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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Specification, functional model and information flows — Call completion supplementary services

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Spécification, modèle fonctionnel et débit d'informations - Services supplémentaires de complément d'appel



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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to the national bodies for voting. Publication as an International Standard requires approval by at least 75% of the national bodies casting a vote.

International Standard ISO/IEC 13866 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology,* Subcommittee SC 6, *Telecommunications and information exchange between systems.*

Annex A of this International Standard is for information only.

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Introduction

This International Standard is one of a series of standards defining services and signalling protocols applicable to Private Integrated Services Networks (PISN). The series uses ISDN concepts as developed by ITU-T and conforms to the framework of Standards for Open Systems Interconnection as defined by ISO/IEC.

This particular International Standard specifies the Call Completion supplementary services.

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Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Call completion supplementary services

1 Scope

This International Standard, specifies supplementary services Call Completion (SS-CC), which are applicable to various basic services supported by Private Integrated Services Network (PISN). Basic services are specified in ISO/IEC 11574.

SS-CC consists of two Supplementary services: the Completion of Calls to Busy Subscribers supplementary service (SS-CCBS) and the Completion of Calls on No Reply supplementary service (SS-CCNR). SS-CCBS allows completion of a call to a subscriber that was unsuccessful because of a busy condition and SS-CCNR allows completion of a call to a subscriber that was unsuccessful because the subscriber, although alerted, did not answer.

Supplementary service specifications are produced in three stages, according to the method described in CCITT Recommendation I.130. This International Standard specifies the stage 1 and stage 2 specifications of SS-CC. The stage 1 specifications (clauses 6 and 7) specify the supplementary services as seen by the users of PISNs. The stage 2 specification (clause 8) specifies the functional entities involved in the supplementary services and the information flows between them.

2 Conformance

In order to conform to this International tandard, a Stage 3 Standard shall specify signalling protocols and equipment Behaviour that are capable of being used in a PISN which supports the supplementary services specified in this International Standard. This means that, to claim conformance a Stage 3 Standard is required to be adequate for the support of those aspects of

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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 Completion of Calls to Busy Subscribers (CCBS) supplementary service shall support are clauses 6 and 8 respectively. The stage 1 and stage 2 clauses which a stage 3 Standard for the Completion of Calls on No Reply (CCNR) supplementary service shall support are clauses 7 and 8 respectively.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 11574:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit-mode 64 kbit/s bearer services-Service description, functional capabilities and information flows .*

ISO/IEC 11579-1:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Part 1: Reference configuration for PISN Exchanges (PINX).*

CCITT Rec. I.112(1988), *Vocabulary of terms for ISDNs (Blue Book).*

CCITT Rec. I.130(1988), *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN (Blue Book).*

CCITT Rec. I.210(1988), *Principles of telecommunications services supported by an ISDN and the means to describe them (Blue Book).*

CCITT Rec. I.221(1988), *Common specific characteristics of services (Blue Book).*

CCITT Rec. Z.100(1988), *Specification and Description Language (Blue Book).*

4 Definitions

For the purposes of this International Standard, the following definitions apply.

4.1 External definitions

This International Standard uses the following terms defined in other documents:

- Basic Service (CCITT Rec. I.210)
- Private Integrated Services Network (PISN) (SO/IEC 11579-1)
- Private Integrated Services Network Exchange (PINX) (ISO/IEC 11579-1)
- Service (CCITT Rec. I.112)
- Signalling (CCITT Rec. I.112)
- Supplementary Service (CCITT Rec. I.210)

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- User (ISO/IEC 11574)

This International Standard refers to the following basic call functional entity (FEs) defined in ISO/IEC 11574:

- Call Control (CC)
- Call Control Agent (CCA)

This International Standard refers to the following basic call inter-FE relationships defined in ISO/IEC 11574:

- r1
- r2
- r3

This International Standard refers to the following basic call information flows defined in ISO/IEC 11574:

- r1_setup request/indication/response/confirmation
- r1_setup_reject request/indication
- r1_report request/indication
- r1_disconnect request/indication
- r2_setup request/indication/response/confirmation
- r2_report request/indication
- r2_release request/indication
- r3_setup request/indication/response/confirmation
- r3_setup_reject request/indication
- r3_report request/indication

This International Standard refers to the following basic call information flow elements defined in ISO/IEC 11574.

- Connection Type (CT)
- Destination Number (DN)
- Destination Subaddress (DS)
- Originating Number (ON)
- Originating Subaddress (OS)

4.2 Other definitions

4.2.1 additional network feature: A capability, over and above that of a basic service, provided by a PISN, but not directly to a User.

4.2.2 busy : A property of a User for whom either a "network determined user busy" or "user determined user busy" condition (see clause 3.1 of CCITT Rec. I.221) exists.

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4.2.3 call, basic call: An instance of the use of a basic service.

4.2.4 call completion: The successful presentation of a previously unsuccessful Call to a destination user (User B) which occurs when the call has entered an alerting phase or has been answered.

4.2.5 free: A property of a User who can accept any attempt by the PISN to present a call to that User (i.e. allow the call to reach the alerting or answered state).

4.2.6 path reservation: The reservation of resources prior to SS-CC Recall in order that a connection path through the PISN is available when User A accepts the SS-CC Recall.

NOTE - Path Reservation does not guarantee that User B will be free when User A accepts the SS-CC Recall.

4.2.7 recall timer: This timer specifies the length of time the network shall wait for a response from user A to a CC Recall.

4.2.8 retention timer: This timer specifies the period of time the network retains the originating call information after a valid call attempt is released.

4.2.9 SS-CC recall: An indication informing User A that User B is no longer busy (in the case of SS-CCBS) or has just completed a period of activity (in the case of SS-CCNR). Acceptance of this indication by User A will cause the call to be completed by the PISN.

4.2.10 SS-CC service duration timer: This timer specifies the length of time that the service shall be active within the network.

4.2.11 User A: The specific User that originated the call and requested the supplementary service.

4.2.12 User B: The User that was initially addressed in the original call set up.

5 List of acronyms

ANF	Additional Network Feature
CC	Call Control (functional entity)
CCA	Call Control Agent (functional entity)
CCBS	Completion of Calls to Busy Subscribers
CCI	Call Control Identifier
CCNR	Completion of Calls on No Reply
CD	Call Completion De-registered
CR	Cancellation Reason
CT	Connection Type
DN	Destination Number
FC	Failure Cause
FE	Functional Entity
FEA	Functional Entity Action

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ISDN	Integrated Services Digital Network
MT	Monitor Type
NDUB	Network Determined User Busy
ON	Originating Number
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
RC	Reject Cause
RL	Request List
RM	Request Maintained
RVC	Reservation Capability
SDL	Specification and Description Language
SI	Status Indicator
SS-CC	Supplementary Service Call Completion

NOTE - This is a generic term, used to describe aspects common to both SS-CCBS and SS-CCNR.

SS-CCBS	Supplementary Service Completion of Calls to Busy Subscribers
SS-CCNR	Supplementary Service Completion of Calls on No Reply
TE	Terminal Equipment
UDUB	User Determined User Busy

6 SS-CCBS stage 1 specification

6.1 Description

6.1.1 General description

Completion of Calls to Busy Subscribers (SS-CCBS) is a supplementary service which is offered to a calling User A. On encountering a busy called User B, it allows User A to request that the PISN monitors User B and notifies User A when User B becomes free. On response by User A to that notification, the PISN shall attempt to complete the call to User B.

6.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all basic services defined in ISO/IEC 11574.

6.2 Procedures

6.2.1 Provision / Withdrawal

SS-CCBS may be provided after pre-arrangement with the service provider (by means of service profile control), or may be available generally to all Users. SS-CCBS may be withdrawn on request of the User or for administrative reasons.

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

Possible subscription options are summarized in table 1.

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Table 1 - SS-CCBS Subscription parameters

Subscription option	Values:
Recall mode	- SS-CC Recall offered to all compatible terminals (NOTE) - SS-CC Recall offered to the terminal which has invoked SS-CCBS

NOTE - If the user has more than one compatible terminal (e.g., passive bus arrangement), this option will result in SS-CC Recall being offered simultaneously to all those terminals, thereby allowing acceptance by any one of those terminals.

6.2.2 Normal procedures

6.2.2.1 Activation/deactivation/registration/Interrogation

SS-CCBS is permanently activated. No information needs to be registered with the PISN for this supplementary service, and therefore interrogation is not applicable.

6.2.2.2 Invocation and operation

When a call from User A fails because the destination User, User B, is busy, the PISN shall retain the call information provided by User A, as described in 9.2.1 of ISO/IEC 11574, for a period during which User A shall be able to request SS-CCBS. On receipt of a request for SS-CCBS during that period, the PISN shall check whether it is possible to initiate the service, and if so shall send an acknowledgment to User A, start monitoring User B and start the SS-CCBS Service Duration Timer. The acknowledgment means that User A can expect to receive a SS-CC Recall if User B becomes free within the period of the SS-CCBS Service Duration Timer.

NOTES

1 The fact that User B is already being monitored, as a result of a call completion request from another user, need not cause rejection of the request from User A. The handling of multiple requests against the same User B is an implementation matter, typically involving some sort of queue arranged in chronological or priority order.

2 The fact that User A has already invoked call completion against another user need not cause rejection of any further requests for call completion from User A. The handling of multiple requests by the same User A is an implementation matter.

3 The period during which SS-CCBS can be invoked and the value of the SS-CCBS Service Duration timer are implementation specific.

After the SS-CCBS request has been acknowledged, User A shall be able to receive and initiate other calls.

A PISN may provide User A with the ability to request a list of outstanding SS-CC-requests that User A has invoked. If the Recall mode is "SS-CC Recall offered to all compatible terminals", details of all requests made by that user should be provided. If the Recall mode is "SS-CC Recall offered to the terminal which has invoked SS-CCBS", only details of requests made by the user

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from that terminal should be provided. The list will be empty if there are no outstanding SS-CC requests.

When the monitoring of User B indicates that User B has become free, and if User A is also free, the PISN shall provide SS-CC Recall, and start the SS-CC Recall timer.

If User A accepts the SS-CC Recall, the PISN shall attempt to complete the call between User A and User B. If the call is successfully presented to User B and enters an alerting phase or is answered, SS-CCBS shall be regarded as complete.

6.2.2.3 Cancellation

The PISN shall provide User A with the ability to request cancellation of at least one of the following:

- all outstanding SS-CC requests for which a SS-CC Recall is still expected;
- the most recent SS-CC request for which a SS-CC Recall is still expected; and,
- a specific SS-CC request for which a SS-CC Recall is still expected.

If the Recall mode is "SS-CC Recall offered to all compatible terminals", requests made by that user should be cancelable. If the Recall mode is "SS-CC Recall offered to the terminal which has activated SS-CCBS", requests made by the user from that terminal should be cancellable.

User A shall be informed of successful cancellation.

6.2.3 Exceptional Procedures

6.2.3.1 Activation/deactivation/registration/interrogation

Not applicable.

6.2.3.2 Invocation and Operation

6.2.3.2.1 Rejection of SS-CCBS Service request

If User A is not permitted to request SS-CCBS, the PISN shall reject the SS-CCBS request with an indication of whether denial is short or long term.

Short term denial shall be used for temporary conditions where a later request for SS-CCBS might be successful. Examples of conditions that may result in a short term denial are:

- limit of requests by User A already reached;
- no call information retained;
- limit of requests against User B already reached; or,
- duplicate request (see 6.2.3.2.5),

Long term denial shall be used when later requests will also be rejected. Examples of a conditions that may result in a long term denial are:

- SS-CCBS not provided to User A; or,
- interworking with a network which does not support SS-CCBS;
- SS-CCBS not allowed against User B (note).

NOTE - This is an implementation option that can apply to certain classes of users.

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6.2.3.2.2 User A is busy on SS-CC recall

If User A is found to be busy when User B becomes free, the PISN shall wait for both Users to become free before providing SS-CC Recall and starting the SS-CC Recall timer. As an option, the PISN can notify User A that the PISN is attempting to complete a call.

NOTE - On receipt of such a notification, User A can either:

- ignore the notification, thereby causing the SS-CC Recall to be delayed;
- cancel the SS-CCBS request; or,
- free resources by disposing of an existing call, thereby allowing the SS-CC Recall to proceed.

6.2.3.2.3 Network congestion

If path reservation is used by the PISN, network congestion can delay the SS-CC Recall, which will not occur until a path has been reserved and both Users are free.

If the PISN does not use path reservation, or interworks with a network which does not allow path reservation, the call completion attempt can fail after User A has accepted the SS-CC Recall because of network congestion. In this case, User A shall be informed of the failure and whether the SS-CCBS request has been maintained by the PISN and a further SS-CC Recall can be expected.

NOTE - Alternative (implementation specific) procedures can also be provided, but are beyond the scope of this Standard

6.2.3.2.4 User B becomes busy after successful SS-CC recall

If User B is busy for the call resulting from a successful SS-CC Recall of User A, the PISN shall either:

- abandon SS-CCBS and release reserved path if path reservation has been performed, indicating the reason for the failure to User A and that the SS-CCBS request has been canceled. In such a case the PISN may allow User A, as an implementation option, the option to re-invoke SS- CCBS if call completion to User B is still required; or,

NOTE - The method used in the PISN to allow User A to re-invoke SS-CCBS is outside the scope of this International Standard.

- resume monitoring of User B, indicating the reason for the failure to User A and that the SS-CCBS request has been maintained. In such a case, User A may, as a User option, request cancellation of the SS-CCBS request, if call completion to User B is no longer required.

As a PISN option, if User B makes an outgoing call after SS-CC Recall has been started, but before User A has accepted the SS-CC Recall, then User B may be notified that the PISN is attempting to complete a call.

NOTE - This gives User B the opportunity to abandon call initiation in order to allow the SS-CCBS call to complete.

6.2.3.2.5 User B becomes busy during path reservation

If user B is found to be busy when path reservation is performed, the path shall be released and the PISN shall wait for User B to become not busy before reattempting path reservation.

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6.2.3.2.6 Duplicate SS-CCBS requests

If User A has already requested SS-CCBS on User B for a particular Basic service, and is awaiting recall, any subsequent request from User A to invoke SS-CCBS on User B, for the same Basic service, shall cause the PISN to either:

- reject the request as a duplicate request; or,
- accept the request as valid.

NOTE - In the case that the PISN accepts the duplicate SS-CCBS request, User A can receive one or more SS-CC Recalls dependent on the treatment of the duplicate request by the PISN.

6.2.3.2.7 Other failure situations

A particular request for the service shall be automatically canceled by the PISN, and User A shall be notified if:

- User B and/or User A is still busy after the SS-CCBS Service Duration Timer expires;
- User A does not accept the SS-CC Recall before the SS-CC Recall timer expires;
- User B invokes or activates a service that conflicts with the existing SS-CCBS invocation;
- for any reason , the PISN is unable to continue with the CCBS invocation.

6.2.3.3 Cancellation

A cancellation request shall be rejected if there are no SS-CC requests for User A or if the request is to cancel a specific SS-CC request which does not exist.

6.3 Interactions with other supplementary services

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

NOTE - Annex A anticipates interactions with future supplementary services and ANFs.

6.3.1 Calling Line Identification Presentation (SS-CLIP)

No interaction.

6.3.2 Connected Line Identification Presentation (SS-COLP)

No interaction.

6.3.3 Calling/Connected Line Identification Restriction (SS-CLIR)

If User A requests override of the SS-CLIR default value for a call, and the call encounters a busy User B, the request to override the default value shall be retained by the network and shall apply to a call resulting from the use of SS-CCBS.

6.3.4 Calling Name Identification Presentation (SS-CNIP)

No interaction.

6.3.5 Connected Name Identification Presentation (SS-CONP)

No interaction.

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6.3.6 Calling/Connected Name Identification Restriction (SS-CNIR)

If User A requests override of the SS-CNIR default value for a call, and the call encounters a busy User B, the request to override the default value shall be retained by the network and shall apply to a call resulting from the use of SS-CCBS.

6.3.7 Completion of Calls on No Reply (SS-CCNR)

If User A has SS-CCNR activated on User B, and User A requests SS-CCBS on User B, this request shall be treated as a duplicate SS-CCBS request in accordance with 6.2.3.2.5.

NOTE - When User B is busy (the pre-requisite for invocation of SS-CCBS by User A) before SS-CC Recall has been started relating to a previous SS-CCNR request, the pending SS-CCNR request has effectively become an SS-CCBS request, as it is awaiting a free User B in order to recall User A. If an SS-CCBS request is then received from User A, relating to User B, this is therefore effectively a duplicate SS-CCBS request and is treated as such by the PISN.

6.3.8 Call Transfer (SS-CT)

No interaction.

6.3.9 Call Forwarding Unconditional (SS-CFU)

a) SS-CFU activated by user B before user A requests SS-CCBS

If the call to User B is diverted to User C by SS-CFU and User C is busy, then a SS-CCBS request from User A shall be applied to the diverted-to User C.

b) SS-CFU activated by user B after user A requests SS-CCBS

If User B activates SS-CFU after User A has requested SS-CCBS and whilst the SS-CC Recall has not yet been accepted by User A, the SS-CCBS request shall either continue to be applied to User B or be canceled.

c) SS-CFU activation by user A

If User A invokes SS-CCBS whilst SS-CFU is activated, or User A invokes SS-CCBS and subsequently activates SS-CFU, SS-CC Recall shall still be given to User A.

6.3.10 Call Forwarding Busy (SS-CFB)

a) SS-CFB activated by user B before user A requests SS-CCBS

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

b) SS-CFB activated by user B after user A requests SS-CCBS

If User B activates SS-CFB after User A has requested SS-CCBS and whilst the SS-CC Recall has not yet been accepted by User A, the SS-CCBS request shall continue to be applied to User B.

c) SS-CFB activation by user A

If User A invokes SS-CCBS whilst SS-CFB is activated, or User A invokes SS-CCBS and subsequently activates SS-CFB, this shall not affect the provision of the SS-CC Recall to User A

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6.3.11 Call Forwarding on No Reply (SS-CFNR)

If User B activates SS-CFNR after User A has requested SS-CCBS and whilst the SS-CC Recall has not yet been accepted by User A, then the SS-CCBS request shall continue to be applied to User B.

NOTE - In such a case, the call resulting from successful completion of SS-CCBS can be subject to SS-CFNR if not answered.

If User A invokes SS-CCBS whilst SS-CFNR is activated, or User A invokes SS-CCBS and subsequently activates SS-CFNR, this shall not affect the provision of the SS-CC Recall to User A.

6.3.12 Path Replacement (ANF-PR)

No interaction.

6.4 Interworking considerations

Where Users A and B are on a different network, the availability of SS-CCBS to User A will be limited by the capabilities of the other network and the interworking functions between the PISN and the other network.

If User B is connected to a public ISDN and the public ISDN version of the SS-CCBS service is available at the network interworking point, User A shall be able to request SS-CCBS on public ISDN User B. In addition, a User A served by the Public ISDN shall be able to request SS-CCBS on a PISN User B.

NOTE - This assumes peer cooperation between the public and private ISDN in provision of the SS-CCBS service

6.5 SS-CCBS overall SDL

Figure 1 contains the dynamic description of SS-CCBS 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-CCBS. The relationship of this process to the basic call process is indicated in the annotations.

Input signals from the left and output signals to the left represent primitives from and to User A. Input signals from the right represent internal stimuli.

