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Terrestrial Trunked Radio (TETRA);
Voice plus Data (V+D);
Part 12: Supplementary services stage 3;
Sub-part 4: Call Forwarding (CF)

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Contents

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Foreword

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

The present document is part 12, sub-part 4 of a multi-part deliverable covering Voice plus Data (V+D), as identified below:

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

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

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

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

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

EN 300 392-7: "Security";

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

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

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

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

EN 300 392-12-1: "Call Identification (CI)";

ETS 300 392-12-2: "Call Report (CR)";

EN 300 392-12-3: "Talking Party Identification (TPI)";

EN 300 392-12-4: "Call Forwarding (CF)";

ETS 300 392-12-5: "List Search Call (LSC)";

EN 300 392-12-6: "Call Authorized by Dispatcher (CAD)";

ETS 300 392-12-7: "Short Number Addressing (SNA)";

EN 300 392-12-8: "Area Selection (AS)";

ETS 300 392-12-9: "Access Priority (AP)";

EN 300 392-12-10: "Priority Call (PC)";

ETS 300 392-12-11: "Call Waiting (CW)";

EN 300 392-12-12: "Call Hold (HOLD)";

EN 300 392-12-13: "Call Completion to Busy Subscriber (CCBS)";

EN 300 392-12-14: "Late Entry (LE)";

EN 300 392-12-16: "Pre-emptive Priority Call (PPC)";

EN 300 392-12-17: "Include Call (IC)";

EN 300 392-12-18: "Barring of Outgoing Calls (BOC)";

EN 300 392-12-19: "Barring of Incoming Calls (BIC)";

EN 300 392-12-20: "Discreet Listening (DL)";

EN 300 392-12-21: "Ambience Listening (AL)";

EN 300 392-12-22: "Dynamic Group Number Assignment (DGNA)";

EN 300 392-12-23: "Call Completion on No Reply (CCNR)";

ETS 300 392-12-24: "Call Retention (CRT)";

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

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

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

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

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

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

NOTE: Part 3, sub-parts 6 and 7 (Speech format implementation), part 4, sub-part 3 (Data networks gateway), part 10, sub-part 15 (Transfer of control), part 13 (SDL) and part 14 (PICS) of this multi-part deliverable are in status "historical" and are not maintained.

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

Introduction

The supplementary service stage 3 description is preceded by the stage 1 [2] and the stage 2 [3] description of the service, according to the method described in ITU-T Recommendation I.130 [i.4]. 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 ITU-T Recommendation I.130 [i.4], 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.

1 Scope

The present document 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 the present document.

The present document is applicable to Voice plus Data individual call or group call; some parts of the present document are applicable to SDS (Short Data Service); more specifically to the following entities:

- the MS 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 interworking SwMI for an individual call.

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

The present document also specifies additional signalling protocol requirements for the support of interactions at the ISI reference point, other supplementary services and ANFs. The present document is applicable to SwMIs that can interconnect to form a TETRA network.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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

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

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

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

[2] ETSI EN 300 392-10-4: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Sub-part 4: Call Forwarding (CF)".

[3] ETSI EN 300 392-11-4: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 11: Supplementary services stage 2; Sub-part 4: Call Forwarding (CF)".

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

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

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

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

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

[9] ETSI EN 300 392-10-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Sub-part 1: Call Identification (CI)".

[10] ETSI EN 300 392-12-13: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 13: Call Completion to Busy Subscriber (CCBS)".

[11] ETSI EN 300 392-12-23: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 23: Call Completion on No Reply (CCNR)".

[12] ETSI EN 300 403-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".

[13] ETSI EN 300 195-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Supplementary service interactions; Part 1: Protocol specification".

[14] ETSI EN 300 196-1: "Integrated Services Digital Network (ISDN); Generic functional protocol for the support of supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".

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

[16] ETSI EN 300 207-1 (V1.2.5): "Integrated Services Digital Network (ISDN); Diversion supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".

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

[18] ITU-T Recommendation X.219: "Remote Operations: Model, notation and service definition".

[19] ITU-T Recommendation X.229: "Remote Operations: Protocol specification".

[20] ITU-T Recommendation X.217: "Information technology - Open Systems Interconnection - Service definition for the Association Control Service Element".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ECMA-174: "Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Call Diversion Supplementary Services (QSIG-CF)".

[i.2] ITU-T Recommendation I.210: "Principles of telecommunication services supported by an ISDN and the means to describe them".

[i.3] ITU-T Recommendation Z.100: "ITU-T Specification and Description Language (SDL)".

[i.4] ITU-T Recommendation I.130: "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[i.5] ITU-T Recommendation Q.9: "Vocabulary of switching and signalling terms".

[i.6] ECMA-173: "Private Integrated Services Network (PISN) - Specification, Functional Model and Information Flows - Call Diversion Supplementary Services (CFSD)".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document the following terms and definitions apply:

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

busy: user is engaged in another telecommunication service

NOTE: 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: instance of the use of a basic service

call forwarding type: reason for call forwarding

NOTE: In order to distinguish SS-CFU, SS-CFB, SS-CFNRy and SS-CFNRc, the (invoked call) forwarding type is used; the word "type" instead of "procedure" is used to avoid possible confusions with other use of the word "procedures" e.g. signalling procedure, etc.

forwarded-to number: number to which a call is forwarded

forwarded-to SwMI: SwMI serving the forwarded-to user

forwarded-to user: user to which a call is forwarded

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

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

NOTE: In case of re-routeing, 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: cause for the forwarding: CFU, CFB, CFNRy or CFNRc

NOTE: Forwarding cause is called forwarding type in the present document.

forwarding user: called user for which the call forwarding is invoked

NOTE: Forwarding user 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 redirection 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

NOTE: In TETRA the connections between users may not exist before the user C has answered to the call.

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

NOTE: In TETRA the connections between users may not exist before the user C has answered to the call.

forwarding type: reason for forwarding

NOTE: The forwarding type and the call forwarding type may be used interchangeably.

last forwarding user: served user from the point of view of the forwarded-to user for a particular stage of call forwarding

NOTE: 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.

Mobile Station (MS): physical grouping that contains all of the mobile equipment that is used to obtain TETRA services

original called number: number of the first called user B in the call (in case of multiple call forwarding user B1)

original called user: 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: user for which the call forwarding supplementary service concerned has been subscribed

NOTE: When a call is made to a served user and call forwarding is invoked, this user may then also be referred to as the forwarding user or if it is the first call forwarding the (original) called user.

served user SwMI: SwMI where the served user is currently registered; it may be served user home SwMI or a visited SwMI

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

SS-CF invocation counter: counter for the number of call forwarding involved in a call or signalling connection during the call establishment phase

Supplementary Service (SS): any service provided by a network in addition to its basic service or services

NOTE 1: This is defined in ITU-T Recommendation Q.9 [i.5].

NOTE 2: 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 [i.2]).

Switching and Management Infrastructure (SwMI): all of the TETRA equipment for a Voice plus Data (V+D) network except subscriber terminals

NOTE: 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)

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

user B: served user (or forwarding user) of a call which is subject to call forwarding

user B1, user B2, user B3, etc.: served (forwarding) users of a call which are subject to multiple stages of forwarding

NOTE 1: B1 is the first served user, B2 is the second served user, B3 is the third served user, etc.

NOTE 2: 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: forwarded-to user with respect to the final stage of call forwarding

3.2 Symbols

For the purposes of the present document, the symbols defined in SDL ITU-T Recommendation Z.100 [i.3] apply.

3.3 Abbreviations

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

ACK	ACKnowledgement
ACSE	Association Control Service Element
AE	Application Entity
AI	Air Interface
ANF	Additional Network Feature
ANF-MM	Additional Network Feature Mobility Management
ANF-ISIMM	Additional Network Feature InterSystem Interface Mobility Management
APDU	Application Protocol Data Unit
CC	Call Control
CF-PDU	Call Forwarding Protocol Data Unit
CFSD	Call Diversion Supplementary Services (F for Forwarding and D for Deflection)
CMCE	Cicuit Mode Control Entity
CR	Change Request, see also SS-CR
DSS1	Digital Subscriber Signalling System No. one
DMO	Direct Mode Operation
EU	European Union
GC	Group Call
GSSI	Group Short Subscriber Identity
GTSI	Group TETRA Subscriber Identity
IC	Individual Call
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISI	Inter-System Interface
ISI-IC	Inter-System Interface Individual Call
ISI-GC	Inter-System Interface Group Call
ISI-MM	Inter-System Interface Mobility Management
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
MM	Mobility Management
MNI	Mobile Network Identity
MS	Mobile Station
NDUB	Network Determined User Busy
OSI	Open System Interconnection
OTAR	Over The Air Re-keying
PDU	Protocol Data Unit
PEI	Peripherial Equipment Interface
PICS	Protocol Implementation Conformance Statement
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
QSIG-CF	Q interface SIGnalling protocol Call Forwarding supplementary service (ECMA standard)
RO	Remote Operation
ROSE	Remote Operations Service Element
RTSE	Reliable Transport Service Element
SCK	Static Cipher Key
SDL	Specification and Description Language
SDS	Short Data Service
SDS-TL	Short Data Service Transport Layer
SS	Supplementary Service

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

SSI	Short Subscriber Identity
SwMI	Switching and Management Infrastructure
TSI	TETRA Subscriber Identity
UDUB	User Determined User Busy
V+D	Voice Plus Data

Supplementary Service abbreviations

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

SS-AL	Ambience Listening
SS-AP	Access Priority
SS-AS	Area Selection
SS-BIC	Barring of Incoming Calls
SS-BOC	Barring of Outgoing Calls
SS-CAD	Call Authorized by Dispatcher
SS-CCBS	Call Completion on Busy Subscriber
SS-CCNR	Call Completion on No Reply
SS-CF	Call Forwarding
SS-CFB	Call Forwarding on Busy
SS-CFNR	Call Forwarding on No Reply (generic for both CFNRy and CFNRc)
SS-CFNRc	Call Forwarding on Mobile Subscriber Not Reachable
SS-CFNRy	Call Forwarding on No Reply
SS-CFU	Call Forwarding Unconditional
SS-CI	Call Identification
SS-CLIP	Calling Line Identification Presentation
SS-CLIR	Calling Line Identification Restriction
SS-COLP	COnnected Line identification Presentation
SS-COLR	COnnected Line identification Restriction
SS-CR	Call Report
SS-CRT	Call Retention
SS-CW	Call Waiting
SS-DGNA	Dynamic Group Number Assignment
SS-DL	Discreet Listening
SS-HOLD	call HOLD
SS-IC	Include Call
SS-LE	Late Entry
SS-LSC	List Search Call
SS-PC	Priority Call
SS-PPC	Pre-emptive Priority Call
SS-SNA	Short Number Addressing
SS-TPI	Talking Party Identification

NOTE 1: Supplementary service abbreviations are also used without "SS-" preamble e.g. "SS-AL" and "AL" are used as appropriate.

NOTE 2: The supplementary services list contains also abbreviations that are not used in the present document. Those are expanding "S-CF" and "SS-CI" supplementary services and are provided for information.

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. A limited set of SS-CFU functions are optionally available for SDS.

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. For groups calls the definition of the group busy may limit the applicability of the 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.

These supplementary services are applicable to all individual circuit mode calls defined in EN 300 392-2 [1]. SS-CFNRy and SS-CFNRc are not applicable to group calls. 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.

SS-CF invocation counter defined in clause 5.2.2.21 limits the number of call forwarding invocations.

4.2 SS-CF services offered over the TNSS-SAP

This clause 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). The SS-CF service access point is used in conformance testing as a normative boundary in MSs and LSs.

NOTE 1: As the present 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 applications are outside the scope of the present document service primitives are used to define information exchange to and from the standardized part of the MS. 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 TNSS-SAP:

- INFORM2 indication;
- INFORM8 indication;
- INFORM9 indication;
- ENABLE request;
- ENABLE ACK indication;
- DISABLE request;
- DISABLE ACK indication; and
- notification indicator.

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

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

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

- DEACTIVATE request;
- DEACTIVATE ACK indication;
- INTERROGATE2 request;
- INTERROGATE2 ACK indication.

NOTE 4: European Union requirement for public networks.

- INFORM5 indication; and
- notification indicator.

The SS-CF service primitives for the calling user at the MS TNSS-SAP:

- notification indicator.

4.2.1 ACTIVATE request

The ACTIVATE request primitive shall be sent by the authorized user MS to the MS CMCE application over TNSS-SAP to activate selected forwarding types for selected basic services.

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
Basic service information	M
Forwarded-to user number	M
Served user number	O (see note)
NOTE: This service element is needed in the case of activation by an authorized user different from the served user.	

4.2.2 ACTIVATE ACK indication

The ACTIVATE ACK indication primitive shall be sent by the MS CMCE application to the authorized user MS over TNSS-SAP to either confirm or infirm activation of the selected forwarding types for selected basic services.

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
Basic service information	M
Forwarded-to user number	M
Served user number	M
Activation request result	M
Cause for rejection	O (see note)
NOTE: This parameter shall only be included in case of rejection.	

4.2.3 DEACTIVATE request

The DEACTIVATE request primitive shall be sent by the authorized user MS to the MS CMCE application over TNSS-SAP to deactivate selected forwarding types for selected basic services.

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	O (see note)
Deactivating user type	M
NOTE: This service element shall 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 CMCE application to the authorized user MS over TNSS-SAP to either ACK indication or infirm deactivation of the selected forwarding types for selected basic services.

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	O (see note 1)
Deactivation request result	M
Cause for rejection	O (see note 2)
Deactivating user number	
NOTE 1: This parameter shall be included in the case of activation by an authorized user different from the served user. NOTE 2: This parameter shall only be included in case of rejection.	

4.2.5 DISABLE request

The DISABLE request primitive shall be sent by the served user over TNSS-SAP to disable the capability of activation and deactivation of the forwarding type by one or all authorized user/users.

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 CMCE application to the Served User MS 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
Cause for rejection	O (see note)
NOTE: This parameter shall only be included in case of rejection.	

4.2.7 ENABLE request

The ENABLE request primitive shall be sent by the served user MS to the MS CMCE application over TNSS-SAP to enable activation/deactivation capability of the selected forwarding types for selected basic services by the selected authorized user.

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 CMCE application to the served user MS over TNSS-SAP to either confirm or infirm activation/deactivation capability of the selected forwarding types for selected basic services.

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
Cause for rejection	O (see note)
NOTE: This parameter shall only be included in case of rejection.	

4.2.9 INFORM2 indication

The INFORM2 indication primitive may be sent by the MS to the calling user MS application over TNSS-SAP to indicate call forwarding.

The INFORM2 indication primitive shall contain the SS-CF parameters listed in table 9.

NOTE: The INFORM2 indication can be replaced by notification information providing the same information.

Table 9: Parameters for the primitive INFORM2 indication

Parameter	Indication
Call forwarding type	M

4.2.10 INFORM5 indication

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

The INFORM5 indication primitive shall contain the SS-CF parameters listed in table 10.

NOTE: Instead of INFORM5 indication notification indicator with value "Call forwarded" may be used.

Table 10: Parameters for the primitive INFORM5 indication

Parameter	Indication
Original forwarding type	M
Original called user number (First served user)	O (see note)
Last forwarding type	O (see note)
Last forwarding user number (Served user number)	O (see note)
NOTE: This parameter shall only be included if allowed by the concerned served user.	

4.2.11 INFORM8 indication

The INFORM8 indication primitive shall indicate to the served user that SS-CF has been activated.

The INFORM8 indication primitive shall contain the SS-CF parameters listed in table 11.

Table 11: Parameters for the primitive INFORM8 indication

Parameter	Indication
Forwarding type	M
Basic service information	O
Forwarded-to user number	O

4.2.12 INFORM9 indication

The INFORM9 indication primitive shall indicate to the served user that SS-CF has been deactivated by an authorized user.

The INFORM9 indication primitive shall contain the SS-CF parameters listed in table 12.

Table 12: Parameters for the primitive INFORM9 indication

Parameter	Indication
Forwarding type	M
Basic service information	O
Forwarded-to user number	O

4.2.13 INTERROGATE request

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

The INTERROGATE request primitive shall contain the SS-CF parameters listed in table 13.

Table 13: Parameters for the primitive INTERROGATE request

Parameter	Request
Served user number	O (see note)
NOTE: This parameter is needed only in the case of interrogation by an authorized user different from the served user.	

4.2.14 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 14.

Table 14: Parameters for the primitive INTERROGATE ACK indication

Parameter	Indication
Forwarding type	M
Basic service information	M
Interrogation request result	M
Served user number	O (see note 1)
Forwarded-to user number	O (see note 2)
Authorized users	O (see note 2)
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 if call forwarding is activated.	

4.2.15 INTERROGATE2 request

The INTERROGATE2 request primitive may be sent by the forwarded-to user application over TNSS-SAP to get the activation status towards himself.

The INTERROGATE2 request primitive shall contain the SS-CF parameters listed in table 15.

Table 15: Parameters for the primitive INTERROGATE2 request

Parameter	Request
Forwarding type	O
Basic service information	O

4.2.16 INTERROGATE2 ACK indication

The INTERROGATE2 ACK indication primitive shall provide to the interrogating user the SS-CF status information towards himself.

The INTERROGATE2 ACK indication primitive shall contain the SS-CF parameters listed in table 16.

Table 16: Parameters for the primitive INTERROGATE2 ACK indication

Parameter	Indication
Forwarding type	M
Basic service information	M
Interrogation request result	M
Served user number	M

4.3 Parameter description

Activation request result =

- accepted;
- rejected.

Authorized user enabled/disabled =

- authorized for activation;
- authorized for deactivation.

Authorized user number =

- ITSI.

Basic service information =

- voice;
- circuit mode data;
- SDS;
- any combination of voice, circuit mode data and SDS.

Cause for rejection =

- insufficient information;
- no valid forwarded-to number;
- user not subscribed;
- not available;
- invalid served user number;
- invalid authorized user number;
- resource unavailable;
- special service number not allowed;
- forwarding to served user number;
- temporarily unavailable;

- basic service not subscribed;
- unspecified;
- number of forwarding exceeded;
- not authorized.

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 =

- ITSI;
- GTSI;
- external subscriber number.

Forwarding type =

- CFU;
- CFB;
- CFNRy;
- CFNRc.

Last forwarding user number (served user number) =

- ITSI;
- GTSI;
- external subscriber number.

Interrogating user number =

- ITSI.

Interrogation request result =

- accepted;
- rejected.

Last forwarding type =

- CFU;
- CFB;
- CFNRy;
- CFNRc.

Last forwarding user number =

- 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 =

- ITSI;
- GTSI;
- external subscriber number.

Presentation of number allowed =

- presentation of number not allowed.

Original forwarding type =

- CFU;
- CFB;
- CFNRy;
- CFNRc.

Served user number =

- ITSI;
- GTSI.

5 Signalling 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 EN 300 392-3-2 [6] for individual calls and EN 300 392-3-3 [7] 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 EN 300 392-3-1 [5] for an originating SwMI, shall apply. In addition, the generic procedures for notification and transfer of SS PDUs, as specified in EN 300 392-9 [4] 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 EN 300 392-3-2 [6] for individual calls and EN 300 392-3-3 [7] 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 EN 300 392-3-1 [5] for a terminating SwMI, shall apply.

Generic procedures for the call independent control (connection orientated) of supplementary services, as specified in EN 300 392-3-1 [5] 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 EN 300 392-3-1 [5] for an originating SwMI, shall apply if the procedure for verification of the forwarded-to number is supported.

In addition, the generic procedures for notification and transfer of SS PDUs, as specified in EN 300 392-9 [4] for SwMI, shall apply.

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 EN 300 392-3-2 [6] for individual calls and EN 300 392-3-3 [7] 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 EN 300 392-3-1 [5] for a terminating SwMI, shall apply.

Generic procedures for the call independent control (connection orientated) of supplementary services, as specified in EN 300 392-3-1 [5] for a Terminating SwMI, shall apply if the procedure for verification of the forwarded-to number is supported.

In addition, the generic procedures for notification and transfer of SS PDUs, as specified in EN 300 392-9 [4] for SwMI, shall apply.

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 EN 300 392-3-2 [6] for individual calls and EN 300 392-3-3 [7] 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 EN 300 392-3-1 [5] for an end SwMI, shall apply.

In addition, the generic procedures for notification and transfer of SS PDUs, as specified in EN 300 392-9 [4] for 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 EN 300 392-3-2 [6] for individual calls.

Generic procedures for the call related control and call independent control (connection oriented) of supplementary services, as specified in EN 300 392-3-1 [5] for a forward switching SwMI, shall apply. In addition, the generic procedures for notification and sending SS PDUs, as specified in EN 300 392-9 [4] for a forwarding SwMI, shall apply.

5.1.6 Requirements on the served or authorized user visited SwMI

Generic procedures for the call independent control (connection orientated) of supplementary services and sending of SS PDUs, as specified in EN 300 392-9 [4] 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 clause 14.7 of EN 300 392-2 [1];
- C/O/M: conditional/optional/mandatory;
- Remark: comment or reference to note(s).

The PDU coding assumes that the served user and the authorized user are identified by their TETRA identities even, if those users have MS-ISDN numbers allocated.

