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Foreword

This European Telecommunication Standard (ETS) has been produced by the European Computer Manufacturers Association (ECMA) on behalf of its members and those of the European Telecommunications Standards Institute (ETSI).

This ETS is one of a series of standards defining services and signalling protocols applicable to Private Telecommunication Networks (PTNs) incorporating one or more interconnected nodes. The series uses the ISDN concepts as developed by CCITT and is also within the framework of standards for open systems interconnection as defined by ISO.

This ETS specifies the signalling protocol for use at the Q-reference point in support of the Call Transfer supplementary service (CT).

The ETS is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO, CCITT, ETSI and other international and national standardisation bodies. It represents a pragmatic and widely based consensus.

This ETS was produced by ECMA using the ECMA guidelines for the production of standards and using the ECMA stylesheet. In order to avoid undue delays in the voting process for this ETS it has been agreed that this ETS will not be converted to the ETSI stylesheet.

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1 Scope

This ETS specifies the signalling protocol for the support of the Call Transfer supplementary service (SS-CT) at the Q reference point between Private Telecommunication Network Exchanges (PTNXs) connected together within a Private Telecommunication Network (PTN).

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 of these two calls.

The Q reference point is defined in ENV 41004.

Service specifications are produced in three stages and according to the method specified in ENV 41005. This ETS contains the stage 3 specification for the Q reference point and satisfies the requirements identified by the stage 1 and stage 2 specifications in ETS 300 260.

The signalling protocol for SS-CT operates on top of the signalling protocol for basic circuit switched call control, as specified in ETS 300 172, and uses certain aspects of the generic procedures for the control of supplementary services specified in ETS 300 239.

The impact on the protocol of interactions between the Call Transfer service and other supplementary services is outside the scope of this ETS.

This ETS is applicable to PTNXs which can interconnect to form a PTN.

2 Conformance

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

3 References

ENV 41004	Reference configuration for connectivity relations of private telecommunication network exchanges (1989).
ENV 41005	Method for the specification of basic and supplementary services of private telecommunication networks (1989).
ENV 41007	Definition of terms in private telecommunication networks (1989).
ETS 300 171	Private Telecommunication Network (PTN); Specification, functional models and information flows, Control aspects of circuit mode basic services (1992).
ETS 300 172	Private Telecommunication Network (PTN); Inter-exchange signalling protocol, Circuit mode basic services (1992).
ETS 300 196	ISDN - Generic Functional Protocol for the Support of Supplementary Services - DSS1 Protocol.
ETS 300 238	Private Telecommunication Network (PTN); Signalling between private telecommunication exchanges, Protocol for the support of name identification supplementary services (1993).
ETS 300 239	Private Telecommunication Network (PTN); Signalling between private telecommunication exchanges, Generic functional protocol for the support of supplementary services (1993).
ETS 300 260	Private Telecommunication Networks (PTN); Specification, functional models and information flows, Call transfer supplementary service (1993).

CCITT Recommendation I.112	Vocabulary of terms for ISDNs (1988).
CCITT Recommendation I.210	Principles of telecommunication services supported by an ISDN and the means to describe them (1988).
CCITT Recommendation Z.100	Specification and description language (1988).

4 Definitions

For the purpose of this ETS, the following definitions apply.

4.1 External definitions

This ETS uses the following terms defined in other documents:

- Alerting (ETS 300 260);
- Answered (ETS 300 260);
- Application Protocol Data Unit (APDU) (ETS 300 239);
- Basic Service (CCITT Recommendation I.210);
- Gateway PTNX (ETS 300 172);
- Interpretation APDU (ETS 300 239);
- Network Facility Extension (NFE) (ETS 300 239);
- Originating PTNX (ETS 300 239);
- Primary Call (ETS 300 260);
- Private (ENV 41007);
- Private Telecommunication Network Exchange (PTNX) (ENV 41007);
- Public ISDN (ENV 41007);
- Secondary Call (ETS 300 260);
- Signalling (CCITT Recommendation I.112);
- Supplementary Service (CCITT Recommendation I.210);
- Supplementary Service Control Entity (ETS 300 239);
- Telecommunication Network (ENV 41007);
- Terminal (ENV 41007);
- Terminating PTNX (ETS 300 239);
- Transfer by join (ETS 300 260);
- Transfer by rerouting (ETS 300 260);
- Transit PTNX (ETS 300 239);
- User (ETS 300 171);
- User A (ETS 300 260);
- User B (ETS 300 260);
- User C (ETS 300 260).

4.2 End PTNX

Within the context of a call, a PTNX which is not acting as a Transit PTNX, i.e. an Originating PTNX, a Terminating PTNX, or a Gateway PTNX.

4.3 Primary PTNX

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

4.4 Redirection Number

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

4.5 Secondary PTNX

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

4.6 Transferring PTNX

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

5 List of acronyms

APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation no. 1
ISDN	Integrated Services Digital Network
NFE	Network Facility Extension
PICS	Protocol Implementation Conformance Statement
PTN	Private Telecommunication Network
PTNX	Private Telecommunication Network Exchange
SDL	Specification and Description Language
SS-CT	Supplementary Service Call Transfer
TE	Terminal Equipment

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 basic services defined in ETS 300 171.

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

NOTE 1

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 ETS.

6.2 SS-CT operational requirements

6.2.1 Provision/Withdrawal

Provision and withdrawal shall be in accordance with 6.2.1 of ETS 300 260.

6.2.2 Requirements on a Transferring PTNX

The basic call procedures specified in ETS 300 172 shall be supported. Generic procedures for the call-related control of supplementary services, as specified in ETS 300 239 for an End PTNX, shall apply.

6.2.3 Requirements on a Primary PTNX

The basic call procedures specified in ETS 300 172 shall be supported.

Generic procedures for the call-related control of supplementary services, as specified in ETS 300 239 for an End PTNX, shall apply.

6.2.4 Requirements on a Secondary PTNX

The basic call procedures specified in ETS 300 172 shall be supported.

Generic procedures for the call-related control of supplementary services, as specified in ETS 300 239 for an End PTNX, shall apply.

6.2.5 Requirements on a Transit PTNX

The basic call procedures specified in ETS 300 172 shall be supported.

Generic procedures for the call-related control of supplementary services, as specified in ETS 300 239 for a Transit PTNX, 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 PTNX.

6.3 SS-CT coding requirements

6.3.1 Operations

The following operations, defined in Abstract Syntax Notation number 1 (ASN.1) in table 1 shall apply.

Table 1 - Operations in support of SS-CT

```
Call-Transfer-Operations
                        {ccitt(0) identified-organization(3) etsi(0)
                         qsig-call-transfer(261) 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
                            {ccitt(0) identified-organization(3) etsi(0)
                            qsig-generic-procedures (239) msi-definition(0) }
                        Name FROM Name-Operations { ccitt(0) identified-organization (3)
                             etsi(0) qsig-name (238) name-operations (0) }
                        notAvailable, invalidCallState, supplementaryServiceInteractionNotAllowed,
                            FROM General-Errors {ccitt(0) identified-organization(3)
                            etsi (0) 196 general-errors (2)}
                        PresentedAddressScreened, PresentedNumberScreened, PartyNumber,
                            PartySubaddress FROM Addressing-Data-Elements { ccitt(0)
                            identified-organization(3) etsi(0) 196 addressing-data-elements (6)}
                            -- Note. The definitions of PresentedAddressScreened,
                            -- PresentedNumberScreened, PartyNumber, and PartySubaddress are
                            -- reproduced in annex B
                        QSIGInformationElement FROM Generic-parameters-definition {
                            ccitt(0) identified-organization(3) etsi(0) qsig-generic-procedures
                            (239) qsig-generic-parameters (6) };

ptn OBJECTIDENTIFIER    ::= {iso(1) identified-organization(3) icd-ecma(0012)
                             private-isdn-signalling-domain(09)}

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

```
CallTransferAbandon     ::= OPERATION
                            ARGUMENT DummyArg

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

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


CallTransferActive      ::= OPERATION
                            ARGUMENT CTActiveArg

CallTransferComplete    ::= OPERATION
                            ARGUMENT CTCompleteArg

CallTransferUpdate      ::= OPERATION
                            ARGUMENT CTUpdateArg

SubaddressTransfer      ::= OPERATION
                            ARGUMENT SubaddressTransferArg

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,
                                reroutingNumber     PartyNumber,
                                resultExtension     CHOICE {
                                                        [6] IMPLICIT Extension,
                                                        [7] IMPLICIT SEQUENCE OF Extension
                                                    } OPTIONAL
                            }
```

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

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

CTActiveArg             ::= SEQUENCE {
                            connectedAddress        PresentedAddressScreened,
                            basicCallInfoElements   QSIGInformationElement OPTIONAL,
                            -- ETS 300 172 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   QSIGInformationElement OPTIONAL,
                            -- ETS 300 172 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   QSIGInformationElement OPTIONAL,
                                -- ETS 300 172 information elements Party category and
                                -- Progress indicator are conveyed
                                argumentExtension       CHOICE {
                                                            [9] IMPLICIT Extension,
                                                            [10] IMPLICIT SEQUENCE OF Extension
                                                        } OPTIONAL
                           }

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) }

Unspecified                ERROR PARAMETER Extension

unspecified                Unspecified ::= {ptn 1008}

callTransferIdentify       CallTransferIdentify    ::= {ptn ct-identify(7) }
callTransferAbandon        CallTransferAbandon     ::= {ptn ct-abandon(8) }
callTransferInitiative     CallTransferInitiative  ::= {ptn ct-initiate(9) }
callTransferSetup          CallTransferSetup       ::= {ptn ct-setup(10) }
callTransferActive         CallTransferActive      ::= {ptn ct-active(11) }
callTransferComplete       CallTransferComplete    ::= {ptn ct-complete(12) }
callTransferUpdate         CallTransferUpdate      ::= {ptn ct-update(13) }
subaddressTransfer         SubaddressTransfer      ::= {ptn subaddress-transfer(14) }


invalidReroutingNumber     ERROR ::= {ptn 1004 }
                               -- used when establishment of the new connection fails because
                               -- the reroutingNumber is not a valid PTN address
unrecognizedCallIdentity   ERROR ::= {ptn 1005 }
                               -- used when establishment of the new connection fails because it
                               -- could not be associated with a SS-CT entity at the Secondary PTNX
establishmentFailure       ERROR ::= {ptn 1006 }
                               -- used when establishment of the new connection fails and
                               -- no other error applies

END                        -- of Call-Transfer-Operations
```

6.3.2 Information elements

6.3.2.1 Facility information element

APDUs of the operations defined in 6.3.1 shall be coded in the Facility information element in accordance with ETS 300 239.

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

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 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 ETS 300 172. These shall be embedded in data elements of type QSIGInformationElement as specified in 11.3.3.4 of ETS 300 239.

In data element basicCallInfoElements, which is of type QSIGInformationElement, the embedded contents shall be coded as Party category and/or Progress indicator information elements specified in ETS 300 172.

6.3.2.3 Other information elements

The following information elements used during the establishment of the new connection (transfer by rerouting) shall be coded as specified in ETS 300 172:

- Bearer capability;
- Called party number;
- Cause;
- Sending complete;
- Transit counter.

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 ETS 300 239.

