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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Specification, functional model and information flows — Call Interception additional network feature

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Spécification, modèle fonctionnel et flux d'informations — Facilité de réseau additionnelle d'interception d'appel

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 15053 was prepared by ECMA (as ACMA-220) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This second edition cancels and replaces the first edition (ISO/IEC 15053:1997), which has been technically revised.

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Introduction

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

This International Standard specifies the Call Interception additional network feature.

This International Standard is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO/IEC JTC 1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Specification, functional model and information flows — Call Interception additional network feature

1 Scope

This International Standard specifies Additional Network Feature Call Interception (ANF-CINT), which is applicable to various basic services supported by Private Integrated Services Networks (PISN). Basic services are specified in ISO/IEC 11574.

ANF-CINT is an additional network feature which enables calls that cannot be completed due to certain conditions to be redirected to a pre-defined intercepted-to user.

ANF specifications are produced in three stages, according to the method described in ETS 300 387. This International Standard contains the stage 1 and stage 2 specifications of ANF-CINT. The stage 1 specification (clause 6) specifies the feature as seen by users of PISNs. The stage 2 specification (clause 7) identifies the functional entities involved in the feature and the information flows between them.

2 Conformance

In order to conform to this International Standard, a stage 3 standard shall specify signalling protocols and equipment behaviour that are capable of being used in a PISN which supports the feature specified in this International Standard. This means that, to claim conformance, a stage 3 standard is required to be adequate for the support of those aspects of clause 6 (stage 1) and clause 7 (stage 2) which are relevant to the interface or equipment to which the stage 3 standard applies.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 11571:1998, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Networks - Addressing*

ISO/IEC 11574:2000, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit-mode 64 kbit/s bearer services - Service description, functional capabilities and information flows*

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

ETS 300 387:1994, *Private Telecommunication Network (PTN); Method for the specification of basic and supplementary services*

ITU-T Rec. I.112:1993, *Vocabulary of terms for ISDNs*

ITU-T Rec. I.210:1993, *Principles of telecommunication services supported by an ISDN and the means to describe them*

ITU-T Rec. I.221:1993, *Common specific characteristics of services*

ITU-T Rec. Z.100:1999, *Specification and description language (SDL)*

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4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1 External definitions

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

- Basic Service (ITU-T Rec. I.210)
- Connection (ITU-T Rec. I.112)
- Network Determined User Busy (ITU-T Rec. I.221)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated services Network eXchange (PINX) (ISO/IEC 11579-1)
- PISN Number (ISO/IEC 11571)
- Service (ITU-T Rec. I.112)
- Signalling (ITU-T Rec. I.112)
- Supplementary Service (ITU-T Rec. I.210)
- User Determined User Busy (ITU-T Rec. I.221)
- User (except in the context of ANF-CINT user) (ISO/IEC 11574)

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

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

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

- r1
- r2
- r3

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

- Disconnect request/indication
- Setup request/indication
- Setup response/confirmation
- Report request/indication
- Release request/indication

4.2 Other definitions

4.2.1 Additional Network Feature

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

4.2.2 ANF-CINT user

An entity, within a PISN, that requests ANF-CINT.

4.2.3 Busy

A property of a user for whom either a Network Determined User Busy or a User Determined User Busy condition exists.

4.2.4 Call, basic call

An instance of the use of a basic service.

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4.2.5 Called user

The user to which a call is directed prior to invocation of ANF-CINT.

4.2.6 Intercepted-to user

The user to which the intercepted call is directed.

4.2.7 Interception cause

A condition that can lead to call interception.

4.2.8 Interception delayed

The redirection of a call to an alternative destination as a result of remaining too long in an alerting or waiting on busy state.

4.2.9 Interception immediate

The redirection of a call to an alternative destination as a result of detecting a condition that prevents the call reaching an alerting or waiting on busy state.

4.2.10 Waiting on busy

A call state in which a call is awaiting answer at a user that is busy on another call.

NOTE - This can arise, for example, as a result of the use of supplementary service Call Offer (SS-CO) during call establishment. A call that is waiting on busy can be transferred.

5 List of acronyms

ANF	Additional Network Feature
ANF-CINT	Additional Network Feature Call Interception
CC	Call Control (functional entity)
CCA	Call Control Agent (functional entity)
CD	Call Deflection
CFB	Supplementary Service Call Forwarding Busy
CFNR	Supplementary Service Call Forwarding No Reply
CFU	Supplementary Service Call Forwarding Unconditional
CLIR	Calling/Connected Line Identification Restriction
CNIP	Calling Name Identification Presentation
CNIR	Calling/Connected Name Identification Restriction
FE	Functional Entity
ISDN	Integrated Services Digital Network
PINX	Private Integrated services Network eXchange
PISN	Private Integrated Services Network
SDL	Specification and Description Language
SS	Supplementary Service
TE	Terminal Equipment

6 ANF-CINT stage 1 specification

6.1 Description

6.1.1 General description

ANF-CINT is invoked by an ANF-CINT user for an unanswered or unsuccessful call, allowing the call to be routed to a special destination in the PISN. The special destination may be dependent on the interception cause.

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The conditions leading to invocation of ANF-CINT are considered as implementation options. Examples of factors that can be taken in account are:

– the source of the call (e.g., the geographic location of the calling user, the network from which the call has entered the PISN);

– the particular interception cause;

– the type of connection (e.g. the originating user is an attendant);

– the call destination;

– time of the day.

6.1.2 Qualifications on applicability to telecommunication services

Call Interception is applicable to all basic services defined in ISO/IEC 11574.

6.2 Procedures

6.2.1 Provision/withdrawal

ANF-CINT shall be PISN instigated. The conditions under which interception is invoked shall be an implementation matter. Also, parameters and values offered by a PISN shall be an implementation matter. A PISN may offer more or less parameters than the one specified below.

Parameters may apply separately to each different condition for which interception is to be invoked.

Parameter	**Value**
Intercepted-to number (*NOTE*)	- PISN number

NOTE - This parameter is not needed for conditions where the intercepted-to number is determined on a call by call basis e.g. the number of the user that transferred the call.

6.2.2 Normal procedures

6.2.2.1 Activation/deactivation/registration/interrogation

The feature shall be permanently activated.

Registration and interrogation shall not apply.

6.2.2.2 Invocation and operation

ANF-CINT shall be invoked for a call if a certain condition, determined by the PISN implementation, is met. Also the parameters with the invocation request shall be determined by the PISN implementation. Examples of interception causes include:

– timeout in waiting on busy condition
– busy user
– closed user group rejection
– do not disturb activated
– incoming barred destination
– invalid number
– no compatible user at destination
– network congestion
– no reply (i.e. timeout during alerting)
– called user access out of service
– route restriction (i.e. calling user not authorized for the route)
– timeout in waiting on busy condition after transfer
– no reply after transfer (i.e. timeout during alerting after transfer)
– upper limit of number of diversions reached

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– upper limit of transit counter reached
– mobile user location not known
– mobile user no longer registered
– mobile terminal not responding
– invalid call diversion destination
– timeout after call hold.

On acceptance of invocation of ANF-CINT, the PISN shall perform redirection towards the intercepted-to user. If interception is invoked because of detecting a condition that prevents the call reaching an alerting or waiting on busy state (interception immediate) the PISN shall complete the release of the call towards the called user immediately. If interception is invoked as a result of remaining too long in an alerting or waiting on busy state (interception delayed) the PISN shall not release the call towards the called user until the call to the intercepted-to user enters an alerting or waiting on busy state. The called user can accept the call during this period.

As an implementation option for interception delayed, the PISN may retain the call towards the called user until the intercepted-to user answers the call. Further procedures in this case are outside the scope of this International Standard.

6.2.2.2.1 Intercepted-to user notification

The intercepted-to user shall be given a notification that the call has been intercepted. This notification shall include:

- the interception cause,
- the called user number/name if available.

6.2.2.2.2 Calling user notifications

The calling user shall be given the notification that the call has been intercepted with the appropriate interception cause. In case of multiple call interceptions, the calling user shall be notified of the first interception and of any subsequent interceptions from intercepted-to users at which an alerting or waiting on busy state has been reached.

For single interception, the intercepted-to user's number and, if available, the intercepted-to user's name shall be sent to the calling user if CLIR/CNIR is not invoked by the intercepted-to user.

For multiple interception, the number and, if available, name of the final intercepted-to user shall be sent to the calling user if CLIR and CNIR respectively has not been invoked by the final intercepted-to user. In addition, if an alerting or waiting on busy state is reached at an intermediate intercepted-to user the number and, if available, name of that intercepted-to user may be sent to the calling user if there is no possibility of CLIR and CNIR respectively being invoked by that intercepted-to user.

6.2.3 Exceptional procedures

6.2.3.1 Activation/deactivation/registration/interrogation

Not applicable.

6.2.3.2 Invocation and operation

If the number of the intercepted-to user is unavailable (e.g. due to number presentation restriction or interworking), the user who would have been given the number shall receive an indication of the reason why no number is given.

In the case of interception delayed, if the intercepted call cannot be completed to the intercepted-to user, then the PISN shall clear the intercepted-to leg of the call and continue to alert or wait on busy at the called user. In this case the calling user shall not be given any notification.

In the case of interception immediate, if the intercepted call cannot be completed to the intercepted-to user, then the PISN shall clear the call, unless it is able to redirect the call to a new intercepted-to user. If the call is cleared, the calling user shall be sent an indication that the call has been intercepted.

6.3 Interactions with other supplementary services and ANFs

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

6.3.1 Calling Line Identification Presentation (CLIP)

No interaction.

6.3.2 Connected Line Identification Presentation (COLP)

No interaction.

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6.3.3 Calling/Connected Line Identification Restriction (CLIR)

An intercepted-to user which has invoked CLIR shall not have its number presented to the calling user, as part of a notification of interception, unless the calling user has an override service profile. An intercepted-to user which is provided with CLIR 'temporary mode' shall not have its identity revealed to the calling user as part of a notification of interception until the intercepted-to user has responded and it is known that restriction is not to be invoked, unless the calling user has an override service profile.

6.3.4 Calling Name Identification Presentation (CNIP)

No interaction.

6.3.5 Connected Name Identification Presentation (CONP)

No interaction.

6.3.6 Calling/Connected Name Identification Restriction (CNIR)

An intercepted-to user which has invoked CNIR shall not have its name presented to the calling user, as part of a notification of interception, unless the calling user has an override service profile. An intercepted-to user which is provided with CNIR 'temporary mode' shall not have its name revealed to the calling user as part of a notification of interception until the intercepted-to user has responded and it is known that restriction is not to be invoked, unless the calling user has an override service profile.

6.3.7 Call Diversion (CFU, CFB, CFNR, CD)

If the call has been diverted before invocation of interception, the diversion indication and the number and name of the original called user, if available and not restricted, shall also be presented to the intercepted-to user.

If the call is diverted after it has been intercepted, the intercepted-to user notification shall be presented to the diverted-to user.

6.3.8 Do Not Disturb (DND)

No interaction.

6.3.9 Do Not Disturb Override (DNDO)

No interaction.

6.3.10 Call Completion to Busy Subscriber (CCBS)

If a call is intercepted and the final intercepted-to user is busy, then a SS-CCBS request made by the calling user shall be applied to the intercepted-to user.

Interception immediate shall not apply to a call resulting from the use of SS-CCBS.

6.3.11 Call Completion on No Reply (CCNR)

If a call is intercepted, and the final intercepted-to user does not answer, then a SS-CCNR request from the calling user shall be applied to the intercepted-to user.

Interception immediate shall not apply to a call resulting from the use of SS-CCNR.