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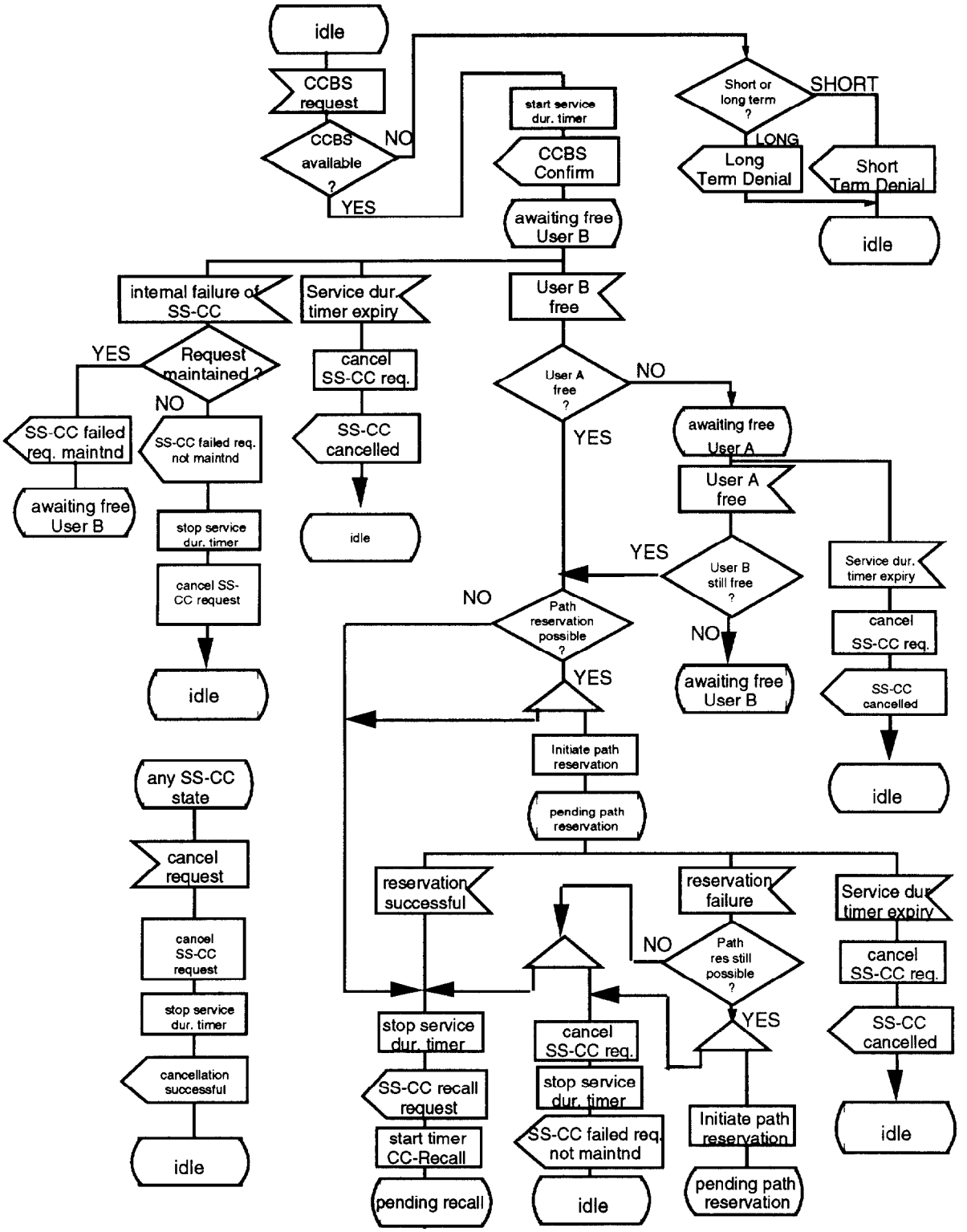
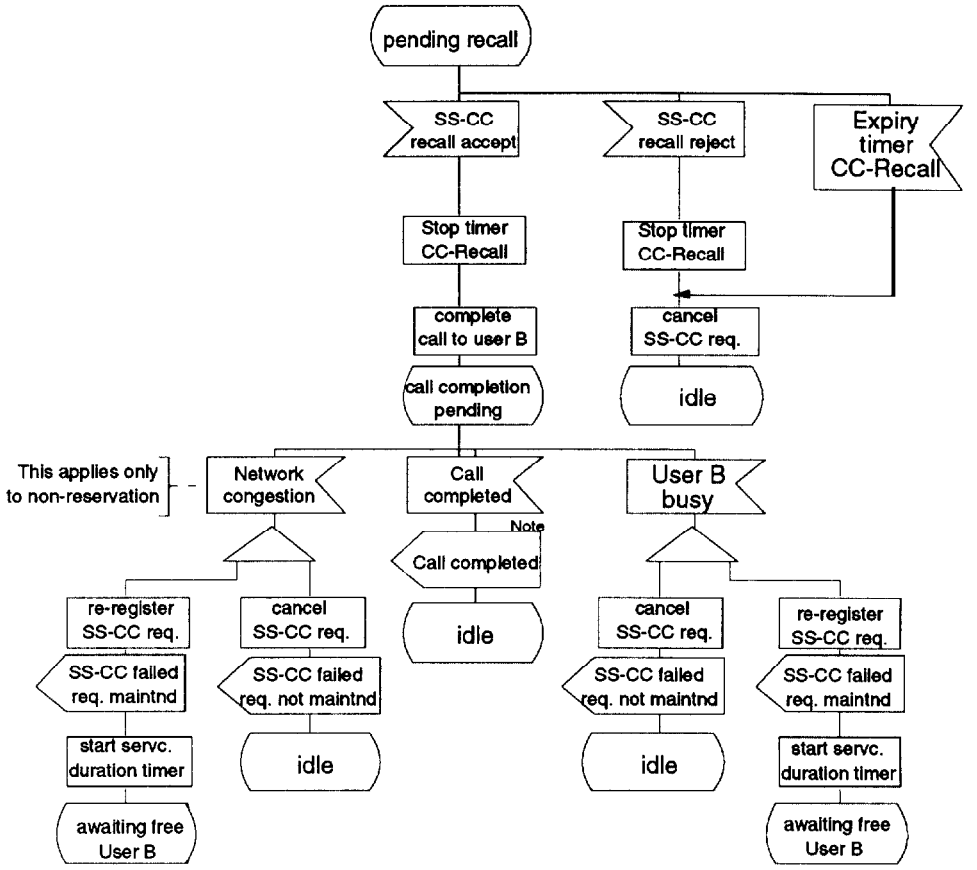


Figure 1- (sheet 1 of 2): SS-CCBS, Overall SDL

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NOTE - These notifications may be the same as the basic call notification of call completion and need not be specific to SS-CCBS.

Figure 1 - (sheet 2 of 2): SS-CCBS, Overall SDL

7 SS-CCNR stage 1 description

7.1 Description

7.1.1 General description

Completion of Calls on No Reply (SS-CCNR) is a supplementary service which is offered to a calling User A. On encountering a called User B which does not answer, it allows User A to request that the PISN monitors User B and notifies User A when User B becomes free after a subsequent period of activity. On response by User A to that notification, the PISN shall attempt to complete the call to User B.

NOTE - User activities that constitute a subsequent period of activity are implementation specific and beyond the scope of this Standard.

7.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all basic services defined in ISO/IEC 11574.

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7.2 Procedures

7.2.1 Provision/Withdrawal

SS-CCNR may be provided after pre-arrangement with the service provider (by means of service profile control), or may be available generally to all Users. SS-CCNR may be withdrawn on request of the User or for administrative reasons.

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

Possible subscription options are summarised in Table 2, which shall apply to the whole access of the served user.

Table 2 - SS-CCNR Subscription parameters

Subscription option	Values:
Recall mode	- SS-CC Recall offered to all compatible terminals - SS-CC Recall offered to the terminal which has activated SS-CCNR

7.2.2 Normal Procedures

7.2.2.1 Activation/deactivation/registration/interrogation

Subclause 6.2.2.1 shall apply, with the exception that 'SS-CCBS' shall be replaced by 'SS-CCNR'.

7.2.2.2 Invocation and operation

When a call from User A fails because the destination User, User B, does not answer, the PISN shall retain the call information provided by User A, as described in 9.2.1 of ISO/IEC 11574, for a period during which User A shall be able to request SS-CCNR. User A shall also be able to request SS-CCNR whilst User B is alerting.

On receipt of a request for SS-CCNR, the PISN shall check whether it is possible to initiate the service, and if so shall send an acknowledgment to User A, start monitoring User B and start the SS-CCNR Service Duration Timer. The acknowledgment means that User A can expect to receive a SS-CC Recall if User B becomes free, after a subsequent period of activity, within the period of the SS-CCNR Service Duration Timer.

NOTES

1 The fact that User B is already being monitored, as a result of a call completion request from another user, need not cause rejection of the request from User A. The handling of multiple requests against the same User B is an implementation matter, typically involving some sort of queue arranged in chronological or priority order.

2 The fact that User A has already invoked call completion against another user need not cause rejection of any further requests for call completion from User A. The handling of multiple requests by the same User A is an implementation matter.

3 The period during which SS-CCNR can be invoked and the value of the SS-CCNR Duration timer are implementation specific.

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After the SS-CCNR request has been acknowledged, User A shall be able to receive and initiate other calls.

A PISN may provide User A with the ability to request a list of outstanding SS-CC requests that User A has invoked. If the Recall mode is "SS-CC Recall offered to all compatible terminals", details of all requests made by that user should be provided. If the Recall mode is "SS-CC Recall offered to the terminal which has activated SS-CCNR", only details of requests made by the user from that terminal should be provided. The list will be empty if there are no outstanding SS-CC requests.

When the monitoring of User B indicates that User B has become free after a period of activity (related to the same basic service as the original call to User B), and if User A is also free, the PISN shall provide SS-CC Recall, and start the SS-CC Recall timer.

If User A accepts the SS-CC Recall, the PISN shall attempt to complete the call between User A and User B. If the call is successfully presented to User B and enters an alerting phase or is answered, SS-CCNR shall be regarded as complete.

7.2.2.3 Cancellation

Subclause 6.2.2.3 shall apply, with the exception that 'SS-CCBS' shall be replaced by 'SS-CCNR'

7.2.3 Exceptional procedures

7.2.3.1 Activation/deactivation/registration and Interrogation

Not applicable.

7.2.3.2 Invocation and operation

7.2.3.2.1 Rejection of SS-CCNR service request

Subclause 6.2.3.2.1 shall apply, with the exception that 'SS-CCBS' shall be replaced by 'SS-CCNR'.

7.2.3.2.2 User A is busy on SS-CC recall

If User A is found to be busy when User B becomes free after a period of activity, the PISN shall wait for both Users to become free before providing SS-CC Recall and starting the SS-CC Recall timer. As an option, the PISN can notify User A that the PISN is attempting to complete a call.

NOTE - On receipt of such a notification, User A can either:

- ignore the notification, thereby causing the SS-CC Recall to be delayed;
- cancel the SS-CCNR request; or,
- free resources by disposing of an existing call, thereby allowing the SS-CC Recall to proceed.

7.2.3.2.3 Network congestion

Subclause 6.2.3.2.3 shall apply, with the exception that 'SS-CCBS' shall be replaced by 'SS-CCNR.

7.2.3.2.4 User B becomes busy after successful SS-CC recall

If User B is busy for the call resulting from a successful SS-CC Recall of User A, the PISN shall either:

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- abandon SS-CCNR indicating the reason for the failure to User A and that the SS- CCNR request has been cancelled. In such a case, User A may, as a User option, invoke SS-CCBS if call completion to User B is still required; or,
- automatically invoke SS-CCBS monitoring of User B, indicating the reason for the failure to User A and that SS-CCBS has been invoked. In such a case, User A may, as a User option, request cancellation of the SS- CCBS request, if call completion to User B is no longer required.

As a PISN option, if User B makes an outgoing call after SS-CC Recall has been started, but before User A has accepted the SS-CC Recall, then User B may be notified that the PISN is attempting to complete a call.

NOTE - This gives User B the opportunity to abandon call initiation in order to allow the SS-CCBS call to complete.

7.2.3.2.5 User B becomes busy during path reservation

If user B is found to be busy when path reservation is performed, the path shall be released and the PISN shall wait for User B to become not busy before reattempting path reservation.

7.2.3.2.6 Duplicate SS-CCNR requests

Sub-clause 6.2.3.2.5 shall apply, with the exception that 'SS-CCBS' shall be replaced by 'SS-CCNR'

7.2.3.2.7 Other failure situations

A particular request for the service shall be automatically cancelled by the PISN, and User A shall be notified if:

- User B has still had no period of activity before the SS-CCNR Service Duration Timer expires;
- User B and/or User A are still busy (after a period of activity by User B) when the SS-CCNR Service Duration Timer expires;
- User A does not accept the SS-CC Recall before the SS-CC Recall timer expires;
- User B invokes or activates a service that conflicts with the existing SS-CCNR invocation;
- for any reason, the PISN is unable to continue with the CCNR invocation.

7.2.3.3 Cancellation

Sub-clause 6.2.3.3 shall apply, with the exception that 'SS-CCBS' shall be replaced by 'SS-CCNR'

7.3 Interaction with other supplementary services

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

NOTE - Annex A anticipates interactions with future supplementary services and ANFs.

7.3.1 Calling Line Identification Presentation (SS-CLIP)

No interaction.

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7.3.2 Connected Line Identification Presentation (SS-COLP)

No interaction.

7.3.3 Calling/Connected Line Identification Restriction (SS-CLIR)

If User A requests override of the SS-CLIR default value for a call, and the call is not answered by User B, the request to override the default value shall be retained by the network and shall apply to a call resulting from the use of SS-CCNR.

7.3.4 Calling Name Identification Presentation (SS-CNIP)

No interaction.

7.3.5 Connected Name Identification Presentation (SS-CONP)

No interaction

7.3.6 Calling/Connected Name Identification Restriction (SS-CNIR)

If User A requests override of the SS-CNIR default value for a call, and the call is not answered by User B, the request to override the default value shall be retained by the network and shall apply to a call resulting from the use of SS-CCNR.

7.3.7 Completion of Calls to Busy Subscribers (SS-CCBS)

Sub-clause 6.3.12 shall apply.

7.3.8 Call Transfer (SS-CT)

No interaction.

7.3.9 Call Forwarding Unconditional (SS-CFU)

a) SS-CFU activated by user B before user A requests SS-CCNR

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

b) SS-CFU activated by user B after user A requests SS-CCNR

If User B activates SS-CFU after User A has requested SS-CCNR and whilst the SS-CC Recall has not yet been accepted by User A, the SS-CCNR request shall either continue to be applied to User B or be cancelled.

c) SS-CFU activation by user A

If User A invokes SS-CCNR whilst SS-CFU is activated, or User A invokes SS-CCNR and subsequently activates SS-CFU, SS-CC Recall shall still be given to User A.

7.3.10 Call Forwarding Busy (SS-CFB)

a) SS-CFB activated by user B before user A requests SS-CCNR

If the call from User A to User B is diverted to User C by SS-CFB and C does not answer, then a SS-CCNR request made shall be applied to the diverted-to User C.

b) SS-CFB activated by user B after user A requests SS-CCNR

If User B activates SS-CFB after User A has requested SS-CCNR and whilst the SS-CC Recall has not yet been accepted by User A, the SS-CCNR request shall continue to be applied to User B.

c) SS-CFB activation by user A

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If User A invokes SS-CCNR whilst SS-CFB is invoked, or User A invokes SS-CCNR and subsequently invokes SS-CFB, this shall not affect the provision of the SS-CC Recall to User A

7.3.11 Call Forwarding on No Reply (SS-CFNR)

If the call to User B is diverted to User C by SS-CFNR and User C does not answer, then a SS-CCNR request from User A shall be applied to either User B or to User C.

If User B activates SS-CFNR after User A has requested SS-CCNR and whilst the SS-CC Recall has not yet been accepted by User A, the SS-CCNR request is not affected.

If User A invokes SS-CCNR whilst SS-CFNR is activated, or User A invokes SS-CCNR and subsequently activates SS-CFNR, this shall not affect the provision of the SS-CC Recall to User A.

7.3.12 Path Replacement (ANF-PR)

No interaction.

7.4 Interworking considerations

Where User B is on a different network, the availability of SS-CCNR to User A will be limited by the capabilities of the other network and the interworking functions between the PISN and the other network.

If User B is connected to a public ISDN and the public ISDN version of SS-CCNR is available at the network interworking point, User A shall be able to request SS-CCNR on public ISDN User B. In addition, a User A served by the Public ISDN shall be able to request SS-CCNR on a PISN User B.

NOTE - This assumes peer cooperation between the public and private ISDN in provision of SS-CCNR.

7.5 SS-CCNR Overall SDL

Figure 2 contains the dynamic description of SS-CCNR 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-CCNR. It is presented as the procedure and state requirements for SS-CCNR that are additional to those for SS-CCBS, as shown in Figure 1. The relationship of this process to the basic call process is indicated in the annotations.

Input signals from the left and output signals to the left represent primitives from and to User A. Input signals from the right represent internal stimuli.

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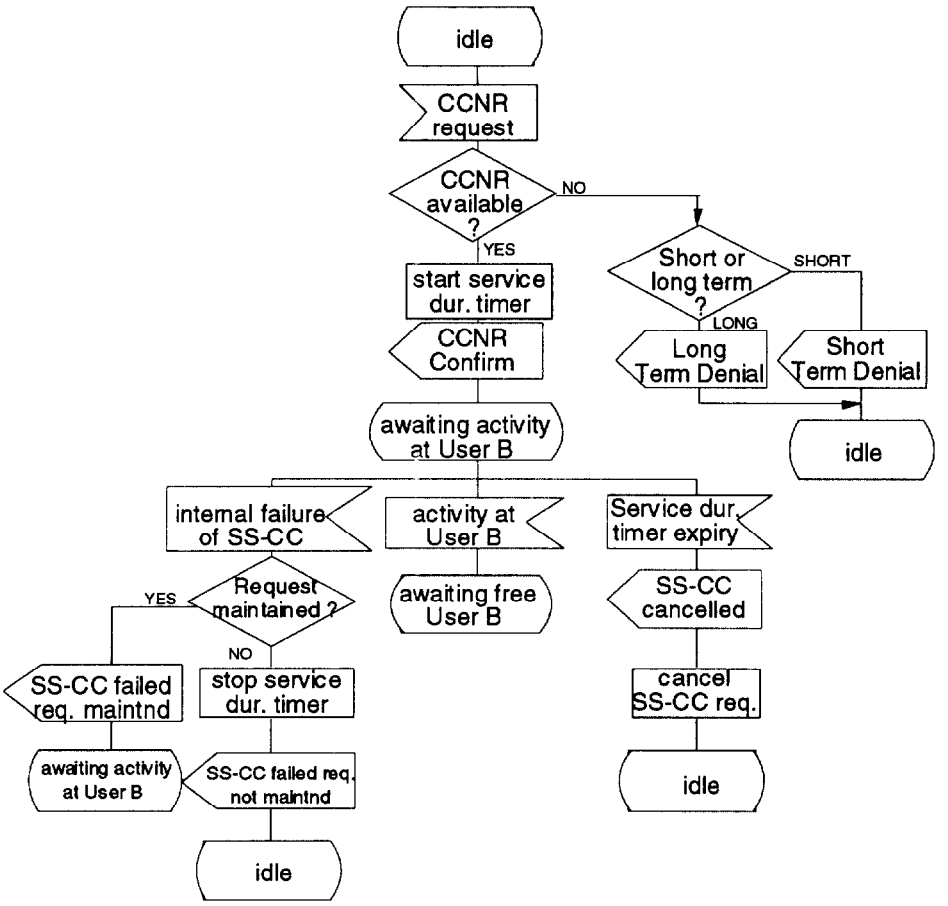


Figure 2 : Additions to SS-CCBS overall SDL for SS-CCNR

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8 SS-CC stage 2 specification

8.1 Functional model

8.1.1 Functional model description

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

FE1 Originating SS-CC Agent FE

FE2 Originating SS-CC Controlling FE

FE3 Terminating SS-CC Controlling FE

FE4 Terminating SS-CC Agent FE

The following functional relationships shall exist between these FEs:

ra between FE1 and FE2,

rb between FE2 and FE3,

rc between FE3 and FE4.

Figure 3 shows these FEs and relationships.

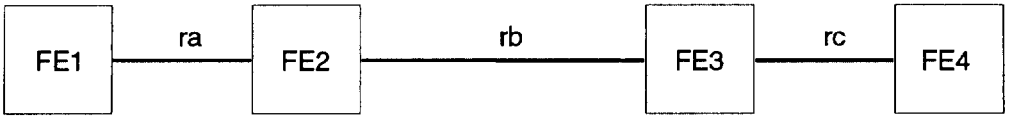


Figure 3. Functional model for SS-CC

8.1.2 Description of the functional entities

8.1.2.1 Originating SS-CC agent FE, FE1

The FE that serves the User that wishes to invoke either of the call completion services (SS-CCBS or SS-CCNR).

8.1.2.2 Originating SS-CC controlling FE, FE2

The FE within the network which co-operates with its peer (FE3) to provide the PISN call completion supplementary service as requested by FE1.

8.1.2.3 Terminating SS-CC controlling FE, FE3

The FE within the network which co-operates with its peer (FE2) to provide the PISN call completion supplementary service as requested by FE1. It also interacts with FE4 to provide the monitoring information that is required for the successful operation of the call completion services.

8.1.2.4 Terminating SS-CC agent FE, FE4

The FE that serves the monitored User (B).

8.1.3 Relationship to basic call functional model

An example of a relationship between the FEs for SS-CC and FEs for the basic call is shown in Figure 4.

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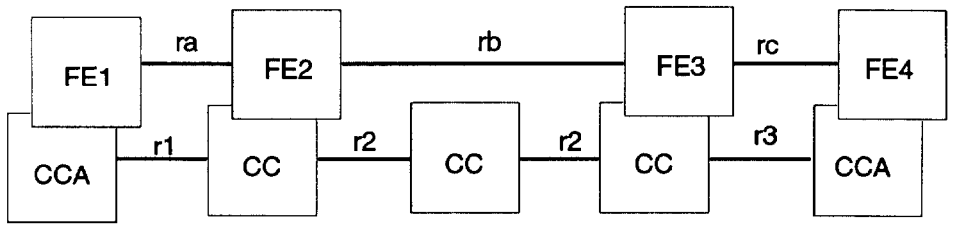


Figure 4 - Example Relationship between model for SS-CC and Basic Call

8.2 Information flows

8.2.1 Definition of Information flows

8.2.1.1 ra_CC_cancellation_access

ra_CC_cancellation_access is a confirmed information flow across ra from FE1 to FE2 which cancels the SS-CC service.

