

E C M A

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-173

PRIVATE TELECOMMUNICATION NETWORKS (PTN)

-

**SPECIFICATION, FUNCTIONAL MODEL AND
INFORMATION FLOWS**

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**DIVERSION SUPPLEMENTARY SERVICES
(CFSD)**

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Brief History

This Standard is one of a series of ECMA 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. It has been produced under work item 2.2.2 of the supplement to ITSTC Memorandum M-IT-05 (Issue 1, November 1989) with the intention of submission to ETSI as a proposed ETS.

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

The Standard 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 standardization 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 prETS 300 199, prETS 300 200 and prETS 300 201 (stage 1), and prETS 300 203, prETS 300 204 and prETS 300 205 (stage 2). Annex A describes the relationship between this Standard and the corresponding ETSs for the public ISDN.

This ECMA Standard has been contributed to ETSI for adoption as an ETS.

Adopted as an ECMA Standard by the General Assembly of June 1992.

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1 Scope

This Standard 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 ECMA-142.

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 ECMA-134. This Standard 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.

The purpose of the stage 1 and stage 2 specifications is to guide and constrain the work on signalling protocols at stage 3. Stage 3, the definition of the networking and access layer 3 signalling protocols to support the supplementary services, is defined in separate ECMA Standards.

NOTE 1

*In clauses 6, 7, 8, 9.1 and 9.2.1, differences compared with corresponding text in the corresponding specifications for public ISDNs (listed in annex B) are indicated by **emboldening**.*

2 Conformance

In order to conform to this Standard, 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 Standard. 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

ECMA-134	Method for the Specification of Basic and Supplementary Services of Private Telecommunication Networks (1989)
ECMA-142	Specification, Functional Model and Information Flows for Control Aspects of Circuit Mode Basic Services in Private Telecommunication Networks (1990)
ECMA-148	Identification Supplementary Services in Private Telecommunication Networks - Specification, Functional Model and Information Flows (1990)
ECMA-155	Addressing in Private Telecommunication Networks (1991)
ECMA-163	Private Telecommunication Networks - Specification, Functional Model and Information Flows - Name Identification Supplementary Services (1992)
CCITT Rec. I.112 (1988)	Vocabulary of terms for ISDNs

- CCITT Rec. I.210 (1988) Principles of telecommunication services supported by an ISDN and the means to describe them
- CCITT Rec. Z.100 (1988) Specification and description language
- ENV 41007 (1989) Definition of Terms in Private Telecommunication Networks

4 Definitions

For the purpose of this Standard the following definitions apply.

4.1 External definitions

This Standard uses the following terms defined in other documents:

- Basic Service (CCITT Rec. I.210)
- Connection (CCITT Rec. I.112)
- Integrated Services Digital Network (CCITT Rec. I.112)
- Private (ENV 41007)
- Private Telecommunication Network Exchange (ENV 41007)
- Public (ENV 41007)
- Public ISDN (ENV 41007)
- Service (CCITT Rec. I.112)
- Signalling (CCITT Rec. I.112)
- Supplementary Service (CCITT Rec. I.210)
- Telecommunication Network (ENV 41007)
- Terminal, Terminal equipment (ENV 41007)
- User (ECMA-142)

This Standard refers to the following basic call functional entities defined in ECMA-142:

- Call Control
- Call Control Agent

This Standard refers to the following basic call inter-FE relationships defined in ECMA-142:

- r1
- r2

This Standard refers to the following basic call information flows defined in ECMA-142:

- 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 user

The user to which a call is diverted.

4.9 Diverting cause

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

4.10 Diverting number

The number of the served user.

4.11 Forwarding

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

NOTE 2

Forwarding can occur as a result of the supplementary services specified in this Standard (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 Standard.

4.12 Forward switching

Network routing 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.

4.13 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.

4.14 Original called number

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

4.15 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.

4.16 Partial rerouting

Network routing 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 3

Rerouting by a Transit PTNX is not considered as partial rerouting.

4.17 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.

4.18 PTN number

A number belonging to a PTN numbering plan (CCITT Rec. E.164 ISDN/Private/Implicit numbering plan) specified in ECMA-155.

4.19 Rerouting

Network routing 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.

4.20 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.

4.21 User A

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

4.22 User B

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

4.23 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 4

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.

4.24 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)
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

Call Forwarding Unconditional permits a served user to have the PTN send all incoming calls, or just those associated with a specified basic service, addressed to the served user's PTN number to another number. The served user's originating service is unaffected. If this service is activated, calls are diverted no matter what is the condition of the termination.

CFU is provided on a PTN number.

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.

For a given PTN number, this service (including options) may be subscribed to for each basic service to which the user of the number subscribes, or collectively for all the basic services to which the user subscribes.

NOTE 5

The subscription options offered by a PTN to the users are considered as implementation options.

6.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all telecommunication services.

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 each PTN number, the supplementary service may be subscribed to for every basic service subscribed to at that PTN number or for only some of the basic services subscribed to at that PTN number.

The subscription parameters and values offered by a PTN shall be an **implementation** matter. A PTN may offer more or less parameters and values than those specified below.

Parameters may apply separately to each basic service subscribed to on each PTN number. For each subscription parameter, only one value shall be selected. Subscription options are summarized in table 1.

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 receives notification that CFU is currently activated	- No - Yes
* 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

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.

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 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 and basic service(s) exist may be carried out before accepting the CFU activation request.

When the served user so activates CFU, the service provider shall return notification of acceptance or rejection of the request (see exceptional procedures for a list of possible causes for rejection). 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 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.
- If activation/deactivation is unsuccessful, the PTN shall inform only the terminal from which the request was received.

It shall be possible to deactivate CFU in either of two ways. The user can specifically deactivate the CFU activation, whereupon the PTN shall discard the diverted-to number. The user can activate CFU for the specified basic service to another number, thus causing the previous invocation of CFU to be overridden.

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.

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 authorized user may activate and/or deactivate CFU at the served user. Authorization shall be implementation dependent (e.g. attendants may be authorized).
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 performed, the served user shall also be notified upon the acceptance of the request including the number of the diverted-to user, the basic service and the served user number. A rejection, if any, of the remote activation/deactivation request shall only be sent to the activating/deactivating user.

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

NOTE 6

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. 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
 - activated for which basic service(s).

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 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 authorized user may interrogate CFU conditions on the served user. Authorization shall be implementation dependent (e.g. attendants may be authorized).
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

When CFU is active, all incoming calls shall be diverted without being offered 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 CFU has been invoked successfully.

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

1. indication that a call has been forwarded unconditionally;
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/CNIP 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 altering 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

It shall not be possible to activate CFU for all basic services and CFU of particular basic services simultaneously.

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,

- basic service to which relevance is requested is not subscribed to.

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 the PTN deactivates CFU without the served user having requested deactivation (e.g. when an exceptional condition occurs), the served user shall receive notification along with the cause.

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 Invocation and operation

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 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.

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.

6.2.3.3 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.

6.3 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 Standard 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 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 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 the Calling Line Identification Restriction is applicable and activated, the Calling Line Identification shall not be presented to the diverted-to user or to the served user unless that user has an override category.

If a diverted-to user subscribes to Connected Line Identification Restriction "permanent mode", then the diverted-to user's number shall not be provided to the calling user with the notification that the call has been diverted.

If a diverted-to user subscribes to Connected Line Identification Restriction "temporary mode", then the diverted-to user's number shall not be provided to the calling user until negotiation with the diverted-to user has taken place and a positive indication from that user has been received (i.e. the default value shall not be used).

NOTE 7

The diverted-to user's number can still be released on answer, after confirmation, or using the default.

In each of the above situations, a calling user that subscribes to COLP and who has override capability shall not be able to receive the diverted-to user's number as part of the diverting notification information, but can invoke COLP with override in order to receive the connected line identity when the call is answered.

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 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 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 8

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 CFNR.

6.3.9 Call Transfer (CT)

No interaction.

6.3.10 Completion of Calls to Busy Subscriber (CCBS)

If the call to user B is diverted to user C by CFU and user C is busy, then a CCBS request if made by user A shall be applied to user C.

If user B activates CFU after user A has requested CCBS and whilst the CCBS recall is pending, then the CCBS request shall either continue to be applied to user B or be cancelled.

If a user invokes CCBS, and either already has activated or subsequently activates CFU, this shall not affect the provision of the CCBS recall to that user.

6.3.11 Completion of Calls on No Reply (CCNR)

If the call to user B is diverted to user C by CFU and user C does not answer, then a CCNR request if made by user A shall be applied to the diverted-to user C.

If user B activates CFU after user A has requested CCNR and whilst the CCNR recall is pending, then the CCNR request shall be either continue to be applied to user B or be cancelled.

If a user invokes CCNR, and either already has activated or subsequently activates CFU, this shall not affect the provision of the CCNR recall to that user.

6.3.12 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 Rec. 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.

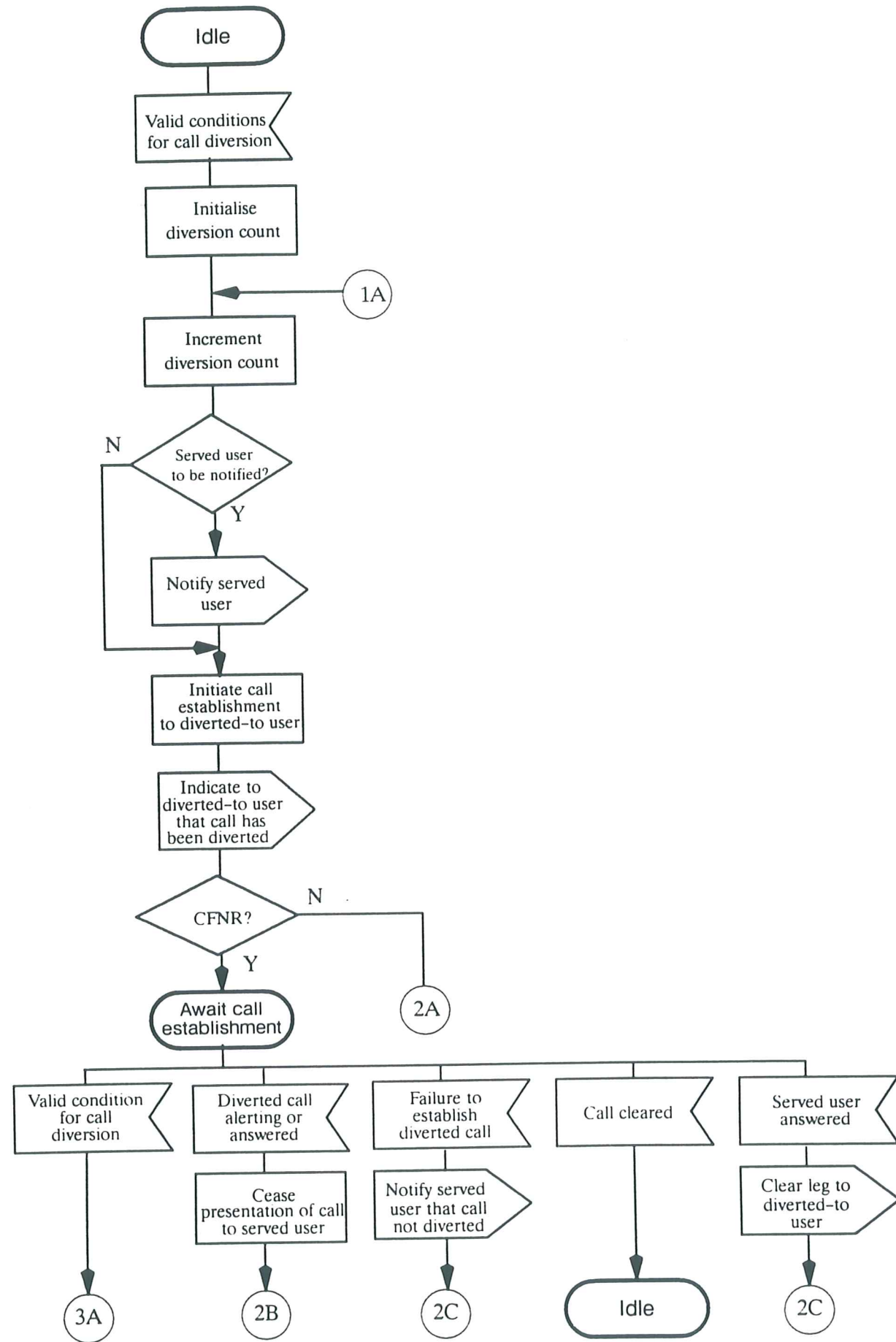
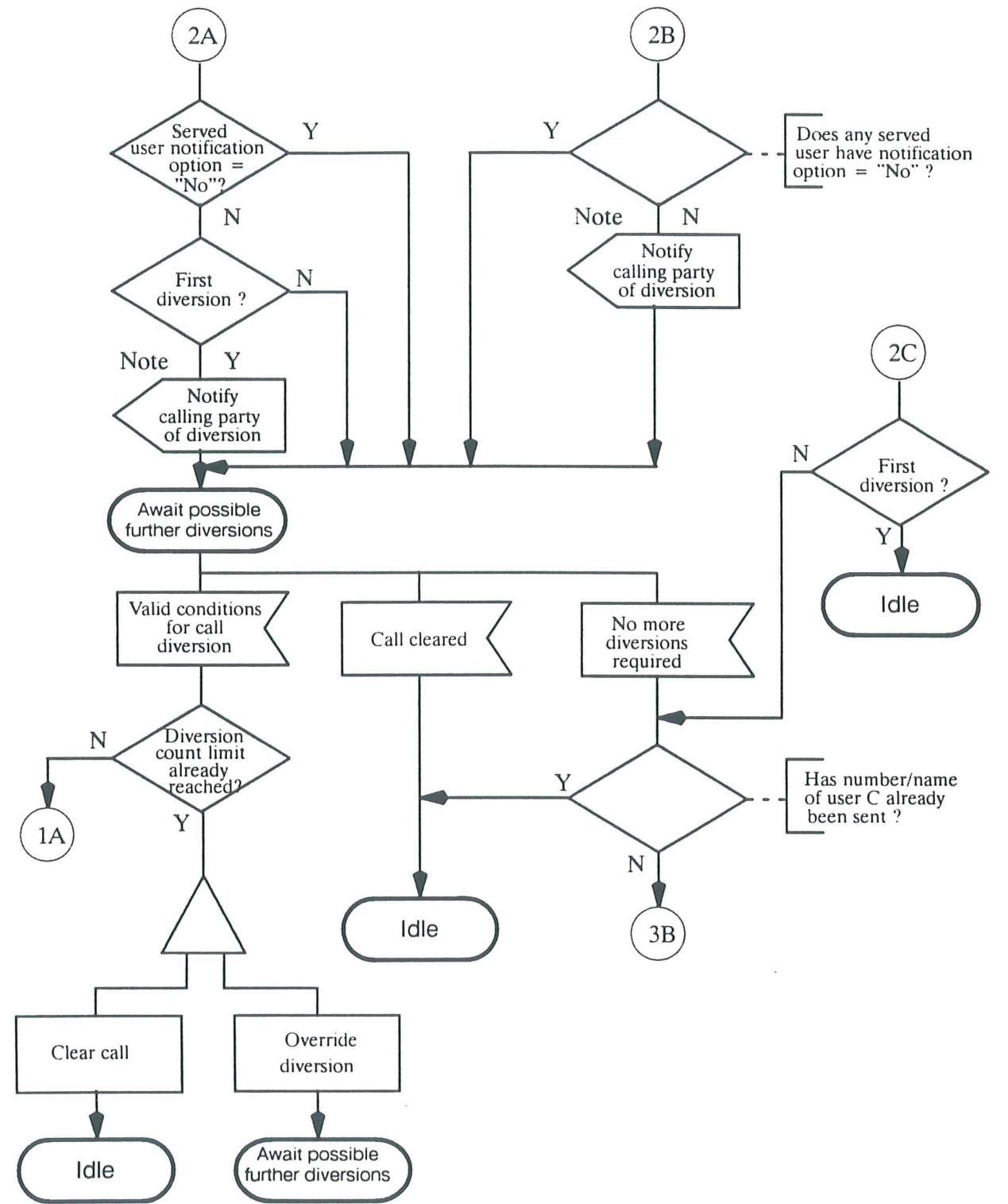