5.2.1.1 ACTIVATE PDU

The ACTIVATE PDU is sent by the authorized user A MS application to the served user home SwMI to activate SS-CF.

NOTE 1: It is assumed that both the served user and the authorized user are not external subscribers to TETRA.

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

NOTE 2: The ACTIVATE PDU adds and/or changes activations on the forwarded-to user, refer to ACTIVATE ACK PDU definition.

Support of ACTIVATE PDU is recommended.

Table 17: ACTIVATE PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	ACTIVATE
Forwarded-to definition	varies	1	M	
Activating user type	2	1	M	
Address type of the served user	2		C	Notes 1 and 2
Served user SSI	24		C	Note 3
Served user extension	24		C	Note 3
NOTE 1: This information element shall be present only, when the activating user type value is "authorized user", in all other cases the information element shall not be present. NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: This information element shall be present as defined by the address type of the served user information element.				

5.2.1.2 ACTIVATE ACK PDU

The ACTIVATE ACK PDU is sent to the authorized user A MS 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 application.

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

NOTE: The ACTIVATE ACK PDU should define all call forwarding types and basic services activated on the forwarded-to user independently which values we requested in the ACTIVATE PDU.

Support of ACTIVATE ACK PDU is mandatory, if ACTIVATE PDU is supported.

Table 18: ACTIVATE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	ACTIVATE ACK
Forwarded-to definition	varies	1	M	
Activating user type	2	1	M	
Address type of the served user	2		C	Notes 1 and 2
Served user SSI	24		C	Note 3
Served user extension	24		C	Note 3
Accept/reject	1	1	M	
Reject cause	4		C	Note 4
NOTE 1: This information element shall be present only, when the Activating user type value is "authorized user", in all other cases the information element shall not be present. NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: This information element shall be present as defined by the Address type of the served user information element. NOTE 4: Shall be present if the Accept/reject information element value is "rejected".				

5.2.1.3 DEACTIVATE PDU

The DEACTIVATE PDU is sent by the authorized user A MS 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 19.

Support of DEACTIVATE PDU is recommended.

Table 19: DEACTIVATE PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	DEACTIVATE
Forwarded-to definition	varies	1	M	
Deactivating user type	2	1	M	
Address type of the served user	2		C	Notes 1 and 2
Served user SSI	24		C	Note 3
Served user extension	24		C	Note 3
NOTE 1: This information element shall not be present, when the deactivating user type value is "served user", in all other cases the information element shall be present. NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: This information element shall be present as defined by the Address type of served user information element.				

5.2.1.4 DEACTIVATE ACK PDU

The DEACTIVATE ACK PDU is sent to the authorized User A MS 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 application.

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

Support of DEACTIVATE ACK PDU is mandatory, if DEACTIVATE PDU is supported.

Table 20: DEACTIVATE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	DEACTIVATE ACK
Forwarded-to definition	varies	1	M	
Deactivating user type	2	1	M	
Address type of the served user	2		C	Notes 1 and 2
Served user SSI	24		C	Note 3
Served user extension	24		C	Note 3
Accept/reject	1	1	M	
Reject cause	4		C	Note 4
NOTE 1: This information element shall not be present, when the deactivating user type value is "served user", in all other cases the information element shall be present. NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: This information element shall be present as defined by the Address type of the served user information element. NOTE 4: Shall be present if the accept/reject information element value is "rejected".				

5.2.1.5 DISABLE PDU

The DISABLE PDU may be sent by the served user A MS to its home SwMI to disable the activation/deactivation capability of an authorized user for SS-CF.

NOTE 1: 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.

NOTE 2: If the terminal of the served user is disabled by security actions, then the disabled authorized user may regain controlling power, if the authorized user was not created by the served user by an ENABLE PDU.

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

Support of DISABLE PDU is optional.

Table 21: DISABLE PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	DISABLE
Forwarding type for voice calls	4	1	M	
Forwarding type for circuit mode data	4	1	M	
Forwarding type for SDS	4	1	M	
Address type of the authorized user	2	2	O	Notes 1, 2, 3 and 4
Authorized user SSI	24		C	Note 5
Authorized user extension	24		C	Note 5
NOTE 1: DISABLE disables both SS-CF activation and SS-CF deactivation by the authorized user. NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: In ECMA-173 [i.6], the disable action corresponds to disabling of activation by a remote user different from the served user. NOTE 4: A DISABLE PDU without an authorized user address, shall indicate disabling of all authorized users for the indicated forwarding and those basic services. NOTE 5: This information element shall be present as defined by the address type of the authorized user information element.				

5.2.1.6 DISABLE ACK PDU

The DISABLE ACK PDU may be sent to the Served User A MS from its home SwMI to either confirm or inform 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 22.

Support of DISABLE ACK PDU is mandatory, if DISABLE PDU is supported.

Table 22: DISABLE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	DISABLE ACK
Forwarding type for voice calls	4	1	M	
Forwarding type for circuit mode data	4	1	M	
Forwarding type for SDS	4	1	M	
Accept/reject	1	1	M	
Reject cause	4		C	Note 1
Address type of the authorized user	2	2	O	Notes 2 and 3
Authorized user SSI	24		C	Note 4
Authorized user extension	24		C	Note 4
NOTE 1: This information element shall be present in case of rejection of the disable operation as indicated by the information element Accept/reject value "rejected". NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: When the authorized user address is not present, then all authorized users for the indicated forwarding type - basic service combinations are disabled. NOTE 4: This information element shall be present as defined by the Address type of the authorized user information element.				

5.2.1.7 ENABLE PDU

The ENABLE PDU may be sent by the served user A MS to its home SwMI to enable the activation/deactivation capability of either a specific authorized user for SS-CF.

NOTE 1: A served user cannot enable itself; a served user is assumed to be always enabled.

NOTE 2: Optionally ENABLE PDU may be used to create an authorized user and enable his activation/deactivation capability at the same time.

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

Support of ENABLE PDU is optional.

Table 23: ENABLE PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	ENABLE
Forwarding type for voice calls	4	1	M	
Forwarding type for circuit mode data	4	1	M	
Forwarding type for SDS	4	1	M	
Address type of the authorized user	2	1	M	Notes 1, 2 and 3
Authorized user SSI	24		C	Note 4
Authorized user extension	24		C	Note 4
NOTE 1: Only the served user shall be able to enable SS-CF activation by an authorized user. NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: ENABLE enables both SS-CF activation and SS-CF deactivation by the authorized user. NOTE 4: This information element shall be present as defined by the Address type of the authorized user information element.				

5.2.1.8 ENABLE ACK

The ENABLE ACK PDU may be sent to the Served User A MS 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 24.

Support of ENABLE ACK PDU is mandatory, if ENABLE PDU is supported.

Table 24: ENABLE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	ENABLE ACK
Forwarding type for voice calls	4	1	M	
Forwarding type for circuit mode data	4	1	M	
Forwarding type for SDS	4	1	M	
Accept/reject	1	1	M	
Reject cause	4		C	Note 1
Address type of the authorized user	2	1	M	Note 2
Authorized user SSI	24		C	Note 3
Authorized user extension	24		C	Note 3
NOTE 1: This information element shall be present in case of rejection of the disable operation as indicated by the information element Accept/reject value "rejected". NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: This information element shall be present as defined by the Address type of the authorized user information element.				

5.2.1.9 INFORM2 PDU

The optional INFORM2 PDU is sent by the forward invoking SwMI to the calling user MS application.

INFORM2 PDU shall contain the SS-CF information elements described in table 25.

NOTE 1: The content of this PDU could also be sent from any SwMI which supports SS-CF in a call related notification.

NOTE 2: Notification information element value "Call is forwarded (diverting)", "CFU invoked", "CFB invoked", "CFNRc invoked" or "CFNRy invoked" may be used instead of or in addition to the INFORM2 PDU.

NOTE 3: Due to multiple call forwarding invocations multiple INFORM2 (or notifications) may be sent to the calling user.

Support of INFORM2 PDU is optional.

Table 25: INFORM2 PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INFORM2
Invoked call forwarding type	2	1	M	

5.2.1.10 INFORM4 PDU

The INFORM4 PDU is sent from the forwarding SwMI to the forwarded-to SwMI. Both in the case of call forwarding by re-routeing and of call forwarding by forward switching this PDU shall be sent from the SS-CF invoking SwMI to the forwarded-to SwMI.

INFORM4 PDU shall contain the SS-CF information elements described in table 26.

NOTE 1: This PDU is not planned to be used to indicate call forwarding due to migration.

NOTE 2: Presentation restriction overriding mechanisms are outside the scope of the present document.

NOTE 3: Only ITSI/GTSI addressing is used as this PDU is always used outer the ISI.

Table 26: INFORM4 PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INFORM4
Original forwarding type	2	1	M	
Original forwarding user identity presentation	1	1	M	Note 1
Original called user ISSI/GSSI	24	1	M	
Original called user extension	24	1	M	
Number of external subscriber number digits of the original called user	5	1	M	Note 2
External subscriber number digit of the original called user	4		C	Repeatable, note 3
Last forwarding user identity presentation	1	1	M	Note 1
Last forwarding information present	1	1	M	
Last forwarding type	2		C	Note 4
Last forwarding user ISSI/GSSI	24		C	Note 4
Last forwarding user extension	24		C	Note 4

NOTE 1: The value of this information element is repeating equivalent SS-CI information element value as it is not conveyed by the SS-CI, which is carrying the calling user information. This information is provided for subsequent SS-CF invocations for generation INFORM5 PDU.
NOTE 2: Although this information element is always present, its presentation to the forwarded to user is defined by the "Original forwarding user identity presentation" information element and rules in the SS-CI [9].
NOTE 3: This information element shall be present as many times as indicated by the "Number of the original called user external subscriber number digits" information element.
NOTE 4: This information element shall be present only if the Last forwarding information present information element has value "identity present". Although this information element may be present, its presentation to the forwarded-to user is defined by the "Last forwarding user identity presentation" information element and rules in the SS-CI.

5.2.1.11 INFORM5 PDU

The INFORM5 PDU is sent by the forwarding SwMI to the user C MS 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. INFORM5 PDU shall contain the SS-CF information elements described in table 27.

NOTE: The INFORM5 PDU can be replaced by notification indicator information element value "Call is forwarded (diverting)", "CFU invoked", "CFB invoked", "CFNRc invoked" or "CFNRy invoked" especially when no forwarding user information is available.

Support of the INFORM5 PDU is optional.

Table 27: INFORM5 PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INFORM5
Original call forwarding type	2	2	O	
Address type of the originally called user	2	2	O	Notes 1 and 2
Original called user ISSI/GSSI	24		C	Note 3
Original called user extension	24		C	Note 3
Number of external subscriber number digits of the original forwarding user	5	2	O	Note 4
External subscriber number digit of the original forwarding user	4		C	Repeatable, note 5
Last call forwarding type	2	2	O	
Address type of the last forwarding user	2	2	O	Notes 2 and 6
Last forwarding user ISSI/GSSI	24		C	Note 7
Last forwarding user extension	24		C	Note 7
NOTE 1: This information element can only be included if no restriction exists at the original called user ITSI/GTSI.				
NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1.				
NOTE 3: This information element shall be present as defined by the Address type of the originally called user information element.				
NOTE 4: This information element shall be present only if it is provided by the external network at interworking and the call to the TETRA user is forwarded by the external network call forwarding supplementary service. The call may be considered as well to be a normal incoming call from the external network and no SS-CF is invoked in the TETRA side.				
NOTE 5: This information element shall be present as many times as defined by the Number of the original forwarding user external subscriber number digits information element.				
NOTE 6: This information element shall only be included if no restriction exists at the last forwarding ITSI/GTSI. This information element is valid only in the case of multiple call forwarding invocations in TETRA systems.				
NOTE 7: This information element shall be present as defined by the Address type of the last forwarding user information element.				

5.2.1.12 INFORM8 PDU

The INFORM8 PDU may be sent to the served user MS application from its home SwMI to indicate activation of SS-CF.

INFORM8 PDU shall contain the SS-CF information elements described in table 28.

NOTE 1: This PDU may be sent in the case where the activation is done by an authorized user different from the served user.

NOTE 2: Instead INFORM8 PDU a notification information element with value "Forwarding (diversion) activated" may be used.

Support of INFORM8 PDU is optional.

Table 28: INFORM8 PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INFORM8
Call forwarding type for voice calls	4	1	M	
Call forwarding type for circuit mode data	4	1	M	
Call forwarding type for SDS	4	1	M	Note 1
Address type of the forwarded-to user	2	2	O	Note 2
Forwarded-to user SSI	24		C	Note 3
Forwarded-to user extension	24		C	Note 3
Number of external subscriber number digits of forwarded-to user	5	2	O	
External subscriber number digit	4		C	Note 4
NOTE 1: In the present document only values "None" and "CFU" are applicable. NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: This information element shall be present as defined by the Address type of the forwarded-to user information element. NOTE 4: This information element shall be present as many times as defined by the number of external subscriber number digits of forwarded-to user information element.				

5.2.1.13 INFORM9 PDU

The INFORM9 PDU may be sent to the served user MS application from its home SwMI to indicate deactivation of SS-CF.

INFORM9 PDU shall contain the SS-CF information elements described in table 29.

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

Support of INFORM9 PDU is optional.

Table 29: INFORM9 PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INFORM9
Forwarding type for voice calls	4	1	M	
Forwarding type for circuit mode data	4	1	M	
Forwarding type for SDS	4	1	M	Note 1
Address type of the forwarded-to user	2	2	O	Note 2
Forwarded-to user SSI	24		C	Note 3
Forwarded-to user extension	24		C	Note 3
Number of external subscriber number digits of forwarded-to user	5	2	O	
External subscriber number digit	4		C	Note 4
NOTE 1: In the present document only values "None" and "CFU" are applicable. NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: This information element shall be present as defined by the Address type of the forwarded-to user information element. NOTE 4: This information element shall be present as many times as defined by the number of external subscriber number digits of forwarded-to user information element.				

5.2.1.14 INTERROGATE PDU

The INTERROGATE PDU is sent either by the served user or by the authorized user MS 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 30.

Support of INTERROGATE PDU is optional.

Table 30: INTERROGATE PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INTERROGATE
Interrogating user type	1	1	M	
Address type of the served user	2		C	Notes 1 and 2
Served user SSI	24		C	Note 3
Served user extension	24		C	Note 3
NOTE 1: This information element shall be present only, when the interrogating user type value is "authorized user". NOTE 2: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 3: This information element shall be present as defined by the Address type of the served user information element.				

5.2.1.15 INTERROGATE ACK PDU

The INTERROGATE ACK PDU is sent to the interrogating user MS application by the home SwMI of the served user as the response to the interrogation.INTERROGATE ACK PDU shall contain the SS-CF information elements described in table 31.

Support of INTERROGATE ACK PDU is mandatory, if INTERROGATE PDU is supported.

Table 31: INTERROGATE ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INTERROGATE ACK
Accept/reject	1	1	M	
Reject cause	4		C	Note 1
Number of forwarded-to users	4		C	Note 2
Forwarded-to definition	varies		C	Note 3
Number of enabled authorized users	4		C	Note 2
Enabled authorized user definition	varies		C	Notes 4 and 5
NOTE 1: This information element shall be present when the Accept/reject information value is "Rejected". NOTE 2: This information element shall be present when the Accept/reject information value is "Accepted". NOTE 3: This information element shall be present as many times as defined by the number of forwarded-to users' information element. NOTE 4: This information element shall be present as many times as defined by the number of enabled authorized users' information element. NOTE 5: Interrogation of disabled authorized users is outside the scope of the present document.				

5.2.1.16 INTERROGATE2 PDU

The INTERROGATE2 PDU is sent either by the forwarded-to or authorized user MS application to the served user home SwMI to interrogate the status of SS-CF on him.

INTERROGATE2 PDU shall contain the SS-CF information elements described in table 32.

Support of INTERROGATE2 PDU is optional.

Table 32: INTERROGATE2 PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INTERROGATE2
Call forwarding type	4	1	M	Note
Basic service information	3	1	M	Note
NOTE: These information elements shall define which basic services for indicated call forwarding types are interrogated.				

5.2.1.17 INTERROGATE2 ACK PDU

The INTERROGATE2 ACK PDU is sent either by the forwarded-to user MS application to the served user home SwMI to interrogate the status of SS-CF activations towards him.

INTERROGATE2 ACK PDU shall contain the SS-CF information elements described in table 33.

Support of INTERROGATE2 ACK PDU is mandatory, if INTERROGATE2 PDU is supported.

Table 33: INTERROGATE2 ACK PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	INTERROGATE2 ACK
Accept/reject	1	1	M	
Reject reason	4		C	Note 1
Number of served user definitions	4		C	Note 2
Served user definition	varies		C	Note 3
NOTE 1: This information element shall be present only, if the accept/reject information element has value "Rejected". NOTE 2: This information element shall be present only, if the accept/reject information element has value "Accepted". NOTE 3: This information element shall be present as many times as defined by the number of served user definitions information element.				

5.2.1.18 REPORT PDU

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 periodicity of the emission of this PDU is outside the scope of the present document 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 2: 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 34.

The support of REPORT PDU is optional.

Table 34: REPORT PDU contents

Information element	Length	Type	C/O/M	Remark
SS type	6	1	M	Defined in EN 300 392-9 [4]
CF-PDU type	5	1	M	REPORT
Invoked call forwarding type	2	1	M	
Served user ITSI	48	1	M	
Basic service information	3	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	Repeatable, note 1
External subscriber number parameters	9	2	O	Note 2
NOTE 1: This information element shall be present as defined by the number of external subscriber number digits information element. NOTE 2: This information element may be present, when the forwarded-to user is external.				

5.2.2 TETRA PDU information element coding

5.2.2.1 Accept/reject

Accept/reject Information element is common to a number of PDU responses and shall be coded as defined in table 35.

Table 35: Accept/reject information element contents

Information element	Length	Value	Remark
Accept/reject	1	0_2	Accepted
		1_2	Rejected

5.2.2.2 Activating/deactivating user type

Activating/deactivating user type information element shall define who is requesting the service. It shall be encoded as defined in table 36.

Table 36: Activating/deactivating user type information element contents

Information element	Length	Value	Remark
Activating/deactivating user type	2	00_2	Served user
		01_2	Authorized user
		10_2	Forwarded-to user, note 1
		11_2	External user, notes 1 and 2
NOTE 1: This information element is not valid for an activating user. NOTE 2: The use of this information element is outside the scope of the present document.			

NOTE: The activating user type information element is encoded using the same values as in the deactivating user type information element although one bit could have been used for the activating user type.

5.2.2.3 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 37.

Table 37: Activation by served user information element content

Information element	Length	Value	Remark
Activation by served user	1	0_2	No
		1_2	Yes

5.2.2.4 Addressing information elements

5.2.2.4.1 General on addresses

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.

Table 38 lists the different user numbers used in the present document in full length. Also shorter addresses are possible as defined by the address type information element.

NOTE: In the present document any TETRA individual subscriber is addressed using its full ITSI (Extension + SSI) and any TETRA group is addressed using its full GTSI (Extension + SSI), when that information is needed by any other than home SwMI of the indicated user. This is line with EN 300 392-3-1 [5], clause 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.

Table 38: Call forwarding list of information element relating to user numbers

Information element	Length	Type	C/O/M	Remark
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 of the forwarded to user	5	1	M	Notes 3 and 5
External subscriber number digit for the forwarded to user	4	1	C	Repeatable, notes 1, 3 and 5
External subscriber number parameters of the forwarded to user	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 of the connected user	5	1	M	Notes 4 and 5
External subscriber number digit of the connected user	4	1	C	Repeatable, notes 1 and 4
External subscriber number parameters of the connected user	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).				

5.2.2.4.2 Address type of the authorized user

Definition in EN 300 392-9 [4], clause 8.4.1 shall apply with the exception that the short number address is not applicable.

5.2.2.4.3 Address type of the forwarded-to user

Definition in EN 300 392-9 [4], clause 8.4.1 shall apply with the exception that the short number address is not applicable.

5.2.2.4.4 Address type of the last forwarding user

Definition in EN 300 392-9 [4], clause 8.4.1 shall apply with the exception that the short number address is not applicable.

5.2.2.4.5 Address type of the originally called user

Definition in EN 300 392-9 [4], clause 8.4.1 shall apply with the exception that the short number address is not applicable.

5.2.2.4.6 Address type of the served user

Definition in EN 300 392-9 [4], clause 8.4.1 shall apply with the exception that the short number address is not applicable.

5.2.2.5 Basic service information

Basic service information element is a condensed form of the general basic service used in the basic TETRA call and shall be coded as defined in table 39.

Table 39: Basic service information element contents

Information element	Length	Value	Remark
Basic service information	3	000_2	None
		001_2	Speech
		010_2	Circuit mode data
		011_2	Speech and circuit mode data
		100_2	SDS
		101_2	SDS and speech
		110_2	SDS and circuit mode data
		111_2	SDS, speech and circuit mode data

5.2.2.6 CF-PDU type

CF-PDU type indicates the type of the CF-PDU as defined in table 40.

