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Part 12: Supplementary services stage 3;
Sub-part 4: Call Forwarding**

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Foreword

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

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

- Part 1: "General network design";
- Part 2: "Air Interface (AI)";
- Part 3: "Interworking at the Inter-System Interface (ISI)";
- Part 4: "Gateways basic operation";
- Part 5: "Peripheral Equipment Interface (PEI)";
- Part 6: "Line connected Station (LS)";
- Part 7: "Security";
- Part 8: "Network management services";
- Part 9: "General requirements for supplementary services";
- Part 10: "Supplementary services stage 1";
- Part 11: "Supplementary services stage 2";
- Part 12: "Supplementary services stage 3";**
- Part 13: "SDL model of the Air Interface (AI)";
- Part 14: "Protocol Implementation Conformance Statement (PICS) proforma specification".

Proposed transposition dates	
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 draft European Telecommunication Standard (ETS) specifies the stage 3 description of the Supplementary Services CFU Call Forwarding Unconditional, CFB Call Forwarding on Busy, CFNRy Call Forwarding on No Reply and CFNRc Call Forwarding on Not Reachable for the Terrestrial Trunked Radio (TETRA).

SS-CFU, SS-CFB, SS-CFNRy and SS-CFNRc are supplementary services which allow a served user to have a TETRA network send all or specific incoming calls addressed to the served user's TETRA number to another number.

Man-Machine Interface and charging principles are outside the scope of this ETS.

The supplementary service stage 3 description is preceded by the stage 1 and the stage 2 description of the service, according to the method described in CCITT Recommendation I.130 [26]. The stage 1 description specifies the service from the user's point of view. The stage 2 description identifies the functional capabilities of each SS and the information flows needed to support the supplementary service as specified in its stage 1 description. The present stage 3 description specifies the protocols at the air interface and at the various Inter-System Interfaces (ISI) to support each Supplementary Service.

NOTE: According to CCITT Recommendation I.130 [26], the stage 3 description of any telecommunication service addresses the network implementation aspects. Consequently it comprises two steps: the specifications of all protocols at the various reference points involved in any of the service procedures (notably the service operation) are the first step of the stage 3 description, and the specifications of the functions of the corresponding network entities are its second step. The latter have not been provided since they can be derived from the specification of the functional entity actions in the stage 2 description.

This ETS is applicable to Voice plus Data individual call or group call; some parts of this ETS are applicable to SDS (Short Data Service); this ETS is neither applicable to Packet Mode of Operation nor to DMO; more specifically to the following entities:

- the MS/LS of either the calling user or the called user during an individual call or a group call;
- the originating Switching and Management Infrastructure (SwMI) in an individual call or a group call;
- the group controlling SwMI for a group call;
- the terminating SwMI in an individual call;
- the inter-working SwMI for an individual call.

This ETS is based on the latest version of ECMA-174 [1]. Contrary to ECMA-174 [1], this ETS does not define Call Deflection and this ETS distinguishes between the case of No Reply and the case of Not Reachable. Moreover, this ETS defines the protocol in cases of group calls and of mobility not covered by ECMA-174 [1].

This ETS also specifies the signalling protocol for the support of the Forwarding Counter (FC) at the ISI reference point between SwMIs connected together within a TETRA Network.

FC is a feature that limits the number of Call Forwarding that a call set-up request may encounter e.g., to protect the network against indefinite looping. FC is associated to Call Forwarding by Forward Switching, itself associated to Individual Call only. The signalling protocol for FC operates in association with the signalling protocols for basic circuit switched call control (as specified in ETS 300 392-2 [4] or ETS 300 392-3-2 [8]) and call independent (connection oriented) signalling connections (as specified in ETS 300 392-9 [6]).

This ETS also specifies additional signalling protocol requirements for the support of interactions at the ISI reference point between FC and other supplementary services and ANFs. This ETS is applicable to SwMIs that can interconnect to form a TETRA Network.

2 Normative references

This draft 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 draft ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] ECMA-174 (1997): "Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Call Diversion Supplementary Services (QSIG-CF)".
- [2] ITU-T Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means to describe them".
- [3] ITU-T Recommendation Z.100 (1993): "CCITT Specification and description language (SDL)".
- [4] ETS 300 392-2 (1995): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [5] ETS 300 392-10-4 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Sub-part 4: Call diversion".
- [6] ETS 300 392-9 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for supplementary services".
- [7] ETS 300 392-3-1 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 1: General design".
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- [24] CCITT Recommendation X.229 (1988): "Remote operations: Protocol specification".
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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of this ETS the following terms and definitions apply:

Additional network feature: additional Network Feature (ANF) is a capability, over and above that of a basic service, provided by a SwMI, but not directly to a SwMI user.

Busy: TETRA destination is considered to be busy if either a "network determined user busy" NDUB or a "user determined user busy" UDUB condition exists by analogy to ISDN.

Call, basic call: call or basic call is an instance of the use of a basic service.

Call forwarding type: order to distinguish SS-CFU, SS-CFB, SS-CFNRY and SS-CFNRC, the call forwarding type shall be used; the word "type" instead of "procedure" is used to avoid possible confusions with other use of the word "procedures" e.g. signaling procedure, etc...

Connected number: number of the user that answers (User C).

Forwarded-to number: forwarded-to number is the number to which a call is forwarded.

Forwarded-to SwMI: forwarded-to SwMI is the SwMI serving the forwarded-to user.

Forwarded-to user: forwarded-to user is the user to which a call is forwarded.

Forwarding: forwarding is the redirection of a call, on behalf of a called user and prior to answer, to a number different from the number of that called user.

Forwarding counter: counter for the number of call forwarding involved in a call or signalling connection during the establishment phase.

Forwarding from Alert: forwarding from Alert is the type of forwarding invoked from an alerting state.

NOTE 1: Forwarding from Alert can occur as a result of the supplementary services CFNRy as specified in this Standard.

Forwarding Immediate: forwarding Immediate is the type of forwarding invoked prior to reaching the alerting state.

NOTE 2: Forwarding Immediate can occur as a result of the supplementary services CFB and CFU as specified in this Standard.

Forwarding number: forwarding number is the number of the served user.

Forwarding SwMI: forwarding SwMI is the SwMI which executes call forwarding.

NOTE 3: In case of rerouteing, the Forwarding SwMI is either the Originating SwMI or the Incoming Gateway SwMI. In case of forward switching, the Forwarding SwMI is the Terminating SwMI.

Forwarding type: forwarding cause is a parameter which contains the Cause for the forwarding: CFU, CFB, CFNRy, or CFNRc. Called forwarding type in this ETS.

Forwarding user: user for which the call forwarding is invoked; it may be the called user first and then any of the successive forwarded-to users (see also last forwarding user).

Forward switching: network routeing algorithm which performs the rerouteing by joining together the first connection from User A's node to User B's node and a second, new connection from User B's node to User C's node.

Forward Switching SwMI: SwMI which performs the forwarding of the call by joining together the first connection from User A's node to User B's node and a second, new connection from User B's node to User C's node.

Last forwarding user: last forwarding user is the served user from the point of view of the forwarded-to user for a particular stage of call forwarding. In the case of a call subject to a single stage of call forwarding, User B is the last forwarding user from the point of view of User C. In the case of a call subject to multiple stages of call forwarding, user B1 is the last forwarding user from the point of view of user B2, user B2 is the last forwarding user from the point of view of user B3, etc. The served user for the final stage of call forwarding is the last forwarding user from the point of view of User C.

Line Station (LS): physical grouping that contains all the fixed equipment that is used to obtain TETRA services through a line.

Mobile Station (MS): physical grouping that contains all of the mobile equipment that is used to obtain TETRA services. By definition, a mobile station contains at least one Mobile Radio Stack (MRS).

Original called number: original called number is the number of User B (in case of multiple call forwarding user B1).

Original called user: original called user is the first served user of a call which is subject to one or more stages of call forwarding, i.e. User B or B1.

Partial re-routeing: network routeing algorithm which performs the call forwarding by replacing a particular part of the connection from User A's node to User B's node by another connection from User A's node to User C's node.

Re-routeing: network routeing algorithm which performs the call forwarding by replacing the connection from User A's node to User B's node by another connection from User A's node to User C's node.

Served user: served user is the user of a particular SwMI number who is requesting that calls to his number be forwarded. This user may also be referred to as the forwarding user or the called user.

served user SwMI: SwMI where the served user is currently registered. For SS-CF invocation and operation, the served user SwMI is the served user visited SwMI.

Signalling connection: connection used to exchange information between peer supplementary service protocol control entities independently of a basic call.

supplementary service: any service provided by a network in addition to its basic service or services (defined in CCITT Recommendation Q.9 [22]). A supplementary service modifies or supplements a basic telecommunication service. Consequently, it cannot be offered to a customer as a stand alone service. It must be offered together with or in association with a basic telecommunication service (excerpt from ITU-T Recommendation I.210 [2]).

Switching and Management Infrastructure (SwMI): all of the TETRA equipment for a Voice plus Data (V+D) network except for subscriber terminals. The SwMI enables subscriber terminals to communicate with each other via the SwMI.

SwMI number: SwMI number is a number belonging to a SwMI numbering plan (ITSI or GTSI).

tele-service: type of telecommunications service that provides the complete capability, including terminal equipment functions, for communication between users according to agreed protocols.

User A: user A is the calling user of a call which is subject to call forwarding.

User B: user B is the served (forwarding) user of a call which is subject to call forwarding.

User B1, user B2, user B3, etc.: these are the served (forwarding) users of a call which are subject to multiple stages of forwarding. B1 is the first served user, B2 is the second served user, B3 is the third served user, etc.

NOTE 4: B2 is also the forwarded-to user with respect to the first stage of call forwarding, B3 is also the forwarded-to user with respect to the second stage of call forwarding, etc.

User C: user C is the forwarded-to user with respect to the final stage of call forwarding.

3.2 Symbols

For the purposes of this ETS, there are no other symbols than those defined by SDL ITU-T Recommendation Z.100 [3].

3.3 Abbreviations

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

ANF	Additional Network Feature
ANF-FC	Additional Network Feature Forwarding Counter
APDU	Application Protocol Data Unit
CFA	Call Forwarding Activating
CFD	Call Forwarding Deactivating
CFF	Call Forwarding Forwarded-to
CFI	Call Forwarding Immediate
CFI	Call Forwarding Interrogating
CFO	Call Forwarding Originating
CFR	Call Forwarding Re-routeing
CFS	Call Forwarding Served User
GC	Group Call
GTSI	Group TETRA Subscriber Identity
IC	Individual Call
ISDN	Integrated Services Digital Network
ISI	Inter System Interface
ITSI	Individual TETRA Subscriber Identity
LS	Line Station
MS	Mobile Station
NDUB	Network Determined User Busy
NRc	Not Reachable
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
ROSE	Remote Operations Service Element
SDL	Specification and Description Language
SS	Supplementary Service

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

SwMI	Switching and Management Infrastructure
TE	Terminal Equipment
TETRA	TErrestrial Trunked Radio
UDUB	User Determined User Busy
V+D	Voice Plus Data

3.1 Supplementary service abbreviations

AP	Access Priority
BIC	Barring of Incoming Calls
BOC	Barring of Outgoing Calls
CAD	Call Authorized by Dispatcher
CCBS	Call Completion to Busy Subscriber (TETRA)
CCNR	Call Completion on No Reply (TETRA)
CF	Call Forwarding
CFB	Call Forwarding on Busy
CFNR	Call Forwarding on No Reply (generic for both CFNRy and CFNRc)
CFNRc	Call Forwarding on Not Reachable
CFNRy	Call Forwarding on No Reply
CFU	Call Forwarding Unconditional
CLIR	Calling/Connected Line Identification Restriction
COLP	COnnected Line Identification Presentation
COLR	COnnected Line Identification Restriction
CW	Call Waiting
DL	Discreet Listening
IC	Include Call
SNA	Short Number Addressing

4 Signalling protocol for the support of SS-CF

4.1 SS-CF description

SS-CFU enables a served user to have the SwMI redirect to another user, calls which are addressed to the served user's SwMI number. SS-CFU may operate on all calls or just those associated with specified basic services. The served user's ability to originate calls is unaffected by SS-CFU. After CFU has been activated calls are forwarded independently of the status of the served user.

SS-CFB enables a served user to have the SwMI redirect to another user, calls which are addressed to the served user's SwMI number and meet busy. SS-CFB may operate on all calls or just those associated with specified basic services. The served user's ability to originate calls is unaffected by SS-CFB.

SS-CFNRY enables a served user to have the SwMI redirect to another user, calls which are addressed to the served user's SwMI number, and for which the connection is not established within a predefined period of time. SS-CFNRY may operate on all calls or just those associated with specified basic services. The served user's ability to originate calls is unaffected by SS-CFNRY.

SS-CFNRC enables a served user to have the SwMI redirect to another user, calls which are addressed to the served user's SwMI number and meet Not Reachable. SS-CFNRC may operate on all calls or just those associated with specified basic services. The served user's ability to originate calls is unaffected by SS-CFNRC when the served user becomes reachable again.

The maximum number of forwarding to a single call is an implementation option. When counting the number of forwarding, all types of forwarding shall be included.

4.1.1 FC description

FC is invoked when it is desired to limit the number of Call Forwarding that a call set-up request may encounter. FC may be used in conjunction with either a Basic call set-up request or a set-up request for a call independent (connection oriented) signalling connection.

Use of FC is mandatory for a TETRA network. The criteria for determining:

- when FC should be invoked;
- the number of Call Forwarding that a call may encounter; and
- the means by which the feature is activated or deactivated.

are network dependent and outside the scope of this ETS. These supplementary services are applicable to all individual calls basic services defined in ETS 300 392-2 [4]. SS-CFNRY and SS-CFNRC are not applicable to group calls. Moreover, SS-CFU is also applicable to SDS.

4.2 SS-CF services offered over the TNSS-SAP

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

NOTE 1: As this document only deals with the SS-CF all the service primitives have been shown without a TNSS-CF-prefix e.g. the TNSS-CF-REQUEST request is shorten into a request.

NOTE 2: As man-machine interface or User A MS/LS applications are outside the scope of this standard service primitives are used to define information exchange to and from the standardized part of the MS/LS. Those primitives may be only indirectly accessible.

NOTE 3: Those primitives apply also to SS-CFU for SDS.

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

- INFORM 2 indication;
- INFORM 8 indication;
- INFORM 9 indication;
- ENABLE request;
- ENABLE ACK indication;
- DISABLE request;
- DISABLE ACK indication.

The SS-CF service primitives for the authorized user (including the served user) at the MS/LS TNSS-SAP shall be:

- ACTIVATE request;
- ACTIVATE ACK indication;
- DEACTIVATE request;
- DEACTIVATE ACK indication;
- INTERROGATE request;
- INTERROGATE ACK indication.

The SS-CF service primitives for any forwarded-user at the MS/LS TNSS-SAP shall be:

- DEACTIVATE request;
- DEACTIVATE ACK indication.

NOTE 4: EEC Requirement.

- INFORM 5 indication.

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

- INFORM7 indication.

NOTE 5: The following information flows do not appear at the MS/LS TNSS-SAP:

- FORWARD;
- FORWARD ACK;
- REPORT;
- INFORM 1;
- INFORM 6.

4.2.1 ACTIVATE request

The ACTIVATE request primitive shall be sent by the Authorized User MS/LS to the MS/LS CMCE application over TNSS-SAP to activate the proper call forwarding type with the parameters needed to invoke SS-CF.

The ACTIVATE request primitive shall contain the SS-CF parameters listed in table 1.

Table 1: Parameters for the primitive ACTIVATE request

Parameter	Request
Forwarding Type	M
Forwarded-to User Number for Basic Service	M
Basic Service Information	M
Served User Number	C (note 1)
Authorized User Number	O (notes 1 and 2)
NOTE 1: This service element shall only be included in the case of activation by an authorized user different from the served user.	
NOTE 2: The Authorized user is in that case the activating user.	

4.2.2 ACTIVATE ACK indication

The ACTIVATE ACK indication primitive shall be sent by the MS/LS CMCE application to the Authorized User MS/LS over TNSS-SAP to either confirm or infirm activation of the proper call forwarding type with the parameters needed to invoke SS-CF.

The ACTIVATE ACK indication primitive shall contain the SS-CF parameters listed in table 2.

Table 2: Parameters for the primitive ACTIVATE ACK indication

Parameter	Indication
Forwarding Type	M
Forwarded-to User Number for Basic Service	M
Basic Service Information	M
Served User Number	M
Activation Request Result	M
Cause for rejection	O (note 1)
Authorized User Number	O (note 2)
NOTE 1:	This parameter shall only be included in case of rejection.
NOTE 2:	This parameter shall only be included in the case of activation by an authorized user different from the served user.

4.2.3 DEACTIVATE request

The DEACTIVATE request primitive shall be sent by the Authorized User MS/LS to the MS/LS CMCE application over TNSS-SAP to deactivate the proper call forwarding type with the proper parameters used to activate SS-CF.

The DEACTIVATE request primitive shall contain the SS-CF parameters listed in table 3.

Table 3: Parameters for the primitive DEACTIVATE request

Parameter	Request
Forwarding Type	M
Basic Service Information	M
Served User Number	M
Deactivating User Number	O (note)
NOTE:	This service element shall only be included in the case of deactivation by an authorized user different from the served user.

4.2.4 DEACTIVATE ACK indication

The DEACTIVATE ACK indication primitive shall be sent by the MS/LS CMCE application to the Authorized User MS/LS over TNSS-SAP to either ACK indication or infirm deactivation of the proper call forwarding type with the parameters used to activate SS-CF.

The DEACTIVATE ACK indication primitive shall contain the SS-CF parameters listed in table 4.

Table 4: Parameters for the primitive DEACTIVATE ACK indication

Parameter	Indication
Forwarding Type	M
Basic Service Information	M
Served User Number	M
Deactivation Request Result	M
Cause for rejection	O (note 1)
Deactivating User Number	O (note 2)
NOTE 1:	This parameter shall only be included in case of rejection.
NOTE 2:	This parameter shall only be included in the case of activation by an authorized user different from the served user.

4.2.5 DISABLE request

The DISABLE request primitive shall be sent by the Served User MS/LS to the MS/LS CMCE application over TNSS-SAP to disable the capability of activation and deactivation of the call forwarding type by an authorized user.

The DISABLE request primitive shall contain the SS-CF parameters listed in table 5.

Table 5: Parameters for the primitive DISABLE request

Parameter	Request
Forwarding Type	M
Basic Service Information	M
Authorized User Number	M

4.2.6 DISABLE ACK indication

The DISABLE ACK indication primitive shall be sent by the MS/LS CMCE application to the Served User MS/LS over TNSS-SAP to either confirm or infirm disabling of the capability to activate call forwarding type.

The DISABLE ACK indication primitive shall contain the SS-CF parameters listed in table 6.

Table 6: Parameters for the primitive DISABLE ACK indication

Parameter	Indication
Forwarding Type	M
Basic Service Information	M
Authorized User Number	M (note 2)
Disable Request Result	M
Cause for rejection	O (note 1)
NOTE 1:	This parameter shall only be included in case of rejection.
NOTE 2:	The number of the authorized user for which disabling of activation/deactivation capability is requested.

4.2.7 ENABLE request

The ENABLE request primitive shall be sent by the Served User MS/LS to the MS/LS CMCE application over TNSS-SAP to enable activation/deactivation capability of the proper call forwarding type by the proper authorized user with the parameters needed to invoke SS-CF.

The ENABLE request primitive shall contain the SS-CF parameters listed in table 7.

Table 7: Parameters for the primitive ENABLE request

Parameter	Request
Forwarding Type	M
Basic Service Information	M
Authorized User Number	M

4.2.8 ENABLE ACK indication

The ENABLE ACK indication primitive shall be sent by the MS/LS CMCE application to the Served User MS/LS over TNSS-SAP to either confirm or infirm activation/deactivation of the proper call forwarding Type with the parameters needed to invoke SS-CF.

The ENABLE ACK indication primitive shall contain the SS-CF parameters listed in table 8.

Table 8: Parameters for the primitive ENABLE ACK indication

Parameter	Indication
Forwarding Type	M
Basic Service Information	M
Authorized User Number	M
Enable Request Result	M
Cause for rejection	O (note)
NOTE: This parameter shall only be included in case of rejection.	

4.2.9 INFORM 2 indication

The INFORM 2 indication primitive shall be sent by the MS/LS CMCE to the Calling User A MS/LS application over TNSS-SAP to indicate call forwarding.

The INFORM 2 indication primitive shall contain the SS-CF parameters listed in table 9.

Table 9: Parameters for the primitive INFORM 2 indication

Parameter	Indication
TETRA Call Identifier	M
Call Forwarded	M

4.2.10 INFORM 5 indication

This INFORM5 indication primitive indicates to the forwarded-to user that call forwarding is taking place.

The INFORM 5 indication primitive shall contain the SS-CF parameters listed in table 10.

Table 10: Parameters for the primitive INFORM 5 indication

Parameter	Indication
Original Forwarding Type	M
Last Forwarding Type	M
Forwarding User Number (Served User Number)	M
Basic Service Information	M
Originating User Number	O (note 1 and 2)
Original Called User Number	O (note 1 and 2)
NOTE 1: This parameter shall not be included in case of CFNRy.	
NOTE 2: This parameter shall only be included if allowed by the previous served user(s).	

4.2.11 INFORM 7 Indication

The INFORM7 Indication Primitive indicates to the Calling User the final destination (user C) number when appropriate.

The INFORM 7 indication primitive shall contain the SS-CF parameters listed in table 11.

Table 11: Parameters for the primitive INFORM 7 indication

Parameter	Indication
Forwarded-to User Number for Basic Service	M

4.2.12 INFORM 8 indication

The INFORM 8 indication primitive shall indicate to the called user (served user B) that SS-CF has been activated.

The INFORM 8 indication primitive shall contain the SS-CF parameters listed in table 12.

Table 12: Parameters for the primitive INFORM 8 indication

Parameter	Indication
Forwarding Type	M
Forwarded-to User Number for Basic Service	M
Basic Service Information	M

4.2.13 INFORM 9 indication

The INFORM 9 indication primitive shall indicate to the called user (served user B) that SS-CF has been activated.

The INFORM 9 indication primitive shall contain the SS-CF parameters listed in table 13.

Table 13: Parameters for the primitive INFORM 9 indication

Parameter	Indication
Forwarding Type	M
Basic Service Information	M

4.2.14 INTERROGATE request

The INTERROGATE request primitive shall be sent by the Authorized User MS/LS to the MS/LS CMCE application over TNSS-SAP to get the activation status for a given user and the corresponding definition of the proper call forwarding type with the parameters needed to invoke SS-CF.

The INTERROGATE request primitive shall contain the SS-CF parameters listed in table 14.

Table 14: Parameters for the primitive INTERROGATE request

Parameter	Request
Forwarding Type	M
Basic Service Information	M
Served User Number	O (note)
Interrogating User Number	O (note)
NOTE:	This parameter shall only be included in the case of interrogation by an authorized user different from the served user.

4.2.15 INTERROGATE ACK indication

The INTERROGATE ACK indication primitive shall provide to the interrogating user the SS-CF status information it requested.

The INTERROGATE ACK indication primitive shall contain the SS-CF parameters listed in table 15.

Table 15: Parameters for the primitive INTERROGATE ACK indication

Parameter	Indication
Forwarding Type	M
Basic Service Information	M
Served User Number	O (note 1)
Interrogating User Number	O (note 2)
Interrogation Request Result	M
Forwarded-to User Number for Basic Service	O (note 3)
Authorized User Activation/Deactivation	O (note 3)
NOTE 1:	This service element shall only be included in the case of interrogation by an authorized user different from the served user.
NOTE 2:	This service element shall only be included in the case of interrogation by an authorized user different from the served user.
NOTE 3:	This service element shall only be included if call forwarding is activated. It may be repeated, if INTERROGATE indicated " all basic services".

4.3 Parameter description

- Activation Request Result;
- Accepted;
- Rejected.

- Authorized User Activation/Deactivation;
- Authorized for activation;
- Non authorized for activation;
- Authorized for deactivation;
- Non authorized for deactivation.

- Authorized User Number;
- ITSI.

- Basic Service Information;
- speech;
- data;
- both speech and data.

NOTE: "Speech service requested" is not a primitive parameter for activation/invocation of SS-CF.

- Call Forwarded;
- Notification of call forwarded;
- No notification of call forwarded.

- Cause for rejection;
- insufficient information;
- no valid forwarded-to number;
- user not subscribed;
- not available;
- invalid served user number;
- resource unavailable;
- supplementary service interaction not allowed;
- special service number;
- forwarding to served user number;
- temporarily unavailable;
- basic service not subscribed;
- unspecified;
- number of forwarding exceeded;
- served user not allowed to activate outside home SwMI.

- Deactivating User Number;
- ITSI.

- Deactivation Request Result;
- Accepted;
- Rejected.

- Disable Request Result;
- Accepted;
- Rejected.

- Disabling User Number;
- ITSI.

- Enable Request Result;
- Accepted;
- Rejected.

- Forwarded-to User Number for Basic Service;
- ITSI;
- GTSI;
- External Subscriber Number.

- Forwarding Type ;
- CFU;
- CFB;
- CFNRy;
- CFNRc;

- Forwarding User Number (Served User Number);
- ITSI;
- GTSI;
- External subscriber number.

- Forwarding Type;
- CFU;
- CFB;
- CFNRy;
- CFNRc.

- Interrogating User Number;
- ITSI.

- Interrogation Request Result;
- Accepted;
- Rejected.

- Last Forwarding Type ;
- CFU;
- CFB;
- CFNRy;
- CFNRc;
- Mobility management;
- Unknown.

- Last Forwarding User Number including restriction indicator;
- ITSI;
- GTSI;
- External Subscriber Number.

- Presentation of number allowed;
- Presentation of number not allowed.

- No notification to calling user;
- Notification without forwarded-to number;
- Notification with forwarded-to number.

- Original Called User Number;
- ITSI;
- GTSI;
- External Subscriber Number.

- Original Called User Number including restriction indicator;
- ITSI;
- GTSI;
- External Subscriber Number.

- Presentation of number allowed;
- Presentation of number not allowed.

- Original Forwarding Type ;
- CFU;
- CFB;
- CFNRy;
- CFNRc;
- Mobility Management;
- Unknown.

- Originating User Number;
- ITSI;
- GTSI;
- External Subscriber Number.

- Originating User Number including restriction indicator;
- ITSI;
- GTSI;
- External Subscriber Number.

- Served User Number;
- ITSI;
- GTSI;
- External Subscriber Number.

- TETRA Call Identifier.

5 Signaling procedures for the support of SS-CF

5.1 SS-CF Operational requirements

5.1.1 Requirements on the Originating SwMI

Call establishment procedures for the outgoing side of an ISI link and call release procedures, as specified in ETS 300 392-3-2 [8] for Individual Calls and ETS 300 392-3-3 [9] in the case of SS-CFU and SS-CFB for Group Calls, shall apply.

Generic procedures for the call related control of supplementary services, as specified in ETS 300 392-3-1 [7] for an Originating SwMI, shall apply. In addition, the generic procedures for notification, as specified in ETS 300 392-9 [6] for an Originating SwMI, shall apply.

5.1.2 Requirements on the Served User SwMI

Call establishment for the incoming side of an inter-SwMI link and call release procedures, as specified in ETS 300 392-3-1 [7] for Individual Calls and ETS 300 392-3-3 [9] in the case of SS-CFU and SS-CFB for Group Calls, shall apply.

Generic procedures for the call related control of supplementary services, as specified in ETS 300 392-3-1 [7] for an Terminating SwMI, shall apply.

Generic procedures for the call independent control (connection orientated) of supplementary services, as specified in ETS 300 392-3-1 [7] for a Terminating SwMI, shall apply if the remote activation, deactivation or interrogation procedure is supported.

Generic procedures for the call independent control (connection orientated) of supplementary services, as specified in ETS 300 392-3-1 [7] for an Originating SwMI, shall apply if the procedure for verification of the forwarded-to number is supported.

5.1.3 Requirements on the Forwarded-to SwMI

Call establishment for the incoming side of an inter-SwMI link and call release procedures, as specified in ETS 300 392-3-2 [8] for Individual Calls and ETS 300 392-3-3 [9] in the case of SS-CFU and SS-CFB for Group Calls, shall apply.

Generic procedures for the call related control of supplementary services, as specified in ETS 300 392-3-1 [7] for a Terminating SwMI, shall apply.

Generic procedures for the call independent control (connection orientated) of supplementary services, as specified in ETS 300 392-3-1 [7] for a Terminating SwMI, shall apply if the procedure for verification of the forwarded-to number is supported.

5.1.4 Requirements on the Re-routeing SwMI

Call establishment for the outgoing and incoming side of an inter-SwMI link and call release procedures, as specified in ETS 300 392-3-2 [8] for Individual Calls and ETS 300 392-3-3 [9] in the case of SS-CFU and SS-CFB for Group Calls, shall apply.

Generic procedures for the call related control of supplementary services, as specified in ETS 300 392-3-1 [7] for an End SwMI, shall apply.

5.1.5 Requirements on a Forward Switching SwMI

Basic call procedures for call establishment and call clearing at a Forward Switching SwMI, as specified in ETS 300 392-3-2 [8] for Individual Calls.

Generic procedures for the call related control and call independent control (connection oriented) of supplementary services, as specified in ETS 300 392-3-1 [7] for a Forward Switching SwMI, shall apply. In addition, the generic procedures for notification, as specified in ETS 300 392-9 [6] for a Forwarding SwMI, shall apply.

5.1.6 Requirements on the Activating SwMI

Generic procedures for the call independent control (connection orientated) of supplementary services, as specified in ETS 300 392-9 [6] for an Originating SwMI, shall apply.

5.1.7 Requirements on the Deactivating SwMI

Generic procedures for the call independent control (connection orientated) of supplementary services, as specified in ETS 300 392-9 [6] for an Originating SwMI, shall apply.

5.1.8 Requirements on the Interrogating SwMI

Generic procedures for the call independent control (connection orientated) of supplementary services, as specified in ETS 300 392-9 [6] for an Originating SwMI, shall apply.

5.2 SS-CF Coding requirements

5.2.1 SS-CF PDUs

The information contained in the following description tables correspond to the following key:

- Length: length of the sub-argument in bits;
- Type: element type (1, 2 or 3) described in subclause 14.7 of ETS 300 392-2 [4];
- C/O/M: conditional/optional/mandatory;
- Remark: comment or reference to note(s).

5.2.1.1 ACTIVATE

The ACTIVATE PDU is sent by the authorized User A MS/LS application to the served user home SwMI to activate of SS-CF. In the case where the authorized user is the served user, this PDU is sent to the served user home SwMI.

- NOTE: It is assumed that both the served user and the eventual authorized user are not external subscribers to TETRA.

ACTIVATE PDU shall contain the SS-CF information elements described in table 16.

Table 16: ACTIVATE PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	ACTIVATE
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	
Forwarded-to user SSI	24	1	M	
Forwarded-to user extension	24	1	M	
External number length indicator	5	1	M	
External subscriber number	variable	1	C	note 2
Served user SSI	24	1	M	
Served user extension	24	1	M	
Activation by Served User	1	1	M	
Authorized user SSI	24	1	C	note 1
Authorized user extension	24	1	C	note 1
NOTE 1: Shall be present in case of activation by user different from served user.				
NOTE 2: Shall be present if the external number length indicator is non zero.				

5.2.1.2 ACTIVATE ACK

The ACTIVATE ACK PDU is sent to the authorized User A MS/LS application from the served user home SwMI through the authorized user home SwMI to either accept activation of SS-CF or to reject activation of SS-CF with a reject cause. In the case where the authorized user is the served user, this PDU is sent from the served user SwMI to the served user MS/LS application.

ACTIVATE ACK PDU shall contain the SS-CF information elements described in table 17.

Table 17: ACTIVATE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	ACTIVATE ACK
Call Forwarding Type	2	1	M	
Forwarded-to user SSI	24	1	M	
Forwarded-to user extension	24	1	M	
External number length indicator	5	1	M	
External subscriber number	variable	1	C	
Basic Service Information	2	1	M	
Served user SSI	24	1	M	
Served user extension	24	1	M	
Authorized user SSI	24	1	C	note 2
Authorized user extension	24	1	C	note 2
Accept/Reject	1	1	M	
Reject Cause	4	1	C	note 1
NOTE 1: Shall be conditional upon accept/reject element value.				
NOTE 2: Shall be present when activating user is different from served user.				

5.2.1.3 DEACTIVATE

The DEACTIVATE PDU is sent by the authorized User A MS/LS application to the served user home SwMI to deactivate SS-CF. In the case where the authorized user is the served user, this PDU is sent to the served user home SwMI.

NOTE: Any forwarded-to user may act as an authorized user for the deactivation of call forwarding procedures and for basic services where this user is a forwarded-to user.

DEACTIVATE PDU shall contain the SS-CF information elements described in table 18.

Table 18: DEACTIVATE PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	DEACTIVATE
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	
Served user SSI	24	1	M	
Served user extension	24	1	M	
Authorized user SSI	24	1	C	note 2
Authorized user extension	24	1	C	note 2
Deactivating User Type	2	1	M	notes 1 and 3
NOTE 1:	Shall not be present at the air interface; shall be present over ISI.			
NOTE 2:	Shall be present when the deactivating user is different from the served user.			
NOTE 3:	Indicates whether the deactivating user is the served user, a permanent authorized user or a temporary authorized user (forwarded-to user).			

5.2.1.4 DEACTIVATE ACK

The DEACTIVATE ACK PDU is sent to the authorized User A MS/LS application from the served user home SwMI to either accept deactivation of SS-CF or to reject deactivation of SS-CF with a reject cause. In the case where the authorized user is the served user, this PDU is sent from the served user home SwMI to the served user MS/LS application.

DEACTIVATE ACK PDU shall contain the SS-CF information elements described in table 19.

Table 19: DEACTIVATE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	DEACTIVATE
Call Forwarding Type	2	1	M	
Forwarded-to user SSI	24	1	M	
Forwarded-to user extension	24	1	M	
External number length indicator	5	1	M	note 1
External subscriber number	variable	1	C	note 1
Basic Service Information	2	1	M	
Served user SSI	24	1	M	note 1
Served user extension	24	1	M	note 1
Authorized user SSI	24	1	C	note 3
Authorized user extension	24	1	C	note 3
Deactivating User Type	2	1	M	notes 2 and 4
Accept/Reject	1	1	M	
Reject Cause	4	1	C	
NOTE 1:	Shall be present in case external number length indicator is non zero.			
NOTE 2:	Shall not appear at the air interface; shall appear over ISI.			
NOTE 3:	Shall be present if authorized user is different from served user.			
NOTE 4:	Indicates whether deactivating user was the served user, a permanent authorized user or a temporary authorized user (forwarded-to user).			

5.2.1.5 DISABLE

The DISABLE PDU is sent by the Served User A MS/LS application to its home SwMI to disable the activation/deactivation capability of an authorized user for SS-CF.

NOTE: A served user cannot disable itself and cannot be disabled by another authorized user, a served user can disable either a specific authorized user or all authorized users.

DISABLE PDU shall contain the SS-CF information elements described in table 20.

Table 20: DISABLE PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	DISABLE
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	
Authorized user SSI	24	1	M	notes 1, 2 and 3
Authorized user extension	24	1	M	
NOTE 1: Only the served user can disable; disabling by an authorized user is outside the scope of this ETS.				
NOTE 2: A dummy authorized user address such as all 0's shall indicate disabling of all authorized user for that type and that basic service.				
NOTE 3: A served user cannot disable itself.				

5.2.1.6 DISABLE ACK

The DISABLE ACK PDU is sent to the Served User A MS/LS application from its home SwMI to either confirm or infirm activation/deactivation disabling of a specific authorized user for SS-CF. This PDU is the expected response to the DISABLE PDU.

DISABLE ACK PDU shall contain the SS-CF information elements described in table 21.

Table 21: DISABLE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	DISABLE ACK
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	
Authorized user SSI	24	1	M	notes 1 and 3
Authorized user extension	24	1	M	notes 1 and 3
Accept/Reject	1	1	M	
Reject Cause	4	1	C	note 2
NOTE 1: Shall be different from the served user address.				
NOTE 2: Shall be present in case of reject of the disable operation.				
NOTE 3: A dummy authorized user address such as all 0's shall indicate disabling of all authorized user for that type and that basic service.				

5.2.1.7 ENABLE

The ENABLE PDU is sent by the Served User A MS/LS application to its home SwMI to enable the activation/deactivation capability of either a specific authorized user or all authorized users for SS-CF.

NOTE: A served user cannot enable itself; a served user is assumed to be always enabled. A served user can enable either a specific authorized user or all authorized users.

ENABLE PDU shall contain the SS-CF information elements described in table 22.

Table 22: ENABLE PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	ENABLE
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	
Authorized user SSI	24	1	M	notes 1, 2 and 3
Authorized user extension	24	1	M	
NOTE 1:	Only the served user shall be able to enable SS-CF activation by an authorized user.			
NOTE 2:	ENABLE enables both SS-CF activation and SS-CF deactivation by the same authorized user.			
NOTE 3:	In ECMA-173, the ENABLE corresponds to enabling of activation by a remote user different from the served user.			

5.2.1.8 ENABLE ACK

The ENABLE ACK PDU is sent to the Served User A MS/LS application from its home SwMI to either confirm or infirm activation/deactivation enabling of a specific authorized user for SS-CF. This PDU is the expected response to the ENABLE PDU.

ENABLE ACK PDU shall contain the SS-CF information elements described in table 23.

Table 23: ENABLE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	ENABLE ACK
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	
Authorized user SSI	24	1	M	notes 1, 2 and 3
Authorized user extension	24	1	M	notes 1, 2 and 3
Accept/Reject	1	1	M	
Reject Cause	4	1	C	note 4
NOTE 1:	Only the served user shall be able to enable SS-CF activation by an authorized user.			
NOTE 2:	ENABLE enables both SS-CF activation and SS-CF deactivation by the same authorized user.			
NOTE 3:	In ECMA-173, the ENABLE corresponds to enabling of activation by a remote user different from the served user.			
NOTE 4:	Shall be present in case of rejection of the enable operation.			

5.2.1.9 FORWARD

See Annex B.

5.2.1.10 FORWARD ACK

See Annex B.

5.2.1.11 INFORM 1

The INFORM 1 PDU is sent from the Served User SwMI to the originating SwMI; in the case of call forwarding by rerouteing, this PDU shall be internal to the originating SwMI and shall not appear on an ISI link; in the case of call forwarding by forward switching, this PDU shall be sent from the Served User SwMI to the Originating SwMI.

INFORM 1 PDU shall contain the SS-CF information elements described in table 24.

Table 24: INFORM 1 PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INFORM 1
Call Forwarding Type	2	1	M	
Forwarded-to user ITSI	48	1	M	
Number of external subscriber number digits	5	1	M	note 3
External subscriber number digit	4	1	C	notes 1 and 3
External subscriber number parameter	9	1	C	notes 2 and 3
NOTE 1: Shall be repeated when number of external subscriber digits non zero.				
NOTE 2: Shall be present when number of external subscriber number digit non zero.				
NOTE 3: Applies to the case of an external forwarded-to user.				

5.2.1.12 INFORM 2

The optional INFORM 2 PDU is sent by the originating SwMI to the calling User A MS/LS application depending on the subscription options of SS-CF.

INFORM 2 PDU shall contain the SS-CF information elements described in table 25.

NOTE: The content of this PDU could also be sent from any SwMI which supports SS-CF in a call related notification.

Table 25: INFORM 2 PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INFORM 2
Call Forwarding Type	2	1	M	

5.2.1.13 INFORM 4

The INFORM 4 PDU is sent from the Forwarding SwMI to the Forwarded-to SwMI; in the case of call forwarding by rerouteing, this PDU shall be sent from the Originating SwMI to the Forwarded-to SwMI; in the case of call forwarding by forward switching, this PDU shall be sent from the Served User SwMI to the forwarded-to User SwMI.

INFORM 4 PDU shall contain the SS-CF information elements described in table 26.

NOTE: This PDU is not planned to be used to indicate call forwarding due to migration.

Table 26: INFORM 4 PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INFORM 4
Last Call Forwarding Type	2	1	M	note 1
Original Call Forwarding Type	2	1	M	
Original called user ITSI	48	1	M	
Last Forwarding user ITSI	48	2	O	note 2
NOTE 1: May be identical to original call forwarding type.				
NOTE 2: In case of multiple forwarding.				

5.2.1.14 INFORM 5

The INFORM 5 PDU is sent by the User C SwMI to the User C MS/LS application to indicate that the call it is receiving is a redirected call. Depending upon the subscription option of the last forwarding (served) user, the forwarded-to user shall or shall not received the last forwarding (served) user number.

INFORM 5 PDU shall contain the SS-CF information elements described in table 27.

Table 27: INFORM 5 PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INFORM 5
Last Call Forwarding Type	2	1	M	
Original Call Forwarding Type	2	1	M	
Original Called User ITSI	48	1	M	
Last Forwarding user ITSI	48	1	C	

5.2.1.15 INFORM 6

The INFORM 6 PDU is sent from the Forwarded-to SwMI to the Originating SwMI regardless of the mode of call forwarding (rerouting or forward switching).

INFORM 6 PDU shall contain the SS-CF information elements described in table 28.

Table 28: INFORM 6 PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INFORM 6
Call Forwarding Type	2	1	M	
NOTE 1: Applies only to the presentation of the finally connected user C.				
NOTE 2: The presentation allowed indicator is contained in the basic call coding and is not coded in this PDU.				

5.2.1.16 INFORM 7

The INFORM 7 PDU is sent to the Calling User A MS/LS application from its originating SwMI.

The content of INFORM 7 is composed of the INFORM2 PDU and the notification that SS-COLP has been invoked.

5.2.1.17 INFORM 8

The INFORM 8 PDU is sent to the served User A MS/LS application from its home SwMI to indicate activation of SS-CF.

INFORM 8 PDU shall contain the SS-CF information elements described in table 29.

NOTE: This PDU is sent in the case where the activation is done by an authorized user different from the served user.

Table 29: INFORM 8 PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INFORM 8
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	
Forwarded-to user ITSI	48	1	M	
Number of external subscriber number digits	5	1	M	
External subscriber number digit	4	1	C	note 1
External subscriber number parameter	9	1	C	note 2
NOTE 1: Shall be repeated when number of external subscriber number digits is non zero.				
NOTE 2: Shall be present when number of external subscriber number digits is non zero.				

5.2.1.18 INFORM 9

The INFORM 9 PDU is sent to the served User A MS/LS application from its home SwMI to indicate deactivation of SS-CF.

INFORM 9 PDU shall contain the SS-CF information elements described in table 30.

NOTE: This PDU is not sent when the deactivation is done by the served user.

Table 30: INFORM 9 PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INFORM 9
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	

5.2.1.19 INTERROGATE

The INTERROGATE PDU is sent either by the served user or by the authorized User A MS/LS application to the served user home SwMI to interrogate the status of SS-CF.

INTERROGATE PDU shall contain the SS-CF information elements described in table 31.

Table 31: INTERROGATE PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INTERROGATE
Call Forwarding Type	2	1	M	
Basic Service Information	2	1	M	
Served user ITSI	48	1	M	
Interrogation by served user	1	1	M	note 1
Authorized user ITSI	48	1	C	note 2
NOTE 1:	This information element shall indicate whether the interrogation is originated by the served user or by an authorized user different from the served user.			
NOTE 2:	Conditional on the interrogation is originated by an authorized user different from the served user.			

5.2.1.20 INTERROGATE ACK

The INTERROGATE ACK PDU is sent to the authorized User A MS/LS application by its home SwMI from the Served User SwMI to report on activation/deactivation of SS-CF and for which service on which authorized user.

INTERROGATE ACK PDU shall contain the SS-CF information elements described in table 32.

