EUROPEAN TELECOMMUNICATION STANDARD

ETS 300 256

November 1993

Source: ETSI TC-ECMA

Reference: DE/ECMA-0006

ICS: 33.080

Key words: PTN, ECMA-173, CFSD

Private Telecommunication Network (PTN); Specification, functional models and information flows Diversion supplementary services

ETSI

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Foreword

This European Telecommunication Standard (ETS) has been produced by the European Computer Manufacturers Association (ECMA) on behalf of its members and those of the European Telecommunications Standards Institute (ETSI).

This ETS is one of a series of standards defining services and signalling protocols applicable to Private Telecommunication Networks (PTNs). The series uses the ISDN concepts as developed by CCITT and is also within the framework of standards for open systems interconnection as defined by ISO.

This particular ETS specifies the Call Forwarding Unconditional, Call Forwarding Busy, and Call Forwarding No Reply supplementary services.

The ETS is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO, CCITT, ETSI and other international and national standardisation bodies. It represents a pragmatic and widely based consensus.

The services specified are compatible with the equivalent services specified by ETSI for public ISDNs. The ETSI specifications (listed in annex B) are to be found in ETS 300 199, ETS 300 200 and ETS 300 201 (stage 1), and ETS 300 203, ETS 300 204 and ETS 300 205 (stage 2). Annex A describes the relationship between this ETS and the corresponding ETSs for the public ISDN.

This ETS was produced by ECMA using the ECMA guidelines for the production of standards and using the ECMA stylesheet. In order to avoid undue delays in the voting process for this ETS it has been agreed that this ETS will not be converted to the ETSI stylesheet.

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1 Scope

This European Telecommunication Standard (ETS) specifies the supplementary services Call Forwarding Unconditional (CFU), Call Forwarding Busy (CFB) and Call Forwarding No Reply (CFNR), which are applicable to various basic services supported by Private Telecommunication Networks (PTNs). Basic services are specified in ETS 300 171.

SS-CFU, SS-CFB and SS-CFNR are supplementary services which apply during call establishment providing a diversion of an incoming call to another destination.

Service specifications are produced in three stages, according to the method described in ENV 41005. This ETS contains the stage 1 and 2 specifications of the Call Forwarding supplementary services. The stage 1 specifications specify the supplementary services as seen by users of PTNs. The stage 2 specifications identify the functional entities involved in the supplementary services and the information flows between them.

2 Conformance

In order to conform to this ETS, a stage 3 standard shall specify signalling protocols and equipment behaviour that are capable of being used in a PTN which supports the supplementary services specified in this ETS. This means that, to claim conformance, a stage 3 standard is required to be adequate for the support of those aspects of the stage 1 and stage 2 clauses which are relevant to the interface or equipment to which the stage 3 standard applies.

The stage 1 and stage 2 clauses which a stage 3 standard for the Call Forwarding Unconditional supplementary service is required to support are clauses 6 and 9 respectively.

The stage 1 and stage 2 clauses which a stage 3 standard for the Call Forwarding Busy supplementary service is required to support are clauses 7 and 9 respectively.

The stage 1 and stage 2 clauses which a stage 3 standard for the Call Forwarding No Reply supplementary service is required to support are clauses 8 and 9 respectively.

3 References

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

ENV 41005	Method for the specification of basic and supplementary services of private telecommunication networks (1989).
ENV 41007	Definition of terms in private telecommunication networks (1989).
ETS 300 171	Private Telecommunication Network (PTN); Specification, functional models and information flows, Control aspects of circuit mode basic services (1992).
ETS 300 173	Private Telecommunication Network (PTN); Specification, functional models and information flows Identification supplementary services (1992).
ETS 300 189	Private Telecommunication Network (PTN); Addressing (1992).
ETS 300 237	Private Telecommunication Network (PTN); Specification, functional models and information flows, Name identification supplementary services (1993).

CCITT Recommendation I.112	Vocabulary of terms for ISDNs (1988).
CCITT Recommendation I.210	Principles of telecommunication services supported by an ISDN and the means to describe them (1988).
CCITT Recommendation Z.100	Specification and description language (1988).

4 Definitions

For the purpose of this ETS the following definitions apply.

4.1 External definitions

This ETS uses the following terms defined in other documents:

- Basic Service (CCITT Recommendation I.210);
- Connection (CCITT Recommendation I.112);
- Integrated Services Digital Network (CCITT Recommendation I.112);
- Private (ENV 41007);
- Private Telecommunication Network Exchange (ENV 41007);
- Public (ENV 41007);
- Public ISDN (ENV 41007);
- Service (CCITT Recommendation I.112);
- Signalling (CCITT Recommendation I.112);
- Supplementary Service (CCITT Recommendation I.210);
- Telecommunication Network (ENV 41007);
- Terminal, Terminal equipment (ENV 41007);
- User (ETS 300 171).

This ETS refers to the following basic call functional entities defined in ETS 300 171:

- Call Control;
- Call Control Agent.

This ETS refers to the following basic call inter-FE relationships defined in ETS 300 171:

- r1;
- r2;
- r3.

This ETS refers to the following basic call information flows defined in ETS 300 171:

- DISCONNECT request/indication;
- REPORT request/indication;
- RELEASE request/indication;
- SETUP request/indication;
- SETUP response/confirmation;
- SETUP REJECT request/indication.

4.2 Additional network feature

A capability over and above that of a basic service provided by a PTN, but not directly to a PTN user.

4.3 Busy

An ISDN destination is considered to be busy if either a "network determined user busy" or a "user determined user busy" condition exists.

4.4 Call, Basic call

An instance of the use of a basic service.

4.5 Connected number

The number of the user that answers (user C).

4.6 Diversion

The redirection of a call, on request of a called user and prior to answer, to a number different from the number of that called user.

4.7 Diverted-to number

The number to which a call is diverted.

4.8 Diverted-to subaddress

The subaddress to which a call is diverted.

4.9 Diverted-to user

The user to which a call is diverted.

4.10 Diverting cause

The parameter which contains the reason for the diversion, e.g. CFU, CFB, CFNR.

4.11 Diverting number

The number of the served user.

4.12 Forwarding

The type of diversion invoked automatically by the network in accordance with information previously registered in the network against the called number

NOTE 1

Forwarding can occur as a result of the supplementary services specified in this ETS (CFU, CFB, CFNR). Diversions of types other than forwarding (e.g. Call Deflection, whereby the diversion is invoked by action of the called user) are outside the scope of this edition of this ETS.

4.13 Forward switching

Network routeing algorithm which performs the diversion 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.

4.14 Last diverting user

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

4.15 Original called number

The number of user B (in case of multiple call diversion user B1).

4.16 Original called user

The first served user of a call which is subject to one or more stages of call diversion, i.e. user B or user B1.

4.17 Partial re-routing

Network routeing algorithm which performs the call diversion by replacing a particular part of the connection from user A's node (located in the public ISDN) to user B's node (located in a private ISDN) by another connection from user A's node to user C's node (located in the public ISDN). The new connection is established completely within the public ISDN by joining together the original connection from user A's node to the public ISDN gateway node and a second, new connection from the public ISDN gateway node to user C's node.

NOTE 2

Re-routing by a Transit PTNX is not considered as partial re-routing.

4.18 Presentation indicator

The indicator showing whether the diverted-to number should be presented to the calling user, as derived from user C's COLR supplementary service.

4.19 PTN number

A number belonging to a PTN numbering plan (CCITT Recommendation E.164 ISDN/Private/Implicit numbering plan) specified in ETS 300 189.

4.20 Re-routing

Network routeing algorithm which performs the call diversion by replacing the connection from user A's node to user B's node by another connection, possibly using some of the elements of the old connection, from user A's node to user C's node.

4.21 Served user

The user of a particular PTN number who is requesting that calls to his number be diverted. This user may also be referred to as the diverting user or the called user.

4.22 User A

The calling user of a call which is subject to call diversion.

4.23 User B

The served (diverting) user of a call which is subject to call diversion.

4.24 User B1, user B2, user B3, etc.

Served (diverting) users of a call which is subject to multiple stages of diversion. B1 is the first served user, B2 is the second served user, B3 is the third served user, etc.

NOTE 3

B2 is also the diverted-to user with respect to the first stage of call diversion, B3 is also the diverted-to user with respect to the second stage of call diversion, etc.

4.25 User C

The diverted-to user with respect to the final stage of call diversion.

5 List of acronyms

ANF	Additional Network Feature
CC	Call Control (functional entity)
CCA	Call Control Agent (functional entity)
CLIP	Calling Line Identification Presentation
CLIR	Calling/Connected Line Identification Restriction
CNIP	Calling Name Identification Presentation
CNIR	Calling/Connected Name Identification Restriction
COLP	Connected Line Identification Presentation
CONP	Connected Name Identification Presentation
DTN	Diverted-to Number
FE	Functional Entity
ISDN	Integrated Services Digital Network
MSN	Multiple Subscriber Number
NDUB	Network Determined User Busy
NSO	Notification Subscription Option
PTN	Private Telecommunication Network
PTNX	Private Telecommunication Network Exchange
SDL	Specification and Description Language
SS-CF, CF	Call Forwarding supplementary services
SS-CFB, CFB	Call Forwarding Busy supplementary service
SS-CFNR, CFNR	Call Forwarding No Reply supplementary service
SS-CFU, CFU	Call Forwarding Unconditional supplementary service
TE	Terminal Equipment
UDUB	User Determined User Busy

6 SS-CFU stage 1 description

6.1 Description

6.1.1 General description

SS-CFU enables a served user to have the PTN redirect to another user calls which are addressed to the served user's PTN 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 SS-CFU has been activated, calls are forwarded independently of the status of the served user.

CFU is provided on a per PTN number basis.

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

6.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all basic services defined in ETS 300 171.

6.2 Procedures

6.2.1 Provision/withdrawal

Provision and withdrawal of CFU shall be by pre-arrangement with the service provider.

CFU subscription shall be on a per PTN number basis. For a given PTN number, this service (including options) may be subscribed to separately for some or all basic services to which the user of the number subscribes, or collectively for all the basic services to which the user subscribes.

The subscription parameters and values offered by a PTN are an implementation matter. A stage 3 standard shall support the parameters and values specified in table 1. A PTN may offer more or less parameters and values than those specified in table 1.

Parameters apply separately to each basic service subscribed to on each PTN number. For each subscription parameter, only one value is selectable.

Table 1 - Subscription options

	Subscription Parameter	Value
*	Served user receives notification that call has been forwarded	- No - Yes
*	Calling user receives notification that call has been diverted	- No - Yes, without diverted-to number/name - Yes, with diverted-to number/name
*	Served user releases his/her number/name to diverted-to user	- No - Yes

6.2.2 Normal procedures

6.2.2.1 Activation/deactivation/interrogation/registration

CFU may be either permanently activated or activated/deactivated under user control.

If activation/deactivation is under user control, the PTN may provide for activation/deactivation by the served user (local activation/deactivation), by another user (remote activation/ deactivation) or both.

The PTN may provide interrogation, which can be local, remote or both.

Registration of information is performed on activation of CFU. There are no separate registration procedures.

6.2.2.1.1 Local activation/deactivation

The served user shall be able to activate CFU separately for each basic service for which CFU is subscribed to and thereby request a different diverted-to number and/or subaddress for each basic service for which CFU is subscribed, and/or shall be able to activate CFU for all basic services for which CFU is subscribed to.

To activate CFU, the served user shall supply:

1. the diverted-to number, which may be accompanied by a diverted-to subaddress;

2. information as to whether CFU is to apply to all basic services for which CFU is subscribed to or to a specific basic service out of the basic services for which CFU is subscribed to;

3. where there is more than one PTN number assigned to the access (i.e. in the context of an MSN arrangement), the PTN number for which CFU shall apply.

Verification that the diverted-to number exists and that the specified basic service is subscribed to at that number may be carried out before accepting the CFU activation request.

The service provider shall return notification of acceptance of the request. Notification of acceptance shall include the number of the diverted-to user to whom the CFU is active.

If a single number **is** used by more than one terminal, activation/deactivation of CFU shall be possible from any terminal which uses this number. When the served user has more than one compatible terminal for the basic service(s) specified at activation time, notification of successful activation/deactivation shall be sent to all the compatible terminals.

In the absence of any of the parameters in the activation procedure (e.g. the diverted-to number), default parameters already known to the PTN may be used.

It shall be possible to deactivate CFU by means of an explicit request for deactivation. A explicit request for deactivation shall be treated as follows:

– if deactivation of CFU for an individual basic service is requested, it shall be accepted only if CFU is already activated for that basic service and shall result in the discarding of the diverted-to number and diverted-to subaddress;

– if deactivation of CFU collectively for all basic services is requested, it shall result in the discarding of any diverted-to numbers and diverted-to subaddresses for individual basic services and any diverted-to number and diverted-to subaddress collectively for all basic services.

It shall be possible to deactivate CFU by activating CFU to a different diverted-to number and/or different diverted-to subaddress. A request for activation of CFU when CFU is already activated shall be treated as follows:

– if activation of CFU for an individual basic service is requested, it shall be accepted only if CFU is not already activated collectively for all basic services and, if CFU is already activated for that individual supplementary service, shall result in the overwriting of the existing diverted-to number and diverted-to subaddress;

– if activation of CFU collectively for all basic services is requested, it shall result in the discarding of any existing diverted-to numbers and diverted-to subaddresses for individual basic services and the overwriting of any existing diverted-to number and diverted-to subaddress collectively for all basic services.

6.2.2.1.2 Remote activation/deactivation

Remote activation/deactivation of CFU shall use one or more of the following procedures:

1. A special authorised user may activate and/or deactivate CFU at the served user. Authorisation shall be implementation dependent (e.g. attendants may be authorised);

2. A user may activate CFU at the served user such that the activating user becomes the diverted-to user, subject to the served user having remote activation enabled in advance. The intended diverted-to user shall be able to activate CFU regardless of whether CFU is already active. The served user may disable a remote activation at any time. If the disable procedure is performed whilst CFU is activated, the CFU shall not be automatically deactivated. The enable and disable procedure may be performed either by the served user or by an implementation specific entity;

3. The diverted-to user may deactivate CFU at the served user. This shall not be dependent on whether the served user has enabled remote activation. The diverted-to user shall lose this capability as soon as CFU is deactivated in this way, and shall not regain the capability if CFU is activated again to a different diverted-to user;

4. The diverted-to user, at the same time as deactivating CFU in accordance with item 3. above, may be able to activate CFU from the served user to another diverted-to user (i.e. change the destination of CFU). The diverted-to user shall lose this capability as soon as CFU is reactivated in this way. The new diverted-to user shall gain the capability.

When a remote activation/deactivation procedure is successfully performed, the activating/deactivating user and the served user shall be notified. This notification shall include the number of the diverted-to user, the basic service and the served user number.

It shall be possible, that the served user activates CFU and the remote user deactivates CFU and vice versa.

NOTE 4

The use of a password facility for remote activation as an implementation option is not excluded.

6.2.2.1.3 Local interrogation

If local interrogation is provided, a PTN shall support interrogation on a per number basis for all basic services and/or for a user specified basic service. Where there is more than one PTN number assigned to the access (i.e. in the context of an MSN arrangement), the user shall supply the PTN number, for which interrogation of CFU is required. The PTN response to an interrogation request shall provide the following information to the user:

- activated or deactivated state of the supplementary service;

- if activated:

  – diverted-to number and, if applicable, diverted-to subaddress;
  – whether activated for all basic services or an individual basic service and the identity of the individual basic service.

As additional information, the interrogation may provide information to the served user, whether remote activation has been enabled (allowed).

Where interrogation is for all basic services for which CFU is subscribed to and CFU has been activated separately for more than one basic service, the above information shall be repeated for each activation.

6.2.2.1.4 Remote interrogation

If remote interrogation is provided, it shall be possible from one or both of the following remote users:

1. A special authorised user may interrogate CFU conditions on the served user. Authorisation shall be implementation dependent (e.g. attendants may be authorised);

2. The diverted-to user may interrogate CFU at the served user.

The remote interrogation request and response shall include the information as specified for local interrogation and additionally the PTN number of the served user.

6.2.2.2 Invocation and operation

All incoming calls indicating a basic service for which CFU is active shall be diverted without being presented to the served user.

6.2.2.2.1 Served user notification

The served user, as a subscription option, may receive notification of the diversion (but will not be able to answer the incoming call). This notification shall be given as soon as the PTN originates the call to the diverted-to user.

This notification shall include the following information (on the call that has been diverted):

1. indication that a call has been forwarded and the reason (CFU);

2. Bearer Capability information and, if available, High Layer Compatibility information and Low Layer Compatibility information;

3. user B's number (applicable in the context of an MSN arrangement).

If multiple diversions have occurred, the notification shall include in addition:

4. original called user's number, if presentation is permitted by the original called user;

5. last diverting user's number, if presentation is permitted by the last diverting user;

6. cause for last diversion.

6.2.2.2.2 Diverted-to user notification

The diverted-to user shall receive an indication that the call has been diverted with the appropriate diversion cause. According to the served user's subscription option, the diverted-to user may receive the served user's number.

If multiple diversion has occurred, the diverted-to user may receive the original called user's number and the last diverting user's number, according to subscription options at those two users. When multiple diversion occurs, the reason for diversion given to the diverted-to user shall relate to the last stage of diversion.

The notification to the diverted-to user may, provided the subscription options allow, additionally include the identification of the served user's name (in case of multiple diversion the name of the original called user and of the last diverting user).

6.2.2.2.3 Calling user notification

As a subscription option of the served user, the calling user may receive a notification that the call has been diverted and as an additional option that notification may include the diverted-to user's number.

For single diversion, notifications shall be sent to the calling user depending on the subscription option of the served user as follows:

- If "No", no notification shall be sent to user A;

- If "Yes, without diverted-to number/name", a notification without number/name shall be sent to user A;

- If "Yes, with diverted-to number/name", a notification with user C's number and optionally the user C's name shall be sent to user A if CLIR/CNIR is not invoked by user C.

For multiple diversions, notifications shall be sent to the calling user depending on the subscription options of the served users as follows:

- If user B1 has "No", no notification shall be sent to user A;

- If user B1 does not have "No", a notification shall be sent to user A as a result of the diversion at user B1. Diversions at successive served users B2, B3, etc. each shall also result in a notification to user A, but only if both:

  - the alerting state has been reached at the served user, and

  - none of the served users has the "No" option.

The number and optionally the name of user C shall be sent to user A, but only if both:

- all served users have "Yes, with diverted-to number/name", and

- CLIR/CNIR is not invoked by user C.

In addition, the number and optionally the name of a user Bn may be sent to user A, if the alerting state has been reached at user Bn, if all users B1 to Bn-1 have "Yes, with diverted-to number/name", and if there is no possibility of CLIR/CNIR being invoked at user Bn.

6.2.3 Exceptional procedures

6.2.3.1 Activation/deactivation

If the PTN cannot accept an activation request, the activating user shall receive a notification that CFU activation was unsuccessful. Possible causes for rejection are e.g.:

- service or option not subscribed to;
- insufficient information;
- diverted-to number is a special service code (e.g. police);
- diverted-to number is the served user's number;
- diverted-to number is an invalid PTN number;
- incorrect served user's number;
- CFU has not been subscribed to for the basic service for which activation is requested.

If the PTN cannot accept a deactivation request, the deactivating user shall receive a notification that CFU deactivation was unsuccessful. Possible causes for rejection are e.g.:

- service or option not subscribed to;
- insufficient information;
- service not activated;
- incorrect served user's number.

If activation/deactivation is unsuccessful, the PTN shall inform only the terminal from which the request was received.

If activation or deactivation of CFU for an individual basic service is requested and CFU is already activated collectively for all basic services, the request shall be denied.

In case of remote activation/deactivation the notification of an unsuccessful activation/ deactivation request shall be sent to the activating/deactivating user only.

