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ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 4 92 94 42 00 - Fax: +33 4 93 65 47 16

Contents

Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Business TeleCommunications (BTC) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

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

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1 Scope

This European Telecommunications Standard (ETS) describes the stage 2 of the Cordless Terminal Handover Additional Network Feature (ANF-CTH) for a Private Integrated Services Network (PISN).

ANF-CTH is an additional network feature that enables a Cordless Terminal Mobility (CTM) user to maintain a call while moving between overlapping location areas belonging to the same visitor area.

This ANF is applicable to all circuit mode basic services as defined in ETS 300 171 [3].

> NOTE 1: The HandOver (HO) procedures described in this document are only applicable on HO between location areas controlled by the same Private Integrated services Network eXchange (PINX).

Additional network feature specifications are produced in three stages according to the method specified in ENV 41005 [2]. This ETS contains the stage 2 specifications of ANF-CTH. It identifies the functional entities involved in the service and the information flows between them.

> NOTE 2: The information flow across the air-interface is outside the scope of this ETS.

The purpose of the stage 2 specification is to guide and constrain the work on signalling protocols at stage 3, while fulfilling the requirements of stage 1 ETS 300 816 [6]. Stage 1 and stage 3 are defined in separate standards.

This ETS contains two stage 2 specifications reflecting different ways of selecting the new location area: selection of the new location area by the CTM user and selection of the new location area by the network.

Conformance to this ETS is met by conforming to a stage 3 standard which fulfils the requirements of this ETS that are relevant to the equipment for which the stage 3 standard applies. Therefore no method of testing is provided for this ETS.

2 Normative references

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

[1]   CCITT Recommendation I.210 (1988): "Principles of telecommunication services supported by an ISDN and the means to describe them".

[2]   ENV 41005 (1989): "Method for the specification of basic and supplementary services of private telecommunication networks".

[3]   ETS 300 171 (1992): "Private Telecommunication Network (PTN) - Specification, functional model and information flows - Control aspects of circuit mode basic services".

[4]   ETS 300 415 (1996): "Private Integrated Services Network (PISN); Terms and definitions".

[5]   CCITT Recommendation Z.100 (1988): "Functional Specification and Description Language (SDL)".

[6]   ETS 300 816 (1996): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Handover Additional Network Feature; Service Description".

3 Definitions and abbreviations

3.1 Definitions

This ETS uses the following terms defined in other documents:

Address:	See ETS 300 415 [4].
Call (basic call):	See ETS 300 171 [3].
Cordless terminal mobility:	See ETS 300 415 [4].
Fixed part:	See ETS 300 415 [4].
Private telecommunication network:	See ETS 300 415 [4].
Private integrated services network exchange:	See ETS 300 415 [4].
PISN number:	See ETS 300 415 [4].
Supplementary service:	See CCITT Recommendation I.210 [1].
Visitor Data Base:	See ETS 300 415 [4].
Visitor area:	See ETS 300 415 [4].

> NOTE: For the purpose of this ETS the visitor area is confined to the coverage area of a single PINX.

This ETS refers to the following Functional Entities (FEs) defined for basic call control ETS 300 171 [3]:

Call Control: Generic functional entity of Call Control.

Call Control Agent: Generic functional entity of Call Control Agent.

This ETS refers to the following inter-FE relationships defined for basic call control ETS 300 171 [3]:

r1: The access relationship between an Originating Call Control Agent functional entity and an Originating Call Control functional entity.

r3: The access relationship between a Destination Call Control Agent functional entity and a Destination Call Control functional entity.

For the purposes of this ETS, the following definitions apply:

CTM user: A PISN user whose calls are processed by the additional network feature ANF-CTH.

Established call: A call for which communication between the end users is possible.

Visitor PINX: The PINX which has direct access to the VDB entry associated with a particular CTM user.

Location area: The coverage area in which a cordless terminal may receive and make calls as a result of a single location registration.

PISN user: A user whose terminal is directly attached to a PISN and therefore can directly use the bearer services and teleservices of the PISN.

User: An entity which uses bearer services or teleservices of a PISN.

3.2 Abbreviations

CC	Call Control functional entity
CCA	Call Control Agent functional entity
ANF	Additional Network Feature
ANF-CTH	Cordless Terminal mobility Handover-Additional Network Feature
CTM	Cordless Terminal Mobility
FE	Functional Entity
FEA	Functional Entity Action
FP	Fixed Part
HO	HandOver
PTN	Private Telecommunication Network
PTNX	Private Telecommunication Network Exchange
SDL	Specification and Description Language
VDB	Visitor Data Base

4 ANF-CTH Stage 2 Description - new location area selected by the CTM user

This clause defines the stage 2 of the CTM Handover Additional Network Feature (ANF-CTH) where the new location area is selected by the CTM user.

4.1 Description

ANF-CTH enables a CTM user involved in a call to continue with the call while moving between overlapping location areas within the same visitor area.

> NOTE: During HO, there may be a brief interruption to the established connection. This ANF should only be used in conjunction with basic services where such a temporary interruption is permissible.

4.2 Derivation of the functional model

4.2.1 Functional model description

The functional model shall comprise the following Functional Entities (FEs).

FE1: CTM user's service agent.

FE2: CTM Handover service execution entity.

FE3: Security Parameter Storage entity.

The following functional relationships shall exist between these FEs;

ra between FE1 and FE2.

rc between FE2 and FE3.

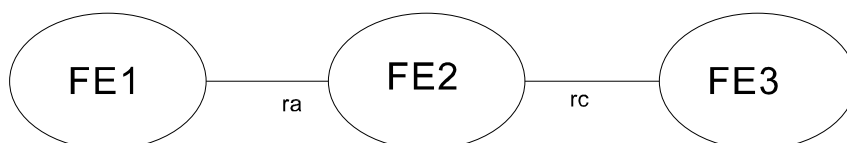Figure 1 shows the FEs and relationships for the handover of a call involving a CTM user.

Figure 1: Functional model for the handover of a call involving a CTM user

4.2.2 Description of functional entities

4.2.2.1 CTM user's service agent, FE1

This FE sends a request to FE2 to re-route the CTM user's call from its current location area to the new location area.

4.2.2.2 CTM Handover service execution entity, FE2

On request from FE1, this FE re-routes the user's call from its current location area to the new location area. It is also responsible for retrieving security parameters from FE3.

4.2.2.3 Security Parameter Storage entity, FE3

This FE provides on request from FE2, information on the security parameters currently in use by the CTM user.

4.2.3 Relationship with a basic service

An example of the relationship between the functional model and a basic service is shown in figure 2. This example is used as the basis for the information flow sequence diagrams in subclause 4.3.
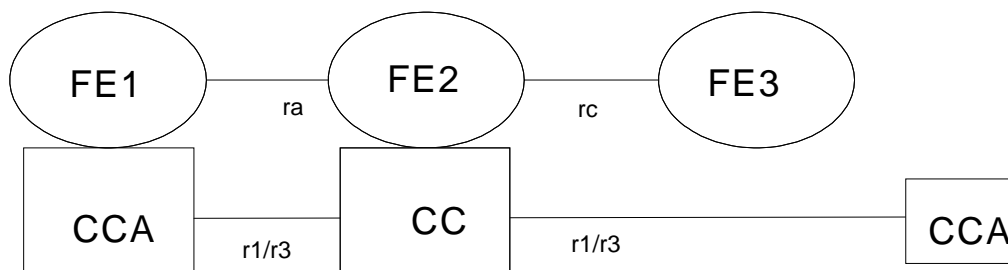
Figure 2: Functional entity model relationship

4.3 Information flows

4.3.1 Information flow sequences

A stage 3 standard shall be capable of providing the information flows shown in figures 3 to 5. It can specify further information flows, e.g. to deal with additional exceptional conditions.

ANF-CTH information flows are shown as solid arrows and basic call information flows are represented by broken arrows. An ellipse embracing two information flows indicates that these flows occur together. Within a column representing an ANF-CTH functional entity, the numbers refer to functional entity actions listed in subclause 4.5.

The information flow sequence for successful HO operation is shown in figure 3.

Figure 3: Information flow sequence for successful handover

Information flow sequences for unsuccessful handover operations are shown in figures 4 and 5.

