INTERNATIONAL STANDARD

ISO/IEC 13869

Second edition
2003-04-01

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Call Transfer supplementary service

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Protocole de signalisation d'interéchange — Service supplémentaire de transfert d'appel

Reference number
ISO/IEC 13869:2003(E)

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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 13869 was prepared by ECMA (as ECMA-178) 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 13869:1995), 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 signalling protocol for use at the Q reference point in support of the Call Transfer supplementary service. The protocol defined in this International Standard forms part of the PSS1 protocol (informally known as QSIG).

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 — Inter-exchange signalling protocol — Call Transfer supplementary service

1 Scope

This International Standard specifies the signalling protocol for the support of the Call Transfer supplementary service (SS-CT) at the Q reference point between Private Integrated Network services eXchanges (PINXs) connected together within a Private Integrated Services Network (PISN).

SS-CT is a supplementary service which enables a User to transform two of that User's calls (at least one of which must be answered) into a new call between the two other users in the two calls.

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 ETS 300 387. 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 13865.

The signalling protocol for SS-CT 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 Call Transfer 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 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 11572:2000, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol*

ISO/IEC 11574:2000, *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)*

ISO/IEC 11582:2002, *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 13865:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Call Transfer supplementary service*

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ISO/IEC 13868:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Name identification supplementary service*s

ISO/IEC 13873:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call Diversion supplementary services*

ISO/IEC 13874:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Path Replacement additional network feature*

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. Q.950:2000, *Supplementary services protocols, structure and general principles*

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

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:

- Alerting (ISO/IEC 13865)
- Answered (ISO/IEC 13865)
- Application Protocol Data Unit (APDU) (ISO/IEC 11582)
- Basic Service (ITU-T Rec. I.210)
- Gateway PINX (ISO/IEC 11572)
- Complete Number (ISO/IEC 11571)
- Interpretation APDU (ISO/IEC 11582)
- Network Facility Extension (NFE) (ISO/IEC 11582)
- Originating PINX (ISO/IEC 11582)
- Primary Call (ISO/IEC 13865)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated services Network eXchange (PINX) (ISO/IEC 11579-1)
- Secondary Call (ISO/IEC 13865)
- Signalling (ITU-T Rec. I.112)
- Supplementary Service (ITU-T Rec. I.210)
- Supplementary Service Control Entity (ISO/IEC 11582)
- Terminating PINX (ISO/IEC 11582)
- Transfer by join (ISO/IEC 13865)
- Transfer by rerouteing (ISO/IEC 13865)
- Transit PINX (ISO/IEC 11582)
- User (ISO/IEC 11574)
- User A (ISO/IEC 13865)
- User B (ISO/IEC 13865)
- User C (ISO/IEC 13865)

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4.2 Other definitions

4.2.1 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, or a Gateway PINX.

4.2.2 Primary PINX

The End PINX which is on the end of the Primary Call nearest to User B.

4.2.3 Redirection number

The number of a transferred User, as provided to the PINX of the other transferred User.

4.2.4 Secondary PINX

The End PINX which is on the end of the Secondary Call nearest to User C.

4.2.5 Transferring PINX

End PINX which initiates the call transfer procedures on behalf of User A.

5 Acronyms

APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation no. 1
ISDN	Integrated Services Digital Network
NFE	Network Facility Extension
PNP	Private Numbering Plan
PICS	Protocol Implementation Conformance Statement
PINX	Private Integrated services Network eXchange
PISN	Private Integrated Services Network
SDL	Specification and Description Language
SS-CT	Supplementary Service Call Transfer

6 Signalling protocol for the support of SS-CT

6.1 SS-CT description

Call Transfer (CT) is a supplementary service which enables a user to transform two of that user's calls (at least one of which must be answered) into a new call between the two other users in the two calls.

This supplementary service is applicable to all basic services defined in ISO/IEC 11574.

Call transfer can be achieved by using one of two methods; transfer by join and transfer by rerouteing. Support of transfer by join is mandatory. Support of transfer by rerouteing is an option, which, if not supported by all PINXs involved in the operation of call transfer, allows fall back to using transfer by join.

NOTE - When an active call has been transferred to an alerting call, the supervision during the alerting phase and the possible procedures to be followed in case the alerting call remains unanswered are outside the scope of this International Standard.

6.2 SS-CT operational requirements

6.2.1 Provision/Withdrawal

Provision and withdrawal shall be in accordance with 6.2.1 of ISO/IEC 13865.

6.2.2 Requirements on a Transferring PINX

The basic call procedures specified in ISO/IEC 11572 shall be supported. 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 Primary PINX

The basic call procedures specified in ISO/IEC 11572 shall be supported.

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

6.2.4 Requirements on a Secondary PINX

The basic call procedures specified in ISO/IEC 11572 shall be supported.

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

6.2.5 Requirements on a Transit PINX

The basic call procedures specified in ISO/IEC 11572 shall be supported.

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

For SS-CT the requirements are limited to the passing on of Facility information elements for which the destination, as indicated in the NFE, is not the Transit PINX.

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6.3 SS-CT coding requirements

6.3.1 Operations

The operations defined in Abstract Syntax Notation number 1 (ASN.1) in table 1 shall apply. The notation is in accordance with ITU-T Rec. X.680 and X.690. The ITU-T Rec. X.208 and X.209 superseded version is in annex F.

Table 1 - Operations in support of SS-CT

```
Call-Transfer-Operations-asn1-97
  {iso(1)  standard(0) pss1-call-transfer(13869) call-transfer-operations-asn1-97 (1)}

DEFINITIONS EXPLICIT TAGS ::=

BEGIN


IMPORTS
        OPERATION, ERROR FROM
Remote-Operations-Information-Objects {joint-iso-itu-t(2) remote-operations(4) informationObjects(5) version1(0)}
        EXTENSION, Extension{} FROM
Manufacturer-specific-service-extension-class-asn1-97 {iso(1) standard(0) pss1-generic-procedures (11582)
msi-class-asn1-97(11)}
        Name FROM
Name-Operations-asn1-97 {iso(1) standard(0) pss1-name (13868) name-operations-asn1-97 (1)}
        supplementaryServiceInteractionNotAllowed,
        notAvailable,
        invalidCallState FROM
General-Error-List {ccitt (0) recommendation (0) q 950  general-error-list (1)}
        PresentedAddressScreened,
        PresentedNumberScreened,
        PartyNumber,
        PartySubaddress FROM
Addressing-Data-Elements-asn1-97 {iso(1) standard(0) pss1-generic-procedures (11582)
addressing-data-elements-asn1-97 (20)}
        PSS1InformationElement
FROM PSS1-generic-parameters-definition-asn1-97 { iso(1) standard (0) pss1-generic-procedures (11582)
 pss1-generic-parameters-asn1-97 (17)};

-- TYPE DEFINITIONS FOR CT OPERATIONS FOLLOW

Call-Transfer-Operations OPERATION ::= {callTransferIdentify | callTransferAbandon | callTransferInitiate |
callTransferSetup | callTransferActive | callTransferComplete | callTransferUpdate | subaddressTransfer}

callTransferIdentify    OPERATION ::= {
                        ARGUMENT    DummyArg
                        RESULT      CTIdentifyRes
                        ERRORS {
                                notAvailable |
                                invalidCallState |
                                unspecified |
                                supplementaryServiceInteractionNotAllowed}
                        CODE        local: 7}
```

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Table 1 - Operations in support of SS-CT (continued)

```
callTransferAbandon     OPERATION ::= {
                        ARGUMENT              DummyArg
                        RETURN RESULT         FALSE
                        ALWAYS RESPONDS       FALSE
                        CODE                  local: 8}

callTransferInitiate    OPERATION ::= {
                        ARGUMENT    CTInitiateArg
                        RESULT      DummyRes
                        ERRORS {
                                    notAvailable |
                                    invalidCallState |
                                    invalidRerouteingNumber |
                                    unrecognizedCallIdentity |
                                    establishmentFailure |
                                    unspecified |
                                    supplementaryServiceInteractionNotAllowed }
                        CODE        local: 9}

callTransferSetup       OPERATION ::= {
                        ARGUMENT    CTSetupArg
                        RESULT      DummyRes
                        ERRORS{
                                    notAvailable |
                                    invalidCallState |
                                    invalidRerouteingNumber |
                                    unrecognizedCallIdentity |
                                    unspecified |
                                    supplementaryServiceInteractionNotAllowed }
                        CODE        local: 10}

callTransferActive      OPERATION::= {
                        ARGUMENT              CTActiveArg
                        RETURN RESULT         FALSE
                        ALWAYS RESPONDS       FALSE
                        CODE                  local: 11}

callTransferComplete    OPERATION ::= {
                        ARGUMENT              CTCompleteArg
                        RETURN RESULT         FALSE
                        ALWAYS RESPONDS       FALSE
                        CODE                  local: 12}
```


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Table 1 - Operations in support of SS-CT (continued)

```
callTransferUpdate      OPERATION ::= {
                        ARGUMENT            CTUpdateArg
                        RETURN RESULT       FALSE
                        ALWAYS RESPONDS     FALSE
                        CODE                local: 13}

subaddressTransfer      OPERATION ::= {
                        ARGUMENT            SubaddressTransferArg
                        RETURN RESULT       FALSE
                        ALWAYS RESPONDS     FALSE
                        CODE                local: 14}

-- TYPE DEFINITIONS FOR CT DATA TYPES FOLLOW

DummyArg ::=  CHOICE {
    null          NULL,
    single        [1] IMPLICIT Extension{{CTExtSet}},
    multiple      [2] IMPLICIT SEQUENCE OF  Extension{{CTExtSet}}
    }

DummyRes ::=  CHOICE {
    null          NULL,
    single        [1] IMPLICIT Extension{{CTExtSet}},
    multiple      [2] IMPLICIT SEQUENCE OF  Extension{{CTExtSet}}
    }

CTIdentifyRes ::=  SEQUENCE {
    callIdentity                    CallIdentity,
    rerouteingNumber                PartyNumber,
    resultExtension                 CHOICE {
                single          [6] IMPLICIT Extension{{CTExtSet}},
                multiple        [7] IMPLICIT SEQUENCE OF Extension{{CTExtSet}}
                                    }    OPTIONAL
    }

CTInitiateArg ::=  SEQUENCE {
    callIdentity                    CallIdentity,
    rerouteingNumber                PartyNumber,
    argumentExtension               CHOICE {
                single          [6] IMPLICIT Extension{{CTExtSet}},
                multiple        [7] IMPLICIT SEQUENCE OF Extension{{CTExtSet}}
                                    } OPTIONAL
    }
```

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Table 1 - Operations in support of SS-CT (continued)

```
CTSetupArg ::=  SEQUENCE {
    callIdentity                    CallIdentity,
    argumentExtension               CHOICE {
            single          [0] IMPLICIT Extension{{CTExtSet}},
            multiple        [1] IMPLICIT SEQUENCE OF Extension{{CTExtSet}}
                                } OPTIONAL
    }

CTActiveArg ::=  SEQUENCE{
    connectedAddress                PresentedAddressScreened,
    basicCallInfoElements           PSS1InformationElement          OPTIONAL,
                                        -- ISO/IEC 11572 information element
                                        -- Progress indicator is conveyed
    connectedName                   Name                            OPTIONAL,
    argumentExtension               CHOICE {
            single          [9] IMPLICIT Extension{{CTExtSet}},
            multiple        [10] IMPLICIT SEQUENCE OF Extension{{CTExtSet}}
                                } OPTIONAL
    }

CTCompleteArg ::=  SEQUENCE {
    endDesignation                  EndDesignation,
    redirectionNumber               PresentedNumberScreened,
    basicCallInfoElements           PSS1InformationElement          OPTIONAL,
                                        -- ISO/IEC 11572 information element
                                        -- Progress indicator is conveyed
    redirectionName                 Name                            OPTIONAL,
    callStatus                      CallStatus DEFAULT  answered,
    argumentExtension               CHOICE {
            single          [9] IMPLICIT Extension{{CTExtSet}},
            multiple        [10] IMPLICIT SEQUENCE OF Extension{{CTExtSet}}
                                } OPTIONAL
    }

CTUpdateArg ::=  SEQUENCE {
    redirectionNumber               PresentedNumberScreened,
    redirectionName                 Name                            OPTIONAL,
    basicCallInfoElements           PSS1InformationElement          OPTIONAL,
                                    -- ISO/IEC 11572 information element
                                    -- Progress indicator is conveyed
    argumentExtension               CHOICE {
            single          [9] IMPLICIT Extension{{CTExtSet}},
            multiple        [10] IMPLICIT SEQUENCE OF Extension{{CTExtSet}}
                                }OPTIONAL       }
```


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Table 1 - Operations in support of SS-CT (concluded)

```
SubaddressTransferArg ::=  SEQUENCE {
    redirectionSubaddress              PartySubaddress,
    argumentExtension                  CHOICE {
                single          [0] IMPLICIT Extension{{CTExtSet}},
                multiple        [1] IMPLICIT SEQUENCE OF Extension{{CTExtSet}}
                                    } OPTIONAL
    }

CallStatus ::=  ENUMERATED{
    answered(0),
    alerting(1)
    }

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

EndDesignation ::=  ENUMERATED {
    primaryEnd(0),
    secondaryEnd(1)
    }

CTExtSet EXTENSION ::= {…}

unspecified                 ERROR  ::= {
                            PARAMETER Extension {{CTExtSet}}
                            CODE local: 1008 }


invalidRerouteingNumber     ERROR ::= {   CODE local: 1004}
                                          -- used when establishment of the new
                                          -- connection fails because
                                          -- the rerouteingNumber is not a valid
                                          -- PISN address

unrecognizedCallIdentity    ERROR ::= {   CODE local: 1005}
                                          -- used when establishment of the new
                                          -- connection fails because it could not be
                                          -- associated with a SS-CT entity
                                          -- at the Secondary PINX

establishmentFailure        ERROR ::= {   CODE local: 1006}
                                          -- used when establishment of the new
                                          -- connection fails and no other error applies
                                          -- of Call-Transfer-Operations

END -- of Call-Transfer-Operations-asn1-97
```

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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 the invoke APDU of the operations defined in 6.3.1, the destinationEntity data element of the NFE shall contain value endPINX.

When conveying the invoke APDU of operations callTransferAbandon, callTransferComplete, callTransferActive, callTransferUpdate or subaddressTransfer, the Interpretation APDU shall contain value discardAnyUnrecognisedInvokePdu.

When conveying the invoke APDU of operation callTransferSetup, the Interpretation APDU shall contain value clearCallIfAnyInvokePduNotRecognised.

When conveying the invoke APDU of operation callTransferIdentify or callTransferInitiate, the Interpretation APDU shall be included with the value rejectUnrecognizedInvokePdu or omitted.

6.3.2.2 Information elements embedded in the Facility information element

APDUs of the operations defined in 6.3.1 may contain information elements defined in and coded according to ISO/IEC 11572. These shall be embedded in data elements of type PSS1InformationElement as specified in Annex B of ISO/IEC 11582.

In data element basicCallInfoElements, which is of type PSS1InformationElement, the embedded contents shall be coded as Progress indicator information elements specified in ISO/IEC 11572.

6.3.2.3 Other information elements

The following information elements used during the establishment of the new connection (transfer by rerouteing) 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 element shall be conveyed in a FACILITY message as specified in ISO/IEC 11582.

The following messages used during the establishment of the new connection and release of the old connections (in case of transfer by rerouteing) shall be as specified in ISO/IEC 11572 and, where applicable, augmented in ISO/IEC 11582:

- CALL PROCEEDING
- CONNECT
- CONNECT ACKNOWLEDGE
- DISCONNECT
- PROGRESS
- RELEASE
- RELEASE COMPLETE
- SETUP

6.4 SS-CT state definitions

6.4.1 States at a Transferring PINX

The procedures at the Transferring PINX are written in terms of the following conceptual states existing within the SS-CT control entity in that PINX in association with a particular Call Transfer request from User A.

6.4.1.1 CT-Idle

SS-CT is not operating.

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6.4.1.2 CT-Await-Answer-From-User-C

A callTransferComplete invoke APDU with callStatus having value alerting has been sent to the Primary PINX. This state may be used during transfer by join.

6.4.1.3 CT-Await-Identify-Response

A callTransferIdentify invoke APDU has been sent to the Secondary PINX. This state is used during transfer by rerouteing.

6.4.1.4 CT-Await-Initiate-Response

A callTransferInitiate invoke APDU has been sent to the Primary PINX. This state is used during transfer by rerouteing.