Table 32: INTERROGATE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	INTERROGATE ACK
Call Forwarding Type	2	1	M	
Accept/Reject	1	1	M	
Reject Cause	4	1	C	
Served user ITSI	48	1	M	
Basic Service Information	2	1	C	
Forwarded-to user ITSI	48	1	M	
Number of external subscriber number digits	5	1	M	note 4
External subscriber number digit	4	1	C	notes 2 and 4
External subscriber number parameter	9	1	C	notes 3 and 4
Interrogation by served user	1	1	M	note 5
Authorized user ITSI	48	1	C	note 1
Authorized User Enabled/Disabled	2	1	C	note 1
Authorized User Activated	1	1	C	note 1
NOTE 1:	May not be present if the served user is the only authorized user.			
NOTE 2:	Shall be repeated if the number of external subscriber number digit is non zero.			
NOTE 3:	Shall be present if the number of external subscriber digits is non zero.			
NOTE 4:	Applies when the forwarded-to user is external.			
NOTE 5:	This information element shall indicate whether the interrogation was originated by the served user or by an authorized user different from the served user.			

5.2.1.21 REPORT

The REPORT PDU is sent to the served user home SwMI from the Served User visited SwMI to report on invocation of SS-CF by the served user and for which service with which forwarded-to user.

- NOTE 1: The implementation of this REPORT PDU is optional; however, if implemented the REPORT PDU will comply with the content below.
- NOTE 2: The periodicity of the emission of this PDU is outside the scope of this ETS and is implementation dependent; when not sent at each invocation of SS-CF, the REPORT PDU may be repeated to report each invocation which occurred since the last reporting.
- NOTE 3: Whether the REPORT PDU is sent at periodic intervals of time or is sent on request from the home SwMI is also implementation dependent.

REPORT PDU shall contain the SS-CF information elements described in table 33.

Table 33: REPORT PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [6]
CF-PDU type	5	1	M	REPORT
Call Forwarding Type	2	1	M	
Served user ITSI	48	1	M	
Basic Service Information	2	1	M	
Forwarded-to user ITSI	48	1	M	
Number of external subscriber number digits	5	1	M	
External subscriber number digit	4	1	C	notes 1 and 3
External subscriber number parameter	9	1	C	notes 2 and 3
NOTE 1:	Shall be repeated when number of external subscriber number digits non zero.			
NOTE 2:	Shall be present when number of external subscriber number digits is non zero.			
NOTE 3:	Applies when forwarded-to user is external.			

5.2.2 TETRA PDU information element coding

5.2.2.1 Addressing Information Elements

- NOTE: In the case of SS-CF in this ETS, any TETRA individual subscriber is addressed using its full ITSI (Extension + SSI) and any TETRA group is addressed using its full GTSI (Extension + SSI). This is line with ETS 300 392-3-1 [7] subclause 8.3.1 where ISTI/GTSI are to be used when TETRA end users need to be addressed. PISNs are used for inter SwMI cases.

Several information elements are related to subscriber Numbers; a generic User Number Information element text is specified ahead of all other information elements; specific user number such as activating user number information element will refer to that generic user number text unless otherwise noted and/or when not applicable.

The following table 34 lists all the different user numbers used in this ETS. The generic user number related information elements are described below and then referenced in the proper sequence.

Table 34: CALL FORWARDING LIST OF INFORMATION ELEMENT RELATING TO USER NUMBERS

Served user ITSI	48	1		note 5
Original called user ITSI	48	1		note 5
Authorized user ITSI	48	1		note 5
Last forwarding user ITSI	48	1		note 5
Forwarding user ITSI	48	1		note 5
Forwarded-to user ITSI	48	1		note 5
Number of external subscriber number digits	5	1	M	notes 3 and 5
External subscriber number digit	4	1	C	notes 1, 3 and 5
External subscriber number parameter	9	1	C	notes 2, 3 and 5
Calling user ITSI	48	1		note 5
Connected user ITSI	48	1		note 5
Number of external subscriber number digits	5	1	M	notes 4 and 5
External subscriber number digit	4	1	C	notes 1 and 4
External subscriber number parameter	9	1	C	notes 2 and 4
NOTE 1: Shall be repeated when number of external subscriber number digit non zero.				
NOTE 2: Shall be present when number of external subscriber number digit non zero.				
NOTE 3: Applies when Forwarded-to user is external.				
NOTE 4: Applies when connected user is external.				
NOTE 5: Used as defined in the relevant PDU(s).				

5.2.2.2 User Identity

This generic information element is sometimes called user identity in the TETRA environment.

The following table 35 applies to the following Call Forwarding PDU information elements:

- Authorized user ITSI;
- Calling user ITSI;
- Connected user ITSI;
- Forwarded-to user ITSI;
- Forwarding user ITSI;
- Last forwarding user ITSI;
- Original called user ITSI;
- Served user ITSI.

Table 35: Individual TETRA Subscriber Identity information element contents

Information element	Length	Value	Remark
ITSI/GTSI	48		See ETS 300 392-1 [21] clause 7

5.2.2.3 External number

Where an external number is to be indicated in an SS-CF PDU, e.g. an external party identification, this shall be done by including the following information elements in the corresponding SS-CF PDU:

- number of external subscriber number digits;
- external subscriber number digit; and
- external subscriber number parameter.

In the frame work of SS-CF, external numbers can be used in relation to:

- forwarded-to user number;
- connected user number.

The definition of the information element external number length indicator shall be as shown in table 36.

Table 36: External number length indicator information element contents

Information element	Length	Value	Remarks
Number of external subscriber number digits	5	00000 ₂	note 1
		> 00000 ₂	note 2
NOTE 1: No external number present.			
NOTE 2: N, the number of digits in the information element external number digits, shall be equal to the information element value.			

The definition of the information element external subscriber number is shown in table 37.

Table 37: External subscriber number digit information element contents

Information element	Length	Value
External subscriber number digit	4	xxxx ₂

The definition of the information element external subscriber number parameter shall be as shown in table 38.

NOTE: The content of this table is in accordance with ITU-T Recommendation Q.931 [10] and ISO 11572 [11].

Table 38: External number subscriber parameter information element contents

Information sub-element	Length	Value	Remarks
Numbering plan identification	4	0000 ₂	Unknown
		0001 ₂	ITU-T Recommendation E.164 [20] (PSTN/ISDN/GSM)
		0010 ₂	Reserved
		0011 ₂	Data Numbering Plan (X.121)
		0100 ₂	Reserved (Telex)
		0101 ₂ -0111 ₂	Reserved
		1000 ₂	National standard numbering plan
		1001 ₂	Private numbering plan
		> 1001 ₂	Reserved for extension
Type of number	3	000 ₂	Unknown/unknown(note 1)
		001 ₂	International number/level 2 regional number (note 1)
		010 ₂	National number /level 1 regional number (note 1)
		011 ₂	Network specific number/PISN specific number (note 1)
		100 ₂	Abbreviated number/level 0 regional number (note 1)
		101 ₂	Reserved for extension
		11 ₂	Reserved for extension
Screening indicator	2	00 ₂	User provided, not screened
		01 ₂	User provided, verified and passed
		10 ₂	User provided, verified and failed
		11 ₂	Network provided
NOTE 1: The second parameter is the meaning of the field type of number (ISO 11572 [11]) when numbering plan identification equals 1001, private numbering plan.			
NOTE 2: The presentation indicator is part of the basic ISI-IC and ISI-GC PDUs			

5.2.2.4 Accept/Reject

Accept/Reject Information element is common to a number of PDU responses and shall be coded as defined in table 39.

Table 39: Accept/Reject information element contents

Information element	Length	Value	Remark
Accept/Reject	1	0 ₂	Accept
		1 ₂	Reject

5.2.2.5 Activation by Served User

Activation by Served User Information element indicates whether the activation/deactivation/interrogation is requested by the served user or not and shall be coded as defined in table 40.

Table 40: Activation by Served User information element content

Information element	Length	Value	Remark
Activation by Served User	1	0 ₂	No
		1 ₂	Yes

5.2.2.6 Authorized User Activated

Authorized User Activated Information element indicates whether the authorized user has been activated for a particular SS-CF Type; it shall be coded as defined in table 41.

Table 41: Authorized User Activated information element content

Information element	Length	Value	Remark
Authorized User Activated	1	0 ₂	No
		1 ₂	Yes

5.2.2.7 Authorized User Enabled/Disabled

Authorized User Enabled/Disabled Information element indicates whether the authorized user has been activated for a particular SS-CF Type; it shall be coded as defined in table 42.

Table 42: Authorized User Enabled/Disabled information element content

Information element	Length	Value	Remark
Authorized User	2	00 ₂	Enabled
		01 ₂	Reserved
		10 ₂	Reserved
		11 ₂	Disabled

5.2.2.8 Basic Service Information

Basic Service Information element is common to a number of PDUs, is a condensed form of the general basic service used in the basic TETRA Call and shall be coded as defined in table 43.

Table 43: Basic Service information element contents

Information element	Length	Value	Remark
Basic Service Information	2	00 ₂	None
		01 ₂	Speech
		10 ₂	Data
		11 ₂	Both Speech and Data

5.2.2.9 Call Forwarding Type

The purpose of the call forwarding Type information element shall be to identify the specific invocation of one of the four call forwarding Types. It shall be encoded as defined in table 44.

Table 44: Call Forwarding Type information element content

Information element	Length	Value	Remark
Call Forwarding Type	2	00 ₂	CFU
		01 ₂	CFB
		10 ₂	CFNRy
		11 ₂	CFNRc

5.2.2.10 Called user migration or SS-CF

See Annex B.

5.2.2.11 CF-PDU type

CF-PDU type indicates the type of the CF-PDU as defined in table 45.

Table 45: CF-PDU type information element contents

Information element	Length	Value	Remark
CF-PDU type	5	0000 ₂	See ETS 300 392-9 [6]
		0001 ₂	See ETS 300 392-9 [6]
		0010 ₂	See ETS 300 392-9 [6]
		0011 ₂	See ETS 300 392-9 [6]
		00100 ₂	See ETS 300 392-9 [6]
		00101 ₂	ACTIVATE
		00110 ₂	ACTIVATE ACK
		00111 ₂	DEACTIVATE
		01000 ₂	DEACTIVATE ACK
		01001 ₂	DISABLE
		01010 ₂	DISABLE ACK
		01011 ₂	ENABLE
		01100 ₂	ENABLE ACK
		01101 ₂	FORWARD (note)
		01110 ₂	FORWARD ACK (note)
		01111 ₂	INFORM 1
		10000 ₂	INFORM 2
		10001 ₂	INFORM 4
		10010 ₂	INFORM 5
		10011 ₂	INFORM 6
		10100 ₂	INFORM 7
		10101 ₂	INFORM 8
		10110 ₂	INFORM 9
		10111 ₂	INTERROGATE
		11000 ₂	INTERROGATE ACK
		11001 ₂	REPORT
		>11001 ₂	Reserved
NOTE: Even though this PDU belongs to ISI-IC, it is assigned a CF-PDU Type.			

5.2.2.12 Deactivating User Type

Deactivating User Type Information element defines whether the deactivating user is the served user, a permanent authorized user or a temporary authorized user (forwarded-to user). It shall be coded as defined in table 46.

Table 46: Deactivating User Type information element contents

Information element	Length	Value	Remark
Deactivating User Type	2	00 ₂	None
		01 ₂	Served user
		10 ₂	Permanent authorized user
		11 ₂	Temporary authorized user (forwarded-to user)

5.2.2.13 Forwarding Type

The purpose of the Forwarding Type information element shall be to identify the specific Forwarding Type of the forwarded call. It shall be encoded as defined in table 47. This information element may be confounded with the original forwarding cause and the last forwarding cause in case of a single call forwarding.

NOTE 1: Same coding as last forwarding type.

NOTE 2: This may be either an intermediate forwarding type or the only forwarding type when there is only one forwarding action.

Table 47: Forwarding Type information element content

Information element	Length	Value	Remark
Forwarding Type	2	00 ₂	CFU
		01 ₂	CFB
		10 ₂	CFNRy
		11 ₂	CFNRc

5.2.2.14 Interrogation by Served User

Interrogation by Served User Information element defines whether the interrogation is operated by either the served user or an authorized user different from the served user and shall be coded as defined in table 48.

Table 48: Interrogation by Served User information element contents

Information element	Length	Value	Remark
Interrogation by Served User	1	0 ₂	Yes
		1 ₂	None

5.2.2.15 Last Forwarding Type

The purpose of the Last Forwarding Type information element shall be to identify the specific last Forwarding Type of the forwarded call. It shall be encoded as defined in table 49.

Table 49: Last Forwarding Type information element content

Information element	Length	Value	Remark
Last Forwarding Type	2	00 ₂	CFU
		01 ₂	CFB
		10 ₂	CFNRy
		11 ₂	CFNRc

5.2.2.16 Original Forwarding Type

The purpose of the Original Forwarding Type information element shall be to identify the specific last forwarding type of the forwarded call. It shall be encoded as defined in table 50.

NOTE: Same coding as Last Forwarding Type.

Table 50: Original Forwarding Type information element content

Information element	Length	Value	Remark
Original Forwarding Type	2	00 ₂	CFU
		01 ₂	CFB
		10 ₂	CFNRy
		11 ₂	CFNRc

5.2.2.17 Reject Cause

Reject Cause information element is a generic information element which regroups Reject Causes common to several PDUs; some of the values may not apply to some PDUs. Reject Cause information element shall be encoded as defined in table 51.

Table 51: Reject Cause information element contents

Information element	Length	Value	Remarks
Reject Cause	4	0000 ₂	Rejected for any Cause (unspecified)
		0001 ₂	User not subscribed to service
		0010 ₂	SS-CF not available
		0011 ₂	Invalid Served User Number
		0100 ₂	Basic Service Not Provided
		0101 ₂	Resource unavailable
		0110 ₂	Invalid Forwarded-to User Number
		0111 ₂	Special Service Number
		1000 ₂	Forwarding to Served User Number
		1001 ₂	Temporarily Unavailable
		1010 ₂	Not Authorized
		1011 ₂	Number of Forwarding exceeded
		1100 ₂	Supplementary Service Interaction Not Allowed
		1101 ₂	Served user not authorized to activate SS-CF when not in home SwMI
		1110 ₂	Reserved
		1111 ₂	Reserved
NOTE:	The PDU contents may be found invalid e.g.: - when some information element values do not exist; or because; - the structure of an air interface PDU is wrong, e.g. O-bit or M-bit absent (see subclause 14.7 of ETS 300 392-2 [4]).		

5.2.2.18 Routing method choice at SETUP

See annex B.5.1.

5.2.2.19 Routing method choice at FORWARD information element

See annex B.5.2.

5.2.2.20 Routing method select

See annex B.5.3.

5.2.2.21 SS-CF Invocation Counter

The purpose of the SS-CF Invocation counter information element shall be to identify the successive number of forwarding that a call has encountered. It shall be used to limit the number of call forwarding of a call e.g. to avoid infinite loops. It shall be encoded as defined in table 52.

Table 52: SS-CF Invocation Counter information element content

Information element	Length	Value	Remark
SS-CF Invocation Counter	5	00000 ₂	No forwarding
		00001-11101 ₂	Normal number of call forwarding
		11110-11111 ₂	Reserved

5.2.2.22 SS-CF Type

This information element is used in the FORWARD/FORWARD ACK PDUs in the ANF-ISI-IC and in the ANF-ISI-GC; it shall be coded as any of the call forwarding type; original, last, etc...

5.2.2.23 SS-Type

SS-Type indicates the type of supplementary service to which the PDU belongs. The coding of the information element SS type shall be defined in table 5 of ETS 300 392-9 [6] and is recalled in table 53 where Call Forwarding is highlighted.

NOTE: All four SS-CF (CFU, CFB, CFNRy and CFNRc) use the same SS-Type; they can be distinguished by the Call Forwarding Type Information Element.

Table 53: SS-Type information element contents

Information element	Length	Value	Remark
SS type	6	.../...	
		04	Call Forwarding
		.../...	

5.2.2.24 Subscription Options for Informing Calling

UserSubscription Options for Informing Calling User Information element is common to a number of SS-CF PDUs and shall be coded as defined in table 54.

Table 54: Subscription Options for Informing Calling User information element contents

Information element	Length	Value	Remark
Subscription Options for Informing Calling User	2	00 ₂	No Notification of Call Forwarding
		01 ₂	Notification of Call Forwarding without Forwarded-to User Number (TETRA option)
		10 ₂	Notification of Call Forwarding with Forwarded-to User Number (note)
		11 ₂	Reserved

NOTE: May be used in case of inter-working.

5.2.3 Additional coding requirements over the ISI

Remote operations protocol and application association control.

The remote operations (RO) protocol is defined in CCITT Recommendations X.219 [23]/X.229 [24]. The generic procedures defined in this Standard provide an encoding mechanism for the transport and use of this RO protocol in the PISN environment for the provision of supplementary services or additional network features.

In the OSI environment, communication between application processes is represented in terms of communication between a pair of application entities (AEs). Communication between application entities are inherently interactive. Typically, one entity requests that a particular operation be performed; the other entity attempts to perform the operation and then reports the outcome of the attempts. The concept of Remote Operations is a vehicle for supporting interactive applications of this type.

The generic structure of an operation is an elementary request/reply interaction. Operations are carried out within the context of an application-association.

Figure 1 models this view.

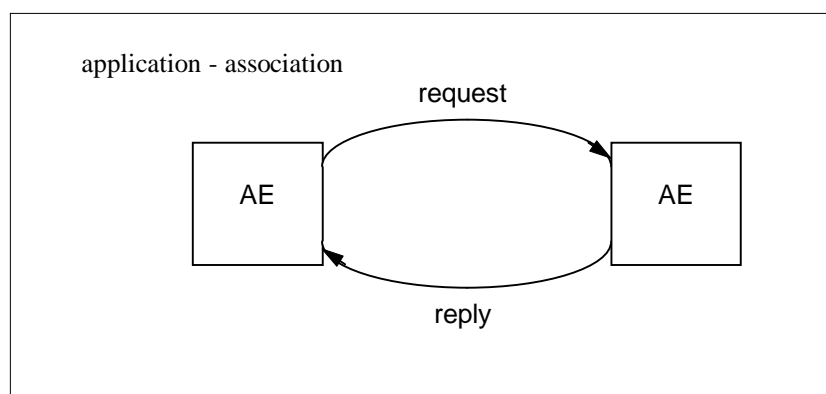


Figure 1: Remote Operations Model

Operations invoked by one AE (the invoker) are performed by the other AE (the performer). Operations may be classified according to whether the performer of an operation is expected to report its outcome:

- in the case of success or failure (a result reply is returned if the operation is successful, an error reply is returned if the operation is unsuccessful);
- in case of failure only (no reply is returned if the operation is successful, an error reply is returned if the operation is unsuccessful);
- in case of success only (a result reply is returned if the operation is successful, no reply is returned if the operation is unsuccessful);
- or not at all (neither a result nor an error reply is returned, whether the operation was successful or not).

Operations may also be classified according to two possible operation modes: synchronous, in which the invoker requires a reply from the performer before invoking another operation; and asynchronous, in which the invoker may continue to invoke further operations without awaiting a reply.

The following Operation Classes are defined:

- Operation Class 1: Synchronous, reporting success or failure (result or error);
- Operation Class 2: Asynchronous, reporting success or failure (result or error);
- Operation Class 3: Asynchronous, reporting failure (error) only, if any;
- Operation Class 4: Asynchronous, reporting success (result) only;
- Operation Class 5: Asynchronous, outcome not reported.

The Operation Class of each operation is agreed to be Operation Class 3 between application entities for this SS-CF Application Protocol draft ETS.

An application association defines the relationship between a pair of AEs, and is formed by the exchange of application (in this case supplementary services) Protocol Control information through the use of the services of underlying layers. The AE that initiates an association is called the association initiating AE, or the association initiator, while the AE that responds to the initiation of an application association by another AE is called the association responding AE, or the association responder.

NOTE 1: In the application of ROSE for the support of supplementary services in PSS1 the underlying services used by ROSE are those provided by GFT-Control or those provided by the Association Control Service Entity (ACSE). No use is made of the services of the Reliable Transport Service Element (RTSE).

Application associations are classified by which application-entity is allowed to invoke operations:

- Association Class 1: Only the association-initiating application-entity can invoke operations;
- Association Class 2: Only the association-responding application-entity can invoke operations;
- Association Class 3: Both the association-initiating and the association-responding application-entities can invoke operations.

This draft ETS assumes Application associations of Association Class 3.

The explicit control of an application-association (establishment, release and abort) is performed by the Association Control Service Element (ACSE) defined in ITU-T Recommendation X.217 [25].

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

- both the sourceEntity and destinationEntity data elements in the Network Facility Extension of this PSS1 facility information element shall contain the value endPINX;
- no interpretation APDU shall be included in this PSS1 facility information element.

NOTE 2: In the case of multiple call forwarding, the sourceEntity and destinationEntity data elements in the Network Facility Extension of this PSS1 facility information element does not contain the value endPINX but the served user home SwMI PINX value excepted in the case of Facility.

NOTE 3: This last note gives served user SwMI the role of anchor; not all SS-CF signaling goes back to the originating SwMI.

In the case of PDUs such as ACTIVATE where the expected reply is FORWARD ACK, the TETRA PDU such as ACTIVATE shall be encoded in the IsiArgument tetraMessage IMPLICIT OCTET STRING of the ROSE Invoke APDU in support of TETRA encoding PDU as defined in subclause 8.4.1 of ETS 300 392-3-1 [7]. The expected TETRA reply PDU ACTIVATE ACK shall be encoded in the IsiArgument tetraMessage IMPLICIT OCTET STRING of an other ROSE Invoke APDU (in the opposite direction) defined in the same clause.

In the case of unconfirmed information flows such as INFORM n, the TETRA PDU such as INFORM n shall be encoded in the IsiArgument tetraMessage IMPLICIT OCTET STRING of the ROSE Invoke APDU in support of TETRA encoding PDU as defined in subclause 8.4.1 of ETS 300 392-3-1 [7].

NOTE: The actions resulting from reception of ERRORS in reply to the ROSE Invoke APDU such as retry, time-out are outside the scope of this ETS.

5.3 SS-CF State Definitions

5.3.1 States at the Originating (Calling) User MS/LS

5.3.1.1 Idle

Either no INFORM2 PDU has been received or it has been received and user MS/LS has gone back to its original state.

5.3.2 States at the Originating SwMI

The procedures for the Originating SwMI are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that SwMI in association with a particular call.

5.3.2.1 CFO-Idle

No INFORM1 PDU has been received.

5.3.2.2 CFO-Forward

The INFORM1 PDU has been received and the subscription option of the served user and the Forwarded-to number have been stored.

5.3.3 States at the Served User MS/LS

5.3.3.1 Idle

MS/LS Served User Application has not invoked Enable and has not invoked Disable.

5.3.3.2 CF-Enable-Wait

MS/LS Served User Application has invoked Enable for a particular authorized user and is waiting for the result positive or negative of its ENABLE invocation.

5.3.3.3 CF-Disable-Wait

MS/LS Served User Application has invoked Disable for a particular authorized user and is waiting for the result positive or negative of its DISABLE invocation.

5.3.3.4 CFA-Idle

MS/LS Served User Application has not activated SS-CF.

5.3.3.5 CFA-Wait

MS/LS Served User Application has requested Activation of SS-CF and is waiting for either the positive reply or the negative reply to its request.

5.3.3.6 CFD-Idle

MS/LS Served User Application has not deactivated SS-CF.

5.3.3.7 CFD-Wait

MS/LS Served User Application has requested Deactivation of SS-CF and is waiting for either the positive reply or the negative reply to its request.

5.3.3.8 CFI-Idle

MS/LS Served User Application has not interrogated SS-CF.

5.3.3.9 CFI-Wait

MS/LS Served User Application has requested Interrogation of SS-CF and is waiting for either the positive reply or the negative reply to its request.

5.3.4 States at the Served User SwMI

The procedures for the Served User SwMI are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity. There are different state machines for activation, deactivation, interrogation and invocation of call Forwarding.

5.3.4.1 Activation states (in association with a particular request for activation)

5.3.4.1.1 CFS-Act-Idle

No processing of an Activate Forwarding request PDU.

5.3.4.2 Deactivation state (in association with a particular request for deactivation)

5.3.4.2.1 CFS-Deact-Idle

No processing of a Deactivate Forwarding request PDU.

5.3.4.3 Interrogation state (in association with a particular request for interrogation)

5.3.4.3.1 CFS-Inter-Idle

No processing of an Interrogate Forwarding request PDU.

5.3.4.4 Invocation states (in association with a particular call)

5.3.4.4.1 CFS-Inv-Idle

Forwarding invocation not in progress.

5.3.4.4.2 CFS-Requested

The Served User SwMI has sent a FORWARD request PDU to the Forwarding SwMI and is waiting for receipt of a FORWARD ACK PDU.

5.3.5 States at the Forwarded-to User MS/LS

5.3.5.1 Idle

Forwarded-to User MS/LS Application has either not received the INFORM7 PDU (indicating that the call presented to it has been forwarded) or has received it and gone back to its original state.

5.3.6 States at the Forwarded-to SwMI

The procedures for the Forwarded-to SwMI are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that SwMI. There are different state machines for the invocation of call Forwarding and restriction checking.

Invocation states (in association with a particular call).

5.3.6.1 CFF-Inv-Idle

No processing of a INFORM2 PDU.

5.3.6.2 CFF-Inv-Wait

An INFORM2 PDU has been received and the Forwarded-to SwMI is waiting for valid presentation restriction information.

5.3.7 States at the Re-routeing SwMI

The procedures for the Forwarding SwMI are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that SwMI in association with a particular call.

5.3.7.1 CFR-Idle

Re-routeing not in progress.

5.3.7.2 CFR-Invoked

The CFNRy re-routeing procedure has been successfully performed and the Forwarding SwMI is waiting for completion of establishment of the call to the Forwarded-to user.

5.3.8 States at the Authorized User MS/LS

Those states are identical to the served user states for activation/deactivation and interrogation; however, in this case they apply to the authorized user(s) and they assume that the authorized user has been enabled by the served user. Any forwarded-to user shall be enabled to deactivate SS-CF. The authorized user is in this case the activating user.

5.3.8.1 CFA-Idle

MS/LS Authorized User Application has not activated SS-CF.

5.3.8.2 CFA-Wait

MS/LS Authorized User Application has requested Activation of SS-CF and is waiting for either the positive reply or the negative reply to its request.

5.3.9 States at the Activating SwMI

The procedures for the Activating SwMI are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that SwMI.

5.3.9.1 CFA-Idle

Activation not in progress.

5.3.9.2 CFA-Wait

An ACTIVATE Forwarding request PDU has been sent. The Activating SwMI is waiting for the response.

5.3.10 States at the Deactivating User MS/LS

5.3.10.1 CFD-Idle

MS/LS Authorized User Application has not deactivated SS-CF.

5.3.10.2 CFD-Wait

MS/LS Authorized User Application has requested Deactivation of SS-CF and is waiting for either the positive reply or the negative reply to its request.

5.3.11 States at the Deactivating SwMI

The procedures for the Deactivating SwMI are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that SwMI.

5.3.11.1 CFD-Idle

Deactivation not in progress.

5.3.11.2 CFD-Wait

A DEACTIVATE Forwarding request PDU has been sent. The Deactivating SwMI is waiting for the response.

5.3.12 States at the Interrogating User MS/LS

5.3.12.1 CFI-Idle

MS/LS Authorized User Application has not interrogated SS-CF.

5.3.12.2 CFI-Wait

MS/LS Authorized User Application has requested Interrogation of SS-CF and is waiting for either the positive reply or the negative reply to its request.

5.3.13 States at the Interrogating SwMI

The procedures for the Interrogating SwMI are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that SwMI.

5.3.13.1 CFI-Idle

Interrogation not in progress.

5.3.13.2 CFI-Wait

An INTERROGATE Forwarding request PDU has been sent. The Interrogating SwMI is waiting for the response.

5.4 SS-CF Signalling procedures

The signalling protocol for Forwarding counter functionality operates in association with the signalling protocols for basic circuit switched call control (as specified in ETS 300 392-2 [4] or ETS 300 392-3-2 [8]) and call independent (connection oriented) signalling connections (as specified in ETS 300 392-9 [6]).

NOTE: The actions specified in the following subclauses are applicable to both cases.

Where a reference is made to procedures specified in ETS 300 392-2 [4] or ETS 300 392-3-2 [8]) and ETS 300 392-9 [6], the interpretation of such reference should be made according to whether the call concerned is a basic call or a call independent signalling connection.

5.4.1 Actions at MS/Ls

5.4.1.1 Activation, deactivation and interrogation

The procedures for activation, deactivation and interrogation only apply to the call forwarding supplementary services.

5.4.1.1.1 Activation

Normal operation for forwarding services

Having subscribed to a specific call forwarding supplementary service (CFU, CFB, CFNRy or CFNRc), in order to activate that service, the authorized user (including the served user) shall send an ACTIVATE PDU to the SwMI using the procedure described in ETS 300 392-9 [6].

The authorized user (including the served user) shall indicate the instance(s) of the supplementary service by use of the following parameters:

- in the type parameter, the type of call forwarding supplementary service to be activated, i.e. the CFU (value "cfu"), CFNRy (value "cfnry"), CFNRc (value "cfnrc") or CFB (value "cfb") supplementary service;
- in the Basic Service parameter, the basic service for which the activation applies. If call forwarding is subscribed to for only one basic service then the user shall set the parameter to either "all Services" or indicate that basic service. If the activation applies to all basic services for which call forwarding is subscribed to and call forwarding is subscribed to for more than one basic service, the user shall set the parameter to "all Services", to activate multiple instances of the supplementary service;
- in the case of activation by an authorized user, the Served User Number parameter for which the activation applies. This will be an individual TETRA number (either ITSI or GTSI).

The authorized user (including the served user) shall indicate in the Forwarded-to User Number parameter the forwarded-to address for that instance(s) of the supplementary service.

NOTE: Although the activation request may succeed, there is no guarantee that the forwarded-to number is a valid TETRA number and that no other service problems exist with the number provided.

To activate an instance of the call forwarding supplementary service, the SwMI shall use the type parameter, the Basic Service parameter, and the Served User Number parameter.

For each number, the network shall activate multiple instances of the call forwarding supplementary service if the Basic Service parameter is set to "All Services" and the call forwarding has been subscribed for several basic services.

If one or more instances are successfully activated, the network shall:

- send an ACTIVATE ACK PDU as described in ETS 300 392-9 [6]; and
- the network shall indicate the instance(s) of the supplementary service by use of the following parameters:
 - in the Type parameter, the type of call forwarding supplementary service activated, i.e. the CFU (value "cfu"), CFNRy (value "cfnr"), CFNRc (value "cfnc") or CFB (value "cfb") supplementary service;
 - in the Basic Service parameter, the basic service as indicated in the ACTIVATE PDU;
 - in the case where activation has been performed by an authorized user different from the served user, Served User Number parameter, the TETRA number for which the activation applies. This will be an individual TETRA number (either ITSI or GTSI).
- the network shall indicate the supplementary service data in the Forwarded-to User Number parameter which shall indicate the forwarded-to address of this instance of the supplementary service.

The served user SwMI, in the case where the activation has been operated by an authorized user different from the served user shall send to the served user a notification that SS-CF has been activated in an INFORM 8 PDU.

Subsequent procedures are as specified in ETS 300 392-9 [6] for terminating the transaction.

An activation can be modified by a subsequent activation (reactivation) procedure.

The Basic Service parameter set to "All Services" within the ACTIVATE PDU indicates one or multiple instances of the supplementary service. A single ACTIVATE ACK PDU indicates the result no matter how many instances can be activated. Only if all requested instances can be activated, or reactivated, an ACTIVATE ACK PDU shall be given.

An activation request covering multiple instances shall apply even if each instance was previously deactivated with a single deactivation request. An activation request covering a single instance shall apply even if that instance was previously deactivated with a multiple deactivation request.

When the served user receives a correctly encoded ACTIVATE ACK PDU, and delivered as specified in ETS 300 392-9 [6], then the served user shall accept the provided information and not respond to the network.

Exceptional procedures for forwarding services

If the network is unable to activate the call forwarding supplementary service, the network shall send an ACTIVATE ACK PDU to the authorized user (who may be the served user) within a Facility information element, using the procedure in ETS 300 392-9 [6], indicating one of the following error values:

- "not Subscribed", if (for a given TETRA number) the requested call forwarding supplementary service has not been subscribed to for the indicated basic service;
- "not Available", if the requested call forwarding supplementary service is not available for the indicated basic service;
- "invalid Served User Number", if the TETRA number provided to identify the served user is not a valid number;
- "supplementary Service Interaction Not Allowed", if the provision of the call forwarding supplementary service activation is precluded due to interaction with other supplementary services, e.g. SS-BIC or SS-BOC;
- "Basic Service Not Provided", if the served user has not subscribed to the basic service for which the call forwarding supplementary service was requested;
- "Resource unavailable", if the resources required to perform adequately the requested call forwarding supplementary service are not available;
- "Invalid Forwarded To Number", if the indicated forwarded-to number cannot be accepted;
- "Special Service Number", if the indicated forwarded-to number identifies a special service number (e.g. police, emergency, operator) and forwarding is prohibited to this special service number;
- "Forwarding To Served User Number", if the indicated forwarded-to number is identical to the TETRA number identifying the served user.

On expiration of timer T2 and the served user not having received any response to the ACTIVATE PDU, the served user shall consider that this attempt to activate the call forwarding supplementary service has failed.

Subsequent procedures for the network and the user are as specified in ETS 300 392-9 [6] for terminating the transaction.

When activation of multiple instances of a call forwarding supplementary service is requested, and if any instance cannot be activated, or reactivated, then none of the requested instances shall be activated. The error value shall be related to an instance that could not be activated or reactivated.

The served user, on receiving a reject PDU, shall take no action, and remain in the same state as before the ACTIVATE PDU was sent.

5.4.1.1.2 Deactivation

Normal operation for forwarding services

In order to deactivate a call forwarding supplementary service, the authorized user (who may be the served user) shall send a DEACTIVATE PDU to the network using the procedure described in ETS 300 392-9 [6].

The served user shall indicate the instance(s) of the supplementary service by use of the following parameters:

- in the Type parameter, the type of call forwarding supplementary service to be deactivated, i.e. the CFU (value "cfu"), CFNRy (value "cfnry"), CFNRc (value "cfnrc") or CFB (value "cfb") supplementary service;

- in the Basic Service parameter, the basic service for which the deactivation applies. If call forwarding is subscribed to for only one basic service then the user shall set the parameter to either "All Services" or indicate that basic service. If the deactivation applies to all basic services for which call forwarding is subscribed to and call forwarding is subscribed to for more than one basic service, the user shall set the parameter to "All Services", to deactivate multiple instances of the supplementary service;
- In the case of deactivation by an authorized user different from the served user, the Served User Number parameter, the TETRA number(s) for which the deactivation applies. This will be an individual TETRA number (ITSI or GTSI).

To deactivate an instance of the call forwarding supplementary service, the network shall use the Type parameter, the Basic Service parameter, and the Served User Number parameter.

If one or more instances are successfully deactivated, the network shall:

- send a DEACTIVATE ACK PDU using the Type in ETS 300 392-9 [6]; and

The network shall indicate the instance(s) of the supplementary service by use of the following parameters:

- in the type parameter, the type of call forwarding supplementary service deactivated, i.e. the CFU (value "cfu"), CFNRy (value "cfnry"), CFNRc (value "cfnrc") or CFB (value "cfb") supplementary service;
- in the Basic Service parameter, the basic service as indicated in the DEACTIVATE PDU;
- in the case where the authorized user is different from the Served User, the Served User Number parameter, the TETRA number for which the deactivation applies. This will be an individual TETRA number (ITSI or GTSI).

The served user SwMI shall notify the served user, in the case where the deactivation has been operated by an authorized user different from the served user that SS-CF has been deactivated by sending an INFORM 9 PDU.

Subsequent procedures are as specified in ETS 300 392-9 [6] for terminating the transaction.

The Basic Service parameter set to "All Services" or the Served User Number parameter set to "all Numbers" within the DEACTIVATE PDU indicates one or multiple instances of the supplementary service. A single DEACTIVATE ACK PDU indicates the result no matter how many instances can be deactivated. Only if all requested instances can be deactivated a DEACTIVATE ACK PDU shall be given.

A deactivation request covering multiple instances shall apply even if each instance was previously activated with a single activation request. A deactivation request covering a single instance shall apply even if that instance was previously activated with a multiple activation request.

When the served user receives a correctly encoded DEACTIVATE ACK PDU, and delivered as specified in ETS 300 392-9 [6], then the served user shall accept the provided information and not respond to the network.

Exceptional procedures for forwarding services

If the network is unable to deactivate the call forwarding supplementary service, the network shall send a DEACTIVATE ACK PDU to the served user within a Facility information element, using the procedure described in ETS 300 392-9 [6], indicating one of the following error values:

- "not Subscribed", if (for a given TETRA number) the requested call forwarding supplementary service has not been subscribed to for the indicated basic service;
- "not Available", if the requested call forwarding supplementary service is not available for the indicated basic service;

- "invalid Served User Number", if the TETRA number provided to identify the served user is not a valid number;
- "not Activated", if none of the requested instances of the supplementary service is activated.

On expiration of timer T3 and the served user not having received any response to the DEACTIVATE PDU, the served user shall consider that this attempt to deactivate the call forwarding supplementary service has failed and that the call forwarding supplementary service may still be activated.

Subsequent procedures for the network and the user are as specified in ETS 300 392-9 [6] for terminating the transaction.

When deactivation of multiple instances of a call forwarding supplementary service is requested, and if any instance cannot be deactivated, then none of the requested instances shall be deactivated. The error value shall be related to an instance that could not be deactivated.

The served user, on receiving a reject PDU, shall take no action, and remain in the same state as before the DEACTIVATE ACK PDU was sent.

5.4.1.1.3 Interrogation of the served user numbers

Normal procedures

In order to obtain the numbers at an interface for which any call forwarding supplementary service has been activated, the authorized user (who may be the served user) shall send an INTERROGATE PDU to the network using the procedure described in ETS 300 392-9 [6].

On receiving an INTERROGATE PDU, the network shall send an INTERROGATE ACK PDU to the authorized/served user using the procedure described in ETS 300 392-9 [6]. This PDU shall specify for a given TETRA number the instances of a call forwarding supplementary service associated with it. If no activation exists, the INTERROGATE ACK PDU shall indicate it.

Subsequent procedures are as specified in ETS 300 392-9 [6] for terminating the transaction.

When the served user receives a correctly encoded INTERROGATE ACK PDU, and delivered as specified in ETS 300 392-9 [6], then the user shall accept the provided information and not respond to the network.

Exceptional procedures

If the network is unable to provide the information requested, the network shall send an INTERROGATE ACK PDU to the user within a Facility information element, using the procedure described in ETS 300 392-9 [6], indicating one of the following error values:

- "not Subscribed", if (for a given TETRA number) none of the call forwarding supplementary services have been subscribed to;
- "not Available", if the requested information is not available or if the data provided by the network exceeds the maximum length allowed for a message.

On expiration of timer T4 and the served user not having received any response to the Interrogate Forwarding PDU, the served user shall consider that this attempt to interrogate the call forwarding supplementary service has failed.

Subsequent procedures for the network and the user are as specified in ETS 300 392-9 [6] for terminating the transaction.

The served user, on receiving a reject PDU, shall take no action, and remain in the same state as before the INTERROGATE PDU was sent.

5.4.1.2 Invocation and operation

5.4.1.2.1 Notification of forwarding to the calling user

All the procedures at the calling user are provided as part of the basic call control and subscription to any specific forwarding supplementary services is not required.

Normal operation

When the first forwarding after the call is requested is indicated to the calling network, and if the subscription option "calling user is notified of forwarding" has a value other than "no" (in this case the subscription option is equivalent to the received subscription option) then the calling network shall send an appropriate message to the calling user with the Notification indicator information element coded "call is forwarding". No other information concerning the forwarding shall be included at this time.

When a subsequent forwarding is indicated to the calling network with the forwarding cause forwarding due to the CFNRy alerting supplementary services (i.e. the served user has reached the alerting phase), and if the subscription option "calling user is notified of forwarding" has a value other than "no" then the calling network shall send an appropriate message to the calling user with the Notification indicator information element coded "call is forwarding". No other information concerning the forwarding shall be included at this time.

If one of the forwarding is due to the CFNRy alerting supplementary services, an indication of forwarding may be received from the forwarded-to user after an ALERTING message has been passed from the forwarding user to the calling user. In this case the calling network shall not pass a second or subsequent ALERTING message to the calling user, but shall include the applicable message content and shall send the forwarding notifications as indicated by the restriction requirements either:

- in the D-CALL PROCEEDING message if the call proceeding indication is also received; or
- in the NOTIFY message if the call proceeding indication is not received.

Exceptional procedures

Exceptional procedures at the calling user's interface shall be according to ETS 300 392-2 [4].

5.4.1.2.2 Identification of the forwarded-to user to the calling user

Identification of the forwarded-to user to the calling user shall not be provided in TETRA; see ETS 300 392-10-4 [5].

5.4.1.3 Procedures for the CFU supplementary service

5.4.1.3.1 Normal operation

If a call to the served user is forwarded unconditionally and the served user's subscription option "served user receives no notification that a call has been forwarded" then, the served user shall not be notified of the SS-CFU invocation and shall not be able to answer the call that is forwarded unconditionally.

5.4.1.3.2 Exceptional procedures

N.A.

5.4.1.4 Network Determined User Busy (NDUB) procedures for the CFB supplementary service

5.4.1.4.1 Normal operation

If a call to the served user is forwarded on network determined user busy and the served user subscription option "served user does not receive notification that a call has been forwarded", the forwarding network shall not send to the served user any Forwarding Information PDU and shall release the call to the served user.

5.4.1.4.2 Exceptional procedures

N.A.

5.4.1.5 User Determined User Busy (UDUB) procedures for the CFB supplementary service

5.4.1.5.1 Normal operation

If a condition exists such that in ETS 300 392-2 [4], the call would be cleared to the calling user with cause either "user busy" or "no circuit/channel available", then the network shall identify the user as UDUB.

If a call to the served user is forwarded on UDUB and the served user subscription option "served user receives notification that a call has been forwarded" has the value "no" then, the forwarding network shall not send to the served user any Forwarding Information PDU and shall clear the UDUB user.

5.4.1.5.2 Exceptional procedures

N.A.

5.4.1.6 Procedures for the CFNRy supplementary service

5.4.1.6.1 Normal operation

If the CFNRy supplementary service is active for the basic service requested by this call, then the network shall start timer T302 on receipt of the first ALERTING message. The value of T302 is a network provider option. The network shall stop timer T302 on receiving a CONNECT message from a user and shall not forward the call.

If call clearing is initiated while T302 is running, the network shall stop timer T302 and shall not forward the call and proceed with the normal clearing procedures according to clause 14 of ETS 300 392-2 [4].

If T302 expires before the network receives a CONNECT message, the network shall forward the call to the forwarded-to address.

If a call to the served user is forwarded on no reply and the served user subscription option "served user receives notification that a call has been forwarded" has the value "no", the forwarding network shall not send to the served user the Forwarding Information PDU.

For TETRA, the network provider option "served user call retention on invocation of forwarding" being set to "clear call on invocation", the network shall clear the call to the served user following the call clearing procedures as defined in clause 14 of ETS 300 392-2 [4] with cause "normal, unspecified".

NOTE: The forwarding network will send the notification information to the calling network when the forwarding operation to the forwarded-to network is invoked.

If the forwarded call is not offered to the forwarded-to user, e.g. due to NDUB, network congestion or the maximum number of forwarding has been reached, then alerting shall not continue at the TETRA served user and the call shall be cleared as defined in clause 14 of ETS 300 392-2 [4] with cause "unsuccessful due to call forwarding".

When the forwarding network receives an indication that the forwarded call is in the Call Received, Connect Request or Active states at the forwarded-to network, the forwarding network shall, if not done previously, initiate call clearing to the served user as defined in clause 14 of ETS 300 392-2 [4] with cause "normal, unspecified".

5.4.1.6.2 Exceptional procedures

Void.