Table 40: CF-PDU type information element contents

Information element	Length	Value	Remark
CF-PDU type	5	00000_2	See EN 300 392-9 [4]
		00001_2	See EN 300 392-9 [4]
		00010_2	See EN 300 392-9 [4]
		00011_2	See EN 300 392-9 [4]
		00100_2	See EN 300 392-9 [4]
		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	INTERROGATE2
		01110_2	INTERROGATE2 ACK
		01111_2	Reserved
		10000_2	INFORM2
		10001_2	INFORM4
		10010_2	INFORM5
		10011_2	Reserved
		10100_2	Reserved
		10101_2	INFORM8
		10110_2	INFORM9
		10111_2	INTERROGATE
		11000_2	INTERROGATE ACK
		11001_2	REPORT
		11010_2	Reserved
		etc.	etc.
		11111_2	Reserved

5.2.2.7 Enabled authorized user definition

The enabled authorized user definition shall contain information elements as defined in table 41.

Table 41: Enabled authorized user definition information element contents

Information element	Length	Type	C/O/M	Remarks
Forwarding type for voice calls	4	1	M	Note 3
Forwarding type for circuit mode data	4	1	M	Note 3
Forwarding type for SDS	4	1	M	Notes 3 and 4
Address type of the authorized user	2	1	M	Note 1
Authorized user SSI	24		C	Note 2
Authorized user extension	24		C	Note 2
NOTE 1: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 2: This information element shall be present as defined by the Address type of the forwarded-to user information element. NOTE 3: This information element shall indicate those call forwarding types for which the enabled authorized user has activating/deactivating authorizations. NOTE 4: In the present document only values "None" and "CFU" are applicable.				

5.2.2.8 External subscriber number

Where an external subscriber number is to be indicated in an SS-CF PDU, e.g. an external party identification, it shall be constructed as defined in EN 300 392-9 [4], clause 8.4.3. The external subscriber number may be also extended with a qualifier.

5.2.2.9 External subscriber number digit

The external subscriber number digit may be also extended with a qualifier e.g. "external subscriber number digit of the last forwarding user". The external subscriber number digit information element shall be encoded as defined in EN 300 392-9 [4], clause 8.4.3 or more precisely in EN 300 392-2 [1], clause 14.8.20.

5.2.2.10 Forwarded-to definition

The forwarded-to definition shall contain information elements as defined in table 42.

Table 42: Forwarded-to definition information element contents

Information element	Length	Type	C/O/M	Remarks
Forwarding type for voice calls	4	1	M	Note 1
Forwarding type for circuit mode data	4	1	M	Note 1
Forwarding type for SDS	4	1	M	Notes 1 and 2
Address type of the forwarded-to user	2	1	M	Note 3
Forwarded-to user SSI	24		C	Note 4
Forwarded-to user extension	24		C	Note 4
Number of external subscriber number digits of forwarded-to user	5	2	O	
External subscriber number digit	4		C	Note 5
NOTE 1: As the CFU overrides all the other types its addition to an activation request with the other types in effect activates only SS-CFU. In deactivation request CFU is applicable to the CFU only. NOTE 2: In the present document only values "None" and "CFU" are applicable. NOTE 3: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 4: This information element shall be present as defined by the Address type of the forwarded-to user information element. NOTE 5: This information element shall be present as many times as defined by the number of external subscriber number digits of forwarded-to user information element.				

5.2.2.11 Forwarding type

The forwarding type information element shall identify the specific invocation of one of the four forwarding types. It shall be encoded as defined in table 43. The values forms a bit map and multiple combinations can be formed by adding the values of each selected type together e.g. for indication for CFB and CFNRc the value is 1010_2.

NOTE 1: As the CFU overrides all the other types its addition to an activation request with the other types in effect activates only SS-CFU.

NOTE 2: In the present document "forwarding type" is used to cover also SDS messages. "Invoked call forwarding type" is used to highlight that the type and instance is related to a call.

Table 43: Forwarding type information element content

Information element	Length	Value	Remark
Forwarding type	4	0000_2	None
		0001_2	CFU
		0010_2	CFB
		0100_2	CFNRy
		1000_2	CFNRc
		1001_2	Reserved
		etc.	etc.
		1111_2	Reserved

5.2.2.12 Invoked call forwarding type

The invoked call forwarding type information element shall identify the specific forwarding type of the forwarded call. It shall be encoded as defined in table 44.

Table 44: Invoked call forwarding type information element content

Information element	Length	Value	Remark
Invoked call forwarding type	2	00_2	CFU
		01_2	CFB
		10_2	CFNRy
		11_2	CFNRc

5.2.2.13 Last forwarding type

The last forwarding type information element shall identify the last forwarding type of the forwarded call. It shall be encoded as defined for invoked call forwarding type information element in table 44.

5.2.2.14 Number of external subscriber number digits

Number of external subscriber number digits information element is also used in format e.g. Number of external subscriber number digits of the original forwarding user, when needed. The Number of external subscriber number digits shall be encoded as defined in EN 300 392-9 [4], clause 8.4.3, table 19.

5.2.2.15 Original forwarding type

The original forwarding type information element shall identify the specific last forwarding type of the forwarded call. It shall be encoded as defined for invoked call forwarding type information element in table 44.

5.2.2.16 Reject cause

The 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 45.

Table 45: 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 any CFx service
		0010_2	User not subscribed to the specified CFx service
		0011_2	No SS-CFx available
		0100_2	Specified SS-CFx not available
		0101_2	Invalid served user number
		0110_2	CFx not provided for speech service
		0111_2	CFx not provided for data service
		1000_2	Invalid forwarded-to user number
		1001_2	Temporarily unavailable
		1010_2	Not authorized, note 2
		1011_2	Invalid authorized user number
		1100_2	Special service number not allowed, note 1
		1101_2	CFx not provided for SDS
		1110_2	Reserved
		1111_2	Reserved
NOTE 1: Call forwarding may not be allowed to certain numbers such as gateway or emergency numbers. NOTE 2: Typical reasons could be "Not authorized to request the service", "User identity not confirmed".			

5.2.2.17 Served user definition

The served user definition shall contain information elements as defined in table 46.

Table 46: Served user definition information element contents

Information element	Length	Type	C/O/M	Remarks
Forwarding type for voice calls	4	1	M	Note 1
Forwarding type for circuit mode data	4	1	M	Note 1
Forwarding type for SDS	4	1	M	Notes 1 and 2
Address type of the served user	2	1	M	Note 3
Served user SSI	24		C	Note 4
Served user extension	24		C	Note 4
NOTE 1: This information element shall indicate for which call forwarding types are activated on the served user. NOTE 2: In the present document only values "None" and "CFU" are applicable. NOTE 3: Only address types "Short Subscriber Identity (SSI)" and "TETRA Subscriber Identity (TSI)" are applicable, refer to EN 300 392-9 [4], clause 8.4.1. NOTE 4: This information element shall be present as defined by the Address type of the forwarded-to user information element.				

5.2.2.18 SS-CF invocation counter

The SS-CF invocation counter information element shall identify the successive number of forwarding invocation that a call has encountered. It shall be used to limit the number of call forwarding invocations of a call e.g. to avoid infinite loops. It shall be encoded as defined in table 47.

NOTE: The maximum value of the SS-CF invocation counter is network dependent and is outside the scope of the present document.

Table 47: SS-CF invocation counter information element content

Information element	Length	Value	Remark
SS-CF invocation counter	5	00000_2	No forwarding
		00001 to 11101_2	Normal number of call forwarding (1-29)
		11110 to 11111_2	Reserved

5.2.2.19 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 as defined in table 5 of EN 300 392-9 [4].

NOTE: All four SS-CF (CFU, CFB, CFNRy and CFNRc) use the same SS-type; they can be distinguished by the (invoked call) forwarding type information element.

5.2.3 Additional coding requirements over the ISI

Remote operations protocol and application association control.

The Remote Operations (RO) protocol is defined in ITU-T Recommendations X.219 [18] and X.229 [19]. The generic procedures defined in the present document 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 is 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.

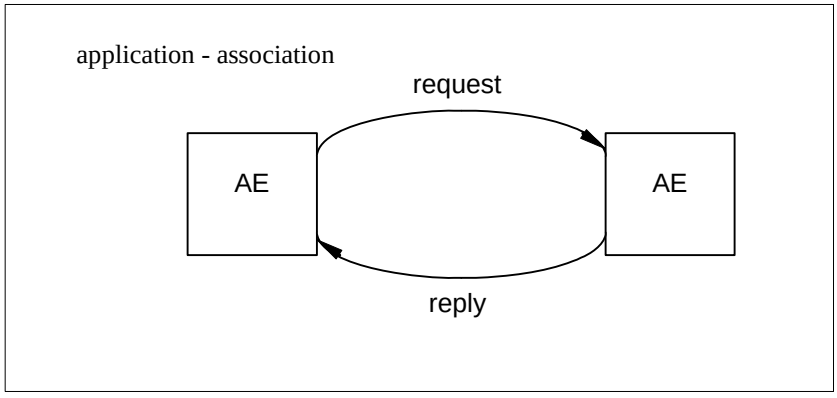

Figure 1: Remote Operations Model

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.

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 Element (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.

The present document 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 [20].

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 signalling goes back to the originating SwMI.

TETRA PDUs 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 clause 8.4.1 of EN 300 392-3-1 [5]. The expected TETRA reply PDU ACTIVATE ACK shall be encoded in the IsiArgument tetraMessage IMPLICIT OCTET STRING of another ROSE Invoke APDU (in the opposite direction) defined in the same clause.

In the case of unconfirmed information flows such as INFORMn, the TETRA PDU such as INFORMn shall be encoded in the IsiArgument tetraMessage IMPLICIT OCTET STRING of the ROSE Invoke APDU in support of TETRA encoding PDU as defined in clause 8.4.1 of EN 300 392-3-1 [5].

NOTE 4: The actions resulting from reception of ERRORS in reply to the ROSE Invoke APDU such as retry, time-out are outside the scope of the present document.

5.3 SS-CF State Definitions

5.3.1 General on state definitions

The state definitions are used in the present document for protocol definition purposes. Implementations may not apply those states and the states are not normative.

The chosen states of the protocol or actually stateless protocol supports a single action request and a response or responses to it without an explicit reference between the request and response or responses. A side-effect of this is that if the user sends another request for the same service, then the received response may be either a response to the first or second request. The service requesting user should wait a response or a suitable time allowing responding entity perform the requested action before sending a new request.

Possible timers and timer values for completion of requested services are outside the scope of the present document.

5.3.2 States at the calling user MS

For SS-CF procedures a single state idle is used.

5.3.3 States at the originating SwMI

The SS-CF procedures for the originating SwMI are presented using only a single SS-CF state idle.

5.3.4 States at the Served User MS

The SS-CF procedures use a single state idle.

5.3.5 States at the served user SwMI

The SS-CF procedures for the served user SwMI are written using a single state idle.

5.3.6 States at the forwarded-to user MS

The SS-CF is presented using a single state idle.

5.3.7 States at the forwarded-to SwMI

The SS-CF procedures for the forwarded-to SwMI are written using a single state idle.

5.3.8 States at the re-routeing SwMI

The SS-CF procedures for the forwarding SwMI are written using a single state idle.

5.3.9 States at the authorized user MS

The SS-CF procedures are presented using a single state idle.

5.3.10 States at the Activating SwMI

The SS-CF procedures for the activating SwMI are written using a single state idle.

5.3.11 States at the deactivating user MS

The SS-CF procedures are presented using a single state idle.

5.3.12 States at the deactivating SwMI

The SS-CF procedures for the deactivating SwMI are written using a single state idle.

5.3.13 States at the interrogating user MS

The SS-CF procedures are presented using a single state idle.

5.3.14 States at the interrogating SwMI

The SS-CF procedures for the interrogating SwMI are written using a single state idle.

5.4 SS-CF signalling procedures

5.4.1 Actions at MSs

5.4.1.1 Activation requesting user MS

5.4.1.1.1 Normal operation

Upon reception of an activate request from user application the authorized user (including the served user) MS shall send an ACTIVATE PDU to the SwMI using the procedure described in EN 300 392-9 [4]. The PDU shall contain information elements as defined in clause 5.2.1.

The basic service information and forwarding type information elements shall indicate which activations are added or replaced by a new activation to the indicated forwarded-to user.

NOTE 1: There can be only a single forwarded-to user for a forwarding type and basic service, but each forwarding type and basic call combination may have different forwarded-to user.

SwMI should return result of the latest activation request in an ACTIVATE ACK PDU and the MS shall pass the result to the user application.

NOTE 2: The ACTIVATE ACK PDU contains only the result of the latest activation to the forwarded-to user and there may be other valid activations due to the previous activations to same or other forwarded-to users.

5.4.1.1.2 Exceptional procedures

If a SwMI is unable to activate the call forwarding supplementary service, then it sends an ACTIVATE ACK PDU to the authorized user (including served user) indicating a reject reason. The MS shall pass that information to the user application.

When activation of multiple instances (multiple basic services and/or call forwarding types) of a call forwarding supplementary service is requested, and if at least one instance is activated, but one or more instance cannot be activated, or reactivated, then those shall be rejected using an independent message with suitable rejection reason in addition to the accepting message.

5.4.1.2 Deactivation requesting user MS

5.4.1.2.1 Normal operation for served or authorized user MS

Upon reception a deactivate request from the user application the authorized user (including the served user) MS shall send a DEACTIVATE PDU to the SwMI using the procedure described in EN 300 392-9 [4]. The PDU shall contain information elements as defined in clause 5.2.1.

The basic service information and forwarding type information elements shall indicate which existing or non-existing activations are removed independently of the forwarded-to user.

Upon reception of a DEACTIVATE ACK PDU the MS shall pass it to the user application.

5.4.1.2.2 Exceptional procedures for served or authorized user MS

If SwMI is unable to deactivate the call forwarding supplementary service, then it sends a DEACTIVATE ACK PDU to the authorized user (including served user) indicating reject reason. The MS shall pass that information to the user application.

When deactivation of multiple instances (multiple basic services and/or call forwarding types) of a call forwarding supplementary service is requested, and if at least one instance is deactivated, but one or more instances cannot be deactivated, then those shall be rejected using an independent message with suitable rejection reason in addition to the accepting message.

5.4.1.2.3 Normal operation for forwarded-to user MS

Upon reception a deactivate request from user application the forwarded-to user MS shall send a DEACTIVATE PDU to the SwMI using the procedure described in EN 300 392-9 [4]. The PDU shall contain information elements as defined in clause 5.2.1.

The basic service information and forwarding type information elements shall indicate which existing or non-existing activations are removed on the forwarded-to user. The forwarded-to user can try to deactivate all or specific set of call forwarding activations towards him.

Upon reception of a DEACTIVATE ACK PDU the MS shall pass it to the user application.

Support of the deactivation by the forwarded-to user is optional.

5.4.1.2.4 Exceptional procedures for forwarded-to user MS

If SwMI is unable to deactivate the call forwarding supplementary service, then it sends a DEACTIVATE ACK PDU to the forwarded-to user indicating reject reason. The MS shall pass that information to the user application.

When deactivation of multiple instances (multiple basic services and/or call forwarding types) of a call forwarding supplementary service is requested SwMI may send multiple DEACTIVATE ACK PDUs indicating the accepted deactivations in a DEACTIVATE ACK PDU and indicating a reason for failure in another.

5.4.1.3 Interrogation requesting user MS

5.4.1.3.1 Normal operation of interrogation

Upon reception an interrogate request from user application the authorized user (including the served user) MS shall send corresponding INTERROGATE PDU to the SwMI using the procedure described in EN 300 392-9 [4]. The PDU shall contain information elements as defined in clause 5.2.1.

Upon reception of INTERROGATE ACK PDU and the MS shall pass that to the user application.

5.4.1.3.2 Exceptional procedures for forwarding services

If SwMI is unable to return interrogation result, then it sends an INTERROGATE ACK to the authorized user (including served user) indicating reject reason. The MS shall pass that information to the user application.

5.4.1.4 Interrogation requesting forwarded-to user MS

5.4.1.4.1 Normal operation of interrogation

Upon reception an interrogate request from user application the authorized user (including the served user) MS shall send corresponding INTERROGATE2 PDU to the SwMI using the procedure described in EN 300 392-9 [4]. The PDU shall contain information elements as defined in clause 5.2.1.

Upon reception of INTERROGATE2 ACK PDU and the MS shall pass that to the user application.

5.4.1.4.2 Exceptional procedures for forwarding services

If SwMI is unable to return interrogation result, then it sends an INTERROGATE ACK to the authorized user (including served user) indicating reject reason. The MS shall pass that information to the user application.

5.4.1.5 Unsolicited indication to the served user

SwMI may inform served user at any time that an authorized user has activated call forwarding by INFORM8 PDU or by a basic call PDU with notification indicator information element set to "Forwarding (diversion) activated", or deactivated call forwarding by INFORM9 PDU. Upon reception of that information MS shall pass it to the user application.

5.4.1.6 Invocation and operation at MS

5.4.1.6.1 General on SS-CF invocation indications

All the procedures, as described in clauses 5.4.1.6.2 and 5.4.1.6.4 at the calling user are provided as part of the basic call control and subscription to any specific forwarding supplementary services is not required at the MS.

In addition there are optional supplementary service based indications described in clauses 5.4.1.6.3, 5.4.1.6.5 and 5.4.1.6.6.

5.4.1.6.2 Notification to the calling user

When the first call forwarding after the call request is invoked the forwarding SwMI may send an appropriate message to the calling user with the notification indicator information element value "call is forwarded", "CFU invoked", "CFB invoked", "CFNRc invoked" or "CFNRy invoked" and the calling user MS shall pass it to the user/or (or neither) INFORM2 PDU. No other information concerning the forwarding will be included at this time.

Upon subsequent SS-CF invocations the forwarding SwMI may send another notification indicator to the calling user as in the first case and the calling user MS shall pass it to the user.

5.4.1.6.3 Additional indication to the calling user

Due to the invocation of SS-CF the calling user MS may receive INFORM2 PDU. If the MS supports this PDU it shall pass inform 2 indication to the user application.

5.4.1.6.4 Notification to the forwarded-to user

Due to the invocation of SS-CF the forwarded-to user MS may receive a notification indicator value "Call is forwarded (diverting)", "CFU invoked", "CFB invoked", "CFNRc invoked" or "CFNRy invoked" in D-SETUP PDU and shall pass it to the user application.

5.4.1.6.5 Additional indication to the forwarded-to user

Due to the invocation of SS-CF the forwarded-to user MS may receive INFORM5 PDU. If the MS supports this PDU it shall pass inform 5 indication to the user application.

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

Identification of the forwarded-to (final destination) user to the calling user may be provided by SS-CI [9] independently of the SS-CF. In the case of multiple call forwarding invocations the intermediate forwarded-to user identify presentation is outside the scope of the present document.

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 e.g. performs power-up registration or makes an outgoing call, the network may send at suitable time INFORM8 PDU or include a notification indicator information element with a notification indicator value of "forwarding activated" in one of the first call control messages for that call sent from the network to the served user. Upon reception of the INFORM8 or notification indicator MS shall pass it to the user application.

5.4.1.7.2 Exceptional procedures

Not applicable.

5.4.2 Actions at the originating SwMI

5.4.2.1 General requirements

When an originating SwMI also provides forwarding SwMI functionality, in support of call forwarding by re-routeing, the joint requirements of clauses 5.4.2 (for an originating SwMI) and 5.4.4 (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 re-routeing is appropriate.

5.4.2.2 Normal Procedure

The originating SwMI shall set up the call towards the home SwMI of the called user using basic call procedures. The value of the SS-CF invocation counter shall not be incremented by the originating SwMI. Normally it is set to zero unless the originating SwMI for TETRA is in fact a SwMI gateway which receives the call from another network and the interworking signalling contains an equivalent value, refer to annex B.

On receipt of an INFORM2 PDU or equivalent notification indicator information element value in a message the originating SwMI should provide a notification of forwarding to the calling user as received.

On receipt of a CONNECT message, the originating SwMI shall consider SS-CF completed.

NOTE: SS-CF is invoked only after the completion of SS-CAD and the CONNECT message, which completes the SS-CF, is related to the forwarded-to user connection.

5.4.2.3 Exceptional Procedures

SS-CF does not set any additional exceptional procedures for originating SwMI as those defined in EN 300 392-3-2 [6] and EN 300 392-3-3 [7].

5.4.3 Actions at the served user home SwMI

5.4.3.1 Normal Procedure

5.4.3.1.1 Activation

On receipt of an ACTIVATE PDU (as specified in EN 300 392-9 [4]), the served user home SwMI shall check that the activation is authorized to the requesting user.

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 the present document.

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 with an ACTIVATE ACK PDU. If the activation requesting user (authorized user) is different from the served user, the served user home SwMI should send a notification to the served user in the INFORM8 PDU or sending notification indicator information element set to value "Forwarding (diversion) activated" in a D-INFO PDU.

5.4.3.1.2 Deactivation

On receipt of a DEACTIVATE PDU (as specified in EN 300 392-9 [4]), the served user SwMI shall check that the deactivation is authorized to the requesting user.

If the deactivation request is valid, the served user SwMI shall deactivate appropriate forwarding type - basic service combinations, answer with a deactivation result DEACTIVATE ACK PDU and should convey an appropriate notification to the served user in the INFORM9 PDU in the case where the served user is different from the authorized user.