6.4.2 States at a Primary PINX

The procedures at the Primary PINX are written in terms of the following conceptual states existing within the SS-CT control entity in that PINX in association with the primary call, i.e. a particular call of User B.

6.4.2.1 CT-Idle

SS-CT is not operating.

6.4.2.2 CT-Await-Setup-Response

A callTransferSetup invoke APDU has been sent to the Secondary PINX. This state is used during transfer by rerouteing.

6.4.2.3 CT-Await-Connect

The Primary Call has been transferred to an alerting Secondary User, and the Primary User has been notified. A CONNECT message indicating answering by the Secondary User is awaited.

6.4.3 States at a Secondary PINX

The procedures at the Secondary PINX are written in terms of the following conceptual states existing within the SS-CT control entity in that PINX in association with a particular call of User C.

6.4.3.1 CT-Idle

SS-CT is not operating.

6.4.3.2 CT-Await-Setup

A callTransferIdentify return result APDU has been sent to the Transferring PINX. This state is used during transfer by rerouteing.

6.5 SS-CT signalling procedures

References in this clause to protocol control states refer to basic call protocol control states defined in ISO/IEC 11572.

NOTE - The specification in this section is based on each of the End PINXs being a different PINX, but this section is also applicable to scenarios where two of the three PINXs are the same. In those scenarios some of the signalling procedures and message flows described in this section are internal to the PINX implementation and therefore outside the scope of this International Standard.

Annex C contains some examples of message sequences.

6.5.1 Actions at a Transferring PINX

Call Transfer procedures shall be initiated on a request from User A specifying the two calls in which User A is involved to be acted upon. The Transferring PINX shall check that one of the two calls is in protocol control state Active and is therefore a valid Primary Call, and that the other call is in protocol control state Active or Call Delivered and is therefore a valid Secondary Call.

If User C is a User in a non-ISDN, additional states are valid for the Secondary Call as specified in 6.7.2.

NOTE 1 - Additional checks carried out by the Transferring PINX, e.g. to satisfy the requirements of ISO/IEC 13865, are outside the scope of this International Standard.

NOTE 2 - The SDL representation of procedures at a Transferring PINX is shown in D.1 of annex D.

After validation of the request for call transfer, the Transferring PINX shall determine which variant of call transfer is to be attempted: join or rerouteing.

NOTE 3 - This depends on the capabilities of the Transferring PINX, the known network topology, and on the known capabilities of the Primary and Secondary PINXs in the current call contexts.

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If call transfer by rerouteing procedures are to be attempted 6.5.1.3 and 6.5.1.4 shall apply, otherwise call transfer by join procedures specified in 6.5.1.1 and 6.5.1.2 shall apply.

On successful completion of call transfer (either by join or by rerouteing), the Transferring PINX shall release User A from the two calls and, depending on the procedures at the access, indicate acceptance to User A.

On failure of call transfer, e.g. because of an invalid request or because of failure of transfer by rerouteing, the Transferring PINX shall retain the two calls at User A and indicate rejection to User A or take implementation dependent action if the calls have been released already from User A.

6.5.1.1 Normal procedures for transfer by join

The Transferring PINX shall join the B-channels of the Primary and Secondary Calls and send a callTransferComplete invoke APDU in a FACILITY message to both the Primary and Secondary PINX using the call references of the Primary and Secondary Call respectively. Within the argument, endDesignation shall be included to give a distinctive designation to each end of the new call. If the Secondary Call was not in protocol control state Active when transferred, the Transferring PINX shall include callStatus with value alerting in the argument of the invoke sent to the Primary PINX. In addition other information may be indicated if available: redirectionNumber and redirectionName to identify the other User in the transferred call, and basicCallInfoElements carrying the progress indications encountered during setup of the other call.

If the Secondary Call is not in protocol control state Active at the time of initiation of the transfer, the Transferring PINX shall enter state CT-Await-Answer-From-User-C in which it shall continue to intercept the signalling connections associated with the former Primary and Secondary Calls.

In state CT-Await-Answer-From-User-C, if the Transferring PINX receives a callTransferUpdate or subaddressTransfer invoke APDU from the Primary PINX, it shall send a callTransferUpdate or subaddressTransfer invoke APDU respectively to the Secondary PINX, and if the Transferring PINX receives a callTransferUpdate or subaddressTransfer invoke APDU from the Secondary PINX, it shall send a callTransferUpdate or subaddressTransfer invoke APDU respectively to the Primary PINX. In either case the information in the argument of the transmitted APDU shall be the same as that in the received APDU and the Transferring PINX shall remain in the same state.

On receipt of a call clearing message from the Primary or Secondary PINX in state CT-Await-Answer-From-User-C, the Transferring PINX shall also clear the call towards the Secondary or Primary PINX respectively in accordance with ISO/IEC 11572. In state CT-Await-Answer-from-User-C, the Transferring PINX shall convey all Notification indicator information elements received in a NOTIFY message from the Primary PINX to the Secondary PINX and vice versa and remain in the same state.

If both the Primary and Secondary Calls are in protocol control state Active, the Transferring PINX shall associate the two connections after having sent the two callTransferComplete invoke APDUs, start to act as a Transit PINX for the resulting call from this point on, and enter state CT-Idle.

On receipt of a CONNECT message on the call reference of the Secondary Call while in state CT-Await-Answer-From-User-C the Transferring PINX shall send a FACILITY message with a callTransferActive invoke APDU on the call reference of the Primary Call. Element basicCallInfoElements may be included. Additionally, if the CONNECT message contained a Facility information element with a connectedName invoke APDU, as defined in ISO/IEC 13868, the Transferring PINX may include the information therein in element connectedName in the callTransferActive invoke APDU instead of relaying the connectedName as a separate invoke APDU. The Transferring PINX shall associate the two connections, begin to act as a Transit PINX for the resultant call, and enter state CT-idle.

6.5.1.2 Exceptional procedures for transfer by join

Not applicable.

6.5.1.3 Normal procedures for transfer by rerouteing

In order to start transfer by rerouteing, the Transferring PINX shall send a callTransferIdentify invoke APDU in a FACILITY message to the Secondary PINX using the call reference of the Secondary Call, start timer T1, and enter state CT-Await-Identify-Response.

On receipt in state CT-Await-Identify-Response of a FACILITY message with a callTransferIdentify return result APDU on the call reference of the Secondary Call, the Transferring PINX shall send a callTransferInitiate invoke APDU in a FACILITY message to the Primary PINX using the call reference of the Primary Call, stop timer T1, and start timer T3. The callIdentity and rerouteingNumber information received within the result of the callTransferIdentify return result APDU shall be relayed within the argument of the callTransferInitiate invoke APDU. State CT-Await-Initiate-Response shall be entered.

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On receipt in state CT-Await-Initiate-Response of a DISCONNECT message with a callTransferInitiate return result APDU using the call reference of the Primary Call, the Transferring PINX shall continue call clearing of the Primary Call according to basic call procedures, initiate call clearing of the Secondary Call according to basic call procedures if this has not been cleared yet, stop timer T3, indicate successful completion of call transfer to User A, and enter state CT-Idle.

Upon receiving in state CT-Await-Identify-Response or CT-Await-Initiate-Response of an indication from basic call control that the Primary and/or Secondary Call has been cleared, the Transferring PINX shall initiate clearing of the other call if this has not been cleared yet, indicate successful completion of call transfer to User A, and enter state CT-Idle.

6.5.1.4 Exceptional procedures for transfer by rerouteing

On receipt in state CT-Await-Identify-Response of a FACILITY message with a callTransferIdentify reject or return error APDU on the call reference of the Secondary Call, the Transferring PINX shall stop timer T1, abort the procedure for transfer by rerouteing, and, depending on the error cause, either reinitiate call transfer using transfer by join procedures as specified in 6.5.1.1 and 6.5.1.2 or enter state CT-Idle.

On expiry of timer T1, the Transferring PINX shall send a callTransferAbandon invoke APDU on the call reference of the Secondary Call, abort the procedure for transfer by rerouteing, and reinitiate call transfer using transfer by join procedures as specified in 6.5.1.1 and 6.5.1.2.

On receipt in state CT-Await-Initiate-Response of a FACILITY message using the call reference of the Primary Call, and conveying a callTransferInitiate reject or return error APDU, the Transferring PINX shall send a callTransferAbandon invoke APDU in a FACILITY message using the call reference of the Secondary Call if this has not been cleared yet, stop timer T3, abort the procedure for transfer by rerouteing, and, depending on the error cause, either reinitiate call transfer using transfer by join procedures as specified in 6.5.1.1 and 6.5.1.2 or enter state CT-Idle.

On expiry of timer T3, the Transferring PINX shall send a callTransferAbandon invoke APDU on the call reference of the Secondary Call if this has not been cleared yet by the Secondary PINX, and abort the procedure for transfer by rerouteing. If the Secondary Call has not been cleared, call transfer shall be reinitiated using transfer by join procedures as specified in 6.5.1.1 and 6.5.1.2, or else state CT-Idle shall be entered.

6.5.2 Actions at a Primary PINX

A PINX shall treat as valid an APDU indicating that it is the Primary PINX for SS-CT only if the protocol control state is Active.

NOTE - The SDL representation of procedures at a Primary PINX is shown in D.2 of annex D.

6.5.2.1 Normal procedures for transfer by join

On receipt of a FACILITY message containing a callTransferComplete invoke APDU while meeting the conditions listed in 6.5.2, the Primary PINX shall proceed as follows. The presence of element endDesignation with value 'primaryEnd' signifies that the PINX shall operate as a Primary PINX. Optionally it may send a callTransferUpdate invoke APDU in a FACILITY message using the call reference on which the callTransferComplete invoke was received. Within the argument, optional data elements redirectionNumber, redirectionName, and basicCallInfoElements containing information relating to User B may be conveyed. The Primary PINX may record details of the transfer, notify User B if this is able to receive a notification, and provide other details received in the invoke to User B as appropriate. A number or name marked as restricted shall not be passed on to the transferred User. The Primary PINX may solicit a subaddress for sending to User C. The Primary PINX shall remain in state CT-Idle.

Additional procedures valid for state CT-Idle are specified in 6.5.5.

6.5.2.2 Exceptional procedures for transfer by join

Not applicable.

6.5.2.3 Normal procedures for transfer by rerouteing

On receipt in state CT-Idle of a FACILITY message containing a callTransferInitiate invoke APDU while in protocol control state Active, the Primary PINX shall determine whether it can participate in the transfer. If so, it shall attempt to establish a new connection by selecting an outgoing B-channel on a route determined by the contents of rerouteingNumber received within the argument of callTransferInitiate. If a B-channel is available, a SETUP message shall be sent using a new call reference in accordance with the procedures of ISO/IEC 11572. The SETUP message shall contain the following information elements:

- Bearer capability, containing the Bearer Capability information of the original call;
- Called party number, containing the number received in rerouteingNumber within the received argument;

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- Facility;
- Sending complete.

The SETUP message shall contain a Facility information element conveying a callTransferSetup invoke APDU, with callIdentity within the argument having the same value as callIdentity in the argument that was received within the callTransferInitiate invoke. The SETUP message may also contain a callTransferUpdate invoke APDU. Within the argument, optional elements redirectionNumber, redirectionName and basicCallInfoElements may be conveyed. Optionally, timer T4 may be started.

State CT-Await-Setup-Response shall be entered. The protocol procedures of ISO/IEC 11572 shall apply during the establishment of the new connection.

NOTE - Initially protocol control will enter state Call Initiated. On receipt of a CALL PROCEEDING message, state Outgoing Call Proceeding will be entered, on receipt of ALERTING, state Alerting will be entered and on receipt of CONNECT, state Active will be entered.

On receipt in state CT-Await-Setup-Response of a CONNECT message (using the call reference of the new connection) containing a callTransferSetup return result APDU, the Primary PINX shall disconnect the B-channel of the old connection and connect User B to the B-channel of the new connection. Timer T4 shall be stopped if running. The Primary PINX may record details of the transfer and notify User B if this is able to receive a notification. If the CONNECT message also contains a callTransferUpdate invoke APDU with, in the argument, optional elements redirectionNumber, redirectionName and/or basicCallInfoElements the information contained therein may be conveyed to User B. A number or name marked as restricted shall not be passed on to the transferred User. The Primary PINX may solicit a subaddress for sending to User C. A DISCONNECT message containing a callTransferInitiate return result APDU shall be sent on the call reference of the old connection to the Transferring PINX. Completion of the release of the old connection shall be in accordance with the protocol procedures of ISO/IEC 11572. State CT-Idle shall be entered.

On receipt in state CT-Await-Setup-Response of an ALERTING message (using the call reference of the new connection) containing a callTransferSetup return result APDU, the Primary PINX shall proceed according to the procedures specified in the paragraph above with the following modification. Instead of CT-Idle, state CT-Await-Connect shall be entered.

On receipt in state CT-Await-Connect of a CONNECT message on the call reference of the rerouted call, indicating call acceptance by User C, the Primary PINX may notify User B, providing details as appropriate, subject to presentation restrictions, and shall enter state CT-Idle.

Additional procedures valid for state CT-Idle are specified in 6.5.5.

6.5.2.4 Exceptional procedures for transfer by rerouteing

If on receipt in state CT-Idle of a FACILITY message containing a callTransferInitiate invoke APDU, the Primary PINX is not able to participate, a callTransferInitiate return error APDU containing an appropriate error shall be sent in a FACILITY message on the call reference on which the invoke was received.

On expiry of timer T4, or on receipt in state CT-Await-Setup-Response of a call clearing message on the call reference of the new connection, possibly containing a callTransferSetup return error APDU or reject APDU, the Primary PINX shall proceed with call clearing of the new connection in accordance with the procedures of ISO/IEC 11572, and send a FACILITY message on the call reference of the primary call. A callTransferInitiate return error APDU shall be conveyed in the FACILITY message, indicating either error value establishmentFailure, or if a callTransferSetup return error has been received, the error value indicated therein.

On detection in state CT-Await-Setup-Response of call clearing by User B, or on receipt of a call clearing message on the call reference of the Primary call, the Primary PINX shall proceed with clearing of the primary call in accordance with the procedures of ISO/IEC 11572, and initiate call clearing of the new connection using the procedures of ISO/IEC 11572.

On detection in state CT-Await-Connect of call clearing of the rerouted connection, either by User B or due to reception of a call clearing message using the call reference of the rerouted connection, the Primary PINX shall proceed with clearing of the rerouted connection in accordance with the procedures of ISO/IEC 11572.

In all of the above cases timer T4 shall be stopped if running and state CT-Idle shall be entered.

6.5.3 Actions at a Secondary PINX

A PINX shall treat as valid an APDU indicating that it is the Secondary PINX for SS-CT only if the protocol control state is Active or Call Received, or if specific conditions applicable to interworking situations as defined in 6.7.1.1 are met.

NOTE - The SDL representation of procedures at a Secondary PINX is shown in D.3 of annex D.

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6.5.3.1 Normal procedures for transfer by join

On receipt in state CT-Idle of a FACILITY message containing a callTransferComplete invoke APDU while meeting the conditions listed in 6.5.3, the Secondary PINX shall proceed as follows. The presence of element endDesignation with value 'secondaryEnd' signifies that the PINX shall operate as a Secondary PINX. Optionally it may send a callTransferUpdate invoke APDU in a FACILITY message to the Primary PINX using the call reference on which the callTransferComplete invoke was received. Within the argument, optional data elements redirectionNumber, redirectionName, and basicCallInfoElements containing information relating to User C may be conveyed. The Secondary PINX may record details of the transfer and may notify User C if this is able to receive this information. If the Protocol Control state of the Secondary Call is Active, the Secondary PINX may solicit a subaddress for sending to User B. The secondary PINX shall remain in state CT-Idle.

NOTE - On detection of answer by User C, a CONNECT message is sent to the Transferring PINX in accordance with the procedures of ISO/IEC 11572, using the call reference of the Secondary Call.

Additional procedures valid for state CT-Idle are specified in 6.5.5.

6.5.3.2 Exceptional procedures for transfer by join

Not applicable.

6.5.3.3 Normal procedures for transfer by rerouteing

On receipt in state CT-Idle of a FACILITY message containing a callTransferIdentify invoke APDU under the conditions listed in 6.5.3, the Secondary PINX shall determine whether it can proceed with SS-CT by rerouteing. If so, it shall send a callTransferIdentify return result APDU in a FACILITY message using the call reference on which the invoke APDU was received, start timer T2, and enter state CT-Await-Setup. Within the argument, callIdentity and rerouteingNumber shall be included. Element rerouteingNumber shall contain a number which, when used as the contents of the information element Called party number in a SETUP message, is sufficient to cause routing to the Secondary PINX.