The following messages used during the establishment of the new connection and release of the old connections (in case of transfer by rerouting) shall be as specified in ETS 300 172:

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

6.4 SS-CT state definitions

6.4.1 States at a Transferring PTNX

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

6.4.1.1 CT-Idle

SS-CT is not operating.

6.4.1.2 CT-Await-Answer-From-UserC

A callTransferComplete invoke APDU with callStatus having value alerting has been sent to the Primary PTNX. 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 PTNX. This state is used during transfer by rerouting.

6.4.1.4 CT-Await-Initiate-Response

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

6.4.2 States at a Primary PTNX

The procedures at the Primary PTNX are written in terms of the following conceptual states existing within the SS-CT control entity in that PTNX 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 PTNX. This state is used during transfer by rerouting.

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 PTNX

The procedures at the Secondary PTNX are written in terms of the following conceptual states existing within the SS-CT control entity in that PTNX 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 PTNX. This state is used during transfer by rerouting.

6.5 SS-CT signalling procedures for invocation and operation

References in this clause to protocol control states refer to basic call protocol control states defined in ETS 300 172.

NOTE 2

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

Annex C contains some examples of message sequences.

6.5.1 Actions at a Transferring PTNX

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 PTNX 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 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 3

Additional checks carried out by the Transferring PTNX, e.g. to satisfy the requirements of ETS 300 260, are outside the scope of this ETS.

NOTE 4

The SDL representation of procedures at a Transferring PTNX is shown in D.1 of annex D.

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

NOTE 5

This depends on the capabilities of the Transferring PTNX, the known network topology, and on the known capabilities of the Primary and Secondary PTNXs in the current call contexts.

If call transfer by rerouting 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 rerouting), the Transferring PTNX 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 rerouting, the Transferring PTNX shall either 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 PTNX 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 PTNX 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 PTNX shall include callStatus with value alerting in the argument of the invoke sent to the Primary PTNX. 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 category of the redirected User and/or 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 PTNX shall enter state CT-Await-Answer-From-UserC in which it shall continue to intercept the signalling connections associated with the former primary and secondary calls.

In state CT-Await-Answer-From-UserC the Transferring PTNX shall convey all received callTransferUpdate and subaddressTransfer invoke APDUs from the Primary PTNX to the Secondary PTNX and vice-versa. On receipt in state CT-Await-Answer-From-UserC of any ETS 300 172 message from the Primary PTNX or Secondary PTNX, other than a CONNECT message received from the Secondary PTNX, the Transferring PTNX shall act as a Transit PTNX.

If both the primary and secondary call are in protocol control state Active, the Transferring PTNX shall associate the two connections after having sent the two callTransferComplete invoke APDUs, start to act as a Transit PTNX for the resulting call from this point onwards, 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-UserC the Transferring PTNX 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 ETS 300 238, the Transferring PTNX 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 PTNX shall associate the two connections, begin to act as a Transit PTNX 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 rerouting

In order to start transfer by rerouting, the Transferring PTNX shall send a callTransferIdentify invoke APDU in a FACILITY message to the Secondary PTNX 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 PTNX shall send a callTransferInitiate invoke APDU in a FACILITY message to the Primary PTNX using the call reference of the primary call, stop timer T1, and start timer T3. The callIdentity and reroutingNumber 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.

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 PTNX 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 PTNX 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 rerouting

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 PTNX shall stop timer T1, abort the procedure for transfer by rerouting, and, depending on the error cause, call transfer may be reinitiated using transfer by join procedures as specified in 6.5.1.1 and 6.5.1.2.

On expiry of timer T1, the Transferring PTNX shall send a callTransferAbandon invoke APDU on the call reference of the secondary call, abort the procedure for transfer by rerouting, 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 PTNX 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 rerouting, and, depending on the error cause, call transfer may be reinitiated using transfer by join procedures as specified in 6.5.1.1 and 6.5.1.2.

On expiry of timer T3, the Transferring PTNX shall send a callTransferAbandon invoke APDU on the call reference of the secondary call if this has not been cleared yet by the Secondary PTNX, and abort the procedure for transfer by rerouting. If possible, 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 PTNX

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

NOTE 6

The SDL representation of procedures at a Primary PTNX 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 PTNX shall proceed as follows. The presence of element endDesignation with value 'primaryEnd' signifies that the PTNX shall operate as a Primary PTNX. 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 PTNX 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 PTNX may solicit a subaddress for sending to User C. The Primary PTNX 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 rerouting

On receipt in state CT-Idle of a FACILITY message containing a callTransferInitiate invoke APDU while in protocol control state Active, the Primary PTNX 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 reroutingNumber 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 ETS 300 172. 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 reroutingNumber within the received argument;
- Facility;
- Sending complete;
- Transit counter, with value zero (optional);

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, with in the argument, optional elements redirectionNumber, redirectionName and basicCallInfoElements. Optionally, timer T4 may be started.

State CT-Await-Setup-Response shall be entered.

The protocol procedures of ETS 300 172 shall apply during the establishment of the new connection.

NOTE 7

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 PTNX 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 PTNX may record details of the transfer and notify User B if this is able to receive a notification. The Primary PTNX may solicit a subaddress for sending to User C. 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. A DISCONNECT message containing a callTransferInitiate return result APDU shall be sent on the call reference of the old connection to the Transferring PTNX. Completion of the release of the old connection shall be in accordance with the protocol procedures of ETS 300 172. 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 PTNX 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 re-routed call, indicating call acceptance by User C, the Primary PTNX 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 rerouting

If on receipt in state CT-Idle of a FACILITY message containing a callTransferInitiate invoke APDU, the Primary PTNX 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 PTNX shall proceed with call clearing of the new connection in accordance with the procedures of ETS 300 172, 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 PTNX shall proceed with clearing of the primary call in accordance with the procedures of ETS 300 172, and initiate call clearing of the new connection using the procedures of ETS 300 172.

On detection in state CT-Await-Connect of call clearing of the re-routed connection, either by User B or due to reception of a call clearing message using the call reference of the re-routed connection, the Primary PTNX shall proceed with clearing of the re-routed connection in accordance with the procedures of ETS 300 172.

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 PTNX

A PTNX shall treat as valid an APDU indicating that it is the Secondary PTNX 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 8

The SDL representation of procedures at a Secondary PTNX is shown in D.3 of annex D.

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 PTNX shall proceed as follows. The presence of element endDesignation with value 'secondaryEnd' signifies that the PTNX shall operate as a Secondary PTNX. Optionally it may send a callTransferUpdate invoke APDU in a FACILITY message to the Primary PTNX 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 PTNX 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 PTNX may solicit a subaddress for sending to User B. The Secondary PTNX shall remain in state CT-Idle.

NOTE 9

On detection of answer by User C, a CONNECT message is sent to the Transferring PTNX in accordance with the procedures of ETS 300 172, 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 rerouting

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 PTNX shall determine whether it can proceed with SS-CT by rerouting. 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 reroutingNumber shall be included. Element reroutingNumber 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 PTNX. Element callIdentity shall be a number which, possibly in conjunction with reroutingNumber, identifies the call on which SS-CT is being invoked. Element callIdentity need not have significance outside the Secondary PTNX.

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 ETS 300 172, if the SETUP contains a callTransferSetup invoke APDU, the Secondary PTNX 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 PTNX 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 ETS 300 172, and associate the new connection (as requested by the SETUP message) with the part of the secondary call to User C. The Secondary PTNX may record details of the transfer, 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 10

On detection of answer by User C, a CONNECT message is sent to the Primary PTNX in accordance with the procedures of ETS 300 172, 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 rerouting

If the secondary PTNX 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 PTNX in a call transfer by rerouting procedure;
- SS-CT by rerouting is not implemented.

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. cause number 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 PTNX shall stop timer T2, abort the procedure for transfer by rerouting, 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 PTNX shall proceed with clearing of the secondary call in accordance with the procedures of ETS 300 172, stop timer T2 if running and enter state CT-Idle.

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

6.5.4 Actions at a Transit PTNX

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

6.5.5 Subsequent actions at a Primary and a Secondary PTNX

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 PTNX 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 PTNX 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 PTNX 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 PTNX

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

- User A is in the PTN and transfers a public ISDN user,
- User A is in the public ISDN and a PTN User is transferred.

6.6.1.1 Impact of interworking if User A is in the PTN

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

If the signalling protocol at the access allows, the Gateway PTNX may 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 PTNX as data element connectedSubaddress in a subaddressTransfer invoke APDU within a FACILITY message.

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

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

The Gateway PTNX 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 PTNX 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 PTNX containing a subaddressTransfer invoke APDU with data element connectedSubaddress, the Gateway PTNX 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 PTNX as data element connectedSubaddress in a subaddressTransfer invoke APDU within a FACILITY message.

6.6.2 Actions at other types of PTNX

The procedures of 6.5 shall apply.

6.7 SS-CT impact of interworking with non-ISDNs

6.7.1 Actions at a Gateway PTNX

6.7.1.1 Transfer within the PTN

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

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

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

NOTE 11

The Outgoing Gateway PTNX, which will perform Secondary PTNX functions in the context of call transfer, has informed the PTNX serving User A of this condition before invocation of call transfer by sending, in accordance with ETS 300 172, 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 PTNX serving User A.

When a Gateway PTNX, which performs Secondary PTNX functions in the context of call transfer by rerouting, 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 PTNX shall forward indications received, representing events like "call transferred, active" or "call transferred, alerting", to the other End PTNX 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, category and name, is dependent on information received from the non-ISDN.

On receipt of a FACILITY message from the other End PTNX containing a subaddressTransfer invoke APDU with data element connectedSubaddress, the Gateway PTNX 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 PTNX as data element connectedSubaddress in a subaddressTransfer invoke APDU within a FACILITY message.

6.7.1.3 Co-operation with a non-ISDN in providing transfer by rerouting

When interworking with another network which supports transfer by rerouting and if the PTNX's also support transfer by rerouting, the two networks may co-operate in the operation of transfer by rerouting.

6.7.2 Actions at other types of PTNX

The procedures of 6.5 shall apply.

Additional protocol control states are valid for a Transferring PTNX 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 PTNX, 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 PTNX during secondary call setup.

Additional procedures are valid for a Primary PTNX if User C is a user in a non-ISDN and transfer by rerouting 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 PTNX shall proceed as if the APDU had been received in an ALERTING message, and enter state CT-Await-Connect.

6.8 SS-CT Parameter Values (Timers)

The following timers apply only to transfer by rerouting.

6.8.1 Timer T1

Timer T1 shall operate at the Transferring PTNX during state CT-Await-Identify-Response. Its purpose is to protect against the absence of a response to the callTransferIdentify invokeAPDU. Timer T1 shall be started on entering state CT-Await-Identify-Response and stopped on leaving that state.

On expiry of timer T1, the Transferring PTNX shall abort the procedure for transfer by rerouting, and reinitiate the transfer operation using transfer by join procedures as specified in 6.5.1.1 and 6.5.1.2.

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

6.8.2 Timer T2

Timer T2 shall operate at the Secondary PTNX 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 invokeAPDU.

Timer T2 shall be started on entering state CT-Await-Setup and stopped on leaving that state.

On expiry of timer T2, the Secondary PTNX shall abort the procedure for transfer by rerouting, and return to state CT-Idle.