Figure 4: Information flow sequence for unsuccessful handover:
CTM user not authorized for handover

Figure 5: Information flow sequence for unsuccessful handover:
Rejection of handover by CTM user

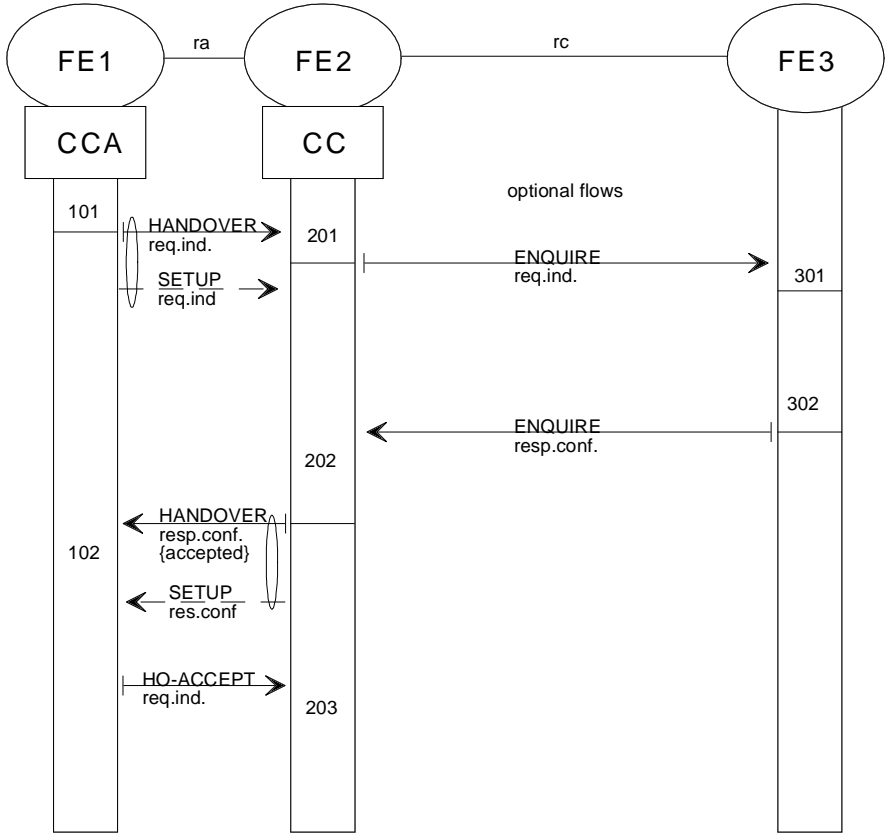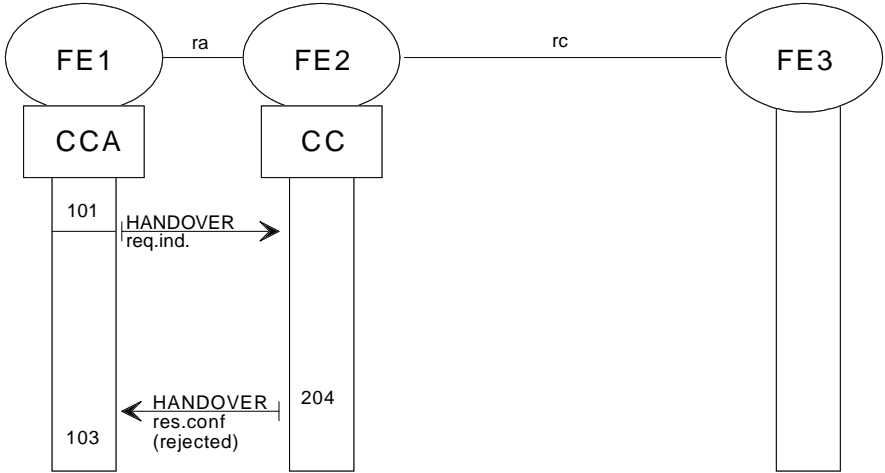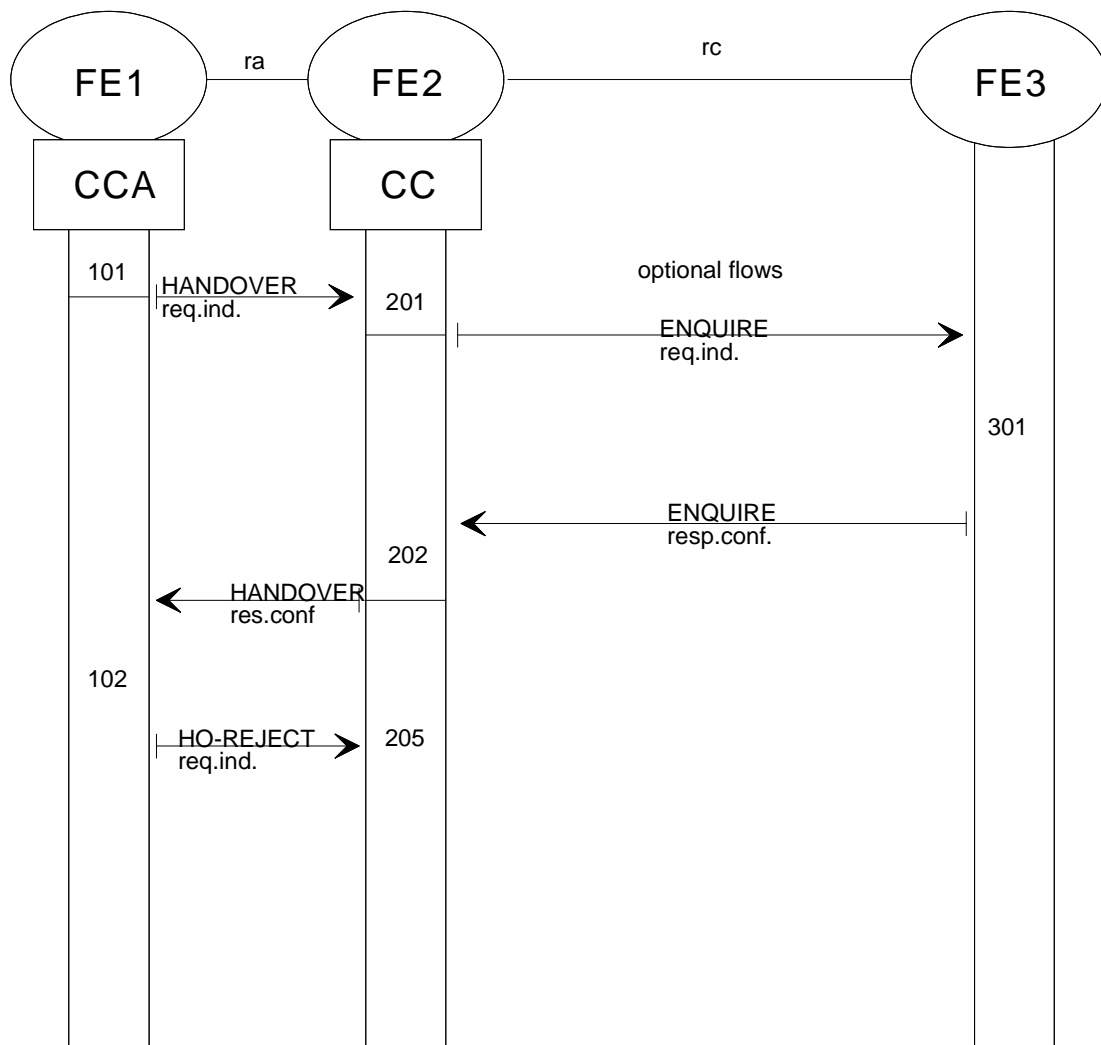### 4.3.2   Definition of information flows

4.3.2.1   ENQUIRE

This optional confirmed information flow conveys a request to provide information regarding the security parameters currently in use by the CTM user. It shall be sent across relationship rc and shall contain the service elements listed in table 1.

Table 1: Contents of ENQUIRE

Service element	Allowed value	Request	Confirm
CTM user's identity		M	
Enquiry result	Security parameters CTM user unknown Security parameters not available		M
NOTE: Security parameters could include a cipher key.			

4.3.2.2   HANDOVER

This confirmed information flow indicates to FE2 that the call should be re-routed through the new location area. It shall be sent across relationship ra and shall contain the service elements listed in table 2.

Table 2: Contents of HANDOVER

Service element	Allowed value	Request	Confirm
CTM user's identity		M	
Call-identifier		O	
Handover result	Accepted Temporarily Rejected Rejected		M
Cipher indication	Yes/No	O	
Security parameters	Security parameters Enquiry failed		O (note)
NOTE: Security parameters are Mandatory if cipher indication has been requested.			

4.3.2.3   HO-ACCEPT

This unconfirmed information flow is used to indicate that a CTM user has accepted HO to a new location area. It shall be sent across relationship ra from FE1 to FE2.

4.3.2.4   HO-REJECT

This unconfirmed information flow indicates that the previous handover request has been rejected and that the call will continue at the old location area. It shall be sent across relationship ra from FE1 to FE2.

4.4   Functional entity behaviour

The figures in this clause 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) CCITT Recommendation Z.100 [5]. Each input and output symbol is labelled to show the source FE of input signals or the destination FE of output signals.