NOTE - The number provided should have significance throughout the PISN. If it is a number from a Private Numbering Plan (PNP), it should be a Complete Number. If it is an E.164 number then a subscriber number can be insufficient, and in some networks a national number can be insufficient.

Element callIdentity shall be a number which, possibly in conjunction with rerouteingNumber, identifies the call on which SS-CT is being invoked. Element callIdentity need not have significance outside the Secondary PINX.

Having agreed the B-channel and sent back a CALL PROCEEDING message in response to an incoming SETUP message, in accordance with the procedures of ISO/IEC 11572, if the SETUP contains a callTransferSetup invoke APDU, the Secondary PINX shall proceed as follows. If the callIdentity in the argument of callTransferSetup matches the call-identity of a call whose SS-CT control entity is in state CT-Await-Setup, the Secondary PINX shall stop timer T2, disconnect the B-channel of the part of the secondary connection to User A, initiate release of this connection by sending a DISCONNECT message in accordance with the procedures of ISO/IEC 11572, and associate the new connection (as requested by the SETUP message) with the part of the Secondary Call to User C. The Secondary PINX may record details of the transfer, may notify the transferred User, and may solicit a subaddress for sending to User B. The SETUP may also contain a callTransferUpdate invoke APDU, having optional elements redirectionNumber, redirectionName and basicCallInfoElements in the argument. The information contained therein may be conveyed to User C, subject to number and/or name presentation restrictions.

Next, if the Secondary Call is in state Active, a callTransferSetup return result APDU shall be sent in a CONNECT message using the call reference of the new connection, but if the Secondary Call is not in protocol control state Active, the return result APDU shall be conveyed in an ALERTING message. The CONNECT or ALERTING message may also contain a callTransferUpdate invoke APDU, carrying optional elements redirectionNumber, redirectionName and basicCallInfoElement in the argument of the invoke. State CT-Idle shall be entered.

NOTE - On detection of answer by User C, a CONNECT message is sent to the Primary PINX in accordance with the procedures of ISO/IEC 11572, using the call reference of the newly routed connection.

Additional procedures valid for state CT-Idle are specified in 6.5.5.

6.5.3.4 Exceptional procedures for transfer by rerouteing

If the secondary PINX is unable to comply with the callTransferIdentify invoke APDU, it shall send back a FACILITY message containing a callTransferIdentify return error APDU with a suitable error. Reasons can include:

- invalid call state;
- a temporary condition prevents participation as Secondary PINX in a call transfer by rerouteing procedure;
- SS-CT by rerouteing is not implemented.

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Any errors other than unrecognizedCallIdentity may be used.

Failure to associate an incoming SETUP message containing a callTransferSetup invoke APDU with a SS-CT entity in state CT-Await-Setup shall result in the sending of a DISCONNECT message to initiate the clearing of the new connection. Depending on implementation, the DISCONNECT shall contain either:

- a suitable cause number in the Cause information element, e.g. 1 "unallocated (unassigned) number"; or
- cause number 29 "facility rejected" in the Cause information element and a return error APDU containing error unrecognisedCallIdentity.

On receipt in state CT-Await-Setup of a callTransferAbandon invoke APDU in a FACILITY message using the call reference of the Secondary Call, the Secondary PINX shall stop timer T2, abort the procedure for transfer by rerouteing, and enter state CT-Idle.

On detection in state CT-Await-Setup of call clearing of the Secondary Call either by User B or due to reception of a call clearing message using the call reference of the Secondary Call, the Secondary PINX shall proceed with clearing of the Secondary Call in accordance with the procedures of ISO/IEC 11572, stop timer T2 if running and enter state CT-Idle.

On expiry of timer T2, the Secondary PINX shall abort the procedure for transfer by rerouteing and enter state CT-Idle.

6.5.4 Actions at a Transit PINX

No special actions are required in support of SS-CT.

6.5.5 Subsequent actions at a Primary and a Secondary PINX

During state CT-Idle, a FACILITY message containing a callTransferUpdate invoke APDU may be received. Information therein may be conveyed to the local user, if this is able to receive that information, and subject to number and/or name presentation restrictions. This information shall override any information received previously in a callTransferComplete invoke APDU.

If during state CT-Idle, a FACILITY message containing a subaddressTransfer invoke APDU is received, the PINX may relay the subaddress on to the local user.

If during state CT-Idle, the local user's terminal supplies subaddress information for transmission to the other user, the PINX shall transmit the information in a subaddressTransfer invoke APDU in a FACILITY message.

If during state CT-Idle a FACILITY message containing a callTransferActive invoke APDU is received, the information received may be conveyed to the local user, if this is able to receive that information, and subject to number and/or name presentation restrictions. The information received shall override any information received previously.

As an implementation option a Primary or Secondary PINX can keep record of the fact that a transfer has occurred and ignore the above events if transfer has not occurred.

6.6 SS-CT impact of interworking with public ISDNs

6.6.1 Actions at a Gateway PINX

Interworking aspects are different depending on the type of interworking situation, the two relevant types are:

- User A is in the PISN and transfers one or two public ISDN users,
- User A is in the public ISDN and one or two PISN Users are transferred.

6.6.1.1 Impact of interworking if User A is in the PISN

When User A is in the PISN, and User B (User C) is in the public ISDN, call transfer is performed within the PISN, and the gateway PINX shall act as Primary (Secondary) PINX.

If the signalling protocol at the access allows, the Gateway PINX shall indicate that transfer has occurred, together with relevant information e.g. whether active or alerting, and the number and/or subaddress of the transferred-to User in appropriate notifications or operations to the public ISDN.

If subaddress information is subsequently received from the public ISDN it shall be forwarded to the other End PINX as data element connectedSubaddress in a subaddressTransfer invoke APDU within a FACILITY message.

6.6.1.2 Impact of interworking if a PISN User is transferred by the public ISDN

When User A is in the public ISDN, call transfer is performed within the public ISDN.

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The Gateway PINX shall forward the information received in the call transfer indication, which consists of an indication "call transferred, active" or "call transferred, alerting" and optionally a redirection number, to the other End PINX in a callTransferComplete invoke APDU within a FACILITY message. Element endDesignation in the invoke APDU shall be coded primaryEnd, except when the call to which call transfer applies is an incoming call from the ISDN that has not yet reached the Active state, in which case element endDesignation shall be coded secondaryEnd. Inclusion of other data elements is dependent on information received from the public ISDN.

On receipt of a FACILITY message from the other End PINX containing a subaddressTransfer invoke APDU with data element connectedSubaddress, the Gateway PINX shall forward a response with subaddress information to the public ISDN if a request for subaddress information is pending.

When subaddress information is received from the public ISDN in a separate operation, this information shall be forwarded to the other End PINX as data element connectedSubaddress in a subaddressTransfer invoke APDU within a FACILITY message.

6.6.2 Actions at other types of PINX

The procedures of 6.5 shall apply.

6.7 SS-CT impact of interworking with non-ISDNs

6.7.1 Actions at a Gateway PINX

6.7.1.1 Transfer within the PISN

When User A is in the PISN, and User B (User C) is in the non-ISDN, call transfer shall be performed within the PISN, and the gateway PINX shall act as Primary (Secondary) PINX.

The gateway shall perform for call transfer a signalling mapping between the signalling system specified in this International Standard and that of the non-ISDN.

An Outgoing Gateway PINX interworking with a non-ISDN shall treat as valid an APDU indicating that it is the Secondary PINX for SS-CT also if the protocol control state is Incoming Call Proceeding or Overlap Receiving.

NOTE - The Outgoing Gateway PINX, which will perform Secondary PINX functions in the context of call transfer, has informed the PINX serving User A of this condition before invocation of call transfer by sending, in accordance with ISO/IEC 11572, a Progress indicator information element with CCITT progress description "interworking with a non-ISDN (no. 1)" in an appropriate message in the backwards direction while it handled the incoming call from the PINX serving User A.

When a Gateway PINX, which performs Secondary PINX functions in the context of call transfer by rerouteing, has associated an incoming SETUP message that contains a callTransferSetup invoke APDU with a call whose SS-CT control entity is in state CT-Await-Setup, it shall proceed according to the procedures defined for this situation in 6.5.3.3, with the modification that if the Secondary call is in protocol control state Incoming Call Proceeding or Overlap Receiving, the callTransferSetup result shall be conveyed in a PROGRESS message.

6.7.1.2 Transfer within the non-ISDN

When User A is in the non-ISDN, call transfer is performed within that network.

When the non-ISDN is able to provide indications of call transfer, the Gateway PINX shall forward indications received, representing events like "call transferred, active" or "call transferred, alerting", to the other End PINX in a callTransferComplete invoke APDU within a FACILITY message. Element endDesignation in the invoke APDU shall be coded primaryEnd, except when the call to which call transfer applies is an incoming call from the non-ISDN that has not yet reached the Active state, in which case element endDesignation shall be coded secondaryEnd. Inclusion of other data elements, such as redirection number, name, is dependent on information received from the non-ISDN.

On receipt of a FACILITY message from the other End PINX containing a subaddressTransfer invoke APDU with data element connectedSubaddress, the Gateway PINX shall forward the subaddress information to the non-ISDN if the signalling system allows.

When subaddress information is received from the non-ISDN, this information shall be forwarded to the other End PINX as data element connectedSubaddress in a subaddressTransfer invoke APDU within a FACILITY message.

6.7.1.3 Cooperation with a non-ISDN in providing transfer by rerouteing

When interworking with another network which supports transfer by rerouteing and if the PINX's also support transfer by rerouteing, the two networks may cooperate in the operation of transfer by rerouteing.

6.7.2 Actions at other types of PINX

The procedures of 6.5 shall apply.

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Additional protocol control states are valid for a Transferring PINX if User C is a User in a non-ISDN. Then call transfer procedures may also be started from states Outgoing Call Proceeding or Overlap Sending. From the perspective of the Transferring PINX, User C shall only qualify as a user in a non-ISDN if a Progress indicator information element with CCITT progress description "interworking with a non-ISDN (no. 1)" has been received in an appropriate message from the Secondary PINX during Secondary Call setup.

Additional procedures are valid for a Primary PINX if User C is a user in a non-ISDN and transfer by rerouteing procedures have been initiated: On receipt in state CT-Await-Setup-Response of a PROGRESS message (using the call reference of the new connection) containing a callTransferSetup return result APDU, the Primary PINX shall proceed as if the APDU had been received in an ALERTING message, and enter state CT-Await-Connect.

6.8 Protocol Interactions between SS-CT and other supplementary services and ANFs

This clause specifies protocol interactions with other supplementary services and ANFs for which stage 3 standards had been published at the time of publication of this International Standard. For interactions with supplementary services and ANFs for which stage 3 standards are published subsequent to the publication of this International Standard, see those other stage 3 standards.

NOTE 1 - Simultaneous conveyance of APDUs for SS-CC and another supplementary service or ANF in the same message, each in accordance with the requirements of its respective stage 3 standard, does not, on its own, constitute a protocol interaction.

NOTE 2 - Additional interactions that have no impact on the signalling protocol at the Q reference point can be found in the relevant stage 1 specifications.

6.8.1 Calling Name Identification Presentation (SS-CNIP)

Protocol interactions are specified in 6.5.

6.8.2 Connected Name Identification Presentation (SS-CONP)

Protocol interactions are specified in 6.5.

6.8.3 Completion of Calls to Busy Subscribers (SS-CCBS)

No protocol interaction.

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

No protocol interaction.

6.8.5 Call Forwarding Unconditional (SS-CFU)

The following interaction shall apply if SS-CFU is supported in accordance with ISO/IEC 13873.

6.8.5.1 Actions at a Transferring PINX for join

In state CT-Await-Answer-From-User-C the Transferring PINX shall convey any received divertingLegInformation1 invoke APDU or divertingLegInformation3 invoke APDU from the Secondary PINX to the Primary PINX.

In state CT-Await-Answer-From-User-C, on receipt of a callRerouting invoke APDU from the Secondary PINX, the Transferring PINX shall act as the Rerouteing PINX. Any divertingLegInformation1 invoke APDUs or divertingLegInformation3 invoke APDUs generated in accordance with Rerouteing PINX procedures shall be sent to the Primary PINX.

When the Transferring PINX enters state CT-Await-Answer-From-User-C, if the transferring PINX had previously received one or more divertingLegInformation1 invoke APDUs (i.e., the PINX was in state CDO-Divert) from the direction of the Secondary PINX or from the Rerouteing PINX, the Transferring PINX shall send a divertingLegInformation1 invoke APDU to the Primary PINX together with the callTransferComplete invoke APDU. The divertingLegInformation1 invoke APDU shall be coded as follows:

- diversionReason (based on the diversion reason of the last divertingLegInformation1 invoke APDU received)
- subscription option (based on the most restrictive subscription option received in any of the divertingLegInformation1 invoke APDUs)
- nominatedNr (based on the nominated number of the last divertingLegInformation1 invoke APDU received).

If the Transferring PINX receives a divertingLegInformation3 invoke APDU in an ALERTING message and the Transferring PINX has not yet sent callTransferComplete invoke APDU to the Primary PINX, then the Transferring PINX shall first send a

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divertingLegInformation1 invoke APDU to the Primary PINX together with the callTransferComplete invoke APDU and then relay the divertingLegInformation3 invoke APDU in a FACILITY message.

6.8.6 Call Forwarding Busy (SS-CFB)

The following interaction shall apply if SS-CFB is supported in accordance with ISO/IEC 13873.

6.8.6.1 Actions at a Transferring PINX for join

Protocol interactions are specified in 6.8.5.1.

6.8.7 Call Forwarding No Reply (SS-CFNR)

The following protocol interactions shall apply if SS-CFNR is supported in accordance with ISO/IEC 13873.

NOTE - If SS-CFNR is invoked for an unanswered, transferred call, either the Transferring PINX acts as Rerouteing PINX (call transfer by join and call forwarding by rerouteing) or the Primary PINX acts as Rerouteing PINX (call transfer by rerouteing and call forwarding by rerouteing) or the Secondary PINX acts as Rerouteing PINX (call forwarding by forward switching).

6.8.7.1 Actions at a Transferring PINX for rerouteing and SS-CFNR Originating PINX

On receipt of a callRerouting invoke APDU after initiating call transfer by rerouteing, the Transferring PINX shall send a callRerouting return error APDU containing error value supplementaryServicelnteractionNotAllowed to the SS-CFNR Served User PINX.

The Transferring PINX shall not pass on a received divertingLeglnformationl invoke APDU and divertingLeglnforrnation3 invoke APDU after initiating call transfer by rerouteing.

6.8.7.2 Actions at a Transferring PINX for join or rerouteing and SS-CFNR Originating PINX

The Transferring PINX shall not initiate signalling for SS-CT while performing call forwarding by rerouteing and prior to clearing either the call to the diverting user or the call to the diverted-to user.

6.8.7.3 Actions at a Secondary PINX for rerouteing and SS-CFNR Served User PINX

On receipt of a callTransferldentify invoke APDU after initiating call forwarding by rerouteing, the SS-CFNR Served User PINX shall send a callTransferldentify return error APDU containing error value supplementaryServicelnteractionNotAllowed to the Transferring PINX.

SS-CFNR shall not be initiated while the Secondary PINX is involved in transfer by rerouteing.

6.8.7.4 Actions at a Secondary PINX for rerouteing and SS-CFNR Served User and Rerouteing PINX

On receipt of a callTransferldentify invoke APDU after initiating call forwarding by forward switching and before a divertingLeglnforrnation1 invoke APDU has been sent, the SS-CFNR Rerouteing PINX shall send a callTransferldentify return error APDU containing error value supplementaryServicelnteractionNotAllowed to the Transferring PINX.

6.8.7.5 Actions at a Secondary PINX for join and SS-CFNR Served User and Rerouteing PINX

On receipt of a callTransferComplete, callTransferUpdate or subaddressTransfer invoke APDU after initiating call forwarding by forward switching, the SS - CFNR Rerouteing PINX shall not pass on the APDU to the Diverted-to PINX while the SS-CFNR rerouteing procedure is in progress. After receipt of an ALERTING or CONNECT message from the Diverted-to PINX and if the diverting user has not already answered the call, the information received in callTransferComplete, callTransferUpdate or subaddressTransfer invoke APDUs shall be passed on to the Diverted-to PINX.

