INTERNATIONAL STANDARD

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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Specification, functional model and information flows — Path replacement 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 de remplacement de chemin

Reference number
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Contents

Foreword

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

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

International Standard ISO/IEC 13863 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

Annexes A and B of this International Standard are for information only.

Introduction

This International Standard is one of a series of International 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 particular International Standard specifies the Path Replacement additional network feature.

Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Path replacement additional network feature

1 Scope

This International Standard specifies the Path Replacement additional network feature (ANF-PR), which is applicable to various basic services supported by Private Integrated Services Networks (PISN). Basic services are specified in ISO/IEC 11574.

ANF-PR is a feature which applies to an established call, allowing that call's connection between Private Integrated Services Network Exchanges (PINXs) to be replaced by a new connection. If the new connection is required to satisfy certain criteria, ANF-PR should be used in conjunction with other supplementary services and/or ANFs. Annex A gives examples of the circumstances under which ANF-PR can be used and criteria which can govern the selection of the new connection.

Additional network feature specifications are produced in three stages, according to the method described in CCITT Recommendation I.130 for supplementary services. This International Standard contains the stage 1 and stage 2 specifications of ANF-PR. The stage 1 specification (clause 6) specifies the feature as seen by an entity which initiates path replacement, the ANF-PR user. The stage 2 specification (clauses 7 and 8) identifies the functional entities involved in the feature and the information flows between them. Clause 7 contains the stage 2 specification for basic operation of the feature. Clause 8 contains the stage 2 specification for an enhanced mode of working which can be employed when supported by all the equipment involved. It allows some of the elements of the old connection to be re-used.

2 Conformance

In order to conform to this International Standard, a stage 3 International 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 International Standard is required to be adequate for the support of those aspects of clause 6 (stage 1) and clauses 7 and 8 (stage 2) which are relevant to the interface or equipment to which the Stage 3 International Standard applies.

3 Normative references

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

ISO/IEC 11571:1994, *Information technology - Telecommunications and information exchange between systems - Numbering and sub-addressing in private integrated services networks.*

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

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

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

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

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

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

4 Definitions

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

4.1 External definitions

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

- Basic service (CCITT Rec. I.210)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated Services Network Exchange (PINX) (ISO/IEC 11579-1)
- Service (CCITT Rec. I.112)
- Signalling (CCITT Rec. I.112)
- Supplementary Service (CCITT Rec. I.210)
- User (except in the context of ANF-PR 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:

- Channel_Acknowledge request/indication
- Release request/indication
- Release response/confirmation
- Setup request/indication
- Setup response/confirmation.

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

- Destination Number.

4.2 Other definitions

4.2.1 additional network feature (ANF): 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-PR user: An entity, within a PISN, that requests ANF-PR.

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

4.2.4 connection: As defined in CCITT Rec. I.112, but limited to the case of providing for the transfer of signals between two PINXs.

NOTE 1 — A connection between two PINXs can pass through zero or more Transit PINXs.

4.2.5 new connection: The connection established by ANF-PR and used to replace all or part of the old connection.

4.2.6 old connection: The connection existing before ANF-PR is invoked.

4.2.7 trombone connection: A connection which has both its ends in the same PINX but which involves at least one Transit PINX.

5 List of acronyms

ANF	additional network feature
ANF-PR	ANF Path Replacement
CC	Call Control (functional entity)
CCA	Call Control Agent (functional entity)
CID	Call Identity (information flow service element)
FE	Functional Entity
ISDN	Integrated Services Digital Network
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
PRE	Path Replacement Error (information flow)
PRP	Path Replacement Propose (information flow)
PRR	Path Replacement Re-use (information flow)
PRRR	PRR Result (information flow service element)
PRS	Path Replacement Setup (information flow)
PRSR	PRS Result (information flow service element)
RN	Rerouteing Number (information flow service element)
SDL	Specification and Description Language

6 ANF-PR stage 1 specification

6.1 Description

6.1.1 General description

ANF-PR is invoked by an ANF-PR user for an established call, allowing that call's connection through the PISN to be replaced by a new connection. If the new connection is required to satisfy certain criteria, ANF-PR should be used in conjunction with other supplementary services and/or ANFs. Annex A gives examples of the circumstances under which ANF-PR can be used and criteria which can govern the selection of the new connection.

6.1.2 Qualifications On Applicability To Telecommunication Services

This additional network feature is applicable to all basic services defined in ISO/IEC 11574.

NOTE 2 — For certain teleservices or certain applications of certain basic bearer services the changeover from the old connection to the new connection can cause unacceptable disruption. See annex B.

6.2 Procedure

6.2.1 Provision/withdrawal

This ANF shall be PISN instigated.

NOTE 3 — Means can be provided for preventing the use of ANF-PR for applications where the changeover from the old connection to the new connection is likely to cause unacceptable disruption. See annex B.

6.2.2 Normal procedures

6.2.2.1 Activation/deactivation/registration/interrogation

The feature shall be permanently activated.

6.2.2.2 Invocation and operation

Invocation shall be on request from an ANF-PR user and shall be permitted only after a call has reached the active state.

On invocation an attempt shall be made to establish a new connection between the Originating PINX and the Terminating PINX. In the absence of specific criteria, the new connection shall be established using the routeing rules which apply to basic call establishment. If the new connection is successfully established it shall be used to replace the old connection, which shall be released.

Changeover from the old connection to the new connection should be done in a manner which minimises disruption to user information.

NOTE 4 — The means of specifying criteria and ensuring that the new connection satisfies those criteria can involve the use of another ANF or supplementary service, which can be either standardised or manufacturer specific.

In some circumstances it may be possible to re-use some elements of the old connection, so that only part of the old connection has to be replaced by a new connection, subject to the given criteria being achievable in that way.

6.2.3 Exceptional procedures

6.2.3.1 Activation/deactivation/registration/interrogation

Not applicable.

6.2.3.2 Invocation and operation

If it is not possible to establish a new connection, the call shall continue to use the old connection and any resources reserved for the new connection shall be released. There shall be no disruption to user information.

In the event of two ANF-users (at opposite ends of the connection) requesting the feature simultaneously, both requests shall be rejected.

NOTE 5 — An ANF-PR user can request the feature again later in the event of failure. In the case of failure due to simultaneous requests, care should be taken to avoid a repeat occurrence, e.g., by use of a random delay.

6.3 Interaction with other supplementary services and ANFs

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

6.3.1 Calling Line Identification Presentation (SS-CLIP)

No interaction.

6.3.2 Connected Line Identification Presentation (SS-COLP)

No interaction.

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

No interaction.

6.3.4 Calling Name Identification Presentation (SS-CNIP)

No interaction.

6.3.5 Connected Name Identification Presentation (SS-CONP)

No interaction.

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

No interaction.

6.3.7 Completion of Calls to Busy Subscriber (SS-CCBS)

No interaction

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

No interaction

6.3.9 Call Transfer (SS-CT)

If call transfer occurs while ANF-PR is in progress, ANF-PR shall be aborted.

ANF-PR can apply to a call which has been transferred. The fact that transfer has occurred can be a reason for invoking ANF-PR (see annex A).

6.3.10 Call Forwarding Unconditional (SS-CFU)

ANF-PR can apply to a call which has been forwarded.

6.3.11 Call Forwarding Busy (SS-CFB)

ANF-PR can apply to a call which has been forwarded.

6.3.12 Call Forwarding No Reply (SS-CFNR)

ANF-PR can apply to a call which has been forwarded.

6.3.13 Call Deflection (SS-CD)

ANF-PR can apply to a call which has been deflected.

6.4 Interworking considerations

The requirements below apply to both incoming calls and outgoing calls.

It shall be possible to use ANF-PR on the PISN part of the connection. The new connection through the PISN shall replace the old connection through the PISN.

When interworking with another network which supports an equivalent feature, it may be possible to cooperate with the other network in order to replace the entire connection.

