EUROPEAN
TELECOMMUNICATION
STANDARD

ETS 300 365

July 1994

Source: ETSI TC-ECMA

Reference: DE/ECMA-00007

ICS: 33.080

Key words: PTN, ECMA-185, CCSD

Private Telecommunication Network (PTN);
Specification, functional model and information flows
Call completion supplementary services

ETSI

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Table of contents

Foreword

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

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

This ETS specifies the Call Completion to Busy Subscriber and Call Completion on No Reply Supplementary Services.

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

The services specified are compatible with the equivalent services specified by ETSI for public ISDNs. The references for the ETSI specifications of the Completion of Calls to Busy Subscriber Supplementary Service are contained in the Bibliography (Annex B) of this ETS. ETSI currently does not define the Call Completion on No Reply Supplementary Service (SS-CCNR).

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

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1 Scope

This European Telecommunication Standard (ETS) specifies Supplementary Services Call Completion (SS-CC), which are applicable to various basic services supported by Private Telecommunication Networks (PTN). Basic services are specified in ETS 300 171.

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 enables a calling User A, encountering a busy destination User B, to have the call completed when User B becomes not busy, without having to make a new call attempt. SS-CCNR enables a calling User A, encountering a destination User B that, though alerted, does not answer, to have the call completed when User B becomes not busy again after a period of activity, without having to make a new call attempt.

Service specifications are produced in three stages, according to the method described in ENV 41005. This ETS 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 PTNs. 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 ETS, a Stage 3 Standard shall specify signalling protocols and equipment behaviour that are capable of being used in a PTN which supports the supplementary services specified in this ETS. This means that, to claim conformance, a Stage 3 Standard is required to be adequate for the support of those aspects of Clauses 6 and 7 (stage 1) and Clause 8 (stage 2) which are relevant to the interface or equipment to which the Stage 3 Standard applies.

The stage 1 and stage 2 clauses which a stage 3 standard for the Call Completion of Calls to Busy Subscriber supplementary service is required to support are Clauses 6 and 8 respectively.

The stage 1 and stage 2 clauses which a stage 3 standard for the Call Completion of Calls on No Reply supplementary service is required to support are Clauses 7 and 8 respectively.

3 References

ETS 300 171:	Private Telecommunication Network (PTN); Specification, functional models and information flows; Control aspects of circuit mode basic services (1992)
CCITT Recommendation I.112:	Vocabulary of terms for ISDNs (1988)
CCITT Recommendation I.210:	Principles of telecommunications services supported by an ISDN and the means to describe them (1988)
CCITT Recommendation I.221:	Common specific characteristics of services (1988)
CCITT Recommendation Z.100:	Specification and description language (SDL) (1988)
ENV 41005:	Method for the specification of basic and supplementary services of private telecommunication networks (1989)
ENV 41007-1:	Definition of terms in private telecommunication networks (1989)

4   Definitions

For the purposes of this ETS the following definitions shall apply.

4.1   External definitions

This ETS uses the following terms defined in other documents:

Basic Service	(CCITT Recommendation I.210)
Connection	(ENV 41007-1)
Network determined user busy	(CCITT Recommendation I.221)
Private	(ENV 41007-1)
Private Telecommunication Network Exchange (PTNX)	(ENV 41007-1)
Public	(ENV 41007-1)
Public ISDN	(ENV 41007-1)
Service	(CCITT Recommendation I.112)
Signalling	(CCITT Recommendation I.112)
Supplementary Service	(CCITT Recommendation I.210)
Telecommunication Network	(ENV 41007-1)
Terminal, Terminal Equipment	(ENV 41007-1)
User	(ETS 300 171)
User determined user busy	(CCITT Recommendation I.221)

This ETS refers to the following basic call functional entity (FEs) defined in ETS 300 171:

-        Call Control (CC)

-        Call Control Agent (CCA)

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

-        r1

-        r2

-        r3

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

-        r1_setup request/indication/response/confirmation

-        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

-        r3_disconnect request/indication

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

- Connection Type (CT)

- Destination Number (DN)

- Originating Subaddress (OS)

- Destination Subaddress (DS)

4.2 Additional Network Feature

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

4.3 Busy

A property of a User for whom either a Network determined user busy or User determined user busy condition exists.

4.4 Call, Basic call

An instance of the use of a basic service.

4.5 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.

4.6 Originating Number

Element Originating Number is as defined in Standard ETS 300 171 with the exception that Screening indicator does not apply.

4.7 Path reservation

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

Note 1

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

4.8 Service retention

The capability to continue with a SS-CC request after the call resulting from acceptance of a SS-CC recall fails due to User B being busy again.

4.9 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 PTN.

4.10 User A

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

4.11 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)

CCI   CC Identifier

CR   Cancellation Reason

DN   Destination Number

FC   Failure Cause

FE   Functional Entity

FEA   Functional Entity Action

ISDN   Integrated Services Digital Network

NDUB   Network Determined User Busy

NPR   No Path Reservation

PTN   Private Telecommunication Network

PTNX   Private Telecommunication Network Exchange

RC   Reject Cause

RL   Request List

RM   Request Maintained

SDL   Specification and Description Language

SI   Status Indicator

SR   Service Retention

SS-CC   Supplementary Service Call Completion

NOTE 2

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

SS-CCBS   Supplementary Service Call Completion to Busy Subscriber

SS-CCNR   Supplementary Service Call Completion 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 Call to Busy Subscriber (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 PTN monitors User B and notifies User A when User B becomes not busy. On response by User A to that notification, the PTN will attempt to complete the call to User B.

6.1.2 Qualifications on Applicability to Telecommunication Services

SS-CCBS is applicable to all circuit-mode basic services defined in ETS 300 171.

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 PTN shall be an implementation matter. A PTN may offer more or less parameters and values than those specified below.

Possible subscription options are summarised in Table 1.

Table 1 - SS-CCBS Subscription parameters

Subscription option	Values:
Recall mode	- SS-CC Recall offered to all compatible terminals (Note 3) - SS-CC Recall offered to the terminal which has invoked SS-CCBS

Note 3

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 and Interrogation

SS-CCBS is permanently activated. No information needs to be registered with the PTN 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 PTN shall retain the call information provided by User A, as described in subclause 9.2.1 of ETS 300 171, 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 PTN shall check whether it is possible to initiate the service, and if so shall send an acknowledgement to User A, start monitoring User B and start the SS-CCBS Service Duration Timer. The acknowledgement means that User A can expect to receive a SS-CC Recall if User B becomes not busy within the period of the SS-CCBS Service Duration Timer.

Note 4

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.

Note 5

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.

Note 6

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 PTN 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 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 not busy, and if User A is also not busy, the PTN shall provide SS-CC Recall, and start the SS-CC Recall timer. The value of this timer shall not exceed 30 seconds. Optionally, path reservation may be employed before providing SS-CC recall.

If User A accepts the SS-CC Recall, the PTN shall attempt to complete the call between User A and User B. In the case of SS-CC recall offered to all compatible terminals, the PTN shall instruct other terminals to stop SS-CC recall. 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 PTN 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 cancellable. If the Recall mode is "SS-CC Recall offered to the terminal which has invoked 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 and 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 PTN 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 subclause 6.2.3.2.6).

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

- SS-CCBS not provided to User A;

- interworking with a network which does not support SS-CCBS; or

- SS-CCBS not allowed against User B (Note 7).

Note 7

This is an implementation option that can apply to certain classes of user.

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 not busy, the PTN shall wait for both Users to become not busy before providing SS-CC Recall and starting the SS-CC Recall timer. The PTN shall notify User A that the PTN is attempting to complete a call. If a path has been reserved, the path shall be released until User A has become not busy. As an option, the PTN may allow a short time for User A to become not busy before releasing the reserved path.

Note 8

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 PTN, network congestion can delay the SS-CC Recall, which shall not occur until a path has been reserved and both Users are not busy. A PTN may cancel SS-CC and inform User A if unable to reserve a path.

If the PTN 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 SS-CCBS shall be cancelled.

6.2.3.2.4 **User B becomes busy after successful SS-CC recall**

If User B is busy when User A accepts the SS-CC Recall, the PTN shall either:

- abandon SS-CCBS indicating the reason for the failure to User A and that the SS-CCBS request has been cancelled. In such a case the PTN may allow User A, as an implementation option, the possibility of re-invoking SS-CCBS if call completion to User B is still required; or,

Note 9

The method used in the PTN to allow User A to re-invoke SS-CCBS is outside the scope of this ETS.

- resume monitoring of User B, indicating the reason for the failure to User A and that the SS-CCBS request has been maintained (service retention). 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.

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 PTN shall wait for User B to become not busy before re-attempting path reservation.

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 PTN to either:

- reject the request as a duplicate request; or,

- accept the request as valid.

Note 10

In the case that the PTN 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 PTN.

6.2.3.2.7   Other Failure Situations

A particular request for the service shall be automatically cancelled by the PTN, 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; or

- for any reason, the PTN 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 PTN Standards were available at the time of publication of this ETS are specified below.

6.3.1   Calling Line Identification Presentation (SS-CLIP)

No interaction.

6.3.2   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.

6.3.3   Connected Line Identification Presentation (SS-COLP)

No interaction.

6.3.4   Calling Name Identification Presentation (SS-CNIP)

No interaction.

6.3.5   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.

6.3.6   Connected Name Identification Presentation (SS-CONP)

No interaction.

6.3.7 Call Forwarding Unconditional (SS-CFU)

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.

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 cancelled.

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.

6.3.8 Call Forwarding Busy (SS-CFB)

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.

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.

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

6.3.9 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 11

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.

6.3.10 Call Transfer (SS-CT)

No interaction.

6.3.11 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 subclause 6.2.3.2.6.

Note 12

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 not busy 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 PTN.

6.3.12 Path Replacement (ANF-PR)

No interaction.

6.4 Interworking considerations

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

A PTN shall permit a PTN User A to request SS-CCBS on public Integrated Services Digital Network (ISDN) User B. A PTN shall permit a User A served by a public ISDN to request SS-CCBS on a PTN User B.

Note 13

This assumes peer cooperation between the public and private ISDN in provision of the SS-CCBS service. See Annex A for further information.

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 Recommendation Z.100 (1988). 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.

Figure 1 (sheet 1 of 4) - SS-CCBS, Overall SDL

Service ccbsstg1   Page_2 (4)

awaiting not busy
User B

| service duration timer expiry | User B not busy | internal failure of SS-CC |

service duration timer expiry → SS-CC cancelled → cancel SS-CC request → idle

User B not busy → User A not busy?

No → User B not busy notification → awaiting not busy User A

Yes → (down)

internal failure of SS-CC → SS-CC cancelled → stop service duration timer → cancel SS-CC request → idle

Path Reservation Possible

User A not busy

service duration timer expiry

No / Yes

Path Reservation Possible?

Yes / Yes / No

User B still not busy?

Yes / No

SS-CC cancelled → cancel SS-CC request → idle

SS-CC recall request → start timer CC-Recall → pending recall

initiate Path Reservation → pending path reservation

awaiting not busy User B

SS-CC recall request → start timer CC-Recall → pending recall

Figure 1 (sheet 2 of 4) - SS-CCBS, Overall SDL

Service ccbsstg1   Page_3 (4)

pending
path reservation

| User B busy | service duration timer expiry | reservation successful |

clear reserved path

awaiting not busy User B

SS-CC cancelled

User A not busy?

Yes

No

cancel SS-CC request

User B not busy notification

SS-CC recall request

idle

start timer CC-recall

start Reservation protect timer

clear retained path

pending recall

path reserve User A busy

awaiting not busy User A

| Reservation protect timer expiry | User A not busy |

clear retained path

stop Reservation protect timer

SS-CC recall request

awaiting not busy User A

start timer CC-recall

pending recall

Figure 1 (sheet 3 of 4) - SS-CCBS, Overall SDL

Service ccbsstg1   Page_4 (4)

pending
recall

SS-CC recall
accept

expiry timer
CC-recall

complete call
to User B

cancel SS-CC
request

call completion
pending

idle

Network
congestion

call
completed

User B
busy

cancel SS-CC
request

stop service
duration timer

stop service
duration timer

call
completed
(Note 14)

cancel SS-CC
request

re-register
SS-CC request

SS-CC
cancelled

idle

stop service
duration timer

SS-CC failed
request
maintained

idle

SS-CC failed
request not
maintained

awaiting not busy
User B

idle

Figure 1 (sheet 4 of 4) - SS-CCBS, Overall SDL

Note 14

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

7 SS-CCNR stage 1 description

7.1 Description

7.1.1 General description

Completion of Call 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 PTN monitors User B and notifies User A when User B becomes not busy after a subsequent period of activity. On response by User A to that notification, the PTN will attempt to complete the call to User B.

Note 15

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

7.1.2 Qualifications on applicability to telecommunication services

SS-CCNR is applicable to all circuit-mode basic services defined in ETS 300 171.

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 PTN shall be an implementation matter. A PTN 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 invoked 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 or is terminated by User A because the destination User, User B, does not answer, the PTN shall retain the call information provided by User A, as described in subclause 9.2.1 of ETS 300 171, 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 PTN shall check whether it is possible to initiate the service, and if so shall send an acknowledgement to User A, start monitoring User B and start the SS-CCNR Service Duration Timer. The acknowledgement means that User A can expect to receive a SS-CC Recall if User B becomes not busy, after a subsequent period of activity, within the period of the SS-CCNR Service Duration Timer.

Note 16

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.

Note 17

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.

Note 18

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

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

A PTN 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-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 not busy after a period of activity (related to the same basic service as the original call to User B), and if User A is also not busy, the PTN shall provide SS-CC Recall, and start the SS-CC Recall timer. Optionally, path reservation may be employed before providing SS-CC recall.

If User A accepts the SS-CC Recall, the PTN shall attempt to complete the call between User A and User B. In the case of successful SS-CC recall offered to all compatible terminals, the PTN shall instruct other terminals to stop SS-CC recall. 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/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 not busy after a period of activity, the PTN shall wait for both Users to become not busy before providing SS-CC Recall and starting the SS-CC Recall timer. The PTN shall notify User A that the PTN is attempting to complete a call. If a path has been reserved, the path shall be released until User A has become not busy. As an option, the PTN may allow a short time for User A to become not busy before releasing the reserved path.

Note 19

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 when User A accepts the SS-CC Recall, the PTN shall either:

- 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.

7.2.3.2.5 User B becomes busy during path reservation

Subclause 6.2.3.2.5 shall apply.

7.2.3.2.6 Duplicate SS-CCNR requests

Subclause 6.2.3.2.6 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 PTN, 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 PTN is unable to continue with the CCNR invocation.

7.2.3.3   Cancellation

Subclause 6.2.3.3 shall apply.

7.3   Interaction with other Supplementary Services

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

7.3.1   Calling Line Identification Presentation (SS-CLIP)

No interaction.

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

If User A requests override of the SS-CLIR default value for a call, and the call fails to be answered, 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.

7.3.3   Connected Line Identification Presentation (SS-COLP)

No interaction.

7.3.4   Calling Name Identification Presentation (SS-CNIP)

No interaction.

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

If User A requests override of the SS-CNIR default value for a call, and the call fails to e answered, 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.

7.3.6   Connected Name Identification Presentation (SS-CONP)

No interaction.

7.3.7   Call Forwarding Unconditional (SS-CFU)

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.

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.

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.

7.3.8 **Call Forwarding Busy (SS-CFB)**

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.

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.

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

7.3.9 **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.

7.3.10 **Call Transfer (SS-CT)**

No interaction.

7.3.11 **Completion of Calls to Busy Subscribers (SS-CCBS)**

Subclause 6.3.11 shall apply.

7.3.12 **Path Replacement (ANF-PR)**

No interaction.

7.4 **Interworking considerations**

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

A PTN shall permit a PTN User A to request SS-CCNR on public ISDN User B. A PTN shall permit a User A served by the Public ISDN to request SS-CCNR on a PTN User B.

Note 20

This assumes peer cooperation between the public and private ISDN in provision of SS-CCNR. As no definition of SS-CCNR is available for public ISDNs, it is unlikely that any interworking of SS-CCNR to public ISDN users will be possible. See Annex A for further information.

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 Recommendation Z.100 (1988). 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.

Service ccnrstg1   Page_1 (1)

idle

CCNR
request

CCNR
available?   No

Yes

start service
duration timer   Short or
                                   Long Term?   Short

CCNR
confirmation   Long term   Short term
                  denial   denial

Long

awaiting activity
at User B   idle

internal failure   activity   service duration
of SS-CC   at user B   timer expiry

stop service   awaiting not busy   SS-CC
duration timer   User B   cancelled

SS-CC   cancel SS-CC
cancelled   request

cancel SS-CC   idle
request

idle

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

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.
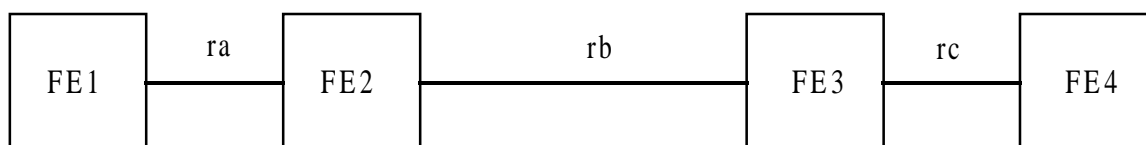
Figure 3 - Functional model for SS-CC

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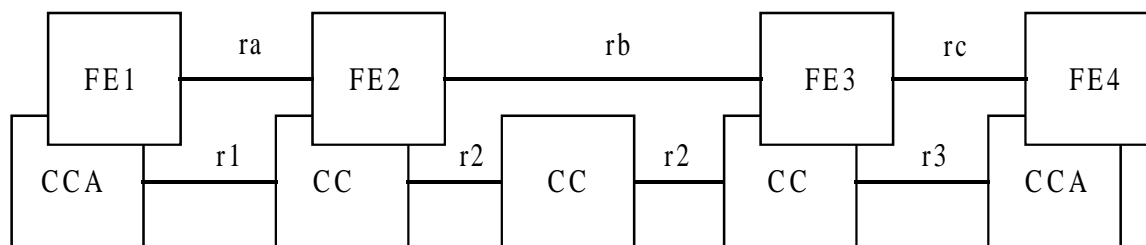
Figure 4 - Example Relationship between model for SS-CC and Basic Call

8.2 Information Flows

8.2.1 Definition of information flows

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

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 elements within the ra_CC_cancellation_access information flow.

Table 3 - Information content of ra_CC_cancellation_access

Element	Request	Confirm
CC Identifier (CCI)	M	-
Reject Cause (RC)	-	O (Note 21)

Note 21

This element shall be included when the cancellation of SS-CC cannot be performed and shall indicate the reason for failure e.g. SS-CC request does not 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 elements within the ra_CC_cancelled information flow.

Table 4 - Information content of ra_CC_cancelled

Element	Request
CC Identifier (CCI)	M
Cancellation Reason (CR)	M
Connection Type (CT)	O (Note 22)
Originating Number (ON)	O (Note 23)
Originating Subaddress (OS)	O

Note 22

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

Note 23

This element shall be included where there is more than one PTN 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 elements within the ra_CC_failed information flow.

Table 5 - Information content of ra_CC_failed

Element	Request
Failure Cause (FC)	M (Note 24)
Request Maintained (RM)	O (Note 25)

Note 24

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

-    *User B busy again, or*

-    *Network Congestion.*

Note 25

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

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 elements within the ra_CC_list information flow.

