segmentation / re-assembly procedures; and
- subclause 8.4 of ETS 300 392-3-1 [2], for the support of the ROSE protocol.

6.2.1 Requirements on the originating SwMI

The originating SwMI entity which operates an invoked ANF-ISIIC shall support call establishment and call clearing procedures for an originating PINX, as specified in ISO/IEC 11572 [15]. In addition, the following rules shall apply for the contents of some information elements in the SETUP message:

- the sending complete information element shall be included when the called party number is complete;

NOTE 1: Although it might be expected that the called party number shall be sent en-bloc, the use of (PISN) overlap sending (see subclauses 10.1.1, 10.1.3 and 10.1.4 of ISO/IEC 11572 [15] for the corresponding descriptions) is not prevented by this standard.

- the bearer capability information element shall be encoded with information transfer capability code equal to unrestricted digital information, and an information transfer rate code equal to 64 kbit/s;

NOTE 2: As an option, when this shall have been standardized (either in ISO/IEC 11572 [15], or in the corresponding ETS), the information transfer rate code might be equal to either 8 kbit/s or multi-rate (8 kbit/s base rate). For the latter, the multiplier code would be chosen from 2 to 4. This would correspond to the use of an N x 8 kbit/s bearer service.

- no progress indicator information element shall be included;
- the calling party number information element shall be included. The corresponding number shall be some PISN number identifying the calling SwMI, or one of its entities. Thus its numbering plan identification code shall be equal to either private numbering plan or unknown. No presentation or screening indicators shall be included (i.e. the calling party information element shall not include octet 3a);

NOTE 3: The type of number code associated to the former will be as defined in table 26 of ISO/IEC 11572 [15].

NOTE 4: Putting an identifier of the calling SwMI in the calling party number information element is not in line with the requirement in subclause 10.5.1 of ISO/IEC 11572 [15] that the number included in this information element shall be that of the calling (TETRA) user.

The reasons for this are first that the calling party number information element is not needed for PISN signalling, and second that any TETRA control entity in a SwMI on the call path (i.e. the terminating SwMI or when different from this SwMI, the called SwMI) needing to know the calling party number will get it as part of the complementary TETRA set-up information (see tables 26 and 31).

- no calling party sub-address information element shall be included;
- the number included in the called party number information element shall be some PISN number identifying the called SwMI, or one of its entities. Thus its numbering plan identification code shall be equal to either private numbering plan or unknown;

NOTE 5: The type of number code associated to the former will be as defined in table 26 of ISO/IEC 11572 [15].

- no called party sub-address information element shall be included;
- no lower layer or high layer compatibility information elements shall be included;
- and the transit counter information element, defined in ETS 300 172 [6], may be included.

Generic procedures for the call related control of supplementary services, specified in ISO/IEC 11582 [17] for an End PINX, shall apply for sending or receiving TETRA specific messages or TETRA information complementary to PSS1 basic call messages. Such messages or complementary information shall be encoded as ROSE operation Invoke APDUs in facility information elements. Notably complementary TETRA set-up information shall be sent in a facility information element in the SETUP message.

NOTE 6: No support of any generic procedure for the call independent control (connection oriented) of supplementary services is required since the ANF-ISIIC protocol is only call related.

6.2.2 Requirements on the terminating SwMI

The terminating SwMI entity which operates an invoked ANF-ISIIC shall support call establishment and call clearing procedures for a terminating PINX, as specified in ISO/IEC 11572 [15]. In addition, the following rules shall apply for the contents of the connected number and connected sub-address information elements in the CONNECT message:

- the connected number information element shall be included. The corresponding number shall be some PISN number identifying the terminating SwMI, or one of its entities. Thus its numbering plan identification code shall be equal to either private numbering plan or unknown. No presentation or screening indicators shall be included (i.e. the called party information element shall not include octet 3a);

NOTE 1: The type of number code associated to the former will be as defined in table 26 of ISO/IEC 11572 [15].

NOTE 2: Putting an identifier of the terminating SwMI in the connected number information element is not in line with the requirement in subclause 10.6.4 of ISO/IEC 11572 [15] that the number included in this information element shall be that of the connected (TETRA) user.

The reasons for this are first that the connected number is not needed for PSS1 signalling and second that any TETRA control entity in a SwMI on the call path (i.e. the originating SwMI or when different from the terminating SwMI, the called SwMI) needing to know the connected party number will get it as part of the complementary TETRA set-up response information (see table 33).

- no connected party sub-address information element shall be included.

No progress indicator should be sent in the ALERTING or CONNECT messages, since no tones or announcements will be sent, and it shall not be considered that an interworking situation occurs for inter-TETRA individual calls. And for the same reason, no PROGRESS message should be sent.

Generic procedures for the call related control of supplementary services, specified in ISO/IEC 11582 [17] for an End PINX, shall apply for receiving or sending TETRA specific messages or TETRA information complementary to PSS1 basic call messages. Such messages or complementary information shall be encoded as ROSE operation Invoke APDUs in facility information elements, notably in the ALERTING or CONNECT messages.

6.2.3 Requirements on a called SwMI when it is different from the terminating SwMI

When the called user is not registered in the called SwMI, this SwMI shall redirect the call. Its redirecting entity which operates an invoked ANF-ISIIC shall support call establishment and call clearing procedures for the incoming side of an inter-PINX link, as specified in ISO/IEC 11572 [15].

Generic procedures for the call related control of supplementary services, specified in ISO/IEC 11582 [17] for an End PINX, shall apply.

6.2.4 Requirements on a routeing SwMI

The routeing SwMI entity which operates an invoked ANF-ISIIC shall support call establishment and call clearing procedures for the outgoing side of an inter-PINX link, as specified in ISO/IEC 11572 [15]. The number included in the calling party number information element of its PSS1 SETUP message shall be the same PISN number as in the PSS1 SETUP message sent by the originating SwMI (see subclause 6.2.1). No presentation or screening indicators shall be included (i.e. the calling party information element shall not include octet 3a). The number included in the called party number information element shall be some PISN number identifying the terminating SwMI, or one of its entities. Thus its numbering plan identification code shall be equal to either private numbering plan or unknown.

NOTE 1: The type of number code associated to the former will be as defined in table 26 of ISO/IEC 11572 [15].

In addition, after having sent this SETUP message, except if the routeing SwMI is also the originating SwMI (case of re-routing), the routeing SwMI shall support the call establishment and call clearing procedures for a transit PINX.

NOTE 2: In the case of forward switching, the incoming side procedures of a transit for receiving the SETUP message are ensured by the called SwMI. They are not needed in the case of re-routing.

Generic procedures for the call related control of supplementary services, specified in ISO/IEC 11582 [17] for an End PINX, shall apply.

6.2.5 Requirements on a SwMI with PSTN/ISDN/PISN incoming gateway

The SwMI entity which operates an invoked ANF-ISIIC for extending an external individual call to a TETRA called user over the ISI shall support call establishment and call clearing procedures for an incoming gateway PINX, as specified in ISO/IEC 11572 [15]. In addition, the following rules shall apply for the contents of some information elements in the SETUP message:

- the sending complete information element shall be included when the called party number is complete;

NOTE 1: Although, it might be expected that the called party number shall be sent en-bloc, the use of (QSIG) overlap sending (see subclauses 10.1.1, 10.1.3 and 10.1.4 of ISO/IEC 11572 [15] for the corresponding descriptions) is not prevented by this standard.

- the bearer capability information element shall be encoded with information transfer capability code equal to unrestricted digital information, and an information transfer rate code equal to 64 kbit/s;

NOTE 2: As an option, when this shall have been standardized (either in ISO/IEC 11572 [15], or in the corresponding ETS), the information transfer rate code might be equal to either 8 kbit/s or multi-rate (8 kbit/s base rate). For the latter, the multiplier code would be chosen from 2 to 4. This would correspond to the use of an N x 8 kbit/s bearer service.

- one, two or three progress indicator information elements shall be included, depending on the number of progress description numbers to send, with:
 - a location code equal to transit network;
 - and for a PSTN call:
 - a CCITT progress description number 1 "call is not end-to-end ISDN";
 - an ISO/IEC progress description number 16 "interworking with a public network";
 - and, if the PSTN access line interface used at the gateway cannot deliver a release signal (e.g. standard PSTN extension line - with no battery reversal signal), an ISO/IEC progress description number 17 "interworking with a network unable to supply a release signal" (or an ISO/IEC progress description number 18 or 19, depending on whether it can supply a release signal after answer, but not before, or before answer, but not after);

- or for a public ISDN call: an ISO/IEC progress description number 16 "interworking with a public ISDN";
 - or for a PISN call: an ECMA progress description number 20 "interworking with a another private network" ;
- the calling party number information element shall be included. The corresponding number shall be some PISN number identifying the gateway SwMI, or one of its entities. Thus its numbering plan identification code shall be equal to either private numbering plan or unknown. No presentation or screening indicators shall be included (i.e. the calling party information element shall not include octet 3a);

NOTE 3: The type of number code associated to the former will be as defined in table 26 of ISO/IEC 11572 [15].

NOTE 4: Putting an identifier of the calling SwMI in the calling party number information element is not in line with the requirement in subclause 10.7.1 of ISO/IEC 11572 [15] that the number included in this information element shall be the calling party number received from PSTN, public ISDN or PISN, if any.

The reasons for this are the same as those given in note 4 of subclause 6.2.1.

- no calling party sub-address information element shall be included;
- the number included in the called party number information element shall be some PISN number identifying the called SwMI, or one of its entities. Thus its numbering plan identification code shall be equal to either private numbering plan or unknown;

NOTE 5: The type of number code associated to the former will be as defined in table 26 of ISO/IEC 11572 [15].

- no called party sub-address information element shall be included;
- no lower layer or high layer compatibility information elements shall be included;
- and the transit counter information element, defined in ETS 300 172 [6], may be included.

Generic procedures for the call related control of supplementary services, specified in ISO/IEC 11582 [17] for an End PINX, shall apply for sending or receiving TETRA specific messages or TETRA information complementary to PSS1 basic call messages. Such messages or complementary information shall be encoded as ROSE operation Invoke APDUs in facility information elements. Notably complementary TETRA set-up information shall be sent in a facility information element in the SETUP message.

6.2.6 Requirements on a SwMI with PSTN/ISDN/PISN outgoing gateways

The SwMI entity which operates an invoked ANF-ISIIC for routing an external individual call from a TETRA called user over the ISI shall support call establishment and call clearing procedures for an outgoing gateway PINX, as specified in ISO/IEC 11572 [15]. In addition, the following rules shall apply for the contents of the called party sub-address information element in the SETUP message and for that of the connected number and connected sub-address information elements in the CONNECT message:

- the connected number information element shall be included in the CONNECT message. The corresponding number shall be some PISN number identifying the gateway SwMI, or one of its entities. Thus its numbering plan identification code shall be equal to either private numbering plan or unknown. No presentation or screening indicators shall be included (i.e. the called party information element shall not include octet 3a);

NOTE 1: The type of number code associated to the former will be as defined in table 26 of ISO/IEC 11572 [15].

NOTE 2: Putting an identifier of the gateway SwMI in the connected number information element is not in line with the requirement in subclause 10.8.5 of ISO/IEC 11572 [15] that the connected number included in this information element shall be that received from PSTN, public ISDN or PISN, if any.

The reasons for this are the same as those given in note 2 of subclause 6.2.2.

- no connected party sub-address information element shall be included in the CONNECT message.

In addition, one, two or three progress indicator information elements shall be sent to the calling SwMI by the gateway SwMI in the appropriate PSS1 message, to indicate interworking, depending on the number of progress description numbers, with:

- a location code equal to transit network;
- and for a PSTN call:
 - a CCITT progress description number 1 "call is not end-to-end ISDN";
 - an ISO/IEC progress description number 16 "interworking with a public network";
 - and, if the PSTN access line interface used at the gateway cannot deliver a release signal (e.g. standard PSTN extension line-with no battery reversal signal), an ISO/IEC progress description number 17 "interworking with a network unable to supply a release signal" (or an ISO/IEC progress description number 18 or 19, depending on whether it can supply a release signal after answer, but not before, or before answer, but not after);
- or for a public ISDN call: an ISO/IEC progress description number 16 "interworking with a public ISDN";
- or for a PISN call: an ECMA progress description number 20 "interworking with a another private network".

Generic procedures for the call related control of supplementary services, specified in ISO/IEC 11582 [17] for an End PINX, shall apply for receiving or sending TETRA specific messages or TETRA information complementary to PSS1 basic call messages. Such messages or complementary information shall be encoded as ROSE operation Invoke APDUs in facility information elements, notably in the PSS1 ALERTING and CONNECT messages.

6.3 ANF-ISIIC coding requirements

As already mentioned in subclause 6.2, TETRA specific messages or TETRA information complementary to PSS1 basic call messages shall be sent using an Invoke APDU of the ROSE operation tetraIcsiMessage defined in table 10 of ETS 300 392-3-1 [2]. This table has been reproduced in the informative annex D.

More precisely:

- the TETRA specific messages or TETRA information complementary to PSS1 basic call messages shall be the TETRA PDUs defined in subclause 6.3.1; and
- those PDUs shall be included in the tetraMessage data element of the ROSE operation tetraIcsiMessage.

The resulting ROSE APDU shall be sent in a facility information element in the relevant PSS1 message (see ISO/IEC 11582 [17] clause 10).

NOTE: Clearly, those PSS1 messages will be call related.

6.3.1 TETRA PDUs

The TETRA PDUs referred to in the ASN.1 definition in table 25 shall be encoded using the same rule as defined in subclause 14.7 of ETS 300 392-2 [1] (for TETRA air interface PDUs).

NOTE 1: As a general rule, the definition of those PDUs has been done on the basis of the corresponding air interface downstream messages. In other words, the sending SwMI is preparing the corresponding message to be sent by the other SwMI on its air interface.

Thus generally those PDUs include the same information elements as air interface messages. However, no facility information elements are included in those PDUs since ANF-ISISS is used instead (see clauses 9 and 10 of ETS 300 392-9 [5])

NOTE 2: Even when only one TETRA PDU type has been defined below for inclusion in a given PSS1 message (e.g. in the ALERTING message), the information element PDU type has been included in this TETRA PDU. The main reason for this is to allow the possibility of defining in the future other TETRA PDU types in the same PSS1 message. Additionally it might ease the processing of these PDUs by the destination SwMI call control application.

The definitions of all possible TETRA PDUs, in the various PSS1 messages, are given below.

6.3.1.1 TETRA PDU giving complementary information in the PSS1 SETUP message sent by the originating or the incoming gateway SwMI

The contents and the encoding of the TETRA PDU giving complementary information in the PSS1 SETUP message sent by the originating or incoming gateway SwMI shall be as defined in table 26.

**Table 26: Contents of TETRA PDU in the PSS1 SETUP message
sent by the originating or incoming gateway SwMI**

| Information element | Length | Type | Owner | C/O/M | Remark |
|--|--|------|-------|-------|-------------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-ORIGINATING SETUP |
| Originating SwMI MNI | 24 | 1 | ANF | M | |
| Routeing method choice | 2 | 1 | ANF | M | See table 67 and note 1 |
| Call time-out, set-up phase | 3 | 1 | CCAp | M | |
| Call time-out | 4 | 1 | CCAp | M | |
| Hook method selection | 1 | 1 | CCAp | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Basic service information | 8 | 1 | CCAp | M | |
| Speech service requested | 3 | 1 | CCAp | C | note 2 |
| | | | CCAp | | |
| Security level at calling user air interface | 2 | 1 | MM | M | note 3 |
| Transmission grant | 2 | 1 | CCAp | M | |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Call priority | 4 | 1 | CCAp | M | |
| Called party address SSI | 24 | 1 | CCAp | M | note 4 |
| Called party extension | 24 | 1 | CCAp | M | note 4 |
| SS-CLIR invoked for calling party | 1 | 1 | SS | M | |
| Calling party address SSI | 24 | 1 | CCAp | M | note 5 |
| Calling party extension | 24 | 1 | CCAp | M | note 5 |
| External subscriber number length | 5 | 1 | CCAp | M | note 6 |
| External subscriber number digits | variable | 1 | CCAp | C | note 7 |
| Speech services supported | 5 | 2 | CCAp | O | note 8 |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | When ISI-ORIGINATING SETUP PDU is sent for re-routing the call, the binary value of the information element routeing method choice shall be equal to 11 ₂ . | | | | |
| NOTE 2: | Conditional on the binary value of the information sub-element circuit mode type in the information element basic service information being equal to 0 (i.e. the call requested is a speech call). | | | | |
| NOTE 3: | In the case of incoming calls from PSTN/ISDN/PISN, the name of this information element should be understood as "security level used in the other network". | | | | |
| NOTE 4: | In the case of an external outgoing call, the called party address SSI and the called party extension shall be those of the outgoing gateway SwMI. | | | | |
| NOTE 5: | In the case of an external incoming call, the calling party address SSI and the calling party extension shall be those of the incoming gateway SwMI. | | | | |
| NOTE 6: | Shall be equal to 00000 ₂ in the case of inter-TETRA calls, and to N, N being the number of digits of the external called party number in the case of an external outgoing call or of the external calling party number in the case of an external incoming call from PSTN/ISDN/PISN if the calling party identification is delivered by that external network. | | | | |
| NOTE 7: | The number of digits included in this information element shall be equal N, the value of the external subscriber number length (see note 6), i.e. this information element shall be conditional on the value of N. | | | | |
| NOTE 8: | May be present only when the information element speech service requested is present (see note 2). | | | | |

NOTE 1: Compared to the definition of the D-SETUP air interface downlink PDU in subclause 14.7.2 of ETS 300 392-2 [1], the following information elements have been deleted:

- calling type identifier, since it is always TETRA subscriber identity (actually ITSI);
- temporary address, since this is never the case;
- facility, since ANF-ISISS is used instead (see clauses 9 and 10 of ETS 300 392-9 [5]).

In addition the following information elements have been added:

- originating SwMI MNI;
- routeing method choice;
- call time-out, set-up phase;
- security level (used) at calling user air interface;
- speech service requested;
- speech services acceptable;
- called party address SSI and called party extension;
- information as to whether SS-CLIR has been invoked for the calling user.