When deactivation of multiple instances (multiple basic services and/or call forwarding types) of a call forwarding supplementary service is requested, and if at least one instance is deactivated, but one or more instance cannot be deactivated, then SwMI shall reject those using an independent message with suitable rejection reason in addition to the accepting message.

5.4.3.1.3 Interrogation

On receipt of an INTERROGATE PDU (as specified in EN 300 392-9 [4]), the Served User SwMI shall check the interrogation request and answer with a return result INTERROGATE ACK PDU if the interrogation request is valid and authorized.

5.4.3.1.4 Invocation and operation

5.4.3.1.4.1 General

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 served user SwMI and 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 re-routeing 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).

5.4.3.1.4.2 CFU invocation and operation

Upon reception of a call set-up the served user SwMI shall invoke SS-CFU, start call set-up to the forwarded to user optionally with notification indicator information element set to "Call is forwarded (diverting)" and/or including INFORM5 PDU into the set-up message. The SwMI should inform the forwarded-to SwMI that the call is a forwarded call including INFORM4 PDU in the case of ISI into the basic call set-up message. In addition SwMI may inform the calling user by either sending INFORM2 PDU, or setting notification information element to value to "Call forwarded" or "CFU invoked" in an appropriate basic call PDU and sending it, or sending both to the calling user (or originating SwMI).

NOTE: The INFORM5 is sent directly to the destination MS, refer to EN 300 392-9 [4], clause 10.3.1, table 26 and the INFORM4 is sent to the forwarded-to SwMI in the case it may need that information for another SS-CF invocation.

The call set-up to the forwarded to user may be an intra-SwMI call inside the served user SwMI, invocation of forward switching or call re-routeing. Refer to EN 300 392-3-2 [6] and EN 300 392-3-3 [7] for the basic call procedures for ISI.

On receipt of a CONNECT message, the served user SwMI shall consider SS-CF completed.

When a call to the served user is forwarded unconditionally SwMI shall not notify the served user of the SS-CFU invocation and the served user cannot answer the call that is forwarded unconditionally.

5.4.3.1.4.3 CFB invocation and operation on Network Determined User Busy (NDUB)

The same procedures as defined in clause 5.4.3.1.4.2 shall apply except that the "CFU invoked" shall be replaced by "CFB invoked". If the called user busy indication originates from the forwarded-to SwMI, then the served user SwMI shall disconnect the call attempt towards the forwarded-to SwMI using basic call procedures.

When a call to the served user is forwarded on network determined user busy the forwarding network shall not send to the served user any forwarding information and the served user cannot answer the call that is forwarded due to network determined user busy condition.

5.4.3.1.4.4 CFB invocation and operation on User Determined User Busy (UDUB)

If the called user disconnects the offered call before answering it and the called user indicates disconnection cause "Called party busy" or "No idle CC entity", CFB should be invoked and the same procedures as defined in clause 5.4.3.1.4.2 shall apply except that the "CFU invoked" shall be replaced by "CFB invoked". If the called user indicates any other disconnection reason such as "Cause not defined or unknown", "User requested disconnect" or "Call rejected by the called party", then the call should be disconnected without CFB invocation. If the called user busy indication originates from the forwarded-to SwMI, then the served user SwMI shall disconnect the call attempt towards the forwarded-to SwMI using basic call procedures.

When a call to the served user is forwarded on UDUB the forwarding network shall not send to the served user any forwarding information and obviously the served user cannot answer the call any more.

5.4.3.1.4.5 CFNRc invocation and operation on early invocation

Early invocation of CFNRc happens, if the home SwMI has information that the called user is detached. The same procedures as defined in clause 5.4.3.1.4.2 shall apply except that the "CFU invoked" shall be replaced by "CFNRc invoked". If the called user not reachable indication originates from the forwarded-to SwMI, then the served user SwMI shall disconnect the call attempt towards the forwarded-to SwMI using basic call procedures.

When a call to the served user is forwarded on early user not reachable the forwarding network shall not send to the served user any forwarding information and the served user cannot answer the call that is forwarded due to early user not reachable condition.

5.4.3.1.4.6 CFNRc invocation and operation on late invocation

Late invocation of CFNRc happens, if the polled user does not respond to the D-SETUP PDU. Determination where the user should be polled is outside the scope of the present document. The same procedures as defined in clause 5.4.3.1.4.2 shall apply except that the "CFU invoked" shall be replaced by "CFNRc invoked". If the called user not reachable indication originates from the forwarded-to SwMI, then the served user SwMI shall disconnect the call attempt towards the forwarded-to SwMI using basic call procedures.

When a call to the served user is forwarded on late user not reachable the forwarding network shall not send to the served user any forwarding information and the served user cannot answer the call that is forwarded due to late user not reachable condition.

NOTE: The served user MS may have received the D-SETUP PDU and the user may have accepted the call, but that signalling is not received at the base station.

5.4.3.1.4.7 CFNRy invocation and operation

If the CFNRy supplementary service is active for the basic service requested by the offered call, then the network shall start CFNRy timer on receipt of the first ALERT PDU. The value of the CFNRy time is a network provider option. The network shall stop the CFNRy timer on the reception of a CONNECT PDU from the called user and shall not forward the call.

If call clearing is initiated by the calling or called user while the CFNRy timer is running, the network shall stop the CFNRy timer and shall not forward the call and proceed with the normal clearing procedures according to clause 14 of EN 300 392-2 [1].

If the CFNRy timer expires before the network receives a CONNECT PDU from the called user, the network shall forward the call to the forwarded-to address and the same procedures as defined in clause 5.4.3.1.4.2 shall apply except that the "CFU invoked" shall be replaced by "CFNRy invoked".

When a call to the served user is forwarded on no reply the forwarding network shall clear the call attempt to the served user and may indicate "SS-specific disconnection" as the disconnect reason.

5.4.3.1.5 Reminder notification to the served user

If the served user has activated a call forwarding supplementary service and makes an outgoing call, the network may include a notification indicator information element with a notification description value of "forwarding activated" in one of the first call control messages for that call sent from the network to the served user. The inclusion may depend on the basic service type and the network may decide how often the reminder is sent. The SDS basic service should not invoke a reminder sending to the served user.

5.4.3.2 Exceptional Procedures

5.4.3.2.1 Activation

If the served user SwMI does not accept the activation request, the served user SwMI shall send to the activating user an ACTIVATE ACK PDU with an appropriate reject cause value.

If the activating user is different from the served user and the SwMI cannot reach the served user in order to inform him about the activation, then the further actions are outside the scope of the present document.

5.4.3.2.2 Deactivation

If the served user SwMI does not accept the deactivation request, the served user SwMI shall send a DEACTIVATE ACK PDU with an appropriate reject cause value.

If the deactivating user is different from the served user and the SwMI cannot reach the served user in order to inform him about the deactivation, then the further actions are outside the scope of the present document.

5.4.3.2.3 Interrogation

If the served user SwMI does not accept the interrogation request, the served user SwMI shall send an INTERROGATE ACK PDU containing an appropriate reject cause value.

5.4.3.2.4 Invocation

When SS-CF is invoked, but the call set-up 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 EN 300 392-3-1 [5], EN 300 392-3-2 [6] and EN 300 392-3-3 [7].

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.

5.4.4 Actions at the Forwarding SwMI

5.4.4.1 Functionalities in the 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 call re-routeing, 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.

The originating SwMI shall follow basic call procedures for the re-routeing, refer to EN 300 392-3-2 [6] and EN 300 392-3-3 [7].

5.4.4.2 Functionalities in the case of call forwarding by forward switching

The forwarding SwMI functionality is incorporated in the served user SwMI in the case 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

Invocation and operation shall be performed as defined in clause 5.4.3.1.4 for served user SwMI.

5.4.4.4 Exceptional procedures

There is no specific SS-CF related exceptional procedures and the basic call exceptional procedures shall apply.

5.4.5 Procedures at the forwarded-to SwMI

5.4.5.1 Normal procedure on invocation

On receipt of a SETUP message with an INFORM4 and with notification and/or INFORM5 PDU the forwarded-to SwMI shall set-up call to the forwarded-to user including the INFORM5 into the call set-up signalling.

If the forwarded-to SwMI invokes another SS-CF on that call, then the procedures defined for the served user SwMI, clause 5.4.3, or the forwarding SwMI, clause 5.4.4, as appropriate shall apply.

When it is known whether presentation restriction applies to the forwarded-to number, the forwarded-to SwMI shall use SS-CI procedures to inform the originating SwMI. This information shall indicate whether the presentation of the forwarded-to number is restricted.

5.4.5.2 Exceptional Procedures

There is no specific SS-CF related exceptional procedures and the forwarded-to SwMI shall behave as defined for the basic call.

5.4.6 Procedures at the served or authorized user visited SwMI

5.4.6.1 Normal Procedure

On receipt of an ACTIVATE, DEACTIVATE, DISABLE, ENABLE, INTERROGATE or INTERROGATE2 PDU from the user, the visited SwMI shall send it to the served user home SwMI using 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 EN 300 392-9 [4]. On receipt of an ACTIVATE ACK, DEACTIVATE ACK, DISABLE ACK, ENABLE ACK, INTERROGATE ACK or INTERROGATE2 ACK PDU, the visited SwMI shall send it to the requesting user.

5.4.6.2 Exceptional Procedures

There are no exceptional procedures caused by activation, deactivation or interrogation in the visited SwMI. Normal air interface and ISI signalling procedures in the case of failed transmission shall apply.

5.4.7 Protocol for SS-CF invocation counter

The signalling protocol for SS-CF invocation counter functionality operates in association with the signalling protocols for basic circuit switched call control (as specified in EN 300 392-2 [1] or EN 300 392-3-2 [6]) and call independent (connection oriented) signalling connections (as specified in EN 300 392-9 [4]) as a result of SS-CF invocations.

Where a reference is made to procedures specified in EN 300 392-2 [1] or EN 300 392-3-2 [6]) and EN 300 392-9 [4], the interpretation of such reference should be made according to whether the call concerned is a basic call or a call independent signalling connection.

The originating SwMI shall set the SS-CF invocation counter to an initial value, which shall be zero unless another value is available due to the interworking, refer to annex B.

Each forward invoking SwMI shall increment the SS-CF invocation counter for each invocation of any SS-CF.

NOTE 1: In the case of call forwarding by re-routeing the re-routeing SwMI does not increment the SS-CF invocation counter as it is already incremented by the forwarding SwMI.

NOTE 2: EN 300 392-3-2 [6] uses also transit counter information element in the ISI-SETUP PDU. That information element is intended for the same purpose over Inter-System Interface as the SS-CF invocation counter, which is also applicable inside a single SwMI. Both are intended to prevent infinite loops. The transit counter and the SS-CF invocation counter are independent of each other.

5.5 Interworking

Annex B describes optional call forwarding interworking with other networks.

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

5.6.1 Interactions with Ambience Listening (SS-AL)

The SS-AL takes precedence to any SS-CF and no SS-CFU shall be invoked in the set up of SS-AL calls.

The ambience listened user may be considered to be busy during an ambience listening call and normal SS-CFB invocation is performed or the new call to the ambience listened user may pre-empt the ambience listening call and no SS-CFB invocation is needed.

5.6.2 Interactions with Call Authorized by Dispatcher (SS-CAD)

The SS-CAD takes precedence to the SS-CF and it will be invoked on the CAD conditions defined for the calling user and the (original) called user before invocation of SS-CF. The SS-CAD is considered to be completed before the invocation of the SS-CF.

Invocation of SS-CAD due to the CAD conditions defined for the served user and the forwarded-to user for the first and any subsequent invocation of SS-CF are outside the scope of the present document.

5.6.3 Other protocol interactions of SS-CFU

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

The interaction defined in clauses 5.6.3.1.1 to 5.6.3.1.3 shall apply if SS-CCBS is supported in accordance with EN 300 392-12-13 [10].

5.6.3.1.1 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 ISI-REDIRECT PDU, 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.

5.6.3.1.2 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.

5.6.3.1.3 Terminating SwMI procedures if CFU is activated by user B after CCBS has been invoked

No protocol interaction.

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

The interaction defined in clauses 5.6.3.2.1 to 5.6.3.2.3 shall apply if SS-CCNR is supported in accordance with EN 300 392-12-23 [11].

5.6.3.2.1 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 ISI-REDIRECT PDU, 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.

5.6.3.2.2 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.

5.6.3.2.3 Terminating PINX procedures if CFU is activated by user B after CCNR has been invoked

No protocol interaction.

5.6.3.3 Interaction with Call Forwarding Busy (SS-CFB)

Protocol interactions are specified in clause 5.4.

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

Protocol interactions are specified in clause 5.4.

5.6.4 Protocol interactions of SS-CFB

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

The interaction defined in clauses 5.6.4.1.1 to 5.6.4.1.3 shall apply if SS-CCBS is supported in accordance with EN 300 392-12-23 [11].

5.6.4.1.1 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 clause 5.6.3.3.1 shall apply.

5.6.4.1.2 Originating SwMI procedures if CFB is activated by SS-CCBS user A

No protocol interaction.

5.6.4.1.3 Terminating SwMI procedures if CFB is activated by user B after CCBS has been invoked

No protocol interaction.

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

The interaction defined in clauses 5.6.4.2.1 to 5.6.4.2.3 shall apply if SS-CCNR is supported in accordance with EN 300 392-12-23 [11].

5.6.4.2.1 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 clause 5.6.3.2.1 shall apply.

5.6.4.2.2 Originating SwMI procedures if CFB is activated by SS-CCNR user A

No protocol interaction.

5.6.4.2.3 Terminating SwMI procedures if CFB is activated by user B after CCNR has been invoked

No protocol interaction.

5.6.4.3 Interaction with Call Forwarding Unconditional (SS-CFU)

Protocol interactions are specified in clause 5.4.

5.6.4.4 Interaction with Call Forwarding No Reply (SS-CFNRy)

Protocol interactions are specified in clause 5.4.

5.6.4.5 Interaction with Call Waiting (SS-CW)

In a SwMI supporting SS-CFB and SS-CW the called 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.

5.6.5 Protocol interactions of SS-CFNRy

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

No protocol interaction.

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

The following interaction defined in clauses 5.6.3.2.1 to 5.6.3.2.3 shall apply if SS-CCNR is supported in accordance with EN 300 392-12-13 [10].

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

The procedures of clause 5.6.3.2.1 shall apply.

5.6.5.2.2 Originating SwMI procedures if CFNR is activated by SS-CCNR user A

No protocol interaction.

5.6.5.2.3 Terminating SwMI procedures if CFNR is activated by user B after CCNR has been invoked

No protocol interaction.

5.6.5.3 Interaction with Call Forwarding Unconditional (SS-CFU)

Protocol interactions are specified in clause 5.4.

5.6.5.4 Interaction with Call Forwarding Busy (SS-CFB)

Protocol interactions are specified in clause 5.4.

5.6.6 Other 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.

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

Clause 5.6.1 shall apply identical to SS-CFU.

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

Clause 5.6.3 shall apply.

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

5.6.7.1 General on interactions

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.

5.6.7.2 Interactions of SS-CFU with ANF-ISIIC

Interactions of SS-CFU with ANF-ISIIC are outside the scope of the present document. Interactions will be presented in EN 300 392-3-2 [6].

5.6.7.3 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.

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 clause 5.6.5.3 shall apply.

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

Examples of interaction of SS-CFB and SS-CFNRy with ANF-ISIIC are presented in annex A.

5.6.8 Protocol Interactions of SS-CF with ANF Group Call

Only SS-CFU and SS-CFB are applicable in that case.

5.6.8.1 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 coincides with the forwarded to group's home SwMI, then an ISI-REROUTE SETUP PDU as defined in table 51 in EN 300 392-3-3 [7] 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.

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

5.6.8.2 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.

NOTE 1: Definition of a busy group is outside the scope of the present document.

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 EN 300 392-3-3 [7] 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-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 3: 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.

5.6.9 Protocol Interactions of SS-CF with ANF-SDS

Only the interaction of SS-CFU with ANF-SDS is applicable in the present document.

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

NOTE 2: The same principle for interaction between SS-CFU and ANF-SDS could be applied to the interaction between SS-CFNRc and ANF-SDS especially, when the served user SwMI knows that the served user MS is not reachable (explicit detachment from the system).

The SDS user data message will be carried through ISI in the same type of TETRA ROSE Invoke APDU as the supplementary services; the SDS message transfer shall use a call unrelated signalling connection, refer to EN 300 392-3-4 [8].

The served user SwMI shall modify the STATUS and SDS-DATA PDUs replacing the destination address by the forwarded-to user address. No indication that the STATUS or SDS-DATA PDU is forwarded will be added into the PDU.

NOTE 3: As neither the sending nor receiving user receives any indication about message forwarding, especially the sending user should be prepared that potential responses to a sent message may be received from another entity than where the original message were sent. In the SDS-TL protocol the sending user may utilize the message reference information element for that purpose, refer to EN 300 392-2 [1], clause 29.3.3.2.

5.6.10 Protocol interactions of SS-CF with ANF Mobility Management

This clause presents interactions of SS-CF with ANF Mobility Management as understood before actual definition of ANF-ISIIC or ANF-ISIGC and may contain material that is no more valid. In the case of inconsistency the ANF-ISIIC EN 300 392-3-2 [6] and ANF-ISIGC EN 300 392-3-3 [7] shall take precedence.

The mobility management in the case of SS-CF insures that:

- no loop should occur 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.

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 48.

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

Table 48: 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

5.6.10.1 Protocol interactions of SS-CFU, early SS-CFB and early SS-CFNRc 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, "early" SS-CFB and "early" SS-CFNRc. 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.

NOTE 1: Early SS-CFB means that the home SwMI of the (served) user B detects that the user B is busy and the priority of incoming call does not cause a pre-emption.

NOTE 2: Early SS-CFNRc means that the home SwMI of the (served) user B detects that the user B is detached from the system.

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 available in the user B home SwMI, which will control the operation of SS-CF. For this operation, the originating SwMI or the SwMIs where the called user B may have migrated do not need to support SS-CF; only user B home SwMI needs to support SS-CF.

The operation of the interaction between SS-CF and ANF-ISIMM is specified in ANF-ISIIC [6] and in ANF-ISIGC [7] as a part of the basic call as a user migration by also informing that the call set-up is modified due to the invocation of SS-CF.

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 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.

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

5.6.10.2.1 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 describe in interactions of SS-CFB with ANF-ISIIC, refer to clause A.2.2.

The contents of the basic migration profile for an individual subscriber is defined in EN 300 392-3-5 [15], clause 33.39.1 and is not repeated here.

5.6.10.2.2 Protocol interactions affecting the called/served user

In those cases where the served user migrates away from its home SwMI, there may 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 clause 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 SS-CF profile exchanges shall take place as defined in EN 300 392-3-5 [15].

SS-CF profiles are described in annex C.

For the description of cases 2, 4, 5 and 7, clause 5.5.7.3.2 shall apply.

5.6.10.2.3 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 clause 5.6.7.4.

The contents of the basic migration profile for an individual subscriber is defined in EN 300 392-3-5 [15], clause 33.39.1 and is not repeated here.

5.6.10.3 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 clause 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.

5.7 SS-CF parameter values (timers)

The SS-CF protocols do not use any defined timers. Basic call timers apply as they are defined in the air interface and ISI protocols. SwMIs involved into the SS-operation may extend values of the basic call timers as defined in the air interface and ISI protocols.

5.8 Support of SDS

The present document provides a limited support of SDS messaging for call forwarding unconditional supplementary service SS-CFU. Activation, deactivation, interrogation and operation by forward switching processes are optionally valid for SDS, refer to. There is no indication to the sending user nor receiving user that the SDS is forwarded. Also no reminder is sent to the served user that the forwarding is activated, when the served user sends SDS messages. The served user may send SDS messages independently of the activation of SS-CFU for SDS.

NOTE: As neither the sending nor receiving user receives any indication about message forwarding, especially the sending user should be prepared that potential responses to a sent message may be received from another entity than where the original message were sent. In the SDS-TL protocol the sending user may utilize the message reference information element for that purpose, refer to EN 300 392-2 [1], clause 29.3.3.2.

Annex A (informative): Interactions of SS-CFB and SS-CFNRy with ANF-ISIIC

A.1 Interactions of SS-CFB and SS-CFNRy with ANF-ISIIC

FORWARD and FORWARD ACK PDUs in the SDL presentations are basic call PDUs and are now re-named in the basic call protocol to ISI-REDIRECT and ISI-FORWARD SWITCH PDUs. Those will be sent only when the basic call requires information exchange. SS-CF specific information without basic call actions will use SS-CF PDUs without the FORWARD or FORWARD ACK PDUs (ISI-REDIRECT and ISI-FORWARD SWITCH PDUs).

In the case there is a conflict between the present annex and ANF-ISIIC EN 300 392-3-2 [6] or ANF-ISIGC EN 300 392-3-3 [7] then the latter ones shall take precedence.

A.2 Interactions

A.2.1 Interactions of late SS-CFB and SS-CFNRy with ANF-ISIIC

Unless otherwise noted, abbreviation SS-CF is in short used to refer to either SS-CFB, SS-CFNRy or SS-CFNRc indifferently.

NOTE 1: Late SS-CFB is the case where the user B state is detected after some signalling towards the user B. It happens especially, when the user B has migrated or the user B invokes "user determined busy" event.

