INTERNATIONAL STANDARD

ISO/IEC 13874

First edition
1995-11-01

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Path replacement additional network feature

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Protocole de signalisation d'interéchange — Facilité de réseau additionnelle de remplacement de chemin

Reference number
ISO/IEC 13874:1995(E)

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 13874 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

Annex A forms an integral part of this International Standard. Annexes B to D 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 signalling protocol for use at the Q reference point in support of the Path Replacement additional network feature.

Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Path replacement additional network feature

1 Scope

This International Standard specifies the signalling protocol for the support of the Path Replacement additional network feature (ANF-PR) at the Q reference point between Private Integrated Services Network Exchanges (PINXs) connected together within a Private Integrated Services Network (PISN).

ANF-PR is a feature which applies to an established call, allowing that call's connection between PINXs to be replaced by a new connection.

The Q reference point is defined in ISO/IEC 11579-1.

Service specifications are produced in three stages and according to the method specified in CCITT Recommendation I.130. This International Standard contains the stage 3 specification for the Q reference point and satisfies the requirements identified by the stage 1 and stage 2 specifications in ISO/IEC 13863.

The signalling protocol for ANF-PR operates on top of the signalling protocol for basic circuit switched call control, as specified in ISO/IEC 11572, and uses certain aspects of the generic procedures for the control of supplementary services specified in ISO/IEC 11582.

This International Standard also specifies additional signalling protocol requirements for the support of interactions at the Q reference point between ANF-PR and other supplementary services and ANFs.

This International Standard is applicable to PINXs which can interconnect to form a PISN.

2 Conformance

In order to conform to this International Standard, a PINX shall satisfy the requirements identified in the Protocol Implementation Conformance Statement (PICS) proforma in annex A.

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 11572:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit-mode bearer services - Inter-exchange signalling procedures and protocol.*

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).*

ISO/IEC 11582:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Generic functional protocol for the support of supplementary services - Inter-exchange signalling procedures and protocol.*

ISO/IEC 13863:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Path replacement additional network feature.*

ISO/IEC 13869:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call transfer supplementary services.*

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).*

ITU-T Rec. Q.950(1993), *Digital Subscriber Signalling System No. 1 (DSS1) - Supplementary services protocols, structure and general principles.*

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:

- ANF-PR user (ISO/IEC 13863)
- Application Protocol Data Unit (APDU) (ISO/IEC 11582)
- Basic Service (CCITT Rec. I.210)
- Call, Basic Call (ISO/IEC 11582)
- Connection (ISO/IEC 13863)
- Incoming Gateway PINX (ISO/IEC 11572)
- Interpretation APDU (ISO/IEC 11582)
- Network Facility Extension (NFE) (ISO/IEC 11582)
- New Connection (ISO/IEC 13863)
- Old Connection (ISO/IEC 13863)
- Originating PINX (ISO/IEC 11572)
- Outgoing Gateway PINX (ISO/IEC 11572)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated Services Network Exchange (PINX) (ISO/IEC 11579-1)
- Signalling (CCITT Rec. I.112)
- Supplementary Service (CCITT Rec. I.210)
- Supplementary Services Control Entity (ISO/IEC 11582)
- Terminating PINX (ISO/IEC 11572)
- Transit PINX (ISO/IEC 11572)
- Trombone Connection (ISO/IEC 13863)
- User (except in the context of ANF-PR user) (ISO/IEC 11574)

4.2 Other definitions

4.2.1 branching PINX: The Transit PINX at which the retained connection finishes and the new connection starts.

4.2.2 cooperating PINX: The end PINX which initiates the establishment of the new connection towards other end PINX involved in the call.

4.2.3 end PINX: Within the context of a call, a PINX which is not acting as a Transit PINX, i.e., an Originating PINX, a Terminating PINX, an Incoming Gateway PINX or an Outgoing Gateway PINX.

4.2.4 preceding PINX: The adjacent PINX in the direction of the cooperating PINX, relative to a particular PINX involved in the old connection.

NOTE 1 — This can be the cooperating PINX itself or a Transit PINX.

4.2.5 replaced connection: That part of the old connection which is not retained and is replaced by the new connection.

4.2.6 requesting PINX: The end PINX which invokes ANF-PR and towards which the new connection is routed.

4.2.7 retained connection: That part of the old connection which is retained and not replaced by the new connection.