In addition the external subscriber number is being encoded in a different manner which uses less bits.

NOTE 2: The originating SwMI MNI has been included in the definition of the TETRA PDU in table 26 to ease the identification of the originating SwMI for the called SwMI or the terminating SwMI (because to do it using the PISN number put in the calling party number information element of the PSS1 SETUP message, as specified in subclause 6.2.1, might have proven problematic in some cases).

Such identification is necessary:

- for enforcing some security mechanisms agreed between operators; or
- to be able to identify whether a proprietary feature can or cannot be used over an ISI; or
- to allow loop connection (notably trombone connection) detection.

NOTE 3: See subclauses 6.3.2.2.10 and 6.3.2.2.13 for the definitions of the information elements routeing method choice and speech services supported, respectively.

6.3.1.2 TETRA PDU giving complementary information in a PSS1 RELEASE message

When a PSS1 RELEASE message is sent towards the called SwMI as a result of call clearing initiated by the calling user before an information channel has been agreed between any two adjacent PISN nodes (e.g. between the originating SwMI and the next node, or between the last but one node and the terminating SwMI), it will include a TETRA PDU, the contents and the encoding of which shall be as defined in table 27. Otherwise, no TETRA PDU will be included in PSS1 RELEASE message.

NOTE: This case is defined as a call clearing exception condition in subclause 10.2.2 of ISO/IEC 11572 [15]. At the air interface, it will correspond to the calling user having sent an early U-DISCONNECT air interface uplink PDU.

Table 27: Contents of TETRA PDU sent in a PSS1 RELEASE message

| Information element | Length | Type | Owner | C/O/M | Remark |
|---|--------|------|-------|-------|-------------|
| PDU type | 6 | 1 | CCAp | M | ISI-RELEASE |
| Disconnect cause | 6 | 1 | CCAp | M | note |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE: This value should be equal to 000001 ("user requested disconnect"). | | | | | |

6.3.1.3 TETRA PDU giving complementary information in a PSS1 PROGRESS message

According to clause 10 of ISO/IEC 11572 [15], a PROGRESS message will only be sent in the case of interworking with a non-TETRA network, i.e. in the case of an external call (since no SwMI involved in the call set-up will send in-band information/patterns otherwise). The contents of TETRA PDU in this message and its encoding shall be as defined in table 28.

Table 28: Contents of TETRA PDU sent in PSS1 PROGRESS message

| Information element | Length | Type | Owner | C/O/M | Remark |
|-----------------------------|---|------|-------|-------|--------------|
| PDU type | 6 | 1 | CCAp | M | ISI-PROGRESS |
| Call time-out, set-up phase | 3 | 1 | CCAp | M | |
| Hook method selection | 1 | 1 | CCAp | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Call status | 3 | 2 | CCAp | O | |
| Basic service information | 8 | 2 | CCAp | O | note |
| Speech service chosen | 3 | 2 | CCAp | O | note |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE: | Mandatory when it is different from requested and when this information element has not already been sent. Otherwise, this information element shall not be included. | | | | |

NOTE: The definition of this PDU has been done on the basis of that of the D-CALL PROCEEDING air interface downlink PDU - except for the addition of the optional information element defining the speech service chosen and the deletion of the facility information element.

6.3.1.4 TETRA message sent by the called SwMI in a PSS1 FACILITY message when it is not the destination SwMI because of migration or SS-CFU activation

The called SwMI is different from the destination SwMI:

- when it is the home SwMI of the called user; and
- when the called user has either migrated or when SS-call diversion has been invoked for the called user to a diverted-to user whose home SwMI is different.

The called SwMI will then inform the originating SwMI about this situation. To do this in the case where:

- either no SS-call diversion has been invoked and the called user has migrated or SS-CFU has been invoked (and the diverted-to user has a different home SwMI); and
- the destination SwMI does not happen to coincide with the originating SwMI; and
- the called SwMI supports forward switching but is not in a position to decide by itself to forward switch the call,

The called SwMI will send to the originating SwMI a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 29.

Table 29: Contents of TETRA PDU sent by the called SwMI in a PSS1 FACILITY message in case it is not the destination SwMI because of migration of the called user or of SS-CFU activation

| Information element | Length | Type | Owner | C/O/M | Remark |
|--|--|------|-------|-------|----------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-SwMI CHANGE INFO |
| Visited/forwarded-to SwMI PISN number length | 5 | 1 | ANF | M | note 1 |
| Visited/forwarded-to SwMI PISN number digits | variable | 1 | ANF | C | note 2 |
| N x 8 kbit/s link with other SwMI | 1 | 1 | ANF | M | |
| Called user migration or SS-CFU | 1 | 1 | ANF | M | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | Shall be equal to N, N being the number of digits of the visited SwMI PISN number. | | | | |
| NOTE 2: | The number of digits included in this information element shall be equal N, the value of the visited SwMI PISN number length (see note 1). | | | | |

6.3.1.5 TETRA message sent by the originating SwMI in a PSS1 FACILITY message to request forward switching

After having received the PSS1 FACILITY message defined in table 29 (whereby the called SwMI informs the originating SwMI that the call has to be diverted to a third SwMI), the originating SwMI may decide to have the call forward switched in the called SwMI. It will then send a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 30.

Table 30: Contents of TETRA PDU possibly sent by the originating SwMI in a PSS1 FACILITY message in response to ISI-SwMI CHANGE INFO PDU

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------|--------|------|-------|-------|--------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-FORWARD SWITCH |
| Proprietary | | 3 | - | O | |

6.3.1.6 TETRA PDU giving complementary information in the PSS1 SETUP message sent by the forward switching SwMI

The contents of this PDU and its encoding shall be as defined in table 31.

**Table 31: Contents of TETRA PDU in PSS1 SETUP message
sent by the forward switching SwMI**

| Information element | Length | Type | Owner | C/O/M | Remark |
|--|--|------|-------|-------|-----------------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-FORWARD SWITCHING SETUP |
| Originating SwMI MNI | 24 | 1 | ANF | M | |
| Call time-out, set-up phase | 3 | 1 | CCAp | M | |
| Call time-out | 4 | 1 | CCAp | M | |
| Hook method selection | 1 | 1 | CCAp | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Basic service information | 8 | 1 | CCAp | M | |
| Speech service requested | 3 | 1 | CCAp | C | note 1 |
| | | | | | |
| Security level at calling user air interface | 2 | 1 | MM | M | note 2 |
| Transmission grant | 2 | 1 | CCAp | M | |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Call priority | 4 | 1 | CCAp | M | |
| Called party address SSI | 24 | 1 | CCAp | M | note 3 |
| Called party extension | 24 | 1 | CCAp | M | note 3 |
| SS-CLIR invoked for calling party | 1 | 1 | SS | M | |
| Calling party address SSI | 24 | 1 | CCAp | M | note 4 |
| Calling party extension | 24 | 1 | CCAp | M | note 4 |
| External subscriber number length | 5 | 1 | CCAp | M | note 5 |
| External subscriber number digits | variable | 1 | CCAp | C | note 6 |
| Speech services supported | 5 | 2 | CCAp | O | note 7 |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | Conditional on the binary value of the information sub-element circuit mode type in the information element basic service information being equal to 0 (i.e. the call requested is a speech call). | | | | |
| NOTE 2: | In the case of incoming calls from PSTN/ISDN/PISN, the name of this information element should be understood as "security level used in the other network". | | | | |
| NOTE 3: | In the case of an external outgoing call, the called party address SSI and the called party extension shall be those of the outgoing gateway SwMI. | | | | |
| NOTE 4: | In the case of an external incoming call, the calling party address SSI and the calling party extension shall be those of the incoming gateway SwMI. | | | | |
| NOTE 5: | Shall be equal to 00000 ₂ in the case of inter-TETRA calls, and to N, N being the number of digits of the external called party number in the case of an external outgoing call or of the external calling party number in the case of an external incoming call from PSTN/ISDN/PISN if the calling party identification is delivered by that external network. | | | | |
| NOTE 6: | The number of digits included in this information element shall be equal N, the value of the external subscriber number length (see note 5), i.e. this information element shall be conditional on the value of N. | | | | |
| NOTE 7: | May be present only when the information element speech service requested is present (see note 1). | | | | |

NOTE: The only differences between the TETRA PDU defined in table 31 and that defined in table 26 are first the values of their information element PDU type, and second the absence of the information element routing method choice from table 31. The latter information element has not been included in this table because the specific value information element PDU type is sufficient to indicate that the call is being forward switched.

6.3.1.7 TETRA PDU giving complementary information in the PSS1 ALERTING message

The contents of this PDU and its encoding shall be as defined in table 32.

Table 32: Contents of TETRA PDU sent in the PSS1 ALERTING message

| Information element | Length | Type | Owner | C/O/M | Remark |
|-----------------------------|--|------|-------|-------|--------------|
| PDU type | 6 | 1 | CCAp | M | ISI-ALERTING |
| Call time-out, set-up phase | 3 | 1 | CCAp | M | |
| Hook method selection | 1 | 1 | CCAp | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Call queued | 1 | 1 | CCAp | M | |
| Basic service information | 8 | 2 | CCAp | O | note |
| Speech service chosen | 3 | 2 | CCAp | O | note |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE: | Mandatory when it is different from requested or from that already sent in another TETRA PDU (i.e. in a PSS1 FACILITY or PROGRESS message). Otherwise, this information element shall not be included. | | | | |

NOTE: The information element hook method selection has been included in table 32 for the purpose of alignment with the D-ALERT air interface downlink PDU (see table 60 of ETS 300 392-2 [1]). However it should be noted that it is needed neither at the ISI nor at the air interface since the mere sending of an ALERTING message or of a D-ALERT PDU implies that the hook selection method chosen by the called user is on/off hook signalling.

6.3.1.8 TETRA PDU giving complementary information in the PSS1 CONNECT message

The contents of this PDU and its encoding shall be as defined in table 33.

Table 33: Contents of TETRA PDU sent in the PSS1 CONNECT message

| Information element | Length | Type | Owner | C/O/M | Remark |
|-------------------------------------|--|------|-------|-------|-------------|
| PDU type | 6 | 1 | CCAp | M | ISI-CONNECT |
| Terminating SwMI MNI | 24 | 1 | ANF | M | |
| Call diverted to a dispatcher | 1 | 1 | ANF | M | |
| Call time-out | 4 | 1 | CCAp | M | |
| Hook method selection | 1 | 1 | CCAp | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Transmission grant | 2 | 1 | CCAp- | M | note 1 |
| Transmission request permission | 1 | 1 | CCAp- | M | note 1 |
| Call ownership | 1 | 1 | CCAp | M | note 2 |
| SS-CLIR invoked for connected party | 1 | 1 | SS | M | |
| Connected party SSI | 24 | 1 | CCAp | M | note 3 |
| Connected party extension | 24 | 1 | CCAp | M | note 4 |
| External subscriber number length | 5 | 1 | CCAp | M | note 5 |
| External subscriber number digits | variable | 1 | CCAp | C | note 6 |
| Call priority | 4 | 2 | CCAp | O | note 7 |
| Basic service information | 8 | 2 | CCAp | O | note 7 |
| Speech service chosen | 3 | 2 | CCAp | O | note 7 |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | The contents of this information element shall be ignored (see note 1 below this table). | | | | |
| NOTE 2: | This element is needed in the case of call collision. | | | | |
| NOTE 3: | In the case of an external outgoing call, the connected party SSI shall be that of the outgoing gateway SwMI. | | | | |
| NOTE 4: | In the case of an external outgoing call, the connected party extension shall be that of the outgoing gateway SwMI. | | | | |
| NOTE 5: | Shall be equal to 0 in the case of inter-TETRA calls, and to N, N being the number of digits of the external connected number in the case of an external outgoing call to PSTN/ISDN/PISN if the connected number identification is delivered by that external network. | | | | |
| NOTE 6: | The number of digits included in this information element shall be equal N, the value of the external subscriber number length (see note 5), i.e. this information element shall be conditional on the value of N. | | | | |
| NOTE 7: | Mandatory when it is different from requested or from that already sent in another TETRA PDU. Otherwise, this information element shall not be included. | | | | |

NOTE 1: The two information elements transmission grant and transmission request permission have been included in table 33 for the purpose of alignment with the D-CONNECT air interface downlink PDU (see table 63 of ETS 300 392-2 [1]). However it should be noted that they are not needed at the ISI for individual calls because the originating SwMI being the controlling SwMI, the terminating SwMI (which sends this ISI CONNECT message) may not take any decision about those information elements.

NOTE 2: The term "connected party" has been preferred to "called party" in the definition of two information elements in table 33 to be aligned with the definition of the PSS1 CONNECT message, in subclause 13.2.3 of ISO/IEC 11572 [15]. It anticipates possible interactions with supplementary services which modify the addressee of the call (e.g. supplementary services call diversion or call authorized by dispatcher). In the absence of such interaction, the connected party will be the called party.

6.3.1.9 TETRA information sent by the terminating SwMI in PSS1 FACILITY messages before the PSS1 ALERTING or CONNECT message

The terminating SwMI may inform the originating SwMI about some characteristics requested in the set-up that it does not support before the PSS1 ALERTING or CONNECT message has been sent. It will do this by sending a TETRA PDU in a PSS1 FACILITY message, the contents and the encoding of which shall be as defined in table 34.

Such PSS1 FACILITY message including this same TETRA PDU may also be sent by a SwMI outgoing gateway, instead of the PSS1 PROGRESS message including the TETRA PDU defined in table 28.

Table 34: Contents of TETRA PDU (possibly) sent in a PSS1 FACILITY message

| Information element | Length | Type | Owner | C/O/M | Remark |
|-----------------------------|---|------|-------|-------|----------------|
| PDU type | 6 | 1 | CCAp | M | ISI-PROCEEDING |
| Call time-out, set-up phase | 3 | 1 | CCAp | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Call status | 3 | 2 | CCAp | O | |
| Basic service information | 8 | 2 | CCAp | O | note |
| Speech service chosen | 3 | 2 | CCAp | O | note |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE: | Mandatory when it is different from requested. Otherwise, this information element shall not be included. | | | | |

NOTE 1: Except for the value of the PDU type information element and for the absence of the information element hook method selection, this PDU definition is the same as that in table 28.

NOTE 2: The information element hook method selection has not been included in table 28, because only the called user may decide which hook method it selects.

If the terminating SwMI decides to prolong the call set-up time on its side while no other information is to be sent to the originating SwMI, it may send a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 35.

Table 35: Contents of TETRA PDU (possibly) sent in a PSS1 FACILITY message to inform about prolongation of the call set-up time

| Information element | Length | Type | Owner | C/O/M | Remark |
|-----------------------------|--------|------|-------|-------|------------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-SETUP PROLONGATION |
| Call time-out, set-up phase | 3 | 1 | CCAp | M | |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |

6.3.1.10 TETRA information sent by the terminating SwMI in a PSS1 FACILITY message during call establishment after the PSS1 ALERTING or CONNECT message

If the terminating SwMI decides to prolong the call set-up time on its side after the PSS1 ALERTING or CONNECT message has been sent (but of course before the call has been established - i.e. it has not yet sent the D-CONNECT ACKNOWLEDGE air interface downlink PDU), it will send a PSS1 FACILITY message including the same TETRA PDU as if it would if it had taken this decision before sending the PSS1 ALERTING message if the call is using on/off hook signalling, or the PSS1 CONNECT message if it is using direct set-up signalling (i.e. the same TETRA PDU as defined in table 35).

6.3.1.11 TETRA information sent by the originating SwMI in a PSS1 FACILITY message before the call has been established

If the originating SwMI decides to prolong the call set-up time on its side, it will send a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 35.

6.3.1.12 TETRA CONNECT ACKNOWLEDGE sent by the originating SwMI in a PSS1 FACILITY message

To acknowledge the PSS1 CONNECT message (in guaranteeing that a radio traffic channel has been to the calling user), the originating SwMI will send an ISI-CONNECT ACKNOWLEDGE PDU. This will be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 36.

Table 36: Contents of TETRA PDU sent in a PSS1 FACILITY message to acknowledge the CONNECT message (CONNECT ACKNOWLEDGE)

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------------------|--------|------|-------|-------|-------------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-CONNECT ACKNOWLEDGE |
| Call time-out | 4 | 1 | CCAp | M | |
| Transmission grant | 2 | 1 | CCAp | M | |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |

6.3.1.13 Other TETRA messages possibly sent by the originating SwMI in PSS1 FACILITY messages

To inform the terminating SwMI that permission to transmit has been granted to the connected user, the originating SwMI will send an ISI-TX GRANTED PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 37.

Table 37: Contents of TETRA PDU sent in a PSS1 FACILITY message to grant transmission permission (ISI-TX GRANTED)

| Information element | Length | Type | Owner | C/O/M | Remark |
|------------------------------------|--|------|-------|-------|----------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-TX GRANTED |
| Transmission grant | 2 | 1 | CCAp | M | |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Encryption control | 1 | 1 | CCAp | M | |
| Speech service used | 3 | 2 | CCAp | O | note 1 |
| | | | | | |
| | | | | | |
| Notification indicator | 6 | 2 | SS | O | |
| Transmitting party type identifier | 2 | 2 | CCAp | O | note 2 |
| Transmitting party address SSI | 24 | 2 | CCAp | C | note 2 |
| Transmitting party extension | 24 | 2 | CCAp | C | note 2 |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | Mandatory if the call is a speech call (as opposed to a data call) and if it corresponds to a change in the speech service previously used during the call. Otherwise, this information element shall not be included. | | | | |
| NOTE 2: | The information elements transmitting party address SSI and the transmitting party extension are not needed for ANF-ISIIC. Consequently neither is the information element transmitting party type identifier. They have been included in the present specification for the purpose of alignment with ANF-ISIGC. | | | | |

To inform the terminating SwMI that the connected user is to be interrupted by the calling user, the originating SwMI will send an ISI-TX INTERRUPT PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 38.