6.2.3.2 Interrogation

If the PTN cannot accept an interrogation request, the interrogating user shall receive a notification that CFU interrogation was unsuccessful. Possible causes for rejection are e.g.:

- service or option not subscribed to;

- insufficient information;
- basic service to which relevance is requested is not subscribed to.

6.2.3.3 Invocation and operation

CFU shall not be invoked on a call to the served user if the call uses a basic service that is not subscribed to by the served user on a basic service for which CFU has not been activated.

In cases where an user normally receives, as part of notification, the number of the diverted-to user, the last diverting user or the original called user and this number is unavailable (e.g. due to number presentation restriction, or interworking), the user who would have been given the number shall receive an indication of the reason why no number is given.

In cases where an user normally receives, as part of notification, the name of the diverted-to user, the last diverting user or the original called user and this name is unavailable (e.g. due to number presentation restriction, or interworking), the user who would have been given the name may receive an indication of the reason why no name is given.

Within a PTN the total number of all diversions for each call shall be limited. The maximum number of such diversions for each call shall be an implementation option. When counting the number of diversions, all types of diversions shall be included. If the limit is reached and an attempt is made to divert the call an additional time, either the calling user shall receive call clearing with an appropriate cause or further diversions shall be overridden by presenting the call to the served user.

If the diverted call cannot be completed to the diverted-to destination, then the PTN shall clear the call. Specifically, if CFU has been invoked and CFNR has not occurred previously during the call setup, then the call shall be cleared back towards the calling user and to the calling user shall be sent an indication that the call cannot be completed. This indication shall not reveal that the call has been diverted. If CFNR has previously occurred, then the procedures for the failure of CFNR shall apply.

The diversion may be overridden for specific calls, e.g. calls from the diverted-to user to the diverting user. The conditions for this shall be implementation specific.

6.3 Interactions with other supplementary services and ANFs

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

6.3.1 Calling Line Identification Presentation (CLIP)

Served user: if subscribed to, the served user shall receive, as part of the served user notification of diversion, the Calling Line Identification of the diverted call, unless CLIR applies and the served user has no override capability.

Diverted-to users, who have subscribed to CLIP shall receive the calling user's number unless CLIR applies and the diverted-to user has no override capability.

6.3.2 Connected Line Identification Presentation (COLP)

If the served user or any served user in the case of multiple diversions, subscribes to the option that the calling user is not notified of diversion, then the calling user shall not be provided with COLP, unless the calling user has override capability.

If the served user or any served user in the case of multiple diversions, subscribes to the option that the calling user is notified, but without the diverted-to user number, then the calling user shall not be provided with COLP, unless the calling user has an override capability.

6.3.3 Calling/Connected Line Identification Restriction (CLIR)

When diversion occurs, the identity of a calling PTN user which has invoked CLIR, shall not be presented to the diverting user or the diverted-to user, unless the diverting user or diverted-to user has the service profile to override this restriction.

A diverted-to PTN user which has invoked CLIR shall not have its identity presented to the calling user, either as COLP or as part of a notification of diversion, unless the calling user has an override service profile. A diverted-to user which is provided with CLIR temporary mode shall not have its identity revealed to the calling user as part of a notification of call diversion until the diverted-to user has responded and it is known that restriction is not to be invoked, unless the calling user has an override service profile.

NOTE 5

The invocation of CLIR at the diverting user has no impact on Call Diversion.

6.3.4 Calling Name Identification Presentation (CNIP)

Unless CNIR has been invoked and the diverted-to user has no override capability, the name of the calling user shall be provided to the diverted-to user. In addition, unless restriction applies and the served user has no override capability, the served user (or users if the call is diverted more than once) shall receive the name of the calling user as part of any notification to the served user that a call has been diverted.

6.3.5 Connected Name Identification Presentation (CONP)

If the served user or any served user in the case of multiple diversions, subscribes to the option that the calling user is not notified of diversion, then the calling user shall not be provided with CONP, unless the calling user has override capability.

If the served user or any served user in the case of multiple diversions, subscribes to the option that the calling user is notified, but without the diverted-to user number/name, then the calling user shall not be provided with CONP, unless the calling user has an override capability.

In all other cases, the provision of the diverted-to user's name shall be in accordance with CONP.

6.3.6 Calling/Connected Name Identification Restriction (CNIR)

When diversion occurs, the name of a calling PTN user which has invoked CNIR, shall not be presented to the diverting user or the diverted-to user, unless the diverting user or diverted-to user has the service profile to override this restriction.

A diverted-to PTN user which has invoked CNIR shall not have its name presented to the calling user, either as CONP or as part of a notification of diversion, unless the calling user has an override service profile. A diverted-to user which is provided with CNIR temporary mode shall not have its identity revealed to the calling user as part of a notification of call diversion until the diverted-to user has responded and it is known that restriction is not to be invoked, unless the calling user has an override service profile.

NOTE 6

The invocation of CNIR at the diverting user has no impact on Call Diversion.

6.3.7 Call Forwarding Busy (CFB)

The invocation of CFU shall take precedence over CFB.

6.3.8 Call Forwarding No Reply (CFNR)

The invocation of CFU shall take precedence over CNFR.

6.3.9 Call Transfer (CT)

No interaction.

6.3.10 Path Replacement (PR)

No interaction.

6.4 Interworking considerations

When interworking with another network, the implementation specific limit of the total number of known diversions for each call shall still apply.

Where a remote user is on a different network, notifications to the remote user, if applicable, shall be sent to the remote user's network for diversion to the remote user. Numbers included in this information shall be provided as required for the other network.

If the private network detects diversion back to a destination in the public network, the private network may request that diversion is performed by the public network.

The PTN may activate, deactivate and interrogate CFU in the public ISDN on behalf of a PTN user.

6.5 Overall SDL

Figure 1 contains the dynamic description of SS-CF using the Specification and Description Language (SDL) defined in CCITT Recommendation Z.100. The SDL process represents the behaviour of the network in providing SS-CF.

Output signals to the left represent primitives to the calling user. Output signals to the right represent primitives to the served user or to the diverted-to user. Input signals from the right represent internal stimuli.

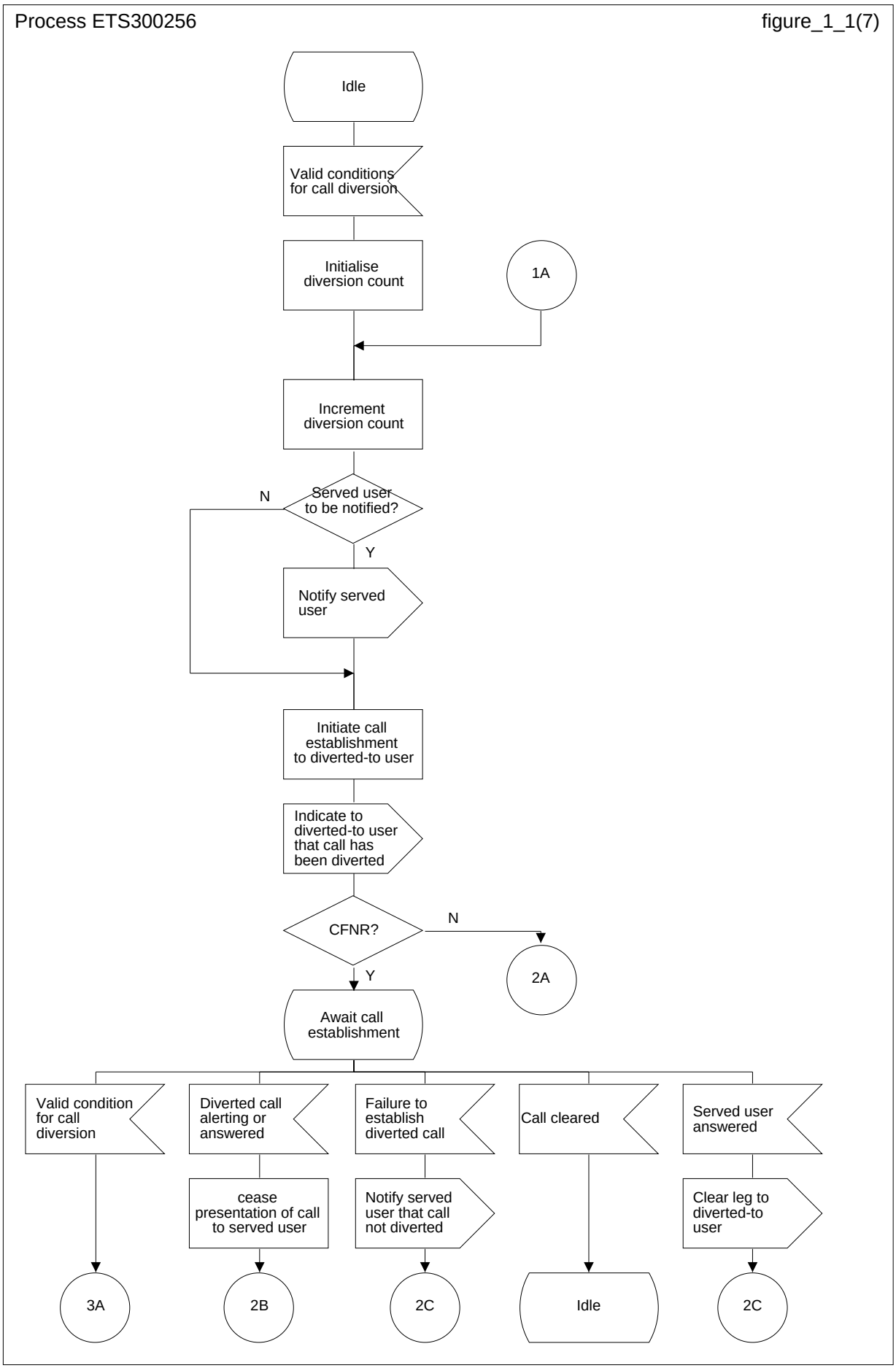

Figure 1 (sheet 1 of 3) - SS-CF, Overall SDL

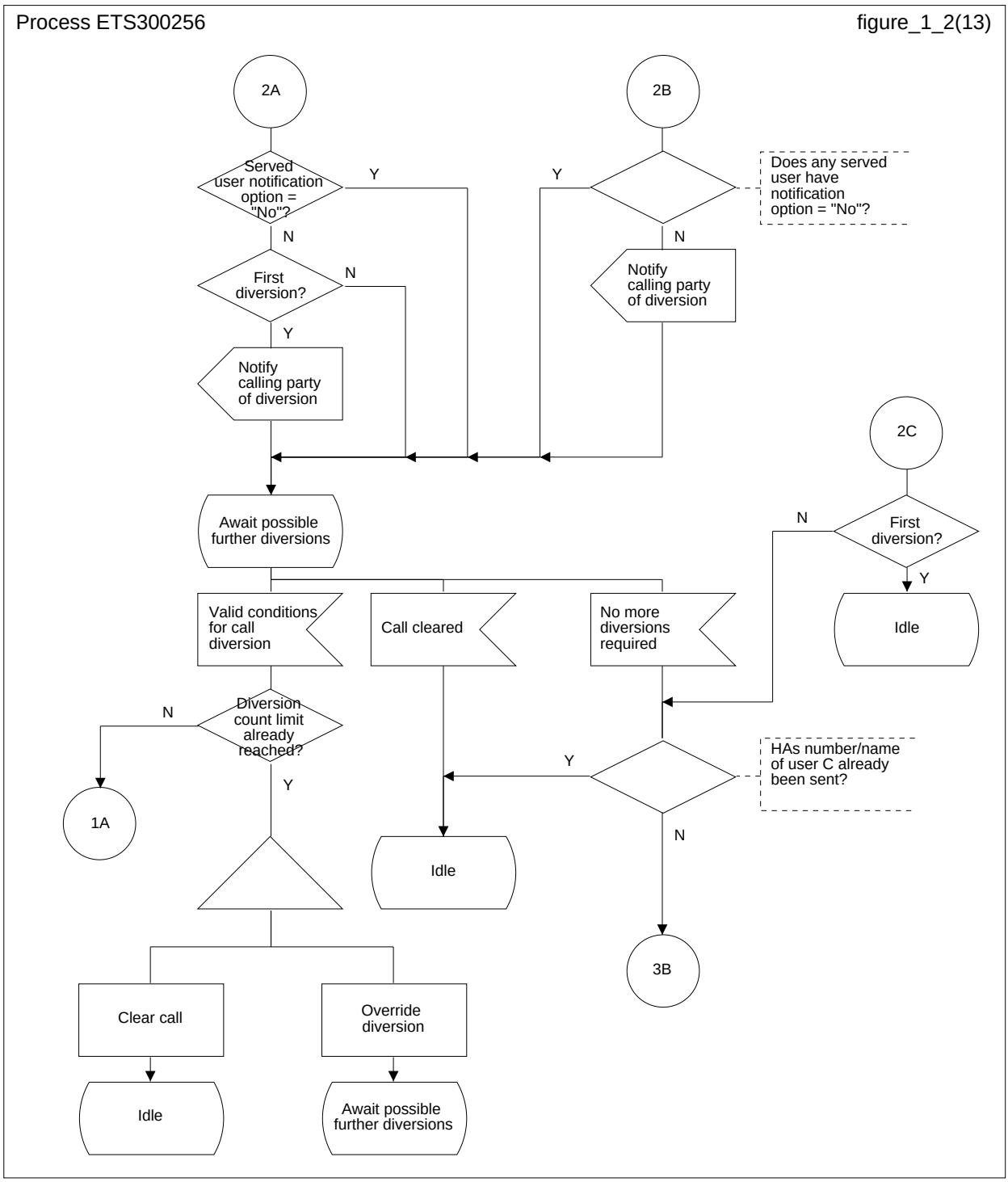

Figure 1 (sheet 2 of 3) - SS-CF, Overall SDL

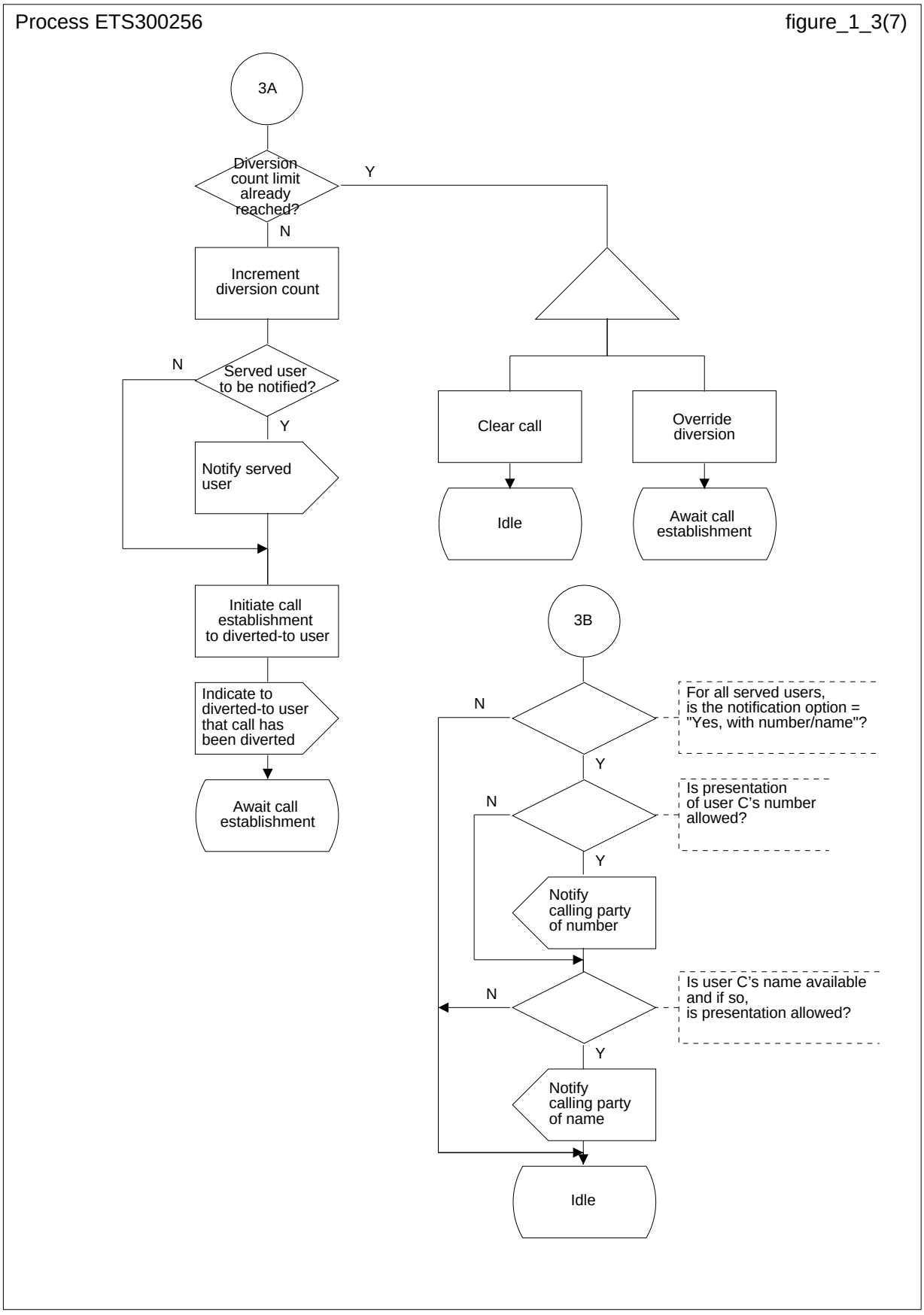

Figure 1 (sheet 3 of 3) - SS-CF, Overall SDL

7 SS-CFB stage 1 description

7.1 Description

7.1.1 General description

SS-CFB enables a served user to have the PTN redirect to another user calls which are addressed to the served user's PTN 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.

CFB is provided on a per PTN number basis.

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

7.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all basic services defined in ETS 300 171.

7.2 Procedures

7.2.1 Provision/withdrawal

6.2.1 shall apply with "CFU" replaced by "CFB".

7.2.2 Normal procedures

7.2.2.1 Activation/deactivation/interrogation/registration

6.2.2.1 shall apply with "CFU" replaced by "CFB".

7.2.2.2 Invocation and operation

All incoming calls indicating a basic service for which CFB is active shall be diverted if the served user is busy.

7.2.2.2.1 Served user notification

6.2.2.2.1 shall apply with "CFU" replaced by "CFB".

7.2.2.2.2 Diverted-to user notification

6.2.2.2.2 shall apply.

7.2.2.2.3 Calling user notification

6.2.2.2.3 shall apply.

7.2.3 Exceptional procedures

6.2.3 shall apply with "CFU" replaced by "CFB".

7.3 Interactions with other supplementary services and ANFs

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

7.3.1 Calling Line Identification Presentation (CLIP)

6.3.1 shall apply.

7.3.2 Connected Line Identification Presentation (COLP)

6.3.2 shall apply.

7.3.3 Calling/Connected Line Identification Restriction (CLIR)

6.3.3 shall apply.

7.3.4 Calling Name Identification Presentation (CNIP)

6.3.4 shall apply.

7.3.5 Connected Name Identification Presentation (CONP)

6.3.5 shall apply.

In addition, as an implementation option, if user C is also busy, the original user's name may be presented to the calling user instead of the user's C name.

7.3.6 Calling/Connected Name Identification Restriction (CNIR)

6.3.6 shall apply.

7.3.7 Call Forwarding Unconditional (CFU)

The invocation of CFU shall take precedence over CFB.

7.3.8 Call Forwarding No Reply (CFNR)

No interaction.

7.3.9 Call Transfer (CT)

No interaction.

7.3.10 Path Replacement (PR)

No interaction.

7.4 Interworking considerations

6.4 shall apply with "CFU" replaced by "CFB".

7.5 Overall SDL

6.5 shall apply.