6.8.7.6 Actions at a Transferring PINX for join

Protocol interactions are specified in 6.8.5.1.

6.8.7.7 Actions at a Primary PINX for join

The actions at an Originating PINX in 6.5.1.1 of ISO/IEC 13873 and 6.5.1.2 of ISO/IEC 13873 shall apply also to the Primary PINX with the following exceptions:

- The basic call protocol control state in which a divertingLegInformation1 invoke APDU or a divertingLegInformation3 invoke APDU can be received is "Active".
- On receipt of a callTransferActive invoke APDU, the Primary PINX shall enter state CT-Idle.

6.8.8 Call Deflection (SS-CD)

The protocol interactions with Call Deflection Immediate shall be as specified in 6.8.5 for interaction with SS-CFU.

The protocol interactions with Call Deflection from Alert shall be as specified in 6.8.7 for interaction with SS-CFNR.

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6.8.9 Path Replacement (ANF-PR)

The following interaction shall apply if ANF-PR is supported in accordance with ISO/IEC 13874.

6.8.9.1 Actions at an ANF-PR Requesting PINX

6.8.9.1.1 Invocation of Call transfer

For the purpose of the requirements below, the following events shall be considered as invocation of SS-CT:

- receipt of callTransferComplete invoke APDU;
- receipt of callTransferIdentify invoke APDU;
- receipt of callTransferInitiate invoke APDU;
- invocation of Call Transfer by the local user.

SS-CT shall be allowed to proceed normally if invoked while the PINX is acting as a Requesting PINX for ANF-PR. If SS-CT is invoked while in ANF-PR state PR-Req-initiating or PR-Req-Rejecting, all signalling for SS-CT shall occur on the old path. If SS-CT is invoked while in ANF-PR state PR-Req-Completing, all subsequent signalling for SS-CT shall be sent on the new path and received SS-CT signals shall be accepted from either path.

A pathReplaceSetup invoke APDU shall be responded to with a return error APDU containing error temporarilyUnavailable if, since sending the pathReplacePropose invoke APDU, SS-CT has been invoked.

NOTE - This will prevent switching over to the new path, so that all signalling for SS-CT can take place on the old path without risk of loss during switch over.

6.8.9.1.2 Initiation of ANF-PR during Call Transfer

ANF- PR shall not be initiated while the PINX is acting as a Transferring PINX, a Primary PINX or a Secondary PINX during SS-CT.

6.8.9.2 Actions at an ANF-PR Cooperating PINX

6.8.9.2.1 Invocation of Call Transfer

On receipt of a callTransferComplete, callTransferIdentify or callTransferlnitiate invoke APDU while acting as an ANF-PR Cooperating PINX in ANF-PR state PR-Coop-Establishment or PR-Coop-Retain, SS-CT shall be allowed to proceed normally using the old path for further signalling, except that if the old path is released as a result of successful ANF-PR, signalling shall continue using the new path.

NOTE - The Requesting PINX will normally abandon ANF-PR by sending back a pathReplaceSetup return error APDU because SS-CT has been invoked. Therefore switch over to a new path will not normally occur.

While acting as an ANF-PR Cooperating PINX in ANF-PR state PR-Coop-Establishment, an SS-CT invocation request from the local user shall be treated in one of the following ways:

- reject the request for SS-CT; or
- wait until ANF-PR is complete before processing the request for SS-CT; or
- abort ANF-PR and proceed with SS-CT.

To abort ANF-PR while in state PR-Coop-Establishment, the Cooperating PINX shall send a DISCONNECT message using the call reference of the new connection, thereby initiating the clearing procedures of ISO/IEC 11572 for the new connection, send a pathReplacePropose return error APDU with error value supplementaryServiceInteractionNotAllowed using the call reference of the old connection, and enter state PR-Coop-Idle.

While acting as an ANF-PR Cooperating PINX in ANF-PR state PR-Coop-Retain, an SS-CT invocation request from the local user shall be treated in one of the following ways:

- reject the request for SS-CT; or
- wait until ANF-PR is complete before processing the request for SS-CT.

6.8.9.2.2 Initiation of ANF-PR during Call Transfer

On receipt of a pathReplacePropose invoke APDU while acting as a Transferring PINX, a Primary PINX or a Secondary PINX during SS-CT, a pathReplacePropose return error APDU shall be sent. The error shall be temporarilyUnavailable.

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6.9 SS-CT Parameter values (Timers)

The following timers apply only to transfer by rerouteing.

6.9.1 Timer T1

Timer T1 shall operate at the Transferring PINX during state CT-Await-Identify-Response. Its purpose is to protect against the absence of a response to the callTransferIdentify invoke APDU.

Timer T1 shall have a value not less than 10 seconds.

6.9.2 Timer T2

Timer T2 shall operate at the Secondary PINX during state CT-Await-Setup. Its purpose is to protect against failure of completion of the call transfer operation, i.e. failure to receive a callTransferSetup or callTransferAbandon invoke APDU.

Timer T2 shall have a value not less than 50 seconds.

6.9.3 Timer T3

Timer T3 shall operate at the Transferring PINX during state CT-Await-Initiate-Response. Its purpose is to protect against the absence of a response to the callTransferInitiate invoke APDU.

Timer T3 shall have a value not less than 50 seconds.

6.9.4 Timer T4

Timer T4 may optionally operate at the Primary PINX during state CT-Await-Setup-Response. Its purpose is to protect against failure to establish the new connection.

NOTE - Alternatively an implementation can rely on basic call timers for this protection.

Timer T4 shall have a value not less than 40 seconds.

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Annex A
(normative)

Protocol Implementation Conformance Statement (PICS) proforma

A.1 Introduction

The supplier of a protocol implementation which is claimed to conform to this International Standard shall complete the following Protocol Implementation Conformance Statement (PICS) proforma.

A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of the protocol have been implemented. The PICS can have a number of uses, including use:

- by the protocol implementor, as a check list to reduce the risk of failure to conform to the standard through oversight;
- by the supplier and acquirer, or potential acquirer, of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the Standard's PICS proforma;
- by the user or potential user of an implementation, as a basis for initially checking the possibility of interworking with another implementation. While interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICSs;
- by a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

A.2 Instructions for completing the PICS proforma

A.2.1 General structure of the PICS proforma

The PICS proforma is a fixed format questionnaire divided into subclauses each containing a group of individual items. Each item is identified by an item number, the name of the item (question to be answered), and the reference(s) to the clause(s) that specifies (specify) the item in the main body of this International Standard.

The "Status" column indicates whether an item is applicable and if so whether support is mandatory or optional. The following terms are used:

m	mandatory (the capability is required for conformance to the protocol);
o	optional (the capability is not required for conformance to the protocol, but if the capability is implemented it is required for conformance to the protocol specifications);
o.<n>	optional, but support of at least one of the group of options labelled by the same numeral <n> is required;
x	prohibited;
c.<cond>	conditional requirement, depending on support for the item or items listed in condition <cond>;
<item>:m	simple conditional requirement, the capability being mandatory if item number <item> is supported, otherwise not applicable;
<item>:o	simple conditional requirement, the capability being optional if item number <item> is supported, otherwise not applicable;

Answers to the questionnaire items are to be provided either in the "Support" column, by simply marking an answer to indicate restricted choice (Yes) or (No), or in the "Not Applicable" column (N/A).

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A.2.2 Additional information

Items of Additional Information allow a supplier to provide further information intended to assist the interpretation of the PICS. It is not intended that a large quantity will be supplied, and a PICS can be considered complete without such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations.

References to items of Additional information may be entered next to any answer in the questionnaire, and may be included in items of Exception information.

A.2.3 Exceptional information

It may occasionally happen that a supplier will wish to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer will be found in the support column for this. Instead, the supplier is required to write into the support column an x.<i> reference to an item of Exception information, and to provide the appropriate rationale in the Exception item itself.

An implementation for which an Exception item is required in this way does not conform to this International Standard. A possible reason for the situation described above is that a defect in the Standard has been reported, a correction for which is expected to change the requirement not met by the implementation.

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A.3 PICS proforma for ISO/IEC 13869

A.3.1 Implementation identification

Supplier	
Contact point for queries about the PICS	
Implementation Name(s) and Version(s)	
Other information necessary for full identification, e.g. name(s) and version(s) for machines and/or operating systems; system name(s)	

Only the first three items are required for all implementations; other information may be completed as appropriate in meeting requirements for full identification.

The terms Name and Version should be interpreted appropriately to correspond with a suppliers terminology (e.g. Type, Series, Model).

A.3.2 Protocol summary

Protocol version	1.0
Addenda implemented (if applicable)	
Amendments implemented	
Have any exception items been required (see A.2.3)?	No [ ] Yes [ ] (The answer Yes means that the implementation does not conform to this International Standard)

Date of statement	

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A.3.3 General

Item	Question/feature	References	Status	N/A	Support
A1	Support of SS-CT by join		m		Yes [ ]
A2	Support of SS-CT by rerouteing		o		Yes [ ] No [ ]

A.3.4 Procedures for SS-CT-Join

Item	Question/feature	Reference	Status	N/A	Support
B1	Support of relevant ISO/IEC 11572 and ISO/IEC 11582 procedures	6.2	m		Yes [ ]
B2	Signalling procedures at a Transferring PINX	6.5.1.1, 6.5.1.2	m		Yes [ ]
B3	Signalling procedures at a Transferring PINX for interworking with a non-ISDN	6.7.2	m		Yes [ ]
B4	Signalling procedures at a Primary PINX	6.5.2.1, 6.5.2.2, 6.5.5	m		Yes [ ]
B5	Signalling procedures at a Secondary PINX	6.5.3.1, 6.5.3.2, 6.5.5	m		Yes [ ]
B6	Behaviour as Gateway PINX to a public ISDN to support transfer of users in the ISDN by a user in the PISN	6.6.1.1	o		Yes [ ] No [ ]
B7	Behaviour as Gateway PINX to a public ISDN to support transfer of users in the PISN by a user in the ISDN	6.6.1.2	o		Yes [ ] No [ ]
B8	Behaviour as Gateway PINX to a non-ISDN to support transfer of users in the other network by a user in the PISN	6.7.1.1	o		Yes [ ] No [ ]
B9	Behaviour as Gateway PINX to a non-ISDN to support transfer of users in the PISN by a user in the other network	6.7.1.2	o		Yes [ ] No [ ]

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A.3.5 Additional procedures for SS-CT-Rerouteing

Item	Name of Item	Reference	Status	N/A	Support
C1	Signalling procedures at a Transferring PINX	6.5.1.3, 6.5.1.4	A2:m	[ ]	m: Yes [ ]
C2	Signalling procedures at a Primary PINX	6.5.2.3, 6.5.2.4, 6.5.5	A2:m	[ ]	m: Yes [ ]
C3	Signalling procedures at a Secondary PINX	6.5.3.3, 6.5.3.4, 6.5.5	A2:m	[ ]	m: Yes [ ]
C4	Behaviour as Gateway PINX to a public ISDN to support transfer of users in the ISDN by a user in the PISN (using transfer by rerouteing in the PISN)	6.6.1.1	o		Yes [ ] No [ ]
C5	Behaviour as Gateway PINX to a non-ISDN to support transfer of users in the other network by a user in the PISN (using transfer by rerouteing procedures)	6.7.1.1	o		Yes [ ] No [ ]
C6	Behaviour as Gateway PINX to a non-ISDN to support transfer of users in the PISN by a user in the other network (using transfer by rerouteing procedures)	6.7.1.3	o		Yes [ ] No [ ]

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A.3.6 Coding

Item	Name of Item	Reference	Status	N/A	Support
D1	Sending of callTransferComplete invoke APDU	6.3	m		Yes [ ]
D2	Sending of callTransferActive invoke APDU	6.3	m		Yes [ ]
D3	Receipt of callTransferComplete invoke APDU	6.3	m		Yes [ ]
D4	Receipt of callTransferActive invoke APDU	6.3	m		Yes [ ]
D5	Sending of callTransferUpdate invoke APDU	6.3	o		Yes [ ] No [ ]
D6	Receipt of callTransferUpdate invoke APDU	6.3	m		Yes [ ]
D7	Sending of subaddressTransfer invoke APDU	6.3	o		Yes [ ] No [ ]
D8	Receipt of subaddressTransfer invoke APDU	6.3	m		Yes [ ]
D9	Sending of callTransferIdentify invoke APDU and receipt of return result and return error APDUs	6.3	A2:m	[ ]	m: Yes [ ]
D10	Sending of callTransferInitiate invoke APDU and receipt of return result and return error APDUs	6.3	A2:m	[ ]	m: Yes [ ]
D11	Sending of callTransferSetup invoke APDU and receipt of return result and return error APDUs	6.3	A2:m	[ ]	m: Yes [ ]
D12	Receipt of callTransferIdentify invoke APDU and sending of return result and return error APDUs	6.3	A2:m	[ ]	m: Yes [ ]
D13	Receipt of callTransferInitiate invoke APDU and sending of return result and return error APDUs	6.3	A2:m	[ ]	m: Yes [ ]
D14	Receipt of callTransferSetup invoke ADPU and sending of return result and return error APDUs	6.3	A2:m	[ ]	m: Yes [ ]
D15	Sending of callTransferAbandon invoke APDU	6.3	A2:m	[ ]	m: Yes [ ]
D16	Receipt of callTransferAbandon invoke APDU	6.3	A2:m	[ ]	m: Yes [ ]

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A.3.7 Interactions between SS-CT and SS-CFNR/SS-CD

Item	Question/feature	Reference	Status	N/A	Support
E1	Support of SS-CFNR or SS-CDA		o		Yes [ ] No [ ]
E2	Support of SS-CFNR or SS-CDA at an Originating PINX		o		Yes [ ] No [ ]
E3	Support of SS-CFNR or SS-CDA at an SS-CFNR/SS-CDA Served User PINX		o		Yes [ ] No [ ]
E4	Support of SS-CFNR or SS-CDA by forward switching at an SS-CFNR/SS-CDA Served User PINX		E3:o	[ ]	o: Yes [ ] No [ ]
E5	Actions at a Transferring PINX for rerouteing and SS-CFNR/SS-CDA Originating PINX	6.8.7.1	c.1	[ ]	m: Yes [ ]
E6	Actions at a Transferring PINX for join or rerouteing and SS-CFNR/SS-CDA Originating PINX	6.8.7.2	E2:m	[ ]	m: Yes [ ]
E7	Actions at a Secondary PINX for rerouteing and SS-CFNR/SS-CDA Served User PINX	6.8.7.3	c.2	[ ]	m: Yes [ ]
E8	Actions at a Secondary PINX for rerouteing and SS-CFNR/SS-CDA Served User / Rerouteing PINX	6.8.7.4	c.3	[ ]	m: Yes [ ]
E9	Actions at a Secondary PINX for join and SS-CFNR/SS-CDA Served User / Rerouteing PINX	6.8.7.5	E4:m	[ ]	m: Yes [ ]
E10	Actions at a Transferring PINX for join	6.8.7.6	E1:m	[ ]	m: Yes [ ]
E11	Actions at a Primary PINX for join	6.8.7.7	E1:m	[ ]	m: Yes [ ]

c.1: if A2 and E2 then mandatory, else N/A

c.2: if A2 and E3 then mandatory, else N/A

c.3: if A2 and E4 then mandatory, else N/A

A.3.8 Interactions between SS-CT and ANF-PR

Item	Question/feature	Reference	Status	N/A	Support
F1	Support of ANF-PR at a Requesting PINX		o		Yes [ ] No [ ]
F2	Support of ANF-PR at a Cooperating PINX		o		Yes [ ] No [ ]
F3	Interactions between SS-CT and ANF-PR at an ANF-PR Requesting PINX	6.8.9.1	F1:m	[ ]	m: Yes [ ]
F4	Interactions between SS-CT and ANF-PR at an ANF-PR Cooperating PINX	6.8.9.2	F2:m	[ ]	m: Yes [ ]

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A.3.9 Timers

Item	Name of Item	Reference	Status	N/A	Support
G1	Support of timer T1	6.8.1	A2:m	[ ]	m: Yes [ ]
G2	Support of timer T2	6.8.2	A2:m	[ ]	m: Yes [ ]
G3	Support of timer T3	6.8.3	A2:m	[ ]	m: Yes [ ]
G4	Support of timer T4	6.8.4	A2:o	[ ]	o: Yes [ ] No [ ]

A.3.10 Interactions between SS-CT and SS-CFU/SS-CDI

Item	Question/feature	Reference	Status	N/A	Support
H1	Support of SS-CFU or SS-CDI		o		Yes [ ] No [ ]
H2	Actions at a Transferring PINX for join	6.8.5.1	H1:m	[ ]	m: Yes [ ]

A.3.11 Interactions between SS-CT and SS-CFB

Item	Question/feature	Reference	Status	N/A	Support
I1	Support of SS-CFB		o		Yes [ ] No [ ]
I2	Actions at a Transferring PINX for join	6.8.6.1	I1:m	[ ]	m: Yes [ ]

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Annex B
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Imported ASN.1 definitions

The content of this annex has been deleted to remove duplicate ASN.1 definitions defined elsewhere.