Table 38: Contents of TETRA PDU sent in a PSS1 FACILITY message to interrupt transmission by the connected user (ISI-TX INTERRUPT)

| Information element | Length | Type | Owner | C/O/M | Remark |
|------------------------------------|--------|------|-------|-------|------------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-TX INTERRUPT |
| Transmission grant | 2 | 1 | CCAp | M | |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Encryption control | 1 | 1 | CCAp | M | |
| Speech service used | 3 | 2 | CCAp | O | note 1 |
| | | | | | |
| | | | | | |
| Notification indicator | 6 | 2 | SS | O | |
| Transmitting party type identifier | 2 | 2 | CCAp | O | note 2 |
| Transmitting party address SSI | 24 | 2 | CCAp | C | note 2 |
| Transmitting party extension | 24 | 2 | CCAp | C | note 2 |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: See note 1 in table 37. | | | | | |
| NOTE 2: See note 2 in table 37. | | | | | |

NOTE: The differences between the TETRA PDUs defined in tables 37 and 38 with the corresponding air interface D-TX GRANTED and D-TX INTERRUPT PDUs are:

- the change of the information element speech service in the latter PDUs into the information element speech service used. As opposed to the former, which was a type 1 element, the information element speech service used is a type 2 element which actually is conditional on the two following conditions: one, that the call be a speech call (as opposed to a data call), and two, that a request is being made through such PDU to change the encoding method which was being used previously during the call;
- the deletion of the facility information element.

To inform the terminating SwMI that transmission has ceased and that the called user may request transmission permission, the originating SwMI will send an ISI-TX CEASED PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 39.

Table 39: Contents of TETRA PDU sent in a PSS1 FACILITY message by the originating SwMI to inform that transmission has ceased (ISI-TX CEASED)

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------------------|--------|------|-------|-------|---------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-TX CEASED |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| | | | | | |

To inform the terminating SwMI regarding continuation of transmission (after it has been interrupted), the originating SwMI will send an ISI-TX CONTINUE PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 40.

Table 40: Contents of TETRA PDU sent in a PSS1 FACILITY message by the originating SwMI on transmission continuation (ISI-TX CONTINUE)

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------------------|--------|------|-------|-------|-----------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-TX CONTINUE |
| Continue | 1 | 1 | CCAp | M | |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| | | | | | |

6.3.1.14 TETRA messages possibly sent by either the originating or the terminating SwMI in a PSS1 FACILITY message

To inform the other end SwMI that it has interrupted transmission, the originating or the terminating SwMI will send an ISI-TX WAIT PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 41.

Table 41: Contents of TETRA PDU sent in a PSS1 FACILITY message to interrupt transmission (ISI-TX WAIT)

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------------------|--------|------|-------|-------|-------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-TX WAIT |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| | | | | | |

To inform the other end SwMI that it wants some call modification or simply call continuation (both as specified in subclause 14.5.1.2 of ETS 300 392-2 [1]) and/or to send DTMF information and/or notifications, the originating or the terminating SwMI will send an ISI-"INFO" DEMAND PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 42.

Table 42: Contents of TETRA PDU sent in a PSS1 FACILITY message to request some call modification (ISI-"INFO" DEMAND)

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------------|--|------|-------|-------|-----------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-INFO DEMAND |
| Call time-out | 4 | 2 | CCAp | O | note 1 |
| Modify request | 9 | 2 | CCAp | O | |
| Speech service requested | 3 | 2 | CCAp | O | note 2 |
| Speech services supported | 5 | 2 | CCAp | O | note 3 |
| DTMF | | 3 | CCAp | O | |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | Shall only be sent if the sending SwMI has decided to change the duration of the call in updating the equivalent information element to the user that it controls (by a D-INFO air interface PDU). | | | | |
| NOTE 2: | Mandatory if the value of the information element modify request corresponds to a change from a data call to a speech call. Also mandatory to change the speech service during a speech call. Otherwise, this information element shall not be included. | | | | |
| NOTE 3: | May be present only when the information element speech service requested is present (see note 2). | | | | |

If the contents of the TETRA PDU defined in table 42, upon receiving the PSS1 FACILITY message including it, the other end SwMI will send a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 43.

Table 43: Contents of TETRA PDU sent in a PSS1 FACILITY message in reply to a call modification request (ISI-"INFO" REPLY)

| Information element | Length | Type | Owner | C/O/M | Remark |
|------------------------|--|------|-------|-------|----------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-INFO REPLY |
| Call time out | 4 | 2 | CCAp | O | note 1 |
| Modify accepted | 9 | 2 | CCAp | O | note 2 |
| Speech service chosen | 3 | 2 | CCAp | O | note 3 |
| DTMF | | 3 | CCAp | O | |
| Notification indicator | 6 | 2 | SS | O | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | Mandatory when it is different from that sent by the other end SwMI in the preceding ISI-INFO DEMAND PDU. Otherwise, this information element shall not be included. | | | | |
| NOTE 2: | Mandatory when it is different from requested. Otherwise, this information element shall not be included. | | | | |
| NOTE 3: | Mandatory when it is different from that sent by the other end SwMI in the preceding ISI-INFO DEMAND PDU. Otherwise, this information element shall not be included. | | | | |

6.3.1.15 TETRA messages possibly sent by the terminating SwMI in PSS1 FACILITY messages

To request transmission grant from the originating SwMI, the terminating SwMI will send an ISI-TX DEMAND PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 44.

Table 44: Contents of TETRA PDU sent in a PSS1 FACILITY message to request transmission grant (ISI-TX DEMAND)

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------------|--|------|-------|-------|---------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-TX DEMAND |
| TX demand priority | 2 | 1 | CCAp | M | |
| Encryption control | 1 | 1 | CCAp | M | |
| Speech service requested | 3 | 2 | CCAp | O | note 1 |
| Speech services supported | 5 | 2 | CCAp | O | note 2 |
| Notification indicator | 6 | 2 | SS | O | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | Mandatory if the call is a speech call (as opposed to a data call) and if it corresponds to a change in the speech service previously used during the call. Otherwise, this information element shall not be included. | | | | |
| NOTE 2: | May be present only when the information element speech service requested is present (see note 1). | | | | |

NOTE: The differences between the TETRA PDU defined in table with the corresponding air interface U-TX DEMAND PDU are:

- the changes of the information element speech service in the latter PDU into the information element speech service used. As opposed to the former, which was a type 1 element, the information element speech service used is a type 2 element which actually is conditional on the two following conditions: one, that the call be a speech call (as opposed to a data call), and two, that a request is being made through such PDU to change the encoding method which was being used previously during the call;

- the addition of the notification indicator information element;
- the deletion of the facility information element.

To inform the originating SwMI that transmission has ceased, the terminating SwMI will send an ISI-TX CEASED PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 45.

Table 45: Contents of TETRA PDU sent in a PSS1 FACILITY message to inform that transmission has ceased (ISI-TX CEASED)

| Information element | Length | Type | Owner | C/O/M | Remark |
|------------------------|--------|------|-------|-------|---------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-TX CEASED |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| | | | | | |

To inform the originating SwMI that it is ready to continue transmission (after having interrupted it), the terminating SwMI will send an ISI-TX CONTINUE PDU. This shall be done using a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 46.

Table 46: Contents of TETRA PDU sent in a PSS1 FACILITY message by the terminating SwMI on transmission continuation (ISI-TX CONTINUE)

| Information element | Length | Type | Owner | C/O/M | Remark |
|------------------------|--------|------|-------|-------|-----------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-TX CONTINUE |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| | | | | | |

6.3.1.16 TETRA PDUs giving complementary information in PSS1 messages to restore the call after the calling or the connected user has migrated in a new SwMI

When one of the two users participating in an established individual call migrates during this call, the call control application in the SwMI in which this user was previously registered will be informed by ANF-ISIMM about this migration. This information will include the PISN number to be used for establishing a connection between the old SwMI and the new SwMI, to allow a subsequent call restoration, unless such connection already exists because the new SwMI coincides with either the other end SwMI (i.e. either the originating or the terminating SwMI) or the forward switching SwMI.

6.3.1.16.1 Case where no connection between the old SwMI and the new SwMI already exists

If the connection between the old SwMI and the new SwMI does not already exist, it shall be set-up by the ANF-ISIIC entity in the old SwMI. If the call was an inter-TETRA call, this will be part of the operation of the ANF-ISIIC invoked for that call. And if the established call was an intra-TETRA call, an ANF-ISIIC will be invoked to establish this connection. In both cases, the old SwMI will send a PSS1 SETUP message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 47.

Table 47: Contents of TETRA PDU in PSS1 SETUP message sent by the old SwMI in the case of migration during an established call

| Information element | Length | Type | Owner | C/O/M | Remark |
|--|--|------|-------|-------|------------------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-CALL RESTORE PREPARATION |
| Other end SwMI MNI | 24 | 1 | ANF | M | |
| Call has been forward switched | 1 | 1 | ANF | M | note 1 |
| Call time-out | 4 | 1 | CCAp | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Basic service information | 8 | 1 | CCAp | M | |
| Speech service used | 3 | 1 | CCAp | C | note 2 |
| | | | | | |
| Security level at calling user air interface | 2 | 1 | MM | M | notes 3 and 4 |
| Controlling SwMI | 1 | 1 | CCAp | M | |
| Transmission grant | 2 | 1 | CCAp | M | |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Call priority | 4 | 1 | CCAp | M | |
| Call identifier | 14 | 1 | CCAp | M | |
| Restoring party address SSI | 24 | 1 | CCAp | M | note 5 |
| Restoring party extension | 24 | 1 | CCAp | M | note 5 |
| SS-CLIR invoked for other party | 1 | 1 | SS | M | |
| Other party address SSI | 24 | 1 | CCAp | M | note 6 |
| Other party extension | 24 | 1 | CCAp | M | note 6 |
| Speech services supported | 5 | 2 | CCAp | O | note 7 |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | Conditional on the binary value of the information sub-element circuit mode type in the information element basic service information being equal to 0 (i.e. the call requested is a speech call). | | | | |
| NOTE 2: | In the case of an intra-TETRA call, the value of this information element shall be equal to zero. | | | | |
| NOTE 3: | This information element, which defines the security level that the originating SwMI requested at call set-up time the terminating SwMI to match, is sent independently of whether the "old SwMI" is the originating SwMI or the terminating SwMI. | | | | |
| NOTE 4: | In the case of an external incoming call from PSTN/ISDN/PISN, the name of this information element should be understood as "security level used in the other network". | | | | |
| NOTE 5: | The case where the restoring party address SSI and the restoring party extension would be those of a gateway is excluded. | | | | |
| NOTE 6: | In the case of an external call, the other party address SSI and the other party extension shall be those of the gateway. | | | | |
| NOTE 7: | May be present only when the information element speech service requested is present (see note 1). | | | | |

NOTE: The two information elements defining the restoring party ITSI have been included in the table above because it was felt that the call identifier value included in this table might not always allow the new SwMI to associate the connection being established to this party when it restores the call (especially since the call identifier value included in this table is not a new SwMI call identifier).

As to the two information elements defining the other party ITSI, they have been included to support the redundancy mechanism provided by the inclusion of these elements in the definition of the air interface U-CALL RESTORE message (see table 78 of ETS 300 392-2 [1]).

To indicate that it accepts the PSS1 SETUP message, if it has not yet received the call restoration message from its new visiting user, the new SwMI will send a PSS1 CONNECT message including only a specific PDU type as defined in table 48.

Table 48: Contents of TETRA PDU sent in the PSS1 CONNECT message

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------|--------|------|-------|-------|---------------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-CALL RESTORE PREPARED |

Then, when the new SwMI receives the call restoration message from its new visiting user, it will send a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 49.

Table 49: Contents of TETRA PDU in PSS1 FACILITY message sent by the new SwMI in the case of call restoration (during the call)

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------------------|--|------|-------|-------|----------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-CALL RESTORATION |
| New SwMI MNI | 24 | 1 | ANF | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Controlling SwMI | 1 | 1 | CCAp | M | |
| Transmission grant | 2 | 1 | CCAp | C | note 1 |
| Transmission request permission | 1 | 1 | CCAp | C | note 1 |
| Call queued | 1 | 1 | CCAp | M | |
| Call time-out | 4 | 2 | CCAp | O | note 2 |
| Call priority | 4 | 2 | CCAp | O | note 2 |
| Basic service information | 8 | 2 | CCAp | O | note 2 |
| Speech service chosen | 3 | 2 | CCAp | O | note 2 |
| Notification indicator | 6 | 2 | SS | O | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | This information element shall be included if and only if the value of the information element controlling SwMI is equal to 1 (i.e. if the new SwMI is going to be the controlling SwMI - for the call). | | | | |
| NOTE 2: | Mandatory when it is different from requested. Otherwise, this information element shall not be included. | | | | |

If the new SwMI has received the call restoration message from its new visiting user in time, it will send the TETRA PDU defined in table 49 in the PSS1 CONNECT message (instead of in a PSS1 FACILITY message).

6.3.1.16.2 Cases where a connection between the old SwMI and the new SwMI already exists

There are two possible cases where a connection between the old SwMI and the new SwMI already exists:

- a) if the call has been forward switched and if the new SwMI coincides with the forward switching SwMI;

NOTE 1: In the case of a basic individual call, there cannot be more than one forward switching SwMI (i.e. the called user home SwMI), but there may more because of interactions with supplementary services which modify the routing of the call (e.g. call diversion).

- b) if the call restoration results in the call becoming an intra-TETRA call, i.e. the new SwMI coincides with either the originating or the terminating SwMI.

In case a), the old SwMI will send to this SwMI a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 50.

Table 50: Contents of TETRA PDU in PSS1 FACILITY message sent by the old SwMI to the forward switching/new SwMI in the case of migration during an established call to avoid a trombone connection at call restoration

| Information element | Length | Type | Owner | C/O/M | Remark |
|--|--|------|-------|-------|---------------------------|
| PDU type | 6 | 1 | CCAp | M | ISI-PATH CALL RESTORATION |
| Other end SwMI MNI | 24 | 1 | ANF | M | |
| Call time-out | 4 | 1 | CCAp | M | |
| Simplex/duplex selection | 1 | 1 | CCAp | M | |
| Basic service information | 8 | 1 | CCAp | M | |
| Speech service used | 3 | 1 | CCAp | C | note 1 |
| Security level at calling user air interface | 2 | 1 | MM | M | notes 2 and 3 |
| Controlling SwMI | 1 | 1 | CCAp | M | |
| Transmission grant | 2 | 1 | CCAp | M | |
| Transmission request permission | 1 | 1 | CCAp | M | |
| Call priority | 4 | 1 | CCAp | M | |
| Call identifier | 14 | 1 | CCAp | M | |
| Restoring party address SSI | 24 | 1 | CCAp | M | note 4 |
| Restoring party extension | 24 | 1 | CCAp | M | note 4 |
| SS-CLIR invoked for other party | 1 | 1 | SS | M | |
| Other party address SSI | 24 | 1 | CCAp | M | note 5 |
| Other party extension | 24 | 1 | CCAp | M | note 5 |
| Speech services supported | 5 | 2 | CCAp | O | note 6 |
| Proprietary | | 3 | - | O | |
| NOTE 1: | Conditional on the binary value of the information sub-element circuit mode type in the information element basic service information being equal to 0 (i.e. the call requested is a speech call). | | | | |
| NOTE 2: | This information element, which defines the security level that the originating SwMI requested at call set-up time the terminating SwMI to match, is sent independently of whether the "old SwMI" is the originating SwMI or the terminating SwMI. | | | | |
| NOTE 3: | In the case of an external incoming call from PSTN/ISDN/PISN, the name of this information element should be understood as "security level used in the other network". | | | | |
| NOTE 4: | The case where the restoring party address SSI and the restoring party extension would be those of a gateway is excluded. | | | | |
| NOTE 5: | In the case of an external call, the other party address SSI and the other party extension shall be those of the gateway. | | | | |
| NOTE 6: | May be present only when the information element speech service requested is present (see note 1). | | | | |

NOTE 2: Except for the value of its information element PDU type and for the absence of the information element call has been forward switched, the contents of the TETRA PDU defined in table 50 is the same as that defined in table 47.

When the forward switching/new SwMI receives the call restoration message from its new visiting user, it will send to the other end SwMI (i.e. either the originating or the terminating SwMI) a PSS1 FACILITY message including the TETRA PDU defined in table 49.

In case b) (i.e. the new SwMI coincides with the originating or the terminating SwMI), the old SwMI will send to the new SwMI a PSS1 FACILITY message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 51.

Table 51: Contents of TETRA PDU sent by the old SwMI to the other end/new SwMI in a PSS1 FACILITY message to avoid a trombone or a loop connection at call restoration

| Information element | Length | Type | Owner | C/O/M | Remark |
|--|--------|------|-------|-------|--------------------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-END CALL RESTORATION |
| Disconnect cause | 6 | 2 | CCAp | M | note |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE: This value should be equal to 100101 ₂ ("ANF clearing to avoid a trombone or a loop connection"). | | | | | |

NOTE 3: The addition of "or loop" (connection) in the title of table 51 and the name corresponding to the disconnect cause value specified in this table anticipates possible interactions with supplementary services which modify the routing of the call (e.g. call diversion). In the absence of such interaction, the loop connection that would result if such a message was not sent when the new SwMI coincides either with the originating or the terminating SwMI can only be a trombone connection.

6.3.1.17 TETRA PDUs giving complementary information in PSS1 DISCONNECT messages

In the case where the called SwMI is the home SwMI of the called user and where this user has migrated, the called SwMI shall send a PSS1 DISCONNECT message to the originating SwMI as part of the call establishment:

- if the information element routing method choice sent by the originating SwMI in its PSS1 SETUP message (included in the TETRA PDU defined in table 26) has led the called SwMI to decide that the ANF-ISIIC would be re-routed; or
- if the called SwMI has identified that the called user is now registered in the originating SwMI after having migrated.

If the called SwMI has decided that the ANF-ISIIC would be re-routed, it shall include in the PSS1 DISCONNECT message a TETRA PDU, the contents and the encoding of which shall be as defined in table 52.