6.3.12 Call Offer (CO)

CO against the called user: If the PISN invokes SS-CO automatically because of the service profile of the calling user or the calling user invokes SS-CO as part of initial call set up, then call interception on busy user shall not apply. In all other cases call interception on a busy user can apply, in which case SS-CO shall not apply.

CO against the intercepted-to user: If a call is intercepted and the intercepted-to user is busy, then if a SS-CO request is received it shall apply to the intercepted-to user.

Interception with cause "waiting on busy not answered" can occur after successful invocation of SS-CO.

6.3.13 Call Intrusion (CI)

CI against the called user: If the calling user invokes SS-CI as part of initial call set up, then call interception on busy user shall not apply. In all other cases call interception on a busy user can apply, in which case call intrusion SS-CI shall not apply.

CI against the intercepted-to user: If a call is intercepted and the intercepted-to user is busy then, if an SS-CI request is received, it shall be applied to the intercepted-to user.

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6.3.14 Call Transfer (CT)

A call resulting from transfer can be subject to interception if it continues to alert or wait on busy at the called user without reply.

6.3.15 Path Replacement (PR)

No interaction.

6.3.16 Advice Of Charge (AOC/S/D/E)

If a call is subject to interception, then the intercepted call can be a charged call.

The invocation of SS-AOC-S/D/E at the time of call establishment by or on behalf of the calling user shall apply to the intercepted call.

6.3.17 Recall (RE)

A call redirected as a result of SS-RE may be subject to interception.

NOTE - ANF-CINT can be used instead of SS-RE, e.g. in case of transfer by rerouteing.

6.4 Interworking considerations

When interworking with another network which supports an equivalent feature, it may be possible to cooperate with the other network in order to provide ANF-CINT.

6.5 Overall SDL

Figure 1 contains the dynamic description of ANF-CINT using the Specification and Description Language (SDL) defined in ITU-T Rec. Z.100 (1999). The SDL process represents the behaviour of the network in providing ANF-CINT. The relationship of this process to the basic call process is indicated in the annotations.

Output signals to the left represent primitives to the calling user. Output signals to the right represent primitives to the intercepted-to user. Input signals from the left represent internal stimuli and primitives from the ANF-CINT user.

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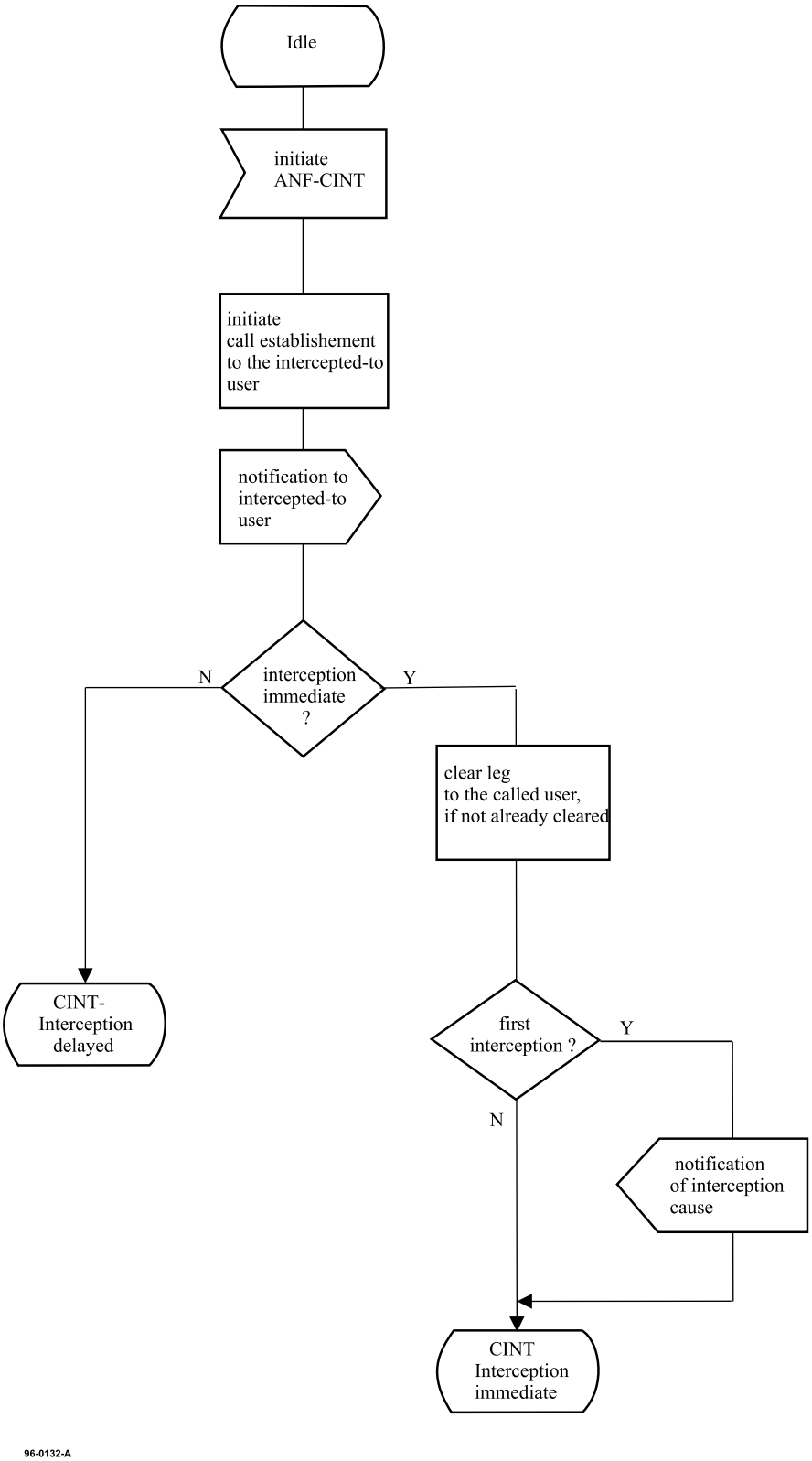


Figure 1 - ANF-CINT, overall SDL (part 1)

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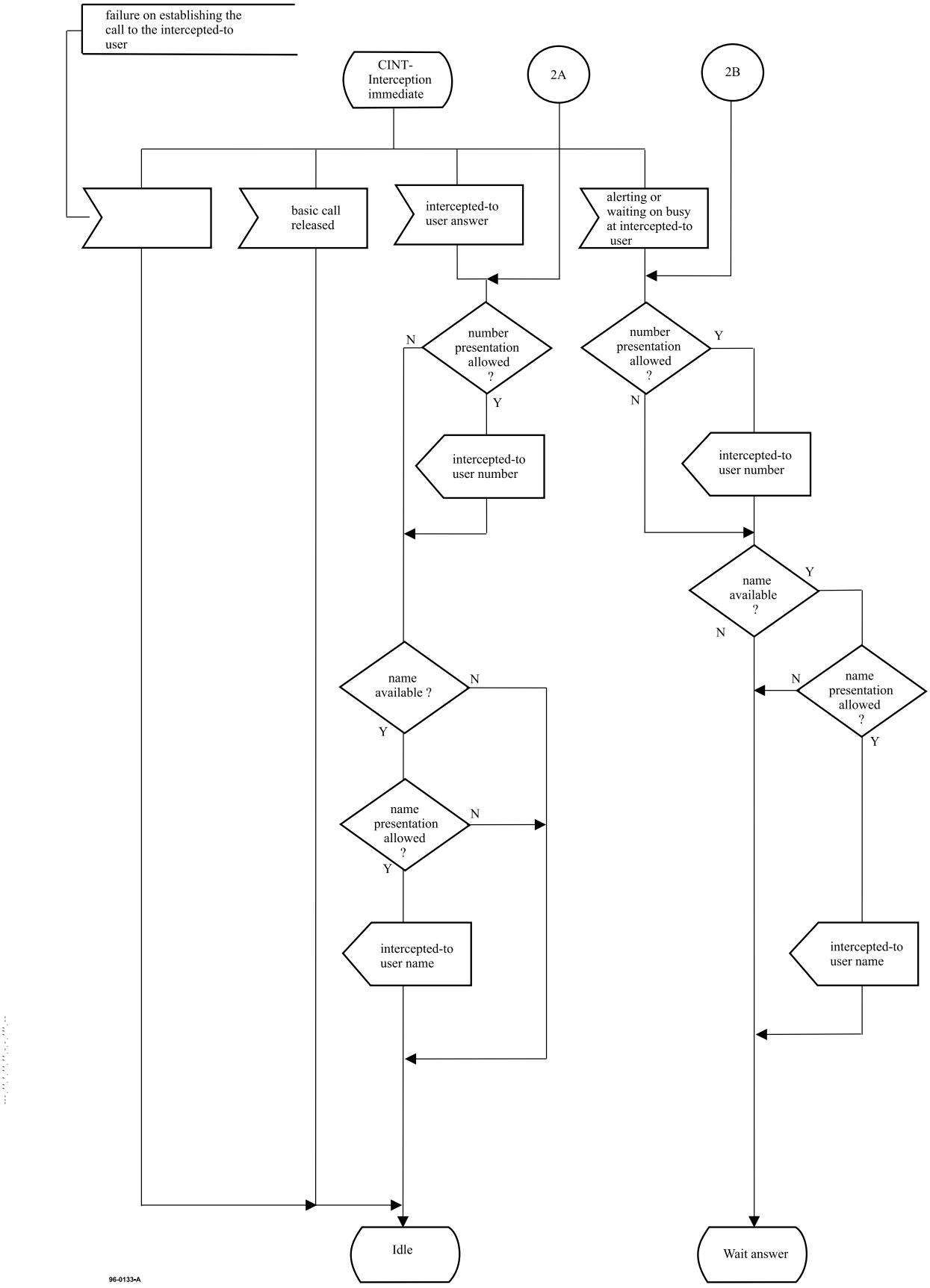


Figure 1 - ANF-CINT, overall SDL (part 2)