6.5 Overall SDL

Figure 1 contains the dynamic description of ANF-PR using the Specification and Description Language (SDL) defined in CCITT Rec. Z.100 (1988). The SDL process represents the behaviour of the PISN in providing ANF-PR. Input signals from the left and output signals to the left represent primitives from and to the ANF-PR user.

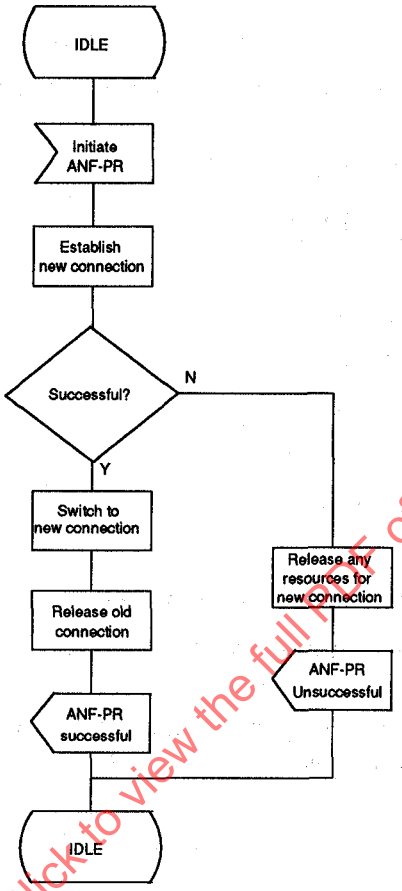


Figure 1 - ANF-PR, overall SDL

7 ANF-PR stage 2 specification - basic operation

7.1 Functional model

7.1.1 Functional model description

The functional model shall comprise the following functional entities:

FE1 Path Replacement Destination;

FE2 Path Replacement Source.

The following functional relationship shall exist between these FEs:

rx between FE1 and FE2.

Figure 2 shows these FEs and this relationship.

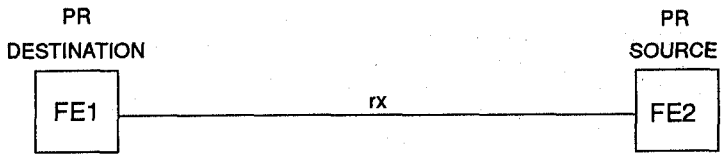


Figure 2 - Functional model for ANF-PR

7.1.2 Description of functional entities

7.1.2.1 Path Replacement destination functional entity, FE1

This functional entity receives a request from the ANF-PR user to initiate ANF-PR and instructs FE2 to attempt to establish a new connection back towards FE1. If the new connection is successfully established, FE1 switches to the new connection and awaits the release of the old connection.

7.1.2.2 Path Replacement source functional entity, FE2

On receipt of instruction from FE1 and if able to proceed with ANF-PR, this functional entity initiates the establishment of a new connection back towards FE1. If the new connection is successfully established, FE2 switches to the new connection and initiates release of the old connection.

7.1.3 Relationship of functional model to basic call functional model

During successful invocation of ANF-PR, the Transit CCs, if any, involved in the old connection shall be replaced by the Transit CCs, if any, involved in the new connection. The Originating and Terminating CCs shall remain.

For the case of a call originating and terminating within the PISN, ANF-PR functional entities shall be related to basic call functional entities as follows:

- FE1 shall be collocated with the Originating CC or the Terminating CC, depending on the location of the ANF-PR user;
- FE2 shall be collocated with the Terminating CC if FE1 is collocated with the Originating CC, or with the Originating CC if FE1 is collocated with the Terminating CC.

Figure 3 shows an example of the relationship between the model for ANF-PR and the model for the basic call. This example is used as the basis of the information flow sequences in 7.2.3.

NOTE 6 — The number of Transit CCs on the new connection can differ from the number on the old connection.

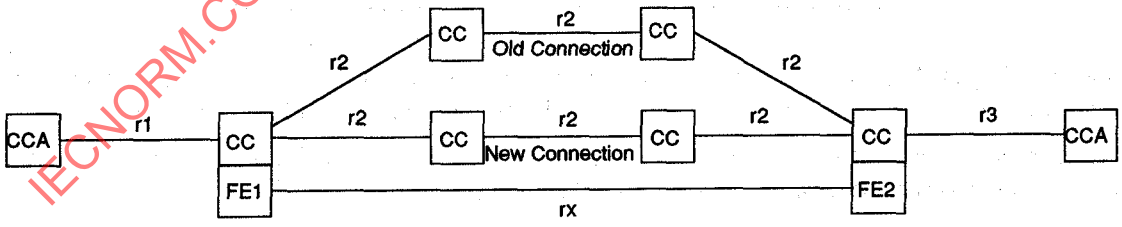


Figure 3 - Example relationship between models for ANF-PR and basic call

7.2 Information flows

7.2.1 Definition of information flows

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

7.2.1.1 PRP (Path Replacement Propose)

PRP is an unconfirmed information flow across rx from FE1 to FE2 which proposes path replacement to FE2.

PRP request/indication is sent using the signalling path of the old connection.

Table 1 lists the service elements within the PRP information flow.

Table 1 - Content of PRP

Service element	Request
Rerouteing Number (RN)	M
Call Identity (CID)	M

Service element RN shall always be included in the PRP request/indication information flow at rx. It shall contain a number from one of the native numbering plans of the PISN (see ISO/IEC 11571). The number shall be suitable for use for routeing the new connection to the physical location where FE1 resides.

Service element CID shall always be included in the PRP request/indication information flow at rx. It shall contain a number which, in conjunction with the number in service element RN, identifies the particular FE1, and therefore the call on which ANF-PR is being invoked. This number need not have significance outside the physical location where FE1 resides.

7.2.1.2 PRS (Path Replacement Setup)

PRS is a confirmed information flow across rx from FE2 to FE1 which indicates to FE1 that the new connection being established is for the purpose of path replacement. The response indicates whether FE1 has successfully correlated the new connection with the old connection and is prepared to switch to the new connection.

PRS request/indication and PRS response/confirmation are sent using the signalling path of the new connection at the time of establishment of that connection.

Table 2 lists the service elements within the PRS information flow.

Table 2 - Content of PRS

Service element	Request	Confirm
Call Identity (CID)	M	-
PRS Result (PRSR)	-	M

Service element CID shall always be included in the PRS request/indication information flow at rx. It shall contain the value received in the corresponding service element of the PRP request/indication information flow.

Service element PRSR shall always be included in the PRS response/confirmation information flow at rx. It indicates whether the request was successful, and if not the reason for failure.

7.2.1.3 PRE (Path Replacement Error)

PRE is an unconfirmed information flow across rx from FE2 to FE1 which indicates to FE1 that path replacement has failed.

Table 3 lists the service element within the PRE information flow.

Table 3 - Content of PRE

Service element	Request
Reason for failure	M

7.2.2 Relationship of information flows to basic call information flows

The PRS request/indication information flow shall be sent in conjunction with the basic call information flow Setup request/indication for the new connection sent across basic call relationship r2. Service element Destination Number of information flow Setup request/indication shall contain the number provided in service element RN of information flow PRP request/indication.

The PRS response/confirmation information flow shall be sent in conjunction with the basic call information flow Setup response/confirmation for the new connection across basic call relationship r2.

Failure to establish the new connection shall result in the initiation of its release using basic call information flow Release request/indication across relationship r2.

Successful switch over to the new connection shall result in the initiation of the release of the old connection using basic call information flow Release request/indication across relationship r2.

7.2.3 Examples of information flow sequences

A stage 3 International Standard for ANF-PR 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, different topologies, etc..