4.4.1 Behaviour of FE1

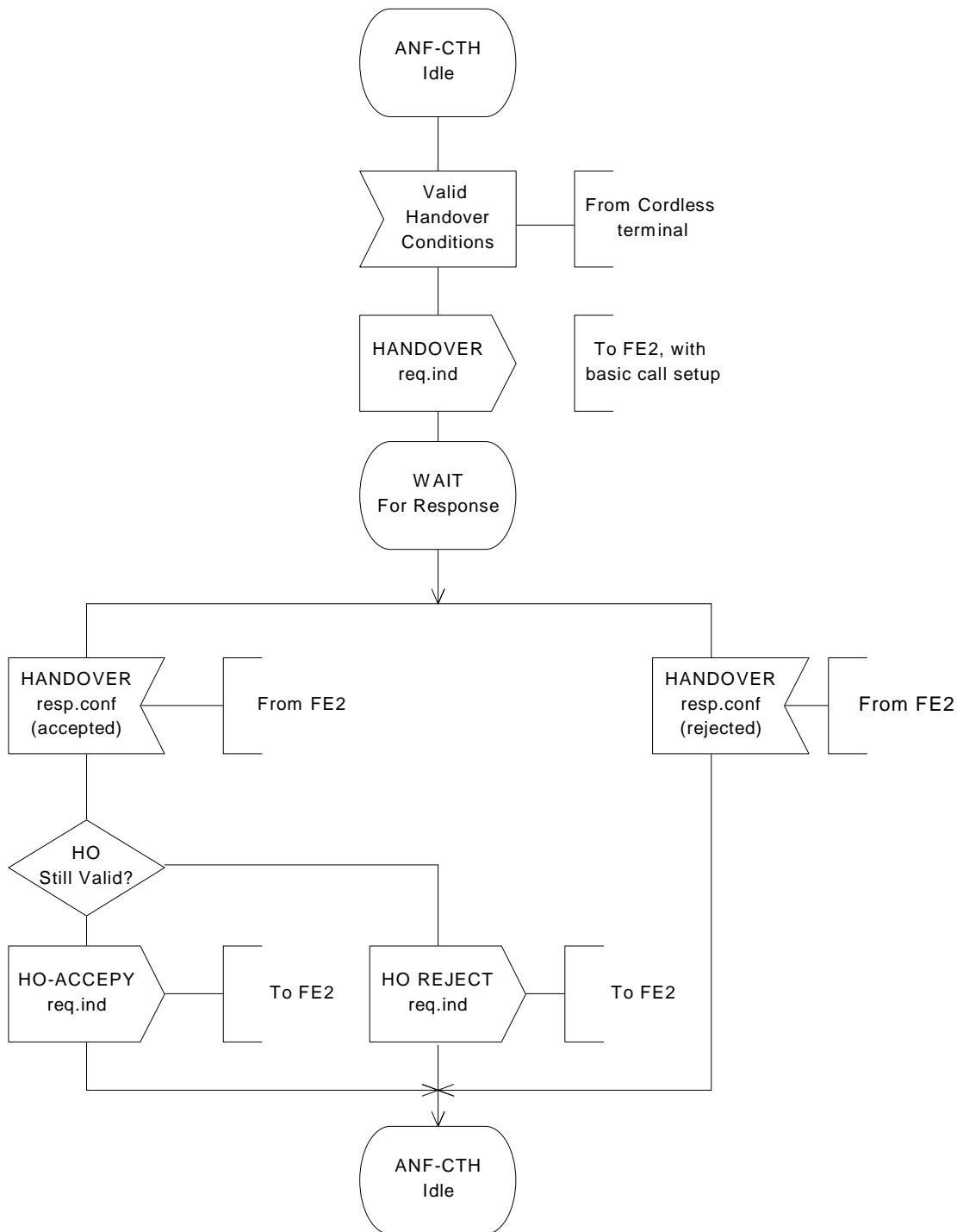Figure 6 contains the SDL diagram for the functional entity FE1.

```
                    ┌─────────────┐
                    │  ANF-CTH    │
                    │    Idle     │
                    └─────────────┘
                           │
                    ┌──────────────┐      ┌──────────────┐
                    │    Valid     │      │ From Cordless │
                    │  Handover    ├──────┤  terminal     │
                    │  Conditions  │      └──────────────┘
                    └──────────────┘
                           │
                    ┌──────────────┐      ┌──────────────┐
                    │  HANDOVER    │      │  To FE2, with │
                    │   req.ind    ├──────┤ basic call setup │
                    └──────────────┘      └──────────────┘
                           │
                    ┌─────────────┐
                    │    WAIT      │
                    │ For Response │
                    └─────────────┘
                           │
```

HANDOVER resp.conf (accepted) — From FE2

HANDOVER resp.conf (rejected) — From FE2

HO Still Valid?

HO-ACCEPY req.ind — To FE2

HO REJECT req.ind — To FE2

```
                    ┌─────────────┐
                    │  ANF-CTH    │
                    │    Idle     │
                    └─────────────┘
```

Figure 6: SDL for Functional Entity FE1

4.4.2 Behaviour of FE2

Figure 7 contains the SDL diagram for the functional entity FE2.
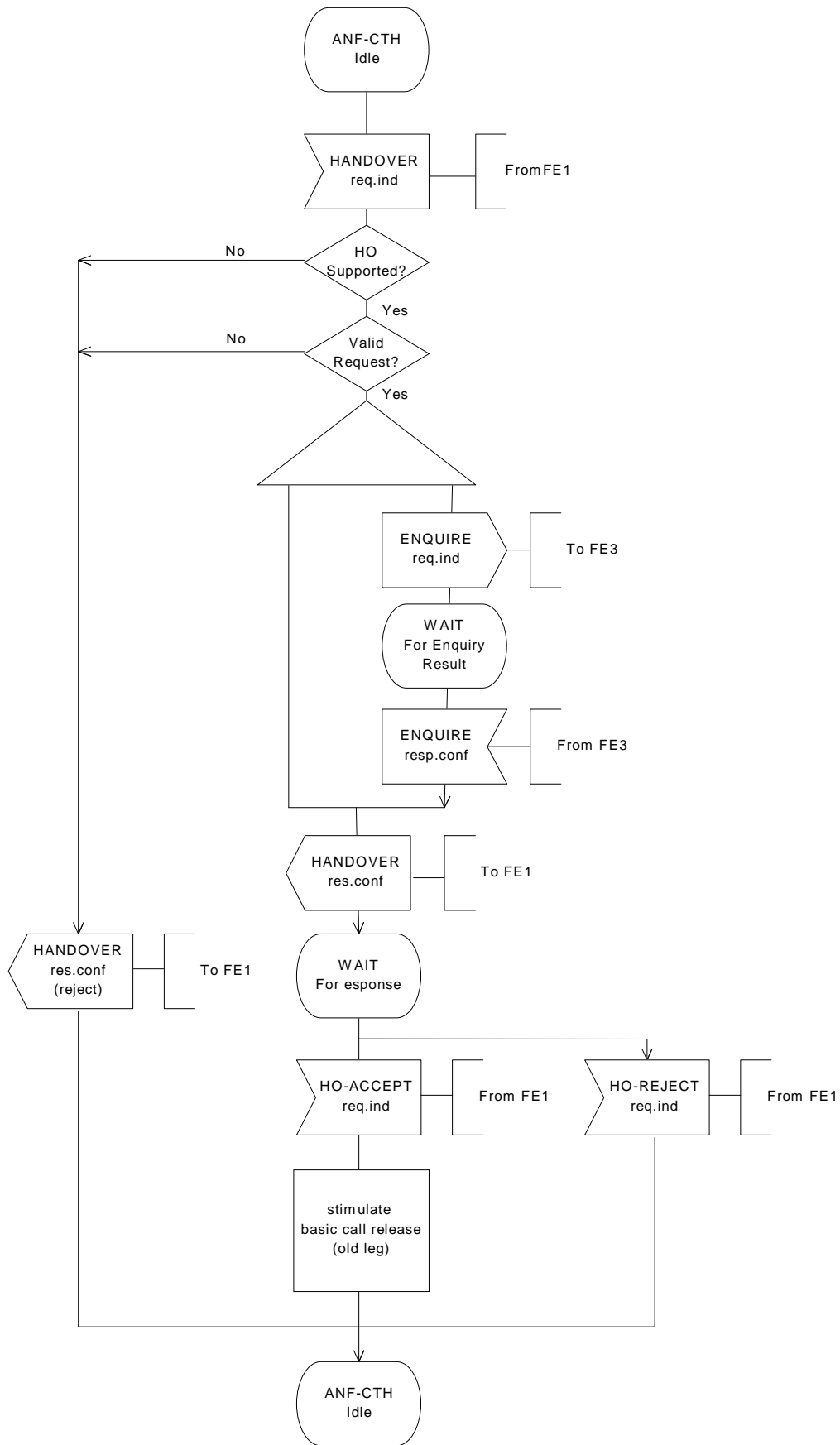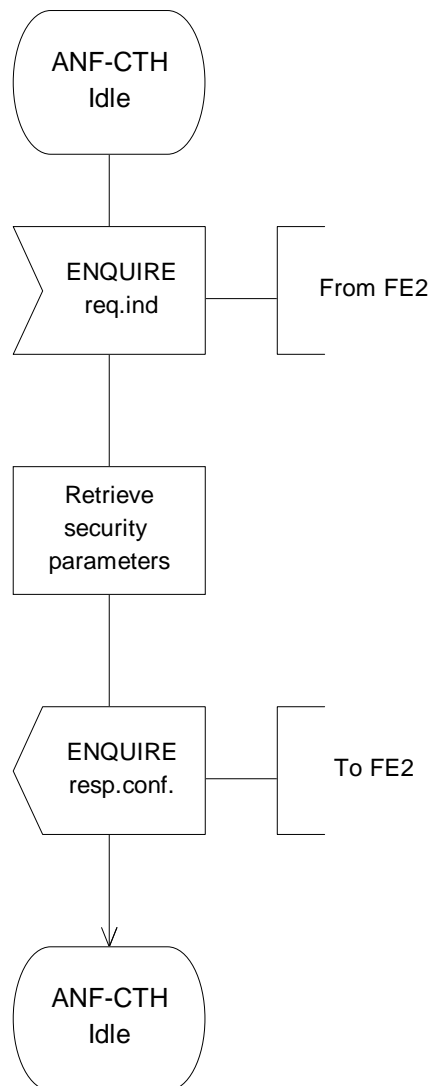
Figure 7: SDL for Functional Entity FE2

4.4.3 Behaviour of FE3

Figure 8 contains the SDL diagram for the functional entity FE3.