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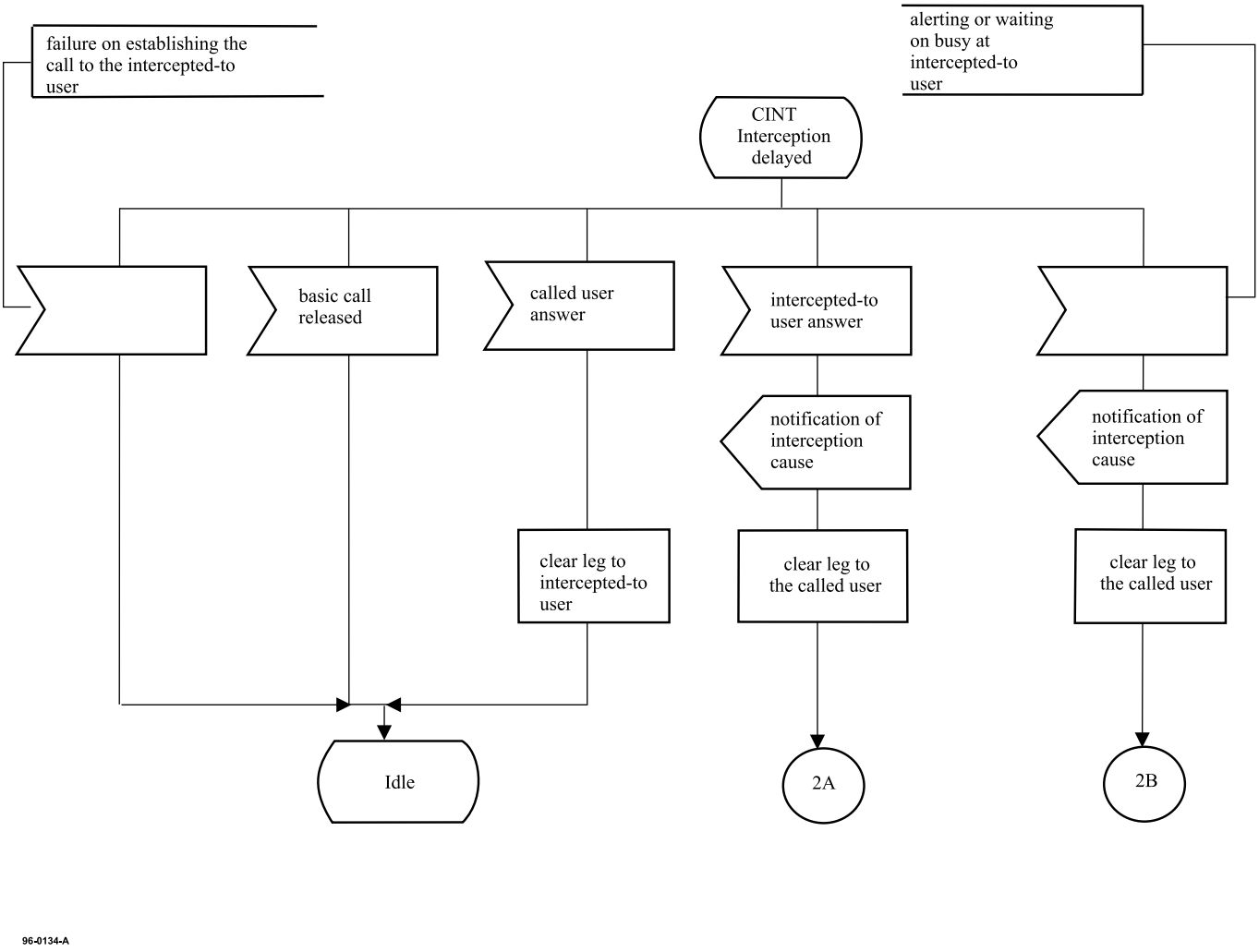


Figure 1 - ANF-CINT, overall SDL (part 3)

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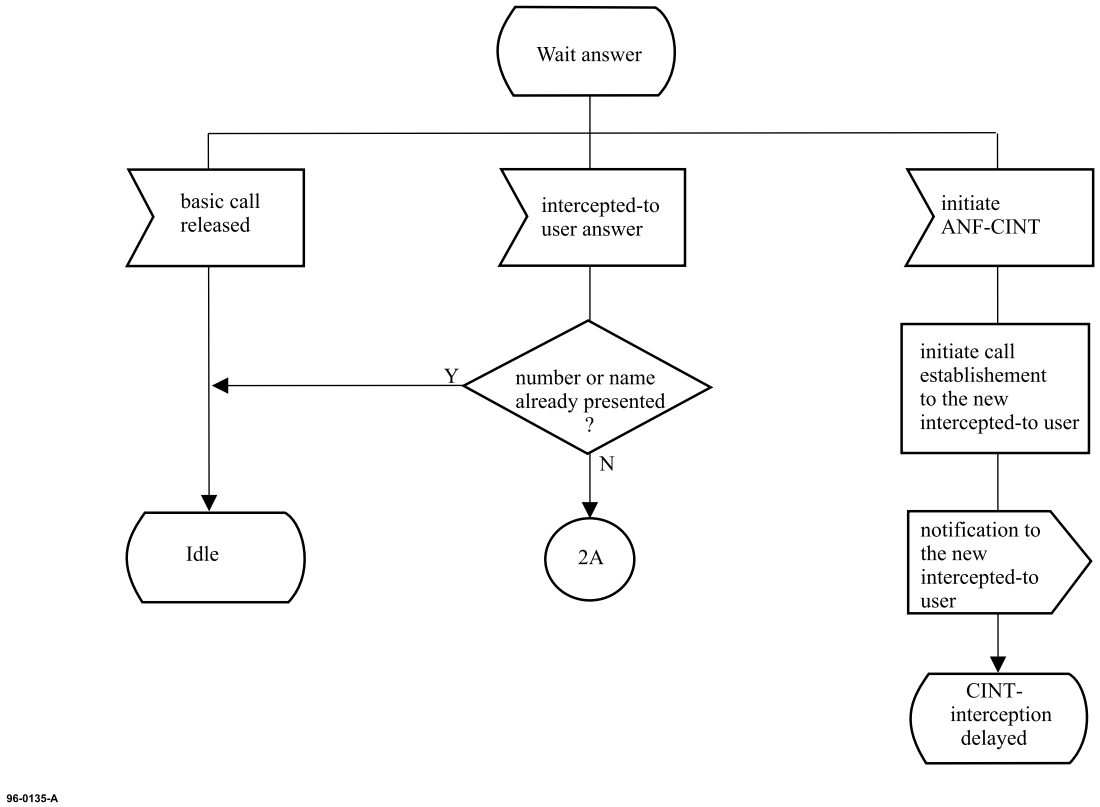


Figure 1 - ANF-CINT, overall SDL (part 4)

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7 ANF-CINT stage 2 specification

7.1 Functional model

7.1.1 Functional model description

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

FE1: Calling user agent
FE2: Calling user control entity
FE3: Call Interception control entity
FE4: Call Interception detection entity
FE5: Intercepted-to user control entity
FE6: Intercepted-to user agent

The following functional relationships shall exist between these FEs:

ra between FE1 and FE2
rb between FE2 and FE3
rc between FE3 and FE4
rd between FE3 and FE5
re between FE5 and FE6

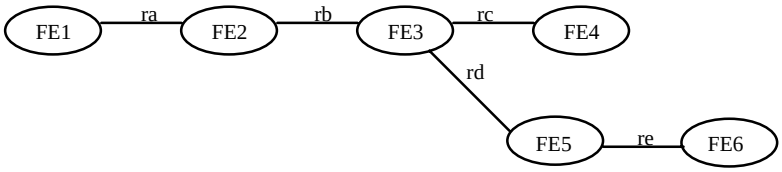


Figure 2 - Functional model for ANF-CINT

7.1.2 Description of functional entities

7.1.2.1 Calling user agent functional entity, FE1

This FE delivers the call interception notification to the calling user.

7.1.2.2 Calling user control functional entity, FE2

This FE provides the appropriate call interception notification to FE1 according to the information received from FE3.

7.1.2.3 Call interception control functional entity, FE3

This FE receives the ANF-CINT invocation from the ANF-CINT user and executes call interception by initiating a new call establishment to the intercepted-to user and requesting release of the leg to the original called user. The leg to the original called user is released immediately on starting the new call establishment (interception immediate) or on receipt of the REPORT request/indication or SETUP response/confirmation information flow (interception delayed).

This FE generates and relays to FE2 and generates to FE5 the call interception information flows providing notification information.

On receiving information from FE4, FE3 provides the ANF-CINT user with information permitting the ANF-CINT user to decide whether interception is required.

7.1.2.4 Call interception detection functional entity, FE4

This FE detects a condition that can lead to call interception and informs FE3.

FE4 also informs FE3 of calls that are not to be subject to interception delayed (e.g. the call is directed to an attendant).

7.1.2.5 Intercepted-to user control functional entity, FE5

This FE provides appropriate call interception notifications to FE6 and provides the intercepted-to user's name, name presentation indicator and number presentation indicator to FE3.

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7.1.2.6 Intercepted-to user agent functional entity, FE6

This FE delivers call interception notifications to the intercepted-to user.

7.1.3 Relationship of functional model to basic call functional model

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

Functional entity FE2 shall be collocated with the calling user's CC or with the Incoming Gateway CC.

Functional entity FE3 shall be collocated with the calling user's CC or with the Incoming Gateway CC or any Transit CC or the Terminating CC or the Outgoing Gateway CC (of the call to the called user).

Functional entity FE4 shall be collocated with the Terminating CC or the Outgoing Gateway CC or any Transit CC (of the call to the called user).

Functional entity FE5 shall be collocated with the intercepted-to user's CC or with the Outgoing Gateway CC.

Functional entity FE6 shall be collocated with the intercepted-to user's CCA.

An example of a relationship between the FEs for ANF-CINT and FEs for the basic call is shown in figure 3.

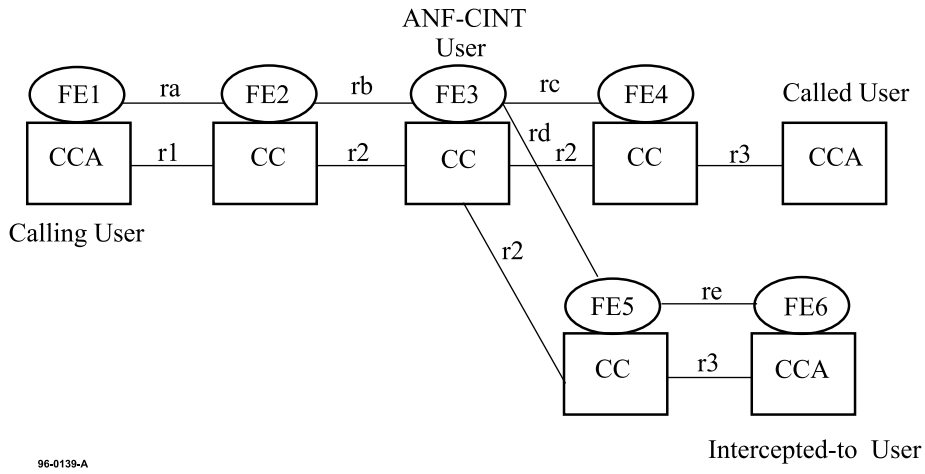


Figure 3 - Example relationship between model for ANF-CINT and basic call

7.2 Information flows

7.2.1 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.

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7.2.1.1 rb_INFORM1

rb_INFORM1 is an unconfirmed information flow across rb from FE3 to FE2 which indicates to FE2 that call interception has been initiated. Table 1 lists the elements within the rb_INFORM1 information flow.

Table 1- Content of rb_INFORM1

Element	Request
Interception cause	M (NOTE 1)
Intercepted-to number	M

NOTE 1 - This element indicates the cause of interception, for example:

timeout in waiting on busy condition
busy user
closed user group rejection
do not disturb activated
incoming barred destination
invalid number
no compatible user at destination
network congestion
no reply (i.e. timeout during alerting)
called user access out of service
route restriction (i.e. calling user not authorized for the route)
timeout in waiting on busy condition after transfer
no reply after transfer (i.e. timeout during alerting after transfer)
upper limit of number of diversions reached
upper limit of transit counter reached
mobile user location not known
mobile user no longer registered
mobile terminal not responding
invalid call diversion destination
timeout after call hold.

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7.2.1.2 ra_INFORM2

ra_INFORM2 is an unconfirmed information flow across ra from FE2 to FE1 which indicates to FE1 that call interception has been initiated.

Table 2 - Content of ra_INFORM2

Element	Request
Interception Cause	M (NOTE 1)

NOTE 1 - This element indicates the cause of interception, for example:

timeout in waiting on busy condition
busy user
closed user group rejection
do not disturb activated
incoming barred destination
invalid number
no compatible user at destination
network congestion
no reply (i.e. timeout during alerting)
called user access out of service
route restriction (i.e. calling user not authorized for the route)
timeout in waiting on busy condition after transfer
no reply after transfer (i.e. timeout during alerting after transfer)
upper limit of number of diversions reached
upper limit of transit counter reached
mobile user location not known
mobile user no longer registered
mobile terminal not responding
invalid call diversion destination
timeout after call hold.