In the figures, ANF-PR 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-PR functional entity, the numbers refer to functional entity actions listed in 7.3. The following abbreviations are used:

req request

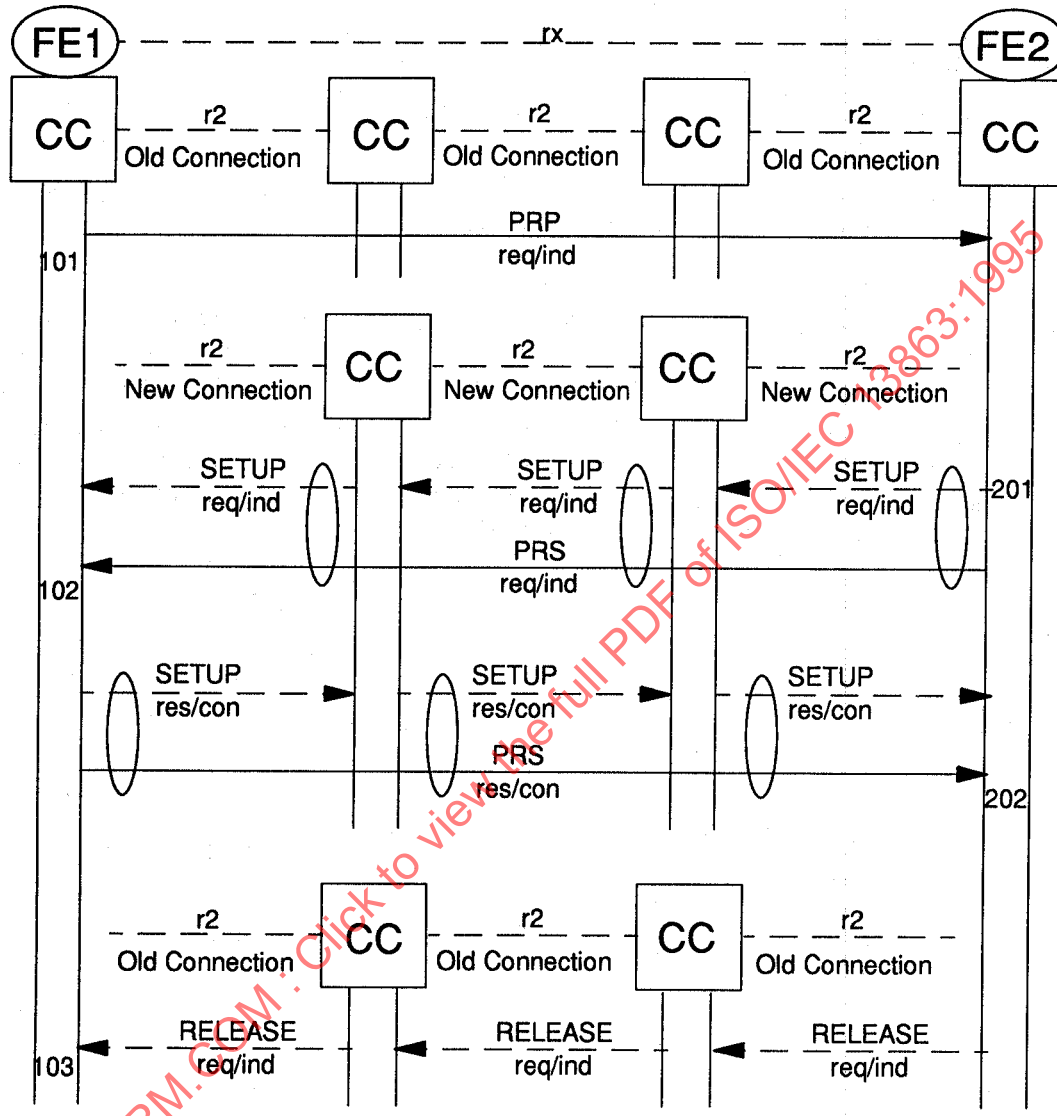
ind indication

res response

con confirmation

7.2.3.1 Normal operation of ANF-PR

Figure 4 shows the information flow sequence for normal operation of ANF-PR.

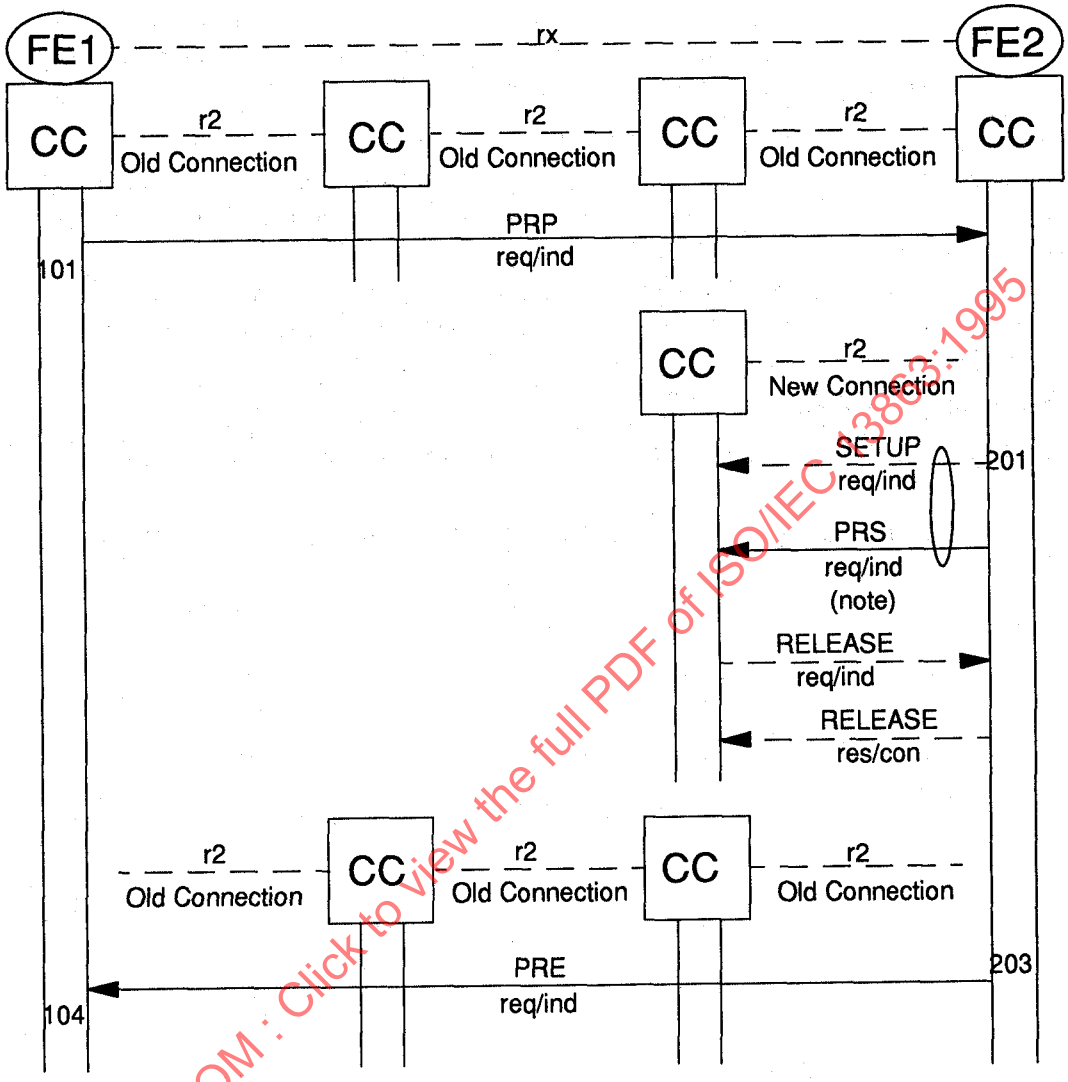


NOTE — For simplicity, basic call information flows Channel_Acknowledge request/indication and Release response/confirmation are not shown.

Figure 4 - Information flow sequence - normal operation of ANF-PR

7.2.3.2 Failure to establish new connection

Figure 5 shows the information flow sequence when establishment of the new connection fails.



NOTE — Because of failure to establish the new connection, the PRS request/indication will not reach FE1.

Figure 5 - Information flow sequence - failure to establish new connection

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 On receipt of a request from the ANF-PR user, obtain Rerouteing Number and Call Identity, and include in PRP request/indication to FE2.

102 On receipt of PRS request/indication (in conjunction with basic call Setup request/indication): correlate new connection with old connection; switch over to the user information channel of the new connection; terminate the user information channel of the old connection in a suitable manner (pending its release); stimulate the sending of a basic call Setup response/confirmation; and return with it a PRS response/confirmation.