Table 52: Contents of TETRA PDU sent by the called SwMI in the PSS1 DISCONNECT message in case of forced re-routing

| Information element | Length | Type | Owner | C/O/M | Remark |
|--|----------|------|-------|-------|----------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-REROUTEING |
| Disconnect cause | 6 | 1 | CCAp | M | note 1 |
| Visited SwMI PISN number length | 5 | 1 | ANF | M | note 2 |
| Visited SwMI PISN number digits | variable | 1 | ANF | C | note 3 |
| Notification indicator | 6 | 2 | SS | O | |
| | | | | | |
| Proprietary | | 3 | - | O | |
| NOTE 1: This value should be equal to 111110 ₂ ("call to be re-routed"). | | | | | |
| NOTE 2: Shall be equal to N, N being the number of digits of the visited SwMI PISN number. | | | | | |
| NOTE 3: The number of digits included in this information element shall be equal N, the value of the visited SwMI PISN number length (see note 2). | | | | | |

If following the reception of the SETUP message from the originating SwMI, the called SwMI identifies that the called user has migrated and is now registered in the originating SwMI, it will include in the PSS1 DISCONNECT message a TETRA PDU, the contents and the encoding of which shall be as defined in table 53. The PSS1 DISCONNECT message with the same TETRA PDU may also be sent as part of the call restoration procedure over the ISI (see subclause 6.5.2.3).

Table 53: Contents of TETRA PDU sent by the called SwMI in the PSS1 DISCONNECT message to avoid a trombone or a loop connection at call set-up or at call restoration

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------------------|--|------|-------|-------|-------------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-PATH CLEARING |
| Disconnect cause | 6 | 1 | CCAp | M | note 1 |
| Called user migration or SS-CFU | 1 | 1 | ANF | M | |
| Incoming call barring status | 2 | 1 | ANF | M | note 2 |
| Notification indicator | 6 | 2 | SS | O | |
| Proprietary | | 3 | - | O | |
| NOTE 1: | This value should be equal to 100101 ₂ ("ANF clearing to avoid a trombone or a loop connection"). | | | | |
| NOTE 2: | This information element is needed to take into account the interactions with local SS-BIC and SS-CAD. | | | | |

NOTE: The addition of "or loop" (connection) in both the title of table 53 and the name corresponding to the disconnect cause value specified in this table anticipates possible interactions with supplementary services which modify the routing of the call (e.g. call diversion). In the absence of such interaction, an invoked ANF-ISIIC can only establish a trombone connection (i.e. when SwMI C coincides with SwMI A).

If after having received the PSS1 FACILITY with the TETRA PDU defined in table 30, the originating SwMI decides to re-route the call, it will clear the call attempt to the called SwMI by sending a PSS1 DISCONNECT message including a TETRA PDU, the contents and the encoding of which shall be as defined in table 54.

Table 54: Contents of TETRA PDU sent in a PSS1 DISCONNECT message to clear the connection to the called SwMI when the call is re-routed

| Information element | Length | Type | Owner | C/O/M | Remark |
|---------------------|--|------|-------|-------|-------------------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-REROUTEING CLEARING |
| Disconnect cause | 6 | 1 | CCAp | M | note |
| Proprietary | | 3 | - | O | |
| NOTE: | This value shall be equal to 101110 ₂ ("call re-routed"). | | | | |

Otherwise, whenever a PSS1 DISCONNECT message is sent as a result of call clearing by the calling user, the connected user, the originating SwMI or the terminating SwMI (including when the call is rejected by the called user, or by the terminating SwMI, e.g. because it cannot match the air interface security level requested by the originating SwMI - in the SETUP message), this message shall include a TETRA PDU, the contents and the encoding of which shall be as defined in table 55.

Table 55: Contents of TETRA PDU sent in the PSS1 DISCONNECT message sent by an end SwMI in case of call clearing or call rejection

| Information element | Length | Type | Owner | C/O/M | Remark |
|------------------------|--------|------|-------|-------|----------------|
| PDU Type | 6 | 1 | CCAp | M | ISI-DISCONNECT |
| Disconnect cause | 6 | 1 | CCAp | M | |
| Notification indicator | 6 | 2 | SS | O | |
| Proprietary | | 3 | - | O | |

6.3.1.18 TETRA PDUs giving complementary information in PSS1 RELEASE COMPLETE messages

If the called SwMI or the terminating SwMI rejects the incoming call without having sent any prior PSS1 message, then according to subclause 10.2.2 of ISO/IEC 11572 [15], it will send a PSS1 RELEASE COMPLETE message, instead of a DISCONNECT message. Then if the situation is the same as one of those described in subclause 6.3.1.17, the corresponding TETRA PDU shall be included in this PSS1 RELEASE COMPLETE message. This concerns the TETRA PDUs defined in tables 52, 53 and 55.

6.3.2 TETRA PDU information element coding

Most of the information elements included in the TETRA PDU definitions in subclause 6.3.1 are identical to those defined for air interface messages - see subclause 14.8 of ETS 300 392-2 [1] for these definitions. But the definitions of some of them are different, i.e. ISI specific. And new information elements are being used at the ISI.

NOTE: A given PDU information element already defined for the air interface may or may not take all its possible values when used in ISI TETRA PDUs.

6.3.2.1 Specific ISI definition of some information elements

6.3.2.1.1 Call time-out, set-up phase

First, as opposed to its definition for the air interface protocol, in subclause 14.8.17 of ETS 300 392-2 [1], this information element shall not set the corresponding timer at the air interface at the other end SwMI (T301 in the case of the terminating SwMI, and T302 in that of the originating SwMI). It simply informs the other end SwMI about the call time-out in the set-up phase decided by the SwMI which is sending this information.

NOTE 1: The other end SwMI may then decide or not to update the relevant timer in the MS/LS involved in the call attempt.

NOTE 2: While the value of the information element call time-out, set-up phase, sent by the terminating SwMI can be used directly by the originating SwMI to "start" (the meaning of "start" being as defined in subclause 14.5 of ETS 300 392-2 [1]) timer T302 with this value, this is not the case for the terminating SwMI with timer T301. How the terminating SwMI handles this information element when it receives it is an implementation matter.

Regarding the coding of this information element, it shall be as defined in table 105 of ETS 300 392-2 [1], except that no predefined value shall be used (i.e. the value 000₂ shall reserved). The resulting coding is defined in table 56.

Table 56: Call time-out, set-up phase information element contents

| Information element | Length | Value | Remark |
|-----------------------------|--------|------------------|----------|
| Call time-out, set-up phase | 3 | 000 ₂ | reserved |
| | | 001 ₂ | 1 s |
| | | 010 ₂ | 2 s |
| | | 011 ₂ | 5 s |
| | | 100 ₂ | 10 s |
| | | 101 ₂ | 20 s |
| | | 110 ₂ | 30 s |
| | | 111 ₂ | 60 s |

6.3.2.1.2 Disconnect cause information element

The purpose of the information element disconnect cause is to inform the SwMI to which the PSS1 clearing message (DISCONNECT or possibly RELEASE COMPLETE, else RELEASE) carrying this information element is sent, of the reason for the release/disconnection. This information element shall be coded as defined in table 57.

Table 57: Disconnect cause information element contents

| Information element | Length | Value | Remark |
|---------------------|---|-------------------------------|--|
| Disconnect cause | 6 | 000000 ₂ | Cause not defined or unknown |
| | | 000001 ₂ | User requested disconnect |
| | | 000010 ₂ | Called party busy |
| | | 000011 ₂ | Called party not reachable |
| | | 000100 ₂ | Called party does not support encryption |
| | | 000101 ₂ | Congestion in infrastructure |
| | | 000110 ₂ | Not allowed traffic case |
| | | 000111 ₂ | Incompatible traffic case |
| | | 001000 ₂ | Requested service not available |
| | | 001001 ₂ | Pre-emptive use of resource |
| | | 001010 ₂ | Invalid call identifier |
| | | 001011 ₂ | Call rejected by the called party |
| | | 001100 ₂ | No idle air interface call control protocol sub-entity |
| | | 001101 ₂ | Expiry of timer |
| | | 001110 ₂ | SwMI requested disconnection |
| | | 001111 ₂ | Acknowledged service not completed |
| | | 010000 ₂ | Reserved |
| | | ...etc. | ...etc. |
| | | 011111 ₂ | Reserved |
| | | ISI specific disconnect cause | |
| 111011 ₂ | Call rejected by the terminating/called SwMI: cause unspecified | | |
| 101110 ₂ | Call re-routed | | |
| 100101 ₂ | ANF clearing to avoid a trombone or a loop connection | | |
| | | 111110 ₂ | Call to be re-routed |

NOTE: The encoding of the possible values of the information element disconnect cause has been defined using 6 bits, that is one more bit than the encoding of the corresponding ones defined for the air interface PDUs. This additional bit has been used to allocate the binary values 0VWXYZ to the disconnect causes having the same definitions as binary values VWXYZ in table 106 of ETS 300 392-2 [1], and thus the binary values 1VWXYZ to the disconnect causes having specific definitions.

The encoding of ISI specific disconnect causes in table 5.7 (i.e. those corresponding to binary values 1VWXYZ) has been done in trying to match as closely as possible the last four digits with the encoding defined for the air interface disconnect causes.

6.3.2.1.3 PDU type

The purpose of the information element PDU type is to clearly identify the type of TETRA PDU sent over the ISI in a PSS1 message. This information element shall be coded as defined in table 58.

NOTE 1: A PDU type value has been defined for every possible TETRA PDU even for those which are the only one possibly sent in a given PSS1 (basic call) message.

Table 58: PDU type information element contents

| Information element | Length | Value | Remark |
|---------------------|--|-----------------------|--|
| PDU Type | 6 | 000000 ₂ | ISI-ALERTING (see table 32) |
| | | 000001 ₂ | Reserved |
| | | 000010 ₂ | ISI-CONNECT (see table 33) |
| | | 000011 ₂ | ISI-CONNECT ACKNOWLEDGE (see table 36) |
| | | 000100 ₂ | ISI-DISCONNECT (see table 55) |
| | | 000101 ₂ | Reserved |
| | | 000110 ₂ | ISI-RELEASE (see table 27) |
| | | 000111 ₂ | ISI-ORIGINATING SETUP (see table 26) |
| | | 001000 ₂ | Reserved |
| | | 001001 ₂ | ISI-TX CEASED (see tables 39 and 45) |
| | | 001010 ₂ | Reserved |
| | | 001011 ₂ | ISI-TX GRANTED (see table 37) |
| | | 001100 ₂ | ISI-TX WAIT (see table 41) |
| | | 001101 ₂ | ISI-TX INTERRUPT (see table 38) |
| | | 001110 ₂ | ISI-CALL-RESTORATION (see table 49) |
| | | 010000 ₂ | Reserved |
| | | 010001 ₂ | Reserved |
| | | ...etc. | ...etc. |
| | | 011111 ₂ | Reserved |
| | | ISI specific PDU Type | |
| 111110 ₂ | ISI-SwMI CHANGE INFO (see table 29) | | |
| 111111 ₂ | ISI-FORWARD SWITCH (see table 30) | | |
| 100111 ₂ | ISI-FORWARD SWITCHING SETUP (see table 31) | | |
| 100001 ₂ | ISI-PROCEEDING (see table 34) | | |
| 110001 ₂ | ISI-SETUP PROLONGATION (see table 35) | | |
| 100101 ₂ | ISI-INFO DEMAND (see table 42) | | |
| 110101 ₂ | ISI-INFO REPLY (see table 43) | | |
| 101010 ₂ | ISI-TX CONTINUE (see tables 40 and 46) | | |
| 101100 ₂ | ISI-TX DEMAND (see table 44) | | |
| 100111 ₂ | ISI-CALL RESTORE PREPARATION (see table 47) | | |
| 100010 ₂ | ISI-CALL RESTORE PREPARED (see table 48) | | |
| 111100 ₂ | ISI-PATH CALL RESTORE PREPARATION (see table 50) | | |
| 111101 ₂ | ISI-END CALL RESTORE PREPARATION (see table 51) | | |
| 100100 ₂ | ISI-REROUTEING (see table 52) | | |
| 100110 ₂ | ISI-PATH CLEARING (see table 53) | | |
| 110110 ₂ | ISI-REROUTEING CLEARING (see table 54) | | |

NOTE 2: The encoding of the possible values of the information element PDU type has been defined using 6 bits, that is one more bit than the encoding of the corresponding ones defined for the air interface PDUs. This additional bit has been used to allocate the binary values 0VWXYZ to the PDU types having the same definitions as binary values VWXYZ in table 114 of ETS 300 392-2 [1] in downlink PDUs, and thus the binary values 1VWXYZ to the PDU types having specific definitions.

Even though encoded values are defined for the PDU types for downlink D-INFO and D-TX CONTINUE messages in table 114 of ETS 300 392-2 [1], the encoding of the PDU types for the corresponding ISI PDUs has been defined as ISI specific. This, because as opposed to the other ISI PDUs for which the PDU type encoded values have been defined as been the same as for air interface downlink PDUs, the meanings of ISI-INFO PDUs and ISI-TX CONTINUE PDUs differ significantly from those of the corresponding air interface downlink PDUs.

6.3.2.2 New information elements used at the ISI

6.3.2.2.1 Call has been forward switched

This information element shall be included in the SETUP message sent to the new SwMI where a user involved in an established inter-TETRA call is registered after having migrated, to prepare call restoration. When its value is set to 1, it shall indicate that the called user home SwMI is the called SwMI and the path of the established call transits through this SwMI. This information element shall be coded as defined in table 59.

Table 59: Call has been forward switched information element contents

| Information element | Length | Value | Remark |
|--------------------------------|--------|-------|--|
| Call has been forward switched | 1 | 0 | Either the terminating SwMI is the called SwMI, or the call has been re-routed |
| | | 1 | The call has been forward switched |

6.3.2.2.2 Call diverted to a dispatcher

This information element shall be coded as defined in table 60.

Table 60: Call diverted to a dispatcher information element contents

| Information element | Length | Value | Remark |
|-------------------------------|--------|-------|-----------------------------------|
| Call diverted to a dispatcher | 1 | 0 | Call not diverted to a dispatcher |
| | | 1 | Call diverted to a dispatcher |

6.3.2.2.3 Called user migration or SS-CFU

This information element shall be coded as defined in table 61.

Table 61: Called user migration or SS-CFU information element contents

| Information element | Length | Value | Remark |
|---------------------------------|--------|-------|--|
| Called user migration or SS-CFU | 1 | 0 | The called user has migrated and SS-CFU has not been activated for this user |
| | | 1 | SS-CFU has been activated for the called user with the home SwMI of the forwarded-to user being a third SwMI |

6.3.2.2.4 Connected party/restoring party/other party address SSI and extension

The coding of these information elements shall be the same as in tables 95 and 96 of ETS 300 392-2 [1].

6.3.2.2.5 Controlling SwMI

This information element is included in the SETUP message sent to the new SwMI where a user involved in an established inter-TETRA or intra-TETRA call is registered after having migrated, to prepare call restoration. It shall indicate whether or this new SwMI is going to be the controlling SwMI for that call (i.e. the user registered in this new SwMI was the calling user). This information element shall be coded as defined in table 62.

Table 62: Controlling SwMI information element contents

| Information element | Length | Value | Remark |
|---------------------|--------|-------|--|
| Controlling SwMI | 1 | 0 | The other end SwMI is the controlling SwMI |
| | | 1 | The new SwMI shall be the controlling SwMI |

6.3.2.2.6 External subscriber number digits

Each digit of the external subscriber 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.

And the information element external subscriber number digits shall be a binary string with a length equal to 4 times N, where N shall be equal to the value of the information element external subscriber number length. The latter, which is defined in the next subclause, is just preceding the former in TETRA PDUs. The first 4 bits of this binary string shall be the coded value of the first digit (or symbol) of the external subscriber number, the next four, the coded value of its second digit (or symbol), and so on to (and including) the Nth digit.

Table 63 illustrates this definition.

Table 63: External subscriber number digits information element contents

| Information element | Length | Value |
|-----------------------------------|--------|---|
| External subscriber number digits | 4 x N | (xxxx ₂)(xxxx ₂)(xxxx ₂)(xxxx ₂) etc ... 1st digit 2nd digit 3rd digit 4th digit |

6.3.2.2.7 External subscriber number length

This information element shall be coded as defined in table 64.

Table 64: External subscriber number length information element contents

| Information element | Length | Value | Remark |
|-----------------------------------|--|--------------------|--------|
| External subscriber number length | 5 | 00000 ₂ | note 1 |
| | | xxxxx ₂ | note 2 |
| NOTE 1: | The presence of the information element external subscriber number digits in TETRA PDUs after this information element shall be conditional on the value of this information element being different from 0. | | |
| NOTE 2: | The number of digits in the information element external subscriber number digits shall be equal to N, the decimal number corresponding to the binary value xxxxx ₂ | | |

NOTE: Actually, the external subscriber number length is not an information element per se, but it is needed according to the PDU encoding rules defined in subclause 14.7 of ETS 300 392-2 [1], for encoding the number digits (the length of which is variable) as "a type 1 element".

6.3.2.2.8 Incoming call barring status

This information element shall be used to inform the ANF-ISIIC entity in the terminating SwMI about the result of SS-BIC barring or SS-CAD authorization of the incoming call. When barred by SS-BIC the incoming call shall then be rejected by the ANF-ISIIC entity in the terminating SwMI unless the call is an intra-TETRA call and a local SS-BIC applies. This information element shall be coded as defined in table 65.

Table 65: Incoming call barring status information element contents

| Information element | Length | Value | Remark |
|------------------------------|--------|-----------------|-------------------------------------|
| Incoming call barring status | 2 | 00 ₂ | Neither SS-BIC nor SS-CAD activated |
| | | 01 ₂ | Call authorized by SS-CAD |
| | | 10 ₂ | Call barred by SS-BIC |
| | | 11 ₂ | Call authorized by SS-BIC |

6.3.2.2.9 N x 8 kbit/s link with other SwMI

This information element shall be used to inform the ANF-ISIIC entity in the originating SwMI that if the call is forwarded switched, whether or not the second leg of the call would be established as an N x 8 kbit/s call. This information element shall be coded as defined in table 66.