Table 6 - Information content of ra_CC_list

Element	Request	Confirm
CC Identifier (CCI)	O (Note 26)	-
Originating Number (ON)	O (Note 27)	-
Reject Cause (RC)	-	O (Note 28)
Request List (RL)	-	O (Note 29)

Note 26

In the case of recall offered to a terminal that invoked SS-CC, all CC identifiers known by FE1 shall be included. In the case of recall offered to all compatible terminals it shall be omitted.

Note 27

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

Note 28

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

Note 29

This element shall be included if the ra_CC_list confirm/response indicates success and shall include a list of PTN addresses 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_accept

ra_CC_recall_accept 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 elements within the ra_CC_recall_accept information flow.

Table 7 - Information content of ra_CC_recall_accept

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 now not busy and instructing FE1 to recall User A.

Table 8 lists the elements within the ra_CC_rem_user_free information flow.

Table 8 - Information content of ra_CC_rem_user_free

Element	Request
CC Identifier (CCI)	M
Destination Number (DN)	M
Connection Type (CT)	O (Note 30)
Originating Number (ON)	O (Note 31)
Originating Subaddress (OS)	O
Destination Subaddress (DS)	O

Note 30

This element shall be included when SS-CC Recall is offered to all compatible terminals, otherwise it shall be omitted.

Note 31

This element shall be included where there is more than one PTN 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 elements within the ra_CC_request information flow.

Table 9 - Information content of ra_CC_request

Element	Request	Confirm
CC Identifier (CCI)	-	M
Recall Mode (RM)	-	M
Reject Cause (RC)	-	O (Note 32)

Note 32

This 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

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 not busy.

Table 10 lists the elements within the ra_CC_status_req information flow.

Table 10 - Information content of ra_CC_status_req

Element	Request	Confirm
CC Identifier (CCI)	O (Note 33)	-
Connection Type (CT)	O (Note 34)	-
Originating Number (ON)	O (Note 34, 35)	-
Originating Subaddress (OS)	O (Note 34)	-
Status Indicator (SI)	-	M (Note 36)

Note 33

This element shall be sent in the case of recall offered to a terminal that invoked SS-CC.

Note 34

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

Note 35

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

Note 36

This element shall indicate either:

- *busy, or*

- *not busy.*

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 elements within the ra_CC_stop_recall information flow.

Table 11 - Information content of ra_CC_stop_recall

Element	Request
CC identifier (CCI)	M

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 not busy.

Table 12 lists the elements within the ra_CC_user_B_free information flow.

Table 12 - Information content of ra_CC_user_B_free

Element	Request
CC Identifier (CCI)	M
Destination Number (DN)	M
Connection Type (CT)	O (Note 37)
Originating Number (ON)	O (Note 38)
Originating Subaddress (OS)	O
Destination Subaddress (DS)	O

Note 37

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

Note 38

This element shall be included where there is more than one PTN 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.

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 elements within the rb_CC_call_reject information flow.

Table 13 - Information content of rb_CC_call_reject

Element	Request
Reject Cause (RC)	M (Note 39)

Note 39

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

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 not busy.

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 PTN 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 elements within the rb_CC_monitor information flow.

Table 14 - Information content of rb_CC_monitor

Element	Request	Confirm
Connection Type (CT)	M	-
Monitor Type (MT)	M (Note 40)	-
Originating Number (ON)	M	-
Destination Number (DN)	M	-
Service Retention (SR)	O (Note 41)	O (Note 42)
No Path Reservation (NPR)	-	O (Note 43)
Reject Cause (RC)	-	O (Note 44)
Originating Subaddress (OS)	O	-
Destination Subaddress (DS)	O	-

Note 40

This element shall indicate either:

- *Monitor for not busy User B, or*

- *Monitor for not busy User B after period of activity.*

Note 41

This element shall be included if FE2 supports service retention.

Note 42

This element shall be included if the rb_CC_monitor request received by FE3 contained the SR element and FE3 also supports service retention. Otherwise the element shall be omitted.

Note 43

This element shall be included in the case of interworking with a network that does not support path reservation. Otherwise it shall be omitted.

Note 44

This 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.*

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 (path reservation). The response indicates whether or not the reservation was successful.

Table 15 lists the elements within the rb_CC_path_reserve information flow.

Table 15 - Information content of rb_CC_path_reserve

Element	Request	Confirm
Reject Cause (RC)	-	O (Note 45)

Note 45
This element shall be included if FE3 rejects the rb_CC_path_reserve request. Possible causes 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.

There are no service elements in this information flow.

8.2.1.19 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 not busy.

Table 16 lists the elements within the rc_CC_status_req information flow.

Table 16 - Information content of rc_CC_status_req

Element	Request	Confirm
Connection Type (CT)	M	-
Destination Number (DN)	O (Note 46)	-
Destination Subaddress (DS)	O	-
Status Indicator (SI)	-	M (Note 47)

Note 46

This element shall be included where there is more than one PTN number associated with User B's access.

Note 47

This element shall indicate either:

- *busy, or*
- *not busy.*

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 ra_CC_failed request/indication information flow shall be sent across ra in conjunction with the basic call r1_disconnect request/indication in the case of failure of the SS-CC call.

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.

The rb_CC_cancellation request/indication information flow shall be sent across rb in conjunction with the basic call r2_release request/indication when User A does not respond to 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_completion request/indication information flow shall be sent across rb in conjunction with the basic call information flow r2_release request/indication used to clear down the network path in the case that User A is busy 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.

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

Table 17 - Relationship of SS-CC information flows to basic call

Information flow		Independent of basic call flow ?	With basic call flow ?	Basic call flows:
ra_CC_cancellation_access	request	yes	-	
	confirm	yes	-	
ra_CC_cancelled	request	yes	yes	r1_report req/ind r1_setup resp/conf
ra_CC_failed	request	-	yes	r1_disconnect req.
ra_CC_list	request	yes	-	
	confirm	yes	-	
ra_CC_recall_accept	request	-	yes	r1_setup_req/ind
ra_CC_rem_user_free	request	yes	-	
ra_CC_request	request	yes	-	
	confirm	yes	-	
ra_CC_status_req	request	yes	-	
	confirm	yes	-	
ra_CC_stop_recall	request	yes	-	
ra_CC_user_B_free	request	yes	-	
rb_CC_call	request	-	yes	r2_setup_req/ind
rb_CC_call_reject	request	-	yes	r2_release req/ind
rb_CC_cancellation	request	yes	yes	r2_release req/ind
rb_CC_free_notification	request	yes	-	
rb_CC_monitor	request	yes	-	
	confirm	yes	-	
rb_CC_path_reserve	request	-	yes	r2_setup req/ind
	confirm	yes	yes	r2_release req.
rb_CC_resume_completion	request	yes	-	
rb_CC_suspend_completion	request	yes	yes	r2_release req.
rc_CC_status_req	request	yes	-	
	confirm	yes	-	

8.2.3   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 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 listed in subclause 8.3.

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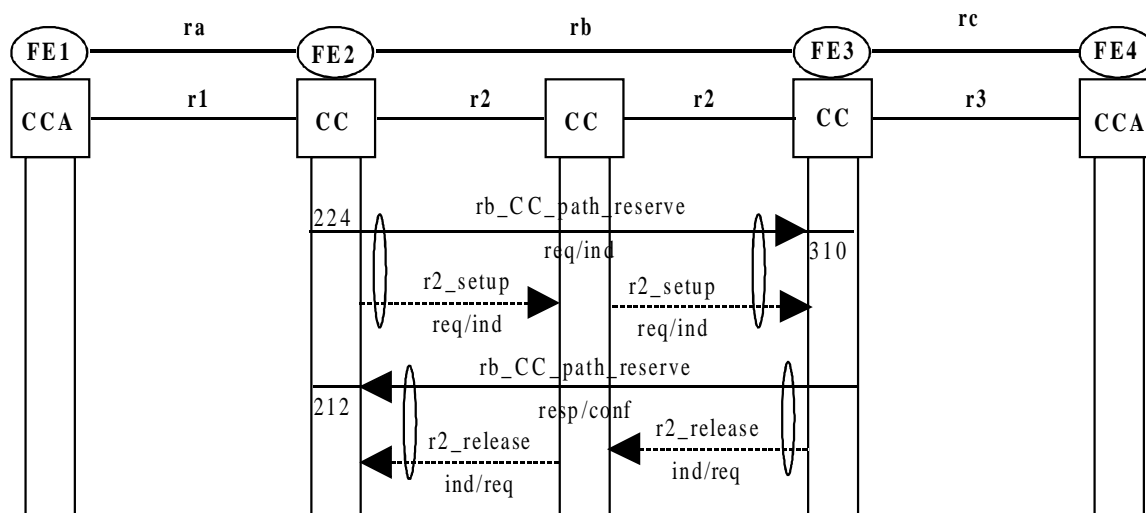
Figure 5 - Successful invocation of SS-CC (SS-CCBS)

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.
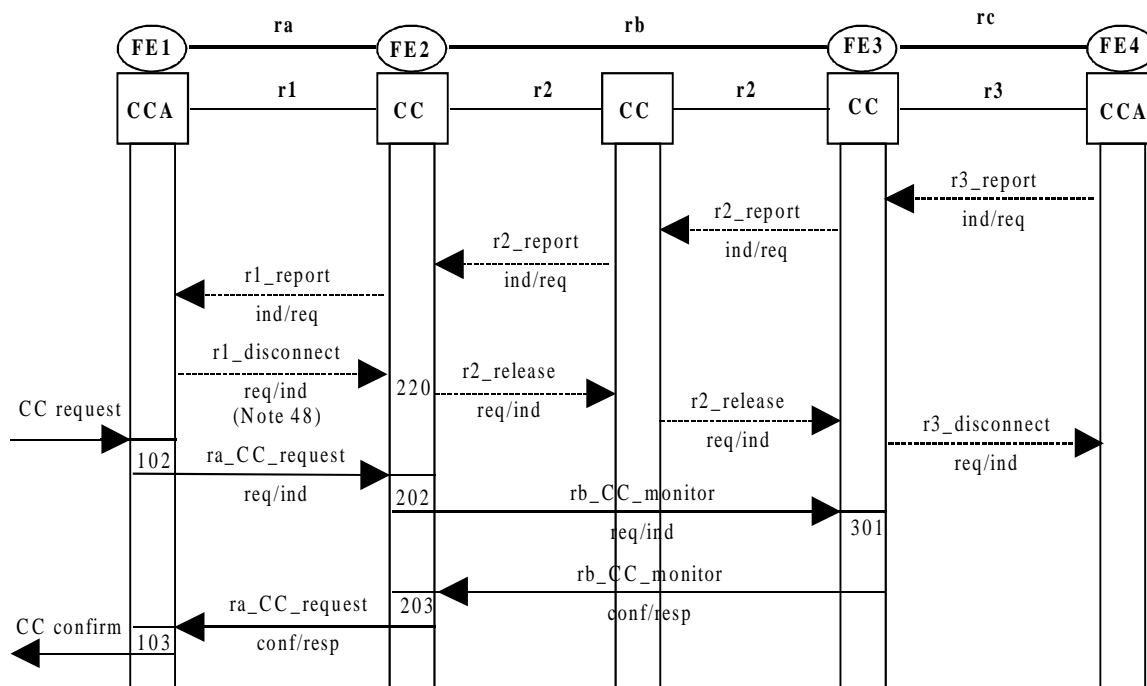
Note 48

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)

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.
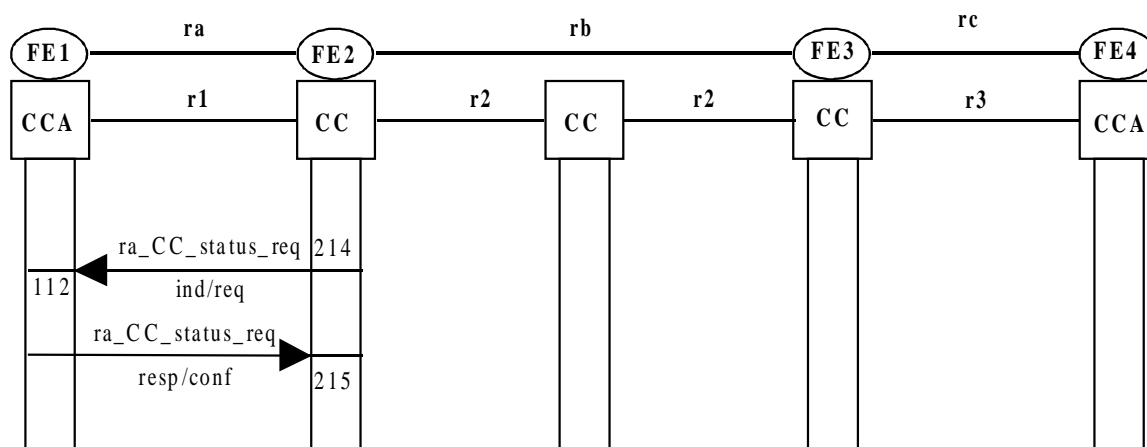
Figure 7 - Status request procedure, User A

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.
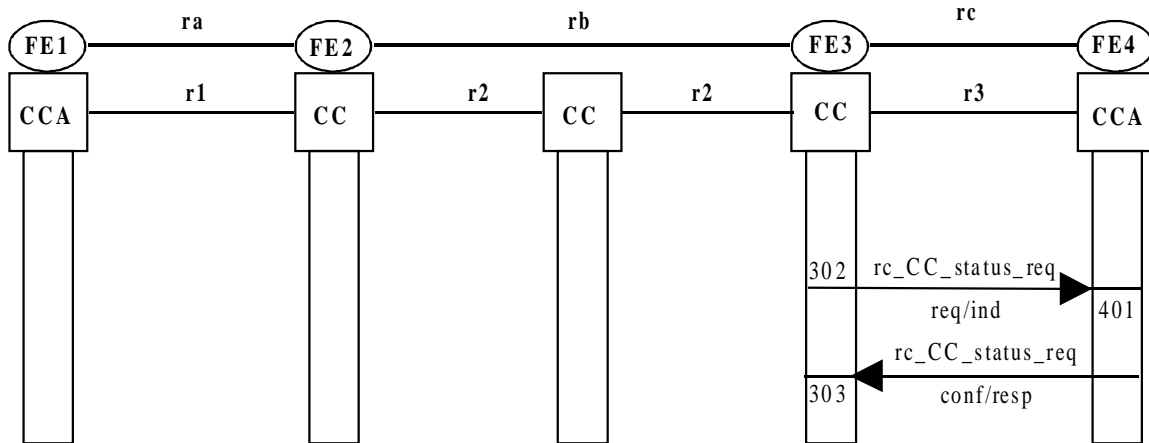
Figure 8 - Status request procedure, User B

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.
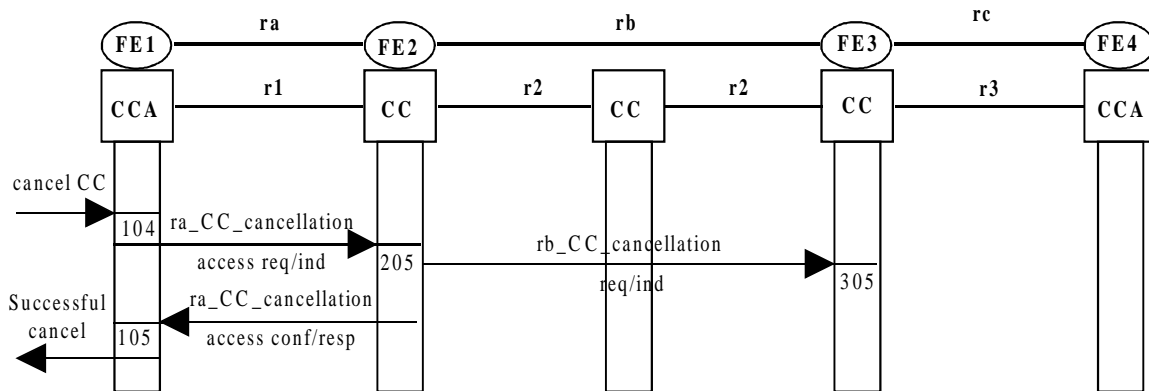
Figure 9 - Cancellation of previously invoked SS-CC request

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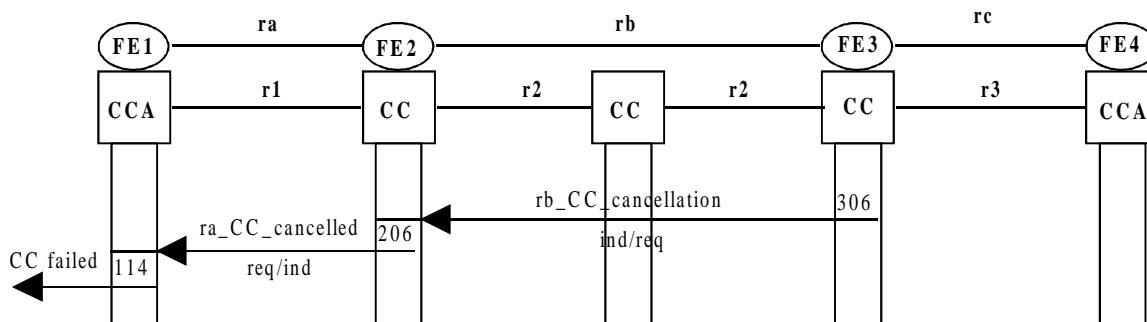
Figure 10 - Remote cancellation of previously invoked SS-CC request for service reasons

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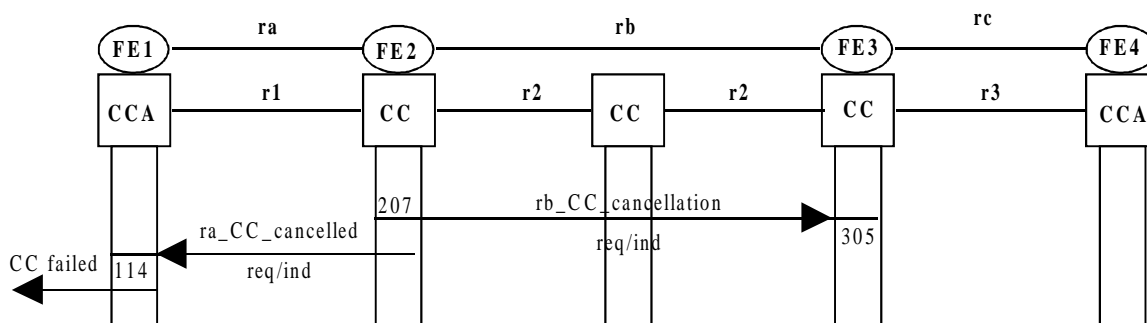
Figure 11 - Local cancellation of previously invoked SS-CC request for service reasons