Figure 8: SDL for Functional Entity FE3

4.5 Functional Entity Actions (FEAs)

The following functional entity actions shall take place at the points indicated in the information flow sequences in subclause 4.3.

4.5.1 FEAs of FE1

101 Detect that valid conditions for handover exist. Send HANDOVER req.ind to FE2, together with basic call setup request.

102 Receive HANDOVER conf. from FE2. If valid conditions for handover still exist, establish the new call to the CTM user then send HO-ACCEPT req.ind to FE2. If handover conditions do not exist, send HO-REJECT req.ind to FE2.

103 Receive HANDOVER resp.conf (rejected) from FE2.

4.5.2 FEAs of FE2

201 Receive HANDOVER req.ind together with basic call setup request from FE1. If handover is supported, optionally send ENQUIRE req.ind to FE3.

202 Receive ENQUIRE resp.conf from FE3 and send HANDOVER resp.conf to FE1, together with basic call setup response.

203 Receive HO-ACCEPT req.ind from FE1, and stimulate the release of the connection over the old FP.

204 Receive HANDOVER req.ind together with basic call setup request from FE1. If handover is not possible, send HANDOVER resp.conf (rejected) to FE1.

205 Receive HO-REJECT req.ind from FE1.

4.5.3 FEAs of FE3

301 Receive ENQUIRE req.ind from FE2. Get the security parameters, formulate ENQUIRE resp.conf and send to FE2.

4.6 Allocation of functional entities to physical locations

The allocation of FEs to physical locations is shown in table 3.

Within the context of this table:

- the end PINX is the PINX to which the FP is connected;
- the visitor PINX shall be the end PINX.

Table 3: Allocation of FEs to physical locations

	FE1	FE2	FE3
Scenario 1	FP New	End PINX	Visitor PINX
Scenario 2	End PINX	End PINX	Visitor PINX
Scenario 3	FP New	End PINX	Old FP
Scenario 4	End PINX	End PINX	Old FP

4.7 Interworking considerations

Not applicable.

5 ANF-CTH stage 2 description for handover - new location area selected by the network

This clause defines the stage 2 of the CTM Handover Additional Network Feature (ANF-CTH) for the case where the network selects the new location area.

5.1 Description

Subclause 4.1 shall apply.

5.2 Derivation of the functional model
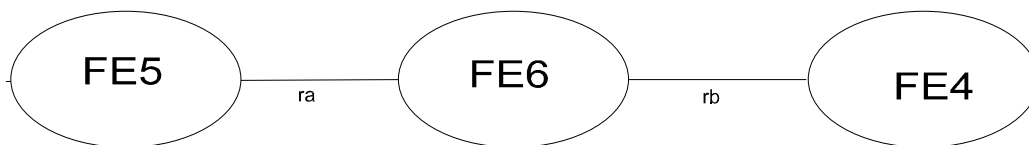
5.2.1 Functional model description

The functional model shall comprise the following Functional Entities (FEs):

FE4: CTM user's new service agent;
FE5: CTM user's old service agent;
FE6: CTM handover service execution entity.

The following functional relationships shall exist between these FEs:

    ra   between FE5 and FE6;
    rb   between FE4 and FE6.

Figure 9 shows the FEs and relationships for the handover of a call involving a CTM user.

Figure 9: Functional model for the handover of a call involving a CTM user

5.2.2 Description of functional entities

5.2.2.1 CTM user's old service agent, FE5

This FE sends a request to FE6 to re-route the CTM user's call from its current location area to a new location area.

5.2.2.2 Handover service execution entity, FE6

On request from FE5, this FE selects a new location area and re-routes the user's call from its current location to the new location area.

5.2.2.3 CTM user's new service agent, FE4

On request from FE6, this FE determines whether or not it is suitable for the new leg of the handover call. It also accepts a call establishment request from FE6 and completes the new connection to the CTM user.

5.2.3 Relationship with a basic service

An example of the relationship between the functional model and a basic service is shown in figure 10. This example is used as the basis for the information flow sequence diagrams in subclause 5.3.
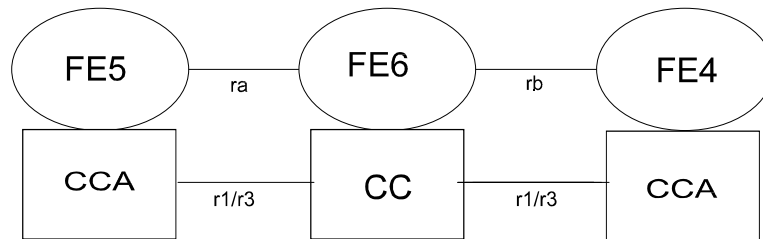

**Figure 10: Functional entity model relationship**

5.3 Information flows

5.3.1 Information flow sequences

A stage 3 standard shall be capable of providing the information flows shown in figures 11 to 14. It can specify further information flows, e.g. to deal with additional exceptional conditions.

ANF-CTH information flows are shown as solid arrows and basic call information flows are represented by broken arrows. An ellipse embracing two information flows indicates that these flows occur together. Within a column representing an ANF-CTH functional entity, the numbers refer to functional entity actions listed in subclause 5.5.

The information flow sequence for successful handover operation is shown in figure 11.
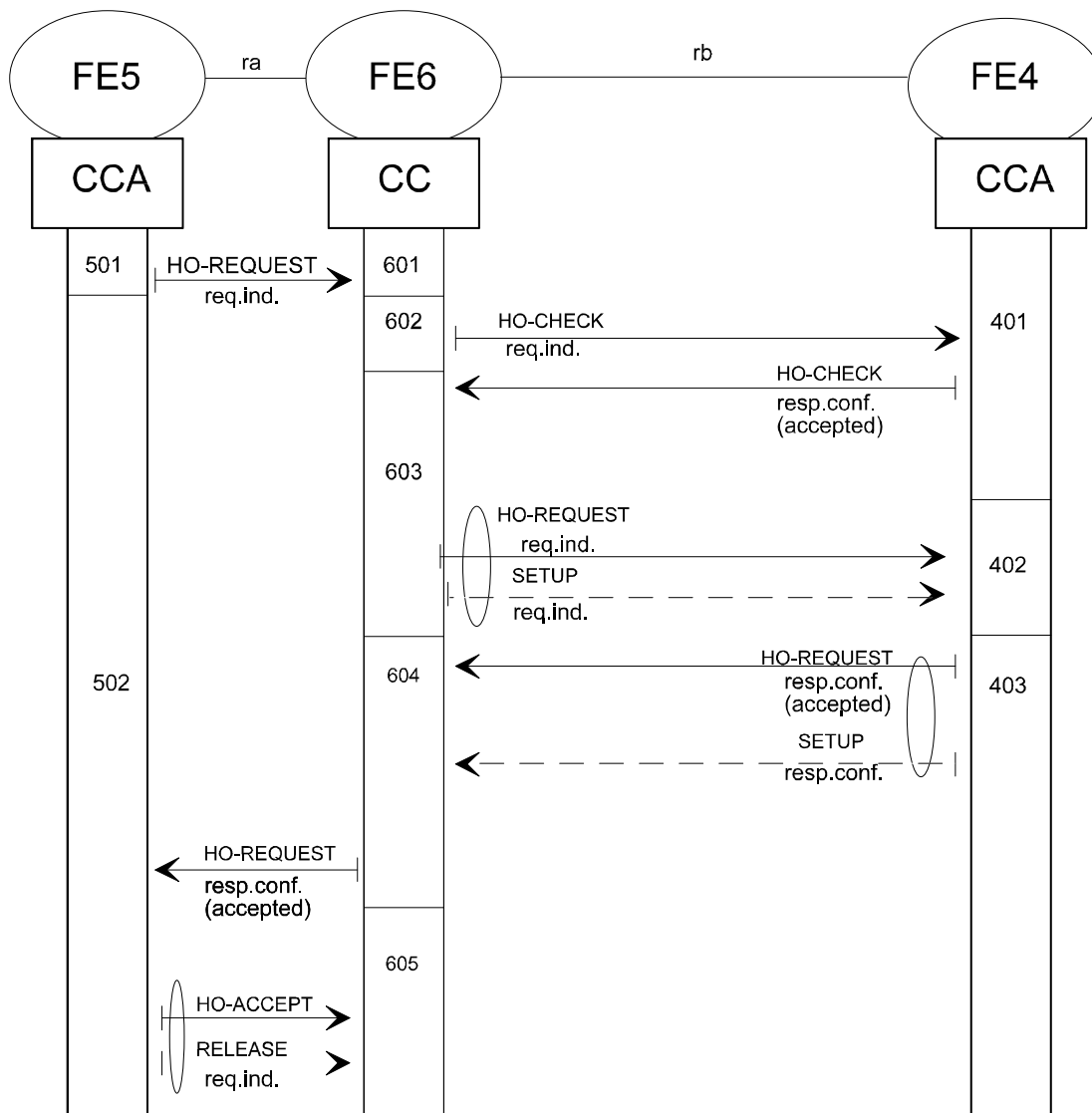
Figure 11: Information flow sequence for successful handover