5.4.1.7 Reminder notification to the served user

5.4.1.7.1 Normal operation

If the served user has activated a call forwarding supplementary service and an outgoing call is made, the network shall, as a subscription option, include a Notification indicator information element with a notification description value of "forwarding activated" in the first call control message for that call sent from the network to the served user, if the following conditions are fulfilled:

- the number given in the Calling party number information element, if provided, is identical to the served user number; and
- the Basic Service information element indicates the same basic service as call forwarding is activated for.

If the Calling party number information element is not included in the SETUP message, or the number is invalid, the network may use a default number of the access if provided when making the comparison. If the subscription is on a per TETRA number basis and if neither the Calling party number information element is provided nor a default number is available at the network, then no reminder notification can be provided for the access of the served user.

5.4.1.7.2 Exceptional procedures

Void.

5.4.2 Actions at the Originating SwMI

When an Originating SwMI also provides Forwarding SwMI functionality, in support of call forwarding by rerouting, the joint requirements of subclause 5.4.2 (for an Originating SwMI) and 5.4.3 (for a Forwarding SwMI) shall apply, with the exception that any communication between the Originating SwMI functionality and the Forwarding SwMI functionality will be an intra-SwMI matter. The messages specified for sending from the Originating SwMI towards the Forwarding SwMI or vice versa will not appear on any inter-SwMI link.

NOTE: The Originating SwMI can act also as Forwarding SwMI in all cases where call forwarding by rerouting is appropriate.

5.4.2.1 Normal Procedure

An Originating SwMI shall include a FORWARDING COUNTER PDU in the ISI-IC-SETUP message sent across an inter-SwMI link. The value of the transit count field shall not be incremented by the Originating SwMI. It shall be set to zero unless the Originating SwMI for TETRA is in fact a SwMI Gateway which receives the call from an other network.

On receipt of an INFORM1 PDU in a FACILITY or CONNECT message while in basic call protocol control state Overlap Sending, Outgoing Call Proceeding or Call Delivered and in state CFO-Idle, the Originating SwMI shall take account of the information therein and enter state CFO-Forward. In determining whether to notify the calling user, the Originating SwMI shall take account of the value of element Subscription Option. If the value No Notification has been received, no notification of forwarding shall be given to the calling user. The forwarded-to number shall not be presented to the calling user at this stage. When the INFORM1 PDU has been received in a CONNECT message, an INFORM6 PDU in the same message shall be handled as specified below.

On receipt of a INFORM1 PDU in a FACILITY or CONNECT message while in state CFO-Forward, the Originating SwMI shall take account of the information therein and remain in the same state. If the value of element Forwarding Type is CFB or CFU, no notification of this further forwarding shall be given to the calling user. If the value of element Forwarding Type is CFNRy or CFNRc, account shall be taken of the value of element Subscription Option in this PDU and in all previously received INFORM1 PDUs for this call. If this or any previous value is No Notification, no notification shall be given to the calling user. The forwarded-to number shall not be presented to the calling user at this stage. When the INFORM1 PDU has been received in a CONNECT message, an INFORM6 PDU in the same message shall be handled as specified below.

On receipt of an INFORM6 PDU in an ALERTING, CONNECT or FACILITY message while in state CFO-Forward, the Originating SwMI shall take account of the information therein, shall remain in the same state if received in an ALERTING or FACILITY message, and shall enter state CFO-Idle if received in a CONNECT message. The forwarded-to number (as received in element Nominated User Number of the last received INFORM1 PDU) shall not be presented to the calling user.

On receipt of a CONNECT message, the Originating SwMI shall enter state CFO-Idle and if SS-COLP has been subscribed to by the calling user and SS-COLR is not invoked, the COnnected Line Identification shall be presented to the calling user in the INFORM 7 PDU.

NOTE: In case of where a call enters another network from the TETRA SwMI and call forwarding occurs in that other network, no INFORM1 or INFORM6 PDUs will be received by the Originating SwMI. Instead, notification(s) of the forwarding in accordance with 6.3.2.2 may be received from the Outgoing Gateway SwMI. Such notifications will be handled in accordance with ETS 300 392-9 [6].

On receipt of a FORWARD request from the called user SwMI and in the case where the call forwarding method is selected to be re-routing (either due to migration or to SS-CF invocation), the originating SwMI shall disconnect the ISI-IC and shall send a FORWARD ACK PDU in a FACILITY associated to the DISCONNECT.

On receipt of a ISI-IC-SETUP message from the Preceding SwMI, the call request shall be processed according to the procedures specified in ETS 300 392-2 [4] or ETS 300 392-3-2 [8]) and ETS 300 392-9 [6].

If the received ISI-IC-SETUP message contains a FORWARDING COUNTER PDU in which the forwarding count field has a value that is less than the acceptable (network dependent) limit, that information element shall be included in the SETUP message sent to the Subsequent SwMI. The value of the forwarding count field in the outgoing FORWARDING COUNTER PDU shall be set to one greater than the value received.

If the received ISI-IC-SETUP message does not contain a FORWARDING COUNTER PDU, the Forwarding SwMI may include a FORWARDING COUNTER PDU in the ISI-IC-SETUP message sent to the Subsequent SwMI. The value of the forwarding count field in this element shall be set to a value not less than 1. A Forwarding SwMI supporting ISI and SS-CF shall support FC.

5.4.2.2 Exceptional Procedures

On call clearing during state CFO-Forward, the Originating SwMI shall enter state CFO-Idle.

If the ISI-IC-SETUP message received from the Preceding SwMI contains a FORWARDING COUNTER PDU in which the forwarding count field has a value that is greater than or equal to the acceptable (network dependent) limit of Call Forwarding to which a call may be subject to, and the SwMI is unable to become a Terminating or Outgoing Gateway SwMI, the call shall be rejected. The acceptable limit shall not exceed 29.

5.4.3 Actions at the Served User SwMI

In the context of invocation, when a Served User SwMI also provides Forwarding SwMI functionality, in support of call forwarding by forward switching, the joint requirements of subclause 5.4.4 (for a Served User SwMI) and 5.4.4 (for a Forwarding SwMI) shall apply, with the exception that any communication between the Served User SwMI functionality and the Forwarding SwMI functionality will be an intra-SwMI matter. The messages specified for sending from the Served User SwMI towards the Forwarding SwMI or vice versa will not appear on any inter-SwMI link.

NOTE: The Served User SwMI can act also as Forwarding SwMI e.g. in cases where call forwarding by rerouting has been rejected or where forward switching is appropriate according to implementation specific Causes (e.g. the forwarded-to user is located in the Served User SwMI).

5.4.3.1 Normal Procedure

5.4.3.1.1 Activation

On receipt of an ACTIVATE PDU using the call reference of a call independent signaling connection (as specified in ETS 300 392-9 [6]), the Served User Home SwMI shall check the received basic service (element Basic Service) for the served user (element Served User Number) and verify that activation is supported and enabled. The address of the (activating) authorized user (element Authorized User Number) may also be taken into account in determining whether activation is to be allowed to proceed.

The procedures used by the Served User Home SwMI for verifying that the forwarded-to user's number is valid are outside the scope of this ETS.

If the activation request is acceptable, the Served User Home SwMI shall activate forwarding of the type indicated by the element type, answer to the authorized user the ACTIVATE PDU with an ACTIVATE ACK PDU and store the received forwarded-to number, if provided. If the authorized user is different from the served user, the Served User Home SwMI shall send a notification to the served user in the INFORM 8 PDU.

5.4.3.1.2 Deactivation

On receipt of a DEACTIVATE PDU using the call reference of a call independent signalling connection (as specified in ETS 300 392-9 [6]), the Served User SwMI shall check the consistency of the received basic service (element Basic Service) for the served user (element Served User Number). The address of the deactivating user (element Deactivating User Number) may also be taken into account in determining whether deactivation is to be allowed to proceed.

If the deactivation request is valid, the Served User SwMI shall deactivate forwarding of the type indicated by the element type, answer the DEACTIVATE PDU with a return result DEACTIVATE ACK PDU and shall convey an appropriate notification to the served user in the INFORM 9 PDU in the case where the served user is different from the authorized user.

5.4.3.1.3 Interrogation

On receipt of an INTERROGATE PDU using the call reference of a call independent signalling connection (as specified in ETS 300 392-9 [6]), the Served User SwMI shall check the interrogation request and answer the INTERROGATE PDU with a return result INTERROGATE ACK PDU if the interrogation request is valid and Call Forwarding is activated. The address of the interrogating user (element Interrogating User Number) may also be taken into account in determining whether interrogation is to be allowed to proceed.

5.4.3.1.4 Invocation

The detection of a call forwarding invoke request results from different local procedures in the Served User SwMI.

When SS-CF is invoked, a FORWARD PDU shall be sent in a call related FACILITY message to the Forwarding SwMI and the CFS-Requested state shall be entered. Sending of the FACILITY message for SS-CFU (SS-CFI) and SS-CFB shall be applicable in the basic call protocol control states Incoming Call Proceeding. Sending of the FACILITY message for SS-CFNry (SS-CFA) shall be applicable in the basic call protocol control state Call Received.

The timer T1 shall be started by the Served User SwMI on entering the CFS-Requested state. The timer shall be stopped on receipt of a return result FORWARD ACK PDU of the Call Forwarding operation.

The following data elements and information elements shall be included in the argument of the FORWARD PDU:

- element Called user migration or SS-CF;
- element Forwarding Type containing the Cause for the last forwarding, indicating a value other than unknown;

- element Original Forwarding Type, only in case of multiple forwarding, containing the Cause for the original forwarding;
- element Called User Number as stored in the Served User SwMI as forwarded-to number;

NOTE 1: The number should have significance throughout the TETRA Network. If it is a number from a Private Numbering Plan (PNP), it should be a Complete Number. If it is an ITU-T Recommendation E.164 [20] number, then a subscriber number can be insufficient, and in some networks, a national number can be insufficient.

- element Forwarding Counter containing the number of forwarding undergone by the call (value one if this is the first forwarding);
- basic service information element, as received in the incoming SETUP message and translated into the SS-CF basic service information element (speech, data or both);
- element Last Forwarding User Number containing the number of the last forwarding user;
- element SUBSCRIPTION OPTION containing the served user's requirements for notifying the calling user;
- element Calling User Number as received in the incoming SETUP message in the Calling party number information element;
- element Original Called User Number, only in case of multiple call forwarding, containing the number of the original called user.

On receipt of the return result FORWARD ACK PDU of the CALL FORWARDING operation, the Served User SwMI shall enter CFS-Inv-Idle state.

NOTE 2: In the case of call forwarding by re-routeing, the call between Forwarding SwMI and Served User SwMI is released by the Forwarding SwMI according to ETS 300 392-3-1 [7], 300 392-3-2 [8] and 300 392-3-3 [9].

5.4.3.2 Exceptional Procedures

5.4.3.2.1 Activation

If the forwarded-to user's number is detected as an invalid number or if the activation request can not be accepted for other Causes, the Served User SwMI shall send back a ACTIVATE ACK PDU with an appropriate reject cause value.

5.4.3.2.2 Deactivation

If the deactivation request is not valid, the Served User SwMI shall answer the DEACTIVATE PDU with a DEACTIVATE ACK PDU containing an appropriate reject cause value.

5.4.3.2.3 Interrogation

If the interrogation request is not valid or if the particular type of Call Forwarding is not activated, the Served User SwMI shall answer the INTERROGATE PDU with a INTERROGATE ACK PDU containing an appropriate reject cause value.

5.4.3.2.4 Invocation

When SS-CF is invoked, but the FORWARD PDU cannot be sent to the Forwarding SwMI (e.g. if the number of forwarding has exceeded the maximum value), then the Served User SwMI shall release the call according to ETS 300 392-3-1 [7], 300 392-3-2 [8] AND 300 392-3-3 [9].

On receipt of the reject FORWARD ACK PDU of the call Forwarding operation or on expiration of timer T1, the Served User SwMI shall enter CFS-Inv-Idle state and shall release the call according to ETS 300 392-3-1 [7], 300 392-3-2 [8] and 300 392-3-3 [9] or try again using forward switching). Timer T1 shall be stopped on receipt of a reject FORWARD ACK PDU of the call Forwarding operation.

If a specific incoming call is received (e.g. from the forwarded-to user to the served user), the Served User SwMI may not invoke SS-CF, but instead offer the call to the served user.

On call clearing during CFS-Requested state, the Served User SwMI shall enter CFS-Inv-Idle state.

5.4.4 Actions at the Forwarding SwMI

The actions described below apply to the case of single call forwarding.

A Terminating SwMI shall ignore the FORWARDING COUNTER PDU if it is contained in any received SETUP message.

5.4.4.1 Case of Call Forwarding by Re-Routeing

The Forwarding SwMI functionality is incorporated in the Originating SwMI in the case of re-routeing. In the case of rerouteing, the communication between the Forwarding SwMI functionality and the Originating SwMI functionality will be an intra-SwMI matter. The related messages specified for sending from the Forwarding SwMI to the Originating SwMI and vice-versa will not appear on any inter SwMI link.

5.4.4.2 Case of Call Forwarding by Forward Switching.

The Forwarding SwMI functionality is incorporated in the Served User SwMI (in support of call forwarding by forward switching). In the case of forward switching the communication between the Forwarding SwMI functionality and the Served User SwMI functionality will be an intra-SwMI matter. The related messages specified for sending from the Forwarding SwMI to the Served User SwMI and vice versa will not appear on any inter-SwMI link.

5.4.4.3 Normal Procedure

On receipt of a FORWARD PDU in a FACILITY message during basic call protocol control states Outgoing Call Proceeding for SS-CFU/SS-CFB and Call Delivered for SS-CFNRY (CFA), the Forwarding SwMI shall check if the forwarding request is valid. If the forwarding request can be performed, the Forwarding SwMI shall answer the FORWARD PDU with a return result FORWARD ACK PDU in a FACILITY message, shall initiate a new call establishment to the new destination (forwarded-to user) and in the case of SS-CFU or SS-CFB shall release the leg towards the Served User SwMI by sending a DISCONNECT message. In the case of SS-CFU or SS-CFB the FORWARD ACK PDU may instead be conveyed in the DISCONNECT message (to the served user SwMI).

The SETUP message for the new call establishment shall include an INFORM4 PDU.

The following specific basic call information elements shall be included:

- the information received in the element Called User Number of the FORWARD PDU shall be included into the Called user number information element;
- the information received in the element Calling User Number of the FORWARD PDU shall be included into the Calling user number information element;
- the Basic Service information element as received in embedded form within the FORWARD PDU.

If the transit counter is used in the new SETUP message, it shall not increment the transit count field.

The following data elements shall be included in the argument of the INFORM4 PDU:

- element Forwarding Counter as received in the FORWARD PDU;
- element Forwarding Type as received in the element Forwarding Type of the FORWARD PDU;

- element Original Forwarding Type if received in the element Original Forwarding Type of the FORWARD PDU;
- element Forwarding User Number as received in the element Last Forwarding User Number of the FORWARD PDU;
- optionally element Original Called User Number if received in the FORWARD PDU.

NOTE: As an implementation option, the Forwarding SwMI may have stored some of the information from the original SETUP message for inclusion in the new SETUP message to the forwarded-to user.

The parameter Forwarding Type received in the FORWARD PDU shall indicate to the Forwarding SwMI whether the SS-CFU/SS-CFB or the SS-CFNry/CFNRc type is to be performed.

After the new SETUP message has been sent, the procedures of the Forwarding SwMI are split into two cases, SS-CFU(CFI)/SS-CFB and SS-CFNry (CFA).

For SS-CFU(CFI)/SS-CFB, the Forwarding SwMI shall send a call related FACILITY message with an INFORM1 PDU to the Originating SwMI. The two remaining legs of the call shall be joined together (Originating SwMI - Forwarded-to SwMI).

For SS-CFNry (CFA), the Forwarding SwMI shall move from the CFR-Idle state into the CFR-Invoked state and wait for further events as follows.

On receipt of an ALERTING message from the Forwarded-to SwMI, the Forwarding SwMI shall initiate call clearing towards the Served User SwMI according to ETS 300 392-3-1 [7], ETS 300 392-3-2 [8] and ETS 300 392-3-3 [9], send an INFORM1 PDU in the FACILITY message to the Originating SwMI and enter the CFR-Idle state. The two remaining legs of the call shall be joined together (Originating SwMI - Forwarded-to SwMI).

On receipt of a CONNECT message (if previously no ALERTING has been received) from the Forwarded-to SwMI, the Forwarding SwMI shall initiate call clearing towards the Served User SwMI according to ETS 300 392-3-1 [7], ETS 300 392-3-2 [8] and ETS 300 392-3-3 [9], send an INFORM1 PDU in the CONNECT message to the Originating SwMI and enter the CFR-Idle state. The two remaining legs of the call shall be joined together (Originating SwMI - Forwarded-to SwMI).

A CONNECT message from the Served User SwMI if received after the acceptance of the FORWARDING PDU shall be ignored and the call forwarding shall continue.

The argument of the INFORM1 PDU shall include the elements Forwarding Type, Subscription Option and Nominated User Number as received in the argument of the FORWARD PDU in the elements Forwarding Type, Subscription Option and Called User Number respectively.

After the two legs of the call have been joined together the Forwarding SwMI shall return to state CFR-Idle and shall act as a Forwarding SwMI for the resulting call.

NOTE: After the two legs of the call have been joined together, the Forwarding SwMI will pass on transparently an INFORM6 PDU. Where an INFORM1 PDU is included in the CONNECT message, this will be in addition to the INFORM6 PDU.

5.4.4.4 Exceptional Procedures

If the forwarding request cannot be performed on receipt of a FORWARD PDU, a FORWARD ACK PDU including the appropriate error value shall be sent back in a FACILITY message.

For events received for SS-CFNry (CFA) in the CFR-Invoked state, the Forwarding SwMI shall perform the following actions.

On receipt of a DISCONNECT, RELEASE or RELEASE COMPLETE message from the Forwarded-to SwMI, the Forwarding SwMI shall complete call clearing towards the Forwarded-to SwMI and enter the CFR-Idle state.

On receipt of a call clearing message from the Originating SwMI or Served User SwMI, the Forwarding SwMI shall continue call clearing according to ETS 300 392-3-1 [7], 300 392-3-2 [8] AND 300 392-3-3 [9], stimulate release of the remaining two legs of the call and enter the CFR-Idle state.

5.4.5 Actions at the Forwarded-to SwMI

5.4.5.1 Normal Procedure

5.4.5.1.1 Invocation

On receipt of a SETUP message with an INFORM4 PDU, the Forwarded-to SwMI shall enter CFF-Inv-Wait state. A forwarding notification and the Forwarding number (and the original called number in case of multiple forwarding) as received shall be conveyed in an appropriate message together with the basic call establishment information to the called user if able and authorized to receive the notification.

When it is known whether presentation restriction applies to the forwarded-to number, the Forwarded-to SwMI shall enter CFF-Inv-Idle state and send an INFORM6 PDU in a FACILITY, ALERTING or CONNECT message to the Originating SwMI. This information shall indicate whether the presentation of the forwarded-to number is restricted. The Forwarded-to SwMI shall not send a FACILITY message with an INFORM6 PDU unless an ALERTING message has already been sent in case of SS-CFNRY (CFA). The PDU shall be sent in the CONNECT message if it has not already been sent in a FACILITY or ALERTING message.

5.4.5.2 Exceptional Procedures

5.4.5.2.1 Invocation

On call clearing during CFF-Inv-Wait state, the Forwarded-to SwMI shall enter CFF-Inv-Idle state.

5.4.5.2.2 Verification of the forwarded-to user's number

A PDU shall be sent back to the Served User SwMI if there are any restrictions detected by the Forwarded-to SwMI.

5.4.6 Actions at the Activating SwMI

5.4.6.1 Normal Procedure

On receipt of a remote activation request from the user, the Activating SwMI shall send an ACTIVATE PDU to the Served User SwMI using the call reference of a call independent signalling connection. The call independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in ETS 300 392-9 [6]. The Activating SwMI shall enter the CFA-Wait state and start timer T2. On receipt of the ACTIVATE ACK PDU, the Activating SwMI shall stop timer T2, revert to the CFA-Idle state and convey the return result back to the activating user.

NOTE: The number to be used in the Called party number information element when establishing the call independent signalling connection is outside the scope of this Standard.

The Activating SwMI is responsible for clearing the call independent signalling connection towards the Served User SwMI. This may occur on receipt of an ACTIVATE ACK PDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

5.4.6.2 Exceptional Procedures

On receipt of the ACTIVATE ACK or reject PDU from the Served User SwMI, the Activating SwMI shall stop timer T2, revert to the CFA-Idle state and indicate rejection to the activating user.

If timer T2 expires (i.e. the ACTIVATE PDU is not answered by the Served User SwMI), the Activating SwMI shall indicate rejection to the user and enter CFA-Idle state.

The Activating SwMI is responsible for clearing the call independent signalling connection towards the Served User SwMI. This may occur on receipt of an ACTIVATE ACK or reject PDU or expiration of timer T2. Alternatively, the signalling connection may be retained for other applications, if appropriate.

5.4.7 Actions at the Deactivating SwMI

5.4.7.1 Normal Procedure

On receipt of a remote deactivation request from the user, the Deactivating SwMI shall send a DEACTIVATE PDU to the Served User SwMI using the call reference of a call independent signalling connection. The call independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in ETS 300 392-9 [6]. The Deactivating SwMI shall enter the CFD-Wait state and start timer T3. On receipt of the DEACTIVATE ACK PDU, the Deactivating SwMI shall stop timer T3, revert to the CFD-Idle state and convey the return result back to the deactivating user.

NOTE: The number to be used in the Called party number information element when establishing the call independent signalling connection is outside the scope of this Standard.

The Deactivating SwMI is responsible for clearing the call independent signalling connection towards the Served User SwMI. This may occur on receipt of a DEACTIVATE ACK PDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

5.4.7.2 Exceptional Procedures

On receipt of the DEACTIVATE ACK or reject PDU from the Served User SwMI, the Deactivating SwMI shall stop timer T3, revert to the CFD-Idle state and indicate rejection to the deactivating user.

If timer T3 expires (i.e. the DEACTIVATE PDU is not answered by the Served User SwMI), the Deactivating SwMI shall indicate rejection to the user and enter CFD-Idle state.

The Deactivating SwMI is responsible for clearing the call independent signalling connection towards the Served User SwMI. This may occur on receipt of a DEACTIVATE ACK reject PDU or expiration of timer T3. Alternatively, the signalling connection may be retained for other applications, if appropriate.

5.4.8 Actions at the Interrogating SwMI

5.4.8.1 Normal Procedure

On receipt of a remote interrogate request from the user, the Interrogating SwMI shall send a INTERROGATE PDU to the Served User SwMI using the call reference of a call independent signalling connection. The call independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in ETS 300 392-9 [6]. The Interrogating SwMI shall enter the CFI-Wait state and start timer T4. On receipt of the INTERROGATE ACK PDU, the Interrogating SwMI shall stop timer T4, revert to the CFI-Idle state and convey the INTERROGATE ACK back to the interrogating user.

NOTE: The number to be used in the Called party number information element when establishing the call independent signalling connection is outside the scope of this Standard.

The Interrogating SwMI is responsible for clearing the call independent signalling connection towards the Served User SwMI. This may occur on receipt of an INTERROGATE ACK PDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

5.4.8.2 Exceptional Procedures

On receipt of the INTERROGATE ACK PDU from the Served User SwMI, the Interrogating SwMI shall stop timer T4, revert to the CFI-Idle state and indicate rejection to the interrogating user.

If timer T4 expires (i.e. the INTERROGATE PDU is not answered by the Served User SwMI), the Interrogating SwMI shall indicate rejection to the user and enter CFI-Idle state.

The Interrogating SwMI is responsible for clearing the call independent signalling connection towards the Served User SwMI. This may occur on receipt of an INTERROGATE ACK PDU or expiration of timer T4. Alternatively, the signalling connection may be retained for other applications, if appropriate.

5.5 Inter-working

5.5.1 Procedures for inter-working with public ISDNs

5.5.1.1 Actions at an Incoming Gateway SwMI

When routing a call entering the TETRA network, an Incoming Gateway SwMI shall include a FORWARDING COUNTER PDU in the ISI-IC-SETUP message sent across the inter-SwMI link. The value of the forwarding count field shall be set to an initial value. This initial value shall be zero unless knowledge of the history of the call enables a higher value to be chosen.

5.5.1.2 Actions at an Outgoing Gateway SwMI

An Outgoing Gateway SwMI may make use of a FORWARDING COUNTER PDU received in an ISI-IC-SETUP message for inter-working with another network that supports an equivalent feature. That outgoing Gateway will convert the TETRA FORWARDING COUNTER PDU into an ISDN compatible format. Otherwise an Outgoing Gateway SwMI shall ignore a FORWARDING COUNTER PDU received in an ISI-IC-SETUP message.

5.5.1.3 Procedures where a call from the public ISDN is forwarded within or beyond TETRA

5.5.1.3.1 Normal operation

Where a call offered by the public network to the TETRA network is forwarded within or beyond the TETRA network, the TETRA network shall send a ForwardingLegInformation1 invoke component, to the public network in a FACILITY, PROGRESS or ALERTING message using the procedure described in subclause 8.3.1.1 of EN 300 196-1 [16]. The ForwardingLegInformation1 invoke component shall contain:

- the Forwarding Reason parameter indicating the reason for forwarding;
- the Subscription Option parameter indicating the value of the subscription option "calling user is notified of forwarding" of the forwarding user;
- the Forwarded-to user Number parameter indicating the forwarded-to number, if provided.

This information is used by the public network to provide notification to the calling user.

In addition, when the TETRA network has determined whether presentation of the forwarded-to number is allowed or not, the TETRA network shall send a ForwardingLegInformation3 invoke component in a FACILITY, ALERTING or CONNECT message in order to convey the Presentation Allowed Indicator parameter.

If the public network receives a correctly encoded ForwardingLegInformation1 invoke component, the public network shall forward the information towards the calling network and not respond to the TETRA network.

If the public network receives a correctly encoded ForwardingLegInformation3 invoke component, the public network shall forward the information towards the calling network and not respond to the TETRA network.

5.5.1.3.2 Exceptional procedures

If a ForwardingLegInformation1 invoke component has been received and if the public network receives a CONNECT message and has not yet received a ForwardingLegInformation3 invoke component, then the public network shall assume that presentation of the forwarded-to number is not allowed and indicate that presentation is not allowed towards the calling network and continue call establishment.

If the TETRA network receives a reject component, the TETRA network shall accept this information and continue with call establishment.

5.5.1.3.3 Presentation of a forwarded call from a public ISDN to the TETRA network

5.5.1.3.4 Normal operation

If a forwarded call is presented from a public ISDN to the TETRA network, then the SETUP message sent from the public network to the TETRA network shall contain a Facility information element including a ForwardingLegInformation2 invoke component using the procedure described in subclause 8.3.1.1 of EN 300 196-1 [16]. This invoke component shall indicate:

- in the Forwarding Counter parameter, the number of forwarding that the call has experienced so far;
- in the Forwarding Reason parameter, the reason for the last forwarding;
- in the Forwarding User Number parameter, the ISDN number of the last forwarding user; and
- in the Original Called User Number parameter, the ISDN number of the first forwarding user if multiple forwarding occurred. This parameter shall not be included if only one forwarding occurred.

The Forwarding User Number parameter and Original Called User Number parameter shall be one of the following choices:

- "presentation Allowed Number", if the presentation is allowed according to the presentation indicator supplied together with the number information; or
- "presentation Restricted", if the presentation is restricted according to the presentation indicator supplied together with the number information; or
- "number Not Available Due To Inter working", if the number is not available due to inter working.

In response to the ForwardingLegInformation2 invoke component, and when the TETRA network has determined whether presentation of the forwarded-to number is allowed or not, the TETRA network shall include a ForwardingLegInformation3 invoke component in the FACILITY, ALERTING or CONNECT message sent to the public network. The Presentation Allowed Indicator parameter shall indicate whether or not presentation of the forwarded-to user's ISDN number is allowed to the calling user.

If the public network receives a correctly encoded ForwardingLegInformation3 invoke component, the public network shall forward the information towards the calling network and not respond to the TETRA network.

5.5.1.3.5 Exceptional procedures

If the public network receives a CONNECT message and has not yet received a ForwardingLegInformation3 invoke component, the public network shall assume that presentation of the forwarded-to number is not allowed and indicate that presentation is not allowed towards the calling network and continue call establishment.

If the TETRA network receives a reject component, the TETRA network shall accept this information and continue with call establishment.

5.5.1.4 Procedures where a call from the TETRA network is forwarded within or beyond the public ISDN

The procedures as stated in subclauses 5.5.1.4 and 5.5.1.5 shall apply.

5.5.1.5 Presentation of a forwarded call from a TETRA network to the public ISDN

5.5.1.5.1 Normal operation

If a forwarded call is presented from a TETRA network to the public ISDN, then the SETUP message sent from the TETRA network to the public network shall contain a Facility information element including a ForwardingLegInformation2 invoke component using the procedure described in subclause 8.3.1.1 of EN 300 196-1 [16]. This invoke component shall indicate:

- in the Forwarding Counter parameter, the number of forwarding that the call has experienced so far;
- in the Forwarding Reason parameter, the reason for the last forwarding;
- in the Forwarding User Number parameter, the (TETRA in the ISDN format) number of the last forwarding user; and
- in the Original Called User Number parameter, the (TETRA in the ISDN format) number of the first forwarding user if multiple forwarding occurred. This parameter shall not be included if only one forwarding occurred.

The Forwarding User Number parameter and Original Called User Number parameter shall be one of the following choices:

- "presentation Allowed Number", when the TETRA network allows to release the forwarding number to the forwarded-to user;
- "presentation Restricted", when the TETRA network restricts the release the forwarding number to the forwarded-to user;

NOTE: The condition "when the TETRA network allows to release the forwarding number to the forwarded-to user" is controlled by the equivalent within the public ISDN of the subscription option "forwarding number is released to forwarded-to user".

- "Number Not Available Due To Inter-working", if the number is not available due to inter-working.

In response to the ForwardingLegInformation2 invoke component, and when it receives from the forwarded-to network the presentation indicator (in accordance with the COLR supplementary service of the forwarded-to user), the public network shall include a ForwardingLegInformation3 invoke component in the FACILITY, ALERTING or CONNECT message sent to the TETRA network. The Presentation Allowed Indicator parameter shall indicate whether or not presentation of the forwarded-to user's ISDN number is allowed to the TETRA calling user.

If the TETRA network receives a correctly encoded ForwardingLegInformation3 invoke component, the TETRA network shall accept the information and not respond to the public network.

5.5.1.5.2 Exceptional procedures

If the TETRA network does not receive a ForwardingLegInformation3 invoke component, the TETRA network shall assume that presentation of the forwarded-to number is not allowed and continue with call establishment.

If the TETRA network receives a reject component, the TETRA network shall accept this information and continue with call establishment.

5.5.1.6 Procedures where a call from the public ISDN is forwarded within or beyond the TETRA network and partial re-routing takes place in the public ISDN

5.5.1.6.1 Normal operation

If a SETUP message is sent from a public network to a TETRA network, and a subsequent partial re-routing request can be allowed for that call, then the public network shall:

- store any information that is not included in the SETUP message but which is available to the network at that time, (e.g. a restricted calling party sub-address);
- store any information that is guaranteed by the public network for regulatory purposes and which is available to the network at that time, (i.e. calling party number, original called number);
- store the progress information that is included in the SETUP message (i.e. information corresponding to the content of the Progress indicator information element).

The public network shall retain this information until a CONNECT message, or a clearing message is received for this call reference.

To request forwarding by partial re-routing, for a call presented from the public network to the TETRA network, the TETRA network shall send a Call Rerouting invoke component to the public network in a FACILITY message using the procedure described in subclause 8.3.1 of EN 300 196-1 [16]. The TETRA network shall send the Facility information element in a FACILITY message to the public network while in the Call Received call state (U7), in the Incoming Call Proceeding call state (U9) or in the Overlap Receiving call state (U25).

The Call Re-routing invoke component shall contain:

- a) in the re-routing Reason parameter, the call re-routing reason. If multiple forwarding have occurred, the re-routing Reason parameter shall contain the reason of the last forwarding;
- b) in the Forwarded-to user number parameter, the forwarded-to address;
- c) in the Forwarding Counter parameter, the number of forwarding which shall be the sum of the number of forwarding indicated in the SETUP message, if any, and the number of forwarding recognized by the TETRA network;
- d) in the q931InfoElement parameter, the Bearer capability information element with contents compatible with the SETUP message that established the call reference;
- e) in the q931InfoElement parameter, Low layer compatibility and High layer compatibility information elements, if available and with contents compatible with the SETUP message that established the call reference;
- f) in the q931InfoElement parameter, the User-user information element for the implicit service 1 request of the user-to-user signalling supplementary service, if available and with contents compatible with the SETUP message that established the call reference. For the explicit request of the user-to-user signalling supplementary service, see EN 300 195-1 [15];
- g) in the Last Forwarding Number parameter, the last forwarding number parameter.

The Last Forwarding Number parameter shall be one of the following choices:

- 1) "presentation Allowed Number", when the TETRA network allows to release the forwarding number to the forwarded-to user in which case the following information is included:
 - unknown Party Number parameter, if the numbering plan is unknown and where the last forwarding user number information is included within this parameter; or

- public Party Number parameter, if the numbering plan is according to the ISDN numbering plan (ITU-T Recommendation E.164 [20]), indicating in the public Type Of Number parameter either "international Number", "national Number", or as a network provider option the value "unknown". The public Number Digits parameter shall contain the last forwarding number information.
- 2) "presentation Restricted", when the TETRA network does not allow to release the forwarding number to the forwarded-to user; or
 - 3) "number Not Available Due To Inter-working", if the number is not available due to inter-working; or
 - 4) "presentation Restricted Number", when the TETRA network does not allow to release the forwarding number to the forwarded-to user, in which case the following information is included:
 - unknown Party Number parameter, if the numbering plan is unknown and where the last forwarding number information is included within this parameter; or
 - public Party Number parameter, if the numbering plan is according to the ISDN numbering plan (ITU-T Recommendation E.164 [20]), indicating in the public Type Of Number parameter either "international Number", "national Number", or as a network provider option the value "unknown". The public Number Digits parameter shall contain the last forwarding number information.

NOTE 1: The condition "when the TETRA network allows to release the forwarding number to the forwarded-to user" is controlled by the equivalent within the TETRA network of the subscription option "forwarding number is released to the forwarded-to user".

NOTE 2: "Compatible" in the above text means that the contents are identical, unless a DSS1 protocol procedure has occurred that alters this information, e.g. fallback within either the bearer capability or high layer compatibility selection.

In addition, the Call Forwarding invoke component may contain in the subscription Option parameter, the value of subscription option "calling user is notified of forwarding". If this parameter is not included the network shall assume "no Notification".

The public network shall act immediately on the call forwarding invocation request and shall perform call forwarding towards the indicated address.

The public network shall use the information received in the Call Forwarding invoke component, and the information stored in the network in order to generate the forwarding call.

Depending on a network provider option, two cases exist:

- the public network shall retain the call to the TETRA network until the forwarded-to user is alerting or has answered (i.e. alerting has not been indicated). The network shall inform the served user that call forwarding is being invoked by sending a FACILITY message containing a Facility information element with the Call Forwarding return result component and shall continue to offer the call to the served user. When an alerting or answer indication has been received from the forwarded-to network, the public network shall clear the call towards the TETRA network by sending a DISCONNECT message with the Cause information element indicating cause #31 "normal, unspecified";

NOTE 3: The forwarding network will send the notification information to the calling network when it receives an alerting indication from the forwarded-to network.

- the public network shall clear the call towards the TETRA network on acceptance of the FORWARD request by sending a DISCONNECT message containing a Facility information element with a Call Forwarding return result component and with the Cause information element indicating cause #31 "normal, unspecified".

NOTE 4: The forwarding network will send the notification information to the calling network when the forwarding operation to the forwarded-to network is invoked.

5.5.1.6.2 Exceptional procedures

If the public network cannot accept the call forwarding invocation request from the TETRA network, it shall send a Facility information element, with a FORWARD ACK component in the FACILITY message and release the invoke identifier. The error value indicated in the FORWARD ACK reject cause component shall be one of the following:

- "not Subscribed", if (for a given ISDN number or for the whole access) the requested call forwarding supplementary service has not been subscribed to for the indicated basic service;
- "not Available", if the requested call forwarding supplementary service is not available for the indicated basic service;
- "supplementary Service Interaction Not Allowed", if the provision of the call forwarding supplementary service activation is precluded by a procedure within clause 5 of EN 300 195-1 [15];
- "resource Unavailable", if the resources required to perform adequately the requested call forwarding supplementary service are not available;
- "Invalid Forwarded-to User Number", if the indicated forwarded-to number cannot be accepted;
- "Special Service Number", if the indicated forwarded-to number identifies a special service number (e.g. police, emergency, operator) and forwarding is prohibited to this special service number;
- "Forwarding To Served User Number", if the indicated forwarded-to number is identical to the ISDN number identifying the served user;
- "Number Of Forwarding Exceeded", if the limit on the number of forwarding has already been reached.

Subsequent procedures for the public and TETRA network are according to normal call handling procedures as described in clause 5 of EN 300 403-1 [14] for public ISDN and ETS 300 392-3-2 [8] for TETRA network.

The TETRA network, on receiving a reject component, shall take no action, and remain in the same state as before the Call Forwarding invoke component was sent.

If the public network receives a reject component from the TETRA network, it shall take no protocol action.

If the public network provider option "served user call retention on invocation of forwarding" is "retain call until alerting begins at the forwarded-to user" and if the call to the forwarded-to user fails (e.g. due to NDUB), no specific protocol action shall be taken towards the TETRA network. Normal call clearing procedures towards the forwarded-to user shall continue to apply.

5.5.1.7 Procedures where a call from the public ISDN to the TETRA network is forwarded by the public ISDN

These procedures are applied where the TETRA network wishes to forward all incoming calls, or all incoming calls for a specific basic service, for that TETRA network user to an alternative destination.

For activation, deactivation and interrogation of the call forwarding supplementary services at the T reference point, the procedures of subclause 9.1 of EN 300 207-1 [18] shall apply except that the activation and deactivation shall only be applicable for the whole TETRA network. All activation and deactivation requests not containing the indication "for all numbers" shall be rejected by sending an appropriate return error component to the TETRA network as specified in subclause 10.2.2.2 of EN 300 196-1 [16].

For invocation and operation of the forwarding supplementary services at the T reference point, the procedures of subclause 9.2.4 of ETS 300 207-1 [18] shall apply except that, if the forwarding user has subscribed to the direct dialling in supplementary service the forwarding network shall include the Called party number information element containing the called user's number in the FACILITY message. In the Called party number information element the type of number shall be set to "international", "national", "subscriber" or "unknown", and the numbering plan identification shall be set to "ISDN numbering plan (ITU-T Recommendation E.164 [20])" or "unknown". The called party number information shall be indicated in the number digits field.

5.5.2 SS-CF Impact of inter-working with non-ISDNs

When an Incoming Gateway SwMI also provides Rerouteing SwMI functionality, in support of call forwarding by rerouteing, the joint requirements of subclause 5.5.2.1 (for an Incoming Gateway SwMI) and subclause 5.4.4.1 (for a Rerouteing SwMI) shall apply.

5.5.2.1 Impact of inter-working on incoming calls

When inter-working with another network which supports equivalent supplementary services, the Incoming Gateway SwMI may provide conversion between the signalling specified in this Standard and the signalling protocol of the other network.

5.5.2.2 Impact of inter-working on outgoing calls

When inter-working with another network which supports equivalent supplementary services, the Outgoing Gateway SwMI may provide conversion between the signalling specified in this Standard and the signalling protocol of the other network.

5.6 Protocol Interactions between SS-CF and other SSs and ANFs

5.6.1 Protocol interactions of SS-CFU

5.6.1.1 Interaction with Completion of Call to Busy Subscriber (SS-CCBS)

The following interaction shall apply if SS-CCBS is supported in accordance with ETS 300 392-12-13 [12].

5.6.1.1.1 Originating SwMI procedures for invoking CCBS at a CFU forwarded-to user

NOTE: In this case the Originating SwMI with regard to CCBS is also the Originating SwMI with regard to CFU.

If CCBS is to be invoked at a busy diverted-to user, the Originating PINX shall store the content of element Nominated User Number, if received in the PDU INFORM 1, and use it:

- as element number B in the argument of any CCBS operation which requires this element;
- as Called party number information element in the SETUP message of any call independent signalling procedure;
- as Called party number information element in the SETUP message of the CCBS Call.

The address of the originally called user shall not be used for CCBS.

If element Nominated User Number is not available, a CCBS request received from User A shall be rejected.

5.6.1.1.2 Originating SwMI procedures if CFU is activated by SS-CCBS User A

No protocol interaction.

NOTE 1: In this case the Originating SwMI with regard to CCBS is the Served User SwMI with regard to CFU.

NOTE 2: If SS-CCBS User A, having a CCBS request outstanding against User B, has activated CFU and the connection release option of CCBS applies, an arriving call independent signalling connection (conveying a CCBS RECALL PDU or a CCBS CANCEL PDU) is not an incoming call and will therefore not be diverted.

5.6.1.1.3 Terminating SwMI procedures if CFU is activated by User B after CCBS has been invoked

No protocol interaction.

5.6.1.2 Interaction with Completion of Calls on No Reply (SS-CCNR)

The following interaction shall apply if SS-CCNR is supported in accordance with ETS 300 392-12-23 [13].

5.6.1.2.1 Originating SwMI procedures for invoking CCNR at a CFU diverted-to user

NOTE: In this case the Originating SwMI with regard to CCNR is also the Originating SwMI with regard to CFU.

If CCNR is to be invoked at a diverted-to user who does not answer, the Originating PINX shall store the content of element Nominated User Number, if received in the PDU INFORM 1, and use it:

- as element number B in the argument of any CCNR operation which requires this element;
- as Called party number information element in the SETUP message of any call independent signalling procedure;
- as Called party number information element in the SETUP message of the CCNR Call.

The address of the originally called user shall not be used for CCNR.

If element Nominated User Number is not available, a CCNR request received from User A shall be rejected.

5.6.1.2.2 Originating SwMI procedures if CFU is activated by SS-CCNR User A

No protocol interaction.

NOTE 1: In this case the Originating SwMI with regard to CCNR is the Served User PINX with regard to CFU.

NOTE 2: If SS-CCNR User A, having a CCNR request outstanding against User B, has activated CFU and the connection release option of CCNR applies, an arriving call independent signalling connection (conveying a CCNR RECALL PDU or a CCNR CANCEL PDU) is not an incoming call and will therefore not be diverted.

5.6.1.2.3 Terminating PINX procedures if CFU is activated by User B after CCNR has been invoked

No protocol interaction.

5.6.1.3 Interaction with Call Transfer (SS-CT)

No protocol interaction.

5.6.1.4 Interaction with Call Forwarding Busy (SS-CFB)

Protocol interactions are specified in subclause 5.4.

5.6.1.5 Interaction with Call Forwarding No Reply (SS-CFNR)

Protocol interactions are specified in subclause 5.4.

5.6.2 Protocol interactions of SS-CFB

5.6.2.1 Interaction with Completion of Calls to Busy Subscriber (SS-CCBS)

The following interaction shall apply if SS-CCBS is supported in accordance with ETS 300 392-12-23 [13].

5.6.2.1.1 Originating SwMI procedures for invoking CCBS at a CFB diverted-to user

NOTE: In this case the Originating SwMI with regard to CCBS is also the Originating SwMI with regard to CFB.

The procedures of subclause 5.6.1.3.1 shall apply.

5.6.2.1.2 Originating SwMI procedures if CFB is activated by SS-CCBS User A

No protocol interaction.

5.6.2.1.3 Terminating SwMI procedures if CFB is activated by User B after CCBS has been invoked

No protocol interaction.

5.6.2.2 Interaction with Completion of Calls on No Reply (SS-CCNR)

The following interaction shall apply if SS-CCNR is supported in accordance with ETS 300 392-12-23 [13].