8.2.3.7 Listing of SS-CC requests

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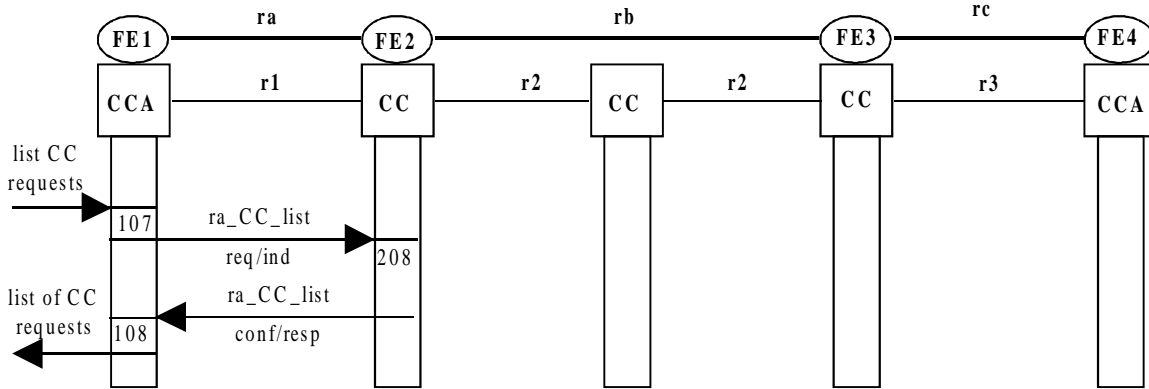
Figure 12 - List of SS-CC request status

8.2.3.8 Successful completion of SS-CC without path reservation

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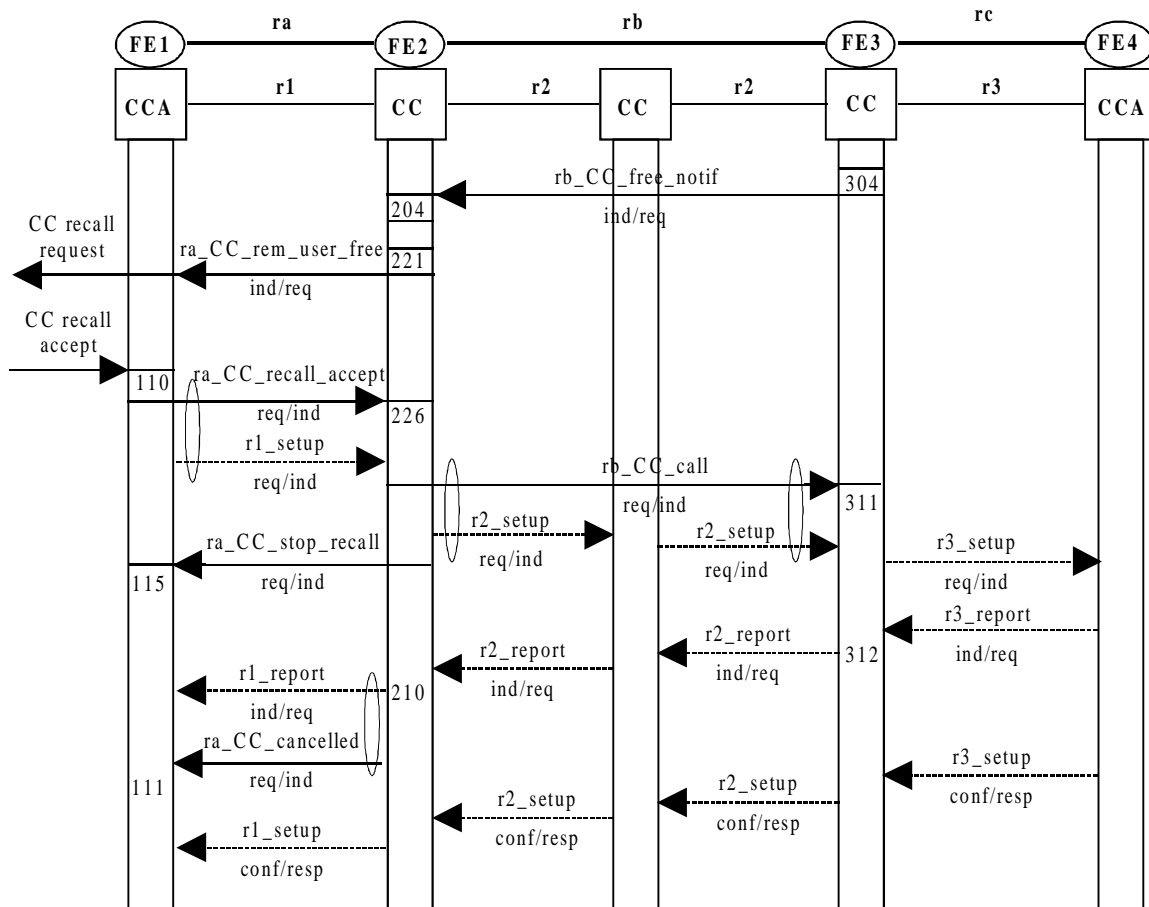
Figure 13 - Successful completion of SS-CC without path reservation

8.2.3.9   **Successful completion of SS-CC with path reservation**

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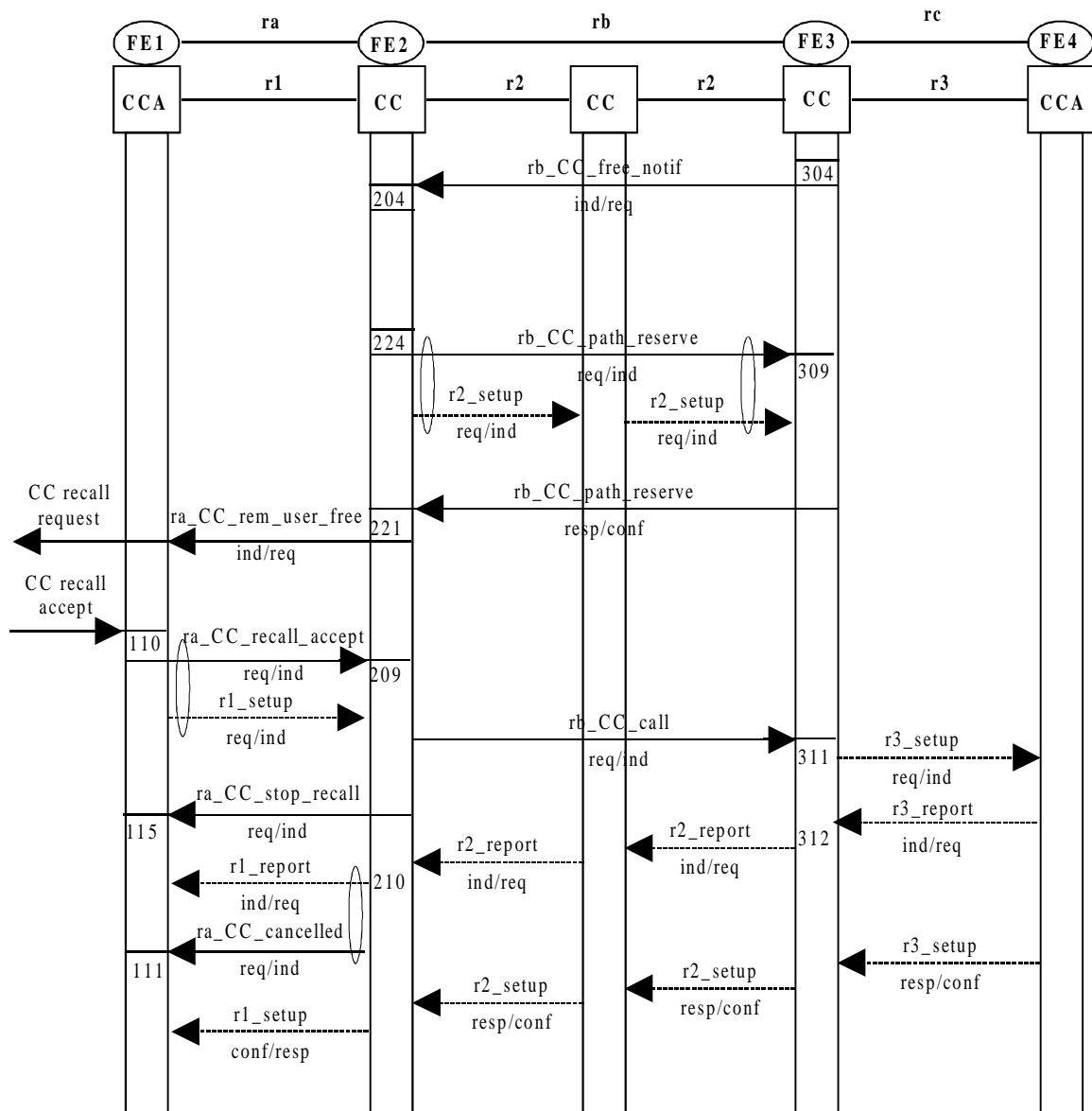
Figure 14 - Successful completion of SS-CC with path reservation

8.2.3.10   Local rejection of SS-CC by PTN

Figure 15 shows the information flow sequence where FE2 rejects the request for SS-CC - i.e. local rejection.
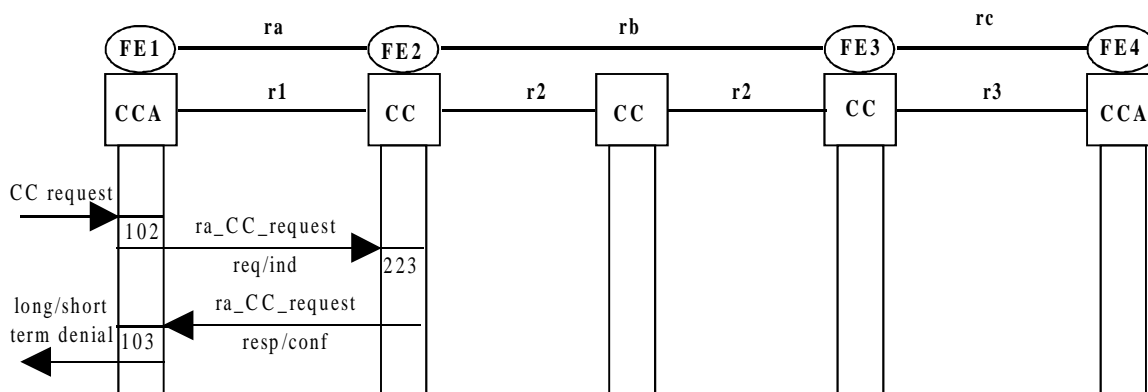
Figure 15 - Local rejection of SS-CC

8.2.3.11   Remote rejection of SS-CC by PTN

Figure 16 shows the information flow sequence where FE3 rejects the request for SS-CC - i.e. remote rejection.
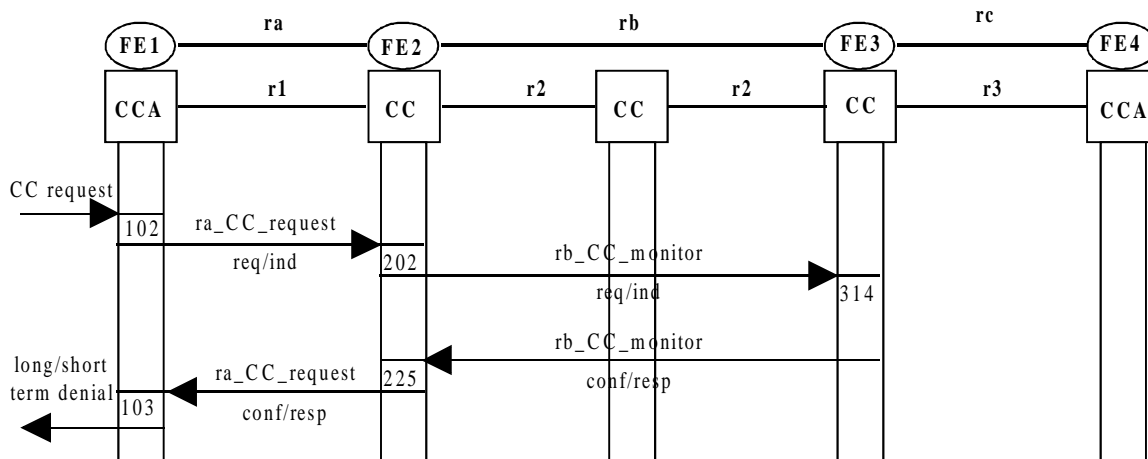
Figure 16 - Remote rejection of SS-CC

8.2.3.12   **User A busy when User B becomes not busy, without path reservation**

Figure 17 shows the information flow sequence where User A is busy on receipt by FE2 of rb_CC_free_notification. When User A becomes not busy again, the service is resumed without path reservation.
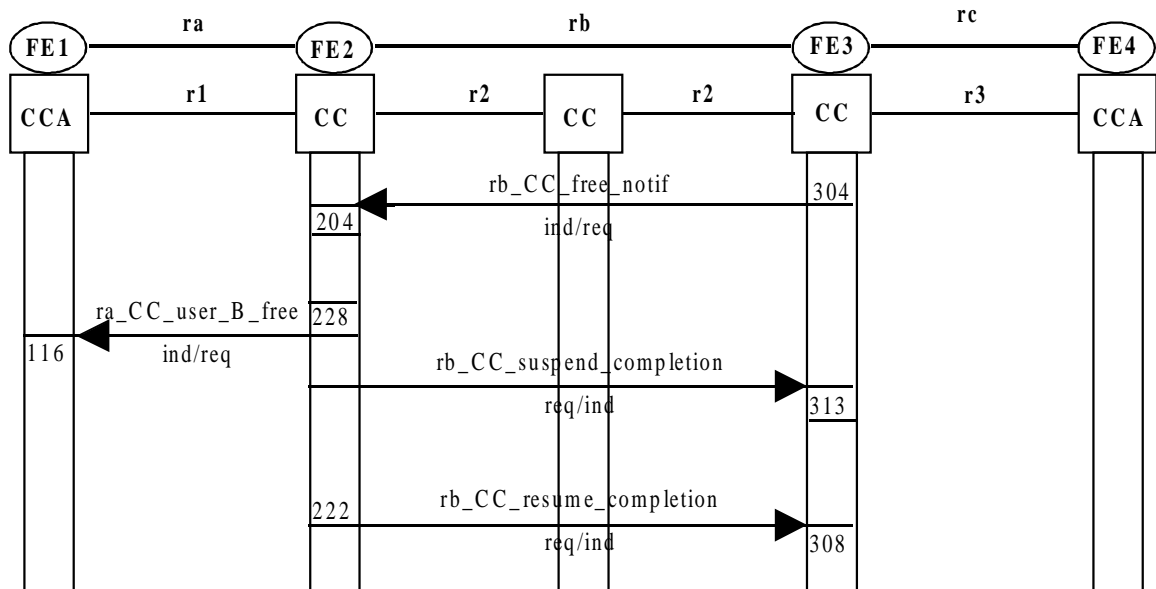
Figure 17 - User A busy when User B becomes not busy, without path reservation

8.2.3.13   User A busy when User B becomes not busy, with path reservation

Figure 18 shows the information flow sequence where User A is busy on receipt by FE2 of rb_CC_free_notification. When User A becomes not busy again, the service is resumed with path reservation.
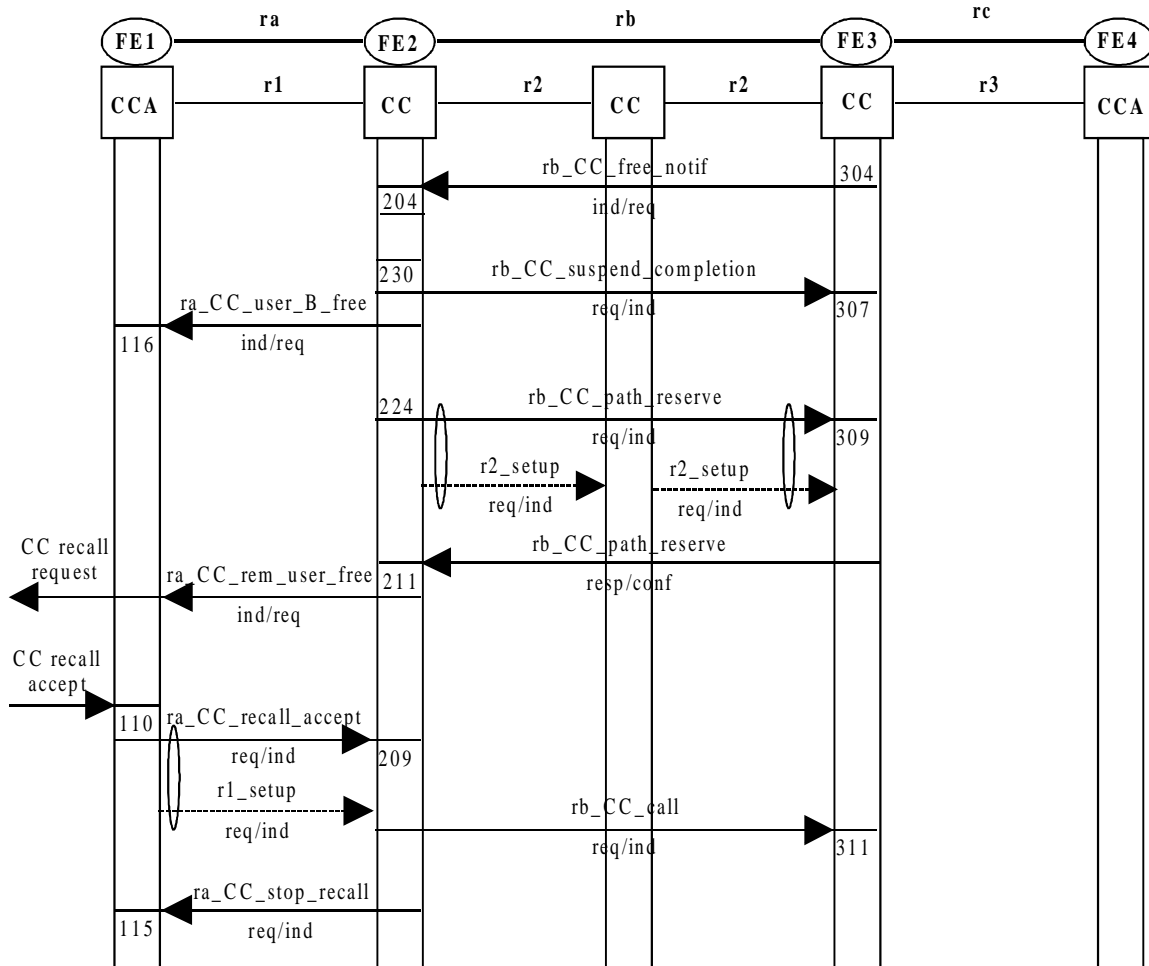
Figure 18 - User A busy when User B becomes not busy, with path reservation