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7.2.1.3 rd_INFORM4

rd_INFORM4 is an unconfirmed information flow across rd from FE3 to FE5 which indicates to FE5 that call interception is taking place and why the call was intercepted.

Table 3 lists the elements within the rd_INFORM4 information flow.

Table 3 - Content of rd_INFORM4

Element (NOTE 4)	**Request**
Interception cause	M (NOTE 5)
Called number	O (NOTE 3)
Called user's name incl. restriction indicator	O (NOTE 1)
Original Called Number incl. restriction indicator	O (NOTE 2)
Original Called Name, including restriction indicator	O (NOTE 6)

NOTE 1 - This element may be omitted in case of name not available or in case of presentation restricted.

NOTE 2 - This element shall be included if the call had been diverted before it was intercepted.

NOTE 3 - This element may be omitted if not available.

NOTE 4 - The Originating Number, Originating Subaddress, Connection Type and Call History are carried in the basic call SETUP request/indication and are not part of INFORM4. The basic call elements are defined in ISO/IEC 11574.

NOTE 5 - This element indicates the cause of interception, for example:

timeout in waiting on busy condition
busy user
closed user group rejection
do not disturb activated
incoming barred destination
invalid number
no compatible user at destination
network congestion
no reply (i.e. timeout during alerting)
called user access out of service
route restriction (i.e. calling user not authorized for the route)
timeout in waiting on busy condition after transfer
no reply after transfer (i.e. timeout during alerting after transfer)
upper limit of number of diversions reached
upper limit of transit counter reached
mobile user location not known
mobile user no longer registered
mobile terminal not responding
invalid call diversion destination
timeout after call hold.

NOTE 6 - This element may be included if the call has been diverted before it was intercepted.

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7.2.1.4 re_INFORM5

re_INFORM5 is an unconfirmed information flow across re from FE5 to FE6 which indicates to FE6 that call interception is taking place and why the call was intercepted.

Table 4 lists the elements within the re_INFORM5 information flow.

Table 4 - Content of re_INFORM5

Element (NOTE 4)	**Request**
Interception cause	M (NOTE 5)
Called number	O (NOTE 1)
Called name	O (NOTE 2)
Original Called Number	O (NOTE 3)
Original Called Name	O (NOTE 6)

NOTE 1 - This element may be omitted if not available.

NOTE 2 - This element may be omitted if not available or restricted.

NOTE 3 - This element shall be included if the call has been diverted before the interception and if no restriction exists.

NOTE 4 - The Destination Number, Connection Type and Call History are carried in the basic call SETUP request/indication and are not part of INFORM5. The basic call elements are defined in ISO/IEC 11574.

NOTE 5 - This element indicates the cause of interception, for example:

timeout in waiting on busy condition
busy user
closed user group rejection
do not disturb activated
incoming barred destination
invalid number
no compatible user at destination
network congestion
no reply (i.e. timeout during alerting)
called user access out of service
route restriction (i.e. calling user not authorized for the route)
timeout in waiting on busy condition after transfer
no reply after transfer (i.e. timeout during alerting after transfer)
upper limit of number of diversions reached
upper limit of transit counter reached
mobile user location not known
mobile user no longer registered
mobile terminal not responding
invalid call diversion destination
timeout after call hold.

NOTE 6 - This element may be included if the call has been diverted before the interception.

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7.2.1.5 rd_INFORM6, rb_INFORM6

rd_INFORM6 is an unconfirmed information flow across rd from FE5 to FE3 which indicates to FE3 the intercepted-to user's name and whether presentation of the intercepted-to user's number and name is allowed.

rb_INFORM6 is an unconfirmed information flow across rb from FE3 to FE2 which indicates to FE2 the intercepted-to user's name and whether presentation of the intercepted-to user's number and name is allowed.

Table 5 lists the elements within the rd_INFORM6, rb_INFORM6 information flow.

Table 5 - Content of rd_INFORM6, rb_INFORM6

Element	Request
Presentation indicator	M (NOTE 1)
Intercepted-to name including restriction indicator	O (NOTE 2)

NOTE 1 - This element shall apply only to the intercepted-to number.

NOTE 2 - This element may be omitted in case of name not available or in case of presentation restricted.

7.2.1.6 ra_INFORM7

ra_INFORM7 is an unconfirmed information flow across ra from FE2 to FE1 which informs FE1 of the intercepted-to user's number and name if appropriate. It shall only be sent if the intercepted-to user's number is not presentation restricted.

Table 6 lists the elements within the ra_INFORM7 information flow.

Table 6 - Content of ra_INFORM7

Element	Request
Intercepted-to number	M
Intercepted-to name	O (NOTE 1)

NOTE 1 - This element shall only be included if no restriction exists. It may be omitted in case of name not available.

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7.2.1.7 rc_INTERCEPT_CONDITION

rc_INTERCEPT_CONDITION is an unconfirmed information flow across rc from FE4 to FE3 which conveys a condition for possible interception and other related information which allow the ANF-CINT user to decide if interception immediate is required.

Table 7 lists the elements within the rc_INTERCEPT_CONDITION information flow.

Table 7 - Content of rc_INTERCEPT_CONDITION

Element	Request
Interception cause	M (NOTE 3)
Called name including restriction indicator	O (NOTE 1)
Original Called Number incl. restriction indicator	O (NOTE 2)
Original Called Name, including restriction indicator	O (NOTES 1, 2)

NOTE 1 - This element may be omitted in case of name not available or in case of presentation restricted or if not known whether presentation is restricted.

NOTE 2 - This element may be included if the call has been diverted before interception.

NOTE 3 - This element indicates the condition for possible interception, for example:

busy user
closed user group rejection
do not disturb activated
incoming barred destination
invalid number
no compatible user at destination
network congestion
called user access out of service
route restriction (i.e. calling user not authorized for the route)
upper limit of number of diversions reached
upper limit of transit counter reached
mobile user location not known
mobile user no longer registered
mobile terminal not responding
invalid call diversion destination.

7.2.1.8 rc_INTERCEPT_DISABLE

rc_INTERCEPT_DISABLE is an unconfirmed information flow across rc from FE4 to FE3 which informs the ANF-CINT user that call interception delayed is disabled. The information flow contains no elements.

7.2.1.9 rc_INTERCEPT_ENABLE

rc_INTERCEPT_ENABLE is an unconfirmed information flow across rc from FE4 to FE3 that re-enables call interception delayed subsequent to sending an rc_INTERCEPT_DISABLE request/indication. The information flow contains no elements.

7.2.2 Relationship of information flows to basic call information flows

The rb_INFORM1 request/indication information flow shall be sent:

- independently of any basic call information flow or
- with r2-REPORT request/indication or
- with r2-SETUP response/confirmation if not already sent.

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The ra_INFORM2 request/indication information flow shall be sent:

– independently of any basic call information flow or
– with r1-REPORT request/indication or
– with r1-SETUP response/confirmation.

The rd_INFORM4 request/indication information flow shall be sent in conjunction with r2_SETUP request/indication.

The re_INFORM5 request/indication information flow shall be sent in conjunction with r3_SETUP request/indication.

The rd_INFORM6 request/indication and rb_INFORM6 request/indication information flows shall be sent:

– independently of any basic call information flow or
– with r2-REPORT request/indication or
– with r2-SETUP response/confirmation if not already sent.

The ra_INFORM7 request/indication information flow shall be sent:

– independently of any basic call information flow or
– with r1-REPORT request/indication or
– with r1-SETUP response/confirmation.

The rc_INTERCEPT_CONDITION request/indication information flow shall be sent:

– with r2_REPORT request/indication (indicating call failure)
– with r2-RELEASE request/indication.

The rc_INTERCEPT_DISABLE request/indication information flow shall be sent:

– independently of any basic call information flow or
– with r2-REPORT request/indication.

The rc_INTERCEPT_ENABLE request/indication information flow shall be sent:

– independently of any basic call information flow or
– with r2-REPORT request/indication.

7.2.3 Information flow sequences

A stage 3 standard for ANF-CINT shall provide signalling procedures in support of the information flow sequences specified below. In addition, signalling procedures should be provided to cover other sequences arising from error situations, interactions with basic call, interactions with other supplementary services and ANFs, different topologies, etc..

In the figures, ANF-CINT 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 ANF-CINT functional entity, the numbers refer to functional entity actions listed in 7.3.

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7.2.3.1 Normal operation of ANF-CINT

7.2.3.1.1 Successful invocation of interception immediate

Figure 4 shows the information flow sequence for successful invocation of interception immediate. The decision whether to send or not the information flow rc_INTERCEPT_CONDITION depends on the condition encountered. It need not be sent if the condition can be indicated by basic call information.

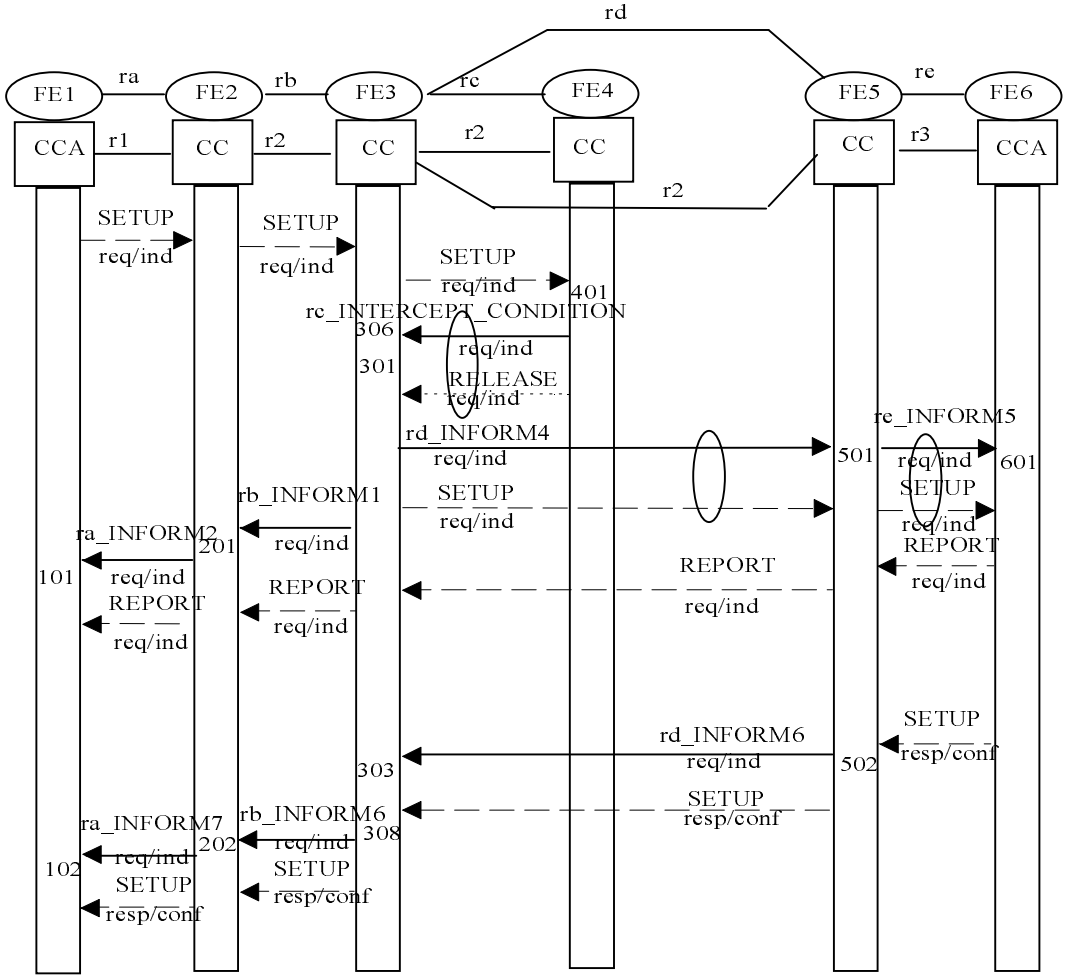


Figure 4 - Information flow sequence - successful invocation of interception immediate

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7.2.3.1.2 Successful invocation of interception delayed

Figure 5 shows the information flow sequence for successful invocation of interception delayed.