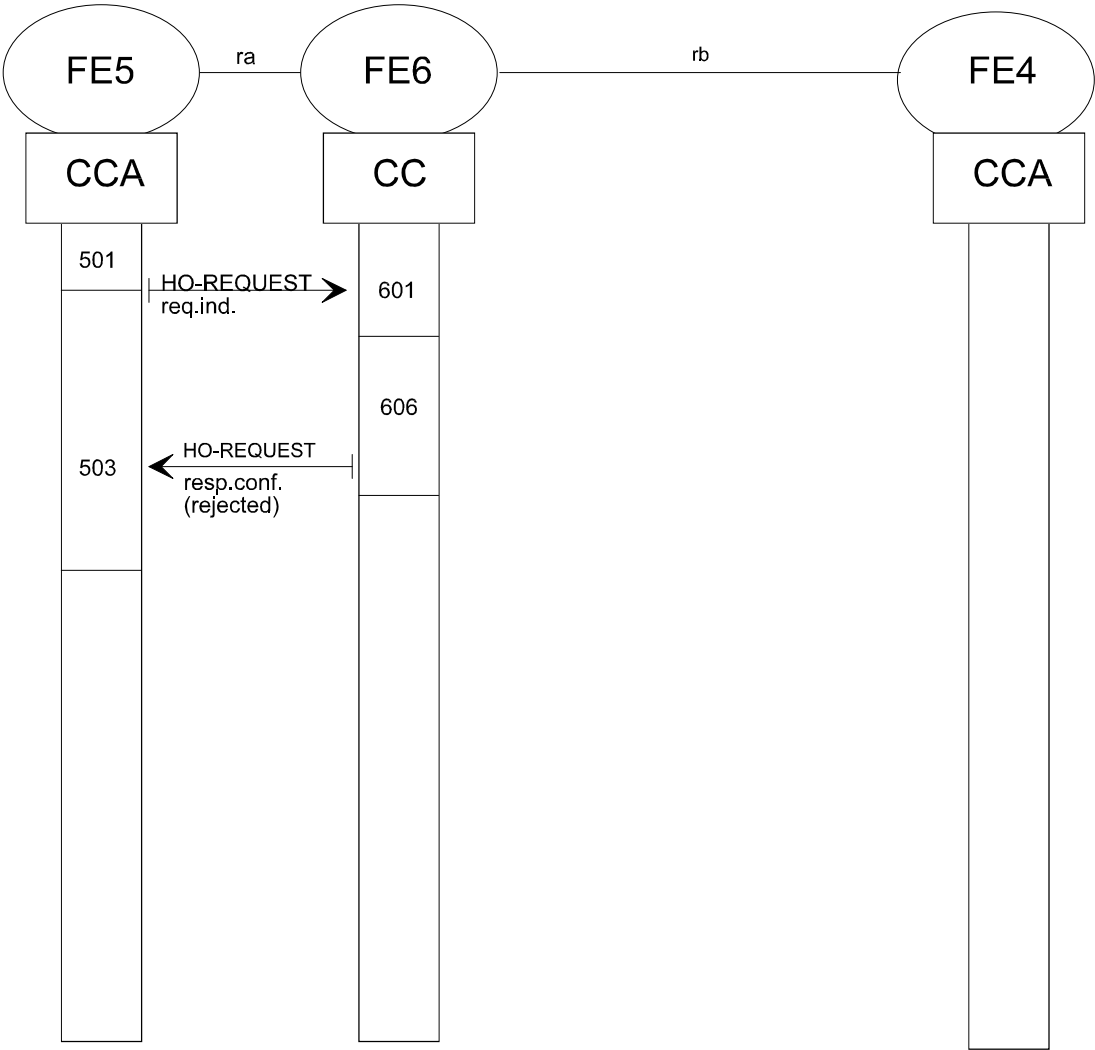Information flow sequences for unsuccessful handover operations are shown in figures 12, 13, 14 and 15.

Figure 12: Information flow sequence for unsuccessful handover: handover request not allowed