Table 3 lists the service elements within the ra_CC_cancellation_access information flow. The column headed "Request" indicates which of these elements are mandatory (M) and which are optional (O) in a ra_CC_cancellation_access request/indication information flow. The column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_cancellation_access response/confirmation information flow.

Table 3 - Information content of ra_CC_cancellation_access

Service Element	Request	Confirm
CC Identifier (CCI)	M	-
Reject Cause (RC)	-	M (NOTE)

NOTE - This service element shall be included when the cancellation of SS-CC cannot be performed and shall indicate the reason for failure. Examples of the reasons that cancellation may not be possible are:

- SS-CC request does not exist; or,
- no invoked SS-CC requests exist.

8.2.1.2 ra_CC_cancelled

ra_CC_cancelled is an unconfirmed information flow across ra from FE2 to FE1 which indicates that the SS-CC service has been cancelled.

Table 4 lists the service elements within the ra_CC_cancelled information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_cancelled request/indication information flow.

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Table 4 - Information content of ra_CC_cancelled

Service Element	Request
Cancellation Reason (CR)	M
CC Identifier (CCI)	M
Connection Type (CT)	O (NOTE 1)
Originating Number (ON)	O(NOTE2)
Originating Subaddress (OS)	O

NOTES

1 - This service element shall only be sent when the recall mode is SS-CC recall offered to all compatible terminals.

2 - This service element shall be included where there is more than one PISN number associated with User A's access.

8.2.1.3 ra_CC_failed

ra_CC_failed is an unconfirmed information flow across ra from FE2 to FE1 informing User A that the SS-CC service has failed, subsequent to successful recall of User A.

Table 5 lists the service elements within the ra_CC_failed information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_failed request/indication information flow.

Table 5 - Information content of ra_CC_failed

Service Element	Request
Failure Cause (FC)	M (NOTE 1)
Request Maintained (RM)	O(NOTE 2)

NOTES

1 - This service element shall indicate the reason for failure of SS-CC. Examples of reasons for failure are:

- User B busy again, or
- Network Congestion.

2 - This service element shall be included when the SS-CC request has been maintained by the PISN subsequent to the failure of the original completion attempt.

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8.2.1.4 ra_CC_list

ra_CC_list is a confirmed information flow across ra from FE1 to FE2 which requests a 'list' of all outstanding SS-CC requests that user A has invoked. The response contains a list of those requests invoked by User A.

Table 6 lists the service elements within the ra_CC_list information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_list request/indication information flow. The column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_list response/-confirmation information flow.

Table 6 - Information content of ra_CC_list

Service Element	Request	Confirm
CC Identifier (CCI)	O	-
Originating Number (ON)	O (NOTE1)	-
Reject Cause (RC)	-	O (NOTE 2)
Request List (RL)	-	O (NOTE 3)

NOTES

1 - This service element shall be included where there is more-than one PISN number associated with User A's access, otherwise it shall be omitted.

2 - This service element shall be included if the CC_list confirm/response indicates rejection and indicate the reason for rejection, otherwise it shall be omitted.

3 - This service element shall be included if the CC_list confirm/response indicates success and shall include a list of PISN numbers on which User A has invoked SS-CC, otherwise it shall not be included. In the case of recall offered to all compatible terminals the corresponding CC Identifiers shall be included together with information to enable terminals to decide whether they are compatible.

8.2.1.5 ra_CC_recall_accepted

ra_CC_recall_accepted is an unconfirmed information flow across ra from FE1 to FE2 in order to indicate that User A has accepted the SS-CC Recall and wishes to complete the original call to User B.

Table 7 lists the service elements within the ra_CC_recall_accepted information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_recall_accepted request/indication information flow.

Table 7 - Information content of ra_CC_recall_accepted

Service Element	Request
CC Identifier (CCI)	M

8.2.1.6 ra_CC_rem_user_free

ra_CC_rem_user_free is an unconfirmed information flow across ra from FE2 to FE1 indicating that User B is not busy and instructing FE1 to recall User A.

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Table 8 lists the service elements within the ra_CC_rem_user_free information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_rem_user_free request/indication information flow.

Table 8 - Information content of ra_CC_rem_user_free

Service Element	Request
CC Identifier (CCI)	M
Connection Type (CT)	O
Destination Number (DN)	M
Destination Subaddress (DS)	O
Originating Number (ON)	O (NOTE)
Originating Subaddress (OS)	O

NOTE - This service element shall be included where there is more than one PISN number associated with User A's access.

8.2.1.7 ra_CC_request

ra_CC_request is a confirmed information flow across ra from FE1 to FE2 which invokes the SS-CC service. The response indicates whether the request to invoke SS-CC has been accepted or rejected. It also indicates the reason if the response indicates rejection.

Table 9 lists the service elements within the ra_CC_request information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_request request/indication information flow. The column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_request response/confirmation information flow.

Table 9 - Information content of ra_CC_request

Service Element	Request	Confirm
CC Identifier (CCI)	-	M
Recall Mode (RM)	-	M
Reject Cause (RC)	-	O (NOTE)

NOTE - This service element shall be included if the CC_request cannot be accepted. Examples of possible error conditions are as follows:

- limit of requests reached locally (User A)
- limit of requests reached remotely (User B)
- duplicate invocation
- SS-CC not provided
- interworking with a network that does not support SS-CC

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8.2.1.8 ra_CC_status_req

ra_CC_status_req is a confirmed information flow across ra from FE2 to FE1 which ascertains the status of User A. The confirmation indicates whether User A is busy or free.

Table 10 lists the service elements within the ra_CC_status_req information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_status_req request/indication information flow. The column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_status_req response/confirmation information flow.

Table 10 - Information content of ra_CC_status_req

Service Element	Request	Confirm
CC Identifier (CCI)	O (NOTE 1)	-
Connection Type (CT)	O (NOTE 2)	-
Originating Number (ON)	O (NOTE 3)	-
Originating Subaddress (OS)	O	-
Status Indicator (SI)	-	M (NOTE 4)

NOTE S

1 - CCI shall be sent in the case of specific recall.

2 - CT shall only be sent when the subscription option "SS-CC Recall offered to all compatible terminals" is subscribed to.

3 - ON shall be included where there is more than one PISN number associated with User A's access.

4 - This service element shall indicate either:

- busy, or
- free.

8.2.1.9 ra_CC_stop_recall

ra_CC_stop_recall is an unconfirmed flow across ra from FE2 to FE1 in order to inform FE1 that another FE1 has accepted the recall. This applies in the case where SS-CC recall is offered to all compatible terminals.

Table 11 lists the service elements within the ra_CC_stop_recall information flow.

Table 11- Information content of ra_CC_stop_recall

Service Element	Request
CC identifier (CCI)	M

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8.2.1.10 ra_CC_user_B_free

ra_CC_user_B_free is an unconfirmed information flow across ra from FE2 to FE1 in order to inform User A, when User A is known to be busy, that User B is now free.

Table 12 lists the service elements within the ra_CC_user_B_free information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a ra_CC_user_B_free request/indication information flow.

Table 12 - Information content of ra_CC_user_B_free

Service Element	Request
CC Identifier (CCI)	M
Connection Type (CT)	O
Destination Number (DN)	M
Destination Subaddress (DS)	O
Originating Number (ON)	O (NOTE)
Originating Subaddress (OS)	O

NOTE -This service element shall be included where there is more than one PISN number associated with User A's access.

8.2.1.11 rb_CC_call

rb_CC_call is an unconfirmed information flow across rb from FE2 to FE3 which initiates offering of the completed call to User B. If Path reservation has not been performed, it also cancels the SS-CC service.

There are no service elements in this information flow.

8.2.1.12 rb_CC_call_reject

rb_CC_call_reject is an unconfirmed information flow across rb from FE3 to FE2 which indicates that offering of the completed call to User B has been unsuccessful.

Table 13 lists the service elements within the rb_CC_call_reject information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a rb_CC_call_reject request/indication information flow.

Table 13 - Information content of rb_CC_call_reject

Service Element	Request
Reject Cause (RC)	M (NOTE)

NOTE - This service element shall indicate the reason for failure. An example of a reason is: User B busy.

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8.2.1.13 rb_CC_cancellation

rb_CC_cancellation is an unconfirmed information flow across rb from FE2 to FE3 or across rb from FE3 to FE2 which cancels the SS-CC service.

There are no service elements in this information flow.

8.2.1.14 rb_CC_free_notification

rb_CC_free_notification is an unconfirmed information flow across rb from FE3 to FE2 informing FE2 that User B is now free.

There are no service elements in this information flow.

8.2.1.15 rb_CC_monitor

rb_CC_monitor is a confirmed information flow across rb from FE2 to FE3 which initiates monitoring at FE3 or re-initiates monitoring in the case where a SS-CC request has failed (e.g. User B busy) and the PISN provides automatic re-registration of the SS-CC service. The response indicates whether or not FE3 has successfully initiated monitoring of User B.

Table 14 lists the service elements within the rb_CC_monitor information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a rb_CC_monitor request/indication information flow. The column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a CC_monitor response/confirmation information flow.

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Table 14 - Information content of rb_CC_monitor

Service Element	Request	Confirm
Connection Type (CT)	M	-
Destination Number (DN)	M	-
Destination Subaddress	O	-
Monitor Type (MT)	M (NOTE 1)	-
Originating Number (ON)	M	-
Originating Subaddress	O	-
Reject Cause (RC)	-	O (NOTE 2)
Reservation Capability (RVC)	-	O (NOTEe 3)
Retain Capability	O	O (NOTE 4)

NOTES

1 - This service element shall indicate either:

- Monitor for free User B, or
- Monitor for free User B after period of activity.

2 - This service element shall be included if the rb_CC_monitor request/indication cannot be accepted. Examples of reasons for rejection are:

- limit of requests reached
- SS-CC not provided, or
- duplicate invocation.

3 - This service element may be included and shall indicate whether or not path reservation is supported by FE3 in order to allow FE2 to decide whether to invoke path reservation or not. If this element is not contained in the rb_CC_monitor request/response received by FE2, an attempt to initiate path reservation may still fail because FE3 does not support path reservation.

4 - This service element may be included if the rb_CC_monitor request received by FE3 contained the RC Retain Capabilityservice element, otherwise the element shall be omitted.

8.2.1.16 rb_CC_path_reserve

rb_CC_path_reserve is a confirmed information flow across rb from FE2 to FE3 which reserves a network connection for the completed call. The response indicates whether or not the reservation was successful. This information flow shall be sent if the path reservation version of SS-CC is provided, otherwise is not required.

Table 15 lists the service elements within the rb_CC_path_reserve information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a rb_CC_path_reserve request/indication information flow. The column headed

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"Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a rb_CC_path_reserve response/confirmation information flow.

Table 15 - Information content of rb_CC_path_reserve

Service Element	Request	Confirm
Reject Cause (RC)	-	O (NOTE)

NOTE - This service element shall be included if FE3 rejects the rb_CC_path_reserve request. It shall indicate either:

- path reservation failed because FE3 does not support path reservation; or,
- path reservation failed for other reasons. Examples are: User B busy or lack of resources at FE3.

8.2.1.17 rb_CC_resume_completion

rb_CC_resume_completion is an unconfirmed information flow across rb from FE2 to FE3 which informs FE3 that User A is no longer busy and that FE3 should re-instate monitoring of User B, in the case that path reservation is not to be performed.

There are no service elements in this information flow.

8.2.1.18 rb_CC_suspend_completion

rb_CC_suspend_completion is an unconfirmed information flow across rb from FE2 to FE3 which informs FE3 that User A is temporarily busy in the case that path reservation has not been performed.

There are no service elements in this information flow.

8.2.1.19 rb_CC_suspend_path_reservation

rb_CC_suspend_path_reservation is an unconfirmed information flow across rb from FE2 to FE3 which informs FE3 that User A is temporarily busy and recall of User A will be delayed.

NOTE - This flow is accompanied by a basic call flow towards FE3 to clear the path established by the path reserve sequence.

There are no service elements in this information flow.

8.2.1.20 rc_CC_status_req

rc_CC_status_req is a confirmed information flow across rc from FE3 to FE4 which ascertains the status of User B. The confirmation indicates whether User B is busy or free.

Table 16 lists the service elements within the rc_CC_status_req information flow. The column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a rc_CC_status_req request/indication information flow. The column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a rc_CC_status_req response/confirmation information flow.

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Table 16 - Information content of rc_CC_status_req

Service Element	Request	Confirm
Connection Type (CT)	M	-
Destination Number (DN)	O (NOTE 1)	-
Destination Subaddress (DS)	O	-
Status Indicator (SI)	-	M (NOTE 2)

NOTES

1 - DN shall be included where there is more than one PISN number associated with User B's access.

2 - This service element shall indicate either:

- busy, or
- free.

8.2.2 Relationship of Information flows to Basic Call Information flows

The ra_CC_recall_accept request/indication information flow shall be sent across ra in conjunction with the basic call r1_setup request/indication sent to initiate call establishment by User A in response to recall.

The rb_CC_cancellation request/indication information flow shall be sent across rb in conjunction with r2_release request/indication when User A rejects SS-CC recall and path reservation has already been performed.

The rb_CC_call request/indication information flow shall be sent across rb in conjunction with the basic call information flow r2_setup request/indication in the case of successful recall of User A when path reservation is not used.

The rb_CC_path_reserve request/indication information flow shall be sent across rb in conjunction with the basic call information flow r2_setup request/indication sent to reserve the network path.

The rb_CC_path_reserve response/confirmation information flow shall be sent across rb in conjunction with the basic call information flow r2_release request/indication clearing the established network path in the case of failure of the reservation.

The rb_CC_suspend_path_reservation request/indication information flow shall be sent across rb in connection with the basic call information flow r2_release request/indication used to clear down the network path in the case that User A is temporarily unavailable after the network path has been reserved.

The rb_CC_call_reject request/indication information flow shall be sent across rb in conjunction with the basic call information flow r2_release request/indication if the call offer to User B is unsuccessful.

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The ra_CC_cancelled request/indication information flow shall be sent across ra in conjunction with the basic call r1_report request/indication or r1_setup response/confirmation in the case where SS-CC is successful.

Table 17 summarizes the relationship of the SS-CC information flows to those of basic call.

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Table 17 - Relationship of SS-CC information flows to Basic Call

Information flow		Independent of basic call ?	With basic call flow ?	Basic call flows:
ra_CC_cancellation_access	request	yes	-	
	confirm	yes	-	
ra_CC_cancelled	request	yes	yes	r1_report_req. r1_setup_resp.
ra_CC_failed	request	-	yes	r1_disconnect req.
ra_CC_list	request	yes	-	
	confirm	yes	-	
ra_CC_recall_accepted	request	-	yes	r1_setup_req.
rb_CC_call	request	yes	yes	r2_setup_req
rb_CC_call_reject	request	-	yes	r2_release req
rb_CC_cancellation	request	yes	yes	r2_release req.
ra_CC_recall_accepted	request	-	yes	r1_setup_req.
ra_CC_rem_user_free	request	yes	-	
ra_CC_request	request	yes	-	
	confirm	yes	-	
ra_CC_status_req	request	yes	-	
	confirm	yes	-	
ra_CC_user_B_free	request	yes	-	
rb_CC_free_notification	request	yes	-	
rb_CC_monitor	request	yes	-	
	confirm	yes	-	
rb_CC_path_reserve	request	-	yes	r2_setup req.
	confirm	yes	yes	r2_release req.
rb_CC_resume_completion	request	yes	-	
rb_CC_suspend_completion	request	yes	-	
rb_CC_suspend_path_ reservation	request	-	yes	r2_release req.
rc_CC_status_req	request	yes	-	
	confirm	yes	-	

8.2.3 Examples of information flow sequences

Signalling procedures shall be provided in support of the information flow sequences shown below. In addition, signalling procedures should be provided to cover other sequences arising

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from error situations, interactions with basic call, interactions with other supplementary services, different topologies, etc..

In the figures, SS-CC 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 simultaneously. Within a column representing an SS-CC functional entity, the numbers refer to functional entity actions are listed in clause 8.3.

The following acronyms are used in figures 5 through 29:

req:	request
cfm:	confirmation
ind:	indication
resp:	response
rem:	remote

8.2.3.1 Successful invocation of SS-CC

8.2.3.1.1 Successful invocation of SS-CCBS

Figure 5 shows the information flow sequence for successful invocation of SS-CC when the SS-CCBS service is requested.

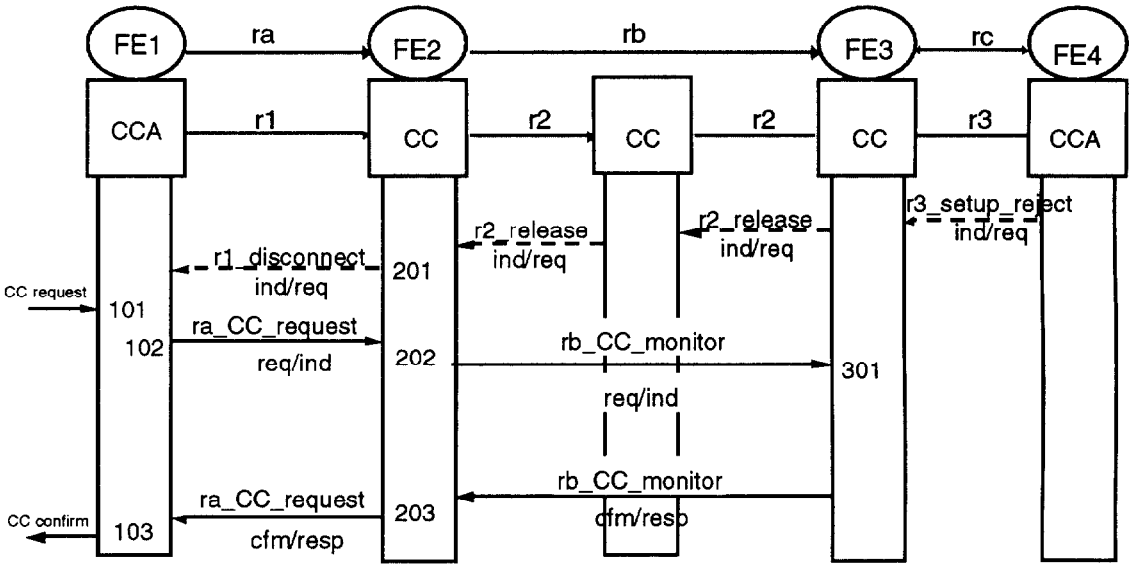


Figure 5 - Successful invocation of SS-CC (SS-CCBS)

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8.2.3.1.2 Successful Invocation of SS-CCNR

Figure 6 shows the information flow sequence for successful invocation of SS-CC when the SS-CCNR service is requested.

NOTE - This example shows invocation of SS-CCNR after releasing the original call. If SS-CCNR is invoked before releasing the original call, r1_disconnect req/ind and the resultant Basic Call information flows will occur later and FEA 220 will not apply.

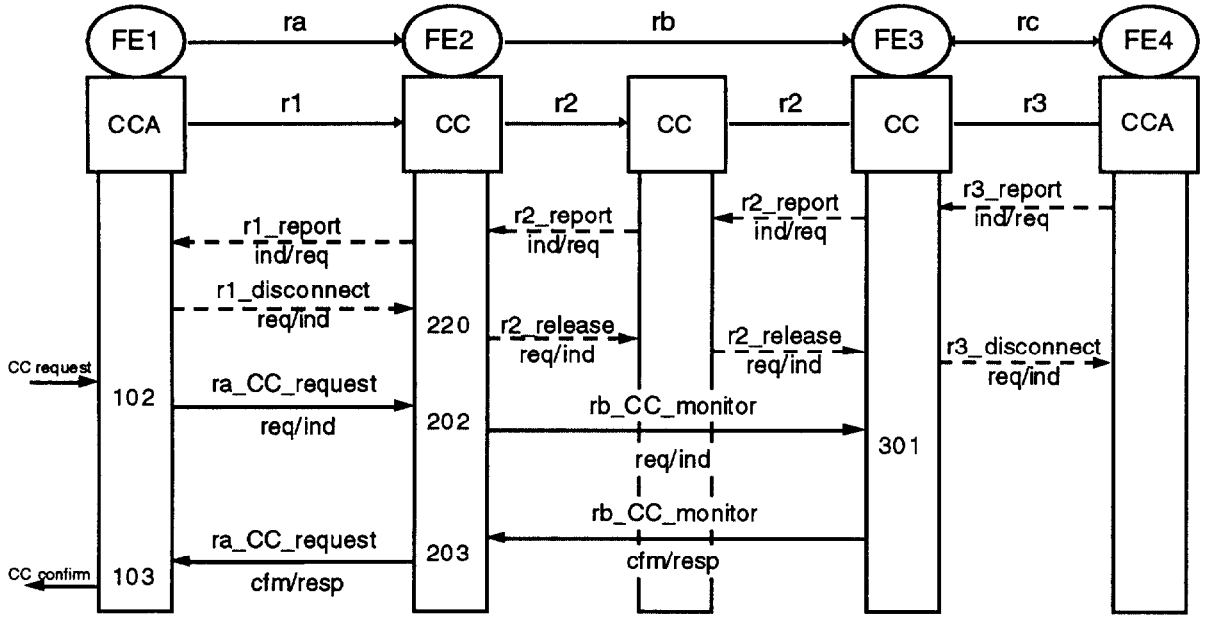


Figure 6 - Successful invocation of SS-CC (SS-CCNR)

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8.2.3.2 Status request procedure, User A

Figure 7 shows the status request procedure for ascertaining the status of User A in the case that User A's status is not known by FE2.