Figure 1 - SS-CF, Overall SDL part 1



NOTE

May be accompanied by a notification of number/name according to the provisions in 6.2.2.2.3.

Figure 1 - SS-CF, Overall SDL part 2

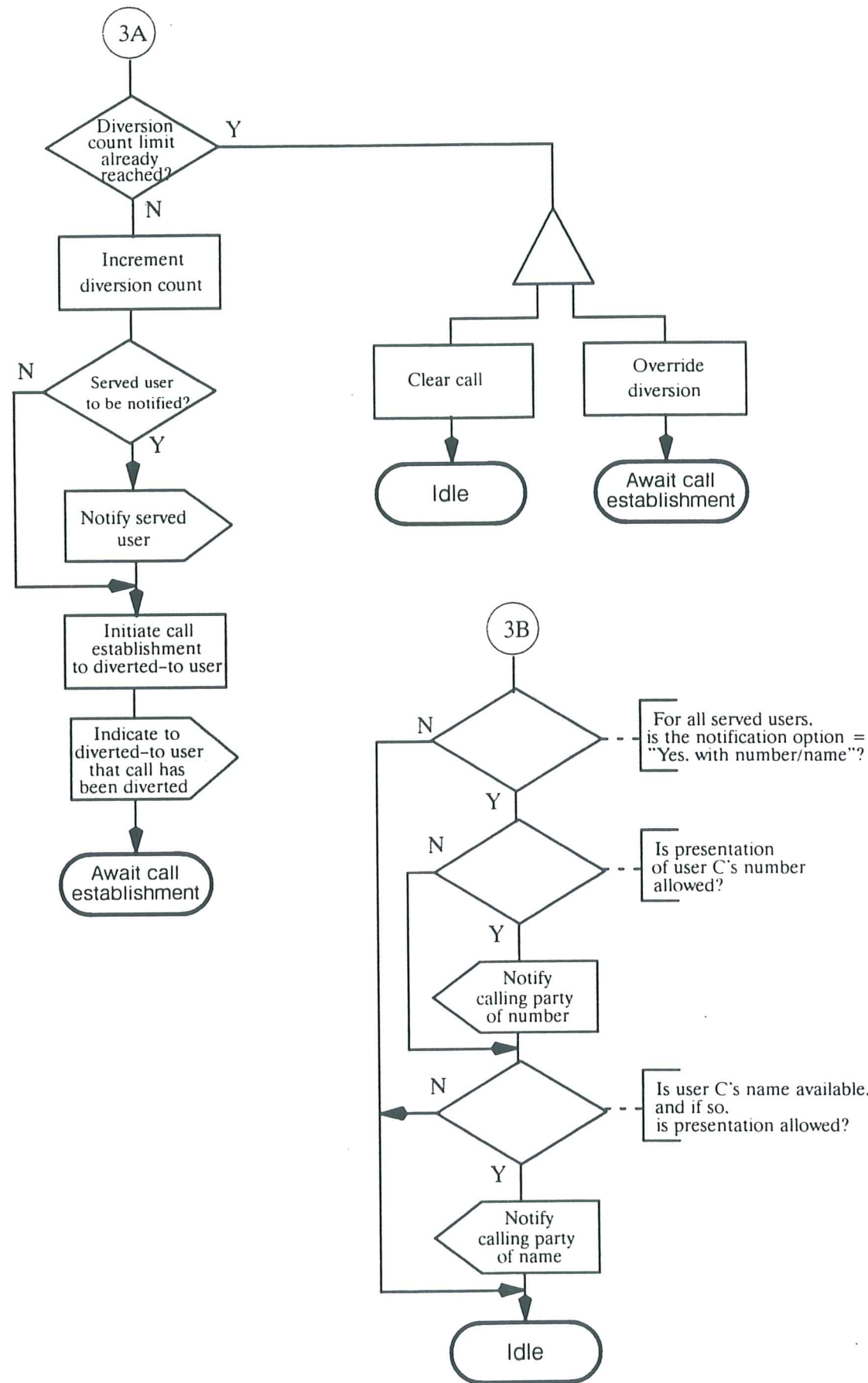


Figure 1 - SS-CF, Overall SDL part 3

7 SS-CFB stage 1 description

7.1 Description

7.1.1 General description

Call Forwarding Busy (CFB) permits a served user to have the PTN send all incoming calls, or just those associated with a specified basic service, which meet a busy condition and are addressed to the served user's PTN number to another number. The served user's originating service is unaffected.

CFB is provided on a PTN number.

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.

For a given PTN number, this service (including options) may be subscribed to for each basic service to which the user of the number subscribes, or collectively for all the basic services to which the user subscribes.

NOTE 9

The subscription options offered by a PTN to the users are considered as implementation options.

7.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all basic telecommunication services.

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

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

7.2.2.2 Invocation and operation

When CFB is active and the served user is Network Determined User Busy (NDUB) or User Determined User Busy (UDUB), then an incoming call to the served user shall be diverted.

7.2.2.2.1 Served user notification

In the case of UDUB, the call will have been offered to the served user and normal call set up information will have been provided. When the diversion attempt is started, the served user shall receive notification that a call has been diverted. No further notification shall be given.

When an incoming call is diverted without being offered to the served user (i.e. NDUB condition), the served user, as a subscription option, may receive notification of the call diversion (but will not be able to answer the incoming call). This notification shall be given as soon as the diversion attempt is started and shall include the following information (on the call that has been diverted):

1. indication that a call has been forwarded on busy;
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 (in case of NDUB only):

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.

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 Standard 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)

Unless CNIP 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 diverting user that a call has been diverted if the call is not presented prior to the invocation of CFB.

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 Completion of Calls to Busy Subscriber (CCBS)

If the call to user B is diverted to user C by CFB and user C is busy, then a CCBS request if made by user A shall be applied either to the diverted-to user C or to the originally called user B.

If user B activates CFB after user A has requested CCBS and whilst the CCBS recall is pending, then the CCBS request shall continue to be applied to user B.

If a user invokes CCBS, and either already has activated or subsequently activates CFB, this shall not affect the provision of the CCBS recall to that user.

7.3.11 Completion of Calls on No Reply (CCNR)

If the call to user B is diverted to user C by CFB and user C does not reply, then a CCNR request if made by user A shall be applied to the diverted-to user C.

If user B activates CFB after user A has requested CCNR and whilst the CCNR recall is pending, then the CCNR request shall continue to be applied to user B.

If a user invokes CCNR, and either already has activated or subsequently activates CFB, this shall not affect the provision of the CCNR recall to that user.

7.3.12 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

Call Forwarding No Reply (CFNR) permits a served user to have the PTN send all incoming calls, or just those associated with a specified basic service, which meet No Reply and are addressed to the served user's PTN number to another number. The served user's originating service is unaffected.

CFNR is provided on a PTN number.

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.

For a given PTN number, this service (including options) may be subscribed to for each basic service to which the user of the number subscribes, or collectively for all the basic services to which the user subscribes.

NOTE 10

The subscription options offered by a PTN to the users are considered as implementation options.

8.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all telecommunication services.

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

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

8.2.2.2 Invocation and operation

When CFNR is active, all incoming calls shall be offered to the served user. Normal call offering information shall be provided to the served user. If the served user does not reply within a specified time interval, the call shall be diverted.

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

The served user, as a subscription option, may receive notification that the call has been diverted. This notification shall be given as soon as the diverting attempt is started.

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 Invocation and operation

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, either the calling user shall receive call clearing with an appropriate cause or further diversions 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.

8.2.3.3 Interrogation

6.2.3.3 shall apply.

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 Standard 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 11

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 12

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 Completion of Calls to Busy Subscriber (CCBS)

If user B activates CFNR after user A has requested CCBS and whilst the CCBS request is pending, then the CCBS request shall continue to be applied to user B.

If a user invokes CCBS, and either already has activated or subsequently activates CFNR, this shall not affect the provision of the CCBS recall to that user.

8.3.11 Completion of Calls on No Reply (CCNR)

If the call to user B is diverted to user C by CFNR and user C does not reply, then a CCNR request if made by user A shall be applied either to user B or to user C.

If user B activates CFNR after user A has requested CCNR and whilst the CCNR request is pending, then the CCNR request shall continue to be applied to user B.

If a user invokes CCNR, and either already has activated or subsequently activates CFNR, this shall not affect the provision of the CCNR recall to that user.

8.3.12 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 routing algorithm and the "rerouting" network routing 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 routing algorithms (call diversion by "forward switching" and call diversion by "rerouting").