NOTE 7 — The method of terminating the old connection's user information channel is an implementation matter. See also annex B.

103 On receipt of an indication from the local CC that the old connection has been released, indicate successful completion of ANF-PR to the ANF-PR user.

104 On receipt of PRE request/indication, terminate ANF-PR and retain the old connection. Depending on the reason for failure, indicate to the ANF-PR user whether it is worthwhile invoking again later.

7.3.2 Functional entity actions of FE2

201 On receipt of PRP request/indication, check that ANF-PR is allowed and stimulate the establishment of a new connection. In conjunction with basic call SETUP request/indication, send PRS request/indication to FE1. Terminate the new connection's user information channel suitably.

NOTE 8 — The method of terminating the new connection's user information channel is an implementation matter. See also annex B.

202 On receipt of PRS response/confirmation indicating success (in conjunction with basic call Setup response/-confirmation), switch over to the new connection. Disconnect the old user information channel and initiate release of the old connection. Terminate ANF-PR.

203 On inability to accept the PRP request/indication, failure to establish the new connection, or receipt of PRS response/confirmation indicating failure (in conjunction with basic call Release request/indication), send PRE request/indication to FE1 and terminate ANF-PR.

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 CCITT Rec. Z.100 (1988).

7.4.1 Behaviour of FE1

Figure 6 shows the normal behaviour of FE1. Input signals from the right and output signals to the right represent information flows from and to FE2 and from the local basic call CC. Input signals from the left and output signals to the left represent primitives from and to the ANF-PR user.

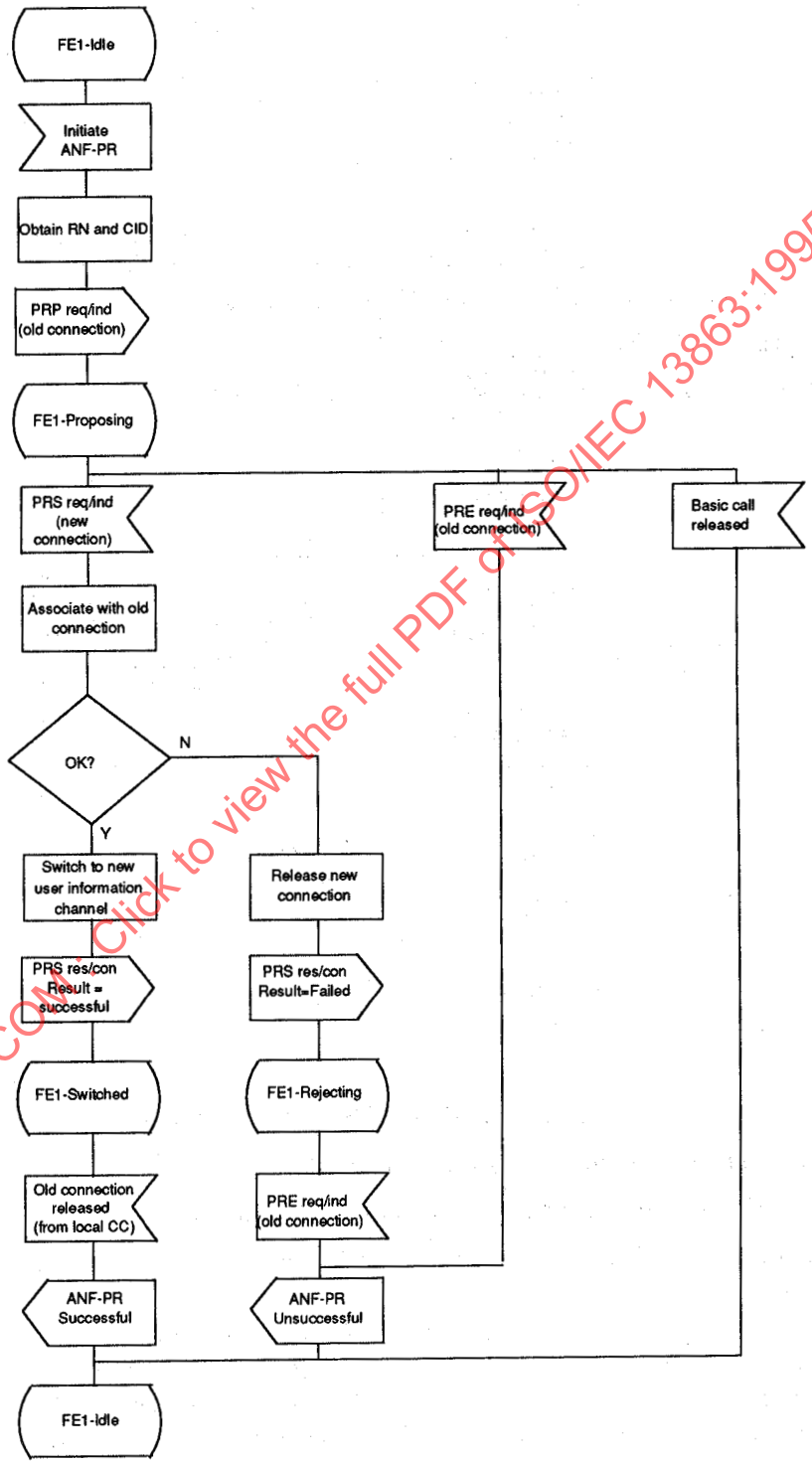


Figure 6 - ANF-PR, SDL for functional entity FE1

7.4.2 Behaviour of FE2

Figure 7 shows the normal behaviour of FE2. Input signals from the left and output signals to the left represent information flows from and to FE1. Input signals from the right represent indications from the local CC.

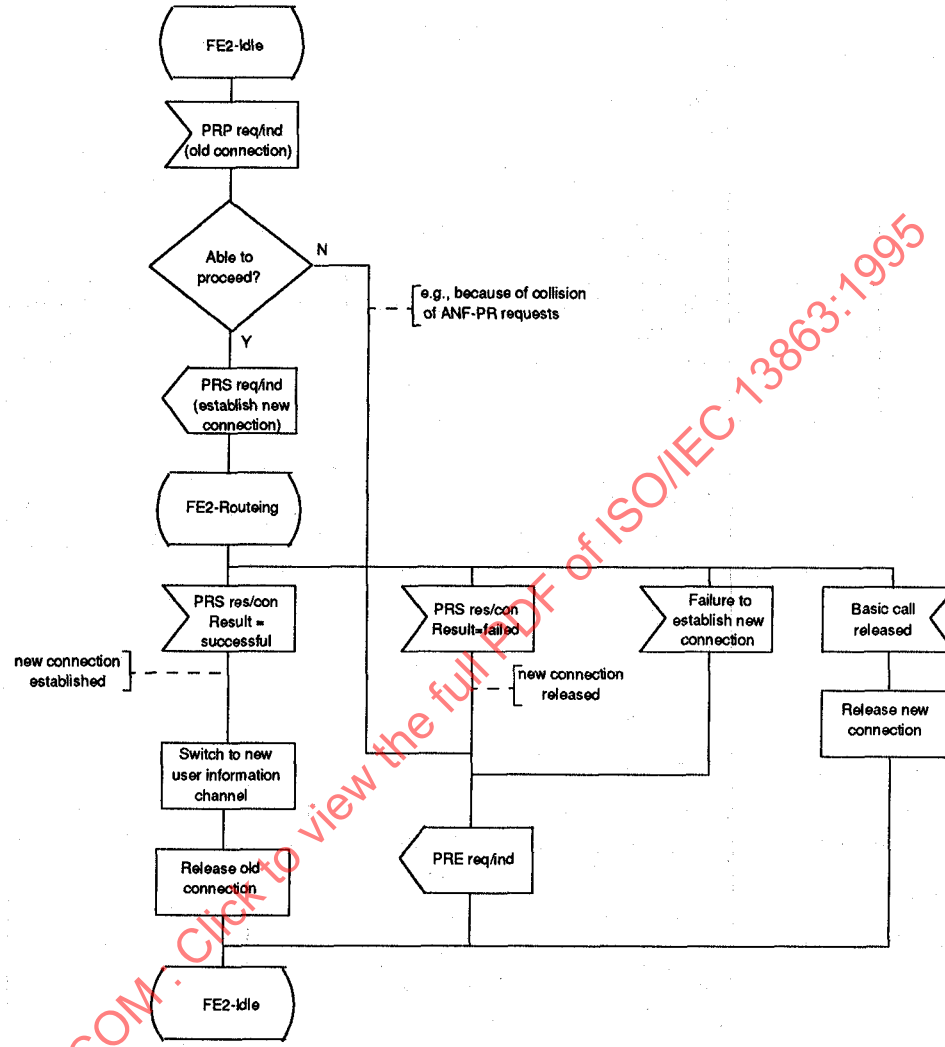


Figure 7 - ANF-PR, SDL for functional entity FE2

7.5 Allocation of functional entities to physical equipment

The allocations of FEs to physical equipment shown in Table 4 shall apply.