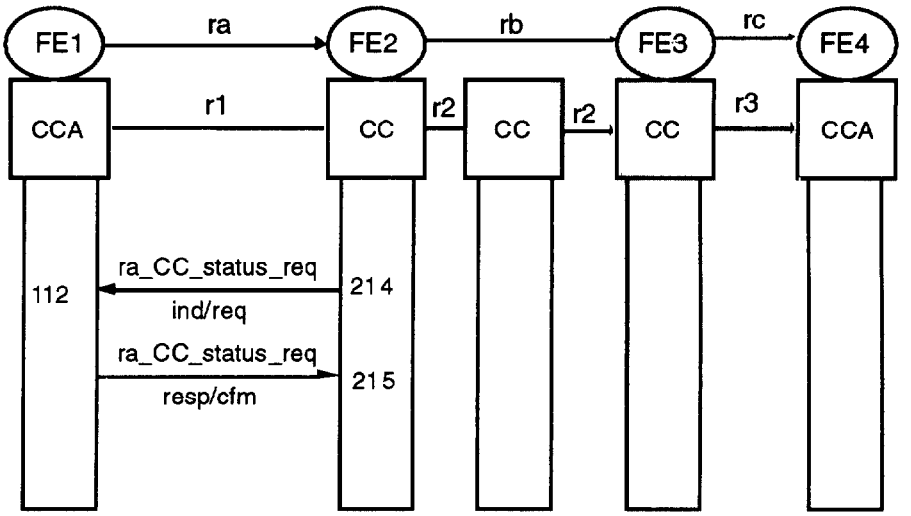


Figure 7 - Status request procedure, User A

8.2.3.3 Status request procedure, User B

Figure 8 shows the status request procedure for ascertaining the status of User B in the case that User B's status is not known by FE3.

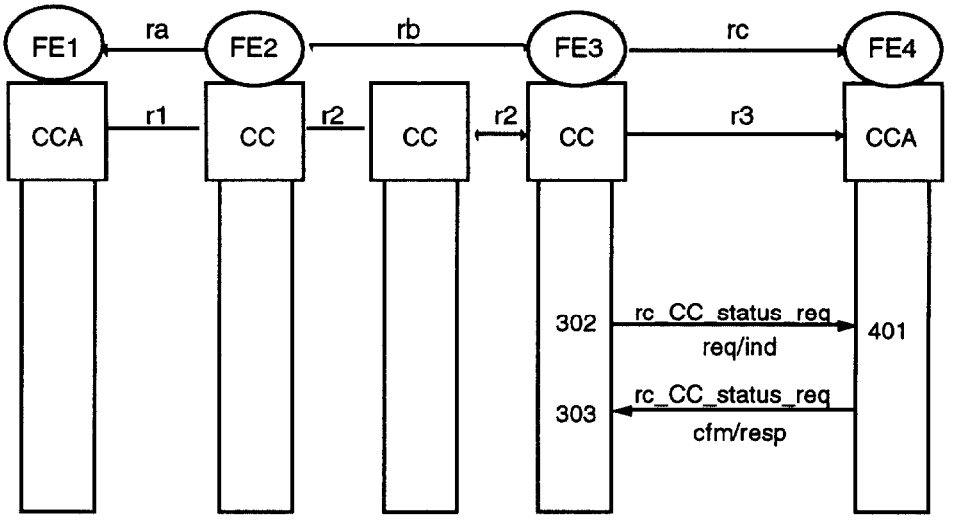


Figure 8 - Status request procedure, User B

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8.2.3.4 Cancellation of previously invoked SS-CC request by User A

Figure 9 shows the information flow sequence where User A requests cancellation of a previously invoked SS-CC request.

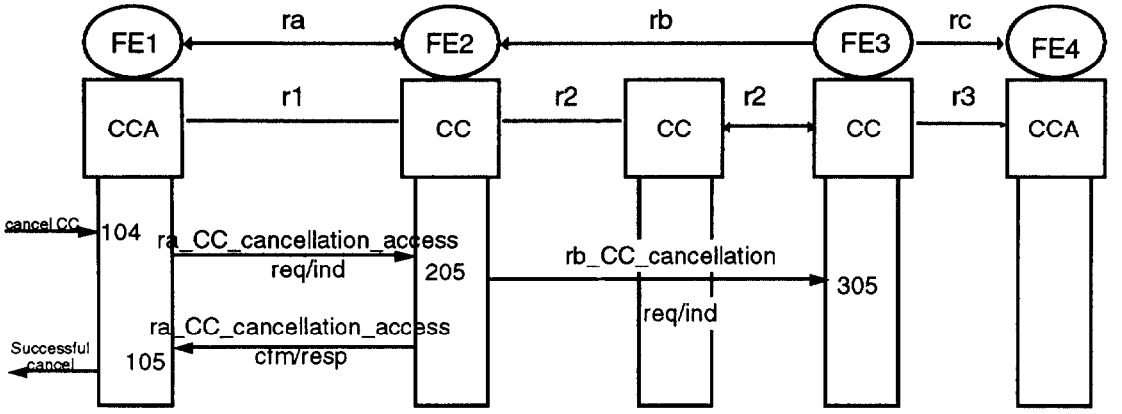


Figure 9 - Cancellation of previously invoked SS-CC request

8.2.3.5 Remote cancellation of previously invoked SS-CC request for service reasons

Figure 10 shows the information flow sequence where FE3 initiates cancellation of a previously invoked SS-CC request.

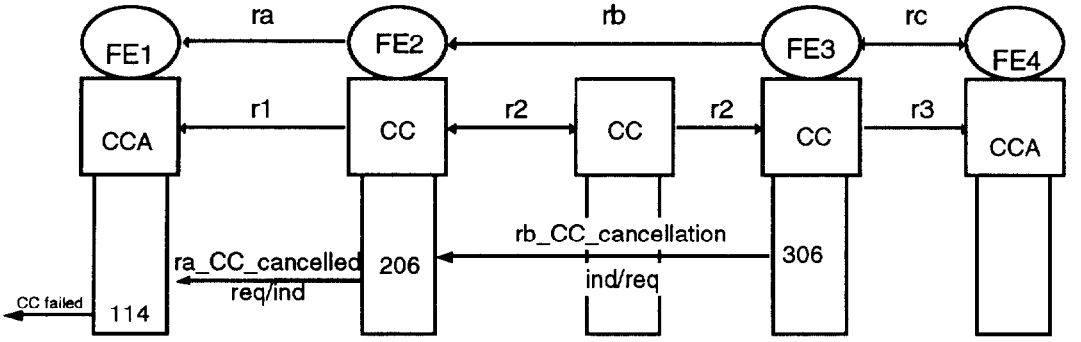


Figure 10 - Remote cancellation of previously invoked SS-CC request for service reasons

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8.2.3.6 Local cancellation of previously invoked SS-CC request for service reasons

Figure 11 shows the information flow sequence where FE2 initiates cancellation of a previously invoked SS-CC request, e.g. for expiry of the SS-CC Service duration timer.

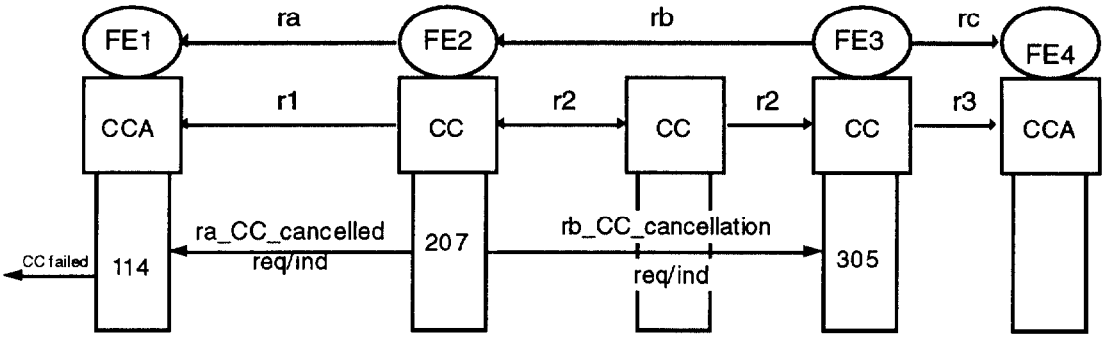


Figure 11 - Local cancellation of previously invoked SS-CC request for service reasons

8.2.3.7 List of SS-CC request status

Figure 12 shows the information flow sequence where User A requests the status of one or more previously invoked SS-CC requests.

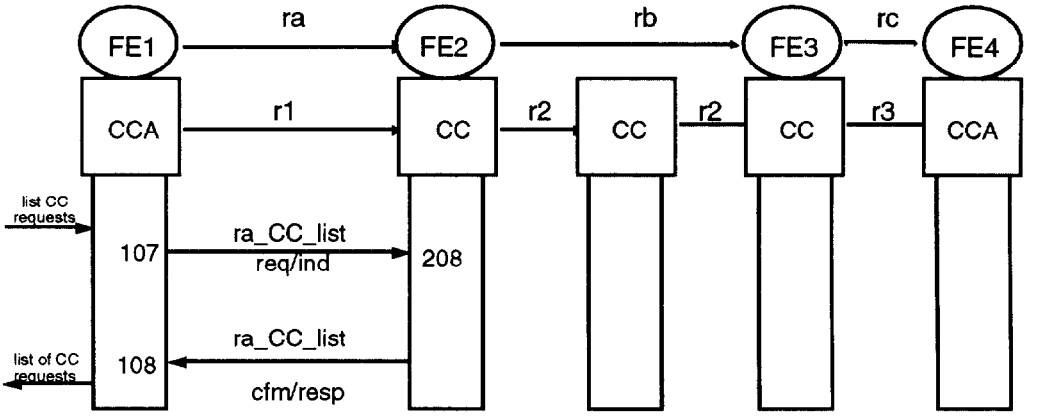


Figure 12 - List of SS-CC request status

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8.2.3.8 Successful completion of SS-CC (without reservation)

Figure 13 shows the information flow sequence where the SS-CC request is successfully completed without prior reservation of a network path.

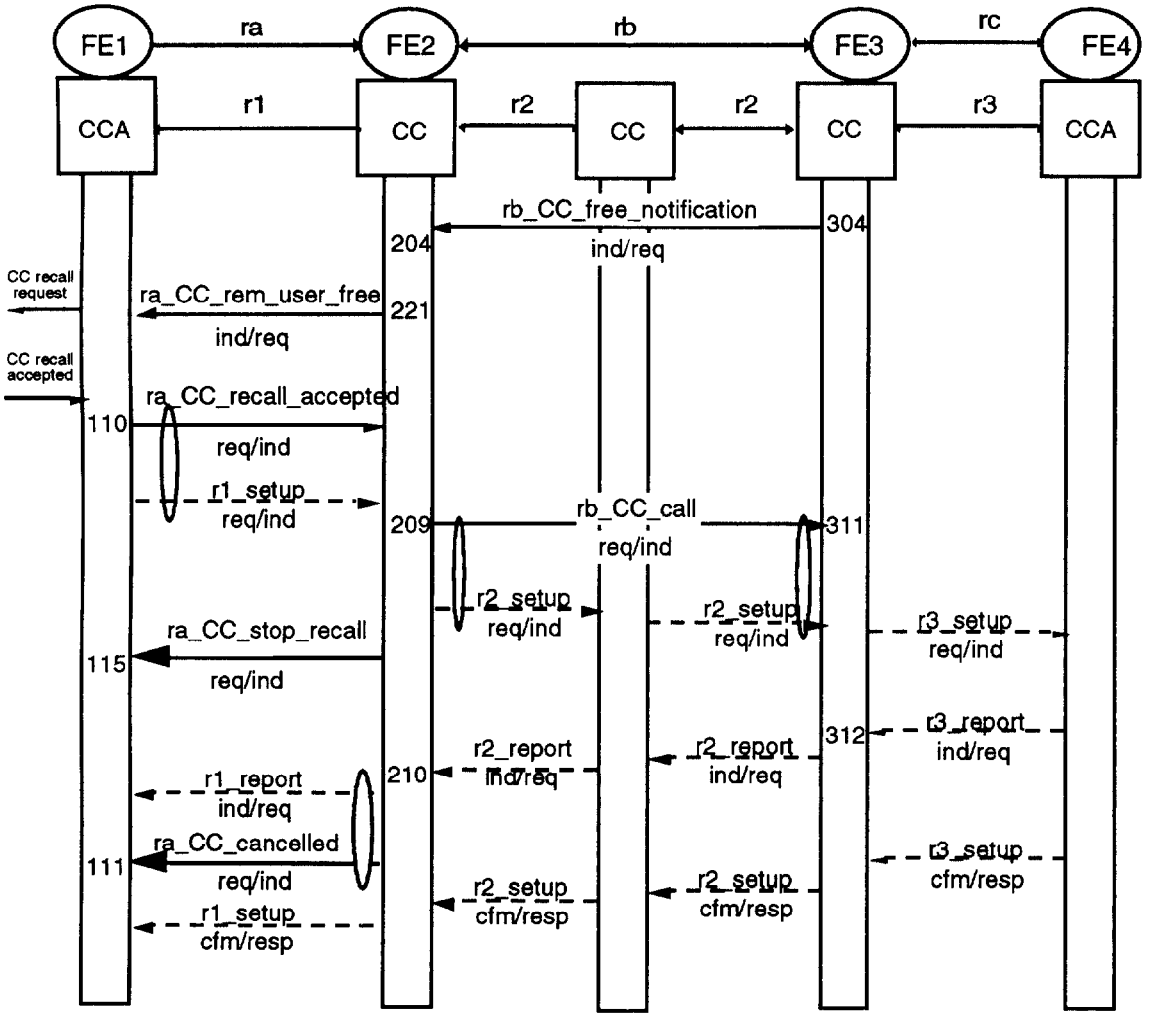


Figure 13 - Successful completion of SS-CC (without reservation)

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8.2.3.9 Successful completion of SS-CC (path reservation successful)

Figure 14 shows the information flow sequence where the SS-CC request is successfull completed after prior reservation of a network path.

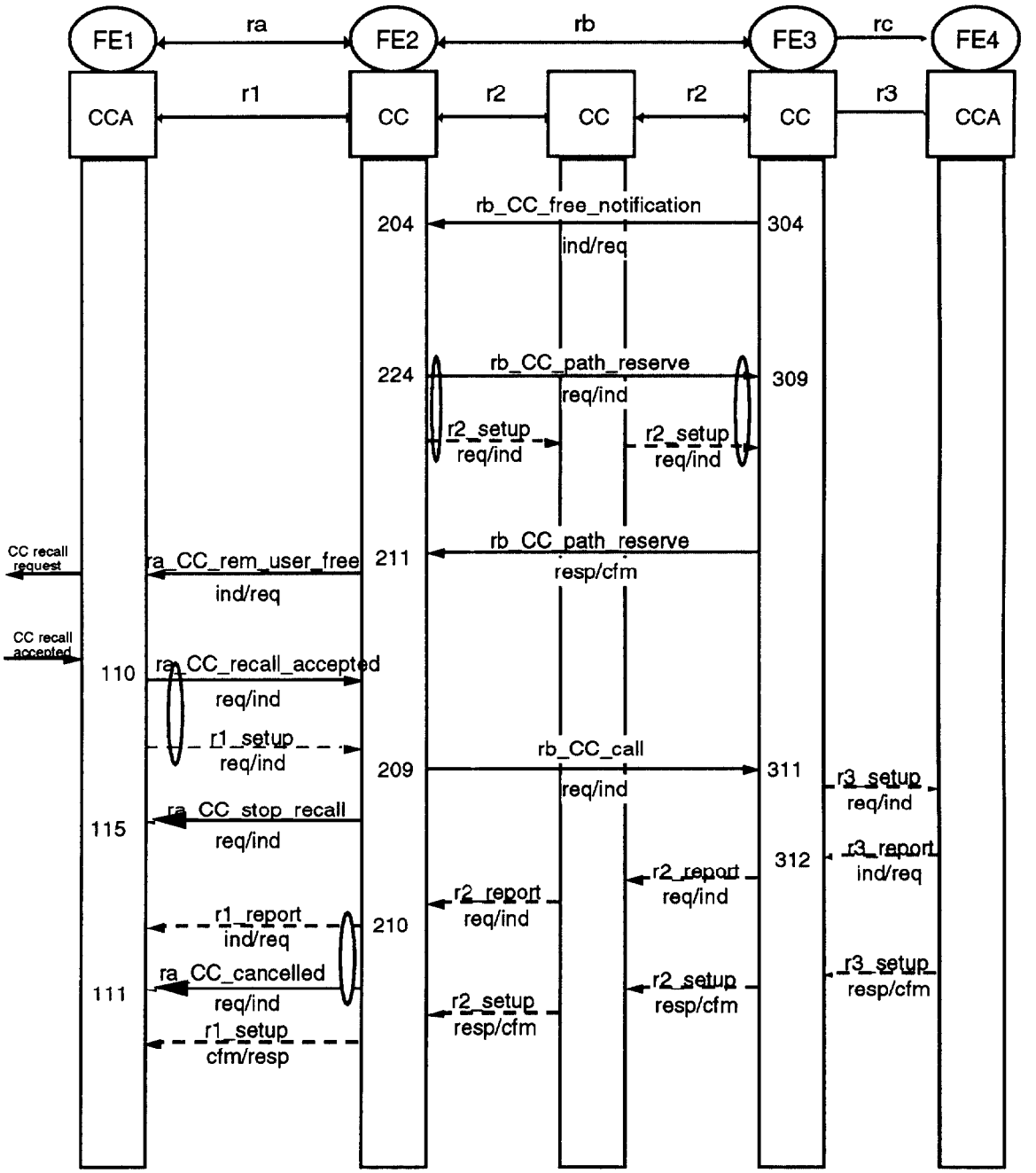


Figure 14 - Successful completion of SS-CC (path reservation successful)

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8.2.3.10 Successful completion of SS-CC (path reservation attempted, fall back to non-reservation)

Figure 15 shows the information flow sequence where the SS-CC request is successfully completed after an attempt to reserve a network path fails and fall back to non-reservation occurs.

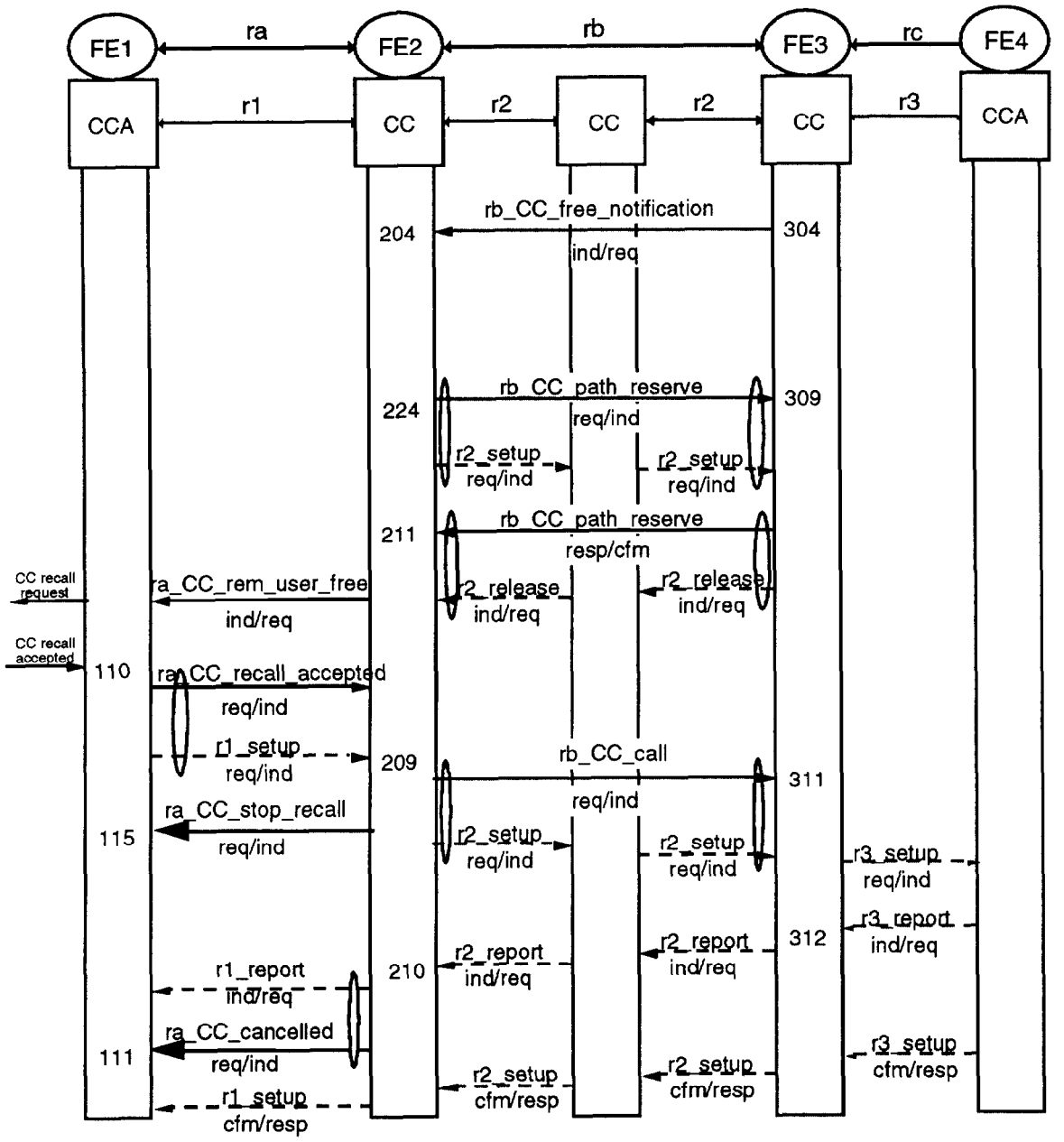


Figure 15 - Successful completion of SS-CC (path reservation attempted, fall back to non-reservation)

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8.2.3.11 Local rejection of SS-CC by PISN

Figure 16 shows the information flow sequence where FE2 rejects the request for SS-CC - i.e. local rejection.