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

6.8.3 Timer T3

Timer T3 shall operate at the Transferring PTNX 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 be started on entering state CT-Await-Initiate-Response and stopped on leaving that state.

On expiry of timer T3, the Transferring PTNX shall abort the procedure for transfer by rerouting, and reinitiate the transfer operation using transfer by join procedures as specified in 6.5.1.1 and 6.5.1.2.

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

6.8.4 Timer T4

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

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

Timer T4 shall be started on entering state CT-Await-Setup-Response and stopped on leaving that state.

On expiry of timer T4, the Primary PTNX shall clear the new connection using the procedures of ETS 300 172, send a callTransferInitiate return error APDU in a FACILITY message on the call reference of the primary call, and return to state CT-Idle.

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

Annex A (normative): Protocol Implementation Conformance Statement (PICS) proforma

A.1 Introduction

The supplier of a protocol implementation which is claimed to conform to ETS 300 261 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 ETS 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 ETS'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 sub-clauses 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 ETS.

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).

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 Exception information

It may be 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 ETS 300 261. A possible reason for the situation described above is that a defect in the ETS has been reported, a correction for which is expected to change the requirement not met by the implementation.

A.3 PICS proforma for ETS 300 261

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 ETS)

Date of statement	

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 rerouting		o		Yes [ ] No [ ]

A.3.4 Procedures for SS-CT-Join

Item	Question/feature	Reference	Status	N/A	Support
B1	Support of relevant ETS 300 172 and ETS 300 239 procedures	6.2	m		Yes [ ]
B2	Signalling procedures at a Transferring PTNX	6.5.1.1, 6.5.1.2	m		Yes [ ]
B3	Signalling procedures at a Transferring PTNX for interworking with a non-ISDN	6.7.2	m		Yes [ ]
B4	Signalling procedures at a Primary PTNX	6.5.2.1, 6.5.2.2, 6.5.5	m		Yes [ ]
B5	Signalling procedures at a Secondary PTNX	6.5.3.1, 6.5.3.2, 6.5.5	m		Yes [ ]
B6	Behaviour as Gateway PTNX to a public ISDN to support transfer of users in the ISDN by a user in the PTN	6.6.1.1	o		Yes [ ] No [ ]
B7	Behaviour as Gateway PTNX to a public ISDN to support transfer of users in the PTN by a user in the ISDN	6.6.1.2	o		Yes [ ] No [ ]
B8	Behaviour as Gateway PTNX to a non-ISDN to support transfer of users in the other network by a user in the PTN	6.7.1.1	o		Yes [ ] No [ ]
B9	Behaviour as Gateway PTNX to a non-ISDN to support transfer of users in the PTN by a user in the other network	6.7.1.2	o		Yes [ ] No [ ]

A.3.5 Additional procedures for SS-CT-Rerouting

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

A.3.6 Coding

Item	Name of Item	Reference	Status	N/A	Support
D1	Sending of callTransferComplete invoke APDU	6.3	m		m: Yes [ ]
D2	Sending of callTransferActive invoke APDU	6.3	m		m: Yes [ ]
D3	Receipt of callTransferComplete invoke APDU	6.3	m		m: Yes [ ]
D4	Receipt of callTransferActive invoke APDU	6.3	m		m: Yes [ ]
D5	Sending of callTransferUpdate invoke APDU	6.3	o		o: Yes [ ] No [ ]
D6	Receipt of callTransferUpdate invoke APDU	6.3	m		m: Yes [ ]
D7	Sending of subaddressTransfer invoke APDU	6.3	o		o: Yes [ ] No [ ]
D8	Receipt of subaddressTransfer invoke APDU	6.3	m		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 [ ]

A.3.7 Timers

Item	Name of Item	Reference	Status	N/A	Support
E1	Support of timer T1	6.8.1	A2:m	[ ]	m: Yes [ ]
E2	Support of timer T2	6.8.2	A2:m	[ ]	m: Yes [ ]
E3	Support of timer T3	6.8.3	A2:m	[ ]	m: Yes [ ]
E4	Support of timer T4	6.8.4	A2:o	[ ]	o: Yes [ ] No [ ]

Annex B (informative): Imported ASN.1 definitions relating to numbers

Table B-1 is an extract from module Addressing-Data-Elements { ccitt(0) identified-organisation(3) etsi (0) 196 addressing-data-elements (6)} in ETS 300 196 showing the definition of address and number data types.

Table B.1 - Imported ASN.1 Definition of address and number data types

```
PresentedAddressScreened ::= CHOICE {
                                presentationAllowedAddress       [0] IMPLICIT AddressScreened,
                                presentationRestricted           [1] IMPLICIT NULL,
                                numberNotAvailableDueToInterworking
                                                                 [2] IMPLICIT NULL,
                                presentationRestrictedAddress    [3] IMPLICIT AddressScreened}

PresentedNumberScreened ::= CHOICE {
                                presentationAllowedNumber    [0] IMPLICIT NumberScreened,
                                presentationRestricted       [1] IMPLICIT NULL,
                                numberNotAvailableDueToInterworking
                                                             [2] IMPLICIT NULL,
                                presentationRestrictedNumber [3] IMPLICIT NumberScreened}

AddressScreened          ::= SEQUENCE {
                                PartyNumber,
                                ScreeningIndicator,
                                PartySubaddress OPTIONAL }

NumberScreened           ::= SEQUENCE {
                                PartyNumber,
                                ScreeningIndicator }

PartyNumber              ::= CHOICE {
                                unknownPartyNumber  [0] IMPLICIT NumberDigits,
                                -- the numbering plan is the default numbering plan of the network
                                publicPartyNumber  [1] IMPLICIT PublicPartyNumber,
                                -- the numbering plan is according to CCITT Rec. E.164 or E.163
                                dataPartyNumber    [3] IMPLICIT NumberDigits,
                                -- not used, value reserved
                                telexPartyNumber   [4] IMPLICIT NumberDigits,
                                -- not used, value reserved
                                privatePartyNumber     [5] IMPLICIT PrivatePartyNumber,
                                --the numbering plan is a Private Numbering Plan according to ETS
                              300 189
                                nationalStandardPartyNumber [8] IMPLICIT NumberDigits }
                                -- not used, value reserved

PublicPartyNumber        ::= SEQUENCE {
                                publicTypeOfNumber   PublicTypeOfNumber,
                                publicNumberDigits     NumberDigits }

PrivatePartyNumber       ::= SEQUENCE {
                                privateTypeOfNumber  PrivateTypeOfNumber,
                                privateNumberDigits    NumberDigits }

NumberDigits             ::= NumericString (SIZE(1..20))

PublicTypeOfNumber       ::= ENUMERATED {
```

```
                                unknown (0),
                                -- if used, number digits carry prefix indicating type of number according
                                -- to national recommendations
                                internationalNumber (1),
                                nationalNumber (2),
                                networkSpecificNumber (3),
                                -- not used, value reserved
                                subscriberNumber (4),
                                abbreviatedNumber (6) }
                                -- valid only for called party at the outgoing access,
                                -- network substitutes appropriate number

PrivateTypeOfNumber         ::= ENUMERATED {
                                unknown (0),
                                level2RegionalNumber (1),
                                level1RegionalNumber (2),
                                pTNSpecificNumber (3),
                                localNumber (4),
                                abbreviatedNumber (6) }

PartySubaddress             ::= CHOICE {
                                UserSpecifiedSubaddress,
                                -- not recommended
                                NSAPSubaddress }
                                -- according to CCITT Recommendation X.213

UserSpecifiedSubaddress     ::= SEQUENCE {
                                SubaddressInformation,
                                oddCountIndicator BOOLEAN OPTIONAL}
                                -- used when the coding of subaddress is BCD

NSAPSubaddress              ::= OCTET STRING (SIZE(1..20))
                                -- specified according to CCITT Rec. X.213. Some networks may limit the
                                -- subaddress value to some other length e.g. 4 octets

SubaddressInformation       ::= OCTET STRING (SIZE(1..20))
                                -- coded according to user requirements. Some networks may limit
                                -- the subaddress value to some other length e.g. 4 octets

ScreeningIndicator          ::= ENUMERATED {
                            userProvidedNotScreened (0),
                                -- number was provided by a remote user terminal equipment, and has
                                -- been screened by a network that is not the local public or the local
                                -- private network.

                            userProvidedVerifiedAndPassed (1),
                                -- number was provided by a remote user terminal equipment (or by a
                                -- remote private network), and has been screened by the local public
                                -- or the local private network.
                            userProvidedVerifiedAndFailed (2),
                                -- not used, value reserved
                            networkProvided (3) }
                                -- number was provided local public or local private network.
```

Table B.2 is an extract from module General-Errors in ETS 300 196.

Table B.2 - Imported ASN.1 definitions from General-Errors

```
notAvailable                                    ERROR :: = 3
invalidCallState                                ERROR :: = 7
supplementaryServiceInteractionNotAllowed       ERROR :: = 10
```

Table B.3 is an extract from module Name-Operations in ETS 300 238.

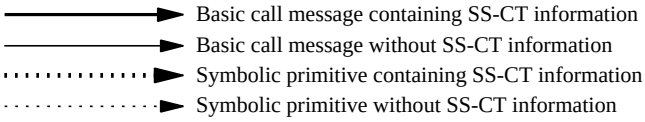
Table B.3 - Imported ASN.1 definitions from Name-Operations

```
Name            ::=   CHOICE
                        {  NamePresentationAllowed,
                           NamePresentationRestricted,
                           NameNot available  }

NamePresentationAllowed
                ::=   CHOICE
                        {   namePresentationAllowedSimple [0] IMPLICIT NameData,
                            namePresentationAllowedExtended [1] IMPLICIT NameSet  }
                        - -  iso8859-1 is implied in namePresentationAllowedSimple.

NamePresentationRestricted
                ::=   CHOICE
                        {   namePresentationRestrictedSimple [2] IMPLICIT NameData,
                            namePresentationRestrictedExtended [3] IMPLICIT NameSet  }
                        - -  iso8859-1 is implied in namePresentationRestrictedSimple.

NameNotAvailable
                ::=    [4] IMPLICIT NULL

NameData        ::=   OCTET STRING (SIZE (1..50))
                        - -  The maximum allowed size of the name field is 50 octets.
                        - -  The minimum required size of the name field is 1 octet.

NameSet
                ::=   SEQUENCE
                        {   nameData            NameData,
                            characterSet        CharacterSet OPTIONAL  }
                        - -  If characterSet is not included, iso8859-1 is implied.

CharacterSet    ::=   INTEGER
                        {   unknown (0),
                            iso8859-1 (1),
                            t-61(2)  }  (0..255)
                        - -  The character set "iso8859-1" is specified in International
                        - -  Standard ISO 8859-1.
                        - -  The character set "t-61" is specified in CCITT Recommendation T.61.
                        - -  Other character sets might be added in further editions of this ETS.
```

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:



xxx.inv	Invoke PDU for operation xxx
xxx.res	Return result PDU for operation xxx
xxx.err	Return error PDU for operation xxx
xxx.rej	Reject PDU for operation xxx

2 The figures show messages exchanged via Protocol Control between PTNXs 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;

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.