8.2.3.14 **No response by User A to SS-CC Recall, without path reservation**

Figure 19 shows the information flow sequence where User A fails to respond to the SS-CC Recall without path reservation.
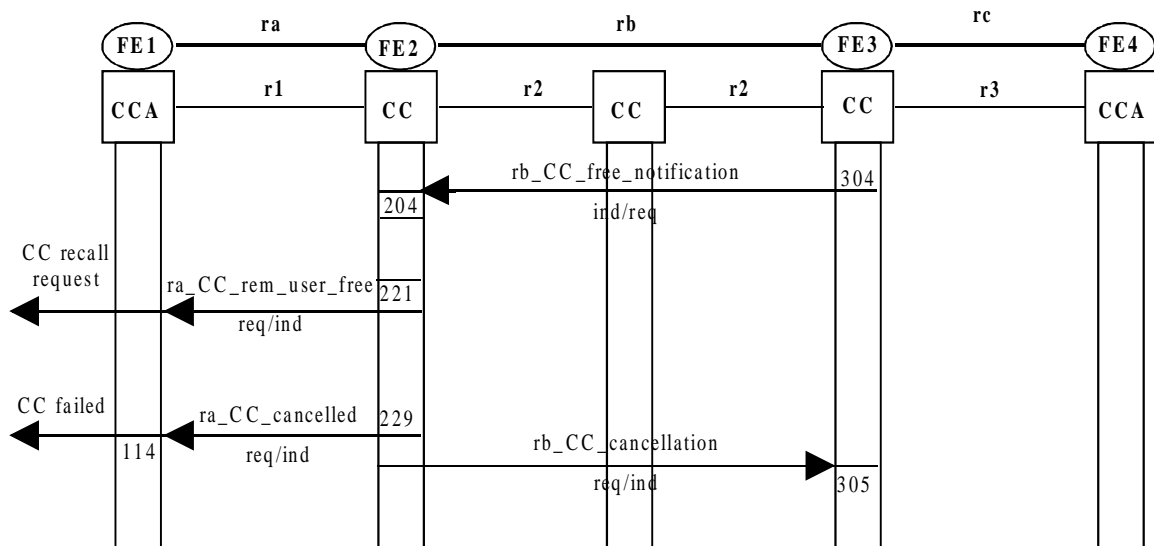
Figure 19 - No response by User A to SS-CC Recall, without path reservation

8.2.3.15 No response by User A to SS-CC Recall, with path reservation

Figure 20 shows the information flow sequence where User A rejects the SS-CC Recall with prior reservation of a network path.
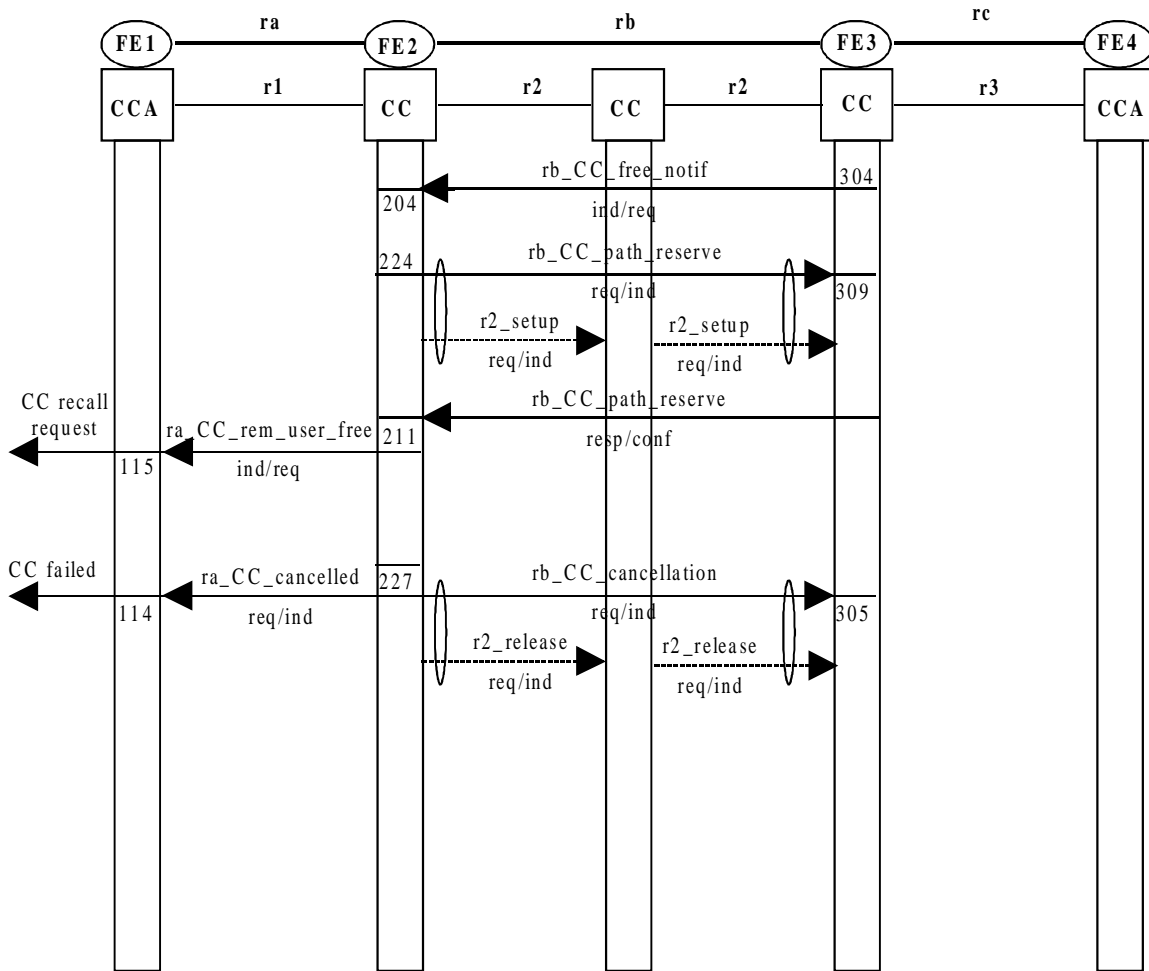
Figure 20 - No response by User A to SS-CC Recall, with path reservation

8.2.3.16   User B busy when SS-CC Recall accepted, without path reservation

Figure 21 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.
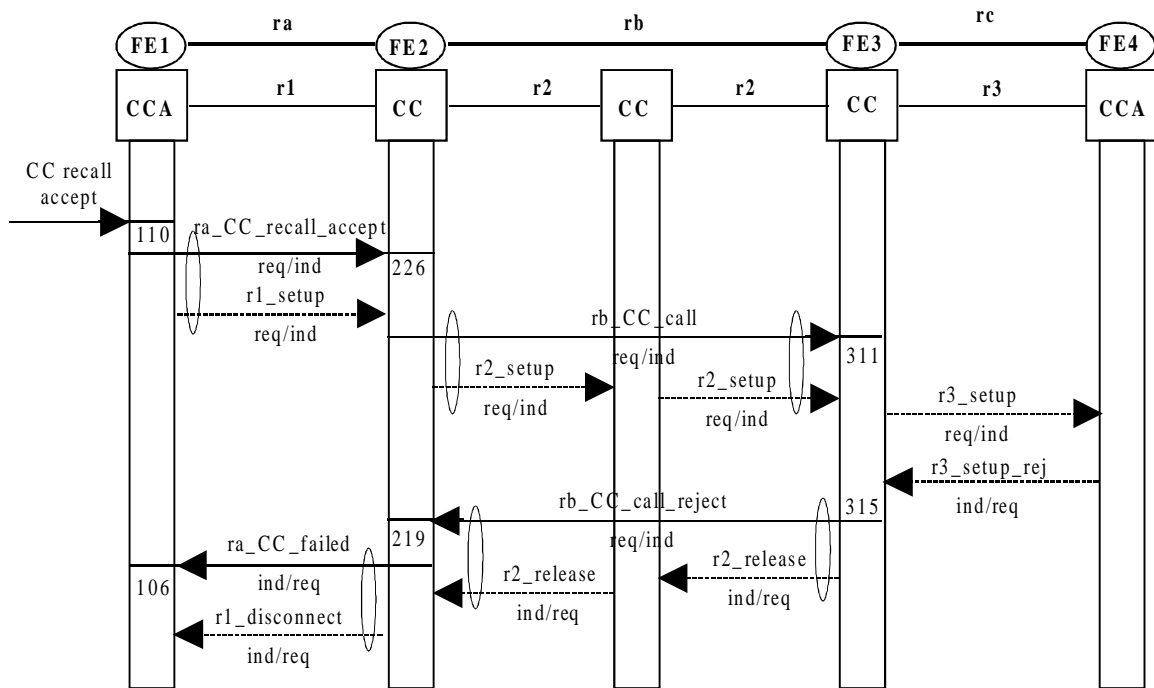
Figure 21 - User B busy when SS-CC Recall accepted, without path reservation

8.2.3.17   User B busy on SS-CC Recall, with path reservation

Figure 22 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.
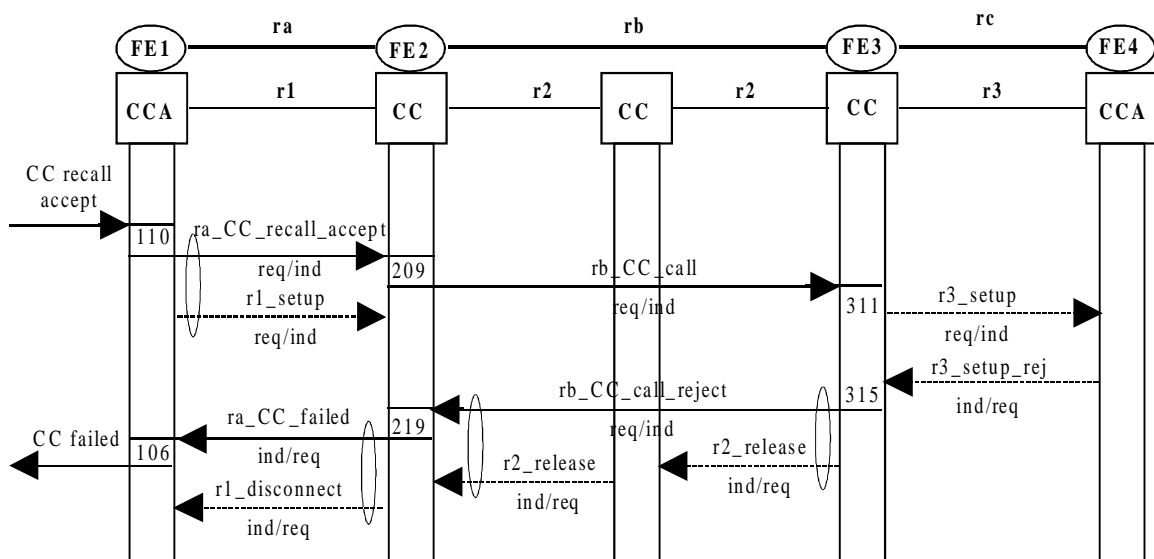
Figure 22 - User B busy on SS-CC Recall, with path reservation

8.2.3.18   No path to User B when User A accepts SS-CC Recall, without path reservation

Figure 23 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.
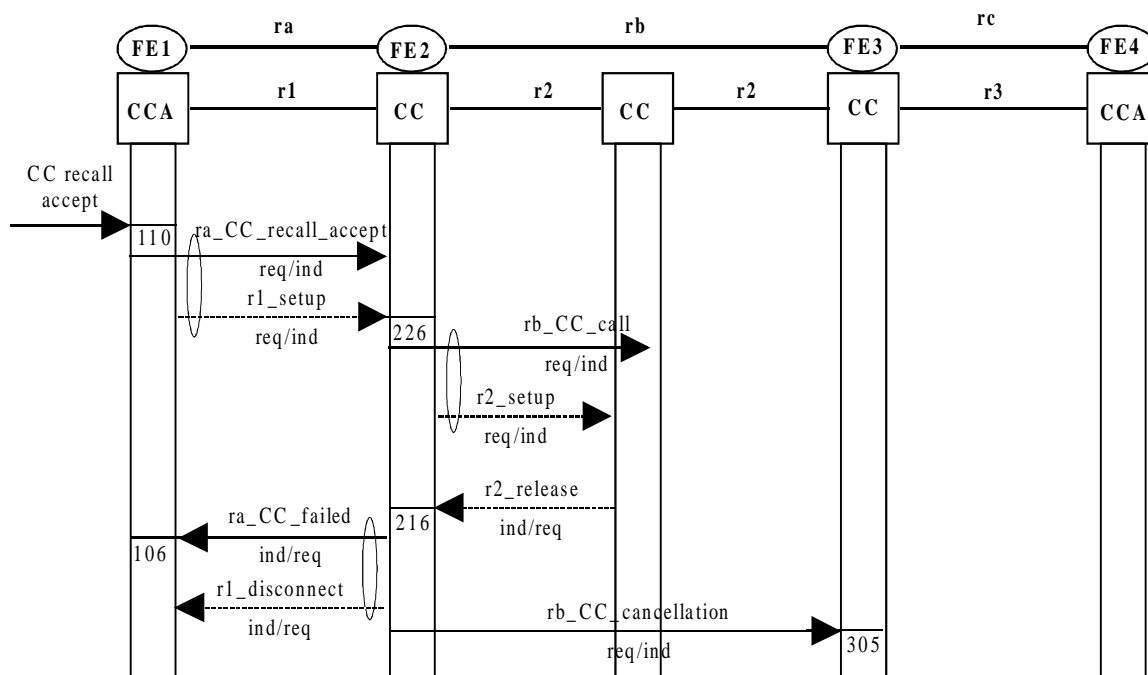
Figure 23 - No path to User B when User A accepts SS-CC Recall, without path reservation

8.2.3.19 **Failure of path reservation due to network congestion**

Figure 24 shows the information flow sequence where the attempt to reserve a network path for the call completion fails due to network congestion.
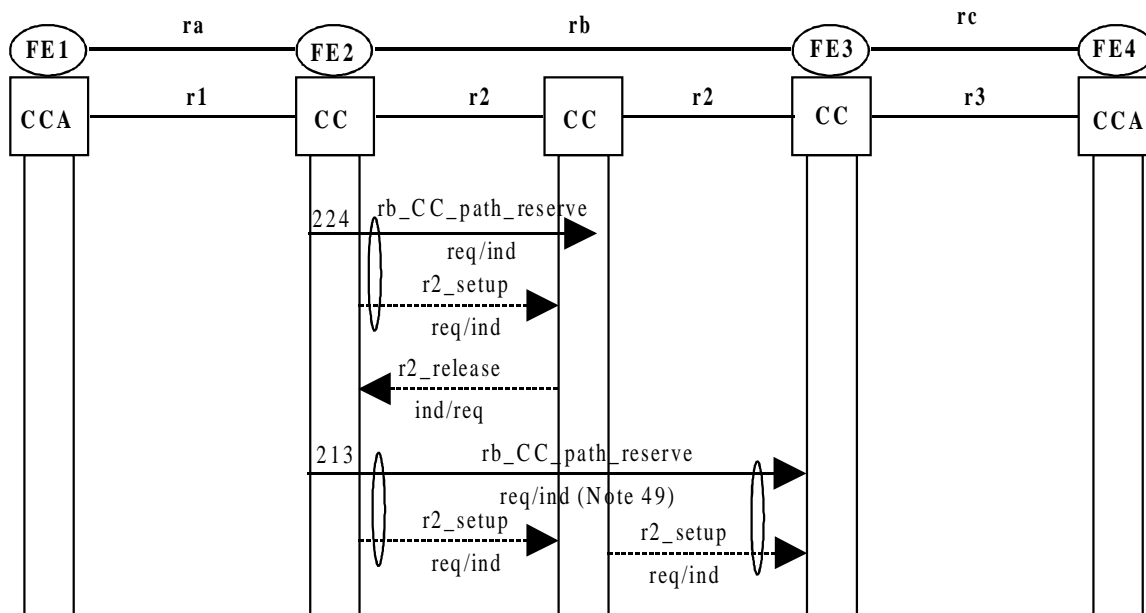
Note 49

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

Figure 24 - Failure of path reservation due to network congestion

8.2.3.20 **Failure of path reservation due to busy User B**

Figure 25 shows the information flow sequence where the attempt to reserve a network path for the call completion fails because User B is again busy.
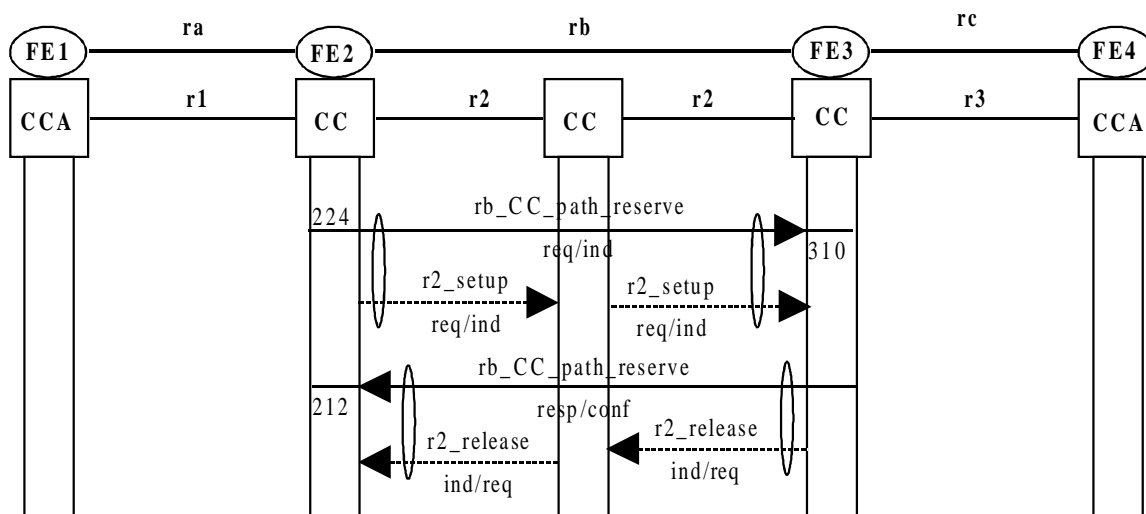
Figure 25 - Failure of path reservation due to busy User B

8.3 Functional entity actions

The following actions shall occur at the points indicated in the figures of subclause 8.2.3.

Note 50

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: 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.

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 conf/resp to FE2 indicating whether User A is busy or not busy.

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.

Note 51

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: Send rb_CC_monitor req/ind to FE3 to monitor User B.

203: Send ra_CC_request conf/resp to FE1 to indicate SS-CC acceptance, record whether service retention applies and start the SS-CC service duration timer relevant to the service requested (SS-CCBS or SS-CCNR).

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/conf 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).

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, send ra_CC_cancelled req/ind to FE1 to inform User A of the failure of SS-CC 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).

208: If the request is valid, return ra_CC_list resp/conf to FE1 indicating any outstanding SS-CC requests.

If the request is not valid, return ra_CC_list resp/conf to FE1 indicating the reason for failure.

209: Stop SS-CC recall timer. Send rb_CC_call req/ind to FE3. In the case of recall mode SS-CC recall to all compatible terminals, send ra_CC_stop_recall req/ind to FE1.

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: Send ra_CC_rem_user_free req/ind to FE1 and start SS-CC recall timer.

212: Await a further rb_CC_free_notification req/ind from FE3, indicating that User B is no longer busy.

213: 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, 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 from the ra_CC_status_req resp/conf.

216: Send ra_CC_failed req/ind to FE1 indicating service not retained, and send rb_CC_cancellation to FE3. Discard details of SS-CC and stop SS-CC service duration timer.

219: Send ra_CC_failed req/ind to FE1 to indicate that the SS-CC recall has failed due to User B busy and whether service retention applies. If the service retention option is supported, await rb_CC_free_notification req/ind from FE3. If service retention is not supported discard details of the SS-CC request and stop service duration timer.

Note 52

If the service has not been retained by FE3, FE2 can use the rb_CC_monitor req/ind to re-invoke the service.

220: Store details of cleared call.

221: On determining that User A is not busy, start SS-CC Recall timer and send ra_CC_rem_user_free req/ind to FE1.