5.6.2.2.1 Originating SwMI procedures for invoking CCNR at a CFB diverted-to user

NOTE: In this case the Originating SwMI with regard to SwMI is also the Originating PINX with regard to CFB.

The procedures of subclause 5.6.1.2.1 shall apply.

5.6.2.2.2 Originating SwMI procedures if CFB is activated by SS-CCNR User A

No protocol interaction.

5.6.2.2.3 Terminating SwMI procedures if CFB is activated by User B after CCNR has been invoked

No protocol interaction.

5.6.2.3 Interaction with Call Forwarding Unconditional (SS-CFU)

Protocol interactions are specified in subclause 5.4.

5.6.2.4 Interaction with Call Forwarding No Reply (SS-CFNRY)

Protocol interactions are specified in subclause 5.4.

5.6.2.5 Interaction with Call Waiting

A SwMI supporting SS-CFB shall also support SS-CW; a user can first invoke SS-CW for an incoming call and then decide to disconnect with User Determined User Busy Disconnect Cause. Called user SwMI shall then invoke SS-CFB and the process will proceed as shown in figure 2.

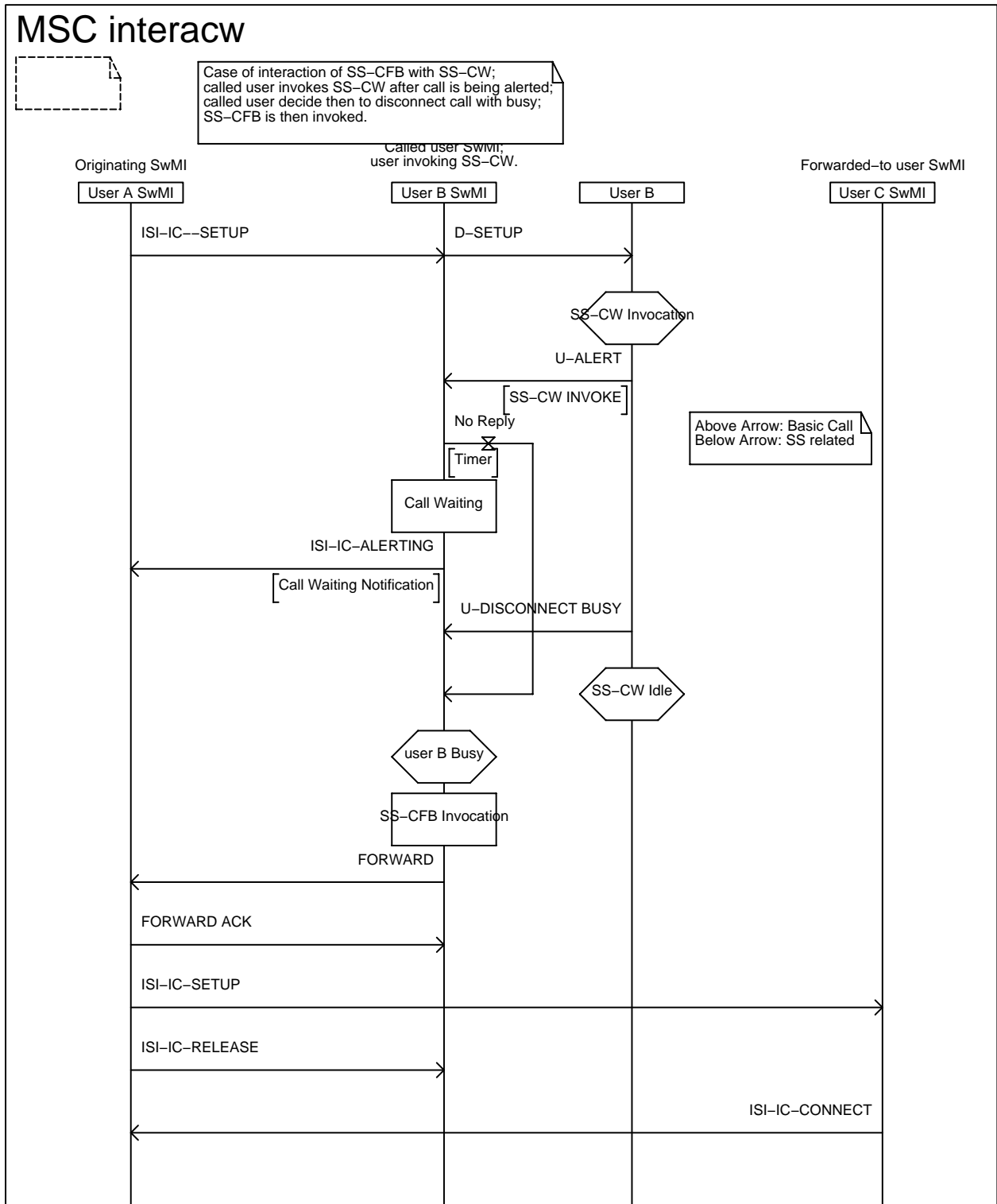


Figure 2: Interaction between SS-CW and SS-CFB

5.6.3 Protocol interactions of SS-CFNry

5.6.3.1 Interaction with Completion of Calls to Busy Subscriber (SS-CCBS)

No protocol interaction.

5.6.3.2 Interaction with Completion of Calls on No Reply (SS-CCNR)

The following interaction shall apply if SS-CCNR is supported in accordance with ETS 300 392-12-13 [12].

5.6.3.2.1 Originating SwMI procedures for invoking CCNR at a CFNR diverted-to user

The procedures of subclause 5.6.1.2.1 shall apply.

5.6.3.2.2 Originating SwMI procedures if CFNR is activated by SS-CCNR User A

No protocol interaction.

5.6.3.2.3 Terminating SwMI procedures if CFNR is activated by User B after CCNR has been invoked

No protocol interaction.

5.6.3.3 Interaction with Call Forwarding Unconditional (SS-CFU)

Protocol interactions are specified in subclause 5.4.

5.6.3.4 Interaction with Call Forwarding Busy (SS-CFB)

Protocol interactions are specified in subclause 5.4.

5.6.4 Protocol interactions of SS-CFNRc

Those protocol interactions apply only to the case of Individual Calls. Interactions of SS-CFNRc are divided into two sub classes:

- Case of "early" CFNRc;
- Case of "late" CFNRc.

"Early" CFNRc is defined as the called/served user home SwMI knows at the call setup time that the called/served user is Not Reachable.

"Late" CFNRc is defined as the called/served user home SwMI is not aware of the fact that the called/served user is not reachable at the time of the call set-up.

5.6.4.1 Protocol interactions of SS-CFNRc in the case of early CFNRc

Subclause 5.6.1 shall apply identical to SS-CFU.

5.6.4.2 Protocol interactions of SS-CFNRc in the case of late CFNRc

Subclause 5.6.3 shall apply.

5.6.5 Protocol interactions of SS-CF with ANF-Inter-System-Interface Individual Call (ANF-ISIIC)

In the case of SS-CFU and SS-CFNRc (in the case where the not reachable indication has reached the user B home SwMI which will be called "early" CFNRc) user B home SwMI can determine immediately the need to invoke SS-CFU or SS-CFNRc. In the case of SS-CFB, SS-CFNRY and "late" SS-CFNRc (in the case where user B home SwMI not reachable indication has not yet reached user B home SwMI), the home SwMI is not able to determine the actual condition of the called user B; only the visited SwMI can; there will therefore be two different interactions between ANF-ISIIC and SS-CFU and "early" SS-CFNRc on one side and between ANF-ISIIC and SS-CFB, SS-CFNRY and "late" SS-CFNRc on the other side.

5.6.5.1 Interactions of SS-CFU with ANF-ISIIC.**5.6.5.1.1 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.

5.6.5.1.2 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).

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.

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.

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).

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

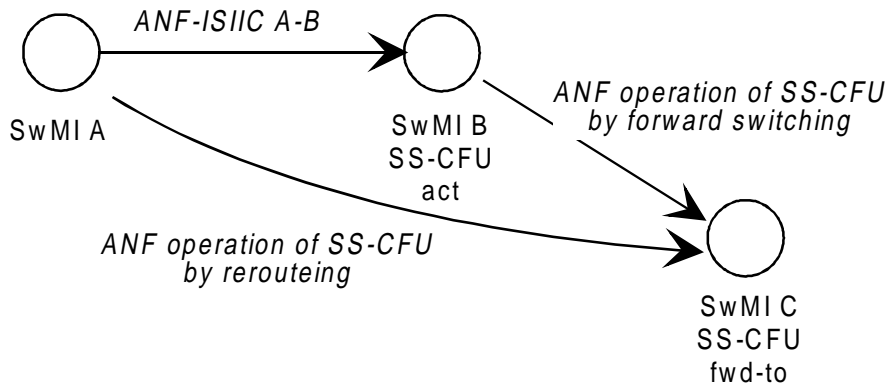


Figure 3: Interaction with SS-CFU Forwarded-to user with home SwMI being SwMI B, having migrated

If the forwarded-to user home SwMI is SwMI B and if this user has migrated, as illustrated by figure 3, 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.

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

The same provisions as in 5.6.5.1.2.6 shall apply if the home SwMI of the forwarded-to user is different from SwMI B and this user has not migrated.

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 4.

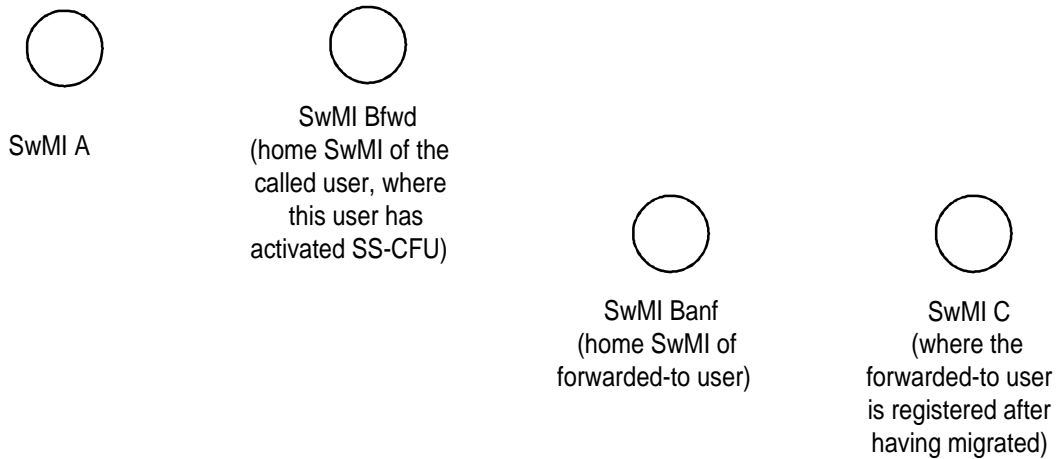


Figure 4: SwMI identification Forwarded-to user with home SwMI different from SwMI B, having migrated

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 subclause 5.6.5.1.2.6, 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 5);
- 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 6);
- 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.

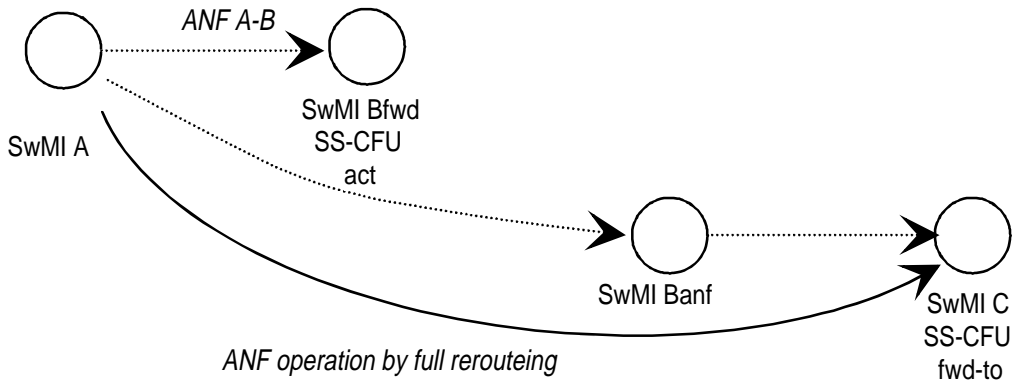


Figure 5: Interaction with SS-CFU re-routing Forwarded-to user with home SwMI different from SwMI B, having migrated ANF operation by full re-routing

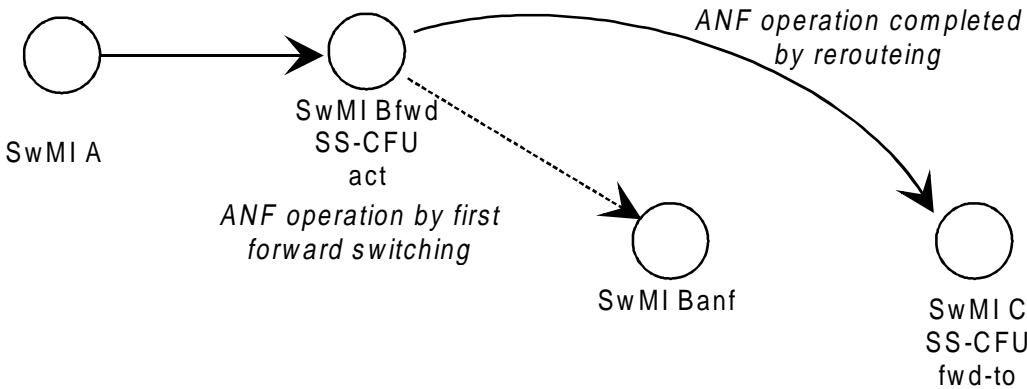


Figure 6: Interaction with SS-CFU operated by forward switching Forwarded-to user with home SwMI different from SwMI B, having migrated ANF operation by first forward switching and then re-routing

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}).

5.6.5.2 Interactions of SS-CFNRc with ANF-ISIIC

In the case where the called user B SwMI is able to immediately determine that user B is not reachable and that SS-CFNRc has been activated for user B, e.g. "early" NRc condition, the situations will be identical to the case of invocation of SS-CFU and subclause 5.6.5.1 shall apply.

In the case where the called user B SwMI has not yet determined that user B is in a not reachable condition (user B is not in its home SwMI) e.g. "late NRc condition, the invocation of SS-CFNRc shall take place in the user B visited SwMI and subclause 5.6.5.3 shall apply.

5.6.5.3 Interactions of SS-CFB and SS-CFNRy with ANF-ISIIC

Unless otherwise noted, SS-CF in short shall be used to refer to either SS-CFB, SS-CFNRy or SS-CFNRc ("late") indifferently.

The purposes of the definition of interactions between ANF-ISIIC and SS-CF shall be to insure that:

- no loop occurs in the call due to call forwarding;
- no undue ISI-IC or ISI-GC resources are assigned to calls that are in fact "local" within the same SwMI;
- the forwarded-to user is different from the original served user;
- the maximum number of allowed forward switching is not exceeded.

While several successive call forwarding may occur for the same call, the description of the protocol interactions of SS-CF and ANF-ISIIC shall be given in terms of the three users involved in the Call Forwarding process for a single Call Forwarding. The extension to multiple call forwarding can be obtained by substitution of the successive roles of the served user and the forwarded-to user.

It is assumed in what follows (at least for clarity) in that clause that:

- each of the involved user has a stable condition e.g. is not migrating at the time a new call is started;
- each of the involved user has its subscription options stable and defined at the time of interaction, e.g. any involved user is not in the process of activation, deactivation, enabling, disabling, interrogation.

A user may be defined as forwarded-to user for several different SS-CF invocations; in the same manner, a served-user for one invocation of SS-CF may be forwarded-to user for another invocation of SS-CF.

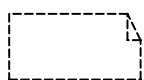
To try to clarify the requirements, the description of the interaction of SS-CF with ANF-ISIIC will be given in the cases of a network operating first in re-routeing only, second in forward switching only and third in forward switching followed by re-routeing.

The protocol interactions of SS-CF with ANF-ISIIC will be specified for each of the users involved in SS-CF, e.g.:

- the calling user;
- the called/served user;
- the forwarded-to user.

Two figures 7 and 8 illustrate a general case of call forwarding in the cases where each user is in its home SwMI (no mobility management) and each user is in a different SwMI.

MSC case0



Each user in its home SwMI;
 call forwarding by forward switching

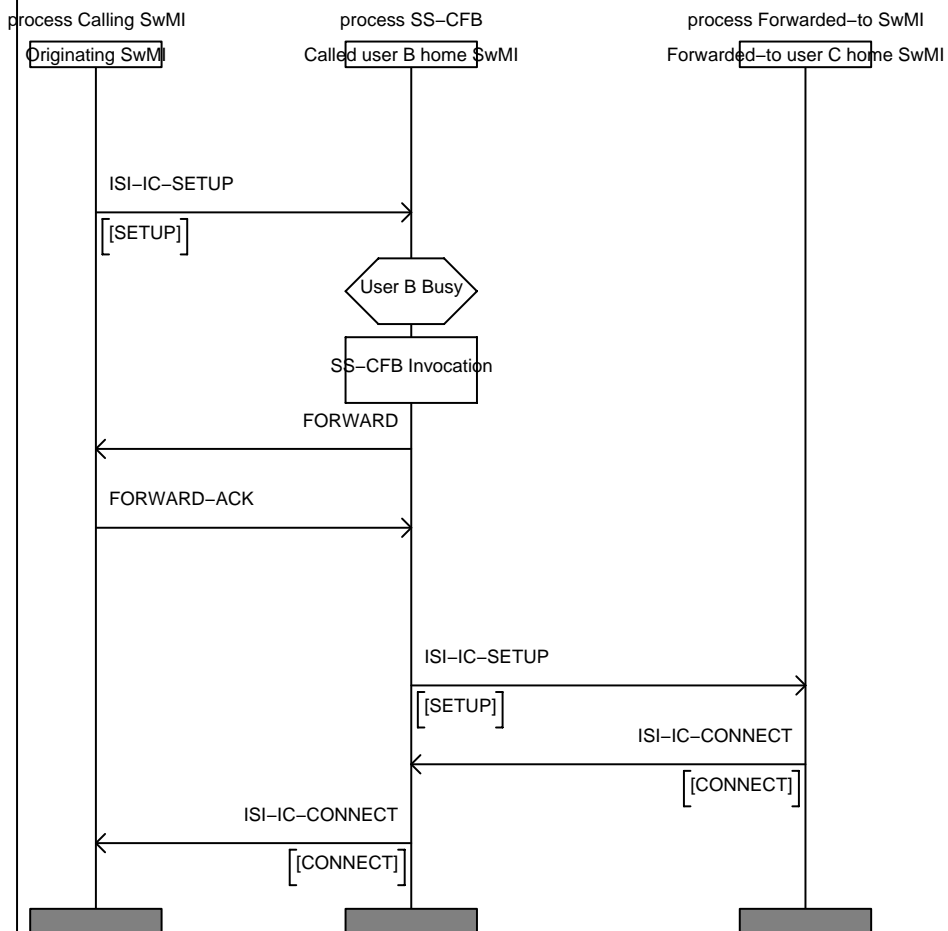


Figure 7: Call forwarding busy by forward switching

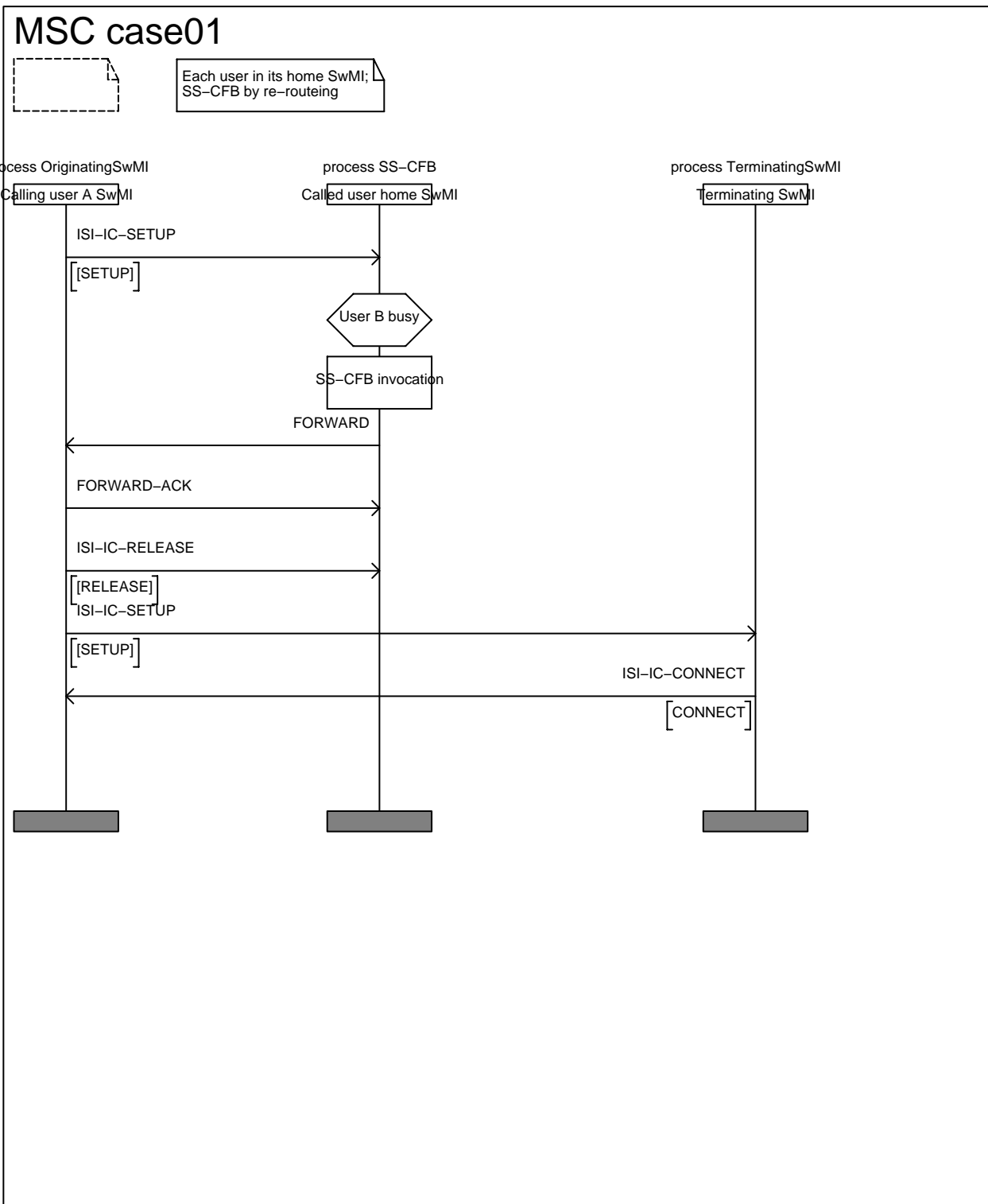


Figure 8: Call forwarding busy by re routing

The identified different cases are listed in table 55.

Table 55: Different cases of interactions

Case #	Home SwMI			Visited SwMI		
	Calling User A	Called/ Served User B	Forward ed-to User C	Calling User A	Called/ Served User B	Forward ed-to User C
1	SwMI A	SwMI A	SwMI A	SwMI B	SwMI A	SwMI A
2	SwMI A	SwMI A	SwMI A	SwMI A	SwMI B	SwMI A
3	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI B
4	SwMI A	SwMI B	SwMI A	SwMI A	SwMI A	SwMI A
5	SwMI A	SwMI B	SwMI A	SwMI A	SwMI C	SwMI A
6	SwMI A	SwMI B	SwMI B	SwMI A	SwMI B	SwMI C
7	SwMI A	SwMI B	SwMI C	SwMI A	SwMI C	SwMI C
8	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI B
9	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI A
10	SwMI A	SwMI B	SwMI C	SwMI B	SwMI B	SwMI C
11	SwMI A	SwMI B	SwMI C	SwMI C	SwMI B	SwMI C

5.6.5.3.1 Protocol interactions affecting the calling user

In those cases where the calling user is visiting a SwMI different from its home SwMI, no specific SS-CF profile needs to have been transferred since the calling user is not the served user of SS-CF.

Case 1

The calling user with home SwMI A is visiting SwMI B. When calling user A sets up a call to user B, SwMI B where user A has migrated shall set-up an ISI-IC according to ETS 300 392-3-2 [8] to SwMI A (user B visited SwMI). SwMI B is not informed at that time of the possible invocation of SS-CF by user B. User B and user C are both in the same SwMI A and in their home SwMIs; the invocation of SS-CF will result in an intra SwMI A call. SwMI A shall monitor the successive internal call forwarding; in the case where the SS-CF invocation leads to a Call Forwarding towards a forwarded-to user being in SwMI B, SwMI A shall release the ISI-IC according to ETS 300 392-3-2 [8] and shall inform SwMI B that the call is a forwarded call in a FORWARD PDU associated to the ISI-IC release. SwMI B shall recognize that the call has now become a call internal to SwMI B, shall accept the release of the ISI-IC, shall accept the call forwarding by replying FORWARD ACK and shall establish that call internally.

In that case, the SwMI B (the calling user visited SwMI) does not need to support SS-CF; the notification to the calling user (call forwarded) will be passed transparently by SwMI B to the calling user. Only in the case where the forwarded-to user is migrating to SwMI B will the SwMI B need to support SS-CF; in the case where SwMI B does not support SS-CF, it will not recognize the FORWARD PDU and will leave it unanswered. The call will be aborted in that case with a cause "unsuccessful call forwarding".

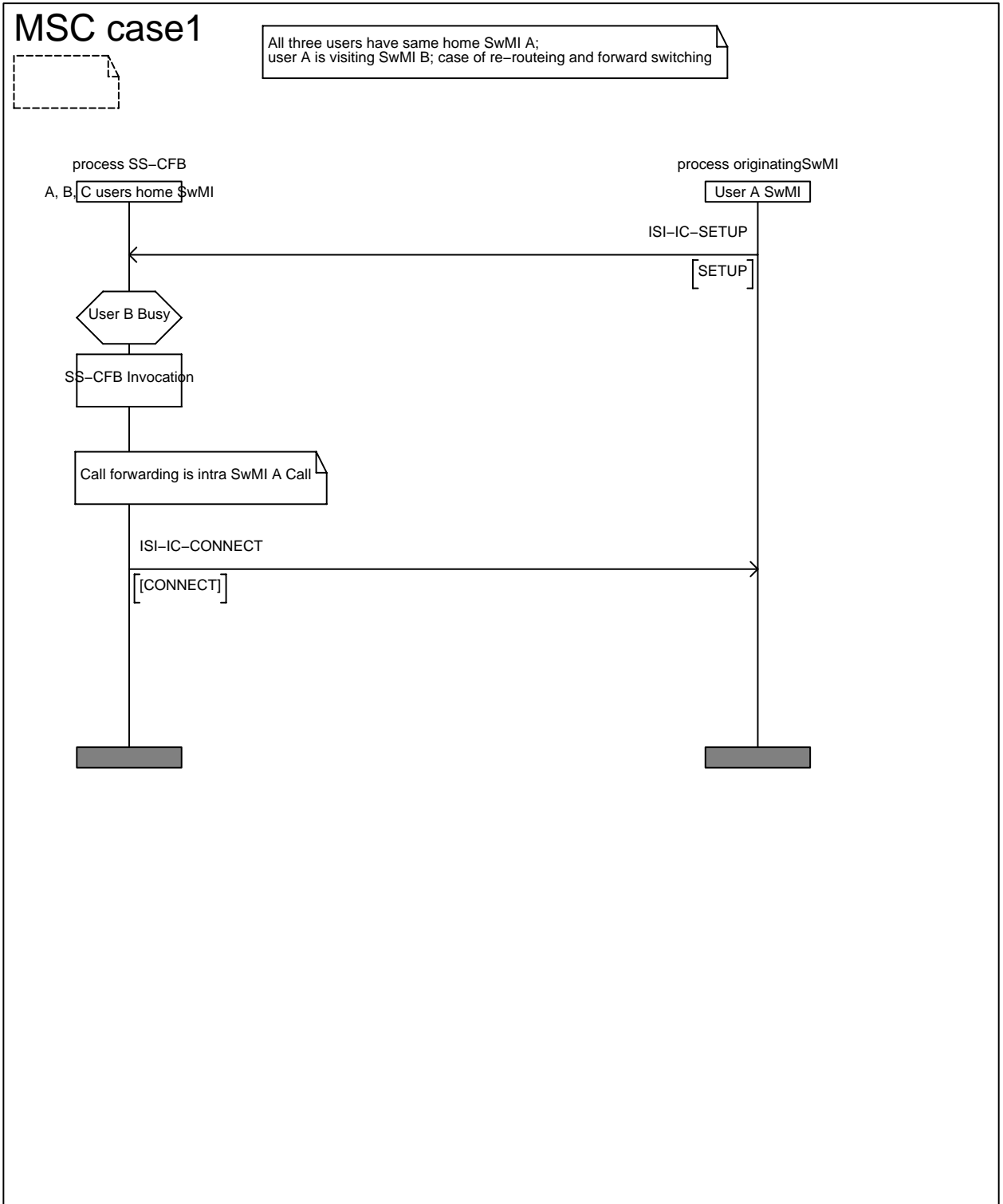


Figure 9: Case 1

Case 10

The calling user with home SwMI A is visiting SwMI B which is both the home and the present SwMI of the served user B. At the time the calling user A in SwMI B sets-up a call to user B, SwMI B shall recognize that user A is now located in the same SwMI as user B and that user A to user B call is a "local" call. As a result of SS-CF being activated and invoked for user B and that invocation leads to a call forwarding to a forwarded-to user C in SwMI C, SwMI B shall send a FORWARD PDU to SwMI C and then set-up an ISI-IC to user C as specified in ETS 300 392-3-2 [8] in SwMI C indicating that the call has been forwarded from SwMI B user B. SwMI C shall monitor the progress of the call within SwMI C and shall keep a record of the initial forwarding user number (user B number) it obtained from SwMI B in the FORWARD PDU; in the case where the forwarded-to user (in the case of multiple call forwarding) is a user in SwMI B, SwMI C shall release the ISI-IC indicating to SwMI B that the call has been forwarded to a forwarded-to user which is in SwMI B. SwMI B shall accept the ISI-IC, shall reply to the FORWARD PDU and shall set-up the call internally.

In that case, SwMI B needs to support fully SS-CF; in that case if SwMI C does not support SS-CF the successive call forwarding will not be successful and the call will be aborted due to "unsuccessful call forwarding".

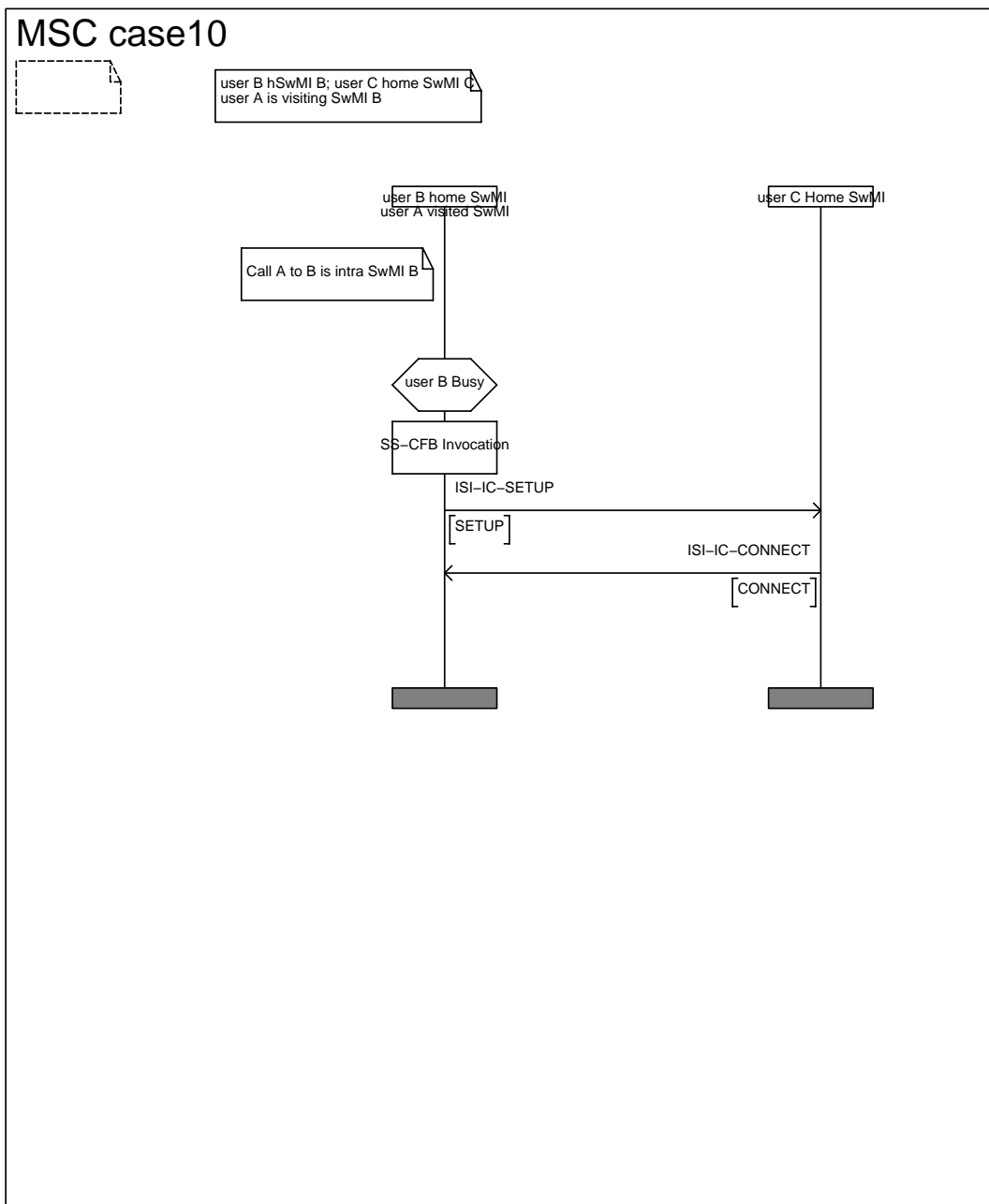


Figure 10: Case 10

Case 11

The calling user with home SwMI A is visiting SwMI C which is the same SwMI as the forwarded-to user SwMI. In the case where the calling user in SwMI C sets up a call to user B in SwMI B, SwMI C shall set-up an ISI-IC call to SwMI B according to ETS 300 392-3-2 [8]. In the case of invocation of SS-CF by user B for that call, SwMI B shall recognize that the forwarded-to user is in SwMI C, shall release the ISI-IC, shall indicate to SwMI C that the call is forwarded to user C which is in SwMI C by a FORWARD PDU. SwMI C shall recognize that the call has now become an internal "local" call to SwMI C, shall reply with a FORWARD ACK PDU, shall accept the release of the ISI-IC and shall set up the call internally. SwMI C shall keep a record of the served user number to avoid forwarding of that call to the served user in case of multiple call forwarding.

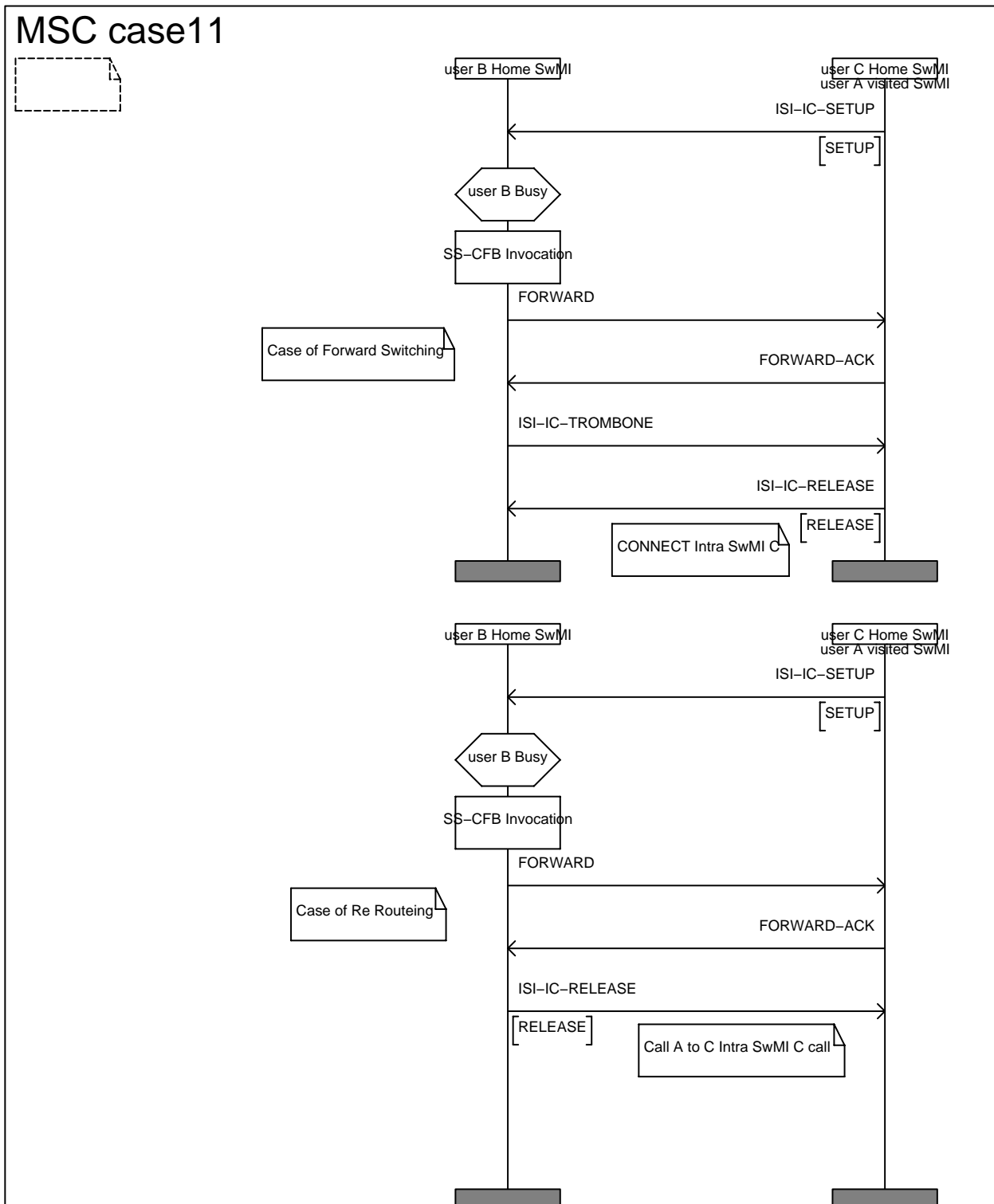


Figure 11: Case 11

5.6.5.3.2 Protocol interactions affecting the called/served user

In those cases where the served user is visiting a SwMI different from its home SwMI, there shall be the need to provide the user B visited SwMI with the profile of user B for SS-CF (see interaction with ANF-MM).

NOTE: That profile transfer is done in two steps by ISI-MM; the first step is to request the visited SwMI to indicate its support of SS-CF; a second step is to provide the visited SwMI with all the profile information needed for that SwMI to support SS-CF in SwMI B for user B.

Case 2

The called/served user is visiting a SwMI B different from its home SwMI A. User B is in a SwMI B different from SwMI A where both users A and C are located. In the case where the calling user sets up a call to the called/served user who is not in its home SwMI A, the originating SwMI A shall recognize the need to establish an ISI-IC to SwMI B. In the case where SS-CF is invoked for the called/served user, SwMI B shall request call forwarding to forwarded-to user in SwMI A in a FORWARD PDU. SwMI A shall recognize that both the calling user and the forwarded-to user are in the same SwMI; SwMI A shall accept the forwarding request with a FORWARD ACK PDU, shall release the ISI-IC and shall set-up an internal "local" call within SwMI A. SwMI A shall keep a record of the fact that call has been forwarded from SwMI B and of the original called user number. SwMI B shall not establish an ISI-IC to SwMI A once the FORWARDrequest has been accepted and the ISI-IC from SwMI A to SwMI B has been released by SwMI A.

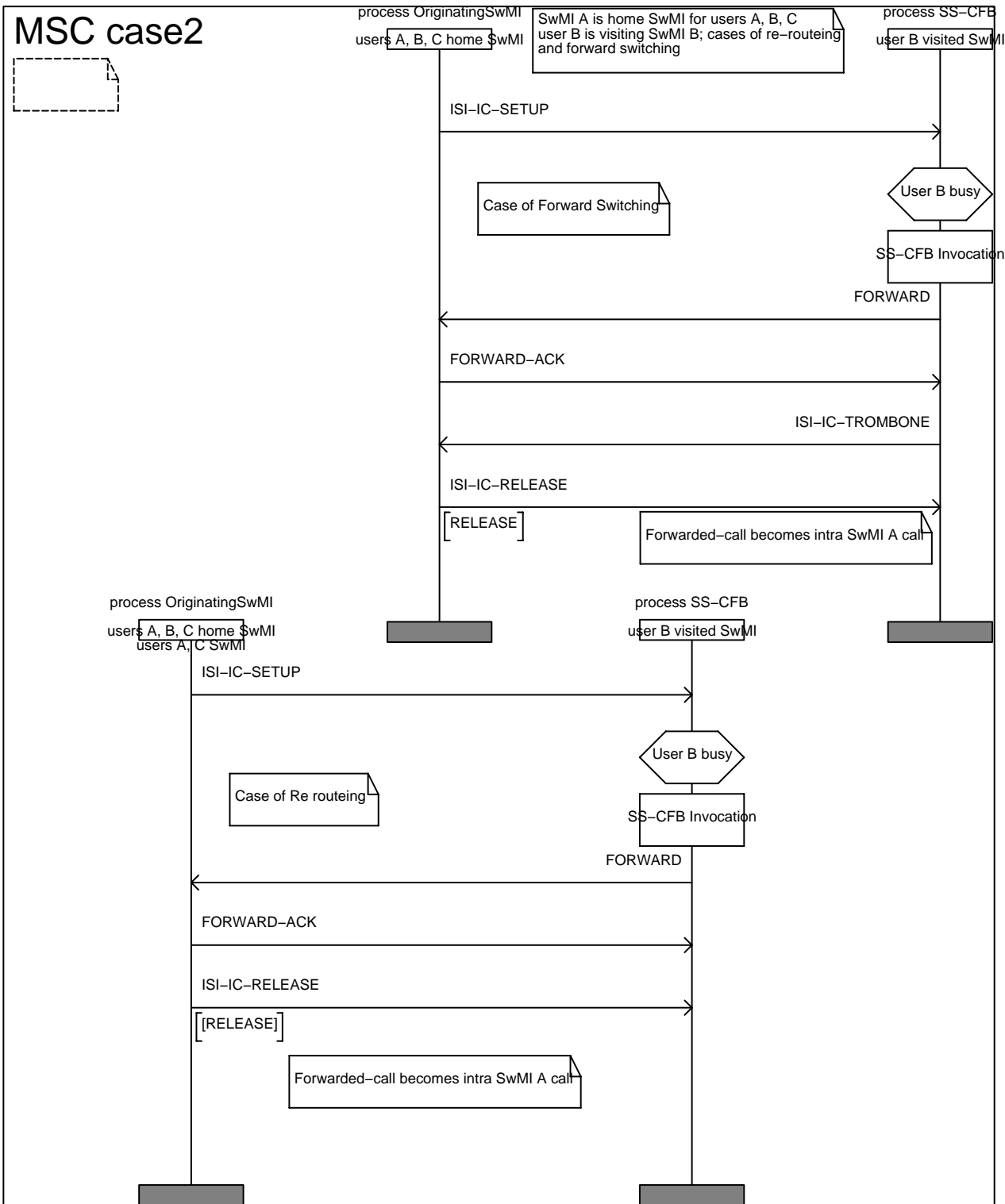


Figure 12: Case 2

Case 4

The called/served user with home SwMI B is visiting the calling user/forwarded-to user SwMI A. SwMI A will have received the SS-CF profile of the called/served user and will know that the called/served user is now in SwMI A. In the case the calling user who is in SwMI A sets up a call to the called user who is now in the same SwMI A as the called user, SwMI A shall recognize the call as an internal "local" call and shall not place an ISI-IC call to SwMI B. Upon invocation of SS-CF at the called/served user, SwMI A will forward internally the call to the forwarded-to user who is also within SwMI A. The forwarding counter is incremented in that case while the transit counter is not incremented. No ISI-IC needs to be established at this point. SwMI A may inform the called/served user home SwMI that SS-CF has been invoked for user B. The information flow corresponding to that case for individual call is provided in Figure 13 of ETS 300 392-3-2 [8] using the TROMBONE flow.