Table 66: N x 8 kbit/s link with other SwMI information element contents

| Information element | Length | Value | Remark |
|-----------------------------------|--------|-------|--|
| N x 8 kbit/s link with other SwMI | 1 | 0 | No information transfer rate equal to N x 8 kbit/s available in the link with other SwMI |
| | | 1 | Information transfer rate equal to N x 8 kbit/s available in the link with other SwMI |

NOTE: In theory, the delivery of this information should be optional. However, like every 1 bit length information element, it has become mandatory since it is more efficient to encode it as a type 1 element in the corresponding TETRA PDU.

6.3.2.2.10 Routeing method choice

This information element shall be coded as defined in table 67.

Table 67: Routeing method choice information element contents

| Information element | Length | Value | Remark |
|------------------------|--------|-----------------|---|
| Routeing method choice | 2 | 00 ₂ | Re-routing not supported |
| | | 01 ₂ | Re-routing supported, forward switching preferred |
| | | 10 ₂ | Re-routing supported, the called SwMI may choose between forward switching and re-routing |
| | | 11 ₂ | Re-routing supported, possible choice between forward switching and re-routing to be made by originating SwMI |

6.3.2.2.11 Security level at calling user/other end air interface

This information element is coded as defined in table 82 of ETS 300 392-7 [4], the contents of which is reproduced in table 68.

Table 68: Security level at (...) air interface information element contents

| Information element | Length | Value | Remark |
|--------------------------------------|--------|-----------------|--------------|
| Security level at (..) air interface | 2 | 00 ₂ | SwMI type 1 |
| | | 01 ₂ | SwMI type 2 |
| | | 10 ₂ | SwMI type 3a |
| | | 11 ₂ | SwMI type 3b |

6.3.2.2.12 Speech service requested/chosen/used

This information element shall be coded as defined in table 69.

Table 69: Speech service requested/chosen/used information element contents

| Information element | Length | Value | Remark |
|--------------------------------------|--------|------------------|------------------------------------|
| Speech service requested/chosen/used | 3 | 000 ₂ | CODEC defined in ETS 300 395-2 [8] |
| | | xx1 ₂ | Reserved |
| | | x10 ₂ | Reserved |
| | | 100 ₂ | Reserved |

6.3.2.2.13 Speech services supported

This information element is a bit-map field indicating which CODEC are supported. The meaning of each bit setting in this information element shall be as defined in table 70.

Table 70: Speech services supported information element contents

| Information element | Length | Value | Remark |
|---------------------------|--------|--------------------|--|
| Speech services supported | 5 | 00000 ₂ | Reserved |
| | | 00001 ₂ | CODEC defined in ETS 300 395-2 [9] supported |
| | | 00010 ₂ | Reserved |
| | | 00100 ₂ | Reserved |
| | | 01000 ₂ | Reserved |
| | | 10000 ₂ | Reserved |

6.3.2.2.14 SS-CLIR invoked for calling/connected/other party

This information element shall be coded as defined in table 71.

Table 71: SS-CLIR invoked for calling/connected/other party information element contents

| Information element | Length | Value | Remark |
|---|--------|-------|-----------------------------------|
| SS-CLIR invoked for calling/connected/other party | 1 | 0 | SS-CLIR not invoked for the party |
| | | 1 | SS-CLIR invoked for the party |

6.3.2.2.15 Visited/forwarded-to SwMI PISN number digits

This information element shall be coded as defined in subclause 6.3.2.2.6.

6.3.2.2.16 Visited/forwarded-to SwMI PISN number length

This information element shall be coded as defined in table 64.

NOTE: Actually, it is not an information element per se, but it is needed according to the PDU encoding rules defined in subclause 14.7 of ETS 300 392-2 [1], for encoding the number digits (the length of which is variable) as "a type 1 element".

6.3.3 PSS1 facility information element

The ROSE operation tetraIsmMessage referred to in subclause 6.3.1 shall be coded in PSS1 facility information elements in accordance with ISO/IEC 11582 [17]. Each such facility information elements shall always include a Network Facility Extension (NFE).

The destinationEntity and sourceEntity data elements of the Network Facility Extension (NFE) shall contain the value endPINX except in one specific case which is presented below, and the sourceEntity and destinationEntity data elements of the argument of the ROSE operation tetraIsmMessage shall contain the value ANF-ISIIC.

In the case where an inter-TETRA call has been established by forward switching, i.e. through the called user home SwMI, if one of the two users engaged in this call migrates and registers in the latter SwMI, the PSS1 FACILITY message including the TETRA PDU defined in table 50 is to be addressed to this SwMI. Thus the destinationEntity data element of the Network Facility Extension (NFE) shall contain the value anyTypeOfPINX with a destinationEntityAddress containing the PISN number indicated by ANF-ISIMM as corresponding to the forward switching/new SwMI.

Whenever the ANF-ISIIC Invoke APDU of the ROSE operation tetraIsmMessage is included in a PSS1 SETUP message, the Interpretation APDU shall be included with the value "clearCallIfAnyInvokePduNotRecognised".

NOTE: According to subclause 8.6 of ETS 300 392-3-1 [2], if the called SwMI or the terminating SwMI do not support inter-TETRA individual calls, i.e. they do not have an ANF-ISIIC entity, when it receives a PSS1 SETUP message addressed to this entity such SwMI:

- will have its ROSE entity rejecting the ROSE Invoke APDU received; and
- will clear the PSS1 call attempt due to the specific value of the Interpretation APDU received together with the ROSE Invoke APDU.

The same will hold if the new SwMI in the call restoration procedure (see subclause 6.5.2.3) does not support inter-TETRA individual calls.

No Interpretation APDU shall be included together with any of the ANF-ISIIC Invoke APDUs of the ROSE operation tetralsiMessage included in other PSS1 messages than SETUP messages.

In accordance with ETS 300 392-3-1 [2] subclause 8.4, the ISI entity concerned in the destination SwMI will trigger the sending of a returnError APDU when one or more of the error causes listed in this subclause has occurred in the reception of an Invoke APDU.

Among those error causes, the cause corresponding to requestNotSupported (see subclause 8.4 of ETS 300 392-3-1 [2]) may only apply when a specific ANF-ISIIC request is not supported. The cases where this may happen are:

- if the called user has migrated, if its home SwMI is the called SwMI and if the originating and the called SwMIs cannot agree on the routing method to be used: forward switching versus re-routing (see table 67);
- if one of the two parties migrates during an individual call and registers in a new SwMI which supports individual calls but not call restoration (see subclause 6.5.2.3).

When the ROSE entity in the source SwMI receives this returnError APDU or a reject APDU, it shall pass it to the call control application in this SwMI. The decision taken by this call control application when the destination SwMI has not already cleared the call is an implementation matter (e.g. clearing the call or if the Invoke APDU was not essential, continue the call).

6.4 ANF-ISIIC state definitions

For further study.

NOTE: These states correspond to both the PINX protocol control states for circuit-mode call, defined in subclause 7.1 of ISO/IEC 11572 [15], and the SwMI protocol control states for individual (circuit-mode) call. The problem is that the latter have not been standardized in ETS 300 392-2 [1].

6.5 ANF-ISIIC signalling procedures

The signalling procedures below specify the conditions under which the SwMI ANF-ISIIC entities send or receive:

- the TETRA ISI PDUs defined in subclause 6.3.1; and
- PISN basic call primitives together with some of these TETRA PDUs.

The specific parameters of some of those primitives have been defined in subclause 6.2.

To simplify the text below, only the results of those PISN basic call primitives have been specified, e.g. sending of a PSS1 SETUP or CONNECT message.

NOTE: From a formal point of view the SwMI PSS1 protocol control entities are not part of the ANF-ISIIC entities.

6.5.1 Call establishment

6.5.1.1 Call request, information channel selection, PISN called number sending and call proceeding

Call establishment shall be initiated by a primitive sent by the CC entity to the ANF-ISIIC entity in the originating SwMI. This ANF-ISIIC entity shall then send the PSS1 SETUP message defined in subclause 6.2.1 including the ISI-ORIGINATING SETUP PDU defined in table 26.

The procedures defined in ISO/IEC 11572 [15] for information channel selection, called number sending, call proceeding shall apply. En bloc sending method should be used but overlap sending method is not ruled out.

6.5.1.2 Called user migration

When the called user is not registered in the called SwMI, if the called SwMI supports forward switching and if the value of the information element routing method choice of the ISI-ORIGINATING SETUP PDU allows it, the called SwMI shall inform the originating SwMI about the called user migration in a PSS1 FACILITY message including the ISI-SwMI CHANGE INFO PDU defined in table 29.

NOTE 1: According to the PSS1 procedures for sending (PSS1) FACILITY backwards, such message will only be sent after the (PSS1) CALL PROCEEDING message has been sent.

After having received this PSS1 FACILITY message, the originating SwMI shall decide either to re-route the call or to have it forward switched, towards the visited SwMI. If it decides to have the call forward switched, it shall send to the called SwMI the ISI-FORWARD SWITCH PDU defined in table 30 in a PSS1 FACILITY message. The called SwMI shall then send to the visited SwMI the PSS1 SETUP message including the ISI-FORWARD SWITCHING SETUP PDU defined in table 31.

If the called SwMI does not support forward switching or if the value of the information element routing method choice of the ISI-ORIGINATING SETUP PDU requests it, the called SwMI shall send a DISCONNECT message including the ISI-REROUTING PDU defined in table 52. To re-route the call, the originating SwMI shall initiate a new call establishment (see subclause 6.5.1.1) and shall send a PSS1 DISCONNECT message including the ISI-REROUTING CLEARING PDU defined in table 54 to clear the ANF.

The migration information is included in both the ISI-ORIGINATING SETUP PDU (see table 26) and the ISI-REROUTING PDU (see table 52) is a PISN number corresponding to the SwMI where the called user has registered.

NOTE 2: This PISN number is the one delivered by the visiting SwMI to the home SwMI as migration information carried by ANF-ISIMM. This ANF will also deliver the MNI of the SwMI where the called user is currently registered.

When the originating SwMI coincides with the visited SwMI, the called SwMI shall send the ISI-PATH CLEARING PDU defined in table 53 in a DISCONNECT message, thereby forcing the call to be established as an intra-TETRA call.

NOTE 3: However an SS-Call diversion defined locally (i.e. for intra-TETRA calls only) may lead to invoke a new ANF-ISIIC.

6.5.1.3 Call characteristics and set-up time negotiation by the terminating SwMI

The terminating SwMI may indicate to the originating SwMI its fallback choice for some characteristics requested for the call in the PSS1 SETUP message that it cannot support (i.e. duplex selection, N slot bearer requested for a data call in the basic service information element, speech service) in sending the TETRA PDU defined in table 34 in a PSS1 FACILITY message. This TETRA PDU includes the information element call time-out, set-up time, defined in subclause 6.3.2.1.1, which allows the terminating SwMI to inform the originating one about its call time-out in the set-up phase.

Instead of this FACILITY message, the terminating SwMI may send a PSS1 FACILITY message including the TETRA PDU defined in table 35 if it only wants to inform the originating SwMI about its call time-out in the set-up phase.

NOTE 1: Hopefully, this call time-out in the set-up phase should be greater than or equal to that indicated by the originating SwMI in its PSS1 SETUP message.

Upon receiving this message, the originating SwMI call control application should ensure that the air interface CC entity extends its timer T302 (see table 58 of ETS 300 392-2 [1], and the ANF-ISIIC entity should extend PSS1 timer T310 (see table 4 of ISO/IEC 11572 [15]), if necessary. If the call has been forward switched, by the called SwMI, the same should apply to the called SwMI.

NOTE 2: If PSS1 timer T310 is implemented in transit PINXs between the originating and the terminating SwMIs which are not part of the forward switching (called) SwMI, it will not be extended by this message.

NOTE 3: According to the PSS1 procedures for sending (PSS1) FACILITY backwards, such message will only be sent after the (PSS1) CALL PROCEEDING message has been sent.

After having received one of the above PSS1 FACILITY messages, the originating SwMI may send a PSS1 FACILITY message including the TETRA PDU defined in table 35 if it wants to inform the terminating SwMI about its call time-out in the set-up phase.

NOTE 4: Having received a PSS1 FACILITY message from the terminating SwMI ensures that a signalling path exists with this SwMI.

6.5.1.4 Call confirmation indication and call connected by the terminating SwMI

The procedures defined in ISO/IEC 11572 [15] for call confirmation indication and call connected shall apply.

If the terminating SwMI is instructed by the called user air interface U-ALERT PDU to use on/off hook signalling, it shall send the PSS1 ALERTING message including the ISI-ALERTING PDU defined in table 32. If it is instructed by the called user air interface U-CONNECT PDU to use direct call set-up signalling, it shall send the PSS1 CONNECT message including the ISI-CONNECT PDU defined in table 33.

The terminating SwMI may use either of these PDUs to indicate to the originating SwMI its fallback choice for some characteristics that it cannot support (i.e. duplex selection, N slot bearer requested for a data call in the basic service information element and speech service; in addition, hook method selection but only in the PSS1 CONNECT message) among those requested for the call in the SETUP PDU received by this SwMI. Once such fallback choices shall have been indicated in a PSS1 message, they shall not be repeated in the next ones, i.e. the PSS1 ALERTING message for the PSS1 CONNECT message in the case of on/off hook signalling, and possibly a PSS1 FACILITY message for the PSS1 ALERTING or CONNECT messages.

To confirm that the call has actually been established on the calling user side, the originating SwMI shall acknowledge the PSS1 CONNECT message in sending to the terminating SwMI a PSS1 FACILITY message including the ISI-CONNECT ACKNOWLEDGE PDU defined in table 36.

Before having received this PSS1 FACILITY message, the terminating SwMI may send a PSS1 FACILITY message including the ISI-SETUP PROLONGATION PDU defined in table 35 if it wants to inform the originating SwMI about its call time-out in the set-up phase (a priori, because it would have modified it).

Similarly, if before having acknowledged the CONNECT message from the terminating SwMI, the originating SwMI wants to inform the terminating SwMI about its call time-out in the set-up phase, it may send a PSS1 FACILITY message including the same ISI-SETUP PROLONGATION PDU defined in table 35.

6.5.1.5 Failure of call establishment

If the call attempt is rejected by the terminating SwMI (because of e.g. incompatibility between the security levels at the calling and the called air interfaces, or internal congestion), by the called user (because e.g. it is busy, or end-to-end encryption was requested in the set-up and this user does not support it) or by the called SwMI when it is not the terminating SwMI, i.e. the called user has migrated, (because of e.g. unassigned number), the SwMI rejecting this call (or relaying the called user rejection) shall send a PSS1 DISCONNECT message including the ISI-DISCONNECT PDU defined in table 55, with the appropriate disconnect cause.

The same shall apply if the terminating SwMI or, when it is not the terminating SwMI, the called SwMI rejects the call attempt by sending the PSS1 RELEASE COMPLETE message.

6.5.2 Call maintenance procedures

6.5.2.1 Transmission control procedures

As already stated in the stage 1 description, the originating SwMI shall be the controlling one. Consequently, it shall send to the terminating SwMI a PSS1 FACILITY message for every D-TX PDU to be sent by the latter to the called user. Each such PSS1 FACILITY message shall include a TETRA PDU corresponding to the relevant D-TX message. These TETRA PDUs are defined in tables 37, 38, 39, 40 and 41.

If the originating SwMI decides to interrupt the call (in sending the air interface of D-TX WAIT PDU to the calling user), it shall then send a PSS1 FACILITY message including the ISI-TX WAIT PDU defined in table 41.

The terminating SwMI shall relay to the originating SwMI the air interface U-TX PDUs that it receives to request transmission grant or inform that transmission has ceased, by sending a PSS1 FACILITY message including the TETRA PDUs defined in tables 44 and 45, respectively. After the terminating SwMI has interrupted the call, to request to the originating SwMI the authorization to continue the call it shall send a PSS1 FACILITY message including the ISI-TX CONTINUE PDU defined in table 46.

6.5.2.2 Call modification and/or continuation

To inform the other end SwMI that it wants to change the call time-out, the originating or the terminating SwMI shall send a PSS1 FACILITY message including the ISI-INFO DEMAND PDU defined in table 42.

NOTE 1: This SwMI should then wait for receiving an agreement from the other end SwMI before requesting the user that it is controlling to start timer T310 using this new call time-out value.

The same PSS1 FACILITY message can also be used to request from the other end some call modification (as specified in subclause 14.5.1.2 of ETS 300 392-2 [1]). The call time-out information element included in this TETRA PDU shall then be related to the modification requested.

Upon receiving the PSS1 FACILITY message including the ISI-INFO DEMAND PDU, the other end SwMI shall send a PSS1 FACILITY message including the ISI-INFO REPLY PDU defined in table 43.

NOTE 2: According to the negotiation clauses for incoming call in subclause 14.5.1.1 of ETS 300 392-2 [1] and to the definition of the class of MS (information) element in table 167 of ETS 300 392-2 [1], possibly supplemented by information transferred by ANF-ISIMM, this other SwMI should always know whether the user that it controls would support the requested changes. This holds notably if the other user has requested a change (from simplex operation) to duplex operation or (from clear call) to encrypted call, which is possible according to subclause 14.5.1.2 of ETS 300 392-2 [1].

6.5.2.3 Call restoration

When during an established (individual) inter-TETRA call, the call control application in the originating or in the terminating SwMI receives the information (from ANF-ISIMM) that the user (participating in the call) which was registered in the SwMI has migrated and is now registered in a new SwMI, the ANF-ISIIC entity invoked for that call should send a PSS1 SETUP message including the ISI-CALL RESTORE PREPARATION PDU defined in table 47.

Similarly, in the case of migration of one of the two users involved in an intra-TETRA call established within a given SwMI, this SwMI should send to the new SwMI a PSS1 SETUP message including the same ISI-CALL RESTORE PREPARATION PDU defined in table 47.