8 SS-CFNR stage 1 description

8.1 Description

8.1.1 General description

SS-CFNR enables a served user to have the PTN redirect to another user calls which are addressed to the served user's PTN number and for which the connection is not established within a defined period of time. SS-CFNR 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-CFNR.

CNFR is provided on a per PTN number basis.

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

8.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all basic services defined in ETS 300 171.

8.2 Procedures

8.2.1 Provision/withdrawal

6.2.1 shall apply with "CFU" replaced by "CFNR".

8.2.2 Normal procedures

8.2.2.1 Activation/deactivation/interrogation/registration

6.2.2.1 shall apply with "CFU" replaced by "CFNR".

8.2.2.2 Invocation and operation

All incoming calls indicating a basic service for which CFNR is active shall be diverted if the served user does not reply within a specified time interval.

The original call shall continue to alert the served user, who shall still be able to accept the call until the call to the diverted-to user has reached an alerting state.

8.2.2.2.1 Served user notification

6.2.2.2.1 shall apply with "CFU" replaced by "CFNR".

8.2.2.2.2 Diverted-to user notification

6.2.2.2.2 shall apply.

8.2.2.2.3 Calling user notification

6.2.2.2.3 shall apply.

8.2.3 Exceptional procedures

8.2.3.1 Activation/deactivation

6.2.3.1 shall apply with "CFU" replaced by "CFNR".

8.2.3.2 Interrogation

6.2.3.2 shall apply.

8.2.3.3 Invocation and operation

CFNR shall not be invoked on a call to the served user if the call uses a basic service for which CFNR has not been activated.

In cases where a user normally receives, as part of notification, the number of the diverted-to user, the last diverting user or the original called user and this number is unavailable (e.g. due to number presentation restriction, or interworking), the user who would have been given the number shall receive an indication of the reason why no number can be given.

Within a PTN the total number of all diversions for each call shall be limited. The maximum number of such diversions for each call is an implementation option. When counting the number of

diversions, all types of diversions shall be included. If the limit is reached and an attempt is made to divert the call an additional time, the diversion shall be overridden.

If the diverted call cannot be completed to the diverted-to destination, then the PTN shall clear the diverted leg of the call and continue to alert the diverting user. If the user has already been notified of CFNR, then the user shall be notified of failure of CFNR.

The call diversion may be overridden for specific calls, e.g. calls from the diverted-to user to the diverting user. The conditions for this shall be implementation specific.

8.3 Interactions with other supplementary services and ANFs

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

8.3.1 Calling Line Identification Presentation (CLIP)

Diverted-to users, who have subscribed to CLIP shall receive the calling user's number unless CLIR applies and the diverted-to user has no override capability.

NOTE 7

If subscribed to, the served (diverting) user receives the Calling Line Identification of all calls, unless CLIR applies and the served user has no override capability.

8.3.2 Connected Line Identification Presentation (COLP)

6.3.2 shall apply.

8.3.3 Calling/Connected Line Identification Restriction (CLIR)

6.3.3 shall apply.

8.3.4 Calling Name Identification Presentation (CNIP)

Diverted-to users, who have subscribed to CNIP shall receive the calling user's name unless CNIR applies and the diverted-to user has no override capability

NOTE 8

If subscribed to, the served (diverting) user receives the Calling Name Identification of all calls, unless CNIR applies and the served user has no override capability.

8.3.5 Connected Name Identification Presentation (CONP)

If the served (diverting) user subscribes to the option that the calling user is not notified of call diversion, then the calling user shall not be provided with CONP, unless the calling user has override capability.

If the served (diverting) user subscribes to the option that the calling user is notified, but without the diverted-to user number/name, then the calling user shall not be provided with CONP, unless the calling user has an override capability.

In all other cases, the provision of the diverted-to user's name on answer shall be in accordance with CONP. The diverted-to user's name shall not be provided on commencement of alerting.

8.3.6 Calling/Connected Name Identification Restriction (CNIR)

6.3.6 shall apply.

8.3.7 Call Forwarding Unconditional (CFU)

The invocation of CFU shall take precedence over CFNR.

8.3.8 Call Forwarding Busy (CFB)

No interaction.

8.3.9 Call Transfer (CT)

If user C who has subscribed to CFNR, does not answer the transferred call, then upon expiration of the CFNR timer, the CFNR shall be attempted.

8.3.10 Path Replacement (PR)

No interaction.

8.4 Interworking considerations

6.4 shall apply with "CFU" replaced by "CFNR".

8.5 Overall SDL

6.5 shall apply.

9 SS-CF stage 2 description

This clause defines the stage 2 of the Call Forwarding supplementary services (CFU, CFB and CNFR) using the "forward switching" network routeing algorithm and the "re-routing" network routeing algorithm.

9.1 Functional model

9.1.1 Functional model description

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

FE1 : Calling user's service agent;
FE2 : Calling user's service control entity;
FE3 : Call diversion execution entity;
FE4 : Call diversion detection and control entity;
FE5 : Served user's service agent;
FE6 : Diverted-to user's service control entity;
FE7 : Diverted-to user's service agent;
FE8 : User's activation, deactivation and interrogation control;
FE9 : User's activation, deactivation and interrogation agent.

The following functional relationships shall exist between these FEs: ra between FE1 and FE2, rb between FE2 and FE3, rc between FE3 and FE4, rd between FE4 and FE5, re between FE3 and FE6, rf between FE6 and FE7, rg between FE4 and FE8, ri between FE4 and FE6 and rh between FE8 and FE9.

Different types of call diversion (e.g. CFU, CFB and CFNR) may be concatenated during multiple call diversion as well as different network routeing algorithms (call diversion by "forward switching" and call diversion by "re-routing").

Figure 2 shows the FEs and relationships for a single stage of call forwarding.

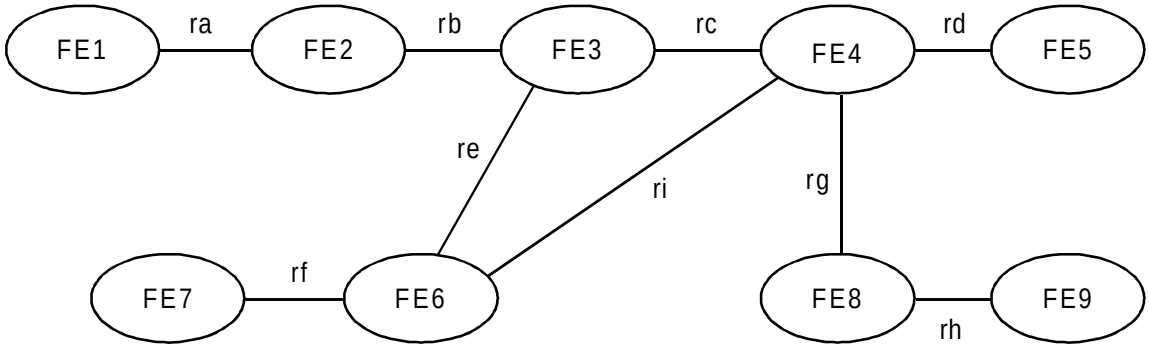

Figure 2 - Functional Model for a single stage of call forwarding

Figure 3 shows the FEs and relationships for two stages of call forwarding.

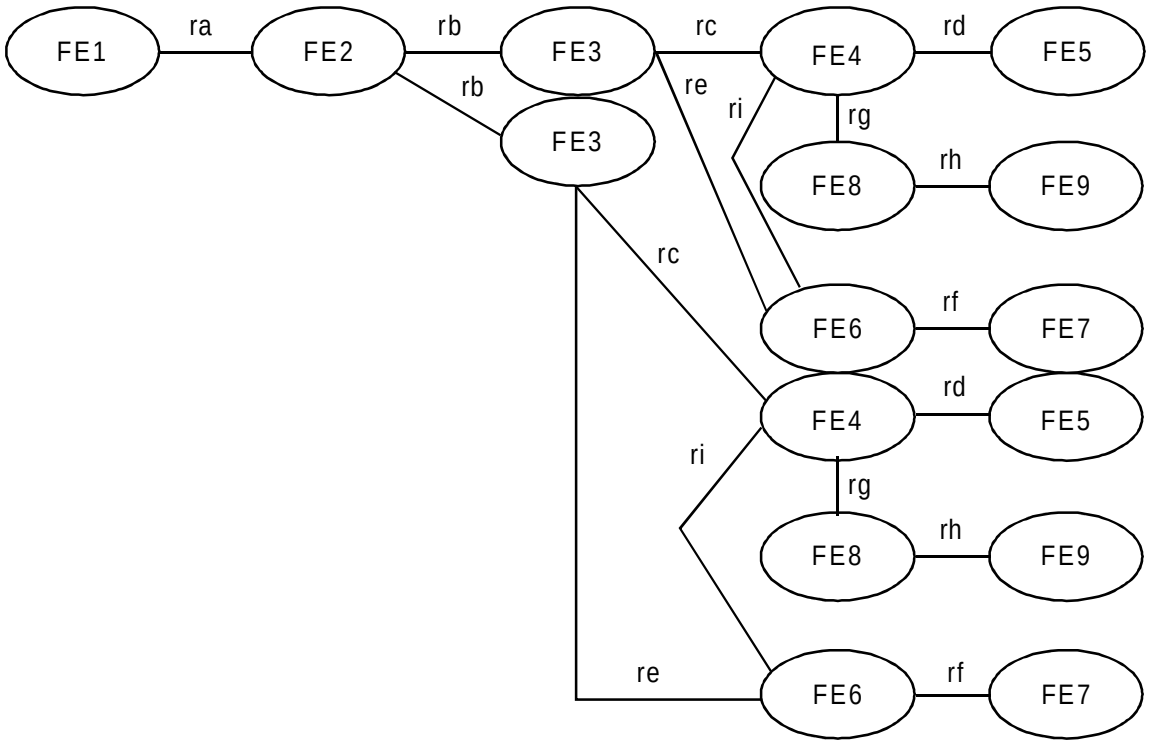

Figure 3 - Functional Entity Model for two stages of call forwarding

9.1.2 Description of the functional entities

9.1.2.1 Calling user's service agent, FE1

This FE delivers the call diversion notifications to the calling user.

9.1.2.2 Calling user's service control entity, FE2

This FE provides the appropriate call diversion notifications to FE1 according to the information received from FE3 and FE6.

9.1.2.3 Call diversion execution entity, FE3

This FE executes call diversion by initiating a new call establishment, and requesting release of the leg to the original called user. FE3 also relays call diversion information to FE2 and FE6.

9.1.2.4 Call diversion detection and control entity, FE4

This FE detects a call diversion request and supervises this request. FE4 provides a notification to FE5 and provides call diversion information to FE3. FE4 also receives activation, deactivation and interrogation requests from FE8 and provides responses to FE8. FE4 is responsible for modifying data related to activation, deactivation and remote activation enabling and disabling.

9.1.2.5 Served user's service agent, FE5

This FE delivers call forwarding notifications to the served user.

9.1.2.6 Diverted-to user's service control entity, FE6

This FE provides appropriate call diversion notifications to FE7 and provides also number presentation restriction information to FE2 via FE3.

9.1.2.7 Diverted-to user's service agent, FE7

This FE delivers call diversion notification to the diverted-to user.

9.1.2.8 User's activation, deactivation and interrogation control, FE8

This FE relays activation, deactivation and interrogation requests and responses between FE9 and FE4.

9.1.2.9 User's activation, deactivation and interrogation agent, FE9

This FE provides activation, deactivation and interrogation requests to FE8 and delivers corresponding responses to the requesting user.

9.1.3 Relationship of Functional Model to Basic Call Functional Model

Functional entity FE1 shall be collocated with user A's CCA.

Functional entity FE2 shall be collocated with user A's CC or with any Incoming Gateway CC.

Functional entity FE3 shall be collocated with user A's CC or with any Incoming Gateway CC or any Transit CC in the case of call diversion by re-routing. Functional entity FE3 shall be collocated with user B's CC (users B1 ... Bn in case of multiple call diversion) in the case of call diversion by forward switching.

Functional entity FE4 shall be collocated with user B's CC (users B1 ... Bn in case of multiple call diversion).

Functional entity FE5 shall be collocated with user B's CCA.

Functional entity FE6 shall be collocated with user C's CC, and also with the CCs for users B2 ... Bn in case of multiple call diversion.

Functional entity FE7 shall be collocated with user C's CCA.

Functional entity FE8 shall be collocated with either the user B's CC or any remote user's CC.

Functional entity FE9 shall be collocated with either the user B's CCA or any remote user's CCA.

An example of the relationship with a basic service is shown in figure 4. This example is used as the basis for the information flow sequence diagrams in 9.2.

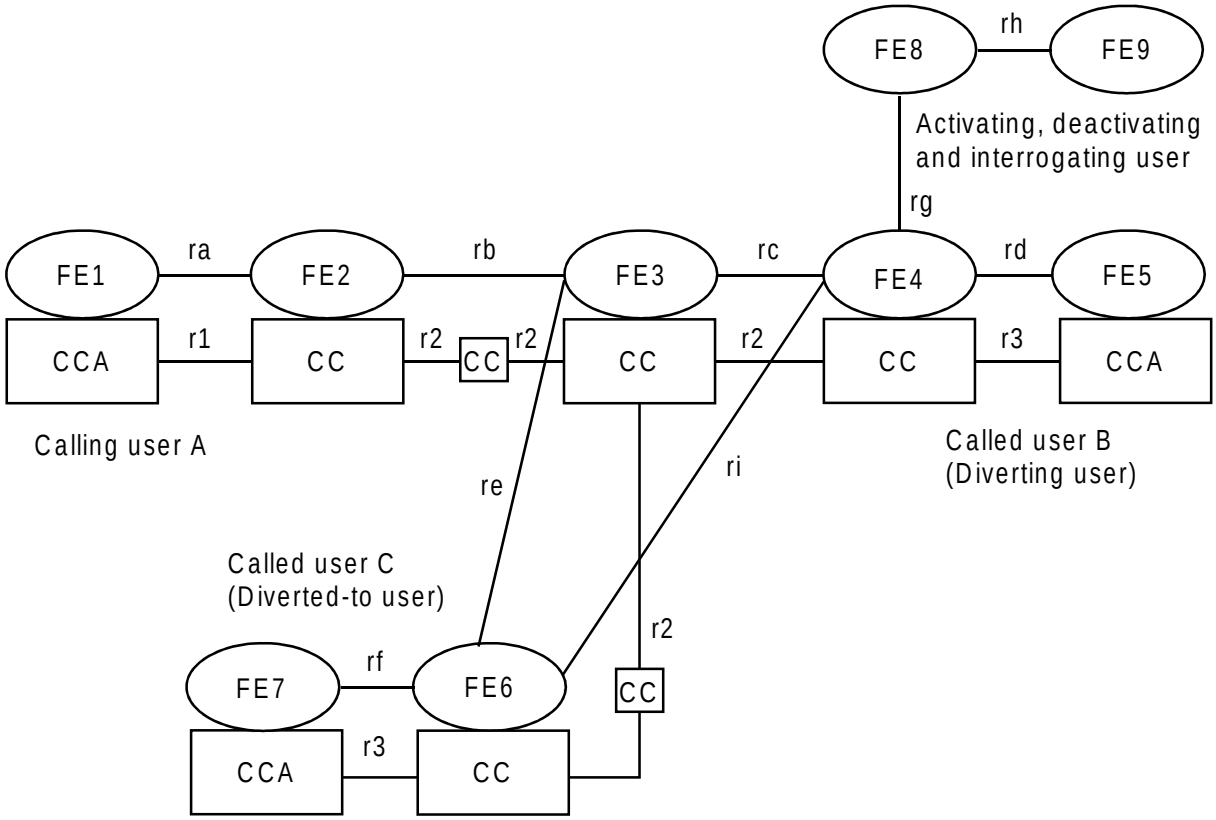

Figure 4 - Functional Entity Model Relationship

9.2 Information flows

9.2.1 Definition of information flows

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

9.2.1.1 INFORM 1

This unconfirmed information flow indicates to FE2 that call diversion has been initiated and informs of calling user notification restrictions (subscription option of user B). It shall be sent over relationship rb and it shall contain the service elements listed in table 2.

Table 2 - Content of INFORM 1

Service elements	Allowed value	Request	Confirm
Notification Subscrip. Option:	No	M	
	Yes, without number/name		
	Yes, with number/name		
Diverting Cause	CFU, CFB, CFNR	M	
Diverted-to Number		M	

9.2.1.2 INFORM 2

This unconfirmed information flow indicates to FE1 that call diversion has been initiated. It shall only be sent if required by the subscription options of user B. It shall be sent over relationship ra. There are no service elements in this information flow.

9.2.1.3 INFORM 3

This unconfirmed information flow indicates to FE5 that call forwarding has been initiated. It shall only be sent if required by the subscription options of user B and it shall not be sent in case of a failure of the call forwarding invocation request. It shall be sent over relationship rd and it shall contain the service elements listed in table 3.

Table 3 - Content of INFORM 3

Service elements	Allowed value	Request	Confirm
Diverting Cause	CFU, CFB, CFNR	M	
Served User's MSN Number		O (Note 6)	
Last Diverting Cause	CFU, CFB, CFNR	O (Note 7)	
Connection Type		M (Note 4)	
Origination Number		O (Note 1)	
Origination Subaddress		O (Note 2)	
Calling Party Name		O (Note 3)	
Last Diverting Number incl. restriction indicator		O (Notes 5, 7)	
Original Called Number incl. restriction indicator		O (Notes 5, 7)	

NOTE 1

If CLIP applies, this service element shall be included as defined for the Identification supplementary services in ETS 300 173.

NOTE 2

If CLIP applies, this service element may be included as defined for the Identification supplementary services in ETS 300 173.

NOTE 3

This shall comprise the elements of information flow INFORM 2 in ETS 300 237.

NOTE 4

This service element is defined in ETS 300 171.

NOTE 5

This service element shall only be included if allowed by the previous served user(s).

NOTE 6

This service element shall only be included if MSN applies for user B.

NOTE 7

This service element shall only be included in case of multiple diversion.

9.2.1.4 INFORM 4

This unconfirmed information flow indicates to FE6 that call diversion is taking place. It shall be sent over relationship re and it shall contain the service elements listed in table 4.

Table 4 - Content of INFORM 4

Service elements	Allowed value	Request	Confirm
Diverting Cause	CFU, CFB, CFNR	M	
Diversion Counter		M	
Diverting Number incl. restriction indicator		M	
Original Called Number incl. restriction indicator		O (Note 3)	
Calling Party Name		O (Note 1)	
Original Called Name incl. restriction indicator		O (Notes 2, 3)	
Diverting Party Name incl. restriction indicator		O (Notes 2)	

NOTE 1

This shall comprise the elements of information flow INFORM 1 in ETS 300 237.

NOTE 2

This service element may be omitted in case of name not available or in case of presentation restricted or if not implemented.

NOTE 3

This service element shall only be included in case of multiple diversion.

NOTE 4

The Diverted-to Number (= Destination Number), Origination Number, Origination Subaddress, Connection Type, Originating Category and Call History are carried in the basic call to user C and are not shown in INFORM 4. The basic call service elements are defined in ETS 300 171.

9.2.1.5 INFORM 5

This unconfirmed information flow indicates to FE7 that call diversion is taking place. It shall be sent over relationship rf and it shall contain the service elements listed in table 5.

Table 5 - Content of INFORM 5

Service elements	Allowed value	Request	Confirm
Diverting Cause	CFU, CFB, CFNR	M	
Diverting Number		O (Note 4)	
Original Called Number		O (Notes 3, 4)	
Origination Number		O (Note 1)	
Origination Subaddress		O (Note 1)	
Calling Party Name		O (Note 2)	
Original Called Name		O (Notes 3, 4, 5)	
Diverting Party Name		O (Notes 4, 5)	

NOTE 1

This service element shall be included as defined for the Identification supplementary services in ETS 300 173.

NOTE 2

This shall comprise the elements of information flow INFORM 2 in ETS 300 237.