4.2.8 subsequent PINX: The adjacent PINX in the direction of the requesting PINX, relative to a particular PINX involved in the old connection.

NOTE 2 — This can be the requesting PINX itself or a Transit PINX.

5 List of acronyms

ANF	Additional Network Feature
ANF-PR	Path Replacement additional network feature
APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation no. 1
ISDN	Integrated Services Digital Network
NFE	Network Facility Extension
PICS	Protocol Implementation Conformance Statement
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
SDL	Specification and Description Language
SS-CT	Call Transfer supplementary service

6 Signalling protocol for the support of ANF-PR

6.1 ANF-PR 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. In the absence of specific criteria, the new connection should be established using the routeing rules which apply to basic call establishment.

NOTE 3 — Annex A of ISO/IEC 13863 gives examples of the circumstances under which ANF-PR can be used and criteria which can govern the selection of the new connection.

The requesting PINX shall request the cooperating PINX to attempt the establishment of a new connection from the cooperating PINX to the requesting PINX. If successful, the new connection shall replace the old connection.

NOTE 4 — The requesting PINX can be either end PINX involved in a call, i.e., the Originating PINX or the Terminating PINX or, in the case of interworking with another network, the Incoming Gateway PINX or Outgoing Gateway PINX.

Optional procedures and coding are specified for allowing the retention of one or more elements of the old connection, starting from the cooperating PINX and continuing as far as a Transit PINX, subject to any given criteria being achievable in that way. A new connection is established from the Transit PINX to the requesting PINX instead of from the cooperating PINX to the requesting PINX.

6.2 ANF-PR operational requirements

6.2.1 Requirements on the cooperating PINX

ANF-PR shall be applicable to a call whose protocol control state, as defined in ISO/IEC 11572, is Active.

NOTE 5 — State Active will have been reached as a result of ISO/IEC 11572 call establishment procedures, possibly in conjunction with supplementary service and/or ANF procedures.

ISO/IEC 11572 protocol control procedures for call establishment at the outgoing side of an inter-PINX link shall apply to the establishment of the new connection. ISO/IEC 11572 protocol control procedures for call clearing shall apply to the release of the old connection in the event of successful switch over to the new connection.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for an end PINX, shall apply.

6.2.2 Requirements on the requesting PINX

ANF-PR shall be applicable to a call whose protocol control state, as defined in ISO/IEC 11572, is Active.

NOTE 6 — State Active will have been reached as a result of ISO/IEC 11572 call establishment procedures, possibly in conjunction with supplementary service and/or ANF procedures.

ISO/IEC 11572 protocol control procedures for call establishment at the incoming side of an inter-PINX link shall apply to the establishment of the new connection. ISO/IEC 11572 protocol control procedures for call clearing shall apply to the release of the old connection in the event of successful switch over to the new connection.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for an end PINX, shall apply.

6.2.3 Requirements on a Transit PINX

6.2.3.1 Transit PINX involved in the replaced connection

ANF-PR shall be applicable to a call whose protocol control state, as defined in ISO/IEC 11572, on each of the two links (incoming and outgoing) is Active and whose call control state, as defined in ISO/IEC 11572 is TCC_Call_Active.

NOTE 7 — State Active will have been reached as a result of ISO/IEC 11572 call establishment procedures, possibly in conjunction with supplementary service and/or ANF procedures.

ISO/IEC 11572 protocol control and call control procedures for call clearing at a Transit PINX shall apply to the release of the old connection in the event of successful switch over to the new connection.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for a Transit PINX, shall apply. For ANF-PR the requirements are limited to the passing on of Facility information elements for which the destination, as indicated in the Network Facility Extension (NFE), is not the Transit PINX.

6.2.3.2 Transit PINX involved in the new connection

ISO/IEC 11572 protocol control and call control procedures for call establishment at a Transit PINX shall apply to the establishment of the new connection.

ISO/IEC 11572 protocol control and call control procedures for call clearing at a Transit PINX shall apply to the release of the new connection in the event of failure to complete ANF-PR successfully.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for a Transit PINX, shall apply. For ANF-PR the requirements are limited to the passing on of Facility information elements for which the destination, as indicated in the Network Facility Extension (NFE), is not the Transit PINX.

6.2.3.3 Transit PINX involved in the retained connection

The procedures below are applicable only if the optional procedures for retention of part of the old connection (6.6) are supported.