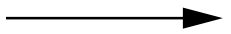
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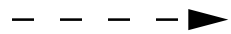
Annex C
(informative)

Examples of message sequences

This annex describes some typical message flows for SS-CT. The following conventions are used in the figures of this annex:

1 The following notation is used:


Protocol message


Service primitive to / from user

xxx.inv	Invoke APDU for operation xxx
xxx.rr	Return result APDU for operation xxx
xxx.re	Return error APDU for operation xxx

2 The figures show messages exchanged via Protocol Control between PINXs involved in SS-CT. Only messages relevant to SS-CT are shown.

3 Only the relevant information content (i.e. remote operation APDUs) is listed below each message name. The Facility information elements containing remote operation APDUs are not explicitly shown. Information with no impact on SS-CT is not shown.

4 The following abbreviations are used:

ctIdentify	callTransferIdentify
ctInitiate	callTransferInitiate
ctSetup	callTransferSetup
ctAbandon	callTransferAbandon
ctActive	callTransferActive
ctComplete	callTransferComplete
ctUpdate	callTransferUpdate
subAdrTfr	subaddressTransfer
ctInvoke	Call Transfer Invoke
ctNotify	Call Transfer Notify

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C.1 Example message sequence for normal operations of call transfer by join, both calls active

Figure C.1 shows an example of a normal operation of transfer by join when both calls are in state Active.

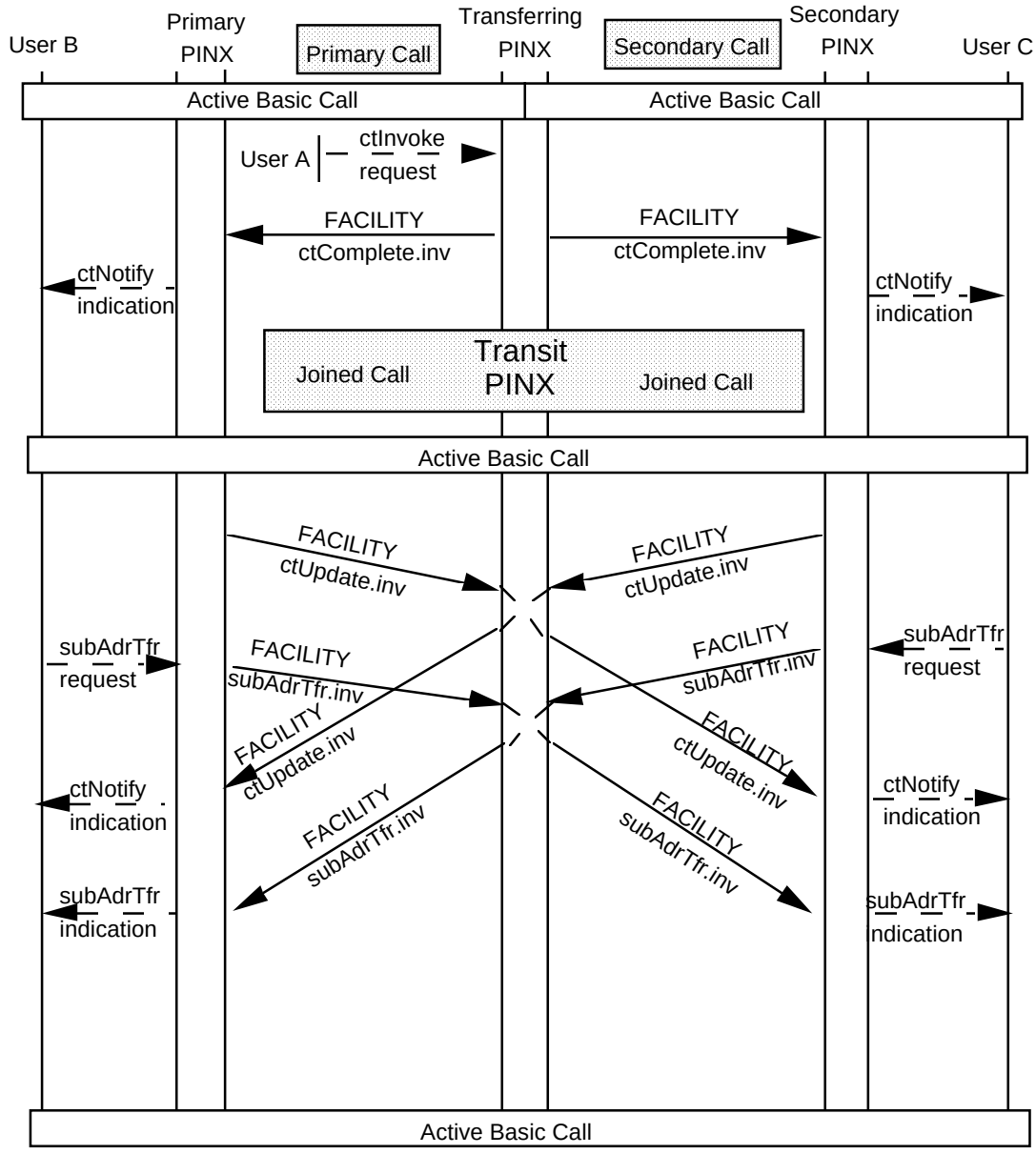


Figure C.1 - Message sequence for normal operation of SS-CT by join, both calls are Active

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C.2 Example message sequence for call transfer by join, one call alerting

Figure C.2 shows an example of a normal operation of transfer by join when one call is active and the other is alerting.

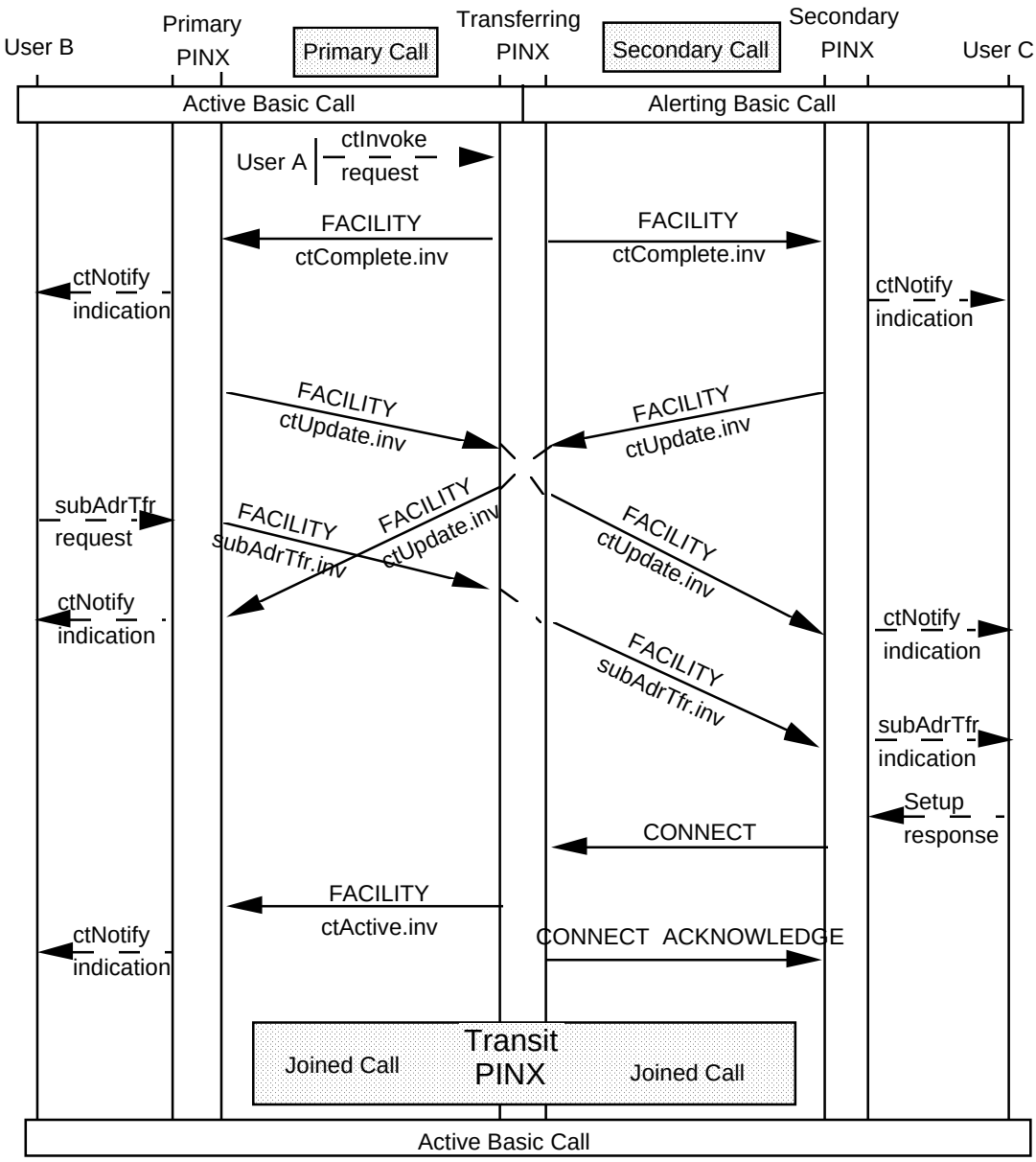


Figure C.2 - Message sequence for normal operation of SS-CT by join, one call is Active and the other is Alerting

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C.3 Example message sequence for normal operation of call transfer by rerouteing

Figure C.3 shows an example of a normal operation of transfer by rerouteing when the two calls involved in the call transfer operation are both in the Active state.

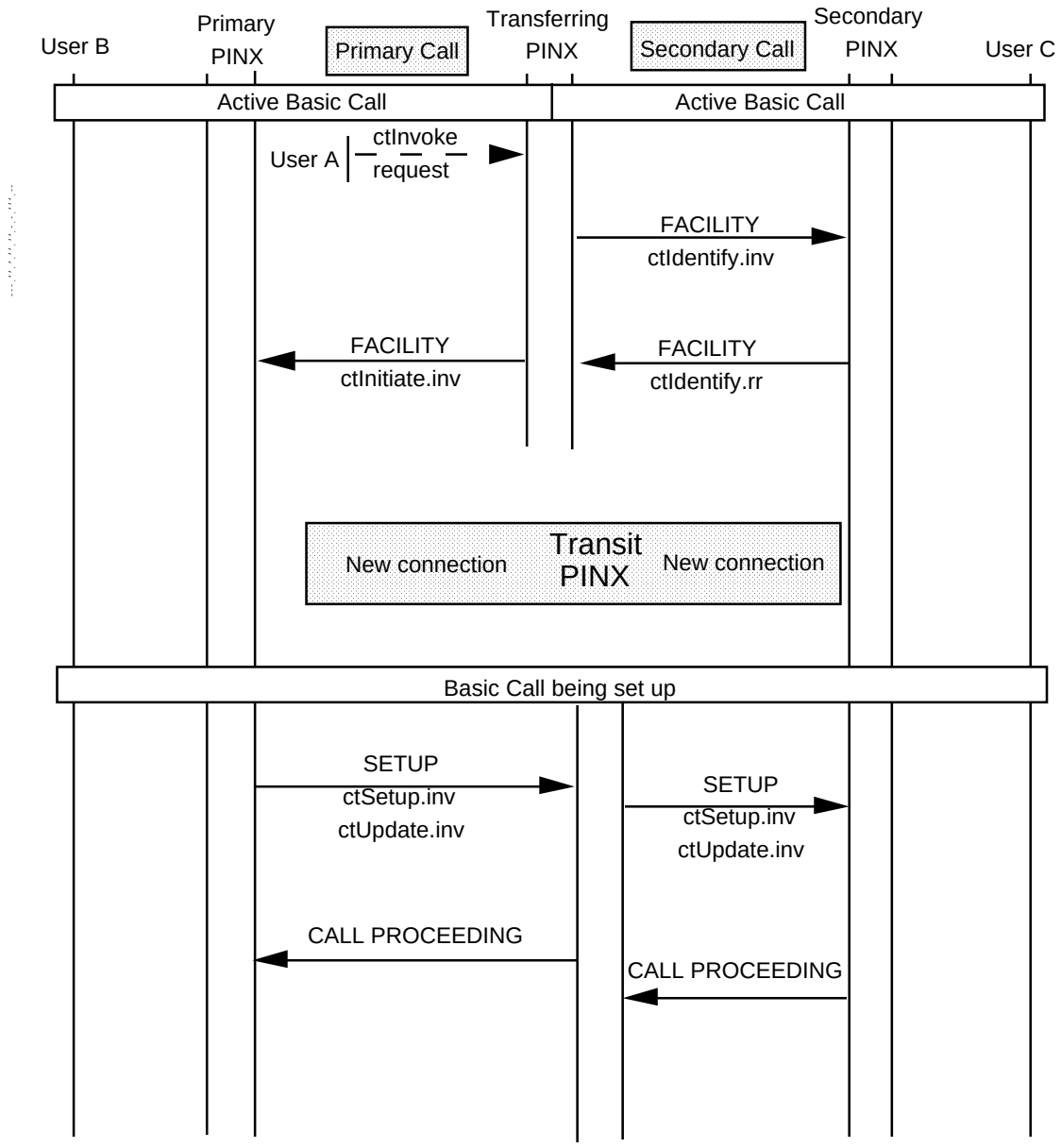


Figure C.3 (sheet 1 of 2) - Message sequence for Call Transfer by rerouteing, both calls are Active

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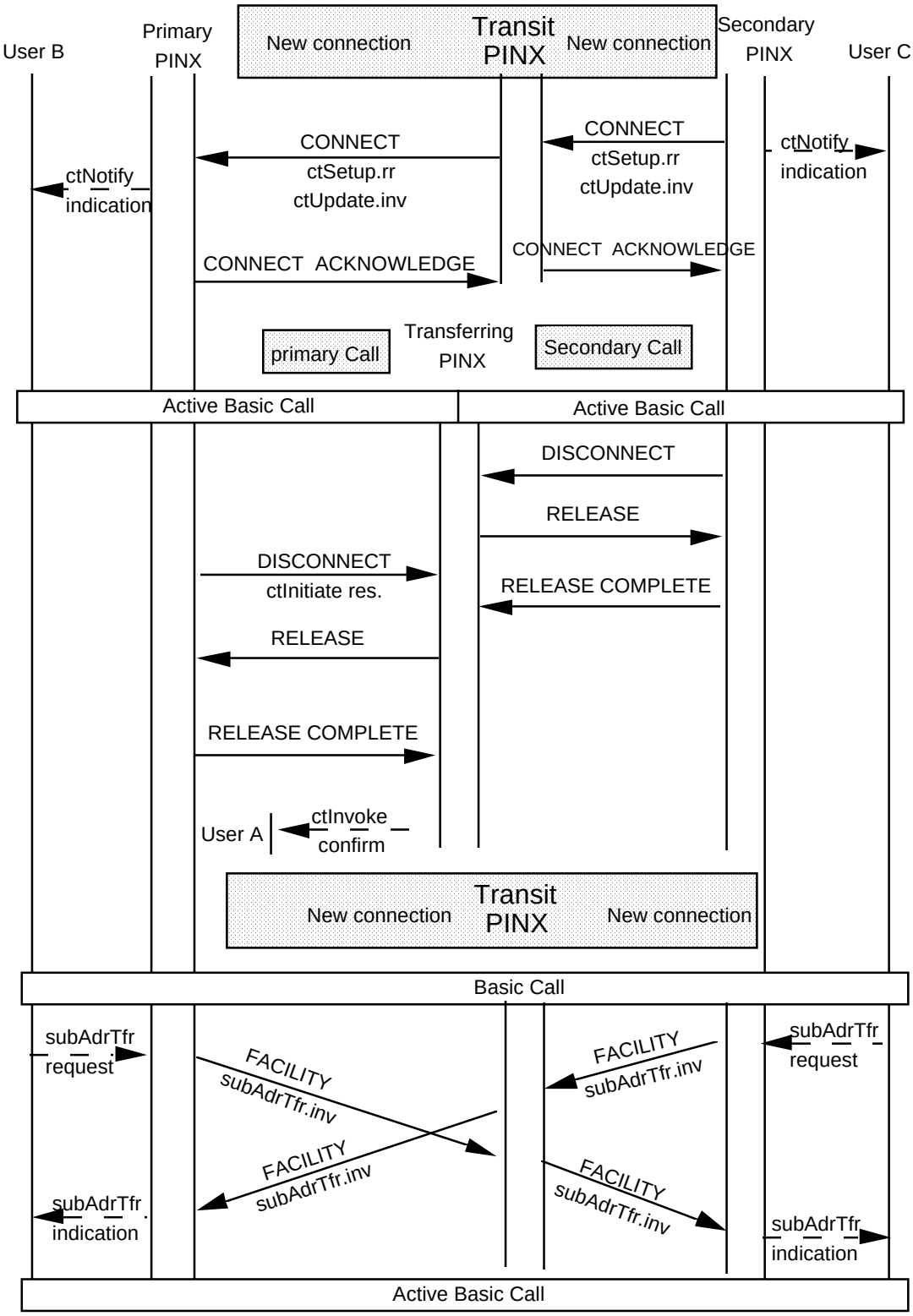


Figure C.3 (sheet 2 of 2) - Message sequence for Call Transfer by rerouteing, both calls are Active

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C.4 Example message sequence for normal operation of call transfer by rerouteing, one call alerting

Figure C.4 shows an example of a normal operation of transfer by rerouteing when one call is in the Active state and the other is alerting.