NOTE 3

This service element shall only be included in case of multiple diversion.

NOTE 4

This service element shall only be included if no restriction exists.

NOTE 5

This service element may be omitted in case of name not available or if not implemented.

NOTE 6

The Diverted-to Number (= Destination Number), Connection Type, Originating Category and Call History are carried in the basic call to user C and are not shown in INFORM 5. The basic call service elements are defined in ETS 300 171.

9.2.1.6 INFORM 6

This unconfirmed information flow indicates whether presentation of user C's number and name is allowed. It shall be sent over relationship re between FE6 and FE3 and over relationship rb between FE3 and FE2 and it shall contain the service elements listed in table 6.

Table 6 - Content of INFORM 6

Service elements	Allowed value	Request	Confirm
Presentation Indicator	present, allowed present, not allowed	M (Note 1)	
Diverted-to Party Name incl. restriction indicator		O (Note 2)	

NOTE 1

The Presentation Indicator shall apply only to the indication of user C's number.

NOTE 2

This service element may be omitted in case of name not available or in case of presentation restricted or if not implemented.

9.2.1.7 INFORM 7

This unconfirmed information flow informs FE1 of the user C's number and name if appropriate. It shall only be sent if required by the subscription options of user B and if user C's number is not presentation restricted. It shall be sent over relationship ra and it shall contain the service elements listed in table 7.

Table 7 - Content of INFORM 7

Service elements	Allowed value	Request	Confirm
Diverted-to Number	PTN number number not available	M	
Diverted-to Party Name	name name not available	O (Note)	

NOTE

This service element shall only be included if no restriction exists. It may be omitted in case of name not available or if not implemented.

9.2.1.8 INFORM 8

This unconfirmed information flow indicates to FE5 that CFU/CFB/CFNR has been activated. It shall be sent over relationship rd and it shall contain the service elements listed in table 8.

Table 8 - Content of INFORM 8

Service elements	Allowed value	Request	Confirm
Diversion Procedure	CFU, CFB, CFNR	M	
Diverted-to Number		M	
Basic Service	all or a specific one	M	
Served User's MSN Number		O (Note)	

NOTE

This service element shall only be included if MSN applies for user B.

9.2.1.9 INFORM 9

This unconfirmed information flow indicates to FE5 that CFU/CFB/CFNR has been deactivated. It shall be sent over relationship rd and it shall contain the service elements listed in table 9.

Table 9 - Content of INFORM 9

Service elements	Allowed value	Request	Confirm
Diversion Procedure	CFU, CFB, CFNR	M	
Basic Service	all or a specific one	M	
Served User's MSN Number		O (Note)	

NOTE

This service element shall only be included if MSN applies for user B.

9.2.1.10 INFORM 10

This unconfirmed information flow indicates to FE4 and FE5 that CFNR has not been completed. It shall be sent over relationship rc and rd and it shall contain the service element listed in table 10.

Table 10 - Content of INFORM 10

Service elements	Allowed value	Request	Confirm
Call State Notification	CFNR leg cleared	M	

9.2.1.11 DIVERT

This confirmed information flow invokes call diversion operation. It shall be sent over relationship rc and it shall contain the service elements listed in table 11.

Table 11 - Content of DIVERT

Service elements	Allowed value	Request	Confirm
Diverting Cause	CFU, CFB, CFNR	M	
Diverted-to Number incl. restriction indicator		M	
Diverted-to Subaddress		O	
Diversion Counter		M	
Connection Type		M (Note 1)	
Origination Number		M (Note 1)	
Origination Subaddress		O (Note 2)	
Calling Party Name		O (Note 5)	
Notification Subscript Option:	No	M	
	Yes, without number/name		
	Yes, with number/name		
Call History		O (Note 2)	
Originating Category		O (Note 2)	
Diverting Number incl. restriction indicator		M	
Original Called Number incl. restriction indicator		O (Note 3)	
Original Called Name		O (Notes 3, 4)	
Diverting Party Name		O (Note 4)	
Diverting Invocation Result	accepted or rejected		M

NOTE 1

This service element is obtained from the basic call SETUP request/indication information flow.

NOTE 2

This service element shall be included if available in the basic call SETUP request/indication information flow.

NOTE 3

This service element shall only be included in case of multiple diversion.

NOTE 4

This service element shall be omitted in case of name not available or in case of presentation restricted or if not implemented.

NOTE 5

This shall comprise the elements of information flow INFORM 1 in ETS 300 237.

9.2.1.12 INTERROGATE

This confirmed information flow conveys call forwarding interrogation. It may be sent over relationship rg and relationship rh and it shall contain the service elements listed in table 12.

Table 12 - Content of INTERROGATE

Service elements	Allowed value	Request	Confirm
Diversion Procedure	CFU, CFB, CFNR	M	
Basic Service	all or a specific one	M	
Served User's Number		O (Note 1)	
Interrogating User's MSN Number		O (Note 2)	
Interrogation Request Result	activated		M
	not activated, or rejected		
Basic Service			O (Note 3)
Diverted-to Number for Basic Service			O (Note 3)
Diverted-to Subaddress for Basic Service			O (Note 3)
Remote Activation	enabled or disabled		O (Note 4)
Interrogating User's Number			O (Note 5)

NOTE 1

This service element shall only be included in remote INTERROGATE information flows.

NOTE 2

This service element shall only be included if MSN applies for the interrogating user.

NOTE 3

This service element shall only be included if call diversion is activated. It may be repeated, if the INTERROGATE request/indication indicates "all basic services".

NOTE 4

This service element may be repeated, if the INTERROGATE request/indication indicates "all basic services".

NOTE 5

This service element shall be included over relationship rg and shall not be included over relationship rh.

9.2.1.13 ACTIVATE

This confirmed information flow activates call forwarding. It may be sent over relationship rg and relationship rh and it shall contain the service elements listed in table 13.

Table 13 - Content of ACTIVATE

Service elements	Allowed value	Request	Confirm
Diversion Procedure	CFU, CFB, CFNR	M	
Diverted-to Number		M	
Diverted-to Subaddress		O	
Basic Service	all or a specific one	M	
Served User's Number		O (Note 1)	
Activating User's MSN Number		O (Note 2)	
Activation Request Result	accepted or rejected		M
Cause for rejection	service not subscribed insufficient information no valid diverted-to no. basic service not subscribed		O (Note 3)
Activating User's Number		O (Note 4)	

NOTE 1

This service element shall only be included in the case of remote activation.

NOTE 2

This service element shall only be included if MSN applies for the activating user.

NOTE 3

This service element shall only be included in case of rejection.

NOTE 4

This service element shall be included over relationship rg and shall not be included over relationship rh.

9.2.1.14 DEACTIVATE

This confirmed information flow deactivates call forwarding. It may be sent over relationship rg and relationship rh and it shall contain the service elements listed in table 14.

Table 14 - Content of DEACTIVATE

Service elements	Allowed value	Request	Confirm
Diversion Procedure	CFU, CFB, CFNR	M	
Basic Service	all or a specific one	M	
Served User's Number		O (Note 1)	
Deactivating User's MSN Number		O (Note 2)	
Deactivation Request Result	accepted or rejected		M
Cause for rejection	service not subscribed		O (Note 3)
	insufficient information		
	basic service not subscribed		
Deactivating User's Number		O (Note 4)	

NOTE 1

This service element shall only be included in case of remote deactivation.

NOTE 2

This service element shall only be included if MSN applies for the deactivating user.

NOTE 3

This service element shall only be included in case of rejection.

NOTE 4

This service element shall be included over relationship rg and shall not be included over relationship rh.

9.2.1.15 ENABLE

This confirmed information flow enables remote call forwarding activation. It may be sent over relationship rd and it shall contain the service elements listed in table 15.

Table 15 - Content of ENABLE

Service elements	Allowed value	Request	Confirm
Diversion Procedure	CFU, CFB, CFNR	M	
Basic Service	all or a specific one	M	
Served User's MSN Number		O (Note 1)	
Enable Request Result	accepted or rejected		M
Cause for rejection	service not subscribed		O (Note 2)
	insufficient information		
	basic service not subscribed		

NOTE 1

This service element shall only be included if MSN applies for user B.

NOTE 2

This service element shall only be included in case of rejection.

9.2.1.16 DISABLE

This confirmed information flow disables remote call forwarding activation. It may be sent over relationship rd and it shall contain the service elements listed in table 16.

Table 16 - Content of DISABLE

Service elements	Allowed value	Request	Confirm
Diversion Procedure	CFU, CFB, CFNR	M	
Basic Service	all or a specific one	M	
Served User's MSN Number		O (Note 1)	
Disable Request Result	accepted or rejected		M
Cause for rejection	service not subscribed		O (Note 2)
	insufficient information		
	basic service not subscribed		

NOTE 1

This service element shall only be included if MSN applies for user B.

NOTE 2

This service element shall only be included in case of rejection.

9.2.1.17 CHECK

This confirmed information flow is used to check if the diverted-to number and basic service(s) exist. It may be sent over relationship ri and it shall contain the service elements listed in table 17.

Table 17 - Content of CHECK

Service elements	Allowed value	Request	Confirm
Diverted-to Number		M	
Basic Service	all or a specific one	M	
Served User's Number		M	
Check Request Result	accepted or rejected		M
Cause for rejection	insufficient information		O (Note)
	no valid diverted-to no.		
	basic service not subscribed		

NOTE

This service element shall only be included in case of rejection.

9.2.2 Information flow sequences

Signalling procedures shall be provided in support of the information flow sequences specified below. In addition, signalling procedures should be provided to cover other sequences arising from error situations, interactions with basic call, interactions with other supplementary services, different topologies, etc.

In the figures, SS-CF information flows are represented by solid arrows and basic call information flows are represented by broken arrows. An ellipse embracing two information flows indicates that the two information flows occur together. Within a column representing an SS-CF functional entity, the numbers refer to functional entity actions listed in 9.3.

9.2.2.1 Information flow sequences for CFU/CFB operation

The information flow sequence for successful CFU/CFB (NDUB) operation is shown in figure 5.

NOTE 9

For CFU (UDUB) the information flow sequence is identical with the exception of additional basic call information flows between user B's CC and user B's CCA.

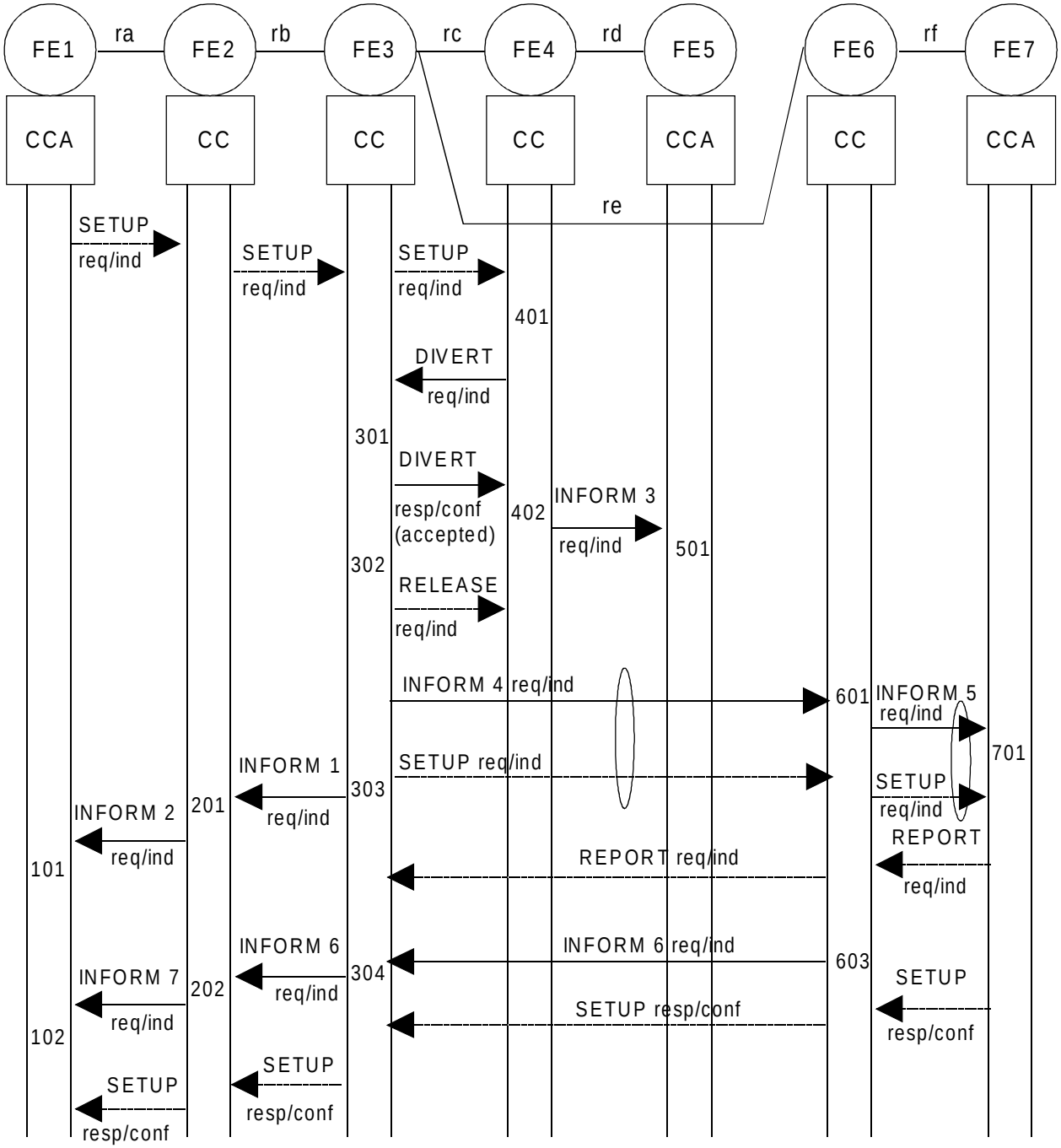

Figure 5 - Information Flow Sequence for successful CFU/CFB operation

The information flow sequences for unsuccessful CFU/CFB (NDUB) operation are shown in figures 6 and 7.

NOTE 10

For CFU (UDUB) the information flow sequences are identical with the exception of additional basic call information flows between user B's CC and user B's CCA.

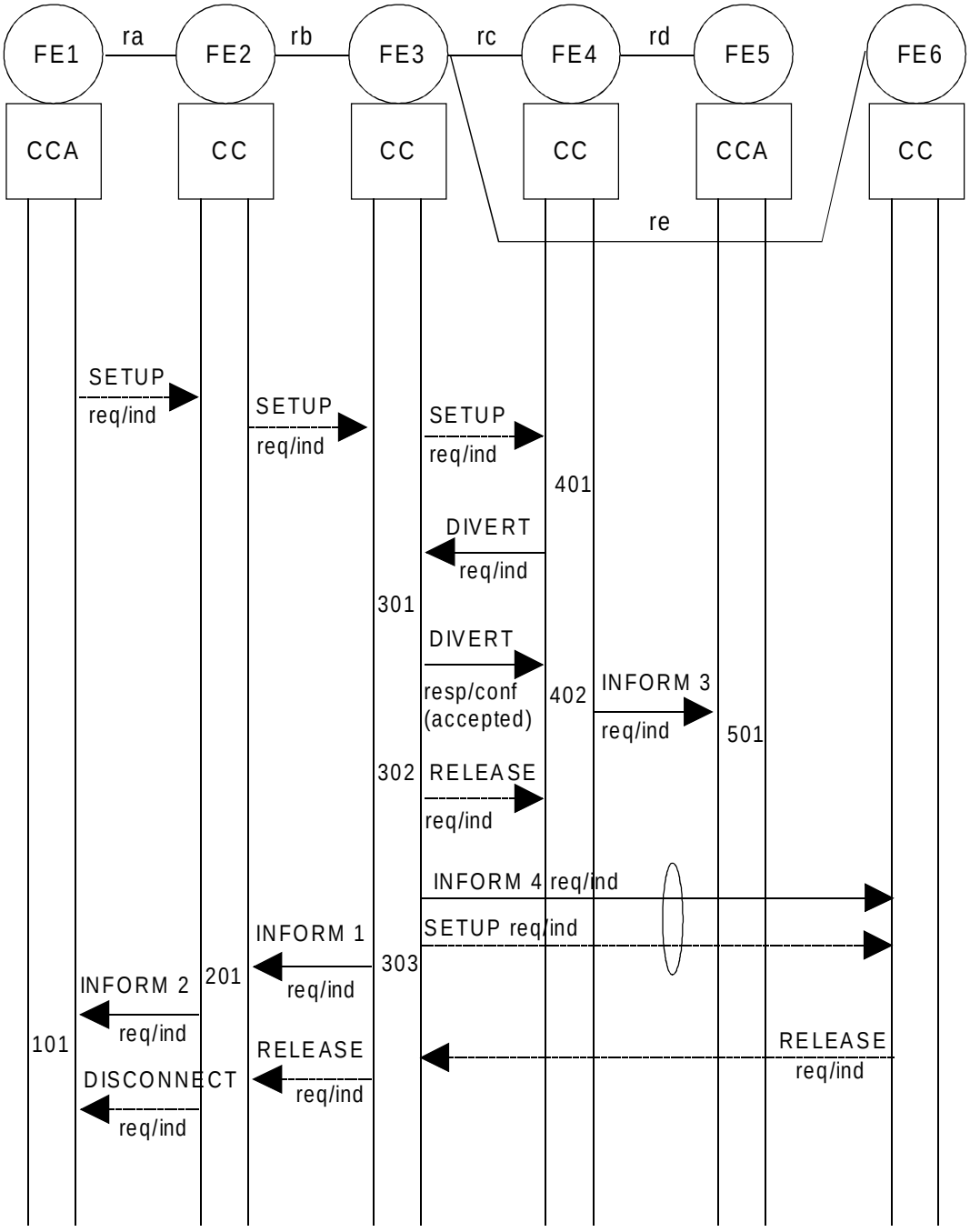

Figure 6 - Information Flow Sequences for unsuccessful CFU/CFB operation: failure of diverted call

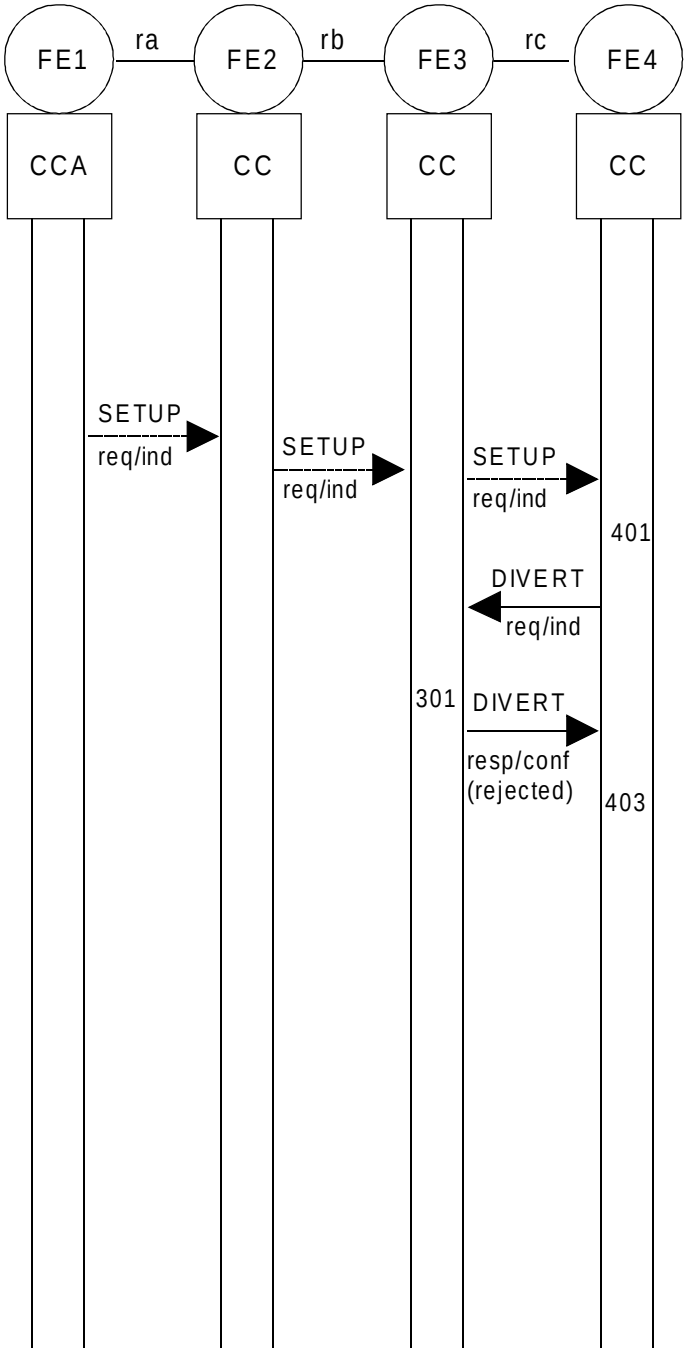

Figure 7 - Information Flow Sequences for unsuccessful CFU/CFB operation: rejection of Call Diversion

9.2.2.2 Information flow sequences for CFNR operation

The information flow sequence for successful CFNR operation is shown in figure 8.