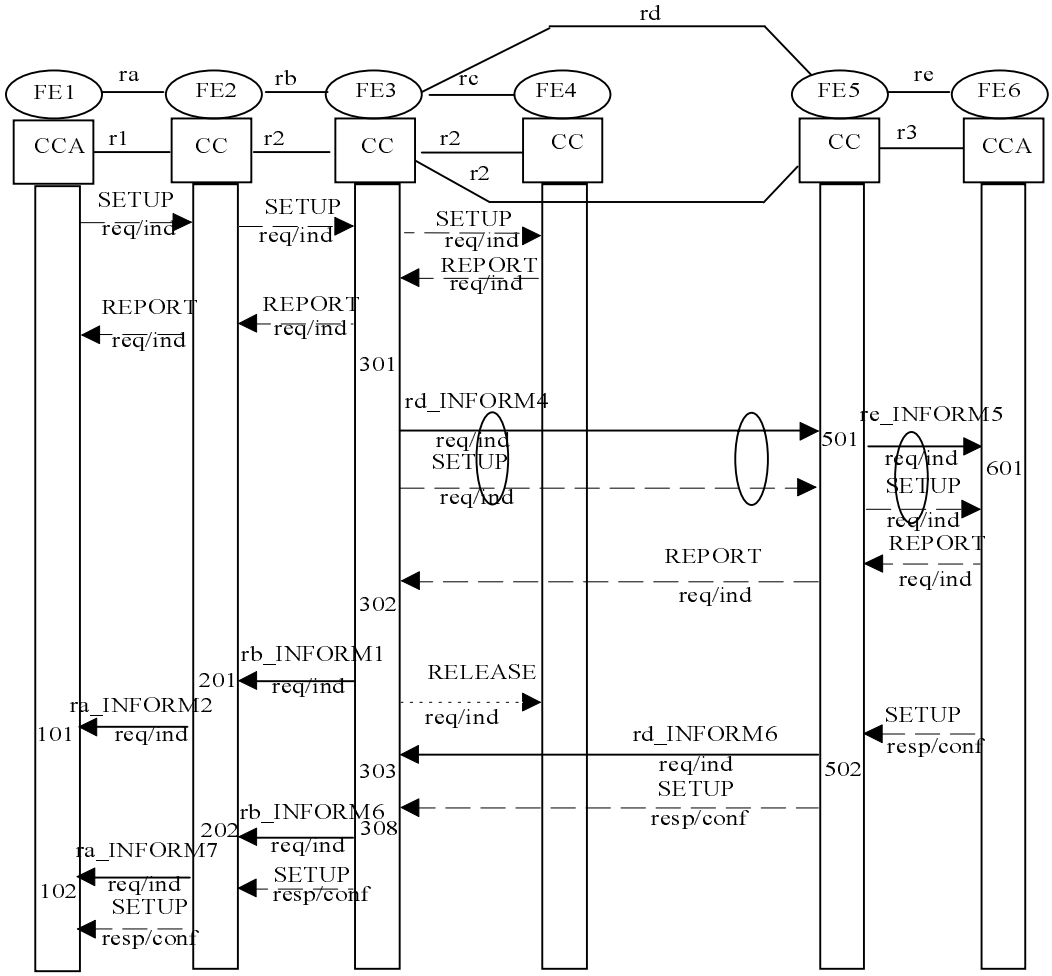


Figure 5 - Information flow sequence - successful invocation of interception delayed

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7.2.3.2 Unsuccessful invocation of ANF-CINT

7.2.3.2.1 Failure of interception immediate

Figure 6 shows the information flow sequence for failure of interception immediate.

The decision whether to send the information flow rc_INTERCEPT_CONDITION depends on the condition encountered. It need not be sent if the condition can be indicated by basic call information.

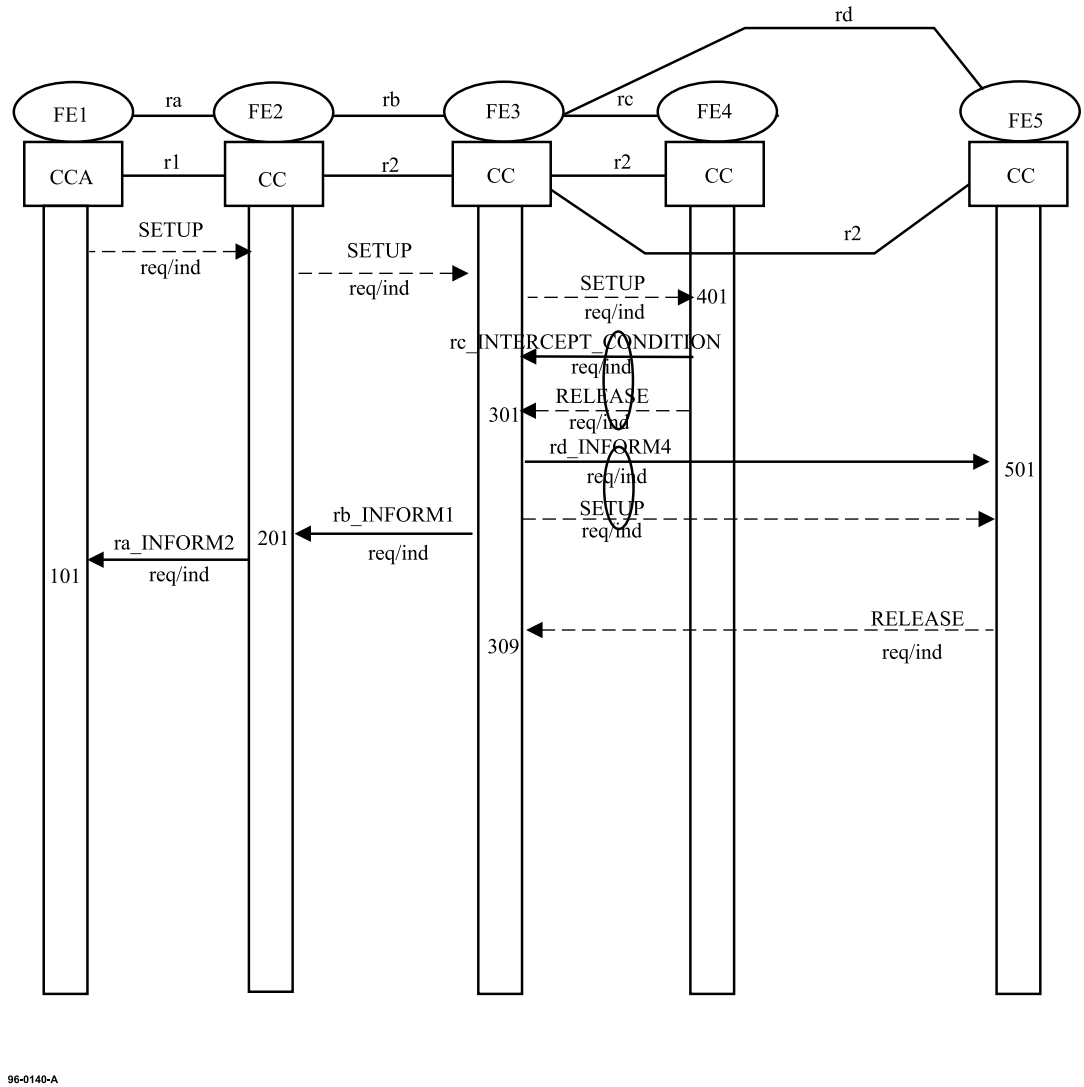


Figure 6 - Information flow sequence - failure of interception immediate

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7.2.3.2.2 Failure of interception delayed

Figure 7 shows the information flow sequence for failure of interception delayed.

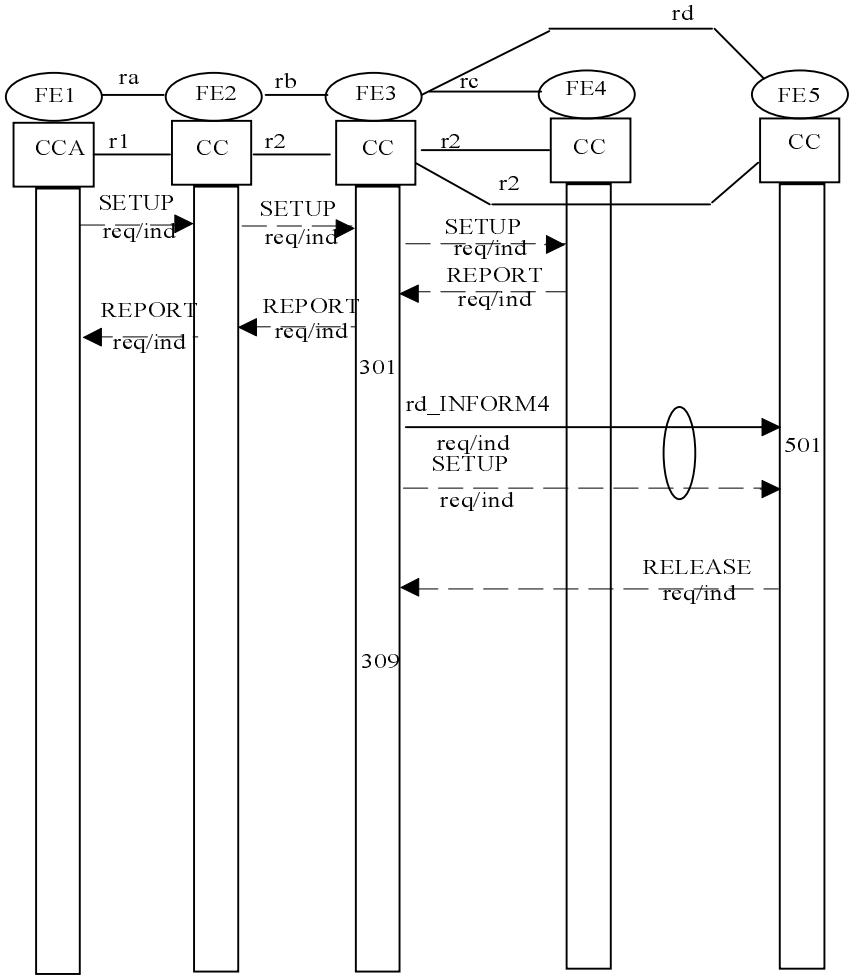


Figure 7 - Information flow sequence - failure of interception delayed

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7.2.3.3 Calling user clearing during interception delayed

Figure 8 shows the information flow sequence for calling user clearing during interception delayed.