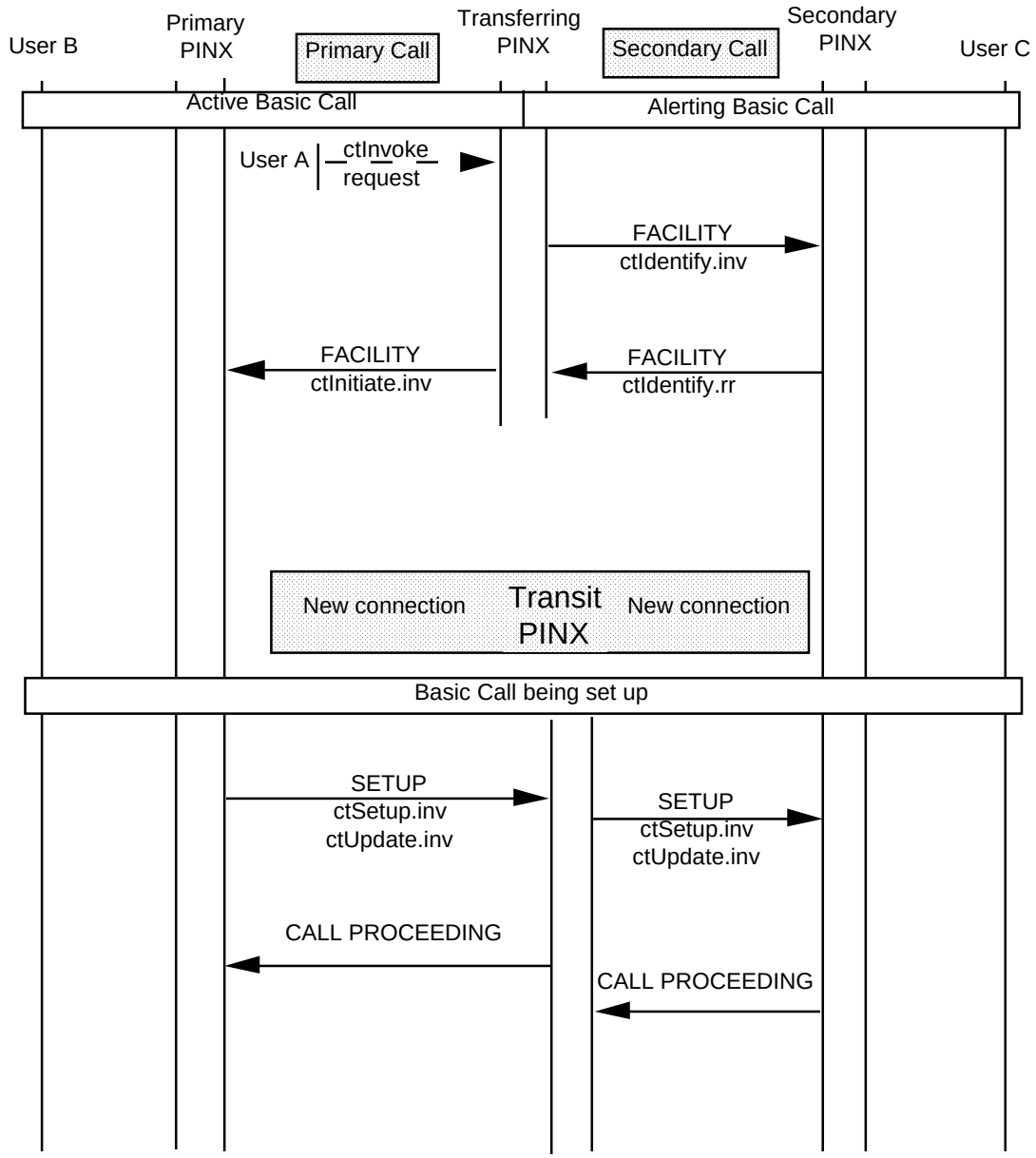


Figure C.4 (sheet 1 of 2) - Message sequence for Call Transfer by rerouteing, one call Active and one Alerting

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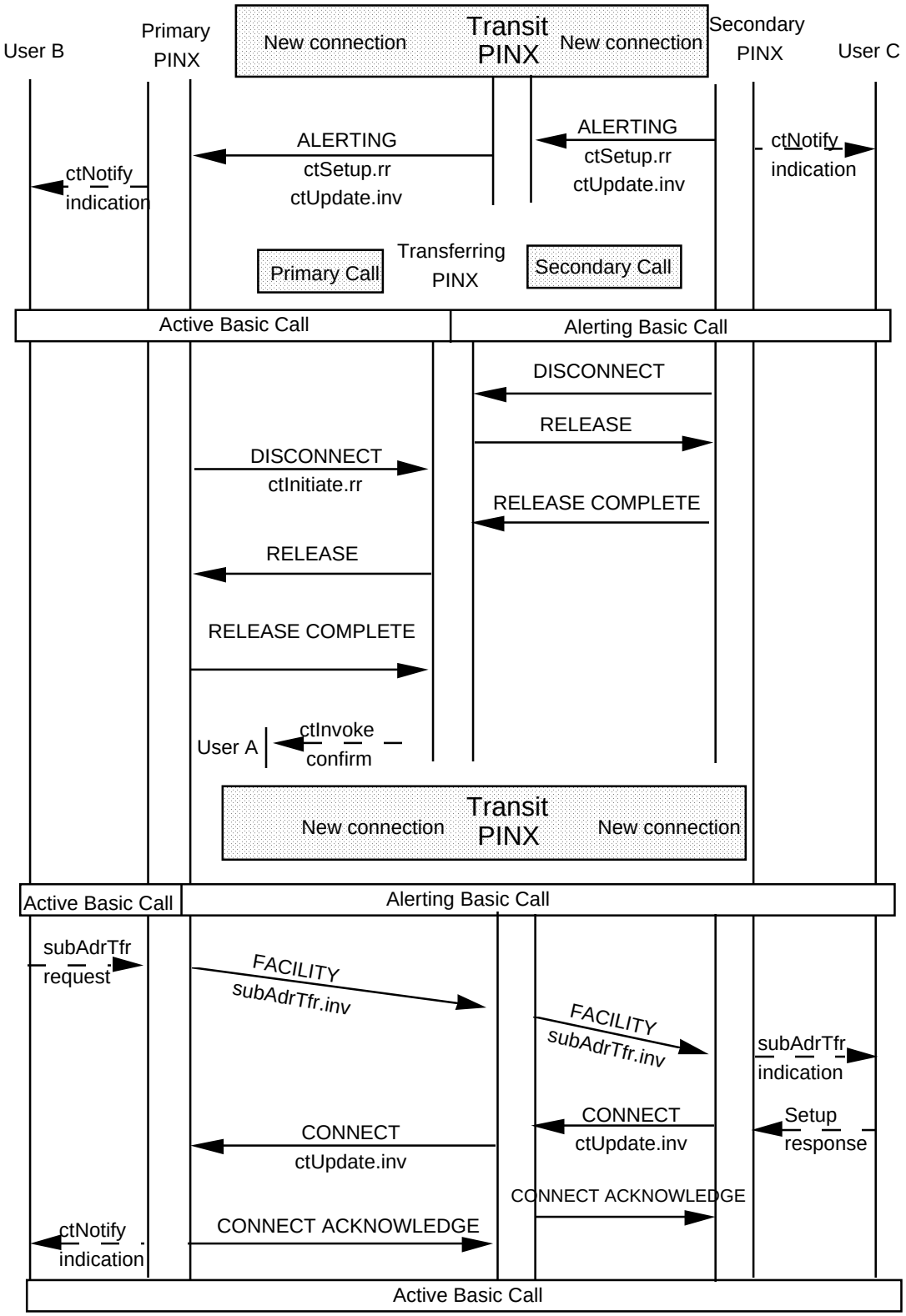


Figure C.4 (sheet 2 of 2) - Message Sequence for Call Transfer by rerouteing, one call is Active, one Alerting

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Annex D
(informative)

Specification and Description Language (SDL) representation of procedures

The diagrams in this annex use the Specification and Description Language defined in ITU-T Rec. Z.100.

Each diagram represents the behaviour of a SS-CT Supplementary Service Control entity at a particular type of PINX. In accordance with the protocol model described in ISO/IEC 11582, the Supplementary Service Control entity uses, via the Coordination Function, the services of Generic Functional Transport Control and Basic Call Control.

Where an output symbol represents a primitive to the Coordination Function, and that primitive results in a PSS1 message being sent, the output symbol bears the name of the message and any remote operation APDU(s) contained in that message. In case of a message specified in ISO/IEC 11572, basic call actions associated with the sending of that message are deemed to occur.

Where an input symbol represents a primitive from the Coordination Function, and that primitive results from a PSS1 message being received, the input symbol bears the name of the message and any remote operation APDU(s) contained in that message. In case of a message specified in ISO/IEC 11572, basic call actions associated with the receiving of that message are deemed to occur.

The following abbreviations are used:

err.	return error APDU
ind.	indication
inv.	invoke APDU
opt.	optional
rcvd	received
rej.	reject APDU
res.	return result APDU
ctIdentify	callTransferIdentify
ctInitiate	callTransferInitiate
ctSetup	callTransferSetup
ctAbandon	callTransferAbandon
ctActive	callTransferActive
ctComplete	callTransferComplete
ctUpdate	callTransferUpdate
subAdrTfr	subaddressTransfer

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D.1 SDL Representation of SS-CT at a Transferring PINX

Figure D.1 shows the behaviour of a SS-CT Supplementary Service Control entity within a Transferring PINX.

Input signals from the right and output signals to the right represent primitives to and from the Coordination Functions in respect of the messages being sent and received.

Input signals from the left and output signals to the left represent stimuli between the SS-CT Supplementary Service Control entity and the SS-CT user.

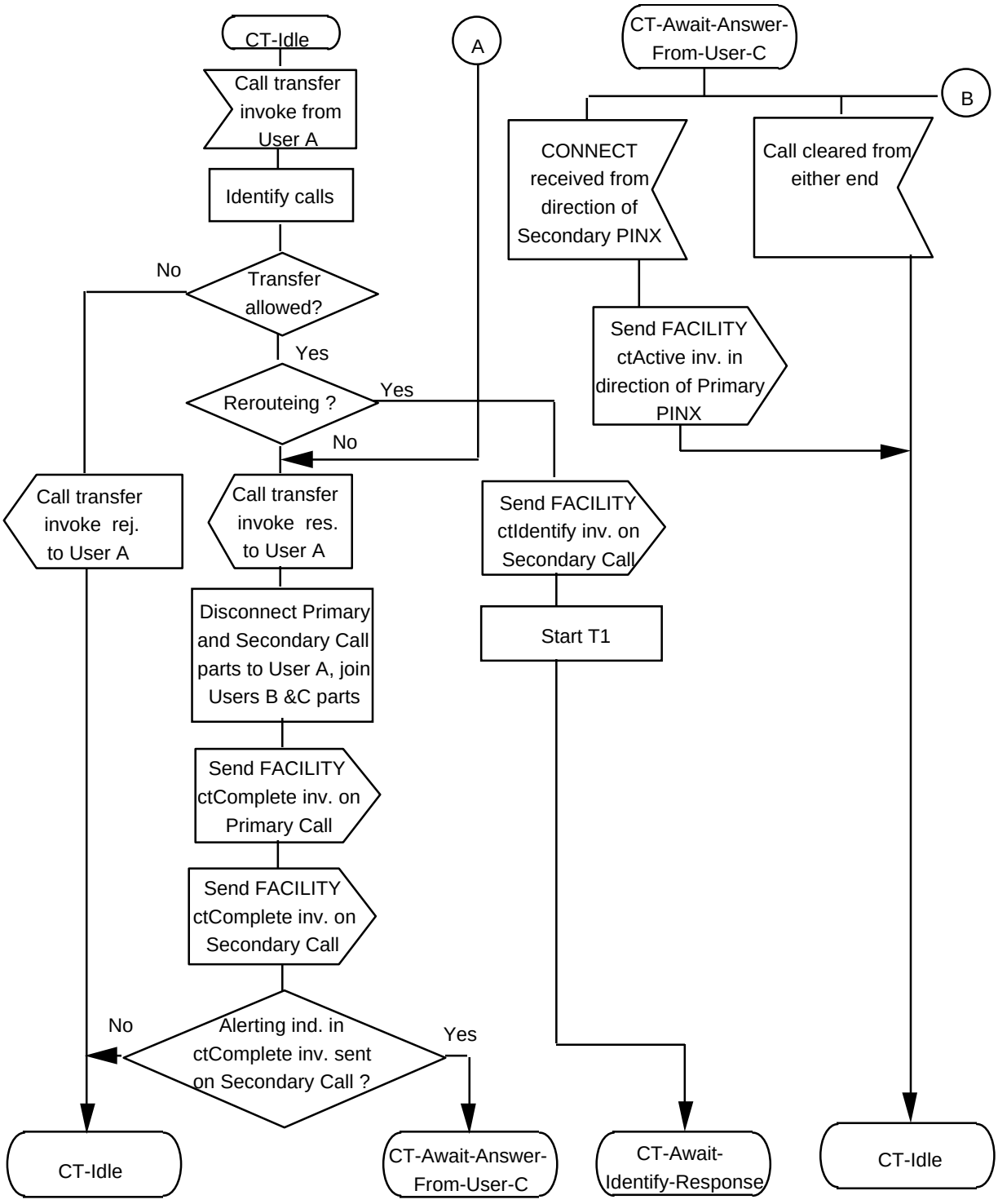


Figure D.1 (sheet 1 of 4) - Transferring PINX SDL

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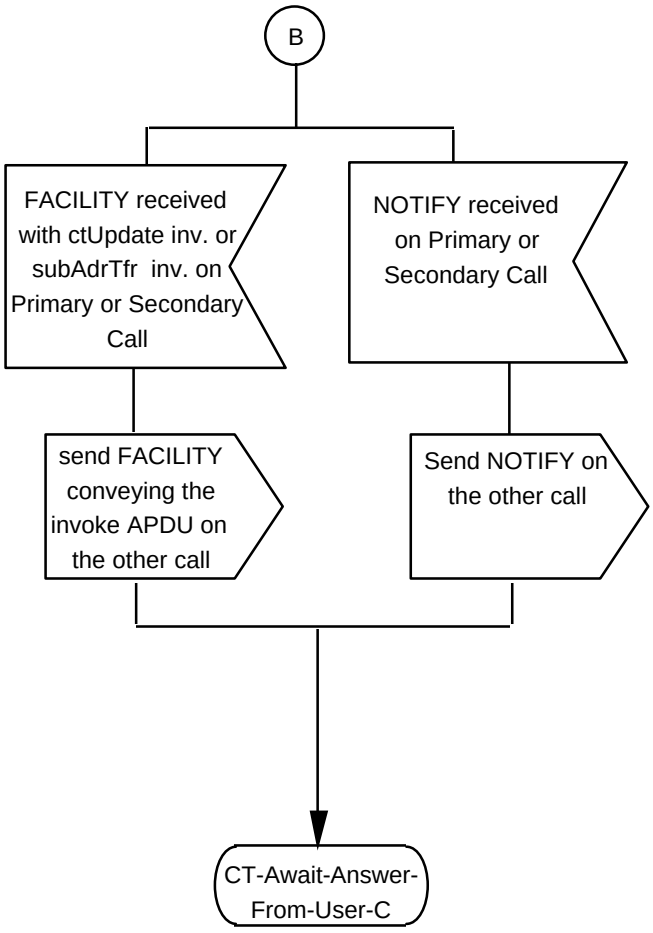