222: On determining that User A is not busy, send rb_CC_resume_completion req/ind to FE3.

223: Send a ra_CC_request conf/resp to FE1 indicating SS-CC rejection and discard details of the SS-CC request.

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.

226: Stop SS-CC recall timer. Send rb_CC_call req/ind to FE3 accompanied by a basic call r2_setup req/ind towards FE3. In the case of recall mode SS-CC recall to all compatible terminals, send ra_CC_stop_recall req/ind to FE1.

227: On expiry of the SS-CC recall timer, send rb_CC_cancellation req/ind to FE3 accompanied by a basic call r2_release req/ind to clear down the reserved path, send ra_CC_cancelled to FE1 and discard details of SS-CC. Stop SS-CC service duration timer.

228: On determining that User A is busy:

- send ra_CC_user_B_free req/ind to FE1;

- send rb_CC_suspend_completion req/ind to FE3; and

- monitor for User A becoming not busy.

229: 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.

230: On determining that User A is busy:

- send ra_CC_user_B_free req/ind to FE1;

- optionally send rb_CC_suspend_completion req/ind to FE3; and

- monitor for User A becoming not busy.

8.3.3 Functional entity actions of FE3

301: On determining that SS-CC is possible:

- if the request was for SS-CCBS, store request against User B, and:

  - if User B is not busy, return rb_CC_monitor resp/conf to FE2 indicating acceptance of the SS-CC request followed by rb_CC_free_notification to FE2 to indicate that User B is now not busy; or

  - if User B is busy, return rb_CC_monitor resp/conf to FE2 indicating acceptance of the SS-CC request and continue to monitor User B's status to determine when User B becomes not busy.

- if the request was for SS-CCNR, return rb_CC_monitor resp/conf to FE2 indicating acceptance of the request.

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 from rc_CC_status_req resp/conf from FE4.

304: Send rb_CC_free_notification req/ind to FE2 to indicate that User B is not busy.

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.

308: Resume monitoring of User B's status to determine when User B becomes not busy.

307: Mark the related SS-CC request as suspended and continue to await rb_CC_path_reserve req/ind from FE2.

309:     Determine that User B is not busy and send rb_CC_path_reserve resp/conf to FE2 indicating success of path reservation.

310:     Determine that User B is busy, send rb_CC_path_reserve resp/conf to FE2 indicating that reservation has failed due to busy, and resume monitoring of User B to determine when User B becomes not busy again. 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.

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

314:     On determining that SS-CC is not possible, return rb_CC_monitor resp/conf to FE2 indicating the reason for rejection.

315:     Send rb_CC_call_reject req/ind to FE2 (accompanied by a basic call reject indication) indicating User B busy. If service retention applies, resume monitoring of User B to determine when User B becomes not busy again. If service retention does not apply, de-register SS-CC.

8.3.4   Functional entity actions of FE4

401:     Respond to rc_CC_status_req req/ind by sending rc_CC_status_req conf/resp to FE3 indicating whether User B is busy or not busy.

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 Recommendation Z.100 (1988).

8.4.1   Behaviour of FE1

Figure 26 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.

Service ccstg2fe1   Page_1 (4)

fe1_idle

ra_cc_user_B_free req/ind

Recall offered to all terminals?

Yes

inform User A that User B is free

fe1_idle

No

fe1_idle

Basic call cleared (busy)

Enable User A to request SS-CCBS

fe1_ccbs possible

SS-CCBS no longer available

fe1_idle

SS-CCBS request

ra_cc_request req/ind

fe1_request pending

ra_cc_request resp/conf

request accepted?

Yes

SS-CC confirm

fe1_cc invoked

Basic call alerting

Enable User A to request SS-CCNR

fe1_ccnr possible

SS-CCNR request

ra_cc_request req/ind

fe1_request pending

SS-CCNR no longer available

fe1_idle

ra_cc_rem_user_free req/ind

Recall offered to all terminals?

No

No

CC recall request

fe1_recall pending

fe1_idle

No

Short or Long Term?

Long

Short

Long term denial

Short term denial

fe1_idle

Figure 26 (sheet 1 of 4) - Behaviour of FE1

Service ccstg2fe1   Page_2 (4)

```
                              ┌─────────────┐
                              │   fe1_idle  │
                              └──────┬──────┘
        ┌────────────────────────────┼────────────────────────────┐
   ┌────┴─────────┐            ┌─────┴────┐              ┌─────────┴──────┐
   │ ra_cc_cancelled        │ cancel   │              │ ra_cc_status_      │
   │ req/ind      │            │ request  │              │ req req/ind        │
   └────┬─────────┘            └─────┬────┘              └─────────┬──────┘
```

```
        ◇───────┬ Recall                    ◇───────┬ Recall                   ◇───────┬ Recall
                 │ offered to                        │ offered to                       │ offered to
                 │ all terminals                     │ all terminals                    │ all terminals

   Yes      No                           Yes      No                          Yes      No
```

CC failed.   fe1_idle   ra_cc_cancellation   fe1_idle   fe1_idle
Request not   access resp/conf
maintained

fe1_idle   fe1_cancel   User A   ◇──────── No
                                          pending   not busy?

                                                                        Yes

ra_cc_cancellation_   ────┐   ra_cc_status_req   ra_cc_status_req
access req/ind   resp/conf   resp/conf

                                                                        fe1_idle   fe1_idle

cancellation   ◇─────────── No
successful?

        Yes

cancellation   cancellation
successful   failed

fe1_idle   fe1_idle

Figure 26 (sheet 2 of 4) - Behaviour of FE1

Service ccstg2fe1   Page_3 (4)

fe1_cc
invoked

ra_cc_user_B_
free req/ind

ra_cc_rem_user_
free req/ind

ra_cc_cancelled
req/ind

cancel
request

ra_cc_status_
req req/ind

inform User A
that User B
is free

CC recall
request

CCfailed.
Request not
maintained

ra_cc_cancellation_
access req/ind

User A
not busy?

No

Yes

fe1_cc
invoked

fe1_recall
pending

fe1_idle

fe1_cancel
pending

ra_cc_status_
req resp/conf

ra_cc_status_
req resp/conf

fe1_cc
invoked

fe1_cc
invoked

ra_cc_cancellation_
access resp/conf

cancellation
successful?

Yes

No

cancellation
successful

cancellation
failed

fe1_idle

fe1_cc
invoked

Figure 26 (sheet 3 of 4) - Behaviour of FE1

Service ccstg2fe1   Page_4 (4)

```
                              ┌─────────────┐
                              │  fe1_recall │
                              │   pending   │
                              └──────┬──────┘
          ┌──────────────────────────┼──────────────────────────┐
   ╱──────────────╲            ┌─────────────┐            ╲──────────────╲
   │ ra_cc_stop_  │            │  CC recall  │             │ ra_cc_cancelled│
   │ recall req/ind│            │   accept    │             │ req/ind        │
   ╱──────────────╱            └──────┬──────┘            ╱──────────────╱
          │                           │                           │
   ┌─────────────┐            ╱──────────────╲            ╱──────────────╲
   │  stop SS-CC │            │ ra_cc_recall_│            │ CC failed.   │
   │   recall    │            │ accept req/ind│           │ Request not  │
   └──────┬──────┘            ╱──────────────╱            │ maintained   │
          │                           │                   ╱──────────────╱
   ┌─────────────┐            ┌─────────────┐                    │
   │   fe1_idle  │            │fe1_completion│            ┌─────────────┐
   └─────────────┘            │   pending    │            │   fe1_idle  │
                              └──────┬──────┘            └─────────────┘
          ┌──────────────────────────┼──────────────────────────┐
   ╲──────────────╲            ╲──────────────╲            ╲──────────────╲
   │ ra_cc_cancelled│          │ ra_cc_stop_  │            │ ra_cc_failed │
   │ req/ind        │          │ recall req/ind│           │ req/ind      │
   ╱──────────────╱            ╱──────────────╱            ╱──────────────╱
          │                           │                           │
   ╱──────────────╲            ┌─────────────┐     ┌──────────┐  ◇ CC still
   │  SS-CC       │            │fe1_completion│    │ CC still │ ◇ registered?◇
   │  completed   │            │   pending    │    │registered?│ ◇           ◇
   ╱──────────────╱            └─────────────┘     └──────────┘  Yes      No
          │                                                       │         │
   ┌─────────────┐                                    ╱──────────────╲  ╱──────────────╲
   │   fe1_idle  │                                    │ CC failed.   │  │ CC failed.   │
   └─────────────┘                                    │ Request      │  │ Request not  │
                                                      │ maintained   │  │ maintained   │
                                                      ╱──────────────╱  ╱──────────────╱
                                                            │                │
                                                     ┌─────────────┐  ┌─────────────┐
                                                     │  fe1_cc     │  │   fe1_idle  │
                                                     │  invoked    │  └─────────────┘
                                                     └─────────────┘
```

Figure 26 (sheet 4 of 4) - Behaviour of FE1

8.4.2 Behaviour of FE2

Figure 27 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.

Service ccfe2   Page_1 (7)

Figure 27 (sheet 1 of 7) - Behaviour of FE2

Service ccfe2   Page_2 (7)

```
                                        ┌─────────────┐
                                        │ fe2_monitor │
                                        │   pending   │
                                        └─────────────┘
                                               │
                                        ┌─────────────┐
                                        │ rb_cc_monitor│──┐
                                        │ resp/conf    │  ╲
                                        └─────────────┘──┘
                                               │
                              no               ◇
                    ┌──────────────────────────◇ CC ◇
                    │                           ◇ accepted ◇
                    │                           ◇  ?  ◇
                    │                               │ yes
          ┌─────────────────┐            ┌─────────────────┐
          │ ra_cc_request   │            │ Store retention │
          │ resp/conf       │            │ details         │
          └─────────────────┘            └─────────────────┘
                    │                               │
          ┌─────────────────┐            ┌─────────────────┐
          │ Discard info    │            │ ra_cc_request   │
          │ for SS-CC       │            │ resp/conf       │
          └─────────────────┘            └─────────────────┘
                    │                               │
              ┌──────────┐                          ◇              ccnr
              │ fe2_idle │                     ◇ CCBS ◇──────────────────┐
              └──────────┘                     ◇ or CCNR ◇                │
                                               ◇   ?   ◇                  │
                                                   │ ccbs                 │
                                        ┌─────────────────┐    ┌─────────────────┐
                                        │ Start CCBS      │    │ Start CCNR      │
                                        │ duration timer  │    │ duration timer  │
                                        └─────────────────┘    └─────────────────┘
                                               │                      │
                                               └──────────┬───────────┘
                                              ┌─────────────────┐
                                              │ fe2_awaiting    │
                                              │ free _notif     │
                                              └─────────────────┘
```

Figure 27 (sheet 2 of 7) - Behaviour of FE2

Service ccfe2   Page_3 (7)

Figure 27 (sheet 3 of 7) - Behaviour of FE2

Service ccfe2 Page_4 (7)

fe2_pending reservation

rb_cc_cancel- -lation req/ind

Basic call (reserv) failed

rb_cc_path_ reserve resp/conf

ra_cc_cancel- -lation_access req/ind

CCBS duration timer expiry

CCNR duration timer expiry

ra_cc_cancelled req/ind

A

User B not busy ?

Path reversion successful ?

no / yes

rb_cc_cancel- -lation req/ind

Discard info for SS-CC and stop service duration timer

fe2_awaiting free_notif

User B not busy ?

ra_cc_cancelled req/ind

fe2_idle

Reservation possible ?

B

yes

no

ra_cc_rem_ user_free req/ind

rb_cc_suspend_ completion req/ind

with r2_release req/ind

Discard info for SS-CC

CC deregistered at FE3 ?

A

Start cc_recall timer

ra_cc_userB_ free req/ind

fe2_idle

yes / no

Temporary condition ?

fe2_pending recall

fe2_suspended

Cancel valid ?

no

yes

yes

rb_cc_cancel- -lation req/ind

Allow congestion to clear

ra_cc_cancel- -lation_access resp/conf

rb_cc_cancel- -lation req/ind

rb_cc_monitor req/ind

ra_cc_cancelled req/ind

rb_cc_path_reserve req/ind

fe2_pending reservation

ra_cc_cancel- -lation_access resp/conf

fe2_monitor pending

Discard info for SS-CC and stop service duration timer

fe2_idle

fe2_pending reservation

Discard info for SS-CC and stop service duration timer

fe2_idle

Figure 27 (sheet 4 of 7) - Behaviour of FE2

Service ccfe2   Page_5 (7)

fe2_suspended

| ra_cc_cancel-
-lation_access
req/ind | User A
not busy | rb_cc_cancel-
-lation
req/ind | CCBS duration
timer expiry | CCNR duration
timer expiry |

no — Cancel valid ?

yes

no — Path reservation possible ?

yes

ra_cc_cancel-
-lation_access
resp/conf

rb_cc_cancel-
-lation
req/ind

ra_cc_cancelled
req/ind

rb_cc_cancel-
-lation
req/ind

fe2_suspended

ra_cc_cancel-
-lation_access
resp/conf

Discard info for
SS-CC and stop
service duration
timer

ra_cc_cancelled
req/ind

rb_cc_resume_
completion
req/ind

rb_cc_path_reserve
req/ind

Discard info for
SS-CC and stop
service duration
timer

Discard info
for SS-CC

fe2_idle

fe2_awaiting
free_notif

fe2_pending
reservation

fe2_idle

fe2_idle

Discard info for
SS-CC and stop
service duration
timer

fe2_idle

Figure 27 (sheet 5 of 7) - Behaviour of FE2

Service ccfe2   Page_6 (7)

```
                                    ┌─────────────┐
                                    │ fe2_pending │
                                    │   recall    │
                                    └──────┬──────┘
                                           │
       ┌──────────────┬────────────────────┴─────────────────────────────────────────┐
       │              │                     │                                          │
 ┌─────────────╲ ┌─────────────╲    ╱──────────────┐                           ╱─────────────┐
 │CCBS duration │ │CCNR duration │   │ ra_cc_recall_│                           │ SS-CC recall │
 │timer expiry  │ │timer expiry  │   │    accept    │                           │ timer expiry │
 └─────┬────────╱ └──────┬───────╱   │   req/ind    │                           └──────┬──────┘
       │◄────────────────┘           └──────┬───────╱                                  │
       │                                    │                                          │
 ╱─────────────┐                     ╱──────────────┐  ┌──────────────────────┐  ╱─────────────┐
 │ rb_cc_cancel-│                     │ rb_cc_call   │  │Accompanied by basic  │  │ rb_cc_cancel-│
 │ -lation      │                     │ req/ind      ├──│call setup to FE3 in  │  │ -lation      │
 │ req/ind      │                     │              │  │case of non path      │  │ req/ind      │
 └─────┬────────╱                     └──────┬───────╱  │reservation           │  └──────┬──────╱
       │                                     │          └──────────────────────┘         │
 ╲─────────────┐                        ╱────┴────╲            yes                   ╲─────────────┐
 │ ra_cc_cancelled                     ╱ Recall    ╲─────────────────┐              │ ra_cc_cancelled
 │ req/ind     │                       ╲ offered to ╱                 │              │ req/ind     │
 └─────┬───────╱                        ╲ terminals ╱                 │              └──────┬──────╱
       │                                 ╲    ?    ╱                  │                     │
 ┌─────────────┐                          no                    ╱──────────────┐     ┌─────────────┐
 │ Discard info│                          │                     │ ra_cc_stop_  │     │ Discard info│
 │  for SS-CC  │                          │                     │   recall     │     │ for SS-CC   │
 └─────┬───────┘                          │                     │   resp/conf  │     │ and stop    │
       │                                  │                     └──────┬───────╱     │ service     │
       │                                  │◄───────────────────────────┘             │ duration    │
       │                                  │                                          │ timer       │
  ┌─────────┐                        ┌─────────┐                                     └──────┬──────┘
  │fe2_idle │                        │fe2_await│                                      ┌─────────┐
  └─────────┘                        │completion                                     │fe2_idle │
                                     └─────────┘                                     └─────────┘
```

Figure 27 (sheet 6 of 7) - Behaviour of FE2

Service ccfe2   Page_7 (7)