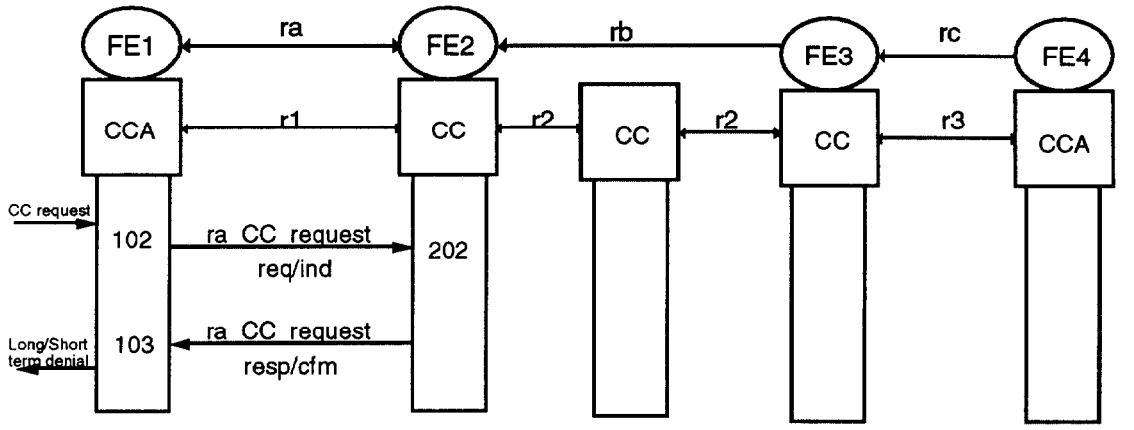


Figure 16 - Local rejection of SS-CC

8.2.3.12 Remote rejection of SS-CC by PISN

Figure 17 shows the information flow sequence where FE3 rejects the request for SS-CC - i.e. remote rejection.

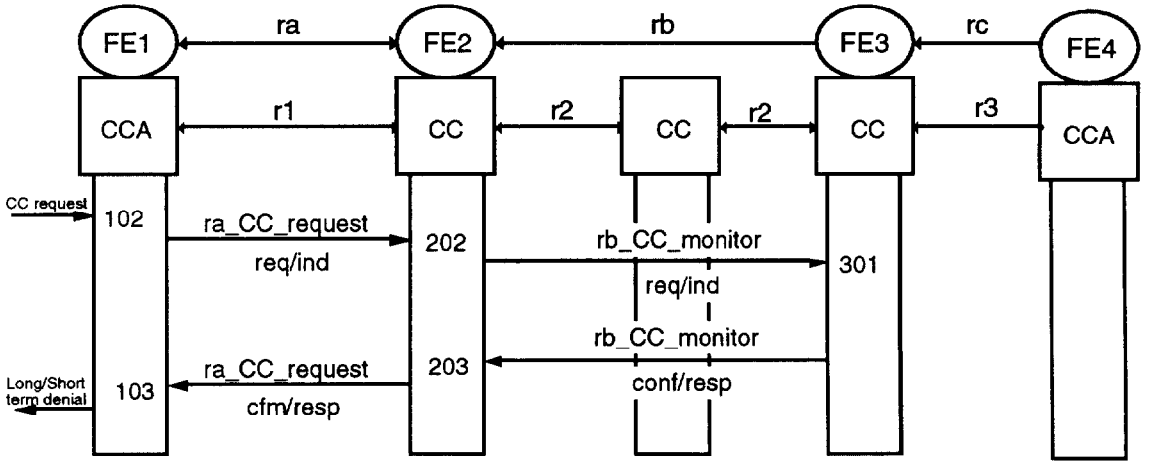


Figure 17 - Remote rejection of SS-CC

8.2.3.13 User A busy when User B becomes not busy (without reservation, request suspended)

Figure 18 shows the information flow sequence where User A is busy when the PISN attempts SS-CC Recall without prior reservation of a network path and the FE2 requests FE3 to suspend the SS-CC request with a view to re-initiating monitoring of User B.

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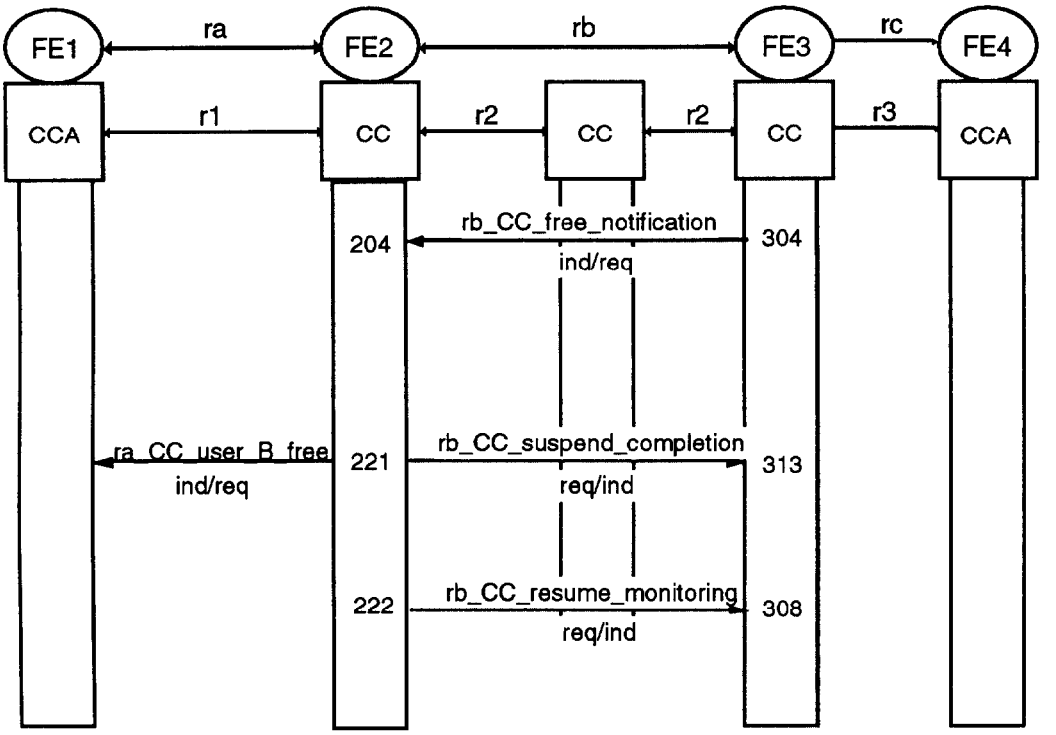


Figure 18 - User A busy on recall (without reservation, request suspended)

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8.2.3.14 User A busy when User B becomes not busy (path reservation successful)

Figure 19 shows the information flow sequence where User A is busy when the PISN attempts SS-CC Recall with prior reservation of a network path.

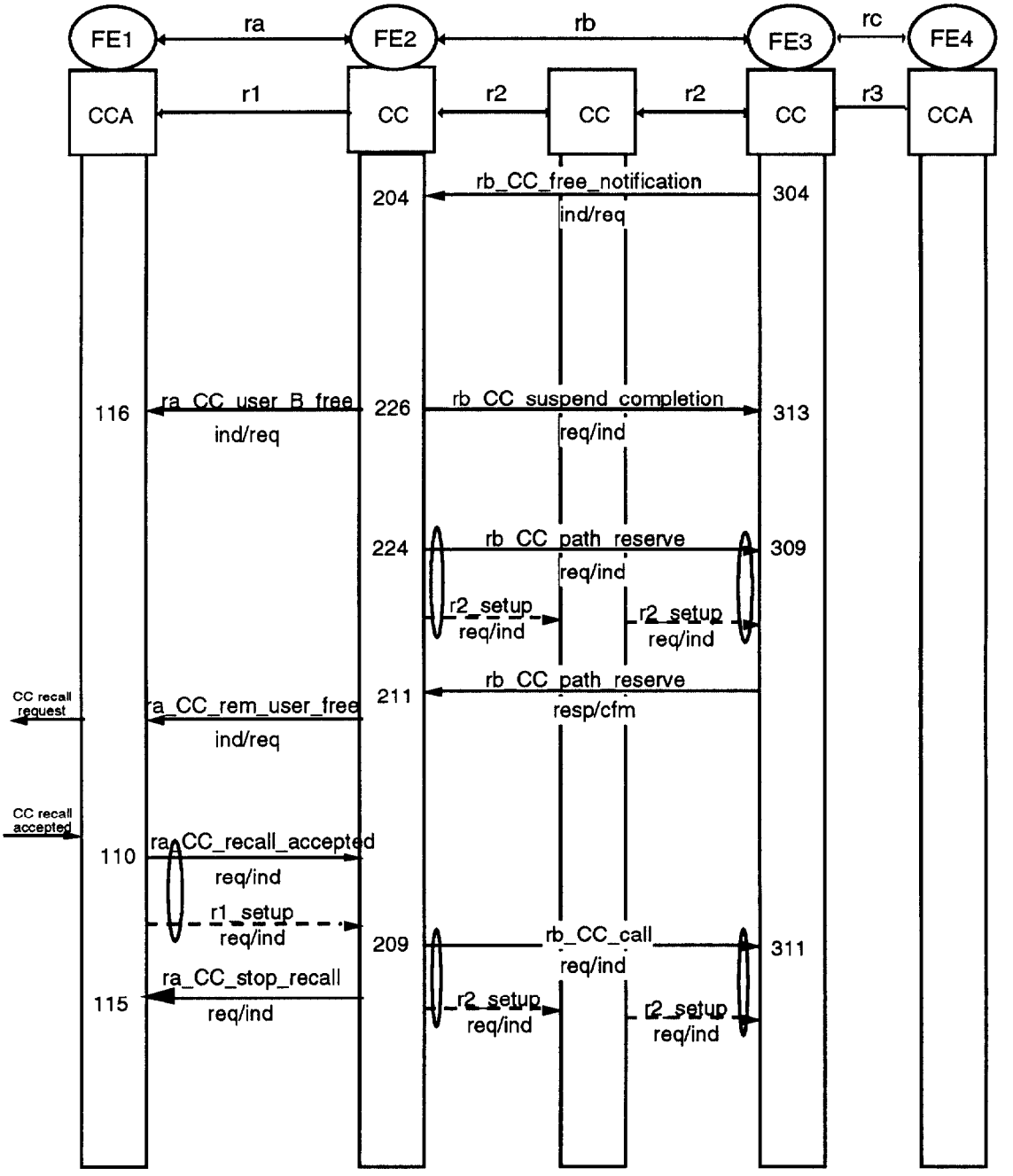


Figure 19 - User A busy on SS-CC Recall (path reservation successful)

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8.2.3.15 User A busy when User B becomes not busy (path reservation attempted, fall back to non-reservation)

Figure 20 shows the information flow sequence where User A is busy when the PISN attempts SS-CC Recall when prior reservation of a network path has failed and fall back to non-reservation occurs.

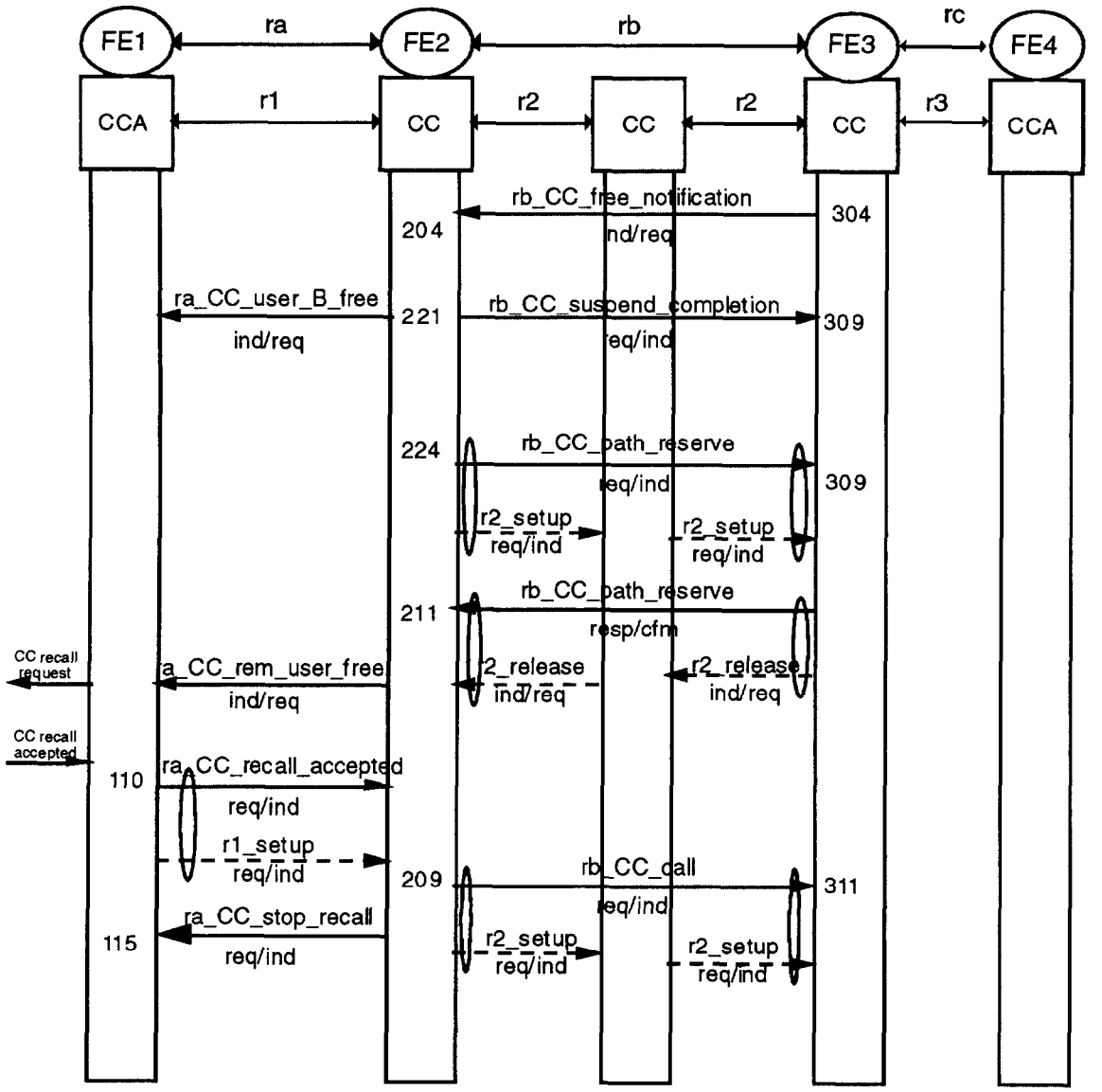


Figure 20 - User A busy on SS-CC Recall (path reservation attempted, fall back to non-reservation)

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8.2.3.16 No response by User A to SS-CC Recall (without reservation)

Figure 21 shows the information flow sequence where User A rejects the SS-CC Recall without prior reservation of a network path.

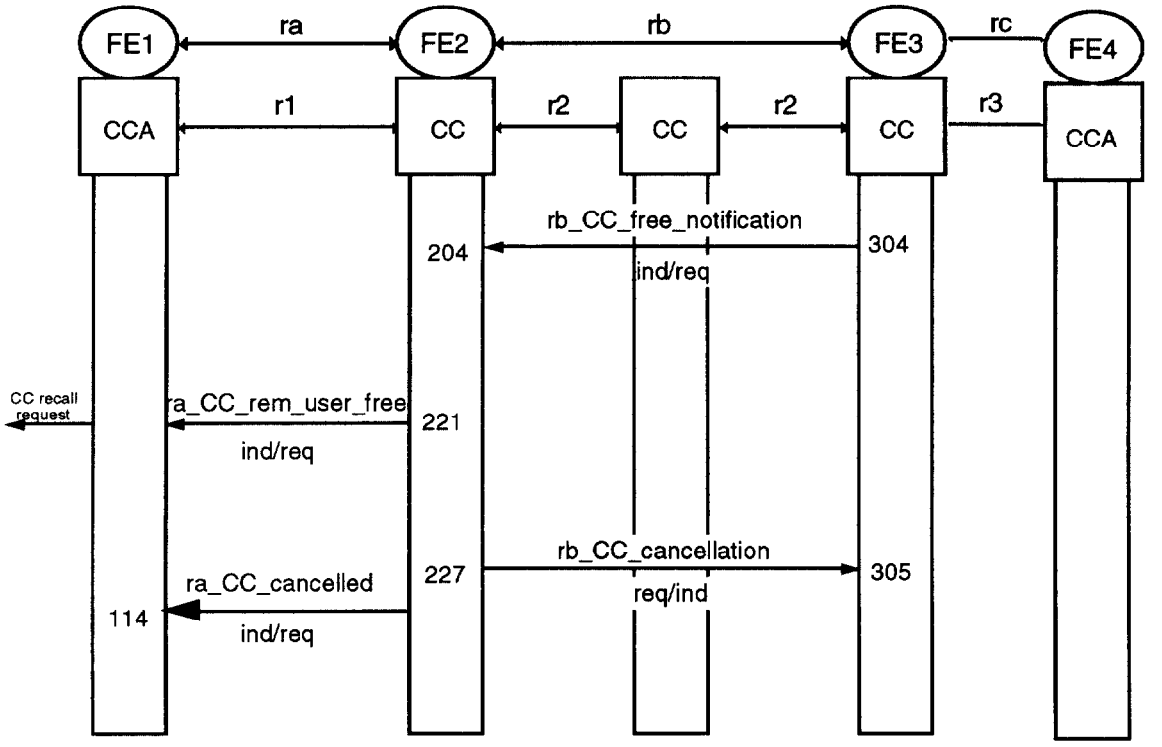


Figure 21 - Rejection of SS-CC Recall by User A (without reservation)

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8.2.3.17 No response by User A to SS-CC Recall (path reservation successful)

Figure 22 shows the information flow sequence where User A rejects the SS-CC Recall with prior reservation of a network path.