FE1 shall be located at either End PINX, depending on where the need for invoking ANF-PR arises. This will depend on the application.

In the case of a trombone connection, the Originating PINX or Incoming Gateway PINX will be the same PINX as the Terminating PINX or Outgoing Gateway PINX. Therefore FE1 and FE2 will be collocated and the new connection and those information flows sent using the signalling path of the new connection will be intra-PINX. Information flow PRP request/indication sent using the signalling path of the old connection will enable FE2 to determine that FE1 is collocated.

Table 4 - Scenarios for the allocation of FEs to physical equipment

	FE1	FE2
Scenario 1	Originating PINX	Terminating PINX
Scenario 2	Originating PINX	Outgoing Gateway PINX (note)
Scenario 3	Incoming Gateway PINX (note)	Terminating PINX
Scenario 4	Incoming Gateway PINX (note)	Outgoing Gateway PINX (note)
Scenario 5	Terminating PINX	Originating PINX
Scenario 6	Terminating PINX	Incoming Gateway PINX (note)
Scenario 7	Outgoing Gateway PINX (note)	Originating PINX
Scenario 8	Outgoing Gateway PINX (note)	Incoming Gateway PINX (note)
NOTE — When interworking with another network which supports an equivalent feature, FE1 or FE2 may be located in that other network, thereby permitting replacement of the entire connection.		

7.6 Interworking considerations

When interworking with another network which does not support an equivalent feature, the FEs for ANF-PR shall be located within PINXs, in accordance with 7.5. All information flows will be internal to the PISN.

When interworking with another network which supports an equivalent feature, the two networks may cooperate in the operation of ANF-PR. In this case, either FE1 or FE2 will be located in the other network and the information flows within the PISN will map on to equivalent information flows in the other network.

8 ANF-PR stage 2 specification - re-use of connection elements

The enhanced functional breakdown of the feature as specified in this clause allows the possibility of re-using some elements of the old connection, so that only part of the old connection has to be replaced by a new connection.

8.1 Functional model

8.1.1 Functional model description

The functional model shall be as specified in 7.1.1 for basic operation, but with the addition of one or more instances of FE "Path Replacement Re-use" (FE3). The functionality of FE2 is enhanced. Additional relationship rz shall exist between FE1 and the adjacent instance of FE3. Additional relationship ry shall exist between adjacent instances of FE3 and between FE2 and the adjacent instance of FE3. See Figure 8.

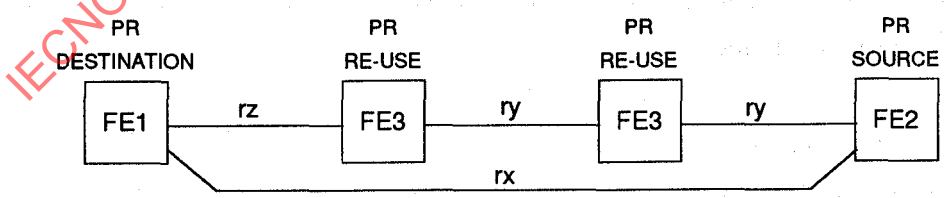


Figure 8 - Functional model for enhanced operation of ANF-PR

8.1.2 Description of functional entities

8.1.2.1 Path Replacement destination functional entity, FE1

7.1.2.1 shall apply.

8.1.2.2 Path Replacement source functional entity, FE2

The functions of FE2 are as specified in 7.1.2.2 with the following enhancement.

FE2 determines whether the existing element of the old connection as far as the next CC can be re-used, and if so instructs an instance of FE3 located at the next CC to establish and switch to the new connection.

8.1.2.3 Path Replacement re-use functional entity, FE3

On receipt of instruction from FE2 or an intervening FE3, this functional entity initiates the establishment of a new connection back towards FE1. If the new connection is successfully established, FE3 connects the re-used connection element from FE2 to the new connection and initiates release of the unwanted parts of the old connection.

FE3 determines whether the existing element of the old connection as far as the next CC can be re-used, and if so instructs a further instance of FE3 located at the next CC to establish and switch to the new connection.

8.1.3 Relationship of functional model to basic call functional model

7.1.3 shall apply with the following modifications.

During successful invocation of ANF-PR with re-use of some or all of the elements of the old connection, the Transit CCs in that part of the old connection which is not re-used are replaced by the Transit CCs, if any, involved in the new connection. Other Transit CCs, including the one from which the new connection starts, are retained, and each has a collocated FE3.

Figure 9 shows an example of the relationship between the model for ANF-PR and the model for the basic call. In this example elements of the old connection are re-used from FE2 as far as the first Transit CC. This example is used as the basis of the information flow sequences in 8.2.3.

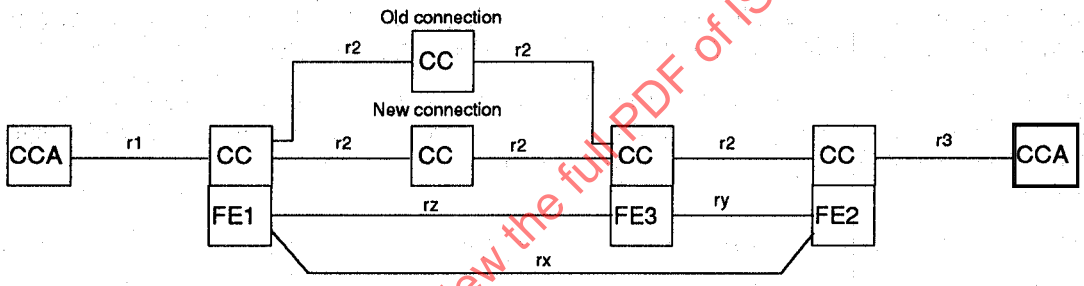


Figure 9 - Example relationship between models for ANF-PR and basic call - re-use of part of the old connection

8.2 Information flows

8.2.1 Definition of information flows

8.2.1.1 PRP (Path Replacement Propose)

7.2.1.1 shall apply.

8.2.1.2 PRS (Path Replacement Setup)

7.2.1.2 shall apply, with the exception that information flow PRS shall occur across relationship rz instead of rx.

8.2.1.3 PRE (Path Replacement Error)

7.2.1.3 shall apply.

8.2.1.4 PRR (Path Replacement Re-use)

PRR is a confirmed information flow across ry from FE2 or FE3 to the next FE3. It instructs the next FE3 to establish and switch to a new connection, elements of the old connection as far as that next FE3 being re-used. The response indicates whether a new connection has been successfully established and switched to.

PRR request/indication and PRR response/confirmation are sent using the signalling path of the old connection.

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

Table 5 - Content of PRR

Service element	Request	Confirm
Rerouteing Number (RN)	M	-
Call Identity (CID)	M	-
PRR Result (PRRR)	-	M

Service element RN shall always be included in the PRR request/indication information flow at ry. It shall contain the number sent to FE2 in service element RN of the PRP request/indication information flow.