Figure 27 (sheet 7 of 7) - Behaviour of FE2

8.4.3 Behaviour of FE3

Figure 28 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.
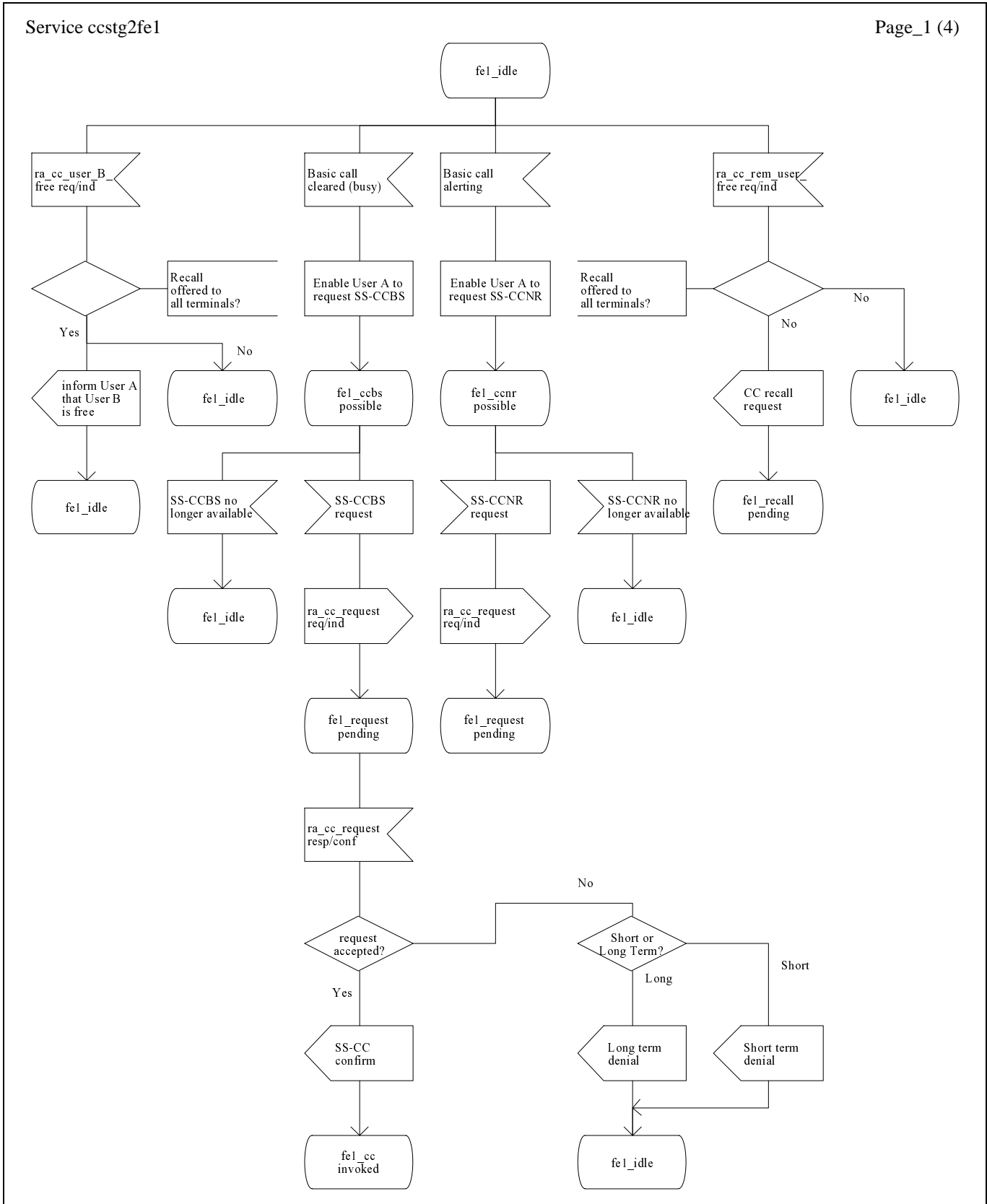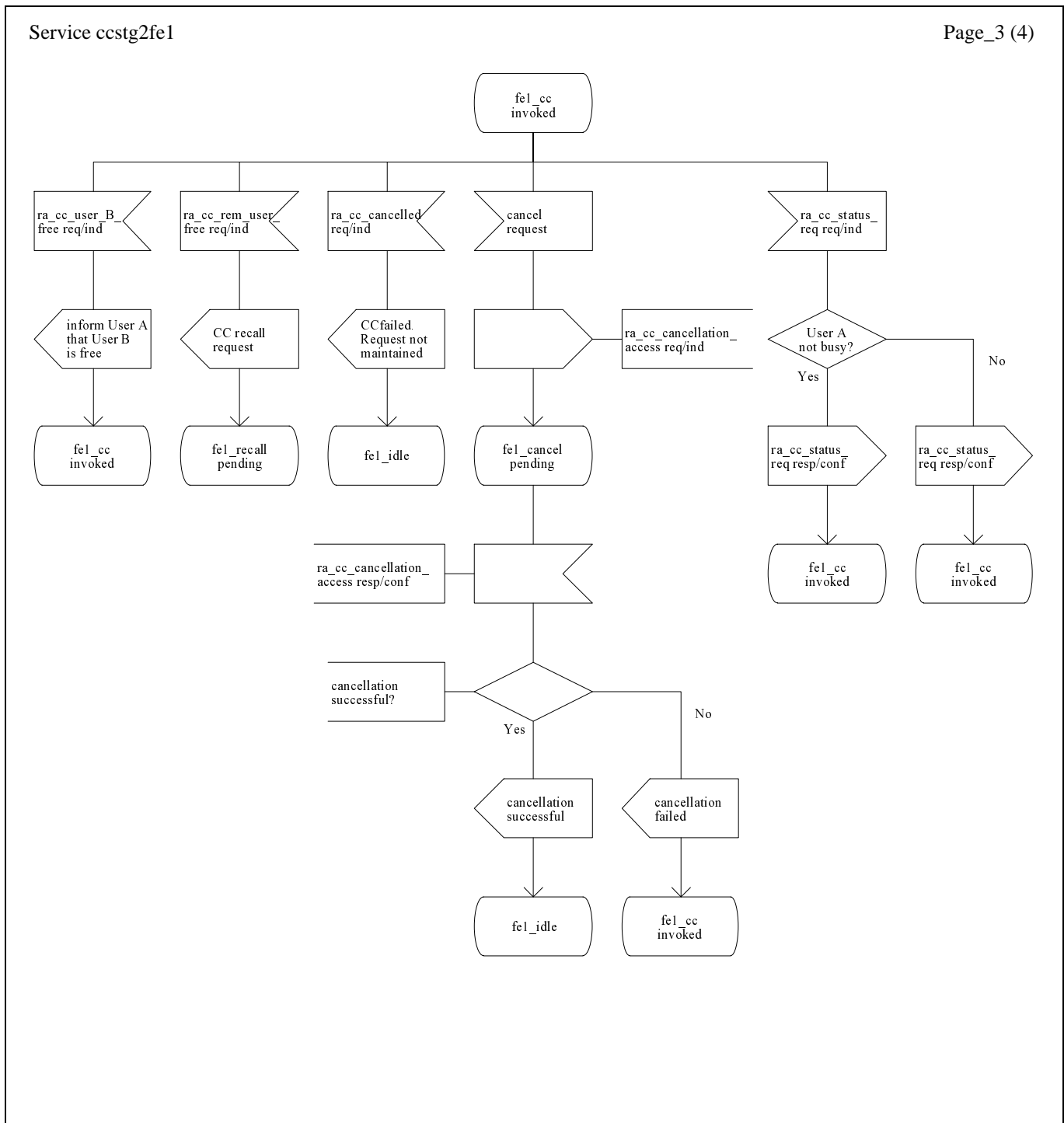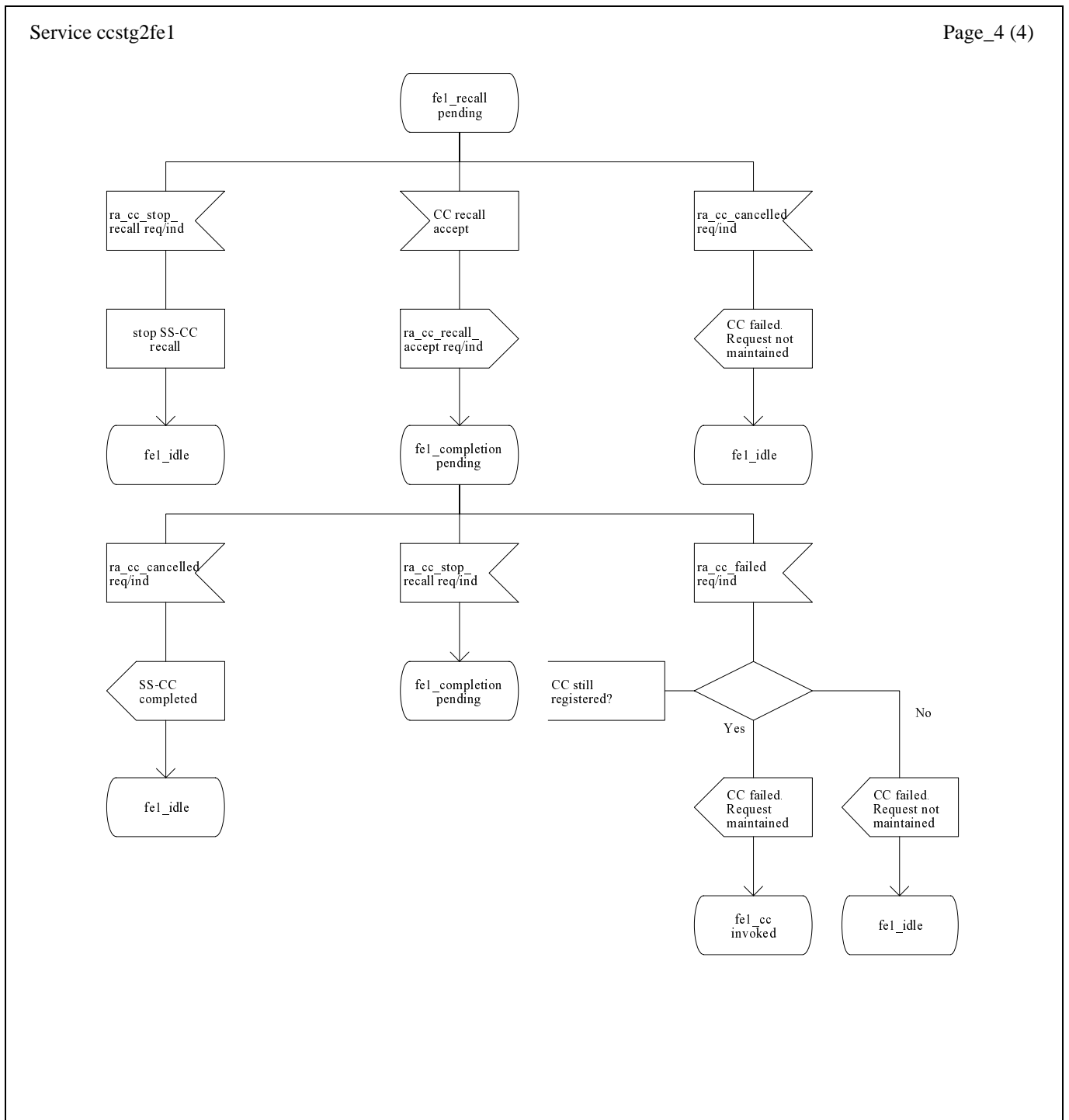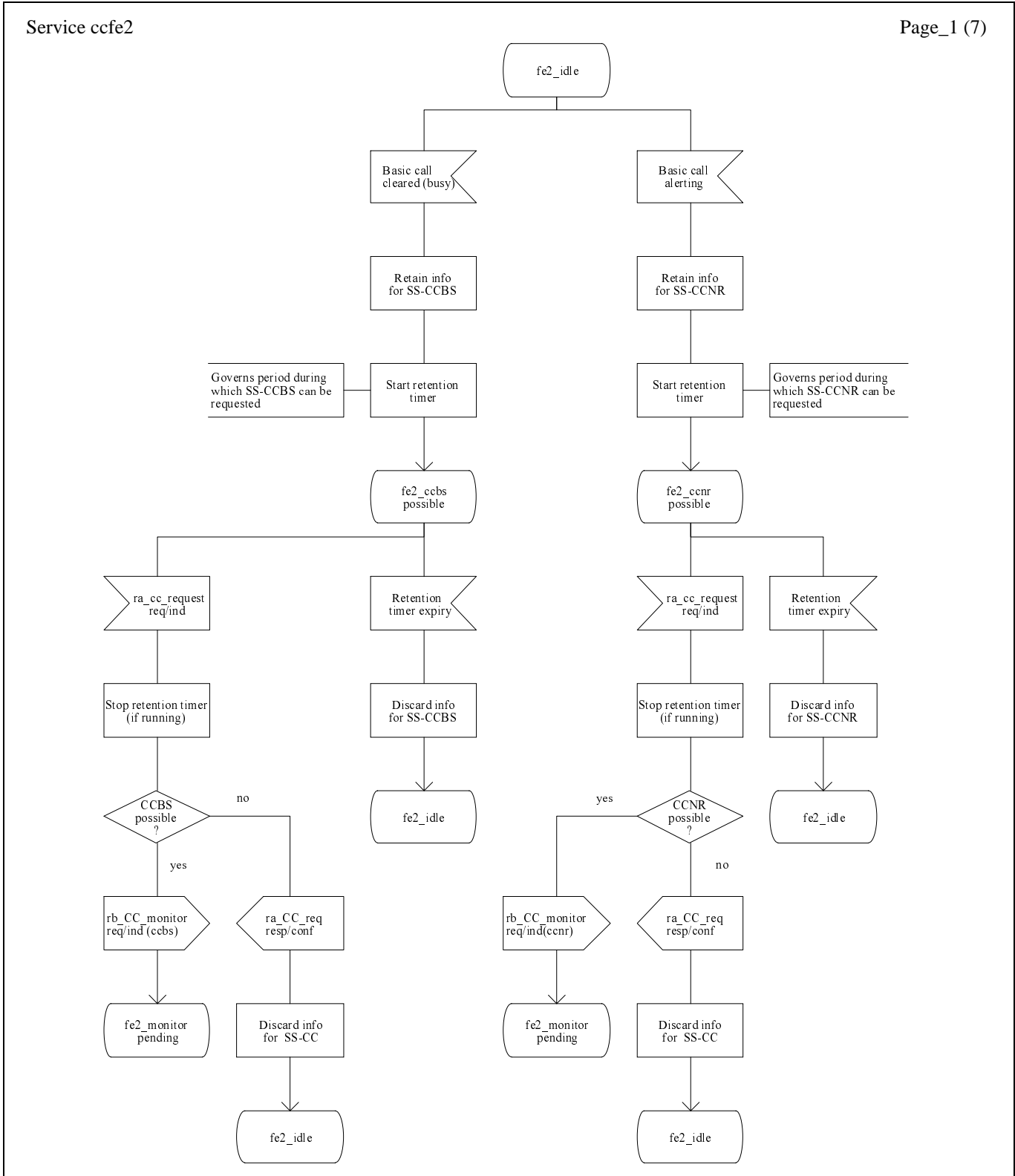