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

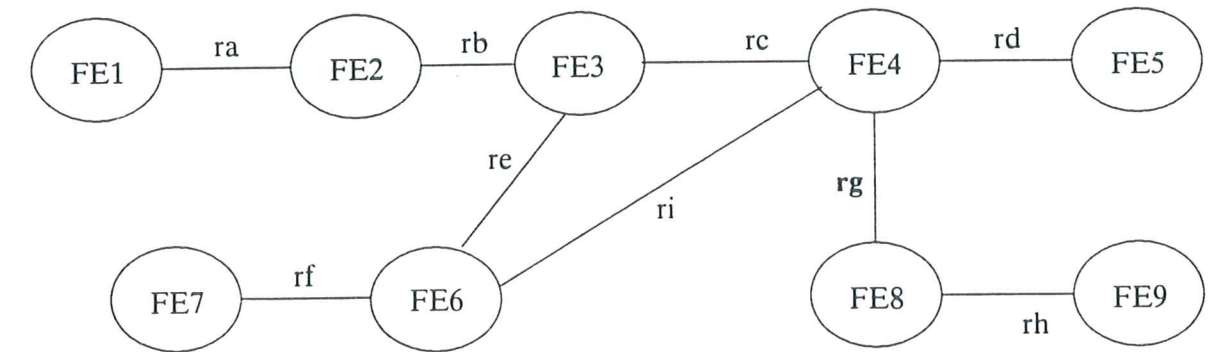


Figure 2 - Functional Model for a single stage of call forwarding

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

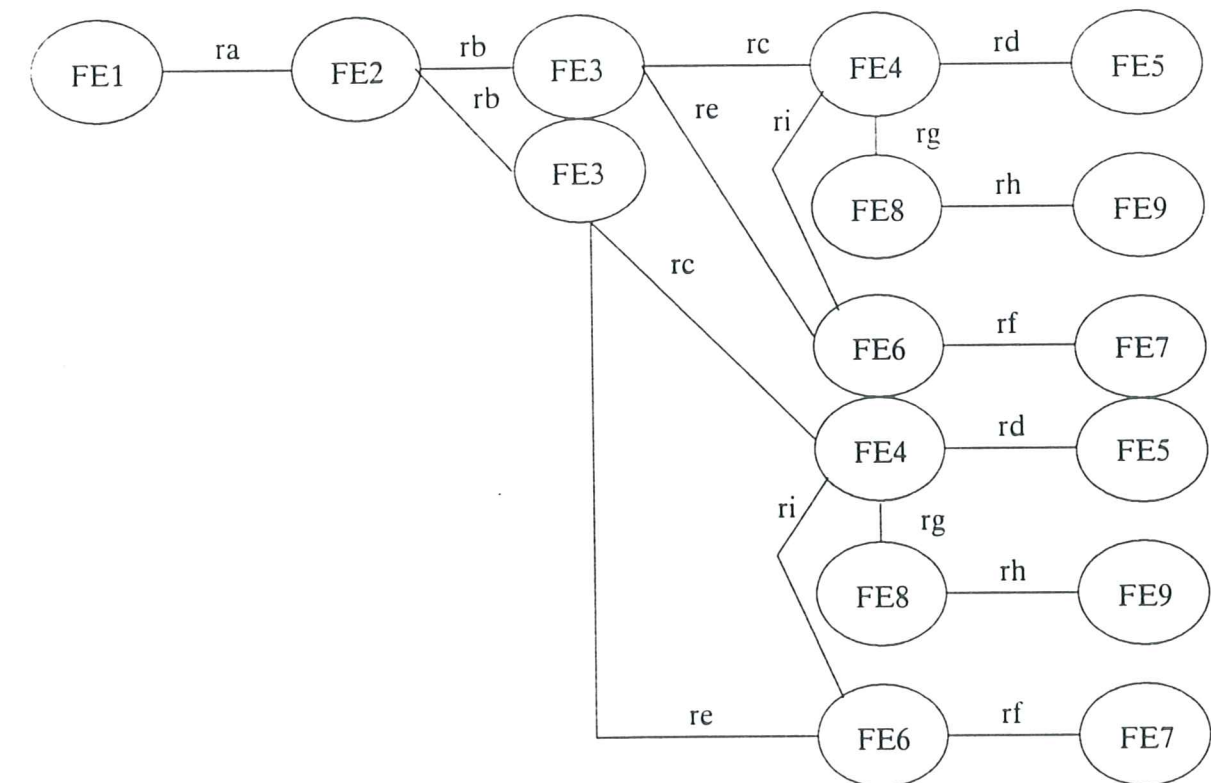


Figure 3 - Functional Entity Model for two stages of call forwarding

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 with a Basic Service**
- 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 rerouteing. 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.**

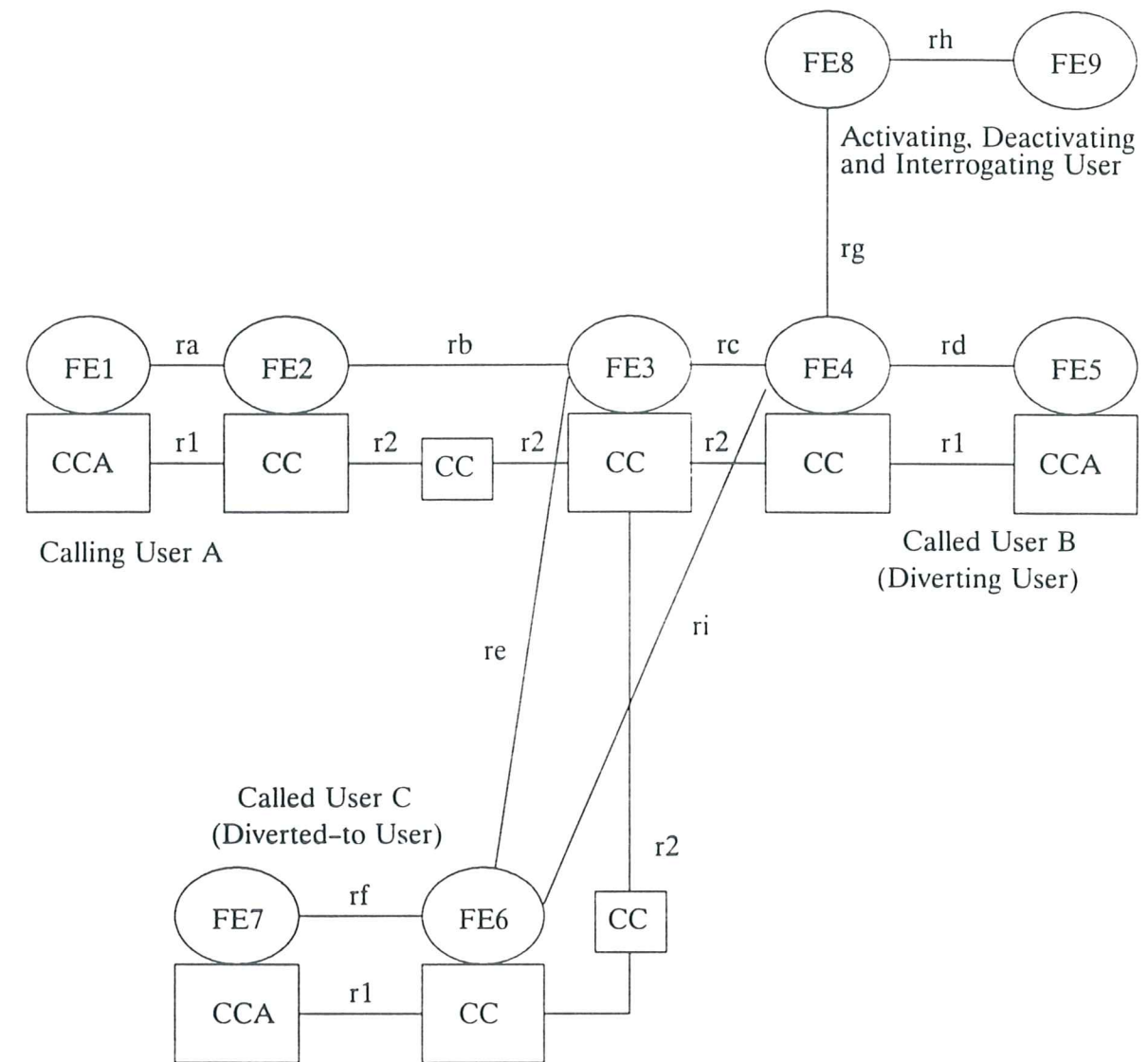


Figure 4 - Functional Entity Model Relationship

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. 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 Yes, without number/name Yes, with number/name	M	
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.

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 (Notes 3, 6)	
Last Diverting Cause	CFU, CFB, CFNR	O (Notes 3, 7, 8)	
Connection Type		O (Notes 3, 4)	
Origination Number		O (Notes 1, 3, 8)	
Origination Subaddress		O (Notes 1, 3, 8)	
Calling Party Name		O (Notes 2, 3, 8)	
Last Diverting Number incl. restriction indicator		O (Notes 3, 5, 7, 8)	
Original Called Number incl. restriction indicator		O (Notes 3, 5, 7, 8)	

NOTE 1

This service element shall be included as defined for the Identification supplementary services in ECMA-148.

NOTE 2

This service element shall be included as defined for the Name Identification supplementary services in ECMA-163.

NOTE 3

This service element shall not be included in case of CFNR.

NOTE 4

This service element is defined in ECMA-142.

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.

NOTE 8

This service element shall not be included in case of CFB UDUB.

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 inc. restriction indicator		O (Notes 2)	

NOTE 1

This service element shall be included as defined for the Name Identification supplementary services in ECMA-163.

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 ECMA-142.

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 ECMA-148.

NOTE 2

This service element shall be included as defined for the Name Identification supplementary services in ECMA-163.

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 ECMA-142.

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
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
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 from FE4 to FE3 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 Yes, without number/name Yes, with number/name	M	
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 incl. restriction indicator		O (Notes 3, 4)	
Diverting Party Name incl. restriction indicator		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 may be omitted in case of name not available or in case of presentation restricted or if not implemented.

NOTE 5

This service element shall be included as defined for the Name Identification supplementary services in ECMA-163.

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)	
Served User's MSN Number		O (Note 2)	
Interrogation Request Result	activated not activated, or rejected		M
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)

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 user B. It shall not be included in remote INTERROGATE information flows.

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".

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	M
Diverted-to Subaddress		O	
Basic Service	all or a specific one	M	
Served User's Number		O (Note 1)	
Served 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)

NOTE 1

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

NOTE 2

This service element shall only be included if MSN applies for user B. It shall not be included in remote ACTIVATE information flows.

NOTE 3

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

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)	
Served User's MSN Number		O (Note 2)	
Deactivation Request Result	accepted or rejected		M
Cause for rejection	service not subscribed insufficient information basic service not subscribed		O (Note 3)

NOTE 1

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

NOTE 2

This service element shall only be included if MSN applies for user B. It shall not be included in remote DEACTIVATE information flows.

NOTE 3

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

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 insufficient information basic service not subscribed		O (Note 2)

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 insufficient information basic service not subscribed		O (Note 2)

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 no valid diverted-to no. basic service not subscribed		O (Note)

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 operation is shown in figure 5.