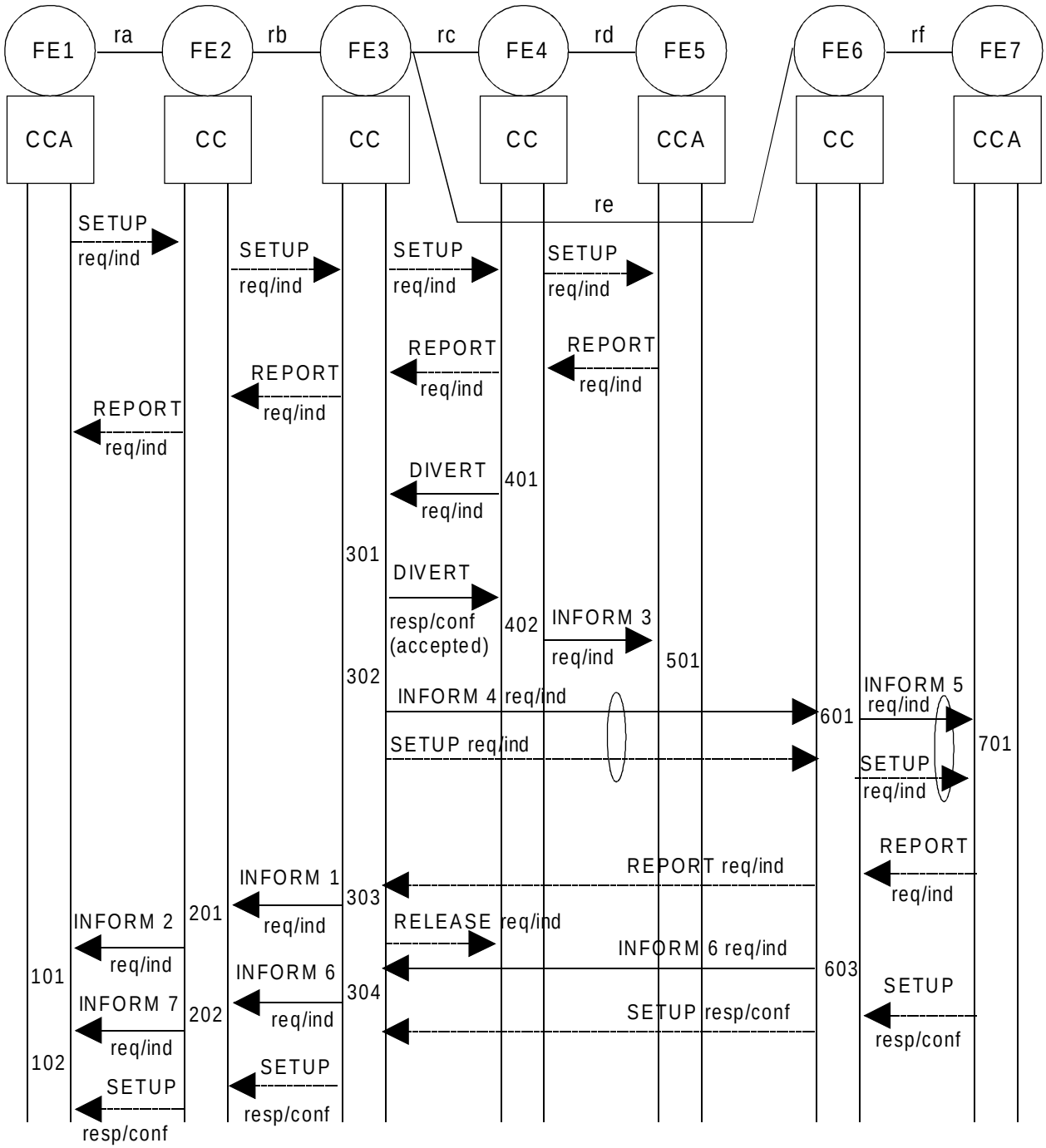

Figure 8 - Information Flow Sequence for successful CFNR operation

The information flow sequence for clearing by user A during CFNR operation is shown in figure 9.

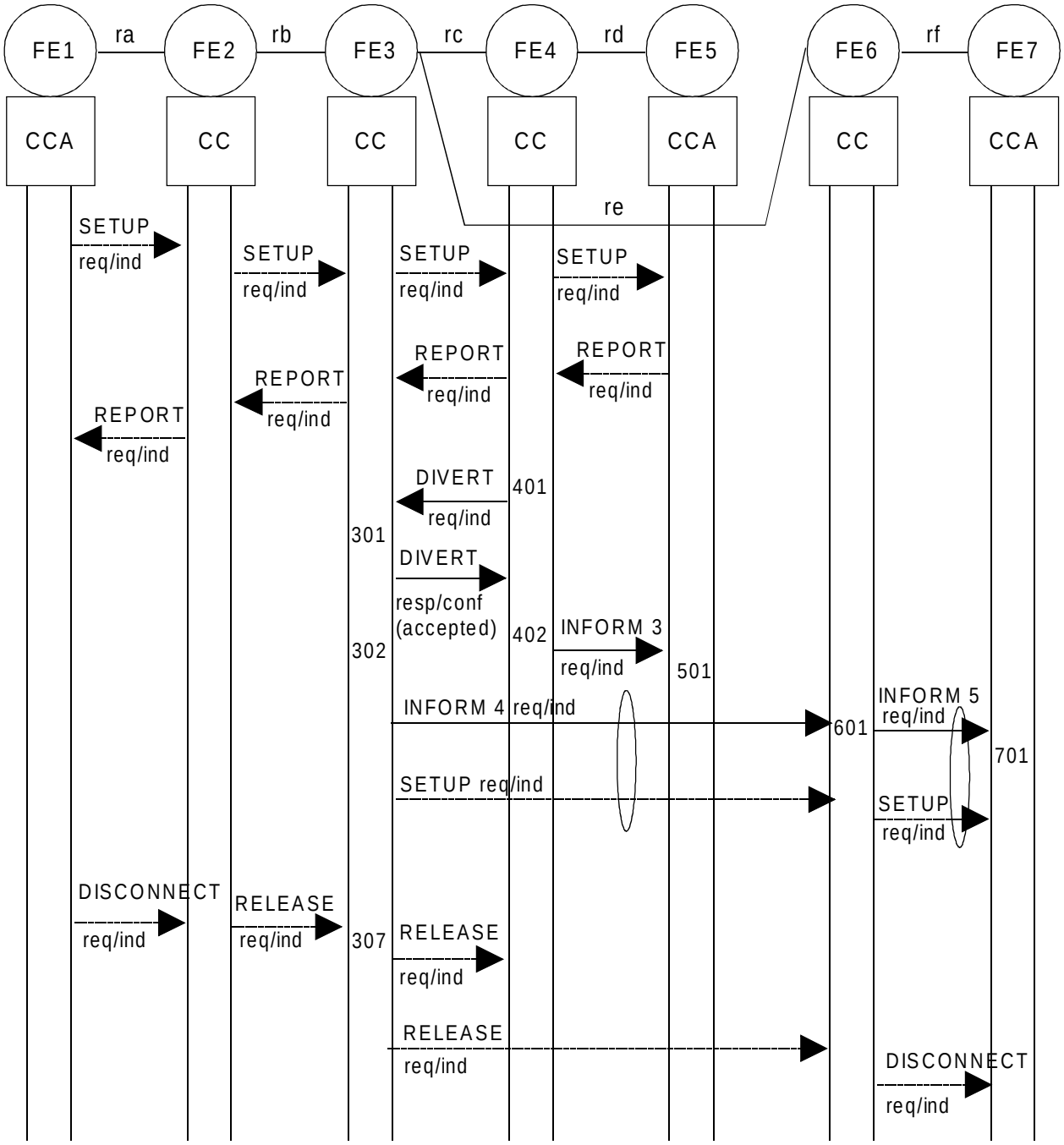

Figure 9 - Information Flow Sequence for clearing by user A during CFNR operation

The information flow sequences for unsuccessful CFNR operation are shown in figures 10 and 11.

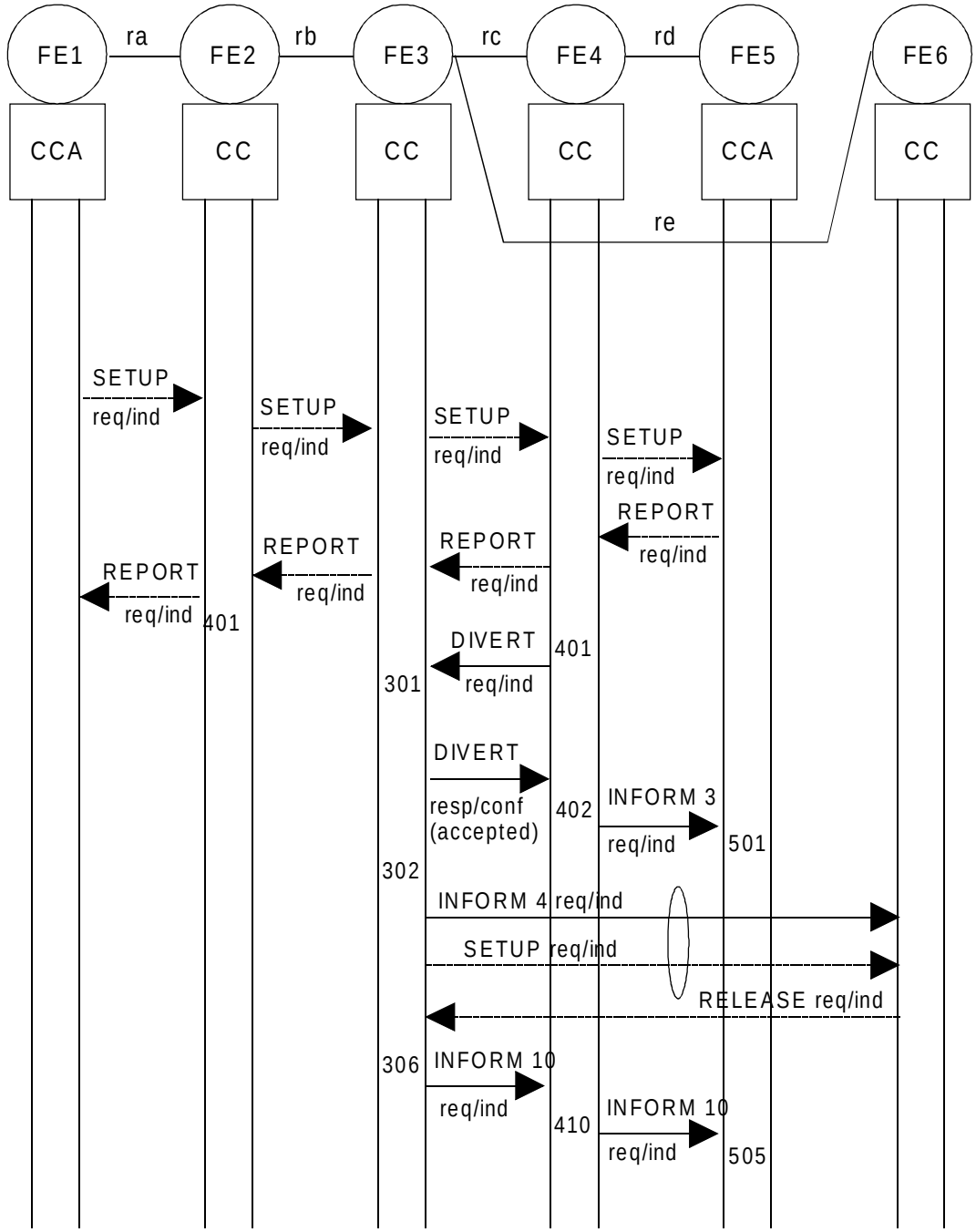

Figure 10 - Information Flow Sequences for unsuccessful CFNR operation: CFNR not completed - original call remains

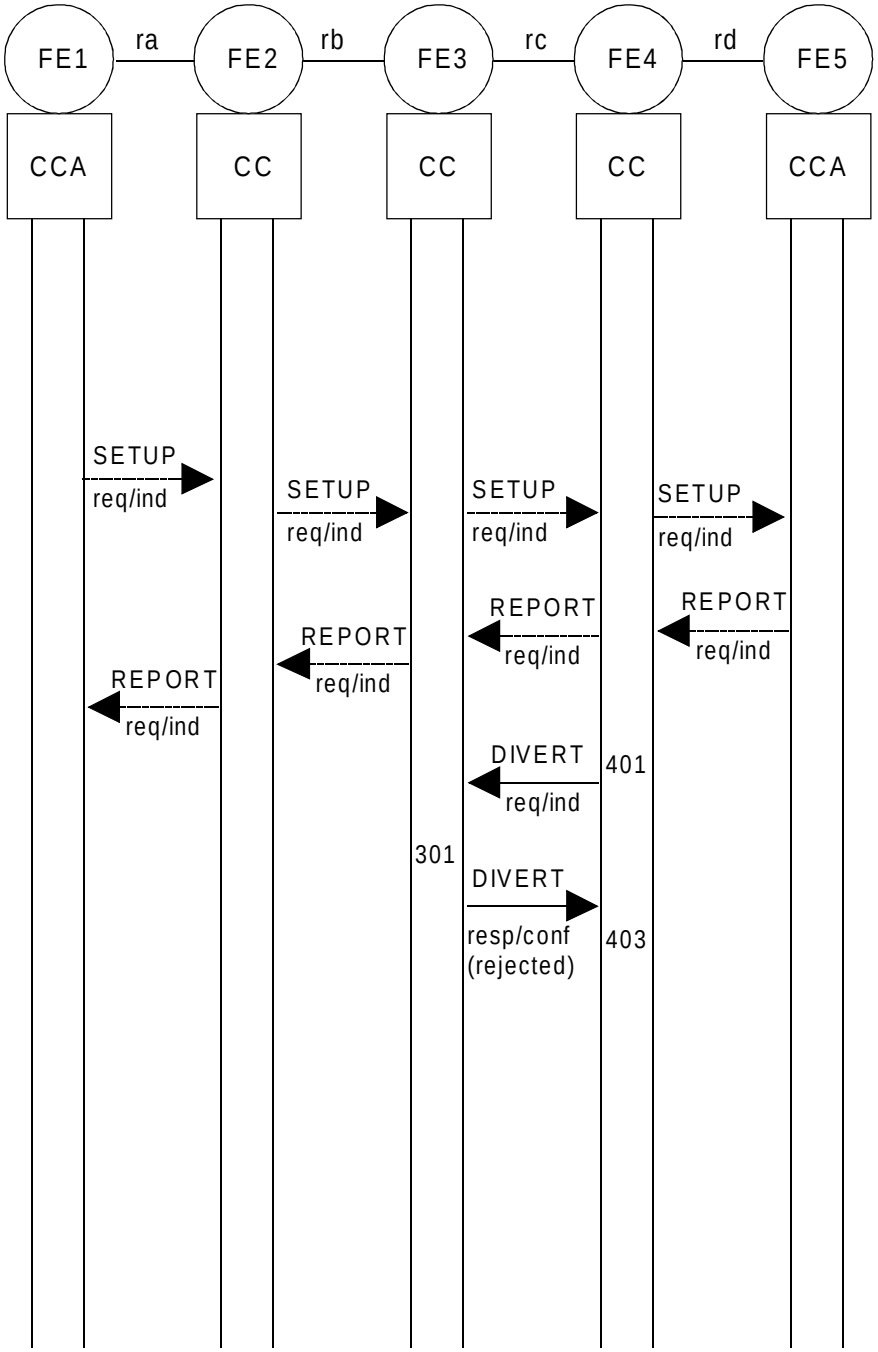

Figure 11 - Information Flow Sequences for unsuccessful CFNR operation: CFNR rejected - original call remains

The information flow sequence if user B answers before receipt of REPORT (alerting) from user C is shown in figure 12.

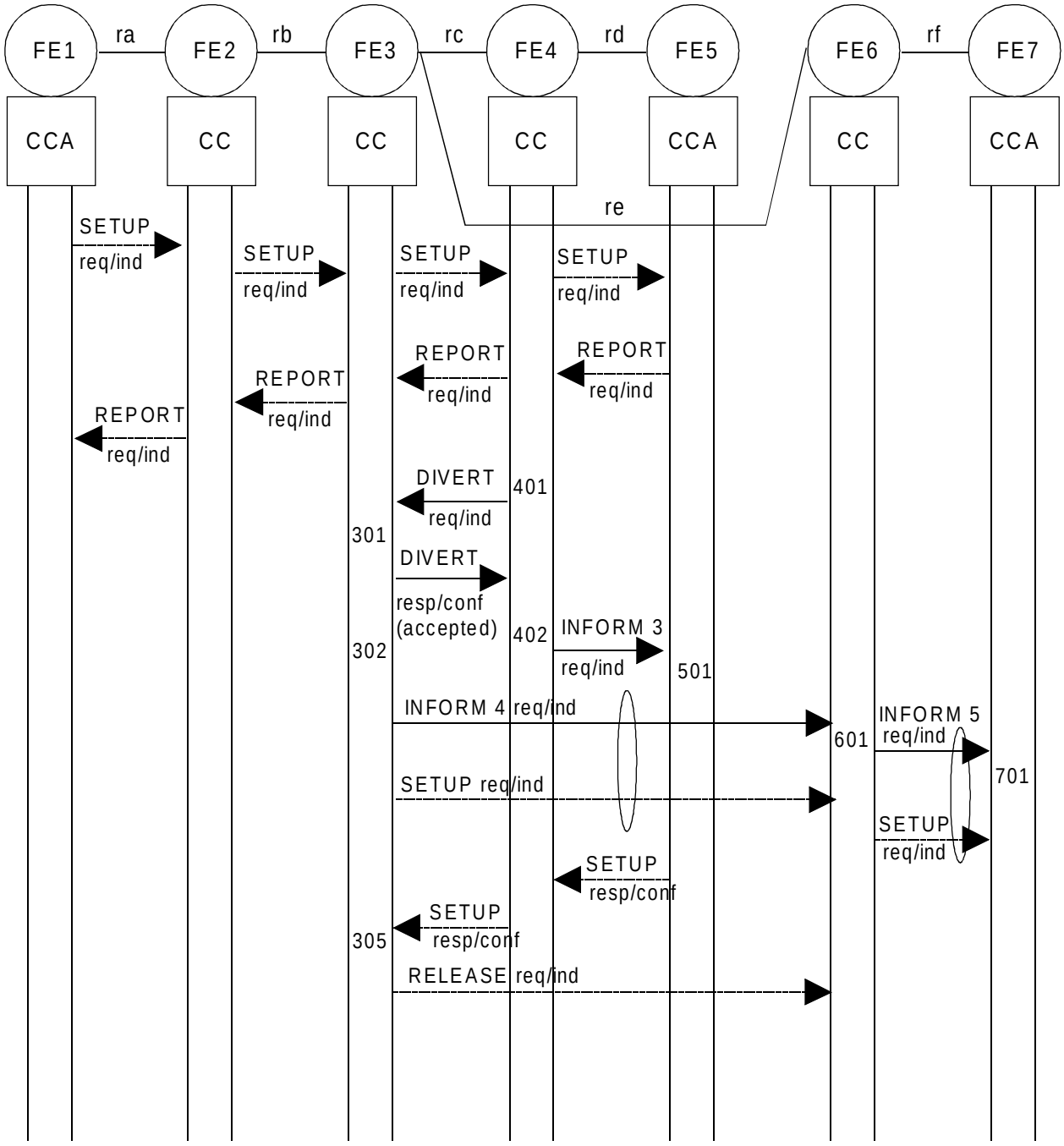

Figure 12 - Information Flow Sequence if user B answers before alerting of user C

9.2.2.3 Information flow sequences for activation

The information flow sequences for activation are shown in figures 13 and 14.