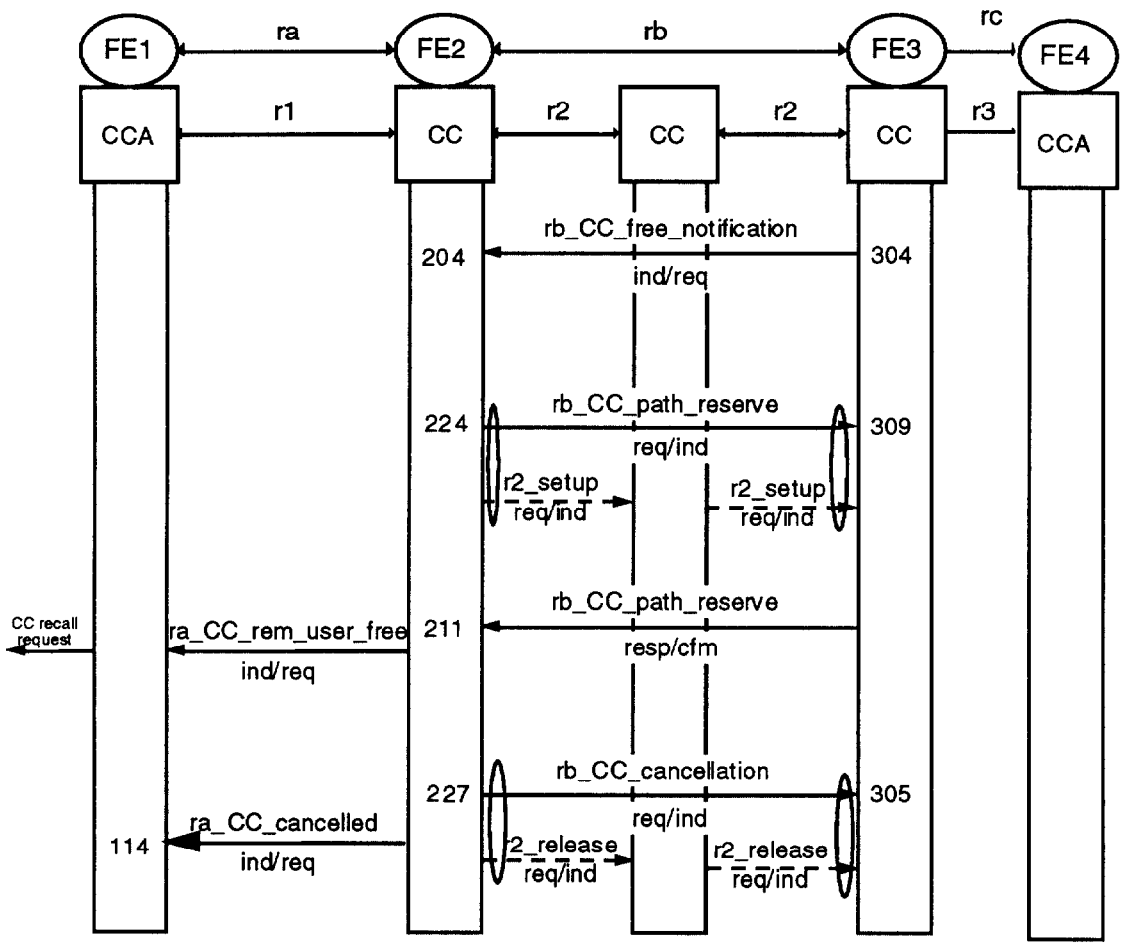


Figure 22 - Rejection of SS-CC recall by User A (path reservation successful)

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8.2.3.18 No response by User A to SS-CC recall (path reservation attempted, fall back to non-reservation)

Figure 23 shows the information flow sequence where User A rejects the SS-CC Recall when prior reservation of a network path has failed and fall back to non-reservation occurs.

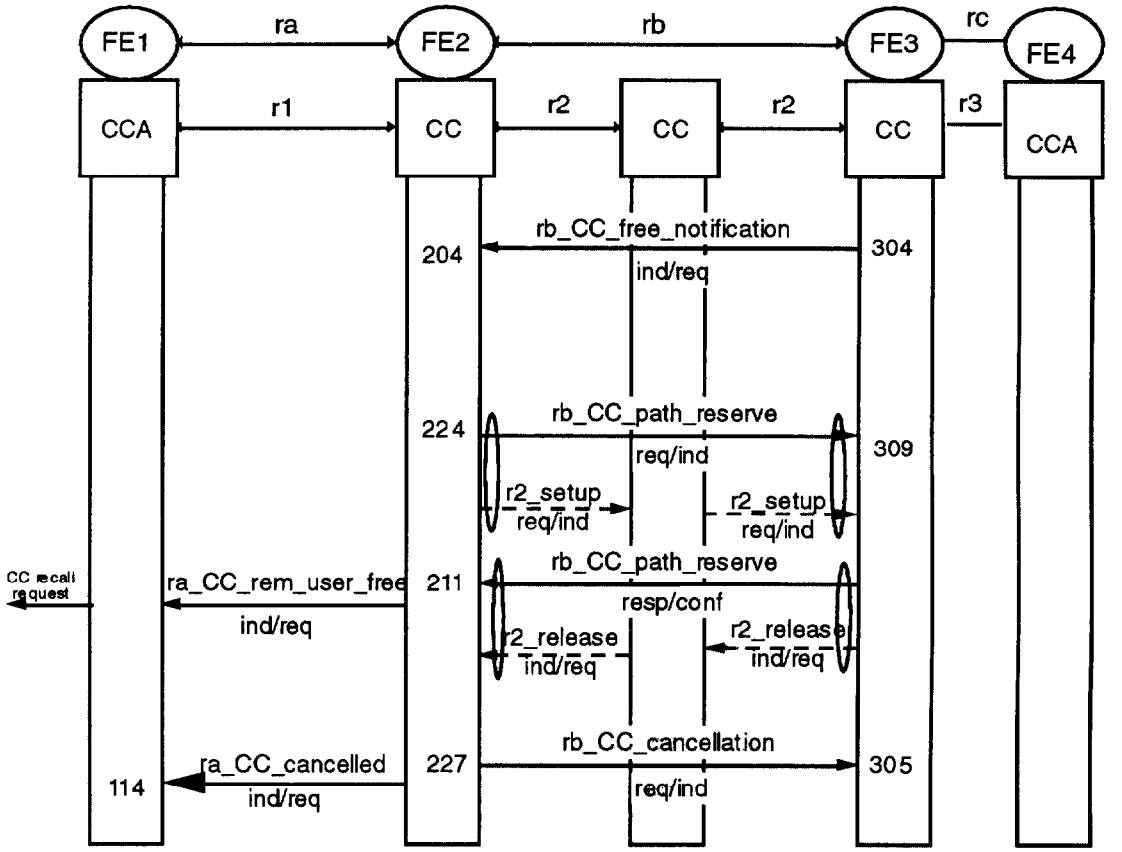


Figure 23 - Rejection of SS-CC recall by User A (path reservation attempted, fall back to non-reservation)

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8.2.3.19 Successful SS-CC recall, User B busy (without reservation)

Figure 24 shows the information flow sequence where User A accepts SS-CC Recall, but User B has become busy by the time the completed call is offered, without prior reservation of a network path.

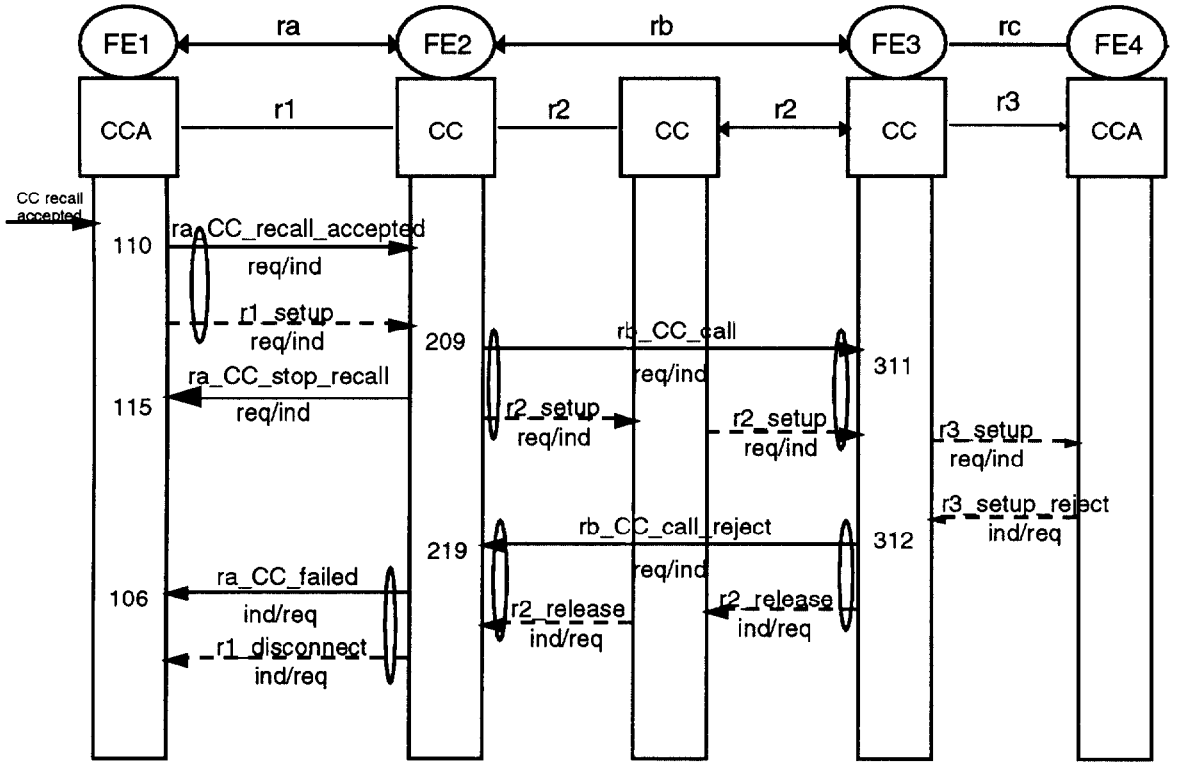


Figure 24 - Successful SS-CC Recall, User B busy (without reservation)

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8.2.3.20 Successful SS-CC recall, User B busy (path reservation successful)

Figure 25 shows the information flow sequence where User A accepts SS-CC Recall, but User B has become busy by the time the completed call is offered, with prior reservation of a network path.

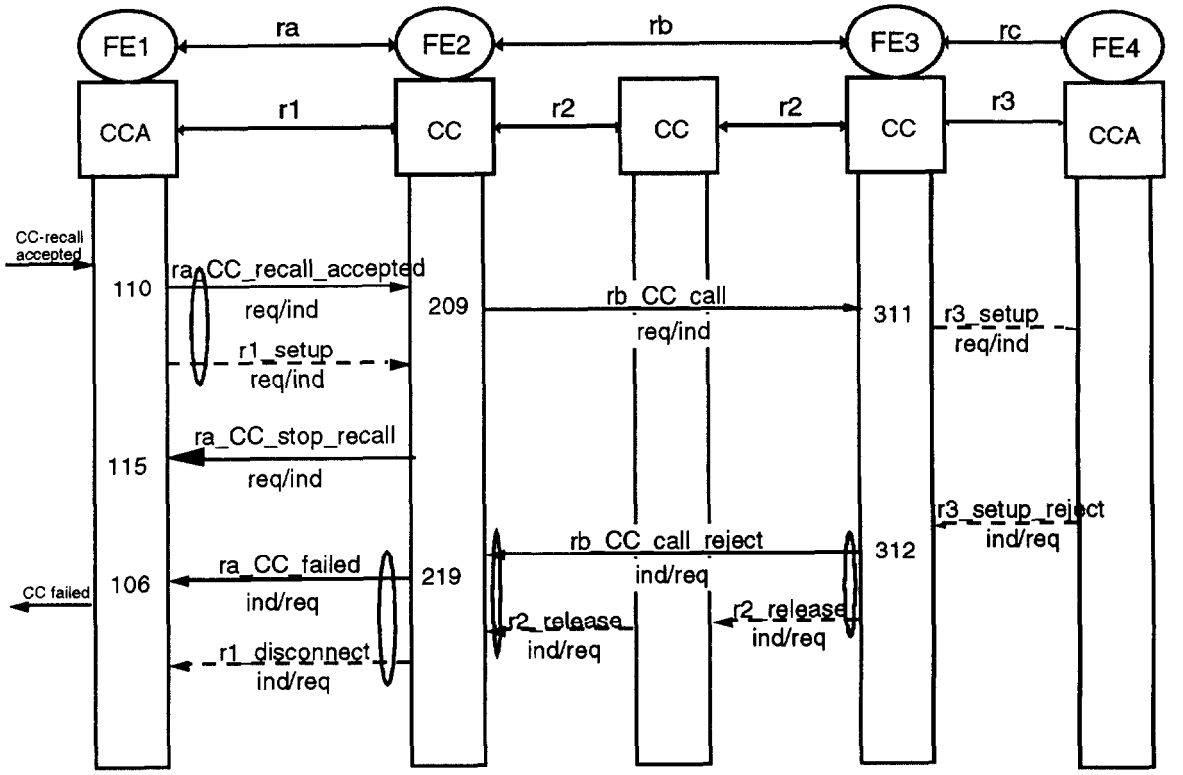


Figure 25 - Successful SS-CC recall, User B busy (path reservation successful)

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8.2.3.21 Successful SS-CC recall, no path to User B (without reservation)

Figure 26 shows the information flow sequence where User A accepts SS-CC Recall, without prior reservation of a network path, but there is no path to User B because of congestion.

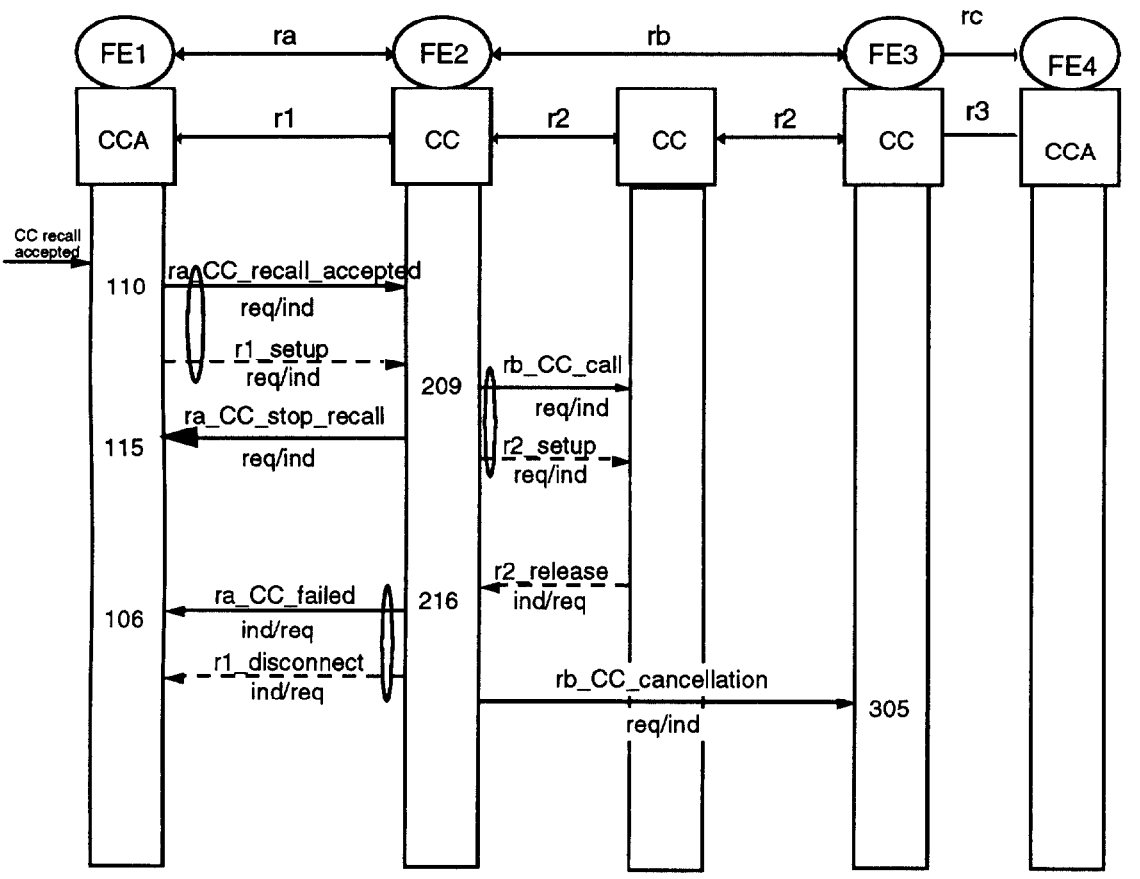
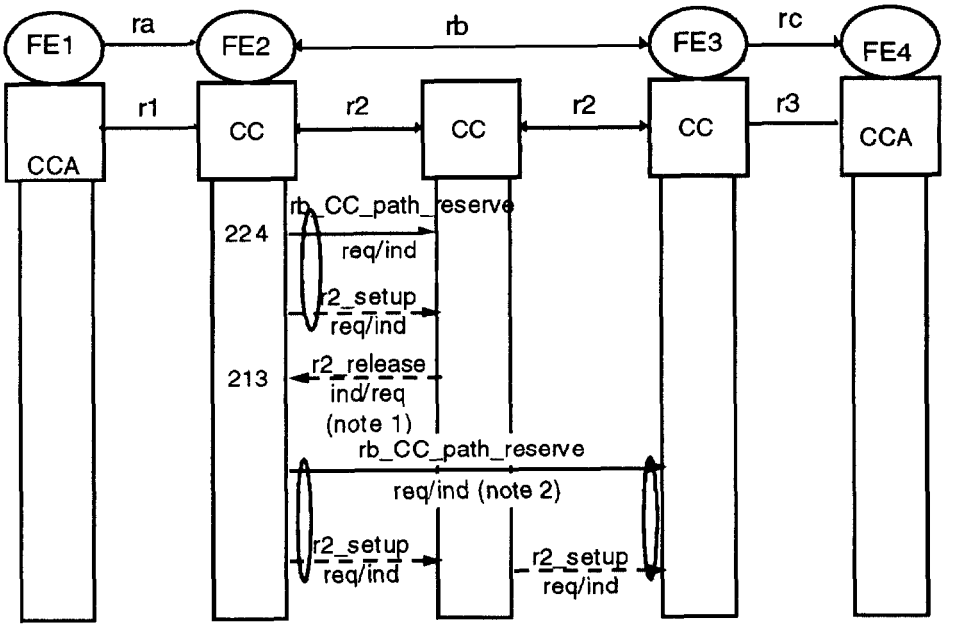


Figure 26 - Successful SS-CC recall, no path to User B (without reservation)

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8.2.3.22 Failure of path reservation due to network congestion

Figure 27 shows the information flow sequence where the attempt to reserve a network path for the call completion fails due to network congestion.



NOTES

1 - This basic call primitive relating to the path reservation attempt is an implicit CC_path_reserve resp/cfm indicating rejection.

2 - Path reservation may be re-attempted by FE2 at some point after the original failure, however a PISN may place a limit on the number of path reservation attempts that will be made.

Figure 27 - Failure of path reservation due to network congestion

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8.2.3.23 Failure of path reservation due to busy User B

Figure 28 shows the information flow sequence where the attempt to reserve a network path for the call completion fails because User B is again busy.

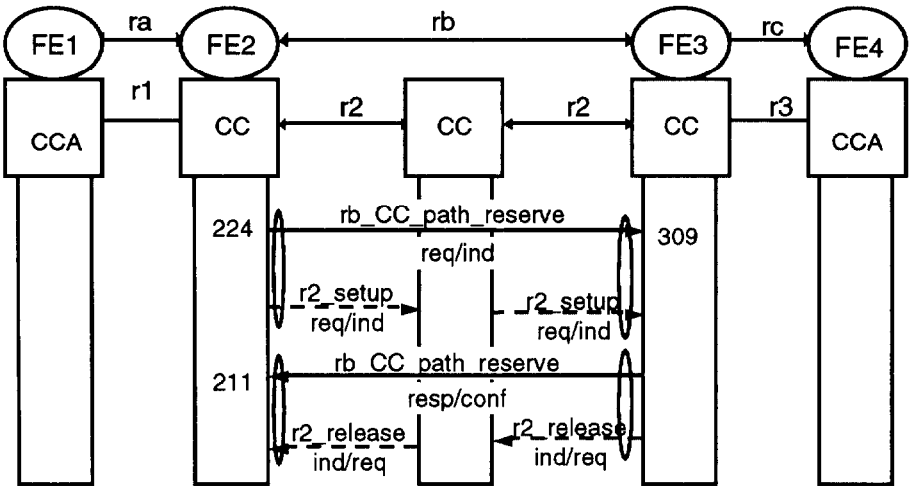


Figure 28 Failure of path reservation due to busy User B

8.3 Functional entity actions

The following actions shall occur at the points indicated in the figures of 8.2. 3

NOTE - In the actions below, whenever the status of Users A or B is required, no details of the procedures to be used are given. It is left up to the capabilities of FE2 and FE3 as to whether this determination is made by means of the status request procedure (see figures 7 and 8) or by some other (e.g. internal) means. In addition, FE2 and FE3 may attempt to determine the status of either User A or User B respectively at any point in the SS-CC service, whether indicated in the following actions explicitly or not. The actions only indicate when the status of these users is specifically required for the correct operation of SS-CC.

8.3.1 Functional entity actions of FE1

101 Store information related to failed or cleared unanswered basic call to enable User A to request SS-CC.

102 Send ra_CC_request req/ind to FE2.

103 Present result of request for SS-CC to User A. If response indicates rejection, discard details of SS-CC.

104 Send ra_CC_cancellation_access req/ind to FE2.

105 Present an indication of the result of the cancellation to User A. If cancellation is successful, discard details of SS-CC.

106 Present indication of failure to User A. If SS-CC has been deregistered, discard details of SS-CC.

107 Send ra_CC_list req/ind to FE2.

108 Present response to User A.

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110 Send ra_CC_recall_accept req/ind to FE2. This shall be accompanied by a basic call r1_setup req/ind toward FE2.