The definition of interactions between ANF-ISIIC and SS-CF will 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 are 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 A.1 and A.2 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.

NOTE 2: FORWARD and FORWARD ACK PDUs are basic call PDUs and will be sent only when the basic call requires information exchange. SS-CF specific information without basic call actions will use SS-CF PDUs without the FORWARD or FORWARD ACK PDU.

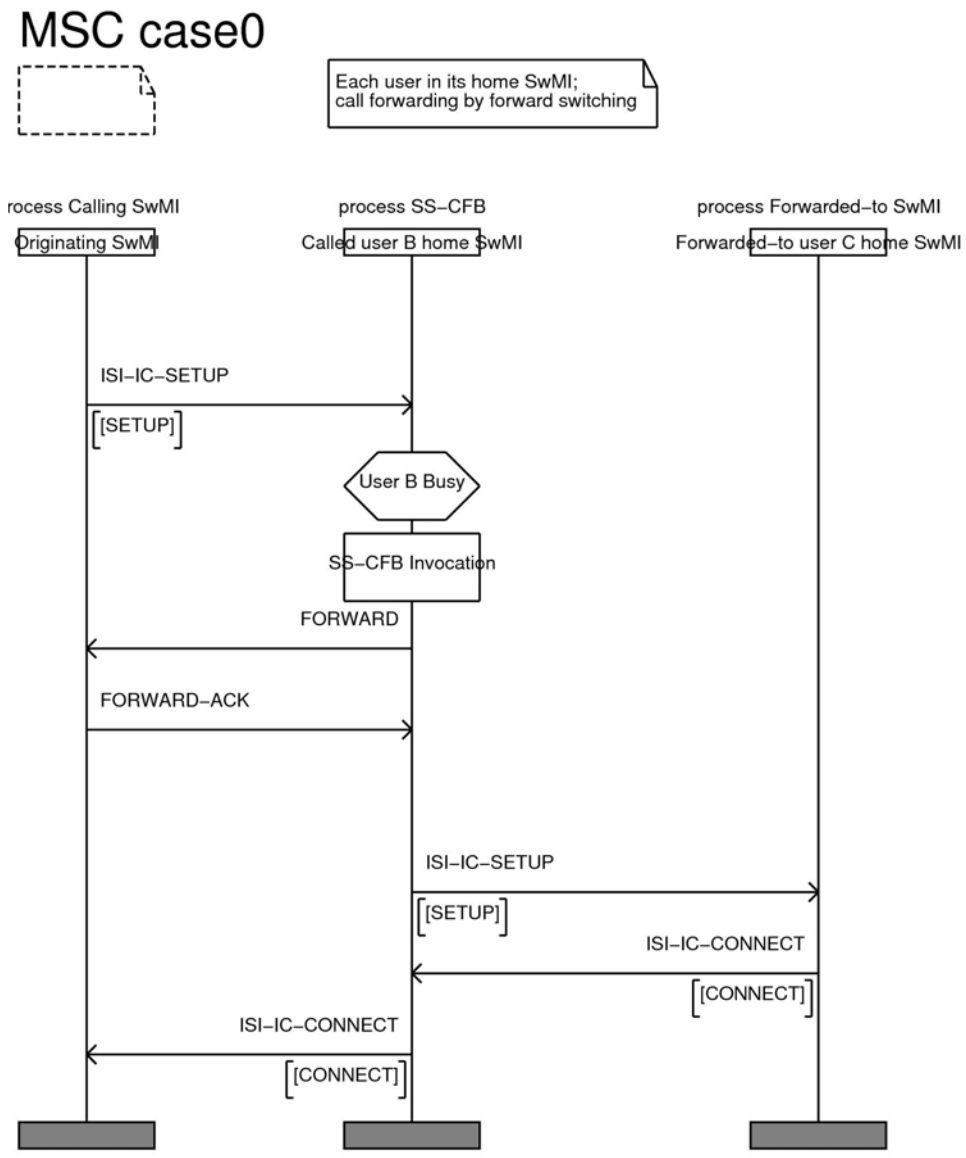

Figure A.1: Call forwarding busy by forward switching

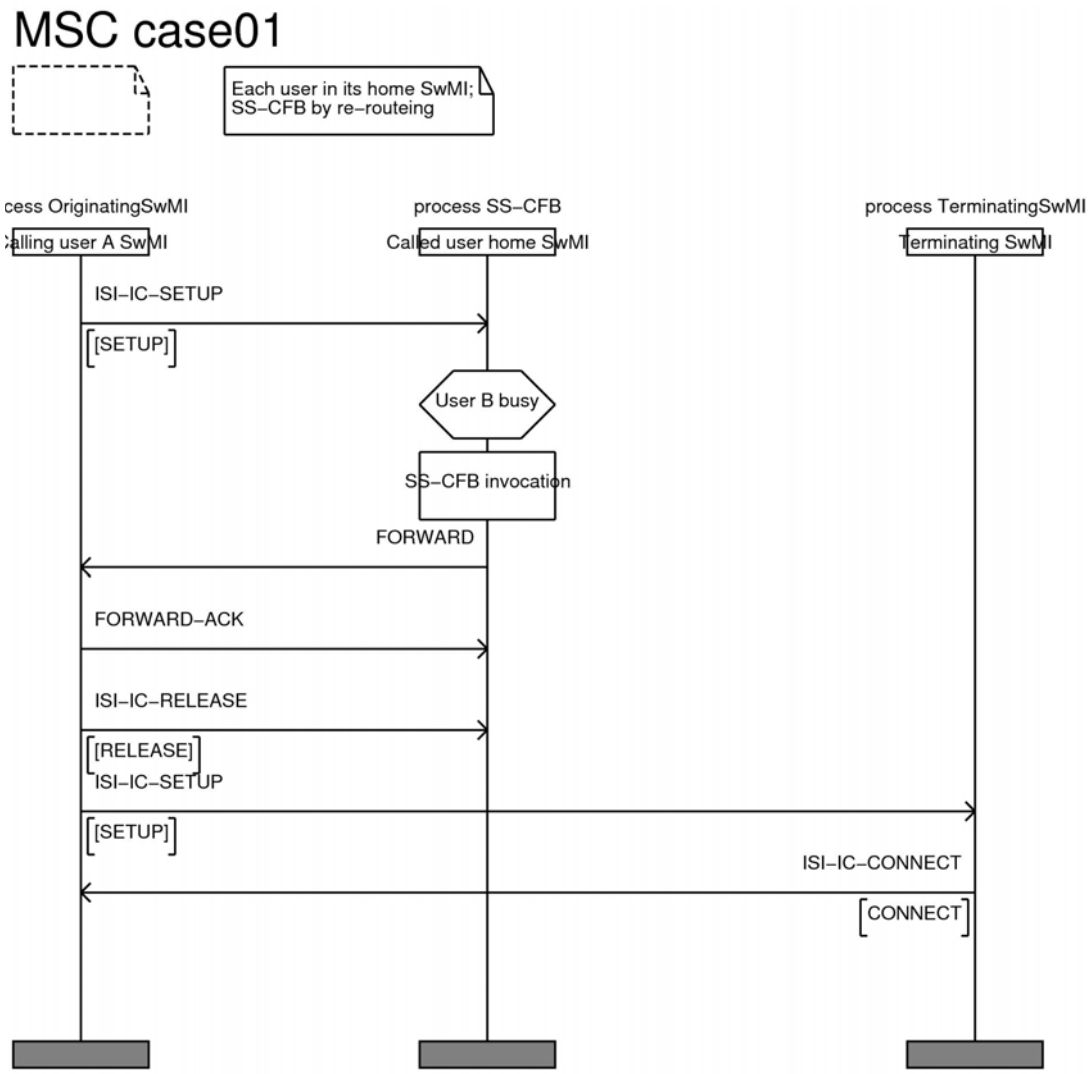

Figure A.2: Call forwarding busy by re routeing

The identified different cases are listed in table A.1.

Table A.1: Different cases of interactions

Case #	Home 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
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
12	SwMI A	SwMI A	SwMI A	SwMI A	SwMI B	SwMI C

A.2.2 Protocol interactions in cases 1, 10 and 11

A.2.2.1 General on cases 1, 10 and 11

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.

A.2.2.2 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 will set-up an ISI-IC according to EN 300 392-3-2 [6] to SwMI A (user B visited SwMI). 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 the originally invoked ISI-IC being still established between SwMI B and SwMI A (but possibly through another access in SwMI A).

In that case, the SwMI B (the calling user visited SwMI) does not need to support SS-CF; the notification indicator information element (call forwarded) and/or the INFORM2 to the calling user will be passed transparently by SwMI B to the calling user.

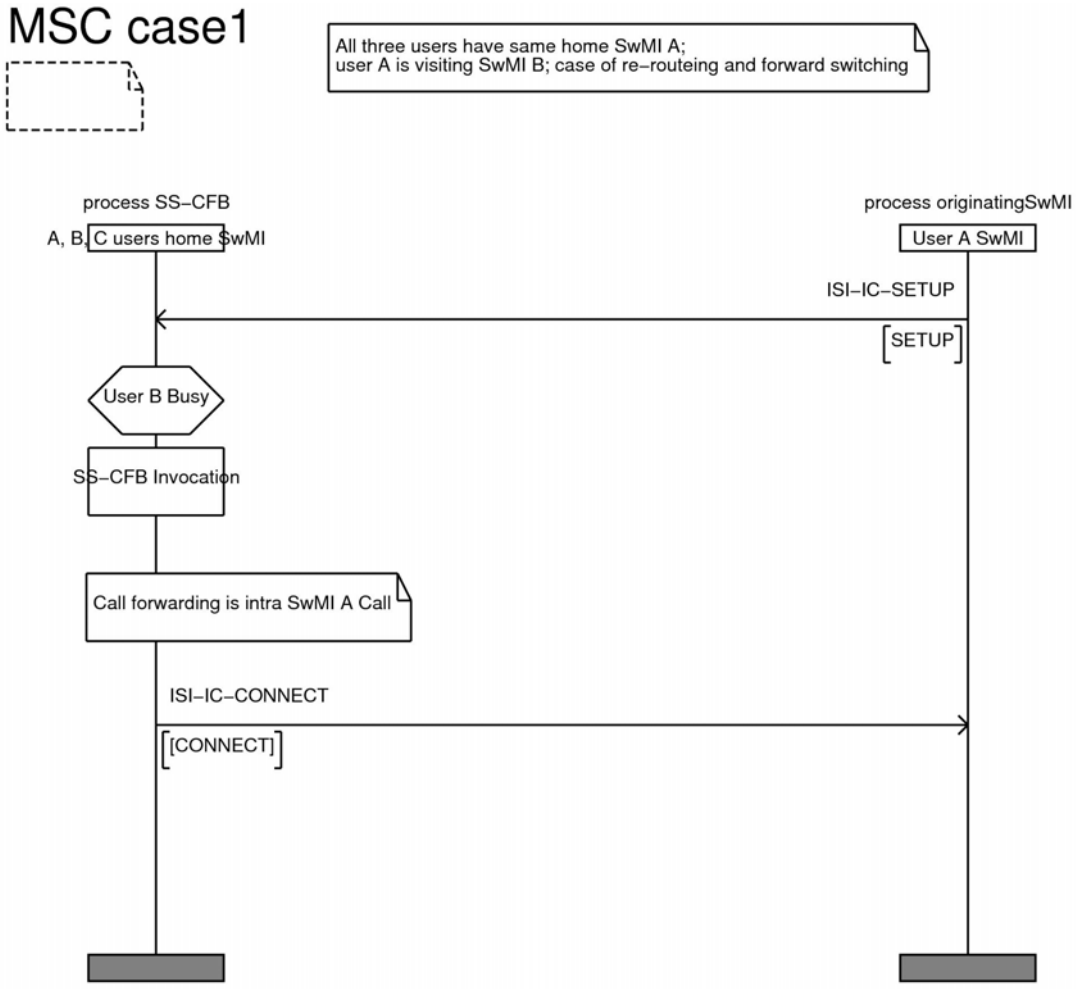

Figure A.3: Case 1

A.2.2.3 Case 10

In the case where another call forwarding supplementary service would be invoked for the forwarded-to user (i.e. case of multiple call forwarding) and where the new forwarded-to user would be in SwMI B, SwMI C will identify the possible trombone connection that would result if it forward switched the invoked ISI-IC. It will inform SwMI B about it in the ISI-IC REDIRECT PDU which it sends to that SwMI (indicating to SwMI B that the call has been forwarded to a forwarded-to user which is in SwMI B). SwMI B will accept the ISI-IC, will clear the invoked ISI-IC (notably in clearing the ISI connection which it had started to establish with SwMI C) and will set-up the call internally.

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 will 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 will invoke an ANF-ISIIC to SwMI C as specified in EN 300 392-3-2 [6], i.e. in sending the ISI-IC SETUP PDU. It will also send the INFORM4 PDU (indicating that the call has been forwarded from user B) together with that ISI-IC SETUP PDU. SwMI C will monitor the progress of the call within SwMI C and will keep a record of the initial forwarding user number (user B number) it obtained from SwMI B in the INFORM4 PDU.

In the case where another call forwarding supplementary service would be invoked for the forwarded-to user (in the case of multiple call forwarding) and where the home SwMI of new forwarded-to user would be SwMI C and that user would have migrated into SwMI C, SwMI C will identify the possible trombone connection that would result if it forward switched the invoked ISI-IC. It will inform SwMI B about it in the ISI-IC REDIRECT PDU which it sends to that SwMI indicating to SwMI B that the call has been forwarded to a forwarded-to user which is in SwMI B. SwMI B will clear the invoked ISI-IC (notably in clearing the ISI connection which it had started to establish with SwMI C) and will set-up the call internally.

Still in the case where another call forwarding supplementary service would be invoked for the first forwarded-to user (in the case of multiple call forwarding) but where the home SwMI of new forwarded-to user would be SwMI B, SwMI C will identify the possible trombone connection that would result if it forward switched the invoked ISI-IC. It will inform SwMI B about it in the ISI-IC REDIRECT PDU which it sends to that SwMI indicating to SwMI B that the call has been forwarded to a (new) forwarded-to user whose home SwMI is SwMI B. SwMI B will clear the invoked ISI-IC (notably in clearing the ISI connection which it had started to establish with SwMI C) and depending whether the new forwarded-to user has migrated or not will invoke a new ISI-IC or set-up the call internally.

In that case, by definition, SwMI B fully supports SS-CF; as to SwMI C it does not support SS-CF, except of course if another call forwarding supplementary service is activated for the forwarded-to user.

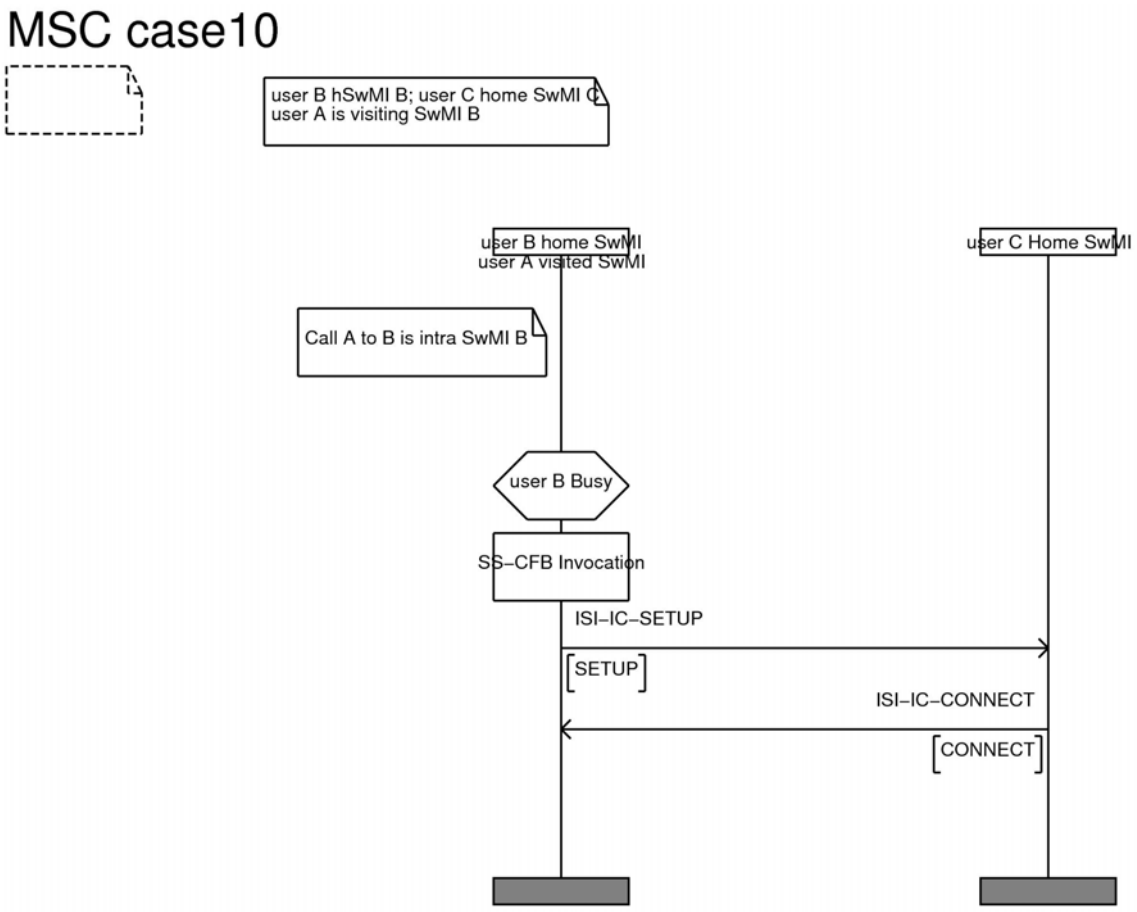

Figure A.4: Case 10

A.2.2.4 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 will set-up an ISI-IC call to SwMI B according to EN 300 392-3-2 [6]. In the case of invocation of SS-CF for that call, SwMI B will identify that the forwarded-to user home SwMI is SwMI C, thus it will identify the possible trombone connection that would result if forward switched the invoked ISI-IC. It will inform SwMI C about it in the ISI-IC REDIRECT PDU which it sends to that SwMI indicating to SwMI C that the call is forwarded to user C. SwMI C will recognize that the call has now become an internal "local" call to SwMI C, will clear the invoked ISI-IC (notably in clearing the ISI connection which it had started to establish with SwMI B) and will set up the call internally.

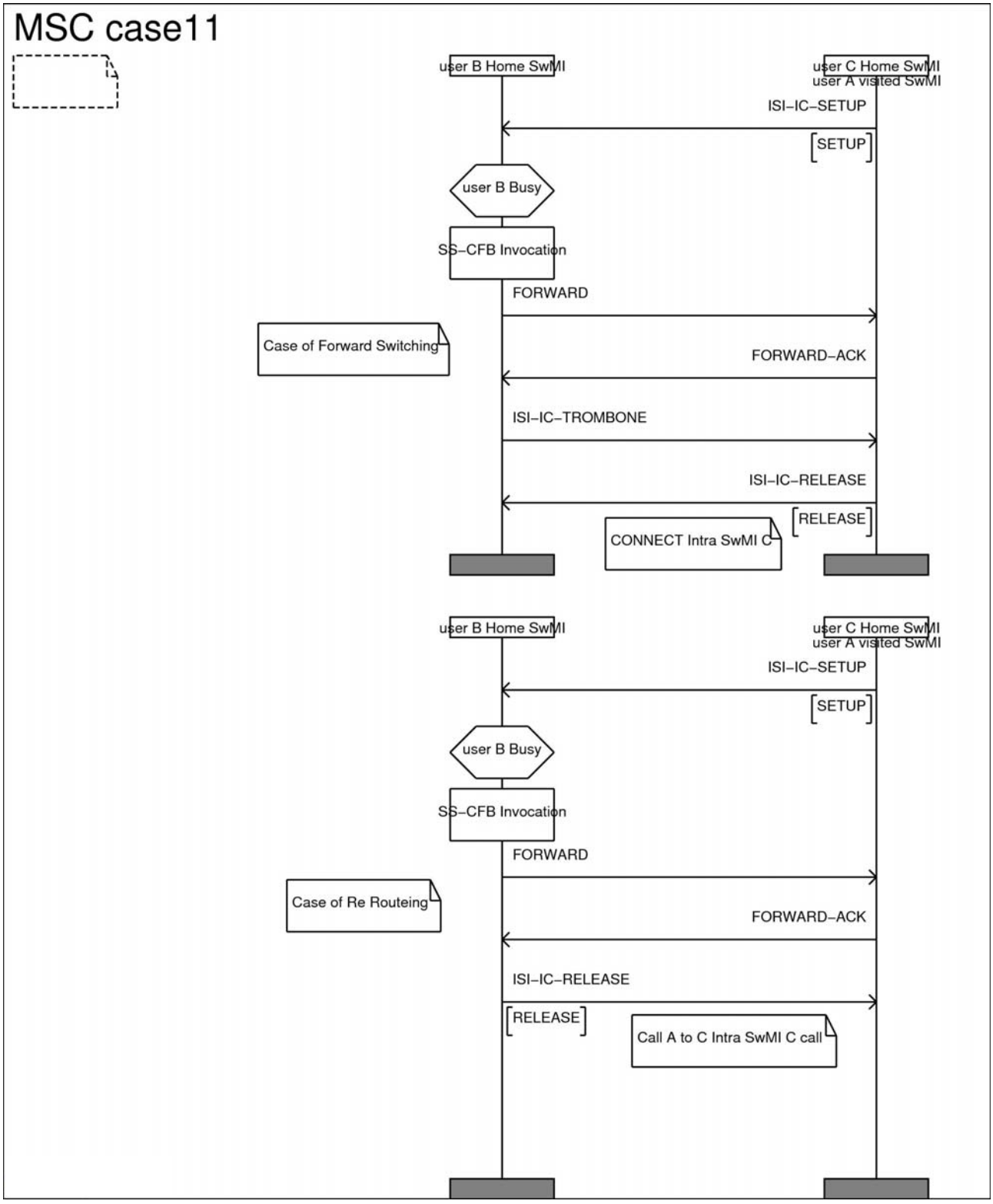

Figure A.5: Case 11

A.2.3 Protocol interactions affecting the called/served user

A.2.3.1 General

In those cases where the served user is visiting a SwMI different from its home SwMI, there will 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.