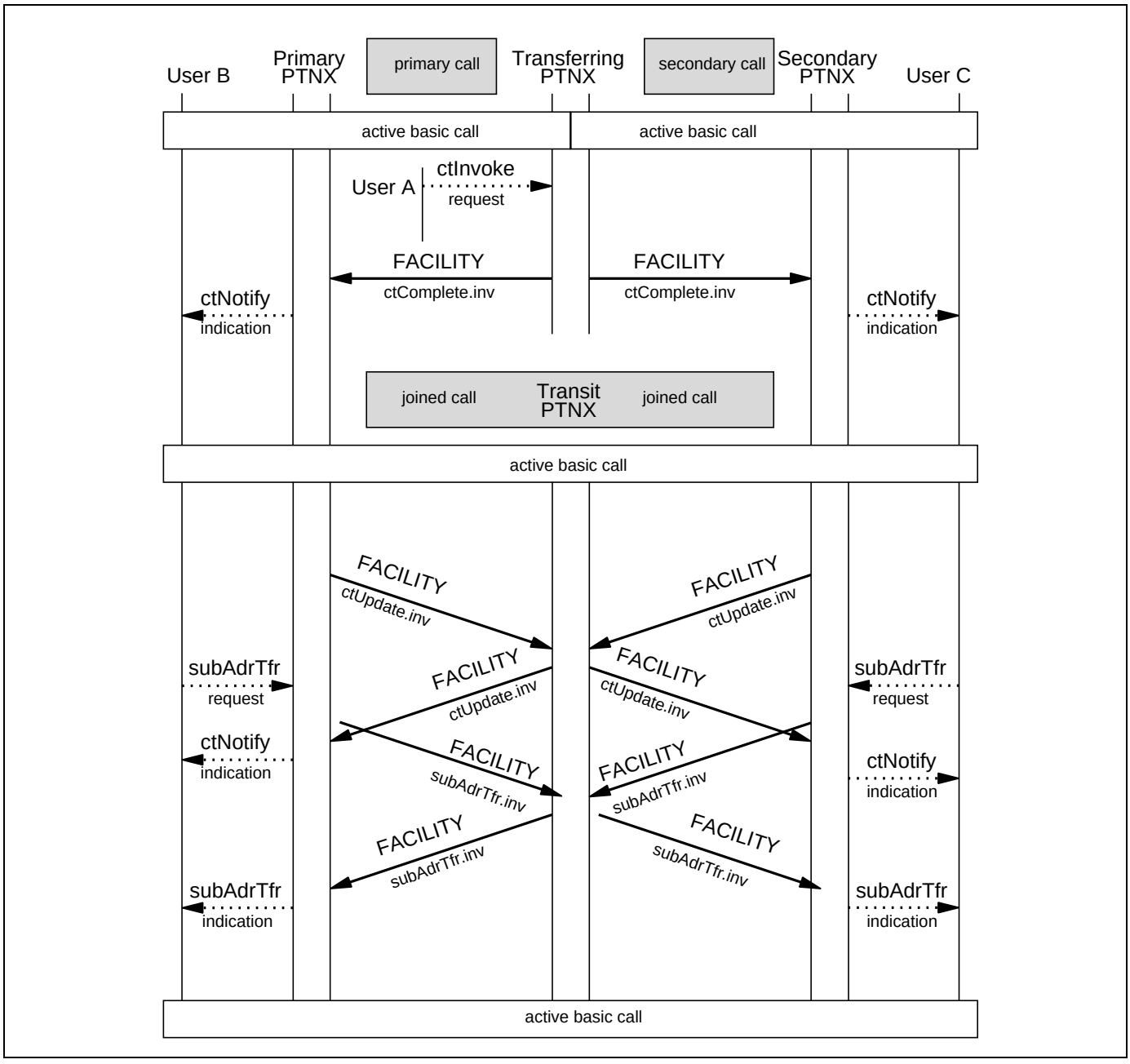


Figure C.1 - Message sequence for normal operation of SS-CT, join calls in Active

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.

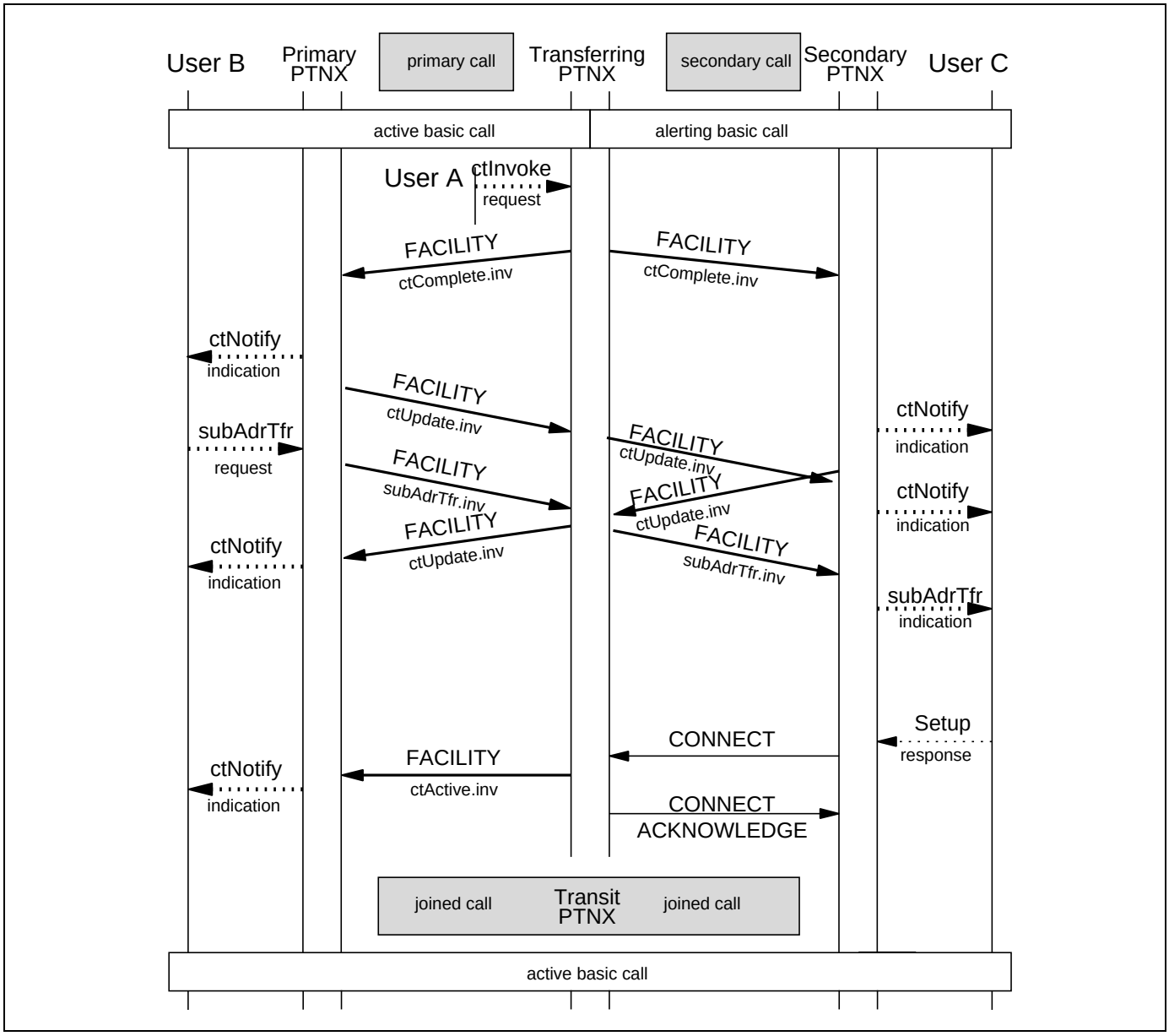


Figure C.2 - Message sequence for normal operation of SS-CT, join Active and Alerting call

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

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

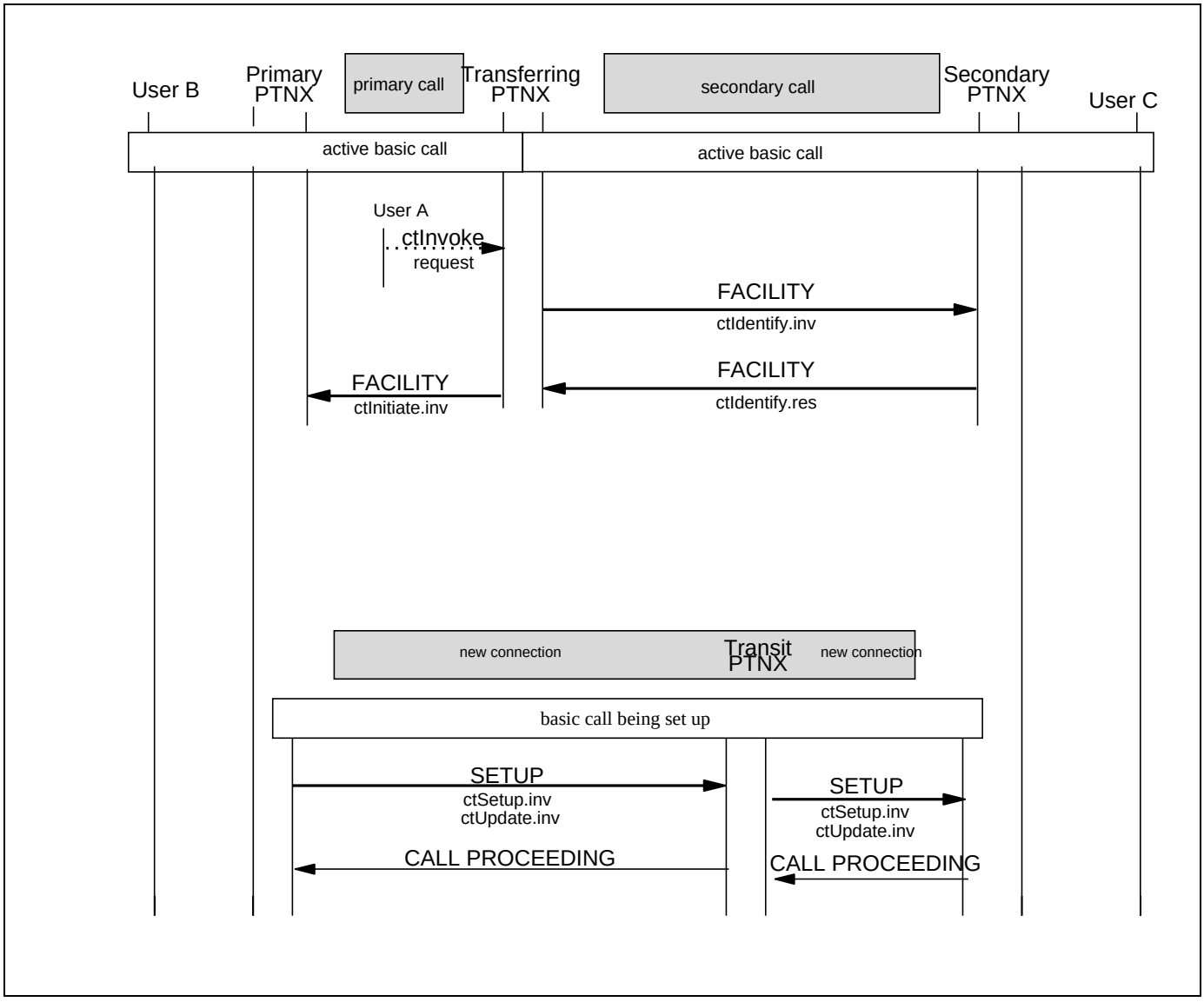


Figure C.3 (sheet 1 of 2) - Message sequence for Call Transfer by rerouting, both calls Active