Figure D.1 (sheet 2 of 4) - Transferring PINX SDL

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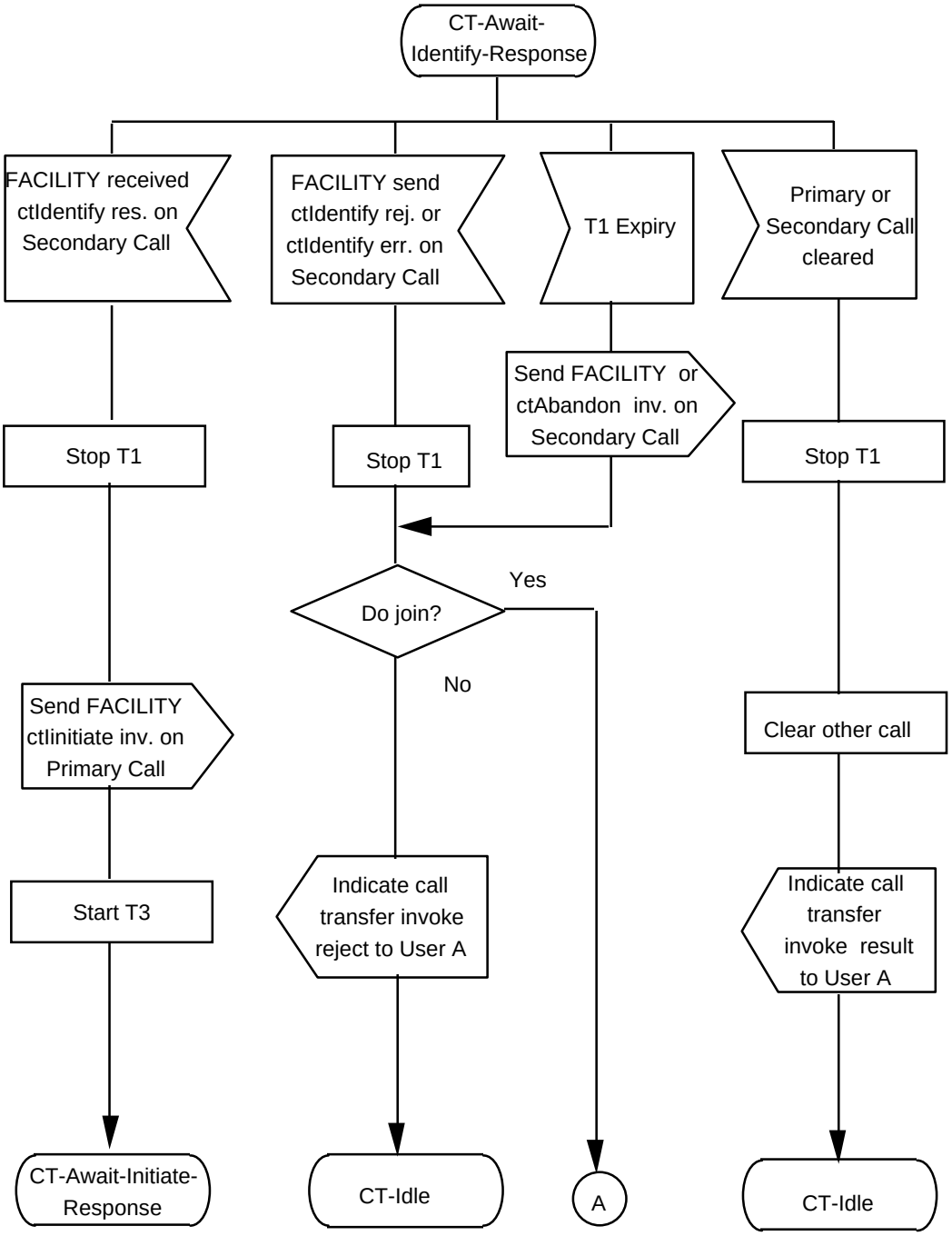


Figure D.1 (sheet 3 of 4) - Transferring PINX SDL

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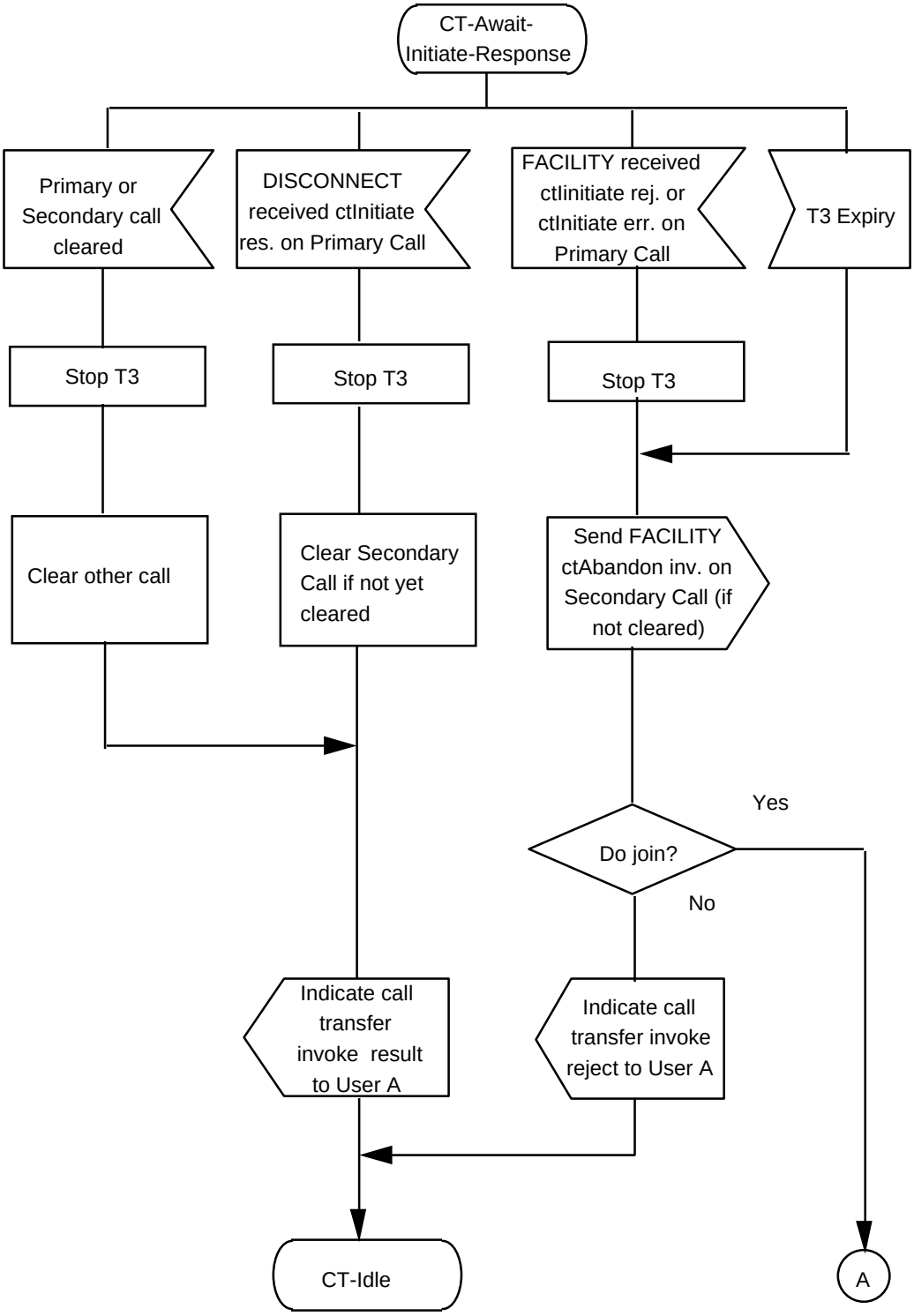


Figure D.1 (sheet 4 of 4) - Transferring PINX SDL

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D.2 SDL Representation of SS-CT at a Primary PINX

Figure D.2 shows the behaviour of a SS-CT Supplementary Service Control entity within a Primary PINX.

Input signals from the left and output signals to the left represent primitives to and from the Coordination Function in respect of messages sent and received.

Input signals from the right and output signals to the right represent stimuli between the SS-CT Supplementary Service Control entity and the transferred User.

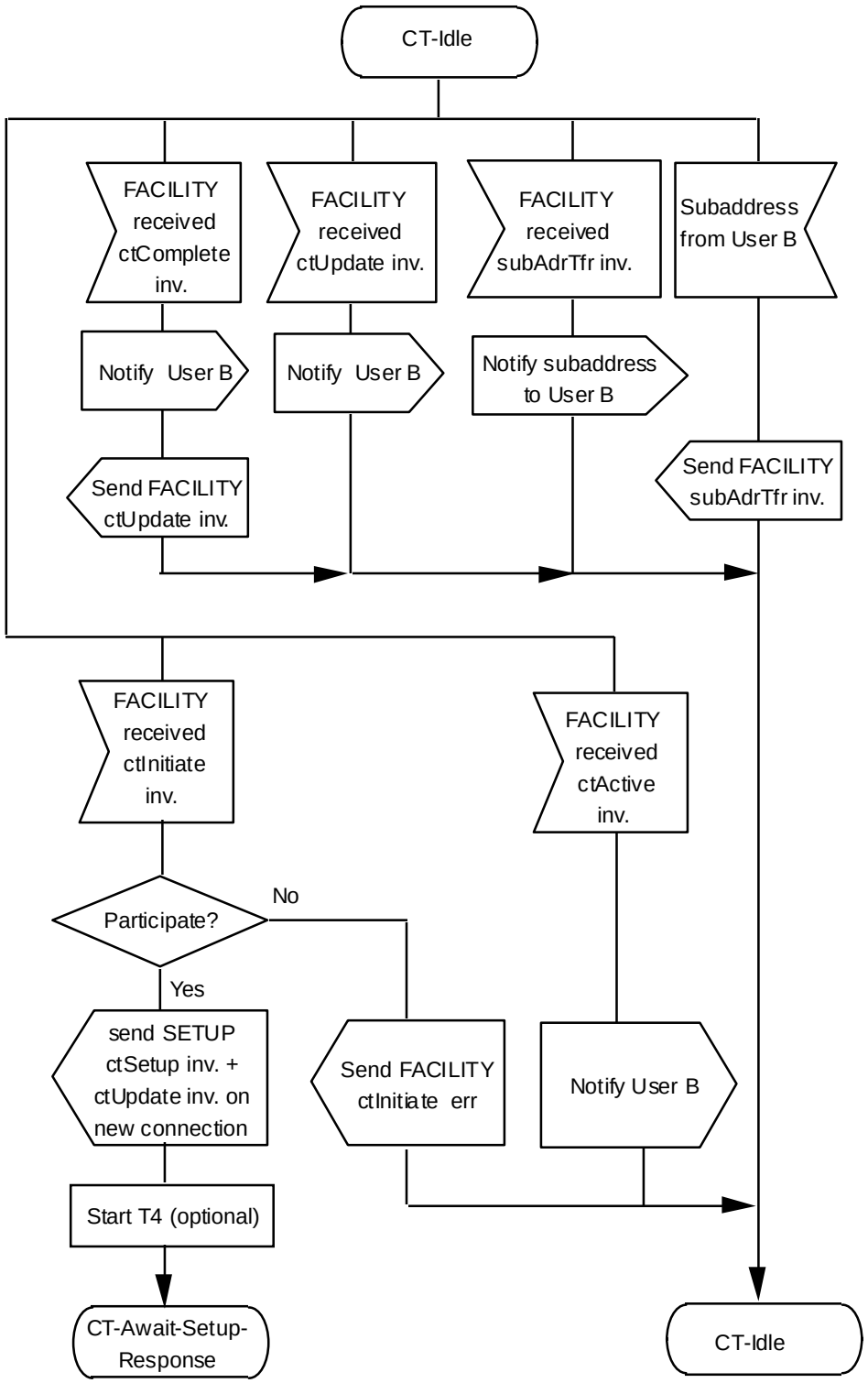


Figure D.2 (sheet 1 of 2) - Primary PINX SDL

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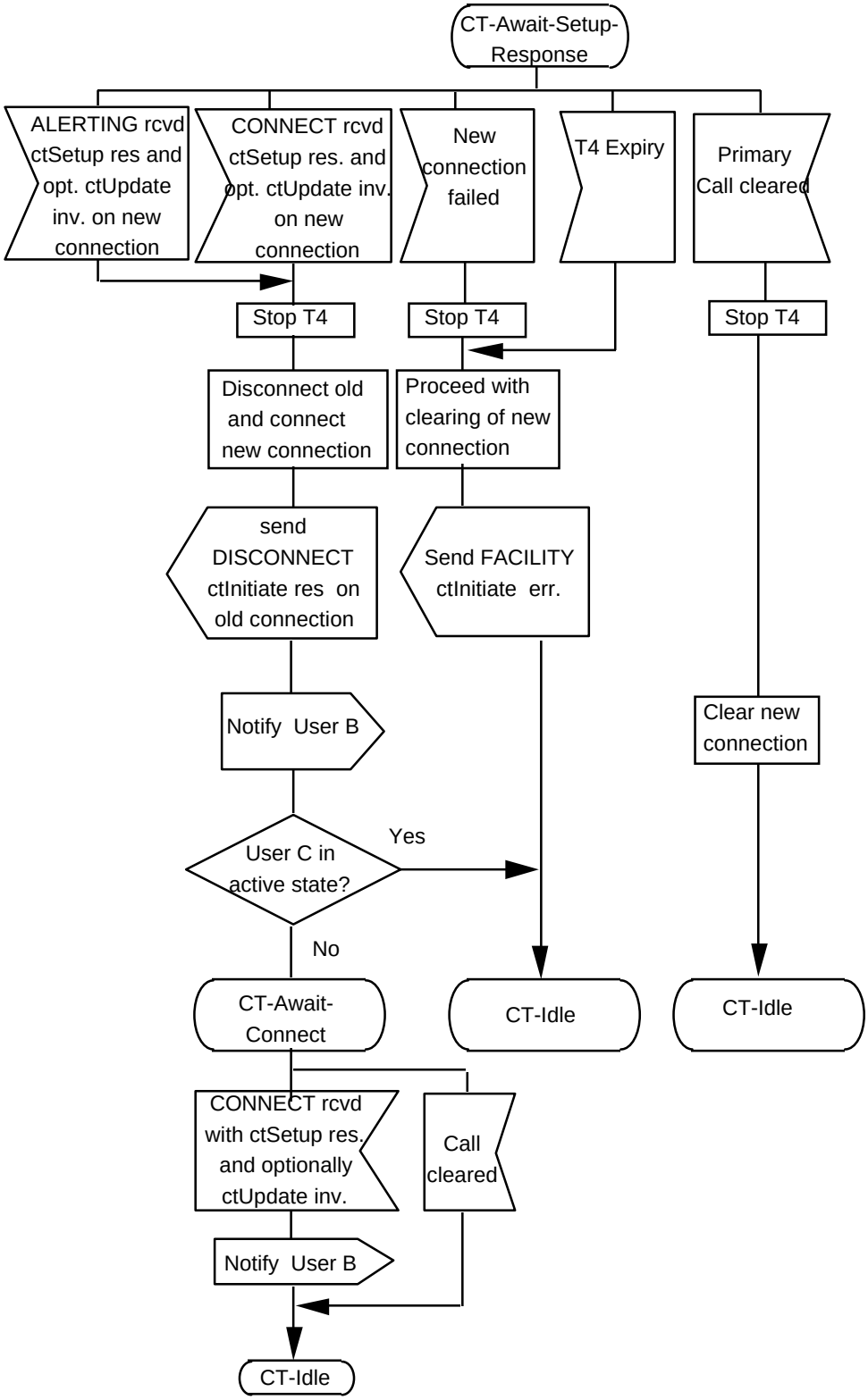


Figure D.2 (sheet 2 of 2) - Primary PINX SDL

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D.3 SDL Representation of SS-CT at a Secondary PINX

Figure D.3 shows the behaviour of a SS-CT Supplementary Service Control entity within a Secondary PINX.