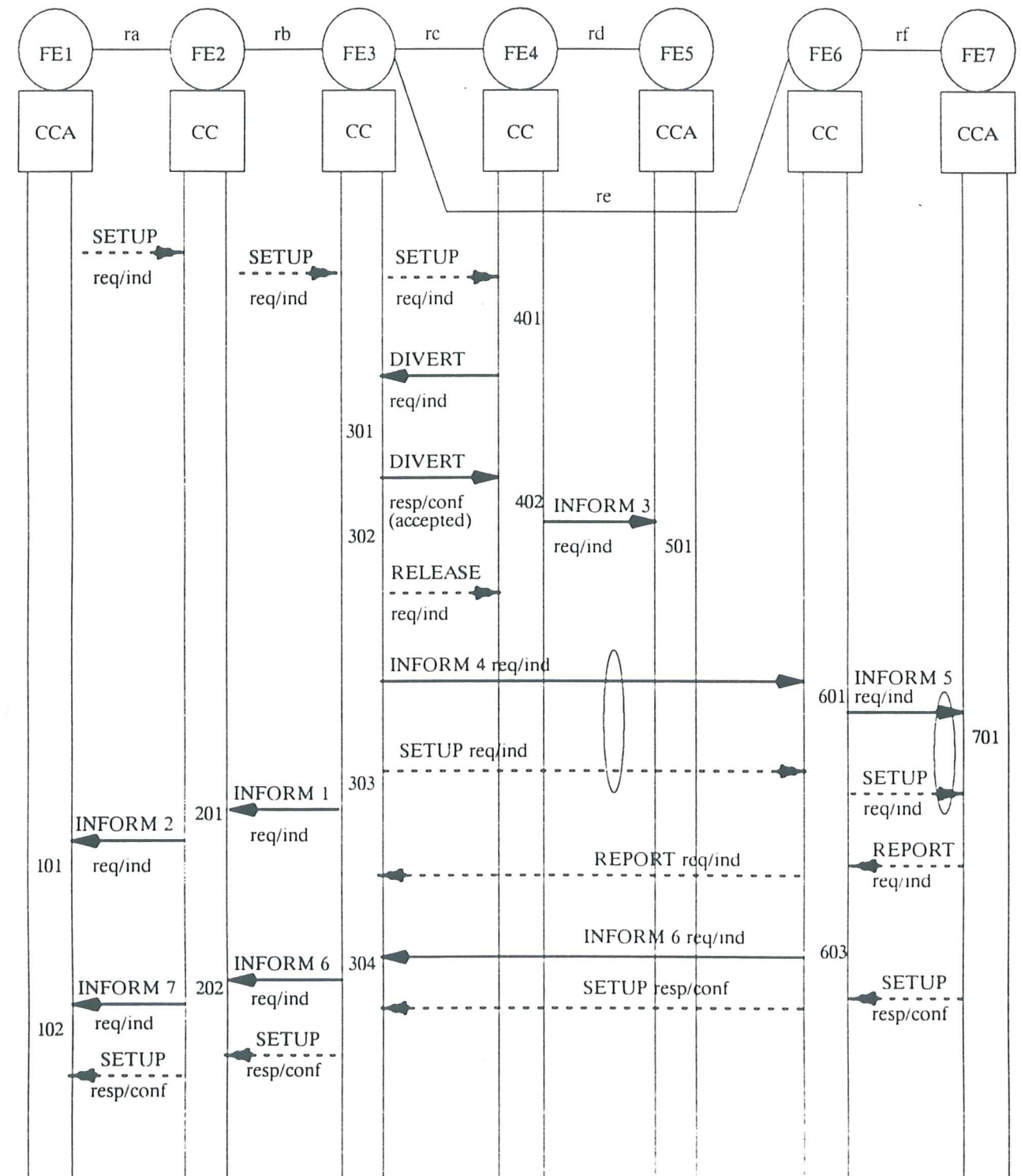


Figure 5 - Information Flow Sequence for successful CFU/CFB operation

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

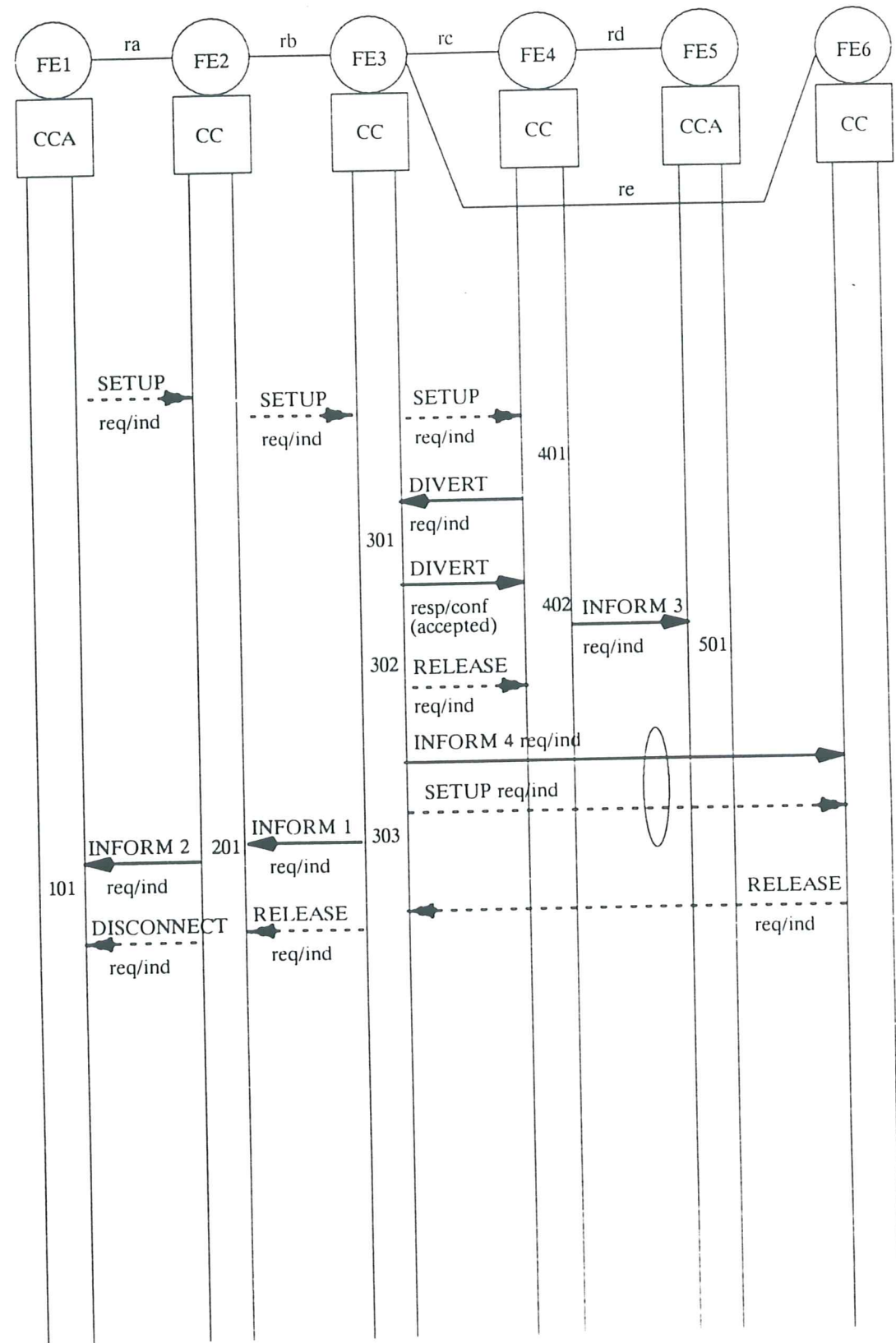


Figure 6 - Information Flow Sequences for unsuccessful CFU/CFB operation: failure of diverted call

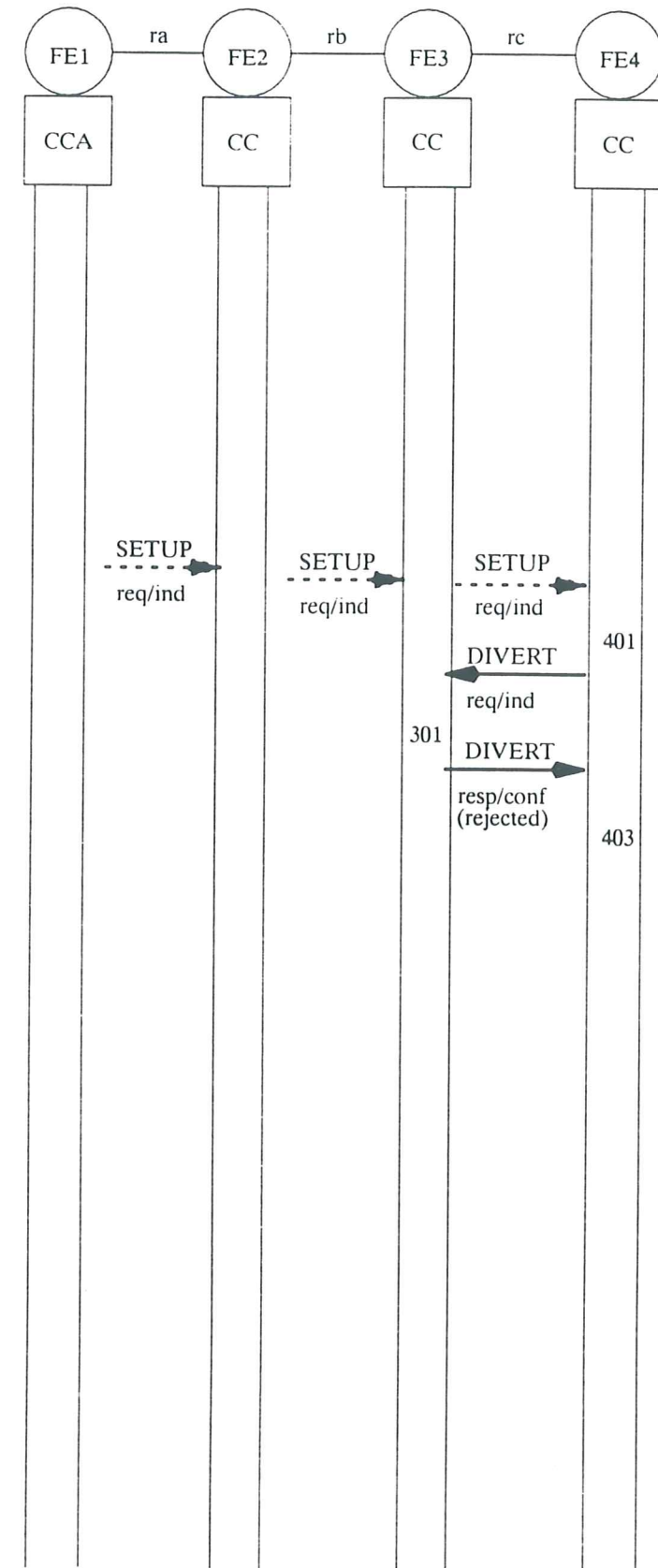


Figure 7 - Information Flow Sequences for unsuccessful CFU/CFB operation: rejection of Call Diversion

9.2.2.2 Information flow sequences for CFNR operation

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

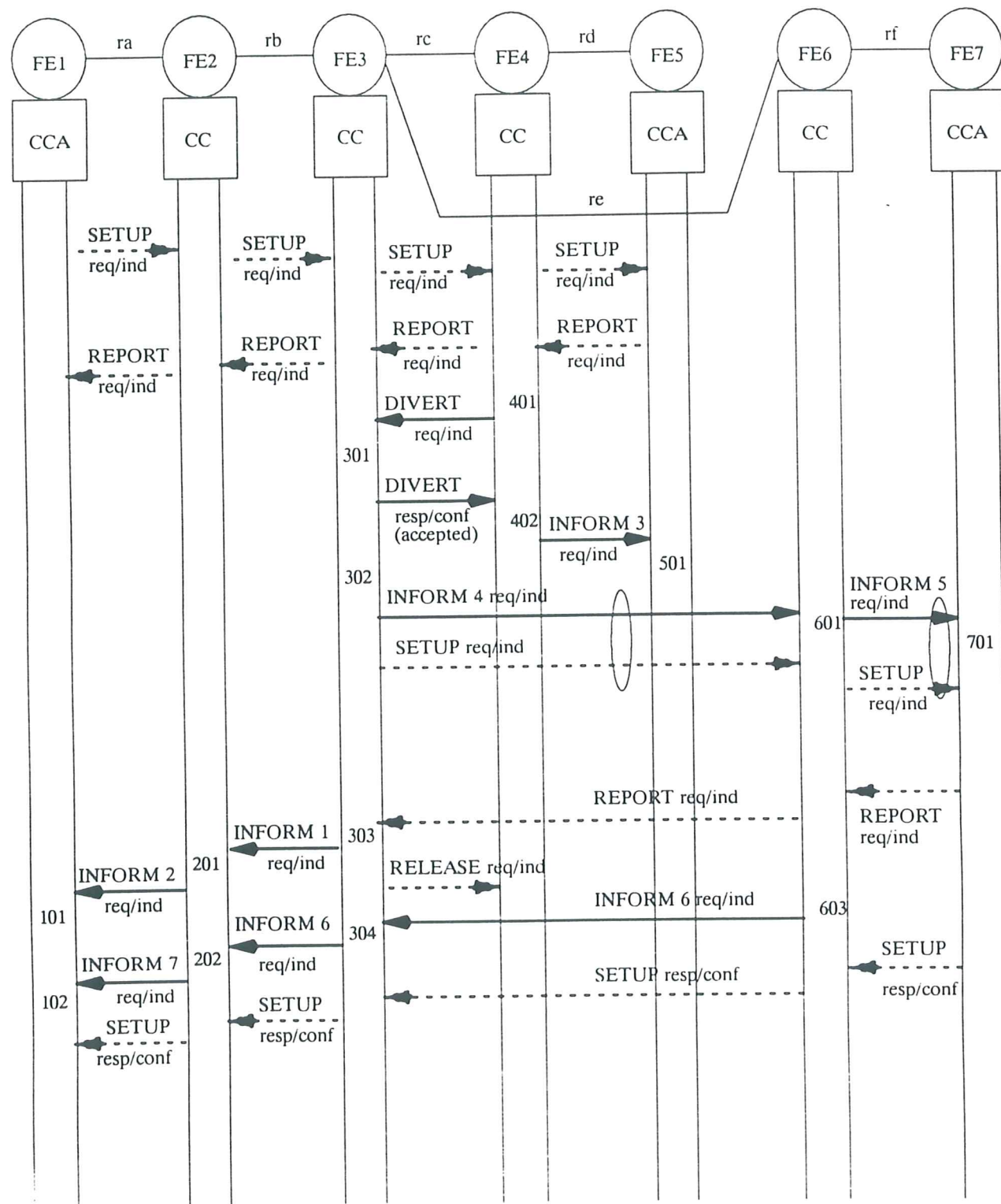


Figure 8 - Information Flow Sequence for successful CFNR operation

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

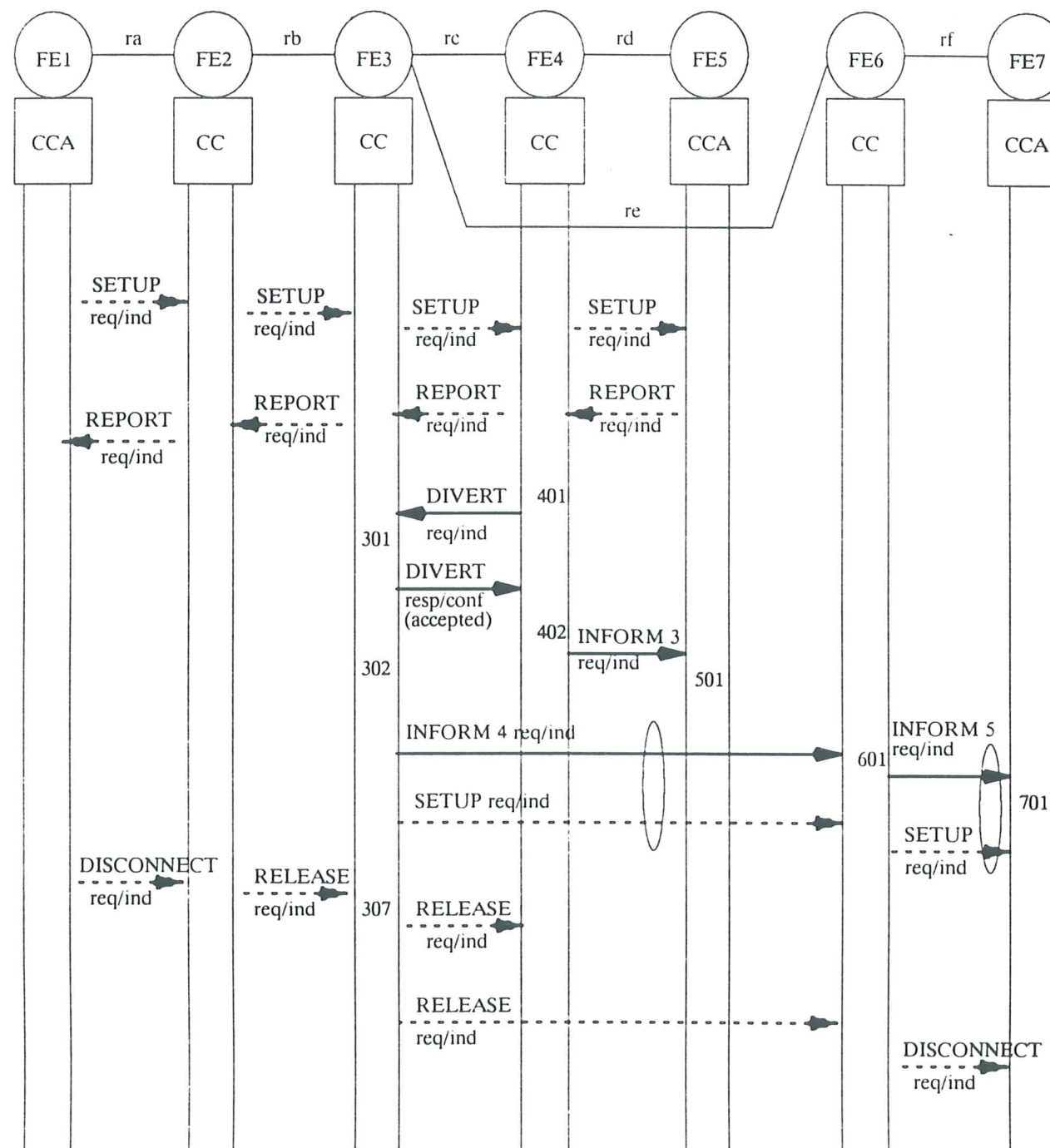


Figure 9 - Information Flow Sequence for clearing by user A during CFNR operation