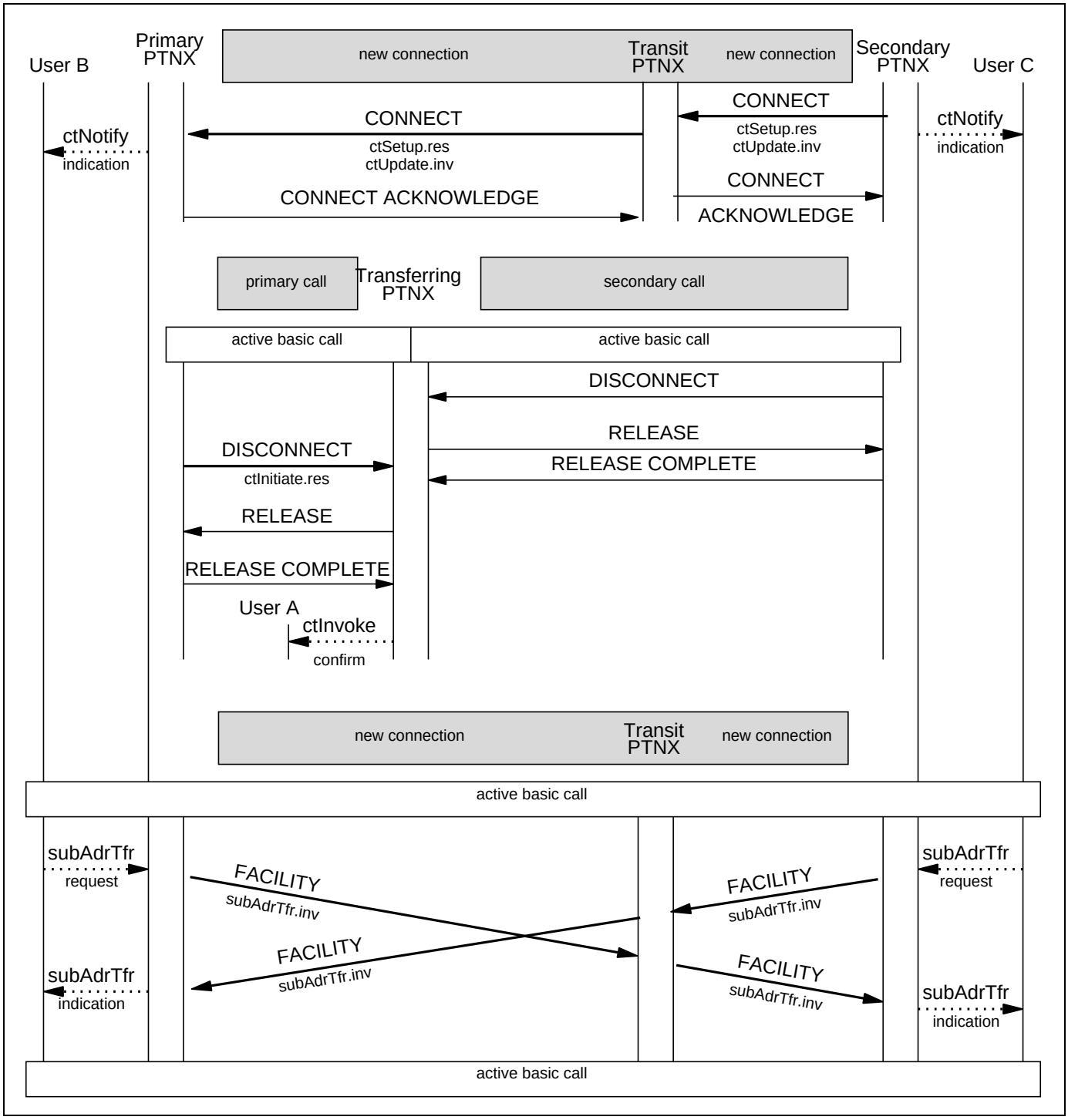


Figure C.3 (sheet 2 of 2) - Message sequence for Call Transfer by rerouting, both calls Active

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

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

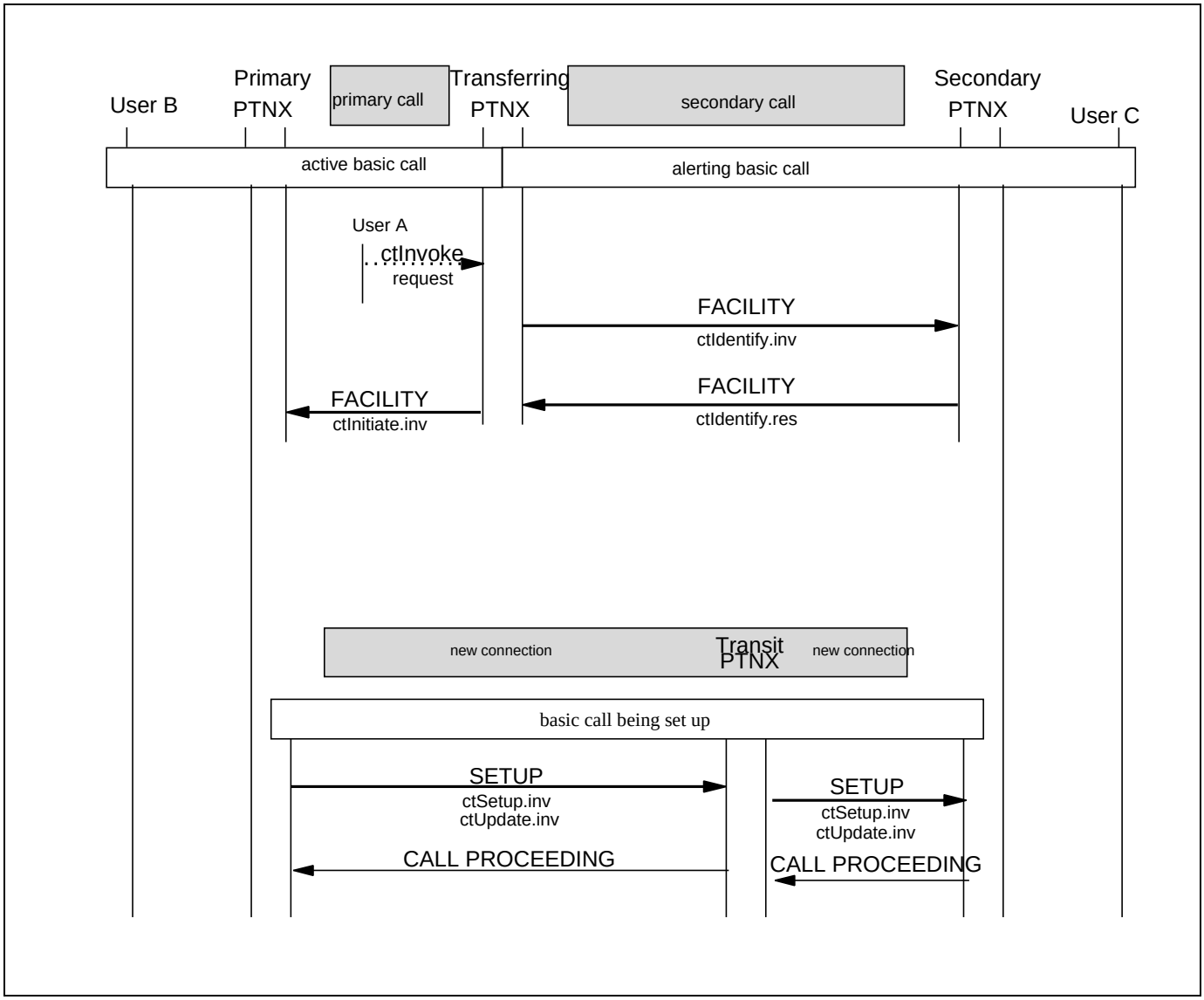


Figure C.4 (sheet 1 of 2) - Message sequence for Call Transfer by rerouting, one call Active, one Alerting

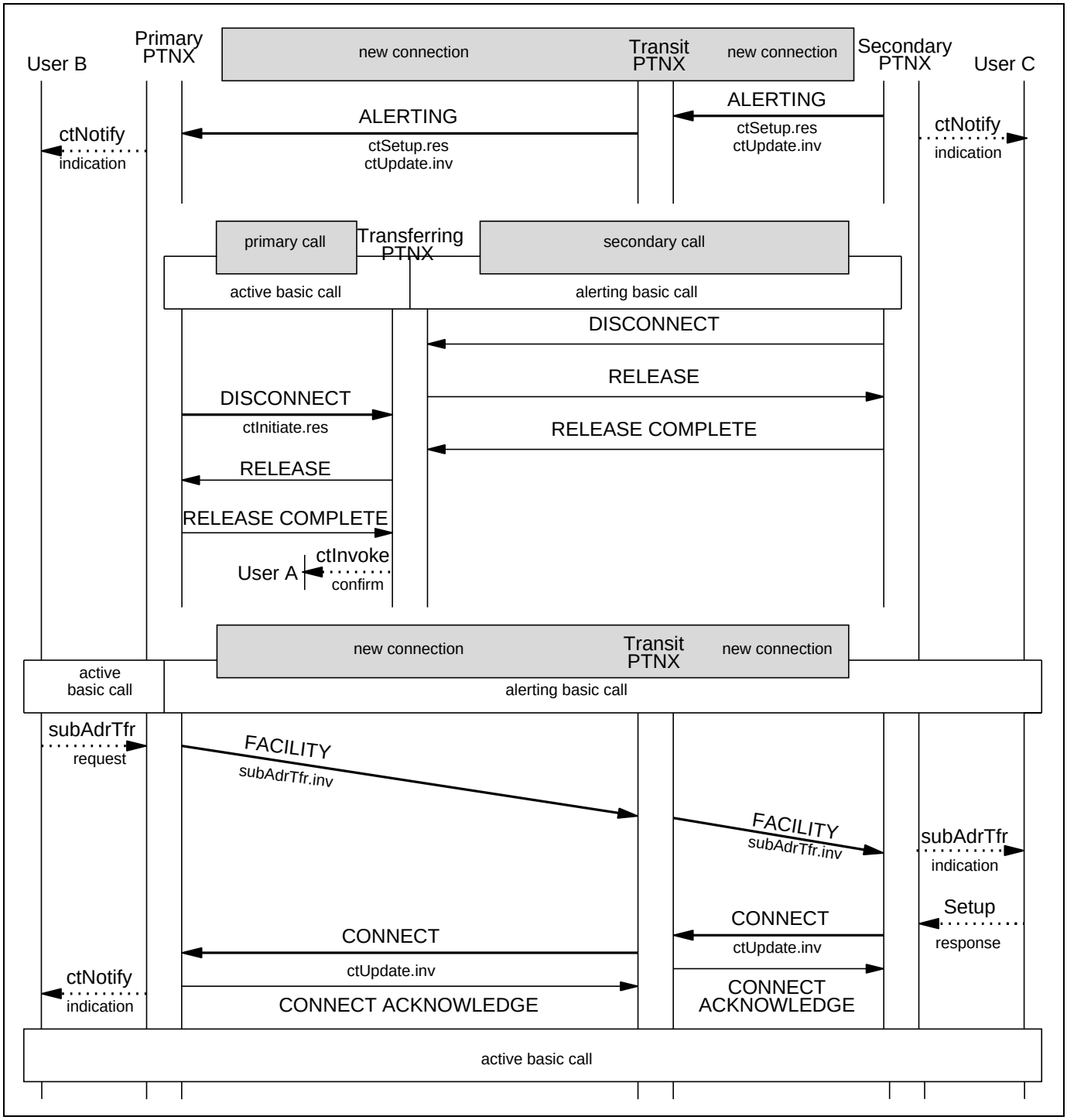


Figure C.4 (sheet 2 of 2) - Message sequence for Call Transfer by rerouting, one call Active, one Alerting

Annex D (informative): Specification and Description Language (SDL): Representation of procedures

The diagrams in this annex use the Specification and Description Language defined in CCITT Recommendation Z.100 (1988).