Service element CID shall always be included in the PRR request/indication information flow at ry. It shall contain the value received in the corresponding service element of the PRP request/indication information flow.

Service element PRRR shall always be included in the PRR response/confirmation information flow at ry. It indicates whether the request was successful, and if not the reason for failure.

8.2.2 Relationship of information flows to basic call information flows

7.2.2 shall apply.

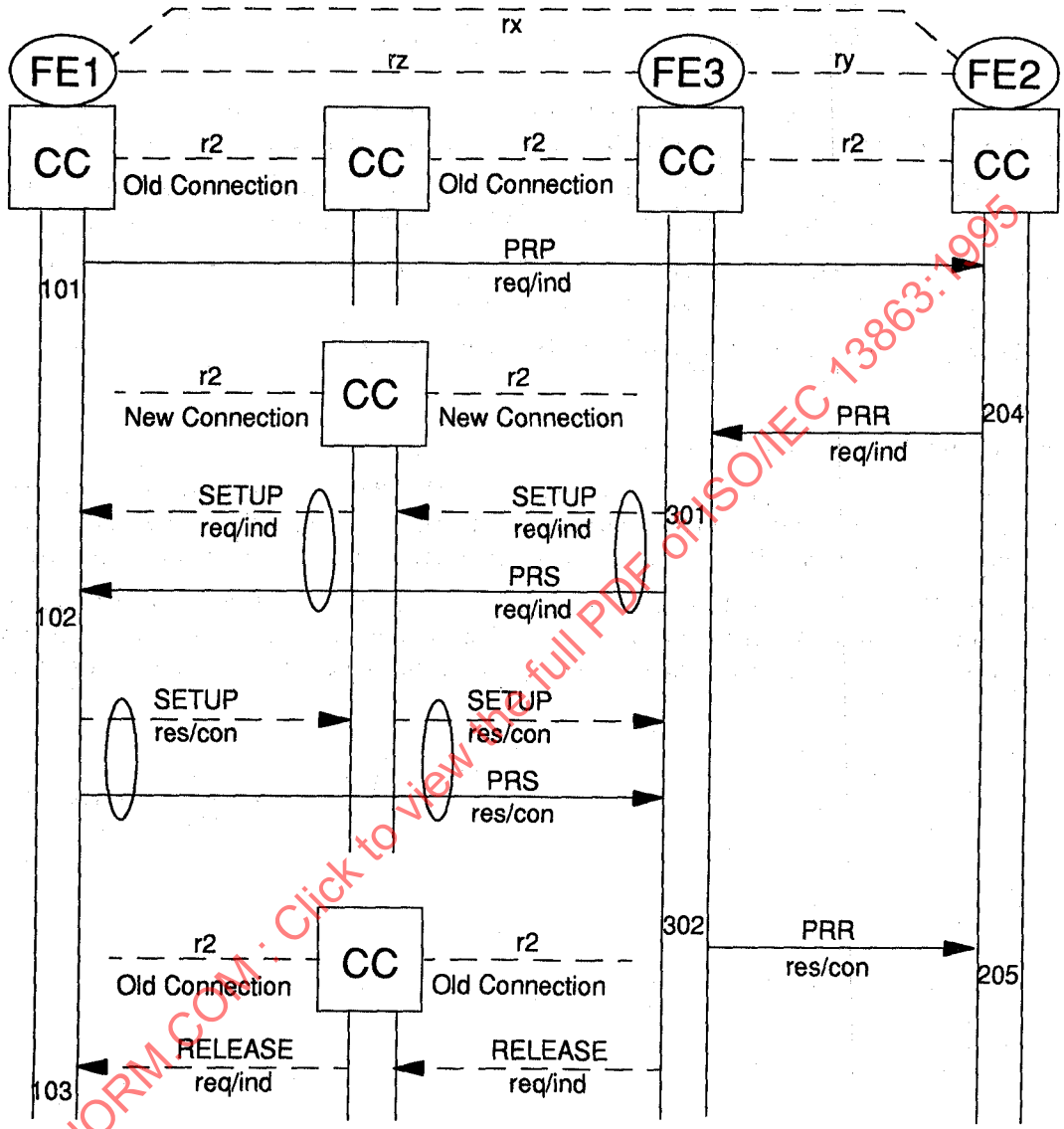
8.2.3 Examples of information flow sequences

Below are examples of typical sequences of information flows. In addition to providing signalling procedures in support of these sequences, a stage 3 International Standard shall also cover other sequences arising from error situations, interactions with basic call, interactions with other supplementary services, different topologies, etc..

In the figures, ANF-PR 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-PR functional entity, the numbers refer to functional entity actions listed in 8.3.

8.2.3.1 Normal operation of ANF-PR with re-use of part of old connection

Figure 10 shows the information flow sequence for normal operation of ANF-PR when that part of the old connection up to the first Transit CC is re-used. The new connection starts at the first Transit CC, at which an instance of FE3 is located.

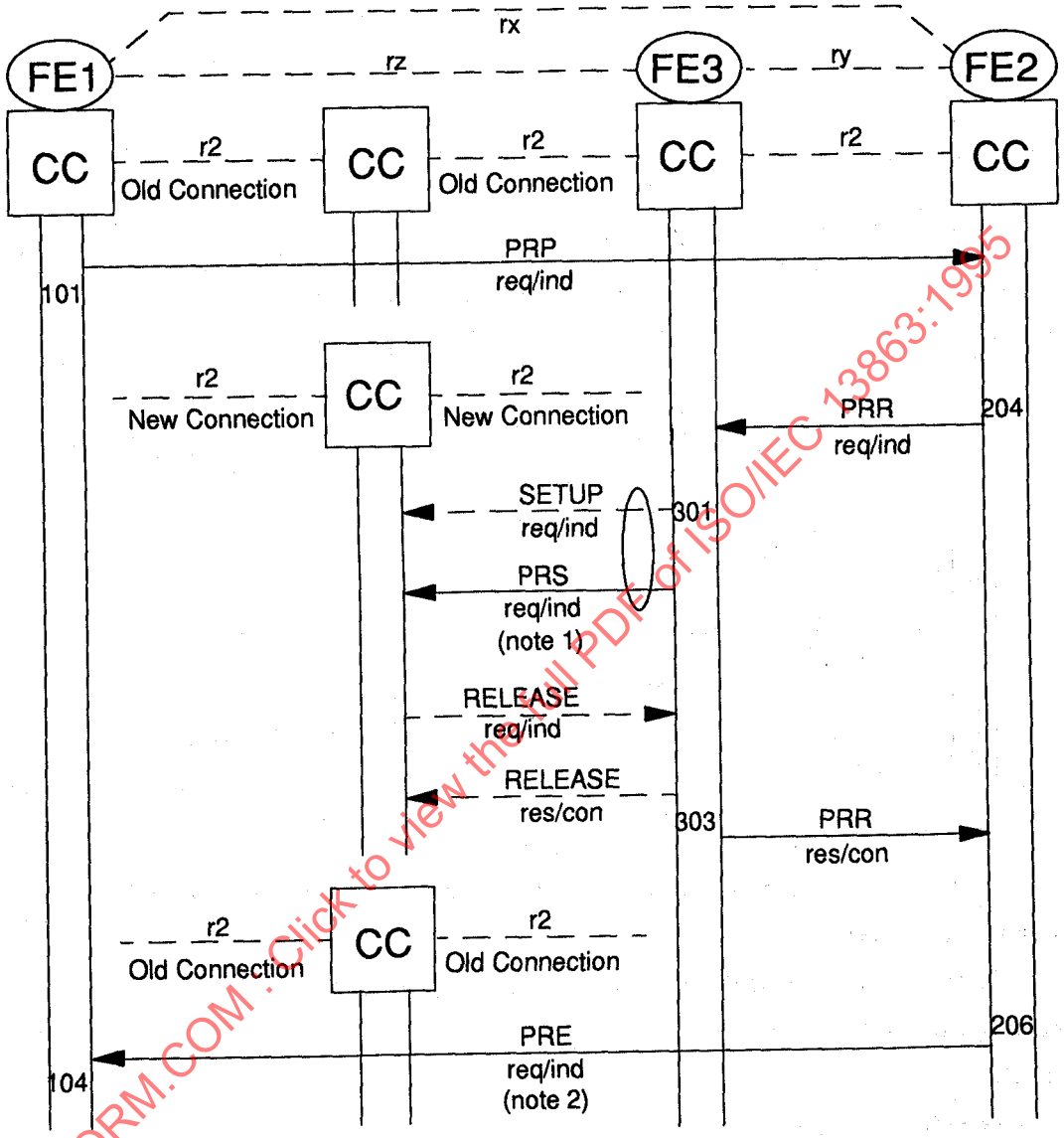


NOTE — For simplicity, basic call information flows Channel_Acknowledge request/indication and Release response/confirmation are not shown.