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

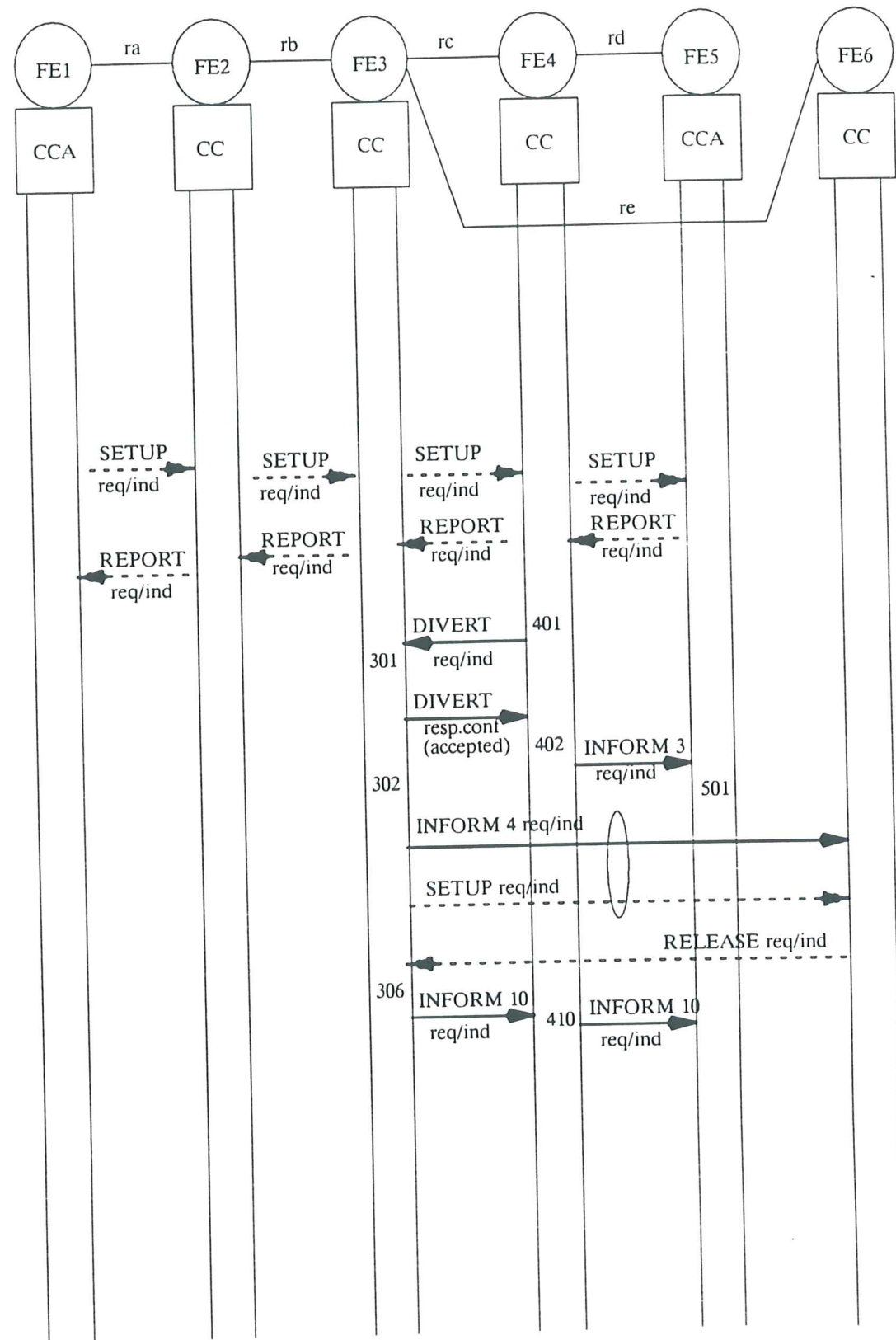


Figure 10 - Information Flow Sequences for unsuccessful CFNR operation: CFNR not completed - original call remains

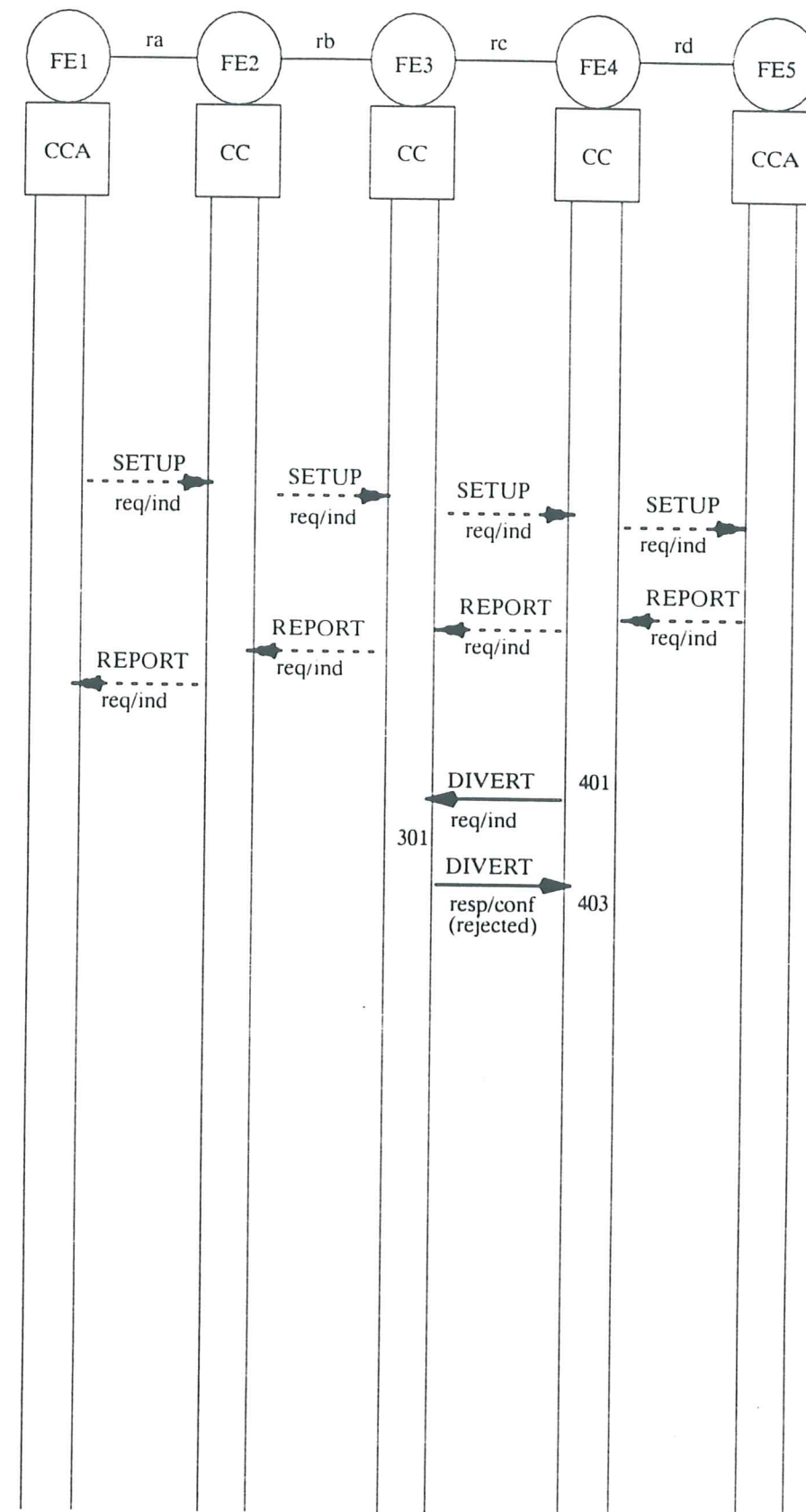


Figure 11 - Information Flow Sequences for unsuccessful CFNR operation: CFNR rejected - original call remains

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

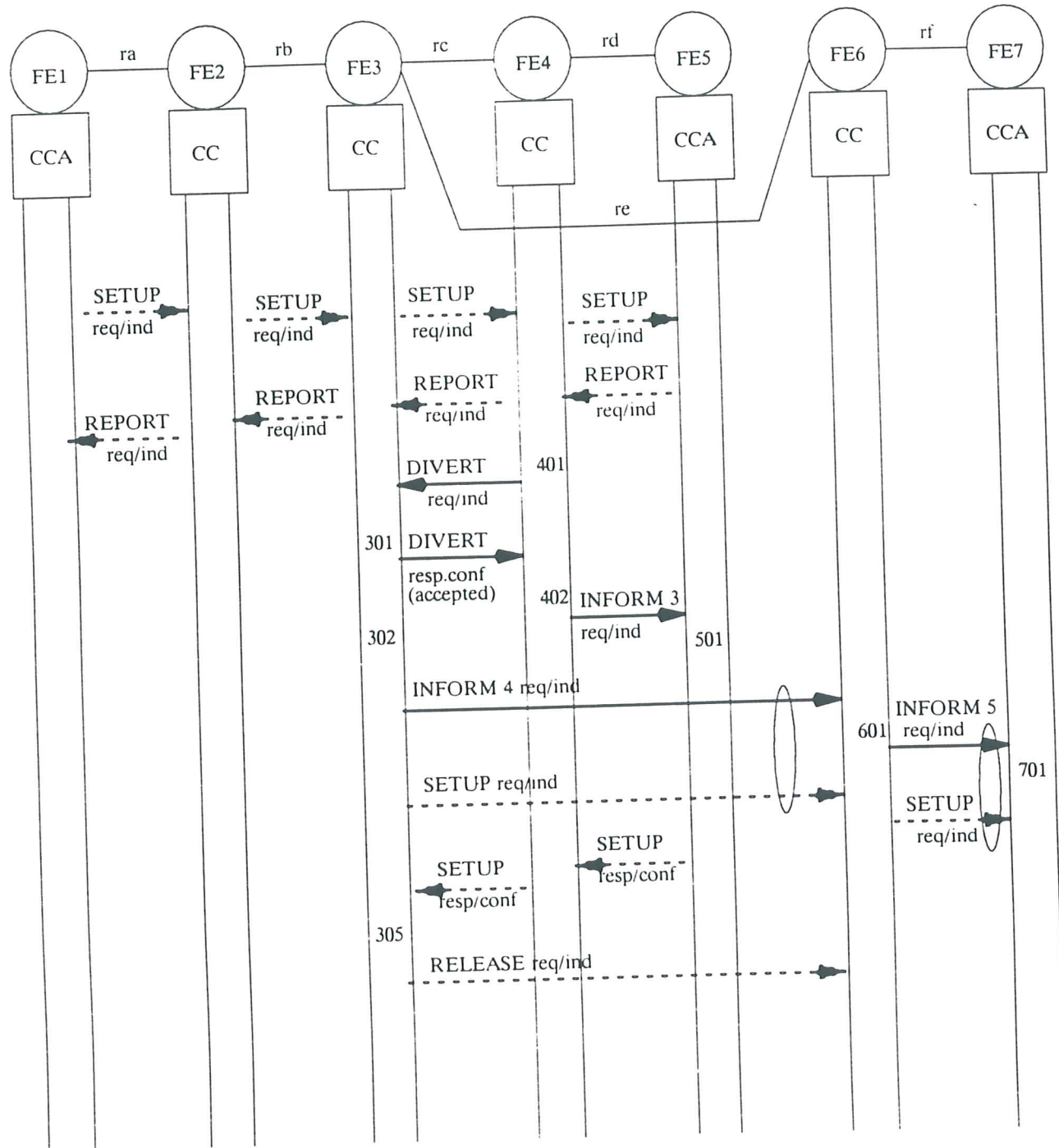


Figure 12 - Information Flow Sequence if user B answers before alerting of user C