Each diagram represents the behaviour of a SS-CT Supplementary Service Control entity at a particular type of PTNX. In accordance with the protocol model described in ETS 300 239, the Supplementary Service Control entity uses, via the Co-ordination Function, the services of Generic Functional Transport Control and Basic Call Control.

Where an output symbol represents a primitive to the Co-ordination Function, and that primitive results in a 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 ETS 300 172, basic call actions associated with the sending of that message are deemed to occur.

Where an input symbol represents a primitive from the Co-ordination Function, and that primitive results from a 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 ETS 300 172, basic call actions associated with the receiving of that message are deemed to occur.

The following abbreviations are used:

inv	invoke APDU;
res	return result APDU;
err	return error APDU;
rej	reject APDU;
ctIdentify	callTransferIdentify;
ctInitiate	callTransferInitiate;
ctSetup	callTransferSetup;
ctAbandon	callTransferAbandon;
ctActive	callTransferActive;
ctComplete	callTransferComplete;
ctUpdate	callTransferUpdate;
subAdrTfr	subaddressTransfer.

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

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

Input signals from the right and output signals to the right represent primitives to and from the Co-ordination 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.

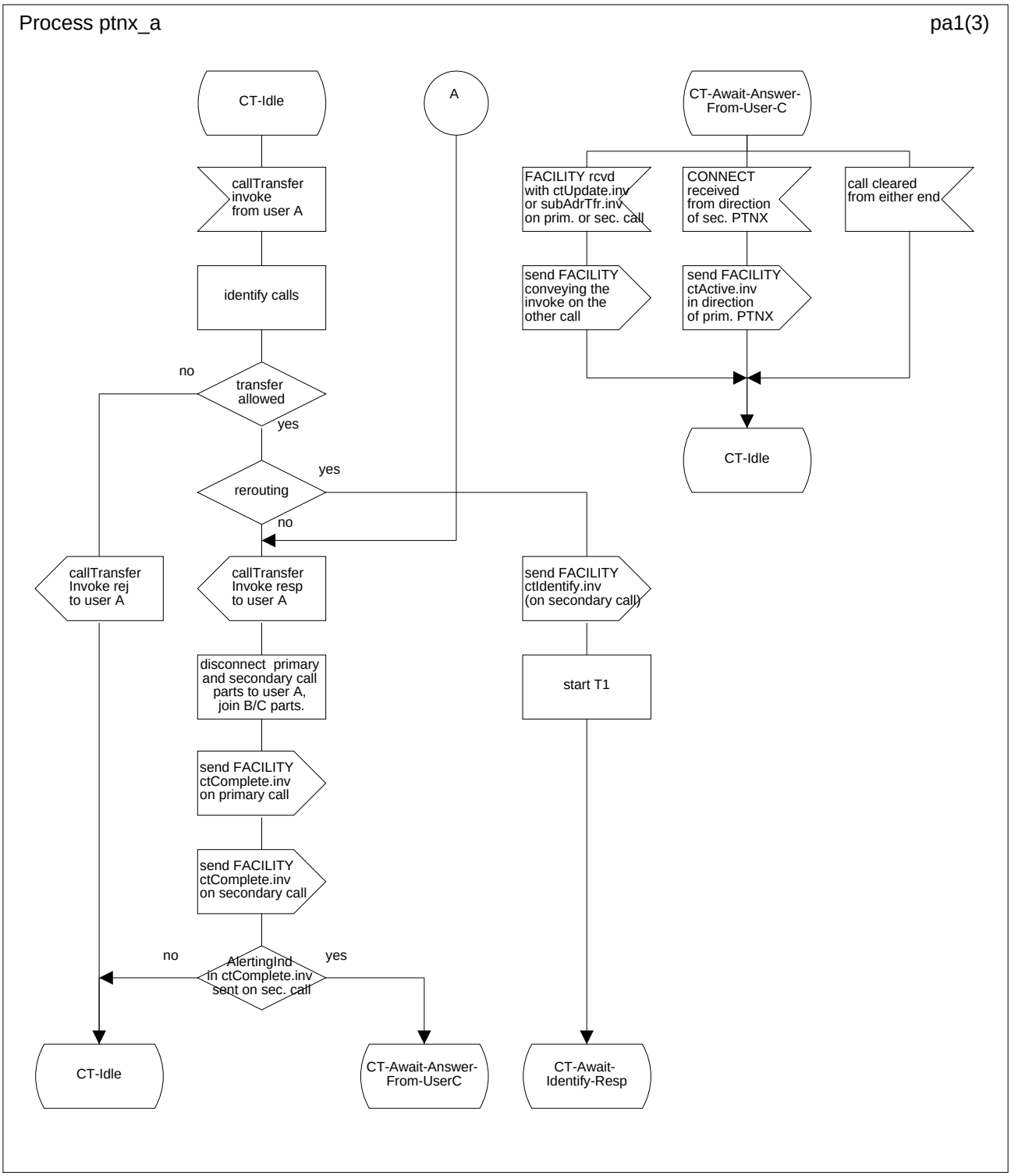


Figure D.1 (sheet 1 of 3) - Transferring PTNX SDL

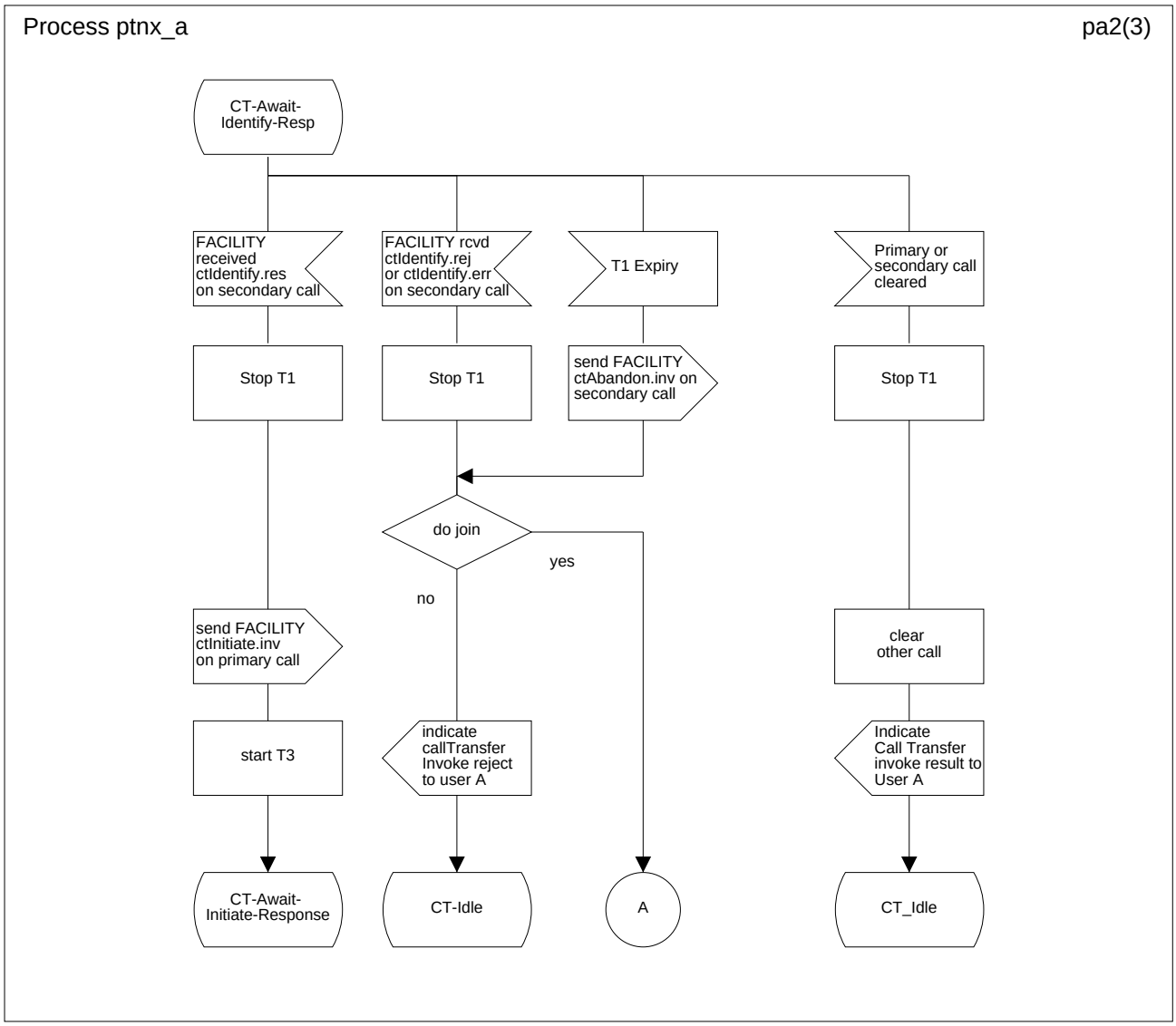


Figure D.1 (sheet 2 of 3) - Transferring PTNX SDL

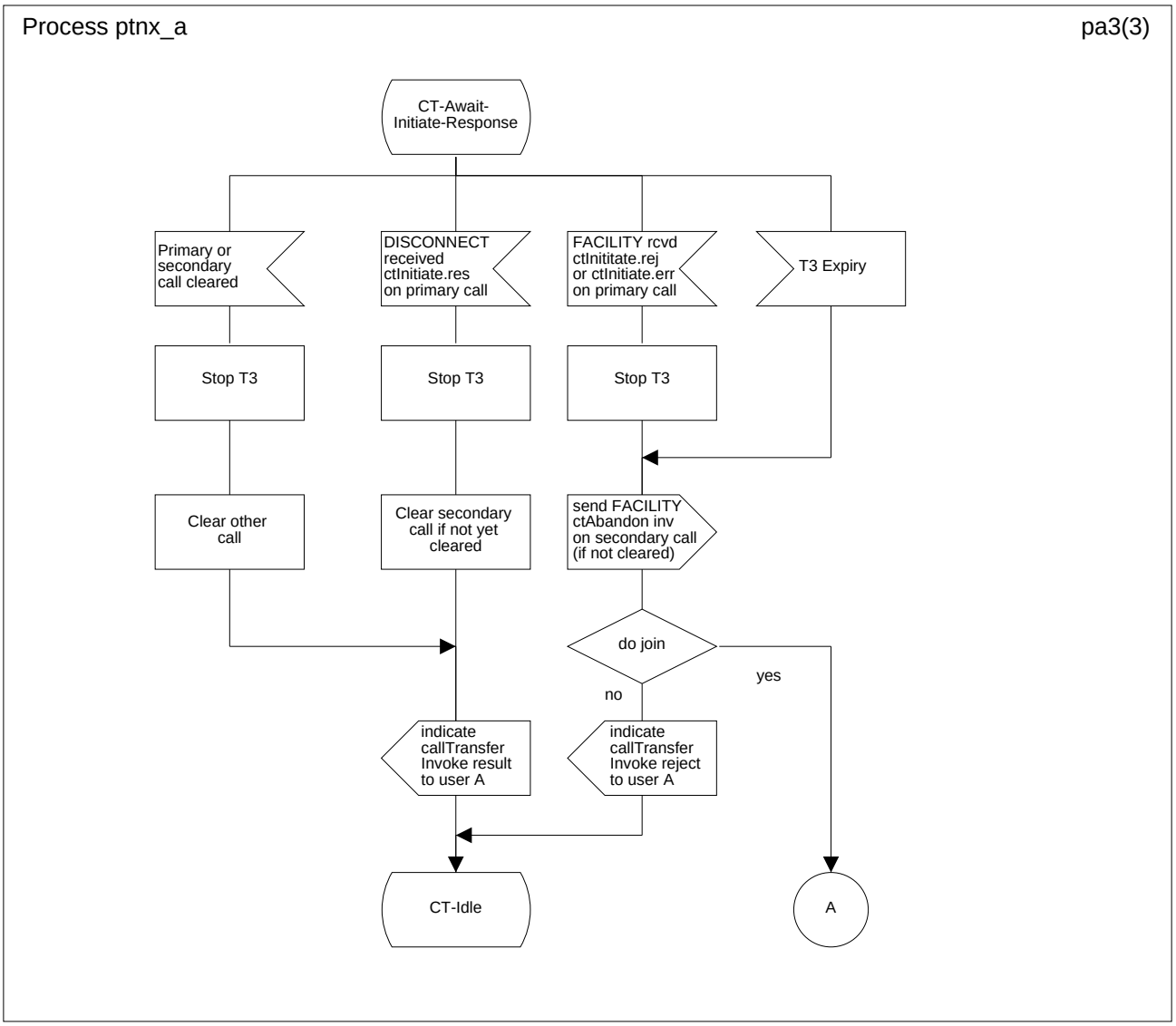


Figure D.1 (sheet 3 of 3) - Transferring PTNX SDL

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

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

Input signals from the left and output signals to the left represent primitives to and from the Co-ordination 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.