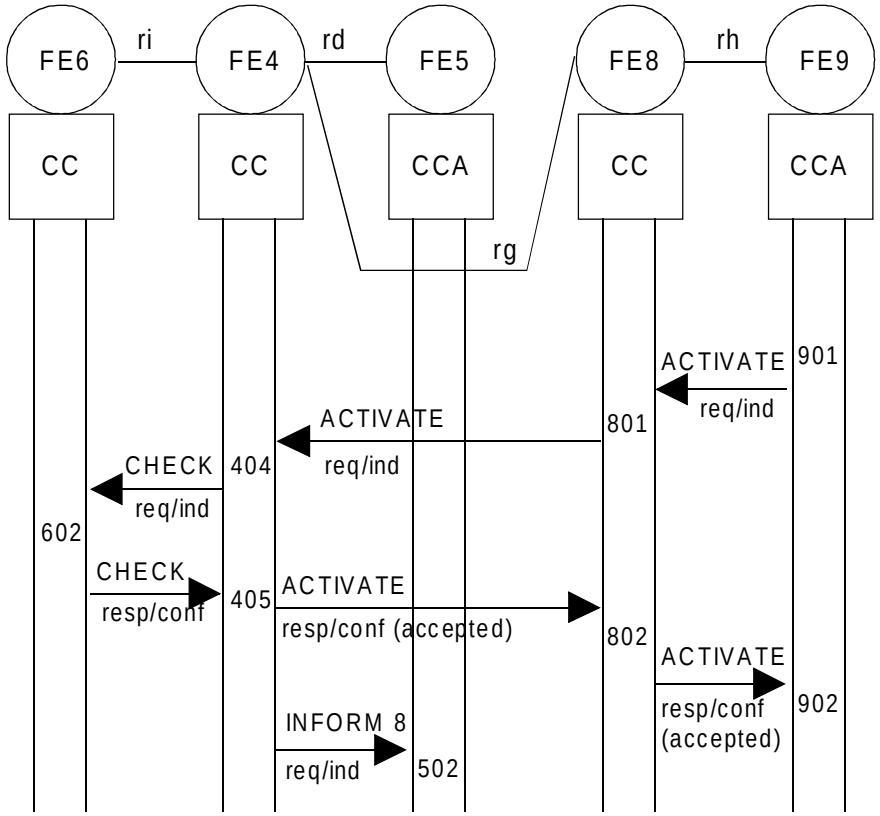

Figure 13 - Information Flow Sequence for activation with CHECK information flow

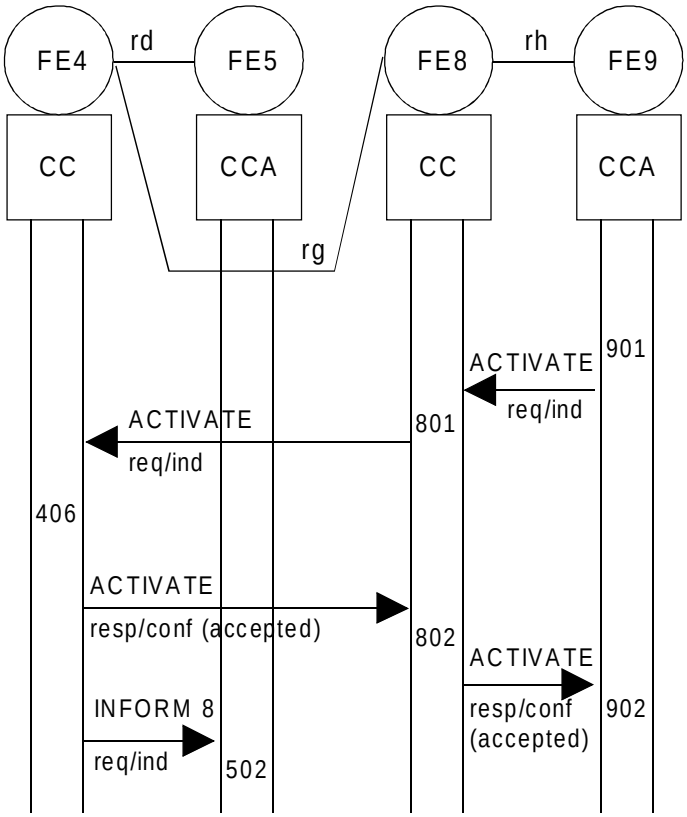

Figure 14 - Information Flow Sequence for activation without CHECK information flow

9.2.2.4 Information flow sequence for deactivation

The information flow sequence for deactivation is shown in figure 15.

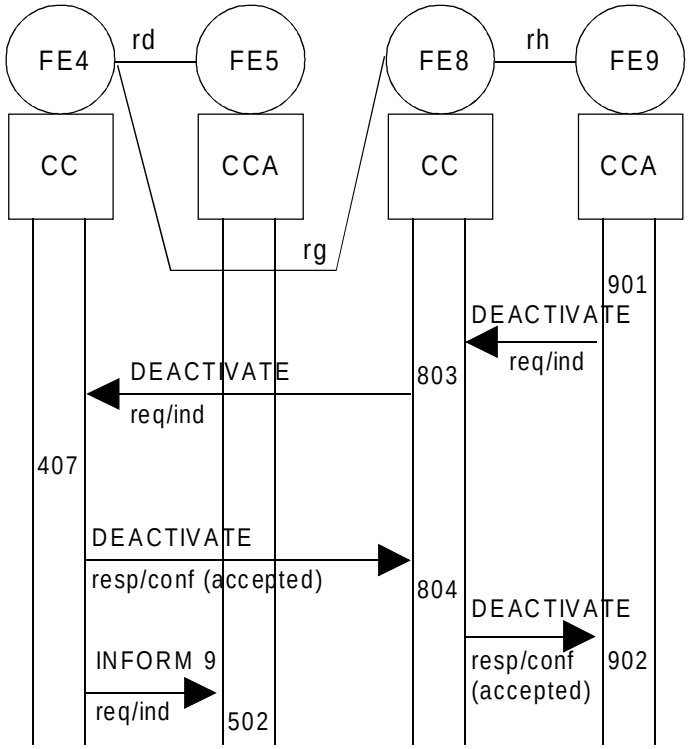

Figure 15 - Information Flow Sequence for deactivation

9.2.2.5 Information flow sequence for enabling/disabling of remote activation

The information flow sequence for enabling/disabling of remote activation is shown in figure 16.

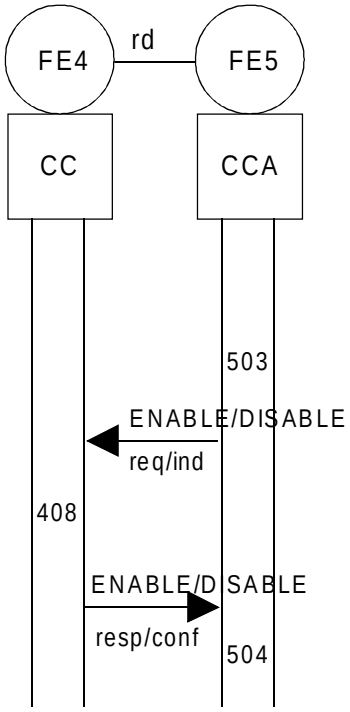

Figure 16 - Information Flow Sequence for enabling/disabling of remote activation

9.2.2.6 Information flow sequence for interrogation

The information flow sequence for interrogation is shown in figure 17.

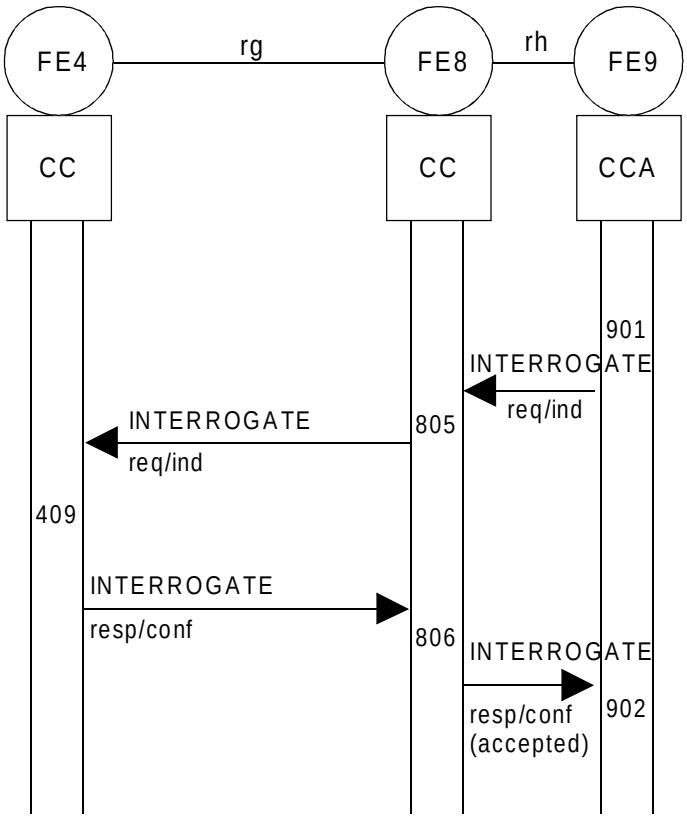

Figure 17 - Information Flow Sequence for interrogation

9.3 Functional Entity actions

The following FE actions shall occur at the points indicated in the figures of 9.2.2.

9.3.1 Functional Entity actions of FE1

101 Deliver call diversion notifications to the user as received from FE2 in INFORM 2 request/ indication.

102 Deliver number and name notifications to the user as received in INFORM 7 request/indication from FE2.

9.3.2 Functional Entity actions of FE2

201 Receive (multiple) INFORM 1 request/indication from FE3 and send each time a call diversion notification in INFORM 2 request/indication to FE1 if allowed. Store the notification subscription options and the diverted-to number.

202 Receive INFORM 6 request/indication from FE3, get the stored notification subscription options, determine if presentation of information is allowed and send the appropriate number and name information in INFORM 7 request/indication to FE1 if allowed.

9.3.3 Functional Entity actions of FE3

301 Receive DIVERT request/indication, check whether the request is allowed and valid and respond to FE4 with DIVERT response/confirmation accordingly.

302 Stimulate the basic call establishment to FE6 if the diversion request is valid. Stimulate the release procedure at leg rc (original call) in case of CFU and CFB. Send INFORM 4 request/ indication to FE6.

303 Send INFORM 1 request/indication to FE2. In case of CFNR, stimulate the release procedure at leg rc on receipt of REPORT request/indication or SETUP response/confirmation from user C.

304 Relay the presentation indicator and the name received in INFORM 6 request/indication from FE6 to FE2.

305 In case of CFNR, stimulate the release procedure at the diverted-to leg (re).

306 Send INFORM 10 request/indication to FE4 when CFNR is not completed.

307 For CFNR, stimulate release of the legs rc and re if the calling user releases the call.

9.3.4 Functional Entity actions of FE4

401 Immediate in the case of CFU, on detection of busy in the case of CFB, or after a specified time interval in the case of CFNR:

- Recognise call diversion activated and invoked from Basic Service;
- Increment the diversion counter:
  - If the incremented diversion counter has exceeded the upper limit, reject the diversion request and do the following: for CFU/CFB either release the call or override call diversion (implementation options); for CFNR maintain the original call;
  - If the incremented diversion counter is not above the upper limit, then send a DIVERT request/indication to FE3.

402 Receive the positive DIVERT response/confirmation from FE3. Depending on subscription options, send INFORM 3 request/indication to FE5.

403 Receive the negative DIVERT response/confirmation from FE3. For CFU/CFB: stimulate release of the call to the calling user or perform an implementation specific procedure, e.g. send DIVERT request/indication to an FE3 at a different location. For CFNR: maintain the original call to the served user or perform an implementation specific procedure, e.g. send DIVERT request/indication to an FE3 at a different location.

404 Validate received ACTIVATE request/indication and send a CHECK request/indication to FE6 in order to check if the diverted-to number and basic service(s) exist.

405 On receipt of a CHECK response/confirmation, further validate received ACTIVATE request/ indication and respond to FE8 with ACTIVATE response/confirmation. Inform FE5 of a successful activation (INFORM 8 request/indication).

406 Validate received ACTIVATE request/indication and respond to FE8 with ACTIVATE response/confirmation. Inform FE5 of a successful activation (INFORM 8 request/indication).

407 Validate received DEACTIVATE request/indication and respond to FE8 with DEACTIVATE response/confirmation. Inform FE5 of a successful deactivation (INFORM 9 request/ indication).

408 Validate received ENABLE/DISABLE request/indication and respond to FE5 with ENABLE/DISABLE response/confirmation.

409 Validate received INTERROGATE request/indication and respond to FE8 with INTERROGATE response/confirmation.

410 Relay optionally INFORM 10 request/indication from FE3 to FE5 if received, if an INFORM 3 request/indication has previously been sent.

9.3.5 Functional Entity actions of FE5

501 Deliver notifications to the user as received from FE4 in INFORM 3 request/indication.

502 Deliver notifications on activation and deactivation to the user as received from FE4.

503 Send enable/disable requests to FE4 as received from the user.

504 Deliver enable/disable responses to the user as received from FE4.

505 Inform the user that CFNR has failed.

9.3.6 Functional Entity actions of FE6

601 Determine if presentation of the number and the name information received from FE3 in INFORM 4 request/indication is allowed and send INFORM 5 request/indication to FE7. Store the last diversion number and original called number and associated presentation restriction indicators for further multiple call diversions.

602 Receive CHECK request/indication from FE4, check optionally if the diverted-to number and basic service(s) exist, and respond to FE4 with CHECK response/confirmation.

603 Send the presentation indicator of the diverted-to user's number and the name of the diverted-to user either on receipt of REPORT request/indication (alerting) if possible or at latest on answer of the basic call to FE3 in INFORM 6 request/indication.

9.3.7 Functional Entity actions of FE7

701 Deliver notifications to the diverted-to user as received from FE6.

9.3.8 Functional Entity actions of FE8

801 Receive ACTIVATE request/indication from FE9. Perform address checking and either relay the ACTIVATE request/indication to FE4 or send a negative ACTIVATE response/ confirmation to FE9.

802 Receive ACTIVATE response/confirmation from FE4 and relay it to FE9.

803 Receive DEACTIVATE request/indication from FE9. Perform address checking and either relay the DEACTIVATE request/indication to FE4 or send a negative DEACTIVATE response/confirmation to FE9.

804 Receive DEACTIVATE response/confirmation from FE4 and relay it to FE9.

805 Receive INTERROGATE request/indication from FE9. Perform address checking and either relay the INTERROGATE request/indication to FE4 or send a negative INTERROGATE response/confirmation to FE9.

806 Receive INTERROGATE response/confirmation from FE4 and relay it to FE9.

9.3.9 Functional Entity actions of FE9

901 Send activation/deactivation/interrogation requests to FE8 as received from the user.

902 Deliver activation/deactivation/interrogation responses to the user as received from FE8.

9.4 Functional Entity behaviour

The figures below are intended to illustrate typical FE behaviour in terms of information flows sent and received.

The behaviour of each FE is shown using the Specification and Description Language (SDL) defined in CCITT Recommendation Z.100.

9.4.1 Behaviour of FE1

Figure 18 contains the SDL diagram for the functional entity FE1. Output signals to the left represent primitives to the user. Input signals from the right represent information flows from FE2.

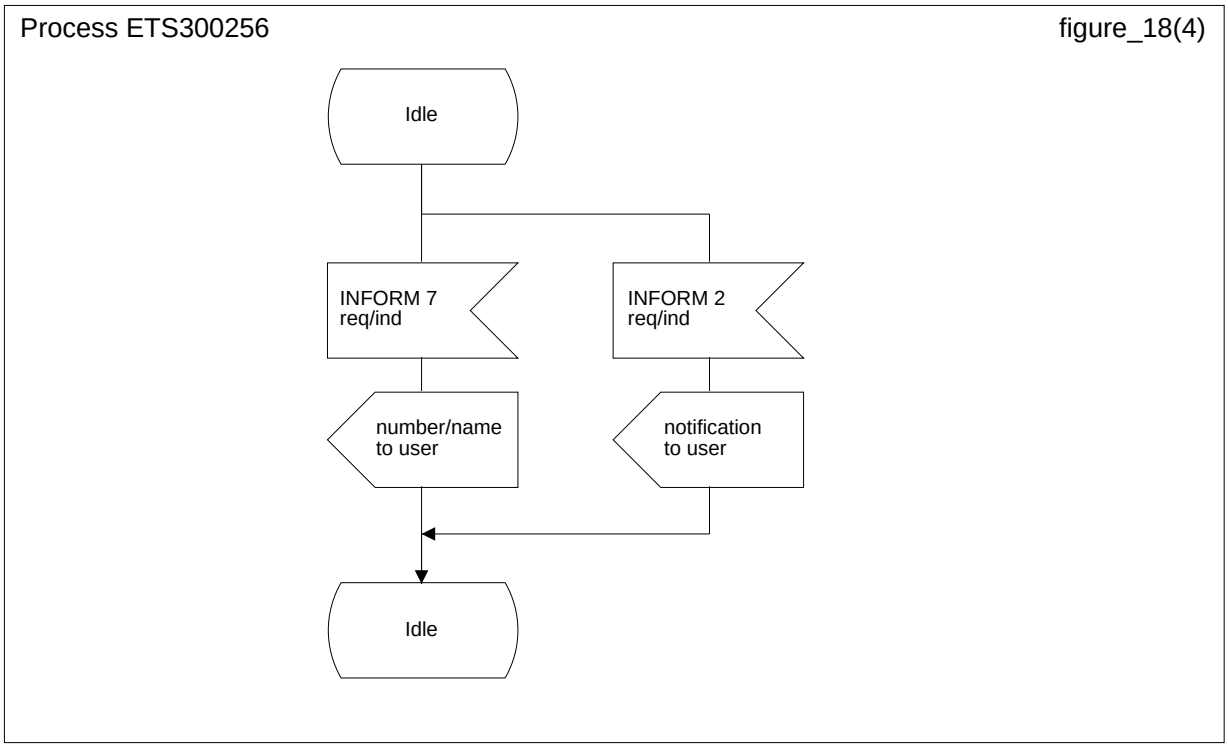

Figure 18 - SDL for Functional Entity FE1

9.4.2 Behaviour of FE2

Figure 19 contains the SDL diagram for the functional entity FE2. Output signals to the left represent information flows to other functional entities. Input signals from the right represent information flows from other functional entities, and input signals from the left represent primitives from local CC.