ANF-PR shall be applicable to a call whose protocol control state, as defined in ISO/IEC 11572, on each of the two links (incoming and outgoing) is Active and whose call control state, as defined in ISO/IEC 11572 is TCC_Call_Active.

NOTE 8 — State Active will have been reached as a result of ISO/IEC 11572 call establishment procedures, possibly in conjunction with supplementary service and/or ANF procedures.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for a Transit PINX, shall apply.

6.2.3.4 Branching PINX

The procedures below are applicable only if the optional procedures for retention of part of the old connection (6.6) are supported.

ANF-PR shall be applicable to a call whose protocol control state, as defined in ISO/IEC 11572, on each of the two links (incoming and outgoing) is Active and whose call control state, as defined in ISO/IEC 11572 is TCC_Call_Active.

NOTE 9 — State Active will have been reached as a result of ISO/IEC 11572 call establishment procedures, possibly in conjunction with supplementary service and/or ANF procedures.

ISO/IEC 11572 protocol control procedures for call establishment at the outgoing side of an inter-PINX link shall apply to the establishment of the new connection. ISO/IEC 11572 protocol control procedures for call clearing shall apply to the release of the replaced connection in the event of successful switch over to the new connection.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for a Transit PINX, shall apply.

6.3 ANF-PR coding requirements

6.3.1 Operations

The operations defined in Abstract Syntax Notation number 1 (ASN.1) in Table 1 shall apply.

Table 1 - Operations in support of ANF-PR

```
Path-Replacement-Operations
                    {iso standard pss1-path-replacement (13874) pr-operations (0)}

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

IMPORTS             OPERATION, ERROR FROM Remote-Operation-Notation
                        {joint-iso-ccitt(2) remote-operations(4) notation (0)}
                    Extension FROM Manufacturer-specific-service-extension-definition
                        {iso  standard
                        pss1-generic-procedures (11582) msi-definition (0)}
                    notAvailable, supplementaryServiceInteractionNotAllowed
                        FROM General-Errors-List
                        {ccitt recommendation q 950 general-error-list (1)}
                    PartyNumber FROM Addressing-Data-Elements
                        { iso(1) standard(0) pss1-generic-procedures(11582) addressing-data-elements(9)
};

PathReplacePropose  ::=  OPERATION
                         ARGUMENT PRProposeArg
                         ERRORS {
                             notAvailable,
                             temporarilyUnavailable,
                             supplementaryServiceInteractionNotAllowed,
                             criteriaPermanentlyUnachievable,
                             criteriaTemporarilyUnachievable,
                             invalidReRouteingNumber,
                             unrecognizedCallIdentity,
                             establishmentFailure,
                             collision,
                             unspecified
                             }

PathReplaceSetup    ::=  OPERATION
                         ARGUMENT       PRSetupArg
                         RESULT     DummyResult
                         ERRORS {
                             criteriaPermanentlyUnachievable,
                             criteriaTemporarilyUnachievable,
                             invalidReRouteingNumber,
                             unrecognizedCallIdentity,
                             temporarilyUnavailable,
                             unspecified
                             }
```

Table 1 (continued)

```
PathReplaceRetain   ::=  OPERATION
                         ARGUMENT PRRetainArg
                         RESULT     DummyResult
                         ERRORS {
                              notAvailable,
                              temporarilyUnavailable,
                              supplementaryServiceInteractionNotAllowed,
                              criteriaPermanentlyUnachievable,
                              criteriaTemporarilyUnachievable,
                              invalidRerouteingNumber,
                              unrecognizedCallIdentity,
                              establishmentFailure,
                              unspecified
                              }

PRProposeArg        ::=  SEQUENCE {
                              callIdentity          CallIdentity,
                              rerouteingNumber      PartyNumber,
                              extension     CHOICE {
                                   [1] IMPLICIT Extension,
                                   [2] IMPLICIT SEQUENCE OF Extension
                              } OPTIONAL
                         }

PRSetupArg          ::=  SEQUENCE {
                              callIdentity          CallIdentity,
                              extension CHOICE {
                                   [1] IMPLICIT Extension,
                                   [2] IMPLICIT SEQUENCE OF Extension
                              } OPTIONAL
                         }

PRRetainArg         ::=  SEQUENCE {
                              callIdentity          CallIdentity,
                              rerouteingNumber  PartyNumber,
                              extension     CHOICE {
                                   [1] IMPLICIT Extension,
                                   [2] IMPLICIT SEQUENCE OF Extension
                              } OPTIONAL
                         }

DummyResult         ::=  CHOICE {
                              NULL,
                              [1] IMPLICIT Extension,
                              [2] IMPLICIT SEQUENCE OF Extension
                         }

CallIdentity        ::=  NumericString (SIZE(1..4))
```