FE5   ra   FE6   rc   FE4

CCA   CC   CCA

501

HO-REQUEST
req.ind.   601

HO-CHECK
602   req.ind.
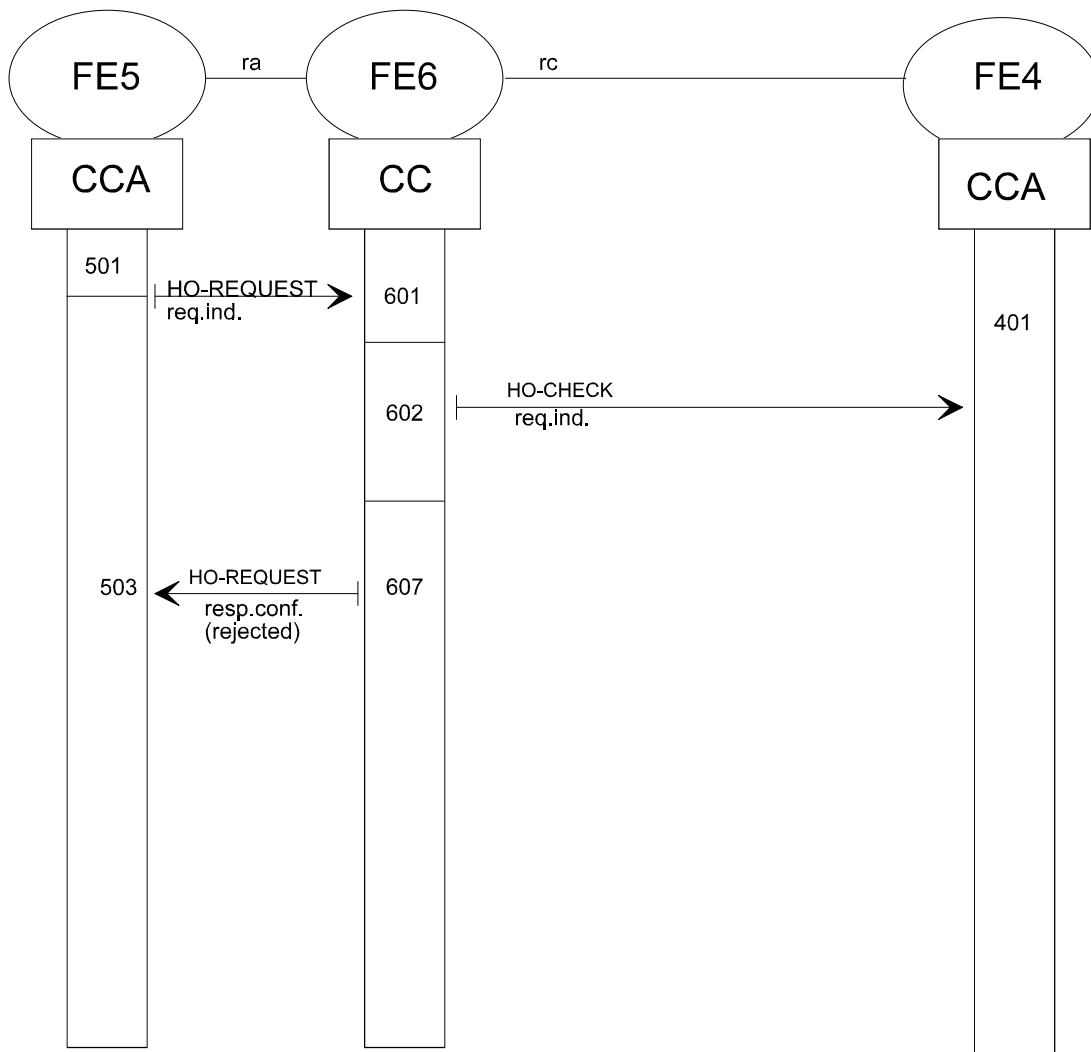
401

503   HO-REQUEST   607
resp.conf.
(rejected)

Figure 13: Information flow sequence for unsuccessful handover: FE4 unable to accept the call
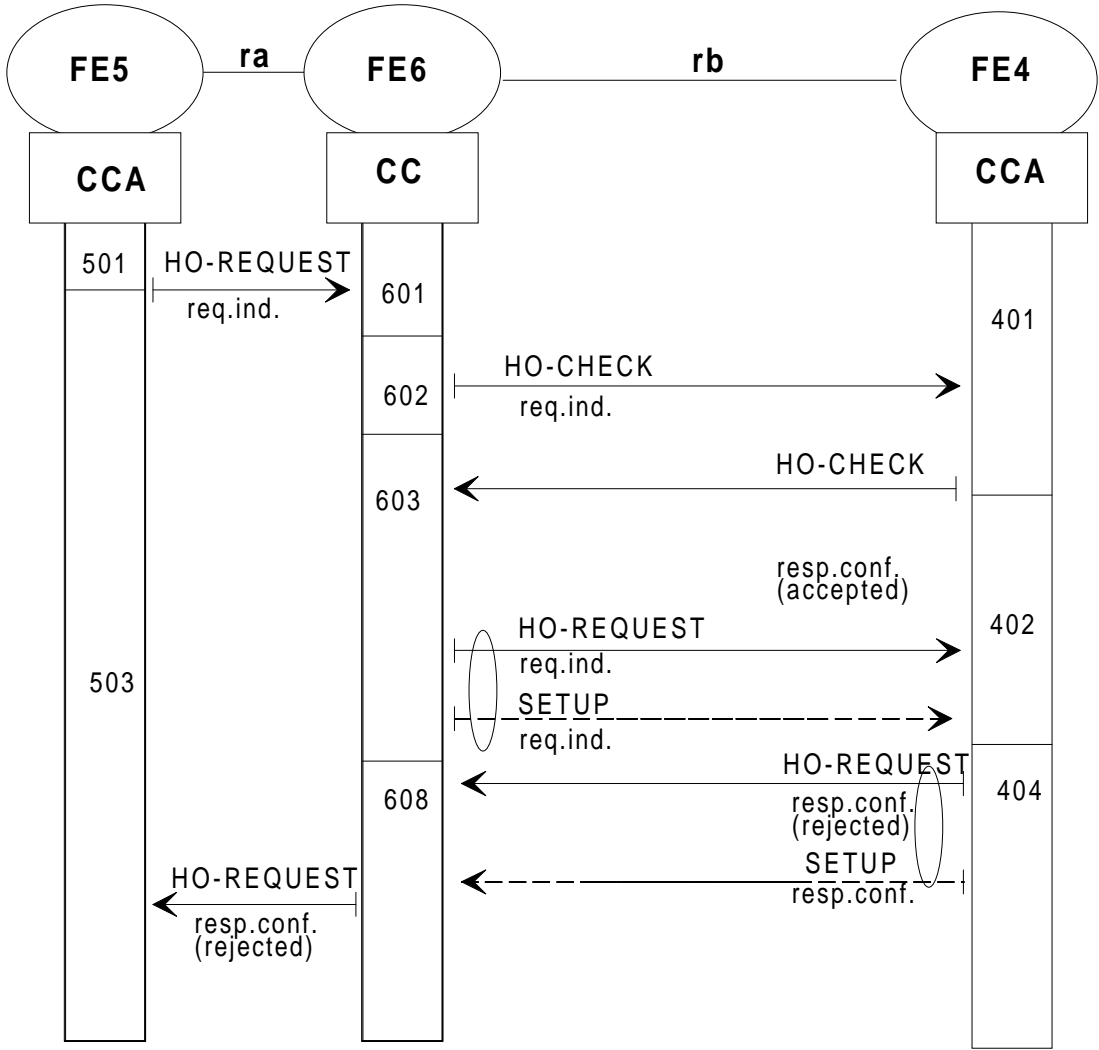
Figure 14: Information flow sequence for unsuccessful handover: rejection of handover by FE4
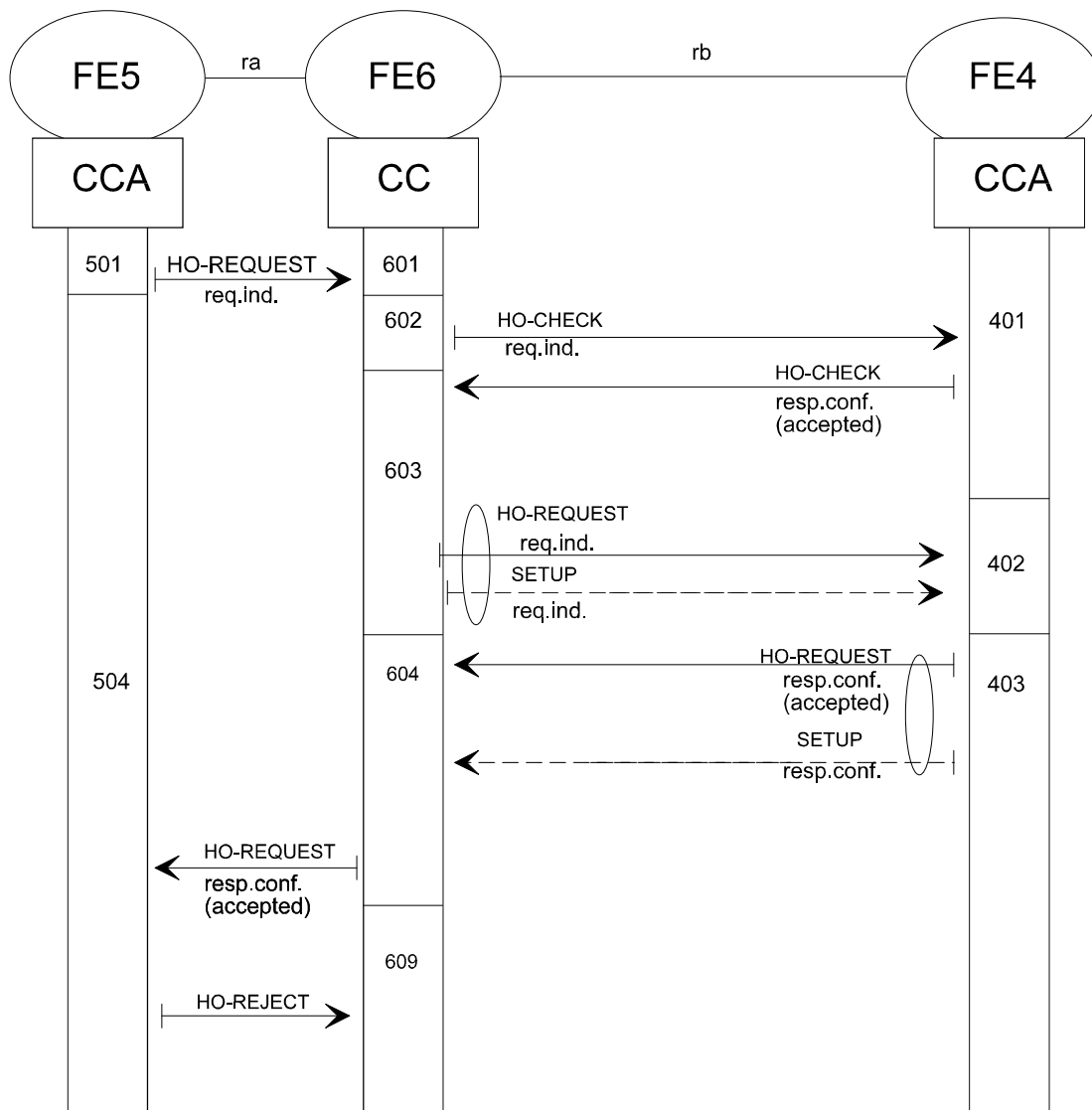
**Figure 15: Information flow sequence for unsuccessful handover:
rejection of handover by CTM user**

5.3.2 Definition of information flows

5.3.2.1 HO-ACCEPT

This unconfirmed information flow is used to indicate that a CTM user has accepted handover to a new location area. It shall be sent across relationship ra from FE5 to FE6.

5.3.2.2   HO-CHECK

This confirmed information flow is used to ask FE4 whether it can accept call establishment to the CTM user. It shall be sent across relationship rb from FE6 to FE4 and shall contain the service elements listed in table 4.

Table 4: Contents of HO-CHECK

Service element	Allowed value	Request	Confirm
CTM user's identity		M	
Call-identifier		O	
Terminal information		M (note)	
HO-CHECK result	Accepted or Rejected		M
NOTE: The terminal information parameter contains information relevant to the air-interface such as radio identities and other information required for the handover process, and is relayed from FE5 to FE4 via FE6.			

5.3.2.3   HO-REJECT

This optional confirmed information flow indicates to FE6 that the previous handover request has been rejected and that the call will continue at the old location area. It shall be sent across relationship ra from FE5 to FE6.

5.3.2.4   HO-REQUEST

Table 5: Contents of HO-REQUEST

Service element	Allowed value	Request	Confirm
CTM user's identity		M	
Call-identifier		O	
Terminal information		M	
HO-REQUEST result	Accepted or Rejected		M
NOTE: The terminal information parameter contains information relevant to the air-interface such as radio identities and other information required for the handover process, and is relayed from FE5 to FE4 via FE6.			

This confirmed information flow indicates to FE6 that the call should be re-routed through the new location area. It shall be sent across relationship ra from FE5 to FE6 and across relationship rb from FE6 to FE4.

5.4   Functional entity behaviour

The figures in this clause 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) CCITT Recommendation Z.100 [5]. Each input and output symbol is labelled to show the source FE of input signals or the destination FE of output signals.