111 Discard details of SS-CC.

112 Send ra_CC_status_req cfm/resp to FE2 indicating whether User A is busy or free.

114 Forward notification of CC failure to User A. Discard details of SS-CC.

115 Stop SS-CC recall if not already accepted.

116 Inform User A that User B is not busy.

8.3.2 Functional entity actions of FE2

201 Store details of failed basic call (with the exception of any originating or Destination subaddress information) .

NOTE - Action 201 could also be initiated by receipt of a busy indication as part of another Supplementary Service, rather than via the release of the basic call.

202 If SS-CC is possible, send rb_CC_monitor req/ind to FE3 to monitor User B.

If SS-CC is not possible, send a ra_CC_request cfm/resp indicating SS-CC rejection to FE1.

203 If the SS-CC request has been accepted, send ra_CC_request cfm/resp to FE1 to indicate SS-CC acceptance, store whether FE3 supports path reservation and start the SS-CC service duration timer relevant to the service requested (SS-CCBS or SS-CCNR).

If the rb_CC_monitor resp/cfm does not indicate acceptance, send ra_CC_request cfm/resp to FE1 to indicate that FE3 did not accept the monitor request and discard details of the SS-CC request.

204 Record the fact that User B is not busy and determine status of User A.

205 Check that the SS-CC request identified in the ra_CC_cancellation_access req/ind is valid.

If valid, send rb_CC_cancellation req/ind to FE3, and ra_CC_cancellation_access resp/cfm to FE1, to acknowledge that cancellation has been successful and discard details of the SS-CC request. Stop the SS-CC service duration timer relevant to the service originally requested (SS-CCBS or SS-CCNR).

If the request is not valid, send ra_CC_cancellation_access resp/cfm to FE1 indicating the reason cancellation could not take place.

206 Send ra_CC_cancelled req/ind to FE1 to indicate the reason for SS-CC cancellation to User A. Discard details of SS-CC. Stop the SS-CC service duration timer relevant to the service originally requested (SS-CCBS or SS-CCNR).

207 In order to cancel SS-CC, send rb_CC_cancellation req/ind to FE3 and send ra_CC_cancelled req/ind to FE1 to inform User A of the failure of SS-CC. Stop the SS-CC service duration timer relevant to the service originally requested (SS-CCBS or SS-CCNR).

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208 If the request is valid, determine the status of the outstanding SS-CC requests and return ra_CC_list resp/cfm to FE1 indicating this status.

If the request is not valid, return ra_CC-list resp/cfm to FE1 indicating the reason for failure.

209 Stop SS-CC recall timer . If recall is to all compatible terminals, send ra_CC-Stop-Recall to FE1. Send rb_CC_call req/ind to FE3. If path reservation has not been requested or has not been successful, this flow shall be accompanied by a basic call r2_setup req/ind towards FE3.

210 Discard details of SS-CC request. Stop the SS-CC service duration timer relevant to the service originally requested (SS-CCBS or SS-CCNR). Send ra_CC cancelled req/ind to FE1.

211 If path reservation has been successful, send ra_CC_rem_user_free req/ind to FE1, start SS-CC recall timer and stop service duration timer.

If path reservation was not successful and FE3 supports the path reservation capability, FE2 shall:

- if FE3 has not de-registered SS-CC and the failure is due to a short term condition (e.g. network congestion), or to User B busy:
  - after an interval, attempt to re-reserve the network path by sending rb_CC_path_reserve req/ind to FE3; or,
  - send rb_CC_cancellation req/ind to FE3, ra_CC_failure req/ind to FE1, discard details of SS-CC and stop SS-CC service duration timer.

- if FE3 has not de-registered SS-CC and the failure is due to a long term condition (e.g. invalid destination), send rb_CC_cancellation req/ind to FE3, send ra_CC_failure req/ind to FE1, discard details of SS-CC and stop SS-CC service duration timer.

- if FE3 has de-registered SS- CC either:
  - attempt to re-register SS-CC by sending rb_CC_monitor req/ind to FE3; or,
  - send ra_CC_failed req/ind to FE1, discard details of SS-CC and stop SS-CC service duration timer.

If path reservation was not successful and FE3 does not support the path reservation capability, send ra_CC_rem_user_free req/ind to FE1.

213 If the failure is due to a short term condition (e.g. network congestion) either:

- after an interval, attempt to re-reserve the network path by sending rb_CC_path_reserve req/ind to FE3; or,
- send rb_CC_cancellation req/ind to FE3, send ra_CC_cancelled req/ind to FE1, discard details of SS-CC and stop SS-CC service duration timer.

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If the failure is due to a long term condition (e.g. invalid destination), send rb_CC_cancellation req/ind to FE3, send ra_CC_cancelled req/ind to FE1, discard details of SS-CC and stop SS-CC service duration timer.

214 In order to check the status of User A, send a ra_CC_status_req req/ind to FE1

215 Determine status of User A.

216 Send ra_CC_failed req/ind to FE1 to indicate that the SS-CC recall has failed and service not retained. Send rb_CC-cancellation req/ind to FE3. Discard details of SS-CC.

217 Send ra_CC_user_B_free and monitor User A's status to determine when User A becomes free.

219 Send ra_CC_failed req/ind to FE1 to indicate that the SS-CC recall has failed and whether the service has been cancelled or is continuing.

If automatic re-registration of SS-CC is supported and SS-CC has been de-registered, send rb_CC_monitor req/ind to FE3 to re-register SS-CC (not shown).

If automatic re-registration of SS-CC is not supported:

- if SS-CC has not been de- registered, send rb_CC_cancellation req/ind to FE3 (not shown).; and,
- discard details of SS-CC.

220 Store details of cleared call (with the exception of any originating or Destination subaddress information) .

221 Determine the status of User A.

- If User A is free:
  - start SS-CC Recall timer; and
  - send ra_CC_rem_user_free req/ind to FE1.
- If User A is busy:
  - send ra_CC_user_B_free req/ind to FE1;
  - send rb_CC_suspend_completion to FE3; and
  - monitor for a call being cleared to User A.

222 Determine status of User A.

- If User A is free, send rb_CC_resume_monitoring req/ind to FE3.
- If User A is busy, monitor for a call being cleared to User A.

224 On determining that User A is not busy, send rb_CC_path_reserve req/ind to FE3 in conjunction with basic call setup req/ind.

225 Send ra_CC_request conf/resp to FE1 to indicate that FE3 did not accept the monitor request and discard details of the SS-CC request.

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226 Determine status of User A. If User A is busy, send ra_CC_User_B_free req/ind to FE1, Optionally send rb_CC-suspend_completion to FE3, and monitor for a call being alerted by User A.

227 On expiry of the SS-CC recall timer, send rb_CC_cancellation req/ind to FE3, send ra_CC_cancelled to FE1 and discard details of SS-CC. If a path reservation has been reserved, send r2.release req/ind with the rb_CC-cancellation req/ind.

8.3.3 Functional entity actions of FE3

301 If SS-CC is possible:

- if the request was for SS-CCBS, store request against User B, and:
  - if User B is free, return rb_CC_monitor resp/cfm to FE2 indicating acceptance of the SS-CC request followed by rb_CC_free_notification to FE2 to indicate that User B is now free; or
  - if User B is busy, return rb_CC_monitor resp/cfm to FE2 indicating acceptance of the SS-CC request and continue to monitor User B's status to determine when User B becomes free.
- if the request was for SS-CCNR, return rb_CC_monitor resp/cfm to FE2 indicating acceptance of the request.

  If SS-CC is not possible, return rb_CC_monitor resp/cfm to FE2 indicating the reason for rejection.

302 In order to determine the status of User B, send a rc_CC_status_req req/ind to FE4.

303 Determine status of User B.

304 Send rb_CC_free_notification req/ind to FE2 to indicate that User B is free.

305 De-register SS-CC on User B and discard details of SS-CC request.

306 In order to cancel SS-CC, send rb_CC_cancellation req/ind to FE2 and de-register SS-CC on User B.

307 Mark the related SS-CC request as temporarily suspended and await a further request for path reservation from FE2.

308 Resume monitoring of User B's status to determine when User B becomes free.

309 If path reservation is supported by FE3 and User B is free, send rb_CC_path_reserve resp/cfm indicating success of path reservation to FE2

If path reservation is supported by FE3 and if User B is busy, send rb_CC_path_reserve resp/cfm indicating that reservation has failed, accompanied by a basic call flow to release the reserved path.

If path reservation is not supported by FE3, send rb_CC_path_reserve resp/cfm indicating that reservation is not supported, accompanied by a basic call flow to release the reserved path.

311 Offer completed call to User B by means of the basic call.

312 If the basic call to User B is accepted and FE3 is informed that User B has reached the Alerting state, discard details of the SS-CC request.

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If the basic call to User B is not accepted by User B, send rb_CC_call_reject req/ind to FE2 (accompanied by a basic call reject indication) indicating the reason for failure of SS-CC and whether the SS-CC registration has been maintained.

313 Mark the related SS-CC attempt on User B as suspended and await notification from FE2 to resume monitoring of User B.

8.3.4 Functional entity actions of FE4

401 Respond to rc_CC_status_req req/ind by sending rc_CC_status_req cfm/resp to FE3 indicating whether User B is busy or free.

8.4 Functional entity Behaviour

The FE Behaviours shown 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.

8.4.1 Behaviour of FE1

Figure 29 shows the normal Behaviour of FE1. Input signals from the left and output signals to the left represent primitives from and to User A. Input signals from the right and output signals to the right represent information flows to and from FE2 and internal stimuli. Only FE1 behaviour for the subscription option value "SS_CC_recall offered to the terminal which has invoked SS-CC" is shown.

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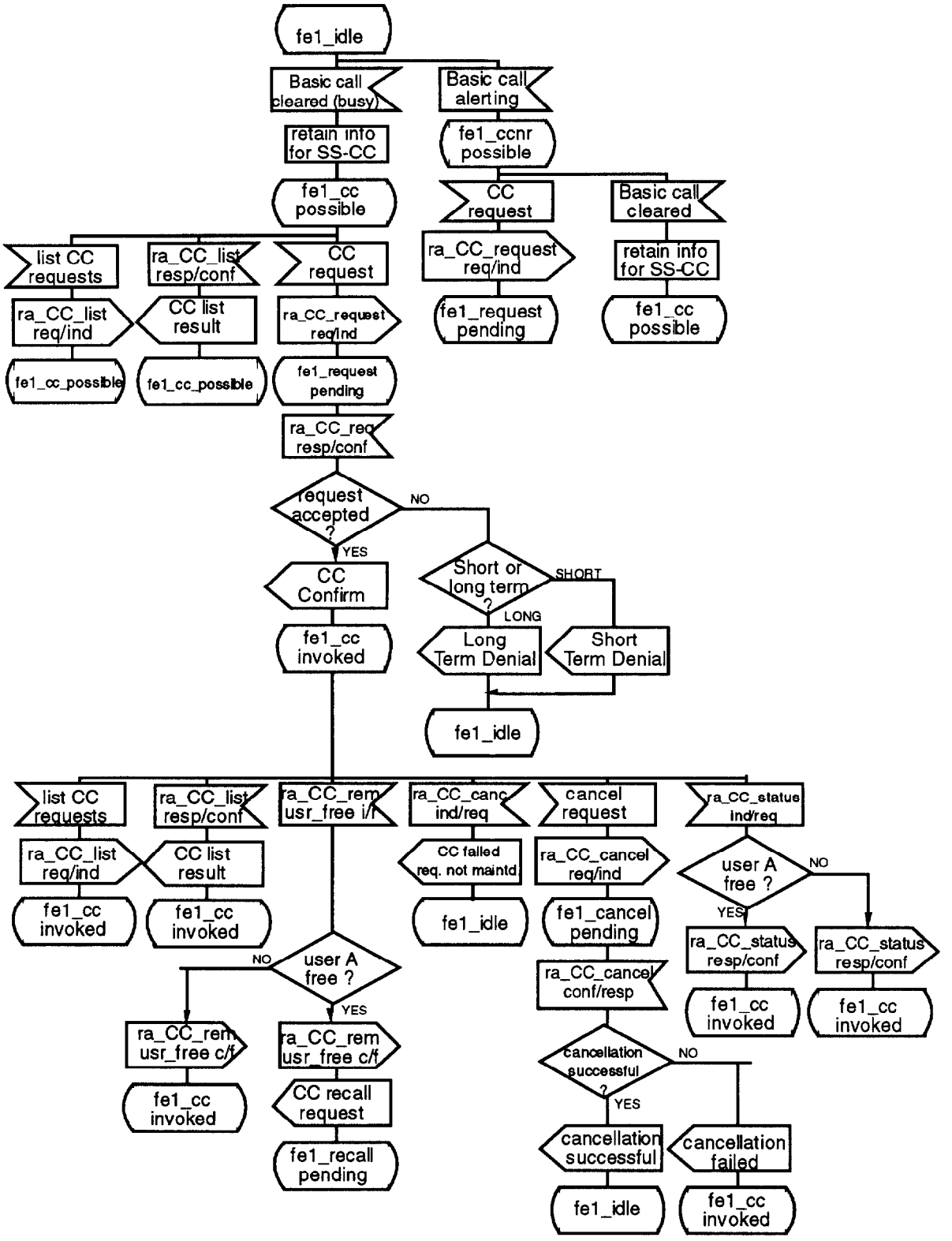


Figure 29 - (sheet 1 of 2). Behaviour of FE1

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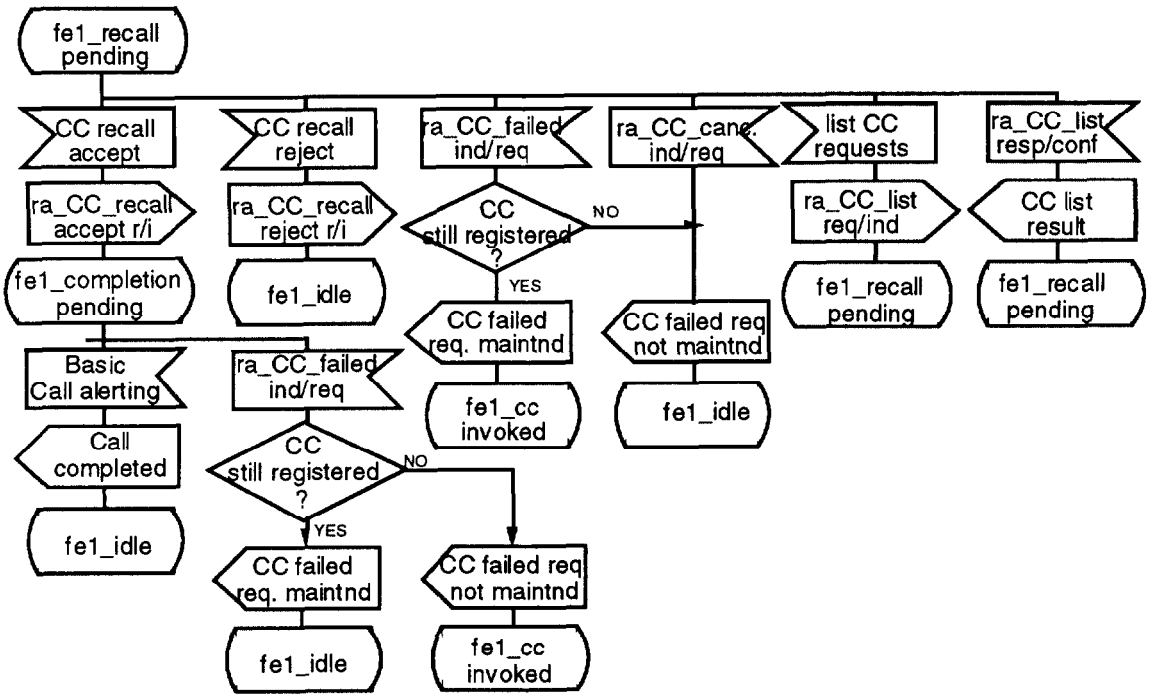


Figure 29 - (sheet 2 of 2). Behaviour of FE1

8.4.2 Behaviour of FE2

Figure 30 shows the normal Behaviour of FE2. Input signals from the right and output signals to the right represent information flows from and to FE3 and internal stimuli. Input signals from the left and output signals to the left represent information flows to and from FE1.

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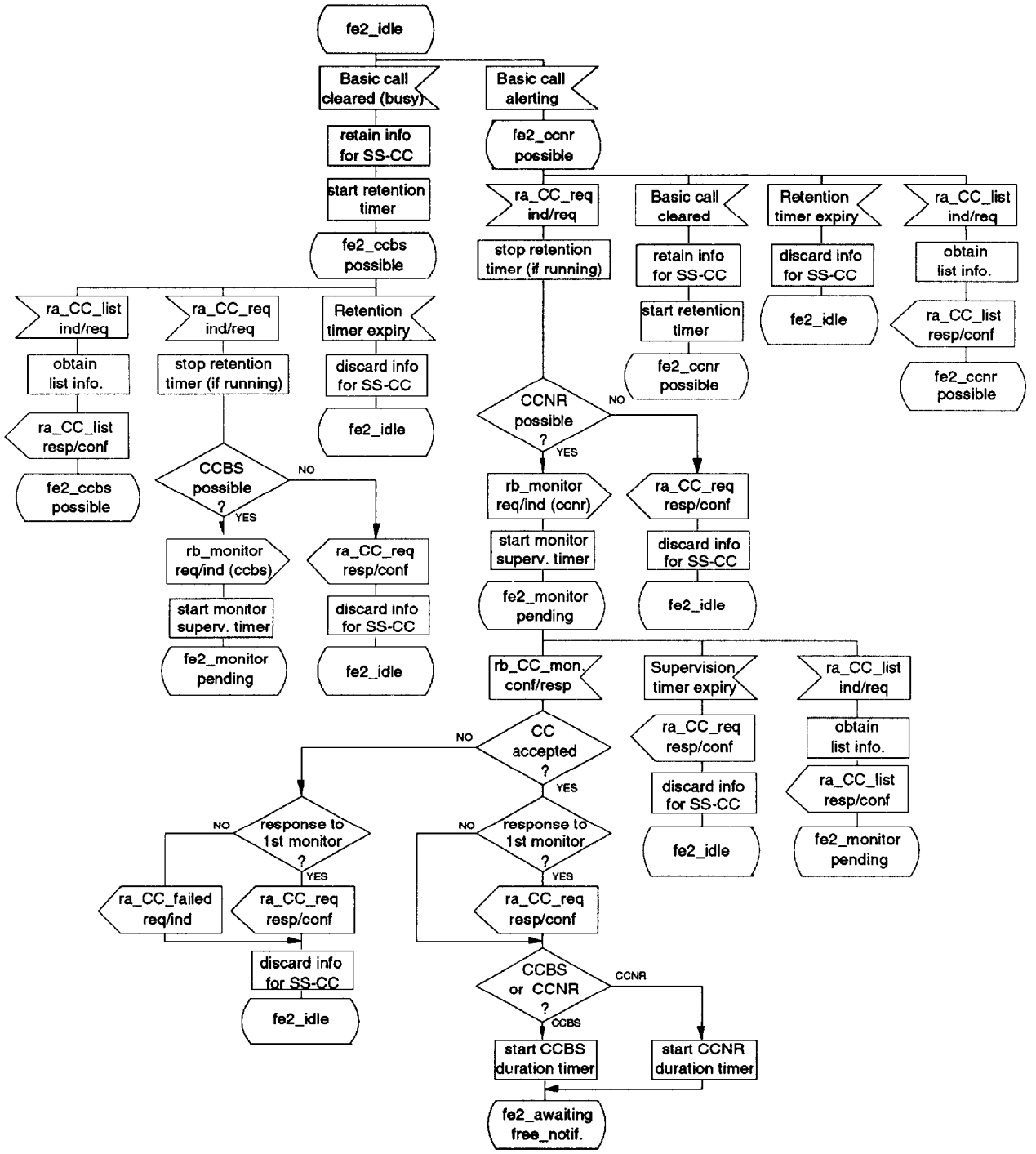