Table 1 (continued)

```
pathReplacePropose      PathReplacePropose ::= 4
pathReplaceSetup        PathReplaceSetup ::=   5
pathReplaceRetain       PathReplaceRetain ::=  6

temporarilyUnavailable
                        ERROR ::= 1000
                            -- used when the operation is temporarily not available and none of
                            -- the other errors applies - a later attempt could be successful

collision               ERROR ::= 1001
                            -- used when a pathReplacePropose invoke APDU is received by a PINX
                            -- which has sent a pathReplacePropose invoke APDU

criteriaPermanentlyUnachievable
                        ERROR ::= 1002
                            -- used when the special criteria requested cannot be achieved
                            -- because the necessary resources are permanently unavailable

criteriaTemporarilyUnachievable
                        ERROR ::= 1003
                            -- used when the special criteria requested cannot be achieved
                            -- because the necessary resources are temporarily unavailable
                            -- a later attempt could be successful

invalidRerouteingNumber
                        ERROR ::= 1004
                            -- used when the establishment of the new connection fails because the
                            -- Called party number information element is not a valid number for
                            -- routeing the new connection to

unrecognizedCallIdentity
                        ERROR ::= 1005
                            -- used when establishment of the new connection fails because it could
                            -- not be associated with the old connection at the requesting PINX

establishmentFailure
                        ERROR ::= 1006
                            -- used when establishment of the new connection fails and no other error
                            -- applies

Unspecified             ERROR PARAMETER Extension
unspecified             Unspecified ::= 1008
                            -- used to convey a manufacturer specific error, possibly with other
information

END                     -- of Path-Replacement-Operations
```


6.3.2 Information elements

6.3.2.1 Facility information element

APDUs of the operations defined in 6.3.1 shall be coded in the Facility information element in accordance with ISO/IEC 11582.

When conveying APDUs of operations pathReplacePropose and pathReplaceSetup, the NFE shall be included.

When conveying the invoke APDU of operation pathReplacePropose, the destinationEntity data element of the NFE shall contain value endPINX.

When conveying the invoke APDU of operation pathReplaceSetup, the destinationEntity data element of the NFE shall contain value endPINX.

When conveying the invoke APDU of operation pathReplaceRetain, the NFE shall be omitted.

When conveying the invoke APDU of operation pathReplaceSetup, the Interpretation APDU shall be included and shall have the value clearCallIfAnyInvokePduNotRecognised. When conveying any other Remote Operations APDU, the Interpretation APDU shall either be omitted or have the value rejectAnyUnrecognisedInvokePdu.

6.3.2.2 Other information elements

The following information elements used during establishment of the new connection and release of the old connection shall be coded as specified in ISO/IEC 11572:

- Bearer capability
- Called party number
- Cause
- Sending complete

6.3.3 Messages

Except for cases where a basic call message is to be conveyed at the same time, the Facility information shall be conveyed in a FACILITY message as specified in ISO/IEC 11582.

The following messages used during establishment of the new connection and release of the old connection shall be as specified in ISO/IEC 11572:

- CALL PROCEEDING

- CONNECT

- CONNECT ACKNOWLEDGE
- DISCONNECT
- RELEASE
- RELEASE COMPLETE
- SETUP

6.4 ANF-PR state definitions

6.4.1 States at the requesting PINX

The procedures for the requesting PINX are written in terms of the following conceptual states existing within the ANF-PR functional entity in that PINX in association with a particular call.

6.4.1.1 State PR-Req-Idle

ANF-PR is not operating.

6.4.1.2 State PR-Req-Initiated

A pathReplacePropose invoke APDU has been sent to the cooperating PINX.

6.4.1.3 State PR-Req-Completing

The new connection has been established and a pathReplaceSetup return result APDU has been sent to the cooperating PINX.

6.4.2 States at the cooperating PINX

The procedures for the cooperating PINX are written in terms of the following conceptual states existing within the ANF-PR functional entity in that PINX in association with a particular call.