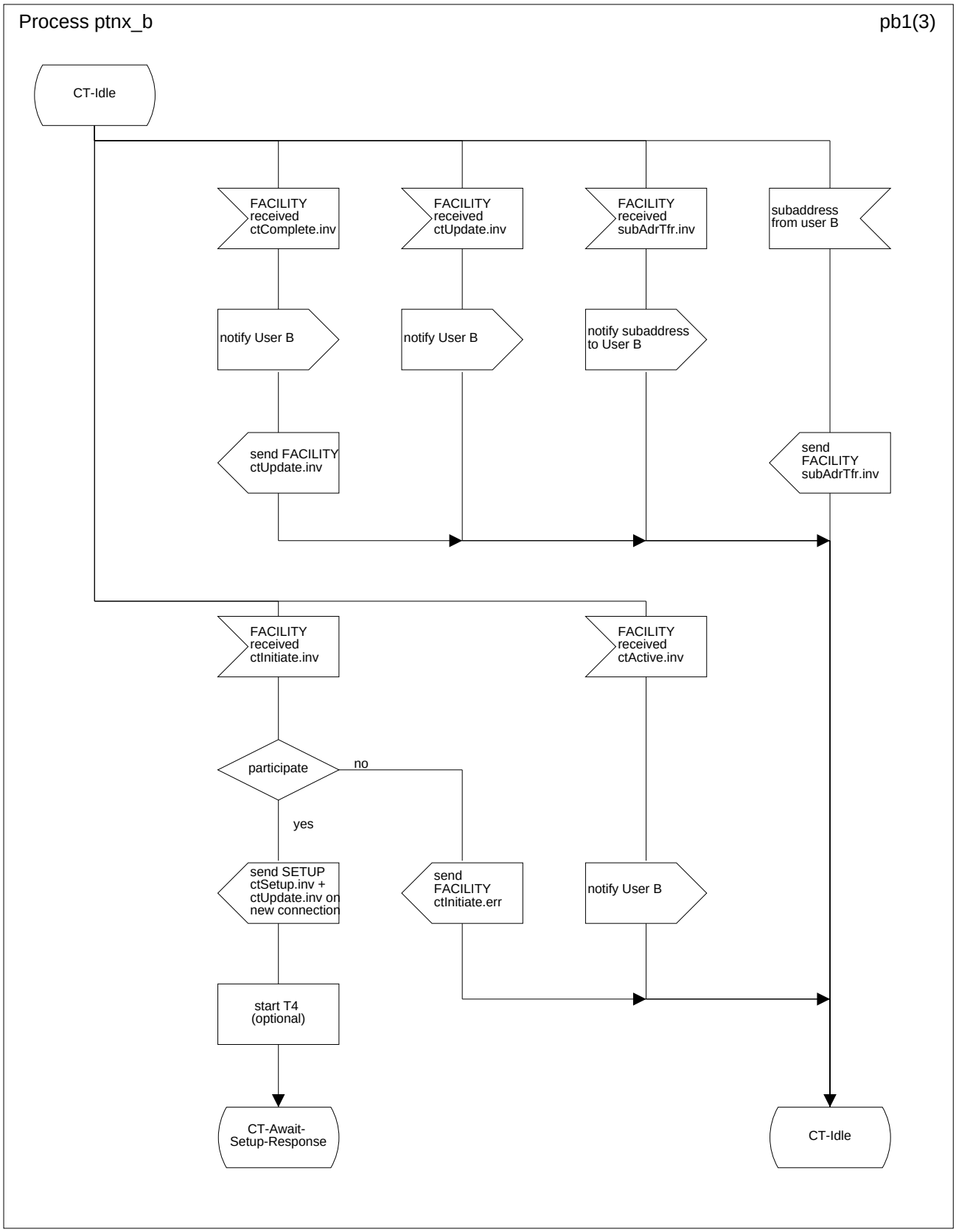


Figure D.2 (sheet 1 of 3) - Primary PTNX SDL

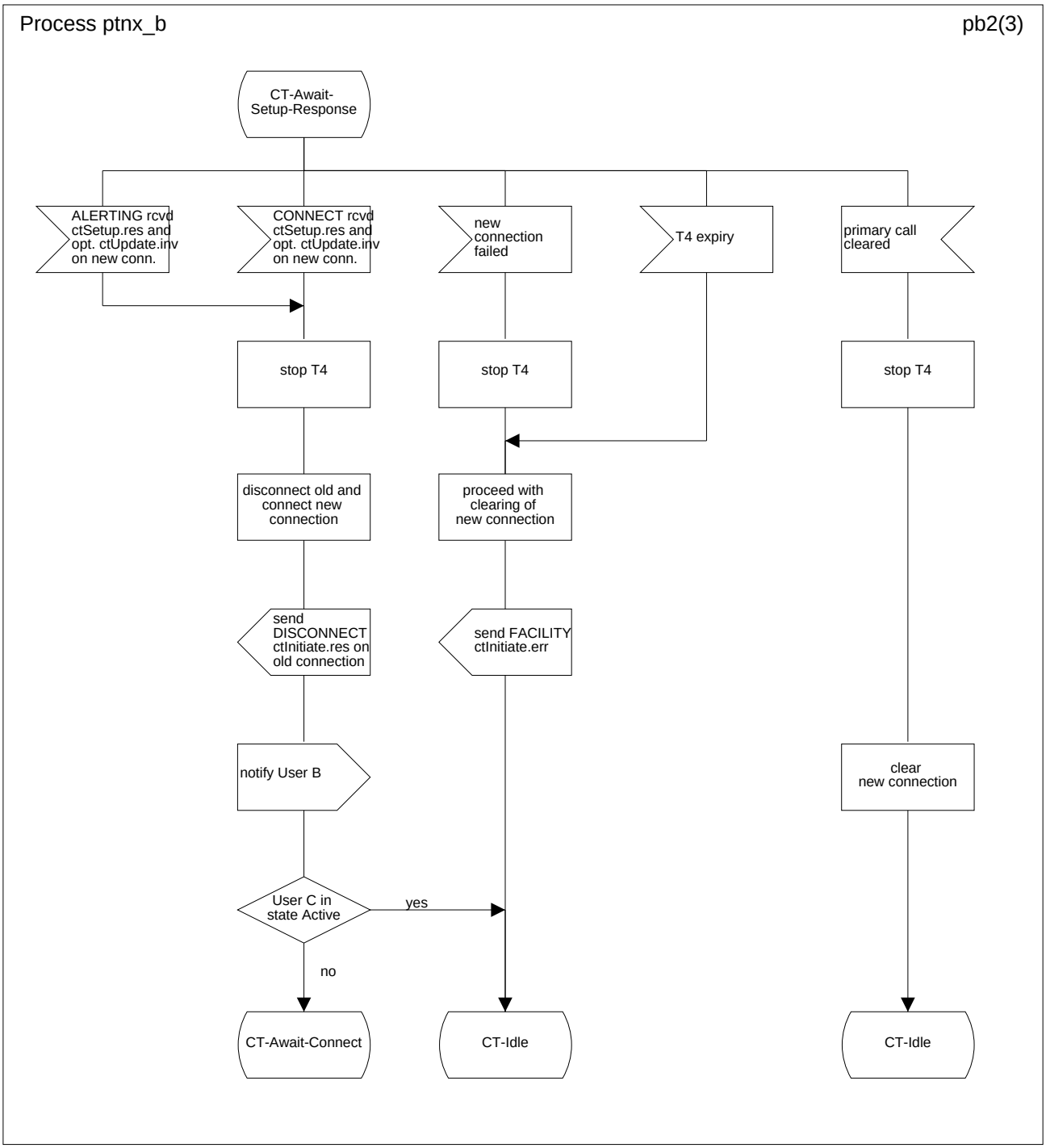


Figure D.2 (sheet 2 of 3) - Primary PTNX SDL

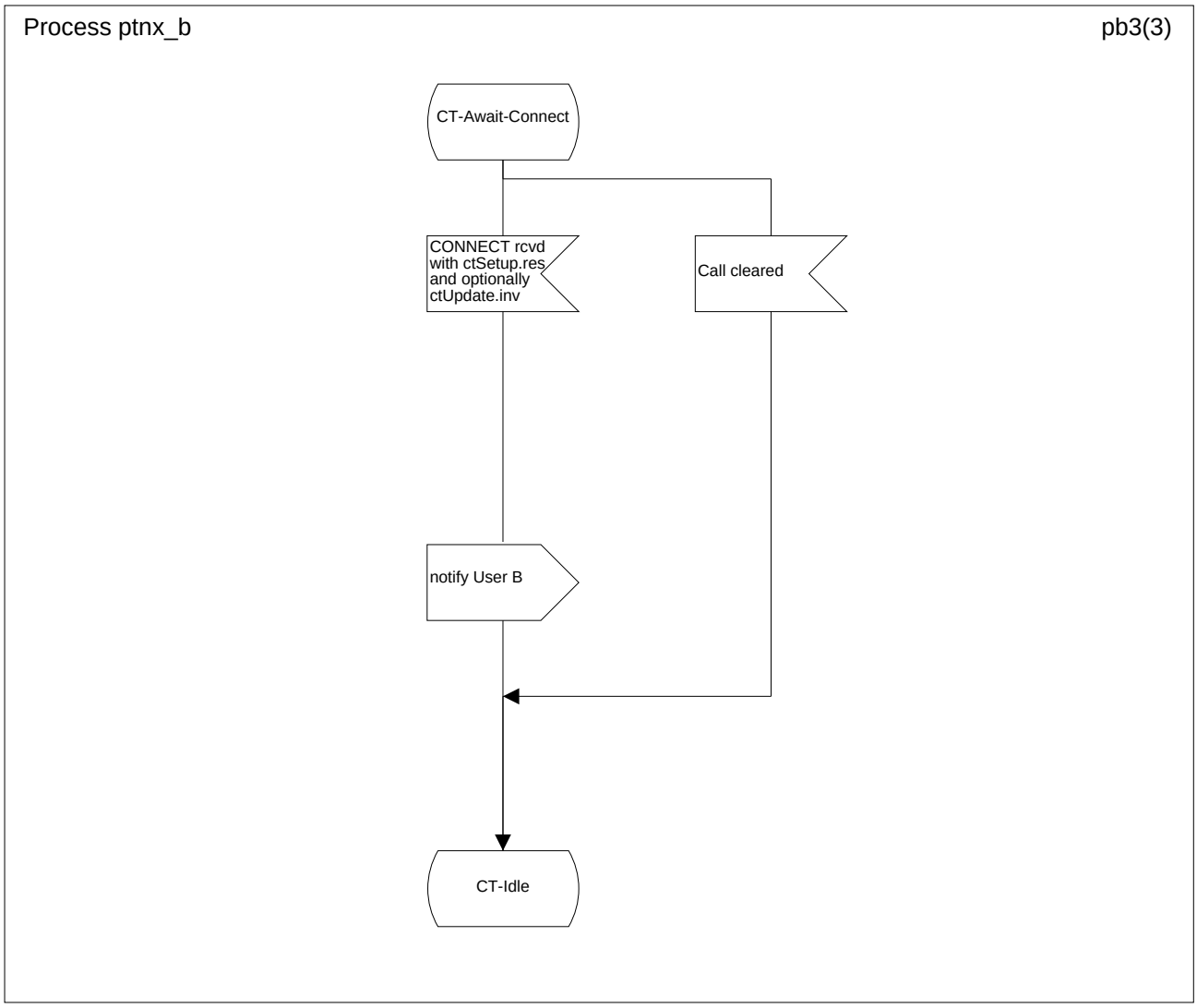


Figure D.2 (sheet 3 of 3) - Primary PTNX SDL

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

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