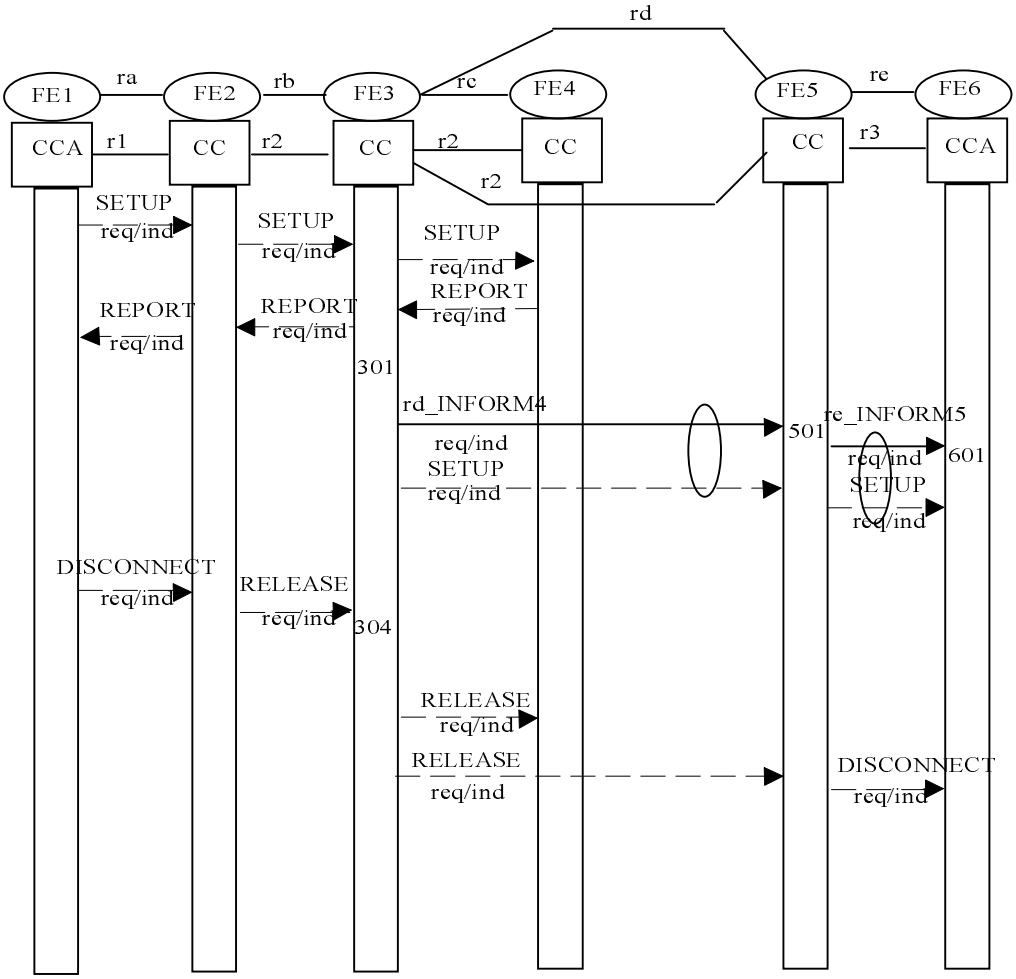


Figure 8 - Information flow sequence - calling user clearing during interception delayed

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7.2.3.4 Called user answers during interception delayed

Figure 9 shows the information flow sequence for the called user answering before alerting the intercepted-to user.

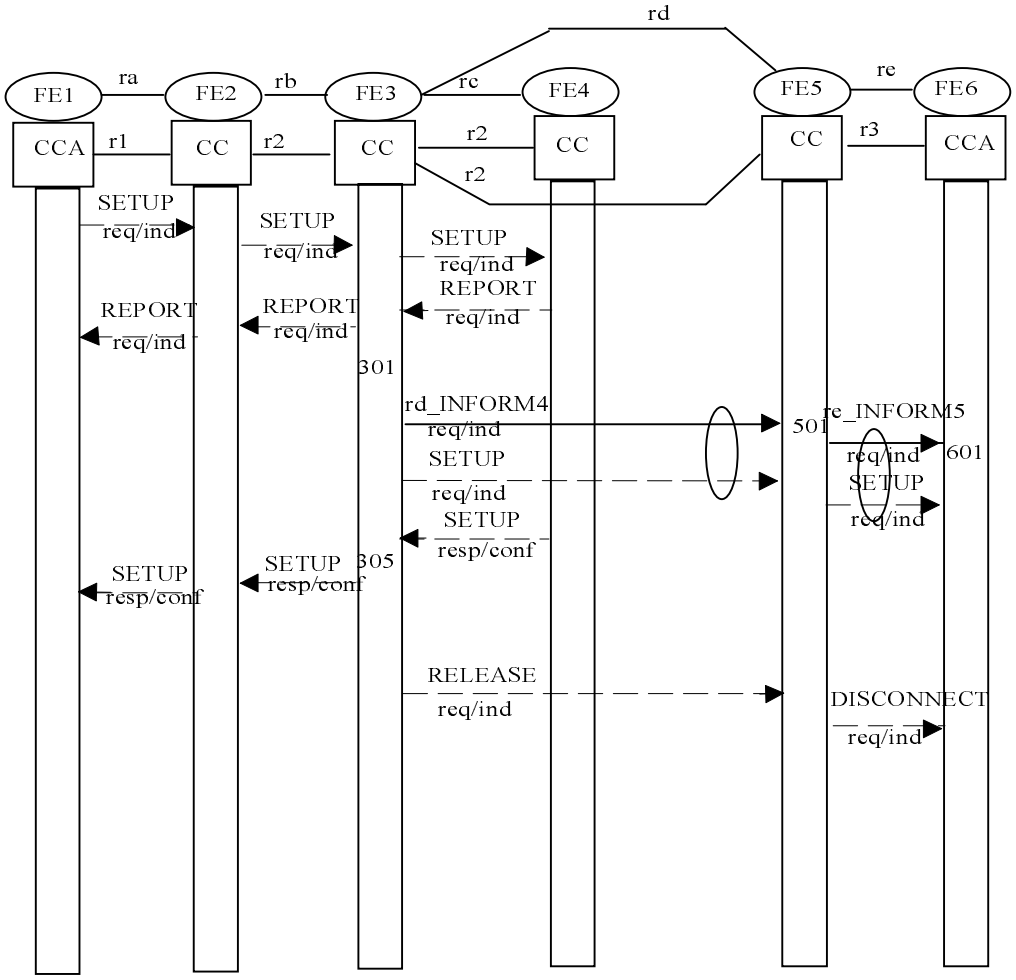


Figure 9 - Information flow sequence - called user answers during interception delayed

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7.2.3.5 Call interception is disabled by FE4

Figure 10 shows the information flow sequence when FE4 disables call interception.

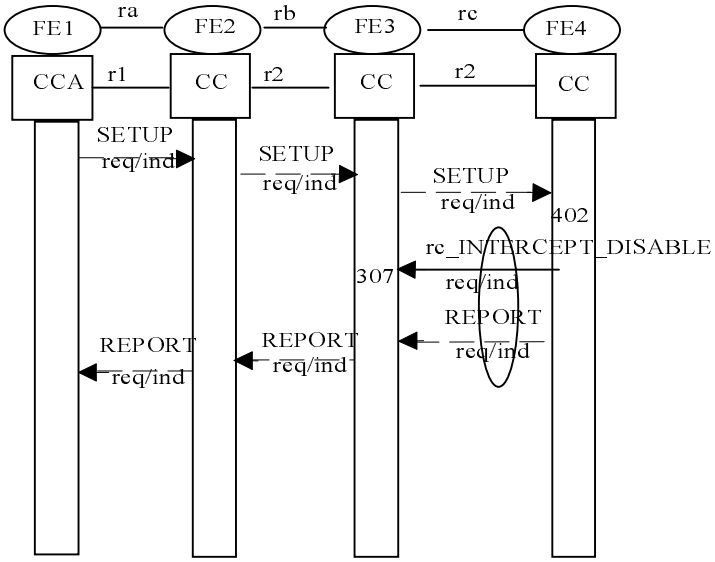


Figure 10 - Information flow sequence - FE4 disables call interception

7.3 Functional entity actions

The following FE actions shall occur at the points indicated in the figures of 7.2.3.

7.3.1 Functional entity actions of FE1

101 Deliver call interception notification to the user as received from FE2 in ra_INFORM2 request/indication.

102 Deliver number and name notification to the user as received from FE2 in ra_INFORM7 request/indication.

7.3.2 Functional entity actions of FE2

201 Receive rb_INFORM1 request/indication from FE3 and send a call interception notification (without number and name notification) in ra_INFORM2 request/indication to FE1.

202 Receive rb_INFORM6 request/indication from FE3, and, if allowed, send the appropriate number and name, if available, information in ra_INFORM7 request/indication to FE1.

7.3.3 Functional entity actions of FE3

301 On receipt of a request from the ANF-CINT user, FE3 performs the following actions:

- stimulate the basic call establishment to FE5 and send the rd_INFORM4 request/indication to FE5;
- in the case of interception immediate, send rb_INFORM1 request/indication to FE2.

302 On receipt of REPORT request/indication or SETUP response/confirmation from the intercepted-to user, in the case of interception delayed, stimulate the release procedure towards the called user and send rb_INFORM1 request/indication to FE2.

303 Relay information received in rd_INFORM6 request/indication from FE5 to FE2.

304 If the calling user releases the call, stimulate the release procedure towards the called and intercepted-to user.

305 If the called user answers, stimulate the release procedure towards the intercepted-to user.

306 On receipt of rc_INTERCEPT_CONDITION request/indication relay the information to the ANF-CINT user.

307 On receipt of rc_INTERCEPT_DISABLE request/indication relay the information to the ANF-CINT user.

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308 On receipt of SETUP response/confirmation indicate successful completion of call interception to the ANF-CINT user if not already indicated.

309 If the call cannot be completed indicate call interception unsuccessful to the ANF-CINT user.

7.3.4 Functional entity actions of FE4

401 Detect conditions that can lead to interception immediate and send rc_INTERCEPT_CONDITION request/indication to FE3.

402 Recognise a specific condition where interception delayed has to be disabled (e.g. the call is directed to an attendant) and send rc_INTERCEPT_DISABLE request/indication to FE3.

7.3.5 Functional entity actions of FE5

501 Determine if presentation of the number and the name information received from FE3 in rd_INFORM4 request/indication is applicable and send re_INFORM5 request/indication to FE6.

502 Send the intercepted-to user's name, name presentation indicator and number presentation indicator in rd_INFORM6 request/indication to FE3 on receipt of r3_REPORT request/indication, if possible, or at the latest on answer.

7.3.6 Functional entity actions of FE6

601 Deliver notifications to the intercepted-to user as received from FE5.

7.4 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 ITU-T Rec. Z.100 (1999).

7.4.1 Behaviour of FE1

Figure 11 shows the normal behaviour of FE1. Output signals to the left represent primitives to the user. Input signals from the right represent information flows from FE2.

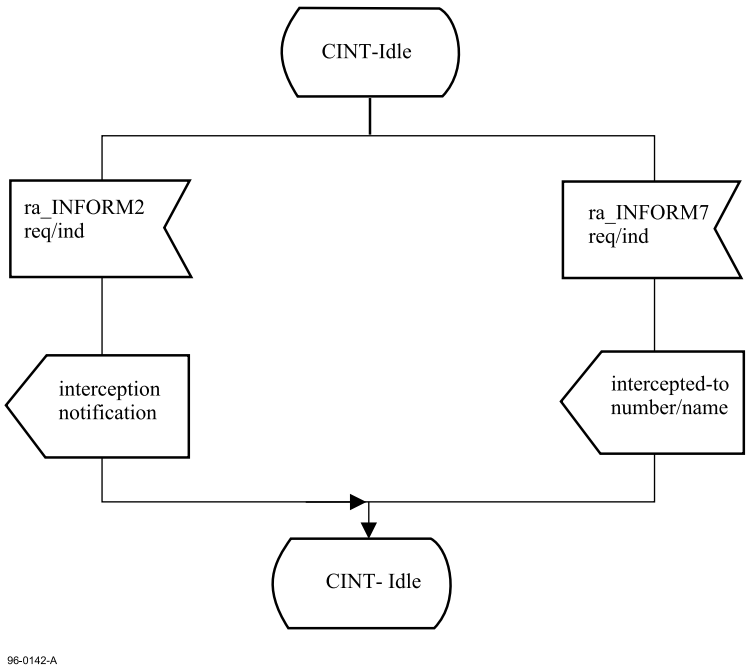


Figure 11 - ANF-CINT, SDL for functional entity FE1

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7.4.2 Behaviour of FE2

Figure 12 shows the normal behaviour of FE2. Output signals to the left represent information flows to other functional entities. Input signals from the right represent information flows from other functional entities, and input signals from the left represent primitives from local CC.