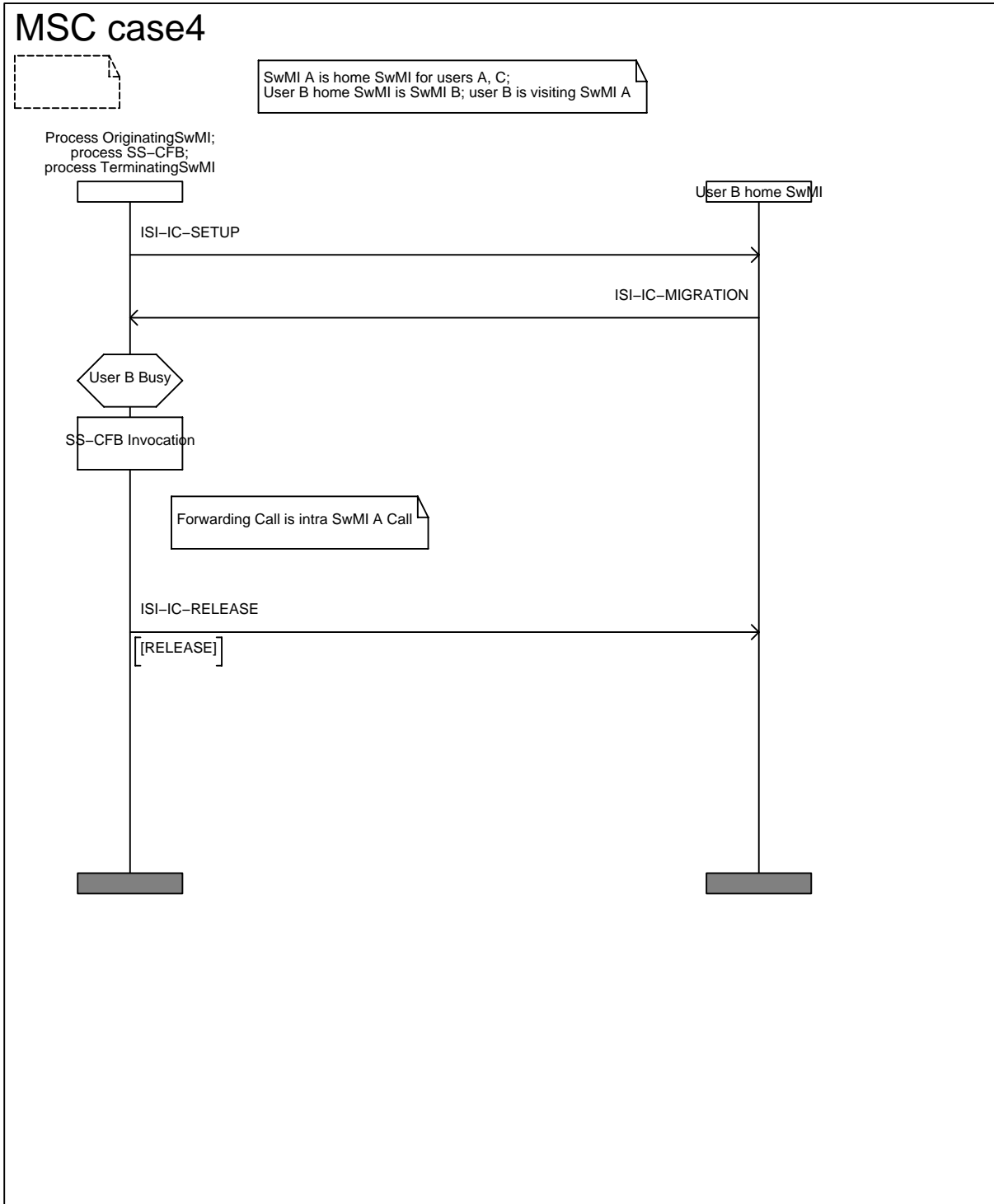


Figure 13: Case 4

Case 5

The called/served user with home SwMI B is visiting SwMI C different from the calling user and from the forwarded-to user SwMI A. SwMI C will have been informed of the SS-CF profile of user B. In the case where the calling user A sets up a call to the called/served user B, the process is as described in ETS 300 392-3-2 [8]. The calling user SwMI A sets up an ISI-IC to the served user home SwMI B; user B home SwMI provides the served user visited SwMI C MNI from the home SwMI database. The call may either be re-routed from the originating SwMI A to SwMI C or be forward switched from the home SwMI B to the served user visited SwMI C. The information flow sequence is contained in Figure 12 of ETS 300 392-3-2 [8] in the case of re-routing, in Figure 11 of ETS 300 392-3-2 [8] in the case of forward switching. In the case of forward switching, the forward counter shall be increased by one. Once the call reaches user B visited SwMI C, SS-CF may be invoked by SwMI C for user B. In the case described here, the forwarded-to user is located in SwMI A so that SwMI C shall place an ISI-IC to SwMI A with a FORWARD PDU; SwMI A shall recognize that the originating calling user is in SwMI A, shall accept the forwarding request with a FORWARD ACK PDU and shall release the ISI-IC from SwMI C; note that in this case, the forwarding counter shall not be incremented for the SwMI C to SwMI A while the transit counter shall be incremented.

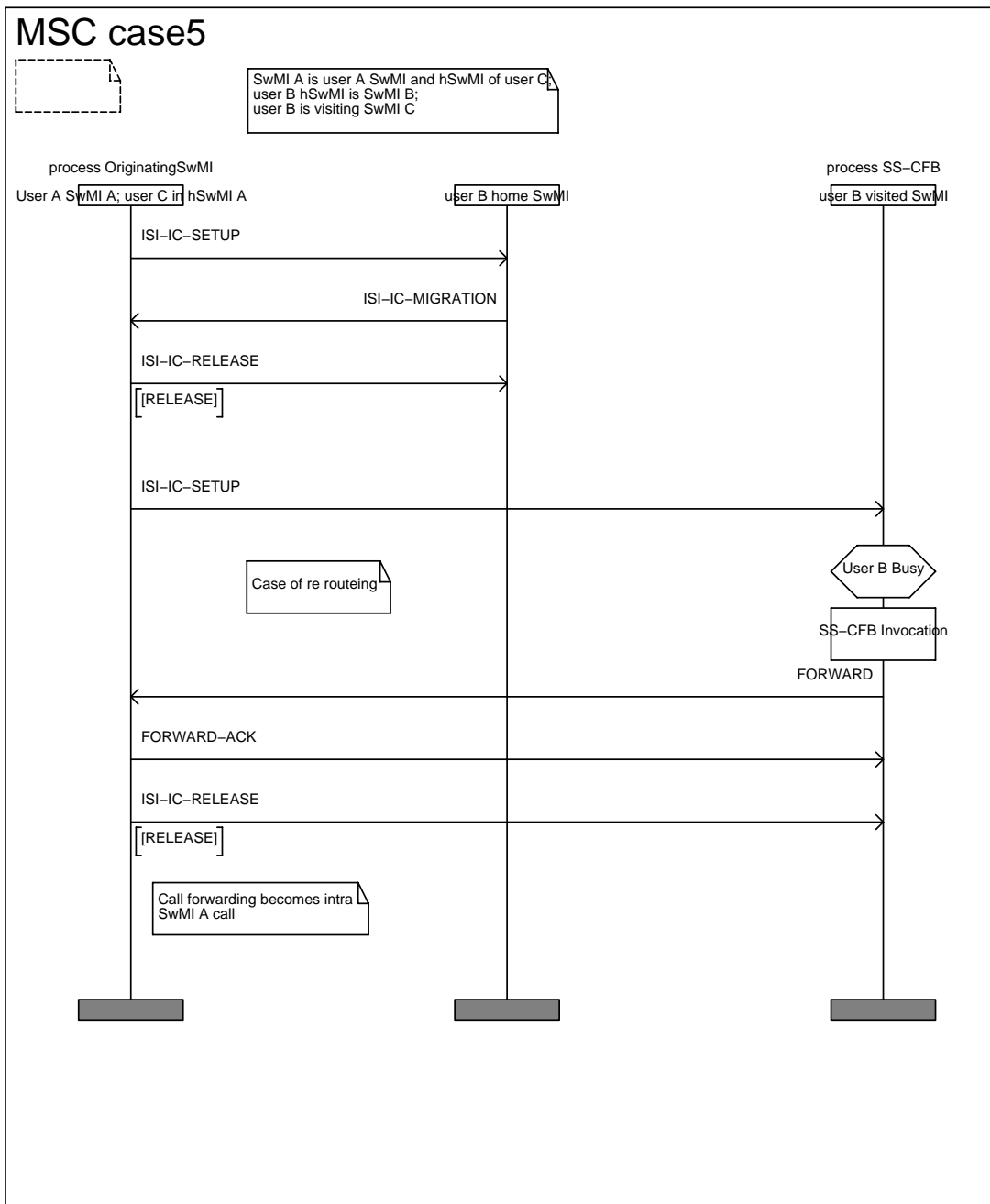


Figure 14: Case 5-1

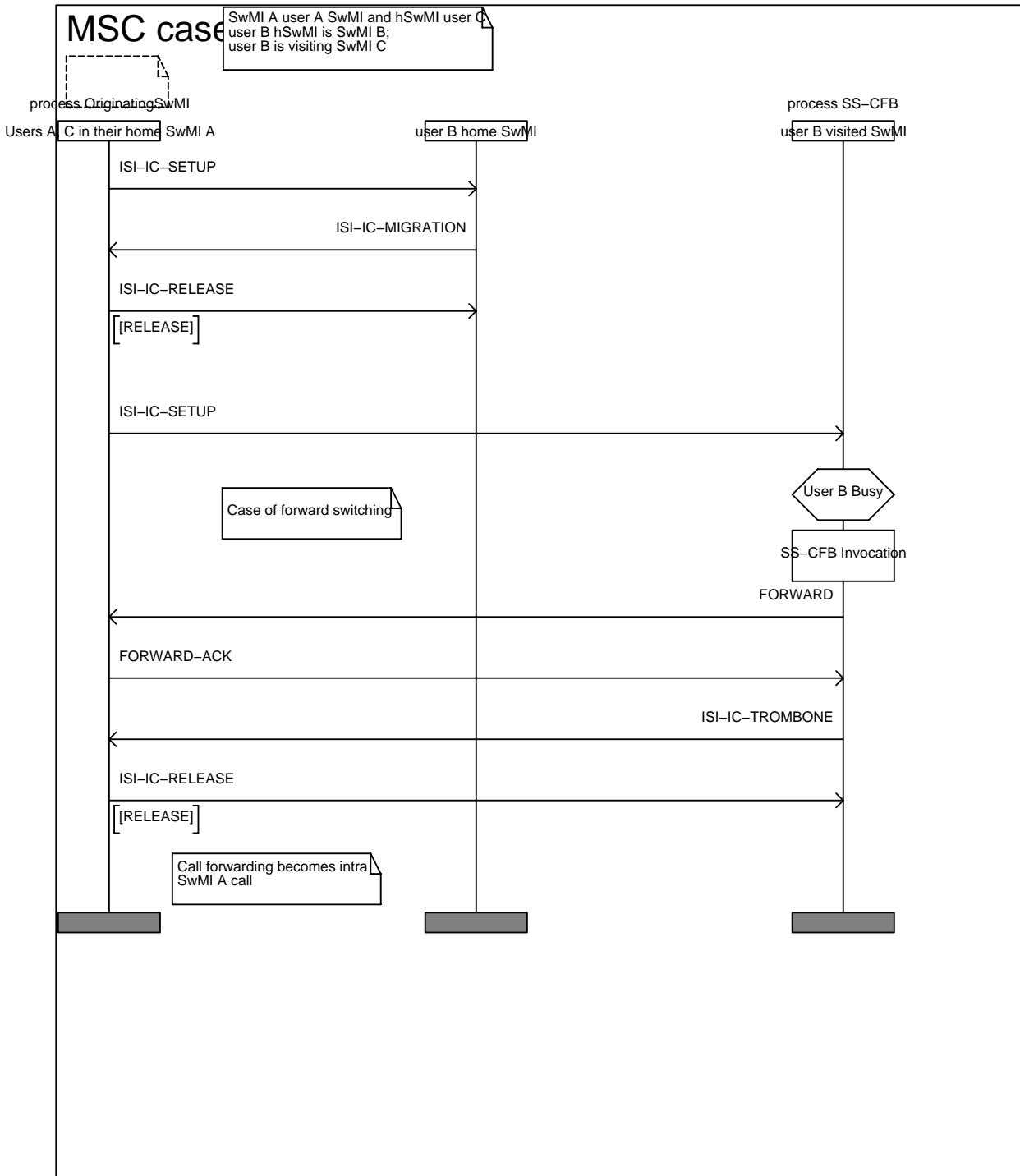


Figure 15: Case 5-2

Case 7

The called/served user with home SwMI B is visiting the forwarded-to user SwMI C. Calling user is in SwMI A, forwarded-to user is in SwMI C. In the case where the calling user sets-up a call to user B, the initial process is the same as described in case 5 e.g. establishment of the call by re-routeing or by forward switching to SwMI C after obtention from user B home SwMI of the new location of user B. Once the call has reached SwMI C, SwMI C may invoke SS-CF for user B; SwMI C shall recognize that now both the served use and the forwarded-to user are both in SwMI C and shall set up an "intra SwMI C" "local" call to complete the call to user C. SwMI C shall inform user A of the call forwarding in a notification message carried by the ISI-IC signalling connection.

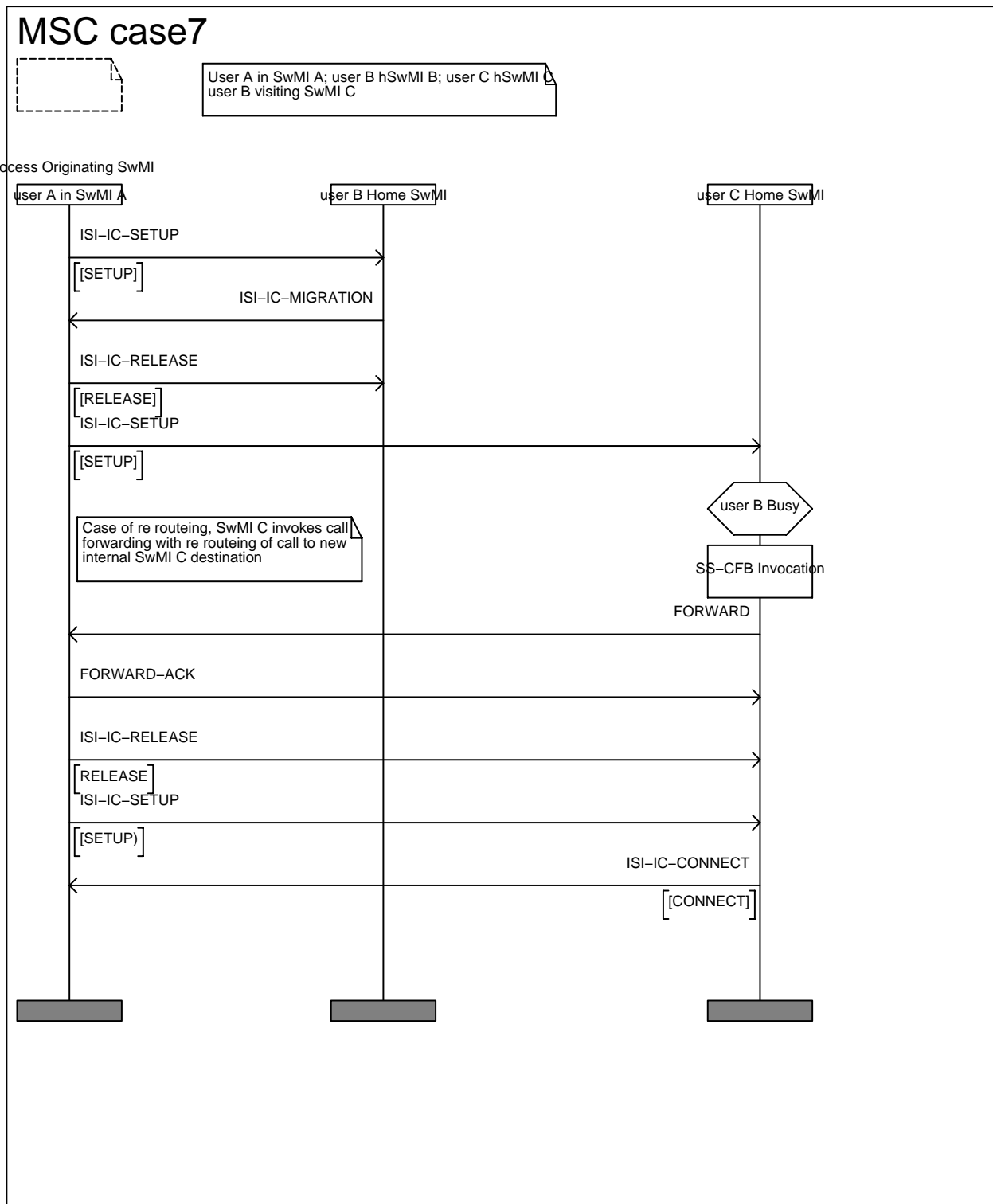


Figure 16: Case 7-1

MSC case72



User A in SwMI A; user B hSwMI B; user C hSwMI C
 user B visiting SwMI C

process Originating SwMI

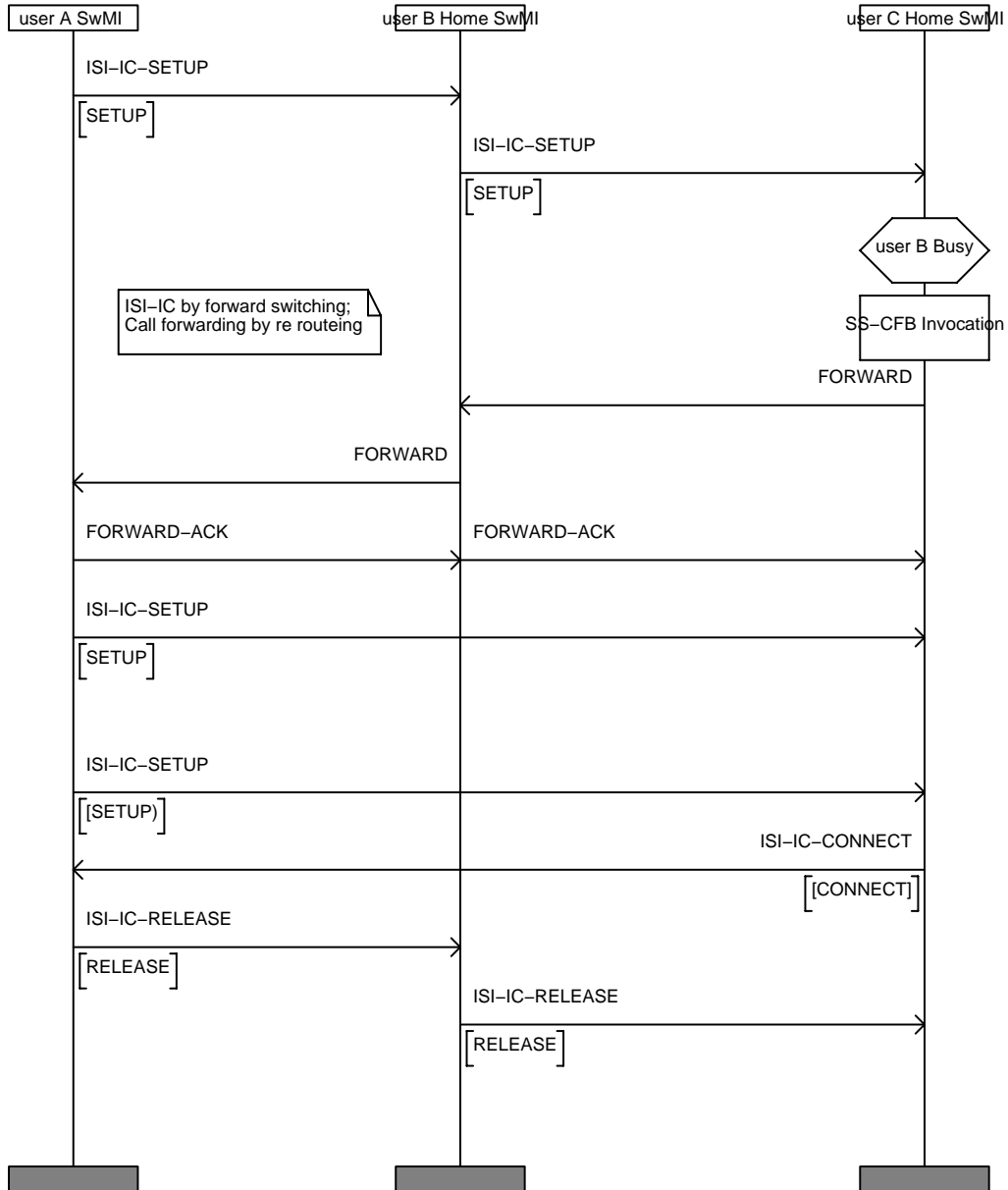


Figure 17: Case 7-2

5.6.5.3.3 Protocol interactions affecting the forwarded-to user

Case 3

The forwarded-to user with home SwMI A is visiting SwMI C different from the calling user SwMI A and from the served user home SwMI A which happen to be the same. In the case where user A sets up a call to user B, SwMI A shall recognize that that call is an "intra SwMI A" "local" call and will try to set-up the call accordingly. In the case where SS-CF is invoked for user B, SS-CF shall indicate that the call shall be forwarded to user C. Forwarded-to user C home SwMI which happens to be SwMI A shall extract from user C home database the new location of the user C. SwMI A shall then set up an ISI-IC call to SwMI C which then shall set-up the call to user C; SwMI C does not need to support SS-CF in that case; it only needs to support the generic design to support supplementary services as defined in ETS 300 392-9 [6]. It shall be able to present to user C the information that the call it is receiving has been forwarded.

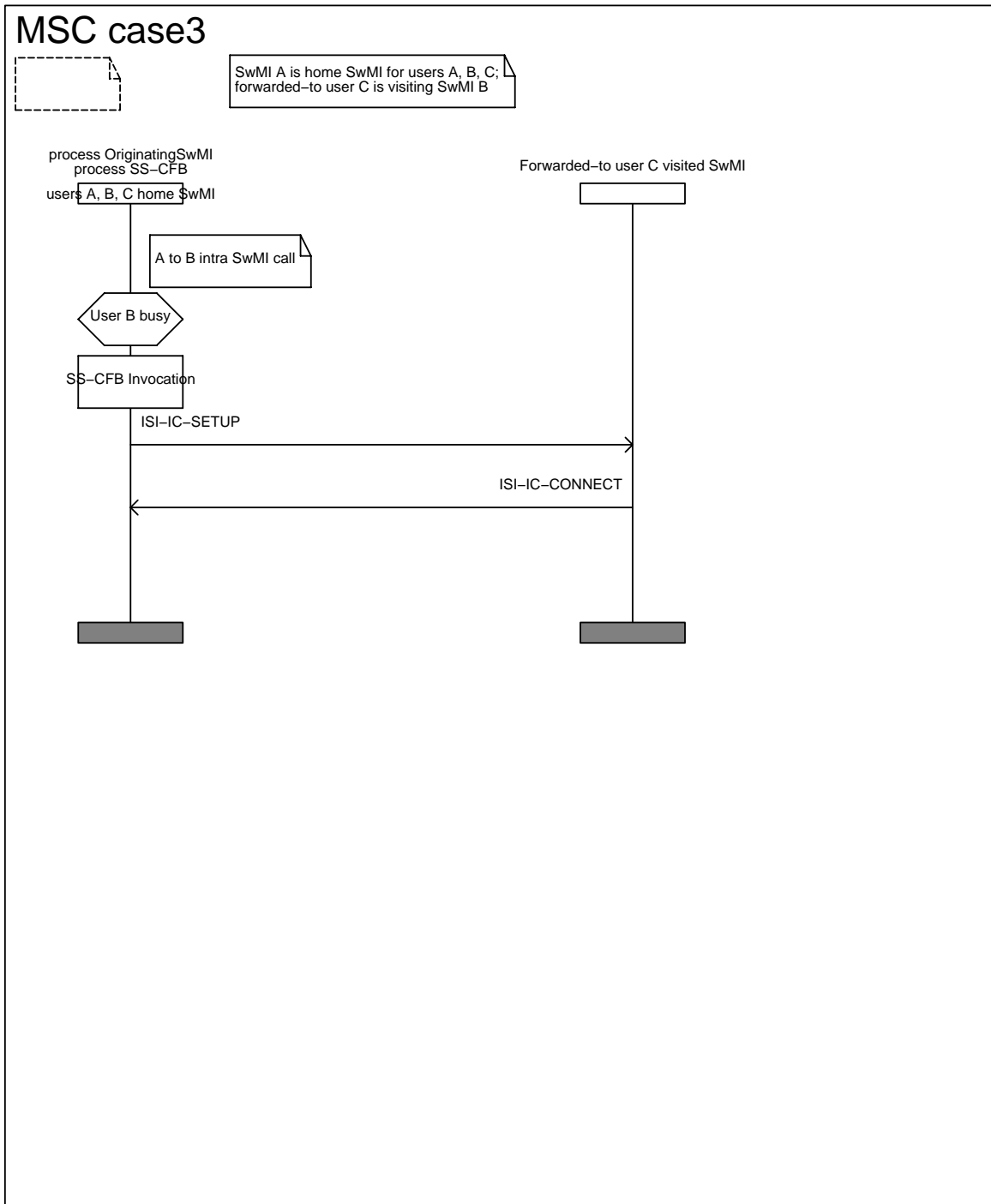


Figure 18: Case 3

Case 6

The forwarded-to user with home SwMI B is visiting SwMI C different from the calling user (home) SwMI A and from the served user (home) SwMI B. The forwarded-to user migration has not been accompanied by any SS-CF profile information unless it is designated itself as a served user when it becomes a called user. In the case where the calling user A sets up a call to user B which is in its home SwMI B, SwMI A sets up an ISI-IC from SwMI A to SwMI B; in the case where SS-CF is invoked for that call for user B, SwMI B will set-up a call to user C which is in SwMI C (SwMI B obtained the MNI of user C from user C home SwMI data base which happens to be SwMI B; this is an internal process to SwMI B in that case). In the case where the originating SwMI has indicated in the ISI-IC-SETUP that it supports re-routeing, SwMI B shall request Call Forwarding to SwMI A in a FORWARD PDU; upon acceptance of Call Forwarding by SwMI A in a FORWARD ACK PDU, SwMI B shall release the ISI-IC to SwMI A; SwMI A shall then re-route the call to SwMI C and to user C; the forwarding counter shall not be incremented in that case. In the case where the originating SwMI has indicated in the original call set-up that it cannot support re-routeing, SwMI B shall proceed with the call to user C by forward switching; SwMI B will set-up a new ISI-IC to SwMI C, shall increase the forwarding counter by one and shall link the two ISI-IC resources (both path and signalling connection). In that case, SwMI C does not need to support call forwarding SwMI C needs only to support General design of supplementary services ETS 300 392-9 [6] to be able to inform forwarded-to user that call it is receiving is a forwarded call.

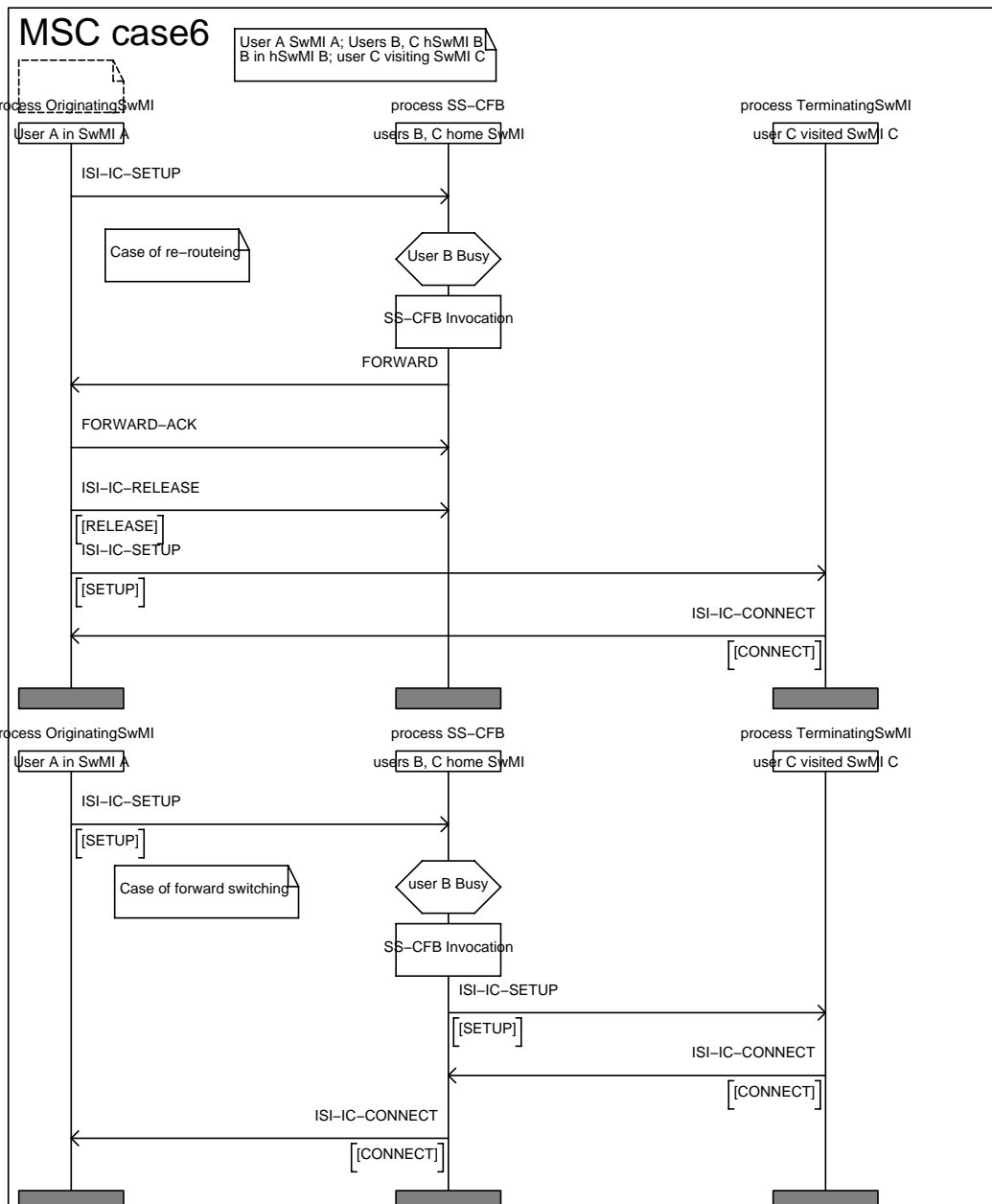


Figure 19: Case 6

Case 8

The forwarded-to user with home SwMI C is visiting SwMI B different from the calling user SwMI A and identical to the served user SwMI. Calling user A is in its home SwMI; served user B is in its home SwMI B; forwarded-to user C is in SwMI B. In the case where the calling user sets up a call to user B, the initial process is identical to case 6 until SwMI B invokes SS-CF. In the case where SwMI A supports call forwarding by re-routing, SwMI B shall request Call Forwarding to SwMI A in a FORWARD PDU; SwMI A shall then proceed with the establishment of an ISI-IC call to user C home SwMI C; user C home SwMI shall inform SwMI A that user C new MNI is SwMI B and shall release ISI-IC from SwMI A. SwMI A shall then release the ISI-IC to SwMI B, accept the forward request from SwMI B in a FORWARD ACK PDU and set-up an ISI-IC call to SwMI B where user C is now located. In the case where the originating SwMI A does not support call forwarding by rerouteing, SwMI B shall proceed with the ISI-IC set-up towards SwMI C, shall obtain the new location of user C from user C home SwMI database, shall recognize that user C is now in SwMI B, shall maintain the original ISI-IC from SwMI A to SwMI B and proceed with the call set-up to user C in SwMI B. In this case SwMI B is assumed to support SS-CF and shall provide the forwarded-to user with the information that the call has been forwarded. SwMI B shall increment by one the forwarding counter.

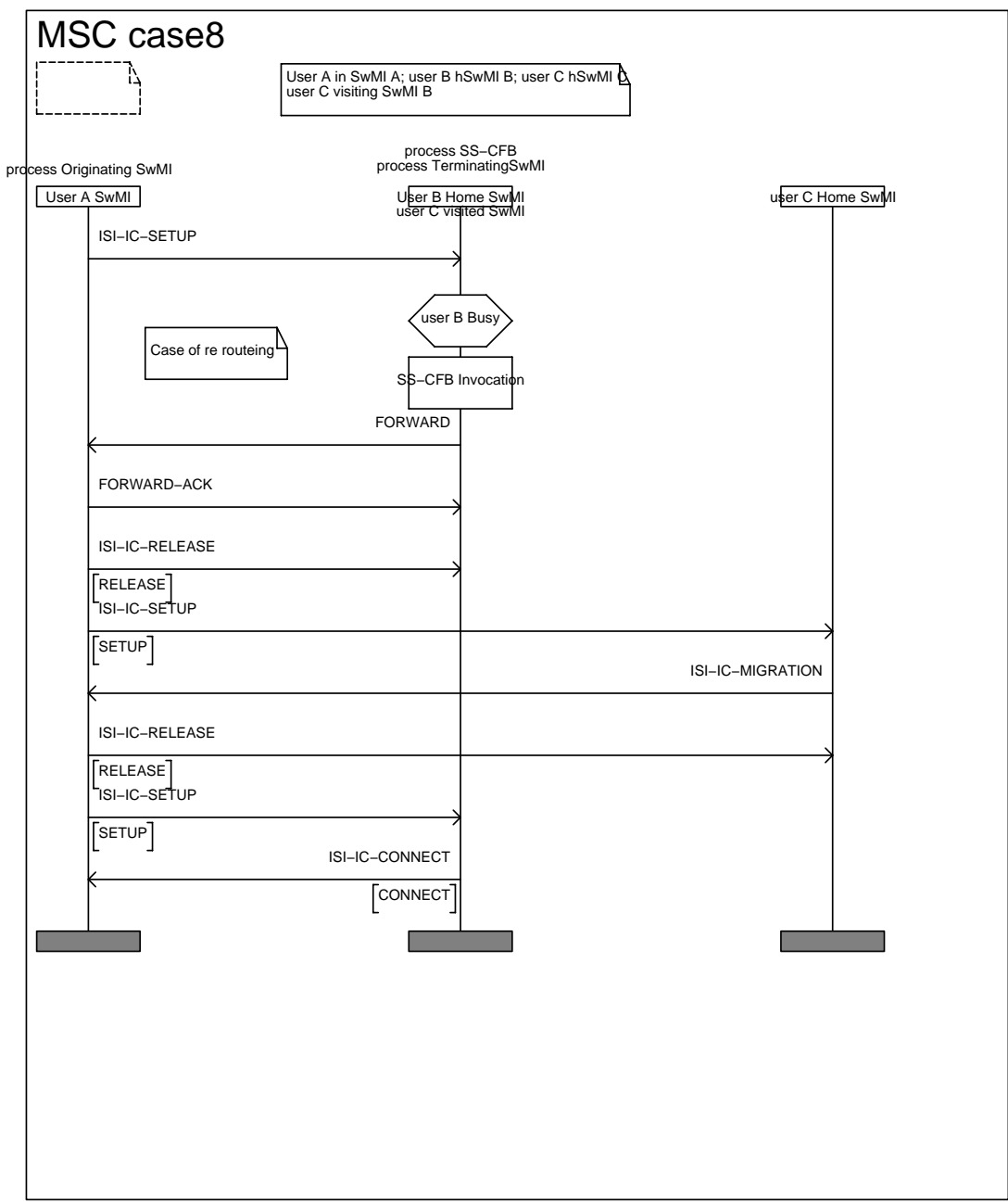


Figure 20: Case 8-1

MSC case82

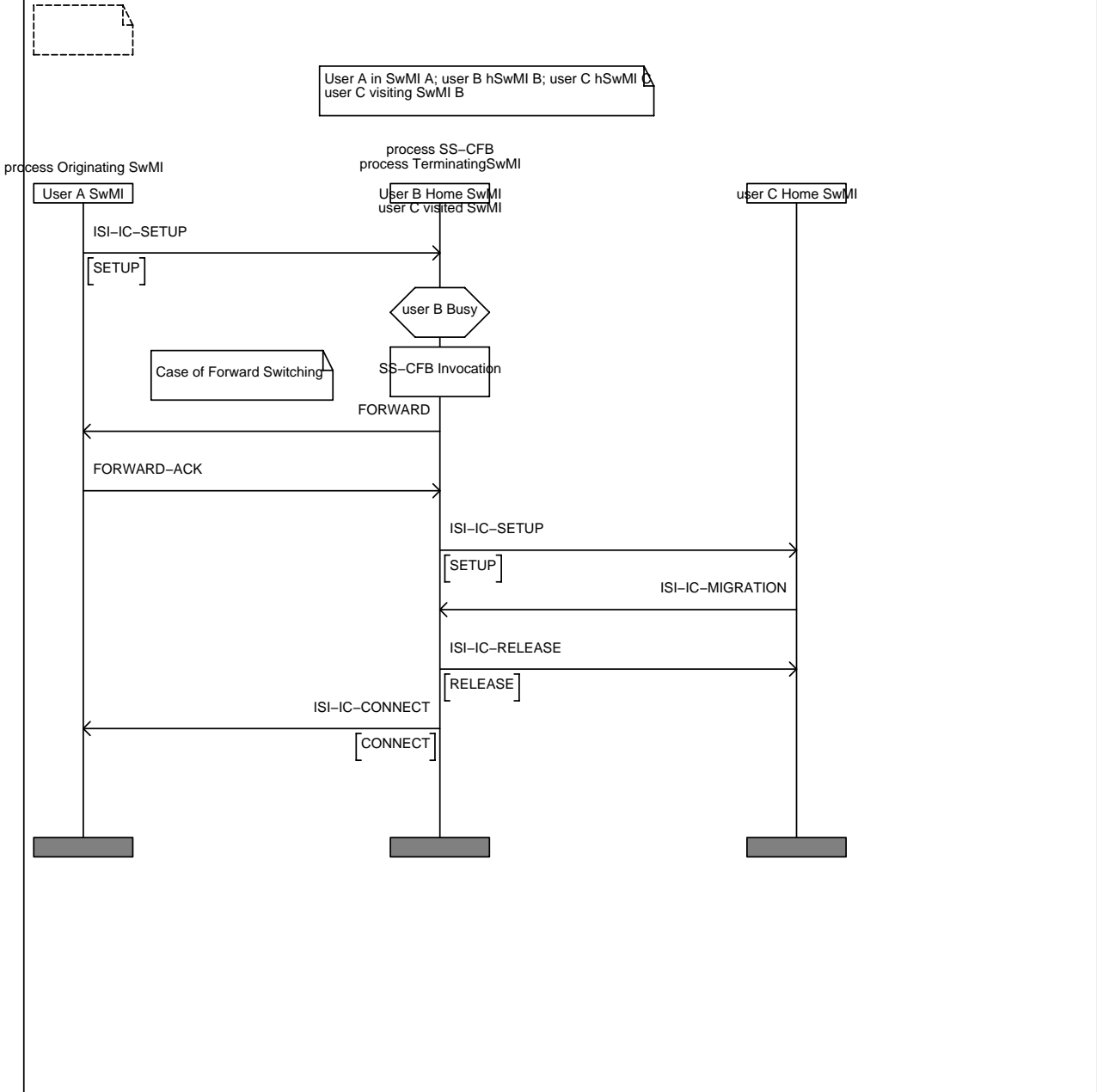


Figure 21: Case 8-2

Case 9

The forwarded-to user with home SwMI is visiting SwMI A different from the served user SwMI. Calling user A is in its home SwMI A; served user B is in its home SwMI B; forwarded-to user is within SwMI A. In the case where the calling user sets-up a call to user B, the initial process is similar to the process in case 6 until SwMI B invokes SS-CF for user B. Depending upon the rerouteing method received coding, SwMI B shall request call forwarding by either re-routeing or forward switching. In the case of call forwarding by re-routeing, SwMI B shall request call forwarding by re-routeing to SwMI A by sending a FORWARD PDU. SwMI A shall accept the request for call forwarding, shall release the ISI-IC to SwMI B, shall obtain from user C home SwMI (SwMI C) the new location of user C which is SwMI A, shall recognize that the forwarded call has now become an "intra-TETRA" "local" call, shall not place a new ISI-IC and shall proceed with the "local" call set-up to user C. SwMI A shall keep a record of the served user number and of the served user location at the time of SS-CF invocation; this record shall be use in case of further call forwarding. In the case of call forwarding by forward switching, SwMI B shall attempt to place a call towards SwMI C, shall obtain user C new location from user C home SwMI database, shall release the ISI-IC call to SwMI C, shall set-up an ISI-IC to SwMI A indicating the calling user number with a trombone indication (SwMI B shall recognize that both the calling user and the forwarded-to user have the same MNI); SwMI A shall recognize the trombone indication, shall release the ISI-IC from SwMI B to SwMI A, shall release the ISI-IC from SwMI A to SwMI B, shall increment the forwarding counter and shall establish the "intra" "local" call within SwMI A; SwMI A shall keep a record of the served user number as well as the original forwarded-to user number; this record may be used in case of multiple call forwarding.