9.2.2.3 Information flow sequences for activation

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

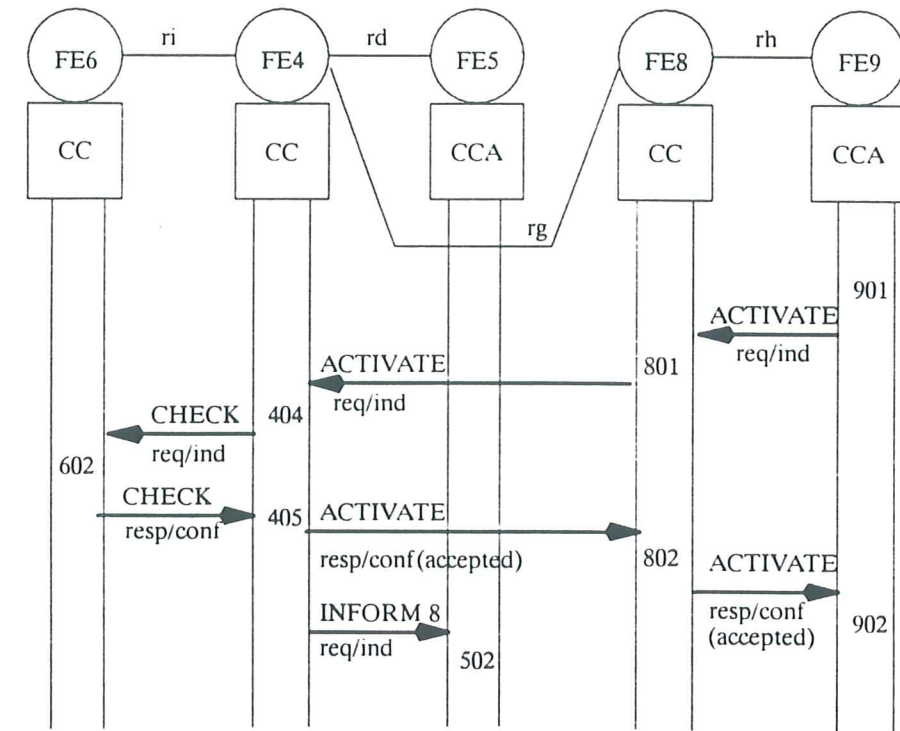


Figure 13 - Information Flow Sequence for activation with CHECK information flow

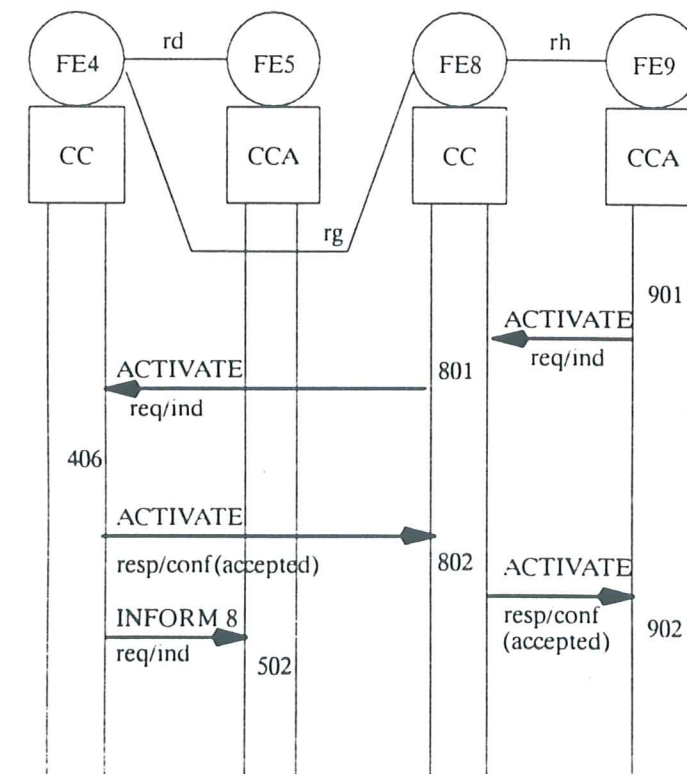


Figure 14 - Information Flow Sequence for activation without CHECK information flow

9.2.2.4 Information flow sequence for deactivation

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

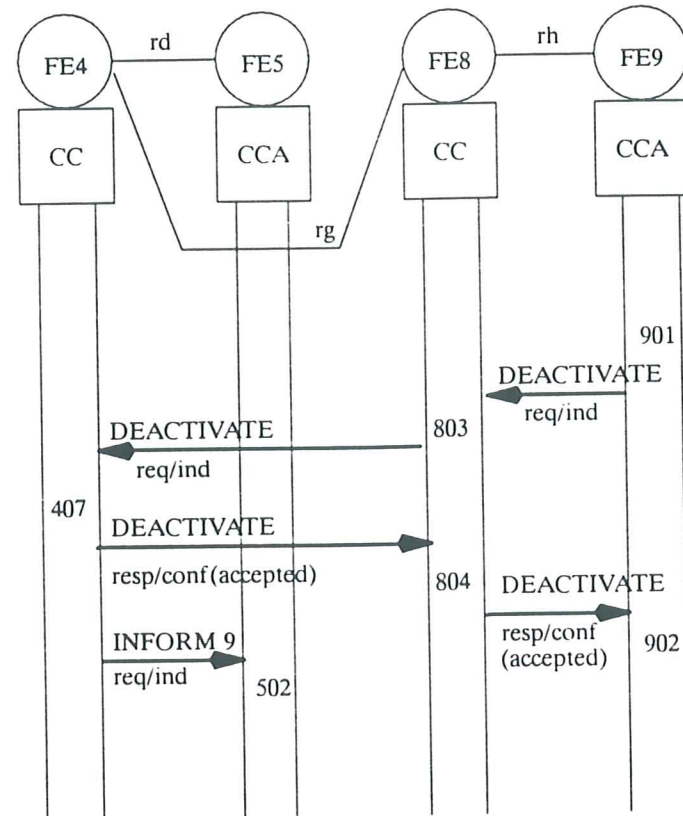


Figure 15 - Information Flow Sequence for deactivation

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.

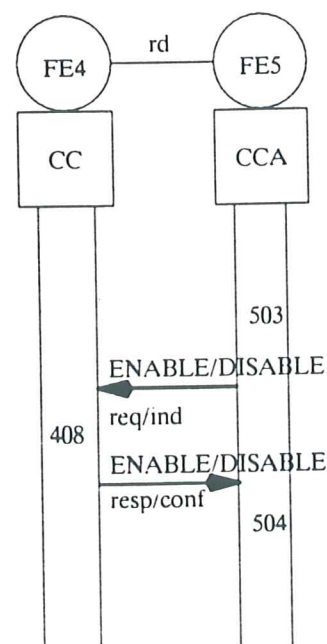


Figure 16 - Information Flow Sequence for enabling/disabling of remote activation

9.2.2.6 Information flow sequence for interrogation

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

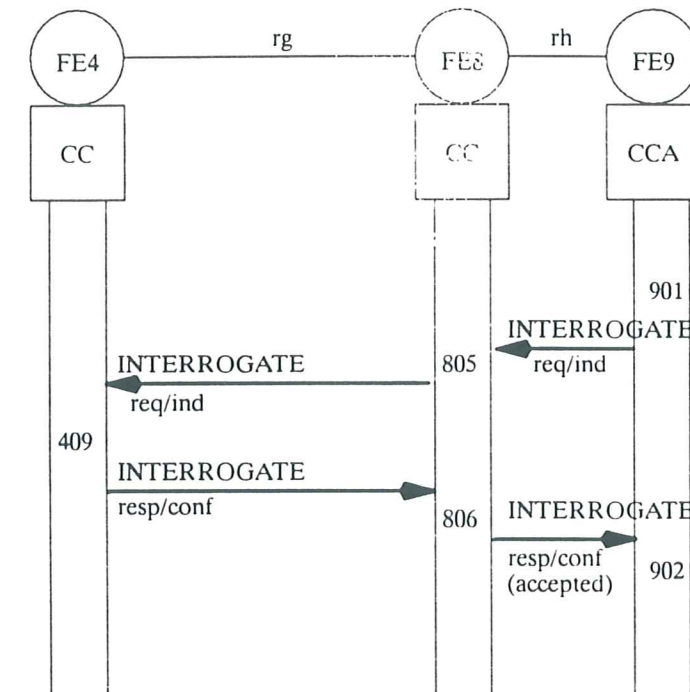


Figure 17 - Information Flow Sequence for interrogation

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 (without number and name information) 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:
 - Recognize 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.

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 Rec. 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.

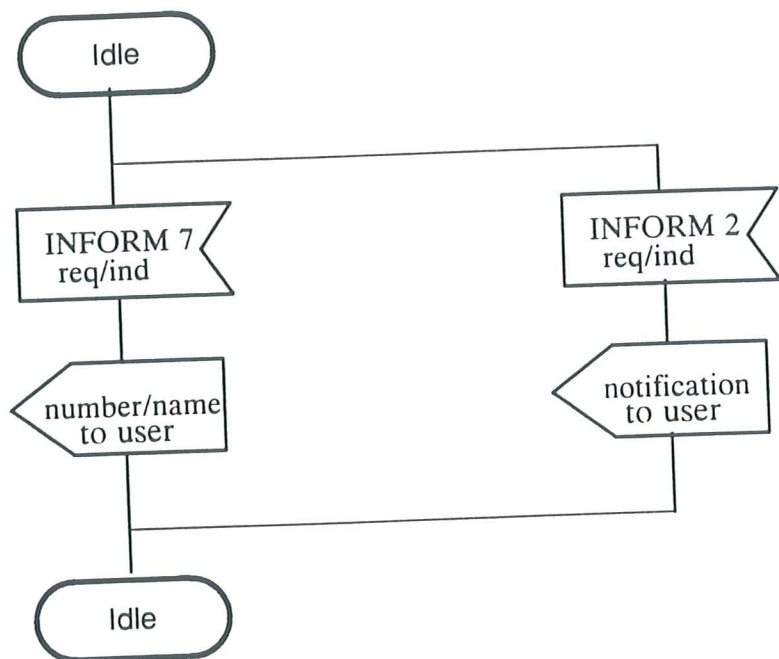


Figure 18 - SDL for Functional Entity FE1

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.

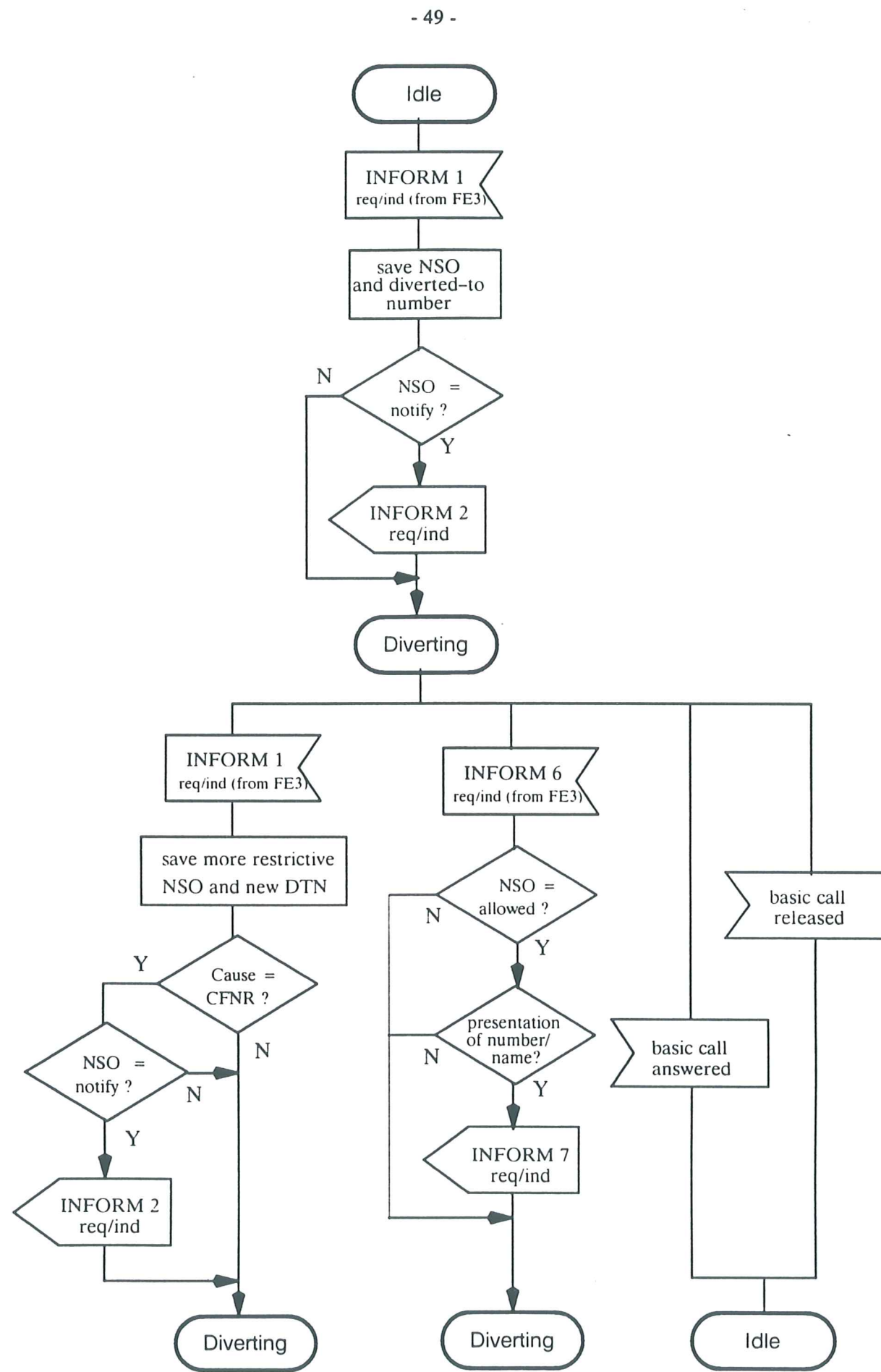


Figure 19 - SDL for Functional Entity FE2

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.