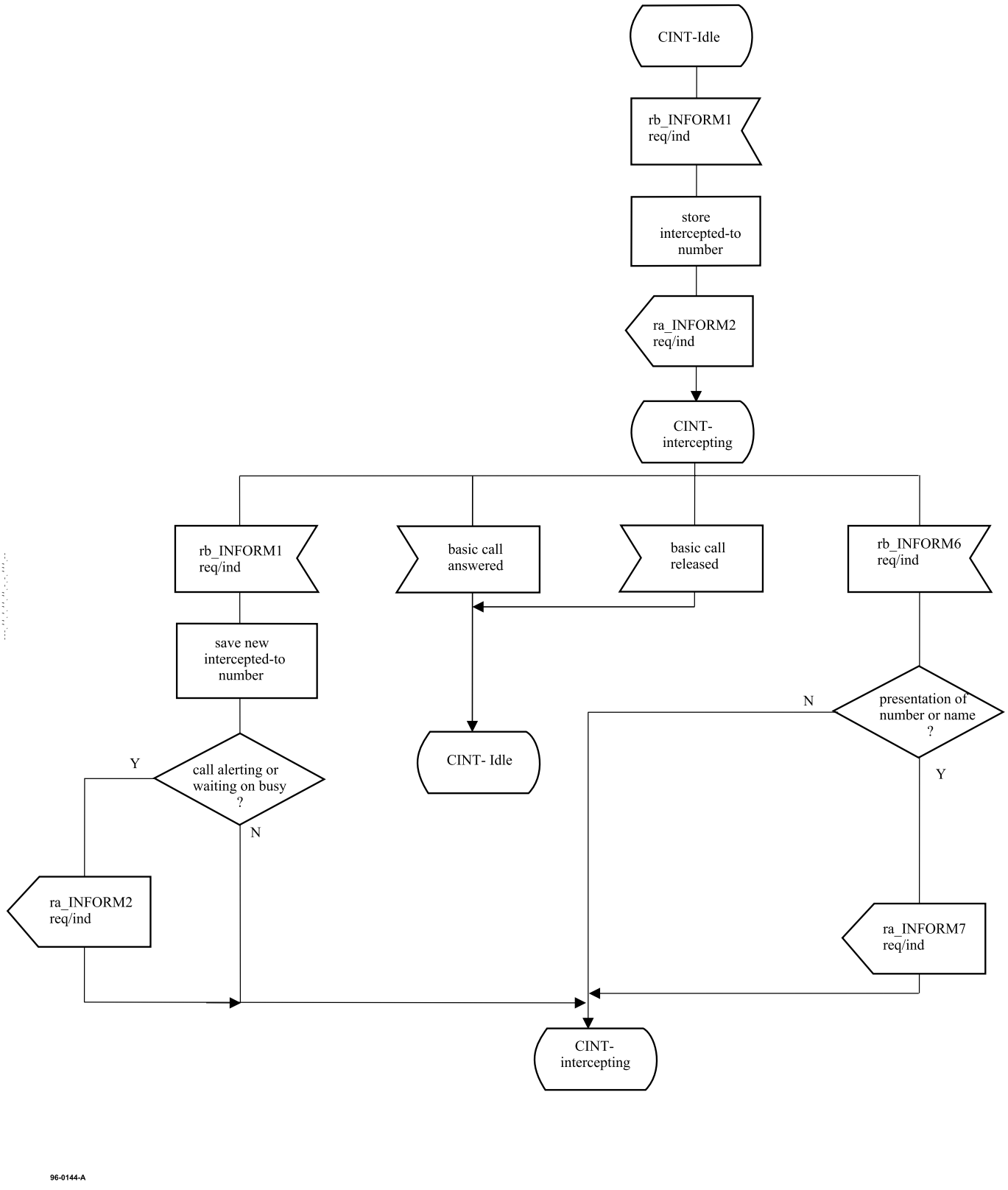


Figure 12 - ANF-CINT, SDL for functional entity FE2

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7.4.3 Behaviour of FE3

Figure 13 shows the normal behaviour of FE3. Output signals to the right and to the left represent information flows to other functional entities. Input signals from the right represent information flows from other functional entities, and input signals from the left represent primitives from the local CC or from the ANF-CINT user. The relationship to the basic call process is indicated in task symbols.

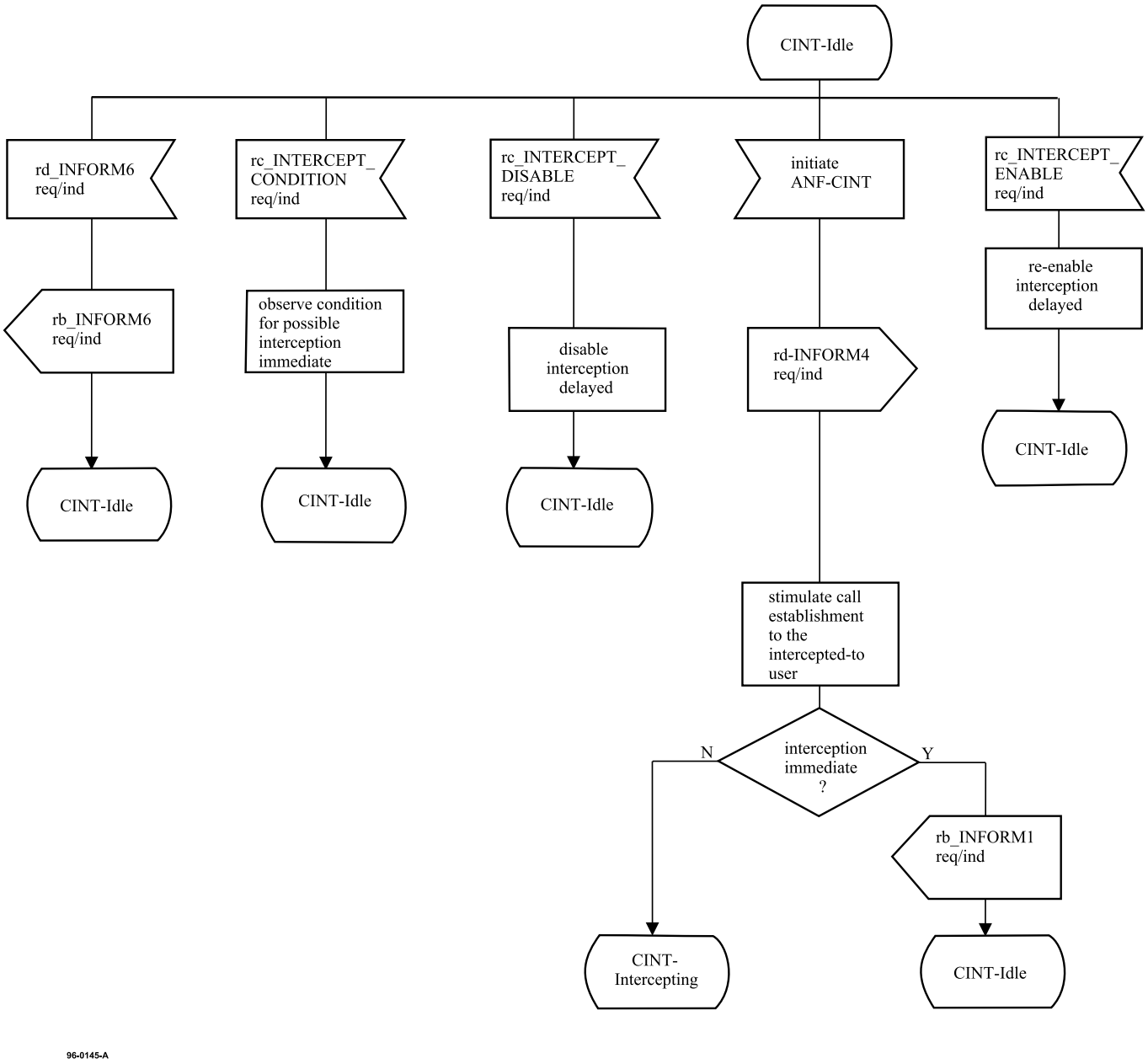


Figure 13 - ANF-CINT, SDL for functional entity FE3 (part 1)

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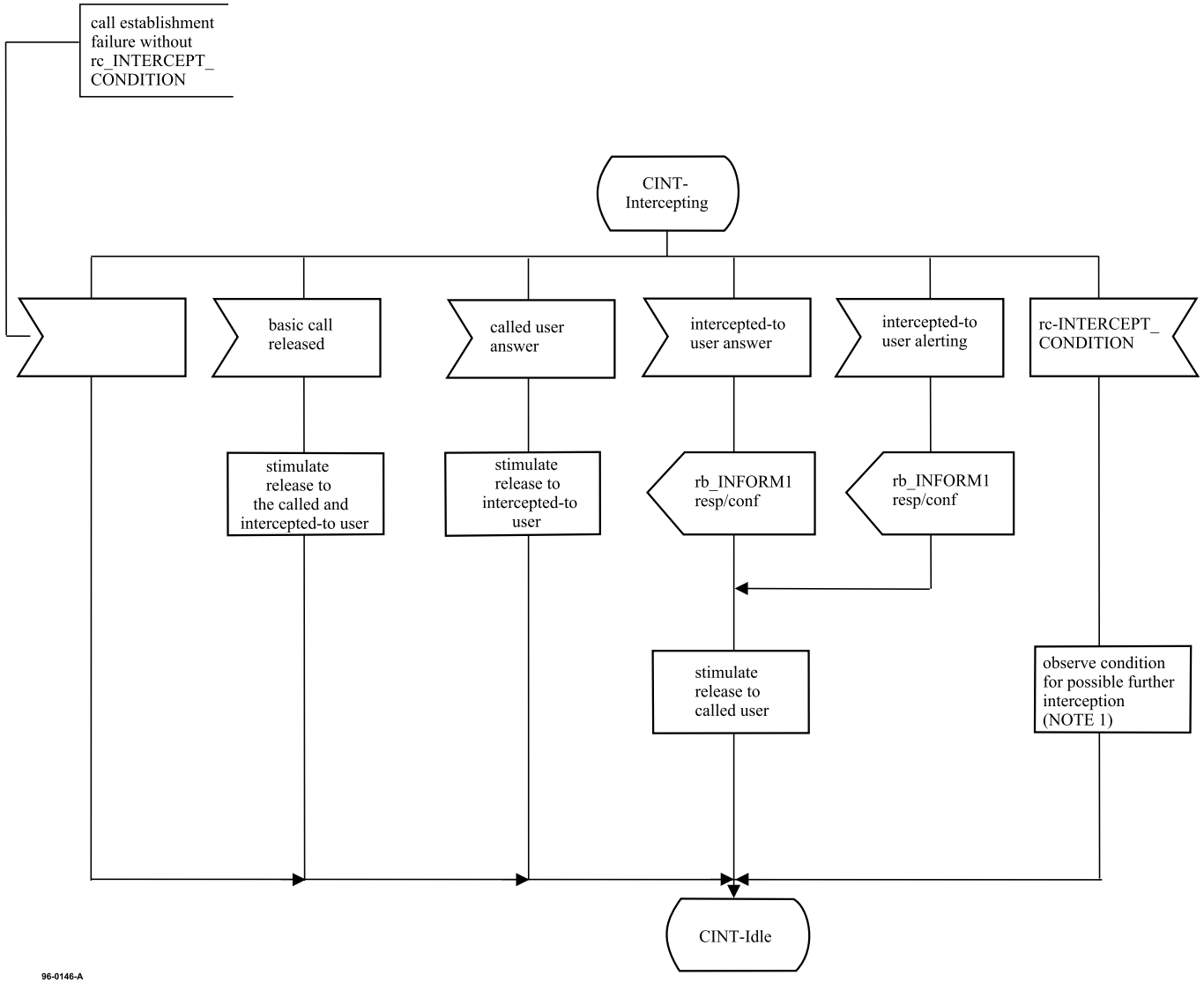


Figure 13 - ANF-CINT, SDL for functional entity FE3 (part 2)

NOTE 1 - Any further interception will be treated as interception delayed, because the original call is already in an alerting or waiting on busy state.