Input signals from the left and output signals to the left represent primitives to and from the Coordination Functions in respect of messages sent and received.

Input signals from the right and output signals to the right represent stimuli between the SS-CT Supplementary Service Control entity and the transferred User.

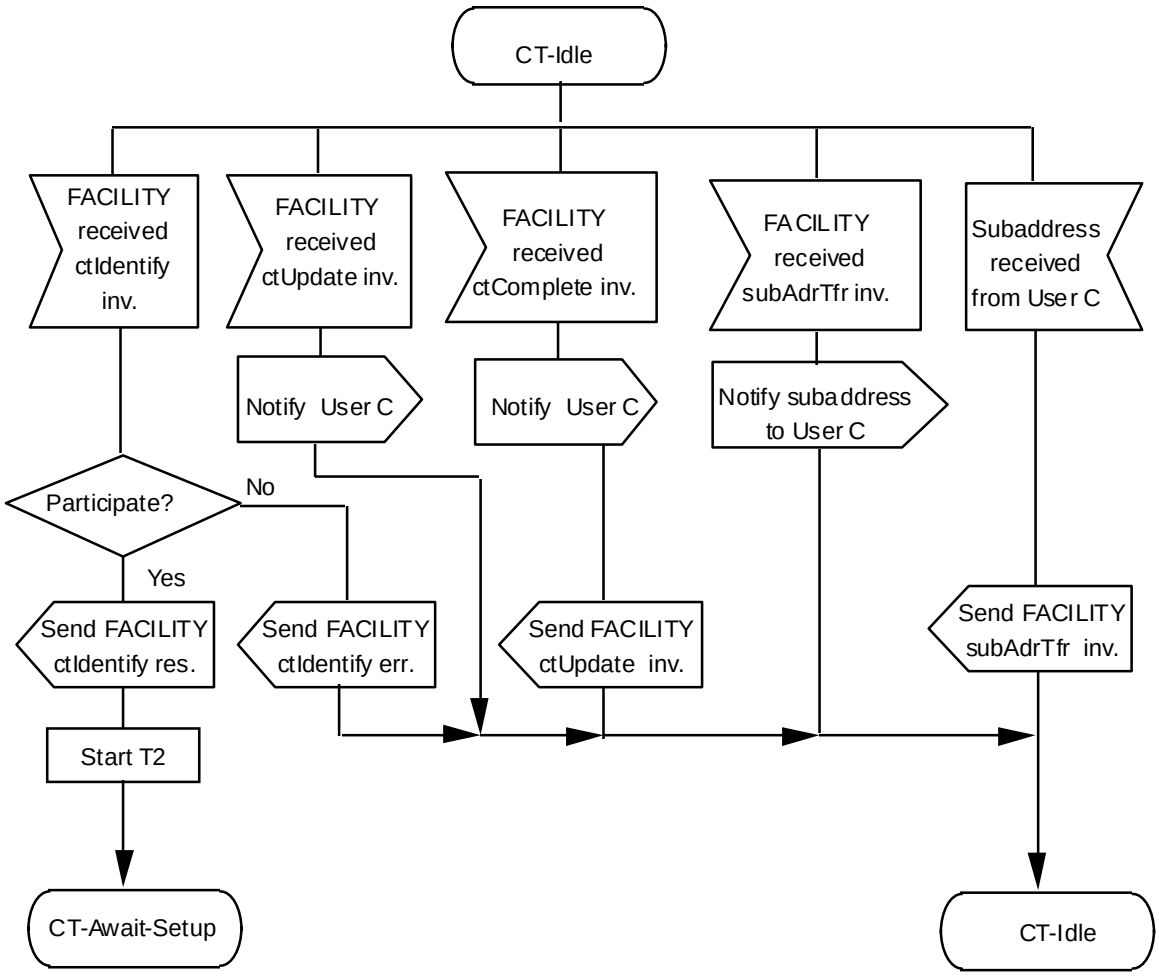


Figure D.3 (sheet 1 of 2) - Secondary PINX SDL

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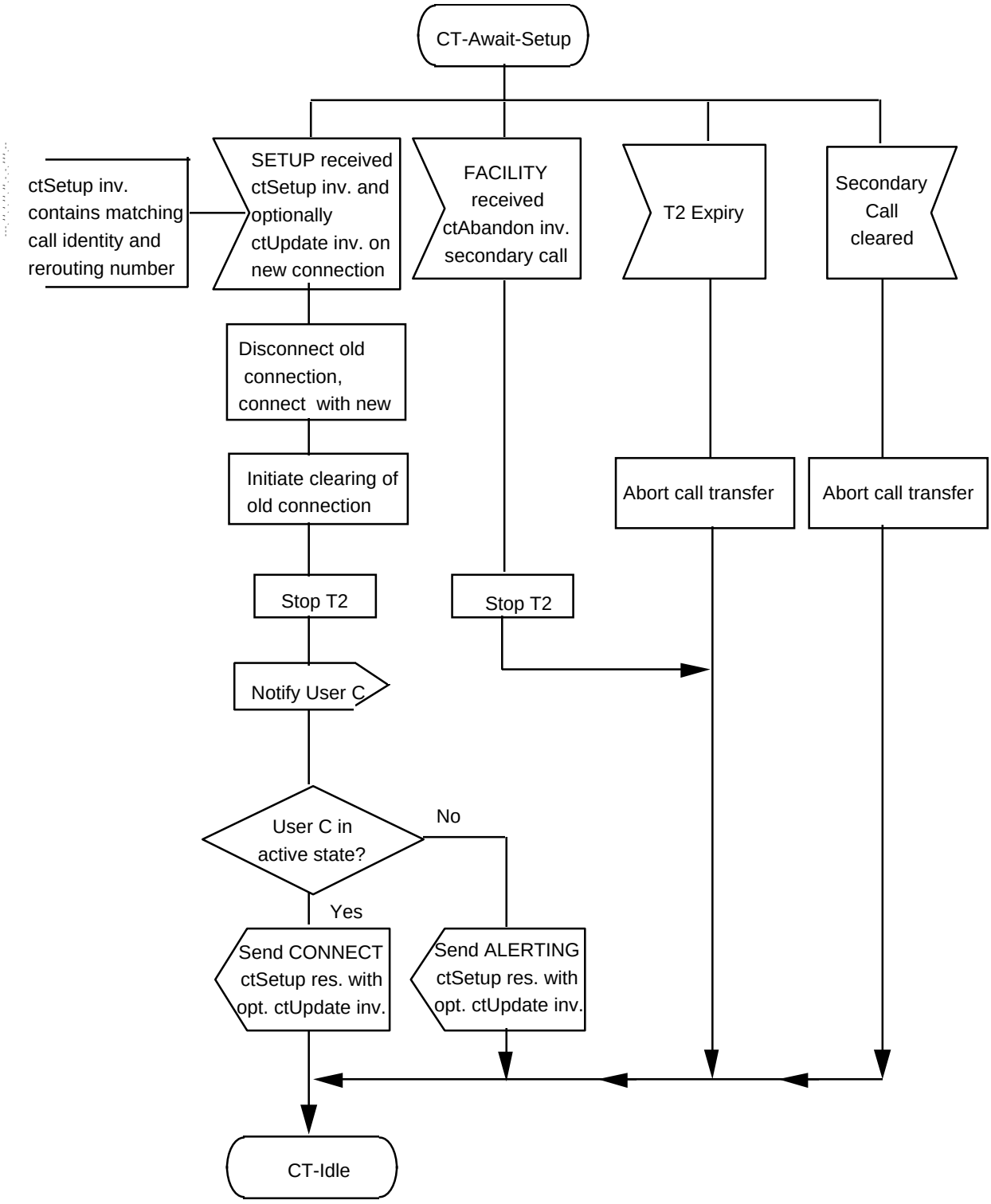


Figure D.3 (sheet 2 of 2) - Secondary PINX SDL

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Annex E
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Bibliography

ITU-T Rec. Q.952.7 Stage 3 description for Explicit Call Transfer supplementary service using DSS1

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Annex F
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ASN.1 definitions according to ITU-T Recs. X.208 / X.209

This annex lists all ASN.1 modules as they were defined in the first edition of ISO/IEC 13869, i.e. based on ITU-T Recommendations X.208 / X.209. Starting with this edition the ASN.1 modules within ISO/IEC 13869 comply with ITU-T Recommendations X.680 / X.690. Please note that regardless of which version of these modules is used as a base of a QSIG implementation, the line encoding remains unchanged. Changes in future editions to modules based on X.680 / X.690 ASN.1 are not reflected in the modules in this annex.

Table F.1 - Call-Transfer-Operations – based on ITU-T Recs. X.208 / X.209

```
Call-Transfer-Operations  {iso(1)  standard(0) pss1-call-transfer(13869) call-transfer-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(1) standard(0)
                  pss1-generic-procedures (11582)  msi-definition(0)}
            Name
FROM  Name-Operations {iso(1)  standard(0) pss1-name (13868)  name-operations (0)}
            supplementaryServiceInteractionNotAllowed,
            notAvailable,
             invalidCallState
FROM  General-Error-List {ccitt (0) recommendation (0) q 950  general-error-list (1)}
            PresentedAddressScreened,
            PresentedNumberScreened,
            PartyNumber,
                 PartySubaddress
FROM  Addressing-Data-Elements {iso(1) standard (0) pss1-generic-procedures (11582)  addressing-data-
elements (9)}
            PSS1InformationElement
FROM PSS1-generic-parameters-definition { iso(1) standard (0) pss1-generic-procedures (11582)
pss1-generic-parameters (6)};
```


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Table F.1 - Call-Transfer-Operations – based on ITU-T Recs. X.208 / X.209 (continued)

```
-- TYPE DEFINITIONS FOR CT OPERATIONS FOLLOW

  CallTransferIdentify ::=    OPERATION
                              ARGUMENT
                                    DummyArg
                                RESULT
                                    CTIdentifyRes
                              ERRORS{
                                    notAvailable,
                                    invalidCallState,
                                    unspecified, supplementaryServiceInteractionNotAllowed
                                    }

CallTransferAbandon ::=  OPERATION
                              ARGUMENT
                                    DummyArg

  CallTransferInitiate ::=    OPERATION
                              ARGUMENT
                                    CTInitiateArg
                                RESULT
                                    DummyRes
                              ERRORS{
                                    notAvailable,
                                    invalidCallState,
                                    invalidRerouteingNumber,
                                    unrecognizedCallIdentity,
                                    establishmentFailure,
                                    unspecified,
                                    supplementaryServiceInteractionNotAllowed
                                    }

  CallTransferSetup ::=       OPERATION
                              ARGUMENT
                                    CTSetupArg
                                RESULT
                                    DummyRes
                              ERRORS{
                                    notAvailable,
                                    invalidCallState,
                                    invalidRerouteingNumber,
                                    unrecognizedCallIdentity,
                                    unspecified,
                                    supplementaryServiceInteractionNotAllowed
                                    }
```

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Table F.1 - Call-Transfer-Operations – based on ITU-T Recs. X.208 / X.209 (continued)

```
  CallTransferActive ::=      OPERATION
                              ARGUMENT
                                    CTActiveArg

  CallTransferComplete ::= OPERATION
                              ARGUMENT
                                    CTCompleteArg

  CallTransferUpdate ::=    OPERATION
                              ARGUMENT
                                    CTUpdateArg

SubaddressTransfer ::=    OPERATION
                              ARGUMENT
                                    SubaddressTransferArg

-- TYPE DEFINITIONS FOR CT DATA TYPES FOLLOW

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

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

CTIdentifyRes ::=  SEQUENCE {
     callIdentity                    CallIdentity,
     rerouteingNumber                PartyNumber,
     resultExtension                 CHOICE {
                                          [6]  IMPLICIT Extension,
                                          [7]  IMPLICIT SEQUENCE OF  Extension
                                          }    OPTIONAL
     }

CTInitiateArg ::=  SEQUENCE {
     callIdentity                    CallIdentity,
     rerouteingNumber                PartyNumber,
     argumentExtension               CHOICE {
                                          [6]  IMPLICIT Extension,
                                          [7] IMPLICIT SEQUENCE OF  Extension
                                          } OPTIONAL
     }
```


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Table F.1 - Call-Transfer-Operations – based on ITU-T Recs. X.208 / X.209 (continued)

```
CTSetupArg ::=  SEQUENCE {
    callIdentity                CallIdentity,
    argumentExtension           CHOICE {
                                    [0]  IMPLICIT Extension,
                                    [1] IMPLICIT SEQUENCE OF  Extension          } OPTIONAL
    }

CTActiveArg ::=  SEQUENCE{
    connectedAddress            PresentedAddressScreened,
    basicCallInfoElements       PSS1InformationElement          OPTIONAL,
                                        -- ISO/IEC 11572 information elements Party
                                        -- category and Progress indicator are conveyed
    connectedName               Name                            OPTIONAL,
    argumentExtension           CHOICE {
                                    [9] IMPLICIT Extension,
                                    [10] IMPLICIT SEQUENCE OF  Extension
                                    } OPTIONAL
    }

CTCompleteArg ::=  SEQUENCE {
    endDesignation              EndDesignation,
    redirectionNumber           PresentedNumberScreened,
    basicCallInfoElements       PSS1InformationElement          OPTIONAL,
                                        -- ISO/IEC 11572 information elements Party
                                        -- category and Progress indicator are conveyed
    redirectionName             Name                            OPTIONAL,
    callStatus                  CallStatus DEFAULT  answered,
    argumentExtension           CHOICE {
                                    [9] IMPLICIT Extension,
                                    [10]  IMPLICIT SEQUENCE OF Extension
                                    } OPTIONAL
    }

CTUpdateArg ::=  SEQUENCE {
    redirectionNumber           PresentedNumberScreened,
    redirectionName             Name                            OPTIONAL,
    basicCallInfoElements       PSS1InformationElement          OPTIONAL,
                                    -- ISO/IEC 11572 information elements Party
                                    -- category and Progress indicator are conveyed
    argumentExtension           CHOICE {
                                    [9]  IMPLICIT Extension,
                                    [10]  IMPLICIT SEQUENCE OF  Extension        } OPTIONAL
    }
```

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Table F.1 - Call-Transfer-Operations – based on ITU-T Recs. X.208 / X.209 (continued)

```
SubaddressTransferArg ::=  SEQUENCE {
    redirectionSubaddress           PartySubaddress,
    argumentExtension               CHOICE {
                                        [0]  IMPLICIT Extension,
                                        [1 ] IMPLICIT SEQUENCE OF Extension
                                        } OPTIONAL
    }

CallStatus ::=  ENUMERATED{
    answered(0),
    alerting(1)
    }

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

EndDesignation ::=  ENUMERATED {
    primaryEnd(0),
    secondaryEnd(1)
    }

-- TYPE DEFINITIONS FOR CT ERRORS FOLLOW

    Unspecified ::=             ERROR PARAMETER Extension

-- VALUE DEFINITIONS FOR OPERATIONS AND ERRORS FOLLOW

    unspecified                 Unspecified         ::= 1008

    callTransferIdentify        CallTransferIdentify    ::= 7
    callTransferAbandon         CallTransferAbandon     ::= 8
    callTransferInitiate        CallTransferInitiate    ::= 9
    callTransferSetup           CallTransferSetup       ::= 10
    callTransferActive          CallTransferActive      ::= 11
    callTransferComplete        CallTransferComplete    ::= 12
    callTransferUpdate          CallTransferUpdate      ::= 13
    subaddressTransfer          SubaddressTransfer      ::= 14


    invalidRerouteingNumber     ERROR       ::= 1004
                                            -- used when establishment of the new
                                            -- connection fails because
                                            -- the rerouteingNumber is not a valid
                                            -- PISN address
```


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Table F.1 - Call-Transfer-Operations – based on ITU-T Recs. X.208 / X.209 (concluded)

```
unrecognizedCallIdentity    ERROR       ::= 1005
                                        -- used when establishment of the new
                                        -- connection fails because it could not be
                                        -- associated with a SS-CT entity
                                        -- at the Secondary PINX

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

END
```

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