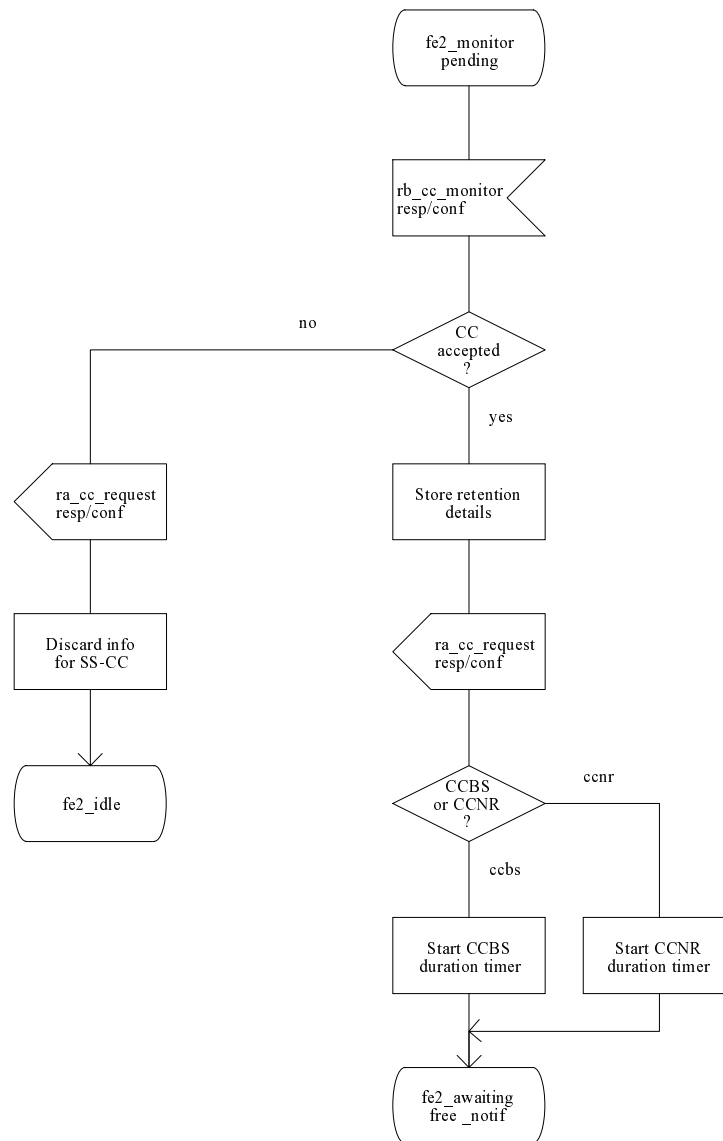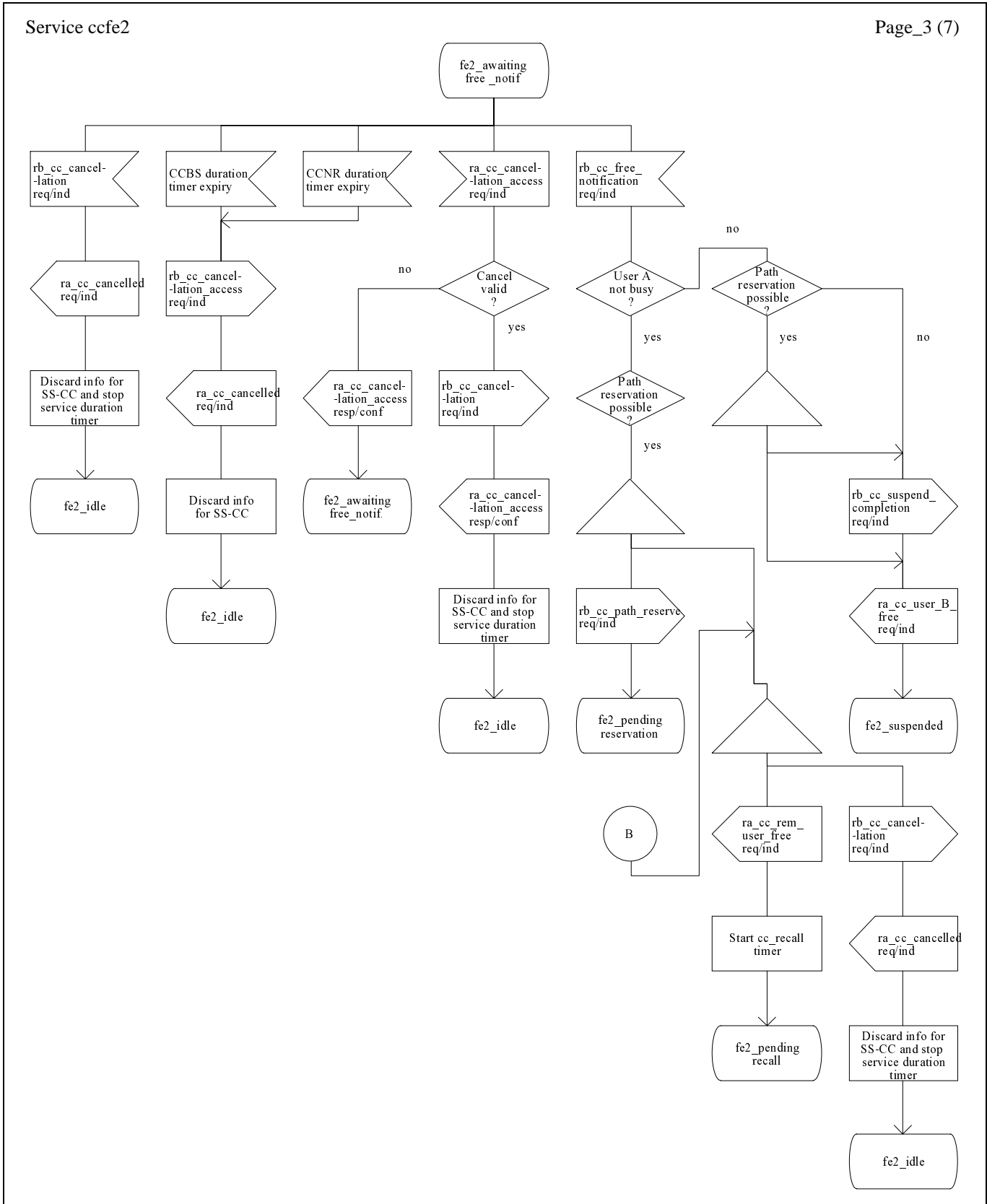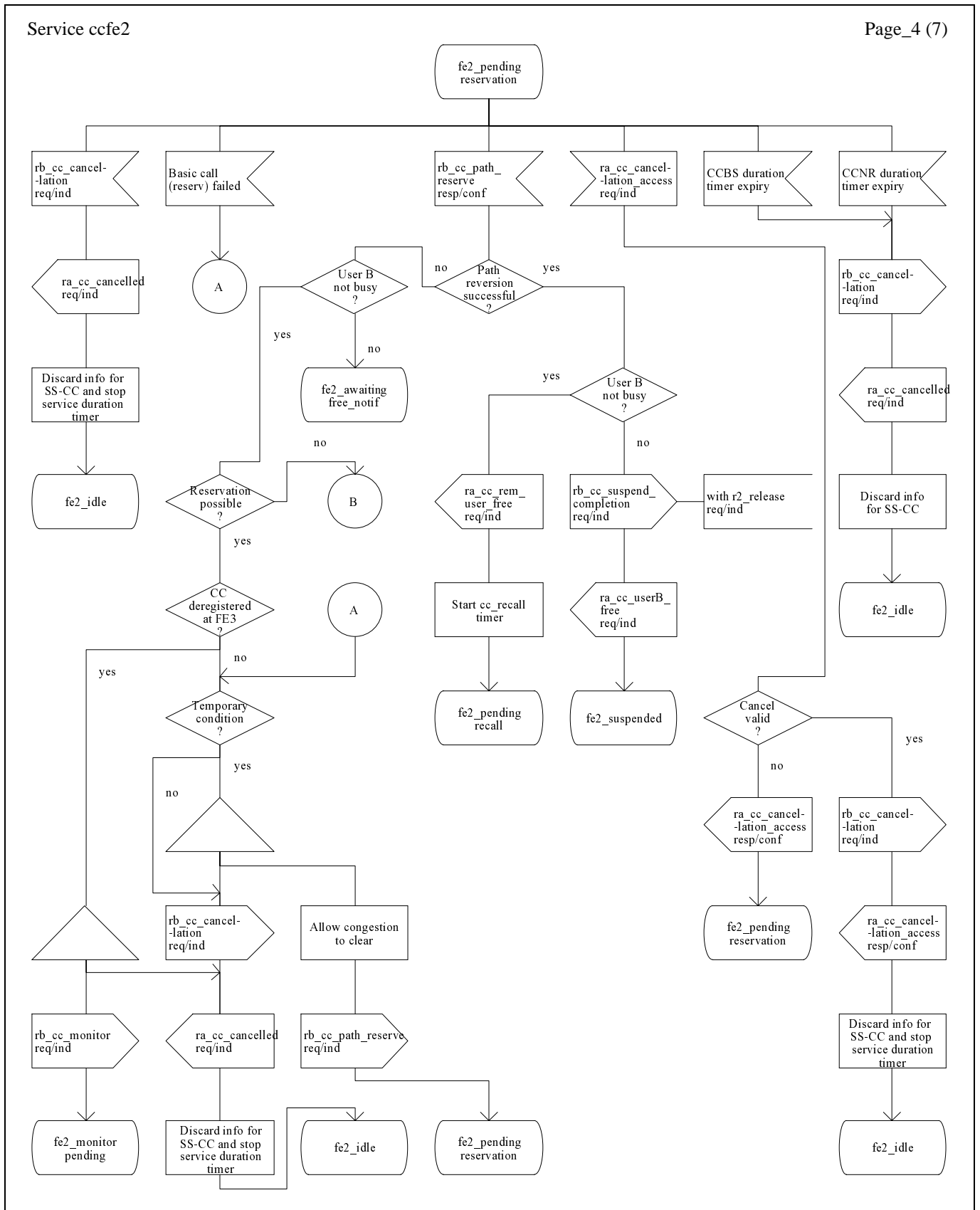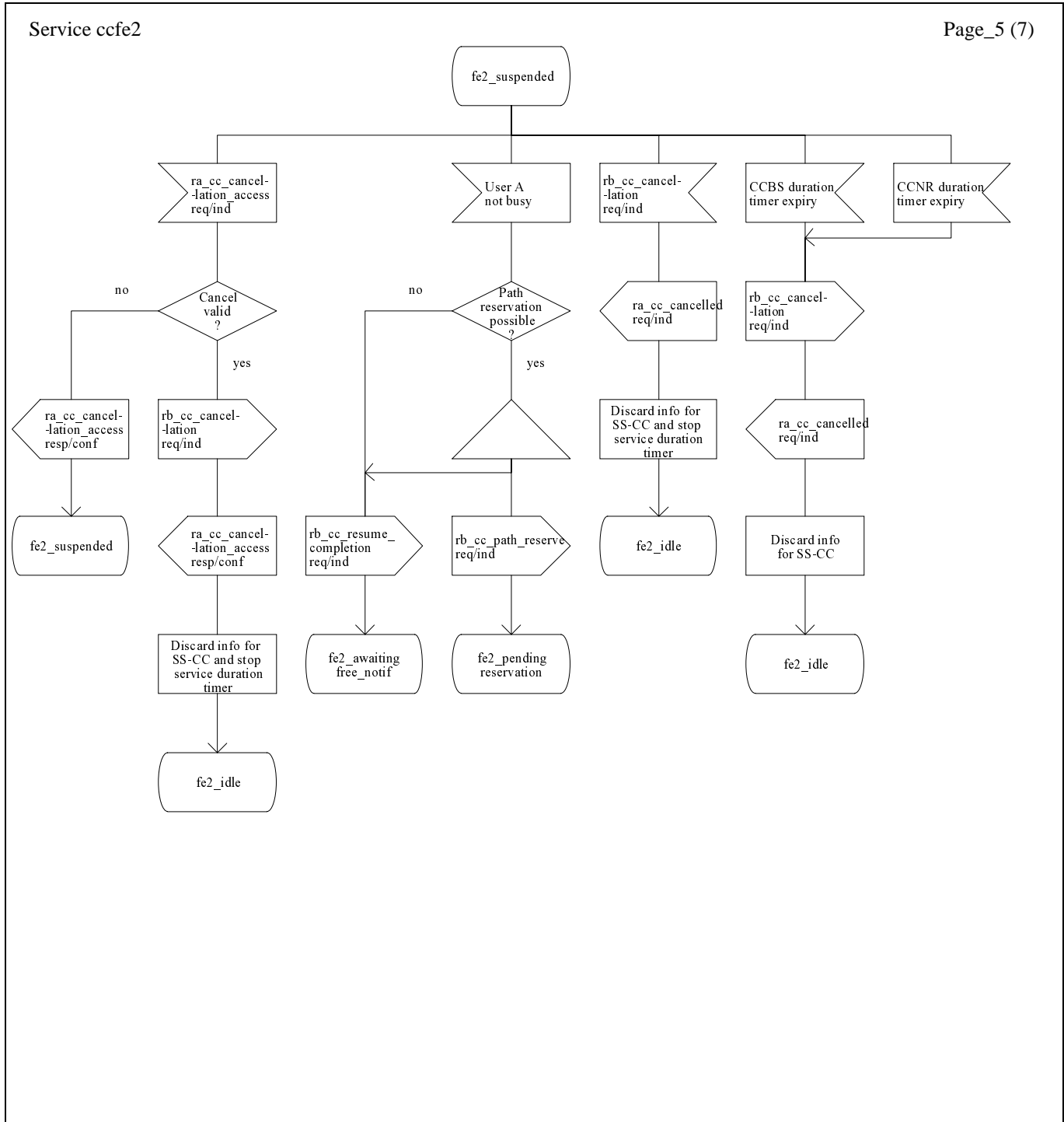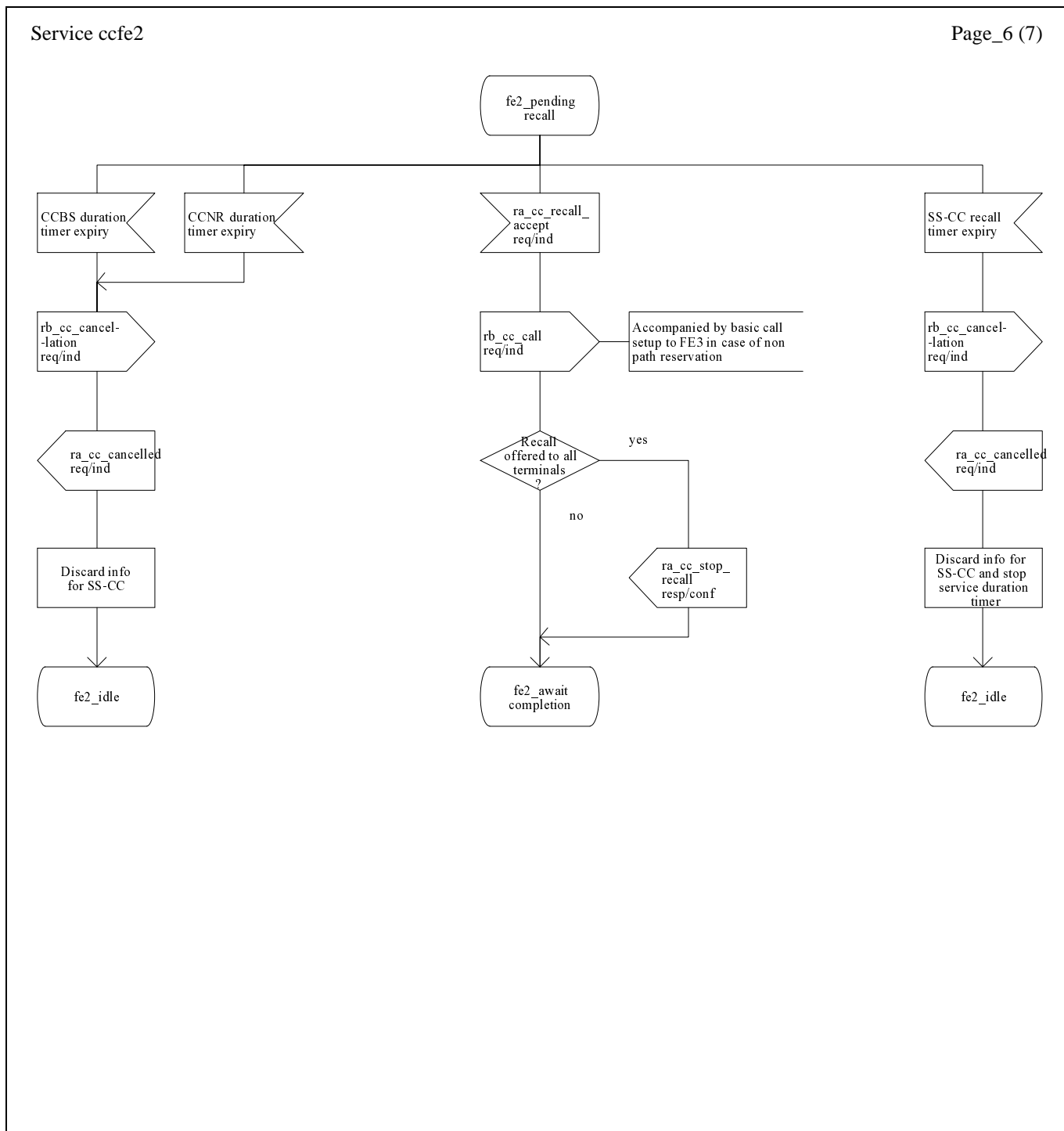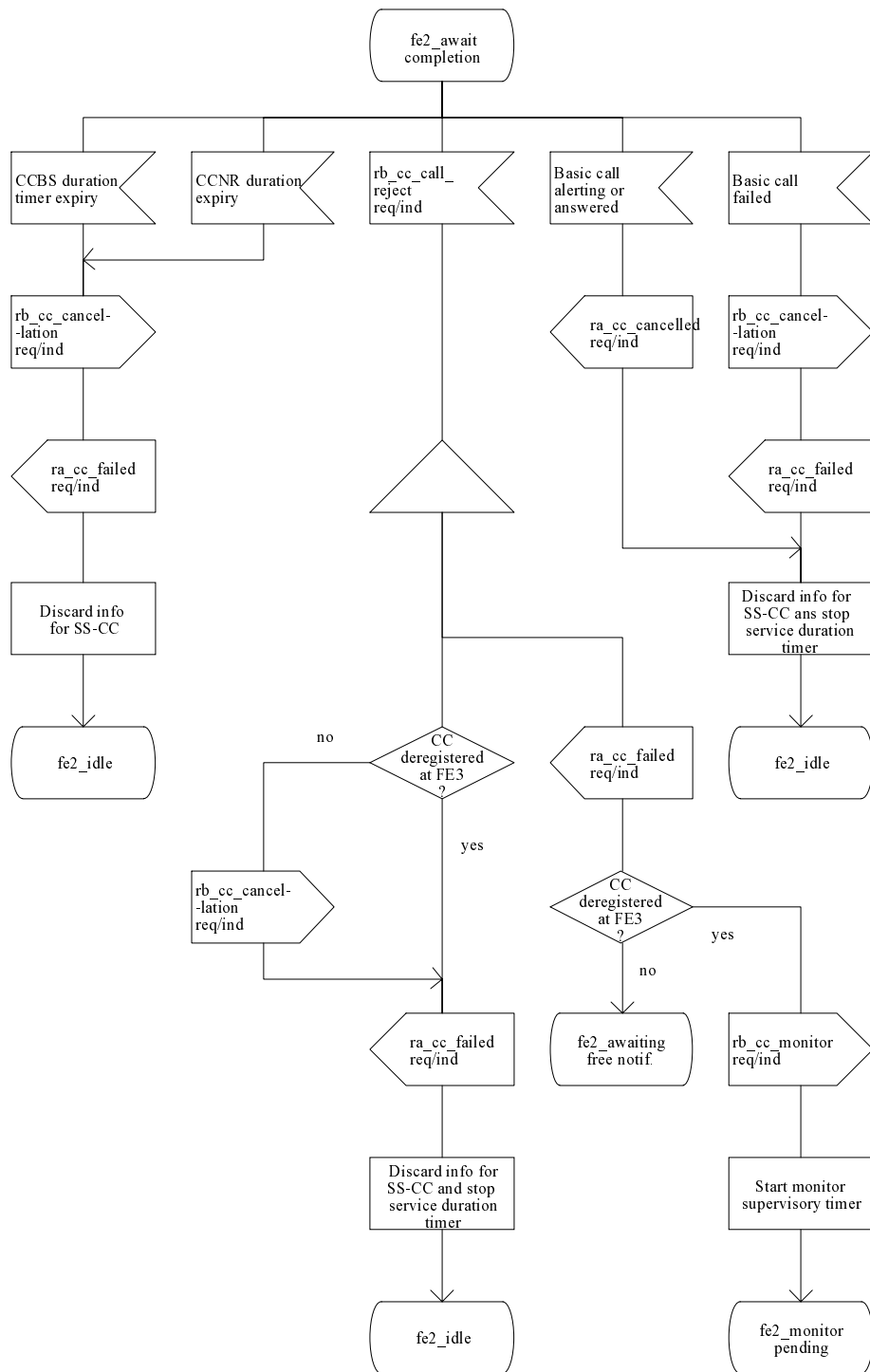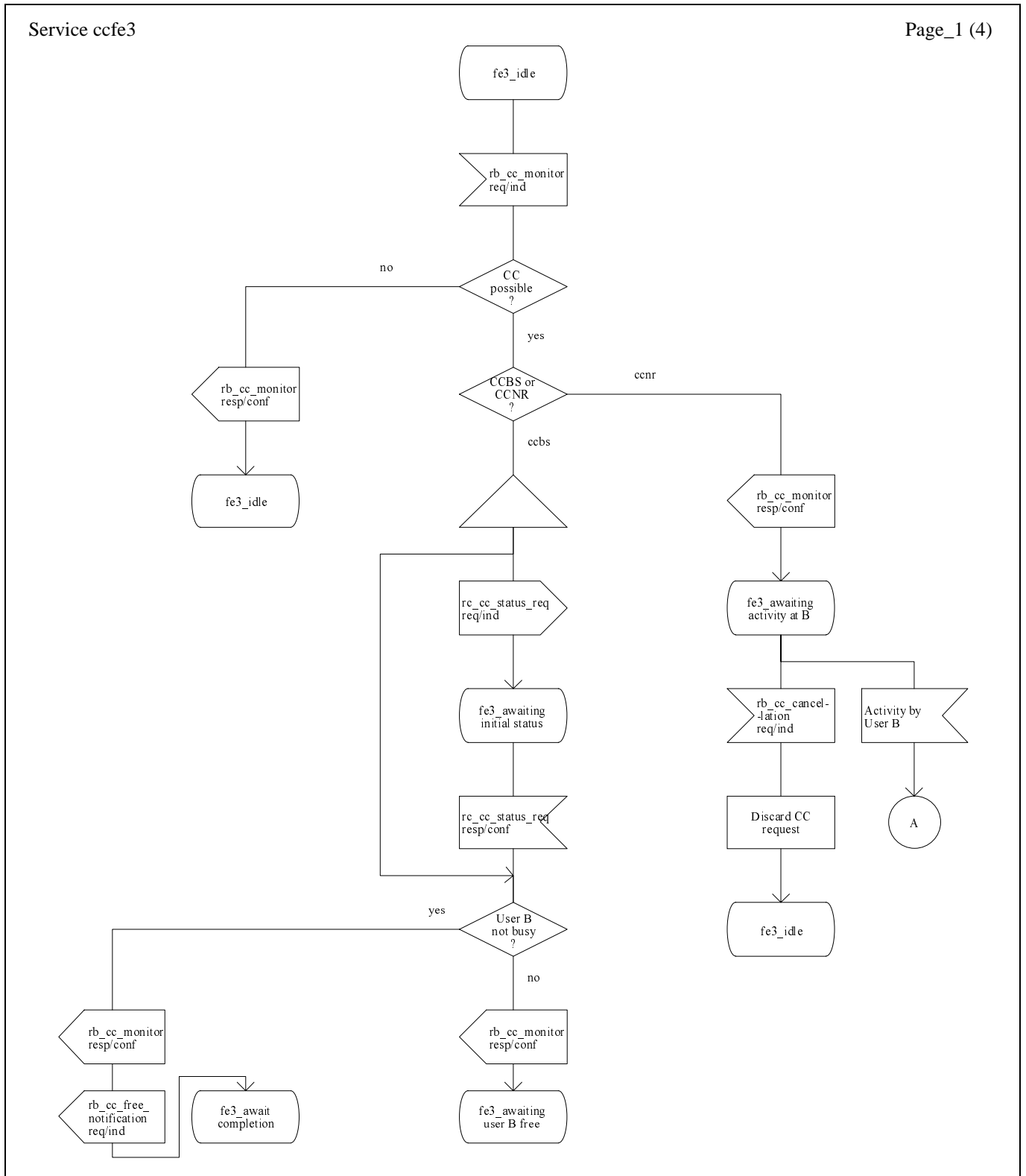
Service ccfe3   Page_1 (4)