Input signals from the left and output signals to the left represent primitives to and from the Co-ordination 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.

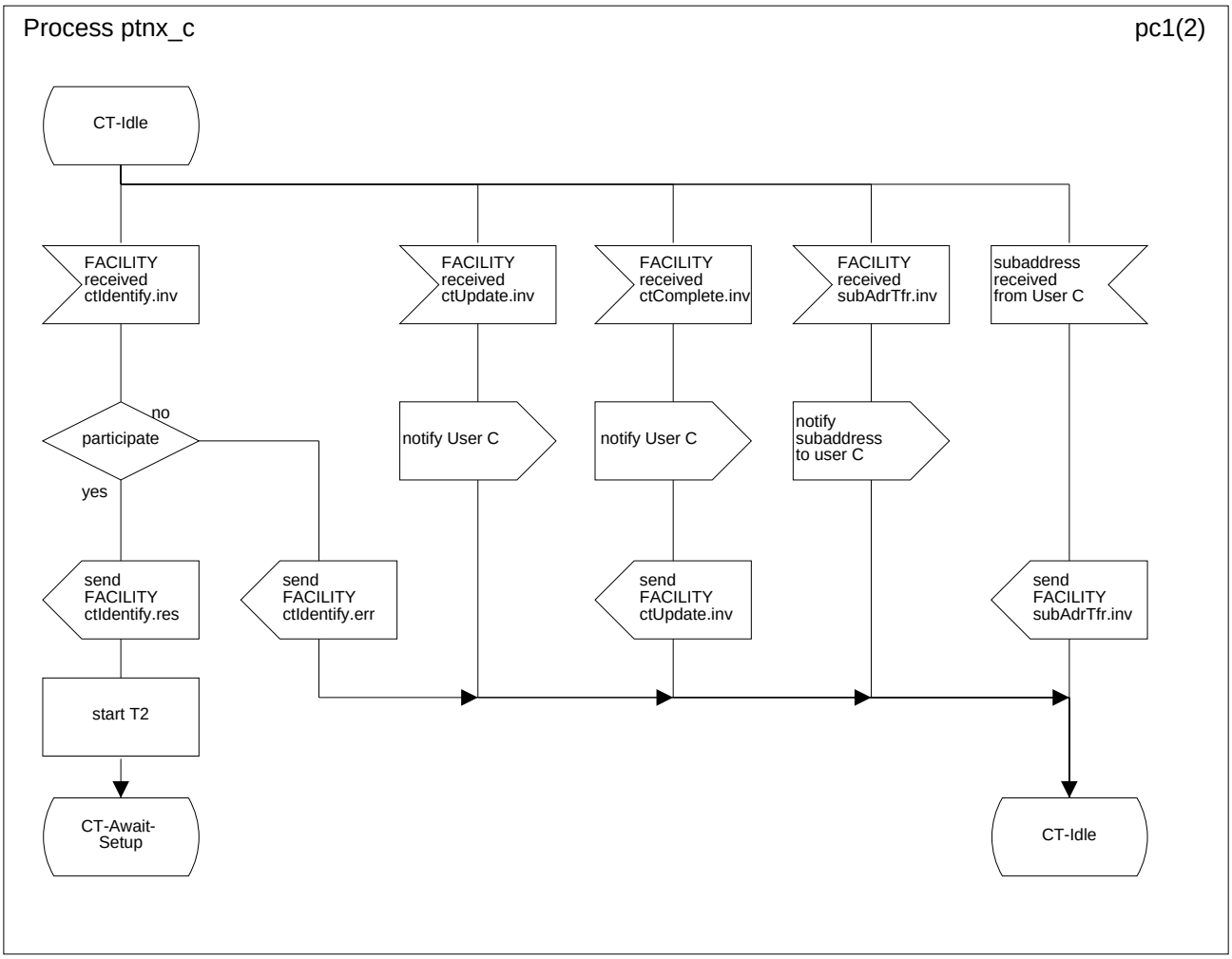


Figure D.3 (sheet 1 of 2) - Secondary PTNX SDL

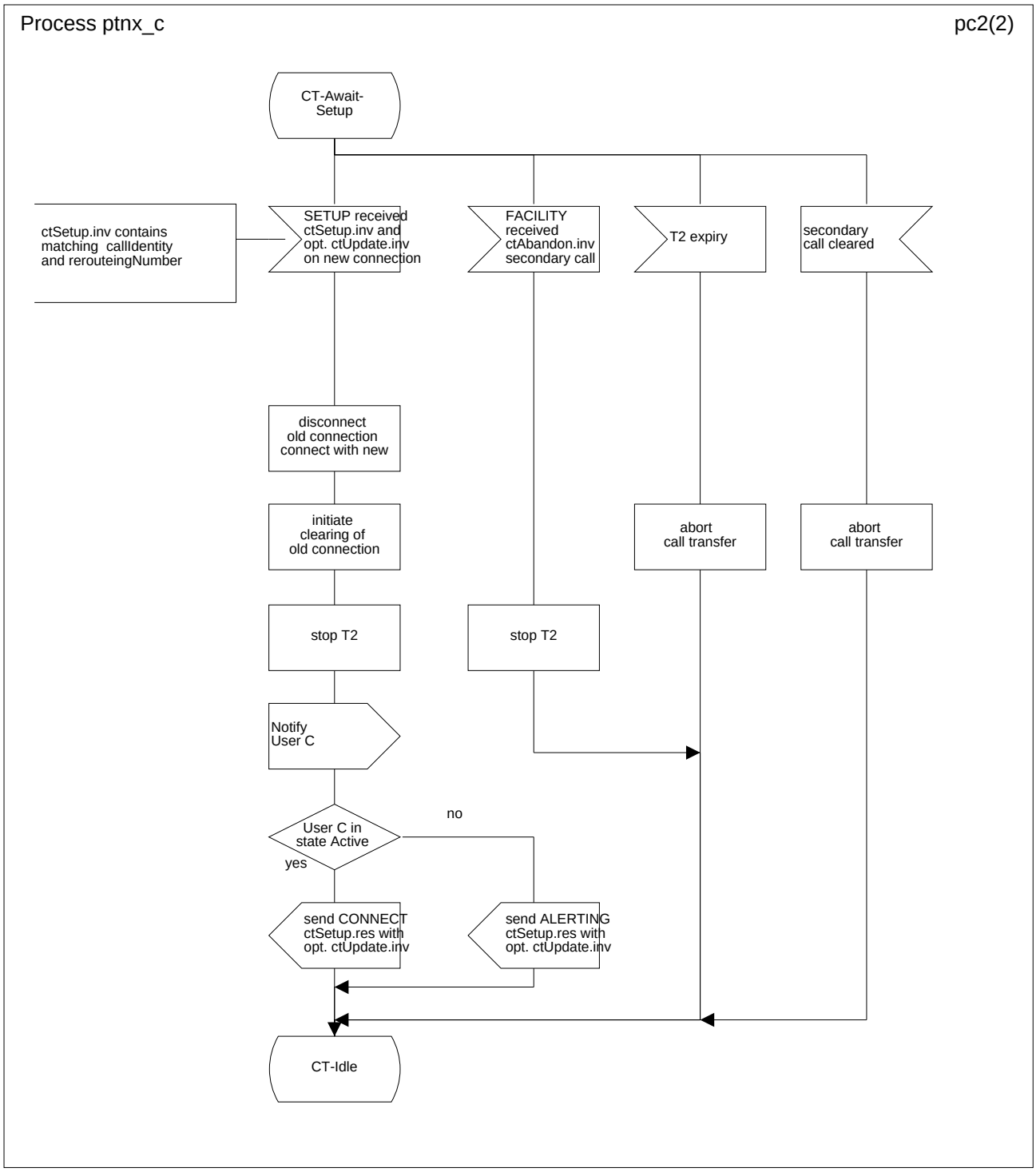


Figure D.3 (sheet 2 of 2) - Secondary PTNX SDL

History

Document history	
November 1993	First Edition
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