NOTE 1: Formally, the SwMI call control application invokes then an ANF-ISIIC. It is this ANF-invoked ISIIC which triggers that PSS1 SETUP message.

In the procedure described below, the originating or terminating SwMI which sent the SETUP message as defined in either of the two preceding paragraphs shall be called the old SwMI.

At the same time that it sends the PSS1 SETUP message, the old SwMI shall start timer T1.

To reject this set-up (because e.g. its air interface security level cannot match that used at calling user air interface), the new SwMI shall send a PSS1 DISCONNECT (else a PSS1 RELEASE COMPLETE message) including the ISI-DISCONNECT PDU defined in table 55.

To indicate that it accepts this set-up, the new SwMI shall send a PSS1 CONNECT message including the ISI-CALL RESTORE PREPARED PDU defined in table 48 if it has not yet received the call restoration message from its new visiting user, or the ISI-CALL RESTORATION PDU defined in table 49, if it has received the call restoration message from its new visiting user in time.

If call restoration (by the migrating user) has occurred after the new SwMI has sent the PSS1 CONNECT message, it shall send the ISI-CALL RESTORATION PDU defined in table 49 in a PSS1 FACILITY message.

When the old SwMI receives that ISI-CALL RESTORATION PDU (whether in a PSS1 CONNECT or FACILITY message) it shall transfer the call (by join), relay this TETRA PDU to the other end SwMI (in a PSS1 FACILITY message) and stop timer T1.

Upon expiry of timer T1, the old SwMI shall release the connection that it had established with the new SwMI in sending a PSS1 DISCONNECT message.

The following procedure is recommended instead of the general one specified above in the special cases where the new SwMI coincides with a SwMI on the call path, i.e.: either the forward switching SwMI if the call has been forward switched or the other end SwMI (terminating or originating SwMI).

If an intra-TETRA call has been forward switched (by the called user home SwMI), if migration of one of the two users engaged in that call occurs and if the new SwMI coincides with the forward switching SwMI, the old SwMI ANF-ISIIC entity should detect this and should then send to the forward switching/new SwMI a PSS1 FACILITY message including the ISI-PATH CALL RESTORE PREPARATION PDU defined in table 50. Upon call restoration, the forward switching/new SwMI shall clear the ISI path not needed any more in sending to the old SwMI the ISI-PATH CLEARING PDU defined in table 53.

Similarly, if instead of coinciding with the forward switching SwMI, the new SwMI coincides with the other end SwMI, the old SwMI ANF-ISIIC entity should detect this and should then send to the other end/new SwMI a PSS1 FACILITY message including the ISI-END CALL RESTORE PREPARATION PDU defined in table 51. Upon call restoration, the other end/new SwMI shall clear the invoked ANF-ISIIC in sending to the end/old SwMI the ISI-PATH CLEARING PDU defined in table 53.

NOTE 2: Clearly, the possibility of trombone (or more generally loop) connection is excluded in the case of migration of one of the two users involved in an established intra-TETRA call.

NOTE 3: If, exceptionally, both users involved in a call migrate and register in new SwMIs, the procedure described in this subclause for the case of a single call restoration will work for the two call restorations, even in the cases where the new SwMIs are:

- both of them, other end SwMIs (i.e. the new SwMI for the calling user is the terminating SwMI or the new SwMI for the called user is the originating SwMI);
- or both of them, the forward switching SwMI;
- or one of them, the other end SwMI, and the other, the forward switching SwMI.

6.5.3 DTMF procedures

The DTMF information shall be sent over the ISI in a PSS1 FACILITY message including the ISI-INFO DEMAND PDU defined in table 42 (see also subclause 6.5.2.2).

NOTE: Since according to ISO/IEC 11582 [17], a PSS1 FACILITY can only be sent by the originating SwMI after a PSS1 signalling path has been established (i.e. a first PSS1 message has been received from the terminating or outgoing gateway SwMI, e.g. PSS1 ALERTING, CONNECT or FACILITY message), this SwMI will have to store the DTMF information that it has received before. Note that this may happen especially as according to ETS 300 392-2 [1], the air interface U-INFO PDU which carry DTMF information can be sent as soon a call reference has been allocated by the (originating) SwMI.

6.5.4 ANF-ISIIC clearing

In the case where the called SwMI is the called user home SwMI, the called user has migrated and the called SwMI does not support forward switching, the called SwMI shall send to the originating SwMI a PSS1 clearing message including the ISI-REROUTEING PDU defined in table 52.

Similarly, in the case where the called SwMI is the called user home SwMI and the called user has migrated and is registered in the originating SwMI, the called SwMI shall send to the originating SwMI a PSS1 clearing message including the ISI-PATH CLEARING PDU defined in table 53.

If the terminating SwMI rejects the incoming call for some TETRA specific cause, e.g. because it cannot match the air interface security level requested by the originating SwMI (in its SETUP message), it shall send a PSS1 clearing message including the ISI-DISCONNECT PDU defined in table 55. The TETRA specific cause for clearing shall then be indicated in the information element disconnect cause of the latter TETRA PDU. The same shall apply for the called SwMI, when it is different from the terminating SwMI and when it rejects the call for a TETRA specific cause different from migration.

In accordance with subclause 10.2.2 of ISO/IEC 11572 [15], the clearing message mentioned in the three preceding paragraphs shall be: either

- a PSS1 RELEASE COMPLETE if the called SwMI has not sent any prior response (PSS1) message; or
- a PSS1 DISCONNECT message otherwise.

If after having received the PSS1 FACILITY including the ISI-SwMI CHANGE INFO PDU defined in table 29, the originating SwMI decides to re-route the call, it shall clear the call attempt to the called SwMI by sending a PSS1 DISCONNECT message including the ISI-REROUTEING CLEARING PDU defined in table 54.

When the call is cleared by the calling user or by the originating SwMI before this SwMI has established a PSS1 information channel (i.e. B_Q channel) with the next PINX, the originating SwMI shall send either a PSS1 DISCONNECT or a PSS1 RELEASE message including the ISI-RELEASE PDU defined in table 27. When the call is cleared by the calling user or by the originating SwMI in any other situation during the call establishment or when the call has been established, the originating SwMI shall send a PSS1 DISCONNECT including this PDU defined in table 55. The reason for this clearing shall be indicated in the information element disconnect cause of this TETRA PDU.

When the call is cleared by the connected user or by the terminating SwMI once it has been established, the terminating SwMI shall send a PSS1 DISCONNECT message including the ISI-DISCONNECT PDU defined in table 55. The same shall apply for the called SwMI if it is different from the terminating SwMI. The reason for this clearing shall be indicated in the information element disconnect cause of this TETRA PDU.

No TETRA PDU shall be included in the case of call clearing by the PSS1 network.

6.5.5 Call collisions

In the case of call collision because two adjacent PISN nodes (including possibly the SwMIs involved in the call establishment or restoration) attempt both to seize the same PISN B_Q channel the procedure defined in ISO/IEC 11572 [15] for call collision shall apply.

In the specific case where an inter-TETRA call number 1 is being established and where the called user of this call is calling at the same time the calling user of this very inter-TETRA call number 1, the following shall apply:

- the two end SwMIs should identify this situation;
- then they should both compare the ITSIs of their respective calling and called users: the SwMI where the user with the larger ITSI number is registered shall be the leading SwMI;
- if the leading SwMI supports call amalgamation, it shall clear the ANF-ISIIC that it had invoked (for its outgoing ISI call attempt), amalgamate its calling user with the remaining invoked ANF-ISIIC (invoked by the other SwMI) and send the ISI-CONNECT PDU (in the PSS1 CONNECT message) for the latter ANF-ISIIC. Then the other SwMI will complete the call establishment;

NOTE 1: As a result of this procedure, the latter SwMI (i.e. the non-leading SwMI) will be the controlling SwMI.

- if the leading SwMI does not support call amalgamation, it will clear the ANF-ISIIC invoked (for its incoming ISI call attempt) by the other SwMI, since the called user for this invoked ANF-ISIIC is busy. Then:
 - if the other SwMI does not support call amalgamation, it will also clear the remaining invoked ANF-ISIIC (invoked by the leading SwMI), since the called user for this invoked ANF-ISIIC is also busy;
 - if the other SwMI supports call amalgamation, it shall amalgamate its calling user with the remaining invoked ANF-ISIIC (invoked by the leading SwMI) and send the PSS1 CONNECT message for the latter ANF-ISIIC. The leading SwMI will then complete the call establishment;

NOTE 2: As a result of this procedure, the leading SwMI will be the controlling SwMI.

- whether it is the leading SwMI or the other, the SwMI which amalgamates the call and sends the PSS1 CONNECT message shall set the information element hook method selection equal to direct set-up signalling in the ISI-CONNECT PDU sent in this PSS1 CONNECT message.

Figure 23 illustrates the procedure just described in the case where the leading SwMI supports call amalgamation.

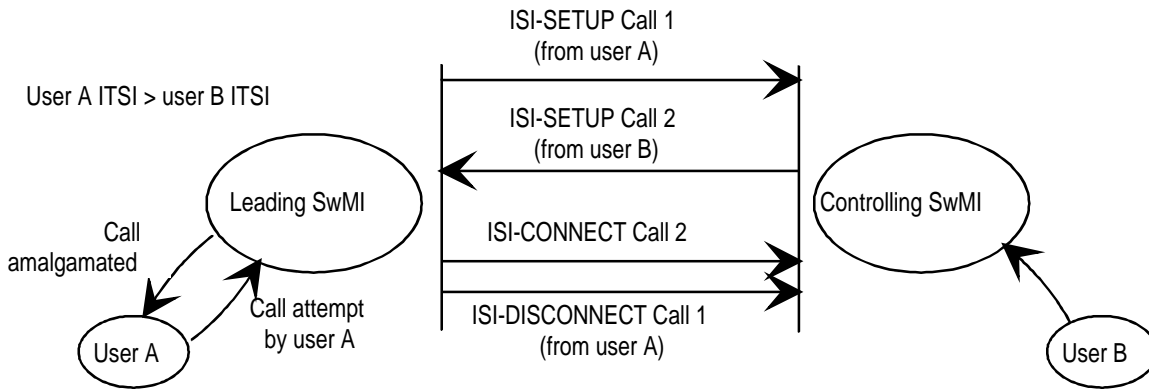


Figure 23: Call collision handling in the case where the leading SwMI supports call amalgamation

6.6 ANF-ISIIC impact of interworking with ISDN/PISN/PSTN

When a (TETRA) calling user requests the establishment of an external individual call through a TETRA gateway located in a SwMI different from that where that user is registered, the originating SwMI shall include both the ITSI number of this gateway and the external number in its ISI-ORIGINATING SETUP PDU, as defined in table 26.

The gateway shall send to the originating SwMI the progress indicator elements and the connected number identity (if available) as specified in subclause 6.2.6.

If these progress indicator elements cannot be sent either in the PSS1 ALERTING or the CONNECT message, the gateway SwMI shall send them in a PROGRESS message. This message may also include the ISI-PROGRESS PDU defined in table 28, to indicate to the originating SwMI its fallback choice for some characteristics requested for the call in the ISI-ORIGINATING SETUP PDU that it cannot support (i.e. duplex selection, N slot bearer requested for a data call in the basic service information element, speech service). If the gateway SwMI does not send such fallback choice characteristics in the ISI-PROGRESS PDU (in a PSS1 FACILITY message), it shall send them in either the ISI-ALERTING PDU or the ISI-CONNECT PDU.

The fallback choice characteristics indicated as optional in the definitions of the TETRA PDUs concerned which have already been sent in a previous PSS1 message shall not be repeated (i.e. when identical to some already sent).

For an external incoming individual call (i.e. to a TETRA called user) routed over the ISI, the incoming gateway shall send the number of the calling party in the other network if available, in its ISI-ORIGINATING SETUP PDU as defined in table 26. It shall also include in this message PSS1 information elements (notably the progress indicator elements) as defined in subclause 6.2.5.

6.7 Protocol interactions between ANF-ISIIC and supplementary services and other ANFs

6.7.1 Interaction with SS-BIC

There is no protocol interaction when the terminating SwMI is the SwMI first called by the originating SwMI (because either the terminating SwMI is the called user home SwMI and this user has not migrated, or the originating SwMI is the called user home SwMI).

When the called user home SwMI is different from the originating SwMI, when this user has migrated and when SS-CAD for incoming calls has not been invoked, the invoked ANF-ISIIC has to ensure the operation of SS-BIC for the incoming call in the called user home SwMI unless a local SS-BIC applies (which overrules the "general" SS-BIC). Such local SS-BIC can only apply if the called user is registered in the originating SwMI (after having migrated). According to subclause 6.5.4, this will be detected by the invoked ANF-ISIIC in the called user home SwMI (using the originating SwMI Mobile Network Identity (MNI)), which will then send a PSS1 DISCONNECT message including the ISI-PATH CLEARING PDU defined in table 53.

Consequently, the protocol interaction between ANF-ISIIC and SS-BIC consists only in having the information element incoming call barring status in this TETRA PDU set to either call barred by SS-BIC or call authorized by SS-BIC.

NOTE: This applies only if SS-CAD for the incoming call has not been invoked, since it overrides SS-BIC.

6.7.2 Interaction with SS-CAD

6.7.2.1 Invocation of a specific ANF-ISIIC

When SS-CAD is invoked for an outgoing individual call and when the dispatcher is located in another SwMI, a specific ANF-ISIIC shall be invoked if the operation of SS-CAD entails the establishment of a call between the calling user and the dispatcher (i.e. diversion to the dispatcher). The corresponding TETRA PDU included in this call PSS1 SETUP message shall be the standard ISI-ORIGINATING SETUP PDU (defined in table 26), i.e. no specific information element identifying this type of call shall be added to this TETRA PDU.

NOTE: Actually the PSS1 SETUP message will carry a specific SS-CAD PDU (CAD REQUEST PDU) in addition to the ISI-ORIGINATING SETUP PDU-which is not an interaction.

The same shall apply if SS-CAD is invoked for an incoming individual intra-TETRA call and if the dispatcher is located in another SwMI.

6.7.2.2 Interception of an already invoked ANF-ISIIC

If SS-CAD has been invoked for an inter-TETRA individual call, the interaction between ANF-ISIIC and SS-CAD shall depend on whether or not SS-CAD operation entails the establishment of a call between the calling user and the dispatcher (i.e. diversion to the dispatcher).

If not, the invoked ANF-ISIIC shall simply be suspended in the SwMI where SS-CAD has been invoked. If yes, the corresponding call to the dispatcher shall be established by the ANF-ISIIC invoked for this inter-TETRA individual call: i.e. no additional ANF-ISIIC shall be invoked. To establish this call if the dispatcher is registered in a SwMI different from the SwMI where SS-CAD has been invoked, the already invoked ANF-ISIIC shall send the PSS1 SETUP message including the ISI-ORIGINATING SETUP PDU defined in table 26 and a specific SS-CAD PDU: CAD REQUEST PDU. The ensuing call to the dispatcher shall be established by forward switching (through the SwMI where SS-CAD has been invoked).

The information element "call diverted to a dispatcher" in the ISI-CONNECT PDU defined in table 33, sent in the PSS1 CONNECT message when the call is established with the dispatcher shall be set on.

NOTE: This caters for the case where the originating SwMI would not support SS-CAD, but would support e.g. SS-TPI or lawful intercept.

6.7.2.3 Completion of call establishment

If the dispatcher is registered in a SwMI different from the SwMI where SS-CAD has been invoked and if a call has been established between the calling user and the dispatcher, to authorize the establishment of the call originally requested to be resumed, the dispatcher SwMI shall send a PSS1 FACILITY message including a specific SS-CAD PDU: CAD ACCEPT PDU. That message shall be addressed to a PISN number which identifies the SwMI where SS-CAD has been invoked (i.e. where diversion to the dispatcher was initiated). This PISN number shall be determined using the MNI value of the SwMI received in the CAD REQUEST PDU mentioned in subclause 6.7.2.2.

Upon receiving the authorization to resume the call establishment, if the call has not been diverted to a dispatcher (i.e. no CONNECT message has yet be sent to the originating SwMI), the call establishment shall proceed as defined in subclause 6.5.1, starting from subclause 6.5.1.2.

Upon receiving the authorization to resume the call establishment, if the call has been diverted to a dispatcher and if the called user has migrated, the diverting SwMI shall send to the terminating SwMI a SETUP message including the ISI-FORWARD SWITCHING PDU defined in table 31.

The contents of the ISI-FORWARD SWITCHING PDU shall be the same as if the call had not been prior established with the dispatcher, except for the value of the information element transmission grant. The latter value shall be set in such a manner that it does not result in any change of transmission permission granted to the calling user, i.e.:

- if the calling user had been granted permission to transmit when the dispatcher authorizes the call to be resumed, the diverting SwMI shall set the value of the information element transmission grant equal to the binary value 11_2 (i.e. transmission granted to another user, see table 126 of ETS 300 392-2 [1]);
- if it is the dispatcher who had been granted permission to transmit when the dispatcher authorizes the call to be resumed, the diverting SwMI shall set the value of the information element transmission grant equal to the binary value 00_2 (i.e. transmission granted, see table 126 of ETS 300 392-2 [1]).

When the diverting SwMI receives the PSS1 CONNECT message sent by the terminating SwMI, it shall send to the originating SwMI a PSS1 FACILITY message including the same ISI-CONNECT PDU received in the PSS1 CONNECT message (defined in table 33).

The diverting SwMI shall then join the connection of the new call to the called/connected user with that of the original call from the calling user (through the originating SwMI) diverted to a dispatcher. In addition if the dispatcher had been registered in a SwMI different from the diverting SwMI, the diverting SwMI shall send a DISCONNECT message to the dispatcher SwMI to clear the connection of the original call with the dispatcher.

Whether or not it supports SS-CAD, the originating SwMI shall recognize the PSS1 FACILITY message sent by the diverting SwMI as the true CONNECT message for the original call. Notably:

- upon receiving that PSS1 FACILITY message including the ISI-CONNECT PDU, it shall send to the terminating SwMI a PSS1 FACILITY message including the ISI-CONNECT ACKNOWLEDGE PDU defined in table 36;
- the originating SwMI shall detect if any modification has occurred in the bearer service definition (i.e. change in the simplex/duplex selection, in the basic service or of CODEC) by analysing the contents of the corresponding information elements in the received ISI-CONNECT PDU.