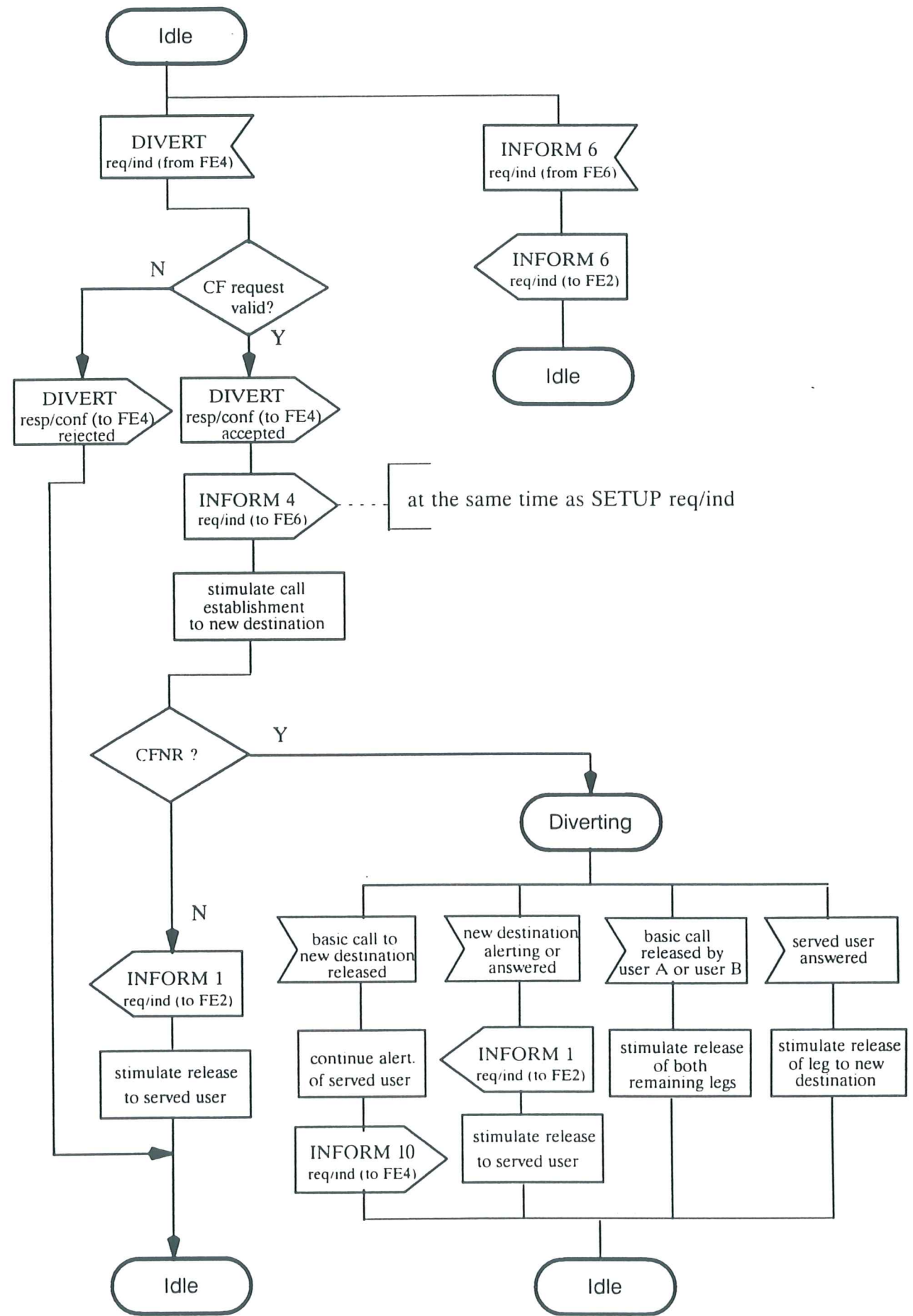


Figure 20 - SDL for Functional Entity FE3

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.

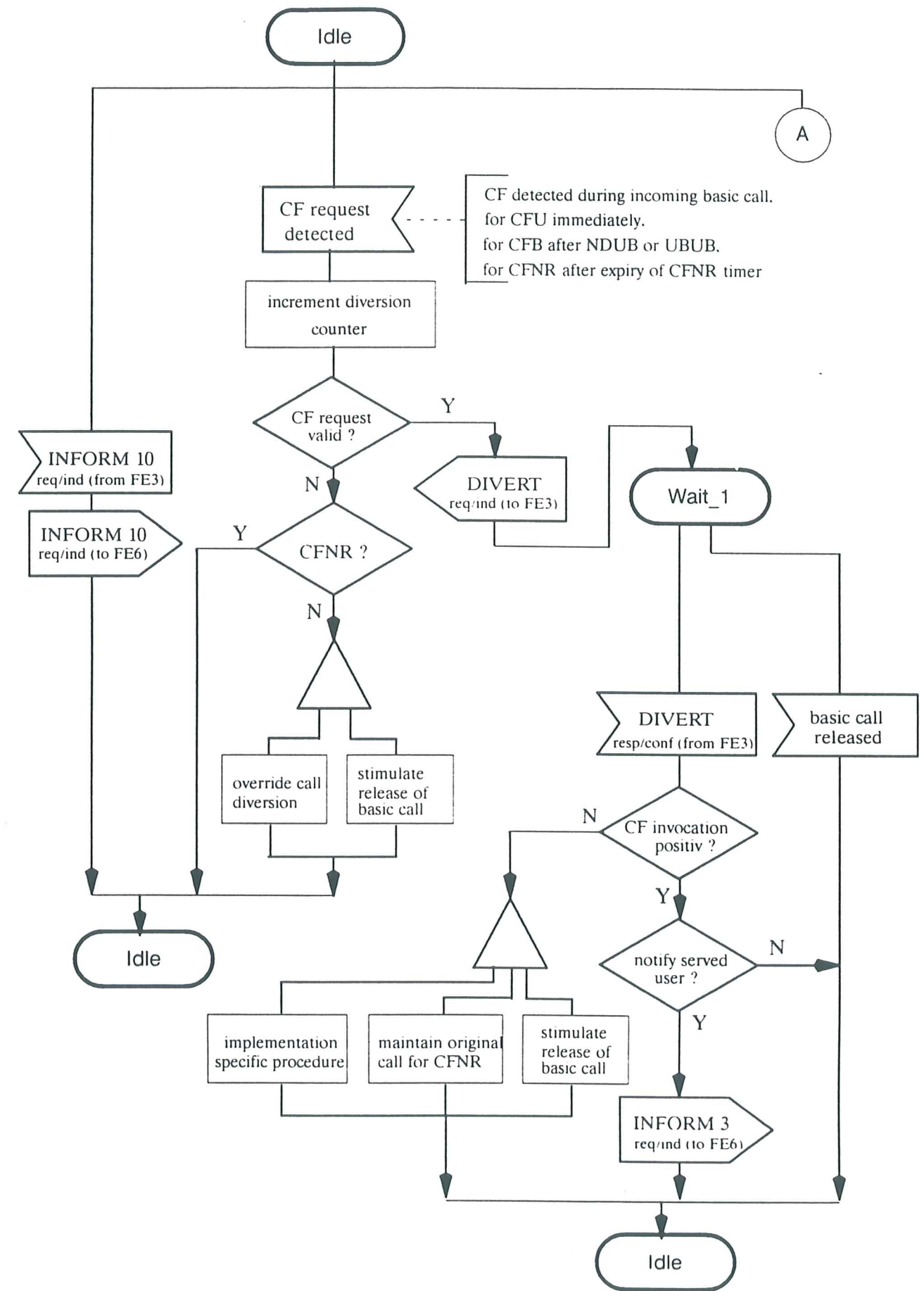


Figure 21 - SDL for Functional Entity FE4 part 1

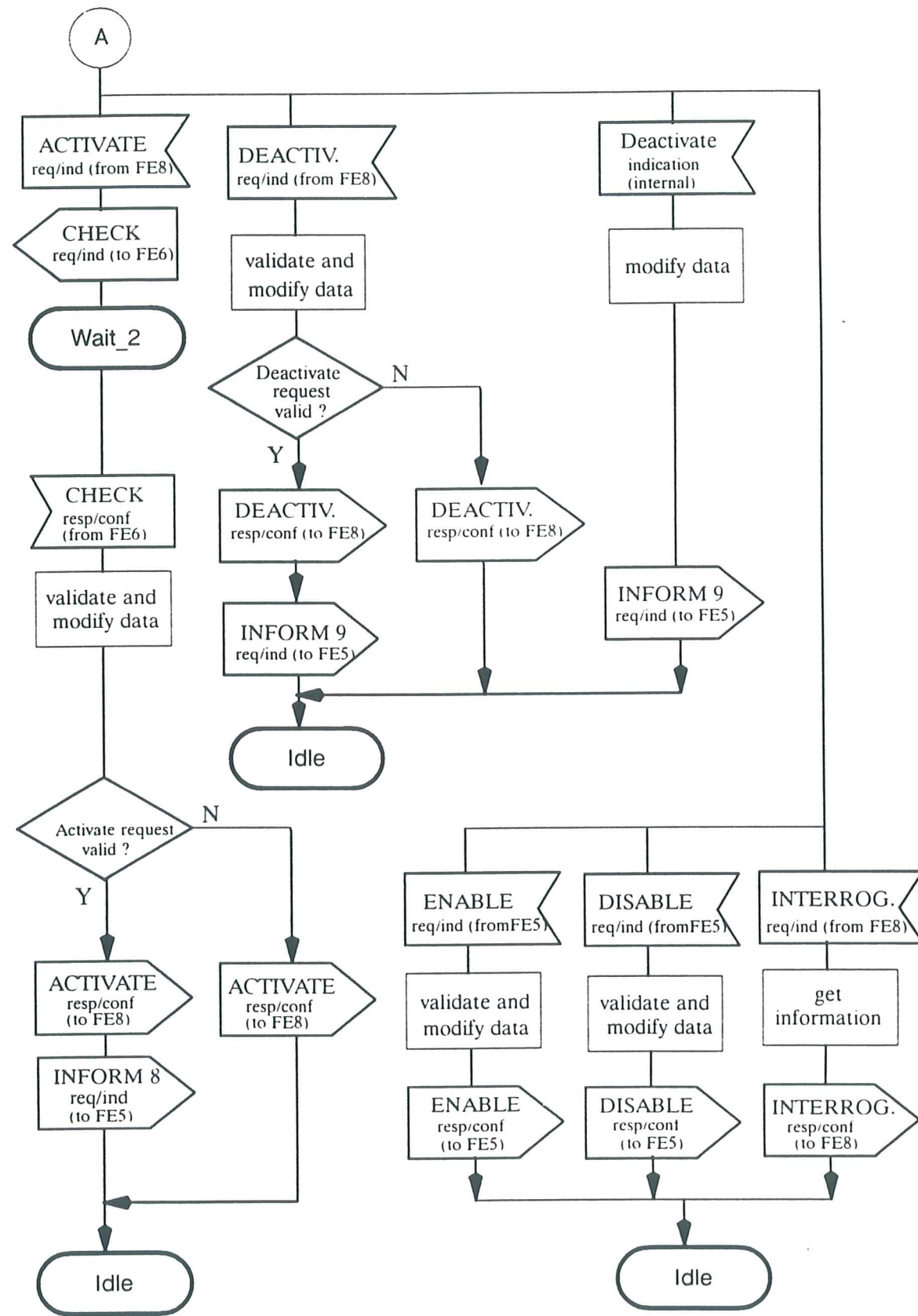


Figure 21 - SDL for Functional Entity FE4 part 2

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.

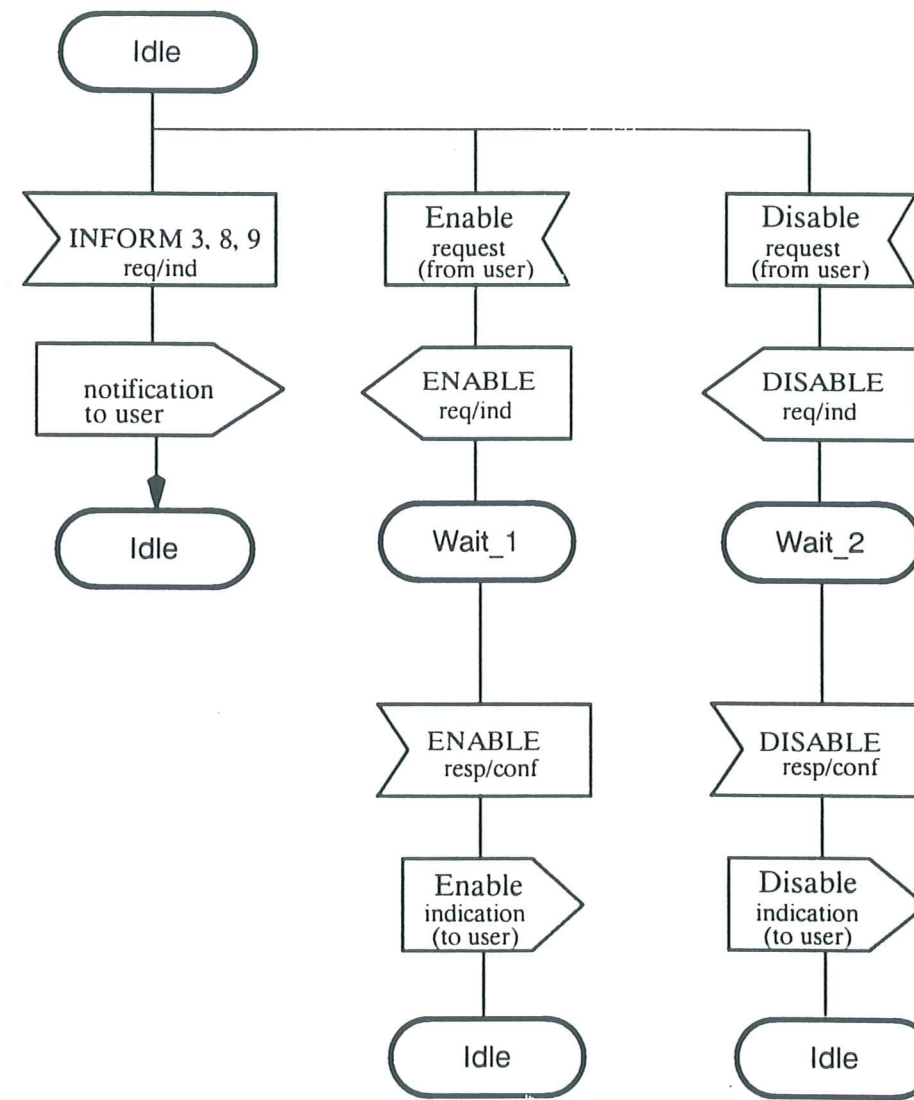


Figure 22 - SDL for Functional Entity FE5

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.