5.4.1 Behaviour of FE4

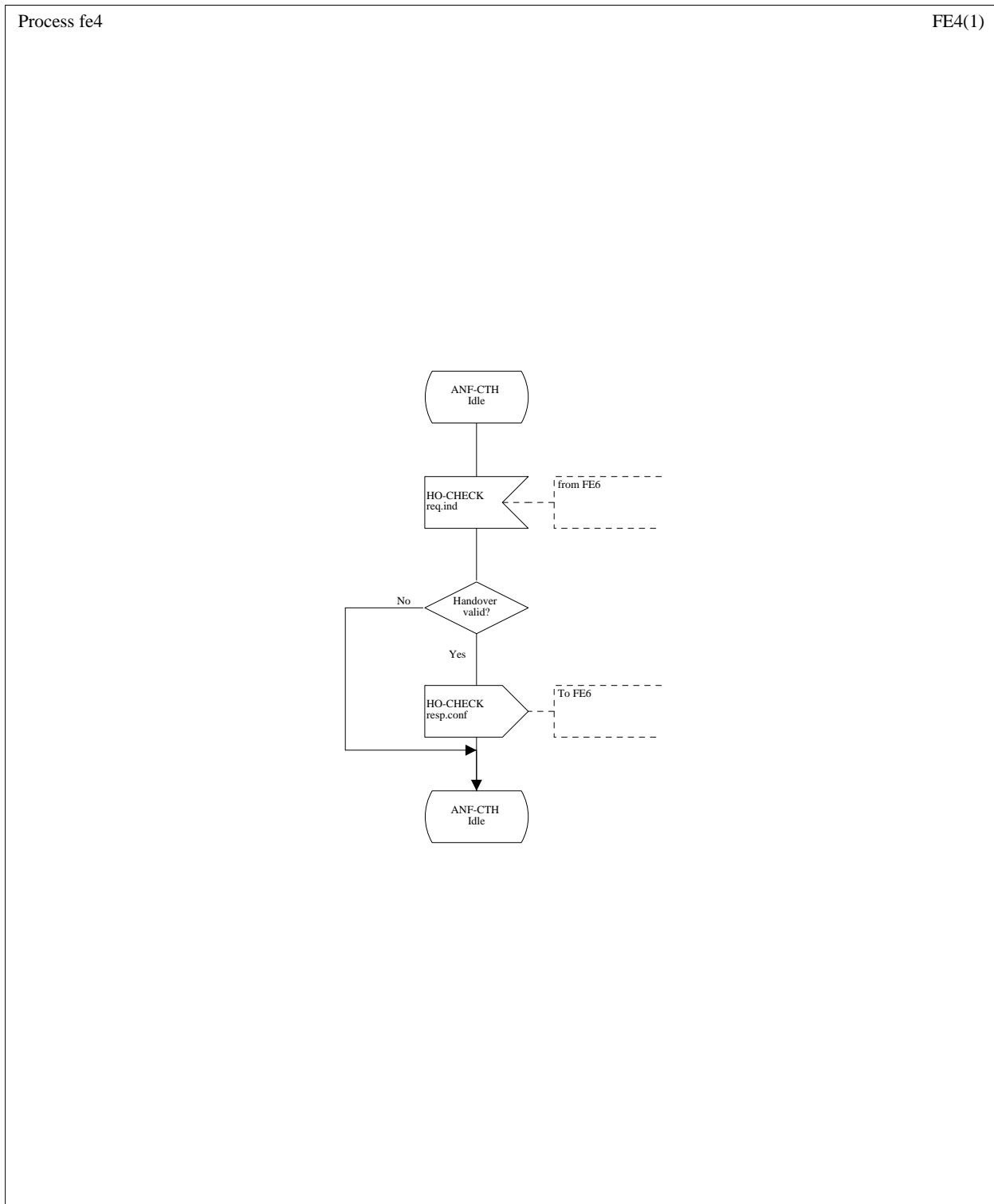Figure 16 contains the SDL diagram for the functional entity FE4

```
Process fe4                                                                  FE4(1)
```


Figure 16: SDL for Functional Entity FE4

5.4.2 Behaviour of FE5

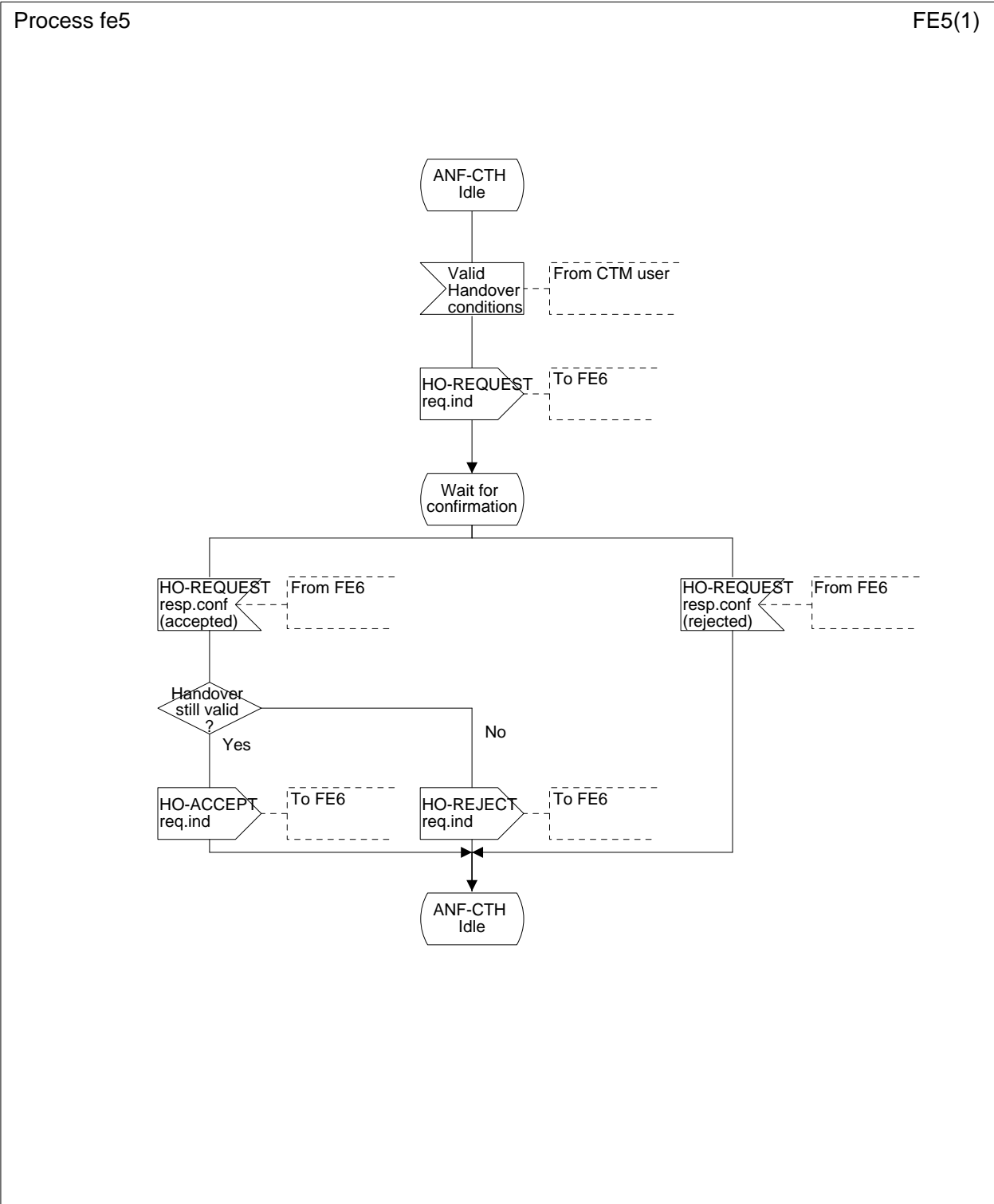Figure 17 contains the SDL diagram for the functional entity FE5.