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7.4.4 Behaviour of FE4

Figure 14 shows the normal behaviour of FE4. Output signals to the left represent information flows to other functional entities. Input signals from the right represent internal stimuli.

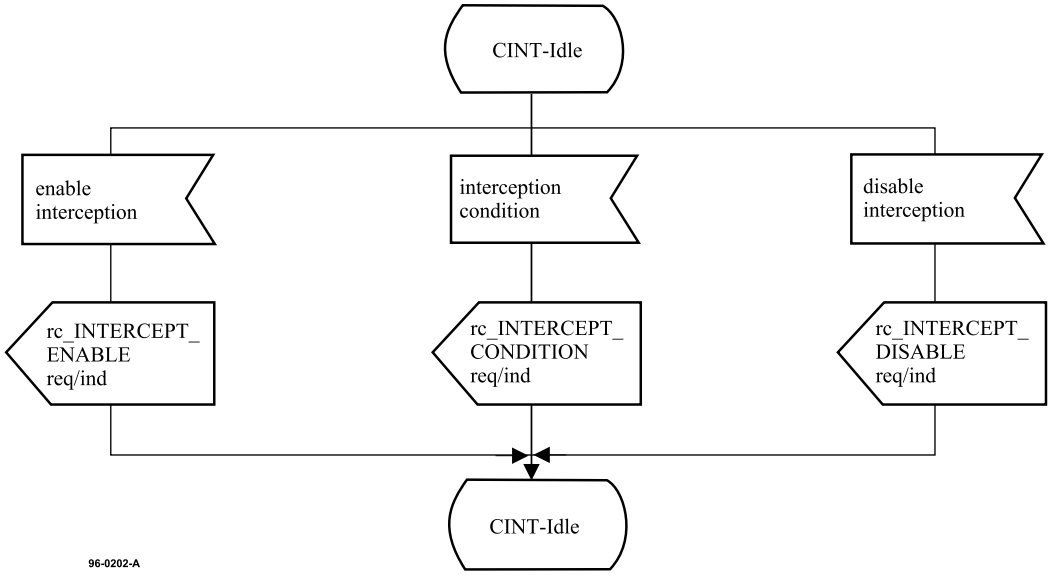


Figure 14 - ANF-CINT, SDL for functional entity FE4

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7.4.5 Behaviour of FE5

Figure 15 shows the normal behaviour of FE5. Output signals to the right and to the left represent information flows to other functional entities. Input signals from the left represent information flows from other functional entities. Input signals from the right represent primitives from the local CC.

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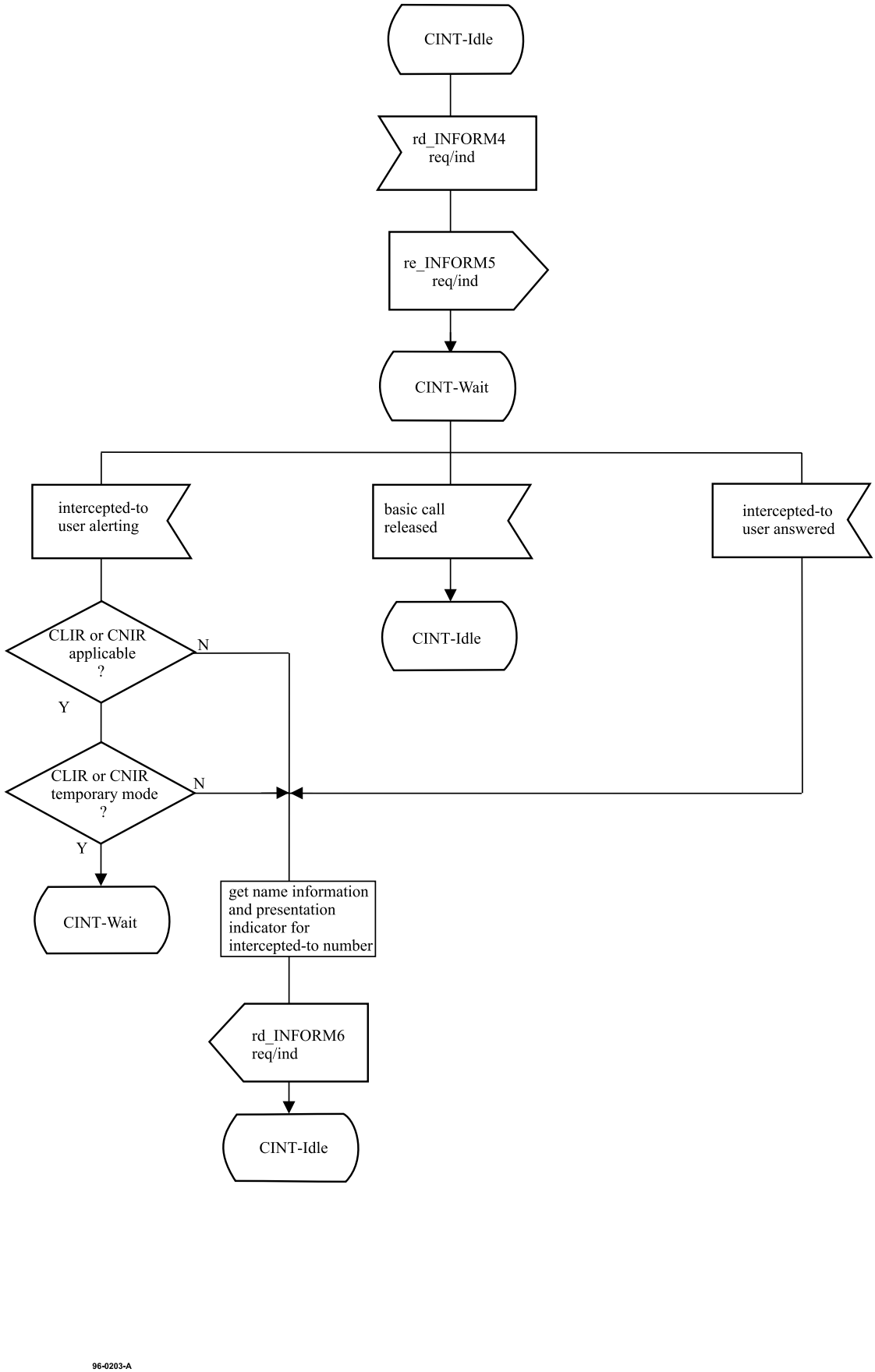


Figure 15 - ANF-CINT, SDL for functional entity FE5

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7.4.6 Behaviour of FE6

Figure 16 shows the normal behaviour of FE6. Output signals to the right represent primitives to the user. Input signals from the left represent information flows from FE5.

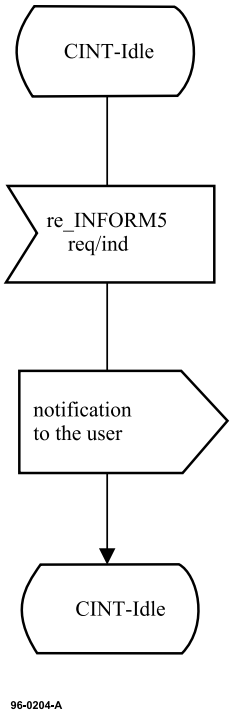


Figure 16 - ANF-CINT, SDL for functional entity FE6

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7.5 Allocation of functional entities to physical equipment

The allocations of FEs to physical equipment shown in table 8 shall apply. In the table, 'TE' represents a TE attached to a PISN. Where a terminal involved is stimulus with respect to ANF-CINT, any FE shown as residing in the TE shall reside instead in that TE's local PINX.

Table 8 - Scenarios for the allocation of FEs to physical equipment

	FE1	FE2	FE3	FE4	FE5	FE6
Scenario 1	TE at the Originating PINX	Originating PINX	Originating PINX	Terminating PINX	Intercepted-to PINX	TE at the Intercepted-to PINX
Scenario 2	TE at the Originating PINX	Originating PINX	Transit PINX (NOTE)	Terminating PINX	Intercepted-to PINX	TE at the Intercepted-to PINX
Scenario 3	TE at the Originating PINX	Originating PINX	Originating PINX	Transit PINX	Intercepted-to PINX	TE at the Intercepted-to PINX
Scenario 4	TE at the Originating PINX	Originating PINX	Transit PINX (NOTE)	Transit PINX	Intercepted-to PINX	TE at the Intercepted-to PINX
Scenario 5	TE at the Originating PINX	Originating PINX	Originating PINX	Outgoing Gateway PINX	Intercepted-to PINX	TE at the Intercepted-to PINX
Scenario 6	TE at the Originating PINX	Originating PINX	Transit PINX (NOTE)	Outgoing Gateway PINX	Intercepted-to PINX	TE at the Intercepted-to PINX
Scenario 7	TE at the Originating PINX	Originating PINX	Terminating PINX	Terminating PINX	Intercepted-to PINX	TE at the Intercepted-to PINX
Scenario 8	TE at the Originating PINX	Originating PINX	Originating PINX	Originating PINX	Intercepted-to PINX	TE at the Intercepted-to PINX
Scenario 9	TE at the Originating PINX	Originating PINX	Outgoing Gateway PINX	Outgoing Gateway PINX	Intercepted-to PINX	TE at the Intercepted-to PINX

NOTE - Scenarios where FE3 is located at a Transit PINX may be subject to restriction specified in stage 3 specifications.

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7.6 Interworking considerations

When interworking with another network that supports an equivalent feature, any of the following FEs can be located in the other network (the remaining FEs being located in the PISN in accordance with 7.5):

- FE1 and FE2;
- FE5 and FE6;
- FE4;
- FE3, FE4, FE5, and FE6;
- FE1, FE2, FE3 and FE4;
- FE1, FE2, FE3, FE5 and FE6.

In addition, FE1 can be located in the other network with FE2 located at the Incoming Gateway PINX, and FE6 can be located in the other network with FE5 located at the Outgoing Gateway PINX.

When interworking with another network that does not support an equivalent feature, FE2 can be located at the Incoming Gateway PINX with FE1 having null functionality, and FE5 can be located at the Outgoing Gateway PINX with FE6 having null functionality.

If FE2 is located in another network or at the Incoming Gateway PINX, FE3 can be located in the Incoming Gateway PINX.

If FE3 is located at the Incoming Gateway PINX, FE4 can be located in the Incoming Gateway PINX.

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