NOTE: The provision in the last paragraph is in line with the requirement in the stage 1 description (see subclause 4.3.11) that the originating SwMI has to handle the set-up response that it receives as if no interception by the dispatcher had taken place; using stage 3 description terminology, this means as if it had received this response from the terminating SwMI in the PSS1 CONNECT message.

If the called user has migrated and is registered in the originating SwMI, then to avoid the overriding of dispatcher authorization by a local SS-BIC, the information element incoming call barring status in the TETRA PDU defined in table 53 shall be set to call authorized by SS-CAD.

6.7.3 Interactions with SS-Call diversion

6.7.3.1 Interaction with SS-CFU at call establishment

The specification of the interaction between ANF-ISIIC and SS-CFU depends on whether the home SwMI of the forwarded-to user is different or not from that of the called user.

If they coincide, the ANF-ISIIC procedure specified in subclause 6.5 shall apply in simply replacing the called user by the forwarded-to user.

NOTE: If the calling and the called users had the same home SwMI and neither had migrated, clearly the call would have been an intra-TETRA call. If in such a case, SS-CFU has been activated for the called user and if the forwarded-to user is registered in a different SwMI, SS-CFU will invoke an ANF-ISIIC for the establishment of the call. The same may hold if the forwarded-to user is registered in the same SwMI as the calling and the called users but its home SwMI is a different SwMI.

If the home SwMI of the diverted-to user is different from that of the called user, this shall be indicated in:

- the ISI-SwMI CHANGE PDU defined in table 29 when this PDU is sent (i.e. when the originating SwMI has not imposed in its SETUP PDU that the call be forward switched and when the forwarded-to user home SwMI does not coincide with the originating SwMI);
- the ISI-PATH CLEARING defined in table 53 when this PDU is sent (i.e. when the forwarded-to user home SwMI coincides with the originating SwMI).

6.7.3.2 Interactions with other call diversion supplementary service at call establishment

When another call diversion supplementary service than SS-CFU has been invoked for a called user and when this called user has migrated, the invoked ANF-ISIIC shall establish the call by forward switching (through the called user home SwMI). It shall detect monitor the ISI PDU sent by the SwMI where the called user is registered to invoke the relevant call diversion supplementary service among those activated for the called user (e.g. busy or no answer).

NOTE: This holds even if the called user is registered in the originating SwMI.

6.7.3.3 Interaction with SS-Call diversion at call restoration

There shall be no interaction between ANF-ISIIC with SS-Call diversion at call restoration, i.e. when a user migrates and registers in a new SwMI during an individual inter-TETRA call established with or more call diversions, the call restoration procedure shall be the same as that described in subclause 6.5.2.3.

This holds notably when the new SwMI coincides with a SwMI on the call path, i.e.: either some forward switching SwMI if the call has been forward switched or the other end SwMI (terminating or originating SwMI).

NOTE 1: There is however a difference between call restoration of an individual inter-TETRA call established with or without call diversion: for the latter only a trombone connection could result when the new SwMI coincides with a SwMI on the call path in the absence of trombone or loop detection by ANF-ISIIC, while a genuine loop connection may occur if many call diversion has been invoked and more than one has been operated has been forward switched. Such a case will arise when e.g. the connected user migrates either in an "upstream" forward switching SwMI (on the call path) or in the originating SwMI.

NOTE 2: In the case where call restoration happens for the connected user in the originating SwMI, or for the calling user, in the terminating SwMI, the possible loop connection will be detected and avoided by the trombone or loop connection detection ensured by ANF-ISIIC.

In the case where call restoration happens for the calling user in the forward switching SwMI just after the originating SwMI on the call path, the possible trombone connection will be detected and avoided by the trombone or loop connection detection ensured by ANF-ISIIC.

Unfortunately, ANF-ISIIC will not be capable to detect a trombone or loop connection resulting from migration when the new SwMI coincides with any other forward switching SwMI on the call path, including the case of call restoration for the connected user in the forward switching SwMI just before the terminating SwMI. The reason for this is that neither the originating nor the terminating SwMIs are informed about all (forward switching) SwMIs on the call path.

6.7.4 Interactions with SS-AoC

If an advice of charge supplementary service is invoked for an inter-TETRA call at its set-up and if some charging information is to be got from another SwMI for operating that supplementary service, a specific SS-AoC PDU shall be included in the PSS1 SETUP message.

When the supplementary services SS-AoC-E or AoC-D have been invoked, independently of whether this is per call or for all calls, when the served user clears the call, instead of sending a PSS1 DISCONNECT message, the SwMI serving this user (e.g. the originating SwMI) shall send a PSS1 FACILITY message including a specific SS-AoC PDU to request charging information from other SwMI(s) on the path (e.g. the gateway or terminating SwMI) and to and to clear the call in delivering such information.

The charging information at the end shall be included in a specific SS-AoC PDU sent by the other end SwMI sent together with the ISI-DISCONNECT PDU defined in table 55 in a PSS1 DISCONNECT message.

6.7.5 Interaction with SS-CLIR

In an individual inter-TETRA call, both the originating and the terminating SwMIs shall support SS-CLIR for the user at the other end (e.g. the terminating SwMI shall support SS-CLIR for the calling user).

To invoke SS-CLIR for the calling user, the originating SwMI shall set to 1 the value of the information element "SS-CLIR invoked for calling party" in the ISI-ORIGINATING SETUP PDU and if sent in the ISI-FORWARD SWITCHING SETUP PDU.

If SS-CLIR has been invoked for the calling user and if the connected user migrates during the call and registers in a new SwMI, the terminating SwMI shall set to 1 the value of the information element "SS-CLIR invoked for other party" in the ISI-CALL RESTORE PREPARATION PDU or ISI-PATH CALL RESTORE PDU sent to the new SwMI. The same requirement shall then apply to the new SwMI if the connected user migrates again during the call.

To invoke SS-CLIR for the connected user, the originating SwMI shall set to 1 the value of the information element "SS-CLIR invoked for connected party" in the ISI-CONNECT PDU.

If SS-CLIR has been invoked for the connected user and if the calling user migrates during the call and registers in a new SwMI, the originating SwMI shall set to 1 the value of the information element "SS-CLIR invoked for other party" in the ISI-CALL RESTORE PREPARATION PDU or ISI-PATH CALL RESTORE PDU sent to the new SwMI. The same requirement shall then apply to the new SwMI if the calling user migrates again during the call.

NOTE: See table 71 for the definition of the information elements "SS-CLIR invoked for calling/connected/other party".

6.7.6 Interaction with SS-CC

To be defined.

6.7.7 Interactions with SS-CRT, SS-PC and SS-PPC

To be defined.

6.7.8 Interactions with other supplementary services

At the time of the writing of this standard, no other supplementary service has been identified which would require for its invocation or its operation an interaction with ANF-ISIIC.

NOTE: Such supplementary services require only the transport of their PDUs (i.e. SS PDUs) through ANF-ISISS, as defined in clauses 9 and 10 of ETS 300 392-9 [5].

6.8 ANF-ISIIC parameter values (timers)

ANF-ISIIC shall use the mandatory timers defined in ISO/IEC 11572 [15]. It shall not use the optional PSS1 timer T301 (for the outgoing side, started by the reception of the PSS1 ALERTING message, and stopped by that of the PSS1 CONNECT message (since it might conflict with the call set-up phase TETRA timer).

In addition, ANF-ISIIC shall use timer T1 as defined in subclause 6.5.2.3, to protect against too much delay of call restoration while a connection between the old SwMI and the new SwMI has been established. The minimum value of this timer shall be 5 seconds, and its maximum value, 30 seconds.

Annex A (normative): Stage 1 description of the interactions of ANF-ISIIC with Call Forwarding Unconditional supplementary service (SS-CFU)

A.1 Possible SS-CFU activation

Except for a possible local SS-CFU activation which is detailed below, if SS-CFU is activated this shall be in the called user home SwMI.

As to the local SS-CFU activation, it may happen when the called user home SwMI is SwMI B (i.e. not SwMI A) and when this user has migrated and is now registered in SwMI A. It shall then only apply for intra-TETRA calls (within SwMI A).

This local SS-CFU activation shall be independent from that in the called user home SwMI (e.g. they can take place both).

When the called user migrates further, this local activation (in SwMI A) shall be cancelled.

A.2 Invocation and operation

Whenever ANF-ISIIC has been invoked, it shall interact with SS-CFU if the latter has been activated (by the called user, this user being at the same time the SS-CFU served user). In addition, when the home SwMI of the called user is SwMI A, SS-CFU shall invoke ANF-ISIIC for forwarding the call if the forwarded-to user home SwMI is different from SwMI A, except possibly when the forwarded-to user happens to be registered in SwMI A after having migrated.

NOTE: In all cases addressed below, notification to the SS-CFU served user (which is a subscription option according to the definition of SS-CFU in PISN standards) will be ensured by SS-CFU, by signalling (i.e. without any need to invoke ANF-ISIIC).

A.2.1 Called user home SwMI being SwMI A

In the case where the called user home SwMI is SwMI A and where this user has activated SS-CFU, the SS-CFU invoked (by SwMI A supplementary service control application) shall simply invoke ANF-ISIIC to forward the call if the forwarded-to user home SwMI is different from SwMI A, except possibly when the forwarded-to user happens to be registered in SwMI A after having migrated.

NOTE 1: When the forwarded-to user is registered in SwMI A after having migrated, whether or not SS-CFU will invoke ANF-ISIIC towards this user home SwMI depends on how SwMI A routes calls to called users registered in this SwMI when it is not their home SwMI (i.e. they have migrated). If SwMI A routes such calls directly (i.e. without invoking ANF-ISIIC), then SS-CFU will forward the calls directly instead of invoking ANF-ISIIC towards the forwarded-to user home SwMI.

When the forwarded-to user is registered in SwMI A after having migrated, if SS-CFU has invoked ANF-ISIIC (in SwMI A) to forward the call (i.e. SS-CFU has not routed the call directly, as an intra-TETRA call), the possible trombone shall be identified by this invoked ANF which shall then clear the call attempt.

NOTE 2: SS-CFU will then route the call internally.

A.2.2 Called user home SwMI being SwMI B

When the called user home SwMI is SwMI B, the ANF-ISIIC originally invoked for establishing the call with the called user shall invoke SS-CFU if it has been activated (by the called user) in this SwMI. This holds whether or not this user has migrated afterwards, except in the special case presented below.

NOTE 1: A different choice might have been made in the case where the called user has not migrated (being registered in SwMI B, its home SwMI): that of letting SwMI B supplementary service control application invoke SS-CFU. This choice was not made because it would have resulted in cascading two invoked ANF-ISIICs if the forwarded-to user is registered in some other SwMI, with more complex signalling.

In the special case where the called user (has migrated and) is now registered in SwMI A, where it has activated another SS-CFU in SwMI A for intra-TETRA calls and where SwMI A call control application has invoked ANF-ISIIC (to SwMI B) to establish the call with the called user, then this ANF shall not invoke the SS-CFU activated in SwMI B (the called user home SwMI). Instead it shall report to SwMI A call control application the information that the called user has migrated and is now registered in SwMI A, and clear the call attempt.

NOTE 2: In such a case, SwMI A supplementary service control application should check whether or not a "local" SS-CFU has been activated for this called user. If yes, when the home SwMI of the forwarded-to user for this "local" SS-CFU is different from SwMI A, this "local" SS-CFU will invoke ANF-ISIIC as defined in A.2.1. If no SwMI A call control application will establish the call to the called user, which would then be an intra-TETRA call.

NOTE 3: The additional condition above (in the last paragraph before note 2) that "the called user has activated another SS-CFU in SwMI A" results in the need for the invoked ANF to check whether a local SS-CFU has been activated before possibly invoking the home SwMI SS-CFU. And if a local SS-CFU has been activated, then, the invoked ANF shall by-pass the invocation of the home SwMI SS-CFU (i.e. if a local SS-CFU has been activated, the home SwMI SS-CFU will not be invoked for the special case of intra-TETRA calls addressed in this last paragraph before note 2).

NOTE 4: On the other hand another issue arises if SwMI A call control application can route directly (i.e. without invoking ANF-ISIIC) calls to called users registered in this same SwMI when it is not their home SwMI (i.e. they have migrated). This issue is that, if no local SS-CFU has been activated, SwMI A supplementary service control application needs to be informed about the activation of SS-CFU in the called user home SwMI, to invoke it. This is why ANF-ISIMM will ensure that whenever a user which has activated SS-CFU in its home SwMI migrates to another network, the SwMI of this other network will be informed about this SS-CFU activation.

The definition of further interactions between SS-CFU and ANF-ISIIC shall depend on whether the forwarded-to user home SwMI:

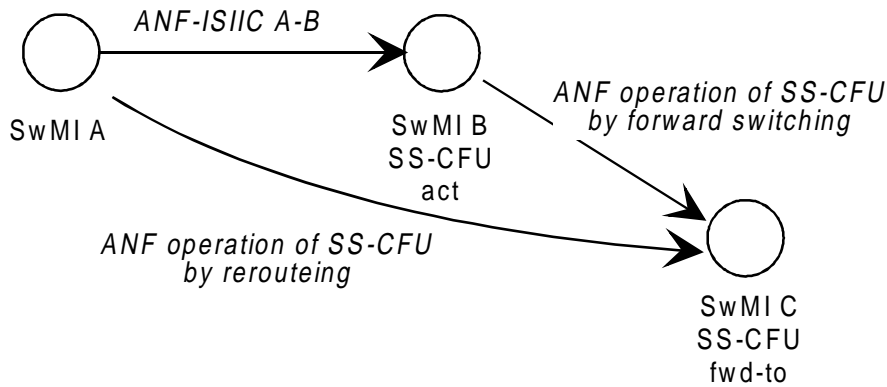
- is SwMI B and this user is registered in its home SwMI;
- is SwMI B and this user has migrated;
- is different from SwMI B and this user is registered in its home SwMI;
- is different from SwMI B and this user has migrated.

But in all these cases, if the forwarded-to user has itself activated a call diversion supplementary service, the ANF operation shall continue in invoking and operating the routing of this new call diversion supplementary service.

A.2.2.1 Forwarded-to user with home SwMI being SwMI B, being registered in its home SwMI

If the forwarded-to user home SwMI is SwMI B and if this user registered in its home SwMI, the ANF-ISIIC originally invoked to establish the call with the called user shall ensure SS-CFU routing (after having invoked it): i.e. by changing destination within SwMI B, to the forwarded-to user instead of to the called user. There shall no further interaction than that mentioned just above (if the forwarded-to user has itself activated another call diversion supplementary service).

A.2.2.2 Forwarded-to user with home SwMI being SwMI B, having migrated



**Figure A.1: Interaction with SS-CFU
Forwarded-to user with home SwMI B, having migrated**

If the forwarded-to user home SwMI is SwMI B and if this user has migrated, as illustrated by figure A.1, the ANF-ISIIC originally invoked to establish the call with the called user shall ensure its routing by changing destination, to the forwarded-to user instead of to the called user. This routing shall be done by the ANF normal operation, that is either by re-routing or by forward switching.

NOTE: Compliance with the standards defining SS-CFU implies that SwMI B should support forward switching.

When SwMI C coincides with SwMI A, this shall be identified by the ANF which shall then inform SwMI A call control application about the possible trombone and clear the call attempt. Moreover, the invoked ANF-ISIIC shall also ensure that the routing of this new SS-CFU shall be established with no loop connection (notably no trombone connection) between the originating and the terminating SwMIs if it has previously invoked one or more call diversion supplementary services.

A.2.2.3 Forwarded-to user with home SwMI different from SwMI B, being registered in its home SwMI

The same provisions as in A.2.2.2 shall apply if the home SwMI of the forwarded-to user is different from SwMI B and this user has not migrated.

A.2.2.4 Forwarded-to user with home SwMI different from SwMI B, having migrated

In what follows, the home SwMI of the forwarded-to user (which is different from SwMI B) will be designated as SwMI B_{anf}, with SwMI C designating the SwMI where this user has registered (after having migrated), and SwMI B_{fwd}, the home SwMI of the SS-CFU served user (i.e. the called user). This is illustrated in figure A.2.

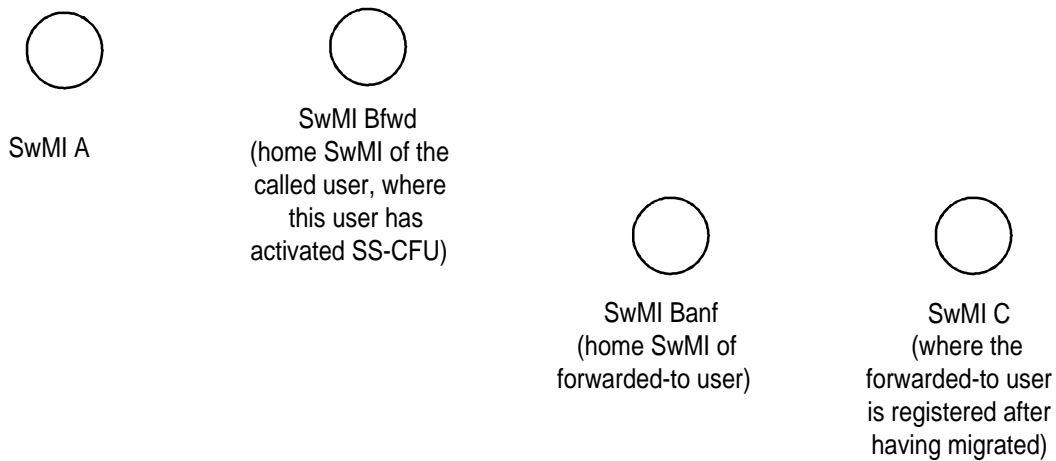


Figure A.2: SwMI identification
Forwarded-to user with home SwMI different from SwMI B, having migrated

Once the ANF-ISIIC originally invoked to route the call to the called user has invoked SS-CFU, except possibly when SwMI C coincides with SwMI B_{fwd}, first, as in the case of A.2.2.2, it shall ensure the routing of the call attempt to SwMI B_{anf} by changing destination, to the forwarded-to user instead of to the called user. Then since the forwarded-to user has migrated and is now registered in SwMI C, this ANF shall complete the routing of the call to the forwarded-to user.