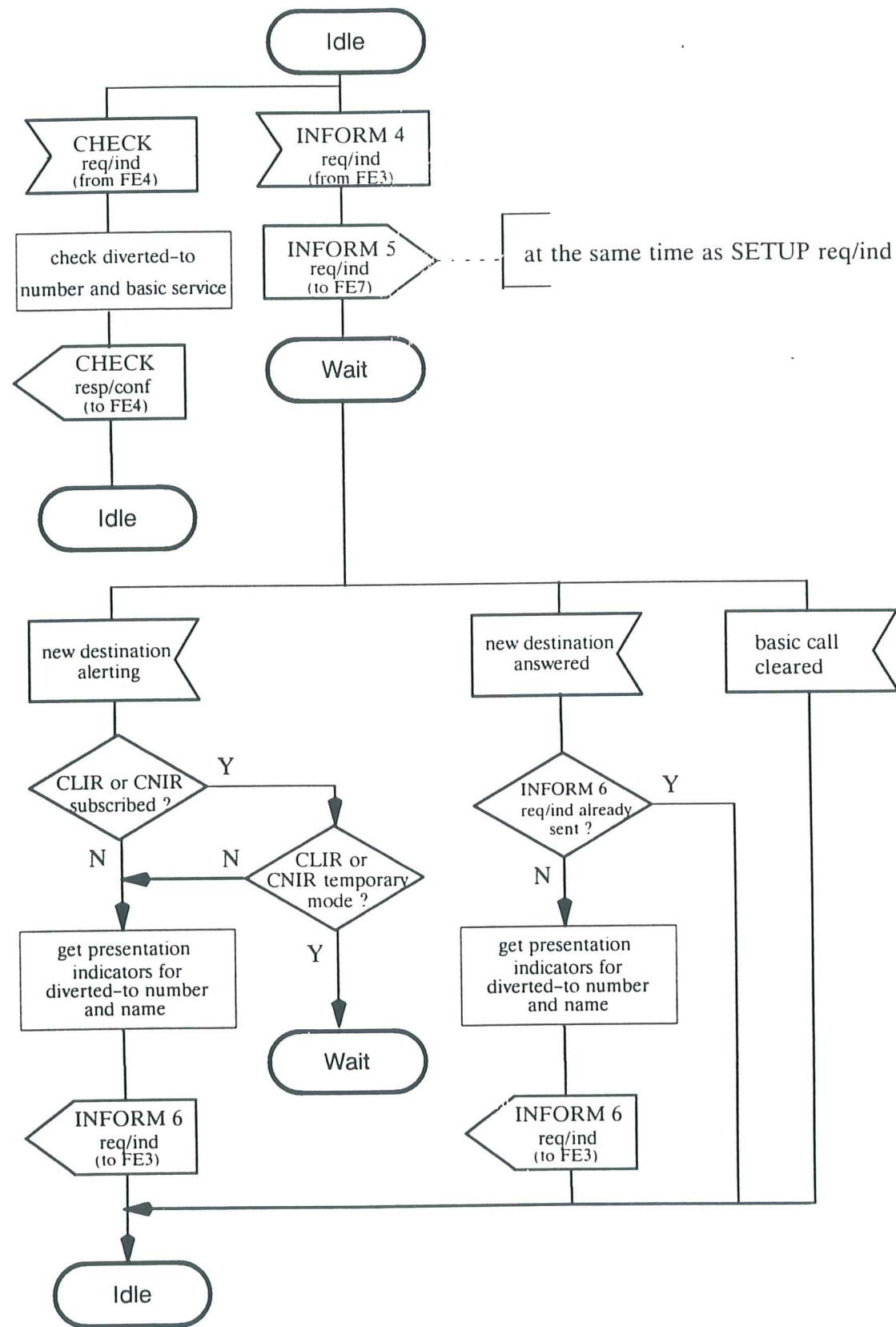


Figure 23 - SDL for Functional Entity FE6

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.

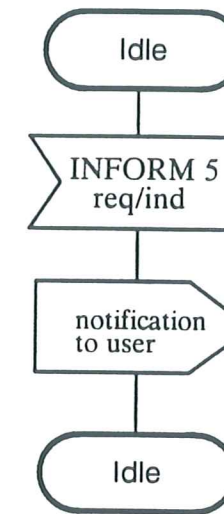


Figure 24 - SDL for Functional Entity FE7

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.

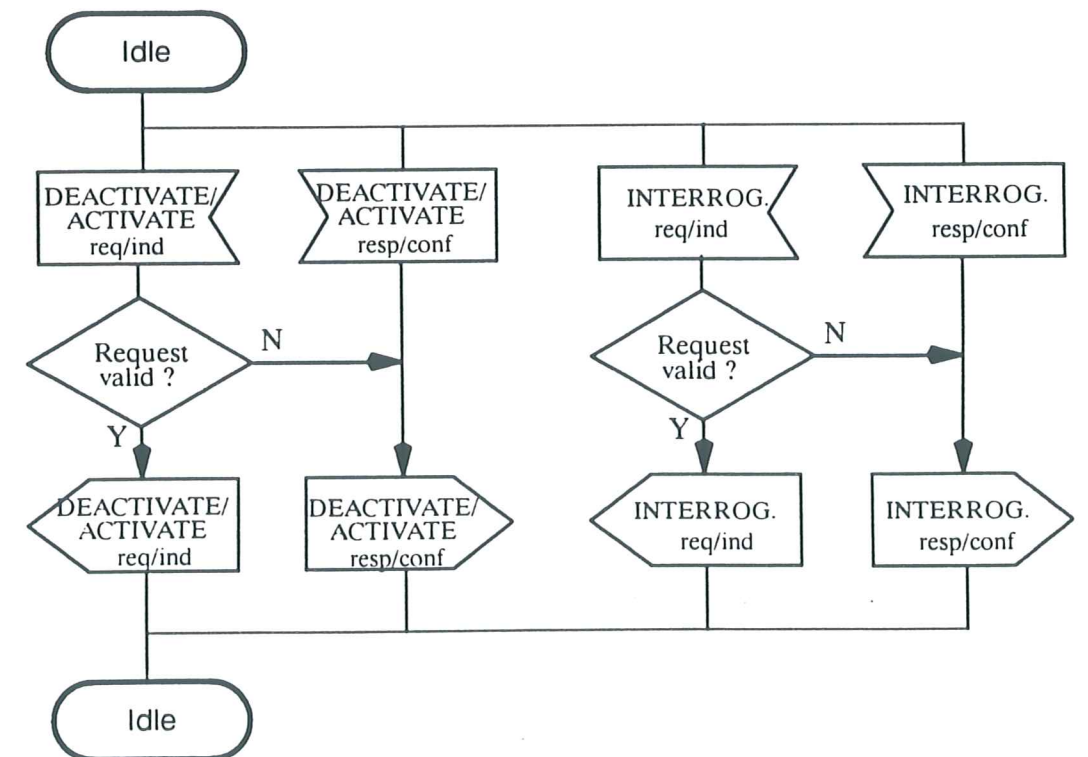


Figure 25 - SDL for Functional Entity FE8

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.

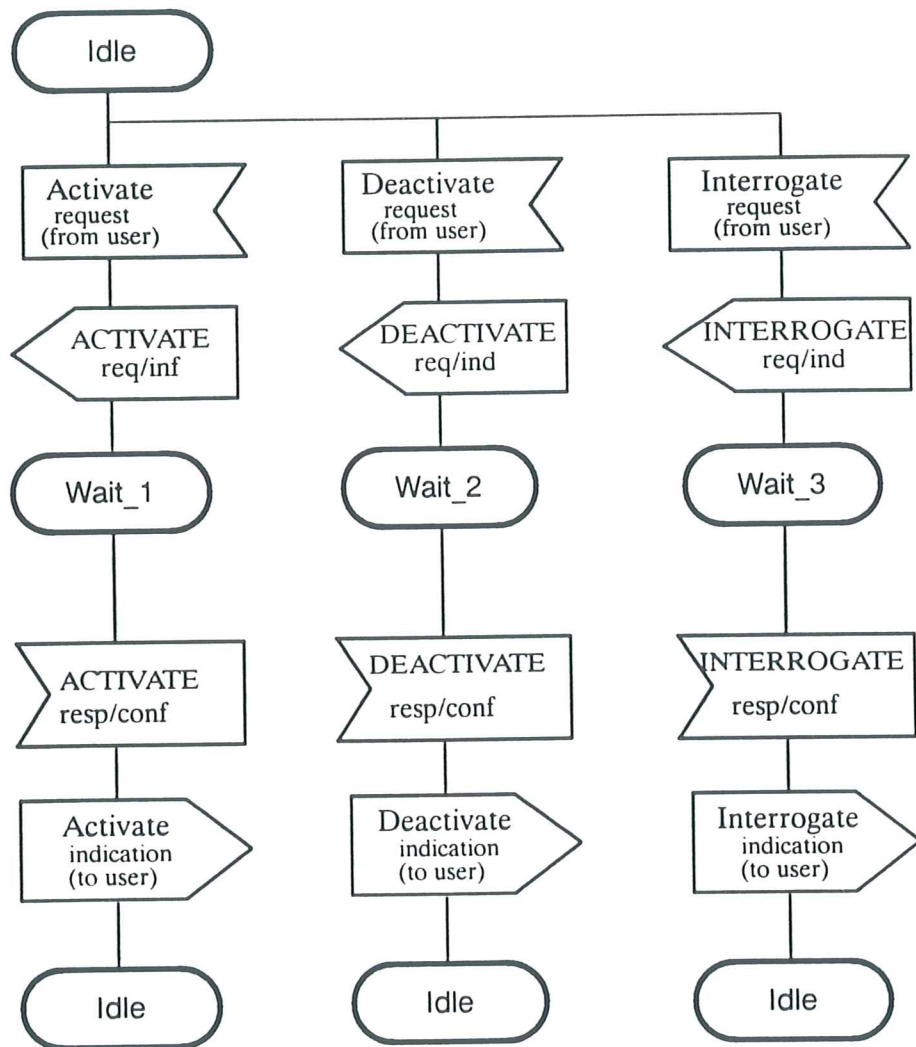


Figure 26 - SDL for Functional Entity FE9

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 rerouting"

FE	User A		FE3	User B		User C	
	FE1	FE2		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 "rerouteing"

FE	User A		FE3	User B		User C	
	FE1	FE2		FE4	FE5	FE6	FE7
Scenario 16	TE	PTNX	Originating PTNX	PTNX	TE	PTNX	TE
Scenario 17	TE	PTNX	Transit PTNX	PTNX	TE	PTNX	TE
Scenario 18	TE	PTNX	Originating PTNX	PTNX	TE	other network	other network
Scenario 19	TE	PTNX	Transit PTNX	PTNX	TE	other network	other network
Scenario 20	other network	other network	Gateway PTNX	PTNX	TE	PTNX	TE
Scenario 21	other network	other network	Transit PTNX	PTNX	TE	PTNX	TE
Scenario 22	other network	other network	Gateway PTNX	PTNX	TE	other network	other network
Scenario 23	other network	other network	Transit 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 24	PTNX	TE	User B PTNX	TE
Scenario 25	PTNX	TE	any PTNX	TE
Scenario 26	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 Standard 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 rerouting option and the remote activation, deactivation and interrogation options are used. There are also differences in the style and layout of this Standard in comparison with the corresponding standards for the public ISDN.

The main differences can be summarized as follows:

1. PTN terminology is used, where appropriate, instead of public ISDN terminology.
2. Stages 1 and 2 are specified together in this Standard, rather than as separate Standards.
3. The specification of the stage 1 aspects in this Standard 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 Standard.
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 Standard.
7. This Standard specifies in addition to the call forwarding by forward switching also the option of call forwarding by rerouting.
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 Standard.

In clauses 6, 7, 8, 9.1 and 9.2.1, differences compared with corresponding text in the corresponding specifications for public ISDNs (listed in annex B) are indicated by **emboldening**.

Annex B
(informative)

Bibliography

- prETS 300 199 Integrated Services Digital Network (ISDN)
Call Forwarding Busy (CFB) supplementary service
Service description
- prETS 300 200 Integrated Services Digital Network (ISDN)
Call Forwarding Unconditional (CFU) supplementary service
Service description
- prETS 300 201 Integrated Services Digital Network (ISDN)
Call Forwarding No Reply (CFNR) supplementary service
Service description
- prETS 300 203 Integrated Services Digital Network (ISDN)
Call Forwarding Busy (CFB) supplementary service
Functional capabilities and information flows
- prETS 300 204 Integrated Services Digital Network (ISDN)
Call Forwarding Unconditional (CFU) supplementary service
Functional capabilities and information flows
- prETS 300 205 Integrated Services Digital Network (ISDN)
Call Forwarding No Reply (CFNR) supplementary service
Functional capabilities and information flows