MSC case9

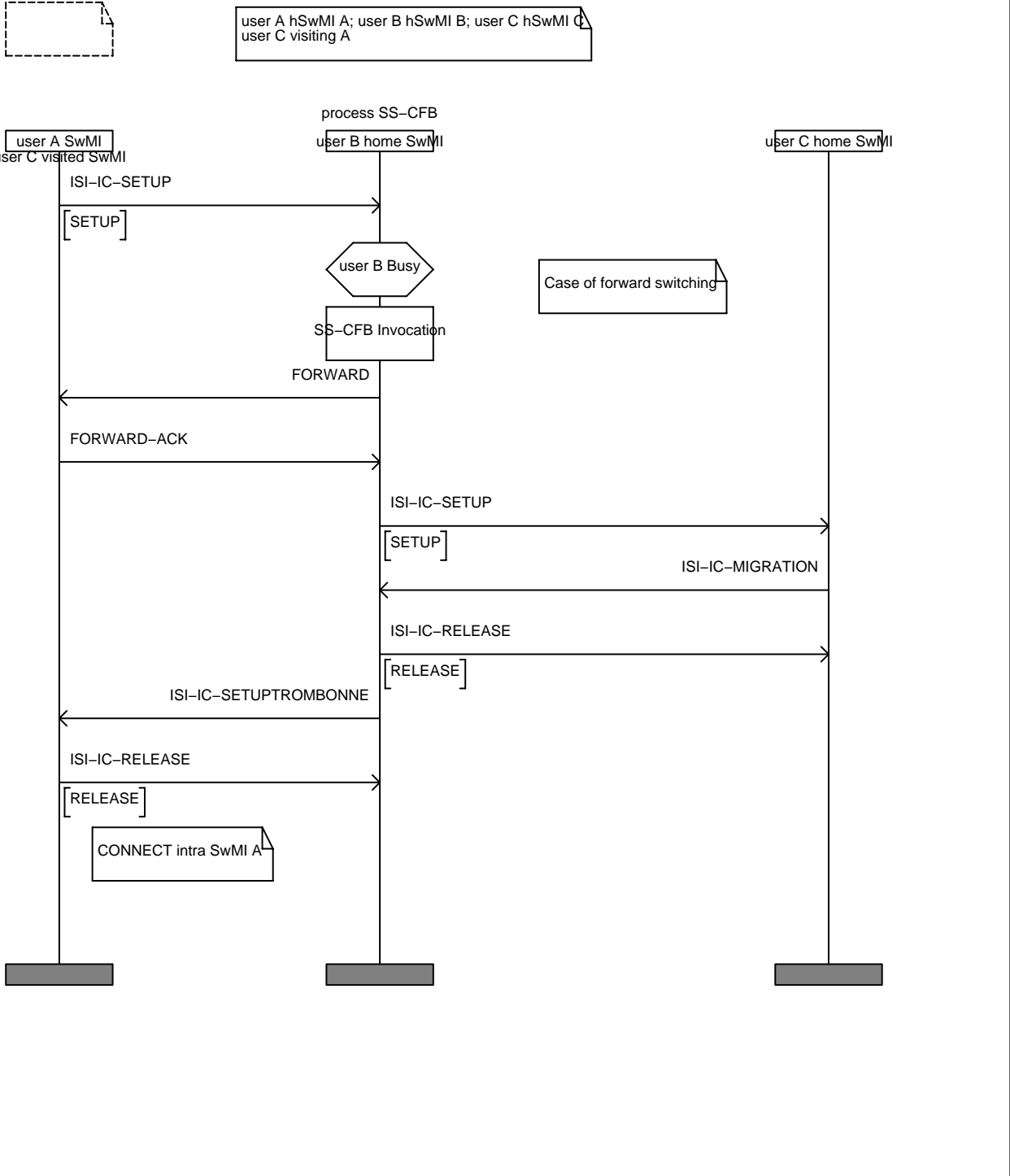


Figure 22: Case 9-1

MSC case91

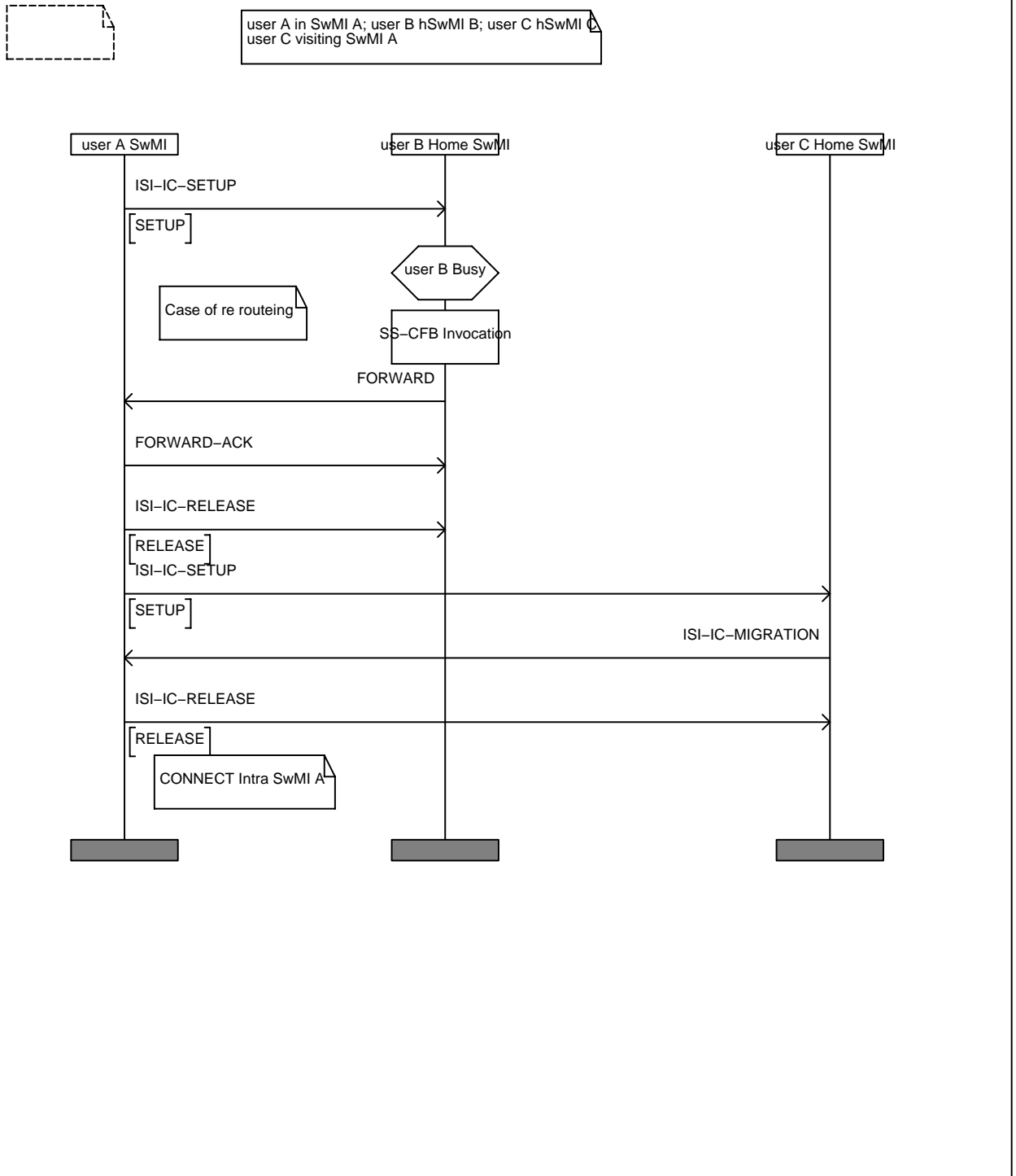


Figure 23: Case 9-2

5.6.6 Protocol Interactions of SS-CF with ANF Group Call

Only SS-CFU and SS-CFB are to be considered in that case.

5.6.6.1 Protocol interactions of SS-CFU with ANF-ISIGC

SS-CFU is applicable for group calls if the call is forwarded unconditionally from one group call to another.

ANF-ISIGC shall interact with SS-CFU when a group call is forwarded to a group located in a SwMI other than the called group home SwMI. The call shall be re-routed to the new group home SwMI.

NOTE 1: SS-CFU can change the service of the call from a group call to an individual call and vice versa.

ANF-ISIGC shall interact with SS-CFU when a group call is forwarded to a group located in a SwMI other than the called group's home SwMI.

When the called group's home SwMI does not coincide with the forwarded to group's home SwMI, then an ISI-REROUTE SETUP PDU as defined in table 51 in ETS 300 392-3-3 [9] shall be sent in a PSS1 RELEASE COMPLETE message back to the originating SwMI. To re-route the call, the ANF-ISIGC entity in the originating SwMI shall initiate a new call establishment, using the group home SwMI MNI received in the ISI-REROUTE SETUP PDU.

NOTE 2: If the calling user and the called group have the same home SwMI and the calling user has not migrated, the call will be an intra-TETRA call. In such cases, if SS-CFU is activated for the called group and if the forwarded-to group is registered in a different SwMI, SS-CFU will invoke an ANF-ISIGC for the establishment of the call.

NOTE 3: When SS-CFU is invoked for a call, i.e. for a group, the SS-CFU notification information is transported transparently between group home SwMI(s) or between the group home SwMI and the originating SwMI.

When a group call request is forwarded unconditionally to an individual, then the group home SwMI shall invoke ANF-ISIIC. ANF-ISIIC shall then consider the ISI-ORIGINATING SETUP PDU sent from the originating SwMI as an individual call set-up indication.

A possible interaction between ANF-ISIIC and ANF-ISIGC shall be through SS Call Forwarding Unconditional.

NOTE 4: When a group call request is forwarded unconditionally to an individual, ANF-ISIGC shall invoke ANF-ISIIC and hereafter become IDLE.

5.6.6.2 Protocol interactions of SS-CFB with ANF-ISIGC

ANF-ISIGC shall interact with SS-CFB when a group call found to be busy is forwarded to a group located in a SwMI other than the called group's home SwMI.

When the called group's home SwMI does not coincide with the forwarded to group's home SwMI, then an ISI-REROUTE SETUP PDU as defined in table 51 in ETS 300 392-3-3 [9] shall be sent in a PSS1 RELEASE COMPLETE message back to the originating SwMI. To re-route the call, the ANF-ISIGC entity in the originating SwMI shall initiate a new call establishment, using the group home SwMI MNI received in the ISI-REROUTE SETUP PDU.

NOTE 1: If the calling user and the called group have the same home SwMI and the calling user has not migrated, the call will be an intra-TETRA call. In such cases, if SS-CFB is activated for the called group and if the forwarded-to group is registered in a different SwMI, SS-CFB will invoke an ANF-ISIGC for the establishment of the call.

NOTE 2: When SS-CFB is invoked for a call, i.e. for a group, the SS-CFU notification information is transported transparently between group home SwMI(s) or between the group home SwMI and the originating SwMI.

When a group call request is forwarded unconditionally to an individual, then the group home SwMI shall invoke ANF-ISIIC. ANF-ISIIC shall then consider the ISI-ORIGINATING SETUP PDU sent from the originating SwMI as an individual call set-up indication.

5.6.7 Protocol Interactions of SS-CF with ANF-SDS

At this stage, there is no text available for ANF-SDS; thus the interaction of SS-CF with ANF-SDS cannot be fully defined. Only the interaction of SS-CFU with ANF-SDS shall be applicable.

NOTE 1: The term SS-CFU for SDS will in fact mean SDS user data message forwarding unconditional.

The SDS user data message will be carried through ISI in the same type of TETRA ROSE Invoke APDU as the other supplementary services; the SDS message transfer is connectionless and it shall use a signaling connection not call related to be transported. Traffic stealing will not be used through ISI due to the fact that QSIG PSS1 does not support traffic stealing.

NOTE 2: It is suggested that the facility field of the D-SDS-DATA be used for conveying the REPORT indicating the successful reception of the SDS-Message at the other end. The address to which the message is delivered shall be the last forwarded-to user address with a notification that the SDS-DATA has been forwarded to a user different from the original destination user.

The following ANF-SDS PDUs shall be used for the transport of the SDS User Data over ISI; those PDUs are derived from the Air Interface SDS PDUs; the calling user becomes the sending user, the called user becomes the receiving user; the forwarded-to user remains the same. The originating SwMI shall send the sending SDS PDU while the terminating SwMI shall receive the receiving SDS PDU.

5.6.7.1 ISI-SDS-RECEIVING-DATA

Message: ISI-SDS-RECEIVING-DATA.

Short description: This PDU shall be for receiving user defined SDS data through ISI.

Table 56: ISI-SDS-RECEIVING-DATA PDU contents

Information element	Length	Type	Owner	C/O/M	Remark
PDU Type	5	1	SDS	M	
Calling party type identifier	2	1	SDS	M	
Calling party address SSI	24	1	SDS	C	note 1
Calling party extension	24	1	SDS	C	note 1
Short data type identifier	2	1	SDS	M	
User defined data-1	16	1	SDS	C	note 2
User defined data-2	32	1	SDS	C	note 2
User defined data-3	64	1	SDS	C	note 2
Length indicator	11	1	SDS	C	note 2
User defined data-4		1	SDS	C	note 2
Facility		3	SS	O	
NOTE 1:	Shall be conditional on the value of Calling Party Type Identifier (CPTI). CPTI = 1; Calling Party SSI. CPTI = 2; Calling Party SSI + Calling Party Extension.				
NOTE 2:	Shall be conditional on the value of Short Data Type Identifier (SDTI). SDTI = 0; User Defined Data-1. SDTI = 1; User Defined Data-2. SDTI = 2; User Defined Data-3. SDTI = 3; Length Indicator + User Defined Data-4.				

5.6.7.2 ISI-SDS-RECEIVING-STATUS

Message: ISI-SDS-RECEIVING-STATUS.

Short description: This PDU shall be the PDU for receiving a pre-coded status message through ISI.

Table 57: ISI-SDS-RECEIVING-STATUS contents

Information element	Length	Type	Owner	C/O/M	Remark
PDU Type	5	1	SDS	M	
Calling party type identifier	2	1	SDS	M	
Calling party address SSI	24	1	SDS	C	note
Calling party extension	24	1	SDS	C	note
Pre-coded status	16	1	SDS	M	
Facility		3	SS	O	
NOTE:	Shall be conditional on the value of Calling Party Type Identifier (CPTI). CPTI = 1; Calling Party SSI. CPTI = 2; Calling Party SSI + Calling Party Extension.				

5.6.7.3 ISI-SENDING-STATUS

Message: ISI-SENDING-STATUS.

Short description: This PDU shall be used for sending a pre-coded status message through ISI.

Table 58: ISI-SENDING-STATUS PDU contents

Information element	Length	Type	Owner	C/O/M	Remark
PDU Type	5	1	SDS	M	
Area selection	4	1	SDS	M	
Called party type identifier	2	1	SDS	M	Short/SSI/TSI
Called party short number address	8	1	SDS	C	note
Called party SSI	24	1	SDS	C	note
Called party extension	24	1	SDS	C	note
Pre-coded status	16	1	SDS	M	
External subscriber number		3	SDS	O	
Facility		3	SS	O	
NOTE:	Shall be conditional on the value of Called Party Type Identifier (CPTI). CPTI = 0; Called Party SNA. CPTI = 1; Called Party SSI. CPTI = 2; Called Party SSI + Called Party Extension.				

5.6.7.4 ISI-SDS-SENDING-DATA

Message: ISI-SDS-SENDING-DATA.

Short description: This PDU shall be for sending user defined SDS data over ISI.

Table 59: ISI-SDS-SENDING-DATA PDU contents

Information element	Length	Type	Owner	C/O/M	Remark
PDU Type	5	1	SDS	M	
Area selection	4	1	SDS	M	
Called party type identifier	2	1	SDS	M	Short/SSI/TSI
Called party short number address	8	1	SDS	C	note 1
Called party SSI	24	1	SDS	C	note 1
Called party extension	24	1	SDS	C	note 1
Short data type identifier	2	1	SDS	M	note 3
User defined data-1	16	1	SDS	C	notes 2 and 3
User defined data-2	32	1	SDS	C	notes 2 and 3
User defined data-3	64	1	SDS	C	notes 2 and 3
Length indicator	11	1	SDS	C	note 2
User defined data-4		1	SDS	C	notes 2 and 4
External subscriber number		3	SDS	O	
Facility		3	SS	O	
NOTE 1:	Shall be conditional on the value of Called Party Type Identifier (CPTI). CPTI = 0; Called Party SNA. CPTI = 1; Called Party SSI. CPTI = 2; Called Party SSI + Called Party Extension.				
NOTE 2:	Shall be conditional on the value of Short Data Type Identifier (SDTI). SDTI = 0; User Defined Data-1. SDTI = 1; User Defined Data-2. SDTI = 2; User Defined Data-3. SDTI = 3; Length indicator + User Defined Data-4.				
NOTE 3	Any combination of address and user defined data type is allowed. However, intention is to fit TNSDS-UNITDATA request into one sub slot when possible. It is recommended that always the shortest appropriate user defined data type is used. One sub slot signalling is possible by using one of the following combinations: - short Number Address & User defined data 1 or 2; - short Subscriber Identity & User defined data 1.				
NOTE 4	The length of user defined data 4 is between 0 and 2047 bits. However, if the basic link is to be used, then the longest recommended length of the user defined data 4 is 1017 bits while using Short Subscriber identity and FCS (see subclause 23.4.2.1 note 2).				

5.6.8 Protocol Interactions of SS-CF with ANF Mobility Management

The purposes of mobility management in the case of SS-CF shall be to insure that:

- no loop occurs in the call due to call forwarding;
- no undue ISI-IC or ISI-GC resources are assigned to calls that are in fact "local" within the same SwMI;
- the forwarded-to user must be different from the original served user;
- the maximum number of allowed forward switching is never exceeded.

While several successive call forwarding may occur for the same call, the description of the protocol interactions of SS-CF and ISI-MM shall be given in terms of the three users involved in the Call Forwarding process for a single Call Forwarding. The extension to multiple call forwarding can be obtained by substitution of the successive roles of the served user and the forwarded-to user.

It is assumed in what follows (at least for clarity) in that clause that:

- each of the involved user is not involved in an active call at the time of their migration;
- each of the involved user migration process is completed at the time a new call is started;

- each of the involved user has its subscription options stable and defined at the time of migration, e.g. at the time of migration, any user is not in the process of activation, deactivation, enabling, disabling, interrogation;
- only one user migrates at a time.

At the time of its migration, a user may be defined as forwarded-to user for several different SS-CF invocations; in the same manner, a served-user for one invocation of SS-CF may be forwarded-to user for another invocation of SS-CF.

Due to the different involvement of the called user home SwMI B in the interactions defined below, the protocol interactions of SS-CF with ISI-MM shall be specified in two types:

- interaction of SS-CFU and SS-CFNRC (early) with ISI-MM;
- interaction of SS-CFB, SS-CFNRY and SS-CFNRC (late) with ISI-MM.

Within those two types and unless otherwise noted, SS-CF generic term shall be used not distinguishing CFU and CFNRC (early) in the first type and CFB, CFNRY and CFNRC (late) in the second type. The migration of a user found to be not reachable at the time of its migration will not be covered since as long as the user is not reachable, its migration towards another SwMI is not identifiable.

The protocol interactions of SS-CF with ANF-MM will be specified for each of the users involved in SS-CF, e.g.:

- the calling user;
- the called/served user;
- the forwarded-to user.

The identified different cases are listed in table 60.

NOTE: Those different cases are similar to the cases described in the interaction with the ANF-ISIIC.

Table 60: Different cases of migration

Case #	Home SwMI			Initial SwMI			Visited SwMI		
	Calling User A	Called/ Served User B	Forwarded- to User C	Calling User A	Called/ Served User B	Forwarded- to User C	Calling User A	Called/ Served User B	Forwarded-to User C
1	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI B	SwMI A	SwMI A
2	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI B	SwMI A
3	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI A	SwMI B
4	SwMI A	SwMI B	SwMI A	SwMI A	SwMI B	SwMI A	SwMI A	SwMI A	SwMI A
5	SwMI A	SwMI B	SwMI A	SwMI A	SwMI B	SwMI A	SwMI A	SwMI C	SwMI A
6	SwMI A	SwMI B	SwMI B	SwMI A	SwMI B	SwMI B	SwMI A	SwMI B	SwMI C
7	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI C	SwMI A	SwMI C	SwMI C
8	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI B
9	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI A
10	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI C	SwMI B	SwMI B	SwMI C
11	SwMI A	SwMI B	SwMI C	SwMI A	SwMI B	SwMI C	SwMI C	SwMI B	SwMI C

5.6.8.1 Protocol interactions of SS-CFU and SS-CFNRC early with ANF-MM

Once SS-CF activated, the invocation of SS-CF for a given user B is immediate in the case of SS-CFU and SS-CFNRC "early". This invocation shall take place in user B home SwMI where all the data concerning user B is stored in home SwMI data bases. The different cases of migration will be similar to the cases of interactions of SS-CF and ANF-ISIIC. The migration cases of calling user A may be assimilated to normal subscriber migration and will not be detailed here. In the same manner, the migration of the forwarded-to user C, as long as this user does not become the forwarding user, is the normal called user migration.

Due to the fact that the invocation of SS-CF can be immediate in this case, all information concerning the called/served user will be reported to the user B home SwMI which will control the operation of SS-CF. For this operation, the SwMIs where the called user B may have migrated don't need to support SS-CF; only user B home SwMI needs to support fully SS-CF.

The general operation of the interaction between SS-CF and ANF-ISIMM is specified as follow.

In the case where calling user A is calling called user B, calling user A SwMI shall set up an ISI-IC to user B home SwMI; called user B home SwMI shall determine from the user B home SwMI data base, the location of user B and the eventual invocation of SS-CF for user B. In the case of invocation of SS-CF and regardless of the present location of user B, user B home SwMI shall request call forwarding to user A SwMI in a FORWARD PDU indicating the preferred re-routeing algorithm and the forwarded-to user C address.

In the case where user A SwMI supports SS-CF and in the case of call forwarding by forward switching, user B home SwMI shall set up a new ISI-IC to user C SwMI and shall link the two ISI-ICs; in the case where user C happens to be in the calling user A SwMI, the trombone shall be avoided by the TROMBONE detection defined in ANF-ISI-IC. In the case where user A SwMI supports SS-CF and in the case of call forwarding by re-routeing, user A SwMI shall release the ISI-IC to user B home SwMI, shall set up a new ISI-IC to user C SwMI and shall indicate that the call has been forwarded. In those two cases, user A SwMI shall reply to the FORWARD request with a FORWARD ACK PDU.

NOTE 1: In those cases, user B home SwMI loses control of SS-CFU since it is by-passed in any further call set up.

In the case where user A SwMI does not support SS-CF, it will not reply to the FORWARD PDU; user B home SwMI shall then proceed with call forwarding by forward switching and shall set up a new ISI-IC to user C home SwMI. User C SwMI does not need to support SS-CF except if the forwarded-to user becomes a served user. In the case where user C is in his home SwMI, the call will be completed. In the case where user C is visiting a SwMI different from his home SwMI and user C SwMI does not support SS-CF, user C home SwMI shall forward switch the call to user C visited SwMI setting up a new ISI-IC.

In the case where user B home SwMI and user C home SwMI coincide, the ANF-ISIIC procedure from user A SwMI to user B home SwMI shall apply in simply replacing the called user by the forwarded-to user.

NOTE 2: No new ISI-IC will be established in that case.

NOTE 3: 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 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 when this PDU is sent (i.e. when the forwarded-to user home SwMI coincides with the originating SwMI).

5.6.8.1.1 Interaction with SS-CF at call restoration

There shall be no interaction between ANF-ISIIC with SS-CF 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 forwarding, the call restoration procedure shall be the same as that described in subclause 6.5.2.3 of ANF-ISIIC.

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 forwarding: 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 forwarding 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.

NOTE 3: 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.

NOTE 4: 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.

5.6.8.2 Protocol interactions of SS-CFB, SS-CFNRy and SS-CFNRc with ANF-MM

5.6.8.2.1 Protocol interactions affecting the calling user

In the cases where the calling user is migrating to a SwMI different from its home SwMI, no specific SS-CF profile needs to be transferred since the calling user is not the served user of SS-CF. The normal mechanism of migration of a MS is to be used. The SwMI where the calling user is migrating to needs only to be able to transfer the notifications resulting from invocation of call forwarding.

Cases 1, 10 and 11 are described in interactions of SS-CFB with ANF-ISIIC subclause 5.6.5.3.1.

The contents of the basic migration profile for an individual subscriber is defined in ETS 300 392-3-5 [17] subclause 33.39.1 and is not repeated here.

5.6.8.2.2 Protocol interactions affecting the called/served user

In those cases where the served user migrates away from its home SwMI, there shall be the need to provide the SwMI to which user B is migrating with the profile of user B for SS-CF. That profile transfer is done in two steps by ISI-MM; the first step is to request the visited SwMI to indicate its support of SS-CF; a second step is to provide the visited SwMI with all the profile information needed for that SwMI to support SS-CF for user B (e.g. the information known to user B home SwMI about SS-CF activation by user B in its home SwMI).

The description in this subclause is general for any case where the served user migrates outside its home SwMI; it shall apply to cases below.

Described in general steps, the migration can be decomposed as follow:

- step 1 The served user visited SwMI shall inform served user home SwMI that the served user has migrated;
- step 2 The served user home SwMI shall be informed by the visited served user SwMI of the new location of the served user;
- step 3 The served user home SwMI sends the original migration profile to the served user visited SwMI with the list of supplementary services that need to be supported for that user including SS-CF;

NOTE 1: At this point, it is generic request for SS-CF not yet specifying which instance of SS-CF (SS-CFB for example) is activated.

- step 4 The served user visited SwMI replies its capabilities in terms of each supplementary service support;
- step 5 The served user home SwMI sends to the served user visited SwMI the SS-CF migration profile with the specific activation(s) of (a) particular SS-CF instance(s) (for example SS-CFB) in case the visited SwMI supports SS-CF;

NOTE 2: In this profile, will be included the authorization given to the served user to modify his profile while outside of his home SwMI.

- step 6 The served user visited SwMI replies with the SS-CF migration profile response which will be identical to the SS-CF migration profile in case all parameters, for the specific activation(s) of (one) instance(s) of SS-CF (SS-CFB for example), are accepted by the visited SwMI.

At that point, migration is considered to be completed.

The following profile exchanges shall thus take place as defined in ETS 300 392-3-5 [17].

SS-PROFILE REJECT

The PDU shall be used to reject the invoked SS-profile update service. It shall be encoded as specified in table 61.

Direction: visited SwMI MM to home SwMI MM.
 Response to: SS-PROFILE UPDATE.
 Response expected: none.

Table 61: SS-PROFILE REJECT

Information element	Length	Type	C/O/M	Remark
PDU type	6	1	M	
ANF-ISIMM invoke id	16	1	M	
SSI (ISSI or GSSI)	24	1	M	
Profile rejection cause	4	1	M	
Recovery	1	1	M	
Proprietary		3	O	

SS-PROFILE UPDATE

The PDU shall be used to invoke the SS-profile update service across the ISI. It shall be encoded as specified in table 62.

Direction: home SwMI MM to visited SwMI MM.
 Response to: none.
 Response expected: PROFILE UPDATE RESPONSE.

Table 62: SS-PROFILE UPDATE

Information element	Length	Type	C/O/M	Remark
PDU type	6	1	M	
ANF-ISIMM invoke id	16	1	M	
SSI (ISSI or GSSI)	24	1	M	
Following conditional element(s) present	1	1	M	
MNI (of the ind. subscriber or of the group)	24	1	C	note 1
MNI (of the visited SwMI MM)	24	1	C	note 1
Profile type (individual /group)	1	1	M	
Recovery	1	1	M	
Number of SS-migration profiles	6	1	M	
SS-migration profiles (original)	variable		C	note 2
Proprietary		3	O	
NOTE 1:	The element shall be present if the value of preceding "Following conditional element(s) present" is "Present", otherwise the element shall be omitted.			
NOTE 2:	The element shall be repeated as indicated by the Number of SS-migration profiles information element. Each element shall contain the information of one original SS-migration profile.			

SS-PROFILE UPDATE RESPONSE

The PDU shall be used to report the successful outcome of the SS-profile update service and it shall be encoded as specified in table 63.

Direction: visited SwMI MM to home SwMI MM.
 Response to: PROFILE UPDATE.
 Response expected: none.

Table 63: SS-PROFILE UPDATE RESPONSE

Information element	Length	Type	C/O/M	Remark
PDU type	6	1	M	
ANF-ISIMM invoke id	16	1	M	
SSI (ISSI or GSSI)	24	1	M	
Profile type	1	1	M	
Recovery	1	1	M	
Number of not supported SSs	6	1	M	
Not supported SS	6	1	C	note 1
Number of SS-migration profiles	6	1	M	
SS-migration profile (temporary)	variable		O	note 2
Proprietary		3	O	
NOTE 1:	The element shall be present as many times as indicated by the element "Number of not supported SSs".			
NOTE 2:	The element shall be repeated as indicated by the Number of SS-migration profiles information element. Each element shall contain information on one temporary SS-migration profile.			

Basic migration profile information

The Basic migration profile information element shall indicate whether the visited SwMI MM has accepted the original basic migration profile as received or whether the visited SwMI MM has created a new temporary migration profile.

NOTE: If created, the temporary migration profile shall be sent to the home SwMI MM.

The basic migration profile information element shall be encoded as specified in table 64.

Table 64: Basic migration profile information element contents

Information element	Length	Value	Remark
Basic migration profile info	1	0	Accepted as received
		1	Redefined by the visited SwMI MM

Individual basic migration profile (original and temporary)

The encoding of the individual basic migration profile (original and temporary) shall be as defined in table 65.

Table 65: Individual basic migration profile (original and temporary) contents

Information element	Length	Type	C/O/M	Remark
Profile status	2	1	M	
Point-to-point call service	2	1	M	
Point-to-multipoint call service	2	1	M	
Point-to-multipoint acknowledged call service	2	1	M	
Point-to-multipoint broadcast service	2	1	M	
Speech service	5	1	M	
Circuit mode unprotected data service	2	1	M	
Circuit mode protected (low) data service	2	1	M	
Circuit mode protected (high) data service	2	1	M	
Interleaving depth	5	1	M	
Duplex service	2	1	M	
CONS	2	1	M	
SCLNS	2	1	M	
IP service	2	1	M	
Authentication service	2	1	M	
OTAR SCK generation service	2	1	M	
OTAR SCK delivery service	2	1	M	
AI encryption state list	5	1	C	note 1
End-to-end encryption service	2	1	M	
Number of SS-information	6	1	M	
SS-information	8	1	C	note 2
SS-information response	8	1	C	note 3
Default SS-information	2	2	O	
SDS profile	6	2	O	
Advanced link service	2	2	O	
Maximum number of time slots	3	2	O	
Call time-out timer (T310)	4	2	O	
Call time-out set-up phase timer (T301)	3	2	O	
Group information	44-*		C	note 4

Information element	Length	Type	C/O/M	Remark
Proprietary		3	O	
NOTE 1:	The information element shall indicate:			
	- all supported states when the Profile status is "Profile update" or "Profile replacement";			
	- the selected state when the Profile status is "Profile Response".			
NOTE 2:	The information element shall be conditional on Profile status as follows:			
	- "Profile Response": element shall be present;			
	- "Profile update" or "Profile replacement": element shall not be present.			
NOTE 3:	The element shall appear as many times as indicated by the element "Number of SS-information".			
NOTE 4:	The "group information" information element may be repeated inside the type 3 element up to the length of the type 3 information element as sets as defined in subclause 33.2.87. There may be also multiple type 3 information elements, if the maximum length of type 3 elements would otherwise be exceeded.			

Profile type

The Profile type element shall indicate whether the migration or SS-migration profile is for an individual subscriber or for a group. It shall be encoded as specified in table 66.

Table 66: Profile type element contents

Information element	Length	Value	Remark
Profile type	1	0 ₂	Individual subscriber
		1 ₂	Group

Profile status

The Profile status element shall specify the type of the basic migration profile or that of the original SS-migration profile (given in one SS-migration profile request element). If the original or the temporary migration profile is part of the migration service or the first group attachment service, the value shall be "Replacement". It shall be encoded as specified in table 67.

Table 67: Profile status element contents

Information element	Length	Value	Remark
Profile status	2	00 ₂	Profile Replacement
		01 ₂	Profile Update
		10 ₂	Profile Response
		11 ₂	Reserved

SS-information

The SS-information element shall indicate if a supplementary service should be supported for the individual subscriber or for the group in the visited SwMI. The SS-information element shall refer to a given supplementary service as indicated by the SS-type information sub-element. It shall be encoded as specified in table 68.

Table 68: SS-information contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	SS-CF (note)
SS-status	2	1	M	
NOTE:	At this point, a generic SS-CF is used and not a specific SS-CF instance.			

SS-information response

The SS-information element shall indicate if a supplementary service is supported or not for the individual subscriber or for the group in the visited SwMI MM. The SS-information element shall refer to a given supplementary service as indicated by the SS-type information sub-element. It shall be encoded as specified in table 69.

Table 69: SS-information response contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	SS-CF
SS-response status	2	1	M	

SS-migration profile (original)

The SS-migration profile (original) shall define one original migration profile of a supplementary service for an individual subscriber or for a group. The element shall be sent from the home SwMI MM to the visited SwMI MM. It shall indicate the home SwMI MM's preference contents for the profile. It shall be encoded as specified in table 70.

Table 70: SS-migration profile (original) contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	SS-CF (note 1)
Profile status	2	1	M	
SS-ISI-PROFILE		3	O	note 2
NOTE 1: If the receiving SwMI MM does not understand the SS-type then it shall ignore the SS-ISI-PROFILE.				
NOTE 2: The contents of SS-ISI-PROFILE shall be as defined, if applicable, for the supplementary service.				

SS-migration profile response (temporary)

The SS-migration profile (temporary) shall define one original migration profile of a supplementary service for an individual subscriber or for a group. The element shall be sent from the visited SwMI MM to the home SwMI MM. It shall indicate the profile that shall be used for the individual subscriber or for the group in the visited SwMI. It shall be encoded as specified in table 71.

Table 71: SS-migration profile (temporary) contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	SS-CF (note 1)
SS-profile response status	2	1	M	
SS-ISI-PROFILE		3	O	note 2
NOTE 1: If the receiving SwMI MM does not understand the SS-type then it shall ignore the SS-ISI-PROFILE.				
NOTE 2: The contents of SS-ISI-PROFILE shall be defined, if applicable, for the supplementary service in each supplementary service subpart of ETS 300 392-2 [4].				

SS-profile response status

The SS-profile response element shall specify the relationship between the original SS-migration profile (received in the SS-profile update_ind) and the created SS-migration profile. It shall be encoded as specified in table 72.

Table 72: SS-profile response status element contents

Information element	Length	Value	Remark
SS-profile response status	2	00 ₂	Original SS-migration profile accepted as received
		01 ₂	Original SS-migration profile redefined, contents not sent to the home SwMI MM
		10 ₂	Original SS-migration profile redefined, contents sent to the home SwMI MM
		11 ₂	Creation of the SS-migration profile failed

SS-profile update indicator

The SS-profile update indicator element shall indicate whether the SS-migration profiles are exchanged as part of the migration or group attachment service. If sent as part of the migration service, the parameter shall also indicate if they are sent before or after the final migration approval (MIGRATION RESPONSE PDU). It shall be encoded as specified in table 73.

Table 73: SS-profile update indicator contents

Information sub-element	Length	Value	Remark
SS-profile update indicator	2	00 ₂	Not applicable
		01 ₂	Sent before final migration approval or Sent as part of group attachment
		10 ₂	Sent after final migration approval Note
		11 ₂	Reserved
NOTE: The value "10 ₂ " is not applicable for groups.			

SS-response status

The SS-response status information element shall indicate whether a supplementary service is supported or not in the visited SwMI MM. It shall be encoded as specified in table 74.

Table 74: SS-response status

Information sub-element	Length	Value	Remark
SS-response status	2	00 ₂	Not supported
		01 ₂	Supported
		10 ₂	Reserved
		11 ₂	Reserved

SS-status

The SS-status information element shall indicate whether a supplementary service should or should not be supported in the visited SwMI MM. It shall be encoded as specified in table 75.

Table 75: SS-status

Information sub-element	Length	Value	Remark
SS-status	2	00 ₂	Not supported
		01 ₂	Supported, with original SS-migration profile
		10 ₂	Supported, without original SS-migration profile
		11 ₂	Reserved

SS-type

SS-type shall specify the TETRA supplementary service as defined in ETS 300 392-9 [6] subclause 8.1.

SS-CF profiles

SS-CF migration original profile.

SS-CF original migration profile is actually an ANF ISIMM information element, sent by the SS-CF served user home SwMI to the served user visited SwMI.

SS-CF original migration profile shall contain the information elements as specified in table 76.

Table 76: SS-CF original migration profile information element content

Information element	Length	Type	C/O/M	Value	Remark
SS-Type	6	1	M		SS-CF
SS-CF provided/non provided	1	1	M	1 ₂ 0 ₂	provided non-provided (note 2)
CFU	1	1	M	1 ₂ 0 ₂	provided non-provided
CFB	1	1	M	1 ₂ 0 ₂	provided non-provided
CFNRy	1	1	M	1 ₂ 0 ₂	provided non-provided (note 1)
CFNRc	1	1	M	1 ₂ 0 ₂	provided non-provided (note 1)
NOTE 1: A group controlling SwMI may not provide CFNRy and CFNRc.					
NOTE 2: If SS-CF is provided, at least one call forwarding type shall be provided.					

SS-CF Served user migration information PDU.

The SS-CF Served user migration information PDU is sent by the served user home SwMI to the served user visited SwMI to provide all parameters needed to activate SS-CF in the served user visited SwMI. Since it is assumed that migration happens while the served user is not involved in a call, there is no need to provide the states of the SS-CF procedure in the SS-CF migration information.

For each served user, there is at most eight different combinations of call forwarding types and basic service since for a given call forwarding type e.g. CFB, there is the need to define at most two set of numbers, one for speech and one for data, both sets could be identical in which case, only one set of number will be used for all basic services.

In the case of migration outside its home SwMI, the use of SS-SNA to define user numbers such as authorized user number, forwarded-to user is debatable.

The SS-CF served user migration information PDU is very similar but not identical to the SS-CF ACTIVATE PDU.

At the time of the migration, forwarding counter is not involved since there is no call in progress.

The fact that the served user may also be either a potential forwarded-to user or a potential calling user needs not be reported in the migration profile.

SS-CF Served user migration information PDU shall contain the SS-CF information elements described in table 77.

Table 77: SS-CF Served user migration information PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	SS-CF
Number of call forwarding Types	2	1	M	
Call Forwarding Type	2	1	M	note 6
SS-CF Status	5	1	M	Activated/Deactivated Note 5
Basic Service Information	2	1	M	note 5
Forwarded-to user short number address	8	1	C	notes 2 and 5
Forwarded-to user SSI	24	1	C	notes 2 and 5
Forwarded-to user extension	24	1	C	notes 2 and 5
External number length indicator	5	1	C	notes 2 and 5
External subscriber number	variable	1	C	notes 2 and 5
Address type of served user	2	1	M	note 5
Served user short number address	8	1	C	notes 1 and 5
Served user SSI	24	1	C	notes 1 and 5
Served user extension	24	1	C	notes 1 and 5
Activation by Served User	1	1	M	note 5
Authorization of activation by served user when outside his home SwMI	1	1	M	notes 5 and 7
Address type of authorized user	2	1	C	notes 4 and 5
Authorized user short number address	8	1	C	notes 3 and 5
Authorized user SSI	24	1	C	notes 3 and 5
Authorized user extension	24	1	C	notes 3 and 5
Authorized user status enabled/disabled	1	1	C	0 disabled 1 enabled
NOTE 1:	Shall be selected as defined by the information element address type of served user.			
NOTE 2:	Shall be selected as defined by the information element address type of the forwarded-to user.			
NOTE 3:	Shall be selected as defined by the information element address type of the authorized user.			
NOTE 4:	Shall be present in case of activation by user different from served user.			
NOTE 5:	May be repeated for each call type.			
NOTE 6:	Only one type at a time.			
NOTE 7:	Home SwMI of served user allows served user to modify his profile while outside his home SwMI.			

Number of Call forwarding types information element content

The Number of Call forwarding types information element shall indicate the number of different call forwarding types associated to the served user. It shall be encoded as specified in table 78.

Table 78: Number of Call forwarding Types information element

Information sub-element	Length	Value	Remark
Number of Call forwarding Types	2	00 ₂	1 (note)
		01 ₂	2
		10 ₂	3
		11 ₂	4
NOTE:	At least one type is associated; if none no migration profile for SS-CF needs to be used.		

For the description of cases 2, 4, 5 and 7, subclause 5.5.5.3.2. shall apply.

5.6.8.2.3 Protocol interactions affecting the forwarded-to user

In the cases where the forwarded-to user is migrating to a SwMI different from its home SwMI, no specific SS-CF profile needs to be transferred since the forwarded-to user is not the served user of SS-CF. The normal mechanism of migration of a MS is to be used. The SwMI where the forwarded-to user is migrating to needs only to be able to transfer the notifications resulting from invocation of call forwarding.

Cases 3, 6, 8 and 9 are described in interactions of SS-CFB with ANF-ISIIC subclause 5.6.5.3.3

The contents of the basic migration profile for an individual subscriber is defined in ETS 300 392-3-5 [17] subclause 33.39.1 and is not repeated here.

5.7 SS-CF parameter values (timers)

5.7.1 Timer T1

This timer shall be started by the Served User SwMI when a FORWARD request PDU is sent to the Forwarding SwMI. The timer shall be stopped on receipt of an FORWARD ACK PDU of the call Forwarding operation. The expiration of this timer shall be equivalent to the receipt of a reject PDU.

Timer T1 shall have a value not less than 10 seconds.

5.7.2 Timer T2

This timer shall be started by the Activating SwMI when an ACTIVATE request PDU is sent to the Served User SwMI. The timer shall be stopped on receipt of a ACTIVATE ACK PDU of the ACTIVATE Forwarding operation. The expiration of this timer shall be equivalent to the receipt of a reject PDU.

Timer T2 shall have a value not less than 30 seconds.

5.7.3 Timer T3

This timer shall be started by the Deactivating SwMI when an DEACTIVATE request PDU is sent to the Served User SwMI. The timer shall be stopped on receipt of a DEACTIVATE ACK PDU of the DEACTIVATE Forwarding operation. The expiration of this timer shall be equivalent to the receipt of a reject PDU.

Timer T3 shall have a value not less than 15 seconds.

5.7.4 Timer T4

This timer shall be started by the Interrogating SwMI when an INTERROGATE request PDU is sent to the Served User SwMI. The timer shall be stopped on receipt of a INTERROGATE ACK PDU of the INTERROGATE Forwarding operation. The expiration of this timer shall be equivalent to the receipt of a reject PDU.

Timer T4 shall have a value not less than 15 seconds.

Annex A (normative): Specification and Description Language (SDL) representation of procedures

The diagrams in this annex use the Specification and Description Language defined in ITU-T Recommendation Z.100 [3].

Each diagram represents the behaviour of an SS-CF Supplementary Service Control entity at a particular type of SwMI. In accordance with the protocol model described in ETS 300 392-9 [6], the Supplementary Service Control entity uses, via the Co-ordination Function, the services of Generic Functional Transport Control and Basic Call Control.

Where an output symbol represents a primitive to the Co-ordination Function, and that primitive results in a message being sent, the output bears the name of the message and any ISI PDU(s) or notification(s) contained in that message. In case of a message specified in ETS 300 392-3-1 [7], basic call actions associated with the sending of that message are deemed to occur.

Where an input symbol represents a primitive from the Co-ordination Function and that primitive is the result of a message being received, the input signal bears the name of the message and any ISI PDU(s) or notification(s) contained in that message. In case of a message specified in ETS 300 392-3-1 [7], basic call actions associated with the receipt of that message are deemed to have occurred.

A.1 SDL Representation of SS-CF at the Originating SwMI

Figure A.1 shows the behaviour of an SS-CF Supplementary Service Control entity within the Originating SwMI.

Input signals from the right represent messages received via Protocol Control or primitives from the co-ordination function.

NOTE: When the forwarding functionality is incorporated in the Originating SwMI (in case of Call Forwarding by rerouting), the input signals from the right represent primitives from the Rerouting SwMI functionality to the Origination SwMI functionality within the Originating SwMI.

Output signals to the left represent primitives to the calling user.

States are marked with the letters "CFO" (Call Forwarding Originating).