fe3_idle

rb_cc_monitor
req/ind

CC
possible
?

no → rb_cc_monitor
resp/conf

fe3_idle

yes

CCBS or
CCNR
?

ccnr → rb_cc_monitor
resp/conf

fe3_awaiting
activity at B

rb_cc_cancel-
-lation
req/ind

Activity by
User B

Discard CC
request

A

fe3_idle

ccbs

rc_cc_status_req
req/ind

fe3_awaiting
initial status

rc_cc_status_req
resp/conf

User B
not busy
?

yes

rb_cc_monitor
resp/conf

rb_cc_free_
notification
req/ind

fe3_await
completion

no

rb_cc_monitor
resp/conf

fe3_awaiting
user B free

Figure 28 (sheet 1 of 4) - Behaviour of FE3

Service ccfe3   Page_2 (4)

fe3_awaiting
user B free

A

rb_cc_cancel-
-lation
req/ind

Stimulus to
check B

Discard
CC request

rc_cc_status_req
req/ind

fe3_idle

fe3_awaiting
status of B

rb_cc_cancel-
-lation
req/ind

rc_cc_status_req
resp/conf

Discard CC
request

B

fe3_idle

User B
not busy
?

yes

no

fe3_awaiting
user B free

rb_cc_free_
notification
req/ind

fe3_await
completion
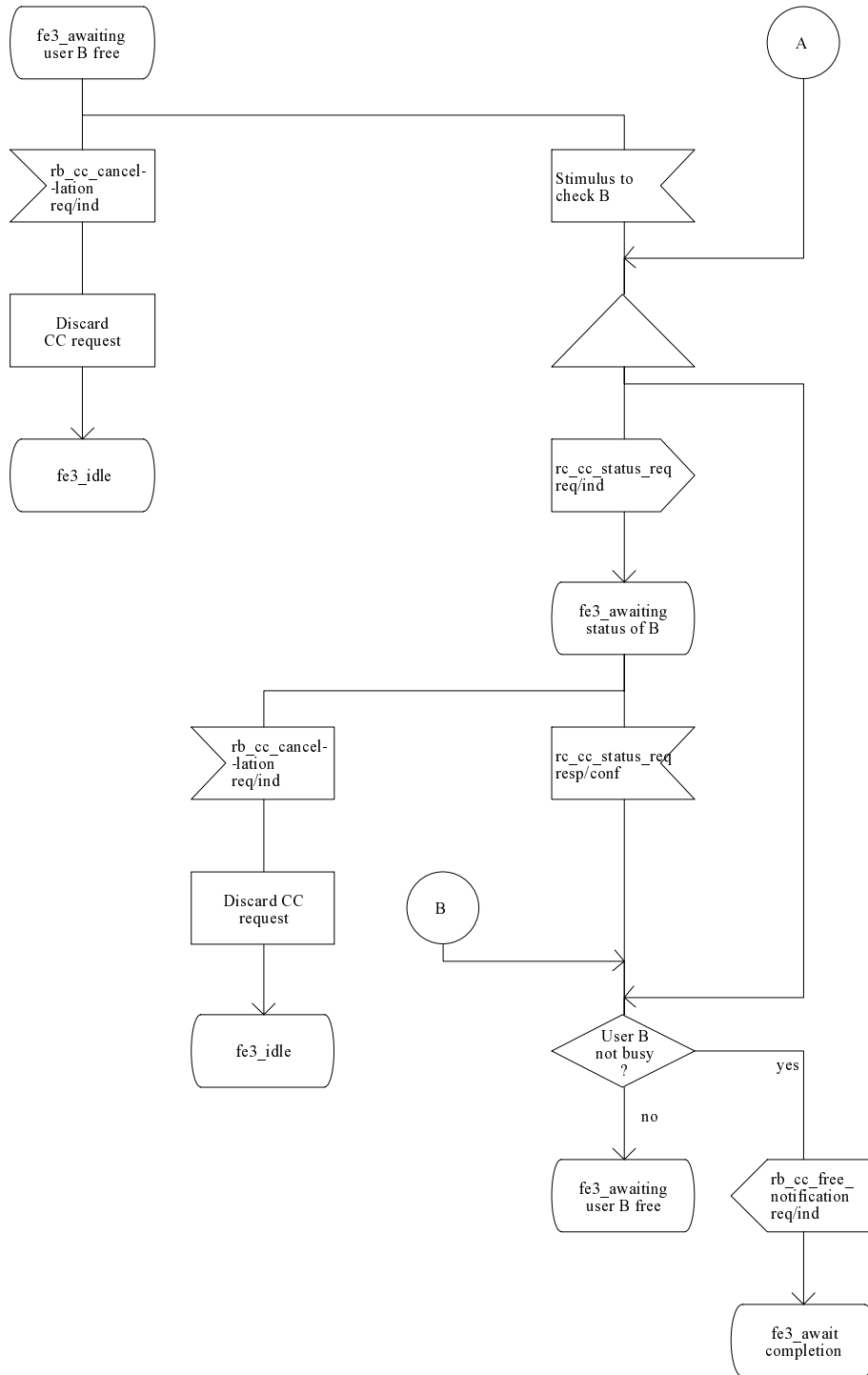
Figure 28 (sheet 2 of 4) - Behaviour of FE3

Service ccfe3   Page_3 (4)

Figure 28 (sheet 3 of 4) - Behaviour of FE3

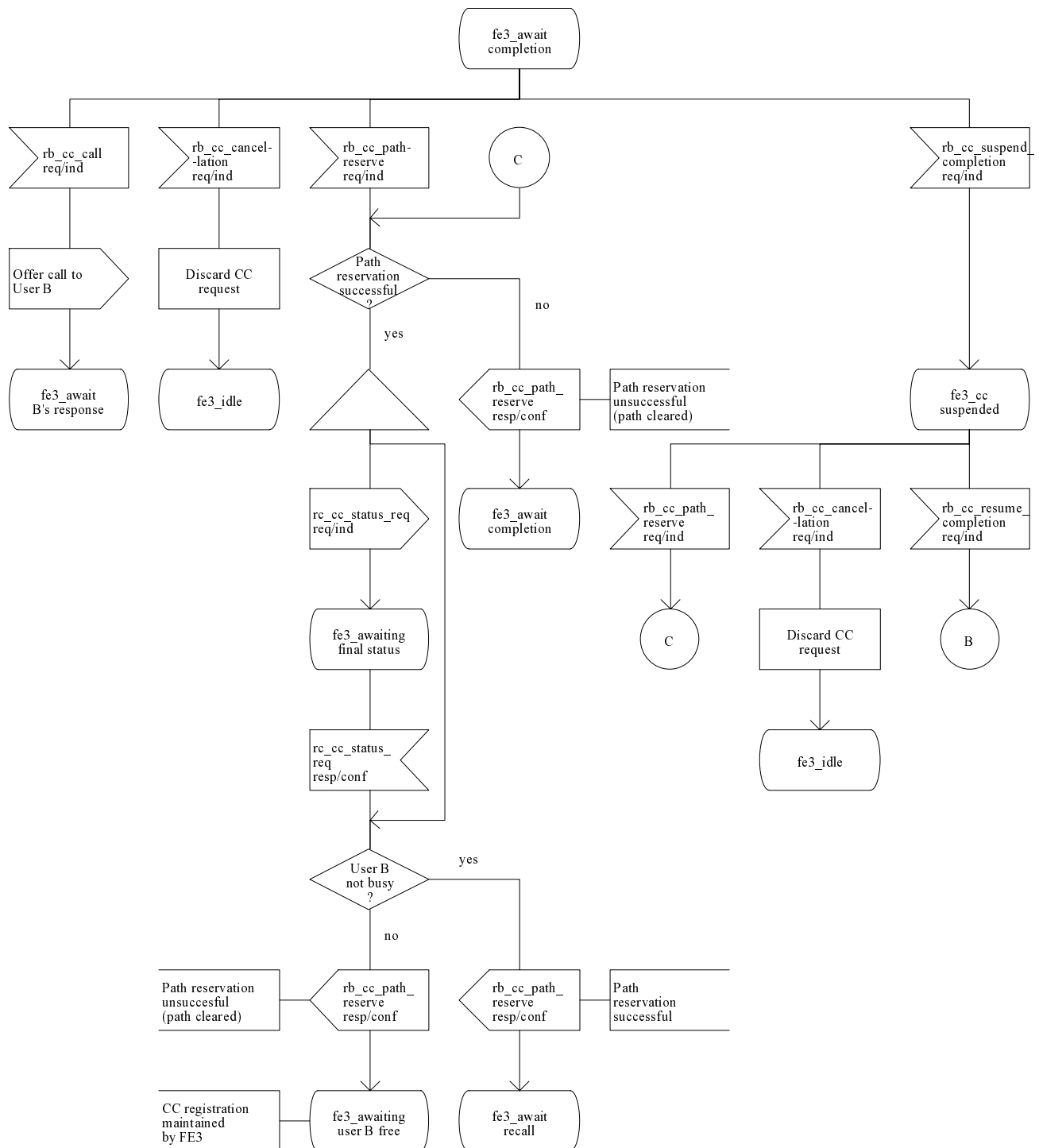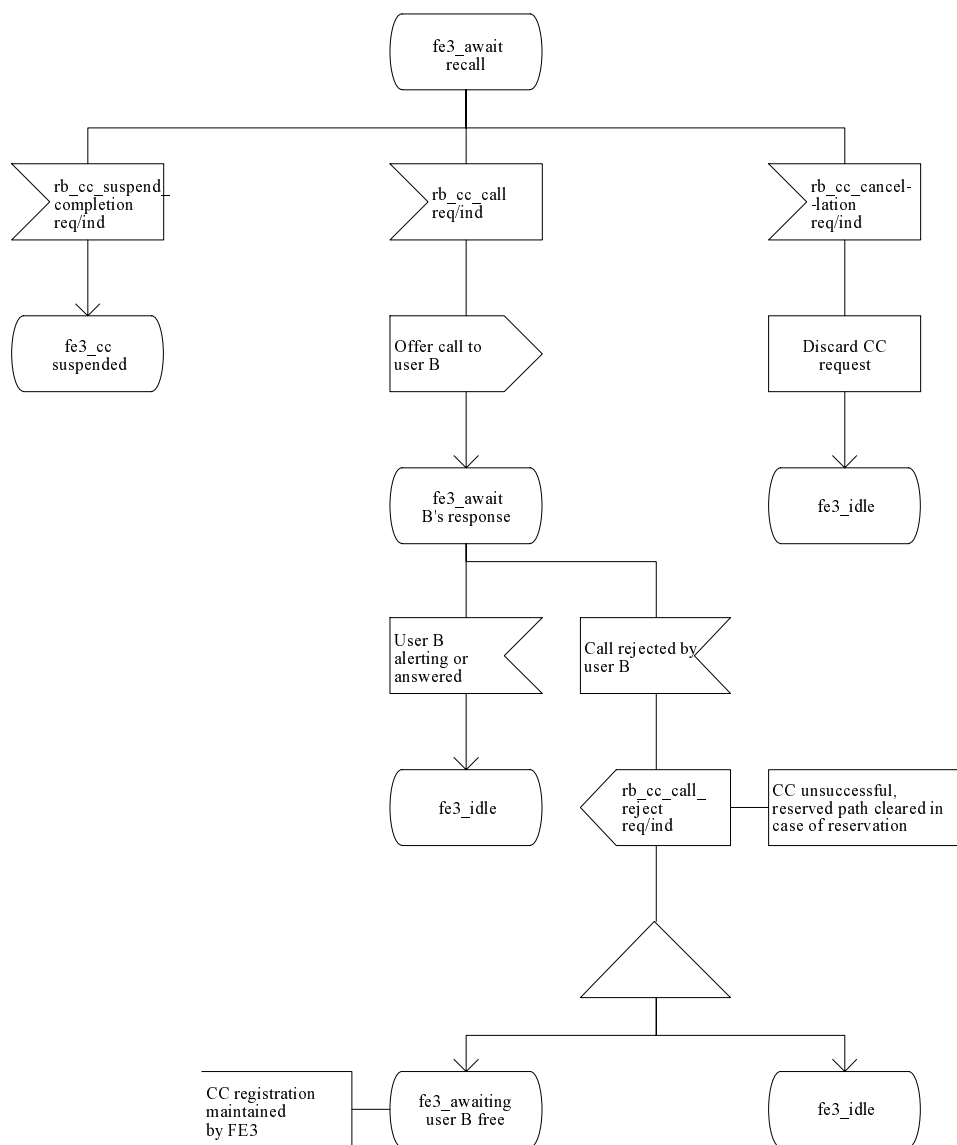Service ccfe3   Page_4 (4)

fe3_await
recall

rb_cc_suspend_
completion
req/ind

rb_cc_call
req/ind

rb_cc_cancel-
-lation
req/ind

fe3_cc
suspended

Offer call to
user B

Discard CC
request

fe3_await
B's response

fe3_idle

User B
alerting or
answered

Call rejected by
user B

fe3_idle

rb_cc_call_
reject
req/ind

CC unsuccessful,
reserved path cleared in
case of reservation

CC registration
maintained
by FE3

fe3_awaiting
user B free

fe3_idle

Figure 28 (sheet 4 of 4) - Behaviour of FE3

8.4.4 Behaviour of FE4

Figure 29 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.
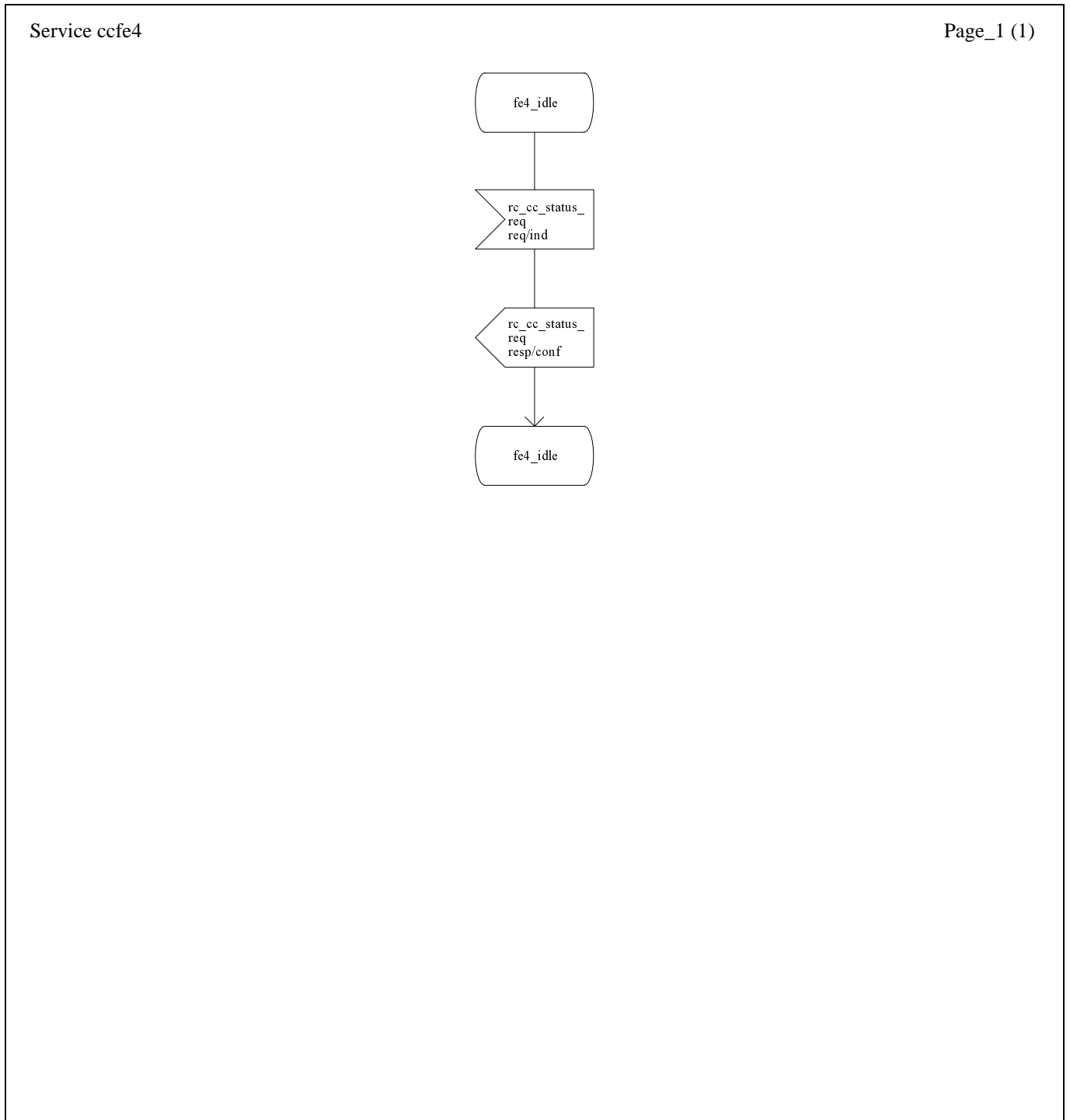
Service ccfe4   Page_1 (1)

fe4_idle

rc_cc_status_
req
req/ind

rc_cc_status_
req
resp/conf

fe4_idle

Figure 29 - Behaviour of FE4

8.5 Allocation of Functional entities to Physical Locations

The allocations of FEs to physical equipment shown in table 18 shall apply. Table 18 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 PTNX.

Table 18 - Scenarios for the Allocation of FEs to Physical Equipment

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

8.6 Interworking considerations

When interworking with a public ISDN, the SS-CC service cannot use path reservation due to the capabilities of the public ISDN service. The gateway PTNX shall ensure that the acknowledgement of the SS-CC monitor request generated from a received monitor confirmation from the public ISDN is forwarded to the requester of SS-CC indicating "no path reservation" in the case that monitoring of a Public ISDN user is requested. In the case of a SS-CC request from the Public ISDN, the Public ISDN will not request path reservation.

When interworking with another network which supports only path reservation, the gateway PTNX shall ensure that the acknowledgement of the SS-CC monitor request generated from a received monitor confirmation from the other network is forwarded to the requester of SS-CC not indicating "no path reservation" in the case that monitoring of a user in that other network is requested. If the PTN uses the non-path reservation subsequent to this request, the gateway PTNX will be responsible for performing the reservation in the other network when the rb_CC_call request/indication flow is received from FE2.

Annex A (informative):   Relationship to corresponding public ISDN standards

SS-CCBS for PTNs specified in this ETS complements and is compatible with the CCBS supplementary service for public ISDNs as specified in ETS 300 357 and ETS 300 358 for stages 1 and 2 respectively. There are no differences which will prevent terminal interchangeability between PTNs and public ISDNs. However, there are significant differences in PTN internal operation. There are also differences in the style and layout of this ETS in comparison with the corresponding ETSs for the public ISDN. The main differences can be summarised as follows.

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

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

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

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

5. In the public ISDN stage 1, the procedures for invocation, listing and cancellation of SS-CCBS (as described in this ETS) are included as 'activation', 'interrogation' and 'deactivation' respectively.

6. The Idle Guard timer in the public ISDN service (which allows a delay before recall of User A to allow User B to initiate another call) is not specified as part of this ETS.

7. Both the path reservation and non path reservation options are included in this ETS. The path reservation option is not specified in the Public ISDN standard.

8. The limitation on the maximum number of SS-CCBS requests User A may have outstanding in the public ISDN service (5) is left as an implementation matter in this ETS.

9. The restriction defined in the public ISDN standard to forbid the offering of new calls to User B whilst recall of User A is pending is left as an implementation matter in this ETS.

10. The limitation on the maximum number of SS-CCBS requests outstanding on User B in the public ISDN service (5) is left as an implementation matter in this ETS.

11. The mechanism for 'queueing' SS-CCBS requests at User B is specified in the public ISDN standard, but left as an implementation matter in this ETS.

12. This ETSs allows duplicate SS-CC invocation requests to be treated in an implementation specific manner, whereas the public ISDN service mandates that the duplicate request replaces the original request.

13. This ETS does not specify the CCBS AVAILABLE req/ind information flow of the Public ISDN standard.

This ETS also specifies SS-CCNR, which is not currently specified for Public ISDN's.

Annex B (informative):   Bibliography

ETS 300 357:   Integrated Services Digital Network (ISDN), Completion of Calls to Busy Subscriber (CCBS) supplementary service; Service description (1994)

ETS 300 358:   Integrated Services Digital Network (ISDN), Completion of Calls to Busy Subscriber (CCBS) supplementary service; Functional capabilities and information flows (1994)

History

Document history	
July 1994	First Edition
February 1996	Converted into Adobe Acrobat Portable Document Format (PDF)