Figure 10 - Information flow sequence - normal operation of ANF-PR with re-use of part of old connection

8.2.3.2 Failure to establish new connection to replace part of old connection

Figure 11 shows the information flow sequence when establishment of a new connection to replace part of the old connection fails. The new connection attempt is from the first Transit CC, at which an instance of FE3 is located.



NOTES

1 — Because of failure to establish the new connection, the PRS request/indication will not reach FE1.

2 — Because of failure to establish the new connection, PRE request/indication is sent . Alternatively FE2 may revert to basic operation and attempt to establish a new connection without re-use of part of the old connection.

Figure 11 - Information flow sequence - failure to establish new connection to replace part of old connection

8.2.3.3 Retention of all of the old connection

Figure 12 shows the information flow sequence for operation of ANF-PR when an attempt is made to re-use the old connection as far as the CC where FE1 is located. This can arise only if the old connection already meets the criteria for the new connection. The old connection is retained and ANF-PR is deemed to have terminated successfully. An FE3 occurs at each Transit CC and at the CC where FE1 is located.

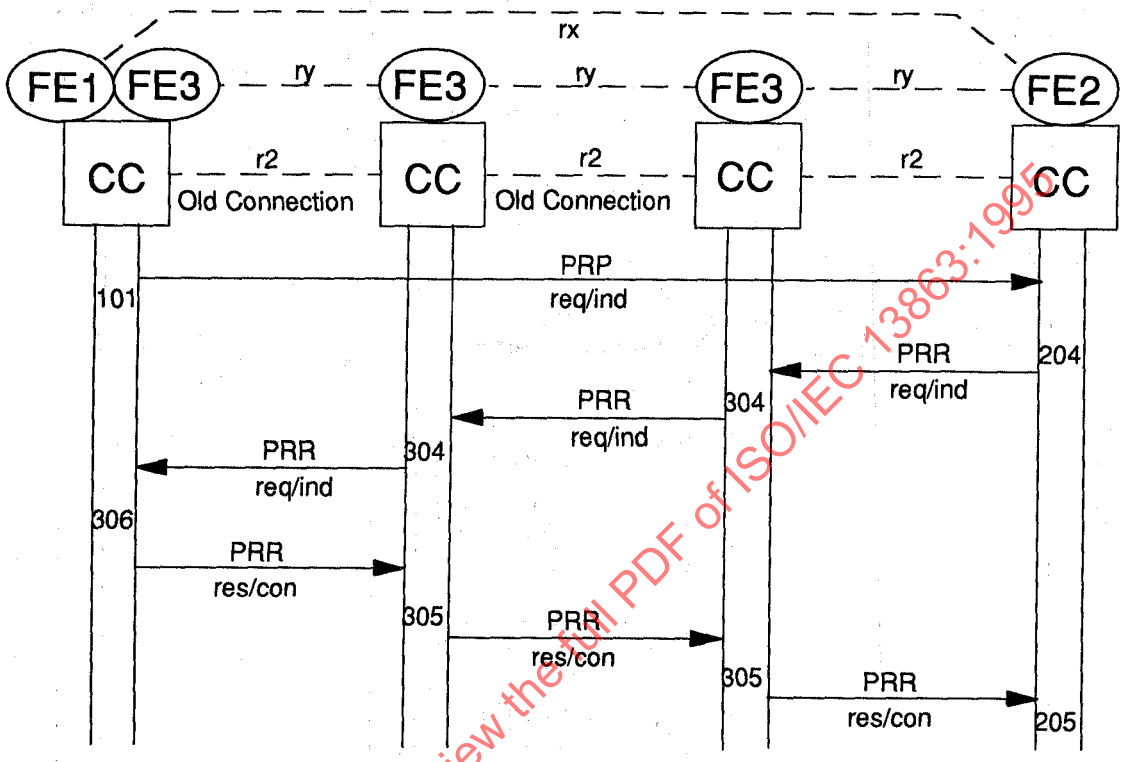


Figure 12 - Information flow sequence - retention of all of the old connection

8.3 Functional entity actions

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

8.3.1 Functional entity actions of FE1

7.3.1 shall apply.

8.3.2 Functional entity actions of FE2

7.3.2 shall apply. In addition, the following actions shall apply.

204 On receipt of PRP request/indication, check that ANF-PR is allowed and discover that the old connection can be re-used as far as the next CC. Send PRR request/indication to FE3.

205 On receipt of PRR response/confirmation indicating success, terminate ANF-PR.

206 On inability to accept the PRP request/indication or receipt of PRR response/confirmation indicating failure, send PRE request/indication to FE1 and terminate ANF-PR. Alternatively, on receipt of PRR response/-confirmation indicating failure, attempt path replacement without re-use of elements of the old connection (action 201).

8.3.3 Functional entity actions of FE3

301 On receipt of PRR request/indication from FE2 or the previous FE3, check that ANF-PR is allowed and initiate the establishment of a new connection. In conjunction with basic call SETUP request/indication, send PRS request/indication to FE1. Terminate the new connection's user information channel suitably.

NOTE 9 — The method of terminating the new connection's user information channel is an implementation matter. See also annex B.

302 On receipt of PRS response/confirmation indicating success (in conjunction with basic call Setup response/-confirmation), switch over to the new connection and send a PRR response/confirmation to FE2 or the previous FE3. Initiate release of the unwanted part of the old connection and terminate ANF-PR.

303 On inability to accept the PRR request/indication, failure to establish the new connection, or receipt of PRS response/confirmation indicating failure (in conjunction with basic call Release request/indication), send PRR response/confirmation indicating failure to FE2 or the previous FE3 and terminate ANF-PR.

304 On receipt of PRR request/indication from FE2 or the previous FE3, check that ANF-PR is allowed and discover that the old connection can be re-used as far as the next CC. Send PRR request/indication to the next FE3.

305 On receipt of PRR response/confirmation from the next FE3, send PRR response/confirmation indicating success to FE2 or the previous FE3

306 On receipt of a PRR request/indication from FE2 or a previous FE3, if this FE3 is collocated with FE1 (i.e., the old connection has been found to satisfy the given criteria) send a PRR response/confirmation indicating success to FE2 or the previous FE3 and terminate ANF-PR.

8.4 Functional entity behaviour

The FE behaviours shown below are intended to illustrate typical FE behaviour in terms of information flows sent and received.

The behaviour of each FE is shown using the Specification and Description Language (SDL) defined in CCITT Rec. Z.100 (1988).

8.4.1 Behaviour of FE1

7.4.1 is applicable.

8.4.2 Enhanced behaviour of FE2

Figure 13 shows the enhanced behaviour of FE2. Input signals from the left and output signals to the left represent information flows from and to FE3 (where stated) and FE1 (otherwise). Input signals from the right represent indications from the local CC.