A.2.3.2 Case 2

The called/served user is visiting a SwMI, SwMI B, different from its home SwMI: SwMI A, while both users A and C are located in SwMI A. In the case where the calling user sets up a call to the called/served user, the originating SwMI A will invoke an ISI-IC to SwMI B. When SS-CF is invoked for the called/served user, SwMI B will identify that the forwarded-to user home SwMI is SwMI A, thus it will identify the possible trombone connection that would result if it forward switched the invoked ISI-IC. It will inform SwMI A about it in the ISI-IC REDIRECT PDU which it sends to that SwMI, indicating that the call is forwarded to user C. SwMI A will recognize that both the calling user and the forwarded-to user are in the same SwMI, thus that the call has now become an internal "local" call in that SwMI; it will clear the invoked ISI-IC (notably in clearing the ISI connection which it had started to establish with SwMI B) and will set-up an internal "local" call within SwMI A.

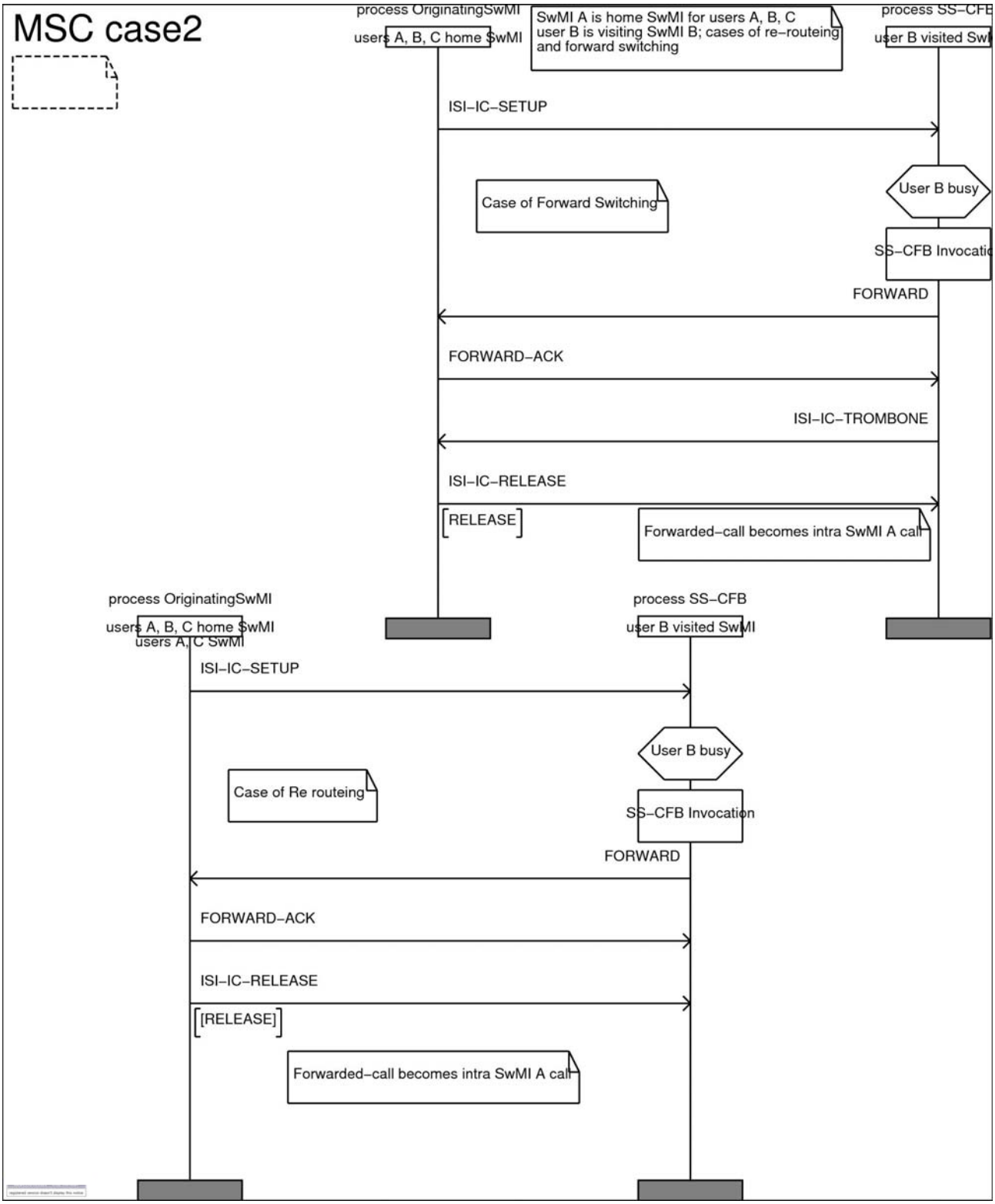

Figure A.6: Case 2

A.2.3.3 Case 4

The called/served user with home SwMI B is visiting the calling user/forwarded-to user SwMI A. SwMI A will know that the called/served user is now in SwMI A and will have received his SS-CF profile. 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, SwMI A may or may not recognize the call as an internal "local" call. If it does, it will not place an ISI-IC call to SwMI B. If it does not, it will invoke such an ISI-IC, which will then inform it that user B is registered in it; this will result in that ISI-IC being cleared. Upon invocation of SS-CF for the called/served user, SwMI A will forward internally the call to the forwarded-to user 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 EN 300 392-3-2 [6] using the ISI-IC-TROMBONE flow.

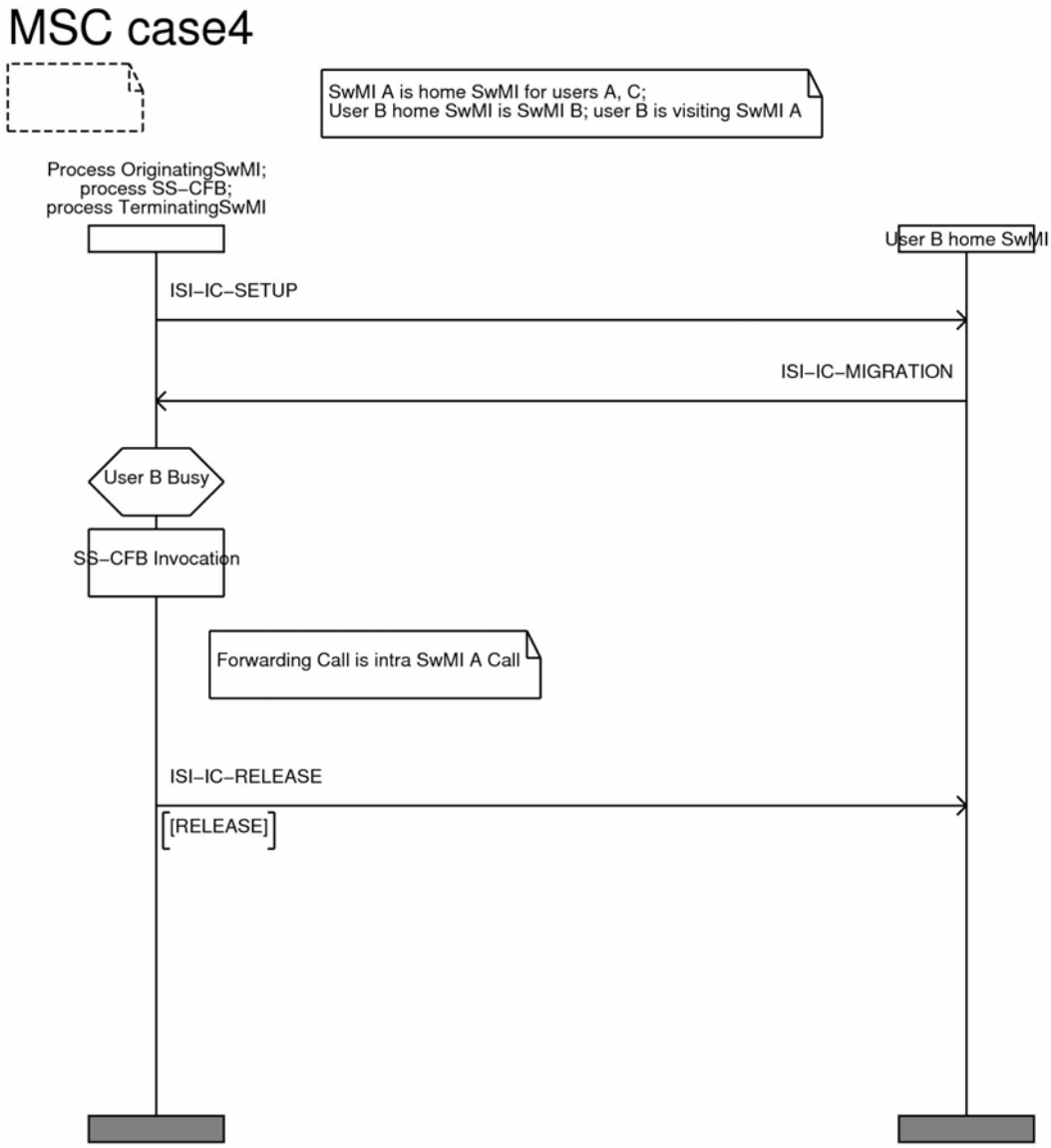

Figure A.7: Case 4

A.2.3.4 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 EN 300 392-3-2 [6]. The calling user SwMI A invokes an ISI-IC to the served user home SwMI B; user B home SwMI provides the served user visited SwMI C MNI from its (home SwMI) database. The call may either be re-routed from the originating SwMI A to SwMI C or be forward switched in the home SwMI B to the served user visited SwMI C. The information flow sequence is contained in figure 12 of EN 300 392-3-2 [6] in the case of re-routeing, in figure 11 of EN 300 392-3-2 [6] in the case of forward switching. Once the call reaches user B visited SwMI C, SS-CF will be invoked for user B in that SwMI (unless it does not support SS-CF). In the case described here, where the forwarded-to user home SwMI is SwMI A, SwMI A will recognize both that the calling user and the forwarded-to user are in the same SwMI, thus that the call has now become an internal "local" call in that SwMI; it will clear the invoked ISI-IC (notably in clearing the ISI connection which it had started to establish with SwMI B) and will set-up an internal "local" call within SwMI A.

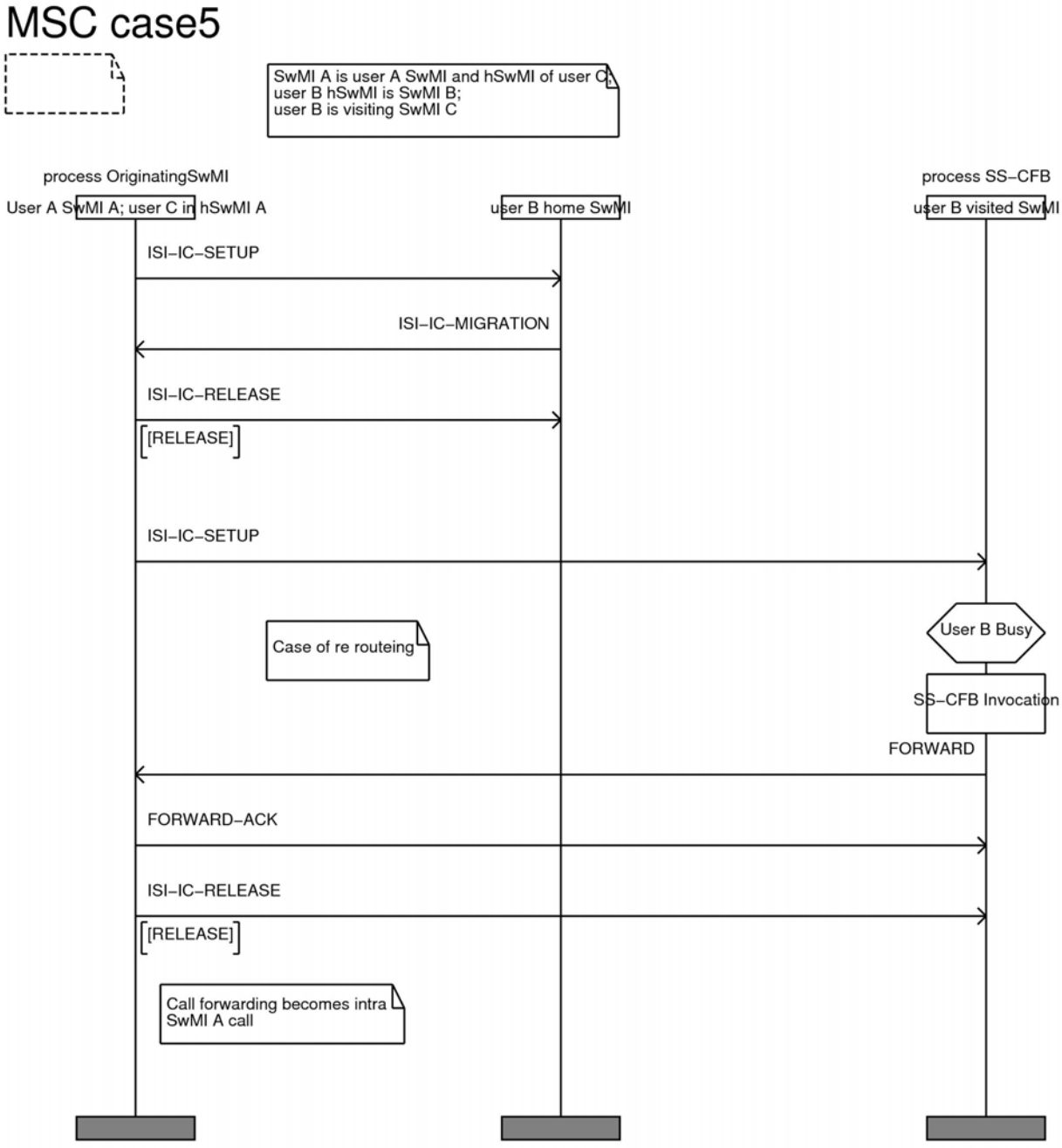

Figure A.8: Case 5-1

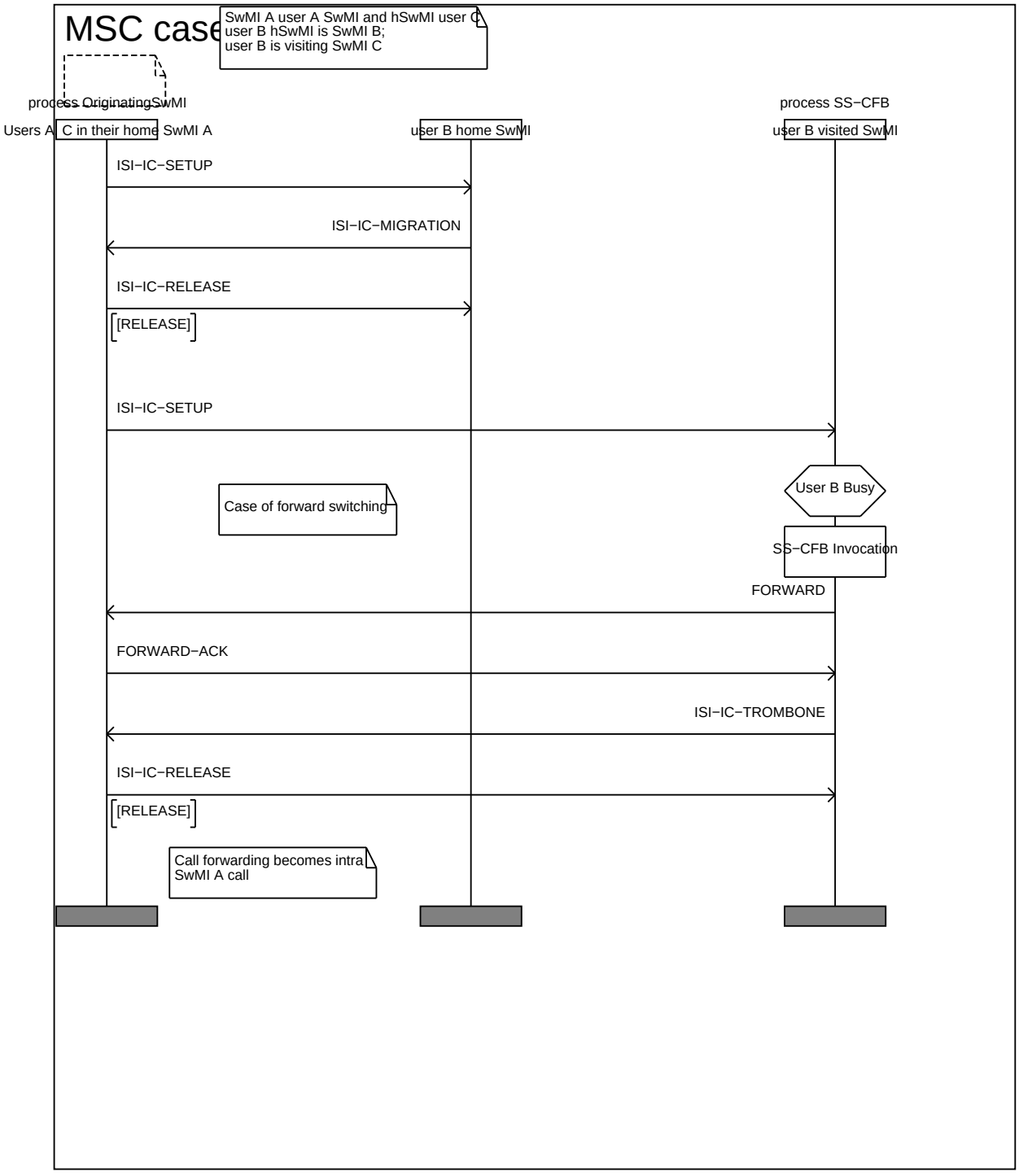

Figure A.9: Case 5-2

A.2.3.5 Case 7

The called/served user with home SwMI B is registered in the home SwMI of the forwarded-to user: SwMI C. Both the calling user and the forwarded-to user are registered in their home SwMIs, SwMI A and SwMI C, respectively. 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 i.e. establishment of the call by re-routeing or by forward switching to SwMI C after obtaining from user B home SwMI the new location of user B. Once the call has reached SwMI C, SS-CF will be invoked for user B in that SwMI (unless it does not support SS-CF); SwMI C will recognize that now both the served user and the forwarded-to user are both in that SwMI and will complete the establishment of the call to user C internally.