This routing shall be done by the ANF normal operation, that is either by re-routing or by forward switching. However, instead of having the ANF deciding in a single step whether to re-route or forward switch the call (on the basis of information provided by a single SwMI B), the ANF shall operate in two steps, using:

- first the information provided by SwMI B_{fwd} to either re-route the call (from SwMI A) to SwMI B_{anf}, or forward switch it (through SwMI B_{fwd});
- then the information provided by SwMI B_{anf}, to again either re-route (either from SwMI A or from SwMI B_{fwd}, depending on how the first step has been operated) the call or forward switch it (through SwMI B_{anf}).

NOTE: This will result in the call being:

- fully re-routed (from SwMI A) to SwMI C (this case is shown in figure A.3);
- or forward switched both through SwMI B_{fwd} and through SwMI B_{anf};
- or forward switched in SwMI B_{fwd} and (partially) re-routed from SwMI B_{fwd} to SwMI C (this case is shown in figure A.4);
- or re-routed from SwMI A to SwMI B_{anf} and forward switched through SwMI B_{anf}.

Of course, the choice of whether to re-route or forward switch the call may be restricted if SwMI A, SwMI B_{fwd} and SwMI B_{anf} do not support both modes of operation.

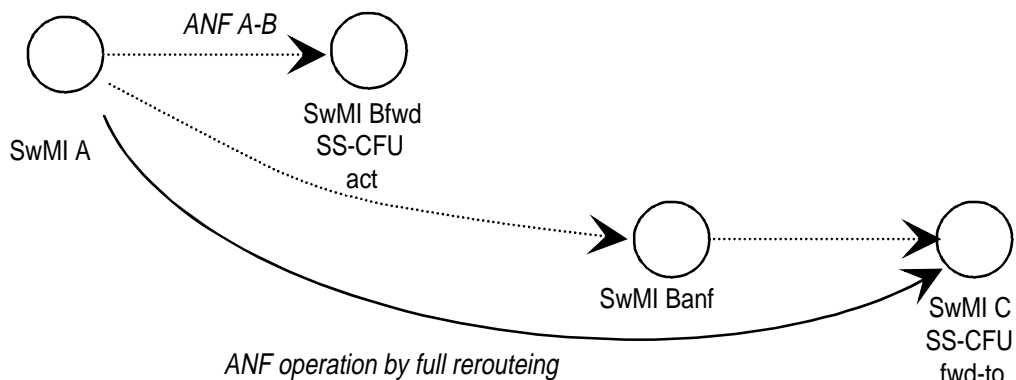


Figure A.3: Interaction with SS-CFU re-routing
 Forwarded-to user with home SwMI different from SwMI B, having migrated
 ANF operation by full re-routing

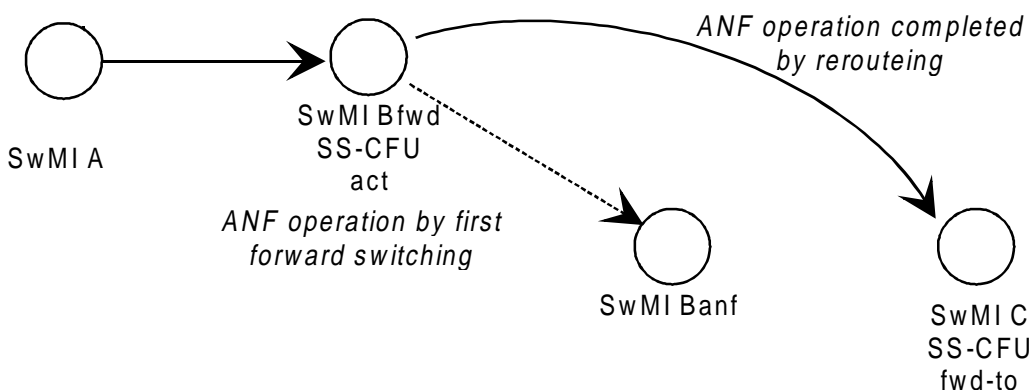


Figure A.4: Interaction with SS-CFU operated by forward switching
 Forwarded-to user with home SwMI different from SwMI B, having migrated
 ANF operation by first forward switching and then re-routing

When SwMI C coincides with SwMI A, this shall be identified by the ANF which shall then ensure that the call shall be established with no loop connection. Moreover, the invoked ANF-ISIIC shall also ensure that this is the case between the originating and the terminating SwMIs if it has previously invoked one or more call diversion supplementary services.

If SwMI C coincides with SwMI B_{fwd} (i.e. the forwarded-to user is registered in SwMI B_{fwd}), whether or not the invoked ANF-ISIIC routes the call attempt first towards SwMI B_{anf} depends on how SwMI B_{fwd} routes calls to called users registered in this SwMI when it is not their home SwMI (i.e. they have migrated).

If SwMI B_{fwd} does not route such calls directly, then the interaction between SS-CFU operation and ANF-ISIIC shall be as specified above, but the invoked ANF shall avoid the trombone that would result from forward switching through SwMI B_{fwd}.

And if it routes such calls directly, then the invoked ANF-ISIIC shall simply ensure the direct routing of SS-CFB (i.e. within SwMI B_{fwd}).

Annex B (normative): Stage 1 description of the interactions of ANF-ISIIC with Call Forwarding on Busy supplementary service (SS-CFB)

B.1 Possible SS-CFB activation

Except for the case of a possible local SS-CFB activation, which is detailed below, if SS-CFB is activated this shall be in the called user home SwMI.

As to the local SS-CFB activation, it may happen when the called user home SwMI is SwMI B (i.e. not SwMI A) and when this user has migrated and is now registered in SwMI A. It shall then only apply for intra-TETRA calls (within SwMI A).

This local SS-CFB activation shall be independent from that in the called user home SwMI (e.g. both can have been activated).

When the called user migrates further, this local activation (in SwMI A) shall be cancelled.

B.2 SS-CFB invocation

Except in the case where the called user home SwMI is SwMI A, and where this user has not migrated (see B.2.1), ANF-ISIIC shall interact with SS-CFB in invoking it. The various possible SS-CFB invocation cases are presented below.

B.2.1 Called user home SwMI being SwMI A

In the case where the called user home SwMI is SwMI A and where this user has activated SS-CFB, if the called user is registered in its home SwMI, SwMI A supplementary service control application shall invoke SS-CFB when it finds the called user busy.

If the called user has migrated, by definition the SwMI where the called user is registered is SwMI B. If SwMI A has invoked ANF-ISIIC (to SwMI B) to route the call to the called user, then the ANF-ISIIC from SwMI A to SwMI B shall invoke SS-CFB if activated and if the called user is found busy.

B.2.2 Called user being registered in its home SwMI, SwMI B being this home SwMI

When the called user home SwMI is SwMI B, if this user has activated SS-CFB, the invoked ANF-ISIIC from SwMI A to SwMI B shall invoke SS-CFB if the called user is found busy.

NOTE: The other solution, of letting SwMI B call control application invoke SS-CFB, was not chosen because it would have resulted in cascading two invoked ANF-ISIICs if the forwarded-to user is registered in some other SwMI, with more complex signalling.

B.2.3 Called user with home SwMI being SwMI B, having migrated

If the called user home SwMI is SwMI B and if this user has migrated, by definition the SwMI where the called user is registered is SwMI C. If SwMI A has invoked ANF-ISIIC (to SwMI B) to route the call to the called user, then this ANF shall invoke SS-CFB if the called user is found busy, except in the special case presented below.

NOTE 1: The call attempt will be cleared by SwMI C call control application with the cause "user found busy", which implies that ANF-ISIIC will not inform SwMI C supplementary service control application about this SS-CFB activation.

NOTE 2: The other solution, of letting SwMI C supplementary service control application invoke SS-CFB, was not chosen because first it would have been more difficult to comply with the logical requirement to operate SS-CFB from SwMI B, the forwarding user home SwMI, and second it would have resulted in cascading two invoked ANF-ISIICs if the forwarded-to user is registered in some other SwMI, with more complex signalling.

In the special case where the called user (has migrated and) is now registered in SwMI A, where it has activated another SS-CFB in SwMI A for intra-TETRA calls and where SwMI A call control application has invoked ANF-ISIIC (to SwMI B) to route the call to the called user, then this ANF shall not invoke the SS-CFB activated in SwMI B. Instead it shall report to SwMI A call control application the information that the called user has migrated and is now registered in SwMI A, and clear the call attempt.

NOTE 3: In such a case, SwMI A supplementary service control application will check whether or not a "local" SS-CFB has been activated for this called user. If yes, when the home SwMI of the forwarded-to user for this "local" SS-CFU is different from SwMI A, this "local" SS-CFU will invoke ANF-ISIIC as defined in B.3.1. If no SwMI A call control application will establish the call to the called user, which would then be an intra-TETRA call.

NOTE 4: The additional condition above (in the last paragraph before note 3) that "the called user has activated another SS-CFB in SwMI A" results in the need for the invoked ANF to check whether a local SS-CFB has been activated before possibly invoking the home SwMI SS-CFB. And if a local SS-CFB has been activated, then, the invoked ANF shall by-pass the invocation of the home SwMI SS-CFB (i.e. if a local SS-CFB has been activated, the home SwMI SS-CFB shall not be invoked for the special case of intra-TETRA calls addressed in this last paragraph before note 3).

NOTE 5: On the other hand another issue arises if SwMI A call control application can route directly (i.e. without invoking ANF-ISIIC) calls to called users registered in this same SwMI when it is not their home SwMI (i.e. they have migrated). This issue is that, if no local SS-CFB has been activated, SwMI A supplementary service control application needs to be informed about the activation of SS-CFB in the called user home SwMI, to invoke it. This is why ANF-ISIMM will ensure that whenever a user which has activated SS-CFB in its home SwMI migrates to another network, the SwMI of this other network will be informed about this SS-CFB activation.

Except for local SS-CFB, the ANF-ISIIC invoked to route the call to the called user shall only route it by forward switching when SS-CFB is active for the called user.

NOTE 6: The latter requirement is to ensure that the invoked ANF-ISIIC invokes SS-CFB in SwMI B - since SwMI B would be by-passed in the case of re-routing.

B.3 SS-CFB operation

The interactions between SS-CFB operation and ANF-ISIIC shall be exactly the same as those between SS-CFU operation and ANF-ISIIC (see clause A2). They are presented below for the sake of completeness - since clause A2 covers the interactions between ANF-ISIIC and both SS-CFU invocation and operation.

These interactions are detailed below, depending on whether the called user home SwMI is SwMI A or SwMI B.

NOTE 1: In all cases addressed below, notification to the SS-CFB served user (which is a subscription option according to the definition of SS-CFB in PISN standards) will be ensured by SS-CFB, by signalling (i.e. without any need to invoke ANF-ISIIC).

B.3.1 Called user home SwMI being SwMI A

In the case where the called user home SwMI is SwMI A and where this user has activated SS-CFB, then the SS-CFB invoked (by SwMI A supplementary service control application) shall simply invoke ANF-ISIIC to forward the call if the forwarded-to user home SwMI is different from SwMI A, except possibly when the forwarded-to user happens to be registered in SwMI A after having migrated.

NOTE 2: When the forwarded-to user is registered in SwMI A after having migrated, whether or not SS-CFB will invoke ANF-ISIIC towards this user home SwMI depends on how SwMI A routes calls to called users registered in this same SwMI when it is not their home SwMI (i.e. they have migrated). If SwMI A routes such calls directly (i.e. without invoking ANF-ISIIC), then SS-CFB will forward the calls directly instead of invoking ANF-ISIIC towards the forwarded-to user home SwMI.

When the forwarded-to user is registered in SwMI A after having migrated, if SS-CFB has invoked ANF-ISIIC (in SwMI A) to forward the call (i.e. SS-CFB has not routed the call directly, as an intra-TETRA call), the possible trombone shall be identified by this invoked ANF which shall then clear the call attempt.

NOTE 3: SS-CFB will then route the call internally.

B.3.2 Called user home SwMI being SwMI B

When the called user home SwMI is SwMI B, the general rule for these interactions is that the originally invoked ANF-ISIIC shall ensure SS-CFB routing (after having invoked it), whether or not the forwarded-to user has migrated. In ensuring this routing, this ANF shall avoid any loop connection. Moreover, the invoked ANF-ISIIC shall also ensure that this is the case between the originating and the terminating SwMIs if it has previously invoked one or more call diversion supplementary services.

NOTE: As illustrated in subclause A.2.2, even when SS-CFB has been invoked while the called user had migrated (see subclause B.2.3), the fact that the routing operation of the invoked ANF-ISIIC had been restricted to forwarded switching (i.e. re-routing was excluded), does not bar to have the call re-routed from SwMI A (as a result of the call forwarding routing operation).

Annex C (informative): Static description of the TETRA individual call bearer service, using attributes

Reformulating the corresponding information defined in ETS 300 392-2 [1] leads to the static description of TETRA bearer service attributes given below using the relevant attributes with the corresponding values as defined in ITU-T Recommendation I.140 [12].

- 1) Information transfer mode: circuit.
- 2) Information transfer rate: from 2,4 kbit/s up to 4 x 7,2 kbit/s (= 28.8 kbit/s) (in the case of data transmission) - see 14.8.2 of ETS 300 392-2 [1].
- 3) Information transfer capability: all TETRA circuit mode bearer and tele- services.
- 4) Structure:
 - for single slot communications: "service data unit integrity" for telephony calls and for end-to-end encrypted data calls, and "unstructured" for other data calls;
 - for multislot communications: "Time Slot Sequence Integrity" (TSSI).

NOTE: According to subclause 4.5.1 of ETS 300 392-2 [1] the air interface time slots comprise 510 bits (possibly only half, in special cases), sent at a data rate of 36 kbit/s (hence a timeslot duration of 14,167 ms). Depending on the type of traffic channel that they carry, these 510 bit time slots carry layer 3 service data units possibly completed by error control bits and interleaved between N time slots of different lengths (e.g. 432 bits for 7,2 kbit/s traffic channel, or 288 bits for 4,8 kbit/s traffic channel). The above statement about the value of the attribute structure in the case of telephony calls and of end-to-end encrypted data calls means that the corresponding layer 3 service data units have to be delivered transparently to the destination access point.

On the other hand, it is clear that the order of the time slots at the air interface should be kept end-to-end in multi-slot communications, hence the structure "TSSI".

- 5) Establishment of communication: demand.
- 6) Symmetry: bi-directional symmetric for duplex operation, and unidirectional for half-duplex operation.
- 7) Communication configuration: point-to-point (since the communication is an individual call).
- 8) Access channel and rate: TDMA timeslot, at a rate of 9 kbit/s.
- 9) Access protocol: air interface protocols for both signalling and user information - as defined in ETS 300 392-2 [1].
- 10) Supplementary services provided: in line with ITU-T Recommendation I.210 [10], the definition of the value of this attribute is under study.
- 11) Quality of service: in line with ITU-T Recommendation I.210 [10], the definition of the value of this attribute is under study.
- 12) Interworking capability: according to ITU-T Recommendation I.140 [12], the possible values of this attribute remain to be defined.
- 13) Operational and commercial aspects: according to ITU-T Recommendation I.140 [12], the possible values of this attribute remain to be defined.

Annex D (informative): Definition of the ISI ROSE operation

Table D.1 reproduces table 10 of ETS 300 392-3-1 [2]. In case of discrepancy, the latter applies.

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

| | |
|--|--|
| TetralsiOperation {ccitt (0) identified-organization (4) etsi (0) tetra(392) isi-encoding-operation(0)} | |
| DEFINITIONS EXPLICIT TAGS ::= | |
| BEGIN | |
| IMPORTS | OPERATION, ERROR FROM Remote-Operations-Notation {joint-iso-ccitt (2) remote-operations (4) notation (0) }; |
| TetralsiMessage | OPERATION -- TETRA ANF-ISI message encoded in the argument |
| ARGUMENT | IsiArgument |
| RESULT | IsiResult |
| ERRORS | { incompleteTetraPDU, requestNotSupported, invalidInfoElement, unspecified} |
| -- Definition of general used data types: | |
| IsiArgument | ::= |
| SEQUENCE | { sourceEntity [0] IMPLICIT AnfSubEntity, destinationEntity [1] IMPLICIT AnfSubEntity, tetraMessage [2] IMPLICIT OCTET STRING, } |
| IsiResult | CHOICE { NULL IsiArgument } |
| incompleteTetraPdu | ERROR PARAMETER ErrorOctetString ::=1 |
| itsiNotRegistered | ERROR ::=2 |
| itsiNotReachable | ERROR ::=3 |
| requestNotSupported | ERROR PARAMETER ErrorRequestNotSupported ::=4 |
| invalidInfoElement | ERROR |

PARAMETER ErrorInvalidInfo

::=5

unspecified ERROR

::= 0

AnfSubEntity ::= ENUMERATED {anfssiss (1), anflsimm (2), anflsiic (3), anflsigc (4), anflsisd (5)}

ErrorOctetString

SEQUENCE {
 octetstring [0] IMPLICIT OCTETSTRING,
 }

ErrorRequestNotSupported

CHOICE {
 mmRequestNotSupported MMRequestNotSupported,
 ssRequestNotSupported SSRequestNotSupported
 }

MMRequestNotSupported [0] IMPLICIT OCTET STRING

SSRequestNotSupported

CHOICE {
 [1] IMPLICIT ListSSNotSupported,
 [2] IMPLICIT ListSSActionNotSupported
 [3] IMPLICIT CombinedSSLListNotSupported
 }

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
 }

CombinedSSLListNotSupported

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

History

| Document history | |
|------------------|--|
| July 1998 | Public Enquiry PE 9846: 1998-07-17 to 1998-11-13 |
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