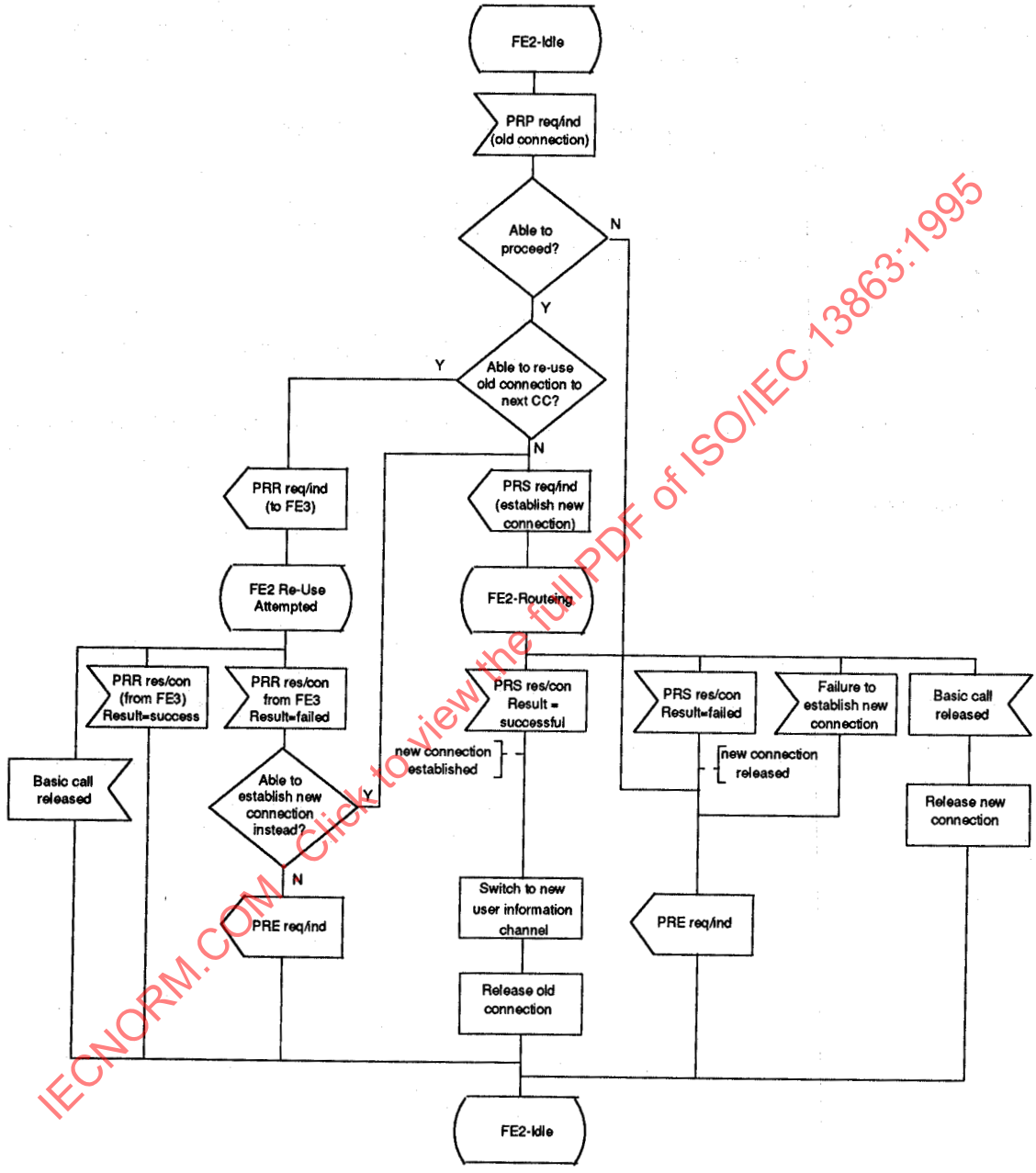


Figure 13 - ANF-PR, SDL for enhanced functional entity FE2

8.4.3 Behaviour of FE3

Figure 14 shows the behaviour of FE3. Input signals from the left and output signals to the left represent information flows from and to the next FE3 (where stated) and FE1 (otherwise). Input signals from the right and output signals to the right represent information flows from and to FE2 or the previous FE3 and indications from the local CC.

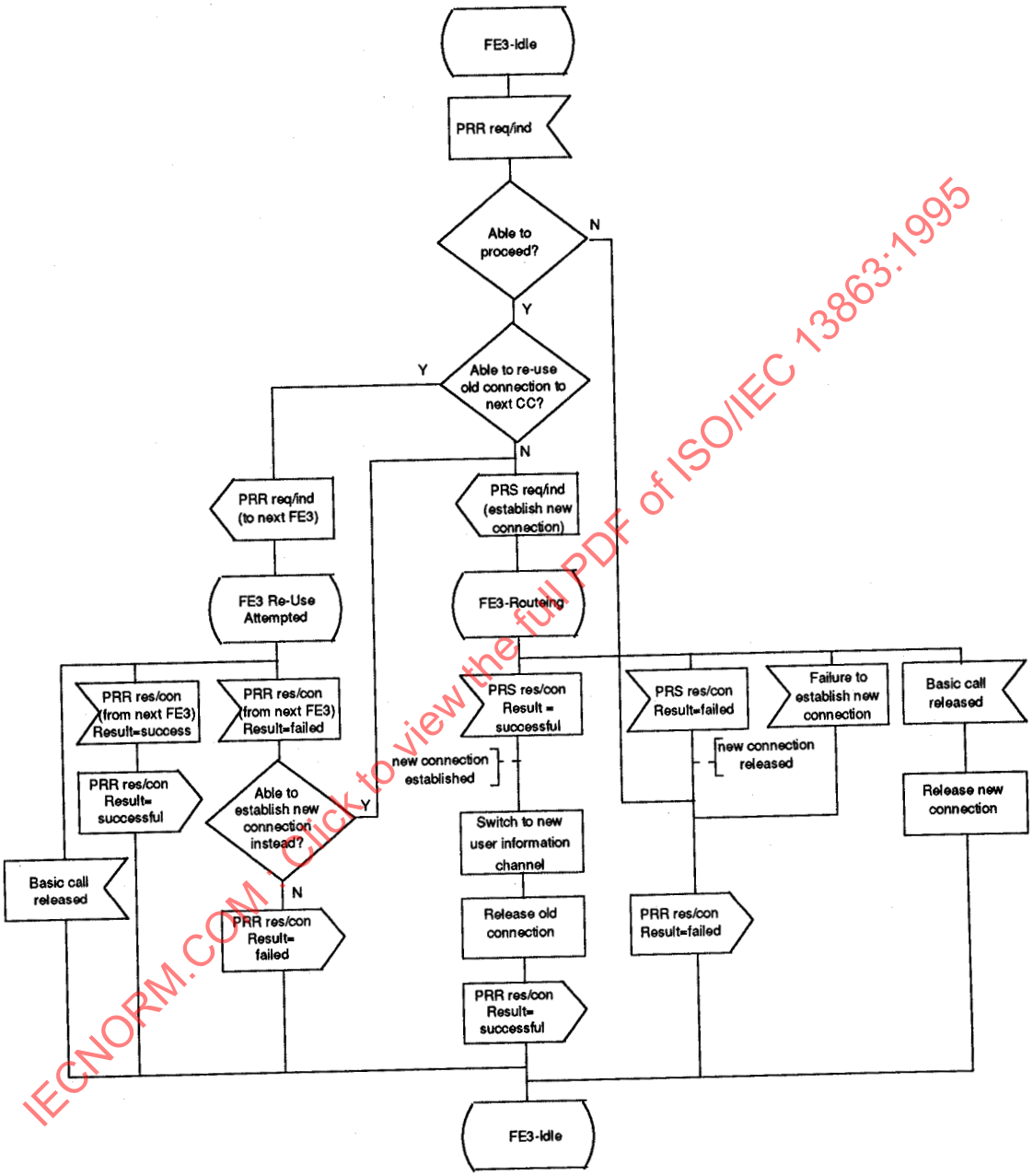


Figure 14 - ANF-PR, SDL for functional entity FE3

8.5 Allocation of functional entities to physical equipment

7.5 shall apply with the following enhancement.

An instance of FE3 shall be located at the Transit PINX at which the new connection starts and at each Transit PINX between that PINX and FE2.

8.6 Interworking considerations

7.6 shall apply. If FE2 is located in another network which supports the re-use of elements of the old connection, an FE3 can be located at the Gateway PINX.