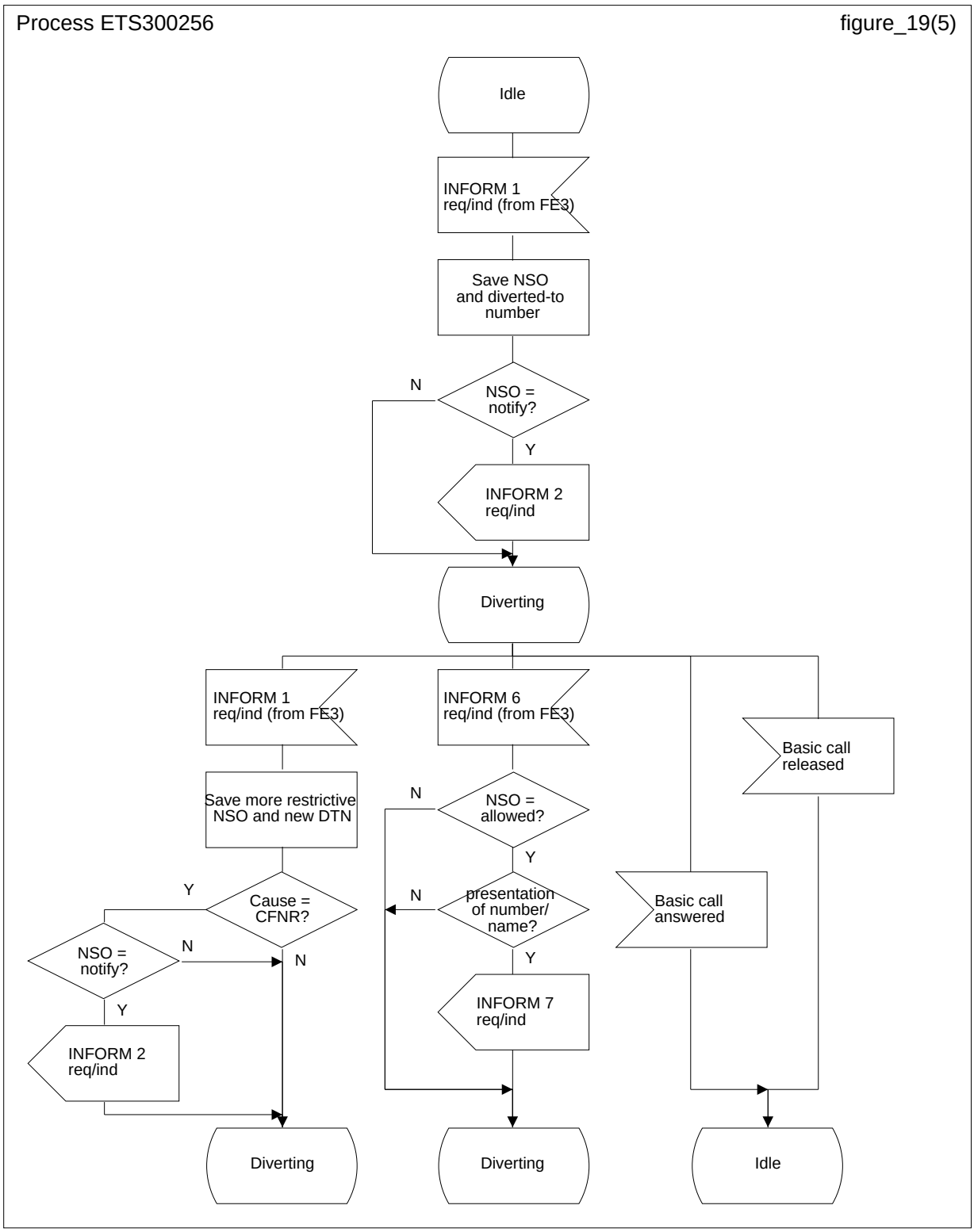

Figure 19 - SDL for Functional Entity FE2

9.4.3 Behaviour of FE3

Figure 20 contains the SDL diagram for the functional entity FE3. Output signals to the right and to the left represent information flows to other functional entities. Input signals from the right represent information flows from other functional entities, and input signals from the left represent primitives from local CC. The relationship to the basic call process is also indicated in task symbols or in the annotations.

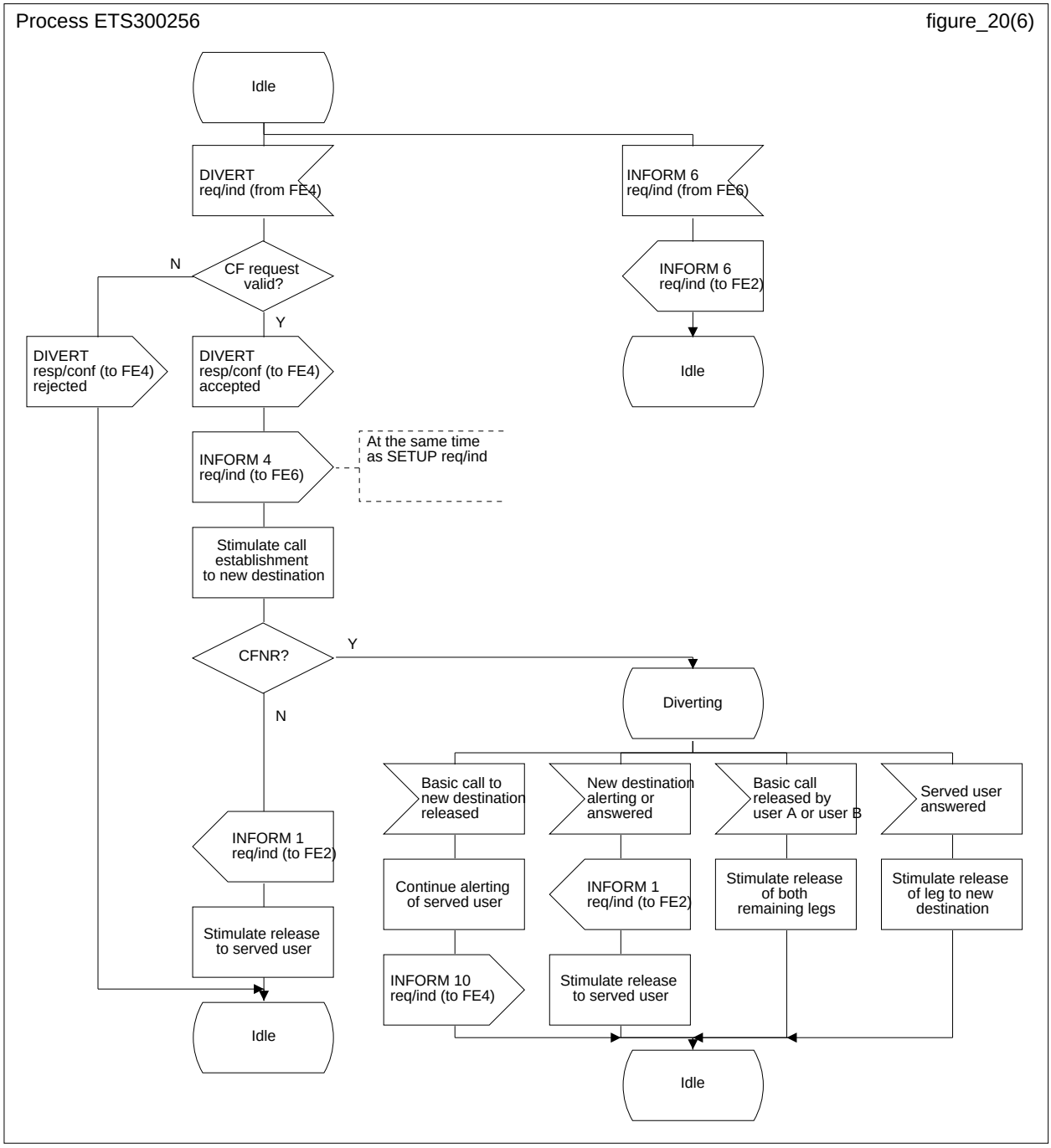

Figure 20 - SDL for Functional Entity FE3

9.4.4 Behaviour of FE4

Figure 21 contains the SDL diagram for the functional entity FE4. Output signals to the right and to the left represent information flows to other functional entities. Input signals from the right represent information flows from other functional entities or internal stimuli, and input signals from the left represent information flows from other functional entities or primitives from local CC. The relationship to the basic call process is also indicated in task symbols or in the annotations.

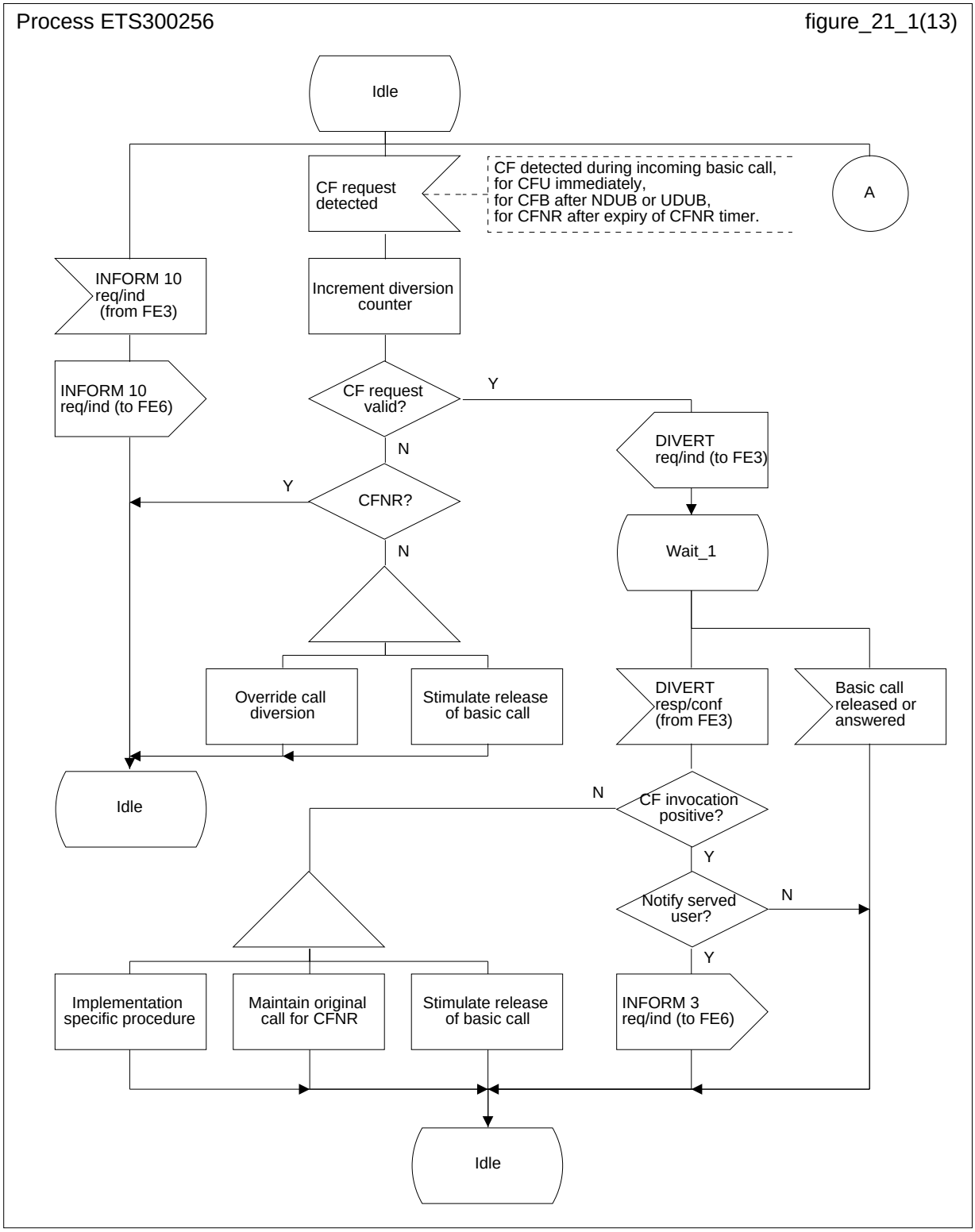

Figure 21 (sheet 1 of 2) - SDL for Functional Entity FE4

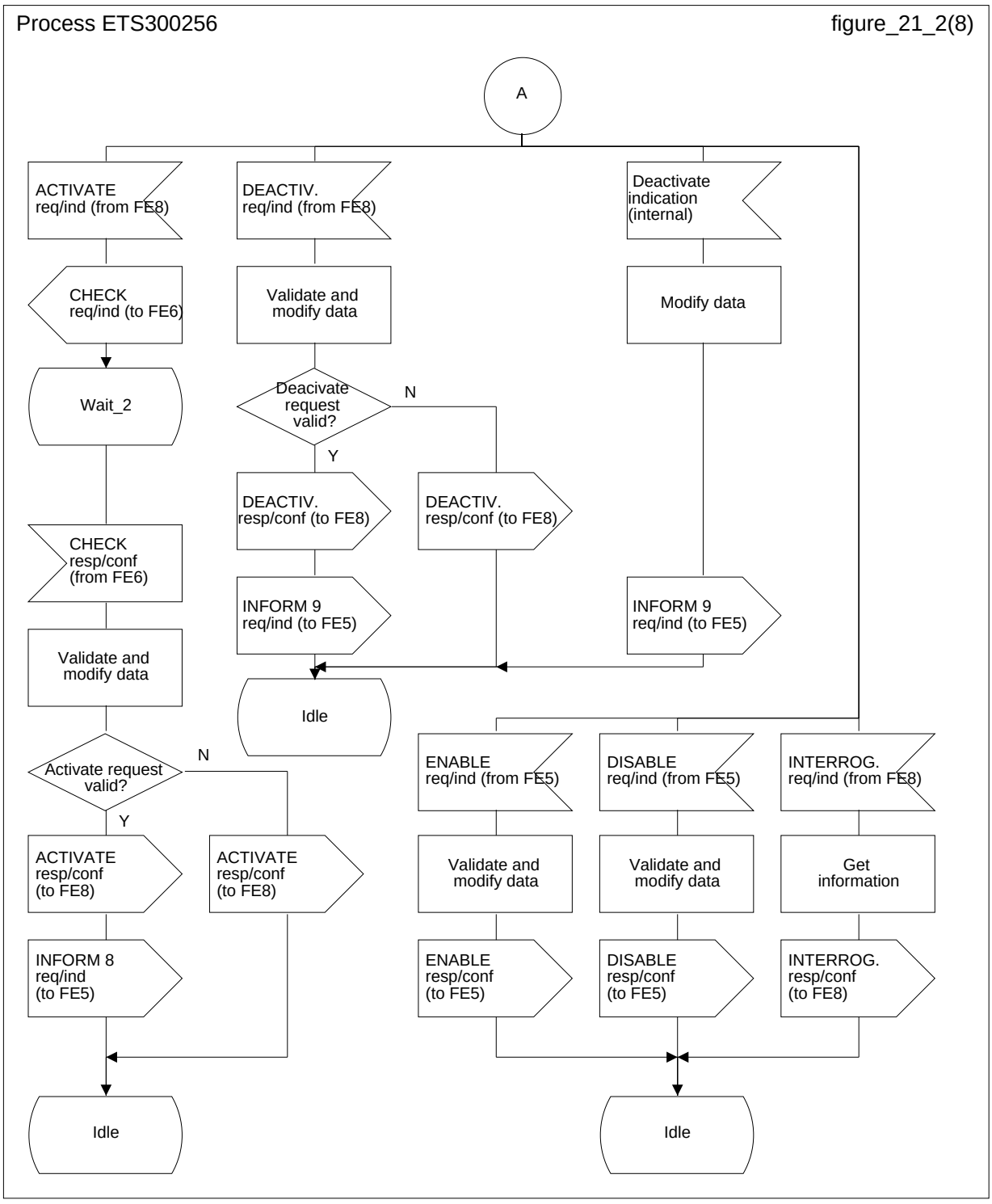

Figure 21 (sheet 2 of 2) - SDL for Functional Entity FE4

9.4.5 Behaviour of FE5

Figure 22 contains the SDL diagram for the functional entity FE5. Output signals to the right represent primitives to the user and output signals to the left represent information flows to FE4. Input signals from the right represent primitives from the user, and input signals from the left represent information flows from FE4.

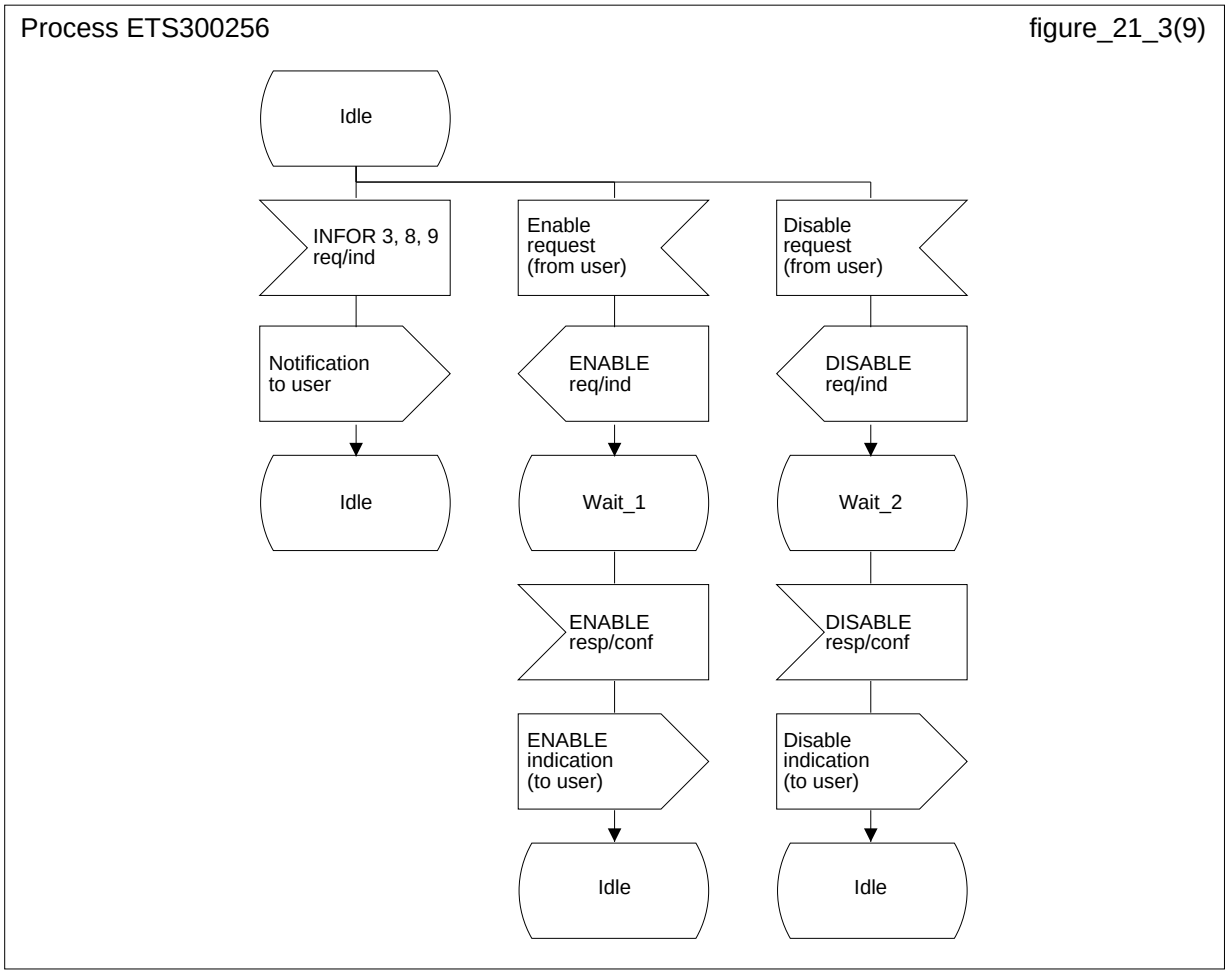

Figure 22 - SDL for Functional Entity FE5

9.4.6 Behaviour of FE6

Figure 23 contains the SDL diagram for the functional entity FE6. Output signals to the right and to the left represent information flows to other functional entities. Input signals from the left represent information flows from other functional entities. Input signals from the right represent primitives from local CC. The relationship to the basic call process is also indicated in task symbols or in the annotations.