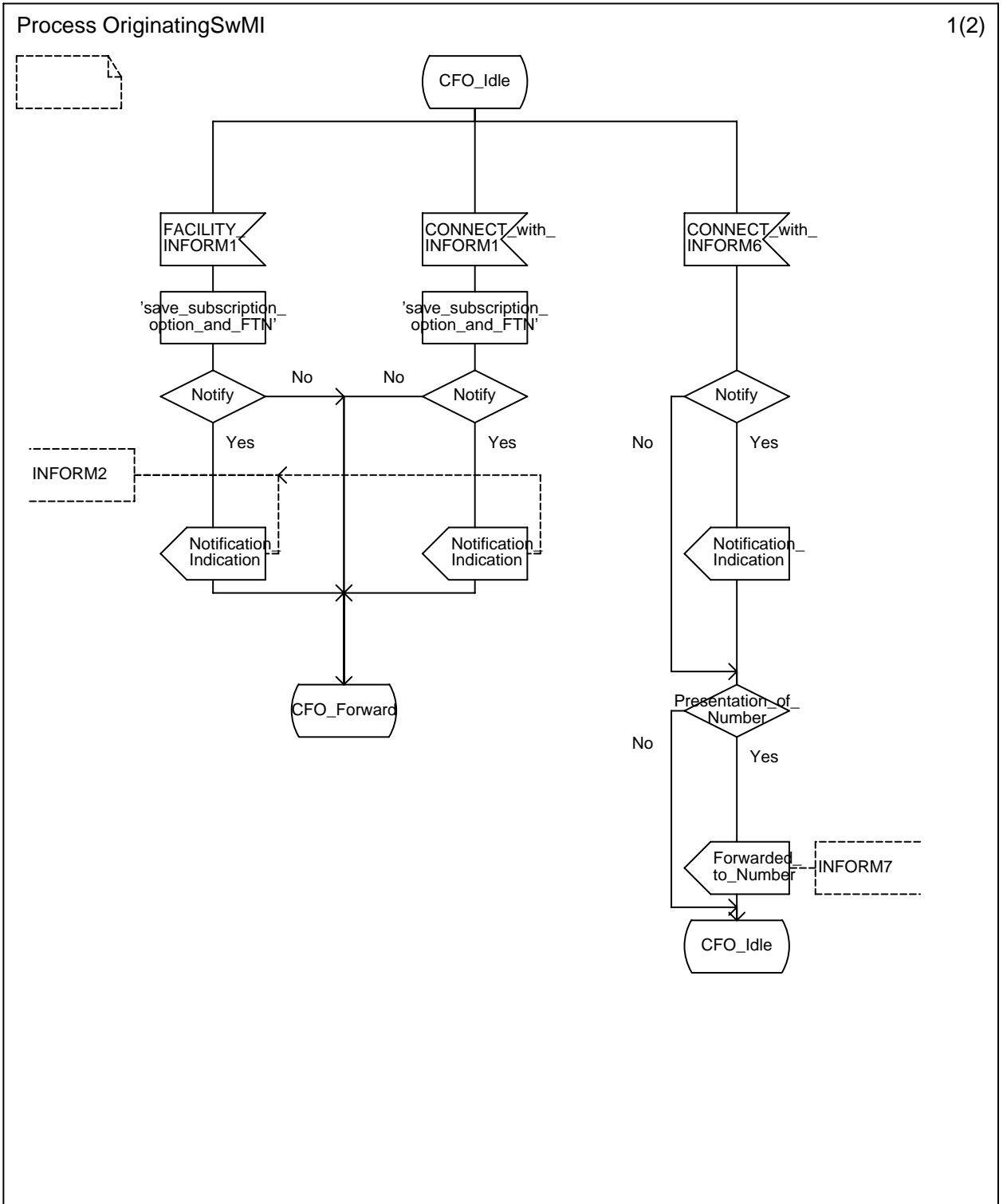


Figure A.1: Originating SwMI SDL (sheet 1 of 2)

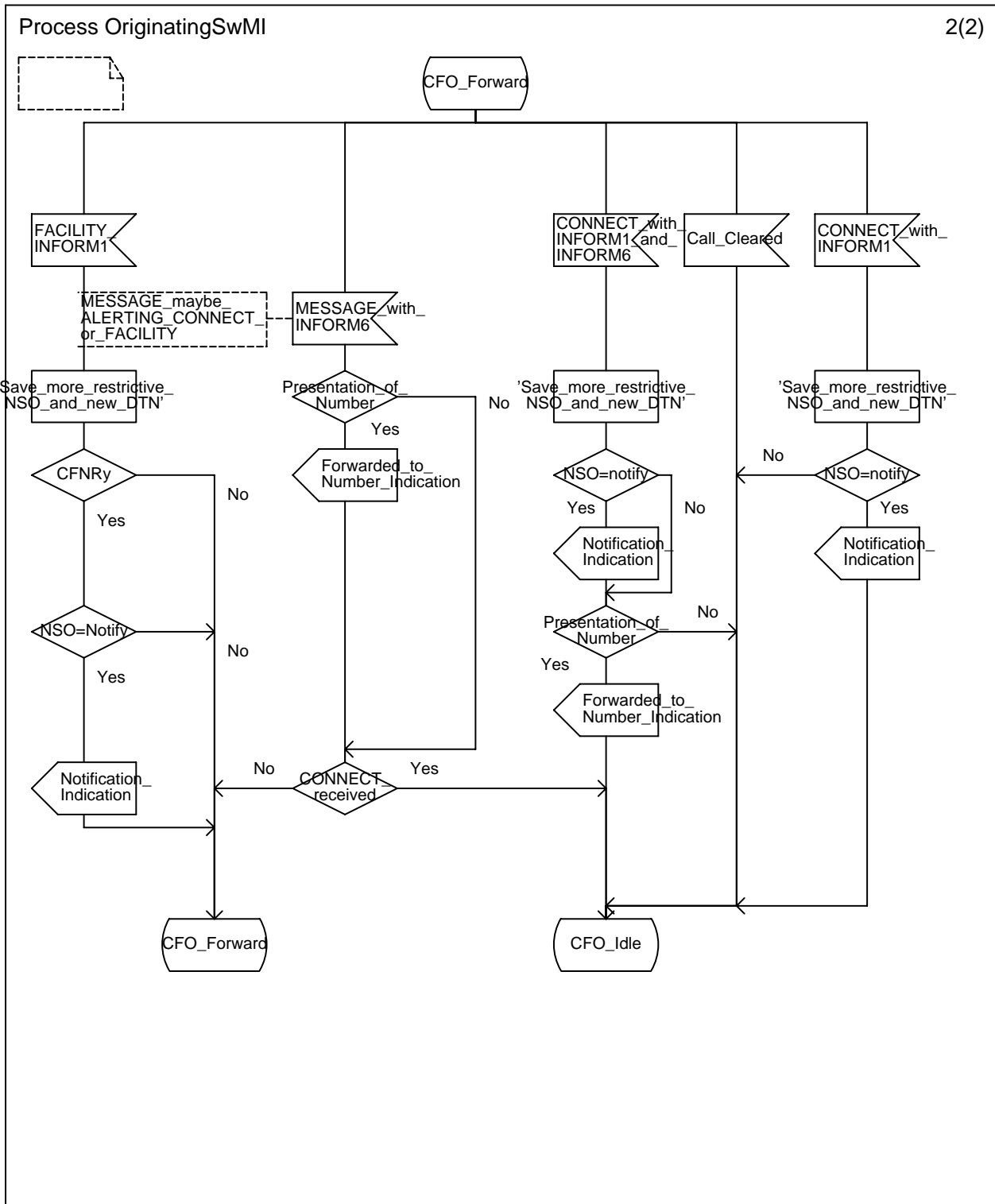


Figure A.1: Originating SwMI SDL (sheet 2 of 2)

Figure A.2 shows the behaviour of an SS-CF Supplementary Service at the Originating User MS/LS.

Input signals from the left represent messages received from the originating SwMI or primitives from the Co-ordination Function.

Output signals to the left represent primitives to the calling user.

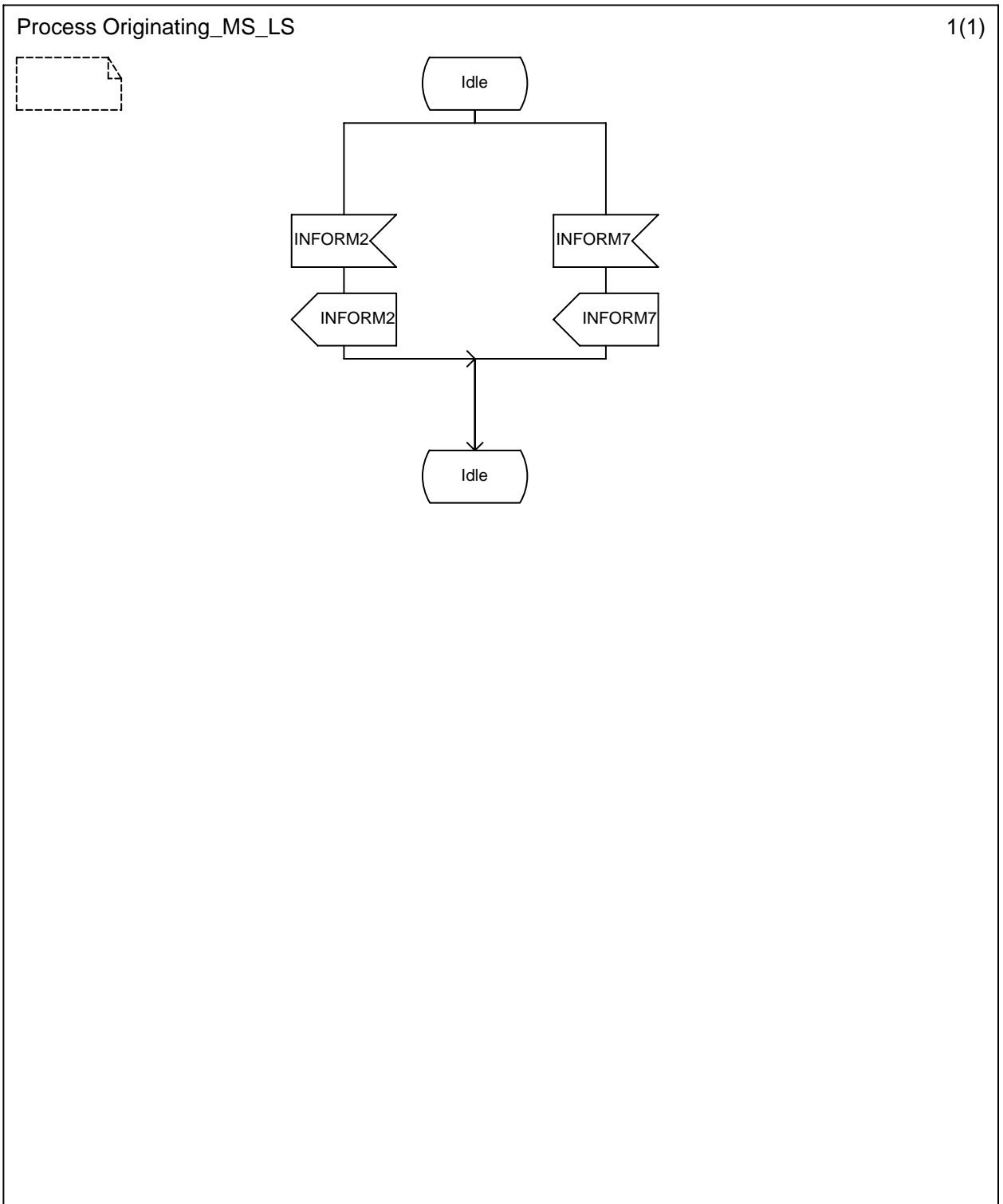


Figure A.2: Originating User MS/LS SDL

A.2 SDL Representation of SS-CF at the Rerouting SwMI

NOTE 1: In case of rerouting, the Rerouting SwMI is either the Originating SwMI or the Incoming Gateway SwMI. In case of forward switching, the Forwarding SwMI is the Served User SwMI.

Figure A.3 shows the behaviour of an SS-CF Supplementary Service Control entity within the Rerouting SwMI.

Input signals from the right represent messages received via Protocol Control or primitives from the Co-ordination Function.

NOTE 2: When the Forwarding functionality is incorporated in the Served User SwMI, the input signals from the right represent primitives from the Served User SwMI functionality to the Forwarding SwMI functionality within the Served User SwMI.

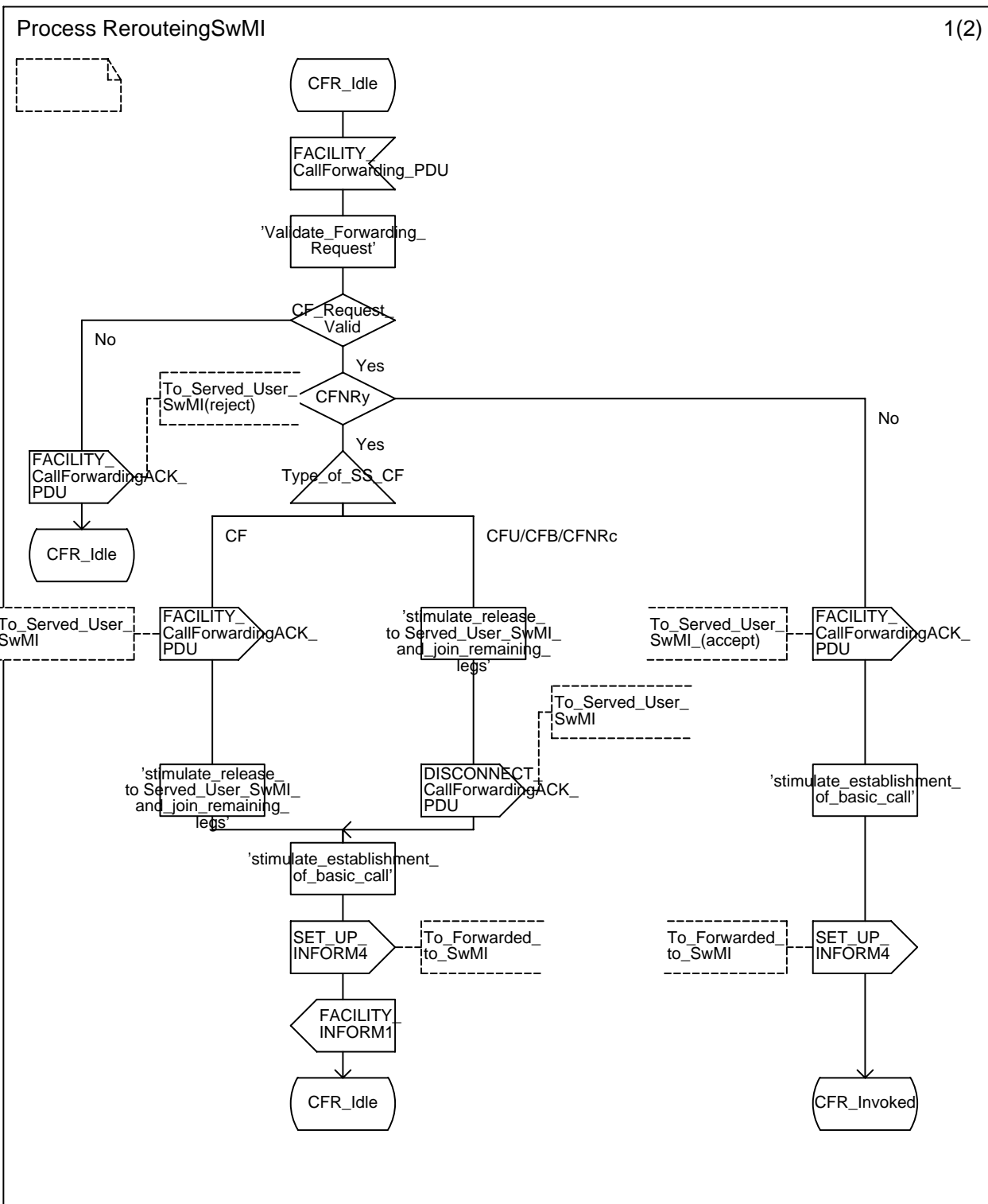
Output signals to the left represent messages sent via the incoming side Protocol Control.

NOTE 3: When the rerouteing functionality is incorporated in the Originating SwMI, the output signals to the left represent primitives from the Rerouteing SwMI functionality to the Origination SwMI functionality within the Originating SwMI.

Output signals to the right represent messages sent via outgoing side Protocol Control.

NOTE 4: When the Forwarding functionality is incorporated in the Served User SwMI, the output signals to the right represent primitives from the Forwarding SwMI functionality to the Served User SwMI functionality within the Served User SwMI or to the Forwarded to SwMI respectively.

States are marked with the letters "CFR" (Call Forwarding Re-routeing).



NOTE: If an INFORM6 PDU is included in the incoming CONNECT message from the Forwarded-to SwMI, this PDU is inserted in addition to the INFORM1 PDU in the outgoing CONNECT message.

Figure A.3: Forwarding SwMI SDL (sheet 1 of 2)

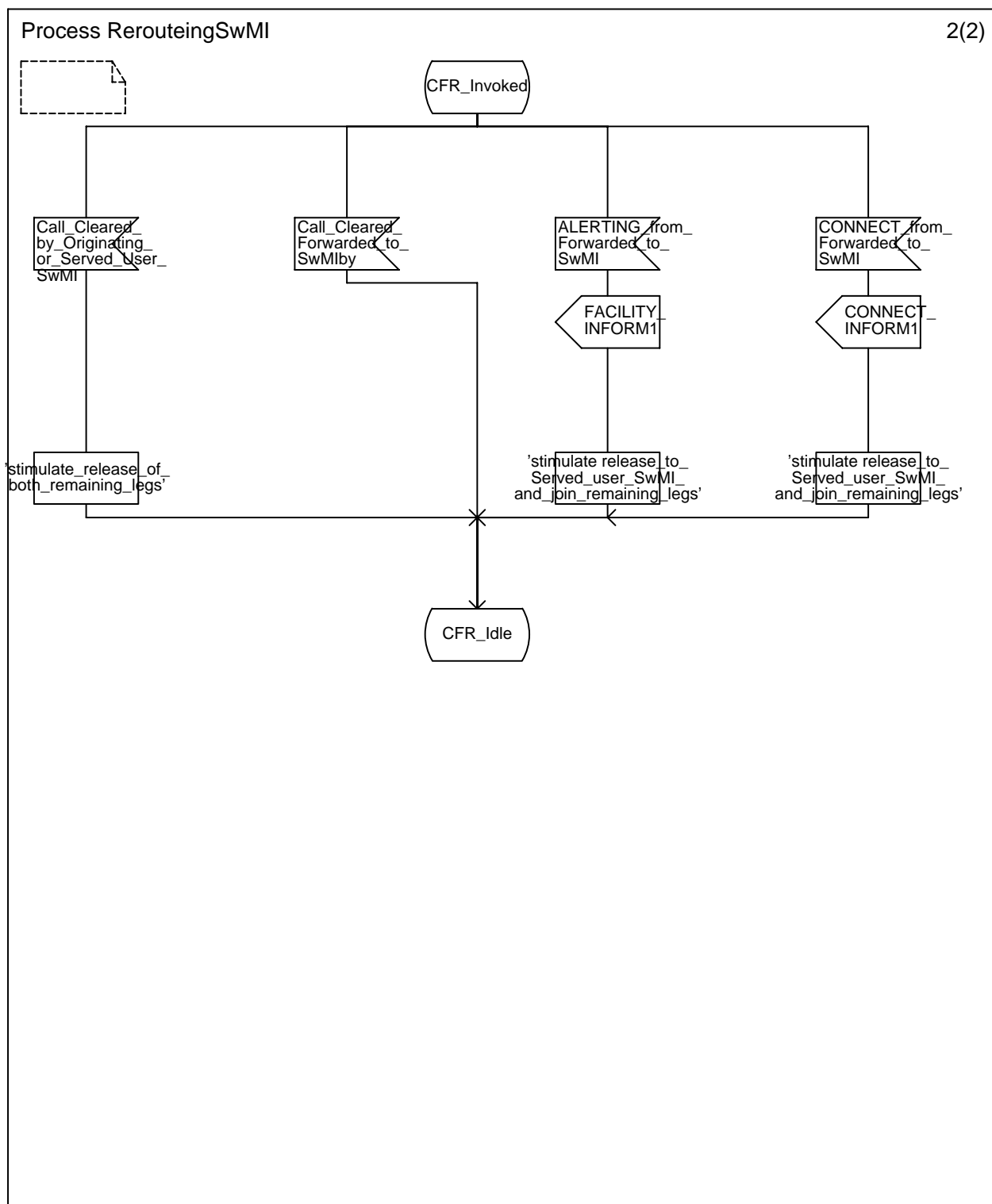


Figure A.3: Rerouteing SwMI SDL (sheet 2 of 2)

A.3 SDL Representation of SS-CF at the Served User SwMI

Figure A.4 shows the behaviour of an SS-CF Supplementary Service Control entity within the Served User SwMI,

Input signals from the left represent messages received via Protocol Control.

NOTE 1: When the Forwarding functionality is incorporated in the Served User SwMI (in case of Call Forwarding by forward switching), the input signals from the left represent primitives from the Forwarding SwMI functionality to the Served User SwMI functionality within the Served User SwMI.

Input signals from the right represent primitives from the Co-ordination Function.

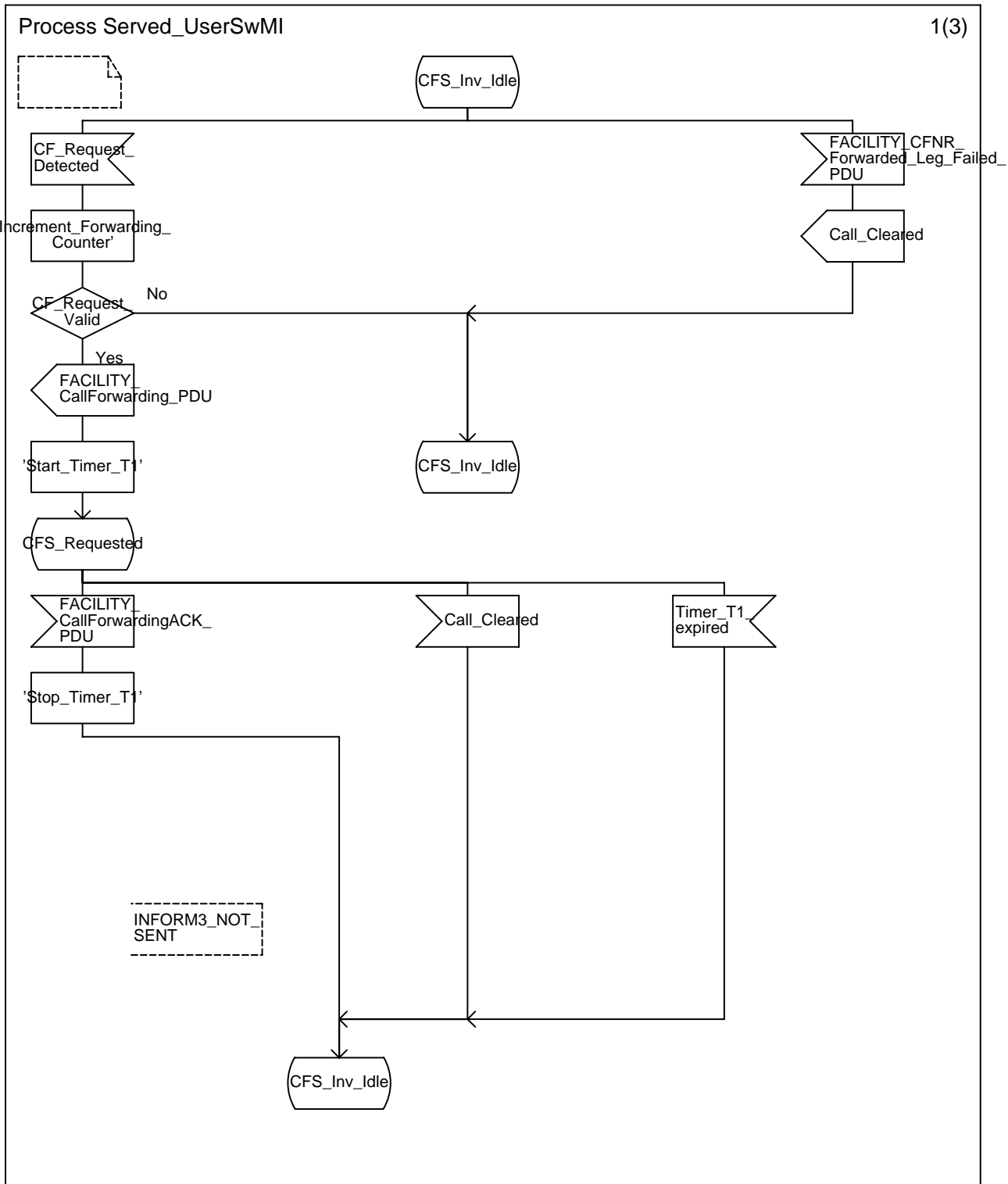
Output signals to the left represent messages sent via the incoming side Protocol Control.

NOTE 2: When the Forwarding functionality is incorporated in the Served User SwMI, the output signals to the left represent primitives from the Served User SwMI functionality to the Forwarding SwMI functionality within the Served User SwMI.

Output signals to the right represent primitives to the served user.

Protocol timer expiration is indicated by input signals from the right.

States are marked with the letters "CFS" (Call Forwarding Served User).



NOTE: Figure A.4, sheet 1 does not show the interaction between multiple invocations of CFNRy (CFA).

Figure A.4: Served User SwMI SDL (sheet 1 of 3)

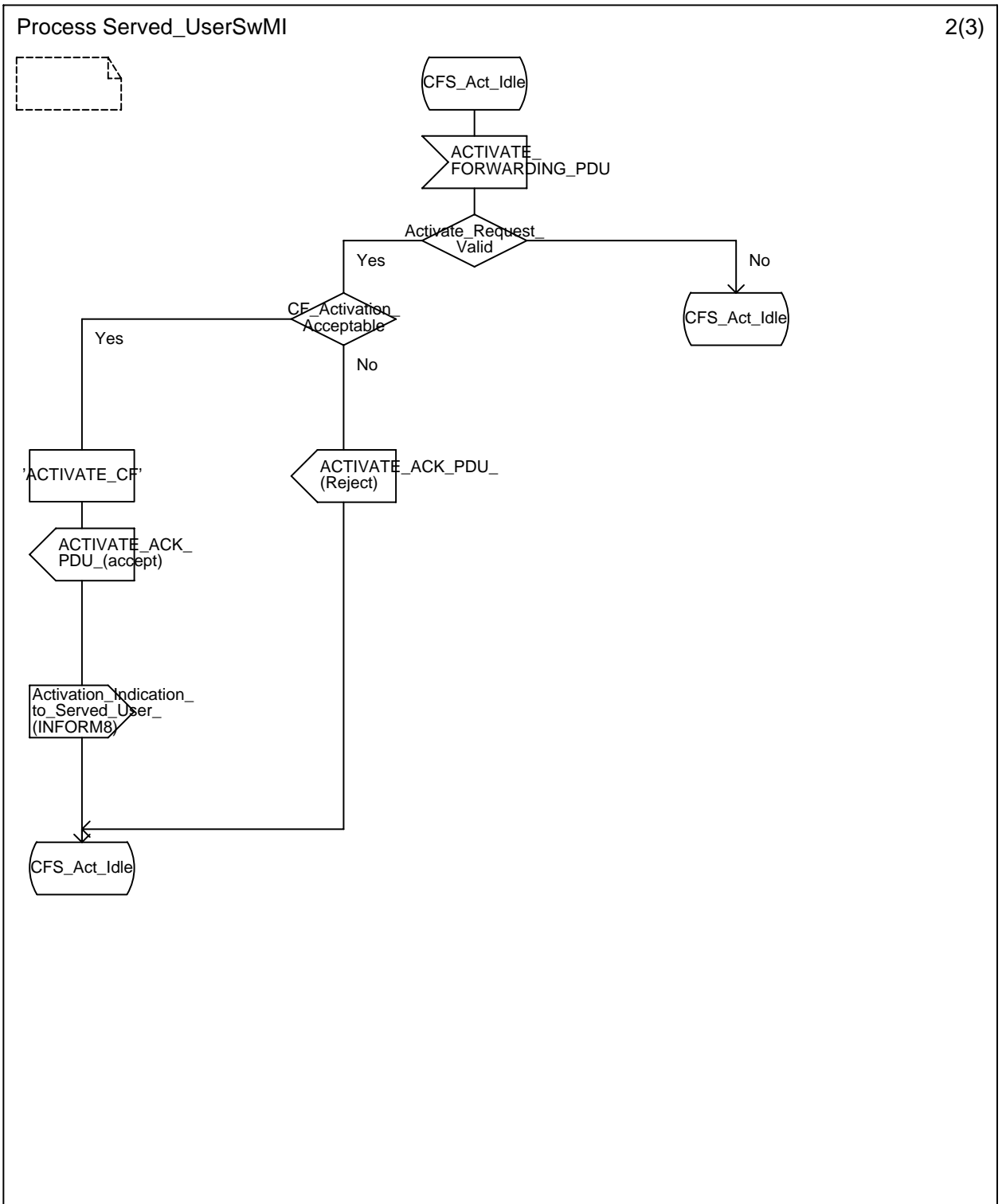
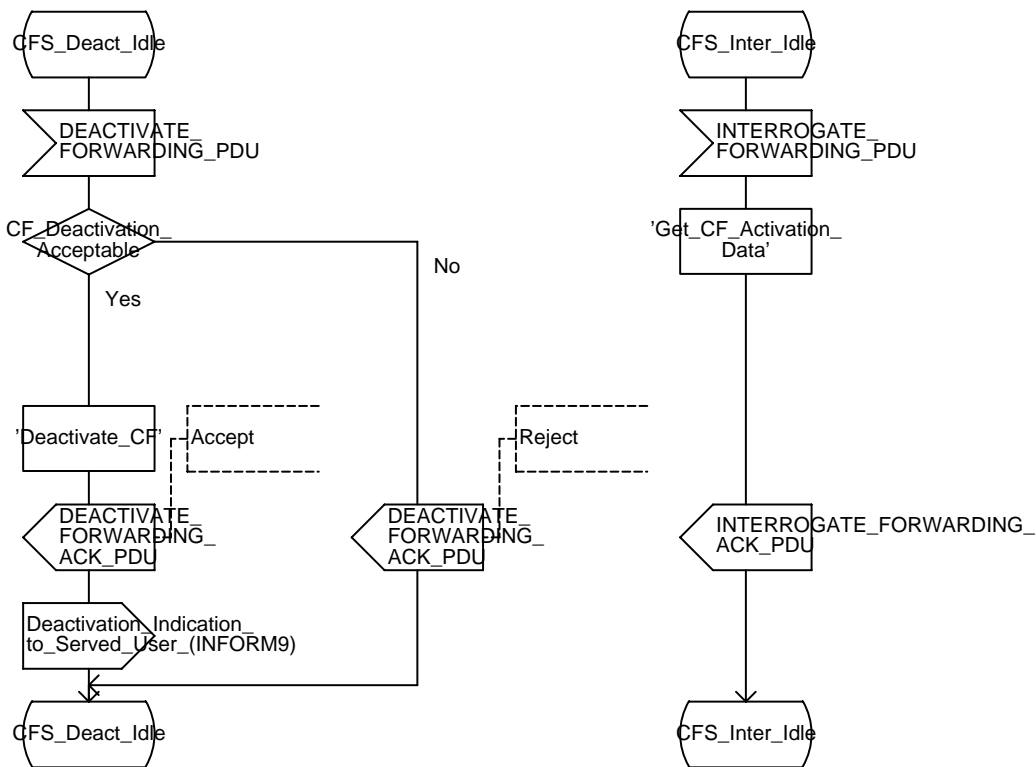


Figure A.4: Served User SwMI SDL (sheet 2 of 3)

Process Served_UserSwMI

3(3)



NOTE: ACTIVATE, DEACTIVATE and INTERROGATE operations are not visible at the ISI reference point in case of local activation, deactivation and interrogation.

Figure A.4: Served User SwMI SDL (sheet 3 of 3)

Figure A.5 shows the behaviour of an SS-CF Supplementary Service at the Served User MS/LS.

Input signals from the left represent messages received from the Served User Application.

Input signals from the right represent primitives from the Co-ordination Function.

Output signals to the left represent messages sent via the incoming side Protocol Control.

Output signals to the right represent primitives to the served user.

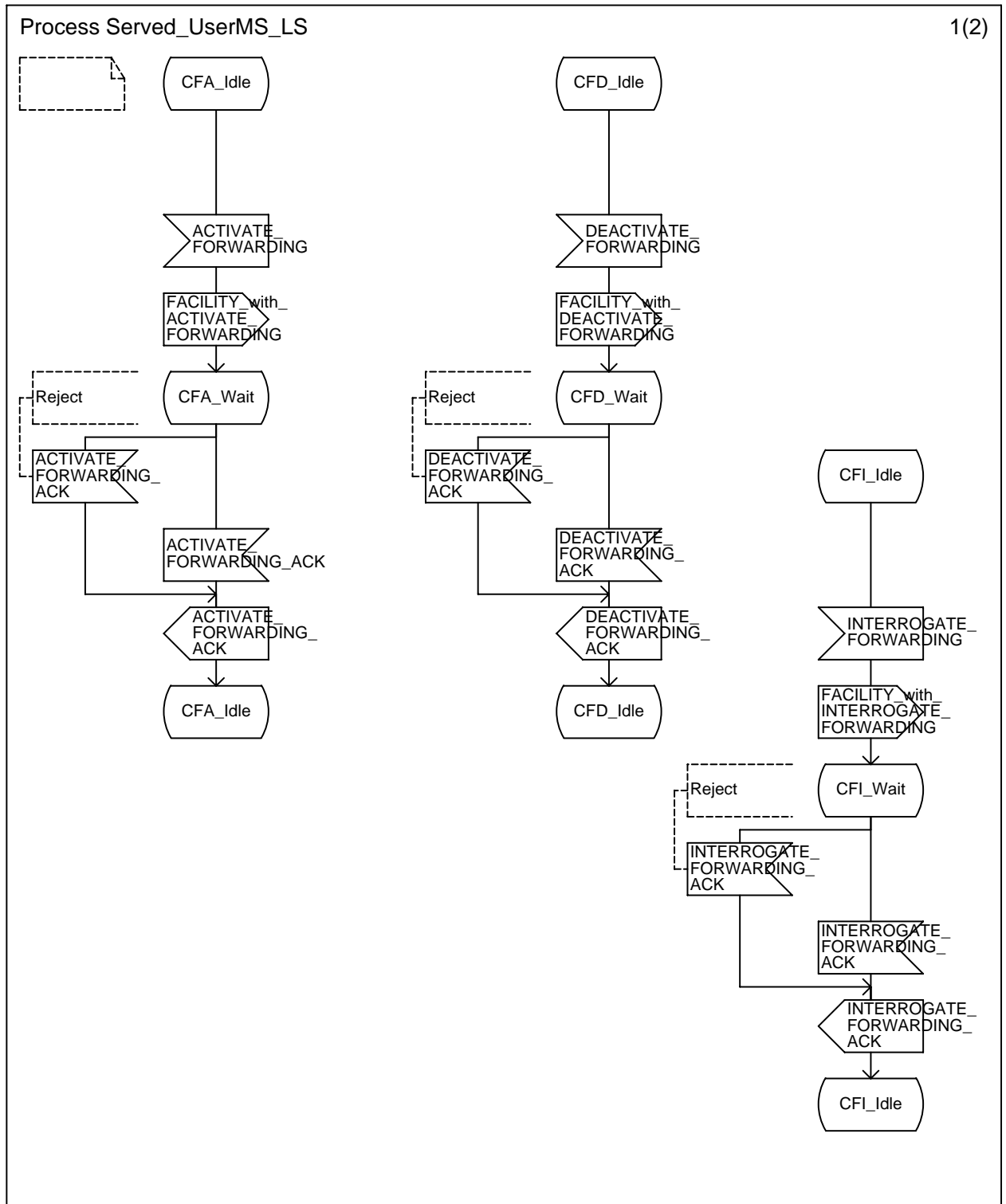


Figure A.5: Served User MS/LS SDL (sheet 1 of 2)

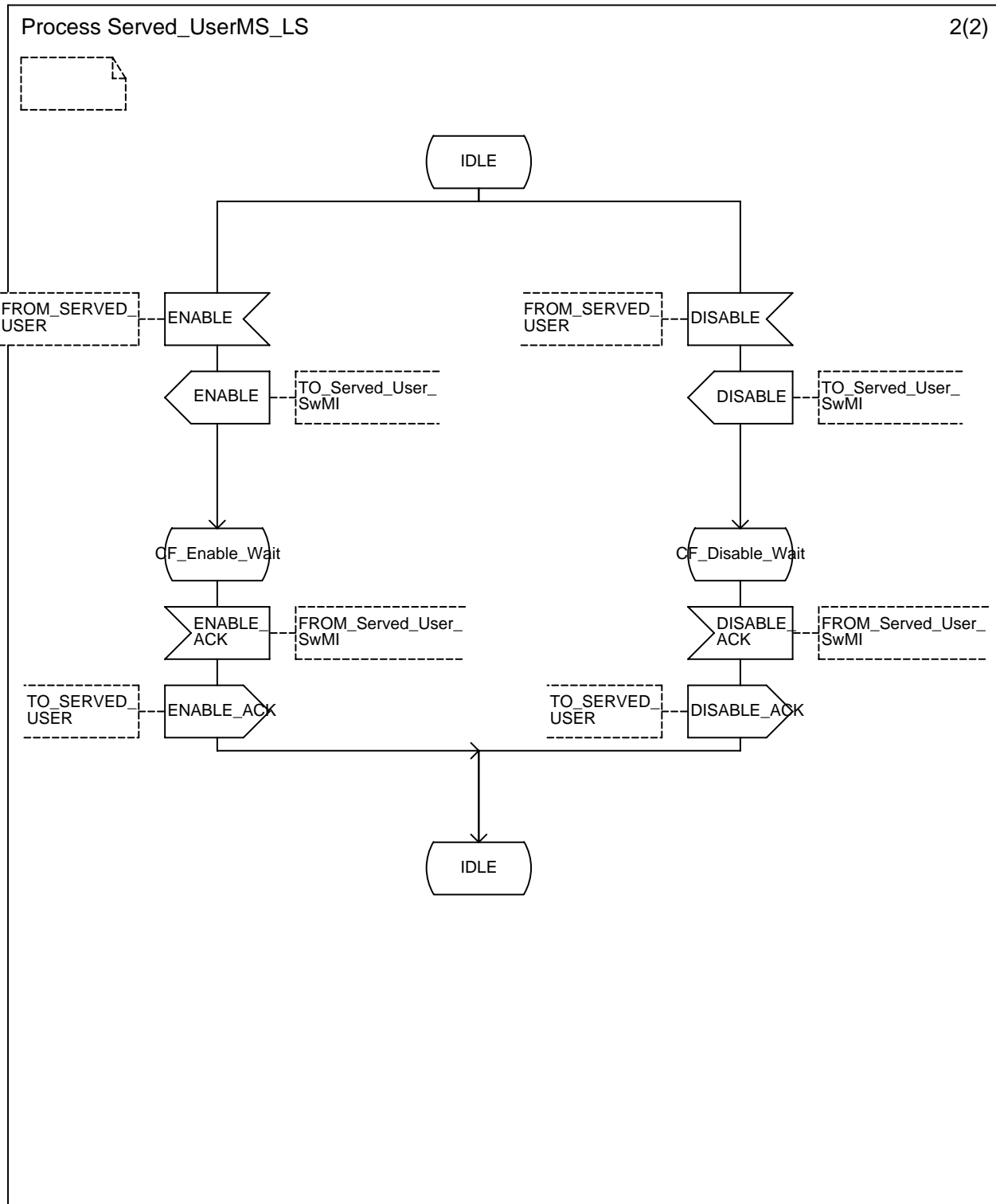


Figure A.5: Served User MS/LS SDL (sheet 2 of 2)

A.4 SDL Representation of SS-CF at the Forwarded-to SwMI

Figure A.6 shows the behaviour of an SS-CF Supplementary Service Control entity within the Forwarded-to SwMI.

Input signals from the left represent messages received via Protocol Control.

Input signals from the right represent primitives from the Co-ordination Function.

Output signals to the left represent messages sent via Protocol Control.

Output signals to the right represent primitives to the forwarded-to user.

States are marked with the letters "CFF" (Call Forwarding Forwarded-to).

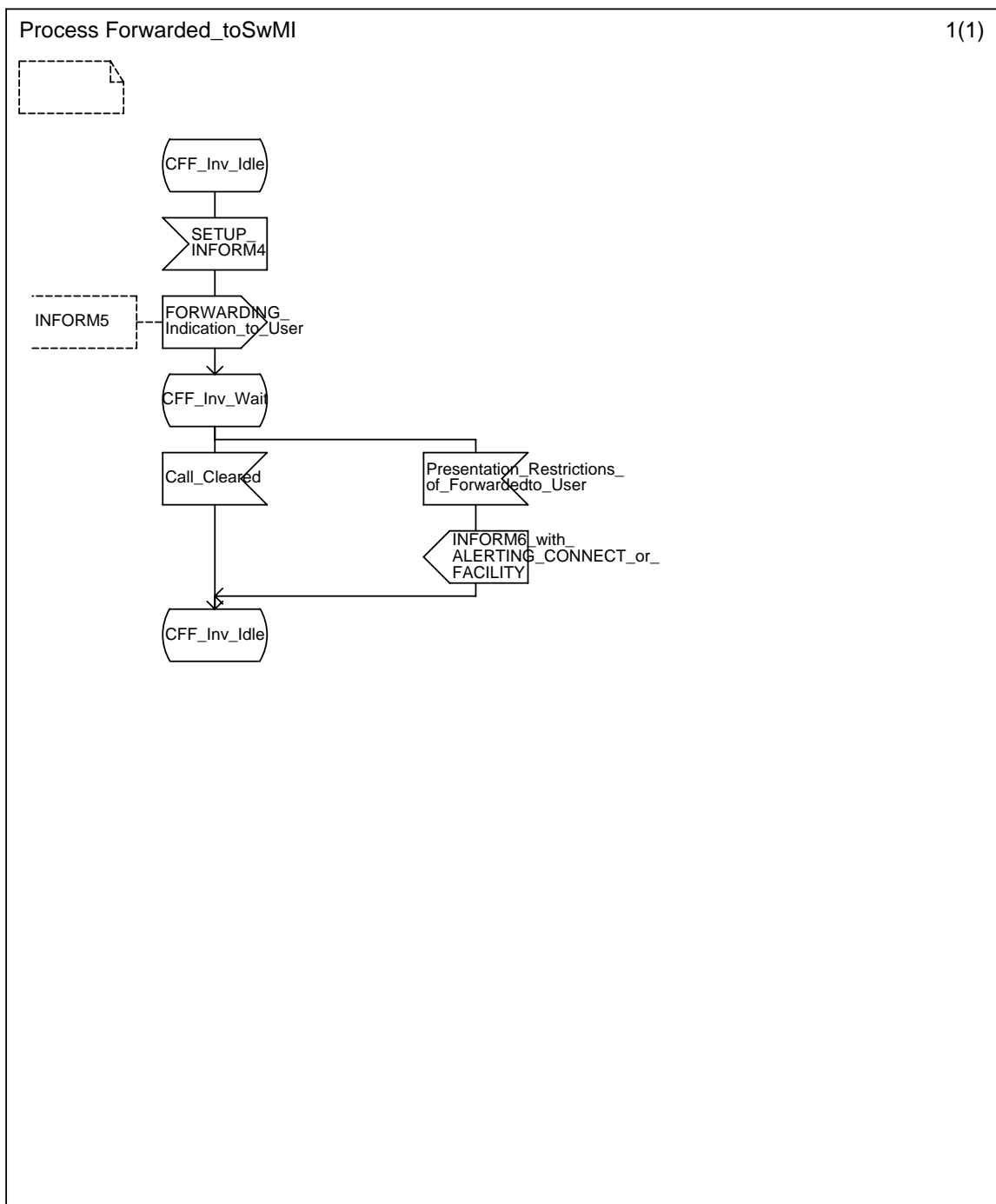


Figure A.6: Forwarded-to SwMI SDL

Figure A.7 shows the behaviour of an SS-CF Supplementary Service at the Forwarded-to User MS/LS.

Input signals from the right represent primitives from the Co-ordination Function.

Output signals to the right represent primitives to the forwarded-to user.