Figure 30 - (sheet 1 of 4): Behaviour of FE2

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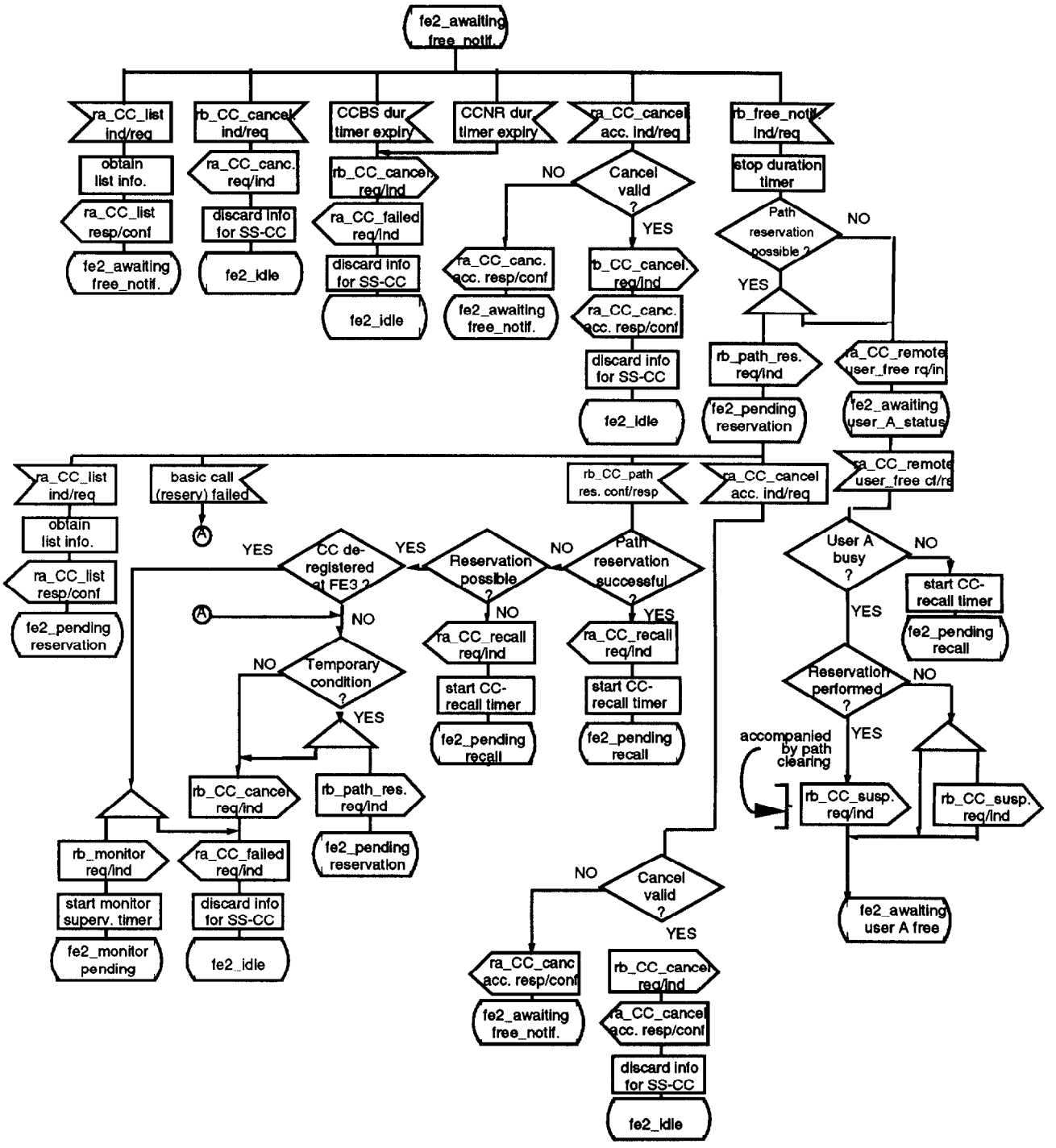


Figure 30 - (sheet 2 of 4): Behaviour of FE2

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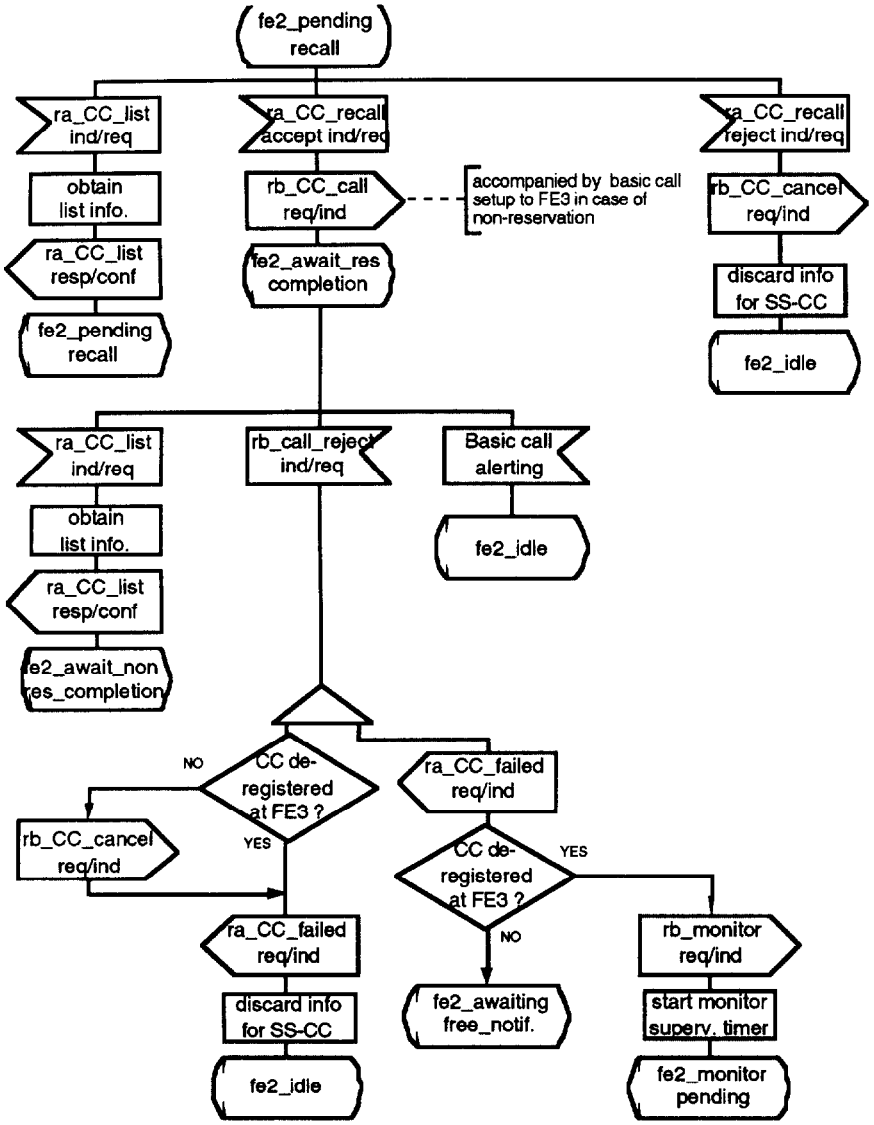


Figure 30 - (sheet 3 of 4): Behaviour of FE2

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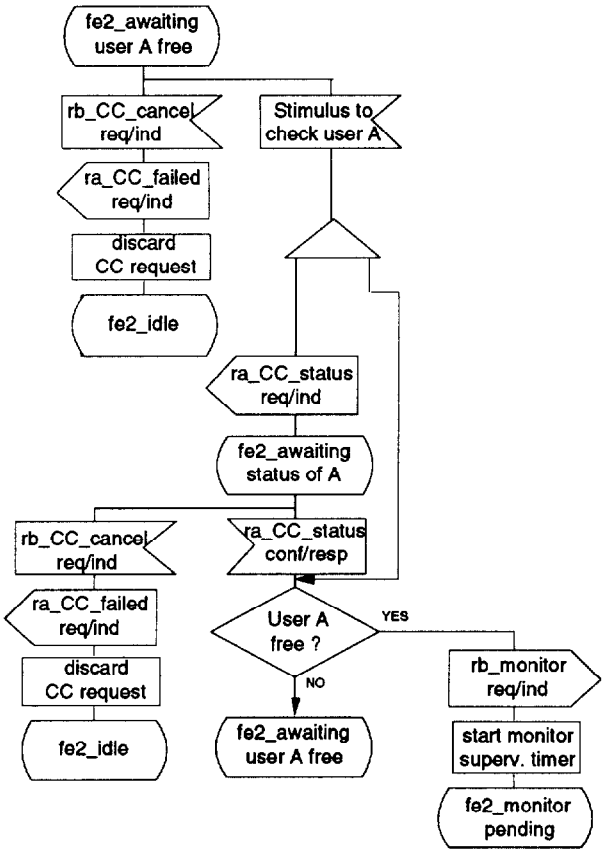


Figure 30 - (sheet 4 of 4): Behaviour of FE2

8.4.3 Behaviour of FE3

Figure 31 shows the normal Behaviour of FE3. Input signals from the right and output signals to the right represent information flows from and to FE4 and internal stimuli. Input signals from the left and output signals to the left represent information flows to and from FE2.

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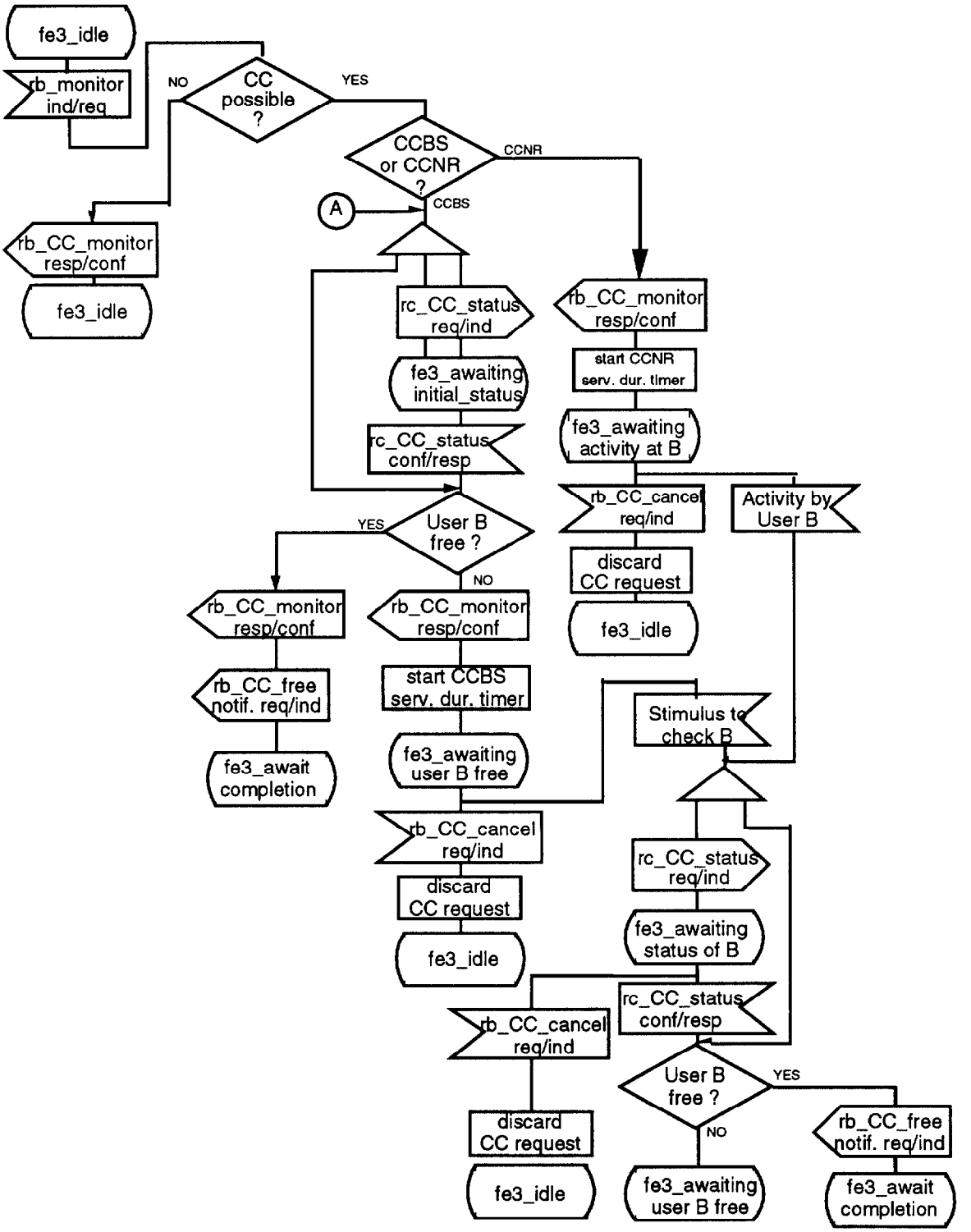


Figure 31 - (sheet 1 of 3): Behaviour of FE3

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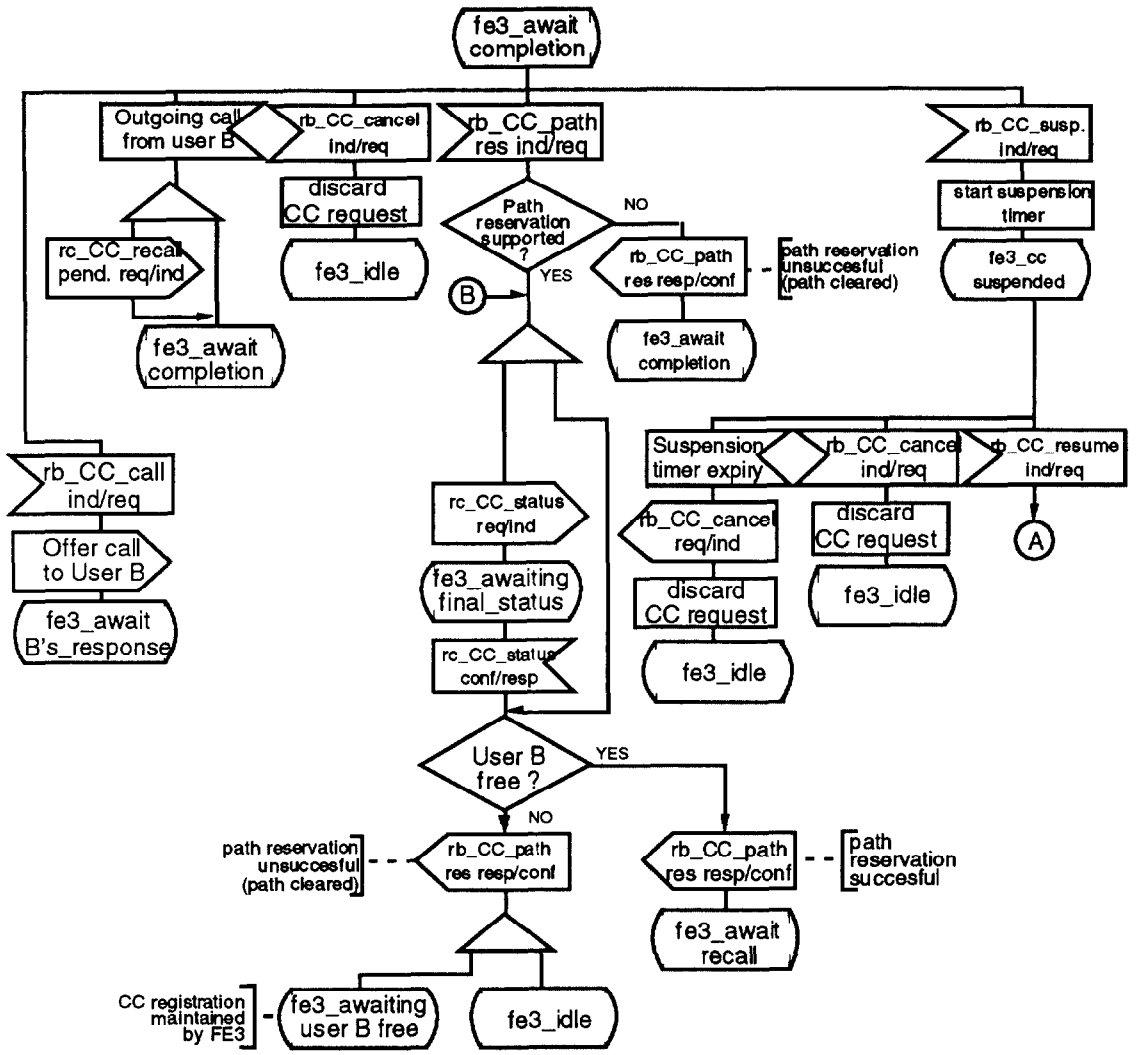


Figure 31 - (sheet 2 of 3): Behaviour of FE3

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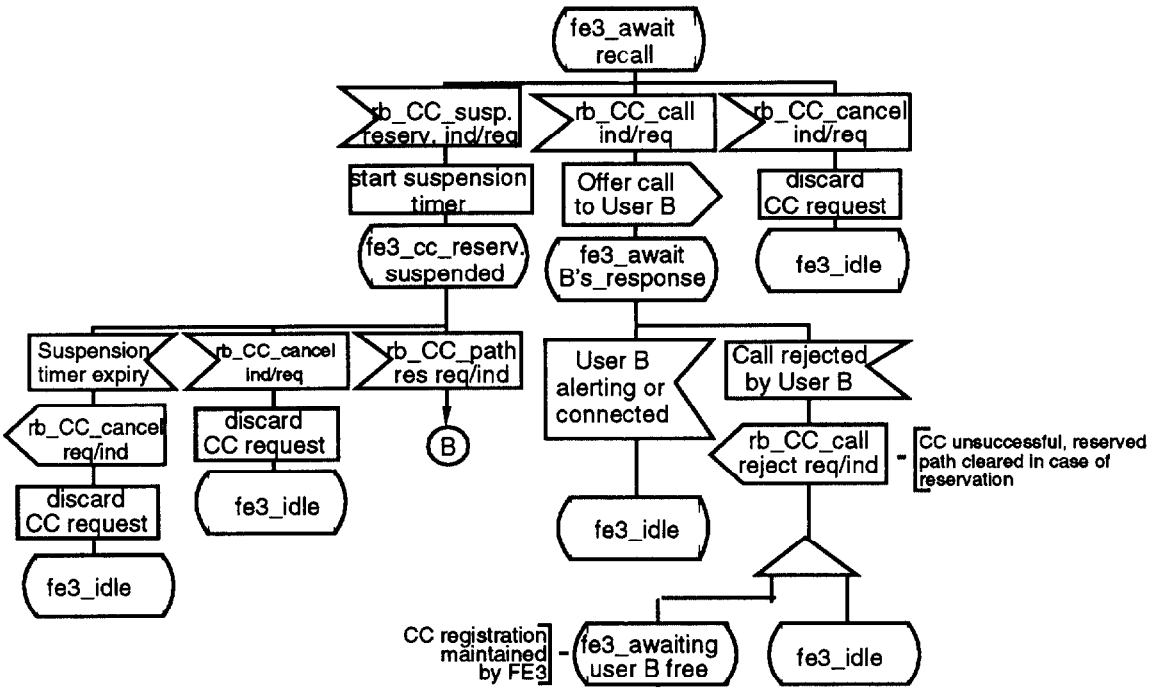


Figure 31 - (sheet 3 of 3): Behaviour of FE3

8.4.4 Behaviour of FE4

Figure 32 shows the normal Behaviour of FE4. Input signals from the left and output signals to the left represent information flows from and to FE3. Input signals from the right and output signals to the right represent primitives to and from User B.

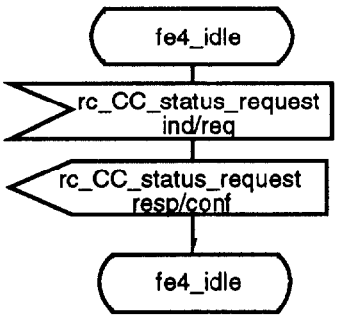


Figure 32 - Behaviour of FE4

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8.5 Allocation of functional entities to physical locations

The allocations of FEs to physical equipment shown in table 17 shall apply.

Table 17 - Scenarios for the allocation of FEs to physical equipment

Scenarios		Functional Entities			
		User A		User B	
		FE1	FE2	FE3	FE4
1	Users A and B in PISN	TE	PINX	PINX	TE
2	User A in PISN, User B in other network	TE	PINX	Other network	Other network
3	User B in PISN and user A in other network	Other network	Other network	PINX	TE
4	Users A and B in other network	Other network	Other network	Other network	Other network

Table 17 illustrates the various scenarios possible, excluding the cases of stimulus terminals. Where a terminal involved is stimulus with respect to SS-CC, any FE shown as residing in the corresponding user's TE shall reside instead in that user's PINX.

8.6 Interworking considerations

When interworking with a public ISDN, the SS-CC service will always fall back to the non-path reservation mode due to the capabilities of the public ISDN service. The gateway PINX shall ensure that the acknowledgment of the SS-CC monitor request generated from a received monitor confirmation from the public ISDN is forwarded to the requestor of SS-CC indicating "reservation not supported" in the case that monitoring of a Public ISDN user is requested. When the PISN is monitoring a PISN user on behalf of a Public ISDN user, the service will always use the non-path reservation mode requested by the Public ISDN.

When interworking with a non-standard network which supports only path reservation, the gateway PINX shall ensure that the acknowledgment of the SS-CC monitor request generated from a received monitor confirmation from the non-standard network is forwarded to the requestor of SS-CC indicating "reservation supported" in the case that monitoring of a user in that other network is requested. If the PISN uses the non-path reservation subsequent to this request, the gateway PINX will be responsible for performing the reservation in the other network when the CC_call request/indication flow is received from FE2.

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Annex A

(informative)

Bibliography

ITU-T Rec I.253.3 (to be published in 1996), Completion of Calls to Busy Subscribers

ITU-T Rec I.253.4(to be published in 1996), Completion of Calls on No Reply

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