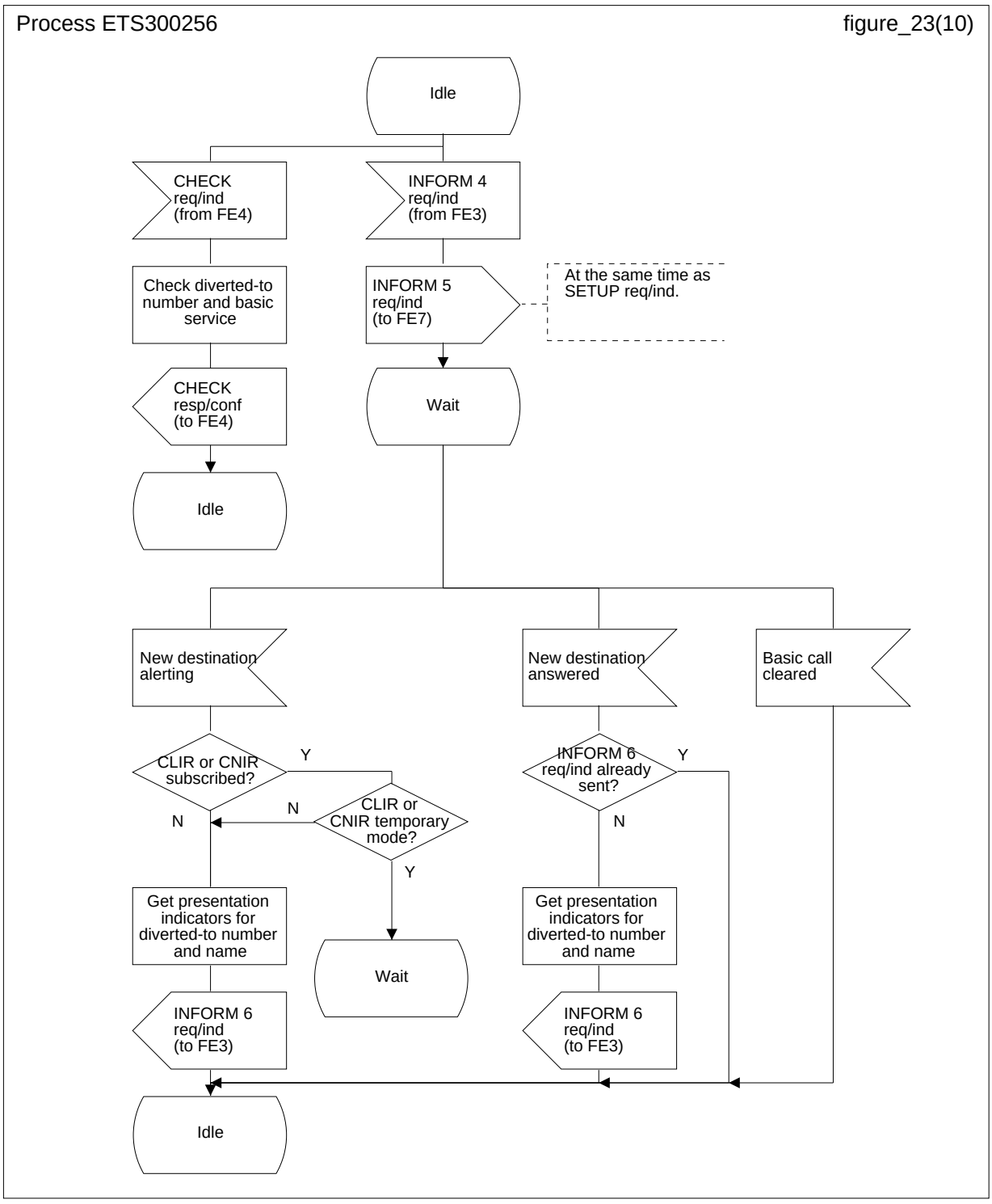

Figure 23 - SDL for Functional Entity FE6

9.4.7 Behaviour of FE7

Figure 24 contains the SDL diagram for the functional entity FE7. Output signals to the right represent primitives to the user. Input signals from the left represent information flows from FE6.

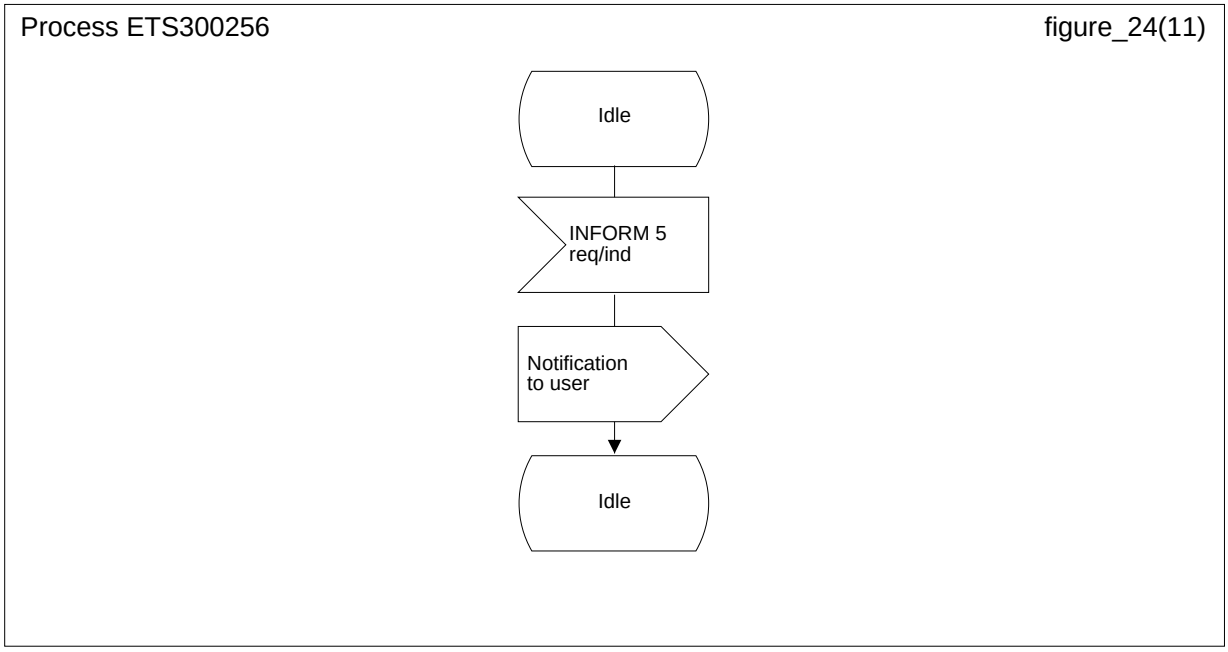

Figure 24 - SDL for Functional Entity FE7

9.4.8 Behaviour of FE8

Figure 25 contains the SDL diagram for the functional entity FE8. Output signals to the right represent information flows to FE9 and output signals to the left represent information flows to FE4. Input signals from the right represent information flows from FE9 and input signals from the left represent information flows from FE4.

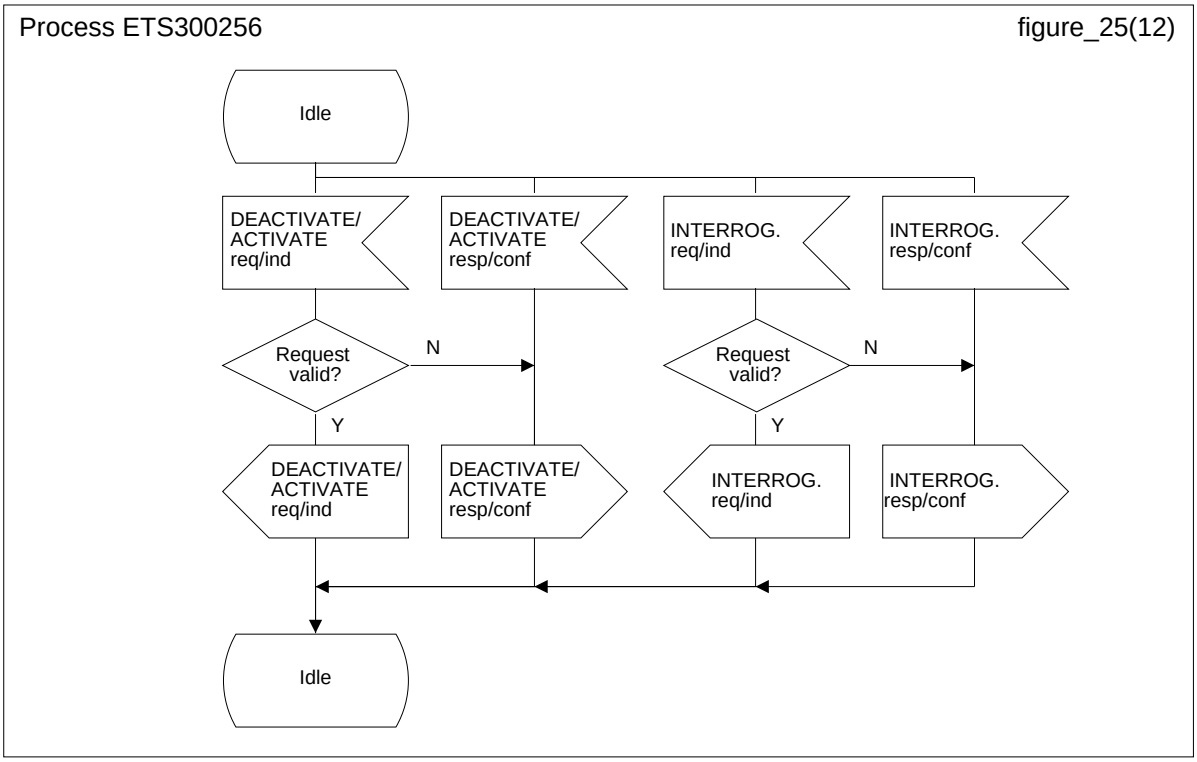

Figure 25 - SDL for Functional Entity FE8

9.4.9 Behaviour of FE9

Figure 26 contains the SDL diagram for the functional entity FE9. Output signals to the left represent information flows to FE8 and output signals to the right represent primitives to the user. Input signals from the left represent information flows from FE8 and input signals from the right represent primitives from the user.

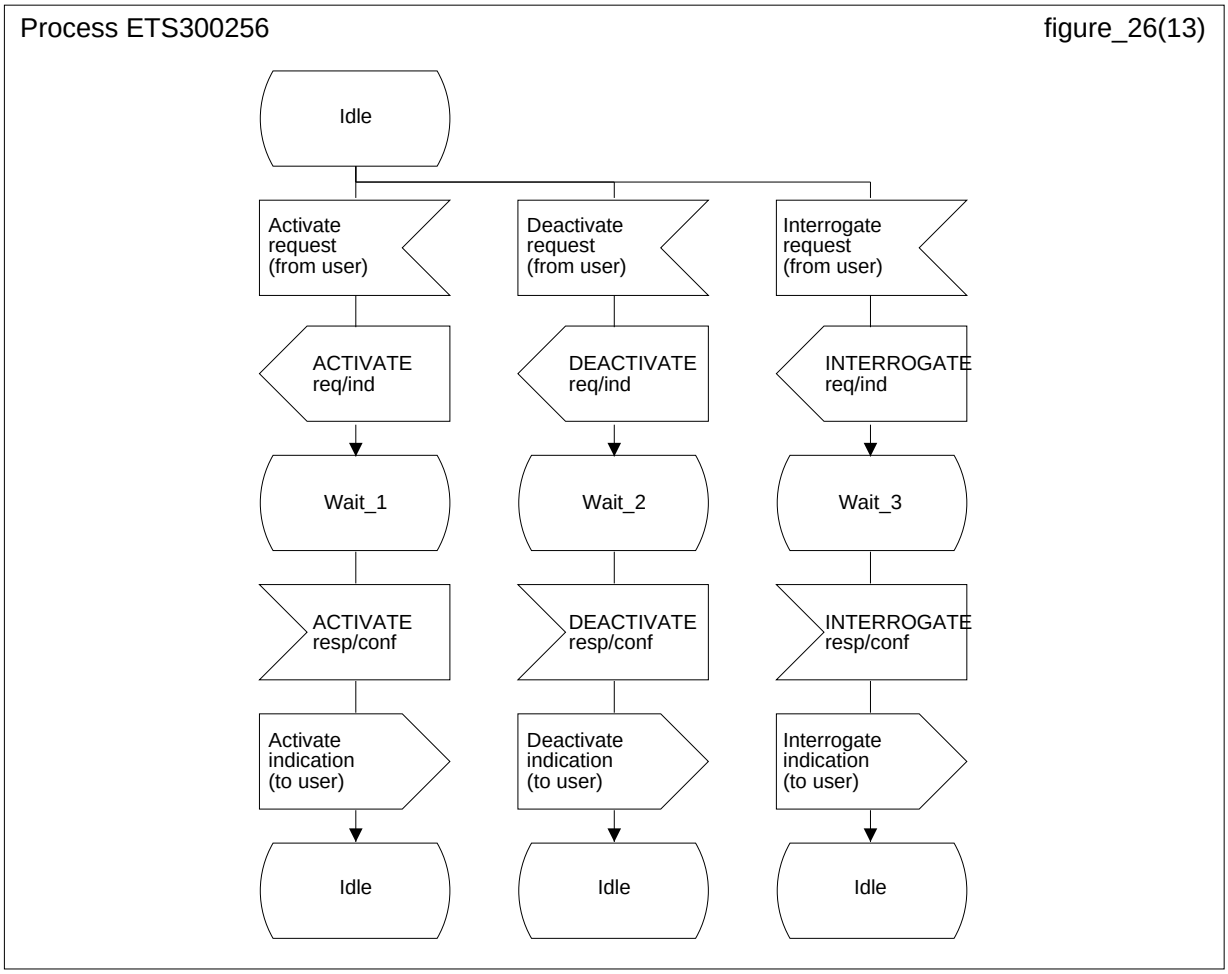

Figure 26 - SDL for Functional Entity FE9

9.5 Allocation of Functional Entities to Physical Locations

The allocation of FEs to physical locations as shown in tables 18, 19 and 20 shall apply. In these tables, "TE" indicates a TE attached to a PTN. Where a terminal involved is stimulus with respect to call diversion, any FE shown as residing in the corresponding user's TE, shall reside instead in that user's PTNX.

Table 18 - Allocation for Call Forwarding operation by "forward switching" and "partial re-routing"

FE	User A			User B		User C	
	FE1	FE2	FE3	FE4	FE5	FE6	FE7
Scenario 1	TE	PTNX	User B PTNX	PTNX	TE	PTNX	TE
Scenario 2	TE	other network	other network	other network	other network	other network	other network
Scenario 3	other network	other network	User B PTNX	PTNX	TE	other network	other network
Scenario 4	other network	other network	other network	other network	other network	PTNX	TE
Scenario 5	TE	other network	other network	other network	other network	PTNX	TE
Scenario 6	TE	PTNX	User B PTNX	PTNX	TE	other network	other network
Scenario 7	other network	other network	User B PTNX	PTNX	TE	PTNX	TE
Scenario 8	other network	other network	other network	other network	TE	other network	other network
Scenario 9	other network	other network	other network	other network	TE	PTNX	TE
Scenario 10	TE	other network	other network	other network	TE	other network	other network
Scenario 11	TE	other network	other network	other network	TE	PTNX	TE
Scenario 12	other network	other network	other network	PTNX	TE	other network	other network
Scenario 13	TE	other network	other network	PTNX	TE	other network	other network
Scenario 14	other network	other network	other network	PTNX	TE	PTNX	TE
Scenario 15	TE	other network	other network	PTNX	TE	PTNX	TE

Table 19 - Allocation for Call Forwarding operation by "re-routing"

FE	User A			User B		User C	
	FE1	FE2	FE3	FE4	FE5	FE6	FE7
Scenario 16	TE	PTNX	Originating PTNX	PTNX	TE	PTNX	TE
Scenario 17	TE	PTNX	Originating PTNX	PTNX	TE	other network	other network
Scenario 18	other network	other network	Gateway PTNX	PTNX	TE	PTNX	TE
Scenario 19	other network	other network	Gateway PTNX	PTNX	TE	other network	other network

Table 20 - Allocation for Call Forwarding activation/deactivation and interrogation

FE		Served User B		De/activating User Interrogating User	
		FE4	FE5	FE8	FE9
Scenario 20		PTNX	TE	User B PTNX	TE
Scenario 21		PTNX	TE	any PTNX	TE
Scenario 22		other network	TE	other network	TE

9.6 Interworking considerations

In cases where FE2, FE3 or FE6 is in another network, information pertaining to relationship rb, rc or re shall be passed as appropriate to the other network by the Gateway PTNX, except any restricted number or name information. In cases where FE4 is in another network, information pertaining to relationship rh shall be passed to the other network by the Gateway PTNX, if the other network supports the equivalent information flow.

In cases where information is received from an FE located in another network by a Gateway PTNX, the information required for SS-CFU, SS-CFB and SS-CFNR shall be used by that PTNX.

Annex A (informative): Relationship to corresponding Standards for Public ISDNs

The call diversion supplementary services for PTNs specified in this ETS complement and are compatible with the corresponding services for public ISDNs as specified by ETSI. There are no differences which will prevent terminal interchangeability between PTNs and public ISDNs. There are significant differences in PTN internal operation when the re-routing option and the remote activation, deactivation and interrogation options are used. There are also differences in the style and layout of this ETS in comparison with the corresponding standards for the public ISDN.

The main differences can be summarised as follows:

1. PTN terminology is used, where appropriate, instead of public ISDN terminology;

2. Stages 1 and 2 are specified together in this ETS, rather than as separate Standards;

3. The specification of the stage 1 aspects in this ETS is in terms of primitives transferred across service access points to/from the user. Public ISDN stage 1 specifications are in terms of the visibility of the service at the S/T and T reference points;

4. In the stage 1 specifications, interactions with other supplementary services are specified only for those other supplementary services for which PTN Standards were available at the time of publication of this ETS;

5. The stage 2 descriptions of CFU, CFB and CFNR are merged together into one common clause;

6. The functional entity "Interface controlling entity" is not used in this ETS;

7. This ETS specifies in addition to the call forwarding by forward switching also the option of call forwarding by re-routing;

8. Remote activation, deactivation and interrogation (i.e. by a non-served user) of call forwarding are specified as additional options;

9. An indication to the served user during a basic call that the forwarding service is active on this number is not specified in this ETS.

Annex B (informative): Bibliography

ETS 300 199 Integrated Services Digital Network (ISDN)
Call Forwarding Busy (CFB) supplementary service
Service description

ETS 300 200 Integrated Services Digital Network (ISDN)
Call Forwarding Unconditional (CFU) supplementary service
Service description

ETS 300 201 Integrated Services Digital Network (ISDN)
Call Forwarding No Reply (CFNR) supplementary service
Service description

ETS 300 203 Integrated Services Digital Network (ISDN)
Call Forwarding Busy (CFB) supplementary service
Functional capabilities and information flows

ETS 300 204 Integrated Services Digital Network (ISDN)
Call Forwarding Unconditional (CFU) supplementary service
Functional capabilities and information flows

ETS 300 205 Integrated Services Digital Network (ISDN)
Call Forwarding No Reply (CFNR) supplementary service
Functional capabilities and information flows

History

Document history	
November 1993	First Edition
January 1996	Converted into Adobe Acrobat Portable Document Format (PDF)