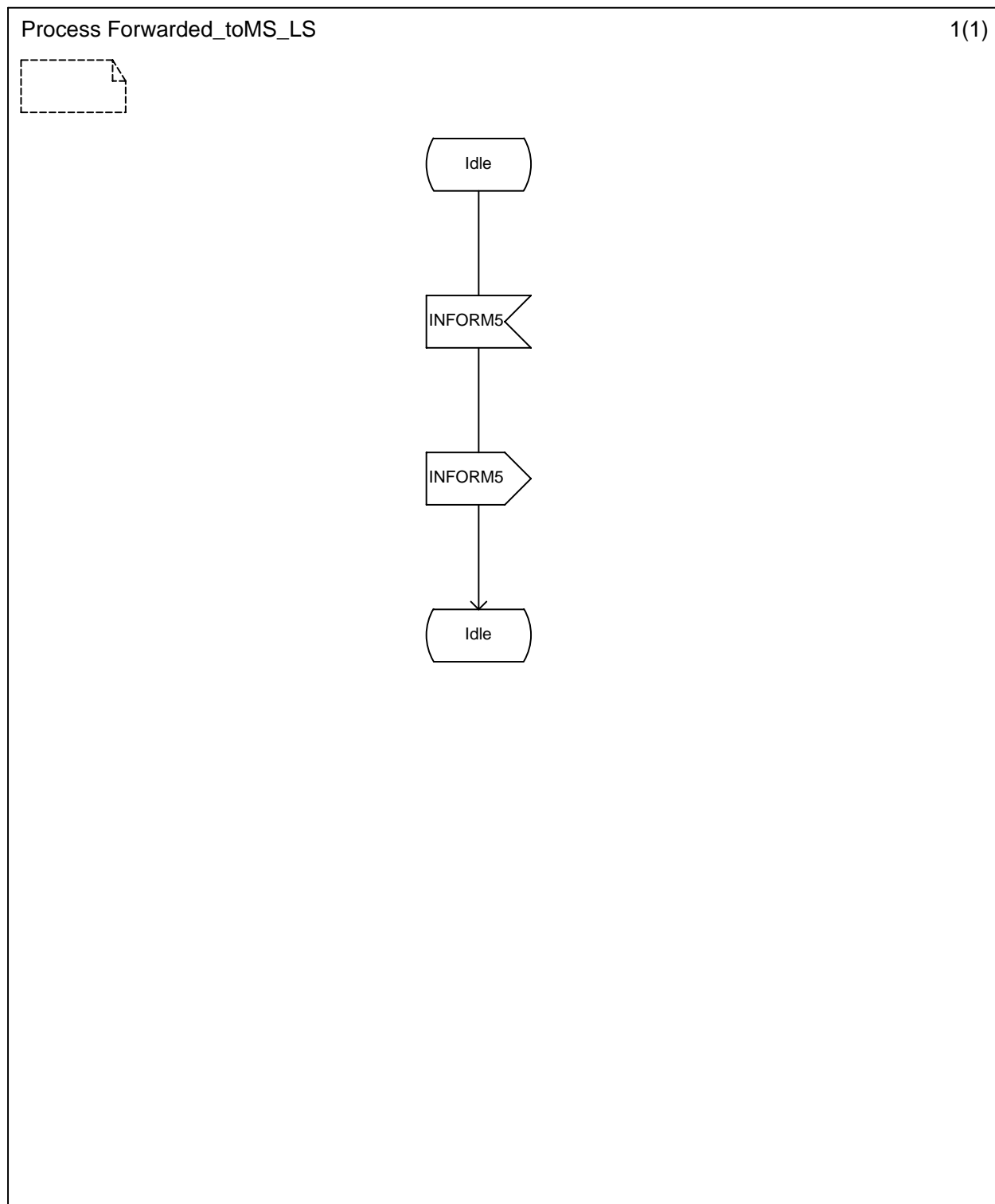


Figure A.7: Forwarded-to User MS/LS SDL

A.5 SDL Representation of SS-CF at the Activating SwMI

Figure A.8 shows the behaviour of an SS-CF Supplementary Service Control entity within the Activating SwMI.

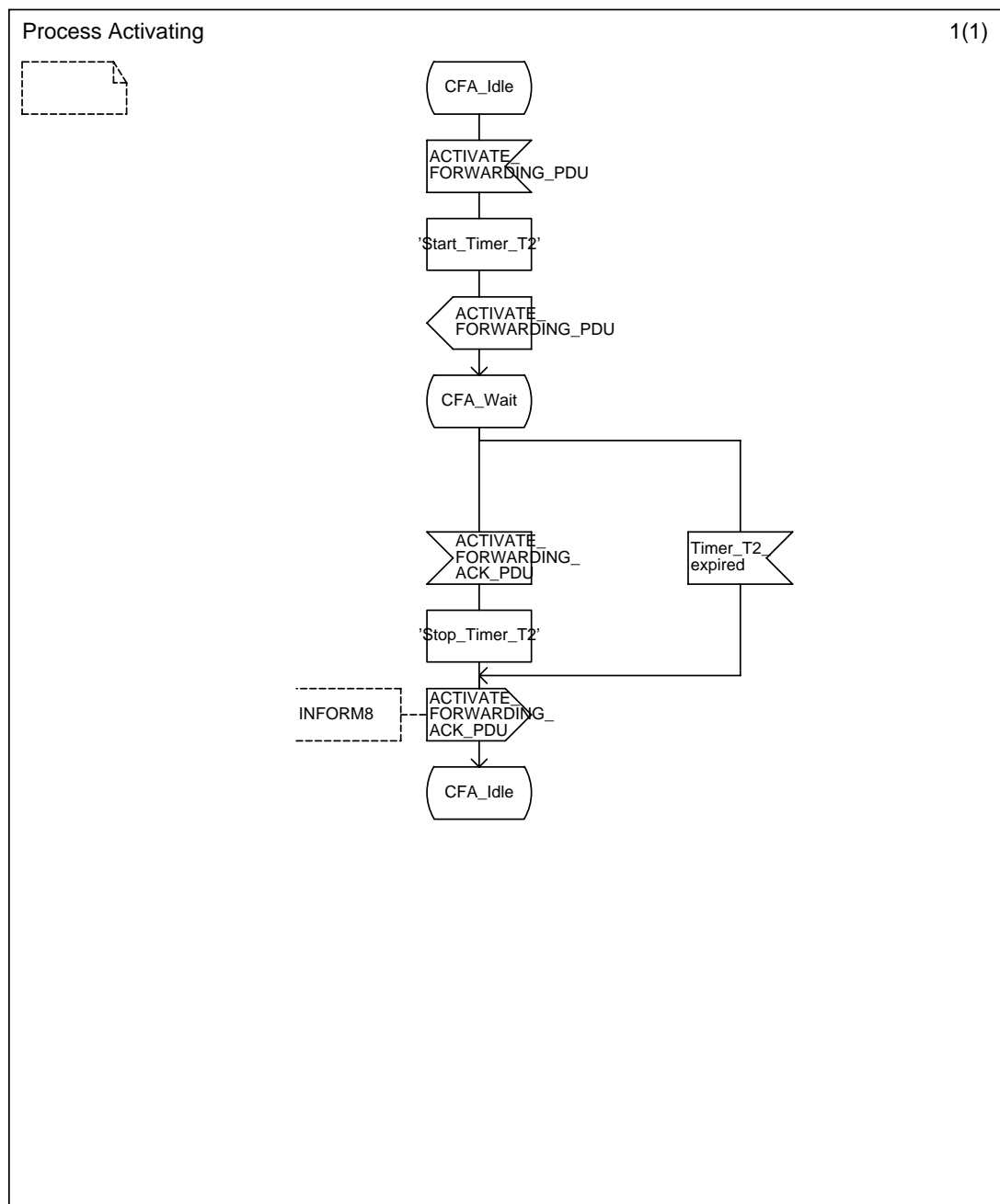
Input signals from the left represent messages received via Protocol Control.

Input signals from the right represent primitives from the activating user or timer expiration.

Output signals to the left represent messages sent via Protocol Control.

Output signals to the right represent primitives to the activating user.

States are marked with the letters "CFA" (Call Forwarding Activating).



NOTE: ACTIVATE operations are not visible at the ISI reference point in case of local activation.

Figure A.8: Activating SwMI SDL

Figure A.9 shows the behaviour of an SS-CF Supplementary Service Control entity within the Activating SwMI.

Input signals from the left represent messages received from the activating user.

Input signals from the right represent primitives from the activating user.

Output signals to the right represent messages sent to Protocol Control.

Output signals to the left represent primitives to the activating authorized user.

States are marked with the letters "CFA" (Call Forwarding Activating).

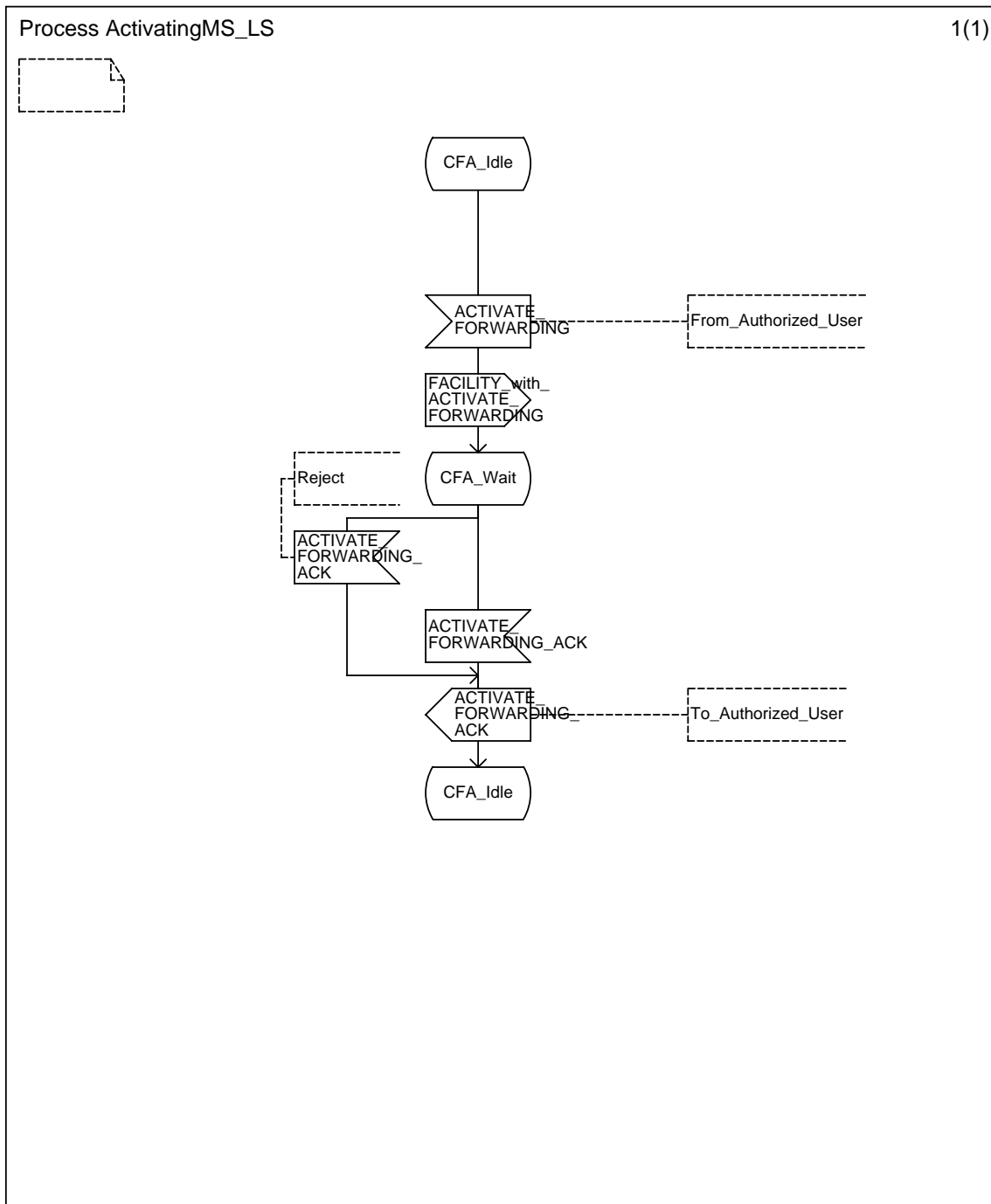


Figure A.9: Activating User MS/LS SDL

A.6 SDL Representation of SS-CF at the Deactivating SwMI

Figure A.10 shows the behaviour of an SS-CF Supplementary Service Control entity within the Deactivating SwMI.

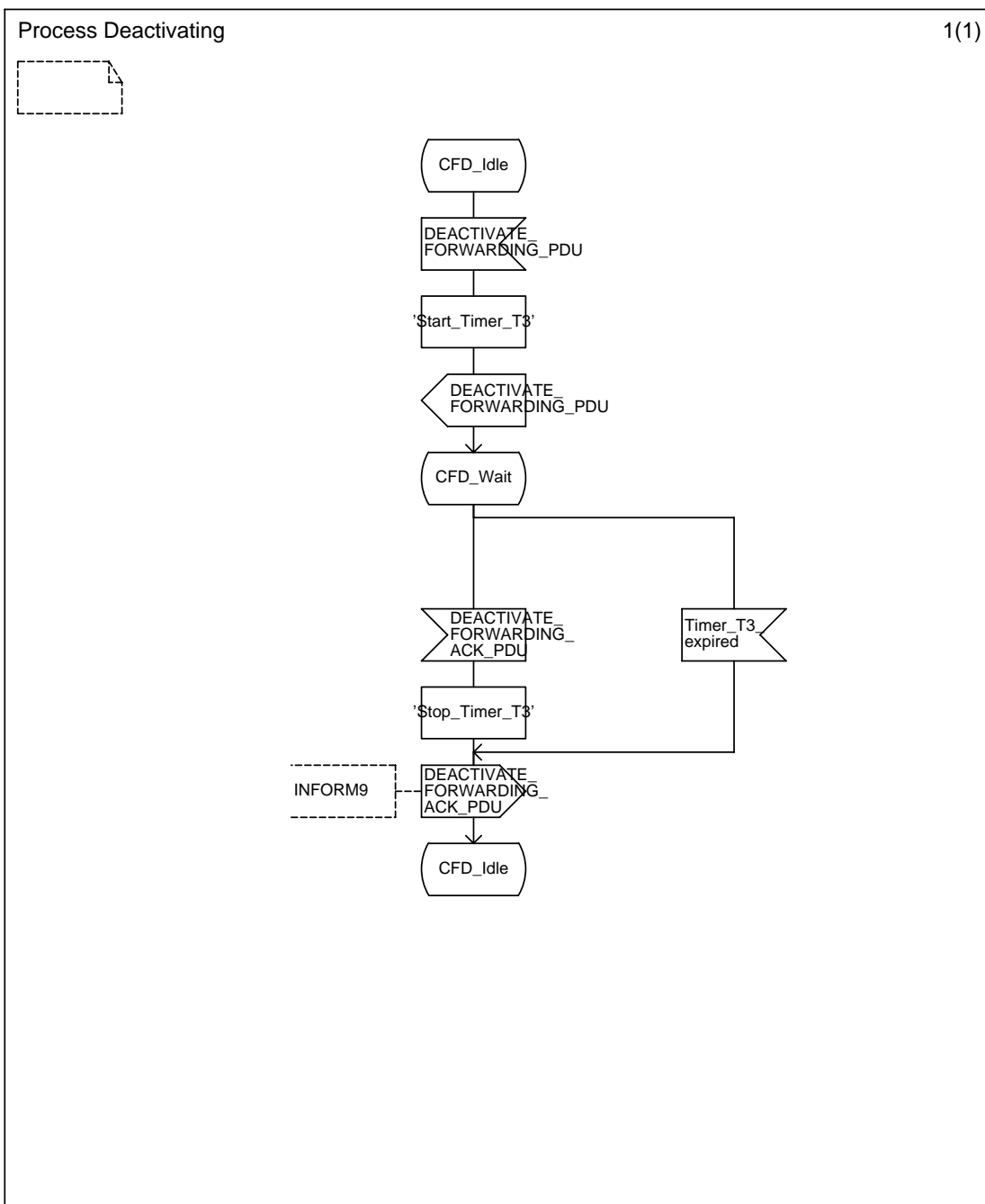
Input signals from the left represent messages received via Protocol Control.

Input signals from the right represent primitives from the deactivating user or timer expiration.

Output signals to the left represent messages sent via Protocol Control.

Output signals to the right represent primitives to the deactivating user.

States are marked with the letters "CFD" (Call Forwarding Deactivating).



NOTE: DEACTIVATE operations are not visible at the ISI reference point in case of local deactivation.

Figure A.10: Deactivating SwMI SDL

Figure A.11 shows the behaviour of an SS-CF Supplementary Service at the Deactivating User MS/LS.

Input signals from the right represent messages received from Protocol Control.

Input signals from the left represent primitives from the deactivating user.

Output signals to the right represent messages sent to Protocol Control.

Output signals to the left represent primitives to the deactivating authorized user.

States are marked with the letters "CFD" (Call Forwarding Deactivating).

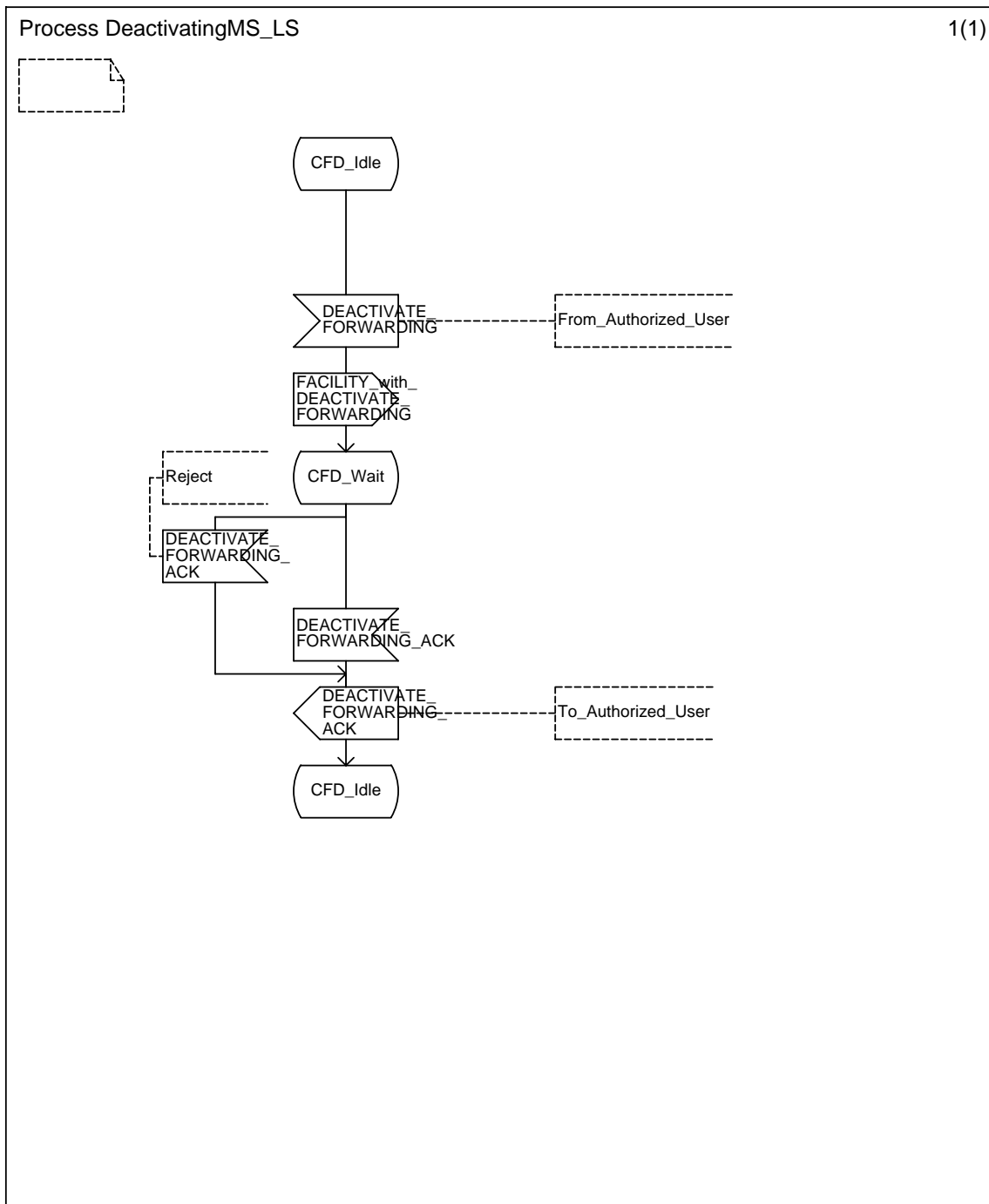


Figure A.11: Deactivating User MS/LS SDL

A.7 SDL Representation of SS-CF at the Interrogating SwMI

Figure A.12 shows the behaviour of an SS-CF Supplementary Service Control entity within the Interrogating SwMI.

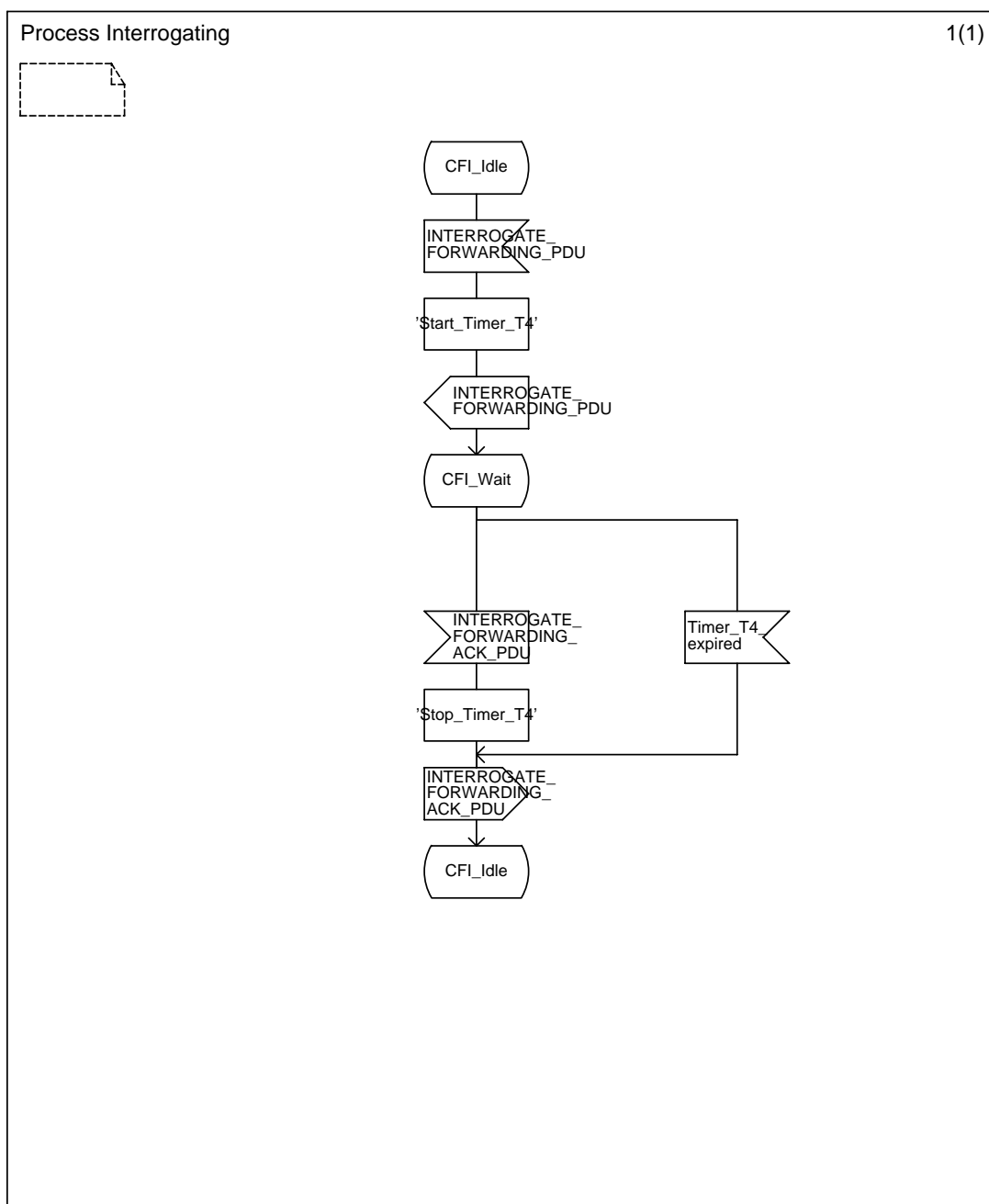
Input signals from the left represent messages received via Protocol Control.

Input signals from the right represent primitives from the interrogating user or timer expiration.

Output signals to the left represent messages sent via Protocol Control.

Output signals to the right represent primitives to the interrogating user.

States are marked with the letters "CFI" (Call Forwarding Interrogating).



NOTE: INTERROGATE operations are not visible at the ISI reference point in case of local interrogation.

Figure A.12: Interrogating SwMI SDL

Figure A.13 shows the behaviour of an SS-CF Supplementary Service at the Interrogating User MS/LS.

Input signals from the right represent messages received from Protocol Control.

Input signals from the left represent primitives from the interrogating user.

Output signals to the left represent messages sent to Protocol Control.

Output signals to the right represent primitives to the interrogating user.

States are marked with the letters "CFI" (Call Forwarding Interrogating).

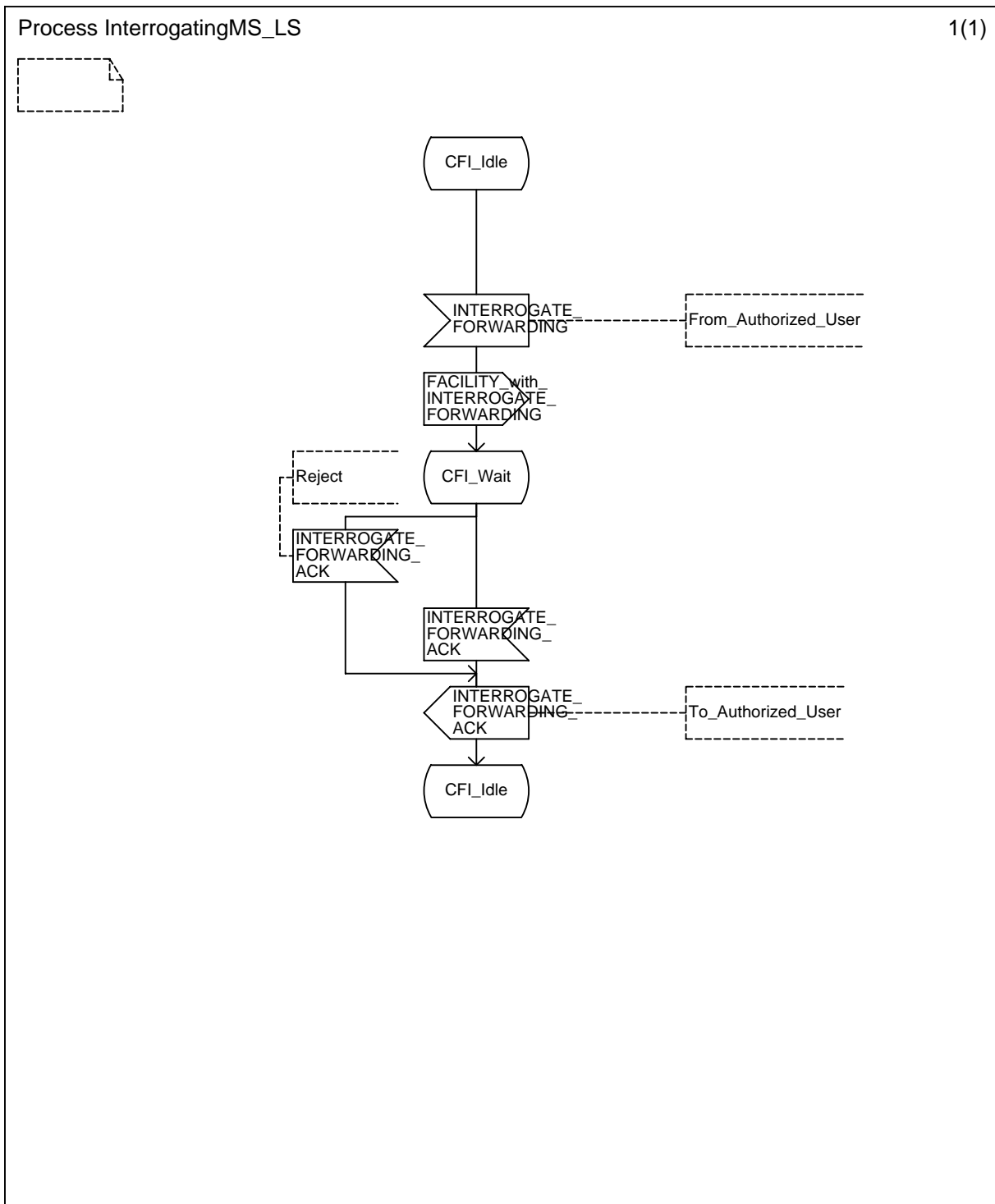


Figure A.13: Interrogating User MS/LS SDL

Annex B (normative): TETRA - Changes to ANF-ISI-IC

This Annex contains the assumed changes to the Public Enquiry version of ETS 300 392-3-2 [8] dated July 1998; once those changes have been incorporated into a revision of the referenced document, this Annex can be deleted. As long as those changes have not been incorporated into the ETS 300 392-3-2 [8], this Annex constitutes a list of discrepancies and matter of improvement for the ANF-ISI-IC document.

B.1 Subclause 6.3.1.2 and table 27

From a TETRA network point of view, the term ISI RELEASE disappears; the term ISI-DISCONNECT shall be used; in order to keep numbering sequence and Table sequence, the subclause 6.3.1.2 and table 27 shall refer to ISI-DISCONNECT and to Table 55 of ETS 300 392-3-2 [8]. The TETRA ISI-DISCONNECT may be placed either in a PSS1 RELEASE or a PSS1 DISCONNECT depending on the status of the call at the time of the TETRA ISI-DISCONNECT.

B.2 Subclause 6.3.1.4. and table 29

In stage 3 of ETS on SS-CF, it has been assumed that a negotiation takes place between the calling user SwMI and the called user home SwMI; the called user home SwMI requests call forwarding with an indicated preference for one of the routing choice and the calling user SwMI accepts or not the preferred choice.

The same mechanism shall be used for the call forwarding due to migration; ISI-IC shall send an ISI-IC-SETUP with the routing method choice information element; the called user SwMI shall request call forwarding using the FORWARD PDU described in table B.3 of annex B of this ETS and shall indicate whether call forwarding is requested due to migration of due to invocation of one of the instances of SS-CF; the calling user SwMI shall select the call forwarding routing method and shall send a FORWARD ACK PDU (see subclause 5.2.1 for its content) to the called SwMI containing the information element routing method select information element.

B.3 Subclause 6.3.1.6

A unique TETRA ISI-IC-SETUP shall be used; tables 26 and 31 of ETS 300 392-3-2 [8] shall be merged with proper routing method choice (forward switching or re routing corresponding to the two cases of tables 26 and 31 of ETS 300 392-3-2 [8]).

The TETRA ISI-IC-SETUP PDU shall contain the element defined in table B.1.

**Table B.1: Contents of TETRA PDU in the PSS1 SETUP message
for ISI-IC-SETUP**

Information element	Length	Type	Owner	C/O/M	Remark
PDU type	6	1	CCAp	M	ISI-IC-SETUP
Originating SwMI MNI	24	1	ANF	M	
Routeing method choice	3	1	ANF	M	note 1
IC resulting from forward switching/re routeing	1	1	ANF	M	
Forwarding Counter	5	1	ANF-FC	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 2
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	48	1	CCAp	M	note 4
SS-CLIR invoked for calling party	1	1	SS	M	
Calling party address ITSI	48	1	CCAp	M	note 5
Number of External subscriber number digits	5	1	CCAp	M	note 6
External subscriber number digit	4	1	CCAp	C	note 7
External subscriber number parameter	9	1	CCAp	C	
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 rerouteing 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).				

B.4 Subclause 6.3.1.17

There shall be a unique ISI-DISCONNECT with different disconnect causes; the ISI-RELEASE is now replaced by an ISI-DISCONNECT; the ISI-REROUTING, ISI-PATH CLEARING, ISI-REROUTING CLEARING and ISI-DISCONNECT shall be merged in the following table B.2 replacing tables 52, 53, 54 and 55 of ETS 300 392-3-2 [8]; the disconnect causes shall be as contained in table 57 of ETS 300 392-3-2 [8].

It is proposed that it is always the calling/originating SwMI which decides to disconnect excepted when it is an end user initiated disconnect.

The TETRA ISI DISCONNECT shall apply both to forward disconnect and to backward disconnect (in the case the called user decides to disconnect).

NOTE 1: In the case where ISI-REROUTING PDU would have been used, after an ISI-IC SETUP is received by the called user home SwMI and the called user has migrated, the home SwMI will inform the originating SwMI of the new location of the called user and will indicate which preferred routing algorithm to use. The originating SwMI indicates the selected routing algorithm; the mechanism of the FORWARD/FORWARD ACK negotiation can be used even when SS-CF is not invoked; the FORWARD ACK accompanies the ISI-DISCONNECT from the originating SwMI to the called user home SwMI; as an addition, the ISI-DISCONNECT may include the disconnect cause "call re-routed". The same mechanism applies to the case where ISI-REROUTING CLEARING would have been used; if distinction needs to be made between "call to be re routed" and "call re routed", two different disconnect causes may be used.

NOTE 2: In the case where ISI-PATH CLEARING would have been used where the originating SwMI after sending an ISI-IC SETUP to the called user home SwMI, receives and recognizes the fact that the called user has migrated to the originating SwMI, the originating SwMI disconnects the call to called user home SwMI with an ISI-DISCONNECT with a disconnect cause "ANF clearing due to avoid a trombone or a loop connection".

Table B.2: Contents of TETRA PDU sent in the PSS1 DISCONNECT message

Information element	Length	Type	Owner	C/O/M	Remark
PDU Type	6	1	CCAp	M	ISI-DISCONNECT
Disconnect cause	6	1	CCAp	M	note 1
Notification indicator	6	2	SS	O	
Called user migration or SS-CFU	1	1	ANF	M	
Incoming call barring status	2	1	ANF	M	note 2
Visited SwMI PISN number length	5	1	ANF	M	note 3
Visited SwMI PISN number digits	variable	1	ANF	C	note 4
Proprietary		3	-	O	
NOTE 1:	The following disconnect cause shall be included in the corresponding information element: <ul style="list-style-type: none"> - ANF clearing to avoid a trombone or a loop connection; - Call to be re-routed; - Call re-routed; - Call clearing; - User disconnect; - Call rejection; - Call forwarding rejected. 				
NOTE 2:	This information element is needed to take into account the interactions with local SS-BIC and SS-CAD.				
NOTE 3:	Shall be equal to N, N being the number of digits of the visited SwMI PISN number.				
NOTE 4:	The number of digits included in this information element shall be equal N, the value of the visited SwMI PISN number length (see note 3).				

B.5 FORWARD PDU

NOTE: The PISN coding represents a new coding with respect to the present ANF-ISI-IC document which needs to be brought in line with this new coding to be consistent.

Table B.3: FORWARD PDU contents

Information element	Length	Type	C/O/M	Remark
ISI-PDU-Type	6	1	M	ANF-ISI-IC
ISI-IC-Type	5	1	M	FORWARD (note 6)
MNI	24	1	M	
PISN Length	5	1	M	note 9
PISN	variable	1	C	notes 7 and 8
Routeing Method Choice	3	1	M	note 1
SS-CF Invocation Counter	5	1	M	
SS-CF Information Present	1	1	M	note 3
SS-CF Type	2	1	C	note 4
Forwarded-to user ITSI	48	1	C	note 4
Forwarded-to user External number length indicator	5	1	C	note 4
Forwarded-to user External subscriber number	variable	1	C	notes 4 and 5
Forwarding user ITSI	48	1	C	notes 2 and 4
Subscription Option for Forwarding User	2	1	C	notes 2 and 4
NOTE 1: The same information element shall be used by the SwMI requesting call forwarding and by the SwMI accepting call forwarding. The SwMI requesting call forwarding shall indicate its capabilities; the SwMI accepting the call forwarding request shall decide and indicate in that information element which rerouteing method shall be used.				
NOTE 2: In the case of TETRA, no forwarding notification shall be sent to the forwarding user; this information element may appear in case of inter-working. Shall include presentation restriction.				
NOTE 3: Allows to distinguish between call forwarding due to migration and call forwarding due to invocation of one of the instances of SS-CF; the particular instance is defined by the information element SS-CF Type; both migration and SS-CF invocation may happen simultaneously, in which case the PDU shall content elements pertaining to both.				
NOTE 4: Conditional on SS-CF Information Present content.				
NOTE 5: Conditional on forwarded-to user external number length indicator different from 0.				
NOTE 6: The same content of this FORWARD PDU may also apply to ANF-ISI-GC.				
NOTE 7: Shall be conditional on a non zero value of the PISN length information element.				
NOTE 8: Shall be equal to the number of digits of the visited SwMI PISN number.				
NOTE 9: The number of digits included in this information element shall be equal to N, the value of the visited SwMI PISN number length (see note 8).				

B.6 FORWARD ACK PDU

The use of FORWARD ACK PDU differs according to the different negotiation situations which may occur as result of either ANF-ISI-IC invocation or SS-CF invocation; in some cases, the role of FORWARD ACK is essential to complete the negotiation; in other cases, the negotiations are completed with the reception of FORWARD PDU and FORWARD ACK PDU is simply an information flow to complete the information on the final outcome of the call forwarding request to the SwMI which requested that forwarding initially.

The content of FORWARD ACK shall be as specified in table B.4.

Table B.4: FORWARD ACK PDU contents

Information element	Length	Type	C/O/M	Remark
ISI-PDU-Type	6	1	M	ANF-ISI-IC
ISI-IC-Type	5	1	M	FORWARD ACK (note 4)
MNI	24	1	M	
PISN Length	5	1	M	note 7
PISN	variable	1	C	notes 5 and 6
Routeing Method Select	3	1	M	
SS-CF Information Present	1	1	M	note 1
SS-CF Type	2	1	C	note 2
Forwarded-to user ITSI	48	1	C	note 2
Forwarded-to user External number length indicator	5	1	C	note 2
Forwarded-to user External subscriber number	variable	1	C	notes 2 and 3
Forwarding user ITSI	48	1	C	note 2
NOTE 1:	Allows to distinguish between call forwarding due to migration, call forwarding due to invocation of one of the instances of SS-CF or both; the particular instance of SS-CF is defined by the information element SS-CF Type; both migration and SS-CF invocation may happen simultaneously, in which case the PDU shall content elements pertaining to both.			
NOTE 2:	Conditional on SS-CF Information Present content.			
NOTE 3:	Conditional on forwarded-to user external number length indicator different from 0.			
NOTE 4:	The same content of this FORWARD PDU may also apply to ANF-ISI-GC.			
NOTE 5:	Shall be conditional on a non zero value of the PISN length information element.			
NOTE 6:	Shall be equal to the number of digits of the visited SwMI PISN number.			
NOTE 7:	The number of digits included in this information element shall be equal to N, the value of the visited SwMI PISN number length (see note 6).			

B.7 Subclause 6.3.2.2.10

In the routeing method choice, there is the need to indicate on one side the capabilities of one SwMI (no forward switching only, re routeing only, both forward switching and re-routeing capabilities); on the other side, there is the need to indicate which routeing algorithm is finally selected. The following proposed information elements can be used indifferently for call routing due to migration and for call forwarding resulting from SS-CF invocation.

The proposed information element coding is suggested both for call forwarding due to migration and for call forwarding due to SS-CF invocation. Tables B.3 and B.4 shall replace table 67.

B.7.1 Routeing method choice at SETUP

This information element is used in an ISI-IC-SETUP. This information element shall contain the capabilities of the originating SwMI in terms of call forwarding by re-routeing, by forward switching or by both.

This information element shall be coded as defined in table B.5.

Table B.5: Routeing method choice at SETUP information element contents

Information element	Length	Value	Remark
Routeing method choice	3	000 ₂	Rerouteing not supported; call forwarding by forward switching only
		001 ₂	Rerouteing supported, forward switching preferred
		010 ₂	Rerouteing supported, the called SwMI may choose between forward switching and rerouteing
		011 ₂	Rerouteing supported, possible choice between forward switching and rerouteing to be made by originating SwMI
		>011 ₂	reserved

B.7.2 Routeing method choice at FORWARD information element

This information element is used by the SwMI requesting call forwarding as a result of SS-CF invocation or as a result of called user migration. It is contained in the FORWARD PDU. This information element shall contain either the capabilities of the called user SwMI in terms of call forwarding or the choice made as a result of the routeing method choice information element received in the ISI-IC-SETUP.

This information element shall be coded as defined in table B.6.

Table B.6: Routeing method choice at FORWARD information element contents

Information element	Length	Value	Remark
Routeing method	3	000 ₂	Forward switching not supported
		001 ₂	Forward switching supported
		010 ₂	Forward switching selected
		011 ₂	Select re-routeing (note)
		>011 ₂	reserved
NOTE: Case of group call.			

B.7.3 Routeing method select

This information element is used either by the SwMI accepting a FORWARD request as a result of SS-CF invocation or as a result of in an ISI-IC-SETUP. This information element shall contain the selected call forwarding routing method; if none compatible, it shall also indicate that no compatible method could be selected.

This information element shall be coded as defined in table B.7.

Table B.7: Routeing method select information element contents

Information element	Length	Value	Remark
Routeing method	3	000 ₂	None. (note 1)
		001 ₂	Call forwarding by rerouteing. (note 2)
		010 ₂	Call forwarding by forward switching.
		>011 ₂	reserved
NOTE 1: Could appear in the case where the SwMI accepting call forwarding is not capable of providing the method requested by the requesting SwMI.			
NOTE 2: Case of group call.			

B.8 Annexes A and B of ETS 300 392-3-2

Both Annexes A and B shall be removed from ETS 300 392-3-2 [8]; interactions between SS-CF and ANF-ISI-IC shall be described in this document.

NOTE 1: The text for the interaction between ANF-ISI-IC and SS-CFU is very close to the text contained in Annex A of ETS 300 392-3-2 [8] Public Enquiry version.

NOTE 2: The text for the interaction between ANF-ISI-IC and SS-CFB in this draft ETS is significantly different from the text of ANF-ISI-IC Annex B of ETS 300 392-3-2 [8].

Annex C (normative): TETRA - Changes to ANF-ISI-GC

This Annex lists changes that are to be brought to ANF ISI-GC to align GC with IC and to align SS-CF and ANF-ISI-GC.

This Annex contains the assumed changes to the Public Enquiry version of ETS 300 392-3-3 [9]; once those changes have been incorporated into a revision of the referenced document, this Annex can be deleted. As long as those changes have not been incorporated into the ETS 300 392-3-3 [9], this Annex constitutes a list of discrepancies and matter of improvement for the ANF-ISI-GC document.

References are made to the affected clause numbers of ETS 300 392-3-3 [9].

C.1 Subclause 6.3.1.1.1

Suggest alignment with the new ISI-IC-SETUP; replacing ISI-ORIGINATING SETUP with ISI-GC-SETUP.

NOTE: The use of "forward" in "used to forward a call set-up request" is somewhat confusing and it is suggested to delete the word "forward".

C.2 Subclause 6.3.1.1.7

Table 51 of subclause 6.3.1.1.7. shall be replaced by the following table C.1.

Table C.1: Contents of TETRA PDU sent in the PSS1 RELEASE COMPLETE message sent by the group home SwMI or the linking controlling SwMI

Information element	Length	Type	Owner	C/O/M	Remark
PDU Type	6	1	CCAp	M	ISI-REROUTE SETUP
Forwarded-to group address SSI	24	1	CCAp	M	
Group/Linking home SwMI MNI forwarded-to group address MNI	24	1	ANF	M	
Basic service	8	1	CCAp	M	
Temporary group member indication	1	1	CCAp	M	note
Notification indicator	6	2	SS	O	
Proprietary		3	-	O	
NOTE:	Indication to the originating SwMI that the calling user is temporarily a member of the called group.				

History

Document history	
September 1999	Public Enquiry PE 9959: 1999-09-15 to 2000-01-14