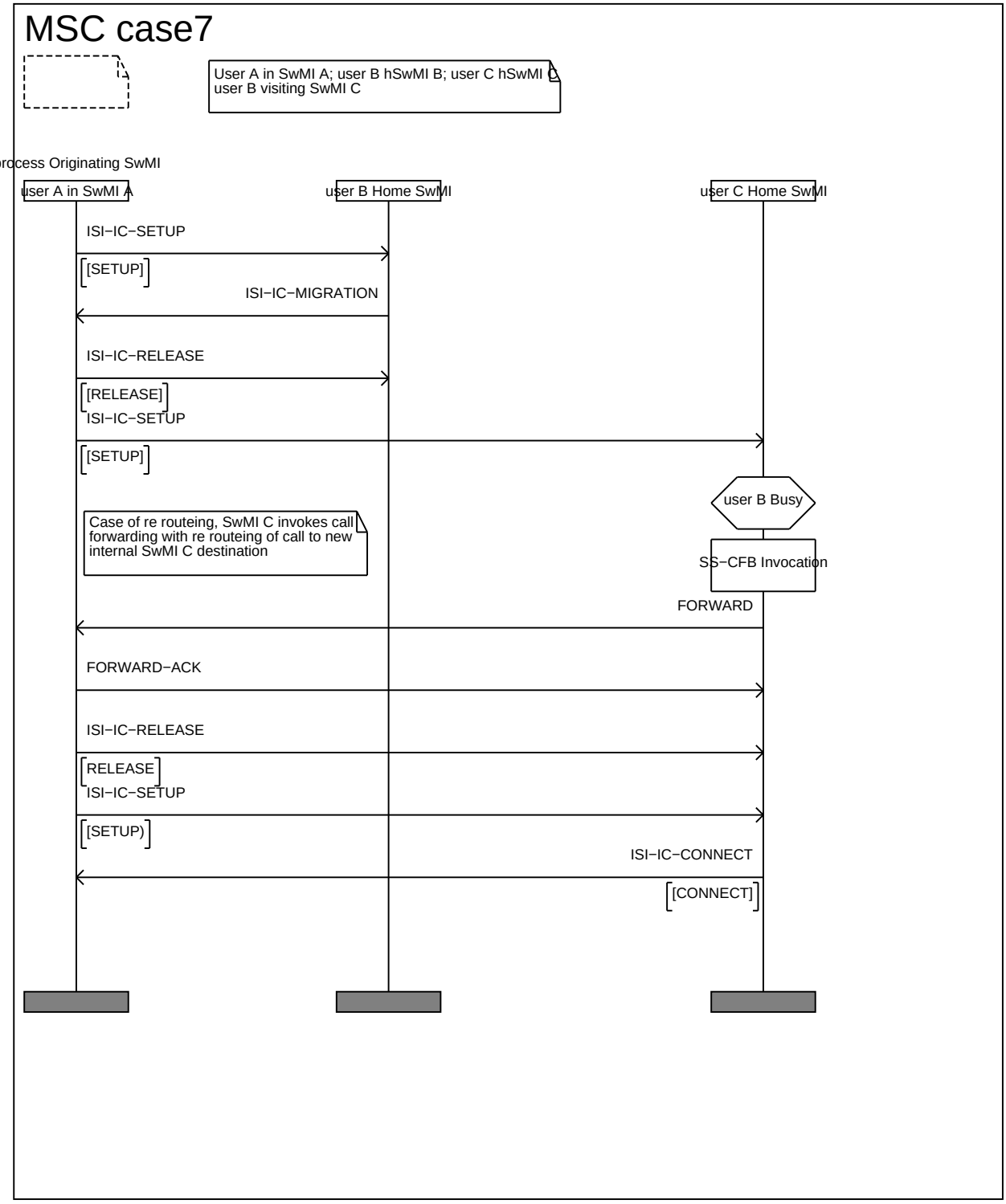

Figure A.10: Case 7-1

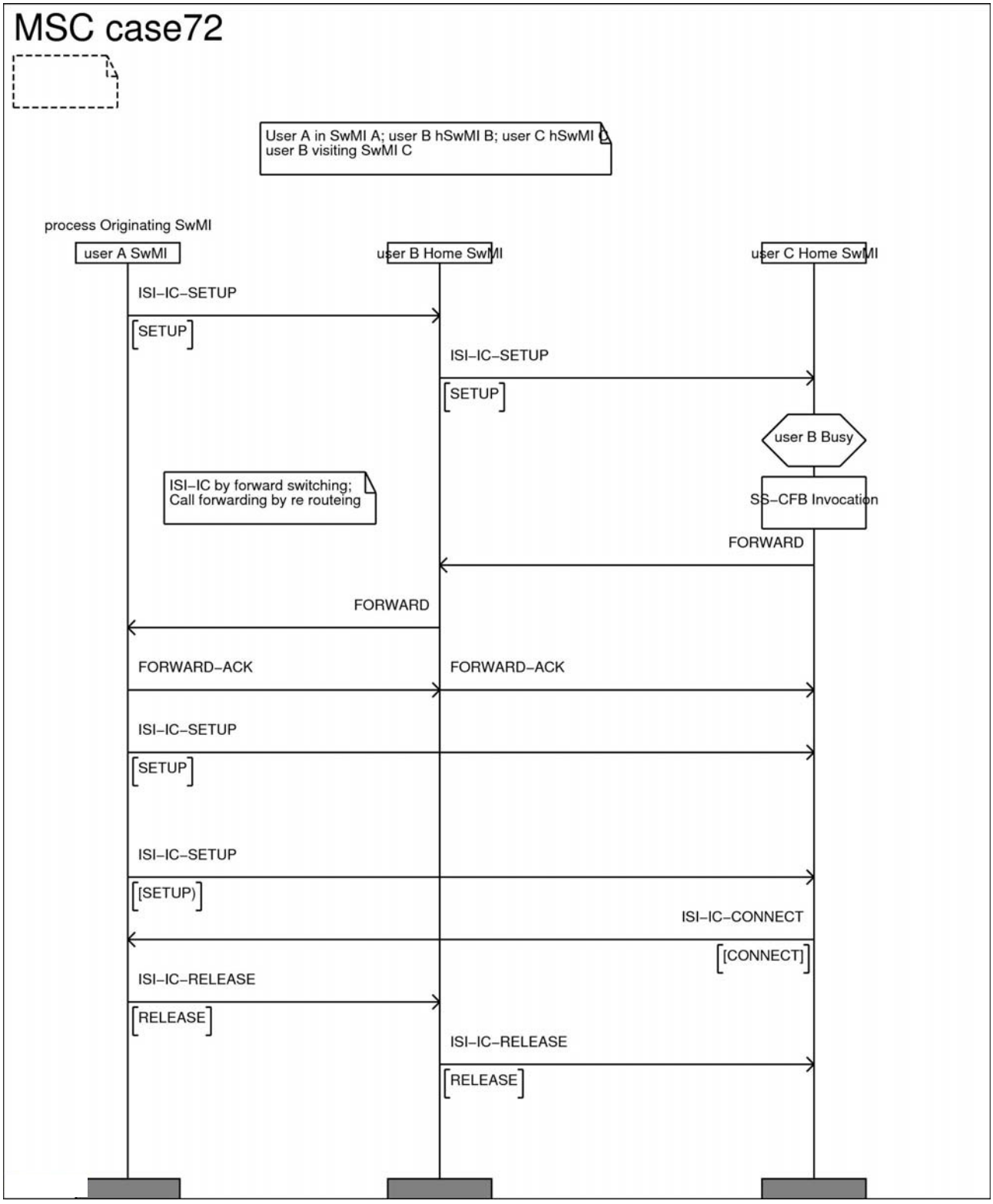

Figure A.11: Case 7-2

A.2.4 Protocol interactions affecting the forwarded-to user

A.2.4.1 General

Cases 3, 6, 8 and 9 are valid for this situation.

A.2.4.2 Case 3

The forwarded-to user with home SwMI A is visiting SwMI C different from the originating SwMI and from the served user home SwMI, which coincide in this case. When user A sets up a call to user B, SwMI A will recognize that that call is an "intra SwMI A" "local" call and will start establishing it accordingly. When SS-CF is invoked for user B, SwMI A, which is also the forwarded-to user home SwMI will extract from its (home database) the new location of the forwarded-to user, user C. SwMI A will then invoke an ISI-IC to SwMI C which then will extend the call to user C.

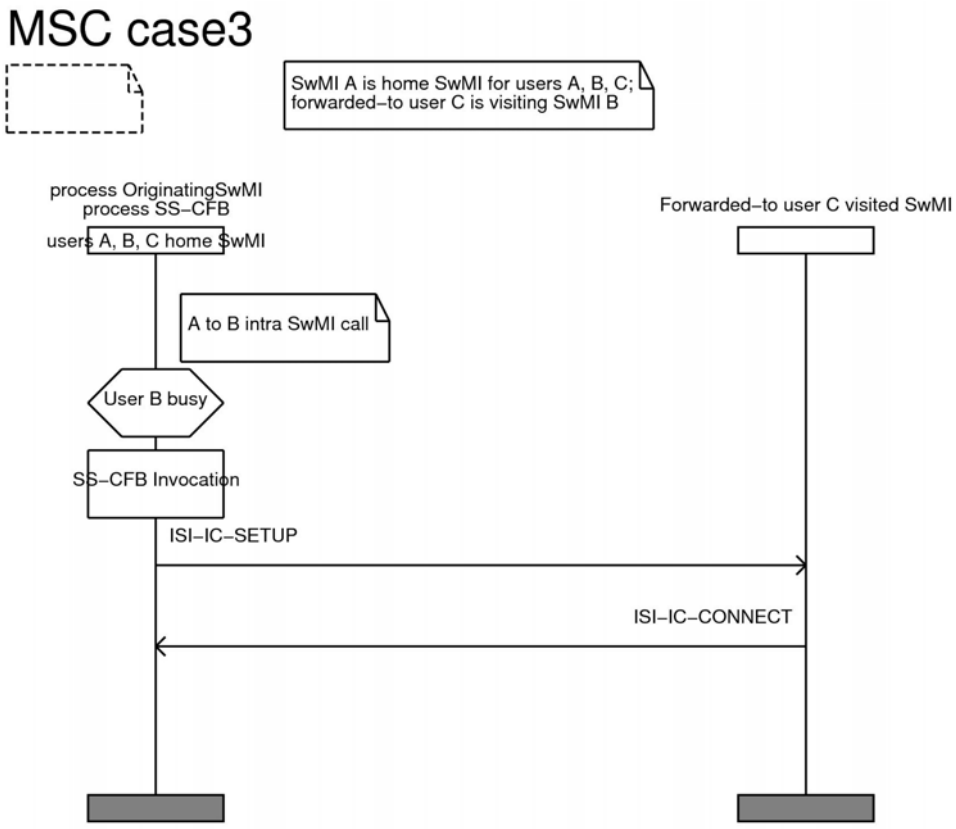

Figure A.12: Case 3

A.2.4.3 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. When the calling user A sets up a call to user B which is registered in its home SwMI B, SwMI A invokes an ISI-IC to SwMI B; when SS-CF is invoked for that call for user B, SwMI B as home SwMI of the forwarded-to user, user C, will extract from its (home database) the new location of that user. Depending on the result of the routeing negotiation, the invoked ANF-ISIIC will be either re-routed to SwMI C from SwMI A, the originating SwMI, or forward switched to SwMI C in SwMI B. In the case of re-routeing, SwMI B will indicate to SwMI A in the ISI-IC REDIRECT PDU both the identity of the forwarded-to user and SwMI C MNI; SwMI A will then re-route the call to SwMI C and clear its ISI-IC connection path to SwMI B. In the case of forward switching; SwMI B will extend the invoked ANF-ISIIC to SwMI C and will join the two ISI-IC resources, with SwMI A and SwMI B (both path and signalling connection), according to the specifications of the underlying PISN.

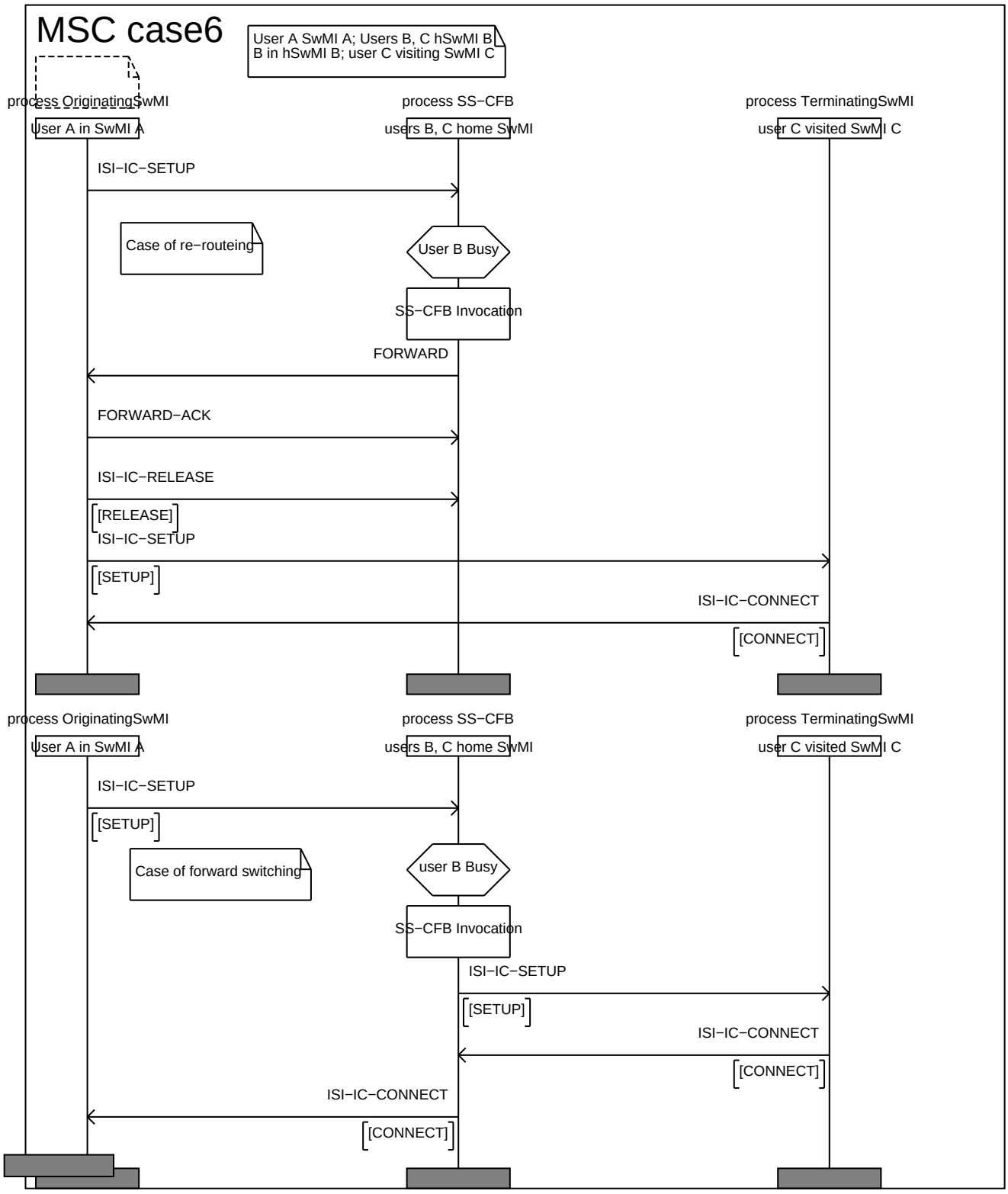

Figure A.13: Case 6

A.2.4.4 Case 8

The forwarded-to user with SwMI C as home SwMI is visiting SwMI B different from the calling user SwMI A and identical to the served user home SwMI. The served user B is registered in its home SwMI B. When the calling user sets up a call to user B, the initial process is identical to case 6 until SS-CF is invoked. SwMI B may or may not then recognize that the forwarded-to user, user C, is registered in that SwMI. If it does, it will complete the call to user C internally. If it does not, depending on the result of the routeing negotiation for the invoked ANF-ISIIC between SwMI A and SwMI B either:

- it will send the ISI-IC REDIRECT PDU to SwMI A to have the invoked ANF-ISIIC re-routed (from SwMI A) to SwMI C the home SwMI of the forwarded-to user; SwMI A will then send the ISI-IC SETUP PDU to SwMI C, user C home SwMI and clear its ISI-IC connection path to SwMI B; SwMI C will then send the ISI-IC REDIRECT PDU to SwMI A informing that SwMI that user C, having migrated, is now registered in SwMI B. SwMI A will then send the ISI-IC SETUP PDU to SwMI B and clear its ISI-IC connection path to SwMI C. SwMI B will then complete the establishment of the call to user C; or

- it will send the ISI-IC SETUP PDU to SwMI C as if it was going to forward switch the invoked ANF-ISIIC. SwMI C will obtain the new location of user C from its (home SwMI) database, will recognize that user C is now in SwMI B, and will indicate this in the ISI-IC REDIRECT PDU which it sends to SwMI B. SwMI B will then complete the establishment of the call to user C and clear its ISI-IC connection path to SwMI C.

NOTE: In case 8, none of the requirements provided above for SwMI C are SS-CF protocol requirements - they are only ANF-ISIIC requirements. In other words, SwMI C does not have to support any requirement of the SS-CF protocol in this case.

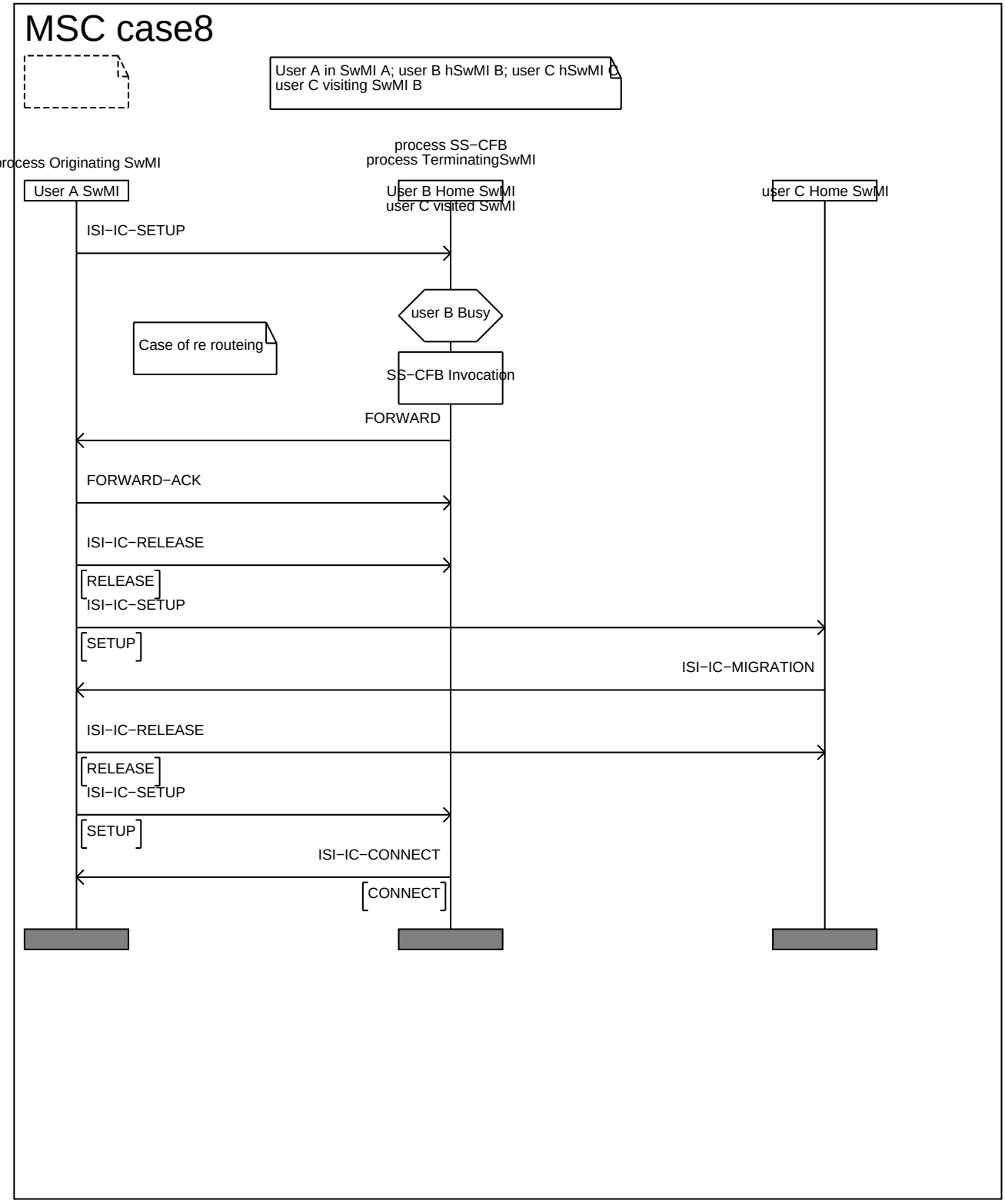

Figure A.14: Case 8-1

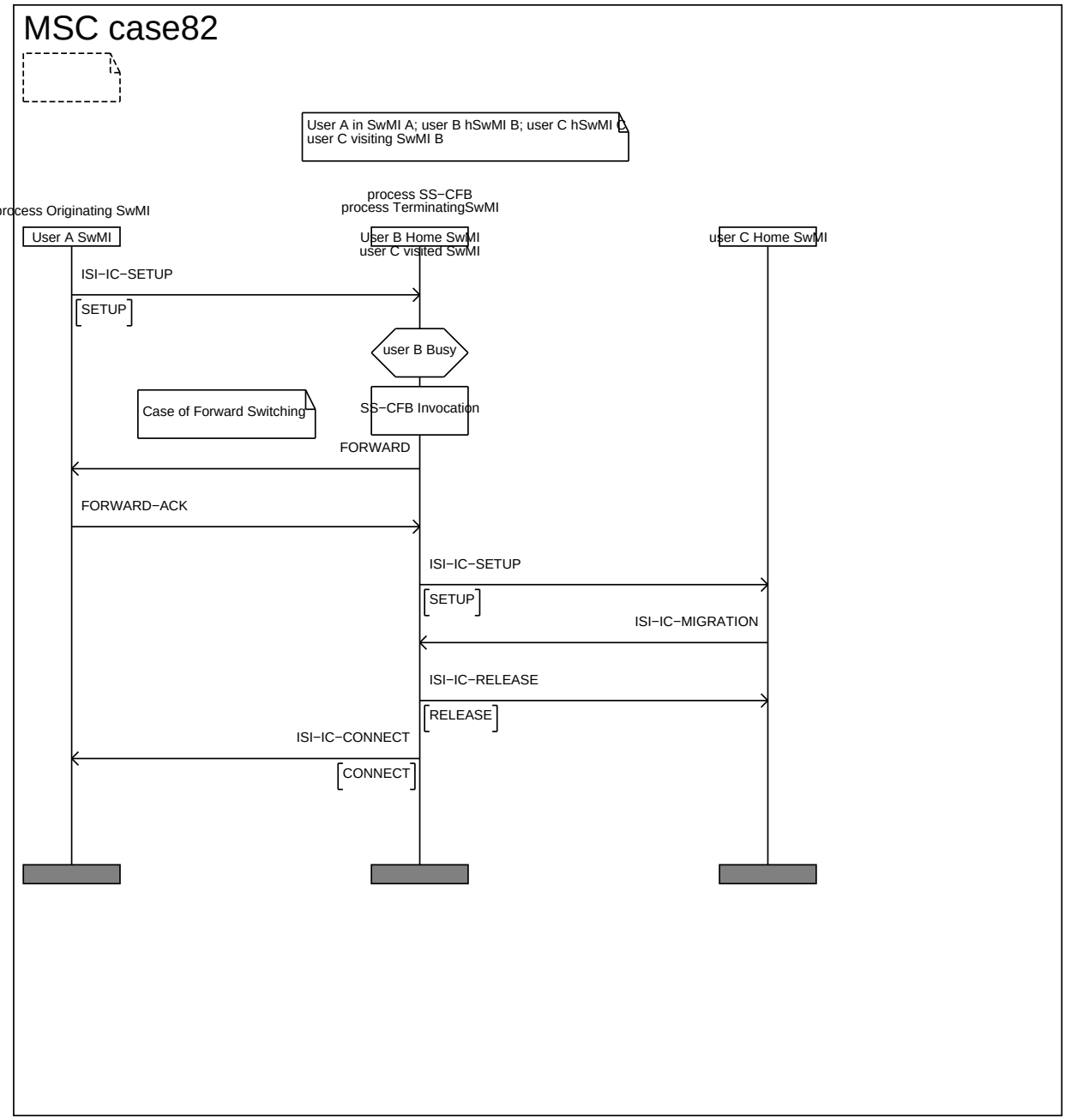

Figure A.15: Case 8-2

A.2.4.5 Case 9

The forwarded-to user with home SwMI, SwMI C is visiting SwMI A, different from the served user home SwMI, SwMI B. Both the calling user A and the served user, user B, are registered in their home SwMIs, SwMI C and SwMI B, respectively. When the calling user sets-up a call to user B, the initial process is similar to the process in case 6 until SS-CF is invoked for user B (in SwMI B). Depending on the routeing negotiation for the invoked ANF-ISIIC between SwMI A and SwMI B either:

- SwMI B will send the ISI-IC REDIRECT PDU to SwMI A to have the invoked ANF-ISIIC re-routed (from SwMI A) to SwMI C the home SwMI of the forwarded-to user. SwMI A will then send the ISI-IC SETUP PDU to SwMI C, user C home SwMI and clear its ISI-IC connection path to SwMI B. SwMI C will then identify that user C is registered in SwMI A, and will send the ISI-IC REDIRECT PDU to SwMI A informing that SwMI that user C, having migrated, is now registered in that SwMI. SwMI A will complete the establishment of the call to user C internally and clear the invoked ANF-ISIIC (notably in clearing the ISI connection which it had started to establish with SwMI C); or

- SwMI B will send the ISI-IC SETUP PDU to SwMI C as if it was going to forward switch the invoked ANF-ISIIC SwMI C will obtain user C new location from its (home SwMI) database, will recognize that user C is now in SwMI A, and will indicate this in the ISI-IC REDIRECT PDU which it sends directly to SwMI A. SwMI A will complete the establishment of the call internally and clear the invoked ANF-ISIIC (notably in clearing the ISI connection started to be established with SwMI C through SwMI B); SwMI A will 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 further invocation of a call forwarding supplementary service.

NOTE: As in case 8, there is no need for SwMI C to support any SS-CF protocol requirement in case 9.

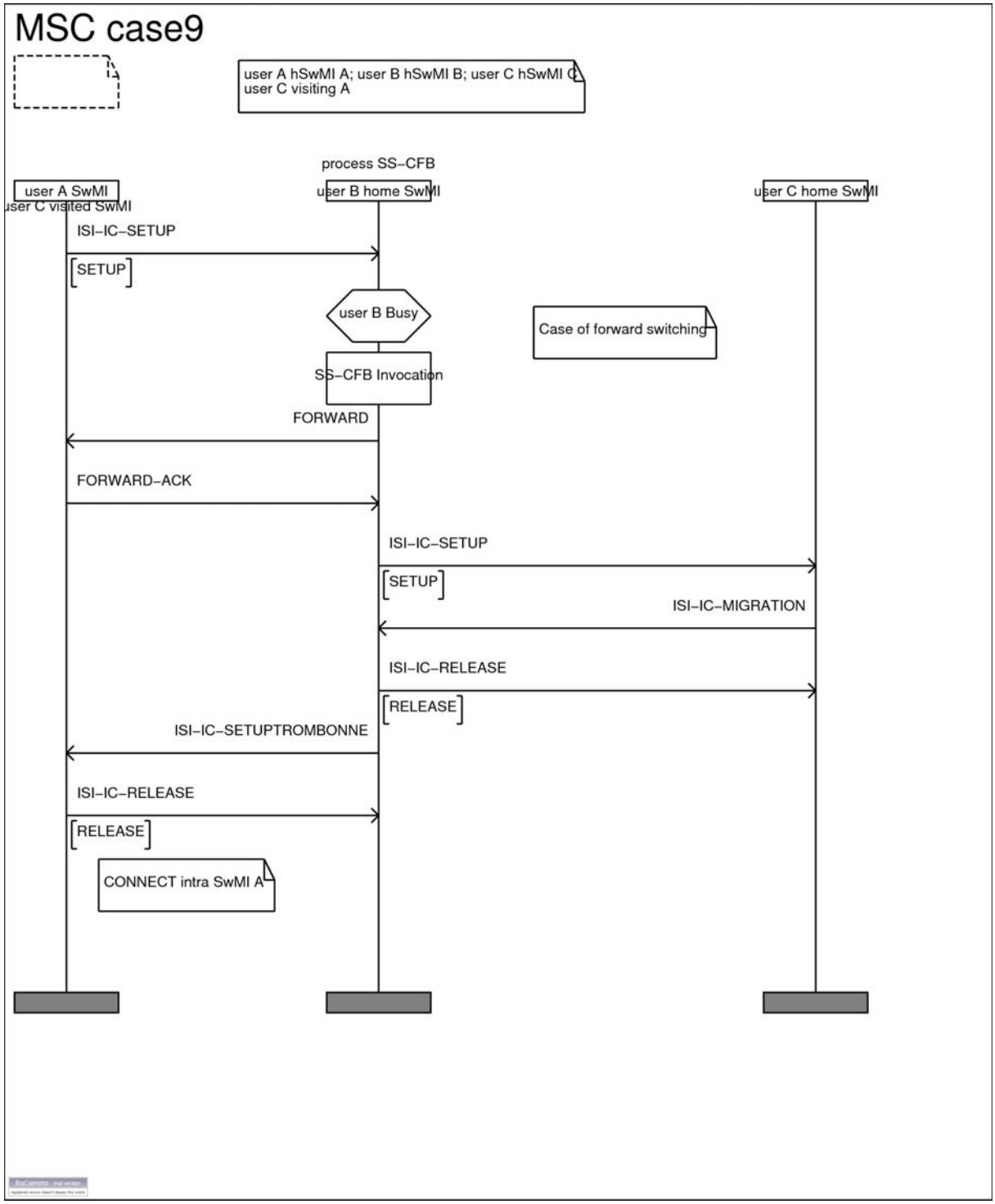

Figure A.16: Case 9-1

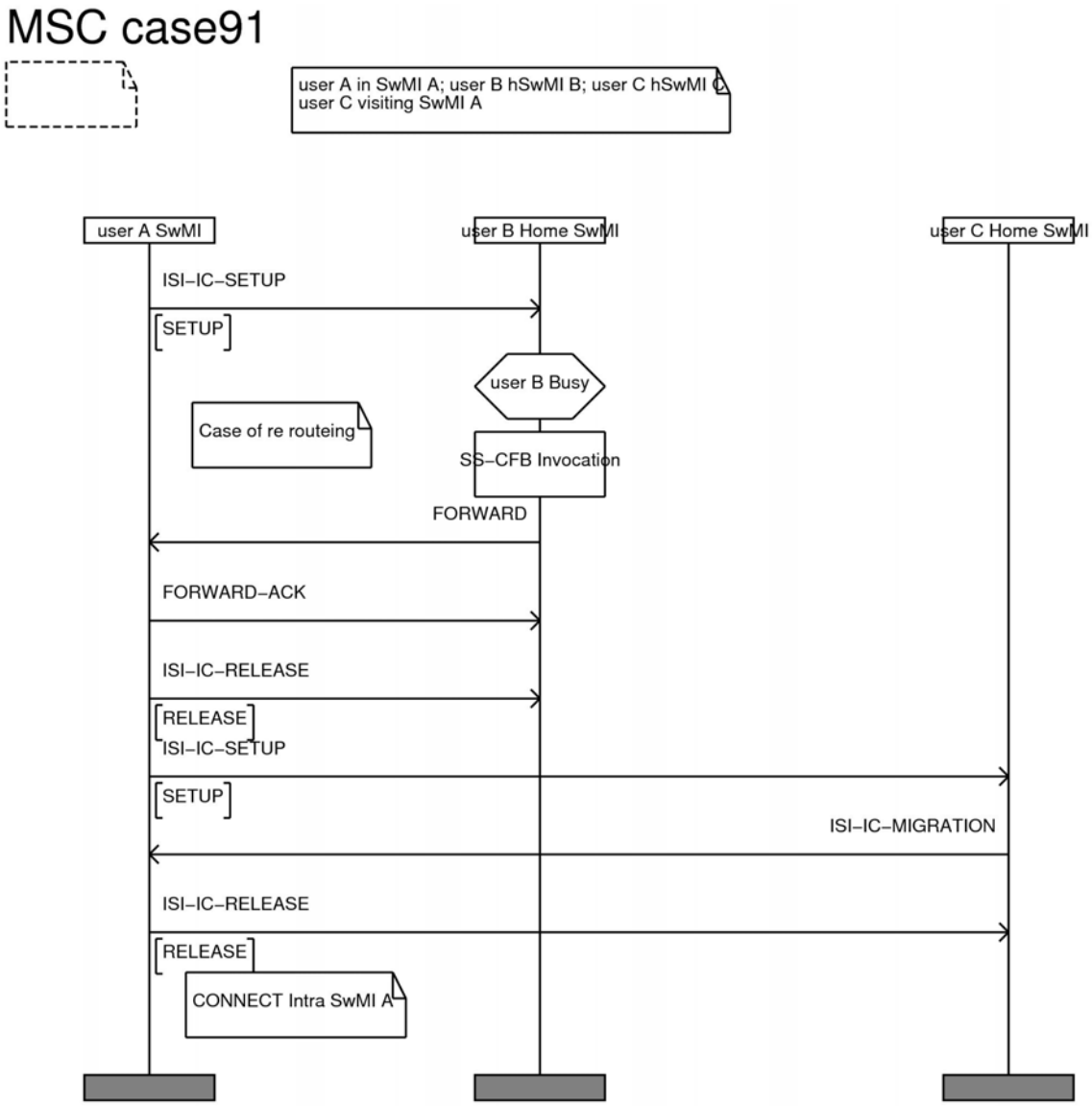

Figure A.17: Case 9-2

A.2.4.6 Case 12

This case is equivalent to a single (home) SwMI case on the SS-CF point of view. The forwarded-to SwMIs just need to support information exchange to the forwarded-to user in addition to the ISI basic call.

Annex B (normative): Interworking with other networks

B.1 Procedures for interworking with public ISDNs

B.1.1 Actions at an incoming gateway SwMI

When routeing a call entering the TETRA network, an incoming gateway SwMI shall set the value of the SS-CF invocation counter information element 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.

B.1.2 Actions at an outgoing gateway SwMI

An outgoing gateway SwMI may make use of a SS-CF invocation counter value received in an ISI-IC-SETUP message for interworking with another network that supports an equivalent feature. That outgoing gateway will convert the TETRA SS-CF invocation counter value into an ISDN compatible format.

B.1.3 Procedures where a call from the public ISDN is forwarded within or beyond TETRA

B.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 clause 8.3.1.1 of EN 300 196-1 [14]. 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;

NOTE: This option is the only one valid in the TETRA network.

- 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 will 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 will forward the information towards the calling network and not respond to the TETRA network.

B.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 will 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.

B.1.3.3 Presentation of a forwarded call from a public ISDN to the TETRA network

B.1.3.3.1 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 clause 8.3.1.1 of EN 300 196-1 [14]. 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.

B.1.3.3.2 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.

B.1.4 Procedures where a call from the TETRA network is forwarded within or beyond the public ISDN

The procedures as stated in clause B.1.5 shall apply.

B.1.5 Presentation of a forwarded call from a TETRA network to the public ISDN

B.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 clause 8.3.1.1 of EN 300 196-1 [14]. 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 interworking", if the number is not available due to interworking.

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.

B.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.

B.1.6 Procedures where a call from the public ISDN is forwarded within or beyond the TETRA network and partial re-routeing takes place in the public ISDN

B.1.6.1 Normal operation

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

- 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 will retain this information until a CONNECT message, or a clearing message is received for this call reference.

To request forwarding by partial re-routeing, for a call presented from the public network to the TETRA network, the TETRA network shall send a Call re-routeing invoke component to the public network in a FACILITY message using the procedure described in clause 8.3.1 of EN 300 196-1 [14]. 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-routeing invoke component shall contain:

a) in the re-routeing Reason parameter, the call re-routeing reason. If multiple forwardings have occurred, the re-routeing 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 in the SS-CF invocation counter information element;

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 [13];

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 [17]), 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 interworking", if the number is not available due to interworking; 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 [17]), 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 will assume "no notification".

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

The public network will 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.

B.1.6.2 Exceptional procedures

If the public network cannot accept the call forwarding invocation request from the TETRA network, it should use a rejection cause:

- "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 [13];
- "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 [12] for public ISDN and EN 300 392-3-2 [6] 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 and wait further signalling.

If the public network receives a reject component from the TETRA network, it shall take no protocol action but wait for further signalling.

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.

B.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 in the public ISDN.

For activation, deactivation and interrogation of the call forwarding supplementary services at the T reference point, the procedures of clause 9.1 of EN 300 207-1 [16] 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 clause 10.2.2.2 of EN 300 196-1 [14].

For invocation and operation of the forwarding supplementary services at the T reference point, the procedures of clause 9.2.4 of EN 300 207-1 [16] 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 [17])" or "unknown". The called party number information shall be indicated in the number digits field.

B.2 SS-CF Impact of interworking with non-ISDNs

B.2.1 Impact of interworking on incoming calls

When interworking with another network which supports equivalent supplementary services, the Incoming gateway SwMI may provide conversion between the signalling specified in the present document and the signalling protocol of the other network.

B.2.2 Impact of interworking on outgoing calls

When interworking with another network which supports equivalent supplementary services, the outgoing gateway SwMI may provide conversion between the signalling specified in the present document and the signalling protocol of the other network.

Annex C (normative): SS-CF profile for mobility management

C.1 Profile exchange

The SS-CF profile exchanges shall take place as defined in EN 300 392-3-5 [15].

C.2 Profile definitions

C.2.1 General on SS-CF profiles

This annex defines ISI profiles for SS-CF. If there is any conflict between this annex and ANF-ISIMM EN 300 392-3-5 [15], then the latter shall apply.

C.2.2 PDU definitions

C.2.2.1 SS-PROFILE REJECT PDU

The SS-PROFILE REJECT PDU shall be used to reject the invoked SS-profile update service. It shall be encoded as specified in table C.1.

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

Table C.1: Contents of SS-PROFILE REJECT PDU

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	

C.2.2.2 SS-PROFILE UPDATE PDU

The SS-PROFILE UPDATE PDU shall be used to invoke the SS-profile update service across the ISI. It shall be encoded as specified in table C.2.

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

Table C.2: Contents of SS-PROFILE UPDATE PDU

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.				

C.2.2.3 SS-PROFILE UPDATE RESPONSE PDU

The SS-PROFILE UPDATE RESPONSE PDU shall be used to report the successful outcome of the SS-profile update service and it shall be encoded as specified in table C.3.

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

Table C.3: Contents of SS-PROFILE UPDATE RESPONSE PDU

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.				

C.2.3 Information element definitions

C.2.3.1 Basic migration profile info

The Basic migration profile info 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 will be sent to the home SwMI MM.

The basic migration profile information element shall be encoded as specified in table C.4.

Table C.4: Basic migration profile info information element contents

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

C.2.3.2 Individual basic migration profile (original and temporary)

The encoding of the individual basic migration profile (original and temporary) information element shall be as defined in table C.5.

Table C.5: 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	
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	variable		C	Note 4
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 clause 33.2.87 of EN 300 392-3-5 [15]. There may be also multiple type 3 information elements, if the maximum length of type 3 elements would otherwise be exceeded.

C.2.3.3 Profile type

The Profile type information 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 C.6.

Table C.6: Profile type information element contents

Information element	Length	Value	Remark
Profile type	1	0_2	Individual subscriber
		1_2	Group

C.2.3.4 Profile status

The Profile status information 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 C.7.

Table C.7: Profile status information 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

C.2.3.5 SS-information

The SS-information 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 C.8.

Table C.8: SS-information information element contents

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

C.2.3.6 SS-information response

The SS-information response 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 C.9.

Table C.9: SS-information response information element contents

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

C.2.3.7 SS-migration profile (original)

The SS-migration profile (original) information element 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 C.10.

Table C.10: SS-migration profile (original) information element contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	SS-CF (see 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.				

C.2.3.8 SS-migration profile response (temporary)

The SS-migration profile (temporary) information element 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 C.11.

Table C.11: SS-migration profile (temporary) information element contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	SS-CF (see 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 EN 300 392-2 [1].				

C.2.3.9 SS-profile response status

The SS-profile response information 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 C.12.

Table C.12: SS-profile response status information 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

C.2.3.10 SS-profile update indicator

The SS-profile update indicator information 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 C.13.

Table C.13: SS-profile update indicator information element 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 (see note)
		11_2	Reserved
NOTE: The value "10_2" is not applicable for groups.			

C.2.3.11 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 C.14.

Table C.14: SS-response status information element contents

Information sub-element	Length	Value	Remark
SS-response status	2	00_2	Not supported
		01_2	Supported
		10_2	Reserved
		11_2	Reserved

C.2.3.12 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 C.15.

Table C.15: SS-status information element contents

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

C.2.3.13 SS-type

SS-type information element shall specify the TETRA supplementary service as defined in EN 300 392-9 [4], clause 8.1.

C.2.3.14 SS-CF profiles

C.2.3.14.1 SS-CF migration original profile

SS-CF original migration profile information element 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 C.16.

Table C.16: SS-CF original migration profile information element content

Information element	Length	Type	C/O/M	Value	Remarks
SS-Type	6	1	M		SS-CF
SS-CF provided	1	1	M	1	not provided
				0	provided, note 1
Forwarding type for voice calls	4	1	C		Note 2
Forwarding type for circuit mode data	4	1	C		Note 2
Forwarding type for SDS	4	1	C		Note 2
NOTE 1: If SS-CF is provided, at least one forwarding type shall be provided. NOTE 2: This information element shall be present only if the SS-CF provided information element is set to "provided".					

C.2.3.14.2 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 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.

At the time of the migration, the SS-CF invocation 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 C.17.

Table C.17: 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	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.

C.2.3.14.3 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 C.18.

Table C.18: Number of Call forwarding Types information element

Information sub-element	Length	Value	Remark
Number of Call forwarding Types	2	00_2	1 (see 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.

Annex D (informative): Specification and Description Language (SDL) representation of procedures

This annex is reserved for presenting procedures using SDL. Currently the protocols are using only a single state and the SDL presentation would add only little value.

Annex E (informative): Bibliography

- ETSI EN 300 392-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".
- ITU-T Recommendation Q.931: "SDN user-network interface layer 3 specification for basic call control".
- ISO 11572: "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol".
- ECMA-225: "Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Transit Counter Additional Network Feature (QSIG-TC)".

Annex F (informative): Change Requests

The present document implements change requests as defined in table F.1.

Table F.1: Change requests

No	CR vers.	Standard Version	Clauses affected	Title	CR Status
001	10	V1.1.1	4.2	Missing option in the served user service primitives	WG3 approved 090507
002	11	V1.1.1	4.3, 5.2.2.16, 5.4.1.2.1, 5.4.3.2.2	Reject cause values	WG3 approved 090507
003	10	V1.2.0	5.8	SDS and CFU interaction	WG3 approved 110908
004	10	V1.2.0	5.2.2.6	SS-LE PDU type for INTERROGATE2 ACK	WG3 approved 110407
005	10	V1.2.0	5.2.1.3	DEACTIVATE PDU Note 1 double negation correction	WG3 approved 110908

History

Document history		
V1.1.1	July 2003	Publication
V1.2.1	July 2010	Publication
V1.3.0	November 2011	One-step Approval Procedure OAP 20120321: 2011-11-22 to 2012-03-21