Figure 17: SDL for Functional Entity FE5

5.4.3 Behaviour of FE6

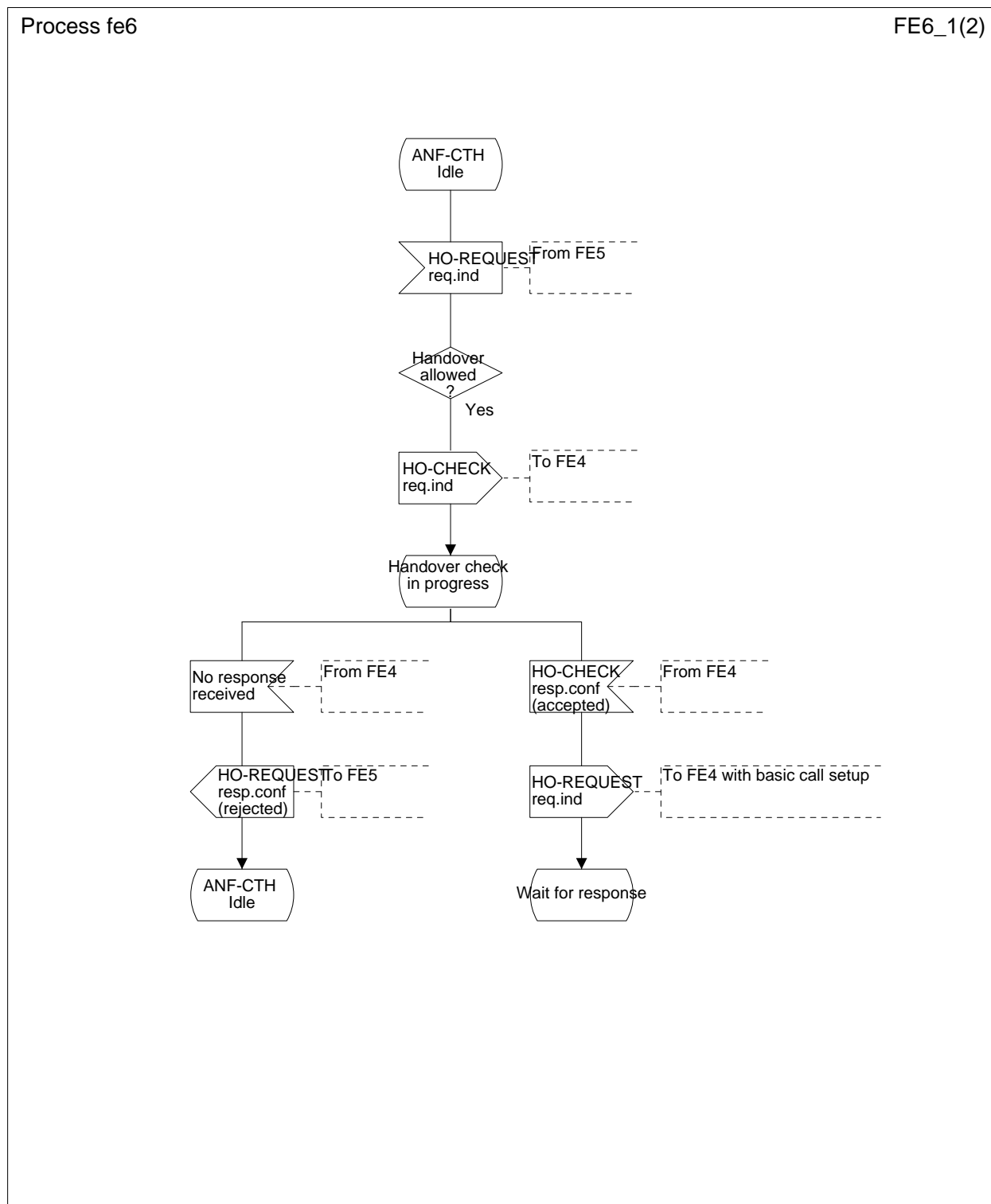Figure 18 contains the SDL diagram for the functional entity FE6.

Figure 18 (sheet 1 of 2): SDL for Functional Entity FE6
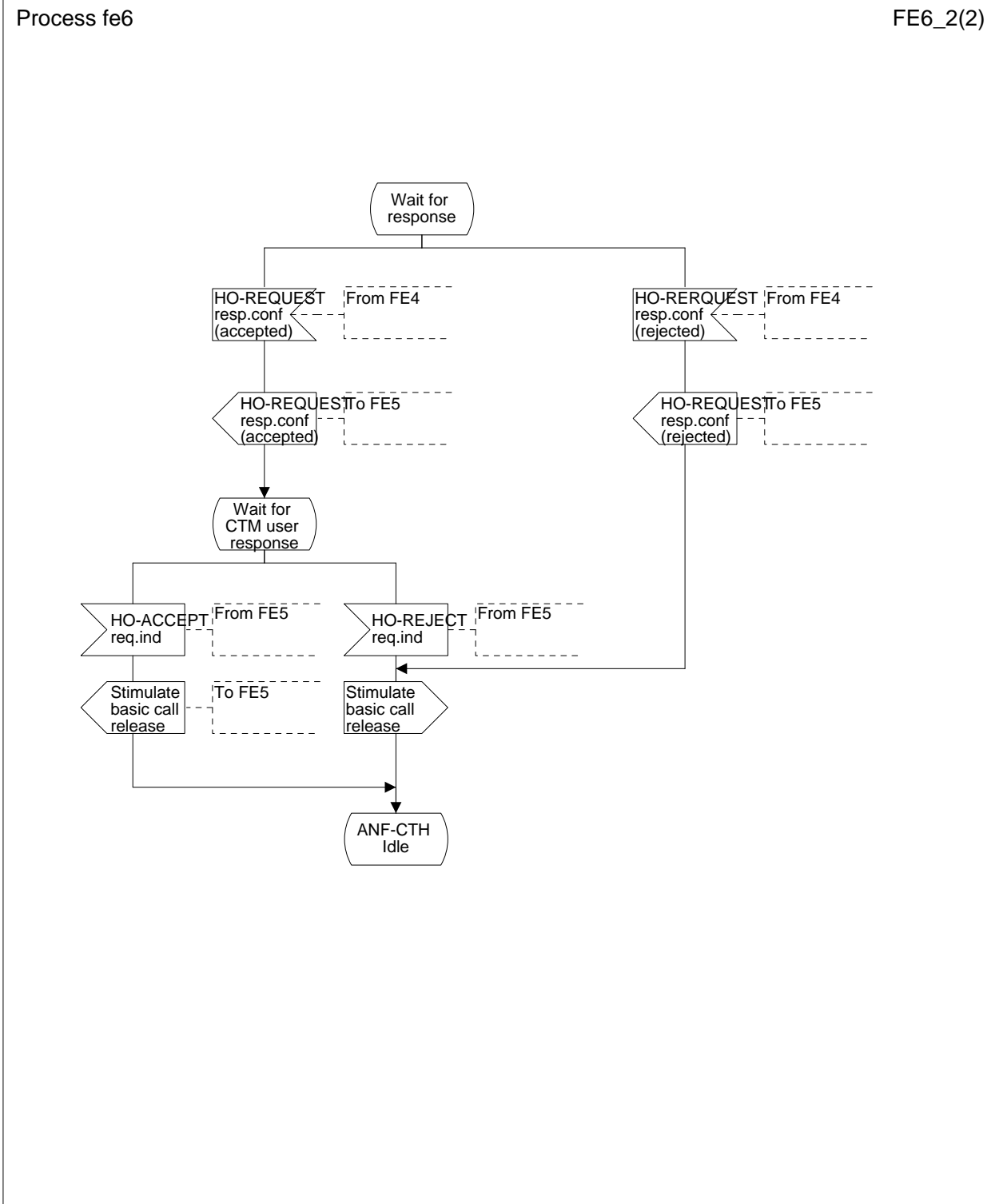
Process fe6
FE6_2(2)

Figure 18 (sheet 2 of 2): SDL for Functional Entity FE6

5.5 Functional entity actions

The following functional entity actions shall take place at the points indicated in the information flow sequences in subclause 5.3.

5.5.1 FEAs of FE4

401   Receive HO-CHECK req.ind from FE6. If handover conditions are valid, send HO-CHECK resp.conf to FE6.

402   Receive HO-REQUEST req.ind in conjunction with basic call setup from FE6.

403   If handover condition are still valid, Send HO-REQUEST resp.conf together with the basic call setup response to FE6.

404   If handover conditions are no longer valid, send HO-REQUEST resp.conf (rejected) together with the basic call response to FE6.

5.5.2 FEAs of FE5

501   Detect that valid conditions for handover exist and send HO-REQUEST req.ind to FE6.

502   Receive HO-REQUEST resp.conf (accepted) from FE6 and if valid conditions for handover still exist, cause the CTM user to re-route the call to FE4 and then send HO-ACCEPT to FE6 together with basic call release.

503   Receive HO-REQUEST resp.conf (rejected) from FE6 and cancel the handover request and retain the connection to the CTM user.

504   Receive HO-REQUEST resp.conf (accepted) from FE6 and if valid conditions for handover no longer exist, retain the connection to the CTM user and send HO-REJECT to FE6.

5.5.3 FEAs of FE6

601   Receive HO-REQUEST req.ind. from FE5 and check that the request is allowed.

602   If HO-REQUEST is allowed, send HO-CHECK req.ind to one or more instances of FE4 as required.

603   Receive (multiple) HO-CHECK resp.conf (accepted) from FE4 and select an instance of FE4 to accept the call. Send HO-REQUEST to the selected instance of FE4 in conjunction with a basic call setup request to establish the new leg of the call to FE4.

604   Receive HO-REQUEST resp.conf (accepted) together with the basic call setup response from FE4. Send HO-REQUEST resp.conf (accepted) to FE5.

605   Receive HO-ACCEPT req.ind from FE5 together with basic call release.

606   If HO-REQUEST from FE5 is not allowed, send HO-REQUEST resp.conf (rejected) to FE5.

607   If no HO-CHECK resp.conf is received from FE4, send HO-REQUEST resp.conf (rejected) to FE5.

608   Receive HO-REQUEST resp.conf (rejected) from FE4 and send HO-REQUEST resp.conf (rejected) to FE5 and stimulate basic call release for the new leg of the call to FE4.

609   Receive HO-REJECT req.ind from FE5 and stimulate basic call release for the new leg of the call to FE4.

5.6 Allocation of functional entities to physical locations

The allocation of FEs to physical locations is shown in table 6.

Within the context of this table:

- the end PINX is the PINX to which the FP is connected;
- the visitor PINX shall be the terminating PINX.

Table 6: Allocation of FEs to physical locations

	FE4	FE5	FE6
Scenario 1	FP (new)	FP (old)	end PTNX
Scenario 2	FP (new)	end PTNX	end PTNX
Scenario 3	end PTNX	FP (old)	end PTNX
Scenario 4	end PTNX	end PTNX	end PTNX

5.7 Interworking considerations

Not applicable.

History

Document history			
May 1997	Public Enquiry	PE 9735:	1997-05-02 to 1997-08-29